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April 13, 2012

VIA EMAIL

State Water Resources Control Board
Office of Chief Counsel
Jeannette L. Bashaw, Legal Analyst
P.O. Box 100
Sacramento, CA 95812-0100
E-mail: jbashaw@waterboards.gov

Re: Petition of San Diego Regional Water Quality Control Board Cleanup and Abatement Order No. R9-2012-0024 and Resolution No. R9-2012-0025

Dear Ms. Bashaw:

On behalf of our client, National Steel and Shipbuilding Company ("NASSCO" or "Petitioner"), we submit this petition ("Petition") to the State Water Resources Control Board ("State Board") pursuant to the requirements of California Water Code section 13320 and California Code of Regulations, Title 23, sections 2050 and 2050.5. This Petition challenges certain aspects of the above-referenced Cleanup and Abatement Order ("Order") for the San Diego Bay Shipyard Sediment Site ("Site"), and Resolution certifying an Environmental Impact Report ("EIR") for the cleanup ("Resolution"). Petitioner requests the State Board to amend the Order and Resolution, or to remand this matter to the San Diego Regional Water Quality Control Board ("Regional Board") for further consideration, consistent with the arguments raised in this Petition.

NASSCO continues to support the process that led to the Order; however, NASSCO understands that a number of parties, including the San Diego Unified Port District,[1] have appealed the Order for various reasons. Accordingly, NASSCO files this Petition to protect its rights, preserve the claims set forth herein, and ensure full and meaningful involvement in all proceedings related to the Order. Despite NASSCO's concerns with the Order, NASSCO remains committed to pursuing a scientifically and legally sound cleanup, continues to participate in an ongoing mediation to allocate funding for the cleanup, and is prepared to fund its fair share of the cleanup once the Order is finalized and an appropriate allocation agreement is

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[1] The San Diego Unified Port District issued a press release on April 10, 2012, stating its intention to challenge the Order. *See* http://www.portofsandiego.org/about-us/general-press-releases/2969-board-of-port-commissioners-to-appeal-san-diego-regional-water-quality-control-board-cleanup-order.html.

reached. NASSCO is therefore optimistic that many, if not all, of the issues raised in this Petition can be resolved at the Regional Board level through the administrative process. NASSCO will continue working voluntarily towards the development of an appropriate Remedial Action Plan ("RAP") for the Site to the extent other dischargers do so as well. NASSCO understands that there will be a public process before the Regional Board for adoption of the RAP. NASSCO is hopeful that the scope of the cleanup will be further defined through that public process and through the Clean Water Act Section 401 certification processes in a manner that will obviate the need for NASSCO's Petition. Therefore, NASSCO requests the State Board to hold the Petition in abeyance, pursuant to the California Code of Regulations, Title 23, section 2050.5(d), until notified by NASSCO whether this matter can be resolved at the Regional Board level.

While the parties have come far in the process, a number of important steps have yet to be completed before cleanup can proceed, including without limitation the development of a RAP and other work plans for the cleanup, a hearing regarding the propriety of certain oversight costs claimed by the Regional Board, and mediation and contribution proceedings to secure and allocate funding for the cleanup. While NASSCO believes that many, if not all, of its concerns can be addressed through informal negotiations with the Regional Board through the RAP and associated processes, the RAP cannot be completed or implemented until the Order is final and the scope of the remediation is known. Assuming the dischargers are able to reach agreement with the Regional Board concerning the scope of cleanup through the RAP, Clean Water Act Section 401 certification, and associated processes, then the need for this appeal may be obviated; however, to facilitate such agreement, the dischargers require sufficient time to carefully work through these processes with the Regional Board staff to ensure an appropriate cleanup plan. NASSCO therefore requests that enforcement of the Order be stayed until the scope of the cleanup is fully defined, for the reasons set forth in NASSCO's Request For Stay Order, attached hereto as Exhibit 1.

The Order seeks to require the largest sediment cleanup to date in San Diego Bay, and a number of parties have devoted substantial time and resources to the process that produced it. NASSCO remains supportive of the process; however, in light of the significant concerns at issue, NASSCO urges the State Board to take the necessary steps to ensure that the Order is defensible and the final remedy is implemented correctly.

In light of the above, NASSCO hereby petitions the State Board to address various actions and inactions of the Regional Board and its staff with respect to the Order and Resolution, several of which are described herein.[2] The information contained in this Petition is

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[2] NASSCO files this Petition as a precautionary measure to protect its rights, preserve the claims raised in this Petition, and ensure full and meaningful involvement in all processes related to the Order. Accordingly, this Petition is specifically intended to preserve NASSCO's rights of appeal to the State Board, and NASSCO reserves the right to fully address before the State Board any and all arguments raised herein in any future submittals to or hearings before the State Board if these matters cannot be resolved at the Regional Board level. NASSCO specifically reserves its right, *inter alia*, to submit further briefing in support of the legal issues raised in this Petition (and during the administrative process), and to refer to documents in the administrative record or

organized in accordance with the numbered list posted on the State Board's website and set forth in California Code of Regulations, Title 23, section 2050(a)(1)-(9):[3]

1. *Name, address, telephone number and e-mail address (if available) of the petitioner.*

   All correspondence should be directed to counsel for Petitioner, at the address, telephone number, and e-mail address identified below:

   Kelly Richardson
   Latham & Watkins LLP
   600 W. Broadway, Ste. 1800
   San Diego, CA 92101
   Telephone: (619) 238-2876
   E-mail: Kelly.Richardson@lw.com

   Petitioner's contact information is as follows:

   National Steel and Shipbuilding Company
   Attn: Matthew Luxton, Vice President and General Counsel
   2798 Harbor Drive
   San Diego, CA 92113
   Telephone: (619) 544-8700
   E-mail: Matthew.Luxton@nassco.com

2. *The action or inaction of the Regional Water Board being petitioned, including a copy of the action being challenged or any refusal to act, if available. If a copy of the regional board action is not available, the petitioner must explain why it is not included.*

   Petitioner challenges the action of the Regional Board in adopting the Order and Resolution, against the weight of the evidence. Copies of the Order and Resolution are attached hereto as Exhibits 3 and 4, respectively.

   Petitioner requests the State Board to amend the Order to reflect the weight of the evidence, or direct the Regional Board to do so, consistent with the arguments raised herein. Petitioner further requests the State Board to reconsider whether the California Environmental Quality Act ("CEQA") applies to the Order, and whether

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transcripts of any Regional Board hearing where relevant issues are raised, insofar as the Regional Board accepts this Petition, and NASSCO's concerns cannot be resolved at the Regional Board level. Cal. Code Regs. Tit. 23, §§ 2050(a)(7), (9).

[3] http://www.waterboards.ca.gov/public_notices/petitions/water_quality/wqpetition_instr.shtml.

certification of the EIR was appropriate in light of the concerns set forth in NASSCO's DEIR and EIR Comments,[4] attached hereto as part of Exhibit 2.

3. *The date the Regional Water Board acted, refused to act, or was requested to act.*

The Regional Board adopted the Order and Resolution on March 14, 2012.

4. *A statement of the reasons the action or inaction was inappropriate or improper.*

The Regional Board's action in adopting the Order was improper because Regional Board findings must be supported by the weight of the evidence. *See* Cal. Code Civ. Proc. § 1094.5 (b), (d) ("Abuse of discretion is established if the respondent has not proceeded in the manner required by law, the order or decision is not supported by the findings, or the findings are not supported by the evidence. . . . In cases in which the court is authorized by law to exercise its independent judgment on the evidence, abuse of discretion is established if the court determines that the findings are not supported by the weight of the evidence. In all other cases, abuse of discretion is established if the court determines that the findings are not supported by substantial evidence in the light of the whole record."). In addition, the Order treated NASSCO differently from similarly-situated dischargers, and proposed cleanup levels that are not technologically and economically feasible, in violation of State Board Resolution No. 92-49 ("Resolution 92-49"). NASSCO hereby incorporates by reference the specific arguments set forth in its Hearing Brief, Initial Comments and Reply Comments, attached hereto as part of Exhibit 2.

In addition, the panel adopted certain revisions to the Order that are not supported by evidence, and approved certain Regional Board oversight costs without the appropriate back-up documentation required by California Water Code sections 13304 and 13365, and which are otherwise unrecoverable. NASSCO incorporates by reference the specific arguments set forth in its Panel Revision Comments, attached hereto as part of Exhibit 2.

