CALIFORNIA
Water Boards

EDMUND G. BROWN JR.
GOVERNOR

MATTHEW RODRIQUEZ
SECRETARY FOR
ENVIRONMENTAL PROTECTION

California Regional Water Quality Control Board, San Diego Region

N00247_000618
NTC SAN DIEGO
SSIC NO. 5090.3.A

July 20, 2012

In reply refer to:
DOD100366600:CKomeylyan

Ms. Janet Lear, BRAC Environmental Coordinator
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, CA 92108-4310

Subject: Feasibility Study Report for IR Site 12, the Former Naval Training Center Boat Channel, San Diego, (dated May 2012) (5090 Ser BPMOW.hmw/0279)

Dear Ms. Lear:

The Feasibility Study Report referenced above (Report) presents an analysis of the results of historical sediment investigation and a feasibility study of various remedial technologies for the cleanup of contaminated sediment at the site. The San Diego Regional Water Quality Control Board (San Diego Water Board) has reviewed the Report and has the following comments:

1. The methodology for resolving or reclassifying the Possibly Impacted stations was presented in the revised Boat Channel Station Assessment document submitted by the Navy on January 23, 2012. In an email dated February 27, 2012 the San Diego Water Board informed the Navy of initial comments on this approach and methodology and requested more time so consultation with experts in this field could be conducted. On February 20, 2012 the Department of the Navy (DoN) responded to the request for more time by stating that "The Navy is well along in the Feasibility Study process and plans to submit the FS document in accordance with the previously submitted schedule" (Attachment 1).

   On May 15, 2012 the San Diego Water Board through an email submitted comments on the Boat Channel Station Assessment document, and the DoN responded that "The bt channel FS is complete and therefore this information will not be considered in this document." (Attachment 2).

   These comments are still not addressed by the DoN to date and will need to be resolved prior to the San Diego Water Board's acceptance of the Report. The San Diego Water Board incorporates the comments here by reference.

2. The Report states that "only Stations S1S1, S1S4, and S1S6 have been designated as likely showing signs of impact ...". The San Diego Water Board disagrees with this statement. Insufficient data is available to support the above

statement. Specifically, sediment quality at stations S1S5, S2S3, S2S4, and S2S9 has not been shown to meet the toxicity objective in the *Water Quality Control Plan for the San Diego Basin.* Furthermore, sediment quality at these stations does not meet the framework of the Sediment Quality Objectives protective conditions. To reclassify a Possibly Impacted station as Unlikely Impacted, the results of the integration of the three lines of evidence must be shown to be caused by factors other than exposure to toxic pollutants. These stations were correctly identified as Possibly Impacted in the context of the Sediment Quality Objectives framework and within the process agreed upon by DoN/San Diego Water Board[1]. The primary factors that the DoN used to support the reclassification recommendations included: response of the amphipod test (considered more ecologically relevant in this analysis by DoN), magnitude of chemistry index, and characteristics of nearby stations. The basis for reclassification of these Possibly Impacted stations to Unlikely Impacted is not justified based on these factors.

3. Additional data or more persuasive analytical results such as a higher density of chemistry stations to investigate gradients, toxicity identification evaluations, or a more complete chemical analyte list (to include current use pesticides) that could be used to support the reclassification of stations S1S5, S2S3, S2S4, and S2S9 to Unlikely Impacted is lacking.

4. The Southern California Coastal Waters Research Project reviewed the station assessment and provided the following comments (Attachment 1):

   The DoN used criteria for reclassifying Possibly Impacted stations that have not been agreed upon by the San Diego Water Board including:

   i. The station not located adjacent to stations designated as likely impacted,
   ii. Toxicity results are not likely related to site-specific conditions,
   iii. Sea Urchin tests are not as ecologically applicable as the amphipod test, and,
   iv. Further evaluation of the Possibly Impacted data included the evaluation of the toxicity results for these stations. The amphipod survival results were given greater weight than the sea urchin fertilization results, and the amphipod survival test conditions were considered more representative of site conditions than the sea urchin fertilization test conditions.

   None of the above arguments presented by the DoN satisfies the conditions of the Water Quality Control Plan framework in which 1) toxic pollutants are not

[1] Letter dated October 4, 2011 from Ms. Julie Chan to Mr. Anthony Megliola attaching Part 1 – Path Forward for Assessment of Aquatic Life Beneficial Uses, Former Naval Training Center Boat Channel.

causing the responses, and 2) other factor (besides chemical contaminants) are responsible.

- Criteria i: Without a better understanding of lateral chemical gradients, proximity to pollutant sources, distance between stations, or other characteristics, reclassifying a Possibly Impacted station as Unlikely Impacted because its neighbors are not like impacted is not justified.

- Criteria iii: toxicity tests are not intended to represent ecological impacts, but rather provide an evaluation of the joint toxic impact of sediment associated chemicals. These tests are utilized as a conservative measure of biological effects that reflect toxicants that may not have been measured in the chemistry analysis.

- Criteria ii and iv: There is no evidence or indication that the urchin toxicity tests were confounded by laboratory handling artifacts or other site specific conditions. The sediment investigation results show evidence of a low level of effect and chemical exposure at the four stations mentioned above, which suggest that stations S1S5, S2S3, S2S4, and S2S9 should remain classified as Possibly Impacted.

5. The DoN states that the remedial action objective for this site is prevention of direct contact between benthic invertebrates and concentrations of sediment chemicals of ecological concern that may be harmful to them.

   However, potential risks to human health posed by this site must also be taken into consideration and any remedy must be evaluated to minimize human health risks. Chemicals of concern associated with risks to human health must be considered for sediment cleanup goals.

6. The DoN states that human health risk to both the recreational and subsistence angler posed by consumption of fish captured in the Boat Channel was considered to be consistent with risk posed by consumption of fish caught in the greater San Diego Bay region.

   After discussions with counsel, the San Diego Water Board informed the DoN that the DoN is free to investigate incremental risk to human health in the former channel compared to greater San Diego Bay (email dated June 28, 2011 to Ms. Lear). However, consistent with CERCLA and State Water Board Resolution No. 92-49, the San Diego Water Board will establish cleanup levels that are protective of human health within the channel regardless of the incremental risk assessment. Cleanup levels must be established to ensure that the chosen remedy at the site complies with all State and CERCLA laws and regulations.

