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 Humboldt State University Telonicher Marine Laboratory Discharge into the Trinidad Head Area of Special Biological Significance

Applicant: Humboldt State University Marine Laboratory
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2. Introduction

The State Water Resources Control Board (State Water Board), under its 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 Trinidad Head ASBS.

The Trinidad Head ASBS was included in this designation for the following reasons: 1. it has a diversity of habitat and biological assemblages; 2. Trinidad Head is the only major headland between Cape Mendocino and Pt. St. George; 3. some species with a northerly distribution are close to their southern limit at Trinidad; and 4. a colonial tunicate, *Cnemidocarpa finmarkiensis*, is common at Trinidad, but is rare elsewhere in California (State Water Board 1979).

Areas to the north and south of Trinidad Head were designated as ASBS because of the fluctuating presence of bull kelp beds, *Nereocystis luetkeana*. Kelp beds are biologically significant in providing both food and shelter for fish and invertebrates. Additionally, the beds are relatively rare along the coast of northern California and can be potentially affected by thermal and waste discharges (State Water Board 1979).

Since 1983, the California Ocean Plan (Ocean Plan) has prohibited the discharge of both point and nonpoint source waste to ASBS, unless the State Water Board grants an exception. The Ocean Plan allows the State Water Board to grant exceptions to Plan requirements where the State Water Board determines that the exception "will not compromise protection of ocean waters for beneficial uses, and, [t]he public interest will be served." Prior to granting an exception, the State Water Board must hold a public hearing and comply with the California Environmental Quality Act, Pub. Resources Code § 21000 et seq. (CEQA). In addition, the United States Environmental Protection Agency must concur.

ASBS are also accorded special protection under the Marine Managed Areas Improvement Act (Act), Pub. Resources Code § 36600 et seq.. Under the Act, ASBS are a subset of state water quality protection areas and, as such, “require special protection as determined by the [State Water Board]” pursuant to the Ocean Plan (Pub. Resources Code § 36700(f)). In all state water quality protection areas, waste discharges must be prohibited or limited by special conditions, in accordance with state water quality law, including the Ocean Plan (*Id.* § 36710(f)).

The Public Resources Code defines six categories of Marine Managed Areas (MMAs). These six categories are: Marine Reserves, Marine Parks, Marine Conservation Areas, Marine Recreation Management Areas, Marine Cultural Preservation Areas, and State Water Quality Protection Areas (SWQPAs). Under state law, the Reserves, Parks and Conservation Areas are further categorized as Marine Protected Areas (MPAs).

The Public Resourses Code states that ASBS are a subset of SWQPAs and require special protection as determined by the State Water Board pursuant to the Ocean Plan and the California Thermal Plan. Specifically, Pub. Resources Code section 36700 (f): “ASBS are a subset of state water quality protection areas, and require special protection as determined by the State Water Resources Control Board pursuant to the 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 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 Trinidad Head ASBS, and constitute the special conditions referred to in Section 36710(f) of the PRC.

On October 18, 2004, the State Water Resources Control Board (State Water Board) notified the Humboldt State University (HSU) Telonicher Marine Laboratory (TML) to cease storm water and nonpoint source waste discharges into an ASBS or to request an exception under the Ocean Plan. On December 21, 2005 the TML responded with a request for an exception to the California Ocean Plan. Subsequently, the State Water Board provided general instructions for exception application packages via its Web site (www.waterboards.ca.gov/water_issues/programs/ocean/asbs.shtml). On December 9, 2005, the State Water Board sent a letter to the TML 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 28, 2006.

The Ocean Plan also states that “The State Board may, in compliance with the California Environmental Quality Act, subsequent to a public hearings, 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 from beneficial uses, and b) the public interest will be served.” In order not to compromise beneficial uses, natural water quality must be maintained in an ASBS. Examples of public interests are marine research, education, and flood control. The exception process, in compliance with the Ocean Plan, is the mechanism by which the Special Protections for the ASBS may be instituted.

3. Project Description

HSU seeks an exception from the Ocean Plan’s prohibition on discharges into ASBS. The exception with conditions, if approved, would allow the continued waste seawater and co-mingled storm water discharge into the Trinidad Head ASBS. This would provide additional protections for beneficial uses that are not currently provided.

Under CEQA, the lead agency is the public agency with primary responsibility over the proposed project. The State Water Board is the lead agency under CEQA for this project because of its regulatory authority over water quality in California and, as specified in the legislation, its lead role in adopting the Individual Exception and mitigating Terms and Conditions, also referred to as Special Protections for the Trinidad ASBS.

4. Environmental Setting

4.1. Trinidad Head ASBS General Overview

The Area of Special Biological Significance (ASBS) is located in the area of Trinidad Head (41°03 115" north latitude, 124°08 110" west longitude), approximately 28 miles (45 km) north of Eureka, California, and encompasses areas both north and south of Trinidad Head. The northern part of the ASBS is approximately 1.97 square miles (5.10 km2) in size; the southern part is about 0.5 square miles (1.3 km2) in size. The northern area is fully exposed to winds and waves, while the southern area is semi-exposed because of the sheltering effects of Trinidad Head. For a complete description of the ASBS, see the State Water Resources Control Board publication, "California Marine Waters ASBS Reconnaissance Survey Report Kelp Beds at Trinidad Head Humboldt County (June 1979)".

The primary uses of the area include commercial and sport fish boat launching and mooring, scientific study, and sport fishing. Three important commercial catches, market crab, silver salmon, and king salmon, are landed at the Trinidad Pier within the ASBS. However, fishing grounds for these species are outside the area (State Water Board 1979).

4.2 ASBS Setting

4.2.1 Humboldt State University Telonicher Marine Laboratory

The Humboldt State University Telonicher Marine Laboratory (TML) is a unit of HSU supporting education and research for the departments of Oceanography, Fisheries Biology, and Biology (Marine Biology option). The laboratory also performs an important public outreach function, including guided tours and summer programs led by a marine naturalist, and self-guided tours of the laboratory's exhibits (public display aquaria and touch tanks). The Laboratory was operational and has been at its present location since 1965.

Located on a 1.3 acre parcel on a 100 ft bluff that overlooks the Pacific Ocean, TML was constructed in 1964 at an original size of about 7,400 ft^2; in 1975, it was expanded to 16,200 ft^2. A five minute walk from the laboratory gives students and faculty access to sandy beach habitats at Trinidad State Beach or to rocky intertidal habitats in Trinidad Bay as well as dock and launch facilities. The TML has two large instructional classrooms/laboratories, offices for 14 faculty and graduate students, specialized research labs, an algal and zooplankton rearing area, and other rooms that support education and research. A recirculating seawater system supplies classrooms and a 2,400 ft^2 wet lab with high-quality, filtered seawater. Seawater is pumped from Trinidad Bay into storage/settling tanks above the Laboratory, gravity fed to a sump, then pumped through sand filters before distribution throughout the facility. The seawater system was upgraded in 1998 with new high-rate sand filters, pumps, and chiller units and has reliably maintained water temperatures at approximately 11-12° C throughout the year. The laboratory's freshwater and seawater discharge system was extensively remodeled during 2008 (at a cost of approximately $350,000) so as to nearly eliminate the laboratory's freshwater discharge to Trinidad Bay. The TML operates no waterfront facilities.

4.3. ASBS Physical Description

4.3.1 Climate

The local climate of the ASBS is dominated by marine factors. In the summer months, a region of high pressure lies off the coast, generating the prevailing northwesterly winds and coastal fog. In winter, this high-pressure zone moves southward and is replaced by a low-pressure zone off the coast. Cool, moist air masses move toward the coast during winter months and on contacting the coastal hills, are uplifted, cool, and drop their moisture as rain. There are no rain gauge records for the immediate Trinidad area, but records of rainfall have been kept at Patrick's Point State Park, 5.7 miles (9.1 km) north of the ASBS, and Arcata Airport, 5.7 miles (9.1 km) to the south. Arcata Airport averages 121 rainy days per year and a rainfall of 46.6 inches per year (118.4 cm/yr). Patrick's Point has 116 rainy days per year and a rainfall of 70.5 inches per year (179.1 cm/yr). The mean monthly air temperatures recorded at the Trinidad Marine Laboratory. The mean annual air temperature is 55.1°F (12.8°C) with lowest air temperatures recorded in January of each year and the highest air temperatures recorded in July (State Water Board 1979).

4.4 Geological Setting

4.4.1 Above Shoreline Land Mass

Three geological components are in evidence in the Trinidad ASBS: the complex Franciscan Formation, Quaternary marine deposits, and modern beach sands (State Water Board 1979).

The Franciscan Formation is geologically complex, having originated as a series of geosynclinal deposits laid down 60-90 million years ago. Shortly after their formation, sedimentary deposits were extensively faulted, sheared, and locally metamorphosed. The Franciscan Formation was then uplifted and eroded, followed by inundation below sea level. Most of the intertidal rocks of the ASBS show the sedimentary structure typical of Franciscan rocks. Little Head is also clearly Franciscan in origin, as are the stacks and pinnacles both north and south of Trinidad Head (State Water Board 1979).

The “blue clay” at the cliff bases in both the north and south portions of the ASBS is particularly interesting as dynamic evidence of the furies to which Franciscan deposits have been subjected. The clays are called "Franciscan melange", shales that have been ground and smashed to small fragments by shearing through the ages. These highly erodible sediments present numerous problems in road building and construction throughout the northern California coastal area. More recent overlying Quaternary deposits often "slump" following exposure and erosion of the underlying Franciscan melange. Most of the more resistant intertidal rocks and stacks are recognized as "graywacke", mineralized sandstone, by geologists. Scattered throughout the area are other resistant rocks, mainly greenstone, a metavolcanic rock, found around the base of Trinidad Pier and in the southern portion of the ASBS. Another resistant Franciscan rock type, chert, is found in the cobble field on the upper beach of the southern part of the ASBS. The chert gravels and small boulders *have* apparently been eroded from the Franciscan melange at the base of the cliffs (State Water Board 1979).

Trinidad Head is not of Franciscan origin. It is a metavolcanic intrusion, which apparently was formed at about the same time as Franciscan deposits were being laid down. The rocks of the Head (mainly hornblende and diorite) are more resistant to erosion than the surrounding Franciscan formation, with the resultant appearance of a promontory (State Water Board 1979).

The bluffs overlooking the ASBS are Quarternary in age and were apparently deposited on top of Franciscan rocks during periods of marine inundation in the past 1-2 million years. The coast has since been uplifted and eroded. Rocks of intermediate age (older than Quaternary, but younger than the Franciscan Formation) have apparently been eroded and left no traces (State Water Board 1979).

Following winter storms, erosion of the Franciscan blue clays is particularly evident and results in increased turbidity of the near shore zone. Local planners and agencies have recognized the danger in placing structures near the present edge of the bluffs because of erosion potential. The bluffs were designated as open space to lessen the possibility of increased erosion and damage to property (State Water Board 1979).

4.4.2. Submarine Substrate for Marine Life

The Trinidad ASBS intertidal zones fall into four major categories: exposed sand beach (north part of the ASBS); semi-exposed sand beach (south part of the ASBS); fully exposed rocky intertidal (northwest face of Trinidad Head, Flatiron Rock, Blank Rock, numerous smaller outcrops and stacks in the northern part of the ASBS); and semi-exposed rocky intertidal (eastern face of Trinidad Head, Little Head, smaller outcrops in the southern part of the ASBS).

4.5 Oceanographic Conditions and Marine Water Quality

4.5.1 Currents

The coastal water is apparently influenced by the subarctic Pacific and Eastern North Pacific Central water masses, which are carried into the area by the southward flowing California current. 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).

The current patterns of the near shore waters of the Trinidad Head ASBS are complex and variable. The two portions of the ASBS are affected quite differently by wave and wind conditions because of their differing exposure. Along the shorelines of both areas, sand and rock are intermixed and subjected to tidal variations of approximately 9.3 feet (2.8 m), dependent on the day and season. The sea bottom in both areas is a mixture of rock and sand, with much transport of sediments throughout the ASBS. In both intertidal and subtidal zones, the sediment is more coarse north of Trinidad Head than to the south, again related to the higher energy wave environment of the exposed area (State Water Board 1979).

Sources of sediment are nearby streams, coastal cliff erosion, and transport from river discharges both south and north of the ASBS; the Klamath River is 34.5 miles (54.2 km) to the north, the Little River and the Mad River are 2.7 miles (4.3 km) and 8.3 miles (13.3 km) to the south respectively. The native geologic materials of the headland and its environs vary in age, composition, and erodability. Erosion of cliff bases is evident both north and south of the Head, with the native materials apparently comprising the majority of fine, medium, and coarse sands along the ASBS shoreline and on the near shore bottom (State Water Board 1979).

The near shore circulation pattern is greatly influenced by the prevailing north to south long shore drift and the interruption of this long shore drift by Trinidad Head. Beach sediments to the north of the Head are much coarser than those to the south, suggesting that finer materials eroded from the cliff bases north of the headland are transported southward, but materials eroded from the cliffs south of the Head tend to remain in a “pocket" in the immediate lee of Trinidad Head. This general pattern of circulation is modified, however, by tidal currents, the wind pattern, and upwelling in Trinidad Bay during certain times of the year (State Water Board 1979).

4.5.2 Water Quality and Temperature

Fluctuations in the temperature and salinity of the near shore waters of the ASBS are relatively moderate. The lowest water temperatures 43°-48°F (6°-7˚C), are generally recorded in late winter or early spring each year depending upon the occurrence of localized upwelling, and the highest water temperatures 53.6°-55.4°F (12°-13°C), are recorded in the late summer or early fall. The mean annual water temperature is about 50°F (10°C). Salinity varies, depending upon rainfall and runoff from surrounding streams. Salinities in the area are generally constant and range from 33°/oo to 34°/oo throughout the year. During periods of high rainfall in the winter, surface water salinity may drop to 20 parts per thousand for brief periods. Modest seasonal changes in water temperature and salinity are typical of the near shore zone along the northern California coast (State Water Board 1979).

The seawater of the area can be characterized as a coastal water mass in a transitional area.

5. Marine Biological Resources of the ASBS

5.1. Intertidal Biota

The Trinidad ASBS intertidal zones fall into four major categories: Exposed sand beach (north part of the ASBS); semi-exposed sand beach (south part of the ASBS); fully exposed rocky intertidal (northwest face of Trinidad Head, Flatiron Rock, Blank Rock, numerous smaller outcrops and stacks in the northern part of the ASBS); and semi-exposed rocky intertidal (eastern face of Trinidad Head, Little Head, smaller outcrops in the southern part of the ASBS). Each of these intertidal habitats supports a flora and fauna influenced by the physical environment, biological interactions between species in each habitat, and the commercial or recreational activities (State Water Board 1979).

5.1.1. Intertidal Habitats of the North ASBS Area; Biological Reconnaissance Survey (1977)

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 48 species of algae and plants, 218 species of invertebrates that inhabit the ASBS. The subtidal zone contains 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 rocky intertidal zone is the most floristically and faunistically diverse habitat of the northern Trinidad Head ASBS. Environmental features of major concern are wave forces, which tend to be predominantly from the northwest and sand movement caused by waves striking the beach adjoining Trinidad Head from the north. Because of large-scale seasonal movements of sand on the beach, a very sparse macrofauna is present there. Species must withstand constant shifting of the substrate, a condition to which only a few species are adapted (State Water Board 1979).

