STATE WATER RESOURCES CONTROL BOARD
DIVISION OF WATER QUALITY
P.O. BOX 100
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INITIAL STUDY

1. Background

Project Title: Exception to the California Ocean Plan for the Hopkins Marine Station Discharge into the Pacific Grove Area of Special Biological Significance

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Note: This document was originally prepared by Constance Anderson and reviewed by Dominic Gregorio, Ocean Unit, on January 12, 2011. Based on Comments received this Initial Study has been revised on July 18, 2011. All revisions are shown in red font. No changes were made to the environmental checklist, the mandatory findings of significance, and the determination.

2. Introduction

The Hopkins Marine Station (HMS) is a unit of Stanford University organized within the Department of Biology in the School of Humanities and Sciences. The Station was founded in 1892, at the time that the University itself was established. HMS is the oldest marine station on the United States Pacific Coast and has been at its present location on China Point since 1918.

The State Water Resources Control Board (State Water Board), under Resolution No. 74-28, designated certain Areas of Special Biological Significance (ASBS) in the adoption of water quality control plans for the control of wastes discharged to ocean waters. To date, thirty-four coastal and offshore island sites have been designated ASBS. Among the ASBS designated was the Pacific Grove ASBS.

Since 1983, the California Ocean Plan (Ocean Plan) has prohibited waste discharges to ASBS (State Water Board 1983). Similar to previous versions of the Ocean Plan, the 2009 Ocean Plan (State Water Board 2009) states: "Waste shall not be discharged to areas designated as being of special biological significance. Discharges shall be located a sufficient distance from such designated areas to assure maintenance of natural water quality conditions in these areas."

The Pacific Grove ASBS was designated for the following reasons: (1) it has a diversity of habitat and biological assemblages; (2) it has dense beds of giant kelp *Macrocystis pyrifera*; (3) surf grass dominates large areas; (4) endangered sea otters forage in this area (State Water Board 1979).

Assembly Bill 2800 (Chapter 385, Statutes of 2000), the Marine Managed Areas Improvement Act, was approved by the Governor on September 8, 2000. This law added sections to the Public Resources Code (PRC) that are relevant to ASBS. Section 36700(f) of the PRC defines a State Water Quality Protection Area (SWQPA) as "a nonterrestrial marine or estuarine area designated to protect marine species or biological communities from an undesirable alteration in natural water quality, including, but not limited to, areas of special biological significance that have been designated by the State Water Board through its water quality control planning process." Section 36710 (f) of the PRC stated: "In a state water quality protection area, point source waste and thermal discharges shall be prohibited or limited by special conditions. Nonpoint source pollution shall be controlled to the extent practicable. No other use is restricted." The classification of ASBS as SWQPAs went into effect on January 1, 2003 (without Board action) pursuant to Section 36750 of the PRC.

Senate Bill 512 (Chapter 854, Statutes of 2004) amended the marine managed areas portion of the PRC, effective January 1, 2005, to clarify that ASBS are a subset of SWQPAs and require special protection as determined by the State Water Board pursuant to the California Ocean Plan and the California Thermal Plan. Specifically, SB 512 amended the PRC section 36700 (f) definition of state water quality protection area to add the following: "'Areas of special biological significance' are a subset of state water quality protection areas, and require special protection as determined by the State Water Board pursuant to the California Ocean Plan adopted and reviewed pursuant to Article 4 (commencing with Section 13160) of Chapter 3 of Division 7 of the Water Code and pursuant to the Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California (California Thermal Plan) adopted by the State Board."

Section 36710(f) of the PRC was also amended as follows: "In a State Water Quality Protection Area, waste discharges shall be prohibited or limited by the imposition of special conditions in accordance with the Porter-Cologne Water Quality Control Act (Division 7 (commencing with Section 13000) of the Water Code) and implementing regulations, including, but not limited to, the California Ocean Plan adopted and reviewed pursuant to Article 4 (commencing with Section 13160) of Chapter 3 of Division 7 of the Water Code and the Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of

California (California Thermal Plan) adopted by the state board. No other use is restricted." This language replaced the prior wording stating that point sources into ASBS must be prohibited or limited by special conditions, and that nonpoint sources must be controlled to the extent practicable. In other words, the absolute discharge prohibition in the Ocean Plan stands, unless of course an exception is granted. The classification of ASBS as a subset of SWQPAs does not change the ASBS designated use for these areas. Practically speaking, this means that waste discharges to ASBS are prohibited under the Ocean Plan and Thermal Plan unless an exception is granted. The terms and conditions in the mitigated negative declaration and in this initial study are special protections recommended by staff for the Pacific Grove ASBS, and constitute the special conditions referred to in Section 36710(f) of the PRC.

On October 18, 2004, the State Water Board notified HMS to cease storm water and nonpoint source waste discharges into an ASBS or to request an exception under the Ocean Plan. On November 30, 2004, HMS responded with a request for an exception to the Ocean Plan. Subsequently, the State Water Board provided general instructions for exception application packages via its Web site. On February 15, 2006, the State Water Board sent a letter to the HMS providing specific instructions and deadlines for submission of the application packages.

The State Water Board then received an application for an individual exception to the Ocean Plan prohibition against waste discharges to ASBS from the responsible party dated August 31st, 2006.

Section III (I)(1) of the 2009 Ocean Plan states: “The State Board may, in compliance with the California Environmental Quality Act, subsequent to a public hearing, and with the concurrence of the U.S. Environmental Protection Agency, grant exceptions where the Board determines: a. The exception will not compromise protection of ocean waters for beneficial uses, and, b. The public interest will be served.”

3. Project Description

HMS seeks an exception from the Ocean Plan’s prohibition on discharges into ASBS. The exception with conditions, if approved, would allow their continued waste seawater effluent and storm water discharge into the Pacific Grove ASBS. This would provide additional protections for beneficial uses that are not currently provided.

4. Environmental Setting

4.1 Pacific Grove ASBS General Overview

The Pacific Grove ASBS is oriented in a northwest-southeast direction, adjacent to the town of Pacific Grove in Monterey County. The official boundary description as stated in the State Water Board publication Areas of Special Biological Significance (1976) is as follows:

Ocean areas within the following boundaries as they existed April 1, 1963: Beginning at the point of intersection of the southeasterly corporate limit line of the City of Pacific Grove produced, and the line of mean high tide of the Bay of Monterey; thence northwesterly along said line of mean high tide to the intersection with the westerly corporate limit line of said City (Asilomar Avenue produced); then north 19° 22' east along said westerly corporate limit line produced, to the point in the Bay of Monterey where the depth of water in said bay is sixty (60) feet measured from the level of mean low tide; thence southeasterly along the line in said bay which line is at a constant depth of sixty (60) feet measured from the level of mean low tide, to the intersection with the southeasterly corporate limit line of said city produced; thence south 58° 58' west along said southeasterly corporate limit line produced, to the point of beginning (State Water Board 1979).

4.2 ASBS Setting

The location of the ASBS at the outer, southernmost extreme of Monterey Bay results in oceanographic and biological features that resemble those of the open ocean. The ASBS is relatively close to the Monterey Submarine Canyon and may be affected by canyon as well as coastal upwelling. The oceanographic seasons in the ASBS, particularly in the western portion, generally correspond with those offshore. Currents in the ASBS are weak, highly variable, and largely influenced by the wind. There is some evidence of a clockwise gyre, or predominantly onshore water movement, during the upwelling period. Because the ASBS is in close proximity to upwelling activity, is shallow, and adjacent to no major drainages, the following conditions exist: (1) surface temperatures are low; (2) thermoclines are unstable and poorly developed; (3) salinity is high and does not fluctuate radically; (4) dissolved oxygen is relatively low; and (5) nutrient levels vary spatially and temporally. The narrowness of the intertidal zone in the eastern portion of the ASBS appears to limit species diversity and abundance; both of the latter features increase to the west as the intertidal zone widens. The seawall adjacent to the ASBS is important in mitigating cliff erosion and channeling and controlling access to the intertidal zone (State Water Board 1979).

4.2.1 Hopkins Marine Station

HMS is located on the waterfront at the northwest end of Cannery Row on the boundary between the cities of Monterey and Pacific Grove.

4.3 ASBS Physical Description

The coastline becomes more exposed to coastal waters as it proceeds from east to west along the ASBS. Point Pinos, only 0.3 miles (0.5 km) west of the ASBS, marks the southern end of Monterey Bay. This long, low-relief granite point continues sub-tidally as a shallow rocky reef, which is an extreme navigational hazard. Both the point and the reef offer considerable protection to the western half of the ASBS, which would otherwise be completely exposed to the open ocean (State Water Board 1979).

4.3.1 Location and Size

The Pacific Grove ASBS is located at the southwest corner of Monterey Bay. It is adjacent to the town of Pacific Grove in Monterey County. The western portion of the ASBS includes part of the Pacific Grove Marine Gardens State Marine Conservation Area and the eastern portion of the ASBS is approximately co-located with the Lovers Point State Marine Reserve. The Edward F. Ricketts State Marine Conservation Area is located adjacent to and southeast of the ASBS, and the Asilomar State Marine Reserve is located adjacent to and west of the ASBS. The length of the coastline adjacent to the ASBS is 3.3 miles (5.3 km). The seaward boundary of the ASBS is an average of 0.43 miles (0.69 km) offshore. The surface area of the ASBS is approximately 680 acres (275 hectares). The western seaward boundary of the ASBS is at 36°38’36” N latitude, 121°55’42” W longitude and is a seaward extension of Asilomar Avenue. The eastern seaward boundary is at 36°37’24” N latitude, 121°53’54” W longitude and is a seaward extension of Eardley Avenue (State Water Board 1979).

4.4 Climate

The ASBS has a Mediterranean climate. Upwelling activity encourages a high incidence of fog, which in turn moderates air temperature (State Water Board 1979). The ASBS lies within the latitudinal range dominated by the Pacific high pressure cell, a clockwise-moving gyre with its center at about 40°N latitude. The proximity of this high pressure cell to the California coast is responsible for large-scale weather patterns within the ASBS.

Rainfall is moderate within the ASBS and highly seasonal. The persistence of the Pacific High almost totally excludes rainfall during the summer. The rainy season begins whenever the Pacific High is dislodged; this can occur as early as September, or as late as January. The length of the rainy season is also highly variable, such that March and April can experience the heaviest rains, or no rain at all.

Wind direction varies seasonally with the location of the Pacific High pressure cell. When this cell is centered over the North Pacific, generally between April and September, the coast catches the eastern edge of the gyre, and prevailing winds are from the northwest. In Monterey, prevailing winds are from the north or northwest over 58% of the time in the spring and summer. The strongest northwest winds usually occur in March and April. During the winter, the Pacific High is frequently dislodged by low pressure systems, in which atmospheric rotation is counter clockwise. Thus, winds accompanying such storm fronts will be from the south, southwest or southeast, depending upon the direction of the storm’s approach. Northerly winds occur as the storm front passes eastward, and represent the western side of the counterclockwise moving gyre. Prevailing winds are still from the northwest, north-northwest or north more than 47% of the time, but are generally weaker than in spring and summer.

Air temperatures in the ASBS are moderate and show little diurnal or seasonal variation. The average annual maximum temperature is 71.1 ºF (21.7°C); the average annual minimum temperature is 48.6°F (9.2°C). The proximity of both the bay and the ocean serves to moderate fluctuations in nearby land temperatures. The afternoon sea breeze keeps maximum temperatures down, whereas the evening fog traps heat radiated off the land and prevents early morning temperatures from dropping further. Fog is a characteristic feature of Pacific Grove weather, particularly in the late spring and summer. During this period, a low-lying fog bank generally persists in the area with only short afternoon breaks. Fog is most prevalent in July, August, and September. Fog is a highly localized phenomenon. Its occurrence is related to that of upwelling, which creates a maximum range between air temperatures over land and water. Fog formation is least common during the fall, when warmer oceanic water invades nearshore areas (State Water Board 1979).

4.5 Geological Setting

4.5.1 Above Shoreline Land Mass

The ASBS is located at the northern end of the Santa Lucia Mountains, where these mountains descend beneath Monterey Bay. The geology of the shoreline and nearshore waters of the ASBS is relatively simple, consisting only of Santa Lucia granodiorite. The rock is highly fractured and, therefore, weathers easily to sand size particles. The rock mass is cut by dikes, which are somewhat more resistant to weathering than the granodiorite. The rocks are extensively jointed in several directions; the most persistent being parallel to the shoreline; jointing frequently occurs perpendicular to this, thus producing a blocky pattern in the exposed outcrops best seen at Lucas Point and Otter Point. The sandy beaches within and adjacent to the ASBS are derived entirely from the granodiorite. Arnal et al (1973) noted that Monterey Bay is a closed system with no sediment being transported into or out of the bay to the north and south. Also, the shoreline at Pacific Grove is situated such that longshore transport into the area from south bay beaches is highly unlikely (State Water Board 1979).

4.5.2 Submarine Topography

The ASBS is located in Monterey Bay, a wide-mouthed, deep bay which is bisected by an extensive submarine canyon. The canyon, as delineated by the 100-fathom curve, occupies 19% of the Bay’s area. It drops off most steeply near shore and is 100 fathoms deep only 1½ miles (2.4 km) offshore. At the mouth of the Bay, the canyon is about 450 fathoms deep and 5 miles (8.0 km) wide (State Water Board 1979). The canyon is aligned in a northeast-southwest direction, so at the mouth of the Bay the canyon is much closer to the southern headlands (4.1 miles, 6.5 km) than it is to Santa Cruz, at the north end of the bay. The south canyon wall is also steeper, dropping from 100 to 900 fathoms in 1½ miles (2.4 km) off Point Pinos (State Water Board 1979). The ASBS lies within the southern “shallows” of the bay, a water area enclosed by the Monterey Peninsula on the west side. Within the ASBS, depth contours are more compressed than in the rest of the southern shallows. The 40 fathom curve is 1 mile (1.6 km) offshore at Pacific Grove, but 3 miles (4.8 km) offshore at Monterey (State Water Board 1979). The subtidal topography of the ASBS consists of shallow water reefs, interspersed with fields of coarse-grained sand. Kelp beds generally mark the location of reefs during the summer. There are also numerous shallow submerged rocks in the ASBS near Point Pinos, Lucas Point (Aumentos Rock), Lovers Point, and Point Cabrillo (State Water Board 1979).

4.5.3 Substrate for Marine Life

The subtidal topography of the ASBS consists of shallow water reefs, interspersed with fields of coarse-grained sand. Kelp beds generally mark the location of reefs during the summer. There are also numerous shallow submerged rocks in the ASBS near Point Pinos, Lucas Point (Aumentos Rock), Lovers Point, and Point Cabrillo (State Water Board 1979).

4.6 Oceanographic Conditions and Marine Water Quality

4.6.1 Currents

Winds, bottom topography, tidal cycles, and the proximity of the open coast influence currents within the ASBS. Current patterns are also influenced by prevailing offshore currents including the California Current and the Davidson Current. As the California Current travels south along the coast, surface waters are driven offshore. This causes upwelling of deeper waters along the coast (State Water Board 1979).

Currents within the ASBS are weak and variable. Because this is a nearshore area, winds, bottom topography and the tidal cycle exert considerable influence on the speed and direction of currents at any particular time. However, the ASBS is also located in close proximity to the open coast, and current patterns are also influenced by prevailing offshore currents. The southward flowing California Current predominates in offshore surface waters between about February and October. This current is the eastern leg of the massive, clockwise-moving North Pacific Gyre; consequently, it brings waters of more northern origin to the central California coast. The influence of the California Current on circulation patterns in the bay depends largely on its speed, which varies seasonally. When it first appears in surface waters, in February, the California Current has an average speed of about .04 knots. Current speed increases rapidly to 0.21 knots in March, and reaches a maximum of 0.28 knots in July. Subsequently, the speed decreases to about 0.07 knots in September and October.

