



# California Regional Water Quality Control Board

## San Francisco Bay Regional Water Quality Control Board



Winston H. Hickox  
Secretary for  
Environmental  
Protection

Internet Address: <http://www.swrcb.ca.gov>  
1515 Clay Street, Suite 1400, Oakland, California 94612  
Phone (510) 622-2300 ☎ FAX (510) 622-2460

Gray Davis  
Governor

**TO:** Stan Martinson, Chief  
Division of Water Quality  
State Water Resources Control Board

**FROM:** Loretta Barsamian, Executive Officer  
**SAN FRANCISCO BAY REGIONAL  
WATER QUALITY CONTROL BOARD**

**DATE:** February 26, 2002

**SUBJECT:** Copper in San Francisco Bay Segments and the 303(d) List

---

### Summary

Due to new information, we believe it is necessary to clarify the rationale for our recommendation on de-listing copper for the segments of San Francisco Bay north of the Dumbarton Bridge. The recommendation to de-list has not changed, but the rationale has been modified. Incidentally, the modified rationale, based on water effect ratio (WER) information, shows that copper levels are below applicable thresholds of impairment in all bay segments north of the Dumbarton Bridge, *including the mouth of the Petaluma River*. As such, we withdraw our recommendation to list the mouth of the Petaluma River for copper.

The prior rationale was that there have been no exceedances of the California Toxics Rule (CTR) chronic objective for dissolved copper (3.1 ug/l) except at the mouth of the Petaluma River. In June 2001, water samples from two sites in the shoals of San Pablo Bay (SPB02 and SPB03 – see attached map for locations) slightly exceeded the chronic objective but not the acute objective of 4.8 ug/l. The values are 3.41 and 3.44 ug/l, respectively. Technically, the marine chronic criterion for dissolved copper adopted in the CTR is 3.1 ug/L *multiplied by a Water Effects Ratio or WER* (40 CFR 131.38 (b) and (c)(4)(i) and (iii)). The default value for the WER is 1.0 unless a WER has been developed as set forth in USEPA's WER guidance (USEPA, 1994<sup>1</sup>). The prior rationale used the default value of 1.0.

We continue to recommend de-listing. WERs have been developed in accordance with USEPA guidance north of the Dumbarton Bridge, and staff believes that this readily available information, existing water quality standards, and discharger commitments to pollution prevention indicate that these water bodies are not impaired by copper and are unlikely to become impaired, thus allowing copper to be de-listed for the San Francisco Bay segments at this time.

---

<sup>1</sup>US EPA, 1994. Interim Guidance on Determination and Use of Water Effect Ratios, USEPA Office of Water, EPA-823-B-94-001, February 1994.

## **Process for Regional Board Recommendations on Changes to the 303(d) List**

On November 28, 2001, the Regional Board adopted a resolution allowing the Executive Officer to transmit the staff recommendations for changes to the 303(d) list of impaired waterbodies. The staff recommendations, documented in a staff report dated November 14, 2001, are based on water quality information readily available, including information solicited from individuals, organizations, and agencies on or before May 15, 2001. Information after May 15 could be used if a study was underway and staff was notified by May 15 of pending information.

At the time of this public solicitation of water quality information, a water quality monitoring study of copper and nickel conducted by the Bay Area Clean Water Agencies (BACWA), Bay Area Stormwater Management Agencies Association (BASMAA), and Western States Petroleum Association (WSPA) was underway. The "special study" design focused on Bay segments north of the Dumbarton Bridge and was developed in cooperation with the Regional Board staff and other interested parties. The study was similar, though not as extensive, as that conducted south of the Dumbarton Bridge, which recommended site-specific objectives for copper and nickel in that Bay segment (See Table 2, below, for information about bay segments south of Dumbarton Bridge). The north of Dumbarton study was not completed by May 15, but we were notified that more information would be available after May 15 pertinent to the decision whether or not to remove copper and nickel from the 303(d) list.