Blank Rock and Flatiron Rock lie approximately 1,600 ft. (500 m) and 3,600 ft. (1,100 m) offshore, respectively, and are somewhat isolated from anthropogenic activities. These two islands are difficult to approach even during periods of relatively calm seas. The intertidal zone is essentially vertical and was surveyed from a boat during low tides in August 1977. The four zones of the Ricketts, Calvin, and Hedgepeth scheme of Pacific Coast zonation were clearly evident. Algae and invertebrates of highly wave-swept surfaces were particularly evident on all sides of the rocks: the seapalm (*Postelsia palmaeformis)*; strap kelp (*Lessoniopsis littoralis)*; California mussel (*Mytilus californianus)*; gooseneck barnacle (*Pollicipes polymerous)*; and several species of coralline algae. The ochre star, (*Pisaster ochraceous)* was more abundant than on inshore rocks, suggesting either that prey populations may be more abundant on the-offshore rocks or, more likely, that collection pressure from visitors to the intertidal zone on shore is essentially absent from these offshore rocks. The vertical surfaces of both rocks were reminiscent of narrow surge channels on exposed coasts, suggesting a highly dynamic wave environment on all sides of the rocks. The intertidal zone extended 12-15 feet (4-5 m) above the low-water line, with the barnacle (*Balanus cariosus)* and the acorn barnacle (*Balanus glandula*) apparent on the higher mid-intertidal acres, with a scattered zone of high intertidal barnacles (*Chthamalus dalli)* and limpets (*Collisella* spp.) grading into barren rock surfaces with sparse lichen cover above the intertidal zone (State Water Board 1979).

Both California Sea lions and Steller Sea Lions haul out on Blank Rock and Flatiron Rock. There was no evidence of their activities affecting the intertidal zone, although increased nutrient levels from their excretions could affect the growth of attached algae and invertebrates (State Water Board 1979)

The northwest face of Trinidad Head is essentially a wave-swept vertical surface. Transect studies were conducted in areas accessible from shore in April and May of 1976. They resulted in the identification of four major assemblages: (1) a low intertidal group of species, dominated numerically by sea palm, strap kelp, seabrush (*Odonthalia* spp.), the giant green anemone (*Anthopleura xanthogrammica)*, and several species of coralline algae; (2) a lower mid-intertidal band of California mussel, gooseneck barnacles, scattered chitons Black Katy Chiton (*Katharina tunicata)*, ochre stars, small whelks (*Nucella* spp.), and some yellow rockweed (*Pelvetiopsis limitata)*; (3) a high mid-intertidal group dominated by acorn barnacles, and barnacle (*Balanus cariosus)*, and their predator *Nucella emarginata*; and (4) a high intertidal assemblage of *Chthamalus dalli* and *Collisella digitalis*. These four groups are typical of wave-swept vertical surfaces along the coast of northern California, and strongly resemble the vertical surfaces of the offshore rocks, except for a decreased abundance of ochre stars, which is probably the result of human collection activities (State Water Board 1979).

Larger rocks and boulders within a few meters of the Head showed noticeable effects of sand scouring. These rocks have been periodically observed for a three-year period during all seasons of the year. During winter months, sand surrounding the rocks is moved offshore, exposing as much as 4-6 ft. (1.3~2 m) of scoured, bare rock surface. These surfaces were colonized almost exclusively by acorn barnacles in the spring of each year, and subsequently buried by sand accretion during summer months. The tops of boulders not buried were dominated by California mussel and several algal species including, nail brush (*Endocladia muricata)*, iridescent seaweed (*Iridaea* spp.), and sea palm. Smaller rocks at higher tidal levels were frequently moved by wave action and had sparse flora and fauna. During periods of decreased wave activity in the spring and summer, smaller rocks were covered by a diatom film, scattered algae including red laver (*Porphyra* spp.), sea lettuce (*Ulva* spp.), and a few barnacles (State Water Board 1979).

Near the northern border of the ASBS some scattered boulders, and a tall sea stack, project from surrounding sands. Scouring is evident around the lower margins of these boulders. As with the rocks near the northwest face of the Head, smaller boulders are periodically buried and exposed because of seasonal sand transport. These surfaces, only temporarily available for settlement, were dominated by barnacles. The major predator of these barnacles, the whelk *Nucella emarginata*, was found to be extremely abundant at times, particularly spring and summer, and may have a major influence on the age structure of barnacle populations. Rock surfaces above the influence of sand transport and scour were dominated by longer-lived species, particularly the aggregating anemone (*Anthopleura elegantissima)*, California mussels, gooseneck barnacles, and several algae. Interestingly, above these species a mixed population of barnacles occurs, suggesting that significant physiological factors (i.e. desiccation) limit the upper extent of these species which appear abundantly on the newly exposed surfaces of lower, sand-scoured rocks each year (State Water Board 1979).

The exposed sand beach was sampled in August, 1977, and had been sampled at various times during prior years. The fauna was found to be very sparse, and dominated numerically by several crustaceans. A few sand crabs, Emerita analoga were found in the summer months each year, with an abundance of 1 adult per 1-2 m2. Juveniles were not collected from this beach. *Haustorid* amphipods, *Eohaustorius* spp. were sometimes encountered on the midbeach. On the low beach, mysids, *Achaeomysis maculata* were sporadically abundant, but found to be much more abundant in the-surf zone adjacent to the beach. Large, attached plants of any type, were absent from the beach intertidal zone, because of the lack of firm substrate on which to secure a holdfast (State Water Board 1979).

Near the high tide mark on the beach, algal wrack frequently accumulates and is fed on by amphipod beach hoppers (*Orchestoidea columbiana)* and kelp flies. Following storm waves in fall and winter, the algal wrack may be as much as one foot deep on the upper beach, with most of the algae torn from rocks offshore and to the north or south of the beach. Frequently, large algae, sea palm and *Lessoniopsis littoralis*, are still attached to a piece of rock when thrown onto the beach, indicating that the rock was fractured by waves pounding on the stipes of attached algae.

5.1.2. Intertidal Habitats of the Southern ASBS Area; Biological Reconnaissance Survey (1977)

Protection of intertidal zones from the full impact of waves is provided in the southern portion of the ASBS by Trinidad Head. The eastern wall of Trinidad Head itself is nearly vertical and displays a zonation pattern typical of semi-exposed surfaces. Limpets, *C.digitalis* and *C. scabra*, were scattered above a band of barnacles, *C. dalli*, and high zone rockweed algae. Mid-intertidal zones were dominated by acorn barnacles, and *Balanus cariosus*, with scattered California mussels and gooseneck barnacles. The mussels and gooseneck barnacles are not as abundant as on the eastern rock faces of the headland, indicating a somewhat less exposed situation. The lower zone is dominated by laminarian algae, including split whip (*Laminaria dentigera)*, feather boa kelp (*Egregia menziesii)*, and neptune's quill (*Alaria marginata)*; red algae (*Iridaea cordata)*, various corallines, and surfgrass (*Phyllospadix scouleri)*. Scattered among the holdfasts of the algae are several invertebrate species, particularly several sponges, hydroids, (including *Abietinaria spp*., *Aglaophenia spp*., and *Tubularia marina)*; a few scattered solitary corals (*Balanophyllia elegans)*; occasional patches of the aggregating anemone, brooding anemones (*Epiactis prolifera)*, and the striped anemone (*Tealia crassicornis)*. Motile fauna included the chitons (*Katharina tunicata*, *Mopalia spp*., *Tonicella lineata)* in association with coralline algae; sea stars (*Pisaster ochrateous*, *Evasterias troschelii*, and *Henricia leviuscula)* and numerous small motile crustaceans (State Water Board 1979).

A small pocket beach curves around from Trinidad Head to Little Head and is composed of coarse to medium grain sand particles. On the high beach, beach hoppers are supported by algal wrack and other detritus, but the infauna of the middle and low beach is sparse, probably related to sand dynamics. On the low beach, mysids are usually abundant during a receding tide. No sand crabs were found on this beach during the survey in 1977 (State Water Board 1979).

Near the base of Trinidad Pier, a boulder field with some rubble from the old whaling station ramp extends from the high tide mark into the sublittoral. The semi-protected nature of this habitat is particularly evident in the diverse fauna and flora attached to the boulders and rubble. Rather than list all species in the habitat, only those species, which seem to be distinctive to this small area were noted. The sea star fauna was more diverse than elsewhere in the ASBS, with the possible exception of sub-littoral areas. Eight species were encountered regularly: ochre sea star, the pink skinned seastar (*P. brevispinus)*, giant seastar (*P. giganteus)*, the leather star (*Dermasterias imbricata)*, the many-rayed star (*Pycnopodia helianthoides)*, and smaller stars (*Evasterias troschelii*, *Henricia leviuscula*, and *Leptasterias hexactis)*. The bat star (*Patiria miniata)* has been rarely seen in the lowermost zones. The large and intertidally uncommon sun star (*Solaster stimpsoni)* has also been collected in this boulder field (State Water Board 1979).

Reduced wave action allows some accumulation of sediment around the boulders, with consequent development of an infaunal assemblage. Two bivalves, the basket cockle (*Clinocardium nuttalli)*, and the rock cockle (*Protothaca staminea)*, are occasionally collected from the area by clammers. A diverse polychaete warm fauna was also present (State Water Board 1979).

Other elements of the flora and fauna of the boulder field are fairly typical of semi-exposed rocky intertidal habitats of the northern California area. The abundance of particular species is higher than encountered in more exposed conditions, a particularly noticeable aspect seen in the lush growth of foliose red and brown algae (State Water Board 1979).

To the east of Trinidad Pier, a bench formation at about the lowtide level follows the contour of Little Head to its most southeasterly point. This shelf has been surveyed several times in past years and has been resurveyed each year by graduate students from Humboldt State University. Some of the more distinctive elements of the biota are mentioned here (State Water Board 1979).

Pools on the bench varied in both depth and size. The largest pools surveyed were about 18 inches (50 cm) deep, 4-5 feet, (1.2-1.8 m) long, and 1-2 feet (0.3-0.6 m) wide. Hermit crabs (*Pagurus spp*.) Turban snails (*Tegula funebralis)*, and kelp crabs (*Pugettia spp*.); were found more abundant than elsewhere in the ASBS because of the tidepool habitats found on the bench. Scattered in the many shaded crevices of the bench were solitary corals in great abundance. Among larger boulders bordering the shelf, laminarian algae were particularly lush including split whip, chain bladder, feather boa kelp, and Neptune's quill. Surfgrass scattered throughout the bench in small and large pools supported a characteristic assemblage of wormlike animals among its holdfasts: a nemertean worm (*Carinoma mutabilis)*, polychaetes (*Schizobranchia insignis, Halosydna brevisetosa*,' *Glycinde polygnatha*, *Neoamphitrite robusta)*, and the sipunculid worm (*Phascolosoma agassizii)*. The holdfasts of laminarian algae generally supported somewhat less diverse, but similar, assemblages of invertebrates (State Water Board 1979).

Little Head has vertical surfaces from the southeast promontory to its termination at a rail boat-launcher, which parallels the northeastern face of the Head. Surge channels dissect the Head near the seaward terminus of the boat launcher and contain a diverse assemblage of hydroids, anemones, solitary corals, bryozoans, laminarian algae, and coralline algae. Higher areas of the intertidal zone are occupied by barnacles, California mussels, and red algae (*Endocladia muricata)*, an assemblage of (State Water Board 1979).

A mixed sand beach-rocky intertidal habitat was found eastward from Little Head to the border of the ASBS. The beach is heavily used by individuals launching small boats into the surf during summer and fall months. This beach has been sampled several times, however only a few species have been found: the ubiquitous opossum shrimp (*Archaeomysis maculate)* on the lower beach, scattered small blood worms (*Euionus mucronata)* on the middle beach and beach hoppers (*Orchestoidea* spp.), on the upper beach. Rocks to the east of the small beach show a typical zonation pattern for semi-exposed surfaces. The boulders are generally large and present mostly vertical surfaces. On some of the rocks, middle zones (2 and 3) were covered by clumps of the aggregating anemone, with clearly defined bare areas between adjacent clones (State Water Board 1979).

A sizeable boulder field lies at the eastern border of the ASBS, but the boulders are large and slope steeply into the intertidal zone. The zonation pattern on vertical rock surfaces is similar to that encountered on Little Head. Sediment does not accumulate between the closely set large boulders; hence, a significant infauna is not found in the boulder field. Around the bases of the most seaward boulders, however, a few brachiopods (*Terebratalia transversa)*, were seen during the lowest tides of each year. This species was apparently quite common subtidally in the ASBS (State Water Board 1979).

Most of the rocks within 100 yards (300 m) of the ASBS shoreline were visited by boat in August 1977. An unusual feature of these offshore rocks was the presence of droppings from Western Gulls, which frequently can be seen resting on the rocks. At times, the gulls have been observed feeding on sea stars, especially *P. ochraceous*, during low tides. The sides of the rocks apparently slope steeply into deeper surrounding waters, as bull kelp (*Nereocystis luetkeana)* float bulbs were found within 3-6 ft. (1-2 m) of the emergent rocks during low tides (State Water Board 1979).

5.2. Subtidal Biota; Biological Reconnaissance Survey (1977)

The biota of the shallow subtidal zone was dominated by individuals from 12 groups (12 phyla). The shallow subtidal zone is considered to include depths ranging from 1 to 40 ft. (0.3 to 13 m). The dominant groups were comprised of the marine plants (Divisions *Chlorophyta*, *Phaeophyta*, *Rhodophyt*a and *Anthophyta)*, sponges (*Porifera*), *Cnidaria, Ectoprocta*, segmented worms (*Annelida*), *Mollusca*, *Arthropoda*, spiny-skinned animals (*Echinodermata*), sea squirts (*Chordata*), fishes (*Chordata*), birds (*Chordata*) and marine mammals (*Chordata*). Mammals and birds have been included as members of the subtidal and intertidal communities because of their utilization of these areas in foraging, nesting, resting, or migrating activities (State Water Board 1979).

5.3. Threatened, Endangered and Other Wildlife

5.3.1. 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).

Both the Ridley and Leatherback turtles have been found in the ASBS at Trinidad Beach in recent years. The specimens that were washed ashore were brought to the lab for observation and measurements prior to their release back to shore (Dave Hoskins HSU 2011).

5.3.2. Marine Birds

Blank Rock and Off Trinidad Rock serve as nesting areas for the following birds: Fork-tailed petral (*Oceanodroma furcata*), Leach's petral (*O. leucorhoa*), Brandt's cormorant (Phalacrocorax penicillatus), Pelagic cormorant (*P. pelagicus*), Western gull (*Larus occidentalis*), Common murre (*Uria aalge*), pigeon guillemot (*Cephus columba*), and Cassin's auklet (*Ptychorhamphus aleutica*) (State Water Board 1979).

