Exhibit H

Program Final Environmental Impact Report
SCH# 2011012042

Exception to the California Ocean Plan for Areas of Special Biological Significance Waste Discharge Prohibition for Storm Water and Nonpoint Source Discharges, with Special Protections

California 40 years of WATER LEADERSHIP
WATER BOARDS

February 21, 2012

ASBS	Applicant	Pesticide/Herbicide Use
		Rodeo and Roundup applied prior to street resurfacing
30	Laguna Beach City	Fertilizers: Turf Supreme, Gro Power Plus, Grow More
		Pesticides/Herbicides: Roundup Pro, Fusilade II, Metaldyhyde 7.5,

5.8.1 – Exception Application Water Chemistry Data

Applicants applying for an exception to the Ocean Plan supplied sampling data from various waterbody types. This data, along with pertinent data from other sources (e.g., data from other storm water discharges already operating under an exception or samples collected by State Water Board staff) were assessed. Data for Ammonia (NH_3), Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Lead (Pb), Mercury (Hg), Nickel (Ni), Selenium (Se), Silver (Ag), Zinc (Zn), and Polynuclear Aromatic Hydrocarbons (PAH) are provided in Appendix 2 for discharges, receiving water, ocean waters away from discharges (i.e., background) and coastal streams draining in to ASBS. These data may be compared to the objectives for metals and ammonia in the California Ocean Plan Table B, shown in Table 5.8.2 (below). The Ocean Plan Table B 30 day average objective for PAHs is 0.0088 µg/L. In addition, a separate PAH, fluoranthene, has an individual 30 day average objective of 15 µg/L. However, the PAH objectives are provided in the Ocean Plan for human health (bioaccumulation/seafood consumption) and not for marine aquatic life protection.

Table 5.8.2. California Ocean Plan Table B 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

Ammonia nitrogen concentrations in receiving water and discharges ranged from 0.01 to190 mg/L (10 to 190,000 µg/L), with a median of 0.2 mg/L (200 µg/L). The highest concentration was from storm runoff from a roof at the Monterey Bay Aquarium (which is not addressed as a party in this exception but has applied for an individual exception.)

This high concentration may be due to gull and other bird droppings. The next highest concentration was 81.9 mg/L (81,900 µg/L) at the Pillar Point Air Force Base, which is a facility to be covered under this exception.

Table 5.8.3 provides the number of samples for copper, lead, nickel, zinc, and PAH for each sample category. It is important to note that while most of the data represented grab samples, a few data points represent composite sampling.

Table 5.8.3. Number of Samples Collected by Category and Constituent

Constituent	Waterbody Category	Number (n)
Copper	*Stream*	16
	Ocean Background Water	9
	Discharges	154
	Ocean Receiving Water	58
Lead	*Stream*	15
	Ocean Background Water	9
	Discharges	144
	Ocean Receiving Water	61
Nickel	*Stream*	15
	Ocean Background Water	9
	Discharges	128
	Ocean Receiving Water	58
Zinc	*Stream*	15
	Ocean Background Water	9
	Discharges	143
	Ocean Receiving Water	58
PAH	*Stream*	12
	Ocean Background Water	10
	Discharges	43
	Ocean Receiving Water	23

The data was assessed using SYSTAT software. Non-detects in the data set were converted to the numeric values of the detection limits in order to perform the statistical analysis. Generally, most of the baseline data was not normally distributed and exhibited high variability for most constituents and categories.

The following figure displays the data distributions for copper, lead, nickel, and zinc.

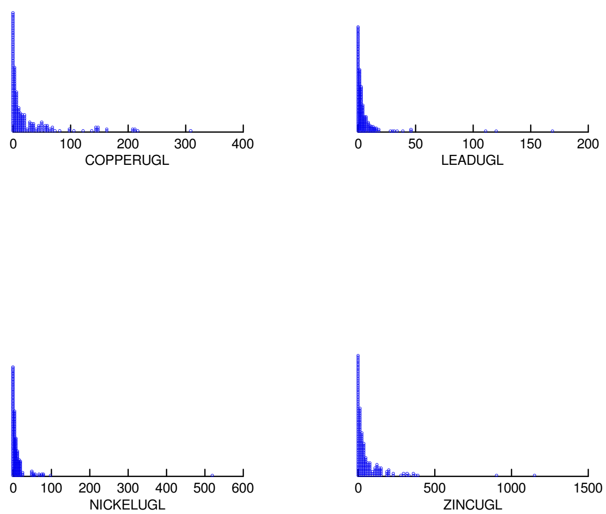

Figure 5.8.1. Data Distributions for Copper, Lead, Nickel, and Zinc.

Based on the skewed nature of the data, a log transformation was performed and "box and whiskers" graphs are provided below to present the data.

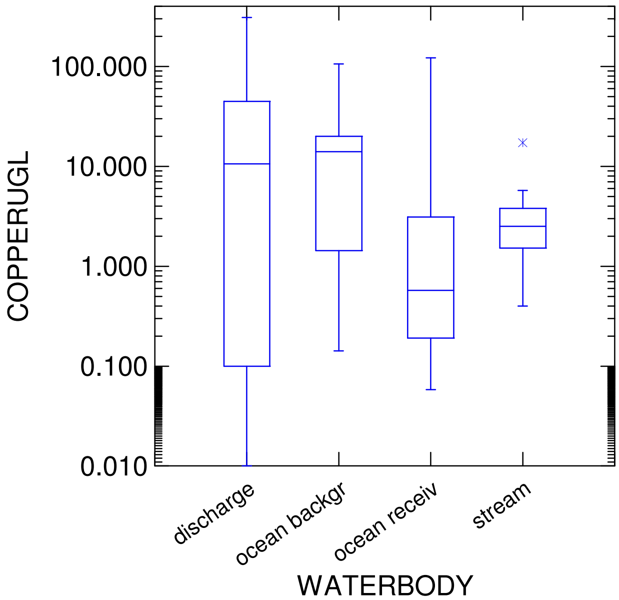

Figure 5.8.2. Copper

The median copper concentration for discharges was 10.6 µg/L and the maximum concentration was 309 µg/L. Seventy-five percent (75%) of the discharge results for copper were below 44.7 µg/L.

Ocean receiving water had a median value of 0.57 µg/L and the maximum concentration was 122 µg/L. Seventy-five percent (75%) of the copper results in the samples were below 3.1 µg/L and 90% are below 26.81 µg/L. The Ocean Plan six-month median is 3.0 µg/L for copper, and the instantaneous maximum is 30 µg/L.

Although based on only nine samples, copper data for ocean waters away from the discharge ("background") was elevated and variable. The median copper concentration in background waters was 14.0 µg/L. This indicates the possibility that ASBS waters may have elevated copper concentrations from sources other than direct discharges such as developed watersheds, even those outside of the ASBS boundaries. Streams draining to ASBS had a median copper concentration of 2.5 µg/L, which is lower than the median copper level in discharges.

Copper is a common constituent in urban runoff and is leached from anti-fouling coatings on vessel hulls. Copper at high levels (above the Ocean Plan standards) is toxic to critical life stages of marine life including the brown alga *Macrocystis pyrifera,* and echinoderms. According to a review by Saiz (1996) the mean no effects concentration (NOEC) for giant kelp gametophyte growth is 16.7 µg/L, and for sea urchin fertilization it is 9.1 µg/L (see Table 5.8.4.).

Table 5.8.4. Data derived from a Comparison of Critical Life Stage Bioassays Performed by Several Different Laboratories

Test Species	**Mean NOEC µg/L**	**st. dev.**
Giant Kelp (*Macrocystis pyrifera* gametophyte growth)	16.7	3.4
Giant Kelp (*Macrocystis pyrifera* gametophyte fertilization)	36.2	14.7
Sand Dollar (*Dendraster excentricus* fertilization	11.6	3.4
Purple Sea Urchin *Strongylocentrotus purpuratus* fertilization)	9.1	4.0

In abalone, copper accumulates in the gill, digestive gland, and foot muscle. The gill is the primary site of copper accumulation and toxicity, while the foot and adductor muscles are secondarily impacted. Mucus accumulation or cytological damage at the gill from the accumulation of copper inhibits sufficient oxygen delivery to the muscles. Since their survival is dependent on adherence to rock surfaces, a reduction of muscle function could be fatal. In addition, abalone exposed to copper may develop asphyxial hypoxia (Viant, Walton, TenBrook, Tjeerdema 2001). Giant kelp, abalone, and echinoderms are present in ASBS.

