Reconsideration of Certain Technical Matters of the Ballona Creek Estuary Toxics TMDL and Ballona Creek Metals TMDL

STAFF REPORT

California Regional Water Quality Control Board
Los Angeles Region
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Acronyms

303(d) list	State of California Clean Water Act Section 303(d) List of Water Quality Limited Segments
BMP	Best Management Practice
$CaCO^3$	calcium carbonate
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CMP	Coordinated Monitoring Plan
CTR	California Toxics Rule
CWA	Clean Water Act
ERL	Effects Range Low
FCG	Fish Contaminant Goal
g/day	grams per day
g/day/ac	gram per day per acre
g/yr	gram per year
kg/yr	kilogram per year
LA	Load Allocation
LACFCD	Los Angeles County Flood Control District
m^3/year	cubic meters per year
mg/L	milligrams per liter
mg/kg	milligram per kilogram
ml	milliliter
MLOE	Multiple Lines of Evidence
mt/m^3	metric ton per cubic meter
MTRLs	Maximum Tissue Residual Levels
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollution Discharge Elimination System
OAL	Office of Administrative Law
OEHHA	Office of Environmental Health Hazard Assessment
p-value	Probability of Rejecting the Null Hypothesis
R^2	Coefficient of Determination
RL	Reporting Limit
SCCWRP	Southern California Coastal Water Research Project
SIP	State Implementation Policy
SQO	Sediment Quality Objectives
SWRCB	State Water Resources Control Board
TIE	Toxicity Identification Evaluation
TMDL	Total Maximum Daily Load
µg/L	micrograms per liter
USEPA	United States Environmental Protection Agency
WLA	Waste Load Allocation

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1. Introduction

This staff report presents technical analyses in support of recommendations to reconsider aspects of two TMDLs in the Ballona Creek watershed, which were previously established by the Los Angeles Regional Water Quality Control Board (Regional Board). The two TMDLs to be reconsidered in this action are the Ballona Creek Estuary Toxics TMDL and the Ballona Creek Metals TMDL. The regulatory background, beneficial uses to be protected, geographical extent and complete TMDL elements along with supporting analysis are described in the respective staff reports and amendments to the Los Angeles Region Water Quality Control Plan (Basin Plan) (LARWQCB, 2005a and LARWQCB, 2005b) at (http://www.waterboards.ca.gov/losangeles/water_issues/programs/tmdl/tmdl_list.shtml) and are not repeated, herein.

While the Regional Board can amend the Basin Plan to adjust a TMDL at any time, implementation plans for TMDLs in the Los Angeles Region have often included scheduled "reconsiderations" by the Regional Board at a specific point during implementation. Specific reconsiderations have been included so that aspects of the TMDL, or the TMDL implementation schedule, could be adjusted based on anticipated new information or methods. This approach has allowed the Regional Board to establish TMDLs with all the required elements, including numeric targets, allocations, and implementation schedules, so that responsible parties could begin implementing the TMDL to improve water quality, while acknowledging the potential benefit to refining certain technical elements of the TMDL or the implementation schedule after additional study and data collection were completed.

2. Background

2.1 History of the TMDLs

Both the Ballona Creek Estuary Toxics TMDL (2006 Toxics TMDL) and the Ballona Creek Metals TMDL (2008 Metals TMDL) were developed and adopted by the Regional Board at the same time. Subsequent litigation delayed the final effective date of the 2008 Metals TMDL, however the final compliance dates remained the same.

The 2006 Toxics TMDL was adopted by the Regional Board on July 7, 2005 (Resolution No. R05-008), approved by the State Water Resources Control Board (State Board) on October 20, 2005 (Resolution No. 2005-0076), and approved by the United States Environmental Protection Agency (USEPA) on December 22, 2005. The effective date of the TMDL is January 11, 2006 upon the filing of the no effect determination with the California Department of Fish and Wildlife.

The 2006 Toxics TMDL addressed impairments due to toxic pollutants in sediment and fish tissue in Ballona Creek and Ballona Creek Estuary including cadmium, copper, lead, silver, zinc, chlordane, DDT, PCBs, and PAHs.

The TMDL set numeric sediment targets based on effects range-low (ERLs) values, which are sediment quality guidelines compiled by the National Oceanic and Atmospheric Administration.

The loading capacity of the sediments was estimated from the annual average net deposition of fine-grained material at the mouth of the Ballona Creek Estuary. This was translated into pollutant specific numbers using the sediment targets and an estimate of bulk sediment density of the fine-grained deposits. This provided a pollutant-specific estimate of the maximum load that could be deposited to the sediments on an annual basis.

The 2008 Metals TMDL was adopted by the Regional Board on July 7, 2005 and approved by USEPA on December 22, 2005.

On February 16, 2006, several cities in Los Angeles County filed a petition for a writ of mandate challenging many aspects of the Los Angeles River and the Ballona Creek Metals TMDLs. On May 24, 2007, the Los Angeles County Superior Court adopted the third of three rulings that collectively denied all of the Cities' challenges to the TMDLs, except for one CEQA claim. Accordingly, the Court directed the Regional Board to consider alternatives to the project before re-adopting the Los Angeles River and Ballona Creek Metals TMDLs. The writ was limited to these issues, and the TMDLs were affirmed in all other respects.

The Regional Board re-adopted the Metals TMDL with a new alternatives analysis on September 6, 2007 (Resolution No. R07-015). The TMDL was approved by the State Board on June 17, 2008 (Resolution No. 2008-0045) and by USEPA on October 29, 2008. The effective date of the TMDL is October 29, 2008, upon USEPA approval.

The 2008 Ballona Creek Metals TMDL addressed impairments in the water column in Ballona Creek for copper, lead, selenium, and zinc. Additionally, the TMDL addressed lead in the water column in Sepulveda Canyon Channel, a tributary to Ballona Creek. The TMDL set numeric targets based on the numeric water quality criteria contained in the California Toxics Rule (CTR).

A Coordinated Monitoring Plan (CMP) was submitted to the Regional Board by the responsible parties and approved on June 25, 2009. Minor revisions have been made since. Subsequently, four annual monitoring reports have been submitted to the Regional Board.

The responsible parties have submitted two separate implementation plans: one plan from the County of Los Angeles and one plan from the City of Los Angeles, Beverly Hills, Culver City, Inglewood, Santa Monica, West Hollywood, and the California Department of Transportation. One recommended study has been completed: Toxicity Identification Evaluation of Sediment (Sediment TIE) in Ballona Creek Estuary (December, 2010).

CMP data (2009 to 2012) show exceedances of the current TMDL numeric targets in water, occurring mostly in wet-weather.

Dry-weather exceedances were observed only for copper both in the total recoverable and dissolved fraction and at all the monitoring stations during the early years (2009 and 2010) of CMP monitoring but were not observed during later years (2010 to 2012).

Both copper and zinc frequently exceeded the current TMDL wet-weather numeric targets at all the monitoring stations. For copper, exceedances in the total fraction were observed almost twice as often as in the dissolved fraction. For zinc, exceedances in the total fraction were observed almost seven times more often than in the dissolved fraction. Lead exceedances occurred exclusively in the total fraction and seldom in the later years. See Appendix D for a thorough summary of CMP water data.

The CMP data also showed exceedances of the TMDL DDT sediment target. The other bioaccumulatives (i.e. PCBs and chlordane) rarely exceeded sediment targets or were not detected. The metals exceedances were more frequent in the earlier years of CMP sediment monitoring (2007 to 2009). In later years (2009 to 2011) exceedances of metals in sediment have not been observed. Sediment toxicity, as measured by amphipod survival tests, continued to be observed. Fish tissues samples from CMP monitoring were available for one year (2012) and were mostly non-detect for metals and most of the organics except DDT. See Appendix D for a thorough summary of the CMP sediment data.

2.2 Required Elements

This reconsideration is not a general reconsideration of *all* the elements of the TMDLs but a re-examination of certain technical issues, which may warrant revision based upon further data collection and analysis, study or experience or which warrant revision due to newly adopted regulations, such as the State's Sediment Quality Objectives (SWRCB, 2009). Table 2-1 shows the reconsideration language from the two TMDLs that is included in the Basin Plan.

Table 2-1 Summary of Reconsideration Elements Specified in the TMDLs

TMDL Due Date	Regional Board Action
2006 Ballona Creek Estuary Toxics TMDL January 11, 2012	The Regional Board shall reconsider this TMDL to re-evaluate the waste load allocations and the implementation schedule.
2008 Ballona Creek Metals TMDL January 11, 2011	The Regional Board shall reconsider this TMDL to re-evaluate the waste load allocations and the implementation schedule.

2.3 Special Studies

In both the 2006 Toxics TMDLs and 2008 Metals TMDLs, the implementation schedule "*allows time for special studies that may serve to refine the estimated of loading capacity, waste load* *and/or load allocations, and other studies that may serve to optimize implementation efforts*" (LARWQCB, 2007).

2.3.1 Metals TMDL 2008

The 2008 Ballona Creek Metals TMDL identified certain studies, which could be useful in a reconsideration of the TMDL (LARWQCB, 2005b):

- Refinement of hydrologic and water quality model
- Additional source assessment
- Refinement of potency factors correlation between total suspended solids and metals loadings during dry and wet weather
- Correlation between short-term rainfall intensity and metals loadings for use in sizing in-line structural BMPs
- Correlation between storm volume and total recoverable metals loading for use in sizing storm water retention facilities
- Refined estimates of metals partitioning coefficients, conversion factors, and site-specific toxicity
- Evaluation of potential contribution of aerial deposition and sources of aerial deposition

Stakeholders have yet to conduct any of the studies identified in the TMDL.

