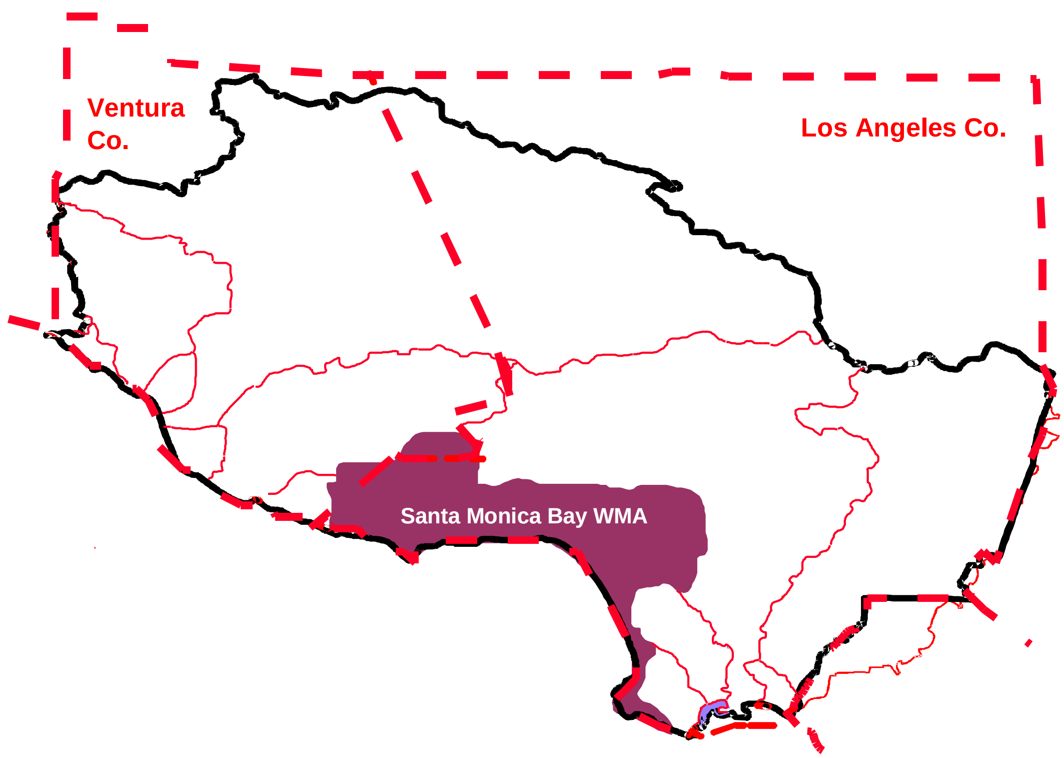
STATE OF THE WATERSHED – Report on Water Quality

The Santa Monica Bay Watershed Management Area
2nd edition



November 2011

California Regional Water Quality Control Board – Los Angeles Region
Shirley Birosik, Watershed Coordinator

PREFACE

This report is one in a series written by the Regional Board's watershed coordinator which summarizes and characterizes surface water or sediment quality data for the Region's watersheds; no policy or regulation is either expressed or intended. The Regional Board is often asked very basic questions about its watersheds and water quality and, in many instances, State of Watershed reports answer these questions. The reports are also helpful in showing how effectively or ineffectively we are all collectively doing monitoring and sharing data/information by going through the process of acquiring and merging data from different sources and making these data/information accessible.

There is some discussion of the watershed's biological resources due to their widespread occurrence and since there are many aquatic life-related beneficial uses sensitive to water and sediment quality problems; however, this report is not meant to be a complete documentation of these resources and instead the reader is encouraged to consult the references cited.

This report is the first in the watershed series to be an update of the original report produced in 1997 (hence, 2nd edition). The first edition was built upon the 1993 *Santa Monica Bay State of the Bay* report produced by the Santa Monica Bay Restoration Project with an emphasis on information available that related to the Santa Monica Bay watershed (land area) as opposed to the Bay alone. In 1997, a team approach was utilized when producing watershed reports whereas now it is primarily the responsibility of the watershed coordinator to complete. The format of these watershed reports has changed considerably since 1997 but there is every intention to both provide new data and reference findings from the previous report for comparison purposes. Use of the Internet was minimal to non-existent in 1997 whereas now virtually every reference is readily available through hyperlinks with the Internet; as a result, often reports cited are only briefly summarized and the reader can consult the full report at his/her leisure.

It became apparent during preparation of this report that tremendous changes have occurred in this Watershed Management Area since the first edition was produced. While much data are available, the amount and extent of research that has occurred is also considerable. A multitude of activities to improve habitat and water quality are ongoing; some are strictly voluntary while others are the direct result of regulatory requirements. The cooperative nature of the work being done among such a diverse groups of stakeholders is to be commended.

Photos embedded in the report were taken by the author; maps were generated in ArcGIS 9.3 by the author.

Prior to release of the public draft, in-house comments were provided by Regional Board staff. An announcement of the public draft report's availability for review and comment was made to the Email lists of interested stakeholders and on the Regional Board's website. Major comments were submitted by Las Virgenes Municipal Water District and Los Angeles County Department of Public Works. The document was revised as appropriate.

November 2011

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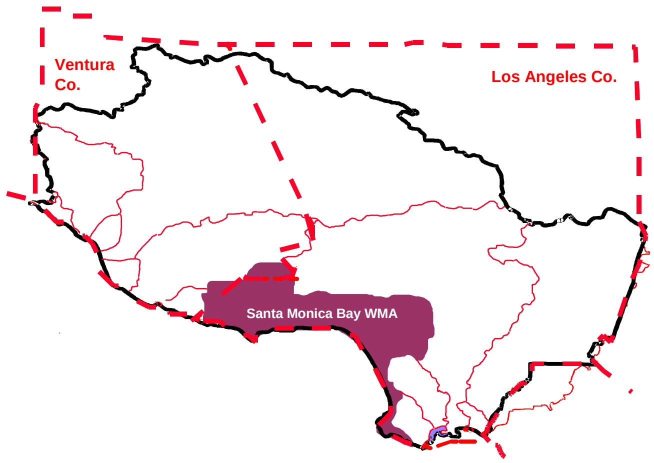
TABLE OF CONTENTS

List of Figures

List of Tables

EXECUTIVE SUMMARY



The Santa Monica Bay Watershed Management Area (WMA), which encompasses an area of 414 square miles, is quite diverse. Its borders reach from the crest of the Santa Monica Mountains on the north and from the Ventura-Los Angeles County line to downtown Los Angeles. From there it extends south and west across the Los Angeles plain to include the area east of Ballona Creek and north of the Baldwin Hills. A narrow strip of land between Playa del Rey and Palos Verdes drains to the Bay south of Ballona Creek. The WMA includes several watersheds, the two largest being Malibu Creek to the north (west) and Ballona Creek to the south. The Malibu Creek area contains mostly undeveloped mountain areas, large acreage residential properties and many natural stream reaches while Ballona Creek is predominantly channelized, and highly developed with both residential and commercial properties (CRWQCB, 2007).

As a nationally significant water body, Santa Monica Bay was included in the National Estuary Program in 1988. It has been extensively studied by the Santa Monica Bay Restoration Project, formed in 1989, (now the Santa Monica Bay Restoration Commission or SMBRC) and the Bay Restoration Plan was approved by US EPA and the State of California in 1995. The SMBRC was established in 2004 to oversee implementation of the Plan (CRWQCB, 2007).

The Santa Monica Bay WMA embraces a high diversity in geological and hydrological characteristics, habitat features, and human activities. Almost every beneficial use defined in the Basin Plan is identified in water bodies somewhere in the WMA; however, many of these beneficial uses are impaired. While some of the impaired areas are showing signs of recovery, beneficial uses that are in relatively good condition still face the threat of degradation. Beneficial use impairment problems in the watershed fall into two major categories: human health risk and natural habitat degradation (CRWQCB, 2007).

Permitted discharges:

- MS4 permittees (84 cities, LA County, and LA County Flood Control District)
- 193 traditional NPDES discharges including: seven major NPDES permit discharges, three POTWs (two direct ocean discharges), one refinery, and three generating stations; 18 are minor discharges
- 175 dischargers covered under general permits
- 87 dischargers covered by an industrial storm water permit
- 401 dischargers covered by the construction storm water permit

Of the major non-stormwater NPDES dischargers in the Santa Monica Bay WMA, the three Publicly-Owned Treatment Works (POTWs), particularly the two direct ocean discharges, are the largest point sources of pollutants to Santa Monica Bay. Pollutants from the minor discharges have been estimated to contribute less than two percent of the total pollutants being discharged to the Bay (CRWQCB, 2007).

State of the Watershed

Description of Watershed

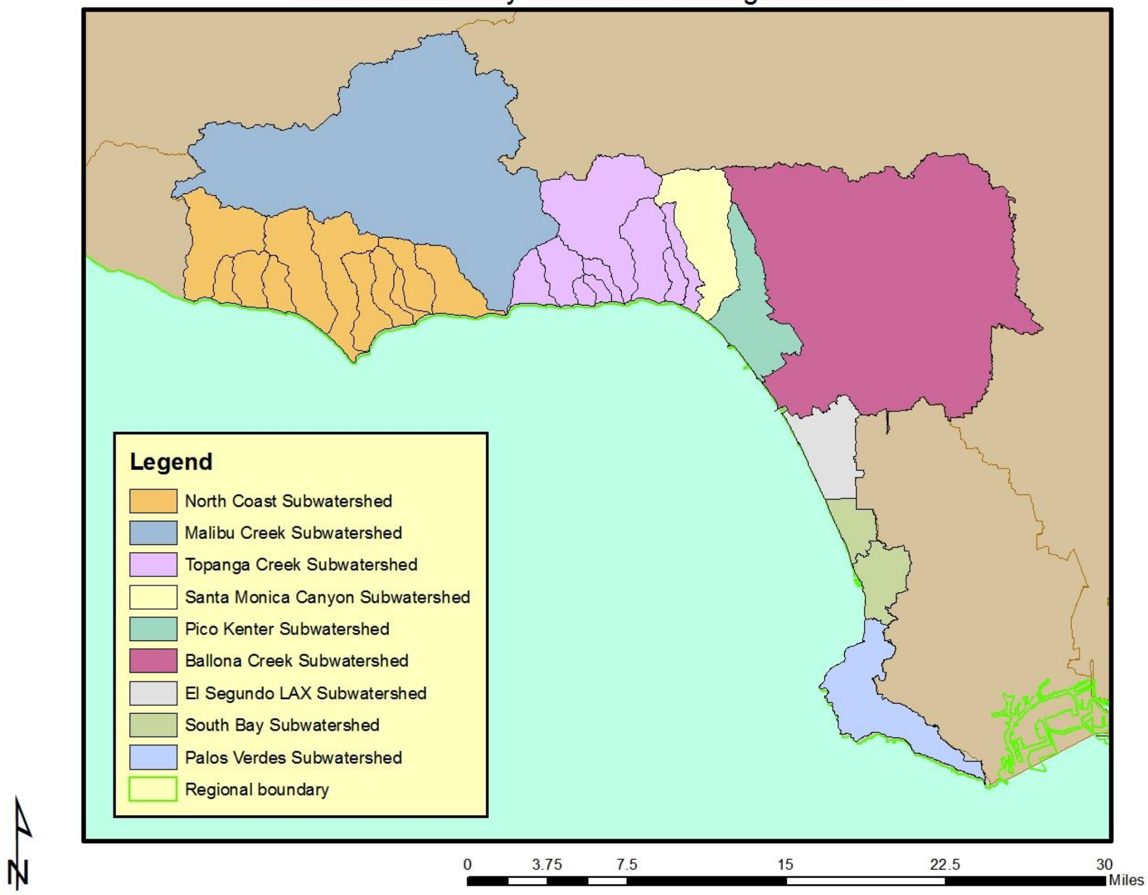
The Santa Monica Bay Watershed Management Area (WMA) includes the Santa Monica Bay and the land area that drains into the Bay. The boundary of the Santa Monica Bay, as defined for the National Estuary Program, extends from the Los Angeles/Ventura County line to the northwest, to Point Fermin on the Palos Verdes Peninsula to the southeast. The 414 square mile land area that drains into the Bay follows the crest of the Santa Monica Mountains on the north to Griffith Park. From there it extends south and west across the Los Angeles coastal plain to include the area east of Ballona Creek and north of the Baldwin Hills. South of Ballona Creek the natural drainage is a narrow coastal strip between Playa del Rey and Palos Verdes (CRWQCB, 1997).

The Santa Monica Bay WMA is located in the Los Angeles Coastal Plain. The Bay itself is part of the Southern California Bight, extending from Point Conception to Cape Colnett in Baja California, and with the California Current as its seaward boundary. The mountainous land forming the watershed's northern boundary is largely the results of the slow grind of the Pacific tectonic plate against the North American tectonic plate with the San Andreas fault marking the point of friction between the two. Sediments eroding from surrounding ranges filled the habitable portion of the Los Angeles Coastal Plain. The climate is Mediterranean, characterized by warm, dry summers and mild, wet winters. The average annual rainfall on the Coastal Plain is 12 to 13 inches but ranges from four to 25 inches. Rainfall also varies with elevation, with foothill areas receiving as much as 40 inches (CRWQCB, 1997).

Surface water flows into the Bay through 28 catchment basins that can be grouped into nine subwatershed areas based on their geographic characteristics as shown in the figure below. There are four major groundwater basins in the area, which correspond to geological features seen above the ground (CRWQCB, 1997).

Figure 1

Subwatersheds and Catchment Areas of the Santa Monica Bay Watershed Management Area



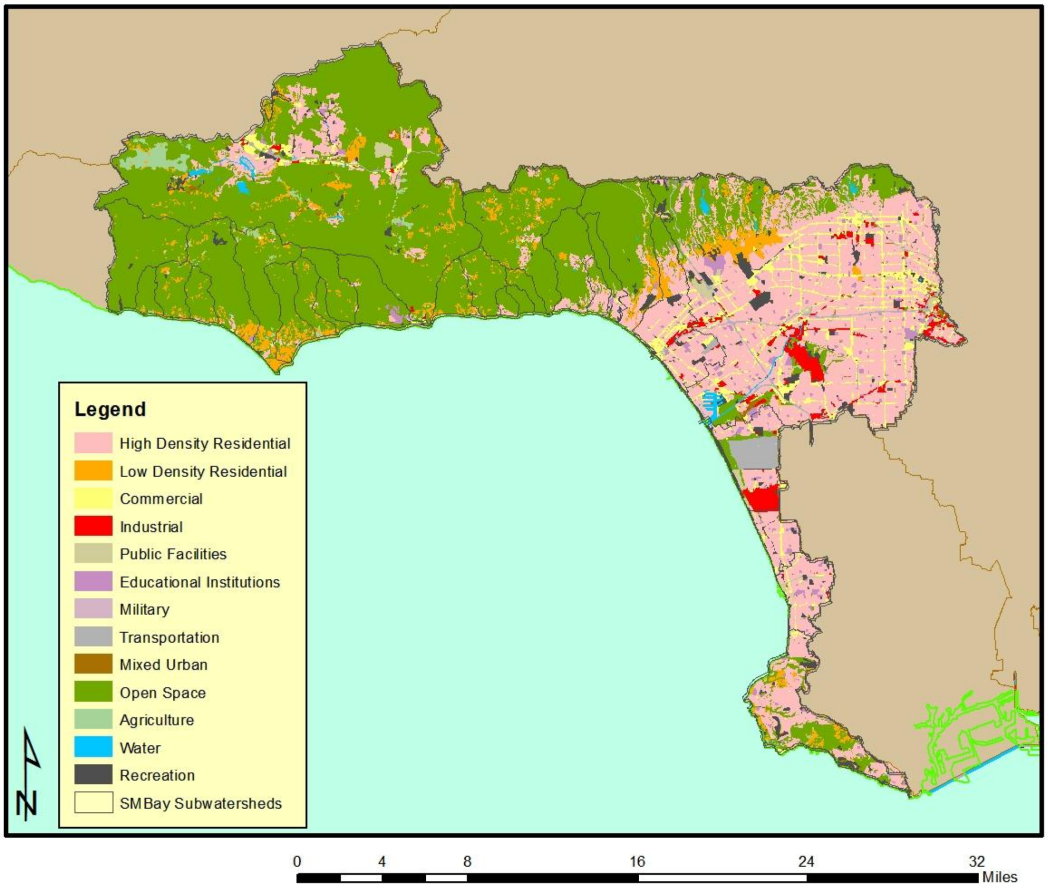
Most land areas of the WMA are located in Los Angeles County, except for a small portion of eastern Ventura County. The cities of Los Angeles and Santa Monica, along with twenty other cities, are located either completed or partially within the watershed. There are also land areas under the jurisdiction of Los Angeles County as well as State and Federal jurisdictions (primarily park lands in the Santa Monica Mountain area) (CRWQCB, 1997).

Approximately 9.86 million people live in Los Angeles County (2008 U.S. Bureau of Census estimate). It is estimated that approximately 2.5 million live within the 414 square mile watershed. In addition, approximately 8.8 million live within the so-called "wasteshed", the area that is served by the large wastewater treatment plants that discharge into the Bay (CRWQCB, 1997).

SCAG land use data from 2005 shows 62% of the area is open space, high density residential is 17% of the area, and low density residential is 2.3% of the area. Commercial and industrial land uses total 6% of the area and are found in all but a handful of the subwatersheds. These land uses are shown in the following figure.

Figure 2

Land Use in the Santa Monica Bay Watershed Management Area



There are large industrial centers in El Segundo, Manhattan Beach, Redondo Beach, and Torrance, which serve as a base for aerospace and other high-tech manufacturing. Other concentrated commercial/ industrial areas in the watershed include Westchester-LAX-Playa del Rey (commercial), Santa Monica-West Los Angeles-Century City (commercial and light industry), Culver City (entertainment industry), Los Angeles Civic Center, and the Highway 101 corridor in Thousand Oaks-Westlake Village (light industry and commercial) (CRWQCB, 1997).

The southern coastal plain portion of the watershed is at or near build-out, therefore, future coastal development in this area will be restricted to scattered infill development, recycling and redevelopment activities. The future population and economic expansion in the area is likely to result in a more dense pattern of human activities and development (CRWQCB, 1997).

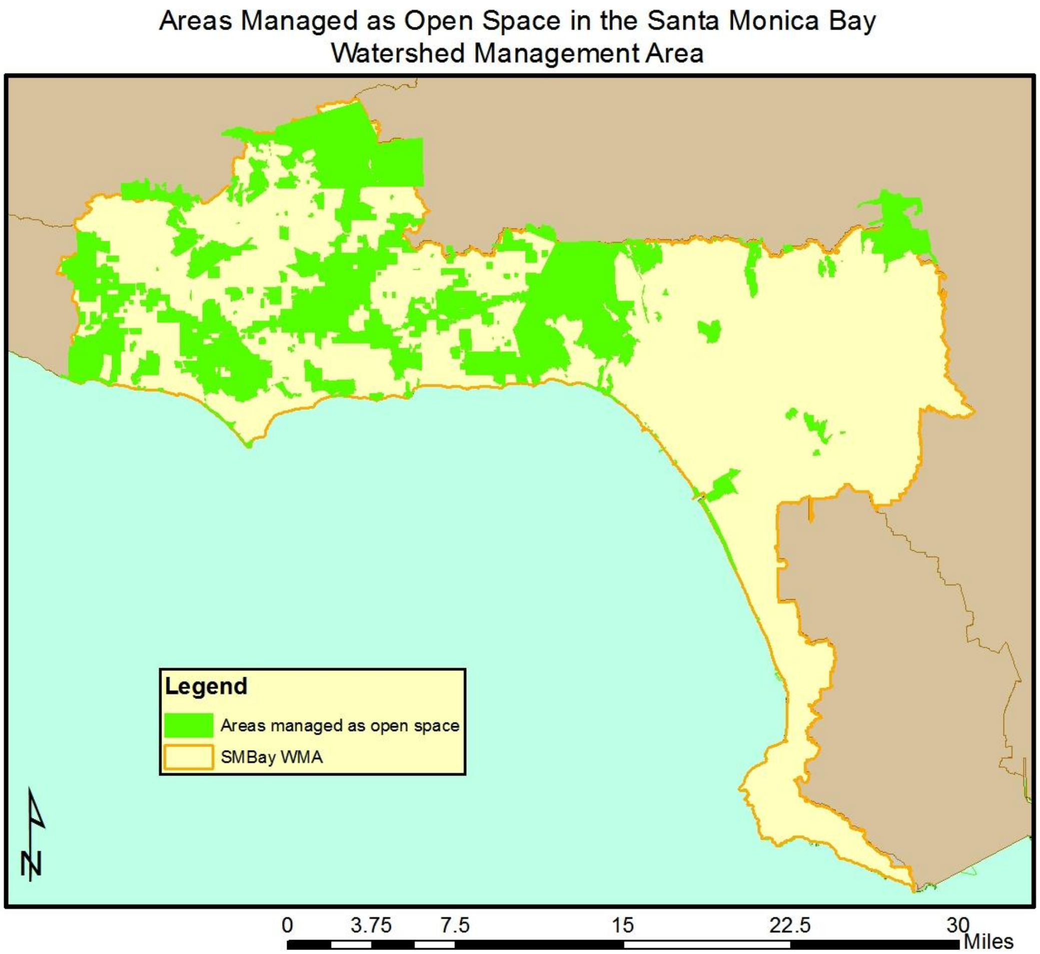
The narrow strip of coastal land in the northern Santa Monica Mountains portion of the watershed is also at or near build-out. Scattered and block new developments take place by encroaching on canyon slopes. New development and business expansion also takes place in the upper watershed, spreading from the Highway 101 corridor to the nearby foothills and even hill-top areas (CRWQCB, 1997).

Economic activities in the watershed are similar to those of Southern California as a whole. Major land-based economic activities include aerospace and other high-tech industries, tourism, entertainment industry, trade, and transportation (CRWQCB, 1997).

Impervious surfaces, which include buildings, roads, sidewalks, parking lots, storm drains and other paved surfaces are inherent to urbanized settings such as the Ballona Creek Watershed; however, these surfaces prevent the natural infiltration of water into the ground. As a result, the volume of storm water runoff increases and water quality deteriorates as polluted water flows to the receiving waters. Most research indicates that water quality is degraded as imperviousness increases; research conducted by Southern California Coastal Water Research Project (SCCWRP) has shown changes in stream channel morphology (which can impact the benthic invertebrate community) can occur at as little as 2-3% total impervious area (Coleman, et al., 2005).. Of the Santa Monica Bay's 414-square mile watershed, 121 square miles (29%) are impervious. The Ballona Creek subwatershed accounts for most of the impervious area, with 72 square miles of impervious surface, (which is 55% of the subwatershed and 17% of the total Bay watershed area). Even the Malibu Creek watershed, with its large expanse of open area, has almost 14 square miles of impervious surface, placing it well above the level of imperviousness at which water quality is impacted (SMBRC, 2004).

The biological and aesthetic resources of the Bay provide many economic benefits to the residents of the watershed. The abundant recreational facilities (including 22 public beaches, a 22-mile-long beach bike path, six piers, small craft harbors with 6,000+ slips, and nine artificial reefs) make the area attractive for a wide range of water-dependent activities. Over 55 million people visit Santa Monica Bay beaches each year to engage in sightseeing, sunbathing, swimming, surfing, and biking. Millions of fishing trips are made to the Bay and on fishing piers each year. The region, especially coastal jurisdictions, depend on tourism associated with these activities to generate jobs and revenues (CRWQCB, 1997). Areas managed as open space by the California Department of Parks and Recreations and the National Park Service, in addition to local agencies, are shown below.

Figure 3



WATER RESOURCES

As is the case for much of coastal Southern California, the Santa Monica Bay watershed is known for its Mediterranean climate – hot, dry summers and cool winters with highly variable amounts of rain influenced by climatic events known as El Nino and La Nina. However, heavy storms do occur and cause catastrophic flooding on occasion. During wet years, the annual total of rainfall can be as great as 40 inches. In addition, the region is rich in groundwater resources with several groundwater basins of large storage capacity. Finally, water imports from the east and north have fundamentally changed the water resources' balance equation and, in a sense, have dramatically expanded the boundary of the watershed (CRWQCB, 1997).

Surface Water

Until storms shifted its course in 1825, the Los Angeles River was the largest river system entering Santa Monica Bay. It once meandered through extensive swamp forests, marshes and lakes between the

Baldwin and Beverly Hills. Today, there is no major river system in the watershed but rather smaller perennial and intermittent streams; Ballona Creek in the Los Angeles Basin and Malibu Creek in the Santa Monica Mountains are the largest (CRWQCB, 1997).

Today, Ballona Creek and its tributaries, which drain a watershed of about 127 square miles, are mostly concrete-lined channels or covered culverts. Besides Ballona Creek, numerous reservoirs, channels, and debris basins have been constructed to control flooding and speed surface flows directly to the ocean (CRWQCB, 1997).

By contrast, Malibu Creek and its tributaries, which drain an area of 110 square miles, are for the most part not channelized. Relatively few tributaries in the upper portions of the Creek drainage have been dammed for recreational and water supply reservoirs. There are about 18 other smaller perennial or seasonal streams which flow through deep and narrow canyons to Santa Monica Bay. Most of these streams remain in their natural condition except for some fills and streambank stabilization due to road and house construction (CRWQCB, 1997). Major surface waters in the WMA are shown below.

Figure 4

Major Surface Waters of the Santa Monica Bay Watershed Management Area

Despite little or no rain throughout much of the year, about two dozen streams or storm drains (including Ballona and Malibu Creeks) have flow in the summer months. Several sources contribute to this phenomenon. Springs and seeps historically were common along the base of the Beverly Hills, Baldwin Hills, the hills above present-day Santa Monica, and in the various canyons in the mountainous area of the watershed. Some of these natural springs and seeps still exist today. Various point and nonpoint source discharges are also contributors to the summer low flow. The former are mostly from groundwater pumped from dewatering projects and from cooling tower discharges. The latter are from over-irrigation, or domestic/industrial illicit connections. Regardless of the sources, these are considered excessive flow because they result at least partly from water imported from outside the watershed (CRWQCB, 1997).

Groundwater

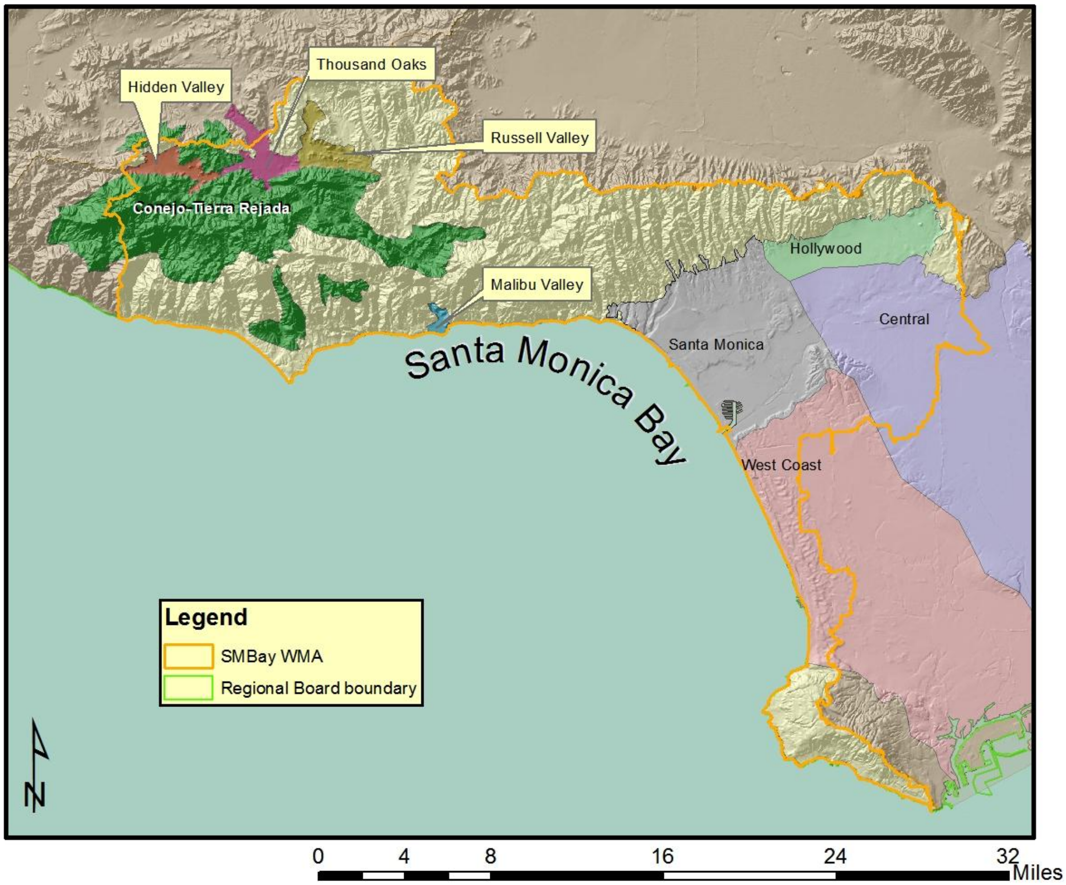
Water in the ground (groundwater) is present at varying depths below land surfaces everywhere. Aquifers, which are permeable units of soil and rock, store ground water that can be easily transmitted and pumped to provide water for uses such as drinking, irrigation and industrial processing. In the Santa Monica Bay watershed (as well as throughout all of southern California), groundwater accounts for most of the local (non-imported) supplies of fresh water (CRWQCB, 1997).

Of the four groundwater basins within the LA Coastal Plain, the Santa Monica Basin and parts of the West Coast, Hollywood, and Central Basins lie within the WMA. Additionally, limited groundwater resources exist in Malibu and Russell Valleys in the Malibu hydrologic area (CRWQCB, 1997). The Metropolitan Water District of Southern California (MWD) has reported that groundwater was once the primary source of drinking water in the Malibu area; with the introduction of imported water to the area in 1965, all known private and public water supply wells have since been abandoned (MWD, 2007). The Los Angeles County Waterworks District No. 29, which provides potable water to coastal areas in the Malibu area, has stated the geology below the District's service area lacks groundwater basins capable of producing an adequate supply of groundwater and, therefore, the District does not have plans to use groundwater sources for future water supply within the District service areas (LACDPW, 2005). Groundwater basins are depicted in Figure 5.

The West Coast Basin Barrier Project recharges aquifers in the West Coast Basin by direct injection into 153 wells of a blend of advanced-treated recycled water and potable water imported from other Regions. The barrier recharges aquifers and prevents seawater intrusion into the West Coast Basin (CRWQCB, 1997).

Figure 5

Groundwater Basins of Santa Monica Bay Watershed Management Area



Water Imports

Water has been imported into the Los Angeles Region from other areas since 1913 when the Los Angeles Aqueduct began delivering water from the Owens Valley. Since that time, southern California has developed a complex system of aqueducts to import water to a rapidly growing population and economy. Water imported to the Region presently meets approximately half of the demand for potable water (CRWQCB, 1997).

The principal systems for importing water are the Los Angeles Aqueduct, which diverts water from the Mono and Owens Rivers Basins; the California Aqueduct (State Water Project), which transports water from northern California; and the Colorado River Aqueduct, which carries water from Lake Havasu on the Colorado River. Importing these waters brings several problems as well as the obvious benefits. Water from the Owens Valley is usually treated for turbidity. Water from the Colorado River generally has a higher mineral content than either local waters or other imported waters although exceptions exist in those Santa Monica Bay watersheds with significant deposits of Tertiary age marine sedimentary rock of the Monterey Formation (Mundy, comm. ltr.). This hardness is the result of dissolved material from soil and rocks in that river's watershed. Water from northern California accumulates organic materials as it flows through the Sacramento-San Joaquin Delta. These organic materials when combined with the chlorine used during typical disinfection treatment processes can result in by-products called trihalomethanes (THMs). These substances have been linked to cancer. A 100 parts per billion (ppb) standard has been established to mitigate the occurrence of THMs in drinking water, while still allowing for adequate disinfection with chlorine (CRWQCB, 1997).

Chloride is one component of hardness in water and, during drought periods, water supplies from northern California often have higher than normal concentrations of chlorides. Excessive chlorides can impair the use of water for human consumption and application on crops. Currently, surface waters within the Santa Monica Bay watershed are not experiencing excessive chloride concentrations due to imported water (CRWQCB, 1997).

About half of the City of Los Angeles' water supply now comes from the Metropolitan Water District, imported water from northern California through the State Water Project (SWP), while about a third is imported from the Los Angeles Aqueduct. Local groundwater accounts for about 10% of the water supply. Another major water supplier in the WMA, the West Basin Municipal Water District, imports about 65% of its water. About 20% is from groundwater and 7% is from recycled water (SMBRC, 2010). The remainder of the water imported in the northern Santa Monica Bay area is provided by the Las Virgenes Municipal Water District (LVMWD) and consists of 100% SWP water. LVMWD also provides recycled water derived from SWP water to meet approximately 20% of total demand (Mundy, comm. ltr.).

Biological Setting

Santa Monica Bay is the submerged portion of the Los Angeles basin and is an integral part of the larger geographic region commonly known as the Southern California Bight. It has a gently sloping continental shelf which extends seaward to the shelf break about 265 feet underwater, then drops more steeply to the floor of the Santa Monica Basin, at about 2,630 feet (CRWQCB, 1997).

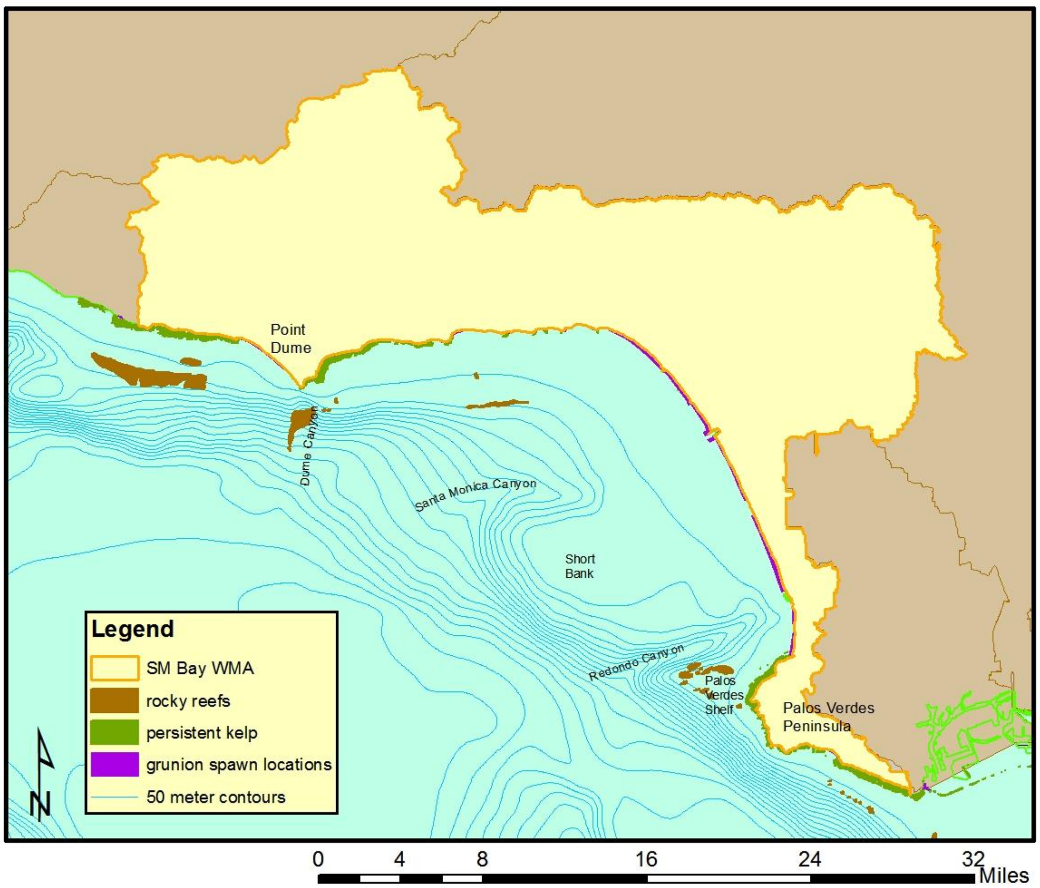
The shelf ranges in width from a few hundred yards to about 12 miles. It is broadest off El Segundo, narrowest off Redondo Beach, and is transected by three submarine canyons: Dume Submarine Canyon off Point Dume; Santa Monica Submarine Canyon seven miles offshore of Ballona Creek; and Redondo Submarine Canyon, a few hundred yards of King Harbor (CRWQCB, 1997).

MARINE HABITATS

The Bay provides a variety of habitats and homes for a highly diverse group of plants and animals, at least 5,000 at last count. The dominant *benthic habitat* in Santa Monica Bay is soft bottom which

Figure 6

Marine Habitat Areas of Santa Monica Bay Watershed Management Area



consists of fine to moderately coarse sediments. Few attached plants live in this habitat but invertebrates are abundant and diverse. Resident animals include crabs and shrimp, snails, worms and echinoderms. Hard bottom areas consist of seafloor covered with bedrock, gravel, and phosphorite. It also includes the deep-water plateau called Short Bank. Kelp beds will often be found in these hard bottom areas at depths of 20 to 70 feet in the subtidal regions west of Malibu and around the Palos Verdes Peninsula. Although far less in acreage than soft bottom, kelp beds in the Bay provide cover and protection, and thus habitat for more than 800 species of fishes and invertebrates, some of which are uniquely adapted for life in the beds. Consequently, kelp beds are important for sport fishing, commercial harvesting of abalone and sea urchins, and recreational diving (CRWQCB, 1997).

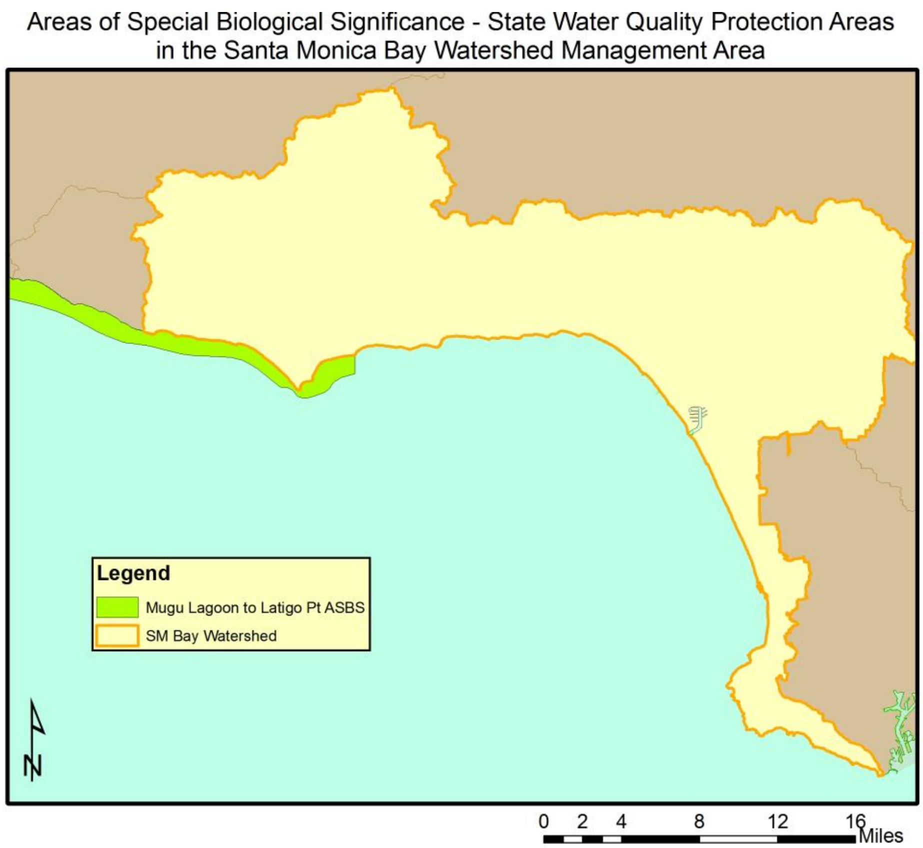
The *pelagic, or open-ocean habitat* is the primary home to fish such as Pacific sardine, northern anchovy, Pacific mackerel, and Pacific bonito; as well as marine mammals such as seals and sea lions. Many species of whales and dolphins are also observed in Bay waters during the winter/spring migration. The thin uppermost layer of the water column (microlayer) is also home to the eggs and larvae of many invertebrates. Phytoplankton are the dominant plant life in the pelagic environment. Red tides (which are typically dominated by dinoflagellates) sometimes develop in nearshore areas when warm temperatures, high light levels, abundant nutrients, and a shallow pycnocline (density gradient) occur together. Localized red tides occur almost every year; extensive ones occur less frequently (CRWQCB, 1997).

BEACH AND INTERTIDAL HABITATS

Sandy beaches are the most prominent and dominant habitat along the Santa Monica Bay shoreline, extending over fifty miles. Sandy beaches in southern California support species of macro invertebrates such as sand crabs and Pismo clams; they also support surf fish, such as California corbina, barred surfperch, and shovelnose guitarfish. Many sandy beaches along the Bay are important spawning grounds for California grunion (SMBRC, 2010). *Intertidal zones* include mud flats, tide pools, sandy beaches, and wave-swept rocks. They provide important habitat and breeding grounds for a variety of plants such as marine algae, fish such as grunion, and many invertebrates. Both beaches and other intertidal zones of Santa Monica Bay are important nesting and feeding grounds for migratory waterfowl and shore birds such as egrets, herons, gulls, terns, sanderlings, and plovers (CRWQCB, 1997).

Because of the existence of kelp beds, tidepools, and significant ecological diversity, the nearshore area between Ventura County line and Latigo Point was designated by the State Water Resources Control Board (SWRCB) an Area of Special Biological Significance (ASBS), now known as a State Water Quality Protection Area (SWQPA). A SWQPA is afforded special protection for marine life to the extent that waste discharge are prohibited within the areas. The same area and the nearshore area between Palos Verdes Point and Flat Rock Point is also designated a "significant ecological area" by the County of Los Angeles (CRWQCB, 1997).

Figure 7



COASTAL WETLANDS AND SHALLOW WATER HABITATS

Enclosed shallow water habitats are important features of the Santa Monica Bay coastline. These waterbodies are protected from rough seas and winter storms and provide a certain amount of stability in the physical environment and availability of food, and serve as important nurseries for local marine fishes (e.g., juvenile California halibut, juvenile white seabass). The relative complexity of the physical environment (piers, mudflats, sandy bottom) tends to allow for considerable diversity in the flora and fauna living there (CRWQCB, 1997).

The Santa Monica Bay WMA contains five estuaries/lagoons (Dume Lagoon, Malibu Lagoon, Topanga Lagoon, Ballona Lagoon and Del Rey Lagoon) and Ballona Wetlands. Lagoons may form at the mouths of rivers (the estuary) periodically when sand bars build up and close off the area. Considerable fluctuations in salinity often result. Coastal wetlands not part of a river system are often a mix of tidal influx and freshwater water inputs (including from urban runoff) which may result in fluctuations in salinity. Many of the species living in estuaries are either adapted to changing salinity (such as some species of pickleweed) or relocate to stay within the appropriate salinity range (such **as** tidewater goby).

Some estuarine fauna have adapted by producing large amounts of offspring with the likelihood that only some will survive. Lagoons are popular overwintering sites for migrating birds and are utilized by species nesting locally (such as the California least tern) during foraging. Many of the species found in estuaries are unique to that habitat and consequently are very sensitive to estuarine habitat loss (CRWQCB, 1997).

The enclosed waters of Marina del Rey and King Harbors also function to a large extent as shallow water habitats. Salinity in these areas is relatively constant and reflective of the nearby ocean waters. Many species of fish use these enclosed waters as nurseries. The mix of hard and soft bottoms yields a large array of organisms; many which might normally attach to rocks will also attach to piers in great abundance (mussels, tunicates). Organisms living in these waters are in constant contact with any pollutants found there (CRWQCB, 1997).

INLAND RIPARIAN HABITATS

Riparian habitat exists along each natural watercourse flowing to the ocean and around the lakes of the watershed. Riparian corridors include those found throughout the Malibu Creek watershed, in other Santa Monica Mountain watersheds such as Arroyo Sequit and Solstice Creek, and adjacent to lakes such as Westlake Lake, Lake Sherwood, and Malibou Lake. Riparian habitat generally consists of plants that need to be in close proximity to water at least for part of the year. Typical riparian vegetation includes sycamore trees, willows, mulefat, and cattails (near lakes). The generally large sycamore trees are used by birds for nesting and are particularly important to birds of prey since they give the height needed for these birds to hunt by sight. Shrubs will supply food and nesting habitat to a large variety of birds and rodents. Larger mammals such as coyote, gray fox, and the occasional bobcat are the common predators. Overhanging vegetation tends to minimize the water's temperature which can be very important to fish such as steelhead trout which migrate upstream to spawn. Continuous habitat along streams leads to the watercourse functioning as a wildlife corridor which allows movement of wildlife from one part of the watershed to another and opens up the amount of habitat available to them to use. Loss of this continuity, as occurs during development next to watercourses and when large roads cross them, can lead to excessive segmentation of the habitat and loss of overall species abundance and diversity (CRWQCB, 1997).

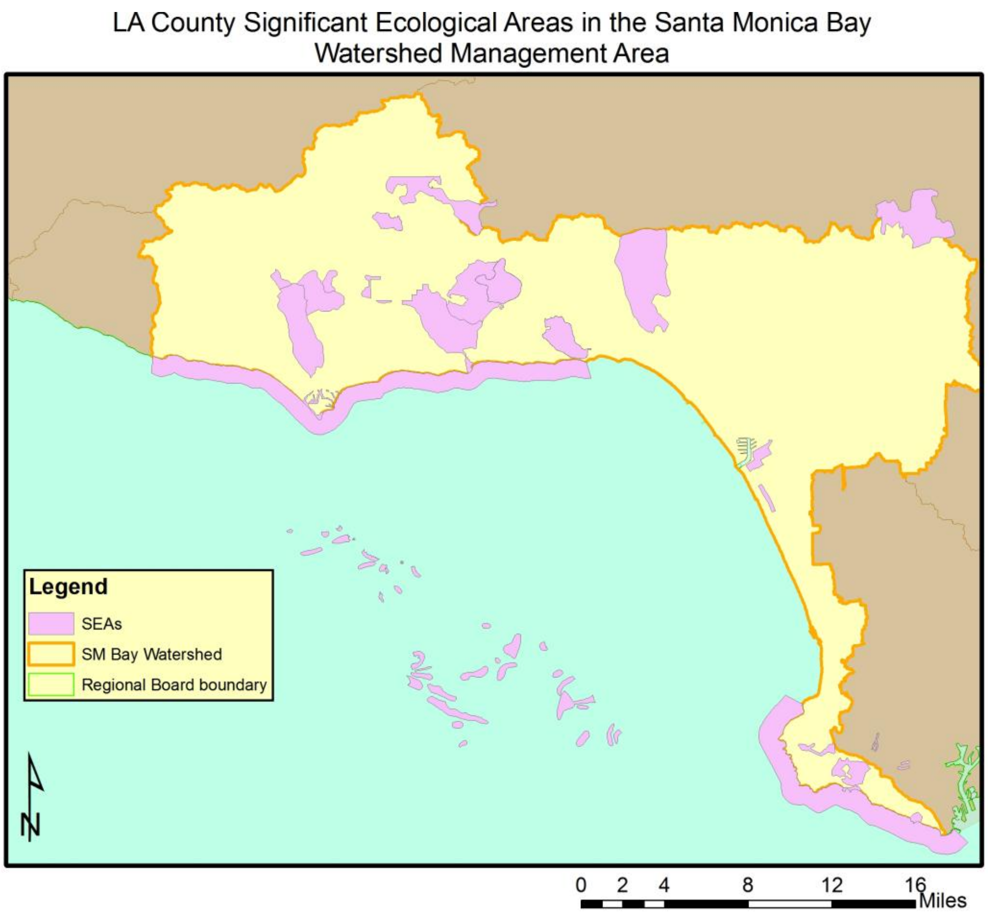
UPLAND HABITATS

Further inland the landscapes are primarily of two types: the Los Angeles coastal plain to the south and the Santa Monica Mountains to the north. Less than 300 years ago, much of the plain was rolling grassland scattered with oak trees. In low-lying areas between hills and bluffs, a major river and dozens of lesser streams meandered through broad valleys and wetlands to the sea. Two higher points of land were the peaks of the Baldwin and Palos Verdes hills where coastal scrubs grew, with chaparral vegetation covering the north-facing slopes and oak savannah blanketing the drier south-facing slopes (CRWQCB, 1997).

However, the grassland today has been replaced by human dwelling structures to become one of the most urbanized areas in the world. Only some coastal scrub habitat remains at the two higher points. Almost all natural waterways were channelized and/or converted to underground culverts. The largest drainage in the coastal plain is Ballona Creek; the Pico-Kenter drainage is second largest. Most others are small storm drains near the coast that extend only a short distance inland and receive no natural flow during summer months (CRWQCB, 1997).

The land in the Santa Monica Mountains to the north by contrast is still mostly open space and remains in a somewhat natural state, mostly free of alteration or development, but impacted by invasive species and mostly bacteria- and nutrient-related water quality issues. Besides coastal riparian, wetlands, grassland and scrub habitats, there are four habitats that are specific to the Santa Monica Mountains. The valley oak woodland occurs exclusively in the western part of the Santa Monica Mountains, particularly in the upper Malibu Creek drainage. It is dominated by valley oak, a deciduous oak 50-110 feet tall. The habitat usually merges with grassland or riparian vegetation near streams. Coastal oak woodland also occurs in the Santa Monica Mountains. This habitat is dominated by coast oak and California walnut.

Figure 8



The mixed chaparral generally occurs above the coastal scrub habitat predominantly on moist coastal or north- and east-facing slopes while the chamise-redshank chaparral predominates on drier, south- and west-facing slopes. The former is dominated by shrubs with stiff evergreen leaves such as scrub oak, ceanothus, and manzanita. The latter is almost exclusively dominated by chamise with some redshank occurring at higher elevations. Both habitat types are fire-adapted. These habitats are heavily used by small herbivores such as rodents and seed/insect-eating birds, as well as by large ones such as deer. Predators include owls, hawks, coyotes, and foxes (CRWQCB, 1997).

ENDANGERED SPECIES

Santa Monica Bay habitats (marine, aquatic, and terrestrial) are home to a number of rare, threatened or endangered species. Birds include California brown pelican, California least tern, western snowy plover, Belding's savannah sparrow, American peregrine falcon, and California gnatcatcher. Butterflies include the El Segundo blue, Palos Verdes blue, and wandering skipper. Endangered plants include Santa Monica Mountains dudleya, Lyon's pentachaeta, Conejo buckwheat, and Santa Susanna tarweed. Fish include tidewater goby and southern steelhead trout; amphibians include the Arroyo toad and the threatened California red-legged frog (CRWQCB, 1997).

Key Water Quality Issues

Though relatively small in size compared with watersheds for major rivers, lakes, or estuaries in other parts of the country, the Santa Monica Bay WMA includes a remarkably high diversity of geological and hydrological characteristics, habitat features, and human activities. Every beneficial use defined in the Basin Plan is identified in water bodies somewhere in the watershed. A complete list of beneficial uses are shown under the "The WMA's Designated Beneficial Uses" section; those identified for each subwatershed area can be found in each Subwatershed section (CRWQCB, 1997).

Beneficial use impairment problems in the watershed fall into two broad categories: those relating to human health and those relating to aquatic life/habitat/wildlife. The former are issues primarily associated with recreational uses of the Santa Monica Bay. The latter are issues associated with terrestrial, aquatic, and marine environments. Pollutant loadings that originate from human activities are common causes of both human health risks and habitat degradation. Encroachment by human development is another major cause for disappearance or degradation of natural habitats (CRWQCB, 1997). General improvement strategies to reduce the risks and degradation are shown. More specific information on assessments conducted by the SMBRC in fulfillment of their mission as well as formal water quality assessments required by the Clean Water Act and conducted by the Regional Board are also shown. General improvement strategies are listed here; strategies specific to subwatersheds are listed in each Subwatershed section.

ADVERSE HUMAN HEALTH IMPACTS

Santa Monica Bay is heavily used by the public for fishing, swimming, surfing, and diving activities; these types of activities are classified as beneficial uses water contact recreation and commercial and sportfishing. However, the ability of people to enjoy these activities has been lost to a certain degree because of the acute health risks associated with swimming in runoff-contaminated surfzone waters, and the chronic (cancer) risk associated with consumption of certain sport fish species in areas impacted by DDT and PCB contamination (CRWQCB, 1997).

Swimming

The First Edition State of the Watershed Report described reports of swimmers increasingly complaining about ear, eye, wound and intestinal infections, skin rashes and other illnesses that allegedly occurred as a result of contact with Bay waters. In investigating sources of contaminants that could be responsible for possible adverse health effects, researchers found evidence that pointed to pathogens possibly carried by urban runoff through storm drains into the Bay. Review of shoreline monitoring data showed higher indicator bacteria (total coliform, fecal coliform, and enterococcus) in waters surrounding storm drain outlets. These are called "indicator" bacteria since their presence suggests pathogenic bacteria and viruses may be also present and do not themselves cause disease (CRWQCB, 1997).

Stronger evidence was found in SMBRP studies completed between 1989 and 1991, when enteric viruses were found in the storm drain effluent at three widely-dispersed locations during dry-weather periods (CRWQCB, 1997).

In summer 1995, the SMBRP conducted a landmark epidemiological study of possible adverse health effects of swimming in Santa Monica Bay. The study found solid evidence that (1) there was an increased risk of illness associated with swimming near flowing storm drain outlets in Santa Monica Bay; (2) there was an increased risk of illness associated with swimming in areas with high densities of bacterial indicators; (3) illnesses were reported more often on days when the samples were positive for enteric viruses; and (4) high densities of bacterial indicators were measured on a significant number of survey days, particularly in front of drains. The study also showed that the total coliform to fecal coliform ratio was one of the better indicators for predicting health risks (CRWQCB, 1997).

As will be seen below under the General Improvement Strategies section, what followed during the next decade was an intensive effort to divert dry-weather flows and, at times, portions of storm flows. With forty drains now diverted during dry-weather, the miles of beach area affected by bacterial indicators should be reduced. SCCWRP is currently conducting epidemiological studies to assess the risk of swimming-related illnesses following exposure to nonpoint source-contaminated waters at three beaches in southern California including Surfrider Beach in Malibu. These studies will examine several new techniques for measuring traditional fecal indicator bacteria, new species of bacteria, and viruses to determine whether they yield a better relationship to human health outcomes than the indicators presently used in California (SCCWRP Website #1).

General Improvement Strategies

- **Implement TMDLs** Adopted bacteria TMDLs include those for Santa Monica Bay Beaches Wet Weather and Dry Weather (2003); Ballona Creek, Ballona Estuary, and Sepulveda Channel (2007); Malibu Creek (2006); and Marina del Rey Back Basins (2004). The TMDLs, implementation plans, and related technical documents for these are available on the Regional Board website as follows:

  Santa Monica Bay Beaches Dry Weather

  http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_9_2002-004_td.shtml

  http://63.199.216.6/larwqcb_new/bpa/docs/2002-004/2002-004_RB_RSL.pdf

  http://63.199.216.6/larwqcb_new/bpa/docs/2002-004/2002-004_RB_BPA.pdf

  Santa Monica Bay Beaches Wet Weather

  http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_14_2002-022_td.shtml

  http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_39_2006-005_td.shtml

  http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_40_2006-006_td.shtml

  http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_41_2006-007_td.shtml

  http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_42_2006-008_td.shtml

Ballona Creek, Ballona Estuary, and Sepulveda Channel

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_45_2006-011_td.shtml

http://63.199.216.6/larwqcb_new/bpa/docs/2006-011/2006-011_RB_RSL.pdf

http://63.199.216.6/larwqcb_new/bpa/docs/2006-011/2006-011_RB_BPA.pdf

Malibu Creek

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_23_2004-019R_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/2004-019R/05_0309/Resolution%202004-19R%20and%20Attachment%20A.pdf

Marina del Rey Back Basins

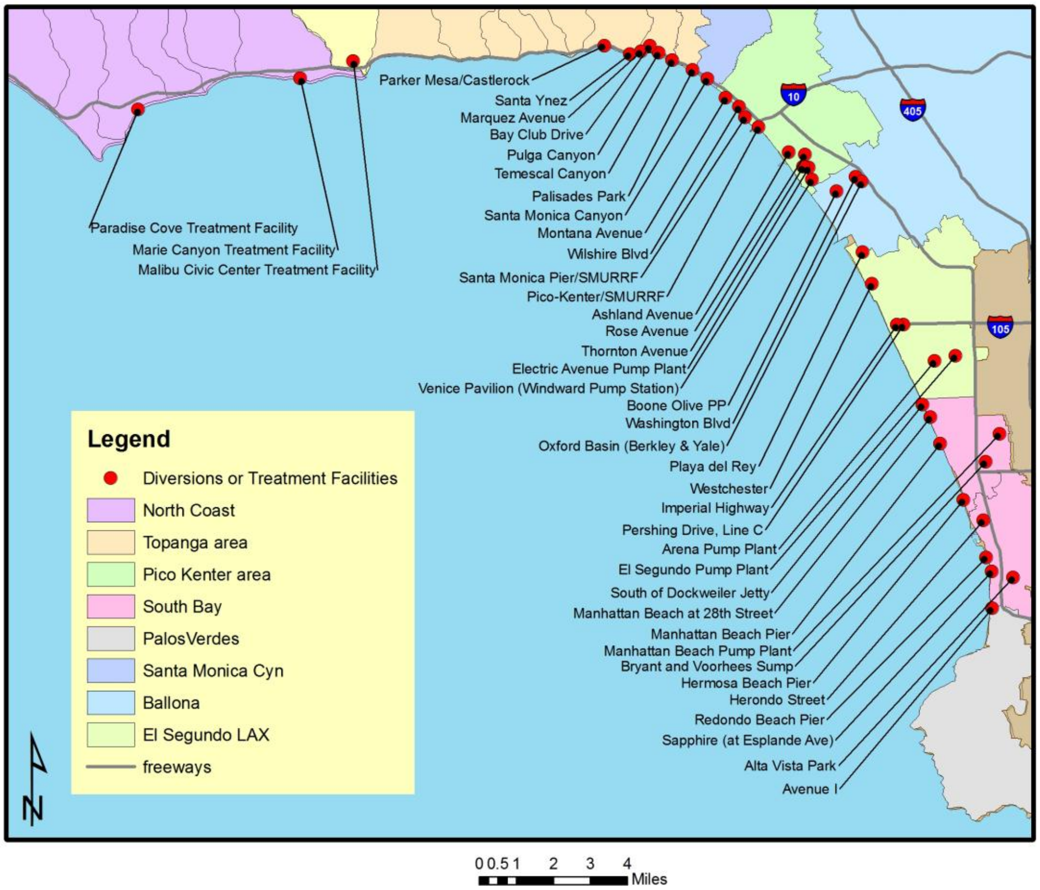
http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_19_2003-012_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_43_2006-009_td.shtml

- **Implement plans for low-flow diversions/treatment facilities** Forty low-flow diversions (LFDs) or runoff treatment facilities have thus far been installed at storm drains leading to Santa Monica Bay in order to reduce coliform levels and beach closures. Some of the LFDs have become full-time diversions. Of the twenty-seven high priority storm drains listed in the beaches dry weather bacteria TMDL, all have been diverted. Lead agencies on these projects include the cities of Los Angeles, Malibu, Manhattan Beach, Redondo Beach, Hermosa Beach, and Santa Monica, and the Los Angeles County Flood Control District (District). More information about LFDs may be found at http://www.lastormwater.org/Siteorg/program/poll_abate/lowflowdiv/lfdpage.htm. The locations of known diversion projects/treatment facilities are shown below.

Figure 9

Low Flow Diversions/Runoff Treatment Facilities in the SM Bay WMA



Seafood Consumption

The general public has been concerned about potential health risks associated with the consumption of contaminated seafood from Santa Monica Bay for a number of years. Eating contaminated seafood is the primary pathway through which humans are exposed to toxic chemicals found in the marine environment. While studies have shown that health risks are limited to consumption of certain seafood species from certain locations, the public perception remains that all seafood in the Bay is contaminated (CRWQCB, 1997).

The most extensively studied contaminants in Santa Monica Bay are dichlorodiphenyltrichloroethane (DDT), polychlorinated biphenyls (PCBs), heavy metals, and their by-products. PCBs and DDT (and its derivatives DDD and DDE) present the greatest risk to individuals who consume seafood from Santa Monica Bay. Over the past 25 years, several species from contaminated areas have exhibited very high levels of PCBs and DDTs. After the discharge of these chemicals was stopped in the early 1970s, contaminant levels in fish tissues declined steeply, but additional decreases have been slower since about 1992. However, both PCBs and DDT degrade naturally at a very slow rate and the earlier sharp decline may have been reflective of the cessation of discharges and reduced bioavailability, while continued evidence of contamination today is a reflection of the slow degradation rate (CRWQCB, 1997).

A series of studies were conducted by the State Office of Environmental Health Hazard Assessment (OEHHA) and the SMBRP to assess the potential risk to humans associated with consumption of seafood species taken from the Bay. According to OEHHA's risk assessment, white croaker is generally considered to be the most contaminated fish in the Bay, especially individuals from areas such as the Palos Verdes Shelf (white croaker have naturally high lipid levels in which the organic pollutants accumulate). Other species found to be relatively contaminated at certain locations are California corbina, queenfish, surfperches and California scorpionfish (CRWQCB, 1997). The 1991 OEHHA study has been supplemented and updated by more recent SMBRP studies as well as by the Palos Verdes Shelf Superfund studies which has led to an updated health advisory by OEHHA released in 2009 which is discussed elsewhere in this document (OEHHA website).

General Improvement Strategies

- **Address consumption of contaminated fish** Implement the Fish Contamination Education Collaborative (FCEC) which is the public outreach and education component of the USEPA's program to protect the most vulnerable populations from the health effects of consuming contaminated fish related to the Palos Verdes Shelf Superfund Site. FCEC is a major part of USEPA's Institutional Controls program and works in conjunction with monitoring and enforcement efforts. More information on the FCEC can be found at http://www.pvsfish.org/.

- **Remediate contaminated sediments** USEPA signed an interim Record of Decision in September 2009 that selects a cleanup remedy for Palos Verdes Shelf. The selected remedy has three components: placing a cover of clean silty sand over the portion of the contaminated sediment deposit that has the highest contaminant surface concentrations and appears to be erosive; monitoring the natural recovery that is occurring in other areas of the Shelf; and continuing the Institutional Controls program that uses outreach and education, enforcement and monitoring to minimize consumption of fish that contain DDTs and PCBs. More information can be found at http://www.epa.gov/region09/superfund/pvshelf/.

- **Develop TMDLs** Specifically, develop TMDLs for the coastal waters impairments based on the fish consumption advisory for DDT and PCBs. These TMDLs are under development by USEPA.

Consumption of Inland Fish

The State Water Resources Control Board's Surface Water Ambient Monitoring Program (SWAMP) released a technical report in 2009 which presented results from the first year of a two-year screening survey of the potential for human exposure and health risks from consuming contaminated sport fish from California lakes and reservoirs. This effort begins a new long-term, statewide, comprehensive bioaccumulation monitoring program for California surface waters. The results presented in this report provide a preliminary assessment of the statewide scope of the bioaccumulation problem in California lakes and reservoirs. The report also provides lake-specific information that can be used to establish priorities for cleanup actions, and identifies lakes where additional sampling may be needed to support fish consumption advisories (Davis, et al., 2009). A number of lakes in this WMA were sampled. Results from two of the pollutants of most concern, PCBs and mercury (the latter shown with the locations of historic gold mines, a potential source for mercury), are shown in the figures below.

Figure 10

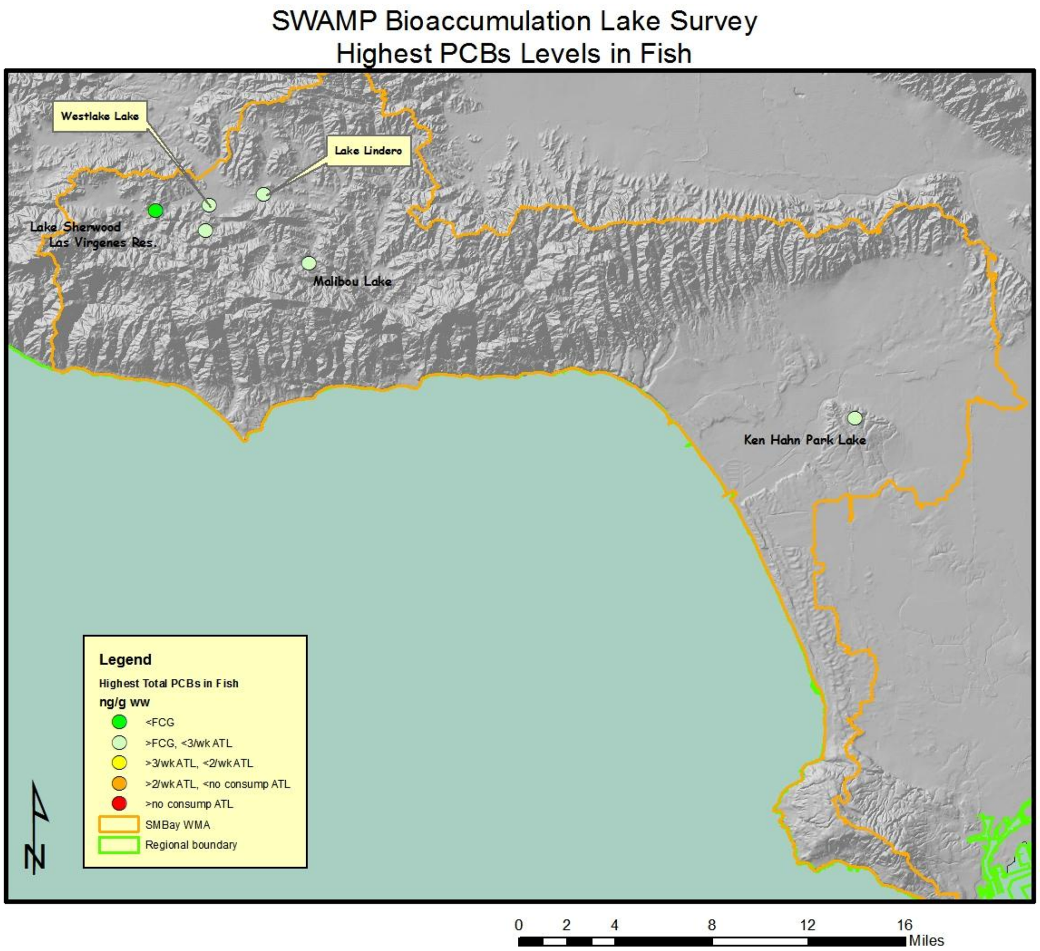
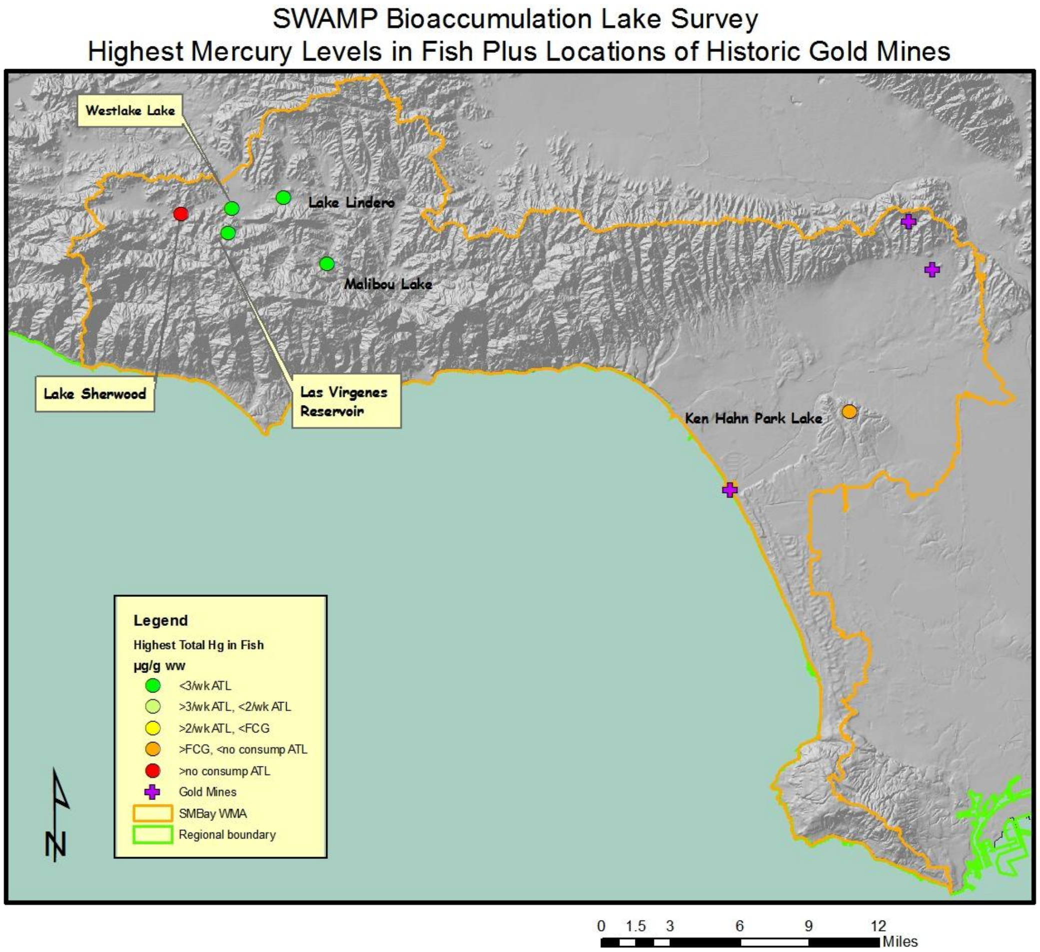


Figure 11



Fish provide unique nutritional benefits while also serving as a significant exposure pathway for several chemicals of concern. Fish Contaminant Goals (FCGs) are estimates of contaminant levels in fish that pose no significant health risk to individuals consuming sport fish at a standard consumption rate of eight ounces per week (32 g/day), prior to cooking, over a lifetime and can provide a starting point for the California Office of Environmental Health Hazard Assessment (OEHHA) to assist other agencies that wish to develop fish tissue-based criteria with a goal toward pollution mitigation or elimination. FCGs prevent consumers from being exposed to more than the daily reference dose for non-carcinogens or to a risk level greater than 1x10-6 for carcinogens (not more than one additional cancer case in a population of 1,000,000 people consuming fish at the given consumption rate over a lifetime). FCGs are based solely on public health considerations without regard to economic considerations, technical feasibility, or the counterbalancing benefits of fish consumption (Klasing and Brodberg, 2008).