The seasonal presence of the California Current corresponds with that of the Pacific high pressure cell, which is responsible for prevailing northwest winds. As the California Current travels south along the coast, surface waters are driven to the right, or offshore, by the combination of northwest winds and the Coriolis force. Upwelling of deeper waters occurs along the coast, causing this oceanographic season to be termed the upwelling period. The closest area of coastal upwelling is 6 to 12 miles (10 to 19 km) south of Monterey Bay. Northwest winds and the California Current both weaken in the early fall, allowing offshore, oceanic water to invade nearshore regions. Both the onset and duration of this oceanographic season, the Oceanic Period, are highly variable; it generally occurs between September and October. The Davidson Period, from about November to February, is characterized by the surfacing of the Davidson Current, a massive, northward flowing counter-current. Throughout most of the year, the Davidson

Current flows beneath the California Current, at depths greater than 655 ft. (200 m). It gradually rises to shallower depths in the fall and reverses current direction intermittently even in surface waters during the winter. This current carries equatorial Pacific water of higher salinity and temperature than generally exists at this latitude and has an important moderating effect on winter ocean temperatures.

As with the California Current, the influence of the Davidson Current on Monterey Bay circulation patterns depends somewhat on its speed. Current speed increases from about 0.04 knots in November to a maximum of 0.14 knots in December and January, and current direction shifts from the south to the southeast. The onset of the Davidson Period corresponds with the advance of atmospheric low pressure cells, and often begins abruptly with the year's first winter storm. The northward flowing current is deflected onshore by the Coriolis force, and downwelling results. Particularly during storms, downwelling is evidenced by large nearshore swells and causes vertical mixing to depths of up to 163 to 330 ft. (50 to 100 m). Upwelled waters enter Monterey Bay near Pt. Pinos, following the contours of the submarine canyon, and exit near Santa Cruz to the north.

As the canyon is oriented in a southwest-northeast direction, the entrance of upwelled water imparts a general counter-clockwise current pattern in the Bay. However, a portion of the entering water sometimes splits off at Pt. Pinos and forms a clockwise eddy near the ASBS. Oceanic waters generally reach the ASBS during a portion of the oceanic period, as the ASBS is located at the outer edge of the bay. The blue, warmer oceanic water is easily distinguished from the bay's typical cold, greener water. Currents are probably weaker and more variable than during the Upwelling Period.

Nearshore currents off Cannery Row tends to be directed offshore, such that drift bottles are recovered often near Santa Cruz. When water movement is onshore, recoveries are made at a more westerly position than during the upwelling period. This could be attributed to a lessening of northwest winds and/or disappearance of a clockwise gyre in the south bay. The Davidson Current is more sluggish than the California Current, and thus its effect on bay circulation is more easily counteracted by prevailing winds. Blaskovich (1973) in (SWCRB 1979) estimated that the Davidson Current determined surface circulation patterns in the bay only when wind speeds were less than one meter per second (about 2.2 miles per hour) (State Water Board 1979).

4.6.2 Water Quality and Temperature

The seawater of the area can be characterized as a coastal water mass in a transitional area. The coastal water is influenced by the subarctic Pacific and Eastern North Pacific Central water masses, which are carried into the area by the southward flowing California current. Salinities in the area are generally constant and range from 33^{o}/oo to 34^{o}/oo throughout the year. Periods of maximum temperature generally occur during the months of August and September. Periods of minimum temperature occur during March, April or May, depending upon the occurrence of localized upwelling. Upwelling in the area results from strong northwest or northeast winds, which displace coastal surface water offshore and drive deeper, nutrient-rich water to the surface. The

Davidson Current, a northward-flowing, warm, low-salinity current, is usually evident off this area during the fall months of October and November (State Water Board 1979).

See the Environmental Impacts section for additional information on water quality.

5. Marine Biological Resources of the ASBS

A biological reconnaissance survey was conducted in 1977 and the report for that survey was published by the State Water Board in 1979. That report enumerated 87 species of algae and plants, 521 species of invertebrates and 17 species of fish that inhabit the ASBS. The subtidal zone contain a high level of species diversity including both vertebrates and invertebrates. Giant kelp dominated in the subtidal area along with dense areas of surf grass, creating jungle-like areas. The kelp bed was most extensive at Point Pinos where there is more rocky substrate.

The intertidal substrate of the ASBS consists of granite boulders and outcrops, interspersed with small, sandy coves. Species diversity and abundance is generally limited. Sea lettuce, split whip, rockweed, ad corallines are examples of the algal species found within the ASBS; while the aggregating anemone and the solitary anemone, barnacles, crabs, red abalone, brown and black turban snails, and various sponges are examples of the diverse fauna found at the ASBS. Filamentous red algae were common on all rocks, mixed with worm tubes and loose sand grains (State Water Board 1979). Appendix A provides a species list from the 1979 Reconnaissance Survey.

Tenera performed “A Comparative Intertidal Study and User Survey, Point Pinos, California” (July 2003), which was submitted as part of the City of Pacific Grove’s exception application. The purpose of the Point Pinos Survey was to investigate the effects of visitor use on the Point Pinos rocky shoreline located on the Monterey Peninsula, and just outside the western boundary of the Pacific Grove ASBS, and was not designed to survey the biological community at outfall locations, or the effects of discharges on the ASBS. In this report, site descriptions were compared to Point Pinos, which receives high levels of visitor use because of its scenic values and easy accessibility from roads, adjoining parking lots, and trails. One of the main attractions of Point Pinos is the rich, diverse marine life along the rocky shore. Tide pools are common in the area, and small sandy beaches also occur along the upper shore.

Five sites surveyed in the State Water Board 1979 Reconnaissance Survey Report (State Water Board 1979) were revisited in July 2002. One of the five sites was located at Point Pinos and the other four sites were situated along the shoreline between Point Pinos and HMS. A species list was developed for each site by walking the area and noting all species encountered. All identifications were made in the field. In contrast, it was not clear in the original study if samples had been collected for laboratory identification. The tide level was slightly above MLLW (above the surf grass zone) during the 2002 survey. Two biologists worked separately in the search effort at each site and created a combined species list for each site. The combined search effort at each site was between 1-2 hours.

The Point Pinos report found it difficult to use the data from the State Water Board 1979 Reconnaissance Report (field survey in 1977) and current data to make direct comparisons over time, as the species list appeared to be affected by differences in the intensity of search effort, time spent at each site, tidal levels during the surveys, and detail to adequately characterize the sampling sites. It was found that the most common species were still present in all areas in both surveys, but there was uncertainty concerning the continued or past occurrences of less common species. Without the same sampling effort in both surveys, there was no assurance in whether a species was not present or simply overlooked.

The total number of algal and invertebrate species found at the Point Pinos site was similar between the 1977 and 2002 surveys. In contrast, more species were found at each of the four other sites in the 2002 survey compared to the 1977 survey, but all of the sites also had species that were unique to one or the other survey.

The appendices in the 1979 State Water Board Report contain other species lists. Tenera found that those lists could not be used for comparison with the current survey. The list of intertidal invertebrates for several areas in the State Water Board Report is based on the cumulative listings from 27 literature and museum references dating in the 1940s-1960s. The species were tabulated for large general areas (Point Pinos, Monterey Peninsula, Pacific Grove, HMS). Because the collecting locations were not specified, the data were of limited use in comparing changes in faunal composition over time. Also, the number of species found in each area probably reflects the number of times each area was sampled. Tenera found, however, that Point Pinos was a popular study area between the 1940s and 1960s, as the species list for Point Pinos is the longest. Tenera concludes that, from their observations, overall diversity has not changed at the Point Pinos site since the survey in 1977.

Tenera found one conclusive difference, however, between the 1977 and 2002 surveys. This was a lack of sea palms (*Postelsia palmaeformis*) in the present survey, although they were not able to conclude whether its absence was due to visitor impacts or other causes. Although not listed as a species of special concern or of rare, endangered, or threatened status by DFG or the U.S. Fish and Wildlife Service, California Code of Regulations prohibit cutting or disturbing this species. Regardless, this species is illegally collected for consumption.

A paper by Sagarin et al (1999) was reviewed. Of 45 invertebrate species studied at the HMS in the Pacific Grove ASBS, the abundances of 8 southern species increased and the abundances of 5 northern species decreased. Annual peak mean shoreline ocean temperatures at Pacific Grove have increased by 2.2° C over the past 60 years. This paper’s conclusion was that changes in the invertebrate fauna in the rocky intertidal community between the period 1931 to 1933 and the period 1993 to 1994 indicate that species' ranges shifted northward, consistent with predictions of change associated with climate change (i.e., warming). However, State Water Board staff also reviewed other work by Schiel et al (2004), which found (for the area at Diablo Canyon in San Luis Obispo County) that changes in community structure were common and there was little support for the hypothesis of predictable directional changes in northern and southern species based on biogeographic models (i.e., there was no obvious connection to global warming).

The Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) is a consortium of four west coast universities that focuses on regional-scale, multidisciplinary research related to coastal rocky reefs. The CBS is a large-scale research project designed to measure diversity and abundance of algae and invertebrates in rocky intertidal communities on the West Coast of temperate North America. This study combines extraordinary precision at the local scale across an expansive spatial scale to create an unprecedented data set for investigating intertidal community structure patterns. In January 2003 and December 2006 PISCO conducted a Coastal Biodiversity Survey (CBS) in the ASBS at Hopkins Marine Station.

The CBS consists of taking a 30 meter section of the rocky intertidal bench and creating transects every three meters, resulting in 11 transect line areas. At least 100 uniformly spaced sample points were then collected from each transect. Special attention was given to mobile invertebrates to ensure they were not over counted. The results of those surveys are listed in Appendix B.

5.1 Threatened, Endangered and Other Wildlife

5.1.1 Marine Reptiles

Marine sea turtles occur in California waters. Four species of federally protected sea turtles may be along the California coast: green (*Chelonia mydas* FE), leatherback (*Dermochelys coriacea* FE), loggerhead (*Caretta caretta* FE), and olive ridley sea turtles (*Lepidochelys olivacea* FE). These marine turtles are circum-global in distribution but breeding colonies have not been observed in California (Coastal Conservancy 2005).

5.1.2 Marine Birds

Birds are important predators of many of the fish and invertebrates inhabiting the coast. In the rocky intertidal zone, several species of shorebirds (especially black turnstones, surfbirds, rock sandpipers, black oystercatchers, willets, and whimbrels) prey on water lice, salt water fleas, and other small crustaceans. Bristle worms, a variety of small mollusks, and occasionally representatives of other invertebrate taxa are also preyed upon. Gulls feed on crab, seastars, *Pisaster ochraceus*, and sea urchins. On the sandy beach, sanderlings and marbled godwits probe for water lice, *Excirolana*, salt water fleas, *Orchestoidea* and *Paraphoxus*, the sandcrab, *Emerita analoga*, and adult and larval insects. Seabirds that capture food near the water surface (pelicans, phlaropes, terns, and gulls) or dive beneath the surface (loons, grebes, cormorants, sea ducks, and alcids) forage on zooplankton, squid and fish, as well as mollusks and crustaceans taken from the seafloor (State Water Board 1979).

Of the 100+ other species occurring somewhat regularly along the California coast, the great majority nest outside of California, with many species migrating annually to the

Arctic to breed. Small numbers of some of these species, often immature birds, remain here throughout the summer (State Water Board 1979).

The California least tern (*Sterna antillarum*) and elegant tern (*Thalasseus elegans*) forage and nest along the California coast. Along the northern and central coast, several species nest close to the intertidal zone, and are present as year-round residents. The black oystercatcher nests on rocks just above the reach of the waves. A smaller shorebird, the snowy plover, nests on the upper areas of beaches. Among seabirds, pelagic cormorants nest in scattered colonies along sea cliffs. This species builds nests on rock shelves along the cliff faces above the surf. Brandt's cormorant, a larger species which typically selects flat areas on islands for colony sites, is also present in large numbers along the northern and central coast. Gulls and black oystercatcher also nest along the coast (State Water Board 1979).

5.1.3 Marine Mammals

All marine mammals are protected under federal law (Marine Mammal Protection Act). Members of this group are predominantly carnivorous and represent the upper end of the marine food chain in the coastal waters. The three orders of marine mammals found along the California coast are the seals and sea lions (*Pinnipedia*), the sea otters (*Fissipedia*) and the dolphins, porpoises, and whales (*Cetacea*); the seals and sea lions are the most easily observed and abundant (State Water Board 1979). The 1979 State Water Board Reconnaissance report documents the following species specifically occurring within the ASBS: *Enhydra lutris nereis* (Southern Sea Otter), *Zalophus californianus* (California Sea Lion), *Phoca vitulina richardsii* (Pacific Harbor Seal), *Phocoena phocoena* (Harbor Porpoise), *Grampus griseus* (Risso's Dolphin), and *Eschrichtius robustus* (Gray Whale).

5.2 Fisheries, Marine Protected Areas and Prohibitions on the Take of Marine Life

As mentioned above the western portion of the ASBS includes part of the Pacific Grove Marine Gardens State Marine Conservation Area and the eastern portion of the ASBS is approximately co-located with the Lovers Point State Marine Reserve. In the Pacific Grove Marine Gardens State Marine Conservation Area only the recreational take of finfish is allowed, and the commercial take of giant kelp (*Macrocystis pyrifera*) and bull kelp (*Nereocystis spp.*) by hand is allowed under certain limiting conditions. Absolutely no take of marine life is allowed in the Lovers Point State Marine Reserve.

5.3 Watershed and Land Use Characterizations

State Water Board staff analyzed watersheds adjacent to ASBS for impermeability (impervious surfaces) based on land use data (Calwater 2.2). Impervious surface greater than 50% was found in watersheds draining to the Pacific Grove ASBS. The exact percentage was 64.52%. Specific watershed land uses and conditions adjacent to ASBS are as follows:

Flows originating from this Monterey County watershed arise primarily from urban runoff. The City of Pacific Grove storm drains discharge into the ASBS including the area adjacent to HMS. The HMS has several point sources of aquarium waste seawater that discharge into the ASBS. The Monterey Bay Aquarium (MBA) located adjacent to and east of the HMS and discharges waste seawater and storm runoff into the ocean immediately adjacent to the ASBS. The City of Monterey storm drains discharge adjacent to the ASBS in the vicinity of MBA and also co-mingle with the Pacific Grove storm drain direct discharge at HMS.

The only somewhat natural drainage into the Pacific Grove ASBS is from Greenwood Creek, which runs through Greenwood Park. Upstream from the park, the creek again becomes part of the storm drain system. All other freshwater discharges to the ASBS are from storm drains (State Water Board 1979).

Within the jurisdiction of the City of Pacific Grove, this area of watershed adjacent to the ASBS comprise of a total of approximately 940 acres (3.80 km^2), predominately residential. The downtown retail sector comprises 30 acres (121,405 m^2). The Pacific Grove Golf Links contribution is approximately 43 acres (174,014 m^2) in size. A buffer zone of parks, open space, and a recreational trail system border the entire length of the ASBS.

6. Scientific Study Uses

6.1. Research

HMS Tuna Research and Conservation Center:

HMS works in partnership with Monterey Bay Aquarium scientists to conduct research related to the conservation of pelagic fishes, especially Atlantic and Pacific blue fin tunas and white sharks at the Tuna Research and Conservation Center (TRCC). The major threats to these species are inadequate fisheries regulations and marine resource policies, and lack of basic ecological knowledge that can inform better resource management policies. Through collaboration with scientists at Stanford University's Hopkins Marine Station, the aquarium conducts research on the basic biology and ecology of tunas, sharks and other open-ocean fishes that contributes directly to improved resource management policies. (MBA Exception App. 11-1 2006)

A few research projects occasionally involve work with non-native (exotic) species. These are held in small-volume, re-circulating aquaria separate from our flow-through seawater system. Water from tanks holding non-native species also is discharged into the sanitary sewer to avoid introduction of exotics into the ASBS (HMS App 2006).