7. Appendix A6, Page A6-1 - The fish concentration calculation used in determining cancer and non-cancer risk at the site uses sediment/clam tissue data from the

Boat Channel sediment study and concentrations of lipids in seafood and seafood tissue total solids content values from Zeeman (2004)[2]. Specifically:

a. BSAF and Sediment TOC values from Boat Channel (presented in the Former NTC Boat Channel Remedial Investigation Report, 2003)
b. Seafood total solids and Seafood lipid values from Zeeman (2004)

How does combining these data from two different studies affect the risks associated with the site? Discuss the uncertainties associated with the use of sediment/clam tissue data from two different studies. Will it under-estimate or over-estimate the risks?

8. Department of Toxic Substances Control (DTSC), Human and Ecological Risk Office (HERO) reviewed the supplemental Human Health Risk Assessment (HHRA) and provided the following comments (Attachment 2):

a. Background lead in sediment – the incremental blood lead increase above background due to fish consumption was assessed as the difference between the blood lead level associated with the Boat Channel sediment SWAC and the blood lead level associated with the background sediment concentration. HERO has deferred to the San Diego Water Board on the reported background concentration for lead in sediment. The San Diego Water Board and DoN collaboratively put together the expanded reference data set utilized for use as background at the site. The value of 56.3 mg/kg is an appropriate value to use for the 95th percentile UPL of the expanded reference data set for lead.

b. Exposure point concentrations – the Boat Channel sediment SWAC is reported as a surface area weighted average concentration for lead, whereas the background sediment concentration is a 95th percentile UPL of the expanded reference data set. The appropriateness of subtracting the blood lead level from background lead is questioned given that two different statistics were used as exposure point concentrations. HERO believes that it is critical that different expressions of the risk assessment results (i.e., site-related and total risk) be based on the same statistic in order to be comparable.

c. Estimation of Lead Concentration in Fish from Sediment Uptake – the supplemental HHRA includes multiple equations which are reported to have been used for estimating contaminant concentrations in fish due to sediment uptake. In the case of lead, the supplemental HHRA states that fish concentrations were calculated differently for adults and children. For the adult evaluation, fish concentrations of lead were calculated according

[2] Zeeman, C.Q.T. 2004. Ecological Risk-Based Screening Levels for Contaminants in Sediments of San Diego Bay, Technical Memorandum CFWO-EC-TM-04-01. U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office, Carlsbad, CA.

to a site-specific regression equation. For children, the supplemental HHRA indicates that fish concentrations were estimated using the SWAC and a project-specific biota sediment uptake factor. The DoN should clarify the apparent discrepancy in the reported methods used to calculate fish concentrations of lead.

It appears that the DoN has used an alternate method (i.e., a site-specific log-log regression equation) than that proposed in their January 7, 2011 email to the San Diego Water Board. HERO calculated a fish concentration of 1.28 mg/kg wet-weight tissue using the SWAC, project-specific biota sediment uptake factor, and dry weight to wet weight conversion factor taken from the DoN's January 2011 email. Using the log-log regression equation, the DoN has calculated a fish concentration of 0.747 mg/kg wet-weight tissue. As such, the DoN calculated concentration is 1.7-fold lower. Please clarify whether the supplemental HHRA uses a different approach than that originally proposed in the January 2011 email, and if so, justification should be provided.

The San Diego Water Board concurs with the use of the site-specific exposure factors such as the sediment SWAC and BSAFs for the former NTC Boat Channel sediments in the supplemental HHRA.

d. Fish Consumption Rate, Children – The DoN has calculated child fish consumption rate of 4.5 g/day by multiplying the adult median consumption rate (21 g/day) by the ratio of child to adult body weights (i.e. 15 and 70 kg). From a risk perspective, HERO is concerned that the DoN has only evaluated fish consumption in children based on a median consumption value. Using the 15 and 70 kg default body weight the OEHHA's recommended 30.5 and 85.2 g/day estimates yields child fish consumption rates of 6.5 g/day and 18.2 g/day. Both of these estimates exceed the DoN's calculated consumption rate of 4.5 g/day, and the high-end estimate of 18.2 g/day is 4-fold greater than the value used by the DoN. There is significant uncertainty in the fish ingestion rates, and assumptions for this variable can vary considerably. Other sources may recommend higher or lower ingestion rates than those recommended by OEHHA. HERO is recommending that the supplemental HHRA be updated to evaluate child exposure using a range of consumption rates rather than reporting an estimate based on median consumption only. Alternatively, HERO is recommending that the OEHHA consumption estimates be used as they are more health protective than the DoN assumption. The San Diego Water Board agrees with HERO's recommendation.

e. Lead Exposure Assessment –

   i. Assumptions - HERO recommends, and the San Diego Water Board agrees, that the methodology used to calculate the

concentration of lead in fish, as well as concerns about the fish consumption rate in children be addressed.

ii. Background – The use of different statistics for calculation of the exposure point concentrations and the background data set are critical from the perspective of making a determination as to magnitude of the 'incremental' lead intake and whether there is a human health concern for lead exposure via fish ingestion.

iii. Upper Percentile Blood Lead Estimates – as part of the initial 2011 evaluation, HERO calculated 90th percentile estimates of the increase in blood lead due to fish consumption for consistency with USEPA's Adult Lead Model (ALM) and DTSC's LeadSpread model. In the supplemental HHRA, blood lead levels were calculated using the DoN's assumptions for subsistence fishers, recreational fishers, and children. However, the upper percentile estimates of the increase in blood lead were not calculated or considered. For consistency with current regulatory lead evaluation methodology, HERO recommends, and the San Diego Water Board agrees, that 90th percentile blood level increase values be calculated for use in evaluating lead exposures. This is particularly relevant for the recreational fisher and child receptors where the fish intake estimates were based on a median, rather than a high-end estimate of exposure.

iv. Units for Dose Estimates – the "Dose" estimates presented in Table A6-5 are reported in units of mg/kg-day. Based on HERO's review of the calculations, the doses appear to actually represent µg/kg-day. Please confirm the units in Table A6-5 and update the supplemental HHRA as appropriate for accuracy.

