

Photo: Garibaldi (Hypsypops rubicundus) in Sanctuary kelp. Courtesy CINMS

A Water Quality Needs Assessment for the Channel Islands National Marine Sanctuary

Submitted to the Channel Islands National Marine Sanctuary Advisory Council by the Conservation Working Group

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EXECUTIVE SUMMARY

The Channel Islands National Marine Sanctuary (the Sanctuary, or CINMS) encompasses the waters that surround Anacapa, Santa Cruz, Santa Rosa, San Miguel and Santa Barbara Islands, extending from mean high tide to six nautical miles offshore each of the five islands. National Marine Sanctuary status confers special meaning and protections to designated marine regions of exceptional beauty and resources. The primary goal of CINMS is to preserve the natural and cultural resources encompassed within its boundaries.

In terms of water quality, the Sanctuary merits a very high level of protection – it is supposed to be a pollution-free zone. Furthermore, according to the Sanctuary staff, the Sanctuary Advisory Council (the Council) and the public, protection of good water quality in the CINMS is a priority. In its 2004 Work Plan, the Council outlined the need for developing near- and long-term water quality recommendations for the Sanctuary. Unfortunately, Sanctuary managers cannot fulfill this objective without having answers to certain key questions: What is the current status of water quality conditions in the Sanctuary? What are the “threats” to water quality (i.e. the anthropogenic sources of pollution) and what do we already understand about those threats? What is being done to address them? On which threats should the Sanctuary take action, and what tools are available to the Sanctuary to ensure those actions are effective?

This report aims to comprehensively address these questions. It begins with a review of the known and potential threats to Sanctuary water quality. The report then summarizes the findings of an extensive investigation of the current status of three core areas of regional water quality management with respect to the identified threats: Research and Monitoring; Jurisdiction, Regulations and Policy; and Public Education and Outreach.

Most importantly, the project serves as a water quality action “needs assessment,” synthesizing the findings in two concluding sections that respectively identify the weaknesses or gaps within each of the three management areas, and recommend actions that Sanctuary managers and stakeholders can take to address those deficiencies.

The report’s recommendations emerge from the expansive goal of maintaining and improving Sanctuary water quality, and thus advancing the Sanctuary’s mission to preserve the natural and cultural resources within its boundaries. However, the recommendations were developed with consideration of the scarcity of CINMS resources and personnel, so opportunities to leverage the Sanctuary’s existing management activities, expertise, and partnerships with other organizations are identified as priority recommendations. While these recommendations do not comprise a water quality plan for the Sanctuary, they are intended to help move CINMS managers toward a water quality planning process.

Overall, this project confirms what the Sanctuary staff already recognizes: Sanctuary water quality conditions, in terms of relevant anthropogenic pollutants, are largely unknown. While this conclusion limits our ability to set specific objectives for water quality action planning, information gathered from the extensive review of gray and peer-review literature and the numerous interviews with scientists, marine resource managers and users, and other stakeholders provides some useful parameters to guide the Sanctuary’s research and management planning.

The information does not suggest that the Sanctuary faces a crisis in general water quality conditions, or any of the specific anthropogenic sources of water pollution. However, the project findings also indicate that *inaction* on the part of the Sanctuary is *not a suitable approach* for protecting good water quality.

The latter conclusion is the result of two project findings. First, *many* types of anthropogenic pollution sources, over *a large geographic range*, potentially harm Sanctuary water quality and/or its resources. These sources include:

- Nonpoint source pollution from the Channel Islands
- Small vessel traffic in Sanctuary waters and the greater Santa Barbara Channel (SBC) region
- Large vessel traffic (>300 gross tons) in the Sanctuary waters and the SBC region
- Former ocean dumpsites
- Ship and plane wreck sites
- Offshore oil and gas production facilities within the SBC
- Other point source discharges to the SBC (e.g. wastewater treatment facilities and cooling water effluents)
- Nonpoint source pollution from the mainland

Second, and crucially, the magnitudes of these pollution sources are dynamic. With certain exceptions, pollution from these sources will increase over current levels, thereby potentially threatening Sanctuary resources.

Collectively, the findings of the report lead to an overarching recommendation. Sanctuary managers and stakeholders have, at present, the opportunity to approach water quality planning *proactively*— rather than reactively in response to a water quality crisis— and should capitalize on this opportunity. Efforts to develop better understanding of water quality dynamics, and to strategically implement certain management tools such as policy and public outreach, will help sustain the good water quality aspects that currently exist in and around the Sanctuary, and forestall water quality degradation from shifting levels of pollution in SBC region. Furthermore, CINMS managers and stakeholders should remain focused on the goal of minimizing and eliminating water pollution in the Sanctuary by (1) making decisions that are guided by this objective, and (2) taking actions that result in a net-positive impact on Sanctuary water quality.

Potential components of the Sanctuary’s future water quality action plan should be evaluated within the “big picture” of water quality factors in the SBC region, which extends from the islands to the mainland. These factors include the anthropogenic pollution sources listed above, emissions from potential future economic activities in and around the Sanctuary, as well as the natural biological, geological and oceanographic characteristics of the SBC region.

The results of this project also point toward two further conclusions. First, the multitude of gaps in scientific understanding of water quality within the Sanctuary requires a concerted effort of research and monitoring within Sanctuary boundaries. However, many factors of Sanctuary water quality operate beyond CINMS boundaries, and throughout the SBC region. Therefore,

rather than relying on the Sanctuary's geographic boundaries or the management resources directly available to define the limits of the water quality action plan components, CINMS managers should organize their planning around the major threats to the Sanctuary's water quality whether within or beyond its borders. To implement these trans-boundary management activities, the Sanctuary should develop collaborative partnerships with agencies and other organizations that already have jurisdiction over, and/or programs for, identified pollution sources that are located beyond CINMS boundaries.

The specific findings of this Needs Assessment are described in detail in the [Water Quality Management Gaps](#) and [CINMS Water Quality Management Recommendations](#). The gaps (described in Section 7) identify aspects of water quality information and management that appear inadequate or nonexistent. They are intended to help the Sanctuary Advisory Council, staff and other stakeholders recognize the management needs and opportunities for protecting good water quality in the Sanctuary and greater SBC region. The recommendations in Section 8 (summarized below) are specific suggestions for action on the part of the CINMS staff. (The summaries are provided only as a quick reference; readers should follow the links to the recommendations themselves for full explanations.)

[8.1 Water Quality Action Planning Approach](#)

Pursue management activities that maintain and improve water quality conditions that support the Sanctuary's natural and cultural resources, as well as recreational uses in the Sanctuary.

[8.2 Research and Monitoring Recommendations \(General\)](#)

Determine the issues that will drive Sanctuary water quality action planning, and frame research and monitoring questions with the purpose of better understanding how water quality factors affect these key issues.

[8.2.1 Existing Data](#)

Compile and characterize existing available water quality-related data (identified in this report) from various long-term research efforts in the SBC region.

[8.2.2 Monitoring within Sanctuary Waters](#)

Identify water quality monitoring needs and develop monitoring plan for Sanctuary waters based on the framed research and monitoring questions and the priorities described in this recommendation.

[8.2.3 Processing of Existing Samples](#)

Analyze existing samples from the Bight '03 survey and the *Pac Baroness* exploration and report/store results in a format and location that are compatible with future monitoring outputs.

[8.2.4 Monitoring Anchorages at the Islands](#)

Continue a monitoring program at popular Island anchorages beyond the current pilot phase, and adapt the monitoring protocol based on the results of this pilot project.

Formalize a partnership with the National Park Service to share visitor use data for the Islands on a regular basis.

8.2.5 Anthropogenic Marine Debris

Coordinate with other organizations to form an umbrella partnership that will fulfill the components of an anthropogenic marine debris research and monitoring program, including beach debris monitoring, a trawling study, boater surveys, pelagic plastics sampling study, and photo-documentation.

8.2.6 Storm Water Plume Research

Develop research partnership to better understand the impact of stormwater plumes from Santa Clara and Ventura Rivers on Sanctuary water quality: Coordinate with researchers interested in this water quality issue (e.g. from the Santa Barbara Long Term Ecological Research project, *Plumes and Blooms* project, or Southern California Coastal Water Research Project) to facilitate implementation of a research project to sample storm water plumes, determine plume compositions, and better understand plume dynamics.

8.2.7 Large Vessel Traffic Monitoring

Continue to coordinate with the National Marine Sanctuaries Program to pilot an Automated Information System data stream interface and associated installation of a base station on Santa Cruz Island to track and log vessel traffic information to a public database.

Pursue opportunities to coordinate with research projects (identified in this report) on Island fog to incorporate sampling for diesel-specific air pollutants and facilitate predictive modeling of Sanctuary and Channel-wide chronic deposition.

8.3 Jurisdiction, Regulations and Policy Recommendations

This section offers both strategic and practical recommendations for CINMS policy and regulations, to help create a Sanctuary unimpaired by anthropogenic pollution. The recommendations are intended to improve the Sanctuary's ability to address existing and likely future water quality threats, and develop partnerships for more effective planning and management.

8.3.1 Sewage Discharge Prevention

Draft a single, unambiguous policy to eliminate untreated human waste discharges from near-shore National Park and Sanctuary users (e.g. kayakers, surfers, and hikers) that will be implemented with consistency throughout both jurisdictions.

Consider policy options (identified in this recommendation) to specifically minimize and eliminate sewage discharges from small vessels.

8.3.2 Strategic Planning and Stakeholder Coordination for Cruise Ship Visitation

Participate in planning by the City of Santa Barbara and other stakeholders for cruise ship visits and get a clear picture of the City's objectives in terms of

attracting and accommodating cruise ships to the SBC region. Additionally, make sure that the Sanctuary has a clear goal for policy towards cruise ships in the SBC (outside of Sanctuary waters) and that this policy is presented to the City of Santa Barbara, and review the Voluntary Agreement that ship captains sign before bringing tenders to the Santa Barbara Harbor.

8.3.3 Discharges Outside Sanctuary Boundaries

Consider establishing regulatory authority to protect against pollution that enters Sanctuary waters after being discharged into the ocean outside of CINMS boundaries (such as that maintained by Stellwagen Bank National Marine Sanctuary).

8.3.4 Interagency Water Quality Stakeholder Alliance

Enhance cooperative relations with State and County agencies, and expanded participation and support for existing multi-agency initiatives.

8.3.5 Water Quality Working Group

Establish a working group to the Advisory Council that focuses on water quality management for the Sanctuary.

8.3.6 Pollution Prevention from Large Vessel Traffic

Through partnerships with representatives from other Sanctuaries subject to shipping impacts (such as Stellwagen Bank, Monterey Bay, and Olympic Coast), encourage federal decision makers to take advantage of existing policy opportunities to reduce pollution impacts from ships in SBC waters, and throughout the world ocean (e.g. Congressional ratification of Annexes IV and VI of the International Convention on the Prevention of Pollution from Ships [MARPOL]).

8.4 Public Education and Outreach Recommendations

Articulate the interconnections between water, water pollution and the choices and actions of the region's community members. Convey this information to all communities, so that individuals are empowered to help protect and improve water quality from the mainland to the Islands.

8.4.1 CINMS Education and Outreach Initiatives

CINMS should consider organizing a "Snapshot Day" modeled after that conducted annually by MBNMS, in order to build public awareness of—and sensitivity to—the Sanctuary, as well as to gather water quality data and build constructive partnerships with organizations and agencies.

8.4.2 CINMS Sanctuary Education Team (SET)

The SET should incorporate Sanctuary water quality information and messages into its existing campaigns, and consider and plan a range of new outreach initiatives to foster public education on Channel and Sanctuary water quality. The SET should be involved in water quality action planning in order to help formalize its education and outreach initiatives as components of a CINMS water quality plan.

8.4.3 Channel Islands Naturalist Corps

Sanctuary staff and stakeholders should help prepare talking points on Channel and Sanctuary water quality for the volunteer Naturalists, who also serve on the “front lines” of public education on Sanctuary water quality. The Naturalists should also coordinate these talking points with concessionaire vessel crews.

8.4.4 CINMS and National Park Visitor Education

Develop and advertise (at their websites, visitor centers and the Islands) a specific, consistent and well-advertised human waste disposal policy, and make sure that visitors are enabled to follow the policy (bathrooms or alternative means of disposal are made available).

8.4.5 Boater Education and Outreach

In the short term, offer assistance to harbors (that express an interest and have available resources) for developing new and more effective signs to inform boaters about water quality and clean boating practices.

Longer term, coordinate an ongoing program for boater education and outreach involving on-the-water and harbor-based training.

8.4.6 Signs in the Harbors and Near Creeks

Coordinate with local agencies, harbors and other organizations to develop and post more effective signs in both English and Spanish — with messages that convey the connection between individuals’ actions and impacts to Channel and Sanctuary water quality.

8.4.7 Anthropogenic Marine Debris

Look for opportunities to partner with other organizations (e.g. NOAA Weather Service and Santa Barbara Creeks Division) to develop public service announcements to encourage good trash management practices (particularly prior to storms).

Overall, this Needs Assessment demonstrates that a proactive approach to maintaining and improving water quality conditions that support the Sanctuary’s natural and cultural resources, informed through analysis of the array of geographically-dispersed factors that affect water quality in the SBC region, would represent both a strategic management decision to countervail future anthropogenic pollution increases, as well as a resource conservation effort well aligned with the mission and purview of the National Marine Sanctuary Program.

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1 INTRODUCTION

The Channel Islands National Marine Sanctuary (the Sanctuary, or CINMS) is a 1,252-square-nautical-mile portion of the Santa Barbara Channel. The Sanctuary is an area of national significance because of its exceptional natural beauty and resources. It encompasses the waters that surround Anacapa, Santa Cruz, Santa Rosa, San Miguel and Santa Barbara Islands, extending from mean high tide to six nautical miles offshore around each of the five islands (see Figure 1). National Marine Sanctuary status confers special meaning and protections to these marine regions; the primary purpose of the Sanctuary is to preserve the natural and cultural resources contained within its boundaries.¹ In terms of water quality, the Sanctuary merits a very high level of protection – it is supposed to be a pollution-free zone. Thus, the CINMS provides a vehicle for achieving and maintaining excellent water quality in the most extraordinary marine habitats of the Santa Barbara Channel region.

Figure 1 The Channel Islands National Marine Sanctuary²



The approach to protection of Sanctuary resources (including water quality) is governed by the CINMS Management Plan. Although the existing plan addresses the need for emergency response in the event of an oil spill, it does not otherwise directly consider water quality

¹ Channel Islands National Marine Sanctuary (CINMS). (n.d.). "About the Sanctuary." Retrieved on November 10, 2004 from the CINMS website: <http://channelislands.noaa.gov/focus/about.html>

² Image taken from the Channel Islands National Marine Sanctuary website: <http://channelislands.noaa.gov/focus/about.html>

concerns. The management plan is currently being updated and this revision will contain a Water Quality Action Plan for the Sanctuary that will serve as the framework for any future water quality program. CINMS staff recognizes that the Sanctuary's lack of a water quality program, and deficiency in dedicated human resources for water quality management, must be addressed for the Sanctuary to fully realize its potential as a vehicle for conservation of the Channel Islands marine environment.

Protection of CINMS water quality has been identified as a priority issue by the Sanctuary's staff and Advisory Council (the Council) and the public.³ In its 2004 Work Plan, the Council outlined the need for developing near- and long-term water quality recommendations for the Sanctuary – a task that requires a comprehensive understanding of the current status of, and threats to, water quality.⁴ This report represents the first step in this process. With this purpose, the report has been written with the needs of the Council and the Sanctuary staff in mind. (The target audience is not limited to these two groups, but other readers should bear in mind that the frame of reference of this report is CINMS water quality.) It provides an overview of threats to water quality as well as an inventory of existing research and monitoring, regulations and management programs, and education and outreach efforts. To help the Council and the Sanctuary staff in designing a Water Quality Action Plan, the report identifies gaps in each of these areas as well as opportunities for collaboration and leveraging existing information and efforts. It is intended to be a detailed and objective source of information – a resource – on Sanctuary water quality.

Potential applications of this report include helping managers prioritize future research and monitoring, aiding the development of projects and partnerships, and incorporating recommendations into a water quality management plan.

³ The goals and structure for this assessment report came about from a meeting at the outset of the project with Sanctuary staff and members of the Advisory Council's Conservation Working Group (CWG). They provided guidance on how best to direct and design this assessment to assist the Sanctuary in developing a water quality program. After the report is approved by the CWG, it will be presented to the Council for consideration and potential submission to the manager of CINMS.

⁴ Channel Island National Marine Sanctuary 2004 Sanctuary Advisory Council Work Plan. (January 23, 2004). Retrieved on July 22, 2004 from the Channel Island National Marine Sanctuary website: http://www.cinms.nos.noaa.gov/sac/pdf/2004_wkplan.pdf

2 STRUCTURE AND METHODS

A great deal of information on water quality in the Santa Barbara Channel (SBC) region was derived from peer-reviewed articles, agency reports and regulations, and white papers. However, information from scientists, managers at different governmental and non-governmental organizations, marine resource users and other stakeholders also form a core source of knowledge about this issue. The interviews that were conducted for this project proved to be essential in providing up-to-date information as well as filling in gaps in understanding. Conclusions in this report draw heavily upon these interviews as well as cited documentation.

To identify gaps under each category (1) research and monitoring, (2) jurisdictions, regulations and policy and (3) education and outreach, the analysis began with identification of the potential anthropogenic threats, or sources of impairment, to CINMS water quality – an inherently challenging aspect of this project. In one respect this task was difficult because baseline (“good”) water quality characteristics have not been defined for the Sanctuary. Even if baseline had existed, parsing out anthropogenic water quality impacts from natural ones is not necessarily feasible. In addition, the boundary of the study was not straightforward. Water quality impairments within CINMS boundaries are obviously important to include. Some of the water quality threats to the greater SBC region are not as clearly concerns to the Sanctuary. These were included, though, because of the connected nature of the marine environment. Pollutants move into the Sanctuary from outside its boundaries, and fish and marine mammals travel freely between the Sanctuary and outer waters. Therefore, the Sanctuary and its resources are potentially exposed to pollution from outside the boundaries. Ignoring these regional water quality issues would have led to an incomplete assessment.

To address the first issue -- lack of baseline water quality information -- this assessment discusses all possible sources of impairment (i.e. no filtering of the list of threats has been done based on likely degree of impact). Presentation of these threats is organized according to their proximity to the Sanctuary, beginning with sources of water quality impairment from the Channel Islands and within CINMS waters, then addressing threats within the Santa Barbara Channel, and finally, those along the coast and from the mainland. Each threat is described generally (for background) and specifically with respect to the Sanctuary. It is crucial to recognize that this structure is based on the geographic *sources* of the pollution, or threats, not necessarily the locations of the end-effects. Although this organizational layout is not necessarily indicative of the scope and type of impacts from different threats, it conforms to the set-up of existing water quality regulations as well as monitoring and protection programs.

The section on research and monitoring starts with a review of broad-based scientific studies that cut across multiple threat types and geographical regions. It goes on to describe the current status of specific research efforts associated with each source of water quality impairment. The assessment of regulations and management follows a similar format; it begins with a review of policy and programs for water quality at multiple jurisdictional levels. Consideration of threat-specific regulations and management follows this section.

For the third category – education and outreach efforts– the report describes the type and scope of current programs and campaigns. It is important to distinguish a key difference between the education/outreach assessment and that of the other two categories. A full needs assessment of education efforts would require a survey and analysis of program curricula and learning objective achievements. This degree of analysis is beyond the scope of the report. The review here is more general; it describes current efforts and gaps in availability of programs to address the identified water quality threats, but it does not analyze the effectiveness of education/outreach efforts or specific programmatic changes that might be applicable.

In each of these sections, gaps and opportunities are identified along the way. A ‘recap’ of these is provided at the end of the report along with a resource list containing links to key information sources and contact information for people and organizations through which opportunities are available for collaboration on water quality research, monitoring, management, education and outreach.

3 SOURCES OF WATER QUALITY IMPAIRMENTS (THREATS)

A wide variety of pollution sources exists in and around CINMS. Point and non-point source pollution of mainland watersheds and coastal waters from the Central Coast to Southern California likely impact CINMS water quality. Several rivers, and numerous small streams and creeks accumulate and transport chemical and particulate pollution from point and non-point sources, such as urban runoff (storm drainage systems, trash and debris), agricultural runoff (erosion-generated sediment, chemical fertilizers and pesticides), industrial discharge sites, and erosion. Concurrently, Goleta, Santa Barbara, Carpinteria, Ventura and other regional urban areas discharge effluent from their sewage treatment plants into the ocean. Deposition of water pollution into the Santa Barbara Channel suggests a potential reduction in CINMS water quality through diffusion and mixing across the Channel, and thus a linkage of mainland water quality control with Sanctuary water quality.

Many offshore activities also may impact Sanctuary water quality, including commercial endeavors such as cargo shipping and oil and gas production; recreational boating and cruise ship traffic; and past and present naval activity ranging from oceanic dumping of hazardous waste, to large vessel passage, to military exercises. Potentially all of these activities involve some form of discharge into the waters in and around the Sanctuary, whether through water-borne pollution or through deposition of airborne discharge into the ocean. A major water quality concern relating to these activities are oil spill events. Possible sources of spills include large and small vessels, oil platform or pipeline leaks, or onshore pipeline breaks.

Certain impacts of pollutants are common among these different threats. Before discussing the specific sources of water quality impairments, this introduction summarizes the general types of pollutants and their common sources and potential impacts. Readers should recognize that these impacts are not necessarily occurring in the Sanctuary or greater SBC region. Furthermore, the list is not meant to be exhaustive. Instead, it is a brief introduction to the pollutant types that are likely to be considered in this report.

- Introductions of *pathogens* (e.g. bacteria, viruses and protozoa) to marine waters can lead to outbreaks of disease and infection in humans and animals. Exposures to pathogens occur through contact with contaminated water as well as consumption of shellfish. Discharges of large quantities of untreated sewage and creek runoff (carrying agricultural and urban wastes) are two sources of pathogens.
- Excessive quantities of *sediments* in coastal waters reduce light penetration and productivity, interfere with filter-feeding and respiration in benthic (bottom dwelling) marine life, and smother reef habitat and kelp forests. Sediments also carry contaminants (e.g. heavy metals and organic compounds) to near-shore habitats. Benthic organisms are especially prone to exposure to these contaminants. Sediment delivery in creek and river runoff is a natural process that occurs during rain events. However, human activities have increased this level of contaminant-transport, possibly resulting in abnormal impacts. In addition to runoff, contaminated sediments are introduced to coastal waters through disposal of materials from port dredging operations.

- In the marine environment, *metals* that have accumulated in sediments cause illness, death and reduced reproduction in benthic organisms (in particular, bivalves). Dissolved metals are toxic to aquatic plants and some fish species. In higher trophic levels (e.g. marine mammals, birds and humans), high concentrations of metals can be carcinogenic as well as cause severe neurological and physiological problems. Two major pathways that introduce metals to coastal waters are stormwater runoff (particularly from urban areas) and dissolution of anti-fouling paints used to prevent attachment of organisms on boat hulls.
- *Pesticides and herbicides* can be immediately lethal to marine animals and plants. In higher level organisms such as birds and marine mammals, pesticides are carcinogens and cause low reproduction rates and neurological problems. Like other marine contaminants, some pesticides and herbicides bind to sediments and persist in the marine environment. Runoff from agriculture and urban landscaping contributes the majority of these pollutants to coastal waters.
- In general, contact with *oils, grease and other hydrocarbon compounds* results in lethal and sublethal effects in a broad range of species due to ingestion, smothering of larvae in benthic and intertidal habitats and oiling of fur or feathers. Oils, grease and certain hydrocarbon compounds (e.g. those that are chlorinated) can persist in sediments where they are ingested by benthic (bottom-feeding) organisms. Lighter hydrocarbons volatilize and/or degrade rapidly, but remain a big concern because they tend to have greater toxicity to marine life. Oil enters marine environments through accidental spills (from tankers, oil production platforms and pipelines), discharges of oily bilge water from vessels, deposition of air pollutants and runoff from urban areas. The Santa Barbara Channel is unique in that a large portion of hydrocarbon gases and tars are emitted from natural seeps.
- Excessive quantities of inorganic *nutrients* can stimulate proliferations of phytoplankton ('algal blooms'). Certain types of algal blooms produce compounds that cause illness or death in marine mammals and humans. As blooms die off, the decomposition of these large quantities of *organic matter* by bacteria can lower dissolved oxygen concentrations. Under extreme anoxic conditions (such as those that occur in the Gulf of Mexico) 'dead-zones' can form in which no marine life can survive. Fertilizer use in agriculture is a contributor of nutrients to coastal waters in the SBC (via agricultural runoff). Additionally, urban runoff, deposition of air pollutants, discharges of sewage and garbage from marine vessels and wastewater treatment outfalls contribute excess nutrients.
- *Trash*, or anthropogenic marine debris, harms marine life primarily via ingestion and entanglement. These impacts are particularly true for Styrofoam and plastic pieces that do not decompose and often resemble food.
- *Non-native organisms and pathogens* that are introduced to new aquatic environments have the potential to survive and proliferate, becoming invasive, or aquatic nuisance species (ANS). Impacts of ANS include loss of biodiversity (due to competition with native species), loss of ecosystem *structure* and functions, outbreaks of diseases (from

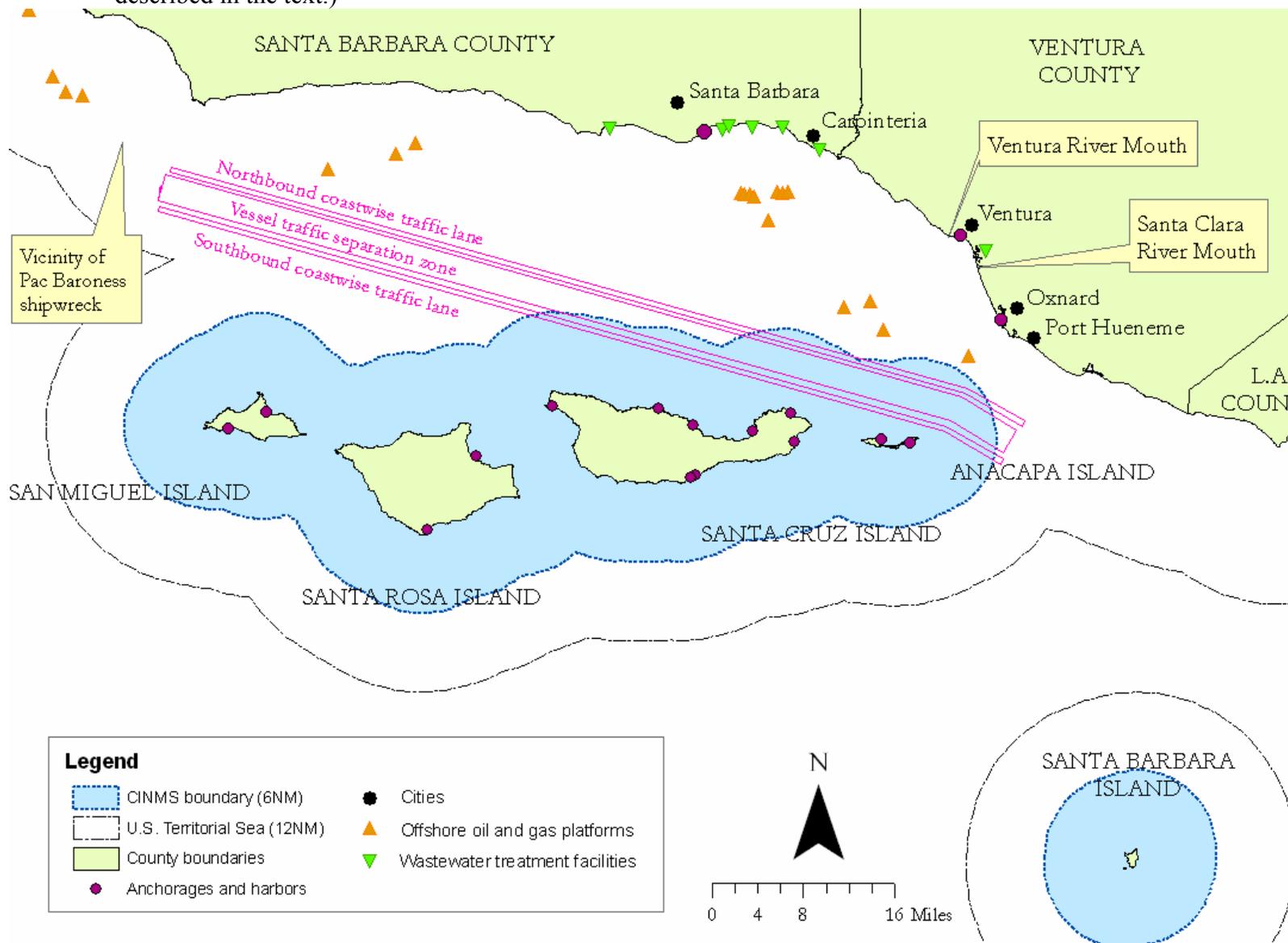
non-native pathogen introductions) and fouling of boats and other marine equipment. Anthropogenic introductions of non-native species occur through intentional releases (e.g. for the purpose of bolstering a dwindling fishery) and accidental introductions (e.g. in ballast water or on the hulls of ships, or from aquariums and aquaculture facilities).

- *Changes to water temperature and/or salinity* can alter marine habitats such that they become unsuitable for native plants and animals. Furthermore, altered conditions potentially increase the risks of invasions into the areas by non-native species.

A common theme in many of these descriptions is the persistence of a pollutant in the environment and its eventual *bioaccumulation* in higher order (trophic level) organisms such as marine mammals, birds and humans. In this process, lower level organisms such as zooplankton and shellfish absorb and store contaminants in their bodies as they feed. As they are eaten by other animals, the toxins continue to accumulate in the next trophic level of organisms. Essentially, the amount of a pollutant is magnified in higher order organisms. Furthermore, many pollutants bind well to fatty tissues, enhancing the likelihood of reaching high toxin concentrations in mammals. This process of bioaccumulation is a key component to the introduction and fate of many pollutants in the marine food web.

The following sections address potential water quality threats that are specific to the Sanctuary's resources. Most of these threats are also shown on the map in Figure 3.

Figure 3 Potential sources of water quality impairments in the SBC region. (Note: Map does not show certain sources that are described in the text.)



3.1 Nonpoint Source Pollution from the Channel Islands

Nonpoint source (NPS) pollution occurs when rainfall or snowmelt, known as stormwater runoff, or water from irrigation activities or other domestic water usage, known as dry weather runoff, washes over land, picking up and transporting pollution into waterways and down to coastal waters. The 2004 report by the U.S. Commission on the Ocean identifies a wide range of pollutants that can be delivered via this pathway: fertilizers, herbicides and pesticides from farming and urban landscaping; sediments from construction sites and timber harvesting; bacteria and viruses from livestock and pet wastes; oil and chemicals from street and parking lot surfaces and industrial facilities; and a variety of airborne pollutants that settle onto land and are washed into waterways. NPS pollution in runoff forms a significant threat to water quality along much of California's coast.

The major potential pollutants in Island runoff are fecal matter, excess nutrients and sediments. Bacteria, parasites and viruses introduced into runoff from human and animal feces can cause diseases in humans, marine mammals and birds. At the Islands, pinnipeds may be especially vulnerable to these threats when they haul out of the water to rest on the shores of the Islands. Excess nutrients from runoff are a concern because they can trigger growth of harmful algae (see Section 3.9) that release toxins. In addition to harming humans and marine life through direct contact, disease-causing bacteria, parasites and toxins can accumulate in shellfish beds which are food sources leading to exposures.

Sedimentation is a concern if it leads to adverse effects on the health of Island seagrass and kelp beds (e.g. sediments covering the plants and diminishing overall light penetration). Seagrasses grow in soft-bottom, protected area and, in general, are particularly vulnerable to reduced light conditions caused by sedimentation and resulting turbidity.⁵ It is important to recognize, however, that measurements of runoff and erosion on these Islands suggest that sedimentation is naturally very high due to climate as well as morphological characteristics.⁶ Episodes of sediment-induced morbidity in seagrass and kelp beds around the Islands might not be solely attributable to anthropogenic impacts.

Recreational areas of high public use, for example the campground at Scorpion Ranch on Santa Cruz Island, were not specifically identified by this report as a concern for NPS pollution in the Sanctuary. This might be because facilities such as outhouses, and informational resources such as Park rangers and signage, are already in place to prevent and control NPS pollution from these areas.

⁵ National Centers for Coastal Ocean Science. (2002). "Appendix I." Science-Based Restoration Monitoring of Coastal Habitats; Volume One: A framework for monitoring plans under the Estuaries and Clean Waters Act of 2000 (Public Law 160-457) and Volume Two: Tools for monitoring coastal habitats. Retrieved on November 15, 2004 from the National Oceanic and Atmospheric Administration web site: <http://coastalscience.noaa.gov/publications/welcome.html>

⁶ Mertes, LAK, Martella, KD, Ruocco, M, Bushinga, WW. (1999). Watershed analysis for runoff and erosion potential on Santa Catalina, Santa Cruz and Santa Rosa Islands. *Proceedings of the Fourth California Island Symposium: Update on the Status of Resources*. Minerals Management Service, Camarillo, CA. OCS Study MMS 99-0038, pp. 461-468. Retrieved on June 14, 2004, from the StarThrower Educational Multimedia web site: <http://www.starthrower.org/research/conservation/cis99mertes.pdf>

However, kayaking around the Islands is a concern for water quality. According to Kate Faulkner, Chief of Resources Management for the Channel Islands National Park⁷:

On Santa Cruz Island where there are “day kayakers,” people are supposed to use the pit toilet at Scorpion. However, there is a problem with individuals landing at other places (particularly Little Scorpion) and defecating. On Santa Rosa Island we have up to 100 multi-day kayakers per year. They are supposed to eliminate below mean high tide. However, this is not done by everybody.

These violations of Park policies can lead to high fecal bacteria levels on beaches and in near shore waters after storm events.

Human activities have also indirectly affected water quality through introduction of livestock to the Islands for grazing. Santa Cruz Island now has a population of feral pigs that degrade stream water quality. Pigs tend to forage in riparian habitats, potentially increasing sedimentation (due to physical disturbance of the soils) and pathogen (bacteria and virus) concentrations in streams and receiving marine waters.⁸ Anecdotal evidence suggests that pigs are prolific in the stream areas and that this might be a significant source of near-shore marine pollution around Santa Cruz Island.⁹ In March 2005, the Channel Islands National Park Service and the Nature Conservancy (owners of 75% of Santa Cruz Island) began a 2-3 year program to eliminate the feral pigs.¹⁰ Assuming that the pigs are successfully removed, levels of sediments and fecal matter in runoff will decline.

In the past, livestock on Santa Rosa Island degraded riparian areas causing introduction of excessive nutrients, bacteria and/or sediments to runoff. This situation might have been problematic for Sanctuary water quality; sediment plumes from Santa Rosa tend to settle out over the Island’s wide and shallow shelf. These sediments are then prone re-suspension by strong currents in the Santa Barbara Channel (SBC). (In contrast, the shelf on the north and south sides of Santa Cruz Island is narrower. This bathymetry reduces the likelihood of sediments spreading into a plume and persisting due to resuspension.^{11,12,13}) Removal of

⁷ Personal email communication with Kate Faulkner (Chief of Natural Resources Management, Channel Islands National Park, CA) on December 2, 2004.

⁸ Dresser, H. (May 2004). Feral Pig (*Sus scrofa*) Soil Disturbance in Henry Coe State Park, California. Senior Research Seminar. Environmental Sciences Department. University of California, Berkeley. Retrieved on June 14, 2004, from the University of California, Berkeley web site: <http://ist-socrates.berkeley.edu/~es196/projects/2004final/Dresser.pdf>

⁹ Personal communication with Jessie Altstatt (Channel Keeper) on June 2, 2004.

¹⁰ Menard, Y. (March 15, 2005). “Feral pig eradication begins on Santa Cruz Island.” Channel Islands National Park News Release, National Park Service, U.S. Department of the Interior, Ventura, CA. Retrieved on May 2, 2005 from the National Park Service website: <http://www.nps.gov/chis/press040805.htm>

¹¹ Auad, G, Hendershott M C, Winant, C D. (1998). Wind induced currents and bottom-trapped waves in the Santa Barbara Channel. *Journal of Physical Oceanography*. 28: 85-102.

¹² Dever, E P. (2003). Objective maps of near-surface flow states near Point Conception, California. *Journal of Physical Oceanography*. 34: 444-461.

the livestock from Santa Rosa Island has facilitated recovery of stream habitats. (As of 1998 the Island had been cleared of cattle and the deer and elk populations were reduced by more than 50%.¹⁴ All remaining deer and elk must be removed by 2011.¹⁵) Although livestock removal diminishes NPS pollution, it is not clear if decades of grazing have created long-term residual effects on the landscapes that continue to increase sedimentation over natural levels.

Future activities could change the amount of sediment runoff from the Channel Islands. For example, an upcoming National Park Service restoration project for the Prisoner's Wetland may reduce sedimentation, whereas fennel-eradication efforts on Santa Cruz Island could temporarily expose areas to soil erosion.¹⁶ Therefore, even if nonpoint source pollution from the Channel Islands is not a significant current threat to Sanctuary water quality, the situation could change with land-use changes (e.g. addition of recreation facilities), restoration efforts or fire events on the islands.

3.2 Small Vessels

In its 2004 Work Plan, the SAC identified the need to ensure clean boating practices as a means to protect CINMS water quality. The Sanctuary is a popular destination for small vessels, including private recreational boats, charter company vessels and commercial fishing boats. (In terms of size, 'small vessels' are considered to be generally <100 gross registered tons (and usually <65 ft in length).^{17,18}) Although intentional discharges of wastes from boats are prohibited in the Sanctuary, small vessel pollution remains a potential threat to water quality. Pollutants from small vessels include sewage from holding tanks (Type III marine sanitation devices (MSD)), diesel fuel spills and debris due to vessel accidents, dissolved metals (e.g. copper) from antifouling paint on boat hulls, oily bilge water discharges and discarded trash (anthropogenic marine debris).

The few number of boats in any one area of the Sanctuary generally limits the likelihood of negative impacts from small vessel pollution. However, Sanctuary researchers have

¹³ Mertes, LAK, Hickman, M, Waltenberger, B, Bortman, AL, Inlander, E, McKenzie, C, Dvorsky, J. (1998). Synoptic views of sediments plumes and coastal geography of the Santa Barbara Channel, California. *Hydrological Processes*. 12, 967-979.

¹⁴ Annual Performance Plan for Channel Islands National Park: Fiscal Year 2003. National Park Service (NPS), U.S. Department of the Interior. Retrieved on May 22, 2004 from the NPS website: <http://data2.its.nps.gov/parks/chis/ppdocuments/fy03annualworkplan.doc>
Personal email communication with Kate Faulkner (Chief of Natural Resources Management, Channel Island National Park, CA) on December 2, 2004.

¹⁵ Leicester, MK. (May 21, 1998). Final Supplement to the Final Environmental Impact Statement/ Resources Management Plan for Improvement of Water Quality and Conservation of Rare Species and Their Habitats on Santa Rosa Island, Channel Islands National Park; Availability. U.S. Environmental Protection Agency (EPA). Federal Register: June 19, 1998 (Volume 63, Number 118). Retrieved on July 14, 2005 from the U.S. EPA website: <http://www.epa.gov/fedrgstr/EPA-IMPACT/1998/June/Day-19/i16375.htm>

¹⁶ Reynolds, J. (June 2002). Santa Cruz Island Primary Restoration Plan. Final Environmental Impact Statement. National Park Service (NPS), U.S. Department of Interior. Retrieved on May 5, 2004 from the NPS website: <http://www.nps.gov/chis/restoringsci/page4.html>

¹⁷ A gross registered ton is equivalent to a volume of 100 cubic feet.

¹⁸ Coast Guard regulatory definitions: 46 CFR Subchapters T (subdivided into small and large vessels) and H.

observed increases in the number of private boats moored around the Islands (particularly at Scorpion Anchorage and Prisoners' Cove) over the past two to three years.¹⁹ With increased visitation, small vessel discharges might become a greater issue for Sanctuary water quality – particularly at anchorage sites that tend to be protected from winds and thus have poorer mixing (that would otherwise flush out and dilute pollutants). Of boating-related pollutants, sewage waste from illegal emptying of holding tanks (Type III MSDs) is the most probable one to enter the Sanctuary. Although Island mooring locations are within the Channel Islands National Park boundaries (i.e. within 1 nautical mile of Island mean high tide), changes to algal growth patterns and contamination of shellfish beds due to chronic additions of fecal bacteria and nutrients could harm Sanctuary marine resources.²⁰

²¹

Small vessel accidents (e.g. groundings and collisions) can lead to releases of diesel fuel and chemicals into the Sanctuary. Each year, approximately a number of small vessel groundings occur within CINMS, resulting in diesel spills.²² Although these fuel spills are small, they tend to occur in near-shore, biologically dense communities and therefore have a high potential for causing acute toxic effects in marine biota.²³ Furthermore vessel wrecks become trash piles that can cover or damage marine habitat. An example is the F/V Reliance which grounded and sank off the south point of Santa Rosa Island in June 2003. Only a small amount of diesel was released at the time of the accident, but the sunken wreckage remains and could harm nearby kelp forest habitat if it is moved during a storm.²⁴

Dissolved metals (e.g. copper) from antifouling paint on boat hulls and release of bilge (water that has collected at the bottom of a vessel) were not identified as threats to Sanctuary water quality in reviewed literature or interviews conducted for this project. It is important, however, to note that these are sources of water quality impairment for the greater SBC region, and in particular, the marinas.²⁵ Dissolved metals build up in sediments and are consumed by benthic fauna and bioaccumulate further up the food chain. In particular, copper, a common antifouling ingredient, is known to be highly toxic to aquatic organisms.²⁶ Bilge water usually contains oils and chemical residues (from vessel

¹⁹ Personal communication with Ben Waltenberger (Physical Scientist, CINMS) on August 18, 2004.

²⁰ Personal communication with Ben Waltenberger (Physical Scientist, CINMS) on August 18, 2004.

²¹ "Shipshape Sanitation." California Department of Boating and Waterways (CDBW). Sacramento, CA. Retrieved on July 7, 2004, from the CDBW website: <http://dbw.ca.gov/Pubs/Sanitation/>

²² CINMS staff maintains a log of data on vessel accidents within the Sanctuary, including fuel spill information.

²³ County of Santa Barbara: Energy Division (CSBED). (March 8, 2004). "Natural Oil Seeps and Oil Spills." Report retrieved on July 8, 2004 from the CSBED website: <http://www.countyofsb.org/energy/information/seepsaper.asp>

²⁴ Channel Islands National Marine Sanctuary (CINMS) Sanctuary Advisory Council. (September 18, 2003). Final Meeting Notes: Manager's Report. Retrieved on December 15, 2004 from the CINMS website: http://channelislands.noaa.gov/sac/pdf/9_19_04.pdf

²⁵ Schiff, KC, Diehl, D, Valkirs, A. (June 22, 2003). Copper emissions from antifouling paint on recreational vessels. Southern California Coastal Water Research Project. Technical report #405. Retrieved on August 10, 2004 from the SCCWRP website: <http://www.sccwrp.org/pubs/techrpt.htm>

²⁶ Seligman, P.F., Zirino, A. (eds.). (November 1998). Chemistry, Toxicity, and Bioavailability of Copper and Its Relationship to Regulation in the Marine Environment. Office of Naval Research Workshop Report. Technical document 3044. Retrieved on December 2, 2004 from the U.S. Navy Space and Warfare Systems Center website: <http://www.spawar.navy.mil/sti/publications/pubs/td/3044/td3044.pdf>

machinery). These pollutants can cause direct harm to aquatic life (e.g. reproductive problems and killing eggs or larvae) as well as indirect problems due to bioaccumulation. While boating might not be a significant source of these pollutants directly to Sanctuary waters, certain CINMS marine resources such as marine mammals and fish are exposed to these toxins in and around harbors/marinas.

Small vessels are also potential sources of anthropogenic marine debris which harm marine life primarily via ingestion and entanglement. Discarded or abandoned fishing gear and plastic wastes are the most prevalent types of anthropogenic marine debris in the Southern California Bight region.²⁷ Due to a lack of monitoring for debris in CINMS and the long distances trash can travel due to winds and currents, it is not possible to be more specific about this threat in terms of the amounts and types within Sanctuary boundaries and sources (e.g. small vessels versus land-based sources). The majority of littering from small vessels is probably accidental. However, some amount of littering might depend on boaters' understanding and views about the relative harm caused by different types of wastes. For example, one boater explained that plastics and Styrofoam have severe negative impacts to marine life and that boaters should be careful not to discard these overboard. While he did not believe that it was right to throw any trash in the ocean, he felt it was less important to be vigilant about preventing other types of litter such as rope, aluminum cans and human wastes because he viewed these as being less harmful wastes—things that the ocean takes care of.²⁸

3.3 Large Vessels

Large vessels, defined as 300 gross registered tons or greater, regularly transit the Channel, including northeastern Sanctuary waters. This large vessel traffic is comprised largely of commercial container ships, vessels much larger than the recreational and fishing boats visiting the islands. Potential pollutants from these ships include untreated sewage, blackwater (i.e. untreated sewage), graywater (i.e. non sewage waste water, for example from sinks and showers), bilge water, containing oils or chemical contaminants, trash, untreated ballast waters potentially containing non-native invasive organisms, and air pollutants. Air pollutants can settle out (i.e. deposit) directly onto coastal waters, or onto land and enter coastal waters via runoff. This report distinguishes between shipping traffic (which includes container, bulk and cargo vessels and oil tankers) and cruise ships. Key pollution concerns are potentially different for these two categories.