Advisory Tissue Levels (ATLs), while still conferring no significant health risk to individuals consuming sport fish in the quantities shown over a lifetime, were developed by OEHHA with the recognition that there are unique health benefits associated with fish consumption and that the advisory process should be expanded beyond conveying simple risk in order to best promote the overall health of the fish consumer. ATLs provide a number of recommended fish servings that correspond to the range of contaminant concentrations found in fish and are used to provide consumption advice to prevent consumers from being exposed to more than the average daily reference dose for non-carcinogens or to a risk level greater than 1x10-4 for carcinogens (not more than one additional cancer case in a population of 10,000 people consuming fish at the given consumption rate over a lifetime). ATLs are designed to encourage consumption of fish that can be eaten in quantities likely to provide significant health benefits, while discouraging consumption of fish that, because of contaminant concentrations, should not be eaten or cannot be eaten in amounts recommended for improving overall health (eight ounces total, prior to cooking, per week). ATLs are one of the criteria that will be used by OEHHA for issuing fish consumption guidelines (Klasing and Brodberg, 2008).

The figures above indicate there is relatively little risk from PCBs in fish caught from the WMA's lakes but some caution needs to be exercised with regards to mercury in fish at Lake Sherwood and at Ken Hahn Park Lake. The figures show the worst-case results from several species collected and analyzed; large-mouth bass by far accumulated the most mercury while other species showed much lower concentrations.

The Southern California Coastal Water Research Project produced a report in 2008 which presented the results of a study into the extent of fishing and fish consumption by fishers in Ventura and Los Angeles County Watersheds in 2005 (Allen et al., 2008). Surveyed sites included both lakes and streams. There were relatively few fishers at Lake Sherwood, a private lake; it was unknown how many consumed fish that were caught. Many more fishers were seen at Ken Hahn Park Lake but only about a quarter of those were interviewed about consumption; most of those interviewed consumed the fish they caught.

General Improvement Strategy

- **Develop TMDLs** Specifically, develop TMDLs for those lakes listed as impaired for fish consumption, namely, Lake Sherwood. Development of these TMDLs by USEPA is underway.

HABITAT DEGRADATION AND WILDLIFE IMPACTS

Human activities such as farming, urbanization, and commercial and industrial development, have significantly changed or degraded the watershed's habitats since the era of Spanish missions and ranchos. The natural habitats have either disappeared or been reduced to a great degree to make space for man-made structures, and/or the flora and fauna have been degraded or altered by pollution, the encroachment of non-native species, or overharvesting. Water temperature changes brought on by El Nino events as well as by releases of pollutants following earthquakes and fires have also contributed to changes in the watershed's ecological community (CRWQCB, 1997).

Marine Habitats

One of the impacts most evident in marine habitats is sediment contamination, which also biologically affects the food web. Contaminant release may occur through natural sediment dynamics, or through disturbance of the sediment, e.g., following vigorous winter storms. Organic compounds such as DDT, PCBs, polynuclear aromatic hydrocarbons (PAHs), and tributyltin (TBT) are found in sediments in concentrations that are harmful to marine organisms at various locations in the Bay. Also found in Bay sediments are heavy metals such as cadmium, copper, chromium, nickel, silver, zinc, and lead. The major historic sources of sediment contamination have been wastewater treatment facilities, thus the accumulations are highest near treatment plant outfalls off of Palos Verdes and Playa del Rey (CRWQCB, 1997).

Bioaccumulation of DDT in white croaker, Dover sole, and California brown pelicans are well-known examples of the impacts caused by sediment contamination. Prior to the 1980s, high concentrations of DDT were found in muscle tissues and/or eggshells of these organisms. DDT in these organisms are implicated in fin erosion and other diseases in fish as well as eggshell thinning and subsequent species decline in the California brown pelican (CRWQCB, 1997).

In addition to tissue damage to individuals caused by contaminated sediment, the health of benthic communities has been affected by discharge of solids and contaminants by wastewater treatment plants. The assemblages of benthic fauna found in areas impacted by historical discharges (pre-1987) near the outfalls have relatively lower diversity compared with other areas in the Bay, and are dominated by several opportunistic species (CRWQCB, 1997).

While areas with high levels of contamination from DDT, PCBs, and lead still remain, the top layer of sediment over most of the Bay is now much cleaner than it was in the 1970s. Banning the use of the most toxic chemicals (DDT and PCBs in the 1970s), initiation of wastewater pretreatment programs (in the 1970s), and improved treatment technology have all contributed to this improvement. Since the early 1980s, contaminant concentrations both in sediment and in the tissues of organisms continue to decrease, though at a much slower rate (CRWQCB, 1997).

The Marine Life Protection Act (MLPA) Initiative is a public-private partnership designed to help the State of California implement the MLPA using the best readily available science. The MLPA requires the state to redesign existing state marine protected areas (MPAs), and to establish a cohesive network of MPAs to protect, among other things, marine life, habitats, and ecosystems such as those described above. More information may be found at http://www.dfg.ca.gov/mlpa (CDFG website).

According to the 2010 State of the Bay report, most of the soft bottom habitat can now be considered in fair to excellent condition because it supports healthy benthic infaunal communities similar to those present within reference areas (except for in the sediments around the JWPCP outfall on the Palos Verdes Shelf). The condition of nearshore rocky reef habitat varies greatly from location to location and ranges from critical to fair condition with some sign of improvement. The recovery of kelp canopy has been considerable but its current extent is still less than 25% of the highs recorded one hundred years ago. Rocky reefs considered in critical condition are those off the southeast end of Malibu and near the Portuguese Bend landslide on Palos Verdes, both of which have been affected by excessive sedimentation. The open ocean, or pelagic, habitat is the most extensive habitat in the Bay; its condition is considered fair to good based on limited data from studies of algal blooms, phytoplankton and zooplankton, fish and mammal assemblage and population, contaminant burdens, and commercial and sportfish catch efforts. Offshore areas appear in better shape than nearshore areas due to distance from human activities (SMBRC, 2010).

General Improvement Strategies

- **Implement the Marine Life Protection Act** The State is in the process of accomplishing this.
- **Remediate contaminated sediments** USEPA signed an interim Record of Decision in September 2009 that selects a cleanup remedy for Palos Verdes Shelf. The selected remedy has three components: placing a cover of clean silty sand over the portion of the contaminated sediment deposit that has the highest contaminant surface concentrations and appears to be erosive; monitoring the natural recovery that is occurring in other areas of the Shelf; and continuing the Institutional Controls program that uses outreach and education, enforcement and monitoring to minimize consumption of fish that contain DDTs and PCBs. More information can be found at http://www.epa.gov/region09/superfund/pvshelf/.
- **Develop TMDLs** Specifically, develop TMDLs for the Santa Monica Bay nearshore and offshore impairments of sediment toxicity and DDTs/PCBs in sediment and fish tissue. Development of these TMDLs by USEPA is underway.

Beach and Intertidal Habitats

Prior to development, the coast between Santa Monica and the Palos Verdes Peninsula consisted primarily of sand dunes and sandy beaches which shifted due to the action of air and water currents. The process of urban development over the years has greatly reduced the size of these dunes and beaches at many locations due to jetties and other man-made structures which increase beach erosion and interfere with sediment transport (CRWQCB, 1997).

Certain species are of particular concern specifically because of the loss or degradation of southern California beach habitat. These include the endangered California least tern, El Segundo blue butterfly and Western snowy plover. Oil spills are also a potential threat to beaches and intertidal habitats, especially to such species as the California grunion, which lays its eggs on sandy beaches. With intense and increasing human use of the beaches and waters of Santa Monica Bay, both trash and the need for beach clean-up have increased. In addition, beaches and rocky intertidal habitats are vulnerable to the contaminants often contained in urban runoff. Filter-feeding intertidal organisms have a particularly high potential for bioaccumulating toxic organic compounds or trace metals. This is demonstrated by the fact that elevated levels of trace metals such as lead and chromium have been found in the tissues of California mussels near Marina del Rey (CRWQCB, 1997).

The 2010 State of the Bay report states that most of the rocky intertidal habitats are considered to be in poor condition with only a few areas, such as Inspiration Point on the Palos Verdes Peninsula, being in fair condition. The poor condition determination is based on a dramatic decline in the population of rocky intertidal organisms and evidence of decreased biodiversity, percentage of plant cover, organism size, and density of species such as octopi and sea hares. The conditions of sandy beach habitats range from poor to fair depending on location and level of manipulation, such as beach grooming, beachfront development, beach infrastructure, and storm drain inputs. Santa Monica Bay beaches are managed primarily for recreation and human safety rather than for value as habitat. The coastal dunes and bluffs along the Bay and on the Palos Verdes Peninsula are considered to be in poor condition due to severe degradation from invasive plants, coastal development, and erosion. The largest remaining contiguous habitat, located near Los Angeles

International Airport, is considered in good condition, largely due to greatly restricted access to the public; a population of the El Segundo blue butterfly persists there (SMBRC, 2010).

General Improvement Strategies

Implement TMDLs Adopted toxics TMDLs include Ballona Creek Metals (2005), Ballona Creek Estuary Toxic Pollutants (2005), and Marina del Rey Harbor Toxics (2006). Implementation plans, where available, and other information for these are available on the Regional Board website as follows:

Ballona Creek Metals

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_28_2005-007_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_60_2007-015_td.shtml

Ballona Creek Estuary Toxic Pollutants

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_29_2005-008_td.shtml

Marina del Rey Harbor Toxics

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_32_2005-012_td.shtml

Malibu Creek Trash

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_63_2008-007_td.shtml

Ballona Creek Trash

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_7_2001-014_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_25_2004-023_td.shtml

Santa Monica Bay Marine Debris

http://63.199.216.6/larwqcb_new/bpa/docs/R10-010/R10-010_RB_RSL.pdf

http://63.199.216.6/larwqcb_new/bpa/docs/R10-010/R10-010_RB_BPA.pdf

Implement species recovery plans Particularly related to dunes and beaches habitats are recovery plans for the El Segundo blue butterfly and the California least tern. Five-year reviews of the recovery plans can be found at http://www.fws.gov/cno/es/California%20least%20tern%205-year%20review.FINAL.pdf

(California least tern) and http://ecos.fws.gov/docs/five_year_review/doc1896.pdf (El Segundo blue butterfly).

Implement beach bluff restoration master plan As described in the 2010 State of Bay report, 38 acres of potential sites in the South Bay area have been identified (SMBRC, 2010).

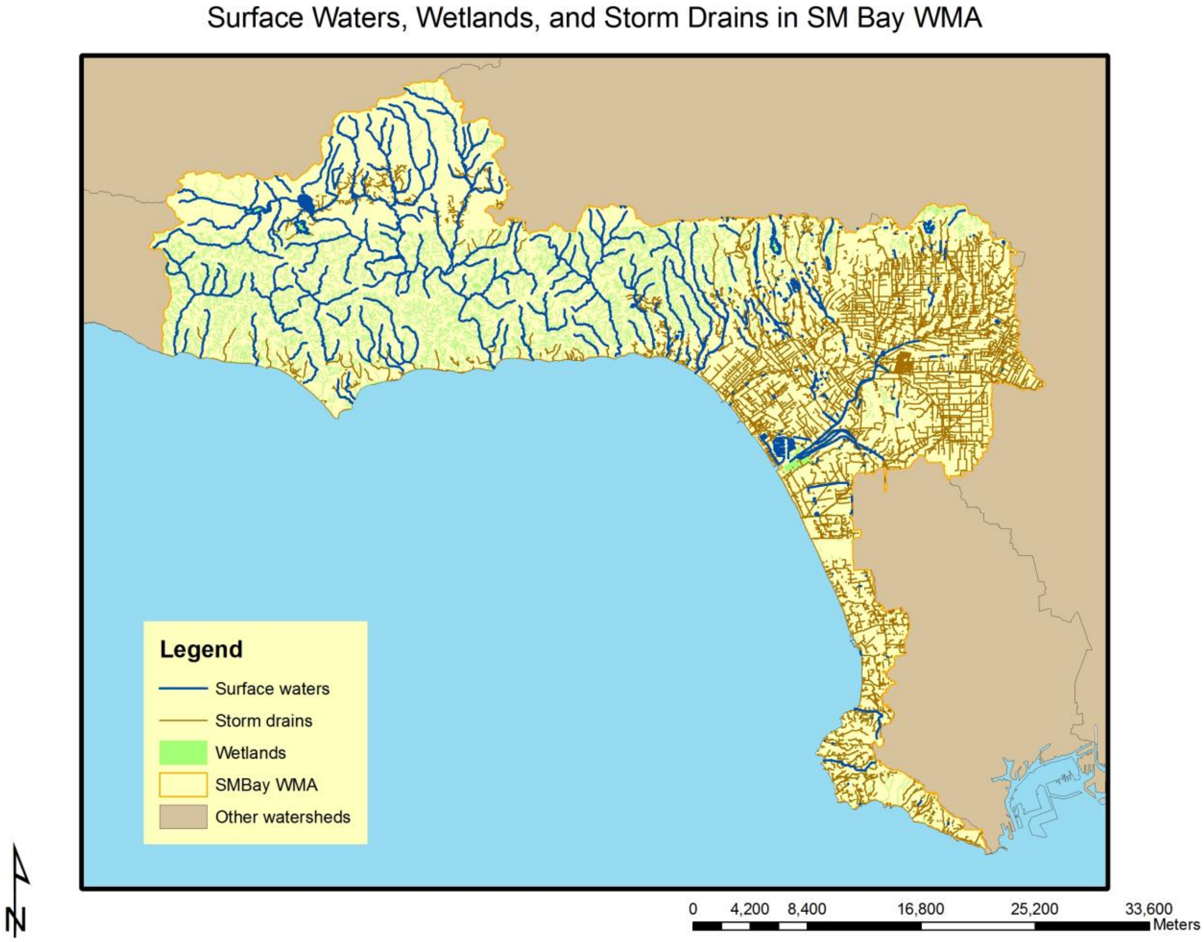
Coastal Wetlands and Riparian Habitats

Wetlands in southern California include freshwater, saltwater and brackish water marshes, swamps and mud flats. Wetlands help mitigate flooding, filter and recharge groundwater, and provide feeding and breeding habitat for fish and waterfowl. Urbanization has had a significant impact on the riparian and wetland resources of the watershed, primarily through filling, alteration of flows, and decrease in water quality. It is estimated that 90% of the historic wetlands of the Santa Monica Bay watershed have been eliminated, with the remaining wetlands significantly degraded (CRWQCB, 1997).

A number of brackish wetlands occur along the edge of Santa Monica Bay; the largest are the Ballona Wetlands Complex (Ballona Wetlands, Ballona Lagoon, Del Rey Lagoon, Oxford Flood Control Basin, and Venice Canals) and Malibu Lagoon. At one time, the Ballona Complex was 2,100 acres of coastal estuary and wetlands. But due to the development of Marina del Rey, the Venice canals, and other residential and commercial properties, as well as the drainage of wetlands for agricultural use and to control insects, and finally, channelization of Ballona Creek, the Ballona Complex had been reduced to approximately 430 acres until a recent acquisition by the State increased it to 600 acres. The site is a mixture of habitats dominated by coastal salt marsh. The 16-acre Ballona Lagoon is an artificially confined tidal channel that connects the Venice Canals to the Pacific Ocean. The 40-acre Malibu Lagoon, at the mouth of Malibu Creek, is also a remnant of a large system (CRWQCB, 1997).

The map below, utilizing a mix of draft and final wetlands data from the National Wetlands Inventory and a recent effort by the State to map coastal wetlands (not mapped for regulatory purposes), shows the much more extensive networks of wetlands remaining within the northern Santa Monica Bay area as compared to the more urbanized southern Santa Monica Bay watersheds. It also shows the dense network of storm drains which have replaced many of the wetlands in the southern Santa Monica Bay area.

Figure 12



The shrinking local wetlands support less biological diversity and are less productive because of their degraded condition. Restricted water flow, which results in poor water quality (high levels of nutrients and/or contaminants), and the actual loss of wetlands are major concerns at most sites. Additional adverse impacts include the lack of shallow water habitat, disruption of upstream flow, introduction of non-native plants and animals, debris and bacteria from urban runoff, and recreational over-use (CRWQCB, 1997).

The 2010 State of the Bay report describes the status of various habitat types and states the condition of the Bay's remaining coastal wetlands and lagoons is poor due to poor tidal exchange, polluted runoff, and the presence of invasive plants and animals; the one exception is considered to be Zuma Lagoon which is in good condition after completion of a restoration project. The report also states that the condition of most of the streams in coastal plain of the WMA is considered to be critical to poor due to the complete or nearly complete loss of their ecological functions, for instance, the almost complete channelization of the Ballona Creek and its tributaries. In the Santa Monica Mountains, streams such as Arroyo Sequit, Cold Creek, and Solstice Creek remain in relatively natural states and their condition is considered to be good to excellent. However, in the rest of the WMA, many streams can only be considered in fair to poor condition due to water quality problems, impacts from non-native species, and disruptions to natural stream flows (SMBRC, 2010).

General Improvement Strategies

Implement TMDLs Adopted toxics TMDLs which may affect wetlands include Ballona Creek Metals (2005), Ballona Creek Estuary Toxic Pollutants (2005), and Marina del Rey Harbor Toxics (2006). Implementation plans, where available, and other information for these are available on the Regional Board website as follows:

Ballona Creek Metals

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_28_2005-007_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_60_2007-015_td.shtml

Ballona Creek Estuary Toxic Pollutants

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_29_2005-008_td.shtml

Marina del Rey Harbor Toxics

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_32_2005-012_td.shtml

Implement the Bay Restoration Plan recommendations and the Wetlands Recovery Project's Regional Strategy The strategy for improving the WMA's wetlands focuses on restoration of priority wetlands and employs a local approach to improving protection. The restoration of the Ballona Wetlands is one of the highest priorities of both the Bay Restoration Commission and the Wetlands Recovery Project. Strategies on restoration, protection, and management of wetlands listed in the Bay Restoration Plan and Wetlands Recovery Project Regional Strategy include:

- Preserve and restore coastal wetland ecosystems
- Preserve and restore stream corridors and wetland ecosystems in coastal watersheds
- Recover native habitat and species diversity
- Integrate wetlands recovery with other public objectives
- Promote education and compatible access related to coastal wetlands and watersheds
- Advance the science of wetlands restoration and management in Southern California
- Protect existing wetlands through improved local regulations and policies.
- Enhance inter-agency coordination.
- Acquire private-owned wetlands.

- Ensure long-term management and monitoring for wetlands.
- Develop and implement a long-term education program focusing on wetlands (CRWQCB, 1997; SMBRC, 2010; SCWRP website #1).

Review applications for 401 water quality certifications The strategy for improving the WMA's wetlands focuses on protection of beneficial uses and implementation of appropriate monitoring. Specific activities include:

- Review of 401 water quality certification applications
- Evaluation of cumulative impacts from dredge and fill activities
- Oversight of compensatory mitigation
- Oversight of 401-certified activities

Upland Habitats

While most of the upland habitat in the coastal plain area of the WMA is now in an urbanized state, a much greater portion of the remaining upland habitat in the Santa Monica Mountains area is in public or non-profit ownership. Acquisition of parcels for their habitat or passive recreational value continues; for instance, the Santa Monica Mountains Conservancy works together with many government and nonprofit agencies to achieve the mutual goal of an interlinking network of parks, trails, and open space for public use and wildlife habitat surrounding the metropolitan areas of Los Angeles and Ventura Counties. The Conservancy works together with the National Park Service and the California Department of Recreation and Parks to cooperatively acquire and manage the parks in the Santa Monica Mountains National Recreation Area (SMMC website).

General Improvement Strategy

Implement the Wetlands Recovery Project's Regional Strategy The strategy for improving the WMA's wetlands includes recognition of the need for buffer areas between coastal wetlands and developed lands.

ASSESSING WATER QUALITY

The watershed's identified problems can be categorized in general as those caused by excessive pollutant loads and those caused by loss of sensitive habitats. Monitoring and special studies conducted over the years by the SMBRC, the Regional Board, dischargers, researchers, and citizen groups have mostly been geared toward evaluating problems associated with pollutants and contaminants although in recent years an increased emphasis on monitoring habitat quality has begun. This section concentrates on that aspect of the watershed's problems (CRWQCB, 1997).

Pollutant loading is the generation and dispersal of pollutants into the environment; a byproduct of the millions of people who reside or undertake activities in the Santa Monica Bay watershed. Pollutant loads have contributed to the impairment of beneficial uses of the Bay watershed. The SMBRP (now SMBRC) spent eight years participating in a multi-agency/stakeholder process which led to identifying the watershed's priority problems and the nineteen constituents that are identified as "pollutants of concern," as well as how these pollutants affect beneficial uses; these were presented in the ***1995 Bay Restoration Plan***. The nineteen pollutants of concern were identified because they presented the greatest problems to the Bay. Specifically, these pollutants met one of the following three criteria:

- Current loadings or historic deposits of the pollutant are impacting the beneficial uses in the watershed.
- Elevated levels of the pollutant are found in sediments of waterbodies in the watershed, or the pollutants have the potential to bioaccumulate.
- The detectable inputs of the pollutant are at a level high enough to be considered potentially toxic to humans and aquatic/marine life (CRWQCB, 1997).

The nineteen pollutants of concern identified were: DDT, PCBs, PAHs, chlordane, tributyltin (TBT), cadmium, chromium, copper, lead, nickel, silver, zinc, bacteria/viruses, total suspended solids, nutrients, trash, chlorine, oxygen demand, and oil & grease. It is important to recognize that not all pollutants of concern are applicable throughout the Bay and its watersheds. In many cases, the sources and the receiving water areas impacted by pollutant loading are restricted to a specific area of the region, as discussed in subsequent sections (CRWQCB, 1997).

Of these pollutants of concern, the organic pollutants DDT, PCBs, PAHs, and chlordane have the highest potential to bioaccumulate in living tissue and accumulate in sediments. The attributes of these chemicals are such that they are hydrophobic (do not mix well in water) and will adsorb onto particles that settle to the bottom or are incorporated into the fatty tissues of organisms living in the water or sediment. People will generally only be at risk should they consistently consume organisms such as fish which may have already bioaccumulated large amounts of these pollutants. DDT, chlordane, and PCBs are manmade chemicals; the first two are banned pesticides while PCBs are a class of chemicals formerly used in hydraulic fluids, paints, and transformers. PAHs are naturally occurring substances found in petroleum hydrocarbons and released through anthropogenic activities such as oil dripping from cars or spills during transport. Storm drains ultimately carry the material to sensitive coastal estuaries or to the ocean. Excessive concentrations of these chemicals in living tissue can lead to problems such as impaired reproduction and pre-cancerous lesions in marine organisms, and may raise the cancer risk in humans who consume these organisms (CRWQCB, 1997).

The metals cadmium, chromium, copper, lead, nickel, silver, and zinc can bioaccumulate in living tissue and accumulate in the sediment, but not to the degree of organic pollutant accumulation. On the other hand, metals can dissolve in the water column to some extent and occur at high enough concentrations to be toxic to aquatic organisms. Thus organisms may be impacted through both bioaccumulation and direct exposure in the sediment and water column. For example, copper is a component of anti-fouling paints applied to boats because it is very toxic to the fouling organisms which would normally attach to any available surface exposed under water. These metals are generally not a human health problem since metals concentrations in fish tissue are generally not high enough to impact humans and the amount of water a person may swallow while swimming is not enough to pose a risk (CRWQCB, 1997).

TBT is an organo-metal previously used extensively in anti-fouling paints. It is highly toxic to aquatic organisms and can be acutely toxic to humans applying the paint without proper safety equipment. It dissolves fairly easily in water but also degrades quickly. It can bioaccumulate in organisms to high concentrations and has been implicated in growth abnormalities in shellfish. Its high toxicity led to a ban in 1987 on its use except on boats of over 82 feet in length or on those with aluminum hulls. The rationale for the length restriction was that most boats moored in the water on a semi-continuous basis were smaller ones and the toxic components of paint leach out during that time (CRWQCB, 1997).

The impacts associated with bacteria and viruses primarily center on human health concerns (CRWQCB, 1997).

Suspended solids can convey organic pollutants to other locations. These solids also create turbidity in the water column and may impact plants such as kelp since light penetration may be reduced. Suspended solids are contributed by urban runoff and discharges from POTWs (CRWQCB, 1997).

Nutrients such as ammonia, nitrates, and phosphates can pose a variety of problems. In the Santa Monica Bay WMA, a major concern is their contribution to excessive growth of algae in streams and enclosed coastal lagoons. Nutrients are both naturally-occurring and produced by anthropogenic activities. Degradation of plant material will contribute nutrients but runoff from over-fertilized lawns and effluent resulting from the treatment of human waste will also contribute. While some algae should be expected, excessive amounts of nutrients added to shallow waters warmed during a summer day can result in a large explosion in algal growth. This growth can be considered a nuisance but may also be harmful if, during algal die-off, oxygen levels drop dramatically and kill fish (CRWQCB, 1997).

Trash is not only an aesthetics problem but poses an aquatic life hazard through consumption or entanglement (CRWQCB, 1997).

Chlorine is a chemical used for disinfection purposes at POTWs and is also used to kill off algae and slime growths in pipes at generating stations and elsewhere. Chlorine can be acutely toxic to aquatic organisms at excessive concentrations (CRWQCB, 1997).

Oxygen demand refers to a situation rather than a specific pollutant. Consumption of oxygen occurs with degradation of organic material such as dead leaves and algae. When this occurs in a water body with little circulation, an excessive demand is put on the available oxygen and fish kills can result. Although not likely to be a problem throughout the Bay, localized problems can occur near large discharge sites and in smaller enclosed receiving waters (CRWQCB, 1997).

Oil & grease is the physical manifestation of PAHs contamination. Usually mufti-colored sheens of oil will appear on the water surface. In most cases, the ultimate fate of the PAHs is of more concern than the sheen, however, if thick enough, oil may coat aquatic life and cause direct injury (CRWQCB, 1997).

The ***2004 State of the Bay Report*** re-evaluated environmental indicators. A diverse panel of environmental professionals chose 27 environmental indicators used in the report. The Bay's health was evaluated in three areas: pollutant loads, health risks to Bay users, and health of the Bay's living resources and habitats. The environmental indicators chosen for each area include:

Pollutant loads

- Mass loads of TSS and trace metals from wastewater treatment facilities
- Mass loads of TSS and trace metals from storm water runoff
- Watershed imperviousness
- Atmospheric input of trace metals
- Mass loading of trash from storm water runoff; trash inputs to the Bay were estimated at 1.4 million tons per year in 2004 (SMBRC, 2004)

Health risks

- Exceedances of bacterial indicator health risk thresholds at Santa Monica Bay beaches during dry and wet seasons
- Annual Average Beach Report Card grades
- Beach closures from sewage spills along the Bay coast
- Muscle tissue concentration of DDT and PCBs in white croaker, kelp bass and other sportfish

Habitats and living resources

- Acreage of protected and specially designated areas in the Bay and the Bay's watersheds
- Concentration of DDTs and trace metals in Bay bottom sediments
- Muscle tissue concentration of DDTs in Dover sole and hornyhead turbot
- Muscle tissue concentration of heavy metals in hornyhead turbot
- Benthic Response Index
- Fish Response Index
- Incidence of fish diseases
- Recreational catch per unit effort for indicator fish species
- Commercial catch per unit effort for indicator fish species
- Size of kelp canopy on Palos Verdes Shelf and along the Malibu Coast
- Available kelp-growing substrates
- Condition (size and density) of target rocky intertidal species
- Condition of grunion runs
- Percentage and acres of open space in the Bay watershed
- Acres of habitats acquired, and/or restored
- Linear miles of riparian habitats restored through non-native removal, fish passage restoration, etc.
- Breeding success of least tern at Venice Beach
- Condition of El Segundo blue butterflies (population and habitat) (SMBRC, 2004)

The SMBRC identified the following priority areas on which to focus resources:

- Achieve zero beach closure due to sewage spills.
- Achieve dry-weather bacteria TMDL limit along Bay beaches.
- Significantly reduce health risks associated with consuming Bay seafood.
- Reduce trash loading to the Bay by 50% by 2006.
- Restore Ballona Wetlands and Malibu Lagoon (SMBRC, 2004)

The ***2008 Update of the Bay Restoration Plan*** noted that significant progress had been made in improving water quality in the WMA. Major milestones accomplished included the upgrade to full secondary treatment by the City of Los Angeles' Hyperion treatment plant, and the County Sanitation Districts of Los Angeles County's Joint Water Pollution Control Plant (JWPCP), the two largest wastewater treatment facilities in the region; the development and implementation of Total Maximum Daily Loads (TMDLs) for waterbodies impaired by poor water quality; and adoption and implementation of the standard urban storm water mitigation plan under the municipal storm water permit (SMBRC, 2009).

The update report stated that despite this progress, significant amounts of pollutants such as trash, pathogens, and heavy metals continue to reach receiving waters. New challenges include addressing the loading and impacts of nutrients and emerging contaminants. Concerted efforts by regulatory and regulated communities are needed to overcome obstacles to further progress and address these new challenges (SMBRC, 2009).

The ***2010 State of the Bay Report*** observed that the pollutants of greatest concern, due to their adverse or potentially adverse impacts on the Bay's beneficial uses, are pathogens, trash, metals, DDT, PCBs, and nutrients. Known impacts of these pollutants include health hazards for humans due to pathogens in the surf zone, aesthetic impacts of trash along the Bay's beaches and streams, and chemical contamination of local fish. The report described the reduction of pollutant loads from wastewater treatment facilities with the greater relative contribution of pollutants through the storm drain system with, in particular, trash, pathogens, metals, and nutrients washing off the urban landscape, into storm drains, and out to the Bay. In addition, historical deposits of toxic pollutants in Bay sediments, such as DDT and PCBs, continue to be released into the environment through biological processes and resuspension, thus contaminating local marine life. Atmospheric deposition, boating activities, and septic systems are also known to contribute to contaminants to the Bay (SMBRC, 2010).

The development and adoption of TMDLs by the Regional Board which serve to assign load reductions needed to prevent impairment of beneficial uses, and their implementation largely through new control measures incorporated into existing National Discharge Elimination System (NPDES) permits was acknowledged. With regards to bacteria for example, the effort began with multiple low-flow diversions to the sanitary sewer at those drains with the most indicator bacteria exceedances. In some cases, year-round diversions have been necessary or installation of disinfection systems (SMBRC, 2010).

Today, impacts from invasive species is a growing concern in this WMA and, in fact, throughout the State. The invasive plant, giant reed, and the invasive animals, crayfish and New Zealand mudsnails, in particular are displacing native biota and degrading habitat (SMBRC, 2010).

California's 2010 Water Quality Assessment – Updating List of Impaired Waters

The State is required to assess the quality of its waters regularly and the results become part of a Water Quality Assessment document produced by the State Water Resources Control Board. Part of that assessment includes updating the State's list of impaired waters (Clean Water Act Section 303(d) list). It should be pointed out that all existing beneficial uses in each waterbody may not have been evaluated due to lack of data.

Surface Waters

The 2010 list of impaired waters indicates impairments of 30 square miles (out of 226 total square miles) of the Santa Monica Bay nearshore and offshore zones due to impacts on aquatic life, fish consumption, and shellfish harvesting. Various beaches are assessed as not supporting body contact recreation. Water quality in some streams within the Malibu subwatershed is impaired by excessive nutrients, bacteria, salts, and in some instances, metals. While natural sources contribute to the problem, nonpoint pollution from human activities is strongly implicated. The quality of the waterways draining more urbanized areas, such as Ballona Creek, is impaired due to a much longer list of pollutants including many metals and organic substances such as DDT and PCBs. Enclosed coastal waterbodies such as Malibu Lagoon are not fully supporting aquatic life, contact recreation, fish consumption, or shellfish harvesting beneficial uses, while many of the watershed's lakes are not supporting contact recreation, aquatic life, or fish consumption beneficial uses. The full report should be consulted for more detailed information (SWRCB website #1).

Table 1. List of Impaired Waters (Clean Water Act Section 303(d)) Approved by USEPA for 2010

Water Quality Limited Segment	Pollutant	TMDL Status	Expected TMDL Completion Date	Completed TMDL
Santa Monica Bay Beaches				
Abalone Cove Beach	DDT (sediment)	TMDL required	1/1/2019	
Abalone Cove Beach	Indicator Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Abalone Cove Beach	PCBs (fish consumption advisory)	TMDL required	1/1/2019	
Amarillo Beach	DDT (fish consumption advisory)	TMDL required	1/1/2019	
Amarillo Beach	PCBs (fish consumption advisory)	TMDL required	1/1/2019	
Big Rock Beach	Coliform Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Big Rock Beach	DDT (fish consumption advisory)	TMDL required	1/1/2019	
Big Rock Beach	PCBs (fish consumption advisory)	TMDL required	1/1/2019	
Bluff Cove Beach	DDT (fish consumption advisory)	TMDL required	1/1/2019	
Bluff Cove Beach	Indicator Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Bluff Cove Beach	PCBs (fish consumption advisory)	TMDL required	1/1/2019	

Water Quality Limited Segment	Pollutant	TMDL Status	Expected TMDL Completion Date	Completed TMDL
Carbon Beach	DDT (fish consumption advisory)	TMDL required	1/1/2019	
Carbon Beach	Indicator Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Carbon Beach	PCBs (fish consumption advisory)	TMDL required	1/1/2019	
Castlerock Beach	DDT (fish consumption advisory)	TMDL required	1/1/2019	
Castlerock Beach	Indicator Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Castlerock Beach	PCBs (fish consumption advisory)	TMDL required	1/1/2019	
Dan Blocker Memorial (Coral) Beach (includes the area of the beach at Latigo Beach and Solstice Canyon)	Coliform Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Dockweiler Beach	Indicator Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Escondido Beach	DDT (fish consumption advisory)	TMDL required	1/1/2021	
Escondido Beach	Indicator Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003

Water Quality Limited Segment	Pollutant	TMDL Status	Expected TMDL Completion Date	Completed TMDL
Escondido Beach	PCBs (fish consumption advisory)	TMDL required	1/1/2019	
Flat Rock Point Beach Area	DDT (fish consumption advisory)	TMDL required	1/1/2019	
Flat Rock Point Beach Area	Indicator Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Flat Rock Point Beach Area	PCBs (fish consumption advisory)	TMDL required	1/1/2019	
Hermosa Beach	Indicator Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Inspiration Point Beach	DDT (fish consumption advisory)	TMDL required	1/1/2019	
Inspiration Point Beach	Indicator Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Inspiration Point Beach	PCBs (fish consumption advisory)	TMDL required	1/1/2019	
La Costa Beach	DDT (fish consumption advisory)	TMDL required	1/1/2019	
La Costa Beach	Indicator Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003

Water Quality Limited Segment	Pollutant	TMDL Status	Expected TMDL Completion Date	Completed TMDL
La Costa Beach	PCBs (fish consumption advisory)	TMDL required	1/1/2019	
Las Flores Beach	Coliform Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Las Flores Beach	DDT (fish consumption advisory)	TMDL required	1/1/2019	
Las Flores Beach	PCBs (fish consumption advisory)	TMDL required	1/1/2019	
Las Tunas Beach	DDT (fish consumption advisory)	TMDL required	1/1/2019	
Las Tunas Beach	Indicator Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Las Tunas Beach	PCBs (fish consumption advisory)	TMDL required	1/1/2019	
Leo Carillo Beach (South of County Line)	Coliform Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Long Point Beach	Coliform Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Long Point Beach	DDT (fish consumption advisory)	TMDL required	1/1/2019	

Water Quality Limited Segment	Pollutant	TMDL Status	Expected TMDL Completion Date	Completed TMDL
Long Point Beach	PCBs (fish consumption advisory)	TMDL required	1/1/2019	
Lunada Bay Beach	Indicator Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Malaga Cove Beach	DDT (fish consumption advisory)	TMDL required	1/1/2019	
Malaga Cove Beach	Indicator Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Malaga Cove Beach	PCBs (fish consumption advisory)	TMDL required	1/1/2019	
Malibu Beach	DDT (fish consumption advisory)	TMDL required	1/1/2019	
Malibu Beach	Indicator Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Malibu Lagoon Beach (Surfrider)	Coliform Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Malibu Lagoon Beach (Surfrider)	DDT (fish consumption advisory)	TMDL required	1/1/2019	
Malibu Lagoon Beach (Surfrider)	PCBs (fish consumption advisory)	TMDL required	1/1/2019	

Water Quality Limited Segment	Pollutant	TMDL Status	Expected TMDL Completion Date	Completed TMDL
Manhattan Beach	Indicator Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Nicholas Canyon Beach	DDT (fish consumption advisory)	TMDL required	1/1/2019	
Nicholas Canyon Beach	Indicator Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Nicholas Canyon Beach	PCBs (fish consumption advisory)	TMDL required	1/1/2019	
Palo Verde Shoreline Park Beach	Pathogens	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Palo Verde Shoreline Park Beach	Pesticides	TMDL required	1/1/2019	
Paradise Cove Beach	DDT (fish consumption advisory)	TMDL required	1/1/2019	
Paradise Cove Beach	Fecal Coliform	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Paradise Cove Beach	PCBs (fish consumption advisory)	TMDL required	1/1/2019	
Point Dume Beach	DDT (fish consumption advisory)	TMDL required	1/1/2019	

Water Quality Limited Segment	Pollutant	TMDL Status	Expected TMDL Completion Date	Completed TMDL
Point Dume Beach	Indicator Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Point Dume Beach	PCBs (fish consumption advisory)	TMDL required	1/1/2019	
Point Fermin Park Beach	DDT (fish consumption advisory)	TMDL required	1/1/2019	
Point Fermin Park Beach	PCBs (fish consumption advisory)	TMDL required	1/1/2019	
Point Fermin Park Beach	Total Coliform	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Point Vicente Beach	Indicator Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Portuguese Bend Beach	DDT (fish consumption advisory)	TMDL required	1/1/2019	
Portuguese Bend Beach	Indicator Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Portuguese Bend Beach	PCBs (fish consumption advisory)	TMDL required	1/1/2019	
Puerco Beach	DDT (fish consumption advisory)	TMDL required	1/1/2019	

Water Quality Limited Segment	Pollutant	TMDL Status	Expected TMDL Completion Date	Completed TMDL
Puerco Beach	Indicator Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Puerco Beach	PCBs (fish consumption advisory)	TMDL required	1/1/2019	
Redondo Beach	Coliform Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Redondo Beach	DDT (fish consumption advisory)	TMDL required	1/1/2019	
Redondo Beach	PCBs (fish consumption advisory)	TMDL required	1/1/2019	
Resort Point Beach	Indicator Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Robert H. Meyer Memorial Beach	Beach Closures	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Robert H. Meyer Memorial Beach	DDT (fish consumption advisory)	TMDL required	1/1/2019	
Robert H. Meyer Memorial Beach	PCBs (fish consumption advisory)	TMDL required	1/1/2019	
Royal Palms Beach	DDT (fish consumption advisory)	TMDL required	1/1/2019	

Water Quality Limited Segment	**Pollutant**	**TMDL Status**	**Expected TMDL Completion Date**	**Completed TMDL**
Royal Palms Beach	Indicator Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Royal Palms Beach	PCBs (fish consumption advisory)	TMDL required	1/1/2019	
Santa Monica Beach	Indicator Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Sea Level Beach	DDT (fish consumption advisory)	TMDL required	1/1/2019	
Sea Level Beach	Indicator Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Sea Level Beach	PCBs (fish consumption advisory)	TMDL required	1/1/2019	
Topanga Beach	Coliform Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Topanga Beach	DDT (fish consumption advisory)	TMDL required	1/1/2019	
Topanga Beach	PCBs (fish consumption advisory)	TMDL required	1/1/2019	
Torrance Beach	Coliform Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003

Water Quality Limited Segment	Pollutant	TMDL Status	Expected TMDL Completion Date	Completed TMDL
Trancas Beach (Broad Beach)	DDT (fish consumption advisory)	TMDL required	1/1/2019	
Trancas Beach (Broad Beach)	Fecal Coliform	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Trancas Beach (Broad Beach)	PCBs (fish consumption advisory)	TMDL required	1/1/2019	
Venice Beach	Indicator Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Whites Point Beach	DDT (fish consumption advisory)	TMDL required	1/1/2019	
Whites Point Beach	Indicator Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Whites Point Beach	PCBs (fish consumption advisory)	TMDL required	1/1/2019	
Will Rogers Beach	Indicator Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Zuma Beach (Westward Beach)	DDT (fish consumption advisory)	TMDL required	1/1/2019	
Zuma Beach (Westward Beach)	Indicator Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003

Water Quality Limited Segment	Pollutant	TMDL Status	Expected TMDL Completion Date	Completed TMDL
Zuma Beach (Westward Beach)	PCBs (fish consumption advisory)	TMDL required	1/1/2019	
Ballona Creek Subwatershed				
Ballona Creek	Cadmium (sediment) (a USEPA-approved TMDL has made a finding of non-impairment for this pollutant)	TMDL completed		Ballona Creek Metals TMDL, 2008
Ballona Creek	Coliform Bacteria	TMDL completed		Ballona Creek, Ballona Estuary, and Sepulveda Channel Bacteria TMDL, 2007
Ballona Creek	Copper, Dissolved	TMDL completed		Ballona Creek Metals TMDL, 2008
Ballona Creek	Cyanide	TMDL required	1/1/2019	
Ballona Creek	Lead	TMDL completed		Ballona Creek Metals TMDL, 2008
Ballona Creek	Selenium	TMDL completed		Ballona Creek Metals TMDL, 2008
Ballona Creek	Toxicity	TMDL completed		Ballona Creek Metals TMDL, 2008
Ballona Creek	Trash	TMDL completed		Ballona Creek and Wetlands Trash TMDL; 2002, 2005
Ballona Creek	Viruses (enteric)	TMDL completed		Ballona Creek, Ballona Estuary, and Sepulveda Channel Bacteria TMDL, 2007
Ballona Creek	Zinc	TMDL completed		Ballona Creek Metals TMDL, 2008

Water Quality Limited Segment	Pollutant	TMDL Status	Expected TMDL Completion Date	Completed TMDL
Ballona Creek Estuary	Cadmium	TMDL completed		Ballona Creek Estuary Toxic Pollutants TMDL, 2006
Ballona Creek Estuary	Chlordane (tissue & sediment)	TMDL completed		Ballona Creek Estuary Toxic Pollutants TMDL, 2006
Ballona Creek Estuary	Coliform Bacteria	TMDL completed		Ballona Creek, Ballona Estuary, and Sepulveda Channel Bacteria TMDL, 2007
Ballona Creek Estuary	Copper	TMDL completed		Ballona Creek Estuary Toxic Pollutants TMDL, 2006
Ballona Creek Estuary	DDT (tissue & sediment)	TMDL completed		Ballona Creek Estuary Toxic Pollutants TMDL, 2006
Ballona Creek Estuary	Lead (sediment)	TMDL completed		Ballona Creek Estuary Toxic Pollutants TMDL, 2006
Ballona Creek Estuary	PAHs (Polycyclic Aromatic Hydrocarbons) (sediment)	TMDL completed		Ballona Creek Estuary Toxic Pollutants TMDL, 2006
Ballona Creek Estuary	PCBs (tissue & sediment)	TMDL completed		Ballona Creek Estuary Toxic Pollutants TMDL, 2006
Ballona Creek Estuary	Sediment Toxicity	TMDL completed		Ballona Creek Estuary Toxic Pollutants TMDL, 2006
Ballona Creek Estuary	Shellfish Harvesting Advisory	TMDL required	1/1/2006	
Ballona Creek Estuary	Silver	TMDL completed		Ballona Creek Estuary Toxic Pollutants TMDL, 2006

Water Quality Limited Segment	Pollutant	TMDL Status	Expected TMDL Completion Date	Completed TMDL
Ballona Creek Estuary	Zinc (sediment)	TMDL completed		Ballona Creek Estuary Toxic Pollutants TMDL, 2006
Ballona Creek Wetlands	Exotic Vegetation	TMDL required	1/1/2019	
Ballona Creek Wetlands	Habitat alterations	TMDL required	1/1/2019	
Ballona Creek Wetlands	Hydromodification	TMDL required	1/1/2019	
Ballona Creek Wetlands	Reduced Tidal Flushing	TMDL required	1/1/2019	
Ballona Creek Wetlands	Trash	TMDL completed		Ballona Creek and Wetlands Trash TMDL; 2002, 2005
Marina del Rey Harbor - Back Basins	Chlordane (tissue & sediment)	TMDL completed		Marina del Rey Harbor Toxics TMDL, 2006
Marina del Rey Harbor - Back Basins	Copper (sediment)	TMDL completed		Marina del Rey Harbor Toxics TMDL, 2006
Marina del Rey Harbor - Back Basins	DDT (tissue) (a USEPA-approved TMDL has made a finding of non-impairment for this pollutant)	TMDL required	1/1/2005	
Marina del Rey Harbor - Back Basins	Dieldrin (tissue) (a USEPA-approved TMDL has made a finding of non-impairment for this pollutant)	TMDL required	1/1/2005	
Marina del Rey Harbor - Back Basins	Fish Consumption Advisory	TMDL completed		Marina del Rey Harbor Toxics TMDL, 2006
Marina del Rey Harbor - Back Basins	Indicator Bacteria	TMDL completed		Marina del Rey Harbor Mothers' Beach and Back Basins Bacteria TMDL, 2004

Water Quality Limited Segment	Pollutant	TMDL Status	Expected TMDL Completion Date	Completed TMDL
Marina del Rey Harbor - Back Basins	Lead (sediment)	TMDL completed		Marina del Rey Harbor Toxics TMDL, 2006
Marina del Rey Harbor - Back Basins	PCBs (tissue & sediment) (shellfish harvesting advisory)	TMDL completed		Marina del Rey Harbor Toxics TMDL, 2006
Marina del Rey Harbor - Back Basins	Sediment Toxicity	TMDL completed		Marina del Rey Harbor Toxics TMDL, 2006
Marina del Rey Harbor - Back Basins	Zinc (sediment)	TMDL completed		Marina del Rey Harbor Toxics TMDL, 2006
Marina del Rey Harbor Beach	Indicator Bacteria	TMDL completed		Marina del Rey Harbor Mothers' Beach and Back Basins Bacteria TMDL, 2004
Malibu Creek Subwatershed				
Lake Lindero	Algae	TMDL completed		Malibu Creek Watershed Nutrients TMDL, 2003 (established by USEPA)
Lake Lindero	Chloride	TMDL required	1/1/2019	
Lake Lindero	Eutrophic	TMDL completed		Malibu Creek Watershed Nutrients TMDL, 2003 (established by USEPA)
Lake Lindero	Odor	TMDL completed		Malibu Creek Watershed Nutrients TMDL, 2003 (established by USEPA)
Lake Lindero	Selenium	TMDL required	1/1/2019	
Lake Lindero	Specific Conductivity	TMDL required	1/1/2019	
Lake Lindero	Trash	TMDL	1/1/2019	

		required		
Water Quality Limited Segment	**Pollutant**	**TMDL Status**	**Expected TMDL Completion Date**	**Completed TMDL**
Lake Sherwood	Algae	TMDL completed		Malibu Creek Watershed Nutrients TMDL, 2003 (established by USEPA)
Lake Sherwood	Ammonia	TMDL completed		Malibu Creek Watershed Nutrients TMDL, 2003 (established by USEPA)
Lake Sherwood	Eutrophic	TMDL completed		Malibu Creek Watershed Nutrients TMDL, 2003 (established by USEPA)
Lake Sherwood	Mercury (tissue)	TMDL required	1/1/2019	
Lake Sherwood	Organic Enrichment/Low Dissolved Oxygen	TMDL completed		Malibu Creek Watershed Nutrients TMDL, 2003 (established by USEPA)
Las Virgenes Creek	Benthic-Macroinvertebrate Bioassessments	TMDL required	1/1/2021	
Las Virgenes Creek	Coliform Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Las Virgenes Creek	Invasive Species	TMDL required	1/1/2021	
Las Virgenes Creek	Nutrients (Algae)	TMDL completed		Malibu Creek Watershed Nutrients TMDL, 2003 (established by USEPA)

Water Quality Limited Segment	Pollutant	TMDL Status	Expected TMDL Completion Date	Completed TMDL
Las Virgenes Creek	Organic Enrichment/Low Dissolved Oxygen	TMDL completed		Malibu Creek Watershed Nutrients TMDL, 2003 (established by USEPA)
Las Virgenes Creek	Scum/Foam-unnatural	TMDL completed		Malibu Creek Watershed Nutrients TMDL, 2003 (established by USEPA)
Las Virgenes Creek	Sedimentation/Siltation	TMDL required	1/1/2019	
Las Virgenes Creek	Selenium	TMDL required	1/1/2019	
Las Virgenes Creek	Trash	TMDL required	1/1/2019	
Lindero Creek Reach 1	Algae	TMDL completed		Malibu Creek Watershed Nutrients TMDL, 2003 (established by USEPA)
Lindero Creek Reach 1	Benthic-Macroinvertebrate Bioassessments	TMDL required	1/1/2021	
Lindero Creek Reach 1	Coliform Bacteria	TMDL completed		Malibu Creek Bacteria TMDL, 2006
Lindero Creek Reach 1	Invasive Species	TMDL required	1/1/2021	
Lindero Creek Reach 1	Scum/Foam-unnatural	TMDL completed		Malibu Creek Watershed Nutrients TMDL, 2003 (established by USEPA)
Lindero Creek Reach 1	Selenium	TMDL required	1/1/2019	
Lindero Creek Reach 1	Trash	TMDL required	1/1/2019	

Water Quality Limited Segment	Pollutant	TMDL Status	Expected TMDL Completion Date	Completed TMDL
Lindero Creek Reach 2 (Above Lake)	Algae	TMDL completed		Malibu Creek Watershed Nutrients TMDL, 2003 (established by USEPA)
Lindero Creek Reach 2 (Above Lake)	Coliform Bacteria	TMDL completed		Malibu Creek Bacteria TMDL, 2006
Lindero Creek Reach 2 (Above Lake)	Scum/Foam-unnatural	TMDL completed		Malibu Creek Watershed Nutrients TMDL, 2003 (established by USEPA)
Lindero Creek Reach 2 (Above Lake)	Selenium	TMDL required	1/1/2019	
Lindero Creek Reach 2 (Above Lake)	Trash	TMDL required	1/1/2019	
Malibou Lake	Algae	TMDL completed		Malibu Creek Watershed Nutrients TMDL, 2003 (established by USEPA)
Malibou Lake	Eutrophic	TMDL completed		Malibu Creek Watershed Nutrients TMDL, 2003 (established by USEPA)
Malibou Lake	Organic Enrichment/Low Dissolved Oxygen	TMDL completed		Malibu Creek Watershed Nutrients TMDL, 2003 (established by USEPA)
Malibu Creek	Benthic-Macroinvertebrate Bioassessments	TMDL required	1/1/2021	
Malibu Creek	Coliform Bacteria	TMDL completed		Malibu Creek Bacteria TMDL, 2006
Malibu Creek	Fish Barriers (Fish Passage)	TMDL required	1/1/2019	

Water Quality Limited Segment	Pollutant	TMDL Status	Expected TMDL Completion Date	Completed TMDL
Malibu Creek	Invasive Species	TMDL required	1/1/2021	
Malibu Creek	Nutrients (Algae)	TMDL completed		Malibu Creek Watershed Nutrients TMDL, 2003 (established by USEPA)
Malibu Creek	Scum/Foam-unnatural	TMDL completed		Malibu Creek Watershed Nutrients TMDL, 2003 (established by USEPA)
Malibu Creek	Sedimentation/Siltation	TMDL required	1/1/2019	
Malibu Creek	Selenium	TMDL required	1/1/2019	
Malibu Creek	Sulfates	TMDL required	1/1/2019	
Malibu Creek	Trash	TMDL completed		Malibu Creek Watershed Trash TMDL, 2009
Malibu Lagoon	Benthic Community Effects	TMDL required	1/1/2011	
Malibu Lagoon	Coliform Bacteria	TMDL completed		Malibu Creek Bacteria TMDL, 2006
Malibu Lagoon	Eutrophic	TMDL completed		Malibu Creek Watershed Nutrients TMDL, 2003 (established by USEPA)
Malibu Lagoon	pH	TMDL required	1/1/2006	
Malibu Lagoon	Swimming Restrictions	TMDL completed		Malibu Creek Bacteria TMDL, 2006
Malibu Lagoon	Viruses (enteric)	TMDL completed		Malibu Creek Bacteria TMDL, 2006

Water Quality Limited Segment	Pollutant	TMDL Status	Expected TMDL Completion Date	Completed TMDL
Medea Creek Reach 1 (Lake to Confl. with Lindero)	Algae	TMDL completed		Malibu Creek Watershed Nutrients TMDL, 2003 (established by USEPA)
Medea Creek Reach 1 (Lake to Confl. with Lindero)	Coliform Bacteria	TMDL completed		Malibu Creek Bacteria TMDL, 2006
Medea Creek Reach 1 (Lake to Confl. with Lindero)	Sedimentation/Siltation	TMDL required	1/1/2019	
Medea Creek Reach 1 (Lake to Confl. with Lindero)	Selenium	TMDL required	1/1/2019	
Medea Creek Reach 1 (Lake to Confl. with Lindero)	Trash	TMDL required	1/1/2019	
Medea Creek Reach 2 (Abv Confl. with Lindero)	Algae	TMDL completed		Malibu Creek Watershed Nutrients TMDL, 2003 (established by USEPA)
Medea Creek Reach 2 (Abv Confl. with Lindero)	Benthic-Macroinvertebrate Bioassessments	TMDL required	1/1/2021	
Medea Creek Reach 2 (Abv Confl. with Lindero)	Coliform Bacteria	TMDL completed		Malibu Creek Bacteria TMDL, 2006
Medea Creek Reach 2 (Abv Confl. with Lindero)	Invasive Species	TMDL required	1/1/2021	
Medea Creek Reach 2 (Abv Confl. with Lindero)	Sedimentation/Siltation	TMDL required	1/1/2019	
Medea Creek Reach 2 (Abv Confl. with Lindero)	Selenium	TMDL required	1/1/2019	
Medea Creek Reach 2 (Abv Confl. with Lindero)	Trash	TMDL required	1/1/2019	
Palo Comado Creek	Coliform Bacteria	TMDL completed		Malibu Creek Bacteria TMDL, 2006
Stokes Creek	Coliform Bacteria	TMDL completed		Malibu Creek Bacteria TMDL, 2006

Water Quality Limited Segment	Pollutant	TMDL Status	Expected TMDL Completion Date	Completed TMDL
Triunfo Canyon Creek Reach 1	Lead	TMDL required	1/1/2019	
Triunfo Canyon Creek Reach 1	Mercury	TMDL required	1/1/2019	
Triunfo Canyon Creek Reach 1	Sedimentation/Siltation	TMDL required	1/1/2019	
Triunfo Canyon Creek Reach 2	Benthic-Macroinvertebrate Bioassessments	TMDL required	1/1/2021	
Triunfo Canyon Creek Reach 2	Lead	TMDL required	1/1/2019	
Triunfo Canyon Creek Reach 2	Mercury	TMDL required	1/1/2019	
Triunfo Canyon Creek Reach 2	Sedimentation/Siltation	TMDL required	1/1/2019	
Westlake Lake	Algae	TMDL completed		Malibu Creek Watershed Nutrients TMDL, 2003 (established by USEPA)
Westlake Lake	Ammonia	TMDL completed		Malibu Creek Watershed Nutrients TMDL, 2003 (established by USEPA)
Westlake Lake	Eutrophic	TMDL completed		Malibu Creek Watershed Nutrients TMDL, 2003 (established by USEPA)
Westlake Lake	Lead	TMDL required	1/1/2019	
Westlake Lake	Organic Enrichment/Low Dissolved Oxygen	TMDL completed		Malibu Creek Watershed Nutrients TMDL, 2003 (established by USEPA)

Water Quality Limited Segment	Pollutant	TMDL Status	Expected TMDL Completion Date	Completed TMDL
Other Areas				
Santa Monica Canyon	Indicator Bacteria	TMDL completed		Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
Santa Monica Canyon	Lead	TMDL required	1/1/2019	
Santa Monica Bay Offshore/Nearshore	DDT (tissue & sediment)	TMDL required	1/1/2019	
Santa Monica Bay Offshore/Nearshore	Debris	TMDL completed		Santa Monica Bay Nearshore and Offshore Debris TMDL, 2010
Santa Monica Bay Offshore/Nearshore	Fish Consumption Advisory (due to DDT and PCBs)	TMDL required	1/1/2019	
Santa Monica Bay Offshore/Nearshore	PCBs (tissue & sediment)	TMDL required	1/1/2019	
Santa Monica Bay Offshore/Nearshore	Sediment Toxicity	TMDL required	1/1/2019	
Sepulveda Canyon	Ammonia	TMDL required	1/1/2019	
Sepulveda Canyon	Copper	TMDL completed		Ballona Creek Metals TMDL, 2008
Sepulveda Canyon	Indicator Bacteria	TMDL completed		Ballona Creek, Ballona Estuary, and Sepulveda Channel Bacteria TMDL, 2007
Sepulveda Canyon	Lead	TMDL completed		Ballona Creek Metals TMDL, 2008
Sepulveda Canyon	Selenium	TMDL completed		Ballona Creek Metals TMDL, 2008
Sepulveda Canyon	Zinc	TMDL completed		Ballona Creek Metals TMDL, 2008

Water Quality Limited Segment	Pollutant	TMDL Status	Expected TMDL Completion Date	Completed TMDL
Solstice Canyon Creek	Invasive Species	TMDL required	1/1/2021	
Topanga Canyon Creek	Lead	TMDL required	1/1/2019	

Groundwaters

Groundwater accounts for only a limited portion of the Santa Monica Bay WMA's supply of fresh water; however, the general quality of groundwater in the watershed has degraded from background levels. Much of degradation reflects land uses (CRWQCB, 1997).

In this watershed area, fertilizers and pesticides, typically used on agricultural lands, contribute to degrade groundwater. In areas that are unsewered, such as Malibu, nitrogen and pathogenic bacteria from overloaded or improperly sited septic tanks can seep into ground water and result in health risks to those who rely on groundwater for domestic water supplies. In areas with aboveground and underground storage tanks, toxics have leaked or are leaking, which can result in volatile organic compounds or petroleum compounds pollution in groundwater. An example of this is the methyl tertiary butyl ether (MTBE) contamination in the city of Santa Monica which has affected a number of wells in the Santa Monica Basin. Compared to surface water pollution, investigation and remediation of polluted groundwater are often more difficult, costly, and time-consuming (CRWQCB, 1997).

Seawater intrusion created by overpumping also has been a problem in the West Coast groundwater basin. However, it is under control in most areas through an artificial recharge system consisting of spreading grounds and injection wells that form a fresh water barrier along the coast. Other replenishment programs are underway using storm runoff, imported water, and recycled water to accomplish reversal of intrusion (CRWQCB, 1997).

The USGS sampled the Los Angeles Region’s coastal priority groundwater basins as part of State Board’s Groundwater Ambient Monitoring and Assessment (GAMA) program in 2006. Groundwater basins within the Santa Monica Bay WMA included in this sampling were the Santa Monica, Hollywood, West Coast, and Central Basins. The study was designed to provide a spatially unbiased assessment of raw groundwater quality within the targeted basins, as well as a statistically consistent basis for comparing water quality throughout California (USGS, 2009).

The study did not attempt to evaluate the quality of drinking water delivered to consumers; after withdrawal from the ground, water typically is treated, disinfected, and/or blended with other waters to maintain acceptable drinking water quality. VOCs were detected in almost three-quarters of the grid wells, and pesticides and pesticide degradates were detected in 42 percent of the grid (randomized) wells. Potential wastewater indicators were detected in 44 percent of the grid wells. All of the detections of these organic compounds in samples from grid wells were below health-based thresholds, with the exception of tetrachloromethane (carbon tetrachloride), a VOC, which was detected above the maximum contaminant level set by the California Department of Public Health (CDPH) (MCL-CA). In targeted wells, there were two detections of trichloroethene (TCE) and one detection of perchloroethene (PCE) above the maximum contaminant level set by USEPA (MCL-US) (USGS, 2009).

Nutrient and trace element concentrations in the grid wells were below health-based thresholds. There were two detections of boron above the California notification level set by the CDPH (NL-CA) in the targeted wells. Activities of radioactive constituents in water samples collected in grid wells were below health-based thresholds, with the exception of two detections of radon-222 that were above the proposed MCL-US; however, none of the samples had an activity above the proposed alternative MCL-US. Total coliforms were detected at one of the targeted wells. Most of the samples from grid wells had concentrations of major elements and total dissolved solids below the non-enforceable thresholds set for aesthetic concerns. Four grid wells had total dissolved solids concentrations above the secondary maximum contaminant level set by the CDPH (SMCL-CA). There were two detections of manganese, and four detections of iron in grid wells above their respective SMCL-CAs, and a single detection of arsenic above the MCL-US. Two targeted wells had concentrations of chloride and sulfate above the recommended SMCL-CA (USGS, 2009).

The WMA's Designated Beneficial Uses

The Regional Board designates beneficial uses of all waterbodies in the Water Quality Control Plan for the Ventura and Los Angeles Coastal Watersheds (usually referred to as Basin Plan). These beneficial uses are the cornerstone of the State and Regional Board's efforts to protect water quality, as water quality objectives are set at levels that will protect the most sensitive beneficial use of a waterbody. Together, beneficial uses and water quality objectives form water quality standards (CRWQCB, 1994).

Twenty beneficial uses for surface waters and four beneficial uses for ground waters in the Santa Monica Bay WMA are designated in the Regional Board's Basin Plan. These beneficial uses are listed by waterbody and hydrologic unit in the table below for surface waters and by basin name and number for ground waters in a separate table. Certain site-specific water quality objectives, namely TDS, sulfate, chloride, boron, and--for surface waters--nitrogen, reflect background levels of constituents in the mid-1970s, in accordance with the State Board's Antidegradation Policy. Water quality objectives for these and for other constituents and parameters can be found in the Basin Plan (CRWQCB, 1994). It should be pointed out that more detailed analyses of beneficial uses occur as needed; these issues are often identified during the Basin Plan Triennial Review process.

