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19. Van Roon, Marjorie. Availability, Toxicity and Uptake of Heavy Metals by Marine Invertebrates – A Review with Reference to the Manukau Harbour, New Zealand. University of Auckland, Department of Planning Working Paper Series 99-2, New Zealand. http://www.planning.auckland.ac.nz/pdfs-ppts/WP-pdf/WP_99_2.pdf
20. Wilson, Laurie K. and John e Elliot 2003 Contaminants in Surf Scoter Wintering in the Strait of Georgia, British Columbia, Canada Abstracts of Poster Presentations, 2003 Georgia Basin/Puget Sound Research Conference March 31- April 3, 2003. http://www.psat.wa.gov/

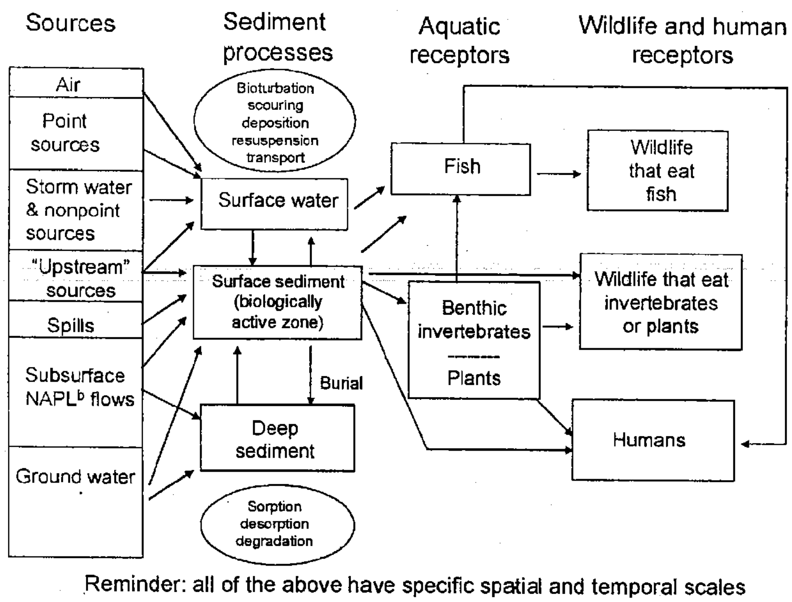


Figure 4 Basic conceptual model for sediment risk assessment[a]

[a]Adapted from Kane-Driscoll and Menzie 2001.
[b]Nonaqueous-phase liquid.

for decision-making purposes. Programmatic objectives for a sediment assessment will vary. For example, a sediment assessment may be conducted in connection with a dredging project to achieve navigable depths in a channel, to determine the need for remedial action outside a navigation channel, or as part of a more general watershed or water quality assessment. These varying objectives will dictate particular investigation tools and methods for quantifying exposures, effects, and ecological and human health risks in the assessment, including the application of SQGs.

The initial assessment phase of the framework includes 4 primary activities: 1) collection and analysis of available and preliminary data, 2) development of a conceptual model for the sediment environment, 3) development of specific sediment assessment questions, and 4) interpretation of initial data relative to SQGs and other relevant ecological benchmarks. Among these activities, conceptual models (e.g., Figure 4) describing contaminant sources, the processes linking those sources to the sediment in question, the physical, chemical, and biological processes occurring within the sediment that affect exposure, and how receptors of concern are exposed to the contaminants associated with the sediment are critical. **Significant effort should be invested at the outset of a sediment investigation to develop a comprehensive conceptual model for contaminated sediments in the aquatic environment under consideration in the assessment. The conceptual model is the basis for formulating project-specific questions that drive subsequent sediment assessment activities.** Programmatically defined conceptual models can be adapted and applied for some routine management applications (Cura et al. 1999).

Figure 2
Relative Frequency Distribution % Fines,
San Diego Bay Bight 98 & Shipyards

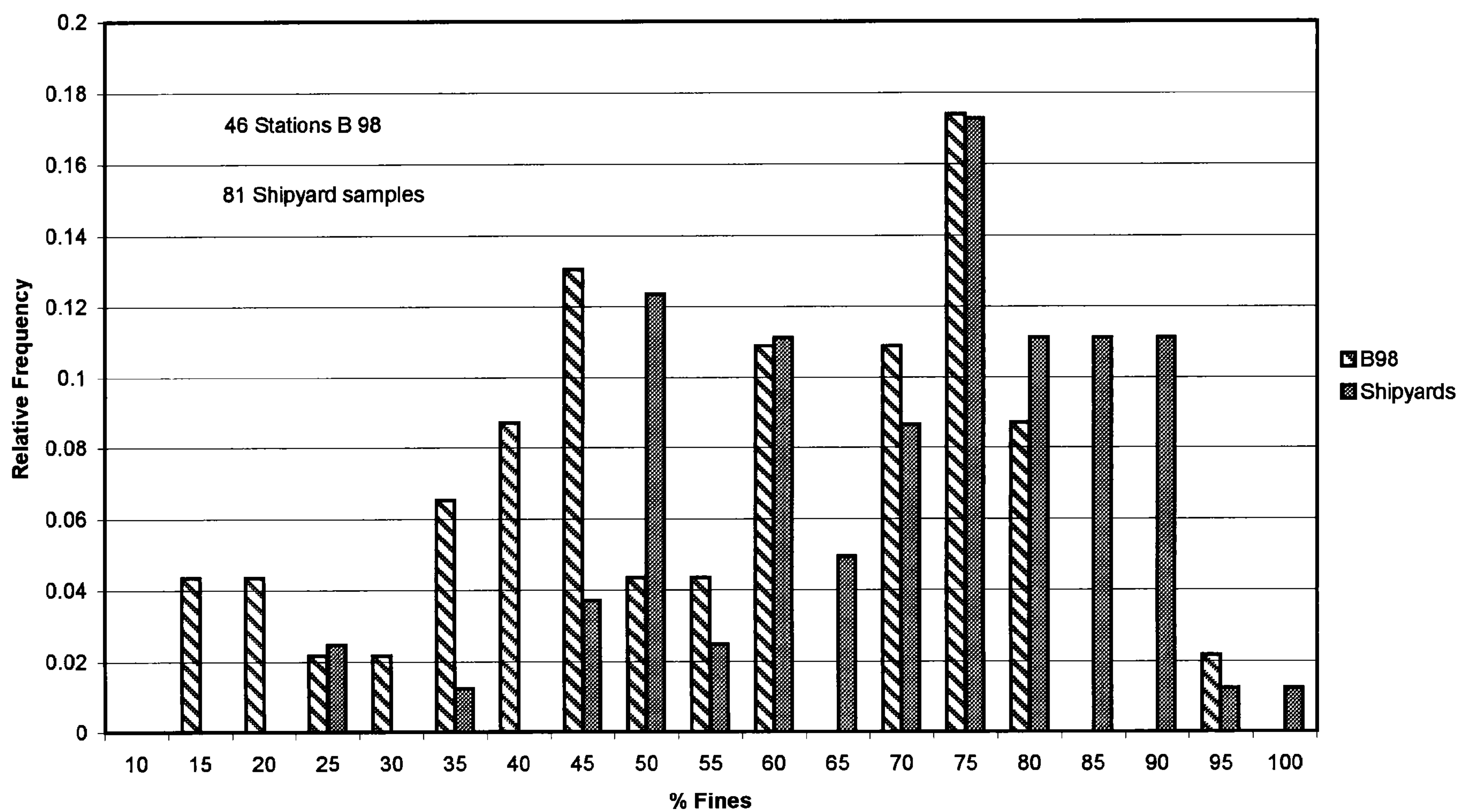


Figure 3
Relative Frequency of TOC, NASSCO and SW Marine

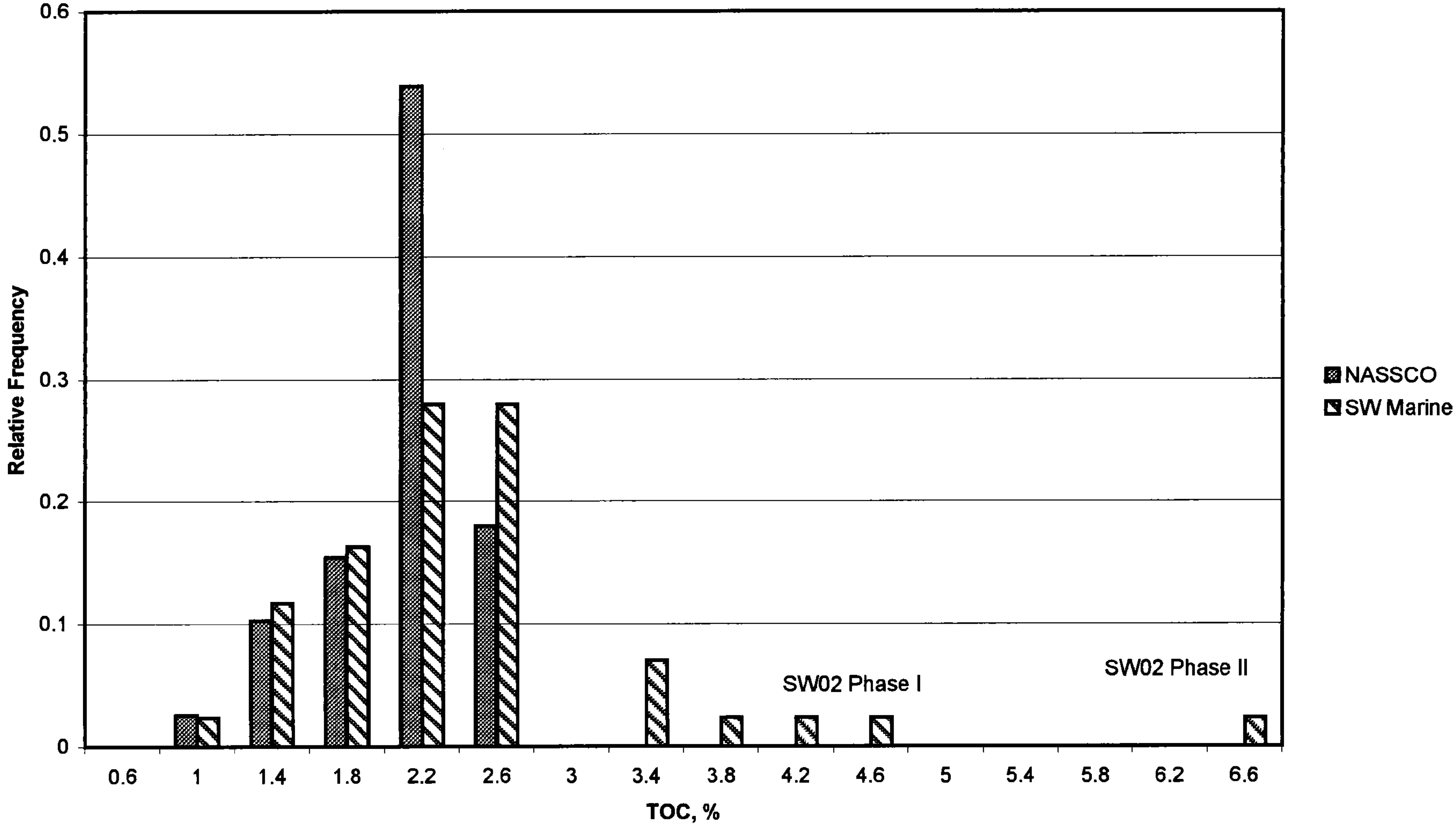


Figure 4
Relative Frequency Distribution , %TOC
Bight 98 San Diego Bay

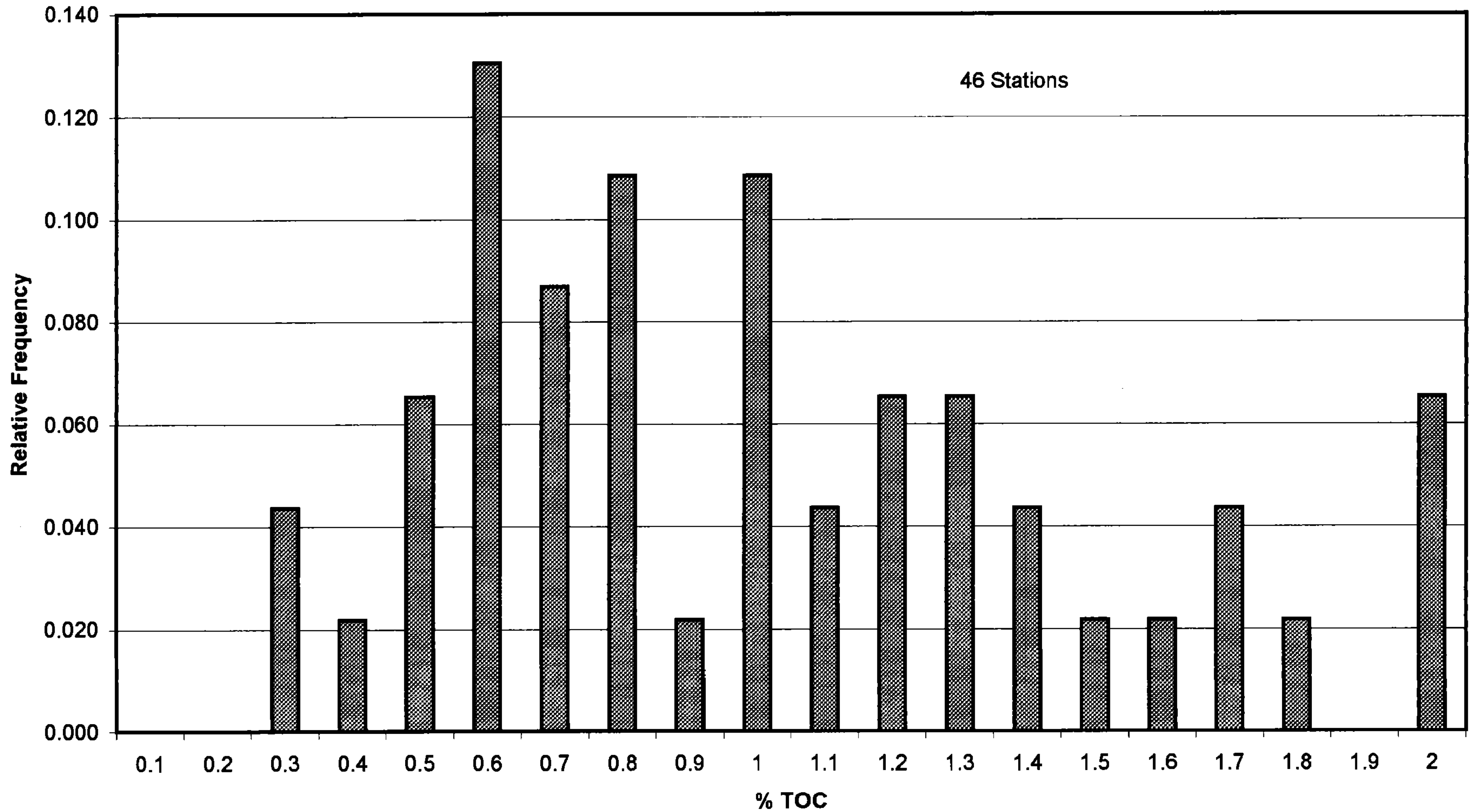
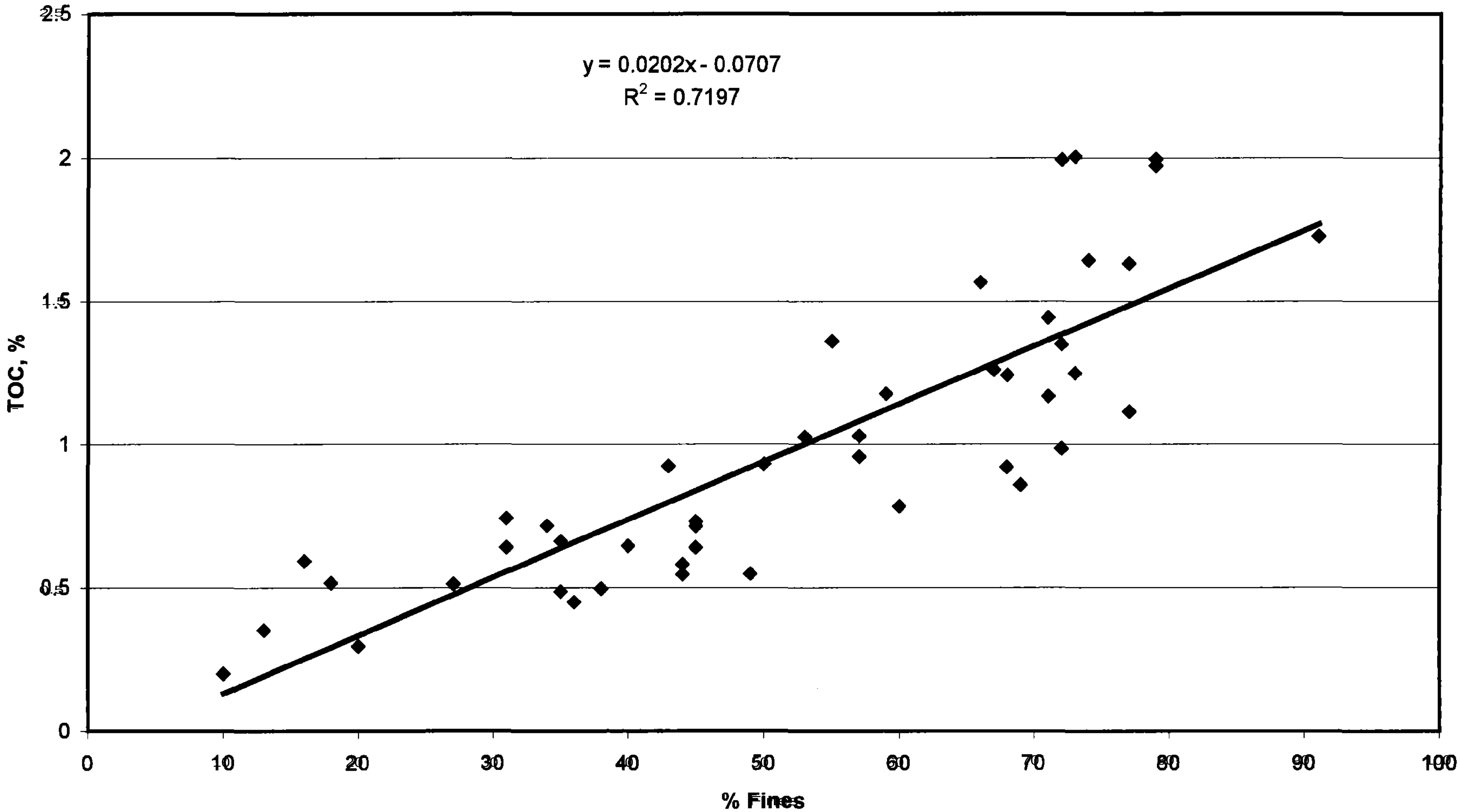
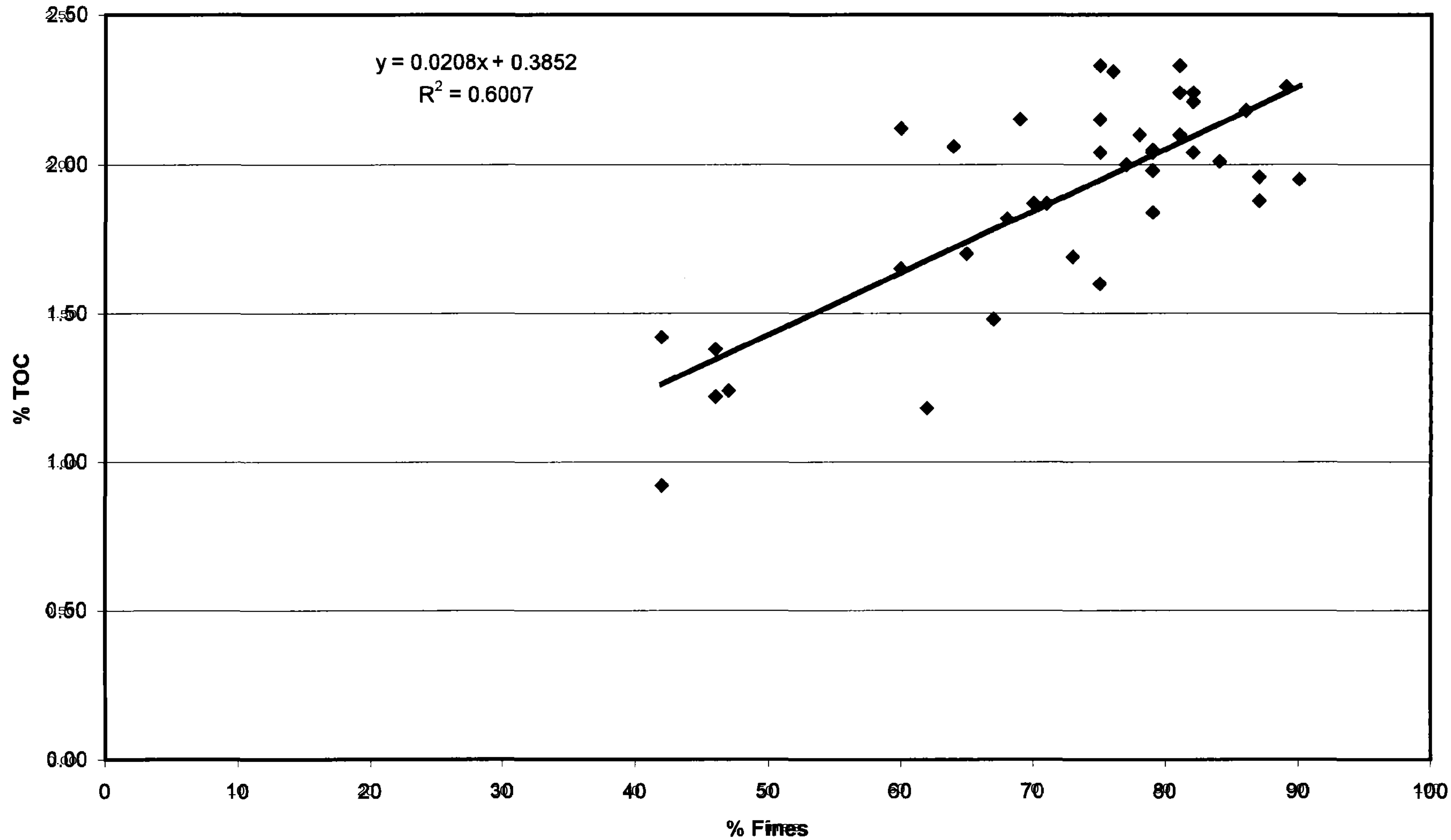


Figure 5
TOC vs. Fines San Diego Bay, Bight 98
46 Stations



EHC 005456

Figure 6
TOC vs Fines, NASSCO Shipyard



EHC 005457

Figure 7
TOC vs Fines, SW Marine Shipyard

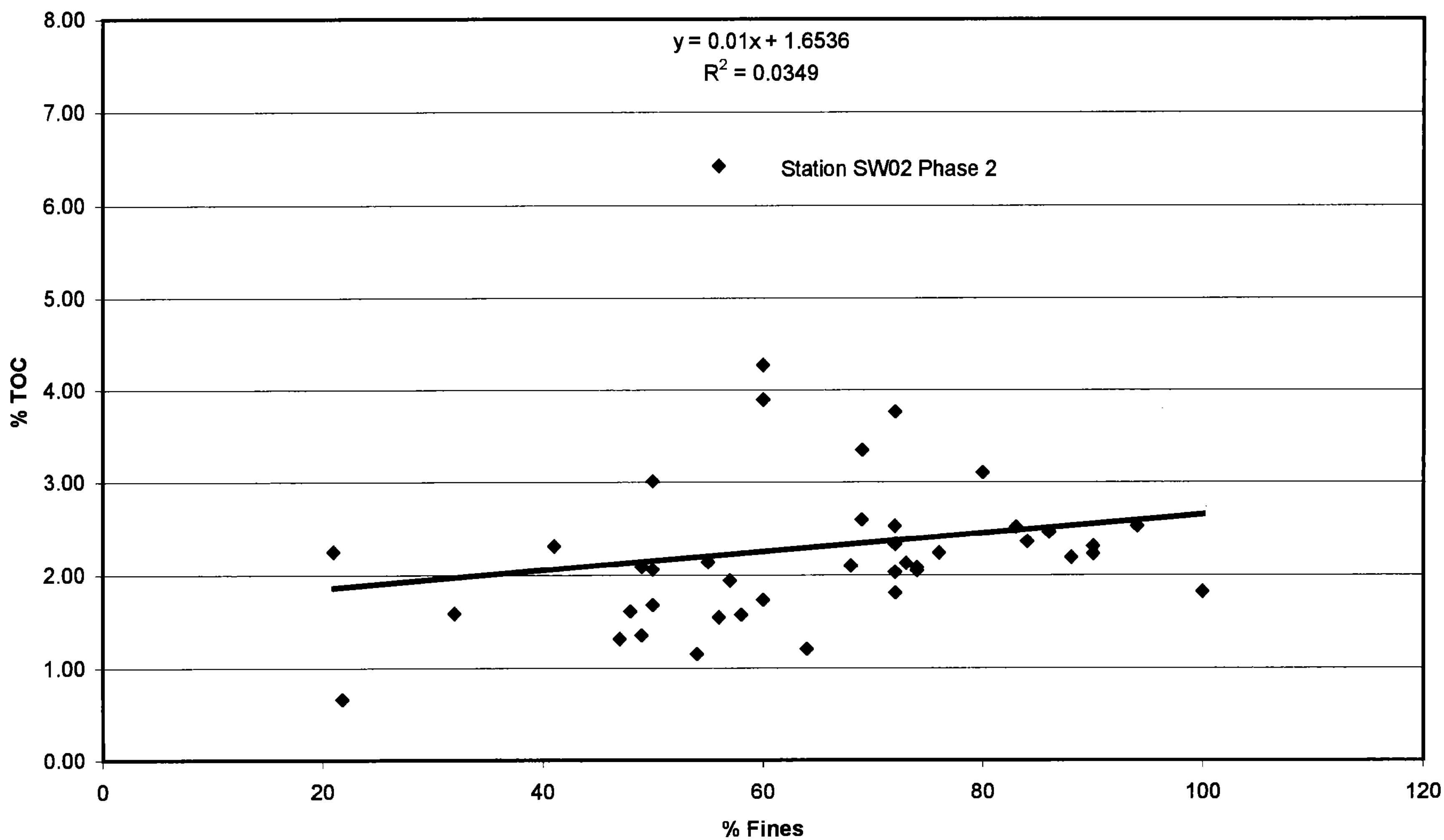


Figure 8
Relation of % Fines to Sum Metals Concentration
< 800 mg/kg & > 800 mg/kg , NASSCO

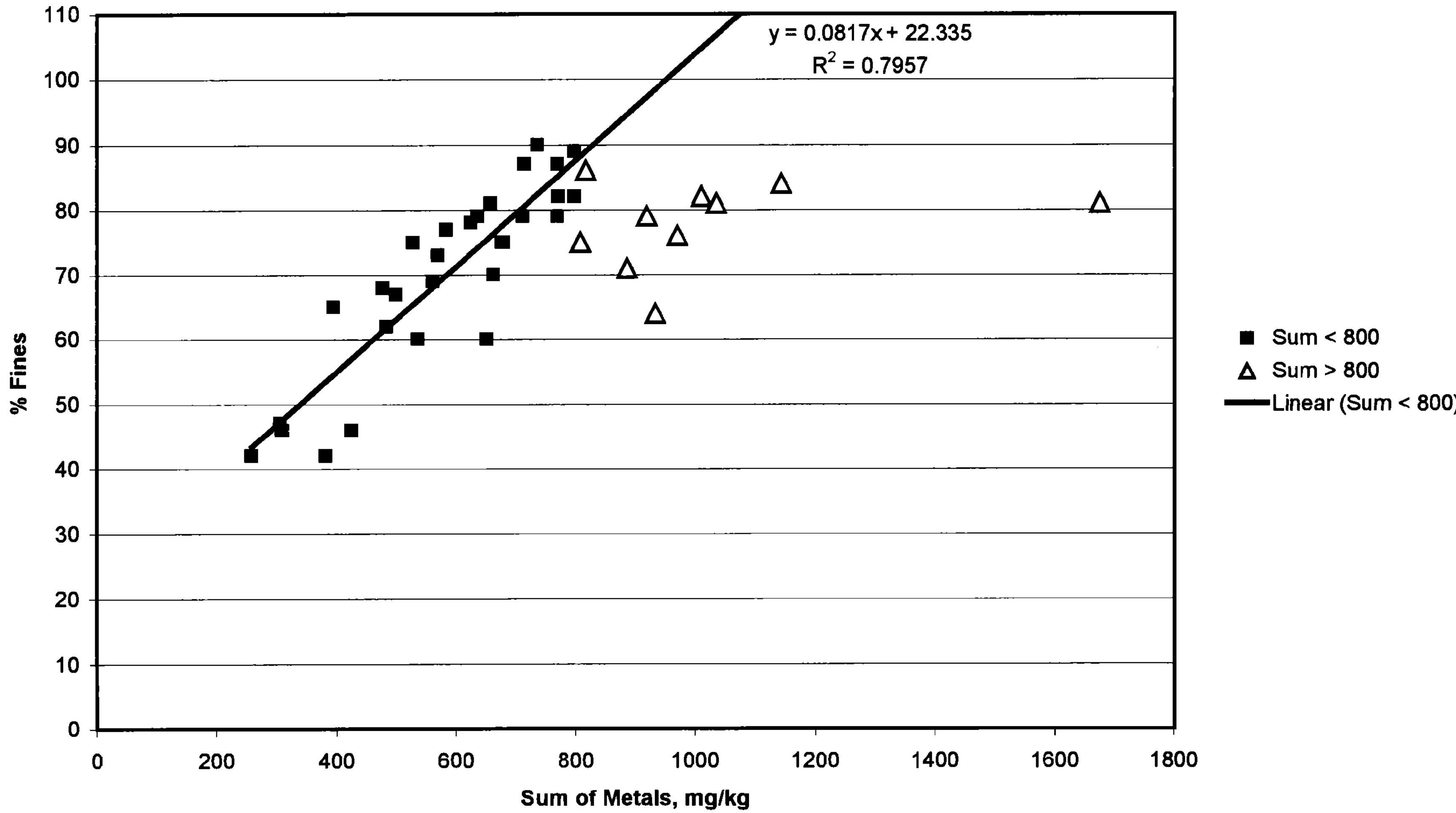


Figure 9
Relative Frequency Distribution Benthic Response Index, BRI, San Diego Bay Bight 98 and Shipyards

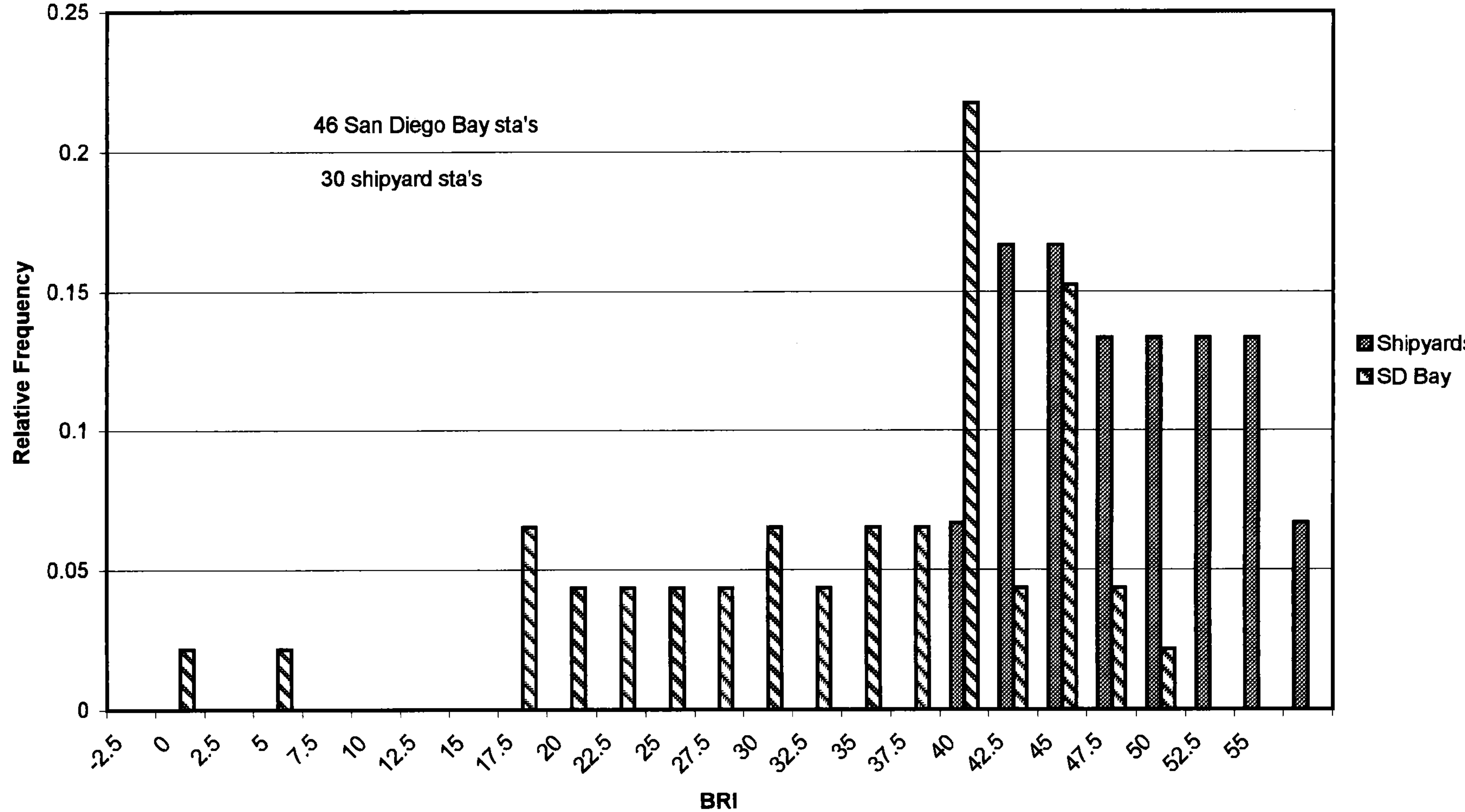


Figure 10
Frequency Distribution, Benthic Response Index, BRI, Bay Council Reference Stations & Shipyard

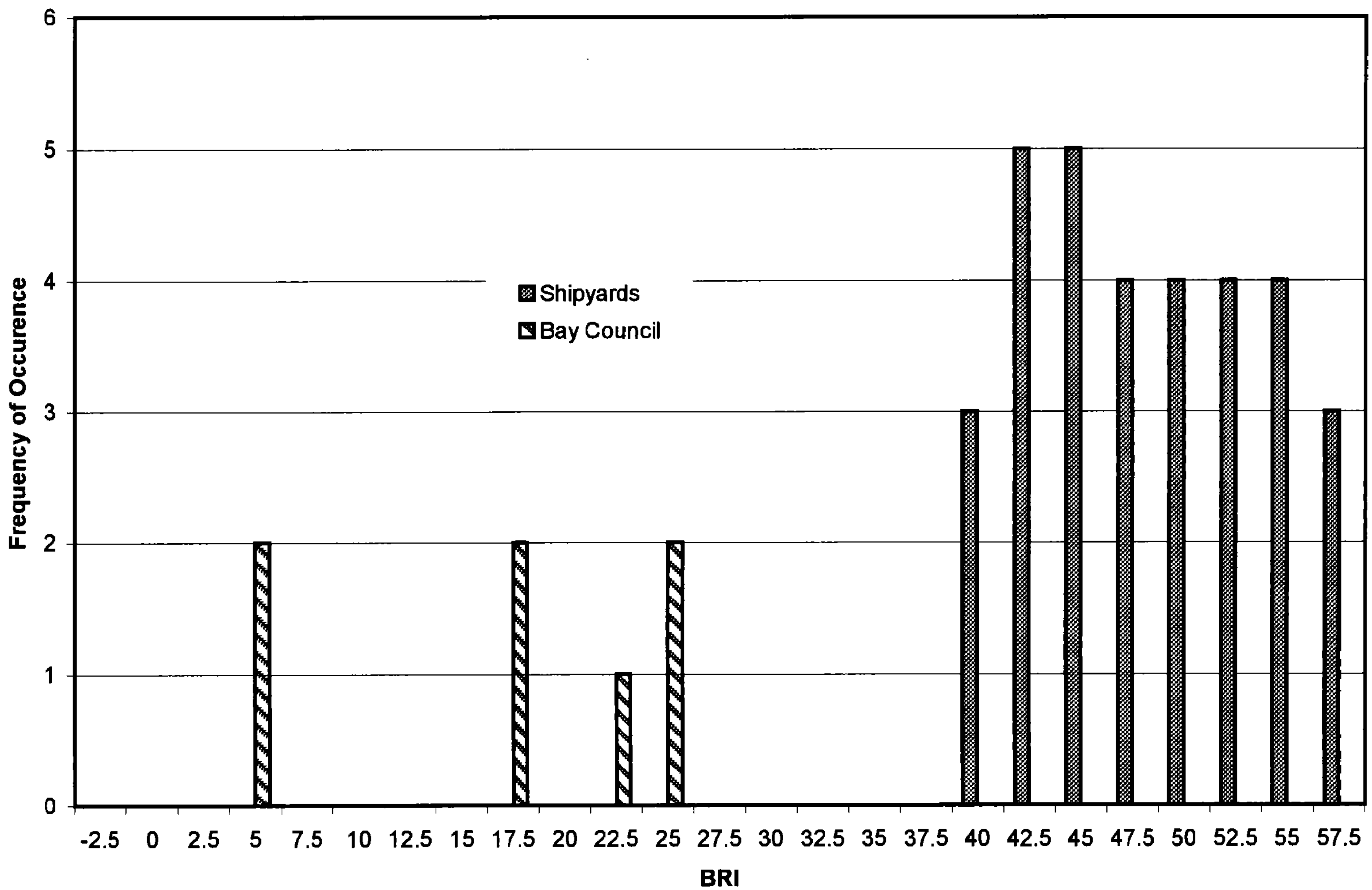
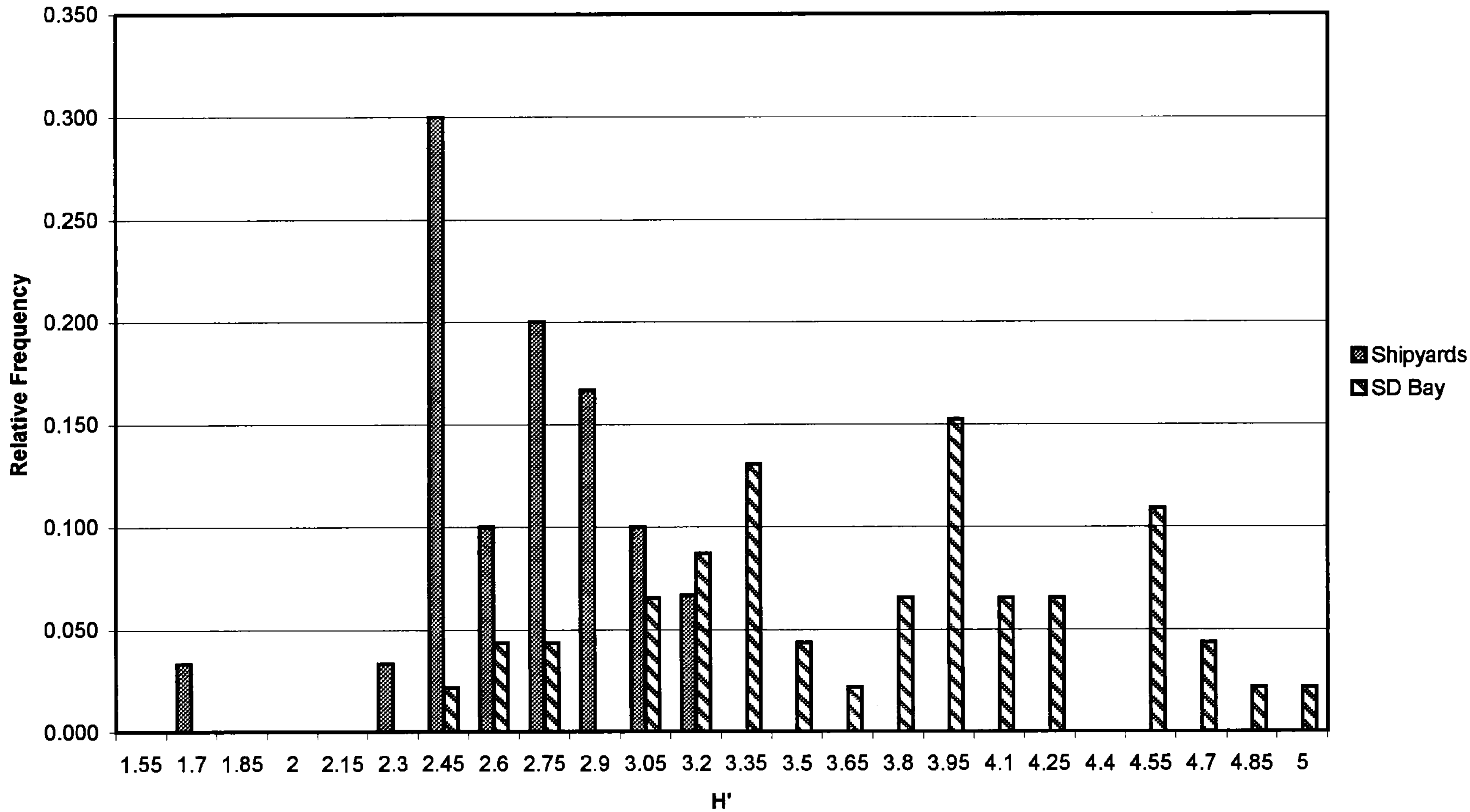


Figure 11
Relative Frequency Distribution, Shannon-Weaver Diversity Index , H',
Shipyards & San Diego Bay Bight 98



Figures

Tables (By Reference)

Laura Hunter

From: Laura Hunter [LauraH@environmentalhealth.org]
Sent: Monday, November 17, 2003 5:04 PM
To: Home (E-mail)
Subject: FW: sensitive benthic species

-----Original Message-----
From: emkimura@earthlink.net [mailto:emkimura@earthlink.net]
Sent: Monday, November 17, 2003 3:10 PM
To: Elainecarlin@Att.Net
Cc: Laura Hunter; Denise Klimas
Subject: sensitive benthic species

Elaine-

I got curious today when I came across a reference to "sensitive benthic species" without any definition. So I checked the web and found some valuable information.

1.Interesting NOAA letter on TBT and impact on benthic community plus uptake in the the food chain. I"ll try to follow up on the analysis method in the letter.
This can,in part, xplain why there are very few sensitive benthic species (low pollution index) in the SWM and NASSCO shipyards
http://www.nwfsc.noaa.gov/research/divisions/ec/ecotox/WhitepapersPDF/TBTWP8_2000.PDF

2. Research Conference 2003 State of Washington PSAT. There are some interesting topics in this conference that we can use
http://www.psat.wa.gov/Publications/2003research/rc03_abstracts/table_of_contents.htm
http://www.psat.wa.gov/Publications/2003research/rc03_abstracts.pdf

3. This following session describes conditions that are similar to that in San Diego Bay, re the low number of sensitive species
http://www.psat.wa.gov/Publications/2003research/rc03_abstracts/oral_sessions/session_6e.htm

I've copied this abstract:
Relationships Among Elements of the Sediment Quality Triad in Puget Sound

Edward R. Long, Margaret Dutch, Sandra Aasen and Kathy Welch

Washington State Department of Ecology

M. Jawed Hameedi

NOS/NCCOS/CCMA

Surficial sediment was collected at 300 locations during 1997-99 from the U.S./Canada border to the inlets of southern Puget Sound and Hood Canal. Statistical and graphical analyses were performed to quantify and illustrate the relationships among measures of chemical contamination, acute toxicity in laboratory tests, and indices of benthic infauna community structure in the sediments. Correlation and principal components analyses indicated a recurring pattern: one or more of the four toxicity tests indicated increasing toxicity as the concentrations of mixtures of organic substances

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[redacted]

[redacted]

[redacted]

[redacted] [redacted]

[redacted]

and trace metals increased among sampling locations. Indices of contamination by complex chemical mixtures were very important variables Sound-wide; however there were significant differences in the composition of the mixtures among the urban bays. Gradients in chemical concentrations and toxicity were accompanied by losses in abundance of sensitive benthic species that lead to declines in total numbers of species and numbers of dominants. Losses in sensitive species overshadowed the increases in abundance of several pollution tolerant organisms. One or more physical factors (water depth, salinity, TOC content, or grain size) were invariably as important as the chemical variables and, therefore, probably contributed to the accumulation of the toxicants in the sediments and the composition of the benthos.

http://www.psat.wa.gov/Publications/2003research/rc03_abstracts/oral_sessions/session_8e.htm
Session 8E: Exposure and Effects of Toxic Chemicals on Wildlife and Biota in Georgia Basin and Puget Sound Notes the reduced numbers of surf scoters in the region due to sediment contamination. They feed on molluscs. species that are known to accumulate endocrine disruptors.

Ed

Laura Hunter

From: emkimura@earthlink.net
Sent: Thursday, November 20, 2003 8:14 PM
To: Laura Hunter; Joy Williams; Paula Forbis; Diane Takvorian; Albert Huang; Allison Rolfe; Bruce Reznick; Cory Briggs; Dan McKirnan; Elaine Carlin; Jim Peugh; Marco Gonzalez; Nohelia Ramos; Sonia Rodriguez; Laura Hunter
Subject: Tributyltin EPA aquatic life water quality criteria.

FYI-

Tributyltin is really nasty stuff. This EPA guideline lowered the saltwater chronic criteria by a factor of 10

Ed

Water Quality Criteria

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EPA Home > Water > Water Science > Water Quality Criteria > Aquatic Life > Tributyltin (TBT) > Fact Sheet

Aquatic Life
Human Health
Biocriteria
Nutrients
Microbial (Pathogen)
Criteria Table
Rulemakings, Withdrawals, and Other Federal Register Notices

Aquatic Life
Tributyltin (TBT)

Fact Sheet:
Notice of Draft Ambient Water Quality Criteria Document for Tributyltin (TBT)

United States
Environmental Protection
Agency Office of Water
(4304T) EPA-822-F-02-003
December 2002

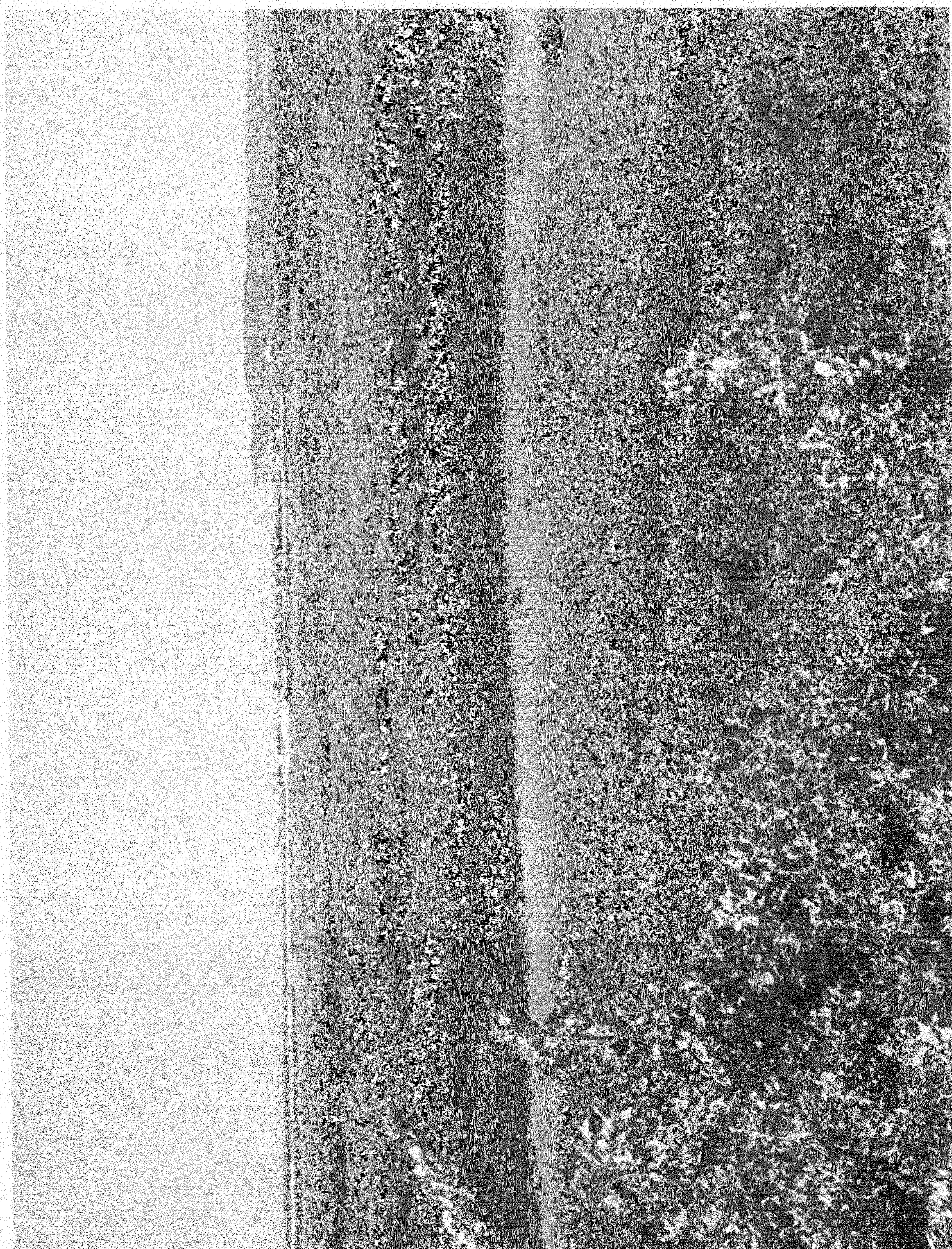
Summary

The U.S. Environmental Protection Agency has published a draft ambient water quality criteria document for tributyltin (TBT) for scientific and technical input. Draft acute and chronic criteria recommendations have been developed to protect aquatic life in both freshwater and saltwater. When finalized, these draft criteria can form the basis for state and tribal water quality standards.

Table A-1. Chemical conditions at bioaccumulation stations

Station	Chemical Conditions
NA06	This station is co-located with NPDES station NSS-07, which had a mercury concentration of 4.2 mg/kg in August 2000 and mercury concentrations ranging from 4.8 to 5.7 mg/kg in 1996 and 1997. This station has the most systematically elevated mercury concentrations of all NPDES stations in the NASSCO leasehold. Concentrations of copper ranged from 250 to 590 mg/kg at this station in the last 5 years, and concentrations of zinc ranged from 170 to 240 mg/kg in the same period. Non-NPDES sampling conducted during 1997 showed concentrations of copper between 350 and 700 mg/kg, and concentrations of zinc between 360 and 590 mg/kg in this region of the leasehold.
NA11	In 1998, the measured copper concentration at this location was 250 mg/kg and that of zinc was 300 mg/kg.
NA12	In 1997, the measured copper concentration at this location was 260 mg/kg and that of zinc was 340 mg/kg.
NA20	In 1997, the measured copper concentration at this location was 180 mg/kg and that of zinc was 320 mg/kg. These concentrations are representative of conditions throughout the southeastem portion of the site.
SW04	In 1998, the measured lead concentration at this location was 770 mg/kg, the highest at the site; that of copper was 1,300 mg/kg, that of mercury was 2.46 mg/kg, and that of zinc was 2,500 mg/kg—copper, zinc, and mercury concentrations were among the highest at the site.
SW08	In 1998, the measured copper concentration was 2,900 mg/kg and that of zinc was 3,100 mg/kg—the highest at the site; that of mercury was 4.70 mg/kg, of lead, 700 mg/kg, and of PCBs, 6.9 mg/kg—mercury, lead, and PCB concentrations were the second or third highest values at the site.
SW13	In 1998, the measured copper concentration was 1,200 mg/kg and that of zinc was 1,100 mg/kg—among the highest at the site. In 1998, the measured lead concentration was 110 mg/kg and that of mercury was 1.88 mg/kg.
SW21	In 1998, the measured mercury concentration was 2.08 mg/kg, that of zinc was 580 mg/kg, and that of PCBs, 3.49 mg/kg—all were among the highest at the site. In 1998, the measured copper concentration was 370 mg/kg and that of lead was 120 mg/kg.
SW28	The PCB concentration measured at this location in 1998 was 11.5 mg/kg, the highest at the site. The concentration of copper was 280 mg/kg, of lead, 89 mg/kg, of mercury, 1.75 mg/kg, and of zinc, 390 mg/kg.

Note: NPDES - National Pollutant Discharge Elimination System
PCB - polychlorinated biphenyl



Laura Hunter

From: Denise Klimas [Denise.Klimas@noaa.gov]
Sent: Friday, November 28, 2003 12:15 PM
To: Elaine Carlin; ed kimura; Laura Hunter
Subject: [Fwd: NASSCO and DTSC]

FYI.

Denise Klimas wrote:

> Tom,
> Were you all aware that DTSC was working on the landside cleanup of
> NASSCO? The human health risk assessor for DTSC,Bryan Eya, recently
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>
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> compare notes about what is going on at NASSCO, and perhaps share some data.
> denise

Laura Hunter

From: Denise Klimas [Denise.Klimas@noaa.gov]
Sent: Tuesday, December 09, 2003 3:11 PM
To: Elaine Carlin; Laura Hunter; ed kimura
Subject: more on NASSCO stormwater Q

Oh, you all really need to read this report dealing with NASSCO's stormwater.

This paper talks about a system put in by NASSCO to reduce the copper and zinc toxicity of their storm water. Apparently, NASSCO no longer discharges to the Bay, but apparently they did. Data showing pre and post treatment are included. Also note in the references section that
there is a citation dated 6/03. I am also sending this to Tom Alo. I got this from Ed Cieslak.

http://www.hartcrowser.com/PDFs/Stormfilter.pdf

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RECD DEC 1 1 2003

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
OFFICE OF RESPONSE & RESTORATION
COASTAL PROTECTION & RESTORATION DIVISION
c/o California Department of Toxic Substance Control,
Human and Ecological Risk Division
8800 Cal Center Drive
Sacramento, CA 95826

VIA FACSIMILE and US Mail

December 5, 2003

Mr. John Robertus
California Regional Water Quality Control Board
San Diego Region
9174 Sky Park Court, Suite 100
San Diego, California 92123

Dear Mr. Robertus:

The National Oceanic and Atmospheric Administration (NOAA) appreciates the opportunity to comment on the NASSCO and Southwest Marine Detailed Sediment Investigation. This document, dated September 2003, consists of three volumes of data and text, and was prepared for the shipyards by their consultant, Exponent.

As you are aware, NOAA has provided a considerable amount of technical support and access to expertise to your staff during the planning and implementation phases of this sediment study. NOAA is committed to continuing this support to your staff during the review of this document and in future phases of the cleanup process. As a co-trustee with the State and the US Fish and Wildlife Service for the protection of estuarine resources and habitat in the Bay, we are very interested in working closely with your staff to ensure that an appropriate evaluation of potential impacts to beneficial uses is conducted at the NASSCO and Southwest Marine shipyards, and that a remedy that both protects and restores impacted trust resources is implemented. At this time NOAA is offering the following general observations about the Sediment Investigation Report. We will be providing a more detailed comment letter about each one of these observations in the very near future. In addition, Dr. Mark Myers with NOAA's National Marine Fisheries Service has performed a review of the fish study section and histopathology report. His report will be part of NOAA's future detailed comments.

Comments

The conclusions stated in the Sediment Investigation Report are not supported by the site-specific data collected during the phased investigations. Further evaluation of the existing data should be conducted before any conclusions can be drawn regarding the impact from site related contaminants to specific beneficial uses in San Diego Bay.

The conclusions that "biological effects detected at the shipyards are not caused by shipyard chemicals", and "beneficial uses are currently at approximately 95% of ideal values" appears to be based on the following components:

- ▶ misinterpretation of the bioaccumulation data;
- ▶ misinterpretation of the fish study results;
- ▶ incorrect assumptions regarding statistical correlations, sediments and toxicity tests;
- ▶ biased interpretation of the benthic data;
- ▶ comparison of site data to inappropriate reference data;
- ▶ rejection of the pore water data;
- ▶ erroneous interpretation that apparent effects threshold concentrations developed for the sediment are protective and appropriate clean-up concentrations;
- ▶ questionable inputs to the risk evaluation for the wildlife receptors;
- ▶ disregard of a weight of evidence approach to evaluating risk; and
- ▶ lack of sediment or biological data adjacent to the recently closed storm drains.

Each one of these aspects of the report has generated a considerable number of comments and questions. Given the importance of this document for informing the Board in their decisions to protect the beneficial uses of San Diego Bay, NOAA recommends that the conclusions of this report be rejected, and the data be re-evaluated in an unbiased and scientifically defensible manner.

If you have any questions about these comments, please feel free to contact me at (916) 255-6686.

Sincerely,

Denise M. Klimas

Denise M. Klimas
NOAA Coastal Resource Coordinator
Office of Response and Restoration

Cc: Mr. David Barker, RWQCB
Mr. Tom Alo, RWQCB
Mr. Scott Sobiech, US FWS
Mr. Bill Paznokas, CA F&G

SUMMARY OF SELECTED STUDIES RELATED TO TOXIC CONTAMINATION IN SAN DIEGO BAY FISH AND SEDIMENTS

Exponent Technical Report, Phase 2
Tissue concentrations in fillets in fish examined in the study were as high as 400 ppb for PCBs. The Tissue Residue Guideline is 20ppb for PCBs.

Chemistry, Toxicity, and Benthic Community Conditions in Sediments of the San Diego Bay region; September, 1996; State Water Resources Control Board et al.
An extensive scientific assessment of San Diego Bay sediments found extensive contamination of the Bay sediments with mercury, copper, zinc, PAH, chlordane, and PCBs. Over 56% of the Bay sediment is estimated to be acutely toxic to amphipods (a marine organism). As much as 74% of the area negatively impacts development of larval sea urchins. San Diego Bay ranked 7th highest for PCB contamination in the county and compared to other West Coast bay, it had the highest contamination of metals, PAHs, hydrocarbons and was most toxic in two out of three toxicity tests.

Risk Assessment for Consumption of Chemically-contaminated shellfish from San Diego Bay, California, Jon A. Van Rhyn, Fall, 1995
High potential cancer and health hazard risks were estimated for various shellfish contaminated with PCBs, Arsenic, TBT, Cadmium, Benzo(b)fluoranthene, Benzo[a]pyrene, and Benzo(a)anthracene at intermediate or high consumption rates.

Chemical Contamination and Associated Fish Diseases in San Diego Bay, Bruce McCain et al., published in Environmental Science Technology, 1992
Found that mean concentrations of PCBs in liver tissue and of selected aromatic compounds (e.f. aromatic hydrocarbons) and their metabolites in bile were also significantly higher in White croaker, barred sand bass, and black croaker than non-urban sites. Established link between fish diseases and contaminated sediments in San Diego Bay. Found the prevalence of liver neoplasms in black croakers the highest reported for a West Coast Marine species outside of Puget Sound. Relatively high prevalence of fin erosion were found in black croakers and barred sand bass in the Bay. Study indicated that sites in south and central Bay are among the most polluted sites sampled so far in the Bay. Aromatic hydrocarbons have not declined in the Bay.

Investigated Health risk assessment of consuming arsenic-containing fish from San Diego Bay, California, Unpublished master's thesis, San Diego State University, J.R. Smith, 1991
Investigated total arsenic exposures from fish collected within and outside the bay. Excess carcinogenic risks at 140 g/day were found to range from 300 in a million to 1 in a 100. These are very high estimated cancer risks.

San Diego Bay Fish Health Risk Study, June 1990, County Health Department
Found elevated levels of mercury, arsenic, and PCBs in some Bay fish. PCBs were found at levels which represent a potential elevated cancer risk when consumption rates were estimated at only 1.1 oz a day. Mercury was estimated as a potential level of concern for unborn or young children at low consumption rates and for individuals who consume fish at higher rates. Evidence of radiation was also found in some fish. Study led to the posting of San Diego Bay against consumption of fish by sensitive populations.

Coastal Environmental Quality in the United States, 1990, National Oceanic and Atmospheric Administration
San Diego Bay sediment exhibited high concentrations of cadmium, copper, lead, mercury, silver, zinc, PCB, PAH and total chlordane. On the basis of this contamination, San Diego Bay was rated as one of the most contaminated urbanized coastal areas in the nation.

Estimados miembros de la Junta Regional para el Control de Calidad del Agua de San Diego: los sedimentos tóxicos amenazan la salud y la seguridad de la gente y a la vida silvestre que usa la Bahía de San Diego. Los sedimentos contaminados deben eliminarse no solo "taparse" o abandonarse a que amenacen futuras generaciones. Queremos una bahía sana para nadar y pescar y sana para la vida silvestre que depende de ella. Es necesario un nivel de saneamiento riguroso para proteger la salud humana, los peces, la vida silvestre y todos los usos beneficiosos de la bahía.

Favor de:

PROTEGER	Los pescadores de la bahía, los peces y la vida silvestre que viven ahí
APOYAR	Un nivel de saneamiento riguroso para los sedimentos en los astilleros de NASSCO y Southwest Marine
OPONER	Cualquier propuesta que deje químicas peligrosas en la bahía.
SOLICITAR	Que los sedimentos contaminados se acarreen por barcaza, ferrocarril, o por camiones cuya ruta de transportación no sea la comunidad de Barrio Logan.

Me preocupo por un San Diego limpio por que:

Nombre
Domicilio

PHOTO

Necesitamos una Bahía Limpia

Sana para la Vida Silvestre
Sana para el Pueblo

¡**Sana** para Futuras Generaciones!

Presidente y Miembros de la Junta Regional para el Control de Calidad del Agua
9174 Sky Park Court, Suite 100
San Diego, CA 92123

Environmental HEALTH COALITION

We Need a Clean Bay

Safe for Wildlife
Safe for Communities
Saved for Future Generations

FACT SHEET

CLEANUP OF TOXIC SEDIMENTS IN SAN DIEGO BAY

Facts:

- San Diego Bay is seriously threatened by contamination with toxic and hazardous chemicals.
- Three large shipyards, NASSCO, Southwest Marine, Campbell, have seriously polluted San Diego Bay by discharging large amounts of toxic materials into the Bay during operations. These shipyards are being directed to clean up the pollution at their sites by the Regional Water Quality Control Board.
- Many of these poisons have ended up concentrating in the sand in the bottom of the Bay (called sediments) where they can contaminate fish and other marine life.
- Many of the toxic chemicals that have been dumped into the Bay bioaccumulate meaning that they concentrate up the food chain and can impact the health of people who consume fish from the Bay and their children.
- Fish from San Diego Bay have been tested and elevated levels of dangerous chemicals have consistently been found, as recently as this year.
- Bay fishing piers have already been posted with a fish consumption warning due to elevated chemical levels in some fish. Children, pregnant or nursing mothers, the elderly and infirm are more at risk from eating contaminated fish.
- If contaminated sediments are removed some of them will be taken out of the Bay by train or truck. If trucks are used, there are truck routes that do not go through the community that should be used.
- Some of the most dangerous chemicals in the Bay remain toxic for 100's of years if not removed.

Issues:

- Consultants for the Shipyards propose to leave all of their contaminated sediments in the Bay and do no cleanup. If this happens, it would put the people who fish from the Bay and wildlife at risk for years to come.
- EHC supports a stringent cleanup level that will remove toxic sediments from the Bay permanently.
- Some portion of the contaminated sediment may have to be removed to a landfill. The option of using rail cars to remove sediment is preferred. If trucks are used, they must be use routes that do not go through the community of Barrio Logan. There are cleaner dredging options and truck emission technologies that must be used.
- There are many fatal flaws in the study done by the polluters about this site. For example, people of many cultures consume fish from San Diego Bay. They consume fish in different ways and at different rates. These differences have not been addressed in the assessments done at this site.

Solutions:

- The Regional Board should direct the shipyards to cleanup up the toxic chemicals in sediments at the Shipyards to levels that will protect human health and the environment.
- The most stringent levels should be set for chemicals that bioaccumulate such as mercury, PCBs, and TBT.
- Air emissions must be minimized during cleanup activities. Removal of sediments by rail car must have first consideration. Any traffic that is created must be routed around and not through Barrio Logan and cleaner emission trucks must be mandated. An electric dredge should be used for the dredging.

For more information, please contact Sonia Rodriguez, Community Organizer, Environmental Health Coalition at (619) 235-0281 (ext 142)
1717 Kettner, Suite 100, San Diego 92101 or check out our website at www.environmentalhealth.org

Chairman Minan and Members of the San Diego Regional Water Quality Control Board
Regional Water Quality Control Board
9174 Skypark Court
San Diego, CA 9 22123-4340

RE: *(Your organization)* support for protective cleanup standards for sediment remediation in San Diego Bay.

Dear Chairman Minan and Regional Board Members:

_*(State your organization and mission)* We understand that you will soon make a very important decision on the cleanup levels of sediments at the NASSCO and Southwest Marine Shipyards. This is a very important decision that will affect the health and quality of life of many of our members. We are very interested in the issue of fish and sediment contamination in San Diego Bay and strongly support a protective cleanup plan for the Bay. All of us recognize the important economic and environmental value of the Bay including its role as an important fish nursery for many commercial and recreational species.

We understand that part of the responsibility of the Regional Water Quality Control Board is to ensure the protection of human health and the marine ecosystem through its decisions. Contaminated sediments are a known source of contamination in fish and cleanup of the bay sediments is a key issue for people who consume the fish. Further, a healthy marine ecosystem is essential for an abundant fishery to thrive. We are confident that you will act to protect the health of the members of our community and all communities by taking action to establish very protective cleanup standards for toxic sediments that have been discharged by the Shipyard into San Diego Bay.

We urge your support and offer our commitment to helping you bring the Bay, and our communities, back to heath.

Thank you very much for the opportunity to comment on this very important decision.

Sincerely,

Toxinformer
Story Outline

Story idea:	Release of fish pier survey

Target publication date:	Jan 05

Submitted By:	LH

What is the purpose of this story?	
x	Call to Action
	Declare Victory/ Defeat
	Update on Campaign/ Organization Activities
	Educate readers about a new issue
	General education/ information (no-toxic household hints, pest control, etc.)
	Other (Please describe)

Timeliness: Does the story centers on events that must be covered in this issue?	There will be a public hearing and decision in early 05 on cleanup of toxic sediments

Frame the Messages

PROBLEM/ISSUE

EHC's Clean Bay Campaign is working for a clean San diego Bay that is a mutli use water resrouce that is safe for swimming and fishing. San Diego Bay has severly contaminated sediments and the fish cannot be consumed with confidence. Most studies of the safety of eating Bay fish assume low levels of consumtion or recreational levels. EHC's new study shows that there is a sub population that consumes Bay fish at a much higher rate.. A important decision will be made that will determine if the Bay will ever be cleaned up. The Regional Water Quality Control Board will establish sediment cleanup levels for highly contaminated sediments at the commercial shipyards of Southwest Marine and NASSCO. Contaminated sediments are a contributor to the presence of contamination in Bay fish. Sediment cleanup in San Diego Bay is a key environmental justice issue and EHC is urging the Board to act with precaution and reflect the significant cumulative impacts on these communities.

Environmental Health Coalition (EHC), a nonprofit environmental justice organization, has long been concerned about contaminated sediments in San Diego Bay and the possibility that disproportionate health impacts of the contamination are borne by the low-income communities of color that catch and eat fish from the bay. Previous studies of fish contamination in San Diego Bay did not explore the fish consumption patterns of people who do subsistence-type fishing, and did not consider the possibility that some people eat more of the fish than the fillet.

What events/actions related to the problem/issue were precursors to this story?
The CBC started in 1987 over concerns related to contaminated sediments. We have been working on the cleanup of the shipyard sediments for the past 10 years. There has been an intense effort for the past 3 years. We have hired experts to advise us on the studies done at the site.

What has EHC done most recently regarding this? Have we been successful?

One of the claims that was made regarding fish consumption was that it was being assumed that people did not eat much fish from the Bay. EHC then conducted a community survey As an environmental justice organization, EHC is very concerned about low-income and communities of color that rely on fishing for subsistence as well as recreational use of bay fish. While there have been limited studies of the health risks of eating Bay fish, they suffered from significant flaws or data gaps and none of them included survey data of subsistence fishers. However, the 1990 *San Diego Bay Fish Health Risk Study* did state that health risks were significant if fish were to be consumed at subsistence rates of 165 grams per day.

Ecological and human health risks is a significant issue related to the clean up of contaminated sediments at NASSCO and Southwest Marine. EHC conducted this community survey into order to obtain basic information about fishing off piers near the shipyards and in the south end of the bay to ensure the interests of this population were considered in the decision-making process.

Methods

We surveyed a total of 109 people fishing from Convention Center pier, Pepper Park, and Chula Vista fishing piers. A total of 10 surveys were completed at the convention Center pier, 79 at Pepper Park Pier, and 20 at the Chula Vista pier during the winter and spring months of 2004. The questionnaire was developed by EHC staff and piloted tested for clarity. All surveys were administered orally by an EHC community organizer, with help from associates who were fluent in Tagalog, Spanish, or English as needed. Each survey took approximately 10 minutes to administer. Survey data were entered into Excel and analysis was done using SPSS Version 9. The survey questionnaire is attached.

EHC conducted a survey of people fishing from piers near areas where contaminated sediments have been found in San Diego Bay. A total of 109 fishers were interviewed in English, Spanish, or Tagalog as appropriate, during the winter and spring of 2004. Piers surveyed included Convention Center pier (downtown), Pepper Park pier (National City), and the Chula Vista pier. Over half the surveyed fishers (58%) fish at least once a week, and a quarter fish daily. Almost two-thirds of the fishers eat their catch. 41% of the children of fishers were reported to eat the fish as well. The number of fish caught at a time varied from 1 to 20. Frying and stewing were the cooking methods mentioned most often. The study does not provide a statistically representative sample of all fishers from San Diego Bay; however, it establishes that a significant subset of people regularly catch and eat fish from the piers near contaminated areas of the bay. Recommendations include the following: Consider the environmental justice impacts in decision-making and implement precaution in all permitting and regulatory decisions.; establish protective clean up levels for remediation of toxic sediments in San Diego Bay and protective sediment quality objectives for the State; revise the Fish Consumption Warning for San Diego Bay based on higher consumption levels; update and replace fish warning signs to include Tagalog; DTSC in conjunction with OEHHA should initiate an outreach and education program to educate fishers of the Bay of the risks of consuming Bay fish and some means to reduce them.

SOLUTION: Is there a solution that EHC is proposing?
EHC will be urging the Regional Board to set protective cleanup levels for sediments in San Diego Bay. In setting the levels, the Board should consider the environmental justice impacts and implement precaution in all permitting and regulatory decisions.; establish protective clean up levels for remediation of toxic sediments in San Diego Bay In addition, the State should set protective sediment quality objectives and revise the Fish Consumption Warning for San Diego Bay based on higher consumption levels; update and replace fish warning signs to include Tagalog; DTSC in conjunction with OEHHA should initiate an outreach and education program to educate fishers of the Bay of the risks of consuming Bay fish and some means to reduce them.