## **Original Rationale for De-Listing Copper in San Francisco Bay Segments**

The staff recommendations of November 14, 2001 include a recommendation to de-list copper in San Francisco Bay segments north of the Dumbarton Bridge, based on evaluation of ambient dissolved copper concentrations against the California Toxics Rule (CTR) water quality objective of 3.1 ug/l and a default WER of 1.0. The data evaluated span 1993 to April 2001, collected by the Regional Monitoring Program (RMP) and a special study, described above. Review of these data indicated that the CTR water quality objective for copper is consistently achieved except at the mouth of the Petaluma River. The staff report noted on page 32 "Regional Board staff recommends that targeted monitoring for copper and nickel continue to ensure that beneficial uses are protected, and to document any other sites in the estuary that may be exhibiting exceedances similar to the mouth of the Petaluma River. Based on the consistently high levels documented at the Petaluma River mouth, the RMP and special study spatial coverage is not adequate conclude that unmonitored freshwater/saltwater interfaces or actively dredged river channels are meeting the water quality standards for copper and nickel." New information bore out this statement, since shoal monitoring in San Pablo Bay showed exceedances of 3.1 ug/l at two monitoring stations in June 2001.

The USEPA Technical Support Document for Water Quality-Based Toxics Control (TSD, 1991) suggests a general rule for exceedance frequency of once per three years for toxic pollutant water quality criteria based on literature on ecosystem recovery from disturbance (Appendix D, page D-5). The TSD notes that exceedances of a criterion maximum concentration (CMC or acute criterion), which is 4.8 ug/l for dissolved copper, will result in death of some organisms. No exceedances of the CMC for copper have been recorded in 466 samples since the RMP began in 1993. The TSD acknowledges that alternative exceedance frequencies may be established for

criterion continuous concentration (CCC or chronic criteria) values, but absent state guidance on the matter, we consider the USEPA default exceedance frequency in the TSD as a precautionary measure.

### **Updated Rationale for De-Listing Copper in San Francisco Bay Segments**

Available water effect ratio (WER) data support our recommendation to de-list copper. The special study, conducted at both shallow and deep-water locations shown on the attached map, indicates that WERs in the bay are higher than 1.5 and usually above 2. Table 1 contains a summary of data from this special study. As referenced above, the CTR allows the national criterion of 3.1 ug/l to be multiplied by the WERs developed in accordance with USEPA guidance to generate applicable thresholds of impairment. Accordingly, a site-specific objective for copper based on WERs does not have to be adopted in the Basin Plan before the State Board can de-list based on the available information and the CTR at 40 CFR 131.38 (b)(1), footnote i, and (c)(4)(i) and (iii).

Available ambient dissolved copper concentrations in the estuary never exceed the most conservative WER-based objectives. This statement is also true for the mouth of the Petaluma River, and as such, we do not recommend that it be listed for copper. For example, out of 50 WERs recently generated based on USEPA guidance in the special study described above, if the lowest 5<sup>th</sup> percentile WER of 1.7 were used, the CTR marine chronic objective for dissolved copper would be 5.3 ug/l, which has not been exceeded in 466 samples in the San Francisco Estuary since the RMP began in 1993. The highest recorded dissolved copper concentration in the RMP was 4.77 ug/l at the mouth of the Petaluma River in 1995. The two new data points from the San Pablo Bay shoals do not exceed the WER-based chronic objective, nor the acute objective of 4.8 ug/l, the latter of which should not be exceeded more than once in three years, according to USEPA (TSD, 1991<sup>2</sup>).

The WERs demonstrate that bay waters consistently render copper less toxic than in lab waters, and justify a site-specific objective(s) for copper in San Francisco Bay segments that is(are) higher than 3.1 ug/l. Since the information is available now to support a finding that the water quality standard for copper is met in the San Francisco Estuary north of the Dumbarton Bridge, but numeric site-specific objective(s) is (are) not established, our de-listing recommendation is accompanied by a recommendation to establish a site-specific objective(s) based on the latest scientific information. Also, as stated in the November 14, 2001 staff report, de-listing must be accompanied by commitments by dischargers to copper pollution prevention to meet the antidegradation portion of the water quality standard.

---

<sup>2</sup>USEPA, 1991. Technical Support Document for Water Quality-based Toxics Control. EPA/505/2-90-001. PB91-127415. March 1991.