2.3.2 2006 Toxics TMDL

The Ballona Creek Toxics TMDL allowed time for certain studies named in the TMDL to be conducted to help inform the Regional Board's re-consideration of the TMDL. These studies include:

- Evaluation and use of low detection level techniques to evaluate water quality concentrations for those contaminants where standard detection limits cannot be used to assess compliance for CTR criteria or are not sufficient for estimating source loadings from tributaries and storm water;
- Developing and implementing a monitoring program to collect the data necessary to apply a multiple lines of evidence approach;
- Evaluate partitioning coefficients between water column and sediment to assess the contribution of water column discharges to sediment concentrations in the Estuary;
- Evaluation and use of sediment TIEs to evaluate causes of any recurring sediment toxicity;
- Studies to refine relationship between pollutants and suspended solids aimed at better understanding of the delivery of pollutants to the watershed;
- Studies to understand transport of sediments to the estuary, including the relationship between storm flows, sediment loadings to the estuary, and sediment deposition patterns within the estuary; and,
- Studies to evaluate effectiveness of BMPs to address pollutants and/or sediments

Of the studies listed above, stakeholders have thus far completed a Toxicity Identification Evaluation for sediment in the Ballona Creek Estuary in 2010 (Bay et al., 2010). The purpose of the study was to determine the extent of chemical contamination within the estuary and identify the likely causes of toxicity.

Some of the findings of the studies are listed below.

1. Chemical contamination of Ballona Creek Estuary sediments is widespread and causing toxicity to sediment-dwelling organisms.
2. Sediment quality in Ballona Creek Estuary shows high seasonal and spatial variability.
3. Pyrethroids, and possibly other current use pesticides, are the principal cause of sediment toxicity in Ballona Creek Estuary.
4. The contaminants currently listed in the Ballona Creek Estuary TMDL are minor contributors to the toxicity

More detailed discussion of the findings can be found in section 3.2.2.

2.3.3 BMP Effectiveness

Both the Toxic Pollutants TMDL and the Metals TMDL required the construction industry to submit the results of wet-weather BMP effectiveness studies to the Regional Board for consideration by January 11, 2013. The purpose of the studies was for the Regional Board to approve BMPs that would result in attainment of wet-weather waste load allocations to be included in the construction stormwater permit. The Building Industry Association initiated a BMP effectiveness study and published the results (Wu, 2010). The study investigated the concentrations of cadmium, copper, lead, and zinc as well as the potential leachability of these metals from a first flush of 18 different BMPs. BMPs with the highest heavy metal concentration did not necessarily have the highest potential to release heavy metals as percentage of the total amount of metals. The study suggests that the release of heavy metals from soil erosion and sedimentation control BMPs can contribute to pollutant loading. However, the findings do not provide the necessary justification for the approval of BMPs that would result in the attainment of wet-weather waste load allocations. No other studies were done that identified or quantified BMPs effectiveness in the removal of metals in wet-weather to attain final WLAs.

3. Technical Matters to be Considered

In this Section, data has been reviewed to update the Ballona Creek Metals TMDLs as follows:

- Section 3.1.1: Additional flow data and updated definitions of wet weather and dry weather based on flow;
- Section 3.1.2: Additional water hardness data used in the calculations of the numeric targets and allocations, as set forth in the California Toxic Rule;
- Section 3.1.3: A re-examination of the selenium data; and

- Section 3.1.4: Additional dissolved and total metals data and the resulting conversion factors used in the calculations of the numeric targets and allocations, as set forth in the California Toxic Rule.

In this Section, data has been reviewed to update the Ballona Creek Estuary Toxics TMDL including updating the TMDL in consideration of the following:

- Section 3.2.2: The Toxicity Identification Evaluation (TIE);
- Section 3.2.1: The State's Sediment Quality Objectives which were adopted after the TMDL; and
- Section 3.2.3: Fish tissue targets.

3.1 2008 METALS TMDL

3.1.1 Flow Characteristics

Under the 2008 Metals TMDL, copper, lead, selenium and zinc have separate dry weather and wet weather targets and allocations. Flow in Ballona Creek was used in the TMDL to determine when wet weather or dry weather targets and allocations applied. Additionally, flow was used to set the critical dry weather flow for calculation of allocations (for allocations in wet weather, load duration curves were used instead of a single critical flow).

While several Los Angeles Region TMDLs define 'wet weather' by the amount of rainfall, the Ballona Creek Metals TMDL defines 'wet weather' by flow. The TMDL defines wet weather as "*any day when the maximum daily flow is equal to or greater than 40 cubic feet per second (cfs) based on the 90th percentile of flow measured at Sawtelle Boulevard over a 10-year period (1987 to 1998).*" In addition, the TMDL determined the median flow rate "*at 14 cubic feet per second (cfs)*," and determined that rate to be the critical dry weather flow.

The Metals TMDL used historic flow data from 1987 to 1998 at Sawtelle Avenue to characterize flow in Ballona Creek and to calculate wet weather flow and dry weather flow.

In this reconsideration, staff has updated the flow calculations and the definitions of 'wet-weather' and 'dry-weather' by including an additional 14 years of flow data.

Table 3-1 presents a summary of daily average flow from the Sawtelle flow gage from 1987 to 2012 and Table 3-2 shows the monthly average flows at the Sawtelle flow gage.

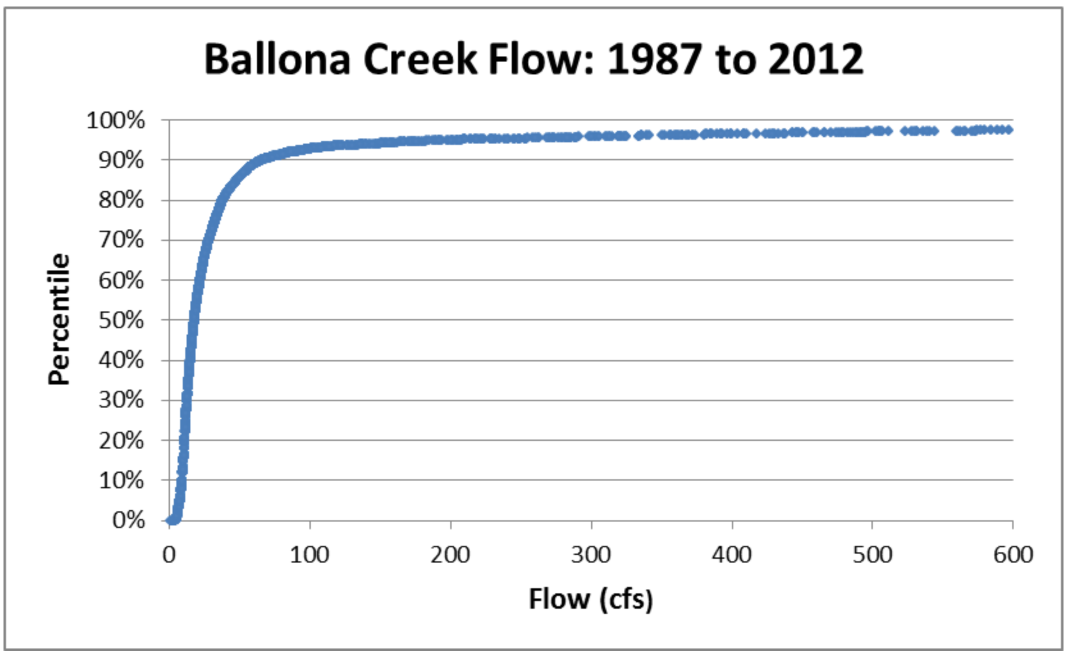
Figure 3-1 is a continuous distribution function graph of the daily average flow percentages and Figure 3-2 shows the monthly average flows.

Table 3-1 Daily Average Flow at Sawtelle Station: 1987 to 2012

	Daily Average Flow (Oct 1987 - June 2012)		
	Non-Summer** (cfs)	Summer* (cfs)	Year Round (cfs)
Minimum	1.060	4.013	1.060
25th percentile	11.90	10.60	11.20
50th percentile	18.40	15.10	**17.00**
Average	16.78	14.11	15.47
75th percentile	35.00	25.10	31.70
90th percentile	90.45	41.94	**63.98**
Maximum	5230.00	571.00	5230.00

*Summer months are defined as June through August
**Non summer months are months excluding June through August
17.0 cfs is the 50th percentile for all flows. **64.0** cfs is the 90th percentile flow.

Figure 3-1 Ballona Creek Daily Average Flow Cumulative Percentages

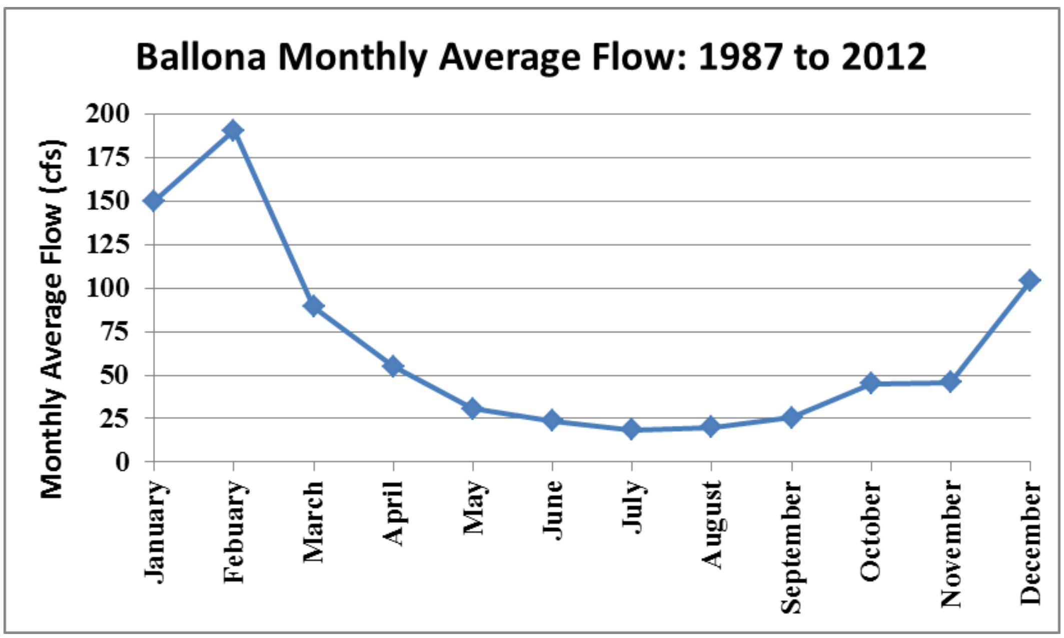


90th percentile flow is **64.0 cfs**.