The Regional Board's action in adopting the Resolution was improper because the project is categorically exempt from CEQA review. Additionally, the EIR contains a number of technical and legal deficiencies, which are discussed in detail in NASSCO's DEIR and EIR Comments. Accordingly, NASSCO incorporates by

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[4] California Water Code Section 13330(c) provides that "the time for filing an action or proceeding subject to Section 21167 of the Public Resources Code for a person who seeks review of the regional board's decision or order under Section 13320 . . . shall commence upon the state board's completion of that review . . . ." NASSCO understands that this provision requires NASSCO to proceed with its appeal of CEQA-related issues before this board prior to seeking a writ of mandate in Superior Court. NASSCO explicitly reserves its right to file a writ of mandate in the future if its concerns are not adequately resolved through this Petition or at the Regional Board level.

reference the specific arguments set forth in its DEIR Comments and EIR Comments, attached hereto as part of Exhibit 2.

5. *How the petitioner is aggrieved.*

Petitioner is aggrieved by the Regional Board's failure to support its findings with the weight of the evidence because Petitioner will be required to pay millions of dollars and disrupt its business operations to perform extensive dredging and cleanup, despite clear evidence that beneficial uses are not significantly impaired when assessed using site-specific evidence and reasonably conservative, protective and scientifically-supported assumptions. Petitioner is further aggrieved to the extent that the Order requires Petitioner to reimburse the Regional Board for oversight costs, when such costs have not been supported by appropriate documentation in compliance with California Water Code sections 13304 and 13365, or are otherwise unrecoverable.

Finally, Petitioner is aggrieved because it was required to fund extensive CEQA review, even though the cleanup is categorically exempt from such review, and because the resulting EIR requires Petitioner to adopt a number of legally deficient and/or infeasible mitigation measures despite significant flaws in the EIR, described in Petitioner's DEIR and EIR Comments attached hereto as part of Exhibit 2.

6. *The action the petitioner requests the State Board to take.*

Petitioner requests the State Board to amend the Order, or direct the Regional Board to do so, in the manner described in Petitioner's attached Hearing Brief and comments. Consistent with the weight of the evidence, Petitioner requests the State Board to revise the Regional Board's findings, or direct the Regional Board to revise its findings, to indicate that beneficial uses at the Site are not significantly impaired, and that extensive sediment dredging is not an appropriate remedy for the Site.

7. *A statement of points and authorities for any legal issues raised in the petition, including citations to documents or hearing transcripts that are referred to.*

While NASSCO supports the process that led to the Order, and believes that mediation with the parties resulted in a number of necessary revisions to the Order, NASSCO remains concerned that the Order, as adopted, is not supported by the weight of the evidence, and treats NASSCO differently from similarly-situated dischargers in violation of Resolution 92-49. For example, the Order imposes cleanup levels and monitoring requirements for the Site that are the most stringent for an industrial site in San Diego Bay, if not California, even though site-specific evidence indicates that beneficial uses at the Site are not significantly impaired when analyzed using realistic, scientifically-supported assumptions.

Likewise, for the first time ever, the Regional Board required a full CEQA review of the cleanup, which resulted in the certification of a Final Environmental Impact Report that is estimated to add millions to the cost of the cleanup—even though the

Order falls within a categorical exception to CEQA and, to NASSCO's knowledge, the Regional Board has never before required CEQA review for a cleanup and abatement order. Moreover, many of the proposed mitigation measures are infeasible within the meaning of CEQA, and thus may not be adopted. Among other things, the Environmental Impact Report (i) failed to consider the monitored natural attenuation alternative that was recommended by leading sediment experts in the 2003 NASSCO and Southwest Marine Detailed Sediment Investigation report ("Shipyard Report"), even though it would avoid all of the project's significant impacts and feasibly accomplish project objectives within a reasonable period of time, (ii) failed to disclose past and continuing discharges of urban runoff to the Site, and reasonably foreseeable impacts to the Site that could be caused by recontamination from urban runoff, and (iii) failed to use a "baseline" that is premised on actual, existing conditions at the Site rather than extremely conservative hypothetical assumptions.

NASSCO is also concerned that the Order requires payment of certain oversight costs without providing the necessary supporting documentation required under California Water Code sections 13304 and 13365, and contends that all claimed oversight costs should be subject to the review process set forth in Finding 41 of the Order.

Petitioner directs the State Board to the specific arguments set forth in NASSCO's Statement of Points and Authorities and attachments thereto, listed below:[5]

a. NASSCO's Statement of Points and Authorities, incorporated by reference and attached hereto as Exhibit 2;

b. NASSCO's Hearing Brief, dated Oct. 19, 2011 ("Hearing Brief"), incorporated by reference and attached hereto as Attachment A to Exhibit 2;

c. NASSCO's Comments on the San Diego Regional Water Quality Control Board Cleanup Team's September 15, 2010 Tentative Cleanup and Abatement Order No. R9-2011-0001, Draft Technical Report, and Shipyard Administrative Record, dated May 26, 2011 ("Initial Comments"), incorporated by reference and attached hereto as Attachment B to Exhibit 2;

d. NASSCO's Reply Comments on the San Diego Regional Water Quality Control Board Cleanup Team's September 15, 2010 Tentative Cleanup and Abatement Order No. R9-2011-0001, Draft Technical Report, and Shipyard Administrative Record, dated June 23, 2011 ("Reply Comments"), incorporated by reference and attached hereto as Attachment C to Exhibit 2;

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5 Petitioner will provide further briefing if requested by the State Board, or if it becomes clear that Petitioner's concerns cannot be resolved at the Regional Board level. At that time, Petitioner will request that the abeyance of this Petition be lifted.

e. NASSCO's Comments on the Draft Environmental Impact Report for the Shipyard Sediment Remediation Project, dated August 1, 2011 ("DEIR Comments") , incorporated by reference and attached hereto as Attachment D to Exhibit 2;

f. NASSCO's Comments on the Proposed Final Environmental Impact Report for the Shipyard Sediment Remediation Project, dated October 19, 2011 ("EIR Comments"), incorporated by reference and attached hereto as Attachment E to Exhibit 2; and

g. NASSCO's Comments on Notice of Public Hearing for Tentative Cleanup and Abatement Order No. R9-2012-0024 and Tentative Resolution No. R9-2012-0025, dated February 24, 2012 ("Panel Revision Comments"), incorporated by reference and attached hereto as Attachment F to Exhibit 2.

8. *A statement that copies of the petition have been sent to the Regional Water Board and to the discharger, if different from the petitioner.*

Copies of this Petition are being emailed to the following individuals at the Regional Board: David Gibson, Executive Officer; James Smith, Assistant Executive Officer; Catherine Hagan, Counsel for Regional Board Advisory Team; and Christian Carrigan, Counsel for the Regional Board Cleanup Team. Copies of this Petition are also being emailed to all of the Designated Parties, in accordance with the attached proof of service.

9. *A statement that the issues raised in the petition were presented to the regional board before the regional board acted, or an explanation of why the petitioner could not raise those objections before the regional board.*

Petitioner has presented the issues raised in this Petition to the Regional Board, before the Regional Board adopted the Order and Resolution.

Please contact me if you have any questions, or require any additional information.

DATED: April 13, 2012

LATHAM & WATKINS LLP

By _____
Kelly E. Richardson
Attorneys for Designated Party
NATIONAL STEEL AND
SHIPBUILDING COMPANY

Attachments

cc: Christian Carrigan, Director, Office of Enforcement, RWQCB
David Gibson, Executive Officer, RWQCB
James Smith, Assistant Executive Officer, RWQCB

Volume 1

Exhibits in Support of:

Petition of San Diego Regional Water Quality Control Board Cleanup and Abatement Order No. R9-2012-0024 and Resolution No. R9-2012-0025

EXHIBIT 1

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Milan	

April 13, 2012

VIA EMAIL

State Water Resources Control Board
Office of Chief Counsel
Jeannette L. Bashaw, Legal Analyst
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Sacramento, CA 95812-0100
E-mail: jbashaw@waterboards.gov

Re: NASSCO's Request For Stay Order for San Diego Regional Water Quality Control Board Cleanup and Abatement Order No. R9-2012-0024 and Resolution No. R9-2012-0025

Dear Ms. Bashaw:

On behalf of our client, National Steel and Shipbuilding Company ("NASSCO" or "Petitioner"), we hereby request the State Water Resources Control Board ("State Board") to stay enforcement of San Diego Regional Water Quality Control Board ("Regional Board") Cleanup and Abatement Order No. R9-2012-0024 ("Order"), for the reasons set forth below:

A. A Stay Should Be Issued To Preserve The Status Quo Until The State Board Has An Opportunity To Rule On This Petition and Related Petitions Filed By Other Dischargers, Or The Need For This Petition Is Obviated Through Future Proceedings Before The Regional Board

NASSCO requests that the State Board stay enforcement of the Order until such time as the merits of this Petition may be reviewed, or the need to appeal is otherwise obviated. A stay should be issued where, as here, a petitioner establishes (1) substantial harm to the petitioner or to the public interest if a stay is not granted; (2) a lack of substantial harm to other interested persons and to the public interest if a stay is granted; and (3) substantial questions of law and fact regarding the disputed action. Cal. Code Regs. Tit. 23 § 2053.