In 2009, HMS developed a new research aquarium to house non-native East Coast invertebrate species under the direction of Dr. Chris Lowe. Dr. Lowe's research on the development of this species required a special holding facility. (Somero 2009)

6.1.2 Education

The HMS has nine tenure-track faculty, 20-30 full-time Ph.D. students, and a support staff of ten. Undergraduate courses are offered in marine science in the winter, spring, and summer terms. Undergraduate enrollments range between approximately twelve and thirty per term. Detailed descriptions of HMS research and teaching programs are found on their web site: http://hopkins.stanford.edu (HMS App 2006).

7. Infrastructure and Discharges

7.1.1 ***Laboratory Facilities and Seawater System***

The Monterey Bay Aquarium pumps seawater from the Pacific Ocean, sand filters it, and supplies it to HMS. HMS uses the seawater in large and small aquarium tanks at the research station. For teaching and research, HMS collects and holds sea urchins, mussels, squid, snails and other invertebrates in these aquaria, as well as a few fish. At any one time, HMS has about 44-110 pounds of animal specimens in its tanks. After study, most of the animals are released back into the ocean. (HMS Application 2006).

HMS discharges seawater continuously from the aquaria through three outfalls into the ocean. HMS does not have a pathology laboratory, nor does it cultivate exotic species. A few research projects occasionally involve work with non-native species. These are always held in small volume, recirculating aquaria separate from Hopkins flow-through seawater system. Water from these tanks is not discharged to the Pacific Ocean; it is directed to the sanitary sewer. HMS does not have a sanitary wastewater treatment system or desalinization facility and does not discharge sanitary wastewater or brine (HMS Application 2006).

HMS does not add chemicals to the aquaria and does not use chemicals to clean the tanks. It feeds the snails and other invertebrates algae and squid harvested from the Pacific Ocean. It feeds the fish about 2.2 pounds per month of fish food with no unnatural additives such as antibiotics and dried squid. The seawater system discharge does not have chemicals such as formalin, antibiotics, exotic species or pathogens. It is best described as a “seawater in, seawater out” system (HMS Application 2006).

Animal waste and uneaten fish food which is discharged as part of the seawater is calculated per 130,000 gallons per day (gpd) at approximately .55 pounds per day (HMS Application 2006).

7.1.2 The Daily Intake and Discharge Volume of Seawater of the System

MBA supplies filtered seawater to HMS at a maximum rate of up to 150 gallons per minute (gpm). Daily average flows are typically in the range of 85- 100 gpm. Seawater supplied to HMS, with the exception of flows through the tuna holding tanks, does not return to MBA and is discharged at HMS (HMS Application 2006). In 2006 the daily discharge volume was approximately 122,400 – 144,000 gallons.

Data source: HMS Application 2006. Hopkins Marine Station Seawater System Outfalls: Flows, Treatments and Discharge Locations

7.1.3 Southern California Coastal Water Research Project Existing Discharge Points 2003

The Southern California Coastal Water Research Project (SCCWRP), under contract to the State Water Board, conducted a survey of all discharges into State Water Quality Protection Areas, now more commonly referred to here as ASBS. SCCWRP's (SCCWRP 2003) final report identified multiple discharge points at HMS which drain storm water, dry-weather flows and aquaria seawater directly to the ASBS. Since that time, HMS has planned for and implemented a number of improvements to remove or correct real or potential discharges that impact water quality and violate the waste discharge prohibition of ASBS.

Figure 1 is a diagram of the HMS seawater system. Seawater is supplied by the Monterey Bay Aquarium, at a current maximal rate of approximately 135 gpm. The actual rate of supply is normally 100 gpm or less. Seawater is sand-filtered at the MBA and then pumped to three storage tanks, from which HMS aquaria are supplied by gravity feed. The seawater supply system is planned to be re-engineered so that seawater will be pumped into the tanks strictly on the basis of need. The overflow of excess seawater from the tanks has been eliminated (pipe **PCG244)**.

The removal of this discharge has decreased the HMS seawater use and discharge by as much as ~70,000 gallons daily, based on the disparity between the current maximal rate of supply by the MBA and periods of minimal requirements for seawater (HMS App 2006).

The aquarium systems receiving seawater from the storage tanks are located in the following buildings: the *Aquaria* (an outdoor roofed facility located between the Loeb and Agassiz Buildings), the *Blinks Building*, the *Agassiz Building*, the *DeNault Family Research Building*, and the *Monterey Boat Works Building* (HMS App 2006).

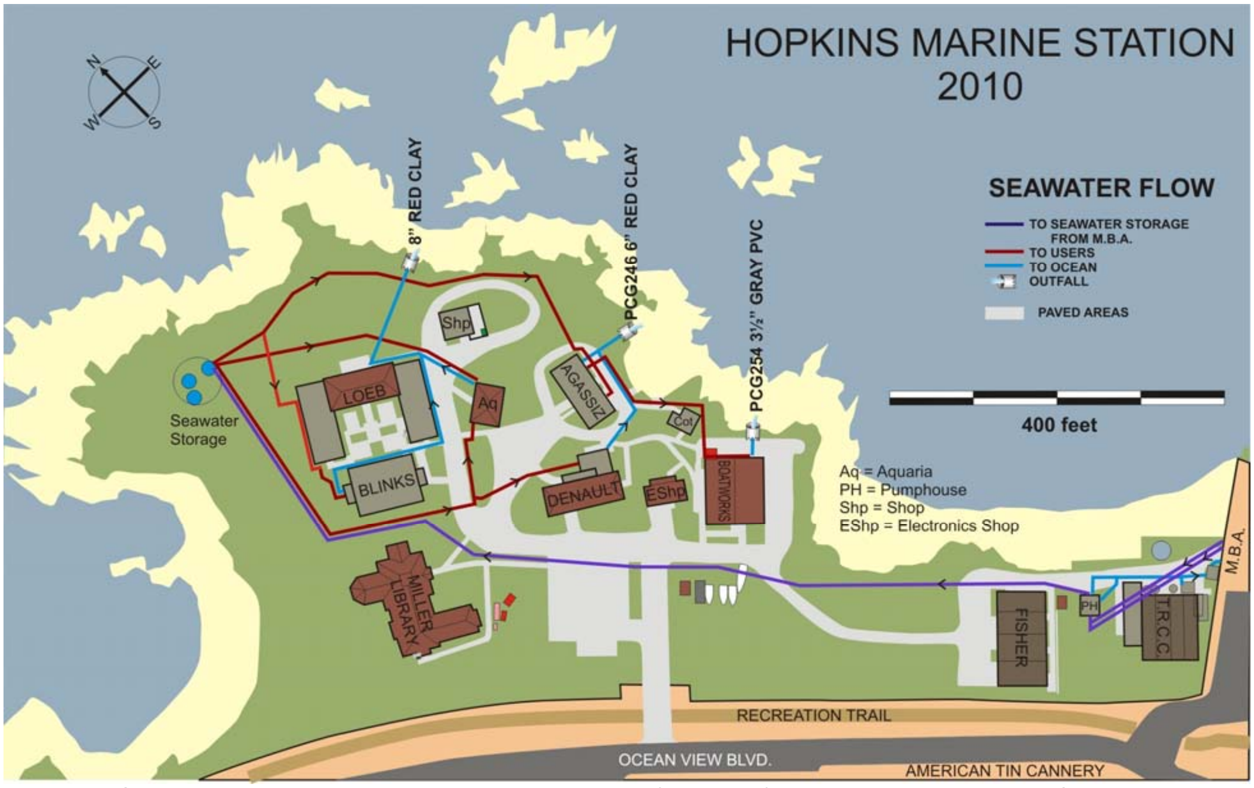


Figure 1. *Sea water supply and discharge systems and locations of aquarium facilities at the Hopkins Marine Station 2006. Two seawater discharges are planned for removal; three seawater system outfalls will remain in place..*

Seawater from these five aquarium systems is discharged at three outfalls, as shown on Figure 1. These three discharge sites are the only permanent outfalls that remain in operation at HMS after mid-2007. Two other seawater discharge sites, one at the Tuna Research and Conservation Center (filter back-flush water) and one from two small tanks near the pump house (PH), ceased discharging seawater into the ASBS in 2007 (HMS Application 2006).

7.1.4 Exotic Species, Parasites, and Pathogens

HMS adds no chemicals to their discharged seawater and does not hold exotic species in the flow-through aquaria. Controls employed to eliminate potential discharge of parasites and non-native (exotic) species are held in re-circulating aquaria that are not connected to the seawater discharge systems. The water from aquaria holding non-native species is routed to the sanitary sewer system, where it goes to the Publicly Owned Treatment Works (POTW) and receives primary and secondary treatment (HMS Application 2006).

The large majority of the specimens held in the lab facilities are species native to the Central California coast, introduction of exotic parasites into the ASBS from the seawater discharged at the three permanent outfalls is not anticipated (HMS Application 2006). In 2009, HMS developed a new research aquarium to house non-native East Coast invertebrate species under the direction of Dr. Chris Lowe. Dr. Lowe's research on the development of this species required a special holding facility. HMS designed an aquarium system patterned after engineering used at MBA for non-native species and approved by James Moore of the California Department of Fish and Game. The new system is similar to an existing purification system that's been operated at HMS for several years by the DeTomaso lab. It is comprised of UV sterilization plus sub-micron filtration of incoming water for their invertebrate tanks. Dr. Lowe's research aquaria seawater outflow will be treated, and then discharged to the Agassiz seawater outfall (Somero 2009, Somero 2010).

7.1.5 The Aquatic Animals Held and Fed in Aquaria

HMS holds only field-collected animals and does not propagate any species in their aquarium facilities. Most animals are invertebrates, primarily sea urchins, mussels, squid, and snails, which represent over 90% of the mass of specimens held at HMS. The total mass of animals held in the aquaria at any one time varies between approximately **20 – 50 kg** (44 – 110 pounds), with quantities depending on teaching and research activities and seasonal availability of specimens. Based on the rates at which specimens are used, it is estimated that their annual use of animals for research and teaching is no greater than **150 kg** (330 pounds). Most of the animals used in the programs are small, weighing less than a few grams in many cases. Many of the animals used in the teaching are returned to the ocean after use.

HMS provides their animals approximately **51 kg** (112.2 pounds) of food during the months of maximal feeding, which typically are during the winter and spring quarters when the teaching program is most active.

7.1.5.1 Invertebrates

Approximately **50 kg** (110 pounds) of food, maximum, are fed to invertebrates each month. Most of this food comprises local species of marine algae. Echinoderms and snails are fed locally collected macroalgae, usually *Macrocystis pyrifera* or *Egregia* sp. Uneaten algae are removed from the tanks and discarded in the trash. Some species of snails are fed carcasses of market squid. Mussels are often maintained for only short periods (a few days to a week) and these specimens generally are not fed. When feeding of mussels occurs, a suspension of local unicellular marine algae is the food used. It is estimated that no more than five liters of algal suspension containing approximately 1-5 grams of algae per liter are used in any given month. One laboratory occasionally maintains populations of locally captured squid (*Loligo opalescens*) in the DeNault aquarium (total mass of squid approximately 10 kg/year). The squid are fed goldfish (APLAC approved protocol). The total mass of food given to the invertebrates held in our tanks is no more than approximately 50 kg/month. Most of this food is naturally occurring marine algae collected in Monterey Bay.

7.1.5.2 Fish

No more than approximately **1 kg** (2.2 pounds) of food per month is given to the fish held at HMS. Two diets are used. One is a premium quality commercial fish food that contains no unnatural additives (e.g., antibiotics). The total amount of food given is approximately 0.5 kg (1.1 pounds) per month. A second diet is dried squid, given at a rate of approximately 0.5 kg per month. Fish are fed to satiation, and all uneaten food is removed from the tanks and disposed off in the trash.

Species cultured at the facility

Appendix E is a full list of species held ("cultured") in aquarium systems at the HMS. All species are native to the Central California coast. Non-native species, when present, are always held in small re-circulating seawater tanks that have no connection to the seawater discharge lines shown in Figure 1. Waste water from the tanks holding non-native species is discharged into the sanitary sewage system, not into the ASBS.

Chemicals Added to the Facility Seawater System and Marine Life Food

No chemicals are added to the HMS seawater systems or to food given to HMS animals. To maintain the integrity of the research and protect the animals held in the aquaria, only seawater and nylon brushes are used to clean the aquaria themselves.

General Description of Seawater System, Intake, and Discharge Locations

MBA provides HMS with a constant supply of filtered seawater for their teaching aquariums and research laboratories (Figure 1). The seawater flow supplied to HMS is dependent upon their demand and varies from about 80 GPM to 150 GPM. Seawater sent to HMS is discharged at HMS and is, therefore, described in the HMS ocean discharge exception application (HMS App 2006).

DISCHARGE POINTS: SEAWATER SYSTEM OUTFALLS

PCG Unidentified#* LOEB BLDG TO REMAIN IN PLACE

A single 6" pipe discharges water from the Blinks Building and the outdoor aquaria facility at a point on the cliff face above the rocky intertidal zone around Bird Rock (the "Hewatt site" (see responses to questions 12 b and 15, below). Approximately 60% of HMS seawater discharge occurs at this site. This pipe was missed in the survey conducted by the State and thus has no PCG number (PCG Unid). This outlet is shown in photo 1. (HMS Application 2006).

Photo 1. (No PCG # assigned)

***Unidentified refers to the fact that no number was previously assigned doing the SCCWRP survey.**

PCG246 and PCG247 AGASSIZ BLDG TO REMAIN IN PLACE

PCG246 currently discharges 100% seawater from the tanks in the Agassiz and DeNault buildings; approximately 30% of HMS seawater discharge occurs at this site. During the 2005 sampling period PCG246 previously discharged a mixture of seawater and storm water, but the storm water was redirected to PCG247 as part of a building remodel in 2006. During the SCCWRP survey of discharges PCG247 drained flowing waste seawater; however, PCG247 currently discharges only storm water originating from roof drains on the Agassiz building. Photo #2 shows these outfall sites.

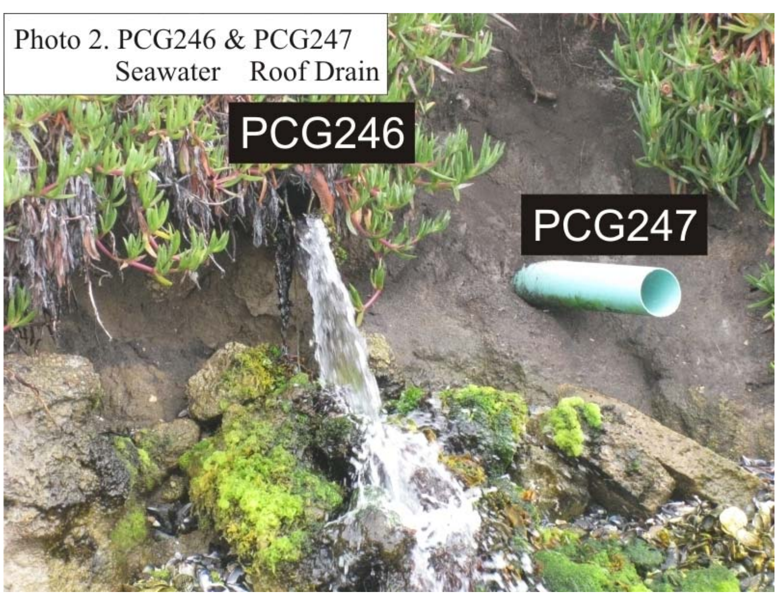


Photo 2. PCG246 & PCG247
Seawater Roof Drain

PCG 254 ***BOAT WORKS BLDG TO REMAIN IN PLACE***

A small (3” diameter) pipe discharges seawater from the outdoor tanks located at the east side of the Monterey Boat Works Building onto a field of granite boulders above the upper reach of Agassiz beach. This outflow pipe is denoted as **PCG254** on the State survey map and is shown in the photo below. This is the smallest of our aquarium facilities and is used primarily to hold specimens for teaching. It is usually in operation only during winter, spring and summer terms. Outflow from this pipe is estimated to accounts for ~10% of HMS total seawater discharge.