Comment [JB1]: [pacte

What are we doing to achieve this?
We are organizing on within the communities most impacted, Barrio Logan, National City, Chula Vista and the fishing piers closest to the contamainted areas.

Comment [JB2]: [pacte

What role are community members playing?
Community members and people who fish the Bay are signing postcards and attending workshops to learn about the issue and intent to present concerns to the Baord.

Comment [JB3]: [pacte

What is the role of EHC allies in the solution?
EHC has worked on this issue for years with representatives of the workers and member organizations of the San Diego Bay Council

Comment [JB4]: [pacte

OUTCOME: If the story is a victory, what did we win?

Did what we expected to happen actually happen? Did our proposed solutions work?

If the story is a defeat, what happened that we did not anticipate? What are our next steps?

ACTION: Who is the target of the action? State the What, Where, How and When of this request.
The Regional Water Quality Control Board is the target of this action. Right now, the hearing is scheduled for Feb. 9 but this could change.

What mechanism are we using for this action? (Post card, petition, email, etc.) Is this information on file at EHC?
We have over 400 postcards signed.

Quoted Sources: Who likely will be quoted in the story? How can these individuals be contacted?		
Name	**Contact information**	**What would they add**
Sonia		organizer
Fisher's that Sonia and Georgette have talked to		Actually fish the Bay

Additional Information: Which supporting documents (letters, reports, press releases, articles) should be used in developing the story?
We have our Fishers Survey and EJ guidance document (attached). We also wrote along letter—also attached.

Photos/Graphics: Will there be any photos/graphics/maps for the story? Are the photos/graphics/maps on file at EHC? If so where are they saved? If not please provide to media dept. as soon as possible. Do new photos/graphics/maps need to be taken/created? Please describe
Sonia has some good photos.

Please do not write below this line. To be filled out by Media Department

Story Summary

Summary Paragraph: If this story is selected for publication during the Campaign Directors Toxie budgeting meeting, Media Dpt. will write a summary paragraph based on the completed outline and return to CDs and Admin for approval.

Story selected for publication on:

Story length/ format:

Outline Approved By:	Campaign Director	Sonya Holmquist	Diane Takvorian	Jason Baker
Date approved				

San Diego Bay Council

A coalition of San Diego environmental organizations dedicated to protection and restoration of San Diego's coastal water resources

December 5, 2003

Mr. Dave Barker
Mr. Craig Carlisle
Mr. Tom Alo
Regional Water Quality Control Board
9174 Skypark Court
San Diego, California 92123-4340

HAND DELIVERED

RE: San Diego Bay Council Comments on Exponent Technical Report and Recommendations for Tentative Cleanup and Abatement Order

Dear Messrs Barker, Carlisle, and Alo:

The member organizations of the San Diego Bay Council have reviewed the Exponent Technical Report and have considerable comment on it. Our submittal includes: this letter, comment letters from Ms. Elaine Carlin, Mr. Ed Kimura, and Mr. David Paradies; all earlier submittals by the Bay Council and member organizations; and attachments.

Our comments have a dual function: 1) to comment on the Technical report and 2) to provide our recommendations to the Board staff regarding the Tentative Cleanup and Abatement Order (CAO). Our summary conclusions are listed in brief below.

Summary Conclusions:

About the Technical Report

- While very large and expensive, the Exponent Study is fundamentally and fatally flawed and cannot be used as a credible basis for the Regional Board's action.

- The report is flawed in virtually every area. Every line of evidence is manipulated whether through poor sampling design and technique (ex: comparison of contaminated sites to contaminated reference stations), analysis (ex: failure to conduct health risk assessments on whole fish or fish filets that exceeded the TRG), statistical hysteronics (ex: claim that only a 1% improvement in protection would result if 1.2 million tons of contaminated sediment was removed), or just flat ignored (dismissal of high pore water results) The list of flaws is long and they are covered in detail in this submittal.

- The report fails demonstrate economic or technical infeasibility required for any cleanup levels other than background levels.

- However, the report does prove the benefit of cleanup to background by demonstrating the significant reduction of contaminants and improvement to water and sediment quality from cleanup to stringent levels.

- The Regional Board should secure their own expert technical assistance in review of this document since the Shipyards are clearly posturing for a lawsuit.

About the Cleanup and Abatement Order:

- The Regional Board is bound by Resolution 92-49 to establish Background Levels as the Cleanup Standard

- The Regional Board should require cleanup to the background levels originally cited in their March 6, 2002 letter. These levels are defensible and in alignment with other state and national standards.

- The CAO should heavily weigh and require clean up of to the most stringent standards bioaccumulative substances present at the site including all chemicals that bioaccumulate in fish, animals, and plants.

- The Regional Board should reflect the principles and guidelines of environmental justice outlined in the resolution passed in October 14, 2003.

- Any determination of background or alternate cleanup levels must be based on a set of reference stations (such as those provided by NOAA and the Bay Council) that protect beneficial uses and must fall within the range of acceptable state and national standards.

- The CAO should include a detailed list of shipyard water quality violations, all sources of pollution, current land side cleanup efforts including analysis of contaminated groundwater plumes, an accounting of profits earned by the shipyards during the decades that they used San Diego Bay as a convenient toxic waste disposal site.

- Regional Board should do their own estimates or require credible and documented estimates on dredging costs.

We Cannot Escape Cumulative Impacts: This is a Very Significant Decision

The evidence is overwhelming. Our ocean ecosystems are in failure and our actions are not adequate to protect them. The news only gets worse about contamination of thc marine ecosystem food chain by persistent organic compounds (POP)such as PCBs are a rising international concern. Recently, the World Health Organization recommended lowering the intake limits for mercury in fish. TBT in low amounts have been found to spawn false penises in females snails. Polar bears can carry PCBs a million times the concentration of PCBs detected in seawater and these body burdens are threatening their survival even in the most pristine environments. Also threatened are the indigenous people who live there due to contamination of their sea based food sources by POPs. When we add to pollution the other pressures on the oceans such as overfishing, loss of habitat, sewage pollution etc the cumulative impacts are devastating.

Those of us with the responsibility to protect the most important and biologically rich marine environments, the coastal waters, must take aggressive actions to restores these waters and their beneficial uses to health. These actions are incumbent upon us if the oceans are ever to recover.

This is not just a local decision with purely localized impacts. In spite of the tireless attempts of Exponent to treat the shipyard leaseholds as small areas with limited significance, the fact remains—the Shipyards have seriously contaminated San Diego Bay. San Diego Bay is an important and sensitive enclosed Bay and estuary attached to the Pacific Ocean. Impacts to the Bay contribute significantly to the cumulative impacts that have degraded coastal waters and the oceans.

Our decision whether or not to clean up one of the most toxic sites in San Diego Bay has local, state, national, and global significance. We urge you to view this decision, and the fight that is sure to come, as a struggle important to the survival of our oceans and ourselves. We know that there are some that dismiss this kind of global perspective as un-scientific or, worse, emotional! Behind closed doors, our experts are derided. Those that would provide advice and counsel to us have been threatened with job repercussions. No matter. We are not deterred. In fact, we are in good company.

We, the undersigned marine scientists and conservation biologists, call upon the world's citizens and governments to recognize that the living sea is in trouble and to take decisive action. We must act quickly to stop further severe, irreversible damage to the sea's biological diversity and integrity...Nothing happening on Earth threatens our security more than the destruction of our living systems. The situation is so serious that leaders and citizens cannot afford to wait even a decade to make major progress toward these goals. To maintain, restore and sustainably use the sea's biological diversity and the essential products and services that it provides, we must act now.

-- Excerpt from **Troubled Waters: A Call for Action** signed by more than 1,600 marine scientists from around the world at the 1998 International Year of the Ocean Conference.

"The oceans are in trouble; the coasts are in trouble; our marine resources are in trouble. These are not challenges we can sweep aside,"

--James Watkins, a former chief of naval operations and national security expert and head of the U.S. Commission on Ocean Policy, September 23, 2002

Because POPs are bioaccumulative and biologically and environmentally persistent, complete elimination of POPs is required in order to protect the health of wildlife and humans.

Ted Schettler, MD, MPH, Science and Environmental Health Network

"It does not matter where on Earth you live, everyone is utterly dependent on the existence of that lovely, living saltwater soup. There's plenty of water in the universe without life, but nowhere is there life without water. The living ocean drives planetary chemistry, governs climate and weather, and otherwise provides the cornerstone of the life-support system for all creatures on our planet, from deep-sea starfish to desert sagebrush. That's why the ocean matters. If the sea is sick, we'll feel it. If it dies, we die. Our future and the state of the oceans are one."

Sea Change A Message of the Oceans Sylvia Earle, 1995.

The recommendation of "do-nothing" advocated by Exponent for their clients is shocking, but not unprecedented in that it fails to recognize certain physical laws of nature. We are reminded of a meeting we had years ago with an editor at the Union Tribune. He stated that because there was no evidence that the ozone layer was thinning directly above Barrio Logan, that the methyl bromide releases from the Port's fumigation facility were insignificant.

NASSCO, SWM and Exponent apparently would have you believe a version of the same thing. That their temporarily leased piece of San Diego Bay in not worthy of protection. They would argue that because we can't do everything to cleanup all contamination in the Bay on the same day we should do nothing. Everyone in the November workshop had to be impressed that neither Mr. Nielsen nor Mr. Tom Ginn PhD. would affirm, out-loud, that they were comfortable with leaving PCBs at 8,400 ppb in San Diego Bay. It was a simple request since their conclusions were that the high levels of contamination were not causing significant impacts and that they should be left to naturally attenuate. It is revealing that they refused to tell it like it was. That, in fact, these "experts" have recommended to you that high levels of toxic and bioaccumulative pollution be left in our Bay to threaten generations for years to come.

Specific Comments

Our more specific comments below supplement our experts' comment letters attached.

The Regional Board is bound by Resolution 92-49 to establish Background Levels as the Cleanup Standard

The law is clear on this point and we will not belabor it again. We refer to Resolution 92-49 and the State Board's analysis dated February 22, 2002 of its applicability to sediment cleanup. (attached) In short, it says:

"A Regional Board must apply Resolution 92-49 if such sediments threaten beneficial uses of the waters of the state and the contamination or pollution is the result of a discharge of waste. Contaminated sediments must be cleaned to background sediment quality unless it would be technogically or economically infeasible to do so."

The Technical Report did not provided a credible case that cleanup to background is technically or economically infeasible. Dredging and disposal of contaminated sediment from this highly active shipping site is 100% feasible. To put it in context, full cleanup is a 1.2 million cubic yards. The Navy has already completed dredging projects in San Diego Bay of over 10 millions of cubic yards. Dredging projects of this size of the Shipyards can and have been done in the Bay repeatedly.

Exponent's analysis of economic infeasibility is unusable since it heavily relies on their unfounded finding that the tons of toxic waste and bioaccumulative chemicals in the Bay at their leasehold has, miraculously, no biological impacts. We are aware of no other credible science that supports similar conclusions except perhaps the earlier, equally flawed, studies of Campbell's Shipyard by PTI, also lead by Tom Ginn. Further, we must continue to point out this is shipyard waste that was illegally discharged there.

The Report is useful however in proving that cleanup to background is highly economically feasible in proving that it is money well spent. For the additional cost, levels in the Bay at this site will be markedly reduced. PCBs from 8,400 ppb to less than 200; TBT from 3450 ppm to 142 ppm; copper form

1500 to 84 ppm; mercury from 4.5 ppm to 0.39 ppm—all very significant reductions and improvements in the water and sediment quality in the Bay.

In spite of its heft, the Technical Report fails to respond to the Regional Board direction in the 13267 letter dated June 1, 2001. The guidelines required that the Shipyards evaluate the feasibility of cleanup alternatives including complete cleanup of all waste discharged and restoration of affected water to background conditions. On March 6, 2002 the Regional Board provided those background cleanup levels. (Letter attached) However, the Technical Report does no such thing. It invents its own levels of 95% of UPL (virtually all of which exceed the background levels determined by the Board) which is not in compliance with the Board's June 1 directive.

Regional Board has to start with the fact that the beneficial uses of the Bay are already impaired

It is proved that San Diego Bay suffers from significant water, sediment, and fish contamination. The extensive Bay Protection and Toxic Cleanup Report chronicled the sediment impacts. All of the fishing piers are posted due to findings of elevated levels of PCBs, arsenic, and mercury in 1990. Water quality monitoring for copper and other contaminants exceed standards. There are many polluters of San Diego and among the largest threat are NASSCO and SWM. These facilities are rated 1-A, the highest threat to water quality for a reason. The Board must set clean up levels that restore beneficial uses.

Regional Board should follow Cal/EPA Environmental Justice Guidelines

On October 14, 2003, the California Environmental Protection Agency (Cal/EPA) Interagency Working Group on Environmental Justice (IWG) – consisting of the Secretary of the Environmental Protection Agency, the Chairpersons/Directors of the California Air Resources Board, State Water Resources Control Board, California Integrated Waste Management Board, Office of Environmental Health Hazard Assessment, Department of Toxic Substances Control, Department of Pesticide Regulation, and the Governor's Office of Planning and Research – adopted a resolution that endorsed the Environmental Justice Advisory Committee's goals and recommendations on achieving environmental justice in California. The Advisory Committee consisted of 17 members representing a broad spectrum of stakeholders including community-based groups, environmental organizations, industry representatives, and regulators.

Currently the IWG is developing a strategy document, which includes an implementation plan, to begin working toward the achievement of the goals set out in the Recommendations. They will depend on the experiences of regulators, community members, and other stakeholders to identify and address any gaps in existing programs, policies, or activities that may impede the achievement of environmental justice.[1] In light of that process, it is clear that the IWG has sent a strong mandate to Cal/EPA and all of its departments that it should be a high priority to implement programs, plans, actions, and policies that protect the public health of communities, especially low-income communities of color.

In particular, the recommendations underscored the importance of using precautionary approaches to environmental and public health protection. The recommendations state, ***"Committee members believe it is not necessary to wait for actual, measurable harm to public health or the environment before evaluating alternatives that can prevent or minimize harm…additional precaution may be needed in***

[1] California Environmental Protection Agency (Cal/EPA) Interagency Working Group (IWG) on Environmental Justice Resolution, Adopted on October 14th, 2003, p. 2. Also see requirements of Public Resources Code section 71113(b)(2).

order to address or prevent environmental justice problems."[2] In exercising precaution, the recommendations state the following types of needs and concerns:[3]

- need for programs and agencies to be more responsive to community concerns about potential threats to their health and/or environment, balanced with a concern that resources are limited and need to be expended to prevent or mitigate well-understood impacts on public health and the environment, and targeted at the most significant impacts first.

- The need for scientifically supported tools, processes, and decisions, balanced with a concern that lack of complete scientific data has been used in the past to delay or prevent reasonable actions to address pollution problems.

- The need of community members to be assured that their health and environment will not be placed at risk by environmental decisions, balanced with a concern that no action can ever be shown to be risk free.

- The need of agencies and businesses to minimize costs and maximize benefits of actions undertaken, balanced with a concern that current methods of evaluating costs and benefits do not adequately address the wider costs to society and benefits of environmental decisions, or the distribution of those costs and benefits.

- The need to reduce emissions/discharges and exposures to toxic contaminants within a disproportionately impacted community, and concerns about the potential for business closure and job loss.

These recommendations serve as valid guidance for this Regional Board to address environmental justice issues regarding the cleanup of sediments in the San Diego Bay. In particular, an environmental justice issue of concern is the consumption of contaminated fish by low-income, people of color populations in the San Diego region. Considering the above recommendations adopted by Cal/EPA, we believe the following should be reflected in this Regional Board's consideration of a sediment cleanup level that is protective of public health:

1. there is a population of low-income and people of color who regularly fish Bay and who may *depend* on healthy aquatic ecosystems and the fish that these ecosystems support, for these populations there may be no real alternatives to eating and using fish, and for many members of these groups it is entirely impractical to "switch" to "substitutes" when the fish on which they rely have become contaminated;

2. the community has voiced a concern with the potential threat of an inadequate sediment cleanup level that will not protect the health of populations that consume fish frequently or on a subsistence basis and that concern needs to be reflected in the cleanup abatement order;

3. there is a lack of scientific data on the levels of consumption of contaminated fish and exposure to harmful toxins for frequent or subsistence fishing populations in the San Diego Bay, specifically for low-income people of color populations;

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[2] Final Recommendations Report of the Cal/EPA Advisory Committee on Environmental Justice, p. 13 (Adopted on October 14th, 2003 by Cal/EPA IWG on Environmental Justice).
[3] Ibid. at 14.

4. it is a well-documented fact that the consumption of contaminated fish with bioaccumulated toxins can result in severe and significant health impacts;

5. and that risk reduction, whereby risk-producers are required to cleanup, reduce, or prevent contamination, is the most practical way to reduce impacts to these populations.

CAO should integrate the precautionary principle adopted by Cal/EPA into Cleanup decision

Exercising precaution while setting cleanup levels for sediments in the San Diego Bay is within the jurisdiction of this Regional Board and the recently adopted Cal/EPA guidelines provide the mandate and support for such action. The discussion below underscores the need for a precautionary approach to setting cleanup levels.

In Exponent's Human Health Risk Assessment for this project, the median fish and shellfish consumption rates is based on 21 grams/day for the general population. Although the United States Environmental Protection Agency currently uses the default values of 17.5 grams a day for the general population, it recommends a default value of 142.4 grams/day, well above Exponent's rate, for subsistence populations.[4] Therefore, the claim that Exponents claim that this is a conservative HRA is not met with the use of 21 grams/day thus voiding its claim that its HRA is protective.

The San Diego region lacks any specific data on subsistence fishing populations. The 1990 San Diego Bay Health Risk Study (Study) is the most current study relating to contaminated fish in the Bay.[5] In that Study only 369 fishers were interviewed and interviews were only held in English, thus excluding a large portion of fishers who did not speak English as their first language and who are prime candidates for being frequent or subsistence fishers. Studies of other urban bays such as San Fransciso found high reats of fish consumptions from the Bay. (AL need citey???

In addition, the Study based its consumption rates on the assumption that fishers only ate certain species and refrained from eating a host of other species such as sea urchins, sea cucumbers, or bottom-feeding fish.[6] Furthermore, the Study assumed that people only ate the fillet of finfish, although it is commonly accepted fact that some populations eat the fat, head, skin, bones, eggs, or internal organs – thus increasing exposure rates.[7] This lack of data it also support establishing a sediment cleanup level that is precautionary and protective of human health.

EHC organizers have visited docks and piers in the San Diego region many times, most recently in the past month and identified individuals that consume fish frequently. Although every decision-maker involved in this important decision is fortunate to live well-above the poverty line, many in Barrio Logan and National City are not so lucky. 35% Families in Barrio Logan and 20% of families in National City survivie on less than $17,000 a year for a family of four. It is credible to assume that people are using protein from the Bay to supplement their diets.

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[4] Fish Consumption and Environmental Justice: A Report developed from the National Environmental Justice Advisory Council, a Federal Advisory Committee to the U.S. Environmental Protection Agency. (November 2002, revised). Citing USEPA, *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health* (October 2000).
[5] San Diego Bay Health Risk Study, prepared by San Diego County Department of Health Services (June 12, 1990).
[6] Supra note 4 at 34-35.
[7] Id.

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Further, the use of 21 grams/day is not a conservative estimate. A host of other studies done around the country illustrate the large differences in the quantities of fish consumed by different demographic groups in the country and can serve as guidance for our region in determining what level represent precaution when setting average daily consumption rates for the San Diego Bay. These studies are abundant evidence that some population of people of color and low-income people eat far greater quantities of fish than the general population. Since the San Diego region lacks this type of specific data, these studies may serve as guidance or an illustrative purpose for estimating risk to similar populations in our region. Below are listed are a few of these studies, which all recommend mean consumption rates for subsistence populations well-above USEPA's default and Exponent's numbers:

- Study by Columbia River Inter-Tribal Fish Commission registered a mean fish consumption rate of 58.7 grams/day and a maximum fish consumption rate of 972 grams/day.[8]

- A study of Asian Pacific Islander populations in King County, Washington showed a mean fish consumption rate of 117.2 grams/day and maximum values of 733.46 grams/day.[9]

- Study in Alabama registered fish consumption rates for low-income African-Americans at 63 grams/day.[10]

- Study in Michigan registered the mean fish consumption rates for low-income African-Americans at 43.1 grams/day.[11]

The existence of a large population who consumes fish from the Bay and near the most contaminated areas further advances the need for precaution to be taken in setting an adequate cleanup level that will protect public health.

Specific Flaws in the Exponent Heath Risk Assessment (HRA)

The manner in which the Exponent Heath Risk Assessment was done reveal further flaws and results in a lack of protection for people who eat fish even at the lower consumption rates levels assumed in the report. Although it is well known, and we have raised before, consumption patterns and quantities for the subsistence and the most at-risk consumer of fish vary.

The flaws in the treatment Heath Risk Assessment (HRA) are striking:

1. Failure to analyze the whole fish is significant. In San Diego, we are fortunate to have a large southeast Asian immigrant community as well as indigenous and tribal communities, Latinos, and a large community from Africa. Stews, raw and whole fish consumption, and other non-fillet-only based consumption patterns can be found in these communities. As we predicted, this consideration was dismissed and the risks were grossly understated. Exponent representatives even went as far as to state that fillets tested were the 'edible fillets like they would normally be prepared.' Normally? By Whom? This analysis did not analyze all the contaminated sand bass fillet risks or the whole fish risks which can be assumed to be significantly higher. A proper analysis would have analyzed the whole fish.

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[8] Columbia River Inter-Tribal Fish Commission, Technical Report 94-3, A Fish Consumption Survey of the Umatilla, Nex Perce, Yakama, and Warm Springs Tribes of the Columbia River Basin (1994); Columbia River Inter-Tribal Fish Commission, Comments to Administrator Broaner

[9] Ruth Sechena, et al., *Asian and Pacific Islander Seafood Consumption Study* (1999).

[10] Alabama Department of Environmental Management (1993).

[11] Patrick C. West, *Race and Incidence of Environmental Hazards: A Time for Discourse.* Bunyan Bryant and Paul Mohai, eds. "Invitation to Poison? Detroit Minorities and Toxic Fish Consumption from the Detroit River," 96, 98 (1992).

It is important to note that even Exponent, stated at the November workshop that the contaminant levels were higher in the whole lobster than in the edible flesh alone. The same would be expected to be true for the Sand Bass had they done the analysis.

2. When the fillets were found to exceed the tissue residue guidelines (TRG) they were dismissed by Exponent and no further assessment was conducted.

3. Exponent dismissed the PCB contamination in the NASSCO Bass (46-54 ppb) as "*well below*" the reference station guidelines (55). The level is not "*well below*", it is between 1 and 9 ppb below.

4. All of the maximum samples far exceeded the PCB tissue residue guidelines of 20 ppb. Tissue contamination above 20 ppb means that beneficial use of REC are not being met at this site. At Southwest Marine tissue concentrations in fillet were as high as 400 ppb.

5. Workers fishing from the pier (which we know occurs) were not considered as consumers.

6. The Exponent HRA assumes that fish and lobsters abide by and respect leasehold lines and pretends that contaminants in the fish and lobster will never leave the site. This is, of course, ridiculous. Exponent also fails to assess impacts to fisher fishing nearby the shipyards at the Crosby Pier. Although this pier is posted against fishing, people fish there often.

7. The Exponent HRA assumes that these areas will be shipyards forever. There is no guarantee of that fact. It is, at least, a possibility that globalization, legislation, base closures, and/or other market pressures could result in one or more closures sometime during the next 100 years.

These problems are so severe as to completely undermine the credibility of the HRA done by Exponent and renders it useless.

Flawed Ecological Risk Assessment (ERA) and in-situ Benthic Analysis

These assessments were likewise, flawed.

1. Exponent found lesions in sand bass but dismissed them as an ecological impact because they were "mild" lesions.

2. Lesions were found at the reference site. Again, use of contaminated reference sites not acceptable. There are sites in the Bay were beneficial uses are protected.

3. Exponent did not analyze the goby which was recommended strongly by resource agencies.

4. Impact demonstrated for Brown Pelican and Surf Scoters, but dismissed by Exponent.

Regional Board should rely on national and state science as a guide candidate levels

At the workshop, Exponent representatives stated that there was no relationship between chemistry and biological effects at the Shipyard sites. Although it is hardly surprising that polluters experts' cannot find any relationship between their toxic chemicals and biological effects, many credible scientists have. It is hard to imagine how PCBs, Mercury, lead, copper, arsenic are all benign in San Diego Bay when in the marine environment in the rest of the world they are so deadly. We recommend that the Board rely on objective scientific papers such as those published by NOAA on PCBs and PAHs in fish as justification for protective cleanup levels. In Lyndal Johnson's July 24, 2000 study, he found that in sediment with PAH contamination *"Above 1000 ppb, there appears to be a substantial increase in the risk of liver disease and reproductive impairment, as well as potential effects on growth."* (Report Attached)

Another reference that should be guide the Regional Board regarding expected impacts of contaminated sediments on beneficial uses is *Incidence of Adverse Biological Effects Within Ranges of Chemical Concentrations in Marine and Estuarine Sediments*; Edward Long et al., Environmental Management, Vol. 19, No. 1. (attached)

The Regional Board must protect against the synergistic and additive effects among all contaminants, especially bioaccumulative contaminants such as is noted in Meador's October, 2000 *An analysis in support of tissue and sediment based threshold concentrations of polychlorinated biphenyls (PCBs) to protect juvenile salmonids listed by the Endangered Species Act.* (attached)

The Regional Board should ensure that issues raised by DTSC in their August 24, 2001 memorandum (attached) and repeatedly by NOAA, USFWS, and the DFG should be addressed and reflected in any final CAO.

Other Responsible Agencies and the Public have expressed Early and Continuous Concerns

Ours are not the first objections that the Regional Board has had to the establishment of high and unprotective cleanup levels in the Bay.

Here are relevant excerpts from *Memorandum from Department of Fish and Game to Mr. John Robertus, Executive Officer, Regional Water Quality Control Board, San Diego Region*, dated March 24, 1999. (Letter is attached.) These comments speak for themselves about the inadequacy of the high cleanup levels at Campbell's and Interim levels at the Shipyards.

"...the Department is extremely concerned with the clean-up levels established by resolution 99-12 and 99-20. In our opinion, the sediment clean-up levels established at 810 parts per million (ppm) for copper, 820 ppm for zinc, 231 ppm for lead, 4.2 ppm for mercury, and 0.95 ppm for PCBs are not protective of fish and wildlife resources found in San Diego Bay."

"...the data used to develop the Campbell AETs included sites which showed measureable toxicity. "

"Our concern for these cleanup levels stems not only from our review of the Campbell and Commercial Basin studies, but also from new information that has become available since the AET's were established for Campbell's and Commercial Basin sites.... The BPTHS data indicates that several sites around the State had concentrations of copper above 400 ppm, zinc above 630 ppm, lead above 171 ppm, mercury above 1.54, and PCBs above 0.865. The sites that had sediment at these concentrations were classified as being in the top 5% of the worst sites in the State for these contaminants. Additional, acute toxicity was shown to be associated with these contaminant levels. For copper, 86% of the samples at 400 ppm or above showed toxicity. The acute toxicity percentages for lead at 171 ppm was 89%, for zinc at 630 ppm it was 74% acute toxicity, for mercury at 1.54 ppm there was 59% acute toxicity, and PCBs at 0.95 showed 63% acute toxicity. It should be noted that the same amphipod test was utilized to determine toxicity for both the Campbell study and the BPTHS study."

"Additional justification for our concerns can be found in screening guidelines produced by the National Oceanic and Atmospheric Agency (NOAA). These guidelines identify AET's for copper, zinc, mercury and PCBs as" copper = 390 ppm, zinc = 410 ppm, mercury = 0.41 ppm, and PCBs = 0.130 ppm. The NOAA AETs for these constituents are also well below those established by the subject resolutions."

"Finally, the State of Washington has recently passed legislation that establishes cleanup criteria based on AETs for Puget Sound. All of the Puget Sound AETs are well below those established by the subject resolutions."

NOAA

A September 12, 2003 letter raised significant concerns about the Distance from Shore Approach, the Statistical Approach, and the use of the reference pool. A proposal for a defensive set of reference stations was submitted in January, 2003. (Both attached)

State of Washington

In a letter dated June 17, 2002, Mr. Brett Betts suggested his concerns over the contaminated reference sites used by Exponent and suggested that all bay-wide data from the past 10 years be used. He also noted that Exponent reference stations 2, 3, 4 and 5 all failed in some way to meet the standards that the State of Washington would allow.

US Fish and Wildlife Service

"The proposed clean-up levels for copper, zinc, lead, and PCBs at the project site exceed concentration levels that are toxic to benthic invertebrates"...
"The Service wants the opportunity to further discuss with the RWQCB clean-up levels designed for this site, along with other sites in San Diego Bay including National Steel and Shipbuilding (NASSCO) and Southwest Marine Shipyard. Our goal is to establish an approach acceptable to the RWQCB, National Oceanic and Atmospheric Administration, California Department of Fish and Game, and the Service, for determining contaminant clean-up levels at current and former shipyard sites that are protective of beneficial uses and trust resources that utilize San Diego Bay."

--US Fish and Wildlife Service to Melissa Mailander, San Diego Unified Port District. Letter dated September 24, 2003

"The Service does not agree that the contaminant clean-up levels for the Campbell Shipyard facility established in the San Diego Regional Water Quality Control Board (RWQCB) Cleanup and Abatement Order (CAO) 95-21 are stringent enough to guarantee long-term protection of fish and wildlife resources in San Diego Bay."

--US Fish and Wildlife Service to John Robertus, Executive Officer, Regional Water Board, Letter dated November 5, 2003

Regional Board should Incorporate the Resolution on Environmental Justice adopted October 14, 2003

On October 14, 2003, the CAL-EPA Interagency Working Group on Environmental Justice adopted a resolution endorsing the California Environmental Justice Advisory Report (EJ Committee) and stated its intention to use the goals and recommendations contained therein to develop an EJ strategy by December 31, 2003. The Regional Board should anticipate these actions by reflecting the goals and recommendations in the Committee report in this CAO. (Resolution attached)

Consideration of TBT must be elevated as an important Shipyard chemical

The experts' letters will further detail our concerns regarding this chemical. Attached is the EPA proposed reduction of the saltwater chronic criterion demonstrating the toxicity and impact of this chemical in our marine environments. The proposed criterion is to be "lowered from a 4-day average of 0.01 ug/l to 0.001 ug/l—a very significant reduction but understandable given the bioaccumulative tendencies of this chemical.

Environmental Justice requires contaminant removal, not continued exposure

Among the most egregious claims by Exponent is that leaving toxic sediment loaded with dangerous bioaccumulating substances in the Bay to poison fish, wildlife, and people for years to come is the best solution to promote environmental justice. As participants in the Environmental Justice Demonstration Project the Shipyards should know better than to exploit this issue so shamelessly. They know full well that removal of the sediments, even if trucks need to be used, can be accomplished in a manner that reduces impacts to the neighboring community. They also fail to note their own operational and historical cumulative impacts from water, soil, and air pollution on the neighboring communities. The contaminated Bay is another impact on the residents of Barrio Logan on a long list of negative shipyard impacts.

In the Cleanup and Abatement Order the Regional Board should include the following findings or requirements:

- The removal of contaminated sediment (that cannot be taken to LA-5) use rail as a mode of transportation to an appropriate landfill.
- The use of some material as landfill cover be explored.
- That the mitigations provided in a comment letter by the Air Pollution Control District on the Campbell's cleanup be adopted including:
    - If trucks are used, they should be required to include technologies that reduce diesel emissions.
    - That an electric dredge be used to reduce emissions in the region.
- If trucks are used, then routes must be required that travel around and not through the community of Barrio Logan. No trucks can be allowed down Crosby Street truck route.

Regional Board should conduct its own assessment of dredging costs

Dredging costs have been driven up in San Diego Bay in the past few years due to the massive amounts of dredging done by the US Navy. Dredging for cleanup in other areas are far less. While often costs are figured here at $100/ton, in other areas it is accomplished for $30/ton. The Regional Board should conduct its own analysis of costs for dredge and removal.

Regional Board cannot support natural attenuation as it won't cleanup anything and will not protect beneficial uses in the short or long term.

The "remedy" recommended in the Exponent report is no remedy. The most dangerous chemicals at this site don't lose their toxic or bioaccumulative qualities for 100's of years. Many don't break down at all. In a recent hearing, a consultant for the Port District was queried by a Commissioner about how long these wastes remain toxic. "Millennia" was his answer.

Even NASSCO has recognized the folly of Do-Nothing "Solution"

In a September 13, 2000 Proposal to Conduct Additional sediment toxicity tests in order to establish sediment cleanup levels for National Steel and Shipbuilding Company, signed by Janice Grace, Vice President of Operations. (attached) It states:
"*No Action: This approach is a recognized, accepted approach to remediation projects both in California and elsewhere in the United States. In this specific case, however, NASSCO acknowledges that the time to achieve the performance goals is too great, and accordingly this approach must be rejected.*" We agree.

Groundwater contamination at NASSCO needs to be assessed and reviewed as a source.

There is a plume of chlorinated solvents on the NASSCO Land-side. DTSC is reviewing a workplan and DTSC officials should be contacted regarding this plume. It is also of concern that the contaminants appear to be near Way 4 and could be leaching otherwise being discharged into the Bay. The Regional Board needs to include an assessment of this source.

Regional Board should Include a listing of previous violations by the Shipyards

NASSCO and SWM have extensive records of violations and threat to water quality. Further, there have been frequent spill so petroleum products at the yards from ships under repair. These facts must be included in the CAO as additional evidence that the waste polluting San Dieog Bay is from their operations.

Who is Exponent?

Attached is a list of "Selected Exponent sediment experience" submitted to you by NASSCO in March, 2000. Even though many of their clients are "Confidential", their work in other areas is revealing. Here are some highlights of what Exponent has done to other regions in the Nation.

Working for a confidential client on the Saginaw River Basin Exponent reviewed data from more than 12 manufacturing plants and *"Used data to develop case summaries and defense strategies for various alleged injuries, including exceedances of water quality criteria, exceedances of sediment quality criteria...excessive bioaccumulation of contaminants in fish and issuance of fish consumption advisories; excessive bioaccumulation, impaired reproduction, and other adverse effects in a variety of bird species...."*

Working for the Chemical Manufacturers Association Exponent reviewed the Michigan Sport Fishing and reports on the procedure to determine bioaccumulation factors resulting in their *"recommendation that EPA's proposed bioaccumulation model we withdrawn because the underlying assumption of equilibrium is not valid for predicting bioaccumulation factors."*

Other miraculous results have occurred when Exponent worked for AlliedSignal in New York looking, apparently, at mercury and *"results of the sediment component of the ecological risk assessment indicate that although widespread sediment contamination occurs in the lake, adverse biological effects are generally confined to a relatively small portion of the lake"*

Predictions Came True: Exponent Report was a colossal waste of time and money

Unfortunately, our predictions have come true about this process. As we stated in our August 28, 2002 letter *"...conducting an outrageously expensive risk assessment, designed and executed in a manner that is heavily manipulated to retain uncertainty in the process is unnecessary, of questionable relevance, and is not supported by our organizations."* Indeed, this is what faces the Board today. A ridiculously expensive pseudo-scientific report, designed, executed, and manipulated to retain uncertainty and obfuscate impacts. It is the perfect example for the growing term "polluter-science"—the best science money can buy.

Conclusion

The law is clear. The presumption of cleanup is to background. Infeasibility has not been proved. Background has been credibly defined by the Regional Board staff. The shipyard's interest in quick resolution to this problem would be better served by applying the money spent on Exponent to removal of all contaminated sediments to background levels.

We strongly urge the Board to reject the recommendations contained in the report as undefensible and non-protective of the beneficial uses of San Diego Bay.

Sincerely,

Laura Hunter
Environmental Health Coalition

Bruce Reznik
San Diego Baykeeper

Jim Peugh
San Diego Audubon Society

Marco Gonzalez
Surfrider Foundation, San Diego Chapter

Ed Kimura
San Diego Chapter of the Sierra Club

Attachments and References for San Diego Bay Council and Expert Comment Letters on Exponent Technical Report Submitted to the Regional Water Quality Control Board, San Diego Region

December 5, 2003

1995
Incidence of Adverse Biological Effects Within Ranges of Chemical Concentrations in Marine and Estuarine Sediments; Edward Long et al., Environmental Management, Vol. 19, No. 1 , pp.81-97.

1998
Troubled Waters: A Call for Action: A consensus reached at the opening of the International Year of the Oceans, signed by over 1600 marine scientists

March 24, 1999
Memorandum from Department of Fish and Game to Mr. John Robertus, Executive Officer, Regional Water Quality Control Board, San Diego Region,

July 26, 2000
Johnson LL. (2000). *An analysis in support of sediment quality thresholds for polycyclic aromatic hydrocarbons (PAHs) to protect estuarine fish.* Internal report, NMFS. Memo from Tracy K. Collier, through John E. Stein, to Steven Landino. July 26, 2000. Northwest Fisheries Science Center, NMFS, NOAA. Seattle, WA.

September 13, 2000
Proposal to Conduct Additional sediment toxicity tests in order to establish sediment cleanup levels for National Steel and Shipbuilding Company, signed by Janice Grace, Vice President of Operations, NASSCO

October 13, 2000
Meador JP, Collier TK., and Stein JE. *An analysis in support of tissue and sediment based threshold concentrations of polychlorinated biphenyls (PCBs) to protect juvenile salmonids listed by the Endangered Species Act.* 138KB, 48p, October 2000

August 24, 2001
Memorandum regarding Regional Water Board Workshop, DTSC to Tom Alo, Regional Water Quality Control Board, San Diego Region.

June 17, 2002
Evaluation of San Diego Bay Reference Station Chemistry and Bioassay Results, Mr. Brett Betts, State of Washington to Laura Hunter, Environmental Health Coalition

February 22, 2002
Applicability of State Board Resolution 92-49 in Setting Sediment Cleanup Levels,
State Water Board to San Diego Regional Board

March 6, 2002
Background Reference Conditions for Assessment and Remediation of Contaminated Sediments at NASSCO and Southwest Marine Shipyards, Letter from Regional Water Board to Mr. Mike Chee and Mr. Sandor Halvax

September 23, 2002
Oceans of Trouble, says U.S. Panel, CBS news report

December 2002
EPA Fact Sheet: *Notice of Draft Ambient Water Quality Criteria Document for Tributltin (TBT)*

January 16, 2003
An Approach for Selecting a San Diego Bay Reference Envelope to Evaluate Site-Specific Reference Stations, Donald MacDonald and Denise Klimas, NOAA

April 2003
Bear Trouble by Marla Cone, Smithsonian Magazine

May 5, 2003
Bay Council proposal for a set of reference stations, San Diego Bay Council letter and attachments to San Diego Regional Board.

June 27, 2003
UN Committee recommends new dietary intake limits for mercury; World Health Organization news release

September 24, 2003
Comment letter on the Draft Supplemental Environmental Impact Report for Campbell Sediment Remediation Aquatic Enhancement (SCH 2002031096, UPD 83356-EIR-550), San Diego Bay, *California,* Letter from Therese O'Rourke, Assistant Field Supervisor, US Fish and Wildlife Service to San Diego Unified Port District

September 30, 2003
Recommendations of the Cal/EPA Advisory Committee on Environmental Justice to the Cal/EPA Interagency Working Group on Environmental Justice, Final Report

October 14, 2003
Resolution by the State of California, Cal EPA, Interagency Working Group on Environmental Justice

November 5, 2003
Comment letter on the Draft Supplemental Environmental Impact Report for Campbell Sediment Remediation Aquatic Enhancement (SCH 2002031096, UPD 83356-EIR-550), San Diego Bay, *California,* Letter from Therese O'Rourke, Assistant Field Supervisor, US Fish and Wildlife Service to John Robertus, Executive Officer, San Diego Regional Board.

Troubled Waters: A Call for Action

A consensus reached at the opening of the International Year of the Oceans, 1998

We, the undersigned marine scientists and conservation biologists, call upon the world's citizens and governments to recognize that the living sea is in trouble and to take decisive action. We must act quickly to stop further severe, irreversible damage to the sea's biological diversity and integrity.

Marine ecosystems are home to many phyla that live nowhere else. As vital components of our planet's life support systems, they protect shorelines from flooding, break down wastes, moderate climate and maintain a breathable atmosphere. Marine species provide a livelihood for millions of people, food, medicines, raw materials and recreation for billions, and are instrinsically important.

Life in the world's estuaries, coastal waters, enclosed seas and oceans is increasingly threatened by:

1. overexploitation of species
2. physical alteration of ecosystems
3. pollution
4. introduction of alien species
5. global atmospheric change.

Scientists have documented the extinction of marine species, disappearance of ecosystems and loss of resources worth billions of dollars. Overfishing has eliminated all but a handful of California's white abalones. Swordfish fisheries have collapsed as more boats armed with better technology chase ever fewer fish. Northern right whales have not recovered six decades after their exploitation supposedly ceased. Cyanide and dynamite fishing are destroying the world's richest coral reefs. Bottom trawling is scouring continental shelf seabeds from the poles to the tropics. Mangrove forests are vanishing. Logging and farming on hillsides are exposing soils to rains that wash silt into the sea, killing kelps and reef corals. Nutrients from sewage and toxic chemicals from industry are overnourishing and poisoning estuaries, coastal waters and enclosed seas. Millions of seabirds have been oiled, drowned by longlines, and deprived of nesting beaches by development and nest-robbing cats and rats. Alien species introduced intentionally or as stowaways in ships' ballast tanks have become dominant species in marine ecosystems around the world. Reef corals are succumbing to diseases or undergoing mass bleaching in many places. There is no doubt that the sea's biological diversity and integrity are in trouble.

To reverse this trend and avert even more widespread harm to marine species and ecosystems, we urge citizens and governments worldwide to take the following five steps:

1. Identify and provide effective protection to all populations of marine species that are significantly depleted or declining, take all measures necessary to allow their recovery, minimize bycatch, end all subsidies that encourage overfishing and ensure that use of marine species is sustainable in perpetuity.
2. Increase the number and effectiveness of marine protected areas so that 20% of Exclusive Economic Zones and the Highs Seas are protected from threats by the Year 2020.
3. Ameliorate or stop fishing methods that undermine sustainability by harming the habitats of economically valuable marine species and the species they use for food and shelter.
4. Stop physical alternation of terrestrial, freshwater and marine ecosystems that harms the sea, minimize pollution discharged at sea or entering the sea from the land, curtail introduction of alien marine species and prevent further atmospheric changes that threaten marine species ecosystems.
5. Provide sufficient resources to encourage natural and social scientists to undertake marine conservation biology research needed to protect, restore and sustainably use life in the sea.

Nothing happening on Earth threatens our security more than the destruction of our living systems. The situation is so serious that leaders and citizens cannot afford to wait even a decade to make major progress toward these goals. To maintain, restore and sustainably use the sea's biological diversity and the essential products and services that it provides, we must act now.

March 8, 2005

Assemblywoman Lori Saldana
1557 Columbia Street
San Diego, 92101

Dear Lori:

Thank you so much for your participation in our news conference releasing our Pier Fishers Survey and recommendations. Your comments were very important and excellent. We appreciate your willingness to step forward on this issue as it is very important for the health of our waterways and for the environmental justice communities who depend on them. We have recently learned that the hearings before the Regional Water Quality Control Board will be June 8th. We hope you can join us again there.

Thanks again for your support.

Sincerely,

Diane Takvorian
Executive Director

Laura Hunter
Clean Bay Campaign

March 11, 2005

Senator Debra Ortiz
California State Senate
Capitol Building Rm-4032
Sacramento, CA 95814

Dear Debra:

Thank you so much for your participation in our news conference releasing our Pier Fishers Survey and recommendations. Your participation was very helpful to us and your comments were very important. We appreciate your willingness to step forward on this issue as it is very important for the health of our waterways and for environmental justice communities who depend on them. We will keep you posted on the progress of any hearings before the Regional Water Quality Control Board as well.

Thanks again for your support.

Sincerely,

Diane Takvorian
Executive Director

Laura Hunter
Clean Bay Campaign

4436 Carlin Place
La Mesa, CA 91941

March 18, 2002

Mr. John Robertus
Regional Water Quality Control Board
9174 Sky Park Court, Suite 100
San Diego CA 92123-4340

RE: San Diego Bay Council responses to the January 15, 2002 from the Regional Board.

Dear Mr. Robertus:

I am writing on behalf of the San Diego Bay Council to thank you for your letter of January 15, 2002, responding to the Council's comments on Phase 1 of the NASSCO and Southwest Marine sediment investigations. We applaud the increased engagement with natural resource trust agencies. As you know, we encouraged the participation of these agencies, and (unsuccessfully) requested that your staff include them in our meeting on Phase 1 of the investigations. By this letter, we formally request their participation in all future meetings.

We fully appreciate the amount of time and effort that went into producing the 50 page response, the clarification of a number of important issues, and the additional requirements made of the consultant. We would also appreciate receiving copies of your correspondence to the consultant making these requirements. The following summarizes our comments that remain outstanding, i.e. comments to which we found your staff's answers to be nonresponsive. We also summarize questions that we have in regard to a number of responses.

We do not indicate here whether we agree or disagree with responses - thus, agreement should not be presumed.

1. Testing for bioaccumulation.

Your staff continues to discuss a "threshold" over which bioaccumulation becomes potentially harmful to human health and wildlife. Any bioaccumulation that is occurring is of concern. Natural resource trust agencies should lead here. When will you decide if you will require a broad scan of bioaccumulative contaminants, rather than just those that exceed the screening criteria established in phase 1? Resident biota includes more than fish and/or shellfish.

2. Sampling for dilution series, pore water, and fish tissue.

(a) Why will verification of AET and EqP values be performed only for copper and zinc?

(b) Your response indicates that the Phase 2 collection of pore water chemistry data will occur at an "appropriate" number of sites, and will provide a basis to develop a wide range of site specific Kp values. How will you decide what is an "appropriate" number?

(c) Part of the rationale given for restricting sampling to the top 2 cm of sediment is that this depth is easily sampled and reflects recent deposition. Why is only recent deposition of concern, and is not ease of sampling an inappropriate rationale toward the goal of protecting the public and environment? The biologically active zone is not limited to 2 cm.

(d) How will "an appropriate" number of stations in order to provide an accurate representation of fish tissue concentrations within the leaseholds be determined? Will natural resource agencies provide this number in addition to determining target species?

3. Core sampling.

It appears from the response that there is little interest in characterizing the overall site for contamination below 2 cm. How is contamination of sediment below 2 cm - that will be exposed over time by a variety of means - to be addressed?

4. AET approach.

(a) What is the safety factor, and what is the rationale behind its selection?

(b) When is Exponent required to illustrate that 30 stations - or whatever number of stations have useable data -- is an adequate number of data points for calculating AET values?

(c) Are significantly large data gaps present in the data, i.e., large chemical concentration gaps between stations? How many of the stations were repositioned based on the sediment profile images? Since stations with physical disturbance were avoided, it appears we have ruled out physical disturbance as a cause of impacts.

5. Benthic fauna.

What is meant by "natural succession of a benthic community? Where is "natural succession" addressed in the phase 1 work plan?

6. On-site fauna.

Why is testing limited to fish and or shellfish? What about food items for diving birds? How will you determine whether to include biochemical, physiological and histopathological impacts?

7. Most sensitive beneficial uses.

The response indicates that the fertilization and development test address more sensitive life stages than that of a larval fish, and therefore addressing larval fish impacts are unnecessary. Thinking of "marine organisms" as a unit in terms of response to toxics ignores what we are beginning to understand about the complexity of ecosystems and their inhabitants. This reasoning also assumes that results of the fertilization and development tests will be statistically defensible and useable

8. Reference sites.

If pooling of reference station data is defensible to obtain a "more robust statistical analysis" - then how are one-to-one comparisons defensible? The response indicates that a decision to make a one-to-one comparison or to pool the data will be determined for each site station based on sediment characteristics. What characteristics will be used to make this decision? Do you mean that you will allow pooling of reference stations that are physically similar to the site station? (This assumes that new reference sites are selected that overlap with the physical properties of the shipyard sites).

9. Protection of wildlife and human health.

Your response indicates that the resource agencies consider *Macoma* testing appropriate for the phase 1 bioaccumulation screening. For the more extensive (non-screening) phase 2 bioaccumulation testing, do the resource agencies concur that the testing of more than one species is preferred?

10. Other missing aspects of protecting beneficial uses.

Our question was not about samples having multiple pollutants in them, but rather about multiple stressors on the animals from other sources in the Bay.

11. Oversight.

What are the results of the split sampling? Why are you analyzing your split samples from only 6 of the 14 stations at which you collected split samples? .

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1. Bioaccumulation and site specific guidelines.

(B) Your response indicates you will contact the state of Washington about potential use of Sedqual. What is the outcome of this contact?

(G) The question is: How do you account for the life of the chemical?

(H) In considering *Macoma* accumulation a worst-case assessment because it actively ingest surface sediments, you are only considering its mode of ingestion, not what science indicates about what chemicals it accumulates at what rates. Are you saying that *Macoma* is a worst-case measure of mercury bioaccumulation, for example?

(K) Has there been a decision on whether the additional risk studies under consideration will be required? How are you assessing impacts on small forage fishes, and other animals besides birds, marine mammals, and large fish?

2. Pore water testing, dilution series test.

(F) The question is: Responsive to which chemicals? How have you determined that all chemical contaminants will be present, and present in appropriate concentrations, at your one station per site?

(H) The question is: How can the dilution test provide a QA check on AET and EqP values when it won't cover the suite of chemicals for which AET and EqP values will be derived?
3. Core sampling.

Do you remain comfortable with Exponent proposing the locations to core sample based on their own analysis of the data, rather than sampling on a grid? As the result of allowing Exponent to decide which chemicals of concern to sample for outside the leasehold boundaries, we now have no data from Phase 1 on the vast majority of area just off-site, for major chemicals of concern.

4. AET

How do the grain size data results affect the veracity of the AET approach?

5. Benthic fauna assessment

(B) Which of the endpoints that you discuss in your response are you *requiring* Exponent to use?

7. Cumulative risk

(A) Until the rest of the Bay is cleaned up, an animal that traverses more than the shipyard area will suffer impacts from more than one source. The question is about this cumulative impact, and how you will factor this in when you set cleanup levels at the shipyard, with the goal of protecting this animal.

(B) This question involves Exponent's assertion that fish tested on site may have picked up contamination from other sites, and again addresses the issue of multiple stressors. The safety factor discussed in the response is to address uncertainty in determining actual exposure of animals from the shipyard sites, but not to address exposure of these animals to other contaminants in areas they traverse (multiple stressors). Again, how will this issue be addressed?

8. Reference Sites.

(B) Only two shipyard stations fall within the range of grain sizes at any reference station. Stating this surprising and extreme failure of the reference sites to match shipyard characteristics as ""do not entirely span the range" is extremely misleading. The response refers to the possibility of requiring additional reference stations - but how could any of the current 5 stations be useable?

(E) What are the results of previous bioaccumulation studies at these reference stations?

Thank you again for your staff's detailed responses to our comments, and for your attention to these important matters.

Sincerely,

Elaine M. Carlin
Scientific Consultant to San Diego Bay Council

Chairman John Minan and Boardmembers
Regional Water Quality Control Board
9174 Skypark Court
San Diego, CA 9 22123-4340

Dear Chairman and Regional Board Members:

Since, 1974, the Union of Pan Asian Communities (UPAC) has been the primary provider of human care services to San Diego's Asian and Pacific Islander communities. The UPAC staff represents over thirty-one different cultures, languages, and dialects. UPAC serves over 17,800 people annually. UPAC has the unique ability to unite diverse cultures and different generations into a community.

Because our mission is to improve the general well being and education of the Asian, Pacific Islander and other ethnic communities of San Diego County we are very interested in the issue of fish and sediment contamination in San Diego Bay and strongly support a protective cleanup plan for the Bay. However, cleanup of the Bay takes on additional significance because we understand that the Bay has additional importance as a supply of food for many Pan Asian communities.

Recently, Environmental Health Coalition released a survey that demonstrates the widespread use of San Diego Bay for a food source for our communities. Of 109 fishers of San Diego Bay surveyed on local fishing piers, 96% were people of color with 57% Latinos and almost 40% were Filipino. The survey results clearly demonstrate that Filipinos comprised a significant number of people who fish from the Bay and they fish the most frequently. The survey found that 98% of Filipinos fished weekly with 55% fishing every day. 61% of the all fishers eat the fish they catch and 2% give the fish to others to eat. Use of fish in stews is traditional in our culture and was noted in the survey as a method of preparation. As you know, stewing and frying are two types of fish preparation that can result in higher exposure of the consumer to any contaminants in the fish.

Children are even more at-risk from exposure to toxic chemicals. Forty-one percent of the over 200 children represented in this survey eat the fish their parents catch and, of these children, 62% have a parent that fishes at least weekly.

The results of the EHC survey are not new. A 1990 Fish Health Study demonstrated that the most successful and the most frequent fishermen in the Bay were Asian and Fillipino. They also consumed fish at a higher rate.

We understand that part of the responsibility of the Regional Water Quality Control Board is to ensure the protection of human health through its decisions. Contaminated sediments are a known source of contamination in fish and cleanup of the bay sediments is a key issue for people who consume the fish. UPAC supports Environmental Health Coalition's position that the Regional Water Quality Control Board should act assertively to remove sediments from the Bay containing dangerous chemicals as soon as is possible. We are confident that you will act to protect the health of the members of our community and all communities by taking action to establish very protective cleanup standards for toxic sediments that have been discharged in to San Diego Bay.

We urge your support and offer our commitment to helping you bring the Bay, and our communities, back to heath.

Thank you very much for the opportunity to comment on this very important decision.

Sincerely,

Margaret Iwanaga-Penros President and CEO
UPAC San Diego

cc.
John Robertus

Environmental HEALTH COALITION

How to Achieve Environmental Justice and Implement Precaution in Environmental Decisions:

Recommendations for Sediment Quality decisions in San Diego Bay

Environmental Health Coalition (EHC) has worked for environmental justice for communities in San Diego for its entire 24-year history. EHC's dedication to pollution prevention is summarized by one of our organizational goals: "To establish the precautionary principle and pollution prevention as the basis of all environmental and public health policies." EHC representatives participated in the development of the ground-breaking Wingspread Statement on the Precautionary Principle and served as a Co-Chair of the California Environmental Protection Agency's Environmental Justice Advisory Committee. In 1987, EHC initiated its Clean Bay Campaign in response to the need to toxic sediment clean up in the Bay. Environmental justice, precaution, and environmental regulation come to a nexus in the decision by the Regional Board in setting sediment cleanup levels for the commercial shipyards in the Bay.

Several members of the Regional Water Quality Control Board, San Diego Region (Regional Board) and staff have stated their interest in and commitment to protecting environmental justice communities and using the precautionary principle OR a precautionary approach in their decision-making. We are encouraged by their interest. However, they have expressed uncertainty regarding how to accomplish these goals. The purpose of this paper is to provide background on this issue and to articulate specific recommendations regarding how these policies should manifest in the activities and decision-making processes of the Regional Board, State Water Resources Control Board and other Boards, Departments and Offices of CalEPA with a responsibility to protect environmental health. These recommendations are directed specifically toward the decision to establish sediment cleanup levels for the NASSCO and Southwest Marine commercial shipyards.

Background

Sediments play a significant role in the health of an aquatic ecosystem for they provide the habitat for aquatic life that lie at the base of the food chain. Those contaminants then bioaccumulate up the food chain and are now found in fish and shellfish tissues in San Diego Bay. Sediment quality in many of our state bays and estuaries is very poor. In many, particularly urban, areas sediments have become contaminated with wastes from military, industrial, sewage treatment, and other discharges. Several notorious chemicals are of special concern for human health as they readily bioaccumulate in the food chain and in humans. Many of these are present in the sediments at the San Diego Bay commercial shipyards and contaminated naval facilities.

The role of sediment cleanup is critical. San Diego Bay is so degraded that it requires restorative action in order to recover its ecosystem viability, to protect users of the Bay, and consumers (human and non-human) of the fish. Restoration of contaminated sediments and aquatic environments has been determined to be a fundamental priority to protect the health of communities of color and low income communities by numerous environmental justice organizations and government agencies. Cleanup efforts are especially important to these communities because they are the most highly exposed and risk "avoidance" (e.g. eating less fish) is simply not realistic economically or, in some cases, a culturally appropriate option. Thus, these communities disproportionately bear the impacts of any contamination left in place.[1] Last, since many of the contaminants have been banned for production (PCBs, Chlordane) or inputs reduced or eliminated (mercury) the presence of these contaminants can only be reduced through cleanup efforts.

In making important decisions about environmental health issues, Environmental Health Coalition and its allies urge the decision-makers to employ a precautionary approach in determining actions. This approach is often summarized as follows:

> *When an activity raises threats of harm to the environment or human health, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically.*

The U.S. Commission on Ocean Policy describes it as:

> *...applying judicious and responsible management practices based on the best available science and on proactive, rather than reactive, policies. Where threats of serious or irreversible damage exist, lack of full scientific certainty shall not be used as a justification for postponing action to prevent environmental degradation.*[2]

San Francisco Board of Supervisors Precautionary Approach Policy states:

> *Where threats of serious or irreversible damage to people or nature exist, lack of full scientific certainty about cause and effect shall not be viewed as sufficient reason for the City to postpone measures to prevent the degradation of the environment or protect the health of its citizens.... Where there are reasonable grounds for concern, the precautionary approach to decision-making is meat to help reduce harm by triggering a process to select the least potential threat.*[3]

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[1] NEJAC at 86
[2] http://www.oceancommission.gov/documents/prepub_report/chapter3.pdf pg. 6
[3] http://temp.sfgov.org/sfenvironment/aboutus/innovative/pp/sfpp.htm

However, all statements about the application of precautionary generally contain a version of this formula: ***When the health of humans and the environment is at stake, it may not be necessary to wait for scientific certainty to take protective action.***

The other mainstay of environmental justice is the need to assess and address cumulative impacts. The working definition of Cumulative impacts can be described as the total burden of all emissions and discharges in a geographical area.[4]

On February 16, 2005, the California Environmental Protection Agency (Cal EPA) Interagency Working Group, consisting of the CalEPA Secretary and the heads of all Boards, Departments, and Offices, adopted guidelines that incorporate cumulative impacts assessment and precautionary approach methods to direct their work. This policy foundation is key to ensuring that disproportionately impacted communities, like those documented in the survey, are afforded equitable protection through the regulatory process. The newly adopted definitions that will be used to guide future work are:

> **Cumulative Impacts** means exposures or public health and environmental effects from combined emissions and discharges, in a geographic area including environmental pollution from all sources, whether single or multi-media, routinely, accidentally, or otherwise released. Impacts take into account sensitive populations and socioeconomic factors, when data is available.
>
> **Precautionary Approach** means taking anticipatory action to protect public health or the environment if a reasonable threat of serious harm exists based upon the best available science and other relevant information, even if absolute and undisputed scientific evidence is not available to assess the exact nature and extent of risk.

While many decisions that face the environmental decision-makers fall into various categories of uncertainty. It is important to distinguish between the uncertainties associated with knowing "how clean is clean" (e.g. trying to figure out how much fish people do eat, how many pregnant women are eating the fish, how much mercury and other pollutants people are actually absorbing—all of which have some uncertainty associated) and uncertainty about the underlying science of mercury/other pollutant toxicity. In this case, it is important to note that there is really **very little** uncertainty about the fact that the chemicals in these contaminated sediments are a real problem and they pose very real risks. Bioaccumulative and persistent toxic chemicals present in the marine environment, if not removed, will continue to pose a threat to human health and the environment far into the future.

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[4] Final Recommendations Report of the Cal/EPA Advisory Committee on Environmental Justice, p. 40 (Adopted on October 14th, 2003 by Cal/EPA IWG on Environmental Justice).

How California state regulators respond to the need to cleanup, restore, and maintain sediment health in bays, estuaries, fresh water, and marine environments is of critical importance and several actions are currently underway.

Recent and Future Relevant Actions

California Environmental Justice Guidelines

In October, 2003, California EPA adopted their *Guidance on Environmental Justice.* EHC's Executive Director, Diane Takvorian was the co-Chair of the Advisory Group that developed the recommendations. These guidelines make several recommendations regarding environmental justice. In summary, the recommendations outline the following goals:

1. Provide for meaningful public participation
2. Integrate Environmental justice into all environmental programs
3. Improve research and data collections with respect to environmental justice, and
4. Ensure coordination and accountability in addressing environmental justice. [5]

In particular, the recommendations underscored the importance of using precautionary approaches to environmental and public health protection. The recommendations state, ***"Committee members believe it is not necessary to wait for actual, measurable harm to public health or the environment before evaluating alternatives that can prevent or minimize harm...additional precaution may be needed in order to address or prevent environmental justice problems."***[6]

State Sediment Quality Objectives Process

Acting under a Court Order, the State Water Resources Control Board is developing Sediments Quality Objectives (SQO) and is preparing to adopt them in 2007. Several advisory committees have been established to advise the State Water Board on this process. EHC is a member of the California Sediment Quality Advisory Committee along with six other environmental groups.

National Environmental Justice Advisory Council (NEJAC)

The NEJAC is a federal advisory committee to the US EPA that addressed the impacts of compromised aquatic ecosystems on communities of color, low-income, tribes, and other indigenous peoples. In November, 2003 they released a report on fish consumption that provides advice and recommendations to EPA regarding measures that should be taken to improve the quality, quantity, and integrity of the Nation's aquatic ecosystems in order to protect the health and safety of people consuming or using fish, aquatic plants, and wildlife. Among other things, this document also raised concerns over a risk avoidance approach where the burden of protection is on the individual and not the polluter versus a risk reduction approach where the risks are reduced or removed so that the burden is lifted from the individual. This report also

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[5] Entire report can be found at http://www.calepa.ca.gov/EnvJustice/Documents/2003/FinalReport.pdf

[6] Final Recommendations Report of the Cal/EPA Advisory Committee on Environmental Justice, p. 13

reports subsistence consumption rates in wide ranges with many over 161 g/day and several tribes over 1000 g/day.[7] EHC has relied heavily on the content of this excellent document and we strongly urge the Regional Board to review the report in full.[8]

National Forum on Contaminants in Fish

The most recent forum was held in January, 2004 in San Diego. According to a presentation by Kate Mahaffey, USEPA, new research has shown that "cord blood" (blood in the umbilical cord) concentrates mercury and can be as high as 70% more in the cord blood than in the maternal blood. This means that mercury concentrations in the mother's blood can be expected to be 70% higher in the fetus. It has also been demonstrated that exposures are higher among women who eat fish and higher among Asians and people of Pacific Island background. Blood mercury concentrations were seven times higher among women who reported eating fish two or more times a week in the past 30 days compared to non-fish eaters.[9]

EHC Fish Consumption Surveys of Fishers on Piers in San Diego Bay

During 2004, EHC conducted a community survey of people fishing from piers in the vicinity of the shipyards and known contaminated sediments sites in the Bay. The survey sought to determine who fishes, how often people fish, who eats the fish, whether they eat fish skin or other organs, and how they cook the fish. Our survey sample is not a representative sample of all San Diego Bay fishers or all south bay residents. However, it is a selective sample of a group that is highly exposed to fish from near the shipyards and the southern portion of San Diego Bay. The survey did not include questions on income but these fishers are from low-income communities and they appear to be engaged in subsistence fishing. For the purpose of protecting highly exposed populations it is appropriate to selectively sample this group -- fishers who fish frequently off of piers near shipyards in San Diego Bay. Among this subpopulation are individuals who fish daily, who catch up to 20 fish at a time, who stew fish, who eat fish parts other than fillets, and who feed fish to their children.

This survey provides the first San Diego-specific data on subsistence fishing. It confirms that estimates made of the quantities of fish eaten by subsistence fishers in other places also apply here. The frequency of fishing and fish eating in our pier fishing population is very different than that of statistically average Americans and may reach or exceed the 161 grams per day level recommended by OEHHA taken from the Santa Monica survey value.[10] Our data clearly establishes that a subpopulation of San Diego residents fish daily, eat the fish, and eat the skin -- not only the fillets. Common cooking methods include stewing, a method that does not reduce exposure to pollutants. A selection of key results indicates any Health Risk Assessment (HRA) based on the assumption that only fillets are consumed or that less than 161 grams per day is consumed understates the human health risk for this group.[11]

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[7] NEJAC, Page 28.
[8] http://www.epa.gov/compliance/resources/publications/ej/fish_consump_recom_report.html
[9] http://www.epa.gov/waterscience/fish/forum/2004/presentations/monday/mahaffey.pdf
[10] http://www.oehha.ca.gov/fish/special_reports/consumexec.html
[11] EHC Survey of Fish Consumption on Piers in San Diego Bay, September, 2004

San Diego Regional Board to establish Sediment Cleanup levels for San Diego Bay

The most important action of all will take place early in 2005 when the San Diego Regional Water Board will establish sediment cleanup levels for several highly contaminated areas setting an important precedent for the Bay.

Recommendations for Use of Precautionary Principle and Environmental Justice in Establishing Sediment Cleanup Levels in San Diego Bay

EHC urges the Regional Board take the following specific actions and follow the recommendations below when making its decision on the sediment cleanup levels for NASSCO and Southwest Marine in early 2005.

1. Ensure that meeting information/notices/location be appropriate to the most impacted public members.

EHC has identified that many of the people who fish regularly for consumption in the Bay are Latino, Southeast Asian, and Filipino. Meetings notices and information should be published in English, Spanish, and Tagalog at a minimum. A location for the meeting should be held in Barrio Logan or National City, near where the shipyards are located. We recommend that the Regional Board hold the hearing at Holiday Inn on the Bay or at a meeting location in Barrio Logan. We request that the Regional Board also provide translation services for attendees at the hearing. These specific actions would be in compliance with the CALEPA EJ Guidelines which we urge the Board to review and incorporate into all public participation activities.

2. Apply precaution and consider seriousness, irreversibility, and cumulative impacts in decision-making.

Regarding the application of a Precautionary Approach , the EJ Advisory Committee encouraged all CalEPA agencies to *"Officially recognize the importance of precaution, and that it is not necessary or appropriate to wait for actual, measurable harm to public health or the environment before evaluating alternatives that can prevent or minimize harm."*[12]

Such recognition and application clearly applies to sediment cleanup levels for chemicals that persist in the environment and bioaccumulate or transform up the food chain. In the shipyard sediment cleanup decision, levels for PCBs, mercury, PAH, and other bioaccumulators must be established in a manner that prevents the damage that

[12] Final Recommendations Report of the Cal/EPA Advisory Committee, p. 21

may be done in the future due to the nature of these chemicals. This will manifest in an analysis that provides for additional measures of protection in setting the cleanup goal.

3. **When determining cleanup levels for persistent and bioaccumulators, use of risk assessments must be de-emphasized and precautionary action emphasized.**

The problems and weaknesses of health risks assessments (HRA) are legion. They assume that some amount of risk is "acceptable", that there is additional assimilative capacity in the environment available, and that such acceptability and capacity can be determined. HRAs promote a false sense of precision, accuracy, and objectivity when in fact they are uncertain, variable and, usually (when conducted by the polluter) highly biased. Risk assessment is widely known to perpetuate and exacerbate the disproportionate burdens on environmental justice communities.[13] The developers of risk assessment always maintained that HRAs were meant to be one of many "tools" for making decisions but history and our own considerable experience has shown us that it is very often the single determiner of the final decision to allow pollution.

It is possible to selectively employ HRAs. We believe that such selective use should be done here. EHC recommends that where the contaminants to be regulated or cleaned up are persistent, bioaccumulative, persistent, and/or highly toxic the HRA should not be used or, in used, should be de-emphasized in the decision-making process. Unlike many chemicals, these chemicals are highly predictable in the environment over time. What is certain is that they are toxic, they will persist for millennia, and ultimately, they will bioaccumulate into our food chain. What is uncertain is exactly when they will be the most toxic, meaning we cannot know for certain which of our future generations can expect the most damaging impact. Since a tenet of precaution is to tread most carefully where damage is to be expected, serious, and irreversible with long-term effects, these chemicals fit the bill for aggressive, precautionary action.

4. **Where risk assessment is used the level of protection for human health must be driven by those most at risk.**

For many years and, in some cases, even today, HRAs were developed on the basis of the risk to a 25 year-old, 200-lb white, male consumer. This is not most at-risk or most exposed individual. Children and pregnant women are far more sensitive receptors. However, a fetus in-utero of a woman who consumes at a subsistence level is the most at-risk from exposure of all. The Regional Board must give additional attention to the chemicals that are of particular concern for children and a developing embryo—PCBs, lead, mercury, arsenic, PAH. The Board's decision should reflect a more stringent, protective level justified by the special vulnerabilities of children and the fetus.

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[13] NEJAC at 55-56, footnote 159

5. **Level of protection should be set assuming subsistence fishers and their families are consuming fish from the Bay.**

The sediment cleanup level must be set to ensure protection of these communities in the long-term. We know that there is, at least, a subpopulation that is consuming fish frequently from the Bay and in large amounts. If used, consideration of the health risk assessment must be done in the service of protecting all of us, not just those who have "typical", middle-class, recreational fish eating habits. Our pier survey establishes that a substantial portion of people who eat fish out of San Diego Bay eat more than fillets. While the upper limit of 161 grams per day of fish used in the Exponent Health Risk Assessment is possibly an appropriate upper bound for fish consumption for some fishers, the assumption that exposure to contaminants in fish is limited to those found in fillets is clearly erroneous for those people who do subsistence fishing in San Diego Bay. If 161 grams/day is used, then a more credible and protective assumption is that 161 grams per day of the **whole** fish are eaten. This will have a very significant impact on the risks assumed.

6. **The basis of protection when determining health risks based on fish consumption should be the amount of fish that would be consumed if the area were not contaminated, not what is consumed now under known contaminated conditions.**

One important issue that is seldom discussed related to fish contamination is that the more the concern that fish may be contaminated, the fewer fish people are inclined to eat in general. This, in turn, depresses the level of protection agencies often feel is necessary to provide to the public because they are not eating as much fish as they would if it were safe. Fortunately, the NEJAC addressed this issue head on. *"When environmental agencies set or approve water quality standards that rely on a picture of exposure that takes people to be eating smaller quantities of fish, agencies will permit relatively greater quantities of pollutant to remain in or be discharged to the water and sediments. That is to say, agencies will set less protective standards."* [14]

The NEJAC study goes on to note that these conditions feed a self-fulfilling downward spiral in protection as the environment and the fish are allowed to be become increasingly contaminated (or cleanup is not done adequately) and individuals are asked to reduce their consumption or fewer people fish or eat the fish due to the warnings, or there are fewer fish caught all of which drive a lower fish consumption rate (FCR) upon which to base regulatory action and the spiral continues downward as the agencies then act to allow greater quantities of pollutant in (or to remain) in the ecosystems.

The response recommended by the NEJAC is to construct baselines that are normative rather than descriptive. For example, do not base fish consumption rate on the current fish consumed today, but rather **what would be consumed if the fish were safe to eat.** This should be the goal that we are striving for in our protection of

[14] NEJAC at 49

beneficial uses. We know that if the fish were safe to eat many San Diego residents would be eating far more fish from the Bay.