Table 2. Beneficial uses of surface waters within the Santa Monica Bay WMA (combined from multiple tables in the Basin Plan) (CRWQCB, 1994)

Coastal Feature or Waterbody[a]	Hydro Unit #	MUN	IND	PROC	AGR	GWR	NAV	REC1	REC2	COMM	WARM	COLD	EST	MAR	WILD	BIOL	RARE	MIGR	SPWN	SHELL	WET[b]
Arroyo Sequit	404.44	P*				I		E	E		E	E			E		E	E	E		E
San Nicholas Canyon Creek	404.43	P*						I	I		I				E						
Los Alisos Canyon Creek	404.42	P*						I	I		I				E		E				
Lachusa Canyon Creek	404.42	P*						I	I		I				E						
Encinal Canyon Creek	404.41	P*						I	I		I				E		E				
Trancas Canyon Creek	404.37	E*						Em	E		E				E		E				
Dume Lagoon [c]	404.36						E	E	E	E			E		E		Ee	Pf	Pf		E
Dume Creek (Zuma Canyon)	404.36	E*						E	E		E	E			E		E	P	P		
Ramirez Canyon Creek	404.35	I*						I	I		I				E				P		
Escondido Canyon Creek	404.34	I*						I	I		I				E		E				
Latigo Canyon Creek	404.33	I*						I	I		I				E		E				
Solstice Canyon Creek	404.32	E*						E	E		E				E			P	P		
Puerco Canyon Creek	404.31	I*						I	I		I				E						
Corral Canyon Creek	404.31	I*						I	I		I				E						
Carbon Canyon Creek	404.16	P*						I	I		I				E						
Las Flores Canyon Creek	404.15	P*						I	I		I				E						
Piedra Gorda Canyon Creek	404.14	P*						I	I		I				E						
Pena Canyon Creek	404.13	P*						I	I		I	E			E						
Tuna Canyon Creek	404.12	P*						I	I		I				E						
Topanga Lagoon [c]	404.11						E	E	E	E			E		E		Ee	Ef	Ef		E

Coastal Feature or Waterbody[a]	Hydro Unit #	MUN	IND	PROC	AGR	GWR	NAV	REC1	REC2	COMM	WARM	COLD	EST	MAR	WILD	BIOL	RARE	MIGR	SPWN	SHELL	WET[b]
Topanga Canyon Creek	404.11	P*						I	I		E	E			E			P	I		
Santa Ynez Canyon	405.13	P*						I	E		I				E		E				
Santa Ynez Lake (Lake Shrine)	405.13	P*						Pk	E		E				E						
Santa Monica Canyon Channel	405.13	P*						Ps	I		P				E						
Rustic Canyon Creek	405.13	P*						I	I		I				E						
Sullivan Canyon Creek	405.13	P*						I	I		I				E						
Mandeville Canyon Creek	405.13	P*						I	I		I				E						
Coastal Streams of Palos Verdes	405.11	P*				I		I	I		I				P		E				
Canyon Streams trib. to Coastal Streams of Palos Verdes	405.12	P*				I		I	I		I				E E		Et				
Stone Canyon Reservoir	405.13	E*	E	E		P		Pk	E		E				E						
Hollywood Reservoir	405.14	E*	E	E		P		Pk	E		E				E						
Franklin Canyon Reservoir	405.14	E*						Pk,u			Pu										
Upper Franklin Canyon Reservoir	405.14	E*	E	E		P		P	E		E				E						E
Malibu Lagoon c	404.21						E	E	E				E	E	E		Ee	Ef	Ef		E
Malibu Creek	404.21	P*						E	E		E	E			E		E	E	E		E
Cold Creek	404.21	P*						E	E			P			E		E		P		E
Las Virgenes Creek	404.22	P*						Em	E		E	P			E		E	P	P		E
Century Reservoir	404.21	P*						E	E		E				E						E
Malibou Lake	404.24	P*					E	E	E		E				E		E				E

Coastal Feature or Waterbody[a]	Hydro Unit #	MUN	IND	PROC	AGR	GWR	NAV	REC1	REC2	COMM	WARM	COLD	EST	MAR	WILD	BIOL	RARE	MIGR	SPWN	SHELL	WET[b]
Medea Creek	404.23	P*				I		Im	I		I	P			E		E				E
Medea Creek	404.24	P*				I		Em	E		E				E						E
Lindero Creek	404.23	P*						I	I		I				E						
Triunfo Creek	404.24	P*						Im	I		I				E						
Triunfo Creek	404.25	P*				I		Im	I		I				E		E				
Westlake Lake	404.25	P*					E	E	E		E				E						
Potrero Valley Creek	404.25	P*				I		I	I		P				E						
Lake Eleanor Creek	404.25	P*				I		I	I		I				E						
Lake Eleanor	404.25	P*				E		E	E		E				E		E				E
Las Virgenes (Westlake) Reservoir	404.25	E	E	E	E			Pk,v	E		P				E						
Hidden Valley Creek	404.26	I*				I		I	I		I				E						
Lake Sherwood	404.26	P*				E	E	E	E		E				E						E
Ballona Creek Estuary c,w	405.13						E	E	E	E			E	E	E		Ee	Ef	Ef	E	
Ballona Lagoon/ Venice Canals c	405.13						E	E	E	E			E	E	E		Ee	Ef	Ef	E	E
Ballona Wetlands c	405.13							E	E				E		E		Ee	Ef	Ef		E
Del Rey Lagoon c	405.13						E	E	E	E			E		E		Ee	Ef	Ef		E
Ballona Creek to Estuary	405.13	P*						ELac, ad	Ead		P				P						
Ballona Creek	405.15	P*							Ead		P				E						
Nearshore Zone ^			E				E	E	E	E				E	E	Ean	Ee	Ef	Ef	Ear	
Offshore Zone			E				E	E	E	E				E	E		Ee	Ef	Ef	E	
Nicholas Canyon Beach	403.43						E	E	E	E				E	E				P	E	
Trancas Beach	403.37						E	E	E	E				E	E				P	E	
Zuma County (Westward) Beach	404.35						E	E	E	E				E	E				P	Ear	
Dume State Beach	404.36						E	E	E	E				E	E				P	E	

Coastal Feature or Waterbody[a]	Hydro Unit #	MUN	IND	PROC	AG R	GWR	NAV	REC1	REC2	COMM	WARM	COLD	EST	MAR	WILD	BIOL	RARE	MIGR	SPWN	SHELL	WET[b]
Dume Lagoon c	404.36						E	E	E	E			E		E		Ee	Pf	Pf		E
Escondido Beach	404.34						E	E	E	E				E	E				P	E	
Dan Blocker Memorial (Corral) Beach	404.31						E	E	E	E	E			E	E				P	E	
Puerco Beach	404.31						E	E	E	E				E	E				P	E	
Amarillo Beach	404.21						E	E	E	E				E	E				P	E	
Malibu Beach	404.21						E	E	E	E				E	E			E	Eas	Ear	
Malibu Lagoon c	404.21						E	E	E				E	E	E		Ee	Ef	Ef		E
Carbon Beach	404.16						E	E	E	E				E	E				P	E	
La Costa Beach	404.16						E	E	E	E				E	E				P	E	
Las Flores Beach	404.15						E	E	E	E				E	E				P	E	
Las Tunas Beach	404.12						E	E	E	E				E	E				P	E	
Topanga Beach	404.11						E	E	E	E				E	E				P	E	
Topanga Lagoon c	405.11						E	E	E	E			E		E		Ee	Ef	Ef		E
Will Rogers State Beach	405.13						E	E	E	E				E	E				P	E	
Santa Monica Beach	405.13						E	E	E	E				E	E			E	Eas	E	
Venice Beach	405.13						E	E	E	E				E	E		E	E	Eas	E	
Marina Del Rey								E													
Harbor	405.13						E	E	E	E				E	E					E	
Public Beach Areas	405.13						E	E	E	E				E	E		E				
All other Areas	405.13						E	P	E	E				E	E		E			E	
Entrance Channel	405.13						E	E	E	E				E	E		E			E	
Dockweiler Beach	405.12		E				E	E	E	E				E	E				P		
Manhattan Beach	405.12						E	E	E	E				E	E				P	E	
Hermosa Beach	405.12						E	E	E	E				E	E				Eas	E	
King Harbor	405.12		E				E	E	E	E				E	E		E				
Redondo Beach	405.12		E				E	E	E	E				E	E		E	E	Eas	E	

Coastal Feature or Waterbody[a]	Hydro Unit #	MUN	IND	PROC	AGR	GWR	NAV	REC1	REC2	COMM	WARM	COLD	EST	MAR	WILD	BIOL	RARE	MIGR	SPWN	SHELL	WET[b]
Torrance Beach	405.12						E	E	E	E				E	E			E	Eas	E	
Port Vicente Beach	405.11						E	E	E	E				E	E				P	E	
Royal Palms Beach	405.11						E	E	E	E				E	E				P	E	
Whites Point County Beach	405.11						E	E	E	E				E	E				P	E	

a Waterbodies are listed multiple times if they cross hydrologic area or subarea boundaries. Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.
b Waterbodies designated as WET may have wetlands habitat associated with only a portion of the waterbody. Any regulatory section would require a detailed analysis of the area.
c Coastal waterbodies which are also listed in Coastal Features Table (2-3) or in Wetlands Table (2-4)..
e One or more rare species utilize all ocean, bays, estuaries, and coastal wetlands for foraging and/or nesting/
f Aquatic organisms utilize all bays, estuaries, lagoons and coastal wetlands, to a certain extent, for spawning and early development. This may include migration into areas which are heavily influenced by freshwater inputs
k Public access to reservoir and its surrounding watershed is prohibited by Los Angeles County Department of Public Works.
m Access prohibited by Los Angeles County Department in the concrete-channelized areas.
s Access prohibited by Los Angeles Count DPW.
t Rare applies only to Agua Magna Canyon & Sepulveda Canyon areas.
u This reservoir is covered and thus inaccessible.
v Public water supply reservoir. Owner prohibits public entry.
w These areas are engineered channels. All references to Tidal Prisms in Regional Board documents are functionally equivalent to estuaries.
x Owner prohibits entry.
ac Limited (L) REC-1 use based on shallow water depths and infrequent use
ad The High Flow Suspension only applies to water contact recreational activities associated with the swimmable goal as expressed in the federal Clean Water Action Section 101(a)(2) and regulated under the REC-1 use, non-contact water recreation involving incidental water contact regulated under the REC-2 use, and the associated bacteriological objectives set to protect those activities. Water quality objectives set to protect (1) other recreational uses associated with the fishable goal as expressed in the federal Clean Water Act section 101(a)(2) and regulated under the REC-1 use and (2) other REC-2 uses (e.g., uses involving the aesthetic aspects of water) shall remain in effect at all times for waters where this footnote appears.
an Areas of Special Biological Significance (along coast from Latigo Point to Laguna Point) and Big Sycamore Canyon and Abalone Cove Ecological Reserves and Point Femin Marine Life Refuge.
ar Areas exhibiting large shellfish populations include Malibu, Point Dume, Point Fermin, White Point and Zuma Beach.
as Most frequently used grunion spawning beaches. Other beaches may be used as well.
E: Existing beneficial use
P: Potential beneficial use
I: Intermittent beneficial use
E,P, and I: shall be protected as required
***** Asterisked MUN designations are designated under SB 88-63 and RB 89-03. Some designations may be considered for exemption at a later date (See Basin Plan pages 2-3, 4 for more details).
^: Nearshore is defined as the zone bounded by the shoreline and a line 1000 feet from the shoreline or the 30-foot depth contours, whichever is further from the shoreline. Longshore extent is from Rincon Creek to the San Gabriel River Estuary

Table 3. Beneficial uses of groundwaters within the Santa Monica Bay WMA[ac] (CRWQCB, 1994)

DWR[ad] Basin No.	BASIN	MUN	IND	PROC	AGR
4-11	**LOS ANGELES COASTAL PLAIN**				
	Central Basin	E	E	E	E
	West Coast Basin	E	E	E	E
	Hollywood Basin	E	E	E	E
	Santa Monica Basin	E	E	E	E
4-16	**HIDDEN VALLEY**	E	P		E
4-19	**THOUSAND OAKS AREA**	E	E	E	E
4-20	**RUSSELL VALLEY**				
	Russell Valley	E	P		E
	Triunfo Canyon area	P	P		E
	Lindero Canyon area	P	P		E
	Las Virgenes Canyon area	P	P		E
4-21	**CONEJO-TIERRA REJADA VOLCANIC AREA** [ak]	E			E
	SANTA MONICA MOUNTAINS-SOUTHERN SLOPES [al]				
	Camarillo area	E	P		E
	Point Dume area	E	P		E
4-22	Malibu Valley	P	P		E
	Topanga Canyon area	P	P		E

ac Beneficial uses for groundwaters outside of the major basins listed on this table have not been specifically listed. However, groundwaters outside of the major basins are, in many cases, significant sources of water. Furthermore, groundwaters outside of the major basins are either potential or existing sources of water for downgradient basins, and such, beneficial uses in the downgradient basins shall apply to these areas.

ad Basins are numbered according to DWR Bulletin No. 118-80.

ak Groundwater in the Conejo-Tierra Rejada Volcanic Area occurs primarily in fractured volcanic rocks in the western Santa Monica Mountain areas.

al With the exception of groundwater in Malibu Valley (DWR Basin No. 4-22) groundwaters along the southern slopes of the Santa Monica Mountains are not considered to comprise a major basin and accordingly have not been designated a basin number by DWR

Beneficial Use Definitions

Beneficial uses in the Regional Board's Basin Plan that are found in the WMA are defined below. The uses are listed in no preferential order.

Municipal and Domestic Supply (MUN)
Uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply.

Agricultural Supply (AGR)
Uses of water for farming, horticulture, or ranching including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.

Industrial Process Supply (PROC)
Uses of water for industrial activities that depend primarily on water quality.

Industrial Service Supply (IND)
Uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well re-pressurization.

Ground Water Recharge (GWR)
Uses of water for natural or artificial recharge of ground water for purposes of future extraction, maintenance of water quality, or halting of saltwater intrusion into freshwater aquifers.

Navigation (NAV)
Uses of water for shipping, travel, or other transportation by private, military, or commercial vessels.

Water Contact Recreation (REC-1)
Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, white water activities, fishing, or use of natural hot springs.

> **Limited Water Contact Recreation (LREC-1):** Uses of water for recreational activities involving body contact with water, where full REC-1 use is limited by physical conditions such as very shallow water depth and restricted access and, as a result, ingestion of water is incidental and infrequent.

Non-contact Water Recreation (REC-2)
Uses of water for recreational activities involving proximity to water, but not normally involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tidepool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.

A High Flow Suspension shall apply to water contact recreational activities associated with the swimmable goal as expressed in the federal Clean Water Act section 101(a)(2) and regulated under the REC-1 use, non-contact water recreation involving incidental water contact regulated under the REC-2 use, and the associated bacteriological objectives set to protect those activities. Water quality objectives set to protect (1) other recreational uses associated with the fishable goal as expressed in the federal Clean Water Act section 101(a)(2) and regulated under the REC-1 use and (2) other REC-2 uses (e.g., uses involving the aesthetic aspects of water) shall remain in effect at all times for waters where the (ad) footnote appears in the beneficial use table. The High Flow Suspension shall apply on days with rainfall greater than or equal to ½ inch and the 24 hours following the end of the ½-inch or greater rain event, as measured at the nearest local rain gauge, using local Doppler radar, or using widely accepted rainfall estimation methods. The High Flow Suspension only applies to engineered channels, defined as inland, flowing surface water bodies with a box, V-shaped or trapezoidal configuration that have been lined on the sides and/or bottom with concrete.

Commercial and Sport Fishing (COMM)
Uses of water for commercial or recreational collection of fish, shellfish, or other organisms including, but not limited to, uses involving organisms intended for human consumption or bait purposes.

Warm Freshwater Habitat (WARM)
Uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

Cold Freshwater Habitat (COLD)
Uses of water that support cold water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

Estuarine Habitat (EST)
Uses of water that support estuarine ecosystems including, but not limited to, preservation or enhancement of estuarine habitats, vegetation, fish, shellfish, or wildlife (e.g., estuarine mammals, waterfowl, shorebirds).

Wetland Habitat (WET)
Uses of water that support wetland ecosystems, including, but not limited to, preservation or enhancement of wetland habitats, vegetation, fish, shellfish, or wildlife, and other unique wetland functions which enhance water quality, such as providing flood and erosion control, stream bank stabilization, and filtration and purification of naturally occurring contaminants.

Marine Habitat (MAR)
Uses of water that support marine ecosystems including, but not limited to, preservation or enhancement of marine habitats, vegetation such as kelp, fish, shellfish, or wildlife (e.g., marine mammals, shorebirds).

Wildlife Habitat (WILD)
Uses of water that support terrestrial ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.

Preservation of Biological Habitats (BIOL)
Uses of water that support designated areas or habitats, such as **Areas of Special Biological Significance (ASBS),** established refuges, parks, sanctuaries, ecological reserves, or other areas where the preservation or enhancement of natural resources requires special protection.

Rare, Threatened, or Endangered Species (RARE)
Uses of water that support habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under state or federal law as rare, threatened, or endangered.

Migration of Aquatic Organisms (MIGR)
Uses of water that support habitats necessary for migration, acclimatization between fresh and salt water, or other temporary activities by aquatic organisms, such as anadramous fish.

Spawning, Reproduction, and/or Early Development (SPWN)
Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.

Shellfish Harvesting (SHELL)
Uses of water that support habitats suitable for the collection of filter-feeding shellfish (e.g., clams, oysters, and mussels) for human consumption, commercial, or sports purposes.

Discharges/Sources

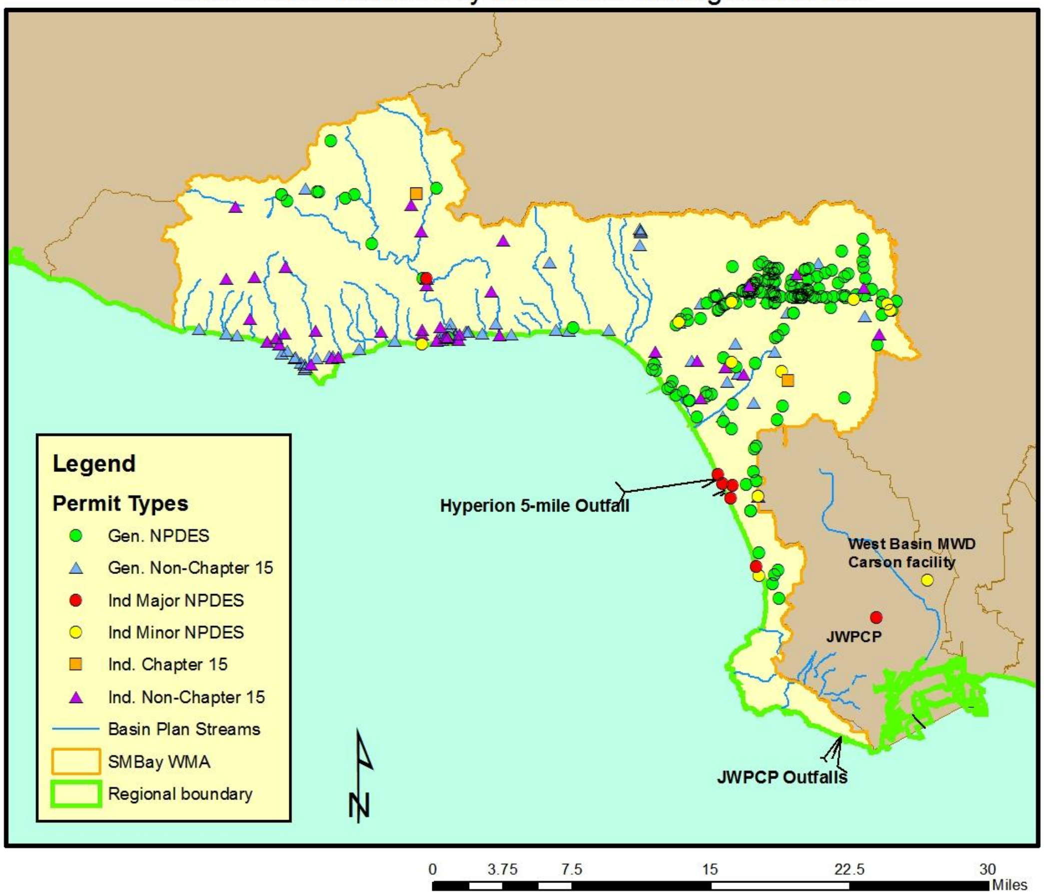
PERMITTED DISCHARGES

There are 193 traditional NPDES discharges into the WMA including seven major NPDES permit discharges (three POTWs [two direct ocean discharges], one refinery, and three generating stations); 18 minor discharges covered under individual permits, and 175 dischargers covered under general permits. In addition, 87 dischargers are covered by an industrial storm water permit and 401 dischargers are covered by the construction storm water permit. Finally, there are 22 municipal dischargers covered under the Los Angeles County Municipal Storm Sewers System (MS4) NPDES permit; Caltrans is covered under its statewide stormwater permit. Of the major NPDES dischargers in the Santa Monica Bay WMA, the three POTWs (particularly the two direct ocean discharges) are the largest traditional point sources of pollutants to Santa Monica Bay. Pollutants from the minor discharges have been estimated to contribute less than two percent of the total pollutants being discharged to the Bay (CRWQCB, 2007).

The locations of facilities with non-stormwater discharges to surface water or to the ground (other than those covered by general industrial or construction stormwater permits) are shown in the following figure. Major NPDES discharges are from either POTWs with a yearly average flow of over 0.5 MGD, from an industrial source with a yearly average flow of over 0.1 MGD, or are those discharges with lesser flows but with potential acute or adverse environmental impacts to surface waters. Minor NPDES discharges are all other discharges to surface waters that are not categorized as a Major (CRWQCB, 2007).

Figure 13

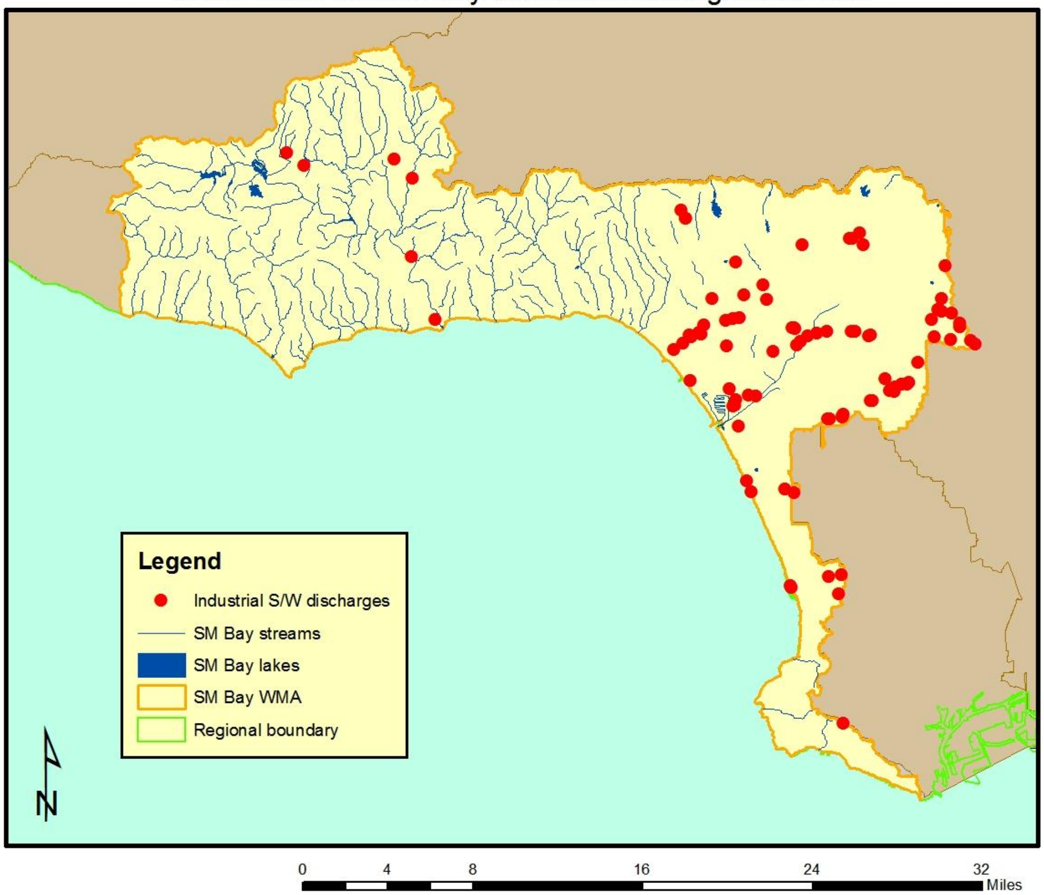
Locations of Facilities Under Permit for Non-stormwater Discharges to the Santa Monica Bay Watershed Management Area



Minor discharges may be covered by general NPDES permits, which are issued administratively, for those that meet the conditions specified by the particular general permit. Non-Chapter 15 discharges are those to land or groundwater such as commercial septic systems or percolation ponds that are covered by Waste Discharge Requirements, a State permitting activity. Chapter 15 discharges generally relate to land disposal (landfills) under Chapter 15 of the California Code of Regulations, again an exclusively State permitting activity (CRWQCB, 2007).

Figure 14

Locations of Dischargers Covered by General Industrial Stormwater Permit in the Santa Monica Bay Watershed Management Area



Discharges covered by the statewide industrial stormwater permit are shown in the figure below. A complete list of discharges in the watershed is available at http://www.waterboards.ca.gov/losangeles/water_issues/programs/regional_program/wmi/ws_santamonica.shtml . Copies of many permits may be downloaded at http://www.waterboards.ca.gov/losangeles/board_decisions/adopted_orders/by_permits_tools.shtml.

Maps showing discharges focused on individual subwatersheds, as appropriate, are shown in the separate subwatershed section of the report. Information on some of the larger discharges to the watershed follows.

Major/Significant NPDES Discharges

City of Los Angeles - Hyperion Treatment Plant

The City owns and operates the Hyperion Treatment Plant, a publicly-owned treatment works (POTW). The Hyperion Treatment Plant is a secondary treatment facility located at 12000 Vista del Mar Boulevard in Playa Del Rey. It is interesting to compare today's information on the facility with that presented in the first edition of this report in 1997. At that time, the Hyperion plant had a design capacity of 420 gallons per day (mgd) and discharged an average of 360 mgd of treated wastewater which was a combination of about 50 percent advanced primary and 50 percent secondary effluent (CRWQCB, 1997). Today, the plant has a dry weather average design treatment capacity of 450 mgd and a wet weather peak hydraulic capacity of approximately 850 mgd. In 2008, the Hyperion Treatment Plant received an average of 320 mgd of influent and discharged an average of 286 mgd of secondary treated effluent to the Pacific Ocean through the five-mile outfall. Approximately 24 mgd of secondary effluent is sent to West Basin Water Recycling Plant - El Segundo for advanced treatment. The Hyperion Treatment Plant ceased the irrigation use of in-plant chlorinated secondary treated wastewater in July 1999 and started using tertiary recycled water from West Basin MWD in August 1999 (CRWQCB website #1).

The Hyperion Treatment Plant is part of a joint outfall system commonly known as the Hyperion Treatment System that consists of the wastewater collection system, the Hyperion Treatment Plant, and three upstream wastewater treatment plants: Donald C. Tillman Water Reclamation Plant (Tillman WRP), Los Angeles-Glendale Water Reclamation Plant (LAGWRP), and Burbank Water Reclamation Plant (Burbank WRP)(owned and operated by a contract city). The Hyperion Treatment System collects, treats, and disposes of sewage from the entire City (except the Wilmington - San Pedro Area, the strip north of San Pedro, and Watts) and from a number of cities and agencies under contractual agreements (CRWQCB website #1).

Approximately 85% of the sewage and commercial/industrial wastewater comes from the City of Los Angeles. The remaining 15% comes from the Contract Cities and Agencies. There are approximately four million people in the Hyperion Treatment System Service Area (CRWQCB website #1).

Currently, the Hyperion Treatment Plant also accepts dry weather urban runoff that is diverted from storm drains into the City's collection system from April 1 to October 31. In October 2009, the City extended this diversion operation from the dry summer months to year-round in order to conform to the compliance schedule for bacteria concentration during winter dry weather, contained in the Santa Monica Bay Beach Dry-weather Bacteria TMDL adopted by the Regional Board (CRWQCB website #1).

The Hyperion Treatment System is an interconnected system and includes approximately 6,500 miles of sewer lines located within the City (including trunk sewers in contract cities and agencies) and additional sewer lines under the control of the contract cities and agencies. Sludge from the City's two upstream plants (Tillman WRP and LAGWRP) is returned to the wastewater collection system and flows to the Hyperion Treatment Plant for treatment. In addition, sludge generated from the Burbank WRP is also returned to the City of Burbank sewer system for treatment at the Hyperion Treatment Plant. The influent to the Burbank WRP can be diverted/bypassed to the Hyperion Treatment Plant during periods of emergency (CRWQCB website #1).

The Hyperion Treatment Plant has provided full secondary treatment since December 1998. Preliminary and primary wastewater treatments consist of screening, grit removal, and primary sedimentation with coagulation and flocculation. In secondary treatment, the primary effluent is biologically treated in a high purity oxygen activated sludge process. After clarification, undisinfected secondary effluent is discharged into Santa Monica Bay through a five mile submerged outfall pipe (CRWQCB website #1).

The fine solids recovered from wastewater treatment processes that consist of primarily inorganic materials are hauled away to landfills. The remaining sludge is anaerobically digested onsite. The digested sludge is screened and dewatered using centrifuges. Starting on January 1, 2003, the Hyperion Treatment Plant implemented full thermophilic digestion to generate Class A "EQ" biosolids (treated sewage sludge) which are beneficially reused offsite for land application and composting projects. The digester gas is cleaned and a major part of the gas is currently exported to the Los Angeles Department of Water and Power's Scattergood Steam Generating Plant, located immediately adjacent to the Hyperion Treatment Plant. The exported digester gas is used as fuel in the generation of electricity. In return, the generating plant provides steam for digester heating for the Hyperion Treatment Plant. During interruptions in the export of steam from the DWP Scattergood Steam Generation Plant, digester gas can be used as fuel for in-plant boilers that provide steam to heat the anaerobic digesters. Any remaining non-exported digester gas may be flared, if necessary, and is regulated under a flare operation permit from the South Coast Air Quality Management District (AQMD) (CRWQCB website #1).

The Hyperion Treatment Plant has developed an industrial wastewater pretreatment program which was approved by USEPA and the Regional Board. The facility also collects and treats in-plant storm water runoff except that, during intense storms, undisinfected storm water overflows may be discharged through Outfall 001. This storm water discharge is regulated under the State Board's storm water general permit for industrial activities (CRWQCB website #1).

The Hyperion Treatment Plant has three ocean outfalls. However, only two outfall discharge points (i.e., 001 and 002) are utilized to discharge treated wastes to the Pacific Ocean. The three ocean outfalls are described as follows:

<u>Discharge Serial No. 001</u> - This is commonly referred to as the "one-mile outfall". It is a 12-foot diameter outfall terminating approximately 5,364 feet west-southwest of the treatment plant at a depth of approximately 50 feet below the ocean surface. This outfall is permitted for emergency discharge of chlorinated secondary treated effluent during extremely high flows, power failures, and preventive maintenance, such as routine opening and closing the outfall gate valve(s) for exercising and lubrication. However, during intense storms or storms associated with plant power outages, direct discharge of undisinfected storm water overflow is also permitted at this outfall. The facility's NPDES permit requires the City to notify the Regional Board and USEPA in advance of any planned preventive maintenance that results in discharges through Discharge Serial No. 001 (CRWQCB website #1). There were three planned preventive maintenance diversion events in 2008. This outfall was inspected twice in 2008 via submarine and SCUBA divers (City of LA, 2009c).

<u>Discharge Serial No. 002</u> - This is commonly referred to as the "five-mile outfall". It is a 12-foot diameter outfall terminating approximately 26,525 feet west-southwest of the treatment plant at a depth of approximately 187 feet below the ocean surface. This outfall is located north of Discharge Serial No. 001 and ends in a "Y" shaped diffuser consisting of two 3,840-foot legs. This is the only outfall permitted for

the routine discharge of undisinfected secondary treated effluent. This outfall was inspected twice in 2008 via submarine and SCUBA divers (City of LA, 2009c).

Discharge Serial No. 003 – This is a 20-inch diameter outfall terminating approximately 35,572 feet west of the treatment plant, at the head of a submarine canyon at a depth of approximately 300 feet below the ocean surface. This outfall had been used to discharge sludge. Under a 1987 amended Consent Decree, this outfall was deactivated in November 1987 when sludge discharge to the ocean was terminated. The outfall has been modified to prevent any possible discharge of sewage or sludge into the Pacific Ocean. The outfall has not been maintained since it was taken out of service. Any discharge from this outfall is prohibited (CRWQCB website #1).

The City has collected and assessed extensive chemical and physical data from Santa Monica Bay at 36 sites during varying conditions, including El Niño, La Niña and winter storm conditions in order to evaluate movement of the discharge plume. The data show that movement of the plume is dictated by the depth of the thermocline or stratification and the direction and strength of highly variable Santa Monica Bay currents. Under typical conditions, the plume is detected within 6,562 feet of the outfall terminus, although it has been detected as far as 26,247 feet away from the outfall. Also, the plume has almost always been detected below the thermocline at a depth ranging from 33 – 180 feet. Infrequently, during winter storm conditions, the plume has been detected at the surface in the vicinity of the outfall. On rare occasions, it has been impossible to detect the plume (CRWQCB website #1).

As the waters of Santa Monica Bay approach the shore, the thermocline intersects the rising sea bottom. This point is typically 3,281 feet (1,000 m) or more offshore and is the theoretical limit of the approach of the plume to the shoreline. The plume has never been detected less than 8,202 feet (2.5 km) from shore, at the 148 feet (45 m) depth contour (CRWQCB website #1).

The City has conducted shoreline and nearshore/inshore water quality monitoring in Santa Monica Bay since the late 1940s. The monitoring results indicated that effluent from Hyperion's five-mile outfall does not reach the shoreline and that elevated bacterial counts are associated with runoff from storm drains and discharges from piers. The direct impacts of the discharge from Hyperion's one-mile outfall on shoreline water quality have not been studied due to the lack of routine discharge. However, it is expected to be very minimal in that effluent discharged from the one-mile outfall is disinfected, and the volume of the discharge is usually much less than five million gallons occurring at most quarterly. This discharge is intended for conducting a functional test of equipment (CRWQCB website #1).

County Sanitation Districts of Los Angeles County - Joint Water Pollution Control Plant

The County Sanitation Districts of Los Angeles County (Districts) owns and operates the Joint Water Pollution Control Plant **(**JWPCP), a POTW. The JWPCP is a secondary treatment facility located at 24501 South Figueroa Street in Carson. The plant has a dry weather average design treatment capacity of 400 mgd and a peak design capacity of 540 mgd (CRWQCB website #1). During 2008, the effluent discharge flow from JWPCP averaged 295.6 mgd (CSDLAC, 2009). As a comparison, information on the facility presented in the first edition of this report included a description that the JWPCP was an advanced primary treatment facility with a dry weather average flow design capacity of 400 mgd, a permitted capacity of 385 mgd and a peak design capacity of 540 mgd. Secondary treatment was provided for only 200 mgd of wastewater (CRWQCB, 1997).

JWPCP is part of a Joint Outfall System with six upstream water reclamation plants - La Cañada, Whittier Narrows, San Jose Creek, Pomona, Los Coyotes and Long Beach. It treats municipal and industrial wastewater. The flow from the six upstream plants can be bypassed, to a limited extent, to JWPCP. The sludge generated from the upstream plants are returned to the joint outfall trunk sewers and conveyed to JWPCP for further treatment. There are approximately five million people in the Joint Outfall System service area and JWPCP receives discharges from more than 1,200 significant industrial users (CRWQCB website #1).

In addition to the JWPCP effluent, the waste brine generated by the West Basin Municipal Water District's Carson Regional Water Recycling Plant is discharged to the ocean through the JWPCP's outfalls via a waste brine line connected to the JWPCP effluent tunnel. This discharge of waste brine is regulated under separate waste discharge requirements and NPDES permit (CRWQCB website #1).

The JWPCP has provided full secondary treatment since 2003. Treatment consists of screening, grit removal, primary sedimentation, pure oxygen activated sludge reactors, secondary clarification, and chlorination. Effluent from the primary sedimentation tanks is biologically treated in pure oxygen activated sludge reactors. The secondary treated effluent is then clarified, chlorinated and pumped into the outfall manifold (CRWQCB website #1).

The fine solids recovered from wastewater treatment processes which are primarily inorganic materials are hauled away to a landfill. The remaining solid fractions are anaerobically digested onsite. The digested solids are screened, and dewatered using centrifuges. The dewatered cake contains approximately 25% solids (Class B biosolids). JWPCP generates approximately 11,000 wet tons of Class B biosolids per week. More than half of the biosolids are managed by composting operations in Riverside and Kern County. One quarter of the biosolids are sent to southwestern Arizona for air drying and direct land application. The remaining biosolids are lime stabilized for Class A land application in Kern County, incinerated in a cement kiln in San Bernardino County, and co-disposed with municipal solid waste in Los Angeles County (CRWQCB website #1).

Digester gas (containing approximately 65% methane), produced from anaerobic digestion of sludge, is used onsite to fuel a combined cycle power plant (gas turbines followed by boilers and a steam turbine) which generates 22 MW of electricity for plant equipment and steam for digester heating. The power plant allows JWPCP to be essentially self-sufficient with respect to its energy requirements and even produces surplus electricity for export to Southern California Edison Co. sufficient to power approximately 1,500 homes (CRWQCB website #1).

After chlorination, the secondary treated effluent travels about 6 miles through tunnels to the outfall manifold and then is discharged to the Pacific Ocean, at Whites Point off the Palos Verdes Peninsula. JWPCP has fifteen discharge points (Discharge Serial Nos. 001 through 015). Four outfalls (Discharge Serial Nos. 001 through 004) are located at Whites Point, off the Palos Verdes Peninsula. Discharge Serial Nos. 001 and 002 are routinely used for discharge of treated wastewater. Discharge Serial No. 003 is used only during times of heavy rains to provide hydraulic relief for flow in the outfall system. Discharge Serial No. 004 serves as a standby outfall to provide additional hydraulic relief during the very heaviest flows. Two discharge points (Serial Nos. 006 and 013) have been eliminated following facility modifications. The remaining nine discharge points, with seven of them being bypass points (Discharge Serial Nos. 007-012, and 014) located prior to the headworks, provide for overflow, emergency bypass, and/or hydraulic relief of the JWPCP. The NPDES permit does not authorize any discharge from these nine discharge points (Discharge Serial Nos. 005, 007-012, 014, and 015). The four permitted ocean discharge points are described in more detail below:

Discharge Serial No. 001 - This outfall routinely discharges approximately 65% of the effluent from the JWPCP. It discharges south of the shoreline off Whites Point, San Pedro. The outfall is 7,440 ft long to the beginning of a single L-shaped diffuser leg which is 4,440 ft long. Depth at the beginning of the diffuser is 167 ft and at the end of the diffuser is 190 ft.

Discharge Serial No. 002 - This outfall routinely discharges approximately 35% of the effluent from the JWPCP. It discharges southwest of the shoreline off Whites Point, San Pedro. The outfall is 7982 ft long to the beginning of a y-shaped diffuser with two legs. Each leg is 1208 ft long. Depth at the beginning of the diffusers is 196 ft and at the end of the diffusers is 210 ft.

Discharge Serial No. 003 - This outfall is used only during times of heavy rains to provide hydraulic relief for flow in the outfall system. When used, it discharges off the Whites Point shoreline between Discharge Points 001 and 002 and about 160 ft below the ocean surface. The outfall is about 6500 ft long and connects to one of three legs of a y-shaped diffuser upstream of the y-intersection. Each leg is approximately 200 ft long. This discharge point was not used in 2008.

Discharge Serial No. 004 - This outfall is used as a standby to provide additional hydraulic relief during the heaviest flow. When used, it discharges off the Whites Point shoreline between Discharge Serial Nos. 002 and 003 and about 110 ft below the ocean surface. The outfall is about 5000 ft long and connects to a single, very short diffuser. This discharge point was not used in 2008 (CRWQCB website #1).

Las Virgenes Municipal Water District - Tapia Water Reclamation Facility

The Tapia Water Reclamation Facility (Tapia) is jointly owned by the Las Virgenes Municipal Water District (LVMWD) and Triunfo Sanitation Districts (Triunfo). Tapia is located at 731 Malibu Canyon Road, in an unincorporated area of Los Angeles County. Tapia treats municipal wastewater from domestic, commercial, and industrial sources to obtain California Title 22 recycled water. The design flow for the facility is 16.1 MGD. In 2008, on average, Tapia treated 8.95 MGD and discharged 4.03 MGD to Malibu Creek (with no discharge in June and July) and less than 0.1 MGD to the Los Angeles River. Tapia recycled the remainder of the tertiary-treated wastewater. Currently, Tapia serves approximately 80,000 residents in western Los Angeles and eastern Ventura Counties (Agoura Hills, Calabasas, Hidden Hills, Thousand Oaks, and Westlake Village) with a service area of over 109 square miles (CRWQCB website #1).

In 1965, LVMWD and Triunfo in a joint venture, built the Tapia facility which discharged 750,000 gpd of secondary treated effluent by spray irrigation. In 1968, the plant's design capacity was expanded to 2 mgd. From 1969 to 1980, year-round discharge to the Creek was prohibited by the Regional Board because of human health and nutrient concerns, and maximum use of recycled water for spray irrigation of fields was required. Discharge was allowed to occur only during, and immediately following, periods of rain when spray fields or percolation areas could not be used; and, between mid-November and mid-April when reclamation and use of all spray fields had been maximized. In 1982, the plant's design capacity was expanded to 8 mgd and the Rancho Las Virgenes Farm was established for injection of biosolids. In 1984, a year-round discharge to the Creek was permitted after the tertiary filters were installed. In 1989, the plant was expanded to 10 mgd. In 1989, the Regional Board adopted an order that permitted a phased increase in the discharge rate up to 16.1 mgd. The construction of facilities for Tapia's treatment capacity expansion, from 10 mgd to 16.1 mgd, was completed in 1994 (CRWQCB website #1).

Tapia treats both the liquid and solid fractions of the municipal wastewater. Treatment starts with coarse screening, grit removal, and primary sedimentation. The flow stream then separates into two routes, one for solids and the other for liquid. The liquid treatment route consists of secondary treatment, tertiary treatment, chlorination, and dechlorination. Prior to 1993, the principal solids treatment route was aerobic digestion at Tapia and land application at the Rancho Las Virgenes Farm. After startup of the Rancho Las Virgenes Composting Facility (Rancho) in 1993, the solids were anaerobically digested, dewatered using centrifuges and then composted (CRWQCB website #1).

The facility conducts coarse screening, grit removal, primary sedimentation, secondary treatment, tertiary treatment, chlorination, and dechlorination. For secondary treatment, Tapia employs an activated sludge process with nitrification and denitrification, followed by secondary clarification. Tertiary 'treatment includes coagulant addition, flocculation and physical filtration through a mono-media coal filter. Sodium hypochlorite solution is added for effluent disinfection, and sodium bisulfate is added for dechlorination (CRWQCB website #1).

Under standard operations, the waste activated sludge (WAS) is sent to Rancho Las Virgenes Composting Facility (Rancho Facility). Generally the digested sludge is centrifuged to remove most of the liquid. The liquid generated by centrifugation (centrate) is sent to a centrate treatment facility where it is treated to reduce ammonia and nitrogen levels before being returned to Tapia via the sanitary sewer. The majority of the WAS is treated at Rancho Facility and recycled as compost. The composting and farm facilities eliminate the need for hauling and disposal of biosolids to landfills. WAS can be aerobically digested and screened at Tapia and pumped to Rancho Las Virgenes Farm, a 91-acre site located at 3240 Las Virgenes Road, for subsurface biosolids injection (the last injection was performed in 2003). The fields are planted with a variety of pasture grasses to agronomically remove nutrients from the injection operation (CRWQCB website #1).

Approximately 60 percent of the treated wastewater is used on an annual basis for landscaping irrigation. Recycled water is also used at Tapia WRF, Pepperdine University, Rancho Las Virgenes Composting Facility and Rancho Las Virgenes Farm. The use of recycled water is regulated under separate water recycling requirements (CRWQCB website #1).

The following are the discharge points to Malibu Creek:

<u>Discharge Serial No. 001</u> – This is the primary discharge point to Malibu Creek located adjacent to the treatment plant. The waste discharged to Malibu Creek is limited to winter months from November 16 through April 14 of each calendar year to minimize the contribution of Tapia’s discharge to the excess freshwater flow into Malibu Lagoon (which leads to elevated Lagoon level and frequent breaching of the sandbar once, or if, the sandbar has formed), thus impacting both wildlife and human health beneficial uses (CRWQCB website #1). The average discharge to Malibu Creek in 2008 during months that a discharge occurred was 5.76 mgd (LVMWD, 2009).

The discharge prohibition is in place except under certain conditions:
i. Treatment plant upset or other operational emergencies;
ii. Storm events as determined by the Executive Officer; or

iii. The existence of minimal streamflow conditions that require flow augmentation in Malibu Creek to sustain endangered species as determined by the Executive Officer (CRWQCB website #1).

For a rainfall event of less than 0.4 inches in 24 hours at the Facility Rain Gauge, the Discharger may discharge to Malibu Creek during the prohibition period during storm events with prior approval of the Executive Officer provided that *all* of the following conditions have been met:

1. The Malibu Lagoon Sand Bar is open; and
2. The spray fields at Rancho Las Virgenes Farm are saturated; and
3. There is no demand for recycled water; and
4. The capacity to send 'wastewater to the Los Angeles River has been exhausted; and
5. All other disposal options are exhausted.

The Discharger may discharge to Malibu Creek during the prohibition period during storm events without prior approval of the Executive Officer provided that *all* of the following conditions have been met:

1. The rainfall event produces 0.4 inches or greater of precipitation in 24 hours at the Facility Rain Gauge; and
2. The Malibu Lagoon Sand Bar is open; and
3. The spray fields at Rancho Las Virgenes Farm are saturated; and
4. There is no demand for recycled water; and
5. The capacity to send wastewater to the Los Angeles River has .been. exhausted; and
6. All other disposal options are exhausted.

<u>Discharge Serial No. 002</u> – This discharge point is used to release surplus effluent from LVMWD's Reservoir #2 which stores water for distribution to the recycled water system. Reservoir #2 has a capacity of 17 million gallons, which is less than a two-day supply during the high demand in summer. Overflow from this reservoir is discharged to Las Virgenes Creek, a tributary to Malibu Creek, near the LVMWD headquarters building located at 4232 Las Virgenes Road in Calabasas. Stormwater runoff enters the reservoir and causes overflow. Such discharges are unintentional and infrequent.

<u>Discharge Serial No. 003</u> – This discharge point is located 0.2 miles downstream of Cold Creek and is no longer used routinely. No recycled water has been discharged at this location except during the storms of 1998. This discharge location was established along with the percolation ponds to offer a bypass option in times of extremely high flow conditions to regulate flow and protect the pond structures (CRWQCB website #1).

West Basin Municipal Water District

<u>West Basin Water Recycling Plant, El Segundo</u>

The West Basin Municipal Water District (West Basin MWD) operates the West Basin Water Recycling Plant (El Segundo Plant) in El Segundo. West Basin MWD is contractually entitled to receive up to 70 mgd of secondary effluent from the Hyperion Treatment Plant for advanced treatment. The El Segundo Plant provides tertiary treatment and/or advanced treatments such as microfiltration and reverse osmosis (RO) to the Hyperion secondary effluent to produce Title 22 and high purity recycled water. Title 22 recycled water is used for beneficial irrigation, industrial applications including cooling water and boiler feed water, and other purposes. The RO treated recycled water is primarily injected into the West Coast Basin Barrier Project to control seawater intrusion. The El Segundo Plant receives an average of 24 mgd of secondary effluent from the Hyperion Treatment Plant (CRWQCB website #1).

The waste brine from the El Segundo Plant is discharged to the ocean through Hyperion's five-mile outfall via a waste brine line from the recycling facility; the waste brine is regulated under these separate waste discharge requirements and NPDES permit (CRWQCB website #1).

Carson Regional Water Recycling Plant, Carson

The West Basin MWD owns and operates the Carson Regional Water Recycling Plant (Carson Plant) located at 21029 South Wilmington Avenue in Carson. The Carson Plant provides advanced treatment to Title 22 recycled water produced by the El Segundo Plant that is also owned and operated by the West Basin MWD. The Carson Plant may discharge up to 0.9 MGD of reverse osmosis brine waste from the treatment process to the Pacific Ocean (offshore of Palos Verdes), via the JWPCP outfalls. 3 During 2008, the Carson Plant discharged an average of 0.53 mgd of brine through the JWPCP outfalls. ? Brine waste is not treated prior to discharge (CRWQCB website #1).

Chevron Products Company – El Segundo Refinery

Chevron has operated the El Segundo Refinery since 1911. The facility is located at 324 West El Segundo Blvd in El Segundo. It manufactures the following products from crude oil: reformulated gasoline, jet fuel, diesel fuel, fuel oils, liquefied petroleum gases, fuel blending components, coke, ammonia, and molten sulfur. Manufacturing processes used at the refinery include atmospheric and vacuum distillation, catalytic cracking, alkylation, isomerization, coking, catalytic reforming, hydrogenation, sulfur recovery, chemical treating, and product blending. Chevron plans to process a long-term average throughput estimated at 265,000 bpod (CRWQCB website #1).

The El Segundo Refinery's wastewater treatment facility discharges an average flow of 7.0 mgd of treated wastewater, with up to 8.8 mgd during dry weather and up to 27 mgd during wet weather, to Santa Monica Bay. The wastewater is comprised of refinery wastewater (6.45 mgd), petroleum hydrocarbon contaminated shallow well groundwater (up to 2.34 mgd), other intermittence sources (4 mgd), and rainfall runoff, which may be contaminated (14 mgd) (CRWQCB website #1).

The discharge occurs through an outfall located approximately 2,200 feet south of Grand Avenue that extends approximately 3,500 feet offshore with its terminus at a depth of 42 feet. In 1994, Chevron constructed a 3,200-foot outfall line extension consisting of a 60-inch nominal diameter, high density polyethylene pipe that was fitted to the existing 300 foot outfall line. A diffuser was attached at the end of the extension. The extended outfall provides a minimum dilution ratio of 80 parts of seawater to one part of effluent . The previous outfall was about 300 feet offshore and had a minimum dilution ratio of 38 parts of seawater to one part of effluent (CRWQCB website #1).

The El Segundo Refinery's wastewater treatment facility consists of two separate drain and treatment systems: the "unsegregated" and the "segregated" system. The unsegregated system is normally used for non-process wastewater including cooling tower blowdown, steam condensate, a portion of the refinery's recovery well groundwater, and other wastewater streams containing free oil removed with primary treatment only. This system is also used to collect and treat storm water. The unsegregated system includes a gravity separator and an induced air flotation unit. The segregated system is normally used to treat petroleum process wastewater containing emulsified oils and a portion of the refinery's recovery well groundwater. It is comprised of gravity separators, a dissolved air flotation unit, and activated sludge units for secondary (biological) treatment (CRWQCB website #1).

The El Segundo Refinery currently uses recycled water from the West Basin MWD for both irrigation and the cooling towers. The refinery's daily consumption of recycled water for irrigation purposes is approximately 200,000 gallons per day (gpd). Additionally, the cooling towers use approximately 3 mgd of nitrified recycled water: The low and high pressure boiler feeds consume approximately 1.23 mgd and 2.57 mgd of recycled water, respectively (CRWQCB website #1).

El Segundo Power, LLC (El Segundo Power Generating Station)

El Segundo Power, LLC, has operated the El Segundo Generating Station (El Segundo Station) since April 4, 1998. The El Segundo Station was formerly operated by Southern California Edison (from the 1950's to April 1998). The El Segundo Station is steam electric generating facility located at 301 Vista del Mar in El Segundo and has a design capacity of 1,020 megawatts. However, by 2000, the El Segundo Generating Station was consistently running less than its full capacity of 1,020 megawatts. The El Segundo Station is permitted to discharge up to 607 mgd of wastes consisting of once-through cooling water from four steam electric generating units (Units 1 through 4), treated chemical metal cleaning wastes, non-chemical metal cleaning wastes, low volume wastes, stormwater runoff, and treated sanitary wastes into the Pacific Ocean through two outfalls (CRWQCB website #1).

To cool generating units 1 and 2, ocean water is supplied at a rate of about 144,000 gallons per minute (gpm) through a concrete conduit (10-feet inside diameter) which extends approximately 2,600 feet offshore to a depth of -30 feet Mean Lower Low Water (MLLW). The intake structure is constructed with a velocity cap that is designed to divert fish away from the intake structure. It also has a screening structure that removes trash, algae, and marine organisms that enter the intake structure with the seawater. Marine fouling of the cooling water conduits (intake and discharge) is controlled by temporarily recirculating (thus increasing the temperature) and reversing the flow of the once-through cooling water alternately in each offshore conduit (i.e., the discharge point becomes the intake point, and the intake point becomes the discharge point). This procedure, referred to as heat treatment, is typically conducted every six weeks and lasts for about six hours per conduit. During the heat treatment, the high temperature last for one hour. The water temperature is increased 23°F when the units are operated at full capacity. The heated water is discharged through Outfall No. 001, a 10-feet diameter conduit that terminates approximately 1,900 feet offshore at a water depth of -26 feet MLLW. During the heat treatment, the temperature of the water discharged through the intake conduit must be raised to 125°F for two hours to kill the fouling organisms (CRWQCB website #1). No heat treatments were conducted on discharge point 001 during 2008. On January 1, 2003, Units 1 and 2 ceased commercial operation; the cooling water system continued to remain in operation. The average discharge flow from Outfall No. 001 was 29.2 mgd in 2008. Chlorination to control biological growths ceased at the end of February 2008 (El Segundo Power, 2009).

The cooling water system for Units 3 and 4 is separate from Units 1 and 2 but is a similar cooling system. The intake conduit (11-feet inside diameter) also extends 2,600 feet to a depth of -30 feet MLLW; it supplies ocean water at a rate of about 295,000 gpm. The water temperature is increased 22°F when the units are operated at full capacity. The heated water is discharged to the ocean through Outfall No. 002

which extend about 2,100 feet offshore at a depth of about -20 feet MLLW. To control biological growths, the condenser tubes are treated by intermittently injecting chlorine, for a maximum of two hours per generating unit per day, into the cooling water stream (CRWQCB website #1). The average discharge flow from Outfall No. 002 was 130.8 mgd in 2008 (El Segundo Power, 2009).

AES Redondo Beach, LLC (Redondo Generating Station)

AES Redondo Beach, LLC (Redondo Generating Station) discharges wastes from its Redondo Generating Station; the permit was originally issued to Southern California Edison, the previous owner of the facility. AES Redondo Beach, LLC, acquired the Redondo Generating Station in 1998. The Redondo Generating Station is a steam electric generating facility located at 1100 Harbor Drive in Redondo Beach. The facility has eight generating units. However, Units 1, 2, 3, and 4 have not been operated for at least four years and because the Discharger has no plans to place them into service in the future, these units are being dismantled. The remaining units (5, 6, 7, and 8) have a design capacity of 1,310 megawatts and are permitted to discharge up to 898 mgd of wastes consisting of once-through cooling water, treated chemical metal cleaning wastes, groundwater seepage, and low volume wastes into Santa Monica Bay (CRWQCB website #1).

The wastes are discharged through two outfalls; Discharge Serial No. 001 consists of two conduits, each extending approximately 1,600 feet offshore, which terminate at a depth of 25 feet MLLW. Wastes discharged through this outfall consist of up to 215 mgd of once-through cooling water from steam electric generating units 5 and 6, five mgd of groundwater seepage from basement areas of the generating station, and four mgd of low-volume wastes (CRWQCB website #1). The average discharge flow from outfall 001 was 41.375 mgd in 2008 (AES Redondo Beach, 2009). Discharge Serial No. 002 consists of one conduit, which extends approximately 300 feet off the beach at King Harbor, Redondo Beach, and terminates at a depth of 20 feet MLLW. Wastes discharged through this outfall consist primarily of once-through cooling water from Units 7 and 8 (up to 674 mgd), with small amounts of condensate overboard overflow, fuel oil tank farm rainfall run-off, and yard drains (CRWQCB website #1). The average discharge flow from outfall 002 was 37.175 mgd in 2008 (AES Redondo Beach, 2009).

Marine fouling of the cooling water conduits (intake and discharge) is controlled by temporarily recirculating (thus increasing the temperature) and reversing the flow of the once-through cooling water alternately in each offshore conduits. This procedure, referred to as heat treatment, is typically conducted every six weeks and lasts for about two hours per conduit. During the heat treatment, the temperature of the water discharged through the intake conduit must be raised to 125°F for two hours to kill the fouling organisms. To control biological growths, the condenser tubes are treated by intermittently injecting chlorine (in the form of sodium hypochlorite), for a maximum of two hours per generating unit per day, into the cooling water stream (CRWQCB website #1).

City of Los Angeles, Department of Water and Power - Scattergood Generating Station

The Scattergood Generating Station is located about 1,500 feet south of the Hyperion Treatment Plant at 12700 Vista del Mar in Los Angeles. The plant is comprised of three steam electric generating units with a total capacity of 820 megawatts and is permitted to discharge up to 496 mgd of wastes containing once-through cooling water, pretreated metal cleaning wastes, low-volume in-plant wastes, cooling tower blowdown, and stormwater runoff into Santa Monica Bay near Dockweiler State Beach in El Segundo (CRWQCB website #1). The average discharge during 2008 was 314.75 mgd (City of LA, 2009a).

Cooling water is drawn from Santa Monica Bay through a single 12 feet diameter conduit, which extends about 1,600 feet offshore. The conduit is equipped with a velocity cap to deter marine life from entering the system. After passage through the generating units' once-through cooling system, wastewater is then discharged to the same size conduit that runs parallel to the intake pipe (CRWQCB website #1).

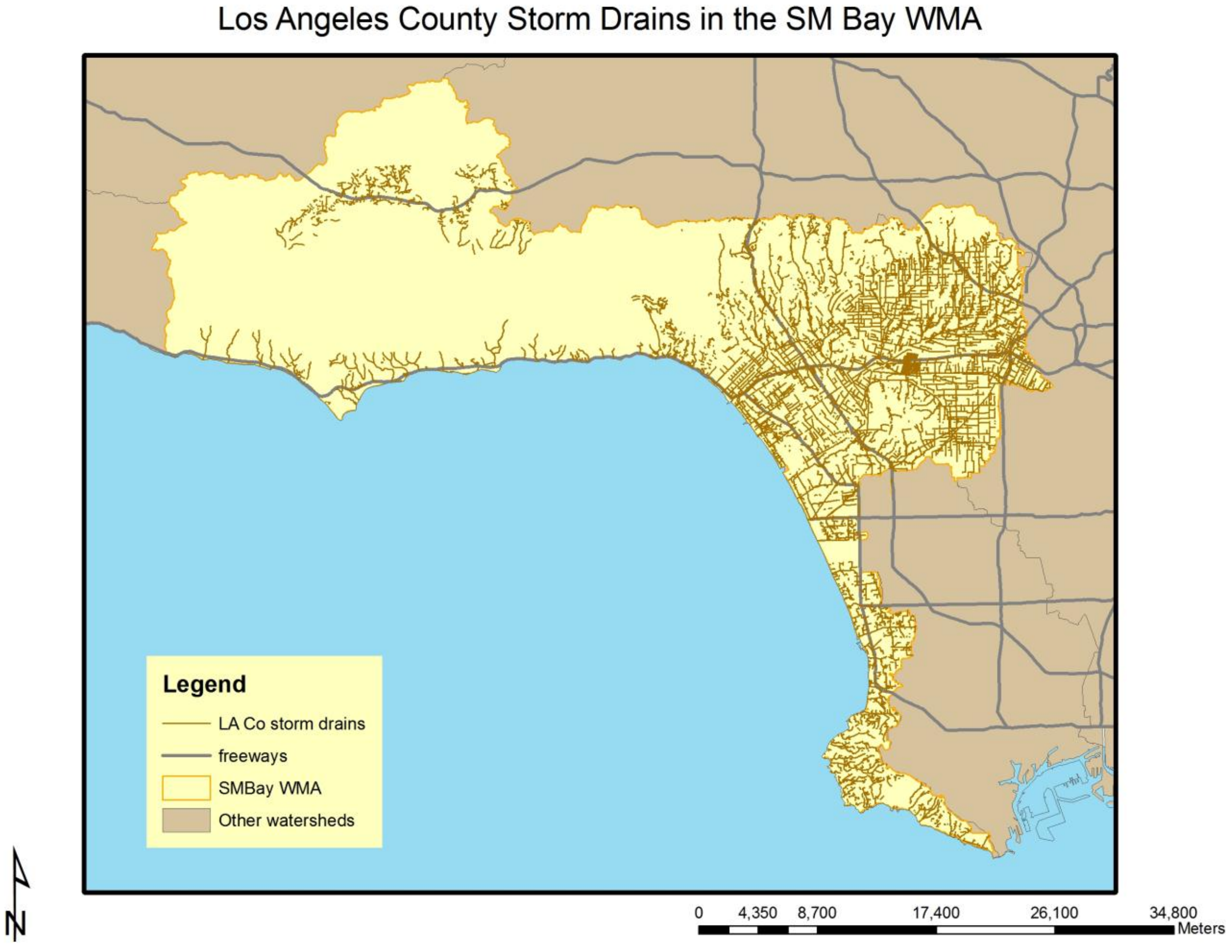
Marine fouling of the cooling water conduits (intake and discharge) is controlled by temporarily recirculating (thus increasing the temperature) and reversing the flow of the once-through cooling water alternately in each offshore conduit. This procedure, referred to as heat treatment, is typically conducted every six weeks and lasts between two and six hours for the three generating units. To control biological growths, the condenser tubes are treated by intermittently injecting chlorine (in the form of sodium hypochlorite) or a combination of chlorine and sodium bromide, for a maximum of two hours per generating unit per day, into the cooling water stream (CRWQCB website #1).

Storm Water/Urban Runoff

Urban and storm water runoff are carried to waterbodies through the Region's massive storm drain system. In some areas of the watershed, the drainage system consists of natural streams, riparian corridors and wetlands, and therefore are waterbodies with considerable ecological value as previously described. The rest is part of the 5,000 mile concrete-lined storm drain network within Los Angeles County that was built to move flood waters quickly to the ocean. The storm drain system is completely separate from the sewer system except where storm drain diversions have been installed (CRWQCB, 1997).

Storm water and urban runoff are discharged to Santa Monica Bay through more than 200 outlets; some are as large as a 370 feet-wide concrete channel connected to other channels many miles inland, while others are so small that they are hard to detect and only drain one or two, blocks near the coast. About a dozen of these outlets have flows during dry-weather, discharging 10 to 25 gallons of water/second. On a rainy day, however, 10 billion gallons can flow through the system. Each year an average of 30 billion gallons of storm water and urban runoff are discharged into Santa Monica Bay (CRWQCB, 1997). Storm drains in the Los Angeles County portion of the WMA are shown in the map below.

Figure 15



Urban and storm water runoff contains greatly varying types of material. Land use strongly influences the types and concentrations of materials found in runoff. Runoff quantity and velocity increases when roads, buildings or pavement (impervious surfaces) cover land that once absorbed and filtered rainfall (CRWQCB, 1997).

The quality, and to some extent, the quantity of storm water runoff is controlled primarily through the use of structural and non-structural best management practices (BMPs). This approach is embodied in the MS4 NPDES permit, which was reissued in December 2001 and subsequently amended in 2006, 2007, 2009, and 2011, to the District (as principal permittee), 85 cities, and County of Los Angeles (as co-permittees) by the Regional Board. Activities such as increased street sweeping decrease the amounts of suspended solids in the receiving waters as well as pollutants which normally adhere to the solids. Public education programs strive to inform people of the impacts of activities such as pouring antifreeze or used motor oil down storm drains or overfertilizing lawns, and can offer alternatives to negative behaviors (CRWQCB, 1997).

General storm water discharge permits for industrial facilities and construction sites were issued by the State Board beginning in the summer of 1992 (CRWQCB, 1997). Currently, approximately 87 general industrial and 401 construction activity permits exist within the WMA (CRWQCB, 2007).

A study entitled, "Sources, Patterns and Mechanisms of Storm Water Pollutant Loading From Watersheds and Land Uses of the Greater Los Angeles Area" was conducted by SCCWRP in 2007. Storm water runoff and the associated contaminants from urban areas is one of the leading sources of water quality degradation in surface waters. Runoff from pervious and impervious areas carries accumulated contaminants (i.e., atmospheric dust, trace metals, street dirt, hydrocarbons, fertilizers and pesticides) directly into receiving waters. Because of the environmental effects of these contaminants, effective storm water monitoring and management requires identification and characterization of the sources, patterns, and mechanisms that influence pollutant concentrations and loads. Little is known about the mechanisms and processes that influence spatial and temporal factors that affect the magnitude and patterns of constituent loading from specific land uses. Specifically, storm water managers need to understand how sources vary by land use type, how patterns of loading vary over the course of a single storm, how loading varies over the course of a storm season, and how applicable national or regional estimates of land use-based loading are to southern California. Ballona Creek, Santa Monica Canyon, and Arroyo Sequit were three sites in the Santa Monica Bay WMA sampled both during dry and wet weather (Stein, et al., 2007).

The study concluded:

- Storm water runoff from watershed and land use-based sources is a significant contributor of pollutant loading and often exceeds water quality standards.
- No single land use type was responsible for contributing the highest loading for all constituents measured.
- All constituents were strongly correlated with total suspended solids.
- Storms sampled from less developed watersheds (i.e., Santa Monica Canyon and Arroyo Sequit) produced constituent event mean concentrations and fluxes that were one to two orders of magnitude lower than comparably-sized storms in urbanized watersheds.
- Storm water runoff of trace metals from the urban watersheds in this study produced a similar range of annual loads as those from traditional point sources such as large publicly-owned treatment plants. However, when combined with dry weather estimates of pollutant loading, the total urban and stormwater runoff from contribution from all watersheds in the greater Los Angeles area far exceeds that of the traditional point sources.
- For all storms sampled, the highest constituent concentrations occurred during the early phases of storm water runoff with peak concentrations usually preceding peak flow.
- Highest constituent loading was observed early in the storm season with intra-annual variability driven more by antecedent dry period than amount of rainfall. This seasonal pattern suggests that focusing management actions on early season storms may provide relatively greater efficiency than distributing lower intensity management actions throughout the season (Stein, et al., 2007).

Highway Stormwater Runoff

Land-use analyses indicate that approximately 0.5 square miles (sq mi) in Malibu Creek/other Rural watersheds and 6.2 sq mi in Ballona Creek/Urban Watersheds are made up of roadways, highways and freeways (CRWQCB, 2007).

Transportation and related activity on roadways, freeways and highways generate a number of pollutants of concern which arise from several sources. For example, hydrocarbons are present in fuels, motor-oil and other lubricating oils; suspended solids are generated during construction; pesticides wash-off from landscape overuse; nitrogen and phosphorous are present as additives in lubricants and in fertilizers; and heavy metals occur in fuel, lubricants, brakepads, vehicle tires, and as by-products of vehicle wear-and-tear (CRWQCB, 2007).

Pursuant to Clean Water Act Section 402(p), storm water permits are required for discharges from a municipal separate storm sewer system (MS4) serving a population of 100,000 or more. USEPA defines an MS4 as a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains) owned or operated by a State (SWRCB website #2).

The California Department of Transportation (Caltrans) is responsible for the design, construction, management, and maintenance of the State highway system, including freeways, bridges, tunnels, Caltrans' facilities, and related properties. Caltrans' discharges consist of storm water and non-storm water discharges from State owned right-of-ways (SWRCB website #2)

Before July 1999, storm water discharges from Caltrans' storm water systems were regulated by individual NPDES permits issued by the Regional Water Boards. On July 15, 1999, the State Water Board issued a statewide permit (Order No. 99-06-DWQ) which regulated all storm water discharges from Department owned MS4s, maintenance facilities and construction activities. The existing permit (Order No. 99-06-DWQ) will be replaced upon adoption of a new permit (SWRCB website #2).

Caltrans' Storm Water Management Plan (SWMP) describes the procedures and practices used to reduce or eliminate the discharge of pollutants to storm drainage systems and receiving waters. Additional information, including technical reports characterizing various aspects of runoff from highways and BMP effectiveness, can be found at the following websites (SWRCB website #2).
http://www.waterboards.ca.gov/water_issues/programs/stormwater/gen_caltrans.shtml

http://www.dot.ca.gov/hq/env/stormwater/special/newsetup/index.htm#SWMP

Each Caltrans district has a workplan which outlines the planned stormwater activities for the upcoming fiscal year. The Los Angeles Regional Board is contained entirely with Caltrans District 7; its workplan includes information about the district's water bodies, best management practices (BMPs) by each division, monitoring programs, corridor studies and TMDLs. It describes how the District will specifically implement the requirements of the Statewide Stormwater Management Plan (SWMP) during fiscal year 2009-2010.

Current goals of District 7 include improving compliance-monitoring practices, enhancing BMP implementation, and extending public outreach. Following are some of the goals for the respective Stormwater Departments:

- To achieve these goals, the District Stormwater Coordinator and Design Stormwater Coordinator have committed to update the Treatment BMP spreadsheet for Treatment BMP locations which fulfills the requirement from Headquarters to maintain a database of all treatment BMPs implemented in each District, and as a result, the entire department.