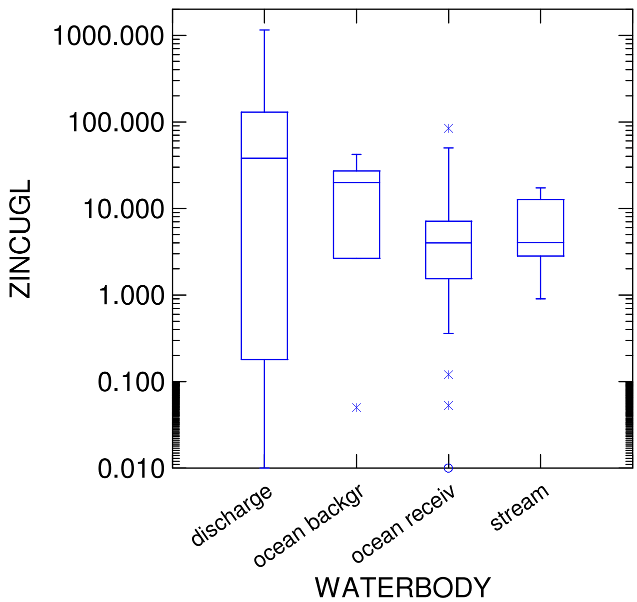

Figure 5.8.3. Zinc

Zinc is another common constituent in urban runoff and is also discharged from vessel hulls (zinc sacrificial anodes). Zinc concentrations were higher in discharges than in the other categories. The median zinc concentration for discharges was 38.0 µg/L and the maximum concentration was 1,150 µg/L. Seventy-five percent (75%) of the discharge results for zinc in the discharges category were below 129.75 µg/L.

Ocean receiving water had a median concentration value of 4.009 µg/L and the maximum concentration was 84.2 µg/L. Seventy-five percent (75%) of the zinc results in the samples were below 7.1 µg/L and 90% were below 30.62 µg/L. The Ocean Plan six-month median is 20 µg/L and the instantaneous maximum is 200 µg/L.

Although based on only nine samples, zinc data for background waters were somewhat elevated. The median zinc concentration in background waters was 20.0 µg/L and the maximum concentration was 42 µg/L. This again indicates the possibility that ASBS waters may have elevated zinc concentrations from sources other than direct discharges. Streams draining into ASBS had a median zinc concentration of 4.046 µg/L, which is lower than the median zinc level in discharges.

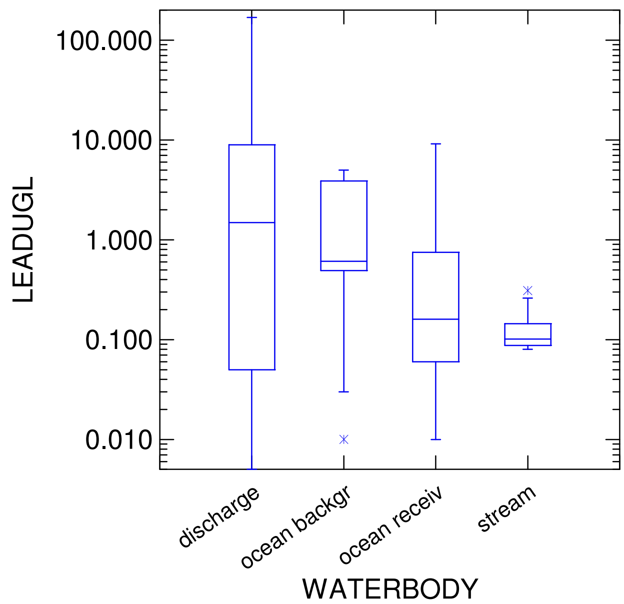

Figure 5.8.4. Lead

Lead concentrations were again higher in discharges category. The median lead concentration for discharges was 1.495 µg/L and the maximum concentration was 169 µg/L. Seventy-five percent (75%) of the discharge results for lead in discharges were below 8.95 µg/L.

Ocean receiving water had a median concentration value of 0.16 µg/L and the maximum concentration was 9.14 µg/L. Seventy-five percent (75%) of the lead results in samples were below 0.751 µg/L and 90% were below 5.0 µg/L. The Ocean Plan six-month median is 2 µg/L and the instantaneous maximum is 20 µg/L.

Although based on only nine samples, lead data for background waters were slightly elevated. The median lead concentration in background waters was 0.607 µg/L and the maximum concentration was 5.0 µg/L. This again indicates the possibility that ASBS waters may have elevated lead concentrations from sources other than direct discharges, such as developed watersheds, even those outside of the ASBS boundaries. Streams draining into ASBS had a median lead concentration of 0.101 µg/L, which is lower than the median lead level in discharges.

One source of lead toxicity found in the environment is anthropogenic activity, including old plumbing found in houses built before 1986. However, even new homes that claim to have “lead-free” plumbing may still contain up to eight percent lead (EPA, 2006). Lead may also be found naturally in the environment. Lead binds to sediment particles in aquatic environments and does not accumulate in fish, but does in some shellfish and mussels (EPA, 2006).

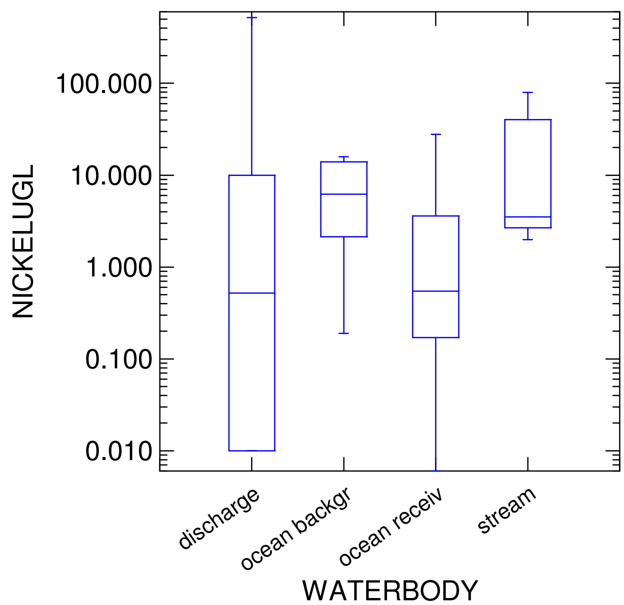

Figure 5.8.5. Nickel

Nickel concentrations were again higher in the discharges category. The median nickel concentration for discharges was 0.52 µg/L, but the maximum concentration was 520 µg/L. Still, 75% of the discharge results for nickel in discharges were below 9.94 µg/L.

Ocean receiving water had a median concentration value of 0.547 µg/L and the maximum concentration was 27.9 µg/L. Seventy-five percent (75%) of the nickel results in samples were below 3.6 µg/L and 90% were below 14.26 µg/L. The Ocean Plan six-month median is 5 µg/L and the instantaneous maximum is 50 µg/L.

Although based on only nine samples, nickel data for background waters were slightly elevated. The median nickel concentration in background waters was 6.2 µg/L and the maximum concentration was 15.9 µg/L. This again indicates the possibility that ASBS waters may have elevated nickel concentrations from sources other than direct discharges, such as developed watersheds, even those outside of the ASBS boundaries.

Streams draining into ASBS had a median nickel concentration of 3.5 µg/L, which is higher than the median nickel level in discharges. Therefore, some component of the nickel in the discharges may be from natural geologic sources.

Nickel has adverse effects on aquatic life such as bacteria, protozoans, mollusks, crustaceans, echinoderms, fishes, amphibians, etc. (Eisler, 1998). Nickel is sometimes found in anthropogenic discharges from mining, industrial, and urban areas. Natural sources of nickel primarily stem from certain minerals (e.g., chalcopyrite, pyrrhotite, pentlandite, garnierite, niccolite, zaratite, and millerite) (EPA nickel, 2006).