Numerous sea-birds nest or rest on Blank Rock or Flatiron Rock. Among birds which have been observed nesting are Brandt's Cormorants, Pelagic Cormorants, Western Gulls, Common Murres, Pigeon Guillemots, Cassin's Auklet, the locally rare Tufted Puffin, Leach's Petrel, and the Forktailed Petrel. There was a single record of a Forktailed Petrel nesting on Blank Rock, the supposed southern breeding limit of this species (cite). Black Oyster-catchers have also been observed (Warren J. Houk, HSU, personal communication cited in State Water Board 1979).

The Common Murre is the most abundant breeding seabird in northern California and one of the most abundant species found at sea. The Brandt's Cormorant and the Double-crested Cormorant are also among this most abundant breeding seabird species in coastal California. These three species of birds are important components of at-sea fauna, are good indicators of annual and long-term oceanographic changes and susceptible to anthropogenic impacts such as oil spills and commercial fisheries interactions (Capitolo et. al. 2006).

The Trinidad Complex of breeding seabirds has been surveyed annually since 1996 and data collected since 1979. The murre colony complex off Trinidad Head is comprised of White, Green, Flatiron, Blank, and Pilot Rocks, as well as the Historic Sea Lion Rock colony. Flatiron Rock has the second highest whole-colony murre count in northern California in 2004. At all five rocks, numbers of murres were lowest in 1997, similar in 1999, 2001, and 2003, and highest in 2004 (Capitolo et. al 2006). Brandt's Cormorants nest primarily at Flatiron Rock in this colony complex. Numbers of nests at Flatiron Rock declined from 1997 to 1999, following 1998 El Niño conditions then increased in 2004. Double-crested Cormorants nested only at Pilot Rock.

5.3.3 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.

The 1979 State Water Board Reconnaissance report documents the following species specifically occurring within the Trinidad Head ASBS: California Sea Lion (*Zalophus californianus),* Stellar Sea Lion (*Eumatopius jubata*), and Pacific Harbor Seal (*Phoca vitulina richardsii*), use Blank Rock and Off Trinidad Rock as hauling out areas. Most sea lion activity was observed in the western area of the ASBS, and harbor seals (*Phoca vitulina*) utilized low-relief exposed rock for hauling out in both Trinidad Bay and the western area of the ASBS. A family of river otters (*Lutra Canadensis*) had been observed in 1976 in the ASBS (State Water Board 1979). The cetaceans Harbor Porpoise *(Phocoena phocoena*), Risso's Dolphin (*Grampus griseus*), and Gray Whale *(Eschrichtius robustus*) are known to inhabit the waters of the ASBS (State Water Board 1979).

Migratory and resident grey whales are present in the ASBS and a short-term resident grey whale pod nearby at Patrick's Point State Park (Hoskins 2011).

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

At the time of this report the ASBS is not designated as a state marine reserve, marine conservation area, or marine park. Fishing is allowed in the ASBS.

5.5 Watershed and Land Use Characteristics

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 8.55% was found in watersheds draining to the Trinidad Head ASBS. This watershed encompasses both urban and rural watersheds. Trinidad Bay has marina facilities including mooring field, vessel haul out, maintenance facilities, and commercial crabbing/fishing pier facilities. Bleach and other detergents are known to still be in use by boat owners within the ASBS mooring field. The City of Trinidad's main storm drain discharges directly into the ASBS immediately adjacent to the TML outfall. Sources of other pollutants arise from vehicle and boat parking directly on the beach, and runoff originating from the adjacent asphalt parking lot. Humboldt State University Marine Lab is located near the headlands. Residences and commercial structures in Trinidad are served by septic systems. Timber harvesting is also a major land use in the watershed and may contribute sediment and related forestry silviculture chemicals.

6. Scientific Study Uses

6.1 Research

A central mission of the TML is to provide support for the research activities of undergraduate and graduate students with interests in the marine sciences. In 2004, 26 undergraduate students conducted year-long independent research projects required for their degree programs. Five master's students completed their thesis research using the facilities of the TML. Each one of these research projects were conducted at TML because the laboratory has a sea water system and aquarium facilities that allow the students to maintain living plants and animals for observation and experimentation. This independent research is a critical component of their training, and required for their degree completion. No suitable on-campus facility exists to provide this type of support should the laboratory be forced to close (Quackenbush, 2006).

Several faculty members working at TML conduct research projects that are in part or entirely supported by the facilities of TML. Often these projects are in direct support of other state or federal agency missions related to the marine environment and its resources. For example, faculty-sponsored research has been conducted for Redwood National Park, the National Marine Fisheries Service, Resources Legacy Fund, and the Office of Atmospheric, Research, National Oceanic and Atmospheric Administration.

6.1.2 University Education and Public Outreach

Faculty in the departments of Oceanography, Fisheries Biology, and Biology (Marine Biology Option) teach classes at TML that are dependent on the access of the laboratory to sea water and marine environments. In 2005 and 2006 the laboratory served 179 undergraduates enrolled in courses. Each of these courses is integral to and in most cases required for the departmental degree programs. The TML supports these courses with lecture rooms, wet lab facilities, and bench lab facilities. There are no suitable facilities on the main campus to teach these marine science classes as they all place substantial reliance on marine laboratory facilities (especially wet labs) that are not duplicated on the main HSU campus.

In addition to providing support for academic instruction at HSU, the wet lab and seawater system provide support for a series of six large display aquaria in the main hallway. These large display aquaria, along with an additional larger display aquarium, are currently in the process of replacement through a generous $100,000 grant from a donor. These display aquaria, along with the TML's outdoor touch tank, and a marine naturalist program, provide an important public outreach function. The TML provides a valuable marine science education role for high schools and elementary schools throughout northern California, in part because TML is the only marine laboratory for an approximately 450 mile stretch of the US Pacific Coast between Bodega Bay, CA, and Charleston, OR. In additional to large number of trips from local elementary school classes, faculty and students from California community colleges make special trips to the marine laboratory during the academic year. The table below summarizes laboratory outreach/marine education statistics over the period 2001-2008. Reported numbers of public visitors annually are minimum estimates based on signatures voluntarily entered into our logbook. Actual laboratory visitation is probably 15,000 - 20,000 visitors annually.

Table 1. Annual Visitors Served Telonicher Marine Laboratory

Year	Annual # of Public Visitors
2001	7,500
2002	11,500
2003	11,524
2004	11,772
2005	11,820
2006	9,250
2007	9,276
2008	7,559

7. Infrastructure

7.1. Laboratory Facilities, Seawater System, and Storm Water

When first constructed in 1965, all floor and laboratory sink drains were routed to the intertidal storm water drain common outfall. Only the sinks, showers and commodes of the original building were connected to the septic system: a 4,500 gallon septic tank and two 8 foot leach pits in the front of the building. Later additions in 1976 connected some but not all laboratory sinks and drains to the septic system. At the time of TML's request for an Exception (Quackenbush, 2006), floor drains in the wet lab and some research and/or teaching laboratories were still tied to the storm water and seawater intertidal outfall drain.

The 2005 wastewater streams at TML (data from the May 2005 Winzler and Kelly Waste Water Management Study) consisted of:

1. Septic system receives: bathrooms and showers; facility sinks (most but not all); facility floor drains (most but not all).
2. Storm water drain receives: facility roof drains, facility sinks (some but not all); facility floor drains (some but not all), parking lot drainage inlets.
3. Sea water drain receives: all waste seawater to the common outfall.

At that time, 2005, it was determined that 7 sinks and 4 floor drains were connected to the storm water drain system. Later detailed inspection added additional laboratory floor drains to this total. The estimated flow to the septic system was 450 gallons per day, primarily from faculty staff and visitor use of restrooms. Water records for the period 2000-2005 show an average water use of 506 gallons per day. The 2005 report recommended flow separation of both interior facility waste streams and exterior facility flows. Separation of seawater discharge from storm water discharge could be achieved with a new installation of an appropriate valve. An additional recommendation was the installation of an oil water separator for the storm water flow. Lastly, all interior sinks and drains were proposed to be directed to the septic tank instead of the storm water drain system (Quackenbush, 2006).

In response to the anticipated requirements of the ASBS program, in February 2006 TML capped off some floor drains that had previously drained to the intertidal outfall. It was not possible at that time to reroute all the drains, but a plan was put in place to reroute the drains to the septic system. In addition, TML also rerouted 3 sinks in rooms 111A, 111B and 111 to the septic system, and capped off sinks in rooms 113A, 116J, and 121 until they could be rerouted to the septic system. The capped off sinks had also previously drained to the intertidal and were to be rerouted to the septic system in a planned project (Quackenbush, 2006).

In 2008, at a cost of about $350,000, TML completed an extensive number of improvements to remove or correct discharges that threaten water quality and violate the waste discharge prohibition of the Trinidad Head ASBS. Plumbing infrastructure was reconfigured so that now no interior freshwater drains are connected to this single discharge (Hankin 2009). All of the laboratory's interior freshwater drains have now been removed from this discharge; these now are plumbed to enter their onsite wastewater treatment system leach pits and their newly constructed leach field.

Specific changes that have been made to improve waste stream management at TML are summarized below:

- All sinks and floor drains were routed to the septic system.
- A pressure distribution leach field was added to the septic system with the original gravity fed leach pits remaining as back-up.
- Three storm drains in the rear parking lot were routed to an oil/water separator removing potential pollutants prior to leaving the facility.
- Drainage inlet filter inserts were installed at three locations at the front of the building to trap contaminants entering those storm drains.
- No bleach is allowed for use to clean aquaria, and holding tanks are now washed out with sea water instead of fresh water.
- Records on number of times, duration, and gpm are now routinely kept for cleaning sand filters, and refilling sea water storage tanks.

- Historically, some boat cleaning was done in the parking area behind the main building; freshwater drained into the storm water drains. Currently, by policy, no boat washing takes place at the site. However, some beach seines and otter trawl nets are rinsed with freshwater after use and this water does enter the storm drains.

TML is in the process of consulting with the City of Trinidad to determine if the stormwater discharge from the rear parking lot and from the western property edge could instead be connected with the City's stormwater system rather than being mixed with the laboratory's seawater return. If the City is willing to allow this and it is economically feasible (preliminary assessments seem encouraging), the TML hopes to accomplish this task within the next two years. If these changes were made, then the only stormwater discharged by TML would originate from roof runoff.

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

Sea Water System

The most basic components of the laboratory's sea water system consist of an intake pump on Trinidad Pier, and a set of two holding tanks on the property. Seawater is pumped from the pier uphill in pipes below Galindo Street, which also run on the east side of the building under the driveway behind the main building. From the storage tanks seawater is then gravity fed to a sump, then pumped through sand filters and water chillers into the building supply and returning into the sump.

Waste Seawater Discharge

The sea water system built in 1965 was intended to pump water from the pier, store it in large tanks and recirculate the sea water through aquariums and wet tables, filter the water and return to the storage tank. In contrast to many coastal marine laboratories, this system was designed from the outset to recirculate water as much as practical to reduce discharge and pumping costs. Over the past 40 years, several additional elements have been added to the current system to expand the overall volume and to control water temperature (additional of chillers in 1998) and reduce the need for additional water exchange. Addition of chillers has reduced seawater pumping from Trinidad Bay by more than 50%. Routine maintenance (back-flushing of sand filters) of the system generates the only significant routine discharge back into the ASBS. Other seawater discharges can be best characterized as occasional and irregular discharges that arise from periodic draining of small tanks estimated in volume of 100-500 gallons and the rare draining and refilling of the redwood storage tanks (approximately once/2 years). Combined volume of the two redwood storage tanks is about 115,000 gallons.

Back-flushing of sand filters takes place whenever the pre- and post-filter pressure differential is about 5 psi. Over the past 3 years, the number of such back-flushing events per year has averaged 7 and ranged from 6 - 9. Each back-flushing event takes approximately 20 minutes to complete. The volume of seawater discharged during each of these back-flushing events typically is about 6,000 gallons (volume estimated based on number of minutes to back-flush times the average gallons per minute pumped during the procedure).

The estimated upper bounds on total volume of seawater discharged on an annual basis from the HSU laboratory has ranged from about 244,500 to 335,000 gallons per year over the period from January 2006 through December 2009 (Appendix E). These upper limits on total annual discharge volume assume that the amount of water pumped annually from Trinidad Bay to redwood storage tanks is equal to the amount of seawater discharged. The volume of seawater periodically pumped from Trinidad Bay can be calculated from the duration of pumping and pumping rate. Evaporative loss in the wet lab may, however, be substantial and may reduce the actual total seawater discharge well below these upper bounds. The majority of sea water discharge is accounted for by back-flushing the sand filters, dumping the sea water in the redwood storage tanks in preparation for tank cleaning and refilling, and occasional overflow from Trinidad Bay sea water pumping. Minor amounts of seawater discharge also occur when small (up to 500 gallons) aquaria are emptied to the seawater return system.

7.1.3 Exotic Species, Parasites, and Pathogens

TML discourages use of exotic species for experiments (Hoskins 2011) and exotic species (species that are not native to California) are not kept in any of the TML facilities (Quackenbush 2006). On the very rare occasion that a student needs to use an exotic species for study it is confined to a closed system only and is isolated from the TML seawater system and subsequent discharge to Trinidad Bay. Fish and invertebrates are dispatched upon completion of the research study then tanks and aquariums are cleaned and sterilized with a bleach solution then routed to onsite waste water treatment system (Hoskins 2011). Currently, TML does not have a protocol in place for detection and prevention of potential parasites or pathogens.

7.1.4 Species Cultured at the Facility

Species that are cultured at TML include rotifers, brine shrimp and 2-3 species of phytoplankton (Hoskins 2011).

7.1.5 Chemicals Added to the Facility Seawater System and Marine Life Food

TML does not add any chemicals to the Laboratory seawater system. Enclosed display tank fish are treated as needed. Display animals are fed smelt or capelin, live cultured algae or brine shrimp. Uneaten food is removed from the tanks and disposed of in the garbage.

7.1.6 Southern California Coastal Water Research Project Survey of Discharge Points

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. SCCWRP's (SCCWRP 2003) final report identified 12 discharge points in the vicinity of the TML, nine greater than 18" inches in diameter or width, and three discharge points greater that 36" inches in diameter or width. These were determined to convey drain storm water, dry-weather flows and aquaria seawater directly to the ASBS (SCCWRP 2003). Since that time, these drains points were ground-truthed to confirm ownership or jurisdiction. As a result, one discharge outfall at the waterfront, approximately 24 inches in width (SCCWRP ID# TRI 033), was confirmed to be operated by the TML (Hankin 2009).

This single outfall at the waterfront is the only direct discharge from the Marine Laboratory and carries (a) storm water runoff from the Marine Laboratory's roof and rear parking lot as well as (b) seawater return when TML backflushes its seawater system and when TML drains and refills the seawater storage holding tanks (Hankin 2009). Thus, during the dry summer period (approximately June 1 through 31 October), when there is almost no rainfall, this discharge pipe has periodic flow that consists almost entirely of waste sea water return during back-flushing events and (in some years) sea water return due to cleaning and refilling the large redwood storage tanks. During the wet winter period (approximately November 1 through 30 May), flow from this discharge pipe is temporally dominated by stormwater runoff from the TML roof, several storm drains near the storage tanks, three storm drains along the western edge of TML property, and three storm drains in the rear parking lot. Runoff from the rear parking lot currently passes through an oil-water separator before joining the single the TML's Little Head discharge pipe.