- The Design Stormwater Unit facilitates the incorporation of water pollution and erosion control recommendations into the planning, design, and construction of all projects in District 7.
- The TMDL Unit participates in implementation plans of adopted TMDLs with waste load allocations assigned to the District.
- The Corridor Studies Unit will oversee the studies for the treatment or reduction of the Department's stormwater discharges, in each identified watershed, by at least 20% below 1994 levels.
- The Construction Stormwater Unit properly implements the SWMP and the DWP within the Division of Construction.
- The Maintenance Unit implements a stormwater program with its allocations that utilizes best management practices for stormwater projection during all of its roadway maintenance activities. The District is committed to applying vegetation control products to minimize usage and/or eliminate pollutant runoff. The District is committed to inspect, repair or clean storm drain systems.
- The Encroachment Permit Stormwater Unit ensures that all permits issued to agencies and other public entities encroaching into the Department's Right-of-Way comply with the NPDES Permit that is consistent with what is required of Maintenance, Construction, and Design.
- The Right-of-Way Stormwater Unit complies with the NPDES permit as required through the SWMP.

The District has also committed to implement BMPs appropriate to the projects, additional education for the staff and the public in partnership with other stakeholders bring the urgency of eliminating stormwater runoff pollution (Caltrans, 2010).

ADDITIONAL SOURCES

Atmospheric Deposition

Deposition of airborne pollutants is recognized as a potentially significant source of contamination to waterbodies in the watershed. The Santa Monica Bay Watershed is situated within the South Coast Air Basin, which experiences the nation's worst air quality. Contaminants that are found to originate from atmospheric deposition include, but are not limited to, chlorinated organic compounds, metals, PAHs, and oxides of nitrogen. The most plausible sources of these pollutants (except chlorinated organic compounds) are deposition of vehicle fuel exhaust and wear of auto parts (CRWQCB, 1997).

It is estimated that most airborne pollutants are carried eventually to waterbodies by storm water runoff, both wet deposition as intercepted by rain drops, and dry deposition as scoured by surface flows. Atmospheric deposition directly to the Bay can be significant when wind direction changes and push air from inland to the sea. Other notable sources of direct deposition include air traffic and wildfire (CRWQCB, 1997).

A study that measured and modeled atmospheric deposition on Santa Monica Bay and the Santa Monica Bay WMA was conducted by SCCWRP and reported on in 2001. This study was designed to answer the following questions:

- What is the total annual load of toxic contaminants and nutrients to Santa Monica Bay/Watershed via atmospheric deposition?
- What proportion of the annual load of toxic contaminants and nutrients from atmospheric deposition is contributed during specific meteorological events or conditions?
- How do atmospheric concentrations of toxic contaminants and nutrients and associated loads vary spatially within the Santa Monica Bay watershed and receiving water and among other regions of Los Angeles (Stolzenbach, et al., 2001)?

The major findings and conclusions of this study were:

- The annual rate of atmospheric transport and deposition of trace metals to Santa Monica Bay, defined as the sum of direct and indirect (on the watershed) deposition, is significant relative to other inputs of metals to the Bay.
- The annual total of atmospheric deposition of metals on Santa Monica Bay and its watershed is primarily the result of chronic daily dry deposition throughout the year, which far exceeds the estimated annual dry deposition of metals resulting from Santa Ana conditions and the annual wet deposition of metals.
- Most of the mass of metals deposited by dry deposition on Santa Monica Bay and its watershed originates as relatively large (bigger than 10 microns) aerosols from area sources (off-road vehicles and small businesses) in the Santa Monica Bay watershed.
- The relative amounts of chromium and zinc contributed by atmospheric and non-atmospheric sources are approximately equal; on the other hand, almost all of the lead inputs to Santa Monica Bay are through atmospheric sources. Non-atmospheric inputs contribute the majority of copper and nickel to the Bay.

The major implications for environmental management are:

- At least for metals, direct atmospheric deposition, primarily chronic daily dry deposition, must be considered as a significant nonpoint source in establishing TMDLs for Santa Monica Bay and waterbodies in the Bay's watershed.
- For some metals, the majority of the metal mass in the urban runoff during the wet season may be material originally associated with aerosols that are transported some distance from their original point of emission into the atmosphere before being deposited in the watershed.
- Reductions of nonpoint source inputs may require a coupling between air quality and water quality regulatory actions and policies. For metals, the most important sources of emission to the atmosphere are non-permitted area sources, which may be relatively difficult to regulate.
- For some sources, the deposition may be primarily composed of large aerosols and may occur very locally, perhaps within 100-500 meters of the source. This pattern of deposition will be difficult to monitor on a regional scale and will require a larger number of localized measurements (Stolzenbach, et al., 2001).

Contaminated Sediments

Contaminated sediment problem areas in the Bay include DDT- and PCB-contaminated sediments around the JWPCP outfall on the Palos Verdes Shelf and Slope, and around the Hyperion Plant outfall in the Santa Monica submarine canyon (CRWQCB, 1997).

Over the last 20 years, there has been a substantial increase in our knowledge about the characteristics of sediments and sediment contamination on the Palos Verdes Shelf. Most of the information comes from the natural resource damage assessment conducted by trustees of a National Oceanic and Atmospheric Administration (NOAA) lawsuit and studies conducted by the SMBRP (CRWQCB, 1997).

Based on the NOAA assessments and other existing information, the U.S. EPA in July 1996 began a Superfund investigation of the contaminated sediments on the Palos Verdes Shelf. Under this investigation, EPA recently completed a site characterization investigation and feasibility analysis and selected a preferred alternative for cleanup of the site (CRWQCB, 1997). More information on these studies are found elsewhere in this document.

Currently, disposal of dredged material is not a significant source of pollutant loading in Santa Monica Bay. The Ballona Creek Entrance Channel is one area of concern for sediment buildup and where periodic maintenance dredging is carried out. Dredged material from these sites is disposed of directly on the beach if it is deemed "clean" and is otherwise compatible (coarse-grained) or is placed in the nearshore zone so that waves can redistribute the sand onto the beach. No permanent solution has been reached for disposal of contaminated sediment. Ocean disposal within Santa Monica Bay is unlikely since there is no permitted ocean dumpsite located in the Bay at this time (CRWQCB, 1997).

Sediment resuspension has been and will continue to be the major loading source for historically deposited toxic chemicals, most notably, DDT and PCBs on the Palos Verdes Shelf. Because of the large size of the contaminated area, capping will only reduce, but not eliminate the input from this source (CRWQCB, 1997).

Water Supply

Water supply could become a source of pollutant loading if the concentration of certain pollutants in either imported water or pumped ground water exceeds the "background" level of existing surface waters. It could be a concern when water supply is considered the only or major source of the pollutant (CRWQCB, 1997).

Natural Sources

In 2007 SCCWRP released a report entitled "Assessment of Water Quality Concentrations and Loads from Natural Landscapes." The overall goal of this study was to evaluate the water quality contributions and properties of stream reaches in natural catchments throughout southern California. Specific questions addressed by this study were:

- What are the ranges of concentrations, loads, and fluxes of various metals, nutrients, solids, algae, and bacteria associated with storm and non-stormwater runoff from natural areas?
- How do the ranges of constituent concentrations and loads associated with natural areas compare with those associated with urban (developed) areas and existing water quality standards?
- How do the environmental characteristics of catchments influence constituent concentrations and loads from natural landscapes?

These questions were addressed by measuring surface water quality at 22 natural open-space sites spread across southern California's coastal watersheds including two sites within the Santa Monica Bay WMA; Arroyo Sequit in the North Coast Area and Cold Creek within the Malibu Creek Watershed.

The results of this study yielded the following conclusions:

- Concentrations and loads in natural areas are typically between one to two orders of magnitude lower than in developed watersheds.
- The wet-weather TSS concentration from natural catchments was similar to that from developed catchments.
- Differences between natural and developed areas are greater in dry weather than in wet weather
- Dry weather loading can be a substantial portion of total annual load in natural areas.
- Peak concentration and load occur later in the storm in natural areas than in developed areas.
- Natural catchments do not appear to exhibit a stormwater first flush phenomenon.
- Concentrations of metals from natural areas were below the California Toxic Rule criteria.
- The ratio of particulate to dissolved metals varies over the course of the storm.
- Wet-weather bacteria concentrations for *E. coli*, *enterococcus*, and total coliform exceeded freshwater standards in 40 to 50% of the samples.
- Concentrations of several nutrients were higher than the proposed USEPA nutrient guidelines.
- Catchment geology was the most influential factor on variability in water quality from natural areas.
- Catchments underlain by sedimentary rock generally produce higher constituent concentrations than those underlain by igneous rock.
- Other environmental factors such as catchment size, flow-related factors, rainfall, slope, and canopy cover as well as land cover did not significantly affect the variability of water quality in natural areas (Stein and Yoon, 2007).

Other Sources

Besides trash and debris generated in the watershed and carried to the ocean via storm flows, beach littering and boating wastes are two other important sources of marine debris. Although the high number of beachgoers and recreational boats utilizing the Bay suggests that the scale of the problem could be large, there is little information regarding the contribution of marine debris from these sources compared with stormwater/urban runoff (CRWQCB, 1997).

In, addition to marine debris, boating activities (and in particular boat maintenance) have been known to be the major source of TBT found in marinas and harbors. Boating activities are also potential sources of pathogens, oil and debris, and the heavy metals copper and zinc (the former from anti-fouling paint and the latter from zinc anodes) (CRWQCB, 1997).

If. not contained, a major oil or hazardous materials spill can cause considerable ecological damage and contribute to the total pollutant loading of polycyclic aromatic hydrocarbons in the watershed. However, large scale spills are generally rare in Santa Monica Bay; most reports of oil spills/sheens over the past three years involve amounts of a few gallons. The majority of larger spills into the Santa Monica Bay WMA involve sewage (CRWQCB, 1997). Spills reported to the California Emergency Management Agency can be viewed as reports at the website http://www.oes.ca.gov/operational/malhaz.nsf/$defaultView?OpenView&Start=1; the spill list can be narrowed down through a search (CEMA website).

Watershed Stakeholder Groups

There are a large number of watershed stakeholder groups with interests in the Santa Monica Bay, both the ocean and the watersheds draining to it. While many meet and conduct activities that focus on their own areas of interest, they will often participate in some of the larger scale groups as well which are highlighted below.

Santa Monica Bay Restoration Commission (formerly, Santa Monica Bay Restoration Project) The Santa Monica Bay Restoration Project (SMBRP) was formed in 1989 under the National Estuary Program in response to the crucial problems of the Bay. The SMBRP was charged with the responsibility of assessing the Bay's problems, developing solutions and putting them into action. Under the five year development process outlined in the Clean Water Act, a comprehensive characterization of the Bay's environmental condition and a plan of action was structured with the involvement of a diverse group of stakeholders organized into SMBRP's Management Conference (Management Committee, Technical Advisory Committee and Public Advisory Committee). The organization and membership of the Bay Watershed Council expanded from the pre-BRP SMBRP Management Conference and became representative of the key stakeholders for the watershed (CRWQCB, 1997). The Bay Commission is now composed of a Watershed Council, Governing Board, Executive Committee, and Technical Advisory Committee (CRWQCB, 2007) More information may be found at http://www.santamonicabay.org .

The scientific characterization of the Bay was described in the SMBRP's "State of the Bay, 1993" report and other technical investigations. This report, along with the Project's recommendations for action, comprised the Bay Restoration Plan (BRP), which was approved by the Governor Wilson and the EPA Administrator Carol Browner in March 1995. With over 200 actions, the Plan addressed the need for pollution prevention, public health protection, habitat restoration and comprehensive resource management (CRWQCB, 1997).

Guided by a watershed perspective, the Bay Restoration Plan recommended many watershed/ subwatershed-based pollutant management strategies and actions and thus became the first watershed management plan developed in the Los Angeles Region (CRWQCB, 1997).

Malibu Creek Watershed Council (with subcommittees) A number of stakeholders began meeting in the late 1980's/early 1990's in the Malibu area. Through their efforts, a list of priority issues that need to be resolved was formulated. This lead to the development of a Natural Resources Plan for the watershed which was prepared by the U.S. Natural Resources Conservation Service. Separate task forces and subcommittees have formed over the years to address specific issues. The Watershed Council consists of members from State and local agencies and organizations, environmental groups, business and dischargers, special districts and the general public. Their mission is to oversee and implement actions that will protect, enhance and restore habitats of the watershed, as well as improve water quality. Current active committees/task forces under the Council include those focusing on habitat/species, monitoring/ water quality, education, and Rindge Dam. The Council's Malibu Lagoon Task Force served as an advisory group to a recently completed lagoon restoration plan. A copy of the final lagoon restoration plan funded by the Coastal Conservancy may be found at http://www.healthebay.org/currentissues/mlhep/default.asp. The Monitoring Subcommittee also met regularly to serve as a Technical Advisory Committee to a Proposition 13-funded watershed-wide monitoring program which has been completed. It is currently working to establish a central repository for monitoring metadata for the watershed. A Malibu Creek Ecosystem Restoration Feasibility Study is underway. The U.S. Army Corps of Engineers and California Department of Parks and Recreation are the major partners in this effort which will evaluate, among other options, the feasibility of restoring the ecosystem through removal of Rindge Dam. The technical advisory group for the effort meets approximately monthly while a larger stakeholder focus group meets as needed. Watershed Council meetings occur every other month while subcommittees may meet intermittently or regularly. More information may be found at http://www.malibuwatershed.org/ (CRWQCB, 2007).

Ballona Creek Watershed Task Force The task force was formed in 2000 as a stakeholder group addressing water quality and habitat issues in the watershed and developing a Ballona Creek Watershed Management Plan which can be found at http://www.ladpw.org/wmd/watershed/bc. The group continues to meet in pursuit of Plan implementation (CRWQCB, 2007).

Topanga Watershed Committee The committee was formed in 1998 as a followup to previous a community group working on developing alternatives to traditional flood control measures. Their focus has expanded to include general watershed management and protection activities as well as volunteer monitoring. Work has also been completed to define the extent of restoration feasible to Topanga Lagoon. A 205(j) grant-funded project conducted baseline water quality monitoring for two years during both dry- and wet-weather. A watershed management plan was finalized in 2002. Watershed residents continue work on implementation of actions identified in the Management Plan. The group meets on an as-needed basis. More information about this group may be found at their website http://www.topangacreekwatershedcommittee.org (CRWQCB, 2007).

Water Quality and Beneficial Use Issues By Subwatershed Areas

This section provides summaries of water quality issues for nine subwatershed areas in the Santa Monica Bay watershed. These nine subwatershed areas are grouped from 28 catchment basins based on their distinctive geographical (topographical and land use) characteristics. Descriptions on each of the nine regions are confined to the land and coastal water areas (areas defined as "waters of the state") and span 414 square miles. Collectively they are known as the ***Santa Monica Bay Watershed Management Area***. Issues related to ocean water outside the "waters of the state" are addressed in a separate "Ocean" section (CRWQCB, 1997).

Each summary of the subwatersheds (including the "Ocean" section) includes a general description of the region, listed of identified beneficial uses, evidence of beneficial use impairments, list of pollutants of concern, information on sources and loading, and water quality improvement strategies. Descriptions and discussion emphasize issues that are specific to and/or a priority in a subwatershed area (CRWQCB, 1997). As appropriate or useful, maps shown in earlier sections of the report are shown again, now zoomed to the subwatershed under discussion.

North Coast

The North Coast region represents one of nine different subwatershed groups that drain to Santa Monica Bay. This subwatershed drains an area of approximately 55 square miles and borders the eastern portion of Ventura County to the west, the Malibu Creek subwatershed to the north and east, and the Pacific Ocean to the south. Several minor streams and creeks discharge directly to the Bay, but there are no major traditional point sources discharges in this subwatershed; permits for discharges to land are generally for on-site septic systems. The area is largely undeveloped, has similar land use activities and pollutant load characteristics, and the immediate receiving waterbody is generally considered pristine (CRWQCB, 1997).

Flows

A number of creeks and streams in the North Coast subwatershed flow directly into Santa Monica Bay. The largest of these creeks are Arroyo Sequit and Trancas. Together, the flows in this region total approximately 5,500 acre-feet per year (CRWQCB, 1997).

Land Uses

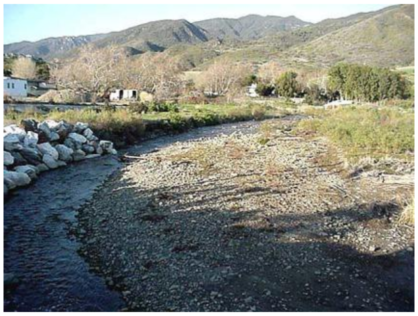
Although this region is rural, there is still evidence of development in the North Coast subwatershed. Most of the development is located close to the coastline, near Point Dume and just north of Malibu Creek and Lagoon. Additionally, a few areas in the upper subwatershed area have been developed, but the percentage is relatively small. Land use activities can be broken down into the following: 92% open space, 7% residential, and less than 1% for commercial/industrial and public (CRWQCB, 1997).

Wetlands

The North Coast region is home to some of the County's last remaining wetlands. They can be found in the drainage areas of Arroyo Sequit Canyon, Trancas Lagoon and Lower Zuma Creek and Lagoon; each varies in both type and function. The Arroyo Sequit Canyon, and Zuma Creek and Lagoon areas are considered riparian freshwater wetlands while Trancas Lagoon represents a more typical saltwater coastal wetland. The drainage areas of these creeks and lagoons lie within the Santa Monica Mountains National Recreation Area, as do several others in this subwatershed. Local wetlands serve several purposes, including providing essential habitats for a diversity of species such as birds, fish, amphibians, reptiles, invertebrates, and mammals. They also act as natural filters which are able to absorb, retain and remove pollutants from the water, recharge groundwater, and they provide flood protection, recreational use, and aesthetic value. The lagoons provide feeding and resting areas for shore birds and migratory waterfowl (CRWQCB, 1997).

Arroyo Sequit Canyon Arroyo Sequit is located approximately 28 miles west of the City of Santa Monica and is one of the best preserved small coastal drainages in the Santa Monica Bay watershed. The drainage area of this canyon is approximately 7,203 acres. The riparian wetlands located there begin at the confluence of the East and West Forks of Arroyo Sequit and extend 3.2 miles to the Pacific Ocean, where a small coastal lagoon has formed. The habitat is primarily sycamore alluvial woodland. Stream flow supports a wide variety of native aquatic animals, including resident and migratory populations of rainbow and steelhead trout. However, the lower floodplain has been encroached upon by the camping facility for Leo Carillo State Beach. Barriers to fish passage and the presence of various invasive species are also concerns. Restoration of the riparian and lagoon habitats is important for native plant and wildlife species (CRWQCB, 1997).

Zuma Creek and Lagoon The Zuma Creek and Lagoon drainage area, of approximately 5,722 acres, is mostly undeveloped national parkland and open space. Lower portions of the creek are channelized in places, and there is a residential area adjacent to the stream just north of the Pacific Coast Highway bridge. The riparian corridor is supported by a small perennial stream, providing the primary source of water for the generally closed lagoon. Freshwater wetland vegetation can also be found there, although it is severely stressed during periodic drought conditions. This area also supports a dune habitat. In dry years, there is typically little water present, but with increased runoff from development and during "wet" years, a larger two-acre lagoon has formed. However, this lagoon has most likely fluctuated in size over time. The area is currently degraded due to past dumping practices and the presence of non-native vegetation. Barriers to fish passage are also of concern and a top priority of the SMBRC (CRWQCB, 1997).



Trancas Creek and Lagoon Trancas Lagoon is a small coastal lagoon approximately nine acres in size located several miles west of Point Dume in Los Angeles County and is fed by numerous small tributaries. However, some runoff enters the lagoon from hillsides and from adjacent land uses, such as residential, commercial, and local roadways (CRWQCB, 1997).

Trancas Creek drains a watershed of 6,233 acres. The mouth of the creek is often closed by sand bars which form due to wave action and littoral transport of sand. The berm closes the system to tidal action and causes the creek flow to back up within the lagoon. In the past, the lagoon was mechanically breached periodically in order to allow outflow and to prevent local flooding. A cement and boulder lined debris basin has been built 0.8 miles up Trancas Canyon and ends at a broad basin just east of PCH near Trancas Beach. The mouth of Trancas Creek has been highly constricted by fill. A shopping center and nursery operation border one side of the lagoon and an old, vacant horse riding area borders the other side (CRWQCB, 1997).

Solstice Canyon Creek Solstice Canyon is home to some of Santa Monica Bay watershed's unique wetlands. Specifically, the Solstice Canyon wetlands are palustrine, i.e., non-tidal wetlands dominated by vegetation. Streams feeding these wetlands are intermittent, flowing only part of the year and the stream corridors are typically steep, narrow and highly erosive. This confines riparian vegetation to the immediate stream channel area (CRWQCB, 1997). The invasive New Zealand mudsnail is of great concern in this area.

Beneficial Uses

The North Coast subwatershed is host to many beneficial uses as can be seen in the table below (CRWQCB, 1994).

Table 4. Beneficial uses of the waters within the North Coast subwatershed

Coastal Feature or Waterbody	Hydro Unit #	MUN	GWR	NAV	REC1	REC2	COMM	WARM	COLD	EST	MAR	WILD	RARE	MIGR	SPWN	SHELL	WET
Arroyo Sequit	404.44	P	I		E	E		E	E			E	E	E	E		E
San Nicholas Canyon Creek	404.43	P			I	I		I				E					
Los Alisos Canyon Creek	404.42	P			I	I		I				E	E				
Lachusa Canyon Creek	404.42	P			I	I		I				E					
Encinal Canyon Creek	404.41	P			I	I		I				E	E				
Trancas Canyon Creek	404.37	E			E	E		E				E	E				
Dume Lagoon	404.36			E	E	E	E			E		E	E	Pf	P		E
Dume Creek (Zuma Canyon)	404.36	E			E	E		E	E			E	E	P	P		
Ramirez Canyon Creek	404.35	I			I	I		I				E			P		
Escondido Canyon Creek	404.34	I			I	I		I				E	E				
Latigo Canyon Creek	404.33	I			I	I		I				E	E				
Solstice Canyon Creek	404.32	E			E	E		E				E		P	P		
Puerco Canyon Creek	404.31	I			I	I		I				E					
Corral Canyon Creek	404.31	I*			I	I		I				E					
Nicholas Canyon Beach	403.43			E	E	E	E				E	E			P	E	
Trancas Beach	403.37			E	E	E	E				E	E			P	E	
Zuma County (Westward) Beach	404.35			E	E	E	E				E	E			P	E	
Dume State Beach	404.36			E	E	E	E				E	E			P	E	
Dume Lagoon	404.36			E	E	E	E			E		E	E	P	P		E
Escondido Beach	404.34			E	E	E	E				E	E			P	E	
Dan Blocker Memorial (Corral) Beach	404.31			E	E	E	E	E			E	E			P	E	
Puerco Beach	404.31			E	E	E	E				E	E			P	E	
Amarillo Beach	404.21			E	E	E	E				E	E			P	E	

E: Existing beneficial use; **P:** Potential beneficial use; **I:** Intermittent beneficial use

Significant Regions

Sections offshore of the North Coast subwatershed (from the Ventura County line to Latigo Point) have been designated as an Area of Special Biological Significance (ASBS) by the State Water Resources Control Board (SWRCB); portions of the land area have been designated as Significant Ecological Areas (SEA) by Los Angeles County. These areas require protection of species or biological communities to the extent that alteration of natural water quality is undesirable, and that the preservation of natural water quality be maintained to the extent practicable. Zuma Canyon, Arroyo Sequit and Point Dume are three such designated areas in this region (CRWQCB, 1997).

The North Coast is also home to state and federally listed endangered species such as *Pentachaeta lyonii* (an endangered plant), *Vireo Belli/* pusillus (an endangered bird), and steelhead trout (an endangered anadramous fish) (CRWQCB, 1997).

The area falls within the Santa Monica Mountains biogeographic population group described in the Draft Steelhead Recovery Plan; the value of and threats to the Core 1 population of fish within Arroyo Sequit, specifically, are highlighted while Solstice Creek is considered to be currently occupied by a Core 2 population. The Core 1 populations are those populations identified as a high priority for recovery actions based on a variety of factors, including: the intrinsic potential of the population in an unimpaired condition; the role of the population in meeting the spatial and/or redundancy viability criteria; the conditions of the population, the severity of the threats facing the populations; the potential ecological or genetic diversity the watershed and population could provide to the species; and the capacity of the watershed and population to respond to the critical recovery actions needed to abate those threats. Core 1 populations form the nucleus of the recovery strategy. Core 2 populations must eventually meet the biological recovery criteria; however, these populations are considered to be of secondary importance in terms of recommended priority of recovery efforts (NOAA, 2009).

Local Parks and Beaches

Zuma Beach is one of the most heavily used beaches in Los Angeles County. Hundreds of thousands of residents and tourists use the area for sunbathing and surfing activities each year. Additionally, educational meetings and field trips are held there for local students and the general public. In 2000, the SMBRC, together with the National Park Service, Los Angeles County Department of Beaches and Harbors, with additional funding from USEPA, completed the restoration and enhancement of lower Zuma Creek and Lagoon. Zuma Wetlands is a small, 6-acre, freshwater marsh and creek situated just north of Point Dume. The wetlands have historically served as a wildlife corridor and nesting site for a variety of birds and small mammals. By the early 1990s, periodic dumping of surplus construction and road building material had heavily impacted the wetlands and surrounding uplands. The existing wetlands had been greatly reduced and, in many areas, native species had been completely replaced by exotic ornamental trees, annual grasses, fennel, mustards, and thistles. High visitation at Zuma Beach also impacted the site (SMBRC website). Barriers to fish passage are also of concern and a top priority of the SMBRC.

Despite the long-term habitat degradation, studies indicated that the site had high potential for successful restoration. In the fall of 1993, federal, state, and nonprofit conservation agencies began planning efforts for a restoration of the remnant freshwater marsh, riparian woodland, saltgrass terrace, and locally rare foredunes at the site. A final restoration plan was completed in April 1997 and in 1998 restoration began. Over the next two years, excavation of construction fill, recontouring of upland habitats, removal of exotic plant species, in-planting of more than 5000 native plants, and the re-creation of an additional two acres of freshwater wetland/dune/riparian habitat was accomplished. The resulting restored wetland has an unusually diverse and highly valuable habitat for wildlife. As an example, more than 110 bird species were recorded over a one-year monitoring period. The project continues to be monitored for exotic species control and habitat protection (SMBRC website).

Leo Carillo State Beach is another popular beach in the North Coast subwatershed. This beach offers many of the same opportunities **as** Zuma Beach, in addition to providing camping grounds, hiking and biking opportunities and many other outdoor activities (CRWQCB, 1997).

Evidence of Impairment

While the beaches are listed as impaired for indicator bacteria and fish consumption, to date there is no documented evidence of impairment from pollutants of concern in the North Coast subwatershed streams, although potential pollution problems exist for areas not in public stewardship (CRWQCB, 1997).

However, this region is threatened by invasion of non-native plant and animal species, sedimentation and erratic stream flows, trash and debris, septic systems and is frequently used by transients which limit diversity and density of plants and wildlife, and pose public safety concerns (CRWQCB, 1997).

Habitat Degradation

Invasive New Zealand mudsnails were first discovered in Solstice Creek in 2007 and in Ramirez and Trancas Creeks in 2009. The individual snails are very small, only 3 – 5 mm long. Each snail can reproduce enormous amounts of offspring through a cloning process called parthenogenesis which can result in very high snail densities on the bottoms of streams which displace native aquatic invertebrates utilized by fish and amphibians for food; they can easily be transferred to other streams through contact with animals or recreational/monitoring equipment. They do not appear to have any natural native predators (SMBRF, 2009).

Pollutants of Concern

There are no associated pollutants of concern for the inland waters of the North Coast subwatershed due to limited human activity in this area. However, as mentioned above, the threat of trash and debris, oil spills and possibly even excessive sedimentation are potential issues for the region. Beaches along Santa Monica Bay, including the ones of this subwatershed, are listed as impaired for indicator bacteria and fish consumption (CRWQCB, 1997).

Sources and Loadings

There are links between potential sources of pollution with pollutants (as identified above) that may threaten the waterbodies and habitats of this region (CRWQCB, 1997).

Trash and Debris

Trash and debris found in the creeks and lagoons most likely comes from improper disposal of waste by beach-goers, visitors, transients and residents. This trash and debris adversely impacts the sensitive habitats of the area as well as creating an aesthetic nuisance (CRWQCB, 1997).

Oil Spills

The threat of spills to the Bay resulting from oil tankers exists given the continual oil transporting activities that occur along California's coastline. Ocean currents have the potential to transport oil from spills directly to the shoreline, thereby significantly degrading this sub-watershed's special coastal habitats (CRWQCB, 1997).

TSS and Fine-grained Sediments

Sediments and total suspended solids (which hinder light transmission into waters, smother spawning areas and hard-bottom subtidal habitats, and provide a transport medium for other pollutants such as heavy metals and pesticides) also have several known and suspect sources. Non-stabilized hillsides, development activities where best management practices have not been properly implemented, improper land grading activities, horse and animal farms located too close to waterbodies, and other relevant agricultural activities all contribute sediments and TSS to this watershed's creeks and streams, which ultimately flow to the lagoons and ocean. Furthermore, fire residual may be washed down by storm runoff, thereby contributing excessive sediments and nutrients to the watershed's receiving waters (CRWQCB, 1997).

Water Quality Improvement Strategies

In accordance with previously identified problems and in order to protect the beneficial uses of waterbodies in this region, the greatest benefits in achieving water quality improvements in the North Coast subwatershed could be achieved by focusing efforts on the following:

- Protect and restore remaining wetlands in the North Coast subwatershed.
- Implement measures to control excessive sedimentation.
- Implement measures to reduce the amount of trash and debris.
- Prevent the introduction of and reduce/eliminate non-native invasive species where feasible.
- Examine the use of septic systems in this subwatershed, particularly near the coastline (CRWQCB, 1997)
- Conduct source identification
- Implement TMDLs

Wetlands Protection and Restoration

Although federal and state regulations seek to protect wetlands from being filled in unnecessarily and assure mitigation of unavoidable impacts, there needs to be more coordination at the local level to ensure protection of the unique wetlands found in this region. Because the wetlands in this subwatershed are affected by the land use activities and water quality impacts that occur upstream, as well as invasion of non-native species, any restoration activities taking place should consider these issues. The SMBRC's Bay Restoration Plan identifies specific actions that can be taken to protect and restore Trancas Lagoon, Arroyo Sequit Canyon and other priority wetlands found throughout the Santa Monica Bay watershed. Development of a comprehensive plan should address identified pollutants and sources found in the North Coast subwatershed and should be based on water quality, salinity, habitat and biodiversity objectives for wetlands restoration (CRWQCB, 1997). Additionally, the State's Wetlands Policy and the Southern California Wetlands Recovery Project (WRP) (described elsewhere in the document) are working to ensure wetlands protection and restoration occurs.

Zuma Canyon Creek and Lagoon In 2000, restoration and enhancement of lower Zuma Creek and Lagoon was completed. The project continues to be monitored for exotic species control and habitat protection (SMBRC website).

A Zuma Canyon restoration and steelhead enhancement feasibility study is on the WRP workplan as a Tier 2 project. The project is estimated to cost $400,000 and would restore 3.5 acres of agricultural area near the entrance of Zuma Canyon on steep slopes that has been planted in avocados. About four acres of agricultural land adjacent to the creek in the coastal plain has already been restored with SMBRC funds. In addition, the National Park Service will expand on the initial baseline habitat assessment by Caltrout, and determine habitat quality and feasibility of steelhead restoration in Zuma Creek, including a habitat assessment, fish passage evaluation, and development of a conceptual restoration plan. A funding source has not yet been identified for the remaining 3.5 acres (SCWRP website #2).

Trancas Canyon Creek and Lagoon The WRP has identified a parcel adjacent to the lagoon for acquisition (Birosik, personal notes).

Solstice Canyon Creek Solstice Creek has been identified as a primary candidate for recovery of the southern steelhead trout, a federal endangered species. Design plans were completed for a project on the WRP workplan to restore steelhead access to approximately 1.5 miles of Solstice Creek. Seven barriers in the National Recreation Area were removed in 2006 and a box culvert within the City of Malibu at the Corral Canyon Road crossing was replaced with a clear span bridge over Solstice Creek. The final fish passage barrier is at Pacific Coast Highway. This project will be a CalTrans Environmental Enhancement and Mitigation program project that would modify the culvert at PCH downstream of the proposed project area. Additionally, acquisition of various parcels near the creek are of importance to preserve habitat linkages (SCWRP website #2).

Arroyo Sequit The middle to upper Arroyo Sequit between State Parks and National Park has an identified gap that could be filled through acquisition from a willing seller (Birosik, personal notes).

Control of Excessive Sedimentation

Sediments are transported by creeks and streams to lagoons and ultimately the ocean. It is a necessary and natural function that replenishes beaches along the coastline. However, excessive sedimentation can be harmful to downstream habitats (as discussed previously) and efforts must be made to control unnatural sediment loads from reaching the local creeks and streams. These efforts should include promoting proper implementation of runoff controls at construction sites, planting native species that will prevent erosion of hillsides and stabilize topsoils, educate appropriate audiences about the impacts of improper land grading activities, and educate owners of horse/animal farms about how the location of their livestock can contribute to sedimentation of adjacent creeks and streams (CRWQCB, 1997).

Reduction of Trash and Debris

Although problems resulting from trash and debris are intermittent and do not pose a constant threat to this watershed, appropriate action should be taken where recurrent problems arise. This may include installing additional trash receptacles, educating the local public and visitors, posting informational signs, installing "trash nets" and establishing volunteer programs where people can serve as both watchdogs and support for cleanup activities (CRWQCB, 1997).

Removal of Non-native Invasive Species

Non-native species limit diversity of local, native plants and animals. Location and types of non-native species throughout the North Coast subwatershed should be identified and mapped. Once this information has been prepared, an assessment should be performed in priority habitats on the feasibility of eliminating non-native species and restoring the area with native, indigenous species (CRWQCB, 1997).

In 2002, the California Department of Fish and Game began developing a plan to coordinate state programs, create a statewide decision-making structure and provide a shared baseline of data and agreed-upon actions so that state agencies may work together more efficiently. In January 2008, with input from multiple state agencies, the public, and other stakeholders, the California Aquatic Invasive Species Management Plan (CAISMP) was approved by the Governor. The CAISMP seeks to identify the steps necessary to minimize the harmful impacts of aquatic invasive species (AIS) in California. More than 160 management actions are organized under the following eight objectives: Coordination & Collaboration, Prevention, Early Detection & Monitoring, Rapid Response & Eradication, Long-term Control & Management, Education & Outreach, Research, and Laws & Regulation. The implementation of the highest priority actions was initiated in 2008 with the formation of the California Aquatic Invasive Species Team (CAAIST). The CAAIST's mission is to coordinate the activities of state agencies charged with implementation of the CAISMP. CAAIST is composed of representatives from over 25 California state agencies, including the Santa Monica Bay Restoration Commission. If the priority actions of the CAISMP can be successfully implemented, California resource managers and policy makers will have taken a huge step forward in the effort to prevent new invasions and minimize impacts from established AIS (SMBRF, 2009).

Examination of Septic Systems

Septic systems are located throughout the North Coast subwatershed. Although there is no direct evidence that septic systems have impaired the beneficial uses or degraded water quality of this subwatershed, they have the potential to leak bacteria and nutrients which can then migrate to sensitive habitats and the surf zone. Special attention should be given to them due to these concerns and other associated problems found in adjacent subwatersheds. Special focus could be given to monitoring water quality in the creeks and lagoons for presence of human pathogens and along the surf zone where potentially problematic septic systems have been identified (CRWQCB, 1997).

Conduct Source Identification

Source Identification Pilot Study The beaches adjacent to the mouths of Ramirez and Escondido Canyons exhibited high levels of fecal indicator bacteria from 2004 through 2006, prompting a study to identify the sources of fecal indicator bacteria and to develop a source tracking protocol that can be used at other beaches in southern California. SCCWRP has been conducting a source identification pilot study in Ramirez Canyon and Escondido Canyon, funded largely by the County Supervisors (SCCWRP website #2).

During the first phase of the study, bacterial surveys of the entire watershed were conducted to identify problem locations that might be contributing to high concentrations at the beach. Fecal bacteria indicators (Enterococcus and total and fecal coliforms), human Bacteroides, optical brighteners, and flow rates were sampled adjacent to key land use areas and at critical tributary confluences. The beach was sampled at the creek mouth and at sites up and down coast. The surveys were conducted weekly from March through May in 2007-2009 (SCCWRP website #2).

The two key findings from this first phase were that: 1) the high bacterial counts observed at the beach during the summers of 2004-2006 were no longer prevalent, and 2) the few beach exceedances we observed did not appear to result from the watershed, which generally had low bacterial concentrations (SCCWRP website #2).

In 2010, the studies will refocus on investigating alternative sources near the mouth of the creek and offshore. These include: 1) birds on the beach and pier, 2) activities at Paradise Cove Beach Café (i.e., washing down restaurant equipment, inadequate disinfection of wastewater), 3) regrowth of enterococci in the concrete channel right near the creek mouth, and 4) contaminated groundwater (SCCWRP website #2).

Implement TMDLs

The TMDLs in effect which impact the North Coast are the dry- and wet-weather bacteria TMDLs for Santa Monica Bay beaches and the Santa Monica Bay nearshore and offshore debris TMDL. Trancas and Zuma Beaches among others in this subwatershed are listed as impaired for indicator bacteria. On the other hand, the North Coast also contains the reference subwatershed for the Santa Monica Bay beach bacteria TMDLs, Arroyo Sequit and its associated beach, Leo Carrillo. For the purpose of implementing the bacteria TMDLs, the area has been divided up into “jurisdictional groups” (JG) – most of the North Coast falls into JG1. The Nicholas Canyon area however falls into JG4. Compliance measures include a number of activities that in combination would result in reducing the number of days in which water quality objectives are exceeded to less than or equal to that of the reference watershed (CRWQCB website #3).

The wet-weather bacteria TMDL stipulates a threshold number of exceedance days based on daily monitoring activities. The number of allowed exceedance days varies somewhat among the beaches but is no more than seventeen. The number of exceedance days for Nicholas Canyon is fifteen. The TMDL features a reference system/anti-degradation approach. The purpose of utilizing this approach is to ensure that bacteriological water quality is at least as good as that of a reference site and that no degradation of existing bacteriological water quality is permitted where existing bacteriological water quality is better than that of a reference site (CRWQCB website #3).

The dry-weather bacteria TMDL also stipulates compliance targets. The general implementation schedule includes two phases:

Phase I: Compliance during Summer Dry Weather. Within three years of the effective date of the TMDL, there may be no exceedances at any location during summer dry weather (April 1 to October 31). This compliance target may be achieved by employing a number of strategies, including diverting storm drain flows to treatment plants, eliminating illicit discharges, controlling sources of bacteria, or implementing "end-of-pipe" treatment. The District, City of Los Angeles, and several other cities adjacent to Santa Monica Bay have been implementing aggressive summer, dry-weather storm drain diversion programs. All 27 priority storm drains have been diverted; additional diversions have been completed and others are planned. (CRWQCB website #3).

Phase II: Compliance during Winter Dry Weather. Within six years of the effective date of this TMDL, compliance with the allowable number of exceedance days (varies by beach) during winter dry weather must be achieved (CRWQCB website #3).

A Coordinated Shoreline Monitoring Plan was developed by a Technical Steering Committee, co-chaired by the County and City of Los Angeles and consisting of representatives from many of the bacteria TMDLs' responsible agencies. In addition, other area stakeholders provided input. The plan is designed to comply with the monitoring requirements of both the dry- and wet-weather TMDLs (CRWQCB website #3).

The Santa Monica Bay Nearshore and Offshore Debris TMDL was adopted by the Regional Board in 2010 and requires that industries that manufacture, store, transport, or otherwise handle plastic pellets as raw material comply with a waste load allocation (WLA) of zero plastic pellets. The zero WLA for the plastic pellets requires that no plastic pellets are allowed to be released, found, or accumulated outside of the premises of the industries or in any stormwater capture device that may be connected with the MS4. Various tasks are required to be completed within a certain time period after the effective date of the TMDL. Key tasks range from achieving 20% reduction of trash from the baseline WLA within four years from the effective date of the TMDL to achieving 100% reduction of trash from the baseline WLA within eight years of the effective date of the TMDL.

Implementation plans and other information for these TMDLs are available on the Regional Board website as follows:

Santa Monica Bay Beaches Dry Weather

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_9_2002-004_td.shtml

http://63.199.216.6/larwqcb_new/bpa/docs/2002-004/2002-004_RB_RSL.pdf

http://63.199.216.6/larwqcb_new/bpa/docs/2002-004/2002-004_RB_BPA.pdf

Santa Monica Bay Beaches Wet Weather

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_14_2002-022_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_39_2006-005_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_40_2006-006_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_41_2006-007_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_42_2006-008_td.shtml

Santa Monica Bay Nearshore and Offshore Debris TMDL

http://63.199.216.6/larwqcb_new/bpa/docs/R10-010/R10-010_RB_RSL.pdf

http://63.199.216.6/larwqcb_new/bpa/docs/R10-010/R10-010_RB_BPA.pdf

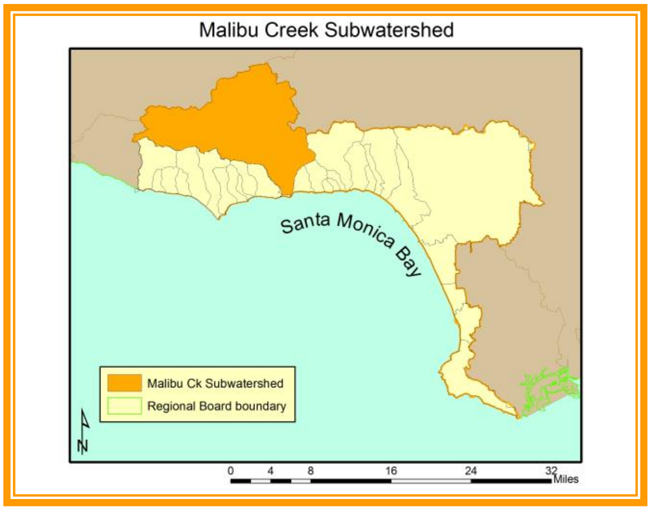
Low Flow Diversions/Treatment Facilities

An increasingly utilized approach to eliminating bacteria from storm drains at its source is the installation of low flow diversions. A low flow diversion is a structural device that routes urban runoff from canyons, streets and small watersheds away from the storm drain system or waterway, and redirects it into the sanitary sewer system or to a local treatment facility, where the contaminated runoff then receives treatment and filtration before being discharged into the ocean (City of LA website #2). Low flow diversions/treatment facilities found within the North Coast subwatershed are show in the table below.

Table 5. Low flow diversions/treatment facilities within the North Coast subwatershed

Diversion/Facility	Year Operational	Agency
Paradise Cove	2010	Malibu
Marie Canyon	2007	District

Malibu Creek



The Malibu Creek subwatershed is one of the largest draining to Santa Monica Bay. With its discharge point to the Bay at the mouth of Malibu Creek and Lagoon, it drains an area of about 109 square miles. Approximately two-thirds of this subwatershed lies in Los Angeles County and the remaining third in Ventura County. Much of the land is part of the Santa Monica Mountains National Recreation area and is under the purview of the National Parks Service. The region borders the eastern portion of Ventura County to the west and north, the North Coast subwatershed to the south, and portions of the Topanga Canyon subwatershed and Los Angeles River watershed to the east. Major tributaries contributing flows to Malibu Creek and Lagoon include Cold Creek, Lindero Creek, Las Virgenes Creek, Medea Creek, and Triunfo Creek. Additionally, five lakes and two reservoirs are located upstream from Malibu Creek; they are Malibou Lake, Lake Sherwood, Westlake Lake, Lake Lindero, Lake Eleanor, and the Las Virgenes and Century Reservoirs. Located at the end of and receiving flows from Malibu Creek is the 40-acre Malibu Lagoon. The Lagoon includes coastal salt marshes and wetlands, and is home to several diverse plant, marine and animal species (CRWQCB, 1997). The subwatershed is underlain by portions of four groundwater basins (Russell Valley, Conejo-Tierra Rejada, Hidden Valley, and Thousand Oaks) and by the entire Malibu Valley groundwater basin; the latter has not been used as a drinking water supply since 1965 and shows evidence of seawater intrusion (MWD, 2007; DWR, 2004).

Flows

At the mouth of Malibu Creek, the estimated dry-weather base flow is approximately 4-11 cfs although peak flows of more than 24,000 cfs have been recorded at the Los Angeles County gauging station in Malibu Creek during the rainy season, which is significantly more that minimum dry-weather flows (CRWQCB, 1997). The broad difference in values between minimum dry-weather and maximum wet-weather flows reflect the dominant influence of storm water runoff, which is typical of stream flow patterns in Southern California. In fact, in the Malibu Creek subwatershed over 70% of the total annual runoff occurs during the winter months, which results in approximately 13,565 acre-feet of water discharged to the Bay each year (Stenstrom and Strecker, 1993).

Land Uses

Although still relatively rural, this region's population has risen to 90,000, resulting in significant changes in types of land use activities. Consequently, artificial flows in the Malibu Creek subwatershed have increased. Today, the region's land uses are 88% open space, 3% commercial/light industry, 9% residential and less than 1% public. However, approximately 22% this subwatershed region is either part of the Santa Monica Mountains National Recreation Area or state park land and development opportunities are limited (CRWQCB, 1997).

Wetlands

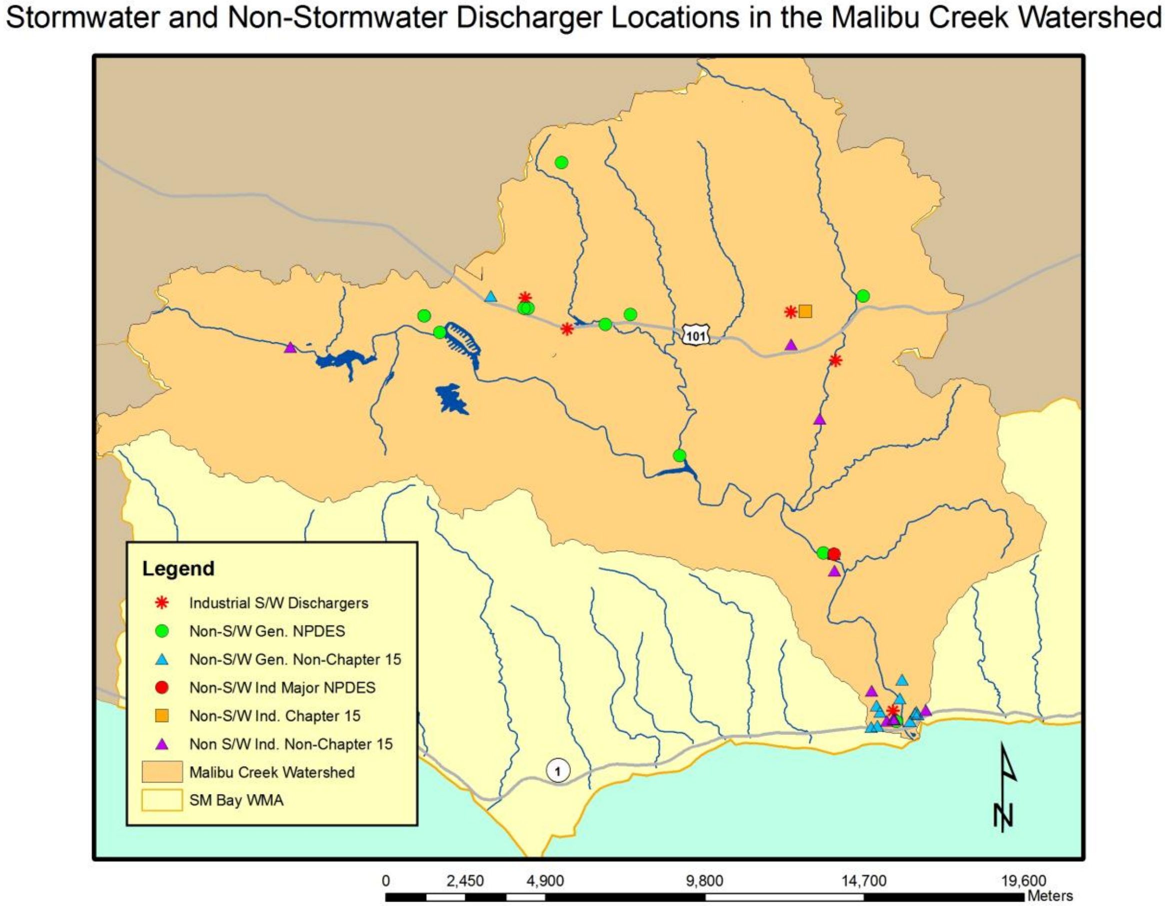
The Malibu Creek subwatershed is also home to some of Southern California's last remaining wetlands. Malibu Lagoon, located at the mouth of Malibu Creek, occupies approximately 40 acres and is characterized as a coastal saltwater wetland habitat. Prior to commercial and residential development of the adjacent and upstream areas, the total acreage of wetlands was approximately 272 acres. Although the area has been severely impacted by urbanization, it supports a variety of species including steelhead trout and tidewater goby (CRWQCB, 1997).

Permitted Discharges

The Malibu Creek subwatershed includes one permitted wastewater treatment facility, the Tapia Water Reclamation Facility, located on Malibu Canyon Road near Tapia Park serves a population of approximately 80,000 from five cities, the western portion of Los Angeles County, and a small portion of Ventura County. Tapia is a tertiary wastewater treatment plant with a design capacity of 16.1 mgd. Pollutant loadings such of TSS, BOD, and metals found in Tapia's wastewater discharges are low. The waste discharged to Malibu Creek is limited to winter months from November 16 through April 14 of each calendar year (except under certain conditions) to minimize the contribution of Tapia’s discharge to the excess freshwater flow into Malibu Lagoon (which leads to elevated Lagoon level and frequent breaching of the sandbar once, or if, the sandbar has formed), thus impacting both wildlife and human health beneficial uses (CRWQCB, 1997). The average discharge to Malibu Creek in 2008 during months that a discharge occurred was 5.76 mgd (LVMWD, 2009). Tapia's recycled water is used for such activities as landscape irrigation; the biosolids generated are recycled at a state-of-the-art composting facility located nearby, then sold or given away (CRWQCB website #1). .

The Malibu Creek subwatershed also includes a number of additional permitted facilities, some of which are covered by the general industrial stormwater permit as can be seen in the figure below (CRWQCB, 2007). In addition, municipal dischargers in the watershed are covered by the Los Angeles County and Ventura County MS4 permits.

Figure 16



Beneficial Uses

The Los Angeles Regional Water Quality Control Board has designated several beneficial uses for the Malibu Creek subwatershed, including unique habitats that support a variety of marine life and wildlife, waters that are used for municipal and domestic supply and commercial and sport fishing opportunities, recreational areas that provide outdoor opportunities for tourists and residents, parks that provide educational opportunities, and groundwater recharge projects. The table below summarizes the beneficial uses designated for all waterbodies in this subwatershed (CRWQCB, 1994).

Table 6. Beneficial uses of the waters within the Malibu Creek subwatershed

Coastal Feature or Waterbody	Hydro Unit #	MUN	IND	PROC	AGR	GWR	NAV	REC1	REC2	COMM	WARM	COLD	EST	MAR	WILD	RARE	MIGR	SPWN	SHELL	WET
Malibu Lagoon	404.21						E	E	E				E	E	E	E	E	E		E
Malibu Creek	404.21	P						E	E		E	E			E	E	E	E		E
Cold Creek	404.21	P						E	E			P			E	E		P		E
Las Virgenes Creek	404.22	P						E	E		E	P			E	E	P	P		E
Century Reservoir	404.21	P						E	E		E				E					E
Malibou Lake	404.24	P					E	E	E		E				E	E				E
Medea Creek	404.23	P				I		I	I		I	P			E	E				E
Medea Creek	404.24	P				I		E	E		E				E					E
Lindero Creek	404.23	P						I	I		I				E					
Triunfo Creek	404.24	P						I	I		I				E					
Triunfo Creek	404.25	P				I		I	I		I				E	E				
Westlake Lake	404.25	P					E	E	E		E				E					
Potrero Valley Creek	404.25					I		I	I		P				E					
Lake Eleanor Creek	404.25	P				I		I	I		I				E					
Lake Eleanor	404.25	P				E		E	E		E				E	E				E
Las Virgenes (Westlake) Reservoir	404.25	E	E	E	E			P	E		P				E					
Hidden Valley Creek	404.26	I				I		I	I		I				E					
Lake Sherwood	404.26	P				E	E	E	E		E				E					E
Malibu Beach	404.21						E	E	E	E				E	E		E	E	E	

E: Existing beneficial use; **P:** Potential beneficial use; **I:** Intermittent beneficial use

Significant Regions

Certain sections offshore of the Malibu Creek subwatershed have been designated as Areas of Special Biological Significance by the State Water Resources Control Board (SWRCB); other land-based portions have been designated as Significant Ecological Areas (SEA) by Los Angeles County. These areas require protection of species or biological communities to the extent that 1) alteration of natural water quality is undesirable and that 2) the preservation of natural water quality be maintained to the extent practicable. The Malibu coastline, Malibu Canyon and Lagoon, Las Virgenes, Malibu Creek State Park and Cold Creek are all such designated areas (CRWQCB, 1997).

The area falls within the Santa Monica Mountains biogeographic population group described in the Draft Steelhead Recovery Plan; the value of and threats to the Core 1 population of fish within Malibu Creek are highlighted. The Core 1 populations are those populations identified as a high priority for recovery actions based on a variety of factors, including: the intrinsic potential of the population in an unimpaired condition; the role of the population in meeting the spatial and/or redundancy viability criteria; the conditions of the population, the severity of the threats facing the populations; the potential ecological or genetic diversity the watershed and population could provide to the species; and the capacity of the watershed and population to respond to the critical recovery actions needed to abate those threats. Core 1 populations form the nucleus of the recovery strategy (NOAA, 2009).

Malibu Lagoon Located at the mouth of Malibu Creek, the lagoon is a brackish waterbody, influenced by intermittent breaching events and inflows from Malibu Creek. The Lagoon serves several purposes such as providing essential habitats for a diversity of species -- birds, fish, reptiles, invertebrates and mammals -- and is an important feeding/nesting area for birds migrating along the Pacific flyway. The Tidewater Goby was reintroduced here, and subsequently declared an endangered species. The lagoon also acts as natural filter which is able to absorb, retain and remove pollutants from the water. It provides recreational use, educational opportunities, aesthetic value, flood protection and is a source of groundwater recharge. In fact, Malibu Lagoon represents one of the most significant coastal lagoons in the entire Santa Monica Bay watershed; Malibu Creek, which feeds the Lagoon, continues to be a significant steelhead trout watercourse and spawning area (CRWQCB, 1997). Malibu Lagoon is currently undergoing the initial phases of a large restoration.

Local Parks and Beaches There are several parks located in this sub-watershed, most notably Malibu Creek State Park and Malibu Creek State Beach. These grounds provide hiking, picnicking, horseback riding, bicycling and educational opportunities as well as swimming, surfing and sunbathing activities. Thousands of visitors flock to this subwatershed's parks and beaches each year and take advantage of the opportunities they provide (CRWQCB, 1997).

Evidence of Impairment

This region's environmental quality is impaired by three major causes: alterations of natural flow regime, pollutant inputs, and degradation of sensitive habitat (CRWQCB, 1997).

Alterations of Natural Flow

Due to the population increase in the Malibu Creek subwatershed, there has been a continued increase of pollutants to Santa Monica Bay from this region. At the terminus of Malibu Creek, Malibu Lagoon receives the natural and artificial runoff from the entire 109-sq. mi. watershed, which reaches as far north as Simi Hills and as far west as Thousand Oaks. While the population utilizes imported water which can lead to increased flows to the creek from irrigation overflows, flow increases can also be attributed to increased hardscaping, and to reduced surface water diversions and withdrawals from wells since local water is no longer being utilized for domestic use (Mundy, comm. ltr.).

Rindge Dam, which was constructed in the 1924-25, has long since filled up with sediment deposits. The 100ft dam now poses problems for fish migration and spawning, where available upstream habitats are crucial to their existence. Most notably impacted by this structure are steelhead trout; the dam impacts their ability to spawn further upstream. Nevertheless, how best to deal with impacts from Rindge Dam are currently underway via a U.S. Army Corps of Engineers ecosystem restoration feasibility study (CRWQCB, 1997).

Contamination

As the volume of runoff in the Malibu Creek subwatershed increases, additional pollutant loads have impaired the region's recreational and biological resources. Advisories are posted discouraging the collection of mussels from the lagoon due to bacteria contamination. Sensitive habitats and native species also found at the Lagoon may be threatened by increased flows from the creek which disrupts the salinity regime and natural flow conditions. Critical habitats are smothered by high TSS loading. Suspended sediments also provide a transport medium for heavy metals, pesticides and other pollutants. Potential problems resulting from increased temperatures also exists in this subwatershed, due to sparse vegetative cover along segments of the creeks. Bacterial counts from water samples taken in the subwatershed creeks and Malibu Lagoon suggest the presence of harmful pathogens in downstream receiving waterbodies (CRWQCB, 1997). While algae is abundant throughout creeks and streams in the Santa Monica Mountains, Busse, et al. (2003) found while studying algae and nutrients in Malibu Creek that human development affects stream algal communities. Both algal biomass and nutrient concentrations were much lower at undisturbed and rural sites than at developed sites.

Furthermore, multiple sources such as storm drain runoff, street runoff, and development activities contribute sediments, trash and debris, and other contaminants to the waterbodies and wetlands located in the Malibu Creek subwatershed. Another source of pollution in this region, especially recently, has been what remains after fires burn in the area. Unfortunately, fire season comes directly before the rainy season so there is little or no opportunity for hillsides to restabilize naturally. The rain, consequently, washes fire residue directly to the local streams and ultimately to Malibu Creek and Lagoon. The result is an increased TSS, nitrogen compounds, and trash and debris (CRWQCB, 1997).

Densely populated suburban commercial and residential developments have encroached upon the Malibu Creek subwatershed and further contribute to the pollution problems it faces. The presence of livestock and intense grazing activities also degrade water quality by denuding vegetation cover, increasing the erodability of soils and hence the sediment load carried by the streamflow. Septic systems, which are located primarily in the lower watershed and coastal stretches, have the potential to leach pathogens and nutrients to local area waterbodies (CRWQCB, 1997).

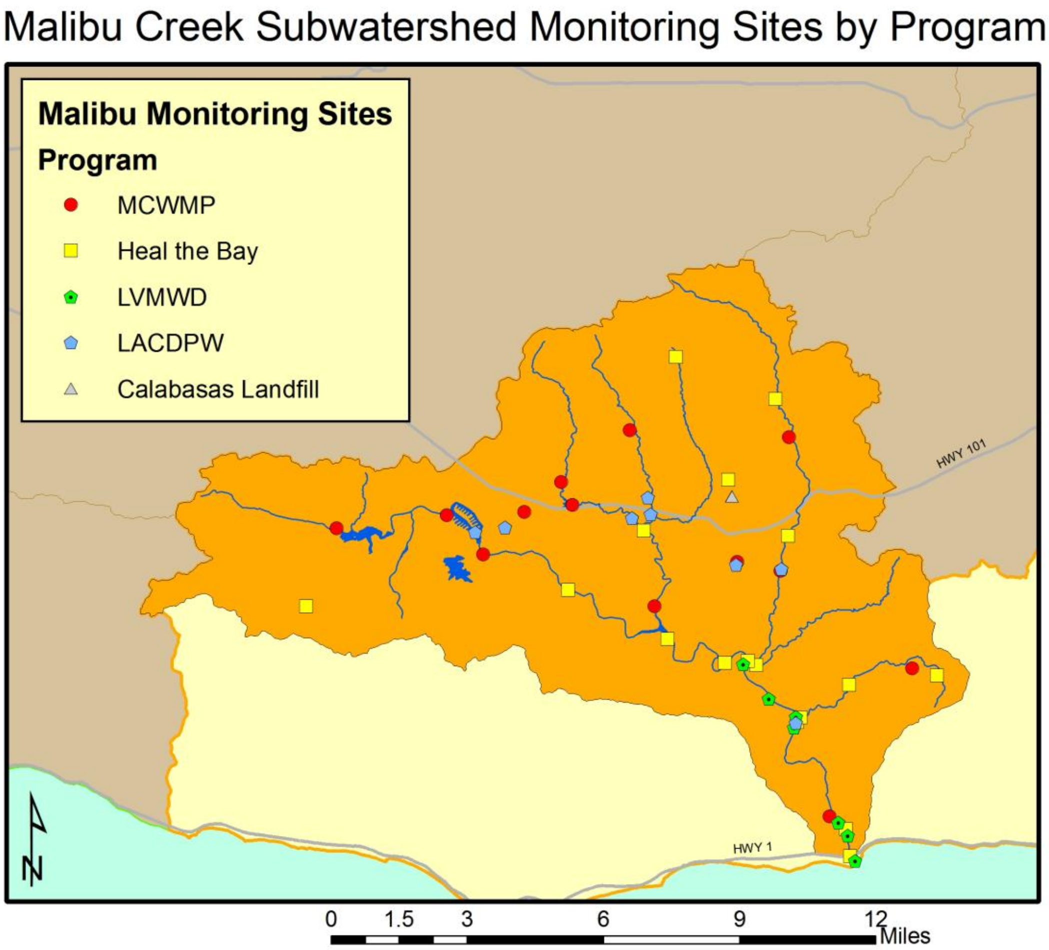
Epidemiology studies are used to identify if swimmers are at risk of developing illnesses based on water contact recreation. Historically, these studies have been conducted infrequently, predominantly at freshwater beaches with known sources of human fecal contamination. The largest benefit from these studies is the identification of relationships between the frequency of illness and levels of fecal indicator bacteria such as total coliforms, fecal coliforms or E. coli, and enterococcus. Such knowledge helps shoreline managers to make appropriate decisions about beach closures and other management measures based on measures of fecal indicator bacteria (SCCWRP website #1). A SMBRP epidemiological study conducted during the summer of 1995 strongly suggested an increased risk of a relatively broad range of symptoms caused by swimming in ocean water near storm drains with positive associations between adverse health effects and a) distance from the drain, and b) bacterial indicators and presence of enteric viruses (SMBRC, 1996).

Epidemiology studies being conducted by SCCWRP address at least two outstanding issues. The first involves potential differences in health risk due to contamination from point source versus nonpoint source discharges. Point sources typically consist of a single predominant source of largely human-derived fecal contamination, while nonpoint sources typically consist of numerous smaller sources, sometimes entirely nonhuman and partially non-fecal in origin. The second involves the application of new water quality indicators. Recent advances in technology have improved indicator measurement methods producing new methods that are more human specific and quite rapid. Before shoreline managers use any of these new methods or indicators for making decisions regarding risk to swimmers, they need to be tested in an epidemiological study to assess their correlation with actual illness rates (SCCWRP website #1).

SCCWRP is currently conducting epidemiological studies to assess the risk of swimming-related illnesses following exposure to nonpoint source contaminated waters at three beaches: Doheny Beach in Dana Point, Avalon Bay Beach on Santa Catalina Island and Surfrider Beach in Malibu. These studies will examine several new techniques for measuring traditional fecal indicator bacteria, new species of bacteria, and viruses to determine whether they yield a better relationship to human health outcomes than the indicators presently used in California (SCCWRP website #1).

Monitoring in the watershed by various agencies over the years has been fairly extensive but also somewhat uncoordinated. The map below shows the major monitoring programs underway; except for the Malibu Creek Watershed Monitoring Program (MCWMP) which was a grant–funded program developed to locate watershed “hot spots” and monitoring by Heal the Bay, the majority of monitoring occurs for rather specific program purposes which may not answer questions concerning watershed health. However, even those programs with common goals may not collect samples on the same day or under similar weather conditions, analyze samples using compatible methods and parameters, and report results in a similar manner.

Figure 17



The MCWMP collected samples twice a month during dry and wet weather at thirteen sites in the watershed between February 2005 and February 2006. Water quality parameters were chosen based on general categories of 303(d)-listed pollutants, including bacteria indicators and those related to sediment and nutrient impairments. After analyzing first year baseline data, "hot spots" were identified for further testing in order to identify the sources of biological and ecological degradation in the watershed. These hot spots were determined by the reoccurrence of high levels of pollutants, especially bacteria and nutrients. Additional monitoring was then conducted in the second (and last) year of the program. The report produced at the end of the two-year period summarized available data for all of the sites shown on the above map; some of the conclusions provided include:

- Bacteria concentrations are generally greatest downstream of urbanized land use areas in most waterbodies.
- Nutrient concentrations are greatest downstream of agricultural areas in the Hidden Valley Creek subwatershed. Organic nitrogen was the predominant form of nitrogen in the Malibu Creek streams, except for Malibu Creek downstream of Tapia WRF during the winter months, when effluent is discharged to the creek.
- Upstream land use alone was not a strong predictor of water quality concentrations.
- Ammonia concentrations were below acute and chronic toxicity targets in most samples.
- The Index of Biotic Integrity (IBI) scores, which grade the health of the invertebrates living on the bottom of streams, were poor or very poor throughout watershed, except in Lower Malibu Creek, where conditions were categorized as fair. Similar results were found by the LA County municipal stormwater permit bioassessment monitoring. Poor IBI scores were influenced by degradation of stream habitat and anthropogenic inputs.
- Calabasas Landfill may be a significant source of total suspended solids in Cheseboro and Liberty Canyon Creeks.
- Most “hot spots” monitoring found exceedances for metals not currently on the 303d list, including aluminum, iron, molybdenum, manganese, and strontium. Mercury and lead generally were below water quality targets (except at the landfill) although on the 303(d) list for Triunfo Creek.
- Selenium concentrations exceeded targets in most subwatersheds. Selenium is positively correlated with nitrate, suggesting that nitrate in groundwater may be mobilizing Se from marine sedimentary bedrock.
- Summer season total phosphorus frequently exceeded the 0.1 mg/l target at most sites (City of Calabasas, 2008). A study conducted by the LVMWD utilizing multiple datasets indicates that summer baseflow and storm runoff from the rock of the Monterey Formation, which dominates the northern headwaters of the watershed, may be naturally high in phosphorus (LVMWD, 2011).

The 2008-2009 Los Angeles County Municipal Stormwater Permit mass emissions monitoring station on Malibu Creek is located at Piuma Road, above the area of tidal influence. Approximately, 105 square miles of land drains to this site; 79% is vacant, close to 6% of the area is used as single family high density residential, about 1% is multi-family residential, and 12.5% is designated as other uses (LACDPW website).

Mass loading While there are considerable loading differences between results for wet- and dry-weather sampling events as well as between the various wet-weather events, the variability is much less here than in an urban watershed such as Ballona Creek. For example, during 2009-2009, copper varied from a low of 0.15 lbs during one dry-weather sampling event to a high of 70.83 lbs during a wet-weather event. Within the dry-weather sampling events, copper loads ranged up to 1.25 lbs. Other metals followed a similar pattern with zinc loading ranging from a low of 0.63 lbs during dry-weather to a high of 258.23 lbs during a wet-weather sampling event (LACDPW website).

Toxicity testing Two dry-weather toxicity sampling events during 2008-2009 resulted in no acute or chronic toxicity to a freshwater organism (*Ceriodaphnia*); a toxic effect was seen during one of the two chronic sea urchin fertilization tests. There was a toxic effect with both species during one the two wet-weather sampling events; there was an effect on the sea urchin only during the other sampling event (LACDPW website).

Chemical/bacteriological testing During the three dry-weather sampling events, fecal coliform bacteria attained the applicable water quality objective (400 mpn/100 ml); however, during two of three sampling events, sulfate did not meet the watershed-specific water quality objective of 500 mg/l (LACDPW website).

During the four wet-weather sampling events, fecal coliform was at excessive concentrations three of four times. Sulfate did not attain the watershed-specific water quality objective in two out of five wet weather events sampled in Malibu Creek. Total dissolved solids (TDS) did not attain the watershed-specific water quality objective (2000 mg/L) once out of five wet weather events sampled (LACDPW website).

