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Clean Estuary Partnership

North of Dumbarton Bridge Copper and Nickel Site-Specific Objectives State Implementation Policy Justification Report

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Table of Contents

Appendices

List of Tables

List of Figures

GLOSSARY OF ACRONYMS

µg/L	Micrograms per liter, or parts per billion
AMEL	Average Monthly Effluent Limit
Ave.	Average
BACWA	Bay Area Clean Water Agencies
BAPPG	Bay Area Pollution Prevention Group
BASMAA	Bay Area Stormwater Management Agencies Association
BMP	Best Management Practice
BOD	Biological Oxygen Demand
CFR	Code of Federal Regulations
CMSA	Central Marin Sanitation Agency
CTR	California Toxics Rule
Cu	Copper
CV	Coefficient of variation
EBDA	East Bay Discharger's Association
EBMUD	East Bay Municipal Utility District
ECA	Effluent Concentration Allowance
EOA	Eisenberg, Olivieri, and Associates
ERS	Electronic Reporting System
FSSD	Fairfield Suisun Sanitary District
g/day	Grams per day
GE	General Electric
I/I	Inflow & Infiltration
IPBL	Interim performance-based effluent limits
LGVSD	Las Gallinas Valley Sanitary District
LTA	Long-term average
MDEL	Maximum Daily Effluent Limit
MEC	Maximum Effluent Concentration
MGD	Million gallons per day
MMWD	Marin Municipal Water District
NDB	North of Dumbarton Bridge
Ni	Nickel
NPDES	National Pollutant Discharge Elimination System
P2	Pollution Prevention
POTW	Publicly Owned Treatment Works
RMP	Regional Monitoring Program
RO	Reverse Osmosis
RWQCB	Regional Water Quality Control Board
SD	Sanitary District
SEED	School Environmental Education Docents
SF	San Francisco
SFO	San Francisco Airport
SIP	Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California; aka State Implementation Policy
SSO	Site-Specific Objective
TOC	Total Organic Carbon
TSS	Total Suspended Solids
US EPA	United States Environmental Protection Agency
WQO	Water Quality Objective
WWTP	Wastewater Treatment Plant

EXECUTIVE SUMMARY

Introduction

Site-specific saltwater aquatic life-based water quality objectives for copper and nickel in the San Francisco Bay north of the Dumbarton Bridge are being considered to modify the existing objectives contained in the amended Basin Plan. The results from the studies performed to date indicate that existing saltwater objectives for copper and nickel should be modified to reflect the best available scientific information pertaining to the toxicity of those metals to aquatic organisms in San Francisco Bay. As part of the process of considering adoption of site-specific objectives, the Regional Water Quality Control Board (RWQCB) must present technical and administrative documentation to support adoption of the proposed site-specific objectives (SSOs) to meet the requirements in the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (State Implementation Policy or SIP), dated March 2001.

Case Studies

The proposed SSOs will be applicable the San Francisco Bay north of the Dumbarton Bridge. Therefore, to address these SIP SSO request requirements, three (3) north of Dumbarton Bridge (NDB) municipal agencies were selected as representative examples of the 40 plus agencies that discharge treated wastewater NDB. The three agencies selected include: (1) a small, shallow water secondary treatment discharger, (2) a medium shallow water advanced secondary treatment discharger, and (3) a large deepwater secondary treatment discharger, respectively. To demonstrate that these three dischargers are reasonably representative of other NDB dischargers, available effluent copper and effluent nickel data from the period 2001 through 2003 from all NDB dischargers was compiled from the RWQCB's Electronic Reporting System (ERS).

To address SIP protocols, existing final effluent limits and potential future effluent limits for copper and nickel were obtained/calculated for each facility, based on existing water quality objectives for copper and nickel. Current effluent quality was compared with these effluent limits to establish the ability to comply and thus the need for SSOs for the three representative agencies. Additionally, an overview analysis of other NDB dischargers was made to validate that the compliance assessment for the three pilot facilities represented the full suite of potentially impacted agencies.

Final Effluent Limit Calculations and Translators

Final average monthly effluent limits (AMELs) and maximum daily effluent limits (MDELs) derived from existing copper and nickel objectives were calculated to be used as the baseline for evaluating whether the three representative treatment plants will be able to comply with them. Translator selection is an important variable.

Ability to comply with final effluent limits in Infeasibility Studies has been determined by comparing the final CTR/SIP based effluent limits to the observed maximum effluent concentration (MEC) and/or the statistically projected maximum.

For copper, none of the case study facilities could consistently comply with final CTR based copper effluent limits calculated with the translators used for the latest NPDES permits. It can be estimated that LGVSD would exceed a 3.4 µg/L limit 100% of the time. FSSD would exceed its 4.8 µg/L limit about 40% of the time. EBMUD would exceed its 7.6 µg/L limit about 75% of the time. This is consistent with the fact that each facility already has interim copper effluent limits given the demonstrated inability to comply with final effluent limits documented in their respective Infeasibility Studies. If updated translators were to be used based on pooled North of Dumbarton study and associated RMP station data, they would still be in non-compliance with calculated copper final limits

For nickel, these three facilities appear as though they could comply with final CTR based effluent limits calculated with the translators used for the latest NPDES permits. This is consistent with the fact that each discharger has final nickel effluent limits in their permits.

Overview Compliance Analysis of Full Suite of NDB Dischargers

For nickel, the three case study plants examined do not exhibit compliance problems with effluent limits derived from the existing nickel objectives. However, examination of effluent data for the full suite of NDB dischargers reveals that potential compliance problems would exist for several industrial dischargers. An additional consideration is that many (over 20) municipal and industrial plants have maximum observed effluent concentrations that exceed the current objective of 8.2 µg/L. This creates a reasonable potential determination under the SIP, necessitating effluent limits and pollutant minimization activities. If site-specific nickel objectives based on best available scientific information were adopted, between 7 to 15 of these plants would not have effluent limits and would not have the incumbent pollutant minimization responsibility.

Existing Treatment & Source Control Measures

Information is presented on each of the three representative discharger's wastewater treatment plant and reclamation facilities and on their source control and pollution prevention programs. The feasibility and cost of potential additional measures required to achieve compliance are also evaluated.

Potential Measures & Economic Impacts to Achieve Compliance

All three facilities also have long-established and well performing source control and pollution prevention programs in place. The majority of influent copper is these and most systems is believed to be a function of the relative corrosivity of the potable water supply and corrosion of copper piping and plumbing fixtures.

Reverse Osmosis is a treatment technology that forces effluent through a very fine molecular sieve, under pressure, to remove contaminants. The byproduct of reverse osmosis is concentrated brine that can (depending on its composition) require treatment as a hazardous waste. The estimated additional annual treatment cost (in 2004 costs) for reverse osmosis treatment at these three facilities is $116 million per year.

Based on the expense of RO, it is appropriate to pursue development and adoption of one or more SSO for copper for the Bay north of the Dumbarton Bridge. This would provide Bay-wide consistency with the fact that similar SSOs for copper and nickel previously been adopted for the Bay south of the Dumbarton Bridge.

Conclusions

This analysis addresses the SIP Section 5.2 requirements that the Regional Board must address in its consideration of site-specific copper and nickel objectives in San Francisco Bay North of Dumbarton Bridge. This analysis illustrates a number of municipal and industrial dischargers operating secondary or advanced secondary treatment plants will suffer compliance problems and unreasonable costs to comply with effluent limits based on existing water quality objectives for copper in San Francisco Bay. Industrial plants may suffer compliance problems relating to nickel. Effluent data and probable effluent limits presented in the above report illustrate the breadth and magnitude of compliance problems.

As a result of the above analysis, and in combination with the findings of the site-specific objectives derivation, it is concluded that action to consider and adopt science-based site-specific copper and nickel saltwater objectives for San Francisco Bay north of the Dumbarton Bridge is warranted and complies with requirements of the SIP and other regulatory requirements.

1. INTRODUCTION

Bioavailability and toxicity of copper and nickel are dependent on site-specific factors such as pH, hardness, suspended solids, dissolved oxygen (i.e., Redox state), dissolved carbon compounds, salinity, and other constituents. Because of the potential for spatial inaccuracies in the national aquatic-life criterion, USEPA has provided guidance concerning three procedures that may be used to convert a national criterion into a site-specific criterion [USEPA, 1994]. One of these, the Indicator Species procedure, is based on the assumption that characteristics of ambient water may influence the bioavailability and toxicity of a pollutant. Acute toxicity in site water and laboratory water is determined in concurrent toxicity tests using either resident species or acceptable sensitive non-resident species that can be used as surrogates for the resident species. The ratio of the ambient to the laboratory water toxicity values, deemed a water effects ratio (WER), can be used to convert a national concentration criterion for a pollutant to a site-specific concentration criterion (or site-specific objective (SSO) in California terminology).

Several prior studies of San Francisco Bay, plus Regional Monitoring Program (RMP) data from 1993 through 1998, have provided evidence that the Bay may not be impaired by ambient levels of dissolved copper and nickel, and that SSOs may be appropriate for the Bay. Calculating proper SSOs will help dischargers establish more reasonable compliance goals.

Site-specific saltwater aquatic life-based water quality objectives for copper and nickel in the San Francisco Bay north of the Dumbarton Bridge are being considered to modify the existing objectives contained in the amended Basin Plan. Site-specific objectives have been developed based on scientific studies performed in accordance with protocols established by USEPA. The results from the studies performed to date indicate that existing saltwater objectives for copper and nickel should be modified to reflect the best available scientific information pertaining to the toxicity of those metals to aquatic organisms in San Francisco Bay. The site-specific studies and resulting site-specific objectives are described in detail in a separate document (SSO Derivation Report, 2004).

As part of the process of considering adoption of site-specific objectives, the Regional Water Quality Control Board (RWQCB) must present technical and administrative documentation to support adoption of the proposed site-specific objectives (SSOs) to meet the requirements in the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (State Implementation Policy or SIP), dated March 2001.

The SIP Section 5.2 (3) requires specific information when dischargers are requesting that the RWQCB develop and adopt SSOs. This information must demonstrate:

"that the discharger cannot be assured of achieving the criterion or objective and/or effluent limitation through reasonable treatment, source control, and pollution prevention measures. This demonstration may include, but is not limited to, as determined by the RWQCB:

- *(a) an analysis of compliance and consistency with all relevant federal and State plans, policies, laws and regulations;*
- *(b) a thorough review of historical limits and compliance with those limits;*
- *(c) thorough review of current technology and technology-based limits; and*

(d) an economic analysis of compliance with the priority pollutant criterion or objective of concern."

The purpose of this document is to provide information to address the above requirements.

2. SIP SECTION 5.2 (3), ITEM (a)

Item (a) above is addressed by the fact that all the involved dischargers to San Francisco Bay are currently operating their wastewater treatment facilities as required by the terms and conditions of their NPDES permits. These NPDES permits implement the federal and State plans, policies, laws, and regulations relevant to these discharges. Items (b), (c), and (d) above are addressed in the remainder of this section.

3. SIP SECTION 5.2 (3), ITEMS (b) AND (c)

The ability to comply with effluent limits for copper and nickel is dependent on two factors: (1) effluent quality for the level of treatment provided and (2) the magnitude of dilution factors and translator values used in the derivation of effluent limits.

3.1 Effluent Quality for the Level of Treatment Provided

As a first step, available effluent data was assembled and analyzed to develop an overall perspective on the performance of Bay area municipal and industrial treatment plants. This information is summarized in the following figures and tables.

Table 1 identifies the secondary treatment, advanced secondary treatment, and industrial plants. **Figure 1** depicts effluent data from secondary and advanced secondary municipal treatment plants discharging to San Francisco Bay. The boxes plots present the median, the 25^{th} percentile, the 75^{th} percentile, extreme values and outliers. The lower and upper boundaries of the box represent the 25^{th} and 75^{th} percentiles, respectively. The horizontal line inside the box represents the median. The length of the box corresponds to the inter-quartile range, which is the difference between the 75^{th} and 25^{th} percentiles. The box plot includes two categories of cases with outlying values. Cases with values that are more than three box-lengths from the upper or lower edge of the box are designated extreme values and are shown with asterisks. Cases with values that are between 1.5 and 3 box-lengths from the upper or lower edge of the box are outliers and shown with circles. The largest and smallest observed values that are not outliers are also shown. Lines (referred to as whiskers) are drawn from the ends of the box to these values.

Table 1. Treatment Plant Categories

Secondary	Advanced Secondary	Industrial
City of Benicia	Fairfield-Suisun Sewer District	Chevron Richmond Refinery
Burlingame	Mt. View Sanitary District	ConocoPhillips (at Rodeo)
Central Contra Costa	Palo Alto	Dow Chemical Company Permit
Delta Diablo Sanitation District	Petaluma Permit	General Chemical Permit
Dublin San Ramon Services District Permit	San Jose & Santa Clara	General Electric Company
EBDA	South Bay System Authority	GWF E 3rd St (Site I) Permit
EBMUD	Sunnyvale	GWF Nichols Rd (Site V) Permit
Las Gallinas Valley SD Permit		Martinez Refining Company
Millbrae		Morton Permit
Novato Sanitary District Permit:		Rhodia Basic Chemicals Permit
Pinole-Hercules		S.F.Airport, Industrial
Rodeo Sanitary District Permit		SAM Permit
S.F. Airport, Water Quality Control Plant		Tesoro Golden Eagle Refinery
San Francisco City & County Southeast		USS - Posco
San Francisco City & County Wet Weather (Bayside)		Valero Benicia Refinery
San Francisco Oceanside		
Sausalito-Marin Sanitary District Permit		
Sewerage Agency of Southern Marin Permit		
Sonoma Valley Permit		
South San Francisco & San Bruno		
Vallejo San & Flood Control District		
North San Mateo		
San Mateo City		
Pacifica Calera Creek		
Tiburon Treatment Plant Permit		
US Navy Treasure Island Permit		
West County/Richmond Permit		

Figure 1. Daily Maximum Effluent Copper and Nickel Concentrations: Secondary vs. Advanced Secondary Municipal Plants (2001 – 2003)

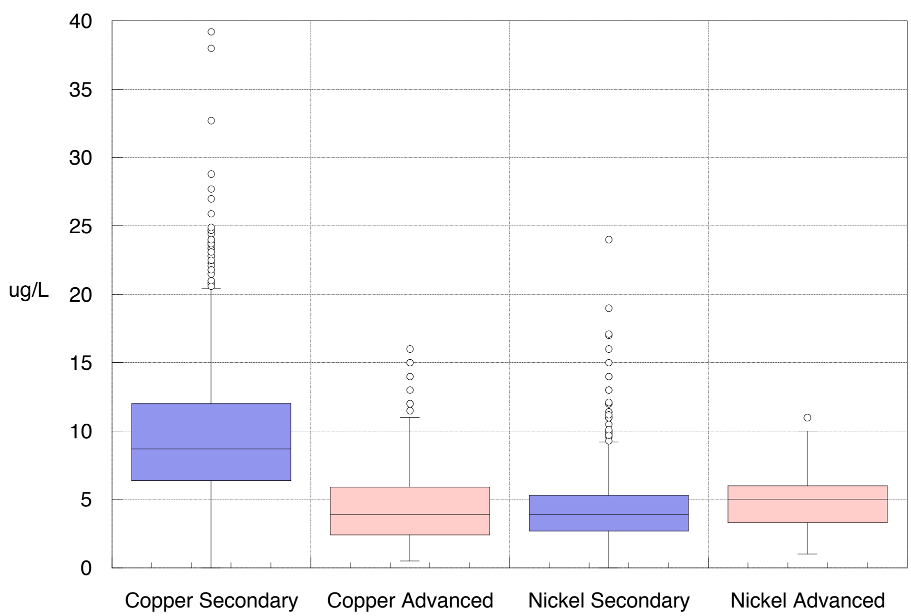
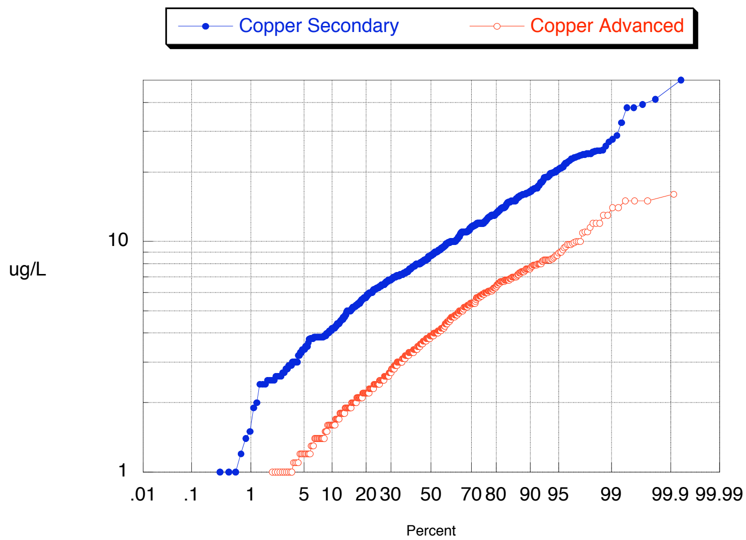
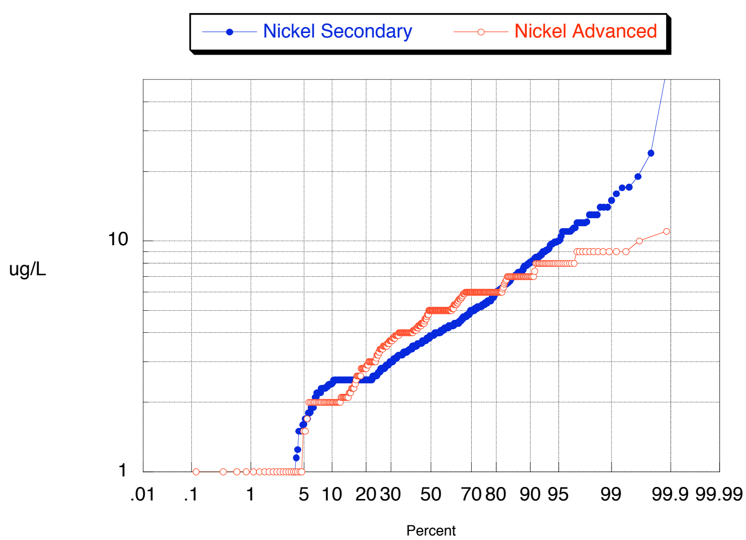


Figure 2 shows the probability plots for effluent copper and nickel from the same group of Bay area treatment plants. As shown in these figures, copper concentrations from advanced secondary plants are almost 50 percent lower than copper concentrations from secondary plants. On the other hand, effluent nickel concentrations are, for the most part, equivalent for the two treatment categories.

Figure 2. Probability Plots for Secondary and Advanced Secondary Treatment Plants (2001 – 2003)





One point (93 µg/L) shown off scale to expand view of remaining datapoints. The point was not censored, just the graph scale truncated.

The above information is derived from available data from individual plants. A listing of those plants and the current average discharge from those facilities is provided in **Table 2**. The copper and nickel effluent data for these plants is summarized in **Tables 3** and **4**.

Table 2. Dischargers Categorized by Current Average Effluent Flow

Discharger	Ave. Flow MGD	Plant Size
Morton Permit	0.027	<1 MGD
GWF E 3rd St (Site I) Permit	0.043	
GWF Nichols Rd (Site V) Permit	0.047	
General Electric Company	0.052	
Rhodia Basic Chemicals Permit	0.109	
Dow Chemical Company Permit	0.26	
General Chemical Permit	0.32	
US Navy Treasure Island Permit	0.417	
S.F. Airport, Industrial	0.69	
Tiburon Treatment Plant Permit	0.706	
S.F. Airport, Water Quality Control Plant	0.75	
Rodeo Sanitary District Permit	0.76	
ConocoPhillips (at Rodeo)	1.49	1-10 MGD
Sausalito-Marin Sanitary District Permit	1.67	
SAM Permit	1.71	
Millbrae	1.86	
Mt. View Sanitary District	1.96	
Novato: Novato Plant	2.01	
Valero Benicia Refinery	2.07	
City of Benicia	3.02	
Sewerage Agency of Southern Marin Permit	3.11	
Pinole-Hercules	3.2	
Novato Sanitary District Permit: Overall	3.25	
Sonoma Valley Permit	3.32	
Las GallinasValley SD Permit	3.34	
Pacifica Calera Creek	3.59	
Burlingame	4.02	
Tesoro Golden Eagle Refinery	4.22	
Novato: Ignacio Plant	4.49	
EBDA: San Leandro	5.45	
Martinez Refining Company	5.98	
Chevron Richmond Refinery	6.32	
North San Mateo	6.83	
Petaluma	7.3	
USS – Posco	7.6	
West County/Richmond Permit	8.87	
South San Francisco & San Bruno	9.91	
Delta Diablo Sanitation District	9.94	
Central Marin	10.43	10-30 MGD
Dublin San Ramon Services District Permit	10.52	
Sunnyvale	12.73	
San Mateo City	12.81	
EBDA: Hayward	13.07	
Vallejo San & Flood Control District	14.02	
EBDA: Castro Valley	15.37	
San Francisco Oceanside	16.38	
Fairfield-Suisun Sewer District	16.57	
South Bay System Authority	16.91	
San Francisco City & County Bayside (wet)	22.75	
Palo Alto	25.1	
EBDA: Overall	27.56	
EBDA: Union SD	29.1	
Central Contra Costa	43.89	40-75 MGD
San Francisco City & County Southeast	71.17	
EBMUD	73.49	
EBDA: E-001	74.96	
San Jose & Santa Clara	110.16	> 100 MGD

Table 3. Daily Maximum Effluent Copper (2001 – 2003)

	Concentration [µg/L]					
Discharger	Min	Max	Median	Mean	SD	n
Burlingame	4.4	38	8	9.8	7.4	34
Central Contra Costa	2	11	6.7	6.6	1.7	27
Central Marin	1.4	4.5	2.7	2.8	0.8	32
Chevron Richmond Refinery	1	15	2.2	3.5	3.4	24
City of Benicia	1.9	27	6.1	6.8	3.8	53
ConocoPhillips (at Rodeo)	1.8	20	6.4	6.7	4	32
Delta Diablo Sanitation District	2.5	16	7.5	7.6	2.1	65
Dow Chemical Company Permit	4.1	25	10	12.2	6.9	29
Dublin San Ramon Services District Permit	21	80	40	44.2	16.3	35
EBDA:	3.8	50	12.3	13.9	7	142
E-001	3.8	18.3	12.5	12.3	2.9	27
Castro Valley	3.9	19	9.6	9.7	3.2	28
Hayward	14.8	50	22.2	24.1	7.7	28
San Leandro	3.9	16.3	8.4	9.1	3.3	28
Union SD	8.1	24.7	14.5	14.3	4	31
EBMUD	3	25.9	9	10.1	5	50
Fairfield-Suisun Sewer District	2.2	9	4.2	4.4	1.4	57
General Chemical Permit	0	5	5	3.7	2.2	11
General Electric Company	5	10	10	8.3	2.4	8
GWF E 3rd St (Site I) Permit	12.2	32.8	21.8	21.9	4.3	40
GWF Nichols Rd (Site V) Permit	13.6	28	19.9	20	3.8	39
Las Gallinas Valley SD Permit	8	25	11	12.6	4.9	10
Martinez Refining Company	2	12	5	5.4	2.2	32
Millbrae	5	14	8	8.8	2.3	35
Morton Permit	1.9	30.5	5	10.6	13.3	4
Mt. View Sanitary District	2.5	8.3	4.7	5	1.4	31
North San Mateo	10	100	11	22.5	31.4	8
Novato Sanitary District Permit:	5.2	11	8.1	8.1	4.1	2
Ignacio Plant	5.2	5.2	5.2	5.2	5.2	1
Novato Plant	11	11	11	11	11	1
Pacifica Calera Creek	2.8	9.3	5.3	5.6	1.7	30
Palo Alto	3.3	11.5	6.3	6.4	1.4	139
Petaluma Permit	1.7	6	3.7	3.6	1.2	15
Pinole-Hercules	1.4	9	4.1	4.6	1.9	31
Rhodia Basic Chemicals Permit	1	22	11	10.7	6	30
Rodeo Sanitary District Permit	0	5	3.4	3.2	1.3	23
S.F. Airport, Water Quality Control Plant	1.2	14.8	6.7	7	3.6	32
S.F.Airport, Industrial	0.3	24.5	4.8	5.5	4.2	34
SAM Permit	15.3	15.3	15.3	15.3	0	1
San Francisco City & County Bayside (wet)	28.5	64.3	50.2	48.2	13.8	10
San Francisco City & County Southeast	6.3	23.8	12.8	13.7	4.2	100
San Francisco Oceanside	5.5	23.9	15.3	16	4.2	30
San Jose & Santa Clara	1.2	6.7	3.2	3.3	1.1	170
San Mateo City	3.2	14	5.6	6	2.2	30
Sausalito-Marin Sanitary District Permit	0	16	11	11.2	2.8	29
Sewerage Agency of Southern Marin Permit	8.3	24	16	15.5	3.6	29
Sonoma Valley Permit	2.9	12	7.7	7.7	1.7	57
South Bay System Authority	4	16	9.7	10.1	2.9	37
South San Francisco & San Bruno	4.6	32.7	10.3	10.6	4.8	32
Sunnyvale	0.5	4.8	1.7	1.9	1	121
Tesoro Golden Eagle Refinery	1.3	20	4	4.6	2.8	122
Tiburon Treatment Plant Permit	5.2	30	20	18.2	6.2	16
US Navy Treasure Island Permit	8.2	23.1	10.8	12.5	3.9	29
USS - Posco	2	4.7	2.5	2.7	0.8	32
Valero Benicia Refinery	1.4	13	8	7.6	2.7	68
Vallejo San & Flood Control District	3.6	11.8	6.3	6.4	1.6	40
West County/Richmond Permit	5	11	7	7.4	1.9	11

Table 4. Daily Maximum Effluent Nickel (2001 – 2003)

	Concentration [µg/L]					
Discharger	Min	Max	Median	Mean	SD	n
Burlingame	0.3	6.6	3.2	3.5	1.2	34
Central Contra Costa	0.5	3.2	1.6	1.6	0.7	27
Central Marin	3.1	7.2	4.1	4.2	0.8	32
Chevron Richmond Refinery	3	26	19.1	18.9	4.7	24
City of Benicia	2.8	8.5	4.4	4.7	1.2	51
ConocoPhillips (at Rodeo)	1.1	13	3	3.3	2.1	32
Delta Diablo Sanitation District	3.8	14	8	8.3	2.7	28
Dow Chemical Company Permit	2.7	40	10	17.1	16	29
Dublin San Ramon Services District Permit	2	5.1	2.8	2.9	0.8	30
EBDA:	5	93	5.4	7.5	7.9	139
E-001	5	19	5.3	6.6	2.9	27
Castro Valley	5	5	5	5	0	28
Hayward	5.4	93	8.6	12.5	16.2	28
San Leandro	5	9.1	5	5.6	1	28
Union SD	5	14	6.4	7.7	2.9	28
EBMUD	5	16	6.7	7.2	2.4	50
Fairfield-Suisun Sewer District	1.5	6.6	3.8	3.9	1	57
General Chemical Permit	2.6	5.5	5	4.8	0.9	8
GWF E 3rd St (Site I) Permit	7.9	58.4	15.2	16.8	7.6	48
GWF Nichols Rd (Site V) Permit	7	92.9	9.7	12.7	16.1	27
Las Gallinas Valley SD Permit	4.2	8.2	4.8	5.5	1.4	10
Martinez Refining Company	10	38	19	20.4	7.7	32
Millbrae	2.6	6.5	3.5	3.6	0.7	48
Morton Permit	1	13	10	8.5	5.2	4
Mt. View Sanitary District	1.7	5.9	3.9	3.7	1.1	20
North San Mateo	50	50	50	50	0	9
Novato Sanitary District Permit:	2.2	2.3	2.3	2.3	0.1	2
Ignacio Plant	2.2	2.2	2.2	2.2	0	1
Novato Plant	2.3	2.3	2.3	2.3	0	1
Pacifica Calera Creek	2.1	5.4	3.2	3.2	0.8	30
Palo Alto	2.8	6	4	4.2	0.8	32
Petaluma Permit	3	6.8	4.1	4.3	1	15
Pinole-Hercules	1.6	7	4.3	4.4	1.1	24
Rhodia Basic Chemicals Permit	7.2	37	20.4	20.4	10.1	10
Rodeo Sanitary District Permit	2.2	6	3.1	3.6	1.2	9
S.F. Airport, Water Quality Control Plant	0.3	5.4	2.3	2.5	0.9	32
S.F.Airport, Industrial	0.5	30	5.4	6.5	6	32
SAM Permit	3.1	3.1	3.1	3.1	0	1
San Francisco City & County Bayside (wet)	2.4	6.6	5.1	4.7	1.5	10
San Francisco City & County Southeast	0.5	17	3.7	4.1	1.8	101
San Francisco Oceanside	1.1	5	2.3	2.4	0.7	30
San Jose & Santa Clara	4	10	6	6.3	1.3	170
San Mateo City	2.8	17	4.2	5.1	3.1	30
Sausalito-Marin Sanitary District Permit	0	7.3	4.3	4.3	1.6	29
Sewerage Agency of Southern Marin Permit	3	5.2	4.3	4.3	0.6	14
Sonoma Valley Permit	1	6	2.6	3	1.4	9
South Bay System Authority	4	11	5.4	5.7	1.4	37
South San Francisco & San Bruno	3.7	17.1	5.2	6.7	3.5	32
Sunnyvale	1	5.7	2	2.1	0.9	83
Tesoro Golden Eagle Refinery	10	87	14	16.5	7.9	122
Tiburon Treatment Plant Permit	2	10	10	6.9	4.2	5
US Navy Treasure Island Permit	1.2	5.7	2.2	2.5	1.1	29
USS - Posco	2	4.7	2.5	2.7	0.8	32
Valero Benicia Refinery	3.3	100	10	12.3	9.9	135
Vallejo San & Flood Control District	2.3	3.6	2.9	2.9	0.4	38
West County/Richmond Permit	5	11	6.9	7.3	2.3	11

Copper and nickel effluent data for individual industrial plants is shown in **Figures 3** and **4**.