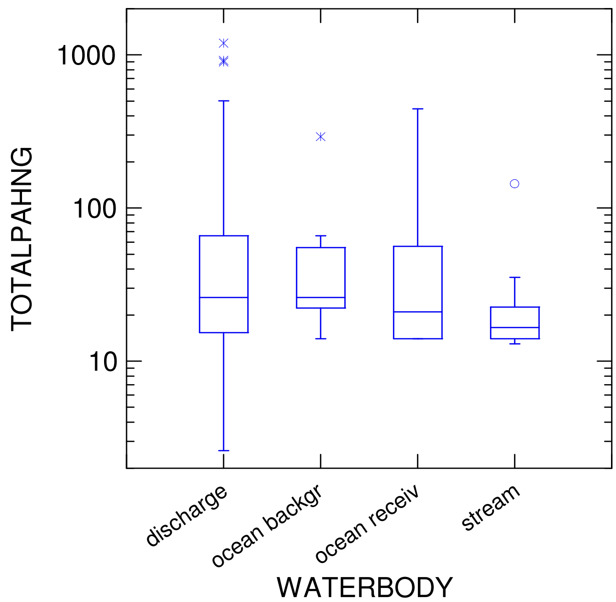

Figure 5.8.6. Ocean Plan PAH

For purposes of recording and assessing PAH data, fluoranthene was combined with the other Ocean Plan PAH compounds. Median and 75th percentile PAH values for discharges, receiving water, and background waters were all somewhat similar. Streams had a similar median level, but a lower 75th percentile value. The discharge PAH concentrations displayed the most variability, with many outliers. Maximum values were much higher for discharges. (It should be noted that the City of San Diego's PAH data was not included in the graph because their Method Detection Limit was measured in micrograms per liter rather than nanograms per liter, thus making all reported levels "Non-Detect" without actual reported levels.)

PAHs may be found in crude oil and petroleum products, and also as a result from the combustion of hydrocarbons. PAHs are known constituents in storm water discharges. The sealcoat found on the surfaces of asphalt, especially parking lots, are a huge source of PAHs found in the environment (USGS PAHs, 2007). The sealcoat can flake off from cars driving on it and then be washed away by rain or erosion into natural bodies of water. Other sources of PAHs include dyes, plastics, and pesticides (EPA PAHs, 2006). PAHs can also bind to sediments in aquatic environments; this leads to problems in these ecosystems that include: inhibited reproduction, delayed emergence, sediment avoidance, and mortality in aquatic invertebrates (USGS PAHs, 2007).

Based on the available results, 11 ASBS did not have metal concentrations in receiving water or discharges above the instantaneous maximum objectives. However, seven did have receiving water or discharge levels above the instantaneous maximum objectives. At the Heisler Park ASBS, the City of Laguna Beach reported elevated levels of copper at a storm drain flow (high reading of 36 µg/L). At the La Jolla ASBS, the City of San Diego reported five elevated levels of copper (high reading of 81.2 µg/L) in storm drain samples taken. At Laguna Point to Latigo Point, the County of Los Angeles reported elevated levels of chromium at four locations (high reading of 97 µg/L) and copper at four locations (high reading of 81.2 µg/L) in storm drain samples taken.

The City of Pacific Grove and Hopkins Marine Laboratory reported elevated levels of zinc at one location (high reading of 201µg/L), copper at two locations (high reading of 69.2 µg/L), mercury at one storm drain was 0.72 µg/L. (While mercury was elevated, the sampling procedures might not have been adequate to avoid sample contamination. Therefore, the mercury results may or may not be relevant, but are reported anyway.)

At SCI, the Department of Defense, US Navy, reported elevated levels of arsenic at two locations (high reading of 87 µg/L), chromium at seven locations (high reading of 1,010 µg/L), copper at fifteen locations (high reading of 309 µg/L), lead at six locations (high reading of 169 µg/L), nickel at five locations (high reading of 520 µg/L), zinc at six locations (high reading of 1150 µg/L), and mercury at one location (high reading of 0.6 µg/L) in storm drain samples taken. (Again, while reported here, there is some question regarding the adequacy of sampling techniques for mercury.)

At Northwest Santa Catalina Island, the Santa Catalina Island Company reported elevated levels of chromium at two locations with a high reading of 43.8 µg/L in storm water runoff. At Southeast Santa Catalina Island, the Connelly-Pacific Company reported elevated levels of copper at three locations (high reading of 40.5 µg/L), and nickel at one location (high reading of 54.00 µg/L) in storm water runoff.

Sea otters and other marine wildlife inhabit certain ASBS. Recently sea otters, which inhabit the ASBS along the Central Coast, have been affected by disease and contaminants. Disease is responsible for roughly 40 percent of the deaths; a rate that is relatively high when compared to disease-caused deaths in other wild predators (USGS 1999). The most frequent infectious disease identified has been toxoplasmosis. *Toxoplasma gondii*, a protozoan disease spread by cat feces, causes inflammation of the brain. Other disease-causing agents have also been identified. The sources of *T. gondii* are terrestrial and may be linked to wastewater treatment plant discharges and/or storm water discharges (SWRCB 2006). Coliform and *Enterococcus* bacteria provide an indication of the presence of fecal contamination, and some part of that fecal contamination may be from domestic animals. For some ASBS, discharge samples were analyzed for indicator bacteria (fecal coliform, total coliform, and enterococci). For fecal coliform, there was a minimum concentration of 1.1 MPN/100 mL, a median of 1,600 MPN/100 mL, and a maximum of 72,699 MPN/100 mL. For total coliform, there was a minimum concentration of 1.1 MPN/100 mL, a median of 4,673 MPN/100 mL, and a maximum of 160,000 MPN/100 mL. For enterococci, there was a minimum concentration of 1.1 MPN/100 mL, a median of 1,702 MPN/100 mL, and a maximum of 92,080 MPN/100 mL.

5.8.2 – Exception Application Toxicity Data

Toxicity tests evaluate the biological response of organisms to the effluent and measure the acceptability of waters for supporting a healthy marine biota. Acute aquatic toxicity tests result in endpoint referred to as a "lethal dose 50" (LC50). The LC50 is the dose that produces mortality in 50% of the test organisms. A high LC50 value indicates low acute toxicity and a low LC50 indicates high toxicity. "Toxicity Units Acute" (TUa) are inverses of the LC50s and are calculated by dividing 100 by the LC50 resulting from a 96-hour toxicity test. High TUa values indicate high toxicity. The Ocean Plan daily maximum objective is 0.3 TUa for acute toxicity.

Samples at various ASBS were measured for acute toxicity in storm water runoff. Eleven samples of storm water runoff were tested for acute toxicity to fish, and many exhibited acute toxic at only moderate levels at or below 1.0 TUa; the most toxic was at the James V. Fitzgerald ASBS with a TUa for two discharge samples of 1.0. Most storm water runoff was not acutely toxic to crustaceans (mysids). However, eight out of 18 samples did exhibit moderate levels of acute toxicity to mysids. The highest acute toxicity to mysids was found in two samples from the City of Pacific Grove runoff discharges into Pacific Grove ASBS, with both samples having a TUa of 1.0.

Thirty six (36) samples of ocean receiving water near storm runoff were also measured for acute toxicity to fish and/or mysids. Half of these samples exhibited no acute toxicity, with the other half exhibiting only slight or moderate acute toxicity. Of these receiving water samples the most toxic of these were at La Jolla ASBS, where two samples had an LC50 for mysids of >75% (95% survival in 65% concentration, 1.33 TUa). One sample of ocean background water offshore of the La Jolla ASBS also displayed slight acute toxicity, with an LC50 for mysids of >75% (1.33 TUa).

Regarding chronic toxicity, the "No Observed Effect Level" (NOEL) is the highest concentration of effluent or receiving water that causes no observable adverse effects on the test organisms in a critical life stage bioassay. NOELs of 100 percent indicate that there was no observed toxicity; NOELs less than 100 percent indicate increasing toxicity with decreasing percent concentration. "Toxicity Units Chronic" (TUc) are inverses of the NOELs and are calculated by dividing 100 by the NOEL resulting from a critical life stage toxicity test. High TUc values indicate high chronic toxicity. The Ocean Plan daily maximum objective is 1.0 TUc for chronic toxicity. The results of chronic toxicity tests on critical life stages of marine life are more sensitive than acute toxicity results and are therefore more informative for purposes of evaluating ASBS discharges.