7. The healthfulness of eating uncontaminated fish should not be used as an excuse to minimize the risks of eating contaminated fish.

At the 2004 *National Forum on Contaminants in Fish* research was presented that demonstrated that the health benefits of consuming fish did not necessarily override the risks of some contamination. Mercury, in particular, was shown to inhibit the natural protective properties of Omega-3s in fish and, in fact, was antagonistic to it.

Mercury was also linked to health risks beyond neural and reproductive damage. One study showed that mercury levels were highly significant in atherosclerosis (thickening of the arteries) demonstrating a 7.3% increase in progressive thickening of the artery for each additional ppm of mercury in hair. In a recent article in E Magazine on women's health, Dr. Ellen Silbergold, a public health professor at John's Hopkins University says that early exposure to mercury for a fetus can increase the severity of autoimmune symptoms and speed up the onset of diseases like lupus.[15] The Center for Disease Control is cited as stating that one in eight American children is born with unsafe levels of mercury in their blood.[16]

Last, contamination with mercury and richness in Omega-3's did not necessarily correlate. Some species that suffer from high levels of contamination did not have high levels of Omega-3.

8. Fish consumption advisories should be considered an interim protection step but not a means of meeting a beneficial use.

This is obvious. The Regional Board should not adopt a cleanup limit that relies on postings or advisories to "meet" beneficial uses.

9. The current polluted condition of the most impacted communities militates for a more protective cleanup level.

The communities of Barrio Logan, Sherman Heights, Logan Heights and National City are the most heavily burdened with toxic exposures in San Diego County. This current and disproportionate burden should be reflected in the Board's justification of establishing more protective limits. EHC has developed considerable information about the cumulative burden on these communities. Such information should be reflected in the Board's findings and decision-making.

10. Multiple Exposures, Cumulative Risks, Susceptibility, and Co-Risk factors should be considered in regulatory decision

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[15] Our Bodies, Ourselves:First-World Women Face Unique Environmental Threats, by Melissa Knopper, p.4, www.emagazine.com

[16] Ibid

The EPA has begun to recognize the important of cumulative and multiple pathways of exposure. A study on the Greenpoint/Williamsburg community in Brooklyn, NY attempted to assess the impacts of consumption of contaminated fish, lead exposure, water ingestion, and air inhalation. The NEJAC report spoke to the important cumulative factors of poverty, lack of access to health care, and assumption of life stages of an individual and other co-risk factors. The report noted that a person *"may be more or less able to withstand and recover from a toxic insult depending on one's income, the quality of one's baseline diet, whether one is employed, whether one has access to adequate health care, whether one has adequate insurance...."* [17]

The co-risk factors of communities of National City and Barrio Logan have been detailed in EHC research. These communities have the highest lead contamination in housing stock, highest cancer, reproductive, respiratory risks from air contaminants, and high poverty rates. These co-exposure rates necessitate additional, more protective actions to respond to the high cumulative burdens of these community residents.

Clean Water Act and State Mission clearly requires protective, restorative action

The goal of the Clean Water Act is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. The mission of the State and Regional Boards is to preserve, enhance and restore the quality of California's water resources, and ensure their proper allocation and efficient use for the benefit of present and future generations. The Regional Board will provide a tremendous benefit to the public by implementing the spirit of its mission and the letter of the laws that it enforces and establish protective clean up limits for San Diego Bay.

There is no other way.

[17] NEJAC at 43

San Francisco Board of Supervisors Precautionary Approach Policy

Where threats of serious or irreversible damage to people or nature exist, lack of full scientific certainty about cause and effect shall not be viewed as sufficient reason for the City to postpone measures to prevent the degradation of the environment or protect the health of its citizens....Where there are reasonable grounds for concern, the precautionary approach to decision-making is meat to help reduce harm by triggering a process to select the least potential threat."

The Wingspread Consensus Statement on the Precautionary Principle January 26, 1998

The release and use of toxic substances, the exploitation of resources, and physical alterations of the environment have had substantial unintended consequences affecting human health and the environment. Some of these concerns are high rates of learning deficiencies, asthma, cancer, birth defects and species extinctions; along with global climate change, stratospheric ozone depletion and worldwide contamination with toxic substances and nuclear materials.

We believe existing environmental regulations and other decisions, particularly those based on risk assessment, have failed to protect adequately human health and the environment - the larger system of which humans are but a part.

We believe there is compelling evidence that damage to humans and the worldwide environment is of such magnitude and seriousness that new principles for conducting human activities are necessary.

While we realize that human activities may involve hazards, people must proceed more carefully than has been the case in recent history. Corporations, government entities, organizations, communities, scientists and other individuals must adopt a precautionary approach to all human endeavors.

Therefore, it is necessary to implement the Precautionary Principle: When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically.

In this context the proponent of an activity, rather than the public, should bear the burden of proof.

The process of applying the Precautionary Principle must be open, informed and democratic and must include potentially affected parties. It must also involve an examination of the full range

Frequently Asked Questions about the Precautionary Principle

Q. What is the precautionary principle?

A. The 1998 Wingspread Statement on the Precautionary Principle summarizes the principle this way:

> "When an activity raises threats of harm to the environment or human health, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically."

All statements of the Precautionary Principle contain a version of this formula: *When the health of humans and the environment is at stake, it may not be necessary to wait for scientific certainty to take protective action.*

Q. Is there some special meaning for "precaution"?

A. It's the common sense idea behind many adages: "Be careful." "Better safe than sorry." "Look before you leap." "First do no harm."
"Precautionary principle" is a translation of the German *Vorsorgeprinzip. Vorsorge* means, literally, "forecaring." It carries the sense of foresight and preparation—not merely "caution."
The principle applies to human health and the environment. The ethical assumption behind the precautionary principle is that humans are responsible to protect, preserve, and restore the global ecosystems on which all life, including our own, depends.

Q. Why should we take action before science tells us what is harmful or what is causing harm?

A. Sometimes if we wait for certainty it is too late. Scientific standards for demonstrating cause and effect are very high. For example, smoking was strongly suspected of causing lung cancer long before the link was demonstrated conclusively. By then, many smokers had died of lung cancer. But many other people had already quit smoking because of the growing evidence that smoking was linked to lung cancer. These people were wisely exercising precaution despite some scientific uncertainty.
When evidence gives us good reason to believe that an activity, technology, or substance may be harmful, we should act to prevent harm. If we always wait for scientific certainty, people may suffer and die and the natural world may suffer irreversible damage.

Q. How do we implement the precautionary principle?

A. The precautionary principle is most powerful when it serves as a guide to making wiser decisions in the face of uncertainty. *Any action that contributes to preventing harm to humans and the environment, learning more about the consequences of actions, and acting appropriately is precautionary.*
Precaution does not work if it is only a last resort and results only in bans or moratoriums. It is best linked to these implementation methods:

- exploring *alternatives* to possibly harmful actions, especially "clean" technologies that eliminate waste and toxic substances;
- placing the *burden of proof* on proponents of an activity rather than on victims or potential victims of the activity;
- setting and working toward *goals* that protect health and the environment; and
- bringing *democracy and transparency* to decisions affecting health and the environment.

Q. Why do we need the precautionary principle now?

A. The effects of careless and harmful activities have accumulated over the years. Humans and the rest of the natural world have a limited capacity to absorb and overcome this harm. There are plenty of warning signs:

- Chronic diseases and conditions affect more than 100 million men, women, and children in the United States—more than a third of the population. Cancer, asthma, Alzheimer's disease, autism, birth defects, developmental disabilities, diabetes, endometriosis, infertility, multiple sclerosis, and Parkinson's disease are becoming increasingly common.
- In laboratory animals, wildlife, and humans, considerable evidence documents a link between levels of environmental contamination and malignancies, birth defects, reproductive problems, impaired behavior, and impaired immune system function. Scientists' growing understanding of how biological systems develop and function leads to similar conclusions.
- Other warning signs are the dying off of plant and animal species, the destruction of ecosystems, the depletion of stratospheric ozone, and the likelihood of global warming.

Serious, evident effects such as endocrine disruption, climate change, cancer, and the disappearance of species can seldom be linked decisively to a single cause. Scientific standards of certainty may be impossible to attain when causes and outcomes are multiple; latent periods are long; timing of exposure is crucial; unexposed, "control" populations do not exist; or confounding factors are unidentified.

Q. We have lots of environmental regulations. Aren't we already exercising precaution?

A. Precaution is at the basis of some U.S. environmental and food and drug legislation, although the principle is not mentioned by name. These laws incorporate foresight, prevention, and care, and many give regulators authority to take action to prevent possible but unproven harm. For example:

- As a precautionary measure, the Food and Drug Administration requires all new drugs to be tested before they are put on the market.
- The Food Quality and Protection Act of 1996 requires pesticides to be proven safe for children or removed. Several are being phased out.
- The National Environmental Policy Act is precautionary in two ways: 1) It emphasizes foresight and attention to consequences by requiring an environmental impact assessment for any federally funded project, and 2) it mandates consideration of alternative plans. NEPA is one of the best national examples of precautionary action.

Other laws are precautionary in intent. The Wilderness Act sets aside certain areas as nonviolable. The Occupational Safety and Health Act imposes a general duty on employers to provide safe working conditions and workplaces. The Endangered Species Act sets the goal of protecting biodiversity. The Clean Water Act establishes strict goals to "restore and maintain the chemical, physical, and biological integrity of the nation's waters."

Unfortunately, precautionary action has been the exception rather than the rule in U.S. environmental policy. Instead, even laws with precautionary intent and substance have been undermined, overridden, and poorly enforced.

Q. Why have these laws failed to protect people and the environment?

A. Many regulations are aimed at cleaning up pollution and controlling the amount of it released into the environment rather than preventing the use and production of toxic substances. These laws are based on the assumption that humans and ecosystems can absorb a certain amount of contamination without being harmed. We are now learning how difficult it is to know what levels of contamination, if any, are safe.

But the greatest weakness in most conservation and toxics policies is that *they are based on the expectation that science can and must provide definitive proof of harm before protective action is taken*. This assumption creates a loophole in regulations, giving the benefit of the doubt to products, technologies, and development projects, even those that are likely to have harmful side effects.

Q. How does the precautionary principle change all that without bringing the economy to a halt?

A. Preventive policies encourage the exploration of better, safer, and often ultimately cheaper alternatives--and the development of cleaner products and technologies. As public awareness grows of hazards and of safer alternatives, these practices represent not only good ethics but also smart business. The markets of the Twenty-First Century will increasingly demand safe products and sustainable technologies.

Countries that implement the precautionary principle, such as Germany and Sweden, are now exporting environmentally sound technologies. Other countries risk being left behind, with outdated, polluting facilities and technologies.

When the public has a say in the deployment of technologies, society and future generations receive more benefits and pay fewer costs in money, suffering, and diminished resources.

Q. How is the precautionary principle being used?

A. The precautionary principle should become the basis for reforming environmental laws and regulations. It can also be applied in industrial practices, science, consumer choices, education, city planning, and legal practice. Here are some examples of policies specifically based on the precautionary principle:

- San Francisco has adopted an environment code with the precautionary principle as article one. For a start, the city is applying the principle to its purchasing decisions.
- The European Union is forming a comprehensive policy, based on the precautionary principle, which would require all chemicals to be tested for their effects on health and the environment. It would put the burden on chemical manufacturers to demonstrate their products are safe. And it would give government immediate authority to regulate substances that show problems.
- Two recent treaties, the Cartagena Biosafety Protocol and the Stockholm Treaty on Persistent Organic Pollutants, invoke the precautionary principle to govern genetically modified organisms and some toxic chemicals.
- The Los Angeles Unified School District adopted the precautionary principle to limit pesticide use in schools. A number of North American cities have similar ordinances.
- Legislation has been presented in New York State applying the principle to state-funded new technologies. Massachusetts is considering precautionary principle legislation governing the phase-out of certain chemicals.
- Verizon Wireless sent a brochure in July 2001 to its US cell-phone customers describing the potential harm to children from radio frequencies emitted by cell phones. Verizon suggested that parents adopt the precautionary principle and limit children's use of cell phones.

Q. Where can I learn more?

A. SEHN has prepared three valuable resources. The Precautionary Principle Handbook, is a practical guide for implementing the precautionary principle locally as well as in larger arenas.

Community, environmental groups and educators find this guide especially useful.
N.B. This link will download the Precautionary Principle Handbook in Rich Text Format (.rtf).
Protecting Public Health and the Environment: Implementing the Precautionary Principle, published in 1999 by Island Press (Carolyn Raffensperger and Joel Tickner, editors), provides a comprehensive theoretical, historical, and practical basis for the precautionary principle - must reading for those who wish to promote the principle.

Preview excerpts from a forthcoming book on the precautionary principle, Precautionary Tools for Reshaping Environmental Policy, 2004
Nancy Myers and Carolyn Raffensperger, editors.

Implementing the Precautionary Principle and addressing Environmental Justice in Sediment Cleanup decisions.

Environmental Health Coalition (EHC) has been worked for environmental justice for communities in San Diego for its entire 24-year history. EHC representatives participated in the Wingspread Conference where the Wingspread Statement and precautionary principles were developed and served as a Co-Chair of the State's Environmental Justice Working group. In 1987, EHC initiated its Clean Bay Campaign in response to the need to toxic sediment clean up in the Bay. Environmental justice, precaution, and environmental regulation come to a nexus in the decision by the Regional Board in setting sediment cleanup levels for the commercial shipyards in the Bay.

Several Regional Board Boardmembers and staff have stated their interest in and commitment to protecting environmental justice communities and using the precautionary principle in their decision and we are encouraged by their interest. However, they have expressed uncertainty regarding how to accomplish these goals. The purpose of this memo is to provide specific recommendations to the San Diego Regional Board regarding how should these policies manifest in their activities and decisions. These recommendations are directed specifically toward the decision to establish sediment cleanup levels for the NASSCO and SouthWest Marine commercial Shipyards.

BACKGROUND

Sediments lie at the base of the food chain and play a significant role in the health of a aquatic ecosystem. Sediment quality in many of our state bays and estuaries is very poor. In many, particularly, urban areas sediments have become contaminated with wastes from military, industrial, sewage treatment, and other discharges. Several notorious chemicals are of special concern for human health as they readily bioaccumulate in the food chain and in humans. Many of these are present in the sediments at the San Diego Bay commercial shipyards.

How California state regulators respond to the need to cleanup, restore, and maintain sediment health in bays, estuaries, fresh water, and marine environments is a critical importance and several actions are currently underway.

Recent and Future Relevant Actions

State Environmental Justice Guidelines

In October, 2003, California EPA adopted their *Guidance on Environmental Justice.* These guidelines make several recommendations regarding environmental justice. In summary, the recommendations set forth the following goals:

1. Provide for meaningful public participation
2. Integrate Environmental justice into all environmental programs
3. Improve research and data collections with respect to environmental justice, and
4. Ensure coordination and accountability in addressing environmental justice.

http://www.calepa.ca.gov/EnvJustice/Documents/2003/FinalReport.pdf

State Sediment Quality Objectives Process
Acting under a Court Order, the State Water Resources Control Board is developing Sediments Quality Objectives (SQO) and is preparing to adopt them in 2007. Several advisory committees have been established to advise the State Water Board on this process. Environmental Health Coalition is a member of the Policy Advisory Committee along with six other environmental groups.

San Diego Regional Board to establish Sediment Cleanup levels for San Diego Bay
In San Diego, a process is underway to establish sediment cleanup levels at several highly contaminated areas, including those identified in the Bay Protection Toxic Hotspot Program and a toxic hotspots of high and medium priorities.

National Environmental Justice Advisory Council (NEJAC)
The NEJAC is a federal advisory committee to the US EPA addressed in the impacts of compromised aquatic ecosystems on communities of color, low-income, tribes, and other indigenous peoples. In November, 2004 they released a report on fish consumption that provides advice and recommendations to EPA regarding measures that should eb taken to improve the quality, quantity, and integrity of the Nation's aquatic ecosystems in order to protect the health and safety of people consuming or using fish, aquatic plants, and wildlife. Among other things, this document also raised concerns over a risk avoidance approach where the burden of protection is on the individual and not the polluter versus a risk reduction approach where the risks are reduced or removed so that the burden is lifted from the individual. EHC has relied heavily on the content of this document and we strongly urge the Regional Board to review the report in full.
http://www.epa.gov/compliance/resources/publications/ej/fish_consump_recom_report.html

2004 National Forum on Contaminants in Fish
The most recent conference was held on January 25-28 in San Diego. According to a presentation by Kate Mahaffey, USEPA in January 2004, new research has shown that "cord blood" (blood in the umbilical cord) concentrate mercury and can be many times higher (70%) in the cord blood. This means that mercury rates in the mother's blood can be expected to be 70% higher in the fetus. It has also been demonstrated that exposures are higher among women who eat fish and higher among Asians and people of Island background. Blood mercury concentrations were 7 times higher among women who reported eating fish 2 or more times a week in the past 30 days compared to non-fish eaters.

http://www.epa.gov/waterscience/fish/forum/2004/presentations/monday/mahaffey.pdf

EHC Pier Surveys
EHC staff are currently in the process of conducting interviews with people fishing off of piers in the vicinity of the shipyards to determine how often they fish, whether they eat

the fish, whether they eat fish skin, and how they cook the fish. We recognize that a pier sample does not produce a representative regional sample of the sort that the Santa Monica study was. However, our data clearly establish that a subpopulation of San Diego residents fish daily, eat the fish, and eat the skin -- not only the fillets. Common cooking methods include stewing, a method that does not reduce exposure to pollutants. These people must not be disregarded in health risk assessments because their fish consumption patterns are different than those of white, middle-class Americans.

We are still in the process of conducting surveys. Surveys are conducted in Spanish, English, and Tagalog. The respondents to date are African American, latino, white, Filipino, and native American. Most of the adult fishers have children, many of whom eat fish.

Our results are preliminary; we will be happy to share our data with you when the study is complete. A selection of key results indicates why we believe the fillet assumption understates the human health risk as expressed in the Exponent HRA.

Preliminary Results

- Half of the sample fishes at least once a week.
- Most of the fishers catch 1 to 2 fish at a time; however, at the high end, up to 20 fish are caught at a time.
- About half of our sample of pier fishers eat the fish they catch. As noted above, many of the children of our respondents eat fish.
- Most of our respondents eat other types of seafood as well as the fish they catch.
- Stewing is a common method of cooking fish. Other methods include frying, baking, and barbequeing.
- We asked whether respondents eat skin as a way to gauge whether fish are always filleted, or whether additional parts of the fish are eaten. A substantial portion of our fishers do report eating skin. There is a large overlap between those who fish frequently and those who eat skin; it is likely they are consuming a large quantity of fish skin, and possibly other highly contaminated parts as well, such as fish heads.

The study is, so far, a small sample, and limited only to pier fishers. Unlike some studies, we did not include sport fishers going out on party boats. For the purpose of protecting highly exposed populations it is appropriate to selectively sample this group -- fishers who fish frequently off of piers near shipyards in San Diego Bay. Although we are not collecting income information, it is reasonable to infer that many of these frequent fishers are subsistence fishers who catch fish to feed themselves and their families. Among this subpopulation are individuals who fish daily, who catch up to 20 fish at a time, who stew fish, who eat fish parts other than fillets, and who feed fish to their children.

Recommendations for Use of Precautionary Principle and Environmental Justice in Establishing Sediment Cleanup Levels in San Diego Bay

EHC recommends the Regional Board take the following specific actions when making its decision on the sediment cleanup levels for NASSCO and Southwest Marine.

The Regional Board should ensure that meeting information/notices/location be appropriate to the most impacted public members.

EHC has identified that many of the people who fish regularly and for consumption in the Bay are Latino, Southeast Asian or Filipino. Meetings notices and information should be published in English, Spanish, and Tagalog at a minimum. A location for the meeting should be held in Barrio Logan or National City, near where the shipyards are located. Such actions would be in compliance with Recommendation #1 of the CALEPA EJ Guidelines.

An educational community and Board workshop is also important to ensure that the impacted public can effectively and meaningfully participate in this important decision.

The Regional Board should apply precaution and consider seriousness, irreversibility, and cumulative impacts in decision.

Regarding the application of the Precautionary Principle, the Advisory Committee encouraged agencies to *"Officially recognize the important of precaution, and that it is not necessary or appropriate to wait for actual, measurable harm to public health or the environment before evaluating alternatives that can prevent or minimize harm."* (Report at 21)

Such recognition and application clearly applies to sediment cleanup levels for chemicals that persist in the environment and bioaccumulate or transform up the food chain. In the Shipyard cleanup decisions, levels for PCBs, mercury, PAH, and other bioaccumulators must be established in a manner that recognizes precaution and the damage that may be done if the future due to the nature of these chemicals. This will manifest in an analysis that provides for additional measures of protection in setting the cleanup goal.

When determining cleanup levels for persistent and bioaccumulators, use of risk assessments must be de-emphasized

The problems and weaknesses of health risks assessments (HRA) are legion. They assume that some amount of risk is "acceptable", that there is additional assimiliative capacity in the environment available, and that such acceptability and capacity can be determined. HRAs promote a false sense of precision, accuracy, and objectivity when in fact they are uncertain, variable and, when conducted by the polluter) highly biased. Risk assessment is widely known to perpetuate aned exacerbate the disproportionate burdens on EJ communities. (NEJAC at 55-56, footnote 159) The developers of risk assessment always maintained that HRAs were meant to be one of many "tools" for making decisions but history has shown us that it is very often the single determiner of the final decision to allow pollution.

It is possible to selectively employ HRAs. We believe that such selective use should be done here. EHC recommends that where the contaminants to be regulated or cleaned up are persistent, bioaccumulative, persistent, and/or highly toxic the HRA should not be used or de-emphasized in the decision-making process. Unlike many chemicals, these chemicals are highly predictable in the environment over time. What is certain is that they are toxic, they will persist for millennia, and ultimately, they will bioaccumulate into our food chain. What is uncertain is when. Since a tenent of precaution is to tread most carefully where damage is to be expected, serious, and irreversible with long-term effects, these chemicals fit the bill.

Where risk assessment is used the level of protection for human health must be driven by the most sensitive receptors.

For many years and, in some cases, even today, health risk assessments were developed on the basis of the risk to a 200-lb white, male consumer. This is not most at-risk or most exposed individual. Children and pregnant women are far more sensitive receptors. However, a fetus in-utero of a woman who consumes at a subsistence level is the most at risk from exposure of all. The Regional Board must give additional attention to the chemicals that are of particular to children and a developing embryo—PCBs, lead, mercury, arsenic, PAH, ??? The Board's decision should reflect a more stringent, protective level justified by the special vulnerabilities of children.

Level of Protection should be set assuming subsistence fishers are consuming fish from the Bay.

The sediment cleanup level must be set to ensure protection of these communities in the long-term. We know that there is, at least, a subpopulation that is consuming fish frequently from the Bay and in large amounts.

If used, consideration of the health risk assessment must be done in the service of protecting all of us, not just those who have "typical", middle-class fish eating habits. Our pier survey establishes that a substantial portion of people who eat fish out of San Diego Bay eat more than fillets. While the upper limit of 161 grams per day of fish used in the Exponent Health Risk Assessment is an appropriate upper bound for fish consumption, the assumption that exposure to contaminants in fish is limited to those found in fillets is clearly erroneous for those people who do subsistence fishing in San Diego Bay. A more accurate and conservative assumption is that up to 161 grams per day of whole fish are eaten.

Normative, not descriptive, baselines should be the basis of protection when determining health risks based on fish consumption.

"When environmental agencies set or approve water quality standards that rely on a picture of exposure that takes people to be eating smaller quantities of fish, agencies will permit relatively greater quantities of pollutant to remain in or be discharged to the water and sediments. That is to say, agencies will set less protective standards." NEJAC at 49

The NEJAC study goes on to note that these conditions feed a self-fulfilling downward spiral in protection as the environments and the fish are allowed to be become increasingly contaminated (or cleanup is not done adequately) and individuals area asked to reduce their consumption or fewer people fish or eat the fish due to the warnings, or there are fewer fish caught all of which drive a lower fish consumption rate (FCR) upon which to base regulatory action and the spiral continues downward as the agencies then act to allow greater quantities of pollutant in (or to remain) in the ecosystems.

The response recommended by the NEJA is to construct baselines that are normative rather than description. For example, not base FCR on the current fish consumed today, but rather what would be consumed if the fish were safe to eat. This should be the goal that we are striving for in our protection of beneficial uses.

The healthfulness of eating uncontaminated fish should not be used as an excuse to minimize the risks of contamination.

At the same February cónference research was presented that demonstrated that the health benefits of consuming fish did not necessarily override the risks of some contamination. Mercury, in particular, was should to inhibit the natural protective properties of Omega-3s in fish and in fact was antagonistic to it.

Mercury was also linked health risks beyond neural and reproductive damage. One study showed that Mercury levels were highly significant in atherosclerosis (thickening of the arteries). 7.3% increase in progressive thickening of the artery for each additional ppm of mercury in hair.

Last, contamination with mercury and richness in Omega-3's did not necessarily correlate. Some species that suffer from high levels of contamination did not have high levels of Omega-3.

Fish Consumption Advisories should be considered an Interim Protection Step and not a means of meeting a beneficial use

The Regional Board should not adopt a cleanup limit that relies on postings or advisories to "meet" beneficial uses.

The current polluted condition of the most impacted communities militates for a more protective cleanup level.

The communities of Barrio Logan, Sherman Heights, Logan Heights and National City are the most heavily burdened with toxic exposures in San Diego County. This current and disproportionate burden should be reflected in the Board's justification of establishing more protective limits. EHC has developed considerable information about the cumulative burden on these communities. Such information should be reflected in the Board's findings and decision-making.

Multiple Exposures, Cumulative Risks, Susceptibility and Co-Risk factors should be considered in regulatory decision

The EPA has begun to recognize the important of cumulative and multiple exposures. A study on the Greenpoint/Williamsburg community in Brooklyn, NY attempted to assess the impacts of consumption of contaminated fish, lead exposure, water ingestion, and air inhalation. The NEJAC report spoke to the important cumulative factors of poverty, lack of access to health care, and assumption of life stages of an individual and other co-risk factors. The report noted that a person *"may be more or less able to withstand and recover* *from a toxic insult depending on one's income, the quality of one's baseline diet, whether on e is employed, whether one has access to adequate health care, whether one has adequate insurance...."* (NEJAC at 43)

The co-risk factors of communities of National City have been detailed in EHC research. These communities have the highest lead contamination in housing stock, highest cancer, reproductive, respiratory risks from air contaminants, high poverty rates.... These co-exposure rates

Clean Water Act clearly requires protective, restorative action

The goal of the Clean Water Act is *"to restore and maintain the chemical, physical, and biological integrity of the Nation's waters."* The mission of the State and Regional Boards is *"to preserve, enhance and restore the quality of California's water resources, and ensure their proper allocation and efficient use for the benefit of present and future generations."*

The role of sediment cleanup is critical. San Diego Bay is so degraded that it requires restoration in order to recover its ecosystem viability, to protect users of the Bay and consumer (human and non-human) of the fish. Restoration of contaminated sediments and aquatic environments were determined to be key to protecting the health of communities of color, low income communities by the NEJAC. Cleanup efforts are espeaclly import to these communites because given that they are most highly exposed and risk "avoidance" (e.g. eating less fish) is simply not a realistic or, in some cases, culturally appropriate option. Thus, these communities will disporportionatly bear the impacts of any contamination left in place. (NEJAC at 86) Last, since many of the contamiants have been banned ofr production (PCBs, Chlordane) or inputs reduced or eliminated (mercury) the presence of these contaminants can only be reduced through cleanup efforts. There is no other way. The Regional Board should implement the spirit and the letter of the laws that it enforeces and establish protective cleanup levels for the sediments at NASSCO and Southwest Marine.

Establishing Sediment Quality Objectives.

State Sediment Quality Objectives Process

In the San Diego RB process and the state SQO we are headed for a big fight over uncertainty. We know and state board staffers concede that vast areas of uncertainty will remain after these worthy but nonetheless paltry studies and analyses are done. How will the SQOs ultimately handle this reality? It seemed crystal clear to me that uncertainty is already being used as an excuse to avoid setting protective standards for the Delta and for toxics that bioaccumulate. Both will be ignored for now because it is "too hard" and there are "limited resources and limited time." We need to repeatedly, consistently and uniformly insist that:

1) standards are a policy decision not merely a scientific one;
2) the policy makers have a moral and legal responsibility to set protective standards;
3) the policy makers can not avoid the responsibility to set protective standards just because the science is not clear. In fact when the science is uncertain that is precisely the circumstance when they should employ a large margin of safety.

Thus the work of the science folks must include an evaluation of the uncertainties. In addition to setting forth what we do know, we should push the science folks to clearly identify and articulate the areas of uncertainty. In other words for a particular SQO proposal the scientists should tell us not only what will be protected but also the beneficial uses that may not be protected. We need to ensure that the policymakers are blocked from hiding behind the science.

The perennial questions related to sediment cleanup speak to the need for a better process for decision-making. These are;

- How clean is clean?
- What does the legal standard "reasonable protection of beneficial uses" mean?
- Who are we protecting and from what?
- How do we regulate to effectively protect ecosystems and human health in the face of uncertainty?

The response of the environmental justice community is to recommend the use of the Precautionary Principle in establishing standards and processes and for regulators to reflect Environmental Justice concerns in their decision-making.

Environmental HEALTH COALITION

ACTION ALERT

We Need a Clean San Diego Bay

Safe for Wildlife *** Safe for People***

Saved for Future Generations!

Toxic sediments threaten the health and safety of people and wildlife using San Diego Bay. Contaminated sediments need to be permanently removed not "capped" over or left in the Bay to threaten future generations. We want a Bay that is safe for swimming and fishing and safe for the wildlife that depends on it. A stringent sediment clean up to background levels is needed to protect human health, fish, wildlife, and all of the beneficial uses of the Bay.

Please join EHC to:

PROTECT People who fish from the Bay and fish and wildlife who live there.

SUPPORT A stringent and protective background cleanup level for sediments at NASSCO and Southwest Marine Shipyards.

OPPOSE Any proposal that leaves dangerous chemicals in the Bay.

- **June 1st: SEDIMENT WORKSHOP**
  9:00 A.M.
- **June 29th: CRITICAL PUBLIC HEARING**
  9:00 A.M.

Both Meetings to be held at the:
San Diego Regional Water Quality Control Board
9174 Sky Park Court, Suite 100
San Diego, CA 92123

As we get closer to the dates, please contact us for details.
Contact Sonia Rodriguez at (619) 474-0220 ext. 142, SoniaR@environmentalhealth.org or Georgette Gómez at (619) 474-0220 ext. 104, GeorgetteG@environmentalhealth.org.

Environmental HEALTH COALITION

ALERTA DE ACCIÓN

Necesitamos una Bahía Limpia

Sana para la Vida Silvestre *** Sana para el Pueblo

¡Sana para Futuras Generaciones!

Los sedimentos tóxicos amenazan la salud y la seguridad de la gente y a la vida silvestre que usa la Bahía de San Diego. Los sedimentos contaminados deben eliminarse no solo "taparse" o abandonarse a que amenacen futuras generaciones. Queremos una bahía sana para nadar y pescar y sana para la vida silvestre que depende de ella. Es necesario un nivel de saneamiento riguroso para proteger la salud humana, los peces, la vida silvestre y todos los usos beneficiosos de la bahía.

Únete a EHC para:

PROTEGER Los pescadores de la bahía, los peces y la vida silvestre que viven ahí.

APOYAR Un nivel de saneamiento riguroso para los sedimentos en los astilleros de NASSCO y Southwest Marine.

OPONER Cualquier propuesta que deje químicas peligrosas en la bahía.

- **1 de junio: Taller de SEDIMENTOS**
  9:00 A.M.

- **29 de junio: IMPORTANTE UDIENCIA PÚBLICA**
  9:00 A.M.

Ambas Reuniones serán en:

San Diego Regional Water Quality Control Board
(Junta Regional para el Control de la Calidad del Agua)
9174 Sky Park Court, Suite 100
San Diego, CA 92123

Ya que nos acerquemos más a las fechas, por favor póngase en contacto con nosotros para detalles.Comuníquese con Sonia Rodríguez llamando al (619) 474-0220 ext. 142, SoniaR@environmentalhealth.org o Georgette Gómez llamando al (619) 474-0220 ext. 104, GeorgetteG@environmentalhealth.org.

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Únete a EHC para:

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  9:00 A.M.

- **29 de junio: IMPORTANTE AUDIENCIA PÚBLICA**
  9:00 A.M.

AMBAS REUNIONES SERÁN EN:

Junta Regional para el Control de la Calidad del Agua
9174 Sky Park Court, Suite 100
San Diego, CA 92123

Ya que nos acerquemos más a las fechas, por favor póngase en contacto con nosotros para detalles.
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REC'D DEC 1 1 2003

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
OFFICE OF RESPONSE & RESTORATION
COASTAL PROTECTION & RESTORATION DIVISION
c/o California Department of Toxic Substance Control,
Human and Ecological Risk Division
8800 Cal Center Drive
Sacramento, CA 95826

VIA FACSIMILE and US Mail

December 5, 2003

Mr. John Robertus
California Regional Water Quality Control Board
San Diego Region
9174 Sky Park Court, Suite 100
San Diego, California 92123

Dear Mr. Robertus:

The National Oceanic and Atmospheric Administration (NOAA) appreciates the opportunity to comment on the NASSCO and Southwest Marine Detailed Sediment Investigation. This document, dated September 2003, consists of three volumes of data and text, and was prepared for the shipyards by their consultant, Exponent.

As you are aware, NOAA has provided a considerable amount of technical support and access to expertise to your staff during the planning and implementation phases of this sediment study. NOAA is committed to continuing this support to your staff during the review of this document and in future phases of the cleanup process. As a co-trustee with the State and the US Fish and Wildlife Service for the protection of estuarine resources and habitat in the Bay, we are very interested in working closely with your staff to ensure that an appropriate evaluation of potential impacts to beneficial uses is conducted at the NASSCO and Southwest Marine shipyards, and that a remedy that both protects and restores impacted trust resources is implemented. At this time NOAA is offering the following general observations about the Sediment Investigation Report. We will be providing a more detailed comment letter about each one of these observations in the very near future. In addition, Dr. Mark Myers with NOAA's National Marine Fisheries Service has performed a review of the fish study section and histopathology report. His report will be part of NOAA's future detailed comments.

Comments

The conclusions stated in the Sediment Investigation Report are not supported by the site-specific data collected during the phased investigations. Further evaluation of the existing data should be conducted before any conclusions can be drawn regarding the impact from site related contaminants to specific beneficial uses in San Diego Bay.

The conclusions that "biological effects detected at the shipyards are not caused by shipyard chemicals", and "beneficial uses are currently at approximately 95% of ideal values" appears to be based on the following components:

- misinterpretation of the bioaccumulation data;
- misinterpretation of the fish study results;
- incorrect assumptions regarding statistical correlations, sediments and toxicity tests;
- biased interpretation of the benthic data;
- comparison of site data to inappropriate reference data;
- rejection of the pore water data;
- erroneous interpretation that apparent effects threshold concentrations developed for the sediment are protective and appropriate clean-up concentrations;
- questionable inputs to the risk evaluation for the wildlife receptors;
- disregard of a weight of evidence approach to evaluating risk; and
- lack of sediment or biological data adjacent to the recently closed storm drains.

Each one of these aspects of the report has generated a considerable number of comments and questions. Given the importance of this document for informing the Board in their decisions to protect the beneficial uses of San Diego Bay, NOAA recommends that the conclusions of this report be rejected, and the data be re-evaluated in an unbiased and scientifically defensible manner.

If you have any questions about these comments, please feel free to contact me at (916) 255-6686.

Sincerely,

Denise M. Klimas

Denise M. Klimas
NOAA Coastal Resource Coordinator
Office of Response and Restoration

Cc: Mr. David Barker, RWQCB
Mr. Tom Alo, RWQCB
Mr. Scott Sobiech, US FWS
Mr. Bill Paznokas, CA F&G

Laura Hunter

From: emkimura@earthlink.net
Sent: Monday, December 15, 2003 4:57 PM
To: Dave Paradies; Laura Hunter; Elaine Carlin
Subject: San Diego Naval Shipyard sediment report

I came across this report while browsing the SPARWAR website.
It has some interesting information about the sediment quality in the naval shipyard. It estimates the sources of copper and zinc, resuspension of the contaminants, hydrolgy of SD Bay. The data maps on copper pollution show not only the Navy yard but NASSCO and SW Marine shipyards as well.

Ed

Sediment Quality Charaterization Naval Station San Diego Jan 1999 Chadwick et al
http://www.spawar.navy.mil/sti/publications/pubs/tr/1777/tr1777.pdf

Scott Sobiech
12/17/2003 03:51 PM

To: "Tom Alo" <alot@rb9.swrcb.ca.gov>
cc: "David Barker" <barkd@rb9.swrcb.ca.gov>, "Craig Carlisle" <craigc@rb9.swrcb.ca.gov>, Denise.Klimas@noaa.gov, Katie Zeeman/CFWO/R1/FWS/DOI@FWS, Andy Yuen/CFWO/R1/FWS/DOI@FWS
Subject: Re: Additional Comments on Shipyard Technical Report

Tom,

You are correct that our efforts will not be directed towards providing more detailed comments on the Shipyard Technical Report. Rather than focusing efforts on the shipyards' report, we (the Service), in cooperation with NOAA, will be evaluating the shipyards results, and using standard risk assessment methods for our own evaluation of risks posed by contaminants in shipyard sediments. We believe this information may assist the Regional Board staff in developing the CAO.

Scott Sobiech
U.S. Fish and Wildlife Service
Carlsbad Fish and Wildlife Office
Chief, Environmental Contaminants Division
6010 Hidden Valley Road
Carlsbad, CA 92009
760 431-9440T
760 431-9624F
"Tom Alo" <alot@rb9.swrcb.ca.gov>

"Tom Alo" <alot@rb9.swrcb.ca.gov>
12/17/2003 01:55 PM

To: <Denise.Klimas@noaa.gov>, <Scott_Sobiech@r1.fws.gov>
cc: "David Barker" <barkd@rb9.swrcb.ca.gov>, "Craig Carlisle" <craigc@rb9.swrcb.ca.gov>
Subject: Additional Comments on Shipyard Technical Report

Denise and Scott,

Thank you for submitting written comments on the NASSCO and Southwest Marine technical report. In your letter dated December 5, 2003 you indicated that you will be providing more detailed comments. However, based on our discussions, it is our understanding that NOAA and USFW will not be providing the Regional Board more detailed written comments on the shipyard's technical report and that your resources will be spent helping us develop the CAOs. Please confirm. Thanks.

--Tom

Tom C. Alo
Water Resources Control Engineer
CA Regional Water Quality Control Board
9174 Sky Park Court, Suite 100
San Diego, CA 92123
Main: (858) 467-2952
Direct: (858) 636-3154
Fax: (858) 571-6972
<alot@rb9.swrcb.ca.gov>

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"The energy challenge facing California is real. Every Californian needs to
take immediate action to reduce energy consumption. For a list of simple
ways you can reduce demand and cut your energy costs,
see our Web-site at http://www.swrcb.ca.gov."

****

San Diego Bay Council
A coalition of San Diego environmental organizations dedicated to protection and restoration of San Diego's coastal water resources

December 5, 2003

Mr. Dave Barker
Mr. Craig Carlisle
Mr. Tom Alo
Regional Water Quality Control Board
9174 Skypark Court
San Diego, California 92123-4340

HAND DELIVERED

RE: San Diego Bay Council Comments on Exponent Technical Report and Recommendations for Tentative Cleanup and Abatement Order

Dear Messrs Barker, Carlisle, and Alo:

The member organizations of the San Diego Bay Council have reviewed the Exponent Technical Report and have considerable comment on it. Our submittal includes: this letter, comment letters from Ms. Elaine Carlin and Mr. Ed Kimura; all earlier submittals by the Bay Council and member organizations; and attachments.

Our comments have a dual function: 1) to comment on the Technical report and 2) to provide our recommendations to the Board staff regarding the Tentative Cleanup and Abatement Order (CAO). Our summary conclusions are listed in brief below.

Summary Conclusions:

About the Technical Report

- While very large and expensive, the Exponent Study is fundamentally and fatally flawed and cannot be used as a credible basis for the Regional Board's action.
- The report is flawed in virtually every area. Every line of evidence is manipulated whether through poor sampling design and technique (ex: comparison of contaminated sites to contaminated reference stations), analysis (ex: failure to conduct health risk assessments on whole fish or fish filets that exceeded the TRG), statistical histrionics (ex: claim that only a 1% improvement in protection would result if 1.2 million tons of contaminated sediment was removed), or just flat ignored (dismissal of high pore water results). The list of flaws is long and they are covered in detail in this submittal.
- The report fails to demonstrate economic or technical infeasibility for cleanup to background levels.
- However, the report does prove the benefit of cleanup to background by demonstrating the significant reduction of contaminants and improvement to water and sediment quality from cleanup to stringent levels.
- The Regional Board must secure an objective expert peer review of this document to ensure a decision protective of state resources. Moreover, it is clear that the shipyards are preparing for a lawsuit.

About the Cleanup and Abatement Order:

- The Regional Board is bound by Resolution 92-49 to establish Background Levels as the Cleanup Standard. There is no legal, scientific, or practical rationale for negotiating this issue with the Shipyards.
- The Regional Board should require cleanup to the background levels originally cited in its March 6, 2002 letter. These levels are defensible and in alignment with other state and national standards.

- The CAO should heavily weigh and require clean up to the most stringent standards for all bioaccumulative substances present at the site, including all chemicals that bioaccumulate in fish, animals, and plants.

- The Regional Board should reflect the principles and guidelines of environmental justice outlined in the resolution passed by the California Environmental Protection Agency on October 14, 2003.

- Any determination of background or alternate cleanup levels must be based on a set of reference stations (such as those provided by NOAA and the Bay Council) that protect beneficial uses and must fall within the range of acceptable state and national standards.

- The CAO should include a detailed list of Shipyard water quality violations, all sources of pollution, current land-side cleanup efforts (including analysis of contaminated groundwater plumes), and an accounting of profits earned by the shipyards during the decades that they used San Diego Bay as a convenient toxic waste disposal site.

- The Regional Board should secure their own independent expert technical assistance in review of this document since the Shipyards are clearly posturing for a lawsuit. This independent assistance should include an assessment of the costs and benefits of various cleanup alternatives

We Cannot Escape Cumulative Impacts: This is a Very Significant Decision

The evidence is overwhelming. Our ocean ecosystems are in failure and our actions are not adequate to protect them. The news only gets worse about contamination of the marine ecosystem food chain by persistent organic compounds (POPs) such as PCBs are a rising international concern. Recently, the World Health Organization recommended lowering the intake limits for mercury in fish. Endocrine disruption of chemicals is of major concern. Polar bears can carry PCBs a million times the concentration of PCBs detected in seawater and these body burdens are threatening their survival even in the most pristine environments. Also threatened are the indigenous people who live there due to contamination of their sea based food sources by POPs. When we add industrial pollution to the other pressures on the oceans such as over-fishing, loss of habitat, sewage pollution, etc, the cumulative impacts are both staggering and devastating.

Those of us with the responsibility to protect the most important and biologically rich marine environments -the coastal waters- must take aggressive actions to restores these environments and their beneficial uses to health. These actions are incumbent upon us if the oceans are ever to recover.

This is not just a local decision with purely localized impacts. In spite of the tireless attempts of Exponent to treat the Shipyard leaseholds as small areas with limited significance, the fact remains—the Shipyards have seriously contaminated San Diego Bay. San Diego Bay is an important and sensitive enclosed Bay and estuary attached to the Pacific Ocean. Impacts to the Bay contribute significantly to the cumulative impacts that have degraded coastal waters and the oceans.

Our decision whether to clean up one of the most toxic sites in San Diego Bay has local, state, national, and global significance. We urge you to view this decision, and the fight that is sure to come, as a struggle important to the survival of our oceans and ourselves. We know that there are some that would like to dismiss such a global perspective as un-scientific or, worse, merely emotional. Behind closed doors, our experts are derided. No matter. We are not deterred. In fact, we are in good company.

We, the undersigned marine scientists and conservation biologists, call upon the world's citizens and governments to recognize that the living sea is in trouble and to take decisive action. We must act quickly to stop further severe, irreversible damage to the sea's biological diversity and integrity...Nothing happening on Earth threatens our security more than the destruction of our living systems. The situation is so serious that leaders and citizens cannot afford to wait even a decade to make major progress toward these goals. To maintain, restore and sustainably use the sea's biological diversity and the essential products and services that it provides, we must act now.

-- Excerpt from *Troubled Waters: A Call for Action* signed by more than 1,600 marine scientists from around the world at the 1998 International Year of the Ocean Conference.

"The oceans are in trouble; the coasts are in trouble; our marine resources are in trouble. These are not challenges we can sweep aside,"

--James Watkins, a retired Admiral, former chief of naval operations, national security expert and head of the U.S. Commission on Ocean Policy, September 23, 2002

Because POPs are bioaccumulative and biologically and environmentally persistent, complete elimination of POPs is required in order to protect the health of wildlife and humans.

Ted Schettler, MD, MPH, Science and Environmental Health Network

"It is now well-established that some chemicals can harm the endocrine systems of a wide range of wildlife species, both on land and at sea, and may give rise to strange 'gender-bending' effects. Tributyl tin, for example, which has been widely used in anti-fouling coatings on ships and in fish farming – appears to have made female snails grow false penises, and to have severely affected oyster fisheries in some areas... It is possible that other environmental contaminants could "sneak up on us', causing further unexpected effects"

A Sea of Troubles, a Report of the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) 2001 #70. p.7

"It does not matter where on Earth you live, everyone is utterly dependent on the existence of that lovely, living saltwater soup. There's plenty of water in the universe without life, but nowhere is there life without water. The living ocean drives planetary chemistry, governs climate and weather, and otherwise provides the cornerstone of the life-support system for all creatures on our planet, from deep-sea starfish to desert sagebrush. That's why the ocean matters. If the sea is sick, we'll feel it. If it dies, we die. Our future and the state of the oceans are one."

Sea Change A Message of the Oceans, Sylvia Earle, 1995.

The recommendation of "do-nothing" advocated by Exponent for its clients is shocking, but not unprecedented in that it fails to recognize certain physical laws of nature. We are reminded of a meeting we had years ago with an editor at the Union Tribune. He stated that because there was no evidence that the ozone layer was thinning directly above Barrio Logan, the methyl bromide releases from the Port's fumigation facility were insignificant.

NASSCO, SWM and Exponent apparently would have you believe a version of the same thing, namely, that their temporarily leased piece of San Diego Bay is not worthy of protection. They argue that because we cannot do everything to cleanup all contamination in the Bay on the same day, we should do nothing. Everyone in the November workshop had to be impressed that neither Mr. Nielsen nor Mr. Tom Ginn PhD. would affirm, out-loud, that they were comfortable with leaving PCBs at 8,400 ppb in San Diego Bay. It was a simple request since their conclusions were that the high levels of contamination were not causing significant impacts and that they should be left to naturally attenuate. It is revealing that they refused to tell it like it is. That, in fact, these "experts" have recommended to you that high levels of toxic and bioaccumulative pollution be left in our Bay to threaten generations for years to come effectively impeaches all of their conclusions and recommendations.

Specific Comments

Our more specific comments below supplement our experts' comment letters attached.

The Regional Board is bound by Resolution 92-49 to establish Background Levels as the Cleanup Standard

The law is clear on this point and we will not belabor it again. We refer to Resolution 92-49 and the State Board's analysis dated February 22, 2002 of its applicability to sediment cleanup. (attached) In short, it says:

"A Regional Board must apply Resolution 92-49 if such sediments threaten beneficial uses of the waters of the state and the contamination or pollution is the result of a discharge of waste. Contaminated sediments must be cleaned to background sediment quality unless it would be technogically or economically infeasible to do so."

The Technical Report did not provided a credible case that cleanup to background is technically or economically infeasible. Dredging and disposal of contaminated sediment from this highly active shipping site is 100% feasible. To put it in context, a full cleanup would address 1.2 million cubic yards. The Navy has already completed dredging projects in the San Diego Bay region of over 10 million cubic yards. Dredging projects of this size of the Shipyards can and have been done in the Bay repeatedly.

Exponent's analysis of economic infeasibility is unusable since it relies heavily on its unsupportable finding that the tons of toxic waste and bioaccumulative chemicals in the Bay at the Shipyard leaseholds have, miraculously, absolutely no biological impacts. We are aware of no other credible science that supports similar conclusions (except perhaps the earlier, equally flawed, studies of Campbell's Shipyard by PTI, also led by Tom Ginn). Further, we must continue to point out this is Shipyard waste that was illegally discharged there to begin with.

The Report is useful, however, to prove that cleanup to background is highly economically feasible, and that it would be money well spent. For the additional cost, levels in the Bay at this site would be markedly reduced. PCB concentrations would be reduced from 8,400 ppb to less than 200; TBT from 3450 ppm to 142 ppm; copper from 1500 to 84 ppm; mercury from 4.5 ppm to 0.39 ppm—all very significant reductions and improvements in the water and sediment quality in the Bay.

Despite its heft, the Technical Report fails to respond to the Regional Board direction in the 13267 letter dated June 1, 2001. The guidelines required that the Shipyards evaluate the feasibility of cleanup alternatives including complete cleanup of all waste discharged and restoration of affected water to background conditions. On March 6, 2002 the Regional Board provided those background cleanup levels. (Letter attached) However, the Technical Report does no such thing. Remarkably, instead, Exponent has invented its own levels (of 95% of UPL), virtually all of which exceed the background levels determined by the Board. Simply, the Shipyards are not in compliance with the Board's June 1st directive.

Regional Board has to start with the fact that the beneficial uses of the Bay are already impaired

It is proved that San Diego Bay suffers from significant water, sediment, and fish contamination. The extensive Bay Protection and Toxic Cleanup Report chronicled the sediment impacts. All of the fishing piers are posted due to findings of elevated levels of PCBs, arsenic, and mercury in 1990. Water quality monitoring for copper and other contaminants exceed applicable standards. There are many polluters of San Diego, and among the largest threats are NASSCO and SWM. These facilities are rated 1-A, the highest threat to water quality for a reason. The Board must set clean up levels that restore beneficial uses.

Regional Board should follow Cal/EPA Environmental Justice Guidelines

On October 14, 2003, the California Environmental Protection Agency (Cal/EPA) Interagency Working Group on Environmental Justice (IWG) – consisting of the Secretary of the Environmental Protection Agency, the Chairpersons/Directors of the California Air Resources Board, State Water Resources Control Board, California Integrated Waste Management Board, Office of Environmental Health Hazard Assessment, Department of Toxic Substances Control, Department of Pesticide Regulation, and the Governor's Office of Planning and Research – adopted a resolution that endorsed the Environmental Justice Advisory Committee's goals and recommendations on achieving environmental justice in California. The Advisory Committee consisted of 17 members representing a broad spectrum of stakeholders including community-based groups, environmental organizations, industry representatives, and regulators.

Currently the IWG is developing a strategy document, which includes an implementation plan, to begin working toward the achievement of the goals set out in the Recommendations. They will depend on the experiences of regulators, community members, and other stakeholders to identify and address any gaps in existing programs, policies, or activities that may impede the achievement of environmental justice.[1] In light of that process, it is clear that the IWG has sent a strong mandate to Cal/EPA and all of its departments that it should be a high priority to implement programs, plans, actions, and policies that protect the public health of communities, especially low-income communities of color.

In particular, the recommendations underscored the importance of using precautionary approaches to environmental and public health protection. The recommendations state, ***"Committee members believe it is not necessary to wait for actual, measurable harm to public health or the environment before evaluating alternatives that can prevent or minimize harm…additional precaution may be needed in order to address or prevent environmental justice problems."***[2] In exercising precaution, the recommendations state the following types of needs and concerns:[3]

- need for programs and agencies to be more responsive to community concerns about potential threats to their health and/or environment, balanced with a concern that resources are limited and need to be expended to prevent or mitigate well-understood impacts on public health and the environment, and targeted at the most significant impacts first.

[1] California Environmental Protection Agency (Cal/EPA) Interagency Working Group (IWG) on Environmental Justice Resolution, Adopted on October 14th, 2003, p. 2. Also see requirements of Public Resources Code section 71113(b)(2).
[2] Final Recommendations Report of the Cal/EPA Advisory Committee on Environmental Justice, p. 13 (Adopted on October 14th, 2003 by Cal/EPA IWG on Environmental Justice).
[3] Ibid. at 14.

- The need for scientifically supported tools, processes, and decisions, balanced with a concern that lack of complete scientific data has been used in the past to delay or prevent reasonable actions to address pollution problems.

- The need of community members to be assured that their health and environment will not be placed at risk by environmental decisions, balanced with a concern that no action can ever be shown to be risk free.

- The need of agencies and businesses to minimize costs and maximize benefits of actions undertaken, balanced with a concern that current methods of evaluating costs and benefits do not adequately address the wider costs to society and benefits of environmental decisions, or the distribution of those costs and benefits.

- The need to reduce emissions/discharges and exposures to toxic contaminants within a disproportionately impacted community, and concerns about the potential for business closure and job loss.

These recommendations serve as valid guidance for this Regional Board to address environmental justice issues regarding the cleanup of sediments in the San Diego Bay. In particular, an environmental justice issue of concern is the consumption of contaminated fish by low-income, people of color populations in the San Diego region. Considering the above recommendations adopted by Cal/EPA, we believe the following should be reflected in this Regional Board's consideration of a sediment cleanup level that is protective of public health:

1. The community has voiced a concern that an inadequate sediment cleanup level will not protect the health of populations that consume fish frequently or on a subsistence basis and that concern needs to be addressed in the cleanup abatement order;

2. There is a population of low-income and people of color who regularly fish the San Diego Bay and who may *depend* on healthy aquatic ecosystems and the fish that these ecosystems support; for these populations there may be no real alternatives to catching and eating fish; and for many members of these groups it may be entirely impractical to "switch" to "substitutes" when the fish on which they rely have become contaminated;

3. There is a lack of quantitative data on the levels of consumption of contaminated fish and exposure to harmful toxins for frequent or subsistence fishing populations in the San Diego Bay, specifically for low-income people of color populations, however data from numerous studies and the USEPA shows that consumption rates for some populations may be has high as 972 grams/day;

4. It is a well-documented fact that the consumption of contaminated fish with bioaccumulated toxins can result in severe health impacts; and

5. That risk reduction, whereby risk-producers are required to cleanup, reduce, or prevent contamination, is the most practical way to reduce impacts to these populations.

CAO should integrate the precautionary principle adopted by Cal/EPA into Cleanup decision

Exercising precaution while setting cleanup levels for sediments in the San Diego Bay is within the jurisdiction of this Regional Board and the recently adopted Cal/EPA guidelines provide the mandate and support for such action. The discussion below underscores the need for a precautionary approach to setting cleanup levels.

In Exponent's Human Health Risk Assessment for this project, the median fish and shellfish consumption rates is based on 21 grams/day for the general population. Although the United States Environmental Protection Agency currently uses the default values of 17.5 grams a day for the general population, it recommends a default value of 142.4 grams/day, over 6 times Exponent's rate, for subsistence populations.[4] Therefore, Exponent's claim that this is a conservative and protective HRA is not met with the use of 21 grams/day is unfounded.

The San Diego region lacks any specific data on subsistence fishing populations. The 1990 San Diego Bay Health Risk Study (Study) is the most current study relating to contaminated fish in the Bay.[5] In that Study only 369 fishers were

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[4] Fish Consumption and Environmental Justice: A Report developed from the National Environmental Justice Advisory Council, a Federal Advisory Committee to the U.S. Environmental Protection Agency. (November 2002, revised). Citing USEPA, *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health* (October 2000).
[5] San Diego Bay Health Risk Study, prepared by San Diego County Department of Health Services (June 12, 1990).

interviewed and interviews were only held in English, thus excluding a large portion of fishers who did not speak English as their first language and who are prime candidates for being frequent or subsistence fishers. Peer reviewed studies of studies of other urban bays such as San Francisco found average rates of fish consumption by populations to range from 100 to 400 grams/day.[6]

In addition, the Study based its consumption rates on the assumption that fishers only ate certain species and refrained from eating a host of other species such as sea urchins, sea cucumbers, or bottom-feeding fish.[7] Furthermore, the Study assumed that people only ate the fillet of finfish, although it is commonly accepted fact that some populations eat the fat, head, skin, bones, eggs, or internal organs – thus increasing exposure rates.[8] This lack of data it also support establishing a sediment cleanup level that is precautionary and protective of human health.

EHC organizers have visited docks and piers in the San Diego region many times, most recently in the past month and identified individuals that consume fish frequently. Although every decision-maker involved in this important decision is fortunate to live well above the poverty line, many in Barrio Logan and National City are not so lucky. 35% Families in Barrio Logan and 20% of families in National City survive on less than $17,000 a year for a family of four. It is credible to assume that people are using protein from the Bay to supplement their diets.

Further, the use of 21 grams/day is not a conservative estimate. A host of other studies done around the country illustrate the large differences in the quantities of fish consumed by different demographic groups in the country and can serve as guidance for our region in determining what level represent precaution when setting average daily consumption rates for the San Diego Bay. These studies are abundant evidence that some populations of people of color and low-income people eat far greater quantities of fish than the general population. Since the San Diego region lacks this type of specific data, these studies may serve as guidance or an illustrative purpose for estimating risk to similar populations in our region. Below are listed are a few of these studies, which all recommend mean consumption rates for subsistence populations well-above USEPA's default and Exponent's numbers:

- Study by Columbia River Inter-Tribal Fish Commission registered a mean fish consumption rate of 58.7 grams/day and a maximum fish consumption rate of 972 grams/day.[9]

- A study of Asian Pacific Islander populations in King County, Washington showed a mean fish consumption rate of 117.2 grams/day and maximum values of 733.46 grams/day.[10]

- Study in Alabama registered fish consumption rates for low-income African-Americans at 63 grams/day.[11]

- Study in Michigan registered the mean fish consumption rates for low-income African-Americans at 43.1 grams/day.[12]

The existence of a large population, or even a small population, who consumes fish from the Bay and near the most contaminated areas further advances the need for precaution to be taken in setting an adequate cleanup level that will protect public health.

Specific Flaws in the Exponent Heath Risk Assessment (HRA)

The manner in which the Exponent Heath Risk Assessment was done reveal further flaws and results in a lack of protection for people who eat fish even at the lower consumption rates levels assumed in the report. Although it is well known, and we have raised before, consumption patterns and quantities for the subsistence and the most at-risk consumer of fish vary.

The flaws in the treatment Heath Risk Assessment (HRA) are striking:

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[6] Persistent Bioaccumulation and Toxic Chemicals 2, ACS Symposium Series 773, Lipnick, Jehsson, Pereus for the American Chemical Society (Oxford University Press, 2001).
[7] Supra note 4 at 34-35.
[8] Id.
[9] Columbia River Inter-Tribal Fish Commission, Technical Report 94-3, A Fish Consumption Survey of the Umatilla, Nex Perce, Yakama, and Warm Springs Tribes of the Columbia River Basin (1994); Columbia River Inter-Tribal Fish Commission, Comments to Administrator Broaner
[10] Ruth Sechena, et al., *Asian and Pacific Islander Seafood Consumption Study* (1999).
[11] Alabama Department of Environmental Management (1993).
[12] Patrick C. West, *Race and Incidence of Environmental Hazards: A Time for Discourse.* Bunyan Bryant and Paul Mohai, eds. "Invitation to Poison? Detroit Minorities and Toxic Fish Consumption from the Detroit River," 96, 98 (1992).

1. Failure to analyze the whole fish is significant. In San Diego, we are fortunate to have a large southeast Asian immigrant community as well as indigenous and tribal communities, Latinos, and a large community from Africa. Stews, raw and whole fish consumption, and other non-fillet-only based consumption patterns can be found in these communities. As we predicted, this consideration was dismissed and the risks were grossly understated. Exponent representatives even went as far as to state that fillets tested were the 'edible fillets like they would normally be prepared.' Normally? By Whom? This analysis did not analyze all the contaminated sand bass fillet risks or the whole fish risks which can be assumed to be significantly higher. According to Casarett and Doull's Toxicology methylmercury (the form you would often expect to find in fish) is fat soluble and has an affinity for brain tissue. (Casarett and Doull's Toxicology at 423.) So, persons who consume the whole fish is consumed will definitely receive a higher dose of mercury than just eat fillets. A proper analysis would have analyzed the whole fish.

It is important to note that even Exponent, stated at the November workshop that the contaminant levels were higher in the whole lobster than in the edible flesh alone. The same would be expected to be true for the Sand Bass had they done the analysis.

2. When the fillets were found to exceed the tissue residue guidelines (TRG) they were dismissed by Exponent and no further assessment was conducted.

3. Exponent dismissed the PCB contamination in the NASSCO Bass (46-54 ppb) as "*well below*" the reference station guidelines (55). The level is not "*well below*", it is between 1 and 9 ppb below.

4. All of the maximum samples far exceeded the PCB tissue residue guidelines of 20 ppb. Tissue contamination above 20 ppb means that beneficial use of REC are not being met at this site. At Southwest Marine tissue concentrations in fillet were as high as 400 ppb.

5. Workers fishing from the pier (which we know occurs) were not considered as consumers.

6. The Exponent HRA assumes that fish and lobsters abide by and respect leasehold lines and pretends that contaminants in the fish and lobster will never leave the site. This is, of course, ridiculous. Exponent also fails to assess impacts to fisher fishing nearby the shipyards at the Crosby Pier. Although this pier is posted against fishing, people fish there often.

7. The Exponent HRA assumes that these areas will be shipyards forever. There is no guarantee of that fact. It is, at least, a possibility that globalization, legislation, base closures, and/or other market pressures could result in one or more closures sometime during the next 100 years.

These problems are so severe as to completely undermine the credibility of the HRA done by Exponent and renders it useless.

Flawed Ecological Risk Assessment (ERA) and in-situ Benthic Analysis

These assessments were likewise, flawed.

1. Exponent found lesions in sand bass but dismissed them as an ecological impact because they were "mild" lesions.

2. Lesions were found at the reference site. Again, use of contaminated reference sites not acceptable. There are sites in the Bay were beneficial uses are protected.

3. Exponent did not analyze the goby which was recommended strongly by resource agencies.

4. Impact demonstrated for Brown Pelican and Surf Scoters, but dismissed by Exponent.

Regional Board should rely on national and state science as a guide for establishing levels

At the workshop, Exponent representatives stated that there was no relationship between chemistry and biological effects at the Shipyard sites. Although it is hardly surprising that polluter's consultants' cannot find any relationship between their toxic chemicals and biological effects, many credible scientists have. It is hard to imagine how PCBs, Mercury, lead, copper, arsenic are all benign in San Diego Bay when in the marine environment in the rest of the world they are so deadly. We recommend that the Board rely on objective scientific papers such as those published by NOAA on PCBs and PAHs in fish as justification for protective cleanup levels. In Lyndal Johnson's July 24, 2000 study, he found that in sediment with PAH contamination *"Above 1000 ppb, there appears to be a substantial increase in the risk of liver disease and reproductive impairment, as well as potential effects on growth."* (Report Attached)

Another reference that should be guide the Regional Board regarding expected impacts of contaminated sediments on beneficial uses is *Incidence of Adverse Biological Effects Within Ranges of Chemical Concentrations in Marine and Estuarine Sediments*; Edward Long et al., Environmental Management, Vol. 19, No. 1. (attached)

The Regional Board must protect against the synergistic and additive effects among all contaminants, especially bioaccumulative contaminants such as is noted in Meador's October, 2000 *An analysis in support of tissue and sediment based threshold concentrations of polychlorinated biphenyls (PCBs) to protect juvenile salmonids listed by the Endangered Species Act.* (attached)

The Regional Board should ensure that issues raised by DTSC in their August 24, 2001 memorandum (attached) and repeatedly by NOAA, USFWS, and the DFG should be addressed and reflected in any final CAO.

Other Responsible Agencies and the Public have expressed Early and Continuous Concerns

Ours are not the first objections that the Regional Board has had to the establishment of high and unprotective cleanup levels in the Bay.

Here are relevant excerpts from *Memorandum from Department of Fish and Game to Mr. John Robertus, Executive Officer, Regional Water Quality Control Board, San Diego Region*, dated March 24, 1999. (Letter is attached.) These comments speak for themselves about the inadequacy of the high cleanup levels at Campbell's and Interim levels at the Shipyards.

"...the Department is extremely concerned with the clean-up levels established by resolution 99-12 and 99-20. In our opinion, the sediment clean-up levels established at 810 parts per million (ppm) for copper, 820 ppm for zinc, 231 ppm for lead, 4.2 ppm for mercury, and 0.95 ppm for PCBs are not protective of fish and wildlife resources found in San Diego Bay."

"...the data used to develop the Campbell AETs included sites which showed measureable toxicity. "

"Our concern for these cleanup levels stems not only from our review of the Campbell and Commercial Basin studies, but also from new information that has become available since the AET's were established for Campbell's and Commercial Basin sites.... The BPTHS data indicates that several sites around the State had concentrations of copper above 400 ppm, zinc above 630 ppm, lead above 171 ppm, mercury above 1.54, and PCBs above 0.865. The sites that had sediment at these concentrations were classified as being in the top 5% of the worst sites in the State for these contaminants. Additional, acute toxicity was shown to be associated with these contaminant levels. For copper, 86% of the samples at 400 ppm or above showed toxicity. The acute toxicity percentages for lead at 171 ppm was 89%, for zinc at 630 ppm it was 74% acute toxicity, for mercury at 1.54 ppm there was 59% acute toxicity, and PCBs at 0.95 showed 63% acute toxicity. It should be noted that the same amphipod test was utilized to determine toxicity for both the Campbell study and the BPTHS study."

"Additional justification for our concerns can be found in screening guidelines produced by the National Oceanic and Atmospheric Agency (NOAA). These guidelines identify AET's for copper, zinc, mercury and PCBs as" copper = 390 ppm, zinc = 410 ppm, mercury = 0.41 ppm, and PCBs = 0.130 ppm. The NOAA AETs for these constituents are also well below those established by the subject resolutions."

"Finally, the State of Washington has recently passed legislation that establishes cleanup criteria based on AETs for Puget Sound. All of the Puget Sound AETs are well below those established by the subject resolutions."

NOAA

A September 12, 2003 letter raised significant concerns about the Distance from Shore Approach, the Statistical Approach, and the use of the reference pool. A proposal for a defensible set of reference stations was submitted on January 16, 2003. (Both attached)

State of Washington

In a letter dated June 17, 2002, Mr. Brett Betts suggested his concerns over the contaminated reference sites used by Exponent and suggested that all bay-wide data from the past 10 years be used. He also noted that Exponent reference stations 2, 3, 4 and 5 all failed to meet the standards that the State of Washington would allow.

US Fish and Wildlife Service

"The proposed clean-up levels for copper, zinc, lead, and PCBs at the project site exceed concentration levels that are toxic to benthic invertebrates"...
"The Service wants the opportunity to further discuss with the RWQCB clean-up levels designed for this site, along with other sites in San Diego Bay including National Steel and Shipbuilding (NASSCO) and Southwest Marine Shipyard. Our goal is to establish an approach acceptable to the RWQCB, National Oceanic and Atmospheric Administration, California Department of Fish and Game, and the Service, for determining contaminant clean-up levels at current and former shipyard sites that are protective of beneficial uses and trust resources that utilize San Diego Bay."
--US Fish and Wildlife Service to Melissa Mailander, San Diego Unified Port District. Letter dated September 24, 2003

"The Service does not agree that the contaminant clean-up levels for the Campbell Shipyard facility established in the San Diego Regional Water Quality Control Board (RWQCB) Cleanup and Abatement Order (CAO) 95-21 are stringent enough to guarantee long-term protection of fish and wildlife resources in San Diego Bay."
--US Fish and Wildlife Service to John Robertus, Executive Officer, Regional Water Board, Letter dated November 5, 2003

Regional Board should Incorporate the Resolution on Environmental Justice adopted October 14, 2003

On October 14, 2003, the CAL-EPA Interagency Working Group on Environmental Justice adopted a resolution endorsing the California Environmental Justice Advisory Report (EJ Committee) and stated its intention to use the goals and recommendations contained therein to develop an EJ strategy by December 31, 2003. The Regional Board should anticipate these actions by reflecting the goals and recommendations in the Committee report in this CAO. (Resolution attached)

Consideration of TBT must be elevated as an important Shipyard chemical

The experts' letters will further detail our concerns regarding this chemical. Attached is the EPA proposed reduction of the saltwater chronic criterion demonstrating the toxicity and impact of this chemical in our marine environments. The proposed criterion is to be "lowered from a 4-day average of 0.01 ug/l to 0.001 ug/l—a very significant reduction but understandable given the bioaccumulative tendencies of this chemical.

Environmental Justice requires contaminant removal, not continued exposure

Among the most egregious claims by Exponent is that leaving toxic sediment loaded with dangerous bioaccumulating substances in the Bay to poison fish, wildlife, and people for years to come is the best solution to promote environmental justice. As participants in the Environmental Justice Demonstration Project the Shipyards should know better than to exploit this issue so shamelessly. They know full well that removal of the sediments, even if trucks need to be used, can be accomplished in a manner that minimizes impacts to the neighboring community. They also fail to note their own operational and historical cumulative impacts from water, soil, and air pollution on the neighboring communities. The contaminated Bay is another impact on the residents of Barrio Logan on a long list of negative shipyard impacts.

In the Cleanup and Abatement Order the Regional Board should include the following findings or requirements:

- The removal of contaminated sediment (that cannot be taken to LA-5) use rail as a mode of transportation to an appropriate landfill.

- The use of some material as landfill cover be explored.

- That the mitigations provided in a comment letter by the Air Pollution Control District on the Campbell's cleanup be adopted including:

- If trucks are used, they should be required to include technologies that reduce diesel emissions.
- That an electric dredge be used to reduce emissions in the region.

- If trucks are used, then routes must be required that travel around and not through the community of Barrio Logan. No trucks can be allowed down Cesar Chavez Parkway.

Regional Board should conduct its own assessment of dredging costs

Dredging costs have been driven up in San Diego Bay in the past few years due to the massive amounts of dredging done by the US Navy. The costs for dredging for cleanup in other areas are far less. While often costs are figured here at $100/ton, in other areas it is accomplished for $30/ton. The Regional Board should conduct its own analysis of costs for dredge and removal.

Regional Board cannot support natural attenuation as it won't cleanup anything and will not protect beneficial uses in the short or long term.

The "remedy" recommended in the Exponent report is no remedy. The most dangerous chemicals at this site don't lose their toxic or bioaccumulative qualities for 100's of years. Many don't break down at all. In a recent hearing, a consultant for the Port District was queried by a Commissioner about how long these wastes remain toxic. "Millennia" was his answer. Apparently the only "remedy" that attenuation can provide is that toxic and bioaccumulative contaminants will gradually contaminate an ever-widening portion of the Bay and further exacerbate acutely and cumulatively to continued degradation of this natural resource.