Figure 3. Daily Maximum Copper Concentrations in Industrial Effluent (2001 – 2003)

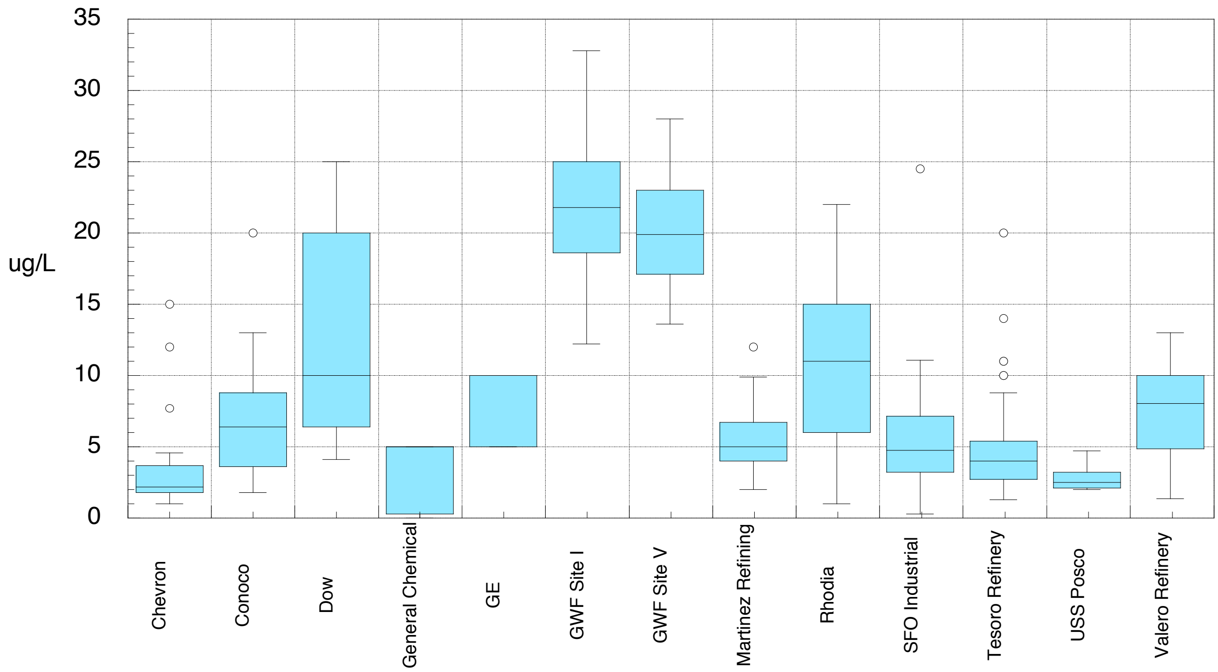


Figure 4. Daily Maximum Nickel Concentrations in Industrial Effluent (2001 – 2003)

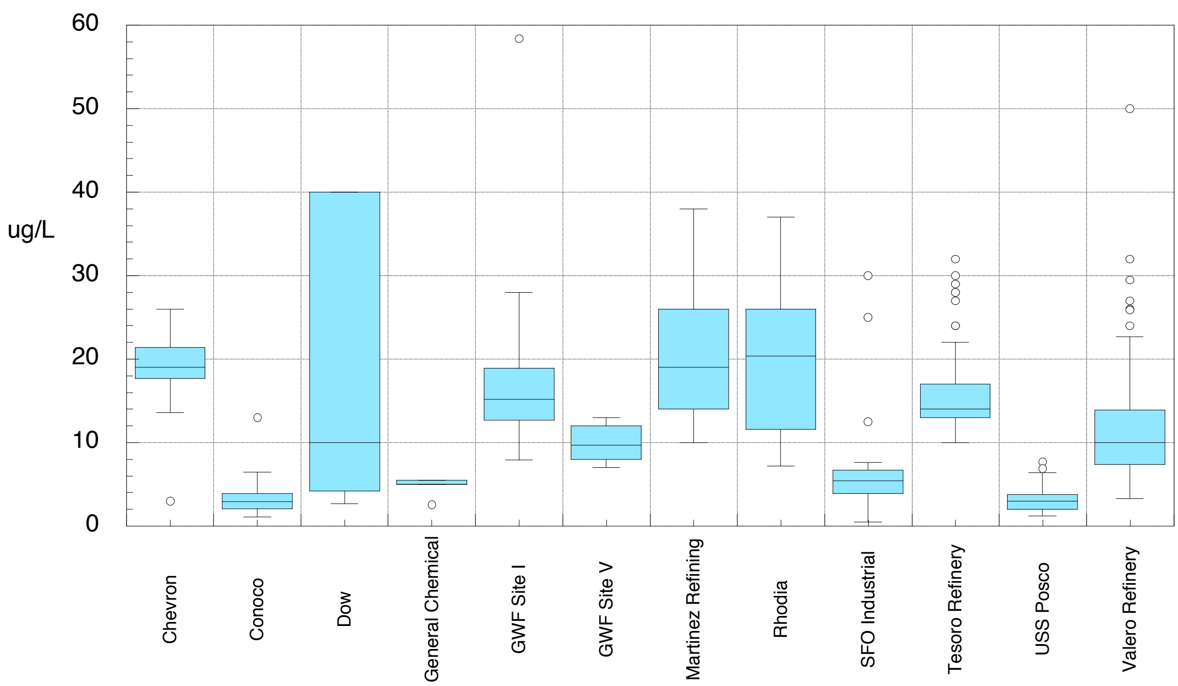


Figure 5. Probability Plots for Industrial Treatment Plants (2001-2003)

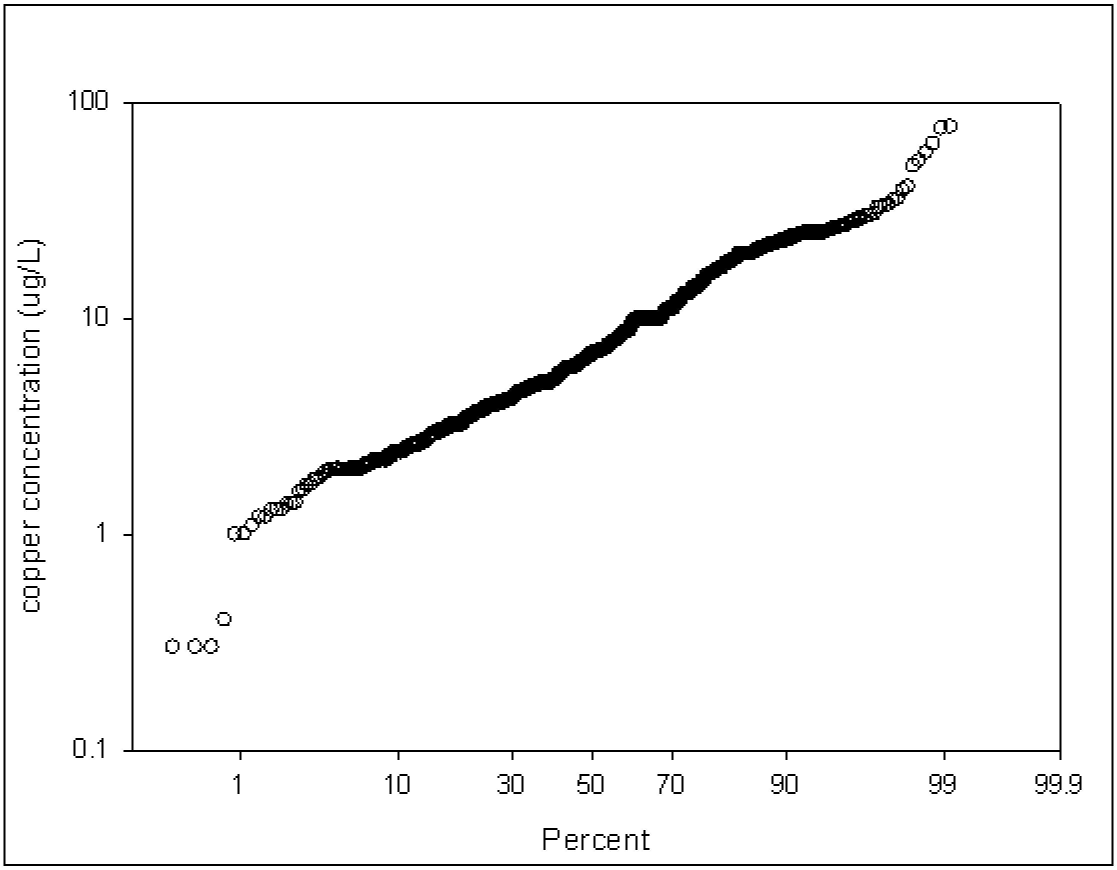
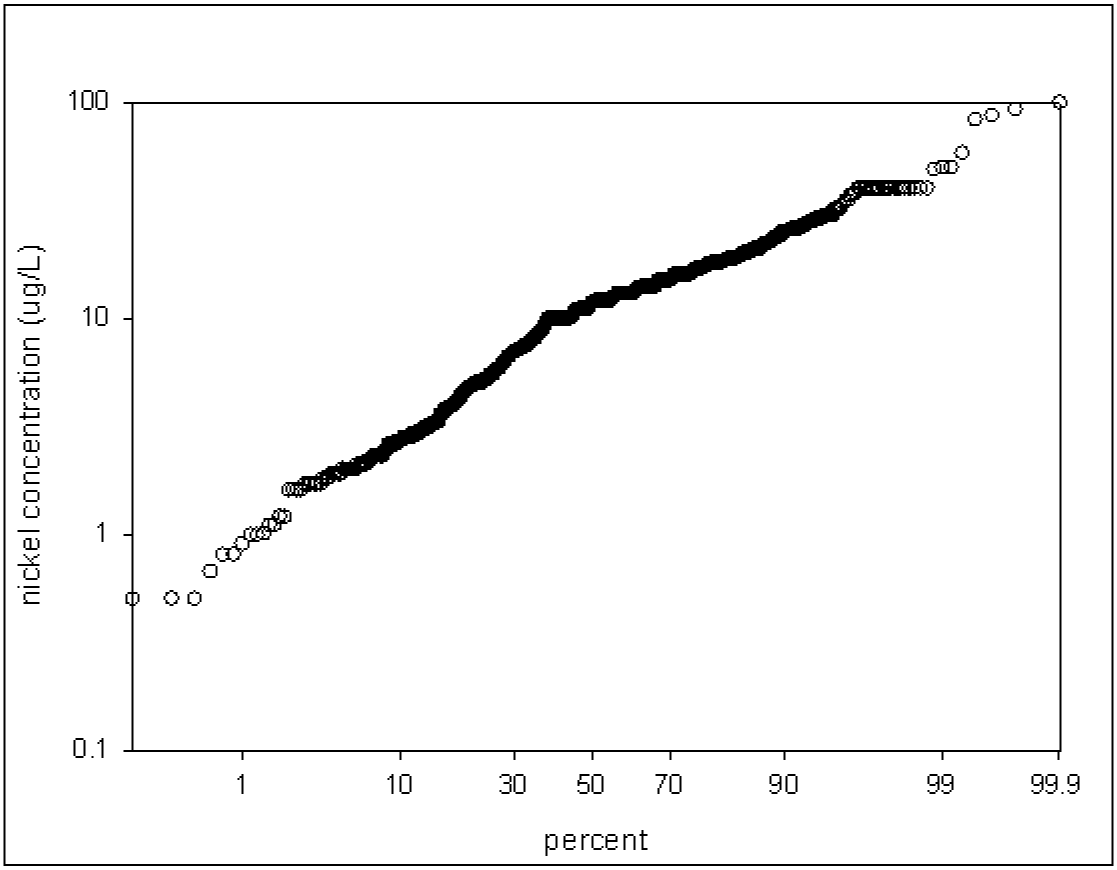


Figure 6. Probability Plots for Industrial Treatment Plants (2001-2003)



The magnitude of copper and nickel loadings from individual municipal and industrial plants to the Bay is shown in **Tables 5** and **6**.

Table 5. POTW Effluent Copper and Nickel Concentrations and Loads (2001-2003)

Discharger	Ave. Flow	Mean Cu	Cu Load	Mean Ni	Ni Load
	MGD	µg/L	g/day	µg/L	g/day
City of Benicia	3.02	6.8	78.0	4.7	53.4
Burlingame	4.02	9.8	149.7	3.5	53.1
Central Contra Costa	43.89	6.6	1091.5	1.6	262.7
Central Marin	10.43	2.8	110.5	4.2	165.8
Delta Diablo Sanitation District	9.94	7.6	285.3	8.3	310.8
Dublin San Ramon Services District Permit	10.52	44.2	1758.3	2.9	115.7
EBDA:	27.56	13.9	1452.9	7.5	780.1
E-001	74.96	12.3	3498.8	6.6	1863.1
Castro Valley	15.37	9.7	565.5	5.0	290.9
Hayward	13.07	24.1	1192.0	12.5	620.3
San Leandro	5.45	9.1	188.2	5.6	115.2
Union SD	29.1	14.3	1572.3	7.7	844.6
EBMUD	73.49	9.9	2743.0	6.6	1821.9
Fairfield-Suisun Sewer District	16.57	4.4	274.6	3.9	242.6
Las Gallinas Valley SD Permit	3.34	12.6	159.7	5.5	69.8
Millbrae	1.86	8.8	62.2	3.6	25.5
Mt. View Sanitary District	1.96	5.0	37.2	3.7	27.5
North San Mateo	6.83	22.5	581.7	50.0	1292.6
Novato Sanitary District Permit:	3.25	8.1	99.6	2.3	27.7
Ignacio Plant	4.49	5.2	88.4	2.2	37.4
Novato Plant	2.01	11.0	83.7	2.3	17.1
Pacifica Calera Creek	3.59	5.6	75.8	3.2	43.5
Palo Alto	25.1	6.4	609.2	4.2	394.3
Petaluma Permit	7.3	3.6	99.1	4.3	119.7
Pinole-Hercules	3.2	4.6	55.8	4.4	52.9
Rodeo Sanitary District Permit	0.76	3.2	9.1	3.6	10.3
S.F. Airport, Water Quality Control Plant	0.75	7.0	19.7	2.5	7.1
San Francisco City & County Southeast	71.17	13.7	3695.5	4.1	1099.9
San Francisco City & County Bayside (wet)	22.75	48.2	4146.1	4.7	405.1
San Francisco Oceanside	16.38	16.0	994.9	2.4	150.0
San Jose & Santa Clara	110.16	3.3	1362.2	6.3	2629.3
San Mateo City	12.81	6.0	291.6	5.1	248.1
Sausalito-Marin Sanitary District Permit	1.67	11.2	70.5	4.3	27.1
Sewerage Agency of Southern Marin Permit	3.11	15.5	183.0	4.3	50.9
Sonoma Valley Permit	3.32	7.7	96.7	3.0	38.0
South Bay System Authority	16.91	10.1	643.5	5.7	363.3
South San Francisco & San Bruno	9.91	10.6	398.5	6.7	251.5
Sunnyvale	12.73	1.9	92.0	2.1	102.1
Tiburon Treatment Plant Permit	0.706	18.2	48.5	6.9	18.5
US Navy Treasure Island Permit	0.417	12.5	19.7	2.5	3.9
Vallejo San & Flood Control District	14.02	6.4	341.1	2.9	153.3
West County/Richmond Permit	8.87	7.4	248.5	7.3	245.7

Table 6. Industrial Effluent Copper and Nickel Concentrations and Loads (2001-2003)

Discharger	Ave. Flow	Mean Cu	Cu Load	Mean Ni	Ni Load
	MGD	µg/L	g/day	µg/L	g/day
Chevron Richmond Refinery	6.32	3.5	83.1	18.9	451.8
ConocoPhillips (at Rodeo)	1.49	6.7	37.7	3.3	18.7
Dow Chemical Company Permit	0.26	8.8	8.7	10.9	10.7
General Chemical Permit	0.32	3.7	4.5	4.8	5.8
General Electric Company	0.052	8.3	1.6	4.8	0.9
GWF E 3rd St (Site I) Permit	0.043	21.9	3.6	16.8	2.7
GWF Nichols Rd (Site V) Permit	0.047	20.0	3.6	12.7	2.3
Martinez Refining Company	5.98	5.4	122.6	20.4	462.6
Morton Permit	0.027	10.6	1.1	8.5	0.9
Rhodia Basic Chemicals Permit	0.109	10.7	4.4	20.4	8.4
S.F. Airport, Industrial	0.69	5.5	14.5	6.5	17.1
SAM Permit	1.71	15.3	99.0	3.1	20.1
Tesoro Golden Eagle Refinery	4.22	4.6	74.1	16.5	262.9
USS - Posco	7.6	2.7	78.9	2.7	78.9
Valero Benicia Refinery	2.07	7.6	59.3	12.3	96.5

3.2 Translator Values used in the Derivation of Effluent Limits

The existing California Toxics Rule (CTR) and San Francisco Bay Basin Plan aquatic life water quality objectives for metals are expressed as dissolved concentrations. The objectives for copper are 4.8 µg/L (acute) and 3.1 µg/L (chronic), and for nickel 74 µg/L (acute) and 8.2 µg/L (chronic). However, by federal regulations (40 CFR 122.45(c)), NPDES permit limits must be expressed as total recoverable metal. Thus an additional factor, a translator, is required to convert the dissolved criteria into total recoverable effluent limits. Translators are unitless values ranging from zero to one that represent the ratio of dissolved metals concentration to total metals concentration in receiving waters:

$$\text{translator} = \frac{\text{dissolved metal concentration}}{\text{total metal concentration}}$$

The most conservative translator is a value of one, implying that all metals discharged in an effluent to a receiving water body will be present in the dissolved form. Effluent limits derived using a translator of 1.0 simply treat the CTR dissolved criteria as total recoverable values.

The next option is to use the EPA's "conversion factor" (listed in the CTR) as a default translator. The federal saltwater copper criteria conversion factor is 0.83; the nickel conversion factor is 0.99. The dissolved CTR criteria are adjusted to a total recoverable basis by dividing by these conversion factors. Effluent limits derived using the default conversion factors would be slightly higher than those based on a unity translator.

$$\text{total metal criteria} = \frac{\text{dissolved metal criteria}}{\text{translator}}$$

The third option is to develop a site-specific translator based on an analysis of receiving water samples. The SIP Section 1.4.1 describes the conditions under which site-specific translators may be used.

In *The Metals Translator: Guidance for Calculating A Total Recoverable Permit Limit from a Dissolved Criterion (June 1996)*, EPA identifies three methods for calculating a site-specific translator. One is direct measurement of the dissolved and total recoverable metal concentrations in receiving water samples. The translator can then be calculated as the ratio of dissolved to total concentrations. For the second method, if a relationship between translators and total suspended solids (TSS) is found, a translator can be calculated by developing an appropriate regression equation and plugging in a representative (EPA recommends median) TSS concentration. The third method is determination of a translator indirectly by means of a partition coefficient, which is functionally related to the number of binding sites associated with the adsorbent. The partition coefficient may be derived as a function of TSS and other factors such as pH, salinity, TOC, etc.

4. CASE STUDIES

The proposed SSOs will be applicable to the San Francisco Bay north of the Dumbarton Bridge. Therefore, to address these SIP SSO request requirements, three north of Dumbarton Bridge (NDB) municipal agencies were selected from the 40 plus agencies that discharge treated wastewater NDB. The three agencies selected include: (1) a small, shallow water secondary treatment discharger, (2) a medium shallow water advanced secondary treatment discharger, and (3) a large deepwater secondary treatment discharger, respectively. The agencies chosen to try to represent the average discharger are the Las Gallinas Valley Sanitary District (LGVSD) Wastewater Treatment Plant, the Fairfield Suisun Sewer District (FSSD), and the East Bay Municipal Utility District (EBMUD).

To demonstrate that these three dischargers are reasonably representative of other NDB dischargers, available effluent copper and effluent nickel data from the period 2001 through 2003 from all NDB dischargers was compiled from the RWQCB's Electronic Reporting System (ERS). The ERS contains data for these facilities and most other municipal and industrial NPDES dischargers to San Francisco Bay. The data were grouped into industrial, POTW secondary treatment and POTW advanced secondary treatment categories, similar to the approach used for the Regional Board's pooled mercury data effluent limit analysis (as prepared by Ken Katen, RWQCB, June 2001). The results of this effort are shown graphically in **Figures 1** and **2**. Examination of these figures indicates that the effluent quality for the three selected dischargers is reasonably representative of other facilities in their respective categories.

Figure 7. Dissolved Copper Case Study Data

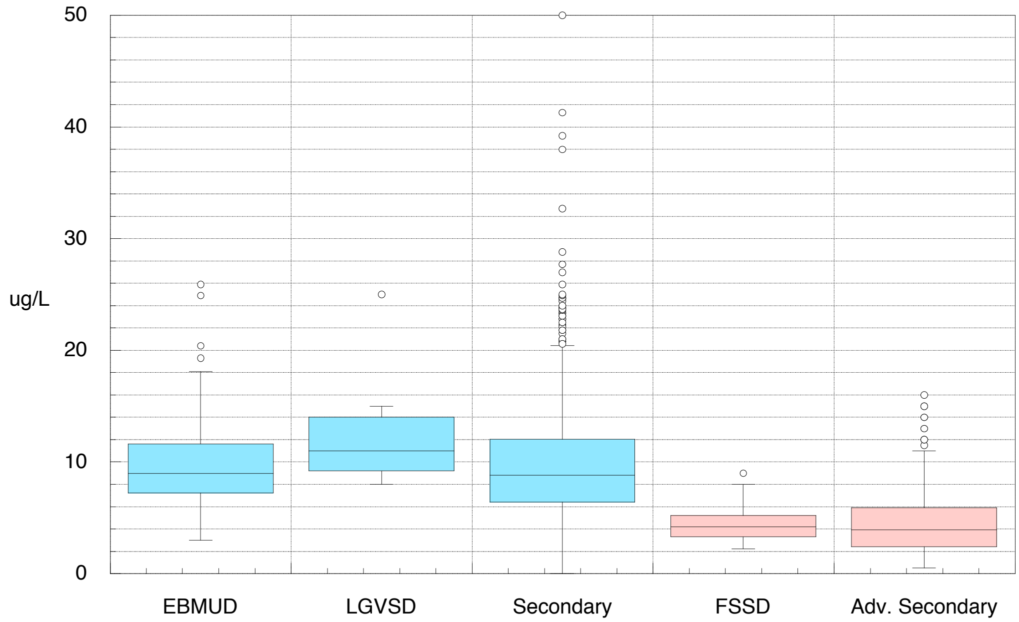


Figure 8. Dissolved Nickel Case Study Data

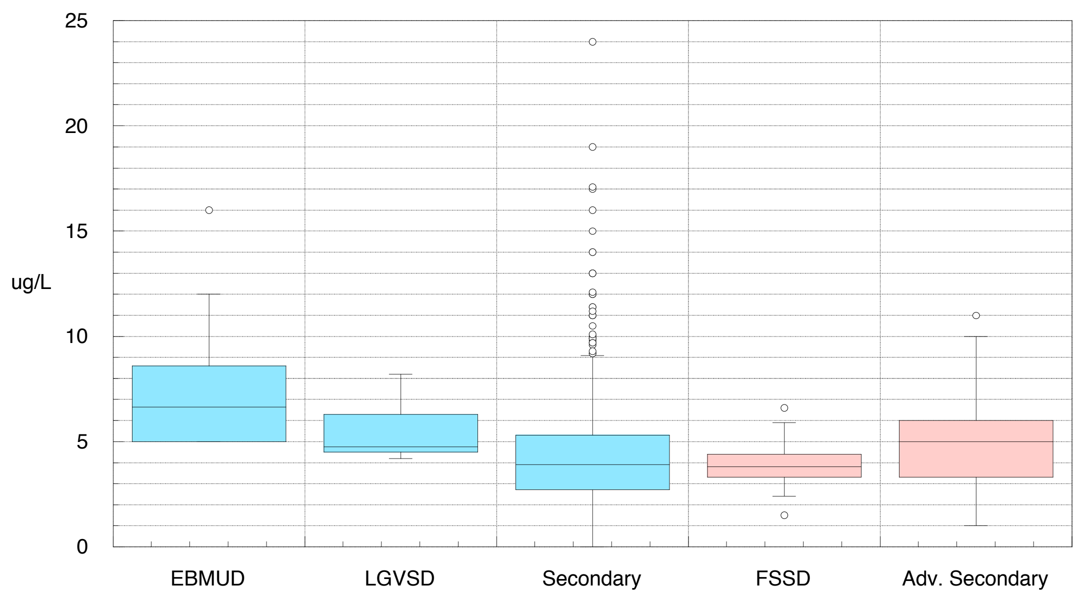


Figure 9. Case Study: Daily Maximum Effluent Copper Probability Data (2001 – 2003)

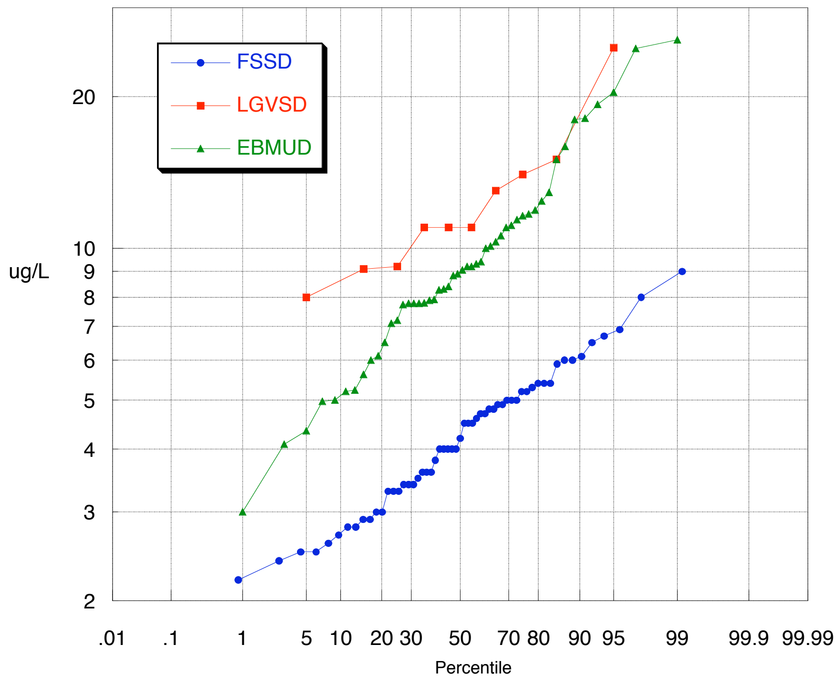
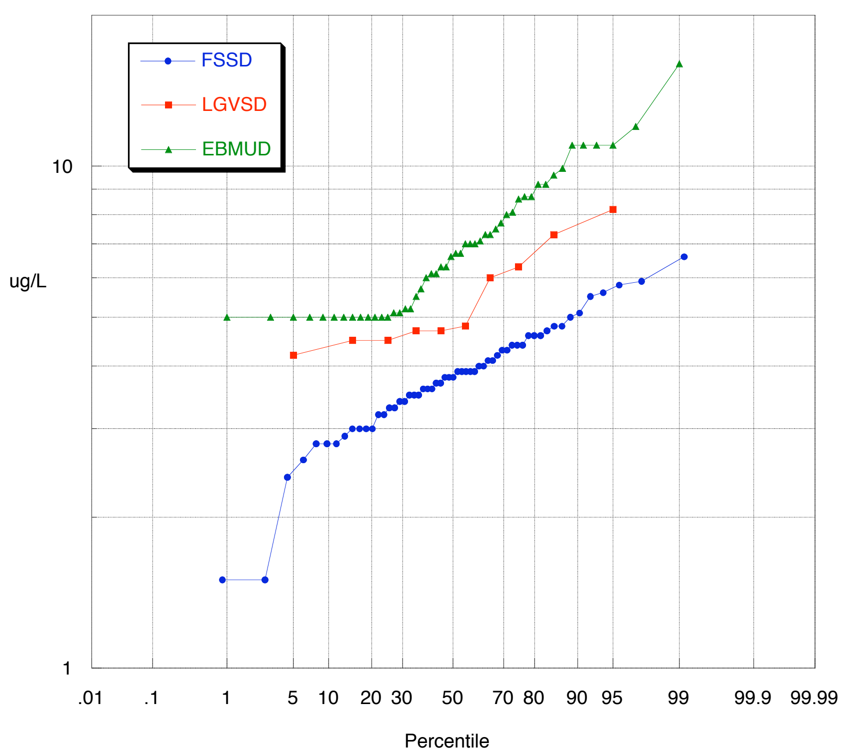


Figure 10. Case Study: Daily Maximum Effluent Nickel Probability Data (2001 – 2003)



To address Items (b) and (c), existing final effluent limits and potential future effluent limits for copper and nickel were obtained/calculated for each facility, based on existing water quality objectives for copper and nickel. Current effluent quality was compared with these effluent limits to establish the ability to comply and thus the need for SSOs for the three representative agencies. Additionally, an overview analysis of other NDB dischargers was made to validate that the compliance assessment for the three pilot facilities represented the full suite of potentially impacted agencies.

5. FINAL EFFLUENT LIMIT CALCULATIONS

Final average monthly effluent limits (AMELs) and maximum daily effluent limits (MDELs) derived from existing copper and nickel objectives are calculated here to be used as the baseline for evaluating whether the three representative treatment plants will be able to comply with them. The approach used is consistent with that that has been used in prior Infeasibility Studies.

Section 1.4 of the SIP contains the applicable steps for calculating final effluent limitations. The first step is to identify the applicable water quality criteria and to adjust the criteria (for translators, hardness or pH) if appropriate. Translator selection is an important variable and is discussed below. The next step is to calculate the effluent concentration allowance (ECA), which incorporates any allowable dilution credit. Dilution credit is only applicable if the background concentration is less than the adjusted water quality criteria and the discharger is a deep-water discharger (e.g. EBMUD). Background concentrations are not used in the shallow water effluent limit calculations because such dischargers (e.g. FSSD and LGVSD) do not receive dilution credit. With a dilution credit of zero, the effluent concentration allowance (ECA) values are set equal to the associated criteria.

For deepwater dischargers such as EBMUD, the allowable dilution credit has historically been limited to 10:1 in this Region. The SIP requires that the observed maximum background concentration be used in the effluent limit calculations. It is unclear at this time what ambient background station(s) should be used and whether total metals or translated dissolved metals data (see below) should be used. Yerba Buena Island RMP Station (BC10) data have been used in the past for RPAs for Central Bay dischargers.

For each ECA based on acute and chronic aquatic life criteria, long-term averages (LTAs) are calculated by multiplying the ECA with a multiplier that adjusts for effluent variability. There is both an acute and chronic ECA multiplier, based on the coefficient of variation (CV) of the discharger's effluent data. The more variable the discharger's effluent data, the higher the CV, the lower the ECA multiplier and the lower (the more stringent) the LTA. The lowest of the calculated acute and chronic LTAs is then selected. Average monthly (AMEL) and maximum daily (MDEL) effluent limits are calculated as the product of the lowest LTA (either chronic or acute) and a second set of multipliers based on the CV of the discharger's effluent data and the number of samples collected per month.

Final effluent limits are the lower of the AMEL and MDEL based on aquatic life criteria or the AMEL and MDEL based on the human health criteria. For copper and nickel the marine aquatic life criteria are the most stringent.

5.1 LGVSD Effluent Limit Options

Table 7 presents alternative effluent limits based on five different translator options, CTR dissolved water quality objectives, and 2001 – 2003 effluent data. The translator options include (from top to bottom):

1) Default translator of 1.0,
2) CTR default conversion factors,
3) LGVSD Miller Creek Translator study "Downstream" 3-station pooled values (the values used in the current permit),
4) RMP Station BD20 (San Pablo Bay) based values, and
5) North of Dumbarton Bridge Study pooled North Bay stations plus associated RMP station based values.

Option 3 – 5 translators are dissolved-to-total ratio based values. Complete calculations are presented in Appendix A.

Table 7. LGVSD Effluent Limit Options

WQO/SSO Dissolved (µg/L)		Translator		AMEL	MDEL	Translator Option
		Median	90th %	Monthly Ave	Daily Max	
Chronic	Acute	Chronic	Acute			
Copper						
3.1	4.8	1	1	2.7	4.5	1
		0.83	0.83	3.3	5.4	2
		0.56	**0.83**	**3.5**	**5.8**	**3**
		0.38	0.66	4.4	7.3	4
		0.38	0.67	4.4	7.2	5
Nickel						
8.2	74	1	1	7.5	10.6	1
		0.99	0.99	7.6	10.7	2
		0.56	**0.82**	**13.4**	**18.9**	**3**
		0.21	0.52	35.7	50.4	4
		0.27	0.57	26.7	37.6	5

Bolded values represent the translator option used in LGVSD's current permit.

5.2 FSSD Effluent Limit Options

Table 8 presents alternative effluent limits based on five different translator options, CTR dissolved water quality objectives, and 2001 – 2003 effluent data. The translator options include (from top to bottom):

1) Default translator of 1.0,
2) CTR default conversion factors,
3) FSSD site-specific study values (the values used in the current permit),
4) RMP Station BF20 (Grizzly Bay) based values, and
5) North of Dumbarton Bridge Study pooled North Bay stations plus associated RMP station based values.

Complete calculations are presented in Appendix A.

Table 8. FSSD Effluent Limit Options

WQO/SSO Dissolved (µg/L)		Translator		AMEL	MDEL	Translator Option
		Median	90th %	Monthly Ave	Daily Max	
Chronic	Acute	Chronic	Acute			
Copper						
3.1	4.8	1	1	2.8	4.3	1
		0.83	0.83	3.3	5.2	2
		0.46	**0.64**	**4.8**	**7.5**	**3**
		0.33	0.51	6.1	9.5	4
		0.38	0.67	4.6	7.2	5
Nickel						
8.2	74	1	1	7.5	10.6	1
		0.99	0.99	7.6	10.7	2
		0.51	**0.91**	**14.7**	**20.7**	**3**
		0.19	0.39	19.2	27.1	4
		0.27	0.57	27.8	39.2	5

Bolded values represent the translator option used in FSSD's current permit.

5.3 EBMUD Effluent Limit Options

Table 9 presents alternative effluent limits based on five different translator options, CTR dissolved water quality objectives, 2001 – 2003 effluent data, ambient concentrations from RMP station BC10 (Yerba Buena Island), and 10:1 dilution. The translator options include (from top to bottom):

1) Default translator of 1.0,
2) CTR default conversion factors,
3) NA (the CTR CFs were used in the current permit),
4) RMP Station BC10 based values, and
5) North of Dumbarton Bridge Study pooled Central Bay plus associated RMP station based values.