TML is in the process of consulting with the City of Trinidad to determine if the stormwater discharge from the rear parking lot and from the western property edge could instead be connected with the City's stormwater system rather than being mixed with the laboratory's seawater return. If the City is willing to allow this and it is economically feasible (preliminary assessments seem encouraging), the TML hopes to accomplish this task within the next two years. If these changes were made, then the only stormwater discharged by TML would originate from roof runoff. We note that the direct connection of rear parking lot runoff to the City of Trinidad's stormwater system was recommended in the 2005 Winzler and Kelley report (at page 14).

7.1.7. Seawater System Intake and Discharge Locations

Beginning in 1965, a sea water pump located on the pier at Trinidad Head pumped water underground, beneath Galindo Street, up to two large redwood storage tanks at the TML. A return discharge of all sea water and storm water originating from the laboratory's roof and rear parking is located in high intertidal zone adjacent to the existing Marine Railway of Little Head (photo 7.1.7.1.). Seawater return consists almost entirely of periodic release of seawater following filter back-flush events. Such events are of approximately 20 minutes duration and typically release about 6,000 gallons per event. Numbers of events have ranged from 6 - 9 per year over the past 3 years.

During the annual dry summer period (approximately June 1 through 31 October), the TML's outfall consists almost entirely of periodic releases of back-flushed sea water discharge and other irregularly scheduled sea water releases (for example, draining and cleaning of the two redwood storage tanks is always scheduled during this dry period). During the annual wet winter period (approximately November 1 through May 30), the TML's discharge is dominated by storm water runoff from the laboratory's rear parking lot and roof. The laboratory is exploring diversion of the rear parking lot storm water runoff into the City of Trinidad's storm water system to further reduce discharge of stormwater in the current mixture of waste sea and storm water.

Photo 7.1.7.1. Discharge Points: Seawater System Outfall SCCWRP ID# TRI 033

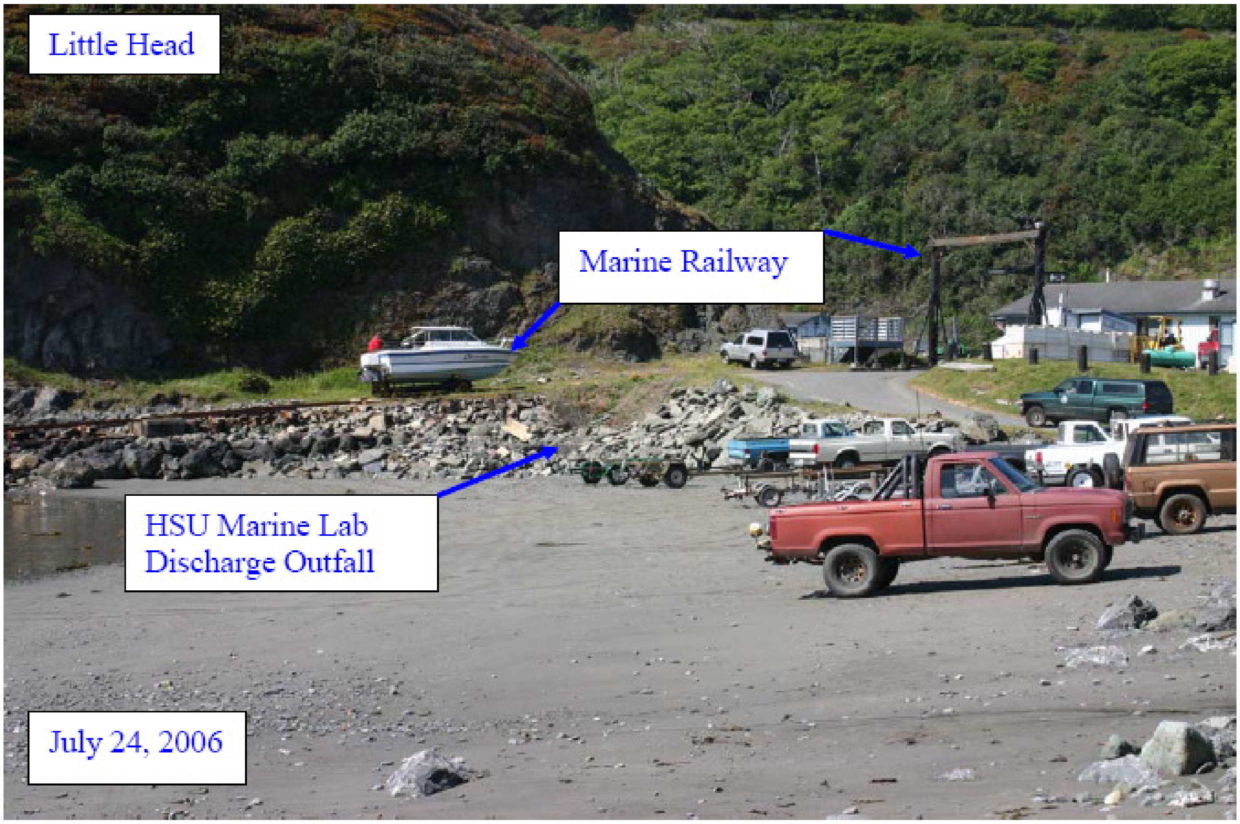
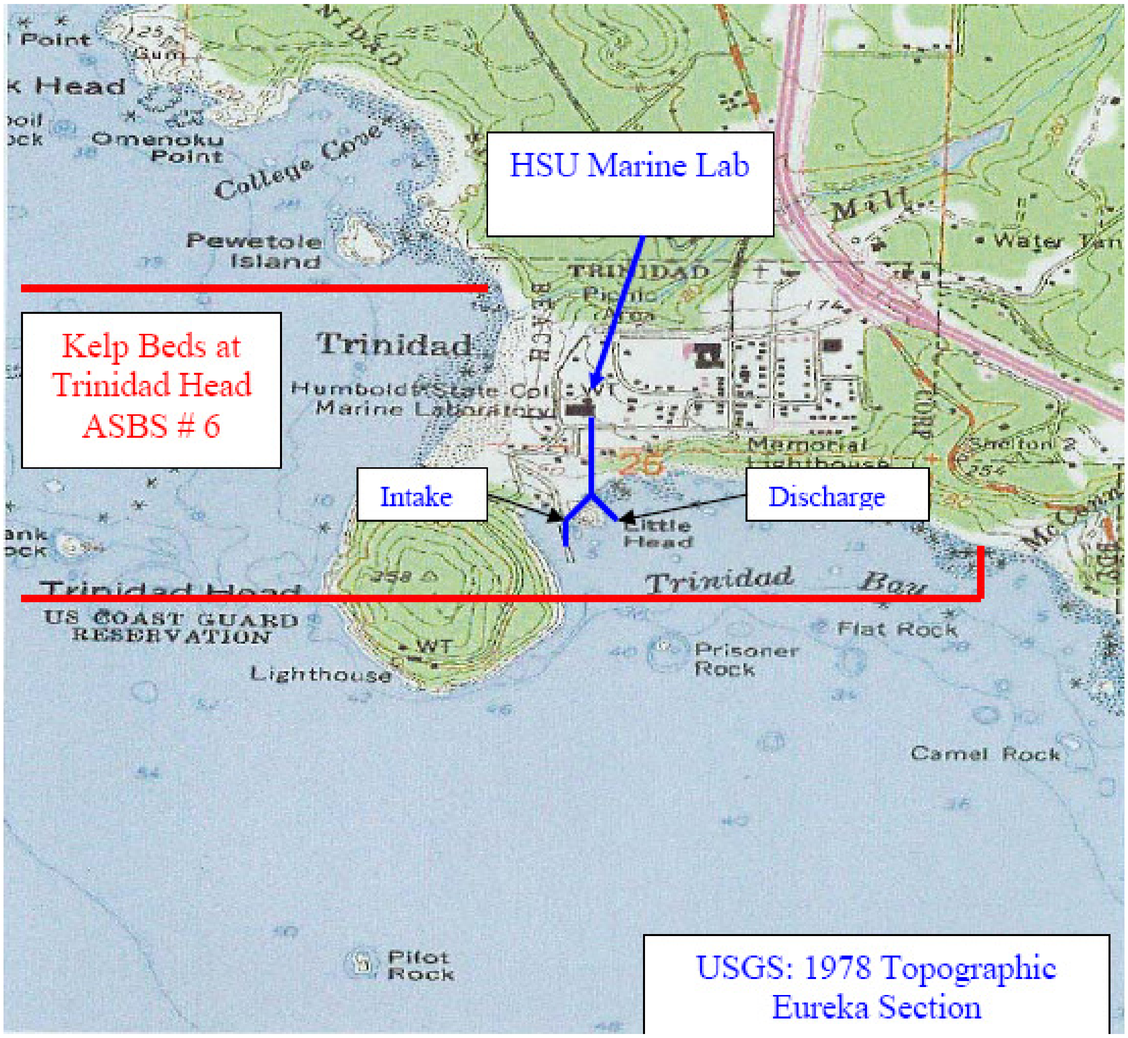


Photo 7.1.7.2. Discharge Points: Seawater System Outfall SCCWRP ID# TRI 033

Illustration 7.1.7.1. Telonicher Marine Laboratory (HSU) Discharge Points: Intake and Discharge



7.2. Facility Pesticide Use

Pesticides and herbicides have not been used in the TML building or grounds for the past 20 years. There are no records from the past that indicate that either was used in any significant amount in the preceding years (Quackenbush, 2006).

7.3. Onsite Sewage Treatment System

The septic tank of the laboratory is a concrete box holding 4,500 gallons which drains to two eight foot deep leach pits in the front of the building. From 1976 until 1998 this tank system was judged in good to excellent shape. As a result of a plumbing failure in one of the restrooms, the septic tank flooded due to overfilling. At the time, a septic tank pump out occurred, the first in 22 years. There were no records at the Physical Plant of TML of any septic tank pump out at TML. Since that time, the Physical Plant has placed the TML septic tank on a revised maintenance schedule of annual pump out and inspection (Quackenbush, 2006). As a result of the 2008 plumbing infrastructure work at TML, a new pressure distribution leach field was added to the septic system. The original gravity-fed leach pits remain as back up to this new leach field system.

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

1. AESTHETICS. Would the project:

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
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:

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
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:

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
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?	☐	☐	☐	☑

4. BIOLOGICAL RESOURCES. Would the project:

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
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

Baseline: 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 24 species of algae and plants and 407 species of invertebrates. Unfortunately only a few species of fish (nine) were observed in Trinidad Bay during the dive surveys conducted during 1976 and 1978. The investigators offered poor visibility and an observational emphasis on attached biota was offered as a reason for the reduced emphasis on fish observations. While somewhat comprehensive, that survey was only qualitative in nature.

One recent report and quantitative data set was available for the Trinidad Head ASBS, Sean Craig's 2006 Humboldt State University Study intertidal survey. This survey provided a quantitative comparison of rocky intertidal species at the discharge site, and at a location distant from the discharge.

The selected waste discharge location is a site where the City of Trinidad's primary storm water outfall is located. Directly adjacent to this pipe is the outfall pipe of the TML. The location is also influenced by the pier's parking lot runoff and certain boat cleaning operations (not operated by the TML). The selected "undisturbed" rocky intertidal sampling site was comparable in substrate and located approximately 100 meters northeasterly along the shoreline away from the first site.

Both sampling sites were similar in appearance, consisting of boulders partially submerged in sand and appeared to be generally unmoved throughout time. Both sampling stations were examined for vertical and horizontal zonation of the marine life. Boulders were randomly selected along a single axis within four distinct shore regions from the high shore to the low shore. These regions were labeled: High, Mid-High, Mid, and Low. A 0.25 square meter quadrat was placed at each sampling point measuring both the vertical and horizontal arrangement of organisms on each boulder. Surveys were conducted during low tide on three consecutive days, May 25, 26, and 27, 2006. Thirty quadrat samples were collected on 10 boulders at the outfall site, and 36 quadrat samples were collected from 12 boulders at the undisturbed site. Each randomly selected boulder was measured for species abundance, composition, and general pattern of zonation of the intertidal algae and invertebrates. Measuring the vertical and horizontal arrangement of organisms allowed for the examination of changes in species composition at the outfall site as compared to the control site.

The log-normal model of abundance and diversity was used to compare the discharge site with the control site. Sessile and mobile invertebrates were measured for abundance using a count and then the log was taken. Anemones and algae were counted as percent cover. The report stated that when considered together, the diversity and abundance of biologically similar organisms within a community are more powerful in assessing the effects of disruption than when taken separately. A log-normal model of abundance and diversity is one tool in applied ecology to test ecosystem integrity, disruption, and health.

Craig reported the same species present at both the outfall (discharge) site and the “undisturbed” location; a total of 23 species were recorded, 10 macrophyte and 13 invertebrate species. The report stated that the outfall site and the “undisturbed” site show a similar pattern in both vertical and horizontal zonation of species. Fucoid algae, including *Fucus gardneri* and *Pelvetiopsis limitata,* were found restricted to the higher regions of boulders generally below the barnacle line across the shore. Also found in the highest zone were a group of red algae species *Mastocarpus papillatus*, *M. jardinii*, *Cryptosiphonia woodii*, *Endocladia muricata* and *Neorhodomela larix.* All four shore zones included barnacles *Chthamalus dalli* and *Balanus glandula,* abundant at the upper reaches of the boulders. The anemone *Anthopleura elegantissima* was present in all but the high zone at both locations.

Abundance between the two sites was not the same. Craig provided the explanation that the difference in organism abundances between the two sites may be due to the physical positioning and slope of the shore line, and describe the outfall site as a long gentle slope more protected from heavy wave action as compared to the “undisturbed” site and filling in more slowly during the incoming tide. The “undisturbed” site was described as being less protected with the potential to be more rapidly immersed with an incoming tide.

At the request of State Water Board staff, Dr. Pete Raimondi of UC Santa Cruz performed a statistical analysis of the Trinidad intertidal data set described above. In that assessment, he used Bray-Curtis ordination (PRIMER software) to compare community structure at reference and impact locations. Using the design and data provided, there is evidence that the impact (outfall) location is different from the “undisturbed” location based on comparison of community composition. This effect was complicated by the interaction between effluent “treatment” (impact vs. undisturbed) and tide height.

For species sampled by counts and those sampled by percent cover, one of three tidal height zones differed between outfall and undisturbed areas, although the differences in the other zones were close to significant. The p-value for the species sampled by counts in the low tide zone was 0.023 (2.3%) and the p-value for percent cover species in the mid tide zone was 0.005 (0.5%). The p-values describe the level of significance of the sample statistics, with lower p-values indicating a greater certainty that there are differences between outfall and undisturbed sites.

Algal species contributing the greatest difference between the discharge and undisturbed site was the red algae *Cryptosiphonia woodii,* being more abundant at the discharge site (Table 2). The aggregating sea anemone *Anthopleura elegantissima* was clearly more abundant at the undisturbed site.

Table 2. Percent cover, intertidal algae, and the aggregating sea anemone A. elegantissima, and their contribution to differences between the outfall site (Group 1) and the undisturbed site (Group 2) 2006.