Samples at various ASBS were tested for chronic toxicity in storm water runoff. Only one (1) of the 35 runoff samples exhibited slight chronic toxicity to fish. However, invertebrates and kelp displayed more sensitivity to runoff samples. Twenty one (21) out of 29 samples exhibited chronic toxicity to giant kelp greater than the Ocean Plan objective of 1.0 TUc, with the highest values of $\geq$16 TUc at Trinidad Head, Carmel Bay, Laguna Point to Latigo Point, and La Jolla ASBS. Twelve (12) out of 15 samples exhibited some chronic toxicity to mysids greater than the Ocean Plan objective of 1.0 Tuc, with the highest chronic toxicity (>16 TUc) at Heisler Park ASBS. Twelve (12) out of 12 samples exhibited chronic toxicity to sea urchins greater than the Ocean Plan objective of 1.0 TUc, with seven samples exhibiting the highest chronic toxicity of 32.0 TUc. Mollusks appeared to have sensitivity to runoff, with five (5) out of six (6) runoff samples tested with bivalves having TUc > 1.0 and the two (2) samples of runoff tested with abalone both had TUc > 1.0, (2.0 and 4.0, TUc, both Carmel Bay ASBS).
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Thirty nine (39) samples at various ASBS were also tested for chronic toxicity to various species in ocean receiving water. Only two (2) 0out of 38 samples exhibited chronic toxicity to fish greater than the Ocean Plan objective of 1.0 TUc, with the highest chronic toxicity (4.0TUc) at Northwest Santa Catalina Island ASBS at the Isthmus Cove. Ten (10) out of 33 samples exhibited chronic toxicity to giant kelp greater than the Ocean Plan objective of 1.0 TUc, with the highest values of 8.0 TUc at Carmel Bay ASBS (Stillwater Cove Pier) and 16.0 TUc at La Jolla ASBS. Only two (2) out of nine (9) samples exhibited slight chronic toxicity to mysids just above the Ocean Plan objective of 1.0 Tuc. Five (5) out of eleven (11) samples exhibited chronic toxicity to sea urchin fertilization greater than the Ocean Plan objective of 1.0 TUc; notably two samples, at Northwest Santa Catalina Island ASBS at Isthmus Cove were very toxic with $\geq$16.0 TUc. Two (2) out of nine (9) receiving water samples tested with bivalves had TUc > 1.0, and none of the two samples of receiving water tested with abalone exhibited chronic toxicity.

5.8.3 - ASBS Application Water Quality Data – Staff Conclusions

It is clear that ASBS discharges generally contain some concentrations of anthropogenic waste. However, it appears that a majority of the ASBS waste discharges exhibited metal concentrations below instantaneous maximum objectives, and a majority of ASBS receiving waters had concentrations of ocean plan metals below the six-month median objective for the protection of marine aquatic life. While most of the discharge samples exhibited chronic toxicity to marine life, the majority of the receiving water samples met the daily maximum chronic toxicity objective. Based on its review of the above baseline chemistry and toxicity data, there is ample evidence to support an Ocean Plan exception for nonpoint source and storm water discharges, but only if such discharges are properly controlled to better maintain natural water quality in ASBS.

Still, a number of discharges had elevated metals and PAH concentrations, and exhibited toxicity, and a few receiving water samples were in violation of Ocean Plan objectives. The testing described above generally had very little replication. This indicates that current waste concentrations are temporally and/or spatially variable. In other words, a given waste discharge may meet objectives at least some of the time, but not necessarily all of the time; some other waste discharges definitely do not have adequate BMPs to prevent violation of objectives all of the time, as displayed by some of the minority samples described above. Therefore, BMPs should be designed and implemented to insure maintenance of natural water quality in ASBS receiving water during design storms. The adoption of Special Protections will reduce wastes in discharges to achieve and maintain natural water quality in ASBS. In addition, discharges and receiving water must be adequately monitored to insure compliance with the Special Protections, based on the range of natural water quality conditions at approved reference stations.

The background (away from the direct discharges) ocean water quality data indicated a majority of samples exhibited concentrations of certain metals above the Ocean Plan six month medians. This may be due to the small sample size, but some of the results may be inaccurate due to inadequate methods. Another possibility is that these elevated levels are real and represent pollution from indirect and possibly distant watershed sources. It is important to remember that these “background” ocean water samples were not approved reference sites (SCCWRP 2010) and therefore do not represent “natural water quality. ”Should post-exception sampling indicate that some ASBS have background water quality at levels above natural water quality, then further assessment should be performed to identify and control the sources where feasible.

As noted above there was a large variance in the data set. Some part of these large data ranges may represent true variability in the environment. However, staff believes that there was also a fair amount of inconsistency in the applicants’ sampling and analysis methodology, which may have contributed somewhat to the variance of the exception application results as well. Regional monitoring programs, with consistent methodology and statewide compatibility, were therefore employed to improve data quality and utility.

5.8.4 - ASBS Regional Monitoring

As described above, a better approach for future ASBS monitoring would be to take a collaborative and coordinated regional approach. Therefore, staff requested the Southern California Coastal Water Research Project to assist, with stakeholder participation, in developing a scientifically sound regional monitoring approach. The goal of this monitoring program is to answer three questions:

- What is the range of natural water quality at reference locations?
- How does water quality along ASBS coastline compare to the natural water quality at reference locations?
- How does the extent of natural quality compare among ASBS with or without discharges?

It was agreed that the regional programs would focus on ASBS ocean water quality. Marine samples would also be collected at reference watershed conditions to answer question number one. Reference conditions were determined as follows:

- At the mouth of a watershed with limited anthropogenic influences and with no offshore discharges in the vicinity.
- Limited anthropogenic influence is defined as a minimum of 95% open space. Preferably, the few anthropogenic sources in a reference watershed will be well attenuated (e.g., natural space buffers between a highway and the high tide line).
- There should be no 303(d) listed waterbodies either in the reference watershed or in the coastal zone.

In the 2007-2008 winter season, a pilot study (SCCWRP 2009) was performed on potential reference sites. Table 5.8.5 provides average results and data ranges for all potential reference site samples:

Table 5.8.5. Statewide Pilot Study Potential Reference Sites Average Results and Data Ranges for All Samples Winter Season 2007-2008

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 (Table 5.8.5.) that the mean values for ammonia and metals were below Ocean Plan six-month medians objectives. The only constituents with maximum values slightly above the six month medians were chromium and lead; in the case of chromium the objective is based on hexavalent chromium, and the chromium value presented above was for total chromium. PAHs were present but are known to be naturally present in watersheds and submarine geological features. Most importantly there were no detectable levels of the synthetic pollutants DDT and PCB in the samples. Although there was a small sample size, and this work only represents one winter season, this first year pilot study may give us a good picture of nearshore ocean natural water quality.

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

Table 5.8.6. Statewide Pilot Study Potential Reference Sites Regional Comparison of Potential Reference Stations

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

One concern voiced by stakeholders is that there may be differences in natural water quality in different regions of the state. Table 5.8.6. represents a regional comparison of the potential reference station results. There were only slight differences between regions with regard to individual constituents, but there are no clear trends overall. This may be due to the small sample size, so additional work should be performed regionally.

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 m from a direct discharge. Sample sites greater than 500 m 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 hr before rainfall and again less than 24 hr after rainfall. Ocean receiving water sites were sampled at most mainland ASBS in California.

The statewide survey illustrated generally good chemical water quality in mainland ASBS sites (Table 5.8.6). None of the constituents exceeded the instantaneous maximum objective in the California Ocean Plan. Seven constituents did not exceed the Ocean Plan's six month median or 30 day average (depending on the specific constituent) including strictly synthetic anthropogenic chemicals such as DDTs or PCBs.

Six constituents (arsenic, cadmium, copper, lead, nickel and zinc) exceeded the six month median but only for relatively small (< 15%) portions of mainland ASBS shoreline. Many of these constituents are common in urban stormwater, but also have natural sources. The lack of excessive chemical contamination in ASBS receiving waters was supported by infrequent (<5% of ASBS shoreline) chronic toxicity to a California endemic species (the purple sea urchin, *Strongylocentrotus purpuratus*).

There were two constituents, chromium and polycyclic aromatic hydrocarbons (PAHs), that exceeded Ocean Plan objectives over relatively large proportions of ASBS shoreline. Chromium exceeded objectives over 50% of ASBS mainland shoreline miles and PAHs exceeded objectives over 87% (Table 5.8.7.). The extent of Ocean Plan exceedence for these two constituents was similar near and far from discharges following storm events, and exceedances of the standards was similar between pre-storm and post-storm conditions near discharges. [9]

Both chromium and PAHs have natural and anthropogenic sources. The chromium objective is based on the more toxic form, hexavalent chromium, but total chromium was analyzed for the statewide probabilistic study. Chromium is a natural product of erosion including that from metamorphic rock, and there is no reason to believe that natural rock erosion products contain significant hexavalent chromium. Also, as mentioned previously, there are natural sources of PAHs (including hydrocarbon seeps, wildfires and plants) and direct atmospheric is another possible source. Furthermore, the objective for PAH is based on human health through bioaccumulation in seafood, and not on the protection of marine aquatic life. Since exceedences were similar between pre-storm and post-storm conditions near discharges, the sources of elevated PAHs may not only be storm related, and may include coastal and beach sediment.

[9] Report to the State Water Resources Control Board, Summation of Findings, Natural Water Quality Committee, 2006-2009, September 1, 2010.