Option 4 – 5 translators are dissolved to total ratio based values. Complete calculations are presented in Appendix A.

Table 9. EBMUD Effluent Limit Options

WQO/SSO		Translator		AMEL	MDEL	Translator Option
Dissolved (μg/L)		Median	90^{th}%	Monthly Ave	Daily Max	
Chronic	Acute	Chronic	Acute			
Copper						
3.1	4.8	1	1	2.6	4.8	1
		0.83	0.83	3.7	6.9	2
		0.83	**0.83**	**3.7**	**6.9**	**3**
		0.68	0.81	10.7	19.7	4
		0.74	0.88	7.6	13.9	5
Nickel						
8.2	74	1	1	42.0	66.0	1
		0.99	0.99	43.0	67.0	2
		0.99	**0.99**	**43.0**	**67.0**	**3**
		0.58	0.78	95.0	149.0	4
		0.65	0.85	82.0	127.0	5

Bolded values represent the translator option used in EBMUD's current permit.

The January 14, 2003 *Draft Additional Analysis of RMP Station BA30 Zinc Translator Information* memo by EOA discussed the issue of how to adjust California Toxics Rule (CTR) dissolved metals based water quality objectives (criteria) and dissolved metals receiving water concentrations, to a total metals basis. This adjustment is required since Federal Regulations require that effluent limitations be expressed on a total metals basis and thus effluent data are collected and analyzed for total metals concentrations. Thus CTR WQOs need to be adjusted from dissolved-to-total concentration to allow comparison to the maximum effluent concentrations (MEC) in the EPA based RPA (the first RPA trigger). For consistency under the State Implementation Plan RPA Section 1.3, Step 6 (the second RPA trigger), background receiving water dissolved metals concentrations need to be similarly adjusted to total metals to allow comparison to the adjusted CTR WQOs developed and used for the MEC comparison.

In this SIP SSO justification analysis, the issue needs to be addressed for calculation of deepwater final effluent limits. Ambient concentrations are not an issue in the calculations for shallow water dischargers, since they are negated out in the formulae by the zero dilution credit. For the deepwater discharger calculations (or RPAs) it can make a large difference whether a total metals or a translated dissolved metals ambient value is used. The above cited memo documents the differences and concludes that it is most scientifically defensible, and consistent, to use translated dissolved metals ambient values.

For purposes of comparison with projected plant effluent concentrations, the calculated limits shown in bold will be used. For LGVSD and FSSD these are the values based on the local site-specific translators used by RWQCB staff in the December 2003 and July 2003 permit reissuances (Option 3). For EBMUD, the north of Dumbarton pooled Central Bay translator based limits will be used (Option 5). For the earlier (June 2001) EBMUD re-issuance, the EPA default conversion factors (Option 2) were used for the Infeasibility Study copper analysis. The Basin Plan 7.1 µg/L total nickel WQO was used for effluent limit derivation so nickel translators were not needed.

5.4 Plant Performance and Ability to Comply

Summary statistics of influent and effluent copper and nickel concentrations are presented below for comparison with the final effluent limits developed above.

Table 10. Case Study Influent Copper and Nickel Summary Statistics

	Influent Copper (µg/L)			Influent Nickel (µg/L)		
	LGVSD	**FSSD**	**EBMUD**	**LGVSD**	**FSSD**	**EBMUD**
# samples	11	36	154	11	36	154
# NDs	0	0	0	0	0	0
Geo. mean	27.8	41.3	62	7.98	8.55	8.40
Geo. std. dev	1.62	1.23	1.35	1.43	1.39	1.49
95th percentile[1]	71.7	61.7	112	16.2	16.4	18.3
99th percentile[1]	96.5	70.1	135	20.2	20.1	23.4
99.87th percentile[1]	118.5	76.5	154	23.6	23.1	27.7
Maximum	57	67	163	16	20.5	46

Notes:
1. Assuming log-normal distrib: Values are: geomean*std dev^1.96; geomean*std dev^2.576; geomean*std dev^3

Table 11. Case Study Effluent Copper and Nickel Summary Statistics

	Effluent Copper (µg/L)			Effluent Nickel (µg/L)		
	LGVSD	**FSSD**	**EBMUD**	**LGVSD**	**FSSD**	**EBMUD**
# samples	10	57	50	10	57	50
# NDs	0	0	6	0	2	12
Geo. Mean	11.98	4.17	9.13	5.38	3.74	6.82
Geo. std. dev.	1.38	1.37	1.58	1.26	1.32	1.35
95th percentile[1]	22.7	7.77	22.3	8.47	6.44	12.2
99th percentile[1]	27.7	9.46	29.5	9.77	7.63	14.7
99.87th percentile[1]	31.8	10.8	35.8	10.8	8.59	16.7
Maximum	25.0	9.0	25.9	8.2	6.6	16.0

Notes:
1. Assuming log-normal distrib: Values are: geomean*std dev^1.96; geomean*std dev^2.576; geomean*std dev^3

Table 12. Effluent Copper (µg/L), Effluent Limits, and Compliance Status

	LGVSD	Comply?	FSSD	Comply?	EBMUD	Comply?
AMEL	**3.5**		**4.8**		**7.6**	
95^{th} percentile[1]	22.7	No	7.77	No	22.3	No
99^{th} percentile[1]	27.7	No	9.46	No	29.5	No
99.87^{th} percentile[1]	31.8	No	10.8	No	35.8	No
Maximum	25	No	9.0	No	25.9	No

Notes:
1. Assuming log-normal distrib: Values are: geomean*std dev^1.96; geomean*std dev^2.576; geomean*std dev^3

Table 13. Effluent Nickel (µg/L), Effluent Limits, and Compliance Status

	LGVSD	Comply?	FSSD	Comply?	EBMUD	Comply?
AMEL	**13.4**		**14.7**		**82**	
95^{th} percentile[1]	8.47	Yes	6.44	Yes	12.2	Yes
99^{th} percentile[1]	9.77	Yes	7.63	Yes	14.7	Yes
99.87^{th} percentile[1]	10.8	Yes	8.59	Yes	16.7	Yes
Maximum	8.2	Yes	6.6	Yes	16.0	Yes

Notes:
1. Assuming log-normal distrib: Values are: geomean*std dev^1.96; geomean*std dev^2.576; geomean*std dev^3

Ability to comply with final effluent limits in Infeasibility Studies has been determined by comparing the final CTR/SIP based effluent limits to the observed maximum effluent concentration (MEC) and/or the statistically projected maximum. The latter is defined and calculated in the same manner as interim performance-based effluent limits (IPBL). Since effluent data are typically log-normally distributed IPBLs are often based on the mean plus three standard deviations of the log-transformed effluent data. IPBLs calculated in this manner approximate the 99.87^{th} percentile of plant performance, a value that the plant would only be expected to exceed once every three years. These values are believed to be a more representative and appropriate measure of likely future plant performance since they are based on the underlying distribution of the data set versus the single occurrence MEC value.

For copper, the above tables demonstrate that <u>none of these facilities could consistently comply with final CTR based copper effluent limits calculated with the translators used for the latest NPDES permits</u>. From the probability plots in **Figure 9** it can be seen that LGVSD would exceed the 3.4 µg/L limit 100% of the time. FSSD would exceed its 4.8 µg/L limit about 40% of the time. EBMUD would exceed its 7.6 µg/L limit about 75% of the time. This is consistent with the fact that each facility already has interim copper effluent limits given the demonstrated inability to comply with final effluent limits documented in their respective Infeasibility Studies. If updated translators were to be used based on pooled North of Dumbarton study and associated RMP station data, they would still be in non-compliance with calculated copper final limits. For nickel, these three facilities appear as though they could comply with final CTR based effluent limits calculated with the translators used for the latest NPDES permits. This is consistent with the fact that each discharger has final nickel effluent limits in their permits.

5.5 Overview Compliance Analysis of Full Suite of NDB Dischargers

For municipal facilities NDB, projected compliance with copper limits appears to be adequately represented by the results of the 3 plants described above. A brief analysis of compliance for all NDB dischargers (**Table 14**) shows that the three case study plants were fairly accurate in their assessment of noncompliance. Average Monthly Effluent Limits (AMELs) were calculated for one plant in each region, and for a shallow and deep discharger in each of these regions using regional translators and WERs. These calculations provided regional AMELs to assess compliance with copper limits.

Table 14. Copper Compliance Status for All Dischargers

SHALLOW WATER DISCHARGERS ABILITY TO COMPLY:

Region 1

WER	Chronic SSO	AMEL	FSSD		GWF E 3rd St		USS - Posco	
			MEC	99.87%	MEC	99.87%	MEC	99.87%
			9.0	10.8	32.8	39.3	4.7	5.9
1.0	2.5	1.8	no	no	no	no	no	no
1.0	3.1	2.3	no	no	no	no	no	no
2.4	6.0	8.5	no	no	no	no	yes	yes
2.4	7.4	8.5	no	no	no	no	no	no

no = could not comply with AMEL
yes = could comply with AMEL

Region 2

WER	Chronic SSO	AMEL	LGVSD		Novato		Petaluma		Sonoma Valley	
			MEC	99.87%	MEC	99.87%	MEC	99.87%	MEC	99.87%
			25.0	31.8	11.0	37.1	6.0	10.0	12.0	15.3
1.0	2.5	2.2	no	no	no	no	no	no	no	no
1.0	3.1	2.7	no	no	no	no	no	no	no	no
2.4	6.0	9.9	no	no	no	no	no	no	no	no
2.4	7.4	10.0	no	no	no	no	yes	yes	no	no

no = could not comply with AMEL
yes = could comply with AMEL

DEEP WATER DISCHARGERS ABILITY TO COMPLY:

Region 1

WER	Chronic SSO	AMEL	City of Benicia		Delta Diablo		Dow Chemical		General Chemical	
			MEC	99.87%	MEC	99.87%	MEC	99.87%	MEC	99.87%
			27.0	26.6	16.0	18.0	25.0	58.4	5.0	5.0
1.0	2.5	3.1	no	no	no	no	no	no	no	no
1.0	3.1	7.6	no	no	no	no	no	no	yes	yes
2.4	6.0	71.0	yes	yes	yes	yes	yes	yes	yes	yes
2.4	7.4	71.0	yes	yes	yes	yes	yes	yes	yes	yes

WER	Chronic SSO	AMEL	Martinez Refining		SAM Permit		GWF Nichols		Valero Refinery	
			MEC	99.87%	MEC	99.87%	MEC	99.87%	MEC	99.87%
			12.0	16.5	15.3	15.3	28.0	34.8	13.0	26.5
1.0	2.5	3.1	no	no	no	no	no	no	no	no
1.0	3.1	7.6	no	no	no	no	no	no	no	no
2.4	6.0	71.0	yes	yes	yes	yes	yes	yes	yes	yes
2.4	7.4	71.0	yes	yes	yes	yes	yes	yes	yes	yes

WER	Chronic SSO	AMEL	Tesoro Refinery		Conoco Phillips		Morton Permit	
			MEC	99.87%	MEC	99.87%	MEC	99.87%
			20.0	18.8	20.0	34.4	30.5	200.0
1.0	2.5	3.1	no	no	no	no	no	no
1.0	3.1	7.6	no	no	no	no	no	no
2.4	6.0	71.0	yes	yes	yes	yes	yes	no
2.4	7.4	71.0	yes	yes	yes	yes	yes	no

no = could <u>not</u> comply with AMEL
yes = could comply with AMEL

Region 2

WER	Chronic SSO	AMEL	Central Marin		CCCSD		Chevr Refinery		Pinole-Hercules	
			MEC	99.87%	MEC	99.87%	MEC	99.87%	MEC	99.87%
			4.5	6.2	11.0	15.9	15.0	19.3	9.0	15.1
1.0	2.5	5.4	yes	no	no	no	no	no	no	no
1.0	3.1	11.0	yes	yes	yes	no	no	no	yes	no
2.4	6.0	85.0	yes	yes	yes	yes	yes	yes	yes	yes
2.4	7.4	87.0	yes	yes	yes	yes	yes	yes	yes	yes

WER	Chronic SSO	AMEL	Rodeo Sanitary		Rhodia Chem		Vallejo San & Flood	
			MEC	99.87%	MEC	99.87%	MEC	99.87%
			5.0	32.8	22.0	80.4	11.8	13.2
1.0	2.5	5.4	yes	no	no	no	no	no
1.0	3.1	11.0	yes	no	no	no	no	no
2.4	6.0	85.0	yes	yes	yes	yes	yes	yes
2.4	7.4	87.0	yes	yes	yes	yes	yes	yes

no = could <u>not</u> comply with AMEL
yes = could comply with AMEL

Region 3

WER	Chronic SSO	AMEL	Burlingame		DSRSD		EBMUD		EBDA	
			MEC	99.87%	MEC	99.87%	MEC	99.87%	MEC	99.87%
			38.0	33.1	80.0	121.4	25.9	35.8	50.0	50.9
1.0	2.5	7.4	no	no	no	no	no	no	no	no
1.0	3.1	12.0	no	no	no	no	no	no	no	no
2.4	6.0	38.0	yes	yes	no	no	yes	yes	no	no
2.4	7.4	50.0	yes	yes	no	no	yes	yes	yes	no

WER	Chronic SSO	AMEL	Millbrae		North San Mateo		Pacifica		SF Oceanside	
			MEC	99.87%	MEC	99.87%	MEC	99.87%	MEC	99.87%
			14.0	18.2	100.0	157.0	9.3	13.4	23.9	38.1
1.0	2.5	7.4	no	no	no	no	no	no	no	no
1.0	3.1	12.0	no	no	no	no	yes	no	no	no
2.4	6.0	38.0	yes	yes	no	no	yes	yes	yes	no
2.4	7.4	50.0	yes	yes	no	no	yes	yes	yes	yes

WER	Chronic SSO	AMEL	SF Southeast		SF Bayside		Sausalito-Marin		San Mateo City	
			MEC	99.87%	MEC	99.87%	MEC	99.87%	MEC	99.87%
			23.8	33.2	64.3	159.3	16.0	18.3	14.0	14.7
1.0	2.5	7.4	no	no	no	no	no	no	no	no
1.0	3.1	12.0	no	no	no	no	no	no	no	no
2.4	6.0	38.0	yes	yes	no	no	yes	yes	yes	yes
2.4	7.4	50.0	yes	yes	no	no	yes	yes	yes	yes

WER	Chronic SSO	AMEL	SFO, WQCP		SFO, Industrial		SASM		Tiburon	
			MEC	99.87%	MEC	99.87%	MEC	99.87%	MEC	99.87%
			14.8	32.8	24.5	255.0	24.0	31.1	30.0	72.8
1.0	2.5	7.4	no	no	no	no	no	no	no	no
1.0	3.1	12.0	no	no	no	no	no	no	no	no
2.4	6.0	38.0	yes	yes	yes	no	yes	yes	yes	no
2.4	7.4	50.0	yes	yes	yes	no	yes	yes	yes	no

WER	Chronic SSO	AMEL	US Navy Tr. Island		West County	
			MEC	99.87%	MEC	99.87%
			23.1	28.1	11.0	15.0
1.0	2.5	7.4	no	no	no	no
1.0	3.1	12.0	no	no	yes	no
2.4	6.0	38.0	yes	yes	yes	yes
2.4	7.4	50.0	yes	yes	yes	yes

no = could <u>not</u> comply with AMEL
yes = could comply with AMEL

Region 4

WER	Chronic SSO	AMEL	S SF & San Bruno	
			MEC	99.87%
			32.7	29.8
1.0	2.5	1.6	no	no
1.0	3.1	2.0	no	no
2.8	7.0	31.0	no	yes
2.8	8.7	42.0	yes	yes

no = could not comply with AMEL
yes = could comply with AMEL

For nickel, the three plants examined do not exhibit compliance problems with effluent limits derived from the existing nickel objectives. However, examination of effluent data for the full suite of NDB dischargers reveals that potential compliance problems would exist for several industrial dischargers. An additional consideration is that many (over 20) municipal and industrial plants have maximum observed effluent concentrations that exceed the current objective of 8.2 µg/L. This creates a reasonable potential determination under the SIP, necessitating effluent limits and pollutant minimization activities. If site-specific nickel objectives based on best available scientific information were adopted, between 7 to 15 of these plants would not have effluent limits and would not have the incumbent pollutant minimization responsibility.

Finally, adoption of the site-specific nickel objective may also avoid unnecessary 303(d) listings for dissolved nickel in San Francisco Bay. With the randomized sampling design that has been adopted by the Regional Monitoring Program, more instances of sampling results that exceed the current nickel objective could occur. Use of the more scientifically defensible site-specific objective would avoid unwarranted listings.

While the selected case study dischargers may be able to comply, review of the complete effluent dataset presented above shows that 4 of 15 industries would not be able to comply, based on the current nickel objective of 8.2 µg/L. It is apparent that industrial NPDES dischargers in particular would be at greater risk of non-compliance for nickel.

6. SIP SECTION 5.2, ITEM (D)

The SIP justification for SSOs to address measures to comply with effluent limits is similar to the justification required by the SIP Section 2.1 for interim effluent limits (i.e. Infeasibility Studies). SIP Section 2.1 requires the discharger to:

a) Document that diligent efforts have been made to quantify pollutant levels in the discharge and sources of the pollutant in the waste stream, and the results of those efforts;
b) Document source control and/or pollution minimization efforts currently underway or completed;

c) Propose schedule for additional or future source control measures, pollution minimization actions, or waste treatment; and
d) Demonstrate that the proposed schedule is as short as practicable.

Each of the three dischargers has completed an Infeasibility Study as part of their most recent permit re-issuances; LGVSD in December 2003, FSSD in July 2003, and EBUMD in June 2001. The Infeasibility Studies included the following analyses: SIP calculated final effluent limits, review of historical plant effluent data, compliance analysis with historical data, review of historical source control and pollution prevention activities, discussion of potential pollution prevention actions based on sources of pollutants and treatment improvements. This SIP SSO justification report uses to the greatest extent possible the large amount of directly pertinent information from these prior Infeasibility Studies.

7. EXISTING TREATMENT AND SOURCE CONTROL MEASURES

The following section presents information on each of the three representative discharger's wastewater treatment plant and reclamation facilities and on their source control and pollution prevention programs. The feasibility and cost of potential additional measures required to achieve compliance are evaluated in the subsequent section.

7.1 Las Gallinas Valley Sanitary District: Existing Wastewater Treatment Plant and Reclamation Facilities

The LGVSD treatment plant provides secondary treatment of wastewater from domestic and commercial sources within the northern area of the City of San Rafael. The District's primarily residential service area has a population of about 30,000. The treatment plant has an average dry weather flow design capacity of 2.92 million gallons per day (MGD). There is no discharge to Miller Creek from June 1 to October 31, as required by the District's permit. All treated effluent is instead stored and reused for pasture and landscape irrigation, and for maintaining water levels in the constructed wetland and marsh areas. The treatment process consists of aerated grit chambers, screen, primary sedimentation clarifier, twin trickling filters and intermediate clarifiers, fixed film reactor, secondary clarifier, deep-bed filters, disinfection with chlorination and dechlorination (dechlorination is not used during the non-discharge season).

The District has and continues to explore possible methods to improve treatment plant performance with the goal of reducing effluent copper, nickel, and other metal concentrations. Most of these efforts are aimed at improving solids removal through the treatment processes. Methods that have been evaluated by the District include chemical addition at the #2 biofilter effluent box, reconfiguration of biofilter recirculation flows to reduce hydraulic loading on the secondary clarifier, and pilot testing of continuously backwashing sand filters. The District's new (November 2002) Plant Superintendent is committed to continued efforts to optimize treatment process efficiency.

The District's Board of Directors has given approval for several capital projects and capital equipment purchases to improve the reliability and efficiency of the LGVSD plant. Several Capital Projects will be completed over the next three years. These include a new biofilter pump station to increase control and flexibility of loading rates, replacement filter media, and a new plant SCADA system. The new SCADA system will enable operators to collect more precise "real time" data and fine tune treatment processes. In addition to WWTP improvements, LGVSD continues to invest significantly in its ongoing infiltration and inflow (I/I) program to reduce peaks wet weather flows to the WWTP.

The District operates a wastewater reclamation project that includes a 20-acre wildlife marsh pond, 40-acres of storage ponds, 200-acres of irrigated pasture and 3-1/2 miles of public trails. In addition, Marin Municipal Water District (MMWD) operates a tertiary filtration water reclamation facility located immediately adjacent to the treatment plant. MMWD treats the District's secondary effluent to produce tertiary disinfected recycled water, which it distributes for a number of uses ranging from landscape irrigation to indoor second plumbing systems. Currently, about 1180 acre-ft/yr (about 48% of the plant's average dry weather flow) is recycled. About 40% of annual recycled water is recycled via the Discharger's pasture irrigation system, and the remaining 60% is recycled via MMWD's recycled water system. The District strives to maximize the length of the non-discharge season beyond the minimum permit requirements when seasonal demands allow.

LGVSD influent and effluent data for total suspended solids (TSS) and biological oxygen demand (BOD) from November 1998 – December 2002 from during the discharge season only (the same time period presented in the Infeasibility Study) are summarized below. These data on conventional pollutant removals are included to address the SIP Section 5.2(3)(c) requirement to demonstrate that the providing reasonable treatment and compliance with technology based limits (TSS, BOD).

The statistical summary of TSS and BOD data below show that the LGVSD plant provides a consistent and above average level of secondary treatment. Long-term average BOD and TSS concentrations were 9.3 and 14.1 mg/L, representing 94% and 91% removals, respectively, well above the 85% removal stipulated in the Federal secondary treatment regulations.

Table 15. LGVSD BOD and TSS Performance

	Effluent BOD (mg/L)	**Effluent TSS** (mg/L)	**Influent BOD** (mg/L)	**Influent TSS** (mg/L)	**% Removal BOD**	**% Removal TSS**
# samples	115	298	113	110	108	90
# NDs	8	0	298	113	110	108
Average	9.3	14.1	188	198	94%	91%
Std. deviation	4.0	7.1	61.2	65.5	4%	5%
95th percentile[1]	17.2	28.0	308	327		
99th percentile[1]	19.6	32.3	346	367		
99.7th percentile[1]	21.3	35.3	372	395		
Geo. mean	8.5	12.4	178	188	94%	91%
Geo. std. dev	1.56	1.70	1.44	1.39		
95th percentile[2]	20.4	35.0	364	361		
99th percentile[2]	26.8	48.6	456	442		
99.7th percentile[2]	32.4	60.8	533	509		
Maximum	21	54	380	530		

7.1.1 Source Control and Pollution Prevention

LGVSD is not required to institute a Pretreatment Program because the average dry weather flow is less than 5 MGD, and because there are no categorical dischargers or dischargers generating greater than 25,000 gallons per day. Nonetheless, the District, beginning in 1993/94, developed a strong pollution prevention (P2) program regulating targeted commercial facilities, educating the public and coordinating with other local and regional programs. Copper control has been a primary focus.

Since June 1994, the District has had an agreement with the Central Marin Sanitation Agency (CMSA) for pollution prevention services to help implement the District's pollution prevention program. District staff, working with CMSA staff, participate in public education activities at local events. District and CMSA staff have developed and purchased a display board and several promotional items for use at these events. The District coordinates its pollution prevention program with activities of other agencies and organizations including School Environmental Education Docents (SEED) a non-profit, grassroots, volunteer program dedicated to youth environmental awareness and stewardship, CMSA, North Bay Watershed Association (NBWA), San Francisco Bay Area Pollution Prevention Program, MCSTOPPP and MMWD.

The District's commercial facility program includes inspecting and permitting automotive facilities, and inspecting printers, photo-processors, dentists and medical facilities. The District has also expanded its program to contact laboratories, facilities with cooling towers and dry cleaners.

The District's P2 Program address potential sources of copper primarily through regulation of automotive facilities (most of which are now zero-discharge) and of printers. The Program's general P2 and public outreach activities (such as discouraging use of copper-based root killers) may also result in reductions in copper loading. It is worth noting that the Marin Municipal Water District's (MMWD's) use of zinc orthophosphate as a water supply corrosion inhibitor (a practice which the District opposes) is driven by MMWD's need to comply with the Lead and Copper rule. MMWD has made the point that any reduction in corrosion control effectiveness, which it believes would occur if it were to switch to a non-zinc based inhibitor, could result in an increase in copper loadings to the treatment plant.

Specific activities related to copper and nickel pollution prevention include: distributing information on alternatives to copper sulfate root killer; distributed BAPPG's copper sulfate root killer brochure to plumbers, distributed letter to local retailers and plumbers about the ban of copper-based root killer and more effective options for root control, conduct quarterly sanitary sewer line sampling at residential and commercial areas, working with automotive facilities to make them all zero discharge except car wash and steam cleaning facilities, and inspecting and sampling car wash and steam cleaning facilities.

The District maintains an active Pollution Prevention Program, which seeks to leverage its efforts by partnering with other agencies and organizations. The resources committed to public outreach, and in particular to the elementary school education program are quite significant for a discharger of its size. The District is committed to continuing these efforts in the future. Although P2 programs can potentially reduce the levels of toxics in the overall environment, there are chemical and physical limitations on how low the reductions will translate to in the effluent. In terms of immediate compliance, source control would provide no possibility of achieving short-term compliance with the projected effluent limits. As a result, it must be judged that additional source control activities do not provide a feasible solution for immediate compliance with projected limits.

7.2 Fairfield-Suisun Sewer District

The Fairfield-Suisun Wastewater Treatment Plant provides tertiary level treatment of wastewater from domestic, commercial and industrial sources within the City of Fairfield, City of Suisun City and, by contract, some unincorporated properties in Solano County. The Discharger's service area currently has a population of approximately 130,000 people (2003).

The Plant has an average dry weather flow design capacity of 17.5 MGD and can treat up to approximately 34.8 MGD during wet weather. The Plant presently treats an annual average flow of 16.1 MGD (2000-2002), with an average dry weather flow of 14.1 MGD (total effluent, 2000-2002). Of the total flow treated, an annual average of 14.4 MGD was discharged, with 1.7 MGD reclaimed for agricultural irrigation.

Approximately 90% of the treated effluent is discharged to the Boynton Slough Outfall. Treated effluent is also discharged intermittently from turnouts located on the Boynton Slough Outfall pipeline to privately owned and managed duck ponds in the Suisun Marsh. The Solano Irrigation District and the Department of Fish and Game determine the frequency and volume of these discharges (primarily based on seasonal rainfall). These duck ponds are waters of the State and United States.

Approximately 10% of the treated effluent is recycled for agricultural irrigation, landscape irrigation, and industrial cooling through the Recycling Outfall, which discharges into irrigation water conveyance and distribution facilities owned and operated by the Solano Irrigation District and the Fairfield-Suisun Sewer District. The discharges of reclaimed water to land are regulated by a separate Order, Water Reclamation Requirements Order No. 91-147, adopted by the Board on October 16, 1991.

7.2.1 Source Control and Pollution Prevention

In addition to its pretreatment program, which regulates 11 industries and 3 groundwater remediation sites, the District has an active pollution prevention program that has been in place since 1992. Currently, the District considers mercury, organophosphate pesticides, perchloroethylene, copper, nickel, lead and zinc to be pollutants of concern. Mercury has the highest priority (A) while pesticides and perchloroethylene are assigned a B priority and the metals are priority C. The District has implemented a variety of activities targeting these pollutants over the years. The activities for copper and nickel are highlighted in **Table 16**.

Table 16. Fairfield-Suisun Pollution Prevention Program Activities

Pollutant of Concern	Source Control Activities
Copper, Nickel	Inspections/ BMPs for vehicles service facilities, metal fabricators, and industry; surface cleaner workshops

Several of the activities listed above have been conducted in cooperation with other local agencies in Vacaville, Vallejo, Fairfield and Suisun City. The District is also an active participant and supporter of several regional groups and programs, including:

- Bay Area Pollution Prevention Group (BAPPG)
- Bay Area Clean Water Agencies (BACWA)
- Bay Area Stormwater Management Agencies Association (BASMAA)
- North Bay Source Control Group
- Napa/ Solano Regional Environmental Public Education Group
- Solano County Environmental Management Local Task Force
- Napa/Solano Air Resource Team

The District has identified copper as a pollutant of concern and has conducted pollution prevention targeting copper sources including corrosion of copper plumbing, root control products, vehicle service facilities, mobile surface cleaners, and metal fabricators. Pollution prevention activities have contributed to a 34% reduction in copper influent levels between 1992 (59 µg/L) and 2000 (39 µg/L). The District has conducted source control for most of the common copper sources so it is not clear how much more reduction may be achieved. The District will review its current copper pollution prevention activities and modify as needed.

7.3 East Bay Municipal Utility District

East Bay Municipal Utility District (EBMUD), Special District No. 1 Water Pollution Control Plant provides secondary treatment of wastewater from domestic, commercial and industrial sources from the cities of Albany, Alameda, Berkeley, Emeryville, Oakland and Piedmont, and from the Stege Sanitary District. EBMUD's service area has a present population of about 636,635.

The wastewater treatment process consists of odor control, grit removal, primary clarification, high purity oxygen activated sludge, secondary clarification, disinfection, dechlorination, and blending of primary and secondary effluent during periods of effluent flows in excess of the secondary treatment capacity. Sludge is currently thickened, anaerobically digested and dewatered before reuse by land application or alternative daily cover in an authorized sanitary landfill. EBMUD discharges treated wastewater through a submerged diffuser adjacent to the San Francisco-Oakland Bay Bridge about 5,664 feet off shore at a depth of 45 feet below mean lower low water. Based on a study conducted by the discharger, the outfall achieves a worst case initial dilution greater than 15:1 and a typical initial dilution of 45:1.

The treatment plant has an average dry weather flow design capacity of 120 million gallons per day (MGD). For wet weather flows, the facility can provide partial secondary treatment up to 325 MGD. Of this, approximately 157 MGD receive primary treatment and up to 168 MGD receive secondary treatment. The plant presently discharges an annual average daily flow of 79.6 MGD.

EBMUD has a separate NPDES permit (Order No. 98-005, NPDES Permit No. CA0038440) to regulate the discharge from its wet weather treatment facilities. These facilities provide for the storage of wet weather sewerage and blending of primary and secondary effluent during wet weather periods when the secondary capacity is exceeded. This Order permits the discharge of overflows from the collection system during rainfall events greater than the 5-year design storm. The U.S. EPA and the Board have classified EBMUD discharge as a major discharge.

In response to the listing of copper and nickel as impairing pollutants for most of the San Francisco Bay, a coalition of dischargers, including EBMUD, believes that additional monitoring data and scientific research may support the de-listing of these two pollutants (in 2002). These dischargers, in conjunction with the Regional Board and through the RMP, are gathering data towards the de-listing.

7.3.1 Source Control and Pollution Prevention

EBMUD has been a leader in Bay area pretreatment and pollution prevention activities since 1974 and has been the recipient of the U.S. EPA National First Place Award as an outstanding pretreatment and pollution prevention program on three separate occasions (1989, 1993 and 1997). A summary of the District's recent source control activities is provided in the *2000 EBMUD Pretreatment and Pollution Prevention Report* dated February 2001.

7.3.1.1 Copper

The District has conducted a number of programs aimed at the identification and reduction of copper sources. The District has developed the following estimates of copper sources as a percentage of total influent loading:

Source Category	% of Influent Loading
Tap Water	58%
Commercial	22%
Other	8%
Human Waste	5%
Industrial	4%
Other Residential	3%
Total	100%

The District has monitored tap water to derive its estimates of water supply contributions of copper. The relatively high contribution from tap water is a result of the relatively corrosive nature of the District's water supply from the Sierra Nevada Mountains. EBMUD's source water is very low in total dissolved solids since it is primarily snowmelt. It is well known that water of this high quality is relatively aggressive and acts as an excellent solvent in an effort to dissolve compounds and become more stable.

The District has also performed sewer system monitoring to quantify copper loadings from residential and commercial sources. Industrial monitoring has been performed under the District's Industrial Pretreatment and Pollution Prevention Program.