The San Diego Water Board is requesting responses to comments within 60 days of receipt of this document and would be happy to meet with you regarding resolution of the Possibly Impacted stations and their inclusion in the feasibility study of sediments at the site. In the subject line of any response, please include the reference number: **DOD100366600:CKomeylyan**. For questions, comments, or to set up a meeting/conference call to discuss this matter, please contact me by phone at 858-467-2734, or by email CKomeylyan@waterboards.ca.gov.

Respectfully,

C. Komeylyan

C. Sherrie Komeylyan
Water Resource Control Engineer
Southern San Diego County Ground Water Unit

CK:jc:apt:jpa:ck

Attachments:

1. Email correspondence dated February 27, 2012 from the San Diego Water Board to Ms. Janet Lear RE: Station Assessment, Former NTC Boat Channel, and Email correspondence from Ms. J. Lear to Mr. J. Anderson dated February 28, 2012.

2. Email correspondence dated May 15, 2012 from C. Komeylyan to Ms. H. Wochnick, Ms. J. Lear regarding the NTC Boat Channel Station Assessment with attachment "Memorandum, Review of NTC Boat Channel Station Assessment, April 3, 2012, Southern California Coastal Water Research Project". and Email dated May 15, 2012 from Ms. J. Lear in response to above email.

3. Memorandum, Naval Training Center – San Diego Boat Channel, Lead Exposure From Ingestion of Fish, June 11, 2012, Department of Toxic Substances Control, Human and Ecological Risk Office

cc by email:

Mr. Anthony Megliola, NAVFAQHQ, BRAC PMO, Anthony.Megliola@navy.mil;
Ms. Heather Wochnick, NAVFAQHQ, BRAC PMO, Heather.Wochinick@navy.mil
Mr. Curtis M. Moss, NAVFAQHQ, BRAC PMO, Curis.M.Moss@navy.mil
Mr. Tom McDonnell, NAVFAQHQ, BRAC PMO, TMcDonnell@BrwnCald.com
Ms. Janet Lear, NAVFAQHQ, BRAC PMO, Janet.Lear@navy.mil
Mr. Andrew Tauriainen, State Water Resources Control Board, Office of Enforcement, ATauriainen@waterboards.ca.gov
Council President Pro Tem Kevin L. Faulconer, Council District 2, KevinFaulconer@sandiego.gov

Tech Staff Info & Use	
Geotracker ID	DOD100366600

Chehreh Komeylyan - Re: Station Assessment, Former NTC boat channel

From: John Anderson
To: Lear, Janet M CIV NAVFACHQ BRAC PMO
Date: Monday, February 27, 2012 5:24 PM
Subject: Re: Station Assessment, Former NTC boat channel
CC: Chan, Julie; Komeylyan, Chehreh; Megliola, Anthony M CIV NAVFACHQ BRAC...

Hi Janet,

Wanted to let you know where we are with the review of the station assessment. Chehreh has been temporarily been pulled into the Shipyard advisory team and will not be available until after March 14th. Vicente Rodriguez has reviewed the station assessments for us and has identified some concerns regarding the rationale used to resolve the possibly impacted stations. Last week our contract with SCCWRP was executed and we will need a little more time so we can consult with SCCWRP and give you our response. We will keep you apprized of our progress and get back to you as soon as we can.

Regards,
John

John P. Anderson, P.G. 5895
Senior Engineering Geologist
Southern Cleanup Unit
San Diego Regional Water Quality Control Board
9174 Sky Park Court, Suite 100
San Diego, CA 92123-4353
tel (858) 467-2975
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e-mail: Janderson@waterboards.ca.gov

>>> "Lear, Janet M CIV NAVFACHQ, BRAC PMO" <janet.lear@navy.mil> 1/17/2012 4:01 PM >>>
Hi Sherrie:

The Navy has integrated the results provided from the three benthic reviewers in accordance with the agreed upon station assessment methodology. The results are provided in the attached document. We have also included the evaluation of the "possibly impacted" stations.

Regards,

Janet

Janet M. Lear, MS, PG
BRAC Environmental Coordinator
Mare Island Naval Shipyard/NTC San Diego
(619) 532-0976
janet.lear@navy.mil

From: "Lear, Janet M CIV NAVFACHQ, BRAC PMO" <janet.lear@navy.mil>
To: JAnderson@waterboards.ca.gov
CC: JChan@waterboards.ca.gov; CKomeylyan@waterboards.ca.gov; sarah.moore@nav...
Date: 2/28/2012 8:09 AM
Subject: RE: Station Assessment, Former NTC boat channel

Hi John:

Thank you for the update. The Navy is well along in the Feasibility Study process and plans to submit the FS document in accordance with the previously submitted schedule.

Regards,
Janet

-----Original Message-----
From: John Anderson [mailto:JAnderson@waterboards.ca.gov]
Sent: Monday, February 27, 2012 17:24
To: Lear, Janet M CIV NAVFACHQ, BRAC PMO
Cc: TMcDonnell@BrwnCald.com; Megliola, Anthony M CIV NAVFACHQ, BRAC PMO; Wochnick, Heather M CIV NAVFAC SW, PACO; Moore, Sarah A CIV NAVFACHQ, BRAC PMO; Chehreh Komeylyan; Julie Chan
Subject: Re: Station Assessment, Former NTC boat channel

Hi Janet,

Wanted to let you know where we are with the review of the station assessment. Chehreh has been temporarily been pulled into the Shipyard advisory team and will not be available until after March 14th. Vicente Rodriguez has reviewed the station assessments for us and has identified some concerns regarding the rationale used to resolve the possibly impacted stations. Last week our contract with SCCWRP was executed and we will need a little more time so we can consult with SCCWRP and give you our response. We will keep you apprized of our progress and get back to you as soon as we can.

Regards,
John

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>>> "Lear, Janet M CIV NAVFACHQ, BRAC PMO" <janet.lear@navy.mil> 1/17/2012 4:01 PM >>>
Hi Sherrie:

The Navy has integrated the results provided from the three benthic reviewers in accordance with the agreed upon station assessment methodology. The results are provided in the attached document. We have also included the evaluation of the "possibly impacted" stations.