Table 5.8.7. Statewide Probabilistic Study Percent of ASBS shoreline that exceeded State Water Board Ocean Plan objectives following storm events.

	Ocean Plan Objective	% Shoreline Greater Than OP Objective		
		All ASBS	<500 m from Discharge	>500 m from Discharge
Ammonia-N[1]	0.6 mg/L	--	--	--
Arsenic[1]	8 ug/L	1.6	2.7	--
Cadmium[1]	1 ug/L	2.1	3.6	--
Chromium[1]	2 ug/L	50	61	35
Copper[1]	3 ug/L	6.9	4.8	9.8
Lead[1]	2 ug/L	4.8	--	11.5
Nickel[1]	5 ug/L	15	24	3
Silver[1]	0.7 ug/L	--	--	--
Zinc[1]	20 ug/L	3.8	6.5	--
HCH-lindanes[2]	8.0 ng/L	--	--	--
Chlordane[2]	0.023 ng/L	--	--	--
DDTs[2]	0.17 ng/L	--	--	--
Dieldrin[2]	0.04 ng/L	--	--	--
PAHs[2]	8.8 ng/L	87	85	89
PCBs[2]	0.019 ng/L	--	--	--

[1] 6-month median
[2] 30-day average

A collaborative ASBS effort was formed between several exception applicants, the State and Regional Water Boards, and SCCWRP in southern California as part of the Southern California Bight regional monitoring program (Bight'08). This study identified and sampled reference sites to measure natural water quality. Stakeholders agreed on reference site criteria that avoided anthropogenic sources by sampling in the surf zone at the mouth of streams located in watersheds having less than 90 % development. Reference site concentrations were then compared to concentrations measured near ASBS direct discharges. Similar to the statewide probabilistic survey described above, Bight'08 focused on wet weather.

Regional reference results had generally low concentrations of Ocean Plan constituents (Table 5.8.8) and a lack of chronic toxicity to sea urchin fertilization. Results were somewhat similar to the pilot reference study for most constituents, with the exception of total suspended solids (which was much higher in the Bight 08 study); this difference was likely due to the larger number of samples and different storm conditions in Bight 08. In the Bight 08 monitoring study, following storms, mean reference site concentrations for six out of eight Ocean Plan metals were at or below the six month median objective, with cadmium and lead having mean concentrations only slightly higher (less than 1.0 ug/L greater) than the objective. The maximum concentration for reference sites exceeded Ocean Plan objectives for seven metals (cadmium, chromium, copper, lead, nickel, silver and zinc). Maximum concentrations for four of these metals (cadmium, chromium, lead and silver) exceeded the daily maximum following storms, but none exceeded the instantaneous maximum. The mean concentration for PAHs at reference sites was also greater than the 30 day average objective. [10]

Table 5.8.8. Southern California Bight Study Minimum, maximum, median, and mean (+ 95% confidence interval) of post-storm chemical concentrations at reference sites in the southern California Bight during 2009.

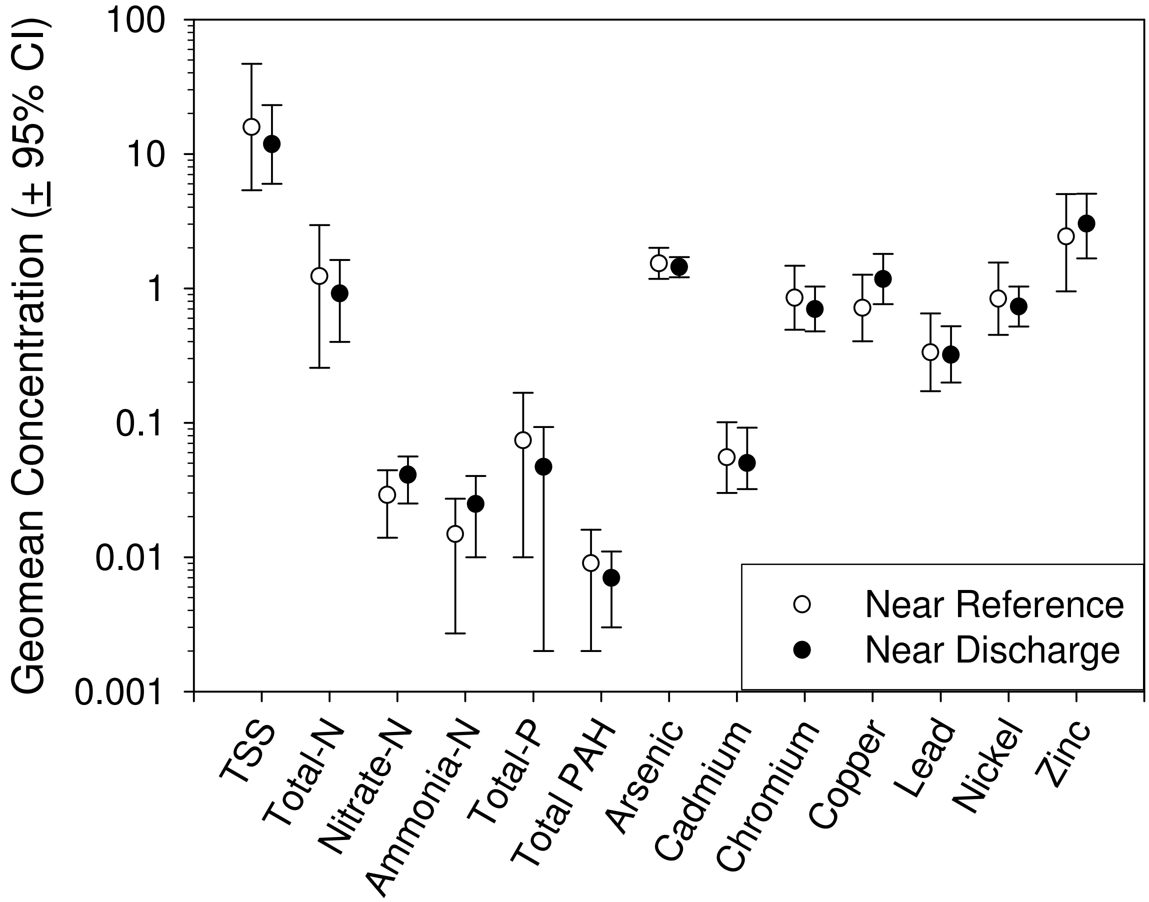
Parameter	Reference Site Concentrations							Ocean Plan Objective
	Units	%ND	Min	Median	Max	Mean	(±)95% CI	
TSS	mg/L	8	Nd	7.7	1692	140	171	-
Ammonia-N	mg/L	64	Nd	nd	0.05	0.01	0.01	0.6
Nitrate-N	mg/L	24	Nd	0.04	0.10	0.05	0.01	-
Nitrite-N	mg/L	88	Nd	nd	0.010	0.002	0.002	-
Total-P	mg/L	44	nd	0.05	0.59	0.08	0.05	-
Total-N	mg/L	65	nd	nd	7.0	0.9	0.7	-
Arsenic	ug/L	0	0.5	1.5	5.0	1.8	0.4	8
Cadmium	ug/L	4	nd	1.5	4.5	1.8	0.5	1
Chromium	ug/L	0	0.2	0.5	16.9	1.9	1.4	2
Copper	ug/L	0	0.05	0.5	6.1	1.1	0.6	3
Lead	ug/L	0	0.1	0.6	9.5	2.4	1.2	2
Nickel	ug/L	0	0.2	0.5	19	2.0	1.8	5
Silver	ug/L	76	nd	nd	6.0	0.7	0.8	0.7
Zinc	ug/L	24	nd	3.3	29	5.2	2.6	20
Total PAH	ng/L	16	nd	6.5	318	22	24	8.8

nd = not detected
95% CI = confidence interval
- = no objectives exist for this parameter

The results for ASBS discharge sites as a whole were generally similar to reference sites (Figure 5.8.7.) Mean concentrations at ASBS discharge sites following storm events were not significantly different from mean reference site concentrations for all constituents; however many for copper results at discharge sites were above the maximum reference site concentrations. In addition there were individual direct discharges with concentrations of certain other constituents that exceeded reference concentrations. For comparing discharge sites to a measure of natural water quality, a threshold level equivalent to the 85th percentile of the reference site post-storm concentrations was used. This 85th percentile level was chosen to represent natural water quality to eliminate uncertainty associated with outliers, thereby being protective of water quality.