7.3.2 Completed or Ongoing Source Control and Pollutant Minimization Measures

The District has implemented the following copper source reduction and pollution minimization actions:

- Water supply corrosion control through pH adjustment (to pH 8.8-9.0) using lime and sodium hydroxide.
- Various activities under the Industrial Categorical Pretreatment Program, including issuing discharge minimization permits to 86 major industrial users, conducting approximately 3,800 discharge monitoring and inspections, and taking enforcement actions.
- Various activities under the Commercial Pollution Prevention Program, including issuance of approximately 1,500 pollution prevention permits to commercial businesses (including potential copper sources such as printing shops, boatyard, auto repair shops, vehicle washing facilities), prohibitions on discharge from specific commercial categories and distribution of a Pollution Prevention Self-audit Checklist.
- Distributed educational information notifying plumbing contractors and hardware stores about the ban on copper sulfate root eradicator.
- Created a "P2 Excellence Award", given annually to industrial and commercial users who have demonstrated consistent compliance and innovative approaches to pollution prevention.
- Developed and implemented a public education program focusing on industrial and commercial entities and the general public since 1988. This outreach program include bill inserts mailing, multi-lingual P2 brochures, public meetings, technical workshops, meetings with trade associations, school program, Earth Day events, Inter-agency referral program, etc.
- Coordinating the pollution prevention activities with the BAPPG, Alameda County Green Business Program and other agencies in the Bay area.

EBMUD estimates that since 1988, the above copper source control activities have resulted in a 35 percent reduction in influent loading to the treatment plant. The estimated reduction in effluent copper load from the EBMUD plant since 1988 has been about 15%.

It must be noted that influent reductions do not necessarily equate to reductions in effluent. Although pollution prevention programs will eliminate the pollutants from the environment, there are chemical and physical limitations on how low the reductions will translate to reductions in effluent concentrations.

8. POTENTIAL MEASURES AND ECONOMIC IMPACTS TO ACHIEVE COMPLIANCE

8.1 Copper

As documented in this report, LGVSD, FSSD, and EBMUD all provide a consistent and high level of wastewater treatment in full compliance with Federal secondary treatment requirements. As documented in their respective Infeasibility Studies, plant operations are already highly optimized and all there are no known plant additional optimization methodologies that would significantly reduce effluent concentrations.

All three facilities also have long-established and well performing source control and pollution prevention programs in place. Potential commercial and industrial copper sources discharging to the collection have long been targeted by these programs and continue to be tracked, inspected, and monitored. There are no known significant additional sources to target that may result in the level of reductions necessary to comply with the potential final limits. Even if there were, at the current influent concentrations, and high level of reductions across the plants, reducing influent concentrations has minimal impact on effluent concentrations (influent versus effluent plots show no minimal to no correlation).

The majority of influent copper is these and most systems is believed to be a function of the relative corrosivity of the potable water supply and corrosion of copper piping and plumbing fixtures. The water purveyors in each of the three dischargers service areas have had corrosion control programs in place for years, as mandated to comply with the Safe Drinking Water Act Lead and Copper Rule.

In a study of Bay Area dischargers, corrosion of copper plumbing was identified as the largest source of copper to wastewater treatment plant influent. For example, the three South Bay POTWs (Palo Alto, San Jose, and Sunnyvale) have estimated that corrosion accounts for 30-58% of the copper loading in their respective influents. Five POTWs attributed reductions in influent or effluent copper levels to reduced corrosivity of the water supply through pH adjustment. Other efforts that were reported to contribute to measurable impacts on influent or effluent copper levels include industrial source control and P2 programs targeting vehicle service facilities and printers. Two POTWs attributed reductions to industrial source control and two POTWs attributed reductions to commercial source control actions.

Recent tests conducted at the LGVSD treatment plant indicate that levels of dissolved copper in the plant effluent are generally above 5 µg/L, which exceeds the all of the calculated AMELs for total copper under different translator assumptions. Therefore, the plant could not consistently meet the AMEL based on the current CTR criteria through further plant optimization or installation of more sophisticated effluent filtration. Even with full treatment capacity effluent filtration, FSSD is unable to comply with the final copper limits. Examination of the effluent copper concentrations for Bay area advanced secondary (i.e. secondary plus filtration) facilities in **Figures 1** and **2** indicates that compliance problems would persist for these facilities. Based on this fact, it is assumed that conventional effluent filtration processes would not be adequate if added at other facilities to achieve compliance. Advanced treatment, such as reverse osmosis, is believed to be the only technology available that would allow facilities to comply with projected copper effluent limits resulting from application of the existing copper objectives.

Reverse Osmosis is a treatment technology that forces effluent through a very fine molecular sieve, under pressure, to remove contaminants. The byproduct of reverse osmosis is concentrated brine that can (depending on its composition) require treatment as a hazardous waste. The estimated cost for reverse osmosis is described below.

Annual treatment cost (i.e. annualized capital costs plus annual operation and maintenance costs) per million gallons per day (MGD) for Reverse Osmosis is based on information contained in *Managing Wastewater in Coastal Environments*, NRC, 1993. In 2004 costs, an estimated annual unit cost of $0.82 million per MGD of design capacity for reverse osmosis treatment will be used in this analysis. For the three plants in question, the current design capacities of those plants are FSSD (17.5 MGD), EBMUD (120 MGD) and LGVSD (<5 MGD). Therefore, the estimated additional annual treatment cost for reverse osmosis treatment at these three facilities is $116 million per year.

The above estimates do <u>not</u> include engineering and project administration costs (capital cost estimates typically include an estimating contingency of 20 percent, a construction contingency of 10 percent, and costs for engineering, legal, environmental and administration of 35 percent), land costs, and RO brine disposal (typically consists of 20 percent of the total treated flow). It is not conceivable that wastewater brine disposal would be allowed through direct discharge to the bay, particularly by a shallow water discharger. Further treatment, concentration, or evaporation of the brine would add considerable extra costs (costs of conveyance or treatment and conveyance of brine to ultimate disposal are potentially of the same magnitude as the base reverse osmosis costs, depending on the vicinity of brine disposal sites) and leave a highly concentrated liquid or crystalline waste product to be disposed of. Energy requirements for reverse osmosis at the magnitude required to attain compliance are extraordinary. For these reasons, reverse osmosis is not believed to be a viable treatment option for attaining compliance.

Based on the above analysis, it is appropriate to pursue development and adoption of one or more SSO for copper for the Bay north of the Dumbarton Bridge. This would provide Bay-wide consistency with the fact that similar SSOs for copper and nickel previously been adopted for the Bay south of the Dumbarton Bridge.

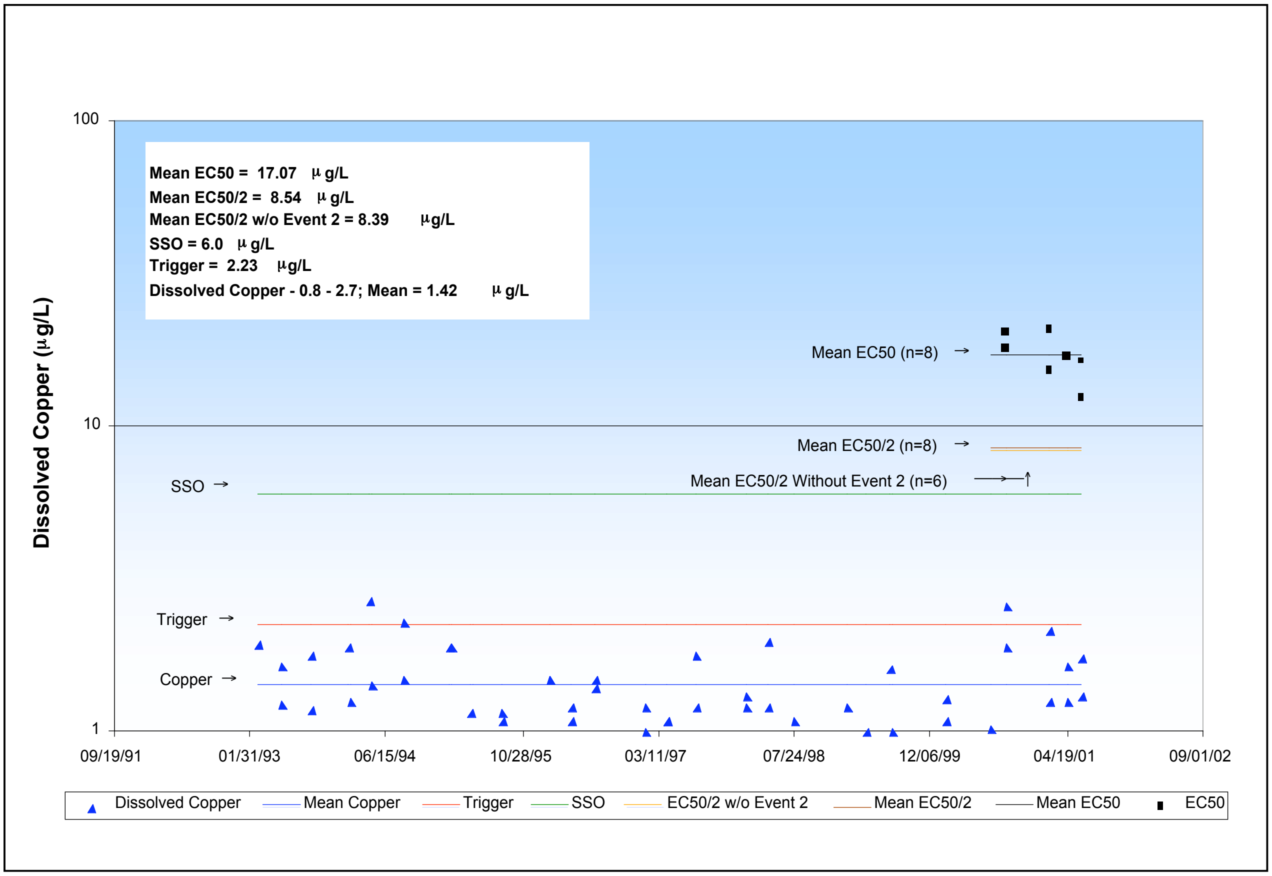
8.2 Nickel

For those dischargers with compliance problems with nickel, the above analysis of costs to achieve compliance would apply. In the case of nickel, industrial dischargers appear to have the greatest potential difficulty with compliance.

9. COORDINATING COMMITTEE MEETINGS

The Copper and Nickel workgroup met several times to discuss the SSOs that would be appropriate for the Bay north of the Dumbarton Bridge (see Appendix E for meeting notes). Discussions were held regarding appropriate segmentation of the Bay and calculations of WERs and translators for these segments. The City of San Jose prepared several slides illustrating the proposed SSOs, existing copper concentrations, potential trigger levels, and copper EC50s (**Figure 11**). **Figure 11** illustrates that the existing copper concentrations in the Bay are well below the SSO. Additionally, this figure indicates how conservative the trigger value is in efforts to assure that the SSO will not be exceeded. Similar figures, and additional information that was presented can be found in Appendix D.

Figure 11. Region 3 Copper Concentrations; Toxicity Values; Potential Trigger, and SSO



Members of the workgroup reviewed and commented on all work products. Their comments on this report have been addressed and are presented in Appendix C.

10. CONCLUSIONS

The above analysis addresses the SIP Section 5.2 requirements that the Regional Board must address in its consideration of site-specific copper and nickel objectives in San Francisco Bay North of Dumbarton Bridge. This analysis illustrates a number of municipal and industrial dischargers operating secondary or advanced secondary treatment plants will suffer compliance problems and unreasonable costs to comply with effluent limits based on existing water quality objectives for copper and nickel in San Francisco Bay. The compliance problems that will occur will not be remedied through source control measures or treatment process optimization. Bay area treatment plants have previously performed source control activities aimed specifically at copper control. The opportunity for additional improvement in influent or effluent levels of copper is therefore very limited. Effluent data and probable effluent limits presented in the above report illustrate the breadth and magnitude of compliance problems.

As a result of the above analysis, and in combination with the findings of the site-specific objectives derivation, it is concluded that action to consider and adopt science-based site-specific copper and nickel saltwater objectives for San Francisco Bay north of the Dumbarton Bridge is warranted and complies with requirements of the SIP and other regulatory requirements.

11. REFERENCES

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Appendix A

SSO-to-POTW Limit Calculations

In the absence of specific guidance and precedents on point of application for deriving translators for a given discharge (i.e. in San Pablo Bay, Miller Creek, overall North Bay), this section presents a range of site-specific translator options for copper and nickel. These were derived from three studies/datasets: 1) the North of Dumbarton Bridge Cu/Ni Study with associated RMP station data, 2) the LGVSD Translator Study Miller Creek data, and 3) RMP San Pablo Bay station (BD20) data. Subsequent FSSD and EBMUD sections contain a more abbreviated discussion of options, focusing on those deemed most probable for use near-term in calculating effluent limits.

The USEPA translator guidance document recommends using a minimum of 8 to 10 pairs of data points (dissolved and total metals) that are representative spatially and temporally (seasonally) of the receiving water to calculate a translator. Each of the three above datasets studies met these criteria and includes data adequate and sufficient to calculate translators.

The *Staff Report on Proposed Site-specific Water Quality Objectives and Water Quality Attainment Strategy for Copper and Nickel for San Francisco Bay South of the Dumbarton Bridge* (RWQCB May 15, 2002, Appendix E) used a pooled data set to calculate copper and nickel translators. In that study, data from two of 12 stations (sloughs) were excluded from the analysis to improve the regression relationship and have the translator better reflect overall conditions in the main (i.e. far field) receiving water.

The July 18, 2003 EOA memo *Cu/Ni North of Dumbarton Bridge – Preliminary Translator Data Analysis Including Both Step 1 and RMP Data* outlined a pooled approach that was consistent with the South Bay Copper/Nickel Study. In that analysis, a range of potential translators was derived using both the simple ratio method and the TSS regression method, and for both individual station and pooled station datasets (all stations, North Bay, Central Bay). The pooled data sets in the North of the Dumbarton Bridge Study showed potentially significant differences between the North and Central Bay groupings of stations versus all stations combined. Differences between ratio and regression based translators were minimal.

LGVSD conducted a site-specific translator study for zinc, copper and nickel as directed in the 1998 permit. The District's *Copper and Nickel Translator Study Update* memo (EOA, March 26, 2003) included individual station and pooled data translators for the Miller Creek sample locations that were from 20 feet downstream from the discharge point to 3,500 feet downstream of the discharge location. The distance from the plant outfall to the San Pablo Bay along the creek is approximately 4,500 feet. At the station located 20 feet downstream from the discharge point E-002 the water depth typically varies from less than one foot at low tide to over five feet at high tide.

The EPA translator guidance document states the "approach to collecting samples <u>beyond</u> the edge of the mixing zone may be especially valuable in estuarine" locations. Therefore, collecting samples located close to the outfall or closely spaced together to capture the exact edge of a mixing zone may not be necessary or appropriate compared to samples collected from locations well beyond the mixing zone. If this latter approach were to be taken, the farthest location downstream (in Miller Creek) or a location in San Pablo Bay would appear to be the most appropriate sampling location(s) from which to calculate a translator.

The table below shows selected translators from the above studies. Translators calculated based on the RMP BD20 data and the North of Dumbarton plus RMP North Bay pooled data are consistent and lower than those based on Miller Creek data. The District's reissued permit (December 2003) used the Miller Creek Special Study three station pooled "downstream locations" (in bold) dataset from which to calculate the acute (90th percentile) and chronic (median) translators used in that permit's reasonable potential analysis and Infeasibility Study.

	Translator	
	Median	90th%
Copper		
N. Dumbarton Bridge Study & RMP Data		
All Stations	0.50	0.83
Central Bay	0.71	0.88
North Bay	0.37	0.67
LGVSD Miller Creek Study		
Downstream Locations	0.56	0.83
All Locations & RMP BD20 Data	0.53	1.0
RMP BD20 data		
San Pablo Bay	0.38	0.66
Nickel		
N. Dumbarton Bridge Study & RMP Data		
All Stations	0.38	0.42
Central Bay	0.60	0.64
North Bay	0.25	0.25
LGVSD Miller Creek Study		
Downstream Locations	0.56	0.82
All Locations & RMP BD20 Data	0.51	1.0
RMP BD20 data		
San Pablo Bay	0.21	0.52

The impact of selection of the above translator values on effluent limits is shown in the tables below.

Table A-1. From SSO-to-POTW Limit: Las Gallinas Valley Sanitary District (COPPER)

WER	Dissolved SSO (WQO)		Dilution	Translator		ECA		CV = 0.39 LTAchronic	LTAacute	Lowest	Monthly Ave	Daily Max	Translator Reference Study
				Median	90th %					LTA			
	Chronic	Acute		Chronic	Acute	Chronic	Acute	mult=0.65	mult=0.45	LTA	AMEL=1.35	MDEL=2.24	
1	2.5	3.9	0	1	1	2.5	3.9	1.6	1.8	1.6	2.2	3.6	Translator = 1
	(2.5)	(3.9)		0.83	0.83	3.0	4.7	2.0	2.1	2.0	2.6	4.4	CTR Default Conversion Factor
				0.56	0.83	4.5	4.7	2.9	2.1	2.1	2.9	4.7	Miller Creek Downstream (NPDES permit value)
				0.38	0.66	6.6	5.9	4.3	2.7	2.7	3.6	6.0	BD20 station from North D.B. Study & RMP
				0.38	0.67	6.6	5.8	4.3	2.6	2.6	3.5	5.9	North D.B. Study N. Bay stations w/RMP data
1	3.1	4.8	0	1	1	3.1	4.8	2.0	2.2	2.0	2.7	4.5	Translator = 1
	(3.1)	(4.8)		0.83	0.83	3.7	5.8	2.4	2.6	2.4	3.3	5.4	CTR Default Conversion Factor
				0.56	0.83	5.5	5.8	3.6	2.6	2.6	3.5	5.8	Miller Creek Downstream (NPDES permit value)
				0.38	0.66	8.2	7.3	5.3	3.3	3.3	4.4	7.3	BD20 station from North D.B. Study & RMP
				0.38	0.67	8.2	7.2	5.3	3.2	3.2	4.4	7.2	North D.B. Study N. Bay stations w/RMP data
2.4	6	9.4	0	0.56	0.83	10.7	11.3	7.0	5.1	5.1	6.9	11.4	Miller Creek Downstream (NPDES permit value)
	(2.5)	(3.9)		0.38	0.66	15.8	14.2	10.3	6.4	6.4	8.6	14.3	BD20 station from North D.B. Study & RMP
				0.38	0.67	15.8	14.0	10.3	6.3	6.3	**8.5**	14.1	North D.B. Study N. Bay stations w/RMP data
2.4	7.4	11.5	0	0.56	0.83	13.3	13.9	8.6	6.2	6.2	8.4	14.0	Miller Creek Downstream (NPDES permit value)
	(3.1)	(4.8)		0.38	0.66	19.6	17.5	12.7	7.9	7.9	10.6	17.6	BD20 station from North D.B. Study & RMP
				0.38	0.67	19.6	17.2	12.7	7.7	7.7	**10.4**	17.3	North D.B. Study N. Bay stations w/RMP data
2.8	7	10.9	0	0.56	0.83	12.5	13.2	8.1	5.9	5.9	8.0	13.3	Miller Creek Downstream (NPDES permit value)
	(2.5)	(3.9)		0.38	0.66	18.4	16.5	12.0	7.4	7.4	10.1	16.7	BD20 station from North D.B. Study & RMP
				0.38	0.67	18.4	16.3	12.0	7.3	7.3	**9.9**	16.4	North D.B. Study N. Bay stations w/RMP data
2.8	8.7	13.4	0	0.56	0.83	15.5	16.2	10.1	7.3	7.3	9.8	16.3	Miller Creek Downstream (NPDES permit value)
	(3.1)	(4.8)		0.38	0.66	22.8	20.4	14.8	9.2	9.2	12.4	20.5	BD20 station from North D.B. Study & RMP
				0.38	0.67	22.8	20.1	14.8	9.0	9.0	**12.2**	20.2	North D.B. Study N. Bay stations w/RMP data

MEC = 25.0 µg/L
GM = 12.0 µg/L
GSD = 1.4 µg/L

Table A-2. From SSO-to-POTW Limit: Las Gallinas Valley Sanitary District (NICKEL)

WER	Dissolved SSO (WQO) Chronic	Dissolved SSO (WQO) Acute	Dilution	Translator Median Chronic	Translator 90th % Acute	ECA Chronic	ECA Acute	CV = 0.25 LTAchronic mult=0.75	LTAacute mult=0.58	Lowest LTA	Monthly Ave AMEL=1.22	Daily Max MDEL=1.72	Translator Reference Study
1	8.2	74	0	1	1	8.2	74.0	6.2	42.9	6.2	7.5	10.6	Translator = 1
				0.99	0.99	8.3	74.7	6.2	43.4	6.2	7.6	10.7	CTR Default Conversion Factor
				0.56	0.82	14.6	90.2	11.0	52.3	11.0	13.4	18.9	Miller Creek Downstream (NPDES permit value)
				0.21	0.52	39.0	142.3	29.3	82.5	29.3	35.7	50.4	BD20 station from North D.B. Study & RMP
				0.27	0.57	30.4	129.8	22.8	75.3	22.8	27.8	39.2	North D.B. Study N. Bay stations w/RMP data
1	11.9	62.4	0	1	1	11.9	62.4	8.9	36.2	8.9	10.9	15.4	Translator = 1
				0.99	0.99	12.0	63.0	9.0	36.6	9.0	11.0	15.5	CTR Default Conversion Factor
				0.56	0.82	21.3	76.1	15.9	44.1	15.9	19.4	27.4	Miller Creek Downstream (NPDES permit value)
				0.21	0.52	56.7	120.0	42.5	69.6	42.5	51.9	73.1	BD20 station from North D.B. Study & RMP
				0.27	0.57	44.1	109.5	33.1	63.5	33.1	**40.3**	56.9	North D.B. Study N. Bay stations w/RMP data
1	16.4	62.4	0	1	1	16.4	62.4	12.3	36.2	12.3	15.0	21.2	Translator = 1
				0.99	0.99	16.6	63.0	12.4	36.6	12.4	15.2	21.4	CTR Default Conversion Factor
				0.56	0.82	29.3	76.1	22.0	44.1	22.0	26.8	37.8	Miller Creek Downstream (NPDES permit value)
				0.21	0.52	78.1	120.0	58.6	69.6	58.6	71.5	100.7	BD20 station from North D.B. Study & RMP
				0.27	0.57	60.7	109.5	45.6	63.5	45.6	**55.6**	78.4	North D.B. Study N. Bay stations w/RMP data
1	20.9	62.4	0	1	1	20.9	62.4	15.7	36.2	15.7	19.1	27.0	Translator = 1
				0.99	0.99	21.1	63.0	15.8	36.6	15.8	19.3	27.2	CTR Default Conversion Factor
				0.56	0.82	37.3	76.1	28.0	44.1	28.0	34.1	48.1	Miller Creek Downstream (NPDES permit value)
				0.21	0.52	99.5	120.0	74.6	69.6	69.6	84.9	119.7	BD20 station from North D.B. Study & RMP
				0.27	0.57	77.4	109.5	58.1	63.5	58.1	**70.8**	99.9	North D.B. Study N. Bay stations w/RMP data

MEC = 8.2 µg/L
GM = 5.4 µg/L
GSD = 1.3 µg/L

Table A-3. From SSO-to-POTW Limit: Fairfield-Suisun Sanitary District (COPPER)

WER	Dissolved SSO (WQO)		Dilution	Translator		ECA		CV = 0.4 LTAchronic	LTAacute	Lowest	Monthly Ave	Daily Max	Translator Reference Study
				Median	90th %								
	Chronic	Acute		Chronic	Acute	Chronic	Acute	mult=0.69	mult=0.5	LTA	AMEL=1.29	MDEL=2.01	
1	2.5	3.9	0	1	1	2.5	3.9	1.7	2.0	1.7	2.2	3.5	Translator = 1
	(2.5)	(3.9)		0.83	0.83	3.0	4.7	2.1	2.3	2.1	2.7	4.2	CTR Default Conversion Factor
				0.46	0.64	5.4	6.1	3.8	3.0	3.0	3.9	6.1	FSSD site specific study (NPDES permit value)
				0.33	0.51	7.6	7.6	5.2	3.8	3.8	4.9	7.7	BF20 station from North D.B. Study & RMP
				0.38	0.67	6.6	5.8	4.5	2.9	2.9	3.8	5.9	North D.B. Study N. Bay stations w/RMP data
1	3.1	4.8	0	1	1	3.1	4.8	2.1	2.4	2.1	2.8	4.3	Translator = 1
	(3.1)	(4.8)		0.83	0.83	3.7	5.8	2.6	2.9	2.6	3.3	5.2	CTR Default Conversion Factor
				0.46	0.64	6.7	7.5	4.7	3.8	3.8	4.8	7.5	FSSD site specific study (NPDES permit value)
				0.33	0.51	9.4	9.4	6.5	4.7	4.7	6.1	9.5	BF20 station from North D.B. Study & RMP
				0.38	0.67	8.2	7.2	5.6	3.6	3.6	4.6	7.2	North D.B. Study N. Bay stations w/RMP data
2.4	6	9.36	0	0.46	0.64	13.0	14.6	9.0	7.3	7.3	9.4	14.7	FSSD site specific study (NPDES permit value)
	(2.5)	(3.9)		0.33	0.51	18.2	18.4	12.5	9.2	9.2	11.8	18.4	BF20 station from North D.B. Study & RMP
				0.38	0.67	15.8	14.0	10.9	7.0	7.0	**9.0**	14.0	North D.B. Study N. Bay stations w/RMP data
2.4	7.4	11.5	0	0.46	0.64	16.2	18.0	11.2	9.0	9.0	11.6	18.1	FSSD site specific study (NPDES permit value)
	(3.1)	(4.8)		0.33	0.51	22.5	22.6	15.6	11.3	11.3	14.6	22.7	BF20 station from North D.B. Study & RMP
				0.38	0.67	19.6	17.2	13.5	8.6	8.6	**11.1**	17.3	North D.B. Study N. Bay stations w/RMP data
2.8	7	10.9	0	0.46	0.64	15.2	17.1	10.5	8.5	8.5	11.0	17.1	FSSD site specific study (NPDES permit value)
	(2.5)	(3.9)		0.33	0.51	21.2	21.4	14.6	10.7	10.7	13.8	21.5	BF20 station from North D.B. Study & RMP
				0.38	0.67	18.4	16.3	12.7	8.1	8.1	**10.5**	16.4	North D.B. Study N. Bay stations w/RMP data
2.8	8.7	13.4	0	0.46	0.64	18.9	21.0	13.0	10.5	10.5	13.5	21.1	FSSD site specific study (NPDES permit value)
	(3.1)	(4.8)		0.33	0.51	26.3	26.4	18.1	13.2	13.2	17.0	26.5	BF20 station from North D.B. Study & RMP
				0.38	0.67	22.8	20.1	15.8	10.0	10.0	**12.9**	20.2	North D.B. Study N. Bay stations w/RMP data

MEC = 9.0 µg/L
GM = 4.2 µg/L
GSD = 1.4 µg/L

Table A-4. From SSO-to-POTW Limit: Fairfield-Suisun Sanitary District (NICKEL)

WER	Dissolved SSO (WQO)		Dilution	Translator		ECA		CV=0.3 LTAchronic	LTAacute	Lowest	Monthly Ave	Daily Max	Translator Reference Study
				Median	90th %								
	Chronic	Acute		Chronic	Acute	Chronic	Acute	mult=0.75	mult=0.58	LTA	AMEL=1.22	MDEL=1.72	
1	8.2	74	0	1	1	8.2	74	6.2	42.9	6.2	7.5	10.6	Translator = 1
				0.99	0.99	8.3	75	6.2	43.4	6.2	7.6	10.7	CTR Default Conversion Factor
				0.51	0.91	16.1	81	12.1	47.2	12.1	14.7	20.7	FSSD site specific study (NPDES permit value)
				0.39	0.19	21.0	389	15.8	225.9	15.8	19.2	27.1	BF20 station from North D.B. Study & RMP
				0.27	0.57	30.4	130	22.8	75.3	22.8	27.8	39.2	North D.B. Study N. Bay stations w/RMP data
1	11.9	62.4	0	1	1	11.9	62	8.9	36.2	8.9	10.9	15.4	Translator = 1
				0.99	0.99	12.0	63	9.0	36.6	9.0	11.0	15.5	CTR Default Conversion Factor
				0.51	0.91	23	69	17.5	39.8	17.5	21.4	30.1	FSSD site specific study (NPDES permit value)
				0.39	0.19	31	328	22.9	190.5	22.9	27.9	39.4	BF20 station from North D.B. Study & RMP
				0.27	0.57	44	109	33.1	63.5	33.1	**40.3**	56.9	North D.B. Study N. Bay stations w/RMP data
1	16.4	62.4	0	1	1	16	62	12.3	36.2	12.3	15.0	21.2	Translator = 1
				0.99	0.99	17	63	12.4	36.6	12.4	15.2	21.4	CTR Default Conversion Factor
				0.51	0.91	32	69	24.1	39.8	24.1	29.4	41.5	FSSD site specific study (NPDES permit value)
				0.39	0.19	42	328	31.5	190.5	31.5	38.5	54.2	BF20 station from North D.B. Study & RMP
				0.27	0.57	61	109	45.6	63.5	45.6	**55.6**	78.4	North D.B. Study N. Bay stations w/RMP data
1	20.9	62.4	0	1	1	21	62	15.7	36.2	15.7	19.1	27.0	Translator = 1
				0.99	0.99	21	63	15.8	36.6	15.8	19.3	27.2	CTR Default Conversion Factor
				0.51	0.91	41	69	30.7	39.8	30.7	37.5	52.9	FSSD site specific study (NPDES permit value)
				0.39	0.19	54	328	40.2	190.5	40.2	49.0	69.1	BF20 station from North D.B. Study & RMP
				0.27	0.57	77	109	58.1	63.5	58.1	**70.8**	99.9	North D.B. Study N. Bay stations w/RMP data

MEC = 6.6 µg/L
GM = 3.7 µg/L
GSD = 1.3 µg/L

Table A-5. From SSO-to-POTW Limit: East Bay Municipal Utility District (COPPER)

WER	Dissolved SSO (WQO)		Dilution (B=3.66)	Translator		ECA		CV=0.5 LTAchronic	LTAacute	Lowest	Monthly Ave	Daily Max	Translator Reference Study
				Median	90th %					LTA			
	Chronic	Acute		Chronic	Acute	Chronic	Acute	mult=0.59	mult=0.38		AMEL=1.44	MDEL=2.64	
1	2.5	4.8	10	1	1	2.5	15	1.5	5.7	1.5	2.1	3.9	Translator = 1
	(2.5)	(3.9)		0.83	0.83	3.0	25	1.8	9.5	1.8	2.6	4.7	CTR Default Conversion Factor
				0.83	0.83	3.0	25	1.8	9.5	1.8	2.6	4.7	CTR Default CF (NPDES permit value)
				0.68	0.81	3.8	26	2.3	10.0	2.3	3.2	6.0	BC10 station from North D.B. Study & RMP
				0.74	0.88	3.4	22	2.0	8.2	2.0	2.9	5.3	North D.B. Study N. Bay stations w/RMP data
1	3.1	4.8	10	1	1	3.1	15	1.8	5.7	1.8	2.6	4.8	Translator = 1
	(3.1)	(4.8)		0.83	0.83	4.4	25	2.6	9.5	2.6	3.7	6.9	CTR Default Conversion Factor
				0.83	0.83	4.4	25	2.6	9.5	2.6	3.7	6.9	CTR Default CF (NPDES permit value)
				0.68	0.81	12.6	26	7.5	10.0	7.5	10.7	19.7	BC10 station from North D.B. Study & RMP
				0.74	0.88	9.0	22	5.3	8.2	5.3	7.6	13.9	North D.B. Study N. Bay stations w/RMP data
2.4	6	9.36	10	0.83	0.83	39	80	23.2	30.3	23.2	33.4	61.3	CTR Default CF (NPDES permit value)
	(2.5)	(3.9)		0.68	0.81	55	83	32.6	31.4	31.4	45.2	82.9	BC10 station from North D.B. Study & RMP
				0.74	0.88	48	73	28.4	27.9	27.9	**40.2**	73.7	North D.B. Study N. Bay stations w/RMP data
2.4	7.4	11.5	10	0.83	0.83	57	106	33.5	40.2	33.5	48.2	88.3	CTR Default CF (NPDES permit value)
	(3.1)	(4.8)		0.68	0.81	76	109	45.1	41.5	41.5	59.8	109.6	BC10 station from North D.B. Study & RMP
				0.74	0.88	68	98	39.9	37.2	37.2	**53.6**	98.3	North D.B. Study N. Bay stations w/RMP data
2.8	7	10.9	10	0.83	0.83	51	99	30.3	37.5	30.3	43.7	80.1	CTR Default CF (NPDES permit value)
	(2.5)	(3.9)		0.68	0.81	70	102	41.3	38.7	38.7	55.7	102.2	BC10 station from North D.B. Study & RMP
				0.74	0.88	62	91	36.4	34.6	34.6	**49.9**	91.4	North D.B. Study N. Bay stations w/RMP data
2.8	8.7	13.4	10	0.83	0.83	72	129	42.3	49.0	42.3	60.9	111.6	CTR Default CF (NPDES permit value)
	(3.1)	(4.8)		0.68	0.81	95	133	55.9	50.5	50.5	72.8	133.4	BC10 station from North D.B. Study & RMP
				0.74	0.88	84.4	120	49.8	45.5	45.5	**65.5**	120.2	North D.B. Study N. Bay stations w/RMP data

Note: When the adjusted SSO is less than the background concentration the chronic ECA was calculated with ECA=adjusted SSO, without dilution.