3.3.1 Shipping Traffic

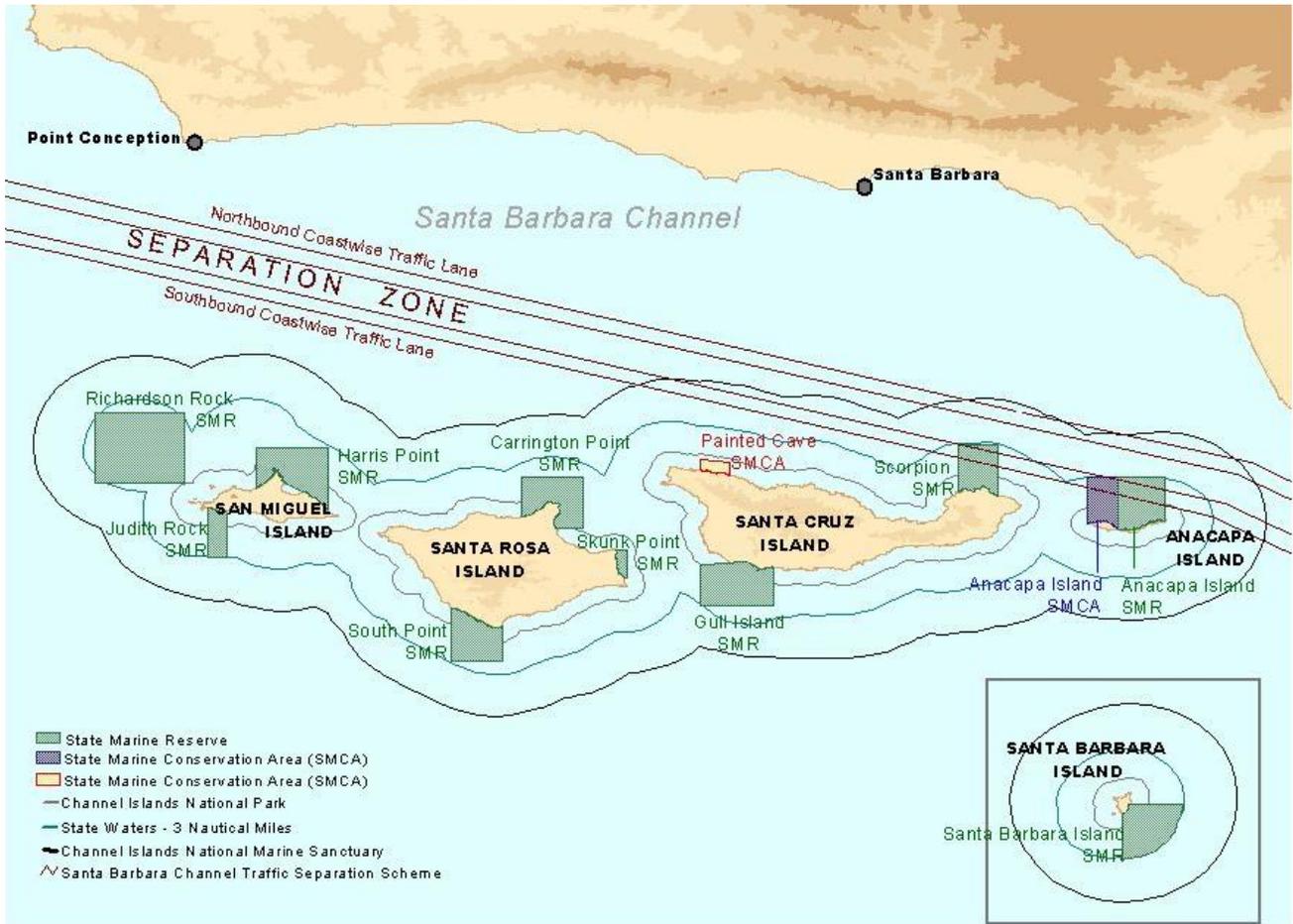
Unlike San Francisco and Los Angeles, the Santa Barbara area does not support a large maritime shipping trade. With one exception, the mainland ports along the Santa Barbara Channel are not equipped to serve large marine vessels. Port

²⁷ Moore, SL, Allen, MJ. (2000). Distribution of anthropogenic and natural debris on the mainland shelf of the Southern California Bight. *Marine Pollution Bulletin*. Vol. 40, No. 1, pp. 83-88.

²⁸ Personal communication, Chuck Mueller (Retired lobster fisherman, Ventura Harbor, CA) on July 7, 2004.

Hueneme, the only commercial deep-water harbor in the Central Coast region, serves niche markets (e.g. import/export of automobiles and produce) and is the primary support facility for the offshore oil industry in the SBC region. Despite this, coastwise large vessel traffic through the Channel is quite high (see Figure 3.3.1). An average of 20 ships per day traverse the SBC in designated international shipping lanes.²⁹ As shown in Figure 3.3.1, these shipping lanes are located within and immediately adjacent to the CINMS.

Figure 3.3.1 The international shipping lanes through the Santa Barbara Channel. Green and blue shaded areas around the Islands are marine reserves.³⁰



Well over half of these vessels are container ships and the rest consist of cargo ships such as dry bulk and auto carriers. Oil tankers make up a relatively small portion of

²⁹ Welch, C. (September 28, 2004). "Bush cut some diesel pollution but let big ships keep spewing." *The Seattle Times*. Retrieved on January, 22, 2005 from the Seattle Times Company website: http://seattletimes.nwsource.com/html/nationworld/2002048167_bushship28m.html

³⁰ Map courtesy of CINMS.

Channel traffic because most travel outside of the Islands.³¹ With the projected 5-10% annual increase in shipping traffic between East Asia and Southern California,³² traffic through the SBC and Sanctuary will also experience increases in vessel traffic volume. In turn, the likelihood of shipping-related accidents that result in fuel spills or discharges of other contaminants might also increase. Other potential water quality threats from shipping include discharges of black and gray-water, oily bilge water, trash, unsecured cargo, and ballast water, which can introduce harmful or invasive non-native species. All of these could have severe, direct impacts on Sanctuary water quality and marine life.

During research for this report, large vessels (including cargo and cruise ships) were specifically mentioned by numerous interviewees as sources of potential or observed Channel pollution. Such discharges from ships (which are illegal) would be of significant concern to the Sanctuary, because they would be occurring near- and within Sanctuary boundaries (corresponding with the Coastwise Lanes). Unfortunately it remains difficult to quantitatively characterize these discharges due to a lack of monitoring of large vessel “behavior” in the SBC, and the exact character and scope of threat is poorly parameterized (nonetheless it should be kept in mind that whatever the true level of threat, it is likely to be increasing proportionally with the above-cited increase in vessel traffic volume).

This lack of information precludes meaningful discussion in this Needs Assessment of the relative threat posed to CINMS by direct discharges of pollutants from shipping traffic. As much as possible, this report does elaborate (below, and in Section 4.3) on the air emissions from shipping as a potential threat to water quality. The inclusion of this discussion on air emissions reflects the availability of information that can be applied to the SBC region as opposed to any known relative importance of this pollution pathway.

Air emissions from large vessels have been identified as a potential threat to water quality resulting from shipping traffic through the SBC. Air pollutants have the potential to become a problem when they settle out of the atmosphere (deposit) onto Sanctuary waters or the Islands. For example, a study done in Santa Monica Bay indicated that a deposition of air pollutants (mostly originating from mainland emissions) was a significant source of pollution in that marine region.³³ With the

³¹ This low proportion is most likely due to the 1992 voluntary agreement by the Western States Petroleum Association to route all tankers carrying crude oil from Alaska to California ports at least 50 nautical miles offshore. “Vessel Traffic Safety,” in *California’s Ocean Resources: An Agenda for the Future*. (March 1997). California Resources Agency. Retrieved on September 28, 2004 from the California Resources Agency website: <http://resources.ca.gov/ocean/97Agenda/Chap5VTS.html>. However, data should be compiled on the routing and volume of tanker traffic south of the Islands, to determine whether pollutants from day-to-day operation of these ships pose a water quality threat to CINMS.

³² Wignall, D. and M. Womersley. 2004. “Shipping Volumes, Routings and Associated Trends.” British Maritime Technology Asia Pacific, Singapore. <http://www.bmtasia.com.sg/>. Presentation given at Shipping Noise and Marine Mammals, May 17, 2004. Arlington, Virginia, USA.

³³ Stolzenbach, KD, Lu, R, Xiong, C, Friedlander, S, Turco, R, Schiff, K, Tiefenthaler, L. (September 2001). Measuring and Modeling of Atmospheric Deposition on Santa Monica Bay and the Santa Monica Bay Watershed.

proximity of the shipping lanes to the Sanctuary and Islands, the high volume of vessel traffic and particular characteristics of large vessel emissions (discussed below), this is an important topic to consider here.

Large marine vessels are generally powered by “category 3” diesel engines. These engines burn “bunker” fuel, a cheap, residue diesel that is essentially the heavy hydrocarbon material that remains after refining crude oil. Bunker fuel tends to have very high sulfur content – on average, 2.7% -- that leads to elevated sulfur dioxide levels in exhaust emissions from large cargo ships.³⁴ Atmospheric pollutant emissions from the diesel combustion in shipping vessel engines also include carbon monoxide (CO), hydrocarbons (HC), aldehydes, diesel particulate matter (i.e. soot) and nitrogen oxides. Diesel engine emissions are a significant source of atmospheric pollution; marine shipping activity is estimated to contribute approximately a third of the air pollution in Santa Barbara County.³⁵ In 2002, 6,700 vessels traversed the shipping lanes with over 87% of these registered under foreign flags.³⁶ Furthermore, by 2015, marine vessel traffic emissions are expected to increase 50% over current levels (assuming similar emissions rates).³⁷ On-board incineration of wastes is another source of air pollution from ships. Incineration produces particulate matter, heavy metals and dioxins.³⁸ (As with the other potential sources of pollution from shipping vessels, it is not clear that on-board incineration is occurring in the SBC.)

Due to the proximity of the shipping lanes to the Sanctuary and high volume of traffic, the Channel Islands themselves as well as Sanctuary waters may be experiencing chronic additions of pollutants and acid from atmospheric deposition. Anacapa and Santa Cruz Islands, in particular, appear to be prone to this form of pollution because the shipping lanes cut directly through the CINMS boundary to the north of the Islands. Since the lanes continue the length of the SBC, other portions of the Sanctuary may also be receiving pollution from marine shipping

Final Report to the Santa Monica Bay Restoration Project. Retrieved on August 3, 2004 from the Southern California Coastal Water Research Project website: www.sccwrp.org

³⁴ Patton, V, Scott, J, Spencer, N. “Smog Alert: How commercial shipping is polluting our air.” Environmental Defense report. Retrieved on July 7, 2004 from the Environmental Defense website:

http://www.environmentaldefense.org/documents/3807_smogalert_2004060.pdf

³⁵ Murphy, TM, McCaffrey, RD, Patton, KA, Allard, DW. The need to reduce marine shipping emissions: A Santa Barbara County case study. Santa Barbara County Air Pollution Control District (SBCAPCD) Paper #70055. Retrieved on June 22, 2004 from the SBCAPCD website:

<http://www.sbcapcd.org/itg/download/awma03finalpaper.pdf>

³⁶ The issue of foreign flags has a tremendous impact on the nature of shipping emissions. Certain nations have avoided enacting or agreeing to place many regulations (environmental ones, in particular) on their marine shipping fleet. Vessels owners choose (i.e. pay a registration fee) to operate under whichever flag they wish and thus avoid using environmentally-friendly technology or practices.

³⁷ Murphy, TM, McCaffrey, RD, Patton, KA, Allard, DW. The need to reduce marine shipping emissions: A Santa Barbara County case study. Santa Barbara County Air Pollution Control District (SBCAPCD) Paper #70055. Retrieved on June 22, 2004 from the SBCAPCD website:

<http://www.sbcapcd.org/itg/download/awma03finalpaper.pdf>

³⁸ “3 Incineration.” in Shipboard Pollution Control. (1998). U.S. Navy and MARPOL Annex V. National Academy Press, Washington D.C. Retrieved on June 2, 2004 from the National Academy Press website:

http://stills.nap.edu/html/shipboard_pollution/chapter3.html#Emissions

traffic. Counter-clockwise wind eddies, turbulent mixing at the air-ocean interface and fog events may contribute to deposition levels in the Sanctuary. It is also possible that shipping emissions are reaching the coastal waters indirectly due to deposition onto the Islands followed by rain/runoff events that deliver pollutants to the Sanctuary. In addition to being a source of acidification, pollutant deposition could introduce toxins that bioaccumulate through the marine food web.

3.3.2 Cruise Ships

In recent years, the numbers of cruise ship visits to Santa Barbara Harbor have averaged about one or two per year.³⁹ Citing the local revenues raised from cruise ship tourism, Santa Barbara city officials seem to be interested in ramping up these activities; four visits occurred in 2004.⁴⁰ Key pollution concerns related to cruise ships are legal and illegal discharges of untreated sewage, blackwater, graywater, oily-bilge and untreated ballast waters. Cruise ships have also been cited in the past for illegal dumping of trash and toxic waste such as dry-cleaning and photo processing chemicals.⁴¹

As with marine cargo shipping, these large passenger vehicles are responsible for engine emissions to air that contribute to chronic pollution. On an individual basis, cruise ship air emissions are likely to be greater than those of other large vessels because of higher electricity demands and solid (non-sewage) waste generation that require more frequent on-board incineration. However, as a class of marine vessels, cruise ships do not constitute a large portion of shipping traffic in the SBC and therefore pose less relative threat in terms of air pollutants.

Unlike most other vessels in the SBC region, cruise ships carry large numbers of passengers. As a result, these vessels produce vast amounts of sewage and graywater. Typical volumes are 210,000 and 1,000,000 gallons (respectively) during a one-week voyage.⁴² Discharges of these wastes introduce large, concentrated inputs of fecal bacteria and nutrients. In regions of low mixing, these releases are often cited as particular concerns due to down stream effects such as sicknesses among beachgoers, shellfish contaminations, de-oxygenation and phytoplankton blooms. Strong mixing in the SBC may rapidly dilute wastes, thus reducing the likelihood of these impacts. However, the mixing by currents and eddies in the SBC may also carry pollutants to the Islands. Furthermore, the overlap of the shipping lanes with CINMS waters presents the possibility of direct releases and subsequent impacts within the Sanctuary.

³⁹ Personal communication with Mick Kronman (Harbormaster, Santa Barbara Harbor). July 16, 2004.

⁴⁰ "S.B. harbors a cruise ship craving." (July 17, 2004). Santa Barbara News-Press.

⁴¹ Schmidt, K. (March 2000). Cruising for Trouble: Stemming the Tide of Cruise Ship Pollution. Report from the Bluewater Network. Retrieved on December 10, 2004 from the Bluewater Network website: http://bluewaternet.org/reports/rep_ss_cruise_trouble.pdf

⁴² *Id.*

Cruise ships also differ from other large vessels in that they regularly generate hazardous wastes such as dry cleaning sludge, photo processing chemicals, paint and print shop wastes and batteries.⁴³ Although vessel operators are not supposed to discharge these wastes to the ocean (under the U.S. Resource Conservation and Recovery Act), cruise lines have violated these regulations in the past.⁴⁴ Furthermore, direct sampling of cruise ship wastewater streams has revealed concentrations of hazardous materials such as heavy metals (e.g. zinc and copper) and organo-chloride compounds that exceed water quality objectives listed in California's Ocean Plan. Among other problems, these pollutants can cause acute poisoning of aquatic life, chronic illnesses, physical deformities and impacts up the food chain due to bioaccumulation.⁴⁵ Heavy metals are also present along with various hydrocarbons (e.g. toluene, benzene) in oily bilge water. This may be of greater concern as a pollution source considering that almost all cited violations by the cruise ship industry have been for releases of oily bilge water. Cruise ships have also been cited for dumping of solid (non-sewage) wastes overboard.⁴⁶

As is the case for shipping traffic in general, cruise ships pose a potential source of invasive species and pathogens due to ballast water discharges. It is unlikely, however, that cruise ships will be exchanging ballast water in the SBC because this is prohibited and they are not actually docking in Santa Barbara Harbor. (They remain moored off-shore and tourists are transported to shore on 200-person tenders). Still, this is another consideration as cruise ship traffic increases in the SBC region.

3.4 Ocean Dumpsites

The SBC region contains multiple sites that were used for dumping of wastes from the 1940's through 1960's. Two sites, one in the vicinity of the Santa Lucia Bank and another south of Santa Cruz Island, have been identified as locations formerly designated for U.S. chemical munitions dumping. A site southeast of Santa Barbara Island might have been used as an explosives dumping area and a location offshore of Port Hueneme might contain 3,100 containers of low-level radioactive waste (at a depth of 4,750 meters).

⁴³ *Id.*

⁴⁴ Klein, R. (October 2003). The Cruise Industry and Environmental History and Practice: Is a Memorandum of Understanding Effective for Protecting the Environment? Report from the Bluewater Network. Retrieved on December 10, 2004 from the Bluewater Network website: http://bluewaternetnetwork.org/reports/rep_ss_kleinrep.pdf

Violations for hazardous waste dumping were in Alaska. No known discharge/dumping violations have occurred from cruise ships within the SBC region.

⁴⁵ Schmidt, K. (March 2000). Cruising for Trouble: Stemming the Tide of Cruise Ship Pollution. Report from the Bluewater Network. Retrieved on December 10, 2004 from the Bluewater Network website: http://bluewaternetnetwork.org/reports/rep_ss_cruise_trouble.pdf

⁴⁶ Citations for bilge discharge and dumping of trash did not occur in the SBC. These examples are mentioned because these past occurrences (along with the low rate of enforcement of these types of violations) suggest a potential behavior pattern that could affect the Sanctuary as the number of cruise ship visits to the SBC increases.

Any dumping of military munitions probably occurred during the 1950's and 1960's. Sites were most likely designated by the U.S. Coast Guard for their depth and remoteness -- features that would make them less likely to be disturbed in the future. Although the types and quantities of chemical munitions at the sites in the vicinity of the SBC are unknown, similar U.S. dumping activities during this era consisted mainly of nerve and mustard gases. In terms of threats to aquatic life, most chemical agents (such as nerve gas) have little impact because they hydrolyze rapidly into non-toxic compounds in seawater. However, explosives and insoluble compounds such as mustard gas can have physical and toxic effects on aquatic organisms and humans if exposures occur. Releases of materials are possible via container leaks or physical disturbances such as contact from trawling nets.^{47,48}

Active dredge material discharge sites are located in the Los Angeles/Long Beach area. Risks from dumped dredge materials occur because these sediments carry high levels of toxic organic compounds and heavy metals that can accumulate in bottom-dwelling organisms and then bioaccumulate in higher trophic levels. A study of dredge disposal sites in the Southern California Bight suggests that they contribute significant contaminant loads (e.g. levels of certain heavy metals, PCBs, PAHs) in comparison with other sources.⁴⁹ Although these disposal sites are not located within the SBC itself, they remain a potential threat to the Sanctuary's resources.

3.5 Wrecks

Shipwrecks within Sanctuary waters and the greater SBC region are possible water quality threats due to diesel fuel spills and discharges of harmful cargo.⁵⁰ Under this category, the *Pacbaroness* shipwreck presents the largest potential risk. In 1987, the *Pacbaroness* (540 ft) collided with an automobile freighter and sank offshore near Point Conception with approximately 80,000 lbs of copper powder concentrate onboard. (The auto carrier did not sink.) Although this shipwreck has not been identified as a source of pollution (beyond the releases due to the accident itself), settling and corrosion of the sunken vessel could lead to releases of copper that would be highly toxic to aquatic life. Furthermore, the *Pacbaroness* sank with 30,000 gallons of remaining bunker fuel that, if leaked, could also have toxic impacts on marine life.⁵¹ (Section 4.6 discusses recent monitoring of the *Pacbaroness*.)

⁴⁷ "Ocean Dumping of Chemical Weapons." (May 5, 2004). Miretrek Systems, Inc. Retrieved on July 27, 2004 from the Miretrek Systems, Inc website:

<<http://www.mitretek.org/home.nsf/homelandsecurity/OceanDumpChemWeap>>

⁴⁸ During World War II, large quantities of mustard gas stores were accidentally dumped in the Baltic Sea off the coast of Italy. Repeated human exposure due to trawler disturbances of the site has been carefully documented, with the most recent occurrence in 1997.

⁴⁹ Steinberger, A, Stein, E, Schiff, KC. (2000). *Characteristics of dredged material disposal to the Southern California Bight between 1991 and 1997*. A report from the Southern California Coastal Water Research Project (SCCWRP). Retrieved on May 2, 2005 from the SCCWRP website:

ftp://ftp.sccwrp.org/pub/download/PDFs/2001_02ANNUALREPORT/04_ar21-andrea.pdf

⁵⁰ Morris, D. (Fall 1996). Channel Graveyard: Wrecks to Respect. *Alolkoy*. Vol. 9, no. 3, p.6. Retrieved on August 18, 2004 from the CINMS website: <http://www.cinms.nos.noaa.gov/publications/fa96alol.pdf>

⁵¹ In the Farallon Islands National Marine Sanctuary, an old shipwreck began episodically leaking its remaining fuel leading to oilings of thousands of seabirds over a ten-year period.

During the investigation of wrecks for this report, other shipwrecks were not identified as likely sources of water quality impairments. According to the U.S. Navy, plane wrecks may have occurred near San Miguel Island while the Navy used this area to train pilots in taking off from, and landing on aircraft carriers.⁵² However, these potential wreck sites are unlikely to pose current threats to water quality because the planes were not carrying cargo and had relatively little fuel.

3.6 Offshore Oil and Gas Production

Oil and gas production in the SBC region consists of 20 operating offshore oil platforms, one oil island offshore the Rincon coast, pipelines to transport oil, gas and produced waters to shore, and support vessel traffic to and from the oil platforms (Figure 3.6).

(continued on page 32)

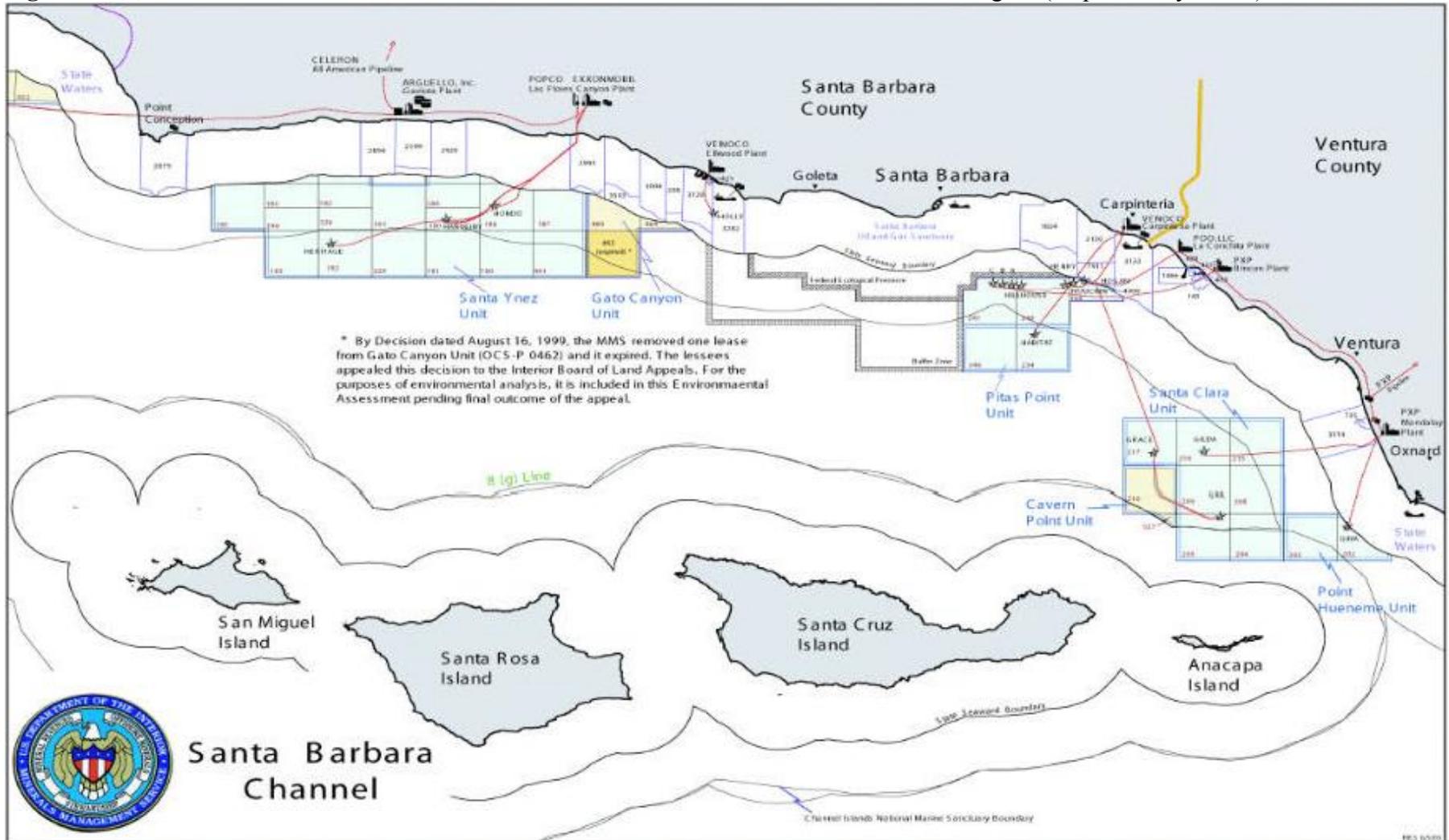
Figure 3.6(a) Locations of oil platforms in the South Coast region.⁵³



⁵² Personal communication, Alex Stone (Sea Range Environment Officer, Pt. Mugu Sea Range, U.S. Navy) on July 28, 2004.

⁵³ Map taken from Steinberger, A, Stein, ED, Raco-Rands, V. (2000). *Offshore oil platform discharges to the Pacific Outer Continental shelf along the coast of Southern California in 1996 and 2000*. A report from the Southern California Coastal Water Research Project (SCCWRP). Retrieved on May 2, 2005 from the SCCWRP website: ftp://ftp.sccwrp.org/pub/download/PDFs/2003_04ANNUALREPORT/ar02-stein_pg16-30.pdf

Figure 3.6(b) California State and US Pacific OCS lease units of the Santa Barbara Channel region (map courtesy MMS)



(continued from page 30)

The platforms are located in federal waters with the exception of platform Holly which is in state waters, southwest of Coal Oil Point. Platform Gail is located about 1,100 meters from the CINMS boundary surrounding Anacapa Island, the other three platforms in the eastern channel are located 2 to 6 miles from the nearest Sanctuary boundary and all the other platforms are greater than 10 miles from the nearest CINMS boundary.

Water quality pollution threats from oil and gas production include releases of oil, produced water, drilling muds, deck drainage and wastewater from oil platforms as well as discharges of ballast, bilge and wastewaters from support ships and deposition of air emissions from platforms and marine vessels. In addition to the existing operations, there are 36 federal and 5-6 state leases that may be developed over the next 25-40 years (see figure 3.6(b)).

Understanding the threats due to hydrocarbon discharges to the SBC from oil production activities is complicated by substantial contribution of these pollutants from other sources, including natural inputs from hydrocarbons seeps off the coast of the Santa Barbara region. (The seeps and other hydrocarbon sources are discussed in Section 4.7.) The severity of negative impacts due to oil spills from the platforms or pipelines depends on the oil type, spill volume, timing, location, oceanographic conditions and the spill emergency response(s).⁵⁴ The Outer Continental Shelf Lands Act defines “a major oil spillage” as “any spillage in one instance of more than two hundred barrels of oil during a period of thirty days.”⁵⁵ However, in a review of hydrocarbon seeps and oil spills in the SBC, the County of Santa Barbara Energy Division states that smaller spills can have major impacts to marine resources (e.g. the Torch pipeline leak near the coast of Vandenberg AFB, 1997) and therefore should be considered “significant.”⁵⁶ Containment and recovery efforts involved in oil spill responses are usually not very efficient, leaving the bulk of the spill in the marine environment. Generally, effects of oil spills in the marine environment include lethal and sublethal effects in a broad range of species due to ingestion and contact (e.g. oiling of fur or feathers and deposition onto benthic organisms in intertidal habitats) with spill materials that can lead to immediate or longer term toxicity (e.g. induced metabolic changes and mutagenic effects), and induce behavioral changes (e.g. in feeding activities and for avoidance of contaminants).⁵⁷

Specific to CINMS water quality, California Coastal Commission reports state that an oil spill from platforms Grace, Gilda, Gail or Gina could contact Anacapa Island (and thus the eastern extent of the CINMS).⁵⁸

⁵⁴ National Research Council (NRC), Commission on Physical Sciences, Mathematics, and Applications. (1985). *Oil in the Sea: Inputs, Fates, and Effects*. Washington D.C.: National Academy Press. Pp. 375-383.

⁵⁵ 43 U.S.C. §1348 (d) (1)

⁵⁶ County of Santa Barbara: Energy Division (CSBED). (March 8, 2004). “Natural Oil Seeps and Oil Spills.” Report retrieved on July 8, 2004 from the CSBED website:

<http://www.countyofsb.org/energy/information/seeps/paper.asp>

⁵⁷ NRC. (1985). Benthic organisms, p. 383, 411, 413-414. Behavioral changes, pp.398-401. Metabolism changes, pp.394-398. Mutagenic effects, pp.384-385.

⁵⁸ California Coastal Commission, Staff Report and Recommendation on Consistency Determination #CD-051-05 (Th 5j): U.S. Department of the Interior’s Minerals Management Service, OCS lease suspension for Cavern Point

In addition to the oil, the platforms draw up produced waters and well treatment fluids during oil production operations. These originate from the natural geologic formations or from seawater that is injected into the wells during the extraction process. Produced waters are the major byproduct during production activities. In the Pacific Region, the average amount of produced water discharged per federal platform was 184.7 million gallons in 2004.⁵⁹ The U.S. Minerals Management Service estimated a yearly average of 330 million gallons produced per platform in the SBC.⁶⁰ As a reservoir of oil is emptied, produced waters constitute a growing percentage of the total material pulled up from a well (potentially reaching 98%).⁶¹ However, produced waters have not composed more than 80% of total material volumes from outer continental shelf production to date.⁶² These wastes are treated, but water-soluble contaminants persist. As a result, discharges of produced waters can contain concentrations of salts, metals, hydrocarbon, organic compounds and sulfur that are greater than the naturally occurring levels in the receiving marine environment. Twelve of the platforms in the SBC discharge their treated produced water into the Channel.⁶³

Platforms on which drilling activities occur also release untreated, water-based drilling muds and cuttings into the marine environment.⁶⁴ During the drilling process, water or oil-based lubricants and cleaners combine with rock and other drilling wastes to form slurries. These slurries, or drilling muds, are composed of water or oil and clays (e.g. barite and bentonite) or polymers as well as heavy metals, traces of hydrocarbons and organophosphates. Drilling muds and cuttings (solid byproducts from the drilling process) are discharged from the platforms. The wastes settle over the ocean floor adjacent to the platforms contributing to the formation of large debris mounds. According to the U.S. EPA, drilling fluids and cuttings are the major pollutant sources discharged from exploratory and development drilling operations.⁶⁵

Unit (lease numbers OCS-P 0210, and OCS-P 0527). Page 32. August 11, 2005. Retrieved from: <http://www.coastal.ca.gov/meetings/mtg-mm5-8.html> September 12, 2005.

⁵⁹ Information from comments provided by Dr. Fred Piltz (Chief, Environmental Studies Section, Pacific OCS Region) in comments on the Draft Water Quality Needs Assessment. (August 10, 2005).

⁶⁰ Minerals Management Service Pacific OCS Region. (June, 2001). Delineation Drilling Activities in Federal Waters Offshore Santa Barbara County, California. Draft Environmental Impact Statement. U.S. Department of the Interior, Camarillo, CA. p.12.

⁶¹ U.S. Environmental Protection Agency (U.S. EPA). (October 2000). Profile of the Oil and Gas Extraction Industry. EPA Office of Compliance Sector Notebook Project, Washington D.C. EPA/310-R-99-006, p. 38. Retrieved on January 12, 2005 from the U.S. EPA website: <http://www.epa.gov/Compliance/resources/publications/assistance/sectors/notebooks/oilgas.pdf>

⁶² Information from written comments by Dr. Fred Piltz (Chief, Environmental Studies Section, Pacific OCS Region) in review of draft of this document. (August 10, 2005).

⁶³ Panzer, D. (1999). Monitoring Wastewater Discharges from Offshore Oil and Gas Facilities in the Santa Barbara Channel and Santa Maria Basin. *Proceedings of the Fifth California Islands Symposium*. March 29 – April 1, 1999. U.S Department of the Interior, Minerals Management Service, Pacific OCS Region.

⁶⁴ Some drilling fluids are oil-based, but release of these to the ocean waters is not permitted. Instead, these muds are either reinjected into the wells or transported to shore for disposal.

⁶⁵ U.S. Environmental Protection Agency (U.S. EPA). (July 18, 2000). FACT SHEET. Proposed National Pollutant Discharge Elimination System (“NPDES”) General Permit No. CAG280000 for Offshore Oil and Gas Exploration, Development and Production Operations off Southern California. U.S. EPA Region 9. Retrieved on January 12, 2005 from the U.S. EPA website: <http://www.epa.gov/Region9/water/npdes/factsheet1.pdf>

A variety of impacts to marine organisms are possible due to changes in water quality caused by discharges of produced waters and drilling muds. In studies that examined toxicity of produced water and/or its constituents to species that are found in the SBC region, effects have included reduced larval settlement in red abalone, reduced survivorship in coral, growth and functional impairments in California mussel and reduced colonization by kelp.^{66,67,68}

According to the California Coastal Commission, even discharges that occur under the new NPDES General Permit for oil platforms are inconsistent with the marine resource, water quality and cumulative impact policies of the Coastal Act. Specifically, the Commission has found that discharges may (1) reduce the long-term productivity of certain marine species to a level below that necessary to sustain healthy populations; (2) potentially contaminate or cause changes in fish species that dwell near the platforms; and (3) cause cumulatively significant adverse impacts, such as chronic sublethal effects.⁶⁹

Although these effects are generally possible, the potential water quality threats to the Sanctuary's resources posed by this pollution source depend on the specific circumstances of the discharges (including location, effluent constituents, and presence or absence of various marine species).

Treated sewage and untreated graywater are also discharged from all of the platforms, introducing fecal bacteria, nutrients and organic compounds (e.g. from detergents).

The support activities associated with oil production are also sources of water quality impairments. Although support activities to the platforms are often coordinated, the numbers of transports required to change crews and restock supplies include >1300 ship and >1800 helicopter transports per year. These vessels depart from Port Hueneme and Santa Barbara (respectively), so they do not generally pass over or near Sanctuary waters.⁷⁰ However, they represent an additional source of the pollutants described under the Large Vessels section.

⁶⁶ Raimondi, PT, Barnett, AM, Krause, PR. (1997). The effects of drilling muds on marine invertebrate larvae and adults. *Environmental Toxicology and Chemistry*. 16: 1218-1228.

⁶⁷ Spangenberg, JV, Cherr, GN. (1996). Developmental effects of barium exposure in a marine bivalve (*mytilus Californianus*). *Environmental Toxicology and Chemistry*. 15:1769-1774.

⁶⁸ Krause, PR. (1995). Spatial and temporal variability in receiving water toxicity near an oil effluent discharge site. *Arch. Environ. Contam. Toxicol.* 29: 523-529.

⁶⁹ California Coastal Commission, Staff Reports and Recommendations on Consistency Determination, report #'s: CD-042-05 through CD-051-05: U.S. Department of the Interior's Minerals Management Service, OCS lease suspensions for 36 oil lease units off San Luis Obispo, Santa Barbara and Ventura Counties. August 11, 2005. Retrieved from: <http://www.coastal.ca.gov/meetings/mtg-mm5-8.html> September 12, 2005.

Additionally, it should be noted that the Coastal Commission has certified NPDES permits for platform discharges under the "override provision" of the Act, but this certification does not obviate the residual impacts of platform discharges on the marine environment.

⁷⁰ Minerals Management Service Pacific OCS Region. (June, 2001). Delineation Drilling Activities in Federal Waters Offshore Santa Barbara County, California. Draft Environmental Impact Statement. U.S. Department of the Interior, Camarillo, CA.

Another water quality consideration is the decommissioning of the oil platforms and production in the SBC.

Debris mounds around platforms are extensive – up to 200 feet across and 30 feet high. Pollutants persist in these mounds and can be redistributed into the water column if the mounds are disturbed. The offshore development leases under which production operations are conducted require complete removal of an oil platform for decommissioning. However, oil producers have failed to clean up and remove the debris mounds. As a result the remaining mounds are potential sources of toxins such as heavy metals. At Chevron's former platform sites near Carpinteria, fishermen, unaware of the mounds, have dragged trawling nets over them.⁷¹ Conclusions from a 2001 study of Chevron's debris mounds in the SBC (conducted under the direction of the CA State Lands- and Coastal Commissions) suggest that incidents such as these might disturb the mounds and re-suspend toxins.⁷²

In terms of the specific water quality threats that oil production poses to the Sanctuary, spills are an obvious concern. A spill from one of the platforms or pipelines, or an accident involving an oil tanker, could introduce hydrocarbons and other contaminants directly to CINMS waters.⁷³ Less drastic, but chronic waste discharges from oil and gas production that do not reach CINMS are obviously not a direct threat to Sanctuary water quality. However, the potential remains for these chronic discharges to harm Sanctuary resources such as wildlife that travel in and out of CINMS boundaries.

3.7 Point Source Pollution

Point source pollution originates from an identifiable point of discharge. In the Sanctuary and greater SBC region, point sources potentially include publicly-owned treatment works, power plants, industrial and stormwater outflows, oil platform operations, dump and wreck sites, improperly-capped oil wells and others. Many of these have been touched upon elsewhere in the discussion of threats, so this section will focus on the remaining sources with the exception of stormwater outflows. (This threat is folded into the discussion of runoff from the mainland.)

Publicly-owned treatment works (POTWs) are facilities that receive wastewater and then clean ('treat') it prior to discharge into a waterbody. Along the SBC mainland coast, there are six municipal wastewater treatment facilities, all of which release treated water into the SBC.⁷⁴

⁷¹ Letter from the Environmental Defense Center to the California Coastal Commission, dated August 9, 1999.

⁷² De Wit, L.A. (March 2001). Shell Mounds Environmental Review. Volume I. Final Technical Report. Prepared for the California State Lands Commission and California Coastal Commission (CCC). Retrieved July 14, 2005 from the CCC website: <http://www.coastal.ca.gov/energy/shellmounds.pdf>

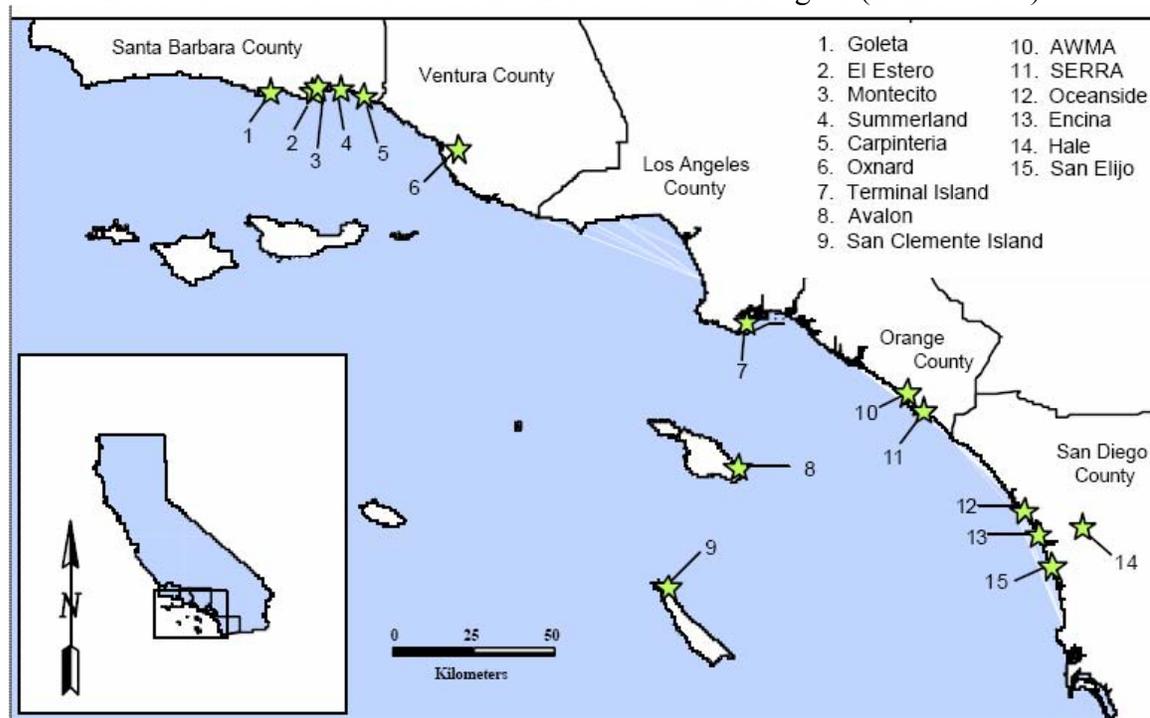
⁷³ Oil tanker activities include barging operations by Venoco from Ellwood, CA and Alaska tanker traffic along the south side of the Islands.

⁷⁴ Goleta, Santa Barbara, Montecito, Summerland, Carpinteria, Oxnard all have POTWs. Information retrieved on November 12, 2004 from the California Environmental Protection Agency, State Water Resources Control Board website: <http://www.swrcb.ca.gov/swim/index.html>

With one exception, these facilities use a combination of primary (physical removal of wastes) and secondary (biological breakdown of wastes) treatments. (Not all wastewater undergoes secondary treatment at the Goleta Wastewater Treatment Plant (WTP); primary and secondary effluents are mixed and disinfected with chlorine which is then deactivated prior to discharge into the ocean.)⁷⁵ Generally, POTWs are potential sources of nutrients, bacteria, viruses, suspended particulate material, toxic compounds, heavy metals, pharmaceutical compounds and marine debris.

In terms of Sanctuary water quality, these POTWs probably pose little direct threat; effluent levels are low (flows range from about 0.2 to 20 million gallons per day at the different sites) and outfalls are close to the mainland shore.⁷⁶ A 2000 SCCWRP survey of

Figure 3.7 Locations of POTWs in the Santa Barbara Channel Region (numbers 1-6).⁷⁷



small municipal wastewater facilities in the Southern California Bight (which includes those along the Santa Barbara coastline) concludes that they contribute relatively minor amounts of contaminants relative to emissions from large facilities. However, this study notes that as large facility contributions of contaminants declined over the past three

⁷⁵ Goleta Sanitary District (GSD). "Treatment." Retrieved November 7, 2004 from the GSD website: <http://www.goletasanitary.org/>

⁷⁶ California Environmental Protection Agency, State Water Resources Control Board. (2004). "All active regulated publicly owned treatment works (POTWS)." Retrieved on November 12, 2004 from the California State Water Resources Board website: <http://www.swrcb.ca.gov/swim/index.html>

⁷⁷ Map taken from Stienberger, A, Schiff, KC. (2000). *Characteristics of effluents from small municipal wastewater treatment facilities in 2000*. Report from the Southern California Coastal Water Research Project (SCCWRP). Retrieved on May 2, 2005 from the SCCWRP website: ftp://ftp.sccwrp.org/pub/download/PDFs/2001_02ANNUALREPORT/02_ar20-andrea.pdf

decades, inputs from small facilities became proportionally more important.⁷⁸ Furthermore, population growth in the southern and central coast regions of California may necessitate expansion of small POTWs and lead to greater discharges of contaminants that become a significant problem for the Sanctuary's resources.

Anecdotal information from one interview suggested that even without direct contact with CINMS water, discharges from the Goleta WTP outflow (located 1 mile offshore of Goleta Beach at a depth of about 95 feet) affect marine resources of the Sanctuary.⁷⁹

The addition of nutrients combined with the availability of substrate, or habitat, (i.e. the effluent pipe) have led to extensive colonization in the vicinity of the effluent area by mussels. In this location, these mussels may contain toxins due to chronic exposure to the WTP effluent. In turn, there is the potential for marine mammals that are attracted to this concentrated food source to be exposed as well.

Two power plants located in the Ventura area intake coastal water for cooling and then release it back to the SBC. In addition to being heated, effluent waters potentially contain chemical residues (e.g. chlorine from disinfection treatments to prevent bio-fouling of the power plant facilities). Possible impacts of these power plant operations include impingement of marine biota on exclusion grates during water intake, re-suspension of sediments, alterations and reductions in the suitability of habitat for native marine species, and toxicity due to contaminants. As with POTWs, direct water quality impairments are unlikely to affect the Sanctuary waters. However, the same concerns about potential indirect influences on Sanctuary resources exist.

3.8 Nonpoint Source Pollution from the Mainland

Runoff from mainland creeks and rivers is a major anthropogenic source of pollutants and debris to the SBC. Intense precipitation during winter storms leads to flushing of waterways into the coastal ocean. In a sense, these big rain events "wash" the landscapes by carrying away materials (e.g. pollutants, vegetation and sediments) that have accumulated or become exposed. The existence and pattern of runoff events themselves are not problematic – rather, they are an important source of nutrients and sediments in the near-shore habitats. However, landscape-use patterns and changes to waterways themselves (e.g. channelizations) have drastically altered the volume, rate and content of runoff. Agricultural practices (including grazing) can add significant levels of sediments, nutrients (nitrate, phosphate, silicates), organo-pesticides and fecal bacteria. Stormwater runoff from urban and developed areas is a source of polycyclic aromatic hydrocarbons (PAH's), metals, pesticides and herbicides, debris (trash) and sewage.

⁷⁸ Stienberger, A, Schiff, KC. (2000). *Characteristics of effluents from small municipal wastewater treatment facilities in 2000*. Report from the Southern California Coastal Water Research Project (SCCWRP). Retrieved on May 2, 2005 from the SCCWRP website:

ftp://ftp.sccwrp.org/pub/download/PDFs/2001_02ANNUALREPORT/02_ar20-andrea.pdf

⁷⁹ Personal communication with Shane Anderson, (Diver/Collector, Marine Operations, University of California, Santa Barbara, CA) on July 15, 2004.

In addition to stormwater runoff, pollutants may also enter coastal waters during periods of no rain or storm events. This dry weather runoff is a result of irrigation activities, sidewalk and street washing, and other uses of domestic water that cause this water to flow over land and into the storm drain system and creeks and rivers, carrying with it pollutants in its path. This type of polluted runoff is a major concern because the volume of water is usually less than what would occur during rainfall events, resulting in more concentrated (less diluted) runoff that eventually flows to the ocean. The pollutants of concern in dry weather runoff are the same as those mentioned previously for stormwater runoff.

From the perspective of protecting Sanctuary water quality, storm-related runoff from the Santa Clara and Ventura Rivers are of greatest concern. These waterways drain large watersheds that are highly developed for urban and agricultural uses. During a storm event, polluted runoff can be propelled into large plumes that spread miles from these river mouths, reaching Anacapa and even Santa Cruz Islands after big storms.⁸⁰

The components of mainland runoff have a variety of negative impacts to the SBC. Beach closures due to high bacteria concentrations after runoff events are the most publicly recognized problem under this category. In terms of the harm caused to the near-shore habitats and the Sanctuary waters themselves, the threat due to pathogens is poorly understood. For the Sanctuary, toxins in mainland runoff may be of greater concern. Heavy metals such as lead, zinc, cadmium and copper mainly enter stormwater from transportation activities (e.g. gasoline, wear to tires and brake pads, etc.) and via atmospheric deposition. In the marine environment, accumulated metals in sediments cause toxicity to benthic organisms (in particular, bivalves) and dissolved metals are toxic to aquatic plants and some fish species.

The Ventura Countywide Stormwater Quality Program conducts yearly monitoring of metals and other contaminants.⁸¹ Over a four-year period (1999-2003), the County of Santa Barbara Project Clean Water (PCW) program conducted annual stormwater quality analyses of various creeks in the County. In all of the study years, concentrations of metals exceeded set water quality standards – the more stringent of the EPA National Recommended Water Quality Criteria (Aquatic Toxicity Standards) or the Regional Water Quality Control Board Basin Plan Objectives.⁸² Although these data are not direct evidence of heavy metals in marine habitats, they suggest that delivery to ocean waters is occurring.