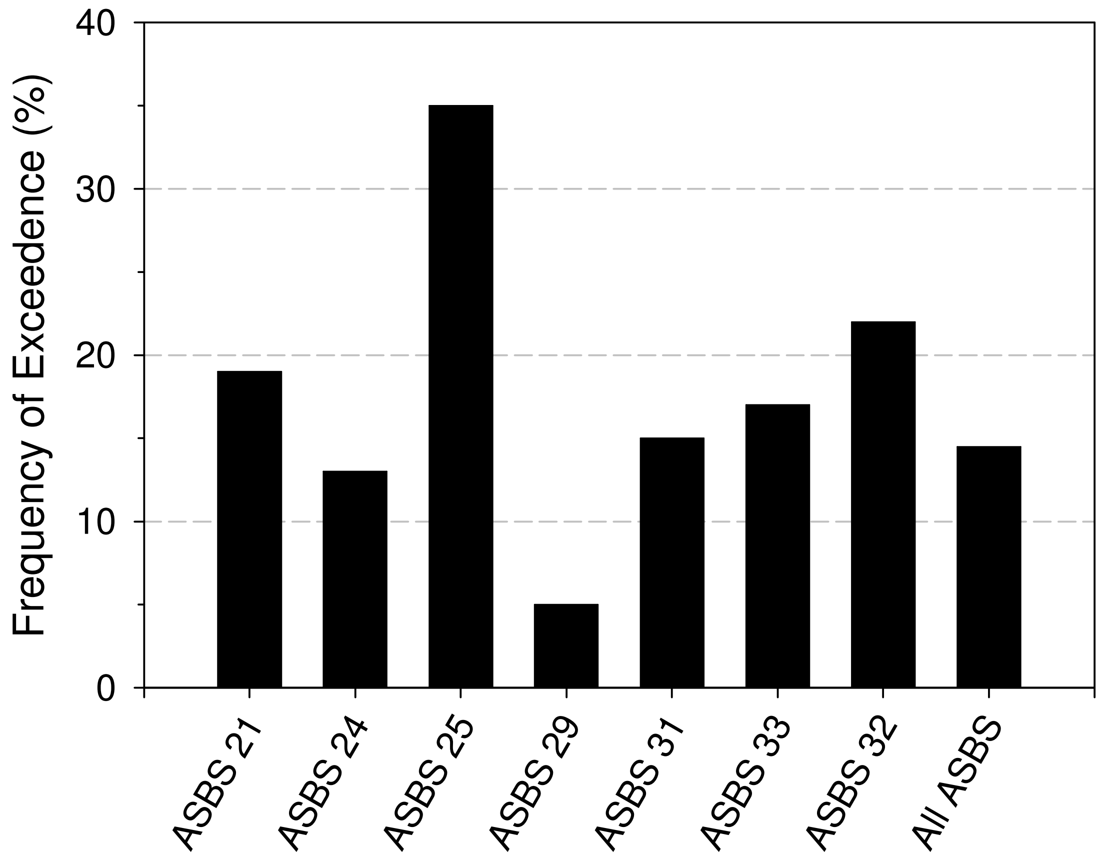
[10] Report to the State Water Resources Control Board, Summation of Findings, Natural Water Quality Committee, 2006-2009, September 1, 2010.

Figure 5.8.7. Southern California Bight Study Comparison of geometric mean (± 95% confidence interval) concentrations in ambient near-shore receiving waters following storm events at reference drainage and ASBS discharge sites. Total suspended solids (TSS) and nutrients in mg/L; Total Polycyclic Aromatic Hydrocarbons (Total PAHs) and total trace metals in µg/L



Exceedences of natural water quality were relatively infrequent at ASBS discharge sites (Figure 5.8.8.). Seven out of eight ASBS in southern California having exceedence rates of less than 25% for all constituents; Northwest Santa Catalina Island ASBS (ASBS 25) had the highest exceedence rate of 35%.

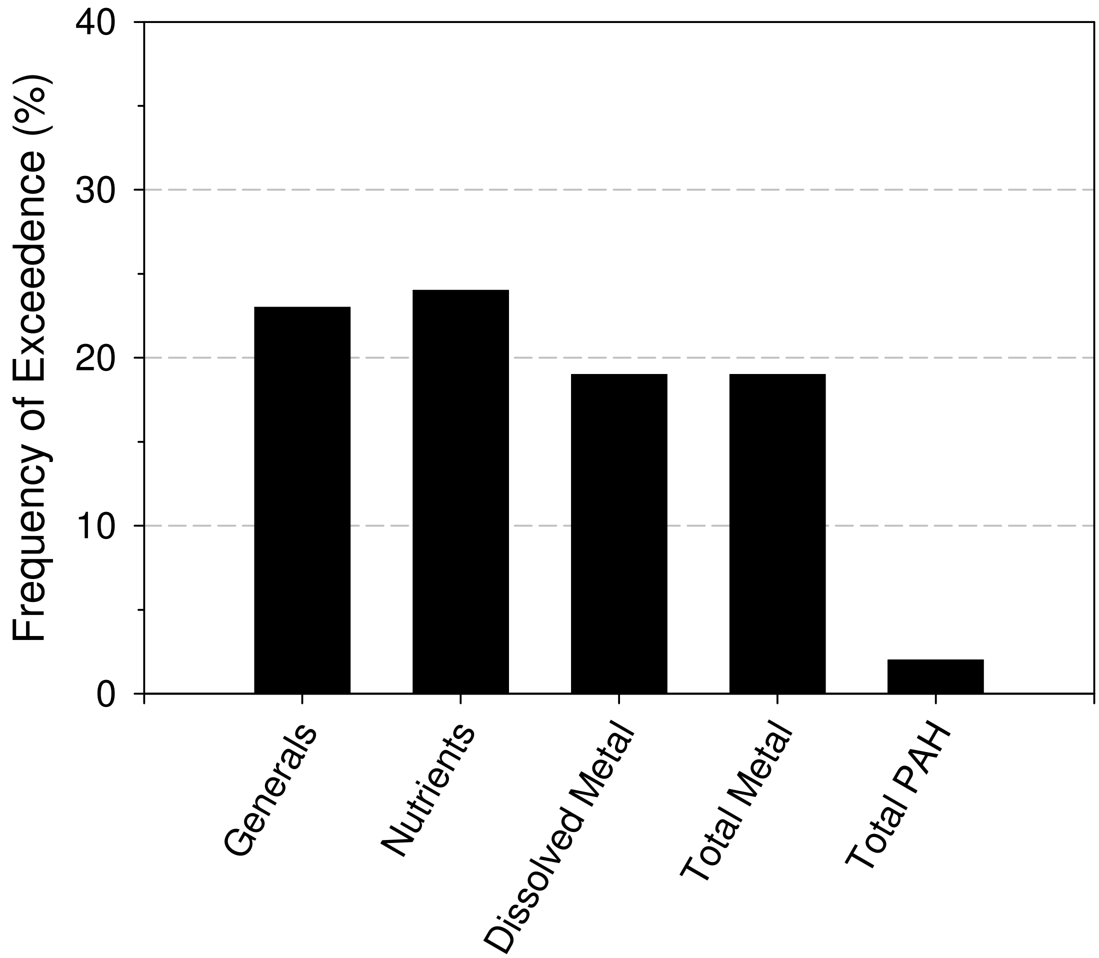
Figure 5.8.8. Frequency of natural water quality exceedences for all parameters during all storm events at each Area of Special Biological Significance (ASBS) in southern California



Where natural water quality was exceeded, general constituents (e.g. total suspended solids), nutrients and trace metals were the most frequent groups to exceed (Figure 5.8.9.). Total and dissolved metals had the same exceedence rate of 19% over the natural water quality thresholds identified in this study. PAHs exceeded the natural water quality threshold in only 2% of the samples. [11]

[11] Final Draft Report , Defining Natural Water Quality In Southern California's Areas Of Special Biological Significance, Kenneth Schiff, Brenda Luk, Dominic Gregorio, and Steve Gruber, 2010

Figure 5.8.9. Frequency of natural water quality exceedences by parameter group for all storm events and all Areas of Special Biological Significance (ASBS) in southern California



Regional and statewide monitoring in ASBS to date has proven very successful in providing scientific evidence of water quality conditions and indications of locations and certain constituents that require additional focus. The Bight'08 study represents the first comprehensive effort to determine natural water quality characteristics in the nearshore following storm events. The Natural Water Quality Committee stated that the Bight'08 program has provided sufficient information for the State Water Board to move forward, but prudent management should seek additional information. For example, Bight'08 quantified intra-annual (storm-to-storm) variability, but lacked inter-annual known to produce natural alterations in ocean water quality. Similarly, additional reference sites in central and northern California are necessary to quantify regional variability. However, in some instances, the reference site approach may be problematic, such as cases of widespread anthropogenic influence (i.e., PAHs and TCDDs) or where distant sources impinge on reference site water quality. (i.e., transport of large stormwater plumes from outside the ASBS). All of these causes of natural variability, and impacts from unanticipated anthropogenic contributions, should be investigated. Therefore staff recommends that where possible the regional approach to ASBS monitoring be designed and implemented to provide comparable and consistent information to manage ASBS discharges.