The Malibu Creek Watershed falls within the Santa Monica Mountains National Recreational Area for which the National Park Service has developed the Mediterranean Coast Network Vital Signs Monitoring Plan. The network also includes Cabrillo National Monument and Channel Islands National Park. The monitoring plan includes assessing a wide variety of ecosystem elements and process, including water quality (NPS, 2005).

Habitat Degradation

In addition to increased water supplies, major modifications of natural land features such as channelization of tributaries, destruction of riparian zones and wetlands, changes in soil infiltration characteristics and the construction of dams cause additional adverse impacts. The invasion of non-native plant species further upsets the natural condition of wetlands and other riparian zones, which in turn impairs their biological functions. Only 5% of the 133 plant species identified at Malibu Lagoon are native estuarine species, and only 30% are native to California (CRWQCB, 1997).

Non-native aquatic species are found in the creeks, streams and lakes of the Malibu Creek sub-watershed and include species such as large-mouth bass, black bullhead, and green sunfish, as well as, a number of non-native invertebrates including Oriental shrimp, crayfish, and the latest threat, New Zealand mudsnail. These non-native aquatic species may adversely affect indigenous species of the area. Crayfish is one such non-native species likely responsible for the severe decline in salamanders and frogs (CRWQCB, 1997).

New Zealand mudsnails were discovered a number of locations in the watershed in 2006 although they likely existed there since at least 2005. The individual snails are very small, only 3 – 5 mm long. Each snail can reproduce enormous amounts of offspring through a cloning process called parthenogenesis which can result in very high snail densities on the bottoms of streams which displaces native aquatic invertebrates utilized by fish and amphibians for food; they can easily be transferred to other streams through contact with animals or monitoring/recreational equipment. They do not appear to have any natural native predators (SMBRF, 2009).

Malibu Lagoon Malibu Lagoon, which for the past 11 years has been managed by State Parks and Recreation Department, now faces new problems. Previously, under an Interim Water Management Plan, State Parks breached the Lagoon's sand berm barrier when water levels rose above 3.7 feet. However, concern for the impacts on endangered species and habitats, the possible adverse health effects to surfers and swimmers, and abrupt changes in salinity of the Lagoon have changed the breaching protocol. Additionally, the California Coastal Commission requires a Coastal Development Permit before breaching activities continue (CRWQCB, 1997). Lagoon enhancements were recommended in the 1999 Malibu

Lagoon enhancement plan prepared by UCLA for the State Coastal Conservancy and a restoration plan has since been developed (SCWRP website #2).

Pollutants of Concern

The pollutants of concern identified for this subwatershed include nutrients (nitrogen and phosphorus compounds), sediments, pathogens, TSS, trash and debris, and oil spills . This region has the second highest loading of TSS in the Santa Monica Bay watershed, which may be in part due to natural causes (CRWQCB, 1997).

Although the Bay Restoration Plan has identified heavy metals as pollutants of concern within the entire Santa Monica Bay, they have not been specifically identified as pollutants of concern in the Malibu Creek sub-watershed. However, heavy metals should continue to be monitored in runoff, especially since models suggest inputs to the Bay from this subwatershed. Likely sources contributing to heavy metals loadings include runoff contaminated from transportation-related activities, as well as, air deposition. More monitoring is warranted before the overall impacts of heavy metals can be confirmed (CRWQCB, 1997).

Sources and Loadings

In the Malibu Creek subwatershed, many point and nonpoint sources of pollution have been identified and can be linked to pollutants of concern (CRWQCB, 1997).

Permitted Discharges

The Tapia Water Reclamation Facility, this subwatershed's major discharger, contributes pollutants including nutrients to Malibu Creek and Lagoon and monitors both effluent and receiving water; no discharge is allowed from April 15 to November 15 except under certain specific circumstances. The concentrations of the majority of pollutants discharged are within the effluent limitations set forth within the NPDES permit; however, there have been exceedances of a few parameters in the effluent: average monthly limitations for total dissolved solids, total suspended solids, total phosphorus, and dichlorobromomethane were exceeded one to two times over a five-year period prior to the last permit renewal. Monitoring is also required by both the Ventura County and Los Angeles County MS4 permits. There are currently no monitoring sites in the Ventura County portion of this subwatershed; a mass emissions site is monitored in Malibu Creek at a Los Angeles County location. There were exceedances of water quality objectives for fecal coliform and sulfate during two of the four wet-weather sampling events in 2009-2010. During dry weather, sulfate exceeded the water quality objective during two of four monitoring events while total dissolved solids did not meet water quality objectives during one of the four sampling events.

Nutrients

Nutrients, which are a major source of pollution to the receiving waterbodies, are found throughout the watershed and have several suspect and known sources. The Tapia Water Reclamation Facility, area storm drains, horse and animal farms, land grading activities, septic systems, agricultural activities and transportation-related activities have all been identified as contributors to the nutrient loads found in the local creeks, streams and the Lagoon (CRWQCB, 1997). Additionally, Stein and Yoon (2008) found watershed geology to be a major factor that influences constituent concentrations from natural catchments.

Catchments underlain by sedimentary rock had higher concentrations of metals, nutrients, and total suspended solids, as compared to areas underlain by igneous rock.

A recent evaluation of available nitrogen data, and modeling to estimate nitrogen loads to Malibu Lagoon from discharges of wastewater through onsite wastewater disposal systems (OWDSs) in the Malibu Civic Center area, was conducted by Regional Board staff. The results estimate that wastewaters transport 30 lb/day of total nitrogen into Malibu Lagoon. The model also indicates that loads are increasing. Nitrogen loads from OWDSs are significantly above the waste load allocation of 6 lb/day established in a TMDL adopted by the US EPA in 2003; staff has determined that OWDSs in the Malibu Civic Center area cumulatively release nitrogen at rates that contribute to eutrophication and impair aquatic life in Malibu Lagoon (CRWQCB website #4).

TSS and Fine-grained Sediments

Sediments and total suspended solids (which hinder light transmission into waters, smother spawning areas and hard-bottom subtidal habitats, and provide a transport medium for other pollutants such as heavy metals and pesticides) also have several known and suspect sources. Non-stabilized hillsides, development activities where best management practices have not been implemented, improper land grading activities, horse and animal farms located to close to creeks and stream and other relevant agricultural activities all contribute sediments and TSS to this watershed's creeks and stream, which ultimately flow to Malibu Creek and Lagoon. Furthermore, fire residual may be washed down by storm runoff and contribute acute excessive sediments and nutrients to the watershed's receiving waters (CRWQCB, 1997).

Pathogens

Malfunctioning septic systems have long been suspected of contributing to the pathogen loads found in Malibu Creek and Lagoon (CRWQCB, 1997). Although the Tapia Water Reclamation Facility also discharges to Malibu Creek, the discharge is in compliance with the 2.2 cfu/100 ml limits for indicator coliform bacteria set by the Regional Board (CRWQCB website #1). Other potential sources of pathogens include recreational inputs and wildlife, households, and storm drain discharges. Regional Board staff recently conducted an evaluation of available indicator bacteria data in the Malibu Civic Center area to examine the hydraulic connection of discharges from OWDSs through groundwater to nearby surface waters. Staff determined that pathogens from wastewaters are likely to migrate to surface waters and that, consistent with data supporting the designations of impairments, threaten human health. The levels of enterococcus do not meet standards protective of human health. Staff also determined that risks of infectious disease from water contact recreation were elevated at beaches in the Malibu Civic Center (CRWQCB website #4).

Oil Spills

Although not currently an issue, the threat of oil spills to the Bay from tankers exists due to continual oil transporting activities along California's coastline. Ocean currents have the potential to transport oil from spills directly to the shoreline, thereby significantly degrading this sub-watershed's special coastal habitats (CRWQCB, 1997).

Water Quality Improvement Strategies

In accordance with previously identified problems and in order to protect the beneficial uses of waterbodies in this region, the greatest benefits in achieving water quality improvements in the Malibu Creek subwatershed could be achieved by focusing efforts on the following:

- Protect and restore remaining wetlands in the Malibu Creek subwatershed.
- Reduce nonpoint source, and urban and stormwater runoff pollutant loading
- Enhance and protect beach and intertidal habitats for threatened and endangered species.
- Develop specific erosion and sediment-control strategies; consider the impacts of hillside developments.
- Implement TMDLs.
- Reduce/eliminate non-native invasive species where feasible.
- Fully implement the provisions of the Basin Plan amendment passed in November 2009 to prohibit On-Site Wastewater Disposal Systems in the Malibu Civic Center Area.
- Encourage water conservation, water recycling, and other steps to reduce the Malibu Creek subwatershed's dependence on imported water and input of unseasonal freshwater into the Creek (CRWQCB, 1997)

Wetlands Protection and Restoration

Because Malibu Lagoon and other wetlands in this subwatershed are affected by the land use activities and water quality impacts that occur upstream, any restoration activities taking place should consider these issues. Development of a comprehensive plan should address pollutants of concern for this region and should be based on water quality, salinity, habitat and biodiversity objectives for wetlands restoration. The SMBRC's Bay Restoration Plan and the WRP's Regional Strategy identify specific actions to protect and restore Malibu Lagoon, as well as other priority wetlands found throughout the Santa Monica Bay watershed (CRWQCB, 1997; SCWRP website #1).

<u>Malibu Lagoon</u> A Tier 1 project on the WRP workplan is restoration of Malibu Lagoon. A restoration and enhancement plan was developed on 2005; Phase 1 of the Restoration and Enhancement Plan included relocation and redesign of the existing public parking and staging areas to maximize habitat restoration area in Phase 2 and to improve water quality in the Lagoon through implementation of BMPs. Phase 2 will involve restoration of the lagoon, including recontouring western lagoon channels, enhancing circulation in the lagoon, creating bird nesting habitat and providing improved educational and recreational opportunities for the public. Ultimately, the goal is restoration and enhancement of the ecological structure and function of Malibu Lagoon by increasing circulation and enhancing wetland habitat. The wetland habitat could potentially be enlarged in the future by restoring the adjacent property once it is acquired (SCWRP website #2). A copy of the lagoon restoration plan, funded by the Coastal Conservancy, may be found at http://www.healthebay.org/currentissues/mlhep/default.asp.

<u>Malibu Creek/Cold Creek</u> A completed WRP project is acquisition of 71.5 acres of upland and riparian habitat along Cold Creek which is a major tributary to Malibu Creek. Other completed WRP projects include the replacement of the Cross Creek Road Arizona crossing of Malibu Creek, which blocked steelhead passage, with a one-lane bridge; and removal of *Arundo donax* from approximately 5.2 miles of stream corridor along Malibu Creek (SCWRP website #2).

Current projects on the WRP workplan include the Upper Malibu Creek Feasibility Study led by the U.S. Army Corps of Engineer with the California Department of Parks and Recreation as the local sponsor. The feasibility study is evaluating options for restoration and enhancement of riparian and aquatic systems above Malibu Lagoon, including the possible removal of Rindge Dam, located about 3 miles upstream from the lagoon. The dam, which is almost completely silted in, acts as a complete barrier to steelhead migration. The study is also focusing on enhancements for endangered steelhead trout and riparian bird habitat. Another current project is the acquisition of approximately 90 acres of wetland, riparian and upland habitat that support La Sierra Lake. The acquisition includes a portion of the lake, four blue-line streams, and the seeps and ephemeral watercourses in the uplands that protect the water source for this three-acre, year-round lake. The primary vegetation communities found on the project site include riparian woodlands, dominated by coast live oak, California bay-laurel, and western sycamore. La Sierra Lake supports 35 obligate and associated wetland plant species, two aquatic mosses, and a rare vernal pool species which has only been reported one other time since 1891 in the Santa Monica Mountains. The project site is immediately downstream from a primarily undisturbed watershed that supports a series of oak, sycamore, willow, and mixed oak and bay riparian plant communities, and is adjacent to the county-designated La Sierra Canyon Significant Ecological Area (SCWRP website #2).

Reduce Nonpoint Source Pollutant Loading

Critical Coastal Area Designations   California's Nonpoint Source (NPS) Pollution Control Program includes requirements for Critical Coastal Area (CCA) designation. The intent of CCA designation is to direct needed attention to coastal areas of special biological, social, and environmental significance and to provide an impetus for these areas to receive special support and resources. These areas include Environmentally Sensitive Habitat Areas (ESHAs) currently designated in California's Coastal Zone Management (CZM) program, as well as areas adjacent to Areas of Special Biological Significance (ASBS), California's National Estuarine Research Reserves (NERRs), National Estuary Program (NEP), and National Marine Sanctuaries. A long-term goal for the NPS program is to improve water quality by implementing the management measures identified in the California Management Measures for Polluted Runoff Report (CAMMPR) by 2013. The short-term plan to achieve this goal is to identify, educate, and promote stakeholder involvement. The State's 2002 CCA Draft Strategic Plan identifies 101 CCAs statewide of which 13 are in the Los Angeles Region (CRWQCB, 2007).

Malibu Creek is identified as CCA #60 in the State's Draft Strategic Plan. It has been identified as such since it flows into a Marine Protected Area and is an impaired water body. The major efforts listed to implement NPS management measures include: work by the Malibu Creek Watershed Advisory Council, various efforts to manage septic systems near Surfrider Beach, projects to capture and treat runoff from Malibu Creek and storm drains in the area, the Assessment of Water Quality and Loadings From Natural Landscapes project conducted by SCCWRP, and implementation of the Santa Monica Bay Restoration Plan (CRWQCB, 2007).

Beaches and Intertidal Habitats

Malibu Creek and Lagoon, as well as several other unique habitats in this sub-watershed, are home to a few threatened and endangered species such as tidewater goby and steelhead trout. Many non-threatened/non-endangered species also rely on these habitats for their existence and may become threatened if habitat degradation continues. Long-term, protective management strategies should be implemented for their protection and may include acquisition of land, public education about the values of these species/habitats, increased enforcement activities, on-going monitoring, and interagency cooperation (CRWQCB, 1997).

Erosion Control Strategies

Development of an erosion and sediment control strategy must consider several factors, including pre-development sediment transport volumes and the impacts of development on the normal sediment transport process. Although natural erosion and sedimentation transport activities are both necessary and desirable for natural beach replenishment and healthy functioning wetlands, excessive erosion and sediment transport can adversely impact downstream sensitive habitats. Assessing appropriate and necessary transport volumes is key to developing this overall control strategy (CRWQCB, 1997).

Implement TMDLs

The Malibu Creek Watershed Monitoring Report also describes the Integrated TMDL Implementation Plan developed by those entities in the watershed affected by current and future TMDLs. The structural and nonstructural BMPs noted address multiple impairments. The targeted pollutants are: trash, sediment (TSS), nutrients (nitrogen and phosphorus), metals, and bacteria (City of Calabasas, 2008).

Beach Bacteria TMDLs Two of the TMDLs in effect which impact Malibu are the dry- and wet-weather bacteria TMDLs for Santa Monica Bay beaches. Surfrider and Malibu Beaches are listed as impaired for indicator bacteria. For the purpose of implementing those TMDLs, the area has been divided up into “jurisdictional groups” (JG) – Malibu Creek falls into JG9. Compliance measures include a number of activities that in combination would result in reducing the number of days in which water quality objectives are exceeded to less than or equal to that of the reference watershed (CRWQCB website #3).

The wet-weather TMDL stipulates a threshold number of exceedance days based on daily monitoring activities. The number of allowed exceedance days varies somewhat among the beaches but is no more than seventeen. The TMDL features a reference system/anti-degradation approach. The purpose of utilizing this approach is to ensure that bacteriological water quality is at least as good as that of a reference site and that no degradation of existing bacteriological water quality is permitted where existing bacteriological water quality is better than that of a reference site, in this case, Leo Carrillo Beach upcoast (CRWQCB website #3).

The dry-weather TMDL also stipulates compliance targets. The general implementation schedule includes two phases:

Phase I: Compliance during Summer Dry Weather. Within three years of the effective date of the TMDL, there may be no exceedances at any location during summer dry weather (April 1 to October 31). This compliance target may be achieved by employing a number of strategies, including diverting storm drain flows to treatment plants, eliminating illicit discharges, controlling sources of bacteria, or implementing “end-of-pipe” treatment. The District, City of Los Angeles and several other cities adjacent to Santa Monica Bay have been implementing aggressive summer, dry-weather storm drain diversion programs. All 27 priority storm drains have been diverted; additional diversions and treatment facilities have been completed and others are planned. (CRWQCB website #3).

Phase II: Compliance during Winter Dry Weather. Within six years of the effective date of this TMDL, compliance with the allowable number of exceedance days (varies by beach) during winter dry weather must be achieved (CRWQCB website #3).

A Coordinated Shoreline Monitoring Plan was developed by a Technical Steering Committee, co-chaired by the County and City of Los Angeles and consisting of representatives from many of the TMDLs' responsible agencies. In addition, other area stakeholders provided input. The plan is designed to comply with the monitoring requirements of both the dry- and wet-weather TMDLs (CRWQCB website #3).

Malibu Creek Bacteria TMDL The bacteria TMDL allows 3 to 6 years for compliance with applicable bacteria water quality standards during dry-weather conditions, and 10 years for compliance during wet-weather conditions, or up to 18 years for wet weather, if an integrated water resources approach is pursued. The implementation plan provides minimum prescriptive criteria for identifying high-risk areas, where onsite-wastewater treatment systems (OWTS) are potentially contributing to bacteria exceedances in the Malibu Creek watershed. Local agencies (city and county health departments and/or building departments) are required to focus their efforts to monitor and require upgrades to OWTS located in high-risk areas. In addition to the areas falling within the high-risk areas, local agencies must also use their knowledge to identify other areas, outside of the high-risk areas, that are likely to impact surface water quality due to local conditions (e.g., fractured bedrock). Legacy Park, in the Malibu Civic Center, which will include treatment wetlands, is a major water quality improvement project aimed at reducing bacteria levels.

Malibu Creek Trash TMDL Compliance with the TMDL is based on the Numeric Target and the Waste Load (point sources) and Load Allocations (nonpoint sources) which are defined as zero trash in and on the shorelines of the listed reaches and lakes of the Malibu Creek Watershed. Consequently, compliance is based on installation of structural best management practices such as full capture or partial capture systems, or implementing a program for trash assessment and collection, or any best management practices approved by the Executive Officer of the Regional Board, to attain a progressive reduction in the amount of trash in the waterbodies of concern.

Santa Monica Bay Nearshore and Offshore Debris TMDL The Santa Monica Bay Nearshore and Offshore Debris TMDL was adopted by the Regional Board in 2010 and requires that industries that manufacture, store, transport, or otherwise handle plastic pellets as raw material comply with a waste load allocation (WLA) of zero plastic pellets. The zero WLA for the plastic pellets requires that no plastic pellets are allowed to be released, found, or accumulated outside of the premises of the industries or in any stormwater capture device that may be connected with the MS4. Various tasks are required to be completed within a certain time period after the effective date of the TMDL. Key tasks range from achieving 20% reduction of trash from the baseline WLA within four years from the effective date of the TMDL to achieving 100% reduction of trash from the baseline WLA within eight years of the effective date of the TMDL.

Implementation plans and other information for these TMDLs are available on the Regional Board website as follows:

Santa Monica Bay Beaches Dry Weather Bacteria

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_9_2002-004_td.shtml

http://63.199.216.6/larwqcb_new/bpa/docs/2002-004/2002-004_RB_RSL.pdf

http://63.199.216.6/larwqcb_new/bpa/docs/2002-004/2002-004_RB_BPA.pdf

Santa Monica Bay Beaches Wet Weather Bacteria

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_14_2002-022_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_39_2006-005_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_40_2006-006_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_41_2006-007_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_42_2006-008_td.shtml

Malibu Creek Bacteria

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_23_2004-019R_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/2004-019R/05_0309/Resolution%202004-19R%20and%20Attachment%20A.pdf

Malibu Creek Trash

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_63_2008-007_td.shtml

Santa Monica Bay Nearshore and Offshore Debris TMDL

http://63.199.216.6/larwqcb_new/bpa/docs/R10-010/R10-010_RB_RSL.pdf

http://63.199.216.6/larwqcb_new/bpa/docs/R10-010/R10-010_RB_BPA.pdf

Low Flow Diversions/Treatment Facilities

An increasingly utilized approach to eliminating bacteria from storm drains at its source is the installation of low flow diversions. A low flow diversion is a structural device that routes urban runoff from canyons, streets and small watersheds away from the storm drain system or waterway, and redirects it into the sanitary sewer system or to a local treatment facility, where the contaminated runoff then receives treatment and filtration before being discharged into the ocean (City of LA website #2). A low flow diversion/treatment facility in the subwatershed has been in operation since 2007 in the Civic Center.

Reduction of Non-native Invasive Species

Non-native species limit diversity of indigenous plants and animals. Location and types of non-native species throughout the Malibu Creek subwatershed should be identified and mapped. Once this information has been prepared, an assessment should be performed in priority habitats on the feasibility of eliminating non-native species and restoring the area with native, indigenous species (CRWQCB, 1997).

In 2002, the California Department of Fish and Game began developing a plan to coordinate state programs, create a statewide decision-making structure and provide a shared baseline of data and agreed-upon actions so that state agencies may work together more efficiently. In January 2008, with input from multiple state agencies, the public, and other stakeholders, the California Aquatic Invasive Species Management Plan (CAISMP) was approved by the Governor. The CAISMP seeks to identify the steps necessary to minimize the harmful impacts of aquatic invasive species (AIS) in California. More than 160 management actions are organized under the following eight objectives: Coordination & Collaboration, Prevention, Early Detection & Monitoring, Rapid Response & Eradication, Long-term Control & Management, Education & Outreach, Research, and Laws & Regulation (SMBRF, 2009).

The implementation of the highest priority actions was initiated in 2008 with the formation of the California Aquatic Invasive Species Team (CAAIST). The CAAIST's mission is to coordinate the activities of state agencies charged with implementation of the CAISMP. CAAIST is composed of representatives from over 25 California state agencies, including the Santa Monica Bay Restoration Commission. If the priority actions of the CAISMP can be successfully implemented, California resource managers and policy makers will have taken a huge step forward in the effort to prevent new invasions and minimize impacts from established AIS (SMBRF, 2009).

Septic System Management Strategy

Septic systems are located throughout the lower Malibu Creek subwatershed. Water quality monitoring results suggest that septic systems might be contributing factors to the impairment of beneficial uses and degrade sensitive habitats in certain areas of this region. These systems have the potential to leak bacteria, pathogens and nutrients which can then migrate through sensitive habitats, and ultimately to the surf zone (CRWQCB, 1997).

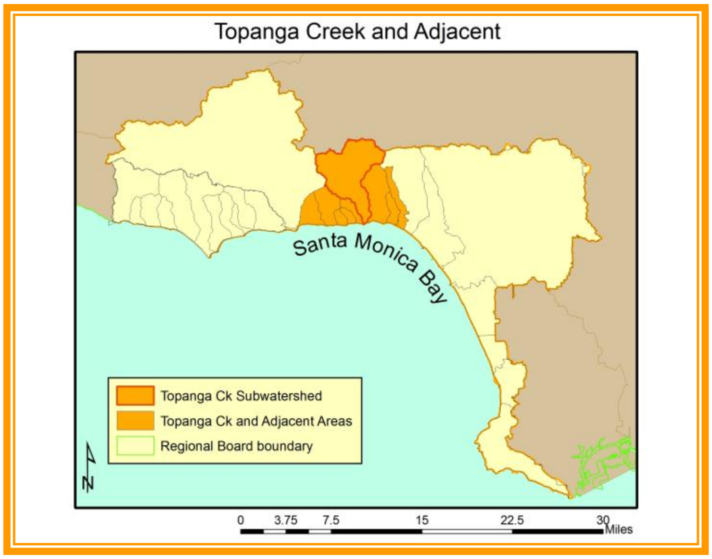
At a November 5, 2009 public hearing, the Regional Board voted to adopt Resolution No. R4-2009-007, an amendment to the Basin Plan to prohibit on-site wastewater disposal systems in the Malibu Civic Center area. The amendment prohibits all new discharges, except certain specific projects which have already progressed through the entitlement process and prohibits discharges from existing systems within six years in commercial areas and within ten years in residential areas from the date of adoption by the Regional Board. This prohibition does not preclude a publicly owned, community-based, solution that includes specific wastewater disposal sites subject to waste discharge requirements to be prescribed by the Regional Board (CRWQCB website #2).

Water Conservation

Water conservation practices, spearheaded by the Las Virgenes Municipal Water District, are already being encouraged in this subwatershed. They have a number of existing programs and pilot projects underway to reduce the importation of water into the watershed, including residential and light commercial water use efficiency surveys, rebates for a variety of outdoor and indoor equipment such as appliances and fixtures including weather-based irrigation controllers, rotating sprinkler nozzles, and high-efficiency clothes washers, among others. LVMWD offers water conservation landscape and irrigation training classes throughout the year to professional and home gardeners, supports conservation education in local schools, provides facility tours, supports local public events and recycles wastewater biosolids into compost which it gives away for free. LVMWD continually seeks to partner with local cities both in and out of its service area, and with other watershed stakeholder groups on projects that reduce water demand and/or benefit the watershed in various ways (Mundy, comm. ltr.). Nearly all the programs implemented by LVMWD are co-funded with local, state and federal funds and are administered with the cooperation of the Municipal Water District of Southern California. Bond funds available through the IRWMP process would be another way to improve water conservation. Currently, over 20% (5,000 acre-feet) of the watershed's urban water demands are being met by water conservation and wastewater recycling (CRWQCB, 1997).

Topanga Creek and Adjacent

Located approximately 4.5 miles west of the City of Santa Monica, the Topanga sub-watershed includes Puerco, Corral, Carbon, Las Flores, Piedra, Pena, Tuna, Topanga, and Santa Ynez Canyons, which covers an area of 18 square miles within the Santa Monica Mountains. This subwatershed borders the Malibu Creek subwatershed to the west, the Los Angeles River watershed to the north, the Santa Monica Canyon and Ballona Creek subwatersheds to the east and the Pacific Ocean to the south. Several creeks and streams discharge directly to the Bay. There are no major point source discharges in this subwatershed (CRWQCB, 1997).



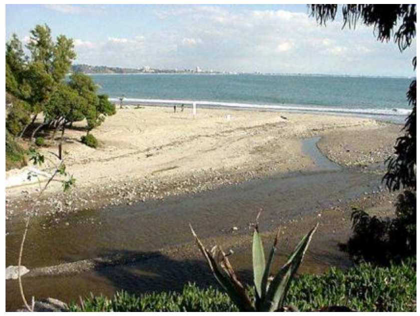
Flows

The creeks in this region flow through towns in the upper reaches and through steep, narrow gorges in the lower reaches, ultimately emptying into the ocean just south of Highway 1. In the lower reaches, the canyons broaden into floodplains with dense riparian vegetation, houses, shacks, and stream crossings. In many places, Topanga Canyon Creek has been lined with boulders and concrete, and banks have been sandbagged to protect from erosion. Abandoned partially-buried vehicles and buildings attest to recurrent flooding experienced in this region. Topanga Canyon has the largest drainage area (and corresponding average annual storm runoff volume), then Santa Ynez, Puerco and Corral Canyons, Las Flores Canyon, Carbon Canyon, and finally Piedra Gorda Canyon, Pena Canyon and Tuna Canyon have the smallest drainage area (CRWQCB, 1997).

Land Uses

Though this region is rural, there is still evidence of residential development in the Topanga sub-watershed. Additionally, a few areas in the upper sub-watershed area have been developed, but the percentage is relatively small. Land use activities can be broken down into the following: 92% open space, 7% residential, and less than 1% for commercial/industrial and public (combined) (CRWQCB, 1997).

Topanga Canyon



A small lagoon exists at the mouth of the creek due to a berm created by littoral drift and wave action. The lagoon is constrained to a narrow, linear basin defined by the high bluffs to either side of the creek. Tidal action occurs, as evidenced by aquatic marine vegetation within this lower part of the creek (CRWQCB, 1997).

Beneficial Uses

The Topanga subwatershed is host to many beneficial uses, including recreational (swimming and surfing), wildlife and marine/aquatic habitat, fish spawning and migration, tidepools, intertidal and beach habitats, among others shown below (CRWQCB, 1994).

Table 7. Beneficial uses of the waters within the Topanga Creek subwatershed and adjacent areas

Coastal Feature or Waterbody	Hydro Unit #	MUN	NAV	REC1	REC2	COMM	WARM	COLD	EST	MAR	WILD	RARE	MIGR	SPWN	SHELL	WET
Carbon Canyon Creek	404.16	P		I	I		I				E					
Las Flores Canyon Creek	404.15	P		I	I		I				E					
Piedra Gorda Canyon Creek	404.14	P		I	I		I				E					
Pena Canyon Creek	404.13	P		I	I		I	E			E					
Tuna Canyon Creek	404.12	P		I	I		I				E					
Topanga Lagoon	404.11		E	E	E	E			E		E	E	E	E		E
Topanga Canyon Creek	404.11	P		I	I		E	E			E		P	I		
Santa Ynez Canyon	405.13	P		I	E		I				E	E				
Santa Ynez Lake (Lake Shrine)	405.13	P		P	E		E				E					
Carbon Beach	404.16		E	E	E	E				E	E			P	E	
La Costa Beach	404.16		E	E	E	E				E	E			P	E	
Las Flores Beach	404.15		E	E	E	E				E	E			P	E	
Las Tunas Beach	404.12		E	E	E	E				E	E			P	E	
Topanga Beach	404.11		E	E	E	E				E	E			P	E	
Will Rogers State Beach	405.13		E	E	E	E				E	E			P	E	

E: Existing beneficial use; **P:** Potential beneficial use; **I:** Intermittent beneficial use

Areas within the Topanga subwatershed have been designated as *Significant Ecological Areas (SEA)* by Los Angeles County. These areas require protection of species or biological communities to the extent that alteration of natural water quality is undesirable and that the preservation of natural water quality be maintained to the extent practicable. Tuna Canyon is one such designated area in this region (CRWQCB, 1997).

Topanga Canyon is home to some of the unique wetlands that can be found throughout the Santa Monica Bay watershed. Specifically, the Topanga Canyon wetlands are palustrine, i.e., non-tidal wetlands dominated by vegetation (trees, shrubs, herbs, mosses and lichens). Many of the streams feeding these wetlands are intermittent, flowing only part of the year and the stream corridors are typically steep, narrow and highly erosive. This in turn confines riparian vegetation to the immediate stream channel area (CRWQCB, 1997).

The area falls within the Santa Monica Mountains biogeographic population group described in the Draft Steelhead Recovery Plan; Topanga Creek is considered to be currently occupied by a Core 2 population. The Core 1 populations are those populations identified as a high priority for recovery actions based on a variety of factors, including: the intrinsic potential of the population in an unimpaired condition; the role of the population in meeting the spatial and/or redundancy viability criteria; the conditions of the population, the severity of the threats facing the populations; the potential ecological or genetic diversity the watershed and population could provide to the species; and the capacity of the watershed and population to respond to the critical recovery actions needed to abate those threats. Core 1 populations form the nucleus of the recovery strategy. Core 2 populations must eventually meet the biological recovery criteria; however, these populations are considered to be of secondary importance in terms of recommended priority of recovery efforts (NOAA, 2009).

Local Parks

There are several parks located in this subwatershed, most notably Topanga Creek State Park, Will Rogers State Park and Will Rogers State Beach. These grounds provide hiking, picnicking, horseback riding and bicycling opportunities as well as swimming, surfing and sunbathing activities. Semi-regular interpretive and educational meetings are also held at these locations. Thousands of visitors visit these locations each year and take advantage of the opportunities they provide (CRWQCB, 1997).

Evidence of Impairment

There is a certain amount of loss and degradation of riparian habitat, as well as, degradation of coastal wetlands such as Topanga Lagoon. While there is limited development in this area, the potential for pollution problems increases as the percentage of developed land increases (CRWQCB, 1997).

The proposed lower Topanga restoration area encompasses almost 204 acres of land including 1.2 miles of Topanga Creek and its surrounding floodplain. Development within the watershed has caused erosion, degraded water quality and habitat values. For example, concrete sacks, rocks, and debris have been used for erosion control, reducing the vegetation along the stream (this problem has recently been corrected). Stream temperatures are high, and because of the high nutrients discharged to the stream summer algal growth is significant. The area is also affected by debris, trash, uncontrolled discharges and vegetation removal (CRWQCB, 1997).

Pollutants of Concern

The pollutants of concern identified for this subwatershed include pathogens, TSS and lead (CRWQCB, 1997).

Likely sources contributing to heavy metals loadings include runoff contaminated from transportation-related activities and air deposition. More monitoring is warranted before the overall impacts of heavy metals can be confirmed (CRWQCB, 1997).

Sources and Loadings

Potential sources of pollution may be linked with the pollutants of concern (identified above) found to threaten the waterbodies of this region.

TSS and Fine-grained Sediments

Sediments and total suspended solids (which hinder light transmission into waters, smother spawning areas and hard-bottom subtidal habitats, and provide a transport medium for other pollutants such as heavy metals and pesticides) also have several known and suspect sources. Non-stabilized hillsides, development activities where best management practices have not been implemented, improper land grading activities, horse and animal farms located too close to creeks and stream and other relevant agricultural activities all contribute sediments and TSS to this watershed's creeks and stream, which ultimately flow to Santa Monica Bay. Furthermore, fire residue may be washed down by storm runoff and contribute acute excessive sediments to the watershed's receiving waters (CRWQCB, 1997).

Water Quality Improvement Strategies

In accordance with previously identified problems and in order to protect the beneficial uses of waterbodies in this region, the greatest benefits in achieving water quality improvements in the Topanga subwatershed could be achieved by focusing efforts on the following:

- Protect and restore remaining wetlands in the Topanga subwatershed.
- Reduce nonpoint source, urban runoff, and stormwater pollutant loading.
- Implement TMDLs.

Wetlands Protection and Restoration

Because the wetlands in this subwatershed are affected by the land use activities and water quality impacts that occur upstream, any restoration activities taking place should consider these issues. Development of a comprehensive plan should address pollutants of concern for this region and should be based on water quality, salinity, habitat and biodiversity objectives for wetlands restoration. Special focus should be given to the Lower Topanga Canyon wetlands area. The SMBRP's Bay Restoration Plan identified specific actions to protect and restore Lower Topanga Canyon as well as other priority wetlands throughout the Santa Monica Bay watershed (CRWQCB, 1997).

Topanga Creek and Lagoon   Completed WRP projects include feasibility studies needed to determine the potential for restoring some of the historic extent and function of Topanga Creek and Lagoon, technical assessments for restoration of Topanga Lagoon based on a conceptual plan in the Topanga Lagoon and Watershed Restoration Feasibility Study, and acquisition of approximately 120 acres in the upper Topanga watershed including Zuniga Pond, a constructed pond, in order to protect western pond turtle habitat, a state-listed species of special concern.   A Tier 1 project on the WRP workplan is implementation of the recommendations of the 2002 Topanga Creek Watershed and Lagoon Restoration Feasibility Study. This is a multi-phased program that will be implemented over several years and in partnership with multiple agencies, particularly State Parks. The primary goals of the program are to:

1. Restore habitat at identified priority locations in order to increase benefits to the endangered steelhead trout and tidewater goby, as well as other aquatic species of special concern in the watershed.

2. Improve passage opportunities for steelhead trout and extend the reach of creek providing suitable habitat for spawning and rearing.
3. Identify ways to improve sediment transport and delivery in order to enhance conditions in the creek and restore beach nourishment opportunities.
4. Improve water quality in all areas of the watershed where impairments have been identified.
5. Continue monitoring of water quality, sediment loads, streambank condition and target species populations (steelhead trout, tidewater gobies, western pond turtles, CA newts, etc.) in order to identify population trends related to restoration actions (SCWRP website #2).

Steelhead trout passage has been improved recently through removal of a berm created previously by private landowners to protect their homes in the floodplain. This land is now owned by the California Department of Parks and Recreation and removal of the berm material was accomplished through funding from multiple agencies. Vegetation in the affected area was also restored with native species plantings and invasives removal (SMBRF, 2009).

<u>Tuna Canyon</u> A completed WRP project is acquisition of approximately 417 acres of land at the lower end of Tuna Canyon to protect a perennial spring and well-developed riparian habitat (SCWRP website #2).

<u>Las Flores Creek</u> A project on the WRP workplan is the restoration of ecological function to Las Flores Canyon Creek, resulting in improved channel stability, protection of the emergent wetland downstream and increased potential habitat for steelhead trout and other native species. Las Flores Canyon drains a watershed of 2,646 acres. The project area is approximately 3.4 acres and involves 2,400 linear feet of the creek. In-stream habitat features will expand the number of current pools available to steelhead trout and create larger pools. Improved passage, resting pools and escape cover will also provide for movement of steelhead to larger upstream spawning pools. The project will install biotechnical bank stabilization to protect against sediment loading and landslides, which are deleterious to native aquatic species as well as the downstream emergent wetland. It will also remove and manage invasive exotic plant species including a small cluster of arundo. The project will preserve and expand native tree canopy to improve in-stream and riparian habitat. Finally, the site will be revegetated with native species (coastal scrub, riparian, sycamore woodland) to restore cover, vegetative structure and increase native diversity. Revegetation will result in increased physical steelhead habitat as well as improved water temperature regulation (SCWRP website #2).

<u>Corral Canyon</u> A Tier 1 project on the WRP workplan is Acquisition of two blocks of property to preserve 849 acres of wildlife and riparian habitat within the Santa Monica Mountains National Recreation Area and reaches of Corral Canyon Creek, a perennial stream that flows into Santa Monica Bay. The objectives of this project are to prevent further fragmentation of wildlife habitat in an area under severe development pressure, as well as to help protect the water quality of the Corral Canyon watershed. Both properties have entitlements that would allow for development. But they both currently remain as undeveloped open space and are part of a major core of coastal habitat and wildlife corridors in the Santa Monica Mountains. Primary vegetation communities include a mosaic of coastal sage scrub and chaparral, oak riparian woodland and upland coastal live oak woodland. Acquisition of these areas would provide an opportunity to link Malibu Creek State Park with parkland owned by the Santa Monica Mountains Conservancy within the SMMNRA. Both properties have the highest priority in the SMMNRA Land Protection Plan (SCWRP website #2).

Reduce Nonpoint Source Pollutant Loading

Critical Coastal Area Designations California's Nonpoint Source (NPS) Pollution Control Program includes requirements for Critical Coastal Area (CCA) designation. The intent of CCA designation is to direct needed attention to coastal areas of special biological, social, and environmental significance and to provide an impetus for these areas to receive special support and resources. These areas include Environmentally Sensitive Habitat Areas (ESHAs) currently designated in California's Coastal Zone Management (CZM) program, as well as areas adjacent to Areas of Special Biological Significance (ASBS), California's National Estuarine Research Reserves (NERRs), National Estuary Program (NEP), and National Marine Sanctuaries. A long-term goal for the NPS program is to improve water quality by implementing the management measures identified in the California Management Measures for Polluted Runoff Report (CAMMPR) by 2013. The short-term plan to achieve this goal is to identify, educate, and promote stakeholder involvement. The State's 2002 CCA Draft Strategic Plan identifies 101 CCAs statewide of which 13 are in the Los Angeles Region (CRWQCB, 2007).

Topanga Canyon Creek is identified as CCA #61 in the State's Draft Strategic Plan since it flows into a Marine Protected Area and is an impaired water body. The major efforts listed to implement NPS management measures include: work by the Malibu Creek Watershed Advisory Council (the small Topanga watershed is adjacent to the much larger Malibu watershed), various efforts to manage septic systems, participation with the Topanga Watershed Committee, implementation of the watershed management plan, and continuance of creek monitoring (CRWQCB, 2007).

Implement TMDLs

The TMDLs in effect which impact the Topanga Creek and adjacent area are the dry- and wet-weather bacteria TMDLs for Santa Monica Bay beaches and the Santa Monica Bay nearshore and offshore debris TMDL. Topanga and Carbon Beaches, among others in this subwatershed, are listed as impaired for indicator bacteria. For the purpose of implementing the bacteria TMDLs, the area has been divided up into "jurisdictional groups" (JG) – the Topanga and adjacent area fall s into JG1 and JG2. Compliance measures include a number of activities that in combination would result in reducing the number of days in which water quality objectives are exceeded to less than or equal to that of the reference watershed (CRWQCB website #3).

The wet-weather bacteria TMDL stipulates a threshold number of exceedance days based on daily monitoring activities. The number of allowed exceedance days varies somewhat among the beaches but is no more than seventeen. The TMDL features a reference system/anti-degradation approach. The purpose of utilizing this approach is to ensure that bacteriological water quality is at least as good as that of a reference site and that no degradation of existing bacteriological water quality is permitted where existing bacteriological water quality is better than that of a reference site (CRWQCB website #3).

The dry-weather bacteria TMDL also stipulates compliance targets. The general implementation schedule includes two phases:

Phase I: Compliance during Summer Dry Weather. Within three years of the effective date of the TMDL, there may be no exceedances at any location during summer dry weather (April 1 to October 31). This compliance target may be achieved by employing a number of strategies, including diverting storm drain flows to treatment plants, eliminating illicit discharges, controlling sources of bacteria, or implementing "end-of-pipe" treatment. The County of Los Angeles, City of Los Angeles and several other cities adjacent to Santa Monica Bay have been implementing aggressive summer, dry-weather storm drain diversion programs. All 27 priority storm drains have been diverted; additional diversions have been completed and others are planned (CRWQCB website #3).

Phase II: Compliance during Winter Dry Weather. Within six years of the effective date of this TMDL, compliance with the allowable number of exceedance days (varies by beach) during winter dry weather must be achieved (CRWQCB website #3).

A Coordinated Shoreline Monitoring Plan was developed by a Technical Steering Committee, co-chaired by the County and City of Los Angeles and consisting of representatives from many of the bacteria TMDLs' responsible agencies. In addition, other area stakeholders provided input. The plan is designed to comply with the monitoring requirements of both the dry- and wet-weather TMDLs (CRWQCB website #3).

Santa Monica Bay Nearshore and Offshore Debris TMDL The Santa Monica Bay Nearshore and Offshore Debris TMDL was adopted by the Regional Board in 2010 and requires that industries that manufacture, store, transport, or otherwise handle plastic pellets as raw material comply with a waste load allocation (WLA) of zero plastic pellets. The zero WLA for the plastic pellets requires that no plastic pellets are allowed to be released, found, or accumulated outside of the premises of the industries or in any stormwater capture device that may be connected with the MS4. Various tasks are required to be completed within a certain time period after the effective date of the TMDL. Key tasks range from achieving 20% reduction of trash from the baseline WLA within four years from the effective date of the TMDL to achieving 100% reduction of trash from the baseline WLA within eight years of the effective date of the TMDL.

Implementation plans and other information for these TMDLs are available on the Regional Board website as follows:

Santa Monica Bay Beaches Dry Weather

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_9_2002-004_td.shtml

http://63.199.216.6/larwqcb_new/bpa/docs/2002-004/2002-004_RB_RSL.pdf

http://63.199.216.6/larwqcb_new/bpa/docs/2002-004/2002-004_RB_BPA.pdf

Santa Monica Bay Beaches Wet Weather

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_14_2002-022_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_39_2006-005_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_40_2006-006_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_41_2006-007_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_42_2006-008_td.shtml

Santa Monica Bay Nearshore and Offshore Debris TMDL

http://63.199.216.6/larwqcb_new/bpa/docs/R10-010/R10-010_RB_RSL.pdf

http://63.199.216.6/larwqcb_new/bpa/docs/R10-010/R10-010_RB_BPA.pdf

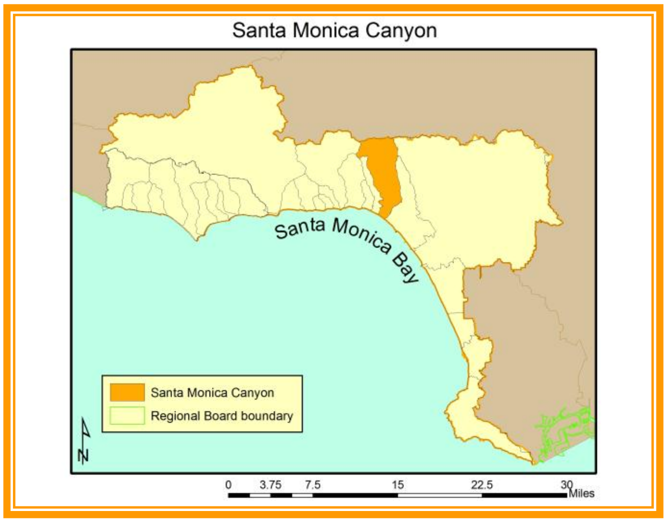
Low Flow Diversions/Treatment Facilities

An increasingly utilized approach to eliminating bacteria from storm drains at its source is the installation of low flow diversions. A low flow diversion is a structural device that routes urban runoff from canyons, streets and small watersheds away from the storm drain system or waterway, and redirects it into the sanitary sewer system or to a local treatment facility, where the contaminated runoff then receives treatment and filtration before being discharged into the ocean (City of LA website #2). Low flow diversions found within the Topanga and adjacent area are show in the table below.

Table 8. Low flow diversions within the Topanga Creek subwatershed and adjacent areas

Low Flow Diversion	Year Operational	Agency
Palisades Park	2000	City of LA
Bay Club Drive	2001	City of LA
Temescal Canyon	2003	City of LA
Pulga Canyon	2004	District
Santa Ynez	2006	District
Marquez Avenue	2006	City of LA
Parker Mesa/Castlerock	2006	District

Santa Monica Canyon



Santa Monica Canyon drains runoff into Santa Monica Bay at the stretch of Will Rogers State Beach near the intersection of Chautauqua Boulevard and Pacific Coast Highway in Pacific Palisades, a community of the City of Los Angeles. The drain receives runoff from an approximately 5,600 acre drainage area, including the Pacific Palisades and the Brentwood/Palisades communities, and a nominal portion of the City of Santa Monica. It also drains runoff from popular attractions such as Will Rogers State Park, Riviera Country Club and portions of Topanga State Park (CRWQCB, 1997).

The Santa Monica Canyon storm drain has two major branches, Santa Monica Canyon and Rustic Canyon. Santa Monica Canyon is a concrete-lined, rectangular open channel, except for a stretch where it traverses underground through the Riviera Country Club. It branches off to Mandeville Canyon and Sullivan Canyon storm drains, near the intersection of Sunset Boulevard and Mandeville Canyon Road. Mandeville Canyon is approximately 1.5 miles long. Sullivan Canyon is first intercepted by the Sullivan Canyon Park Debris Basin, then extends towards Mulholland Drive. Including Sullivan Canyon, the Santa Monica Canyon has a total length of approximately eight miles. Rustic Canyon joins Santa Monica Canyon near the intersection of Entrada Way and Short Avenue. It also has a total length of approximately eight miles and is an open, natural creek for most of its length. Its upper reach extends to the Topanga State Park near Mulholland Drive (CRWQCB, 1997).

The drainage area of Santa Monica Canyon is comprised of mostly low density residential and open spaces, with minimal manufacturing and industrial activities (CRWQCB, 1997).

Santa Monica Canyon flows year round with a typical dry flow of approximately 100-300 thousand gallons/day. As occurs in the storm drain system elsewhere in the county, flow in the drain can increase to an estimated hundred million gallons per day during a significant storm event (CRWQCB, 1997).

Beneficial Uses

Beneficial uses are identified for this subwatershed in two areas: those associated with the creeks and those associated with ocean water influence by discharges from the land. The table below summarizes the beneficial uses designated for waterbodies in this subwatershed (CRWQCB, 1994).

Table 9. Beneficial uses of the waters within the Santa Monica Canyon

Coastal Feature or Watershed	Hydro Unit #	MUN	REC1	REC2	WARM	WILD
Santa Monica Canyon Channel	405.13	P	P	I	P	E
Rustic Canyon Creek	405.13	P	I	I	I	E
Sullivan Canyon Creek	405.13	P	I	I	I	E
Mandeville Canyon Creek	405.13	P	I	I	I	E

E: Existing beneficial use; **P:** Potential beneficial use; **I:** Intermittent beneficial use

Evidence of Impairments

The Will Rogers State Beach is one of the heavily used recreational area in Santa Monica Bay. Yet the area has also developed a reputation for severe pollution as indicated by bacterial count measurements and special studies. Over the years, high indicator bacterial counts have been found in nearshore waters surrounding the nearby drain's outlet. As a result, warning signs advising people not to swim in the adjacent area are permanently posted. However, although a SMBRP study found enteric viruses in Pico-Kenter drain (now diverted to a treatment facility), enteric viruses were not found in runoff samples collected at Santa Monica Canyon (CRWQCB, 1997).

The strongest evidence of impairment is provided by the SMBRP epidemiological study conducted in summer 1995. The beach adjacent to Santa Monica Canyon was one of the three sites surveyed. Besides finding higher health risks associated with swimming near the storm drains, the study also showed that bacterial indicator counts were higher near the Santa Monica Canyon drain than farther from it (CRWQCB, 1997).

Pollutants of Concern

The pollutants of concern identified for this subwatershed area include pathogens and total suspended solids (CRWQCB, 1997).

Sources and Loadings

The occurrence of pathogenic contamination of runoff and surfzone water as measured by bacterial indicator concentrations is highly episodic. Generally the incidence of contamination occurs only when there is storm drain flow. However, the frequency and magnitude of contamination does not seem to be related to the frequency and amount of the flow, nor the size of the drainage area. Surfzone water is more likely be contaminated when a storm drain discharges directly to the surfzone (CRWQCB, 1997).

In 1994, the City of Los Angeles conducted a study of the possible sources of bacterial contamination in the Santa Monica Canyon. In this study, samples from the Santa Monica Canyon upstream sub-drainage basin were collected at 10 locations and were analyzed for total and fecal coliform in order to isolate the pollutant sources. The test results appear to show no discernible pattern. However, the test results did indicate consistently higher bacterial contamination counts coming from the Santa Monica Canyon branch, specifically from the upper watershed (CRWQCB, 1997).

Septic tanks do not seem to be a major source of bacterial contamination. Only about 2% of the total number of homes in the drainage area have no sewer connections and, therefore, have septic tanks. The most likely bacterial contamination sources are fecal matter being released from horse stables, pets, and wild animals, and decomposed organic matter from trees. There are several horse stables built adjacent to Sullivan Canyon, Mandeville Canyon, and Rustic Canyon. Rustic Canyon is used as a trail by horseback riders. Finally, Will Rogers State Park has continuous equestrian activities and maintains some horse stables within the facility (CRWQCB, 1997).

Water Quality Improvement Strategies

There is a general consensus among stakeholders that the greatest impact and need for improvement in this subwatershed area is to reduce acute health risks associated with swimming at beaches impacted by pathogen-contaminated surfzone waters. Control of pathogen inputs into the nearshore areas should be the priority for pollutant control measures planned in this area (CRWQCB, 1997).

However, unlike in Pico-Kenter and adjacent drain area, diversion of low flow to treatment plant is not a desirable solution to the problem because the sewer facilities in this area do not have the extra capacity to receive and transport the expected amount of added low flow. Re-design and construction of the pipeline would be costly. There are two other alternative measures that are considered more suitable at this time. The first one is a public education program. The second is to promote implementation of BMPs by horse stable operators, by disseminating pamphlets, conducting employee training, and installing runoff containment devices (CRWQCB, 1997).

Reduce Nonpoint Source Pollutant Loading

Critical Coastal Area Designations California's Nonpoint Source (NPS) Pollution Control Program includes requirements for Critical Coastal Area (CCA) designation. The intent of CCA designation is to direct needed attention to coastal areas of special biological, social, and environmental significance and to provide an impetus for these areas to receive special support and resources. These areas include Environmentally Sensitive Habitat Areas (ESHAs) currently designated in California's Coastal Zone Management (CZM) program, as well as areas adjacent to Areas of Special Biological Significance (ASBS), California's National Estuarine Research Reserves (NERRs), National Estuary Program (NEP), and National Marine Sanctuaries. A long-term goal for the NPS program is to improve water quality by implementing the management measures identified in the California Management Measures for Polluted Runoff Report (CAMMPR) by 2013. The short-term plan to achieve this goal is to identify, educate, and promote stakeholder involvement. The State's 2002 CCA Draft Strategic Plan identifies 101 CCAs statewide of which 13 are in the Los Angeles Region (CRWQCB, 2007).

Santa Monica Canyon is identified as CCA #62 in the State's Draft Strategic Plan; it is an impaired water body that flows into a Marine Protected Area. Santa Monica Canyon is formed by the confluence of three major watersheds. Approached from the shoreline it extends upstream for a couple of miles to include lower Rustic Canyon and lower Sullivan Canyon, both entering tangentially from the northwest and ends at the entrance to Mandeville Canyon which extends six miles farther north to the crest of the Santa Monica Mountain. The major efforts listed to implement NPS management measures include: work by the nearby Malibu Creek Watershed Advisory Council; dry weather diversions at Will Rogers State Beach; and participation with the North Santa Monica Bay Water Quality Improvement Project (CRWQCB, 2007).

Implement TMDLs

The TMDLs in effect which impact the Santa Monica Canyon are the dry- and wet-weather bacteria TMDLs for Santa Monica Bay beaches and the Santa Monica Bay nearshore and offshore debris TMDL. For the purpose of implementing the bacteria TMDLs, the area has been divided up into "jurisdictional groups" (JG) – the Santa Monica Canyon area falls into JG2. Compliance measures include a number of activities that in combination would result in reducing the number of days in which water quality objectives are exceeded to less than or equal to that of the reference watershed (CRWQCB website #3).

The wet-weather bacteria TMDL stipulates a threshold number of exceedance days based on daily monitoring activities. The number of allowed exceedance days varies somewhat among the beaches but is no more than seventeen. The TMDL features a reference system/anti-degradation approach. The purpose of utilizing this approach is to ensure that bacteriological water quality is at least as good as that of a reference site and that no degradation of existing bacteriological water quality is permitted where existing bacteriological water quality is better than that of a reference site (CRWQCB website #3).

The dry-weather bacteria TMDL also stipulates compliance targets. The general implementation schedule includes two phases:

Phase I: Compliance during Summer Dry Weather. Within three years of the effective date of the TMDL, there may be no exceedances at any location during summer dry weather (April 1 to October 31). This compliance target may be achieved by employing a number of strategies, including diverting storm drain flows to treatment plants, eliminating illicit discharges, controlling sources of bacteria, or implementing "end-of-pipe" treatment. The District, City of Los Angeles and several other cities adjacent to Santa Monica Bay have been implementing aggressive summer, dry-weather storm drain diversion programs. All 27 priority storm drains have been diverted; additional diversions have been completed and others are planned (CRWQCB website #3).

Phase II: Compliance during Winter Dry Weather. Within six years of the effective date of this TMDL, compliance with the allowable number of exceedance days (varies by beach) during winter dry weather must be achieved (CRWQCB website #3).

A Coordinated Shoreline Monitoring Plan was developed by a Technical Steering Committee, co-chaired by the County and City of Los Angeles and consisting of representatives from many of the bacteria TMDLs' responsible agencies. In addition, other area stakeholders provided input. The plan is designed to comply with the monitoring requirements of both the dry- and wet-weather TMDLs (CRWQCB website #3).

<u>Santa Monica Bay Nearshore and Offshore Debris TMDL</u> The Santa Monica Bay Nearshore and Offshore Debris TMDL was adopted by the Regional Board in 2010 and requires that industries that manufacture, store, transport, or otherwise handle plastic pellets as raw material comply with a waste load allocation (WLA) of zero plastic pellets. The zero WLA for the plastic pellets requires that no plastic pellets are allowed to be released, found, or accumulated outside of the premises of the industries or in any stormwater capture device that may be connected with the MS4. Various tasks are required to be completed within a certain time period after the effective date of the TMDL. Key tasks range from

achieving 20% reduction of trash from the baseline WLA within four years from the effective date of the TMDL to achieving 100% reduction of trash from the baseline WLA within eight years of the effective date of the TMDL.

Implementation plans and other information for these TMDLs are available on the Regional Board website as follows:

Santa Monica Bay Beaches Dry Weather

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_9_2002-004_td.shtml

http://63.199.216.6/larwqcb_new/bpa/docs/2002-004/2002-004_RB_RSL.pdf

http://63.199.216.6/larwqcb_new/bpa/docs/2002-004/2002-004_RB_BPA.pdf

Santa Monica Bay Beaches Wet Weather

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_14_2002-022_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_39_2006-005_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_40_2006-006_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_41_2006-007_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_42_2006-008_td.shtml

Santa Monica Bay Nearshore and Offshore Debris TMDL

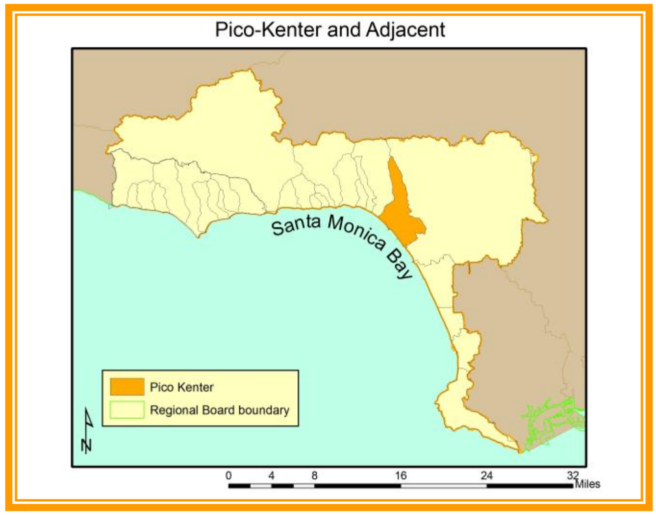
http://63.199.216.6/larwqcb_new/bpa/docs/R10-010/R10-010_RB_RSL.pdf

http://63.199.216.6/larwqcb_new/bpa/docs/R10-010/R10-010_RB_BPA.pdf

Low Flow Diversions/Treatment Facilities

An increasingly utilized approach to eliminating bacteria from storm drains at its source is the installation of low flow diversions. A low flow diversion is a structural device that routes urban runoff from canyons, streets and small watersheds away from the storm drain system or waterway, and redirects it into the sanitary sewer system or to a local treatment facility, where the contaminated runoff then receives treatment and filtration before being discharged into the ocean. A low flow diversion was installed in 2003 by the City of Los Angeles to treat dry weather runoff from this drainage.

Pico-Kenter and Adjacent



The land use in this mostly urbanized subwatershed is 48% single family, 21% multiple family, 6% commercial, 3% public, and 19% open space. The subwatershed is named after the Pico-Kenter drain which is located where Pico Boulevard intersects the beach in the City of Santa Monica. The drain enters Santa Monica Bay in a 20-foot-wide by 8-foot high reinforced concrete box. The storm drain system drains a 4,147 acre area that includes much of Santa Monica and part of West Los Angeles and Brentwood. There are two drains: one owned by Los Angeles County and the other by CalTrans. Except for some upstream canyon areas, the drain is largely underground pipe. The storm drain flows year round with a typical dry flow of approximately 0.5 cubic feet per second (100-300 thousand gallons/day). Like storm drain channels in the rest of the watershed, flows in the drain can swell to an estimated hundred million gallons per day during a significant storm (CRWQCB, 1997).

Besides the Pico-Kenter drain, there are about a dozen relatively small catchment basins with beach or surfzone outlets between Pacific Palisades and Marina del Rey. These drains are also mostly concrete underground pipes. Combined with and including the Pico-Kenter drain, they drain a subwatershed of 9,105 acres. The other drains, in order of size of drainage area are: Rose Avenue, Wilshire Boulevard, Montana Avenue, Brooks Avenue, Thornton Avenue, Ashland Avenue, Venice Pavilion, and Santa Monica Pier (CRWQCB, 1997). Dry weather diversion/treatment facilities are in operation at these drains.

Beneficial Uses

Beneficial uses for waterbodies in this subwatershed are primarily identified for the coastal waters that receive discharges from the storm drains. Beaches in the area include the Santa Monica Beach and Venice Beach. These beaches are often heavily used, especially on weekends and in summer months. Santa Monica Beach is the busiest beach in the County, with up to 2.5 million visits each year (CRWQCB, 1994).

Table 10. Beneficial uses of the waters within the Pico-Kenter and adjacent area

Coastal Feature or Waterbody	Hydro Unit #	NAV	REC1	REC2	COMM	MAR	WILD	RARE	MIGR	SPWN	SHELL
Santa Monica Beach	405.13	E	E	E	E	E	E		E	E	E
Venice Beach	405.13	E	E	E	E	E	E	E	E	E	E

E: Existing beneficial use; **P:** Potential beneficial use; **I:** Intermittent beneficial use

Despite the high usage by humans, the beaches do provide habitats for many species of seabirds. A breeding site for the California least tern is located at Venice Beach (CRWQCB, 1997).

The nearshore surfzone areas are sandy bottom and are popular swimming and surfing areas. Like most offshore zones of the Bay, the sea floor consists of soft-bottom habitat that supports a diverse number of organisms, including more than 100 species of demersal fish. It is also an area with significant recreational boat traffic (CRWQCB, 1997).

Evidence of Impairments

Health Risks Associated with Swimming

The beaches and surfzone in the Santa Monica-Venice area are probably the most heavily used recreational area in Santa Monica Bay. Yet the area has also developed a reputation for severe pollution as indicated by bacterial count measurements and special studies. Over the years, high indicator bacterial counts have been found in nearshore waters surrounding several storm drain outlets. Prior to diversion of low flows to Hyperion treatment plant in 1992, total coliform and enterococcus counts in surfzone near Pico-Kenter storm drain exceeded Ocean Plan objectives as high as 18 percent of times. As a result, warning signs advising people not to swim in the adjacent area were posted permanently. Warning signs were also posted near other area drains with low flows. In a study conducted by the SMBRP in 1992, enteric viruses were found in runoff samples collected at the Pico-Kenter storm drain (CRWQCB, 1997).

The strongest evidence of impairment is provided by the SMBRP epidemiological study conducted in summer 1995 as presented earlier. Ashland Avenue storm drain was one of the three study sites surveyed during the study. Besides finding that higher health risks are associated with swimming near flowing storm drains such as Ashland, the study also showed that bacterial indicator counts were higher near the Ashland storm drain than farther from it (CRWQCB, 1997).

Elevated Contaminant Levels and Toxicity

Data collected over the years have shown that contaminants have accumulated in marine organisms in the nearshore area of the watershed. Studies conducted by the SMBRP in 1993 found that dry-weather runoff from Ashland Avenue was toxic to marine organisms. Toxicity exhibited at this site in general was higher than the toxicity exhibited in Ballona Creek and other sites investigated during the study. Toxicity identification and evaluation indicated that the sources of toxicity likely resulted from heavy metals (CRWQCB, 1997).

In a SMBRP pilot study conducted in 1991, chemical analysis of low flow runoff samples from Kenter Canyon drain showed that mean concentrations of chromium, copper, lead and zinc exceeded Ocean Plan Water Quality objectives. The levels of PAHs were about 35 times the Ocean Plan objectives. Furthermore, in a two week episode, high concentration of chlordane were detected in the runoff (CRWQCB, 1997).

The storm drains in this area also carry trash and debris to the nearshore waters. This trash and debris, either washing back onto beaches, or deposited on the sea floor, create a nuisance and health hazard to beach goers, swimmers, and boaters, and pose danger to marine life. Significant hazardous material spills infrequently occur in the drainage areas and wash down to the ocean, caused beach closures and the posting of warning signs (CRWQCB, 1997).

Pollutants of Concern

The pollutants of concern identified for this subwatershed area include pathogens, heavy metals (Pb, Cu, Zn, Cd, Ag), debris, oil and grease, PAHs, and chlordane (CRWQCB, 1997).

Sources and Loadings

Pathogens

Besides Pico-Kenter and Ashland Avenue drains, high concentrations of bacterial indicators were also found in effluent from drains at Santa Monica, Thornton Avenue, and Brooks Avenue. The occurrence of pathogenic contamination of runoff and surfzone water as measured by bacterial indicator concentrations is highly episodic. Surfzone water is more likely be contaminated when a storm drain outlet discharges directly to the surfzone (CRWQCB, 1997).

Potential sources of pathogens to storm drains include illegal sewer connection and sewer dumping, sewer leak, domestic animals, food service business, and outdoor camping (CRWQCB, 1997).

Heavy Metals, TSS, PAHs, and Oil and Grease

The Pico-Kenter storm drain has the second (to Ballona Creek) largest drainage area in the southern urban area of the watershed. Due to its large size and urban land use, the Pico-Kenter drainage contributes significantly to total loadings of several pollutants to the Bay. The SMBRP in 1993 estimated that the drain is the third largest loading source among 28 catchment basins (second in the southern urban area) for lead, copper, zinc, total suspended solids, and oil and grease. Combined, the area contributes approximately 5% of heavy metals, 4% of total suspended solid, and 6% of oil and grease (CRWQCB, 1997).

The MS4 discharge apparently is the primary source of pollutant loading in this subwatershed. There are fourteen non-stormwater permitted discharges in the area; the majority are discharges of treated groundwater and are of small volume. There are ten discharges covered by the general industrial stormwater NPDES permit and nine (a mix of residential and commercial) covered by the general construction stormwater NPDES permit. On the other hand, transportation-related activities are identified as probably the most important source for heavy metals, PAHs, and oil and grease. The loading of these (heavy metals and PAHs) are likely result of deposition of auto fuel exhaust and auto part wear (tires, brake pad, etc.). Other potential sources of heavy metals are excessive fungicide and insecticide use (CRWQCB, 1997).

Chlordane

Since the use of chlordane has been restricted since 1988, the source of chlordane in runoff is believed to be from unauthorized usage and dumping of stocked chemicals (CRWQCB, 1997).

Trash and Debris

Littering and illegal dumping are the primary sources of trash and debris found in the Pico-Kenter Area. However, the amount of trash and debris collected (through street sweeping and annual cleanup of catch basins and storm drain channels) is unknown at this time (CRWQCB, 1997).

Water Quality Improvement Strategies

There is a general consensus among stakeholders that the greatest impact and need for improvement in this area is the acute health risks associated with swimming in runoff contaminated surfzone waters. Control of pathogen inputs in the nearshore water should be the priority for pollutant control measures planned in this area. Other pollutants of concern identified for this area should continue be monitored (CRWQCB, 1997).

Several alternatives for pathogenic contamination control have been investigated in this area. The outlet of the Pico-Kenter storm drain was first extended 600 yard beyond the surfzone in 1991 Then in 1992, the Pico-Kenter storm drain became the first drain in the watershed to have its low-flow temporarily diverted to a treatment plant (CRWQCB, 1997).

Planned as a long-term solution, the City of Santa Monica and City of Los Angeles partnered to construct a facility that uses ultraviolet light to treat the effluent of Pico-Kenter and Santa Monica Pier storm drains on site at the Santa Monica Urban Runoff Recycling Facility (SMURRF). The facility became active in 2001 and began diverting and treating 500,000 gallons per day to recycled water quality. Additionally, the City of Los Angeles and the District conducted a series of studies that evaluated the feasibility and cost-effectiveness of diverting other problematic storm drains in the area to the sanitary sewer. The City of Los Angeles is diverting runoff from eleven drains during the dry season to the Hyperion treatment facility. These drainage areas include eight within the City of Los Angeles: Temescal Canyon, Palisades Park, Santa Monica Canyon, Rose Avenue Drain, Thornton Avenue Drain, Venice Pavilion Drain, Imperial Avenue Drain, and the Bay Club Drain. The District has built three low-flow diversions: Ashland Avenue Drain, Brooks Avenue Drain, and Playa del Rey. This combined effort prevents seven million gallons a day of contaminated runoff from flowing untreated into Santa Monica Bay (City of Santa Monica website, SWRCB website #3).