	Group 1	Group 2	
Species	Av.Abund	Av.Abund	Contrib%
Cryptosiphonia woodii (%)	40.33	0.2	21.38
Anthopleura elegantissima (%)	1.78	17.6	17.52
Endocladia muricata (%)	6.11	17.2	16.04
Fucus gardneri (%)	15.67	3.3	14.9
Pelvetiopsis limitata (%)	8.11	1.1	9.59
Mastocarpus papillatus (%)	4.44	4.3	7.46
Mastocarpus sporophyte (%)	2.56	5.2	6.69

Data source: Telonicher Marine Laboratory Ocean Plan exception application August 28, 2006. Table source: "Evaluation of ASBS assessments in rocky intertidal communities for the State Water Board" Dr. Peter Raimondi March 6, 2009.

The barnacle *Chthamalus dali*, black limpets, and the barnacle *Balanus glandula* contributes the greatest differences between the outfall and undisturbed sites (Table 3).

Table 3. Counts, Intertidal invertebrates, and their contribution to differences between the outfall site (Group 1) and the undisturbed site (Group 2) 2006.

	Group 1	Group 2	
Species	Av.Abund	Av.Abund	Contrib%
Chthamalus dali (count)	2.47	3.82	34.97
Little Black Limpets (count)	0.64	2.34	20.81
Balanus glandula (count)	1.69	1.35	15.71
Littorines (count)	0.42	0.69	8.49
Lottia digitalis (count)	0.61	0.1	6.23
Chitons	0.41	0	4.5

Data source: Telonicher Marine Laboratory Ocean Plan exception application August 28, 2006. Table source: "Evaluation of ASBS assessments in rocky intertidal communities for the State Water Board" Dr. Peter Raimondi March 6, 2009.

For species sampled by counts and those sampled by percent cover, 1 of 3 tidal height zones differed between outfall and undisturbed sites, although the differences in the other 2 of 3 zones were close to significant.

The following figures 1, 2, and 3, provide a graphic representation of the Bray-Curtis multivariate results provided by Dr. Raimondi. Each symbol represents a quadrat sample result. The graphs show that some outfall and undisturbed quadrats cluster together, but some outfall quadrats cluster separately as do some undisturbed quadrats. This displays the differences between the outfall and undisturbed community data sets.

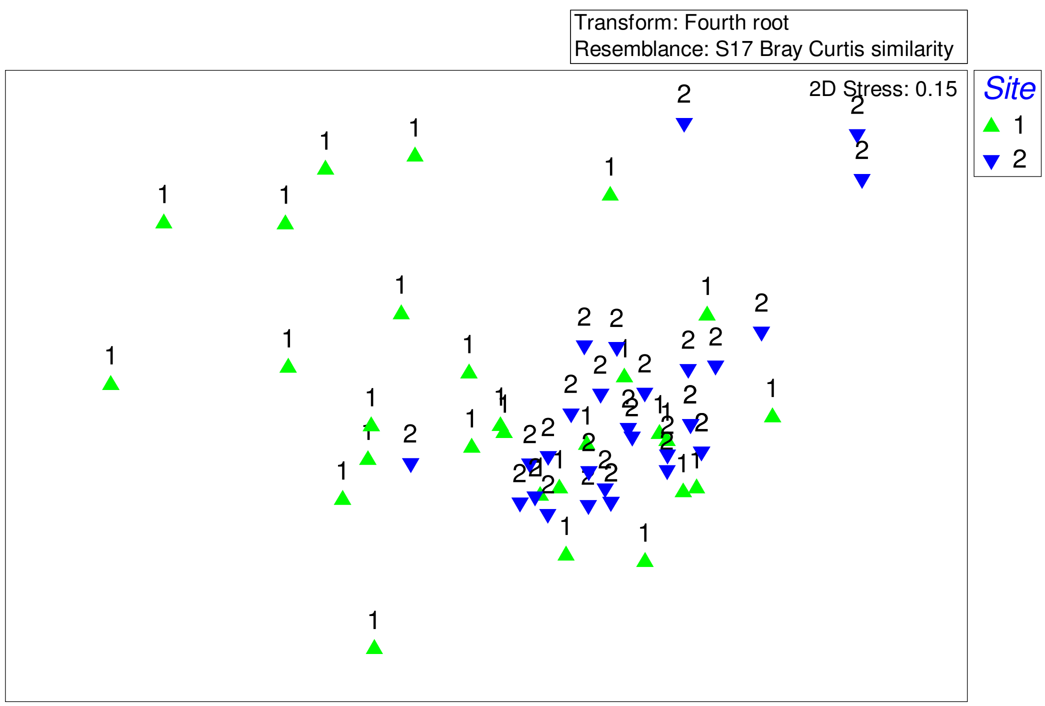


Figure 1. Above, Trinidad Head ASBS. All tidal zones combined. Site 1 is the outfall Site and Site 2 is the "undisturbed" site. Dr. Peter Raimondi March 9, 2009.

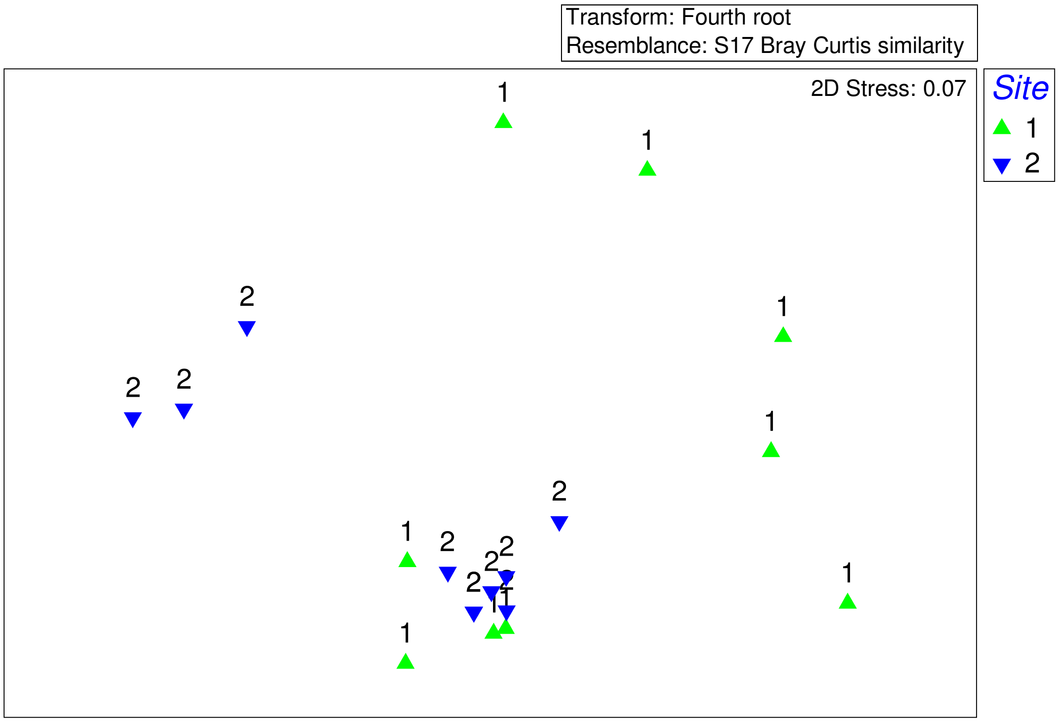


Figure 2. Above Trinidad Head ASBS. Low tide zone, species measured by counts. Site 1 is the outfall site and Site 2 is the "undisturbed" site. Dr. Peter Raimondi March 9, 2009.

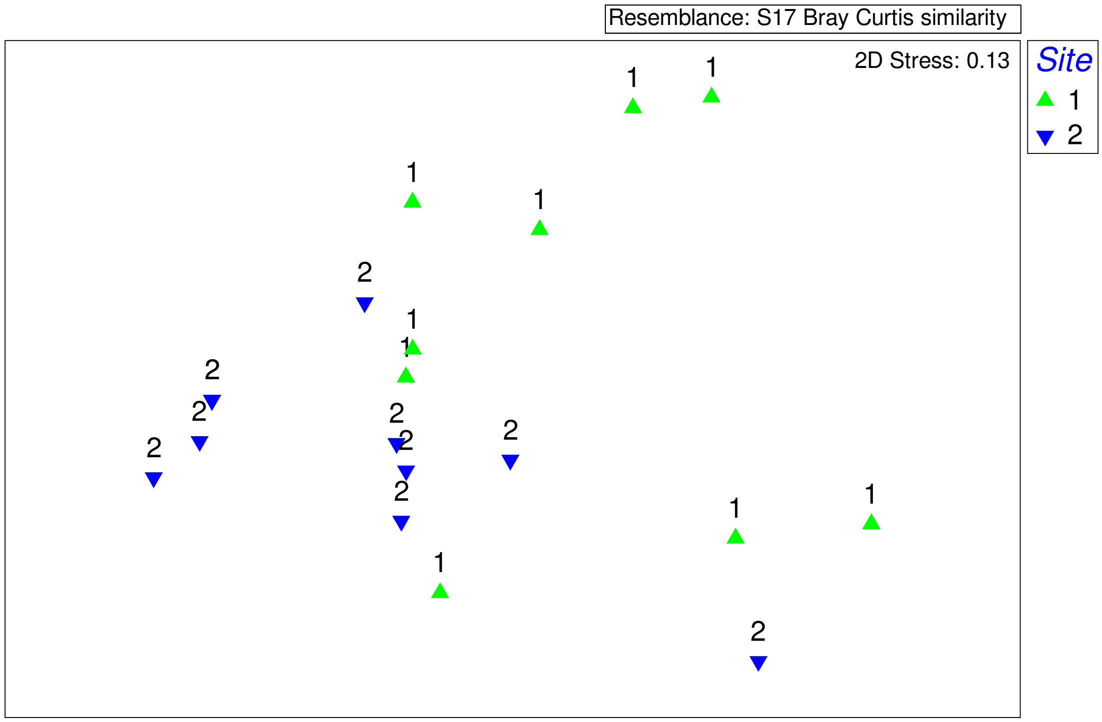


Figure 3. Above Trinidad Head ASBS. Mid tide zone, sessile species measured by percent cover. Site 1 is the outfall site and Site 2 is the "undisturbed" site. Dr. Peter Raimondi March 9, 2009.

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 TML discharges, as long as they are properly controlled. The adoption of these Special Protections will only 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. 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 conditions will be required to monitor the ongoing status and protection of marine aquatic life:

Monitoring

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 staff, in consultation with the State Water Board's Division of Water Quality staff, must approve the survey design. The results of the survey must be completed and submitted to the Regional Water Board within 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 staff.

5. CULTURAL RESOURCES. Would the project:

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
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:

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
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:

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
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:

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
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?	☐	☐	☐	☑
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 wild land fires, including where wild lands are adjacent to urbanized areas or where residences are intermixed with wild lands?	☐	☐	☐	☑

9. HYDROLOGY and WATER QUALITY. Would the project:

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
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 storm water 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?	☐	☐	☐	☑

Water Quality Impacts

9.1. California Ocean Plan Water Quality Objectives and Natural Water Quality

The California Ocean Plan prohibits waste discharges to ASBS and requires that discharges should be a sufficient distance away from the ASBS so as not to alter 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) was 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 Natural Water Quality Committee's "Summation of Findings 2006-2009" and the results of the statewide probabilistic survey entitled "Status of California's Marine Water Quality Protected Areas" are found in Appendix A and B, respectively.

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

Table 4. California Ocean Plan Table B Chemical Objectives

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

9.1.1 Reference Site Pilot Study

In the 2007-2008 winter season, a pilot study was performed on potential reference sites. Table 5 provides average results and data ranges for all potential reference site samples:

Table 5. 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.

One concern voiced previously by stakeholders is that there may be differences in natural water quality in different regions of the state. Table 6 represents a regional comparison of the potential reference station results. One sample was collected in reference areas on the North Coast during a runoff event.

Table 6. 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)

9.1.2. 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 hours before rainfall and again less than 24 hours 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 Trinidad ASBS. Table 7 reports the results of the 2009 ASBS Water Quality Survey for the Trinidad ASBS sample locations. ASBS water samples were collected prior to a storm event and after the beginning of a storm event at two locations in the Trinidad ASBS, one at a discharge and one over 500 meters from any discharge.

In non-storm conditions (pre-storm) at the background site, water quality concentrations for almost all the constituents analyzed are within the Ocean Plan standards. The only constituents that slightly exceeded the Ocean Plan levels were total suspended solids (TSS), and total chromium. Total suspended solids may be naturally occurring (e.g. sand or kelp fragments) and due to wave energy, and chromium may have both anthropogenic and geological sources. Hexavalent chromium was not analyzed for this survey. In non-storm conditions (pre-storm) at the discharge site, concentrations for nearly all the constituents analyzed are within the Ocean Plan standards, with total chromium being the only exception.

Post rainfall water quality in the Trinidad ASBS exhibited evidence of minor storm runoff effects. At the background site concentrations of TSS, chromium, nickel and PAHs exceeded Ocean Plan levels, and both total chromium and total nickel were slightly higher than for the pre-storm concentrations. Again, the TSS is probably an indicator of natural detrital and sediment particles. Both chromium and nickel may be from natural geological and/or possibly anthropogenic sources. Interestingly the total chromium and nickel concentrations were much higher than the dissolved chromium and nickel, which are generally considered the more bioavailable forms. Similarly total PAHs may have both natural and anthropogenic sources. At the discharge site only chromium and PAHs exceeded the Ocean Plan levels, and chromium was higher than during pre-storm conditions. However, chromium and PAHs at the discharge site were lower than at the background site, indicating that an area wide water quality condition (anthropogenic, natural or both) has a stronger influence than that of the discharges.

Table 7. Statewide ASBS Water Quality Survey, Results for Trinidad Head ASBS

		Background (>500 meter from discharges)		Discharge Site	
Constituents/Units	Ocean Plan Objective (Table B six-month median except where noted)	Pre-storm Event	Post-storm Event	Pre-storm Event	Post-storm Event
Ammonia-N (mg/L)	0.6	0 (ND)	0 (ND)	0 (ND)	0 (ND)
Nitrate+Nitrite-N (mg/L)	N/A	0.14	0.04	0.14	0.06
TP-Total (mg/L)	N/A	0.12	0.34	0.62	0.09
TN (mg/L)	N/A	0 (ND)	0 (ND)	0 (ND)	2.2
TSS (mg/L)	60 *	525.5	193.3	20.79	59
DOC (mg/L)	N/A	0 (ND)	0 (ND)	0 (ND)	0.1
Arsenic-Dissolved (ug/L)	N/A	1.31	1.25	0.13	1.25
Arsenic-Total (ug/L)	8	1.75	1.89	1.54	1.7
Cadmium – Dissolved (ug/L)	N/A	0.02	0.01	0.01	0.01
Cadmium – Total (ug/L)	1	0.04	0.04	0.03	0.03
Chromium-Dissolved (ug/L)	N/A	0.19	0.23	0.19	0.17
Chromium-Total(ug/L)	2	4.19	5.45	2.57	4.05
Copper-Dissolved (ug/L)	N/A	0.27	0.21	0.19	0.17
Copper-Total(ug/L)	3	1.8	2.14	1.06	1.15
Iron-Dissolved(ug/L)	N/A	0 (ND)	0 (ND)	0.5	0.7
Iron Total (ug/L)	N/A	936.9	1286.5	552	782.1
Lead -Dissolved(ug/L)	N/A	0 (ND)	0 (ND)	0 (ND)	0 (ND)
Lead -Total(ug/L)	2	0.40	0.60	0.22	0.31
Nickel-Dissolved (ug/L)	N/A	0.52	0.46	0.42	0.41
Nickel-Total(ug/L)	5	4.86	5.43	2.71	3.91
Silver-Dissolved (ug/L)	N/A	0 (ND)	0 (ND)	0 (ND)	0 (ND)
Silver-Total(ug/L)	0.7	0 (ND)	0 (ND)	0 (ND)	0 (ND)
Zinc-Dissolved (ug/L)	N/A	0 (ND)	0 (ND)	0 (ND)	0 (ND)
Zinc-Total(ug/L)	20	0 (ND)	0.22	1.03	0.82
Total PAH(ug/L)	0.01**		0.14		0.04

* Table A Effluent Limit
** Table B 30 day average
Data Source: Status of California's Marine Water Quality Protected Areas, Southern California Coastal Water Research Project Technical Report 631, September 2010..