Table 3-2 Monthly Average Flow at Sawtelle Station: 1987 to 2012

Month	Minimum	Median	Average	Maximum	Standard Deviation
January	19.30	69.85	150.23	569.52	168.15
February	16.70	149.59	190.73	657.55	161.25
March	13.38	66.08	89.47	283.01	70.61
April	8.58	45.34	55.03	193.73	47.14
May	6.65	24.72	30.69	90.03	20.65
June	8.27	15.51	23.82	68.58	16.53
July	6.15	15.79	18.71	49.37	10.73
August	6.75	16.34	20.20	47.44	11.42
September	6.43	19.18	25.45	74.00	20.53
October	10.49	26.24	45.15	178.91	45.54
November	7.59	40.71	45.87	117.92	29.37
December	8.67	66.73	104.31	406.02	97.39

Figure 3-2 Ballona Creek Monthly Average Flows



Stream and flow conditions were not found to be very different from conditions as assessed in the 2008 Metals TMDL. The winter months along with March are the high flow months, based on the 1987-2012 dataset at the Sawtelle station, while the other months are significantly lower. This tendency follows the precipitation patterns in Southern California with the wet months occurring typically in the winter time.

Based on an analysis of the flow data (1987 to 2012), the 90th percentile of flow at Sawtelle Boulevard is 64.0 cfs. The 50th percentile or median of flow at Sawtelle Boulevard is 17.0 cfs.

3.1.1.1 Recommendation Flow

Based on the analysis of data over the roughly 24 year period including the flow data for the 2008 Ballona Creek Metals TMDL as well as newer flow data, staff recommends adjusting the wet weather definition to 64.0 cfs. This represents an increase from 40 cfs as established in the 2008 Ballona Metals TMDL.

Additionally, staff recommends adjusting the critical dry-weather flow in Ballona Creek from 14.0 cfs to 17.0 cfs based 50th percentile or median of flow measured at Sawtelle Boulevard over the roughly 24 year period.

These recommendations use the same method as the 2008 TMDL (i.e. 90th percentile, 50th percentile) but are based on a lengthier dataset which more accurately describes the current follow characteristics.

3.1.2 Hardness

The toxicity of metals in the water column varies with the water hardness. Metals are less toxic in harder water. Hardness generally represents the concentration of calcium carbonate. Water quality criteria to protect aquatic life are therefore calculated at different concentrations of hardness measured in milligrams per liter (mg/L) calcium carbonate ($CaCO^3$).

The 2008 Ballona Creek Metals TMDL evaluated Los Angeles County Flood Control District (LACFCD) data from 1996 to 2002 for the Municipal Separate Storm Sewer System monitoring to calculate median hardness for wet-weather and evaluated Southern California Coastal Water Research Project data (SCCWRP, 2004) to calculate median hardness for dry-weather. As result, a median hardness of 77 mg/L and 300 mg/L were determined for wet and dry-weather respectively.

As part of the reconsideration, staff has considered additional, more recent hardness data in addition to the hardness data considered in the 2008 TMDL. The additional hardness data includes more recent LACFCD data, Ballona Creek Metals and Toxics TMDL CMP data, and City of Los Angeles status and trends data. These calculations used the recommended flow of 64.0 cfs as the definition of wet weather. The results are summarized in Tables 3-3 and 3-4 and Figure 3-3 and Figure 3-4.

Table 3-3 Ballona Creek Wet-Weather Hardness

Wet Weather Hardness (mg/L $CaCO^3$)			
	(Dec 1996 - Mar 2000)	(Aug 2000 - June 2012)	(Dec 1996 - June 2012)
Median	70	107	**82**
90th Percentile	225	400	315

Figure 3-3 Ballona Creek Wet-Weather Hardness (mg/L $CaCO^3$)

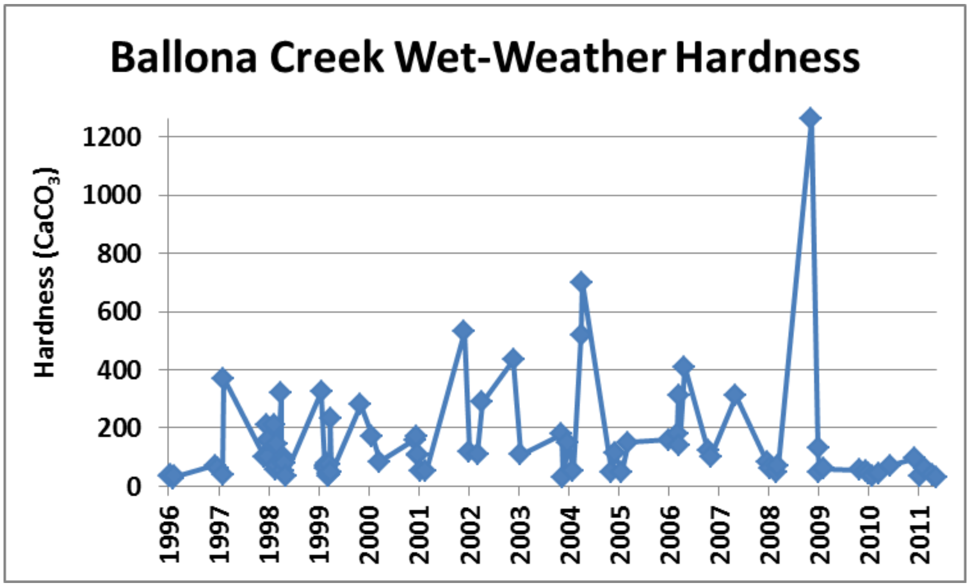


Figure 3-4 Ballona Creek Dry-Weather Hardness (mg/L CaCO3)

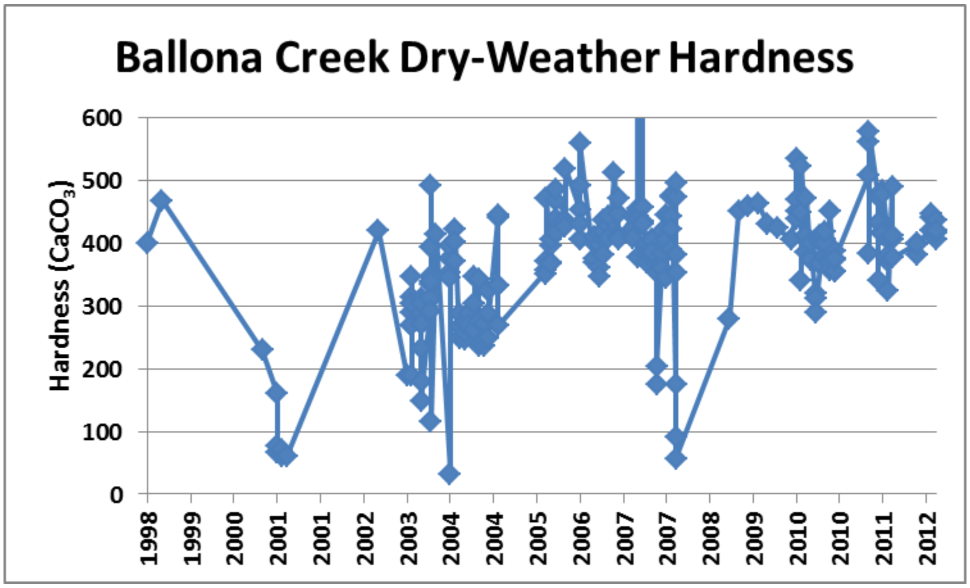


Table 3-4 Ballona Creek Dry-Weather Hardness

Dry Weather Hardness (Oct 1998 - June 2012) (mg/L CaCO3)				
Percentile	**All Reaches***	**Reach 1**	**Reach 2**	**Sepulveda**
Median	**396**	368	382	419
90th Percentile	470	474	443	517

*The "All reaches" column includes hardness data from Reach 1, Reach 2, and Sepulveda Channel.

The median wet-weather hardness, 82 mg/L $CaCO^3$, was higher than the 2008 Metals TMDL wet weather hardness of 77 mg/L. The dry-weather median hardness, 396 mg/L, was higher than the 2008 Metals TMDL of 300 mg/L.

3.1.2.1 Recommendation Hardness

Staff recommends adjusting dry-weather hardness value to 396 mg/L and the wet-weather hardness to 82 mg/L based on 50th percentile or median of hardness as measured within the Ballona Creek watershed for the calculation of targets and allocations as described by the California Toxics Rule. These recommendations use the same method as the 2008 TMDL (i.e. 90th percentile, 50th percentile) but are based a more robust dataset and more accurately characterizes the hardness in Ballona Creek Watershed compared to the original TMDL.

3.1.3 Selenium

The 2008 Metals TMDL examined the available selenium data from Ballona Creek collected by LACFCD and SCCWRP and found that there were no exceedances of the selenium criteria in either of the dry-weather datasets. However, in both cases the detection limits were greater than the chronic criterion. Selenium was measured twice in storm water at concentrations that exceeded the chronic criterion. Therefore, the 2008 metals TMDL found that the data were insufficient to conclude that there was no selenium impairment (and insufficient to remove the selenium impairment from the State's CWA 303(d) list). Accordingly, targets and allocations were developed for selenium in Ballona Creek.

As part of this reconsideration, staff has considered more recent selenium data in addition to the data considered in the 2008 metals TMDL. The additional data includes more recent LACFCD data and Ballona Creek Metals and Toxics TMDL CMP data. This evaluation did not include SCCWRP data because the SCCWRP data had reporting limits (RL) as high as 10-100 μg/L, well above the TMDL target of 5 μg/L. The results are summarized in Table 3-5.