**Table 1 - Comparison of Calculated Site Specific Dissolved Copper Water Quality Objectives with Ambient Dissolved Copper Concentrations**

Station		Event 1 - Sept. Dry			Event 2 - Feb. Wet			Event 3 - Apr. Spg.			Event 4 - June Dry		
		WER	Calc. SSO (ug/L)	Diss. Cu (ug/L)	WER	Calc. SSO (ug/L)	Diss. Cu (ug/L)	WER	Calc. SSO (ug/L)	Diss. Cu (ug/L)	WER	Calc. SSO (ug/L)	Diss. Cu (ug/L)
Central Bay	BA40	2.7	8.4	2.9	4.2	13.0	2.7	2.7	8.4	2.5	3.1	9.7	2.9
	BB15	2.4	7.5	2.9	3.2	10.0	2.1	2.7	8.3	2.1	2.5	7.8	2.0
	LCB01	2.5	7.8	2.5	4.7	14.4	2.7	2.4	7.6	2.8	2.4	7.4	2.5
	LCB02	2.4	7.5	2.8	5.2	16.1	3.0	2.8	8.6	2.8	2.2	6.7	2.5
	BB30	2.5	7.8	2.6	3.5	10.8	2.2	2.4	7.4	1.6	2.4	7.5	1.7
	BC10	2.2	6.9	1.9	2.6	8.0	1.3	2.4	7.4	1.3	1.8	5.7	1.3
North Bay	BD20	2.2	6.8	2.5	2.6	7.9	1.9	2.0	6.2	1.5	1.5	4.8	2.1
	SPB01	2.0	6.2	2.5	2.6	8.1	2.4	2.9	9.0	1.8	2.0	6.3	2.5
	BD15	2.7	8.4	4.2	5.3	16.5	4.3	3.4	10.5	3.6	2.4	7.5	3.8
	SPB02	1.7	5.3	2.8	3.2	9.9	2.0	2.4	7.4	1.9	2.2	7.0	3.4
	SPB03	1.7	5.4	2.8	2.5	7.6	2.0	2.7	8.3	2.0	2.1	6.5	3.4
	BF10	2.5	7.9	2.8	3.5	10.9	2.5	3.1	9.6	2.3	*	*	2.7
	BF20	1.7	5.2	2.8	3.2	9.9	2.6	1.6	5.0	2.2	*	*	2.3

Calculated SSO = WER x 3.1 ug/L

\* suspect data under investigation

**TABLE 2 – RATIONALE FOR LISTING OR DE-LISTING**

Water Body	Hydrologic Basin	Pollutant	Recommended Action	303(d) Listing or De-Listing Rationale	Total Samples	Monitoring Dates	Data Source(s)
San Francisco Bay Segments North of the Dumbarton Bridge - Channel <sup>3</sup>	Suisun Basin, San Pablo Basin, Central Basin, South Bay Basin	Copper	De-List	<p>Since March 1993, there have been 2 exceedances of the 3.1 ug/l objective at Redwood Creek in 1994. The arithmetic mean of all samples for channel stations is 1.6 ug/L during this time period. However, there have been 10 measurements between 2.7 ug/L and 3.1 ug/L during this time. These occurred at the San Bruno Shoal, Napa River, Redwood Creek, Pacheco Creek, and Oyster Point stations. There have been no exceedances of the acute dissolved objective 4.8 ug/l.</p> <p>From 50 Water Effect Ratios developed in accordance with EPA guidance, the lower 5<sup>th</sup> percentile value of 1.7 yields a CTR objective of 5.3 ug/l, which has not been exceeded in any shoal or channel monitoring conducted since 1993.</p>	286	3/93 – 6/01	RMP and Special study

<sup>3</sup> RMP stations North of Dumbarton Bridge with depth > 3 meters: BF10 Pacheco Creek, BD50 Napa River, BD40 Davis Point, BD30 Pinole Point, BD20 San Pablo Bay, BC60 Red Rock, BC30 Richardson Bay, BC20 Golden Gate, BC10 Yerba Buena Island, BB70 Alameda, BB30 Oyster Point, BB15 San Bruno Shoal, and BA40 Redwood Creek.

Water Body	Hydrologic Basin	Pollutant	Recommended Action	303(d) Listing or De-Listing Rationale	Total Samples	Monitoring Dates	Data Source(s)
San Francisco Bay Segments North of the Dumbarton Bridge - Shoals <sup>4</sup>	Suisun Basin, San Pablo Basin, Central Basin, South Bay Basin	Copper	De-List	<p>Since March 1993, there have been 18 exceedances of the 3.1 ug/l objective – mostly at the Petaluma River station. Samples at 2 shallow water special study stations in San Pablo Bay recently exceeded the objective. Additionally, there were 10 measurements between 2.7 ug/L and 3.1 ug/L, and these occurred at Grizzly Bay and the recent special study shallow water stations in San Pablo Bay and Lower SF Bay. The arithmetic mean of all samples for all shallow water stations is 2.2 ug/L during this time period. There have been no exceedances of the acute dissolved objective 4.8 ug/l.</p> <p>From 50 Water Effect Ratios developed in accordance with EPA guidance, the lower 5<sup>th</sup> percentile value of 1.7 yields a CTR objective of 5.3 ug/l, which has not been exceeded in any shoal or channel monitoring conducted since 1993.</p>	102	3/93 – 6/01	RMP and Special study

<sup>4</sup> RMP and special study stations North of Dumbarton Bridge with depth <= 3 meters: BF40 Honker Bay, BF20 Grizzly Bay, BD15 Petaluma River, BC41 Point Isabel, two special study Lower San Francisco Bay shallow or shoal stations, three special study San Pablo Bay shallow stations.