SEAWATER DISCHARGE LOCATIONS

TRCC Discharge PCG259

The TRCC located at HMS is used jointly by MBS and HMS researchers. Three large holding tanks at the TRCC have separate recirculated seawater systems. Seawater supplied to each of these systems is discharged to two locations.

1) Overflow from each of the holding tanks flows back to the MBA Near Shore Wing (NSW) Exotic Species Treatment System in the NSW basement and is discharged to the NSW Tidal Basin Discharge (SEA-1).
2) Prior to 2007 the filter backflush from the sand filters associated with each of these systems is directed to a storm drain discharge located on the beach adjacent the TRCC. This discharge is described in the HMS ocean discharge exception application. After July 2007 filter backflush from the TRCC sand filters will be rerouted back to MBA, treated, and discharged to the NSW Tidal Basin Discharge (SEA-1; see Section 13). (MBA Exception App. 8-7)

The TRCC discharge will be the responsibility of the MBA and will be henceforth included under the exception and permit for MBA.

One additional permanent aquarium facility is located on Stanford University property, the TRCC (TRCC Fig. 1). At the time when State Water Board staff initially inspected the HMS the TRCC waste seawater that discharged directly from the HMS co-mingled with a City of Pacific Grove storm drain. Since that time the TRCC seawater system has been separated from the HMS system described above. This facility is operated jointly by HMS and MBA. The TRCC receives its seawater directly from MBA's system and all seawater from the aquaria is returned to the MBA for discharge through its seawater system. Prior to 2007 there was still one form of discharge from the TRCC on HMS property into the ASBS: back-flush water from the filtration system used to condition the water for the TRCC's large aquaria where tuna are held. Discharge volume of a full back-flush is approximately 11,000 gallons.

Prior to 2007 the back-flush water was discharged into the ASBS through pipe **PCG259**. However, the system handling filter back-flush was re-engineered, so that all back-flush water is now returned to the MBA. There, it is treated along with the seawater leaving MBA aquaria in which non-native ("exotic") species are held. Re-engineering entailed installation of two 5,500 gallon storage tanks, to hold the back-flush water before it is injected into the treatment system. The design of the system was completed, funding by the MBA, and the project was completed in mid-2007. After that the TRCC has reportedly ceased discharge of any waste from HMS property into the ASBS (HMS App 2006 and personal communication George Somero 2010).

Two temporary aquaria were located adjacent to the seawater pumping facility ("Pump House" in Fig.1). They discharged into a site just to the east of the Fisher Building (PCG259). These two temporary tanks were removed by mid 2007, in concert with the re-engineering of the back-flush return system at the TRCC (HMS App 2006).

Waterfront Facilities

Fuel storage for boats is located in a waterproof metal shed behind the Boatworks Building, in Fire Marshal approved flammable storage cabinets with secondary containment. Surface water runoff from this area drains toward the Agassiz building lift station, and the outfall area PCG249. (Figure 1 Hopkins Marine Station 2006 Storm Drains & Sanitary Sewer). Small skiffs are launched from Agassiz Beach (the beach south of the Agassiz Building). One large ship ("Friendship") is towed and launched from the Monterey Marina.

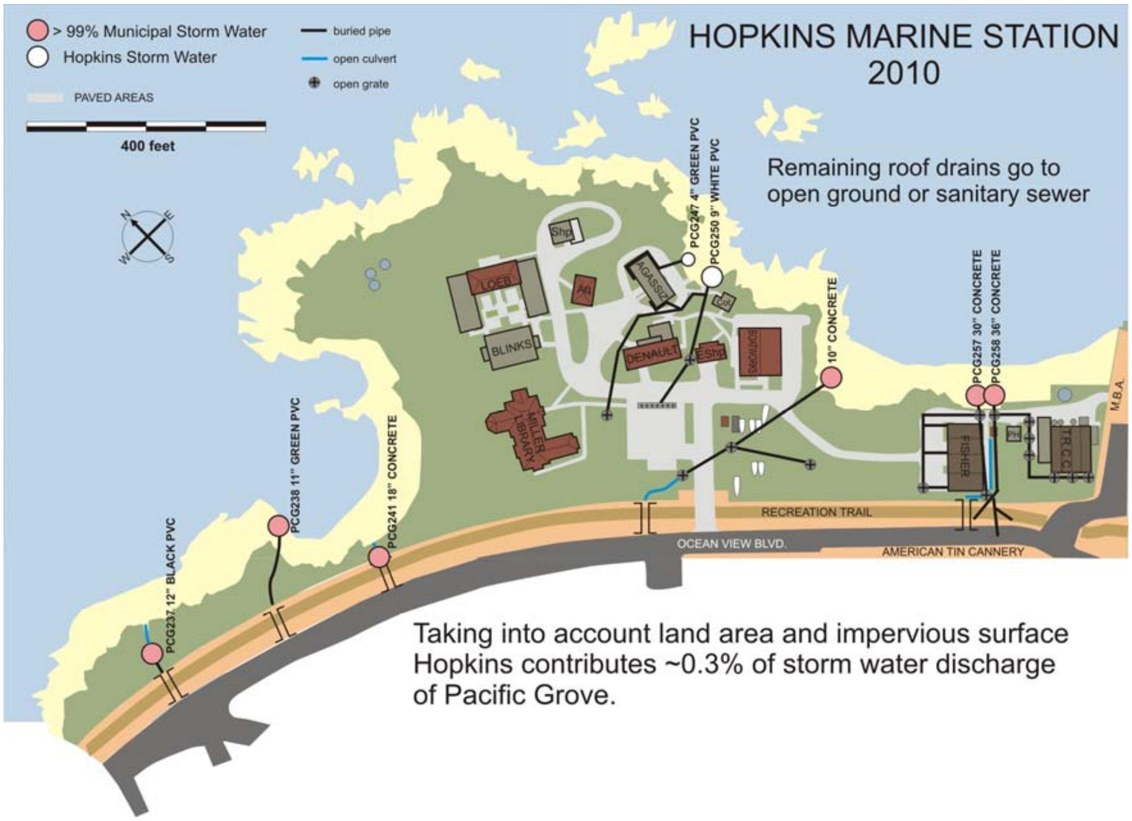
7. 2 Storm Water Discharges

HMS is built on 11 acres of oceanfront land. The property has 28% impervious area that includes buildings, parking lots and paved foot paths. The remaining property is natural open space that provides a recharge area for rainfall. HMS has implemented Best Management Practices (BMPs) to minimize its potential impacts on storm water and storm water runoff and listed in the August 2006 submittal (HMS Application 2006).

HMS is within the footprint of the City of Pacific Grove's Phase II municipal storm water permit. HMS has no industrial activity and does not have its own NPDES storm water permit (HMS Application 2006).

There are ten storm water discharge outfalls on HMS property. Five discharge locations are composed of urban runoff from the City of Pacific Grove, two of which are non-point sources. Three of these collect storm water from the municipal storm drain system in the City of Pacific Grove and mix with storm water generated from rainfall on HMS property. The remaining two discharges are primarily storm water generated from rainfall on HMS property. Two of the discharge points convey storm water from HMS building downspouts, parking lots, and paved footpaths. HMS calculates that its 11 acres of land represent 0.6% of the surface area of the City of Pacific Grove (HMS Application 2006, HMS Comments 2011).

Figure 2 shows the complete 2006 storm water drainage systems at HMS. HMS is built upon 11 acres of oceanfront land. The bedrock is primarily granite and soil coverage is quite shallow in most areas. The property has 28% impervious area (research building footprints, associated parking lots, and paved foot paths). The remaining 72% of the land is natural and provides a recharge area for rainfall. HMS has a diesel-fueled emergency generator with a double-walled fuel storage tank. A metal shed houses small quantities of double-contained fuel canisters used for the out-board motor for small research boats. Covered dumpsters in a fenced, cement-floored area are used to hold waste and recyclables for weekly pick-up. No run-off from this area into the ASBS occurs. Pesticides and herbicides are not applied at HMS except for the application of boric acid around the Loeb building to control ants. There are no loading docks or outside vehicle or equipment service areas at HMS.



<u>Figure 2</u>. Storm drain and sanitary sewer systems at the Hopkins Marine Station.

7.3 General Summary of Discharges and Improvements

Table 1 outlines the identified discharge points and corrections or implementation measures taken.

Table 1 Hopkins Marine Station SCCWRP 2003 Discharge Points and Status 2010

SCCWRP ID	Number of Discharge Points	Responsible Party	Description	Status	Waste Discharge Corrective Action Needed by HMS?
PCG237– PCG241	5	City of Pacific Grove	Drains municipal waters across Stanford property	Existing	No
PCG242	1	Stanford Hopkins	Pipe	Removed and capped	No
PCG243	1	Stanford Hopkins	Old pump house	Out of service	No
PCG244	1	Stanford Hopkins	Seawater holding tank overflow	Removed and capped	No
PCG245	1	Stanford Hopkins		Removed and capped	No
PCG246	1	Stanford Hopkins	Seawater outfall Agassiz	Existing	No
PCG247	1	Stanford Hopkins	storm water from roof	Existing	Yes
PCG248	1	Stanford Hopkins	Groundwater seep	Existing	No
PCG249	1	Stanford Hopkins	Storm drain Denault/EShp	Removed and capped	No
PCG250	1	Stanford Hopkins	Parking lot/roof storm drain	Existing	Yes
PCG251,252,253	1	Stanford Hopkins	Pipe	Removed and capped	No
PCG254	1	Stanford Hopkins	Seawater outfall Boatworks Bldg	Existing	Yes
PCG255	1	Stanford Hopkins	Pipe	Removed and capped	No
PCG256	1	Stanford Hopkins	Pipe	Removed and capped	No
PCG 257		Pacific Grove is the primary responsible party; Stanford Hopkins contributes	Pipe co-mingles City and Hopkins	Existing	Yes, will work with the primary responsible party
PC258	1	Pacific Grove is the primary responsible party; Stanford Hopkins contributes	Pipe co-mingles City and Fisher Bldg	Existing	Yes, will work with the primary responsible party
PCG259	1	Stanford Hopkins	TRCC Backflush outfall	Removed and rerouted to Monterey Bay Aquarium	No
PCG260,261	2	Monterey Bay Aquarium	Located on Aquarium property	Existing	No
PCG 262	1	Stanford Hopkins	Drains TRCC	Removed and capped	No
PCG 263,264,265,266	4	City of Pacific Grove	Seawall seep drains	Existing	No
sheet runoff	1	Stanford Hopkins	Dive gear/boat rinse area	Existing	Yes
PCG unid	1	Stanford Hopkins	Seawater outfall Loeb Bldg	Existing	Yes
PCG unid	1	Stanford Hopkins with contribution from City of Pacific Grove	10" storm drain adjacent to the Boatworks Building	Exisitng	Yes

Data source: Hopkins Marine Station Ocean Plan Exception Application August 24, 2006. SCCWRP ID's: SCCWRP 2003 Final Report . Comments received from Stanford HMS on Initial Study March 2011.

In addition to these improvements, HMS has implemented housekeeping practices which include a policy of no washing of cars allowed anywhere at HMS; all fish cleaning is to be done inside and waste goes to the sanitary sewer. All grey water at HMS is discharged to the sanitary sewer. Oil changes, for all vehicles such as cars and boats are only done at licensed service stations and never on the premises. Fueling for small boats involves filling detachable tanks in the fuel storage shed (behind the Boatworks Building) and, when the boats are launched, plugging these tanks into the outboard motors. No fuel is added to tanks when boats are on the beach or in the water. The large ship ("Friendship") is launched from the Monterey marina, where fueling takes place.

II. Environmental Impacts

The environmental factors checked below could be potentially affected by this project. See the checklist on the following pages for more details.

☐	Aesthetics	☐	Agriculture and Forestry Resources	☐	Air Quality
☑	Biological Resources	☐	Cultural Resources	☐	Geology/Soils
☐	Greenhouse Gas Emissions	☐	Hazards & Hazardous Materials	☑	Hydrology/Water Quality
☐	Land Use/Planning	☐	Mineral Resources	☐	Noise
☐	Population/Housing	☐	Public Services	☐	Recreation
☐	Transportation/Traffic	☐	Utilities/Service Systems	☑	Mandatory Findings of Significance

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
1. AESTHETICS. Would the project:				
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☐	☑
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☑
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☐	☑
d) Create a new source of substantial light or glare that would adversely affect day or nighttime views in the area?	☐	☐	☐	☑
2. AGRICULTURAL AND FOREST RESOURCES. In determining whether impacts to agricultural resources are significant environmental impacts, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. Would the project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping & Monitoring Program of the California Resources Agency, to non-agricultural uses?	☐	☐	☐	☑
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☑
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)) or timberland (as defined by Public Resources Code section 4526)?	☐	☐	☐	☑
d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☑
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☐	☑
3. AIR QUALITY. Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☐	☑
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☐	☑
c) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☐	☑
d) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors)?	☐	☐	☐	☑
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☐	☑

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
4. BIOLOGICAL RESOURCES. Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the DFG or USFWS?	☐	☑	☐	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the DFG or USFWS?	☐	☑	☐	☐
c) Have a substantial adverse effect on federally-protected wetlands as defined by Section 404 of the federal Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, *etc.*) through direct removal, filling, hydrological interruption or other means?	☐	☐	☐	☑
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory corridors, or impede the use of native wildlife nursery sites?	☐	☐	☐	☑
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☑
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☑

Biological Resources Impacts

A biological reconnaissance survey was conducted in 1977 and the report for that survey was published by the State Water Board in 1979. That report enumerated 87 species of algae and plants, 521 species of invertebrates and 17 species of fish that inhabit the ASBS. However, while somewhat comprehensive that survey was only qualitative in nature.

Five sites surveyed in the State Water Board 1979 Reconnaissance Survey Report were revisited by Tenera in July 2002 while conducting field work for the Point Pinos Report. One of the five sites was located at Point Pinos and the other four sites were situated along the shoreline between Point Pinos and Hopkins Marine Station. A species list was developed for each site by walking the area and noting all species encountered. All identifications were made in the field. In contrast, it was not clear in the original study if samples had been collected for laboratory identification. The tide level was slightly above MLLW (above the surf grass zone) during the 2002 survey. Two biologists worked separately in the search effort at each site and created a combined species list for each site. The combined search effort at each site was between 1-2 hours.

Tenera found it difficult to use the data from the State Water Board 1979 Reconnaissance Report (field survey in 1977) and current data to make direct comparisons over time, as the species list appeared to be affected by differences in the intensity of search effort, time spent at each site, tidal levels during the surveys, and detail to adequately characterize the sampling sites. It was found that the most common species were still present in all areas in both surveys, but there was uncertainty concerning the continued or past occurrences of less common species. Without the same sampling effort in both surveys, there was no assurance in whether a species was not present or simply overlooked.