Should NASSCO be subject to enforcement of the Order's requirements during the pendency of this Petition, NASSCO would suffer substantial harm because the Order requires extensive cleanup that is not supported by the weight of the evidence, the costs of which would be significant. Attachment A, Declaration of T. Michael Chee ("Chee Decl."), at ¶ 4. Once cleanup is initiated and paid for, it cannot be undone even if the Order is found to have been adopted in error. By contrast, while NASSCO will suffer substantial harm without the issuance

of a stay, neither the public interest nor any interested parties will suffer significant harm in the event the stay is issued because current conditions at the Site do not pose an imminent or substantial endangerment to humans or wildlife; in fact, the weight of the evidence in the record indicates that beneficial uses at the Site are not significantly impaired. Id., at ¶¶ 4-5. In light of such evidence, there are substantial questions of fact and law regarding whether the Regional Board's adoption of the Order—which imposes the lowest cleanup levels in San Diego Bay for an industrial site—is legally and scientifically justified. Moreover, NASSCO expects that it will quickly become clear whether NASSCO is able to resolve its concerns at the Regional Board level, or whether it will be required to proceed with its Petition; accordingly, any stay is likely to be short in duration. In light of the extensive time and resources that NASSCO, and others, have invested in this process, fundamental fairness and diligence require taking the necessary time to ensure that the final remedy is implemented correctly. Accordingly, the State Board should stay enforcement of the Order until this Petition is resolved.

1. NASSCO Will Suffer Substantial Harm If A Stay Is Not Granted

The dischargers will be subject to substantial harm if enforcement of the Order is not stayed during the pendency of NASSCO's Petition and related petitions filed by other parties. The Order requires the dischargers to submit a Remedial Action Plan ("RAP") within ninety (90) days after the adoption of the Order; however, the details of the RAP will depend on the content of the Order. Accordingly, the scope of the Order must be finalized before the RAP can be completed. Further, the Order would require the dischargers to begin pursuing a number of environmental permits, and similar work prerequisite to cleanup that may not be necessary if NASSCO prevails on its Petition. Finally, the Order requires substantial cleanup—at an estimated cost of tens of millions of dollars—that is not supported by the weight of the evidence, and that may ultimately be unnecessary, depending upon the outcome of the Petition.

2. No Other Person Will Suffer Substantial Harm If A Stay Is Granted

While the dischargers, including NASSCO, face substantial harm if a stay is not granted, no other person will suffer substantial harm if enforcement is stayed. Conditions at the Site do not pose an imminent or substantial endangerment to the public; in fact, the weight of the evidence in the record indicates that the Site does not pose any significant risk to wildlife or humans. Chee Decl. at ¶ 5; NASSCO and Southwest Marine Detailed Sediment Investigation ("Shipyard Report"), at 10-42-43, 11-20; Evaluation of Draft Technical Report for Tentative Cleanup and Abatement Order No. R9-2011-0001 for the NASSCO Shipyard Sediment Site ("Ginn Report"), at 109-11. Indeed, NASSCO is a secure military industrial facility that does not permit fishing, swimming, or recreational uses, and will remain so until at least 2040 under the terms of its current lease. Id. at ¶ 6; see also Expert Opinion Letter Regarding Draft Technical Report for Tentative Cleanup and Abatement Order No. R9-2011-0001 ("Finley Report"), at 16-17; Ginn Report, at 90. As an active military industrial shipyard, NASSCO implements strict access controls that will prevent public exposure to sediments during the stay period; accordingly, a stay will not substantially impact the public or any other person. Id.

Moreover, NASSCO intends to continue to work with the Regional Board staff to resolve its concerns with the Order, in part through voluntary discussions regarding RAP development,

and to negotiate with other dischargers regarding allocation of funding for cleanup. Because certain governmental parties have indicated that settlement approvals required to secure funding for the cleanup will take ninety (90) days to obtain once an agreement is finalized, it is unlikely that a stay of enforcement will significantly delay the cleanup. *See e.g.,* Attachment B, United States Navy's Status Report In Response To Court's Order of March 9, 2012 (Mar. 21, 2012). As discussed in NASSCO's cover letter and Petition, NASSCO is optimistic that many of its concerns can be resolved through informal discussions with Regional Board staff regarding the details of the RAP, and other necessary pre-remedial plans. While NASSCO hopes that it can resolve its concerns at the Regional Board level, the Petition and stay are necessary to preserve NASSCO's rights in the event that an appropriate resolution cannot be reached.

3. This Petition Involves Substantial Questions Of Law And Fact Regarding Whether The Cleanup Required By The Order Is Scientifically And Legally Appropriate

Substantial questions of law and fact exist regarding the action taken by the Regional Board. The Order requires dredging of 143,400 cubic yards of sediment—the largest environmental dredging project in San Diego Bay history—at an estimated cost of tens of millions of dollars, without adequate evidence that beneficial uses at the Site are impaired. The highly conservative, overly protective Order requires unprecedented cleanup levels in spite of the favorable findings and conclusions of a multimillion dollar sediment investigation, conducted with substantial input and oversight by Regional Board staff. The investigation, which has been recognized as the most extensive sediment investigation that the Regional Board has ever required to be conducted in San Diego Bay, concluded that beneficial uses at the Site were not significantly impaired. Against the weight of the evidence, the Order imposes massive dredging, and in doing so, treats NASSCO differently from other similarly-situated sites in San Diego Bay in violation of State Board Resolution No. 92-49. Additionally, the Order fails to adequately account for the technological infeasibility of cleanup while discharges from Chollas Creek and other sources of off-site discharges remain uncontrolled, and fails to recognize the economic infeasibility of the dredging remedy, in light of the favorable results of the investigation. Taken together, these substantial questions of law and fact—coupled with the fact that this cleanup is likely to serve as precedent for a number of future cleanups in San Diego Bay and throughout California—strongly weigh in favor of a stay pending the resolution of NASSCO's Petition.

B. Conclusion

For the reasons set forth herein, the State Board should preserve the status quo, and stay enforcement of the Order until NASSCO's petition is resolved through the State Board appeal process, or through ongoing negotiations with Regional Board staff.

DATED: April 13, 2012

LATHAM & WATKINS LLP

By _____
Kelly E. Richardson
Attorneys for Designated Party
NATIONAL STEEL AND
SHIPBUILDING COMPANY

Attachment A

LATHAM & WATKINS LLP
Robert M. Howard (SB No. 145870)
Kelly E. Richardson (SB No. 210511)
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Attorneys for Designated Party
National Steel and Shipbuilding Company

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

SAN DIEGO REGION

IN THE MATTER OF: CLEANUP AND ABATEMENT ORDER NO. R9-2012-0024	**DECLARATION OF T. MICHAEL CHEE IN SUPPORT OF NASSCO'S REQUEST TO STAY ENFORCEMENT OF CLEANUP AND ABATEMENT ORDER NO. R9-2012-0024**

I, T. Michael Chee, declare and state as follows:

1. I am the Environmental Manager at Designated Party National Steel and Shipbuilding Company ("NASSCO"). I hold a Bachelors of Science Degree in Marine Biology, and have worked at NASSCO for 39 years, including 26 years developing and managing NASSCO's environmental programs and department as Environmental Manager. I make this declaration based on personal knowledge and, if called as a witness, I could competently testify thereto.

2. As the Environmental Manager at NASSCO, my job responsibilities entail supervising a staff of six environmental specialists, taking appropriate measures to minimize or eliminate potential environmental risks and ensure compliance with applicable laws and regulations. I oversee the development of environmental programs and projects in support of NASSCO's Environmental Management System to ensure environmental compliance, pollution prevention and continual improvement. NASSCO is certified as an ISO 14001 facility.