Water Body	Hydrologic Basin	Pollutant	Recommended Action	303(d) Listing or De-Listing Rationale	Total Samples	Monitoring Dates	Data Source(s)
San Francisco Bay, Central - Channel <sup>5</sup>	Central Basin	Copper	De-List	<b>De-list Central SF Bay segment.</b> Since March 1993, there have been <b>no</b> exceedances of the 3.1 ug/l objective. There were no measurements greater than 2.2 ug/L in this Bay segment during this time period, and the arithmetic mean of all samples for central SF Bay stations is 1.0 ug/L.	84	3/93 - 6/01	RMP and Special study
San Francisco Bay, Central - Shoal (Point Isabel only)	Central Basin	Copper	De-List	<b>De-list Central SF Bay segment including shoals.</b> Since March 1993, there have been <b>no</b> exceedances of the 3.1 ug/l objective at this station. There were no measurements greater than 2.0 ug/L at this station, and the arithmetic mean of all samples for this station is 1.2 ug/L during this time period.	21	3/93 - 7/99	RMP data

<sup>5</sup> RMP central bay stations: BC60 Red Rock, BC41 Point Isabel, BC30 Richardson Bay, BC20 Golden Gate, and BC10 Yerba Buena Island.

Water Body	Hydrologic Basin	Pollutant	Recommended Action	303(d) Listing or De-Listing Rationale	Total Samples	Monitoring Dates	Data Source(s)
San Francisco Bay Segments North of the Dumbarton Bridge	Suisun Basin, San Pablo Basin, Central Basin, South Bay Basin	Nickel	De-List	<p><b>Using CTR 8.2 ug/L dissolved as standard: De-list all SF Bay segments North of Dumbarton Bridge except for segment including mouth of Petaluma River.</b> Since March 1993, there have only been 4 exceedances of the CTR objective of 8.2 ug/L dissolved. All of these were at the Petaluma River Station. The most recent exceedance occurred in February 2001 and was twice the Basin Plan objective.</p> <p><b>Using 1986 Basin Plan 7.1 ug/L total as standard: <u>List</u> all SF Bay segments North of Dumbarton Bridge except for segment including mouth of Petaluma River.</b> Since March 1993, there have been 102 exceedances of the current Basin Plan objective of 7.1 ug/L total nickel. Of these exceedances, there have been 9 at Davis Point, 13 at Grizzly Bay, 9 at Honker Bay, 13 at Napa River, 19 at Petaluma River, 10 at San Pablo Bay. 36 exceedances in 1998-99 alone. Staff believe that the 1986 Basin Plan objective is technically outdated.</p>	467	3/93 – 4/01	RMP and Special study
South San Francisco Bay (south of the Dumbarton Bridge)	Santa Clara Basin	Copper	De-List	<p><b>Using proposed site-specific objective of 6.9 ug/l dissolved, De-list South San Francisco Bay south of the Dumbarton Bridge.</b> 0 out of 690 samples exceed this proposed SSO. If CTR value of 3.1 ug/l dissolved (WER=1.0) is used, then 35% of samples exceed and the listing would be retained.</p>	690	2/97 – 12/00	San Jose Copper and Nickel Study



Water Body	Hydrologic Basin	Pollutant	Recommended Action	303(d) Listing or De-Listing Rationale	Total Samples	Monitoring Dates	Data Source(s)
South San Francisco Bay (south of the Dumbarton Bridge)	Santa Clara Basin	Nickel	De-List	Using proposed site-specific objective of 12 ug/l dissolved, De-list South San Francisco Bay south of the Dumbarton Bridge. 0.17% of samples (1 of 604) exceed this objective (once in three years, in compliance with standard). If CTR value of 8.2 ug/l dissolved is used, then 1% of samples (6 out of 604) exceed and the listing would be retained.	604	2/97 – 12/00	San Jose Copper and Nickel Study