According to Tenera the total number of algal and invertebrate species found at the Point Pinos site was similar between the 1977 and 2002 surveys. In contrast, more species were found at each of the four other sites in the 2002 survey compared to the 1977 survey, but all of the sites also had species that were unique to one or the other survey.

The appendices in the 1979 State Water Board Report contain other species lists. Tenera found that those lists could not be used for comparison with the current survey. The list of intertidal invertebrates for several areas in the 1979 State Water Board Report is based on the cumulative listings from 27 literature and museum references dating in the 1940s-1960s. The species were tabulated for large general areas (Point Pinos, Monterey Peninsula, Pacific Grove, HMS). Because the collecting locations were not specified, the data were of limited use in comparing changes in faunal composition over time. Also, the number of species found in each area probably reflects the number of times each area was sampled. Tenera found, however, that Point Pinos was a popular study area between the 1940s and 1960s, as the species list for Point Pinos is the longest. Tenera concludes that, from their observations, overall diversity has not changed at the Point Pinos site since the survey in 1977.

Tenera found one conclusive difference, however, between the 1977 and 2002 surveys. This was a lack of sea palms (*Postelsia palmaeformis*) in the present survey, although they were not able to conclude whether its absence was due to visitor impacts or other causes. Although not listed as a species of special concern or of rare, endangered, or threatened status by DFG or the U.S. Fish and Wildlife Service, California Code of Regulations prohibit cutting or disturbing this species. Regardless, this species is illegally collected for consumption.

One very important limitation of the Tenera 2002 study was that it was designed to assess visitor use and not designed to assess quantitative differences between biological communities at discharge locations as compared to undisturbed reference conditions.

The applicant provided two manuscripts, Barry et al 1995 and Sagarin et al, 1999. The work by Barry indicated that at HMS there had been a shift of species abundances consistent with the idea of global warming. Schiel et al found (for a different area) that changes in community structure were common due to thermal pollution warming but that there was no obvious link to global warming. The State Water Board staff asked Dr. Raimondi (2009) to evaluate Barry et al to determine if the data provided had any potential for use in the question of the effects of runoff on marine life. According to Dr. Raimondi, this paper did not provide any insight relevant to an assessment of discharges into ASBS

Limitations of existing data and recommendations for further work

Based on a review of the above information, functional biological communities are found in the ASBS even in the presence of anthropogenic influences. There is adequate evidence to allow an exception to the Ocean Plan for HMS discharges, as long as they are properly controlled. The adoption of these Special Protections will reduce pollution and improve habitat, thereby allowing for improved and sustained protection for marine aquatic life.

Additional biological monitoring must be performed in order to insure protection of marine aquatic life. A well-planned approach to biological investigations is required to adequately address the question of waste discharge impacts. Toward this end State Water Board staff is supportive of a regional approach to monitoring, with statewide comparability, including biological monitoring. Further staff conclusions regarding future biological monitoring are as follows:

- For best results future biological monitoring in this ASBS should be linked to a rigorous regional approach, with statewide consistency.

- The reference sites should be selected with the advice of a team of experts.

- There would be much more power to assess community differences and impacts, or if any differences are due to natural variability, if there are adequate replication and more reference sites.

- Community composition should be compared between discharge and reference sites using statistically robust techniques such as multivariate cluster analysis.

- Ideally, the results of this rigorous and comprehensive sampling effort will yield an index of community health in relation to waste discharges, and possibly the identification of less comprehensive cost-effective biological indicators for future use.

The following mitigating condition will be required to monitor the ongoing status and protection of marine aquatic life:

- *The discharge must comply with all other applicable provisions, including water quality standards, of the Ocean Plan. Natural water quality conditions in the receiving water must not be altered as a result of the discharge(s) and marine communities must be protected from pollution. Natural Ocean Water Quality will be determined by a comparison to the range of constituent concentrations in reference areas agreed upon via the regional monitoring program(s) or in the absence of a central coast regional monitoring program by the State Water Board in consultation with the Regional Water Board.*

- *Rocky Intertidal Marine Life Survey: At least once every permit cycle (every five years), a quantitative survey of rocky intertidal marine life must be performed near the discharge and at a reference site. The Regional Water Board, in consultation with the State Water Board's Division of Water Quality, must approve the survey design. The results of the survey must be* *completed and submitted to the Regional Water Board at least six months prior to permit expiration. Alternatively this requirement may be met by participation in a regional monitoring program approved by the State Water Board.*

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
5. CULTURAL RESOURCES. Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☐	☐	☐	☑
b) Cause a substantial adverse change in the significance of an archaeological resource as defined in §15064.5?	☐	☐	☐	☑
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☑
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☐	☑
6. GEOLOGY and SOILS. Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:	☐	☐	☐	☑
i) Rupture of a known earthquake fault, as delineated in the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines & Geology Special Publication 42.	☐	☐	☐	☑
ii) Strong seismic ground shaking?	☐	☐	☐	☑
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☐	☑
iv) Landslides?	☐	☐	☐	☑
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☐	☑
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?	☐	☐	☐	☑
d) Be located on expansive soils, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☐	☑
e) Have soils incapable of adequately supporting the use of septic tanks or alternate wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	☑
7. GREENHOUSE GAS EMISSIONS -- Would the project:				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☐	☑
b) Conflict with any applicable plan, policy or regulation of an agency adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☐	☑
8. HAZARDS and HAZARDOUS MATERIALS. Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☐	☑
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☐	☑
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within ¼ mile of an existing or proposed school?	☐	☐	☐	☑
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code §65962.5 and, as a result, would it create a significant hazard to the public or to the environment?	☐	☐	☐	☑

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or a public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☑
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☑
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☑
h) Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☑
9. HYDROLOGY and WATER QUALITY. Would the project:				
a) Violate any water quality standards or waste discharge requirements?	☐	☑	☐	☐
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (*e.g.*, the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	☑
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☐	☐	☑
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☐	☐	☐	☑
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☐	☑
f) Otherwise substantially degrade water quality?	☐	☑	☐	☐
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☑
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	☑
i) Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☑
j) Inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☑

Hydrology and Water Quality Impacts

California Ocean Plan Chemical Objectives

The California Ocean Plan prohibits waste discharges to ASBS and requires that discharges be a sufficient distance away from the ASBS to assure maintenance of natural water quality in the ASBS. Since 2003 the State Water Board adopted exceptions have required that natural water quality be met as a condition to discharges into ASBS. Considerable work has been funded by the State Water Board to address the question of what constitutes natural water quality. A committee of scientists (the Natural Water Quality Committee) has been convened to assist in answering this question, and three studies have been performed on water quality in ASBS: 1) a pilot study on reference sites in northern, central and southern California; 2) a statewide probabilistic survey of ASBS water quality near discharges and away from discharges (background water quality); and 3) a targeted survey of water quality at discharges and at reference sites in southern California.

The California Ocean Plan also provides numeric objectives for the protection of marine aquatic life based on a conservative estimate of chronic toxicity. The following (Table 2) are certain California Ocean Plan numeric objectives.

Table 2. California Ocean Plan Table B Chemical Objectives, Marine Aquatic Life

Constituent	Inst. Max.	Daily Max.	6 Mo. Median
Arsenic	80 µg/L	32 µg/L	8 µg/L
Cadmium	10 µg/L	4 µg/L	1 µg/L
Chromium	20 µg/L	8 µg/L	2 µg/L
Copper	30 µg/L	12 µg/L	3 µg/L
Lead	20 µg/L	8 µg/L	2 µg/L
Mercury	0.4 µg/L	0.16 µg/L	0.04 µg/L
Nickel	50 µg/L	20 µg/L	5 µg/L
Selenium	150 µg/L	60 µg/L	15 µg/L
Silver	7 µg/L	2.8 µg/L	0.7 µg/L
Zinc	200 µg/L	80 µg/L	20 µg/L
NH_3N	6,000 µg/L	2400 µg/L	600 µg/L

Natural Water Quality

As part of the Scripps Institute of Oceanography (SOI) exception, State Water Board directed staff to create an ASBS Natural Water Quality Committee (NWQC) to define natural water quality in the San Diego-Scripps ASBS in La Jolla. The NWQC had a three-year mission to advise State Water Board staff regarding impacts of SIO's discharges into an adjoining ASBS. While the committee focused on SIO and other relevant data in the vicinity of SIO, they also recognized the importance of their work in the context of the greater ASBS, Ocean Plan, and storm water issues.

In September 2010 a final report from the NWQC was presented to the State Water Board, which included a definition of Natural Water Quality. The definition states that natural water quality is "That water quality (based on selected physical chemical and biological characteristics) that is required to sustain marine ecosystems, and which is without apparent human influence, i.e., an absence of significant amounts of: a) man-made constituents (e.g., DDT), b) other chemicals (e.g., trace metals), physical (temperature/thermal pollution, sediment burial) and biological (e.g., bacteria) constituents at levels that have been elevated due to man's activities above those resulting from the naturally occurring processes that affect the area in question, and c) non-indigenous biota (e.g., invasive algal bloom species) that have been introduced either deliberately or accidentally by man."

The definition also states that: "it is not practical to identify a unique seawater composition as exhibiting natural water quality. Nevertheless, the committee believes that it is practical to define an operational natural water quality for an ASBS, and that such a definition must satisfy the following criteria:

- it should be possible to define a reference area or areas for each ASBS that currently approximate natural water quality and that are expected to exhibit the likely natural variability that would be found in that ASBS,
- any detectable human influence on the water quality must not hinder the ability of marine life to respond to natural cycles and processes."

The NWQC's complete definition of Natural Water Quality and their other findings may be found in the Summation of Findings, Natural Water Quality Committee 2006-2009, in Appendix C.

Reference Site Pilot Study

In the 2007-2008 winter season, a pilot study was performed on potential reference sites. Table 3 provides average results and data ranges for all potential reference site samples:

Table 3. Average Results and Data Ranges for All Potential Reference Site Samples

Constituent	Units	All Sites n = 8
TSS	mg/L	40.8 (2.3 - 180)
Ammonia	mg/L	0.02 (ND - 0.04)
Nitrate	mg/L	0.02 (ND - 0.06)
Nitrite	mg/L	0.005 (ND - 0.01)
Phosphorus	mg/L	0.19 (ND - 1.13)
Chromium	µg/L	0.87 (0.1 - 3.17)
Copper	µg/L	0.86 (ND - 2.76)
Lead	µg/L	0.98 (ND - 4.65)
Nickel	µg/L	1.53 (ND - 4.58)
Zinc	µg/L	2.13 (ND - 9.37)
Total PAH	µg/L	0.081 (0.001 - 0.444)
Total DDT	µg/L	ND
Total PCB	µg/L	ND
Toxicity Assay	% fertilization	96.8 (92 - 99)

It is clear from the above information that the mean values for ammonia and metals were below Ocean Plan six-month medians objectives. The only constituents with maximum values slightly above the six month medians were chromium and lead; in the case of chromium the objective is based on hexavalent chromium, and the chromium value presented above was for total chromium. PAHs were present but are known to be naturally present in watersheds and submarine geological features. Most importantly there were no detectable levels of the synthetic pollutants DDT and PCB in the samples. Although there was a small sample size, and this work only represents one winter season, this first year pilot study may give us a good picture of nearshore ocean natural water quality.

Not all of the eight samples were collected when surface stream runoff entered ocean waters. However when comparing samples with surface drainage influence and with samples when no drainage was occurring, the average values for metals and PAH was slightly higher when there was no drainage. This indicates a likelihood that stream runoff provides some reduction of metal and PAH concentration due to natural dilution.

Table 4. Regional Comparison of Potential Reference Stations

Constituent	Units	North Coast n = 1	Central Coast n = 2	South Coast n = 2
TSS	mg/L	12.3	5.35 (2.3 - 8.4)	34.5 (21.7 - 47.2)
Ammonia	mg/L	0.03	0.02 (ND - 0.04)	0.015 (ND - 0.03)
Nitrate	mg/L	0.06	0.01	0.005 (ND - 0.01)
Nitrite	mg/L	0.01	ND	0.005 (ND - 0.01)
Phosphorus	mg/L	ND	ND	0.016 (ND - 0.032)
Chromium	µg/L	1.12	0.11 (0.1 - 0.12)	0.76 (0.6 - 0.92)
Copper	µg/L	1.07	0.31 (ND - 0.62)	0.91 (0.28 - 1.54)
Lead	µg/L	0.15	0.20 (ND - 0.39)	1.11 (0.51 - 1.71)
Nickel	µg/L	1.56	0.66 (ND - 1.31)	1.88 (0.53 - 3.23)
Zinc	µg/L	ND	0.77 (0.1 - 1.45)	2.56 (2.44 - 2.69)
Total PAH	µg/L	0.003	0.003 (0.001 - 0.004)	0.018 (0.012 - 0.024)
Total DDT	µg/L	ND	ND	ND
Total PCB	µg/L	ND	ND	ND
Toxicity Assay	% fertilization	98	96.5 (96 - 97)	95.5 (92 - 99)

One concern voiced by stakeholders is that there may be differences in natural water quality in different regions of the state. Table 4 represents a regional comparison of the potential reference station results. Two samples were collected in reference areas on the Central Coast.

Statewide Probabilistic Study

The State Water Board funded a statewide monitoring program during the winter of 2008-09 to assess water quality in ASBS near and far from direct discharges. Over 100 chemical constituents and toxicity were measured from 62 sites using a probabilistic study design; roughly half of sites were sampled in the ocean directly in front of a direct discharge into an ASBS and the other half were located in the ocean greater than 500 meters from a direct discharge. Sample sites greater than 500 meters from direct discharges may be influenced by other watershed drainages either into or outside of the ASBS, and therefore may represent background but not necessarily natural conditions. Samples at each site were collected less than 24 hour before rainfall and again less than 24 hour after rainfall. Ocean receiving water sites were sampled at most mainland ASBS in California.

The statewide survey illustrated generally good chemical water quality at the Pacific Grove ASBS. Tables 5 reports the results of the 2009 ASBS Water Quality Survey for the Pacific Grove ASBS sample locations. Samples were collected prior to a storm event and after the beginning of a storm event at one location in the Pacific Grove ASBS near discharges (station D035); however there was no "non-discharge" site (>500 meters from a discharge) in the Pacific Grove ASBS.

In non-storm conditions (pre-storm), water quality for almost all the constituents analyzed is within the Ocean Plan standards. Synthetic anthropogenic chemicals such as DDTs or PCBs were not detected. The only constituent that slightly exceeded the Ocean Plan objective (0.0088 µg/L) was total PAH (0.013 µg/L). Therefore overall pre-storm water quality in the Pacific Grove ASBS is very good.

Post rain receiving water near discharges in Pacific Grove ASBS exhibited evidence of minor storm runoff impacts. Concentrations of nutrients and certain metals show increases from the pre-rain sample. While most constituents did not exceed standards, three constituents (total copper, total zinc, and PAHs) exceeded the lowest applicable objectives (six month median for metals and 30 day average for PAHs) at the Pacific Grove ASBS. The post-rain total copper concentration of 3.5 µg/L slightly exceeds the Ocean Plan six month median water quality objective of 3.0 µg/L but was also greater than the statewide pilot study mean and maximum reference concentrations (Table 3). The total zinc concentration of 21.2 µg/L slightly exceeds the Ocean Plan six month median water quality objective of 20 µg/L but was also greater than the statewide pilot study mean and maximum reference concentrations (Table 3). Both dissolved copper and zinc were similar to the total copper and zinc concentrations, and just slightly below the Ocean Plan six month median objectives. For total PAH the post-rain sample (0.014 µg/L), virtually the same as the pre-rain sample, slightly exceeded Ocean Plan objective of 0.0088 µg/L; nevertheless this was within the range of PAH concentrations (0.001-0.444 µg/L) found at reference sites statewide during the 2007-08 pilot study (Table 3).

