
**APPENDIX D: SUPPORTING INFORMATION ON BOUNDARY
EVALUATION**

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This appendix provides supporting information for the Boundary Evaluation Action Plan (Section III). The sanctuary boundary concepts described below were developed in 2000 and 2001 as preliminary working draft options. They were designed to represent a range of potential modifications to the existing Sanctuary boundary.

The boundary concept maps were developed by CINMS staff working in close public consultation with the Sanctuary Advisory Council. These maps depict working versions, not final versions, of possible boundary alternatives. These concepts will be analyzed in a future supplemental environmental impact statement (SEIS), which will include information from a biogeographic study being conducted by NOAA's National Centers for Coastal and Ocean Science. Summary information about the biogeographic study is also presented in this Appendix. The forthcoming SEIS will present an analysis of boundary alternatives to the public. Public comments will be solicited and responded to before a decision on boundary change, if any, is made by NOAA in the future.

Boundary Concepts

Boundary Concept 1

Boundary Concept 1 includes the entire management plan study area, plus an additional portion over the Santa Lucia bank. At 6,707 square nm, it covers the largest area of all boundary concepts. It encompasses the widest range and variety of habitats. Boundary Concept 1 also encompasses the greatest variety of uses and is adjacent to 150 miles of mainland coastline. Human uses encompassed include oil and gas exploration and development, commercial and recreational fishing, other types of recreation, harbors, watersheds, and military use. There are 39 developed oil and gas leases included within Boundary Concept 1. This is the only boundary concept including coastal areas adjacent to harbors.

Boundary Concept 1A

Boundary Concept 1A encompasses 6,038 nm (squared). Like Concept 1, it includes examples of the features making this area a unique environment: the conjunction of two biogeographic provinces as well as the transition area between the two. It also encompasses a range of human activities as varied as Concept 1, except for the exclusion of offshore oil and gas leases and coastal ports and harbors. As is also the case for Concept 1, the Concept 1A area is noted for encompassing a transition zone between two distinct biogeographical coastal provinces, where the cold temperate waters of the California Current flowing from the north meet the warm temperate waters of the of the California Countercurrent. Concept 1A also includes mainland coastal area of approximately 150 miles.

The outer boundary of Concept 1A extends slightly north of Point Sal on the north, extends to include a section west of the coast approximately 80 nm east to west and 50 nm from north to south. South of this westernmost section, Boundary Concept 1A encompasses the Santa Barbara Channel and areas from approximately 10 to 20 nm south of the existing Sanctuary boundary. Moving east south of the existing Sanctuary,

Boundary Concept 1A then drops south to include the existing Sanctuary around Santa Barbara Island. The boundary then heads north, ending at Point Mugu. The boundaries of Concept 1A were also discreetly drawn around state and federal outer continental shelf (OCS) oil and gas leases. In addition, the boundary as it pertains to ports and harbors uses as a baseline the Colreg Line as currently depicted on nautical charts, with adjustments for harbor construction occurring since the line was drawn.

Boundary Concept 2

Boundary Concept 2 encompasses 4,127 square nm, or 62 percent of Boundary Concept 1. Unlike Concepts 1 and 1A, the mainland coastal component of Concept 2 is begins at Gaviota and extends north Point Sal. Thus, Concept 2 is not adjacent to more urbanized areas of the mainland coast. As with Concept 1 and 1A, Boundary Concept 2 also includes a wide diversity of marine habitats and species, and examples of the features making this area a unique environment: the conjunction of two biogeographic provinces as well as the transition area between the two.

Boundary Concept 3

Boundary Concept 3 encompasses 2,862 square nm. Concept 3 includes a limited connection to a section of rural mainland coast extending from the southern boundary of Vandenberg Air Force Base south past Point Conception and east past Cojo Anchorage. A distinguishing feature of Concept 3 is the mainland coastal component extends to the coast without overlapping state or federal oil and gas leases, and without adjoining any urban coastal areas.

Boundary Concept 4

Boundary Concept 4 includes only offshore areas, and does not contact the coast. This concept encompasses 2,385 square nm, which is 36 percent of Boundary Concept 1. This concept is only slightly larger than then existing Sanctuary, and features a contiguous connection to Santa Barbara Island.

Concept 4 encompasses a larger area than the existing Sanctuary, providing a contiguous connection between the northern Channel Islands and Santa Barbara Island. As with Concepts 1, 1A, and 2, Boundary Concept 4 includes important offshore physical features, including portions of the Santa Barbara Basin. Concept 4 does not include habitats associated with the mainland coast, such as mainland kelp beds, wetlands, and linkages to coastal watersheds. It includes portions of the gray whale migration route, seabird foraging areas, and other important biological features.

Boundary Concept 5

Boundary Concept 5 encompasses 1,411 square nm and is closest among the concepts to the existing Sanctuary boundary. Concept 5 essentially squares off the existing curved Sanctuary boundary. Like Concept 4, Concept 5 does not include areas of the mainland coast and its associated coastal features and habitats. Concept 5 includes all the unique island habitats but without the connection to Santa Barbara Island.

Boundary Concept Maps and Data Attribute Tables

Figures 60-61 show the boundaries of boundary concept. Tables 29 and 30 compare various human use activities and environmental features occurring within each of the boundary concepts.