⁸⁰ Warrick, JA, Mertes, JAK, Washburn, L, Siegel, DA. (2004). Dispersal forcing of southern California river plumes, based on field and remote sensing observations. Vol. 24, pp. 46-52.

Monitoring of the Santa Clara River watershed by Warrick et al indicates that during annual recurrence flood events (i.e. those likely to occur every ~2 years), sediment plumes stretch ~10 km offshore. During large flooding events (i.e. those likely to occur only every ~10 years), the sediment plumes extend ~30 km offshore.

⁸¹ The Ventura County Watershed Protection District, the County of Ventura as well as numerous cities have received a National Pollutant Discharge Elimination System permit for discharges to sewer storm drain systems. This stormwater quality monitoring is conducted for compliance under this permit.

⁸² Information taken from the County Santa Barbara Project Clean Water (PCW) “Water Quality Analysis Reports” for 1999-2000, 2000-2001, 2001-2002 and 2002-2003. Retrieved August 30, 2004 from the PCW website: http://www.countyofsb.org/project_cleanwater/documents.htm

The PCW analyses also revealed concentrations of certain pesticides that exceeded the water quality standards. Chloropyrifos, Diazinon and Malathion are organophosphate pesticides that are toxic to aquatic life at very low concentrations. Exceedances of these standards occurred all four years despite aggressive efforts to phase-out commercial availability beginning in 2000. Although levels of glyphosate (e.g. Roundup or Rodeo) were not above the drinking water standard (which is the only existing limit set for this herbicide), the PCW concluded that its concentrations and presence in all samples indicated excessive applications. Glyphosate is considered less harmful because it adheres strongly to soils (reducing likelihood of leaching into groundwater), degrades rapidly and does not tend to bioaccumulate.⁸³ Even with these properties, glyphosate could be prevalent in runoff plumes – possibly reaching well into the Channel (depending on how rapidly it degrades).

Oils, grease and hydrocarbons that enter stormwater from transportation activities, fuels, detergents, industrial products and more, can kill fish and other aquatic organisms or cause chronic health and reproductive impairments. Some petroleum hydrocarbons volatilize quickly and/or are rapidly degraded, but these also tend to have more toxic impacts. Oils, grease and certain hydrocarbon compounds (e.g. those that are chlorinated) persist in sediments causing harm directly to benthic infauna and indirectly to higher trophic levels through bioaccumulation. Levels of oil and grease were high in “first flush” runoff⁸⁴ measurements, as were levels of organic compounds and biochemical oxygen demand (BOD).⁸⁵ These pollutants can lead to anoxic conditions, but it is not clear that these impacts are likely to occur beyond certain sheltered near-shore habitats along the mainland.

Sediments and nutrients are also potentially harmful, but the degree of threat is less clear with these two components. High levels of sedimentation can smother kelp bed habitat and create excessive turbidity, preventing light penetration in the (normally) photic layer. The geomorphology of the coastal mountains is conducive to high sediment production. While human actions have increased sedimentation overall, pre-anthropogenic levels in the channel region were also quite large. Therefore, the incremental impacts to near-shore habitats may or may not be negative. In terms of the Sanctuary’s waters specifically, the sediments are relatively unimportant (in comparison with other mainland runoff components). Analysis of the Santa Clara River plumes suggests that approximately 85% of the released sediments deposit on the near-shore shelf and never reach CINMS.

Impacts due to anthropogenic increases to nutrient levels in mainland runoff are also complex. The pulses of river/creek runoffs during intense rainstorms are the main, natural sources of nutrients for near-shore kelp beds. In this sense, the situation may be similar to that of sediments; anthropogenic additions may or may not be harmful. Channel waters are

⁸³ “Consumer Factsheet on: Glyphosate.” (April 27, 2004). U.S. Environmental Protection Agency (USEPA). Retrieved on August 23, 2004 from the USEPA website:

http://www.epa.gov/safewater/contaminants/dw_contamfs/glyphosa.html

⁸⁴ First flush is the initial period of stormwater runoff during which the concentration of pollutants is substantially higher than during later stages.

⁸⁵ Water Quality Analysis Report: Rain Year 2000/2001. (September 2001). County of Santa Barbara, CA, Project Clean Water (PCW). Retrieved on August 23, 2004 from the PCW website:

http://www.countyofsb.org/project_cleanwater/Documents/2000-01_Sampling_Report.pdf

normally oligotrophic and additional nutrient sources (particularly inorganic nitrogen) could enhance near-shore primary production and be considered beneficial.

Nutrient additions also correlate to phytoplankton blooms in the SBC (as seen during times of upwelling). In general, blooms are an important food source in the channel, but certain diatoms and dinoflagellates in blooms produce toxins that bioaccumulate into higher trophic levels (see Harmful Algal Blooms section). Runoff could be causing more frequent and intense blooms of harmful algal species. Furthermore, even with (spatially) smaller runoff plumes, these effects could be widespread in the Channel. Currents in the SBC tend to sweep up along the mainland towards Pt. Conception where they collide with the California Current (southward). Surface waters can be swept back towards the Islands in a gyre over the Santa Barbara Basin. This intense stirring could be distributing the added nutrients over a large area; although the concentrations after such mixing would be dilute, even a small increase in a limiting component (e.g. nitrate, ammonium, phosphate, silicates, etc.) could significantly boost phytoplankton production.

3.9 Harmful Algal Blooms

Harmful algal blooms (HABs)– also known as ‘red tide’ events – are explosions of toxin-producing plankton populations. These are natural phenomena in the SBC, usually occurring in spring/early summer under conditions of high nutrient concentrations, warm sea surface temperatures and low salinity. One particularly problematic HAB toxin in the SBC is domoic acid. This neurotoxin is (usually) produced by a diatom, *Pseudo-nitzschia*. Domoic acid bioaccumulates in the food chain, causing sickness and subsequent deaths of marine mammals (via strandings) and birds. (Dolphins, sea lions and seabirds are especially prone to poisoning because they consume small fish that feed on the plankton blooms.) The numbers of domoic acid poisoning deaths have been noticeably higher in the SBC region in recent years.^{86,87} This toxin can also pose a health hazard for humans through consumption of tainted shellfish.

3.10 Potential future sources of pollution

3.10.1 Liquefied Natural Gas (LNG) Terminals

Construction of two offshore LNG receiving and regasification terminals has been proposed for delivering gas via pipeline to Oxnard; Crystal Energy wants to use the Grace oil platform which is 11 miles offshore, 6.5 miles from the CINMS boundary and 10 miles from the northeast point of Santa Cruz Island; and BHP Billiton is proposing to build a floating terminal (the “Cabrillo Port”) about 14 miles offshore,

⁸⁶ Cota, M. (April 15, 2004). “Sick sea otters washing ashore.” KSBY News. Retrieved on August 11, 2004 from the European Cetacean Bycatch Campaign website:

http://www.eurocbc.org/domoic_acid_otter_deaths_california_15apr2005page1564.html

⁸⁷ Santa Barbara Natural History Museum. “Marine Mammal Strandings.” Retrieved August 2, 2004 from the SBNHM website: <http://www.sbnature.org/research/vertebrates/marmammal01.htm>

12 miles from CINMS and 18 miles from Anacapa Island.^{88,89,90,91} Water quality impairments due to these projects could occur during construction as well as operation of the terminals. These threats include discharges (both intentional and accidental) to the ocean from the terminals themselves as well as from associated activities. Direct discharges include untreated sewage, wastewater, heated water from cooling of electricity generators, chilled waters from the regasification processes and platform runoff (that may contain chemicals used in maintenance and operation of the facilities).

Associated activities such as construction of pipelines to shore, delivery of gas and vessel traffic involved in support for the terminals pose additional water quality threats. Diesel tugboats (required for construction and continued support) and LNG tanker vessels would contribute to the emissions described under the Marine Vessels section. Furthermore, the offloading of LNG from cargo vessels may increase the likelihood of exotic species introductions from ballast water exchanges.

3.10.2 Open Ocean Aquaculture

Aquaculture is the “propagation and rearing of aquatic species in controlled or selected environments.”⁹² Open ocean aquaculture of finfish is typically conducted in large, saucer-shaped cages anchored to the seabed. Although potential benefits of open ocean aquaculture include reduced impacts to near-shore marine resources, locating such facilities in the SBC region might introduce new threats to Sanctuary resources. The large volumes of wastes produced by concentrated fish-farming could reach the Sanctuary waters leading to acute impacts (e.g. illnesses in marine animals, plankton blooms). Ideally, currents and eddies in the SBC would dissipate any pollutants to safe levels, but actual mixing effects and pollutant concentrations would depend strongly on specific facility locations and farming practices.

Although no open ocean aquaculture facilities exist in the SBC region, proposals for projects are on the horizon. For example, Hubbs-Sea World Research Institute developed plans for an aquaculture facility on Platform Grace, situated 6.5 miles from the CINMS boundary and 10 miles from the northeast point of Santa Cruz Island. The five-year project plan involved farming of finfish (striped bass (non-native), blue fin tuna and California yellowtail) in gravity surface and submerge

⁸⁸ Murillo, S. (October 11, 2003). Firms Tout Natural Gas Terminals. *Los Angeles Times*. Los Angeles, CA.

⁸⁹ “Project Description.” Cabrillo Port Liquefied Natural Gas Deepwater Port Environmental Impact Statement and Environmental Impact Report. Retrieved July 7, 2004 from the Cabrillo Port LNG website: <http://www.cabrilloport.ene.com/description.htm>

⁹⁰ The current status of these proposed projects is as follows. The U.S. Coast Guard (USCG) and the California State Lands Commission (CSLC) are preparing a joint environmental impact statement and report (EIS/EIR) for the Cabrillo Port. This draft EIS/EIR is expected to be completed late in 2005. In February 2004, Crystal Energy LLC submitted an application to the USCG and CSLC for the conversion of Platform Grace to an LNG receiving terminal. The application has not been deemed complete.

⁹¹ Persily, L. (March 21, 2004). Second try for LNG venture by Crystal parent. *Petroleum News*. Vol.9: No.12.

⁹² U.S. Congress. (1980). “National Aquaculture Act of 1980.” *U.S. Code* Title 16, §2801.

cages, as well as halibut and abalone on the platform itself.^{93 94} Such a facility would likely represent a new point source of feces, diseases and parasites, uneaten food, herbicides (used to keep the cages algae-free) and antibiotics in the SBC.

3.10.3 Desalination Facilities

Desalination is a “process that removes dissolved minerals (including but not limited to salt) from seawater, brackish water or treated wastewater.”⁹⁵ Byproducts of this process include large quantities of concentrated brine. If released into marine environments, waste brine can significantly increase salinity levels near the discharge point. The SBC region does not currently have desalination plants in operation, but future scarcity of drinking water could lead to the reopening of the facility in the City of Santa Barbara and/or proposals for new facilities along the coast or on offshore oil platforms.

⁹³ Benjamin, N. (December, 2002). Aquaculture’s next wave threatens to swamp commercial fisheries. *Fishermen’s News*. Pacific Coast Federation of Fishermen’s Association (PCFFA). Retrieved August 3, 2004 from the PCFFA website: <http://www.pcffa.org/fn-dec02.htm>

⁹⁴ Currently, the partnership is seeking a National Pollution Discharge Elimination System (NPDES) permit from the U.S. EPA.

⁹⁵ Pantell, SE. (October 1993). Seawater Desalination in California. California Coastal Commission (CCC). Retrieved on July 14, 2005 from the CCC website: <http://www.coastal.ca.gov/desalrpt/dtitle.html>

4 RESEARCH AND MONITORING

This review of research and monitoring focuses mainly on the efforts to quantify amounts of pollutants and debris entering Sanctuary waters and the greater Santa Barbara Channel (SBC) region. Although specific research and monitoring gaps vary depending on particular threats, an overarching need exists for regular, in situ water quality monitoring within CINMS boundaries.⁹⁶ A consensus exists among marine resource managers, users and researchers that water quality conditions in the Sanctuary are relatively good, however most acknowledge that the true status is unknown at this time. Towards addressing this lack of knowledge, direct monitoring for pollutants such as fecal coliform bacteria, grease and oils, persistent organic toxins and metals achieves multiple goals. It provides baseline water quality data, identifies those threats that create the most significant impairment problems and complements existing remote sensing techniques by providing comparative, ground-truthing data.

Currently, numerous research programs in and around CINMS seek to answer questions about the marine resources of the region. In terms of water quality, very few of these research efforts go beyond sampling of temperature, salinity and, to a lesser extent, nutrients, in the study areas.⁹⁷ These types of information are valuable towards recognizing inherent characteristics of the marine ecosystems. However, they do not directly inform Sanctuary managers about anthropogenic threats to CINMS water quality. Indirectly, pollutant loads could be inferred from information on physical ocean processes in the channel (e.g. currents, winds, upwelling). At this point, however, the in situ sampling for this type of correlation has not been done. Furthermore, with the exception of hydrocarbons from the natural seeps and the nutrients in mainland runoff, there is little research conducted on the ecological impacts of known pollutants in the Channel region.

The CINMS Draft Management Plan Water Quality Action Plan identifies two key research programs that provide analyses of water quality: the Southern California Bight Regional Monitoring Surveys (Bight Surveys) and the *Plumes and Blooms* (PnB) program. These data collection efforts help achieve the Sanctuary's goal "to better evaluate and understand localized and large-scale spatial and temporal impacts from oceanographic and climatic changes..." Due to various factors such as collection frequency and project scale and resolution, they seem less conducive to evaluation of anthropogenic impacts in the coastal zone and offshore CINMS marine resources – an additional objective of the Sanctuary's action plan.

Data from the *Plumes and Blooms* (PnB) research program provide an overview/ introduction to the scale and temporal patterns of basic water quality factors in the SBC. This long-term study of ocean color monitors sea surface temperature as well as sediment and chlorophyll concentrations

⁹⁶ Please note that this recommendation is made under the assumption that the Sanctuary has an overarching research goal of characterizing the threats to water quality specifically within the CINMS boundaries. All of the threats in this report have been conclusively identified as sources of pollution to the SBC region, but their particular contributions to the Sanctuary remain unclear.

⁹⁷ Abeles, A, Chiang, L, Stadler, M, Pitterle, B, Airame, S, Fangman, S, Bergen, M, Ugoretz, J. (February 20, 2003). "Summary of Research Programs in the Channel Islands National Marine Sanctuary." Report was retrieved on February 18, 2004 from the Channel Islands National Marine Sanctuary website: http://www.cinms.nos.noaa.gov/marineres/mpa_workshop.html

via biweekly direct sampling of the channel and SeaWiFS (Sea-Viewing Wide-Field-of-Vision Sensor) satellite data. Translation factors between remote and in situ data are being refined to improve consistency in interpretation of the SeaWiFS results. Researchers are struggling to deal with certain region-specific atmospheric conditions that pose challenges to developing robust correlations. The combined interface of the Islands, SBC and marine/coast produces very dynamic and unusual atmospheric patterns that must be controlled for in translational computations. Despite these issues, PnB researchers have been able to use SeaWiFS data to discern coincidental spatial patterns of temperature, nutrient and biomass levels. According to Dave Siegel (Principal Investigator), these correlations help them make predictions about water quality factors in a certain area based on conditions in another region of the SBC.⁹⁸

Among other research efforts, the Southern California Coastal Water Research Project (SCCWRP) coordinates the Southern California Regional Monitoring Surveys (Bight Surveys) – a collaborative study of coastal ecology, shoreline microbiology and water quality from Pt. Conception to Baja California. Surveys were conducted in 1994, 1998 and 2003. For water quality, sampling in the SBC region was conducted along linear transects from the coast towards the ocean from the Santa Clara River mouth, Port Hueneme, Oxnard, Calleguas Creek mouth and Point Dume. (One transect from the Santa Clara River mouth extended across the SBC to Santa Cruz Island.) An east-west transect along the north sides of Anacapa and Santa Cruz Islands was also sampled. In situ collections were conducted once each in the dry season (October) and after storms early in the rainy season (Jan-Feb) and later in the rainy season (Feb-Mar). These samples were tested for salinity, dissolved oxygen, pH, turbidity, nutrient and chlorophyll concentrations and temperature.⁹⁹ Reports for the '94 and '98 Bight Surveys do not touch specifically on the results from these data collections, and reports for the 2003 survey are not available yet.^{100,101}

In addition to the Bight Surveys, SCCWRP has conducted water quality research in Santa Monica Bay using a great many of the approaches that could be applied to water quality questions in the Sanctuary. Ideally, the Sanctuary staff can leverage its existing involvement with the Bight Surveys to enlist the help of researchers from the SCCWRP in developing a pro-active, system-wide water quality assessment program for CINMS. Inherently, this is a very complex task due to the wide variety of pollution sources, unique physical ocean processes, remote location, numerous jurisdictions and more. SCCWRP has faced at least some of these issues in its work in the L.A. region, and the Sanctuary could benefit tremendously from their expertise.

⁹⁸ Personal communication with Dave Siegel (Principal Investigator, Plumes and Blooms, Marine Science Institute, University of California, Santa Barbara) on May 11, 2004.

⁹⁹ Southern California Bight 1998 Regional Marine Monitoring Survey (Bight'98). (October 1998). Water Quality Workplan. Southern California Coastal Water Research Project (SCCWRP). Retrieved on August 5, 2004, from the SCCWRP website: <http://www.sccwrp.org/regional/98bight/waterqua/wqwkpln.htm>

¹⁰⁰ Southern California Bight 1994 & 1998 Regional Marine Monitoring Surveys (Bight'94 & Bight'98). (March 2003). Executive Summaries and Volumes I-VII. Southern California Coastal Water Research Project (SCCWRP). Retrieved on August 18, 2004, from the SCCWRP website: <http://www.sccwrp.org/regional/94scbpb/94docs.htm> & <http://www.sccwrp.org/regional/98bight/98docs.htm>

¹⁰¹ Personal communication with Satie Airame (Science Advisor, CINMS staff), on June 30, 2004. Due to lack of funding, water quality samples taken from the SBC region during the Bight'03 survey might still be awaiting analysis.

In addition to the Bight Surveys and PnB research, the Partnership in Interdisciplinary Studies of Coastal Oceans¹⁰² (PISCO) research consortium is a source of in situ water quality information at the Islands. PISCO maintains multiple stationary moorings around Santa Cruz and Anacapa Islands that sample temperature and water movements at three depths. The Santa Barbara Coastal Long Term Ecological Research (SBCLTER) Project¹⁰³ conducts shipboard sampling of temperature, salinity, nutrients and particle concentrations across the SBC on a seasonal basis. At this point, the information gathered from these two projects provides limited help in assessing water quality impairments in the Sanctuary and SBC channel region. However, the established moorings and research activities as well as the Sanctuary's existing collaborative relationships with these programs offer possibilities of collecting more comprehensive water quality data with (relatively) minimal additional resources. Options include attaching additional sampling equipment for toxics (e.g. metals, polycyclic aromatic hydrocarbons, etc.) to moorings and/or incorporating additional testing on water samples taken from shipboard sampling.

Representing the whole picture of water quality impacts to the Sanctuary's marine resources involves understanding individual physiological, as well as broader ecological, influences of water pollutants. There are additional resources available to the Sanctuary for characterizing effects at these levels.¹⁰⁴ Studies of kelp bed responses to additions of nutrients, sediment and toxics are conducted under the SBCLTER project. Although SBCLTER focuses on coastal mainland habitat, findings on near-shore ecological impacts to kelp habitat may be transferable (in part) to the Channel Islands. PISCO is another important resource for these data as well as guidance on methodologies. PISCO researchers are involved in developing and demonstrating the combined use of biochemical indicators and remote sensing technology to reveal both ecological and physiological responses within and among communities along a physical environmental gradient.^{105,106} In the future, NOAA might take the lead in implementing and operating an integrated ocean and coastal observation system (OCOS) for the U.S. coasts, oceans and Great Lakes. A bill that is currently under consideration by U.S. Congress (as of July 2005) outlines multiple objective for an OCOS, including enabling "advances in scientific understanding of the oceans and the Great Lakes."¹⁰⁷ Although the proposed legislation sets general mandates that do not specifically reference water quality, this type of research might easily be folded into the implementation of an integrated OCOS.

¹⁰² Partnership in Interdisciplinary Studies of Coastal Oceans is based at four west coast universities: University of Oregon, Stanford University, University of California at Santa Cruz and at Santa Barbara. Web site: <http://www.piscoweb.org/>

¹⁰³ Santa Barbara Coastal Long Term Ecological Research Project is based at the Marine Sciences Institute, University of California, Santa Barbara. Web site: < <http://sbc.lternet.edu/> >

¹⁰⁴ This report does not go into detail about research/monitoring of physiological and ecological impacts of specific pollutants. Without characterization of pollutant types and loads in the Sanctuary, it is unclear which areas of ecotoxicology are applicable.

¹⁰⁵ Menge, B., A. Olson, and E. Dahlhoff. (2002). Environmental stress, bottom-up effects, and community dynamics: Integrating molecular-physiological with ecological approaches. *Integrative and Comparative Biology*. Pp.892-908.

¹⁰⁶ Dalhoff, EP. (2004). Biochemical indicators of stress and metabolism: Applications for marine ecological studies. *Annual Review of Physiology*. Vol. 66, pp.183-207

¹⁰⁷ U.S. Congress (2005, February 10). "Ocean and Coastal Observation System Act of 2005." Senate bill S.361. House of Representatives bill H.R.1584.

The Coastal Toxicology Program (through the UC Toxic Substances and Research Program) is another potential source of information on environmental fate and ecotoxicology of pollutants found in Sanctuary waters.¹⁰⁸ The SCCWRP program also has a group of researchers investigating toxicology in the marine environment. Furthermore, the Coastal Ecology portion of the Bight Surveys involved extensive sampling and toxicity testing of sediments in the SBC region (almost 100 sites). This helped establish reference benthic community characteristics and presented snap-shots of the concentrations and spatial extent of sediment contaminants and toxicities in fish and macroinvertebrates.¹⁰⁹

Although a review of water quality testing techniques is not part of this project, one technology that Sanctuary staff is already considering is worth mentioning here. A semi-permeable membrane device (SPMD) consists of a porous plastic tube containing a fatty material that mimics fish membrane lipids. As water passes through the membrane material, hydrophobic compounds are retained as they would be in fish fatty tissues. These sampling devices are usually deployed in an aquatic environment for three to four weeks after which they are retrieved and chemically analyzed to determine total accumulated amounts as well as average compound concentrations in the environment.¹¹⁰ SPMDs target hydrophobic contaminants such as organopesticides, polycyclic aromatic hydrocarbons (PAHs) and polychlorinated byphenyls (PCBs) – pollutants that are likely to enter the SBC from oil production, shipping emissions, hydrocarbon seeps and in runoff from urban or agricultural areas.

In certain ways, the SPMD technology is ideally suited to the needs of the Sanctuary. It requires minimal research vessel and staff time, and it could be deployed (at least initially) on existing moorings at the islands. The PISCO program already has multiple research moorings around Santa Cruz and Anacapa Islands. As part of the Santa Barbara Channel – Santa Maria Basin Study, the Center for Coastal Studies (Scripps Institution of Oceanography) uses two, long-term mooring sites at the islands (one at the northeast end of Anacapa Island and another north of San Miguel Island). Unfortunately, the SPMDs and other remote testing approaches cannot test for fecal bacteria levels. With concerns about the growing boating and cruise ship activity in the SBC, this is a key pollutant of concern. At this point, monitoring fecal coliform levels would still require manual (i.e. from ship or kayak) sampling.¹¹¹

The following sections address research and monitoring of the specific sources of potential water pollution identified in Section 3.

¹⁰⁸ Information retrieved on August 27, 2004 from the Coastal Toxicology Program website: <http://www.coastalresearchcenter.ucsb.edu/ctp/>

¹⁰⁹ Southern California Bight 1998 Regional Marine Monitoring Survey (Bight'98). (March 2003). Volume IV: Sediment Toxicity and Volume VII: Benthic Infauna. Southern California Coastal Water Research Project (SCCWRP). Retrieved on August 5, 2004, from the SCCWRP website: <http://www.sccwrp.org/regional/98bight/98docs.htm>

¹¹⁰ Huckins, JN, Petty, JD, Lebo, JA, Orazio, CE, Clark, RC, Gibson, VL. (January 3, 2002). SPMD Technology Tutorial (3rd Edition). U.S. Geologic Survey (USGS). Retrieved on August 12, 2004 from the USGS website: http://www.waux.cerc.cr.usgs.gov/SPMD/SPMD-Tech_Tutorial.htm

¹¹¹ Personal communication with Libe Washburn (Geography Department, UCSB), on August 23, 2004. Dr. Washburn and Dr. Patricia Holden (Bren School, UCSB) have, in the past, applied for funding of an interdisciplinary project to develop research tools that addressed both microbiological and physical oceanographic factors of marine pollution. Unfortunately, this project did not receive funding at that time.

4.1 Nonpoint Source Pollution from the Islands

At this time, potential nonpoint source (NPS) pollutants in Island runoff are not monitored or quantified (in Island streams or near-shore marine habitats), so it is not possible to determine the degree of threat.¹¹²

Research concerning geomorphology, soil characteristics and vegetation has been conducted for the northern Channel Islands. Individually, these types of studies do not contribute much to the understanding of runoff processes, but systems-wide assessments of drainages are more helpful. In 1995, the National Park Service's Resources Division staff of the Natural Resource Program Center conducted a riparian-wetland analysis using the Proper Functioning Condition (PFC) method to determine livestock impacts to stream conditions on Santa Rosa Island.¹¹³ (At the time, the Island was still home to cattle grazing.) The methodology assesses "the 'functional condition' of riparian systems according to 17 hydrology, vegetation and stream geomorphology factors."¹¹⁴ Of the streams sampled, the 1995 study found that those subject to grazing were nonfunctional with the exception of one which was functional-at-risk (see footnote for definitions of these classifications).¹¹⁵ By 1998, cattle had been eliminated from the Island. The National Park Service revisited Santa Rosa Island in 2004 and repeated the study using the same methodology and found dramatic improvements in the geomorphology and riparian vegetation in drainages which trap sediments. The PFC method does not involve taking measurements of chemical or physical water quality parameters, so direct conclusions

¹¹² Personal communication with Steve Ortega (Physical Scientist, National Park Service) on March 3, 2004.

¹¹³ U.S. Department of the Interior, Bureau of Land Management. (1998). Riparian Area Management: A User Guide to Assessing Proper Functioning Condition and the Supporting Science for Lotic Areas. TR 1737-15. BLM National Applied Resource Sciences Center. Denver, CO.

¹¹⁴ Channel Island National Park. (2004). Riparian System Recovery after Removal of Livestock from Santa Rosa Islands. Report from the Channel Island National Park (CINP), CA. Provided by Kate Faulkner (Chief of Natural Resources Management, CINP, CA) on December 2, 2004.

¹¹⁵ Rosenlieb, G, Wagner, J, Jackson, B. (Fall 1996). Assessing the condition of riparian-wetland areas. *Park Science Magazine*. Vol 16, No 4. Retrieved on July 16, 2004 from the National Park Service website: [http://www2.nature.nps.gov/parksci/vol16/vol16\(4\)/16assess.htm](http://www2.nature.nps.gov/parksci/vol16/vol16(4)/16assess.htm)

Functional: Adequate vegetation, landform, or large woody debris are present to: (1) dissipate stream energy associated with high waterflows, thereby reducing erosion and improving water quality; (2) filter sediment, capture bedload, and aid floodplain development; (3) improve floodwater retention and groundwater recharge; (4) develop root masses that stabilize stream banks against cutting action; (5) develop diverse ponding and channel characteristics to provide habitat and the water depths, durations temperature regimes, and substrates necessary for fish production, waterfowl breeding, and other uses; and (6) support greater biodiversity.

Functional-At Risk: Riparian-wetland areas are in functional condition, but an existing soil, water, or vegetation attribute makes them susceptible to degradation. For example, a stream reach whose upper watershed is being overgrazed may have the attributes of a properly functioning system, but it may be poised to suffer severe erosion in a future large storm due to artificially increased runoff upstream.

Nonfunctional: Riparian-wetland areas that clearly are not providing adequate vegetation, landform, or large woody debris to dissipate stream energy associated with high flows and thus are not reducing erosion, improving water quality, etc., as already described, are nonfunctional. The absence of certain physical attributes such as a floodplain where one should exist are indicators of nonfunctioning conditions.

about changes in storm runoff composition are not possible. However, impacts to near-shore water quality due to runoff can be inferred from this type of analysis.

At a larger scale, digital and remote sensing data of watershed morphologies for the entire Channel Islands have been collected. An analysis of the runoff and erosion potentials indicated that the islands have very high erosion potentials and conversion rates of rainfall to runoff due to steep terrain and shallow soils. The study also showed that Santa Rosa Island is the major source of sediment plumes due to the symmetric configuration of its drainages that deliver runoff from the center of the island all the way to the coast. Drainages on Santa Cruz Island are less symmetric, resulting in smaller potential for offshore plumes from the Island.¹¹⁶ This difference has been documented in aerial photos and satellite images taken after winter storms.

Runoff from the Islands was identified as a potentially significant source of sediments and bacteria to surrounding waters in the past. With the ongoing restoration efforts to return the Islands to pre-grazing status by restoring native species and improving riparian habitats, this is likely to become less and less of a water quality concern. It is important to recognize, however, that the geomorphology and soil composition will continue to make the landscape prone to erosion. Furthermore, assertions about Island runoff impacts to Sanctuary water quality are just speculation at this time because the existing research on Island watersheds and plumes does not include analysis of the extent and composition of sediment plumes from the Islands. To begin addressing this question Leal Mertes (Geography Department, UCSB) suggests analyzing existing synoptic plume data to construct a predictive spatial range of plume sizes correlated to precipitation levels. If the storm runoff composition was known, the various plume ranges could serve as proxies for spatial delivery of sediments, and, in turn, any carried pollutants to the marine habitat. Dr. Mertes has offered the use of her synoptic plume data, but information on runoff composition has not been collected.

Currently, none of the Islands have a stream monitoring program in place. Fresh water creek monitoring on Santa Rosa Island was conducted in the mid 1990's by the National Park Service.¹¹⁷ More recently, ideas for on-island monitoring of creek water quality have been suggested for Santa Cruz Island.^{118,119} Although the Island no longer has livestock, feral pigs are potentially increasing the levels of sediments, nutrients and fecal bacteria in

¹¹⁶ Mertes, LAK, Martella, KD, Ruocco, M, Bushinga, WW. (1999). Watershed analysis for runoff and erosion potential on Santa Catalina, Santa Cruz and Santa Rosa Islands. *Proceedings of the Fourth California Island Symposium: Update on the Status of Resources*. Minerals Management Service, Camarillo, CA. OCS Study MMS 99-0038, pp. 461-468. Retrieved on June 14, 2004, from the StarThrower Educational Multimedia web site: <http://www.starthrower.org/research/conservation/cis99mertes.pdf>

¹¹⁷ Personal communication with Steve Ortega, Physical Scientist at Channel Islands National Park on March 5, 2004. Testing was conducted at 9 sites on Santa Rosa Island using a Heriba Probe to measure dissolved oxygen, temperature, pH, salinity. Grab samples were taken from four of the sites and tested for total nitrogen, phosphorus and nutrient loading; as well as fecal and total coliform counts. Steve estimated that 50-60 samplings (per site) have been conducted since the 1990's. Data have not been published, but the Park Service apparently has internal report (in spreadsheet format).

¹¹⁸ Personal communication with Tim Coonan, Superintendent for Channel Islands National Park on June 16, 2004.

¹¹⁹ Personal communication with Jessie Altstatt at Santa Barbara Channelkeeper on June 2, 2004.

the creeks prompting a proposal to develop a protocol for monitoring changes in water quality as a result of pig removal.¹²⁰

4.2 Small Vessel Traffic

Monitoring of boating impacts to water quality is relatively limited at this time. Ben Waltenberger (CINMS Physical Scientist) conducts regular aerial monitoring of marine mammals and boats around the Islands.¹²¹ The Sanctuary has partnered with Santa Barbara Channelkeeper, a local non-profit organization (see Section 6.2.1 on page 124 for more information), to pilot a project that monitors boating-related pollutants in the water and sediments at popular anchorages around the islands. Thus far, Channelkeeper representatives have collected samples from eight anchorages around Santa Cruz and Anacapa Islands during low-use time periods and over the July 4th weekend (2005). Samples are being monitored total coliform, *E.coli* and *Enterococcus* counts, as well as grease and oils.¹²² (This type of information could be combined with data from NOAA's periodic aerial survey counts of boats and weather and current patterns to better understand the likely fate of the pollutants.) To parse out the influences of boating on human health factors from other contributors to fecal coliform counts (e.g. feral pigs on Santa Cruz Island, marine mammal haul-out areas and bird rookeries), the testing needs to be coordinated with on-island creek monitoring.

Although water quality impairment due to dissolution of antifouling paints is not a direct threat to CINMS waters, it may be beneficial for the Sanctuary staff and Advisory Council to be aware of current information/studies on this issue. The Southern California Coastal Water Research Program (SCCWRP) recently conducted a comparative review of copper emissions from various hull treatments and activities (e.g. cleaning, mooring). The report finds that while dissolution rates of copper are highest after hull cleaning, the biggest determinant to total emissions is the type of hull coating because passive leaching results in 95% of the emitted copper mass. This suggests that in addition to the use of best management practices for hull cleaning (e.g. dry docking), promoting the use and improvement of biocide-free coatings is an important management strategy for emissions reductions.¹²³ Other helpful information may also come from the University of California Sea Grant Extension Project that has recently released two studies on antifouling

¹²⁰ Personal email communication with Kate Faulkner (Chief of Natural Resources Management, Channel Island National Park, CA) on December 2, 2004. Ms. Faulkner provided a copy of the "Scope of Work" for a researcher from the University of Northern Arizona who is developing a monitoring protocol.

¹²¹ Personal communication with Ben Waltenberger (Physical Scientist, CINMS) on August 18, 2004. Ben conducts aerial surveys at the Islands 2-3 times per week (depending on weather conditions and status of the plane. (In the past surveys have been canceled for 1-2 months due to aircraft repairs.) Three different flight paths, or transects, are used in monitoring. The first consists of double "figure-8's" over San Miguel, Santa Rosa and Santa Cruz Islands. The second goes from Anacapa to Santa Barbara Island (which is circled twice). The last transect is not predefined and can cover any area in the SBC region.

¹²² Personal communication with Jessie Altstatt at Santa Barbara Channelkeeper and Sarah MacWilliams at CINMS on June 22 and 24, 2005.

¹²³ Schiff, KC, Diehl, D, Valkirs, A. (June 22, 2003). Copper emissions from antifouling paint on recreational vessels. Southern California Coastal Water Research Project. Technical report #405. Retrieved on August 10, 2004 from the SCCWRP website: <http://www.sccwrp.org/pubs/techrpt.htm>

approaches. One documents a demonstration project of different non-toxic antifouling treatments for recreational boat hulls. The other project looks at economic incentives for boaters to use anti-fouling coatings.¹²⁴

4.3 Large Vessel Traffic

Currently, no efforts exist to directly monitor either the volume or water quality impacts of large vessel traffic in the SBC. However, the National Marine Sanctuary Program currently intends to pilot a vessel-logging technology with an Automated Identification System (AIS) located near the shipping lanes, on Santa Cruz Island. The Program's AIS receives information about vessel identities, exact positions and cargo types from transponders carried by large vessels within the Santa Barbara Channel. (By law, all of these large vessels have the identification transponders.) Olympic National Marine Sanctuary uses this type of system to monitor vessel traffic and facilitate enforcement of traffic regulations in Puget Sound. For CINMS, this system is a potential real-time source of data on large vessel traffic—a key first step to characterizing this threat to Sanctuary water quality.¹²⁵

In the SBC, pollution from large marine vessels is challenging (impractical) to specifically pinpoint. Some pollution originates from prohibited discharges (e.g. bilge or ballast discharges) and would require prolonged enforcement/monitoring of individual ships' behaviors to effectively estimate quantities and potential impacts. This section focuses on research gaps and opportunities related to diesel emissions which are more consistent and thus easier to monitor.

Very little research has been done that applies to water quality impacts due to the air emissions from shipping traffic in the SBC. In general, though, numerous studies exist of rates and patterns of pollutant additions via atmospheric deposition to marine environments. Most applicable to circumstances in the SBC is a comprehensive study by the Southern California Coastal Water Research Project (SCCWRP) of the amounts and spatial patterns of atmospheric deposition of nutrients and toxic contaminants (focusing on trace metals) to Santa Monica Bay. Wet deposition was sampled directly. Measured air concentrations were used to model regional meteorological conditions and, in turn, estimate dry deposition.

The results of this study showed that deposition (direct additions to Santa Monica Bay as well as indirect additions due to deposition on the watershed and subsequent runoff to the Bay) was “significant relative to other inputs of metals to the Bay.”¹²⁶ Other findings that

¹²⁴ Johnson, LT, Miller, JA. (May 2004). Nontoxic Antifouling Strategies Demonstration Project & Nontoxic Antifouling Strategies Economic Incentives Study. California Sea Grant College Program. Retrieved on August 16, 2004 from the University of California Sea Grant Extension Project- San Diego website: <http://seagrant.ucdavis.edu/publications.htm>

¹²⁵ “Meeting Highlights, Friday March 18, 2005,” Channel Islands National Marine Sanctuary Advisory Council. Retrieved on May 14, 2005 from the CINMS website: http://www.cinms.nos.noaa.gov/sac/pdf/3_18_05.pdf

¹²⁶ Stolzenbach, KD, Lu, R, Xiong, C, Friedlander, S, Turco, R, Schiff, K, Tiefenthaler, L. (September 2001). Measuring and Modeling of Atmospheric Deposition on Santa Monica Bay and the Santa Monica Bay

are relevant to this issue in the SBC were: dry deposition is the primary pathway of pollutant additions from the atmosphere; most deposition appears to occur within close proximity to the emission source; and the relatively large particle size (>10 microns) of aerosols that constitute the majority of deposited trace metal mass indicates that most of these contaminants originated from “area sources (off-road vehicles and small businesses) in the Santa Monica Bay watershed.”¹²⁷ While these results cannot be directly extrapolated to the SBC region, they indicate that deposition may be a significant contaminant source here as well. In particular, the latter two findings – large aerosols from area sources account for most of the metal deposition and most deposition occurs from nearby sources -- suggest the importance of examining deposition in the SBC where the shipping lane, oil production and hydrocarbon seeps are all point sources that fall within these two parameters.

From the Sanctuary’s perspective, understanding the specific threat from marine shipping vessels involves first establishing whether air pollution is being transmitted to the Sanctuary waters. Although deposition (wet or dry) of diesel emissions has not been directly measured, certain factors (in addition to the SCCWRP findings) indicate that it is probably occurring. Based on observations of the exhaust emissions from cargo vessels, soot (visible particulate matter) appears to settle quite rapidly onto the ocean surface.¹²⁸ A series of tracer studies of offshore and coastal dispersion of pollutants conducted at Ventura, Carpinteria and Pismo Beach indicated that the depth of mixing of the marine boundary layer (the air just above the ocean surface) is quite shallow (approximately 100m). This suggests that plumes in these regions are more likely to become trapped and create high pollutant concentrations.¹²⁹

On a regional scale, a model such as the one used in the SCCWRP study could be applied to the SBC to measure total deposition of nutrients and pollutants. However, parsing out the contribution from the shipping lanes specifically might require a more focused approach. An offshore and coastal dispersion (OCD) model to determine impacts from point sources (or, in this case, line sources) has been developed and was tested for the SBC region. Further application of this model would require extensive on- and offshore, hourly meteorological data collection.^{130,131}

Fog in the SBC and at the Islands may be a key deposition path. The prevalence of this deposition pathway depends on a variety of factors, such as hygroscopicity of the released

Watershed. Final Report to the Santa Monica Bay Restoration Project. Retrieved on August 3, 2004 from the Southern California Coastal Water Research Project website: www.scewrb.org

¹²⁷ *Id.*

¹²⁸ Personal communication with Michael Hanrahan (Underwater filming) on August 5, 2004, and with Jessie Altstatt (Channelkeeper) on June 2, 2004.

¹²⁹ “Appendix C Air Emissions and Air Quality” in Shipboard Pollution Control. U.S. Navy and MARPOL Annex V. National Academy Press, Washington D.C. 1998. Retrieved on June 2, 2004 from the National Academy Press website: http://stills.nap.edu/html/shipboard_pollution/appendix-c.html#PollutantDispersionintheMarineBoundaryLayer

¹³⁰ “A.7: Offshore and Coastal Dispersion Model” in Appendix A—Summaries of Preferred Air Quality Models. Compliance Resource Center. Retrieved on June 2, 2004 from the Seton Resource Center website: <http://www.setonresourcecenter.com/40CFR/Docs/wcd0005a/wcd05a4f.asp>

¹³¹ “Dispersion Models.” Technology Transfer Network. U.S. Environmental Protection Agency (EPA). Retrieved on June 2, 2004 from the EPA website: <http://www.epa.gov/scram001/tt22.htm#rec>

pollutants (relative affinity for water), fog formation patterns in the SBC, and mixing at the air/ocean interface. The hygroscopic nature of the emissions determines, in part, the capacity for fog droplets to carry the shipping emissions pollutants. Laboratory studies of diesel soot have shown that it is not very hygroscopic. However, addition of sulfur significantly increased the affinity for water of the hydrocarbon particulate matter that is the main constituent of the soot.¹³² As discussed previously, most large marine vessels use bunker fuel that is quite high in sulfur content. Although the evidence is indirect, these two factors— prevalence of fog in the Channel region and the potentially hygroscopic nature of the soot emissions— suggest that fog may act as a pollution vector.

Very little research on fog formation and composition in the SBC had been conducted. However, two projects at UCSB may prove beneficial to the Sanctuary in addressing parts of this issue. Ted Eckmann, a graduate student in the Geography Department, researches fog formation patterns in the SBC.¹³³ His work could help in predicting deposition hot-spots or patterns (e.g. seasonal or diurnal) of transport to the islands. Chris Still, a professor in the same department, began (in 2004) a study on Santa Cruz Island of the role of fog in the ecological functions of the coastal ecosystems. His work involves on-island monitoring of fog-water delivery (due to physical interception by vegetation) and fog composition. When contacted about this needs assessment, Dr. Still expressed willingness to potentially incorporate additional testing of fog composition for pollutants specific to shipping traffic emissions.¹³⁴

As with research on transport and deposition of large vessel air emissions, the monitoring of vessel traffic is scant. In a case study of marine shipping emissions in the county, the Santa Barbara County Air Pollution Control District (SBCAPCD) had to use records of arrivals and departures from the Ports of L.A./Long Beach and Hueneme to determine the number of transits and types of vessels through the Channel (the District then used engine emissions rates based on vessel types to calculate released criteria pollutant quantities [e.g. NO_x, SO_x, and particulate matter]¹³⁵). It may be possible to leverage some of the existing NOAA resources, such as the aerial photo monitoring and the AIS, to gather empirical data on vessel traffic. In turn, this data could serve in extrapolating both quantities and rates of deposition to Sanctuary waters.

Although additional existing research and information for this issue do not appear to exist, there are published methodologies for detecting diesel exhaust-specific pollutants and assessing their toxicity to aquatic organisms. With basic estimates of delivery of diesel pollutants (via direct deposition to the Sanctuary waters and via runoff from the islands), an assessment could be conducted on the risks to CINMS resources posed by current shipping

¹³² Weingartner, E, Burtscher, H, Baltensperger, U. (1997). Hygroscopic properties of carbon and diesel soot particles. *Atmospheric Environment*. Vol. 31, No. 15, pp. 2311-2327.

¹³³ Information about Ted Eckmann's (Geography Department, University of California) research can be found at his website: <http://www.geog.ucsb.edu/~ted/>

¹³⁴ Personal communication with Chris Still (Professor, Geography Department, University of California, Santa Barbara) on June 20, 2004. Additional information on Dr. Still's research can be found at his website: <http://www.geog.ucsb.edu/%7Ecstill/research/channel.html>

¹³⁵ Personal communication (email) with Anthony Fournier (Air Quality Engineer, Santa Barbara County Air Pollution Control District) on August 3, 2004.

emissions as well as projected future emissions. With 10-year projections for a 50-100% increase in maritime transport emissions, developing a better understanding of diesel emissions impacts on the Sanctuary is an important research objective.¹³⁶

4.4 Anthropogenic Marine Debris

Anthropogenic marine debris is identified in this report as a polluting byproduct of several activities listed as “threats.” It is also discussed separately in this subsection to relay important research and monitoring conducted specifically on anthropogenic marine debris itself, irrespective of the activity from which it originated.

A few studies have been conducted on sources and types of marine debris in the SBC and along the beaches of the Channel Islands. A trawling survey of types, distribution and amounts of marine debris on the seafloor of the Southern California Bight mainland shelf was conducted in July and August of 1994 by the Southern California Coastal Water Research Project (SCCWRP).¹³⁷ The study found very little anthropogenic marine debris in the SBC region (northern Bight). (The scope of the project did not include the shelf around the Islands.) Interesting trends were revealed; in terms of debris types, the overall greatest form was fishing gear followed by plastic wastes. Concentrations of anthropogenic marine debris increased with greater depths (i.e. moving from the inner to outer continental shelf), and around outfall sites of publicly owned treatment works (POTW). Bottles and cans, in particular, were quite common around the POTW outfalls despite being too large to have passed through outfall screens. By comparing locations/types of anthropogenic debris with natural debris (from marine and terrestrial sources), the study concluded that a majority of human-generated wastes were likely originating from boating activity (disposal of trash and incidental items). It also attributed the high concentrations of bottles and cans at POTW outfalls to boating activities due to the popularity of these sites for recreational fishing.

This 1994 study is the most recent of its kind that extends into the SBC itself. However, SCCWRP has sponsored two trawl sampling studies of plastic debris at different depths at sites near Long Beach and in Santa Monica Bay. Results indicated that the highest level of plastics occurred at the seafloor. At the surface, the plastic-to-plankton mass ratio (per cubic meter) for plastic pieces that were within the same size range as zooplankton was 0.6.¹³⁸ The potential implications for marine life that ingest plankton are concerning.

The Algalita Marine Research Foundation (AMRF), a non-profit organization based in Long Beach CA, has led multiple program initiatives that address plastics debris in the

¹³⁶ Murphy, TM, McCaffrey, RD, Patton, KA, Allard, DW. The need to reduce marine shipping emissions: A Santa Barbara County case study. Santa Barbara County Air Pollution Control District (SBCAPCD) Paper #70055. Retrieved on June 22, 2004 from the SBCAPCD website:

<http://www.sbcapcd.org/itg/download/awma03finalpaper.pdf>

¹³⁷ Moore, SL, Allen, MJ. (2000). Distribution of anthropogenic and natural debris on the mainland shelf of the Southern California Bight. *Marine Pollution Bulletin*. Vol. 40, No. 1, pp. 83-88.