Table 3-5 Ballona Creek Water Quality: Selenium

Selenium (in total recoverable selenium): 1996 to 2011			
Weather	**TMDL Target**	**Above Target**	**Total Samples**
All	5 μg/L	**9**	**130**
Wet	5 μg/L	4	101
Dry	5 μg/L	5	29

Selenium was originally listed on the 2002 Clean Water Act 303(d) List of Water Quality Limited Segments (303(d) List) due to selenium exceedances in three out of 24 water samples. This selenium listing was specifically for the 6.5 mile portion of Ballona Creek, Reach 2.

Since the adoption of the 2002 303(d) List, the State Water Resources Control Board adopted the Water Control Policy for Developing California's Clean Water Act Section 303(d) List, 2004 (Listing Policy). The Listing Policy uses a weight of evidence approach to evaluate whether to place waters on, or remove waters from, the 303(d) List (SWRCB, 2004).

The re-examined data, described above, satisfies the data quality requirements of sections 6.1.4 and 6.1.5 of the Listing Policy and the frequency of exceedance, 9 exceedances out of 130 samples, does not exceed the allowable frequency listed in Table 4.1 of the Listing Policy. Table 4.1 is the "Maximum Number of Measured Exceedances Allowed to Remove a Water Segment from the Section 303(d) List for Toxicants." The data quality and the limited exceedances of the criteria would allow selenium to be delisted based on Table 4.1.

Analysis of selenium data from Sepulveda Channel, Reach 1, and Centinela Creek does not suggest water quality impairments in the other portions of the watershed.

3.1.3.1 Recommendation

Staff recommends removing Selenium from the TMDL, including the Waste Load Allocations (WLAs) and Load Allocations (LAs). However, staff does not recommend removing all the monitoring requirements for selenium to ensure the watershed does not become impaired due to selenium again in the future. Monitoring for selenium should be consistent with monitoring requirements required in the MS4 permit integrated monitoring program or coordinated integrated monitoring program. Staff will recommend removing selenium from the State's CWA 303(d) list at the next listing opportunity should additional collected data continue to support delisting.

3.1.4 Conversion Factors

Metals in the water column may be present in a dissolved form or may be present adhered to particles. The California Toxics Rule expresses metals criteria in *dissolved* metal concentrations because this is the bioavailable form. However, NPDES permit limits (40 CFR section 122.45(c)), must be expressed as *total recoverable* metal concentrations. TMDLs and waste load allocations (WLA) are expressed in total recoverable metals because the WLA go into NPDES permits. Conversion factors or translators are necessary to convert the dissolved criteria into total recoverable limits.

Conversion factors are unitless values ranging from zero to one and represent the ratio of the concentration of dissolved metals to total metals. The most conservative conversion factor has a value of one, signifying that all metals are in the dissolved form. The CTR provides default conversion factors, less than one, unless a site-specific conversion factor is developed.

As discussed in section 3.1.2, the Ballona Creek Metals TMDL was developed with data from LACFCD and SCCWRP. The TMDL did not develop site-specific conversion factors for dry-weather due to insufficient data, except for lead. To develop site-specific conversion factors for wet-weather, the 2008 TMDL regressed dissolved metals against total recoverable metals and used the slope of the regression as conversion factors for copper and zinc.

As part of the reconsideration, staff has considered more recent metals data in addition to the data considered in the 2008 TMDL. The data includes more recent LACFCD data and Ballona Creek Metals and Toxics TMDL CMP data.

Staff found that the dissolved to total metal ratios in Ballona Creek were too variable to use the slope of the regression as conversion factors as was done in the 2008 TMDL. Using the regression method, the data yielded very low coefficient of determination (R^2) values. The slopes, R^2, and the probability of rejecting the null hypothesis (p-values) are included in Appendix A.

However, staff did observe that the dissolved to total metal ratios in Ballona Creek were generally less than the CTR default conversion factors.

Therefore, staff developed site-specific conversion factors using the 90th percentile of the dissolved to total metal ratios. This method is in accordance with the 2005 California State Policy for the Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (State Implementation Policy or SIP) and the 1996 USEPA metals translator guidance (USEPA, 1996) and is a conservative method (while not as conservative as the CTR default).

The analyses of dissolved to total metal ratios in Ballona Creek are summarized in Tables 3-6 and 3-7. A comparison between the default CTR conversion factors, original 2008 TMDL conversion factors, and 90th percentile ratios are listed in Table 3-8.

Table 3-6 Ballona Creek Dry-Weather Metals Total to Dissolved Ratio

Dry-Weather			
Percentile	**Copper**	**Lead**	**Zinc**
25 Percentile	0.37512376	0.1203102	0.2842562
Average	0.52140837	0.2657982	0.5203868
Median	0.50797117	0.2014493	0.500000
75 Percentile	0.68525202	0.3256068	0.7442393
90 Percentile	0.81623216	0.5512821	0.8490741

Table 3-7 Ballona Creek Wet-Weather Metals Total to Dissolved Ratio

Wet-Weather			
Percentile	**Copper**	**Lead**	**Zinc**
25 Percentile	0.21694915	0.0223356	0.1660623
Average	0.40231061	0.1990569	0.4470274
Median	0.34829523	0.0445161	0.2861613
75 Percentile	0.59952349	0.2827723	0.7647569
90 Percentile	0.81356053	0.6774701	0.9453686

Table 3-8 Comparison of Wet and Dry Weather Conversion Factors: CTR, 2008 Metals TMDL, and 90th Percentile

Constituent	CTR Default Translators	2008 TMDL Translators	90%
Cu Dry	0.96	0.96	**0.816**
Cu Wet	0.96	0.62	**0.814**
Pb Dry	0.590[1]	0.631[3]	**0.551**
Pb Wet	0.820[2]	0.829[4]	**0.677**
Zn Dry	0.986	0.986	**0.849**
Zn Wet	0.978	0.79	**0.945**

[1]Conversion factor is hardness dependent and was based on a hardness of 396 mg/L
[2]Conversion factor is hardness dependent and was based on a hardness of 82 mg/L
[3]Conversion factor is hardness dependent and was based on a hardness of 300 mg/L
[4]Conversion factor is hardness dependent and was based on a hardness of 77 mg/L

3.1.4.1 Recommendation Conversion factors

Staff recommends the 90th percentile values of the dissolved to total metal ratios for the conversation factors.

3.1.5 Summary of Adjusted Targets and Allocations for the Metals TMDL

The recommended adjustments to flow rate, hardness, and conversion factors compel revision of the dry and wet-weather targets as well WLAs for metals.

3.1.5.1 Numeric Targets

Based on the recommendations made in sections 3.1.1, 3.1.2, and 3.1.4, the numeric targets were adjusted. As with the 2008 Metals TMDL, the chronic criteria were the most limiting values for copper, lead, and zinc and were the basis for the dry-weather numeric targets. For wet-weather, the acute criteria were the most limiting values and the basis of the wet-weather targets. The targets are shown in Table 3-9 and 3-10.

The freshwater aquatic life criteria for metals in the CTR are expressed as a function of hardness of the receiving water. The targets in Table 3-9 and Table 3-10 were evaluated based on a median hardness value of 396 mg/L for wet weather and 82 mg/L for dry weather, which is consistent with other previously adopted metals TMDLs in the region including the Calleguas Creek Watershed Metals TMDL, the San Gabriel River Metals and Selenium TMDL, and the Los Angeles Metals TMDL.

Calculation of targets also requires the conversion factors. The conversion factors in Table 3-8 were used.

The water quality targets in the TMDL are expressed as the water quality criteria from the federal California Toxics Rule (CTR). CTR criteria include a numerical threshold (developed, as above, considering hardness and conversion factors) multiplied by a water-effect ratio (WER). The WER has a default value of 1.0 unless a site-specific WER is approved. To use a WER other than the default of 1.0, a study must be conducted consistent with USEPA's WER. At this time, there are no WERs established for Ballona Creek, so the WER = 1.0..

If the Regional Board approves site-specific WERs in these waterbodies, the TMDL targets will be modified in accordance with all legal and regulatory requirements, and adopted by the Regional Board through the state's basin plan amendment process.

Table 3-9 Dry-Weather Numeric Targets

Metal	Target* (µg/L) Dissolved	Conversion Factor	Target* (µg/L) Total
Copper	29.03*WER	0.816	35.56*WER
Lead	10.83*WER	0.551	19.65*WER
Zinc	379.16*WER	0.849	446.55*WER

*Targets based on a hardness of 396 mg/L

Table 3-10 Wet-Weather Numeric Targets

Metal	Target* (µg/L) Dissolved	Conversion Factor	Target* (µg/L) Total
Copper	11.14*WER	0.814	13.70*WER
Lead	52.00*WER	0.677	76.75*WER
Zinc	99.04*WER	0.945	104.77*WER

*Targets based on a hardness of 82 mg/L

3.1.5.2 Loading Capacity

The dry-weather loading capacity of Ballona Creek and Sepulveda Canyon Channel for each metal was derived by multiplying the revised hardness-adjusted dry-weather numeric targets expressed as total recoverable (Table 3-9) by the critical flow assigned to these two waterbodies. The loading capacities are presented as total recoverable metals for quantification of total recoverable metals loads.

As discussed in section 3.1.2, the median flow measured in Ballona Creek based on historic flow data is 17 cfs. This flow was used to define the critical dry-weather flow for Ballona Creek at Sawtelle Boulevard (upstream of Sepulveda Canyon Channel). For Sepulveda Canyon Channel, the assumed flow value of 6.3 cfs was used (no change from 2008 Metals TMDL). Table 3-11 shows the revised dry-weather loading capacities for Ballona Creek and Sepulveda Canyon Channel.