Figure 55: Map Of Boundary Concept 1

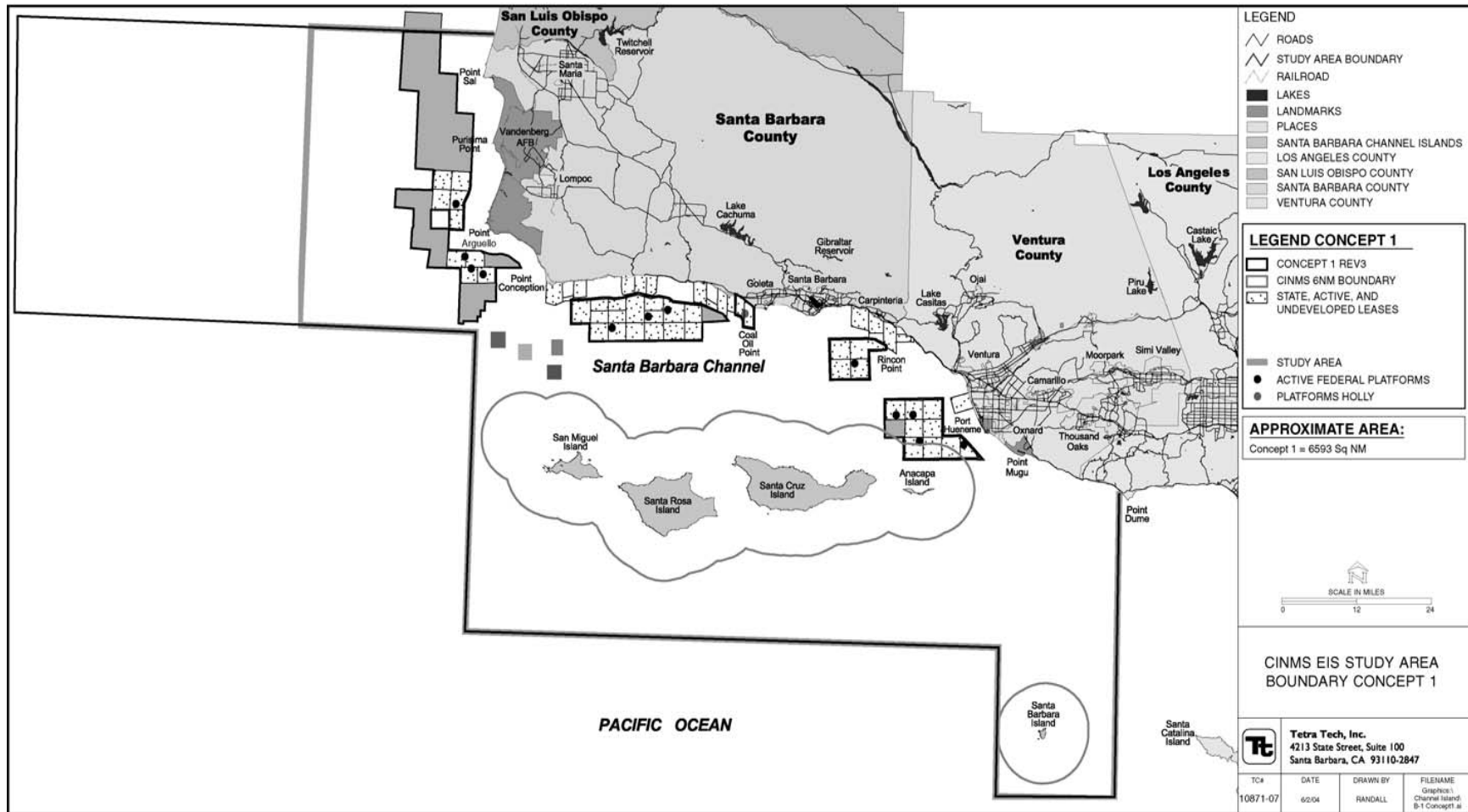


Figure 56: Map Of Boundary Concept 1A

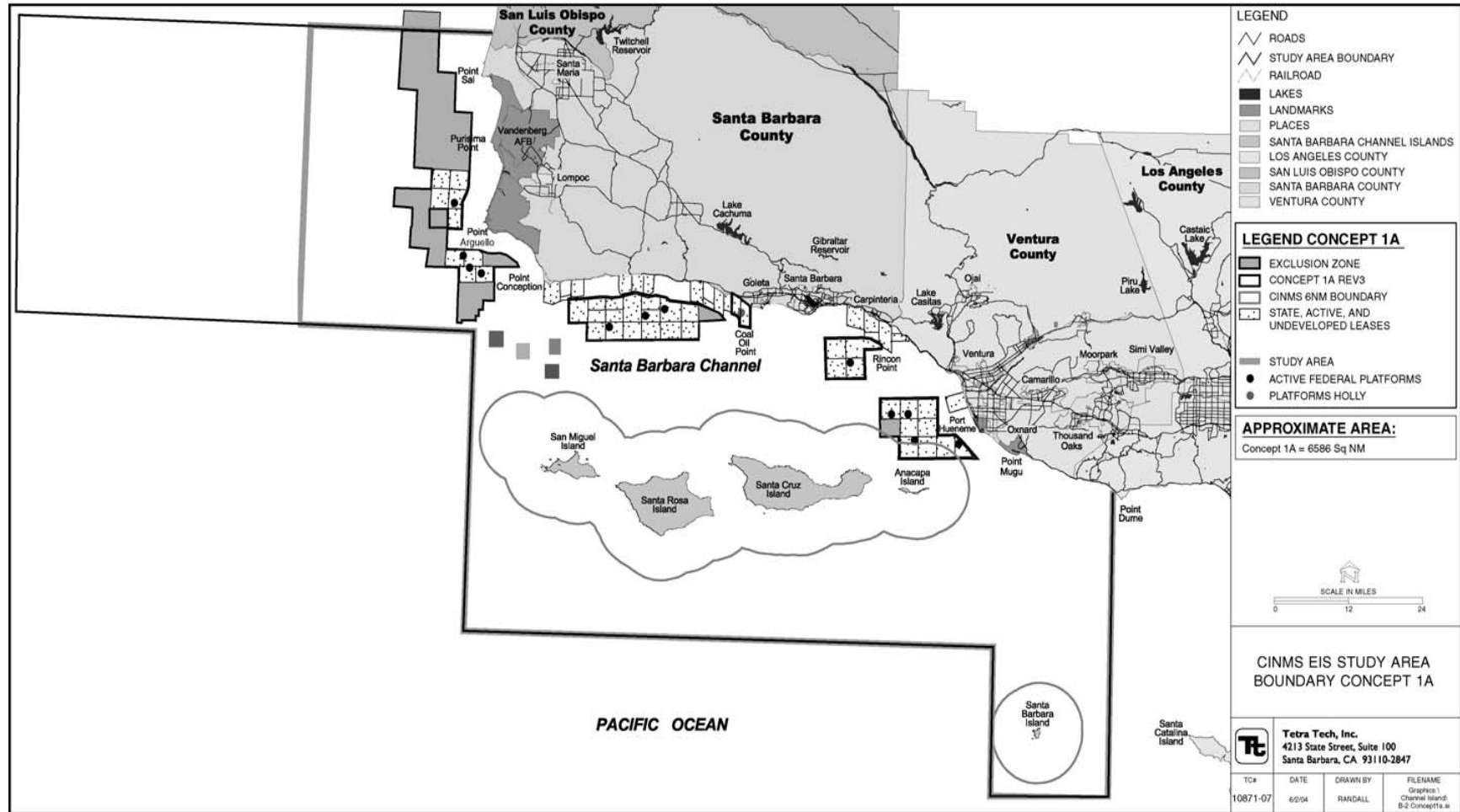


Figure 57: Map Of Boundary Concept 2

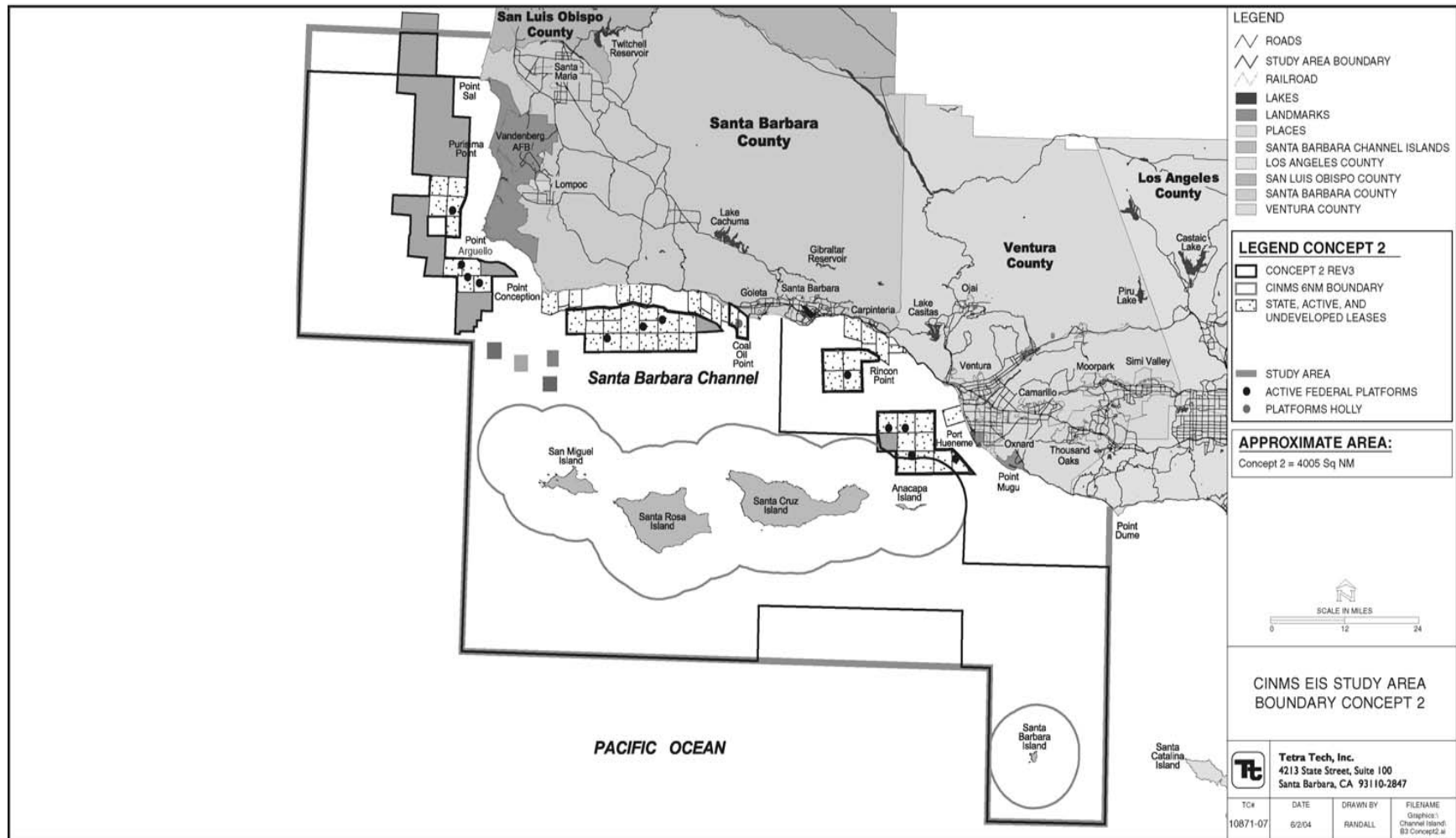


Figure 58: Map of Boundary Concept 3

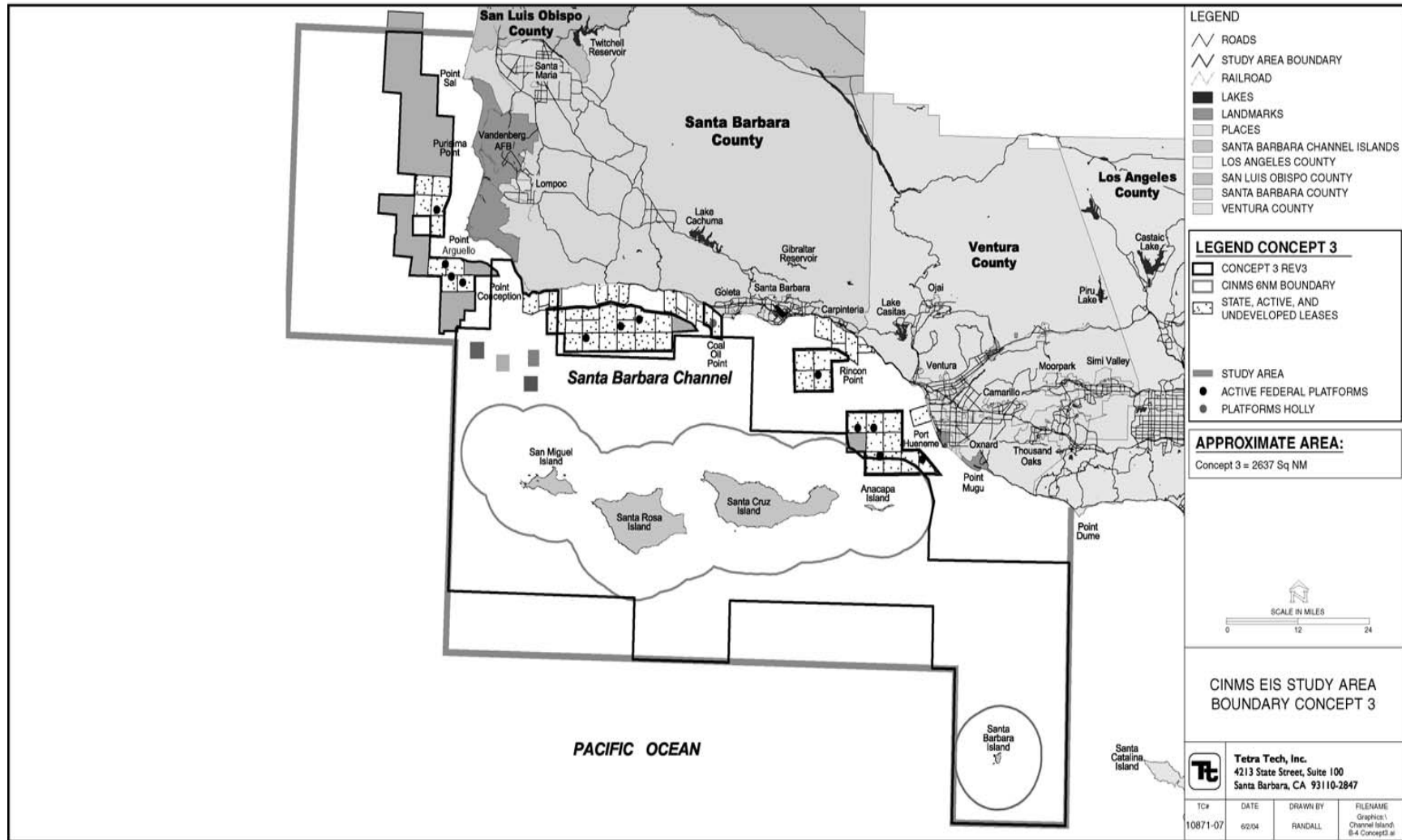


Figure 59: Map Of Boundary Concept 4

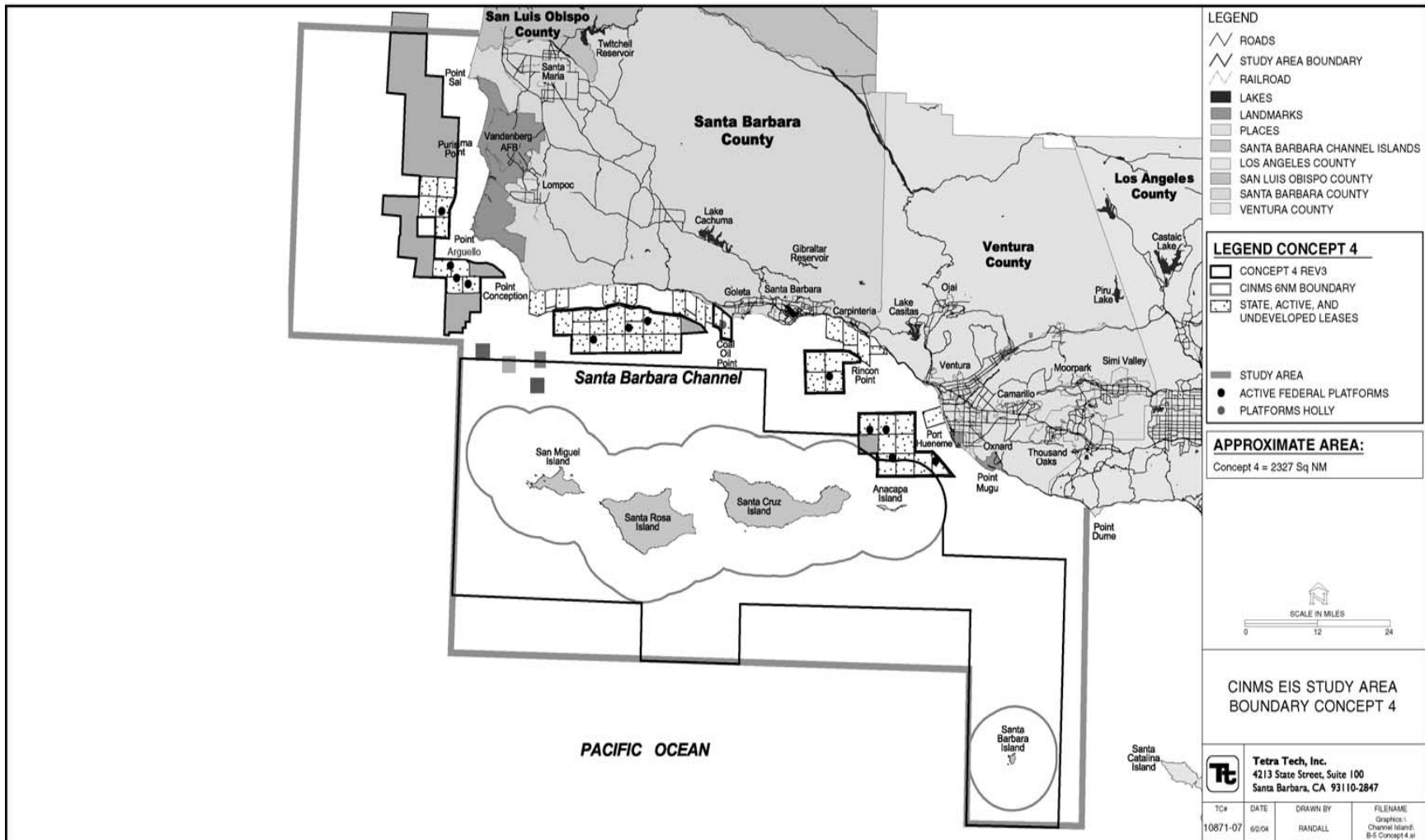


Figure 60: Map Of Boundary Concept 5

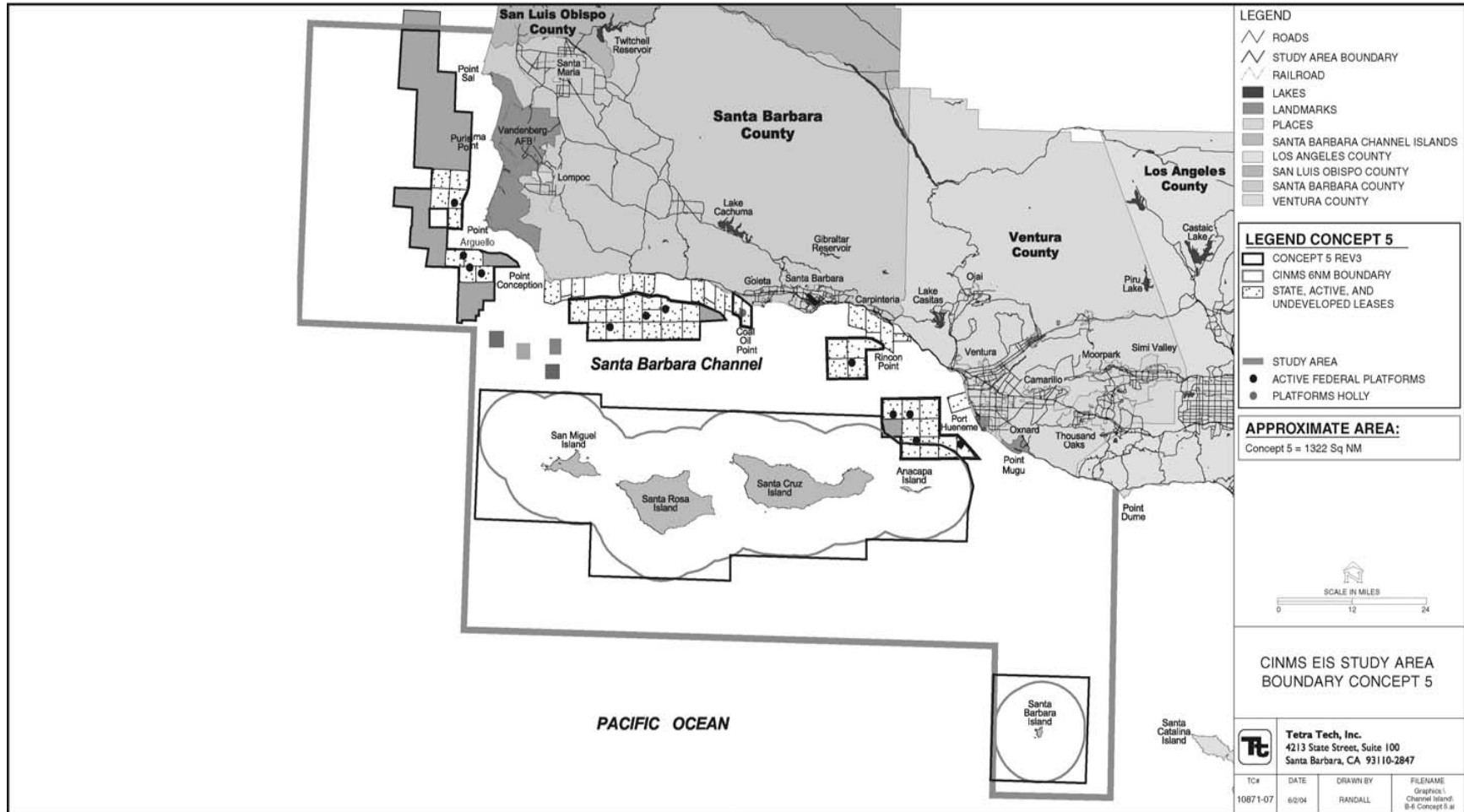


Table 28: Comparison of Human Use Attributes for Boundary Concepts

USES	Significance of Use	Study Area	Status Quo	Preliminary Boundary Concept					