¹³⁸ Moore, CJ, Moore, SL, Weisberg, SB, Lattin, GL, Zellers, AF. (2002). A comparison of neustonic plastic and zooplankton abundance in southern California's coastal waters. *Marine Pollution Bulletin*. Vol. 44, pp 1035-1038.

ocean. AMRF founder, Charles Moore, has led the organization's survey of pelagic plastics in the Northern Pacific Gyre and collaborated with the SCCWRP on the study offshore near Long Beach. With funding from the State Water Resources Control Board, AMRF is currently completing a study of source of plastics in two Los Angeles County watersheds.¹³⁹ AMRF is a potentially valuable sources of expertise and guidance should the Sanctuary choose to go further with characterizing this marine debris issue.

From 1989 to 1993 various beaches at San Miguel and Santa Rosa Islands were monitored for anthropogenic debris as part of a National Park Marine Debris Monitoring Program (jointly funded by the National Park Service and the National Marine Fisheries Service).¹⁴⁰ Over 90% of debris found each year was plastics – namely foam pieces. Based on the debris types and the very low visitor-ship to the surveyed beaches, the study concluded that the majority of debris originated from the mainland.¹⁴¹ Almost 10% of the plastic debris was attributed to fishing and boating. This type of study has not been repeated since the completion of this program. While a multi-year study is probably unnecessary, a one-time review of the survey sites (using the same methodology from the National Park Service program) would provide a valuable comparison for understanding changes in the degree of water quality threat posed by marine debris. Furthermore, this particular study provides an excellent framework for classifying debris based on likely sources and potential species-specific impacts.

Ongoing monitoring of trash at mainland beaches in the SBC region is conducted by The Ocean Conservancy under its National Marine Debris Monitoring Program (NMDMP) which is funded by the U.S. EPA. Monitoring of NMDMP sites is conducted every 28 days by program volunteers. Maps of monitoring sites and survey data are available at the NMDMP web site.¹⁴²

4.5 Ocean Dumpsites

Monitoring and research of suspected historic dumpsites and their impacts have not been conducted.¹⁴³ Due to the depths of most of the munitions dumping locations, investigation of the sites would most likely entail use of remote operated vehicles for access.

¹³⁹ "Initiatives: Current AMRF/ORV Algalita Projects." Algalita Marine Research Foundation (AMRF). Retrieved on August 14, 2004 from the AMRF website: <http://www.algalita.org/initiatives.html>

¹⁴⁰ Richards, DV. (1993). Marine Debris Monitoring Program: 1993 Annual Report. National Park Service (NPS), Channel Island National Park, Ventura, CA. Technical Report CHIS-94-04. Retrieved on June 28, 2004 from the NPS website: <<http://www.nature.nps.gov/im/units/chis/HTMLpages/AnnlReports/MarineReports.htm>>

¹⁴¹ Although pinpointing the exact sources of trash is not possible, the study definitively shows that debris from the mainland reaches the islands. In a post-storm survey (December 1992), sugar cane (which is only grown on the mainland) was found on the island beaches.

¹⁴² "National Marine Debris Monitoring Program." The Ocean Conservancy. Retrieved August 1, 2004 from the Ocean Conservancy website: <http://www.oceanconservancy.org/dynamic/learn/programs/debris/debris.htm>
Program Coordinator is Adina Rose.

¹⁴³ Personal communication. Alex Stone (Sea Range Environment Officer, Pt. Mugu Sea Range, U.S. Navy) on July 28, 2004. Alex was not aware of any monitoring of historical dumping sites and the Navy does not have records of what has been put at these locations. According to Alex, the sites were probably used for munitions disposal as ships returned from the east Pacific at the end of World War II. Once it became apparent that dumping was

The Southern California Coastal Water Research Project (SCCWRP) conducted a study of dredge disposal contamination (based on National Pollution Discharge Elimination System (NPDES) permit reports) for the Southern California Bight between 1984 and 1997. Contaminant loads from dredge materials represented a significant portion of the total combined loads from large municipal wastewater treatment facilities and dredge disposal sites.¹⁴⁴ Unfortunately, the SCCWRP analyses did not specifically consider the Hueneme Canyon site, and attempts to locate NPDES reports for this needs assessment were unsuccessful. A potential source of data is the Restoration Advisory Board for the Ventura County Naval Base which has overseen sampling of historic dredge materials to monitor hot spots in the harbors.¹⁴⁵

4.6 Wrecks

During the Sanctuary Quest 2002 research project, a U.S. Navy remotely operated vehicle filmed the *Pacbaroness* wreckage. The site had significant marine life on and around the ship indicating that toxic pollutants are not likely to be leaking. Researchers also noted that the vessel was covered with sediments – more than they had expected considering when the ship sank.^{146,147} Although this suggests that the risk of release is limited, Bob Schwemmer (Cultural Resources Coordinator, CINMS) cautions that the *Pacbaroness* should not be ruled out as a water quality threat. Sediment samples that were collected from the wreck and a reference site during the project have not yet been analyzed. Comparing hydrocarbon and copper concentrations should reveal if leaking is probable and if further testing (e.g. water sampling) is recommended.¹⁴⁸

occurring, the Coast Guard began designating locations (that were quite deep) as a way of “keeping a handle” on the situation. Since this was “before the era of RCRA and other environmental laws, vessels were not required to report what they were dumping.” As for when dumping stopped, Alex thought that this type of military disposals tapered off during the 1960’s and had stopped entirely by 1970. Alex has responded to “multiple” congressional inquiries into these sites and expressed personal interest in pushing for a collaborative effort (Navy and Sanctuary) to send a remote operated vehicle down to look at the sites.

¹⁴⁴ Steinberger, A, Stein, E, Schiff, KC. (2000). *Characteristics of dredged material disposal to the Southern California Bight between 1991 and 1997*. A report from the Southern California Coastal Water Research Project (SCCWRP). Retrieved on May 2, 2005 from the SCCWRP website:

ftp://ftp.sccwrp.org/pub/download/PDFs/2001_02ANNUALREPORT/04_ar21-andrea.pdf

¹⁴⁵ “RAB Minutes.” (March 6, 2003). Restoration Advisory Board Naval Base Ventura County Meeting Minutes. Retrieved on July 15, 2004 from the Naval Facilities Engineering Command website:

<http://www.efds.w.navy.mil/Environmental/Ventura.htm>

¹⁴⁶ Marquis, S. (July 15, 2002). “NOAA Unveils Initial Findings from California Shipwreck Visit.” Press Release. National Marine Sanctuaries, NOAA. Retrieved on August 18, 2004 from the NOAA website:

http://www.sanctuaries.nos.noaa.gov/news/pressreleases/pressrelease07_15_02.html

¹⁴⁷ Interview of Sarah Fangman by Val Zavala and Jess Marlow. (July 26, 2002). Life & Times Transcript. KCET. Retrieved on August 18, 2004 from the KCET website:

<http://www.kcet.org/lifeandtimes/archives/200207/20020726.php>

¹⁴⁸ Personal communication (email) with Bob Schwemmer (Cultural Resources Coordinator, CINMS) on August 16, 2004.

Due to the expense and coordination involved, regular monitoring of wreckage sites is not reasonable. However, there may be opportunities to collaborate further with the U.S. Navy on investigation of specific wreckages.

4.7 Hydrocarbons

Types of hydrocarbons found in the SBC include gas (e.g. methane), light and heavy oils, grease and tars. Anthropogenic sources of hydrocarbons to the SBC include oil production activities, bilge wastes from marine vessels, urban runoff in stream outflows and atmospheric deposition of air pollutants. This region is unique from other California coastal areas because the overwhelming majority of hydrocarbons originate from large natural seeps. Natural releases of gas and oil occur along the SBC coast (sporadically) from the Vandenberg AFB (Pt. Sal) region to Ventura in both near-shore areas as well as the outer continental shelf. To classify these seeps as water quality threats in the manner in which the term has been applied in this report would be inaccurate; they are natural occurrences.¹⁴⁹ However, characterization of this source is necessary to give context to anthropogenic hydrocarbon pollution impacts in the SBC region.¹⁵⁰

The UCSB Seeps Group studies the seep field off of Coal Oil Point– the most prolific of the seep fields in the region. This project has determined that total emissions from the field are approximately 10⁵ cubic meters of gas and 100 barrels of oil per day.¹⁵¹ Although the hydrocarbons have significant biological effects in the immediate vicinities of the release sites, oil from the seeps is less likely to be a crucial water quality influence in the Sanctuary. Monitoring of the movements of oil emissions from the seeps shows that slicks from Coal Oil Point are swept west along the coast. The slicks collide with Pt. Conception causing them to disperse into small droplets in the water column. This ‘impact’ tends to destroy the slick formation and prevents most of the seeps material from entering the Santa Barbara Basin gyre that would move it towards the Islands. Small eddies will sometimes push seeps oil towards the central SBC, but synoptic data indicate that these are unlikely to reach the Sanctuary waters.^{152,153} Large bubbles of gas seepage rise to the surface and disperse into the atmosphere while smaller bubbles remain suspended in the water column. High levels of mixing tend to dilute these gaseous hydrocarbons quite rapidly in the SBC.

¹⁴⁹ County of Santa Barbara: Energy Division (CSBED). (March 8, 2004). “Natural Oil Seeps and Oil Spills.” Report retrieved on July 8, 2004 from the CSBED website: <http://www.countyofsb.org/energy/information/seepspaper.asp>

¹⁵⁰ Since the natural seeps are almost exclusively responsible for introductions of hydrocarbon gases and tars into the SBC, this overview of research and monitoring does not address these hydrocarbons.

¹⁵¹ Leifer, I, Boles, J, Clark, J, Holden, P, Luyendyk, B, LaMontagne, M, Olmann, C, Valentine, D, Washburn, L. (September, 2003). Towards a comprehensive picture of hydrocarbon seepage in the Santa Barbara Channel, California. 7th International Conference on Gas Geochemistry, Freiberg, Germany. Retrieved on August 3, 2004 from the Bubbleology.com website: http://www.bubbleology.com/Abstracts/ICGG7_2_Abstract.html

¹⁵² DiGiacomo, PM, Washburn, L, Holt, B, Jones, BH. (2004). Coastal pollution hazards in souther California observed by SAR imagery: stormwater plumes, wastewater plumes, and natural hydrocarbon seeps. *Matine Pollution Bulletin*. In press.

¹⁵³ Personal communication with Ira Liefer (Principal Investigator, Seeps Group, UCSB), August 30, 2004.

Direct biological impacts attributed to the seeps are mostly localized to the seeps sites and generally do not include mortalities. Despite the potential for toxicity, benthic productivity near the seeps themselves is quite high, indicating that these communities are acclimated to the extreme concentrations of hydrocarbons. Seeps hydrocarbons do not appear to have strong impacts on plankton growth/survival with the exception of jellyfish that are occasionally pinned to the surface waters when gases collect in their bells. Anecdotal evidence suggests that marine animals generally avoid the areas of the seeps. Fish abundance is similar between seeps and other, comparable habitats even though individual fish displayed symptoms of long-term hydrocarbon toxicity (e.g. lesions, reduced reproduction).¹⁵⁴ Seeps appear to cause relatively few bird deaths. This is possibly because birds learn to avoid seepage areas.^{155,156} For the most part, these communities and species groups have interacted with the seeps over long time frames that have enabled them to develop sustainable survival balances in the presence of high hydrocarbon levels.

This co-development scenario does not apply to oil spills in the SBC. Adverse impacts of oil spills have been well-documented in the SBC and elsewhere. These impacts include oil toxicity to benthic organisms, declines in photosynthesis and growth of phytoplankton, fur oiling and toxicity in marine animals through ingestion and contact with oil, lethal and sub-lethal impacts on fish (particularly at larval and juvenile age stages), and oiling of feathers and toxicity to birds resulting in high mortalities and lower reproductive success. From 1969-1999, a total of 841 oil spills occurred from the offshore oil production in SBC; 796 were spills of <1 barrel, 40 spills were 1<50 barrels and 7 were >50 barrels. Total oil spilled from these seven largest spills (which include the 1969 Santa Barbara spills) is estimated at 80,900 barrels. (Based on sum-total comparisons with the volume of hydrocarbons from the seeps, this amount of oil is a relatively small contribution of hydrocarbons to the SBC.) Using a modeling approach based on the amount of oil handled, the Minerals Management Service estimates the risk of a 1,000 barrel or greater spill at 41.2% for the next 28 years.¹⁵⁷

A major spill is considered to be one >200 barrels over a 30-day period, so almost none of these spills are considered major. However, the 1997 Torch Pipeline spill of 163 barrels off the coast of Vandenberg Air Force Base deposited oil over a 40 mile stretch of coastline and resulted in oilings of hundreds of seabirds.¹⁵⁸ These impacts demonstrate that the significance of an oil spill depends heavily upon the specific circumstances (e.g. spill site,

¹⁵⁴ Roy, LA, Steinert, S, Bay, SM, Greenstein, D, Sapozhnikova, Y, Bawardi, O, Leifer, I, Schlenk, D. (2003). Biochemical effects of petroleum exposure in hornyhead turbot (*Pleuronichthys verticalis*) exposed to a gradient of sediments collected from a natural petroleum seep in CA, USA. *Aquatic Toxicology* 65 (2003) 159-169. Retrieved on May 13, 2004 from the Southern California Coastal Water Research Project website: ftp://ftp.sccwrp.org/pub/download/PDFs/417_biochemical.pdf

¹⁵⁵ County of Santa Barbara: Energy Division (CSBED). (March 8, 2004). "Natural Oil Seeps and Oil Spills." Report retrieved on July 8, 2004 from the CSBED website: <http://www.countyofsb.org/energy/information/seepspaper.asp>

¹⁵⁶ Personal communication with Ira Liefer (Principal Investigator, Seeps Group, UCSB), August 30, 2004.

¹⁵⁷ McCrary, MD, Panser, DE, Pierson, MO. (2003). Oil and gas operations offshore California: Status, Risks and Safety. U.S. Department of the Interior, Minerals Management Service, Pacific OCS Region, Camarillo, CA.

¹⁵⁸ County of Santa Barbara: Energy Division (CSBED). (March 8, 2004). "Natural Oil Seeps and Oil Spills." Report retrieved on July 8, 2004 from the CSBED website: <http://www.countyofsb.org/energy/information/seepspaper.asp>

currents, weather conditions, etc.) as well as the amount of oil discharged and the effectiveness of response and cleanup efforts.

Most oil and gas production in the SBC occurs near the mainland coast, reducing the magnitude of direct threat to water quality within CINMS boundaries. As with the movement of slicks from the hydrocarbon seeps in the same areas, the likely path for oil discharges would not intersect Sanctuary waters. Therefore, the Sanctuary's key concerns associated with oil spills from most platforms are the potentially significant impacts to marine wildlife.

A key exception exists, however, in oil production within the Santa Clara Unit (see fig. 3.6(b)). Platforms drilling from this lease unit— Gail, Gina, Grace and Gilda— are quite close to Anacapa Island and the CINMS boundary, and, as mentioned above, have been identified by the California Coastal Commission as representing an oil spill threat to Anacapa Island and CINMS.¹⁵⁹

Unlike many of the other threat areas, this needs assessment did not identify any key gaps in terms of research and monitoring of oil spills that would improve management decision-making.

Other sources of oil to the SBC include the produced water discharges from the platforms. Based on discharge permit requirements, the total maximum allowable discharge of hydrocarbons is 85 barrels per year in federal waters and no discharge from platforms in state waters.¹⁶⁰ Estimates of the hydrocarbon contributions to the SBC from other sources such as mainland runoff, bilge discharges and atmospheric deposition have not been made. Relative to the hydrocarbon seeps, though, these other sources are minor in magnitude. Still, the low relative magnitude of other sources of hydrocarbons should not be misconstrued as a dismissal of the environmental impacts of these inputs. Depending on timing, spatial characteristics and location of hydrocarbon additions (e.g. a sudden influx of hydrocarbons in oily bilge discharge from a large ship, or a plume from a runoff event), these inputs can have significant adverse impacts to water quality in the Sanctuary and the greater SBC region.¹⁶¹ Gaps in research and monitoring on these sources are folded into discussions in Sections 4.9, 4.2 and 4.3.

¹⁵⁹ California Coastal Commission, Staff Report and Recommendation on Consistency Determination #CD-051-05 (Th 5j): U.S. Department of the Interior's Minerals Management Service, OCS lease suspension for Cavern Point Unit (lease numbers OCS-P 0210, and OCS-P 0527). Page 32. August 11, 2005. Retrieved from: <http://www.coastal.ca.gov/meetings/mtg-mm5-8.html> September 12, 2005.

¹⁶⁰ County of Santa Barbara: Energy Division (CSBED). (March 8, 2004). "Natural Oil Seeps and Oil Spills." Report retrieved on July 8, 2004 from the CSBED website: <http://www.countyofsb.org/energy/information/seepsaper.asp>

Steele, J. (January 1983). A Review of Some Physical and Biological Effects of Oil Well Drilling Fluids. This report was prepared for the CA Dept of Fish and Game, and identified potential impacts from the discharge of fluids from oil and gas platforms. Based on this report, the State Lands Commission prohibits ocean discharges from platforms in state waters.

¹⁶¹ California Coastal Commission, Staff Reports and Recommendations on Consistency Determination, report #'s: CD-042-05 through CD-051-05: U.S. Department of the Interior's Minerals Management Service, OCS lease suspensions for 36 oil lease units off San Luis Obispo, Santa Barbara and Ventura Counties. August 11, 2005. Retrieved from: <http://www.coastal.ca.gov/meetings/mtg-mm5-8.html> September 12, 2005.

4.8 Offshore Oil and Gas Production

Results from monitoring of water quality threats that emerge from day-to-day oil production operations are available through Discharge Monitoring Reports (DMRs) from the oil lease operators. DMRs are required under the National Pollutant Discharge Elimination System (NPDES) General Permit that applies to the platforms in the SBC. (Monitoring requirements for both the past and current General Permits are summarized in Table 4.7). Drilling muds and cuttings (assuming drilling activities are occurring) are monitored for volumes discharged, toxicity to test organisms (only conducted occasionally), presence of free oils (by checking for a water surface sheen near discharge points), excess cement content, the use of a prohibited drill lubricant, mercury, and cadmium. Produced water effluents are monitored for oil, grease (free and dissolved), heavy metals, cyanides, organic compounds, added treatment chemicals and radioactivity. Compliance monitoring occurs once or twice per year and is conducted by Minerals Management Service (MMS) in lieu of the EPA.

Table 4.7 Permit monitoring requirements for oil platform effluents.¹⁶²

Effluent	Old NPDES Permit Limits	Current NPDES Permit Limits
001 Drilling Discharges (mud and cuttings)	<ul style="list-style-type: none"> • Daily visual sheen observation • Monthly volume estimate • Continuous constituent additive inventory • Once per mud system toxicity test if unapproved muds are discharged • No discharge of oil-based drilling mud • Annual report of heavy metal contaminants in barite • Use of generic mud 	<ul style="list-style-type: none"> • Total volume limits applied to each platform • End-of-well toxicity • No discharge of oi-based drilling mud or mud contaminated with diesel • Limits on cadmium and mercury in barite • Continuous constituent and additive inventory • Static sheen test • Use of generic muds
002 Produced Water	<ul style="list-style-type: none"> • Monthly oil and grease samples • Monthly flow estimate (daily max = 72 mg/l) • Yearly metals and phenols analysis 	<ul style="list-style-type: none"> • Weekly oil and grease samples (29 mg/l monthly average; 42 mg/l daily max) • Flow limits applied for each platform • Quarterly monitoring of metals and other parameters • Whole effluent toxicity (chronic)
003 Well Treatment Completion	<ul style="list-style-type: none"> • Volume monitoring • No discharge of free oil monitored by visual observations 	<ul style="list-style-type: none"> • Volume monitoring • No discharge of free oil monitored by static sheen test

¹⁶² Table reproduced from Minerals Management Service. (June 19, 2003). OCS Environmental Assessment: Revisions to the Point Arguello Field Development and Production Plans to Include Development of the Eastern Half of Lease OCS-P 0451. Arguello Inc. U.S Department of the Interior, Minerals Management Service, Pacific OCS Region. Retrieved January 10, 2005 from the Minerals Management Service website: http://www.mms.gov/omm/pacific/enviro/FEA/0451_FEA_body.pdf

Table 4.7 is reproduced from Table 2.10 of this MMS document.

& Workover Fluids		<ul style="list-style-type: none"> Once per job oil and grease samples (29mg/l monthly average; 42 mg/l daily max)
004 Deck Drainage	<ul style="list-style-type: none"> Volume monitoring No discharge of free oil monitored by visual observations 	<ul style="list-style-type: none"> Volume monitoring No discharge of free oil monitored by visual observations
005 Domestic & Sanitary Wastes	<ul style="list-style-type: none"> Flow rate Residual chlorine 	<ul style="list-style-type: none"> Flow rate Observation of floating solids (for facilities manned by 9 or fewer persons) Residual chlorine and foam for domestic wastes (for facilities manned by 9 or more persons)

Data from past DMRs indicate that phenol, cyanides and nickel are commonly detected in produced waters, but violations of the General Permit requirements and California Ocean Plan limits have not been noted.¹⁶³

In addition to the general monitoring requirements, the permit requires operators to sample and monitor produced water discharges for a “Reasonable Potential Analysis.” Monitoring data for chemical parameters (including a range of metals, inorganic, and organic constituents) will be used by the EPA to determine if the “discharges cause, or have the reasonable potential to cause, or contribute to an excursion above” the limits set in the permit. Similarly, the EPA will conduct a reasonable potential analysis for chronic toxicity of produced waters based on monitoring data (in red abalone, giant kelp and topsmelt) provided by the operators. In terms of understanding the effects of produced waters discharges on CINMS resources, these analyses will lay some empirical groundwork for characterizing the relative importance of this pollution source.¹⁶⁴

It is important to recognize the useful limits of monitoring information provided under the DMR requirements. First, the monitoring is done on effluents as opposed to water and sediment samples. As a result, monitoring data do not provide empirical information about ambient concentrations. Second, based on EPA standards, calculation of effluent concentrations is estimated for 100m dispersion distance from the point of discharge. This is done because studies in the Gulf of Mexico have indicated that concentrations of contaminants in produced water dilute rapidly— 100-fold within 100 meters.¹⁶⁵ The direct effluent concentrations are multiplied by standardized dilution factors to calculate the concentrations reported in the DMRs. The EPA calculates dilution factors using a proven

¹⁶³ Panzer, D. (1999). Monitoring Wastewater Discharges from Offshore Oil and Gas Facilities in the Santa Barbara Channel and Santa Maria Basin. *Proceedings of the Fifth California Islands Symposium*. March 29 – April 1, 1999. U.S Department of the Interior, Minerals Management Service, Pacific OCS Region.

¹⁶⁴ Environmental Protection Agency. (15 September 2004). “Authorization to discharge under the National Pollution Discharge Elimination System for Oil and Gas Exploration, Development, and Production Facilities.” General Permit No. CAG280000. Retrieved on September 7, 2005 from the EPA website: <<http://www.epa.gov/Region9/water/npdes/ocsgeneralpermit904.pdf>>

¹⁶⁵ U.S. Environmental Protection Agency (U.S. EPA). (October 2000). Profile of the Oil and Gas Extraction Industry. EPA Office of Compliance Sector Notebook Project, Washington D.C. EPA/310-R-99-006. Retrieved on January 12, 2005 from the U.S. EPA website: <http://www.epa.gov/Compliance/resources/publications/assistance/sectors/notebooks/oilgas.pdf>

model (PLUMES).¹⁶⁶ In the SBC region, dilution factors are usually between 500:1 and 1500:1.¹⁶⁷ In turn, the calculated concentrations may be a very poor representation of actual levels. Despite these issues, the DMR information is useful for estimating total contaminant loading to the Santa Barbara Channel region from the oil platforms. A Southern California Coastal Water Research Project study synthesized data from DMRs in 1996 and 2000 for all platforms in South California. The analysis indicated that with the exception of phenols, the contaminant loading from oil production was less than that of the small municipal wastewater treatment facility discharges in the same region. As a result, the study authors characterized the platform discharges as a relatively “minor” contributor of contaminants to Southern California’s coastal waters.¹⁶⁸ On average, this conclusion is accurate; however, the underlying assumptions of uniform discharge rates and dilution of pollutants to, and into, the marine environment is probably a poor reflection of actual conditions.

Discrepancies exist in the predicted plume dilution patterns of produced waters that are discharged from platforms in the SBC. As part of the approval process for the new General Permit (issued December 1, 2004), the National Marine Fisheries Service raised concerns about the adverse impacts of produced water discharges on essential fish habitat (EFH). In response, EPA conducted modeling of produced waters plume dilution. The agency found dilution rates (at the 100m distance) of 430 and 730:1 (under different conditions); minimum concentrations for acute and chronic toxicity to fish occurred at 7.5-12.5m and 30-35m, respectively, from the platform. Based on these results, the EPA notes that the agency “believes that these results do show that the volume of water in which adverse effect may occur is indeed limited.”¹⁶⁹ A modeling study by Washburn, Stone and MacIntyre (1999) resulted in smaller potential dilution factors (100 and 500:1 at 80m distance) and showed that patches of produced water up to 1000m from the source could occur.¹⁷⁰ Based on this and other studies of produced water, Raimondi and Boxshall conclude that the potential exists for discharge of produced waters to “cause severe,

¹⁶⁶ U.S. Environmental Protection Agency (U.S. EPA). (July 18, 2000). FACT SHEET. Proposed National Pollutant Discharge Elimination System (“NPDES”) General Permit No. CAG280000 for Offshore Oil and Gas Exploration, Development and Production Operations off Southern California. U.S. EPA Region 9. Retrieved on January 12, 2005 from the U.S. EPA website: <http://www.epa.gov/Region9/water/npdes/factsheet1.pdf>

¹⁶⁷ Panzer, D. (1999). Monitoring Wastewater Discharges from Offshore Oil and Gas Facilities in the Santa Barbara Channel and Santa Maria Basin. *Proceedings of the Fifth California Islands Symposium*. March 29 – April 1, 1999. U.S. Department of the Interior, Minerals Management Service, Pacific OCS Region.

¹⁶⁸ Steinberger, A, Stein, ED, Raco-Rands, V. (2003). *Offshore oil platform discharges to the pacific outer continental shelf along the coast of southern California in 1996 and 2000*. A report from the Southern California Coastal Water Research Project (SCCWRP). Retrieved May 2, 2005 from the SCCWRP website: ftp://ftp.sccwrp.org/pub/download/PDFs/2003_04ANNUALREPORT/ar02-stein_pg16-30.pdf

¹⁶⁹ U.S. Environmental Protection Agency (U.S. EPA). (July 18, 2000). Addendum to FACT SHEET. Final National Pollutant Discharge Elimination System (“NPDES”) General Permit No. CAG280000 for Offshore Oil and Gas Exploration, Development and Production Operations off Southern California. U.S. EPA Region 9. Retrieved on January 12, 2005 from the U.S. EPA website: <http://www.epa.gov/Region9/water/npdes/ocsfinalddendum2factsheet.pdf>

¹⁷⁰ Washburn, L, Stone, S, MacIntyre, S. (1999). Dispersion of produced water in a coastal environment and its biological implications. *Continental Shelf Research*. 19(1):57-78.

generally sub-lethal, effects to organisms over distances well beyond that predicted by plume dilution models.”¹⁷¹

Similar concerns about dispersion and dilution exist for drilling muds and cuttings. Various studies of drilling mud releases indicate that concentrations of particulate matter and barium reach background levels rapidly within short distances from the platforms (e.g. 0.1-0.6 km).¹⁷² However a tracer study of barium transport from drilling muds released from two oil platforms off of Point Conception demonstrated detectable concentrations at 3.5 and 6.8km from the sources.¹⁷³ A recent study of the fate of drilling muds discharged near platforms indicates that strong storms cause significant resuspension of the discharge, followed by deposition in deeper waters.¹⁷⁴

As part of the newly issued General Permit, the permit recipients are required to 1) evaluate direct lethal, sublethal and bioaccumulative effects of produced water on Federally-managed fish species; and 2) model dilution and dispersion plumes from the produced water discharge site to define the area in which Federally-managed fish species are adversely affected.¹⁷⁵ The results of this study (completed June 1, 2005) could be helpful to the Sanctuary in qualifying the degree of threat posed by oil platforms to CINMS resources.

Studies of chronic exposures at platforms in the Gulf of Mexico indicate that certain sets of taxonomic groupings (e.g. amphipods and echinoderms) are sensitive to toxics. (High heavy metal concentrations appear to drive these toxicity responses.) Population growth in other taxa such as polychaetes, oligochaetes and nematodes is enhanced by organic enrichment from the platform discharges.¹⁷⁶ As indicated previously, data on the pollutant concentrations in the water and sediment around the platforms and fauna that live on the platforms are not collected in the SBC. This information would be helpful in defining the threat that these facilities pose to fish and marine mammals. To partially overcome this information gap, the Sanctuary can pair existing information about concentrations and toxicities in benthic platform organisms with studies of fish and benthic communities

¹⁷¹ Raimondi, PT, Boxshal, A. (2002). Effects of Produced Water on Complex Behavior Traits of Invertebrate Larvae. MMS OCS Study 2002-050. Coastal Research Center, Marine Science Institute, University of California, Santa Barbara, California. MMS Cooperative Agreement Number 14-35-0001-30758.

¹⁷² Minerals Management Service Pacific OCS Region. (June, 2001). Delineation Drilling Activities in Federal Waters Offshore Santa Barbara County, California. Draft Environmental Impact Statement. U.S. Department of the Interior, Camarillo, CA.

¹⁷³ Coats, DA. (1994). Deposition of drilling particulates off Point Conception, California. *Marine Environmental Research*. Vol. 37, No.2, pp.95-127.

¹⁷⁴ Lick, WJ. (2003). Risk Analysis. MMS OCS Study 2003-015. Coastal Research Center, Marine Science Institute, University of California, Santa Barbara, California. MMS Cooperative Agreement number 14-35-0001-3047.

¹⁷⁵ U.S. Environmental Protection Agency (U.S. EPA). (July 18, 2000). Addendum to FACT SHEET. Final National Pollutant Discharge Elimination System (“NPDES”) General Permit No. CAG280000 for Offshore Oil and Gas Exploration, Development and Production Operations off Southern California. U.S. EPA Region 9. Retrieved on January 12, 2005 from the U.S. EPA website:

<http://www.epa.gov/Region9/water/npdes/ocsfinalddendum2factsheet.pdf>

¹⁷⁶ Peterson, CH, Kennicutt II, MC, Green, RH, Montagna, P, Harper, DE, Powell, EN, Roscigno, PF. (1996). Ecological consequences of environmental perturbations associated with offshore hydrocarbon production: a perspective on long-term exposures in the Gulf of Mexico. *Can. J. Fish. Aquat. Sci.* 53:2637-2654.

around the SBC platforms¹⁷⁷ in a toxicity modeling approach.¹⁷⁸ This would provide a first-pass estimate of bioaccumulation risks for fish and marine mammals.

4.9 Point Source Pollution

Annual effluent monitoring data reports that are required by the Regional Water Quality Control Boards (Central Coast and Los Angeles regions) under the National Pollutant Discharge Elimination System (NPDES) permits are the primary source of information about this potential water quality threat. Compliance with the NPDES program requires the following monitoring.¹⁷⁹

- Daily-weekly: flow amount; oil and grease, coliform
- Weekly-monthly: suspended solids; biological oxygen demand (BOD), ammonia-N, pH
- Quarterly-annually: bioassay, cyanide, DDT, PCB, other organic compounds; heavy metals (generally: As, Cd, Cr, Cu, Pb, Hg, Ni, Ag, Zn), bivalve tissue samples (heavy metal concentrations), fish muscle tissue samples (various organic compound concentrations), sediment samples (pesticide, petroleum hydrocarbon and heavy metal concentrations)

Southern California Coastal Water Research Project (SCCWRP) conducted analyses of effluent reports from selected years (1971, 1987, 1989, 1993, 1994, 1995 and 2000) for small municipal wastewater treatment facilities (i.e. POTWs), or those that process <25 million gallons per day. Results of these analyses indicate that effluent flow from small facilities (which include the six POTWs within the Santa Barbara Channel region) has remained relatively constant from 1987 onward. In the same period, effluent concentrations of almost all sampled parameters declined significantly between 1995 and 2000. The exceptions were suspended solids, oils and grease, and ammonia concentrations.¹⁸⁰ A

¹⁷⁷ *Examples include:*

Love, MS, Casselle, JE, Snook, L. (2000). Fish assemblages around seven oil platforms in the Santa Barbara Channel area. *Fish. Bull.* 98:96-117.

Brewer, GD, Piltz, F, Hyland, J. (n.d.). Monitoring changes in benthic communities adjacent to OCS oil production platforms off California.

¹⁷⁸ Nisbet, R, Muller, EB. (2001). Sublethal effects of toxicants on organisms: a modeling approach with dynamic energy budgets. MMS OCS Study 2001-043. Coastal Research Center, Marine Science Institute, University of California, Santa Barbara, CA. MMS Cooperative Agreement Number 14-35-0001-30761 and 14-35-0001-30758.

¹⁷⁹ Monitoring parameters and frequencies vary depending on the specific wastewater treatment facility. This information was retrieved on May 2, 2005 from the Coastal Water Quality Monitoring Inventory web site hosted by the San Francisco Estuary Institute: <http://www.sfei.org/camp/ByCounty1.htm>

¹⁸⁰ Stienberger, A, Schiff, KC. (2000). Characteristics of effluents from small municipal wastewater treatment facilities in 2000. Report from the Southern California Coastal Water Research Project (SCCWRP). Retrieved on May 2, 2005 from the SCCWRP website: ftp://ftp.sccwrp.org/pub/download/PDFs/2001_02ANNUALREPORT/02_ar20-andrea.pdf

The study explicitly compares the relative contribution of effluent parameters to the Southern California coastal waters from small municipal wastewater treatment facilities to that of four large facilities. Since none of the large facilities are within the Santa Barbara Channel itself, discussion of these has been omitted here. SCCWRP conducts annual analyses of these large facilities and the analysis of year 2000 constituent loading to the Southern California region, indicated that small facilities contributed 12% of flow but contained only an average

similar SCCWRP study of power generation facilities that discharge cooling water effluent indicated that despite their large effluent volumes, the Mandalay and Ormond facilities contribute minor levels of contaminants relative to the six POTWs in the Channel.¹⁸¹ Assuming that SCCWRP continues to periodically synthesize and analyze the NPDES information for POTWs and other point sources, the Sanctuary can rely on these reports as a means of monitoring this potential water quality threat.

Although the NPDES effluent reports are a key data source for this threat, they omit a few contaminants of concern for Sanctuary resources. Heal the Ocean distributed a wastewater discharge inventory for California that includes example sampling (i.e. not systematic) for the presence/absence of Hepatitis A and enteric viruses, which were detected at certain wastewater treatment and stormwater outflows.¹⁸² Beyond this source of information, no viral monitoring is available for the Santa Barbara Channel region. Sampling for potential pharmaceutical contaminants in wastewater has not been conducted.

Indirectly, research on small plume monitoring methods could benefit the Sanctuary's assessment of point source threats to water quality. Remote sensing techniques facilitate monitoring of near shore wastewater plumes as demonstrated by DiGiacomo et al (2004) using synthetic aperture radar (SAR) for the Southern California Bight region.¹⁸³

4.10 Nonpoint Source Pollution from the Mainland

Unlike most of the other threat topics in this report, mainland runoff to coastal waters is already a focus of multiple research projects and monitoring programs. As a result, a substantial amount of existing data is available to the Sanctuary. Furthermore, a variety of tools could be applied to future characterization of pollutant additions, transport and stirring processes and loads that are delivered to the waters surrounding the Islands.

Numerous agencies and organizations monitor water quality in watersheds and at beaches in Santa Barbara and Ventura Counties. The City of Santa Barbara Creeks Division conducts water quality monitoring in Arroyo Burro, Laguna Channel, Mission Creek and Sycamore watersheds. The City's program began in May 2001 with weekly sampling for indicator bacteria on a weekly basis at 30 sites and spot sampling for some chemicals. After

of 8% of the total pollutant load. Although this represents a proportional increase in the relative constituent loading, large facilities remain the primary POTW source of pollutants to the region.

¹⁸¹ Steinberger, A, Stein, ED. (2000). *Characteristics of effluents from power generating stations in the Southern California Bight in 2000*. A report from the Southern California Coastal Water Research Project (SCCWRP). Retrieved on May 5, 2005 from the SCCWRP website:

ftp://ftp.sccwrp.org/pub/download/PDFs/2003_04ANNUALREPORT/ar03-stein_pg31-40.pdf

¹⁸² Hauser, H. (2005). *Ocean wastewater discharge inventory for the State of California*. A report from Heal the Ocean, Santa Barbara, CA. Retrieved May 2, 2005 from the Heal the Ocean website:

http://www.healtheocean.org/CA_Discharge_Inventory.pdf

The author specifically indicates that it is not the intention of Heal the Ocean to "provide a regular testing service for the community."

¹⁸³ DiGiacomo, PM, Washburn, L, Holt, B, Jones, BH. (2004). Coastal pollution hazards in southern California observed by SAR imagery: stormwater plumes, wastewater plumes, and natural hydrocarbon seeps. *Marine Pollution Bulletin*. 49: 1013-1024.

collecting this baseline water quality information, the City expanded the monitoring in 2003 to “focus on pollutants throughout the watershed, the performance of treatment and restoration projects, and water quality during storm events.”¹⁸⁴ Currently, the program’s monitoring data that provide information about pollutants entering the SBC includes weekly sampling of indicator bacteria in the watersheds, and sampling of creeks during two storms (including the “first flush”) for indicator bacteria and chemical pollutants.¹⁸⁵

Other monitoring efforts are also tracking water quality in watersheds and at beaches. The Ventura Countywide Stormwater Quality Program conducts yearly monitoring of metals and other contaminants.¹⁸⁶ Over a four-year period (1999-2003), the County of Santa Barbara Project Clean Water (PCW) program conducted annual stormwater quality analyses of various creeks in the county. The Santa Barbara County Public Health Department, Environmental Health Services monitors 20 beaches on a weekly basis for total and fecal coliform and enterococcus.¹⁸⁷ Until recently, the County of Ventura Environmental Health program conducted weekly monitoring for these same contaminants at 50 beaches.¹⁸⁸

To address a gap in water quality monitoring for Ventura River and Goleta Slough watersheds, Santa Barbara Channelkeeper and Surfrider Foundation have partnered to run the Stream Teams monitoring program. This volunteer-powered program conducts monthly sampling of dissolved oxygen, turbidity, conductivity, pH, temperature and flow, as well as three bacterial indicators and nitrate and phosphate levels.¹⁸⁹ Data for each sampling site within the two watersheds (from 2001 for Ventura River and from 2002 from Goleta Slough) are made available at the Stream Team website <http://stream-team.org/index.html>. Considering the relative importance of stormwater from the Ventura River to Sanctuary water quality, this program is another important source of data in demonstrating the links in water quality from streams to coastal/near-shore areas to the SBC and Sanctuary.

Since June 2001, Santa Barbara Channelkeeper has also been sampling bacterial indicators in the surf zone at Fernald Point (in Montecito) and in lower and upper Romero Creek (when there is flow) every other week.¹⁹⁰

¹⁸⁴ City of Santa Barbara Creeks Division. (n.d.). Water Quality Improvement: Water Quality Monitoring Program. Retrieved on May 22, 2005 from the Creeks Division website:

http://www.santabarbaraca.gov/Resident/Community/Creeks/Water_Quality_Improvement.htm

¹⁸⁵ *Id.*

¹⁸⁶ The Ventura County Watershed Protection District, the County of Ventura as well as numerous cities have received a National Pollutant Discharge Elimination System permit for discharges to sewer storm drain systems. This stormwater quality monitoring is conducted for compliance under this permit. Information about the Ventura Countywide Stormwater Program can be found at the program website:

<http://www.vcstormwater.org/monitor.htm>

¹⁸⁷ Information retrieved on August 12, 2004 from the Santa Barbara County Public Health website:

<http://www.sbcphd.org/ehs/ocean.htm>

¹⁸⁸ County of Ventura recently lost funding for winter monitoring. Weekly monitoring is only conducted in the dry season now. Personal communication with Tracy Duffey (Water Quality Unit, California Coastal Commission), January 13, 2004.

Original information about the Ventura monitoring program was retrieved on August 12, 2004 from the County of Ventura Environmental Health website: <http://www.ventura.org/envhealth/programs/ocean/>

¹⁸⁹ Information taken on April 14, 2005 from the Stream Team website: www.stream-team.org

¹⁹⁰ Personal communication, Kira Schmidt (Executive Director, Santa Barbara Channelkeeper) on May 23, 2005.

Further south, Ventura Coastkeeper is developing a Citizen Monitoring Program for Calleguas Creek watershed that will gather water quality information which it will report to the Regional Water Quality Control Board. This watershed is located just south of, and is slightly smaller than, the Santa Clara River watershed.¹⁹¹ The investigation for this report did not reveal similar water quality monitoring efforts for the Santa Clara River watershed.

The Santa Barbara Channel Long Term Ecological Research (SBCLTER) Program studies the influence of watershed land cover/use patterns (via runoff) on the near shore kelp forest ecosystem. Investigating patterns of nutrient delivery and uptake has been a core research activity. SBCLTER researchers have been monitoring dissolved inorganic nutrients (nitrate, phosphate, ammonium) in creeks in 11 watersheds that drain into the SBC. Coastal waters at Carpinteria, Naples Reef and Arroyo Quemado are regularly monitored for biogeochemical parameters— nitrate (at 30-minute intervals) as well as carbon and nitrogen isotopes, particulate organic compounds, organic nitrogen, silica, and chlorophyll and phosphate (monthly). On a less frequent basis (seasonally), the SBCLTER conducts cross-channel cruises to sample nutrients and particulate organic concentrations. As described previously, the Partnership in Interdisciplinary Studies of Coastal Oceans (PISCO) also collects temperature data at stationary mooring located along the coast as well as around Santa Cruz and Anacapa Islands. Plumes and Blooms is a source of spatial and temporal patterns of sediment movement, sea surface temperature and chlorophyll (biomass) concentrations that occur during runoff events.

These data make valuable contributions towards characterizing mainland runoff impacts to the Sanctuary, but they are not sufficient. For example, the Islands Runoff section includes a recommendation from Leal Mertes on using synoptic documentation of sediment plumes along with in situ monitoring to extrapolate pollutant loading. As with the Islands, in situ measurements of mainland plume contents are not available (for the most part). This is one of the biggest gaps in research on runoff.

There are a few examples in which this type of sampling has been conducted. Warrick et al conducted water sampling from (as close to as possible to) the Santa Clara River mouth and from a ship during a February 1998 flood event. Researchers have used nitrate auto-analyzers on the SBCLTER moorings to measure concentrations (at 1, 5 and 10 meter depths) during a runoff event in March of 2001. Using data on currents with in-stream-with mooring-nitrate measurements they developed correlation factors between stream concentrations and subsequent offshore loading.¹⁹² SBCLTER researchers were also able to make use of the research vessel *Pt. Sur* (135-foot) for offshore nitrate sampling from Coal Oil Point to Ventura during a storm in February 2004. These direct-sampling

¹⁹¹ Information retrieved on May 17, 2005 from the Wishtoyo Foundation website: <http://www.wishtoyo.org/vck-water-quality-monitoring.html>

¹⁹² McPhee-Shaw, EE, Siegel, D, Washburn, L, Brzezinski, M. (June 6, 2002). Oceanographic data from near-shore stations, 2001, with implication for nutrient delivery to kelp reefs. Santa Barbara Channel LTER. PowerPoint® presentation at the Applied Physics Laboratory Seminar Series. University of Washington, Seattle, WA. Retrieved on August 20, 2004 from the ICESS website: <http://www.icesse.ucsb.edu/~eemcphee/>

approaches have indicated that runoff-induced nitrate concentrations can be three to five times greater than natural, upwelling-induced levels (10 to 20 μM).¹⁹³

These sampling efforts are too sporadic and narrowly focused on nitrate concentrations to address some of the very significant water quality concerns of mainland runoff – namely additions of organopesticides, metals and other toxic compounds from agriculture-intensive land use as well as urbanization (development). Furthermore, these current studies do not make the connection between mainland stream concentrations and those at the Islands.

Ideally, ship-board sampling would be conducted during flooding events to measure pollutant concentrations and plume toxicity to indicator species.^{194,195} This is a logistically challenging approach; staff and equipment have to be available on short notice to do the cruise and there is substantial risk in conducting testing so close to shore during runoff-producing conditions. Another possibility for sampling plumes is to combine the use of moorings and surface drifters with other water quality testing techniques.¹⁹⁶ For example, it may be possible to fit surface drifters with remote water sampling equipment and then deploy these into runoff plumes. These drifters would probably not accommodate a wide range of water quality tests (due to space limitations and lack of available remote sample techniques), but specific tests on the drifters could be tailored to the expected pollutants in a plume.¹⁹⁷ Creek data— in situ water sampling, NPDES compliance monitoring from point sources, watershed land-use information— are available for many of the SBC region waterways to guide decisions about which pollutants to target in offshore remote sampling.

Measurements of surface currents can be used to predict the flow patterns (i.e. transport processes) as well as stirring of plume and ocean waters. Due to the lower density of freshwater, plumes of runoff (containing dissolved materials and sediment from the waterways) are mainly in surface waters.¹⁹⁸ Researchers at UCSB are using high frequency (HF) radar to measure surface (to 1 meter depth) currents in the channel region. HF radar is deployed from land and currently there are four sites in the channel region: Refugio Beach, Coal Oil Point, Summerland, Mandalay (unfortunately, the Summerland site will be dismantled soon). This arrangement provides sufficient “coverage” of the western portion of the SBC for characterizing the counter-clockwise eddy in that region (over the Santa Barbara Basin). However, the surface currents are not well understood in the eastern portion of the channel due to a lack of station sites for the HF radar.¹⁹⁹ With the most far-

¹⁹³ Personal communication with Libe Washburn (Geography Department, UCSB), on August 23, 2004.

¹⁹⁴ Washburn, L, McClure, KA, Jones, BH, Bay, SM. (2003). Spatial scales and evolution of stormwater plumes in Santa Monica Bay. *Marine Environmental Research*. Vol.56(1-2), pp.103-125.

¹⁹⁵ Bay, S, Jones, BH, Schiff, K, Washburn, L. (2003). Water quality impacts of stormwater discharges to Santa Monica Bay. *Marine Environmental Research*. Vol.56(1-2), pp.205-223.

¹⁹⁶ Near Surface Drifters. Scripps Institution of Oceanography. Prepared for the Autonomous and Lagrangian Platforms and Sensors Workshop. Retrieved on August 13, 2004 from the Geosciences Professionals Inc website: http://www.geo-prose.com/ALPS/white_papers/niiler.doc

¹⁹⁷ Personal communication with Libe Washburn (Department of Geography, UCSB), on August 23, 2004.

¹⁹⁸ Warrick, JA, Mertes, LAK, Washburn, L, Siegel, D. (2004). Dispersal forcing of Southern California river plumes, based on field and remote sensing observations. *Geo-Marine Letters*. Vol. 24, pp. 46-52.