Table 3-11 Dry-Weather Loading Capacity Expressed as Total Recoverable Metals in (grams/day)

Waterbody	Flow (cfs)	Copper	Lead	Zinc
Ballona Creek	17	1,479.2	817.2	18,573.1
Sepulveda Channel	6.3	548.2	302.9	6,883.0
Total	23.3	2,027.4	1,120.1	25,456.1

The wet-weather loading capacities were calculated by multiplying the daily storm volume by the numeric target expressed as total recoverable (Table 3-10). The wet-weather loading capacity applies to any day when the maximum daily flow measured at a location downstream of Sepulveda Canyon Channel, such as Inglewood Boulevard is equal to or greater than 64 cfs, which represents the 90th percentile flow. The loading capacities for copper, lead, and zinc in wet-weather are listed in Table 3-12.

Table 3-12 Wet-Weather Loading Capacity Expressed as Total Recoverable Metals

Metal	Loading Capacity
Copper	13.70 µg/L x Daily Storm Volume
Lead	76.75 µg/L x Daily Storm Volume
Zinc	104.77 µg/L x Daily Storm Volume

3.1.5.3 Waste Load Allocations

Allocations were assigned to point and nonpoint sources throughout the watershed in order to meet the TMDLs for Ballona Creek and Sepulveda Canyon Channel. Mass-based LAs were developed for direct atmospheric deposition in the 2008 Metals TMDL and are unchanged.

A grouped mass-based waste load allocation (WLA) was developed for storm water permittees (Los Angeles County MS4, Caltrans, General Industrial and General Construction) for both dry weather and wet weather by subtracting the mass-based WLAs and LAs from the total loading capacity illustrated in the equation listed below. The WLAs are listed in Table 3-13 and Table 3-14.

Combined Storm Water Sources = Critical Flow x Target - Direct Air Deposition

Table 3-13 Dry-Weather Combined Mass-Based Waste Load Allocations for Caltrans and MS4 permittees as Total Recoverable Metals

Waterbody	Cu (g/day)	Pb (g/day)	Zinc (g/day)
Ballona Creek	1477.2	815.9	18566.3
Sepulveda	547.9	302.7	6882.0
Total	2025.1	1118.5	25448.3

Table 3-14 Wet-Weather Combined Mass-Based Waste Load Allocations

Metal	Combined Storm Water Permittees (g/day)
Copper	1.362×10^{-5} x Daily Storm Volume
Lead	7.630×10^{-5} x Daily Storm Volume
Zinc	1.042×10^{-4} x Daily Storm Volume

WLAs are further separated between the separate MS4 permittees and Caltrans in dry-weather and separate storm water permittees in wet-weather and are presented in Table 3-15 and Table 3-16.

Table 3-15 Dry-Weather Mass-Based Waste Load Allocations for Caltrans and MS4 permittees as Total Recoverable Metals

Permittee	Cu (g/day)	Pb (g/day)	Zinc (g/day)
Ballona Creek			
MS4 Permittees	1457.6	805.0	18320.1
Caltrans	19.6	10.8	246.2
Sepulveda Channel			
MS4 Permittees	540.6	298.7	6790.8
Caltrans	7.3	4.0	91.3

Table 3-16 Wet-Weather Mass-Based Waste Load Allocations

Metal	General Construction Stormwater (g/day)	General Industrial Stormwater (g/day)	Caltrans (g/day)	MS4 Permittees (g/day)
Copper	3.763×10^{-7} x Daily Storm Volume	9.433×10^{-8} x Daily Storm Volume	1.806×10^{-7} x Daily Storm Volume	1.297×10^{-5} x Daily Storm Volume
Lead	2.108×10^{-6} x Daily Storm Volume	5.284×10^{-7} x Daily Storm Volume	1.012×10^{-6} x Daily Storm Volume	7.265×10^{-5} x Daily Storm Volume
Zinc	2.878×10^{-6} x Daily Storm Volume	7.213×10^{-7} x Daily Storm Volume	1.381×10^{-6} x Daily Storm Volume	9.917×10^{-5} x Daily Storm Volume

Each storm water permittee enrolled under the general construction or industrial storm water permits received individual WLAs on a per acre basis, based on the acreage of their facility listed in Table 3-17.

Table 3-17 Wet-Weather Waste Load Allocation for an Individual General Construction or Industrial Storm Water Permittee

Metal	Individual General Construction or Individual General Industrial Permittee (g/day/ac)
Copper	1.673×10^{-10} x Daily Storm Volume
Lead	9.369×10^{-10} x Daily Storm Volume
Zinc	1.279×10^{-9} x Daily Storm Volume

Concentration-based WLAs were established for the minor NPDES permits and general non-storm water NPDES permits that discharge to Ballona Creek or its tributaries to ensure that these do not contribute to exceedances of the CTR criteria. The concentration-based WLAs for dry-weather and wet-weather are equal to the revised numeric targets expressed as total recoverable metals listed in Table 3-9 and Table 3-10.

3.2 2006 Toxics TMDL

3.2.1 Sediment Quality Objectives (SQOs)

The Water Quality Control Plan for Enclosed Bays and Estuaries - Part 1 Sediment Quality (SWRCB, 2009), which promulgated Sediment Quality Objectives (SQOs), was adopted after the effective date of the Ballona Creek Estuary Toxics TMDL.

The SQO Part I employs a multiple lines of evidence approach (MLOE) for the evaluation of sediments to interpret narrative water quality objectives to protect estuarine habitat, marine habitat, commercial and sport fishing, aquaculture, and shellfish harvesting beneficial uses. The three lines of evidences or “triad” for assessing sediment quality include sediment toxicity, benthic community conditions, and sediment chemistry. High confidence in the assessment of sediment quality is achievable when all three lines of evidence are available for assessing a waterbody. This assessment is sometimes called a “direct effects” assessment for the direct effect of contaminants and toxicity on benthic organisms and does not include an assessment of the “indirect effects” of contaminants transferring up the food chain to fish, which can impact human health.

The MLOE are used to categorize a sediment as “Unimpacted,” “Likely unimpacted,” “Inconclusive,” “Possibly impacted,” Likely impacted,” or “Clearly impacted.” The categories - “Unimpacted,” and “Likely unimpacted” - are considered as achieving the protective condition for aquatic life in sediment.

Little MLOE data is currently available to assess Ballona Creek Estuary using the SQO. Bight ’08 is one of the few data sources available that has employed the MLOE outlined in the SQO. Figure 3-5 is a map of Bight’ 08 monitoring stations for Ballona Creek Estuary. The SQO MLOE category results from Bight’ 08 are listed in Table 3-18.

Figure 3-5 Bight' 08 stations in the Ballona Creek Estuary

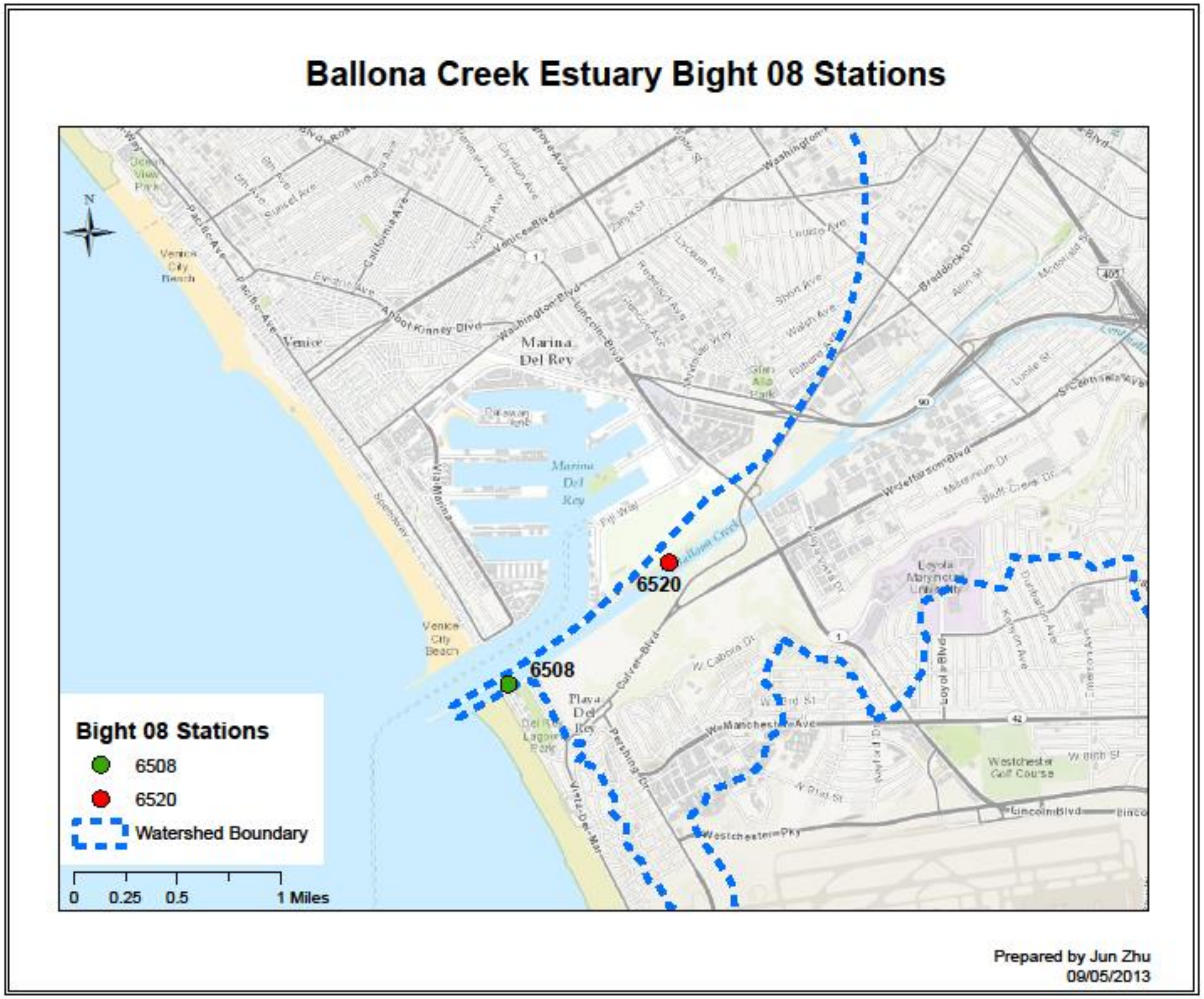


Table 3-18 Bight' 08 SQO Categories for Ballona Creek Estuary

Site	SQO Category	Toxicity	Chemistry	Benthic Community
6508	Unimpacted	Nontoxic	Moderate Exposure	Low Disturbance
6520	Likely Impacted	High Toxicity	Low Exposure	Moderate Disturbance

Two toxicity tests were used to characterize sediment throughout the Southern California Bight during Bight' 08: a 10-day survival test using the amphipod *Eohaustorius estuarius* and a 10-day embryo development test using *Mytilus galloprovincialis* (Bay *et al.*, 2011). The results of the Bight '08 toxicity tests were used to classify sediments according to toxicity categories included in the SQOs.