Implement TMDLs

The TMDLs in effect which impact the Pico-Kenter area are the dry- and wet-weather bacteria TMDLs for Santa Monica Bay beaches and the Santa Monica Bay nearshore and offshore debris TMDL. For the purpose of implementing the bacteria TMDLs, the area has been divided up into "jurisdictional groups" (JG) – the Pico-Kenter area falls into JG3. Both Santa Monica and Venice Beaches are listed as impaired for indicator bacteria. Compliance measures include a number of activities that in combination would result in reducing the number of days in which water quality objectives are exceeded to less than or equal to that of the reference watershed (CRWQCB website #3).

The wet-weather bacteria TMDL stipulates a threshold number of exceedance days based on daily monitoring activities. The number of allowed exceedance days varies somewhat among the beaches but is no more than seventeen. The TMDL features a reference system/anti-degradation approach. The purpose of utilizing this approach is to ensure that bacteriological water quality is at least as good as that of a reference site and that no degradation of existing bacteriological water quality is permitted where existing bacteriological water quality is better than that of a reference site (CRWQCB website #3).

The dry-weather bacteria TMDL also stipulates compliance targets. The general implementation schedule includes two phases:

Phase I: Compliance during Summer Dry Weather. Within three years of the effective date of the TMDL, there may be no exceedances at any location during summer dry weather (April 1 to October 31). This compliance target may be achieved by employing a number of strategies, including diverting storm drain flows to treatment plants, eliminating illicit discharges, controlling sources of bacteria, or implementing "end-of-pipe" treatment. The District, City of Los Angeles and several other cities adjacent to Santa Monica Bay have been implementing aggressive summer, dry-weather storm drain diversion programs. All 27 priority storm drains have been diverted; additional diversions have been completed and others are planned (CRWQCB website #3).

Phase II: Compliance during Winter Dry Weather. Within six years of the effective date of this TMDL, compliance with the allowable number of exceedance days (varies by beach) during winter dry weather must be achieved (CRWQCB website #3).

A Coordinated Shoreline Monitoring Plan was developed by a Technical Steering Committee, co-chaired by the County and City of Los Angeles and consisting of representatives from many of the bacteria TMDLs' responsible agencies. In addition, other area stakeholders provided input. The plan is designed to comply with the monitoring requirements of both the dry- and wet-weather TMDLs (CRWQCB website #3).

<u>Santa Monica Bay Nearshore and Offshore Debris TMDL</u> The Santa Monica Bay Nearshore and Offshore Debris TMDL was adopted by the Regional Board in 2010 and requires that industries that manufacture, store, transport, or otherwise handle plastic pellets as raw material comply with a waste load allocation (WLA) of zero plastic pellets. The zero WLA for the plastic pellets requires that no plastic pellets are allowed to be released, found, or accumulated outside of the premises of the industries or in

any stormwater capture device that may be connected with the MS4. Various tasks are required to be completed within a certain time period after the effective date of the TMDL. Key tasks range from achieving 20% reduction of trash from the baseline WLA within four years from the effective date of the TMDL to achieving 100% reduction of trash from the baseline WLA within eight years of the effective date of the TMDL.

Implementation plans and other information for these TMDLs are available on the Regional Board website as follows:

Santa Monica Bay Beaches Dry Weather

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_9_2002-004_td.shtml

http://63.199.216.6/larwqcb_new/bpa/docs/2002-004/2002-004_RB_RSL.pdf

http://63.199.216.6/larwqcb_new/bpa/docs/2002-004/2002-004_RB_BPA.pdf

Santa Monica Bay Beaches Wet Weather

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_14_2002-022_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_39_2006-005_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_40_2006-006_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_41_2006-007_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_42_2006-008_td.shtml

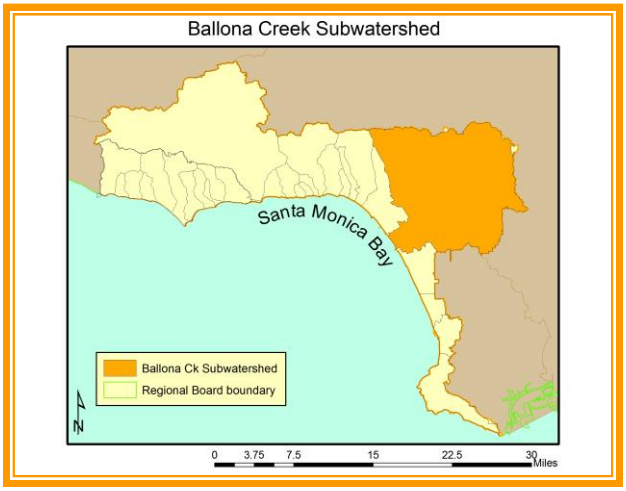
Low Flow Diversions/Treatment Facilities

An increasingly utilized approach to eliminating bacteria from storm drains at its source is the installation of low flow diversions. A low flow diversion is a structural device that routes urban runoff from canyons, streets and small watersheds away from the storm drain system or waterway, and redirects it into the sanitary sewer system or to a local treatment facility, where the contaminated runoff then receives treatment and filtration before being discharged into the ocean (City of LA website #2). Low flow diversions found within the Pico Kenter and adjacent area are show in the table below.

Table 11. Low flow diversions within the Pico-Kenter and adjacent areas

Low Flow Diversion	**Year Operational**	**Agency**
Ashland Avenue	2006	District
Electric Avenue Pump Plant	2001	District
Montana Avenue	2005	Santa Monica
Pico-Kenter	2001	Tri-agency
Rose Avenue	2005	District
Santa Monica Pier	2001	Santa Monica
Thornton Avenue	1999	City of LA
Venice Pavilion (Windward Ave Pump Station)	2003	City of LA
Wilshire Avenue	2005	Santa Monica

Ballona Creek



Ballona Creek, with its discharge point to Santa Monica Bay adjacent to the entrance of the Marina del Rey harbor, drains a watershed of about 127 square miles. It is the largest drainage tributary to Santa Monica Bay. The watershed boundary extends in the east from the crest of the Santa Monica Mountains southward and westward to the vicinity of central Los Angeles and thence to Baldwin Hills. Tributaries of Ballona Creek include Centinela Creek, Sepulveda Canyon Channel, Benedict Canyon Channel, and numerous other storm drains. Ballona Creek is concrete lined upstream of Centinela Boulevard. All of its tributaries are either concrete channels or covered culverts. The channel downstream of Centinela Boulevard is trapezoidal composed of grouted rip-rap side slopes and an earth bottom (CRWQCB, 1997).

Adjacent to the downstream channel of Ballona Creek are Marina del Rey small craft harbor, Ballona Lagoon and Venice Canals, Del Rey Lagoon, and Ballona Wetlands. Although they do not discharge directly into the Creek, they are grouped as waterbodies in this subwatershed because of their proximity and various forms of hydrological connections to the Ballona Creek (CRWQCB, 1997).

Flows

Ballona Creek conveys approximately 10 cfs of dry-weather base flow and up to 36,000 cfs of wet-weather flow (100-year storm event). The maximum wet-weather flow can be about 400 times the minimum dry-weather flow. This is suggestive of the dominant influence of stormwater runoff, which is typical of the stream flow pattern in Southern California (CRWQCB, 1997). The average annual runoff from Ballona Creek is 34 billion gallons per year; runoff from a 0.45 inch storm is 0.5 billion gallons based on an average rainfall of 14.95 inches per year (City of LA, 2009).

Land Uses

Ballona Creek collects runoff from several partially urbanized canyons on the south slopes of the Santa Monica Mountains as well as from intensely urbanized areas of West Los Angeles, Culver City, Beverly Hills, Hollywood, and parts of central Los Angeles. The urbanized area accounts for 80 percent of the watershed area; the partially developed foothill and mountains make up 20 percent. There are some areas of undeveloped land in the Santa Monica Mountains on the north side of the subwatershed, and a section along the east side of Ballona Creek near the Pacific Ocean. Some open space also remains in the Baldwin Hills area along with an oil field. All other areas are typically urbanized (CRWQCB, 1997).

Beneficial Uses

Beneficial uses are identified for this subwatershed in three areas: beneficial uses associated with the Ballona Creek channel, those associated with other waterbodies such as Marina del Rey, Ballona Wetlands and Lagoon, and those associated with ocean water influenced by discharges from the land. and are shown below (CRWQCB, 1994).

Table 12. Beneficial uses of the waters within the Ballona Creek subwatershed

Coastal Feature or Waterbody	Hydro Unit #	MUN	NAV	REC1	REC2	COM M	WAR M	EST	MAR	WIL D	RARE	MIG R	SPWN	SHELL	WE T
Marina Del Rey				E											
Harbor	405.13		E	E	E	E			E	E				E	
Public Beach Areas	405.13		E	E	E	E			E	E	E				
All other Areas	405.13		E	P	E	E			E	E	E			E	
Entrance Channel	405.13		E	E	E	E			E	E	E			E	
Ballona Creek Estuary	405.13		E	E	E	E		E	E	E	E	E	E	E	
Ballona Creek to Estuary	405.13	P		EL	E		P			P					
Ballona Creek	405.15	P			E		P			E					
Ballona Lagoon/Venice Canals	405.13		E	E	E	E		E	E	E	E	E	E	E	E
Ballona Wetlands	405.13			E	E			E		E	E	E	E		E
Del Rey Lagoon	405.13		E	E	E	E		E		E	E	E	E		E

E: Existing beneficial use
P: Potential beneficial use
I: Intermittent beneficial use
EL: Limited beneficial use

Marina del Rey/Ballona Creek Complex

Marina del Rey Harbor and the estuarine portion of Ballona Creek together provide many important beneficial uses. Marina del Rey is one of the largest small craft harbors in the world accommodating more than 6,000 private pleasure boats. Besides the recreational value provided, the Marina/Creek complex is an important habitat for many invertebrates, fish, bird, and mammal species (CRWQCB, 1997).

The benthic fauna in the area is typical of areas with shallow warm waters, a fine-grained, silty bottom and, in the marina, with limited circulation. The most common benthic species in the area are roundworms that account for about 30% of the total benthic population and found primarily in the channel entrance. Polychaetes are also common in the poorly-circulated inner marina. The fish population has limited diversity due to the less favorable physical and environmental conditions in the area. Certain seabirds are seasonally common in the area. The species found here are those that occur in sheltered waters of shallow depths (e.g., grebes and scoters), or generalist species (e.g., gulls). California sea lions and harbor seals are often seen on the breakwater and jetties (CRWQCB, 1997). Sampling during 2004 yielded 77,674 total fish of all age groups (including larvae and eggs) representing 56 different species. By far, the majority of these were eggs, larvae, and juveniles, which attests to the Harbor's continued value as a nursery ground (ABC Labs, 2005).

Several federally defined threatened, endangered, and candidate species may occur in the complex and adjacent beach areas. The species that are sensitive to environmental disturbances include the California least tern, California brown pelican, and western snowy plover (CRWQCB, 1997).

Ballona Wetland Complex

The Ballona Wetlands ecosystem represents one of the few remaining regionally significant coastal wetlands available in Santa Monica Bay. Within Los Angeles County, it is estimated that coastal wetlands have been reduced by 96% compared with pre-development conditions. The nearest comparable wetlands are Malibu and Mugu Lagoons to the north and Los Cerritos Wetlands to the south. The Ballona Wetlands play not only a crucial role in sustaining regionally limited habitats and species, but also an important role in providing opportunities for the public to experience these environments (SCC, 2006).

The project site is owned by the State of California, the California Department of Fish & Game (CDFG) owns 540 acres and the State Lands Commission (STC) owns 60 acres. The California Fish and Game Commission also recently designated the Ballona Wetlands as an Ecological Reserve. This designation covers the land owned by CDFG and part of the land owned by SLC. The designation provides additional protection for the natural resources of the site and specifies compatible public uses for the area (SCC, 2006).

In previous studies the site has been divided into three areas designated as Areas A, B, and C. In addition, the Freshwater Marsh lies within the project area (SCC, 2006).

<u>*Area A*</u> includes approximately 139 acres north of the Ballona Creek, west of Lincoln Boulevard and south of Fiji Way. Site elevations range between approximately 9 and 17 ft MSL, fill was placed on Area A during the excavations of Ballona Creek and Marina Del Rey. Area A is undeveloped with the exception of a parking area along the western boundary and a drainage channel along the northern boundary. In addition, the Gas Company currently maintains four monitoring well sites in the western end of this Area (SCC, 2006).

Area B, approximately 338 acres in size, lies south of Ballona Creek and west of Lincoln Boulevard. Area B extends south to Cabora Drive, a utility access road near the base of the Playa Del Rey Bluff. To the west, Area B extends into the dunes that border homes along Vista del Mar. Site elevations range between approximately 2 and 5 ft in the lower flat portions, and up to 50 ft MSL below the Del Rey Bluff. Area B contains the largest area of remnant unfilled wetlands with abandoned agricultural lands to the northeast, and the Freshwater Marsh to the southeast. The Gas Company has easements for oil wells, one of which is active, and supporting access routes in Area B (SCC, 2006).

Area C is north of the Ballona Creek and east of Lincoln Boulevard in the City of Los Angeles. The Harbor Freeway forms the sites northeastern border. The site is approximately 66 acres in size and is traversed in an east-west direction by Culver Boulevard. Area C contains fill from the construction of the Ballona Creek Flood Control Channel, and developments such as Marina del Rey, the Pacific Electric Railroad, the raising of Culver Boulevard and the Marina Freeway. Elevations within Area C range approximately between 4.5 and 25 ft MSL. Area C is mostly undeveloped with exception of ball fields and supporting minor structures (SCC, 2006).

The *Freshwater Marsh* is located west of Lincoln Blvd, south of Jefferson Boulevard adjacent to Area B in the City of Los Angeles. The Freshwater Marsh was constructed between 2001 and 2003 and treats urban runoff and stormwater from the Playa Vista development and from Jefferson Boulevard. It is operated and managed by the Ballona Wetlands Conservancy, a non-profit organization established for that purpose. A riparian corridor east of Lincoln Boulevard and outside of the project area is currently being constructed that will connect to the south end of the Freshwater Marsh (SCC, 2006).

CDFG owns the *Ballona Creek* through the project area. The channel is trapezoidal, with bottom widths varying from 80 to 200 feet and depths varying from 19 to 23 feet from the top of the levee. The side slopes are lined with concrete, paving stones and riprap; the channel bottom is not armored (SCC, 2006).

The Del Rey Lagoon/Ballona Wetlands is a mixture of habitats dominated by coastal salt marsh. Freshwater riparian habitat also exists along the foot of the bluff. The wetlands support hundreds of species of plants, insects, and animals. Common plant species include pickleweed, salt grass, frankenia, jaumea, saltbush, etc. in the salt marsh area and tale, cattail, willows, cottonwood, threesquare, umbrella sedge, etc. in the freshwater riparian area. Animal species across all major taxonomic groups are observed in the wetlands, including many special status species such as Belding's Savannah sparrow, salt marsh shrew, Dorothy's El Segundo dune weevil, and salt marsh skipper, etc. The wetlands also provide spawning ground for fish species such as California halibut (CRWQCB, 1997).

The 16-acre Ballona Lagoon is an artificially confined tidal channel that connects the Venice canal to the Pacific Ocean (CRWQCB, 1997).

Beaches

The adjacent beaches of the area include Venice Beach located upcoast and Dockweiler State Beach located downcoast. These beaches are often heavily used, especially on weekends and in summer months. Jetties along the channels are also regularly used by pedestrians and fishers (CRWQCB, 1997).

Nearshore and Offshore Areas

The nearshore and offshore zones near the discharge point of Ballona Creek are areas heavy in traffic for recreational boat activities because its vicinity to Marina del Rey. Like in most parts of the Bay, the sea floor is consisted of soft-bottom habitat that supports a diverse number of organisms, including more than 100 species of demersal fish (CRWQCB, 1997).

Evidence of Impairments

The Ballona Creek subwatershed is part of the Santa Monica Bay region that continues to experience significant development in response to demand for housing and business with coastal amenities. Two of many consequences associated with modern human inhabitation are natural habitat replacement/ destruction, and increased pollutant loading to waterbodies within the subwatershed (CRWQCB, 1997).

Habitat Degradation

At one time, the Ballona Wetland Complex was 2,100 acres of coastal estuary and wetlands. With the development of Marina del Rey, the Venice canals, and other residential and commercial properties, the draining of wetlands for agricultural use, oil drilling, and to control insects; and the channelization of Ballona Creek; the Wetland Complex has been reduced to approximately 430 acres (CRWQCB, 1997). The 2001 graduate thesis, "Seeking Streams", produced by a team of students in the Cal Poly Pomona Department of Landscape Architecture 606 Studio Program, documented the locations of the underground remnants of the stream system which once drained from the Santa Monica Mountains to the coastal wetlands (Braa, et al., 2001).

Most parts of the 260-acre Ballona Wetlands are degraded or severely degraded. After channelization of Ballona Creek, the wetland's only connection to the ocean is culverts with flap gates. However, these flap gates allow only limited amounts of sea water into the marsh. The tidal range rarely exceeds one meter. In Area A of the wetlands next to the Marina, there is no tidal exchange through the culvert to the Marina because bank height and elevation of the surrounding lands are above the tidal amplitude (CRWQCB, 1997).

The degraded wetlands support fewer species and is less productive. Many species characteristic of pristine salt marshes in the area are lacking. Additional adverse impacts include the introduction of non-native plants and animals, debris and bacteria from urban runoff, and recreational overuse (CRWQCB, 1997).

Elevated Contaminant Levels and Toxicity

Data collected over the years have shown that contaminants are accumulated in the estuarine area of the watershed both in sediments and in marine organisms (CRWQCB, 1997).

Studies conducted by the SMBRP in 1993 and 1995 found that both dry- and wet-weather runoff were toxic to marine organisms. Almost all samples collected from the main channel and two major tributaries exhibited toxicity using the sea urchin fertilization test until the runoff/storm waters were diluted 10 times. Tests conducted on sediment samples also exhibited toxic effects. Toxicity identification and evaluation indicated that the probable sources of toxicity varies. In one case the source was consistent with the presence of organic chemicals. On another occasion the source was consistent with the presence of toxic metals (CRWQCB, 1997).

Sediment samples have been collected in the harbor and analyzed for a number of pollutants for years by ABC Labs for the Los Angeles County Department of Beaches and Harbor; and prior to that, by USC Harbors Environmental Projects. Recently, more intensive characterization sampling has been conducted by Weston Solutions. The figures below show a small subset of the available data; namely, copper in the sediment in 1997 versus in 2007 when compared to sediment quality guidelines which serve as a simple general point of reference.

Figure 18

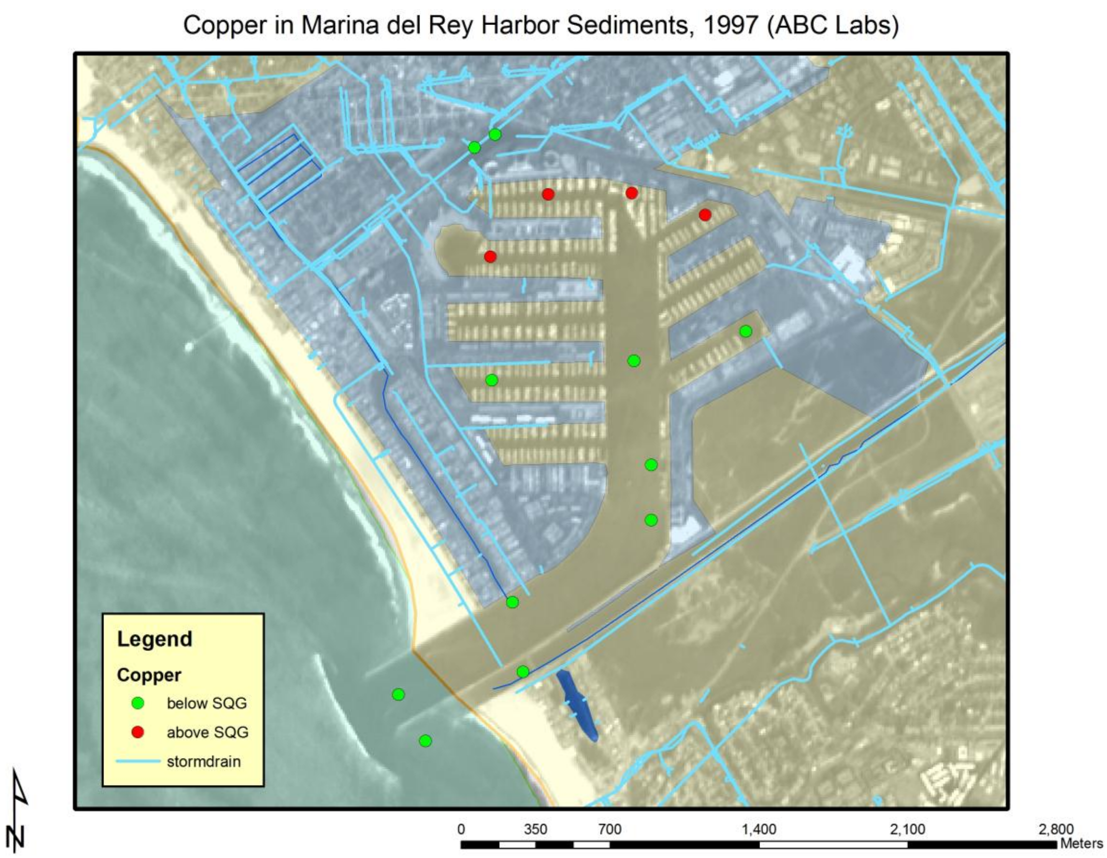
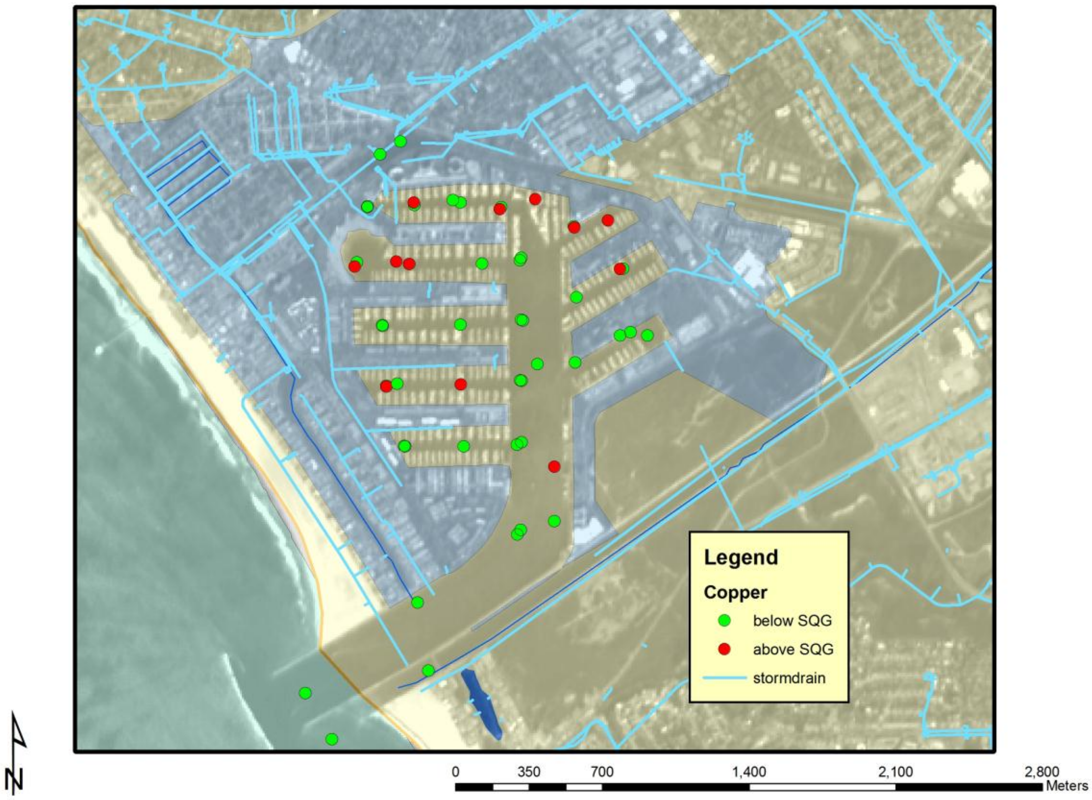


Figure 19

Copper in Marina del Rey Harbor Sediments, 2007 (Weston Solutions and ABC Labs)



Broadly speaking, at least with regards to copper, concentrations which may be of concern are mostly found in the back basins of the harbor.

Bacterial indicator levels measured at stations near Ballona Creek entrance frequently exceed levels prescribed in the Basin Plan. As a result, warning signs are posted permanently on each side of the Creek to advise people not to swim in the area. Over the years, beach areas were closed many times due to sewage spills and illegal dumping (CRWQCB, 1997).

Everyday, tons of trash and debris wash into the sea from Ballona Creek. When floating on the water surface, washed back onto beaches, or deposited on the sea floor, trash creates a nuisance and health hazard to beach goers, swimmers, and boaters, and pose dangers to marine life (CRWQCB, 1997).

The results of a study on watershed-based sources of contaminated sediments in San Pedro Bay-area harbors (in this case, the Ballona Creek Watershed as a source to Marina del Rey Harbor) conducted by SCCWRP and reported on in 2003, found typical modeled wet-weather annual loads to Marina del Rey from Ballona Creek range from 7 kg/year for cadmium to 381 kg/yr for lead, 1,081 kg/yr for copper, and

6,901 kg/year for zinc. Suspended solid loadings typically range from approximately 3,000 metric tons/year from Ballona Creek. General conclusions reached included that the majority of contaminants to the Harbor were deposited from Ballona Creek while industrial discharges represented a fraction of the total annual load. In some years, dry season loading may equal or exceed wet weather loading and constitute the majority of total annual load from the watershed. The magnitude of dry season flow translates to large dry season loading for several contaminants, such as copper, nickel, and zinc. Long-term trends in annual loading of metals appear consistent, while trends in annual loading of DDTs and PCBs appear to have declined. Annual loads of most metals are in the 103 – 105 kg/year range, with zinc and copper loading typically exceeding loads of other metals, most likely due to their relatively ubiquitous use and distribution. As a result, management strategies would need to account for typical annual variations of up to five orders of magnitude. Industrial and residential land uses contribute the greatest percent of annual contaminant loading (Stein, et al., 2003).

Another study conducted by SCCWRP and reported on in 1999 addressed the effect of stormwater and urban runoff discharge into Santa Monica Bay and found the following:

- Virtually every sample of Ballona Creek stormwater tested was toxic to sea urchin fertilization.
- The first storms of the year produced the most toxic stormwater in Santa Monica Bay during the study.
- The toxic portions of the stormwater plume were variable in size, extending from ¼ to 2 miles offshore of Ballona Creek.
- Surface water toxicity caused by unidentified sources was frequently encountered during dry weather in Santa Monica Bay.
- Zinc was the most important toxic constituent identified in stormwater. Copper and other unidentified constituents may also be responsible for some of the toxicity measured in Santa Monica Bay.
- The measured concentrations of zinc and copper in Ballona Creek stormwater were estimated to account for only 5 to 44 percent of the observed toxicity.
- Sediments offshore of Ballona Creek generally had higher concentrations of urban contaminants, including common stormwater constituents such as lead and zinc.
- Sediments offshore of Ballona Creek showed evidence of stormwater impacts over a large area (Bay, et al., 1999).

Pollutants of Concern

The pollutants of concern identified for this subwatershed include heavy metals (Pb, Cu, Zn, Cd, Ag), debris, pathogens, oil and grease, PAHs, and chlordane. Possible future hydrological modifications of existing infrastructure such as dredging, fill, damming, channelization, and other types of construction are also a major concern because of their potential for impairment of water quality and aquatic and marine habitats (CRWQCB, 1997).

Although not identified as pollutants of concern initially in the Bay Restoration Plan, DDTs and PCBs should continue be monitored in the runoff from this subwatershed. Traces of DDTs and PCBs are still detected in sediment samples collected near the mouth of the Creek, and higher concentrations are still present in mussel tissues in the area (CRWQCB, 1997).

Sources and Loadings

Ballona Creek

Early Mass Loading Studies Because of its large size and urban land use, Ballona Creek contributes significantly to total loadings of several pollutants to the Bay and to Marina del Rey Harbor. In 1993, the SMBRP estimated that Ballona Creek is the largest loading source among 28 catchment basins for lead, copper, zinc, total suspended solid, and oil and grease. A reconnaissance study performed by the Army Corps of Engineers in 1995 estimated that Ballona Creek yielded about 46,000 cubic yards of sandy material and about 5,300 cubic yards of silt annually (CRWQCB, 1997).

Sampling and analysis conducted during the 1995/96 wet season indicated that the metals (Ag, Cd, Cu, Cr, Ni, Pb, and, Zn) mass load contributed by the three main tributaries is proportional to their flow (Ballona main channel>Sepulveda channel>Centinela channel). However, the load from each channel was a significant contributor to the overall pollution load from this subwatershed (CRWQCB, 1997).

Current MS4 Monitoring The 2008-2009 mass emissions monitoring station on Ballona Creek is located at Sawtelle Blvd., above the area of tidal influence. Approximately, 89 square miles of land drains to this site; 40% of the area is used as single family high density residential, 12% is multi-family residential, 11% is vacant, 10% is retail/commercial, nearly 7% is mixed residential, 3.5% is light industrial, and 12% is designated as other uses. Despite this subwatershed's prevalence of impervious surfaces, Ballona Creek produced much more sediment per square mile compared to Malibu Creek, even though the two watersheds have comparable areas (LACDPW website).

Mass loading Not surprisingly, there are very large loading differences between results for wet- and dry-weather sampling events as well as between the various wet-weather events which can have very different rainfall amounts and patterns. For example, during 2008-2009, copper varied from a low of 1.24 lbs during one dry-weather sampling event to a high of 1,163.29 lbs during a wet-weather event. Within the dry-weather sampling events, copper loads ranged up to 11.52 lbs. Other metals followed a similar pattern with zinc loading ranging from a low of 2.53 lbs during dry-weather to a high of 4385.44 lbs during a wet-weather sampling event (LACDPW website).

Toxicity testing Two dry-weather toxicity sampling events during 2008-2009 resulted in no acute or chronic toxicity to a freshwater organism (*Ceriodaphnia*); a toxic effect was seen with the chronic sea urchin fertilization test. Similar results were found during the two wet-weather sampling events. 42

Chemical/bacteriological testing During the three dry-weather sampling events, fecal coliform bacteria did not attain the applicable water quality objective (400 mpn/100 ml) two out of three times sampled during dry weather (LACDPW website).

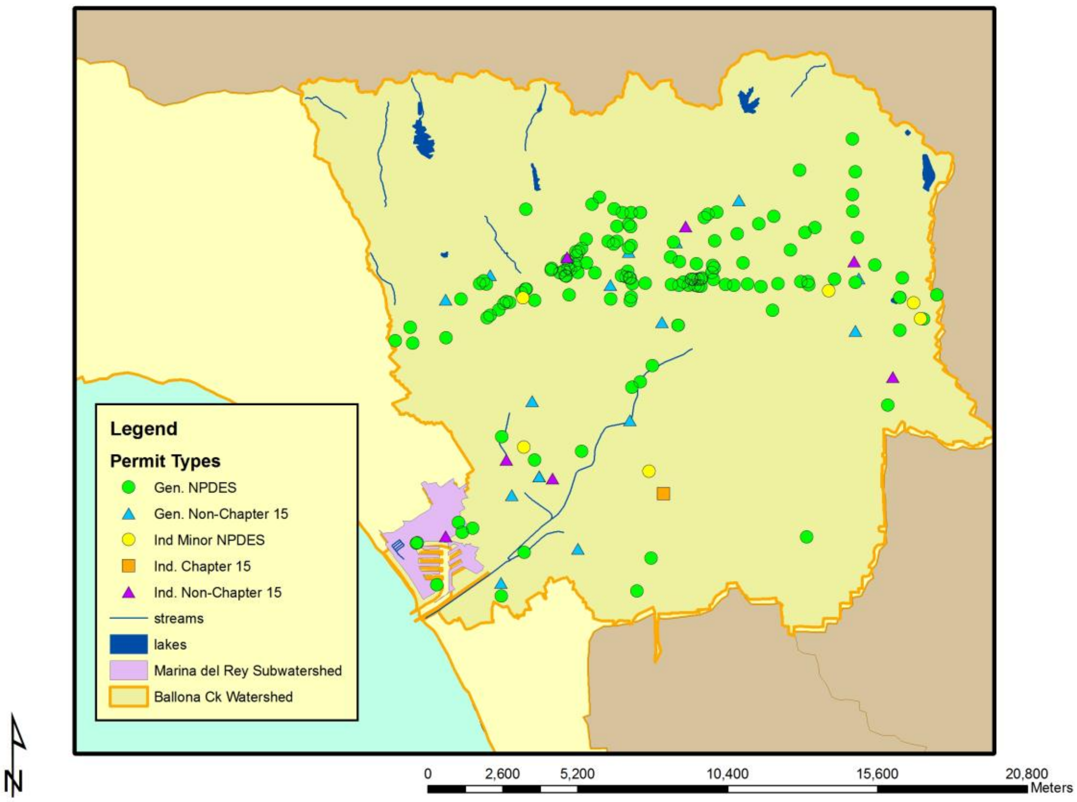
During the five wet-weather sampling events, two constituents were at excessive concentrations for most or all of the events: fecal coliform and zinc. Fecal coliform bacteria did not attain the applicable water quality objective five out of five times sampled during wet weather in Ballona Creek which is subject to the wet weather suspension of the REC-1 beneficial use during high flow periods. Dissolved copper did not attain the hardness-based water quality objective during wet weather at Ballona Creek for three of the five events measured. Dissolved copper concentrations were fairly consistent but the hardness at Ballona Creek was quite variable. Dissolved zinc did not attain the hardness-based water quality objective during one of the five wet-weather sampling events (LACDPW website).

Dry Weather Metals and Bacteria Loading Distribution into Ballona Creek A study conducted by SCCWRP and reported on in 2004 characterized the spatial distribution of sources of dry weather metals and bacteria loading to Ballona Creek. Metals concentrations in Ballona Creek were below chronic criteria under the California Toxics Rule between 96% and 100% of the in-river samples. In contrast, bacteria concentrations at the majority of storm drains and in-river sites were consistently above AB411 water quality standards. In general, Ballona Creek exhibits a bimodal distribution of elevated metals and bacteria, with the highest levels occurring between km 3 and 6, immediately upstream of the tidal portion of the creek and between km 9 and 12, below the portion of the watershed where Ballona Creek daylights from an underground storm drain to an exposed channel. These two portions of Ballona Creek correspond to locations where storm drains with consistently high concentrations and loads discharge to the creek. Of the 40 drains sampled, four account for 85% of the daily storm drain volume. Between 91% and 93% of the total daily load for metals is contributed by eight drains. Nine drains consistently have the highest concentrations of metals and bacteria. Metals concentrations may vary by 5-fold and bacteria concentrations may vary by up to five orders of magnitude on an intra- and inter-annual basis. The authors report that despite this variability, managing a relatively small number of storm drain inputs has the potential to result in substantial improvement in water quality in Ballona Creek (Stein and Tiefenthale, 2004).

Permitted Discharges There are 170 permitted non-stormwater discharges in the Ballona Creek Watershed; six are into the Marina del Rey Subwatershed. The majority of these permitted discharges are ground water seepage drained for construction site preparation and treated contaminated groundwater. Some are discharges of cooling water. These permitted discharges of non-stormwater into the storm drains have a combined discharge that is about 8% of the discharges from stormwater runoff (CRWQCB, 1997).

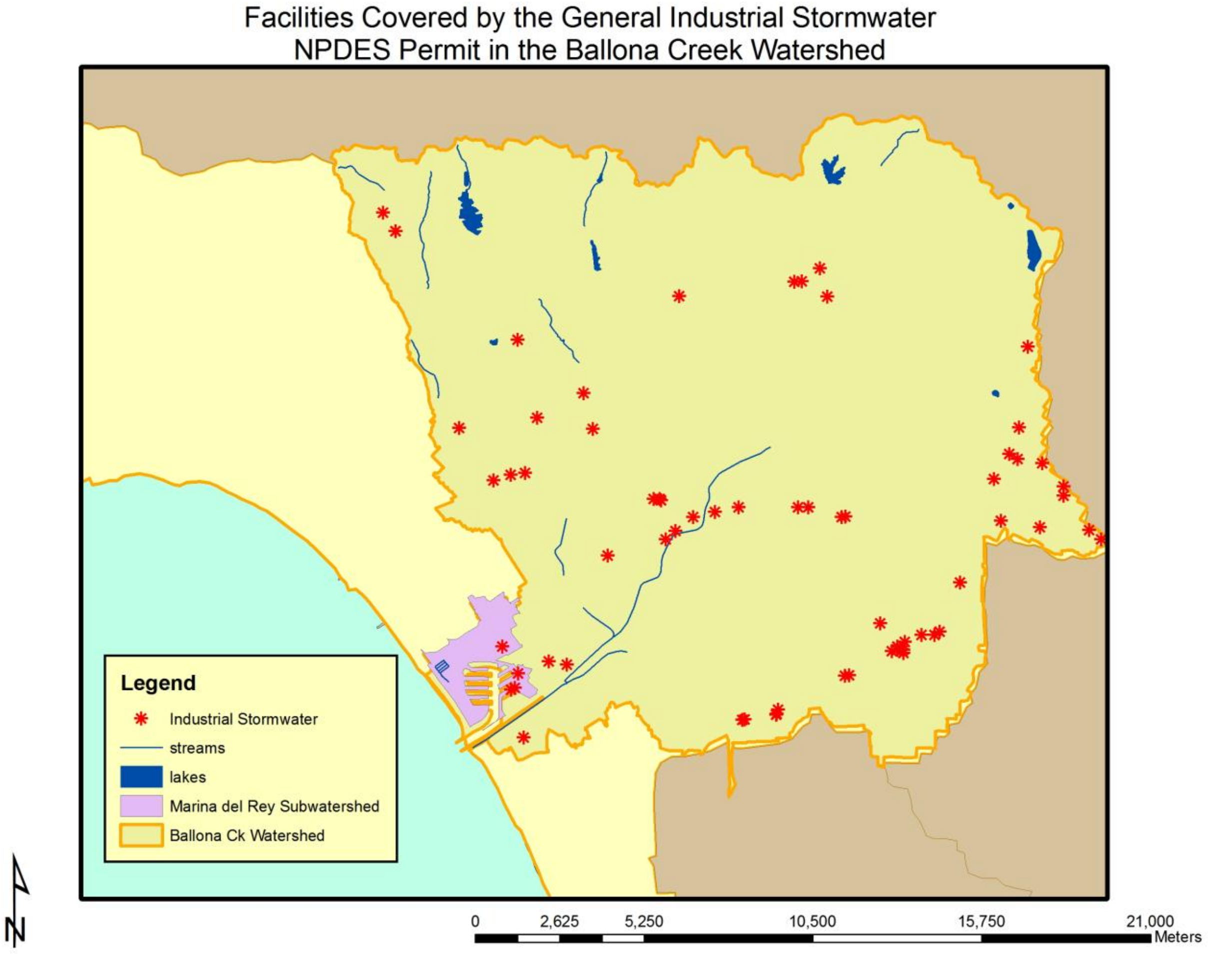
Figure 20

Non-Stormwater NPDES Discharger Locations in the Ballona Creek Watershed



There are 66 facilities covered by the general industrial stormwater NPDES permit. Electric, gas and sanitary services; local and interurban passenger transit; and fabricated metal products are a large component of these businesses based on their Standard Industrial Classification (SIC) code. There are approximately 70 facilities covered by the general construction stormwater NPDES permit in the Ballona Creek Watershed (CRWQCB, 2007).

Figure 21



Transportation-Related Sources There are many potential sources for pollutants of concern in this region. Among them, transportation-related activities are identified as probably the most important source for heavy metals, PAHs, and oil and grease. Monitoring of highway runoff conducted by California Department of Transportation has shown high concentrations of copper, lead, and zinc. The loading of these (heavy metals and PAHs) likely are resulting from deposition of auto fuel exhaust, an auto part wear (tires, brake pad, etc.). Other potential sources of heavy metals are fungicide and insecticide use. In addition, natural oil seeps, which are far more abundant in this region than other parts of Santa Monica Bay, may be an important contributor of oil and grease loading to Ballona Creek (CRWQCB, 1997).

Sources of Trash and Debris Littering and illegal dumping are major sources of trash and debris found in Ballona Creek. Los Angeles County Department of Beaches and Harbors collects tons of trash on adjacent beaches after major rain storm each year. Most of the trash collected by the Department are materials carried downstream by the Creek and then washed on shore by tidal action. Since 1994, the District installed a trash net near the mouth of the Ballona Creek (CRWQCB, 1997). The amount of trash collected during each month of 2002, ranged from practically zero during dry-weather months to about 95 tons during wet periods (LACDPW, 2004). Another major source of specifically plastic debris are industries that manufacture, store, process, and otherwise handle plastic pellets as raw material which is being addressed through the Santa Monica Bay Nearshore and Offshore Debris TMDL (CRWQCB website #3).

Sources of Pathogens Potential sources of pathogens to the Creek also include illegal sewer connections and sewage dumping, domestic animals, and the transient population. A study is being undertaken by the City of Los Angeles to evaluate the effects of street washing on loading of pathogenic materials into the storm drain system (CRWQCB, 1997).

Sewer leaks occurred in the past at various locations within the watershed, especially in areas where sewer lines are in parallel to the storm drain system. There were several incidences of sewer overflows during winter storms each year. In response, the City of Los Angeles has been replacing old sewer lines (CRWQCB, 1997).

Marina del Rey Harbor

There are four drainages that are located around and drain directly into Marina del Rey Harbor. Although these drainage areas constitute only about 1% of the total drainage area of Ballona Creek subwatershed, two of the drainages, Oxford Basin and Washington Drain, are significantly more industrialized than the Ballona Creek average, and thus are potentially significant sources of industrial contaminants such as heavy metals. Also, the area with surface drainage to Marina del Rey Harbor area has a high percentage of commercial use and thus is a potentially significant source for contaminants such as oil and grease in the harbor (CRWQCB, 1997). Finally, the five NPDES-permitted non-stormwater discharges to the harbor are covered by a general permit for discharges of groundwater from construction dewatering to surface waters; there is also an individual non-Chapter 15 waste discharge requirements for discharge to the ground (CRWQCB website #1).

Contaminants due to nonpoint sources from marine activities in the harbor include primarily lead, copper, zinc, PAHs, TBT and bacteria. Compared with contaminant loading in Ballona Creek, lead releases due to marine activities are essentially negligible but zinc releases may be higher. This estimate is based on the assumption that the extent of zinc anode use has remained essentially the same over the last decades. The use of TBT as an antifouling agent in vessel paints has been restricted since 1987. Monitoring data has indicated a decline in TBT concentration in sediment in the harbor (CRWQCB, 1997).

Water Quality Improvement Strategies

In accordance with the problems identified previously, greatest benefits could be achieved should water quality improvement efforts be focused on the following:

- Protect and restore remaining wetland and riparian habitats in the region.
- Prevent and reduce mass loading of pollutants that accumulate in sediments of the Creek and near shore sea floor and that are toxic and/or bioaccumulate in marine organisms.
- Prevent and reduce loading of pollutants that may deplete the recreational value of nearby beaches and nearshore water by either imposing health risk or aesthetic nuisance (CRWQCB, 1997).
- Implement TMDLs.

Protect and Restore Wetlands and Riparian Habitats

Restoration of the Ballona Wetlands Complex Acquisition of parcels within the Ballona Wetlands Complex is a completed project of the Wetlands Recovery Project (SCWRP website #2). The project site is now owned by the State of California; the California Department of Fish & Game (CDFG) owns 540 acres and the State Lands Commission (SLC) owns 60 acres. The California Fish and Game Commission also recently designated the Ballona Wetlands as an Ecological Reserve. This designation covers the land owned by CDFG and part of the land owned by SLC. The designation provides additional protection for the natural resources of the site and specifies compatible public uses for the area. A wetlands restoration plan is currently being developed for the area. More information may be found at http://www.balloanrestoration.org (SCC, 2006).

Coordinating with Ballona Wetlands restoration planning, an Army Corps-funded Ecosystem Restoration Feasibility Study is also underway. The goal of the study is to restore, enhance, and create estuarine and riparian habitat and function in the Ballona wetlands and creek and enhance endangered species habitat. Sub-goals include, 1) provide an optimal mix of coastal dependant wetland habitats in terms of ecological integrity, function, diversity, and productivity; 2) restore riparian and aquatic habitat and contribute to the regional habitat connectivity and corridors, and to future restoration activities; and 3) contribute to regional wildlife, and recreation linkages and corridors (USACE website).

Ballona Lagoon was the site of a major restoration in 1997. Activities included: dredging at the southern end of the lagoon to create a deep water pool, removal of inactive oil pipelines and an abandoned concrete structure from the middle of the lagoon, stabilizing the lagoon banks with native vegetation, and constructing a visitor's overlook (SMBRC website).

Related Studies and Plans The State Coastal Conservancy, through the Santa Monica Bay Restoration Foundation, has funded a number of studies which will aid in overall watershed/wetlands restoration. They include:

1) The Historical Ecology of the Ballona Creek Watershed - The purpose of this study is to understand the unique watershed characteristics that shape the current system and that can guide appropriate restoration work. This project requires extensive historical research as well as GIS mapping work and will result in a publication that illustrates the geologic, hydrologic and human development of Ballona Creek watershed. As was done for the San Gabriel watershed, it will identify historical reference points in the watershed, as well as factors that influence landscape change, including land use, climate, floods and fires. It will help define restoration and management options for various locations and purposes throughout the watershed (SCC website).

2) Water Budget for the Ballona Creek Watershed - This study will identify inputs and outputs for the watershed including mapping natural springs and identifying natural flows in storm drains and stream channels. The information will help guide restoration planning to maximize water quality and habitat improvement benefits. The study will help inform decisions about where to place water treatment facilities and other BMPs, to ensure greatest benefit from treating stormwater rather than treating the cleaner, natural flows, which will ultimately contribute to more efficiently and cost-effectively meeting TMDL requirements in the watershed (SCC website).

3) Ballona Greenway Plan - This project will complete the Ballona Greenway Plan. The Greenway Plan was initiated by the Ballona Watershed Task Force and preliminary design work has been done. The outcome of this project will be final designs for portions of the Greenway including landscape guidelines for a Ballona-specific plant palette. This project has proceeded in close consultation with the MRCA and Baldwin Hills Conservancy on their pocket park and bike path beautification plans (SCC website).

Restoration of Stone Canyon Creek Funding from the Coastal Conservancy has been granted to the Santa Monica Baykeeper, in cooperation with other entities, to restore a stretch of Stone Canyon Creek on the UCLA campus. Out of the estimated 419 acres of campus, less than 12 acres remain of natural native habitat. The creek banks are filled with invasive vegetation and are suffering from erosion despite artificial shoring efforts (SCC website).

This site was part of previous small-scale year restoration effort funded by the Southern California Wetland Recovery Project's small grants program. That effort removed non-native vegetation from 0.36 acres of the site. The current project will build upon that work by conducting continued weeding of invasive vegetation, maintenance of existing plants, planting of new native vegetation, and the replacement of 8 exotic trees with native trees. The project will expand the restoration effort to approximately 0.25 additional acres of area along Stone Canyon Creek making the total area restored along the creek approximately 0.60 acres (SCC website).

Recommendations for Daylighting Streams The 2001 Cal Poly Pomona graduate thesis, "Seeking Streams", provided a framework for daylighting streams within the upper Ballona Creek subwatershed through providing general design guidelines for re-creating streams in an urban setting and more detailed designs for Sacatela Creek and flows through Lafayette Park (Braa, et al., 2001).

Strategies for Reducing Mass Loading of Heavy Metals, PAHs, and Chlordane

Many storm water control BMPs have been implemented in this subwatershed, primarily under the municipal stormwater NPDES program. Most of the BMPs implemented to date are general pollution prevention measures such as public education, street sweeping, and household hazardous waste collection. Additionally, source-specific BMPs have been developed and are being implemented to address these pollutants of concern more effectively (CRWQCB, 1997).

<u>Ballona Creek Watershed Management Plan</u> The Los Angeles County Department of Public Works was awarded a Proposition 13 Watershed Protection Grant by the State Water Resources Control Board to prepare a watershed plan for Ballona Creek. The Ballona Creek Watershed Task Force met for about a year during Plan development and the final Plan was released in 2004. The overarching goal of the Plan was to "Set forth pollution control and habitat restoration actions to achieve ecological health." The Plan includes an extensive list of priority actions, best management practices, and potential demonstration projects to achieve that goal including those specifically related to improving water quality. Some of these activities have been accomplished including the development of a GIS-based comprehensive storm drain map for the county (LACDPW, 2004).

<u>Ballona Creek Watershed Stormwater BMP Implementation Program</u> The Ballona Creek Watershed Stormwater BMP Planning and Implementation Strategy was funded with Proposition 12 funds granted to the City of Los Angeles by the Coastal Conservancy in 2003 and was completed in September 2005. This study identified and prioritized locations within the Ballona Creek watershed, identified and selected specific BMPs for those locations and developed a strategic implementation plan. The study involved numerous watershed stakeholders and resulted in a short list of preferred BMP projects in the watershed. From that list, the Rain Barrels Pilot Project (Downspout Retrofit Program) was selected for implementation. The goal of this project is to significantly reduce the amount of precipitation that becomes runoff from the targeted residential areas (Jefferson, Sawtelle, and Mar Vista areas). This will be accomplished by implementing a Downspouts Disconnection Program, on private properties, to reroute roof runoff from the stormwater collection system to on-site pervious areas, infiltration planters, and/or rain barrels. This pilot program will help improve water quality and manage floods, especially in areas with limited storm drain capacity. The project is expected to control the runoff from 600 out of the 1,600 properties within the two targeted areas. Based on that and based on typical level of imperviousness associated for each land use, the estimated annual average volume that will be eliminated from discharging into Ballona Creek is 1,130,000 cubic feet. Downspouts in the targeted areas were retrofitted during summer 2009 with funding from the SMBRC. Up to 100 on-site treatment BMPs (bioretention/filtration planter boxes/rain barrels) were also proposed to be installed. Subsequent to the implementation of this program, its success will be assessed, and runoff reduction and water quality impacts will be quantified. This pilot program, if successful, will have broader application within the Santa Monica Bay region, especially on areas with limited storm drain capacity and flood-prone locations (City of LA website #1).

Critical Coastal Area Designations California's Nonpoint Source (NPS) Pollution Control Program includes requirements for Critical Coastal Area (CCA) designation. The intent of CCA designation is to direct needed attention to coastal areas of special biological, social, and environmental significance and to provide an impetus for these areas to receive special support and resources. These areas include Environmentally Sensitive Habitat Areas (ESHAs) currently designated in California's Coastal Zone Management (CZM) program, as well as areas adjacent to Areas of Special Biological Significance (ASBS), California's National Estuarine Research Reserves (NERRs), National Estuary Program (NEP), and National Marine Sanctuaries. A long-term goal for the NPS program is to improve water quality by implementing the management measures identified in the California Management Measures for Polluted Runoff Report (CAMMPR) by 2013. The short-term plan to achieve this goal is to identify, educate, and promote stakeholder involvement. The State's 2002 CCA Draft Strategic Plan identifies 101 CCAs statewide of which 13 are in the Los Angeles Region (CRWQCB, 2007).

Ballona Creek is identified as CCA #68 in the Draft Strategic Plan; it is an impaired water body that flows into a Marine Protected Area. The major efforts listed to implement NPS management measures include: work by the Ballona Wetlands Foundation to preserve and protect the Ballona Wetlands ecosystem through research, educational programs and activities; activities at the Friends of Ballona Wetlands Education/Ecology Center; construction of the Ballona Creek Stormwater Trash Capture System; work undertaken by the nonprofit Ballona Creek Renaissance; implementation of the Santa Monica Bay Restoration Plan; posting of creek pollution warning signs; a metals source study; various TMDLs; implementation of the Ballona Creek Watershed Management Plan; and use of Clean Beaches Initiative funds to implement the Santa Monica Bay Restoration Plan (CRWQCB, 2007).

Water Quality Compliance Master Plan for Urban Runoff In 2007, the City of Los Angeles' Energy and the Environment/AdHoc River Committee directed the City's Bureau of Sanitation to create a Water Quality Compliance Master Plan for Urban Runoff (WQCMPUR). It was intended this plan would outline the City's strategy in achieving Clean Water Act standards as well as compliance with all urban runoff regulations and mandates (City of LA, 2009b).

The plan was asked to address how the City will incorporate public input and follow the principles:

- Identify all pollutants of concern in the City by type and location, including watershed or water body;
- Prioritize polluted areas within the City and create a compliance timetable;
- Identify existing efforts to reduce pollutants of concern and comply with all state and federal regulations;
- Identify strategies — such as on-site retention/infiltration, structural best management practices, regional multi-use benefit projects (including the identification of potential sites for such projects), and non-structural educational and regulatory measures (including ordinance changes to encourage on-site infiltration) for the City to meet Clean Water Act standards by pollutant and by water body or watershed;
- Provide a technical nexus between the strategies and water quality standards attainment and demonstrate that strategy implementation will result in standards compliance;

- Identify water quality data gaps including those that need to be filled in order to determine if the City is in full compliance with water quality requirements in the Los Angeles County stormwater permit and applicable TMDLs; and
- Identify estimated costs and sources of financial support including, but not limited to state and local bonds, stormwater pollution abatement funds, County flood control fees, and sewer service charges.

The plan was intended to integrate existing efforts already underway such as the Integrated Resources Plan, Integrated Regional Water Management Plan, and other relevant watershed management plans, and developed in partnership with stakeholders from the public, environment groups, and regulators including the Los Angeles Regional Water Quality Control Board and local municipalities (City of LA, 2009).

The plan was finalized in 2009. Its strategy is to build on ongoing successful initiatives and programs, identify common grounds (for benefits and funding), and seek new initiatives that will address complex problems. This approach will also promote water conservation and factor in objectives identified by other plans, including increased recreation opportunities and support for the greening of Los Angeles. The plan's implementation strategy is divided into three initiatives:

Water Quality Management Initiative - Describes how Water Quality Management Plans for each of the City's four watersheds and TMDL-specific Implementation Plans will be developed to ensure compliance with water quality regulations. Using the guidelines of the WQCMPUR, these Water Quality Management Plans and TMDL Implementation Plans will:

- Identify BMPs for implementation that will result in compliance with water quality regulations by using design storm and BMP performance criteria;
- Select and prioritize the BMPs for implementation in the watersheds, focusing on the BMPs outlined in the Citywide Collaboration and the Outreach Initiatives;
- Coordinate with ongoing watershed management activities where common goals exist;
- Support the urban runoff management goals of the Water IRP;
- Establish a quantitative nexus between the BMPs selected for implementation and water quality standards attainment;
- Establish metrics to measure success.

Citywide Collaboration Initiative – Recognizes that urban runoff management is closely linked with urban development and redevelopment, requiring:

- Citywide collaboration and coordination of urban runoff management;
- City policies and guidelines for urban development and redevelopment that focus on using green solutions to manage urban runoff; and
- Strategies to promote Low Impact Development (LID) and stormwater use.

Outreach Initiative – Promotes public education and community engagement with a focus on preventing urban runoff pollution and will:

- Enhance outreach activities to reach appropriate target audiences;
- Establish methods to quantify water quality benefits achieved through outreach activities; and

promote community engagement in all of the City's urban runoff management activities (City of LA, 2009).

Strategies for Reducing Trash Load and Incidence of Pathogen Contamination

Initially a trash net installed by the Los Angeles County Department of Public Works in Ballona Creek proved effective in stopping trash from entering the ocean during dry weather. However, dry-weather trash load only counts for a small portion of the annual total. Preventing trash loads during wet-weather storms must rely on thorough cleanup of the storm drain channel, the catch basins, and ultimately the streets that drain to the creek (CRWQCB, 1997).

The Ballona Creek Trash TMDL was adopted by the Regional Board in 2002 and, per the TMDL, a trash baseline load was determined in 2004. The County also monitored results obtained with Automatic Retractable Screen partial-capture devices. Eventually, in 2007 after extensive testing, a full-capture device, the connector pipe screen, was certified by the Regional Board as a full-capture device. At that point, the County changed its implementation strategy from partial capture with trash monitoring to installation of full-capture devices. A full-capture device requires no monitoring since it has been certified to trap all particles retained by a 5-millimeter mesh screen and has a design treatment capacity of no less than the peak-flow rate resulting from a one-year, one-hour storm. The County is installing full-capture systems in all Ballona Creek Watershed County-unincorporated areas. Therefore, no additional baseline and compliance monitoring is necessary. The first phase of the Full-Capture Project included retrofitting 225 of the 310 catch basins within the Ballona Creek Subwatershed with full-capture devices, yielding a 78.41 percent reduction of the trash baseline. This phase of the project was completed on December 12, 2008. The TMDL requires a 50 percent reduction of the trash baseline by September 30, 2009 (Implementation Year 6). Incorporated areas subject to the trash TMDL include the cities of Los Angeles, West Hollywood, Culver City, Santa Monica, and Beverly Hills (LACDPW website).

In 2007, the City of Los Angeles also obtained Regional Board certification for two full-capture devices, horizontal screen inserts and vertical trash capture screen inserts (City of LA website #1).

The City of West Hollywood continues to implement BMPs such as enhanced street sweeping, hand pick-up of litter, daily pickup from streetside trash containers, the addition of streetside recycling containers, and retrofit of catch basins with trash excluders. The City of Beverly Hills has similar BMPs it continues to implement with public education instead of hand pickup being the fourth BMP (LACDPW website).

The Santa Monica Bay Nearshore and Offshore Debris TMDL was adopted by the Regional Board in 2010 and requires that industries that manufacture, store, transport, or otherwise handle plastic pellets as raw material comply with a waste load allocation (WLA) of zero plastic pellets. The zero WLA for the plastic pellets requires that no plastic pellets are allowed to be released, found, or accumulated outside of the premises of the industries or in any stormwater capture device that may be connected with the MS4. WLAs for plastic pellets are assigned to permittees of the Industrial Storm Water General Permit within the Santa Monica Bay WMA that have Standard Industry Classification (SIC) codes associated with industrial activities involving plastic pellets which may include, but are not limited to, 282X, 305X, 308X, 39XX, 25XX, 3261, 3357, 373X, and 2893. Additionally, industrial facilities with the term "plastic" in the facility or operator name, regardless of the SIC code, may be subject to the WLA for plastic pellets. Other industrial permittees within the Santa Monica Bay WMA that fall within the above categories, but are regulated through other general permits and/or individual industrial storm water permits are also required to comply with the WLA for plastic pellets.

Industries must comply with the Statewide Industrial Permit or other general or individual industrial permits, which require a Stormwater Pollution Prevention Plan (SWPPP) to be prepared and kept onsite at all times. The SWPPP addresses the areas where pellets tend to spill, as well as an overall plan to keep plastic pellets from being released off of the premises. The SWPPP incorporates structural and nonstructural BMPs that are implemented to keep pellets on site, including specific practices that are used to clean up incidental or large spills. Jurisdictions and agencies identified as responsible jurisdictions for point sources of trash in the Santa Monica Bay debris TMDL and in the Ballona Creek trash TMDLs shall either prepare a Plastic Pellet Monitoring and Reporting Plan (PMRP), or demonstrate that a PMRP is not required under certain circumstances. The PMRP serves to monitor the amount of plastic pellets being discharged from the MS4, establishes triggers for a possible need to increase industrial facility inspections and enforcement of SWPPP requirements for industrial facilities identified as responsible for the plastic pellet WLA, and addresess possible plastic pellet spills.

Given the ample size of the Creek and its flow, dry-weather diversion of its flow does not seem to be as feasible as it has been planned for many other storm drains for remediating the pathogen input problem. Therefore, in order to reduce the pathogen input from the creek, public agencies must explore upstream options such as a better surveillance system, an effective sanitary survey tool, and an expanded public education campaign (CRWQCB, 1997).

Here, again, many actions and practices described in the Ballona Creek Watershed Management Plan if implemented would serve to reduce trash loading and the incidence of pathogen contamination (LACDPW, 2004).

Implement TMDLs

<u>Ballona Creek Trash TMDL</u> The Regional Board adopted the Ballona Creek Trash TMDL in 2002. The implementation schedule requires a 10 percent progressive reduction of the trash baseline load each year starting two years (2004) after the establishment of the TMDL until the numeric target of zero trash is achieved (2015) (CRWQCB website #3).

<u>Santa Monica Bay Beaches Wet- and Dry-Weather Bacteria TMDLs</u> For the purpose of implementing those TMDLs, the area has been divided up into “jurisdictional groups” (JG) – the Ballona Creek area falls into JG8. Compliance measures include a number of activities that in combination would result in reducing the number of days in which water quality objectives are exceeded to less than or equal to that of the reference watershed (CRWQCB website #3).

The wet-weather TMDL stipulates a threshold number of exceedance days based on daily monitoring activities. The number of allowed exceedance days varies somewhat among the beaches but is no more than seventeen. The TMDL features a reference system/anti-degradation approach. The purpose of utilizing this approach is to ensure that bacteriological water quality is at least as good as that of a reference site and that no degradation of existing bacteriological water quality is permitted where existing bacteriological water quality is better than that of a reference site (CRWQCB website #3).

The dry-weather TMDL also stipulates compliance targets. The general implementation schedule includes two phases:

Phase I: Compliance during Summer Dry Weather. Within three years of the effective date of the TMDL, there may be no exceedances at any location during summer dry weather (April 1 to October 31). This compliance target may be achieved by employing a number of strategies, including diverting storm drain flows to treatment plants, eliminating illicit discharges, controlling sources of bacteria, or implementing "end-of-pipe" treatment. The District, City of Los Angeles and several other cities adjacent to Santa Monica Bay have been implementing aggressive summer, dry-weather storm drain diversion programs. All 27 priority storm drains have been diverted; additional diversions have been completed and others are planned (CRWQCB website #3).

Phase II: Compliance during Winter Dry Weather. Within six years of the effective date of this TMDL, compliance with the allowable number of exceedance days (varies by beach) during winter dry weather must be achieved (CRWQCB website #3).

A Coordinated Shoreline Monitoring Plan was developed by a Technical Steering Committee, co-chaired by the County and City of Los Angeles and consisting of representatives from many of the TMDLs' responsible agencies. In addition, other area stakeholders provided input. The plan is designed to comply with the monitoring requirements of both the dry- and wet-weather TMDLs (CRWQCB website #3).

<u>Ballona Creek Bacteria TMDL</u> The TMDL has multi-part numeric targets for wet-weather and winter dry-weather based on the updated bacteria objectives for marine and fresh waters designated for contact recreation (REC-1), and fresh waters with Limited REC-1 and REC-2 beneficial use designations. However, in all cases, there are zero summer dry-weather exceedance days allowed. Ballona Creek is subject to the high flow suspension of recreational beneficial uses for engineered channels during and immediately following large wet-weather events. The bacteria water quality objectives do not apply during these periods. Historical rainfall data for the watershed indicate a median value of 16 days per year during which the suspension of the recreational beneficial uses would apply. The "natural sources exclusion" approach may be used if an appropriate reference system cannot be identified due unique characteristics of the target water body. Del Rey Lagoon and the Ballona Wetlands are connected to Ballona Estuary via connecting tide gates. Preliminary data suggest that Ballona Wetlands is a sink for bacteria from Ballona Creek and it is therefore not considered a source in this TMDL. Inputs to Ballona Estuary from Del Rey Lagoon are considered nonpoint sources of bacterial contamination. Del Rey Lagoon may be considered for a natural source exclusion if its contributing bacteria loads are determined to be as a result of wildlife in the area, as opposed to anthropogenic inputs. The TMDL will require a source identification study for the lagoon in order to apply the natural source exclusion (CRWQCB website #3).

Two different strategies for achieving compliance with the TMDL were developed by the stakeholders using a combination of treatment and control options. The "Preferred Strategy" provides an integrated resources approach to the TMDL implementation and meets a range of other long-term watershed planning goals. This "Preferred Strategy" relies on a combination of options, including flow and bacteria source control, with limited treatment and discharge as well as small amount of diversion to the Hyperion

Treatment Plant. Some of the activities and projects that can begin to address this strategy are already in the planning phase by certain stakeholder groups in some areas of the watershed. An "Alternative Strategy" was also developed that relies more heavily on the capture, treatment and discharge of stormwater. This strategy was developed to compare the preferred strategy against an alternative based on more conventional engineering and construction with potentially lower risk but much greater investment in infrastructure and much less opportunity to achieve multiple objectives. Implementing some of these strategies is likely to require investigative studies to determine their potential environmental impact to the Creek and Estuary. In addition, various environmental and regulatory feasibility issues would need to be addressed early in the implementation phase when stakeholders develop the Implementation Plan (CRWQCB website #3).

The City of Los Angeles has funded the Cleaner Rivers through Effective Stakeholder-led TMDLs (CREST) for the purpose of developing plans to restore impaired waters and protect water quality. CREST was formed in 2004 through a partnership initiated by the City of Los Angeles, the Regional Board, and US EPA Region 9. CREST began focusing on the Ballona Creek Bacteria TMDL in Spring of 2005. CREST partners were closely involved with many aspects of the TMDL during its development and worked on the details of compliance strategies (CRWQCB website #3).

<u>Ballona Creek Metals TMDL</u> The metals TMDL for Ballona Creek contains both wet- and dry-weather allocations for point and nonpoint sources. The County of Los Angeles, City of Los Angeles, Beverly Hills, Culver City, Inglewood, Santa Monica, West Hollywood, and Caltrans may jointly decide how to achieve the necessary reductions in metals loading by employing one or more potential implementation strategies. Examples of non-structural controls include more frequent and appropriately timed storm drain catch basin cleanings; improved street cleaning by upgrading to vacuum type sweepers; and, educating industries of good housekeeping practices. Structural BMPs may include placement of storm water treatment devices specifically designed to reduce metals loading such as infiltration trenches or filters at critical points in the storm water conveyance system. The diversion and treatment strategy includes the installation of facilities to provide capture and storage of dry- and/or wet-weather runoff and diversion of the stored runoff to the wastewater collection system for treatment at the City's Hyperion Treatment Plant during low flow conditions at the plant, if possible. Other strategies such as small dedicated runoff treatment facilities such or alternative BMPs may be implemented to meet the TMDL requirements (CRWQCB website #3).

<u>Ballona Creek Estuary Toxic Pollutants TMDL</u> The TMDL is for toxic pollutants, such as metals, legacy pesticides, and toxicity in the sediments of the estuary. Numeric targets for the Ballona Creek Toxics TMDL are based on sediment quality guidelines compiled by the National Oceanic and Atmospheric Administrations (NOAA) Effects Range-Low (ER-L) guidelines. Potential implementation strategies for this TMDL are similar to those of the Ballona Creek Metals TMDL (CRWQCB website #3).

A coordinated monitoring plan has been developed by the cities in the watershed, along with the County of Los Angeles and CalTrans, for the Ballona Creek Metals TMDL and Ballona Creek Estuary Toxic Pollutants TMDL. Testing of dry- and wet-weather water quality and sediment quality effectiveness monitoring is included (CRWQCB website #3).

Marina del Rey Harbor Bacteria TMDL The TMDL covers the area of Marina del Rey Harbor called Mothers' (Marina) Beach and the Back Basins. While there are no allowable exceedance days at any of the locations during dry-weather, the allowable number of winter dry-weather exceedance days is three at most locations (except it is zero at one location near Mothers' Beach). The allowable number of winter wet-weather exceedance days varies by location but is no more than seventeen. An implementation plan was by the County of Los Angeles, Cities of Los Angeles and Culver City, and California Department of Transportation through a collaborative effort with interested stakeholders. A hybrid of three different compliance approaches was eventually selected. It utilizes an iterative adaptive process and features the following Control Programs: Public Information and Participation Program, Institutional Control Program, and Structural BMPs Program (CRWQCB website #3).