9.2. TML Discharges and Water Quality

As part of their monitoring requirement for the exception application, TML staff collected grab samples of storm water, lab seawater effluent, and ocean receiving water on May 23, 2006. Section 9.2.1 presents water quality characteristics and toxicity of TML aquaria seawater effluent and ocean receiving water. Toxicity analysis of TML seawater effluent and corresponding ocean receiving water are discussed below in section 9.2.1. Section 9.2.2 presents TML water quality characteristics of their storm water effluent. Toxicity analysis of TML facility and grounds storm water runoff and corresponding ocean receiving water site are discussed in section 9.2.2.2.

ASBS ocean receiving water samples labeled R1 and R2 were collected adjacent to the outfall. ASBS ocean water grab samples labeled MS1 and MS2 were collected 150 meters from the outfall at a low tide event in a 2-meter depth of water.

9.2.1 Water Quality Analysis of TML Aquaria/Waste Seawater Discharge and Receiving Water- Chemical and Physical Characteristics

Metals

Monitoring data collected and reported for metals in the seawater effluent, as required for the Ocean Plan exception application, is presented in Table 8. Metals are presented as total metals (not dissolved).

Table 8. Metals, TML Seawater Effluent and Ocean Receiving Water 2006.

Chemical	**Ocean Plan Objectives 6- month median µg/L**	**Seawater Effluent µg/L Lab**		**Ocean Receiving µg/L**
		R1 Lab	R2 Lab	R1
Arsenic	**8.0**	3.48	3.42	1.98
Cadmium	**1.0**	0.25	0.26	0.08
Chromium	**2.0**	0.24	0.24	**9.89**
Chromium hexavalent	**2.0**	**7.0**	ND < 0.005	---
Copper	**3.0**	1.23	1.25	2.64
Lead	**2.0**	ND < 0.01	ND < 0.01	0.77
Mercury	**0.04**	ND < 0.01	ND < 0.01	ND < 0.01
Nickel	**5.0**	2.94	3.02	**7.75**
Selenium	**15.0**	0.03	0.02	0.03
Silver	**0.7**	ND	ND	ND
Zinc	**20.0**	6.21	7.42	6.66

Data source: Humboldt State University Marine Laboratory exception application August 28,2006; CRG Marine Laboratories Inc. June 27, 2006 Report. Grab samples used for analysis were collected May 23, 2006. Methods - trace metals by ICPMS using method EPA 1640m; mercury (Hg) by CVAFS using method EPA 245.7m.
(---) Indicates constituent or sample site not tested. ND indicates constituent sampled but non-detected.

Waste Seawater Effluent:

The waste seawater effluent had low concentrations for most trace metals, with the exception of hexavalent chromium. Elevated levels of hexavalent chromium (Cr VI) were present in sample R1 but not detected (ND) in sample R2. The lack of detecting Cr VI in sample R2 may be due to the high method detection limit of milligrams per liter, instead of the Ocean Plan required lower detection limits measured in micrograms per liter. The TML seawater effluent sample result of 7.8 µg/l CR VI sample R1 exceeded the Ocean Plan 6-month median value for total chromium of 2.0 µg/l. However, there is a significant discrepancy in the analytical data, with hexavalent chromium concentrations greater than the low total chromium concentrations in the waste seawater effluent (0.24 µg/l in both replicates), casting some doubt as to the validity of measurements.

Chromium is an essential trace metal for living organisms, but, its high toxicity, mutagenicity and carcinogenicity render it hazardous at very low concentration (Iyer 2004). As a transition metal, chromium exists in a range of oxidation states from -2 to +6. Chromium exists primarily in two oxidation states, hexavalent, Cr (VI) and trivalent, Cr (III). Cr (VI) is highly soluble in water and most responsible for responses of toxicity and dietary deficiency while trivalent chromium is very insoluble in water and deemed responsible for relatively fewer effects. Cr (VI) is about a hundred times more toxic and soluble than Cr (III).

Ocean receiving water:

The ASBS ocean receiving water sample site (for replicates R1 and R2) is located immediately adjacent to both the City of Trinidad storm drain and the TML laboratory outfalls. The ocean receiving water had low concentrations for most trace metals, with the exception of chromium and nickel. Total chromium (Cr) in ocean receiving water sample R1 was 9.89 µg/L, exceeding the Ocean Plan 6-month median value of 2.0 µg/l. Total nickel was also elevated in the ocean receiving water sample and reported at 7.75 µg/L, exceeding the Ocean Plan 6-month median value of 5.0 µg/L. It is important to note that the receiving water tests were generally consistent with the statewide probabilistic survey discussed above, where the only metals that exceeded objectives were chromium and nickel, indicating some regional source(s). However, both chromium and nickel concentrations in the receiving water were higher during TML's survey than during the statewide survey in the Trinidad ASBS.

The elevated nickel level in receiving water does not seem to be related to the lab discharge, which is considerably lower. The elevated chromium level in the receiving water may be related to the lab discharge, for which there was an elevated hexavalent chromium measurement. However, the hexavalent chromium concentration in the waste seawater effluent was lower than in the receiving water concentration of total chromium; one possibility is that the source intake water for the lab seawater system may be contaminated with chromium due to other sources. Again, there is a significant discrepancy in the analytical data, with hexavalent chromium concentrations greater than the total chromium concentrations in the waste seawater effluent, casting some doubt as to the validity of measurements for the waste seawater.

There are other sources in the immediate area that have the potential to impact water quality, including Trinidad runoff, the neighboring fishing pier, and waterfront activities. These will be discussed below.

Conventional Constituents:

Monitoring data collected and reported for conventional constituents in the seawater effluent and ocean receiving water, as required for the Ocean Plan exception application, is presented in Table 9.

Table 9. Conventional Constituents in TML Seawater Effluent and Ocean Receiving Water, 2006

Chemical	**Ocean Plan 6- month median or effluent limits**	**Seawater Effluent**		**Ocean Receiving**			
		R1	R2	R1	R2	MS1	MS2
Ammonia as N	**600.0 µg/L**	ND <10 µg/L	ND <10 µg/L	10.0 µg/L	---	250.0 µg/L	250.0 µg/L
BOD5	**No standard**	1.4 mg/L	---	---	---	---	---
Chlorine-Residual	**2.0 (µg/L)**	ND < 5 µg/L	---	**34.0 µg/L**	**37.0 µg/L**	**625.0 µg/L**	**625.0 µg/L**
Nitrate as N	**No standard**	160.0 µg/L	160.0 µg/L	40.0 µg/L	---		
Turbidity	**225.0 NTU***	1.8 NTU	---	21.0 NTU	21.2 NTU		
Settleable Solids	**3.0 mL/L ***	ND < 0.2 mL/L	---	---	---		
Temperature	**No standard**	---	---	45.5 ˚F	---		
pH	**6.0-9.0**	7.6	---	8.0	8.1		
Salinity	**No standard**	$32.5^{0/00}$	---	$33.2^{0/00}$	$33.2^{0/00}$		

(---) Indicates constituent or sample site not tested.
ND indicates constituent sampled but non-detected.
*Maximum at any time.

Waste Seawater Effluent

Monitoring data for conventional constituents are required for NPDES permit holders for waste seawater effluents. Thought not currently covered by an NPDES permit, TML effluent and receiving water samples were collected and tested for these general chemistry parameters. Effluent replicate samples R1 and R2 both displayed acceptable levels for the most constituents tested. While chlorine bleach is sometimes used by marine laboratories to sterilize tanks between experiments, there was no residual chlorine detected in the waste seawater effluent sample. Ammonia N was not detected above 0.01 mg/L, and is less than the Ocean Plan six month median objective is 0.6 mg/L. Ammonia N in the effluent is also less than that in the receiving water (10 µg/L), indicating a possible source other than the TML seawater.

Nitrate nitrogen levels in the waste seawater effluent (0.16 mg/l) were elevated in compared to the receiving water (0.04 mg/l), and were higher than levels found in the reference areas (mean of 0.02 mg/l) during the pilot study. The elevated nitrate levels indicate the presence of metabolic wastes from the marine life held in the laboratory aquaria.

Ocean receiving water

Most general chemistry results fell within the Ocean Plan limits, with the exception of residual chlorine. However, while ammonia nitrogen concentrations did not exceed the standard, at MS1 and MS2 the concentrations (0.25 mg/L) were higher than levels found in the reference areas (mean of 0.02 mg/l) during the pilot study. Ammonia N for R1 was much lower (0.01 mg/L), being located immediately at the outfall. This indicates a more distant source for ammonia than the outfall, but does not rule out storm runoff from TML and Trinidad as a contributor.

Residual chlorine results exceeded the Ocean Plan 6 month median of 2.0 µg/L. Samples R1 and R2 were 34.0 µg/L and 37.0 µg/L, respectively. Samples MS1 and MS2 were collected 150 yards from R1 and R2, toward the boat launching facilities. Results were 625.0 µg/L each for MS1 and MS2. It is interesting to note that residual chlorine was not detected in the laboratory seawater effluent, which was not contributing to the elevated receiving water residual chlorine levels. The ASBS seawater samples were elevated compared to Ocean Plan limits adjacent to the outfall and were magnified in the samples collected 150 meters out and closer to the boat launch facility. Other sources in the immediate area have the potential to impact water quality, including Trinidad runoff, the neighboring fishing pier, and waterfront activities. Historically chlorine bleach has been used as a cleaning agent by individuals at the Trinidad pier and waterfront facilities.

Many NDPES Permit holders discharging estuarine or marine water into the coastal waters of California are required to monitor their effluent and/or receiving water for residual chlorine, even if they are not chlorinating their effluent. Chlorine is toxic to marine aquatic life and therefore Table B of the California Ocean Plan (State Water Board 2005) provides 6-month median, daily maximum, and instantaneous maximum objectives of 2, 8, and 60 µg/L, respectively as levels protective of marine life. The USEPA 304(a) water quality criteria for chlorine in seawater are in terms of chlorine-produced oxidants (CPO), which includes the oxidative products of chlorine (hypobromous acid (HOBr), hypobromous ion (OBr-), and bromamines). The one- hour average criteria is 19 µg/L for TRC and 13 µg/L for CPO, and the four day average criteria is 11 µg/L for TRC and 7.5 µg/L for CPO. However, the analytical methods typically used for Residual Chlorine (Standard Methods for the Examination of Water and Wastewater 19th Edition, 1995) have detection limits around 10 µg/L or higher, which exceeds the Ocean Plan 6-month median and daily maximum values.

While chloride ions are the most abundant ions in seawater, free chlorine is highly reactive and not a natural component in marine water. The formation of potentially dangerous byproducts as a result of chlorination can lead to negative consequences for ecologically important areas along our coast. Once introduced into a solution, chlorine is generally present as either hypochlorous acid or hypochlorites which are both regarded as free chlorine. These compounds quickly react with the surrounding constituents, such as bromide, iodide, ammonia, and manganese through oxidation reactions to form a variety of products. Exposure to sunlight or any agitation of the solution increases the rates of these reactions. Any free chlorine that is left over is labeled as residual chlorine. Residual chlorines in the form of sodium hypochlorite (NaOCl) are acutely toxic to marine and estuarine organisms (Anasco 2008).

9.2.1.2. Toxicity Analysis of Waste Seawater Discharge

As part of their monitoring requirement for the exception application, evaluations of the acute and chronic toxicity of TML seawater effluent, storm water runoff and ocean receiving water were performed from samples collected May 23, 2006. TML staff collected grab samples of storm water, lab seawater effluent, and ocean receiving water. The evaluation consisted of performing the following USEPA toxicity tests; the chronic germination and growth test with the giant kelp, *Macrosystis pyrifera*; the chronic (7-day) survival and growth test with larval mysid shrimp *Americamysis bahia*; the chronic (7-day) survival and growth test with larval fish *Menidia beryllina*; and the acute (96-hour) mysid survival test with the larval mysid shrimp, *Americamysis bahia.*

Chronic Toxicity Testing

The goal of aquatic toxicity tests is to estimate the “safe” or “no-effect” concentration of substances, which will permit normal propagation of fish and other aquatic life in the receiving waters. The possible endpoints that have been considered in various tests to determine the adverse effects of toxicants include death and survival, decreased reproduction and growth, locomotor activity, gill ventilation rate, heart rate, blood chemistry, histopathology, enzyme activity, olfactory function, and terata. Since it is not feasible to detect and/or measure all of these (and other possible) effects of toxic substances on a routine basis, observations in toxicity tests required in the Ocean Plan generally have been limited to only a few effects, such as mortality, growth, and reproduction.
A multi-concentration, or definitive test, consisting of a control and a minimum of five effluent concentrations are used in the chronic toxicity test for effluent. The tests are designed to provide dose-response information, expressed as the percent effluent concentration that affects the hatchability, gross morphological abnormalities, survival, growth, and/or reproduction. The highest concentration that has no statistically significant observed effect on those responses when compared to the controls is the No-Observed-Effect-Concentration (NOEC). The No Observed Effect Level (NOEL) is expressed as the maximum percent effluent or receiving water that causes no observable effect on a test organism as determined by the result of a critical life stage toxicity test. The Ocean Plan requires chronic toxicity to be expressed as TUc=100/NOEL. For example, if the NOEL is 100% effluent, then the TUc = 1.0 and there is no chronic toxicity. The Ocean Plan objective for chronic toxicity is 1.0 TUc.

Use of the pass/fail tests consisting of a single effluent concentration and a control is not recommended. Chronic toxicity (TUc) results were calculated by the applicant’s consultant, Pacific Ecorisk, using the equation TUc=100/NOEC and tested at 100% pass/fail concentration only. In addition, Pacific Ecorisk also calculated TUc values for a comparison of discharge and receiving water, instead of comparison to control values. Staff does not agree with these approaches to calculating the TUc. Therefore the chronic toxicity results presented below do not include the TUc values calculated by Pacific Ecorisk, but do provide the chronic toxicity endpoints from the bioassays.