3. Based on my general experience, and my work with experts in connection with the San Diego Regional Water Quality Control Board's ("Regional Board") cleanup of the Shipyard Sediment Site ("Site"), I am familiar with the cost of environmental work in general and with the cost of remediation at the Site. I am also generally familiar with how sediment cleanup work is designed, permitted, contracted and performed.

4. Based upon this understanding, NASSCO would suffer substantial harm if required to proceed with the remedial design, permitting, contracting and sediment remediation in accordance with the time limits in the Regional Board's Cleanup and Abatement Order No. R9-2012-0024 ("Order"), while NASSCO's Petition to the State Water Resources Control Board ("State Board") is pending. The above-described work is very expensive, and is dependent upon the specific terms of the Order; accordingly, NASSCO will be substantially harmed if it is required to spend resources to plan, permit, or perform remedial work while the final terms of the Order remain subject to change.

5. By contrast, if a stay is issued, neither the public interest nor other interested parties would be substantially harmed because current conditions at the Site do not pose an

imminent or substantial endangerment to human health or the environment, and environmental conditions at the Site have improved greatly over the past several decades.

6. Additionally, NASSCO is an active military industrial facility, and will remain such until at least 2040 under the terms of its current lease with the San Diego Unified Port District. As an active military industrial shipyard, NASSCO employs strict security measures to prevent unauthorized public access and recreational use of the leasehold. Access to both the uplands and tidelands portions of the leasehold is highly restricted: a security boom in the bay prevents unauthorized vessels from approaching within 300 feet of the leasehold, and the presence of security guards and other barriers—including security booms, buildings, and eight-foot fences topped with razor wire—prevent the public from entering the leasehold from the shore. NASSCO also enforces strict security through video surveillance, identification and clearance requirements for anyone entering or exiting the premises, alarm systems, and the use of security personnel.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that this declaration was executed this 12th day of April, 2012 at San Diego, California.

T. Michael Chee

Attachment B

IGNACIA S. MORENO
Assistant Attorney General
Environment and Natural Resources Division
C. SCOTT SPEAR
DUSTIN J. MAGHAMFAR
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ATTORNEYS FOR
UNITED STATES NAVY

UNITED STATES DISTRICT COURT

SOUTHERN DISTRICT OF CALIFORNIA

CITY OF SAN DIEGO,

Plaintiff,

v.

NATIONAL STEEL & SHIPBUILDING COMPANY, *et al.*,

Defendants.

AND ALL RELATED COUNTER AND CROSS CLAIMS

Case No. 09-cv-02275-WQH (BGS)

UNITED STATES NAVY'S STATUS REPORT IN RESPONSE TO COURT'S ORDER OF MARCH 9, 2012 (Doc. No. 191)

Defendant United States Navy ("Navy") hereby submits its status report in response to the Court's Order dated March 9, 2012 (Doc. No. 191).

Since submission of Navy's status report on October 3, 2011 (Doc. No. 160), the parties continue to engage in good faith mediation before the court-appointed mediator, Timothy Gallagher. Navy believes progress has been made towards reaching agreement on settlement

terms that will resolve the pending litigation. Navy also believes that it remains in the best interests of the parties, as well as in the interests of judicial economy, to continue the mediation for an additional two months in an effort to complete the negotiation of a written settlement agreement.

As the parties have been negotiating settlement terms for several months, Navy submits that the parties should be able to reach agreement on those terms on or before May 31, 2012. If tentative agreement is reached on a written settlement agreement by May 31, 2012, the United States will then need an additional 90 days to obtain the necessary settlement approvals within the United States Department of Justice and the United States Department of the Navy to execute the agreement. Therefore, Navy respectfully requests the stay of Phase II discovery through August 31, 2012, provided that settlement terms are tentatively agreed upon by May 31, 2012.

If the parties are unable to reach tentative agreement on written settlement terms by May 31, 2012, Navy respectfully requests an order (1) requiring the parties to notify the Court on June 1, 2012 that an agreement has not been reached and (2) scheduling a case management conference thereafter at the Court's earliest convenience regarding the commencement of Phase II discovery.

Respectfully submitted,

IGNACIA S. MORENO
Assistant Attorney General
Environment and Natural Resources Division

/s/ C. Scott Spear
C. Scott Spear
Dustin J. Maghamfar
Attorneys for United States Navy

Dated: March 21, 2012

CERTIFICATE OF SERVICE

The undersigned hereby certifies that he is an employee in the Environmental Defense Section of the U.S. Department of Justice and is a person of such age and discretion to be competent to serve papers;

That on March 21, 2012, he served a copy of:

DEFENDANT UNITED STATES NAVY'S STATUS REPORT IN RESPONSE TO COURT'S ORDER OF MARCH 9, 2012 (Doc. No. 191)

by Notice of Electronic Filing this 21st day of March, 2012, upon all counsel of record using the CM/ECF system.

/s/ C. Scott Spear
C. Scott Spear

EXHIBIT 2

MEMORANDUM OF POINTS AND AUTHORITIES IN SUPPORT OF NASSCO'S PETITION REQUESTING REVIEW OF REGIONAL BOARD ORDER NO. R9-2012-0024 AND RESOLUTION R9-2012-0025

Pursuant to Section 13320 of the California Water Code and Section 2050 of Title 23 of the California Code of Regulations, National Steel and Shipbuilding Company ("Petitioner" or "NASSCO") submits this preliminary Memorandum of Points and Authorities in support of its Petition to the State Water Resources Control Board ("State Board") to review, vacate and/or amend the March 14, 2012 adoption of (1) Cleanup and Abatement Order No. R9-2012-0024 ("Order") and (2) Resolution No. R9-2012-0025 ("Resolution") by the San Diego Regional Water Quality Control Board ("Regional Board"). The Order found NASSCO to be a discharger responsible for certain constituents of concern found in the San Diego Bay bottom marine sediment within the NASSCO and BAE Systems Ship Repair, Inc. tidelands leaseholds ("Shipyard Sediment Site" or "Site"),[1] including metals, PCBs, TBT, and HPAH ("COCs"), and prescribed cleanup levels for the same pursuant to California Water Code Section 13304. The accompanying Resolution certified an environmental impact report for the Order pursuant to the California Environmental Quality Act ("CEQA"), which makes the Order the first cleanup and abatement order in San Diego Bay history to be subject to CEQA review and sets an impractical precedent of requiring CEQA review for future Regional Board cleanup actions.

I. INTRODUCTION

Petitioner hereby appeals, and requests a stay of, the findings set forth in the Order on the grounds that the Regional Board's findings are not supported by the weight of the evidence. Pursuant to California Code of Civil Procedure Section 1094.5(b), a Regional Board abuses its discretion where it "has not proceeded in the manner required by law, the order or decision is not supported by the findings, or the findings are not supported by the evidence." *Id.* To survive a challenge of abuse of discretion, Regional Board decisions must be supported by the weight of the evidence. Cal. Water Code § 13330(e); Cal Code Civ. Proc. § 1094.5(c).

But the Regional Board's Order is predicated on excessively conservative and unrealistic assumptions that are not supported by the evidence collected from the Site. In fact, the weight of the evidence in the administrative record indicates that the Site poses no significant risks to human health or wildlife, and that monitored natural attenuation is the appropriate remedy for the Site. Moreover, contrary to State Board Resolution No. 92-49 and principles of due process and equal protection, the Order also treats Petitioner differently than similarly situated dischargers and fails to account for the technological and economic feasibility concerns previously raised by Petitioner.

For these reasons, as well as those set forth in attachments A through F hereto, Petitioner requests that the State Board (1) amend the Order, or remand this matter to the Regional Board for further consideration, consistent with the arguments raised herein, and (2) vacate the

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[1] More specifically, the site is defined as "The San Diego Bay bottom marine sediment along the eastern shore of central San Diego Bay extending approximately from the Sampson Street Extension to the northwest and Chollas Creek to the southeast, and from the shoreline out to the San Diego Bay main shipping channel to the west." Order, at ¶ 1.

Resolution and clarify that the Order is exempt from CEQA pursuant to the categorical exemptions set forth in CEQA Guidelines sections 15307, 15308 and 15321.