¹⁹⁹ The transmitting and receiving equipment for HF needs to be situated within ~30m of the water. Although the equipment is minimal, getting landowner permission to use sites along the coast have been challenges for this approach. Libe Washburn (Geography Department, UCSB) estimates that with an additional site between

reaching plumes originating from the Santa Clara and Ventura Rivers, understanding surface flows in the eastern SBC is essential for characterizing transport patterns.²⁰⁰

A recently funded research project, the Coastal Ocean Current Monitoring Project (COCMP), should also enhance the detection capabilities of HF radar along the coast. Within the next two to five years the Scripps Institute of Oceanography and San Francisco State University will be installing HF radar equipment along the entire California coast to monitor near-shore surface currents. Eventually, this system will generate hourly data about the SBC region that will be posted and accessible on the internet.^{201,202} The Southern Central California CODAR project at UCSB manages the existing HF radar research in the SBC region. Daily averages of surface currents in the channel are available at the project website. Libe Washburn (Geography Department, UCSB) manages the CODAR program and will be the UCSB site coordinator for the upcoming COCMP.

Synoptic methods are also important for monitoring transport processes. The *Plumes and Blooms* work (described earlier) with aerial photography and SeaWiFS to record sediment movements is one source of information. Synthetic aperture radar (SAR) is another technology that has been used to document sediment plumes as well as hydrocarbon releases from seeps. Combining these data with the HF radar surface currents information could eventually allow researchers to make detailed predictions of plume destinations.²⁰³ More fine-scale measurements of freshwater runoff and ocean water stirring are possible with surface drifters measuring salinity and temperature in the path of runoff plume.²⁰⁴

The State Water Resource Control Board Mussel Watch Program is a monitoring project that involves sampling and tissue analysis of mussels from locations from Mexico to Oregon. This program yields data on California coastal water quality that assists the SWRCB in regulation and management, especially near coastal cities. The mussel sampling locations nearest to the SBC are in Monterey and Los Angeles Counties, and the last data set was generated in the 1990's. As a result, this program does not currently contribute to

Summerland and Ventura as well as one on Anacapa Island, his research group would have sufficient coverage of surface currents in the eastern portion of the Channel.

²⁰⁰ The SBLTER and PISCO projects also monitor currents (near shore) using acoustic doppler current profilers (ADCP) located at mooring sites along the coast from Carpinteria to Pt. Sal. ADCP measures the entire water column (as opposed to just the top 1m).

²⁰¹ Rodgers, T. (July 1, 2004). "Grant awarded for high-tech ocean study." The San Diego Union-Tribune. San Diego, CA. Retrieved on August 24, 2004 from the San Diego Union-Tribune website: http://www.signonsandiego.com/uniontrib/20040701/news_2m1grant.html

²⁰² Additional information concerning this project can be found at the California Coastal Ocean Monitoring Program website: <http://www.cocmp.org/>

²⁰³ Currently, certain challenges exist for synoptic monitoring techniques. Aerial photography and SeaWiFS depend heavily on weather conditions. While the SeaWiFS data are available daily, the technology does not penetrate clouds and often requires complex extrapolations to provide full images of the SBC. The SAR imagery does penetrate atmospheric conditions, but can produce unreliable results under exceptionally calm or high winds. Availability of SAR data is also problematic; the images are not taken daily (a challenge to comprehensively monitoring runoff events), the data are expensive and acquisition of the images involves a poorly designed software system.

²⁰⁴ The use of surface drifters is mentioned as a possible approach. This project did not reveal any ongoing drifter studies in the SBC at this time. Carter Ohlmann (USGS, San Diego) has conducted surface drifter experiments in Southern California Bight in the past.

water quality research and monitoring for the Sanctuary. Nonetheless, a CINMS-area sampling location could conceivably be added for the next state-wide Mussel Watch survey, should these data prove useful in understanding CINMS water quality needs.

4.11 Harmful Algal Blooms

Monitoring of marine mammal strandings has revealed an increase in poisonings over the past few years and there is speculation that anthropogenic additions of nutrients to the SBC are leading to higher toxin concentrations.²⁰⁵ Anthropogenic eutrophication of coastal waters has been correlated with enhanced toxicity of algal blooms in certain areas (e.g. Gulf of Mexico).^{206,207} As of yet, studies of algal bloom dynamics in the SBC have not shown a similar correlation for domoic acid production, but this research is ongoing.²⁰⁸

Still, it is likely that anthropogenic additions of nutrients to the SBC are exacerbating this water quality threat. In SBC, upwelling events have been shown to cause blooms of *Pseudo-nitzschia*. In general, strong correlations between algal growth and increases of inorganic nitrogen (e.g. nitrate and ammonia) have been demonstrated in coastal areas worldwide.²⁰⁹ A lack of any observed marine mammal strandings at the Islands in the past two years (when big domoic acid events have occurred) has generated speculation that mainland runoff is stimulating the algal blooms.²¹⁰ Research in the SBC is ongoing to explore the factors driving *Pseudo-nitzschia* blooms and production of domoic acid.²¹¹

²⁰⁵ Personal communication (email) with Clarissa Anderson (Master's Candidate, Department of Ecology and Evolutionary Biology, UCSB) on May 21, 2004.

²⁰⁶ Mengelt, C, Prezelin, BB. (2002). A potential novel link between organic nitrogen loading and *Pseudo-nitzschia* blooms. *California and the World Ocean Conference 2002*. Water Quality, Toxic Algal Bloom and Ecosystem Health Abstract.

²⁰⁷ Leong, SCY, Murat, A, Nagashima, Y, Taguchi, S. (March 15, 2004). Variability in toxicity of the dinoflagellate *Alexandrium tamarense* in response to different nitrogen source and concentrations. *Toxicon*. Vol. 43, no. 4, pp. 407-415.

²⁰⁸ Hernandez, R, Mengelt, C, Prezelin, BB. (2003). Is there a link between eutrophication and *Pseudo-nitzschia* multiseries blooms? *Camp Symposium*, Irvine, CA. Poster presentation.

²⁰⁹ Anderson, DM, Glibert, PM, Burkholder, JM. (August 2002). Harmful algal blooms and eutrophication: Nutrient sources, composition, and consequences. *Estuaries*. Vo. 25, No. 4b, pp. 704-726.

²¹⁰ Cota, M. (April 15, 2004). "Sick sea otters washing ashore." KSBY News. Retrieved on August 11, 2004 from the European Cetacean Bycatch Campaign website.

²¹¹ Anderson, C, Brzezinski, M, Siegel, D, Washburn, L, Guilocheau, N. (February 2004). Are Harmful Algal Blooms Responsible for the Variability in Phytoplankton Species Composition During Spring Blooms in the Santa Barbara Channel? *ASLO/TOS Ocean Research 2004 Conference*. Honolulu, HI. Retrieved on July 9, 2004 from: www.aslo.org/honolulu2004

Table 4.12 Summary of data sources and monitoring efforts

Threat	Existing Data (D) & Analyses (A)	Ongoing Monitoring (M) & Research (R) Efforts	Info Sources
Channel Islands runoff	D1) Limited number of stream samples from Santa Rosa Island taken in the mid 1990's: DO, temp., salinity, fecal/total coliform, N, P. Photo documentation of riparian recovery. D2) Synoptic data of runoff plumes. A1) Island geomorphology analysis	M1) Island streams: None currently, but might be implemented on Santa Cruz Island in conjunction with the feral pig eradication.	D1 & M1) Kate Faulkner (National Park Service) D2 & A1) Leal Mertes (Geography Department, UCSB)
Small Vessels		M1) Anchorages at the islands: Weekly over-flight surveys by Sanctuary staff. M2) Water quality at anchorages: None currently, but a monitoring project has been proposed.	M1) Ben Waltenberger (CINMS) M2) Jessie Altstatt (Santa Barbara Channelkeeper)
Large Vessels	D1) Annual estimates of ships (current and future expected numbers and types) through the shipping lanes A1) Atmospheric deposition of heavy metals in the Southern California Bight region. A2) Ecological risk assessment of shipping emissions	M1) Automation Information System pilot project to provide information on vessel traffic in Santa Barbara Channel R1) Deposition of air pollution onto island watersheds and the Sanctuary: None currently, but ongoing research efforts of fog at the islands provide opportunity to investigate this factor	D1) Santa Barbara County Air Pollution Control District A1) SCCWRP A2) Sara Polgar M1) Todd Jacobs (Nat'l Marine Sanctuary Program) R1) Chris Still (Professor), Ted Eckmann (PhD student) (Geography Department, UCSB)
Anthropogenic Marine Debris	A1) Trawl sampling studies of marine debris in the water column of the Southern California Bight A2) Beach debris monitoring studies	M1) Beach debris monitoring R1) Studies of marine plastic debris and zooplankton	A1) SCCWRP A2) National Park Service (CINP) M1) National Marine Debris Monitoring Program (Adina Rose, Ocean Conservancy) R1) Algalita Marine Research Foundation (Charles Moore)

Ocean Dump-sites	A1) Sampling and analyses of dredge disposal sites in Southern California (no sites within Channel)		A1) SCCWRP (A. Steinberger)
Wrecks	D1) Shipwreck information for the Santa Barbara Channel region D2) Data collection from the <i>Pacbaroness</i> shipwreck.		A1) Shipwreck Database (CINMS) A2) Sanctuary Quest 2002 (CINMS)
Hydrocarbons	D1) Measures of natural hydrocarbon seepage A1) Analyses of ecological effects of seepage		D1) Seeps Group (University of California, Santa Barbara); and Minerals Management Services (Pacific OCS Region, Camarillo, CA) A1) SCCWRP & County of Santa Barbara Energy Division
Offshore Oil and Gas Production	D1) Pollutant levels in water and sediments around platforms A1) Studies of chronic exposures to pollutants discharged from oil production platforms A2) Movements and concentrations of discharges of produced waters and drilling muds	M1) Discharges from platforms	D1 & M1) Discharge Monitoring Reports (NPDES permitting) & SCCWRP A1) SCCWRP & other research efforts A2) Libe Washburn (Geography Department, UCSB)
Point Sources	D1 & A1) Discharge data and analyses for POTWs, and power generation facilities	M1) Monitoring of effluent contaminant levels from point sources	D1 & A1) Effluent monitoring reports (NPDES permitting); and SCCWRP
Mainland Runoff	D1 & A1) Indicator bacteria and chemical pollutants in Santa Barbara County watersheds and analyses of watershed management approaches D2) Water quality factors in Goleta Slough, Ventura River, Romero Creek D3) Fecal bacteria levels at beaches D4) Nutrient levels in the SBC D5) Chlorophyll, sea surface temperatures and salinity in the SBC D6) Stormwater plume characteristics	M1) Indicator bacteria and chemical pollutants in Santa Barbara County watersheds and analyses of watershed management approaches M2) Water quality factors in Goleta Slough, Ventura River, Romero Creek M3) Fecal bacteria levels at beaches M4) Nutrient levels in the SBC M5) Chlorophyll, sea surface temperatures and salinity in the SBC R1) Stormwater plume characteristics	D1 & A1 & M1) City of Santa Barbara Creeks Division; County of Santa Barbara Project Clean Water program (1999-2003); and Santa Barbara LTER D2 & M2) Stream Teams (Santa Barbara Channelkeeper and Surfrider Foundation) and Channelkeeper D3 & M3) Santa Barbara County Public Health Dept.; and, D3 only) Ventura County Public Health Dept D4 & M4) Santa Barbara LTER; and PISCO D5 & M5) Plumes and Blooms; Santa

			Barbara LTER; and PISCO D6 & R1) Leal Mertes (Geography Department, UCSB); and Libe Washburn (Geography Department, UCSB)
Harmful Algal Blooms	D1 & A1) Species composition of phytoplankton blooms and frequencies of harmful blooms	R1) Research on potential links between runoff and harmful algal blooms	D1 & A1) Monitoring (water sampling and satellite imagery) during bloom events in the SBC region (HAB-TrAC Research Program at UCSB and University of Southern California, LTER and Plumes and Blooms) R1) HAB-TrAC Research Program at UCSB and University of Southern California

UCSB: University of California at Santa Barbara
 SCCWRP: Southern California Coastal Water Research Project
 LTER: Long Term Ecological Research
 PISCO: Partnership for Interdisciplinary Studies of Coastal Ocean

5 JURISDICTION, REGULATIONS AND POLICY

Many human activities— past and present, terrestrial and marine— impact marine water quality. In recognition of the environmental degradation caused by water pollution, water quality control has emerged as an aim of political and regulatory frameworks ranging from multinational treaties to community governments, to the Sanctuary itself. Consequently, numerous jurisdictions participate in water quality control for CINMS and its surrounding waters.

Federal and State laws regulating activities that cause water pollution represent the core of water quality control for California’s South Coast and the waters in and around CINMS. However, a web of municipal, county, state and federal controls, including legislated water quality standards, enforcement agencies and pollution prevention programs contribute to the total jurisdictional and regulatory framework. Governmental agencies in charge of regulating specific activities such as offshore oil production play a role in preventing unintentional impacts to water quality, as do international treaties and organizations such as the United Nations. Non-governmental and non-regulatory organizations such as conservation groups and education and research institutions also contribute to this framework through data collection, pollution prevention and cleanup programs often coordinated with, or supported by, governmental agencies.

This section delineates these elements of the existing framework for water quality control in and around CINMS, including jurisdictions and supporting initiatives, identifying both tools available to enhance CINMS water quality management, as well as areas of regulatory weakness or absence that should be addressed for the long term conservation of Sanctuary resources.

5.1 Overview of Regulatory Structure and Jurisdiction

The major federal and California State legislation affecting water quality in the Santa Barbara Channel region are outlined in Boxes 5.1.2(a) and (b). In general, regulatory requirements for water quality control tend to devolve from federal to state to regional and local governments. Several federal and state agencies conduct enforcement of anti-pollution regulations in and around the Sanctuary. Because of a geographical designation based on Islands of a National Park, CINMS and its surrounding waters are subject to a variety of overlapping state and federal jurisdictions. Figure 5.1.1 depicts the pertinent jurisdictional boundaries for this discussion of water quality regulation and policy.

CINMS, as designated in September 1980, surrounds the Channel Islands National Park (CINP), and encompasses 1,252.5 square nautical miles of ocean from mean high tide to six nautical miles offshore San Miguel, Santa Rosa, Santa Cruz, Anacapa and Santa Barbara Islands.²¹²

(continued on page 77)

²¹² Channel Islands National Marine Sanctuary, Regulations and Restrictions:
http://www.cinms.nos.noaa.gov/drop_down/reg.html

Figure 5.1.1 Water quality-related features and jurisdictions in the SBC region.

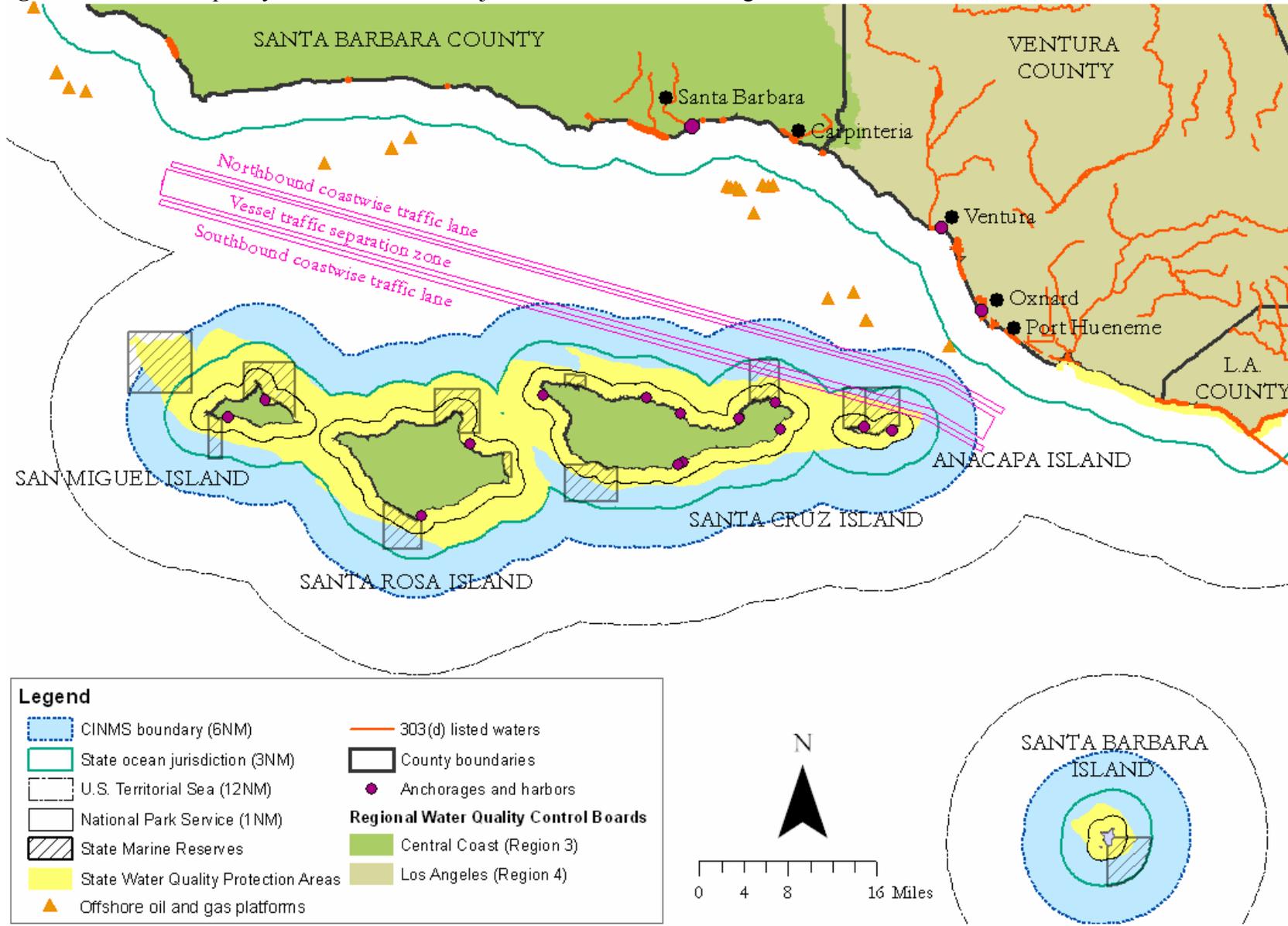


Figure 5.1.2(a) Major Federal water quality legislation impacting CINMS

Federal Water Pollution Control Act (Clean Water Act) 1972 and 1987 (33 USC § 1251 et seq.)

- Principal federal legislation for pollution prevention and water quality protection in surface waters.
- Addresses point and non-point source pollution by requiring states to adopt water quality standards, and submit those standards to the US Environmental Protection Agency (EPA) for approval.
- Requires identification of the “beneficial uses” of a water body and establishment of water quality criteria objectives to protect the water body for these beneficial uses.
- Major water quality protection Sections of the Clean Water Act:
 - 303(d): Requires states to list surface waters not attaining established water quality standards, and establish Total Maximum Daily Loads (TMDL) for specific pollutants in individual watersheds. A TMDL is a calculation of the maximum amount of a pollutant that a water-body can receive and still meet water quality standards, and an allocation of that amount to the pollutant's various sources.
 - 312: Regulations for Sewage Discharge from Vessels
 - Marine Sanitation Device (MSD) mandated for all vessels with installed toilets
 - Illegal to discharge untreated sewage or sewage from Type III MSD (sewage holding tank) within 3 nautical miles of shore
 - Allows states to establish vessel No Discharge Zones (NDZ), with EPA approval, if safe and adequate pumpout and dump facilities are available, or if sewage discharge prohibition is needed to protect environmentally sensitive areas.
 - 319: Requires that states assess non-point source (NPS) pollution problems, establish NPS programs to address them and provide funding to support the programs; nine “key elements” or criteria must be met for state NPS programs to achieve EPA approval. [*California’s Non-point Source Plan is now jointly administered by the California Coastal Commission, the State Water Resources Control Board and the Regional Water Quality Control Boards*].
 - 402(b): The National Pollutant Discharge Elimination System (NPDES) is a permitting system for point source discharges to surface waters, and establishes technology- and water quality-based treatment standards.

Marine Protection, Research and Sanctuaries Act (MPRSA) 1972 (33 USC § 1401 et seq.)

Unless authorized by a permit, the MPRSA generally prohibits (1) transportation of material from the US for the purpose of ocean dumping; (2) transportation of material from anywhere for the purpose of ocean dumping by US agencies or US-flagged vessels; (3) dumping of material transported from outside the US into the US territorial sea [MPRSA § 101].

Ocean Dumping Ban Act 1988 (§ 2030)

Enacted as an amendment to MPRSA; prohibits all ocean discharge of municipal sewage sludge and industrial waste after December 31, 1991.

Oil Pollution Act 1990 (33 USC § 2702 et seq.)

The Oil Pollution Act (OPA) of 1990 streamlined and strengthened EPA’s ability to prevent and respond to catastrophic oil spills. A trust fund financed by a tax on oil is available to clean up spills when the responsible party is incapable or unwilling to do so.

Coastal Zone Management Act (CZMA) 1972 (16 USC § 1451 et seq.)

Establishes a national framework for management, protection development and beneficial use of the coastal zone. Pursuant to the CZMA, the California Coastal Management Program was developed and approved by NOAA, and authorizes jurisdiction of the California Coastal Commission and the State Coastal Conservancy.

Figure 5.1.2(a) (continued) Major Federal water quality legislation impacting CINMS

Coastal Zone Reauthorization Amendments (CZARA) 1990

- Passed by Congress in recognition that the CZMA did not specifically address water quality
 - 6217: The “Protecting Coastal Waters” amendment requires states with approved coastal zone management programs to develop and implement, in coordination with state water quality agencies, coastal NPS pollution control programs. [*As noted above, California implements this section of CZARA through its Nonpoint Source Plan (as required by Section 319 of the CWA)*].
 - 306 (d)(16): Requires that state coastal zone management programs contain enforceable policies and mechanisms to implement applicable requirements of 6217.

Figure 5.1.2(b) Major California State water quality legislation

Porter-Cologne Water Quality Control Act 1969 (California Water Code § 13000 et seq.)

- Principal State law governing water quality and the beneficial uses of water, applicable to surface waters as well as wetlands and groundwater.
- Pursuant to the Porter-Cologne Act, California policy requires:
 - That quality of all the waters of the State shall be protected,
 - That all activities and factors affecting the quality of water shall be regulated to attain the highest water quality within reason, and,
 - That the State must be prepared to exercise its full power and jurisdiction to protect the quality of water in the State from degradation.
- Establishes the State Water Resources Control Board (SWRCB) and the nine Regional Water Quality Control Boards (RWQCB)
 - The State and Regional boards implement the provisions of the Act and have primary responsibility for individual permitting (including Clean Water Act NPDES permitting), inspection, and enforcement actions within each of the nine delineated hydrologic regions.
 - Section 401 of the Clean Water Act also gives the SWRCB authority to review and approve, condition or deny any proposed federally permitted or licensed activity that may impact California water quality.
- Requires creation and adoption of water quality control plans to guide policy on water pollution prevention.
 - SWRCB has created and adopted several statewide water quality control plans pertinent to CINMS, including:
 - *Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California* (known as the “California Thermal Plan”)
 - *Water Quality Control Plan for the Ocean Waters of California* (known as “The California Ocean Plan”). In addition to ocean pollution control parameters, the Ocean Plan defines designation criteria and regulations for the California State Water Quality Protection Areas. However, the Ocean Plan does not regulate vessel discharges, or directly address dredge material dumping.
 - *Plan for California's Non-Point Source Pollution Control Program* (known as NPS Program Plan)
 - Regional water quality control plans, known as basin plans, have also been created and adopted by the RWQCB of each of the nine delineated hydrologic regions.
 - Basin plans identify the existing and potential beneficial uses of State waters, establish water quality objectives to protect these uses, and contain implementation, surveillance, and monitoring plans.
 - Portions of water quality control plans are subject to review by the EPA; when approved by the EPA the water quality objectives and beneficial use designations become water quality standards under the Clean Water Act.

Figure 5.1.2(b) (continued) Major State water quality legislation impacting CINMS

Statement of Policy with Respect to Maintaining High Quality Waters in California (known as the SWRCB Anti-degradation Policy): SWRCB Resolution No. 6816

- Restricts degradation of surface and ground waters, particularly to protect bodies of water where existing water quality is higher than necessary for the protection of beneficial uses.

California Coastal Act 1976 (Public Resources Code (PRC) § 30000 et seq.)

- Enacted to provide for the conservation and planned development of the State's coastline.
- Mandates the California Coastal Commission (CCC) to carry out numerous activities pertinent to water quality through permitting processes, and determination of a proposed project's consistency with the Coastal Act, such as:
 - To protect against spillage of crude oil, gas, petroleum products, or hazardous wastes
 - To protect environmentally sensitive habitat areas
 - To protect the biological productivity and quality of coastal waters
- To minimize harmful effects on coastal waters, including water quality, from fill within ports
- In practice, the CCC protects water quality through:
 - Managing coastal development that generates runoff or spills, assisting local coastal governments and other agencies to address land use and development activities that may produce non-point source pollution, and implementing educational and technical assistance programs.
- Requires coastal cities and counties to adopt Local Coastal Plans (LCPs) that meet Coastal Act standards and policies.

PRC §§ 36700-37900 (6 classifications for designating managed marine areas, effective January 1, 2002)

- Mandates the authority to designate State Marine Reserves, for the protection or restoration of special marine species, communities, habitats and ecosystems (CINMS includes eight marine reserves and one marine conservation area).
- Mandates the authority for SWRCB to designate State Water Quality Protection Areas (SWQPA) (formerly known as Areas of Special Biological Significance).
 - Defined to be a "non-terrestrial marine area designated to protect marine species or biological communities from an undesirable alteration in natural water quality"

California Environmental Quality Act (CEQA), 1970 (Public Resources Code (PRC) § 21000 et seq.)

- Environmental impact assessment law modeled on the National Environmental Policy Act.
- SWRCB, the RWQCBs, and all State and local government agencies must comply with CEQA while considering approval of permits and other entitlements related to proposed discretionary activities.
- CEQA has 6 objectives, related to identifying, assessing, disclosing, avoiding and reducing environmental impacts from a proposed project, as well as generating viable project alternatives, fostering interagency cooperation, and enhancing public participation.

(continued from page 73)

The National Marine Sanctuary Program manages these waters and the resources therein with jurisdiction and aims for resource conservation and multiple-use established by the National Marine Sanctuaries Act of 1972. CINMS shares federal administrative jurisdiction over the waters within one nautical mile of the islands with the National Park Service: along with the Islands themselves (excluding 90% of Santa Cruz Island, which is

owned by the Nature Conservancy), CINP also includes the waters within one nautical mile of their mean high tide.

As the Channel Islands are territory of the State of California, the waters of the first three nautical miles from the Islands are also waters of the State of California. State water quality control legislation, and state agencies including the California Environmental Protection Agency (CalEPA), the California Department of Fish and Game, and the California Coastal Commission (CCC) thus share jurisdiction of this portion of CINMS.

Within CalEPA, the California State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Boards (of Regions 3 (Central Coast) and 4 (Los Angeles)) maintain primary State jurisdiction over the State waters in CINMS. Jurisdictional activities conducted by these boards include permitting and regulation of discharge to surface (marine and terrestrial) waters, creation of comprehensive “basin plans,” and nonpoint source pollution prevention. SWRCB has designated the waters one nautical mile of Santa Cruz, Santa Rosa, San Miguel, Santa Barbara and Anacapa islands as State Water Quality Protection Areas (SWQPA’s, formerly known as “areas of special biological significance”).²¹³ The State and Regional boards also coordinate water quality management for the watersheds of the Channel Islands themselves²¹⁴, which flow directly into CINMS, as well as the mainland watersheds that flow into the Santa Barbara Channel.

Finally, in the federal waters of CINMS from three to six nautical miles of the Islands’ mean high tide lines, the National Marine Sanctuary Program shares jurisdiction with several other federal agencies. The US EPA administers all discharge permitting, as well as compliance monitoring and enforcement of pollution laws in federal waters.

The Office of Law Enforcement of NOAA, and the US Coast Guard, within the Department of Homeland Security, also share jurisdiction to enforce pollution regulations and prohibitions in CINMS. Within and beyond the outer boundary of the Sanctuary, several further activity-specific jurisdictions exist to organize and control both governmental and commercial uses of the area’s waters; all pertain, to some degree, to CINMS water quality.

The US Navy maintains authority over the Point Mugu Sea Range, a large ocean area that overlaps with roughly southern half of CINMS, and continues southward from it.²¹⁵ The

²¹³ SWRCB. 2003. “Areas of Special Biological Significance: California’s Marine State Water Quality Protection Areas.” These marine areas receive special protection under PRC § 36710 (f): “In a state water quality protection area point source waste and thermal discharges shall be prohibited or limited by special conditions. Nonpoint source pollution shall be controlled to the extent practicable.”

²¹⁴ Anacapa and Santa Barbara islands lie within Region 4 (Los Angeles) (see: http://www.waterboards.ca.gov/losangeles/html/programs/regional_program/ws_channelislands.html); Santa Cruz, San Miguel and Santa Rosa islands are included in Region 3 (Central Coast) (see: http://www.waterboards.ca.gov/centralcoast/images/reg3map_001.jpg)

²¹⁵ Navigational Chart: U.S. West Coast, California, Point Dume to Purisima Point, July 29, 2000. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service Coast Survey. Washington D.C.

US Navy uses the Sea Range for fleet exercises, missile test firings, and gunnery exercises.²¹⁶

The US Minerals Management Service (MMS), a federal agency within the Department of the Interior, administers the nation's offshore oil and gas resources beyond the states' waters three nautical miles from the coastline. This area of jurisdiction is known as the Outer Continental Shelf (OCS); the Pacific OCS Region, headquartered in Camarillo, California, includes the area off California, Oregon and Washington. This office manages exploitation of all federal oil and gas leases in the Southern California waters. This authority includes responsibility for ensuring that oil and gas resource development operations (such as exploration and production) comply with applicable environmental protection regulations such as the Oil Pollution Act and the Clean Water Act.²¹⁷

As the principal Federal agency responsible for oil and gas development in the Pacific OCS, the MMS must conduct its oversight and approval of such development in compliance with several Federal laws and their associated regulations. The MMS is charged with ensuring development project compliance with NEPA prior to approving any proposed OCS activity that constitutes an "Action." In completing its NEPA review for a proposed action, the MMS may conduct "categorical exclusion" reviews or prepare either an environmental assessment (EA) or an environmental impact statement (EIS), depending on the breadth and magnitude of the proposed action's possible environmental effects.²¹⁸

CINMS extends into the federal OCS Region approximately three nautical miles (its waters beyond California State jurisdiction). Except for five active leases issued prior to March 30, 1981, exploring for, developing and producing hydrocarbons within the Sanctuary is prohibited (15 CFR 922.71). There are 83 active leases in OCS waters off Southern California, including 23 platforms and 43 producing leases, with 137 thousand barrels of oil per day in output as of 1999.²¹⁹

The International Maritime Organization (IMO), an agency of the United Nations that organizes and regulates international commercial shipping, also maintains a level of jurisdictional authority in and around the Sanctuary. The IMO has final approval authority over designation or alteration of vessel traffic separation schemes²²⁰ such as that of the Santa Barbara Channel, which routes vessel traffic directly through the Sanctuary near Anacapa Island.²²¹ The IMO also coordinates the main international treaties addressing the prevention of pollution from ships, collectively known as the International Convention on

²¹⁶ US Department of Defense. 2002. Final Environmental Impact Statement/Overseas Environmental Impact Statement: Point Mugu Sea Range. Prepared by the US Department of the Navy, Naval Air Systems Command, Naval Air Warfare Center Weapons Division, Point Mugu, California.

²¹⁷ "Federal, State & Local Government Jurisdiction in the Channel Islands National Marine Sanctuary." Prepared for the Channel Islands National Marine Sanctuary Advisory Council, April 1999. Compiled by Sanctuary Staff.

²¹⁸ *Id.*

²¹⁹ *Id.*

²²⁰ "California's Ocean Resources: An Agenda for the Future." P. 5F-2. The Resources Agency of California. July 1995. Available at: http://resources.ca.gov/ocean/html/chapt_5f.html

²²¹ Navigational Chart: U.S. West Coast, California, Point Dume to Purisima Point, July 29, 2000. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service Coast Survey. Washington D.C.

the Prevention of Pollution from Ships of 1973, and modified by the protocol of 1978 (MARPOL 73/78).²²² Six “annexes” pertaining to specific types of discharges from ships comprise the convention; with all in force among signatories as of May 19, 2005 (see Figure 5.1.3).²²³

Figure 5.1.3 The International Convention on Prevention of Pollution from Ships

Annex I: Regulations for the Prevention of Pollution by Oil

- Limits on operational discharges of oil from ships
- 1992 amendment requires new oil tankers to have double hulls and establishes phase in schedule

Annex II: Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk

- The discharge of chemicals is allowed only to reception facilities until certain concentrations and conditions (which vary with the category of substances).
- No discharge of residues containing noxious substances is permitted within 12 miles of the nearest land.

Annex III: Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form

- Detailed standards on packing, marking, labeling, documentation, stowage, quantity limitations, exceptions and notifications for shipping of harmful substances.

Annex IV: Prevention of Pollution by Sewage from Ships

Annex V: Prevention of Pollution by Garbage from Ships

- Specifies volumes and distances from land for garbage discharge.
- Complete ban on dumping into the sea of all forms of plastic.

Annex VI: Prevention of Air Pollution from Ships (entry into force 19 May 2005)

- Establishes limits on sulphur oxide and nitrogen oxide emissions from ship exhausts
- Prohibits deliberate emissions of ozone depleting substances.
- Also establishes requirements for platforms and drilling rigs at sea.

The United States has ratified Annexes I, II, III, and V of MARPOL 73/78 which establishes those annexes as law for US registered ships and enforcement responsibility for the USCG in US waters.²²⁴

Northward of CINMS, the waters of the Santa Barbara Channel lie entirely within the 12 nautical mile boundary of the US territorial sea, which implies full US sovereignty and federal jurisdiction.²²⁵ Further northward, California state authority resumes at the Three Nautical Mile Line, with corresponding jurisdictions of agencies such as CCC, the Regional Water Quality Control Boards (under the California Environmental Protection Agency) and the State Lands Commission, which oversees the development of California’s oil and gas resources and is responsible for preventing oil spills.²²⁶

Finally, at the mainland, elements of CWA and the Porter-Cologne Act require that incorporated counties (such as Ventura, Santa Barbara and San Luis Obispo) and cities

²²² International Maritime Organization, MARPOL: http://www.imo.org/Conventions/mainframe.asp?topic_id=255

²²³ *Id.*

²²⁴ USCG Division of Naval Architects, oil pollution prevention information: <http://www.uscg.mil/hq/gm/mse/ppe.htm>

²²⁵ NOAA Office of Coast Survey: <http://chartmaker.ncd.noaa.gov/csdl/mbound.htm>

²²⁶ California State Lands Commission: <http://www.slc.ca.gov/>

(such as Santa Barbara, Goleta, and Ventura) develop pollution control programs within their areas of jurisdiction to comply with regulations on point sources such as water treatment facilities and nonpoint source pollution.

5.2 CINMS Jurisdictional Authority

5.2.1 Legislation and Regulations

The National Marine Sanctuaries Act, 16 U.S.C. § 1431 et seq. (NMSA) authorizes the Department of Commerce (DOC) to designate sanctuaries for “the primary purpose of resource protection” (16 U.S.C. § 1431(b)). The agency structure within DOC is as follows²²⁷:

National Oceanic and Atmospheric Administration
National Ocean Service
Office of Ocean and Coastal Resource Management
Sanctuaries and Reserves Division

The stated aims of the program pertain directly to the conservation of marine water quality, considered as both a resource in and of itself,²²⁸ and as an environmental dynamic that impacts other sanctuary resources such as flora and fauna. As stated in the National Marine Sanctuaries Act and Program Regulations, § 922.2 (b), the mission of the National Marine Sanctuary Program includes goals to:

1. Identify and designate as National Marine Sanctuaries areas of the marine environment which are of special national significance;
2. Provide authority for comprehensive and coordinated conservation and management of these marine areas, and activities affecting them, in a manner which complements existing regulatory authorities;
3. Support, promote, and coordinate scientific research on, and monitoring of, the resources of these marine areas, especially long-term monitoring and research of these areas;
4. Enhance public awareness, understanding, appreciation, and wise use of the marine environment;
5. Facilitate to the extent compatible with the primary objective of resource protection, all public and private uses of the resources of these marine areas not prohibited pursuant to other authorities;
6. Develop and implement coordinated plans for the protection and management of these areas with appropriate Federal agencies, State and local governments, Native American tribes and organizations, international organizations, and other

²²⁷ “Federal, State & Local Government Jurisdiction in the Channel Islands National Marine Sanctuary.” Prepared for the Channel Islands National Marine Sanctuary Advisory Council, April 1999. Compiled by Sanctuary Staff.

²²⁸ “Sanctuary resource” is statutorily defined to mean any living or non-living resource of a sanctuary that contributes to the conservation, recreational, ecological, historical, research, educational or aesthetic value of the sanctuary (16 U.S.C § 1432(8)).

- public and private interests concerned with the continuing health and resilience of these marine areas;
7. Create models of, and incentives for, ways to conserve and manage these areas;
 8. Cooperate with global programs encouraging conservation of marine resources; and
 9. Maintain, restore, and enhance living resources by providing places for species that depend upon these marine areas to survive and propagate.

The Channel Islands National Marine Sanctuary Regulations outline several regulatory prohibitions to promote resource conservation within its boundaries, and several of these pertain directly to control of water quality:

Discharge of Substances

- No person shall deposit or discharge any materials or substances except:
 - Fish or parts and chumming materials (bait)
 - Water (including cooling water) and other biodegradable effluents incidental to vessel use of the sanctuary generated by:
 - marine sanitation devices;
 - routine vessel maintenance, e.g. deck wash down
 - engine exhaust; or
 - meals aboard vessels;
 - Effluents incidental to hydrocarbon exploration and exploitation activities as allowed by these regulations (15 CFR § 922.71 *Prohibited Activities*).

Additionally, several prohibitions or regulations exist for activities with potential to adversely impact water quality:

Alteration of, or Construction on, the Seabed

- Except in connection with the laying of any pipeline as allowed by these regulations, within two nautical miles of any island, no person shall:
 - Construct any structure other than a navigation aid, or
 - Drill through the seabed, or
 - Dredge or otherwise alter the seabed in any way, other than to anchor vessels, or
 - To bottom trawl from a commercial fishing vessel.

Commercial Vessel Operations

- Except to transport persons or supplies to or from an island, no person shall operate within one nautical mile of an island any vessel engaged in the trade of carrying cargo, including but not limited to tankers and other bulk carriers and barges, or any vessel engaged in the trade of servicing offshore installations. In no event shall this section be construed to limit access for fishing (including kelp harvesting), recreational or research vessels.

Hydrocarbon Production

- Exploring for, developing, and producing hydrocarbons except pursuant to leases executed prior to March 30, 1981, and except the laying of pipeline, if... oil spill contingency equipment is available at the site of such operations, is prohibited (15 CFR § 922.71 *Prohibited Activities*).

5.2.2 CINMS Management Plan

In addition to codified regulations, water quality conservation is also a goal of CINMS management. The Sanctuary's original management plan was drafted in 1983 and contains information about the CINMS environment and resources, bureaucratic administration, regulations, boundaries, budgeting, priority issues and proposed responses, and performance measures. In recognition of advances in science and technology, innovations in marine resource management techniques and newly emergent management issues, CINMS is currently revising its management plan in order to integrate new understanding and new tools into Sanctuary management.²²⁹

The management plan update includes two *purposes*:

1. To inform Sanctuary constituents, including the general public, about the Sanctuary and the management actions CINMS has planned for the next five years
2. To guide site management toward achievement of the Sanctuary's goals with the best means available.²³⁰

The updated management plan will specifically address the management of water quality through its "Water Quality Protection Planning Strategy," with a stated objective to "Protect the chemical, physical and biological integrity of the Sanctuary by restoring and maintaining water quality." CINMS hopes to implement this strategy with assistance from the newly-established West Coast Regional Water Quality Coordinator for the National Marine Sanctuaries Program, through partnering "with local and state agencies and constituent groups in a comprehensive and coordinated effort for water quality protection," and by working to "better define the Sanctuary's role in water quality protection through policy development, research, and education."²³¹

CINMS has identified three *activities* to undertake, towards fulfilling the updated management plan's stated water quality purposes:

²²⁹ Personal communication: Sarah MacWilliams, Sanctuary management plan specialist. January 14, 2005.

²³⁰ Id.

²³¹ Id.

1. Compile and synthesize information on jurisdictional water quality authorities and responsibilities, including governmental agencies, research and management programs, and water quality threats.
2. Review state and regional water quality management: work with interagency committees to evaluate and comment on management of existing and emerging water quality issues. Partners include the Sanctuary Advisory Council (SAC), state and federal agencies, county agencies, and NGOs.
3. Develop and propose priority corrective actions for managing Sanctuary water quality impacts. This activity includes identification of needs and opportunities to coordinate water quality management efforts with other agencies, public and private groups, and determination of the feasibility of implementing additional water quality management strategies using existing resources and programs. Also, this includes ascertaining need for both additional resources and water quality outreach and education.²³²

This needs assessment is designed to facilitate accomplishment of these activities; should this document be adopted these activities should be reassessed and clarified to eliminate redundancy and stay up-to-date with actual progress made in implementing the revised management plan's Water Quality Protection Strategy.

Finally, CINMS should review the Water Quality Protection Program (WQPP) maintained by the Monterey Bay National Marine Sanctuary (MBNMS) as a model for developing its own future program.²³³ During its 1992 establishment process, MBNMS, recognizing that "water quality is key to ensuring protection for all Sanctuary resources," drafted a Memorandum of Agreement as part of Sanctuary establishment that was signed by eight federal, state and local agencies agreeing to work together to develop the WQPP for MBNMS. Today, the WQPP has expanded to a voluntary partnership of 25 governmental agencies, as well as public and private groups "dedicated to protecting and enhancing water quality in [MBNMS] and its watersheds" through four detailed plans, including Urban Runoff, Marinas and Boating, Regional Monitoring, and Agriculture and Rural Lands.²³⁴

5.2.3 Water Quality Law Enforcement within CINMS

The U.S. Coast Guard (USCG), within the Department of Homeland Security, is the federal government's primary maritime law enforcement agency, enforcing federal laws and treaties of the United States on the high seas and in federal waters.²³⁵ Within three miles of California shore, the USCG shares jurisdiction with the State of California. Enforcement of CINMS water quality conservation regulations and prohibitions on discharges is thus largely the responsibility of the USCG; other

²³² Id.

²³³ Id.

²³⁴ Monterey Bay National Marine Sanctuary, Water Quality Protection Program for the MBNMS: <http://www.mbnms.nos.noaa.gov/resourcepro/water-pro.html>

²³⁵ "California's Ocean Resources: An Agenda for the Future." P. 3-6. The Resources Agency of California. July 1995. Available at: http://resources.ca.gov/ocean/html/chapt_3.html

water quality related laws and regulations this agency enforces include the Federal Water Pollution Control Act of 1972, the Oil Pollution Act of 1990, Hazardous Materials Transportation Act of 1974, Marine Pollution by Dumping of Wastes and Other Matter Convention, Act to Prevent Pollution from Ships of 1980, and others.²³⁶

The USCG's mission includes maritime law enforcement, national security, maritime safety and marine environmental protection.²³⁷ According to Sanctuary staff, USCG and CINMS continue to improve the coordination of enforcement operations in the Sanctuary. The NOAA Office of Law Enforcement (OLE), while largely focused on upholding fisheries law, also engages in enforcement of the Sanctuaries Act and the associated emissions regulations. CINMS staff also takes part in enforcement of the Sanctuary's pollution prohibition laws, and provides enforcing presence throughout CINMS concurrent with aerial and marine environmental monitoring.²³⁸

5.3 Federal and State Surface Water Pollution Control

A broad set of US federal laws and California state laws establish water quality standards and protections, and grant authority to agencies of the State of California to execute these responsibilities.

California's governor-appointed State Water Resources Control Board (SWRCB), a member-agency of the cabinet-level California Environmental Protection Agency (Cal EPA), coordinates and manages these responsibilities via nine Regional Water Quality Control Boards.²³⁹ The Regional Boards perform the review and permitting of all proposed activities involving waterborne discharge that could impact the quality of California watersheds or offshore state waters (ocean areas within three miles off the California coastline, including islands).²⁴⁰ The Regional Boards are also responsible for general watershed management, including control of non-point sources of anthropogenic pollution to insure compliance with federal EPA water quality standards.²⁴¹ Up to nine part-time Board members appointed by the governor comprise each of these semi-autonomous Regional Boards, with boundaries of jurisdiction delineated throughout California along watershed borders (see Figure 5.1.1).

Regions 3 and 4 broadly encompass the watersheds closest to CINMS, and their respective Water Quality Control Boards share jurisdiction over the various Channel Islands

²³⁶ "Federal, State & Local Government Jurisdiction in the Channel Islands National Marine Sanctuary." Prepared for the Channel Islands National Marine Sanctuary Advisory Council, April 1999. Compiled by Sanctuary Staff.

²³⁷ US Coast Guard: <http://www.uscg.mil/overview/>

²³⁸ Personal communication, February 23, 2005: Michael Murray, CINMS Advisory Council and Management Plan Coordinator.