5.8.5 - Bioaccumulation

As part of their monitoring program for their ASBS exception and NPDES Permit, Scripps Institution of Oceanography (SIO), who performed a bioaccumulation study in receiving waters. This monitoring, which used both transplanted mussels and resident sand crabs, occurred in the vicinity of localized reference and ASBS discharge sites in the San Diego-Scripps ASBS and the La Jolla ASBS. SIO results indicated that:

1) most organic constituents were present at statistically nonsignificant levels relative to a reference sites during the study period;
2) certain pollutants were elevated in transplanted mussels near the SIO pier in the San Diego-Scripps ASBS (Cr, Ni, Fe, and Mn) and at the south end of the adjoining La Jolla ASBS (As) where the City of San Diego storm outfalls are located relative to other sites within the study area;
3) certain pollutants were elevated in transplanted mussels near the SIO pier (Cr and Ni) relative to historical statewide Mussel Watch results; and
4) large relative variability in tissue concentrations from sand crabs due to age/reproductive status precluded an assessment of spatial scale gradients and an evaluation of potential effects. [12]

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

5.8.5.1 <u>State Mussel Watch Program Data</u>

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

An Elevated Data Level (EDL) is defined for the purposes of the SMWP as that concentration of a toxic substance in mussels or clams that equals or exceeds a specified percentile (such as 85 or 95 percent) of all measurements of the toxic substance in the same species and exposure condition (resident or transplant). Historical information on SMWP sites at ASBS are provided in Appendix 3)

[12] Report to the State Water Resources Control Board, Summation of Findings, Natural Water Quality Committee, 2006-2009, September 1, 2010.

The SMWP program has suffered from a lack of funding since 2000. The Department of Fish and Game at Moss Landing Laboratories collected and analyzed mussel samples since 2001 from a limited list of sites. Only 18 sites are currently being monitored for the Water Boards by the California Department of Fish and Game. SMWP primary targets areas with known or suspected impaired water quality. For this report, data from the following sites in or near ASBS have been reviewed: Pacific Grove ASBS, James V. Fitzgerald ASBS, Bodega Head (near but not within the ASBS), and Trinidad Head ASBS.

The available data for trace elements and organic constituents from 2001 to 2005 were reviewed and compared to the EDL 85 and EDL 95. Most trace elements were present at low concentration in all ASBS. However none of the elements exceeded the EDL 85 or EDL 95 in transplanted mussels at any of the ASBS during 2001-2005 sampling periods.

Certain synthetic chlorinated hydrocarbon compounds were elevated at some ASBS sites. Pesticide compounds including cis-chlordane, trans-chlordane, total chlordane, heptachlor epoxide, and dieldrine exceeded the EDL 85 in Trinidad Head, James V. Fitzgerald and Pacific Grove ASBS, and at Bodega Head, during one or more sampling events in 2001 to 2004. Data from James V. Fitzgerald and Pacific Grove ASBS also show exceedences of the EDL 95 for DDD, DDE, and PCB 1254.

Appendix 3 provides State Mussel Watch data at or near ASBS from 2001 to 2005.

5.8.5.2 <u>NOAA NS&T Mussel Watch Program Data</u>

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

The NOAA NS&T Program analyzes bivalve tissue samples from the mussels *M. edulis and M. californianus* for trace metals, synthetic organic constituents, and histopathology. The NOAA NS&T sampling is conducted every two years.

There are several pre-2007 historical sites in the NOAA NS&T data base that are in or near ASBS. These were:

- Klamath River Flint Rock Head (Redwood National Park ASBS)
- Point Delgada Shelter Cove (King Range ASBS)

- Bodega Head (near Bodega ASBS)
- Farallon Islands East Landing (Farallon Islands ASBS)
- Pacific Grove Lovers Point (Pacific Grove ASBS)
- San Miguel Island Otter Harbor (San Miguel, Santa Rosa and Santa Cruz Islands ASBS)
- Santa Cruz Island Fraser Point (San Miguel, Santa Rosa and Santa Cruz Islands ASBS)
- Point Dume (Laguna Point to Latigo Point ASBS)
- Catalina Island Bird Rock (NW Santa Catalina Island ASBS)
- Newport Beach West Jetty (near Robert Badham ASBS)
- La Jolla (near the La Jolla ASBS).

Beginning in 2007, SCCWRP and the State Water Board entered into a partnership with the NOAA Status and Trends Mussel Watch Program. SCCWRP agreed to sample in southern California and the State Water Board staff agreed to sample in central and northern California. Samples are sent to NOAA contracted laboratories for analysis at no cost to the State. In exchange for providing sampling at existing NOAA sites several additional sampling sites were sampled and analyzed, many at ASBS. During the sampling period 2007-2009 the following sites were added in or near ASBS:

- Sea Ranch (near Del Mar Landing ASBS)
- Gerstle Cove (Gerstle Cove ASBS)
- Duxbury Reef (Duxbury Reef ASBS)
- Point Reyes (near Point Reyes Headlands ASBS)
- Ano Nuevo (Ano Nuevo ASBS)
- Partington Point (Julia Pfeiffer Burns ASBS)
- Anacapa (North Middle) Island (Santa Barbara and Anacapa Islands ASBS)
- Mugu Lagoon (adjacent to Laguna Point to Latigo Point ASBS)
- Old Stairs (Laguna Point to Latigo Point ASBS)
- San Nicolas Island (San Nicolas Island and Begg Rock ASBS)
- San Clemente Island (San Clemente Island ASBS)
- Crystal Cove State Park (Irvine Coast ASBS)
- Scripps Reef (San Diego-Scripps ASBS)

Concentrations of ten constituents (including trace metals and PAHs) in samples from 2007 to 2009 were assessed at all mussel watch sites statewide and at ASBS sites. It is important to mention that all of these constituents have both anthropogenic (e.g., polluted runoff) and natural sources. Natural sources for trace metals include natural background in seawater, sometimes accentuated by upwelling and coastal erosion. In fact, certain metals, including copper and zinc, are essential micronutrients that when present at naturally low concentrations are essential for marine life. Hydrocarbon seeps are an important potential source for PAHs. The following information is provided to give a general status of these constituents in mussel tissue in ASBS.

Arsenic
Mean and median arsenic concentrations for all mussel watch sites statewide were 10.53 µg/ dry g and 9.45 µg/ dry g, respectively. Mean and median arsenic concentrations for all ASBS sites were 13.35 µg/ dry g and 10.8 µg/ dry g, respectively. San Clemente Island ASBS has the highest concentration of arsenic in mussels (39.9 µg/ dry g) among all ASBS sites, and also had the highest concentration of all mussel watch stations statewide.

Cadmium
Mean and median cadmium concentrations for all mussel watch sites statewide were 5.163 µg/ dry g and 5.01µg/ dry g, respectively. Mean and median cadmium concentrations for all ASBS sites were 7.522 µg/ dry g and 6.825 µg/ dry g, respectively. The Carmel Bay ASBS at Arrowhead Point has the highest concentration of cadmium in mussels (14.4 µg/ dry g) among all ASBS sites, and also had the highest concentration of all mussel watch stations statewide.

Chromium
Mean and median chromium concentrations for all mussel watch sites statewide were 1.753 µg/ dry g and 1.46 µg/ dry g, respectively. Mean and median chromium concentrations for all ASBS sites were 1.76 µg/ dry g and 1.6 µg/ dry g, respectively. Bodega Head, near the Bodega Head ASBS, has the highest concentration of chromium in mussels (4.61 µg/ dry g) among all sites in or near ASBS.

Copper
Mean and median copper concentrations for all mussel watch sites statewide were 9.28 µg/ dry g and 8.36 µg/ dry g, respectively. Mean and median copper concentrations for all ASBS sites were 9.335 µg/ dry g and 8.195 µg/ dry g, respectively. The King Range ASBS, at Point Delgada (Shelter Cove) has the highest concentration of copper in mussels (15.5 µg/ dry g) among all ASBS sites, and also had the highest concentration of all mussel watch stations statewide (see Figure 5.8.10.).