Even NASSCO has recognized the folly of Do-Nothing "Solution"

In a September 13, 2000 Proposal to Conduct Additional sediment toxicity tests in order to establish sediment cleanup levels for National Steel and Shipbuilding Company, signed by Janice Grace, Vice President of Operations. (attached) It states:

"<u>No Action</u>: This approach is a recognized, accepted approach to remediation projects both in California and elsewhere in the United States. In this specific case, however, NASSCO acknowledges that the time to achieve the performance goals is too great, and accordingly this approach must be rejected." We agree.

Groundwater contamination at NASSCO needs to be assessed and reviewed as a source.

There is a plume of chlorinated solvents on the NASSCO Land-side. DTSC is reviewing a workplan and DTSC officials should be contacted regarding this plume. It is also of concern that the contaminants appear to be near Way 4 and could be leaching or otherwise being discharged into the Bay. The Regional Board needs to include an assessment of this source.

Regional Board should include a listing of previous violations by the Shipyards

NASSCO and SWM have extensive records of violations and threats to water quality. Further, there have been frequent spills of petroleum products at the yards from ships under repair. These facts must be included in the CAO as additional evidence that the waste polluting San Diego Bay is from their operations.

Who is Exponent?

Attached is a list of "Selected Exponent sediment experience" submitted to you by NASSCO in March 2000. Even though many of their clients are "Confidential", their work in other areas is revealing. Here are some highlights of what Exponent has done to other regions in the Nation.

Working for a confidential client on the Saginaw River Basin Exponent reviewed data from more than 12 manufacturing plants and *"Used data to develop case summaries and defense strategies for various alleged injuries, including exceedances of water quality criteria, exceedances of sediment quality criteria...excessive bioaccumulation of contaminants in* *fish and issuance of fish consumption advisories; excessive bioaccumulation, impaired reproduction, and other adverse effects in a variety of bird species…."*

Working for the Chemical Manufacturers Association Exponent reviewed the Michigan Sport Fishing and reports on the procedure to determine bioaccumulation factors resulting in their *"recommendation that EPA's proposed bioaccumulation model be withdrawn because the underlying assumption of equilibrium is not valid for predicting bioaccumulation factors."*

Other miraculous results have occurred when Exponent worked for AlliedSignal in New York looking, apparently, at mercury and *"results of the sediment component of the ecological risk assessment indicate that although widespread sediment contamination occurs in the lake, adverse biological effects are generally confined to a relatively small portion of the lake"*

In each of these cases Exponent's findings sound more like biased advocacy than unbiased scientific analysis.

Conclusion

The law is clear. The presumption of cleanup is to background. Infeasibility has not been proved. Background has been credibly defined by the Regional Board staff. The shipyard's interest in quick resolution to this problem would be better served by applying the money spent on Exponent to removal of all contaminated sediments to background levels.

We strongly urge the Board to reject the recommendations contained in the report as undefensible and non-protective of the beneficial uses of San Diego Bay.

Sincerely,

Laura Hunter
Environmental Health Coalition

Bruce Reznik
San Diego Baykeeper

Jim Peugh
San Diego Audubon Society

Marco Gonzalez
Surfrider Foundation,
San Diego Chapter

Ed Kimura
Sierra Club
San Diego Chapter

David Rosenfeld
International Brotherhood of
Electrical Workers Local 569

Additional Bay Council's Expert Comment Letters From Ed Kimura and Elaine Carlin follow this letter

December 4, 2003
San Diego Bay Council Memorandum by Ed Kimura

December 5, 2003
Comments on the September 3, 2003 Exponent Report "NASSCO and Southwest Marine Detailed Sediment Investigation" Prepared by Elaine M. Carlin, Consultant to the San Diego Bay Council

Attachments and References for San Diego Bay Council and Expert Comment Letters on Exponent Technical Report Submitted to the Regional Water Quality Control Board, San Diego Region

December 5, 2003

1995
Incidence of Adverse Biological Effects Within Ranges of Chemical Concentrations in Marine and Estuarine Sediments; Edward Long et al., Environmental Management, Vol. 19, No. 1 , pp.81-97.

July 25, 1996
SMS Technical Information Memorandum" Statistical Evaluation of Bioassay Results

1998
Troubled Waters: A Call for Action: A consensus reached at the opening of the International Year of the Oceans, signed by over 1600 marine scientists

March 24, 1999
Memorandum from Department of Fish and Game to Mr. John Robertus, Executive Officer, Regional Water Quality Control Board, San Diego Region,

March 2000
UNEP Global POPS Treaty: The Precautionary Principle and Persistent Organic Pollutants Issue Paper, Ted Schettler, MD, MPH, Science and Environmental Health Network

July 26, 2000
Johnson LL. (2000). *An analysis in support of sediment quality thresholds for polycyclic aromatic hydrocarbons (PAHs) to protect estuarine fish.* Internal report, NMFS. Memo from Tracy K. Collier, through John E. Stein, to Steven Landino. July 26, 2000. Northwest Fisheries Science Center, NMFS, NOAA. Seattle, WA.

September 13, 2000
Proposal to Conduct Additional sediment toxicity tests in order to establish sediment cleanup levels for National Steel and Shipbuilding Company, signed by Janice Grace, Vice President of Operations, NASSCO

October 4, 2000
Letter from Environmental Health Coalition regarding sediment cleanup levels at NASSACO and SWM

October 13, 2000
Meador JP, Collier TK., and Stein JE. *An analysis in support of tissue and sediment based threshold concentrations of polychlorinated biphenyls (PCBs) to protect juvenile salmonids listed by the Endangered Species Act.* 138KB, 48p, October 2000

November 6, 2000
Letter from Moss Marine Laboratory

December 2000
EPA Fact Sheet on Stressor Identification Guidance Document

January 2001
A Sea of Troubles, a Report of the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) #70.

August 24, 2001
Memorandum regarding Regional Water Board Workshop, DTSC to Tom Alo, Regional Water Quality Control Board, San Diego Region.

August 21, 2001
Bay Council letter on Phase 1

February 22, 2002
Applicability of State Board Resolution 92-49 in Setting Sediment Cleanup Levels,
State Water Board to San Diego Regional Board

March 6, 2002
Background Reference Conditions for Assessment and Remediation of Contaminated Sediments at NASSCO and Southwest Marine Shipyards, Letter from Regional Water Board to Mr. Mike Chee and Mr. Sandor Halvax

March 6, 2002
March 18, 2002
Comment letters from San Diego Bay Council Consultant Elaine Carlin.

May 8, 2002
Evaluation of Phase 1 Benthic Macroinvertebrate Data and Sediment Profile Imaging for the NASSCO and Southwest Marine Sediment Investigation in San Diego Bay, Prepared by Richard E. Ford, PhD for the San Diego Bay Council

June 17, 2002
Evaluation of San Diego Bay Reference Station Chemistry and Bioassay Results, Mr. Brett Betts, State of Washington to Laura Hunter, Environmental Health Coalition

September 23, 2002
Oceans of Trouble, says U.S. Panel, CBS news report
November 21, 2002
U.S. EPA Region 9 Biological Technical Assistance Group (BTAG) Recommended Toxicity Reference Values for Mammals

November 2002
Fish Consumption and Environmental Justice: A Report Developed for the National Environmental Justice Advisory Council Meeting of December 3-6, 2001

December 2002
EPA Fact Sheet: *Notice of Draft Ambient Water Quality Criteria Document for Tributltin (TBT)*

January 16, 2003
An Approach for Selecting a San Diego Bay Reference Envelope to Evaluate Site-Specific Reference Stations, Donald MacDonald and Denise Klimas, NOAA

April 2003
Bear Trouble by Marla Cone, Smithsonian Magazine

May 5, 2003
Bay Council proposal for a set of reference stations, San Diego Bay Council letter and attachments to San Diego Regional Board.

June 27, 2003
UN Committee recommends new dietary intake limits for mercury; World Health Organization news release

September 24, 2003
Comment letter on the Draft Supplemental Environmental Impact Report for Campbell Sediment Remediation Aquatic Enhancement (SCH 2002031096, UPD 83356-EIR-550), San Diego Bay, *California,* Letter from Therese O'Rourke, Assistant Field Supervisor, US Fish and Wildlife Service to San Diego Unified Port District

September 30, 2003
Recommendations of the Cal/EPA Advisory Committee on Environmental Justice to the Cal/EPA Interagency Working Group on Environmental Justice, Final Report

October 14, 2003
Resolution by the State of California, Cal EPA, Interagency Working Group on Environmental Justice

November 5, 2003
Comment letter on the Draft Supplemental Environmental Impact Report for Campbell Sediment Remediation Aquatic Enhancement (SCH 2002031096, UPD 83356-EIR-550), San Diego Bay, *California,* Letter from Therese O'Rourke, Assistant Field Supervisor, US Fish and Wildlife Service to John Robertus, Executive Officer, San Diego Regional Board.

Troubled Waters: A Call for Action

A consensus reached at the opening of the International Year of the Oceans, 1998

We, the undersigned marine scientists and conservation biologists, call upon the world's citizens and governments to recognize that the living sea is in trouble and to take decisive action. We must act quickly to stop further severe, irreversible damage to the sea's biological diversity and integrity.

Marine ecosystems are home to many phyla that live nowhere else. As vital components of our planet's life support systems, they protect shorelines from flooding, break down wastes, moderate climate and maintain a breathable atmosphere. Marine species provide a livelihood for millions of people, food, medicines, raw materials and recreation for billions, and are instrinsically important.

Life in the world's estuaries, coastal waters, enclosed seas and oceans is increasingly threatened by:

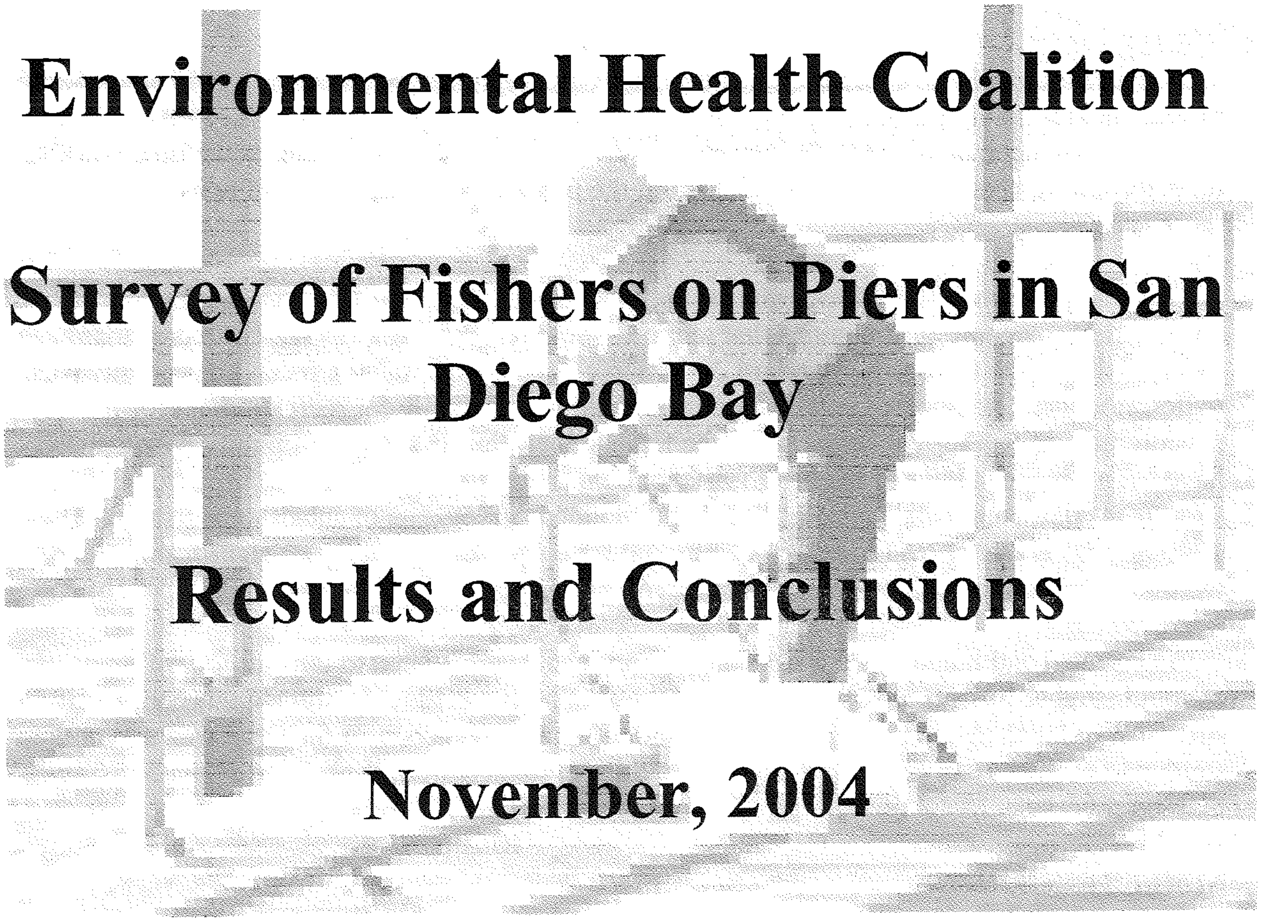
1. overexploitation of species
2. physical alteration of ecosystems
3. pollution
4. introduction of alien species
5. global atmospheric change.

Scientists have documented the extinction of marine species, disappearance of ecosystems and loss of resources worth billions of dollars. Overfishing has eliminated all but a handful of California's white abalones. Swordfish fisheries have collapsed as more boats armed with better technology chase ever fewer fish. Northern right whales have not recovered six decades after their exploitation supposedly ceased. Cyanide and dynamite fishing are destroying the world's richest coral reefs. Bottom trawling is scouring continental shelf seabeds from the poles to the tropics. Mangrove forests are vanishing. Logging and farming on hillsides are exposing soils to rains that wash silt into the sea, killing kelps and reef corals. Nutrients from sewage and toxic chemicals from industry are overnourishing and poisoning estuaries, coastal waters and enclosed seas. Millions of seabirds have been oiled, drowned by longlines, and deprived of nesting beaches by development and nest-robbing cats and rats. Alien species introduced intentionally or as stowaways in ships' ballast tanks have become dominant species in marine ecosystems around the world. Reef corals are succumbing to diseases or undergoing mass bleaching in many places. There is no doubt that the sea's biological diversity and integrity are in trouble.

To reverse this trend and avert even more widespread harm to marine species and ecosystems, we urge citizens and governments worldwide to take the following five steps:

1. Identify and provide effective protection to all populations of marine species that are significantly depleted or declining, take all measures necessary to allow their recovery, minimize bycatch, end all subsidies that encourage overfishing and ensure that use of marine species is sustainable in perpetuity.
2. Increase the number and effectiveness of marine protected areas so that 20% of Exclusive Economic Zones and the Highs Seas are protected from threats by the Year 2020.
3. Ameliorate or stop fishing methods that undermine sustainability by harming the habitats of economically valuable marine species and the species they use for food and shelter.
4. Stop physical alternation of terrestrial, freshwater and marine ecosystems that harms the sea, minimize pollution discharged at sea or entering the sea from the land, curtail introduction of alien marine species and prevent further atmospheric changes that threaten marine species ecosystems.
5. Provide sufficient resources to encourage natural and social scientists to undertake marine conservation biology research needed to protect, restore and sustainably use life in the sea.

Nothing happening on Earth threatens our security more than the destruction of our living systems. The situation is so serious that leaders and citizens cannot afford to wait even a decade to make major progress toward these goals. To maintain, restore and sustainably use the sea's biological diversity and the essential products and services that it provides, we must act now.



Environmental Health Coalition

Survey of Fishers on Piers in San Diego Bay

Results and Conclusions

November, 2004

ABSTRACT

Environmental Health Coalition (EHC), a nonprofit environmental justice organization, has long been concerned about contaminated sediments in San Diego Bay and the possibility that disproportionate health impacts of the contamination are borne by the low-income communities of color that catch and eat fish from the bay. Previous studies of fish contamination in San Diego Bay did not explore the fish consumption patterns of people who do subsistence-type fishing, and did not consider the possibility that some people eat more of the fish than the fillet. EHC conducted a survey of people fishing from piers near areas where contaminated sediments have been found in San Diego Bay. A total of 109 fishers were interviewed in English, Spanish, or Tagalog as appropriate, during the winter and spring of 2004. Piers surveyed included Convention Center pier (downtown), Pepper Park pier (National City), and the Chula Vista pier. 58% of the surveyed fishers fish at least once a week, and 25% fish daily. Almost 70% of the fishers eat their catch. 41% of the children of fishers eat the fish as well, as reported by interviewee. The number of fish caught at a time varied from 1 to 20. Frying and stewing were the cooking methods mentioned most often. The study does not attempt to sample of all fishers from San Diego Bay; however, it establishes that a significant subset of people regularly catch and eat fish from the piers near contaminated areas of the bay.

Introduction

Environmental Health Coalition's Clean Bay Campaign was established in 1987 in response to data that found high levels of dangerous chemicals in the shellfish of San Diego Bay. Since then EHC has been involved in the clean up of contaminated sediment sites of the Bay, working on determining health risks of eating fish from the Bay and advising community members of these risks.

As an environmental justice organization, EHC is very concerned about communities of color and low-income communities that rely on "subsistence fishing" as well as recreational use of bay fish. While there is no standard definition of subsistence fishing it can be generally used to describe local, non-commercial fisheries oriented not primarily for recreation but for the procurement of fish for consumption of the fishers, their families and community. While there have been limited studies of the health risks of eating Bay fish, they have suffered from significant flaws and data gaps; none of them included survey data of subsistence fishers. The 1990 *San Diego Bay Fish Health Risk Study* did state that health risks were significant, if fish were to be consumed at subsistence rates of 165 grams per day.

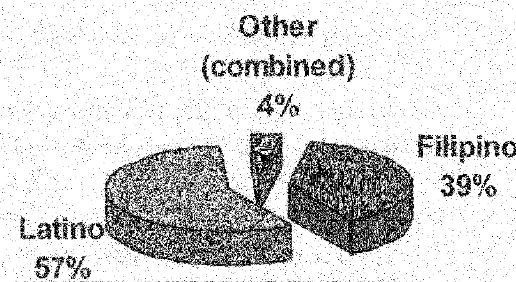
Ecological and human health risks are a significant issue related to the clean up of contaminated sediments at NASSCO and Southwest Marine. EHC conducted this community survey in order to obtain basic information about fishing off piers near the shipyards and in the south end of the bay to ensure the interests of this population were considered in the decision-making process.

Methods

We surveyed a total of 109 people fishing from Convention Center pier, Pepper Park pier, and Chula Vista fishing piers. A total of 10 surveys were completed at the Convention Center pier, 79 at Pepper Park pier, and 20 at the Chula Vista pier during the winter and spring months of 2004. The questionnaire was developed by EHC staff and pilot-tested for clarity. An EHC community organizer administered the survey orally, along with associates who were fluent in Tagalog, Spanish, or English as required. Each survey took approximately 10 minutes to administer. Survey data was then entered into an Excel spreadsheet, and analysis was done using SPSS software, Version 9. Survey questionnaire attached.

Results

The survey population of 109 fishers was mostly people of Latino or Filipino descent, with smaller numbers of Native American, African American, and European Americans. Surveyed fishers are from the south bay area, including the Logan area of San Diego, National City, Chula Vista, Bonita, Spring Valley, and Tijuana. The survey group represents an opportunity sample of fishers from south bay piers; it is not a randomized sample.



Of the 109 fishers surveyed:

- Filipino fishers comprised 39% of the survey sample
- Latino fishers comprised 57% of the survey sample
- 78% have children. The number of children ranges from 1 to 6, with an average of 2.
- 61% eat the fish they catch. Another 2% give it away; someone is eating that fish.
- 58% of the sample, fish one or more times a week. Of these, 25% fish daily or almost daily (4 to 7 times per week).
- Of these, 72% who fished at least one or more times a week and 98% who fished daily or almost daily (4 to 7 times per week) are Filipino
- 55% of the Filipino fishers fish daily and 98% fish weekly.
- Latino fishers accounted for 7% of those who fish daily or almost daily (4 to 7 times per week,) and 24% of those who fish one or more times a week.
- The breakdown among Latinos as a group: 3% fish daily or almost daily (4 to 7 times per week) and 23% fish one or more times a week.
- Other ethnic groups were too small to be tabulated separately.
- The number of fish caught at one time ranged from 1 to 20, with an average of 1.7.
- Species of fish caught include mackerel, bass, sting ray, yellowtail, and bonita.
- Methods of cooking fish include stewing, frying, baking, and barbequing, with frying and stewing mentioned most often.
- 12.6% of the sample reported eating fish skin, an indication that fish are sometimes eaten whole, or that parts of the fish other than fillets are eaten.
- 73% of the sample eats other types of seafood, in addition to what they catch themselves. Fishers who eat their own fish are statistically more likely to also eat other seafood.

- Of the 209 children represented in this survey, 41% eat fish. Of these children, 62% have a parent who fishes at least weekly.

These results suggest that, at the high end of the exposure continuum, a subset of children may be eating fish once to several times weekly, eating relatively large amounts, and eating other seafood as well.

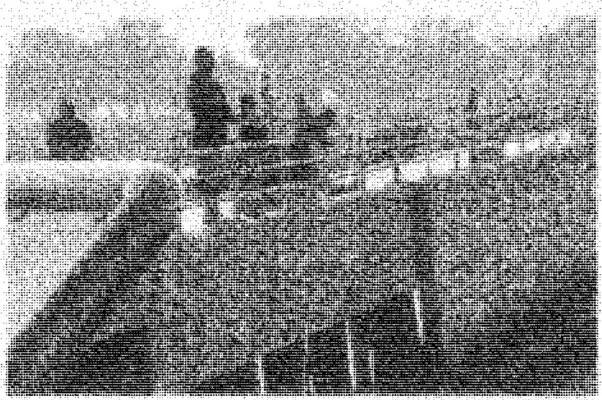
Discussion and Conclusions

Our survey sample is a selective sample of a group that is highly exposed to fish from near the shipyards and the southern portion of San Diego Bay; it is not a representative sample of all San Diego Bay fishers or all south bay residents. The analysis of the survey extrapolated income based on place of residence[1] and they appear to be engaged in subsistence fishing. The number of fishers found at these three piers establishes that subsistence pier fishing is a common practice and may be thought of as a subculture rather than an isolated hobby of a few individuals.

This survey provides the first San Diego-specific data on subsistence fishing. It confirms that estimates made of the quantities of fish eaten by subsistence fishers in other places also apply here. The frequency of fishing and fish eating in our pier fishing population is very different than that of statistically average Americans and may reach the 161-165 grams per day level which is a level of higher or "subsistence" consumption.

Our survey also establishes that fish are not always filleted. 13% of our sample reported eating fish skin, among them people who fish frequently and who catch large amounts of fish. A health-conservative estimation of the exposure to fish contaminants must assume that whole fish are eaten. Likewise, methods of cooking fish include frying and stewing, two methods that remove less contamination than other methods.

In conclusion, our survey provides evidence that a subpopulation of San Diegans engages in subsistence fishing off of piers near the shipyards and contaminated areas in San Diego Bay. Among this subpopulation are individuals who fish daily, who catch up to 20 fish at a time, who stew fish, who eat fish parts other than fillets, and who feed fish to their children.



[1] According to the 2000 Census, 35% of families in the Logan area of San Diego have incomes below the federal poverty level. In National City, 20% of families live below the federal poverty level.

EHC Recommendations

Due to the significant environmental justice considerations in protecting this subpopulation, all decisions made regarding cleanup, remediation, and permitting of additional discharges to the Bay must be made in the context of protecting the health of environmental justice communities as outlined in EHC's *How to Achieve Environmental Justice and Implement Precaution in Sediment Cleanup Decisions in San Diego Bay: An environmental justice model for decision-making.*

As a result of this study, EHC proposes the following recommendations be pursued:

1. Consider the environmental justice impacts in decision-making and implement precaution in all permitting and regulatory decisions.

2. Establish protective clean up levels for remediation of toxic sediments in San Diego Bay and protective sediment quality objectives for the State.

3. Revise the Fish Consumption Warning for San Diego Bay based on higher consumption levels.

4. Update and replace fish warning signs to include Tagalog

5. DTSC in conjunction with OEHHA should initiate an outreach and education program to educate fishers of the Bay of the risks of consuming Bay fish and some means to reduce them.

6. State and federal agencies with trust responsibilities for ecosystem and human health should be included and actively participate in environmental and land use planning decisions that impact the safety of the food chain in San Diego Bay.

APPENDICES

- Copy of Survey Results
- Copy of Survey Questionnaire in English, Spanish and Tagalog
- Summary of Selected Studies Related to Toxic Contamination in San Diego Bay Fish and Sediments
- *How to Achieve Environmental Justice and Implement Precaution in Sediment Cleanup Decisions in San Diego Bay: an environmental justice model for decision-making.* Environmental Health Coalition; October, 2004
- Safe Fish Consumption- PSR handout
- Media Clips

SUMMARY OF SELECTED STUDIES RELATED TO TOXIC CONTAMINATION IN SAN DIEGO BAY FISH AND SEDIMENTS

Exponent Technical Report, Phase 2
Tissue concentrations in fillets in fish examined in the study were as high as 400 ppb for PCBs. The Tissue Residue Guideline is 20ppb for PCBs.

Chemistry, Toxicity, and Benthic Community Conditions in Sediments of the San Diego Bay region; September 1996, State Water Resources Control Board, et al.
An extensive scientific assessment of San Diego Bay sediments found extensive contamination of the Bay sediments with mercury, copper, zinc, PAH, chlordane, and PCBs. Over 56% of the Bay sediment is estimated to be acutely toxic to amphipods (a marine organism). As much as 74% of the area negatively impacts development of larval sea urchins. San Diego Bay ranked 7th highest for PCB contamination in the county and compared to other West Coast bay, it had the highest contamination of metals, PAHs, hydrocarbons and was most toxic in two out of three toxicity tests.

Risk Assessment for Consumption of Chemically-contaminated shellfish from San Diego Bay, California, Jon A. Van Rhyn, Fall, 1995
High potential cancer and health hazard risks were estimated for various shellfish contaminated with PCBs, Arsenic, TBT, Cadmium, Benzo(b)fluoranthene, Benzo[a]pyrene, and Benzo(a)anthracene at intermediate or high consumption rates.

Chemical Contamination and Associated Fish Diseases in San Diego Bay, Bruce McCain et al., published in Environmental Science Technology, 1992
Found that mean concentrations of PCBs in liver tissue and of selected aromatic compounds (e.f. aromatic hydrocarbons) and their metabolites in bile were also significantly higher in White croaker, barred sand bass, and black croaker than non-urban sites. Established link between fish diseases and contaminated sediments in San Diego Bay. Found the prevalence of liver neoplasms in black croakers the highest reported for a West Coast Marine species outside of Puget Sound. Relatively high prevalence of fin erosion were found in black croakers and barred sand bass in the Bay. Study indicated that sites in south and central Bay are among the most polluted sites sampled so far in the Bay. Aromatic hydrocarbons have not declined in the Bay.

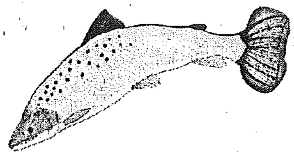
Health risk assessment of consuming arsenic-containing fish from San Diego Bay, California, Unpublished master's thesis, San Diego State University, J.R. Smith, 1991, cited in Van Rhyn, 1995
Investigated total arsenic exposures from fish collected within and outside the bay. Excess carcinogenic risks at 140 g/day were found to range from 300 in a million to 1 in a 100. These are very high estimated cancer risks.

San Diego Bay Fish Health Risk Study, June 1990, County Health Department
Found elevated levels of mercury, arsenic, and PCBs in some Bay fish. PCBs were found at levels which represent a potential elevated cancer risk when consumption rates were estimated at only 1.1 oz a day. Mercury was estimated as a potential level of concern for unborn or young children at low consumption rates and for individuals who consume fish at higher rates. Evidence of radiation was also found in some fish. Study led to the posting of San Diego Bay against consumption of fish by sensitive populations.

Coastal Environmental Quality in the United States, 1990, National Oceanic and Atmospheric Administration

San Diego Bay sediment exhibited high concentrations of cadmium, copper, lead, mercury, silver, zinc, PCB, PAH and total chlordane. On the basis of this contamination, San Diego Bay was rated as one of the most contaminated urbanized coastal areas in the nation.

2004 National Forum on Contaminants in Fish



January 25–28, 2004
San Diego, California

List of Registrants

☐
Charles Abernathy
Toxicologist
U.S. EPA - HECD
Ariel Rios Building
1200 Pennsylvania Ave, N.W.
Washington, DC 20460
Phone: 202-566-1084
Fax: 202-566-1140
E-mail: abernathy.charles@epa.gov

☐
Dianne Albright
Environmental Planner
Lytton Rancheria
1250 Coddingtown Center
Suite 1
Santa Rosa, CA 95401
Phone: (707) 575-5917
Fax: (707) 575-6974
E-mail: Dseidneralbright@aol.com

☐
Tom Alo
WRCE
California Water Quality Control Board
9174 Sky Park Court
Suite 100
San Diego, CA 92123
Phone: 858-636-3154
Fax:
E-mail: alot@rb9.swrcb.ca.gov

☐
Jeffrey Armstrong
Scientist
Orange County Sanitation District
PO Box 8127
Fountain Valley, CA 92827-8127
Phone: (714) 593-7455
Fax: (714) 962-2591
E-mail: jarmstrong@ocsd.com

☐
David Acheson, Ph.D.
U.S. Food and Drug Administration
5100 Paint Branch Pkwy
HFS-006 Room 2B-004
College Park, MD 20744
Phone: (301) 436-1910
Fax: (301) 436-2633
E-mail: david.acheson@cfsan.fda.gov

☐
Lanetta Alexander
Director, Environmental Epidemiology
Indiana State Department of Health
2 North Meridian
Section 3D
Indianapolis, IN 46204
Phone: 317-233-7162
Fax: 317-233-7378
E-mail: lalexand@isdh.state.in.us

☐
Henry Anderson
Wisconsin Department of Health & Family Services
1 West Wilson Street
P.O. Box 7850
Madison, WI 53707-7850
Phone: 608-266-1253
Fax:
E-mail: anderha@dhfs.state.wi.us

☐
Deborah Arnwine
Environmental Specialist V
Tennessee Department of Environment and Conservation
Tennessee DEC - Division of Water Pollution Control
7th Floor L & C Annex
Nashville, TN 37243-1534
Phone: 615-532-0699
Fax: 615-532-0046
E-mail: debbie.arnwine@state.tn.us

☐
Holly Arrigoni
Life Scientist
U.S. EPA - Region 5
Water Quality Branch
77 W. Jackson Blvd, WQ-16J
Chicago, IL 60611
Phone: 312-886-6822
Fax:
E-mail: arrigoni.holly@epa.gov

☐
Donald Axelrad
Florida Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, FL 32399-2400
Phone: 850-414-1347
Fax:
E-mail: don.axelrad@dep.state.fl.us

☐
Wayne Ball
Toxicologist
Utah Department of Health
PO Box 142104
Salt Lake City, UT 84094
Phone: 801-538-6191
Fax: 801-538-6564
E-mail: wball@utah.gov

☐
Alex Barron
Virginia Department of Health
1500 East Main Street
Room 124
Richmond, VA 23218
Phone: 804-786-1763
Fax:
E-mail: abarron@vdh.state.va.us

☐
Michael Bender
Director
Mercury Policy Project
1420 North St.
Montpelier, VT 05602
Phone: 802 223-9000
Fax:
E-mail: mercurypolicy@aol.com

☐
Annette Ashizawa, Ph.D.
Epidemiologist
CDC/ATSDR
1600 Clifton Road NE
Mailstop F-29
Atlanta, GA 30333
Phone: (770) 488-3338
Fax: (770) 488-4178
E-mail: ADA8@cdc.gov

☐
Walter Baker
Assistant Director
Utah Division of Environmental Quality
PO Box 144870
Salt Lake City, UT 84114-4870
Phone: 801-538-6008
Fax: 801-538-6088
E-mail: wbaker@utah.gov

☐
Kristie Baptiste
Environmental Policy Analyst
Nez Perce Tribe
PO Box 365
Lapwai, ID 83540
Phone: (208)843-7375
Fax: (208)843-7378
E-mail: kristieb@nezperce.org

☐
Joseph Beaman
Maryland Department of the Environment
1800 Washington Blvd.
Baltimore, MD 21230
Phone: 410-537-3906
Fax:
E-mail: jbeaman@mde.state.md.us

☐
Jeffrey Bigler
Co-Chair
U.S. EPA - Office of Science & Technology
1200 Pennsylvania Ave. NW
Washington DC, DC 20460
Phone: 202-566-0389
Fax:
E-mail: bigler.jeff@epa.gov

☐
Stephen Blackwell
ATSDR
1600 Clifton Road
Atlanta, GA 30333
Phone: 404-498-0321
Fax: 404-498-0061
E-mail: sblackwell@cdc.gov

☐
Tammy Blazys
QA Technician
Stolt Sea Farm, Inc.
350 Long Beach Blvd.
Stratford, CT 06615
Phone: (203) 345-0200
Fax:
E-mail: tammy.blazys@stoltseafarm.com

☐
Susan Boehme
Project Director
New York Academy of Sciences
2 E. 63rd Street
New York, NY 10021
Phone: 212.838.0230 x403
Fax: 212.838.6719
E-mail: sboehme@nyas.org

☐
Steve Bradbard
U.S. Food and Drug Administration, Consumer Studies
DHHS/FDA/CFSAN/OSAS/DMST
College Park, MD 20740
Phone:
Fax:
E-mail: steve.bradbard@fda.hhs.gov

☐
Dr. Pamela Bridgen
CEO
Environment International Ltd.
5505 34th Avenue NE
Seattle, WA 98105
Phone: (206) 525-3362
Fax: (206) 525-0869
E-mail: pj.bridgen@envintl.com

☐
Todd Blanc
Environmental Specialist, Risk Assessment
Missouri Department of Health and Senior Services
930 Wildwood Drive
Jefferson City, MO 65102
Phone: 573-751-6160
Fax: 573-526-6946
E-mail: blanct@dhss.mo.gov

☐
Catherine Bodurow
Senior Scientist
U.S. EPA - Office of Science Coordination & Policy
1200 Pennsylvania Ave. NW
MC 7203M
Washington, DC 20460
Phone: (202)564-8481
Fax: (202)564-8482
E-mail: joseph.catherine@epa.gov

☐
Brian Boltz
Yellowhawk Tribal Health Center
PO Box !60
Pendleton, Or 97801
Phone: 541-966-9830
Fax: 541-278-7572
E-mail: bboltz@yel.portland.ihs.gov

☐
Mark Brady
Environment International Ltd.
5505 34th Avenue NE
Seattle, WA 98105
Phone: (206) 525-3362
Fax: (206) 525-0869
E-mail: mark.brady@envintl.com

☐
Robert Brodberg
California Environmental Protection Agency, Office of Environmental Health Hazard Assessment
Office of Environmental Health Hazard Assessment
301 Capitol Mall
Sacramento, CA 95814-4327
Phone: (916) 323-4763
Fax:
E-mail: rbrodber@oehha.ca.gov

☐
Barbara Brooks
Hawaii Department of Health
919 Ala Moana Blvd
Honolulu, HI 96814
Phone: 808-586-4249
Fax:
E-mail: bbrooks@eha.health.state.hi.us

☐
Kathryn Brown
Health Writer
East Oregonian Publishing Company
2206 NE 19th Ave.
Portland, OR 97212
Phone: (503)284-3532
Fax:

E-mail: kbbrown@eastoregonian.com

☐
Holly Brown-Williams
Associate Director
California Policy Research Center
University of California
1950 Addison St., #202
Berkeley, CA 94720-1182
Phone: 510-642-5514
Fax: 510-642-8793
E-mail: holly.brown@ucop.edu

☐
Gary Buchanan
Research Scientist
New Jersey Department of Environmental Protection - Division of Science, Research and Technology
PO Box 409
401 East State Street
Trenton, NJ 08625
Phone: 609-633-8457
Fax: 609-292-7340
E-mail: gary.buchanan@dep.state.nj.us

☐
Laina Bush
Policy Analyst
HHS
200 Independence Ave SW
Room 445F
Washington, DC 20201
Phone: (202)260-7329
Fax: (202)205-8835
E-mail: laina.bush@hhs.gov

☐
Michael Callam
Program Specialist
Nebraska Department of Environmental Quality
Suite 400 The Atrium
1200 N Street
Lincoln, NE 68509
Phone: 402-471-4249
Fax: 402-471-2909
E-mail: michael.callam@ndeq.state.ne.us

☐
Linda Candler
Vice President
National Fisheries Institute
1901 N. Ft. Myer Dr.
Suite 700
Arlington, VA 22209
Phone: 703-778-4134
Fax: 703-524-4619
E-mail: lcandler@nfi.org

☐
Craig Carlisle
CA RWQCB
9174 Sky Park Court, Suite 100
San Diego, CA 92123
Phone: (858) 637-7119
Fax: (858) 571-6972
E-mail: craigc@rb9.swrcb.ca.gov

☐
David Carpenter
University at Albany, SUNY, Department of Environmental Health & Toxicology
East Campus B Wing, Room B242
One University Place
Rensselaer, NY 12144-3456
Phone: 518-525-2660
Fax: 518-525-2665
E-mail: carpent@uamail.albany.edu

☐
William Carvalho
President
Carvalho Fisheries
1585 Heartwood Dr. Ste. D
McKinleyville, CA 95519
Phone: (707) 839-3270
Fax: (707) 839-3260
E-mail: carvalhofish@aol.com

☐
Pornkeo Chinyavong
Environmental Chemist
CSC
6101 Stevenson Ave
Alexandria, VA 22304
Phone: (703)461-2346
Fax: (703) 461-8056
E-mail: PChinyavong@CSC.com

☐
Kimberly Cornelison
Environmental Scientist
Louisiana Department of Environmental Quality
PO Box 4314
Baton Rouge, LA 70821
Phone: 2252193590
Fax: 2252193582
E-mail: kimberly.cornelison@La.gov

☐
David Crane
Laboratory Director
CA Dept of Fish and Game
2005 Nimbus Road
Rancho Cordova, CA 95670
Phone: 916-358-2859
Fax: 916-985-4301
E-mail: dcrane@ospr.dfg.ca.gov

☐
John Cubit
Injury Assessment Coordinator, SW
NOAA Damage Assessment Center
Suite 4470
501 W. Ocean Blvd.
Long Beach, CA 90802
Phone: (562) 980-4081
Fax: (562) 980-4065
E-mail: John.Cubit@noaa.gov

☐
Scott Daugherty
Aisling Group
39 Oakview Terrace
Jamaica Plain, MA 02130
Phone: 617-504-8718
Fax:
E-mail: daughertyst@earthlink.net

☐
Tracy Collier
NOAA Fisheries
2725 Montlake Blvd E
Seattle, WA 98112
Phone: 206 860 3312
Fax:
E-mail: tracy.k.collier@noaa.gov

☐
Carol Craig
Public Information Officer
Yakama Nation Fisheries Program
PO Box 151
Toppenish, WA 98948
Phone: (509) 865-6262
Fax:
E-mail: ccraig@yakama.com

☐
Steve Crawford
Passamaququoddy Tribe at Pleasant Point
Tribal Government Drive
Route 190
Perry, ME 04667
Phone: (207) 853-2600
Fax:
E-mail: stevecrawford@wabanaki.com

☐
Patricia Cunningham
Environmental Biologist
RTI International
800 Park Place Drive
Room G318
Research Triangle Park, NC 27709
Phone: (919) 316-3722
Fax: (919) 541-7155
E-mail: patc@rti.org

☐
Marjorie Davidson
U.S. Food and Drug Administration
DHHS/FDA/CFSAN/FSI/FSI
RM3B008, HFS-032
College Park, MD 20740
Phone: 301-436-1588
Fax:
E-mail: marjorie.davidson@cfsan.fda.gov

☐
Diane Davis
Administrative Assistant
Idaho Department of Health and Welfare
450 W State Street
6th floor
Boise, ID 83720
Phone: 208-334-0606
Fax: 208-334-6573
E-mail: davisd@idhw.state.id.us

☐
Melissa DeSantis
Public Outreach Specialist
Tetra Tech, Inc.
10306 Eaton Place
Suite 340
Fairfax, VA 22030
Phone: (703) 385-6000
Fax: (703) 385-6007
E-mail: melissa.desantis@tetratech-ffx.com

☐
Tim Drexler
RPM
U.S. EPA - Region 5
77 W. Jackson Blvd.
SF-5J
Chicago, IL 60604
Phone: (312) 353-4367
Fax: (312) 886-7191
E-mail: drexler.timothy@epa.gov

☐
David Drury
Sr. Engineer
Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, CA 95118
Phone: 408 265-2600
Fax:
E-mail: ddrury@valleywater.org

☐
Claude Dykstra
Survey Manager
International Pacific Halibut Commission
PO Box 95009
Seattle, WA 98145
Phone: 206-634-1838
Fax: 206-632-2983
E-mail: claude@iphc.washington.edu

☐
Vikki Denslow
4320 Mentone Street #4
San Diego, CA 92107
Phone: 619-223-1315
Fax:
E-mail: vikkitd@yahoo.com

☐
Rebecca Dotson
Travel and Conference Assistant
Tetra Tech, Inc.
10306 Eaton Place
Suite 340
Fairfax, VA 22030
Phone: (703) 385-6000
Fax: (703) 385-6007
E-mail: rebecca.dotson@tetratech-ffx.com

☐
Cerissa Drumm
H.& N Foods International
5580 South Alameda Street
Vernon, CA 90058
Phone: (323) 586-9317
Fax: (323) 586-9333
E-mail: cerissa_drumm@hnfoods.com

☐
Carlyle Ducheneaux
Superfund Pilot Project Director
Cheyenne River Sioux Tribe Environmental Protection Department
PO Box 590
Eagle Butte, SD 57625
Phone: (605) 964-6568
Fax: (605) 964-1072
E-mail: cducheneaux@crstepd.org

☐
Grace Egeland
McGill University
Centre for Indigenous Peoples' Nutrition and Environment
CINE Building
Montreal, Quebec, Canad H3A 2K6
Phone: 514-398-8642
Fax:
E-mail: egeland@macdonald.mcgill.ca

☐
Eric Eisminger
Kentucky Department of Water
14 Reilly Road
Frankfort, KY 40601
Phone: 502-564-3410
Fax:
E-mail: eric.eisminger@mail.state.ky.us

☐
Steven Ellis
Director, NW Water Services
Tetra Tech, Inc.
6100 219th Street SW, Suite 550
Mountlake Terrace, WA 98043
Phone: (425) 673-3676
Fax: (425) 673-9119
E-mail: steve.ellis@tetratech.com

☐
Dennis Fewless
North Dakota Department of Health - Environmental Health Section
1200 Missouri Avenue
Bismarck, ND 58504-5264
Phone: 701-328-5215
Fax: 701-328-5200
E-mail: dfewless@state.nd.us

☐
Einar Fleagle
Environmental Director
McGrath Native Village Council
P.O. Box 116
McGrath, AK 99627
Phone: (907) 524-3024
Fax: (907) 524-3899
E-mail: Einar@mcgrathalaska.net

☐
Peter H. Flournoy
General Counsel
American Fishermen's Research Foundation
740 North Harbor Drive
San Diego, CA 92101-5806
Phone: 619-232-0954
Fax: 619 232 2511
E-mail: phf@pacbell.net

☐
Jeffrey Ek
FIGH Project Assistant
Families in Good Health
411 E. 10th, St., Suite # 207
Long Beach, CA 90813
Phone: (562) 491-9100
Fax: (562)491-9824
E-mail: vek@chw.edu

☐
Robert Felix
Teratogen Information Specialist
CTIS Pregnancy Risk Information Line
UCSD Medical Center
200 West Arbor Drive, #8446
San Diego, CA 92103
Phone: 619-543-2128
Fax: 619-543-2066
E-mail: rfelix@ucsd.edu

☐
Jacqueline Fisher
Health Coordinator
U.S. EPA - Great Lakes National Program Office
77 W. Jackson Blvd.
mail code G17-J
Chicago, IL 60604
Phone: 312-353-1481
Fax: 312-353-2018
E-mail: fisher.jacqueline@epa.gov

☐
Luis Flores
RPM
U.S. EPA - Region 4
61 Forsyth St SW
Atlanta, GA 30303
Phone: 4045628807
Fax: 4045628788
E-mail: flores.luis@epa.gov

☐
Henry Folmar
MS Department of Environmental Quality
1542 Old Whitfield Road
Pearl, MS 39042
Phone: 601-664-3910
Fax:
E-mail: Henry_Folmar@deq.state.ms.us

☐
Dr. Jeffery Foran
Great Lakes Indian Fish & Wildlife Commission
5005 N. Palisades Rd.
Whitefish Bay, WI 53217
Phone: (414) 963-9299
Fax:
E-mail: Jforan@wi.rr.com

☐
Robert Frey
Pennsylvania Department of Environmental Protection
400 Market Street
10th Floor PO Box 8555
Harrisburg, PA 17105-8555
Phone: 717-787-9637
Fax:
E-mail: rofrey@state.pa.us

☐
Vicki Fry
Associate Civil Engineer
Sacramento Regional County Sanitation District
10545 Armstrong Avenue
Suite 101
Mather, CA 95655
Phone: (916) 876-6113
Fax: (916) 876-6160
E-mail: FRYV@SACCOUNTY.NET

☐
Paula Galloway
Marketing Assistant
EWOS Canada Ltd
1720-14th Avenue, Suite 212
Campbell River, BC V9W8B9
Phone: (250)286-8361
Fax: (250)286-0788
E-mail: paula.galloway@ewos.com

☐
Margy Gassel
Research Scientist II
California Environmental Protection Agency, Office of Environmental Health Hazard Assessment
1515 Clay Street 16th Floor
Oakland, CA 94612
Phone: (510) 622-3166
Fax: (510) 622-3218
E-mail: mgassel@oehha.ca.gov

☐
Anthony Forti
Research Scientist
New York State Department of Health
547 River Street Room 330
Troy, NY 12180
Phone: 518-402-7800
Fax: 518-402-7819
E-mail: ajf01@health.state.ny.us

☐
Eric Frohmberg
Maine Bureau of Health
Environmental Health Unit
11 State House Sta.
Augusta, ME 4333
Phone: 207-287-8141
Fax:
E-mail: eric.frohmberg@state.me.us

☐
Sharon Fuller
Executive Director
Ma'at Youth Academy
445 Valley View Rd.
Suite D
Richmond, CA 94803
Phone: (510) 222-6594
Fax: (510) 222-0274
E-mail: syfuller@igc.org

☐
Ephraim Garrett
Laboratory Director
National Seafood Inspection Laboratory
705 Convent Street
Pascagoula, MS 39567
Phone: 228-769-8964
Fax: 228-762-7144
E-mail: diane.east@noaa.gov

☐
Bob Gerlach
Alaska Department of Environmental Conservation
555 Cordova Street
Anchorage, AK 99501
Phone: 907-269-7635
Fax: 907-269-7510
E-mail: bob_gerlach@dec.state.ak.us

☐
Richard Greene
Environmental Engineer
Delaware DNREC
820 Silver Lake Boulevard
Suite 220
Dover, DE 19904-2464
Phone: 302-739-4590
Fax: 302-739-6140
E-mail: rgreene@state.de.us

☐
Daniel Hahn
Injury Assessment Coordinator
NOAA Damage Assessment Center
9721 Executive Center Dr. N., Suite 114
St. Petersburg, FL 33702
Phone: (727) 570-5391 x5715
Fax: (727) 570-5390
E-mail: daniel.hahn@noaa.gov

☐
Joel Hansel
Environmental Scientist
U.S. EPA - Region 4
61 Forsyth St. SW
Water Management Division
Atlanta, GA 30303
Phone: (404) 562-9274
Fax: (404) 562-9224
E-mail: hansel.joel@epa.gov

☐
George Henderson
Florida Department of Environmental Protection
100 Eighth Avenue Southeast
St. Petersburg, FL 33701-5020
Phone: 727-896-8626
Fax: 727-893-1679
E-mail: george.henderson@fwc.state.fl.us

☐
David Hohreiter
BBL
6723 Towpath Road
P.O. Box 66
Syracuse, NY 13214
Phone: 315-446-9120
Fax: 315-449-0017
E-mail: dh@bbl-inc.com

☐
Amanda Guay
Oregon Health Division - Office of Environmental Toxicology
800 NE Oregon Street
Suite 608 State Office Building
Portland, OR 97232
Phone: 503-731-4015
Fax:
E-mail: amanda.m.guay@state.or.us

☐
Michael Haire
U.S. EPA
1200 Pennsylvania Ave. NW 4503-T
Washington, DC, DC 20460
Phone: 202-566-1224
Fax: 202-566-1333
E-mail: haire.michael@epa.gov

☐
Rick Haverkate
Director of Health Services
Michigan Inter-Tribal Council
2956 Ashmun Street
Sault Ste. Marie, MI 49783
Phone: 906-632-6896 x 134
Fax: 906-635-4212
E-mail: rickh@itcmi.org

☐
Thomas Hinners
Research Chemist
U.S. EPA - Office of Research and Development
Environmental Sciences Division, NERL, ORD
944 East Harmon Avenue
Las Vegas, NV 89119
Phone: (702) 798-2140
Fax: (702) 798-2142
E-mail: hinners.tom@epa.gov

☐
Brenda Hoppe
Project Coordinator
Oregon Health and Science University
3181 SW Sam Jackson Park Road
Mailcode L606
Portland, OR 97239
Phone: (503) 494-1076
Fax: (503) 494-7397
E-mail: hoppeb@ohsu.edu

☐
Thomas Hornshaw
Manager, Toxicity Assessment Unit
Illinois Environmental Protection Agency
535 West Jefferson
Springfield, IL 62761
Phone: 217-785-0830
Fax: 217-782-1431
E-mail: thomas.hornshaw@epa.state.il.us

☐
Albert Huang
Policy Advocate
Environmental Health Coalition
1717 Kettner Blvd., Suite 100
San Diego, CA 92101
Phone: 619-235-0281
Fax:
E-mail: alberth@environmentalhealth.org

☐
Pamela Imm
Research Program Manager
Population Health Sciences
1 W. Wilson St., Room 150
Madison, WI 53703
Phone: (608) 267-3565
Fax: (608) 263-2820
E-mail: immpb@dhfs.state.wi.us

☐
LiJun Jin
Toxicologist
Idaho Department of Health and Welfare
450 W State Street
6th floor
Boise, ID 83720
Phone: 208-334-0606
Fax: 208-334-6573
E-mail: jinl@idhw.state.id.us

☐
Lin Kaatz Chary
Chicago School of Public Health, Environmental and Occupational Health Sciences
SPH, MC 922
Great Lakes Center-SPH; 2121 W. Taylor, Rm 210
Chicago, IL 60612
Phone: 312-413-1969
Fax:
E-mail: lchary@uic.edu

☐
Patti Howard
Water Quality Coordinator
Columbia River Inter-Tribal Fish Commission
CRITFC
729 NE Oregon Suite 200
Portland, OR 97232
Phone: (503) 238-0667
Fax: (503) 235-4228
E-mail: howp@critfc.org

☐
Laura Hunter
Director Clean Bay Campaign
Environmental Health Coalition
1717 Kettner Blvd., Suite 100
San Diego, CA 92101
Phone: 619-235-0281
Fax: 619-232-3670
E-mail: LauraH@environmentalhealth.org

☐
Guillermo Jaimes
Community Coordinator
Fish Contamination Education Collaborative (FCEC)
320 W. 4th St.
Ste 560
Los Angeles, CA 90013
Phone: (213) 576-6634
Fax: (213) 620-6573
E-mail: gjaimes@dhs.ca.gov

☐
Darcy Jones
Environmental Scientist
California State Water Resources Control Board
1001 I Street,
15th Floor
Sacramento, CA 95812
Phone: 916-323-9689
Fax: 916-341-5584
E-mail: joned2@dwq.sw.rcb.ca.gov

☐
Ian Kanair
ENR Director
Snoqualmie Tribe
P.O. Box 280
4480 Tolt Avenue
Carnation, WA 98014
Phone: (425) 333-6551
Fax:
E-mail: ian@snoqualmienation.com

☐
Jane Kay
Environment Writer
San Francisco Chronicle
901 Mission St.
San Francisco, CA 94103
Phone: 415-777-8704
Fax:
E-mail: jkay@sfchronicle.com

☐
Russell Keenan
Vice President - Technical Director
AMEC Earth & Environmental
15 Franklin Street
Portland, ME 04101
Phone: (207) 879-4222
Fax: (207) 879-4223
E-mail: russell.keenan@amec.com

☐
Bruce Kirschner
Environmental Scientist
International Joint Commission
PO Box 32869
Detroit, MI 48232
Phone: 519 257 6710
Fax: 519 257 6740
E-mail: kirschnerb@windsor.ijc.org

☐
Susan Klasing
Staff Toxicologist
CA EPA, OEHHA
1001 I Street
Sacramento, CA 95812
Phone: (530) 753-8335
Fax:
E-mail: sklasing@oehha.ca.gov

☐
Barbara Knuth
Cornell University
Department of Natural Resources
122A Fernow Hall
Ithaca, NY 14853
Phone: 607-255-2822
Fax:
E-mail: bak3@cornell.edu

☐
Denise Keehner
U.S. EPA
Ariel Rios Building (4305T)
1200 Pennsylvania Ave, N.W.
Washington, DC 20460
Phone: 202-566-1566
Fax:
E-mail: keehner.denise@epa.gov

☐
Edward Kimura
Sierra Club
6995 Camino Amero
San Diego, CA 92111
Phone: (858) 569-2025
Fax:
E-mail: emkimura@earthlink.net

☐
Lon Kissinger
Toxicologist
U.S. EPA - Region 10
1200 Sixth Avenue
Seattle, WA 98101
Phone: (206) 553-2115
Fax: (206) 553-0119
E-mail: Kissinger.Lon@epa.gov

☐
Neil Kmiecik
Great Lakes Indian Fish and Wildlife Commission
P.O. Box 9 - Maple Lane
Odanah, WI 54861
Phone: 715-682-6679 ext. 136
Fax:
E-mail: nkmiecik@glifwc.org

☐
Fred Kopfler
Senior Environmental Scientist
U.S. EPA Gulf of Mexico Program
Mail Code: EPA/GMPO
Stennis Space Center, MS 39529
Phone: (228) 688-2712
Fax: 228) 688-2709
E-mail: kopfler.fred@epa.gov

☐
Rachelle Kosoff
Graduate Student
Cornell University
C5-173 VMC
Cornell University
Ithaca, NY 14853
Phone: 607-227-9882
Fax:
E-mail: rek26@cornell.edu

☐
Elaine Krueger
Director, Environmental Toxicology Program
Massachusetts Department of Public Health - Environmental Health Assessments
250 Washington Street
7th Floor
Boston, MA 02108
Phone: 617-624-5757
Fax: 617-624-5777
E-mail: Elaine.Krueger@state.ma.us

☐
Arnold M Kuzmack
U.S. EPA - Office of Water
MC 4301T
Washington, DC 20460
Phone: (202) 566-0432
Fax: (202) 566-0441
E-mail: kuzmack.arnold@epa.gov

☐
John Laferty
Manager, Custom Products
Environmental Resource Associates
6000 West 54th Avenue
Arvada, CO 80002
Phone: 3034318454
Fax: 3034210159
E-mail: jlaferty@eraqc.com

☐
Dan Landeen
Biologist
Nez Perce Tribe ERWM
PO Box 365
Lapwai, ID 83540
Phone: 208-843-7375
Fax:
E-mail: danl@nezperce.org

☐
Bill Kramer
Manager, WQS Database
U.S. EPA
1200 Pennsylvania Ave NW
Mail Code 4305T
Washington, DC 20460
Phone: (202) 566-0385
Fax: (202) 566-0409
E-mail: kramer.bill@epa.gov

☐
Joanne Kuprys
Research & Development Associate
Enviro-Test Laboratories
9936-67 Avenue
Edmonton, Ab T6E 0P5
Phone: (780) 413-5227
Fax: (780) 437-2311
E-mail: jkuprys@envirotest.com

☐
Amy Kyle
Research Scientist
University of California
322 Cortland Ave
PMB-226
San Francisco, CA 94110
Phone: 510-642-8847
Fax:
E-mail: adkyle@socrates.berkeley.edu

☐
William Lambert
Scientist and Associate Professor
Oregon Health & Science University
3181 SW Sam Jackson Park Rd
Mailcode L606
Portland, OR 97239
Phone: (503) 494-9488
Fax: (503) 494-4278
E-mail: lambertw@ohsu.edu

☐
Diana Lee
Research Scientist
California Department of Health Services
1515 Clay Street, Ste. 1700
Oakland, CA 94612
Phone: (510) 622-4483
Fax: (510) 622-4505
E-mail: dlee1@dhs.ca.gov

☐
Sun Hyung Lee
Health Educator
California Department of Health Services/EHIB
1515 Clay Street
Suite 1700
Oakland, CA 94612
Phone: (510)622-4476
Fax: (510)622-4505
E-mail: slee@dhs.ca.gov

☐
Valerie Lee
President
Environment International Ltd.
5505 34th Avenue NE
Seattle, WA 98105
Phone: (206) 525-3362
Fax: (206) 525-0869
E-mail: valerie.lee@envintl.com

☐
Dorothy Leonard
Interstate Shellfish Sanitation Conference
776 Rolling View Drive
Annapolis, MD 21401
Phone: (410) 626-7206
Fax: (410) 626-8275
E-mail: msmussel@oceanequities.org

☐
Sharon Lin
Project Manager
U.S. EPA - Region 9
75 Hawthorne Street
SFD-7-1
San Francisco, CA 94105
Phone: (415) 972-3446
Fax: (415) 947-3526
E-mail: lin.sharon@epa.gov

☐
Belinda Lo
Scientific Evaluator
Health Canada
1st Fl. East, Banting Bldg. Tunney's Pasture
PL # 2201B1
Ottawa, On K1A 0L2
Phone: (613) 941-6224
Fax: (613) 990-1543
E-mail: belinda_LO@HC-SC.GC.CA

☐
Dr. G. Fred Lee
President
G. Fred Lee & Associates
27298 E. El Macero Dr.
El Macero, CA 95618
Phone: (530) 753-9630
Fax: (530) 753-9956
E-mail: gfredlee@aol.com

☐
Anna Maria Leon Guerrero
Biologist
Guam Environmental Protection Agency
P.O. Box 22439 GMF
Barrigada, GU 96921
Phone: (671) 475-1658
Fax: (671) 477-9402
E-mail: ganm@guamepa.govguam.net

☐
Fred Leslie
Chief, Aquatic Assessment Unit/Field Operations Division
Alabama Department of Environmental Management
PO Box 301463
Montgomery, AL 36130-1463
Phone: (334) 260-2748
Fax: (334) 272-8131
E-mail: fal@adem.state.al.us

☐
Gerald Llewellyn
Branch Chief
417 Federal Street
Dover, DE 19901
Phone: 302 744-4540
Fax: 302 739-3171
E-mail: Gerald.Llewellyn@state.de.us

☐
Shirley Louie
Arkansas Department of Health - Office of Epidemiology
4815 W. Markham Street
Slot 63
Little Rock, AR 72205
Phone: 501-661-2833
Fax: 501-280-4090
E-mail: slouie@healthyarkansas.com

☐
Tony Lowery
Program Coordinator
National Seafood Inspection Laboratory
705 Convent Street
Pascagoula, MS 39567
Phone: 228-769-8964
Fax: 228-762-7144
E-mail: tony.lowery@noaa.gov

☐
Paul Lumley
Watershed Department Program Manager
Columbia River Inter-Tribal Fish Commission
CRITFC
729 NE Oregon, Suite 200
Portland, OR 97232
Phone: (503) 238-0667
Fax: (503) 235-4228
E-mail: lump@CRITFC.org

☐
Lucia Machado
Physical Research Scientist
Colorado Department of Public Health, Monitoring Unit
WQCD-MON-B2
4300 Cherry Creek Drive South
Denver, CO 80246-1530
Phone: 303-692-3585
Fax: 303-782-0390
E-mail: lucia.machado@state.co.us

☐
Elizabeth Erin Mack
Senior Scientist
DuPont
PO Box 6101
Glasgow 300
Newark, DE 19714
Phone: (302)366-6703
Fax: (302)366-6607
E-mail: elizabeth-erin.mack@usa.dupont.com

☐
Kathryn Mahaffey
U.S. EPA Headquarters
Ariel Rios Building
1200 Pennsylvania Ave, N.W., Mail Code: 7203M
Washington, DC 20460
Phone: 202-564-8440
Fax:
E-mail: mahaffey.kate@epa.gov

☐
William Luksemburg
President
Alta Analytical Laboratory
1104 Windfield Way
El Dorado Hills, CA 95762
Phone: 9169331640
Fax: 9166730106
E-mail: billux@altalab.com

☐
Marian Maas
Iowa Department of Natural Resources
Wallace State Office Building
502 E. 9th Street
Des Moines, IA 50319
Phone: 515-281-8143
Fax: 515-281-8895
E-mail: marian.maas@dnr.state.ia.us

☐
Maura Mack
Chief, Community Participation and Education Section
Environmental Health Investigations Branch
California EPA
1515 Clay Street
Suite 1700
Oakland, CA 94612
Phone: 510-622-4414
Fax: 510-622-4505
E-mail: mmack@dhs.ca.gov

☐
Trina Mackie
M.S.
University of California, Berkeley
2608 Sacramento Street, Apt. B
Berkeley, CA 94702
Phone: 510-540-7262
Fax:
E-mail: tmackie@dhs.ca.gov

☐
Aaron Mair
Board Member
W. Haywood Burns Environmental Education Center
596 Manning Blvd.
Albany, NY 12210
Phone: 518-426-2924
Fax: 518-463-0544
E-mail: staff@w-haywoodburns.org

☐
Barbara Malczewska-Toth
Environmental Health Epidemiologist
New Mexico Department of Health Office of Epidemio
1190 St. Francis Drive, Suite N-1320
P.O. Box 26110
Santa Fe, NM 87502-6110
Phone: (505)476-3028
Fax: (505)827-0013
E-mail: btoth@doh.state.nm.us

☐
Gina Margillo
Project
Fish Contamination Education Collaborative
320 W. 4th St.
Ste 560
Los Angeles,, CA 90013
Phone: 213-620-2586
Fax:
E-mail: gmargill@dhs.ca.gov

☐
Dave McBride
Washington Department of Health
PO Box 47846
Olympia, WA 98504-7846
Phone: 360-236-3176
Fax:
E-mail: dave.mcbride@doh.wa.gov

☐
Tom McDonald
California Environmental Protection Agency, Office of Environmental Health Hazard Assessment
1515 Clay Street
16th Floor
Oakland, CA 94612
Phone: 510-623-3187
Fax: 510-622-3211
E-mail: tmcdonal@oehha.ca.gov

☐
David McHone
President
California Aquaculture Association
2400 W. Coast Hwy. Ste #D
Newport Beach, CA 92663
Phone: 949.64566035
Fax: 949-645-1165
E-mail: dmchone@pacbell.net

☐
Randy Manning
Georgia Department of Natural Resources
Floyd Tower East, 205 Butler Street
SE Suite 1152
Atlanta, GA 30334
Phone: (706) 369-6376
Fax:
E-mail: randy_manning@mail.dnr.state.ga.us

☐
Kathleen Mayo
Tribal Water Quality Standards Coordinator
U.S. EPA - Region 5
Mail Code WQ-16J
77 West Jackson Blvd.
Chicago, IL 60604
Phone: (312) 353-5592
Fax: (312) 886-0168
E-mail: mayo.kathleen@epa.gov

☐
Patricia McCann
Minnesota Department of Health, Division of Environmental Health
121 E 7th Place, Suite 220
PO Box 64975
Minneapolis, MN 55164-0975
Phone: 651-215-0923
Fax:
E-mail: patricia.mccann@health.state.mn.us

☐
Ken McGhee
Environmental Justice Coordinator
California Bay-Delta Authority
761 Minnie Way
Sacramento, CA 95831
Phone: 916-445-0740
Fax: 916-445-7297
E-mail: kmcghee@calwater.ca.gov

☐
Dana Minerva
Booz Allen Hamilton
4306 Van Buren St.
University Park, MD 20782
Phone: 703-377-1043
Fax:
E-mail: minerva_dana@bah.com

☐
Ashley Moats
Technical Editor
Tetra Tech, Inc.
10306 Eaton Place
Suite 340
Fairfax, VA 22030
Phone: (703) 385-6000
Fax: (703) 385-6007
E-mail: ashley.moats@tetratech-ffx.com

☐
Ken Moore
Executive Director
Interstate Shellfish Sanitation Conference
209 Dawson Road
Suite 2
Columbia, SC 29223
Phone: 803-788-7559
Fax: 803-788-7576
E-mail: issc@issc,org

☐
Dale Norton
Toxics Studies Unit Manager
Washington State Department of Ecology
300 Desmond Drive
Olympia, WA 98504-7710
Phone: (360) 407-6765
Fax: (360) 407-6884
E-mail: dnor461@ecy.wa.gov

☐
Peter Orris
University of Illinois at Chicago School of Public Health
Cook County Hospital, Division of Occupational Medicine
1900 W. Polk, Rm. 500
Chicago, IL 60612
Phone: 312-864-5520
Fax: 312-864-9701
E-mail: porris@uic.edu

☐
Mary Ott
Environmental Scientist
U.S. EPA - Region 8
8EPR-EP-WQU
999 18th Street, Ste 300
Denver, CO 80202-2466
Phone: 303-312-6909
Fax: 303-312-6955
E-mail: ott.toney@epa.gov

☐
Alan Monji
RWQCB - San Diego
9174 Skypark Court
Suite 100
San Diego, CA 92123
Phone: 858-637-7140
Fax: 858-571-6972
E-mail: monja@rb9.swrcb.ca.gov

☐
Elizabeth Murphy
Project Officer for the Great Lakes Fish Monitoring Program
U.S. EPA - Great Lakes National Program Office
77 W. Jackson Blvd.
Chicago, IL 60604
Phone: 312-353-4227
Fax: 312-3532018
E-mail: murphy.elizabeth@epa.gov

☐
Sandie O'Neill
Research Scientist
Washington Department of Fish and Wildlife
600 Capitol Way North
Olympia, WA 98501-1091
Phone: 360-902-2843
Fax: 360-902-2844
E-mail: oneilsmo@dfw.wa.gov

☐
Ana Maria Osorio
Regional Medical Officer
U.S. Food and Drug Administration - Pacific Region
1301 Clay Street
Suite 1180N
Oakland, CA 94612-5217
Phone: 510.637.3960, ext 117
Fax: 510.637.3976
E-mail: AnaMaria.Osorio@fda.gov

☐
Ira Palmer
Program Manager
District of Columbia Fisheries and Wildlife Division
51 N Street, SE
Washington, DC 20002
Phone: 202-535-2266
Fax: 202-535-1373
E-mail: ira.palmer@dc.gov

☐
James Pendergast
Chief, Health Protection & Modeling Branch
U.S. EPA - Office of Science & Technology
Ariel Rios Building
1200 Pennsylvania Ave, N.W., Mail Code: 4305T
Washington, DC 20460
Phone: 202-566-0398
Fax: 202-566-0409
E-mail: pendergast.jim@epa.gov

☐
John Persell
Minnesota Chippewa Tribe Research Lab
PO Box 217
Cass Lake, MN 56633
Phone: 218-335-6303
Fax:
E-mail: mctwq@paulbunyan.net

☐
Susan Peterson
Aroostook Band of Micmacs Environmental Health Department
8 Northern Road
Presque Isle, ME 04769
Phone: 207-764-7765
Fax:
E-mail: speterson@micmachealth.org

☐
Patrick Rainey
Technical Director
Severn Trent Laboratories
880 Riverside Parkway
West Sacramento, Ca 95605
Phone: (916) 374-4411
Fax: (916) 372-7768
E-mail: prainey@stl-inc.com

☐
Robin Reash
Senior Environmental Scientist
American Electric Power
1 Riverside Plaza
Columbus, OH 43215
Phone: (614) 223-1237
Fax: (614) 223-1252
E-mail: rjreash@aep.com

☐
Karen Perry
Deputy Director, Environment & Health
Physicians for Social Responsibility
1875 Connecticut Avenue NW
Suite 1012
Washington, DC 20009
Phone: (202) 667-4260
Fax:
E-mail: kperry@psr.org

☐
Dan Petersen
Biological Scientist
U.S. EPA
26 W. Martin Luther King Drive
Cincinnati, OH 45268
Phone: 513-569-7831
Fax: 513-569-7585
E-mail: petersen.dan@epa.gov

☐
Syeda Qadri
Environmental Scientist
Louisiana Department of Environmental Quality
PO Box 4314
Baton Rouge, LA 70821
Phone: 2252193603
Fax: 2252193582
E-mail: syeda.qadri@la.gov

☐
Dhitinut Ratnapradipa
Program Manager
Rhode Island Department of Health
3 Capitol Hill
Room 201
Providence, RI 02908-5097
Phone: 401-222-3424
Fax: 401-222-6953
E-mail: dhitinutr@doh.state.ri.us

☐
Sam Rector
Arizona Department of Environmental Quality
MC 5415A-1
1110 W Washington Street
Phoenix, AZ 85007
Phone: 602-771-4536
Fax: 602-771-4528
E-mail: rector.sam@ev.state.az.us

☐
Walter Redmon
Senior Biologist
U.S. EPA - Region 5
77 W. Jackson Blvd
Chicago, IL 60604
Phone: 312/ 886-6110
Fax: 312/ 886-0168
E-mail: redmon.walter@epa.gov

☐
Mike Ripley
Chippewa Resource Authority
179 West 3 Mile
Sault Ste Marie, MI 49783
Phone: 906-632-0072
Fax:
E-mail: mripley@lighthouse.net

☐
Sonia Rodriguez
Community Organizer
Environmental Health Coalition
1717 Kettner Blvd., Suite 100
San Diego, CA 92101
Phone: 619-235-0281
Fax: 619-232-3670
E-mail: SonizR@environmentalhealth.org

☐
Lola Sablan-Santos
Executive Director
Guam Communications Network
4210 Long Beach Blvd,
Suite 218
Long Beach, CA 90807
Phone: (562) 989-5690
Fax: (562) 989-5694
E-mail: lolas@guamcomnet.org

☐
Neil Sass
Alabama Department of Public Health - Division of Epidemiology
RSA Tower, Suite 310
PO Box 303017
Montgomery, AL 36130-3017
Phone: 334-206-5941
Fax:
E-mail: nsass@adph.state.al.us

☐
Howard Reid
Montana Food, Drug and Cosmetics Program Manager
Montana Department of Public Health and Human Services
1400 Broadway Street
Cogswell Building, Rm. C214
Helena, MT 59620
Phone: 406-444-5309
Fax: 406-444-4135
E-mail: hreid@state.mt.us

☐
George Robertson
Senior Scientist
Orange County Sanitation District
PO Box 8127
Fountain Valley, CA 92728-8127
Phone: (714) 593-7468
Fax: (714) 962-2591
E-mail: grobertson@ocsd.com

☐
Bruce Ruppel
New Jersey Department of Environmental Protection
Division of Science, Research and Technology
P.O. Box 409
Trenton, NJ 08625-0409
Phone: 609-984-6548
Fax:
E-mail: bruppel@dep.state.nj.us