				1	1A	2	3	4	5
Number of harbors	<ul style="list-style-type: none"> Focus of commercial and recreational activities. Source of pollutants from vessel-related activity and maintenance. Source of pollutants from dredging, and from construction and maintenance of piers. 	4	0	4	0	0	0	0	0
Number of commercial fish blocks	<ul style="list-style-type: none"> Impact of concentrated human activity on ecological balance. Impacts from various gear types. 	89	27	89	54	58	43	40	27
Number of military installations	<ul style="list-style-type: none"> Concentration of human activity. Support military activities impacting Sanctuary. 	4	0	4	1	1	1	0	0
Miles of Vandenberg AFB coastline	<ul style="list-style-type: none"> Source of launch, helicopter, and flight test noise impacts. Source of debris disposal into Sanctuary waters. 	35	0	35	35	35	3	0	0
Percentage of concept included in Sea Range	<ul style="list-style-type: none"> Source of noise and explosion impacts. Source of debris disposal. 	70%	95%	80%	55%	75%	70%	90%	95%
Number of producing state oil and gas leases	<ul style="list-style-type: none"> Potential source of environmental pollution. Visual impacts of platforms and facilities. Impacts from decommissioning. 	2	0	2	0	0	0	0	0
Number of producing federal oil and gas leases	<ul style="list-style-type: none"> Potential source of environmental pollution. Visual impacts of platforms and facilities. Impacts from decommissioning. 	19	0	19	0	7	0	0	0
Number of potentially developed federal oil and gas leases	<ul style="list-style-type: none"> Impacts from seismic studies. Impacts from disturbance of the seabed. Impacts from discharge. 	75	0	75	0	62	0	0	0
Percentage of area encompassed by producing or potentially producing oil and gas leases	<ul style="list-style-type: none"> Source of ocean disposal (muds and cuttings). Focus of human activity. Impacts from seismic studies. Impacts from disturbance of the seabed. Impacts from discharge. Potential source of environmental pollution. Visual impacts of platforms and facilities. Impacts from decommissioning. 	9%	0%	9%	0%	11%	0%	0%	0%
Number of active oil and gas support facilities (piers, etc.)	<ul style="list-style-type: none"> Support activities impacting offshore areas. Potential source of environmental pollution. Visual impacts of facilities. 	37	0	37	0	16	0	0	0
Number of aquaculture facilities	<ul style="list-style-type: none"> Potential for introduction of exotic species. Potential impacts on water quality and benthic habitats. 	10	0	10	2	2	0	0	0