²³⁹ California State Water Resources Control Board: <http://www.waterboards.ca.gov/about/mission.html>

²⁴⁰ California State Water Resources Control Board: <http://www.waterboards.ca.gov/sbforms/form200.doc>

²⁴¹ California State Water Resources Control Board Non-Point Source (NPS) Pollution Control Program: <http://www.swrcb.ca.gov/nps/protecting.html>

themselves. Region 3 jurisdiction extends from Santa Clara County (north of Santa Cruz) through San Luis Obispo and Santa Barbara Counties, including the critical South Coast (Hydrologic Unit 15) and Carpinteria watersheds (Hydrologic Sub-area (15.34)). Region 3 also includes San Miguel, Santa Rosa and Santa Cruz Islands (collectively HU 16).²⁴²

Region 4 extends over Ventura and LA County watersheds, small portions of Kern and Santa Barbara Counties, as well as Anacapa and Santa Barbara Island watersheds. Jurisdiction covers all coastal drainages flowing to the Pacific Ocean between Rincon Point (on the coast in western Ventura County) and the eastern Los Angeles County line, as well as the drainages of five coastal islands (Anacapa, San Nicolas, Santa Barbara, Santa Catalina, and San Clemente).²⁴³

The Porter-Cologne Act names the Regional Water Quality Control Boards “... the principal State agencies with primary responsibility for the coordination and control of water quality” (§13001). Each Regional Board is directed to “...formulate and adopt water quality control plans for all areas within the region.” A water quality control plan for the waters of an area is defined as having three components: beneficial uses which are to be protected, water quality objectives which protect those uses, and an implementation plan which accomplishes those objectives (§13050). Further, “such plans shall be periodically reviewed and may be revised” (§13240). Each Regional Board, including the Central Coast Board (Region 3), and the Los Angeles Board (Region 4), fulfill this strategic water quality control planning mandate through completion of “Basin Plans,”²⁴⁴ which designate beneficial uses of surface waters, set numerical objectives that must be attained or maintained to protect the designated beneficial uses and conform to the state’s anti-degradation policy, and describe implementation programs to protect all waters in the Region.”²⁴⁵

While numerous water quality standards and activity-based pollution control laws exist at both federal and state levels, controls of water quality in California’s watersheds tend to target either *point sources* of pollution— emissions from single point of origin or introduced into a receiving stream from a specific outlet— or non-point sources (NPS) of water quality impairment, characterized as diffuse and not having a single point of origin.²⁴⁶

²⁴² California Watershed Information Technical System: Geographic Information by Hydrologic Region. http://ceres.ca.gov/watershed/geographic/central_coast.html

²⁴³ Los Angeles Regional Water Quality Control Board Hydrologic Units, Hydrologic Sub-areas, Lakes and Rivers. <http://www.swrcb.ca.gov/rwqcb4/images/region4hu2web.jpg>

²⁴⁴ “Water Quality Control Plan for the Central Coast Region (3): Basin Plan.” September 8, 1994. California Regional Water Quality Control Board, Central Coast Region (3). Available at: <http://www.swrcb.ca.gov/rwqcb3/WMI/Index.htm>

²⁴⁵ “Water Quality Control Plan for the Los Angeles Region (4): Basin Plan.” February 23, 1995. California Regional Water Quality Control Board, Los Angeles Region (4). Available at: http://elib.cs.berkeley.edu/cgi-bin/doc_home?elib_id=1872

²⁴⁶ EPA – Clean Watersheds Needs Survey Glossary: <http://www.epa.gov/owm/mtb/cwns/1996rtc/glossary.htm>

5.3.1 Point Source Pollution

As administrators of the Clean Water Act National Pollution Discharge Elimination System (NPDES) program, California's Regional Boards review and permit project applications for municipal facilities such as waste water treatment plants; industrial facilities such as factories and offshore oil rigs in state waters (the waters within three nautical miles of California coastline); federal facilities such as prisons and military bases; and pretreatment programs to remove substances from municipal, commercial or domestic discharge that might pass through or interfere with municipal treatment processes or which may contaminate sewage sludge intended for soil enrichment. Regional Boards also review and conduct "general permitting" of projects and facilities such as large construction areas that become point sources of water pollution due to storm runoff, and administer Section 13260 of the California State Water Code (CWC) which requires reporting of all waste discharge "that could affect the quality of the waters of the State." An applicant's Report of Waste Discharge (ROWD) is reviewed by the appropriate Regional Board, which has a statutory obligation under CWC §13269 to prescribe waste discharge requirements if any such measures are deemed necessary.

The five-member State Water Resources Control Board reviews formal appeals of Regional Board decisions regarding project permitting.

The Office of US EPA Region 9 (which includes all of California in its regional jurisdiction) regulates and issues permits to facilities discharging into ocean waters beyond the three-nautical mile line for state waters.²⁴⁷ Section 403 of the CWA requires that NPDES permits for discharges into the territorial seas, contiguous zone, and the oceans be issued in compliance with EPA's guidelines for determining the degradation of marine waters. This includes discharges associated with offshore oil and gas exploration, development, and production on the outer continental shelf.

The codified discharge prohibitions within Sanctuary waters apparently pre-empt or obviate the need for regulation and permitting of most polluting activities within the Sanctuary under the Clean Water Act. However, CINMS authorizes in its water quality control language "...activity producing hydrocarbons... pursuant to leases executed prior to March 30, 1981" (15 CFR § 922.71 *Prohibited Activities*). As CINMS lies entirely within US territorial seas, US EPA Region 9 maintains regulatory jurisdiction over such "grandfathered" discharge activity, and requires NPDES permitting if appropriate. NPDES permitting jurisdiction also extends from beyond Sanctuary boundaries to the mainland shore to the north, and to 12 nautical miles from the southern shores of the Channel Islands (and in a circle of approximately 12 nautical mile radius around Santa Barbara Island).

Through the NPDES permitting process, the Regional Boards and the office of EPA Region 9 insure that discrete discharges into Southern California watersheds and the

²⁴⁷ US EPA Region 9. <http://www.epa.gov/region09/>

ocean within and around the Sanctuary comply with regulatory standards. The EPA also maintains a multi-layered enforcement program that includes permit compliance assistance, compliance incentives, compliance monitoring, and enforcement response to parties involved in pollution discharge.²⁴⁸

The CINMS water quality threat posed by standard oil and gas development operations is perhaps the single most significant addressed by the EPA's NPDES. In September of 2004, after several decades of operations and often un-permitted platform discharges, EPA issued a general NPDES permit for all offshore oil and gas facilities located in the Southern California OCS. The permit establishes effluent limitations, prohibitions, and other conditions for discharges from the 22 existing development and production platforms as well as from any new exploratory drilling operations located in Pacific OCS lease blocks offshore southern California. It also requires the platform operators to complete individual (platform-by-platform) assessments of alternatives to ocean discharging (e.g. barging wastes to shore or re-injecting them).

The permit supercedes all previously existing permits, and incorporates effluent limitation guidelines for the oil and gas industry promulgated by EPA in 1993.²⁴⁹ As a result of the Coastal Commission's consistency certification process under the Coastal Zone Management Act, the permit also includes:

- A provision in which the discharge effluent standards that EPA applies to all OCS oil and gas operations will be the more stringent of either the SWRCB Ocean Plan criteria, or the national CWA 304(a) criteria;
- A requirement for third party monitoring;
- A directive that the individual platform operators must each complete a study of alternatives to ocean discharge by December 2006.²⁵⁰

While this NPDES permit is currently in effect, the Western States Petroleum Association is also presently being challenging its legality in court.²⁵¹

Platform discharges are prohibited (through permit conditions) in California State waters.

5.3.2 Nonpoint Source Pollution

²⁴⁸ EPA Region 9: Introduction to Enforcement and Compliance Assurance.
<http://www.epa.gov/region09/enforcement/intro.html>

²⁴⁹ *Notice of Final Permit Issuance*: NPDES General Permit for Offshore Oil and Gas Exploration, Development and Production Operations off Southern California. September 15, 2004. U.S EPA, Region 9, CWA Standards and Permits Office, San Francisco, CA.

²⁵⁰ *Addendum to fact sheet*: Final NPDES General Permit No. CAG280000 for Offshore Oil and Gas Exploration, Development and Production off Southern California. September 15, 2004. U.S EPA, Region 9, CWA Standards and Permits Office, San Francisco, CA.

²⁵¹ *Western States Petroleum Association v. Nastri*, No. 04-75605 (9th Cir.).

The NPDES permitting scheme regulating point sources of pollution, discussed above, is one crucial component to standards implementation. Unfortunately, regulation of point sources does not alone protect all California waterways from becoming impaired relative to state and federal standards.

Nonpoint source pollution, such as runoff from urban and agricultural areas, and deposition of organic and chemical airborne pollutants, accumulate in watersheds that flow into the Santa Barbara Channel, impacting marine water quality near shore and potentially within the Sanctuary as well. State and federal jurisdictional authorities have developed several regulatory tools over time to employ in addressing non-point source pollution in watersheds, ranging from monitoring and control of individual pollutants, to strategic water quality control planning for watersheds and regional basins. While the impact of marine pollution from mainland watersheds on CINMS remains undocumented and poorly understood, these regulatory tools represent a level of protection of Channel water quality today and management opportunity for the protecting CINMS water quality in the future.

Section 303(d) of the Clean Water Act requires that the states make a list of waters that are not attaining standards after implementation of point source pollution controls. For waters on this list (and where the US EPA administrator deems they are appropriate) the states are to develop total maximum daily loads (TMDLs). A TMDL must account for all sources of the pollutants that caused the water to be listed, and must include a margin of safety to ensure that the water-body can be used for the purposes the State has designated. It must also account for seasonal variation in water quality. Federal regulations require that the TMDL, at a minimum, account for contributions from point sources as well as contributions from non-point sources.²⁵² California's Regional Boards set the TMDL values for the state's watersheds, and identify the uses for each water-body, such as drinking water supply, contact recreation, and aquatic biology support, and the scientific criteria to support each use.

Watersheds with the most significant impairments are targeted for TMDL establishment; the values are formally approved as amendments to a Region's basin plan, or, more rarely, when written into a new basin plan revision.²⁵³ Waterways on the Channel Islands themselves are not currently identified by Region 3 and 4 Boards as impaired, and thus TMDLs are not required for these waterways. Nevertheless, TMDL values have been established for some regional mainland watersheds that flow into the Channel, and establishment of further TMDLs could be a management option should certain pollutants in mainland runoff be identified as degrading to CINMS water quality.

For example, Ventura County's Santa Clara River Watershed, when subjected to flood-type runoff events, is identified in this report as the mainland pollution source

²⁵² State Water Resources Control Board: TMDL Information:
<http://www.waterboards.ca.gov/tmdl/background.html#background>

²⁵³ *Id.*

perhaps most threatening to Sanctuary water quality. This watershed is subjected to significant urban pollution and agricultural runoff and thus presents considerable management challenges; major EPA identified impairments include (in order of most often reported): nitrate/nitrite (NO₃ and NO₂, respectively), high coliform count, chloride, trash, and total dissolved solids. In response TMDLs have been established in 14 locations along the watershed by the Regional Board and approved by the EPA, for nitrate/nitrite, organic enrichment/low dissolved oxygen, and ammonia (NH₃).²⁵⁴

While the US EPA has mandated that waterways must meet certain water quality standards since the inception of the Clean Water Act, the State Water Resources Control Board's Watershed Management Initiative (WMI) represents an important development within California's state regulation and control of water quality, as well as an evolutionary step in governmental management of water resources in general. The WMI, as the name implies, aims to manage watersheds holistically and efficiently. In its Strategic Plan, SWRCB identifies the aim of the WMI as "to integrate various surface and ground water regulatory programs while promoting cooperative, collaborative [management] efforts within a watershed" and "to focus limited resources on key issues." The SWRCB articulates the scope of this approach: "To protect water resources within a watershed context, a mix of point and non-point source discharges, ground and surface water interactions, and water quality/water quantity relationships must be considered. State and Regional boards respond to this challenge through (watershed management)."²⁵⁵

During initial implementation of the WMI, each Regional Board identified the key watersheds in their Region, prioritized their water quality issues, and developed watershed management strategies. The Region 3 Board (with jurisdiction over San Luis Obispo and Santa Barbara Counties) initially approved a list of six targeted watersheds including the San Lorenzo River, Pajaro River, Salinas River, Morro Bay, Santa Maria River, and Santa Ynez River. San Luis Obispo Creek and the South Coast of Santa Barbara County were subsequently added. The selected watersheds were recognized as having significant water quality problems, as well as local efforts and commitment to address their respective problems.

In 1998 Region 3 reorganized its jurisdiction by watershed units, with an array of new stated aims based on more holistic management of each area, including establishment of TMDLs, urban runoff control, expand non-point source control, etc.²⁵⁶

As of 2002, Region 3 began emphasizing the development of TMDLs in the Region's "many impaired waterbodies... in line with greater emphasis on TMDLs

²⁵⁴ EPA Total Maximum Daily Loads: Section 303(d) List Fact Sheet for Watershed SANTA CLARA.

http://oaspub.epa.gov/pls/tmdl/huc_rept.control?p_huc=18070102&p_huc_desc=SANTA%20CLARA

²⁵⁵ "Strategic Plan." November 15, 2001. State Water Resources Control Board/Regional Water Quality Control Boards. Available at: http://www.swrcb.ca.gov/strategicplan/docs/01strategic_plan.pdf

²⁵⁶ "Watershed Management Initiative Chapter." January 2002. Regional Water Quality Control Board, Central Coast Region (Region 3). Available at <http://www.waterboards.ca.gov/centralcoast/BasinPlan/Index.htm>

statewide.” The Region devoted a unit to TMDL development, and began coordinating efforts to increase stakeholder awareness of water quality issues, regulatory requirements, and appropriate management practices to reduce non-point source pollution region wide.²⁵⁷

Region 4 began with pilots for Ventura and Calleguas watersheds and is currently expanding its program with five-year review cycles (including NPDES permitting, monitoring, TMDL development, etc.) for each watershed. Like Region 3, its jurisdiction is now organized by watershed units, and includes a growing list of TMDLs established for the most impaired of its waterways. CINMS managers should monitor the TMDL establishment process for Region 4 watersheds, as this nonpoint source pollution management protocol may represent an asset in Sanctuary water quality control as research is conducted to better understand how storm water plumes from major watersheds impact CINMS water quality.

5.3.3 Other State Programs

Beyond implementing federal statutes such as the Clean Water Act and US EPA water quality mandates, State agencies such as the State and Regional Water Resources Control Boards, as well as the State Resources Agency, maintain other policies and programs related to water quality management, monitoring, and pollution control in California waters. Many of these benefit CINMS water quality, or represent a management opportunities for enhancing it in the future.

Mussel Watch Program

The SWRCB Mussel Watch Program is a monitoring project within the Surface Waters and Toxic Substance Monitoring Program. Sampling and tissue analysis of mussels from intermittent locations from Mexico to Oregon yields data on California coastal water quality that assists the State Water Resource Control Board in regulation and management, especially near coastal cities. This program may not be particularly useful for CINMS water quality control at present, as the nearest mussel sampling locations are in Monterey and Los Angeles Counties, and the last data set was generated in the 1990’s. Nonetheless, a CINMS-area sampling location could conceivably be added for the next state-wide Mussel Watch survey, should these data prove useful in understanding CINMS water quality needs.

The California Ocean Action Plan

In September of 2004, in fulfillment of a directive issued by Governor Schwarzenegger, the California Resources Agency and CalEPA released a report entitled *Protecting Our Ocean: California’s Action Strategy*. Known as the Ocean Action Plan, the report represented an official State response to the findings reported by both the U.S. Commission on Ocean Policy and the Pew Oceans Commission. The Ocean Action Plan aims to “develop a plan of action for ocean and coastal management in California,” to respond to the crisis in marine resource

²⁵⁷ Id.

management identified by both national commissions, as well as the need for “the demands of California’s growing population.”²⁵⁸ At minimum, the Governor’s directive required that the plan address marine resource management needs in the areas of “Governance; Economics and Funding; Research, Education, and Technology Development; and Stewardship.”²⁵⁹

The Ocean Action Plan explicates four fundamental goals in marine resource conservation for the State to pursue, all of which pertain to ocean water quality:

1. Increase the abundance and diversity of aquatic life in California’s ocean, bays, estuaries, and coastal wetlands
2. Make the water in those bodies cleaner
3. Provide a marine and estuarine environment that Californians can productively use and safely enjoy
4. Support ocean dependent economic activities

The Ocean Action Plan then lists and describes two sets of recommended policy and funding actions for the State to engage in, to achieve the goals. Several of the articulated actions relate directly to water quality management.

The first set, “Immediate and Ongoing Actions,” includes several items with significant relevance to water quality in State marine areas. Recommended actions refer variously to enacting specific legislative bills, providing funding for existing initiatives, or establishing a position for California’s executive branch on issues or initiatives (see Figure 5.3.3(a)).

The second set, “Comprehensive and Long-term Actions,” includes detailed recommendations organized by the four areas required by the Governor’s directive to be addressed (governance, economics and funding, research and education, and stewardship). While most of these recommended actions relate at least indirectly to CINMS water quality, there are certain directly pertinent actions listed that may represent policy-based management opportunities for Sanctuary.

The comprehensive actions list for recommendations to California governance mirrors the immediate actions list on two significant points: first, it recommends encouragement by the Schwarzenegger administration for Federal adoption of “major provisions of the final report of the U.S. Commission on Ocean Policy, and other national ocean and coastal recommendations from the Pew Ocean Commission... that are acceptable to California;”²⁶⁰ and, second, for signing of COPA into law, which the Governor did on September 23, 2004.²⁶¹

²⁵⁸ Protecting Our Ocean: California’s Action Strategy. September, 2004. Prepared by the California Resources Agency and the California Environmental Protection Agency. Available at: http://resources.ca.gov/ocean/Cal_Ocean_Action_Strategy.pdf

²⁵⁹ *Id.*

²⁶⁰ *Id.*

²⁶¹ California Legislative Information: http://www.leginfo.ca.gov/pub/03-04/bill/sen/sb_1301-1350/sb_1319_bill_20040923_chaptered.html

In summary, the California Ocean Protection Act (COPA) establishes the Ocean Protection Council in state government, consisting of the Secretary of the Resources Agency, the Secretary for Environmental Protection, and the Chair of the State Lands Commission, as well as one member each of the Senate and Assembly, to meet with the Council as nonvoting, ex officio members.

COPA requires the Ocean Protection Council to coordinate activities of state agencies that are related to the protection and conservation of coastal waters and ocean ecosystems, to improve the effectiveness of state efforts to protect ocean resources within existing fiscal limitations, consistent with specified legislative findings and declarations, to establish policies to coordinate the collection and sharing of scientific data related to coast and ocean resources between agencies, and to identify and recommend to the Legislature and the Governor changes in law and policy needed to meet the above goals. Finally, COPA establishes the California Ocean Protection Trust Fund and authorizes expenditures approved by the Legislature for activities related to coastal and ocean resources.²⁶² Going forward, CINMS should consider the Ocean Protection Council and the Ocean Protection Trust Fund as assets in managing water quality in the waters of the Sanctuary with shared jurisdiction.

The Ocean Action Plan's comprehensive and long-term actions list also includes six recommendations in the area of Research, Education, and Technology Development. These include recommendations for statewide marine research and monitoring, and public outreach strategies, revitalizing online databases and news and documentation networks, systematic incorporation of ocean and coastal concepts into environmental education in the K-12 curriculum, and forming partnerships with formal education institutions and organizations providing informal education.²⁶³ In many ways these recommendations resemble recommendations made in this report, and thus should be considered an asset by CINMS for future collaboration with the State in water quality and marine resource management, as well as public education and outreach.

Finally, in the area of "Ocean and Coastal Stewardship," the Ocean Action Plan recommends four actions based around an acknowledgment that "the recommendations of the U.S. Commission on Ocean Policy, and the ocean and coastal protection and management needs of the State of California, make a compelling case for ecosystem management approaches." The four recommended actions in the stewardship subset (see Figure 5.3.3(b)) are based around coordinating and integrating watershed and marine resource management efforts of the various state agencies and programs, as well as between agencies at the federal, state and local levels. (*continued on page 95*)

²⁶² Id.

²⁶³ Protecting Our Ocean: California's Action Strategy. September. 2004. Prepared by the California Resources Agency and the California Environmental Protection Agency. Available at: http://resources.ca.gov/ocean/Cal_Ocean_Action_Strategy.pdf

Figure 5.3.3(a) “Immediate and Ongoing Actions” of the California Ocean Action Plan

- *Sign the California Ocean Protection Act (COPA) into Law.* The Schwarzenegger administration has worked with the Legislature and interest groups to help craft COPA, SB 1319, which will establish the cabinet-level California Ocean Council to coordinate and fund new actions to protect and manage California's Ocean and Coastal Resources. The FY 04/05 Budget for the State of California, approved by the legislature and signed into law by Governor Schwarzenegger, provides \$10 million in Tidelands Revenues for implementing ocean and coastal management objectives. This money becomes available with the enactment of SB 1319 and when sufficient Tidelands funds become available. [COPA (SB 1319) approved by Governor Schwarzenegger September 23, 2004. See California Legislative Information: http://www.leginfo.ca.gov/pub/03-04/bill/sen/sb_1301-1350/sb_1319_bill_20040923_chaptered.html.]
- *Demand Improvements in National Ocean Policy.* The Schwarzenegger Administration will meet with the President's Council of Environmental Quality within 30 days of the release of the final report of the U.S. Commission on Ocean Policy to demand strong federal action to protect and manage California's (and this nation's) ocean and coastal resources.
- *Eliminate Adverse Impacts of Offshore Oil and Gas Development.* The Schwarzenegger Administration will continue to defend California's right and duty to protect the California coast from the impacts of new offshore oil and gas leasing, exploration, or development on the federal Outer Continental Shelf and will encourage the federal government to seek a settlement to extinguish the 36 leases off the California Coast.
- *Support the California Coastal Commission and Coastal Management.*
- *Implement the Marine Life Protection Act Initiative.* Implementation of the MLPA will lead to a network of marine reserves, marine parks, and marine conservation areas along the California Coast.
- *Launch the Coastal Currents Monitoring System (Ocean Observation Systems).* The Schwarzenegger administration has recently approved the final funding for a \$21 million investment to establish a statewide coastal currents monitoring system that will provide real-time information to assist with fisheries management, oil spill movement, and even search and rescue operations. It will be the first step in establishing a statewide Ocean Observation System.
- *Complete the California Coastal Sediment Management Plan.* This plan will help address sediment management issues regarding coastal erosion, port maintenance, and wetland restoration.
- *Develop an Ocean and Coastal Stewardship Campaign.* The Schwarzenegger administration will work with members of government, academia, industry, and non-governmental organizations to develop a series of public service announcements to help get the word out regarding the role of average citizens in protecting and managing California's ocean and coastal resources.
- *Identify, Assess, and Enforce Existing Laws.* The Schwarzenegger administration is conducting an inventory of all existing laws that impact ocean and coastal resources and their management, which will be followed by an assessment of law enforcement effectiveness.
- *Develop a Long-Term Funding Strategy for Ocean and Coastal Protection and Management.* The Schwarzenegger administration will identify California's current level of investment in ocean and coastal management, enforcement, monitoring, research and education and use this information to identify gaps, areas of overlap, and to develop a long-term funding strategy.
- *Continue Support for the Clean Beaches Initiative.* The Schwarzenegger administration will continue to support the Clean Beaches Initiative to improve water quality at recreational beaches.

(continued from page 93)

The California Ocean Council (as established by COPA), appears to be assigned with taking the lead in these coordination efforts, particularly Action 12— “to integrate coastal water quality programs to improve their efficiency and effectiveness in cleaning up coastal watersheds, estuaries, bays, beaches, and near-shore waters.”²⁶⁴ This action should be interesting to Sanctuary managers and stakeholders, in the context water quality management both around the Channel Islands and in the mainland watersheds in the South Coast region that may impact Sanctuary water quality. However, the Ocean Action plan then tasks the California Ocean Council with developing yet another “action plan” to complete the water quality-oriented Action 12, giving the appearance of redundant bureaucracy. The work of the California Ocean Council should be monitored by Sanctuary managers and stakeholders, and encouraged by those parties to convert recommendations in its action plans to completed, practical steps.

California Ocean Stewardship Act of 2000; California Ocean Science Trust:

In 2000 Governor Davis signed into law the California Ocean Resources Stewardship Act (CORSA) which allows the Secretary for Resources Agency to form the California Ocean Trust, now called the California Ocean Science Trust (OST). CORSA also required the Secretary for Resources to prepare an inventory of ocean resource science coordination efforts in California.²⁶⁵

The Ocean Science Trust operates as a non-profit organization, to fund marine and coastal research in California and to encourage coordinated, multi-agency, multi-institution approaches to ocean resource science. The federally funded Coastal Impact Assistance Program provided initial funding of \$850,000 for OST, which “provides an opportunity to combine public resources with those from the private sector and nonprofit organizations, to promote new coastal and ocean research, education, and management approaches within California.” Upon establishment, the OST was envisioned to provide funding for projects that improve “coordination and collaboration, research or monitoring activities related to a variety of scientific questions about coastal and ocean habitats, fisheries, water quality, and coastal erosion.”²⁶⁶

The Board of Trustees for the OST meets twice a year (most recently in July 2005), and has generated a series of guiding and planning documents, including a 2005-06 Work Plan, its “California Coastal and Ocean Science Needs Assessment,” and its “California Ocean and Coastal Information, Research, and Outreach Needs Workshop Final Summary Report.”²⁶⁷

²⁶⁴ *Id.*

²⁶⁵ California Department of Resources; California Ocean Stewardship Act information: http://resources.ca.gov/ocean/CORSA/CORSA_index.html

²⁶⁶ *Id.*

²⁶⁷ California Ocean Science Trust, Reports: <http://www.calost.org/reports.asp>

Figure 5.3.3(b) California Ocean Action Plan: Comprehensive Actions in Ocean and Coastal Stewardship

Action 10

Pursue, support, implement, and establish long-term funding for coordinated ecosystem management approaches at the federal, state, and local levels to guide and improve the stewardship of ocean and coastal resources. The successful long-term implementation of ecosystem management will require a commitment of political will and funds from the highest levels of both the federal and state government.

Action 11

Restructure, focus, and strengthen the “California Watershed Management Memorandum of Understanding (MOU)” to identify priority watersheds for resource protection and use, fishery recovery, and water quality, and improve delivery of state technical and financial assistance to impaired coastal watersheds. Multiple state entities within the California Environmental Protection Agency (Cal/EPA) and California Resources Agency currently administer programs that provide technical assistance or financial support for various aspects of watershed management, and hundreds of local watershed partnerships exist in the state and all these efforts need to be coordinated.

Action 12

Integrate coastal water quality programs to improve their efficiency and effectiveness in cleaning up coastal watersheds, estuaries, bays, beaches, and near-shore waters. The California Ocean Council will develop an action plan to coordinate state financial and technical assistance programs to facilitate projects and programs that restore and protect coastal and near-shore resources, habitats, and water quality.

Action 13

Identify and prioritize issues that may benefit from additional coordination by the California Ocean Council. California faces ongoing challenges in its efforts to manage and protect marine habitats, living marine resources, the very existence of beaches, and to maintain substantial economic uses and infrastructure.

State Legislation on Beach Sanitation and Monitoring

The SWRCB has been directed by the State Legislature to take a series of actions to monitor and manage water quality at public beaches. Recent major legislation²⁶⁸ includes:

- AB411 (Wayne and Shelley, 1997-1998) – *Beach sanitation*. Requires local health officers to test waters adjacent to public beaches within their jurisdiction and to take related action in the event of a known sewage release. The bill also requires the local health officer to post conspicuous warning signs and establish a telephone hotline to inform the public about a beach that fails to meet standards developed by the Department of Health Services as required in the bill. Implementation began 1/1/99.

²⁶⁸ SWRCB, Clean Beaches Legislation:

http://www.swrcb.ca.gov/rwqcb4/html/water_qty/BWQ/recent_legislation.html

- AB538 (Wayne, 1999-2000) – *Public beaches: Bacteriological standards*. Directs the State Water Resources Control Board to develop protocols for identifying sources of contamination where bacteriological standards have been repeatedly exceeded at heavily visited beaches.
- AB1946 (Wayne, 1999-2000) – *Public beaches: Survey*. Requires local health officers to submit a monthly survey to the SWRCB detailing information on beach postings and closures due to failure to meet bacteriological standards. Requires SWRCB to establish a specific format for the surveys, make the information available to the public on a monthly basis, and publish an annual statewide report.

California’s Marine State Water Quality Protection Areas

Assembly Bill 2800, approved by the Governor on September 8, 2000, established definition within the California Public Resources Code (PRC § 36700 (f)) for State Water Quality Protection Areas (SWQPA). Specifically, SWQPAs are defined as: ...non-terrestrial marine or estuarine area[s] designated to protect marine species or biological communities from an undesirable alteration in natural water quality, including, but not limited to, areas of special biological significance that have been designated by the [SWRCB] through its water quality control planning process.²⁶⁹

Two SWQPAs (established by SWRCB as areas of special biological significance (ASBS)) exist within CINMS, delineated by both county and RWQCB boundaries. ASBS No. 17, within the jurisdiction of the Central Coast (Region 3) Water Quality Control Board and Santa Barbara County, includes the waters surrounding San Miguel, Santa Rosa, and Santa Cruz Islands to a distance of one nautical mile offshore, or to the 300-ft isobath, *whichever is the greatest*.²⁷⁰ ASBS No. 22, within the jurisdiction of the Los Angeles (Region 4) Water Quality Control Board and Ventura County, includes the waters surrounding Santa Barbara and Anacapa Islands to a distance of one nautical mile offshore, or to the 300-ft isobath, again, *whichever is greatest*.²⁷¹ As demonstrated in the jurisdiction map (Figure 5.1), the 300-ft isobath aspect of both of these SWQPAs often pushes the boundary of these areas to the 3 Nautical Mile Line, or outer limit of State jurisdiction.

Concurrent with the establishment of SWQPAs, PRC § 36710 (f) states that within SWQPAs, “point source waste and thermal discharges shall be prohibited or limited by special conditions. Nonpoint source pollution shall be controlled to the extent practicable.” As of June, 2005, SWRCB is conducting active enforcement of prohibitions on both point and nonpoint source pollution in California’s 34

²⁶⁹ “Areas of Special Biological Significance: California’s Marine State Water Quality Protection Areas.” State Water Resources Control Board (SWRCB). Designated March 21, 1974 (Resolution No. 74-28), April 18, 1974 (Resolution No. 74-32), and June 19, 1975 (Resolution No. 75-61). June 2003 revision.

²⁷⁰ *Id.*

²⁷¹ *Id.*

SWQPAs, with municipalities especially targeted under recent enforcement efforts.²⁷²

While SWQPA designation for the two CINMS Areas of Special Biological Significance does represent an elevated level of water quality protection for Sanctuary waters, it is important to note that the SWRCB Ocean Plan governs the discharge prohibitions maintained for these State marine protected areas, and that this plan excludes vessels and vessel discharges from its jurisdiction.²⁷³

As discussed in the water quality threats section of this report, vessel discharges likely represent a more significant ongoing threat to Sanctuary water quality than runoff from the Islands themselves, or most other potential sources of pollution. Because both the Ocean Plan and the CINMS regulations exclude vessel discharges from their discharge prohibitions, these jurisdictions appear to have redundant strengths as well as weaknesses in protecting Sanctuary water quality. However, as the impact of storm water plumes from major mainland rivers on CINMS water quality becomes better understood, the State's will to protect SWQPAs from nonpoint source pollution may become an asset in better protecting Sanctuary water quality from this seasonal threat.

5.4 California Coastal Commission

Established by voter initiative in 1972, and made permanent by the California State Legislature through passage of the California Coastal Act of 1976, the California Coastal Commission (CCC) plans and regulates the development and conservation of the lands and waters of the California coastal zone.²⁷⁴ On land the coastal zone varies in width from several hundred feet in highly urbanized areas up to five miles in certain rural areas, and offshore the coastal zone includes all three miles of ocean waters within the State of California jurisdiction.²⁷⁵

The stated mission of the CCC is to: "Protect, conserve, restore, and enhance environmental and human-based resources of the California coast and ocean for environmentally sustainable and prudent use by current and future generations."²⁷⁶ Its primary functions include:

1. Permitting of projects for a broad array of development activities (construction of buildings, divisions of land, and activities that change the intensity of use of land or public access to coastal waters).

²⁷² Personal communication, Tracey Duffey, Critical Coastal Areas Coordinator for Southern California, California Coastal Commission. June 23, 2005.

²⁷³ Personal communication, Dominic Gregorio, Division of Water Quality, Ocean Standards Unit, SWRCB. June 24, 2005.

²⁷⁴ California Coastal Commission, Program Overview: <http://www.coastal.ca.gov/whoweare.html>

²⁷⁵ *Id.*

²⁷⁶ *Id.*

2. Administration of the Coastal Zone Act Reauthorization (CZARA), which requires California's coastal cities and counties to have a Coastal Plan that includes general water quality control mandates.

Carrying out these two core functions (project review and permitting, and administration of coastal plans) provides the bulk of coastal water quality control maintained by the CCC.²⁷⁷ Furthermore, protection of California's coastal water quality and other marine resources dependant on water quality are explicated within the Public Resources Code defining the role of the CCC in relation to "Biological Productivity and Wastewater. CA PRC §30231 states:

The biological productivity and the quality of coastal waters, streams, wetlands, estuaries, and lakes appropriate to maintain optimum populations of marine organisms and for the protection of human health shall be maintained and, where feasible, restored through among other means, minimizing adverse effects of wastewater discharges and entrainment, controlling runoff, preventing depletion of ground water supplies, substantial interference with surface water flow, encouraging wastewater reclamation, maintaining natural vegetation buffer areas that protect riparian habitats, and minimizing alteration of natural streams.

The CCC also maintains several collaborative projects and public outreach initiatives²⁷⁸ that target conservation of Coastal water quality, under the umbrella of its "Water Quality Program."²⁷⁹

The foremost of these initiatives is the CCC's "Plan for California's Nonpoint Source Pollution Control Program," or NPS Program Plan, which aims to provide a unified, statewide approach to dealing with nonpoint source pollution through coordination of all governmental agencies with water quality control jurisdiction. The SWRCB collaborates with the CCC in leading the NPS Program Plan, through which these agencies fulfill their obligations to the Clean Water Act and CZARA, respectively.²⁸⁰ Both laws mandate effective management of nonpoint source pollution.

Initially, all State governmental agencies with influence over California water quality met under the leadership of the CCC and SWRCB and developed a 15-year plan with 61 management measures (organized into 6 categories such as Agriculture, Marinas & Recreational Boating, and Urban Management Measures). Each agency then wrote its own plan to implement these measures into its operations. Today, a total of 28 state agencies are working collaboratively through the Interagency Coordinating Committee (IACC) to

²⁷⁷ Personal communication, Tracey Duffey, CCC representative. February 23, 2005.

²⁷⁸ CCC outreach and education programs include Boating Clean and Green, to inform California boaters of environmentally sound boating practices at docks and waterfronts, and the California NEMO (Nonpoint Education for Municipal Officials) Project, to keep California's "land use decision makers informed on the links between land use and water quality, and updated on nonpoint source pollution issues" (see <http://www.coastal.ca.gov/nps/npsndx.html#NPS> and the Education and Outreach section of this report for summary information on these programs).

²⁷⁹ California Coastal Commission, Water Quality Program: <http://www.coastal.ca.gov/nps/npsndx.html>

²⁸⁰ California Coastal Commission, California's Nonpoint Source Pollution Control Program (January 2000): <http://www.coastal.ca.gov/nps/npsndx.html#NPS>

implement California's NPS Program Plan. Its goals are to: (1) improve interagency coordination and promote statewide consistency in implementing the NPS Program Plan; (2) promote the watershed approach in addressing non-point source pollution; and (3) provide a forum for resolving policy and programmatic conflicts among State agencies.²⁸¹

The NPS Program Plan is important for CINMS water quality because of its systematic and broad-scale approach to reducing pollution in mainland runoff. The organized effort to improve interagency cooperation and statewide consistency represents a management opportunity for CINMS, as the connections between nonpoint source pollution in mainland runoff and Sanctuary water quality become better understood and the needs for managing impacts from mainland pollutants thus become better articulated.

The CCC's relatively new Critical Coastal Areas (CCA) Program, another water quality management initiative, exists to help local stakeholders and government agencies protect particular coastal-zone watershed areas in "critical need of protection from polluted runoff."²⁸² Both the CZMA and CZARA require creation of such a watershed management program to address coastal areas with severe water quality issues. While the CCC does not directly implement the programs, it acts as a partner in implementation through provision of guidance, information and resources (including funding) to coalitions of local agencies and organizations to conduct assessments and develop watershed management action plans for their CCA. Similar to the State Water Quality Protection Area, designation of a marine area (within the Coastal Zone) as an ASBS by SWRCB triggers designation of that area as a CCA— thus ASBS No. 17 and ASBS No. 22 within CINMS are both considered Critical Coastal Areas.²⁸³

The CCA Program is designed to help form teams of local stakeholders (watershed groups, special interest organizations, and community members) and all government agencies to develop community-based CCA Action Plans for addressing polluted runoff that threatens coastal resources within these CCAs.²⁸⁴ As pilot programs for the two Channel Islands CCAs are developed, CINMS managers and stakeholders should investigate the potential for leveraging both regulatory and outreach assets provided by the CCA program in addressing Sanctuary water quality threats that penetrate the current State and Federal regulatory framework.

CCC also coordinates the California Non-point Education for Municipal Officials (CA NEMO) Partnership. This partnership works as a member of the National NEMO Network, which educates local land use decision makers about the relationship of land use to natural resource protection, with a focus on water resources. The California NEMO partnership was formed by local, state, and national agencies to develop an educational

²⁸¹ *Id.*

²⁸² "California's Critical Coastal Areas: Watershed Assessment and Action Plan Outline." California Coastal Commission, Critical Coastal Areas Committee. December 17, 2004. Available at: <http://www.coastal.ca.gov/nps/cca-plan-outline.pdf>

²⁸³ Personal communication, Tracey Duffey, CCC representative. February 23, 2005.

²⁸⁴ "California's Critical Coastal Areas: Watershed Assessment and Action Plan Outline." California Coastal Commission, Critical Coastal Areas Committee. December 17, 2004. Available at: <http://www.coastal.ca.gov/nps/cca-plan-outline.pdf>

program linking land use to water quality. The program goal is to keep California's land use decision makers updated on non-point source pollution related issues, by working with local communities to develop the tools necessary to protect natural resources, including water quality, and community character. Natural resource based planning is introduced as a framework for addressing land use and water quality issues within California's municipalities.

Lastly, and with a relationship to CA NEMO, is CCC's Model Urban Runoff Program (MURP), a "how-to" guide for local governments to address the issues of polluted runoff in the urban environment. The program consists of a manual and associated workshops that help small municipalities develop, finance, implement, and enforce a comprehensive program for managing storm water pollution and improving water quality.

5.5 City and County Jurisdictions and Programs

Storm water runoff from urban and suburban areas such as cities like Santa Barbara, Oxnard, Goleta, Port Hueneme, Carpinteria, and Ventura, and from unincorporated urban areas under County jurisdictions, is recognized as a significant source of water pollution. Pollutants that accumulate on the impervious surfaces of urban areas until storm events wash them into streams and offshore commonly include pesticides, fertilizers, oils, salts, litter and other debris, sediment, and untreated human and animal sewage.²⁸⁵

Toward reducing harmful urban runoff, and preventing impairment of waterways into which municipal storm systems discharge gathered runoff, EPA developed the Phase I and Phase II Storm Water Programs as components of the NPDES framework. Under California's implementation of the Phase I and Phase II programs, operators of municipal separate storm sewer systems (known by the contracted acronym MS4), as well as operators of construction sites, require authorization from the appropriate Regional Water Quality Control Board under an NPDES permit to discharge storm water-borne pollutants.²⁸⁶

In response to the growing threat of urban runoff, and 1987 Amendments to the Clean Water Act (CWA), the U.S. Environmental Protection Agency (EPA) developed Phase I of the NPDES Stormwater Program in 1990. The Phase I program targets sources of storm water runoff that have "the greatest potential to negatively impact water quality." Under Phase I, EPA requires NPDES permit coverage for storm water discharges from medium and large MS4s (those that serve 100,000 people or more), as well as construction sites that disturb more than five acres. Operators of either category are required to submit comprehensive permit applications and are issued individual NPDES permits.

²⁸⁵ US Environmental Protection Agency, Office of Water. "Storm Water Phase II Final Rule: An Overview." Fact Sheet 1.0. January 2000. This EPA document points out data from a 1996 National Water Quality Inventory indicating that 13 percent of impaired rivers and 45 percent of impaired estuaries "are affected by urban/suburban storm water runoff."

²⁸⁶ EPA, Sectors of Industrial Activity that Require Permit Coverage, Storm Water Program: <http://cfpub.epa.gov/npdes/stormwater/swcats.cfm>

In addition to the permit requirement, the Phase I Rule²⁸⁷ requires all operators of medium and large MS4s to develop a storm water management program (SWMP) designed to prevent harmful pollutants from being washed by storm water runoff into the MS4 (or from being dumped directly into the MS4), then into local water bodies.²⁸⁸

The Stormwater Phase II Final Rule,²⁸⁹ promulgated in 1999, expands the jurisdiction of the Phase I program by requiring additional operators of MS4s, (those serving less than 100,000 people), as well as operators of small construction sites (1-5 acres of disturbed area) to obtain a NPDES permit and develop an SWMP.²⁹⁰ The SWMP needs to describe how the regulated entity will identify and implement a range of Best Management Practices (BMPs) into an effective storm water management program that includes 6 minimum control measures, evaluation/assessment and reporting efforts, and record-keeping. Under these regulations the program must be developed and implemented. The storm water management program is intended to: 1) Reduce the discharge of pollutants to the "maximum extent practicable"; 2) Protect water quality; and 3) Satisfy the appropriate water quality requirements of the Clean Water Act.²⁹¹

Maximum extent practicable, MEP, is a standard that establishes the level of pollutant reductions that MS4 operators must achieve through implementation of a storm water management program. Permittees such as Santa Barbara County and cities such as Santa Barbara, Santa Maria and Carpinteria determine what the MEP is on a location-by-location basis and consider such factors as conditions of receiving waters, specific local concerns, and other aspects of a comprehensive watershed plan.²⁹²

The Phase II Rule defines a storm water management program for a small MS4 as a program composed of six elements that, when implemented together, are expected to reduce pollutants discharged into receiving water-bodies to the MEP. These six program elements, or minimum control measures (MCM), are²⁹³:

1. Public Education and Outreach
2. Public Participation/Involvement
3. Illicit Discharge Detection and Elimination
4. Construction Site Runoff
5. Post Construction Runoff Control
6. Pollution Prevention/Good Housekeeping for Municipal Operations

NPDES permit status and SWMPs for major SBC region municipalities are described below.

²⁸⁷ 55 FR 47990 (November 16, 1990)

²⁸⁸ EPA, Phase I Storm Water Program: <http://cfpub.epa.gov/npdes/stormwater/phase1.cfm>

²⁸⁹ 64 FR 68722 (December 8, 1999)

²⁹⁰ EPA, Phase II Storm Water Program: <http://cfpub.epa.gov/npdes/stormwater/phase2.cfm>

²⁹¹ *Id.*

²⁹² County of Santa Barbara, Project Clean Water, NPDES Regulatory Requirements and Applicable Standards: http://www.countyofsb.org/project_cleanwater/NPDES.htm

²⁹³ *Id.*

5.5.1 Santa Barbara County

Santa Barbara County plays several roles in water quality control in its creeks and coastal areas, including upholding water quality regulations, conducting monitoring, and coordinating and supporting special initiatives. The County fulfills these roles through coordination of its “Project Clean Water,” which also serves to organize a coalition of water quality stakeholders such as government agencies, community groups, and individual community members. Project Clean Water participants collectively work to investigate and implement solutions to contamination and pollution in local creeks that contribute to water quality degradation and county beach closures. Methods include regular “walks” of County creeks by both employees and volunteers to perform visual surveys, identify water quality problems, and execute corrective actions as necessary; County staff also collect samples for water quality analysis for pollutants including bacteria, pesticides, and oil. Data from sample testing is used to identify critical areas that must be targeted for appropriate remediation.²⁹⁴

The Santa Barbara County Board of Supervisors established Project Clean Water in 1998 to identify and implement solutions to creek and ocean water pollution on the South Coast; the County’s Public Works Department, through its Water Agency, and the Public Health Department, through its Environmental Health Services agency, were the two principal County departments assigned to fulfill these tasks. Since establishment, however, an array of governmental parties and non-governmental organizations have joined Project Clean Water, including the cities of Santa Barbara and Carpinteria, the Urban Creeks Council, the Audubon Society, local chapters of the Surfrider Foundation, Heal the Ocean, CURE, and the Community Environmental Council, as well as many community members. Project Clean Water produces an annual water quality report for the County Board of Supervisors, and sponsors studies to help pinpoint sources of pollution and develop an understanding of the County’s pollutant dynamics.²⁹⁵

In May 2004 the County of Santa Barbara released its Draft Storm Water Management and Discharge Control Ordinance to “reduce the impact of urban runoff on creek and ocean water quality,”²⁹⁶ and to provide legal authority for enforcement as required by the Phase II storm water regulations for the urbanized unincorporated areas of the county on the South Coast, in the Santa Ynez Valley, and in the Orcutt area of the Santa Maria Valley.^{297,298} In September of 2004 the

²⁹⁴ Project Clean Water – County of Santa Barbara: http://www.countyofsb.org/project_cleanwater/

²⁹⁵ *Id.*

²⁹⁶ “County Releases Draft Storm Water Ordinance.” Santa Barbara County Public Works Department, press release. May 26, 2005. Available at <http://www.countyofsb.org/pwd/PressRelease/StormWaterOrd052604.doc>

²⁹⁷ Discharges within incorporated areas of Santa Barbara County, discharges that require state or federal permits or waivers such as municipal treatment facilities and agricultural discharges, and certain County-owned facilities such as the transfer station are not targeted by the plan.

draft ordinance was submitted as the County of Santa Barbara Storm Water Management Plan (SWMP) to the Region 3 Water Quality Control Board for approval,²⁹⁹ which is still pending as of June 2005.³⁰⁰

Released as a component of Project Clean Water, the ordinance was developed as one of several Clean Water Act NPDES permit requirements established by the federal Clean Water Act and upheld by the SWRCB. Development of such an ordinance (and the SWMP included within it) is one of several of NPDES Phase II permit requirements, defined by the State of California General Storm Water Permit, which was adopted for small municipalities such as the County of Santa Barbara in March 2003.³⁰¹

The ordinance and SWMP are designed to prevent watershed pollution by codifying best management practices (BMPs) for an array of human activities, and targets illegal dumping and connections to the storm drain system through prohibitions on such pollutant discharge for substances such as oil, grease, chemicals and sewer waste. The SWMP identifies “impaired” (303(d) listed) waterways in the County, which were also considered in the plan’s development (though the plan notes that “streams listed as impaired may be subject to further, more focused, regulatory action by the State such as implementation of [TMDL] limitations.”). Finally, the draft ordinance assigns enforcement responsibility to the County’s Public Works Director and establishes an administrative fine structure for ordinance violations.³⁰²

5.5.2 Ventura County

Ventura County’s storm water control program naturally shares similarities with that of Santa Barbara County, in order to comply with the same State and Federal mandates within Phase I and Phase II storm water discharge programs. However, while the County of Santa Barbara is independently developing a storm water control ordinance and SWMP in order to comply with a statewide NPDES General Permit for small municipalities under Phase II, Ventura County has taken an alternate path toward storm water regulation compliance.

The County of Ventura partnered with the Ventura County Flood Control District, and the Cities of Camarillo, Fillmore, Moorpark, Ojai, Oxnard, Port Hueneme, San Buenaventura (Ventura), Santa Paula, Simi Valley, and Thousand Oaks to form the Ventura Countywide Storm Water Quality Management Program (SWQMP); this multi-party partnership then applied for a NPDES permit for storm water discharge

²⁹⁸ *County of Santa Barbara Storm Water Management Plan*. September 10, 2004. Project Clean Water manager Robert Almy. Available at: http://www.countyofsb.org/project_cleanwater/Documents/SWMP/SWMP-RWQCB_withoutredline904_2_.pdf

²⁹⁹ *Id.*

³⁰⁰ Personal communication via phone, Robert Almy, Project Clean Water manager. June 15, 2005.