☐
Charles Santerre
Associate Professor
Purdue University
700 West State Street
Stone Hall, Room 205
West Lafayette, IN 47907
Phone: 765-496-3443
Fax: 765-494-0674
E-mail: santerre@cfs.purdue.edu

☐
Gary Schiffmiller
Fisheries Biologist/Environmental Scientist
New Mexico Environment Department, Surface Water Quality Bureau
1190 St. Francis Drive
PO Box 26110
Santa Fe, NM 87502
Phone: 505-827-2470
Fax: 505-827-0160
E-mail: gary.schiffmiller@nmenv.state.mn.us

☐
Rita Schoeny
U.S. EPA - Office of Water
Ariel Rios Building
1200 Pennsylvania Ave, N.W., Mail Code: 4301T
Washington, DC 20460
Phone: 202-566-1127
Fax:
E-mail: schoeny.rita@epa.gov

☐
Kathleen Schuler
Environmenal Health Scientist
Institute for Agriculture & Trade Policy
2105 First Av. S.
Minneapolis, MN 555404
Phone: 612-870-3468
Fax: 612-813-5612
E-mail: kschuler@iatp.org

☐
Joe Sekerke
Florida Department of Health
2600 Blairstone Road
MS 6540
Tallahassee, FL 32399-2400
Phone: 850-245-4248
Fax:
E-mail: joe_sekerke@doh.state.fl.us

☐
Sophia Serda
Toxicologist
U.S. EPA - Region 9
75 Hawthorne Street SFD-8B
San Francisco, CA 94105-3901
Phone: 415-972-3057
Fax:
E-mail: sophiaserda@epa.gov

☐
Gregg Serenbetz
Research Fellow
U.S. EPA
1200 Pennsylvania Ave. NW
Mailcode 4504T
Washington, DC 20460
Phone: 202-566-1253
Fax: 202-566-1336
E-mail: serenbetz.gregg@epa.gov

☐
Candy Schrank
Wisconsin Department of Natural Resources
101 S. Webster Street
PO Box 7921
Madison, WI 53707-7921
Phone: 608-267-7614
Fax: 608-266-2244
E-mail: schracs@dnr.state.wi.us

☐
Karen Schwinn
Associate Director
U.S. EPA - Region 9
75 Hawthorne St.
(WTR-1)
San Francisco, CA 94105
Phone: 451-972-3472
Fax: 415-947-3537
E-mail: schwinn.karen@epa.gov

☐
Lorenzo Sena
Env. Prot. Specialist
U.S. EPA - Region 7
901 N. 5th Street
Kansas City, KS 66101
Phone: 913-551-7017
Fax: 913-551-8752
E-mail: sena.lorenzo@epa.gov

☐
Clyde Serda
Chef - Reporter
CAPC Culinarian
2154 Lincoln ave
Alameda, CA 94501
Phone: 510-769-8422
Fax:
E-mail: chefclyde@earthlink.net

☐
Mylynda Shaskus
Environmental Specialist 2
Ohio EPA
Lazarus Government Center
PO Box 1049
Columbus, OH 43216-1049
Phone: 614-466-6308
Fax:
E-mail: mylynda.shaskus@epa.state.oh.us

☐
Val Siebal
Chief Deputy Director
California Environmental Protection Agency, Office of
Environmental Health Hazard Assessment
1001 "I" Street, 25th Floor
Sacramento, CA 95814
Phone:
Fax:
E-mail: vsiebal@oehha.ca.gov

☐
Shannon Soileau
Louisiana Department of Health & Hospitals - Office of
Public Health
325 Loyola Ave
Suite 210
New Orleans, LA 70112
Phone: 504-568-8537
Fax:
E-mail: ssoileau@dhh.state.la.us

☐
Leanne Stahl
Environmental Scientist
U.S. EPA - Office of Science & Technology
Mail Code 4305T
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460
Phone: (202) 566-0404
Fax: (202) 566-0409
E-mail: stahl.leanne@epa.gov

☐
Alan Stern
New Jersey Department of Environmental Protection
401 East State Street
PO Box 409
Trenton, NJ 08625
Phone: 609-633-2374
Fax:
E-mail: astern@dep.state.nj.us

☐
Brian Toal
Connecticut Department of Public Health
410 Capitol Avenue
MS#11 CHA, PO Box 340308
Hartford, CT 06134-0308
Phone: 860-509-7741
Fax:
E-mail: Brian.Toal@po.state.ct.us

☐
Jamie Snow
CDC/CSTE Applied Epidemiologist
Wyoming Department of Health
2300 Capitol Ave
Hathaway Building 4th Floor
Cheyenne, WY 82002
Phone: (307) 777-7172
Fax: (307) 777-5402
E-mail: jsnow@state.wy.us

☐
Kelly Speth
ECCH Coordinator
Ma'at Youth Academy
445 Valley View Rd.
Suite D
Richmond, CA 94803
Phone: (510) 222-6594
Fax: (510) 222-0274
E-mail: kaspeth@igc.org

☐
John Stanfill
Nez Perce Tribe ERWM
PO Box 365
Lapwai, ID 83540
Phone: 208-843-7375
Fax:
E-mail: johns@nezperce.org

☐
Laurie Sullivan
Environmental Scientist
NOAA ORR/CPRD
75 Hawthorne St.
SFD-8
San Francisco, CA 94105
Phone: (415) 972-3210
Fax: (415) 744-1881
E-mail: Laurie.Sullivan@noaa.gov

☐
William Toomey
West Virginia Bureau for Public Health
350 Capitol Street
Charleston, WV 25301-3712
Phone: 304-558-6746
Fax: 304-558-0324
E-mail: wtoomey@wvdhhr.org

☐
Donald Trees
Principal
Booz Allen Hamilton
8283 Greensboro Drive
McLean, Va 22102
Phone: (703)902-5406
Fax: (703)902-3613
E-mail: Trees_Donald@BAH.com

☐
Kirby Tyndall
Sr. Toxicologist
Pastor, Behling & Wheeler, LLC.
2000 S. Mays, Suite 300
Round Rock, TX 78664
Phone: (512) 671-3434
Fax: (512) 671-3446
E-mail: kirby.tyndall@pbwllc.com

☐
Eric Uram
Regional Representative
Sierra Club
214 North Henry Street
Suite 203
Madison, WI 53703-2200
Phone: 608-257-4994
Fax: 608-257-3513
E-mail: eric.uram@sierraclub.org

☐
Linda Vaught
Mississippi Department of Environmental Quality
Information Center
2380 Hwy 80 West, P.O. Box 20305
Jackson, MS 39289-1305
Phone: (601) 961-5053
Fax:
E-mail:

☐
Micah Vieux
Outreach Program Associate
Ohio Environmental Council
1207 Grandview Ave. Suite 201
Columbus, OH 43212
Phone: (614) 487-7506
Fax: (614) 487-7510
E-mail: cockburn9@yahoo.com

☐
Jeffrey Tuttle
Toxicologist
U.S. EPA - Region 3
3HS41
1650 Arch Street
Philadelphia, PA 19103
Phone: (215)814-3236
Fax:
E-mail: tuttle.jeffrey@epa.gov

☐
Alyce Ujihara
Research Scientist
California Department of Health Services
1515 Clay Street
Suite 1700
Oakland, CA 94612
Phone: (510) 622-4481
Fax: (510) 622-4505
E-mail: aujihara@dhs.ca.gov

☐
Jim VanDerslice
Senior Epidemiologist
Washington Department of Health
Office of Environmental Health Hazard Assessment
P.O. Box 47486
Olympia, WA 98504-7846
Phone: (360) 236-3183
Fax: 360-236-2251
E-mail: Jim.VanDerslice@DOH.WA.GOV

☐
Manny Velazquez
Account Executive
STL
1701 South Grand Avenue
Santa Ana, CA 92705
Phone: 714-258-8610
Fax: 714-258-2018
E-mail: mvelazquez@stl-inc.com

☐
Chau Vu
U.S. EPA - Region 1
1 Congress Street, Suite 1100 (HBS)
Boston, MA 02135
Phone: (617) 918-1446
Fax:
E-mail: vu.chau@epa.gov

☐
Rachel Walsh
Environmental Public Health Nurse
Yakama Indian Health Center
401 Buster Rd
Toppenish, WA 98948
Phone: (509) 865-2102 ext 208
Fax:
E-mail: cwalsh@yak.portland,ihs.gov

☐
Erica Weis
Research Scientist
California Department of Health Services
1515 Clay St. Ste 1700
Oakland, CA 94530
Phone: 510-406-2501
Fax: 510-622-4505
E-mail: eweis1@dhs.ca.gov

☐
Stephen Wente
U.S. Geological Society
2280 Woodale Dr
Mounds View, MN 55112
Phone: 763-783-3272
Fax:
E-mail: spwente@usgs.gov

☐
Kirk Wiles
Texas Department of Health - Seafood Safety Division
1100 W. 49th Street
Austin, TX 78756
Phone: 512-719-0215
Fax:
E-mail: kirk.wiles@tdh.state.tx.us

☐
John Wilson
U.S. EPA - Office of Water
1200 Pennsylvania Ave. NW
(MC 4504T)
Washington, DC 20460
Phone: (202) 566-1158
Fax:
E-mail: wilson.john@epa.gov

☐
Michael Walsh
Database Manager
CSC
6101 Stevenson Ave
Alexandria, VA 22304
Phone: (703) 461-2461
Fax: (703) 461-8056
E-mail: MWalsh23@CSC.com

☐
Lynn Wellman
Regional Water Quality Coordinator
U.S. Fish and Wildlife Service - Region 2
PO Box 1306, Room 4012
Albuquerque, NM 87103
Phone: 505.248.6652
Fax: 505.248.6922
E-mail: Lynn_Wellman@fws.gov

☐
Sarah Weppner
Idaho Department of Health and Welfare - Bureau of Environmental Health and Safety
PO Box 83720
450 West State Street
Boise, ID 83720-0036
Phone: 208-334-0606
Fax: 208-334-6573
E-mail: weppners@idhw.state.id.us

☐
Luanne Williams
North Carolina Department of Health and Human Services
Division of Public Health
Raleigh, NC 27699-1912
Phone: 919-733-3410
Fax:
E-mail: Luanne.Williams@ncmail.net

☐
Steven Wolff
Wyoming Game and Fish Department
5400 Bishop Boulevard
Cheyenne, WY 82006
Phone: 307-777-4673
Fax:
E-mail: steve.wolff@wgf.state.wy.us

☐
Michael Wolfram
Remedial Project Manager
U.S. EPA - Region 9
75 Hawthorne St.
San Francisco, CA 94105
Phone: (415)972-3027
Fax:
E-mail: wolfram.michael@epa.gov

☐
Jay Wright
Oklahoma Department of Environmental Quality
707 N Robinson
Oklahoma City, OK 73117-1212
Phone: 405-702-1039
Fax:
E-mail: jay.wright@deq.state.ok.us

☐
Tracey Woodruff
Senior Scientist
U.S. EPA
75 Hawthorne St
OPPA-1
SF, CA 94105
Phone: 415 947 4277
Fax:
E-mail: woodruff.tracey@epa.gov

☐
Edward Younginer
South Carolina Department of Health and Environmental Control
2600 Bull Street
Columbia, SC 29201
Phone: 803-898-4399
Fax:
E-mail: youngiem@dhec.sc.gov

Response to SY Rpt Jan 2004 Dept Fish & Game

To: Mr. Tom Alo
Regional Water Quality Control Board
9174 Sky Park Court, Suite 100
San Diego, CA 92123-4340

Date: January 28, 2004

From: Michael Martin, Ph.D.
California Department of Fish and Game
Office of Spill Prevention and Response
Resource Assessment Program
20 Lower Ragsdale Dr., Suite 100
Monterey, CA 93940

Subject: NASSCO and Southwest Marine Detailed Sediment Investigation, Volumes 1 – 3

Introduction

The California Department of Fish and Game, Office of Spill Prevention and Response (DFG-OSPR) received the "NASSCO and Southwest Marine Detailed Sediment Investigation" on October 14, 2003. I appreciate the opportunity to provide this review at this time, to assist you and the staff in developing a cleanup plan for the NASSCO and Southwest Marine, herein referred to as the "shipyards". The report was prepared for the shipyards by Exponent, Bellevue, Washington.

Background

National Steel and Shipbuilding Company (NASSCO) and Southwest Marine Inc. shipyards have conducted a sediment investigation in response to Resolutions No. 2001-02 and 2001-03, adopted by the California Regional Water Quality Control Board, San Diego Region (RWQCB), on February 21, 2001. Regional Board staff issued guidelines for conducting the investigation on June 1, 2001 (RWQCB 2001). The investigation included two phases of fieldwork, which were conducted in 2001 and 2002. The overall work plan for the detailed sediment investigation (Exponent 2001) describes the major components of the investigation. The supplementary Phase 2 field sampling plan (FSP) (Exponent 2002) describes additional details of the second round of sampling. This document presents the results of field sampling and analyses of those data with respect to potential effects of sediment contamination on aquatic life, aquatic-dependent wildlife, and human health at the shipyards.

The objectives of the current investigation are to:

1. Determine the nature and extent of sediment contamination resulting from

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historical waste discharges at the shipyard sites

2. Identify any limitations on beneficial uses of San Diego Bay associated with
sediment chemicals discovered at the sites.

3. Derive appropriate remedial alternatives to address shipyard-related sediment chemicals.

These objectives respond to Resolutions 2001-02 and 2001-03 and the specific information requirements of Regional Board staff as specified in Water Code Section 13267, and in a manner consistent with State Water Resources Control Board (SWRCB) Resolution 92-49. These objectives are intended to protect beneficial uses of San Diego Bay at the shipyards, considering all the demands being made, and to be made, on those waters. The specific beneficial uses to be protected from sediment contamination (RWQCB 2001) include:

- Aquatic wildlife–specifically, the benthic community
- Aquatic-dependent wildlife–specifically, birds, mammals, and reptileswhich consume fish and other aquatic organisms
- Human health–specifically, consumption of fish and shellfish.

General Comment

Although the report has been generally well prepared and written in an professional manner, utilizing current state of the science for chemical and toxicological procedures and techniques, it is heavily biased in its interpretations and conclusions, which are not supported by the results of their studies and evaluations. DFG has provided a considerable amount of technical consultation with the project plans, studies, and interim reports that were prepared and distributed. On several consultations, I provided guidance, suggestions, and recommendations, which I believed would be employed to develop a more focused evaluation of the site. With respect to issues regarding the protection of estuarine resources, habitats, and the man's wise use of fish and wildlife resources of the Bay, I do not believe that the authors have presented objective conclusions and remedial action recommendations, based upon the results of the studies, particularly with an emphasis for environmental protection that stresses the "precautionary principle" and the ultimate goal of the process to protect the beneficial uses of the bay, not only in the context of the shipyards themselves, but with an overall goal to protect San Diego Bay as a whole ecosystem. In my analysis, I concluded that the preponderance of evidence presented in the Exponent work demands remedial actions, which are not addressed by the Remedial Alternative recommended by the consultants: Natural Recovery with Monitoring. From the report and investigations performed, I find substantive evidence of: a) adverse effects in toxicity and bioaccumulation, of higher contaminant concentrations in shipyards' sediments compared with reference sites, b) of modified benthic communities in, or adjacent to, the shipyards with several community metrics, c) of contaminant concentrations in pore water at the shipyards' sites which exceed current State standards, and d) of several adverse fish histopathologies at the shipyards' sites. The consultants used risk evaluation inputs factors, which avoided point estimate hazard quotients to identify "hot spots" within the shipyards' sites, as well as not evaluating juvenile exposures (following Cal EPA risk assessment guidance, 1999). Other areas of concern or potential adverse ecological effects may have been caused by: 1) the lack of toxicological screening (or evaluation) of polychlorinated biphenyls (by TEQ evaluation) and no evaluation of polychlorinated terphenyls, which are arguably more environmentally hazardous than PCBs (Filyk, 2003), as well as organo-tin compounds, mercury; 2) no evaluation of polycyclic aromatic hydrocarbons in sediments because of the lack of promulgated US Criteria (other criteria can be found in the literature); 3) USE of AET approach for evaluating and selecting cleanup alternatives; 4) presence of PAHs of petrogenic origin at shipyard sites; 4) a very biased, as opposed to a balanced, presentation, which emphasized the null findings (i.e., reference and shipyards's sites being similar), rather than those conditions where shipyards' conditions were less favorable than reference conditions, and finally, 5) a very determined, and disturbing argument throughout the report, presented with each piece of evidence in the report, implying that shipyards' data or results should be discounted and not further considered (which suggests that a "preponderance of evidence" approach is not a valid or appropriate approach for the environmental evaluation).

Comments

1. *Section 3.1. Definition of Reference Conditions (Page 3-1).* With respect to the issue of "reference" or "background" conditions in San Diego Bay, the reference stations selected should be those sites which reflect the cleanest conditions in San Diego Bay, that have been developed consistent with national or state standards or guidance. The report (Section 3.2.3) argues that the board staff selected the final reference stations in a biased manner, citing several factors or reasons for why these stations are not appropriate to be used as reference or background condition. Consistent with my review and suggestions with the development of the final reference pool, I believe the reference pool selection process, conducted by the board staff and with consultation with the natural resource trustees and consultants, is consistent with other California sites and regions. One of those important issues with the reference pool comparisons is

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the distribution of sediments with respect to Total Organic Carbon (TOC) or particle size, as contaminants tend to be sequested in sediments, which have finer particle sizes and higher TOCs. If particle size or organic carbon contents of background and shipyards' site differ, then most sediment specialists and authorities recommend that those sites not be compared directly. Some organic contaminants can be normalized to organic carbon by dividing by the fraction of organic carbon. This normalization process has also been used for divalent cationic metals: lead, nickel, copper, cadmium, and zinc. Metals have normalized to aluminum or iron, and particle size. I recommend the re-evaluation of the final reference pool with these ideas about TOC and/or particle size distributions in mind.

2. *Section 4.5. Association of Metals with Sediment Minerals (Page 4-10).* The report discusses a microprobe analysis of metals, including copper as a model compound, and concludes that: "because copper and chromium are present primarily as mineral constituents, they are expected to have a low bioavailability." This is a different approach to estimating bioavailability, especially when the consultants actually did bioaccumulation experiments (Section 7 – Phase 1 evaluation) and field contaminant measurements in tissues (Section 10 – Phase 2 evaluation). Figures 7-4 and 7-5 are graphs of the concentrations of Cu and Pb in sediments, and tissues of *Macoma* clams in laboratory-based bioaccumulation testing. While the rates of accumulation relative to concentrations in sediments have low slopes (i.e., not proportional accumulation, caused by short term test exposures?), there appears to be a strong relationship between tissue concentrations and sediment concentrations. The Phase 2 field sampling of eelgrass, forage fish, sand bass, and mussels from shipyards site and reference site (Tables 10-1 to 10-4) indicates bioaccumulation for most metals, PCBs, and TBT (refer to following table):

Table A. Comparisons of Mean Detected Tissue Concentrations from Exponent Tables 10-1 to 10-4.

Constituent	Eel grass	Forage fish	Sand bass	Mussel
Total PCBs	Ship>Ref 2X	Ship>Ref 2X	Ship>Ref 3X	Ship>Ref 1X
Tributyl Tin	Ship>Ref 6X	Ship>Ref 4X	Ship>Ref 4X	Ship>Ref 4X
Arsenic	Ship>Ref 2X	Ship = Ref	Ship>Ref 1X	Ship>Ref 2X
Cadmium	Ship>Ref 3X	Ship = Ref	Ship>Ref 10X	Ship = Ref
Copper	Ship>Ref 9X	Ship = Ref	Ship>Ref 2X	Ship>Ref 3X
Lead	Ship>Ref 5X	Ship>Ref 2X	Ship>Ref 3X	Ship>Ref 2X
Nickel	Ship>Ref 2X	Ship>Ref 5X	Ship>Ref 1X	Ship>Ref 2X
Selenium	Ship = Ref	Ship>Ref 2X	Ship>Ref 10X	Ship = Ref
Zinc	Ship>Ref 2X	Ship = Ref	Ship>Ref 2X	Ship>Ref 1X

Total PAH	Ship>Ref 5X	Ship>Ref 1X	Ship>Ref 1X	Ship>Ref 6X
Hg	--	--	--	Ship>Ref 2X

The pattern that is evident from these data summaries is bioaccumulation with most of the constituents, and it ranges between no tissue accumulation (Ship = Ref) to up to 10 times the concentrations in shipyard samples compared with reference site samples. In no cases is there greater accumulation in the reference site compared with the shipyards sites. Both laboratory (Phase 1) and field evaluations (Phase 2) show consistent patterns of bioaccumulation and provide evidence of bioaccumulation, which was apparently not found in the microprobe, physical studies.

3. *Section 4.7. Summary (Pages 4-14 & 4-15)*. The report makes several conclusions, with regard to the shipyards' contaminant distributions: a) there was a distinct and consistent spatial pattern (i.e. higher concentrations of most contaminants) found near the northern boundary of Southwest Marine Shipyard, as well as higher concentrations nearshore (i.e., immediately adjacent to the shipyards' shore facilities); b) shipyards' sediment concentrations are generally higher than reference site concentrations; c) acid-volatile sulfides (AVS) were not sufficient to sequester or limit bioavailability of metals; d) the absence of graded bedding in the upper layer of sediments in certain areas of the shipyards sites suggests a physical disturbance of the sediments at those locations; e) PAHs generally appeared to be of a pyrogenic origin, although at SW02, and other stations, PAHs of petrogenic origin may be present; and f) distinct vertical distributions with higher chemical contaminant concentrations in surface sediments were found at most shipyard site locations (a few stations have an inverted pattern with higher concentrations at deeper levels and are ungraded bedding sediments).

   In a review of the BRI index, Professor John Gray of the University of Oslo suggested that little may be accomplished by developing an index to pollution. "One important aspect of these developments is that it is a simple matter to calculate statistically significant degrees of contamination and effects and then to plot these back on maps of the monitored areas. The areas of contamination and effects can readily be interpreted by managers so that there is no need to derive simple indices. These facts are well-documented in the literature (e.g. Olsgard & Gray 1995 examining effects of oil and gas exploration on the Norwegian continental shelf)." Simply put, this means one plots the effects (i.e., acute toxicity or community changes) and the degrees of chemical contamination, and then examines the plots for similarity of patterns.

4. *Section 5.1. Comparison of Site and Reference Data (Pages 5.1 and 5.2).* Statistical comparisons could not be carried out for several constituents because of high proportions of non-detects: cadmium, hexavalent chromium, selenium, and all of the butyltins. The report noted: "Most of these chemicals were undetected at almost all stations. Dibutyltin and TBT were undetected at all three of the stations in the final reference pool, but were detected at several shipyard stations." Although the results from individual stations were not evaluated (data was pooled and <u>results characterize the shipyards as a whole</u>), concentrations of copper, lead, mercury, zinc, PAHs, and total PCBs (as homologs) are higher than reference sites.

5. *Section 5.2. Comparison to California Water Quality Criteria (Pages 5.2 and 5.3).* There are no US EPA or California Toxics Rule Critera for Polycyclic Aromatic Hydrocarbons (PAHs) and Polychlorinated Terphenyls, although Environment Canada (Filyk, 2003) and British Colombia (2003. <u>http://wlapwww.gov.bc.ca/wat/wq/BCguidelines/pahs.html#table3</u>) have published toxicological guidance information on these classes of compounds. Filyk (2003) concluded that risked-based fish concentrations show PCTs may be more toxic than PCBs as well as US EPA, Region 3 <u>http://epa.gov/reg3hwmd/risk/rbc1003.pdf</u>). Since the PCBs do have a promulgated CTR value, and the potency of PCTs are higher than those of PCBs, concentrations of PCTs in pore water which exceed the PCB criteria are more hazardous than PCBs (PCTs were not measured or reported?). Final criteria for tributyl tin have been been published by US EPA (2004: http://www.epa.gov/fedrgstr/EPA-WATER/2004/January/Day-05/w082.htm). The criterion for TBT is 0.0074 ug/L. The standard for Hg, cited by the report as 0.94 ug/L is highlighted in the published CTR table as "may be underprotective", and indicates that a Tissue Residue derived standard for mercury is 0.025 ug/L.

   Copper concentrations at all shipyards stations exceeded the CTR and at all reference stations; however, or copper concentrations of shipyards are greater than those of reference (= [Cu ship > Cu ref]). Concentrations of total PCBs (measured as homologs) exceeded the CTR at all shipyards' stations, as well as one half of the reference site stations (2 of 4). Overall, concentrations of total PCBs were greater at the shipyards' sites than reference sites. Lead exceeded the CTR at 7 stations (total measured = 14). Concentrations of mercury, by Tissue Residue standard are exceeded at all shipyard sites [Hg ship > Hg ref]. There is no CCC published for Ag (there is a CMC), however [Ag ship > Ag ref].

   There is a US EPA ambient water quality standard of 0.0074 ug/L for tributlytin, as well as DTSC guidance action level criterion of 0.001 ug/L (DTSC, 2003: <u>http://www.dtsc.ca.gov/ScienceTechnology/ftp/econote3.pdf</u>). Both the water quality standard and criterion are exceeded at all shipyard and reference stations; however, the [butyl tin ship > butyl tin ref].

The British Colombian guidance for individual PAHs are exceeded at all shipyard and reference sites for benzo(a)pyrene @ 0.01 ug/L (limit of detection 2 times the guidance value, but [BaP ship > BaP ref] , at 2 shipyard locations for chrysene, and at 1 each for fluorine and acenaphthene.

6. *Section 5.3. Relationship between Pore Water and Sediment Chemistry (Page 5-3 et seq.).* The authors suggest that there needs to be "a relationship between pore water and sediment concentrations", in order to related sediment concentrations to ambient water quality criteria. When pore water and sediments are in equilibrium, a theoretic model might be useful to link sediment and pore water concentrations. In this investigation, however, pore water was measured at reference and shipyards sites, so a direct comparison of pore water can be made to ambient water quality standards (i.e., CTR). Section 5.2 of the consultant's report evaluates the CTR comparison, and should be amended to address those issues raised in comment #5.

   This section discusses the need to evaluate the statistical relationships between pore water, and points out that there is a linear, statistically significant relationship between pore water and sediment for copper, lead, mercury, zinc, TBT, and PCBs, and a lack of such relationship for arsenic, chromium, nickel, and silver. There were too few detected samples to evaluate cadmium and selenium. The authors then evaluate the graphs and conclude that there is some unexplained influences that may cause bias in the samples. They also point out that one station (SW04) had unusually high pore water concentrations, and may be "outlier" samples for certain pore water chemicals. Notwithstanding these arguments suggesting the samples are biased "high" (for example, there are certainly counter-arguments that the pore water samples are biased low for extraction efficiencies, non-equilibrium conditions between bulk sediments and pore waters, organismal perturbations which may dilute pore water concentrations, etc.) and presuming that all QA/QC validations were performed, I recommend that the pore water concentrations measured in the study be evaluated directly for compliance with CTR, and that, in the case of those metals with statistically significant linear correlations, that calculation of sediment concentrations, based upon pore water concentrations, may have some validity and applicability. It was not clear from the reports whether or not other non-linear correlation evaluations were conducted. I am presuming that RWQCB has regulatory authority over pore waters and contaminated sediments and the CTR applicable to pore waters as waters of the state in an enclosed bay: "OBJECTIONABLE BOTTOM DEPOSITS are an accumulation of materials or substances on or near the bottom of a water body which creates conditions that adversely impact aquatic life, human health, beneficial uses, or aesthetics. These conditions include, but are not limited to, the accumulation of pollutants in the sediments and other conditions that result in harm to benthic organisms, production of food chain organisms, or fish egg development. The presence of such deposits shall be determined by RWQCB(s) on a case-by-case basis" (from Implementation of the Bays and Estuaries Plan, 2000 @ http://www.swrcb.ca.gov/iswp/final.pdf).

7. *Section 6.2. Determination of Toxic Effects (Page 6-2 to 6-4)*. Three sediment toxicity tests were used to evaluate toxicity: 1) an acute 10-day amphipod (*Eohaustorius*) test to evaluate whole sediment; b) a short term (48-hr) mussel embryo development test; and c) a short-term (40-minute) echinoderm egg fertilization test, using standardized bioassay testing protocols for each species and test. An additional amphipod test, using a dilution series were used on two previously known-to-be elevated chemical constituent locations (SW04 and NA07). Two statistical evaluations were conducted upon the three data sets: a 95%Lower Predictive Limit with a comparison to the final reference pool and a Dunnett's test, using a one tailed experiment-wise 95% confidence limit. Both tests resulted in the same determination of differences between the shipyard sites and the final reference pool.

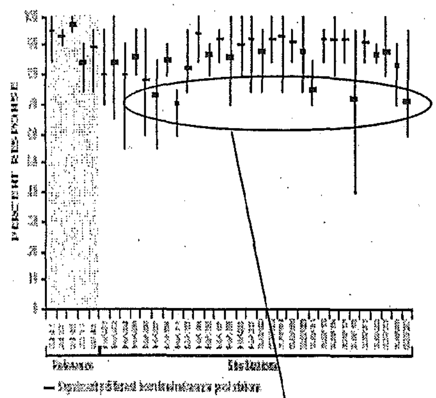

Figure 6-3. Amphipod survival response by station

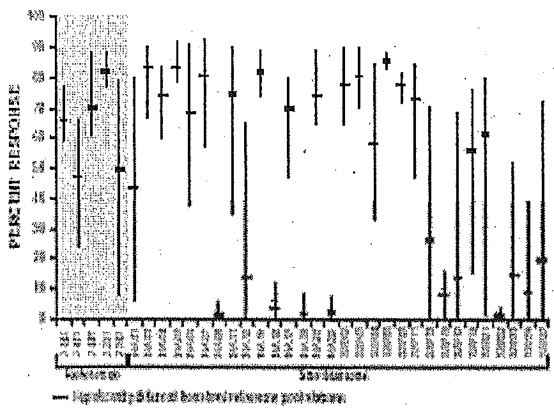

Figure 6-4. Bivalve normality response by station

The echinoderm test showed no significant differences between final reference site and shipyard sites. Six of the 30 shipyard sites were acutely toxic [NA6, NA7, NA11, SW13, SW18, and SW 27 to amphipod adults (Figure 6.3)]. The bivalve toxicity test had 12 of the 30 sites with significantly different mortality [NA9, NA12, NA16, NA19, NA22, SW13, SW15, SW17,SW22, SW23, SW25, SW27 (Figure 6-4)].

Plotting the stations with significant toxicity for amphipods and bivalves revealed an interesting pattern (Figure 1, attached; Exponent Report Figure 6-6): In 5 of the 8 "fingers" (between piers) toxicity was recorded. One of the fingers had no toxicity tests. With respect to whether or not the toxicity was associated with (significant correlations) chemical constituent concentrations, toxicity tests reflect an integration of multiple stressors. The presence of toxicity alone reflects impairment of the use of state waters, as well as contrary to the Fish and Game Code (§ 5650, an ARAR for cleanup decisions). The Exponent report (Pages 6-3 and 6-4) discusses at length the lack of concordance (one site with toxicity reported for 2 or 3 tests), and concludes that it cannot be determined why toxicity only occurs with one test. I believe that the presence of toxicity with any of the tests (they may underestimate chronic toxicity, for example) is an unacceptable condition in State waters. The relationship between chemicals and the toxicity test results will be reviewed below in Section 9.

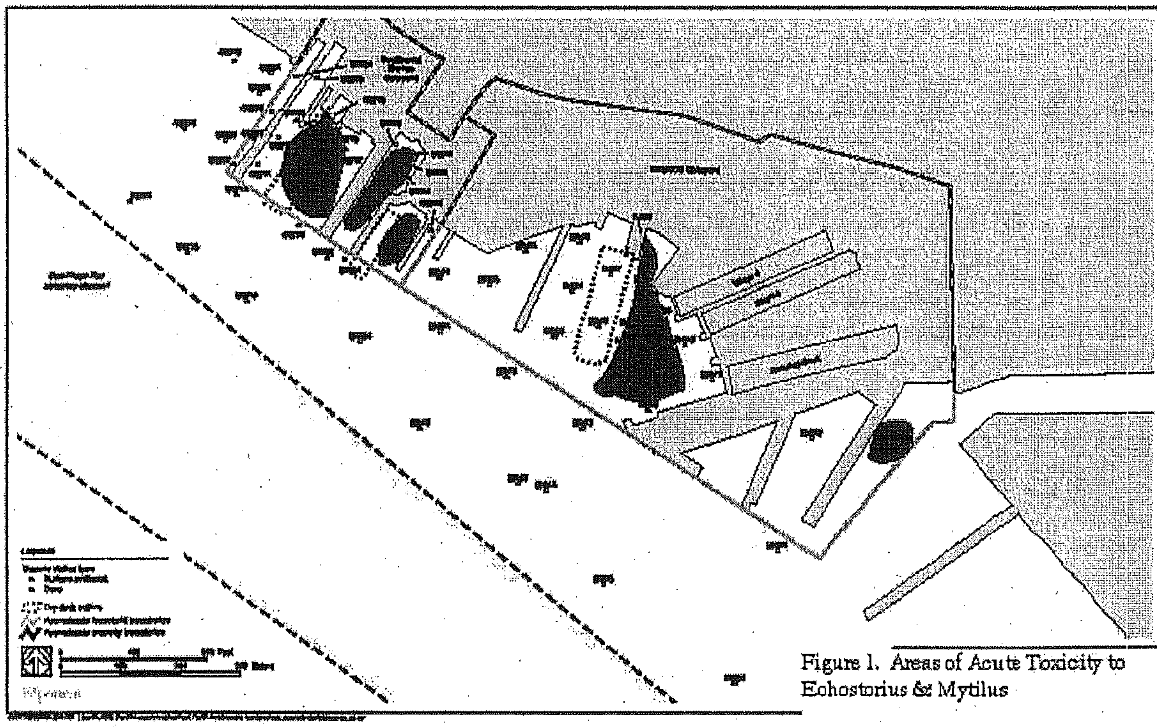

Figure 1. Areas of Acute Toxicity to Eohostorius & Mytilus

8. *Section 7. Bioaccumulation Tests (Page 7-1).* Sediment Bioaccumulation tests were conducted during Phase 1 investigations, consisting of 4 stations at SMW, 5 stations at NASSCO, and 5 stations at reference sites. The conclusion of the report is that "the chemical concentrations in *Macoma* tissue relative to the chemical concentrations in sediment indicates that bioaccumulation of chemicals is occurring." Significant correlations (linear regression analyses)

were found for As, Cu, Pb, Hg, Zn, TBT, PCBs, and Total HPAH, and data was summarized in Figures 7-1 to 7-10. Figure 7-9 for PCBs is shown as an example of the strong correlation between sediment and tissue concentrations. As stated in Section 4.5 comments above: both laboratory (Phase 1) and field evaluations (Phase 2) show consistent patterns of bioaccumulation and provide evidence of bioaccumulation, which was apparently not found in the microprobe, physical studies. Plotting those chemicals (where higher concentrations mean higher bioaccumulation on a site map, reveals the areas where significant bioaccumulation is most likely occurring (Figure 2).

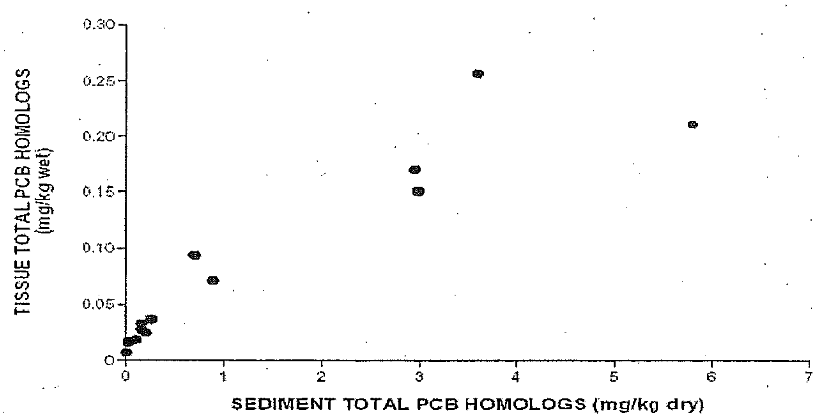

Figure 7-9. Tissue and sediment data for total PCB homologs

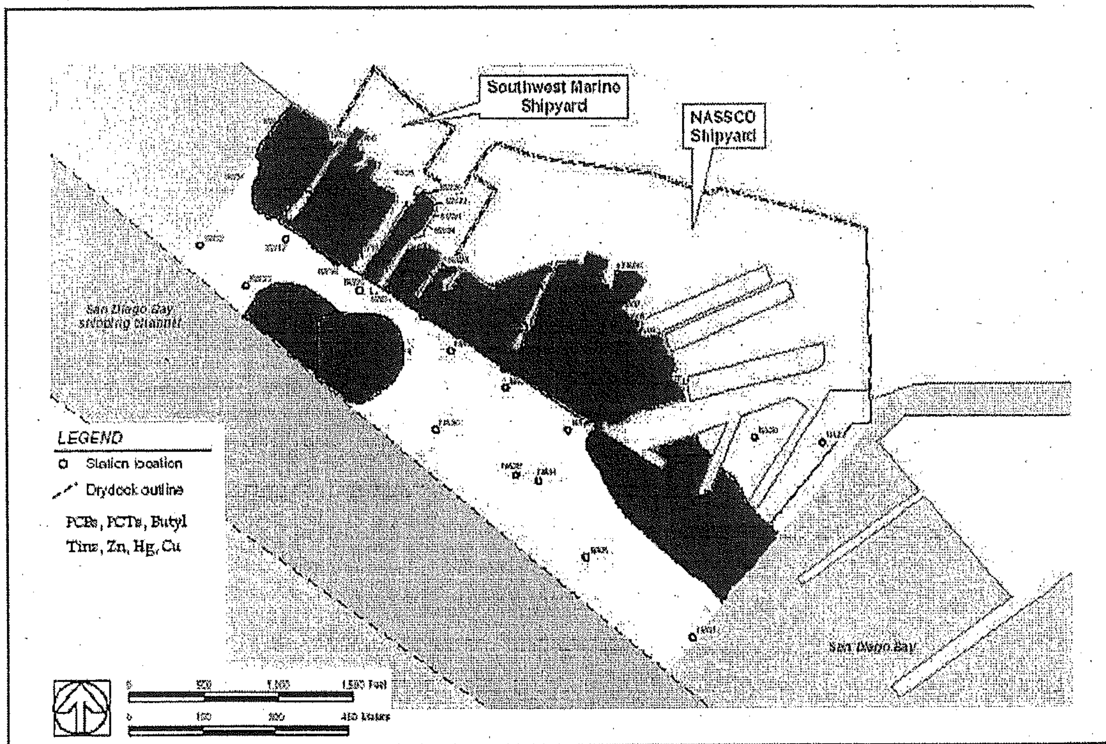

Figure 2 . Contours of Bioaccumulative Chemicals- Summed

Exponent

9. *Section 8. Evaluation of Benthic Macroinvertebrates and Fishes (Pages 8-1).* This section generally discusses the methods used to evaluate benthic macroinvertebrates and fishes. Sampling techniques included benthic grabs for macroinvertebrates, sediment profile imaging, and fishes collections with hook/lines and trawls

10. *Section 8. Benthic Macroinvertebrate Communities (Page 8-1 and 8-2).* There were two evaluations of the Phase 1 benthic macroinvertebrate data: SPI photographs and benthic macroinvertebrate sampling. In addition, the final reference pool stations and shipyard sites were evaluated with the Benthic Response Index (BRI). The consultants provided a review of the BRI, and suggested that because it has not been fully peer reviewed and validated, it is not considered to be as reliable an indicator of the benthic macroinvertebrate conditions as a more thorough analysis of community characteristics. There may be several fundamental criticisms (Gray, pers.comm.) about the BRI which include the following: firstly, the attempt to relate contaminant levels, toxicity and effects on abundance is fraught with interpretational difficulties. There are

different levels of measurement precision and thus a single value for the pollution tolerance of a given species cannot be made. Secondly, use of abundance data of each of the species used in the pollution tolerance index is subject to huge variability. Species abundances vary with natural environmental variables, with season and from year-to-year. Thus there are unlikely to be predictable patterns of species abundances at uncontaminated reference sites nor along the putative pollution gradient. Thus there MUST be variability and at best 95% CI.'s need to be developed for all the species used. These criticisms coupled with the lack of peer review and scientific publication increase uncertainty about the usefulness of the BRI to predict or identify contaminated-affected benthic macroinvertebrate communities. In my opinion, these criticisms do not totally negate the use of the BRI, only that the findings from the analyses be used in a cautionary fashion, i.e. it is only one of several approaches to be examined to explain the distribution (and responses) of the benthic macroinvertebrate communities. Professor Gray (pers. comm.) had two other observations regarding the BRI: "The first is in the shipyard consultants report (Technical Memorandum 6, Page 9): 'None of benthic communities can be considered extremely altered.' This is not the point. Multivariate methods can detect subtle changes and that is what environmental monitoring is aimed at. It is the subtle changes detected that should lead to managerial action to prevent future major effects occurring. The second statement is in the main report (SCCWRP, 2003 , Page 27) 'The BRI cannot be used to diagnose sources because benthic macrofauna respond in a similar manner to natural and anthropogenic disturbance.' Benthic fauna do NOT respond in a similar manner to anthropogenic and natural disturbance, that is the whole point of monitoring programs. Multivariate methods (and hopefully the BRI) measure change in benthic systems and this change may be caused by natural or anthropogenic factors. There ARE methods to unravel the causes as suggested above." Professor Gray's suggestions on those methods were: "the widely-used procedures of analyzing the contaminant data using a PCA and the fauna using MDS or CANOCO give acceptable levels of discrimination of effects. There are sound procedures to relate contaminant to effects and to separate out effects of natural environmental variables in both PRIMER and CANOCO. The areas of effect and contamination can be plotted on maps and are clearly interpretable by managers."

11. *Section 8.1.1 Sediment Profile Photographs (Page 8.2)* I have reservations with the SPI approach to analyses, as it predominantly relies upon photographs from a camera, which is dropped into the bottom. It takes qualitative interpretations to evaluate the communities and conditions, and it does not lend itself to numeric or quantitative analyses: its focus is on the redox potential (i.e., the depth or distribution of the oxic and anoxic layer and the presence of methane (which is an indication of the degree of organic enrichment). While the information on, and observations of, redox potential (Section 8.1.1.1),

Southwest Marine), withall exhibiting either no alterations or minor differences from reference stations based on benthic metrics; **Station Group 5 -** Two adjacent Southwest Marine stations (SW13 and SW15) located in a dry dock area; **Station Group 6 -** Two adjacent Southwest Marine stations (SW04 and SW08) located in a shallow protected area; and **Station Group 7 -** Two outermost reference stations (2441 and 2433). Further examination of each of the shipyards stations groupings are discussed in detail in Section 8.1.3.8 and Section 8.1.3.9, below.

15. *Section 8.1.3.5. MDS Analysis of Benthic Communities (Pages 8-14 and 8-15).* Nonmetric MDS largely preserved the seven station groups identified by the classification analysis and showed the following distributions Figure 8-18): **Station Group 1 -** The single station in this group (NA22) was located at the southeast boundary of the site and is the station closest to Chollas Creek; **Station Group 3 -** Six stations (NA04, NA05, NA11, NA12, NA15, NA16) were clustered in the central part of a large open area in the southeast part of the site; three stations (SW21, SW22, and SW23) were clustered in a confined nearshore area in the northwest part of the site; and three stations (SW03, SW17, and NA20) were isolated in various parts of the site; **Station Group 4 -** Eight stations (SW02, SW09, SW11, SW18, SW25, SW27, NA01, and NA03) were located in a relatively continuous band along the offshore area of the northwest part of the site; five stations (NA06, NA07, NA09, NA17, and NA19) were located in a relatively continuous band along the nearshore area of the southeast part of the site; **Station Group 5 -** Both stations from this group (SW13 and SW15) were located adjacent to each other in a dry dock area in the northwest part of the site **Station Group 6 -** Both stations from this group (SW04 and SW08) were located adjacent to each other in a shallow protected area in the northwest part of the site. **Group 2 and 7** are the reference stations.

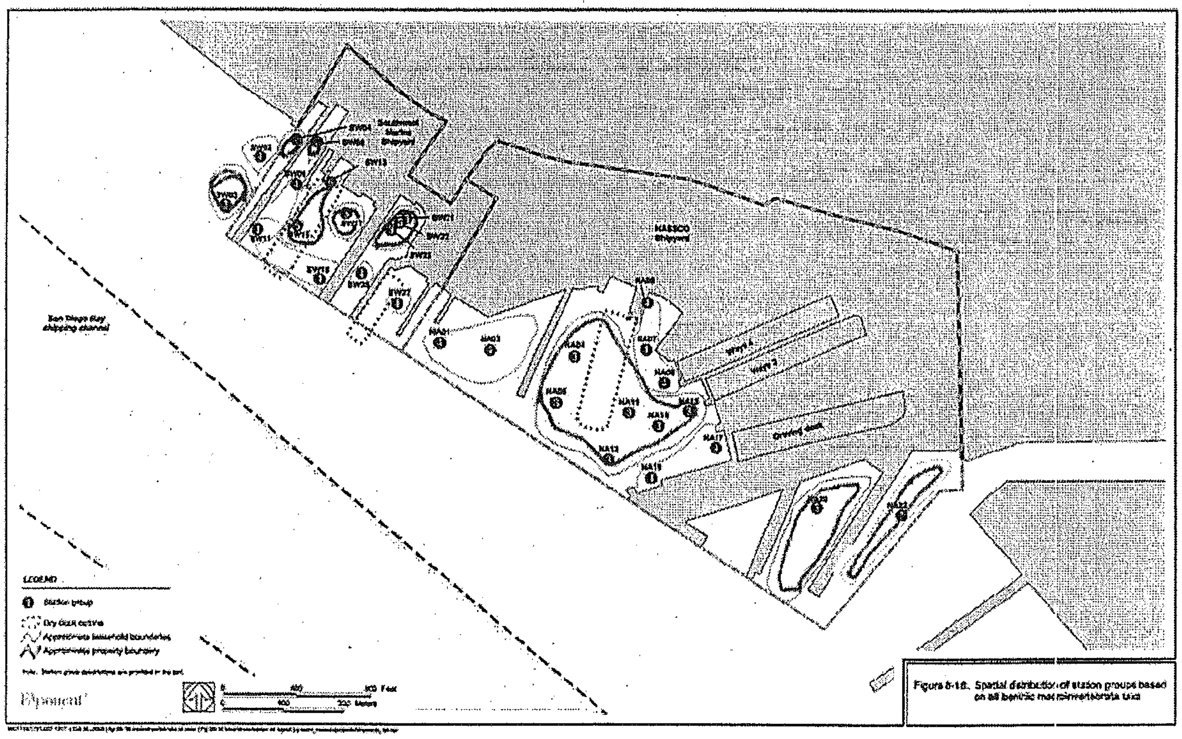

Figure 8-18. Spatial distribution of station groups based on all benthic macroinvertebrate taxa

16. *Section 3.1.3.8. Identification of Potential Benthic Indicator Species (Pages 8-17 to 8-20).* While benthic ecologists are always attempting to categorize species, based upon their "pollution tolerances or sensitivities" (just as SCCWRP's BRI), no one standardized or accepted method has prevailed. In examining the shipyards approach, four groups of benthic organisms were identified (including "outliers" group). For each group, species were selected and judged as sensitive or tolerant (I note that Hunt et al. (2001) referred to them as "positive" or "negative" indicator species, and this constituted only 1/6th of their "relative benthic index". I also note that Hunt et al. (2001) had different methods of sampling benthic organisms, with a 0.5 mm screen, rather than a 1.0 mm screen. Shipyards categorize those as "sensitive" or "tolerant". Hunt et al.'s classification considered negative indicators to be highly opportunistic species that thrive in disturbed, polluted or marginal environments and are not found in polluted, while positive indicators are not found in polluted habitats and are characteristic of regions where anthropogenic and other severe disturbances do not play major roles in structuring communities.

Another difficulty with the use of the benthic indicator groups proposed is that it is based on a very small number of the potential species, of which classifications are either not known or poorly known. Shipyards report identifies the following in each group: Benthic group 1 (2 species, no information; 1 species, sensitive); Benthic group 2 (1 species, tolerant; 3 species, no information); Benthic group 3A (1 group, tolerant;1 related species, tolerant; 1 group, inconclusive); Benthic group 3B (1 species, tolerant; 1 species, no information); Benthic group 3C (2 species tolerant, 1 species sensitive); Benthic group 3D (1 species unknown; 1 group, considered sensitive); Benthic group outliers (2 species, no information). I mention two points with the proposed index: 1) the majority of species utilized has no information, and 2) those species for which a category could be found tended to be "negative" or "tolerant" species or higher classifications (i.e., classes, such as all crustaceans). I think that this line of evidence is weak, especially in a decision of how the benthic community has been "altered" or is "different from reference" (i.e., is it caused by shipyards pollution, physical disturbance of the bottom, or other factors).

17. *Section 8.1.3.9. Benthic Community Composition at Selected Stations (Pages 20 to 22).* Because there is some confusion with respect to the status of each of the benthic groups, for example, is Benthic Group 3 C "tolerant", because 2 of the species are "tolerant" and 1 species is "sensitive"? , I find this particular section of the report of limited value for interpretation of the benthic community status. The authors tend utilize the index in favor of: 1) demonstrating the range of "reference" benthic conditions, apparently ranging from tolerant to sensitive, 2) opining that one station (NA22) is adversely affected by pollution (from non-shipyard sources), 3) suggesting that the presence of molluscs at Station Group 5 is the result of physical disturbance, and 4) opining that Station Group 6 has representatives from both tolerant and sensitive species, and but that the effects are probably not pollution related.

18. *Section 8.1.3.10. Assessment of Differences in Benthic Macroinvertebrate Communities (Pages 8-22 to 8-23).* The shipyards report presents a classification of stations based upon differences between benthic metrics: Stations at which some kind of effect on the benthic communities were classified as having minor, moderate, or major differences from reference area conditions, based on the following criteria: a) Minor Differences – a difference was found for only one benthic metric and the station clustered closely with one or more stations at which no differences on benthic metrics were found; b) Moderate Differences – Differences were found for one or two benthic metrics and the station clustered closely with one or more stations with major differences based on benthic metrics. Alternatively,

differences were found for two benthic metrics and the station did not cluster closely with any other station; and c) Major Differences were found for three or more benthic metrics. In this section (1st paragraph), the authors of the Shipyards Report emphasize that they are using a "very conservative" approach in this analysis, because they have not factored in grain size, TOC, and water depth. On the contrary, it is, arguable, a less conservative approach, because the authors have judged the degree of differences on a scale, which suggests that "Minor" and "Moderate" alterations of the benthic community is a better condition than a "Major" alteration. A "minor" alteration, for example, of the loss of all diversity, but no other changes in benthic metrics is suggested as an acceptable alteration, whereas I would judge that alteration unacceptable for the protection of the beneficial use of aquatic habitat. I approached this utilizing all of the data, and redrew the Shipyards report figure (Figure 5)

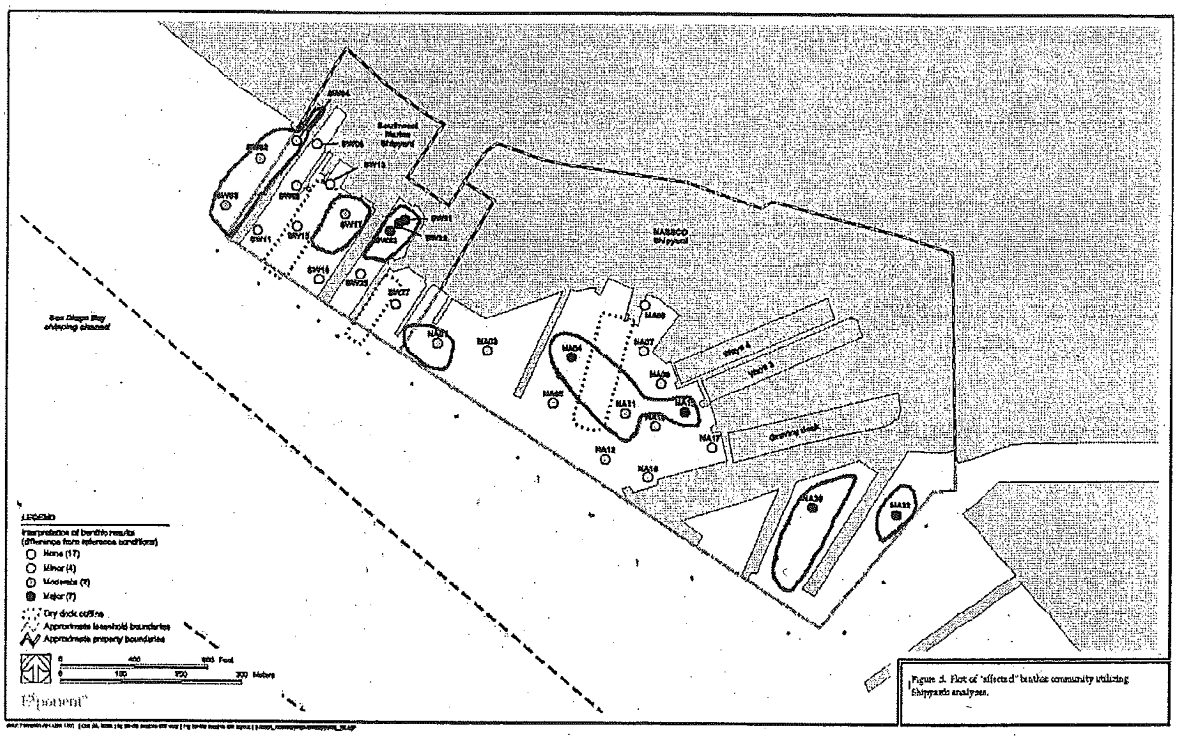

Figure 5. Plot of "affected" benthic community utilizing Shipyards analyses.

With this plot, one can see that there are several areas of "changes" in the benthic macroinvertebrate metrics. It looks very similar in distribution to the previous figure (Figure 8-18).

19. *Section 8.1.4 Benthic Response Index (Pages 8-23 to 8-25) and Section 8.1.4.1 (Pages 8-25 to 8-34).* In this section, the authors describe the Benthic Response Index (BRI). The BRI was developed in a manner similar

to a BRI developed previously for evaluating benthic communities on the mainland shelf of southern California. The BRI is the abundance-weighted average of the pollution-tolerance values that have been assigned to individual benthic species found in the bays of southern California. Several reservations with its use and interpretation were pointed out by the authors of the Shipyards Report, in an appendix to the report. I am not a qualified benthic ecologist and do not have an opinion on the issues that have been raised by the Shipyards Report authors, and others (Gray, pers. comm.). It has been employed in the evaluation of municipal waste discharges of the southern California shelf. Acknowledging that there are issues with the approach, I reviewed the analysis presented in the Shipyards Report, as it appears. I suggest that the use of the information should be done with the thought that there is some uncertainty with the validity of the approach, but if it is supported by other information, then that would add to the "weight-of-evidence" toward a decision on sediment remediation. I have "no comment" on arguments regarding the validity of the BRI in Sections 8.1.4.1. I note that 13 of 20 in the "final reference stations", fall within the BRI reference index of 0-31 (Table 8-14). It is possible that a reference envelope should be an index which spans the range of BRI's measured in San Diego Bay, as a regional site specific index (0-38). With that in mind, I examined the BRI's computed for the Shipyard site stations (see Figure 4). With that criterion, all of the stations within Shipyards sites exceed the "BRI reference index". There would appear to be at least two interpretations of the BRI for sediment remediation. Each of the response levels from reference to 3 presumably reflects increasing degradation of the community, and evaluations of sites could develop a ranking system which shows the worst and best conditions. Another approach would be to evaluate the community response, relative to the "reference", judging that any alteration from reference represents interference with the beneficial use of the aquatic habitat. I favor the latter interpretation, as it is clear that the intention of the Board is to restore the beneficial uses to the "reference" or "baseline" condition. This is the approach that the Resource Trustee agencies favor, with the implementation of their custodial responsibilities at hazardous waste sites (DOI regulations, 1996, CFR 43, Part 11). There is also an issue about the lack of information outside the boundaries of the Shipyards properties, as the property line demarcation may not reflect the pollutant and communities distribution.

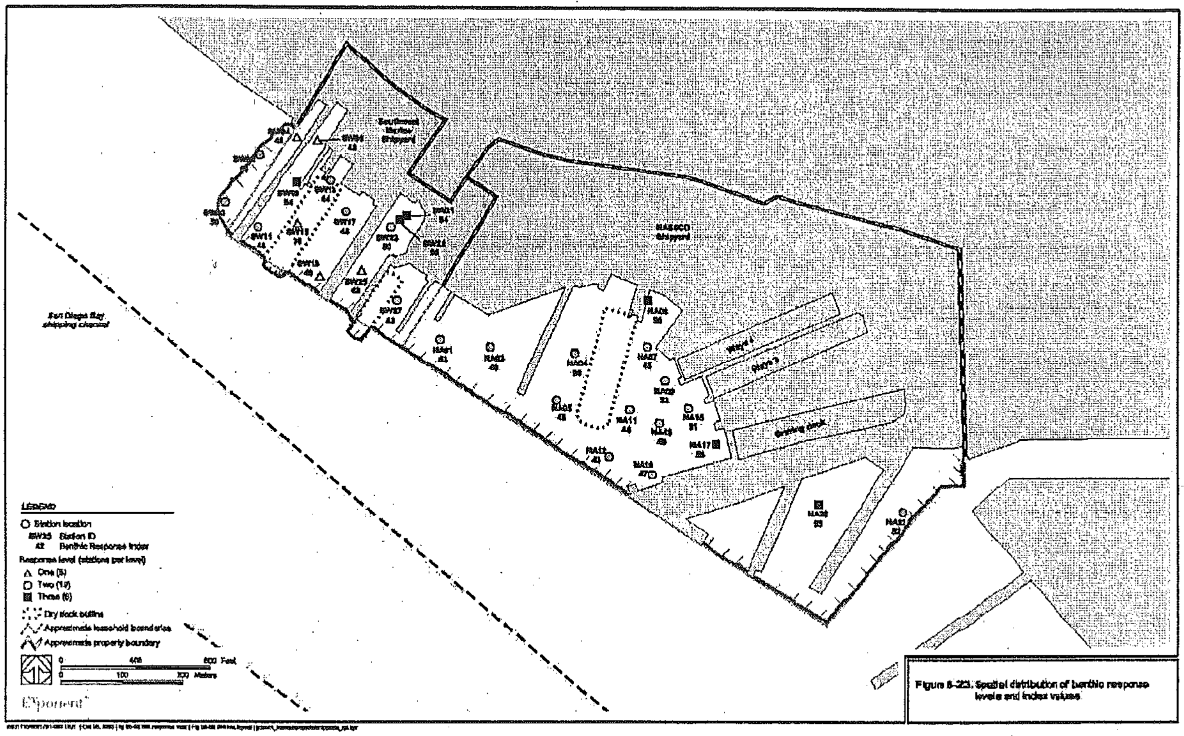

Figure 8-23. Spatial distribution of benthic response levels and index values

20. *Section 8.1.4.2 Summary of BRI Applicability (Pages 8-34 to 8-37).* Despite the numerous objections and critical comments regarding the BRI, it showed patterns of the benthic macroinvertebrate community in the Shipyards sites to be different from the reference sites, in my view. The lack of concordance with other measures may or may not be of ecological significance; hence, I think that the information (and patterns) from the BRI is a piece of useful evidence. Certainly, the alternative analysis, offered by the Shipyards consultants, have some of the same deficiences that the BRI has. I recommend that the SWWRP benthic ecologists review the comments, and provide responses, so that you can better evaluate the appropriateness of the comments and constraints on the BRI.

21. *Section 8.1.5 Summary of Benthic Macroinvertebrate Community Conditions (Pages 8-37 and 8-38).* Obviously, I do not agree with the evaluation and opinions, found in the Exponent report. The statistical tests on eight individual benthic macroinvertebrate indices identified differences between the shipyard stations and reference stations. The categorization or classification of those into absent, minor, moderate, or major was based solely on the number of indices which were different, but did not really address the issue of how those changes might interfere with the normal function or responses of the communities to contaminant exposure.

Therefore, I considered the change (not the degree) as an important indication of the potential effects of contaminants on the benthic macroinvertebrate communities.

22. *Section 8.2 et seq. Fish Histopathology (Pages 8-38 to 8-49).* This section was reviewed by Dr. Mark Myers of NOAA Fisheries in Seattle. I read those comments, and they seem to be balanced and factual. It certainly took a different spin that those of the consultants, i.e., some of the fish lesions and histopathological biomarkers were higher in Shipyard sites than reference, suggesting some adverse impacts upon fish.

23. *Section 9 Assessment of Potential Effects Upon Aquatic Life (Page 9-1).* The report discusses the results of the measures of biological effects (toxicity tests and benthic macroinvertebrate community analysis compared relative to the chemical concentrations at the individual stations. Here, statistical correlation analyses were employed to try and see if there was an association between chemicals and adverse biological effects. One of the significant "problems" of the chemical data set is that all of the constituents covary (except for selenium, that had a large number of non-detects). This report utilized a linear regression model for the evaluation. It is possible that other correlation analyses might be useful (Hunt et al., 2001) utilized both multi- and univariate correlations (as well as Toxicity Identification Evaluations to determine classes of chemicals causing toxicities in pore waters). Figure 9-1 demonstrates the difficult interpretation of the acute amphipod toxicity response (all other chemicals will plot just about the same). A typical dose-response toxicity test should have a distribution as shown by the red line, i.e. low concentrations of chemical with high survival, and vice versa. So what happened to these experiments?

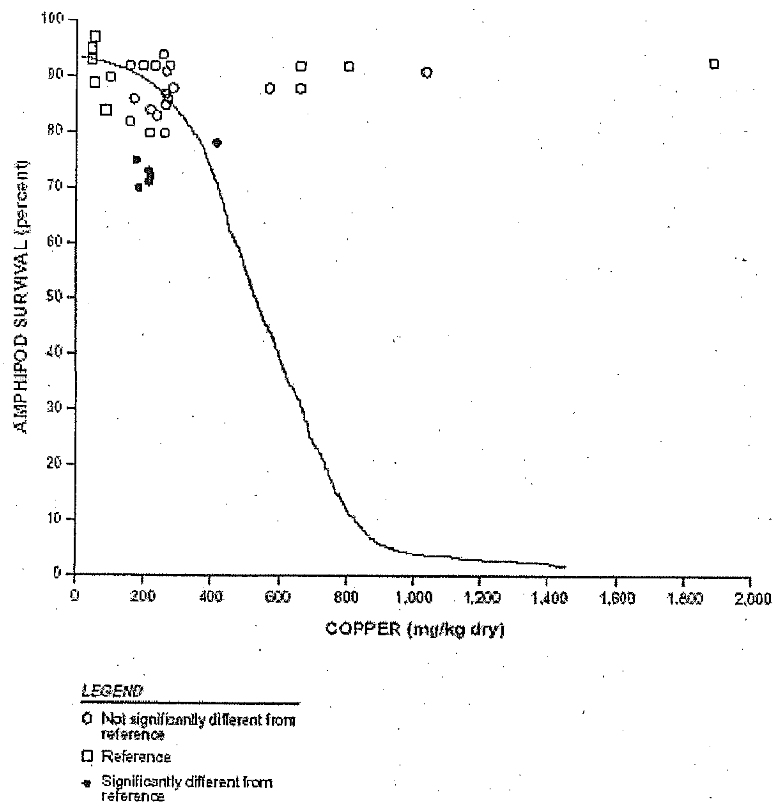

Figure 9-1. Sediment copper concentrations in relation to amphipod survival

All of the report's explanations of the lack of correlations may be plausible: the magnitude of the biological effects may be too small to allow significant effects to be identified; the tests of biological effects may be inaccurate; complex variations may occur among concentrations of causative chemicals; chemicals other than the putative shipyard chemicals may be producing the observed biological effects; and effects other than chemical toxicity may be producing the observed biological effects. Have chemical concentrations of these sediments produced toxic results at other sites? Are the test species less sensitive to toxicants than the field species? ?

Unexplained toxicities, as well as lack of toxicities, are common to these types of toxicity evaluations. I would also suggest that the chemical concentrations relative to the ERM quotient (Hunt et al., 2001) be looked at to see if there is consistency among the reference sites and shipyards sites. The lack of toxicity response from some chemicals (such as PCBs) might be explained by the fact that it generally is thought to be not very acutely toxic, but its chronic toxicity is a result of bioaccumulation and trophic transfer in the food web.

I have not had an opportunity to review the remainder of the report, due to time constraints and other project priorities, but will attempt to provide a review of the remainder of the report in the very near future.

(84)

California Regional Water Quality Control Board
San Diego Region

Terry Tamminen
Secretary for Environmental Protection

9174 Sky Park Court, Suite 100, San Diego, California 92123-4340
(858) 467-2952 • Fax (858) 571-6972
http://www.swrcb.ca.gov/rwqcb9

Arnold Schwarzenegger
Governor

RECD FEB 24 2004

February 23, 2004

Mr. Sandor Halvax
Southwest Marine Inc.
P.O. Box 13308
San Diego, CA 92170-3308

Mr. Michael Chee
NASSCO
P.O. Box 85278
San Diego, CA 92186-5278

In reply refer to:
PLRP:03-0066.05:otbre
PLRP:03-0137.05:otbre

Dear Mr. Halvax and Mr. Chee

INVESTIGATION ORDER NOs. R9-2004-0026 AND R9-2004-0027

Enclosed are Investigation Order Numbers R9-2004-0026 and R9-2004-0027 pertaining to the Southwest Marine Shipyard and National Steel and Shipbuilding Company (hereinafter NASSCO) Shipyard, respectively. The Orders direct the recipient to submit a historical site assessment report to completely document all activities in the vicinity of the current Southwest Marine or NASSCO Shipyard leasehold that may have affected water quality.

If you have questions regarding Investigation Order Numbers R9-2004-0026 and R9-2004-0027 please call Brennan Ott at (858) 268-5362.

Sincerely,

Craig L. Carlisle

Craig L. Carlisle
Senior Engineering Geologist
San Diego Regional Water Quality Control Board

Enclosures:
Investigation Order No. R9-2004-0026;
Attachments to Investigative R9-2004-0026; and
Investigation Order No. R9-2004-0027

cc: Denise Klimas, NOAA, 8810 Cal Center Drive, Sacramento, CA 95826
Scott Sobiech, US Fish and Wildlife, 6010 Hidden Valley Road, Carlsbad, CA 92008-4219
Michael Martin, CA Fish and Game, 20 Lower Ragsdale Drive, Monterey, CA 93940
San Diego Bay Council, c/o Laura Hunter, EHC, 1717 Kettner Blvd. #100, San Diego, CA 92101

From: "Tom Alo" <alot@rb9.swrcb.ca.gov>
To: <RBRODBER@oehha.ca.gov>
Date: 2/25/2004 9:49:11 AM
Subject: San Diego Bay Council's Comments on Shipyard HH Study

.5 HRS

Bob,

Attached are San Diego Bay Council's comments on NASSCO and SWM shipyard technical report.
Please focus your attention on the comments regarding the human health study:

Pages 5-7 = "Regional Board should follow Cal/EPA Environmental Justice Guidelines"
Pages 7-8 = "CAO should integrate the precautionary principle adopted by Cal/EPA into Cleanup decision"
Pages 8-9 = "Specific Flaws in the Exponent Health Risk Assessment (HRA)"

Please review their HH comments and let's discuss when we chat next Tuesday at 11:00 am. Thanks.

--Tom

CC: "David Barker" <barkd@rb9.swrcb.ca.gov>, "Craig Carlisle" <craigc@rb9.swrcb.ca.gov>

Sand bass

PCB cancer risk / non cancer.

largest risk to shore angler @ Sw Marine

~9-10X shore angler NASSCO & Ref site

greater than lobster risk

@ NASSCO shore & boat ≈ and ≈ Ref site

@ SWM shore ~ 3X boat

SWM boat ~ 2X NASSCO

" " ~ 2X ref

lobster

highest @ SWM > Ref ~ 2X NASSCO

PCBs WB values 3-8X fillet; but variation

lobster PCB risks < Sand bass

lobster Hg best at NASSCO almost ≈ 5X SWM

& 5X Ref

ref & SWM ≈

Non-Cancer Risks using max values

	Genpop	EI	subsist	EI
Nout				
sb-PCBs	8.6E-1	4.2E-3	64.6	3.3E-2
lobster PCBs	—	—	—	—
lobster Hg	—	—	—	—
Nin				
sb-PCBs	6.9E-1	2.3E-2	5.3	1.8E-1
lobster PCBs	1.7E-1	5.6E-3	1.3	4.3E-2
lobster Hg	1.6	5.3E-2	12	4.1E-1
Sout				
sb-PCBs	1.7	3.3E-3	1.3E+1	2.5E-2
lobster PCBs	—	—	—	—
lobster Hg	—	—	—	—
Sin				
sb PCBs	6	1.4E-1	4.6E+1	1.1
lobster PCBs	3.2E-1	7.2E-3	2.4	5.6E-2
lobster Hg	3.2E-1	7.5E-3	2.5	5.8E-2

1 HR

(I)

3-2-04

Tom Alo
Craig Carlisle

Sec 8

FRACTIONAL INTAKE UNDERESTIMATE
→ UNDEREST
→ more
→ using 10^{-5} → could go 10^{-6}
use 21 & 161
Δ F intake risk could go up

barriers & base times don't mean
add onsite-workers →
illegal fishing - precedent from other site

assumption ~~that~~ potential future use
→ site no longer at shipyard
→ protect
* atty → beneficial uses → support eating fish
assume 100% use fact

165 as screen
San Diego 1990 → used 162 ∴ supports 161

?? whole body ?? → under estimate mention this

(2)

old coal fired power plant near SWOI (north end): PCBs + Hg
+ tank farms

maybe NASSCO smelter.

consumption rate: 161 reasonable

for whole: compare + say ~~this~~ could be this much higher

SF Bay
2.5 µg/Kg 10^{-5} sediment screen level
current ppb → order mag ~~below~~ above screen.
so are fish tissue.

SV is applicable for Bays & Estuaries

12-8-03

no NOAA on call
fish + wildlife may join.

David Carlisle
Tom Alo
flexible on date

→ Shipyard not there forever
∴ people may be able to fish there eventually → ∴ should cleanup meet water quality standards

→ Do they really calculate off site ?

Not considered off site use

Enviro Health Coalition

ounsel SWRCB make decision on secure shipyard
policy decision
redraft for fishers on site
+ lease line → restricted zone extends beyond lease line

From: Robert Brodberg
To: Michael, Pete
Date: 11/29/03 4:40PM
Subject: fishing survey

Hi Pete,
I am reviewing the NASSCO/Southwest Marine site assessment for Tom Alo in your office. The assessment estimates fractions of fishing for the site based on either linear shoreline or water area within the lease hold. I think this is an over simplification and reduces any estimate of consumption from the site. I referred back to some rough data from the fishing survey we did to come up with my own estimate of fishing intensity. Based on this I would say that we observed the most fishing from boats in the north bay and the least in the south bay, and that the level of fishing from boats in the central bay in the general vicinity of this site was intermediate between these two. Does that seem reasonable to you? I recall you had a partial write-up of a report. Did you finish it?