It is important to note that a negative result from a chronic toxicity test for one species *does not preclude* the presence of toxicity to other species. Also, because of the potential temporal variability in the toxicity of effluents, a negative test result with a particular sample does not preclude the possibility that samples collected at some other time might exhibit chronic toxicity.

Acute Toxicity Testing

Acute toxicity tests were not performed for the lab seawater effluent or ocean receiving water samples, however, acute test were performed on storm water sample and discussed later in this document.

Results: Chronic Toxicity Tests – Seawater effluent and Receiving Water

Mysid Shrimp - *Americamysis bahia*

Mysids are epibenthic crustaceans which are considered to be highly sensitive to metals, with the greatest sensitivity at the reproductive endpoints, and less sensitive at mortality and growth endpoints (Hunt 2002). Growth endpoints are often less sensitive than survival in mysid tests, especially with trace-metal toxicants. This is often because the few mysids surviving at higher concentrations are relatively large.

For the survival tests, there was a 92.5% mean survival in the lab seawater effluent and a 97.5% mean survival in the ocean receiving water sample. For the growth test, the mean biomass value was 0.25 mg in the lab effluent, 0.33 mg for the ocean receiving water sample, and 0.28 mg for the laboratory control. The waste seawater effluent has mean biomass biomass results lower than for the control or receiving water, possibly indicating a low level of chronic toxicity in 100% effluent.

Giant Kelp - *Macrocyctis pyrifera*

In the germination test, there was 3.4% mean germination at the ocean receiving water sample, 86% mean germination in the lab seawater effluent, and 87% mean germination in the control. A mean germination of 3.4% is extremely low and indicative of toxicity in the receiving water, but it is important to note that there are multiple sources of discharge in the receiving water that are not associated with TML. The laboratory performing the assays, in their report dated June 30, 2006 (Pacific Ecorisk 2006) state that there is not a significant difference between seawater effluent and the seawater control. The ocean receiving water sample also showed a stunted kelp growth rate of 6.4 µm compared to 14.8 µm and 15.0 µm, respectively, of the seawater effluent and natural seawater control samples. There is clearly a significant difference between the ocean receiving water sample and the control, but this does not appear to be of the lab seawater effluent, but very likely other adjacent sources.

Toxicity identifications evaluations (TIEs) may be used to identify various combinations or individual constituents that would contribute to marine life toxic effects. TIEs were not performed, so the exact causes of the toxicity in the receiving water samples discussed above are not known. However, from chemical analysis of the samples we know that chromium, nickel and residual chlorine in excess of Ocean Plan standards were found in the receiving water.

Fish - *Menidia beryllina*

Chronic toxicity of TML seawater effluent to *Menidia* in the survival test show a 95% mean survival, and a 95% mean survival in the ocean receiving water. The natural seawater control test also resulted in 95% mean survival. The survival

NOEC as calculated by the analytical laboratory was 100% lab seawater effluent. For the growth assay, mean fish biomass was 0.98 mg for the ocean receiving water test, and the mean fish biomass was 0.99 mg for the seawater effluent sample. Mean biomass values of the natural seawater control were similar at 1.02 mg.

Table 10. TML Seawater Effluent and Ocean Receiving Water Chronic Toxicity Analysis 2006

Waterbody Description	Toxicity Test Type	Mysid Shrimp	Giant Kelp	Fish
Lab seawater effluent	Chronic	(92.5% mean survival) (0.25 mg biomass)	(86.0% mean germination) (14.8 µm mean growth)	(95.5% mean survival) (0.99 mg biomass)
Ocean Receiving water	Chronic	(97.5% mean survival) (0.33 mg biomass)	(3.4% mean germination) (6.4 µm growth)	(95% mean survival) (0.98 mg biomass)
Natural seawater control sample	Chronic	(92.5% mean survival) (0.28 mg biomass)	(87.0% mean germination) (15.0 µm growth)	(95% mean survival) (1.02 mg mean biomass)

Data source: Humboldt State University Marine Laboratory exception application August 28,2006, “An Evaluation of the Toxicity of Humboldt State University Storm water and Lab Effluent Samples,” Pacific EcoRisk June 2006. Notes: Seawater effluent and receiving water are grab samples collected on May 23, 2006.

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

Seawater System

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 North Coast regional monitoring program by the State Water Board in consultation with the North Coast Regional Water Quality Control Board (Regional Water Board).

TML will not discharge chemical additives, including antibiotics and chlorine, in the seawater discharge system effluent. In addition and at a minimum, TML, 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.

TML must develop 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.

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.

Once annually, an effluent sample collected from the waste seawater discharge during a filter backwash event during the dry season, must be analyzed for Ocean Plan Table A constituents (except oil and grease), Biochemical Oxygen Demand, salinity, temperature, and Ocean Plan Table B constituents (for marine life, except cyanide, phenolic compounds, endosulfan, endrin, and HCH). Ammonia must be measured at a detection limit of 10 µg/L. Based on the results from the first year Regional Water Board staff 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

Pre-storm monitoring: At least once per 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.

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

Reference Site Monitoring

Reference samples must also be monitored at the same time as the effluent samples (twice annually) 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.

9.2.2. Storm Water Quality Analysis

9.2.2.1. *Storm Water - Chemical and Physical Characteristics*

It is important to consider that storm water runoff from the TML is discharged through the same outfall that also discharges waste seawater, with the two potentially co-mingled during any particular sampling event. For the sampling and analysis described in this document separate storm water and waste seawater samples were taken at their confluence prior to co-mingling. Another important consideration is that the TML runoff and the City of Trinidad runoff are discharged via separate outfalls that are immediately adjacent to each other.

<u>Metals</u>

Table 11 includes the analytical results for Ocean Plan Table B metals for storm water. Ocean Plan Table B values serve specifically for the protection of marine aquatic life. For comparison purposes the receiving water sample results (which are the same as those provided above in the waste seawater section) are provided again.

Metals in Storm Runoff

Four trace metals had concentrations in the runoff samples greater than the Ocean Plan six month median objectives. The cadmium concentrations in replicate R1 was 3.3 μg/L and in R2 it was 3.5 μg/L. The hexavalent chromium in the storm drain sample was reported at 5.0 μg/L for R1 and was not detected in R2. The copper concentration for R1 was 29.8 μg/L and was 30.9 μg/L for R2). Zinc was reported for R1 at 41.8 μg/L and for sample R2 at 42.2 μg/L. These trace metals are generally known to be found in storm water runoff.

Metals in Ocean Receiving Water Influenced by Storm Runoff

The ASBS ocean receiving water sample site (for replicates R1 and R2) is located immediately adjacent to both the City of Trinidad storm drain and the TML laboratory outfalls. The ocean receiving water adjacent to the outfalls had concentrations for most trace metals below Ocean Plan six month median objectives, with the exception of chromium and nickel. Total chromium (Cr) in ocean receiving water sample R1 was 9.89 μg/L, exceeding the Ocean Plan 6-month median value of 2.0 μg/l. Total nickel was also elevated in the ocean receiving water sample and reported at 7.75 μg/L, exceeding the Ocean Plan 6-

month median value of 5.0 µg/L. It is important to note that the receiving water tests were generally consistent with the statewide probabilistic survey discussed above, where the only metals that exceeded objectives were chromium and nickel, indicating some regional source(s). However, both chromium and nickel concentrations in the receiving water were higher during TML's survey than during the statewide survey in the Trinidad ASBS.

The elevated nickel level in receiving water does not seem to be related to the TML storm runoff discharge, which is considerably lower. The elevated chromium level in the receiving water may be related to the TML storm runoff discharge, for which there was an elevated hexavalent chromium measurement. However, there is a significant discrepancy in the runoff sample analytical data, with hexavalent chromium concentrations greater than the total chromium concentrations, casting some doubt as to the validity of measurements.

There are other sources in the immediate area that have the potential to impact water quality, including Trinidad runoff, the neighboring fishing pier, and waterfront activities.

Hexavalent chromium (Cr VI) ocean receiving water grab samples labeled MS1 and MS2 were collected 150 meters from the outfall at a low tide event in a 2 meter depth of water. Results for MS1 and MS2 were each 100.0 µg/L**.** Sample R1 was collected in the ocean immediately adjacent to the storm drain outfall, reported a non-detect for hexavalent chromium, however that sample was analyzed at a higher level of detection limit measured in milligrams per liter (mg/l), making it impossible to determine the hexavalent chromium concentration at the outfall in µg/L.

The use of chromium is extensive, such as in wood preservation (e.g.,marine wharfs), metal alloys and chrome-plating, chromium-associated pollution. Marine wharves are sometimes preserved with chromated copper arsenate (CCA), which is known to be toxic to aquatic biota (The Handbook of Environmental Chemistry 2000). Therefore it is possible that the pier at Trinidad is a source of chromium in the receiving water.

While total zinc did not exceed the Ocean Plan six month median objectives, it was elevated above the statewide probabilistic study's post storm results for background concentrations (> 500 meters from a discharge) in Trinidad ASBS. Total zinc in the receiving water (6.66 µg/L) was greater than the background concentration of 0.22 µg/L, and while total zinc in the receiving water was still within the range of statewide reference conditions in the pilot study, it was greater than the single value available for the north coast (zinc not detected at that reference station).

Table 11. Metals Analysis HSU Marine Laboratory Storm Water and Ocean Receiving Water 2006

Chemical	Ocean Plan 6-month median (µg/L)	Storm Drain Outfall (µg/L)		Ocean Receiving Water (µg/L)			MDL (µg/L)
		R1	R2	R1	MS1	MS2	
Arsenic	**8.0**	2.0	1.9	1.98	---	---	0.01
Cadmium	**1.0**	**3.3**	**3.5**	0.08	---	---	0.005
Chromium	**2.0**	1.6	1.9	**9.89**	---	---	0.025
Chromium - hexavalent	**2.0**	**5.0**	---	ND (0.005mg/l)	**0.1 mg/L**	**0.1 mg/L**	0.005 mg/L
Copper	**3.0**	**29.8**	**30.9**	2.64	---	---	0.01
Lead	**2.0**	1.0	0.97	0.76	---	---	0.005
Mercury	**0.04**	ND	---	ND	---	---	0.01
Nickel	**5.0**	2.7	2.8	**7.75**	---	---	0.005
Selenium	**15.0**	0.7	0.8	0.032			0.01
Silver	**0.7**	ND	ND	ND			0.02
Zinc	**20.0**	**41.8**	**42.2**	6.66			0.005

Data source: Humboldt State University Marine Laboratory exception application August 28,2006. Notes: Storm water and ocean receiving water are grab samples collected on May 23, 2006.
(---) Indicates constituent or sample site not tested.
ND indicates constituent sampled but non-detected.

Conventional Constituents:

Storm runoff replicate samples had detectable levels of ammonia N (30.0 ug/L) and nitrate N (100.0 ug/L). Chlorine residual was measured at a level of 11.0 µg/L, which exceeds the Ocean Plan six month median. Chlorine bleach is sometimes used by marine laboratories to sterilize tanks between experiments, and since the waste seawater and storm drain systems have a common outfall, it is possible that the source could have been TML's tank cleaning activities. Chlorine is also present in potable water supplies, which are another potential source at TML.

Ocean receiving water

As mentioned in a previous section, while ammonia N concentrations did not exceed the standard, at MS1 and MS2 the concentrations (0.25 µg/L) were higher than levels found in the reference areas (mean of 0.02 mg/l) during the pilot study. Ammonia N for R1 was present but much lower (0.01 mg/L) adjacent to the outfall; since the runoff had higher ammonia than the receiving water (R1), the runoff could therefore be a contributing. Nevertheless it is clear that another source (not TML) has a much greater contribution of ammonia in the ASBS.

Nitrate nitrogen levels in the receiving water (0.04 mg/l) were slightly higher than levels found in the reference areas (mean of 0.02 mg/l) during the pilot study. It is conceivable that the nitrate N in the storm runoff is contributing to the level in the receiving water.

Residual chlorine in the receiving water at the outfall exceeded the Ocean Plan 6 month median of 2.0 µg/L. Samples R1 and R2 were 34.0 µg/L and 37.0 µg/L, respectively. Samples MS1 and MS2 were collected 150 yards from R1 and R2, toward the boat launching facilities. Results were 625.0 µg/L each for MS1 and MS2.

The TML runoff had a 11 µg/L residual chlorine, and therefore is one contributor to residual chlorine in the receiving water. However, since the receiving water is higher in chlorine than runoff near the outfall, and even higher more distant from the outfall, it is clear that some other larger source is contributing residual chlorine to the ASBS. Other sources in the immediate area have the potential to impact water quality, including Trinidad runoff, the neighboring fishing pier, and waterfront activities. Historically chlorine bleach has been used as a cleaning agent by individuals at the Trinidad pier and waterfront facilities.

Table 12. Telonicher Marine Laboratory Storm Water and Ocean Receiving Water 2006

Chemical	**Ocean Plan 6- month median or effluent limit**	**Storm Water**		**Ocean Receiving**		**Ocean Receiving**	
		R1	**---**	**R1**	**R2**	**MS1**	**MS2**
Ammonia as N	**600.0 µg/L**	30.0 **µg/L**	**---**	10.0 **µg/L**	---	250.0 **µg/L**	250.0 **µg/L**
Chlorine Residual	**2.0 µg/L**	**11.0 µg/L**	**---**	**34.0 µg/L**	**37.0 µg/L**	**625.0 µg/L**	**625.0 µg/L**
Nitrate as N	**no standard**	100.0 **µg/L**	**---**	40.0 **µg/L**	---	**---**	**---**
Turbidity	**225.0* NTU**	8.3 NTU	**---**	21.0 NTU	21.2 NTU	**---**	**---**
Temperature	**No standard**	46.22 ˚**F**	**---**	45.5 ˚**F**	---	**---**	**---**
pH	**6.0-9.0**	7.0	**---**	8.0	8.1	**---**	**---**
Salinity	**No standard**	1.4 $^{0/00}$	**---**	33.2 $^{0/00}$	33.2 $^{0/00}$	**---**	**---**

(---) Indicates constituent or sample site not tested.
ND indicates constituent sampled but non-detected.
*Maximum at any time.

Polynuclear Aromatic Hydrocarbons *(PAHs)*

Table 13 includes the analytical results for Ocean Plan 30-day Average (Table B) PAHs (also known as polynuclear aromatic hydrocarbons) for storm water and ocean receiving samples collected by TML staff on August 28, 2006.

PAHs in Storm Runoff

Total Ocean Plan PAHs in storm runoff were 43.1 ng/l, much higher than the Ocean Plan 30-day average of 8.8 ng/l. The Ocean Plan PAH objectives are very low and are based on human health effects due to bioaccumulation and seafood consumption. Nevertheless PAHs, at higher levels (0.3 µM Benzo[a] Pyrene) (Nugueria 2006), are known to be toxic to marine life.

PAHs in the marine environment receive considerable attention, partly because of their carcinogenicity and partly because they are comparatively easily detectable. Marine invertebrates, particularly mollusks, accumulate PAHs and tend to retain the profile of the source of PAHs. Fish, on the other hand tend to metabolize PAHs in various ways and are excreted.