Table 28: Comparison of Human Use Attributes for Boundary Concepts

USES	Significance of Use	Study Area	Status Quo	Preliminary Boundary Concept					
				1	1A	2	3	4	5
Number of desalination plants	<ul style="list-style-type: none"> Discharge plume supports only species with broad salinity tolerances Potentially toxic trace elements concentrate in surface layer above discharge plume. Impacts from species entrainment in intakes. 	2	0	2	1	1	0	0	0
Number of Outfalls	<ul style="list-style-type: none"> Source of marine pollution. Sources of pollution to breeding and juvenile development areas for coastal and offshore species. 	10	0	10	4	4	3	0	0
Percent of VTSS within Concept	<ul style="list-style-type: none"> Ships are a source of exotic species. Source of marine pollution. Source of air pollution and noise. Safety issues. 	100%	25%	100%	75%	75%	60%	50%	30%
Percent of area used for recreation (visual estimate)	<ul style="list-style-type: none"> Source of noise disturbance. Source of debris disposal. 	50%	50%	50%	35%	35%	30%	40%	50%

Table 29: Comparison of Environmental Attributes for Boundary Concepts

ATTRIBUTES	Significance of Attribute	Study Area	Status Quo	Preliminary Boundary Concept					
				1	1A	2	3	4	5
Total square miles	<ul style="list-style-type: none"> Indicator of ecosystem representation. 	8,882	1,658	8,882	7,996	5,009	3,790	3,159	1,869
Percentage of total ecosystem represented	<ul style="list-style-type: none"> Extent a complete system is represented. 	100%	19%	100%	62%	57%	43%	36%	21%
Number of plateaus, gyres, banks, & subsea canyons	<ul style="list-style-type: none"> Area's uniqueness connected to geomorphology. Habitat and species diversity. 	7	1	7	5	5	4	3	2
Percentage of continental slope	<ul style="list-style-type: none"> Links to oceanic systems. Promotes upwelling. 	100%	0%	100%	100%	50%	50%	50%	0%
Diversity of bathymetry	<ul style="list-style-type: none"> Benthic habitat and species diversity. 	9	1	9	9	6	5	4	2
Percentage of submerged rocky reef	<ul style="list-style-type: none"> Attachment site for kelp and numerous invertebrates. Food source and habitat protection for fish. 	100%	60%	100%	90%	90%	75%	70%	60%
Percentage of undeveloped mainland coastline	<ul style="list-style-type: none"> Mainland representative of unaltered habitats. Source for comparison studies with islands. 	100%	0%	100%	100%	100%	18%	0%	0%
Number of wetlands	<ul style="list-style-type: none"> Breeding and feeding ground for birds. Support fish and invertebrate larval and juvenile stages. 	4	0	4	4	1	0	0	0
Number of major natural hydrocarbon seeps	<ul style="list-style-type: none"> Unique ecosystem feature and benthic community. 	1,200	0	1,200	900	900	300	0	0
number of areas of significant upwelling	<ul style="list-style-type: none"> Nutrient supply feeds primary productivity. 	5	2	5	5	5	3	2	2
Number of anoxic basins	<ul style="list-style-type: none"> Unique species assemblage. Nutrient sink. Oil and gas reservoir. 	2	0	2	2	2	2	1	0
Percentage of cetacean migration and feeding corridors (north and south)	<ul style="list-style-type: none"> Vital part of life cycle for a special-status species. 	100%	20%	100%	100%	60%	40%	25%	20%
Percentage of seabird foraging sites	<ul style="list-style-type: none"> Support species diversity and abundance. 	100%	67%	100%	84%	84%	84%	67%	67%
Number of known fish larval sources	<ul style="list-style-type: none"> Important part of life history supporting the diversity of commercial and non-commercial fish species. 	2	0	2	2	2	2	2	0