Regards,

Janet

Janet M. Lear, MS, PG
BRAC Environmental Coordinator
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(619) 532-0976
janet.lear@navy.mil

From: "Lear, Janet M CIV NAVFACHQ, BRAC PMO" <janet.lear@navy.mil>
To: heather.wochnick@navy.mil; CKomeylyan@waterboards.ca.gov
CC: sarah.moore@navy.mil; anthony.megliola@navy.mil; TMcDonnell@BrwnCald.com...
Date: 5/15/2012 12:07 PM
Subject: RE: NTC Boat Channel Station Assessment

Hi Sherrie:

The bt channel FS is complete and therefore this information will not be considered in this document.

Regards,
Janet

Janet M. Lear, MS, PG
BRAC Environmental Coordinator
Mare Island Naval Shipyard/NTC San Diego
(619) 532-0976
janet.lear@navy.mil

-----Original Message-----
From: Chehreh Komeylyan [mailto:CKomeylyan@waterboards.ca.gov]
Sent: Tuesday, May 15, 2012 11:59
To: Wochnick, Heather M CIV NAVFAC SW, PACO; Lear, Janet M CIV NAVFAC HQ, BRAC PMO
Cc: John Anderson
Subject: NTC Boat Channel Station Assessment

Good morning Janet,

Attached please find SCCWRP's write up on their review of the Station Assessment memo. Steve's review was of the original report sent to us and so please disregard his comments regarding Tables 3 and Table 7. I'm back to overseeing my pre-shipyards case load and in the process of reviewing Steve's comments but wanted to share them with you for consideration in the preparation of the feasibility study report.

Please let me know if you have any questions and/or comments.
Sincerely,

C. Sherrie Komeylyan
South San Diego County Groundwater Unit

SOUTHERN CALIFORNIA COASTAL WATER RESEARCH PROJECT

A Public Agency for Environmental Research

Memorandum

To: John Anderson
From: Steve Bay
Subject: Review of NTC Boat Channel Station Assessment
Date: April 3, 2012

The Navy's recent report on the NTC Boat Channel Station Assessment was reviewed at the request of the San Diego Regional Water Quality Control Board. This review in organized into three sections: 1) review of the technical process for station evaluation described in the report, 2) evaluation of the recommendations for reclassification of stations initially classified as Possibly Impacted, and 3) supplemental information regarding the relationship between toxicity and benthic community response.

Station Evaluation and Report

The station evaluation report applied the SQO assessment framework in a reasonable and appropriate manner, considering the limitations of the data. These limitations include the application of a different set of chemistry evaluation indices (determined by prior arrangement), inclusion of an additional toxicity test (sea urchin fertilization), and use of best professional judgment rather than benthic indices to assess benthic community condition. However, the report contains several errors in the methods description and presentation of the results that are misleading and should be corrected before this report is considered final. The following items should be corrected in the final report:

Page 1, para. 3. There is no figure describing the benthic community evaluation process, as indicated in the text.

Page 1., para. 5. The source of the sea urchin toxicity test evaluation thresholds are incorrectly attributed to the State's Water Quality Control Plan for Enclosed Bays and Estuaries. This test is not referenced in that document.

Table 3. The benthic line of evidence category shown for each station is incorrect; every instance of a Moderate classification should be changed to Low and every instance of a Low classification should be changed to Reference.

Table 7. This table contains incorrect values for the Benthic LOE, Severity of Biological Effects, and Station Assessment columns, as a result of using incorrect Benthic LOE values from Table 3.

Station Map. No results are included for station S1S16, even though it is listed on the map. Clarification of the omission is needed in the report.

Reclassification of Possibly Impacted Stations

The report correctly identifies six stations as Possibly Impacted in the context of the SQO framework. The assessment data for each of these six stations are reviewed, along with the characteristics of adjacent stations to support reclassification of the stations as either Likely Impacted or Likely Unimpacted. The primary factors used to support the reclassification recommendations were: response of the amphipod test (considered more ecologically relevant), magnitude of the chemistry index, and characteristics of nearby stations. Overall, the report recommends that five of the six stations be reclassified as Likely Unimpacted.

The argument for reclassification for these stations is not persuasive on several grounds. First the basis for reclassification is not consistent with guidance in the Water Quality Control Plan, as excerpted below:

> *The Water Board shall designate the category* ***Possibly Impacted*** *as meeting the protective condition if the studies identified in Section VII.F demonstrate that the combination of effects and exposure measures are not responding to toxic pollutants in sediments and that other factors are causing these responses within a specific reach segment or waterbody.*

The water quality control plan states that two criteria need to be satisfied in order to determine that a Possible Impacted station meets the SQO: 1) toxic pollutants are not causing the responses, and 2) other factors (besides chemical contaminants) are responsible. Neither of these two conditions appear to be met for the five stations identified in the report. For example: station S2S9 is considered to be Likely Unimpacted because the station "is not located adjacent to stations designated as Likely Impacted, and the toxicity results are not likely related to site-specific conditions". Neither of these arguments satisfies the conditions of the water quality control plan. While the Plan endorses the use of spatial analysis to help determine the extent of concern and proximity to sources of pollution, it does not support the conclusion that the results are unreliable if adjacent stations do not agree. Without a higher density of sampling, one cannot exclude the likelihood that the results reflect heterogeneity in sediment composition or site-specific sources nearby. Evidence of substantial heterogeneity in NTC sediment conditions is present in at the end of the channel, where adjacent stations are classified as Unimpacted and Likely Impacted.

In several instances, the report asserts that the sea urchin test is not as ecologically applicable as the amphipod test. This statement is consistent with general opinion, but the toxicity tests are not intended to represent ecological impacts, but rather provide an evaluation of the joint toxic impact of sediment associated chemicals. These tests are meant to be a conservative measure of biological effects that reflect toxicants that may not have been measured in the chemistry analyses. Extraction and handling of pore water for toxicity testing may result in conditions that are not necessarily representative of in situ conditions, but no evidence is presented that these results were confounded by handling artifacts. The uncertainty surrounding interpretation of these results is partly the basis why these results are classified as Possibly Impacted.

The results show consistent evidence of both a low level of effect and chemical exposure for four of these five stations (S2S12 being the exception), suggesting that these stations should remain classified as Possibly Impacted.