Regards
Bob

From: "Pete Michael" <michp@rb9.swrcb.ca.gov>
To: <RBRODBER@oehha.ca.gov>
Date: Mon, Sep 17, 2001 11:27 AM
Subject: San Diego Bay fish tissue stations

Bob,
Here's my preliminary summary of where people fish in San Diego Bay, based on our August 19-20 fishing count. Cari Blemker is working up the data. The ranks shown below are relative and are based only on my recollections. Please adjust the numbers. In the short term Gary could use this information to help identify additional fish sampling stations for PCB followup.
The relative ranking shows that more people fish from boats in the north Bay on the weekend, especially the morning, but fewer fish from boats later in the day and during the week. The numbers represent the estimated concentration of fishing activity. The public fishing piers and the Navy North Island fishing pier stayed very busy throughout the day and during the week. The North Island pier was surprisingly busy on Sunday and Monday. We did not see anyone fishing in the industrial areas in the central Bay, although it must happen from time to time. No one was seen fishing at the Crosby St. pier just north of the bridge. That pier had No Fishing signs posted. Several boats worked the Coronado Bridge, with one boat trolling in circles around one of the piers. Only isolated fishing boats and small groups of people fishing from shore were seen in the south Bay, although the Chula Vista pier was always active.
I hope this helps.
Pete

DRAFT

Relative
Rank

Sunday
6 Boat fishing, north Bay ova Sunday
10 Shelter Island fishing pier
6 Navy North Island fishing pier across from Shelter Island
4 Boat fishing, cental Bay
10 Downtown Fifth Avenue fishing pier
2 Coronado shore fishing north of ferry landing
0 Crosby St. pier
2 Coronado Bridge piers
3 Central Bay boat fishing
7 Chula Vista J. St. Marina fishing pier
2 Coronado Cays near hotel
1 South Bay boat and shore fishing

Monday
2 Boat fishing, north Bay
8 Shelter Island fishing pier
6 Navy North Island fishing pier across from Shelter Island
2 Boat fishing, central Bay
7 Downtown Fifth Avenue fishing pier
2 Coronado shore fishing north of ferry landing
0 Crosby St. pier
2 Coronado Bridge piers
2 Central Bay boat fishing
5 Chula Vista J. St. Marina fishing pier
1 Coronado Cays near hotel
1 South Bay boat and shore fishing → least

CC: <Gichikawa@mlml.calstate.edu>, "Cari Blemker" <blemc@rb9.swrcb.ca.gov>, "Lesley

3+4) calculations assuming on site concentrations migrate off site

selection
8) rei species + chems to be used in RA based only on Risk
then show what happens in comparison to Reference sites

?. Calculate risk @ Reference site too ?

4) Redo risk calculations assuming [chem sed] outside lease = inside

10) ?redo inside expo for high end consumer assuming that some day may be ?ed access to site

→ ... regardless of reference level in Bay ... regardless of whether there is an equal risk elsewhere! where did this come from!

10-2-02

San Diego Bay

ALLAN R9

Tom Lipp (DFG)
Pat McLernon (DFG)

Gary didn't talk to them.

Collection last Wed started
3 boats
"JB" trawls
2 MRC boats - hook & line

doing histo → say all cutting done by same person Dr Marty

→ Black croaker move in outer area not on structure

BILL PASNOKAS - Local DFG

[one halibut 37"]
rest 6-10"

were > 10"

spotted sand bass good for PCBs
reports
March/April time frame

10/2/2002
Fish Survey Sept 2002

Fish Collection at NASSCO and Southwest Marine

9/25/02 - 9/29/02

inside boom piers & dry dock

outside boom

west of shipyard toward amphibious base

12 - legal size

8-14 inches

Species	Inner Shipyards (NASSCO and SWM)	Outer Shipyards (NASSCO and SWM)	Reference Area	Total (Fish Counts Estimates)	Comments
Spotted Sand Bass	>60 each area, 50 for histopath, 10 for tissue chemistry	>60 each area, 50 for histopath, 10 for tissue chemistry	>60, 50 for histopath, 10 for tissue chemistry	>300	Fish > 8 in total length kept for study. Selected for histopath, ecorisk (large birds and mammals) and human health
Barred Sand Bass	71	48	44	163	All bass collected at Reference were less 8 inches total length - small
Round Ray	164	39	29	232	
Black Croaker	2	8	6	16	
Calif Halibut	2	1	1	4	
Yellowfin Croaker	1	3	0	4	
Other Flatfish (Spotted and Diamond Turbots)	13	8	4	25	
Bonefish	0	1	1	2	
Gobies	1	0	>25	>26	Gobies observed in stomach contents from one Spotted Bass collected from the inner shipyards
Scorpionfish	1	0	0	1	
White Croaker	0	0	0	0	
Speckledfin Midshipman					
Butterfly Ray	1	0	0	1	
Sargo	0	1	0	1	
Anchovies	Yes	Yes			Selected for Ecorisk, small birds for Inner NASSCO, outer NASSCO and outer SWM
Topsmelt		Yes	Yes		Selected for Ecorisk, small birds for inner SWM and Reference
Lobsters	Yes		need diff In Progress area		Still trying to collect lobsters at reference areas, may move traps to alternate Reference locations
Crabs	None	None	In Progress		
	Collection Methods				
Trawls	Yes	Yes	Yes		
Hook and Line	Yes	Yes	Yes		
Beach Seine	Yes	No	Yes		
Fish Traps	In Progress	No	No		Still trying to collect gobies at the inner areas
Number of Trawls	17	13	5	35	

hard to get

Heavy security at shipyard
No-one allowed in.

→ Employees can fish from pier.

8-12-02

S.D. NASSCO / SOUTHWEST SITE

EXPONENT PLAN

→ TBT A WASTE CONSTITUENT
∴ measure

Gobies: hard to collect; must dig out; no practical way to collect (fine mess otter trawl)

→ compare "site fish" to reference fish to see if diff from Bay
[histopath is it site or is it comparative]

CRABS ? red rock ?
↳ could be lobsters → add in!

(1)

8-8-02

R-9 Phase 2 Workplan

Tom & other RB peeps -
Denise Klimas - NOAA
(no MIKE ANDERSON)
MIKE MARTIN
Don MacDonald NOAA
Scott Sobiech FWS.

1) Table 6 chems ≠ to text
2) use BSAFs for HH in Table 3
add TBT to Table 6
3) ~~pg 6 & Table 6~~
do As inorganic for HH

4) page 10 how many locations in shipyard + as reference are fish for HH.
5) Mixing histopath & chem analysis is hard
concern → "clean samples"

6) Can't tell what will be caught.
Break out 3 studies
human health
histopath
- ecorisk - gobies

~~5 hits~~
to missing

7 skin off/on ? send protocol!
8 composites or individuals ?

Monday 9:30
page by page → add in comments

Robert Brodberg - Comments on Phase 2 Workplan

From: "Tom Alo" <alot@rb9.swrcb.ca.gov>
To: <Denise.Klimas@noaa.gov>, <Donald.Macdonald@noaa.gov>, <RBRODBER@oehha.ca.gov>, <MMARTIN@OSPR.DFG.CA.GOV>, <Scott_Sobiech@r1.fws.gov>
Date: 8/7/2002 11:37 AM
Subject: Comments on Phase 2 Workplan
CC: <MAnders7@dtsc.ca.gov>, "David Barker" <barkd@rb9.swrcb.ca.gov>, "Craig Carlisle" <carlc@rb9.swrcb.ca.gov>, "Alan Monji" <Monja@rb9.swrcb.ca.gov>, "Brennan Ott" <otbre@rb9.swrcb.ca.gov>

Hello everyone. I hope you all received the draft Phase 2 workplan and had a chance to review it. Given our extremely tight schedule we felt that the most efficient way to relay our comments to Exponent was via conference call. But before we talk to Exponent I would like to setup an internal conference call so we can share and discuss our comments. I would like to have the internal discussion on Thursday, August 8 at 2:30 pm and then have the Exponent conference call on Monday, August 12 at 9:30 am. Please let me know if you are available. Thanks.

?

--Tom

(1)

4-17-02

Tom ~~Ab~~ Abe
David Barker
Mike Martin

Macoma

1) do they accumulate as much as fish ?? NO is evidence

2) don't incorporate trophic transfer

3) are they at steady state ?

4) what are SF Bay clam species ??

Tiered Study

Chems concern
PCBs
PAHs ←
→ lead ←
TBT ←
other metals

→ Just south of bridge on eastern side ←

PRELIM SCREEN
→ 2 tiers
existing data
Exponent on site

prelim. eval of site
→ RIFS → will it be needed ?

Navy survey of fish in Bay + histo path study + biomarker

BRODBERG 000062

fidelity + histopath not on fish we collected

PCBs: Test sed concentration @ site × BSAF × conversion factor for wet wt

↓

calc HQ or cancer risk

where from other studies?

→ global review

→ Try using real data as check on this ←

TIER 2 MORE DATA COLLECTION fish & inverts

potential for fishing → is the site closed / institutional controls / management actions

Need to send data to them:

"OEHHA contract" left over from DOD

site clean up — SWRCB contract prob w/ Dave

$7-8 K may disappear in June

Tank + DOD not using

Sed

Exponent

Exponent
15375 SE 30th Place
Suite 250
Bellevue, WA 98007

telephone 425-643-9803
facsimile 425-643-9827
www.exponent.com

February 25, 2004

Tom Alo
California Regional Water Quality Control Board
San Diego Region
9174 Sky Park Court, Ste. 100
San Diego, CA 92123

Subject: Responses to California Department of Fish and Game Comments on the NASSCO and Southwest Marine Sediment Investigation Report
Project No. 8601718.002 and 8601731.002

Dear Tom:

On behalf of NASSCO and Southwest Marine, Exponent has prepared responses to the comments on the detailed sediment investigation report that were submitted by Michael Martin of the California Department of Fish and Game; these responses are attached. If you have any questions about these responses, please call me at (425) 643-9803.

Sincerely,

Dreas Nielsen
Project Manager

Enclosure

cc: Shaun Halvax, Southwest Marine
Mike Chee, NASSCO
Lane McVey, NASSCO
Tom Ginn, Exponent

Exponent®
15375 SE 30th Place, Suite 250
Bellevue, WA 98007

February 25, 2004

Responses to California Department of Fish and Game Comments on Detailed Sediment Investigation Report

Following are responses to comments on the detailed sediment investigation report received from Michael Martin of the California Department of Fish and Game. These responses were prepared by Exponent on behalf of NASSCO and Southwest Marine.

The text of each comment is summarized below, and followed by a response; the original set of comments should be referred to for the entire text of a comment.

1. a) Reference stations should reflect the cleanest conditions in San Diego Bay, and the final reference pool was selected appropriately. b) If the physical characteristics of sediment differ between site and reference locations, they should not be compared directly. c) Some chemicals can be normalized to TOC, iron, aluminum, or particle size; [comparisons to] the final reference pool should be re-evaluated.

    a) The detailed sediment investigation report contains an extensive discussion of the criteria for selection of reference sites. In brief, both U.S. EPA guidance and the Regional Board staff's own guidance for this project specify that reference sites should be indicative of local conditions exclusive only of effects attributable to the site being evaluated. This criterion is intended to allow determination of adverse biological effects that are associated specifically with the site of interest—in this case, the shipyards. This criterion is consistent with the purpose of this investigation. Reference stations selected by this criterion are not necessarily intended to represent the cleanest conditions in the bay, because the purpose of this investigation is not to identify the difference between current conditions and ideal conditions, but to determine the impairments to beneficial uses caused by shipyard-associated chemicals.

    b) The comment states that site and reference conditions should not be directly compared if their physical characteristics differ. Different physical characteristics between site and reference stations are a consequence, at least in part, of the inclusion of stations from the outer parts of the bay and from near the central axis of the bay in the final reference pool. Greater flushing in these parts of the bay prevents the accumulation of fine sediments, such as are found near the shipyards. Although matched physical conditions between site and reference stations is to be preferred, comparisons can be made despite differences, if the likely effect of those differences is known and is considered when interpreting the differences. In this case, the finer particles and higher organic content at the shipyards would lead to higher chemical concentrations in shipyard sediment than in reference sediment, all other conditions being equal. Comparison of site and reference conditions will therefore, in this case, lead to a conservative (protective) identification of differences. The extent of the difference that would be observed, given equivalent loading but different grain size, can be estimated based on the observed variations in grain size. The modal grain size at reference areas is fine sand to silt, equivalent to a particle size of approximately 62 μm, and the modal grain size at the shipyards is silt to clay, equivalent to a particle size of approximately 4 μm. The ratio of surface area to mass of sediment particles at the shipyards is therefore approximately 16 times greater than the ratio of surface area to mass of sediment particles at the reference sites. If chemicals are associated with sediment particles only by surface adsorption, and all available adsorption area is utilized, then, all other conditions being equal, sediment at the shipyards would be expected to have chemical concentrations that are approximately 16 times greater than sediment at the reference sites. Although sorption capacity depends on particle type (and other factors) as well as surface area, this type of quantitative comparison of sites provides a basis for interpreting the significance of different chemical concentrations in locations with different particle sizes. The presence of a higher organic carbon content at the shipyards will further increase the difference in potential sorption capacities of shipyard and reference sediments. And, because some metals at the shipyard are present within the sediment particles in the form of ore minerals, the total potential capacity of shipyard sediments is even greater for these metals.

c) Standardization of chemical concentrations to the concentration of TOC—or any other measured sediment constituent—can increase uncertainty and hamper interpretation of differences. This occurs because the coefficient of variation of a ratio is larger than the coefficient of variation of either of the two measurements used to create the ratio. Uncertainty about the value of a standardized concentration is therefore greater than uncertainty about the value of the unstandardized concentration. Standardization of chemical concentrations to a single variable such as TOC also can introduce inaccuracies because chemical concentrations are not necessarily controlled solely by the variable selected for standardization (Landrum and Robbins 1990).

2. Use of microprobe to determine that metal bioavailability may be low is a "different" approach; bioaccumulation of chemicals at the shipyards was shown by the Phase 1 bioaccumulation tests and by the Phase 2 tissue measurements; the microprobe 'did not find' evidence of bioaccumulation.

The microprobe analysis does not measure bioaccumulation, it identifies the physical and chemical forms in which metals are present within the sediment particles. These results help to explain the reason for the observed low levels of toxicity and bioaccumulation of metals. The comment that the microprobe "did not find" evidence of bioaccumulation misrepresents the type of measurements made with the microprobe.

The full text of this comment includes a table (Table A) that is identified as showing the ratios between mean detected concentrations in tissues at reference areas and the shipyards. Excluding undetected data from an analysis of chemical data will bias the estimated concentrations high, and ratios of such concentrations could be biased either high or low. Therefore, Table A should properly include both detected and undetected data. However, even if the undetected data are excluded, there are several errors in this table, which consistently—and in some cases substantially—overstate the difference between site and reference conditions. A corrected table is presented here as Table 1.

3. This comment first summarizes conclusions of the sediment chemistry investigation. The comment also states that there is no need to derive indices such as the BRI, and that maps of the distributions of chemical concentrations and biological effects should be used to evaluate the similarity of patterns of biological effects and chemical distributions.

   No response is required to the summarization of the sediment chemistry investigations.

   Maps can be used to evaluate the similarity of patterns of biological effects and chemical distributions, and appropriate maps are included in the detailed sediment investigation report. Examination of these maps reveals that there is actually very little similarity in the patterns of biological effects and chemical concentrations, at least for the chemicals potentially associated with shipyard activities. Standard statistical methods can be used to quantitatively assess the degree of association between chemical concentrations and biological effects, and these methods also have been applied. The results are summarized in section 9.1 of the detailed sediment investigation report.

4. The comment quotes from the final report regarding statistical comparisons between chemical concentrations at the shipyard sites and the reference areas. No specific comment is made, although the quoted phrase "results characterize the shipyards as a whole," is underlined.

   Because of the indefinite nature of the comment, no specific response is possible.

5. Environment Canada has published sediment quality criteria for PAH, for British Columbia; Filyk (2003) [complete citation not given] and U.S. EPA Region 3 have indicated that PCTs may be more toxic than PCBs; final criteria for TBT have been published by U.S. EPA; the CTR value for mercury may be underprotective; concentrations of several chemicals at the shipyards exceeded the CTR and concentrations at reference stations; the EPA water quality standard and the DTSC guidance level for TBT were exceeded at the shipyards; several PAH concentrations in pore water exceed British Columbia guidance values.

   Sediment quality criteria for British Columbia are not relevant to the shipyard sites in San Diego Bay. The physical, biological, and chemical environments differ between these locations. An intensive site-specific study was conducted at the shipyard sites, and application of non-site specific criteria from a distant, and very dissimilar, location is not appropriate.

   Although the comment does not include a complete citation for Filyk (2003), there are two recent documents, evidently by the same author, that are relevant. Regarding the toxicity of polychlorinated terphenyls (PCTs), Filyk (undated; the document cites 2002 publications, so it was published in either 2002 or 2003) states: "The toxicity of PCTs is considered to be very similar to that of PCBs," and WHO (2003) (the chapter on PCTs was evidently prepared by Greg Filyk) states: "The toxicity of PCTs has not been extensively investigated and is considered to be very similar to that of PCBs, with the long-term toxicity being most important.... A general difficulty in toxicological studies of PCTs is the contamination of the PCT mixtures with PCBs. It is difficult to determine whether observed effects are caused by the PCTs or by the PCB contaminants."

Contrary to the implication in the comment, these summaries of PCT toxicity do not indicate that PCTs are more toxic than PCBs.

The U.S. EPA Region 3 table of risk-based concentrations (RBC) for human health protection (Hubbard 2003) includes a provisional value for the cancer slope factor (CSF) for PCTs (noted as derived in conjunction with the National Center for Exposure Assessment [NCEA]), and RBCs derived from this provisional CSF. No source for this provisional value (i.e., the studies on which it is based) is identified in the table, Region 3's referring website (http://epa.gov/reg3hwmd/risk/index.htm), the NCEA website, or in EPA's Integrated Risk Information System. The origin and accuracy of this value therefore cannot be assessed. Furthermore, this general screening-level RBC established by EPA Region 3 is not appropriate as a substitute for a site-specific risk assessment at the San Diego shipyard site. The memorandum in which the table is published states (Hubbard 2003): "The primary use of RBCs is for chemical screening during baseline risk assessment" and "*[T]he RBC Table does not constitute regulation or guidance, and should not be viewed as a substitute for a site-specific risk assessment*" (emphasis in original). The memorandum's author has also specifically stated that there is a large uncertainty associated with the RBC for PCTs, and that that value should not be used as a basis for cleanup because of this uncertainty (Yost 2004, pers. comm.).

Although U.S. EPA has published a revised surface water quality criterion for TBT, and DTSC has used the provisional EPA water quality criterion for TBT in an example of the application of a toxicity equivalency factor for dibutyltin (HERD 2003), site-specific data from the shipyards show that there is no relationship between concentrations of TBT in pore water and any type of biological effect (Spearman rank correlation, overall alpha = 0.05; regression was used to predict pore water concentrations at triad stations without regard to variability of the underlying relationships between TBT in pore water and sediment.). Abundances of gastropod molluscs potentially susceptible to TBT-mediated imposex (the development of both male and female sex organs) are also unrelated to TBT concentrations at the shipyards. None of the gastropod species known to be susceptible to imposex are found at the shipyards or the reference areas. Of the two orders represented by these species, Mesogastropoda and Neogastropoda, only one neogastropod species, *Nassarius tegula*, is abundant at the shipyards and present at some reference stations (eight other neogastropods occur at low abundance). If imposex is present in *N. tegula* at the shipyards, and is interfering with reproduction, lower abundances should be associated with higher TBT concentrations. However, there is no relationship between *N. tegula* abundance and TBT concentration.

As the comment notes, chemical concentrations in shipyard sediments commonly exceed those at reference stations, and concentrations in pore water commonly exceed the California Toxics Rule (CTR) values. As noted in the detailed investigation report, and in a preceding response, differences in concentration between site and reference stations are to be expected based on the physical differences in the sediment, and relatively higher concentrations of metals in shipyard sediment are also attributable, in part, to the presence of ore minerals in the sediment. Also as described in the investigation report, there are no statistically significant associations between chemical concentrations and adverse biological effects, and neither human nor ecological risks are associated with the chemical concentrations at the shipyards. Consequently, there is no evidence that higher chemical concentrations in shipyard sediment are the cause of limitations to beneficial uses.

6. a) Section 5.2 of the report should be amended to include comparisons of the sort indicated in the previous comment. b) "[P]ore water samples are biased low for extraction efficiencies, non-equilibrium conditions between bulk sediments and pore waters, organismal perturbations which may dilute pore water concentrations, etc." c) "It was not clear from the reports whether or not other non-linear correlation evaluations were conducted."

   a) For the reasons described in the response to the previous comment, comparison of pore water data to non-site-specific screening values is not appropriate.

   b) Pore water samples met quality control standards for recovery (bias) for all analytes except arsenic, which may be biased low in all samples, and for butyltins, which may be biased low at Reference Station 2243 (see Appendix F of the detailed sediment investigation report). The comment implying that all pore water data are biased low as a result of extraction efficiencies is therefore incorrect.

   The comment that pore water data are biased low by non-equilibrium conditions in the sediment is not supported, and the assertion itself is not a valid argument. The lack of thermodynamic equilibrium between sediment and pore water does violate an assumption of the equilibrium-partitioning approach, but it does not mean that measured pore water concentrations are biased either high or low. The equilibrium state has no effect on the equipment or methods used to collect, extract, or analyze the pore water. In fact, lack of thermodynamic equilibrium between sediment and pore water is one reason why the equilibrium partitioning approach to develop sediment quality values is highly uncertain and is generally inappropriate for assessing benthic effects, especially when compared to other methods.

   Similarly, bioturbation and ventilation of the sediment by tube-dwelling macroinvertebrates may indeed affect chemical concentrations in the pore water, and such an effect would violate an assumption of the equilibrium partitioning approach, but this effect would not introduce a bias in the equipment or methods used to collect, extract, and analyze the pore water.

   c) Non-linear correlations were carried out for those constituents for which the variance depended on the magnitude of the concentration. These data were transformed to decouple the mean and variance, and correlations were performed on the transformed data. These are identified in Table 5-2 of the detailed sediment investigation report—chemicals with non-linear prediction equations were transformed, and the corresponding R-square values are the square of the correlation coefficient.

7. Toxicity was found in 5 of 8 regions between piers; toxicity tests reflect an integration of multiple stressors; the presence of toxicity represents an impaired condition; the presence of any toxicity is unacceptable.

Current state of the art for sediment investigations, and specific guidance from Regional Board staff, is to use a weight-of-evidence approach to interpret multiple measurements of biological effects. Such an approach was followed in the detailed sediment investigation, and this approach was previously reviewed—and not disapproved, changed, or adversely commented on—by staff of the Regional Board and resource agencies, including the Department of Fish and Game. Other studies have also observed apparent toxicity in one test that is not confirmed by other tests or measurements including studies in California estuaries (Anderson et al. 2001; Hunt et al. 1998). Such differences between toxicity tests can be the result of differences in analytical precision, discriminatory power, and sensitivity to confounding factors such as physical characteristics of the sediment (Long et al. 1990). Switching at this point to an alternate approach exemplified by 'any toxicity is unacceptable' for the shipyard investigation would be arbitrary and unjustified.

In the context of the purpose of this investigation, which was to determine the impairments of beneficial uses caused by shipyard-associated chemicals, it must be reiterated that the observed toxicity was not linked to shipyard-associated chemicals using well-established methods for inferring causal relationships. The comment that toxicity tests represent an integration of multiple stressors is certainly true, and very germane. The shipyard-associated chemicals measured in this investigation were generally highly correlated with one another (see Table 9-2 of the investigation report), and so, where one chemical was present in relatively high concentration, other chemicals were also present in relatively high concentration. However, locations with the highest concentrations of all shipyard chemicals did not exhibit toxicity. Thus, integration of multiple shipyard-associated stressors, under conditions where the greatest likelihood of toxicity responses is to be expected, nevertheless did not produce toxicity. These data strongly indicate that shipyard-associated chemicals are not the cause of the toxicity responses that are observed.

8. a) Phase 1 and Phase 2 studies show that bioaccumulation is occurring, "which was apparently not found in the microprobe, physical studies." b) Areas of "significant" bioaccumulation can be plotted on a map.

   a) See the response to comment 2 regarding interpretation of the microprobe data.

   b) 'Significant' bioaccumulation is assessed by human and ecological risk assessments. These assessments were conducted, and they indicate that there is no risk above established threshold levels.

9. This comment refers to methods for evaluating benthic macroinvertebrates and fish, but contains no critique of those methods or the results.

   No response required.

10. a) There may be several fundamental problems with the BRI; point estimates of pollution tolerance cannot be made, and confidence intervals should be used; findings from the BRI analysis should be used with caution. b) Multivariate methods can be used to identify small

changes and to identify sources. c) Procedures exist to relate contaminant concentrations to effects. d) Spatial distributions of chemical concentrations and biological effects are easily interpretable.

a) Comments made on the limitations of the BRI approach are consistent with those in the detailed sediment investigation report, and no response to these comments is necessary.

b) The suggestion that multivariate methods be used to evaluate benthic macroinvertebrate data is also consistent with the approach taken in the investigation report. Some multivariate methods can also be used to help identify sources in cases where the different sources are well characterized and have distinct chemical characteristics. In general, however, the chemical characteristics of potential sources in central San Diego Bay (both current and historical) are not well defined.

c) Procedures do exist to relate contaminant concentrations to effects. The model for such interpretations is an experimental single-chemical bioassay or dosing study, where biological effects are measured at various chemical levels, and the dose-response function evaluated. The fundamental procedure used is regression, possibly preceded by appropriate data transformation (e.g., the logit transformation when an S-shaped response function is observed). The same procedures can be followed in environmental investigations. In typical environmental investigations, multiple chemicals are considered potential effectors, and so, when chemical concentrations covary, observation of a dose-response relationship must be interpreted more cautiously than it would be in single-chemical experiments. This is because a dose-response relationship will be observed for any non-toxic chemical (or physical characteristic) that covaries with a toxic chemical. The existence of a statistically significant regression, or correlation, therefore does not necessarily imply causation. These well-established procedures for relating biological effects to chemical concentrations have been applied in the detailed sediment investigation, and are described in Section 9.1 of the report. Such methods are also identified in the literature as important techniques to assess causality (Sokal and Rohlf 1982; Shipley 2002; Suter et al. 2002) and have been used in other programs in California (Long et al. 1990; Hunt et al. 2001).

d) Spatial distributions of biological effects and chemical concentrations may or may not be easily interpretable, depending on what they show. For example, the spatial distribution of mercury in surface sediment shows an elevated concentration near the shipping channel—this observation is not easily interpretable in terms of potential sources. For another example, the spatial distributions of chemical concentrations and biological effects at the shipyards are unlike one another, an observation that is not easily interpretable in terms of shipyard-associated chemicals as potential causes of biological effects.

11. a) SPI requires qualitative analysis to interpret communities and conditions. b) SPI analyses are disconnected from chemical analyses of the sediment. c) A more thorough evaluation of its use elsewhere, particularly at shipyards, would be valuable.

a) SPI analyses produce both quantitative and qualitative information. Measurements of the depth of the apparent redox potential discontinuity, for example, are entirely quantitative, and convey important information about biological activity in the sediment. Identification and enumeration of taxa in the sediment is semi-quantitative, in that it requires professional skills (for this reason, Germano and Associates was retained to conduct the SPI analyses—the principal of this firm, Joseph Germano, was one of the originators of this technique and has been applying it for 20 years). Interpretation of the taxa present in terms of community composition (e.g., successional stage) also requires professional expertise and experience with field validation of the method. In this respect, it is similar to other standard sediment assessment techniques—for example, larval development bioassays, which require professional expertise in the determination of normal or abnormal development. Also, because of the large number of observations that can be readily made at a site (or location) using SPI, the replication of results produces a further quantitative aspect of the data.

b) SPI analyses do not produce any direct information on chemical content of the sediment. In this regard they are like the toxicity tests and the benthic macroinvertebrate analyses: a separate measurement of biological conditions only. Any of these measurements of biological conditions can subsequently be used in an evaluation of the relationships between biological and chemical conditions.

c) SPI has been used widely for site assessment for the last two decades, including by regulatory agencies such as NOAA and U.S. EPA. A detailed history of SPI usage was not included in the investigation report—nor was such information included for other assessment methods used. Information about SPI usage is available on the Internet and in the peer-reviewed literature. For example, a brief description of the methods, accompanied by a bibliography of studies that have used SPI, can be found at http://www.csc.noaa.gov/lcr/text/spi_info.html.

12. This comment describes methods for macroinvertebrate sampling and analysis, but contains no remarks regarding the application of those methods or the interpretation of the results.

    No response is required.

13. This comment reiterates some of the methods and conclusions of the benthic macroinvertebrate analysis, but contains no remarks regarding the application of those methods or the interpretation of the results.

    No response is required.

14. This comment reiterates some of the results of the benthic macroinvertebrate analysis, but contains no remarks regarding the application of those methods or the interpretation of the results.

    No response is required.

15. This comment reiterates some of the methods and conclusions of the benthic macroinvertebrate analysis, but contains no remarks regarding the application of those methods or the interpretation of the results.

    No response is required.

16. The evaluation of pollution indicator species within each benthic group is weak because of the small number of species with information on pollution sensitivity.

    As was noted in comment 10, pollution sensitivity is a complex response that is not well represented by a single value, brief description, or single example. The final investigation report included information on potential pollution sensitivity of various benthic groups to provide auxiliary information on the composition of benthic communities. Because pollution tolerance assessments are non-quantitative, cannot necessarily be generalized to all different types of sites, and are not available for all species, this information was not a major component of the overall evaluation of the likelihood of adverse biological effects.

17. The analysis of benthic community composition at selected stations is of limited value because the pollution sensitivity of the various groups of benthic taxa is not well defined.

    See comment 16 and the response to that comment.

18. a) Evaluating benthic community differences based on metrics, without considering grain size or TOC, might not be conservative because the classifications of "minor," "moderate," and "major" effects does not consider the specific metric affected. "[T]he loss of all diversity" alone would not be a minor effect. b) A map was annotated by the commenter, evidently based on his interpretation of the benthic metrics' importance.

    a) Differences in physical conditions (grain size and TOC) between shipyard stations and reference stations result in differences in the habitat. These differences in habitat are likely to result in differences in the benthic communities, solely as a result of physical factors, regardless of the presence or absence of toxic chemicals. For this reason, statistical comparison of benthic community metrics may result in the identification of significant differences that would not exist but for physical differences in the habitat. Relative to the purpose of identifying biological effects that are attributable to shipyard-related chemicals, these comparisons are therefore conservative.

    The ranges of each of the benthic community metrics are shown in Figures 8-8 through 8-15 of the detailed sediment investigation report. Even stations with statistically significant differences from reference conditions in one or more metrics support large numbers of benthic organisms and taxa. In particular, the condition cited in the comment—loss of all diversity—does not occur at any of the shipyard stations. The lowest diversity value by far was observed at Reference Station 2231, because of dominance of the community by an invasive species.

    b) The derivation of the red boundaries on the annotated map accompanying this comment is not explained. The text indicates that the red boundaries indicate areas of "change," but the nature of the changes indicated is not explicitly specified—for example, areas are not categorized as having minor, moderate, or major differences from reference conditions, by whatever criteria the commenter applied. From inspection of the annotated map, it appears that the rule used to identify "changes" was simply any difference from reference condition, by any metric. Use of such a simple rule, however, is not consistent with the commenter's apparent intent to weight the different metrics on the basis of relative biological significance. This approach also does not take account of the information provided by classification analyses of communities and of stations, or of the actual taxonomic composition of species present at different stations. This additional information *is* used in the detailed sediment investigation report to evaluate the magnitude of benthic community alterations, as described in the text and summarized in Table 8-10 of the report. In the absence of any description of the method used by the commenter, and a rationale for the superiority of that method, the annotated map accompanying this comment is unsupported by any reliable analysis. In the following comment, the commenter states that "I am not a qualified benthic ecologist," which may be the reason for the absence of a detailed rationale for the boundaries shown on the annotated map.

19. a) There are issues with the BRI approach; 'no comment' on these issues, but if supported by other evidence, the BRI should be included in a weight-of-evidence approach. b) Most BRI values at the shipyards fall outside the range of BRI values in the final reference pool (including benthic data from Bight '98 and Chollas/Paleta studies). c) Lack of [benthic macroinvertebrate] information outside the shipyard leaseholds is an issue.

a) The comment's statement that the BRI analysis is only to be considered if it is supported by other evidence implicitly acknowledges that the other evidence is more authoritative. The multivariate analyses and evaluations of taxonomic composition that were performed are indeed more authoritative. There is some correspondence between the BRI scores and the results of these other evaluations, but, as described in section 8.1.4.1 of the report, this correspondence is so weak that the BRI has little ability to distinguish different levels of community alteration. For this reason, the BRI results would have only added uncertainty, not new information, to the weight of evidence analysis, and consequently the BRI results were not used.

b) Reference conditions are most accurately characterized by the overall distribution of data, not by the simple range between maximum and minimum values. Use of overall distributions is the basis for standard statistical tests and of the Regional Board staff's specification of the use of the 95 percent upper prediction limit for comparison of chemistry data. In addition, the commenter's evaluation of BRI values in the final reference pool includes data from the Bight '98 study, and because of differences in time, methods, and taxonomy, data from the current study should not be pooled with data from the Bight '98 study. Furthermore, the identification of any BRI threshold value is inappropriate, based on both the inherent limitations of the BRI method, but also on the poor actual correspondence with altered community conditions, as described in Section 8.1.4.1 of the detailed sediment investigation report.

c) Although there are benthic community alterations in the active parts of both shipyards, there are no alterations observed at the outermost stations in the active areas of the shipyards. Areas where altered stations are not bounded by unaltered stations are at the mouth of Chollas Creek (Station NA22); in the engine testing area at NASSCO (Station NA20), where alterations are evidently due to physical disturbance; and outside the Southwest Marine leasehold to the northwest. In the last of these cases, there are stations with no benthic alterations between the altered stations and the principal working areas of the shipyards. Therefore, there is no unbounded gradient of benthic alterations that is clearly associated with shipyard operations.

20. a) The benthic macroinvertebrate analysis in the report has "some of the same deficiencies that the BRI has." b) SCCWRP benthic ecologists should review the comments on the BRI approach.

a) All measurements and analyses of environmental data have uncertainties associated with them. However, the comment does not state explicitly what deficiencies the commenter feels that the multivariate analyses share with the BRI analyses, or what the implications might be. No specific response to the comment is possible, therefore, other than to note that the assertion is unsubstantiated.

b) The critique of the BRI approach contained in the detailed sediment investigation report has been presented to SCCWRP benthic ecologists.

21. Categorization of levels of benthic alteration "was based solely on the number of indices which were different, did not really address the issue of how those changes might interfere with the normal function or responses of the communities to contaminant exposure."

Categorization of levels of benthic alteration was *not* based solely on the number of indices that were different between the shipyards and reference conditions. As described on pages 8-22 and 8-23 of the report, and as further indicated by the descriptions in Table 8-10, the results of the classification analysis and the abundances of pollution-sensitive taxonomic groups were also used to categorize stations appropriately.

Determination of the normal function of benthic communities is difficult, partly because of the difficulties associated with drawing conclusions about processes solely from measurements of species abundances, and partly because the idea of 'function' can be approached in several different ways. For example, one important aspect of community function can be considered to be the ability of the community to provide food for fish and—directly or indirectly—other higher trophic level organisms. In this regard, recently disturbed communities can have a higher level of function than older communities, because recently disturbed communities have a larger amount of macroinvertebrate biomass located at the sediment surface, where it is subject to predation. Bioturbation can be considered to be another important aspect of community function, and in this regard mature benthic communities ordinarily have the highest level of function because these communities are characterized by head-down deposit feeders that convey buried material to the sediment surface. As these two examples show, different measures of community function can effectively conflict with one another. In addition to strictly functional aspects of benthic communities, however, other features of these communities could also be considered to be intrinsically valuable—diversity, for example. Integrating all of the possible indicators of community function, and of intrinsically valued community features, would be a very complex undertaking, and there is no established framework for doing so. Instead, this investigation, as is typical of benthic community assessments, has focused on assessment of differences between site and reference conditions. This approach is certainly based on the assumption that similar communities have similar functions. However, the converse is not necessarily true: different communities do not necessarily have different functions (by whatever measure of function one chooses to apply). For this reason, information on the clustering of communities, and the relative abundances of specific taxa or groups, has been used to augment the strictly statistical assessment of differences, to produce a more complete assessment of the level of benthic community alteration.

22. The severity of some of the fish lesions was greater at the shipyard sites than at the reference area, suggesting some adverse impacts on fish.

    Statistical differences between site and reference areas were found for several types of lesions, with prevalences higher at the sites for some, and higher at the reference areas for others. The presence of these lesions, however, is not necessarily associated with decreases in fish growth, survival, or reproduction. Analysis of fish age, length, and weight data (as described in the investigation report) shows that overall characteristics of populations at both shipyard and reference sites are equivalent. Consequently, and contrary to the comment's assertion, the presence of those lesions is not having any evident adverse impacts on the fish.

23. a) Multi- and univariate correlation analyses such as used by Hunt et al. (2001) [complete citation not given] might be useful in interpreting the relationship between toxicity and sediment chemistry; all the report's explanations of the lack of correlations may be plausible. b) The ERM quotient should be looked at. c) PCB may be chronically, but not acutely, toxic.

    a) Because a complete citation is not provided for Hunt et al. (2001), the correlation analyses used by those authors have not been reviewed.

    b) Effects range-median (ERM) quotients are based on values that were developed to be used for site screening—that is, to determine whether further site-specific evaluation is warranted. An extensive site-specific study has been completed at the shipyards, and use of ERM-based screening tools is not appropriate or relevant. As for relating ERM quotients to toxicity test results, because sediment chemical concentrations all covary, ERM quotients will vary with sediment chemical concentrations; because of the absence of relationships between sediment chemistry and toxicity, there will likewise be an absence of relationships between ERM quotients and toxicity.

    c) Although these are short-term tests, the echinoderm fertilization test and the bivalve development test both use sensitive life stages, and are recognized as sensitive indicators of toxicity. The benthic macroinvertebrate analyses represent the results of chronic exposure to chemicals in place at the shipyard sites, including chronic exposure to PCBs. Similarly, the fish histopathology and fish condition data represent the results of chronic exposures. The effects of bioaccumulation resulting from chronic exposure were also assessed by the risk assessments, which used indigenous organisms collected at the shipyards. The assessment methods used in this study have therefore included a number of methods of assessing potential impacts of chemicals that, like PCBs, may not be acutely toxic.

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Table 1. Comparison of ratios of tissue chemical concentrations at shipyard and reference locations

Chemical	Eel Grass		Forage Fish		Spotted Sandbass		Mussel	
	Comment Table A	Mean Shipyard/ Reference	Comment Table A	Mean Shipyard/ Reference	Comment Table A	Mean Shipyard/ Reference	Comment Table A	Mean Shipyard/ Reference
Total PCBs	2	2.9	2	1.8	3	2.1	1	1.0
TBT	6 [a]	3.5	4	2.0	4	3.0	4	3.3
Arsenic	2	2.0	1	1.3	1	1.4	2	1.6
Cadmium	3	1.8	1	0.7	10	2.6	1	1.2
Copper	9	6.3	1	0.9	2	1.8	3	2.4
Lead	5	4.9	2	1.0	3	2.6	2	1.7
Nickel	2	1.8	5	0.3	1	1.2	2	1.7
Selenium	1 [a]	1.1	2	0.5	10	3.3	1	1.0
Zinc	2	2.1	1	1.3	2	1.0	1	1.3
Total PAHs	5 [a]	3.5	1	1.2	1	1.1	6	4.2
Mercury	--		--			--	2	1.5

Note: PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl
TBT - tributyltin

[a] Undetected in reference area; ratio uses the sample reporting limit for the reference area value.

NASSCO Request No. 7

March 25, 2004

Robert K. Brodberg, Ph.D.
Senior Toxicologist
Chief, Fish and Water Quality Evaluation
Pesticide and Environmental Toxicology Section
Office of Environmental Health Hazard Assessment
California Environmental Protection Agency
P.O. Box 4010
Sacramento, California 95812-4010

Re: Fish fillets versus whole fish for Health Risk Assessments of San Diego Bay

Dear Dr. Brodberg:

Environmental Health Coalition (EHC) is a 24-year-old, nonprofit environmental justice organization that works in the San Diego/Tijuana region. For several years EHC has been a participant in the ongoing controversy over proper cleanup levels for contaminated sediments in San Diego Bay. In our review of the Health Risk Assessment that was developed by Exponent, Inc., for the November 14, 2003, *Technical Report and Recommendations for Tentative Cleanup and Abatement Order*, we have become concerned that the methodology for assessing human exposure from contaminants in fish does not adequately protect all of the fishers who catch and eat fish from San Diego Bay. In particular, the methodology assumes that only the fillets of fish are eaten. This assumption is not true for a small but very active group of subsistence fishers.

EHC staff are currently in the process of conducting interviews with people fishing off of piers in the vicinity of the shipyards to determine how often they fish, whether they eat the fish, whether they eat fish skin, and how they cook the fish. We recognize that a pier sample does not producc a representative regional sample of the sort that the Santa Monica study was. However, our data clearly establish that a subpopulation of San Diego residents fish daily, eat the fish, and eat the skin -- not only the fillets. Common cooking methods include stewing, a method that does not reduce exposure to pollutants. These people must not be disregarded in health risk assessments because their fish consumption patterns are different than those of white, middle-class Americans.

We are still in the process of conducting surveys. Surveys are conducted in Spanish, English, and Tagalog. The respondents to date are African American, latino, white, Filipino, and native American. Most of the adult fishers have children, many of whom eat fish.

March 25, 2004

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We are still in the process of conducting surveys. Surveys are conducted in Spanish, English, and Tagalog. The respondents to date are African American, latino, white, Filipino, and native American. Most of the adult fishers have children, many of whom eat fish.

Our results are preliminary; we will be happy to share our data with you when the study is complete. A selection of key results indicates why we believe the fillet assumption understates the human health risk as expressed in the Exponent HRA.

Preliminary Results

- Half of the sample fishes at least once a week.

- Most of the fishers catch 1 to 2 fish at a time; however, at the high end, up to 20 fish are caught at a time.

- About half of our sample of pier fishers eat the fish they catch. As noted above, many of the children of our respondents eat fish.

- Most of our respondents eat other types of seafood as well as the fish they catch.

- Stewing is a common method of cooking fish. Other methods include frying, baking, and barbequeing.

- We asked whether respondents eat skin as a way to gauge whether fish are always filleted, or whether additional parts of the fish are eaten.. A substantial portion of our fishers do report eating skin. There is a large overlap between those who fish frequently and those who eat skin; it is likely they are consuming a large quantity of fish skin, and possibly other highly contaminated parts as well, such as fish heads.

Conclusion

The 2001 OEHHA report, *Chemicals in Fish: Consumption of Fish and Shellfish in California and the United States*, notes that "U.S. EPA encourages states or tribal authorities to select the most appropriate data to adequately protect the most highly exposed population when developing state or local criteria. Alternatively, water quality criteria can be developed without the use of specific local data, but should be based on representative consumption rates such that the criteria will support consumption of fish from the water body at rates at which local users consume fish." Our study is, so far, a small sample, and limited only to pier fishers. Unlike the Santa Monica study, we did not include sport fishers going out on party boats. For the purpose of protecting highly exposed populations it is appropriate to selectively sample this group -- fishers who fish frequently off of piers near shipyards in San Diego Bay. Although we are not collecting income information, it is reasonable to infer that many of these frequent fishers are subsistence fishers who catch fish to feed themselves and their families. Among this subpopulation are individuals who fish daily, who catch up to 20 fish at a time, who stew fish, who eat fish parts other than fillets, and who feed fish to their children.

Health risk assessment must be done in the service of protecting all of us, not just those who have "typical", middle-class fish eating habits. Our survey establishes that a substantial portion of people who eat fish out of San Diego Bay eat more than fillets. While the upper limit of 161 grams per day of fish used in the Exponent Health Risk Assessment is an appropriate upper bound for fish consumption, the assumption that exposure to contaminants in fish is limited to those found in fillets is clearly erroneous for those people who do subsistence fishing in San Diego Bay. A more accurate and conservative assumption is that up to 161 grams per day of whole fish are eaten.

We understand that you are commenting on the Exponent Health Risk Assessment, and we believe it is important for you to know that local data are being gathered that call for a re-evaluation of exposure to contaminants from bay fish. We believe the Exponent HRA should be re-done, using this more health-protective assumption. Subsequent HRAs that pertain to San Diego Bay should likewise use the whole-fish standard to protect the most highly exposed people. Thank you.

Sincerely,

Joy Williams, MPH
Community Assistance/Research Director

ANCHOR
ENVIRONMENTAL, L.L.C.

Anchor Environmental, L.L.C.
1423 3rd Avenue, Suite 300
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131

Technical Memorandum

To: Craig Carlisle, Regional Water Quality Control Board

From: Michael Whelan, P.E. and David Templeton, Anchor Environmental, L.L.C.

Date: April 6, 2004

Re: Calculation of Dredging Volumes for Sediment Investigation and Feasibility Study NASSCO and Southwest Marine Shipyards, San Diego, California

Cc: Shaun Halvax, Southwest Marine
Lane McVey and Mike Chee, NASSCO
Dreas Nielsen and Tom Ginn, Exponent

This memorandum provides details on the estimation of dredging volumes as presented in the Feasibility Study portion of the NASSCO and Southwest Marine (SWM) Detailed Sediment Investigation Report (henceforth, "the Report", Exponent, 2003).

The Feasibility Study identifies various remedial alternatives representing two different cleanup criteria. The alternatives are described in Section 17 of the Report. The alternatives, and their corresponding estimated dredging volumes, are as follows:

- **Alternative A – Monitored Natural Recovery.** No dredging required
- **Alternative B – Remediation to LAET Criteria.** Estimated dredging volume = 75,850 cy
- **Alternative C – Remediation to Final Reference Pool Chemical Conditions.** Estimated dredging volume = 1,200,000 cy

To support the development and evaluation of preliminary sediment remediation scenarios, the cleanup design at the site was divided into a series of sediment management units (SMUs). The SMUs are identified in Figure 1. They were defined with the following considerations in mind:

- *Vertical Extents of Cleanup Exceedances.* The vertical depth of cleanup level exceedences in each core was identified. The maximum vertical depth of candidate cleanup level exceedance within a core (or cores) was rounded to the next deeper foot depth increment to determine the estimated dredging depth at each core location.

- *Horizontal Extents of Cleanup Level Exceedances.* Boundaries between adjacent SMUs were generally located midway between adjacent sample core locations. The estimated dredging depth for the core(s) within or adjacent to the defined SMUs was applied to the entire SMU area as the estimated average dredging depth.
- *Constructability.* In consultation with contractors, consideration was given to how the potential dredging would be accomplished. The estimate of the vertical extent of dredging within each SMU was based on bathymetry and how a dredge cut would be designed. For example, contractors reported that typical dredge widths are between 50 and 80 feet, so dredge widths of no less than 70 feet were used. Similarly, dredging is typically accomplished to a given elevation, rather than to a given depth, so the areas were assumed to be dredged as a series of flat surfaces. Areas where the mudline was currently sloping at angles of 8:1 (horizontal to vertical) or steeper were identified as separate SMUs to distinguish them from "flat" areas. Areas with sloping bathymetry would generally require a "stair-stepped" dredging techniques or dredging to a surfical slope inclination.
- *Marine Structures.* Additional consideration was given for the physical attributes of the shipyard facilities. Marine structures (piers and decks) and existing slopes were used in some cases to define SMU boundaries. This reflects the fact that areas alongside (or partially under) marine structures, or in other limited access areas, constrain the ability of typical dredging equipment to remove sediments. These considerations are reflected in the designation of SMUs (and in the estimation of dredging volumes).
- *Shipyard Operations.* The delineation of SMUs was based on potential interactions between dredging activities and shipyard operations. For example, a SMU that lies between a berth and the navigation channel line could be dredged with a vessel in the berth. On the other hand, SMUs 100, 105, 110, and 150 lie beneath existing dry docks, which would require temporary relocation to allow dredging. Using this as a factor in defining SMUs facilitates the evaluation of remediation scenarios, because it gives each SMU a uniform set of scheduling and management considerations.
- *Property Ownership.* SMUs were divided along the SWM/NASSCO leasehold boundary and along the perimeter boundaries for each shipyard, thus separating areas between the two shipyards, and distinguishing areas within leasehold areas from those outside of it.

Tables 1 and 2 provide a list of the SMUs and their estimated dredging volumes, for Alternative B (Table 1 – Cleanup to LAET Criteria) and for Alternative C (Table 2 – Remediation to Final Reference Pool Conditions), respectively. Note that for Alternative B, the areas requiring cleanup are shown on Figure 2; these areas are roughly equivalent to the cleanup areas identified on Figure 12-2 of the Report (figure titled "Cleanup areas identified by the LAET method"). For Alternative C, it was assumed that ALL of the SMUs shown on Figure 1 would be dredged.

The general method of volume estimation was as follows for each SMU:

1. A representative core(s) was identified for the SMU (see Figure 1).
2. The depth of exceedance of each candidate cleanup level was identified for the representative core(s). Refer to Appendix B of the Report for chemistry information supporting the exceedance depths.
3. If the SMU does not contain a core, a dredging depth was selected by interpolating from adjacent SMUs.
4. An estimated average "neatline" dredging depth was selected for the SMU. This depth was typically selected by taking the depth of exceedance of the candidate cleanup level and rounding up to the nearest foot deeper. This allows for an overdredging allowance, which is generally granted to the dredging contractor to ensure that the neatline volume is fully removed, accounting for the accuracy of the dredging equipment and its positioning. Specified overdredging allowances for projects of this type are usually in the range of 6 inches to one foot.
5. An additional foot of dredging was included to allow for residuals cleanup. It is likely that post-dredging confirmational sampling will be required to assure the post-dredge sediment surface does not contain contaminants above chemical cleanup levels. In our experience it is fairly common for this sampling to indicate that some amount of "residual" contamination is present on the seafloor after dredging is completed. This often warrants an additional pass by the dredging contractor.
6. A dredging volume was calculated by multiplying the surface area of the SMUs by the dredging depth (plus the additional foot). For the LAET cleanup scenario, some SMUs

would be only partially dredged; the areas used for the volume calculation were adjusted accordingly.

7. Finally, some adjustments were made to the dredging volumes to account for the fact that nearby slopes could contribute additional volume through sloughing of side walls, while adjacent structures and revetments may require dredging offsets to avoid adverse impacts on stability.

For additional clarification, Figures 3 and 4 present cross-sections through representative portions of the shipyards, and depict the conceptual extents and depths of dredging that were used in estimating volumes.

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Table 1
Summary of SMU Volumes Dredged under Alternative B (Cleanup to LAET Criteria)

SMU	Representative Core(s)	Depth(s) of Contaminant Exceedeence (feet)	Estimated Average Dredging Depth[1] (ft)	TOTAL Surface Area of SMU (sf)	Fraction of SMU Area Requiring Dredging	DREDGED Surface Area of SMU (sf)	Estimated Volume of Dredging to Neatline Elevation (cy)	Estimated Volume of 1 ft Additional Dredging[2] (cy)	Adjustment to Volume for protection of Bulkheads, Piers, Shoreline Revetments[3]	Total Estimated Dredging Volume (cy)
10	SW02	2.0	**3**	74,700	0.25	18,675	2,100	700	-290	2,510
15	SW02	2.0	**3**	59,725	0.75	44,794	5,000	1,700	-240	6,460
45	SW02	2.0	**3**	16,100	1.00	16,100	1,800	600	0	2,400
60	SW04	4.1	**5**	26,200	1.00	26,200	4,900	1,000	190	6,090
65	SW08	4.0	**5**	17,600	0.25	4,400	800	200	0	1,000
90	SW08	4.0	**5**	15,600	0.25	3,900	700	100	260	1,060
125	SW20, SW24	1.5, 3.0	**3**	41,250	1.00	41,250	4,600	1,500	-560	5,540
155	SW28	5.3	**6**	36,000	0.25	9,000	2,000	300	-180	2,120
170	SW28	5.3	**6**	21,000	0.25	5,250	1,200	200	30	1,430
200	SW28	5.3	**6**	30,000	0.50	15,000	3,300	600	-110	3,790
280	NA04	8.3	**9**	63,000	0.75	47,250	15,800	1,800	1,740	19,340
305	NA04	8.3	**9**	42,500	0.50	21,250	7,100	800	0	7,900
370	NA09	6.0	**7**	34,300	0.75	25,725	6,700	1,000	-710	6,990
380	NA09, NA16	6.0, 4.0	**6**	47,100	0.50	23,550	5,200	900	-480	5,620
390	NA16	4.0	**5**	64,600	0.25	16,150	3,000	600	0	3,600
TOTALS							64,200	12,000	-400	**75,850**

Notes

1. Based on estimated vertical extents of contaminant exceendance in relevant or nearby cores, with nominal addition of an extra foot for overdredging in most cases.
2. Additional foot of dredging represents potential redredging in the event of residual post-dredging contamination (see text).
3. Volume adjustment reflects setback of dredging from sensitive structures, plus sloughing of material around edges of dredge prism.

Table 2
Summary of SMU Volumes Dredged under Alternative C (Cleanup to Reference Pool Conditions)

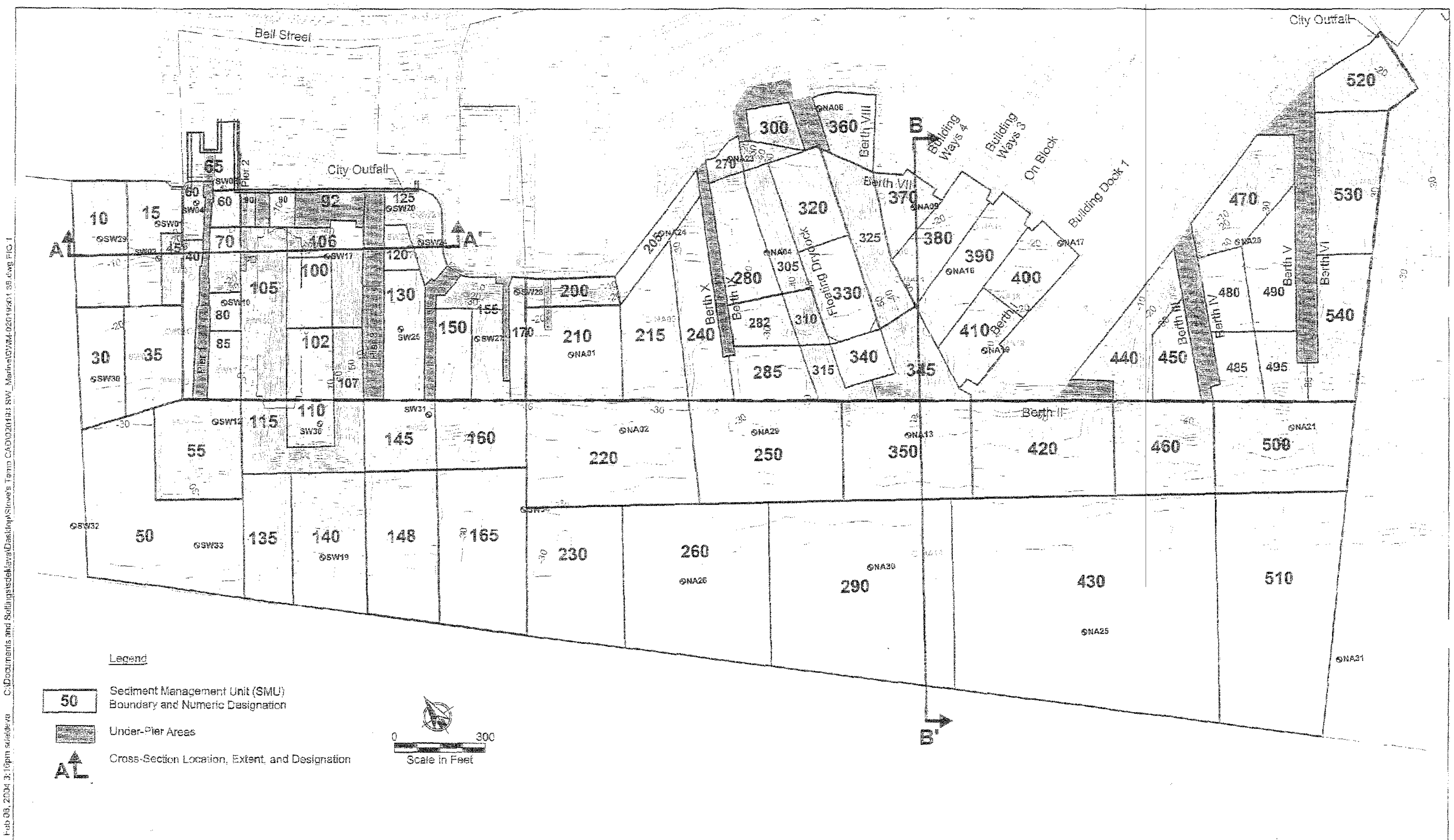
SMU	Representative Core(s)	Depth(s) of Contaminant Exceedeence (feet)	Estimated Average Dredging Depth[1] (ft)	Surface Area of SMU (sf)	Estimated Volume of Dredging to Neatline Elevation (cy)	Estimated Volume of 1 ft Additional Dredging[2] (cy)	Adjustment to Volume for protection of Bulkheads, Piers, Shoreline Revetments[3]	Total Estimated Dredging Volume (cy)
10	SW29	6.0	7	74,700	19,400	2,800	-910	**21,290**
15	SW01, SW02	5.4, 4.0	5	59,725	11,100	2,200	-470	**12,830**
30	SW30	8.0	8	59,675	17,700	2,200	0	**19,900**
35	-	est.	4	69,000	10,200	2,600	0	**12,800**
40	-	est.	3	26,500	2,900	1,000	390	**4,290**
45	SW02	4.0	5	16,100	3,000	600	0	**3,600**
50	SW32, SW33	2.0, 2.0	2	216,000	16,000	8,000	0	**24,000**
55	SW12	3.7	4	89,100	13,200	3,300	60	**16,560**
60	SW04, SW08	4.1, 6.0	6	26,200	5,800	1,000	300	**7,100**
65	SW08	6	7	17,600	4,600	700	0	**5,300**
70	-	est.	4	21,000	3,100	800	430	**4,330**
80	SW10	2.0	3	13,000	1,400	500	100	**2,000**
85	-	est.	2	25,300	1,900	900	100	**2,900**
90	SW08	6	7	15,600	4,000	600	540	**5,140**
100	SW17	6.2	7	33,000	8,600	1,200	0	**9,800**
102	-	est.	6	36,000	8,000	1,300	0	**9,300**
105	SW10	2.0	3	80,500	8,900	3,000	140	**12,040**
106	SW17	6.2	7	50,000	13,000	1,900	1,790	**16,690**
107	-	est.	4	25,000	3,700	900	290	**4,890**
110	SW36	4.3	5	25,500	4,700	900	0	**5,600**
115	-	est.	4	70,400	10,400	2,600	0	**13,000**
120	-	est.	3	15,000	1,700	600	110	**2,410**
125	SW20, SW24	2.4, 3.0	3	41,250	4,600	1,500	-560	**5,540**
130	SW25	4.2	5	52,800	9,800	2,000	1,350	**13,150**
135	-	est.	3	67,200	7,500	2,500	0	**10,000**
140	SW19	4.0	4	108,000	16,000	4,000	0	**20,000**
145	SW31	2.0	3	55,200	6,100	2,000	70	**8,170**
148	-	est.	2	112,700	8,300	4,200	0	**12,500**
150	-	est.	2	33,000	2,400	1,200	130	**3,730**
155	SW27	4.25	5	36,000	6,700	1,300	-150	**7,850**
160	-	est.	3	72,000	8,000	2,700	0	**10,700**
165	SW34	2.0	3	159,000	17,700	5,900	0	**23,600**
170	SW28	5.3	6	21,000	4,700	800	30	**5,530**
200	SW28	5.3	6	30,000	6,700	1,100	-110	**7,690**
205	NA24	2.0	3	30,800	3,400	1,100	-660	**3,840**
210	NA01	5.5	6	99,225	22,100	3,700	390	**26,190**
215	-	est.	5	82,350	15,300	3,100	0	**18,400**
220	NA02	3.7	4	195,400	28,900	7,200	0	**36,100**
230	SW34	2.0	3	145,300	16,100	5,400	0	**21,500**
240	NA24	2.0	3	81,800	9,100	3,000	410	**12,510**
250	NA29	2.0	3	161,500	17,900	6,000	0	**23,900**
260	NA26	2.0	3	275,600	30,600	10,200	0	**40,800**
270	NA23	4.0	5	11,250	2,100	400	-190	**2,310**
280	NA04	8.3	9	63,000	21,000	2,300	1,740	**25,040**
282	-	est.	6	30,000	6,700	1,100	290	**8,090**

Table 2
Summary of SMU Volumes Dredged under Alternative C (Cleanup to Reference Pool Conditions)

SMU	Representative Core(s)	Depth(s) of Contaminant Exceedeence (feet)	Estimated Average Dredging Depth[1] (ft)	Surface Area of SMU (sf)	Estimated Volume of Dredging to Neatline Elevation (cy)	Estimated Volume of 1 ft Additional Dredging[2] (cy)	Adjustment to Volume for protection of Bulkheads, Piers, Shoreline Revetments[3]	Total Estimated Dredging Volume (cy)
285	-	est.	3	51,700	5,700	1,900	40	**7,640**
290	NA30	2.0	3	368,400	40,900	13,600	0	**54,500**
300	NA06	3.9	4	13,650	2,000	500	-120	**2,380**
305	NA04	8.3	9	42,500	14,200	1,600	0	**15,800**
310	-	est.	6	20,000	4,400	700	0	**5,100**
315		est.	3	26,900	3,000	1,000	0	**4,000**
320	NA04	8.3	9	48,400	16,100	1,800	7,880	**25,780**
325	NA09	8.0	9	60,300	20,100	2,200	190	**22,490**
330		est.	6	53,800	12,000	2,000	0	**14,000**
340	-	est.	4	26,900	4,000	1,000	0	**5,000**
345	-	est.	4	47,400	7,000	1,800	-140	**8,660**
350	NA13	2.0	3	134,600	15,000	5,000	0	**20,000**
360	NA06	3.9	4	42,000	6,200	1,600	0	**7,800**
370	NA09	8.0	9	34,300	11,400	1,300	-1,040	**11,660**
380	NA09, NA16	8.0, 6.1	8	47,100	14,000	1,700	-740	**14,960**
390	NA16	6.1	7	64,600	16,700	2,400	0	**19,100**
400	NA17	4.0	5	45,800	8,500	1,700	-1,600	**8,600**
410	NA19	5.8	6	45,800	10,200	1,700	-1,490	**10,410**
420	-	est.	3	150,700	16,700	5,600	-300	**22,000**
430	NA25	2.0	3	615,700	68,400	22,800	0	**91,200**
440	-	est.	6	69,200	15,400	2,600	-1,360	**16,640**
450	-	est.	5	42,300	7,800	1,600	580	**9,980**
460	-	est.	4	170,600	25,300	6,300	60	**31,660**
470	NA20	8.1	9	78,000	26,000	2,900	-2,220	**26,680**
480	NA20	8.1	9	45,800	15,300	1,700	1,160	**18,160**
485		est.	7	32,000	8,300	1,200	770	**10,270**
490	NA20	8.1	9	59,000	19,700	2,200	2,220	**24,120**
495		est.	7	32,300	8,400	1,200	410	**10,010**
500	NA21	6.0	7	138,100	35,800	5,100	0	**40,900**
510	NA31	0.0	2	316,200	23,400	11,700	0	**35,100**
520	-	est.	5	49,500	9,200	1,800	-690	**10,310**
530	-	est.	5	90,400	16,700	3,300	790	**20,790**
540	-	est.	5	80,700	14,900	3,000	670	**18,570**
TOTALS					970,000	230,000	11,000	**1,210,000**

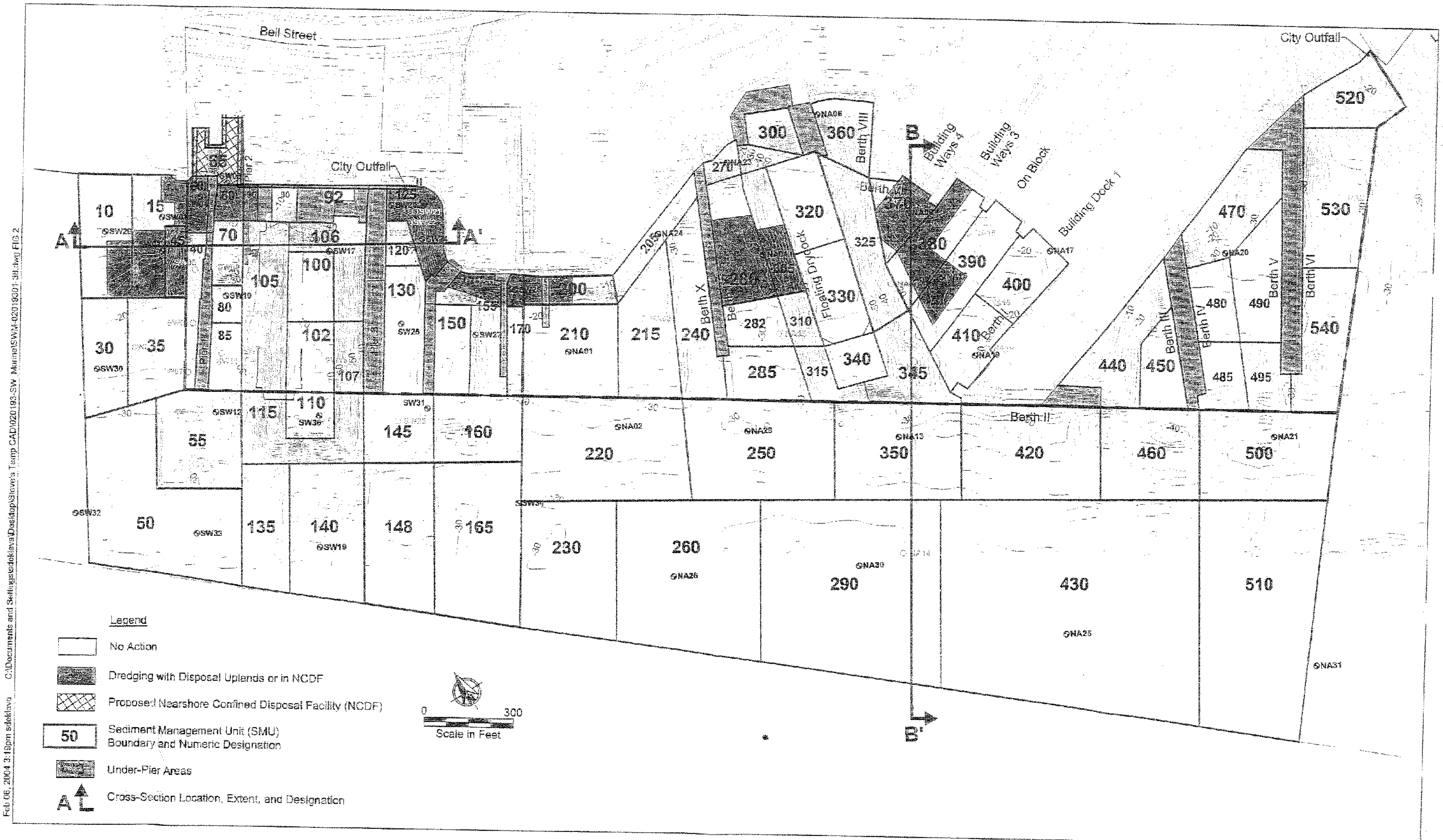
Notes

1. Based on estimated vertical extents of contaminant exceendance in relevant or nearby cores, with nominal addition of an extra foot for overdredging in most cases.
2. Additional foot of dredging represents potential redredging in the event of residual post-dredging contamination (see text).
3. Volume adjustment reflects setback of dredging from sensitive structures, plus sloughing of material around edges of dredge prism.



ANCHOR ENVIRONMENTAL, L.L.C.

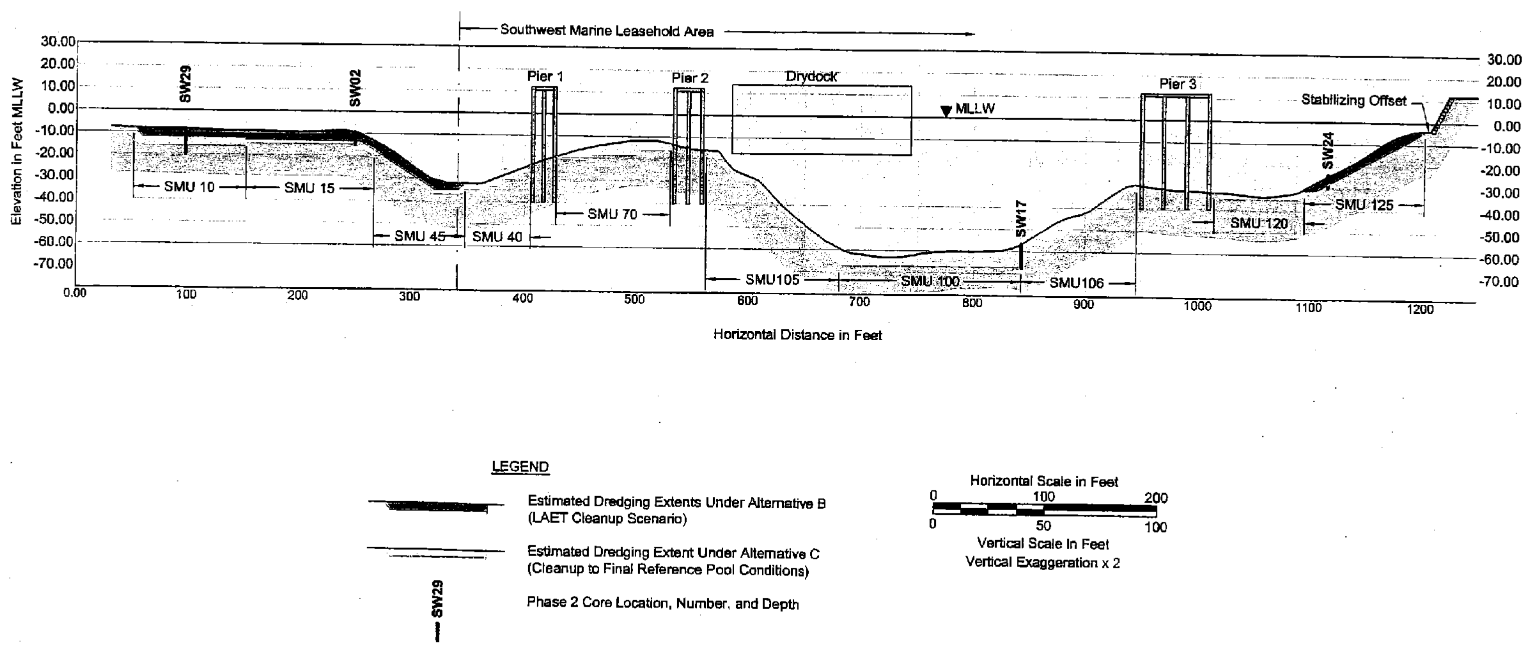
Figure 1
Layout of Sediment Management Units (SMUs)
Southwest Marine and NASSCO Shipyards
San Diego, California



ANCHOR ENVIRONMENTAL, L.L.C.