MEC = 25.9 µg/L
GM = 9.1 µg/L
GSD = 1.6 µg/L

Table A-6. From SSO-to-POTW Limit: East Bay Municipal Utility District (NICKEL)

WER	Dissolved SSO		Dilution (B=3.81)	Translator		ECA		CV=0.33					
				Median	90th %			LTAchronic	LTAacute	Lowest	Monthly Ave	Daily Max	Translator Reference Study
	Chronic	Acute		Chronic	Acute	Chronic	Acute	mult=0.69	mult=0.5	LTA	AMEL=1.29	MDEL=2.01	
1	8.2	74	10	1	1	47.7	706	32.9	353	32.9	42	66	Translator = 1
				0.99	0.99	48.5	713	33.5	357	33.5	43	67	CTR Default Conversion Factor
				0.99	0.99	48.5	713	33.5	357	33.5	43	67	CTR Default CF (NPDES permit value)
				0.58	0.78	107.1	914	73.9	457	73.9	95	149	BC10 station from North D.B. Study & RMP
				0.65	0.85	91.9	836	63.4	418	63.4	82	127	North D.B. Study N. Bay stations w/RMP data
1	11.9	62.4	10	1	1	84.7	590	58.4	295	58.4	75	117	Translator = 1
				0.99	0.99	85.9	596	59.3	298	59.3	76	119	CTR Default Conversion Factor
				0.99	0.99	85.9	596	59.3	298	59.3	76	119	CTR Default CF (NPDES permit value)
				0.58	0.78	171	766	117.9	383	117.9	152	237	BC10 station from North D.B. Study & RMP
				0.65	0.85	149	700	102.7	350	102.7	**132**	206	North D.B. Study N. Bay stations w/RMP data
1	16.4	62.4	10	1	1	130	590	89.5	295	89.5	115	180	Translator = 1
				0.99	0.99	131	596	90.6	298	90.6	117	182	CTR Default Conversion Factor
				0.99	0.99	131	596	90.6	298	90.6	117	182	CTR Default CF (NPDES permit value)
				0.58	0.78	248	766	171.4	383	171.4	221	345	BC10 station from North D.B. Study & RMP
				0.65	0.85	218	700	150.4	350	150.4	**194**	302	North D.B. Study N. Bay stations w/RMP data
1	20.9	62.4	10	1	1	154	590	106.1	295	106.1	137	213	Translator = 1
				0.99	0.99	156	596	107.4	298	107.4	139	216	CTR Default Conversion Factor
				0.99	0.99	156	596	107.4	298	107.4	139	216	CTR Default CF (NPDES permit value)
				0.58	0.78	290	766	200.1	383	200.1	258	402	BC10 station from North D.B. Study & RMP
				0.65	0.85	255	700	176.0	350	176.0	**227**	354	North D.B. Study N. Bay stations w/RMP data

Note: When the adjusted SSO is less than the background concentration the chronic ECA was calculated with ECA=adjusted SSO, without dilution.

MEC = 16.0 µg/L
GM = 6.8 µg/L
GSD = 1.4 µg/L

Appendix B

Influent and Effluent Time Series Plots

Figure B-1. LGVSD Influent and Effluent Time Series for Copper.

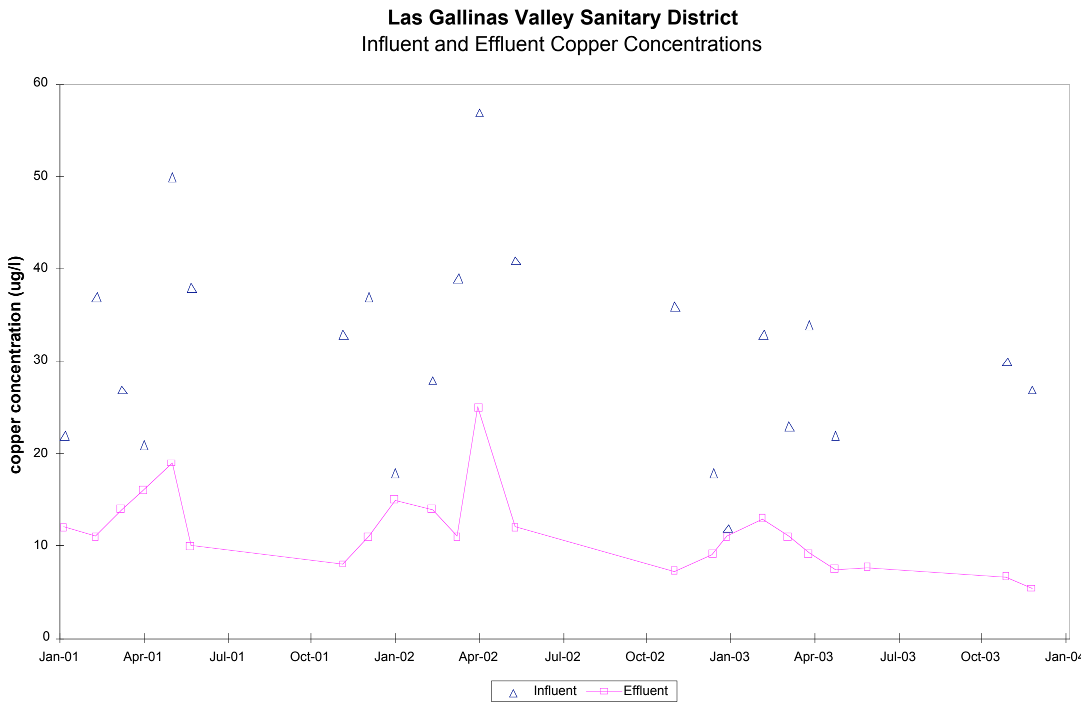


Figure B-2. LGVSD Influent and Effluent Time Series for Nickel.

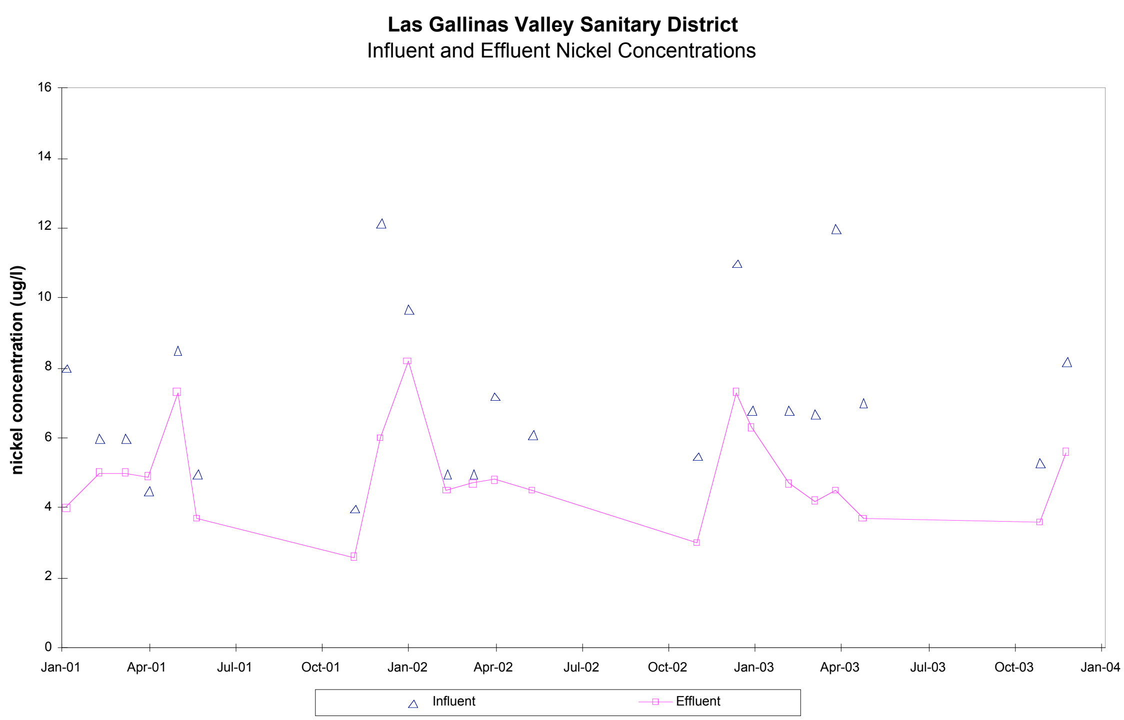


Figure B-3. FSSD Influent and Effluent Time Series for Copper.

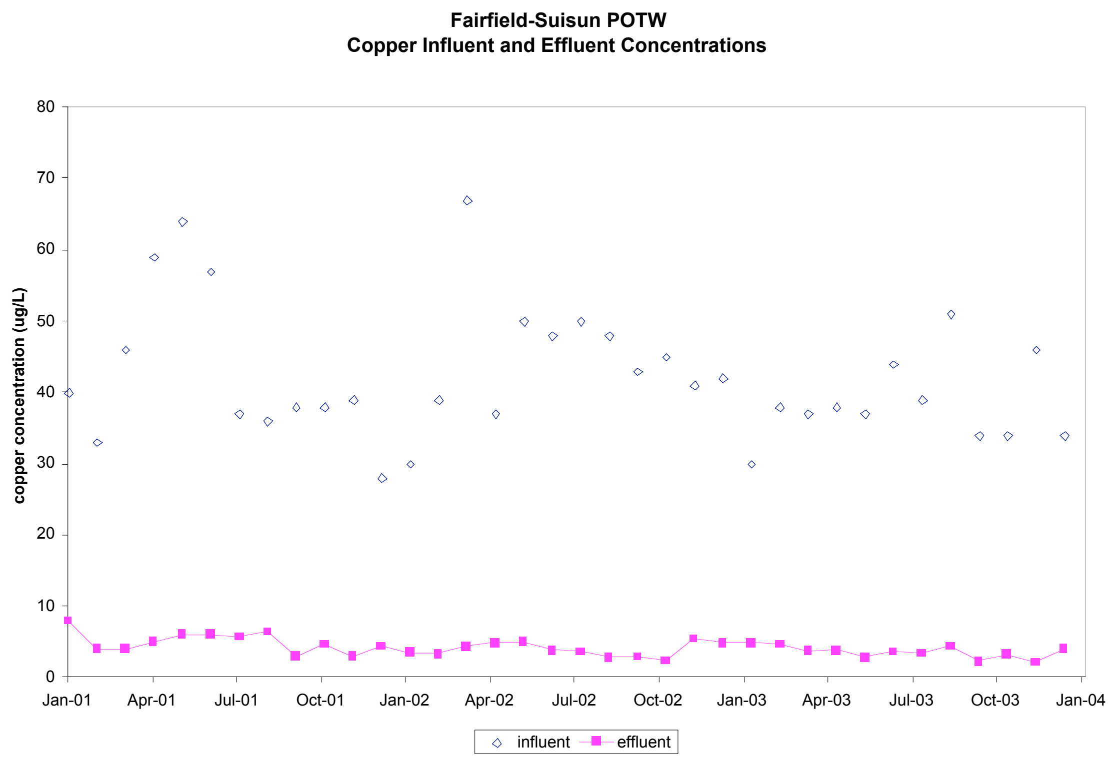


Figure B-4. FSSD Influent and Effluent Time Series for Nickel.

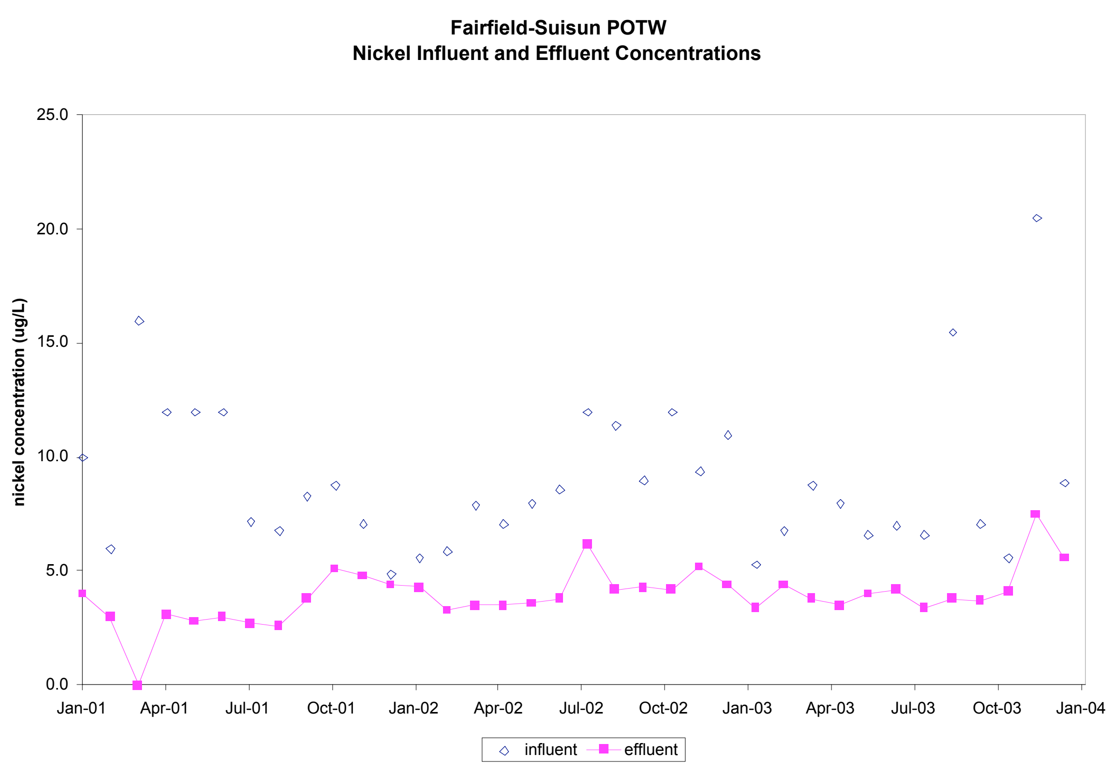


Figure B-5. EBMUD Influent and Effluent Time Series for Copper.

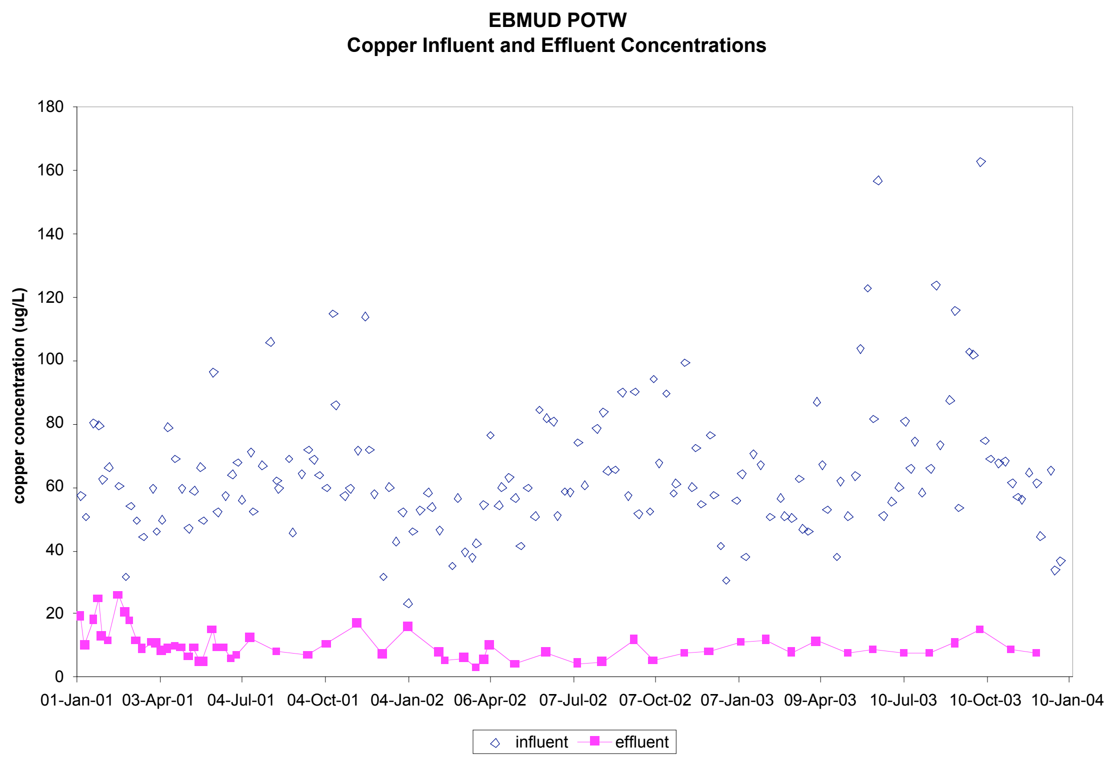
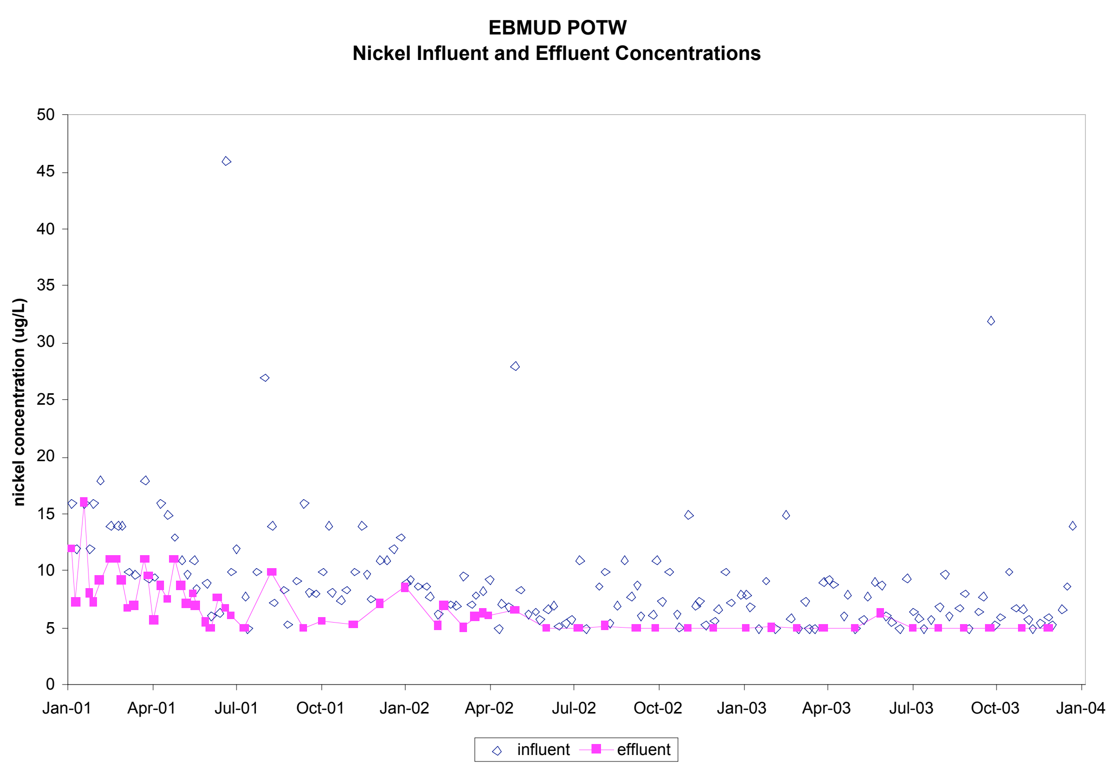


Figure B-6. EBMUD Influent and Effluent Time Series for Nickel.



Appendix C

Response to Comments

Richard Looker's Comments

1) The report is a helpful summary of data. Overall, the document presents a satisfactory (after some concerns are addressed) argument for a copper SSO and a weak argument for a nickel SSO.

Response: *No response necessary.*

2) It is not valid to compare the AMEL to maximum values if there was monitoring more than once per month for certain facilities. When reporting on ability to comply, please use the AMEL compared to monthly means (if they exist) and the MDEL compared to single values. If only one sample per month is available, it is ok to compare it to the AMEL but you should say that it is just one sample.

Response: *There are very few monthly means available. For the majority of the plants, they only sample once per month for metals and compliance therefore this has to be evaluated relative to the AMEL.*

3) The report did not present a convincing argument that the effluent limits could **NOT** be met through reasonable treatment, source control, and pollution prevention measures. I will give specifics later.

Response: *See Attachment C-1 for additional nickel data analysis. Additional supporting information will be developed as part of the follow-up CEP funded copper/nickel 04/05 Basin Plan Amendment assistance project. Information previously submitted to the RWQCB on these topics was reported by reference rather than repetition here. WWTP treatment plant performance data is submitted in monthly and annual Self-Monitoring Reports. Bay area municipal dischargers have been providing a minimum of secondary treatment since at least the early 1980s. TSS is probably the best indicator of secondary treatment plant performance. WWTPs over 5 mgd submit annual and semi-annual Federal Pretreatment Program reports detailing regulation of categorical and significant industrial users. These pretreatment programs have been in place since at least the early to mid-1980s. Source control and pollution prevention programs have been required since 1988 and earlier for shallow water dischargers. Results are required to be reported to the RWQCB in annual reports. (See January 23, 2002 RWQCB Item 13, "Status Report of Pretreatment and Pollution Prevention Programs" for a comprehensive history of these activities).*

4) Page 2: define the box and whisker plots

Response: *Added definition of box & whisker plots upfront.*

5) Page 13: EBMUD does not appear to be a good representative for secondary plants – it seems on the high side.

Response: *The next phase of work on this project will expand the analysis to all plants, beyond the three-plant case study analysis provided for in the scope of work for the FY 03-04 phase of the project that produced this report (CEP 04/05 Basin Plan Amendment assistance project). Representativeness was a qualitative decision taking into account size, service area (urban/industrialized), treatment facilities, discharge location, history of good operations and maintenance (past national awards), extensive pretreatment and pollution prevention programs (received USEPA 2004 first place award for pretreatment), and source water in the service area (mainly potentially corrosive Sierra snowmelt/runoff from Pardee Reservoir). EBMUD also discharges into the Central Bay, different from the San Pablo and*

Suisun Bays that LGVSD and FSSD discharge to. If the comment is referring strictly to the relative nickel concentration, EBMUD's median value is about 6.5 µg/L vs the pooled secondary value of about 4 µg/L. Both are quite low relative to even the unadjusted CTR dissolved WQO of 8.2 µg/L.

6) Page 19: Why did you bring up this issue of the translation of ambient metals here? Did you use this technique here to compute the effluent limits here? You mainly just confused me. What method did you actually use in this report? I guess I need more background on this issue that is contained here.

Response: *It is important to look at ambient total metals concentrations for comparison to total effluent limits when assessing compliance issues (i.e. comparison to MECs), especially for deepwater dischargers who receive dilution credit. SIP protocols for calculating effluent limits were used, which include translation of ambient concentrations. This issue of selection and use of translators is complex in part because of a lack of region-wide policy guidance. Translator decisions are being made on a permit by permit basis. Additional information on how translators were used in this report for calculating effluent limits is provided in Tables A-1 to A-3 of this report and in the separate Translator Derivation Report. An extensive evaluation of alternative methods of using translators relative to deriving background concentrations for effluent limit calculations was prepared by EOA and included as part of the reissuance of the South Bay permits in 2003. A copy is posted on the RWQCB website with each permit as "EOA memo" for the RWQCB August 20, 2003 meeting. To reduce the complexity of this report, discussion of potential compliance with effluent limits under different translator and site-specific objective alternatives for the three case studies was included in the separate SSO derivation report (Tables 11 – 13).*

7) Page 19: Why are the EBMUD EL so low? Do they not get dilution credit? Thought those limits would be higher. Please give an appendix showing the details of the calcs.

Response: *EBMUD does normally receive dilution credit (10:1). However, when ambient (RMP) total copper values are used in the SIP effluent limit calculations with the CTR WQO of 3.1 µg/L, dilution credit is not allowed. This relates in part to the unresolved translator selection and application policy issues discussed in the response immediately above. More details are provided in Table A-3 of Appendix A.*

8) Pages 21-22: last paragraph – not a strong argument for nickel. There is minimal compliance challenge. From what is presented here, there is not enough for me to use to demonstrate that the SSO for nickel is a necessity. The arguments about triggering RPA and avoiding listings are not strong either.

Response: *See Attachment C-1. Additional supporting information will be developed as part of the follow-up CEP funded copper/nickel 04/05 Basin Plan Amendment assistance project.*

9) Pages 22-29: The material here does not add up to addressing "that the discharger cannot be assured of achieving the criterion and/or effluent limitation through reasonable treatment, source control, and pollution prevention measures".

Response: *Additional supporting information will be developed as part of the follow-up CEP funded copper/nickel 04/05 Basin Plan Amendment assistance project, including information regarding plant awards for treatment, source control and/or pollution prevention. Most of this information was obtained from previously submitted, and approved, Infeasibility Studies for the three case study dischargers. At that time, the level of detail provided was deemed sufficient to conclude that the POTWs could not comply* *with CTR based copper limits, and that it was appropriate to include interim performance based limits in each of the three permits.*

10) There are unsupported claims (page 25 for Las Gallinas) that "…additional source control activities do not provide a feasible solution for immediate compliance with projected limits." For FSSD, the report mentions the reductions in copper influent from 1992 and 2000 and then says "it is not clear how much more reduction may be achieved". There is no credible evidence presented that FSSD is doing all reasonable source control. At least for EBMUD, you point out that it is an award-winning facility with respect to P2 so this is tangible evidence that they are doing the reasonable activities.

Response: *This subject will be documented more thoroughly in the next phase of work. (CEP 04/05 Basin Plan Amendment assistance project). Also as noted above, information previously submitted to the RWQCB on these topics was reported by reference (i.e. in annual P2reports) rather than repeated here.*

11) Page 29: You only made the case that Las Gallinas was in full compliance with the Federal secondary requirements. FSSD is a tertiary, and you gave no information regarding EBMUD in this regard. I have nothing on which to evaluate whether they are doing all reasonable treatment.

Response: *This subject will be documented more thoroughly in the next phase of work. (CEP 04/05 Basin Plan Amendment assistance project). Also as noted above, information previously submitted to the RWQCB on these topics was reported by reference (monthly and annual SMRs) rather than repetition here. Effluent TSS/BOD time series data will be compiled as part of the follow-up work to document "reasonable treatment."*

12) Page 29: You refer to low influent metal concentrations for these facilities, but I have no basis of comparison to evaluate this statement. Thus, I cannot evaluate the conclusion that this is evidence of optimum P2/source control programs.

Response: *The reference to low influent concentration has been removed, since this is a subjective statement. Influent metals data are not currently submitted to the ERS so the requested data are more time consuming to compile. Available influent data show that copper in the 40-60 µg/L range is quite common with some areas, such as some that are served Hetch Hetchy potable water, may have influent concentrations closer to 100 µg/L. Influent total nickel values for some facilities are less than the 8.2 µg/L CTR dissolved WQO. The proposed influent/effluent "report card" time series plots will show comparative influent performance information.*

13) Page 29: You say that there is not much relationship between influent and effluent concentrations in the second paragraph from the end. Yet, you imply that the 35% reduction in EBMUD influent copper occurred over the same period of time that a 15% reduction in copper load occurred for that facility. The report also states that FSSD influent copper was reduced 34% over the period 1992 to 2000, but there was not a corresponding statement about impacts to effluent concentrations or loading. The statements seem contradictory.

Response: *There is subsequent reduction in effluent due to reduction in influent, to a point. At some point, continual reduction of the influent does not result in any noticeable reduction in effluent. This topic will be addressed further in the next phase of work where influent and effluent data will be presented (CEP 04/05 Basin Plan Amendment assistance project).*

14) Page 32: The report did not make a strong argument for nickel SSOs. The report did not make the argument that compliance problems could be addressed through source control or treatment process optimization – it just said it without proof. Very little argument was presented that improvement opportunities are limited to reduce influent or effluent levels of copper.

Response: *See Attachment C-1. This subject will be documented more thoroughly in the next phase of work. (CEP 04/05 Basin Plan Amendment assistance project). Also as noted above, information previously submitted to the RWQCB on these topics was reported by reference rather than repetition here.*

15) I think that the case can be made stronger for copper with some more information about influent concentrations.

Response: *This topic will be addressed further in the next phase of work where more influent and effluent data will be presented (CEP 04/05 Basin Plan Amendment assistance project) through the use of plant "Report Cards."*

16) Can you make the case, by showing me longer time series of influent concentrations, that we have reached a plateau and that influent concentrations have been steady for some time AND that those influent concentrations are low compared to some reasonable metric? You say they are low, but how would I know if the statement was true?

Response: *This topic will be addressed further in the next phase of work where influent and effluent data will be presented (CEP 04/05 Basin Plan Amendment assistance project) through the use of plant "Report Cards." Most of the dramatic reductions in influent concentrations referred to occurred during the 1980s, following implementation of the pretreatment and pollution prevention programs at most WWTPs. Influent/effluent plots as will be generated for plants for the last several years or more show them to be in "maintenance" mode, i.e. maintaining consistent WWTP performance and maintaining implementation of pretreatment/P2 programs. Figure 1 of the January 23, 2002 RWQCB status report on Pretreatment and P2 shows that most of the heavy metal loading reduction for the Region occurred between 1986 and 1991. That Figure also shows that loadings have been generally flat from 1992 to 1999 even though flows increased, indicating that some concentration reductions were still occurring.*

17) Can you provide evidence that EBMUD is performing better than it needs to be according to federal secondary guidelines?

Response: *Data has been compiled on effluent TSS/BOD concentrations to show performance relative to the 30/30 mg/L federal secondary treatment limits (see below). The absence of Mandatory Minimum Penalties is also an indicator that the plant has been operating satisfactorily.*

EBMUD BOD Results (mg/L):

Month	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
JAN	23	18	18	18	19	20	19	18	12	14	14	13	15	19	14
FEB	26	22	23	17	20	21	15	32	17	15	17	15	11	13	20
MAR	31	19	21	18	22	20	14	25	10	12	17	14	11	12	13
APR	18	19	21	16	21	16	19	24	11	15	15	13	14	12	15
MAY	16	21	19	15	14	18	17	28	14	13	15	10	10	14	12
JUN	14	22	14	17	17	21	16	27	18	11	11	11	11	10	10
JUL	14	20	14	15	19	21	16	24	14	14	9	12	11	8.6	9
AUG	12	18	13	15	18	23	18	20	14	15	8.0	8.9	10	13	10
SEP	13	22	13	15	20	19	24	24	15	13	11	11	10	14	
OCT	18	17	14	17	17	15	24	14	15	11	12	10	11	13	
NOV	17	16	17	14	17	18	23	17	14	17	11	13	14	11	
DEC	18	18	17	17	15	15	20	13	14	16	13	15	18	14	
AVE	**18.3**	**19.3**	**17.0**	**16.2**	**18.3**	**18.9**	**18.8**	**22.2**	**14.0**	**13.8**	**12.7**	**12.2**	**12.2**	**12.8**	**12.8**

EBMUD TSS Results (mg/L):

Month	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
JAN	21	11	16	21	17	19	18	22	19	13	17	12	18	19	16
FEB	25	15	22	16	24	22	13	19	21	17	20	16	10	12	26
MAR	33	15	20	15	20	17	13	17	13	13	16	14	11	12	14
APR	15	14	17	15	18	18	18	23	14	19	19	13	13	14	14
MAY	17	20	18	16	15	22	17	19	13	11	15	12	9	15	15
JUN	13	15	13	19	17	22	16	22	19	12	12	14	12	14	15
JUL	12	17	12	17	19	22	18	21	21	18	10	15	15	12	13
AUG	9	15	10	16	21	27	17	20	18	19	11	13	12	16	20
SEP	9	18	10	15	21	21	19	22	14	14	10	16	12	20	
OCT	13	14	11	16	19	16	13	11	11	14	12	13	15	13	
NOV	13	13	11	13	19	21	14	20	13	17	11	18	16	17	
DEC	14	17	16	14	15	14	18	14	12	17	13	15	25	16	
AVE	**16.2**	**15.3**	**14.6**	**16.1**	**18.8**	**20.1**	**16.2**	**19.2**	**15.7**	**15.3**	**13.8**	**14.3**	**14.0**	**15.0**	**16.6**

18) Can you provide some evidence that there are no or small possible reductions in effluent concentrations that can be gained through P2/source control or treatment process improvement? You say this, but I did not really see evidence that I can point to when I have to make this argument.