The SQO uses four indices, Benthic Response Index (BRI), Index of Biotic Integrity (IBI), Relative Benthic Index (RBI), and River Invertebrate Prediction and Classification System (RIVPACS), to assess for benthic community conditions. The benthic community category is determined by the median of all benthic indices response categories. Individual benthic index scores and categories are listed in Appendix C.

Based on the Bight' 08 data, station 6520 located upstream from Del Rey Lagoon was classified as "Likely Impacted" so the site exceeds the State's Sediment Quality Objectives.

3.2.2 Toxicity Identification Evaluation (TIE)

Stakeholders completed a Toxicity Identification Evaluation for sediment in the Ballona Creek Estuary in 2010 (Bay *et al.*, 2010). The purpose of the study was to determine the extent of chemical contamination within the estuary and identify the likely causes of toxicity. The TIE used similar methods to the "stressor identification" methods later outlined in the State's SQOs.

A TIE consists of several chemical or physical modifications of a toxic sample. Each modification is designed to affect the toxicity of a particular type of contaminant (e.g., trace metals or organics). By comparing the post-treatment sample toxicity with that of an unmodified sample (baseline toxicity), it is possible to identify whether certain types of contaminants are contributing to the sample's toxicity. A variety of TIE treatments were applied in this study, depending on whether a sediment or pore water sample was analyzed. Three types of treatments were usually applied to the whole sediments or pore water; these treatments enabled sediment toxicity to be classified as likely due to trace metals, trace organics, or pyrethroid pesticides.

Some of the findings of the studies are listed below.

1. Chemical contamination of Ballona Creek Estuary sediments was widespread and causing toxicity to sediment-dwelling organisms.
2. Sediment quality in Ballona Creek Estuary shows high seasonal and spatial variability.
3. Pyrethroids, and possibly other current use pesticides, are the principal cause of sediment toxicity in Ballona Creek Estuary.
4. The contaminants currently listed in the Ballona Creek Estuary toxics TMDL including DDT, PCBs and PAHs are minor contributors to the toxicity, but metals were responsible for some toxicity to sea urchins.

Because the TIE study found pyrethroids to be a major contributor to toxicity, the Regional Board may wish to pursue including pyrethroids on the State's 303(d) list in the future or develop a pyrethroid TMDL.

While DDT, PCBs and PAHs were not found to be significant contributors to the toxicity in this particular study, an analysis of the current Ballona Creek CMP data indicates continued exceedances of the sediment DDT, PCB and chlordane targets as well as metals targets in sediment. DDT was also present in the limited fish sampling, but at levels below the Office of Environmental Health Hazard Assessment Fish Contaminant Goals (2008).

3.2.3 PAHs

PAHs were originally included on the State's 1998 303(d) List.

Since the adoption of the 1998 303(d) List, the State Water Resources Control Board adopted the Water Control Policy for Developing California's Clean Water Act Section 303(d) List, 2004 (Listing Policy). The Listing Policy uses a weight of evidence approach to evaluate whether to place waters on, or remove waters from, the 303(d) List (SWRCB, 2004).

Sediment samples collected in Ballona Creek Estuary since the implementation of the CMP show zero exceedances of the PAH target. This data satisfies the data quality requirements of sections 6.1.4 and 6.1.5 of the Listing Policy and the frequency of exceedance, 0 exceedances out of 36 samples, does not exceed the allowable frequency listed in Table 4.1 of the Listing Policy. Table 4.1 is the "Maximum Number of Measured Exceedances Allowed to Remove a Water Segment from the Section 303(d) List for Toxicants." The data quality and the limited exceedances of the criteria would allow PAHs to be delisted based on Table 4.1.

3.2.4 Recommendation based on the TIE and SQOs

Staff recommends requiring attainment of the protective SQO categories of "Unimpacted," or "Likely unimpacted" and including SQO assessment in the required monitoring.
Staff recommends removing the DDT, PCBs and chlordane targets, WLA and LA based on the ERLs, which are intended to protect the benthic beneficial use (i.e., direct effects). Targets, WLA and LA to protect the human health beneficial use (i.e., indirect effect) are discussed in Section 3.2.3, below.

In addition, to confirm the likely toxicity contributor or to determine additional toxicity contributors, staff recommends that a stressor identification to include examination of DDT, chlordane and PCBs, as required by the State's EB&E Plan Part 1 (Section VII.F), is conducted if sediments fail to meet the protective condition of Unimpacted or Likely Unimpacted after 2013.

Staff recommends removing the TMDL for PAHs, including the WLAs and LAs. However, staff does not recommend removing all the monitoring requirements for PAHs to ensure the watershed does not become impaired due to PAHs again in the future. Staff will recommend removing PAHs from the State's CWA 303(d) list at the next listing opportunity should additional collected data continue to support delisting.

3.2.5 Fish Targets

During the 2005 TMDL development, staff reviewed the original listing data for pesticides which included Mussel Watch data and Toxic Substance Monitoring Program data and assessed the data against the Office of Environmental Health Hazard Assessment (OEHHA) screening values. Staff found that there was a single fish data point and three shellfish data points for Ballona Creek Estuary and the data was more than 10-years old at the time. Based on the limited amounts of data and the age of the data, staff did not recommend including fish tissue targets or developing allocations to address bioaccumulatives in fish tissue at that time. The toxics TMDL included a requirement for fish and mussel tissue monitoring and the CMP included an annual monitoring effort for fish and mussel. Mussels have been collected every year (2009- 2012). To date, only three fish have been collected (in 2012). The fish and mussel data is shown in Appendix D.

The State's Water Quality Control Plan for Enclosed Bays and Estuaries – Part 1 Sediment Quality (EB&E Plan Part 1), which was adopted in 2009 after the original establishment of the toxics TMDL, includes (1) a narrative objective to protect benthic communities along with an evaluation approach based on integrating multiple lines of evidence (the "triad" approach) to determine whether this objective is achieved, and (2) a narrative objective to protect the human health beneficial use. Therefore, it is necessary to include fish tissue targets and associated sediment targets for the bioaccumulatives to protect the human health beneficial use and ensure that the narrative objective for indirect effects contained in the State's EB&E Plan is achieved. The requirement that a TMDL for a particular pollutant must be developed to achieve all water quality objectives for that pollutant set to protect designated beneficial uses was affirmed in a 2011 court decision, Anacostia Riverkeeper, Inc., et al. v. Lisa Jackson, US EPA. In its decisions, the court affirmed that a TMDL must address all the beneficial uses and water quality objectives for a particular pollutant whether or not they are listed on the Section 303(d) list.

Additionally, since the adoption of the 2006 TMDL, fish consumption guidelines have been instituted for southern California waters including Ballona Creek estuary (OEHHA, 2009). Ballona Creek estuary is in the fish consumption "red zone" in the 2009 fish consumption advisory. Depending on species of fish and gender and age of the potential consumer, OEHHA and the State of California recommends no consumption, "Do Not Eat" of as many as 5 fish species (white croaker, black croaker, topsmelt, barred sand bass, and barracuda) and as many as 14 species have recommended consumption limitations.

Since adoption of the toxics TMDL, OEHHA developed new fish screening values in 2008, “Fish Contaminant Goals and Advisory Tissue Levels for Common Contaminants in California Sport Fish: Chlordane, DDTs, Dieldrin, Methylmercury, PCBs, Selenium, and Toxaphene” (OEHHA, 2008).

Use of fish tissue targets is necessary and appropriate to account for uncertainty in the relationship between pollutant loadings and beneficial use effects (USEPA, 2002) and directly addresses potential human health impacts from consumption of contaminated fish or other aquatic organisms. Use of fish tissue targets also allows the TMDL analysis to more completely use site-specific data where limited water column data are available, consistent with the provisions of 40 CFR section 130.7(c)(1)(i). Thus, use of Fish Contaminant Goals (FCGs) provides an effective method for accurately quantifying achievement of the water quality objectives/standards (Table 3-19).

Table 3-19 Targets for bioaccumulatives in fish tissue (LARWQCB, 2011)

Pollutant	Fish Tissue target (µg/kg wet)	Associated sediment target (µg/kg dry)
Chlordane	5.6	1.3[b]
Total DDT	21	1.9[b]
Total PCBs	3.6	3.2[c]

[b]Chlordane and total DDT associated sediment values from Newport Bay Indirect Effects draft report (SFEI, 2007)
[c]PCBs-total associated sediment target from San Francisco Bay bioaccumulation study (Gobas and Arnot, 2010)
N/A indicates that a target is not established in this TMDL for this constituent.