Table 5. Statewide ASBS Water Quality Survey, Results for Pacific Grove ASBS Randomly Selected Sample Station

Constituent	Discharge Pre Storm Event	Discharge Post Storm Event	Units
Ammonia-N	0 (ND)	0.03	MG/L
Nitrate + Nitrite-N	0.07	0.46	MG/L
TP-Total	0.033	0.079	MG/L
TN	0 (ND)	0	MG/L
TSS	2.3	5.2	MG/L
DOC	0 (ND)	1.9	MG/L
Arsenic-Dissolved	1.33	1.90	µg/L
Arsenic-Total	1.47	2.33	µg/L
Cadmium-Dissolved	0.03	0.034	µg/L
Cadmium-Total	0.036	0.054	µg/L
Chromium-Dissolved	0.161	0.332	µg/L
Chromium-Total	0.195	0.592	µg/L
Copper-Dissolved	0.33	2.72	µg/L
Copper-Total	0.48	3.54	µg/L
Iron-Dissolved	0 (ND)	24.5	µg/L
Iron-Total	35.1	128.4	µg/L
Lead-Dissolved	0.064	0.245	µg/L
Lead-Total	0.274	0.958	µg/L
Nickel-Dissolved	0.193	0.74	µg/L
Nickel-Total	0.267	0.859	µg/L
Silver-Dissolved	0 (ND)	0	µg/L
Silver-Total	0 (ND)	0	µg/L
Zinc-Dissolved	0 (ND)	19.85	µg/L
Zinc-Total	0 (ND)	21.24	µg/L
PAHs	0.013	0.014	µg/L

Applicant Water Quality Testing Results

As part of their monitoring requirement for the exception application, samples were collected for HMS waste seawater effluent, storm water runoff, and ocean receiving water.

Waste Seawater Effluent Water Quality

General Considerations for Toxicity Testing

Toxicity tests evaluate the biological response of organisms to the effluent and measure the acceptability of waters for supporting a healthy marine biota. Acute aquatic toxicity tests result in endpoint referred to as a “lethal dose 50” (LC50). The LC50 is the dose that produces mortality in 50% of the test organisms. A high LC50 value indicates low acute toxicity and a low LC50 indicates high toxicity. “Toxicity Units Acute” (TUa) are inverses of the LC50s and are calculated by dividing 100 by the LC50 resulting from a 96-hour toxicity test. High TUa values indicate high toxicity. The Ocean Plan daily maximum objective is 0.3 TUa for acute toxicity, but according to the Ocean Plan this criterion may be applied to discharges with permitted dilution values of $\geq$100:1 at the edge of the mixing zone. Since dilution values were not applied to the storm water or receiving water samples collected by applicants, the percent survival results in the chronic toxicity tests are presented to provide information about acute toxicity.

Regarding chronic toxicity, the "No Observed Effect Level" (NOEL) is the highest concentration of effluent or receiving water that causes no observable adverse effects on the test organisms in a critical life stage bioassay. The Ocean Plan requires chronic toxicity to be expressed as TUc=100/NOEL. NOELs of 100 percent indicate that there was no observed toxicity; NOELs less than 100 percent indicate increasing toxicity with decreasing percent concentration. For the following toxicity tests the TUc was calculated as TUc=100/NOEC for both test responses. The NOEC is the no observed effects concentration.

Use of pass/fail tests consisting of a single effluent concentration and a control is not recommended. HMS effluent and receiving water toxicity tests were performed using a single effluent concentration and a control. Since a dilution series protocol was not performed in either the acute or chronic bioassays and test organisms exposed to 100% concentration only, these results (Table 6) may not adequately reflect accurate organism response to toxicity endpoints.

Waste Seawater Toxicity Results

On June 15, 2006 two samples of HMS waste seawater (aquaria effluent and TRCC effluent) and receiving water were sampled and analyzed for chronic toxicity. There was no significant toxicity to kelp and fish associated with waste seawater effluent. Likewise there was no significant reduction in survival for mysids in waste seawater. However, there was a significant reduction in mysid growth (> 1.0 TUc) associated with the TRCC waste seawater effluent. Since that time the TRCC effluent has been re-routed to the Monterey Bay Aquarium for discharge.

Three marine species, kelp, shrimp and fish were again evaluated for toxicity in 2007. HMS waste seawater effluent and receiving water toxicity tests were performed using a single effluent concentration and a control. Waste seawater and receiving water toxicity results for samples collected on August 20, 2007 are presented in Table 6.

Chronic toxicity testing with kelp (*Macrocyctis pyrifera*) resulted in no significant reductions in kelp germination or growth in the waste seawater effluent or the receiving water. The germination and growth no observed effects concentrations (NOECs) were 100% effluent which resulted in 1.0 TUc for both endpoints.

Chronic toxicity testing with mysid shrimp (*Americamysis bahia*) resulted in no significant reductions in mysid survival or growth in the waste seawater effluent or the receiving water. The survival and growth NOECs were 100% effluent resulting in 1.0 TUc for both endpoints.

Chronic toxicity with fish (*Menidia beryllina)* resulted in no significant reductions in fish survival in the waste seawater or the receiving water. The survival NOEC was 100% effluent, resulting in 1.0 TUc. However, there was a slight, but statistically significant, reduction in fish growth in the aquaria effluent compared to the receiving water. The statistically significant decrease in the biomass observed is likely attributed to the mortality of one test organism in the effluent treatment. However, when the effluent sample biomass was compared to the seawater control, there was no significant difference.

Table 6. HMS Aquaria Seawater Effluent and Receiving Water Toxicity Analysis 2007

Sample Description	Toxicity Test Type	Mysid Shrimp TUc	Kelp	Fish TUc
Aquaria effluent	Chronic	1.0 100% mean survival 0.25 mg mean biomass	1.0 TUc 81.4% mean germination 13.9 µm germ tube length	1.0 95.0% mean survival 0.64 mg mean biomass
Receiving water	Chronic	97.5% mean survival 0.24 mg mean biomass	83.0% mean germination 14.2 µm germ tube length	97.5% mean survival 0.75 mg mean biomass
Seawater Control (from Bodega Marine Lab)	Chronic	97.5% mean survival 0.25 mg mean biomass	83.4% mean germination 13.6 µm germ tube length	97.5% mean survival 0.73 mg mean biomass

Waste Seawater Chemical and Physical Constituents

Samples were collected for Hopkins Marine Station waste seawater effluent (March 22, 2005, June 15, 2006 and September 1, 2006) and ocean receiving water (June 15, 2006). Monitoring data for constituents in seawater effluent and receiving water is presented in Tables 7 and 8.

Table 7. Hopkins Marine Station Seawater Results, Conventional Pollutants, 2005 and 2006

Chemical (unit)	Ocean Plan 6-month median	Ocean Receiving 6/15/06		Seawater Discharge 3/22/05		Seawater Discharge 6/15/06	
		Site #13 Offshore		**Site #2 Agassiz**		**Site #12 TRCC**	**Site #10 Aquaria Loeb**
Ammonia – N (µg/L)	**600.0**	20.0		ND		10.0	ND
Nitrate-N (µg/L)		40.0				870.0	80.0
Turbidity (NTU)	**225.0***	ND		1.8		2.80	0.20
Settleable Solids (ml/L)	**3.0***	ND				0.2	ND
pH	**6.0-9.0**	8.1				7.59	7.64
Salinity (0/00)		33.2				35	35

*Maximum at any time.

Seawater system discharge samples were composite samples. Ocean receiving water samples were grab samples.

Table 8. Metals in Waste Seawater Effluent and Receiving Water, 2005 and 2006

Chemical	Seawater Discharge 9/1/06			Ocean Receiving 6/15/06	Seawater Discharge 3/22/05	Seawater Discharge 6/15/06	
Units µg/L	Site #10 Aquaria Loeb	Site HOWS	Site #2 Agassiz	Site #13 Offshore	Site #2 Agassiz	Site #12 TRCC	Site #10 Aquaria Loeb
Arsenic	1.47	1.691	1.56	0.954	1.58	1.419	1.282
Cadmium	0.048	0.054	0.039	0.035	0.05	0.113	0.036
Chromium	0.58	2.68	0.7	0.355	1.15	1.575	0.435
Chromium - hexavalent	---	---	---	---	ND	---	---
Copper	0.664	1.178	0.487	0.555	**4.54**	**13.501**	0.5
Lead	0.009	0.491	0.01	0.141	0.685	0.789	0.032
Mercury	ND	ND	ND	ND	0.019	ND	ND
Nickel	0.285	0.748	0.317	0.197	1.61	1.518	0.252
Selenium	ND	0.046	ND	0.026	0.043	0.196	0.01
Silver	ND	ND	ND	ND	ND	ND	ND
Zinc	0.854	0.172	0.219	5.047	19.3	12.376	6.644

(---) Indicates constituent or sample site not tested. ND indicates constituent sampled but non-detected.

Seawater system discharge samples were composite samples. ASBS ocean water samples were grab samples.

It is clear that certain ASBS waste seawater discharges generally contain some concentrations of waste. For example, nitrate nitrogen in waste seawater at Loeb Aquaria (80 µg/L) and TRCC (870 µg/L) were higher than the pilot study statewide reference results (maximum value 0.06 mg/L, which is 60 µg/L). However, in terms of the water quality objectives, the waste seawater was below standards for most constituents, except copper on occasion, at Agassiz in March 2005 and at TRCC in June 2006. The Agassiz waste seawater was originally co-mingled with roof storm drainage, but was no longer co-mingled following the March 2005 sample. The June 2006 sample for that outfall indicated water quality improvements for copper and zinc. It should be noted that the discharge from TRCC has since been routed to the Monterey Bay Aquarium. The receiving water samples did meet Ocean Plan objectives.

Storm Water Water Quality

Storm Water Toxicity Results

Storm water samples were collected for toxicity analysis on March 6, 2006. Samples for toxicity testing were collected at two locations representing HMS storm runoff, from the Agassiz and Denault Buildings and parking lot (HAGZ) and from the grounds and buildings at the TRCC (HTRC). Three other samples were collected that were primarily municipal runoff from Pacific Grove (PGWB, PGAF, and PGSW). PGWB storm water flows originate from Pacific Grove and there are no contributions from HMS. PGAF includes exclusively storm water flows from the streets of Pacific Grove. These waters enter HMS property at the fence line behind the Fisher building. PGSW includes exclusively storm water flows from the streets of Pacific Grove. These waters enter HMS property at the fence line behind parking lot. Storm water chronic toxicity results are presented in Table 9.

As in the above seawater effluent testing, there is one caution that should be mentioned about the following results. Since a dilution series protocol was not performed in the chronic bioassays and test organisms exposed to 100% concentration only, these results (Table 9) may not adequately or completely reflect accurate organism response to toxicity endpoints.

For giant kelp (*Macrocystis pyrifera*) chronic toxicity tests, there were significant reductions in germination in the PGAF, HTRC, PGSW and PGWB storm waters. It should be noted that according to HMS, the PGAF, PGSW, and PGWB samples are predominantly from the City of Pacific Grove. The reductions in germination at the HTRC and PGSW storm water samples may have been driven by the unusually low inter-replicate variability. The germination NOEC was <100% storm water, resulting in >1.0 TUc in four of the samples. There were no significant reductions in kelp germination in the HAGZ storm water sample; the germination NOEC was 100% storm water, resulting in 1.0 TUc for the HAGZ sample. There were significant reductions in mean germ tube length in each of the storm water samples. There were also reduced germ tube growth in the Artificial Sea Salt Control indicating that the artificial sea salt that was being used to adjust the salinity of the storm water samples to the required test salinity may have been an artifact limiting germ tube growth; there were no significant reductions in germ tube growth in any of the storm water samples relative to the Artificial Sea Salt Control; the resulting growth NOEC was 100% storm water when compared to the Artificial Sea Salt Control, resulting in 1.0 TUc for all 5 samples.

For mysids (*Americamysis bahia*) chronic toxicity tests, there were no significant reductions in mysid survival in the storm water samples; the NOEC was 100% storm water, and the TUc was 1.0 for all samples. The PGAF storm water sample, which is exclusively runoff from the City of Pacific Grove representing run-on storm water quality as it enters HMS, was acutely toxic to mysids (TUa = 1.17), but the other storm water samples (HTRC, HAGZ, PGSW, and PQWB) were not acutely toxic. In addition, there were significant reductions in mysid growth in the PGAF, HTRC, PGSW, and PGWB storm water samples. The NOEC of <100% storm water resulted in >1.0 TUc in these four samples. There were no significant reductions in mysid growth in the HAGZ storm water (NOEC 100% storm water, 1.0 TUc).

For fish (*Menidia beryllina*) chronic toxicity tests, there was no significant reduction in survival or growth in any of the storm water samples. The NOEC was 100% storm water, resulting in 1.0 TUc for each of the five storm water samples.

Table 9. HMS Storm Water Runoff Chronic Toxicity Analysis 2006

Waterbody Description	Site Description	Toxicity Test Type	Mysids	Kelp	Fish
Storm water	HGAZ (PCG 250) primarily storm water from HMS parking lot with some contribution from Pacific Grove	Chronic	Survival 1.0 TUc 90% mean survival Growth 1.0 Tuc (0.19 mg mean biomass)	Germ. 1.0 TUc 95.6 mean% germination Growth 1.0 Tuc germ tune length 14.6 µm	Survival 1.0 TUc 90% mean survival Growth 1.0 Tuc 0.63 mg mean biomass
Storm water	HTRC Composed of runoff from around the TRCC facility commingled with runoff from Pacific Grove before draining to the ASBS via PCG258	Chronic	Survival 1.0 TUc 100% mean survival Growth >1.0 Tuc 0.15 mg mean biomass	Germ. >1.0 TUc 93 mean% germination Growth 1.0 Tuc germ tune length 13.5 µm	Survival 1.0 TUc 95% mean survival Growth 1.0 Tuc 0.66 mg mean biomass
Storm water	PGWB Composed of runoff from Pacific Grove and draining into ASBS from PCG238	Chronic	Survival 1.0 TUc 95% mean survival Growth >1.0 Tuc 0.17 mg mean biomass	Germ. >1.0 TUc 87 mean% germination Growth 1.0 Tuc germ tune length 15.2 µm	Survival 1.0 TUc 95% mean survival Growth 1.0 Tuc 0.69 mg mean biomass
Storm water	PGAF Composed of runoff from Pacific Grove prior to co-mingling with runoff from HMS before draining to the ASBS via PCG257	Chronic	Survival 1.0 Tuc 90% mean survival Growth >1.0 Tuc 0.12 mg mean biomass	Germ. >1.0 TUc 89.6 mean% germination Growth 1.0 Tuc germ tune length 14.1 µm	Survival 1.0 TUc 97.5% mean survival Growth 1.0 Tuc 0.73 mg mean biomass
Storm water	PGSW Composed of runoff from Pacific Grove prior to co-mingling with runoff from HMS	Chronic	Survival 1.0 TUc 92.5% mean survival Growth >1.0 TUc 0.16 mg mean biomass	Germ. >1.0 TUc 93.2 mean% germination Growth 1.0 Tuc germ tune length 14.5 µm	Survival 1.0 TUc 95% mean survival Growth 1.0 Tuc 0.68 mg mean biomass

Storm Water Chemical Constituents

Samples were collected for HMS storm water runoff and analyzed for metals and ammonia in storm water. Results provided in the HMS 2006 exception application are provided in Table 10.