II. THE ORDER IS BASED ON EXCESSIVELY CONSERVATIVE, UNREALISTIC ASSUMPTIONS THAT SKEW ITS FINDINGS OF IMPAIRMENT

After a decade of study, the administrative record is replete with evidence indicating that beneficial uses at the Site are not impaired, and that the Site poses no significant risk to human health or wildlife.

In 2001, the Regional Board directed Exponent, one of the premier sediment and environmental consulting firms in the nation, to perform an unprecedented multi-million dollar investigation under the supervision and direction of Board staff. The investigation, which gathered data for multiple lines of evidence—including chemistry (the concentration of chemicals of concern in the sediment), toxicity (measuring whether observed chemical concentrations harm sediment-dwelling organisms in lab tests), and benthic community assessment (counting whether sediment-dwelling organisms exist at the site in the same numbers and diversity that would be expected in a healthy community)—concluded that beneficial uses at the Site were not impaired. NASSCO and Southwest Marine Detailed Sediment Investigation (2003) ("Shipyard Report"), at 10-42-43, 11-20. Additionally, recent testing conducted in July 2009 indicates that sediment conditions at the Site have even *improved* since the Exponent investigation was conducted in 2001.

The Regional Board's Order and Technical Report rely entirely on the same data collected and analyzed by Exponent; however, the Regional Board finds impairment by applying several excessively conservative and unreasonable assumptions about how humans and wildlife might be exposed to COCs in Site sediments, including without limitation: (1) unrealistic catch and consumption estimates, (2) excessively conservative estimates of chemical concentrations in fish tissue, (3) unrealistic estimations regarding how frequently wildlife are likely to forage at the Site, (4) highly conservative risk thresholds for assessing risks to aquatic-dependent wildlife, and (5) biased assessment frameworks for assessing risks to aquatic life. *See generally* Attachment A, NASSCO's Hearing Brief, dated October 19, 2011; Attachment B; NASSCO's Comments on the September 15, 2010 Tentative Order and Draft Technical Report, dated May 26, 2011; Attachment C, NASSCO's Reply Comments on the September 15, 2010 Tentative Order and Draft Technical Report, dated June 23, 2011. As a result of these overly conservative assumptions, the Order finds "significant risk" where none exists, and is therefore not scientifically supportable. In addition, the Regional Board adopted certain changes proposed by the hearing panel, even though such revisions were not supported by the evidence presented at the hearing, as described in Attachment F, NASSCO's Comments on Notice of Public Hearing for Tentative Order No. R9-2012-0024 and Resolution No. R9-2012-0025.

III. THE ENTIRETY OF THE RECORD INDICATES THAT EXTENSIVE SEDIMENT DREDGING IS NOT AN APPROPRIATE REMEDY

Taken as a whole, the administrative record supports the conclusion that the massive dredging remedy set forth in the Order is contrary to law because it is neither scientifically

justified nor economically feasible. Accordingly, the Order should be amended based on the following considerations:

First, the Order treats NASSCO differently than similarly-situated dischargers in violation of State Board Resolution No. 92-49 ("Resolution 92-49"), and principles of due process and equal protection. Resolution 92-49 provides that that the "Regional Water Board shall: . . . [p]rescribe cleanup levels which are *consistent* with appropriate levels set by the Regional Water Board for analogous discharges that involve similar wastes, site characteristics, and water quality considerations." *Id.* at II.A.9 (emphasis added); Deposition of David Barker ("Barker Depo"), at 345:12-17 (Resolution 92-49 ensures that Regional Boards treat similar sites similarly). Principles of due process and equal protection also require fundamental fairness, and similar treatment under the law. U.S. Const. amend. XIV, §1; Cal. Const. art. I, §§ 7, 15. However, the Order imposes radically more stringent cleanup levels upon NASSCO than were required at other sediment sites in San Diego Bay, despite substantial similarities among the sites.

Second, the Water Code and Resolution 92-49 explicitly require Regional Boards to "consider[] all demands being made and to be made on [the Bay] and the total values involved," and to ensure that recommended cleanups are economically feasible and cost-effective. Cal. Water Code § 13000; Resolution 92-49, at III.G. The Regional Board is required to do so by objectively "balanc[ing] . . . the incremental benefit of attaining further reduction in the concentrations of primary [contaminants of concern] [against] the incremental cost of achieving those reductions." RWQCB Draft Technical Report (Mar. 14, 2012) ("DTR"), at 31-1. However, the incremental benefits of the dredging remedy set forth in the Order does not justify the increased cost when compared to less costly remediation methods. *See generally* Attachments A - C.

Third, less costly remediation methods will achieve cleanup goals within a reasonable time. Pursuant to Water Code Section 13360, the Regional Board may not specify a particular manner by which dischargers must cleanup or abate the effects of their wastes. Rather, the Regional Board must concur with any cleanup and abatement proposal which the dischargers have demonstrated has a substantial likelihood of achieving compliance with cleanup goals and objectives within a reasonable timeframe. *Id.* The administrative record contains ample evidence that natural attenuation is occurring, is protective of beneficial uses, and will achieve compliance with cleanup goals within a reasonable time. *See generally* Attachments A - C. Although the Regional Board rejected monitored natural attenuation because complete control of site sources has not been fully demonstrated, the Regional Board failed to adequately address the argument that re-contamination from off-site sources such as Chollas Creek would affect *all* potential remedies, including the dredging remedy recommended by the Order. If anything, the lack of Chollas Creek source control favors the selection of monitored natural attenuation, as it makes little sense to spend tens of millions of dollars to dredge to unprecedented cleanup levels when ongoing Chollas Creek discharges continue to impact the Site, and are not expected to be controlled for at least 20 years. The Regional Board also ignored the technological infeasibility concerns raised by Petitioner regarding requiring compliance with the exceptionally stringent cleanup levels set forth in the Order while the Site continues to be impacted by uncontrolled Chollas Creek discharges.

The Regional Board's discretion in adopting the Order is bound by Water Code Section 13360, State Board Resolution 92-49, and principles of due process and equal protection. When scientific and economic considerations are weighed appropriately, the most appropriate remedy is monitored natural attenuation to ensure that Site conditions remain protective of beneficial uses while sediment chemical concentrations attenuate.

IV. SIMILAR SITES MUST BE TREATED SIMILARLY, BUT OTHER SEDIMENT REMEDIATION PROJECTS HAVE NOT BEEN SUBJECTED TO CEQA REVIEW AND MITIGATION

Resolution 92-49 also provides that the "Regional Water Board *shall* . . . prescribe cleanup levels which are *consistent* with appropriate levels set by the Regional Water Board for analogous discharges that involve similar wastes, site characteristics, and water quality considerations." (emphasis added). *See also* Barker Depo., at 345:12-345:17 (recognizing that one goal of Resolution 92-49 is to ensure that the Regional Boards treat similar sites similarly). Constitutional principles of due process and equal protection likewise require both fundamental fairness and similar treatment of similarly situated persons subject to the same legislation or regulation. U.S. Const. amend. XIV, §1; Cal. Const. art. I, §§ 7, 15. Contravening these principles, the Project appears to be the only sediment remediation project in San Diego Bay that the Regional Board has subjected to CEQA review and mitigation, notwithstanding that the project falls under a number of categorical exemptions to such review as set forth in Attachment D, NASSCO's Comments on the Draft Environmental Impact Report for the Shipyard Sediment Remediation Project, dated August 1, 2011. Moreover, even if CEQA review is deemed appropriate (which NASSCO strongly disputes), the Environmental Impact Report certified by the Regional Board pursuant to the Resolution contains a number of legal deficiencies (including proposed mitigation measures that are infeasible under CEQA), and should be rejected. *See generally*, Attachments D and E, NASSCO's Comments on the Proposed Final Environmental Impact Report for the Shipyard Sediment Remediation Project, dated October 19, 2011. Among other things, the Environmental Impact Report (i) failed to consider the monitored natural attenuation alternative, even though it was recommended by sediment experts, and would avoid all of the project's significant impacts and feasibly accomplish project objectives in a reasonable period of time; (ii) failed to disclose past and continuing discharges of urban runoff to the Site and reasonable foreseeable impacts to the Site that could be caused by recontamination from the same; and (iii) failed to use a "baseline" that is premised on actual, existing conditions at the Site rather than extremely conservative hypothetical assumptions. *Id.*

V. THE ORDER REQUIRES PETITIONER TO REIMBURSE REGIONAL BOARD OVERSIGHT COSTS, DESPITE THE CLEANUP TEAM'S NON-COMPLIANCE WITH WATER CODE SECTION 13365

While the Order establishes a separate process for determining the recoverability of certain staff oversight costs, the Order nonetheless requires the dischargers, including Petitioner to reimburse the State of California $168,173 for other oversight costs set forth in Finding 41 of the Order. However, Petitioner contests certain of these costs, for the reasons set forth in Attachment F. For example, the Regional Board ordered Petitioner to pay for the cost of digitizing the administrative record, even though Petitioner objected to such costs as "unreasonable" within the meaning of Water Code section 13304 before they were incurred.