Response: *This topic will be addressed further in the next phase of work where influent and effluent data will be presented (CEP 04/05 Basin Plan Amendment assistance project) through the use of plant "Report Cards."*

19) For nickel, I do not see much here for me to make the case that an SSO is needed.

Response: *See page 31 and Attachment C-1. It appears most appropriate to proceed with a weight of evidence type approach for justifying a nickel SSO rather than simply a compliance necessity approach.*

Andy Gunther's Comments

20) This is a very technical report on a very specific subject, and I just want to verify that it is meant for a very technical audience. The narrative assumes a significant amount of background knowledge on the subject (both in general and specifically regarding certain cited reports), and I had some difficulty following some of the discussion. This is only a problem if it is necessary for neophytes like me to understand everything, which may not be required (for a CMIA report a different standard would apply). I have made some specific suggestions for a little background to help folks like me below. As a CEP document, I would recommend that an executive summary be prepared that provides the problem, the analysis, and the conclusion. I think it could be easily created by quickly editing a cut and paste of a few paragraphs.

Response: *An Executive Summary has been added to the report.*

21) I'd like to see just a bit more overview at the beginning to set the stage. As I understand it, if best available scientific information indicates current standards are overprotective, then we CAN adopt SSOs. But we only NEED to undertake this when not doing so would leave dischargers unable to comply even after taking reasonable measures. Thus, we've prepared this document to show that SSOs are needed? (If I'm wrong here, you get my point in #1!). If I'm right, it would be great to have a simple explanation like that to kick off the analysis.

Response: *Introduction now includes broader overview of the work.*

22) Would attaching as an appendix the executive summary of the previous study that calculates and justifies SSOs that are still protective of the environment be too much trouble? It would have been helpful for me.

Response: *There is a separate companion SSO report to this SIP justification report that describes the range of WER based SSOs that could be justified. The executive summary from the July 2002 WER report that describes the derivation of the WERs will be appended to the SSO report.*

23) P. 1 At the end of paragraph 1, the document referenced should be cited.

Response: *Citation has been added.*

24) P. 2 The "whiskers" on the plots are not explained in the caption. What do the boxes, bars, and dots represent?

Response: *Added definition of box & whisker plots upfront.*

25) P. 3 The rationale for tossing the outlier should be described, and then the outlier should be eliminated from the nickel data that are displayed in Figure 2.

Response: *The text will be changed to read "One point (93 µg/L) shown off scale to expand view of remaining datapoints. The point was not censored, just the graph scale truncated.*

26) P. 12 The statement at the end of paragraph 2 needs more support. What criteria are used to decide that the dischargers are "reasonably representative?" Clearly, there are many secondary plants with higher concentrations in their effluent than the two that were selected.

Response: *Added text to this section to clarify. See earlier responses.*

27) P. 16 It would help to show the equations here...the number of acronyms being generated can be overwhelming for the uninitiated. What "unresolved policy issues" are referred to in the second paragraph? Statements like that leave the reader wondering how fundamental these "issues" are. If I understand it, the issue is what station do we select to represent background? If so, just state why you selected certain stations. The way it's worded now can raise unnecessary alarm.

Response: *Added translator equations, added a glossary of acronyms at the front of the report, and removed reference to "unresolved policy issues."*

28) P. 17-19 From the text, I understand that the bold line of numbers in the tables represent the translator option used facility's last permit? That should be stated in the caption

Response: *Added captions on the appropriate tables.*

29) P. 19 RPA is Reasonable Potential Analysis? This is not defined. In the middle paragraph, the arguments that are used to identify the "most scientifically defensible" method should be included here or an appendix. Especially since the document you cite is labeled "draft." It seems to me that the argument here is for using derived rather than measured values, which seems a bit unusual.

Response: *Added a glossary of acronyms, included methods, and evaluated the appropriate methods. The referenced document was an attachment ("EOA Memo") to the three South Bay POTW permits that were reissued 1n 2003. See RWQCB website and Board meeting agenda for August 20, 2003 Items 11, 12, and 13. Translators are also addressed in a separate CEP translator derivation report.*

30) P. 21 Since you have three industrial plants that have nickel problems, doesn't this suggest that your three municipal examples do not adequately represent the industrial facilities?

Response: *Evaluation has been edited to include all dischargers (see Attachment C-1). The industrial and municipal facilities performances are more similar than dissimilar. There were collectively only a very small number of elevated nickel effluent values (see page 31).*

31) P. 25 "P2" I assume means Pollution Prevention? This should be defined, as should BAPPG.

Response: *Added a glossary of acronyms.*

32) P. 26 End of second paragraph concludes "regulated by this Order." What order are we talking about? 4th paragraph ends with reference to Table X, which I assume should be Table 14?

Response: *Removed reference to Order and fixed table reference(s).*

33) P. 29 In the second paragraph under the copper subheading, it is stated that the three plants have low copper influent concentrations. As there is no reference provided, it is not possible to determine if this is fact or speculation.

Response: *Removed reference to low influent concentrations to avoid confusion.*

Arleen Feng's Comments

34) It looks like BASMAA is rather peripheral for this document, but in general I agree with Andy that it is hard to follow and gets so focused on analytical "trees" it fails to make its "forest" points more compelling. A few additional comments

Response: *No response necessary.*

35) It would be helpful to if this document defined the list, number and/or categories of NDB dischargers requesting the SSOs, and clarified which subsets of this universe are referenced in various Figures or Tables. Tables 1-3 do not list names in the same sequence, making it hard to compare/peruse although one assumes that the reference to "available data" accounts for some of the differences. If the reader is not really meant to look at the content of these tables, just note their bulk and proceed to the analysis, then consider putting them in an appendix.

Response: *Sorted tables in same sequence (alphabetical) for consistency and created a table identifying secondary plants, advanced secondary plants, and industrial plants.*

36) Historical limits are not mentioned till Page 16; I suggest moving background on WQ objectives and translators to bottom of page 1, and/or at least insert a narrative summary of where this analysis is going before plunging into step 1.

Response: *Moved translator discussion forward to Section 3.*

37) It's hard to follow the text through the thickets of tables. References seem to be missing/incorrect for several figures and/or tables; also inconsistent use of Attachment / Appendix A.

Response: *Clarified references to tables/figures and fixed inconsistencies.*

Attachment C-1. Nickel Evaluation

The Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (State Implementation Policy, SIP) indicates that a site-specific objective may be developed under three conditions. These conditions, as well as how they have been addressed, are discussed below.

(1) A written request for a site-specific study, accompanied by a preliminary commitment to fund the study, subject to development of a workplan, is filed with the RWQCB;

A work plan was prepared in 2000 [Grovhoug, T. and Salvia, S. Work Plan for Copper and Nickel Impairment Assessment to Assist in Preparation of 2002 303(d) List: San Francisco Bay, North of Dumbarton Bridge. August 17, 2000] to provide data which fairly characterized existing ambient water column levels of copper and nickel in San Francisco Bay north of the Dumbarton Bridge. One intended use of this data was the development of site-specific water quality objectives.

(2) Either:

(a) a priority pollutant criterion or objective is not achieved in the receiving water; or

(b) a holder of an NPDES permit demonstrates that they do not, or may not in the future, meet an existing or potential effluent limitation based on the priority pollutant criterion or objective;

An assessment of discharger compliance with effluent limits based on four potential chronic nickel site-specific objectives. These four include the CTR objective of 8.2 µg/L, and potential SSOs of 11.9 µg/L, 16.4 µg/L, or 20.9 µg/L. The table below lists the lowest of these four potential SSOs with which certain discharger's can comply (see Attachment 1 for full analysis tables). For instance, GWF 3rd Street would not be in compliance with the 8.2 µg/L, 11.9 µg/L, 16.4 µg/L SSOs, but can comply with the 20.9 µg/L SSO. Likewise, Hayward, Rhodia, Tesoro and GWF Nichols cannot comply with the 8.2 µg/L objective, but could comply with the 11.9 µg/L SSO.

SHALLOW WATER DISCHARGERS				
Chronic SSO	AMEL	MEC	99.87%	Discharger
20.9	70.8	58.4	43.2	GWF 3rd Street (Site I)

DEEP WATER DISCHARGERS				
Chronic SSO	AMEL	MEC	99.87%	Discharger
11.9	132	93.0	50.8	Hayward
11.9	132	37.0	92.4	Rhodia
11.9	132	87.0	37.2	Tesoro
11.9	132	92.9	43.5	GWF Nichols (Site V)

all units are µg/L

SSO = site-specific objective

AMEL = average monthly effluent limit

MEC = maximum effluent concentration

99.87% = 3 standard deviations about the mean

*(3) A demonstration that the discharger cannot be assured of achieving the criterion or objective and/or effluent limitation through reasonable treatment, source control, and *pollution prevention measures. This demonstration may include, but is not limited to, as determined by the RWQCB:*

> *(a) an analysis of compliance and consistency with all relevant federal and State plans, policies, laws, and regulations;*
> *(b) a thorough review of historical limits and compliance with those limits;*
> *(c) a thorough review of current technology and technology-based limits; and*
> *(d) an economic analysis of compliance with the priority pollutant criterion or objective of concern.*

Based on the assessment above, there are three dischargers who would not have been able to comply in at least one instance with effluent limits based on the CTR nickel objective of 8.2 µg/L, one who could not comply with limits based on an SSO of 16.4 µg/L, and one who could not comply with limits based on an SSO of 20.9 µg/L. Time-series plots are provided below to show trends in effluent concentrations for each plant. Efforts toward addressing reasonable treatment, source control, and pollution prevention measures for each discharger is outside the scope of work performed to date. As additional work toward the Basin Plan amendment progresses, these issues will be addressed.

Discharger	Ave Flow (MGD)	N	# Exceedances of AMEL	99.87% (µg/L)	MEC (µg/L)	Next Max (µg/L)	Ave w/MEC (µg/L)	Ave w/o MEC (µg/L)
GWF 3rd Street	0.043	48	2	43.2	58.4	28.0	16.8	15.9
GWF Nichols	0.047	27	1	43.5	92.9	13.0	12.6	9.6
Rhodia	0.109	10	0	92.4	37.0	32.0	18.5	15.9
Tesoro	4.22	12 2	1	37.2	87.0	32.0	16.0	16.0
EBDA - Hayward	13.07	28	1	50.8	93.0	24.0	12.5	9.6

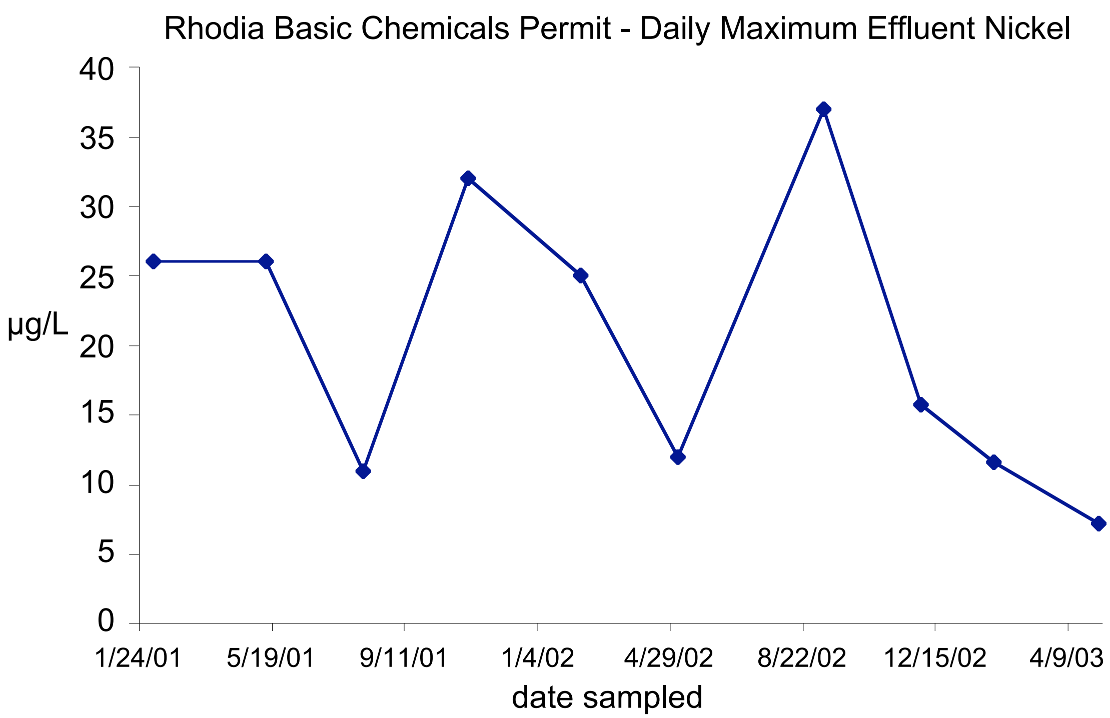
<u>GWF 3rd Street</u>
There were 2 daily maximum effluent data points (58.4 and 28 µg/L) that exceeded the Shallow Water discharger AMEL of 27.8 µg/L. The average of all effluent data was 16.8 µg/L, well below 27.8 µg/L.

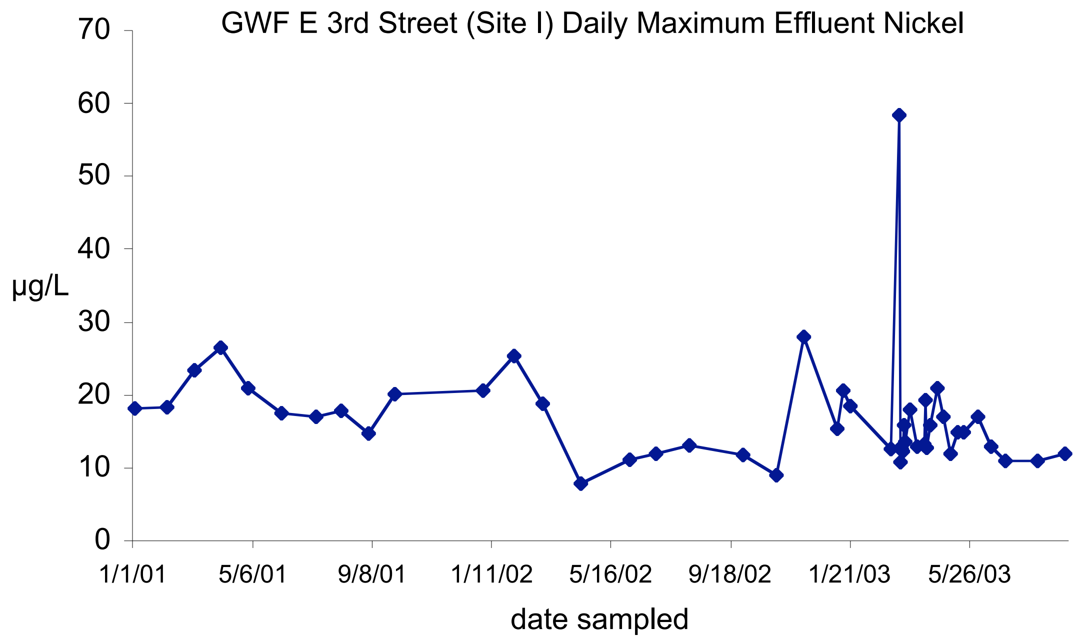
<u>GWF Nichols</u>
There was 1 daily maximum effluent data point (92.9 µg/L) that exceeded the Deep Water discharger AMEL of 82 µg/L. The next highest data point was 13 µg/L. The average of all effluent data was 12.6 µg/L with the 92.9 µg/L value and 9.6 without the 92.9 µg/L.

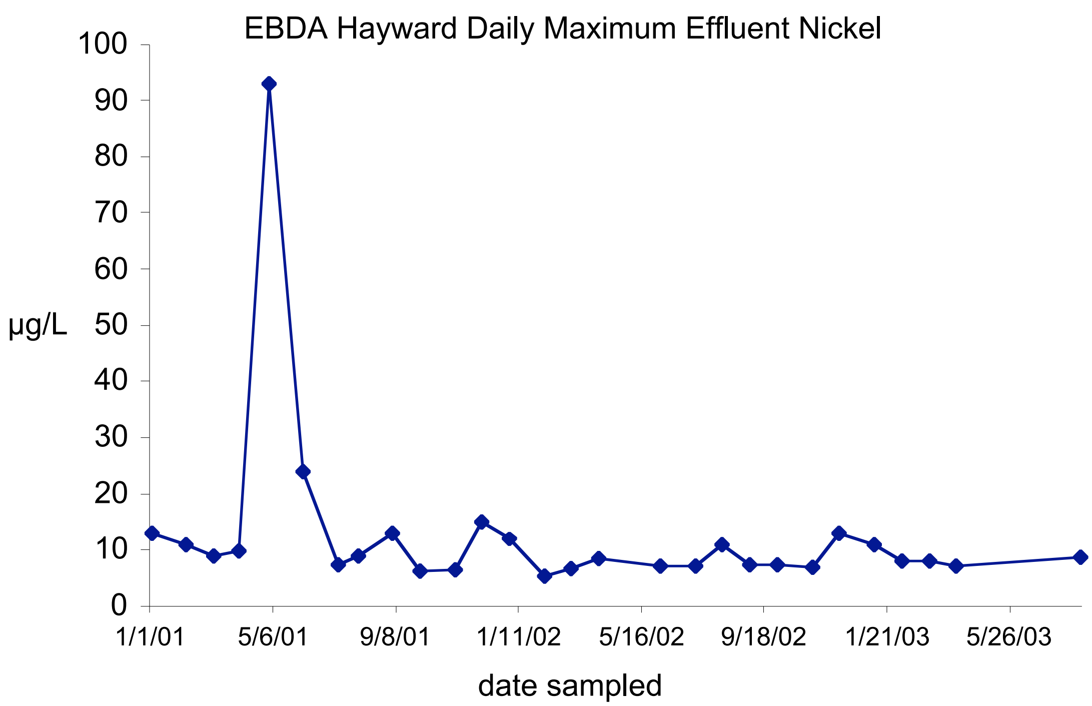
<u>Rhodia</u>
There were no daily maximum effluent data points that exceeded the Deep Water discharger AMEL of 82 µg/L. The 99.87th percentile (92.4 µg/L) exceeded the AMEL of 82 µg/L.

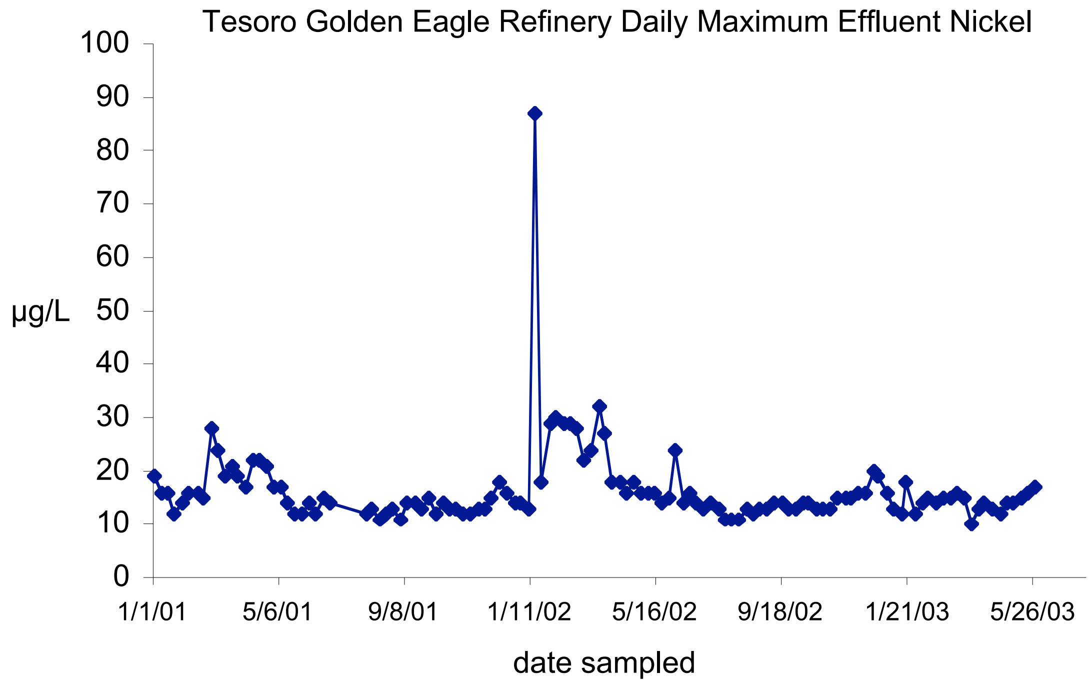
Tesoro
There was 1 daily maximum effluent data point (87 µg/L) that exceeded the Deep Water discharger AMEL of 82 µg/L. The next highest data point was 32 µg/L. The average of all effluent data was 16 µg/L with or without the 87 µg/L value.

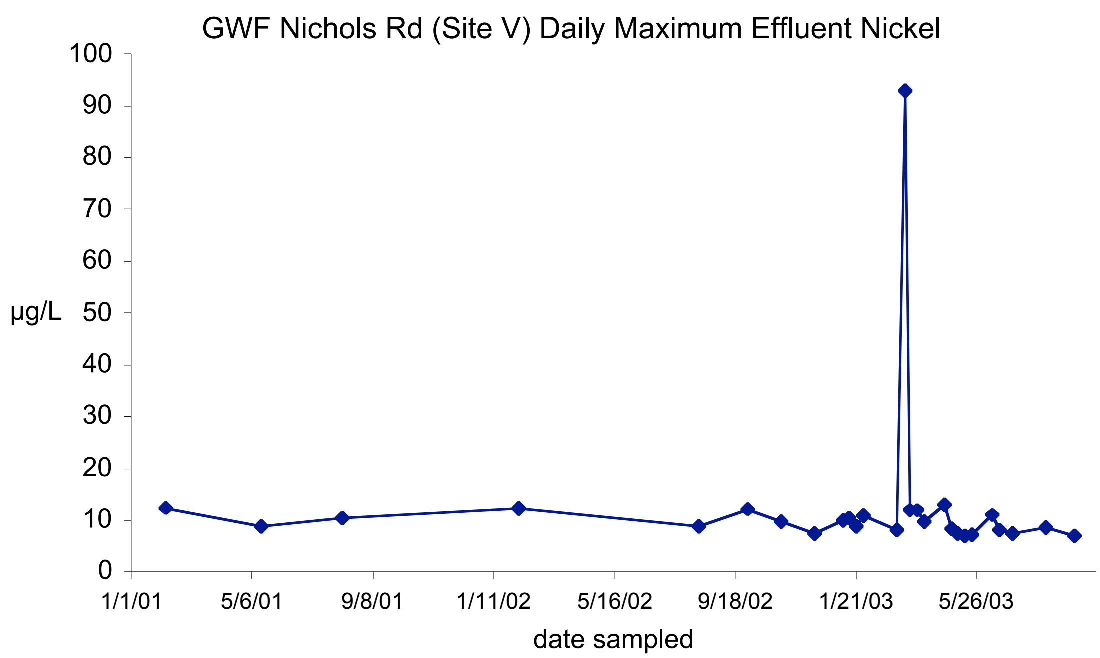
EBDA – Hayward
There was 1 daily maximum effluent data point (93 µg/L) that exceeded the Deep Water discharger AMEL of 82 µg/L. The next highest data point was 24 µg/L. The average of all effluent data was 12.5 µg/L with the 93 µg/L value and 9.6 without the 93 µg/L. However, the compliance point for Hayward is the combined EBDA discharge, and there were no exceedances in the combined flow.




GWF E 3rd Street (Site I) Daily Maximum Effluent Nickel
70
60
50
40
µg/L
30
20
10
0
1/1/01
5/6/01
9/8/01
1/11/02
5/16/02
9/18/02
1/21/03
5/26/03
date sampled


EBDA Hayward Daily Maximum Effluent Nickel
100
90
80
70
60
µg/L
50
40
30
20
10
0
1/1/01
5/6/01
9/8/01
1/11/02
5/16/02
9/18/02
1/21/03
5/26/03
date sampled


Tesoro Golden Eagle Refinery Daily Maximum Effluent Nickel
100
90
80
70
60
µg/L
50
40
30
20
10
0
1/1/01
5/6/01
9/8/01
1/11/02
5/16/02
9/18/02
1/21/03
5/26/03
date sampled


GWF Nichols Rd (Site V) Daily Maximum Effluent Nickel
100
90
80
70
60
µg/L
50
40
30
20
10
0
1/1/01
5/6/01
9/8/01
1/11/02
5/16/02
9/18/02
1/21/03
5/26/03
date sampled

Appendix D

Powerpoint Presentations
from June 3, 2004
Workgroup Meeting

Selection of NDB Copper WERs

Use Of The *Mytilus* Embryo Assays to Derive SSOs for San Francisco Bay North of Dumbarton Bridge

Environmental Services Department
City of San Jose
June 3, 2004

Approach to SSO Development NDB

- Indicator Species Procedure
- A biologically-based adjustment to the EPA national copper criterion
- Adjustment accounts for differences between clean laboratory seawater and the specific characteristics of the site water

Water-Effect Ratio Procedure

- Collect: Site Water - presumed to have high binding capacity
  Laboratory Water - "clean" natural seawater with low binding capacity
- Spike with varying amounts of copper
- Inoculate with sensitive embryos
- Determine EC50s

WER & SSO Calculation

- WER = Site Water EC50/Lab Water EC50
- Final WER (FWER) = Geometric mean WER
- SSO = FWER X National Criterion
- $$\text{SSO} = \frac{\text{Site Water EC50}}{\text{Lab Water EC50}} \times \text{Lab Water (National) Criterion}$$

Definition of Terms

- EC50 - 50% effect concentration; acute endpoint
- FAV - Final Acute Value (Regression of 4-most-sensitive genera)
- CMC - Criterion Maximum Concentration (FAV/2) - EPA acute criterion
- ACR - Acute-to-Chronic Ratio (acute endpoint divided by the chronic endpoint of the same material under the same conditions)
- FCV - Final Chronic Value (FAV/ACR)
- CCC - Criterion Continuous Concentration (the lower of the FCV, the Final Plant Value, or the Final Residue Value

EPA Procedure

- Review acute & chronic tests, assemble acute & chronic databases and rank species
- Minimum Data Requirements
  - 8 Families represented in database, etc.
- Derive FAV by Regression method; derive CMC
- Derive ACR - 8 methods listed in the 1995 EPA Saltwater Copper Addendum
- Derive CCC directly or indirectly

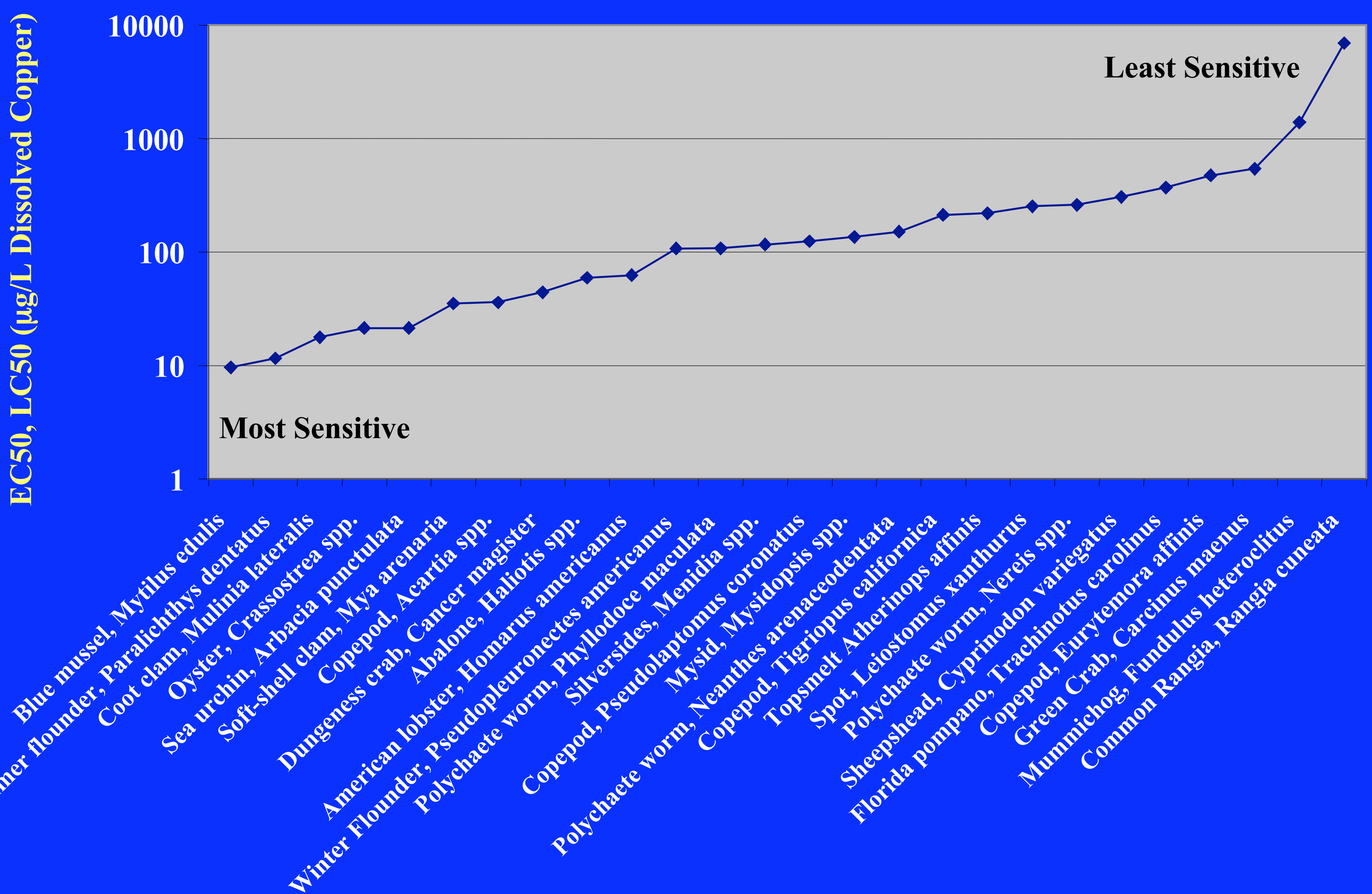
EPA 1995 Saltwater Copper Addendum

ACR Derivation - Method 4

“When acute tests used to derive the FAV are from embryo/larval tests with molluscs, and a limited number of other taxa, it has been considered appropriate to assume that the ACR is 2.0; thus the CMC equals the CCC [e.g., copper (SW), cyanide (SW)]”

The current (CTR) Copper ACR is 3.127

Ranked Genus Mean Acute Values for Saltwater Copper Criteria (From: 1995 Saltwater Copper Addendum)

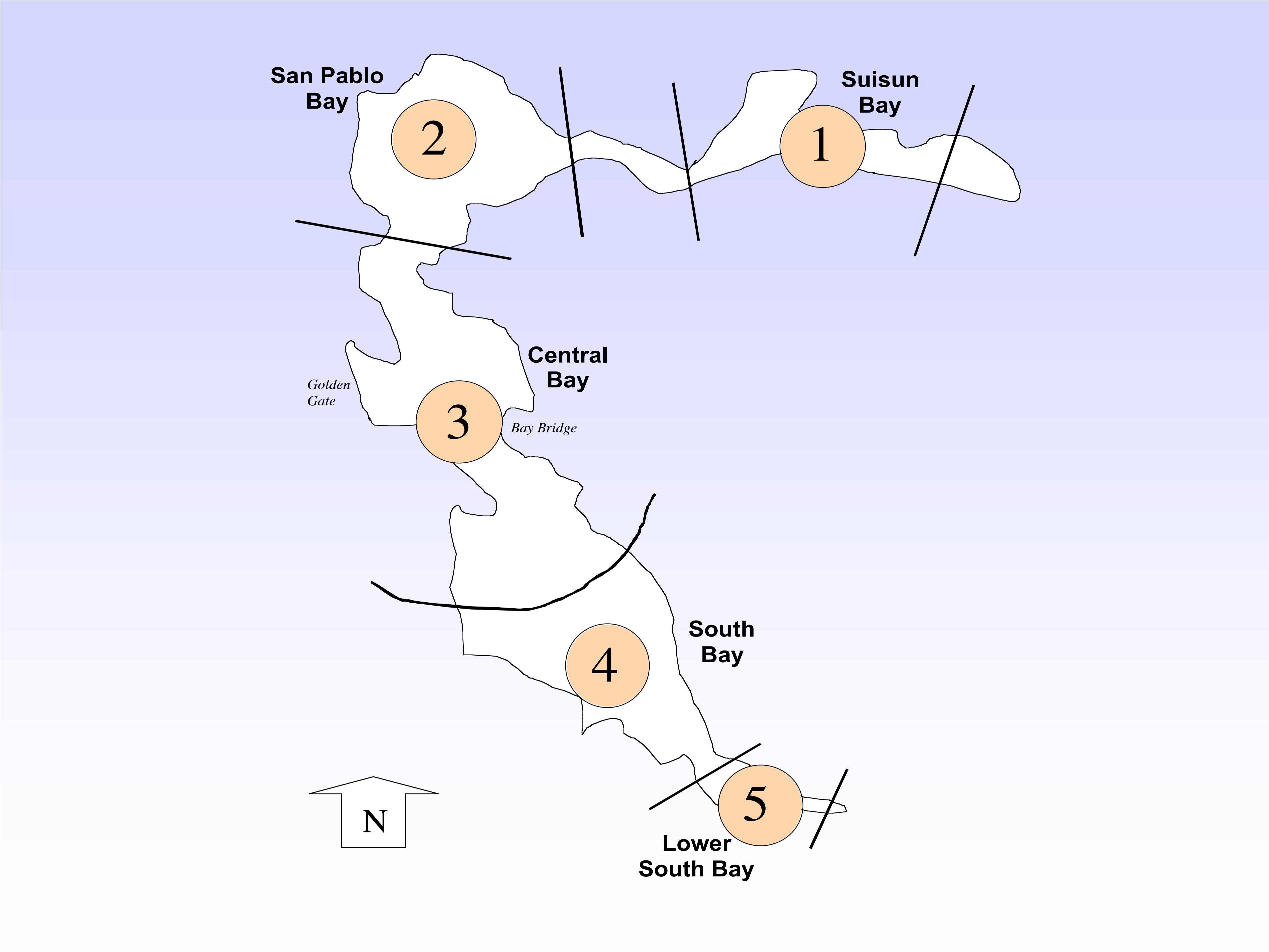


Sensitivity Revisited

- Copper FAV lowered from 10.39 to 9.625 ppb to protect *Mytilus* sp.
- Mytilus embryo/larval development tests conducted on very sensitive life stage
- ACR (3.127) not based on *Mytilus* sp. but on *Daphnia, Gammarus, Physa* & *Mysidopsis* (now *Americamysis*)
- National Criterion modified by current Mytilus Lab Water data from 3.1 to 2.5 ppb

More Definition of Terms

- Power Analysis - Statistical method used to develop an ambient concentration trigger
- Trigger - The smallest increment that can be statistically detected in future sampling given a specific n (number of samples) and a specific variability (variance) in existing data.