Santa Monica Bay Nearshore and Offshore Debris TMDL The Santa Monica Bay Nearshore and Offshore Debris TMDL was adopted by the Regional Board in 2010 and requires that industries that manufacture, store, transport, or otherwise handle plastic pellets as raw material comply with a waste load allocation (WLA) of zero plastic pellets. The zero WLA for the plastic pellets requires that no plastic pellets are allowed to be released, found, or accumulated outside of the premises of the industries or in any stormwater capture device that may be connected with the MS4. Various tasks are required to be completed within a certain time period after the effective date of the TMDL. Key tasks range from achieving 20% reduction of trash from the baseline WLA within four years from the effective date of the TMDL to achieving 100% reduction of trash from the baseline WLA within eight years of the effective date of the TMDL.

Implementation plans and other information for these TMDLs are available on the Regional Board website as follows:

Santa Monica Bay Beaches Dry Weather

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_9_2002-004_td.shtml

http://63.199.216.6/larwqcb_new/bpa/docs/2002-004/2002-004_RB_RSL.pdf

http://63.199.216.6/larwqcb_new/bpa/docs/2002-004/2002-004_RB_BPA.pdf

Santa Monica Bay Beaches Wet Weather

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_14_2002-022_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_39_2006-005_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_40_2006-006_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_41_2006-007_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_42_2006-008_td.shtml

Marina del Rey Harbor Toxics

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_32_2005-012_td.shtml

Marina del Rey Back Basins

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_19_2003-012_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_43_2006-009_td.shtml

Ballona Creek, Ballona Estuary, and Sepulveda Channel Bacteria

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_45_2006-011_td.shtml

http://63.199.216.6/larwqcb_new/bpa/docs/2006-011/2006-011_RB_RSL.pdf

http://63.199.216.6/larwqcb_new/bpa/docs/2006-011/2006-011_RB_BPA.pdf

Ballona Creek Metals

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_28_2005-007_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_60_2007-015_td.shtml

Ballona Creek Estuary Toxic Pollutants

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_29_2005-008_td.shtml

Ballona Creek Trash

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_7_2001-014_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_document s/bpa_25_2004-023_td.shtml

Santa Monica Bay Nearshore and Offshore Debris TMDL

http://63.199.216.6/larwqcb_new/bpa/docs/R10-010/R10-010_RB_RSL.pdf

http://63.199.216.6/larwqcb_new/bpa/docs/R10-010/R10-010_RB_BPA.pdf

Low Flow Diversions/Treatment Facilities

An increasingly utilized approach to eliminating bacteria from storm drains at its source is the installation of low flow diversions. A low flow diversion is a structural device that routes urban runoff from canyons, streets and small watersheds away from the storm drain system or waterway, and redirects it into the sanitary sewer system or to a local treatment facility such as the SMURRF, where the contaminated runoff then receives treatment and filtration before being discharged into the ocean or is reused (City of LA website #2). Low flow diversions found within the Ballona Creek subwatershed are show in the table below.

Table 13. Low flow diversions within the Ballona Creek subwatershed

Low Flow Diversion	Year Operational	Agency
Boone Olive PP	2007	District
Oxford Basin (Berkley at Yale)	2008	District
Washington Blvd	2007	District

El Segundo/LAX Area

The El Segundo subwatershed drains an area of about 6,680 acres. The subwatershed extends from Playa del Rey to the north, Westchester, the Los Angeles International Airport (LAX) area of the City of Los Angeles, the City of El Segundo, the area adjacent to Chevron refinery and adjacent area and a small portion of the City of Manhattan Beach to the south. Major subdrainage areas in this region include, in order of size starting with the largest, North Westchester, Imperial Highway, Chevron Refinery, El Segundo Boulevard, Playa del Rey, the Hyperion Treatment Plant, and the Scattergood Power Plant (CRWQCB, 1997).

Land Uses

Land use in this region is a mixture of residential, industrial and commercial development and public beaches. The land use can be broken down as 54% commercial/industrial and other urban use, 29% residential use, 14% vacant/open space, and 3% public use (CRWQCB, 1997).

Major Industrial and/or Commercial Facilities

There are several major industrial and/or commercial facilities of regional significance in this area, including an airport, a wastewater treatment plant, two electrical power generation stations, and an oil refinery. There are also some aerospace-related industries located in this region (CRWQCB, 1997).

LAX The Los Angeles International Airport that serves as the hub of the regional airport system is in this area. It also represents one large contributor to runoff which in the past discharged to Santa Monica Bay largely via the Imperial drain. However, in late 1989 a retention basin and pretreatment facility was completed that handles about 1.8 million gallons of storm water "first flush" as well as dry weather low flow (CRWQCB, 1997).

Hyperion Treatment Plant The Hyperion Treatment Plant is also located in the area. It is one of the largest POTWs in the country that serves over three million residents in a 480 square mile area. It also provides solids treatment for sludge discharged from two upstream facilities located in the San Fernando Valley. LAX and the Hyperion plant comprise a large percentage of the commercial and other urban land use in this region. Both facilities are either in the planning stage for or undergoing expansion and capital improvement of its treatment works (CRWQCB, 1997).

Power Stations There are two power generation stations in this area: Los Angeles Department of Water and Power's Scattergood Generating Station, and Southern California Edison's El Segundo Generating Station. The power generating stations use seawater from Santa Monica Bay to cool steam condensers. Cool seawater is pumped into the station, circulated through a non-contact heat exchanger, and discharged at temperatures above the intake temperature. Chlorine *is* also injected periodically to control biological growth (CRWQCB, 1997).

El Segundo Refinery The Chevron El Segundo Refinery has been in operation since 1911 and now manufactures various petroleum products including gasoline, jet fuel, kerosene, solvent, coke, fuel oil, liquefied petroleum gases and propylene polymer. Since the early 1970s, Chevron had discharged secondary treated wastewater through an outfall 300 feet offshore. In September 1994, the outfall pipe was extended to 3,500 feet which effectively removed the last point source discharge from the near shore environment (CRWQCB, 1997).

Parks and Beaches

The major beach in the area is the Dockweiler State Beach which extends from Playa del Rey in the north to Manhattan Beach in the south. The beach is heavily used on weekends and in the summer (CRWQCB, 1997).

Beneficial Uses

The major beneficial uses identified for this subwatershed are use of seawater as industrial cooling water for power generation, use of the Bay to transport crude and refined petroleum, and use of seawater for swimming, boating, and sport fishing (CRWQCB, 1994).

Table 14. Beneficial uses of the waters within the El Segundo/LAX area

Coastal Feature or Waterbody	Hydro Unit #	IND	NAV	REC1	REC2	COMM	MAR	WILD	SPWN
Dockweiler Beach	405.12	E	E	E	E	E	E	E	P

E: Existing beneficial use; **P:** Potential beneficial use; **I:** Intermittent beneficial use

Evidence of Impairments

Sewage Spills

Over the years, there were many incidents of untreated or partially treated wastewater overflowing from the Hyperion Treatment Plant or spills flowing through storm drain channels to the Bay due to either broken pipes, excessive quantity of flow or waste processing errors. The incidents caused beach closure or swimming warning for a period of time (CRWQCB, 1997).

Oil Spills /Seepage

Crude oil and refined petroleum products can enter the marine environment through tanker accidents, fueling, tank cleaning, bilge pumping, improper disposer or on-land spills into storm drains. Possible seeping of crude oil or the refined petroleum products from the pipelines as well as spills of oil occur every year in the Bay (including the ocean area adjacent to this subwatershed), each with the potential for serious impacts on the water quality and marine resources (CRWQCB, 1997).

Wildlife Habitat

The El Segundo Dunes are a remnant of a once-vast coastal ecosystem. The physical features of the dunes themselves constitute an endangered landform. Nine hundred species of plants and animals have recently been recorded on these dunes, 35 of which are limited in range to Southern California. At least eleven species exist only within the boundaries of the El Segundo Dunes and all of them are in danger of extinction. The best example is the El Segundo blue butterfly which is a federal and state-listed endangered species (CRWQCB, 1997).

Pollutants of Concern

The pollutants of concern identified for the El Segundo/LAX sub-watershed area include pathogens, debris, heavy metals, oil and grease, PAHs and chlordane (CRWQCB, 1997).

Source and Loading

Potential sources of pathogens to storm drains include illegal sewer connections and sewage dumping, sewer leaks, domestic animals, food service business, and outdoor camping. During major sewage spills, the Hyperion Treatment Plant also becomes the source of pathogen inputs into the Bay (CRWQCB, 1997).

Sources of debris include illegal waste dumping into storm drains, improper solid waste disposal, and construction activities. Sources for pollutants such as heavy metals, PAHs, oil and grease are more likely from transportation-related activities. The waste jet fuel from LAX and petroleum piping activities from the oil refinery are also considered possible pollutant sources (CRWQCB, 1997).

Chlordane found in the runoff is believed to be from the unauthorized usage and dumping of stocked chemicals into storm drains (CRWQCB, 1997).

Water Quality Improvement Strategies

Source reduction of pathogen inputs in near shore waters should be the priority for water quality improvement in this region. Other pollutants of concern should also be monitored regularly. Source control BMPs should be implemented to reduce the sources of pollutants loading into storm runoff. If feasible, diversion of some problematic storm drains into the sewer system should also be pursued (CRWQCB, 1997).

Another priority is augmenting the ongoing restoration of the El Segundo Dunes and creating an El Segundo Dunes Habitat Preserve. Restoration is urgently needed in order to halt the spread of invasive species, and avoid further extinctions and the extirpation of native species. The long-term goal of the restoration program is to create a Dunes Habitat Preserve of approximately 200 contiguous acres and to restore and preserve the natural ecology of the area (including the adjacent acreage owned by Chevron (CRWQCB, 1997).

Implement TMDLs

The TMDLs in effect which impact the El Segundo/LAX area are the dry- and wet-weather bacteria TMDLs for Santa Monica Bay beaches and the Santa Monica Bay Nearshore and Offshore Debris TMDL. Dockweiler Beach is listed as impaired for indicator bacteria. For the purpose of implementing the bacteria TMDLs, the area has been divided up into “jurisdictional groups” (JG) – the El Segundo/LAX area falls into JG2. Compliance measures include a number of activities that in combination would result in reducing the number of days in which water quality objectives are exceeded to less than or equal to that of the reference watershed (CRWQCB website #3).

The wet-weather bacteria TMDL stipulates a threshold number of exceedance days based on daily monitoring activities. The number of allowed exceedance days varies somewhat among the beaches but is no more than seventeen. The TMDL features a reference system/anti-degradation approach. The purpose of utilizing this approach is to ensure that bacteriological water quality is at least as good as that of a reference site and that no degradation of existing bacteriological water quality is permitted where existing bacteriological water quality is better than that of a reference site (CRWQCB website #3).

The dry-weather bacteria TMDL also stipulates compliance targets. The general implementation schedule includes two phases:

Phase I: Compliance during Summer Dry Weather. Within three years of the effective date of the TMDL, there may be no exceedances at any location during summer dry weather (April 1 to October 31). This compliance target may be achieved by employing a number of strategies, including diverting storm drain flows to treatment plants, eliminating illicit discharges, controlling sources of bacteria, or implementing “end-of-pipe” treatment. The District, City of Los Angeles and several other cities adjacent to Santa Monica Bay have been implementing aggressive summer, dry-weather storm drain diversion programs. All 27 priority storm drains have been diverted; additional diversions have been completed and others are planned (CRWQCB website #3).

Phase II: Compliance during Winter Dry Weather. Within six years of the effective date of this TMDL, compliance with the allowable number of exceedance days (varies by beach) during winter dry weather must be achieved (CRWQCB website #3).

A Coordinated Shoreline Monitoring Plan was developed by a Technical Steering Committee, co-chaired by the County and City of Los Angeles and consisting of representatives from many of the bacteria TMDLs’ responsible agencies. In addition, other area stakeholders provided input. The plan is designed to comply with the monitoring requirements of both the dry- and wet-weather TMDLs (CRWQCB website #3).

The Santa Monica Bay Nearshore and Offshore Debris TMDL was adopted by the Regional Board in 2010 and requires that industries that manufacture, store, transport, or otherwise handle plastic pellets as raw material comply with a waste load allocation (WLA) of zero plastic pellets. The zero WLA for the plastic pellets requires that no plastic pellets are allowed to be released, found, or accumulated outside of the premises of the industries or in any stormwater capture device that may be connected with the MS4. Various tasks are required to be completed within a certain time period after the effective date of the TMDL. Key tasks range from achieving 20% reduction of trash from the baseline WLA within four years from the effective date of the TMDL to achieving 100% reduction of trash from the baseline WLA within eight years of the effective date of the TMDL.

Implementation plans and other information for these TMDLs are available on the Regional Board website as follows:

Santa Monica Bay Beaches Dry Weather

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_9_2002-004_td.shtml

http://63.199.216.6/larwqcb_new/bpa/docs/2002-004/2002-004_RB_RSL.pdf

http://63.199.216.6/larwqcb_new/bpa/docs/2002-004/2002-004_RB_BPA.pdf

Santa Monica Bay Beaches Wet Weather

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_14_2002-022_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_39_2006-005_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_40_2006-006_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_41_2006-007_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_42_2006-008_td.shtml

Santa Monica Bay Nearshore and Offshore Debris

http://63.199.216.6/larwqcb_new/bpa/docs/R10-010/R10-010_RB_RSL.pdf

http://63.199.216.6/larwqcb_new/bpa/docs/R10-010/R10-010_RB_BPA.pdf

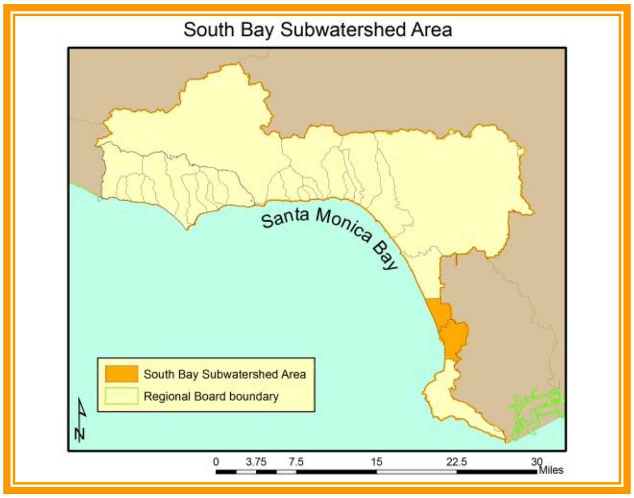
Low Flow Diversions/Treatment Facilities

An increasingly utilized approach to eliminating bacteria from storm drains at its source is the installation of low flow diversions. A low flow diversion is a structural device that routes urban runoff from canyons, streets and small watersheds away from the storm drain system or waterway, and redirects it into the sanitary sewer system or to a local treatment facility, where the contaminated runoff then receives treatment and filtration before being discharged into the ocean (City of LA website #2). Low flow diversions found within the El Segundo-LAX area are show in the table below.

Table 15. Low flow diversions within the El Segundo/LAX area

Low Flow Diversion	Year Operational	Agency
Arena Pump Plant	2006	District
El Segundo Pump Plant	2006	District
Imperial Highway	2003	City of LA
Pershing Drive, Line C	2006	District
Playa del Rey	2001	District
Westchester	2004	District

South Bay



The South Bay subwatershed drains an area of approximately 7,054 acres. The subwatershed includes major portions of the City of Manhattan Beach, the City of Hermosa Beach, the City of Redondo Beach, and the City of Torrance. Storm drains in the area are all narrow and rather small. The notable drains include the Redondo Pier and Herondo Drains (CRWQCB, 1997).

Land Uses

The major land use of the region is high density single- or multiple-family residential use. The land uses include 81% residential use, 9 % commercial/industrial and other urban use, 8% public use, and 3% vacant/open space (CRWQCB, 1997).

Major Industrial/Commercial Facilities

Although most land uses are residential, the Redondo Generating Station, a major industrial facility operated by Southern California Edison, is located in this area. There are also some aerospace-related industries established in various places within the region (CRWQCB, 1997).

Parks, Beaches and Harbors

There are three very popular beaches in this subwatershed: Redondo Beach, Hermosa Beach, and Torrance Beach. Three piers are located at Manhattan Beach, Redondo Beach, and Hermosa Beach respectively. These piers draw large crowds on weekends and in the summer time. King Harbor, located in Redondo beach, docks 1,500 recreational boats (CRWQCB, 1997).

Beneficial Uses

The major beneficial uses identified for this sub-watershed are use of seawater as industrial cooling water for power generation, and various recreational uses including swimming, boating and sport fishing. Marine and wild life habitats also exist in beach and nearshore areas. For example, beaches in the area provide spawning ground for California grunion each year. Shallow nearshore protected areas such as King Harbor serve as important nurseries for local marine fishes (e.g., California halibut, white seabass) (CRWQCB, 1994).

Table 16. Beneficial uses of the waters within the South Bay area

Coastal Feature or Watershed	Hydro Unit #	IND	NAV	REC1	REC2	COMM	MAR	WILD	RARE	MIGR	SPWN	SHELL
Redondo Beach	405.12	E	E	E	E	E	E	E	E	E	E	E
King Harbor	405.12	E	E	E	E	E	E	E	E			
Manhattan Beach	405.12		E	E	E	E	E	E			P	E
Hermosa Beach	405.12		E	E	E	E	E	E			E	E

E: Existing beneficial use; **P:** Potential beneficial use; **I:** Intermittent beneficial use

Evidence of Impairments

Enteric viruses were found in the Herondo drain in a SMBRP study. Beaches in the area were infrequently closed due to sewage spills in storm water drains (CRWQCB, 1997).

Data collected over the years have shown that contaminants are accumulated in marine organisms in the nearshore area of the watershed (CRWQCB, 1997).

Trash and debris were often found on the beaches and there is continuous need for beach cleanup (CRWQCB, 1997).

Pollutants of Concern

The major pollutants of concern within the South Bay subwatershed are debris, pathogens, oil and grease, heavy metals, and PAHs (CRWQCB, 1997).

Source and Loading

Potential sources of pathogens to storm drains include illegal sewer connection and sewage dumping, sewer leaks, domestic animals, food service business, and outdoor camping. During major sewage spills, the Hyperion Treatment Plant also becomes the source of pathogens to surfzone in this area (CRWQCB, 1997).

Sources of debris include illegal waste dumping into storm drains, improper solid waste disposal, and construction activities. Sources of pollutants such as heavy metals, PAHs, oil and grease are more likely from transportation-related activities in the area. Advection from the adjacent wastewater treatment facility outfall is also a potential source (CRWQCB, 1997).

Water Quality Improvement Strategies

The reduction of the pathogens input in the near shore water should be the priority for pollution control measures in this region. Implementation of storm water source control BMPs will likely to reduce the loading of pollutants of concern. Alternatively additional problematic storm drains can be diverted into sewer system (CRWQCB, 1997).

Implement TMDLs

The TMDLs in effect which impact the South Bay are the dry- and wet-weather bacteria TMDLs for Santa Monica Bay beaches and the Santa Monica Bay nearshore and offshore debris TMDL. Redondo, Manhattan, and Hermosa Beaches are listed as impaired for indicator bacteria. For the purpose of implementing the bacteria TMDLs, the area has been divided up into "jurisdictional groups" (JG) – the South Bay falls into JG5 and JG6. Compliance measures include a number of activities that in combination would result in reducing the number of days in which water quality objectives are exceeded to less than or equal to that of the reference watershed (CRWQCB website #3).

The wet-weather bacteria TMDL stipulates a threshold number of exceedance days based on daily monitoring activities. The number of allowed exceedance days varies somewhat among the beaches but is no more than seventeen. The TMDL features a reference system/anti-degradation approach. The purpose of utilizing this approach is to ensure that bacteriological water quality is at least as good as that of a reference site and that no degradation of existing bacteriological water quality is permitted where existing bacteriological water quality is better than that of a reference site (CRWQCB website #3).

The dry-weather bacteria TMDL also stipulates compliance targets. The general implementation schedule includes two phases:

Phase I: Compliance during Summer Dry Weather. Within three years of the effective date of the TMDL, there may be no exceedances at any location during summer dry weather (April 1 to October 31). This compliance target may be achieved by employing a number of strategies, including diverting storm drain flows to treatment plants, eliminating illicit discharges, controlling sources of bacteria, or implementing "end-of-pipe" treatment. The District, City of Los Angeles and several other cities adjacent to Santa Monica Bay have been implementing aggressive summer, dry-weather storm drain diversion programs. All 27 priority storm drains have been diverted; additional diversions have been completed and others are planned (CRWQCB website #3).

Phase II: Compliance during Winter Dry Weather. Within six years of the effective date of this TMDL, compliance with the allowable number of exceedance days (varies by beach) during winter dry weather must be achieved (CRWQCB website #3).

A Coordinated Shoreline Monitoring Plan was developed by a Technical Steering Committee, co-chaired by the County and City of Los Angeles and consisting of representatives from many of the TMDLs' responsible agencies. In addition, other area stakeholders provided input. The plan is designed to comply with the monitoring requirements of both the dry- and wet-weather bacteria TMDLs (CRWQCB website #3).

The Santa Monica Bay Nearshore and Offshore Debris TMDL was adopted by the Regional Board in 2010 and requires that industries that manufacture, store, transport, or otherwise handle plastic pellets as raw material comply with a waste load allocation (WLA) of zero plastic pellets. The zero WLA for the plastic pellets requires that no plastic pellets are allowed to be released, found, or accumulated outside of the premises of the industries or in any stormwater capture device that may be connected with the MS4.

Various tasks are required to be completed within a certain time period after the effective date of the TMDL. Key tasks range from achieving 20% reduction of trash from the baseline WLA within four years from the effective date of the TMDL to achieving 100% reduction of trash from the baseline WLA within eight years of the effective date of the TMDL.

Implementation plans and other information for these TMDLs are available on the Regional Board website as follows:

Santa Monica Bay Beaches Dry Weather

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_9_2002-004_td.shtml

http://63.199.216.6/larwqcb_new/bpa/docs/2002-004/2002-004_RB_RSL.pdf

http://63.199.216.6/larwqcb_new/bpa/docs/2002-004/2002-004_RB_BPA.pdf

Santa Monica Bay Beaches Wet Weather

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_14_2002-022_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_39_2006-005_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_40_2006-006_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_41_2006-007_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_42_2006-008_td.shtml

Santa Monica Bay Nearshore and Offshore Debris

http://63.199.216.6/larwqcb_new/bpa/docs/R10-010/R10-010_RB_RSL.pdf

http://63.199.216.6/larwqcb_new/bpa/docs/R10-010/R10-010_RB_BPA.pdf

Low Flow Diversions/Treatment Facilities

An increasingly utilized approach to eliminating bacteria from storm drains at its source is the installation of low flow diversions. A low flow diversion is a structural device that routes urban runoff from canyons, streets and small watersheds away from the storm drain system or waterway, and redirects it into the sanitary sewer system or to a local treatment facility, where the contaminated runoff then receives treatment and filtration before being discharged into the ocean or reused (City of LA website #2). Low flow diversions found within the South Bay area are show in the table below.

Table 17. Low flow diversions within the South Bay area

Low Flow Diversion	**Year Operational**	**Agency**
Herondo Street	2005	District
Manhattan Beach at 28th Street (The Strand)	2006	District
Manhattan Beach Pump Plant	2004	District
South of Dockweiler Jetty	2001	District
Manhattan Beach Pier	1990	Manhattan Beach
Hermosa Beach Pier	2010	Hermosa Beach
Redondo Beach Pier	2005	Redondo Beach
Sapphire (at Esplande Ave)	2010	Redondo Beach
Bryant and Voorhees Sump	2008	Manhattan Beach
Alta Vista Park	2010	Redondo Beach

Palos Verdes Peninsula

The Palos Verdes Peninsula subwatershed extends from near the southern boundary of the City of Redondo Beach to Point Fermin along the coastline. Inland, the subwatershed consists of a 10,977 acre area on the north west slope of the Palos Verdes Peninsula. Municipalities in this area include the Cities of Palos Verdes Estates, Rolling Hills Estates, and Rancho Palos Verdes (CRWQCB, 1997) and portions of Redondo Beach and Torrance. The notable drain is Avenue I.

Land Uses

The majority of land uses in this region is low-density residential development with some horse properties; There are some open spaces including beaches, wildlife habitats and natural preserves. Only limited areas within this region are identified for commercial or industrial uses. The land uses include 59% residential use, 36% vacant/open space, 3% commercial/industrial use, and 3% public use (CRWQCB, 1997).

Beaches and Coves

Along the rugged coast there are several coves and bays including Malaga Cove, Bluff Cove, Lunada Bay, and Abalone cove. These coves and bays provide the habitats for a variety of marine life. In addition, areas such as Pt. Vicente, Abalone Cove County Beach, Portuguese Pt., Inspiration Pt., Portuguese Bend, Royal Palms Beach, and Whites Point County Beach are popular destinations that attract tourists or residents for recreational purposes (CRWQCB, 1997).

Beneficial Uses

Beneficial uses identified in this subwatershed are primarily recreational uses including swimming, diving, boating and sport fishing. The waterbodies in this region also contain important marine and wild life habitats. The rocky tidal and nearshore zones provide unique habitats for filter-feeding shellfish (e.g., clams, oysters, abalone, and mussels). With the biodiversity of tidepools, spawning ground for the California grunions and other marine organisms, the whole coastal area of this region is designed as "significant ecological area" by the County of Los Angeles (CRWQCB, 1994).

Table 18. Beneficial uses of the waters within the Palos Verdes Peninsula

Coastal Feature or Waterbody	Hydro Unit #	MUN	GWR	NAV	REC1	REC2	COMM	WARM	MAR	WILD	RARE	SPWN	SHELL
Coastal Streams of Palos Verdes	405.11	P	I		I	I		I		P	E		
Canyon Streams Trib. To Coastal Streams of Palos Verdes	405.12	P	I		I	I		I		E	E		
Port Vicente Beach	405.11			E	E	E	E		E	E		P	E
Royal Palms Beach	405.11			E	E	E	E		E	E		P	E
Whites Point County Beach	405.11			E	E	E	E		E	E		P	E

E: Existing beneficial use; **P:** Potential beneficial use; **I:** Intermittent beneficial use

Evidence of Impairments

Elevated concentrations of contaminants such as PCBs, DDT, and heavy metals including: lead, copper, chromium, nickel, silver, zinc and mercury were found in the Bay sediments in this region. Highly contaminated discharges through the JWPCP's White Point outfall prior to the 1980s left a contamination zone of several square miles with approximately 100 tons of DDT deposition (CRWQCB, 1997).

The accumulation and biomagnification of such contaminants have been observed in various. species of fish and shellfish. According to a comprehensive seafood contamination study and risk assessment conducted by the State Office of Environmental Health Hazard Assessment (OEHHA) and SMBRP, elevated concentrations of several contaminants (including PCBs and DDTs) in fishes was found, especially from this region. White croaker was found to be the most contaminated fish from this area as well as in other areas of the Bay. Other species found to be relatively contaminated are California corbina, queenfish, surfperches and California scorpionfish (CRWQCB, 1997).

Land slides in the area have destroyed some coastal habitats. Population declines of some bird species and certain species of shellfish such as black abalone have also been observed in this region (CRWQCB, 1997).

Pollutants of Concern

The main pollutants of concern in this subwatershed are total suspended solid (TSS) and nutrients. Historical deposits of PCBs and DDT on the Palos Verdes Shelf continue to be of concern because the risk that it poses to marine organisms and individuals who consume seafood from this area (CRWQCB, 1997).

Sources and Loading

TSS originate primarily from the erosion of hillsides. Nutrients originate from application of fertilizers. Some horse properties may also be sources of excessive nutrient inputs in this region. Historic deposits are the primary sources of DDT, PCBs, and heavy metals in sediments offshore of the Peninsula (CRWQCB, 1997).

Water Quality Improvement Strategies

Nonpoint source best management practices (BMPs) should be implemented to reduce the nutrients and TSS inputs to the Bay from this subwatershed. Restoration and protection of intertidal habitats and protection of endangered species (either from over harvesting or water pollution) should continue to be water quality improvement priorities (CRWQCB, 1997).

In 2009, USEPA released a feasibility study which describes the development, evaluation, and comparison of remedial action alternatives to manage the contaminated sediment at the Palos Verdes Shelf site. The report also presents potential remediation goals for the protection of human and ecological health and presents remedial alternatives including dredging and capping of various amounts of contaminated sediment. USEPA announced their preferred alternative for remediating the Palos Verdes Shelf Superfund site in June 2009. The alternative is an interim remedy that proposes institutional controls, monitored natural recovery and a containment cap. Construction is expected to take three years and cost an estimated $36,000,000 (USEPA and CH2M Hill, 2009).

Implement TMDLs

The TMDLs in effect which impact the Palos Verdes Peninsula are the dry- and wet-weather bacteria TMDLs for Santa Monica Bay beaches and the Santa Monica Bay nearshore and offshore debris TMDL. Whites Point, Point Vicente, and Royal Palms Beaches are listed as impaired for indicator bacteria. For the purpose of implementing the bacteria TMDLs, the area has been divided up into “jurisdictional groups” (JG) – the Palos Verdes Peninsula falls into JG7. Compliance measures include a number of activities that in combination would result in reducing the number of days in which water quality objectives are exceeded to less than or equal to that of the reference watershed (CRWQCB website #3).

The wet-weather bacteria TMDL stipulates a threshold number of exceedance days based on daily monitoring activities. The number of allowed exceedance days varies somewhat among the beaches but is no more than seventeen. The TMDL features a reference system/anti-degradation approach. The purpose of utilizing this approach is to ensure that bacteriological water quality is at least as good as that of a reference site and that no degradation of existing bacteriological water quality is permitted where existing bacteriological water quality is better than that of a reference site (CRWQCB website #3).

The dry-weather bacteria TMDL also stipulates compliance targets. The general implementation schedule includes two phases:

Phase I: Compliance during Summer Dry Weather. Within three years of the effective date of the TMDL, there may be no exceedances at any location during summer dry weather (April 1 to October 31).

This compliance target may be achieved by employing a number of strategies, including diverting storm drain flows to treatment plants, eliminating illicit discharges, controlling sources of bacteria, or implementing "end-of-pipe" treatment. The County of Los Angeles, City of Los Angeles and several other cities adjacent to Santa Monica Bay have been implementing aggressive summer, dry-weather storm drain diversion programs. All 27 priority storm drains have been diverted; additional diversions have been completed and others are planned (CRWQCB website #3).

Phase II: Compliance during Winter Dry Weather. Within six years of the effective date of this TMDL, compliance with the allowable number of exceedance days (varies by beach) during winter dry weather must be achieved (CRWQCB website #3).

A Coordinated Shoreline Monitoring Plan was developed by a Technical Steering Committee, co-chaired by the County and City of Los Angeles and consisting of representatives from many of the TMDLs' responsible agencies. In addition, other area stakeholders provided input. The plan is designed to comply with the monitoring requirements of both the dry- and wet-weather bacteria TMDLs (CRWQCB website #3).

The Santa Monica Bay Nearshore and Offshore Debris TMDL was adopted by the Regional Board in 2010 and requires that industries that manufacture, store, transport, or otherwise handle plastic pellets as raw material comply with a waste load allocation (WLA) of zero plastic pellets. The zero WLA for the plastic pellets requires that no plastic pellets are allowed to be released, found, or accumulated outside of the premises of the industries or in any stormwater capture device that may be connected with the MS4. Various tasks are required to be completed within a certain time period after the effective date of the TMDL. Key tasks range from achieving 20% reduction of trash from the baseline WLA within four years from the effective date of the TMDL to achieving 100% reduction of trash from the baseline WLA within eight years of the effective date of the TMDL.

Implementation plans and other information for these TMDLs are available on the Regional Board website as follows:

Santa Monica Bay Beaches Dry Weather

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_9_2002-004_td.shtml

http://63.199.216.6/larwqcb_new/bpa/docs/2002-004/2002-004_RB_RSL.pdf

http://63.199.216.6/larwqcb_new/bpa/docs/2002-004/2002-004_RB_BPA.pdf

Santa Monica Bay Beaches Wet Weather

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_14_2002-022_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_39_2006-005_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_40_2006-006_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_41_2006-007_td.shtml

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/bpa_42_2006-008_td.shtml

Santa Monica Bay Nearshore and Offshore Debris

http://63.199.216.6/larwqcb_new/bpa/docs/R10-010/R10-010_RB_RSL.pdf

http://63.199.216.6/larwqcb_new/bpa/docs/R10-010/R10-010_RB_BPA.pdf

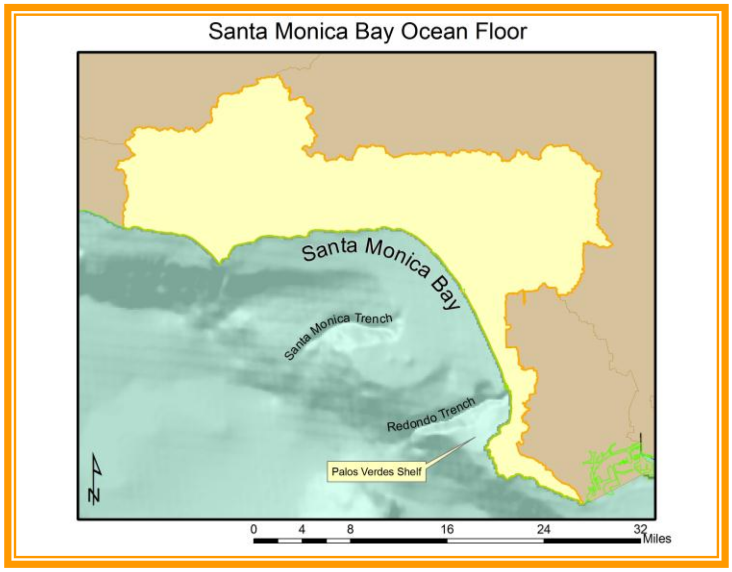
Low Flow Diversions/Treatment Facilities

An increasingly utilized approach to eliminating bacteria from storm drains at its source is the installation of low flow diversions or treatment facilities. A low flow diversion is a structural device that routes urban runoff from canyons, streets and small watersheds away from the storm drain system or waterway, and redirects it into the sanitary sewer system or to a local treatment facility, where the contaminated runoff then receives treatment and filtration before being discharged into the ocean (City of LA website #2). Low flow diversions found within the Palos Verdes area are show in the table below.

Table 19. Low flow diversions within the Palos Verdes area

Low Flow Diversion	Year Operational	Agency
I Street	2006	District
Alta Vista Park	2010	Redondo Beach

Pacific Ocean



Santa Monica Bay Ocean Floor

This section provides characterization of the nearshore and offshore regions of Santa Monica Bay (from the low-tide line to the outer boundary of the Bay). The areas surrounding the two POTW outfalls are highlighted in this section because more information is available and/or more impacts have been observed (CRWQCB, 1997).

Santa Monica Bay is the submerged portion of the Los Angeles Basin. The sea floor of the Bay is primarily soft bottom which consists of fine to moderately coarse sediments. Far less in acreage than soft bottom, hard bottom areas are generally restricted to the subtidal regions at 20 to 70 feet west of Malibu and around the Palos Verdes Peninsula. There is only one naturally occurring deep rocky area. Called Short Bank, it is located approximately six miles offshore of Ballona Creek, between Santa Monica and Redondo Submarine Canyons (CRWQCB, 1997).

The two largest POTWs in the region have for years discharged treated municipal wastewater directly into the Bay through their ocean outfalls. Over the last 50 years, the City of Los Angeles' Hyperion Treatment Plant has constructed and used three offshore pipes into Santa Monica Bay. A 1-mile offshore pipe was used between 1950 and 1960s at a water depth of 50 ft. to discharge approximately 190 mgd of chlorinated secondary effluent. This pipe is still used occasionally to divert overflows from a 5-mile offshore pipe. The 5-mile offshore pipe has been in full service since 1960 discharging, at a water depth of 190 ft, primary-treated effluent in the early years, and secondary-treated effluent at the present time. Finally, a 7-mile long sludge pipe was constructed to discharge at the head of Santa Monica Canyon to a depth of 320 ft. The pipe became operational in 1957 but use was discontinued in 1987. Since that time all sludge has been either transported to a landfill or used to produce a claylike product (CRWQCB, 1997).

The Los Angeles County Sanitation Districts' Joint Water Pollution Control Plant (JWPCP) began ocean disposal of wastewater onto the Palos Verdes Shelf in 1937 through a 5-ft diameter pipe; a 6-ft. diameter pipe was added in 1947. These outfalls discharged at water depths of 110 and 160 ft., respectively. Today these two pipes are only used as standbys for hydraulic relief during heavy rains. The current outfalls are a 7.5 ft. diameter pipe completed in 1956 that ends in a Y-shaped multiport diffuser, and a 10 ft. diameter pipe added in 1966 with a dog-legged, multi-port diffuser. Both are discharging secondary-treated effluent 1.9 mile offshore at 200 ft. depth (CRWQCB, 1997).

In addition to the two ocean POTW outfalls, the Chevron El Segundo Refinery has an outfall pipe 3;500 ft. offshore which discharges primary and secondary-treated wastewater. The pipe was extended from a 300 ft. pipe in 1994 (CRWQCB, 1997).

Chevron also maintains, a two-berth offshore tanker mooring facility in 42 to 66 feet of water. This facility transports crude oil and refined products to tankers at a frequency of approximately 20 tankers per month. Except for this tanker movement, most commercial and naval shipping activities occur outside Santa Monica Bay, in the shipping lanes offshore, and in nearby Los Angeles and Long Beach Harbors (CRWQCB, 1997).

Three power generating stations (the City of Los Angeles Department of Water and Power's Scattergood Plant, El Segundo Power’s El Segundo Plant, and AES’ Redondo Beach Plant) use seawater from Santa Monica Bay to cool steam condensers. Cool seawater is pumped into the station, circulated through noncontact heat exchangers, and discharged at temperatures above the intake temperature. In addition to elevated temperatures, the once-through cooling water may include treated wastewater which is determined to be non-hazardous as defined. by state and federal regulations. Chlorine is also injected periodically to control biological growth (CRWQCB, 1997).

Although oil and gas reserves are believed to occur on the Santa Monica Bay shelf, oil and gas development in or near Santa Monica Bay has been limited However, two natural. oil seeps are known in Santa Monica Bay. One, with three seepage zones, is located about 2 3 miles off Redondo Beach, near the head of the Redondo Submarine Canyon; the other has two seepage zones and is located about 4 6 miles off Manhattan Beach. The daily flow (to the surface) is estimated to range from 64 to 756 gallons per day, but maybe several times this amount during and after local earthquakes (CRWQCB, 1997).

At present, there is one permitted dump site (LA2) near, but outside of, Santa Monica Bay. The material disposed of at this site originates from maintenance and construction dredging in Los Angeles and Long Beach Harbors; material deposited here must be very clean.

Beneficial Uses

Twelve beneficial uses are identified for nearshore and offshore areas of Santa Monica Bay, including industrial and navigational uses, recreational uses, and biological/ecological uses (CRWQCB, 1994).

Table 20. Beneficial uses of the nearshore and offshore areas of the Santa Monica Bay

Coastal Feature or Waterbody	IND	NAV	REC1	REC2	COM M	MAR	WIL D	BIO L	RARE	MIG R	SPWN	SHELL
Nearshore Zone	E	E	E	E	E	E	E	E	E	E	E	E
Offshore Zone	E	E	E	E	E	E	E		E	E	E	E

E: Existing beneficial use; **P:** Potential beneficial use; **I:** Intermittent beneficial us

The Bay provides a variety of habitats for a great diversity of plant and animal species at least 5,000 at last count. Soft bottom, the dominant benthic habitat in Santa Monica Bay, has few attached plants as residents but has an abundant and diverse invertebrate population. Kelp beds, located in hard bottom areas in the subtidal regions west of Malibu and around the Palos Verdes Peninsula, provide cover and protection and thus habitat for more than 800 species of fishes and invertebrates, some of which are uniquely adapted for life in the beds. Consequently, kelp beds are important for sport fishing, commercial harvesting of abalone and sea urchins, and recreational diving. Short Bank, the only naturally occurring deep rocky area, thrives with populations of several rockfish species and unique invertebrates (CRWQCB, 1997).

The pelagic, or open-ocean habitat is the primary home to fish such as Pacific sardine, northern anchovy, Pacific mackerel, and Pacific bonito; as well as marine mammals such as seals and sea lions. Many species of whales and dolphins are also observed in Bay waters; passing through the Bay during the winter/spring migration. The pelagic habitat (microlayer) is also home to the eggs and larvae of many invertebrates. One of the unique habitats is the shallow nearshore protected areas of the Bay (e.g., Malibu Lagoon, Marina del Rey Harbor), which serve as important nurseries for local marine fishes such as California halibut and white seabass). Finally, the pelagic habitat is utilized for foraging by several endangered bird species such as California brown pelican and California least tem (CRWQCB, 1997).

Tankers travel in and out of the Bay to transport oil at Chevron's mooring facility. Otherwise, no major shipping lanes cross into the Bay. Commercial fishing has been prohibited in about 62% of the Bay proper to protect local fish populations. Since December 1993, commercial fishing using gill and trammel nets are banned within three nautical miles of the mainland (CRWQCB, 1997).

Evidence of Impairments

The marine habitats of Santa Monica Bay have historically experienced severe impacts from human activities. The most obvious impacts are changes observed in benthic habitats as a result of POTW ocean discharges. Overfishing has been linked to depletion and/or decline of many marine species. Finally, natural phenomena such as El Nino have also played an important role in downturn and upturn of habitat conditions in the Bay (CRWQCB, 1997).

Over the years, discharge of biosolids from the Hyperion Treatment Plant and the JWPCP created a large sludge field around outfalls. These sludge fields, especially those formed before the 1980s, contain high concentrations of toxic chemicals. Between 1950 and 1970s, large amounts of DDT and PCBs from local chemical manufacturers and other industrial facilities were dumped into the ocean through the POTW outfalls. What remains today is a heavily contaminated zone of approximately 320 acres on the Palos Verdes Shelf near the JWPCP outfall where the median total DDT concentration exceeds 2 ppm and median total PCBs concentration exceeds 200 ppb. Besides DDT and PCBs, there has been little evidence that the concentrations of toxic organic, compounds such as PAHs, and heavy metals (including cadmium, copper, chromium, nickel, silver, zinc, and lead) are at levels, deemed harmful to marine organisms. However, the concentrations of these metals are significantly higher than the background levels in most parts of Santa Monica Bay. They are also relatively higher than the rest of the Southern California Bight (CRWQCB, 1997; USEPA and CH2M Hill, 2009).

DDT in white croaker, Dover sole, and brown pelicans are well-known examples of the damage caused by sediment contamination. High concentrations of DDT were found in muscle tissues of these organisms. In the 1970s, biomagnifcation of DDT in these organisms resulted in fin erosion and other diseases in fish, and eggshell thinning and a subsequent decline in the population of California brown pelicans. Although fish tissue concentrations of DDT have declined since the 1970s, consumption of fish from the shelf area remains a problem (CRWQCB, 1997). The State of California Office of Environmental Health Hazard Assessment (OEHHA) website at http://www.oehha.ca.gov/fish/so_cal/socal061709.html provides updated information from June 2009 regarding a health advisory and safe eating guidelines for marine fish caught along the southern California coastline from Ventura Harbor to San Mateo Point (OEHHA website).

In addition to the risks posed to human and animals by contaminated sediment, the health of benthic community has been affected by discharge of solids from wastewater treatment plants. Assemblages of benthic fauna in sludge fields near the outfalls had relatively lower diversity compared with other areas in the Bay and were dominated by several opportunistic species. There has been substantial improvement of the benthic community from the conditions of the mid-1980s in the vicinity of the Hyperion 5-mile outfall since the elimination of solids discharge through this outfall (CRWQCB, 1997).

Pollutants of Concern

The pollutants of concern identified for the ocean area of Santa Monica Bay include TSS, DDT, PCBs, heavy metals (Pb, Cu, Zn, Ni, Cd, Cr, and Ag), PAHs, and trash and debris (marine debris). Although not identified as a pollutant of concern in this area, pathogens should continue to be monitored in popular nearshore recreational areas (CRWQCB, 1997).

Sources and Loadings

The region's two largest POTWs used to contribute significant mass loadings of TSS to areas adjacent to their outfalls. However, the annual mass emissions of TSS have decreased steadily, from 160,000 metric tons (combined) in the early 1980s to approximately 43,000 metric tons in 1994, due to advances in treatment technologies and land disposal of solids (CRWQCB, 1997).

The mass load of TSS estimated for storm water in 1994 was 54,000 metric tons. However, it is unknown to what extent the mass load in storm water should be considered a natural phenomenon (CRWQCB, 1997).

Since DDT and PCBs were banned in early 1970s, sediment resuspension of historical deposition has been and will continue to be the major loading source for these toxic chemicals, especially on and near the toxic "hot spot" on the Palos Verdes Shelf though the exact amount of DDT and PCB loading through resuspension and other process is not well understood. Concentrations of DDT and PCBs in surface sediments on the PV Shelf has shown a decrease as the heavily contaminated layer, produced principally in the 1950s to early 1970s, as these sediments have gradually been covered by less contaminated effluent and natural sediment. However, the concentrations of DDTs and PCBs in the surface sediments have remained relatively high since late 1980s in the area of the JWPCP outfall. This suggests that a portion of the "historical" DDT (largely as the metabolite p,p'-DDE) as well as PCBs are being brought to the sea floor surface by a combination of natural physical, chemical or biological processes that operate within or on the sediment. In 1992, the maximum concentration of buried DDTs exceeded 300 ppm near the outfall pipes while maximum buried PCBs exceeded 20 ppm. Sampling conducted in 2001 revealed the maximum concentration of buried DDE exceeded 200 ppm near the outfall pipes with similar maximum surface concentrations. Combined data from 1992 – 2004 showed surface concentrations of DDTs in the area of the outfalls up to 155 ppm while 1992 data showed PCBs up to 2 ppm in surface sediments. The subareas with surface concentration of DDTs greater than 1 ppm covered 11,000 acres in 1992 while during 2002/2004 they covered 9,660 acres, a decrease of 12%. Subareas with surface concentrations of DDTs greater than 10 ppm decreased 56% during the same time period, from 2,000 acres to 8,900 acres. The subareas with surface concentrations of PCBs greater than 0.3 ppm decreased 49% between 1992 and 2002/2004, going from 5,560 acres to 3,385 acres. Subareas with surface concentrations of PCBs greater than 1 ppm decreased 26% during the same time period, from 2,075 acres to 1,532 acres. The mass of DDT in surface sediments remaining in the most heavily contaminated subarea is estimated to be approximately 5,000 lbs; the PCBs mass in this are is estimated to be 188 lbs (CRWQCB, 1997; USEPA and CH2M Hill, 2009).

Current loading of DDT and PCBs from effluents of POTWs and storm water is considered minimal (below detection limits most of the time). Atmospheric deposition and advection (from LA Harbor which receives runoff from the Dominguez Channel drainage area, where many DDT-contaminated land sites are located) are considered potential sources of DDTs (CRWQCB, 1997).

As for TSS, the two POTWs used to be the largest source of loading for the six heavy metals of concern. However, mass emissions of most metal constituents have decreased in recent years due to better source control and an upgrading of treatment levels at the two POTWs (CRWQCB, 1997). As a result, stormwater runoff of trace metals from urban watersheds now produce a similar range of annual loads as those from point sources such as the large POTWs. However, when combined with dry estimates of pollutant loading, the total nonpoint source contribution from all watersheds in the greater Los Angeles area far exceeds that of the point sources (Stein, et al., 2007). In general, sediment concentrations of lead, copper, zinc, and cadmium are higher in areas influenced by POTW effluent, primarily due to historical discharges. There is also evidence of enrichment of these metals in nearshore areas impacted by storm water runoff. If the current trend in metal loading continues, the distribution of metal concentration in sediments may be different in the future (CRWQCB, 1997).

Sources of PAH loadings are more diverse. POTWs are a significant (but probably not the largest) source of PAHs to the Bay. A larger portion of PAHs likely originates from nonpoint sources such as storm water runoff and atmospheric deposition. A portion of loadings measured in storm water runoff may originate from indirect atmospheric deposition as well. PAHs are also an important component of oil and grease (CRWQCB, 1997).

Sources of marine debris include storm water runoff, beach litter, boating activities, illegal dumping, and occasionally, discharge from POTWs. Besides fragmentary information collected on beach litter and trash and debris carried by storm runoff, very little is known about the current loading and deposition of trash and debris in Santa Monica Bay (CRWQCB, 1997).

Water Quality Improvement Strategies

Progressive water quality improvement efforts over the last two decades have brought many significant improvements. There are many signs that the Bay has been recovering and no longer deserves its reputation as one of the most contaminated ocean areas in the nation. However, two of the major challenges remaining are how to continue the trend of pollutant loading reductions as projected population growth occurs in the region, and how to effectively remediate the historical deposition of DDT and PCBs in the Bay's sediment (CRWQCB, 1997).

With information provided by long-term, extensive compliance monitoring conducted by POTWs and industrial dischargers, the general environmental conditions of the Bay are relatively well-understood. However, the information is still limited; far more data have been gathered from soft and hard bottom benthic habitats where the POTW and industrial discharge outfalls are located, while much less is known about the conditions of habitats (primarily hard bottom and rocky intertidal) in other areas of the Bay where no direct discharges occur. On the other hand, mass loadings of pollutants from sources other than POTWs and direct industrial dischargers cannot be reliably made due to lack of monitoring data (CRWQCB, 1997).

Aimed at solving the identified problems, marine water quality improvement efforts should focus on the following areas:

- Continue to prevent and reduce mass loading of pollutants that accumulate in the Bay's sediments through completion of the treatment upgrades at POTWs and implementation of storm water runoff BMPs;

- Implement a mass emissions policy for pollutants of concern that accumulate in marine environment and integrate the approach into NPDES permits;

- Implement the identified preferred alternative for remediation of historic DDT/PCBs deposits in the Palos Verdes shelf's sediments; and

- Develop TMDLs for impairments

- Implement the Comprehensive Bight-wide monitoring program developed in 2007.

  The monitoring program is was developed to collect information on the relative loading, distribution, and impacts of pollutants of concern, which are crucial for determining the best pollutant management approach. Generally, the program focuses on ecosystem resources rather than on anthropogenic inputs and impacts and seeks to put together a picture of the overall conditions in the Bay. It lays out new monitoring designs for five major habitat types within the Bay. Each includes a core motivating question, a number of related objectives, specific monitoring approaches, indicators, and data products, and sampling designs detailing number and locations of stations, sampling frequency, and measurements to be collected. The program incorporates key monitoring efforts that extend from the outer Bay to the high tide line along the shore and is intended to complement other efforts, such as TMDLs, that link land and marine environments. Five major habitat (or ecosystem) types are covered in the Comprehensive Monitoring Program:

- Pelagic Ecosystem
- Soft Bottom Ecosystem
- Hard Bottom Ecosystem
- Rocky and Sandy Intertidal
- Wetlands (SMBRC website)

Watershed Restoration Plans in the WMA

Some items in this section may also function as assessment and improvement strategies which are discussed in the next section. Some of the more planning-oriented documents below eventually led to improvement strategies or set the stage for active implementation work. The emphasis is on plans which contain either a large water quality improvement/restoration component or some other actions which indirectly lead to water quality improvement; the list is not meant to be an exhaustive documentation of all planning documents.

- Santa Monica Mountains Comprehensive Planning Commission, 1979. Santa Monica Mountains Comprehensive Plan.

  The natural resource value of the Santa Monica Mountains was recognized as early as the 1930s. By 1972, the Ventura-Los Angeles Mountains and Coastal Study Commission recommended establishing a continuing planning and permit-issuing agency to assure environmentally sound use. Four years later, the Legislature passed AB 163 that would, in part, carry out that recommendation. The bill created the Santa Monica Mountains Comprehensive Planning Commission and empowered it to prepare "a comprehensive and specific plan which is capable of implementation, for the conservation and development of (the mountains) consistent with the preservation of the resource."

  The Preliminary Comprehensive Plan, consisting of the land use, conservation, recreation, transportation, scenic parkways and corridors, and public services and facilities elements, was adopted in July 1978. Following final adoption of the policy and economic elements of the plan, the Commission identified alternative implementation strategies and potential responsible implementation agencies in February 1979.

  In 1978, Congress created the Santa Monica Mountains National Recreation Area, in part implementing policies recommended in the Commission's Preliminary Report. The National Parks and Recreation Act of 1978 authorized the appropriation of $125 million for National Park Service land acquisition within the National Recreation Area, $500,000 for National Park Service park development, and $30 million in grants to the State of California for specific uses in the Santa Monica Mountains Zone. Furthermore, Congress recognized the Santa Monica Mountains Comprehensive Planning Commission as the planning entity for the Santa Monica Mountains Zone and required that the Commission identify agencies responsible for implementing the Comprehensive Plan.

  The Santa Monica Mountains Conservancy Act was enacted in 1979 by AB 1312 based on the recommendations of the Santa Monica Mountains Comprehensive Planning Commission. The Santa Monica Mountains Conservancy was established by the California State Legislature in 1980. For more information, see the Santa Monica Mountains Conservancy webpage http://www.smmc.ca.gov.

- Santa Monica Bay Restoration Project, 1995. The Bay Restoration Plan.
  http://santamonicabay.org/smbay/AboutUs/TheBayRestorationPlan/tabid/55/Default.aspx

The Bay Restoration Plan outlined actions to promote pollution prevention and source reduction, integrate pollution management, more effectively manage of storm water and urban runoff, cleanup contaminated sediments, address oil and hazardous materials spills, improve information about risks associated with seafood consumption and swimming in the Bay, and continue improvement of municipal wastewater discharges.

- Las Virgenes/Malibu/Conejo Council of Governments. 2001. Watershed Management Area Plan for the Malibu Creek Watershed. Prepared by PCR Services Corporation and WaterCycle LLC

  The goals of the Watershed Management Area Plan (WMAP) report are to establish a framework for sustainable watershed management and to recommend further actions to be carried out, in order to:

  - Identify and manage processes contributing to water quality degradation and water quantity problems;
  - Identify protection, conservation, enhancement, restoration, and retrofit opportunities that support biodiversity and improve water quality;
  - Develop long-term programs for evaluating natural resources, water quantity issues and water quality data collection and analysis; and
  - Restore natural processes with respect to the hydrological cycle, which can result in better overall water quality.

- Owens, Bradley. 2001. A Protection Revitalization Plan for Las Virgenes Creek. California State Polytechnic University, Pomona Graduate Program in Landscape Architecture.

  The purpose of this report was to provide a document with which to manage Las Virgenes Creek watershed with regard to biodiversity and human use, provide a tool on which to base grant requests for related projects, expand the existing educational base, and to provide a model from which to draw from in other similar geographic areas. It provided specific recommendations to improve water quality, increase habitat connectivity, and provide educational opportunities. A copy can be obtained at http://www.owenswatershedplanning.com/LV/.

- City of Calabasas, 2003. Las Virgenes, McCoy, and Dry Canyon Creeks Master Plan for Restoration, Phase I: Comprehensive Study. Prepared by EDAW, Inc.

  The overall objectives of the Clean Water Act 205(j) grant study were to: establish baseline environmental conditions; evaluate historical changes in the watershed; define opportunities and constraints for improving water quality (related both to Total Maximum Daily Loads and aquatic habitat); assess opportunities and constraints to restore creek and riparian habitat; and identify recreational and educational facilities and opportunities. The Phase I report can be downloaded at http://www.cityofcalabasas.com/environmental/water-resources.html

- Los Angeles County Department of Public Works, Watershed Management Division, 2004. Ballona Creek Watershed Management Master Plan. Prepared by EIP Associates.

  The Los Angeles County Department of Public Works was awarded a Proposition 13 Watershed Protection Grant by the State Water Resources Control Board to prepare a watershed plan for Ballona

Creek. The Ballona Creek Watershed Task Force met for about a year during Plan development and the final Plan was released in 2004.

http://www.ladpw.org/wmd/watershed/bc/bcmp/masterplan.cfm

- Santa Monica Bay Restoration Commission, 2004. State of the Bay. http://santamonicabay.org/smbay/Library/DocumentsReports/tabid/97/Default.aspx

  The 2004 State of the Bay report described the environmental health of the Bay and measured progress towards achieving the goals of the Bay Restoration Plan which outlines 74 priority actions that address critical environmental problems facing the Bay.

- City Of Calabasas, 2005. Las Virgenes, McCoy, and Dry Canyon Creeks Master Plan for Restoration, Phase II: Feasibility Study. Prepared by Willdan.

  In 2005 the City of Calabasas wanted to complete the next step toward implementing the projects identified in the Phase I study and investigate the cost and feasibility of implementing the projects. The Phase II study provides this information. It can be downloaded at http://www.cityofcalabasas.com/environmental/water-resources.html.

- California State Coastal Conservancy and California Department of Parks and Recreation, 2005. Malibu Lagoon Restoration and Enhancement Plan. Prepared by Moffatt & Nichol and Heal the Bay.

  The Malibu Lagoon Restoration and Enhancement Plan presents detailed information to implement and monitor the preferred restoration alternative, the Modified Restore and Enhance Alternative (Alternative 1.5), as specified in the Malibu Lagoon Feasibility Study Final Alternatives Analysis. Implementation details are provided in the form of plans for water management, habitat management, access, and monitoring to facilitate implementation of the monitoring program and subsequent environmental review and permitting. Alternative 1.5 includes relocating the existing parking lot to the northwest while installing BMPs to minimize or eliminate runoff, leaving the main channel essentially untouched, deepening and recontouring the channel on the east side In order to create a new avian island, and changing the layout of the west lagoon system of channels. The Plan may be downloaded at http://www.healthebay.org/assets/pdfdocs/mlhep/issues_mlhep_finalplan.pdf.

- Los Angeles County Department of Public Works, 2007. North Santa Monica Bay Watersheds Regional Watershed Implementation Plan, 3rd Draft. Prepared by CDM.

  There are three water quality regulations of concern in the mostly rural North Santa Monica Bay Watersheds area – NPDES permits, particularly the ones for municipal separate storm sewer systems (MS4); TMDLs; and AB 885 which will regulate on-site wastewater systems (septic systems). To address these regulations, municipalities and agencies within the NSMBW are developing a Regional Watershed Implementation Plan (RWIP). The goal of the NSMBW RWIP is to address watershed management principles through strategic implementation of best management practices (BMPs) to obtain optimal regional benefits in a cost-efficient manner.

The objectives of the RWIP are:

- To improve and maintain water quality within the NSMBW consistent with MS4 NPDES permits, TMDLs, and AB 885 regulations;
- To recommend a plan of action to address compliance with the MS4 NPDES permits, TMDLs, and AB 885 regulations;
- To compile and link all relevant existing plans and documents in the North Santa Monica Bay and address any information gaps among these documents;
- To integrate all existing and future TMDLs in the NSMBW into the RWIP; and
- To be a living document that is updated as the RWIP is implemented and as requirements in the NPDES permits, TMDL requirements, and AB 885 evolve.

- Santa Monica Bay Restoration Commission, 2008. Bay Restoration Plan 2008 Update. http://santamonicabay.org/smbay/AboutUs/TheBayRestorationPlan/tabid/55/Default.aspx

  The 2008 Update of the Bay Restoration Plan noted that significant progress had been made in improving water quality in the WMA. Major milestones accomplished included the upgrade to full secondary treatment of the two largest wastewater treatment facilities in the region; the development and implementation of TMDLs for waterbodies impaired by poor water quality; and adoption and implementation of the standard urban storm water mitigation plan under the municipal storm water permit. The report also noted that despite this progress, significant amounts of pollutants such as trash, pathogens, and heavy metals continue to reach receiving waters. New challenges include addressing the loading and impacts of nutrients and emerging contaminants.

- Santa Monica Bay Restoration Commission, 2009 draft. A Ballona Greenway Plan.

  The Greenway Plan was initiated by the Ballona Watershed Task Force and preliminary design work has been done. The outcome of this project will be final designs for portions of the Greenway including landscape guidelines for a Ballona-specific plant palette. This project has proceeded in close consultation with the MRCA and Baldwin Hills Conservancy on their pocket park and bike path beautification plans. The final plan will be a vision of how needs for flood management, water quality improvements, habitat, and recreational access might be accomplished. http://www.santamonicabay.org/smbay/Library/DocumentsReports/tabid/97/grm2id/405/Default.aspx

- Santa Monica Bay Restoration Commission, 2010. State of the Bay Report.

  The 2010 State of the Bay Report observed that the pollutants of greatest concern, due to their adverse or potentially adverse impacts on the Bay's beneficial uses, are pathogens, trash, metals, DDT, PCBs, and nutrients. Known impacts of these pollutants include health hazards for humans due to pathogens in the surf zone, aesthetic impacts of trash along the Bay's beaches and streams, and chemical contamination of local fish. The report described the reduction of pollutant loads from wastewater treatment facilities with the greater relative contribution of pollutants through the storm drain system with, in particular, trash, pathogens, metals, and nutrients washing off the urban landscape, into storm drains, and out to the Bay. In addition, historical deposits of toxic pollutants in

Bay sediments, such as DDT and PCBs, continue to be released into the environment through biological processes and resuspension, thus contaminating local marine life. Atmospheric deposition, boating activities, and septic systems are also known to contribute to contaminants to the Bay.

The development and adoption of TMDLs by the Regional Board which serve to assign load reductions needed to prevent impairment of beneficial uses, and their implementation largely through new control measures incorporated into existing NPDES permits was acknowledged. With regards to bacteria for example, the effort began with multiple low-flow diversions to the sanitary sewer at those drains with the most indicator bacteria exceedances. In some cases, year-round diversions have been necessary or installation of disinfection systems.

Impacts from invasive species is a growing concern in this WMA. The invasive plant, giant reed, and the invasive animals, crayfish and New Zealand mudsnails, in particular, are displacing native biota and degrading habitat. The report can be downloaded at http://santamonicabay.org/smbay/NewsEvents/StateoftheBay/StateoftheBayReport/tabid/176/Default.aspx.

Summaries of Key Assessment and Improvement Strategies Affecting Water Quality Issues and Beneficial Uses

Much has happened in the Region since the first edition report was produced. While the precursor of today's Santa Monica Bay Restoration Commission (the Santa Monica Bay Restoration Project) led much of the active restoration work in the WMA then, today a multitude of efforts are underway – some specific to the WMA (or subwatersheds) and some that affect the entire State. More information on these activities are presented elsewhere in the subwatershed sections as relevant; however, below is a listing of major efforts underway that may span several subwatersheds along with the lead agencies/partners. Virtually all of these efforts have engaged multiple stakeholders active on multiple fronts. Additionally, many of the projects/studies described below overlap or coordinate at some level with each other. Also, they may be part of watershed restoration strategies described in the previous section. For instance, a number of fairly watershed-specific activities are underway in the Ballona Creek Watershed including wetlands restoration, watershed plan implementation, and ecosystem restoration. But all of these watershed-specific activities occur within a larger regional context such as the Santa Monica Bay Restoration Commission's area of influence which is itself embedded within the Los Angeles Regional Water Quality Control Board's area which in turn is part of the area being addressed through the Southern California Wetlands Recovery Project. Along the way, there's a mix of jurisdictions (federal/state/local), a mix of regulatory authority (from no regulatory mechanisms in place to those mandated by regulation), and a mix of focus on land versus ocean.

Wetlands Recovery Project – multiple partners

The Southern California Wetlands Recovery Project (WRP) was formed in 1998 to develop and implement a regional strategy to increase the pace and effectiveness of wetlands recovery in the region. It is a partnership of public agencies working cooperatively to acquire, restore, and enhance coastal wetlands and watersheds between Point Conception and the International border with Mexico. Using a non-regulatory approach and an ecosystem perspective, the WRP works to identify wetland acquisition and restoration priorities, prepare plans for these priority sites, pool funds to undertake these projects, implement priority plans, and oversee post-project maintenance and monitoring.

The WRP Regional Strategy involves long-term goals and specific implementation strategies to guide the efforts of the WRP and its partners. The Regional Strategy was developed through a multi-year planning process involving all the WRP partners, including the Science Advisory Panel and County Task Forces, As such, the Strategy articulates a shared vision that each partner – at the federal, state, and local level – can turn to for guidance in how to manage staff effort, direct resources, and measure progress. Information on the WRP can be found at http://www.scwrp.org.

The WRP is headed by a Board of Governors (BOG) comprised of top officials from each of the participating agencies. The Wetlands Managers Group and the Public Advisory Committee serve as advisory groups to the Board. The Wetlands Managers Group consists of staff-level personnel from the participating agencies and is responsible for drafting the regional restoration plan and advising the Governing Board on regional acquisition, restoration, and enhancement priorities.

County Task Forces help solicit projects for consideration for WRP funding by the Managers Group and Board of Governors. The program provides funding for acquisition, restoration, and enhancement projects for coastal wetlands and watersheds in Southern California.

The WRP also has a Science Advisory Panel (SAP) and a wetlands ecologist who acts as liaison with the SAP. Recent activities have focused on coordination with a statewide effort to develop methods for rapid assessment of wetlands and development of a wetlands regional monitoring program. A paper on the habitat value of treatment wetlands has also been written and is available on the WRP's webpage at http://www.scwrp.org/documents/SAP/Treatment_wetlands/LitReviewWebCover.pdf. Additionally, the SAP developed the general framework for an Integrated Wetlands Regional Assessment Program (IWRAP) – a regional wetlands monitoring program - as well as detailed recommendations for estuarine and coastal lagoon monitoring.

Wetlands Mapping - multiple partners

Describing the extent and distribution of current-day wetlands, in the form of wetland and riparian inventories, is essential to long-term protection of wetland resources. The WRP, as well as other partners in coastal Northern and Central California, have embarked on detailed mapping of the State's coastal wetlands. These maps will serve as the foundation for the IWRAP within the WRP's area of influence. Work on these maps is expected to finish in 2010 and is being funded primarily through grant monies. More information, including downloads, can be found at the following website: http://www.socalwetlands.com/website/main.htm. In parallel with this work is a project which is digitizing coastal survey maps from the 1800s in order to document the extent and type of wetlands present in southern California before much of the major development took place in the area. In certain areas, such as Ballona, more intensive "historical ecology" work is underway and is expected to finish in 2010. In these areas, in addition to the digitized historic maps, other historical documents are researched to portray a more accurate and complete picture of an area's wetlands and events which affected them such as floods and droughts, as well as, narrative anecdotal information describing in the first person activities and events in the watershed. This historical information eventually will be available via a website for download.

Wetlands Policy – State

In April 2008, the State Water Resources Control Board (State Water Board) adopted Resolution No. 2008-0026. The resolution gave the Wetland Policy Development Team (staff from the State Water Board and the North Coast and San Francisco Bay Regional Water Quality Control Boards), specific directions on the process to follow as they developed a statewide policy to protect wetland and riparian areas (Policy). The Team's Charter states it will develop the Policy in three phases:

Phase 1 – establish a Policy to protect wetlands from dredge and fill activities. The Development Team is directed to develop and bring forward for State Water Board consideration: (a) a wetland definition that would reliably define the diverse array of California wetlands based on the U. S. Army Corps of Engineers' existing wetland delineation methods to the extent feasible, (b) a wetland regulatory mechanism based on the existing Federal Clean Water Act 404 (b)(1) guidelines that includes a watershed focus, and (c) an assessment method for collecting wetland data to monitor progress toward wetland protection and to evaluate program development.

Phase 2 – Amend the Policy to protect wetlands from all other activities potentially impacting water quality. The Development Team is directed to develop and bring forward for State Water Board consideration: (a) new and/or revised beneficial use definitions, (b) water quality objectives, and (c) a program of implementation to achieve the water quality objectives, as necessary, to protect wetland-related functions.