Petitioner also objects to the costs listed in Finding 41 to the extent that the Regional Board has not provided the documentation required by Water Code Section 13365. The Water Code permits recovery only of "*reasonable* costs actually incurred in cleaning up the waste, abating the effects of the waste, supervising cleanup or abatement activities, or taking other remedial action." *See* Water Code sections 13304 and 13365 (emphasis added). Under the plain terms of Water Code sections 13304 and 13365, the Regional Board may not recover any amount without first providing the bill, and a daily detail of work performed and time spent by each employee and contractor employee sufficient to prove that the expenditure was "reasonable." *Id.*; *see also* NASSCO Comment Letter Regarding Revisions To The TCAO, dated October 19, 2011.

Petitioner has requested documentation supporting the Regional Board's claimed costs in multiple comment letters dating back to October 19, 2011; however, while the Regional Board has provided some invoices, adequate documentation has not been provided for certain of the costs set forth in Finding 41. For example, certain of the OEHHA invoices provided by the Cleanup Team fail to provide any meaningful description of the work performed, referring only to a "State Water Resources Control Board Work Transmittal Form" that has not been provided to Petitioner. Moreover, many of the claimed costs are likely time-barred.

Accordingly, Petitioner requests the State Board to amend the Order to exclude such costs, and to clarify that *all* claimed oversight costs will be subject to the separate process set forth in Finding 41 for determining recoverability of Regional Board staff costs.

VI. CONCLUSION

As set forth above, the Regional Board's findings are contrary to the weight of the evidence contained in the administrative record. Accordingly, for the reasons set forth herein, Petitioner respectfully requests the State Board to amend (or instruct the Regional Board to amend) the Order to conform with the record evidence that (1) beneficial uses are not impaired when analyzed using reasonable assumptions, (2) Site sediments do not pose significant risks to human health or wildlife, and (3) monitored natural attenuation is the appropriate remedy for the Site. Petitioner further requests the State Board to clarify that the revised Order is categorically exempt from CEQA, and to make clear that *all* oversight costs claimed by the Regional Board will be subject to the separate process for determining recoverability set forth in Finding 41 of the Order.

DATED: April 13, 2012

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By _____

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Attachment A

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CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

SAN DIEGO REGION

IN THE MATTER OF TENTATIVE CLEANUP AND ABATEMENT ORDER NO. R9-2011-0001 (SHIPYARD SEDIMENT CLEANUP)	**NATIONAL STEEL AND SHIPBUILDING COMPANY'S HEARING BRIEF** Date: November 9, 14, 15, 16, 2011

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I. INTRODUCTION

The Tentative Order would require the parties to spend $60-72 million on the largest environmental dredging project in San Diego Bay history, purportedly to protect beneficial uses of water within the security-boomed areas leased to NASSCO and BAE. Using extremely conservative assumptions that have no basis in reality and are inconsistent with agency guidance, the Tentative Order finds that dredging will ameliorate some *theoretical* risk to aquatic life, aquatic-dependent wildlife, and human health. In fact, using conservative but realistic assumptions, there are no *predicted* impacts to beneficial uses. More importantly, site-specific analyses demonstrate the lack of any *actual* impairment.

Under these circumstances, massive dredging at the Site would do more harm than good, particularly where most of the contamination is safely buried deep in the sediment. The theoretical benefits do not outweigh the significant economic, social, and environmental impacts associated with such a massive dredging project, including potential job loss, noise, traffic, air emissions, re-suspension of contaminants, and the destruction of a thriving ecosystem.

Human Health: The human health impairment finding is driven by theoretical assumptions that over the course of 30-70 years, anglers will only fish at the Site (nowhere else), will only eat fish and shellfish caught at the Site, will only eat the most contaminated fish, will eat a large amount of fish and shellfish per day, and will always eat the entire fish (guts, skin, bones, organs, and all, for subsistence anglers). These assumptions are facially unreasonable, particularly where military security measures at the NASSCO leasehold prohibit public access and fishing, making it impossible for anglers to obtain any of their diet from the Site. Moreover, even if fishing were allowed at will at NASSCO, changing any one of these assumptions to a more reasonable, but still conservative approach (such as assuming that anglers occasionally eat fish caught elsewhere in the bay) results in no significant human health risk. Indeed, EPA categorizes the levels of mercury found in fish at NASSCO as "low levels of mercury" within the range recommended for consumption, and chemicals of concern in fish at NASSCO, including PCBs, are not at levels significantly different than background conditions. Deposition of Tom Alo ("Alo Depo"), at 115:13-115:21, 116:8 – 116:20.

Aquatic Wildlife: Similarly, the aquatic-dependent wildlife impairment finding is driven by unreasonable assumptions, such as assuming birds, turtles, and sea lions in San Diego Bay get 100% of their diet from the Site and not from anywhere else in San Diego Bay or any other water body, including the Pacific Ocean. This assumption is wholly unrealistic, given the size of each species' known home range and the level of activity at the Site. Even if it *is* assumed that these species forage only within the shipyards, Board staff concludes in the Draft Technical Report ("DTR") that *not a single species will exceed the level of exposure beyond which regulatory guidance indicates adverse effects are likely to occur.*

Aquatic Life: The aquatic life analysis assumes that all sediments have at least a "low" likelihood of negatively impacting sediment-dwelling creatures and fish, even where sampled and found to be identical to background reference conditions. Staff's analysis places undue weight on the concentrations of contaminants in sediment, contrary to applicable regulatory guidance. As a result, the DTR's impairment finding is primarily driven by theoretical *predictions* about the likelihood of biological effects based on the sediment chemical concentrations, rather than site-specific data documenting the absence of *actual* effects on the sediment-dwelling creatures and fish at the Site. Even under this skewed framework, the DTR concludes that ***only one*** area at NASSCO (polygon NA19) is "likely" impaired.

Natural Attenuation: By 1960, when NASSCO began operating at the shipyard, discharges from the City sewer had created a large sludge bed at the site that was devoid of life. DTR, at 10-9. Forty years later, when sampling was conducted in 2001-02, conditions had already naturally improved to the point that mature benthic communities were thriving in the sediment. In 2003, Exponent concluded that Monitored Natural Attenuation ("MNA") was the appropriate remedy for the Site. Studies conducted in 2009-10 confirm that sediment chemical concentrations are continuing to decline due to natural processes. Board staff does not, and cannot, dispute that natural attenuation is occurring and is a reasonable remedy, particularly in light of (i) the absence of significant risk; (ii) NASSCO's lease through 2040 (sufficient time for natural attenuation to occur); (iii) NASSCO's status as a "zero discharge" facility for

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stormwater; and (iv) long-term monitoring requirements that can detect an issue and trigger further action, if needed.

Thus, the Board should order the parties to monitor whether conditions naturally continue to improve over time. If they do, then dredging should not be necessary. If not, or if the shipyard changes to a more sensitive use (such as a fishing pier), the Board can consider whether to order the parties to dredge at that time. This result protects beneficial uses, while avoiding the significant impacts to the parties, community, and environment attributable to massive dredging.[1]

II. WHAT WE KNOW AFTER MORE THAN A DECADE OF INVESTIGATION

At the outset of these proceedings, it was alleged that the Site was a "dead zone" due to elevated sediment chemical concentrations, and that wide-spread dredging would be necessary. After a decade of study, we now know that conditions are much better than previously assumed.

In 2001, the Board concluded that it was not appropriate to establish cleanup levels based solely on sediment chemistry. The Board directed Exponent, one of the premier sediment and environmental consulting firms in the nation, to perform an unprecedented multi-million dollar investigation under the supervision and direction of Board staff. The investigation gathered data for multiple lines of evidence—including chemistry (the concentration of chemicals of concern in the sediment), toxicity (measuring whether observed chemical concentrations harm sediment-dwelling organisms in lab tests), and benthic community assessment (counting whether sediment-dwelling organisms exist at the site in the same numbers and diversity that would be expected in a healthy community)—to determine the extent and potential environmental impacts of contamination at the site, and identify sediment cleanup alternatives.