San Pablo Bay
Suisun Bay
Central Bay
Golden Gate
Bay Bridge
South Bay
Lower South Bay
1
2
3
4
5
N

Bay Region Mean Water-Effect Ratios

	Region 1	Region 2	Region 3	Region 4	Region 5
Arith. Mean	2.6	2.51	2.48	3.01	2.806
Geo. Mean	2.49	2.40	2.44	2.9	2.771
n	6	20	8	16	40

San Jose Recommendation

- Adopt Ni WER of 2.4 for Bay Regions 1-3
- Adopt Ni SSO of 6.0 for Bay Regions 1-3
  - (2.4 X 2.5 = 6)

- Adopt Ni WER of 2.771 for Bay Region 4
  - (lowered from 2.9 to 2.771)
- Adopt Ni SSO of 6.9 for Bay Region 4

Figure 1. Bay Region 1 Copper Concentrations; Toxicity Values; Potential Trigger and Site-Specific Objective

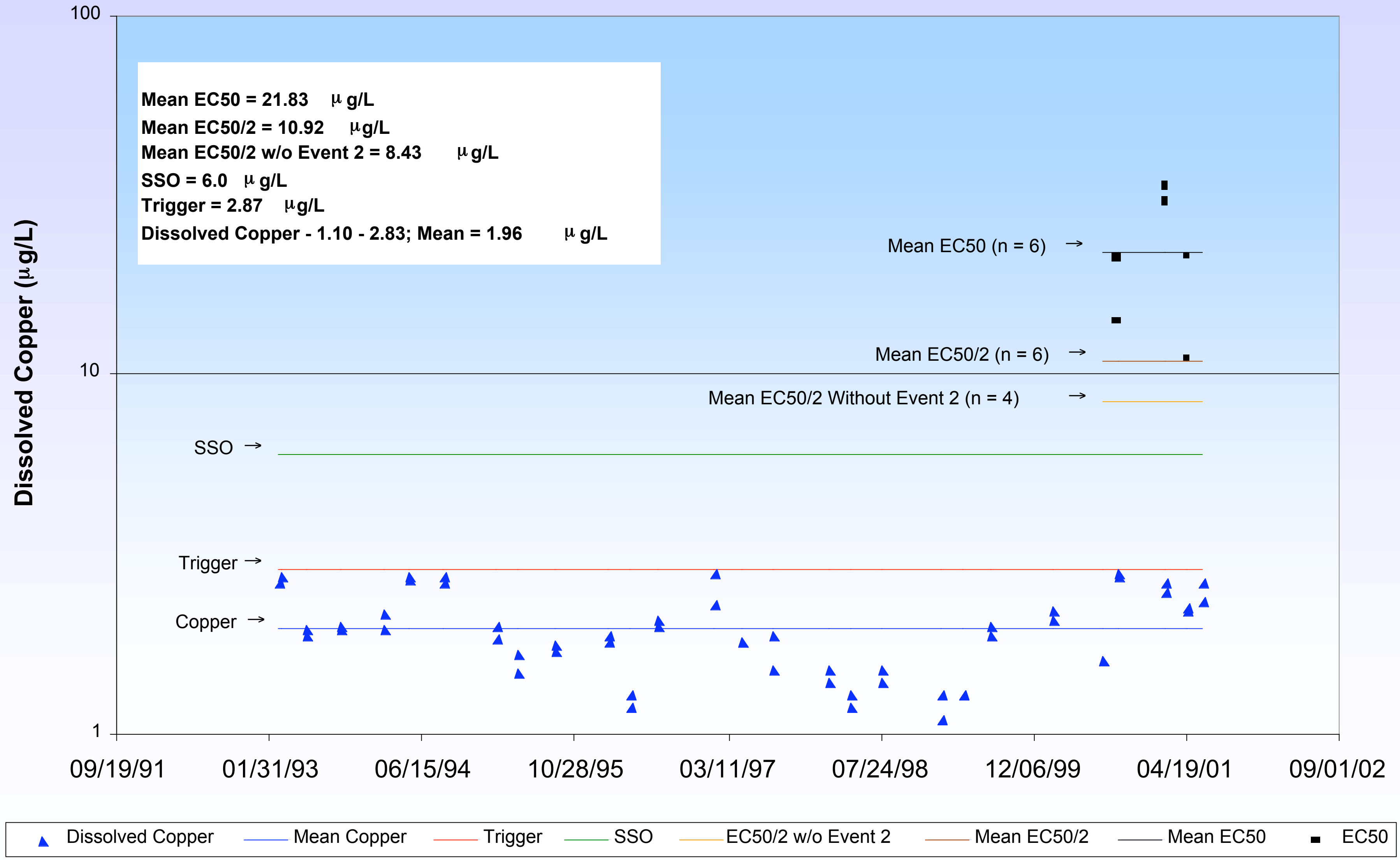


Figure 2. Bay Region 2 Copper Concentrations; Toxicity Values; Potential Trigger and Site-Specific Objective

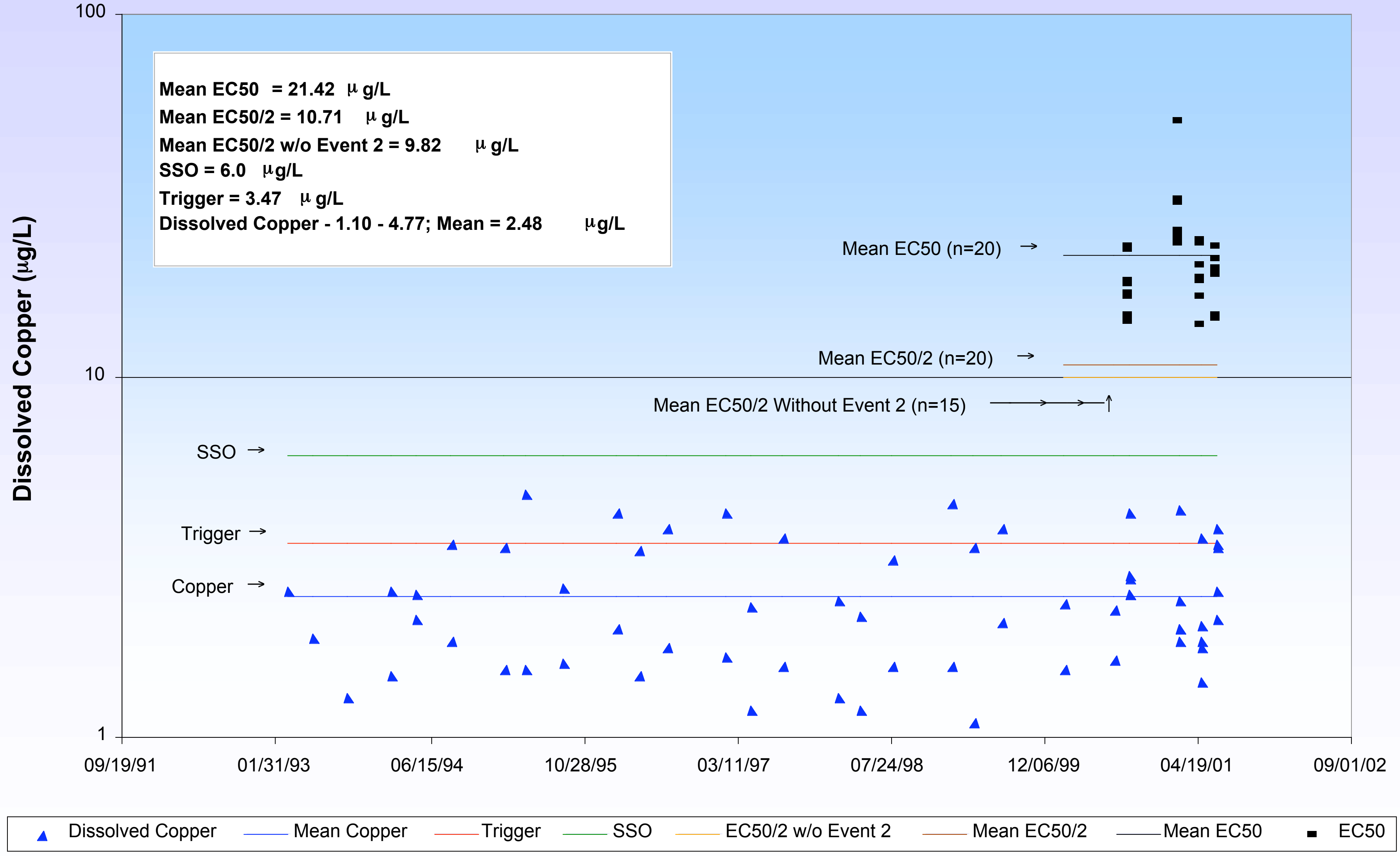


Figure 3. Bay Region 3 Copper Concentrations; Toxicity Values; Potential Trigger and Site-Specific Objective

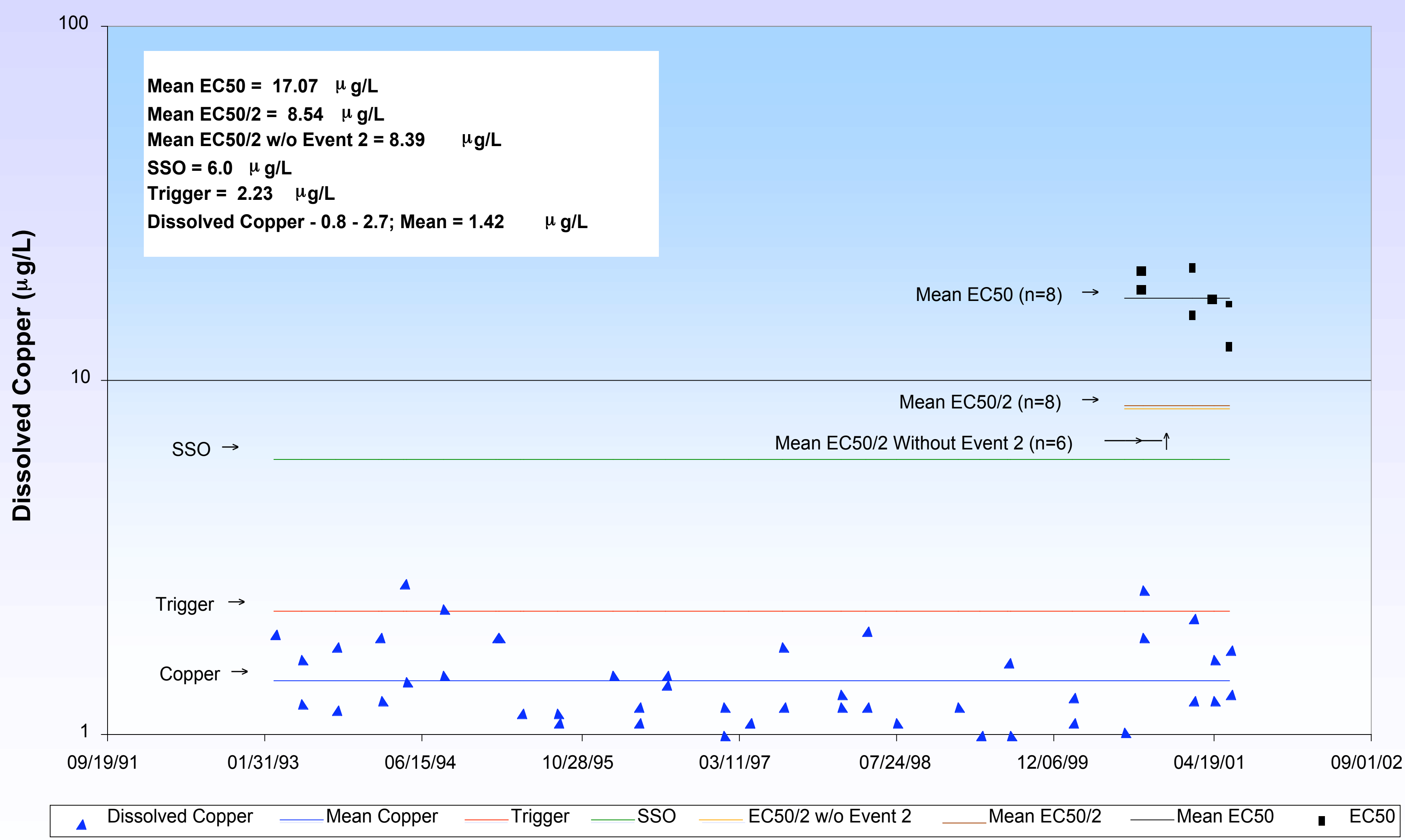


Figure 4. Bay Region 4 Copper Concentrations; Toxicity Values; Potential Trigger and Site-Specific Objective

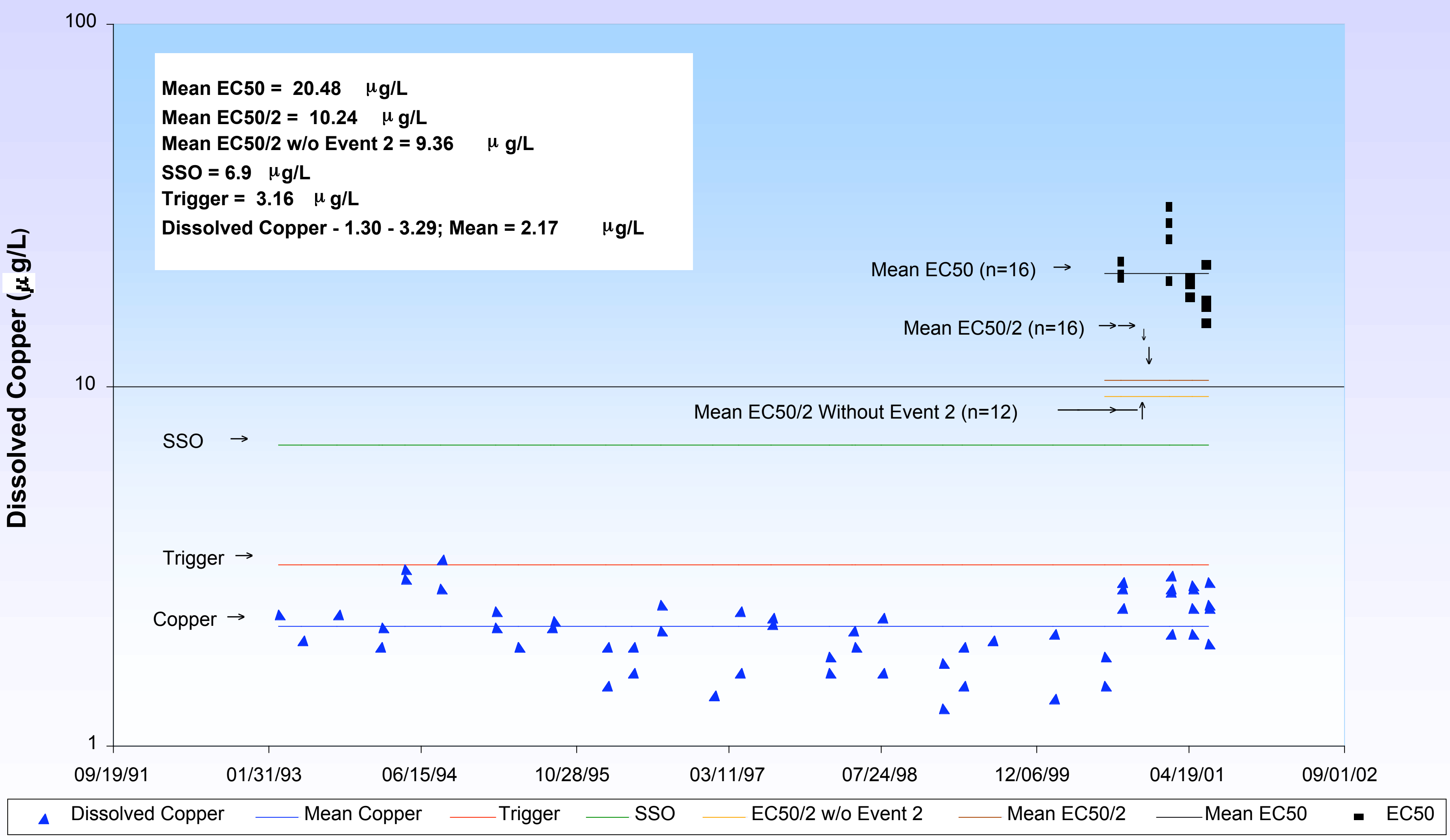
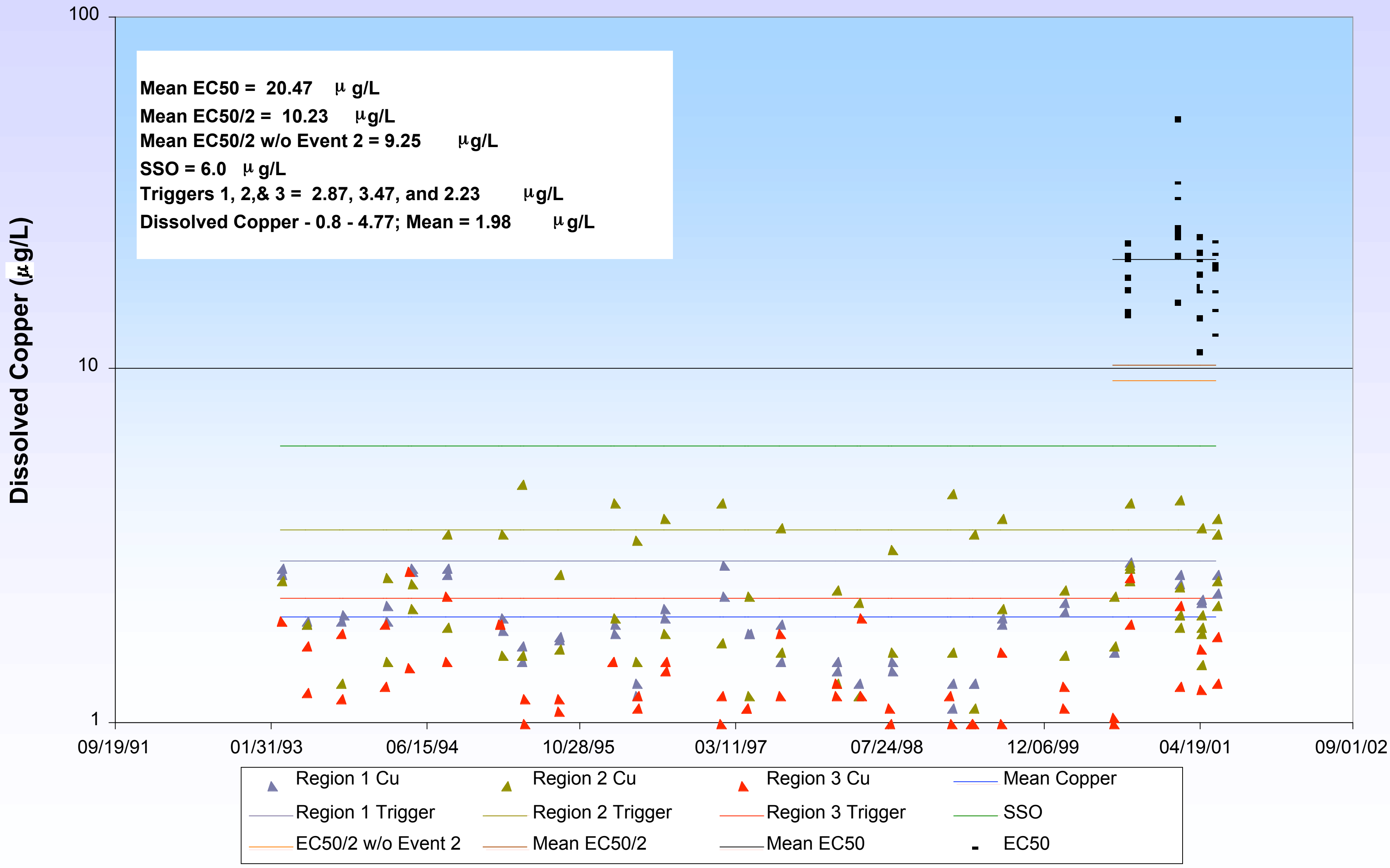
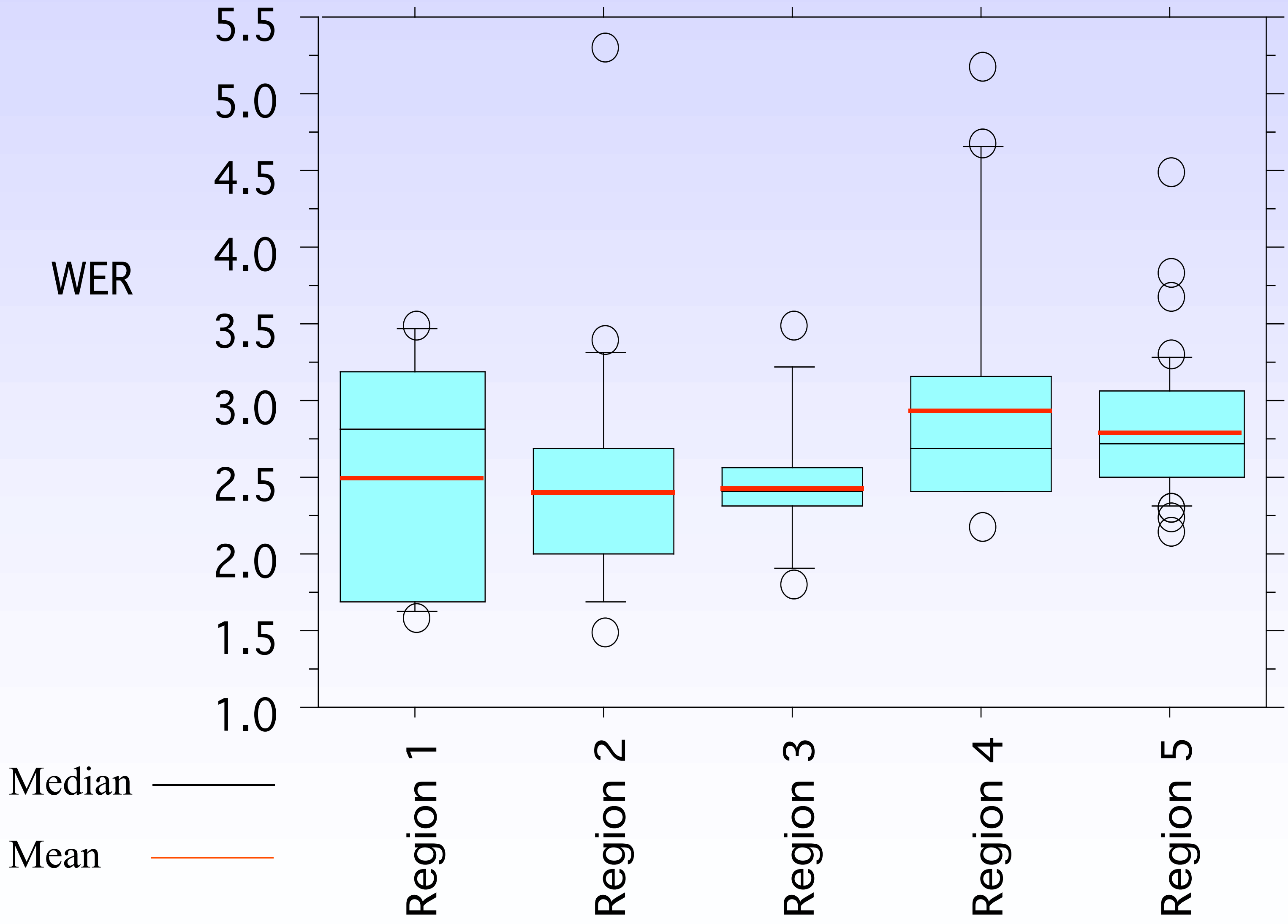


Figure 5. Bay Regions 1-3 Copper Concentrations; Toxicity Values; Potential Triggers and Site-Specific Objective

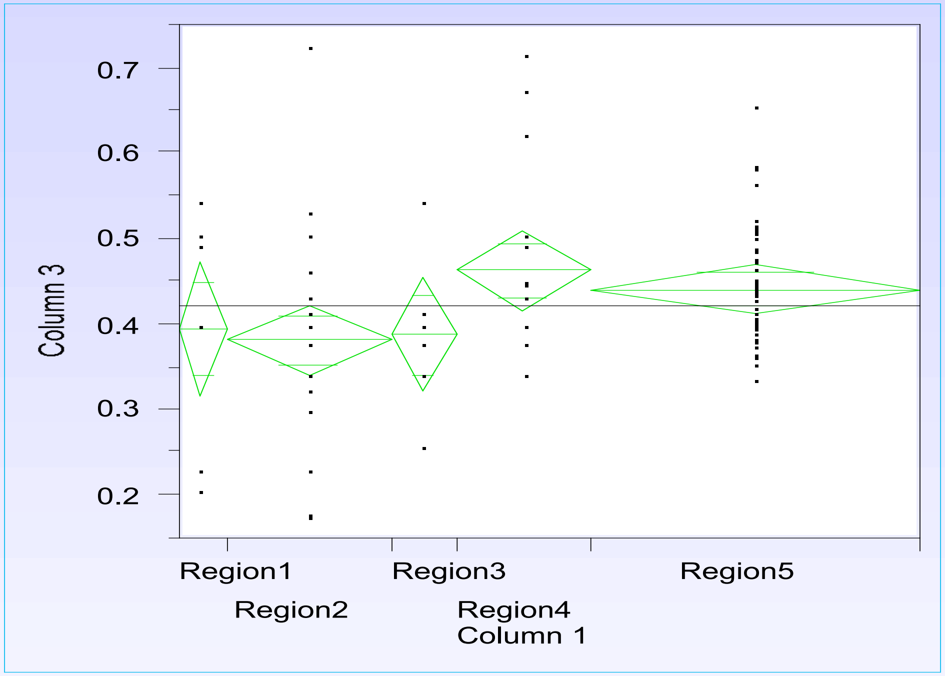


Geometric Mean WERs by Bay Region



ANOVA of Mean log WERs by Bay Region

Column 3 By Column 1



Oneway Anova

Summary of Fit

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	4	0.09099623	0.022749	2.4028
Error	85	0.80476062	0.009468	Prob>F
C Total	89	0.89575685	0.010065	0.0560

Means for Oneway Anova

Legend

Height = 95% Confidence Interval

Width = n

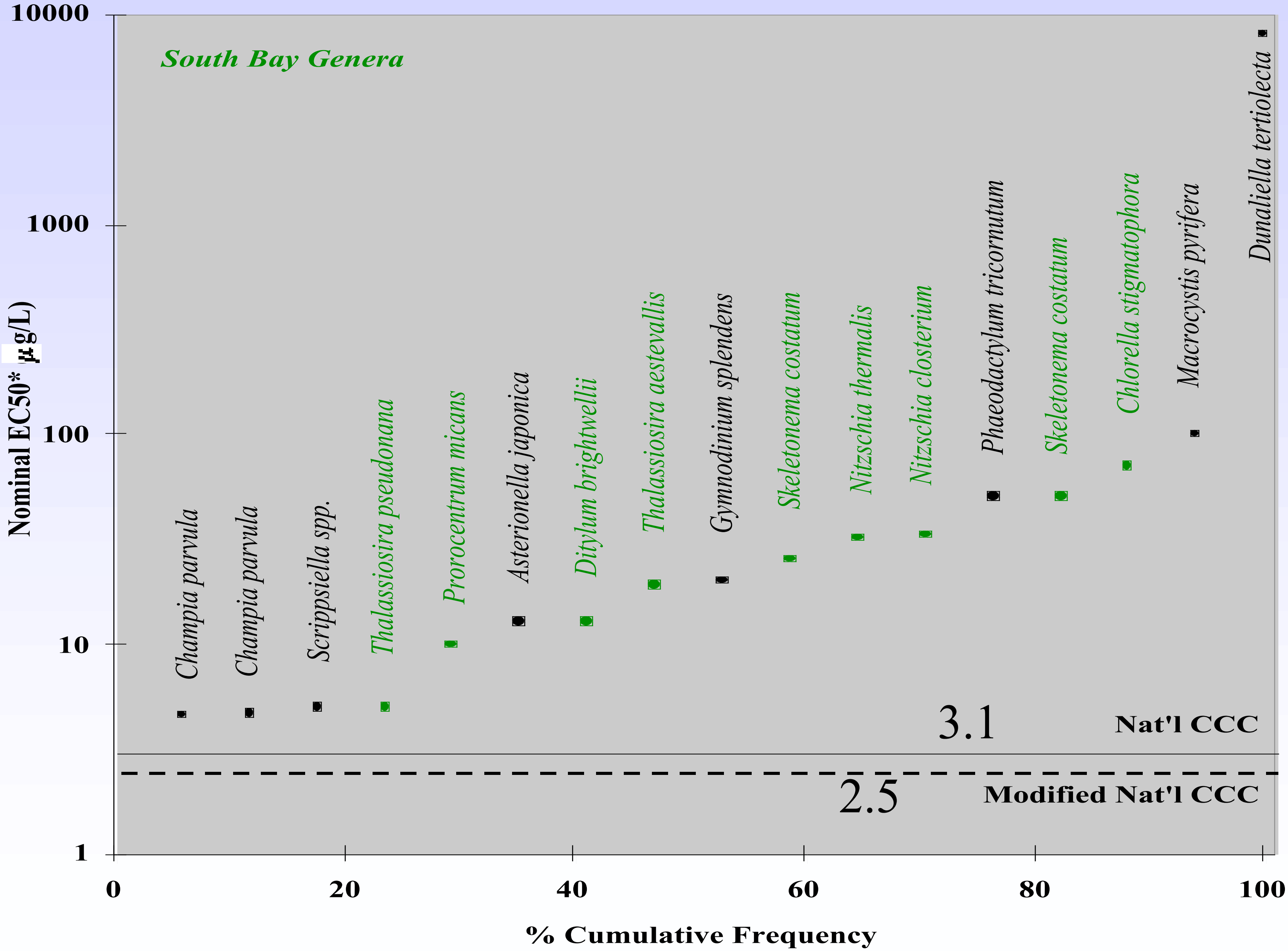
Horizontal Lines = Mean of Logs +/- 1s

Black dots = Individual WERs

Protection of Plants

- Evaluate Primary Production (surveys of species abundance and composition)
- Evaluate factors affecting phytoplankton (light, nutrients, grazing, hydrodynamics, etc.)
- Evaluate current research (e.g. Dr. Bruland speciation results)
- Can evidence of impacts to phytoplankton be linked to copper?
- EPA Final Plant Value - Value obtained by selecting the lowest result from a test with an important aquatic plant species in which the concentration of test material was measured and the endpoint was biologically important (EPA Office of Water). The Final Plant Value must be obtained from a chronic test using vascular plants or a macrophyte such as Champia (Dave Hansen, personal communication)