³⁰¹ “County Releases Draft Storm Water Ordinance.” Santa Barbara County Public Works Department news release. May 26, 2005. Available at <http://www.countyofsb.org/pwd/PressRelease/StormWaterOrd052604.doc>

³⁰² *Id.*

from all its MS4s. In August, 2000, the Los Angeles RWQCB approved the application and issued the NPDES permit for storm water discharges from the municipalities into the Coastal watersheds used as receiving waters by their MS4s. These watersheds include the Santa Clara and Ventura Rivers, the Calleguas Creek, and other coastal watersheds within Ventura County.³⁰³

The permitted Ventura County SWQMP describes management measures that are included and how they are organized; it lists tasks required to accomplish the measures, the schedule for implementation, and specific goals. The schedule and tasks are projected for the 5-year permit period (the permit must be renewed July 27, 2005). The Implementation chapter of the Ventura County SMP consists of the following elements: general program management; programs for residents, industrial and commercial businesses, land development, construction sites, co-permittee (e.g. the cities of Ventura, Thousand Oaks, and Oxnard) MS4 maintenance, and illicit discharge control.³⁰⁴

The Ventura Countywide SWQMP also includes the Storm Water Monitoring Plan, which consists of land-use based monitoring combined with receiving water monitoring and modeling. The Monitoring Plan has four major objectives:

1. Characterizing stormwater discharges by monitoring sites representative of different land uses: industrial, agricultural, and residential.
2. Establishing the impact of stormwater discharges on receiving waters by conducting receiving water quality, mass emission, and bioassessment monitoring.
3. Identifying pollutant sources based on analysis of monitoring data, inspection of businesses, and investigation of illicit discharges.
4. Defining stormwater program effectiveness using data collected before and after implementation of pollution prevention programs.³⁰⁵

In addition, the SWQMP included the signing of an agreement to participate in the Regional Monitoring Program established for Southern California municipal programs under the guidance of the Southern California Coastal Water Research Project (SCCWRP).³⁰⁶

As discussed in this report's Threats section, storm water plumes from Ventura County watersheds are known to extend from the mainland into CINMS. As the impact of these plumes on Sanctuary water quality becomes better understood, CINMS staff could take advantage of the SWQMP permit renewal process to

³⁰³ California Regional Water Quality Control Board, Los Angeles. August 3, 2000. Ventura County Municipal Storm Water NPDES Permit (Board Order No. 00-108; NPDES Permit No. CAS004002). Available at: <http://www.vcstormwater.org/ventcopermit.pdf>

³⁰⁴ *Id.*

³⁰⁵ Ventura County Watershed Protection District, Countywide Stormwater Monitoring Plan: <http://www.vcstormwater.org/>

³⁰⁶ California Regional Water Quality Control Board, Los Angeles. August 3, 2000. Ventura County Municipal Storm Water NPDES Permit (Board Order No. 00-108; NPDES Permit No. CAS004002).

formally convey plume data and Sanctuary needs in regard to better protecting CINMS water quality from Ventura County storm water runoff.

5.5.3 Cities of Santa Barbara County

As discussed, the NPDES Phase II clean water regulations target construction sites of one to five acres, and MS4s serving populations less than 100,000. In April 2003, the State of California adopted runoff requirements for all such facilities in the State under a General Phase II NPDES permit; in turn the Regional Boards require, review and approve SWMPs for all such MS4s within their respective jurisdictions.³⁰⁷ The Central Coast (Region 3) Water Quality Control Board is responsible for issuing the permits to facility operators in Santa Barbara County—the Cities of Carpinteria, Santa Barbara, Goleta, Buellton, Solvang, Lompoc, and Santa Maria are responsible for implementing independent SWMPs, in order to comply with the States Phase II General permit requirements. Each city’s program must include components similar to those outlined above for county or multi-party SWMPs, including the six pollution components listed on page 101, such as prevention outreach, illicit discharge enforcement and programs for construction sites and commercial and industrial sites.³⁰⁸

The City of Santa Barbara submitted its draft SWMP to the Central Coast RWQCB in July of 2003 after receiving City Council approval; after receiving comments from the Central Coast Regional Board in December of 2004, the City formed an interdepartmental staff team with representatives from the Community Development, Public Works, Parks and Recreation and Fire Departments. With coordination by the Creeks Division, the staff team worked together between March and June of 2005 to prepare the draft final SWMP.³⁰⁹ This document is now pending approval from the RWQCB.

Also related to storm water runoff management, the City of Santa Barbara established the Creek Restoration and Water Quality Improvement Program (CRWQIP) in November of 2000 through ballot Measure B, which raised hotel tax from 10% to 12% in order to fund the program. CRWQIP seeks to improve creek and ocean water quality and restore natural creek systems by implementing storm water and urban runoff pollution reductions, creek restoration and community education programs. More specifically, the Program employs community creek clean-ups, regular street sweeping and storm water projects (such as filters), and water quality monitoring within the City limits to control water quality. Nine staff

³⁰⁷ Memorandum RE: Storm Water Management Plan. June 9, 2005. To: Creeks Restoration/Water Quality Improvement Program Citizen Advisory Committee. From: Jill E. Zachary, Creeks Restoration/Clean Water Manager, City of Santa Barbara Parks and Recreation Department.

³⁰⁸ County of Santa Barbara, Project Clean Water, NPDES Regulatory Requirements and Applicable Standards: http://www.countyofsb.org/project_cleanwater/NPDES.htm

³⁰⁹ Memorandum RE: Storm Water Management Plan. June 9, 2005. To: Creeks Restoration/Water Quality Improvement Program Citizen Advisory Committee. From: Jill E. Zachary, Creeks Restoration/Clean Water Manager, City of Santa Barbara Parks and Recreation Department.

members maintain program operations, including one full time enforcement officer; public input is channeled through the Citizen's Advisory Commission. The City's program works in partnership with Santa Barbara County and its Project Clean Water.

Santa Barbara County's other MS4 operators all have SWMPs pending, in various states of advancement through a process of submittal, review and revision with the Region 3 Board. The status of each municipality's SWMP, as of August 2005, are as follows³¹⁰:

- Carpinteria: draft SWMP is under review
- Buellton: draft SWMP is under review
- Solvang: draft SWMP is under review
- Lompoc: draft SWMP review letter sent from RWQCB to MS4, Regional Board awaits an amended SWMP
- Goleta: draft SWMP review letter sent from RWQCB to MS4, Regional Board awaits an amended SWMP
- Santa Maria: second SWMP review letter sent to MS4, Regional Board awaits an amended SWMP

It should be noted that the process through which a Santa Barbara County MS4 develops a SWMP that complies with the general permit can involve multiple iterations of submittal and comment. However, if a SWMP is not amended to the satisfaction of the RWQCB, the Board can take enforcement action against that MS4.³¹¹

5.6 Vessels

Section 312 of the US Clean Water Act requires the use of a marine sanitation device (MSD) for storing, treating and discharging sewage on all commercial and recreational vessels that are equipped with installed toilets. The statute does not apply to vessels with portable toilets or any other on-board portable sewage reception system, gray water from bath or kitchen sinks; and does not apply to vessels beyond the Three Nautical Mile Line.³¹² To be clear, it does apply to all vessels with installed toilets within the State waters around the Channel Islands, or the first three nautical miles outward from the shoreline of the Channel Islands National Park.

More specifically, the regulation establishes requirements for one of three types of MSDs with graduated levels of sewage treatment, variously required based on vessel length³¹³:

³¹⁰ Personal Communication via email with Jennifer J. Bitting, (Storm Water Program Manager, California Regional Water Quality Control Board, Central Coast Region). August 22, 2005.

³¹¹ *Id.*

³¹² U.S. EPA, vessel discharge information:

http://www.epa.gov/owow/oceans/regulatory/vessel_sewage/vsdfaq.html

³¹³ *Id.*

- Type I- Flow-through device (maceration and disinfection) required for vessels equal to or less than 65 feet in length
 - Type I MSDs rely on maceration and disinfection for treatment of the waste prior to its discharge into the water.
 - The effluent produced must not have a fecal coliform bacteria count greater than 1000 per 100 milliliters and have no visible floating solids.
- Type II- Flow-through device (maceration and disinfection) required for vessels greater than 65 feet in length
 - Type II MSDs are similar to the Type I; however, the Type II devices provide an advanced form of the same type of treatment and discharge wastes with lower fecal coliform counts and reduced suspended solids.
 - The effluent produced must not have a fecal coliform bacteria count greater than 200 per 100 milliliters and suspended solids not greater than 150 milligrams per liter.
- Type III- Holding tank, required for any length
 - This MSD is designed to prevent the overboard discharge of treated or untreated sewage.

Type III MSDs are commonly called holding tanks because the sewage flushed from the marine head is deposited into a tank containing deodorizers and other chemicals. The contents of the holding tank are required to be stored until they can be properly disposed of at a shore-side pump-out facility. Type III MSDs can be equipped with a discharge option, usually called a Y-valve, which allows the boater to direct the sewage from the head either into the holding tank or directly overboard,³¹⁴ however, as noted above, discharging the contents directly overboard is legal only beyond the Three Nautical Mile Line.

Based on the identification of sewage discharges as a relatively significant threat to Sanctuary water quality, it should be noted that the EPA regulations allowing untreated sewage discharges beyond the Three Nautical Mile Line, concurrent with the Sanctuary's discharge prohibition exemption for pollution related to standard vessel operations, represent a gap in the regulatory framework for control of CINMS water quality. Concurrently, a formal assessment of whether sufficient enforcement effort exists to ensure that the EPA regulations for vessel operations outlined above are adhered to within the first three nautical miles of Sanctuary waters may need to be conducted. Should current and future monitoring efforts reveal that biological pollutants such as fecal coliform bacteria from boaters are impairing Sanctuary water quality, enhancement of existing enforcement effort could prove significantly useful for maintaining and improving Sanctuary water quality.

5.6.1 Small vessels

³¹⁴ *Id.*

Within the past few years, the National Park Service (NPS) has made certain anchorages and landing sites open-access (i.e. no permit required). Sites such as Scorpion Anchorage and Prisoner's Cove on Santa Cruz Island that were already popular with concessionaires are now experiencing increasing visitation from private boats.³¹⁵ Since comprehensive enforcement of State, EPA and Sanctuary discharge regulations is considered impossible, Sanctuary resource managers rely upon public education (via web information, brochures, presentations at public events) to encourage compliance in addition to enforcement activities conducted by the USCG, NPS and Sanctuary officials.

Based on data from water quality monitoring currently being conducted at major anchorages, an assessment of current vessel pollution prevention efforts may be required to quantify needs in boater enforcement and education. Furthermore, boater outreach program enhancements as well as enforcement effort increases may be required simply to “keep up” with increases in boater visitation.

5.6.2 Large vessels

The International Maritime Organization, with over 160 member nations, approves oceanic shipping lanes such as the Santa Barbara Channel Vessel Traffic Separation Scheme. These north- and southbound shipping lanes route vessel traffic from Los Angeles and Long Beach to Point Conception, and pass directly through eastern and northern portions of the Sanctuary. The IMO also maintains and upholds the International Convention on the Prevention of Pollution from Ships (MARPOL 73/78), and its six Annexes pertaining to water quality control. Vessels traveling near and through CINMS, and registered from nations that have ratified the IMO's regulations could be considered as within the jurisdiction of this international treaty. Because the Coastwise Lanes lie within US territorial waters, the USCG shares jurisdiction over their establishment and routing, as well as enforcement of MARPOL 73/78 regulations: “Any violation of the MARPOL 73/78 Convention within the jurisdiction of any Party to the Convention is punishable either under the law of that Party or under the law of the flag State.”³¹⁶

The IMO also possesses authority to designate protected status to marine areas through definition as a “Particularly Sensitive Sea Area” (PSSA), should that area be shown to be subject to ecological impact from commercial shipping. Each PSSA designation includes location-specific regulations to control impacts from shipping, such as “area to be avoided” status, vessel speed limits, or other appropriate

³¹⁵ Personal communication with Ben Waltenberger (Physical Scientist, CINMS) on August 18, 2004. Ben conducts aerial surveys of the islands (2-3 times per week) and has noticed a significant increase in the number of small vessels anchored around the islands in the past 2-3 years. He estimates that if he sees about 40 vessels around a cove/anchorage (e.g. Scorpion Anchorage or Prisoner's Cove), approximately 50% are sail boats. The remaining 50% are private recreational fishing vessels, power boats and a few commercial fishermen.

³¹⁶ International Maritime Organization: <http://www.imo.org/home.asp>

measures.³¹⁷ While CINMS is not currently established as a PSSA, or formally considering such designation, this regulatory action has been raised as an option for management of acoustic emissions in around the Sanctuary, and could also be employed to protect water quality from large vessels. Florida Keys National Marine Sanctuary has successfully achieved PSSA designation as a component of marine resource conservation efforts there,³¹⁸ and thus represents an intra-agency model for CINMS should large vessel traffic be identified as a significant water quality threat.

Diesel engine emissions to air

The IMO recently garnered the majority ratification of the 1997 International Convention for the Prevention of Marine Pollution (MARPOL) Annex VI. Starting in May 2005, this treaty establishes controls on emissions of ozone depleting compounds and NO_x, requires use of low-sulfur content diesel fuel and limits volatile organic compounds (VOC) from marine vessels. It also prohibits on-board incineration of certain wastes that contribute to toxic air pollutants.³¹⁹

Unfortunately, the required air emissions reductions under this treaty are not expected to improve significantly upon existing emissions levels.³²⁰ Furthermore, the treaty has yet to be ratified by the countries under which the majority of vessels travel—Panama, U.S. and Liberia. The U.S. EPA has recently issued regulations for *new* non-road diesel vehicles that will limit emissions of particulate matter and NO_x beginning in 2008 and cut the allowable sulfur levels in diesel fuel to 500ppm by 2007 and 15ppm by 2010.³²¹

At the state level, the Maritime Working Group under the California Air Resources Board is developing a program to retrofit shipping vessels with emissions-reducing technologies. In the pilot phase of the program, the Santa Barbara County Air Pollution Control District is planning to implement this approach for two to three ships that are commonly traversing the SBC. Currently the District is in discussions with a vessel operator to demonstrate a retrofit control technology.³²²

5.6.3 Cruise ships

³¹⁷ Haren, Angela. 2005. April, 2005. *Creating a Quiet Sanctuary: Reducing Noise Pollution from Commercial Shipping in the Channel Islands National Marine Sanctuary*. Applied Policy Project, UCLA School of Public Affairs.

³¹⁸ *Id.*

³¹⁹ Lloyd's Register. (June 1, 2004). "Classification News. Statutory alert: MARPOL Annex VI, Regulations for the Prevention of Air Pollution from Ships – Entry into force on May 19, 2005." <http://www.sbcapcd.org/itg/download/awma03finalpaper.pdf>

³²⁰ Santa Barbara County Air Pollution Control District (SBCAPCD). (2003). The need to reduce marine shipping emissions: A Santa Barbara County Case Study. Retrieved on May 13, 2004 from the SBCAPCD website: <http://www.sbcapcd.org/itg/download/awma03finalpaper.pdf>

³²¹ Bergman, C, Millett, J. (May 11, 2004). "New Clean Diesel Rule Major Step in a Decade of Progress." July 1, 2004 from the U.S. EPA, Diesel Boats and Ships website: <http://www.epa.gov/otaq/marine.htm>.

³²² Personal communication (email) with Anthony Fournier (Air Quality Engineer, Santa Barbara County Air Pollution Control District), August 14, 2004

Discharges from cruise ships in and around the Sanctuary may represent the single greatest under-regulated threat to CINMS water quality. An average one-week cruise ship voyage generates more than 50 tons of garbage, one million gallons of gray water (waste water from sinks, showers, galleys and laundry processes), 210,000 gallons of sewage (also known as blackwater), and 35,000 gallons of oil-contaminated water—a wastewater discharge rate similar to a municipality of 2000 people.³²³ Unfortunately, discharges of sewage, effluent from properly functioning engines, and graywater from cruise ships are exempt from the NPDES program, despite being similar in scale to municipal POTWs and other dischargers requiring NPDES permits.³²⁴

Furthermore, the total cruise ship industry is predicted to grow by 8.5% annually for the next decade.³²⁵

Like all vessels, cruise ships are required to follow the EPA regulations outlined above for use of a Type II MSD for treatment of sewage before discharge into the ocean, including Sanctuary waters. However, even if onboard sewage treatment reduces bacteria counts per liter to within the legal requirement,³²⁶ the sheer volume of treated sewage often discharged from cruise ships still represents a very large quantity of pollution, despite being technically legal and incidental to standard vessel operations. Similarly, deck wash, engine exhaust and food waste discharges are all technically allowed by Sanctuary regulations, despite the unusual water quality threat posed by the discharge volumes involved in such activities from cruise ships.

Perhaps the strongest protection for Sanctuary water quality from cruise ship discharge lies in three State laws signed by the Governor in September 2004, that came into effect January 1, 2005.

- AB 2093 prohibits cruise ships from discharging graywater from kitchens, laundries, and showers into State waters (the waters within the Three Nautical Mile Line).
- AB 2672 prohibits cruise ships from dumping sewage, treated or untreated, into State Waters.
- AB 471 prohibits cruise ships from burning garbage, paper, sludge and any other materials in onboard incinerators while operating within State waters.

³²³ Huber, N., A. Rettinger, M. Soto, R. Tornek, M. Williams. 2004. “An Environmental Analysis and Economic Analysis of Cruise Ship Discharges in California State Waters.” Group project brief. Donald Bren School of Environmental Science and Management.

³²⁴ Petition to Vice Admiral Conrad C. Lautenbacher, Administrator, NOAA, to Promulgate Regulations to Prohibit Cruise Ship Discharges in Marine Sanctuaries. September 15, 2003. From Teri Shore, Clean Vessels Campaign, Bluewater Network.

³²⁵ *Id.*

³²⁶ This assumption alone may be in question; the environmental advocacy organization the Bluewater Network states, “treated wastewater [from cruise ships] is not monitored or tested to determine if it meets effluent standards.” Bluewater Network press release, September 24, 2004. “Cruise Ship Dumping and Burning Banned in California.” Contact: Teri Shore, Bluewater Network.

Unfortunately, as State laws these regulations do not protect the outer three nautical miles of Sanctuary waters from currently legal but potentially detrimental cruise ship discharges. Currently the City of Santa Barbara has a voluntary agreement with certain cruise ship captains that there will be “no dumping of sewage or graywater within 12 nautical miles of the Santa Barbara coast,”³²⁷ yet the Sanctuary lacks a regulatory or agreement-based policy to protect CINMS water quality from cruise ship discharges in and around its boundaries.

³²⁷ Bridley, John. (July 15, 2004). “Harbor Operations Report.” City of Santa Barbara Waterfront Department Memorandum. Retrieved on July 27, 2004 from the City of Santa Barbara website: http://www.tstwebsrv.ci.santa-barbara.ca.us/departments/waterfront/administration/internet_posting/harbor_commission/staff_reports/2004-07-15_july_15_2004_report_3.pdf

6 PUBLIC EDUCATION AND OUTREACH

The following section is an overview of water quality-related programs, agencies, organizations, and businesses in Santa Barbara and Ventura Counties. Included are summaries of:

1. Organizations and programs that conduct water quality education and outreach
2. Organizations and programs that conduct public education and outreach, to which water quality education could be added
3. Businesses that do not have a formal education and outreach component, but that could include one

This section compiles the water quality outreach and education efforts within Santa Barbara and Ventura Counties, from the mainland to offshore waters of the Sanctuary. Programs and organizations have been described according to a few central characteristics, including each program's respective mission statement, organization (as a business, governmental, or non-profit public interest entity), programmatic partners, sources of funding, target audience, methods of outreach, program goals.

The type of information collected for each entity is not identical, so some categories will be absent in the discussion of certain programs, organizations, or businesses, while other non-categorized information is included. Also, many of the programs and organizations discussed in this report have several areas of concentration apart from water quality issues; only their water quality outreach and education efforts have been included. Sections 7 and 8, which cover the CINMS water quality management gaps and recommendations, describe the missing or insufficient components of current outreach and education efforts, and identify opportunities for the Sanctuary and other educational entities to address these gaps.

This discussion of public education and outreach efforts related to Sanctuary water quality is divided into three geographical categories. The first category includes programs that deal primarily with mainland water quality issues; the second category includes programs with a coastal or offshore water quality focus. Programs that focus specifically on CINMS and the Channel Islands National Park (CINP) comprise the third category.

This geographical categorization is useful for the organization and clarity of this report, however many listed programs maintain efforts that extend beyond one given category (for example, a given organization may target hikers on both the Channel Islands and the mainland). Such programs are listed only once, though the full scope of their efforts is described.

Also, it should be noted that within the third section, programs maintained by the Sanctuary, and, similarly, those maintained by the National Park, are listed and reviewed in separate categories in order to give a more thorough review of current outreach and education efforts.

6.1 Mainland Water Quality

The programs in this section predominantly address onshore water quality in Santa Barbara and Ventura Counties. While investigating the education and outreach under this category a few recurring themes emerged from interviews with program representatives:

- Teachers are hard pressed for time and are rarely able to dedicate hours to planning a lesson. It is much more common for teachers to ask for a representative from the Creeks Division, the Community Environmental Council, or Project Clean Water to teach water quality education rather than to teach pre-developed curricula or form their own water-related lesson plan.
- Redundancy and overlap in education and outreach efforts exists between many programs in the study area, preventing maximal effectiveness in the use of resources, and resulting in unfilled gaps in other areas.
- As of now, environmental groups do not communicate enough with one another to facilitate coordinated and complimentary education and outreach efforts.

6.1.1 Community Environmental Council (CEC)

www.communityenvironmentalcouncil.org

Tahara Ezrahti, CEC Education Coordinator

(805) 884-0459 x 12, enviroed@cecmail.org

Program mission

The CEC Education Program mission is to fill gaps created by budget cuts in education that jeopardize the quality and quantity of environmental education by developing and providing a comprehensive environmental curriculum. Water quality is one of three environmental themes on which the CEC concentrates its education activities. The organization focuses its water quality education and outreach efforts in four watersheds (Arroyo Burro Creek, Mission Creek, Carpinteria Creek, San Jose Creek) that serve as models for community-based planning. Each watershed has different education and outreach needs. Example activities include: rebuilding habitat, monitoring water quality, organizing neighborhood groups, and educating people about the impacts of everyday decisions such as using pesticides and fertilizers.

Organization

CEC is a local, non-profit organization. Its scope of work regarding water quality deals mainly with Santa Barbara County.

Funding

Funding comes mainly from the City of Santa Barbara due, in part, to the City paying for and overseeing programs conducted by the CEC. CEC has contracted with Santa Barbara County as well, but funding from this source is comparatively less.

Target audience

Most of the CEC Education Program activities target children. Other outreach programs relate less specifically to children and more to the entire range of community members (i.e. whoever affects and is affected by the watersheds).

Methods

The CEC owns and manages the Southcoast Watershed Resource Center (at Arroyo Burro Beach) which is a research area open to the public. It has two on-line computers and a small library and serves as a center for water testing, demonstrations of a watershed model, interpretive walks, Green Schools Program, and volunteer opportunities that coincide with other water quality outreach activities in Santa Barbara County. The CEC's specific water quality education and outreach activities include:

1. Classes participate in fieldtrips to the Southcoast Watershed Resource Center at Arroyo Burro Beach where kids experience water sampling in a 'wetlab' and use an interactive watershed model. Field trips are available Monday through Friday mornings and are two hours long. Free to public schools in Santa Barbara County; private schools, camps, community organizations and other groups are \$50 per field trip (maximum of 35 students).
2. CEC's Creek Kid Series is a program that uses creeks as outdoor classrooms. Students first learn to monitor the creek's health by conducting field tests, then gain an appreciation for the creek through service learning, such as planting native plants. The Creek Kid Series is geared toward grades 4-6 and includes the following activities:
 - Using watershed models to study water flow and pollutants
 - Reading watershed maps
 - Surveying the physical and biological components of a healthy creek
 - Studying macro invertebrates as indicators of pollution
 - Watershed restoration techniques (e.g. bioswales, native plant restoration)
 - A creek clean-up
 - Studying drainage patterns on school grounds
 - Chalk art around storm drains on campus
3. The Brower Green Teens are trained to implement educational activities that go on at the South Coast Watershed Resource Center at Arroyo Burro Beach, bringing their educational message to the community by presenting lessons on healthy watersheds to after-school groups like A-Ok and the Boys and Girls Clubs.

6.1.2 Project Clean Water

www.countyofsb.org/project_cleanwater/

Michelle Wilson, Project Clean Water Program Specialist
(805) 568-3546, mwilson@co.santa-barbara.ca.us

Program mission

Project Clean Water aims to protect public health while enhancing environmental quality in Santa Barbara County watersheds and at local beaches.

Organization

Project Clean Water was originally an unaffiliated non-profit organization. The County of Santa Barbara took over the program 1998. However, Project Clean Water works with the City of Santa Barbara and the CEC because the County has little funding for educational programs and the program must cover a large area. As of now, nobody from Project Clean Water directly heads up education and outreach. The CEC works with schools in the unincorporated areas, while the City of Santa Barbara works with the incorporated schools. The programs in each area are essentially the same.

Funding

Funded by Santa Barbara County. This funding is very low compared to money generated by the City for its programs. (See Section 6.1.3, description of funding for the City of Santa Barbara Creeks Division.)

Target audience

School children (K-12) as well as the community at large with outreach efforts like the Storm Drain Marking Program.

Methods

As previously mentioned, the CEC implements Project Clean Water programs in schools in the unincorporated areas of the County, and the City of Santa Barbara implements these programs for schools within city limits. The programs (described below under 1) in both areas are essentially the same. All brochures and handouts from Project Clean Water are provided in both English and Spanish.

1. Education specialists throughout the County provide presentations and access to educational resources. Classroom materials and lesson plans focusing on water issues are available to teachers throughout the County.
 - “Watershed Woman” (K-2nd): A short skit help students learn about watersheds, the difference between a storm drain and the sewer, causes of water pollution, how to prevent it.
 - “Watershed Model” (3rd-6th): A hands-on model lets students physically pollute a watershed and demonstrates the difference between point source and non-point source pollutants.
 - “Mountains to the Sea Watershed Curriculum” (4th -8th): Introduces both teachers and students to our water cycle, runoff, and the connection between our local creeks and the ocean.
2. The Storm Drain Marking Program fosters community awareness of storm drains in the street that drain directly to the creeks or ocean and that water and other waste that goes into storm drains is NOT treated at a wastewater treatment

plant. Project Clean Water labels the storm drains with the following logo: “No Dumping, Drains to Ocean.”

3. Monthly meetings open to the public
4. Volunteer opportunities

6.1.3 City of Santa Barbara, Creeks Division

www.sbcreeks.com

Daniel Huecker, Creeks Outreach Coordinator for the City of Santa Barbara
897-2606, DHuecker@SantaBarbaraCA.gov

Program mission

The Creeks Division seeks to improve creek and ocean water quality and restore natural creek systems with the implementation of storm water and urban runoff pollution reduction, creek restoration and community education programs.

With its substantial funding source, the program is focusing on larger, project-oriented efforts and less on smaller activities that are already conducted by environmental nonprofits. The program manager also wants to collaborate with other environmental programs so that efforts are not duplicated, and scheduled education and outreach activities do not conflict.

Organization

The Creeks Outreach Division is the educational element of the City of Santa Barbara’s Creeks Restoration and Water Quality Improvement Program that began in November 2000 when Measure B was passed. It is a new local government agency.

Funding

The Creeks Restoration & Water Quality Division is funded by a hotel tax increase (“Measure B”) in the City of Santa Barbara which generated total revenues of \$2.8 million in 2004. This funding source not only pays for the Creeks Division programs and activities, but also for the City to oversee programs conducted by the CEC. This is beneficial to both entities; the City cannot staff a large number of people in the Creeks Division, while the CEC cannot raise the amount of money generated by Measure B alone.

Target audience

K-12 children, Santa Barbara residents, and local businesses through a variety of age/occupation-appropriate outreach efforts.

Description

In terms of education for children K-12, the Creeks Division has four ways to work with teachers:

1. Teachers coordinate personally with the head of the Creeks Division (Daniel Huecker) to develop a lesson plan or plan field trips.
2. Teachers work with Elise Stevens of the City's Public Works Department to develop lesson plans.
3. Teachers contact the CEC to visit the Watershed Resource Center or join the Creek Kids Series.
4. Teachers can use a curriculum of their choosing. Examples include lessons from the Creek Network or the Mountains to the Sea Watershed Curriculum, which is the same group of lessons as in the Project Clean Water program.

In terms of education and outreach for other community members, the Creeks Division has seven other programs and activities:

1. Creeks Division consults its advisory committee at monthly meetings. The meetings are open to the public and are televised on Channel 18. People can give input and update their knowledge of restoration efforts, budget expenditures, etc.
2. Public meetings are held during the implementation of City projects to discuss impacts, benefits, and aspirations regarding watershed consciousness and clean creeks.
3. Creeks Division hosts, participates, and supports community events to promote water quality education (e.g. tabling during Santa Barbara Earth Day festivities).
4. Along with the CEC, Santa Barbara Channelkeeper, and Audubon Society, the Creeks Division helps to put on "Creek Week."
5. Creeks Division is using new media for advertising water quality messages. Whereas past efforts have concentrated simply in printed brochures, advertisements are now run on television, radio, and in selected newspapers and magazines (e.g. Blue Edge, and The Independent).
6. Creeks Division offers one of the few Business Outreach programs, where the City works with local auto shops and restaurants to implement pollution prevention measures. After a voluntary inspection process, water conscious businesses are presented with a "Clean Creeks Certified Sticker" that they can use to advertise in the community.
7. The City is working to develop bridge signs over the many creeks in Santa Barbara that will identify the particular watershed. The message reads "Keep Our Creeks Clean. 'X' Creek flows to the ocean."

6.1.4 Santa Barbara Urban Creeks Council (UCC)

www.sb-urbancreeks.org/

Meets on the third Tuesday 7:00 to 10:00pm, 2707 State Street.

Eddie Harris, President: 968-3000, sbucc@silcom.com

Program mission

The UCC seeks to educate decision makers and the general public about the aesthetic, recreational and ecological values of natural streams.

Organization

UCC is a non-profit, tax-deductible grassroots organization comprised of community volunteers.

Funding

Private donations and grass-roots contributions from the UCC's 2,500 members.

Target audience

Santa Barbara City Council, Planning Commission, owners of property adjacent to Santa Barbara creeks, general public.

Methods:

- UCC members visit areas of special concern with neighbors and property owners to increase the awareness of the value of our natural streams
- UCC helps connect property owners and planners with appropriate experts for help during projects (e.g. engineers, hydrological and ecological consultants, and other environmental groups in the community)
- UCC provides information through tabling at public events; writes monthly newsletters and fact sheets; and sponsors creek cleanups
- UCC participates in planning and permitting issues before local agencies, testifying as an advocate for water quality protections

6.1.5 Surfrider Foundation: Santa Barbara, Isla Vista and Ventura County Chapters

Santa Barbara Chapter: www.rain.org/~srfrdrsb/
Dan Weiner, Chapter president

Isla Vista Chapter: <http://orgs.sa.ucsb.edu/sf/>

Ventura Chapter: <http://www.surfrider.org/ventura/index.html>
Paul Jenkin, Chapter president

Program mission

The Surfrider Foundation is a non-profit environmental organization dedicated to the protection and enjoyment of the world's oceans, waves and beaches for all people, through conservation, activism, research and education.

Organization

Surfrider is a national organization comprised of local chapters. In the South Coast region, there are three chapters of Surfrider.

Funding

Surfrider is funded by donations from chapter members and the public.

Target audience

Members of the community who frequent the beach or surf; school audiences, those that impact the ocean.

Methods

Surfrider is a national organization with a main educational program called “Respect the Beach,” which has been presented to over 10,000 classrooms and community groups throughout the country. Locally however, the three chapters of Surfrider each concentrate on different areas of water quality and ocean issues for education and outreach:

1. Santa Barbara Surfrider tends to focus on coastal development issues; informing the public of projects such as the subdivisions proposed on the Gaviota Coast, and raising money to oppose or improve development proposals assessed as threatening to public access and resource conservation. Meetings are held on the first Thursday of the month, every other month, at 7:30pm in the Southcoast Watershed Resource Center at Arroyo Burro Beach.
2. Isla Vista (IV) Surfrider concentrates on outreach for UCSB students and on ocean water testing in the Goleta area. The IV Chapter has a full lab in conjunction with the Blue Water Task Force, where scientific observation leads members and interns to an understanding of watersheds as dynamic systems that are integrally linked to the health of our oceans, waves and beaches. Surfrider members write notices and record point source pollution and littering violations, and forward information to the County.
3. The Ventura County Surfrider Chapter coordinates ongoing water quality monitoring, primarily on the Ventura River watershed (as a partner in Stream Team; see SB Channelkeeper). Gathered data from monthly sampling is all posted online at the Stream Team website³²⁸ in a format that allows users to chart the status of an array of biological and chemical pollutants over user-designated time periods. Additionally, the Stream Team publishes and makes freely available a number of scientific papers on Ventura River water quality.
4. Members of both the IV and Santa Barbara Chapters make occasional classroom visits (upon invitation by a teacher) to discuss water, beach, and ocean quality. Santa Barbara Surfrider provides multimedia presentations about pollution and its effects on the coastal environment. During every presentation Surfrider emphasizes the personal impact and responsibility of each student in the environment.
 - In the fall students learn about the effects of storm water runoff and pollution and their combined impact on our watershed, beach, and marine ecosystems.
 - Spring presentations include discussion of pollution issues at our local beaches.

³²⁸ Ventura River Stream Team: <http://stream-team.org/Ventura/main.html>

The complementary (rather than redundant) relation of the three regional Surfrider chapters could be considered a good example of how water quality programs should be organized between groups, in order to provide the most positive impact. However, the IV Surfrider and Blue Water Task Force do not readily disclose their findings to other non-Surfrider water quality organizations. Since water quality data are not shared between all interested parties, important connections in water quality factors might be missed. Additionally, it is rare that the information from the water quality tests at IV Surfrider are made public.

6.1.6 Ventura Coastkeeper

<http://www.wishtoyo.org/ventura-coastkeeper.html>

Program Mission, Organization, Funding

Ventura Coastkeeper (VCK), a member of the Waterkeeper Alliance, is a community based, non-profit, membership organization “dedicated to protecting, preserving and restoring Ventura County's marine habitat, coastal waters, and watershed” and maintaining “a healthy environment for everyone in our diverse community through advocacy, education, enforcement and citizen action.”

Methods

VCK directs much of its organizational effort toward enforcement and water quality monitoring. However public outreach and education are employed as components of its cases.

6.1.7 Shoreline Preservation Fund (SPF), University of California, Santa Barbara (UCSB)

<http://spf.as.ucsb.edu/>

Scott Bull, Program Director: (805) 893-5166, spf@as.ucsb.edu

Program mission

SPF provides funds to the local programs that seek to enhance, protect, or restore the shoreline through preservation, education, open access, research, and restoration efforts.

Organization

The Shoreline Preservation Fund is managed by a Board of Directors comprised entirely of UCSB students, and a grants manager, who conducts SPF administration and coordination with applicants. Applicants present their proposals at regular meetings, so that Board Members can ask specific questions to each applicant. The proposals are denied, funded entirely or modified to fit the needs of the student body.

Funding

Funds are generated by students of UCSB: for each quarter, every student pays a \$3

locked-in fee to provide money for the Shoreline Preservation. Students and other members of the community can then apply to SPF for financial support of their proposed environmental project.

Target audience

The target audience of SPF-funded education and outreach projects can vary, however projects that benefit or improve the educational opportunities for the UCSB student body are the top funding priority.

Methods

SPF funds citizens' groups that do smaller projects like local water quality testing. SPF will provide essential equipment and the financial support for achieving the relevant goals of each project. There are several water quality outreach groups that have been funded in the past:

- UCSB Water Quality
- Devereux Slough Water Quality
- Citizens Planning Association
- Blue Water Task Force
- Goleta Stream Team
- IV Surfrider (water quality signs)

In addition, SPF pays UCSB student interns to work at the Watershed Resource Center and the Ty Warner Sea Center, where community members are educated about local water quality issues through watershed models and creek and ocean sample testing.

The data collected by the various SPF funded groups is not readily available to students at UCSB or the larger community.

6.1.8 Heal the Ocean

<http://www.healthocean.org/home.htm>

Hillary Hauser, Principal Organizer: (805) 965-7570, info@healthocean.org

Program mission

Heal the Ocean's organizational philosophy is to raise money to fund engineering and water quality studies, and hire consultants to determine sources of groundwater pollution (e.g. from leaking sewer pipes, landfill material, or septic systems). Heal the Ocean then publicizes the gathered information, and leverages it to advocate for clean-up and better water quality control from regulatory agencies such as the Regional Water Quality Control Boards.

Organization

Heal the Ocean's day-to-day organizing is conducted by its executive director; boards of directors and advisors guide and facilitate its initiatives.

Funding

Largely based on community donations.

Target audience

All ages including homeowners, consumers, environmental activists. Program efforts focus mostly within Santa Barbara County.

Methods

Heal the Ocean concentrates primarily on wastewater infrastructure – sewers and septic systems – as well as ocean dumping practices that have contributed to ocean pollution that close Santa Barbara beaches. The program emphasizes wastewater infrastructure:

1. Helping homeowners identify and reconfigure improperly placed septic systems that pollute groundwater, creeks, and the ocean.
2. Helping to prevent ocean dumping practices that result from inadequate knowledge of the link between boater activity and ocean pollution.
3. Collaborating with state, county, and local governmental agencies to address water quality along the coastline.

6.1.9 Ventura Countywide Stormwater Quality Management Program (SWQMP)**Program Mission**

Enhance, protect and preserve water quality in Ventura County water bodies using proactive and innovative ideas for preservation of biodiversity, ecological viability and human health. Work as a countywide team with public agencies, private enterprise, the environmental community and the general public to locally implement Clean Water Act requirements, balancing the actions taken with social and economic constraints.

Organization

SWQMP was formed when the County of Ventura partnered with the Ventura County Flood Control District, and the Cities of Camarillo, Fillmore, Moorpark, Ojai, Oxnard, Port Hueneme, San Buenaventura (Ventura), Santa Paula, Simi Valley, and Thousand Oaks. SWQMP then successfully applied for a stormwater discharge permit from the Los Angeles RWQCB, to cover all its runoff control systems. As required by the permit, the SWQMP maintains several public education and outreach components to help prevent pollution.

Methods

SWQMP acts as an informational clearinghouse for pollution prevention in Ventura County, by maintaining and (through its website³²⁹) providing access to a broad collection of informational publications and fact sheets, discharge permit

³²⁹ Ventura Countywide Stormwater Quality Management Program home: <http://www.vcstormwater.org/index.htm>

applications and disclosure forms, and contact information for local governmental experts and authorities.

SWQMP's education and outreach efforts are organized into four major sub-programs based on target audience; some of the programs appear to blur the distinction between compliance regulation and public outreach:

- The Business Program provides application-specific information and publications for an array of businesses known to discharge polluted runoff, such as carpet cleaners, groundskeepers, and vehicle washers and detailers.
- The Construction Program provides an array of publications for construction site operators, including fact sheets, Stormwater Pollution Prevention Plan templates, a compilation of best management practices (BMPs) for construction sites, and other information on achieving compliance with the CA State General Construction Activities Storm Water Permit.
- The Planning and Land Development Program provides information for planners and developers in hardcopy and online, including BMP's, permit requirements, and technical guidance for stormwater control. In addition, this program offers presentations on specific topics in prevention of pollution from land development, and hosts workshops.
- The Residential/Public Outreach Program provides colorful and informative pamphlets to inform and empower children, adults and families to prevent pollution of watersheds and the ocean. Specific brochures include pieces designed for children, pet owners, for residences, for the prevention of dumping in storm drains, and on sustainable landscaping. All brochures are available online.

6.2 Harbor, Vessel Traffic and Offshore Water Quality

The programs in this section predominantly address water quality in coastal and offshore areas of Santa Barbara and Ventura Counties.

6.2.1 Santa Barbara Channelkeeper

<http://www.sbck.org/index.cfm>

Leigh Ann Grabowsky, Watershed Programs Director: (805) 563-3377,

lag@sbck.org

Jessie Altstatt, Science Director: (805) 563-3377, jessie@sbck.org

Program mission

Protecting and restoring the Santa Barbara Channel region and its watersheds, through enforcement, citizen action, and education. Channelkeeper collects baseline data on the 'health' of local streams and watersheds, recruits and trains a force of volunteer water quality stewards, and locates sources of pollution. Channelkeeper has partners at UCSB who help with data analysis and reporting.

Organization

The Santa Barbara Channelkeeper is a member of the National Water Keeper Alliance.

Funding

Generated by different sources, including local and state governments, foundations, private donations and the Shoreline Preservation Fund (see Section 6.1.6)

Target audience

Local community, school groups (junior high through college level), community service groups, stake-holder groups; volunteers have ranged in age from 8 to 80.

Methods

Channelkeeper is working to eliminate the flow of pollution into our local Channel by providing educational opportunities to children and adults in the County:

1. Kelp-bed Monitoring and Education Program: “Eco-karts” in Santa Barbara schools remain in the classroom for kids to learn about kelp biology, reproduction and ecological importance of kelp beds. The kelp beds remain in the classrooms for up to two months.
2. Citizens can volunteer with Channelkeeper to participate in their Regional Kelp Restoration Project, where volunteers monitor water quality and conduct fish counts.
3. Santa Barbara Stream Team: Channelkeeper manages a watershed monitoring program that involves volunteers from the local community in monthly stream water quality monitoring events. The Ventura River program, maintained in conjunction with Surfrider, Ventura Chapter, has 15 monitoring sites along the watershed, and has been accumulating data since January 2001. The Goleta program, with 12 monitoring sites, was begun in mid-2002. The volunteers are trained on-site to use instruments to collect data on dissolved oxygen, turbidity, temperature, conductivity and pH, and they also collect samples that are taken back to the lab and processed for bacterial indicators and nutrients. The data is available on a website for all to use, and Goleta data is accessible in the local paper Creek Report Card.
4. Opinion Editorials in local newspapers raising awareness about storm water runoff as the single biggest source of water pollution and the need for strict storm water control standards.
5. Collaborating with the CINMS to conduct water quality sampling and testing around the Islands, particularly at popular anchorages and moorings (July 2005).

Channelkeeper has identified gaps in monitoring of many creeks in the Santa Barbara area resulting from time and money constraints. Additionally, staff members are looking for better ways to get data out to the public.

6.2.2 Santa Barbara Museum of Natural History's Ty Warner Sea Center

Jasmine Vasavada, Volunteer Coordinator: (805) 682-4711 x104,
jvasavada@sbnature.org

Program mission

Along with the Museum of Natural History, the Sea Center provides the Santa Barbara community with educational programs that are intended to promote scientific literacy, and foster understanding and appreciation of the region's marine environment.

Organization

The Sea Center is a division of the Santa Barbara Museum of Natural History, a local entity of education and outreach. The Center has recently reopened (April 23, 2005) after completing a major expansion project.

Partners

California Coastal Conservancy, Channel Islands National Marine Sanctuary, CEC, Partnership for Interdisciplinary Studies of Coastal Oceans, CA Department of Fish and Game, UCSB Marine Science Institute, Santa Barbara Channelkeeper, NOAA

Target audience

Outreach for both children and adults; includes tourists visiting the Santa Barbara area.

Methods

The center is divided into several different stations that cover a variety of subjects

1. A demonstration station with touch-tanks
2. An information station where individuals can input levels of salinity, temperature, and oxygen into a computer that calculates subsequent ocean health
3. A wet deck that allows individuals to lower a sampling bottle through an open floor into the ocean to check the clarity and contents of the water
4. A "you can help" area that encourages individuals to pick up trash, maintain household septic systems, and to pick up after pets, especially at beaches and creeks
5. A water quality testing stations that analyzes the pH, salinity, oxygen, clarity, and odor of given water samples

6.2.3 Ventura and Santa Barbara Harbors

Santa Barbara Visitor Information: (805) 564-5531

Ventura Harbor Patrol: (805) 642-8618

Partners

Information provided by brochures available at both harbor visitor information centers that is put out by the following programs or agencies:

- Counties of Ventura and Santa Barbara
- Community Environmental Council (805) 963-0583
- C.A. Department of Boating & Waterways (888) 326-2822 or www.dbw.ca.gov
- Ocean Conservancy “Good Mate” Program

Target audience

Boaters based at the respective harbors.

Methods

The patrol offices of each harbor primarily enforce violations against harbor regulations, including water quality protections. The California Boating Law of 2003 specifies that a state or local peace officer may board a vessel and issue a citation if that vessel is discharging sewage in an area where the discharge is prohibited. This method is obviously more reactive than preventative in terms of water quality outreach and education.

However, in addition to issuing citations for violations against harbor water quality regulations, the harbors try to educate the boating community by providing each boater with a “Welcome to Our Harbor” bag that includes information about:

1. Clean boating services that encourage boaters to dispose of used oil and drained filters at a waste oil recycling center, to use a porta-potty and dispose of sewage waste in an onshore dump station, and to prevent the discharge of plastics or garbage containing plastics into any waters.
2. Green boat maintenance tips that encourage boaters to make repairs at the end of the season when the boat is out of the water, to use fresh water to clean boats after every use, to use environmentally friendly cleaning methods and products, and to use alternatives to toxic products when cleaning or polishing boats.
3. Discharge laws, for example State laws prohibiting discharge of untreated boat sewage into any of California’s lakes, rivers, reservoirs, or State coastal waters (within the Three Nautical Mile Line delineating State jurisdiction). In addition, the Channel Islands Harbor is a federally proclaimed no discharge zone (NDZ) where the discharge of any treated or untreated sewage is prohibited.
4. Contact information and locations of waste collection facilities for proper disposal.
5. “The Changing Tide,” a newsletter presented by the Santa Monica Bay Restoration Foundation in cooperation with the Department of Boating & Waterways. In Volume 5, Issue 2 of Fall 2001, the main article focused on advice with respect to sewage discharge from recreational boats:

“The most environmentally sound way to manage sewage onboard is to have an MSD with a holding tank that is always emptied at a sewage pump-out. Alternatively, you may choose to keep a portable sanitary toilet onboard and empty it at a shore-side dump station or in your toilet at home.”

Unfortunately, it is unclear how effective the welcome packets are for boater

outreach, or if there tends to be any systematic follow-up in outreach and education after distribution of the welcome bags. Also, there appears to be a lack of harbor support for environmentally sensitive boat cleaning and maintenance methods, specifically non-toxic or biodegradable cleaning products, sewage pump-outs, and receptacles for toxic and non-toxic refuse.

6.2.4 Island Packers

(805) 642-1393; www.islandpackers.com/

Organization

Island Packers is one of two official concessionaires to the Channel Islands National Park, which allows them to land passengers on the Channel Islands for hiking, surfing, kayaking, camping, etc. (Truth Aquatics (below) is the other official concessionaire).

Target audience

Customers that pay for passage to the Channel Islands National Marine Sanctuary and National Park.

Methods

Seven different educational programs are offered for students. They include half-day whale watching, full-day island trips, and the new Two-Day Floating Classroom Excursion.

1. Ocean Science Mini Lab: Natural history of the Channel Islands and the various types of wildlife that depend on a healthy ocean. Students examine water quality sampling techniques that enhance understanding of ocean systems. Cost is \$17.00 per person.
2. Ocean in Motion: Island Packers Naturalists make presentations about the local island environment in school classrooms (in Ventura County only). The cost is \$100.00 for the first presentation and \$60.00 for successive presentations.
3. There are five boating trips available for East Anacapa, West Anacapa, East Santa Cruz, Mid Santa Cruz, or a non-landing whale watching trip.