The sediment investigation has been described by staff as "the most extensive sediment investigation ever conducted for a site in San Diego Bay." Deposition of David Barker ("Barker Depo"), at 83:5-12. It gathered chemistry data for all 66 stations within the NASSCO and BAE

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[1] The evidence cited herein is representative of the evidence in the administrative record supporting each point, but is not intended to be an exhaustive summary of all evidence supporting each point. This brief incorporates by reference NASSCO's May 26, 2011 TCAO and DTR comments, and June 23, 2011 rebuttal, as well as NASSCO's August 1, 2011 comments on the Draft Environmental Impact Report ("EIR"), and Final EIR comments, submitted concurrently.

leaseholds (31 within NASSCO), and gathered toxicity and benthic community data for 30 stations (15 within NASSCO), resulting in a comprehensive data set. NASSCO and Southwest Marine Detailed Sediment Investigation ("Shipyard Report"), at Tables 2-2, 2-3. These data were compared to data from reference stations selected by the Board from locations least likely to be impacted by contaminants in San Diego Bay. DTR, at 17-1; Shipyard Report, at 3-7.

In 2003, Exponent issued its Shipyard Report, which reveals a healthy, mature benthic community inhabiting the Site, and concludes that Site conditions are protective of aquatic life, aquatic-dependent wildlife, and human health beneficial uses. Shipyard Report, at 10–42-43, 11-20. For these reasons, and because dredging would not produce any long-term improvement in beneficial uses relative to current conditions, the Shipyard Report selects MNA as the preferred remedy, noting that "monitored natural recovery, is the only alternative that provides acceptable effects on beneficial uses and is technically and economically feasible." *Id.* at 19–12-13.

III. THE ORDER IS BASED ON EXCESSIVELY CONSERVATIVE, UNREALISTIC ASSUMPTIONS THAT SKEW ITS FINDINGS OF IMPAIRMENT

The Tentative Order ("TCAO") and DTR rely almost entirely on the same data used in the Shipyard Report. TCAO, at ¶ 13; DTR, at 13–1-4. Contrary to the Shipyard Report, however, the TCAO and DTR conclude that human health, aquatic-dependent wildlife, and aquatic life beneficial uses are significantly impaired, and select extensive dredging as the remedy. These findings are skewed by a series of unrealistic, excessively conservative assumptions, which compound on one another resulting in absurd conclusions.

A. There Is No Significant Risk To Human Health (TCAO, ¶ 25)

Technical guidance indicates that a two-tiered risk assessment to evaluate potential risks to human health is appropriate. Tier I represents a screening analysis, where conservative assumptions are used to determine whether there is a theoretical possibility of impairment. DTR, at 26-1. If Tier I indicates theoretical impairment, then regulators should conduct a more complex, Tier II analysis, replacing conservative assumptions with real-world, site-specific data to determine whether there is an actual risk. The DTR finds that human health beneficial uses

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for San Diego Bay are impaired by relying on a number of unrealistic, inappropriate assumptions for its Tier II analysis, which, when removed, demonstrate no significant risk to human health.

First, contrary to EPA guidance to employ realistic catch estimates, the DTR assumes that San Diego Bay recreational and subsistence anglers will catch all the fish and shellfish they eat every day for a 30 to 70 year period from the NASSCO leasehold. Evaluation of Draft Technical Report for Tentative Cleanup and Abatement Order No. R9-2011-0001 for the NASSCO Shipyard Sediment Site ("Ginn Report"), at 81, 88; DTR, at 28-12, 28-13, Table 28-7; Alo Depo, at 93:12-18, 94:19-95:11, 101:3-23. This is highly unrealistic. NASSCO is a militarily-secured facility with no public access, where fishing is not allowed. Moreover, there is no evidence that the NASSCO leasehold (43 acres in size) could supply all the fish and shellfish San Diego Bay recreational and subsistence anglers catch daily for 30 to 70 years. Expert Opinion Letter Regarding Draft Technical Report for Tentative Cleanup and Abatement Order No. R9-2011-0001 ("Finley Report"), at 17; Alo Depo, at 144:9-144:14.

Second, the DTR assumes subsistence anglers always consume the entire fish or shellfish (including the skin, guts, liver, and other organs), and not just the fillet or edible portion, which substantially increases risk because internal organs typically contain higher chemical concentrations. DTR, at 28-17. To assume that *all* subsistence anglers *always* consume the entire fish is excessively conservative and unrealistic. Alo Depo, at 121:18-25. In fact, the Santa Monica Bay angler study—which formed the basis for the consumption rates used in the DTR—found that only *one percent* of surveyed anglers consumed the whole fish. Ginn Report, at 89. Thus, rather than blindly assuming that all subsistence anglers always consume the entire fish or shellfish, it would have been more reasonable to assume consumption based on site-specific data.

Third, the DTR assumes that subsistence anglers consume *only* spotted sand bass or lobster, but neglect other species caught by anglers, thereby overestimating exposure to chemicals. For example, a significant portion of the typical sport catch includes topsmelt and jacksmelt, which have much lower maximum PCB concentrations than spotted sand bass. Ginn Report, at 88. Accordingly, by assuming that anglers *always* consume *only* the species of fish with the highest maximum chemical concentrations, the DTR overestimates exposure. *Id.*

Fourth, the DTR assumes that the maximum measured chemical concentrations in spotted sand bass and lobster are representative of typical exposure for recreational and subsistence anglers, despite the fact that multiple samples were collected at each sampling station. DTR, at 28-17. This simplistic approach "gives no insight as to the potential variability in the risk estimates as a function of the range and frequency of measured contaminant levels. In essence, each of the risk estimates presented by the [DTR] relies on a single measured (in this case, maximum) value, which can yield a highly biased risk estimate, particularly if the underlying data set is skewed." Finley Report, at 14. Furthermore, the 1989 EPA guidance the DTR relies on was superseded in 2005. *Id.* The DTR should have based risk estimates on measures of central tendency (such as means, averages, and/or distributions of the underlying measured concentrations), instead of selecting maximum measurements as the typical exposure.

Finally, the DTR assumes the highest possible value of inorganic arsenic observed in literature reviews, instead of collecting and analyzing actual fish tissue from the Site for inorganic arsenic. Because Staff uses the highest estimate, not real-world data, the DTR's conclusion that inorganic arsenic in seafood theoretically harvested at the NASSCO site "poses a theoretical increased" cancer risk compared to reference areas is invalid. Ginn Report, at 87.

In sum, the human health risk finding is driven by excessively conservative, unrealistic assumptions that are inappropriate in a Tier II analysis. Correcting the DTR's errors, Dr. Finley, a board-certified toxicologist with over 20 years of experience conducting and managing human health risk assessments, found that fish and shellfish caught at NASSCO do not pose a significant risk to human health. Finley Report, at 23-28. Accordingly, the DTR and TCAO should be revised to incorporate Dr. Finley's analysis and conclusions.

B. There Is No Significant Risk To Aquatic-Dependent Wildlife (TCAO, ¶ 21)

The DTR erroneously concludes that aquatic-dependent wildlife uses are impaired, based on theoretical exposure models that are replete with excessively conservative and unrealistic assumptions that do not follow regulatory guidance, and bias the results towards finding risk.

The DTR modeled the dietary exposure of six representative species—the California least tern, California brown pelican, Western grebe, Surf scoter, and East Pacific green turtle—to

predict whether these species are likely to be affected by the concentrations of chemicals observed in the fish, shellfish, and eelgrass at the Site. The DTR then compared these predicted exposures to risk thresholds and chemical exposure levels of species foraging in reference areas. At least two of the DTR's unrealistic assumptions in the Tier II risk analysis make it unreliable.

First, the DTR assumes that each species obtains *all* of its food from the Site, greatly inflating the predicted degree of risk to each species. DTR, at 24-10, Table 24-6 (Area Use Factor set to 1). This is plainly unrealistic since all six species have home ranges substantially larger than the 43 acre NASSCO leasehold (an active heavy industrial zone, unattractive to most wildlife). Ginn Report, at 61, Table 6; Alo Depo, at 331:16-19, 334:3-15, 335:8-336:3, 339:5-9, 346:10-13. It also disregards regulatory guidance, which require consideration of site-specific information regarding available habitat, and the foraging preferences and behavior of target species. *Id.* at 59. Using conservative, realistic use factors that assume species obtain a portion of their diet from the Site shows no significant risks to aquatic-dependent wildlife. *Id.* at 60.