Table 10. Metals and Ammonia - Storm Drain Discharge Water

Constituent	PCG 238 PGWB	PCG 250 HGAZ 3/22/05	PCG 250 HGAZ 3/22/05	PCG 250 HGAZ 3/6/06	HBBW Unid (a)	HBBW Unid (a)	PGSW	PCG 257	PGAF Unid (b)
Arsenic µg/L	0.95	1.33	1.32	1.39	1.68	1.76	1.17	23.9	29.9
Cadmium µg/L	0.3	<0.1	<0.1	ND	ND	ND	0.3	ND	ND
Chromium µg/L	1.23	13.4	12.4	0.4	0.47	0.46	1.49	0.22	0.18
Copper µg/L	45.2	36.2	36.2	13.1	11	11	19.1	7.52	7.65
Lead µg/L	18.1	15.3	15.3	1.33	4.69	4.63	31.5	3.53	2.12
Mercury µg/L	ND	0.7	0.72	0.021	0.0149	0.0172	0.0155	ND	ND
Nickel µg/L	2.44	2.68	2.63	0.82	0.93	0.92	1.65	0.34	0.39
Selenium µg/L	ND	0.94	0.55	ND	ND	0.5	ND	ND	ND
Silver µg/L	ND	<0.1	<0.1	ND	ND	ND	ND	ND	ND
Zinc µg/L	201	102	102	33.4	59.9	59.4	129	115	94
Ammonia mg/L	<0.01	0.06			.01		20	300	0.47

(---) Indicates constituent or sample site not tested. ND indicates constituent sampled but non-detected.
Seawater system discharge samples were composited prior to analysis.

Again, it is clear that discharges of storm water generally contain some concentrations of waste. In addition, storm water runoff appears to be more of a concern than the waste seawater discharges. It appears that three of the storm water samples (PCG 238/PGWB and two replicates of PCG250/HGAZ on 3/22/05) exhibited copper concentrations above instantaneous maximum objective (30 µg/L). One storm water sample (PGSW) exhibited a lead concentration above the instantaneous maximum objective (20 µg/L). Two storm water samples (two replicates of PCG250/HGAZ on 3/22/05) exhibited mercury concentrations above the instantaneous maximum objective (0.4 µg/L). One storm water sample (PCG238) exhibited a zinc concentration above the instantaneous maximum objective (200 µg/L). All nine of the samples exceeded the six-month median objective for at least one of the metals, with the copper and zinc objectives being exceeded for all samples. Eight samples exceeded the six-month median objective for lead and two samples exceeded the six-month median objective for arsenic.

It must be noted that runoff in PGSW and PGAF is from the City of Pacific Grove. Samples PGSW and PGAF represent the City's runoff prior to co-mingling with HMS runoff. PGSW then drains to PCG 257 and PGAF drains to HBBW. PCG 257 and HBBW represent runoff which is mostly municipal runoff, with minor contribution from HMS. In addition, a comparison of samples for PCG250 (HMS runoff) did show an improvement between March 2005 and March 2006, but still exceeded the six month median objectives for copper and zinc.

Mussel Watch Bioaccumulation

Statewide mussel watch monitoring is an important tool in assessing bioaccumulation and water quality. Information from the National Ocean and Atmospheric Administration (NOAA) National Status and Trends (NS&T), and by the State Water Board Mussel Watch Program (SMWP) are provided below to assess spatial distributions and temporal trends in chemical contamination in or near certain ASBS.

The SMWP was initiated in 1977 by the State Water Board to provide a uniform statewide approach to the detection and evaluation of toxic substances in California coastal waters, bays, harbors, and estuaries. The SMWP conducted a monitoring program using transplanted bivalve (*Mytilus californianus*) for trace elements and organic contaminants. The tissue samples were analyzed for the presence of trace elements and legacy pesticides.

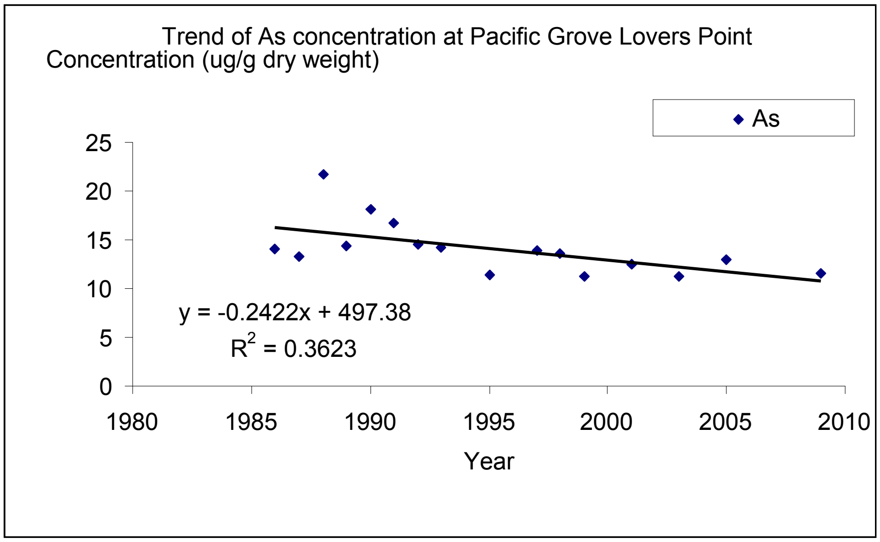
An Elevated Data Level (EDL) is defined for the purposes of the SMWP as that concentration of a toxic substance in mussels or clams that equals or exceeds a specified percentile (such as 85 or 95 percent) of all measurements of the toxic substance in the same species and exposure condition (resident or transplant). The available data for trace elements and organic constituents from 2001 to 2005 were reviewed and compared to the EDL 85 and EDL 95. Most trace elements were present at low concentration in the ASBS. However none of the elements exceeded the EDL 85 or EDL 95 in transplanted mussels in the ASBS during 2001-2005 sampling periods. However certain synthetic chlorinated hydrocarbon compounds were elevated (2001-2005). Pesticide compounds including cis-chlordane, trans-chlordane, total chlordane, heptachlor epoxide, and dieldrine exceeded the EDL 85 in the Pacific Grove ASBS. During that period the Pacific Grove ASBS also exhibited exceedances of the EDL 95 for DDD, DDE, and PCB 1254.

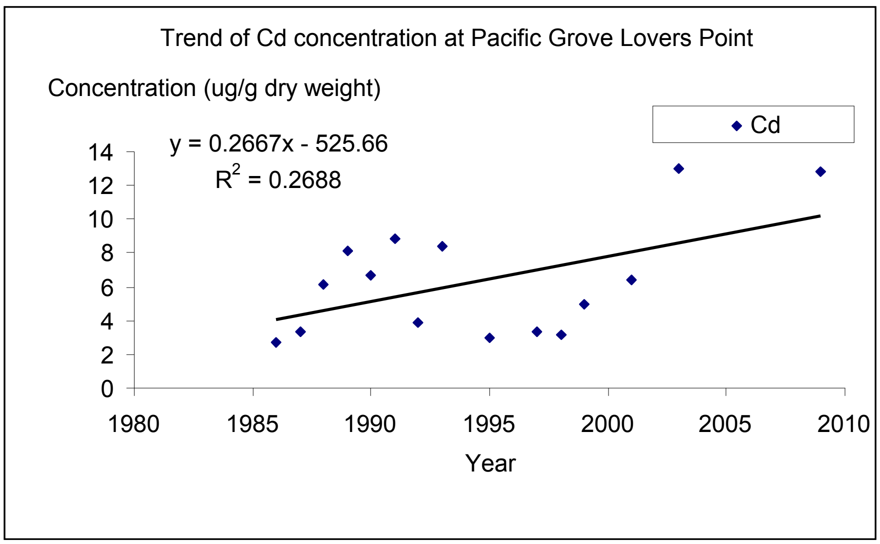
To characterize the spatial distributions and trends in contaminant levels in the coastal ocean, NOAA NS&T Program was formed in 1986. The NOAA NS&T Mussel Watch Program measures the presence of concentrations of a broad suite of trace metals and organic chemicals in resident bivalves. The NS&T Mussel Watch Program is national in scale and the sampling sites are representative of a large area.

The NOAA NS&T Program analyzes bivalve tissue samples from the mussels *M. edulis and M. californianus* for trace metals, synthetic organic constituents, and histopathology. The NOAA NS&T sampling is conducted every two years. The Pacific Grove ASBS has been sampled for *Mytilus californianus* since 1986. Unlike the transplanted mussel results from the SWMP, the NOAA resident mussel analytical results are very recent (2009).

Between 1986 and 2010, 18 constituents (total butyltins, total chlordanes, total DDTs, total dieldrins, total PAHs, total PCBs, Se, Sb, Ag, Al, As, Cd, Cr, Cu, Hg, Ni, Pb, Sb, Se, and Zinc) were analyzed in Pacific Grove Lovers Point. Graphs for the 18 constituents are provided in Appendix D with linear regression trend lines and R^2 values provided. Most trace metals are either staying the same or showing decreases in mussel tissues. There were limited data for tin (n=6 from 1986-1993) but the trend for that short period was significantly downward. Arsenic concentrations also show a significant decrease at the Pacific Grove ASBS. However, cadmium concentrations have increased at the Pacific Grove ASBS (Figure 3). Cadmium in mussels has been known to be associated with upwelling events and therefore it is possible that the cadmium increases at Pacific Grove may be at least in part due to natural causes. Concentrations of total butyltins, total chlordanes, total DDTs, total dieldrins, and total PCBs are trending downward, but not significantly; PAHs had an insignificant upward trend.

Figure 3 Mussel Watch Trends for Arsenic and Cadmium





According to the latest data (2007-2009), concentrations of most organic contaminant (including chlordane, DDT, PAH and PCB) and metals are lower than the statewide 85th percentile concentrations. The exceptions were dieldrin, cadmium, lead, and zinc. Mussel tissue dieldrin concentration is 6.27 ug/dry g which is higher than the statewide 85th percentile concentration (5.49ng/dry g). Cadmium concentration in mussel tissue (12.8 µg/dry g) is higher than the statewide 85th percentile (7.498 µg/dry g) concentration. Again, cadmium in mussel tissue may be indicative, at least in part, on natural upwelling. Lead concentration in mussel tissue (7.03 µg/dry g) is higher than the statewide 85th percentile (2.246 µg/dry g) concentration. Zinc concentration in mussel tissue (189 µg/dry g) is higher than the statewide 85th percentile (187.8 µg/dry g) concentration.

Storm Water BMPs

Appendix F describes in detail many of the best management practices (BMPs) now employed or soon to be initiated at the Hopkins Marine Station. These BMPs comprise the University-wide policies of Stanford and additional BMPs that reflect the unique characteristics of Hopkins Marine Station. The bulleted statements below provide an overview of current and future BMPs at the Station.

Current BMPs

- The separation of seawater and storm water (no commingling): *complete August 2006*
- All campus staff are trained immediately upon Facility arrival and annually thereafter for proper chemical handling and disposal and proper storm water best management practices. *Annual*
- Catch basins are labeled appropriately and cleaned out annually. *Annual*
- No pesticides or herbicides are used on property. *Current practice*
- Minimal outdoor hazardous materials (emergency generator fuel storage, small fuel containers for boats): Containers are properly labeled; locked storage; secondarily contained; inspected regularly; absorbent materials are kept on hand. *Current practice*
- Small boat fueling area is covered; regularly inspected and requires spill response training before use. *Current practice.*
- All dumpsters and recycling containers are leak-proof, have lids that are kept closed, sited on concrete surfaces located distant from storm drains, emptied weekly and inspected regularly. *Current practice.*

Planned BMPs

- Gradual conversion of paved walkways and parking lot to permeable pavement. *To be completed as surfaces require replacement.*
- Install moisture sensor irrigation controls to prevent over-watering of landscaping. *Expected completion 2007.* 888
- Replace lawn with native plantings to reduce water use, potential herbicide/pesticide use, and irrigation over-watering. Project underway: area around Miller Library and Monterey Boat Works Building completed (2005). *Expected full completion 2008.*
- Formalize current swale on property to treat storm water run-off from the City of Pacific Grove's recreation trail onto Station property: re-direct water to large field to allow percolation into soil. *Expected completion 2008.*

Hopkins has fully separate storm water and seawater discharges; there is no commingling. Hopkins has established its BMPs for the storm water generated from impervious areas at our 11 acre site. The Station has no industrial activities and does not have its own NPDES storm water permit. By far the greatest amount of storm water discharge occurring on Station property is water collected off-Station in the City of Pacific Grove and discharged through municipal storm water pipes that outfall into the HSMR ASBS. HMS estimated their storm water discharge relative to that from the City of Pacific Grove. Surface area of the City of Pacific Grove is 1,830 acres (79,714,800 square feet). HMS 11 acres (479,160 square feet) represent **0.6%** of the surface area of the City. This would leave HMS to receive less than one percent of the total rainfall of the City of Pacific Grove. The city is largely built-up and has minimal permeable area, whereas most of HMS acreage (approximately 72%) is covered by natural vegetation or lawn. This represents a relatively small fraction of rainfall on the HMS 11 acres likely to end up as storm water runoff, relative to the City of Pacific Grove.

Compliance history for drainages into the ASBS, including any spills, or upset events that resulting in the discharge of toxic or otherwise prohibited substances reports that no fuel spills, upset events or discharges of toxic chemicals have occurred at HMS (HMS Application 2006)..

Staff Summary of Pacific Grove ASBS Water Quality and HMS Discharges

Receiving water quality in the ASBS is generally good and supportive of marine life during dry weather. Resident mussel samples indicate that most trace metals and organic contaminants are either staying the same or showing decreases over time. In addition, according to the latest data (2007-2009), most analyzed metals, and total PAHs, are lower than the statewide 85^{th} percentile concentrations; the exceptions were cadmium, lead, and zinc.

During a storm event there appeared to be a slight increase in certain storm water constituents (nutrients and certain metals) in an ocean water sample collected in the ASBS; copper and zinc slightly exceeded the six month median objective but other metals meet the standards. The ASBS receives runoff from Phase II municipal storm water dischargers, Monterey and Pacific Grove, as well as HMS and the Monterey Bay Aquarium, so there are multiple contributions of runoff and waste seawater. Any alterations of water quality in the ASBS are not necessarily attributed to a single discharger.

HMS waste seawater does contain waste at very low levels. Most waste seawater appears to meet Ocean Plan objectives with the exception that samples did not always meet the six month median objectives for copper, and one sample exhibited very slight chronic toxicity effects. The HMS storm water (and neighboring Pacific Grove runoff) also contains waste but exceeds Ocean Plan standards much more frequently than waste seawater.

Given the status of the receiving water there is ample evidence to support an Ocean Plan exception for waste seawater and storm water discharges, but only if such discharges are properly controlled to maintain natural water quality in ASBS. HMS has already made improvements in its waste seawater discharges, and has also implemented or committed to BMPs to improve runoff quality. The adoption of Special Protections will further protect water quality by requiring the reduction of wastes in discharges. In addition, discharges and receiving water must be adequately monitored to insure compliance with the Special Protections, based on the range of natural water quality conditions at approved reference stations.

The following mitigating conditions will be required for the exception in relation to the waste seawater effluent.

- *HMS will not discharge chemical additives, including antibiotics and chlorine, in the seawater discharge system effluent. In addition and at a minimum, HMS, for its seawater effluent, must comply with effluent limits implementing*

Table B water quality objectives as required in Section III.C. of the Ocean Plan.