The argument for reclassifying S2S12 as Likely Unimpacted is also weak because of its reliance on the unsupported conclusion that the results are due in part to "non site-specific conditions". However, the extreme lack of agreement between the benthic and toxicity LOEs suggests that the original assessment result is highly uncertain. The occurrence of high toxicity without a corresponding impact on the benthos is not necessarily evidence of suspect data, as previous studies have documented many such instances (Figure 1). The lack of use of benthic indices in the present study complicates resolution of this issue, as there is no documentation of the specific benthic characteristics used by the experts to justify their opinions. It is possible that such results indicate that chemical-related toxicity was present in the test samples, but that this toxicity may either be extremely labile or enhanced by laboratory handling, which might diminish any impact on the resident benthos over long-term exposure. Given the uncertainty and lack of concordance in these data, an argument can be made for reclassifying this station as Likely Unimpacted.

Suggestions for Alternate Station Reclassification

My opinion is that all of the Possibly Impacted stations are correctly classified. This assessment category is intended to represent just those types of situations encountered in this study. Without further data, such as a higher density of chemistry stations to investigate gradients, toxicity identification evaluations, or a more complete chemical analyte list (e.g., to include current use pesticides), it is difficult to support reclassification of these six stations. Any reclassification would have to be based on opinion, rather than data. Without additional or more persuasive analysis results to the contrary, these stations should be considered as not meeting the SQO protected condition.

I do not strongly object to considering S2S12 as meeting the protected condition, however, it is just as likely that an alternative evaluation of the benthos would result in a different classification of Low disturbance for this site, which would diminish the argument for reclassification.

Future arguments for reclassifying possibly impacted stations would need a stronger scientific foundation. There are several types of information that would provide this foundation:

1) subsequent sampling at the same location that provides a different classification,
2) improved benthic community analysis that shows the presence of unaffected benthos or that any effects are not due to toxicants,
3) TIE or other studies that show the toxic or benthic effects are not due to toxic contaminants, and
4) a determination that the spatial extent of the impacts are not significant in the context of the study or program

Relationships between Toxicity and Benthos

The use of a multiple line of evidence approach in sediment quality assessment is based on the limitations of our current methods for measuring chemistry, toxicity, and benthic impacts in environmental samples. None of these measures alone is reliable as an indicator of sediment quality and all three measures are needed for the most reliable sediment quality assessment. The SQO Scientific Steering Committee recognized these limitations and advised strongly against using fewer than all three lines of evidence in California's SQO program.

A common misconception in applying the multiple line of evidence approach in sediment quality assessment is that the toxicity test results should correspond to impacts to the benthic community. In a perfect world, perhaps, but the role of toxicity tests is to represent the potential for toxic impacts due to all contaminants present. Toxicity tests indicate both the magnitude of chemical exposure and the biological effects of this exposure, but the laboratory testing conditions may not accurately represent in situ exposure conditions or the sensitivity of the benthos under chronic exposure conditions. Differences in toxicity test response and benthic community condition are frequently encountered and may be extreme, as the data in Figure 1 illustrate. These data show the matched results for amphipod toxicity and four measures of benthic community condition, based on an extensive data set from southern California bays and estuaries.

The figure shows that high toxicity is occasionally detected in samples classified as having unaffected benthos, and that lack of toxicity is not necessarily predictive of a nondisturbed benthos. Unfortunately, there are few methods available to identify the cause of benthic disturbance, and benthic ecologists recognize that most methods of benthic community assessment cannot distinguish between contaminant effects and other factors.

Toxicity identification evaluations currently offer the best approach for helping to resolve situations where the benthic and toxicity LOEs strongly disagree. Without TIE information or alternative field studies, it is difficult to determine the basis for discrepancies between any of the SQO lines of evidence.