Figure 2
Estimated Dredge Areas Corresponding to LAET Cleanup Scenario
Southwest Marine Inc. and NASSCO Ship Yards
San Diego, California

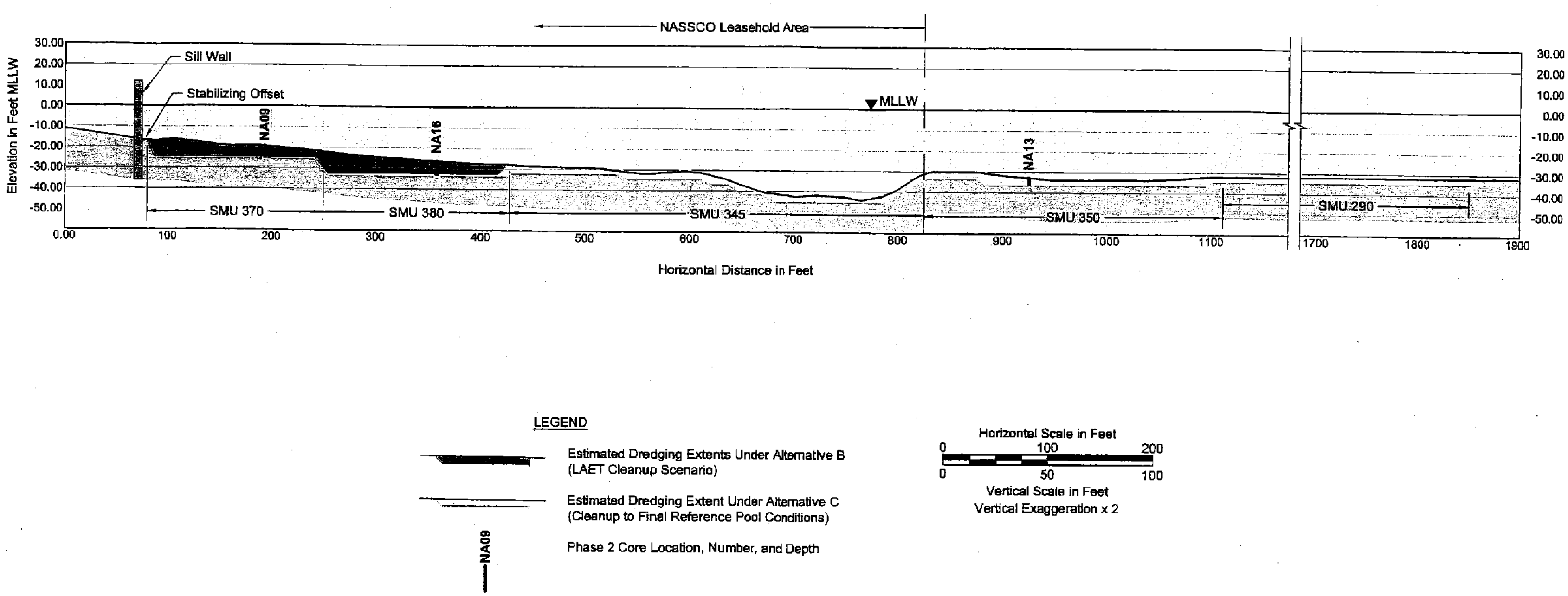
EHC 000501



Feb 06, 2004 3:04pm sdekleva C:\Documents and Settings\sdekleva\Desktop\Steve's Temp CAD\020193-SW_Marine\SWM-02018301-37.dwg FIG 3

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 3
Cross-Section A-A' Showing Assumed Dredge Depths
Southwest Marine and NASSCO Ship Yards
San Diego, California



ANCHOR ENVIRONMENTAL, L.L.C.

Figure 4
Cross-Section B-B' Showing Assumed Dredge Depths
Southwest Marine and NASSCO Ship Yards
San Diego, California

From: Alan Monji
To: Alo, Tom; Barker, David; Cole, Keri
Date: 4/18/2001 4:22 PM
Subject: Fwd: Re: Sediment Water Interface questions
Attachments: Re: Sediment Water Interface questions

SOme answers to your questions about sediment water interface

Alan

Message Id: 3ADE21BF.A91 : 10 : 43292
Subject: Fwd: Re: Sediment Water Interface questions
Created By: Monja@rb9.swrcb.ca.gov
Scheduled Date:
Creation Date: 4/18/2001 4:22 PM
From: Alan Monji

Recipients

Recipient	Action	Date & Time	Comment
RB9Post.Region9			
To: David Barker (barkd.RB9Post.Region9@rb9.swrcb.ca.gov)			
To: Keri Cole (colek.RB9Post.Region9@rb9.swrcb.ca.gov)			
To: Tom Alo (alot.RB9Post.Region9@rb9.swrcb.ca.gov)			

Post Offices

Post Office	Delivered	Route
RB9Post.Region9		rb9.swrcb.ca.gov

Files

File	Size	Date & Time
MAIL		
MESSAGE	640	4/18/2001 4:22 PM

Options

Concealed Subject:	No
Expiration Date:	None
Priority:	Standard
Reply requested by	None
Security:	Standard
To Be Delivered:	Immediate

From: Bryn Phillips <bmphillips@ucdavis.edu>
To: "Alan Monji" <Monja@rb9.swrcb.ca.gov>
Date: 4/18/2001 4:07 PM
Subject: Re: Sediment Water Interface questions

Allen,

Good to hear from you. Yes the bike is mistreating me! But only because I don't ride it enough. I have been running a lot lately so the bike has been in the garage. I must admit, having shocks on the forks has made me more ballsy when I go downhill. There is good riding around here if you ever visit. A few years ago they opened up Fort Ord land to the public. Miles of fire roads and single track. Some real challenging stuff too. Every time I go out there I see a coyote or a bobcat or something. No bad wrecks yet, I'm too much of a wuss.

Regarding SWI... As you read in that first paper, we sample the overlying water in the exposure chamber at intervals to assess chemical flux. We haven't done a lot of chemistry work with the SWI system, but we usually use sacrificial cores that we can draw a large volume of water from. Depending on your chemicals (metals or organics) and your lab, you can get away with relatively small volumes for analysis. For the study you read about I think we had 5 tox cores, and then an additional core for metals and one for organics, for each day. Throw in a water quality core for good measure. When we draw the water out of the core we take it from about 1 cm off the sediment surface. Since clean water is added over the sediment the day before the organisms are introduced, all of the chemicals in the water come from the sediment. You can choose which intervals to sample.

I hope this is helping. I feel like I am blathering. Brian has a paper in press, but I am not sure if it is out yet. Here is the reference:

Anderson, B.S., J.W. Hunt, B.M. Phillips, R. Fairey, J. Newman, H.M. Puckett, M. Stephenson, K.T. Taberski, R. Tjeerdema. 2001. Influence of sample manipulation on contaminant flux and toxicity at the sediment-water interface. Marine Environmental Research. 51: 191-211.

So what is this about school work? Are you working on career advancement or fun, or both?

Give me a call if you have any questions.

Later,
Bryn

Bryn Phillips
University of California, Davis
Marine Pollution Studies Laboratory
34500 Coast Route One
Monterey, CA 93940
(831) 624-0947
(831) 626-1518 fax
bmphillips@ucdavis.edu

Message Id: 3ADE1E2D.095 : 19 : 49301
Subject: Re: Sediment Water Interface questions
Created By: "bmphillips@ucdavis.edu".mime.Internet
Scheduled Date:
Creation Date: 4/18/2001 4:06 PM
From: Bryn Phillips <bmphillips@ucdavis.edu>

Recipients

Recipient	Action	Date & Time	Comment
RB9Post.Region9			
To: Alan Monji (Monja@rb9.swrcb.ca.gov)			

Post Offices

Post Office	Delivered	Route
RB9Post.Region9		rb9.swrcb.ca.gov

Files

File	Size	Date & Time
Header	1162	
MESSAGE	2190	4/18/2001 4:06 PM

Options

Concealed Subject:	No
Expiration Date:	None
Priority:	Standard
Reply requested by	None
Security:	Standard
To Be Delivered:	Immediate

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
OFFICE OF RESPONSE & RESTORATION
COASTAL PROTECTION & RESTORATION DIVISION
c/o California Department of Toxic Substance Control,
Human and Ecological Risk Division
8800 Cal Center Drive
Sacramento, CA 95826

April 20, 2004

Mr. Tom Alo
California Regional Water Quality Control Board
San Diego Region
9174 Sky Park Court, Suite 100
San Diego, CA 92123-4340

REC'D APR 30 2004

Dear Mr. Alo:

NOAA appreciates the opportunity to provide comments to you on two reports associated with the investigation of the NASSCO and Southwest Marine Shipyards. Dr. Gary D. Marty prepared a September 2003 report entitled, Necropsy and Histopathology of Spotted Sea Bass Sampled from San Diego Harbor, for the Shipyard's consultant, Exponent. Details and results of this report were incorporated into the NASSCO and Southwest Marine Detailed Sediment Investigation (September 2003) submitted by Exponent for the NASSCO and Southwest Marine Shipyards. NOAA's Coastal Protection and Restoration Division has requested the assistance of Mark S. Myers, a fish biologist and pathologist with the ecotoxicology branch of the NOAA Northwest Fisheries Science Center, in reviewing and commenting on these reports. The fish histopathology section (Section 8.2), and the fish bile section (Section 8.3) of the Detailed Sediment Investigation were reviewed, and comments on these sections are included in this letter.

Necropsy and Histopathology of Spotted Sea Bass Sampled from San Diego Harbor

General comments:

- The necropsy procedure, tissue processing, and histopathologic analysis of tissues were conducted according to appropriate and accepted protocols, and no comments will be provided on these sections. The figures contain good quality micrographs that show excellent documentation of the lesions encountered, and they are well described.

- The fish species analyzed in this report is normally referred to as spotted sandbass, not as spotted sea bass. Please make this correction in the text.

- Based on NOAA's past experience with examination of spotted sandbass and barred sandbass from San Diego Harbor, very few toxicopathic lesions have been found in these species. This is especially true for the liver or kidney of spotted sandbass from south San Diego Bay. Based on this observation, it would have been preferable to sample and examine white croaker or black croaker. However, it appears that reasonable attempts to capture these better sentinel species were carried out.

Summary and comment on the major histopathological findings:

- Abundant hepatocellular lipofuscin, indicating degradation of cell organelles, was found in all fish caught in the NASSCO "inside" location and in both the "inside" and "outside" locations at Southwest Marine. This is a significant, contaminant-associated effect that appears to moderately to severely affect approximately 12 to 20% of fish from inside the shipyard sites. Data indicate that fish collected from the reference site were only mildly affected.

- Abundant hemosiderin, indicating increased destruction of red blood cells, was most commonly found in "outside" shipyard locations. No hemosiderin was found in fish at the "inside" shipyard sites. Some attempt should be made to analyze this difference.

- Five out of the 253 fish collected during the study had liver weights greater than 10 grams. In addition, these five fish were female or female-intersex fish, and all came from the NASSCO site. There should be further discussion in the text regarding this potentially important finding and its overall significance.

- There are fewer "cysts of unknown etiology" from inside sites than from outside or reference sites. Scientists at NOAA have also seen this lesion in numerous marine/estuarine species and refer to it as an "oocyte-like body". It appears to be an infectious organism of some sort and, like Dr. Marty; NOAA does not know it's precise diagnosis. NOAA agrees with Dr. Marty that it may represent a life-history stage of *Ichthyophonus sp.*

- The generation of new nephrons was greater in kidneys from fish collected at the reference site. This may indicate a higher growth rate in fish found at the reference site. The scores for renal nephritis were higher in fish from the NASSCO location, and the only severe case of renal nephritis was found at Southwest Marine. It should be noted in the document that growth and survival of fish may be impaired by renal nephritis.

- Lipofuscin scores in testis of fish, which is an indicator of impaired reproduction, were found to be higher "inside" the shipyard sites than those

found at the reference site. Approximately 5-12% of the collected fish were affected, and the only severe cases were seen in fish from inside the shipyard sites. In one case, a male with severe lipofuscin found at the NASSCO "inside" location also had no maturing sperm. In the ovaries, pigmented macrophage aggregates (PMAs) were found in about 20% of the fish and were highest in fish from "inside" both shipyard sites. PMAs in female fish from inside shipyard sites may be significant, but there is a need to account for fish age in these analyses. Site differences in PMAs for testis were not significant.

- According to Marty (p. 4) and Appendix 5, intersex gonads were found at similar frequencies in fish collected at the shipyard sites and reference site. This effect was most common in smaller females, except for "inside" NASSCO, which had several large female-intersex fish. Based on NOAA scientist's previous experience in histologically examining barred and spotted sandbass from southern California, a large number of intersex fish were identified. As mentioned by Marty (p. 8), this may not be a surprising observation considering that these two species are thought to be hermaphroditic (protogynous), and typically change sex from female to male with advancing age. However, this feature of spotted sandbass should be discussed further in the analysis.

- Although three fish collected in the study had carcinomas, NOAA agrees with Dr. Marty that the tumor development identified in these fish does not appear to be specifically related to exposure at the NASSCO or Southwest Marine sites.

- The document states on p. 8 that "more fish from the inside shipyard sites had evidence of tissue damage than did fish from the outside shipyard sites". Although the document states that the most striking differences were in the liver, review of the report also shows that the gonad and kidney had significant lesions. These lesions were distinct enough to be used to separate fish from the contaminated areas and reference area. Further discussion should be provided on the significance of this observation.

- The prevalence of renal nephritis is consistent with increased disease in fish from inside the NASSCO site. Lower scores in regenerative tubules are consistent with reduced growth, but there does not appear to have been an evaluation of the age of the fish in relation to this finding. There is a possibility of higher values in younger fish. In addition, higher values would be expected in situations where fish were exposed to renal toxicants. Further discussion should be provided on the significance of this observation, and the relationship to the age of the fish.

- In Appendix 1, type specimens for foci of cellular alteration (FCA) and cholangitis/biliary hyperplasia are shown but not discussed. Please see additional comments on this subject later in this letter. Dr. Marty or Exponent should provide a discussion and analysis of the significance of these lesions.

- In the discussion of the data from Appendix 4, there is no evaluation or interpretation in the main text of Marty's report of atresia of yolked follicles, and atresia of unyolked follicles in the ovary. Also, there is no inclusion of the lesions F-INT (female, intersex) or M-INT (male, intersex) in the summary of male and female type specimens. Please provide a discussion and analysis of the significance of these findings.

- In the discussion of the data from Appendix 6, there is not an evaluation or even a mention of the preneoplastic foci of cellular alteration observed in the liver, as well as cholangitis/biliary hyperplasia, which were diagnosed, in spotted sandbass from all of the sampling sites. Both of these lesion classes, but especially the foci of cellular alteration, have been extensively used in wild fish as histopathological biomarkers of exposure to contaminants such as PAHs. The highly selective and biased failure to report in the text that preneoplastic focal lesions were detected in the liver of spotted sandbass from all sites in this study is disturbing. Regardless of their stated rationale that the lesions were not discussed because there were no statistically significant differences in the prevalence of lesions among the sites, the lesions were identified during the histopathological examination, and their significance should have been evaluated in the discussion.

  Upon independent review of the liver lesion data presented in Appendix 6, the following prevalence of foci of cellular alteration (clear cell foci, eosinophilic foci, basophilic foci) among the sampling sites were found: reference site (15.4%); inside NASSCO (18.0%); outside NASSCO (16.0%): inside Southwest Marine (9.8%); and outside Southwest Marine (16.0%). The same observations apply to the presence of cholangitis/biliary hyperplasia in the same fish, at the following prevalence: reference site (11.5%); inside NASSCO (34.0%); outside NASSCO (24%); inside Southwest Marine (19.6%); and outside Southwest Marine (20.0%). These data should be subjected to further statistical analyses that account for fish age (e.g. stepwise logistic regression analyses) to prove that there are/are not inter-site differences in risk of lesion occurrence. There is also a possible need for outside QA and review of the actual histologic slides to confirm/refute the presence of these focal lesions in the fish examined in this study.

Additional Work and Synthesis

In his report, Dr. Marty states the further need to synthesize the data to include fish age data (which has been done to a certain extent) and contaminant data. He also recommends Transmission Electron Microscopy of liver tissue to confirm lipofuscin, special stains to distinguish lipofuscin and hemosiderin (he did these specials stains), and suggests doing CYP1A staining in liver to further document PAH exposure.

Review of Exponent Sediment Report, Section 8.2, Fish Histopathology

Some explanation should be included in this report as to why the spotted sandbass was collected rather than the white croaker, the original target species.

Lesions Elevated at Shipyard Locations

Based on NOAA's review of the histopathology report, it is clear that the authors of the Exponent report have been selective and have not fully reported Marty's findings and data from the appendices in Marty's report. Marty did find and report higher scores for liver lipofuscin in fish from the "inside" shipyard sites, higher scores for hepatic hemosiderin in fish from the "outside" shipyard sites, higher scores for renal nephritis in fish from "inside" NASSCO, and higher scores for shiny gill foci (gross lesion) in fish from "inside" Southwest Marine. However, he also found higher scores for lipofuscin in gonads of fish from the "inside" shipyard sites, as well as increased scores for pigmented macrophage aggregates in ovaries of fish from the "inside" shipyard sites. These lesions in the gonad are not discussed in the Exponent sediment report, and considering these lesions affect reproductive organs, they should have been discussed and evaluated.

In addition, NOAA's evaluation of the liver lesion data also suggests that the prevalence of cholangitis/biliary hyperplasia may be elevated compared to reference sites (11.5%), at the "inside" and "outside" shipyard sites, especially at the "inside" NASSCO site (34%).

The statement in the Exponent report that only 4 of the 70 lesions evaluated in the study were elevated in the shipyard sites compared to the reference site is overly simplistic, given that a large majority of the lesions were not toxicopathic in nature, and were in essence, incidental findings.

Lesions Elevated at the Reference Area

The relevance of lesions found at the reference site is oversimplified in Exponent's discussion and conclusion. The data presented in Table 8-18 are attempting to show the reader that the prevalence of some lesions were higher at the reference site, as compared to one or more of the shipyard sites, whether or

not these lesions have anything at all to do with exposure to contaminants. For example, renal tubular regeneration is higher at the reference site as compared to outside NASSCO, only; severe atresia of yolked oocytes is higher at the reference site as compared to inside SWM only. Other lesions with higher prevalence at the reference than at the shipyard sites are only gross lesions, none of which have an established relationship to contaminant exposure.

Significance of Lesions

NOAA reviewed the liver lesion data presented in Appendix 6 of the Marty report and found that a number of fish from both the reference site, and the "inside" and "outside" shipyard sites were affected by preneoplastic foci of cellular alteration, including basophilic, clear cell and eosinophilic foci. However, in the Exponent report it is falsely stated that only two fish in this study exhibited one of the liver lesions typically associated in other field studies with contaminant exposure. The two fish were from the reference site, and identified as affected with either a hepatocellular adenoma or a biliary carcinoma (both liver neoplasms).

Data presented in the appendices of the Marty report show that preneoplastic foci of cellular alteration were detected in fish from all of the sampling sites. The extent of these important preneoplastic focal lesions was not mentioned or discussed in the text of the Marty report. Although Marty diagnosed these lesions, and did not discuss the lesion data in his report text, the Exponent report directly states in the text (page 8-44, lines 8-13), and in Table 8-19, that these lesions did not occur in any fish examined. Even if no significant inter-site differences in the prevalence of these foci of cellular alteration were found, this is a significant omission of very important information. The existence of these lesions at any site indicates a harmful effect strongly linked to PAH exposure, whether that occurred at a reference or shipyard site. It is incorrect to state that these lesions were not detected in the study. The Exponent report should acknowledge the diagnosis of these lesions and should address their significance in the Sediment Report.

The existence of liver neoplasms and foci of cellular alteration in spotted sandbass from the "reference" site calls into question the appropriateness of the selected reference site. Based on information from other studies utilizing these lesions as histopathological biomarkers of contaminant exposure, these toxicopathic lesions rarely occur in fish from uncontaminated reference sites. The questionable appropriateness of the reference site is further shown by the very high levels of PAH metabolites measured in bile of spotted sandbass from the reference site. This issue is discussed in more detail in the section on fish bile near the end of this letter.

Evaluations of fish growth, condition, and spatial comparisons

NOAA recommends that the fish condition index be defined more precisely and be consistent with standard, accepted approaches. The condition index should be expressed as the weight in grams/(length in cm)^3, and could be multiplied by 100 (Fulton's condition index). Also, fish growth in fisheries biology is typically assessed with formulas more complex than simple age at length curves. A more complex curve, like the Von Bertalanffy growth curve should have been used in the growth analysis. Based on the relatively low sample size, and the stratification by sex, it is not surprising that no clear trends in growth or condition factor were determined. However, these comparisons should be repeated using a proper condition index and the age-length relationships typically used to assess growth in fisheries biology studies. Exponent should provide these additional analyses and should discuss their significance.

Comparisons Based on Liver Lesions

A condition index commonly used in fish biology should be used here, as well as age-length relationships typically used in fish biology to assess growth (e.g., Von Bertalanffy growth curves). In the second paragraph, these results actually indicate that an adverse effect on fish growth was not associated with the presence of either abundant hepatic lipofuscin, or hemosiderosis. Relative to the condition index in fish with and without these lesions, the fact that these liver lesions tended to occur in older fish that typically possess higher condition indices helps to explain the fact that fish with the lesions had higher condition indices. These findings are not surprising. Similar comparisons of growth rates and condition factors in English sole, with and without toxicopathic liver lesions, and that have exceptionally strong and consistent associations with exposure to PAHs, have also rarely shown any effect of these lesions on growth or fish condition in wild fish.

Review of Exponent Sediment Report, Section 8.3, Fish Bile

The finding of levels of fluorescent aromatic compounds (FACs) at benzo[a]pyrene wave lengths in the range of 0.7-4.6 *u*g/g protein at the reference site clearly shows exposure to PAH levels far beyond what would normally be expected at a relatively uncontaminated reference site. In most new publications in which FACs data are presented, including those from studies done by the Northwest Fisheries Science Center, biliary FACs data are typically expressed in ng BaP equivalents/g protein, so that the protein-adjusted levels in fish from the present study ranged from 700-4600 ng/g protein, with a mean of 2070 ng/g protein. These levels are far beyond the level of 1000 ng BaP equiv/g protein that NOAA typically uses as a benchmark to define a response in fish from an area that is significantly contaminated by PAHs.

For example, previously reported biliary FACS data from barred sandbass from sites in San Diego Bay and vicinity (McCain et al., 1992), showed levels ranging from ~100 ng/g at the Dana Point reference site, to approximately 1600 ng/g at East Harbor Island, approximately 4000 ng/g at 28th Street Pier (near the Southwest Marine and NASSCO) sites, and approximately 5500 ng/g at National City. Except for the reference site value at Dana Point, which was considerably lower than the levels at the reference site for the present study, these levels in a closely related species, barred sandbass, are comparable to the levels detected from similar sites in the present study in spotted sandbass.

It would also be helpful in the presentation of the biliary FACs data if Figures 8-34 through 8-36 could be shown as means $\pm$ 1 std. deviation or a 95% confidence interval, rather than as means, minimum and maximum. Presentation of the data in this suggested format is the more accepted format in scientific documents, and will enable the reader to interpret the statistical relationships among levels at the reference and shipyard sites, as well as to more critically evaluate the data with respect to some of the statements made on p. 8-49. For example, the statement is made that levels of bile breakdown products (actually, these are usually referred to as "metabolites") in fish from the shipyards are not significantly greater ($P<0.05$) than concentrations at the reference area. This in fact may be the case, but it is not possible to critically evaluate this statement in the format in which the data are presented. Moreover, it is probably not valid to state that "concentrations in fish from within the shipyard leaseholds are generally less than concentrations in fish from outside the leaseholds", if in fact there is no statistically significant difference between "inside" and "outside" sites.

Report Conclusions

Exponent's report concludes that fish from in or near the shipyards are not affected by contaminant exposure. This conclusion is overly simplistic and ignores some important data and diagnoses related to effects associated with contaminants known to be found at the Shipyards. Exponent and/or Dr. Marty should re-evaluate the data as recommended in these comments, and submit the data and diagnosis for additional quality assurance evaluation by another histopathologist prior to making any definitive conclusion regarding the impact to fish from site-related contaminants.

Thank you for the opportunity to comment of this report. If you have questions related to these comments, please contact me at (916) 255-6686, or directly contact Mark Myers at (206) 860-3329.

Sincerely,

Denise M. Klimas

Denise M. Klimas
Coastal Resources Coordinator
Office of Response and Restoration

Reference:

McCain et al.,1992. Chemical contamination and associated fish diseases in San Diego Bay. Environmental Science & Technology 26(4): 725-733.

Cc:
Mark Myers, NOAA NMFS
Donald MacDonald, NOAA ORR
Scott Sobiech, USFWS
Katie Zeeman, USFWS
Bill Paznokas, CA F&G
Laura Hunter, Environmental Health Coalition

Office of Environmental Health Hazard Assessment

Joan E. Denton, Ph.D., Director
Headquarters • 1001 I Street • Sacramento, California 95814
Mailing Address: P.O. Box 4010 • Sacramento, California 95812-4010
Oakland Office • Mailing Address: 1515 Clay Street, 16th Floor • Oakland, California 94612

Terry Tamminen
Agency Secretary

Arnold Schwarzenegger
Governor

MEMORANDUM

TO: Tom Alo
Water Resource Control Engineer
San Diego Regional Water Quality Control Board
9174 Sky Park Court, Suite 100
San Diego, CA 92123-4340

VIA: Jim Carlisle, D.V.M, Senior Toxicologist
Applied Risk Assessment Unit
Integrated Risk Assessment Section

FROM: Robert K. Brodberg, Ph.D., Senior Toxicologist
Fish and Water Quality Evaluation Unit
Pesticide and Environmental Toxicology Section
Office of Environmental Health Hazard Assessment

Robert K. Brodberg

DATE: April 29, 2004

SUBJECT: REVIEW OF THE EXPONENT NASSCO AND SOUTHWEST MARINE DETAILED SEDIMENT INVESTIGATION

I have reviewed the EXPONENT "NASSCO and Southwest Marine Detailed Sediment Investigation, Technical Report" with emphasis on Section 11, containing the Human Health Risk Assessment. I have the following comments.

1. The statement in the Executive Summary (page xxxiv) that "Consumption rates for <u>high-end</u> consumers were used, as recommended by the Office of Environmental Health Hazard Assessment," is misleading. Two consumption rates (21 and 161 grams per day) were used in the Human Health Risk Assessment. The rate of 21 grams per day is a reasonable estimate of fish consumption for recreational fishers in San Diego. Only the 161 gram per day rate is considered representative of high-end (e.g., subsistence) consumers. This rate, from a survey of fishers in Santa Monica Bay, is an appropriate value to use as an estimate of consumption by San Diego subsistence fishers. Although consumption rates for San Diego fishers were estimated as part of the San Diego Health Risk Study, the rates from the Santa Monica Bay study are more robust because the results are based on a larger sample size (i.e., more

interviews). A similar cross-section of anglers from different racial and ethnic backgrounds was interviewed in both studies. This term is also misapplied in the body of the Human Health Risk Assessment. The Executive Summary and text should be changed to clarify that two consumption rates were used, and that the 21 gram per day rate represents recreational anglers and the 161 gram per day rate represents subsistence or other high-end consumers. The Conceptual Site Model, Figure 1.3, should be revised to include this consumption pathway for subsistence/high-end fishers.

2. The characterization of the Screening Values (SVs) from the "Prevalence of Selected Target Chemical Contaminants in Sport Fish from Two California Lakes: Public Health Designed Screening Study, Office of Environmental Health Hazard Assessment (OEHHA), 1999" is misleading. These SVs are applicable for chemicals in all fishes and water bodies (i.e., freshwater, estuarine, and marine) for the stated toxicity end-points and assumptions. These SVs, called "tissue residue guidelines (TRGs)" on page 11-2 of the Human Health Risk Assessment, are intended to be used to determine when more sampling or a health evaluation is warranted. SVs in this report are used to determine when chemicals are of concern for species or sites, and then a risk assessment is performed for the identified Chemicals of Potential Concern (COPCs). Using SVs to determine when a risk assessment should be done is an appropriate application. However, they are not necessarily "health-protective" of all consumers, as this report implies. They would not reflect the potential risk of consumers eating more than the consumption rate used to set the SV for a given chemical, or cases where a different toxicity endpoint was used. Thus, they would not necessarily identify all chemical and site combinations where subsistence consumers (i.e., those consuming 161 grams per day) might be at risk. The term "health-protective" should be deleted on page 11-2.

3. As indicated on page 11-4 there were different chemicals used in the two shipyards and, while access inside the leaseholds may be restricted at present, there is still boat access outside of the leaseholds. This seems especially pertinent to the Southwest Marine Shipyard where there is access to the north and the west, and higher concentrations of several chemicals (e.g., mercury and PCBs) are found inside and immediately outside of the leasehold in the sediments and fish. It is plausible that some of the chemicals in sediment have migrated from inside the leasehold to outside the leasehold. It is also plausible that some anglers might fish off of one or the other of these leaseholds more frequently than indicated in the Fractional Intake calculations (see Comment 6). In this case their exposure and hazard or risk could be higher than calculated in this report and might increase if more chemicals migrate off of the leasehold. The areas outside of the leaseholds are clearly accessible for fishing and cover a larger area in which fish moving in and out in of the leasehold might accumulate chemicals to the same concentration as inside the leasehold. The issue of sediment migration from the leaseholds to sites adjacent to them should be addressed as a scenario in the risk assessment, because this scenario could lead to sediment concentrations and risk outside of the leaseholds that are equivalent to those inside.

4. The selection of chemicals of potential concern (COPCs) on pages 11-4 and 11-5 is not appropriate for human health risk assessment. Concentrations at "reference sites" should not be considered in the selection of COPCs in this case. The selection of organic chemicals as COPCs should be based solely on the whether or not a chemical exceeds its SV for fish tissue. Trace metals should also be selected primarily based on whether or not they exceed their fish tissue SV. Using this procedure PCBs and mercury should be retained as COPCs for all fish and all sites, since maximum values from these sites in fish or shellfish exceed their respective SVs. In some situation, when it can be demonstrated that high natural levels of a trace metal are present in sediment and fish, these levels may be used to deselect some metals. This procedure is not applicable for mercury in this case. However, inorganic arsenic can reasonably be excluded as a COPC based on the assumption on page 11-4 that inorganic arsenic is about 4% of total arsenic.
5. OEHHA did not characterize the population in the Santa Monica Bay study as representing a "high fish consumption rate population" (page 11-8), but as a "population that regularly fishes and consumes fish and shellfish." This should be corrected.
6. The assumptions for the Fractional Intake calculations from these two sites (pages 11-9 and 11-10) don't really reflect the distribution of fishing activity in San Diego Bay or all of the fishing scenarios that should be considered. Assuming that all shore and boat sites are equally accessible and desirable is an over-simplification of fishing intensity. Fishing is not evenly distributed in San Diego Bay. There tends to be the greatest activity in the north bay, the least in the south bay, and the central bay (in the vicinity of these leaseholds) has intermediate fishing activity. The potential also exists for boat anglers to take more fish with chemical concentrations like those in the leasehold (see #3 above) from areas near these leaseholds than is indicated based on the Fractional Intake calculations. Further, it is possible that some boat fishers may enter the leaseholds to fish. It is also possible that workers on these two sites may fish from the sites. And, it is also possible that in the future there will be direct fishing access to these sites because they are no longer shipyards. The risks and hazards from full fishing access for both consumption levels should also be considered as a possible scenario for these sites. I have calculated the risks and hazards for this full access scenario for shore and boat fishers inside (shore fisher) and outside (boat fisher) both leaseholds and shown them with risks and hazards based on the Fractional Intake scenario in Table 1 and 2. The greatest overall risk is to shore fishers inside South West Marine. Risks to boat fishers here are also higher than at NASSCO. Some risks and hazards from this scenario are high and suggest that remediation is in order. Risks for some subsistence consumers might be three or more times higher than shown in my tables if they prepare and consume whole body fish.
7. Maximum lobster (edible muscle only) mercury concentrations from NASSCO are about five times higher than at South West Marine. There is large variation in mercury concentration in lobster from NASSCO inside the leasehold. Examination of supplementary Table E-7 (lengths and weights of fish and lobsters) suggests that these variations are due in part to a broad range in total length of lobster from this site. However, there were large lobster of

similar size from South West Marine and even larger lobster from the reference site with lower mercury concentrations. This suggests that some of this difference in concentration is site-related. Supplementary Table E-7 should be included in the final report so that size and concentration relationships can be examined.

8. The statement on page 11-14 that Aroclor 1260 was the only Aroclor detected is misleading. Aroclor 1260 was not the only detected Aroclor. Aroclor 1254 was detected in the whole body spotted sand bass, but apparently was not detected in sand bass fillet. The concentrations of Aroclor 1254 were very similar to the concentrations of Aroclor 1260 in the whole body samples. There is a Reference Dose for Aroclor 1254 and it is appropriate to use it to calculate the potential Hazard Index for Aroclor 1260 and total Aroclors as is done on page 11-17. It is odd that Aroclor 1254 was not detected in these samples of spotted sand bass fillet because it has been detected in this same species from San Diego Bay in fillet samples analyzed through the Coastal Fish Contamination Program. The statement that Aroclor 1260 was the only Aroclor detected should be deleted or changed to include reference to the Aroclor 1254 in the whole body samples.
9. The report suggests that subsistence fishing inside the leasehold is not possible, and no risk level is calculated (page 11-15). However, as noted above, workers might be fishing on these sites and consumption of spotted sand bass from inside the South West Marine leasehold at the high rate of 161gm/day would yield a risk of 1.8×10^{-5} from PCBs using the conservative Fractional Intake assumptions for this site. This shows that risks can exceed the 1×10^{-6} level (a level often used for water quality criterion) at high consumption rates even if restricted access to the site is assumed. This risk would be higher if workers do fish inside the leasehold. This should be noted.
10. On page 11-16, the U.S. EPA (2000e) guidance document updates and replaces the Sampling and Guidance Manuals cited with more information on cooking and trimming reductions. The 50% reduction in PCB concentrations used in the Great Lakes Guidance is a better estimate of likely reduction from trimming and cooking. Reductions of 60-90% are not typical. Discussion based on the older U.S. EPA documents should be deleted.

CONCLUSION

Specific cases are noted above in which the human health risk assessment should be revised to address individual comments. An alternate scenario recognizing that full fishing access might occur in or near the leaseholds should also be included in the risk assessment and risks should be calculated for this scenario. The issue of offsite migration is not addressed in the human health risk assessment. It is important to determine whether contaminated sediment is moving off site into more accessible areas adjacent to the leasehold. If this has occurred or is occurring then calculations based on increasing exposure to fishers in areas adjacent to the leasehold should also be included in the human health risk assessment.

cc: Jim Carlisle
Anna Fan

Table 1: Cancer risk levels from PCBs using lesser of UCL or maximum tissue concentration at a site.

Site/species	Recreational fisher CR 21 gm/day no FI	Recreational fisher CR 21 gm/day Site FI included	Subsistence fisher CR 161 gm/day no FI	Subsistence fisher CR 161 gm/day Site FI included
NASSCO Boat fisher				
Sand bass (M) (54 ppb PCBs)	1.4×10^{-5}	6.9×10^{-8}	1.1×10^{-4}	5.3×10^{-7}
NASSCO Shore fisher				
Sand bass (M) (46 ppb PCBs)	1.2×10^{-5}	4.0×10^{-7}	9.1×10^{-5}	3.1×10^{-6}
Lobster (M) (11 ppb PCBs)	2.8×10^{-6}	9.6×10^{-8}	2.2×10^{-5}	7.4×10^{-7}
Lobster (WB) (76 ppb PCBs)	2.0×10^{-5}	6.6×10^{-7}	1.5×10^{-4}	5.1×10^{-6}
SW Marine Boat fisher				
Sand bass (M) (110 ppb PCBs)	2.8×10^{-5}	5.7×10^{-8}	2.2×10^{-4}	4.3×10^{-7}
SW Marine Shore fisher				
Sand bass (M) (400 ppb PCBs)	1.0×10^{-4}	2.4×10^{-6}	7.9×10^{-4}	1.8×10^{-5}
Lobster (M) (21 ppb PCBs)	5.4×10^{-6}	1.2×10^{-7}	4.1×10^{-5}	9.5×10^{-7}
Lobster (WB) (59 ppb PCBs)	1.5×10^{-5}	3.5×10^{-7}	1.2×10^{-4}	2.7×10^{-6}

CR = consumption rate
FI = Fractional index for site
M = muscle tissue
WB = whole body
UCL = Upper confidence limit concentration value was used

Table 2: Non-cancer risk levels from PCBs and Hg using lesser of UCL or maximum tissue concentration at a site.

Site/species	Recreational fisher CR 21 gm/day no FI	Recreational fisher CR 21 gm/day Site FI included	Subsistence fisher CR 161 gm/day no FI	Subsistence fisher CR 161 gm/day Site FI included
NASSCO Boat fisher				
Sand bass (M) (54 ppb PCBs)	0.8	4.1×10^{-3}	6.2	3.1×10^{-2}
NASSCO Shore fisher				
Sand bass (M) (46 ppb PCBs)	0.7	2.3×10^{-2}	5.3	0.2
Lobster (M) (11 ppb PCBs)	0.2	5.6×10^{-3}	1.3	4.3×10^{-2}
Lobster (WB) (76 ppb PCBs)	1.1	3.8×10^{-2}	8.7	0.3
Lobster (M) (521 ppb Hg)	1.6	5.3×10^{-2}	12	0.4
SW Marine Boat fisher				
Sand bass (M) (110 ppb PCBs)	1.7	3.3×10^{-3}	12.7	2.5×10^{-2}
SW Marine Shore fisher				
Sand bass (M) (400 ppb PCBs)	6	0.1	46	1.1
Lobster (M) (21 ppb PCBs)	0.3	7.2×10^{-2}	2.4	0.2
Lobster (WB) (59 ppb PCBs)	0.9	2.0×10^{-3}	6.8	5.8×10^{-2}
Lobster (M) (109 ppb Hg)	0.3	1.1×10^{-2}	2.5	8.6×10^{-2}

CR = consumption rate
FI = Fractional index for site
M = muscle tissue
WB = whole body
UCL = Upper confidence limit concentration value was used

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
OFFICE OF RESPONSE & RESTORATION
COASTAL PROTECTION & RESTORATION DIVISION
c/o California Department of Toxic Substance Control,
Human and Ecological Risk Division
8800 Cal Center Drive
Sacramento, CA 95826

April 20, 2004

Mr. Tom Alo
California Regional Water Quality Control Board
San Diego Region
9174 Sky Park Court, Suite 100
San Diego, CA 92123-4340

REC'D APR 30 2004

Dear Mr. Alo:

NOAA appreciates the opportunity to provide comments to you on two reports associated with the investigation of the NASSCO and Southwest Marine Shipyards. Dr. Gary D. Marty prepared a September 2003 report entitled, Necropsy and Histopathology of Spotted Sea Bass Sampled from San Diego Harbor, for the Shipyard's consultant, Exponent. Details and results of this report were incorporated into the NASSCO and Southwest Marine Detailed Sediment Investigation (September 2003) submitted by Exponent for the NASSCO and Southwest Marine Shipyards. NOAA's Coastal Protection and Restoration Division has requested the assistance of Mark S. Myers, a fish biologist and pathologist with the ecotoxicology branch of the NOAA Northwest Fisheries Science Center, in reviewing and commenting on these reports. The fish histopathology section (Section 8.2), and the fish bile section (Section 8.3) of the Detailed Sediment Investigation were reviewed, and comments on these sections are included in this letter.

Necropsy and Histopathology of Spotted Sea Bass Sampled from San Diego Harbor

General comments:

- The necropsy procedure, tissue processing, and histopathologic analysis of tissues were conducted according to appropriate and accepted protocols, and no comments will be provided on these sections. The figures contain good quality micrographs that show excellent documentation of the lesions encountered, and they are well described.

- The fish species analyzed in this report is normally referred to as spotted sandbass, not as spotted sea bass. Please make this correction in the text.

- Based on NOAA's past experience with examination of spotted sandbass and barred sandbass from San Diego Harbor, very few toxicopathic lesions have been found in these species. This is especially true for the liver or kidney of spotted sandbass from south San Diego Bay. Based on this observation, it would have been preferable to sample and examine white croaker or black croaker. However, it appears that reasonable attempts to capture these better sentinel species were carried out.

<u>Summary and comment on the major histopathological findings</u>:

- Abundant hepatocellular lipofuscin, indicating degradation of cell organelles, was found in all fish caught in the NASSCO "inside" location and in both the "inside" and "outside" locations at Southwest Marine. This is a significant, contaminant-associated effect that appears to moderately to severely affect approximately 12 to 20% of fish from inside the shipyard sites. Data indicate that fish collected from the reference site were only mildly affected.

- Abundant hemosiderin, indicating increased destruction of red blood cells, was most commonly found in "outside" shipyard locations. No hemosiderin was found in fish at the "inside" shipyard sites. Some attempt should be made to analyze this difference.

- Five out of the 253 fish collected during the study had liver weights greater than 10 grams. In addition, these five fish were female or female-intersex fish, and all came from the NASSCO site. There should be further discussion in the text regarding this potentially important finding and its overall significance.

- There are fewer "cysts of unknown etiology" from inside sites than from outside or reference sites. Scientists at NOAA have also seen this lesion in numerous marine/estuarine species and refer to it as an "oocyte-like body". It appears to be an infectious organism of some sort and, like Dr. Marty; NOAA does not know it's precise diagnosis. NOAA agrees with Dr. Marty that it may represent a life-history stage of *Ichthyophonus sp.*

- The generation of new nephrons was greater in kidneys from fish collected at the reference site. This may indicate a higher growth rate in fish found at the reference site. The scores for renal nephritis were higher in fish from the NASSCO location, and the only severe case of renal nephritis was found at Southwest Marine. It should be noted in the document that growth and survival of fish may be impaired by renal nephritis.

- Lipofuscin scores in testis of fish, which is an indicator of impaired reproduction, were found to be higher "inside" the shipyard sites than those

found at the reference site. Approximately 5-12% of the collected fish were affected, and the only severe cases were seen in fish from inside the shipyard sites. In one case, a male with severe lipofuscin found at the NASSCO "inside" location also had no maturing sperm. In the ovaries, pigmented macrophage aggregates (PMAs) were found in about 20% of the fish and were highest in fish from "inside" both shipyard sites. PMAs in female fish from inside shipyard sites may be significant, but there is a need to account for fish age in these analyses. Site differences in PMAs for testis were not significant.

- According to Marty (p. 4) and Appendix 5, intersex gonads were found at similar frequencies in fish collected at the shipyard sites and reference site. This effect was most common in smaller females, except for "inside" NASSCO, which had several large female-intersex fish. Based on NOAA scientist's previous experience in histologically examining barred and spotted sandbass from southern California, a large number of intersex fish were identified. As mentioned by Marty (p. 8), this may not be a surprising observation considering that these two species are thought to be hermaphroditic (protogynous), and typically change sex from female to male with advancing age. However, this feature of spotted sandbass should be discussed further in the analysis.

- Although three fish collected in the study had carcinomas, NOAA agrees with Dr. Marty that the tumor development identified in these fish does not appear to be specifically related to exposure at the NASSCO or Southwest Marine sites.

- The document states on p. 8 that "more fish from the inside shipyard sites had evidence of tissue damage than did fish from the outside shipyard sites". Although the document states that the most striking differences were in the liver, review of the report also shows that the gonad and kidney had significant lesions. These lesions were distinct enough to be used to separate fish from the contaminated areas and reference area. Further discussion should be provided on the significance of this observation.

- The prevalence of renal nephritis is consistent with increased disease in fish from inside the NASSCO site. Lower scores in regenerative tubules are consistent with reduced growth, but there does not appear to have been an evaluation of the age of the fish in relation to this finding. There is a possibility of higher values in younger fish. In addition, higher values would be expected in situations where fish were exposed to renal toxicants. Further discussion should be provided on the significance of this observation, and the relationship to the age of the fish.

- In Appendix 1, type specimens for foci of cellular alteration (FCA) and cholangitis/biliary hyperplasia are shown but not discussed. Please see additional comments on this subject later in this letter. Dr. Marty or Exponent should provide a discussion and analysis of the significance of these lesions.

- In the discussion of the data from Appendix 4, there is no evaluation or interpretation in the main text of Marty's report of atresia of yolked follicles, and atresia of unyolked follicles in the ovary. Also, there is no inclusion of the lesions F-INT (female, intersex) or M-INT (male, intersex) in the summary of male and female type specimens. Please provide a discussion and analysis of the significance of these findings.

- In the discussion of the data from Appendix 6, there is not an evaluation or even a mention of the preneoplastic foci of cellular alteration observed in the liver, as well as cholangitis/biliary hyperplasia, which were diagnosed, in spotted sandbass from all of the sampling sites. Both of these lesion classes, but especially the foci of cellular alteration, have been extensively used in wild fish as histopathological biomarkers of exposure to contaminants such as PAHs. The highly selective and biased failure to report in the text that preneoplastic focal lesions were detected in the liver of spotted sandbass from all sites in this study is disturbing. Regardless of their stated rationale that the lesions were not discussed because there were no statistically significant differences in the prevalence of lesions among the sites, the lesions were identified during the histopathological examination, and their significance should have been evaluated in the discussion.

  Upon independent review of the liver lesion data presented in Appendix 6, the following prevalence of foci of cellular alteration (clear cell foci, eosinophilic foci, basophilic foci) among the sampling sites were found: reference site (15.4%); inside NASSCO (18.0%); outside NASSCO (16.0%): inside Southwest Marine (9.8%); and outside Southwest Marine (16.0%). The same observations apply to the presence of cholangitis/biliary hyperplasia in the same fish, at the following prevalence: reference site (11.5%); inside NASSCO (34.0%); outside NASSCO (24%); inside Southwest Marine (19.6%); and outside Southwest Marine (20.0%). These data should be subjected to further statistical analyses that account for fish age (e.g. stepwise logistic regression analyses) to prove that there are/are not inter-site differences in risk of lesion occurrence. There is also a possible need for outside QA and review of the actual histologic slides to confirm/refute the presence of these focal lesions in the fish examined in this study.

Additional Work and Synthesis

In his report, Dr. Marty states the further need to synthesize the data to include fish age data (which has been done to a certain extent) and contaminant data. He also recommends Transmission Electron Microscopy of liver tissue to confirm lipofuscin, special stains to distinguish lipofuscin and hemosiderin (he did these specials stains), and suggests doing CYP1A staining in liver to further document PAH exposure.

Review of Exponent Sediment Report, Section 8.2, Fish Histopathology

Some explanation should be included in this report as to why the spotted sandbass was collected rather than the white croaker, the original target species.

Lesions Elevated at Shipyard Locations

Based on NOAA's review of the histopathology report, it is clear that the authors of the Exponent report have been selective and have not fully reported Marty's findings and data from the appendices in Marty's report. Marty did find and report higher scores for liver lipofuscin in fish from the "inside" shipyard sites, higher scores for hepatic hemosiderin in fish from the "outside" shipyard sites, higher scores for renal nephritis in fish from "inside" NASSCO, and higher scores for shiny gill foci (gross lesion) in fish from "inside" Southwest Marine. However, he also found higher scores for lipofuscin in gonads of fish from the "inside" shipyard sites, as well as increased scores for pigmented macrophage aggregates in ovaries of fish from the "inside" shipyard sites. These lesions in the gonad are not discussed in the Exponent sediment report, and considering these lesions affect reproductive organs, they should have been discussed and evaluated.

In addition, NOAA's evaluation of the liver lesion data also suggests that the prevalence of cholangitis/biliary hyperplasia may be elevated compared to reference sites (11.5%), at the "inside" and "outside" shipyard sites, especially at the "inside" NASSCO site (34%).

The statement in the Exponent report that only 4 of the 70 lesions evaluated in the study were elevated in the shipyard sites compared to the reference site is overly simplistic, given that a large majority of the lesions were not toxicopathic in nature, and were in essence, incidental findings.

Lesions Elevated at the Reference Area

The relevance of lesions found at the reference site is oversimplified in Exponent's discussion and conclusion. The data presented in Table 8-18 are attempting to show the reader that the prevalence of some lesions were higher at the reference site, as compared to one or more of the shipyard sites, whether or

not these lesions have anything at all to do with exposure to contaminants. For example, renal tubular regeneration is higher at the reference site as compared to outside NASSCO, only; severe atresia of yolked oocytes is higher at the reference site as compared to inside SWM only. Other lesions with higher prevalence at the reference than at the shipyard sites are only gross lesions, none of which have an established relationship to contaminant exposure.

Significance of Lesions

NOAA reviewed the liver lesion data presented in Appendix 6 of the Marty report and found that a number of fish from both the reference site, and the "inside" and "outside" shipyard sites were affected by preneoplastic foci of cellular alteration, including basophilic, clear cell and eosinophilic foci. However, in the Exponent report it is falsely stated that only two fish in this study exhibited one of the liver lesions typically associated in other field studies with contaminant exposure. The two fish were from the reference site, and identified as affected with either a hepatocellular adenoma or a biliary carcinoma (both liver neoplasms).

Data presented in the appendices of the Marty report show that preneoplastic foci of cellular alteration were detected in fish from all of the sampling sites. The extent of these important preneoplastic focal lesions was not mentioned or discussed in the text of the Marty report. Although Marty diagnosed these lesions, and did not discuss the lesion data in his report text, the Exponent report directly states in the text (page 8-44, lines 8-13), and in Table 8-19, that these lesions did not occur in any fish examined. Even if no significant inter-site differences in the prevalence of these foci of cellular alteration were found, this is a significant omission of very important information. The existence of these lesions at any site indicates a harmful effect strongly linked to PAH exposure, whether that occurred at a reference or shipyard site. It is incorrect to state that these lesions were not detected in the study. The Exponent report should acknowledge the diagnosis of these lesions and should address their significance in the Sediment Report.

The existence of liver neoplasms and foci of cellular alteration in spotted sandbass from the "reference" site calls into question the appropriateness of the selected reference site. Based on information from other studies utilizing these lesions as histopathological biomarkers of contaminant exposure, these toxicopathic lesions rarely occur in fish from uncontaminated reference sites. The questionable appropriateness of the reference site is further shown by the very high levels of PAH metabolites measured in bile of spotted sandbass from the reference site. This issue is discussed in more detail in the section on fish bile near the end of this letter.

Evaluations of fish growth, condition, and spatial comparisons

NOAA recommends that the fish condition index be defined more precisely and be consistent with standard, accepted approaches. The condition index should be expressed as the weight in grams/(length in cm)^3, and could be multiplied by 100 (Fulton's condition index). Also, fish growth in fisheries biology is typically assessed with formulas more complex than simple age at length curves. A more complex curve, like the Von Bertalanffy growth curve should have been used in the growth analysis. Based on the relatively low sample size, and the stratification by sex, it is not surprising that no clear trends in growth or condition factor were determined. However, these comparisons should be repeated using a proper condition index and the age-length relationships typically used to assess growth in fisheries biology studies. Exponent should provide these additional analyses and should discuss their significance.

Comparisons Based on Liver Lesions

A condition index commonly used in fish biology should be used here, as well as age-length relationships typically used in fish biology to assess growth (e.g., Von Bertalanffy growth curves). In the second paragraph, these results actually indicate that an adverse effect on fish growth was not associated with the presence of either abundant hepatic lipofuscin, or hemosiderosis. Relative to the condition index in fish with and without these lesions, the fact that these liver lesions tended to occur in older fish that typically possess higher condition indices helps to explain the fact that fish with the lesions had higher condition indices. These findings are not surprising. Similar comparisons of growth rates and condition factors in English sole, with and without toxicopathic liver lesions, and that have exceptionally strong and consistent associations with exposure to PAHs, have also rarely shown any effect of these lesions on growth or fish condition in wild fish.

Review of Exponent Sediment Report, Section 8.3, Fish Bile

The finding of levels of fluorescent aromatic compounds (FACs) at benzo[a]pyrene wave lengths in the range of 0.7-4.6 ug/g protein at the reference site clearly shows exposure to PAH levels far beyond what would normally be expected at a relatively uncontaminated reference site. In most new publications in which FACs data are presented, including those from studies done by the Northwest Fisheries Science Center, biliary FACs data are typically expressed in ng BaP equivalents/g protein, so that the protein-adjusted levels in fish from the present study ranged from 700-4600 ng/g protein, with a mean of 2070 ng/g protein. These levels are far beyond the level of 1000 ng BaP equiv/g protein that NOAA typically uses as a benchmark to define a response in fish from an area that is significantly contaminated by PAHs.

For example, previously reported biliary FACS data from barred sandbass from sites in San Diego Bay and vicinity (McCain et al., 1992), showed levels ranging from ~100 ng/g at the Dana Point reference site, to approximately 1600 ng/g at East Harbor Island, approximately 4000 ng/g at 28th Street Pier (near the Southwest Marine and NASSCO) sites, and approximately 5500 ng/g at National City. Except for the reference site value at Dana Point, which was considerably lower than the levels at the reference site for the present study, these levels in a closely related species, barred sandbass, are comparable to the levels detected from similar sites in the present study in spotted sandbass.

It would also be helpful in the presentation of the biliary FACs data if Figures 8-34 through 8-36 could be shown as means $\pm$ 1 std. deviation or a 95% confidence interval, rather than as means, minimum and maximum. Presentation of the data in this suggested format is the more accepted format in scientific documents, and will enable the reader to interpret the statistical relationships among levels at the reference and shipyard sites, as well as to more critically evaluate the data with respect to some of the statements made on p. 8-49. For example, the statement is made that levels of bile breakdown products (actually, these are usually referred to as "metabolites") in fish from the shipyards are not significantly greater ($P<0.05$) than concentrations at the reference area. This in fact may be the case, but it is not possible to critically evaluate this statement in the format in which the data are presented. Moreover, it is probably not valid to state that "concentrations in fish from within the shipyard leaseholds are generally less than concentrations in fish from outside the leaseholds", if in fact there is no statistically significant difference between "inside" and "outside" sites.

Report Conclusions

Exponent's report concludes that fish from in or near the shipyards are not affected by contaminant exposure. This conclusion is overly simplistic and ignores some important data and diagnoses related to effects associated with contaminants known to be found at the Shipyards. Exponent and/or Dr. Marty should re-evaluate the data as recommended in these comments, and submit the data and diagnosis for additional quality assurance evaluation by another histopathologist prior to making any definitive conclusion regarding the impact to fish from site-related contaminants.

Thank you for the opportunity to comment of this report. If you have questions related to these comments, please contact me at (916) 255-6686, or directly contact Mark Myers at (206) 860-3329.

Sincerely,

Denise M. Klimas

Denise M. Klimas
Coastal Resources Coordinator
Office of Response and Restoration

Reference:

McCain et al.,1992. Chemical contamination and associated fish diseases in San Diego Bay. Environmental Science & Technology 26(4): 725-733.

Cc:
Mark Myers, NOAA NMFS
Donald MacDonald, NOAA ORR
Scott Sobiech, USFWS
Katie Zeeman, USFWS
Bill Paznokas, CA F&G
Laura Hunter, Environmental Health Coalition

Office of Environmental Health Hazard Assessment

Joan E. Denton, Ph.D., Director
Headquarters • 1001 I Street • Sacramento, California 95814
Mailing Address: P.O. Box 4010 • Sacramento, California 95812-4010
Oakland Office • Mailing Address: 1515 Clay Street, 16th Floor • Oakland, California 94612

Terry Tamminen
Agency Secretary

Arnold Schwarzenegger
Governor

MEMORANDUM

TO: Tom Alo
Water Resource Control Engineer
San Diego Regional Water Quality Control Board
9174 Sky Park Court, Suite 100
San Diego, CA 92123-4340

VIA: Jim Carlisle, D.V.M, Senior Toxicologist
Applied Risk Assessment Unit
Integrated Risk Assessment Section

FROM: Robert K. Brodberg, Ph.D., Senior Toxicologist
Fish and Water Quality Evaluation Unit
Pesticide and Environmental Toxicology Section
Office of Environmental Health Hazard Assessment

DATE: April 29, 2004

SUBJECT: REVIEW OF THE EXPONENT NASSCO AND SOUTHWEST MARINE DETAILED SEDIMENT INVESTIGATION

I have reviewed the EXPONENT "NASSCO and Southwest Marine Detailed Sediment Investigation, Technical Report" with emphasis on Section 11, containing the Human Health Risk Assessment. I have the following comments.

1. The statement in the Executive Summary (page xxxiv) that "Consumption rates for high-end consumers were used, as recommended by the Office of Environmental Health Hazard Assessment," is misleading. Two consumption rates (21 and 161 grams per day) were used in the Human Health Risk Assessment. The rate of 21 grams per day is a reasonable estimate of fish consumption for recreational fishers in San Diego. Only the 161 gram per day rate is considered representative of high-end (e.g., subsistence) consumers. This rate, from a survey of fishers in Santa Monica Bay, is an appropriate value to use as an estimate of consumption by San Diego subsistence fishers. Although consumption rates for San Diego fishers were estimated as part of the San Diego Health Risk Study, the rates from the Santa Monica Bay study are more robust because the results are based on a larger sample size (i.e., more

interviews). A similar cross-section of anglers from different racial and ethnic backgrounds was interviewed in both studies. This term is also misapplied in the body of the Human Health Risk Assessment. The Executive Summary and text should be changed to clarify that two consumption rates were used, and that the 21 gram per day rate represents recreational anglers and the 161 gram per day rate represents subsistence or other high-end consumers. The Conceptual Site Model, Figure 1.3, should be revised to include this consumption pathway for subsistence/high-end fishers.

2. The characterization of the Screening Values (SVs) from the "Prevalence of Selected Target Chemical Contaminants in Sport Fish from Two California Lakes: Public Health Designed Screening Study, Office of Environmental Health Hazard Assessment (OEHHA), 1999" is misleading. These SVs are applicable for chemicals in all fishes and water bodies (i.e., freshwater, estuarine, and marine) for the stated toxicity end-points and assumptions. These SVs, called "tissue residue guidelines (TRGs)" on page 11-2 of the Human Health Risk Assessment, are intended to be used to determine when more sampling or a health evaluation is warranted. SVs in this report are used to determine when chemicals are of concern for species or sites, and then a risk assessment is performed for the identified Chemicals of Potential Concern (COPCs). Using SVs to determine when a risk assessment should be done is an appropriate application. However, they are not necessarily "health-protective" of all consumers, as this report implies. They would not reflect the potential risk of consumers eating more than the consumption rate used to set the SV for a given chemical, or cases where a different toxicity endpoint was used. Thus, they would not necessarily identify all chemical and site combinations where subsistence consumers (i.e., those consuming 161 grams per day) might be at risk. The term "health-protective" should be deleted on page 11-2.

3. As indicated on page 11-4 there were different chemicals used in the two shipyards and, while access inside the leaseholds may be restricted at present, there is still boat access outside of the leaseholds. This seems especially pertinent to the Southwest Marine Shipyard where there is access to the north and the west, and higher concentrations of several chemicals (e.g., mercury and PCBs) are found inside and immediately outside of the leasehold in the sediments and fish. It is plausible that some of the chemicals in sediment have migrated from inside the leasehold to outside the leasehold. It is also plausible that some anglers might fish off of one or the other of these leaseholds more frequently than indicated in the Fractional Intake calculations (see Comment 6). In this case their exposure and hazard or risk could be higher than calculated in this report and might increase if more chemicals migrate off of the leasehold. The areas outside of the leaseholds are clearly accessible for fishing and cover a larger area in which fish moving in and out in of the leasehold might accumulate chemicals to the same concentration as inside the leasehold. The issue of sediment migration from the leaseholds to sites adjacent to them should be addressed as a scenario in the risk assessment, because this scenario could lead to sediment concentrations and risk outside of the leaseholds that are equivalent to those inside.

4. The selection of chemicals of potential concern (COPCs) on pages 11-4 and 11-5 is not appropriate for human health risk assessment. Concentrations at "reference sites" should not be considered in the selection of COPCs in this case. The selection of organic chemicals as COPCs should be based solely on the whether or not a chemical exceeds its SV for fish tissue. Trace metals should also be selected primarily based on whether or not they exceed their fish tissue SV. Using this procedure PCBs and mercury should be retained as COPCs for all fish and all sites, since maximum values from these sites in fish or shellfish exceed their respective SVs. In some situation, when it can be demonstrated that high natural levels of a trace metal are present in sediment and fish, these levels may be used to deselect some metals. This procedure is not applicable for mercury in this case. However, inorganic arsenic can reasonably be excluded as a COPC based on the assumption on page 11-4 that inorganic arsenic is about 4% of total arsenic.
5. OEHHA did not characterize the population in the Santa Monica Bay study as representing a "high fish consumption rate population" (page 11-8), but as a "population that regularly fishes and consumes fish and shellfish." This should be corrected.
6. The assumptions for the Fractional Intake calculations from these two sites (pages 11-9 and 11-10) don't really reflect the distribution of fishing activity in San Diego Bay or all of the fishing scenarios that should be considered. Assuming that all shore and boat sites are equally accessible and desirable is an over-simplification of fishing intensity. Fishing is not evenly distributed in San Diego Bay. There tends to be the greatest activity in the north bay, the least in the south bay, and the central bay (in the vicinity of these leaseholds) has intermediate fishing activity. The potential also exists for boat anglers to take more fish with chemical concentrations like those in the leasehold (see #3 above) from areas near these leaseholds than is indicated based on the Fractional Intake calculations. Further, it is possible that some boat fishers may enter the leaseholds to fish. It is also possible that workers on these two sites may fish from the sites. And, it is also possible that in the future there will be direct fishing access to these sites because they are no longer shipyards. The risks and hazards from full fishing access for both consumption levels should also be considered as a possible scenario for these sites. I have calculated the risks and hazards for this full access scenario for shore and boat fishers inside (shore fisher) and outside (boat fisher) both leaseholds and shown them with risks and hazards based on the Fractional Intake scenario in Table 1 and 2. The greatest overall risk is to shore fishers inside South West Marine. Risks to boat fishers here are also higher than at NASSCO. Some risks and hazards from this scenario are high and suggest that remediation is in order. Risks for some subsistence consumers might be three or more times higher than shown in my tables if they prepare and consume whole body fish.
7. Maximum lobster (edible muscle only) mercury concentrations from NASSCO are about five times higher than at South West Marine. There is large variation in mercury concentration in lobster from NASSCO inside the leasehold. Examination of supplementary Table E-7 (lengths and weights of fish and lobsters) suggests that these variations are due in part to a broad range in total length of lobster from this site. However, there were large lobster of

similar size from South West Marine and even larger lobster from the reference site with lower mercury concentrations. This suggests that some of this difference in concentration is site-related. Supplementary Table E-7 should be included in the final report so that size and concentration relationships can be examined.

8. The statement on page 11-14 that Aroclor 1260 was the only Aroclor detected is misleading. Aroclor 1260 was not the only detected Aroclor. Aroclor 1254 was detected in the whole body spotted sand bass, but apparently was not detected in sand bass fillet. The concentrations of Aroclor 1254 were very similar to the concentrations of Aroclor 1260 in the whole body samples. There is a Reference Dose for Aroclor 1254 and it is appropriate to use it to calculate the potential Hazard Index for Aroclor 1260 and total Aroclors as is done on page 11-17. It is odd that Aroclor 1254 was not detected in these samples of spotted sand bass fillet because it has been detected in this same species from San Diego Bay in fillet samples analyzed through the Coastal Fish Contamination Program. The statement that Aroclor 1260 was the only Aroclor detected should be deleted or changed to include reference to the Aroclor 1254 in the whole body samples.
9. The report suggests that subsistence fishing inside the leasehold is not possible, and no risk level is calculated (page 11-15). However, as noted above, workers might be fishing on these sites and consumption of spotted sand bass from inside the South West Marine leasehold at the high rate of 161gm/day would yield a risk of 1.8×10^{-5} from PCBs using the conservative Fractional Intake assumptions for this site. This shows that risks can exceed the 1×10^{-6} level (a level often used for water quality criterion) at high consumption rates even if restricted access to the site is assumed. This risk would be higher if workers do fish inside the leasehold. This should be noted.
10. On page 11-16, the U.S. EPA (2000e) guidance document updates and replaces the Sampling and Guidance Manuals cited with more information on cooking and trimming reductions. The 50% reduction in PCB concentrations used in the Great Lakes Guidance is a better estimate of likely reduction from trimming and cooking. Reductions of 60-90% are not typical. Discussion based on the older U.S. EPA documents should be deleted.

CONCLUSION

Specific cases are noted above in which the human health risk assessment should be revised to address individual comments. An alternate scenario recognizing that full fishing access might occur in or near the leaseholds should also be included in the risk assessment and risks should be calculated for this scenario. The issue of offsite migration is not addressed in the human health risk assessment. It is important to determine whether contaminated sediment is moving off site into more accessible areas adjacent to the leasehold. If this has occurred or is occurring then calculations based on increasing exposure to fishers in areas adjacent to the leasehold should also be included in the human health risk assessment.

cc: Jim Carlisle
Anna Fan

Table 1: Cancer risk levels from PCBs using lesser of UCL or maximum tissue concentration at a site.

Site/species	Recreational fisher CR 21 gm/day no FI	Recreational fisher CR 21 gm/day Site FI included	Subsistence fisher CR 161 gm/day no FI	Subsistence fisher CR 161 gm/day Site FI included
NASSCO Boat fisher				
Sand bass (M) (54 ppb PCBs)	1.4×10^{-5}	6.9×10^{-8}	1.1×10^{-4}	5.3×10^{-7}
NASSCO Shore fisher				
Sand bass (M) (46 ppb PCBs)	1.2×10^{-5}	4.0×10^{-7}	9.1×10^{-5}	3.1×10^{-6}
Lobster (M) (11 ppb PCBs)	2.8×10^{-6}	9.6×10^{-8}	2.2×10^{-5}	7.4×10^{-7}
Lobster (WB) (76 ppb PCBs)	2.0×10^{-5}	6.6×10^{-7}	1.5×10^{-4}	5.1×10^{-6}
SW Marine Boat fisher				
Sand bass (M) (110 ppb PCBs)	2.8×10^{-5}	5.7×10^{-8}	2.2×10^{-4}	4.3×10^{-7}
SW Marine Shore fisher				
Sand bass (M) (400 ppb PCBs)	1.0×10^{-4}	2.4×10^{-6}	7.9×10^{-4}	1.8×10^{-5}
Lobster (M) (21 ppb PCBs)	5.4×10^{-6}	1.2×10^{-7}	4.1×10^{-5}	9.5×10^{-7}
Lobster (WB) (59 ppb PCBs)	1.5×10^{-5}	3.5×10^{-7}	1.2×10^{-4}	2.7×10^{-6}

CR = consumption rate
FI = Fractional index for site
M = muscle tissue
WB = whole body
UCL = Upper confidence limit concentration value was used

Table 2: Non-cancer risk levels from PCBs and Hg using lesser of UCL or maximum tissue concentration at a site.

Site/species	Recreational fisher CR 21 gm/day no FI	Recreational fisher CR 21 gm/day Site FI included	Subsistence fisher CR 161 gm/day no FI	Subsistence fisher CR 161 gm/day Site FI included
NASSCO Boat fisher				
Sand bass (M) (54 ppb PCBs)	0.8	4.1×10^{-3}	6.2	3.1×10^{-2}
NASSCO Shore fisher				
Sand bass (M) (46 ppb PCBs)	0.7	2.3×10^{-2}	5.3	0.2
Lobster (M) (11 ppb PCBs)	0.2	5.6×10^{-3}	1.3	4.3×10^{-2}
Lobster (WB) (76 ppb PCBs)	1.1	3.8×10^{-2}	8.7	0.3
Lobster (M) (521 ppb Hg)	1.6	5.3×10^{-2}	12	0.4
SW Marine Boat fisher				
Sand bass (M) (110 ppb PCBs)	1.7	3.3×10^{-3}	12.7	2.5×10^{-2}
SW Marine Shore fisher				
Sand bass (M) (400 ppb PCBs)	6	0.1	46	1.1
Lobster (M) (21 ppb PCBs)	0.3	7.2×10^{-2}	2.4	0.2
Lobster (WB) (59 ppb PCBs)	0.9	2.0×10^{-3}	6.8	5.8×10^{-2}
Lobster (M) (109 ppb Hg)	0.3	1.1×10^{-2}	2.5	8.6×10^{-2}

CR = consumption rate
FI = Fractional index for site
M = muscle tissue
WB = whole body
UCL = Upper confidence limit concentration value was used

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
OFFICE OF RESPONSE & RESTORATION
COASTAL PROTECTION & RESTORATION DIVISION
c/o California Department of Toxic Substance Control,
Human and Ecological Risk Division
8800 Cal Center Drive
Sacramento, CA 95826

April 20, 2004

Mr. Tom Alo
California Regional Water Quality Control Board
San Diego Region
9174 Sky Park Court, Suite 100
San Diego, CA 92123-4340

REC'D APR 3 0 2004

Dear Mr. Alo:

NOAA appreciates the opportunity to provide comments to you on two reports associated with the investigation of the NASSCO and Southwest Marine Shipyards. Dr. Gary D. Marty prepared a September 2003 report entitled, Necropsy and Histopathology of Spotted Sea Bass Sampled from San Diego Harbor, for the Shipyard's consultant, Exponent. Details and results of this report were incorporated into the NASSCO and Southwest Marine Detailed Sediment Investigation (September 2003) submitted by Exponent for the NASSCO and Southwest Marine Shipyards. NOAA's Coastal Protection and Restoration Division has requested the assistance of Mark S. Myers, a fish biologist and pathologist with the ecotoxicology branch of the NOAA Northwest Fisheries Science Center, in reviewing and commenting on these reports. The fish histopathology section (Section 8.2), and the fish bile section (Section 8.3) of the Detailed Sediment Investigation were reviewed, and comments on these sections are included in this letter.

Necropsy and Histopathology of Spotted Sea Bass Sampled from San Diego Harbor

General comments:

- The necropsy procedure, tissue processing, and histopathologic analysis of tissues were conducted according to appropriate and accepted protocols, and no comments will be provided on these sections. The figures contain good quality micrographs that show excellent documentation of the lesions encountered, and they are well described.

- The fish species analyzed in this report is normally referred to as spotted sandbass, not as spotted sea bass. Please make this correction in the text.

- Based on NOAA's past experience with examination of spotted sandbass and barred sandbass from San Diego Harbor, very few toxicopathic lesions have been found in these species. This is especially true for the liver or kidney of spotted sandbass from south San Diego Bay. Based on this observation, it would have been preferable to sample and examine white croaker or black croaker. However, it appears that reasonable attempts to capture these better sentinel species were carried out.

<u>Summary and comment on the major histopathological findings</u>:

- Abundant hepatocellular lipofuscin, indicating degradation of cell organelles, was found in all fish caught in the NASSCO "inside" location and in both the "inside" and "outside" locations at Southwest Marine. This is a significant, contaminant-associated effect that appears to moderately to severely affect approximately 12 to 20% of fish from inside the shipyard sites. Data indicate that fish collected from the reference site were only mildly affected.