Phase 3 – Amend the Policy to protect surface waters from impacts that may result from riparian areas disturbances. The Development Team is directed to develop, and bring forward for State Water Board consideration: (a) new and/or revised beneficial use definitions, (b) water quality objectives, and (c) a program of implementation to achieve the water quality objectives, as necessary, to protect riparian area water quality related functions.

As of the date of this report, Phase 1 is underway and the Team has proposed a wetlands definition. More information may be found at
http://www.waterboards.ca.gov/water_issues/programs/cwa401/wrapp.shtml.

Once-through Cooling Water Policy – State

A draft policy, entitled Water Quality Control Policy on the Use of Coastal and Estuarine Waters for Power Plant Cooling has been developed by the State Water Resources Control Board and applies to the State's thermal power plants that currently withdraw water from the State's navigable waters using a single-pass system, also known as once-through cooling (OTC). Adoption of technology-based standards will address the adverse effects associated with cooling water withdrawals from the State's coastal and estuarine waters. The federal Clean Water Act addresses OTC's adverse impacts in Section 316(b), which mandates technology-based measures to minimize adverse environmental impacts from cooling water intake structures.

OTC can cause adverse impacts when aquatic organisms are trapped against a facility's intake screens (impinged) and cannot escape, or when they suffer injuries that increase mortality. Smaller organisms, such as larvae and eggs, can be drawn through a facility's entire cooling system (entrained) and subjected to rapid pressure changes, chemical treatment systems, and violent shearing forces, only to be discharged along with the now heated cooling water and other facility wastewaters. The State's active coastal power plants that use OTC maintain the capacity to withdraw more than 16 billion gallons of cooling water per day. Over the course of a year, billions of eggs and larvae are effectively removed from coastal waters, while millions of adult fish are lost due to impingement. These OTC systems, many of which have been in operation for 30 years or more, present a considerable and chronic stressor to the State's coastal aquatic ecosystems by reducing important fisheries and contributing to the overall degradation of the State's marine and estuarine environments.

The Policy adopts appropriate technology-based standards that will significantly reduce these adverse impacts and implements a statewide process by which this goal can be achieved without disrupting the critical needs of the State's electrical generation and transmission system. This approach further reduces the permitting burden on the Regional Water Boards by coordinating implementation at the state level.

More information concerning the Policy may be found at http://www.waterboards.ca.gov/water_issues/programs/npdes/cwa316.shtml.

Recycled Water Policy – State

The State Board's Recycled Water Policy was adopted on February 3, 2009, and became effective on May 14, 2009. The overarching goal of the policy is to increase the use of recycled water while protecting water quality. More specifically the Policy looks to:

- Increase the use of recycled water over 2002 levels by at least one million acre-feet per year (afy) by 2020 and by at least two million afy by 2030.
- Increase the use of stormwater over use in 2007 by at least 500,000 afy by 2020 and by at least one million afy by 2030.
- Increase the amount of water conserved in urban and industrial uses by comparison to 2007 by at least 20 percent by 2020.
- And, substitute as much recycled water for potable water as possible by 2030.

Additionally, it is the intent of the Policy that local water and wastewater entities, together with salt/nutrient contributing stakeholders, will fund locally driven and controlled collaborative processes open to all stakeholders to prepare salt/nutrient management plans for each groundwater basin/sub-basin in California. It is also the intent of the State Board that because stormwater is typically lower in nutrients and salts and can augment local water supplies, inclusion of a significant stormwater use and recharge component within the salt/nutrient management plans is critical to the long-term sustainable use of water in California. A copy of the policy may be downloaded at http://www.waterboards.ca.gov/water_issues/programs/water_recycling_policy/docs/recycledwaterpolicy_approved.pdf .

Proposed Regulations and Waiver For Onsite Wastewater Treatment Systems (OWTS) – State

The State Water Board proposes to adopt regulations and a statewide conditional waiver (waiver) that establish minimum requirements for the permitting, monitoring, and operation of OWTS, as required by AB 885. The waiver allows owners of OWTS to discharge wastewater without having to file a report of waste discharge (and obtain WDRs) with a Regional Water Board as long as the existing or new OWTS and its owner comply with the applicable minimum requirements set forth in the waiver. The regulations and waiver contain requirements that are substantially the same. On February 23, 2009, the State Board closed the public comment period for draft regulations regarding OWTS. During the comment period (Nov. 7, 2008 to Feb. 23, 2009), the State Board received more than 2,500 e-mail comments and hundreds of comment letters, and recorded many hours of oral comments from 12 public workshops held throughout the State. Board Staff will be recommending substantial changes based on all of the input from the public, will draft revised regulations based on the public comments received, will work with the agencies and groups identified in the enabling legislation (AB 885), and when a new set of draft regulations is written, will notice another public comment period so that all stakeholders have a chance to provide input. More information on the proposed regulations may be found at http://www.waterboards.ca.gov/water_issues/programs/septic_tanks/

Report on Discharges into State Water Quality Protection Areas - State

In the mid-1970's, thirty-four areas on the coast of California were designated as areas requiring protection by the State Water Resources Control Board, and were called Areas of Special Biological Significance (ASBS). As of January of 2003, these areas have been re-designated as State Water Quality Protection Areas (SWQPAs). The Public Resources Code states that point source waste and thermal discharges into SWQPAS are prohibited or limited by special conditions, and nonpoint sources discharging into SWQPAs must be controlled to the extent practicable.

Despite the designation of these areas for protection, little was known about the presence and types of discharges that occurred in these areas. The goal of the survey was to document the number and types of discharges into each of the thirty-four SWQPAs. Of relevance to this WMA is the Mugu Lagoon to Latigo Point SWQPA which runs along the northern end of the Santa Monica Bay coastline covering approximately 22.5 miles and is the largest of the SWQPAs adjacent to the mainland. The survey revealed 444 outlets and discharges, the most of all the SWQPAs. An outlet is defined as any naturally occurring water body that drains into or immediately adjacent to a SWQPA. This includes the following: perennial streams (or their estuaries), ephemeral streams, naturally occurring gullies in coastal bluffs and cliffs, and naturally occurring springs or seeps in wild areas (not associated with anthropogenic activities). Some of naturally occurring streams surveyed were modified with bridges, culverts or other road crossings, but the determination was made to still classify these as outlets and not discharges. It should be noted that many of the outlets, while naturally occurring, were known or suspected to be impacted from pollution sources upstream, and therefore may be contributors to pollution in the SWQPAs.

Storm water discharges that occupied what previously were natural drainage channels, but which are now heavily urbanized and modified to carry urban runoff, were not considered natural outlets and were instead labeled as "discharges"; 410 of the 444 total in the Mugu Lagoon to Latigo Point SWQPA were labeled as discharges rather than natural outlets. More information may be found at http://www.waterboards.ca.gov/water_issues/programs/ocean/asbs.shtml.

Santa Monica Mountains Steelhead Habitat Assessment Project, 2006 – multiple partners

Steelhead are migratory rainbow trout that are born in freshwater streams and spend a portion of their lives in the ocean before returning to freshwater to spawn. During the early 1900's steelhead were abundant in some coastal streams of the Santa Monica Mountains. Over the past century, human modification of riverine habitat greatly reduced steelhead populations in southern California and the National Marine Fisheries Service (NMFS) listed the southern steelhead Ecologically Significant Unit (ESU) as a federally endangered species in 1997. The NMFS estimates the southern steelhead population to be less than 1% of its historic population size (it has decreased from 50,000 prior to the 1950's to fewer than 500 today). The loss of freshwater habitat due to the construction of migration barriers such as road crossings, dams, and flood control structures presents the single greatest limiting factor for steelhead in the Santa Monica Mountains. Ultimately, NMFS seeks to recover the southern California steelhead population. The purpose of this 2006 assessment was to identify the best opportunities for restoring habitat to recover the Santa Monica Mountains population of steelhead. The project was funded by the SMBRC and the California Department of Fish and Game with in-kind services provided by multiple agencies and individuals.

There were two major goals of the assessment; one was identification and prioritization of the streams within the 23 watersheds of the Santa Monica Mountains that should be selected for steelhead restoration actions. Experts familiar with the region then selected thirteen focal watersheds based on hydrology, historic and current steelhead distribution, and best professional judgment. The second goal, within each focal watershed, was to recommend what specific actions could be implemented, where, and at what cost.

To evaluate the benefit of restoration actions, project objectives sought to determine:

- The amount of high quality steelhead habitat for spawning and rearing that currently exists;
- The amount of degraded steelhead habitat for spawning and rearing and the types of degradation; and
- The potential causes of degraded habitat quality.

In order for decision makers to achieve cost effective restoration projects, three prioritization analyses were developed. The results of applying these three evaluation analyses point to three general ranking categories, and thus three groups of prioritized watersheds on which to potentially focus prime steelhead restoration activities:

1. Top Priority: The Malibu, Topanga, and Arroyo Sequit watersheds were consistently identified as the highest priority watersheds. Of these, Arroyo Sequit is receiving the least amount of restoration attention or activity.

2. Middle Priority: The prioritization evaluations discovered four candidate watersheds (Zuma, Trancas, Big Sycamore, and Las Flores) where little prior or current steelhead restoration activity exists. Zuma and Trancas have significant restoration potential and many opportunities exist in these two watersheds.

3. Lowest Priority: Escondido, Lechuza, Corral, Encinal, and Little Sycamore were identified as the lowest priority watersheds. These streams, based on the amount and quality their habitat, small size of their watersheds, limited hydrologic capabilities, and apparent absence of steelhead lead this report to conclude higher priorities and better opportunities exist elsewhere.

Restoration Recommendations In addition to identifying Keystone barrier restoration activities, the assessment found a variety of opportunities to aid and possibly accelerate steelhead recovery in the region. The report recommends that the following actions be pursued:

- Existing steelhead restoration activity at Malibu and Topanga should be continued and strengthened.
- While concerted efforts are underway at Malibu and Topanga creeks, Arroyo Sequit also is being utilized by steelhead but no comprehensive watershed-based plan is in place. A comprehensive watershed plan should be developed and implemented.
- Existing steelhead restoration actions, albeit noteworthy, are fragmented and without a single entity to maximize effectiveness or public outreach opportunities. Support to enhance/coordinate the capacity of existing organizations is needed.
- A comprehensive steelhead monitoring program for the Santa Monica Mountains is essential to fill voids in steelhead biology. Life history and discernable population trends, as the result of current and future restoration actions, is needed.
- The agencies funding this report should sponsor and host within one year a conference gathering all interested parties, agencies, and municipalities to identify and select a firm set of projects from this report in a prioritized fashion so that efforts to restore steelhead and streams of the Santa Monica Mountains are done with the greatest biological and cost effectiveness possible.

Fish Passage Recommendations Restoring steelhead access to upstream habitat requires a bottom to top approach. Keystone barriers, which are the most downstream barrier blocking or significantly impeding upstream adult steelhead passage, were identified in focal watersheds. Providing effective upstream steelhead passage at Keystone barriers is an essential step to steelhead recovery within each watershed and the region.

Of the 110 steelhead migration barriers, 43% are natural. The majority (62%) of the 110 barriers are severe, 33% modest, and 3% of minor severity to steelhead upstream migration. Each of the 13 focal watersheds in the Santa Monica Mountains contained a least one Keystone barrier to adult steelhead spawning migration. If all barriers were remedied, over 29 miles of suitable steelhead stream habitat would become available. The cost estimates to take corrective actions at the individual Keystone barriers ranged from as little as $70,000 to as high as $40 million. In total the cumulative cost exceeds $70 million.

The full document may be downloaded at http://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=10485.

Steelhead/Rainbow Trout Resources South of the Golden Gate, California - Center for Ecosystem Management and Restoration

This report, with accompanying database, was released in 2008 and presents a distillation of the large amount of available information regarding steelhead/rainbow trout habitat. It includes information concerning presence/absence and other natural history and habitat features in specific streams necessary for an understanding of how steelhead resources may have changed over time. Information on both historical and current presence/absence of steelhead/rainbow trout is described in a narrative fashion and also presented in both tabular form and on maps which are available for download at http://www.cemar.org (CEMAR, 2008).

Integrated Resources Plan – City of Los Angeles

The Integrated Resources Plan (IRP) is a 2020 strategic facilities plan for the City of Los Angeles' wastewater, runoff, and recycled water programs. There are a number of features relevant to this WMA including onsite percolation of wet weather runoff at schools and government properties, and neighborhood-scale percolation at vacant lots. It also calls for continued implementation of water conservation programs, such as smart irrigation devices to reduce outdoor water use and urban runoff.

The implementation strategy for the IRP will be directed by certain "triggers" that include policy decisions regarding recycled water and groundwater replenishment, and regulatory decisions regarding POTW discharges to inland waters such as the Los Angeles River (no POTWs discharge to inland waters in this WMA within the City of Los Angeles).

Specific directions were given to City staff on the next studies and evaluations required for progress. The following provide direction to staff on immediate activities and actions for recycled water, water conservation, and runoff management, dependent on staff and funding availability.

Water Conservation

- Direct the City of Los Angeles Department of Water and Power (DWP) to continue conservation efforts, including programs to reduce outdoor usage, including using smart irrigation devices on City properties, schools and large developments (those with 50 dwelling units or 50,000 gross square feet or larger), and to increase incentives to residential properties.
- Direct DWP to work with Building and Safety in continued conservation efforts, including evaluating and considering new water conservation technologies, including no-flush urinal technology.
- Direct DWP to continue conservation efforts, including working with Building and Safety to evaluate and develop policy that requires developers to implement individual water meters for all new apartment buildings
- Direct DWP to continue conservation awareness efforts, including increasing education programs on the benefits of using climate-appropriate plants with an emphasis on California friendly plants for landscaping or landscaped areas and to develop a program of incentives for implementation.
- Direct Planning to consider the development of City Directive to require the use of California friendly plants in all City projects where feasible and not in conflict with other facilities usage.

Runoff Management – Wet Weather Runoff

- Direct Public Works to review SUSMP (Standard Urban Stormwater Management Plan) requirements to determine ways to require where feasible on-site infiltration and/or treat/reuse, rather than treat and discharge, including in-lieu fees for projects where infiltration is infeasible.
- Direct Building and Safety to evaluate and modify applicable codes to encourage all feasible Best Management Practices (BMPs) for maximizing on-site capture and retention and/or infiltration of stormwater instead of discharge to the street and storm drain, including porous pavement. (This is currently handled through variances). Direct Public Works and Department of Planning to evaluate the possibility of requiring porous pavements in all new public facilities larger greater than 1 acre. Program feasibility should consider slope and soil conditions.

- Direct Department of Planning to evaluate ordinances that would need to be changed to reduce the area on private properties that can be paved with non-permeable pavement.
- Direct Public Works to evaluate and implement integration of porous pavements into the sidewalks and street programs where feasible.
- Direct Public Works and DWP and Department of Recreation and Parks to prepare a concept report and determine the feasibility of developing a powerline easement demonstration project (for greening, public access, stormwater management, and groundwater replenishment).
- Direct Public Works and DWP to work with the Los Angeles Unified School District (LAUSD) to determine the feasibility of developing projects for both new schools and for retrofitted schools, as well as government/city-owned facilities with stormwater management BMPs. [Provide wet weather runoff storage (cisterns) to beneficially use wet weather runoff for irrigation. Also, schools and government properties to reduce paving and hardscape and add infiltration basins to allow percolation of wet weather runoff into the ground where feasible.]
- Direct Public Works and General Services and the Department of Transportation (DOT) to maximize unpaved open space in City-owned properties and parking medians through using all feasible BMPs and by removing all unnecessary pavement.
- Direct Public Works to include all feasible BMPs in the construction or reconstruction of highway medians under its jurisdiction.
- Direct Public Works to coordinate with the Million Trees LA team on identifying potential locations of tree plantings that would provide stormwater benefit, with consideration of slope and soil conditions .

Runoff Management - Dry Weather Runoff

- In the context of developing TMDL implementation plans, direct Public Works to consider diversion of dry weather runoff from Ballona Creek to constructed wetlands, wastewater system, or urban runoff plant for treatment and/or beneficial use. Coordinate with the Department of Recreation and Parks.
- In the context of developing TMDL implementation plans, direct Public Works to consider diversion of dry weather runoff from inland creeks and storm drains to wastewater system or constructed wetlands or treatment/retention/infiltration basins with consideration for slope and topography.

General

- Direct the Department of Planning to consider opportunities to incorporate IRP policy decisions in the General Plan, Community Plan, and Specific Plan updates or revisions.
- Direct Department of Recreation and Parks to coordinate with Public Works on including stormwater management BMPs in all new parks.
- Direct General Services in coordination with Planning and Public Works to evaluate feasibility of all City properties identified as surplus for potential development of multiple-benefit projects to improve stormwater management, water quality and groundwater recharge.

The IRP can be downloaded at http://www.lacitysan.org/irp/

TMDLs – Regional Board

Information is available at
http://www.waterboards.ca.gov/losangeles/water_issues/programs/tmdl/tmdl_list.shtml for

- Ballona Creek Trash TMDL, 2002 (and 2005 revision)
- Santa Monica Bay Beaches Wet Weather and Dry Weather Bacteria TMDLs, 2003
- Ballona Creek Metals TMDL, 2005
- Ballona Creek, Ballona Estuary, and Sepulveda Channel Bacteria TMDL, 2007
- Ballona Creek Estuary Toxic Pollutants, 2005
- Malibu Creek Bacteria TMDL, 2006
- Malibu Creek Watershed Nutrients TMDL, established by USEPA in 2003
- Marina del Rey Harbor Toxics TMDL, 2006
- Marina del Rey Back Basins Bacteria TMDL, 2004
- Santa Monica Bay Nearshore and Offshore Debris TMDL, 2010

Ocean Protection Council – State

The Ocean Protection Council (OPC) was created pursuant to the California Ocean Protection Act which was signed into law in 2004 by Governor Arnold Schwarzenegger.

The OPC is guided by principles included in Act:

- Recognizing the interconnectedness of the land and the sea, supporting sustainable uses of the coast, and ensuring the health of ecosystems
- Improving the protection, conservation, restoration, and management of coastal and ocean ecosystems through enhanced scientific understanding, including monitoring and data gathering
- Recognizing the "precautionary principle": where the possibility of serious harm exists, lack of scientific certainty should not preclude action to prevent the harm
- Identifying the most effective and efficient use of public funds by identifying funding gaps and creating new and innovative processes for achieving success
- Making aesthetic, educational, and recreational uses of the coast and ocean a priority
- Involving the public in all aspects of OPC process through public meetings, workshops, public conferences, and other symposia

The OPC is tasked with the following responsibilities:

- Coordinate activities of ocean-related state agencies to improve the effectiveness of state efforts to protect ocean resources within existing fiscal limitations
- Establish policies to coordinate the collection and sharing of scientific data related to coast and ocean resources between agencies
- Identify and recommend to the Legislature changes in law
- Identify and recommend changes in federal law and policy to the Governor and Legislature

The 2009-2011 priorities of the OPC are outlined in A Vision for Our Ocean and Coast: Five-Year Strategic Plan. For the upcoming years, more specific guidance is given in the 2009-2011 OPC priorities document. The priorities are focused around six areas of interest, including: governance, research and mapping, ocean and coastal water quality, physical processes and habitat structure, ocean and coastal ecosystems, and education and outreach. The OPC's website is http://www.opc.ca.gov/

Marine Life Protection Act – State

The Marine Life Protection Act (MLPA) Initiative is a public-private partnership designed to help the State of California implement the MLPA using the best readily available science, as well as the advice and assistance of scientists, resource managers, experts, stakeholders and members of the public. The MLPA requires the state to redesign existing state marine protected areas (MPAs), and to establish a cohesive network of MPAs to protect, among other things, marine life, habitats, ecosystems and natural heritage, as well as to improve recreational, educational and study opportunities provided by marine ecosystems.

Marine protected areas within the MLPA South Coast Study Region (Point Conception south to the California/Mexico border) will be evaluated and redesigned with input from a regional stakeholder group, a science advisory team, a blue ribbon task force, the California Department of Fish and Game (DFG), the California Department of Parks and Recreation, and other interested parties. An available document, the "Regional Profile of the MLPA South Coast Study Region", is intended to support the MPA planning process by providing background information and data on the biological, oceanographic, socioeconomic, and governance characteristics of the south coast study region. The regional profile has been reviewed and revised based on input from regional stakeholders. This profile will assist stakeholders and decision-makers in evaluating existing MPAs in the study region and developing alternative proposals for a network of MPAs which meet the goals of the MLPA and which form a component of the statewide MPA network. More information may be found at http://www.dfg.ca.gov/mlpa.

Integrated Regional Water Management Plan – Greater Los Angeles County

The Santa Monica Bay WMA falls within the Greater Los Angeles County Integrated Regional Water Management Plan (IRWMP) Region as well as within two of its subregions, North Santa Monica Bay and South Bay. Although originally envisioned as a mechanism to secure bond funds in the short-term, the Greater Los Angeles County IRWMP, as well as the many others around the State, are envisioned as providing the roadmap to improve water supplies, enhance water supply reliability, improve surface water quality, preserve flood protection, conserve habitat, and expand recreational access in the Region. The Plan is also intended to define a comprehensive vision for the Region which will generate local funding, position the Region for future state bonds, and create opportunities for federal funding. Details on the Plan and opportunities for stakeholder involvement can be found at http://www.lawaterplan.org

Green Solution Project, Phase II

Green Solution Project, Phase I, provided quantification and identification of urban lands within LA County that would be needed for conversion to pervious, multi-benefit projects (park, recreation, wetlands and natural lands) to help meet water quality improvement goals and regulatory requirements through the infiltration or treatment of stormwater before it reaches Santa Monica Bay. The study also identified publicly owned lands within the County to assess the extent to which these lands could be used for these projects. The products of Phase I include a series of GIS-based maps depicting publicly-owned parcels within the Santa Monica Bay watershed, along with their size and general land uses.

The Coastal Conservancy, through Community Conservancy International, is funding Phase II which is needed to refine parcel data for selected land use categories; analyze hydrology and other parcel attributes related to suitability for stormwater infiltration/treatment; develop a ranking matrix to screen and prioritize candidate parcels for water quality project implementation; and develop concept designs for five high-ranking priority parcels. More information can be found at http://www.ccint.org/greensolution.html.

Low Impact Development Ordinance – County of Los Angeles

Los Angeles County adopted Ordinance No. 2008-0063 in November 2008 which established low impact development standards for developments constructed after January 1, 2009. The standards are intended to mimic undeveloped stormwater and urban runoff rates and volumes in any storm event up to and including a 50-year storm, prevent pollutants of concern from leaving a development site as the result of storms, and minimize hydromodification impacts to natural drainage systems. To aid implementation of this ordinance, the County prepared a Low Impact Development Standards Manual. The ordinance is available at http://planning.lacounty.gov/view/green_building_program while the Development Standards Manual can be downloaded at http://planning.lacounty.gov/green.

Low Impact Development Ordinance – City of Los Angeles

In January 2010, he City of Los Angeles Board of Public Works approved a low impact development (LID) ordinance which will require 100% of runoff from a storm of ¾ inch magnitude be captured or reused at new homes, larger commercial developments, and some redevelopments. If these requirements are not met, developers will be required to pay a stormwater pollution fee that will be allocated to other public LID projects. To aid implementation of this ordinance, the City prepared a Development Best Management Practices Handbook. Information on the LID program can be found at http://www.lastormwater.org/Siteorg/program/LID/lidintro.htm.

Low Impact Development Ordinance – City of Santa Monica

The City of Santa Monica's Urban Runoff Pollution Cotnrol Control Ordinance requires that all new developments and substantial remodels prepare an Urban Runoff Mitigation Plan to ensure the site maximizes permeable surface area and minimizes the amount of runoff directed to impermeable areas. Runoff from a ¾ inch rain event must be treated or infiltrated. More information may be found at http://santamonica.org/Departments/OSE/Categories/Green_Building/Guidelines/Siting_and_Form/Runoff_Mitigation_Plan.aspx

Water Quality Compliance Master Plan for Urban Runoff - City of Los Angeles

This 2009 plan utilizes a strategy to build on ongoing successful initiatives and programs, identify common grounds (for benefits and funding), and seek new initiatives that will address complex problems. This approach will also promote water conservation and factor in objectives identified by other plans, including increased recreation opportunities and support for the greening of Los Angeles. It may be downloaded at http://www.lastormwater.org/Siteorg/program/masterplan.htm.

Summaries of Key Monitoring Programs and Large-scale Studies

Historic Statewide Monitoring Programs (CRWQCB, 1997)

The first edition of this State of the Watershed Report noted that there had been a considerable number of short- and long-term monitoring programs implemented in the WMA, particularly over the previous twenty years, that focused on urban runoff effects in general along the coastline and the fate of PCBs- and DDT-contaminated sediment on the Palos Verdes Shelf. The results of three statewide monitoring programs, State Mussel Watch (SMW), Toxic Substances Monitoring (TSM), and Bay Protection and Toxic Cleanup (BPTC), which included biological measurements, were summarized in an appendix of the first edition report. The TSM sampled fish for bioaccumulation of toxic pollutants, generally but not exclusively in fresh waters; the SMW Program sampled shellfish, generally in marine waters, for bioaccumulation; and the BPTC Program sampled sediments, generally in harbors and estuaries, for pollutants, toxicity, and the health of the benthic community. While the former two programs sampled from the early 1980s until the late 1990s, the BPTC Program operated from the early 1990s until the late 1990s.

The first edition report stated that the SMW Program had found that the open coastline of the Santa Monica Bay WMA was much cleaner than its enclosed waters (harbors and marinas, generally), at least for most substances that are both bioaccumulative and bioavailable to mussels either placed in a location or that naturally occur at a site. The pattern of accumulation for DDT and PCBs was different, however, and this may have represented the residual effects of past coastal discharges and historic sediment contamination reflected by the BPTC Program data. Fish bioaccumulation problems which might have human health implications were relatively minor in those fresh and estuarine waters sampled (except for concerns over mercury in Lake Sherwood fish which continue today) while the potential for aquatic life impacts existed in Marina del Rey Harbor and Ballona Creek (also concerns which continue today).

With regards to sediment contamination found through the BPTC Program, one group of chemicals sampled was polynuclear aromatic hydrocarbons (PAHs) which are found in oil products. The PAHs that are categorized as low molecular weight PAHs (LPAHs) are considered indicative of spills or recent releases of oil from natural seeps. High molecular weight PAHs (HPAHs) are indicative of hydrocarbon combustion such as would be found in runoff from streets or in marinas from boating activities. Grouped in that fashion, LPAHs and HPAHs can be roughly indicative of sources.

Sediments in the Ballona Creek estuary were more contaminated with PAHs than the other sites sampled in the WMA. Approximately 80-90% of the PAHs found at all of the sampled sites were HPAHs which are indicative of combustion.

Polychlorinated biphenyls (PCBs) may also be evaluated in a similar manner. PCBs are composed of mixtures of various congeners which differ mostly in the number of chlorine atoms they contain. The number of chlorine atoms determines the chemical and physical characteristics of the final PCB mixture. A higher number of chlorine atoms is associated with thicker, heavier PCBs while less chlorine atoms are associated with lighter PCBs. Heavier PCBs are also more injurious to animals and humans. The results of sediment analyses by the number of chlorine atoms gives a characteristic "fingerprint" which may reveal a common source. PCB congener data for Palos Verdes, Marina del Rey, and Ballona Creek were assessed and showed no clear indication of a common fingerprint among the three areas which could mean there is either no common source or no recent common source since PCBs do degrade over time.

With regards to concentrations of other organic chemicals in the sediments of the WMA, it was clear DDT was still being found at highly elevated levels in sediments off of the Palos Verdes Peninsula, almost certainly due to past discharges and dumping practices. Chlordane is a banned insecticide that was used to control ants and termites. It is highly persistent and was likely still being used in residential areas where individuals may have remaining stocks. This was reflected in the higher levels found in Ballona Creek.

Marina del Rey sediments contained the highest levels of metals overall with copper levels especially high compared to other embayments in the WMA. Ballona Creek contained very high levels of zinc and lead but not copper. These numbers were considered expected since copper was and continues to be used extensively in antifouling bottom paints which is likely used on the majority of boats moored in the marina. On the other hand, copper is not as large a component in urban or storm water runoff and thus should not be as high in Ballona Creek. However, at that time, lead and zinc were still commonly found in urban runoff although lead occurred in much lower concentrations since the advent of unleaded gasoline.

Sediments were also evaluated for toxicity. Survival of test organisms in Malibu Lagoon sediments was quite good. The average survival of organisms tested during four sampling runs spanning three years in the Palos Verdes area was also good. On the other hand, survival of test organisms in sediments from Marina del Rey and Ballona Creek was relatively poor.

Palos Verdes Shelf Studies and Planning for Cleanup - USEPA

Coastal Marine Fish Contaminants Survey

In 2007, the National Oceanographic and Atmospheric Administration (NOAA) and the USEPA released a report on the results of a 2002-2004 coastal marine fish contaminants survey. NOAA participated on behalf of the natural resources trustees which include NOAA, US Fish and Wildlife Service, National Park Service, California Department of Fish and Game, California State Lands Commission, and California Department of Parks and Recreation. The highest concentration of total DDT found in white croaker (a bottom-feeding fish with a high lipid content) in 2002 was almost 33,700 ppb at a sampling location near the west side of the JWPCP outfall. Total PCBs were found at 2,950 ppb at that location. Samples collected by the County Sanitation Districts of Los Angeles County in both 2002 and 2005 near the east side of outfall were an order of magnitude lower (NOAA and USEPA, 2007).

Palos Verdes Shelf Superfund Site Operable Unit 5 of the Montrose Chemical Corp. Final Feasibility Study

In 2009, USEPA released a feasibility study which describes the development, evaluation, and comparison of remedial action alternatives to manage the contaminated sediment at the Palos Verdes Shelf site (USEPA and CH2M Hill, 2009).

The report describes the results of the aforementioned 2002 – 2004 coastal marine fish contaminant survey and summarizes the results of sampling for DDT and PCBs in white croaker off the Palos Verdes Peninsula (including near the outfall) from 1999 through 2006. The data show a general decline in PCBs concentration and a more dramatic decline in DDT concentrations, particularly near the outfall. The report also compares total DDT and total PCBs concentration in pelagic fish (anchovy, mackerel, and sardine) and squid in the Southern California Bight in the early 1980s during various studies and during a 2003-2004 study conducted by SCCWRP. While there are differences in species and sampling locations, these studies show a general decline in both DDT and PCBs concentrations in the Bight over the twenty-year time period (USEPA and CH2M Hill, 2009).

Using recreational angler consumption rates developed during the1994 SMBRP Seafood Consumption Study, fish tissue concentrations found to be protective of human health were, for DDTs in fish fillet, 490 ppb and for PCBs in fish fillet, 80 ppb, based on 21.4 g/day consumption. This would result in an excess lifetime cancer risk of 1×10^{-5}. When consumption was based on 116 g/day, protective levels were at 400 ppb for DDTs and 70 ppb for PCBs with an excess lifetime cancer risk of 1×10^{-4}. Pelagic fish concentrations of PCBs and DDTs are generally below those levels while higher concentrations are associated with bottom-feeding fish, particularly, white croaker (USEPA and CH2M Hill, 2009).

The document reported on ecological risk to the fauna of the Palos Verdes Shelf area including effects on the benthic community, fish, and predators of fish through contaminated sediment. The evaluation found that the highest risks are in the vicinity of the JWPCP outfalls. Intermediate-risk areas are generally to the north and northwest of the outfalls. Low-risk areas occur south of the outfalls, in waters less than 30 m in depth, at the far northern areas of the Palos Verdes Shelf, and throughout the remainder of the Bight. Benthic invertebrates and local fish would be directly affected by contaminated sediment whereas predators of fish, such as birds, would be affected through food-chain transfer of the pollutants. Sediment concentrations of PCBs in the Palos Verdes Shelf area are below levels considered to be protective of benthic infauna and concentrations of DDTs are of concern only in the immediate area around the outfalls. Regarding risk to fish-eating birds and mammals, concentrations of DDTs continue to pose a risk while PCBs pose a much lower risk (USEPA and CH2M Hill, 2009).

The report also presents potential remediation goals for the protection of human and ecological health and presents remedial alternatives including dredging and capping of various amounts of contaminated sediment (USEPA and CH2M Hill, 2009).

USEPA announced their preferred alternative for remediating the Palos Verdes Shelf Superfund site in June 2009. Public meetings were held in June and comments were accepted into July. A news release on June 11, 2009, stated “The EPA's Preferred Alternative Plan is an interim remedy that proposes institutional controls, monitored natural recovery and a containment cap. On October 5, 2009, a news release issued by USEPA announced, in part "The U.S. Environmental Protection Agency has selected a cleanup strategy for the Palos Verdes Shelf Superfund Site, where a large area on the ocean floor off the Palos Verdes peninsula is contaminated with DDT and PCBs. The EPA will spend more than $50 million to cap the most contaminated sediment on the shelf, as well as continue the highly effective public outreach program to protect at-risk populations from consuming contaminated fish." More information on the Palos Verdes Shelf contamination issues and potential federal remediation actions can be found at http://www.epa.gov/region09/superfund/pvshelf.

Municipal Separate Storm Sewer System (MS4) Monitoring (Municipal Stormwater NPDES Permit) – MS4 permittees

The major objectives of the Monitoring Program outlined in the Municipal Stormwater Permit are to:

- Assess permit compliance,
- Measure and improve the effectiveness of the Stormwater Quality Management Plans,
- Assess the chemical, physical, and biological impacts of receiving waters resulting from urban runoff,
- Characterize stormwater discharges,
- Identify sources of pollutants,
- Assess the overall health and evaluate long-term trends in receiving water quality.

The required monitoring includes the following components:

- Core Monitoring Program: mass emission, water column toxicity, tributary, shoreline, and trash monitoring. Mass emission and toxicity monitoring conducted in the Santa Monica Bay WMA were located in Malibu and Ballona Creeks. The most recent tributary monitoring took place outside of the WMA. Trash monitoring occurred on Ballona Creek.
- Regional Monitoring Program: estuary sampling and bioassessment and the results of three special studies. Estuary sampling was completed in conjunction with Bight '03 work. Bioassessment sampling occurred at one site on Ballona Creek and at four sites tributary to the mainstem of Malibu Creek.

An Integrated Receiving Water Impacts Report was created in 2004-2005 that incorporates results, analysis, and progress of the Core and Regional Monitoring Programs. That report also looked at trends for the period 1994-2005. Annual Stormwater Monitoring Reports can be found on the Los Angeles County Department of Public Works website at http://dpw.lacounty.gov/wmd/NPDES/report_directory.cfm. Results for Ballona and Malibu Creeks sampling are summarized in those subwatershed sections. The reporting on the most recent shoreline monitoring results for bacterial indicators is briefly summarized here (LACDPW website).

Dry-weather Approximately, 2,400 samples were collected for bacteria indicator monitoring during the most recent sampling year at eighteen sites along Santa Monica Bay. Stations located at Santa Monica Canyon Storm Drain and Santa Monica Pier were the northern Bay sites with the highest geometric means for all bacterial indicators during dry-weather. Stations at Ashland and Windward had the lowest dry-weather geometric means in the northern Bay area for all indicators. Southern Bay stations located at the mouth of Ballona Creek and at Redondo Beach Pier had the highest bacterial densities for all indicator bacteria during dry-weather with the Ballona Creek site the highest (of all sites sampled) and the Redondo Beach Pier site the next highest. The higher geometric means were recorded for northern stations when compared to stations to the south; storm drains flow more consistently in the north (LACDPW website).

<u>Wet-weather</u> Annual geometric means for FY 2008-2009 revealed higher bacterial densities for all three fecal indicators during wet-weather when compared to dry-weather. Water quality will deteriorate during and immediately after a rainstorm, but generally return to previous levels within two to four days. Northern Bay stations exhibited higher mean values during wet-weather than those to the south for all fecal indicators. Northern stations with the highest wet-weather bacterial densities were stations at Surfrider Beach, Santa Monica Canyon Storm Drain, and Pico-Kenter Storm Drain. Although total coliform and E. coli means were comparable among these three stations, the Enterococcus mean value at the Santa Monica Canyon Storm Drain was almost twice as high as means at the other two sites. For stations to the south, wet-weather mean values at the Ballona Creek station were highest for all fecal indicators. Comparing all stations, north and south, the total coliform wet-weather mean was highest at Ballona Creek; E. coli was highest at Surfrider Beach, Santa Monica Canyon Storm Drain; and the enterococcus mean value was highest at Santa Monica Canyon Storm Drain (LACDPW website).

Surface Water Ambient Monitoring Program (SWAMP) – State

<u>Santa Monica Bay Streams Study</u> California's Surface Water Ambient Monitoring Program (SWAMP) is a comprehensive monitoring program designed to assess the quality of the beneficial uses of the State's water resources. In 2003-2004, the Santa Monica Bay WMA was sampled. The main goal of the sampling in the WMA was to obtain an overall view of the health of the watershed. Additionally, the monitoring plan was designed to provide information on potential reference sites in the watershed, and beneficial use attainment or non-attainment. Sixty-one sites distributed among the approximately 30 coastal sub-watersheds of the WMA were selected for sampling. In most cases, two stations were sampled in each sub-watershed. Sampling was completed at 59 sites; two sites were dry during sampling events. Sampling was conducted during the spring seasons of 2003 and 2004. Sampling at all stations included field measurements (conductivity, DO, pH, salinity, temperature, turbidity, and current speed), conventional water column chemistry (alkalinity, ammonia-N, boron, chloride, chlorophyll a, conductivity, dissolved oxygen, fluoride, hardness, nitrate-N, nitrite-N, orthophosphate, sulfate, total dissolved solids (TDS), temperature, total Kjeldahl nitrogen (TKN), total phosphorous (P), and turbidity) and bacteriology. Bioassessment was conducted at 39 sites and enzyme-linked immunosorbent assay (ELISA) analyses for chlorpyrifos and diazinon were conducted at 37 sites. During spring 2003, a subset of twenty stations was sampled for water column toxicity, dissolved metals, and organophosphate chemistry, and another subset of five stations was sampled for dissolved metals only. Additionally, two sites located near gas stations were tested for MTBE (SWRCB, 2005).

Some highlights of the findings were: DO was < 90% saturation at 34 sites during at least one sampling event while pH was > 8.5 at nine sites. Chloride exceeded USEPA criteria for protection of aquatic life at thirteen sites. Sulfate and TDS concentrations exceeded California Secondary MCLs (generally associated with taste) at most sites. E. coli and fecal coliform exceeded freshwater single sample limits at sites throughout the WMA. Metals were generally below criteria, objectives or action levels. With the exception of chorpyrifos and diazinon, no other organic compounds were detected. Acute and chronic water column toxicity were detected at six sites in the WMA. Five of these sites were each in the lower portion of their respective sub-watersheds (Lower Trancas Canyon, Lower Puerco Canyon, Lower Marie Canyon, Lower Ramirez Canyon, and Ballona Creek at Centinela) with one in the upper portion (Upper Escondido Canyon). Benthic IBI scores ranged from 4 to 78 and represented four condition categories ranging from Very Poor to Good. No scores were in the Very Good category. Very Poor scores were found at Lower Marie Canyon, Malibu Lagoon, Middle Santa Ynez Canyon, Lower Santa Monica Canyon, Lower Rustic Canyon, Ballona Creek at Centinela, and unnamed drainages into Upper and Lower Malaga Cove. The majority of Very Poor and Poor sites were located toward the southern end of Santa Monica Bay. On the other hand, sites rated as Good were mostly found more toward the northern end of Santa Monica Bay. Inconsistent patterns in physical habitat, water chemistry, and toxicity data prevent the conclusion of which factors contribute to degraded biotic condition. There were differences between upper and lower sites within individual watersheds. However, differences were not consistent among watersheds. In several watersheds, more water quality problems were indicated in the lower portions, while in other watersheds conditions were similar among sites. However, in some cases the upper and lower sites were located very close together and may not truly represent the upper and lower portions of the watershed (SWRCB, 2005).

The deterministic sampling design used in the study did not have the statistical power necessary for making conclusions with regard to the watershed as a whole (percentage of streams in the watershed or region that support beneficial uses, and how that percentage is changing over time). Additionally, the original study design called for locating two sites in a sub-watershed, one site in the upper watershed and the other in the lower watershed near its intersection with Pacific Coast Highway. However, due to the inability to find sites with running water and access, sites designated “Upper” were not always in the true upper portion of the watershed, and in some cases were located in close proximity to the “Lower” sites. Thus, not all paired Upper and Lower sites in this study represented a true comparison of the characteristics of the upper and lower portions of the watersheds. However, this may be virtually impossible due to the ephemeral nature of southern California streams (SWRCB, 2005).

<u>California Lakes Fish Contamination Study</u> The State Water Resources Control Board released a report entitled *Contaminants in Fish from California Lakes and Reservoirs*, that presents initial results from a statewide survey. The monitoring indicates that concentrations of mercury in indicator species are above human health thresholds across much of the state. PCBs were second to mercury in exceeding thresholds, although far fewer lakes reached concentrations that pose potential health concerns to consumers of fish from California lakes. Concentrations of other pollutants were generally low and infrequently exceeded thresholds (Davis, et al., 2009).

The report was a product of the Surface Water Ambient Monitoring Program and presented findings from the first year (2007) of a two-year study. The study marks the beginning of a new program that will track sport fish contamination in California lakes, rivers, streams, and coastal waters (Davis, et al., 2009).

The study sampled more than 200 of the most popular fishing lakes in the state and also conducted a random sampling of 50 of California's other 9,000 lakes to provide a statistical statewide assessment. The species selected for sampling are known to accumulate high concentrations and be good indicators of contamination problems, however, the study was not design to provide consumption advice which would require more detailed monitoring and a much higher level of funding (Davis, et al., 2009).

Fish tissue concentrations were evaluated using thresholds developed by the California Office of Environmental Health Hazard Assessment (OEHHA) for methylmercury, PCBs, dieldrin, DDTs, chlordanes, and selenium. Fish Contaminant Goals (FCGs) were developed; these are estimates of contaminant levels in fish that pose no significant health risk to individuals consuming sport fish at a standard consumption rate of eight ounces per week, prior to cooking. FCGs prevent consumers from being exposed to more than the daily reference dose for non-carcinogens or to a risk level greater than one additional cancer case in a population of 1,000,000 people consuming fish at the given consumption rate over a lifetime. FCGs are based solely on public health considerations relating to exposure to each individual contaminant, without regard to economic considerations, technical feasibility, or the counterbalancing benefits of fish consumption (Davis, et al., 2009).

OEHHA determined that there is a compelling body of evidence and general scientific consensus that eating fish at dietary levels that are easily achievable, but well above national average consumption rates, appears to promote significant health benefits, including decreased mortality, i.e., there are unique health benefits associated with fish consumption. Advisory tissue levels (ATLs) were developed as a result. ATLs were calculated using the same general formulas as those used to calculate FCGs, with some adjustments in order to incorporate the benefits of fish consumption. ATLs provide a number of recommended fish servings that correspond to the range of contaminant concentrations found in fish and are designed to prevent consumers from being exposed to more than the average daily reference dose for non-carcinogens or to a risk level greater than one additional cancer case in a population of 10,000 people consuming fish at the given consumption rate over a lifetime. The use of ATLs still confers no significant health risk to individuals consuming sport fish in the quantities shown over a lifetime, while encouraging consumption of fish that can be eaten in quantities likely to provide significant health benefits and discouraging consumption of fish that, because of contaminant concentrations, should not be eaten or cannot be recommended in amounts suggested for improving overall health (Davis, et al., 2009).

While the Lake Study report said that lakes were considered "clean" if all average pollutant concentrations in all species were below all OEHHA thresholds, for the purposes of this State of the Watershed Report, the data were assessed for the worst case scenario, i.e., the highest values found rather than average values for each of the chemicals of concern (mercury and PCBs, for the most part) (Davis, et al., 2009).

High mercury levels were found at two of the WMA's lakes, Ken Hahn Park Lake and Lake Sherwood. Atmospheric deposition is a possibility; the size of the lakes, how often maintenance dredging occurs, and the potential for fish to survive and be long-lived (thus bioaccumulating more pollutants) are all factors to be considered. The other chemical of concern in fish is total PCBs in a few lakes; however, PCBs levels in fish tissue in the WMA's lakes are much lower relative to mercury levels in fish when compared to the OEHHA thresholds (Davis, et al., 2009).

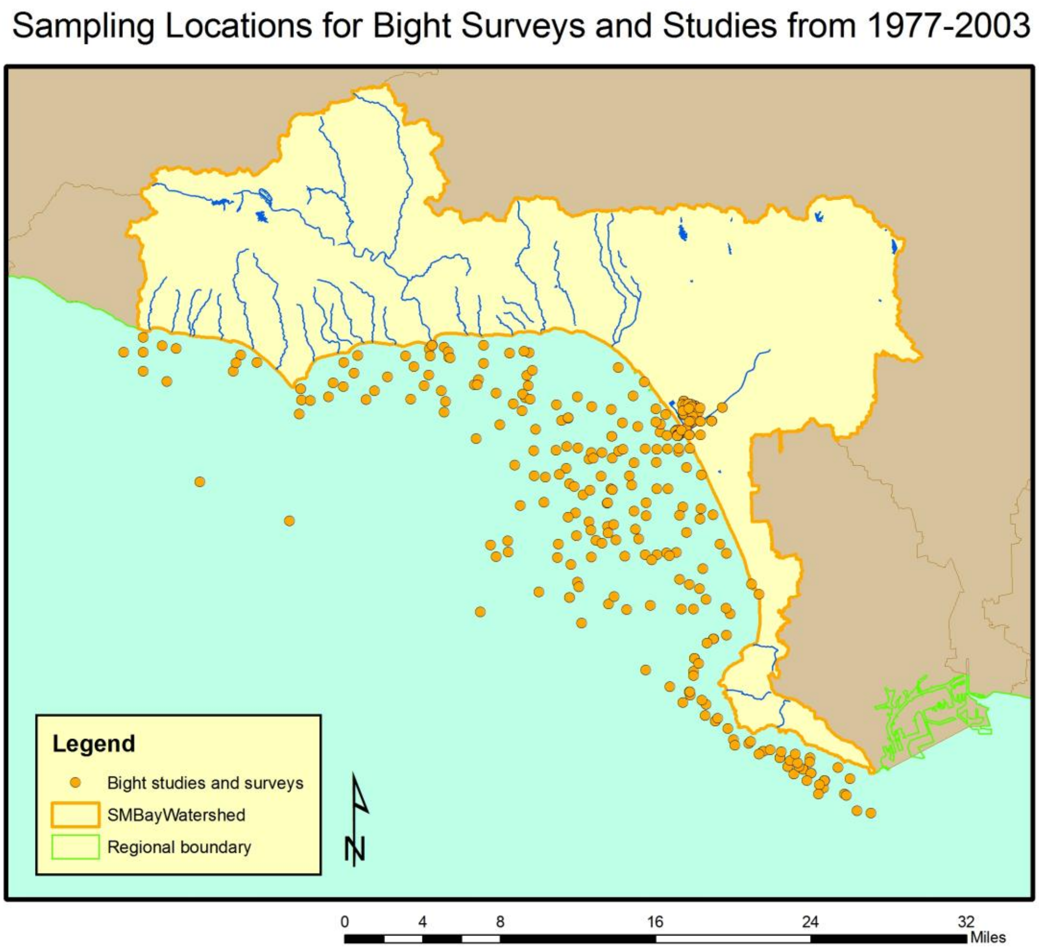
Southern California Bight-wide Monitoring (and Related Coordinated Monitoring) – multiple partners

A massive amount of data has been collected in the Southern California Bight and its adjacent coastal water bodies through large-scale monitoring programs which began in 1977 with a Bight-wide reference survey, coordinated by SCCWRP, which included sampling sediment chemistry and fish abundance and was followed by multiple additional surveys and studies which added to the large dataset of chemistry and biology. The 1977 survey was followed by more limited reference surveys in 1985 and 1990. In 1994, the Southern California Bight Pilot Project was undertaken. Additional biological and chemical measures were added with the Pilot Project and coordination of ocean monitoring required of major NPDES dischargers occurred in order to maximize use of resources among all the agencies already conducting monitoring. Bight-wide monitoring conducted in such a fashion became a regular occurrence beginning in 1998 and has followed every five years since. In 2003, additional focus was put on harbors while in 2008 estuaries were given additional attention. The effort continues to be led by SCCWRP in coordination with the other funding agencies and interested stakeholders. Datasets from these surveys and Bight projects are available for download from the SCCWRP website at http://www.sccwrp.org.

Much of the sediment data collected through the survey and Bight monitoring programs were subsequently collected and combined into a single Microsoft Access database along with sediment data from various special studies of Santa Monica Bay and the Palos Verdes Shelf. The consolidated sediment database can also be downloaded off the SCCWRP website.

The figure below shows the sampling locations from 1977-2003 associated with the many surveys and studies conducted in the Bight and its adjacent harbors with a sediment component.

Figure 22



The southern California Stormwater Monitoring Coalition (SMC) is also conducting large-scale, coordinated monitoring. The SMC was formed in 2000 by the Phase I municipal stormwater NPDES lead permittees and the NPDES regulatory agencies in southern California. Their research agenda, published in 2001, consisted of fifteen projects focusing on three major areas: 1) developing a regional monitoring infrastructure; 2) understanding stormwater runoff mechanisms and processes; and 3) assessing receiving water impacts. As an example, the SMC developed a regional coordinated freshwater stream bioassessment monitoring program which began in 2009. The invertebrates which are collected during bioassessment sampling integrate the effects of multiple stressors, including chemical pollutants and physical alterations in receiving waters and thus are of great use in assessment impacts to sensitive beneficial uses. This work has been closely coordinated with bioassessments being conducted in southern California by the state's Surface Water Ambient Monitoring Program (SMC website).

Summary/Conclusions

The years since the first edition report was published in 1997 have seen incredible changes in the ability to share information. Virtually no reference materials were available electronically at that time and data were maintained in completely separate locations, often in very different formats. Maps were often hand-drawn or copied from USGS quad sheets. Digitized geographic information was relatively rare and the programming to utilize such information required considerable training. The ability to access the Internet was in its infancy and the use of Email was just beginning. Although there is an enormous amount of electronic information available today, much remains in paper form that is of considerable value. This report focuses almost exclusively on electronically-available information. Considering the great interest by the public and elected officials that continues in Santa Monica Bay and its adjacent land areas, there was no shortage of useful, readily available electronic information.

These reference materials speak to a concerted and quite collaborative effort to repair the damaged resources of the WMA. While much voluntary work is occurring at a neighborhood/citizen group scale, agency-driven actions, often regulatory in nature, are setting the stage for most of the work through mandated results with strict timelines and requirements. The references also highlight the increasing contributions of stormwater and urban runoff, relative to more traditional point sources, to impairments of beneficial uses. It is clear urbanized areas produce more pollutants than areas that are mostly open space. It is also clear that runoff from large areas of impervious surfaces are detrimental to aquatic life.

Increasingly, agencies are turning to integrated approaches to resolve seemingly disparate problems such as lack of open space, degraded wetlands and riparian habitats, impaired water quality, contaminated sediments and marine life, and flooding. These integrated approaches often promote increased open space through policies such as low impact development, which in turn, reduce impervious surfaces, increase infiltration, reduce flooding, improve the water quality of runoff, and put less stress on the riparian areas and wetlands that remain. The Regional Board encourages these types of integrated water resources approaches to addressing the water quality issues in the Santa Monica Bay WMA. Targeted use of structural and non-structural BMPs along with public education and outreach in the short-term also continues to be an important part of the overall solution.

The ability to access data (as opposed to "information") electronically continues to be a problem. While the Water Boards are moving toward use of "regional data centers" with the assistance of the California Water Quality Monitoring Council (see http://www.waterboards.ca.gov/water_issues/programs/monitoring_council/index.shtml), in the meantime, obtaining raw data (particularly, historic data) is a sometimes tortuous process. Virtually every entity that conducts monitoring or special studies stores their data electronically yet formats are quite different and are at times completely incompatible. This will no doubt continue to be a problem until regional data centers are in full operation.

References

ABC Labs, 2005. The Marine Environment of Marina del Rey Harbor, 2004-2005. Aquatic Bioassay Consulting Labs. Prepared for the Los Angeles County Department of Beaches and Harbors.

AES Redondo Beach, 2009. AES Redondo Beach Generating Station 2008 Annual Report. AES Redondo Beach, LLC.

Allen, J., E. Jarvis, V. Raco-Rands, G. Lyon. J. Reyes, and D. Petschauer. 2008. Extent of Fishing and Fish Consumption By Fishers in Ventura and Los Angeles County Watersheds in 2005. Southern California Coastal Water Research Project (Technical Report #574). ftp://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/574_FishConsumpLA_Ventura2005.pdf

Bay, S., B. Jones, and K. Schiff. 1999. Study of the Impact of Stormwater Discharge on the Beneficial Uses of Santa Monica Bay. Southern California Coastal Water Research Project and USC Hancock Institute for Marine Studies. Prepared for Los Angeles County Department of Public Works. ftp://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/317_TR_summseagrant.pdf

Birosik, S. personal notes. Notes taken at Wetlands Recovery Project Santa Monica Mountains Forum, 2004, by Shirley Birosik.

Braa, B., J. Hall, C. Lian, and G. McCollum, 2001. Seeking Streams. Cal Poly Pomona 606 Studio Graduate Program.

Busse, L, J. Simpson, S Cooper, K. Kamer, and E. Stein, 2003. A Survey of Algae and Nutrients in the Malibu Creek Watershed. University of California, Santa Barbara and Southern California Coastal Water Research Project (Technical Report #412). Prepared for the California Regional Water Quality Control Board, Los Angeles Region. ftp://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/412_algae_nutrients.pdf

Caltrans, 2010. Stormwater Management Program, District 7 Work Plan Central Coast, Central Valley, Los Angeles, and Lahontan Regions Fiscal Year 2010-2011. California Department of Transportation. http://www.dot.ca.gov/hq/env/stormwater/annual_report/distwkplan/d07_ar_pub_dwp.pdf

CDFG website. Marine Life Protection Act California Department of Fish and Game. http://www.dfg.ca.gov/mlpa/

CEMA website. Spill reports. California Emergency Management Agency http://www.oes.ca.gov/operational/malhaz.nsf/$defaultView?OpenView&Start=1

CEMAR, 2008. Steelhead/Rainbow Trout Resources South of the Golden Gate, California. Center for Ecosystem Management and Restoration. http://www.cemar.org

City of Calabasas, 2008. Malibu Creek Watershed Monitoring Report. Prepared by Camp Dresser & McKee Inc. http://www.cityofcalabasas.com/environmental/water-resources.html

City of LA, 2009a. Scattergood Generating Station 2008 Annual Report. City of Los Angeles, Department of Water and Power.

City of LA, 2009b. Water Quality Compliance Master Plan for Urban Runoff. City of Los Angeles. http://www.lastormwater.org/Siteorg/program/masterplan.htm

City of LA, 2009c. Hyperion Treatment Plant 2008 Annual Report. City of Los Angeles, Department of Public Works, Bureau of Sanitation.

City of LA, 2006. Integrated Resources Plan. City of Los Angeles http://www.lacitysan.org/irp/

City of LA website #1. Stormwater Program. City of Los Angeles http://www.lastormwater.org

City of LA website #2. Storm Drain Low Flow Diversions. http://lastormwater.org/Siteorg/program/poll_abate/lowflowdiv/lfintro.htm

City of Santa Monica website. Urban Runoff Recycling Facility. http://www01.smgov.net/epwm/smurrf/smurrf.html

Coleman, D., C. MacRae and E. Stein, 2005. Effect of Increases in Peak Flows and Imperviousness on the morphology of Southern California Streams. A report to the Stormwater Monitoring Coalition. Southern California Coastal Water Research Project Report #450.

CRWQCB, 2007. Watershed Management Initiative Chapter. California Regional Water Quality Control Board-Los Angeles Region. Prepared by Shirley Birosik. http://www.waterboards.ca.gov/losangeles/water_issues/programs/regional_program/wmi/wmi_chapter_2007.pdf

CRWQCB, 1997. Santa Monica Bay: State of the Watershed, First Edition. California Regional Water Quality Control Board-Los Angeles Region. http://www.waterboards.ca.gov/losangeles/water_issues/programs/regional_program/wmi/ws_santamonica.shtml

CRWQCB, 1994. Water Quality Control Plan – Los Angeles Region (Basin Plan). California Regional Water Quality Control Board-Los Angeles Region. http://www.waterboards.ca.gov/losangeles/water_issues/programs/basin_plan/

CRWQCB website #1. Permit Search Tool http://www.waterboards.ca.gov/rwqcb4/board_decisions/adopted_orders/by_permits_tools.shtml

CRWQCB website #2. Resolution No. R4-2009-007 Amendment to the Water Quality Control Plan for the Coastal Watersheds of Ventura and Los Angeles Counties to Prohibit On-site Wastewater Disposal Systems in the Malibu Civic Center Area
http://www.waterboards.ca.gov/losangeles/press_room/announcements/Public-Hearing-Malibu/Malibu_Final_Resolution_Docs/3.%20RESOLUTION.pdf

CRWQCB website #3. Total Maximum Daily Loads.
http://www.waterboards.ca.gov/losangeles/water_issues/programs/tmdl/tmdl_list.shtml

CRWQCB website #4. Prohibition for Septic Systems and Onsite Wastewater Treatment Systems in the Malibu Civic Center, Tech Memo #4. California Regional Water Quality Control Board-Los Angeles Region.
http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/71_New/2010_0426/TechMemo4.pdf

CSDLAC, 2009. Joint Water Pollution Control Plant 2008 Annual Report. County Sanitation Districts of Los Angeles County.

Davis, J.A., et al., 2009. Contaminants in Fish From California Lakes and Reservoirs: Technical Report on Year One of a Two-Year Screening Study. Prepared for the State Water Resources Control Board, Surface Water Ambient Monitoring Program.
http://www.waterboards.ca.gov/water_issues/programs/swamp/lakes_study.shtml

DWR, 2004. Groundwater Bulletin 118, Malibu Valley Groundwater Basin. California Department of Water Resources.

El Segundo Power, 2009. El Segundo Generating Station 2008 Annual Report. El Segundo Power, LLC.

Klasing, S. and R. Brodberg. 2008. Development of Fish Contaminant Goals and Advisory Tissue Levels for Common Contaminants in California Sport Fish: Chlordane, DDTs, Dieldrin, Methylmercury, PCBs, Selenium, and Toxaphene. California Office of Environmental Health Hazard Assessment, Sacramento, CA. http://www.oehha.ca.gov/fish/gtlsv/index.html

LACDPW, 2005. Urban Water Management Plan - Waterworks District No. 29, Malibu and the Marina del Rey Water System. Los Angeles County Department of Public Works.
http://dpw.lacounty.gov/wwd/web/docs/reports/District%20No.%2029%20-%202005%20Urban%20Water%20Management%20Plan.pdf

LACDPW, 2004. Ballona Creek Watershed Management Master Plan. Los Angeles County Department of Public Works, Watershed Management Division. Prepared by EIP Associates.
http://www.ladpw.org/wmd/watershed/bc/bcmp/masterplan.cfm

LACDPW website. Los Angeles County Municipal Stormwater monitoring. Los Angeles County Department of Public Works http://dpw.lacounty.gov/wmd/NPDES/report_directory.cfm

LVMWD, 2011. Water Quality in the Malibu Creek Watershed, 1971 – 2010. Las Virgenes Municipal Water District.

LVMWD, 2009. Tapia 2008 Annual Report. Las Virgenes Municipal Water District.

Mundy, J. comm. ltr., 2010. JPA Comments on Draft Santa Monica Bay State of the Watershed Report. Las Virgenes – Triunfo Joint Powers Authority, John Mundy, General Manager, Las Virgenes Municipal Water District.

MWD, 2007. A Status Report on the Use of Groundwater in the Service Area of the Metropolitan Water District of Southern California, Report Number 1308. The Metropolitan Water District of Southern California. http://www.mwdh2o.com/mwdh2o/pages/yourwater/supply/groundwater/gwas.html#4

NOAA. 2009. Draft Southern California Steelhead Recovery Plan. National Oceanic and Atmospheric Administration. http://swr.nmfs.noaa.gov/recovery/So_Cal/Southern_California_Steelhead_Public_Draft_Recovery_Plan.pdf

NOAA and USEPA, 2007. 2002-2004 Southern California Coastal Marine Fish Contaminants Survey. National Oceanic and Atmospheric Administration and U.S. Environmental Protection Agency http://earth1.epa.gov/region9/superfund/pvshelf/pdf/montrose_report.pdf

NPS, 2005. Mediterranean Coast Network — Vital SIgns Monitoring Plan. Natural Resources Technical Report NPS/MEDN/NRTR—2006/001, National Park Service, Thousand Oaks, California. http://science.nature.nps.gov/im/units/medn/im/monitoring/mednmonitoring.cfm

OEHHA, 2009. 2009 Update of California Sport Fish Advisories March 2009. Office of Environmental Health Hazard Assessment. http://www.oehha.org/fish/pdf/DiscAdvyUpdates032309.pdf

OEHHA website. Coastal Fish Consumption Guidelines and Advisories. Office of Environmental Health Hazard Assessment. http://www.oehha.ca.gov/fish/so_cal/socal061709.html

Orton, R. comm. ltr., 2008. Response to Data Solicitation – Basin Plan Triennial Review, Malibu Creek Watershed and Upper Los Angeles River – Reach 6, Las Virgenes – Triunfo Joint Powers Authority, Dr. Randal Orton, Resource Conservation Manager, Las Virgenes Municipal Water District.

SCC, 2006. Draft Ballona Wetland Existing Conditions Report. State Coastal Conservancy. Prepared by Phillip Williams & Associates, Ltd. http://www.santamonicabay.org/smbay/ProgramsProjects/HabitatRestorationProject/BallonaWetlandsRestoration/BallonaDocuments/tabid/153/Default.aspx

SCC website. Coastal Conservancy staff recommendations for funding, April 2008. http://www.coastalconservancy.ca.gov/sccbb/0804bb/0804Board04_SMB_Restoration_Project.pdf

SCCWRP website #1. Epidemiological studies. Southern California Coastal Water Research Project http://www.sccwrp.org/view.php?id=49

SCCWRP website #2. Beach water quality. Southern California Coastal Water Research Project. http://www.sccwrp.org/ResearchAreas/BeachWaterQuality/MicrobialSourceTracking/UpperSantaMonicaBayMicrobialSourceTracking.aspx

SCWRP website #1. Regional Strategy. Southern California Wetlands Recovery Project. http://www.scwrp.org/regional_strategy.htm

SCWRP website #2. Workplan and list of completed projects. Southern California Wetlands Recovery Project. http://www.scwrp.org/work_plan.htm

SMBRC, 2010. State of the Bay. Santa Monica Bay Restoration Commission. http://santamonicabay.org/smbay/NewsEvents/StateoftheBay/StateoftheBayReport/tabid/176/Default.aspx

SMBRC, 2009. 2008 Bay Restoration Plan Update. Santa Monica Bay Restoration Commission. http://www.santamonicabay.org/smbay/LinkClick.aspx?link=BRP+1-8-09+Final+web.pdf&tabid=55

SMBRC, 2004. State of the Bay. Santa Monica Bay Restoration Commission. http://www.santamonicabay.org/smbay/Library/DocumentsReports/tabid/97/grm2id/14/Default.aspx

SMBRC, 1996. An Epidemiological Study of Possible Adverse Health Effects of Swimming in Santa Monica Bay. Santa Monica Bay Restoration Commission (as Santa Monica Bay Restoration Project). Prepared by Robert Haile, et al.

SMBRC website. Santa Monica Bay Restoration Commission. http://www.santamonicabay.org

SMBRF, 2009. SMBRF newsletter November 2009, Journal of the Center for Santa Monica Bay Studies – Urban Coast . Santa Monica Bay Restoration Foundation. http://www.santamonicabay.org/smbay/LinkClick.aspx?link=CSMBS/00_Cover_TOC.pdf&tabid=178

SMC website. Stormwater Monitoring Coalition http://www.socalsmc.org/

SMMC website. Santa Monica Mountains Conservancy. http://www.smmc.ca.gov

Stein, E. and V. Yoon , 2007. Assessment of Water Quality Concentrations and Loads from Natural Landscapes. Watershed Technical Report 500. Southern California Coastal Water Research Project. ftp://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/500_natural_loading.pdf

Stein, E., L. Tiefenthaler and K. Schiff , 2007. Sources, Patterns and Mechanisms of Storm Water Pollutant Loading from Watersheds and Land Uses of the Greater Los Angeles Area, California, USA. Watershed Technical Report 510. Southern California Coastal Water Research Project. ftp://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/510_pollutant_loading.pdf

Stein, Eric and Liesl Tiefenthaler. 2004. Characterization of Dry Weather Metals and Bacteria in Ballona Creek. Southern California Coastal Water Research Project. ftp://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/427_ballona_watershed.pdf

Stein, E., D. Ackerman, and K. Schiff, 2003. Watershed-based Sources of Contaminants to San Pedro Bay and Marina del Rey: Patterns and Trends. Southern California Coastal Water Research Project. Prepared for: The Los Angeles Contaminated Sediments Task Force. ftp://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/413_cstf_watershed.pdf

Stenstrom, Michael and Eric Strecker. 1993. Assessment of Storm Drain Sources of Contaminants to Santa Monica Bay. http://www.seas.ucla.edu/stenstro/r/r33

Stolzenbach, K., R. Lu, C. Xiong, S. Friedlander, R. Turco, K. Schiff, L. Tiefenthaler , 2001. Measuring and Modeling of Atmospheric Deposition on Santa Monica Bay and the Santa Monica Bay Watershed Technical Report 346. Southern California Coastal Water Research Project. ftp://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/346_smb_atmospheric_deposition.pdf

SWRCB, 2005. Water Quality in the Santa Monica Bay Watershed Under the Surface Water Ambient Monitoring Program (SWAMP) Fiscal Year 2001-2002. Prepared by the Marine Pollution Studies Laboratory and Moss Landing Marine Laboratories for SWAMP. http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/r4smb_swampfinalrpt.pdf

SWRCB website #1. 2006 Water Quality Assessment and 303(d) List of Impaired Waters. State Water Resources Control Board. http://www.waterboards.ca.gov/water_issues/programs/tmdl/303d_lists2006_epa.shtml

SWRCB website #2. Caltrans stormwater permit. State Water Resources Control Board. http://www.waterboards.ca.gov/water_issues/programs/stormwater/gen_caltrans.shtml

ftp://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/510_pollutant_loading.pdf

SWRCB website #3. Clean Beaches Initiative Project Summary. State Water Resources Control Board. http://www.swrcb.ca.gov/water_issues/programs/beaches/cbi_projects/docs/summaries/114_ashland_ave.pdf

USACE website. Ballona Creek Ecosystem Restoration Feasibility Study. U.S. Army Corps of Engineers http://www.spl.usace.army.mil/cms/index.php?option=com_content&task=view&id=64&Itemid=31

US Census Bureau website, http://quickfacts.census.gov/qfd/states/06/06037.html

USEPA and CH2M Hill, 2009. Palos Verdes Shelf Superfund Site Operable Unit 5 of the Montrose Chemical Corp. Superfund Site Final Feasibility Study. U.S. Environmental Protection Agency and CH2M Hill http://www.epa.gov/region09/superfund/pvshelf

USGS, 2009. Ground Water Quality Data in the Coastal Los Angeles Basin Study Unit, 2006: Results from the California GAMA Program. Prepared by U.S. Geological Survey in cooperation with the State Water Resources Control Board.
http://www.waterboards.ca.gov/water_issues/programs/gama/docs/dsr_coastallabasin.pdf