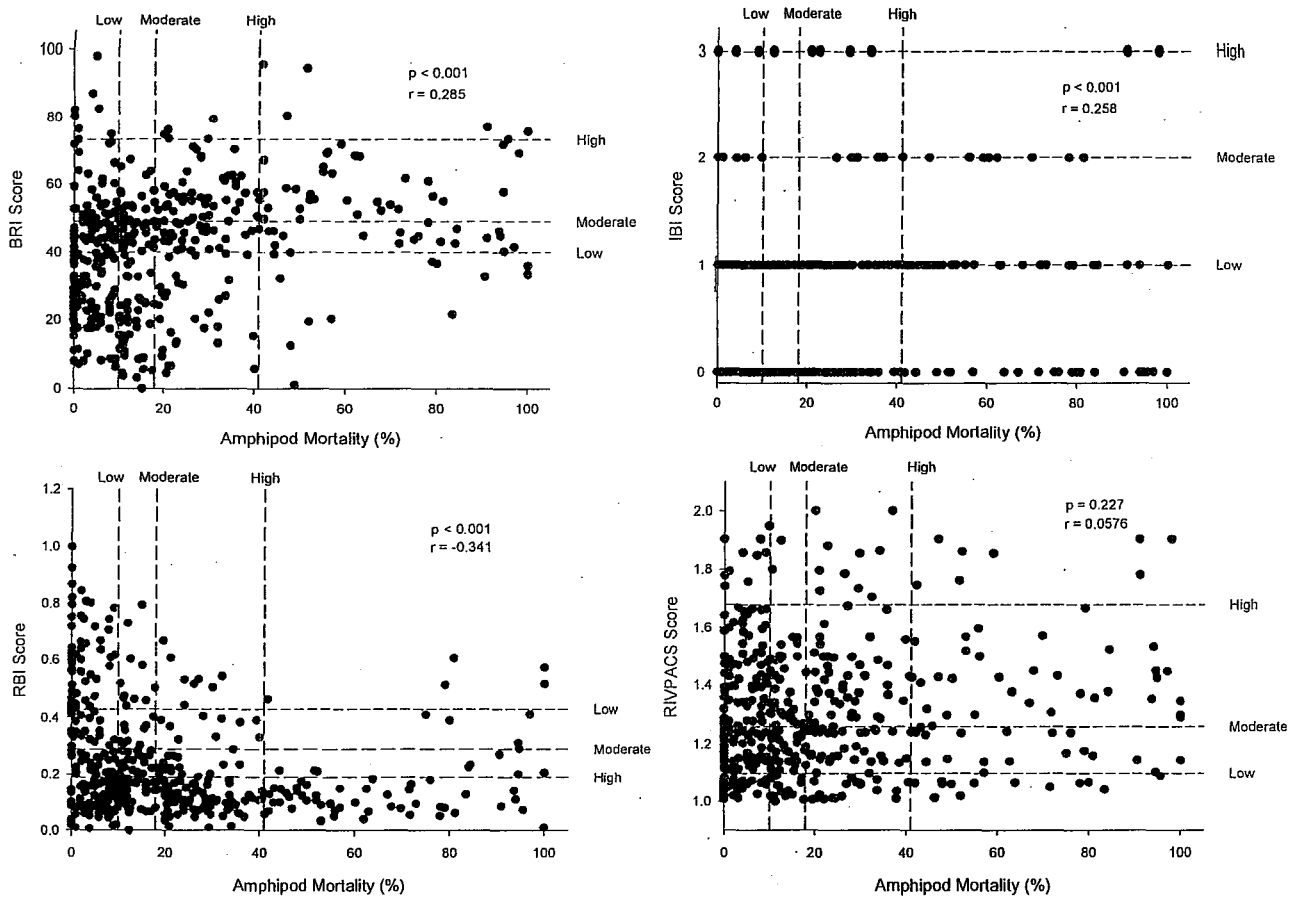

Figure 1. Benthic index scores versus amphipod mortality for the four indices used to assess benthic condition. BRI (top left); RBI (bottom left); IBI (top right); RIVPACS (bottom right). P value and r are from Spearman's correlations. Dashed lines indicate the respective SQO thresholds for benthic condition and toxicity.

Department of Toxic Substances Control

Matthew Rodriquez
Secretary for
Environmental Protection

Deborah O. Raphael, Director
8800 Cal Center Drive
Sacramento, California 95826-3200

Edmund G. Brown Jr.
Governor

MEMORANDUM

TO: C. Sherrie Komeylyan
Southern Cleanup Unit
San Diego Regional Water Quality Control Board
9174 Sky Park Ct., Suite 100
San Diego, CA 92123

FROM: for Tracy L. Behrsing, Ph.D.
Staff Toxicologist
Human and Ecological Risk Office (HERO)
8800 Cal Center Drive
Sacramento, CA 95826-3200

DATE: June 11, 2012

SUBJECT: NAVAL TRAINING CENTER – SAN DIEGO BOAT CHANNEL, LEAD EXPOSURE FROM INGESTION OF FISH

PCA: 11320

DOCUMENT REVIEWED: Appendix A6 Supplemental Human Health Risk Assessment With Sediment-to-Fish Uptake Model. Draft Feasibility Study (FS) Report, Installation Restoration (IR) Site 12, Boat Channel Sediments, Former Naval Training Center (NTC) San Diego, California. Submission forwarded to HERO by Southern Cleanup Unit, San Diego Regional Water Quality Control Board (RWQCB; C. Sherrie Komeylyan) on May 31, 2012.

BACKGROUND: In a February 10, 2011 email communication (J. Anderson to J. Polisini), the San Diego RWQCB requested HERO review of information regarding lead exposure at the Naval Training Center – San Diego (NTC-SD) Boat Channel. Specifically, HERO was requested to comment on the Navy's proposal for evaluation of human exposure to lead resulting from fish uptake of lead from sediment and subsequent ingestion of fish by anglers at NTC-SD Boat Channel.

In a January 7, 2011 email communication (J. Lear to J. Anderson), the Navy presented a proposal for evaluation of lead in sediment. Because DTSC's Lead Risk Assessment Spreadsheet (LeadSpread) does not provide for an exposure scenario based on fish uptake of lead from sediment and the subsequent ingestion of fish by anglers, the Navy proposed to evaluate lead in sediment using the US Food and Drug Administration (USFDA) food safety guidance of 1.5 mg/kg wet-weight for crustaceans and 1.7 mg/kg wet-weight for clams, mussels, and oysters (USFDA 2001). For the evaluation, the Navy proposed that the site concentration for fish tissue lead be estimated using a sediment surface-area weighted average concentration (SWAC) of 87 mg/kg dry-weight sediment, a project-specific biota sediment uptake factor (BSAF) of 0.101 kg dry-weight sediment/kg dry-weight tissue, and a project-specific dry-weight to wet-weight conversion factor of 0.1461 kg dry-weight tissue/kg wet-weight tissue.

HERO provided initial comments indicating that we would not support the Navy's proposal because: 1) the USFDA criteria frequently involve risk management criteria beyond risk/hazard (please note that the actual basis of the criteria could not be determined based on the limited reference information provided on the USFDA website); and, 2) the Navy is already calculating the fish tissue concentration with site-specific sediment criteria.

Rather than using the Navy's proposed approach, HERO recommended use of the Cal/EPA Office of Environmental Health Hazard (OEHHA) Air Toxics Hot Spots Program Chapter 9 methodology for calculation of the lead dose from fish consumption (OEHHA 2000). Following calculation of the lead dose, HERO recommended comparing the estimated lead exposure to Cal/EPA's most recent toxicity criterion for lead. Specifically, in 2007, CalEPA OEHHA developed a new toxicity evaluation of lead in which the 10 µg/dL threshold blood lead concentration was replaced with a source-specific "benchmark change" of 1 µg/dL blood lead (PbB) (OEHHA 2007). As the most recently developed CalEPA toxicity criterion for lead, HERO considers the 1 ug/dL PbB criterion appropriate for use in evaluating exposures to lead from fish consumption at NTC-SD Boating Channel.

In a March 16, 2011 memorandum, HERO reviewed the Navy's January 7, 2011 proposal and conducted an initial evaluation of lead exposure from ingestion of fish contaminated from sediment at the Naval Training Center – San Diego Boat Channel. Use of both the Cal/EPA OEHHA Air Toxics Hot Spots Program Chapter 9 methodology and the US Environmental Protection Agency (USEPA) Adult Lead Model in conjunction with OEHHA's 1 µg/dL PbB benchmark change criterion indicated the potential for a human health concern associated with this exposure pathway at the site.

SCOPE OF REVIEW: HERO has reviewed the Appendix A6 Supplemental Human Health Risk Assessment, as related to potential human health concerns for lead exposure from ingestion of fish contaminated with by lead in site sediment only. Information regarding the site history, sampling of environmental media, quality assurance procedures,

and site characterization was not provided or reviewed. We defer to the RWQCB on these matters.