Table 29: Comparison of Environmental Attributes for Boundary Concepts

ATTRIBUTES	Significance of Attribute	Study Area	Status Quo	Preliminary Boundary Concept					
				1	1A	2	3	4	5
Number of known submerged American Indian sites	<ul style="list-style-type: none"> Record of past uses. Less subject to human intrusion than terrestrial sites. 	53	18	53	49	49	23	18	18
Number of known submerged historic shipwrecks & aircraft sites	<ul style="list-style-type: none"> Recreational interest. Historic significance and information sources. 	169	154	169	169	169	156	154	154
Number of known submerged historic mainland use sites	<ul style="list-style-type: none"> Historic significance and information sources. 	26	0	26	26	20	6	0	0
Percentage of kelp forests represented	<ul style="list-style-type: none"> Keystone species. Provides food, attachment sites, and shelter for invertebrates and fish. Supports juvenile fish. 	100%	55%	100%	100%	70%	60%	55%	55%
Miles of rocky beach represented	<ul style="list-style-type: none"> Transition from onshore to offshore habitats. Rich assortment of species compared to sandy beach. Seabird foraging. Pinniped haulout. 	159	129	159	159	148	132	129	129
Miles of sandy beach represented	<ul style="list-style-type: none"> Transition from onshore to offshore habitats. Shorebird foraging. Pinniped haulout. High recreational interest in accessible mainland areas. 	168	44	168	168	105	53	44	44
Number of seabird colonies	<ul style="list-style-type: none"> Support species diversity and abundance. Representative mainland and island colonies. 	89	37	89	89	83	37	37	37
Number of pinniped haul out areas	<ul style="list-style-type: none"> Supports most diverse pinniped haulout and rookery areas in the world. 	18	13	18	18	16	13	13	13
Number of mainland watersheds	<ul style="list-style-type: none"> Estuaries support juveniles of offshore species. Link to onshore processes. 	5	0	5	5	3	0	0	0
Total mainland watershed area (square miles)	<ul style="list-style-type: none"> Indicator of pollutant, sediment, and nutrient input into Sanctuary waters. 	4,890	0	4,890	4,890	1,299	0	0	0
Percentage of area linked to rural coastal watersheds	<ul style="list-style-type: none"> Basis for evaluation of mainland human impacts by comparison with pristine island watersheds. 	100%	0%	100%	100%	100%	12%	0%	0%

Biogeographic Study

Project Summary of the Biogeographic Assessment of the Channel Islands National Marine Sanctuary and Surrounding Areas

The study of biogeography focuses on examining spatial patterns in the distribution of habitats, species, or assemblages throughout the landscape and understanding their significance. Typically this information is collected over large-scales rather than examining local occurrences of animals. This information then provides managers with a basis for determining components of the biota typical of an area and therefore appropriate for management.

Understanding the biogeography of the region within and adjacent to Channel Islands National Marine Sanctuary (CINMS) has been an integral component of the evaluation of the various boundary concepts from the beginning. One of the three principle drivers behind the evaluation of the differing boundary concepts was the emerging knowledge of how connected the resources within current sanctuary boundaries are with those around it. In 2003, NCCOS was asked by the NMSP to evaluate the strength of those connections within the six boundary concepts developed by the sanctuary staff and the Advisory Council by conducting a biogeographic assessment. When completed, this biogeographic assessment will be used in conjunction with a suite of other boundary analysis criteria under consideration by NMSP management (e.g., socioeconomics, management feasibility, etc.) to help inform any future decision-making on sanctuary boundary change.

The initial step in the biogeographic assessment process was the identification of key species to be analyzed. Emphasis was given to threatened species as well as those of particular ecological or commercial significance. The collection of relevant physical and biological data sets in the region of interest composed the second step in the process. Over 50 researchers along the west coast from federal and state agencies, NGO's and academia were contacted in an effort to assemble all existing distributional data pertinent to the species selected as well as their associated habitats. Data was collected and analyzed which describe the physical setting in terms of bathymetry, substrate, ocean color, and surface currents. Biological data was then collected on invertebrate, fish, marine mammal, and bird communities. Additional data was gathered to provide species specific information on those taxa as well as kelp and seagrasses.

The analysis step began with an examination of broad-scale biogeographic patterns over the entire range for which data was available in the given data set. Where data was sufficient, an analysis of community structure as well as the individual species identified by the sanctuary as being of high importance was presented. Next, the six boundary concepts were evaluated with respect to both the community and species level information. Three different metrics were utilized in this process: an absolute metric (count), a relative metric (density or mean), and the Optimal Area Index (OAI) for each boundary alternative. This third metric, the OAI, represents the relative increase in a measure of ecological value (e.g. number of animals), divided by the relative increase in area of a given boundary concept compared to the current boundary. Finally, the analyses conclude with a section summarizing all the results and integrating them to evaluate the patterns apparent within the different boundary concepts. Data collection and synthesis has been completed at this stage and the integration phase is slated for completion September 2005.

Throughout the assessment project, each component of the report was reviewed. All data providers, together with others familiar with the data sets, and selected members of the Sanctuary Advisory Council were consulted to obtain consensus on the analytical methodology utilized and to ensure accurate interpretation of the resulting patterns. This assessment builds upon and complements a similar effort recently completed by NCCOS for the three sanctuaries in northern and central California (Cordell Bank, Gulf of the Farallones, and Monterey Bay national marine sanctuaries; NCCOS, 2003) and a comprehensive west coast assessment completed by NOS in the late 1980s resulting in the “West Coast of North America, Coastal and Ocean Zones, Strategic Assessment: Data Atlas.” By drawing on data and analyses already conducted by NCCOS and the local research community, this assessment represents one of the most robust efforts of its kind. While the immediate focus of this assessment is to evaluate a series of boundary expansion concepts for the sanctuary, this biogeographic study should help to inform managers faced with other spatially explicit management decisions in this region. In addition, this assessment represents a summary of existing comprehensive, large-scale data sets. Taxa missing or areas not covered highlight the need for future research to fill these gaps. Additional information on this assessment is on the project website at http://biogeo.nos.noaa.gov/projects/assess/ca_nms/cinms/.