The acute toxicity of PAHs to fish is relatively low and decreases with increasing molecular weight (The Handbook of Environmental Chemistry, 2000). On the other hand, chronic toxicity may manifest itself by various sublethal responses such as immune suppression, eye lens cataracts and liver lesions. Delayed genotoxicity in the liver and kidney has also been observed in bottom dwelling fish (Nugueria, 2006). In fish, PAH biotransformation occurs mainly in the liver and form byproducts which cause gene mutations or DNA and RNA alteration. These gene mutations lead to the carcinogenesis process and tumor development.

PAHs in ASBS Ocean Receiving Water

Total Ocean Plan PAHs in the receiving water were 107.8 ng/l, much higher than the Ocean Plan 30-day average of 8.8 ng/l. Since the TML runoff contains PAHs, it does contribute to PAHs in the receiving water. However, the receiving water concentrations were greater than in the TML runoff, and therefore another source (or sources) has a greater contribution. It is important to note that the receiving water concentration of 107.8 ng/L is somewhat a little lower than but consistent with the background result from the statewide probabilistic study (140.6 ng/L) for post storm conditions. Another important result from the statewide probabilistic study is that PAHs did not meet the Ocean Plan objective for a majority of ASBS sites throughout the state. The pilot reference study had a mean result for PAHs of 81 ng/L, one order of magnitude greater that the Ocean Plan objective. Undoubtedly there are both natural and anthropogenic sources that contribute to the ubiquitous PAH levels.

The most important sources for the marine environment to consider are wood preserved with creosote, petroleum (both spills and natural seeps), and storm water. PAHs in runoff are a result of oil leaks, combustion of fossil fuels, and natural sources (e.g. forest fires). PAHs are released into the environment in mixtures that may be characteristic for different sources.

Table 13. PAHs - TML Storm Water and Ocean Receiving Water 2006

Chemical	Ocean Plan 30-day Average*	Storm water *Units ng/l*		Ocean Receiving Water *Units ng/l*	
	Units ng/l	**R1**	**R2**	**R1**	**R2**
Acenaphthylene	**	ND	---	ND	---
Anthracene	**	ND	---	17.6	---
1.2-benzanthracene	**	ND	---	ND	---
3,4-benzofluoranthene	**	---	---	---	---
Benzo[k]fluoranthene	**	---	---	---	---
1.12-benzoperylene	**	---	---	---	---
Bezno[a]pyrene	**	ND	---	ND	---
Chrysene	**	ND	---	ND	---
Debenzo[ah]anthracene	**	ND	---	ND	---
Fluorene	**	ND	---	ND	---
Fluoranthene	***15,000***	5.9	---	4.6	---
Indeno[1,2,3-cd]pyrene	**	ND	---	ND	---
Phenanthrene	**	7.5	---	13.8	---
Pyrene	**	5.2	---	ND	---
Total PAHs	**8.8**	**43.1**	---	**107.8**	---

Data source: Humboldt State University Marine Laboratory exception application August 28,2006. Notes: Storm water and ocean receiving water are grab samples collected on May 23, 2006. (---) Indicates constituent or sample site not tested.
ND indicates constituent sampled but non-detected.

*Polynuclear aromatic hydrocarbons (PAHs) shall mean the sum of acenaphthylene, anthracene, 1.2-benzanthracene, 3,4-benzofluoranthene, benzo[k]fluoranthene, 1.12-benzoperylene, bezno[a]pyrene, chrysene, debenzo[ah]anthracene, fluorene, indeno[1,2,3-cd]pyrene, phenanthrene and pyrene (California Ocean Plan 2005).
** No individual objective

9.2.2.2. Storm Water - Water Quality Toxicity Analysis - Chronic and Acute Tests

Acute and chronic toxicity evaluations were performed for TML facilities and grounds storm water runoff and corresponding ocean receiving water. Storm water samples collected for analysis were grab samples obtained from end-of-pipe (SCCWRP ID# TRI 033), the primary storm water outfall. Toxicity results are provided in Table 14.

CHRONIC TOXICITY

Mysid Shrimp - Chronic toxicity of storm water to mysid shrimp***,*** *Americamysis bahia,* there was 97.5% mean survival in the storm water test and 95% mean survival in the ocean receiving water test. Pacific Ecorisk reports state that the differences between the two results are not significant. In the growth response test, mean biomass values were 0.24 mg in the storm water sample, 0.30 mg in the ocean receiving water sample, and 0.27 mg in the control. This indicates some chronic toxicity associated with the storm runoff at 100% concentration.

Giant Kelp - Chronic toxicity of storm water to kelp (*Macrocyctis pyrifera*), there was 78% mean germination at the storm water sample and 3.4% mean germination in the ocean receiving water. In the artificial salt control test for kelp germination, the mean germination was 83.6 percent. Kelp growth in the storm water sample was 11.8 µm mean germ tube length, 6.4 µm mean germ tube length in the ocean receiving water sample, and 15.1µm mean germ tube length in the artificial salt control result was. These results indicate some toxicity in the storm runoff sample and even greater toxicity in the receiving water, which as discussed above is influenced by additional sources.

Fish - Chronic toxicity of storm water to fish (*Menidia beryllina)* there was a 95% mean survival rate in both the storm water sample and ocean receiving water sample, and a 97.5% survival in the control. In the fish growth response, there was a mean biomass value of 1.08 mg in the storm water sample, 0.98 mg in the ocean receiving water sample, and 0.97 mg for the control. These results indicate no critical life stage effects on *Menidia beryllina*.

ACUTE TOXICITY

The Ocean Plan requires acute toxicity to be expressed as TUa= 100/96-hr LC 50%. The LC 50% or LC 50 (Lethal Concentration) is the percent waste resulting in a 50% survival of test organisms and must be determined by static of continuous flow bioassay techniques. If specific identifiable substances in the effluent can be demonstrated by the discharger as being rendered harmless upon discharge to the marine environment, but not as a result of dilution, the LC 50 may be determined after the test samples are adjusted to remove the influence of those substances. When it is not possible to measure the 96-hour LC 50 due to greater than 50 percent survival of the test species in 100 percent waste, the toxicity concentration should be calculated by the expression TUa=log(100-S)/1.7 (where S= percentage survival in 100% waste). If S>99, the TUa must be reported as zero.

The consultant for TML, Pacific Ecorisk, did not perform a dilution series for the acute bioassay; the test organisms were exposed to 100% concentration only. Thus, these results may not adequately reflect accurate organism response to toxicity endpoints. Furthermore Pacific Ecorisk calculated acute toxicity (TUa) results were calculated using the equation TUa=100/NOEC. Staff disagrees with this approach and therefore does not provide the TUa values in Table 14 or the following discussion.

Mysid Shrimp - One acute toxicity assay was performed on the mysid shrimp species *Americamysis bahia* for the storm water runoff and ocean receiving water. In this test, both the storm water and ocean receiving water resulted in 87.5% mean survival, compared to an 85% mean survival for the control. Based on these results there appears to be no acute toxicity for mysids in the runoff or receiving water.

Table 14. TML Storm Water Runoff and Receiving Water Toxicity Analysis 2006

Waterbody Description	Toxicity Test Type	Shrimp	Kelp	Fish
Storm water	Chronic	(97.5% survival)* (0.24 mg biomass)	(78.0% mean germination)* (11.8 µm growth)	(95% mean survival)* (1.08 mg biomass)
Ocean receiving water	Chronic	(95% mean survival)* (0.30 mg biomass)	(3.4%mean germination)* (6.4 µm growth)	(95% survival)* (0.95 mg biomass)
Artificial Salt Control	Chronic	(92.5% mean survival) --- TUc (0.27 mg biomass)	(83.6% mean germination) --- TUc ** (15.1 µm growth)	(97.5% mean germination) --- TUc (0.97 mg biomass)
Storm water	Acute	(87.5% mean survival)**	---	---
Ocean receiving water	Acute	(87.5% mean survival)**	---	---
Artificial Salt Control	Acute	(85% mean survival)	---	---

Data source: Humboldt State University Marine Laboratory exception application August 28,2006, "An Evaluation of the Toxicity of Humboldt State University Storm water and Lab Effluent Samples," a report by Pacific EcoRisk June 2006. Notes: Storm water runoff and ocean receiving water are grab samples collected on May 23, 2006. Where no data is available (---) is used.

The following mitigating conditions will be required for the exception to address dry weather flows and storm water runoff:

Dry Weather Flows

TML 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.

TML 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.

Storm Water Runoff

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, and must meet effluent limitations for the comingled waste seawater and storm water effluent. 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.

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

Storm Water Runoff Monitoring

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 greater than 0.5 inch per day), the storm water runoff effluent (co-mingled with waste seawater effluent if necessary) must be sampled and analyzed from the storm drain for all Ocean Plan Table A constituents, and indicator bacteria.

Once every permit cycle, during wet weather (storm event greater than 0.5 inches per day), the storm water effluent must be sampled and analyzed additionally for Table B constituents (for marine aquatic life except acute toxicity) and PAHs.

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

Receiving Water Monitoring

Pre-storm monitoring: At least once per 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.

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

Reference Site Monitoring

Reference samples must also be monitored at the same time as the effluent samples (twice annually) 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.

Metals Analysis

For metals analysis, waste seawater, co-mingled waste seawater and 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.

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 the discharge and at a reference site. The Regional Water Board staff, in consultation with the State Water Board's Division of Water Quality staff, 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 permit expiration. Based on the study results, Regional Water Board staff, in consultation with the Division of Water Quality staff, 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 staff.

Sediment Study

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 staff 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 staff.

<u>Alteration of Natural Water Quality</u>

Waste seawater and storm runoff discharges must not cause or contribute to any alteration of natural water quality conditions in the receiving water.

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).

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), TML 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, TML 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 TML has complied with the procedures described above and is implementing the revised SWMP, then TML does not have to repeat the same procedure for continuing or recurring exceedances of the same constituent*

The following mitigating conditions will be required for the exception in relation to construction activity:

Construction Activity Potentially Affecting the ASBS

TML 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 TML 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.

9.3 Biological Pollutants (Invasive Species*)*

Any marine organism not indigenous to the Trinidad ASBS that may possibly be introduced through the laboratory or aquarium discharges is considered a biological pollutant. Currently available information (California Department of Fish and Game (DFG) 2005) indicates that there are no invasive species that would be associated with a possible introduction from the TML 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.

Examples of marine invasive species include, but may not be limited to: *Caulerpa taxifolia*, a Mediterranean Sea green algae; *Terebrasabella heterouncinata,* a South African parasitic polychaete worm which parasitizes marine mollusks such as abalone; *Potamocorbula amurenis*, an Asian clam that is a highly efficient filter feeder; and *Carcinus maenas*, the European Green crab, a voracious predator on native invertebrates (CDFG 2005).

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 (CDFG

2001). The pathways that are most applicable to TML are inadvertent releases or "stowaways" on another species when specimens are collected and brought to the lab.

Before being introduced into (or when/if detected in) the research laboratory tanks at TML, any of the above species, or any other non-native species that are not listed above, TML must notify the State Water Board and the California Department of Fish and Game (Marine Division) immediately.

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

- TML *must develop 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.*

9. LAND USE AND PLANNING. Would the project:

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
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?	☐	☐	☐	☑

10. MINERAL RESOURCES. Would the project:

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
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?	☐	☐	☐	☑

11. NOISE. Would the project result in:

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
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 ground borne vibration or ground borne noise levels?	☐	☐	☐	☑

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
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?	☐	☐	☐	☑
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?	☐	☐	☐	☑

12. POPULATION AND HOUSING. Would the project:

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
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?	☐	☐	☐	☑

13. 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:

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Fire protection?	☐	☐	☐	☑
b) Police protection?	☐	☐	☐	☑
c) Schools?	☐	☐	☐	☑
d) Parks?	☐	☐	☐	☑
e) Other public facilities?	☐	☐	☐	☑

14. RECREATION. Would the project:

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
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?	☐	☐	☐	☑

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
b) Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment?	☐	☐	☐	☑

15. TRANSPORTATION / TRAFFIC. Would the project:

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
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)?	☐	☐	☐	☑
e) Result in inadequate emergency access?	☐	☐	☐	☑
f) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☐	☐	☐	☑

16. UTILITIES AND SERVICE SYSTEMS. Would the project:

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
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?	☐	☐	☐	☑

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
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?	☐	☐	☐	☑

17. MANDATORY FINDINGS OF SIGNIFICANCE.

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
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?	☐	☐	☐	☑

Summary

Currently, the TML discharges two distinct sources of potential pollution to the ASBS: 1. aquaria seawater and filter backwash; and 2. storm water co-mingled at times with waste seawater.

First, the seawater discharge is of a similar salinity and temperature to that of the receiving water. This seawater is reported to have added nutrients (other than metabolic wastes from the species in culture), chemicals (such as chlorine or copper) or antibiotics, as they are not in use at TML. No exotic species (species that are not native to California) are routinely kept in any of the TML facilities, so there is no possibility of exotic species release. Sinks and lab drains have in the past drained directly to the ASBS, but TML has eliminated this discharge and as part of its reconstruction plan reduced this to zero in 2009 (Hankin, 2009).

Second, there is no history or records of the septic system of TML leaching to any seeps nearby the lab and by that pathway discharging to the ASBS. All Trinidad houses are on either vintage or modem septic systems and they may discharge to the ASBS. However their discharges have not yet been determined, nor distinguished from any TML discharge (Quackenbush, 2006).

Lastly, the parking lot and surface roadway drains have directly discharged in the ASBS for 40 plus years. TML completed the addition of an oil water separator on this line in 2009 and recent measurements of rain event discharges have indicated no oil or grease. Storm water discharge did have elevated PAH levels (0.043 ug / l), but the receiving water at Trinity Bay also had elevated PAH levels of 0.1 07 ug / l. This PAH level may be reduced with the addition of the new oil water separator. Copper and zinc levels were elevated in the storm water discharge, but not beyond the instant maximum of the Ocean Plan. Since no copper is used in the TML aquarium system, this copper and zinc may have its origin in the parking lots and roadways or culverts (Quackenbush, 2006). Other Responsible Parties currently discharging to the ASBS include the City of Trinidad and the Trinidad Rancheria. Both Parties have applied for coverage under the General Exception.

If TML were required to cease discharge of all seawater from the TML, it would have limited options and discontinue their lab seawater system.

If TML were required to cease all storm water discharge to the ASBS it would be faced with another difficult task of dealing with a huge volume of storm water.

In the winter period Trinidad has intense rain fall from November to March, 40-70 inches per year. TML may be able to reduce both copper and zinc levels in the storm water discharge. This may be accomplished with some policy changes on parking, and some additional management practices. It may also require reworking the current drain system. TML has been actively seeking some alternatives to manage this potential pollution source to the ASBS (Quackenbush, 2006).

MANDATORY FINDINGS OF SIGNIFICANCE

Under the less stringent and somewhat inadequate controls currently in force, TML 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 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 TML discharge will not compromise the protection of ocean waters of the ASBS for beneficial uses, and the public interest will be served. In fact the exception and an NPDES permit issued based on these terms and conditions will provide better protections for beneficial uses.

Granting the conditional exception, likewise, will not violate federal antidegradation requirements because water quality will not be lowered, 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 lower than that prescribed in the Ocean Plan; and, the people of California benefit from the research and education provided by TML   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.

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8/22/11

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8/22/11

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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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