Figure 3-6 Map of Yellow and Red Zones for Fish

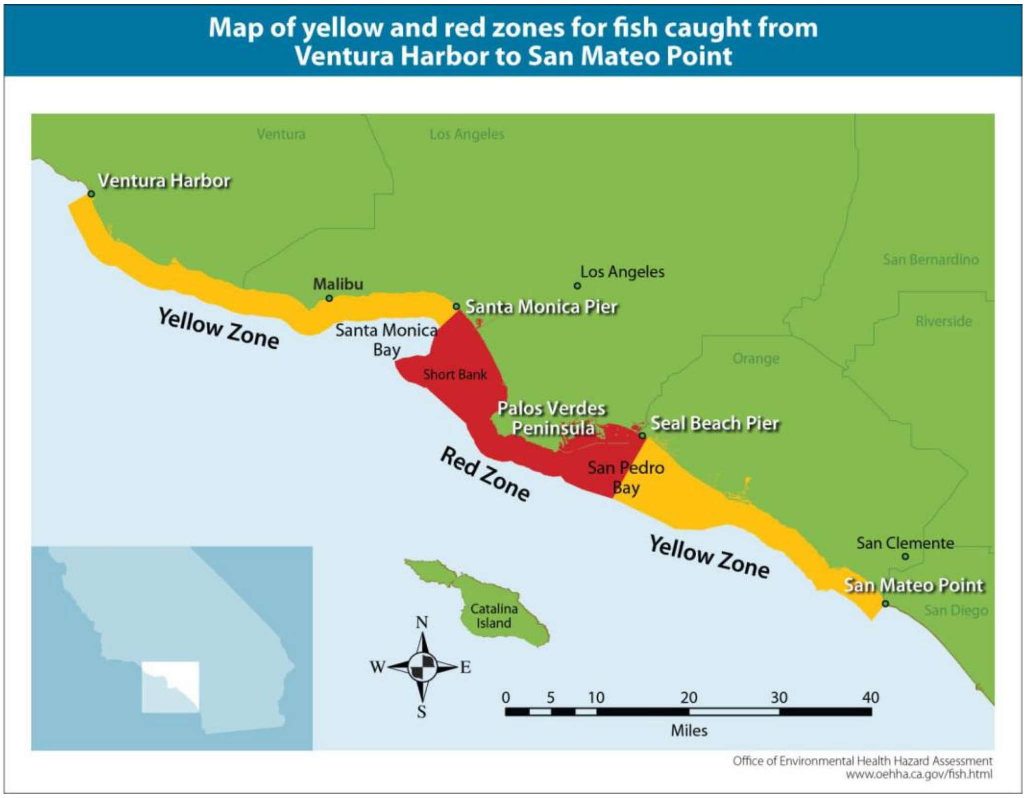


Figure taken from OEHHA, 2009. Health Advisory and Safe Eating Guidelines for Fish from Coastal Areas of Southern California: Ventura Harbor to San Mateo Point

3.2.5.1 Recommendations fish targets

Staff recommends that fish tissue targets and associated sediment targets be included in the Ballona Creek Estuary Toxics TMDL. The loading capacity, LAs, and WLAs shall be adjusted accordingly, where necessary. The fish tissue targets and associated sediment targets are consistent with other previously adopted TMDLs in the region including the Dominguez Channel and Greater Los Angeles and Long Beach Harbors Toxics TMDL.

3.2.6 Summary of Adjusted Targets and Allocations for the 2006 Toxics TMDL

Staff has recommended using the fish tissue associated sediment targets for the bioaccumulative targets, DDT, PCBs and chlordane. Therefore, the loading capacity and wasteload and load allocations are adjusted based on the fish tissue associated sediment targets shown in Table 3-19.

For the calculation of loading capacity in the 2006 toxics TMDL, the translation to pollutant specific loading capacity was calculated by multiplying the average annual deposition of 5,004 m^3/year of fine sediment, defined as silts (grain size 0.0625 millimeters) and smaller, by the numeric sediment targets. The bulk sediment density of the deposition was assumed to be 1.42

metric tons per cubic meter (mt/m^3) (Steinberger et al., 2003). The TMDL is set equal to the loading capacity. Revisions to the loading capacity was made in the same manner. The resultant loading capacity and numeric target for toxics is shown in Table 3-20.

Table 3-20 Sediment Numeric Targets and Loading Capacity

Organics	Numeric Target (µg/kg)	Loading Capacity (g/yr)
Chlordane	**1.3**	**9.2**
DDTs	**1.9**	**13.5**
Total PCBs	**3.2**	**22.7**

Mass-based load allocations (LAs) were developed for open space and direct atmospheric deposition in the 2006 TMDL and the same calculation is used here to update the LAs. Open Space refers to discharges directly to Ballona Creek or a tributary and not through the MS4 and was estimated as 0.6% of the watershed. The LA for open space was calculated by multiplying the percentage of the watershed contributing to discharges from open space by the total loading capacity. The LA for direct atmospheric deposition was developed based on the percent area of surface water, which was estimated at 0.6% of the total watershed area. The LA for atmospheric deposition was calculated by multiplying this percentage by the total loading capacity. The revised LAs for open space and direct aerial deposition for PCBs are shown in Table 3-21.

Table 3-21 Mass-based Load Allocations

Organics	Direct Aerial Deposition (kg/yr)	Open Space Capacity (g/yr)
Chlordane	**0.05**	**0.05**
DDTs	**0.08**	**0.08**
Total PCBs	**0.13**	**0.13**

Allocations for NPDES-regulated storm water discharges from multiple point sources may be expressed as a single categorical waste load allocation (WLA) when data and information are insufficient to assign each source or outfall individual allocations. The combined storm water WLAs as partitioned among the four storm water permits (Los Angeles County MS4, Caltrans, general industrial, and general construction) are provided below based on an estimate of the percentage of land area covered under each permit (Table 3-22). Waste load allocations are expressed as allowable sediment-bound pollutant load that can be deposited in the estuary.

Table 3-22 Mass-based Waste Load Allocations

Organics	General Construction permittees (g/yr)	General Industrial permittees (g/yr)	Caltrans (g/yr)	MS4 Permittees (g/yr)	Combined Stormwater (g/yr)
Chlordane	**0.25**	**0.06**	**0.12**	**8.69**	**9.13**
DDTs	**0.37**	**0.09**	**0.18**	**12.70**	**13.35**
Total PCBs	**0.62**	**0.16**	**0.30**	**21.40**	**22.48**

Each storm water permittee enrolled under the general construction or industrial storm water permits received an individual waste load allocation on a per acre basis, based on the acreage of their facility as presented in Table 3-23.

Table 3-23 Mass-based Waste Load Allocations for Individual General Construction or Industrial Storm Water permittee (per acre)

Organics	General Construction permittees (g/yr)	General Industrial permittees (g/yr)
Chlordane	**0.11**	**0.11**
DDTs	**0.16**	**0.16**
Total PCBs	**0.28**	**0.28**

Concentration-based WLAs have been developed for the minor NPDES permits and general non-storm water NPDES permits that discharge to Ballona Creek or its tributaries to ensure that these do not contribute significant loadings to the system. The concentration-based WLAs are equal to the numeric targets. All minor NPDES permittees and general non-storm water NPDES permittees shall not discharge sediments with concentrations greater than the numeric targets as listed in Table 3-20.

3.3 Other Matters to be Considered

3.3.1 Implementation Schedule

The Ballona Creek Metals TMDL and the Ballona Estuary Toxics TMDL both include targets and allocations for multiple responsible parties, including MS4 and Caltrans storm water NPDES permittees. The TMDLs also include a phased implementation schedule. The phased implementation includes requirements to gradually reduce pollutant loads by addressing increasing percentages of the total contributing drainage area.

With the recently adopted Los Angeles County MS4 permit (Order No. R4-2012-0175) and Caltrans stormwater permit (Order No. 2012-0011-DWQ), compliance determination has become more complex with Enhanced Watershed Management Programs, Watershed Management Programs and the potential for multiple monitoring groups in a single watershed.

Staff has recognized a need for additional flexibility in compliance determination. Load reductions measured at the end-of-pipe or in stream may provide stakeholders additional flexibility in terms of targeted BMP selection and design.

3.3.1.1 Recommendation

Staff recommends revising the TMDL implementation schedule to specify implementation requirements by calendar dates instead of requirements due in numbers of months or years from the effective date of the TMDL. Staff also recommends allowing compliance with interim requirements to be demonstrated either by gradual load reductions as measured by the percentage of the total drainage area addressed, or load reductions as measured at the end-of-pipe or in stream.