- *Waste Seawater Effluent Monitoring*

  - *Flows for the seawater discharge system discharging to the ASBS must be measured monthly and reported quarterly to the Regional Water Board.*

  - *During the first year of each permit cycle, quarterly effluent samples must be collected from the waste seawater discharge. These samples must be analyzed for Ocean Plan Table A constituents (except oil and grease), Ammonia N, Biochemical Oxygen Demand, salinity, and temperature.*

  - *Once annually, one of the effluent samples collected from the waste seawater discharge during wet weather and must be analyzed additionally for Ocean Plan Table B constituents (for marine life, except acute toxicity). Based on the results from the first year the Regional Water Board will determine the Table B constituents to be tested annually during the remainder of the permit cycle, except that ammonia nitrogen and chronic toxicity (for at least one consistent invertebrate or algal species) must be tested at least annually for the waste seawater effluent.*

- *Receiving Water Monitoring*

  - *At least once per a permit cycle the receiving water adjacent to the seawater discharge system and storm water discharges must be sampled 24 hours prior to a storm event.*

  - *Post storm receiving water adjacent to the seawater discharge system and storm water discharges must also be monitored at every time the effluent is sampled and analyzed for the same constituents as annual waste seawater samples and storm water samples. The sample location for the receiving water will be in the surf zone immediately adjacent to the outfall location where effluent is sampled. Optionally, specifically for storm runoff receiving water samples, samples may be composited.*

  - *For receiving water monitoring, alternatively, this requirement may be met by participation in a regional monitoring program approved by the State Water Board.*

- *Reference Site Monitoring*

  - *Reference samples must also be monitored at the same time as the effluent samples and analyzed for the same constituents as annual waste seawater samples and storm water samples. Reference samples will be collected in the ocean at a station determined via a regional monitoring program, or in the absence of such program by the State Water Board.*

Samples at the reference station during wet weather may be collected immediately following a storm event, but in no case more than 24 hours after, if sampling conditions are unsafe during the storm. Wet weather reference samples must be collected at the point where runoff from a reference watershed enters the ocean in the surf zone.

- *Alternatively this requirement may be met by participation in a regional monitoring program approved by the State Water Board.*

The following mitigating conditions will be required for the exception in relation to non-storm runoff and storm water management plans:

- *HMS must continue to prevent all discharges of non-storm water facility runoff (i.e., any discharge of facility runoff that reaches the ocean that is not composed entirely of storm water), except those associated with the operation and maintenance of the seawater system, and emergency fire fighting.*

- *HMS must specifically address the prohibition of non-storm water runoff and the reduction of pollutants in storm water discharges draining to the ASBS in a Storm Water Management Plan/Program (SWMP).*

- *The SWMP must describe the measures by which non-storm water discharges have been eliminated, how these measures will be maintained over time, and how these measures are monitored and documented.*

- *The SWMP must also address storm water discharges, and how pollutants have been and will be reduced in storm water runoff into the ASBS through the implementation of BMPs. The SWMP must describe the BMPs currently employed and BMPs planned (including those for construction activities), with an implementation schedule.*

- *Discharges must be free of trash, petroleum products and pesticides.*

- *The BMPs and implementation schedule must be designed to ensure natural water quality conditions in the receiving water due to either a reduction in flows from impervious surfaces or reduction in pollutants (with Table B Instantaneous Maximum objectives measured in the effluent as target levels), or some combination thereof. The implementation schedule must be developed to ensure that the BMPs are implemented within one year of the approval date of the SWMP by the Regional Water Board.*

- *The SWMP must include a map of surface drainage of storm water runoff, including areas of sheet runoff, and any structural Best Management Practices employed. The map must also show the storm water conveyances in relation to other facility features such as the laboratory seawater system and discharges, service areas, sewage treatment, and waste and hazardous materials storage areas. The SWMP must also include a* *procedure for updating the map and plan when other changes are made to the facilities.*

- *HMS is required to submit their final SWMP to the Regional Water Board within one year of the effective date of this exception.*

- *If the results of receiving water monitoring indicate that the storm water runoff is causing or contributing to an alteration of natural water quality in the ASBS, as measured at the reference station(s), HMS is required to submit a report to the Regional Water Board within 30 days of receiving the results. Those constituents in storm water that alter natural water quality or Ocean Plan receiving water objectives must be identified in that report. The report must describe BMPs that are currently being implemented, BMPs that are planned for in the SWMP, and additional BMPs that may be added to the SWMP. The report shall include a new or modified implementation schedule. The Regional Water Board may require modifications to the report. Within 30 days following approval of the report by the Regional Water Board, HMS must revise its SWMP to incorporate any new or modified BMPs that have been and will be implemented, the implementation schedule, and any additional monitoring required. As long as HMS has complied with the procedures described above and is implementing the revised SWMP, then HMS does not have to repeat the same procedure for continuing or recurring exceedances of the same constituent.*

Storm Water Runoff Monitoring

- *HMS is not required to monitor storm water outfalls that convey City of Pacific Grove "only" effluent under easement agreements. HMS is final custodian for "end of pipe" outfalls that it contributes to including co-mingled flows with City of Pacific Grove, thus must monitor and report for those outfalls.*

- *Flows for storm water runoff (by storm event) must be measured (or estimated) monthly and reported annually to the Regional Water Board.*

- *Once annually, during wet weather (storm event), the storm water runoff effluent must be sampled and analyzed from each storm drain for all Ocean Plan Table A constituents. Fecal Indicator Bacteria should be monitored at the larger outfalls shared with City of Pacific Grove.*

- *Once every permit cycle, during wet weather (storm event) on a rotating basis among discharge points, or a composite of all storm drains annually, the storm water runoff effluent must be sampled and analyzed additionally for Table B constituents (for marine aquatic life except acute toxicity), PAHs, pyrethroids, and OP Pesticides.*

- *The Regional Water Board may, at its discretion, after receiving and analyzing the required water quality monitoring data, choose to reduce and/or eliminate certain monitoring requirements for constituents that routinely are found in concentrations below Ocean Plan objectives.*

- *Receiving Water Monitoring*

    - *At least once per a permit cycle the receiving water adjacent to the seawater discharge system and storm water discharges must be sampled 24 hours prior to a storm event.*

    - *The receiving water adjacent to the seawater discharge system and storm water discharges must also be monitored during or immediately after a storm (wet weather). Receiving water samples must be collected when annual waste seawater effluent and storm water effluent is sampled, and analyzed for the same constituents as annual waste seawater samples and storm water samples. Wet weather samples in the receiving water may be collected immediately following a storm event, but in no case more than 24 hours after, if sampling conditions are unsafe during the storm. The sample location for the receiving water will be in the surf zone immediately adjacent to the outfall location where effluent is sampled. Optionally, specifically for storm runoff receiving water samples, samples may be composited.*

    - *For receiving water monitoring, alternatively, this requirement may be met by participation in a regional monitoring program approved by the State Water Board.*

- *Reference Site Monitoring*

    - *Reference samples must also be monitored at the same time as the effluent samples and analyzed for the same constituents as annual waste seawater samples and storm water samples. Reference samples will be collected in the ocean at a station determined via a regional monitoring program, or in the absence of such program by the State Water Board. Samples at the reference station during wet weather may be collected immediately following a storm event, but in no case more than 24 hours after, if sampling conditions are unsafe during the storm. Wet weather reference samples must be collected at the point where runoff from a reference watershed enters the ocean in the surf zone.*

    - *Alternatively this requirement may be met by participation in a regional monitoring program approved by the State Water Board.*

The following mitigating conditions will be required for the exception in relation to nonpoint source pollution from the waterfront and marine operations and construction activity in the ASBS:

- *HMS must prepare a waterfront and marine operations non-point source management plan containing appropriate management practices to address non-point source pollutant discharges. Appropriate management measures will include those described in the State's Non-point Source Program*

Implementation Plan for marinas and recreational boating, as applicable. The Regional Water Board, in consultation with the State Water Board's Division of Water Quality, will review the plan. The Regional Water Board shall appropriately regulate non-point source discharges in accordance with the State Water Board's Policy for Implementation and Enforcement of the Non-point Source Pollution Control Program. The plan must be implemented within six months of its approval.

- *HMS will notify the Regional Water Board within 180 days prior to any construction activity that could result in any discharge or habitat modification in the ASBS. Furthermore HMS must receive approval and appropriate conditions from the Regional Water Board prior to performing any significant modification, re-building or renovation of the facilities within the ASBS, per the requirements of Section III.E.2 of the Ocean Plan.*

The following mitigating conditions will be required for the exception in relation to water quality in general:

- *Sediment Toxicity: Once annually, the subtidal sediment and storm water outfall must be sampled and analyzed for Ocean Plan Table B constituents. For sediment toxicity testing, only an acute toxicity test using the amphipod Eohaustorius estuarius must be performed. Based on the first year sample results the Regional Water Board will determine specific constituents to be tested during the remainder of each permit cycle, except that acute toxicity for sediment must be tested annually. Alternatively this requirement may be met by participation in a regional monitoring program approved by the State Water Board.*

- *Butyltin Study: A butyltin study must be performed during the first year of the permit cycle for water, sediment and marine life in the Monterey Boat Yard vicinity. The marine life bioaccumulation study may use crabs or mussels as the target species. Collaboration between HMS, Monterey Bay Aquarium and the City of Pacific Grove is encouraged as a collaborative approach for these studies.*

- *Bioaccumulation Study: Once during the upcoming permit cycle, a bioaccumulation study using California mussels (Mytilus californianus) must be conducted to determine the concentrations of metals near field and far field. The Regional Water Board, in consultation with the Division of Water Quality, must approve the study design. The results of the survey must be completed and submitted to the Regional Water Board at least six months prior to the end of the permit cycle (permit expiration). Based on the study results, the Regional Water Board, in consultation with the Division of Water Quality, may adjust the study design in subsequent permits, or add additional test organisms. Alternatively this requirement may be met by participation in a regional monitoring program approved by the State Water Board.*

- *For metals analysis, storm water effluent, reference samples, and receiving water samples must be analyzed by the approved analytical method with the* *lowest minimum detection limits (currently Inductively Coupled Plasma/ Mass Spectrometry) described in the Ocean Plan.*

- *If monitoring information indicates that natural ocean water quality is not maintained, but there is sufficient evidence that a discharge is not contributing to the alteration of natural water quality, then the Regional Water Board may make that determination. In this case, sufficient information must include runoff and seawater system effluent sample data that has equal or lower concentrations for the range of constituents at the applicable reference area(s).*

Biological Pollutants (Invasive Species)

Any marine organism not indigenous to the Central California waters that may possibly be introduced through the laboratory or aquarium discharges is considered a biological pollutant. Invasive species in the marine environment generally 'arrive' to a location by one of these methods: 1) they are discharged as part of the ballast water from a docked or passing ship; 2) they are inadvertently released; 3) they come in as a 'stowaway' on another species; or 4) they are deliberately released (California Department of Fish and Game (DFG) 2001). The pathways that are most applicable to HMS are inadvertent releases or "stowaways" on another species.

Currently available information (DFG 2009) indicates that there are no invasive species that would be associated with a possible introduction from the HMS discharges. Still, the potential for such introductions of potentially invasive species or pathogenic organisms does exist, and such accidental introductions could alter the marine community in an undesirable way.

The following mitigating condition will be required for the exception as they relate to biological pollutants:

- *HMS must pursue and implement a program for prevention of Biological Pollutants (non-native invasive species) in consultation with the California Department of Fish and Game Marine Resources Division*

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
10. LAND USE AND PLANNING. Would the project:				
a) Physically divide an established community?	☐	☐	☐	☑
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☑
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☑

11. MINERAL RESOURCES. Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of future value to the region and the residents of the State?	☐	☐	☐	☑
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	☐	☐	☐	☑
12. NOISE. Would the project result in:				
a) Exposure of persons to, or generation of, noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☐	☑
b) Exposure of persons to, or generation of, excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	☑
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☑
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☑

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing in or working in the project area to excessive noise levels?	☐	☐	☐	☑
f) For a project within the vicinity of a private airstrip, would the project expose people residing in or working in the project area to excessive noise levels?	☐	☐	☐	☑
13. POPULATION AND HOUSING. Would the project:				
a) Induce substantial population growth in an area either directly (*e.g.*, by proposing new homes and businesses) or indirectly (*e.g.*, through extension of roads or other infrastructure)?	☐	☐	☐	☑
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☑
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☑
14. PUBLIC SERVICES. Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service rations, response times or other performance objectives for any of the public services:				
a) Fire protection?	☐	☐	☐	☑
b) Police protection?	☐	☐	☐	☑
c) Schools?	☐	☐	☐	☑
d) Parks?	☐	☐	☐	☑
e) Other public facilities?	☐	☐	☐	☑
15. RECREATION. Would the project:				
a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☑
b) Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment?	☐	☐	☐	☑
16. TRANSPORTATION / TRAFFIC. Would the project:				
a) Exceed the capacity of the existing circulation system, based on an applicable measure of effectiveness (as designated in a general plan policy, ordinance, etc.), taking into account all relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	☐	☐	☐	☑
b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?	☐	☐	☐	☑
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☑
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☑

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
e) Result in inadequate emergency access?	☐	☐	☐	☑
f) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☐	☐	☐	☑
17. UTILITIES AND SERVICE SYSTEMS. Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☑
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental impacts?	☐	☐	☐	☑
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental impacts?	☐	☐	☐	☑
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☑
e) Result in a determination by the wastewater treatment provider that serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☑
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	☑
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☑
18. MANDATORY FINDINGS OF SIGNIFICANCE.				
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☑	☐	☐
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)	☐	☐	☐	☑
c) Does the project have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	☑

MANDATORY FINDINGS OF SIGNIFICANCE

Under the less stringent and somewhat inadequate controls currently in force, HMS discharges waste into the ASBS and is in violation of the ASBS prohibition. The project, granting an exception with special mitigating conditions (i.e. special protections), will allow the continued discharge of waste seawater and storm water runoff, and therefore has the potential to degrade water quality. However, under these special protections, the quality of the discharge will improve from historical and current conditions, with an important reduction in the potential to degrade water quality. If all of the special protections designed to limit the discharge are met, as described in this Initial Study, the HMS discharge will not compromise the protection of ocean waters of the ASBS for beneficial uses, and the public interest will be served.

Granting the conditional exception, likewise, will not violate federal antidegradation requirements because water quality will not be degraded, but rather will be improved. Further, allowance of the exception will not violate the State Water Board's antidegradation policy (State Water Board 1968) since water quality conditions will improve; the discharge will not unreasonably affect present and anticipated beneficial uses; the discharge will not result in water quality worse than that prescribed in the Ocean Plan; and, the people of California benefit from the research and education provided by HMS while beneficial uses will still be protected.

DETERMINATION

Based on this initial evaluation, we find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because mitigation measures have been incorporated into the project. A MITIGATED NEGATIVE DECLARATION will be prepared.

This document was originally prepared by Constance Anderson and reviewed by Dominic Gregorio, Ocean Unit, on January 12, 2011. Based on Comments received this Initial Study has been revised on July 18, 2011. No changes were made to the environmental checklist, the mandatory findings of significance, and the determination.

Revised Document Prepared By:

July18, 2011

Constance Anderson Date

Environmental Scientist, Ocean Unit

Revised Document Reviewed by:

Dominic Gregorio — July18, 2011

Dominic Gregorio — Date

Senior Environmental Scientist, Ocean Unit

Authority: Public Resources Code Sections 21083, 21084, 21084.1, and 21087.

Reference: Public Resources Code Sections 21080(c), 21080.1, 21080.3, 21082.1, 21083, 21083.1 through 21083.3, 21083.6 through 21083.9, 21084.1, 21093, 21094, 21151; *Sundstrom v. County of Mendocino*, 202 Cal. App. 3d 296 (1988); *Leonoff v. Monterey Board of Supervisors*, 222 Cal. App. 3d 1337 (1990).

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