Consistent with our March 2011 review, our evaluation focused on exposure to lead from the fish ingestion pathway only. We did not review the Navy's evaluation of potential site contaminants other than lead, and exposure pathways other than ingestion of fish contaminated with lead from site sediment were not considered. For reference, the submission reports a recreational fisher cancer risk and noncancer hazard index of 1E-5 and 0.6, respectively, for contaminants other than lead based on the fish ingestion pathway alone. For subsistence fishers, the risk and hazard index for contaminants other than lead were reported as 7E-5 and 5, respectively, for the fish ingestion pathway alone. These risks exceed the 1E-6 point of departure, and the hazard index exceeding one indicates a potential concern based on noncancer effects. We recommend this be considered as part of risk management decisions.

The evaluation included in our March 2011 memorandum (and discussed herein) was based on the Navy's proposed SWAC, project-specific BSAF, and project-specific dry-weight to wet-weight conversion factor. Given our limited knowledge of the site, we defer to the RWQCB as to the site data supporting the proposed sediment concentration as well as the appropriateness of the site-specific assumptions. Our use of the project-specific Navy assumptions does not imply that we have reviewed nor necessarily concur with these assumptions.

GENERAL COMMENTS

1. **Background Lead.** The surface area weighted average concentration (SWAC) of lead in sediment (87 mg/kg) was compared to the reported background concentration (95th percent upper predictive limit [UPL] of the expanded reference data set) for lead in sediment (56.3 mg/kg). We have the following comments.

   a. Final Sediment SWAC. Based on our review of the submission, it appears that the "Final Sediment SWAC" column of Table A6-1 has been incorrectly listed as 31 mg/kg sediment dry weight. Because the site sediment SWAC (87 mg/kg) exceeded the reported background sediment expanded reference concentration (56.3 mg/kg), the "Final Sediment SWAC" should be listed as 87 mg/kg. (Note that this error does not appear to impact the submissions' lead evaluation, as Table A6-5 uses the correct values).

   b. Background Lead in Sediment. In the current Navy submission, the incremental blood lead (PbB) increase above background due to fish consumption was assessed as the difference between the PbB level associated with the "Boat Channel Sediment SWAC" (87 mg/kg) and the PbB level associated with the "Background Sediment" Concentration (56 mg/kg). In their "Results of Lead Exposure Assessment", the Navy reports incremental PbB increases *above background*. Specifically, incremental PbB increases above background were calculated by

subtracting the PbB level estimated using *background sediment data* from the PbB level estimated using the *Boat Channel Sediment SWAC*. The incremental PbB increase was then compared to the Cal/EPA lead criterion of 1 µg/dL.

For example, for the subsistence fisher, the Navy calculated a fetal PbB level of 5.2 µg/dL due to fish consumption based on the site sediment SWAC (87 mg/kg). Using the background sediment concentration (56 mg/kg), a fetal PbB level of 4.3 µg/dL was calculated for this receptor. The incremental PbB increase *above background* (0.9 µg/dL; calculated as 5.2 minus 4.3) was then compared to Cal/EPA's 1 µg/dL criterion. Because the incremental PbB increase *above background* was less than 1 µg/dL, the Navy concluded that site-related lead exposure from ingestion of fish contaminated by site sediment is not a human health concern for this receptor.

i. On a site-specific basis, HERO does not necessarily disagree with applying the 1 µg/dL PbB criterion as a source-specific, *incremental* increase above background. For other sites where lead is the medium of concern, HERO has commented that consideration of ambient lead levels in soil is dependent upon the strength of the ambient lead evaluation components such as the size of the site, the site history, the number of samples, contract reporting limits, frequency of samples reported as non-detect, and the magnitude of the proposed ambient concentration.

ii. For the current site, HERO is unfamiliar with the background lead sediment data set, and we defer to the RWQCB on the reported background concentration for lead in sediment (56.3 mg/kg). We strongly recommend RWQCB staff confirm that this is an appropriate assumption of the site, given the Navy's application of the Cal/EPA 1 µg/dL criterion as an *incremental* increase whereby PbB levels due to "background" lead in sediment were subtracted out.

In addition to the overall confidence in the background data set, a key consideration for the current site evaluation is the issue of the exposure point concentrations (EPCs) used by the Navy. The "Boat Channel Sediment SWAC" is reported as a surface area weighted average concentration for lead; whereas the "Background Sediment" concentration is a 95th percent UPL of the expanded reference data set. We strongly question the appropriateness of subtracting the PbB level from "background" lead, given that two different statistics were used as EPCs. For risk assessment at other sites, HERO has commented that it is critical that different expressions of the risk assessment results (i.e., site-related and total risk) be based on the same statistic in order to be comparable. This recommendation regarding the need to use EPCs based on the same statistic applies to the current evaluation.

2. **Estimation of Lead Concentration in Fish from Sediment Uptake.** The submission includes multiple equations which are reported to have been used for estimating contaminant concentrations in fish due to sediment uptake (see pages A6-1,

A6-4, and A6-5). In the case of lead, the submission reports that fish concentrations were calculated differently for adults and children.

For the adult evaluation, fish concentrations of lead were calculated according to the following regression equation which is stated to be "site specific for Boat Channel" (Source: BEI 2003): Log(Fish concentration) = (0.4045 x Log (Sed Con) – 0.0759).

For children, page A6-5 indicates that fish concentrations were estimated using the SWAC and a project-specific biota sediment uptake factor (BSAF). Interestingly, Table A6-5 reports that the log-log regression equation was used to estimate fish concentrations of lead for both the adult and child evaluations.

a. The Navy should clarify the apparent discrepancy in the reported methods used to calculate fish concentrations of lead.

b. Based on our review, it appears that the Navy has used an alternate method (i.e. a site-specific log-log regression equation) than that proposed in their January 7, 2011 email. Previously, HERO calculated a fish concentration of 1.28 mg/kg wet-weight tissue using the SWAC, project-specific biota sediment uptake factor (0.101 kg dry-weight sediment/kg dry-weight tissue), and dry weight to wet weight conversion factor = project-specific assumption (0.1461 kg dry-weight tissue/kg wet-weight tissue) taken from the Navy's January 2011 email. Using the log-log regression equation, the Navy has calculated a fish concentration of 0.747 mg/kg wet-weight tissue. As such, the Navy calculated concentration is 1.7-fold lower.