Sensitivities of saltwater plants to copper



WER studies with Algae

- Unicellular Algae
  - Regional Board Study with *Thalassiosira* sp.
    - Dissolved Copper WER = 2.3
    - Total Copper WER = 6.1
- Multicellular Algae
  - NY/NJ Harbor Study with *Champia* sp.
    - Dissolved Copper WER = 2.17
- Both Studies produced higher WERs for algae than for animals

Development of a S.F. Bay Site-Specific Chronic Criterion for Nickel

Using the EPA Recalculation Procedure and Modification of the EPA Nickel Saltwater Acute-To-Chronic Ratio

Environmental Services Department
City of San Jose
June 3, 2004

Background

- The City of San Jose's NPDES nickel limit dropped from 100 μg/l in 1989 to 8.3 μg/l in 1993.
- Regional Board implemented San Francisco Bay nickel WQC of 8.3 μg/l (1994).
- City of San Jose performed site-specific studies in 1989 & recalculation on nickel (1996). These studies were of limited usefulness but helped point out data gaps (chronic and ACR data)

Result of Initial Recalculation

- National & San Francisco Bay saltwater nickel CCC of 10.2 µg/l proposed following the recalculation procedure (with corrections and additions to the 1986 EPA database for nickel)
- Current Nickel Final ACR based on 2 freshwater and 1 saltwater species (FACR=17.99)

Introduction to ACR Study

- EPA establishes acute and chronic aquatic life protection for pollutants using toxicity data
- Chronic values are most often calculated from acute data employing an acute-to-chronic ratio (ACR)
- Few chronic saltwater values are available for nickel toxicity
- This study presents acute and chronic nickel toxicity data for 3 West Coast saltwater species

Acute-to-Chronic Ratio

- Acute endpoint divided by the chronic endpoint of the same test material under the same test conditions

Current Acute-to-Chronic Values

Pimephales promelas (Fathead minnow)	35.58
Daphnia magna (Water flea)	29.86
Americamysis bahia (Mysid shrimp)	5.478
Final ACR	17.99

ACR Study Objectives

- Produce acute & chronic nickel toxicity data on 3 West Coast saltwater species
- Use flow-through conditions
- Verify (<u>measure</u>) concentrations in test water
- Recalculate a Final ACR for nickel
- Evaluate SF Bay site-specific Ni criteria

Summary statistics for *Atherinops affinis*, (topsmelt)

Species	Endpoints	Values
Atherinops affinis	Acute Endpoint: 96-h Survival	
	Acute Value, LC50 (μg/L):	26,560
	Most Sensitive Chronic Endpoint: 40-d Survival	
	Lower Chronic Limit (μg/L):	3,240
	Upper Chronic Limit (μg/L):	5,630
	Chronic Value (geo. mean of upper and lower limits, μg/L):	4,270
	Acute-to-Chronic Ratio:	6.22

Summary statistics for *Haliotis rufescens*, (red abalone)

Species	Endpoints	Values
Haliotis rufescens	Acute Endpoint: 48-h Development	
	Acute Value, EC50 (μg/L):	145.46
	Most Sensitive Chronic Endpoint: 20-d Juvenile Growth	
	Lower Chronic Limit (μg/L):	21.5
	Upper Chronic Limit (μg/L):	32.5
	Chronic Value (geo. mean of upper and lower limits, μg/L):	26.43
	Acute-to-Chronic Ratio:	5.50

Summary statistics for *Mysidopsis intii* (mysid Shrimp)

Species	Endpoints	Values
Mysidopsis intii	**Acute Endpoint: 96-h Survival**	
	Acute Value, LC50 (μg/L):	**148.60**
	Most Sensitive Chronic Endpoint: 28-d Survival	
	Lower Chronic Limit (μg/L):	**10.0**
	Upper Chronic Limit (μg/L):	**48.8**
	Chronic Value (geo. mean of upper and lower limits, μg/L):	**22.09**
	Acute-to-Chronic Ratio:	**6.73**

Re-Recalculation: Applying current acute toxicity data to saltwater nickel re-calculation

National Water Quality Criterion			San Francisco Bay Site-Specific WQC		
Rank #	Species	GMAV	Rank #	Species	GMAV
4	*Mysidopsis (bigelowi & intii)*	306.9	4	*Mercenaria mercenaria*	310
3	*Mercenaria mercenaria*	310	3	*Heteromysis formosa*	151.7
2	*Heteromysis formosa*	151.7	2	*Mysidopsis intii*	148.6
1	*Haliotis rufescens*	145.5	1	*Haliotis rufescens*	145.5

Re-calculation of national and site-specific nickel FAVs and CMCs

	EPA 1986 National Ni WQC	Revised National Ni WQC	SF Bay Site-Specific Ni WQC
Number GMAVs in dataset	20	26	24
Final Acute Value	149.2	145.5	124.8
Criterion Maximum Concentration	74.6	72.8	62.4

Application of ACRs in re-calculations of saltwater Final ACR and CCC

Acute-to-Chronic Ratios (ACRs); Saltwater Only				
Species	Species Mean ACR	Calculated FACR	Revised Nat'l CCC	SF Bay Site-Specific CCC
Americamysis bahia (Mysidopsis bahia)	5.478			
Atherinops affinis	6.22			
Mysidopsis intii	6.73			
Haliotis rufescens	5.50	5.959	24.42	20.94

Re-calculations of Final ACRs (combined) and CCCs

Acute-to-Chronic Ratios (ACRs); Combined Freshwater & Saltwater				
Species	Species Mean ACR	Calculated FACR	Revised Nat'l CCC	SF Bay Site-Specific CCC
Pimephales promelas	35.58			
Daphnia magna	29.86			
Americamysis bahia (Mysidopsis bahia)	5.478	17.99	8.293	9.805
Atherinops affinis	6.22			
Mysidopsis intii	6.73			
Haliotis rufescens	5.50	10.50	13.86	11.89

Conclusions

- **ACRs for saltwater species are significantly lower than those for freshwater species**
- **Chronic nickel Water Quality Criterion is highly dependent on the Final ACR**
- **A national CCC would be 24.42 and 13.86 ppb, respectively, based on saltwater and combined saltwater/freshwater ACRs**
- **S.F. Bay Site-Specific CCCs would be 20.94 and 11.89, respectively, based on saltwater and combined saltwater/freshwater ACRs**

Nickel SSO is Conservative

- EPA (Dr. Thursby) July 28, 1998 commented that "…the data from the present study could be used to make a case that saltwater and freshwater ACRs may be different. This could substantially lower the FACR for the calculation of a nickel site-specific (objective) for South San Francisco Bay."
- Recalculated Nickel SSO lower than re-calculated national criterion

Adopted Chronic Criterion

- Water Board approved a site-specific objective for the South Bay of 11.9 ppb
- This SSO is applicable to the entire S.F. Bay

Application to S.F. Bay NDB?

- Water Board (Richard Looker) comments on NDB SIP Ni Justification - “From what is presented here, there is not enough for me to use to demonstrate that the SSO for nickel is a necessity. The arguments about triggering RPA and avoiding listings are not strong either.
- EPA (Alexis Strauss) comment on Mercury: “Aquatic Life standards for toxic pollutants are generally applied with an allowable exceedance frequency of no greater than once in any three year period (see 40 CFR 131.36(c)(2) at Table 4 Notes 1 and 2, 40 CFR 131.38(c)(2), and Technical Support Document for Water Quality-based Toxics Control, EPA 1991.”

Application to S.F. Bay?

- During Event 2 of the NDB Cu/Ni Study, station BD15 (Petaluma River) had a dissolved nickel concentration of 17.2 ppb.
- Given a 3-year averaging period, isn’t this likely to happen again?
- Isn’t avoidance of a 303(d) listing sufficient reason to adopt an appropriate SSO for nickel for S.F. Bay NDB?
- Adopting a marine ACR would set the Nickel SSO at 20.94 ppb, above 17.2 ppb found at BD15.

Nickel ACR Report:

www.ci.san-jose.ca.us/esd/pub_res.htm

Appendix E

Copper & Nickel Workgroup Meeting Notes

Copper and Nickel Impairment Assessment Study
North of Dumbarton Bridge
CEP Workgroup Meeting June 3, 2004
EOA, 1410 Jackson Street, Oakland

Meeting Handouts:

- Agenda
- *Copper and Nickel North of the Dumbarton Bridge: Impairment Assessment and Site Specific Objectives Project* slides from presentation given by Tom Hall & Tom Grovhoug during meeting.
- San Jose response to Water Board staff comments
- *Development of a S.F. Bay Site-Specific Chronic Criterion for Nickel* slides from presentation given by Pete Schafer during meeting.
- *Selection of NDB Copper WERs* slides from presentation given by Pete Schafer during meeting.

Attendees:

- Tom Foley (City of American Canyon)
- Giti Hernvian (City of American Canyon)
- Pete Schafer (City of San Jose)
- Karen McDonough (City of San Jose)
- Jim Ervin (City of San Jose)
- Ray Arnold – on phone (Cu Development Assoc.)
- Michael Yu (Sonoma County Water Agency)
- Kristine Corneillie (LWA, for City of Petaluma)
- Andy Gunther (AMS/CEP)
- Paul Salop (AMS/CEP)
- Arlene Feng (BASMAA/ACPWA)
- Larry Bahr (FSSD)
- Steve Moore (Water Board)
- Richard Looker (Water Board)
- Tom Hall (EOA)
- Tom Grovhoug (LWA)

General Announcements:
Richard Looker recently attended the Bay Planning Coalition Meeting, where Tracy Collier, NOAA, gave a presentation on PAHs and sublethal effects of copper. The mode of action is that it affects the ability to smell, particularly in juvenile fish, making them more susceptible to predators. A significant drop in the ability to smell was seen at dissolved copper concentrations of 5 ug/L, and effects were seen at as low as 2-3 ug/L. Richard will email the PowerPoint presentation, once he receives it from Tracy. This issue will need to be addressed as part of this NDB copper site specific objective project. Since the studies were performed in freshwater, it may not be as applicable or an issue for the Bay.

Richard also brought up the subject of the proposed new national criterion for copper. The new objective would change the current saltwater objective of 3.1 ug/L to 2.4 ug/L. However, it was discussed that EPA does not appear to have yet addressed any of the comments received on this change. San Jose's data was incorrectly used. San Jose provided EPA with corrected data and clarification for recalculation during the comment period. Relevant data from the NDB project was also provided to EPA (by EOA). It was also mentioned that there is consideration of a variable criterion based on site-specific water chemistry (similar to freshwater criteria).

Copper/Nickel Project Overview
Five draft reports have been prepared as part of the CEP FY 03-04 scope of work.

- Copper and Nickel Site Specific Objectives North of the Dumbarton Bridge – State Implementation Plan Justification Report (Draft February 2004);
- North of Dumbarton Bridge of Copper and Nickel Site Specific Objective (SSO) Derivation (Draft March 2004);
- North of Dumbarton Bridge Copper and Nickel Development and Selection of Finals Translators (Draft March 2004);
- North of Dumbarton Bridge Copper and Nickel Conceptual Model and Impairment Assessment Report (Draft April 2004); and
- Copper Sources in Urban Runoff Information Update (title subject to change, Draft March 2004).

Purpose of Meeting
Tom Hall discussed the agenda and the goals of the meeting which were to agree on the meeting format and process for reviewing reports, comments, and responses to comments. The group was then to discuss approaches for selecting SSOs and translators for NDB and as appropriate, discuss recommendations for specific SSOs and translators. The agenda and approach to achieving desired outcomes were approved.

Step 1 Water Effects Ratio (WER) Study Summary

Tom Hall and Tom Grovhoug presented the background of the Copper & Nickel Step 1 Impairment Assessment Work (handout):

- Step 1 work occurred between 1999 – 2002, with the final report being published in July 2002. The work was funded by BACWA, BASMAA and WSPA.
- Step 1 work was a direct extension of the City of San Jose's work in the South Bay. The report also addressed the issue of whether deep vs. shallow areas of the Bay would result in very different WERs or copper concentrations.
- Four sampling events over one year at 13 stations provided adequate data to account for spatial and temporal variability. The study design was reviewed and approved by the Technical Review Committee after the first sampling event.

SIP SSO Report:

- The SSO report is a requirement of the SIP. The original report outline included the use of 3 POTWs as case studies to evaluate compliance with CTR versus SSO based copper and nickel effluent limits. Available effluent data from the Electronic Reporting System (ERS) database for other POTWs and industries were also evaluated. A concern was raised that the arguments in the report did not adequately demonstrate "that the discharger cannot be assured of achieving the criterion and/or effluent limitation through reasonable treatment, source control, and pollution prevention measures" (per SIP Section 5.2(3)).

  Action Item: Look at all dischargers, not just a representative sampling to get a more complete picture of economic impacts to each discharger relative to complying with CTR based effluent limits. Better documentation of nickel compliance problems is needed.

- This discussion brought up the translator issue – how could regional translators be calculated/applied in a manner that is “fair” to everyone? (See later item on agenda)
- The three case study POTWs were:
  - FSSD (medium advanced secondary treatment, zero dilution)
  - EBMUD (large secondary treatment, 10:1 dilution)
  - LGVSD (small secondary treatment, zero dilution)
- Probability plots for POTWs and Industrial dischargers were presented as well as tables of probable effluent limits showing the case studies’ ability to comply with these limits.

Development of a S.F. Bay Site-Specific Chronic Criterion for Nickel - Pete Schafer presentation (see Powerpoint handout).

- The City of San Jose performed studies in 1996-1998 to develop a nickel site-specific objective (SSO). This included a recalculation of the national nickel criterion and a study to develop Acute-to-Chronic Ratios (ACR) for three additional marine species. ACRs are a way to calculate chronic criteria from acute values when sufficient chronic data is not available to directly calculate a Final Chronic Value. The current nickel ACR is based on acute and chronic data for 3 species (2 freshwater species and 1 saltwater species). Nickel ACRs for saltwater species appear to be considerably lower than the freshwater ACRs.

  The lower the Final ACR is, the higher the calculated chronic criterion using a given Final Acute Value. The average ACR for the current 3 species is 17.99. The 3 new (saltwater) species tested by the City of San Jose produced ACRs of 6.22, 5.50, and 6.73 (all significantly lower than current 17.99). The City then used the new ACR data to recalculate both chronic National criteria and site-specific objectives first using Final ACRs derived first exclusively from marine species and second from a combination of marine and freshwater species. Chronic SSOs recalculated in these ways are applicable bay-wide, not just to the Lower South Bay.

- The four derived options for a final chronic value were thus **24.42** ppb (revised national criterion using an ACR based only on marine species), **20.94** ppb (derived SSO using an ACR based only on marine species), **13.86** ppb (revised national criterion using an ACR based on a combination of marine and freshwater species), and **11.89 ppb** (derived SSO using an ACR based on a combination of marine and freshwater species). The final number approved in the Lower South Bay effort was 11.89 ppb, the most conservative of all of the derived nickel chronic criteria.

- A question was posed as to whether marine species tend to have different ACRs than freshwater species, but no one present had a definitive answer. There are various approaches that the EPA uses to derive ACRs. Usually, sensitive species have sensitive ACRs, but sometimes there is no relationship between these two variables. Since chronic data are typically lacking, the EPA often uses both freshwater and marine ACRs in combination to derive final ACRs, especially for marine species. In the case of nickel, however, there appears to be a significant difference between ACRs for freshwater and marine species.

  Marine species appear to have lower ACRs (which produce higher final chronic SSOs). The chronic nickel SSO approved for Lower South Bay is thus quite conservative since it was based on a combination of marine and freshwater ACRs. A chronic nickel SSO of 20.94 ppb based on the more technically robust marine-only ACR may have been as appropriate (or more appropriate) than the approved SSO of 11.89 ppb.

- The report on nickel recalculation can be found on the City of San Jose's website http://www.ci.san-jose.ca.us/esd under Publications & Research.

- After Pete's presentation, the representatives from the Water Board (Steve Moore & Richard Looker) discussed "Where do we go from here?" They had no disagreements on the science. However, they indicated that a potential roadblock is that the Staff Report needs to outline why this SSO process got started (compliance issues, etc.). Currently, nickel NDB doesn't appear to present the same level of compliance issues that copper does. The federal antidegradation policy states "this is a tier 2 water body…water quality can be decreased to meet social or economic needs". One policy issue to address then becomes "why do we need to decrease water quality when there is no burden on the discharger?" A related policy and public perception issue discussed was "does raising the objective result in lower water quality?"

  Discharger representatives noted that increasing the objective to 11.9 ug/L or 20.94 ug/L does not mean they can or will increase discharged nickel concentrations. Water Board staff noted that the Office of Administrative Law reviews changes to objectives and in part has to make a "determination of necessity," i.e. are there compliance problems or other reasons for having to adopt an SSO? The only documented area in the bay exceeding the CTR 8.2 ug/L dissolved nickel WQO is at the mouth of the Petaluma River. This area already has its own 303(d) listing. Others mentioned that some industrial dischargers may not be able to comply with CTR based limits. The group agreed to further investigate this issue as part of subsequent work on the SIP SSO justification report, including documentation of what dischargers with potential compliance issues have already done or could do to comply, and the associated costs.

NDB Copper WERs - Tom Hall and Tom Grovhoug presented background information on the NDB Copper & Nickel Work and 50 resultant WER datapoints.

- Plots of dissolved copper WERs were presented and the Water Board attendees suggested that it would be good to change "Event 1, Event 2, etc" notation to "dry weather, wet weather, etc" notation.
- The Biotic Ligand Model work performed by the Copper Development Association (CDA) was discussed in terms of how it was a good check of the model and of the Cu/Ni study data.
- In the Step 1 work effort, the Bay was separated in to North and Central areas. Upon the restructuring of the RMP efforts, the data collected in Step 1 were then re-evaluated using the Region 1, 2, 3, 4, 5 designations.

NDB Copper SSOs by Bay Region - Pete Shafer continued his presentation on the City of San Jose's recommended options for WERs and SSOs (handouts).

- Pete discussed that the copper criteria ultimately approved for the Bay NDB must be protective and he provided graphs of ambient copper, trigger, toxicity values, and potential SSOs to show that the City's recommended SSOs appeared to be protective. The City's approach would create two SSOs for the entire Bay. **These potential SSOs were 6.0 ppb for Bay regions 1-3** (Suisun Bay (1), San Pablo Bay (2), and Central Bay (3)) and **6.9 ppb for Bay regions 4 & 5** (South Bay (4) and Lower South Bay (5) below Dumbarton Bridge). This approach protects

Mytilus sp., the most sensitive species in the EPA database and a commercially important species.

- Ambient dissolved copper monitoring trigger levels were discussed. Pete clarified that based on the lower South Bay approach, for a trigger to be exceeded, the mean of the annual dataset would need to increase to the trigger level, not just one data point.
- It was also pointed out that it is important to watch seasonal variation. Dissolved copper concentrations are typically lower during the winter and higher in the summer.

After Pete's presentation, Richard Looker and Steve Moore said the SSO work "looks good" and they could support the two proposed WER values (2.4 for Regions 1-3; 2.7 for Regions 4-5). San Bruno Shoal was identified as the line between Regions 3 and 4.

- Individual dischargers will need provide input on the compliance impacts of the proposed SSOs since under one policy scenario there could be different translators for each discharger, resulting in different effluent limits for each (see next section below). The CEP group agreed to incorporate a more detailed compliance analysis into the final report.\
- Water Board staff noted that it is important to be careful as we move forward with SSOs about sending messages such as "copper and nickel are not a problem". There was concern that such statements could be construed as license to back off on current levels of control efforts. Copper and nickel can more appropriately be viewed as a lesser threat now, based on the greater level of knowledge available.
- Jim Ervin of the City of San Jose mentioned that it is important to be cautious in recommending alternatives to copper products that may result in other unanticipated adverse impacts (i.e., pesticides or endocrine disruptors).

Translators - The next topic discussed was the issue of choosing translators for the Bay NDB. The initial translator analysis used both the direct ratio method and the TSS regression method and incorporated both the NDB study data and historic RMP data. Given the large amount of data available, the relatively low r-squared values in the regression plots, and the small differences in the resultant values between the two methods, use of the direct ratio calculation results were recommended.

- Richard Looker indicated that pursuant to the SIP, the Water Board staff appears to be open to discussing possible site specific dilution studies for Bay Area dischargers. Development of a revised dilution policy has been identified as part of the Basin Plan trienniel review process as an important but potentially complex and resource intensive issue to pursue.
- The proposed Regional translator approach was presented.
- A example table was presented showing case study POTW compliance with copper effluent limits based on a WER of 2.4. EBMUD could comply with effluent limits calculated using 2.4, FSSD could comply sometimes, and LGVSD could not comply based on historic data.
- To date, absent regional translator policy guidance, translators have most commonly been applied on a discharger by discharger, case-by-case basis by NPDES permit writers. However, it was recognized that one or more pooled, regional translators, particularly for deep-water dischargers, may be appropriate. Shallow-water dischargers may need to evaluate site-specific translators, develop a rationale for using regional RMP-based translators, or create groupings based on shallow regions (i.e., Napa River region). Translator issues need to be addressed on a regional basis by dischargers, permit writers, Basin Plan staff, and TMDL staff. Translator issues were recommended to be discussed as part of the Basin Plan triennial review.

- It was decided the best short-term translator approach may be to proceed with the Basin Plan Amendment for the SSOs including one or more translators for deep water dischargers and to address shallow discharger translators outside of the BPA process so as to not unduly hold up the SSO approval process. Waiting to develop the more complex policy guidance for translators for shallow-water dischargers may be acceptable, as long as the issue does not get lost once the SSO is adopted. Larry Bahr proposed to take this phased translator approach to BACWA for discussion.

Next Steps

- The draft NDB Cu/Ni Conceptual Model Impairment Assessment Report (CMIAR) summarizes and updates the status of scientific uncertainties regarding copper impairment from the South Bay study. Hydrodynamic modeling (w/sediment) may help with answering some of the remaining questions (i.e., accumulation of Cu in sediment and effects on ambient conditions) but would be costly (~$50,000).
- The CEP is currently looking at available models. Jay Davis created a 1-box model of the Bay for PCBs. It is recognized that the Bay is not a single box, and different regions likely behave very differently. The USGS has created a 41-box model that takes into account sediment transport. The 41-box model is currently being calibrated on salinity and bathymetry. SFEI is converting the USGS model to a multi-box model using the five Bay segments for the RMP, and taking the first cut to determine how it can be improved and what other information is needed (erosion, deposition) to do so. Easily manipulated models are necessary.
- The Brake Pad Partnership Proposition 13 funded copper fate and transport study will be using the USEPA BASINS watershed model to generate bay-wide estimates of copper loading. These loading estimates will be used as input to the URS/SFO hydrodynamic/sediment model for bay-wide copper fate and transport modeling during 2006.
- The City of San Jose indicated they would be resistant to funding more modeling that would only be applicable to copper. San Jose could support modeling that could be used for multiple parameters and region wide.
- Andy Gunther encouraged people to fill in CEP project description forms re: developing models for multiple parameters.

Finalize CEP Reports. No one indicated a desire to provide further comments on the draft reports, so the four reports will be finalized based on the comments received as of this 6/4/04 meeting.

6/21/04 CEP Cu/Ni workgroup meeting. The FY 04-05 CEP Cu/Ni Basin Plan Amendment (BPA) technical assistance draft scope of work and the next steps for the Copper and Nickel Action Plans are scheduled to be discussed in more detail at the 6/21 meeting. In response to a question from Andy Gunther, Richard confirmed that supporting CAP development is a vital part of the CEP's task to assist the BPA process.

CEP Cu/Ni Workgroup Meeting June 21, 2004
Bay-Wide C/NAP Development
Process Meeting
RWQCB, Oakland
10:00 – 1:00

Key Issues Discussed:

- Work Group Role and Ground Rules - The ground rules and general role of CEP Cu/Ni Work Group were discussed. Richard Looker is the Chair of the Work Group. Other members formally designated by the Technical Committee include Larry Bahr (BACWA), Arlene Feng (BASMAA), Goeff Brosseau (BASMAA Alternate), Kevin Buchan (WSPA), Steve Overman (WSPA contact on Cu, Ni, Cn), Dan Cloak (Environmental Technical Representative), Karen McDonough and Pete Schafer (South Bay liaisons and technical experts). Co-Project Manager Tom Hall led the meeting. The roles and responsibilities of the CEP Cu/NI Work Group versus the previously established larger more broadly based Coordinating Committee were discussed. It was agreed that separate support activities for the Coordinating Committee seemed unnecessary, given that the copper/nickel site specific objective project is now being conducted under the auspices of the CEP and the CEP Copper / Nickel Workgroup.

  It was agreed that an e-mail (through the Cu/Ni Coordinating Committee Yahoo users group) would be distributed announcing the disbanding of the Coordinating Committee and formal transition to the CEP Cu/NI Work Group. The e-mail would provide options on how interested parties could stay involved with the CEP process and reiterated the roles and responsibilities of the CEP process and Work Groups. It was also decided that Paul Salop will maintain the e-mail list and distribute Work Group communications. Environmental and WSPA representatives will be courtesy cc'd on all Work Group lists but are not assumed to be active members unless they have indicated a desire to participate as such on an individual project.

- Overview Of Copper/Nickel Action Plan Effort to Date- Tom Hall briefly described the five draft CEP work products have been prepared to date. These documents will provide information to be used in the Site Specific Objective (SSO) Basin Plan amendment package.

- Existing Copper Control Programs/Reporting NDB- Most POTWs are implementing some level of copper control measures which are already being reported on within pretreatment program reports and pollution prevention program reports. POTW permits reissued since the SIP adoption (May 2000) contain requirements based on SIP Section 2.4.5.1 to develop and implement Pollutant Prevention and Minimization Programs (PMP) for "pollutants of concern." It was noted that PMP requirements appear to address most if not all of the topics and issues being discussed relative to POTW copper/nickel action plan (C/NAP) responsibilities (except for ambient monitoring "triggers").

  There was general acknowledgement that CAP reporting doesn't necessarily have to be in a separate document and it would be desirable to minimize redundant reporting of the same information. The group discussed that if done properly, it may be possible to report by reference to where applicable copper control information is contained in other reports. There was little enthusiasm for generating or reviewing the 50 or 60 additional reports that would result if each and every POTW and stormwater program bay-wide had to submit a separate annual report as part of a bay-wide CAP effort.

Recently reissued stormwater permits have requirements to develop pollutant reduction plans (PRP) for copper and other pollutants of concern. Summaries of pollutant reduction plan activities are reported within Annual Reports. The ACCWP copper PRP table of activities for FY 03-04 was briefly discussed as a potential model or starting point for stormwater program CAP purposes. It was agreed that the additional descriptive information contained in the full ACCWP copper PRP would be provided to the workgroup to facilitate further discussions of what else may need to be added for it to serve as a potential bay-wide template.

{*Update*: More detailed information on the ACCWP copper PRP was summarized in a draft August 2004 report by EOA titled "*History of San Francisco Bay Area Municipal Stormwater Program Copper Control Activities*." The report was distributed to the workgroup in late September for review."}

- Marine anti-fouling coatings- Marine anti-fouling coatings, identified within the draft *Copper Sources in Urban Runoff* (*and Shoreline Activities)* report, are potentially a significant copper source to certain areas of the Bay. However, copper from these coatings is not a source within urban runoff. The group agreed that the report title should be changed and a disclaimer added to the preface to clarify this fact. It was suggested that the focus on anti-fouling coating follow-up should be on documenting the magnitude of the source. It was noted that the Department of Pesticide Regulation (DPR) has more direct regulatory authority than the Water Board over anti-fouling coatings. The DPR workgroup is reviewing if a statewide effort is needed.
- P2 Menu Project- Kristine Corneillie provided an update of the P2 Menu Project. The Project, which has been on-going for approximately one year, provides pollutants of concern (i.e., copper mercury, pesticides and fats, oils and greases), their potential sources and control techniques. It was asked if the final P2 Menu could be used as a reference document for selecting future Bay-wide CAP baseline activities. Richard said that he would consider its use for this purpose. However, it is necessary to review the P2 Menu to see what is missing. {Update: final comments focusing on relative effectiveness assessments and costs are being accepted through October 2nd. The P2 Menu steering committee is meeting 9/22/04 to discuss next steps.}
- Website Projects- John Fusco and Tom Hall provided a brief update regarding SCVURPPP's development of prototype web-based projects to 1) track impairment assessment uncertainty studies (SFEI staff assisting), and 2) set up an environmental clearinghouse that will contain links to other sites with information on copper pollution prevention activities. Both activities are being conducted in accordance with SCVURPPP's Copper Action Plan. The environmental clearinghouse is targeted for completion in December 20004. Once developed, SCVURPPP envisions a yet to be determined bay-wide entity will need to take over responsibility for their updating and maintenance.
- Bay-wide C/NAP Development Process- When developing the CAP, it was suggested that the Work Group look at the short list in the draft *Copper Sources in Urban Runoff* (*and Shoreline Activities)* report as a starting point. Regional Board staff stated that reporting should include a purpose and goal of each action. Two things will be required for each action: a performance or effectiveness measure/metric and an activity measure/metric.
- Draft FY 04-05 CEP Cu/Ni Scope of Work – The draft FY 04-05 scope was briefly reviewed. It was agreed to add a new first task to develop a proposed framework/outline for the bay-wide CAP. While there was general awareness of the various "pieces" of the CAP, this framework effort would assist the workgroup in developing a more detailed CAP outline. It was also agreed to include in

the Basin Plan Amendment assistance task selected items from Richard Looker's 1/14/04 email on that subject. {Update: Scope changes made and approved by the CEP in July}.

- Action Items- Kristine will contact Betsy E. about the availability of P2 menus for review.

Next Steps:

- Distribute an e-mail (through the Yahoo users group) announcing the disbanding of the Coordinating Committee and formal transition to the CEP Cu/NI Work Group. The e-mail will provide options on how to move on, identify future involvement and clarify the roles and responsibilities of the Work Group. {Update: An email (copy attached) was sent out disbanding the CC users group as of the end of August 2004}.

Issue Bin:

- Administrative review of annual Water Quality Attainment Strategy reports. Should member agencies combine the individual reports into one bay-wide summary report? If so, who will be the lead agency? CEP?