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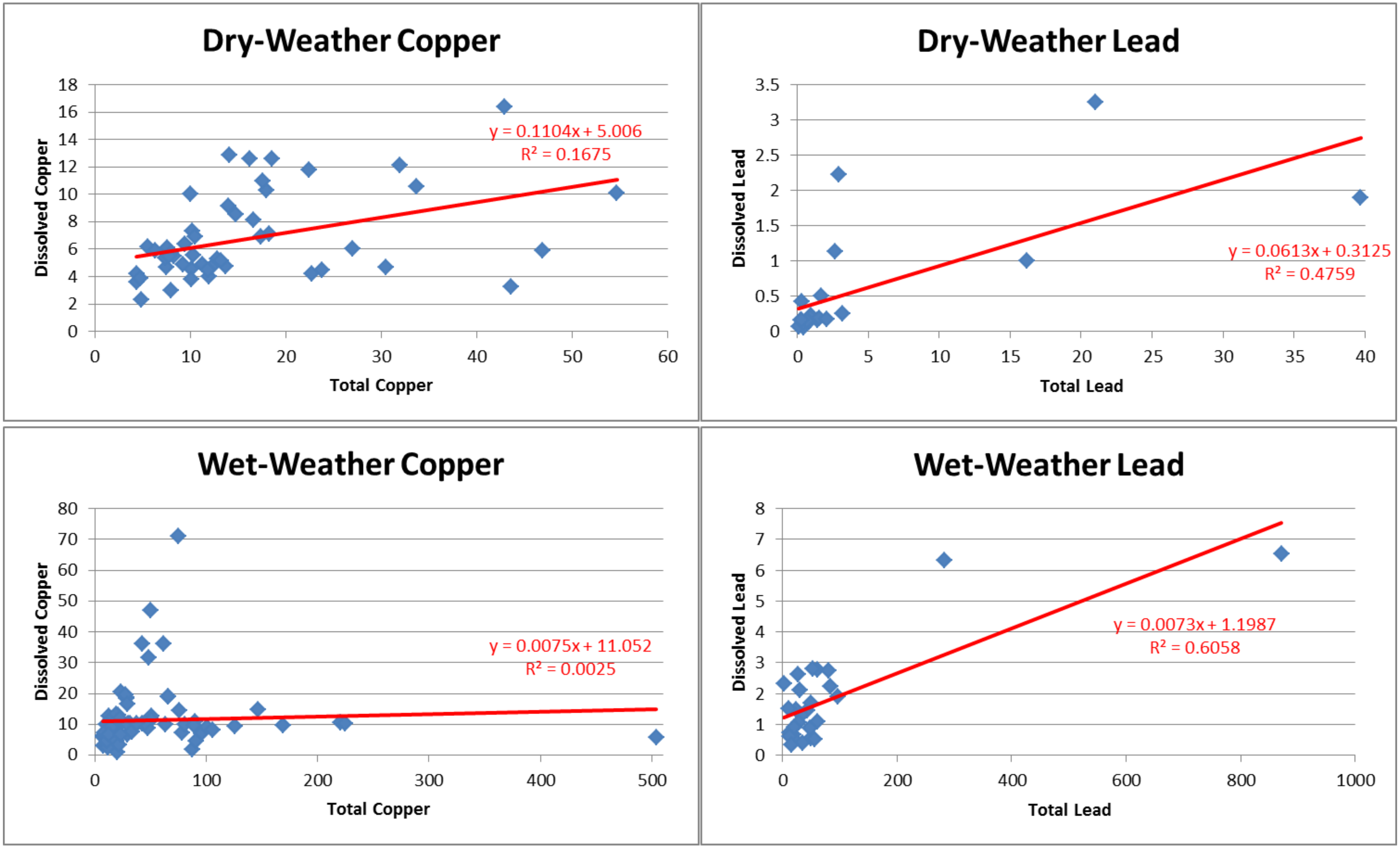
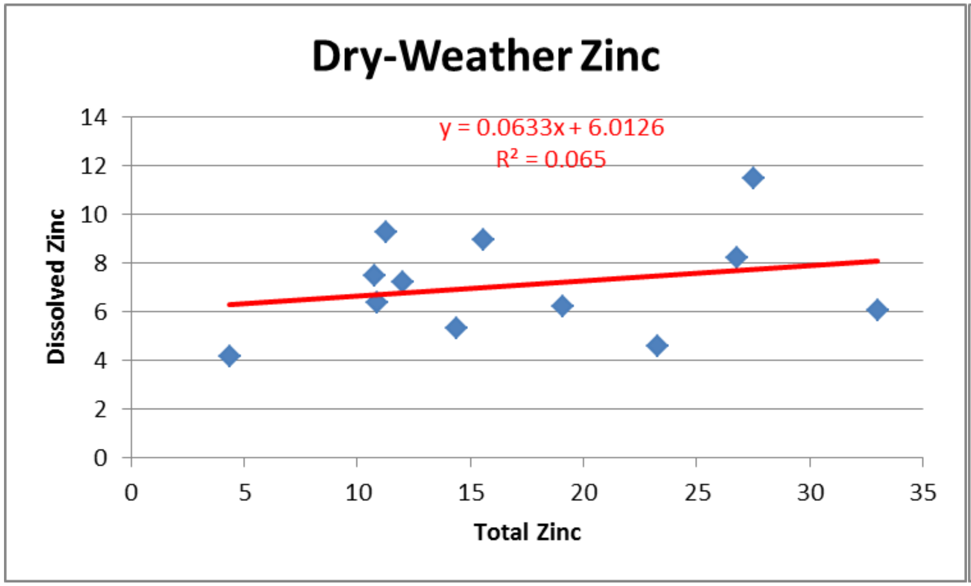
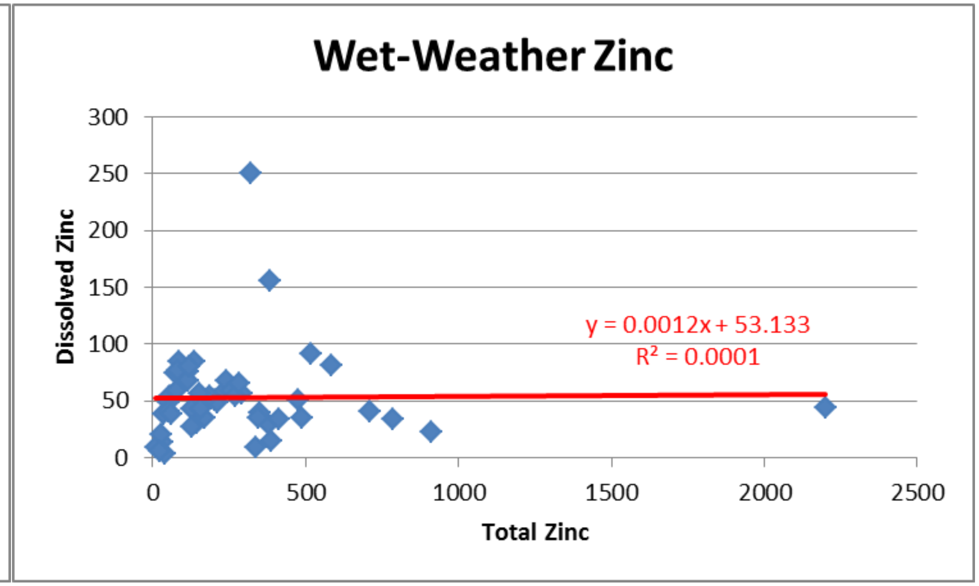
Appendix A: Metals Conversion Factor Statistics

	Dry-Weather			Wet-Weather		
	Copper	**Lead**	**Zinc**	**Copper**	**Lead**	**Zinc**
R2	0.167519	0.4758929	0.74741	0.0498468	0.00874	0.0031388
Slope	0.1104	0.0613	0.0633	0.0075	0.0073	0.0012
P-value	0.1134234	0.9887555	0.00872	0.0001548	0.02137	0.0001018

Appendix B: Total Recoverable Metals to Dissolved Metals Regression Charts




Dry-Weather Zinc
y = 0.0633x + 6.0126
R² = 0.065
Dissolved Zinc
Total Zinc
0
2
4
6
8
10
12
14
0
5
10
15
20
25
30
35


Wet-Weather Zinc
y = 0.0012x + 53.133
R² = 0.0001
Dissolved Zinc
Total Zinc
0
50
100
150
200
250
300
0
500
1000
1500
2000
2500

Appendix C: Bight 2008 Benthic Index Scores and Categorizations

Station ID	RBI Score	RBI Category	IBI Score	IBI Category	BRI Score	BRI Category	RIVPACS Score	RIVPACS Category
6508	0.359921	Reference	1	Low Disturbance	34.37145	Reference	0.558163	Moderate Disturbance
6520	0.203917	Low Disturbance	1	Low Disturbance	51.07464	Moderate Disturbance	0.281828	High Disturbance

Appendix D: CMP Data Characterization: 2007 to 2012

Receiving Water Data: 2009 to 2012							
		Copper (µg/L)		Lead (µg/L)		Zinc (µg/L)	
		Total Recoverable	Dissolved	Total Recoverable	Dissolved	Total Recoverable	Dissolved
Dry	TMDL Numeric Target	24	23	13	8.1	304	300
	Exceedance of the target	8	2	0	0	0	0
	Sample Count	100	100	100	100	100	100
Wet	TMDL Numeric Target	18	11	59	49	119	94
	Exceedance of the target	59	32	9	0	55	8
	Sample Count	62	62	62	62	62	62

Sediment Grab Data: 2007 to 2011										
	Metals					Bioaccumulatives				
	Cadmium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Silver (mg/kg)	Zinc (mg/kg)	Total Chlordane (µg/kg)	Total DDT (µg/kg)	Total PCB (µg/kg)	Total PAH (µg/kg)	Amphipod Survival % (10 day)
TMDL Numeric Target	1.2	34	46.7	1	150	0.5	1.58	22.7	4022	70
Exceedance of the target	4	7	5	4	6	3	20	2	0	24
Sample Count	36	36	36	36	36	36	36	36	36	34

Fish Tissue Data: 2012										
	Metals						Bioaccumulatives			
Species	Arsenic (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Selenium (mg/kg)	Zinc (mg/kg)	Total Chlordane (µg/kg)	Total DDTs (µg/kg)	Total PCBs (µg/kg)	Total PAHs (µg/kg)
Speckled Sanddab	NS	NS	NS	NS	NS	NS	0*	0*	0*	0*
Spotted Turbot	1.75	0.4	ND	NS3	0.69	3.49	0*	0*	0*	0*
Staghorn Sculpin	ND	0.03	ND	0.0066	0.65	5.24	0*	0*	0*	0*

*Individual isomers, cogeners, or compounds were below detection limit
NS= Not enough samples to run analysis
ND= Non-detect or below detection limits

Composite Mussel Tissue Data														
			Metals						Bioaccumulatives					
Station	Date	Species	Cadmium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Silver (mg/kg)	Zinc (mg/kg)	Total Chlordane (µg/kg)	Total DDTs (µg/kg)	Total PCBs (µg/kg)	Dieldrin (µg/kg)	Total PAHs (µg/kg)
BCE-2	12/28/2009	*Mytilus edulis*	0.300	1.48	0.37	NA	ND	25.8	0	6.5	3#	ND	0.0
	6/17/2010	*Mytilus edulis*	0.285	0.76	0.84	0.0062	ND	13.3	0	10.6	0	NA	NA
	6/21/2011	*Mytilus galloprovin cialis*	0.36	0.82	0.19	ND	ND	15.7	0	18.5	0	NA	0
BCE-4	12/28/2009	*Mytilus edulis*	0.340	1.72	0.40	NA	ND	25.3	0	3.5	0#	ND	0.0
	6/17/2010	*Mytilus edulis*	0.177	0.92	0.69	0.0075	ND	14.2	0	8.7	0	NA	0

#=Total PCB Congeners
ND= Non-detect or below detection limits
NA=Not Analyzed