- Abundant hemosiderin, indicating increased destruction of red blood cells, was most commonly found in "outside" shipyard locations. No hemosiderin was found in fish at the "inside" shipyard sites. Some attempt should be made to analyze this difference.

- Five out of the 253 fish collected during the study had liver weights greater than 10 grams. In addition, these five fish were female or female-intersex fish, and all came from the NASSCO site. There should be further discussion in the text regarding this potentially important finding and its overall significance.

- There are fewer "cysts of unknown etiology" from inside sites than from outside or reference sites. Scientists at NOAA have also seen this lesion in numerous marine/estuarine species and refer to it as an "oocyte-like body". It appears to be an infectious organism of some sort and, like Dr. Marty; NOAA does not know it's precise diagnosis. NOAA agrees with Dr. Marty that it may represent a life-history stage of *Ichthyophonus sp.*

- The generation of new nephrons was greater in kidneys from fish collected at the reference site. This may indicate a higher growth rate in fish found at the reference site. The scores for renal nephritis were higher in fish from the NASSCO location, and the only severe case of renal nephritis was found at Southwest Marine. It should be noted in the document that growth and survival of fish may be impaired by renal nephritis.

- Lipofuscin scores in testis of fish, which is an indicator of impaired reproduction, were found to be higher "inside" the shipyard sites than those

found at the reference site. Approximately 5-12% of the collected fish were affected, and the only severe cases were seen in fish from inside the shipyard sites. In one case, a male with severe lipofuscin found at the NASSCO "inside" location also had no maturing sperm. In the ovaries, pigmented macrophage aggregates (PMAs) were found in about 20% of the fish and were highest in fish from "inside" both shipyard sites. PMAs in female fish from inside shipyard sites may be significant, but there is a need to account for fish age in these analyses. Site differences in PMAs for testis were not significant.

- According to Marty (p. 4) and Appendix 5, intersex gonads were found at similar frequencies in fish collected at the shipyard sites and reference site. This effect was most common in smaller females, except for "inside" NASSCO, which had several large female-intersex fish. Based on NOAA scientist's previous experience in histologically examining barred and spotted sandbass from southern California, a large number of intersex fish were identified. As mentioned by Marty (p. 8), this may not be a surprising observation considering that these two species are thought to be hermaphroditic (protogynous), and typically change sex from female to male with advancing age. However, this feature of spotted sandbass should be discussed further in the analysis.

- Although three fish collected in the study had carcinomas, NOAA agrees with Dr. Marty that the tumor development identified in these fish does not appear to be specifically related to exposure at the NASSCO or Southwest Marine sites.

- The document states on p. 8 that "more fish from the inside shipyard sites had evidence of tissue damage than did fish from the outside shipyard sites". Although the document states that the most striking differences were in the liver, review of the report also shows that the gonad and kidney had significant lesions. These lesions were distinct enough to be used to separate fish from the contaminated areas and reference area. Further discussion should be provided on the significance of this observation.

- The prevalence of renal nephritis is consistent with increased disease in fish from inside the NASSCO site. Lower scores in regenerative tubules are consistent with reduced growth, but there does not appear to have been an evaluation of the age of the fish in relation to this finding. There is a possibility of higher values in younger fish. In addition, higher values would be expected in situations where fish were exposed to renal toxicants. Further discussion should be provided on the significance of this observation, and the relationship to the age of the fish.

- In Appendix 1, type specimens for foci of cellular alteration (FCA) and cholangitis/biliary hyperplasia are shown but not discussed. Please see additional comments on this subject later in this letter. Dr. Marty or Exponent should provide a discussion and analysis of the significance of these lesions.

- In the discussion of the data from Appendix 4, there is no evaluation or interpretation in the main text of Marty's report of atresia of yolked follicles, and atresia of unyolked follicles in the ovary. Also, there is no inclusion of the lesions F-INT (female, intersex) or M-INT (male, intersex) in the summary of male and female type specimens. Please provide a discussion and analysis of the significance of these findings.

- In the discussion of the data from Appendix 6, there is not an evaluation or even a mention of the preneoplastic foci of cellular alteration observed in the liver, as well as cholangitis/biliary hyperplasia, which were diagnosed, in spotted sandbass from all of the sampling sites. Both of these lesion classes, but especially the foci of cellular alteration, have been extensively used in wild fish as histopathological biomarkers of exposure to contaminants such as PAHs. The highly selective and biased failure to report in the text that preneoplastic focal lesions were detected in the liver of spotted sandbass from all sites in this study is disturbing. Regardless of their stated rationale that the lesions were not discussed because there were no statistically significant differences in the prevalence of lesions among the sites, the lesions were identified during the histopathological examination, and their significance should have been evaluated in the discussion.

  Upon independent review of the liver lesion data presented in Appendix 6, the following prevalence of foci of cellular alteration (clear cell foci, eosinophilic foci, basophilic foci) among the sampling sites were found: reference site (15.4%); inside NASSCO (18.0%); outside NASSCO (16.0%): inside Southwest Marine (9.8%); and outside Southwest Marine (16.0%). The same observations apply to the presence of cholangitis/biliary hyperplasia in the same fish, at the following prevalence: reference site (11.5%); inside NASSCO (34.0%); outside NASSCO (24%); inside Southwest Marine (19.6%); and outside Southwest Marine (20.0%). These data should be subjected to further statistical analyses that account for fish age (e.g. stepwise logistic regression analyses) to prove that there are/are not inter-site differences in risk of lesion occurrence. There is also a possible need for outside QA and review of the actual histologic slides to confirm/refute the presence of these focal lesions in the fish examined in this study.

Additional Work and Synthesis

In his report, Dr. Marty states the further need to synthesize the data to include fish age data (which has been done to a certain extent) and contaminant data. He also recommends Transmission Electron Microscopy of liver tissue to confirm lipofuscin, special stains to distinguish lipofuscin and hemosiderin (he did these specials stains), and suggests doing CYP1A staining in liver to further document PAH exposure.

Review of Exponent Sediment Report, Section 8.2, Fish Histopathology

Some explanation should be included in this report as to why the spotted sandbass was collected rather than the white croaker, the original target species.

Lesions Elevated at Shipyard Locations

Based on NOAA's review of the histopathology report, it is clear that the authors of the Exponent report have been selective and have not fully reported Marty's findings and data from the appendices in Marty's report. Marty did find and report higher scores for liver lipofuscin in fish from the "inside" shipyard sites, higher scores for hepatic hemosiderin in fish from the "outside" shipyard sites, higher scores for renal nephritis in fish from "inside" NASSCO, and higher scores for shiny gill foci (gross lesion) in fish from "inside" Southwest Marine. However, he also found higher scores for lipofuscin in gonads of fish from the "inside" shipyard sites, as well as increased scores for pigmented macrophage aggregates in ovaries of fish from the "inside" shipyard sites. These lesions in the gonad are not discussed in the Exponent sediment report, and considering these lesions affect reproductive organs, they should have been discussed and evaluated.

In addition, NOAA's evaluation of the liver lesion data also suggests that the prevalence of cholangitis/biliary hyperplasia may be elevated compared to reference sites (11.5%), at the "inside" and "outside" shipyard sites, especially at the "inside" NASSCO site (34%).

The statement in the Exponent report that only 4 of the 70 lesions evaluated in the study were elevated in the shipyard sites compared to the reference site is overly simplistic, given that a large majority of the lesions were not toxicopathic in nature, and were in essence, incidental findings.

Lesions Elevated at the Reference Area

The relevance of lesions found at the reference site is oversimplified in Exponent's discussion and conclusion. The data presented in Table 8-18 are attempting to show the reader that the prevalence of some lesions were higher at the reference site, as compared to one or more of the shipyard sites, whether or

not these lesions have anything at all to do with exposure to contaminants. For example, renal tubular regeneration is higher at the reference site as compared to outside NASSCO, only; severe atresia of yolked oocytes is higher at the reference site as compared to inside SWM only. Other lesions with higher prevalence at the reference than at the shipyard sites are only gross lesions, none of which have an established relationship to contaminant exposure.

Significance of Lesions

NOAA reviewed the liver lesion data presented in Appendix 6 of the Marty report and found that a number of fish from both the reference site, and the "inside" and "outside" shipyard sites were affected by preneoplastic foci of cellular alteration, including basophilic, clear cell and eosinophilic foci. However, in the Exponent report it is falsely stated that only two fish in this study exhibited one of the liver lesions typically associated in other field studies with contaminant exposure. The two fish were from the reference site, and identified as affected with either a hepatocellular adenoma or a biliary carcinoma (both liver neoplasms).

Data presented in the appendices of the Marty report show that preneoplastic foci of cellular alteration were detected in fish from all of the sampling sites. The extent of these important preneoplastic focal lesions was not mentioned or discussed in the text of the Marty report. Although Marty diagnosed these lesions, and did not discuss the lesion data in his report text, the Exponent report directly states in the text (page 8-44, lines 8-13), and in Table 8-19, that these lesions did not occur in any fish examined. Even if no significant inter-site differences in the prevalence of these foci of cellular alteration were found, this is a significant omission of very important information. The existence of these lesions at any site indicates a harmful effect strongly linked to PAH exposure, whether that occurred at a reference or shipyard site. It is incorrect to state that these lesions were not detected in the study. The Exponent report should acknowledge the diagnosis of these lesions and should address their significance in the Sediment Report.

The existence of liver neoplasms and foci of cellular alteration in spotted sandbass from the "reference" site calls into question the appropriateness of the selected reference site. Based on information from other studies utilizing these lesions as histopathological biomarkers of contaminant exposure, these toxicopathic lesions rarely occur in fish from uncontaminated reference sites. The questionable appropriateness of the reference site is further shown by the very high levels of PAH metabolites measured in bile of spotted sandbass from the reference site. This issue is discussed in more detail in the section on fish bile near the end of this letter.

Evaluations of fish growth, condition, and spatial comparisons

NOAA recommends that the fish condition index be defined more precisely and be consistent with standard, accepted approaches. The condition index should be expressed as the weight in grams/(length in cm)^3, and could be multiplied by 100 (Fulton's condition index). Also, fish growth in fisheries biology is typically assessed with formulas more complex than simple age at length curves. A more complex curve, like the Von Bertalanffy growth curve should have been used in the growth analysis. Based on the relatively low sample size, and the stratification by sex, it is not surprising that no clear trends in growth or condition factor were determined. However, these comparisons should be repeated using a proper condition index and the age-length relationships typically used to assess growth in fisheries biology studies. Exponent should provide these additional analyses and should discuss their significance.

Comparisons Based on Liver Lesions

A condition index commonly used in fish biology should be used here, as well as age-length relationships typically used in fish biology to assess growth (e.g., Von Bertalanffy growth curves). In the second paragraph, these results actually indicate that an adverse effect on fish growth was not associated with the presence of either abundant hepatic lipofuscin, or hemosiderosis. Relative to the condition index in fish with and without these lesions, the fact that these liver lesions tended to occur in older fish that typically possess higher condition indices helps to explain the fact that fish with the lesions had higher condition indices. These findings are not surprising. Similar comparisons of growth rates and condition factors in English sole, with and without toxicopathic liver lesions, and that have exceptionally strong and consistent associations with exposure to PAHs, have also rarely shown any effect of these lesions on growth or fish condition in wild fish.

Review of Exponent Sediment Report, Section 8.3, Fish Bile

The finding of levels of fluorescent aromatic compounds (FACs) at benzo[a]pyrene wave lengths in the range of 0.7-4.6 *u*g/g protein at the reference site clearly shows exposure to PAH levels far beyond what would normally be expected at a relatively uncontaminated reference site. In most new publications in which FACs data are presented, including those from studies done by the Northwest Fisheries Science Center, biliary FACs data are typically expressed in ng BaP equivalents/g protein, so that the protein-adjusted levels in fish from the present study ranged from 700-4600 ng/g protein, with a mean of 2070 ng/g protein. These levels are far beyond the level of 1000 ng BaP equiv/g protein that NOAA typically uses as a benchmark to define a response in fish from an area that is significantly contaminated by PAHs.

For example, previously reported biliary FACS data from barred sandbass from sites in San Diego Bay and vicinity (McCain et al., 1992), showed levels ranging from ~100 ng/g at the Dana Point reference site, to approximately 1600 ng/g at East Harbor Island, approximately 4000 ng/g at 28th Street Pier (near the Southwest Marine and NASSCO) sites, and approximately 5500 ng/g at National City. Except for the reference site value at Dana Point, which was considerably lower than the levels at the reference site for the present study, these levels in a closely related species, barred sandbass, are comparable to the levels detected from similar sites in the present study in spotted sandbass.

It would also be helpful in the presentation of the biliary FACs data if Figures 8-34 through 8-36 could be shown as means $\pm$ 1 std. deviation or a 95% confidence interval, rather than as means, minimum and maximum. Presentation of the data in this suggested format is the more accepted format in scientific documents, and will enable the reader to interpret the statistical relationships among levels at the reference and shipyard sites, as well as to more critically evaluate the data with respect to some of the statements made on p. 8-49. For example, the statement is made that levels of bile breakdown products (actually, these are usually referred to as "metabolites") in fish from the shipyards are not significantly greater ($P<0.05$) than concentrations at the reference area. This in fact may be the case, but it is not possible to critically evaluate this statement in the format in which the data are presented. Moreover, it is probably not valid to state that "concentrations in fish from within the shipyard leaseholds are generally less than concentrations in fish from outside the leaseholds", if in fact there is no statistically significant difference between "inside" and "outside" sites.

Report Conclusions

Exponent's report concludes that fish from in or near the shipyards are not affected by contaminant exposure. This conclusion is overly simplistic and ignores some important data and diagnoses related to effects associated with contaminants known to be found at the Shipyards. Exponent and/or Dr. Marty should re-evaluate the data as recommended in these comments, and submit the data and diagnosis for additional quality assurance evaluation by another histopathologist prior to making any definitive conclusion regarding the impact to fish from site-related contaminants.

Thank you for the opportunity to comment of this report. If you have questions related to these comments, please contact me at (916) 255-6686, or directly contact Mark Myers at (206) 860-3329.

Sincerely,

Denise M. Klimas

Denise M. Klimas
Coastal Resources Coordinator
Office of Response and Restoration

Reference:

McCain et al.,1992. Chemical contamination and associated fish diseases in San Diego Bay. Environmental Science & Technology 26(4): 725-733.

Cc:
Mark Myers, NOAA NMFS
Donald MacDonald, NOAA ORR
Scott Sobiech, USFWS
Katie Zeeman, USFWS
Bill Paznokas, CA F&G
Laura Hunter, Environmental Health Coalition

Office of Environmental Health Hazard Assessment

Joan E. Denton, Ph.D., Director
Headquarters • 1001 I Street • Sacramento, California 95814
Mailing Address: P.O. Box 4010 • Sacramento, California 95812-4010
Oakland Office • Mailing Address: 1515 Clay Street, 16th Floor • Oakland, California 94612

Terry Tamminen
Agency Secretary

Arnold Schwarzenegger
Governor

MEMORANDUM

TO: Tom Alo
Water Resource Control Engineer
San Diego Regional Water Quality Control Board
9174 Sky Park Court, Suite 100
San Diego, CA 92123-4340

VIA: Jim Carlisle, D.V.M, Senior Toxicologist
Applied Risk Assessment Unit
Integrated Risk Assessment Section

FROM: Robert K. Brodberg, Ph.D., Senior Toxicologist
Fish and Water Quality Evaluation Unit
Pesticide and Environmental Toxicology Section
Office of Environmental Health Hazard Assessment

Robert K. Brodberg

DATE: April 29, 2004

SUBJECT: REVIEW OF THE EXPONENT NASSCO AND SOUTHWEST MARINE DETAILED SEDIMENT INVESTIGATION

I have reviewed the EXPONENT "NASSCO and Southwest Marine Detailed Sediment Investigation, Technical Report" with emphasis on Section 11, containing the Human Health Risk Assessment. I have the following comments.

1. The statement in the Executive Summary (page xxxiv) that "Consumption rates for high-end consumers were used, as recommended by the Office of Environmental Health Hazard Assessment," is misleading. Two consumption rates (21 and 161 grams per day) were used in the Human Health Risk Assessment. The rate of 21 grams per day is a reasonable estimate of fish consumption for recreational fishers in San Diego. Only the 161 gram per day rate is considered representative of high-end (e.g., subsistence) consumers. This rate, from a survey of fishers in Santa Monica Bay, is an appropriate value to use as an estimate of consumption by San Diego subsistence fishers. Although consumption rates for San Diego fishers were estimated as part of the San Diego Health Risk Study, the rates from the Santa Monica Bay study are more robust because the results are based on a larger sample size (i.e., more

interviews). A similar cross-section of anglers from different racial and ethnic backgrounds was interviewed in both studies. This term is also misapplied in the body of the Human Health Risk Assessment. The Executive Summary and text should be changed to clarify that two consumption rates were used, and that the 21 gram per day rate represents recreational anglers and the 161 gram per day rate represents subsistence or other high-end consumers. The Conceptual Site Model, Figure 1.3, should be revised to include this consumption pathway for subsistence/high-end fishers.

2. The characterization of the Screening Values (SVs) from the "Prevalence of Selected Target Chemical Contaminants in Sport Fish from Two California Lakes: Public Health Designed Screening Study, Office of Environmental Health Hazard Assessment (OEHHA), 1999" is misleading. These SVs are applicable for chemicals in all fishes and water bodies (i.e., freshwater, estuarine, and marine) for the stated toxicity end-points and assumptions. These SVs, called "tissue residue guidelines (TRGs)" on page 11-2 of the Human Health Risk Assessment, are intended to be used to determine when more sampling or a health evaluation is warranted. SVs in this report are used to determine when chemicals are of concern for species or sites, and then a risk assessment is performed for the identified Chemicals of Potential Concern (COPCs). Using SVs to determine when a risk assessment should be done is an appropriate application. However, they are not necessarily "health-protective" of all consumers, as this report implies. They would not reflect the potential risk of consumers eating more than the consumption rate used to set the SV for a given chemical, or cases where a different toxicity endpoint was used. Thus, they would not necessarily identify all chemical and site combinations where subsistence consumers (i.e., those consuming 161 grams per day) might be at risk. The term "health-protective" should be deleted on page 11-2.
3. As indicated on page 11-4 there were different chemicals used in the two shipyards and, while access inside the leaseholds may be restricted at present, there is still boat access outside of the leaseholds. This seems especially pertinent to the Southwest Marine Shipyard where there is access to the north and the west, and higher concentrations of several chemicals (e.g., mercury and PCBs) are found inside and immediately outside of the leasehold in the sediments and fish. It is plausible that some of the chemicals in sediment have migrated from inside the leasehold to outside the leasehold. It is also plausible that some anglers might fish off of one or the other of these leaseholds more frequently than indicated in the Fractional Intake calculations (see Comment 6). In this case their exposure and hazard or risk could be higher than calculated in this report and might increase if more chemicals migrate off of the leasehold. The areas outside of the leaseholds are clearly accessible for fishing and cover a larger area in which fish moving in and out in of the leasehold might accumulate chemicals to the same concentration as inside the leasehold. The issue of sediment migration from the leaseholds to sites adjacent to them should be addressed as a scenario in the risk assessment, because this scenario could lead to sediment concentrations and risk outside of the leaseholds that are equivalent to those inside.

4. The selection of chemicals of potential concern (COPCs) on pages 11-4 and 11-5 is not appropriate for human health risk assessment. Concentrations at "reference sites" should not be considered in the selection of COPCs in this case. The selection of organic chemicals as COPCs should be based solely on the whether or not a chemical exceeds its SV for fish tissue. Trace metals should also be selected primarily based on whether or not they exceed their fish tissue SV. Using this procedure PCBs and mercury should be retained as COPCs for all fish and all sites, since maximum values from these sites in fish or shellfish exceed their respective SVs. In some situation, when it can be demonstrated that high natural levels of a trace metal are present in sediment and fish, these levels may be used to deselect some metals. This procedure is not applicable for mercury in this case. However, inorganic arsenic can reasonably be excluded as a COPC based on the assumption on page 11-4 that inorganic arsenic is about 4% of total arsenic.
5. OEHHA did not characterize the population in the Santa Monica Bay study as representing a "high fish consumption rate population" (page 11-8), but as a "population that regularly fishes and consumes fish and shellfish." This should be corrected.
6. The assumptions for the Fractional Intake calculations from these two sites (pages 11-9 and 11-10) don't really reflect the distribution of fishing activity in San Diego Bay or all of the fishing scenarios that should be considered. Assuming that all shore and boat sites are equally accessible and desirable is an over-simplification of fishing intensity. Fishing is not evenly distributed in San Diego Bay. There tends to be the greatest activity in the north bay, the least in the south bay, and the central bay (in the vicinity of these leaseholds) has intermediate fishing activity. The potential also exists for boat anglers to take more fish with chemical concentrations like those in the leasehold (see #3 above) from areas near these leaseholds than is indicated based on the Fractional Intake calculations. Further, it is possible that some boat fishers may enter the leaseholds to fish. It is also possible that workers on these two sites may fish from the sites. And, it is also possible that in the future there will be direct fishing access to these sites because they are no longer shipyards. The risks and hazards from full fishing access for both consumption levels should also be considered as a possible scenario for these sites. I have calculated the risks and hazards for this full access scenario for shore and boat fishers inside (shore fisher) and outside (boat fisher) both leaseholds and shown them with risks and hazards based on the Fractional Intake scenario in Table 1 and 2. The greatest overall risk is to shore fishers inside South West Marine. Risks to boat fishers here are also higher than at NASSCO. Some risks and hazards from this scenario are high and suggest that remediation is in order. Risks for some subsistence consumers might be three or more times higher than shown in my tables if they prepare and consume whole body fish.
7. Maximum lobster (edible muscle only) mercury concentrations from NASSCO are about five times higher than at South West Marine. There is large variation in mercury concentration in lobster from NASSCO inside the leasehold. Examination of supplementary Table E-7 (lengths and weights of fish and lobsters) suggests that these variations are due in part to a broad range in total length of lobster from this site. However, there were large lobster of

similar size from South West Marine and even larger lobster from the reference site with lower mercury concentrations. This suggests that some of this difference in concentration is site-related. Supplementary Table E-7 should be included in the final report so that size and concentration relationships can be examined.

8. The statement on page 11-14 that Aroclor 1260 was the only Aroclor detected is misleading. Aroclor 1260 was not the only detected Aroclor. Aroclor 1254 was detected in the whole body spotted sand bass, but apparently was not detected in sand bass fillet. The concentrations of Aroclor 1254 were very similar to the concentrations of Aroclor 1260 in the whole body samples. There is a Reference Dose for Aroclor 1254 and it is appropriate to use it to calculate the potential Hazard Index for Aroclor 1260 and total Aroclors as is done on page 11-17. It is odd that Aroclor 1254 was not detected in these samples of spotted sand bass fillet because it has been detected in this same species from San Diego Bay in fillet samples analyzed through the Coastal Fish Contamination Program. The statement that Aroclor 1260 was the only Aroclor detected should be deleted or changed to include reference to the Aroclor 1254 in the whole body samples.
9. The report suggests that subsistence fishing inside the leasehold is not possible, and no risk level is calculated (page 11-15). However, as noted above, workers might be fishing on these sites and consumption of spotted sand bass from inside the South West Marine leasehold at the high rate of 161gm/day would yield a risk of 1.8×10^{-5} from PCBs using the conservative Fractional Intake assumptions for this site. This shows that risks can exceed the 1×10^{-6} level (a level often used for water quality criterion) at high consumption rates even if restricted access to the site is assumed. This risk would be higher if workers do fish inside the leasehold. This should be noted.
10. On page 11-16, the U.S. EPA (2000e) guidance document updates and replaces the Sampling and Guidance Manuals cited with more information on cooking and trimming reductions. The 50% reduction in PCB concentrations used in the Great Lakes Guidance is a better estimate of likely reduction from trimming and cooking. Reductions of 60-90% are not typical. Discussion based on the older U.S. EPA documents should be deleted.

CONCLUSION

Specific cases are noted above in which the human health risk assessment should be revised to address individual comments. An alternate scenario recognizing that full fishing access might occur in or near the leaseholds should also be included in the risk assessment and risks should be calculated for this scenario. The issue of offsite migration is not addressed in the human health risk assessment. It is important to determine whether contaminated sediment is moving off site into more accessible areas adjacent to the leasehold. If this has occurred or is occurring then calculations based on increasing exposure to fishers in areas adjacent to the leasehold should also be included in the human health risk assessment.

cc: Jim Carlisle
Anna Fan

Table 1: Cancer risk levels from PCBs using lesser of UCL or maximum tissue concentration at a site.

Site/species	Recreational fisher CR 21 gm/day no FI	Recreational fisher CR 21 gm/day Site FI included	Subsistence fisher CR 161 gm/day no FI	Subsistence fisher CR 161 gm/day Site FI included
NASSCO Boat fisher				
Sand bass (M) (54 ppb PCBs)	1.4×10^{-5}	6.9×10^{-8}	1.1×10^{-4}	5.3×10^{-7}
NASSCO Shore fisher				
Sand bass (M) (46 ppb PCBs)	1.2×10^{-5}	4.0×10^{-7}	9.1×10^{-5}	3.1×10^{-6}
Lobster (M) (11 ppb PCBs)	2.8×10^{-6}	9.6×10^{-8}	2.2×10^{-5}	7.4×10^{-7}
Lobster (WB) (76 ppb PCBs)	2.0×10^{-5}	6.6×10^{-7}	1.5×10^{-4}	5.1×10^{-6}
SW Marine Boat fisher				
Sand bass (M) (110 ppb PCBs)	2.8×10^{-5}	5.7×10^{-8}	2.2×10^{-4}	4.3×10^{-7}
SW Marine Shore fisher				
Sand bass (M) (400 ppb PCBs)	1.0×10^{-4}	2.4×10^{-6}	7.9×10^{-4}	1.8×10^{-5}
Lobster (M) (21 ppb PCBs)	5.4×10^{-6}	1.2×10^{-7}	4.1×10^{-5}	9.5×10^{-7}
Lobster (WB) (59 ppb PCBs)	1.5×10^{-5}	3.5×10^{-7}	1.2×10^{-4}	2.7×10^{-6}

CR = consumption rate
FI = Fractional index for site
M = muscle tissue
WB = whole body
UCL = Upper confidence limit concentration value was used

Table 2: Non-cancer risk levels from PCBs and Hg using lesser of UCL or maximum tissue concentration at a site.

Site/species	Recreational fisher CR 21 gm/day **no FI**	Recreational fisher CR 21 gm/day **Site FI included**	Subsistence fisher CR 161 gm/day **no FI**	Subsistence fisher CR 161 gm/day **Site FI included**
NASSCO Boat fisher				
Sand bass (M) (54 ppb PCBs)	0.8	$4.1x10^{-3}$	6.2	$3.1x10^{-2}$
NASSCO Shore fisher				
Sand bass (M) (46 ppb PCBs)	0.7	$2.3x10^{-2}$	5.3	0.2
Lobster (M) (11 ppb PCBs)	0.2	$5.6x10^{-3}$	1.3	$4.3 x10^{-2}$
Lobster (WB) (76 ppb PCBs)	1.1	$3.8x10^{-2}$	8.7	0.3
Lobster (M) (521 ppb Hg)	1.6	$5.3x10^{-2}$	12	0.4
SW Marine Boat fisher				
Sand bass (M) (110 ppb PCBs)	1.7	$3.3x10^{-3}$	12.7	$2.5x10^{-2}$
SW Marine Shore fisher				
Sand bass (M) (400 ppb PCBs)	6	0.1	46	1.1
Lobster (M) (21 ppb PCBs)	0.3	$7.2x10^{-2}$	2.4	0.2
Lobster (WB) (59 ppb PCBs)	0.9	$2.0x10^{-3}$	6.8	$5.8x10^{-2}$
Lobster (M) (109 ppb Hg)	0.3	$1.1x10^{-2}$	2.5	$8.6x10^{-2}$

CR = consumption rate
FI = Fractional index for site
M = muscle tissue
WB = whole body
UCL = Upper confidence limit concentration value was used

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
OFFICE OF RESPONSE & RESTORATION
COASTAL PROTECTION & RESTORATION DIVISION
c/o California Department of Toxic Substance Control,
Human and Ecological Risk Division
8800 Cal Center Drive
Sacramento, CA 95826

April 20, 2004

Mr. Tom Alo
California Regional Water Quality Control Board
San Diego Region
9174 Sky Park Court, Suite 100
San Diego, CA 92123-4340

REC'D APR 3 0 2004

Dear Mr. Alo:

NOAA appreciates the opportunity to provide comments to you on two reports associated with the investigation of the NASSCO and Southwest Marine Shipyards. Dr. Gary D. Marty prepared a September 2003 report entitled, Necropsy and Histopathology of Spotted Sea Bass Sampled from San Diego Harbor, for the Shipyard's consultant, Exponent. Details and results of this report were incorporated into the NASSCO and Southwest Marine Detailed Sediment Investigation (September 2003) submitted by Exponent for the NASSCO and Southwest Marine Shipyards. NOAA's Coastal Protection and Restoration Division has requested the assistance of Mark S. Myers, a fish biologist and pathologist with the ecotoxicology branch of the NOAA Northwest Fisheries Science Center, in reviewing and commenting on these reports. The fish histopathology section (Section 8.2), and the fish bile section (Section 8.3) of the Detailed Sediment Investigation were reviewed, and comments on these sections are included in this letter.

Necropsy and Histopathology of Spotted Sea Bass Sampled from San Diego Harbor

General comments:

- The necropsy procedure, tissue processing, and histopathologic analysis of tissues were conducted according to appropriate and accepted protocols, and no comments will be provided on these sections. The figures contain good quality micrographs that show excellent documentation of the lesions encountered, and they are well described.

- The fish species analyzed in this report is normally referred to as spotted sandbass, not as spotted sea bass. Please make this correction in the text.

- Based on NOAA's past experience with examination of spotted sandbass and barred sandbass from San Diego Harbor, very few toxicopathic lesions have been found in these species. This is especially true for the liver or kidney of spotted sandbass from south San Diego Bay. Based on this observation, it would have been preferable to sample and examine white croaker or black croaker. However, it appears that reasonable attempts to capture these better sentinel species were carried out.

Summary and comment on the major histopathological findings:

- Abundant hepatocellular lipofuscin, indicating degradation of cell organelles, was found in all fish caught in the NASSCO "inside" location and in both the "inside" and "outside" locations at Southwest Marine. This is a significant, contaminant-associated effect that appears to moderately to severely affect approximately 12 to 20% of fish from inside the shipyard sites. Data indicate that fish collected from the reference site were only mildly affected.

- Abundant hemosiderin, indicating increased destruction of red blood cells, was most commonly found in "outside" shipyard locations. No hemosiderin was found in fish at the "inside" shipyard sites. Some attempt should be made to analyze this difference.

- Five out of the 253 fish collected during the study had liver weights greater than 10 grams. In addition, these five fish were female or female-intersex fish, and all came from the NASSCO site. There should be further discussion in the text regarding this potentially important finding and its overall significance.

- There are fewer "cysts of unknown etiology" from inside sites than from outside or reference sites. Scientists at NOAA have also seen this lesion in numerous marine/estuarine species and refer to it as an "oocyte-like body". It appears to be an infectious organism of some sort and, like Dr. Marty; NOAA does not know it's precise diagnosis. NOAA agrees with Dr. Marty that it may represent a life-history stage of *Ichthyophonus sp.*

- The generation of new nephrons was greater in kidneys from fish collected at the reference site. This may indicate a higher growth rate in fish found at the reference site. The scores for renal nephritis were higher in fish from the NASSCO location, and the only severe case of renal nephritis was found at Southwest Marine. It should be noted in the document that growth and survival of fish may be impaired by renal nephritis.

- Lipofuscin scores in testis of fish, which is an indicator of impaired reproduction, were found to be higher "inside" the shipyard sites than those

found at the reference site. Approximately 5-12% of the collected fish were affected, and the only severe cases were seen in fish from inside the shipyard sites. In one case, a male with severe lipofuscin found at the NASSCO "inside" location also had no maturing sperm. In the ovaries, pigmented macrophage aggregates (PMAs) were found in about 20% of the fish and were highest in fish from "inside" both shipyard sites. PMAs in female fish from inside shipyard sites may be significant, but there is a need to account for fish age in these analyses. Site differences in PMAs for testis were not significant.

- According to Marty (p. 4) and Appendix 5, intersex gonads were found at similar frequencies in fish collected at the shipyard sites and reference site. This effect was most common in smaller females, except for "inside" NASSCO, which had several large female-intersex fish. Based on NOAA scientist's previous experience in histologically examining barred and spotted sandbass from southern California, a large number of intersex fish were identified. As mentioned by Marty (p. 8), this may not be a surprising observation considering that these two species are thought to be hermaphroditic (protogynous), and typically change sex from female to male with advancing age. However, this feature of spotted sandbass should be discussed further in the analysis.

- Although three fish collected in the study had carcinomas, NOAA agrees with Dr. Marty that the tumor development identified in these fish does not appear to be specifically related to exposure at the NASSCO or Southwest Marine sites.

- The document states on p. 8 that "more fish from the inside shipyard sites had evidence of tissue damage than did fish from the outside shipyard sites". Although the document states that the most striking differences were in the liver, review of the report also shows that the gonad and kidney had significant lesions. These lesions were distinct enough to be used to separate fish from the contaminated areas and reference area. Further discussion should be provided on the significance of this observation.

- The prevalence of renal nephritis is consistent with increased disease in fish from inside the NASSCO site. Lower scores in regenerative tubules are consistent with reduced growth, but there does not appear to have been an evaluation of the age of the fish in relation to this finding. There is a possibility of higher values in younger fish. In addition, higher values would be expected in situations where fish were exposed to renal toxicants. Further discussion should be provided on the significance of this observation, and the relationship to the age of the fish.

- In Appendix 1, type specimens for foci of cellular alteration (FCA) and cholangitis/biliary hyperplasia are shown but not discussed. Please see additional comments on this subject later in this letter. Dr. Marty or Exponent should provide a discussion and analysis of the significance of these lesions.

- In the discussion of the data from Appendix 4, there is no evaluation or interpretation in the main text of Marty's report of atresia of yolked follicles, and atresia of unyolked follicles in the ovary. Also, there is no inclusion of the lesions F-INT (female, intersex) or M-INT (male, intersex) in the summary of male and female type specimens. Please provide a discussion and analysis of the significance of these findings.

- In the discussion of the data from Appendix 6, there is not an evaluation or even a mention of the preneoplastic foci of cellular alteration observed in the liver, as well as cholangitis/biliary hyperplasia, which were diagnosed, in spotted sandbass from all of the sampling sites. Both of these lesion classes, but especially the foci of cellular alteration, have been extensively used in wild fish as histopathological biomarkers of exposure to contaminants such as PAHs. The highly selective and biased failure to report in the text that preneoplastic focal lesions were detected in the liver of spotted sandbass from all sites in this study is disturbing. Regardless of their stated rationale that the lesions were not discussed because there were no statistically significant differences in the prevalence of lesions among the sites, the lesions were identified during the histopathological examination, and their significance should have been evaluated in the discussion.

  Upon independent review of the liver lesion data presented in Appendix 6, the following prevalence of foci of cellular alteration (clear cell foci, eosinophilic foci, basophilic foci) among the sampling sites were found: reference site (15.4%); inside NASSCO (18.0%); outside NASSCO (16.0%): inside Southwest Marine (9.8%); and outside Southwest Marine (16.0%). The same observations apply to the presence of cholangitis/biliary hyperplasia in the same fish, at the following prevalence: reference site (11.5%); inside NASSCO (34.0%); outside NASSCO (24%); inside Southwest Marine (19.6%); and outside Southwest Marine (20.0%). These data should be subjected to further statistical analyses that account for fish age (e.g. stepwise logistic regression analyses) to prove that there are/are not inter-site differences in risk of lesion occurrence. There is also a possible need for outside QA and review of the actual histologic slides to confirm/refute the presence of these focal lesions in the fish examined in this study.

Additional Work and Synthesis

In his report, Dr. Marty states the further need to synthesize the data to include fish age data (which has been done to a certain extent) and contaminant data. He also recommends Transmission Electron Microscopy of liver tissue to confirm lipofuscin, special stains to distinguish lipofuscin and hemosiderin (he did these specials stains), and suggests doing CYP1A staining in liver to further document PAH exposure.

Review of Exponent Sediment Report, Section 8.2, Fish Histopathology

Some explanation should be included in this report as to why the spotted sandbass was collected rather than the white croaker, the original target species.

Lesions Elevated at Shipyard Locations

Based on NOAA's review of the histopathology report, it is clear that the authors of the Exponent report have been selective and have not fully reported Marty's findings and data from the appendices in Marty's report. Marty did find and report higher scores for liver lipofuscin in fish from the "inside" shipyard sites, higher scores for hepatic hemosiderin in fish from the "outside" shipyard sites, higher scores for renal nephritis in fish from "inside" NASSCO, and higher scores for shiny gill foci (gross lesion) in fish from "inside" Southwest Marine. However, he also found higher scores for lipofuscin in gonads of fish from the "inside" shipyard sites, as well as increased scores for pigmented macrophage aggregates in ovaries of fish from the "inside" shipyard sites. These lesions in the gonad are not discussed in the Exponent sediment report, and considering these lesions affect reproductive organs, they should have been discussed and evaluated.

In addition, NOAA's evaluation of the liver lesion data also suggests that the prevalence of cholangitis/biliary hyperplasia may be elevated compared to reference sites (11.5%), at the "inside" and "outside" shipyard sites, especially at the "inside" NASSCO site (34%).

The statement in the Exponent report that only 4 of the 70 lesions evaluated in the study were elevated in the shipyard sites compared to the reference site is overly simplistic, given that a large majority of the lesions were not toxicopathic in nature, and were in essence, incidental findings.

Lesions Elevated at the Reference Area

The relevance of lesions found at the reference site is oversimplified in Exponent's discussion and conclusion. The data presented in Table 8-18 are attempting to show the reader that the prevalence of some lesions were higher at the reference site, as compared to one or more of the shipyard sites, whether or

not these lesions have anything at all to do with exposure to contaminants. For example, renal tubular regeneration is higher at the reference site as compared to outside NASSCO, only; severe atresia of yolked oocytes is higher at the reference site as compared to inside SWM only. Other lesions with higher prevalence at the reference than at the shipyard sites are only gross lesions, none of which have an established relationship to contaminant exposure.

Significance of Lesions

NOAA reviewed the liver lesion data presented in Appendix 6 of the Marty report and found that a number of fish from both the reference site, and the "inside" and "outside" shipyard sites were affected by preneoplastic foci of cellular alteration, including basophilic, clear cell and eosinophilic foci. However, in the Exponent report it is falsely stated that only two fish in this study exhibited one of the liver lesions typically associated in other field studies with contaminant exposure. The two fish were from the reference site, and identified as affected with either a hepatocellular adenoma or a biliary carcinoma (both liver neoplasms).

Data presented in the appendices of the Marty report show that preneoplastic foci of cellular alteration were detected in fish from all of the sampling sites. The extent of these important preneoplastic focal lesions was not mentioned or discussed in the text of the Marty report. Although Marty diagnosed these lesions, and did not discuss the lesion data in his report text, the Exponent report directly states in the text (page 8-44, lines 8-13), and in Table 8-19, that these lesions did not occur in any fish examined. Even if no significant inter-site differences in the prevalence of these foci of cellular alteration were found, this is a significant omission of very important information. The existence of these lesions at any site indicates a harmful effect strongly linked to PAH exposure, whether that occurred at a reference or shipyard site. It is incorrect to state that these lesions were not detected in the study. The Exponent report should acknowledge the diagnosis of these lesions and should address their significance in the Sediment Report.

The existence of liver neoplasms and foci of cellular alteration in spotted sandbass from the "reference" site calls into question the appropriateness of the selected reference site. Based on information from other studies utilizing these lesions as histopathological biomarkers of contaminant exposure, these toxicopathic lesions rarely occur in fish from uncontaminated reference sites. The questionable appropriateness of the reference site is further shown by the very high levels of PAH metabolites measured in bile of spotted sandbass from the reference site. This issue is discussed in more detail in the section on fish bile near the end of this letter.

Evaluations of fish growth, condition, and spatial comparisons

NOAA recommends that the fish condition index be defined more precisely and be consistent with standard, accepted approaches. The condition index should be expressed as the weight in grams/(length in cm)^3, and could be multiplied by 100 (Fulton's condition index). Also, fish growth in fisheries biology is typically assessed with formulas more complex than simple age at length curves. A more complex curve, like the Von Bertalanffy growth curve should have been used in the growth analysis. Based on the relatively low sample size, and the stratification by sex, it is not surprising that no clear trends in growth or condition factor were determined. However, these comparisons should be repeated using a proper condition index and the age-length relationships typically used to assess growth in fisheries biology studies. Exponent should provide these additional analyses and should discuss their significance.

Comparisons Based on Liver Lesions

A condition index commonly used in fish biology should be used here, as well as age-length relationships typically used in fish biology to assess growth (e.g., Von Bertalanffy growth curves). In the second paragraph, these results actually indicate that an adverse effect on fish growth was not associated with the presence of either abundant hepatic lipofuscin, or hemosiderosis. Relative to the condition index in fish with and without these lesions, the fact that these liver lesions tended to occur in older fish that typically possess higher condition indices helps to explain the fact that fish with the lesions had higher condition indices. These findings are not surprising. Similar comparisons of growth rates and condition factors in English sole, with and without toxicopathic liver lesions, and that have exceptionally strong and consistent associations with exposure to PAHs, have also rarely shown any effect of these lesions on growth or fish condition in wild fish.

Review of Exponent Sediment Report, Section 8.3, Fish Bile

The finding of levels of fluorescent aromatic compounds (FACs) at benzo[a]pyrene wave lengths in the range of 0.7-4.6 *u*g/g protein at the reference site clearly shows exposure to PAH levels far beyond what would normally be expected at a relatively uncontaminated reference site. In most new publications in which FACs data are presented, including those from studies done by the Northwest Fisheries Science Center, biliary FACs data are typically expressed in ng BaP equivalents/g protein, so that the protein-adjusted levels in fish from the present study ranged from 700-4600 ng/g protein, with a mean of 2070 ng/g protein. These levels are far beyond the level of 1000 ng BaP equiv/g protein that NOAA typically uses as a benchmark to define a response in fish from an area that is significantly contaminated by PAHs.

For example, previously reported biliary FACS data from barred sandbass from sites in San Diego Bay and vicinity (McCain et al., 1992), showed levels ranging from ~100 ng/g at the Dana Point reference site, to approximately 1600 ng/g at East Harbor Island, approximately 4000 ng/g at 28th Street Pier (near the Southwest Marine and NASSCO) sites, and approximately 5500 ng/g at National City. Except for the reference site value at Dana Point, which was considerably lower than the levels at the reference site for the present study, these levels in a closely related species, barred sandbass, are comparable to the levels detected from similar sites in the present study in spotted sandbass.

It would also be helpful in the presentation of the biliary FACs data if Figures 8-34 through 8-36 could be shown as means $\pm$ 1 std. deviation or a 95% confidence interval, rather than as means, minimum and maximum. Presentation of the data in this suggested format is the more accepted format in scientific documents, and will enable the reader to interpret the statistical relationships among levels at the reference and shipyard sites, as well as to more critically evaluate the data with respect to some of the statements made on p. 8-49. For example, the statement is made that levels of bile breakdown products (actually, these are usually referred to as "metabolites") in fish from the shipyards are not significantly greater ($P<0.05$) than concentrations at the reference area. This in fact may be the case, but it is not possible to critically evaluate this statement in the format in which the data are presented. Moreover, it is probably not valid to state that "concentrations in fish from within the shipyard leaseholds are generally less than concentrations in fish from outside the leaseholds", if in fact there is no statistically significant difference between "inside" and "outside" sites.

Report Conclusions

Exponent's report concludes that fish from in or near the shipyards are not affected by contaminant exposure. This conclusion is overly simplistic and ignores some important data and diagnoses related to effects associated with contaminants known to be found at the Shipyards. Exponent and/or Dr. Marty should re-evaluate the data as recommended in these comments, and submit the data and diagnosis for additional quality assurance evaluation by another histopathologist prior to making any definitive conclusion regarding the impact to fish from site-related contaminants.

Thank you for the opportunity to comment of this report. If you have questions related to these comments, please contact me at (916) 255-6686, or directly contact Mark Myers at (206) 860-3329.

Sincerely,

Denise M. Klimas

Denise M. Klimas
Coastal Resources Coordinator
Office of Response and Restoration

Reference:

McCain et al.,1992. Chemical contamination and associated fish diseases in San Diego Bay. Environmental Science & Technology 26(4): 725-733.

Cc:
Mark Myers, NOAA NMFS
Donald MacDonald, NOAA ORR
Scott Sobiech, USFWS
Katie Zeeman, USFWS
Bill Paznokas, CA F&G
Laura Hunter, Environmental Health Coalition

Laura Hunter

From: David Barker [DBarker@waterboards.ca.gov]
Sent: Thursday, July 14, 2005 5:20 PM
To: John Robertus
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Supervising Engineer
California Regional Water Quality Control Board San Diego Region
(858) 467-2989 CALNET 734-2989

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To: Laura Hunter
Subject: RE: Shipyard CAO Status and Other Matters

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From: John Robertus [robej@rb9.swrcb.ca.gov]
Sent: Friday, September 03, 2004 12:10 PM
To: bruce@sdbaykeeper.org
Cc: jminan@acusd.edu; marco@coastlawgroup.com; Laura Hunter; David Barker; Art Coe; mkafka@san.rr.com; gabe@sdbaykeeper.org
Subject: RE: status of sediment remediaiton levels

Bruce Resnik,

Thank you for your continuing interest and participation in the very complex effort to clean up contaminated sediments in San Diego Bay. At this point in time I anticipate that we will have a final draft of the Tentative Order to accomplish the task on or about 1 October, 2004. Once we have reviewed it for completeness and accuracy it will be released for public review. We will ensure that all parties including the environmental community have sufficient time to review this document. I anticipate that the hearing on this matter will take place within the next 4 months. I request that you contact David Barker (858-467-2989) for additional information.

Although you are dissappointed that this clean-up effort has been anything but speedy, it is important to note that we have been able to continuously work on this project through the recent years of significant budget cuts, hiring freeze and competing priorities such as reducing sewage spills and enforcing a myriad of permits and waste discharge permits. We have been pouring resources into this effort for a decade and we are confident the process will succeed. I am particularly encouraged that we have been able to pursue our own regional sediment quality standards and not have to rely exclusively on the sediment quality standards that are yet to be developed by the SWRCB. As you know, sediment quality standards for the cleanup of the sediments in San Diego Bay do not currently exist.

I am confident that our collective efforts will result in the long-term restoration and protection of the beneficial uses of the waters and sediments of the Bay.

Respectfully,

John Robertus, Executive Officer, SDRWQCB

"For information about the California Regional Water Quality Control Board, San Diego Region, see our Web-site at http://www.swrcb.ca.gov ."

EHC 009111

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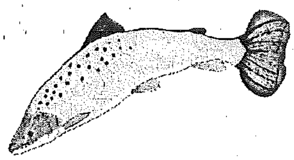
2004 NATIONAL FORUM ON CONTAMINANTS IN FISH



JANUARY 25–28, 2004
SAN DIEGO, CALIFORNIA

LIST OF REGISTRANTS

☐
Charles Abernathy
Toxicologist
U.S. EPA - HECD
Ariel Rios Building
1200 Pennsylvania Ave, N.W.
Washington, DC 20460
Phone: 202-566-1084
Fax: 202-566-1140
E-mail: abernathy.charles@epa.gov

☐
Dianne Albright
Environmental Planner
Lytton Rancheria
1250 Coddingtown Center
Suite 1
Santa Rosa, CA 95401
Phone: (707) 575-5917
Fax: (707) 575-6974
E-mail: Dseidneralbright@aol.com

☐
Tom Alo
WRCE
California Water Quality Control Board
9174 Sky Park Court
Suite 100
San Diego, CA 92123
Phone: 858-636-3154
Fax:
E-mail: alot@rb9.swrcb.ca.gov

☐
Jeffrey Armstrong
Scientist
Orange County Sanitation District
PO Box 8127
Fountain Valley, CA 92827-8127
Phone: (714) 593-7455
Fax: (714) 962-2591
E-mail: jarmstrong@ocsd.com

☐
David Acheson, Ph.D.
U.S. Food and Drug Administration
5100 Paint Branch Pkwy
HFS-006 Room 2B-004
College Park, MD 20744
Phone: (301) 436-1910
Fax: (301) 436-2633
E-mail: david.acheson@cfsan.fda.gov

☐
Lanetta Alexander
Director, Environmental Epidemiology
Indiana State Department of Health
2 North Meridian
Section 3D
Indianapolis, IN 46204
Phone: 317-233-7162
Fax: 317-233-7378
E-mail: lalexand@isdh.state.in.us

☐
Henry Anderson
Wisconsin Department of Health & Family Services
1 West Wilson Street
P.O. Box 7850
Madison, WI 53707-7850
Phone: 608-266-1253
Fax:
E-mail: anderha@dhfs.state.wi.us

☐
Deborah Arnwine
Environmental Specialist V
Tennessee Department of Environment and Conservation
Tennessee DEC - Division of Water Pollution Control
7th Floor L & C Annex
Nashville, TN 37243-1534
Phone: 615-532-0699
Fax: 615-532-0046
E-mail: debbie.arnwine@state.tn.us

☐
Holly Arrigoni
Life Scientist
U.S. EPA - Region 5
Water Quality Branch
77 W. Jackson Blvd, WQ-16J
Chicago, IL 60611
Phone: 312-886-6822
Fax:
E-mail: arrigoni.holly@epa.gov

☐
Donald Axelrad
Florida Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, FL 32399-2400
Phone: 850-414-1347
Fax:
E-mail: don.axelrad@dep.state.fl.us

☐
Wayne Ball
Toxicologist
Utah Department of Health
PO Box 142104
Salt Lake City, UT 84094
Phone: 801-538-6191
Fax: 801-538-6564
E-mail: wball@utah.gov

☐
Alex Barron
Virginia Department of Health
1500 East Main Street
Room 124
Richmond, VA 23218
Phone: 804-786-1763
Fax:
E-mail: abarron@vdh.state.va.us

☐
Michael Bender
Director
Mercury Policy Project
1420 North St.
Montpelier, VT 05602
Phone: 802 223-9000
Fax:
E-mail: mercurypolicy@aol.com

☐
Annette Ashizawa, Ph.D.
Epidemiologist
CDC/ATSDR
1600 Clifton Road NE
Mailstop F-29
Atlanta, GA 30333
Phone: (770) 488-3338
Fax: (770) 488-4178
E-mail: ADA8@cdc.gov

☐
Walter Baker
Assistant Director
Utah Division of Environmental Quality
PO Box 144870
Salt Lake City, UT 84114-4870
Phone: 801-538-6008
Fax: 801-538-6088
E-mail: wbaker@utah.gov

☐
Kristie Baptiste
Environmental Policy Analyst
Nez Perce Tribe
PO Box 365
Lapwai, ID 83540
Phone: (208)843-7375
Fax: (208)843-7378
E-mail: kristieb@nezperce.org

☐
Joseph Beaman
Maryland Department of the Environment
1800 Washington Blvd.
Baltimore, MD 21230
Phone: 410-537-3906
Fax:
E-mail: jbeaman@mde.state.md.us

☐
Jeffrey Bigler
Co-Chair
U.S. EPA - Office of Science & Technology
1200 Pennsylvania Ave. NW
Washington DC, DC 20460
Phone: 202-566-0389
Fax:
E-mail: bigler.jeff@epa.gov

☐
Stephen Blackwell
ATSDR
1600 Clifton Road
Atlanta, GA 30333
Phone: 404-498-0321
Fax: 404-498-0061
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☐
Tammy Blazys
QA Technician
Stolt Sea Farm, Inc.
350 Long Beach Blvd.
Stratford, CT 06615
Phone: (203) 345-0200
Fax:
E-mail: tammy.blazys@stoltseafarm.com

☐
Susan Boehme
Project Director
New York Academy of Sciences
2 E. 63rd Street
New York, NY 10021
Phone: 212.838.0230 x403
Fax: 212.838.6719
E-mail: sboehme@nyas.org

☐
Steve Bradbard
U.S. Food and Drug Administration, Consumer Studies
DHHS/FDA/CFSAN/OSAS/DMST
College Park, MD 20740
Phone:
Fax:
E-mail: steve.bradbard@fda.hhs.gov

☐
Dr. Pamela Bridgen
CEO
Environment International Ltd.
5505 34th Avenue NE
Seattle, WA 98105
Phone: (206) 525-3362
Fax: (206) 525-0869
E-mail: pj.bridgen@envintl.com

☐
Todd Blanc
Environmental Specialist, Risk Assessment
Missouri Department of Health and Senior Services
930 Wildwood Drive
Jefferson City, MO 65102
Phone: 573-751-6160
Fax: 573-526-6946
E-mail: blanct@dhss.mo.gov

☐
Catherine Bodurow
Senior Scientist
U.S. EPA - Office of Science Coordination & Policy
1200 Pennsylvania Ave. NW
MC 7203M
Washington, DC 20460
Phone: (202)564-8481
Fax: (202)564-8482
E-mail: joseph.catherine@epa.gov

☐
Brian Boltz
Yellowhawk Tribal Health Center
PO Box !60
Pendleton, Or 97801
Phone: 541-966-9830
Fax: 541-278-7572
E-mail: bboltz@yel.portland.ihs.gov

☐
Mark Brady
Environment International Ltd.
5505 34th Avenue NE
Seattle, WA 98105
Phone: (206) 525-3362
Fax: (206) 525-0869
E-mail: mark.brady@envintl.com

☐
Robert Brodberg
California Environmental Protection Agency, Office of Environmental Health Hazard Assessment
Office of Environmental Health Hazard Assessment
301 Capitol Mall
Sacramento, CA 95814-4327
Phone: (916) 323-4763
Fax:
E-mail: rbrodber@oehha.ca.gov

EHC 003974

☐
Barbara Brooks
Hawaii Department of Health
919 Ala Moana Blvd
Honolulu, HI 96814
Phone: 808-586-4249
Fax:
E-mail: bbrooks@eha.health.state.hi.us

☐
Holly Brown-Williams
Associate Director
California Policy Research Center
University of California
1950 Addison St., #202
Berkeley, CA 94720-1182
Phone: 510-642-5514
Fax: 510-642-8793
E-mail: holly.brown@ucop.edu

☐
Laina Bush
Policy Analyst
HHS
200 Independence Ave SW
Room 445F
Washington, DC 20201
Phone: (202)260-7329
Fax: (202)205-8835
E-mail: laina.bush@hhs.gov

☐
Linda Candler
Vice President
National Fisheries Institute
1901 N. Ft. Myer Dr.
Suite 700
Arlington, VA 22209
Phone: 703-778-4134
Fax: 703-524-4619
E-mail: lcandler@nfi.org

☐
David Carpenter
University at Albany, SUNY, Department of Environmental Health & Toxicology
East Campus B Wing, Room B242
One University Place
Rensselaer, NY 12144-3456
Phone: 518-525-2660
Fax: 518-525-2665
E-mail: carpent@uamail.albany.edu

☐
Kathryn Brown
Health Writer
East Oregonian Publishing Company
2206 NE 19th Ave.
Portland, OR 97212
Phone: (503)284-3532
Fax:

E-mail: kbbrown@eastoregonian.com

☐
Gary Buchanan
Research Scientist
New Jersey Department of Environmental Protection - Division of Science, Research and Technology
PO Box 409
401 East State Street
Trenton, NJ 08625
Phone: 609-633-8457
Fax: 609-292-7340
E-mail: gary.buchanan@dep.state.nj.us

☐
Michael Callam
Program Specialist
Nebraska Department of Environmental Quality
Suite 400 The Atrium
1200 N Street
Lincoln, NE 68509
Phone: 402-471-4249
Fax: 402-471-2909
E-mail: michael.callam@ndeq.state.ne.us

☐
Craig Carlisle
CA RWQCB
9174 Sky Park Court, Suite 100
San Diego, CA 92123
Phone: (858) 637-7119
Fax: (858) 571-6972
E-mail: craigc@rb9.swrcb.ca.gov

☐
William Carvalho
President
Carvalho Fisheries
1585 Heartwood Dr. Ste. D
McKinleyville, CA 95519
Phone: (707) 839-3270
Fax: (707) 839-3260
E-mail: carvalhofish@aol.com

☐
Pornkeo Chinyavong
Environmental Chemist
CSC
6101 Stevenson Ave
Alexandria, VA 22304
Phone: (703)461-2346
Fax: (703) 461-8056
E-mail: PChinyavong@CSC.com

☐
Kimberly Cornelison
Environmental Scientist
Louisiana Department of Environmental Quality
PO Box 4314
Baton Rouge, LA 70821
Phone: 2252193590
Fax: 2252193582
E-mail: kimberly.cornelison@La.gov

☐
David Crane
Laboratory Director
CA Dept of Fish and Game
2005 Nimbus Road
Rancho Cordova, CA 95670
Phone: 916-358-2859
Fax: 916-985-4301
E-mail: dcrane@ospr.dfg.ca.gov

☐
John Cubit
Injury Assessment Coordinator, SW
NOAA Damage Assessment Center
Suite 4470
501 W. Ocean Blvd.
Long Beach, CA 90802
Phone: (562) 980-4081
Fax: (562) 980-4065
E-mail: John.Cubit@noaa.gov

☐
Scott Daugherty
Aisling Group
39 Oakview Terrace
Jamaica Plain, MA 02130
Phone: 617-504-8718
Fax:
E-mail: daughertyst@earthlink.net

☐
Tracy Collier
NOAA Fisheries
2725 Montlake Blvd E
Seattle, WA 98112
Phone: 206 860 3312
Fax:
E-mail: tracy.k.collier@noaa.gov

☐
Carol Craig
Public Information Officer
Yakama Nation Fisheries Program
PO Box 151
Toppenish, WA 98948
Phone: (509) 865-6262
Fax:
E-mail: ccraig@yakama.com

☐
Steve Crawford
Passamaquoddy Tribe at Pleasant Point
Tribal Government Drive
Route 190
Perry, ME 04667
Phone: (207) 853-2600
Fax:
E-mail: stevecrawford@wabanaki.com

☐
Patricia Cunningham
Environmental Biologist
RTI International
800 Park Place Drive
Room G318
Research Triangle Park, NC 27709
Phone: (919) 316-3722
Fax: (919) 541-7155
E-mail: patc@rti.org

☐
Marjorie Davidson
U.S. Food and Drug Administration
DHHS/FDA/CFSAN/FSI/FSI
RM3B008, HFS-032
College Park, MD 20740
Phone: 301-436-1588
Fax:
E-mail: marjorie.davidson@cfsan.fda.gov

☐
Diane Davis
Administrative Assistant
Idaho Department of Health and Welfare
450 W State Street
6th floor
Boise, ID 83720
Phone: 208-334-0606
Fax: 208-334-6573
E-mail: davisd@idhw.state.id.us

☐
Melissa DeSantis
Public Outreach Specialist
Tetra Tech, Inc.
10306 Eaton Place
Suite 340
Fairfax, VA 22030
Phone: (703) 385-6000
Fax: (703) 385-6007
E-mail: melissa.desantis@tetratech-ffx.com

☐
Tim Drexler
RPM
U.S. EPA - Region 5
77 W. Jackson Blvd.
SF-5J
Chicago, IL 60604
Phone: (312) 353-4367
Fax: (312) 886-7191
E-mail: drexler.timothy@epa.gov

☐
David Drury
Sr. Engineer
Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, CA 95118
Phone: 408 265-2600
Fax:
E-mail: ddrury@valleywater.org

☐
Claude Dykstra
Survey Manager
International Pacific Halibut Commission
PO Box 95009
Seattle, WA 98145
Phone: 206-634-1838
Fax: 206-632-2983
E-mail: claude@iphc.washington.edu

☐
Vikki Denslow
4320 Mentone Street #4
San Diego, CA 92107
Phone: 619-223-1315
Fax:
E-mail: vikkitd@yahoo.com

☐
Rebecca Dotson
Travel and Conference Assistant
Tetra Tech, Inc.
10306 Eaton Place
Suite 340
Fairfax, VA 22030
Phone: (703) 385-6000
Fax: (703) 385-6007
E-mail: rebecca.dotson@tetratech-ffx.com

☐
Cerissa Drumm
H.& N Foods International
5580 South Alameda Street
Vernon, CA 90058
Phone: (323) 586-9317
Fax: (323) 586-9333
E-mail: cerissa_drumm@hnfoods.com

☐
Carlyle Ducheneaux
Superfund Pilot Project Director
Cheyenne River Sioux Tribe Environmental Protection
Department
PO Box 590
Eagle Butte, SD 57625
Phone: (605) 964-6568
Fax: (605) 964-1072
E-mail: cducheneaux@crstepd.org

☐
Grace Egeland
McGill University
Centre for Indigenous Peoples' Nutrition and Environment
CINE Building
Montreal, Quebec, Canad H3A 2K6
Phone: 514-398-8642
Fax:
E-mail: egeland@macdonald.mcgill.ca

EHC 003977

☐
Eric Eisminger
Kentucky Department of Water
14 Reilly Road
Frankfort, KY 40601
Phone: 502-564-3410
Fax:
E-mail: eric.eisminger@mail.state.ky.us

☐
Steven Ellis
Director, NW Water Services
Tetra Tech, Inc.
6100 219th Street SW, Suite 550
Mountlake Terrace, WA 98043
Phone: (425) 673-3676
Fax: (425) 673-9119
E-mail: steve.ellis@tetratech.com

☐
Dennis Fewless
North Dakota Department of Health - Environmental Health Section
1200 Missouri Avenue
Bismarck, ND 58504-5264
Phone: 701-328-5215
Fax: 701-328-5200
E-mail: dfewless@state.nd.us

☐
Einar Fleagle
Environmental Director
McGrath Native Village Council
P.O. Box 116
McGrath, AK 99627
Phone: (907) 524-3024
Fax: (907) 524-3899
E-mail: Einar@mcgrathalaska.net

☐
Peter H. Flournoy
General Counsel
American Fishermen's Research Foundation
740 North Harbor Drive
San Diego, CA 92101-5806
Phone: 619-232-0954
Fax: 619 232 2511
E-mail: phf@pacbell.net

☐
Jeffrey Ek
FIGH Project Assistant
Families in Good Health
411 E. 10th, St., Suite # 207
Long Beach, CA 90813
Phone: (562) 491-9100
Fax: (562)491-9824
E-mail: vek@chw.edu

☐
Robert Felix
Teratogen Information Specialist
CTIS Pregnancy Risk Information Line
UCSD Medical Center
200 West Arbor Drive, #8446
San Diego, CA 92103
Phone: 619-543-2128
Fax: 619-543-2066
E-mail: rfelix@ucsd.edu

☐
Jacqueline Fisher
Health Coordinator
U.S. EPA - Great Lakes National Program Office
77 W. Jackson Blvd.
mail code G17-J
Chicago, IL 60604
Phone: 312-353-1481
Fax: 312-353-2018
E-mail: fisher.jacqueline@epa.gov

☐
Luis Flores
RPM
U.S. EPA - Region 4
61 Forsyth St SW
Atlanta, GA 30303
Phone: 4045628807
Fax: 4045628788
E-mail: flores.luis@epa.gov

☐
Henry Folmar
MS Department of Environmental Quality
1542 Old Whitfield Road
Pearl, MS 39042
Phone: 601-664-3910
Fax:
E-mail: Henry_Folmar@deq.state.ms.us

☐
Dr. Jeffery Foran
Great Lakes Indian Fish & Wildlife Commission
5005 N. Palisades Rd.
Whitefish Bay, WI 53217
Phone: (414) 963-9299
Fax:
E-mail: Jforan@wi.rr.com

☐
Robert Frey
Pennsylvania Department of Environmental Protection
400 Market Street
10th Floor PO Box 8555
Harrisburg, PA 17105-8555
Phone: 717-787-9637
Fax:
E-mail: rofrey@state.pa.us

☐
Vicki Fry
Associate Civil Engineer
Sacramento Regional County Sanitation District
10545 Armstrong Avenue
Suite 101
Mather, CA 95655
Phone: (916) 876-6113
Fax: (916) 876-6160
E-mail: FRYV@SACCOUNTY.NET

☐
Paula Galloway
Marketing Assistant
EWOS Canada Ltd
1720-14th Avenue, Suite 212
Campbell River, BC V9W8B9
Phone: (250)286-8361
Fax: (250)286-0788
E-mail: paula.galloway@ewos.com

☐
Margy Gassel
Research Scientist II
California Environmental Protection Agency, Office of Environmental Health Hazard Assessment
1515 Clay Street 16th Floor
Oakland, CA 94612
Phone: (510) 622-3166
Fax: (510) 622-3218
E-mail: mgassel@oehha.ca.gov

☐
Anthony Forti
Research Scientist
New York State Department of Health
547 River Street Room 330
Troy, NY 12180
Phone: 518-402-7800
Fax: 518-402-7819
E-mail: ajf01@health.state.ny.us

☐
Eric Frohmberg
Maine Bureau of Health
Environmental Health Unit
11 State House Sta.
Augusta, ME 4333
Phone: 207-287-8141
Fax:
E-mail: eric.frohmberg@state.me.us

☐
Sharon Fuller
Executive Director
Ma'at Youth Academy
445 Valley View Rd.
Suite D
Richmond, CA 94803
Phone: (510) 222-6594
Fax: (510) 222-0274
E-mail: syfuller@igc.org

☐
Ephraim Garrett
Laboratory Director
National Seafood Inspection Laboratory
705 Convent Street
Pascagoula, MS 39567
Phone: 228-769-8964
Fax: 228-762-7144
E-mail: diane.east@noaa.gov

☐
Bob Gerlach
Alaska Department of Environmental Conservation
555 Cordova Street
Anchorage, AK 99501
Phone: 907-269-7635
Fax: 907-269-7510
E-mail: bob_gerlach@dec.state.ak.us

☐
Richard Greene
Environmental Engineer
Delaware DNREC
820 Silver Lake Boulevard
Suite 220
Dover, DE 19904-2464
Phone: 302-739-4590
Fax: 302-739-6140
E-mail: rgreene@state.de.us

☐
Daniel Hahn
Injury Assessment Coordinator
NOAA Damage Assessment Center
9721 Executive Center Dr. N., Suite 114
St. Petersburg, FL 33702
Phone: (727) 570-5391 x5715
Fax: (727) 570-5390
E-mail: daniel.hahn@noaa.gov

☐
Joel Hansel
Environmental Scientist
U.S. EPA - Region 4
61 Forsyth St. SW
Water Management Division
Atlanta, GA 30303
Phone: (404) 562-9274
Fax: (404) 562-9224
E-mail: hansel.joel@epa.gov

☐
George Henderson
Florida Department of Environmental Protection
100 Eighth Avenue Southeast
St. Petersburg, FL 33701-5020
Phone: 727-896-8626
Fax: 727-893-1679
E-mail: george.henderson@fwc.state.fl.us

☐
David Hohreiter
BBL
6723 Towpath Road
P.O. Box 66
Syracuse, NY 13214
Phone: 315-446-9120
Fax: 315-449-0017
E-mail: dh@bbl-inc.com

☐
Amanda Guay
Oregon Health Division - Office of Environmental Toxicology
800 NE Oregon Street
Suite 608 State Office Building
Portland, OR 97232
Phone: 503-731-4015
Fax:
E-mail: amanda.m.guay@state.or.us

☐
Michael Haire
U.S. EPA
1200 Pennsylvania Ave. NW 4503-T
Washington, DC, DC 20460
Phone: 202-566-1224
Fax: 202-566-1333
E-mail: haire.michael@epa.gov

☐
Rick Haverkate
Director of Health Services
Michigan Inter-Tribal Council
2956 Ashmun Street
Sault Ste. Marie, MI 49783
Phone: 906-632-6896 x 134
Fax: 906-635-4212
E-mail: rickh@itcmi.org

☐
Thomas Hinners
Research Chemist
U.S. EPA - Office of Research and Development
Environmental Sciences Division, NERL, ORD
944 East Harmon Avenue
Las Vegas, NV 89119
Phone: (702) 798-2140
Fax: (702) 798-2142
E-mail: hinners.tom@epa.gov

☐
Brenda Hoppe
Project Coordinator
Oregon Health and Science University
3181 SW Sam Jackson Park Road
Mailcode L606
Portland, OR 97239
Phone: (503) 494-1076
Fax: (503) 494-7397
E-mail: hoppeb@ohsu.edu

☐
Thomas Hornshaw
Manager, Toxicity Assessment Unit
Illinois Environmental Protection Agency
535 West Jefferson
Springfield, IL 62761
Phone: 217-785-0830
Fax: 217-782-1431
E-mail: thomas.hornshaw@epa.state.il.us

☐
Albert Huang
Policy Advocate
Environmental Health Coalition
1717 Kettner Blvd., Suite 100
San Diego, CA 92101
Phone: 619-235-0281
Fax:
E-mail: alberth@environmentalhealth.org

☐
Pamela Imm
Research Program Manager
Population Health Sciences
1 W. Wilson St., Room 150
Madison, WI 53703
Phone: (608) 267-3565
Fax: (608) 263-2820
E-mail: immpb@dhfs.state.wi.us

☐
LiJun Jin
Toxicologist
Idaho Department of Health and Welfare
450 W State Street
6th floor
Boise, ID 83720
Phone: 208-334-0606
Fax: 208-334-6573
E-mail: jinl@idhw.state.id.us

☐
Lin Kaatz Chary
Chicago School of Public Health, Environmental and Occupational Health Sciences
SPH, MC 922
Great Lakes Center-SPH; 2121 W. Taylor, Rm 210
Chicago, IL 60612
Phone: 312-413-1969
Fax:
E-mail: lchary@uic.edu

☐
Patti Howard
Water Quality Coordinator
Columbia River Inter-Tribal Fish Commission
CRITFC
729 NE Oregon Suite 200
Portland, OR 97232
Phone: (503) 238-0667
Fax: (503) 235-4228
E-mail: howp@critfc.org

☐
Laura Hunter
Director Clean Bay Campaign
Environmental Health Coalition
1717 Kettner Blvd., Suite 100
San Diego, CA 92101
Phone: 619-235-0281
Fax: 619-232-3670
E-mail: LauraH@environmentalhealth.org

☐
Guillermo Jaimes
Community Coordinator
Fish Contamination Education Collaborative (FCEC)
320 W. 4th St.
Ste 560
Los Angeles, CA 90013
Phone: (213) 576-6634
Fax: (213) 620-6573
E-mail: gjaimes@dhs.ca.gov

☐
Darcy Jones
Environmental Scientist
California State Water Resources Control Board
1001 I Street,
15th Floor
Sacramento, CA 95812
Phone: 916-323-9689
Fax: 916-341-5584
E-mail: joned2@dwq.sw.rcb.ca.gov

☐
Ian Kanair
ENR Director
Snoqualmie Tribe
P.O. Box 280
4480 Tolt Avenue
Carnation, WA 98014
Phone: (425) 333-6551
Fax:
E-mail: ian@snoqualmienation.com