HERO defers to the RWQCB on the site-specific uptake equation used in the Navy's evaluation, as we are unfamiliar with the source which was cited (BEI 2003). According to the submission, the RWQCB and Navy agreed to the site-specific exposure factors such as the sediment SWAC and BSAF. Minimally, we recommend the Navy clarify whether the submission uses a different approach than that originally proposed in their 2011 email. If so, justification should be provided. We note that there is uncertainty associated with the estimation of lead concentrations. One potential option to address this uncertainty may be to collect fish for lead analysis.

3. <u>Fish Consumption Rate.</u> As discussed in our March 2011 memorandum, HERO evaluated lead exposures using a range of assumed fish ingestion rates based on OEHHA and USEPA recommendations (range 0.48 g/kg-day to 1.89 g/kg-day; equivalent to approximately 30.5 g/day to 132 g/day for adults using OEHHA and USEPA adult body weight assumptions).

a. <u>Adults.</u> The Navy has selected alternate fish consumption rate estimates for recreational fishers (21 g/day) and subsistence fishers (161 g/day). The submission also indicates that these consumption rate estimates are consistent with similar

recent Water Board projects in San Diego Bay, and the Water Board and Navy have agreed to the fish ingestion rate estimates.

Based on the provided information, HERO defers to the RWQCB as to whether the Navy assumptions are consistent with previous agreements and other Water Board sites. For reference, the Navy's recreational fisher assumption (21 g/day) is 30% lower than the OEHHA recommended average ingestion rate (30.5 g/day), and 75% lower than the OEHHA recommended high-end ingestion rate (85.2 g/day). The Navy's subsistence fisher assumption (161 g/day) is more conservative than OEHHA's high-end ingestion rate (85.2 g/day) as well as USEPA's subsistence fisher ingestion rate (132 g/day).

Overall, if risk management decisions for adults (and the fetus of a pregnant adult) are based upon subsistence fishers, the difference in these assumptions should not be an issue from a risk perspective since the Navy assumption is more conservative.

b. Children. As discussed in our 2011 memorandum, OEHHA's Chapter 9 recommends that average and high-end values of 0.48 and 1.35 g/kg body weight-day be used as default noncommercial fish ingestion rates for the 9-, 30-, and 70-year exposure scenarios. In the absence of data on fisher-caught fish consumption in children, OEHHA's guidance assumes that fish consumption would be proportional to body weight (OEHHA 2000). Furthermore, OEHHA's Table 9.4 recommends default values for fisher caught fish consumption in children of 8.7 g/day (average) and 24.3 g/day (high end) based on the ratio of the time-weighted average body weight of 18 kg for 0-9 year olds and 63 kg for 0-70 years.

Rather than using OEHHA assumptions, the Navy has calculated a child fish consumption rate of 4.5 g/day by multiplying the adult median consumption rate (21g/day) by the ratio of child to adult body weights (i.e. 15 and 70 kg).

From a risk perspective, we are concerned that the Navy has only evaluated fish consumption in children based on a median consumption value. Using the 15 and 70 kg default body weights with OEHHA's recommended 30.5 and 85.2 g/day estimates yields child fish consumption rates of 6.5 g/day and 18.2 g/day. Both of these estimates exceed the Navy's assumption, and the high-end estimate (18.2 g/day) is 4-fold greater than the Navy value.

As previously commented, we consider there to be significant uncertainty in the fish ingestion rates. Assumptions for this variable can vary considerably and other sources may recommend higher or lower ingestion rates than those recommended by OEHHA. HERO would recommend that the submission be updated to evaluate child exposures using a range of consumption rates rather than reporting an estimate based on median consumption only. Alternatively, we recommend the OEHHA consumption estimates be used as they are more health protective than the Navy assumption.

4. **Lead Exposure Assessment:** The lead exposure assessment presented in the submission is generally consistent with HERO's evaluation, and we were able to confirm the calculations as reported. We have the following comments for consideration.

a. Assumptions. As discussed above, we recommend that the methodology used to calculate the concentration of lead in fish, as well as concerns about the fish consumption rate in children be addressed. The Navy's estimated fish concentration for lead is 1.7-fold lower than calculated by HERO. For children, the Navy's assumed fish consumption rate is 4-fold lower than the corresponding high-end OEHHA recommendation. The risk assessment results are dependent on both of these issues.

b. Background. As discussed above, the issue of "background" lead needs to be carefully considered, particularly with respect to the exposure point concentrations selected for the site and background data sets. This issue is critical from the perspective of making a determination as to magnitude of the 'incremental' lead intake and whether there is a human health concern for lead exposures via fish ingestion.

c. Upper Percentile PbB Estimates. As part of initial 2011 evaluation, HERO calculated 90th percentile estimates of the increase in PbB due to fish consumption for consistency with USEPA's Adult Lead Model (ALM) and DTSC's LeadSpread. In the current submission, PbB levels were calculated using Navy assumptions for subsistence fishers, recreational fishers, and children. However, upper percentile estimates of the increase in PbB were not calculated or considered.

For consistency with current regulatory lead evaluation methodology, HERO recommends that 90th percentile PbB increase values be calculated for use in evaluating lead exposures. This is particularly relevant for the recreational fisher and child receptors where the fish intake estimates were based on a median, rather than a high-end estimate of exposure.

d. Units for Dose Estimates. For reference, the "Dose" estimates presented in Table A6-5 are reported in units of mg/kg-day. Based on our review of the calculations, the doses appear to actually represent µg/kg-day. We recommend this be confirmed, and the submission updated as appropriate for accuracy.

CONCULSIONS

HERO has reviewed the Former Naval Training Center San Diego Appendix A6 Supplemental Human Health Risk Assessment With Sediment-to-Fish Uptake Model, with respect to lead exposure from ingestion of fish contaminated from site sediment. We have noted several issues which we would recommend be addressed for the submission, including the methodology used to calculate lead concentrations in fish, the fish

consumption rates for children, and calculation of 90th percentile PbB estimates. We strongly recommend the issue of background lead be considered, given the Navy's application of the Cal/EPA 1 µg/dL criterion as an *incremental* increase whereby PbB levels from ingestion of fish impacted by "background" lead in sediment were subtracted out. In addition to the overall confidence in the background data set, a key consideration for the current site evaluation is the issue of the exposure point concentrations (EPCs) used by the Navy.

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