None of the education efforts directly address water quality issues.

6.2.5 Truth Aquatics

(805) 962-1127; www.truthaquatics.com/

Contact: Captain Tommy Cappannelli

Organization

Truth Aquatics is one of two official concessionaires to the Channel Islands National Park. Trips to the Islands can include both day-scuba diving and day hiking, as Truth Aquatics has teamed up with the National Park Service to coordinate Island tours.

Target audience

Truth Aquatics' clientele is largely composed of scuba divers, though there are some island excursionists. There are no specific educational trips to the Channel Islands through Truth Aquatics, and the local outfitter primarily hosts adult tourists.

Methods

Though Truth Aquatics would seem to be a prime candidate for educating its passengers about Channel and Sanctuary water quality, the business currently has no systematic program to do so.

In addition:

- The three Truth Aquatics boats are equipped with holding tanks for raw sewage and biodegradable toilet paper. According to Captain Cappannelli, sewage is not dumped unless the boats are located two miles offshore of the mainland; it is unclear to Truth Aquatics what the sewage discharge regulations are for boats in and around the Sanctuary.
- Truth Aquatics vessels regularly cross the Coastwise Shipping Lanes en route to and from the Islands. Captain Cappannelli notes that there are frequent slicks of oil and debris rafts present in the shipping lanes, which he attributes to commercial ships.
- Captain Cappannelli notes that most passengers have little conception of water quality issues in or around CINMS, however they do claim to notice declines in marine diversity when scuba diving.

6.3 National Marine Sanctuary Programs

Donna Meyers has been hired by the National Marine Sanctuary Program to serve as the Regional Water Quality Coordinator for West Coast National Marine Sanctuaries, including CINMS. Sanctuary staff has been meeting with Ms. Meyers since the beginning of 2005 to discuss water quality planning at the CINMS. The Regional Water Quality Coordinator position is intended to help with visioning, initial planning work and development of Sanctuary water quality programming. Ms. Meyers has facilitated the Sanctuary's partnership with Santa Barbara Channelkeeper for water quality monitoring at popular anchorages around the Islands (conducted summer of 2005). An education and outreach component of this project is expected to follow.

6.3.1 CINMS Channel Islands Naturalists Corps

www.cinms.nos.noaa.gov/edu/edu_natc.html

Shauna Bingham, Volunteer & Outreach Coordinator

(805) 382-6149 x102, shauna.bingham@noaa.gov

Clare Fritzsche, Volunteer & Outreach Coordinator

(805) 382-6149 x105, clare.fritzsche@noaa.gov

Program mission

Informal and formal contact with the community that raises awareness of the resources found within the Channel Islands National Marine Sanctuary and the Channel Islands National Park, educating individuals about the rich cultural and biological diversity of the said area. In addition, the Naturalist Corps collects data on Sanctuary and Park resources and supports cooperation among the whale watching community in their public education efforts.

Organization

Naturalist Corps is an outreach program run by the CINMS and overseen by the National Oceanic and Atmospheric Administration (NOAA).

Funding

Primary funding is through fiscally appropriated funds of the CINMS programs, though the Naturalist Corps also receives funding through the Channel Islands National Park and National Marine Sanctuary Foundations, and the “Aid the Channel Islands Naturalist Corps Program.”

Target audience

Naturalist Corps educates volunteer naturalists, who in turn educate people onboard marine excursion vessels visiting the Channel Islands National Marine Sanctuary and National Park. Each year, over 100,000 passengers, including tourists, school children, and local residents visit the Sanctuary and National Park.

Methods

The Naturalist Corps has three main approaches for water education and outreach:

1. Community members (18 or older) can volunteer to be trained as informal or formal outreach educators onboard whale-watch tours, boat tours, and on hikes of the Channel Islands. More “formal” Corps volunteers can monitor sanctuary and park resources or collect marine mammal sightings data on board marine excursion vessels of Santa Barbara Harbor, Ventura Harbor, and Channel Islands Harbor. Volunteers must first receive training from scientists and other experts regarding island ecology, oceanography, and history of the Santa Barbara Channel. The 5-week training course includes lectures, field trips, and a certification exam and provides individuals with up-to-date information on Sanctuary and Park issues. The volunteer commitment is for a period of one year, with a minimum of ten hours of work each month.
2. Community Outreach events and presentations such as on Earth Day, at the Whale Festivals, at School Science Fairs, at Dive and Yacht Clubs, and at Rotary Clubs. Naturalist Corp volunteers provide Sanctuary and National Park slide presentations for the above-mentioned events and programs.
3. Distributing brochures, posters, and other media throughout Ventura and Santa Barbara Counties that inform people of specific issues, events, or programs.

The Marine Sanctuary has identified the need to plan for additional volunteer/outreach programs that address issues of:

- Marine reserves education
- Water quality/boater education
- Multi-cultural outreach and education

6.3.2 Sanctuary Education Team (SET)

<http://www.cinms.nos.noaa.gov/sac/wgsub.html>

Jonna Engel, Sanctuary SET Staff Liaison: jonna.engle@noaa.gov

Organization

The SET is a working group of the CINMS Advisory Council.

Methods

The current divisions of the SET address recreational boating, recreational fishing, yachting, marine education, diving, media, environmental conservation, research, and tourism. There is no specific division of the SET that links the water quality of terrestrial ecosystems and mainland practices to the water quality of the CINMS. An education/outreach program (carried out in collaboration within existing water quality education groups, such as the CEC, Channelkeeper, or the City of Santa Barbara Creeks Division) that connects offshore and onshore water quality could contribute toward achieving the SET's mission for its programs to "support marine reserves (existing or potentially new) at the Channel Islands."

6.3.3 Multicultural Education for Resource Issues Threatening Oceans Program (MERITO)

<http://www.mbnms.nos.noaa.gov/educate/merito/welcome.html>

Rocio Lozano de Knowlton, MERITO Bilingual Community Liaison

(805) 382-6149 x 108, Rocio.Lozano@noaa.gov

Program mission

MERITO seeks to reach culturally diverse audiences throughout Santa Barbara and Ventura Counties about water quality and resource protection. It is implemented with the vision of a comprehensive community-based program that stresses collaboration between organizations in Santa Barbara, Ventura, and Oxnard for specific projects and events. MERITO intends to educate people about the connection between water quality and the Channel Islands in its conservation messages.

Organization

MERITO was originally started by NOAA to address education gaps identified in a demographic analysis of the Monterey Bay. A similar needs assessment in Santa Barbara recently concluded that education and outreach programs need to address a greater diversity of audiences. The MERITO program in the Santa Barbara and Ventura areas initiated participation at Hispanic community events in April 2005, and will formally start program implementation in September 2005. NOAA is

implementing MERITO regionally nationwide, while the CINMS will be running the local MERITO program.

Funding

Funding will come from the National Marine Sanctuary Foundation and fund raising efforts. The local Sanctuary budget will also provide some funding.

Target audience

MERITO is not specifically geared toward Hispanics, but generally towards any communities of cultural diversity. However, due to the large percentage of Hispanics in the local area (approximately 34% of Santa Barbara and Ventura County populations), the local program will emphasize addressing the needs of this demographic.

Methods

There are several recommendations that were listed in the needs assessment for the Santa Barbara and Ventura regions. MERITO plans to coordinate education and outreach efforts in the following areas over the next three years:

1. Hispanic adult education
2. Bilingual outreach materials (e.g. bus signs)
3. After-school curricula (including fieldtrip opportunities)
4. Teacher training opportunities
5. Media campaign
6. Internship opportunities for bilingual undergraduates and graduate students

6.3.4 NOAA National Marine Sanctuary Education Website

<http://sanctuaries.noaa.gov/education>

Michiko Martin, National Marine Sanctuaries Education Coordinator
(301) 713-3125 ext. 254

Program mission

NOAA's National Marine Sanctuary Program has unveiled a new education website as part of a continuing NOAA effort to enhance public awareness, understanding and appreciation of the marine environment by:

1. Educating the public about America's 13 National Marine Sanctuaries.
2. Providing resources for teachers to support ocean literacy in America's classrooms.

Methods

The new website is intended to simulate a class room, with labs and activities, online storybooks, games, information on marine careers, activities, and free materials. In addition educators will find water quality curricula, lesson plans, and activities that will expand students' knowledge about science, technology, resource management, and marine ecosystems. There are several links on the NOAA website that connect potential students and volunteers to various programs:

- LiMPETS, an environmental monitoring program designed for students.

- Field studies for teachers and students in partnership with the National Geographic Society’s “Living Classroom” project.
- NOAA’s “Dive into Education Marine Science Program,” designed to provide K-12 teachers with professional development using hands-on, standards-based, ocean science activities.
- Providing educators with access to a marine science education network for future field studies, partnerships, professional development and grant-based funding opportunities.

6.4 Channel Islands National Park

6.4.1 Channel Islands National Park Visitor Information

<http://www.nps.gov/chis/homepage.htm>

Mainland Visitor Center, 1901 Spinnaker Drive in the Ventura Harbor
(805) 658-5730

Program mission

Preservation of the natural, historical, and cultural resources that encompass the Channel Islands, including marine and terrestrial ecosystems.

Organization

The Channel Islands National Park < National Park Service < U.S. Department of the Interior

Methods

Under the general regulation code of Sanitation & Refuse (36 CFR §2.14), conditions for the disposal, containerization, or carryout of human waste have been established as follows: “For beach camping, human waste must be containerized and disposed of at a proper facility. Single point discharges are permitted at sea.”

Currently, information stating the campers should not go to the bathroom below the mean high tide line is not well publicized at the Park’s website. There appears to be a lack of coordinated outreach to educate Island visitors about Park and Sanctuary policy, and the potential water quality threats from not packing out all human waste.

Zion National Park (ZNP) in Utah has a “Leave No Trace” program to protect its aquatic ecosystems that Channel Islands National Park could benefit from examining. The Zion Canyon Narrows, an area within ZNP that is particularly sensitive to impacts of untreated human waste disposal, has a “Human Waste Disposal Project” that requires and helps campers to pack out and properly dispose of all human waste. The policy and program are articulated in detail at www.nps.gov/zion/ZionNarrows.htm, and publicized uniformly and consistently throughout ZNP literature, materials and signage. Below is an excerpt from the “Human Waste Disposal Project”:

"With the increase in recreational use along Zion National Park waterways, the National Park Service has introduced a human waste disposal program for overnight users in the Narrows. An environmentally friendly human waste disposal bag, complete with use and disposal instructions, will be provided to all party members with every Narrows overnight permit. The bag is called Restop 2. It is a lightweight, sanitary way to pack out waste. The bag within a bag design and ziplock closure securely contains waste and odor, while the special blend of polymers instantly breaks down waste and turns it into a deodorized gel. The contents of the bag are safe for landfills and may be deposited in the trash. Use of this waste disposal system is strongly encouraged as a means for protecting the Virgin River."

ZNP's combination of clear messaging (Leave No Trace), consistent and well publicized policy, and provision of facilitating technology (the Restop 2) may be a good model for CINMS and CINP of public education and outreach for water quality protection.

6.4.2 Parks as Classrooms Program

<http://www.nps.gov/chis/classroom.htm>

Carol Peterson, Education Coordinator

(805) 658-5735, carol_peterson@nps.gov

Yvonne Menard, Chief of Interpretation, Head of Outreach

(805) 658-5725

Program mission

Parks as Classrooms allows children of local schools to visit the Channel Islands, where they are introduced to cultural, historical, and natural themes of the Santa Barbara's offshore archipelago. In-class programs cover a variety of natural and cultural history topics and are tied to the curriculum students are studying. Water quality is not a central point of discussion.

Organization

Parks as Classrooms is a program of the National Park Service in partnership with the National Park Foundation and exists across the country.

Target audience

Children, grades 2-5 and university-level students.

Methods

1. The Environmental Education Van brings materials of the Channel Islands National Park to the classroom. This van is a dedicated compressed natural gas vehicle, with up to 90% cleaner emissions and demonstrates the practical use of alternative fueled vehicles.

-
2. Live Underwater Video Program: Every Tuesday and Thursday from Memorial Day through Labor Day, rangers conduct screenings of a video presentation from Anacapa, featuring an interpretive dive through the kelp forest.

7 WATER QUALITY MANAGEMENT GAPS

The gaps in water quality management described in this section help the Sanctuary Advisory Council, staff and other stakeholders recognize the management needs and opportunities for protecting good water quality in the Sanctuary and greater Santa Barbara Channel region. Specific recommendations for action on the part of the Channel Islands National Marine Sanctuary (CINMS) staff are presented in Section 8. In these two sections (7 and 8), the term ‘management’ encompasses all three categories covered in this Needs Assessment report: (1) research and monitoring, (2) jurisdiction, regulations and policy, and (3) public education and outreach. The term ‘gap’ refers to absences of information or management efforts. In some cases, gaps are not absolute – some amount information and/or management efforts do exist, but because these appear to be insufficient, the issue is included as a gap. Many of the gaps in public education and outreach fall under this latter category.

For the most part, the gaps are framed as statements of water quality information or management activities that are unavailable, not occurring, or currently insufficient. *Italicized gaps represent those that are in the process of being filled. The names of agencies, organizations and/or people who are addressing these gaps are included.*

7.1 Gaps in Research and Monitoring

The actual status of water quality conditions in the Sanctuary is variable and not well documented in terms of traditional water quality constituents; for the most part, water quality conditions are unknown. Furthermore, without sufficient data to characterize these conditions, documenting changes in water quality (e.g. in response to specific events or management efforts) is not possible. Many of the gaps identified below address missing components of a ‘baseline’ set of water quality conditions.

7.1.1 General

- Comprehensive set of questions that need to be addressed by data collection and analyses
- Regular field monitoring within Sanctuary waters for pathogens, turbidity, pesticides and herbicides, nutrient levels and organic matter, hydrocarbons, anthropogenic marine debris
- Clearinghouse of data from existing and future water quality sampling
- Processing of the Bight ‘03 samples

7.1.2 Nonpoint Source Pollution from the Channel Islands

- Watershed monitoring program for major drainages
- In situ monitoring of runoff plume contents
- Analyses of sediment delivery from the Islands to near-shore waters
- Systematic monitoring of beaches at the Islands for trash and human wastes from recreational activities, and reporting of these results

7.1.3 Small Vessel Traffic

- *Water sampling at popular anchorage areas for pathogens, oil and grease (Channelkeeper: Kira Schmidt, Jessie Altstatt)*

7.1.4 Large Vessel Traffic

- *Vessel monitoring system (National Marine Sanctuary Program is piloting an interface to the Automated Identification System which tracks all large vessels. The system's range will expand to reach all of the Sanctuary waters in 2005. National Marine Sanctuary Program: Todd Jacobs)*
- Monitoring of discharges (e.g. bilge, diesel air emissions, etc.)
- Air and fog sampling on Islands and over Sanctuary waters

7.1.5 Anthropogenic Marine Debris

- Ongoing, periodic beach debris monitoring at the Channel Islands
- Trawling study that is specific to the shelf around the islands
- Pelagic plastics sampling in Sanctuary waters and greater Channel region
- Surveys of boaters about trash (solids, non-sewage) and dumping

7.1.6 Ocean Dumpsites

- Investigation of formerly active dumpsites outside the CINMS boundaries (visual), and sample collection via ROV

7.1.7 Wrecks

- Compilation of information about recent incidents of small boat wrecks
- Processing of sediment samples from *Pac Baroness* wreckage site visit

7.1.8 Offshore Oil and Gas Production

- In situ monitoring of contaminant concentrations, including pollutants from atmospheric deposition, in water and sediments around the active platforms (and at control sites)

7.1.9 Nonpoint Source Pollution from the Mainland

- In situ measurements of storm water plume contents, and understanding of plume dynamics and fate after storm events (e.g. how far do plumes travel, how fast do they dilute, what components remain in the water column)
- Systematic 'first flush' stream monitoring
- Systematic monitoring of dry-weather discharges to the ocean
- Understanding of airborne pollutants that impact Channel water quality through atmospheric deposition
- Data clearinghouse of monitoring results from different programs

7.2 Gaps in Jurisdiction, Regulations and Policy

7.2.1 Sewage Discharge Prevention

- Kayakers, hikers, and other island shoreline users: Coordinated policy, education campaign and regulation to minimize and eliminate discharge of untreated human waste into intertidal and near shore waters
- Small vessels: Policy and regulatory responses to illegal discharges of untreated sewage, and discharges of treated sewage from vessels in certain high vessel-density times and areas
- Cruise ships: Policy and regulations to address cruise ship discharges in and around Sanctuary waters, beyond the Three Nautical Mile Line

7.2.2 Strategic Planning and Stakeholder Coordination for Cruise Ship Visitation

- Cruise ship visits to Santa Barbara and the Channel Islands region are actively promoted by some stakeholders, though the Sanctuary may lack information, and policy or regulatory tools to manage the impacts of increased cruise ship traffic

7.2.3 Harmful Discharges Outside CINMS Boundaries

- Regulatory authority to address present and future activities that discharge chemical, biological or energetic (e.g. acoustic) emissions outside CINMS boundaries that may subsequently enter and injure Sanctuary water quality or other resources

7.2.4 Pollution Prevention from Large Vessel Traffic

- Discharge limitations on vessels flying under flags from nations that are non-signatories to international treaties on the prevention of pollution from ships
- U.S. ratification of Annexes IV and VI of the International Convention on the Prevention of Pollution from Ships
- Assessment of maintaining adequate Sanctuary, U.S. Coast Guard and other enforcement efforts as large vessel traffic increases
- “Particularly Sensitive Sea Area” designation (under the IMO), or alternative method to adopt area regulations or advisory measures

7.3 Gaps in Public Education and Outreach

7.3.1 Mainland Nonpoint Source Pollution in Creeks

- Authoritative articulation of how mainland pollution impacts CINMS water quality and resources
- Encouraging preservation of the buffer space between creeks and property lines to prevent destabilization and erosion
- Water quality education and outreach for mainland businesses, especially those with commercial applications for water and water disposal (e.g. washing service vehicles)

7.3.2 Channel Islands and Sanctuary Visitor Education

- Consistent messaging to all Sanctuary and Park visitors about the importance of protecting water quality at the Channel Islands and in the Sanctuary

- Clear, coordinated and uniformly communicated policy on human waste disposal, and the importance of protecting water quality, for Park and Sanctuary visitors
- Definitive coordination between the Sanctuary and Park, the Naturalist Corps, and the concessionaires (Island Packers and Truth Aquatics) to insure education of visitors on human waste discharge policy.

7.3.3 Communication among Groups and Programs

- Sharing of data and information from water quality testing between various groups, programs and the public
- Coordination among groups to design complimentary and diverse water quality education and outreach programs, to avoid programmatic redundancy
- Community directory of routinely updated contact information and program descriptions (e.g. an umbrella “Mainland Water Quality Coordination Website”)

7.3.4 Signs in Harbors and Near Creeks

- Posted signs in English and in Spanish that describe regulations and articulate the connection between individuals’ actions and ocean water quality

7.3.5 Boater Education and Outreach

- Follow up and “continuing education” of boaters in the region’s harbors, to reaffirm and disseminate the benefits of good boating practices, as well as vessel discharge regulations
- Improved/additional signs at harbors to promote non-polluting boating practices
- Provision of clearly marked bins for disposal of toxic and non-toxic wastes
- Definitive coordination with concessionaires (Truth Aquatics and Island Packers) and their crews on Sanctuary vessel discharge regulations

7.3.6 Anthropogenic Marine Debris

- A regularly updated photo archive to document waste in the Santa Barbara Channel after large weather events
- Public outreach to secure loose garbage before storm events

8 CINMS WATER QUALITY MANAGEMENT RECOMMENDATIONS

8.1 Water Quality Action Planning Approach

The CINMS staff should approach water quality planning with the overall goal of sustaining exceptional water quality in the Sanctuary and greater Santa Barbara Channel (SBC) region through proactive attention to existing and emerging threats to water quality. More specifically, the Sanctuary should pursue management activities that maintain and improve water quality conditions that support the Sanctuary's natural and cultural resources, as well as recreational uses in the Sanctuary.

This is a challenging goal because the majority of sources of water pollution that affect Sanctuary resources are located outside of its boundaries. As a result the staff cannot (due to jurisdictional, and/or resource limitations) take independent actions to address many of the threats identified in Section 3. However, the SBC region has an extensive infrastructure of organizations, programs and regulations that address water quality issues. This infrastructure enables the staff to ensure that gaps (outside the scope of the Sanctuary's jurisdiction) are addressed through collaborations with agencies and organizations that are in good positions to tackle the issues at hand. Furthermore, the Sanctuary's unique resources (e.g. its research vessel) and expertise (e.g. in developing interpretive displays) often complement other organizations' capacities (e.g. large volunteer base). As a result, the Sanctuary is well positioned to be a coordinating partner in water quality management efforts.

Based on the broad geographic range of threats and the Sanctuary's capacity to act as a partner in management efforts, the staff should not limit the water quality action plan to the Sanctuary boundaries. Instead, water quality protection efforts should be prioritized based on a combination of three general factors:

1. Reasonable expectations about the degrees of threat to the Sanctuary's natural and cultural resources posed by the different anthropogenic sources of water pollution. (The descriptions of potential sources of pollution in Section 3, the gaps identified in Section 7 as well as the recommendations in this section will assist the staff and Council with this factor.)
2. Leveraging available CINMS staff and Advisory Council resources and expertise.
3. Opportunities to easily coordinate water quality management efforts with/by other organizations. (Sections 4, 5 and 6 of this report highlight potential opportunities for coordination with other organizations.)

8.2 Research and Monitoring Recommendations

A general research and monitoring gap identified in Section 7.1 is the lack of a comprehensive set of questions that the Sanctuary staff wants to see addressed through data

collection and analyses. These questions are fundamental in guiding research and monitoring efforts.

The CINMS staff and Advisory Council should determine the issues that are driving their water quality action planning. For example, key issues might include habitat degradation, human contact with pollutants (through recreation activities), shellfish contamination, or species composition changes. After determining these drivers, the staff should frame research and monitoring questions with the purpose of better understanding how water quality factors affect these key issues. Furthermore, they should formulate questions with subsequent water quality management steps in mind; the gathered data and analyses required to answer these questions should, for example, inform policy decisions, help the Sanctuary and other agencies target their enforcement efforts, and lead to more effective education and outreach efforts.

To facilitate these steps, the CINMS staff, Advisory Council and its appropriate working groups (e.g. the Research Activities Panel) should seek opportunities to consult with Donna Meyers (the West Coast Sanctuaries Regional Water Quality Coordinator), managers of water quality programs at other National Marine Sanctuaries such as Monterey Bay and Florida Keys, and researchers at the Southern California Coastal Water Research Project.

Donna Meyers has suggested convening a meeting of scientists and representatives from academia, research institutes, governmental agencies and other organizations that are interested and involved in water quality-related research and monitoring in the Santa Barbara Channel region. Since a meeting has not yet been proposed, the scope, goals and format remain unarticulated. Regardless, this type of forum could provide an excellent opportunity for the CINMS staff and Advisory Council to receive input on the research and monitoring questions described in Section 8.2. Additionally, managers and stakeholders may have opportunities to learn more about data sources and research/monitoring efforts in the region, and to establish partnerships for future data sharing and effort-coordination.

Based on these potential benefits, the staff and Advisory Council should assist in planning and coordination of such a conference. Even if the Sanctuary cannot take an active hosting role, staff and Council members should actively support and participate in the meeting.

Phyllis Grifman, Associate Director of Sea Grant, has suggested that the CINMS compile a list of research priorities for Sanctuary water quality and distribute it to both the UC and USC Sea Grant programs, and the California Ocean Science Trust, for use in their research planning. Such a list could be the end-product for a Santa Barbara Channel water quality research conference like the one proposed above; the exercise of generating a prioritized list could be constructive and focusing for conference participants, and fruitful for Sanctuary water quality planning.

8.2.1 Existing Data

Section 4 of this Needs Assessment report describes long-term, large-scale research programs in the SBC region and the data that are available from these (e.g. satellite

imagery from the Plumes and Bloom Program). The report concludes, overall, that these long-term data sources are almost solely oceanographic; they are not informative in terms of the water quality conditions (e.g. concentrations of fecal bacteria and oils and grease) that are affected by the potential sources of anthropogenic pollution to the SBC region. However, the staff should consult directly with the program researchers and pull together and characterize these existing data to determine if this is really the case. Even if none of the information is directly helpful in determining pertinent water quality conditions, some data will certainly complement water quality research and monitoring that the Sanctuary coordinates for the SBC region. Furthermore, the process of compiling and examining this existing data will enable the staff to effectively utilize (if applicable) this information in the future, and to begin considering how they wish to store and organize Sanctuary water quality data.

8.2.2 Monitoring within Sanctuary Waters

To begin addressing the lack of knowledge about baseline water quality conditions, the staff should identify water quality monitoring needs and develop a monitoring plan for Sanctuary waters based on their research and monitoring questions (recommended above) and through consultation and coordination with the Southern California Coastal Water Research Project (SCCWRP). This plan should:

1. Account for water quality factors that are most likely to be affected by existing and future potential threats identified in this report.
2. Leverage existing research and monitoring efforts (e.g. SCCWRP research projects) and infrastructure (e.g. Partnership for Interdisciplinary Study of Coastal Ocean (PISCO) buoys in Sanctuary waters, Regional Water Quality Control Board monitoring programs).
3. Account for all steps in the monitoring process (e.g. collection, analysis, and reporting) and ensure sufficient resources are dedicated for completing these steps.³³⁰
4. Include a data storage/reporting structure that is flexible enough to incorporate information from past monitoring efforts.

It is unrealistic to expect that the CINMS staff will have the available time and funds to independently implement this monitoring program. Instead, the Sanctuary should facilitate implementation through a series of partnerships with other organizations. A few concerns with this ‘coordination’ approach exist: monitoring efforts might decline or stop after an initial pilot project; CINMS staff might not receive data consistently; and last, the lack of a centralized monitoring program might prevent timely data analysis and reporting of results. To help avoid these issues, the Sanctuary and its partners need to set concrete goals and objectives for

³³⁰ If dedicated resources are insufficient for a comprehensive monitoring plan, we recommend scaling back the monitoring program (e.g. to sample for fewer pollutants, or less frequently) rather than foregoing *any* of the steps in the monitoring process.

their monitoring partnerships and explicitly agree upon their respective roles and responsibilities at the outset.

8.2.3 Processing of Existing Samples

If appropriate, the CINMS staff should ensure that existing samples from the Bight '03 survey and the Pac Baroness exploration are analyzed and that results are reported/stored in a format and location that are compatible with future monitoring outputs.

8.2.4 Monitoring Anchorages at the Islands

Small vessel discharges are a potential, direct water pollution threat to Sanctuary waters. To enable the Sanctuary to empirically assess the degree of this threat and to guide future education and outreach, the staff should monitor (or coordinate a program that monitors) anchorages around the Islands. This program should include:

1. Sampling for oil and grease and bacterial indicators at popular anchorages around the Islands during low and high use times.
2. Concurrent sampling of control sites and (when possible) locations utilized by seabirds and pinnipeds.
3. Monitoring of anchorages for numbers and types of vessels concurrently with the water sampling.
4. Comparisons of water sampling results with vessel monitoring information (types, volume and locations) over time.

Recently, the CINMS staff has taken steps to address this recommendation; the Sanctuary has partnered with Santa Barbara Channelkeeper to pilot an anchorage monitoring program at the Islands. The staff should endeavor to continue this monitoring program beyond the pilot phase, and to adapt the monitoring protocol based on the results of this pilot project.

In addition to the CINMS staff's regular aerial monitoring of vessels at the islands, the National Park Service collects visitor use data for the Islands. This information could augment the anchorage monitoring efforts (as well as other water quality sampling). The Sanctuary should formalize a partnership with the National Park Service to share visitor use data on a regular basis.

8.2.5 Anthropogenic Marine Debris

Anecdotal reports of trash in the SBC region suggest that anthropogenic marine debris is a significant water quality concern for the Sanctuary. Trawling studies and

surveys of pelagic plastics in the Southern California Bight reinforce this concern. To better understand the degree of this threat and to pinpoint the primary sources of trash, an anthropogenic marine debris research and monitoring program is necessary. This program should include:

1. Ongoing, periodic beach debris monitoring at the Islands.
2. A trawling study that is specific to the shelf around the Islands.
3. Surveys of boaters about their trash disposal practices.
4. A pelagic plastics sampling study in Sanctuary waters and the greater SBC region.
5. Consistent efforts to photo document trash in the SBC.
6. A system for reporting photo documentation and other monitoring results to the public.

A program such as this is far too large for the Sanctuary to take on independently. Instead, the CINMS staff should coordinate with organizations such as the SCCWRP, the Algalita Marine Research Foundation, the National Park Service and The Ocean Conservancy to form an umbrella partnership that could address some of the program components described above. (Ideally, these research and monitoring objectives could be folded into existing efforts by these organizations.) In addition to acting as a coordinator, the Sanctuary might have opportunities to contribute certain key resources to the monitoring program (e.g. use of the CINMS research vessel) that would facilitate its implementation.

8.2.6 Storm Water Plume Research

For the most part, nonpoint source pollution from the mainland is geographically removed from the Sanctuary. However, this source of pollutants potentially harms the Sanctuary's living resources that travel throughout the SBC region. Additionally, storm water plumes from the Santa Clara and Ventura Rivers have been documented reaching CINMS waters as a result of large storms. As a result, nonpoint source pollution from the mainland remains an un-quantified threat to water quality in the Sanctuary at this time.

The characteristics, dynamics and fate of large plumes from these rivers are all poorly understood. To address this gap, the staff should coordinate with researchers (e.g. from the Santa Barbara Long Term Ecological Research project, Plumes and Blooms project, SCCWRP and/or nonprofit organizations that conduct water quality monitoring) who have an interest in this water quality issue to help them implement a research project to sample storm water plume composition for the Santa Clara and Ventura Rivers.

Due to the type of research and the pollution source that it addresses, dedication of significant CINMS resources to the project does not make sense. However, the

Sanctuary might be in a good position to coordinate the project and/or contribute necessary resources (e.g. by making the research vessel available for sampling).

8.2.7 Large Vessel Traffic Monitoring

Discharges and airborne emissions from large shipping vessels and cruise ships are a potential water quality threat for the CINMS waters (see Section 3.3). To begin to characterize this potential threat, the staff needs to know the volume and composition of large vessel traffic traveling through Sanctuary waters. To fill this gap, the staff is coordinating with the National Marine Sanctuary Program to pilot an Automated Information System data stream interface and associated installation of a base station on Santa Cruz Island to track and log vessel traffic information to a public database.

Deposition of diesel emissions pollutants from large vessel traffic may be a chronic source of water quality impairments. We do not recommend that CINMS staff conduct or coordinate a research project on atmospheric transport and deposition. However, the Sanctuary might be able to coordinate with academic research projects to have them incorporate a deposition-monitoring component that will empirically measure site-specific pollution rates and facilitate predictive modeling of Sanctuary and Channel-wide chronic deposition (Refer to Section 4.2.2 for a description of academic research being conducted on fog at the Islands).

8.3 Jurisdiction, Regulations and Policy Recommendations

Answering the question of ‘how’ to enhance the existing regulatory framework to better manage water quality in the Sanctuary often requires technical information and expertise beyond the purview of this report and its authors. However, the gaps in the regulatory framework identified in Section 7.2 represent a useful starting point for articulating specific goals for decision makers as they develop new policy or regulations. The recommendations in this section describe these potential goals and suggest formalized solutions to high priority water quality threats that have the potential to compromise the Sanctuary’s mission to preserve its extraordinary natural and cultural resources.

Development of these recommendations has been guided by an overarching, long-term objective of sustaining exceptional water quality in the Sanctuary and the greater SBC region through proactive attention to emerging threats. Similarly, these recommendations are offered envisioning a future in which the Sanctuary is not subject to impairment from anthropogenic pollution.

8.3.1 Sewage Discharge Prevention

Discharges of treated and untreated human waste into the Sanctuary represent a potential threat to CINMS water quality and a deficiency in coordination of policy and regulation. From near shore visitors such as hikers and kayakers, to small vessels in popular anchorages, to cruise ships in and around the Sanctuary, treated and untreated sewage discharges should be controlled to the maximum extent practicable.

A single, unambiguous policy to eliminate untreated human waste discharges from near-shore National Park and Sanctuary users (e.g. kayakers, surfers, and hikers), such as “leave no trace” should be drafted and implemented with consistency throughout both jurisdictions. Such policy should include parameters for CINMS and National Park education and outreach efforts, including prominent display in program websites, teacher education for naturalists, concessionaires and charter boat captains, and distribution of packable, disposable human waste containers.³³¹

Similarly, treated and untreated sewage discharges from small vessels (such as pleasure craft) may represent a Sanctuary water quality threat facilitated by gaps in policy and regulation. Results of water quality monitoring during times of high vessel density should be analyzed in consideration of whether small vessel discharges should be addressed through an updated regulatory framework for vessel operations in and around the Sanctuary. Policy options such as establishment of EPA-sanctioned “No Discharge Zones” in popular Channel Islands anchorages, and deployment of an enhanced education effort to inform boaters of the CINMS sewage discharge policy, water quality conservation, and proper use of marine sanitation devices, could help proactively preserve good Sanctuary water quality as well as reduce impact from what may already be a CINMS water quality problem. Furthermore, the staff should consider policy options to minimize and eliminate sewage discharges from small vessels, such as partnering with regional harbors to deploy sewage-receiving stations and promoting their use.

Finally, in recognition of what is likely the greatest sewage effluent threat, cruise ship discharges should be prohibited within Sanctuary waters. The existing regulatory gap, which allows vessels including cruise ships to dump effluent in Sanctuary waters beyond the Three Nautical Mile Line, should be closed.

8.3.2 Strategic Planning and Stakeholder Coordination for Cruise Ship Visitation

Cruise ship visitation in the SBC region is being promoted by municipalities and business groups, and is projected to increase. An unmanaged increase in cruise ship

³³¹ See related discussion in Education and Outreach recommendations. Zion National Park implements a model policy to eliminate human waste discharge in the Narrows of the Virgin River canyon, a popular Park hike. All campers purchasing a permit for overnight camping in the narrows are given “Restop 2” receptacles, double plastic bag enclosures with enzyme catalysts that reduce fecal matter to “deodorized gel” for safe and easy pack out and disposal [see: <http://www.nps.gov/zion/ZionNarrows.htm>]. The policy requiring the packing out of human waste is stated and explained clearly throughout ZNP publications, and a product to facilitate doing so is widely available.

visitation to the Sanctuary (if the current regulatory framework is not adapted to this change) may represent a water quality threat, especially in the CINMS waters beyond the Three Mile Line of State jurisdiction (see above). In order to properly manage impacts from this activity, the staff must have a clear picture of City and business group intentions with cruise ship visits and vice versa. Similarly, the staff must take responsibility to inform the City of Sanctuary management issues with cruise ships. Planning for increased cruise ship visitation must be coordinated between jurisdictions and agencies. In summary, the CINMS staff should:

- Participate in planning by the City of Santa Barbara and other stakeholders for cruise ship visits.
- Get a clear picture of the City's objectives in terms of attracting and accommodating cruise ships to the SBC region.
- Make sure that the Sanctuary has a clear goal for policy towards cruise ships in the SBC (outside of Sanctuary waters) and that this policy is presented to the City of Santa Barbara.
- Review the Voluntary Agreement that ship captains sign before bringing tenders to the Santa Barbara Harbor (review the specific process for setting up this agreement with each cruise vessel).

8.3.3 Discharges Outside Sanctuary Boundaries

Future research and monitoring efforts may demonstrate that Sanctuary water quality is impacted by point and nonpoint sources of waterborne, airborne, chemical, and thermal pollution initially discharged outside the CINMS boundaries. There are several present and potential future activities around the Sanctuary that may represent this type of trans-boundary threat, including storm-event runoff from mainland rivers, airborne discharges such as diesel exhaust and incineration from commercial shipping traffic, oil lease development, open ocean aquaculture, and discharges from liquefied natural gas terminals.

Currently, the Sanctuary does not have regulatory authority to protect against pollution that enters its boundaries after being discharged into the ocean. Such authority could enhance current water quality protection efforts and proactively position the Sanctuary to better manage threats from future economic activities in the SBC region. It is worth noting that such authority would not be precedent setting-- other National Marine Sanctuaries such as Stellwagen Bank already include "enter and injure" clauses in their discharge regulations to protect resources and water quality.

8.3.4 Interagency Water Quality Stakeholder Alliance

The multi-party, interagency Memorandum of Understanding (MOU) maintained by Monterey Bay National Marine Sanctuary's Water Quality Protection Program might serve as a useful model for CINMS as it considers a water quality

conservation program of its own. While it remains uncertain if a formal MOU is as appropriate for the Sanctuary area as it is for Monterey Bay, enhancement of cooperative relations with State and County agencies, and expanded participation and support for existing multi-agency initiatives such as Santa Barbara County's Project Clean Water could both facilitate pollution reduction in the short term, and facilitate more formalized cooperation in the future should that outcome be identified as a worthy target.

8.3.5 Water Quality Working Group

Although the lack of a Water Quality Working Group does not constitute a jurisdictional, regulatory or policy gap, a working group that is dedicated to CINMS water quality issues could serve as a valuable asset to Sanctuary management. A Water Quality Working Group could provide another good channel for dialog between the public and Sanctuary staff; the group could provide a vehicle for potential partner organizations or institutions (such as those mentioned throughout this report), help channel useful information back into CINMS and the SAC, and involve stakeholders in the Sanctuary's water quality, such as tourism-related business representatives in Sanctuary water quality planning.

8.3.6 Pollution Prevention from Large Vessel Traffic

The Sanctuary has few immediate options for exerting regulatory control over commercial shipping and other large vessel traffic. However, preventing harm to CINMS water quality from the activity's array of chemical, biological and energetic (e.g. acoustic) discharges requires some form of management. While the Sanctuary is obviously not positioned to develop such authority on its own, National Marine Sanctuary Program representatives could work to inform U.S. Federal and California State policy makers and foreign relations officials of this growing regulatory need. Managers from the Sanctuary, in partnership with representatives from other Sanctuaries subject to shipping impacts (such as Stellwagen Bank, Monterey Bay, and Olympic Coast), could also encourage decision makers to take advantage of existing policy opportunities to reduce pollution impacts from ships in SBC waters, and throughout the world ocean: U.S. ratification of Annexes IV and VI of the International Convention on the Prevention of Pollution (MARPOL) of ships is one obvious example, that could bolster US enforcement jurisdiction over transiting ship traffic, reduce pollution and help encourage other nations to also ratify the complete MARPOL convention.

8.4 Public Education and Outreach Recommendations

While much remains unknown about all the factors that impact Sanctuary water quality, it is known that all our region's community members— from tourists visiting Anacapa for the

first time, to the South Coast’s urban citizens that never visit the Islands— make choices that cumulatively and inevitably impact the water quality of the Channel and the Sanctuary. Concurrently, the populations of coastal counties from San Luis Obispo to Los Angeles are growing— these four counties grew by an average of about 10% between the 1990 and 2000 censuses.³³² Consequently, CINMS managers and stakeholders have both a vested interest and a duty to empower all the region’s communities through education and outreach to make decisions that protect and enhance the region’s water quality.

How anthropogenic pollution , whether originating from boaters, Island visitors, or mainland residents, impacts the Sanctuary must be clearly articulated, and the information conveyed clearly to all communities and demographics in the Santa Barbara Channel Region. This is perhaps the summary recommendation for public education and outreach on Sanctuary water quality.

8.4.1 CINMS Education and Outreach Initiatives

To help gather data, foster partnerships with other organizations and agencies, and publicize the interconnections between mainland, coastal, and Sanctuary waters, CINMS should consider partnering with local agencies and organizations to sponsor a “Snapshot Day” event modeled after the event in MBNMS— a one day annual event that MBNMS sponsors where volunteers take water quality measurements at local creeks, streams, and beaches throughout the South Coast region. For similar reasons, CINMS should consider coordinating an Channel Islands clean up for the National Coastal Cleanup Day.

8.4.2 CINMS Sanctuary Education Team

The SET should obviously be a spearhead in water quality education for South Coast communities, and there are several initiatives it could undertake to serve in this role.

- Facilitate a meeting of area conservation groups doing water quality education and outreach to discuss CINMS water quality needs, and opportunities for coordinating and complimenting efforts.
- Evaluate existing water quality education programs and curricula, including development of recommendations for implementing Sanctuary water quality messages. The results should then be shared with regional groups, along with up-do-date Sanctuary materials such as textual and graphical information (perhaps in a conference setting related to the previous bulleted recommendation).
- Plan or prepare materials for public outreach:

³³² Southern California Association of Governments (SBCAG) website, US Census Data. Retrieved September 12, 2005, from <http://www.scag.ca.gov/census/pdf/CaliforniaCountyGrowth.pdf>
Population growth between 1990 and 2000 for the respective counties is reported as follows: San Luis Obispo – 13.6%; Santa Barbara – 8.0%, Ventura – 12.6%, Los Angeles – 7.4%.

- CINMS water quality presentation for Santa Barbara Speakers Bureau, Chamber of Commerce, and other tourism industry related associations
- CINMS Water quality fact sheet
- Public service announcements – Radio, TV, Print
- Encourage regional media to highlight concerns about Water Quality in SB Channel and CINMS
- Encourage the Ty Warner Sea Center, Santa Barbara Natural History Museum, and planners for the new CINMS facility at UCSB to create displays illustrating water quality dynamics in the Santa Barbara Channel and CINMS

It should be noted that such initiatives could be pursued “independently,” from a SET that is motivated to help protect and improve CINMS water quality. However, such initiatives will also likely be important components of CINMS Water Quality Action Planning (in conjunction with the Regional Water Quality Coordinator for West Coast Sanctuaries). By establishing such initiatives as formally identified components of action planning, the SET may be better supported and thus more effective in executing these assignments.

8.4.3 Channel Islands Naturalist Corps

Similar to the SET, the CINC serves regularly on the “front lines” of public education and outreach on Sanctuary issues, and is thus a natural leader for public education on Sanctuary water quality. In the short term, Sanctuary staff and stakeholders should help prepare talking points on Channel and Sanctuary water quality for the volunteer Naturalists. The Naturalists should also coordinate these talking points with concessionaire vessel crews.

8.4.4 Channel Islands National Park and Sanctuary Visitor Education

To address concerns that improper visitor human waste disposal practices are a water quality threat, the Sanctuary and National Park Service should coordinate to develop and advertise (at their websites, visitor centers and the Islands) a specific and consistent policy, and make sure that visitors are enabled in following the policy consistently. Furthermore, the two agencies should coordinate closely with concessionaires to make sure that they are emphasizing the overall importance of sustaining good water quality at the Islands and in CINMS waters, and that all visitors are specifically informed about the bathroom policy.

8.4.5 Boater Education and Outreach

Despite efforts to post signs, policies, and regulations in harbors and in boater pamphlets, there still remains a need to increase boater education and training. The

Sanctuary is not in a position to take on responsibility for this education and outreach at harbors along the mainland. However, in the short term, the staff might be able to offer assistance to harbors (that express an interest and have available resources) for developing new and more effective signs to inform boaters about water quality and clean boating practices.

The Sanctuary's education staff members are in the early stages of developing an on-the-water education and information program similar to the Team O.C.E.A.N. (Ocean Conservation Education Action Network) program at Florida Keys NMS. The goals of Team OCEAN are to facilitate protection of the marine resources while enriching the experiences of visitors to the Sanctuary. Trained volunteer teams are stationed at popular sites in the Sanctuary during peak recreational boating seasons in order to educate fellow boaters about the unique nature of the Sanctuary's habitats, and to share information about boating practices/skills and anecdotal knowledge about the best sites for different types of recreation activities.³³³

This type of peer-to-peer education would provide an excellent opportunity for the staff to incorporate water quality protection messages into CINMS education and outreach efforts. Longer term, the Sanctuary staff should consider coordinating an ongoing, two-tier training program for boater education and outreach. Volunteers would receive on-the-water training (most likely based on the Team OCEAN model) as well as training through the Dockwalkers program at the Santa Barbara, Ventura and Channel Islands Harbors.

California Coastal Commission's Boating Clean and Green program offers the Dockwalkers training program. CINMS would need to coordinate with a local nonprofit organization that would arrange the Dockwalkers trainings and then manage ongoing outreach and education efforts by trained volunteers. The Dockwalkers program, run by Save Our Shores in Monterey, Santa Cruz and San Mateo Counties, is very successful, and could serve as a model for a program in the Santa Barbara Channel region.

8.4.6 Signs in the Harbors and Near Creeks

The content and number of signs in harbors, neighborhoods and near creeks needs improvement. Although this is beyond the geographic jurisdiction of the Sanctuary, it is important for CINMS staff to coordinate (where possible) with local agencies, harbors and other organizations to develop and post more effective signs—ones that clearly convey the connection between mainland and Sanctuary, and the cumulative

³³³ Information retrieved on July 4, 2005 from the Florida Keys National Marine Sanctuary website: <http://floridakeys.noaa.gov/edu/ocean.html>

impacts of individuals' choices and actions on the health of their beaches, the Channel and the Sanctuary. Signs must be posted in both English and Spanish.³³⁴

Specifically, the staff should pursue opportunities to leverage the Sanctuary's existing partnership with the Coastal Watershed Resource Center at Arroyo Burro to address this need. The Sanctuary has in-house expertise in developing signs and interpretive information that it can contribute to this partnership.

8.4.7 Anthropogenic Marine Debris

Recommendation 8.2.5 outlines the basic component of a marine debris research and monitoring program. Concurrent with these research and monitoring efforts, the Sanctuary should try to consistently publicize and/or oversee a User Photo Archive that documents sightings of marine debris (as well as other pollutants) in the SBC region. Giving the public concrete images to associate with harmful trash disposal practices will help people understand their on-shore connections to the Sanctuary.³³⁵

Additionally, the consistent monitoring might indicate what activities and geographic areas contribute the most anthropogenic marine debris. This would allow the Sanctuary to target its education and outreach efforts most effectively. As an example, during this winter season's heavy rains, weather-specific advertisements and signage (e.g. warnings in communities that read "*A storm is coming— secure your garbage*") might have improved water quality protection efforts. For suggestions on developing public announcements, the Sanctuary staff might want to contact Monterey Bay NMS which has had success with its water quality radio Public Service Announcements in the past.

To implement these types of public education and outreach activities, the CINMS staff should consider partnering with the Weather Service (another National Oceanic and Atmospheric Administration agency) to run public service messages or storm information programs on the weather channel. The staff might also want to explore opportunities to collaborate with the Santa Barbara Creeks Division on some of its recent efforts to reach a broader audience through radio and television announcements.

³³⁴ Bilingual signage is crucial for educating the roughly 41% of Southern California residents that consider themselves Hispanic (2000 U.S. Census data available at <http://www.scag.ca.gov/census/>). Also, it is reported that bilingual Hispanics assimilate information in posted messages approximately four times faster than if the message is stated in English alone.

³³⁵ To avoid giving the public an inaccurate impression that the Sanctuary and Islands are trash-ridden, photos of marine debris rafts from weather events should be juxtaposed with photos depicting normal conditions, as well as clear explanations of both situations.