Lead
Mean and median lead concentrations for all mussel watch sites statewide were 1.948 µg/ dry g and 1.36 µg/ dry g, respectively. Mean and median lead concentrations for all ASBS sites were 2.279 µg/ dry g and 1.345 µg/ dry g, respectively. The Farallon Islands ASBS, at East Landing, has the highest concentration of lead in mussels (17.8 µg/ dry g) among all ASBS sites, and also had the highest concentration of all mussel watch stations statewide.

Mercury
Mean and median mercury concentrations for all mussel watch sites statewide were 0.116 µg/ dry g and 0.074µg/ dry g, respectively. Mean and median mercury concentrations for all ASBS sites were 0.144 µg/ dry g and 0.106 µg/ dry g, respectively.

San Miguel Island (ASBS 17), at Otter Harbor, has the highest concentration of mercury in mussels (0.69 µg/ dry g) among all ASBS sites, and also had the highest concentration of all mussel watch stations statewide.

Nickel
Mean and median nickel concentrations for all mussel watch sites statewide were 2.913 µg/ dry g and 2.18 µg/ dry g, respectively. Mean and median nickel concentrations for all ASBS sites were 2.973 µg/ dry g and 2.5 µg/ dry g, respectively. The Redwoods National Park ASBS at the mouth of the Klamath River has the highest concentration of nickel in mussels (9.23 µg/ dry g) among all ASBS sites, and also had the highest concentration of all mussel watch stations statewide.

Silver
Mean and median silver concentrations for all mussel watch sites statewide were 0.166 µg/ dry g and 0.061µg/ dry g, respectively. Mean and median silver concentrations for all ASBS sites were 0.131µg/ dry g and 0.084µg/ dry g, respectively. The Laguna Point to Latigo Point ASBS, at Point Dume in Malibu, has the highest concentration of silver (0.842 µg/ dry g) among all the ASBS sites.

Zinc
Mean and median zinc concentrations for all mussel watch sites statewide were 144.98 µg/ dry g and 138 µg/ dry g, respectively. Mean and median zinc concentrations for all ASBS sites were 156.8 µg/ dry g and 160.5 µg/ dry g, respectively. San Miguel Island (ASBS 17), at Otter Harbor has the highest concentration of zinc in mussels (232 µg/ dry g) among all ASBS sites.

Total PAHs
Mean and median total PAH concentrations for all mussel watch sites statewide were 1139.17ng/ dry g and 122.2ng/ dry g, respectively. Mean and median total PAH concentrations for all ASBS sites were 128.68 ng/ dry g and 100.1 ng/ dry g, respectively. Ano Nuevo ASBS has the highest concentration of total PAHs in mussels (688.7ng/ dry g) among all the ASBS sites.

Trends for historical data (1986 – 2009) at several mussel watch sites at or near ASBS were assessed. Most organic pollutants are either staying the same or showing significant decreases in mussel tissues. Chlordane concentrations show a significant decrease at King Range ASBS, Laguna Point to Latigo Point ASBS, NW Catalina Island ASBS, and La Jolla ASBS. Butyltin concentrations show a significant decrease near the Robert Badham ASBS and in the Laguna Point to Latigo Point ASBS. DDT is also decreasing significantly at Laguna Point to Latigo Point ASBS.

Most trace metals are either staying the same or showing significant decreases in mussel tissues. Arsenic concentrations show a significant decrease at the Pacific Grove ASBS, NW Catalina Island ASBS and La Jolla ASBS. Lead concentrations show a significant decrease near in the Robert Badham ASBS and in the La Jolla ASBS.

Mercury concentrations show a significant decrease near in the Laguna Point to Latigo Point ASBS. Selenium concentrations are decreasing at Laguna Point to Latigo Point ASBS. Silver concentrations show a significant decrease near the Robert E. Badham ASBS and in the La Jolla ASBS. Tin concentrations are decreasing at the King Range ASBS, Pacific Grove ASBS, Laguna Point to Latigo Point ASBS, NW Catalina Island ASBS, and near the Robert Badham ASBS. However there were a few metals that were increasing at certain ASBS. Copper concentrations are increasing at the King Range ASBS; this increase in copper in mussels at the King Range ASBS is of concern because that site has the highest copper concentrations in resident mussels of any mussel watch site (Figure 5.8.10). Cadmium concentrations are increasing at the Pacific Grove ASBS and Laguna Point to Latigo Point ASBS. Mercury concentrations are increasing near the Robert Badham ASBS and in the La Jolla ASBS.

Appendix 3 provides the NOAA Mussel Watch data for ASBS.

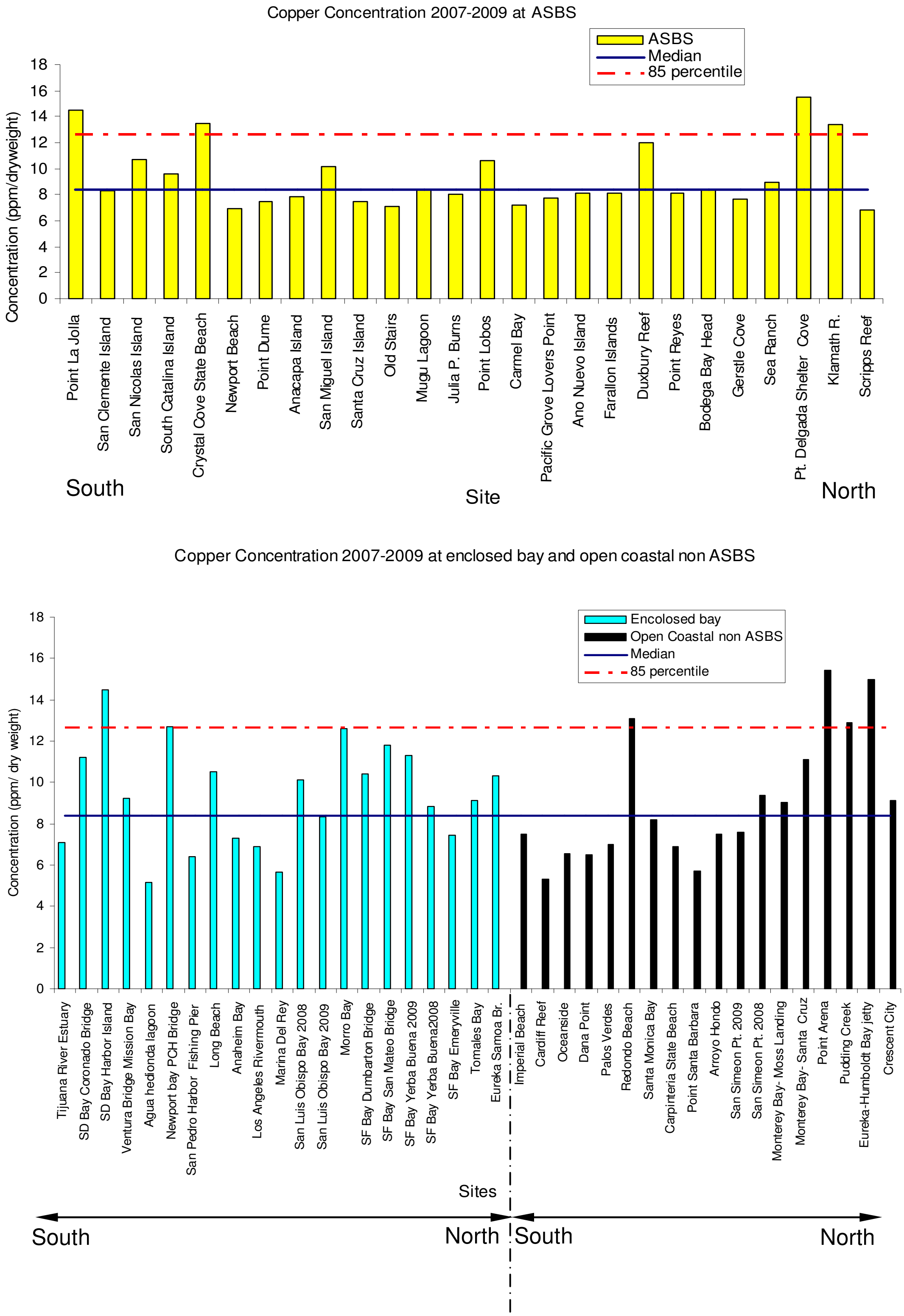


Figure 5.8.10. Mussel watch copper concentrations in ASBS and at other sites statewide.