Second, it is generally accepted that the point where adverse effects from dietary exposure to a given chemical occurs lies somewhere *between* the established "no-observed-adverse-effect-level" ("NOAEL") (a level of exposure that is believed to have no adverse effects on receptors of concern) and the "lowest-observed-adverse-effect-level" ("LOAEL") (the lowest level of exposure shown to have *any* adverse effects on receptors of concern). Alo Depo, at 357:2-358:1. Accordingly, when a creature is exposed to a chemical above the LOAEL, it is likely that adverse effects will be observed; however, there is no evidence that adverse effects will be observed for exposure above the NOAEL but below the LOAEL. DTR, at 24-12.

The DTR finds aquatic-dependent wildlife impairment only by setting the risk threshold at the no-effects level (NOAEL), even though the true point where adverse effects will occur is somewhere *above* the NOAEL. DTR, at 24-12; Alo Depo, at 360:11-361:7. This approach is inconsistent with agency guidance. Ginn Report, at 67, 70-71; Alo Depo, at 357:2-358:1. Significantly, even assuming that *all* species obtained *all* of their food from the shipyard, *not a single species exceeded the lowest-effects level (LOAEL) for any chemical.* DTR, at 24-6, Table

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24-3. Without these unrealistic assumptions, the adverse aquatic-dependent wildlife finding is unsupportable.

C. There Is No Significant Risk To Aquatic Life (TCAO, ¶ 14)

1. Framework For Assessing Aquatic Life

The aquatic life impairment analysis is based on a "weight of the evidence" approach that examines "multiple lines of evidence" to determine whether sediment-dwelling creatures are adversely affected by sediment chemicals. DTR, at § 18. The three lines of evidence—which form the sediment "triad"—include sediment chemistry, sediment toxicity, and benthic community data. For each line of evidence, the DTR determines whether sediment poses a "low," "moderate," or "high" likelihood of adverse impacts to sediment-dwelling creatures. *Id.* The DTR then assigns an "impairment category" of either "unlikely," "possibly," or "likely" impacts to each station, based on whether the combined lines of evidence indicate "low," "moderate," or "high" likelihood of effects. *Id.* As demonstrated below, the framework is biased towards finding "likely" impacts, even where impacts do not exist.

2. The DTR Is Biased Because It Assumes All Sediment Will Have At Least A "Low" Likelihood of Adverse Effects On Aquatic Life

The framework is biased towards finding adverse effects because it does not allow the possibility of "no" likelihood of impacts. DTR, at 18–26-27. Instead, it assumes that all sediment will impact sediment-dwelling creatures to some degree. Even pristine sediment would be characterized as having a "low" likelihood of impacts, and would be categorized as "unlikely" to be impaired (instead of definitively "unimpaired"). Alo Depo, at 232:13-22, 299:8-300:17. This framework (developed by Staff and the environmental community without industry stakeholders), conflicts with the State Board's Sediment Quality Objectives, which allow for "unimpacted" or "inconclusive" findings. DTR, at 15–2-3; Alo Depo, at 289:7-290:6.

3. The DTR Places Undue Weight On Sediment Chemistry

Sediment chemistry is a poor diagnostic tool when used in isolation. Ginn Report, at 13, 52-54. Indeed, that is why the Board required the Exponent triad investigation in 2001. Furthermore, staff recognize that "high" chemistry does not necessarily indicate biological

impacts. DTR, at 15-1 ("[S]ediment chemistry . . . provides inadequate information to predict biological impact"); Deposition of David Gibson ("Gibson Depo"), at 143:7-13 ("Q: [S]hould . . . evidence of toxicity be given more weight than chemistry? A. . . . yes because the reaction of the organism itself is a better indicator of true risk than the chemistry alone; but they do have to both be considered together."); Alo Depo, at 227:10-18, 228:22-229:3.

Yet the framework erroneously places undue emphasis on sediment chemistry. For example, whenever sediment chemistry is "high"—even where little or no toxicity or adverse effects on sediment-dwelling creatures is observed—the conclusion must be "likely" or "possibly" impacted, contrary to the State Sediment Quality Objectives. DTR, at 18-26, Table 18-14.

Over-emphasis on sediment chemistry is especially disturbing considering how that line of evidence is assessed. The DTR classifies sediment chemistry as presenting a "low," "medium," or "high" likelihood of adversely affecting sediment-dwelling creatures based on whether chemical concentrations exceed certain benchmarks set forth in generic sediment quality guidelines ("SQGs"). This approach, however, ignores the fact that SQGs are guidelines, used to *predict* whether adverse effects will be found in field studies measuring toxicity and benthic communities, not whether a chemical *actually is* causing ill effects. Alo Depo, at 225:13-226:16. This means the framework relies more on a predictive tool, uncalibrated to the Site, than on the direct measures of how sediment-dwelling creatures at the Site are actually responding.

4. Sediment-Dwelling Creatures At Most Stations At NASSCO Are As Healthy As They Are At Reference Stations in San Diego Bay

The condition of actual sediment-dwelling creatures at the five NASSCO polygons slated for remediation is nearly indistinguishable from creatures at San Diego Bay reference stations. Three NASSCO remedial areas (NA06, NA15, NA17) are equivalent to reference conditions along all seven biological metrics examined, including three sediment toxicity tests (amphipod survival; sea urchin fertilization; bivalve development) and four benthic community metrics (BRI; abundance; number of taxa; Shannon-Wiener diversity). DTR, Tables 18-8, 18-12; Figure F-1, Toxicity and Benthic Community Results for NASSCO Stations Within The Remedial

Footprint (Alo Depo, Ex. 1123). Two other polygons (NA09, NA19) are equivalent to reference under all metrics except the bivalve larvae test (an experimental test ultimately plagued by extreme variability, even at reference stations). Alo Depo, at 255:18-25, 262:6-267:16.

These results strongly suggest that chemicals in Site sediments have limited bioavailability (a measure of the potential for a chemical to enter into ecological or human receptors). Bioavailability recognizes that the *form* of a chemical substance often dictates whether organisms will be affected. For example, a fish may be unaffected by the addition of a copper wire to its tank, whereas the addition of copper sulfate is likely to be lethal. Importance of Bioavailability for Risk Assessment of Sediment Contaminants at the NASSCO Site—San Diego Bay ("Allen Report"), at ii; Barker Depo, at 91:16-92:29; Alo Depo, at 225:24-226:16.

Despite the framework's bias towards finding adverse effects by overemphasizing sediment chemistry and failing to adequately assess bioavailability, only NA19 is designated as "likely" impaired. NA09 and NA17 are designated "possibly" impaired, and NA06 and NA15 are "unlikely" to be impaired. Figure F-2, NASSCO Remedial Stations by Triad Designation; DTR, at Table 18-1. Viewing all of the direct lines of evidence -- toxicity and benthic community analyses -- for all NASSCO stations demonstrates that there is minimal impairment to aquatic life at the Site. See Figure 3; Alo Depo, Exs. 1124-1125. It simply does not make sense to spend tens of millions of dollars "remediating" these polygons based on the DTR's improper emphasis on sediment chemistry.

IV. MONITORED NATURAL ATTENUATION ("MNA") IS LEGALLY REQUIRED, SCIENTIFICALLY SUPPORTED, AND ECONOMICALLY JUSTIFIED

Not only is MNA scientifically supported and economically justified, but it is also legally sanctioned. As discussed below, the Board is constrained by legal principles, including the Water Code, State Board Resolution 92-49, and principles of fundamental fairness and due process, which prohibit dredging from being selected as the preferred remedy in the TCAO.

A. Massive Dredging In The Order Is Contrary To Law Because It Is Neither Scientifically Justified Nor Economically Feasible

///

1. The Order Treats NASSCO Differently Than Similarly Situated Dischargers In Violation of Resolution No. 92-49, And Principles Of Due Process And Equal Protection

Resolution 92-49, promulgated as a regulation, provides that the "Regional Water Board shall: . . . [p]rescribe cleanup levels which are *consistent* with appropriate levels set by the Regional Water Board for analogous discharges that involve similar wastes, site characteristics, and water quality considerations." *Id.* at II.A.9 (emphasis added); Barker Depo, at 345:12-17 (Resolution 92-49 ensures that Regional Boards treat similar sites similarly). Principles of due process and equal protection also require fundamental fairness, and similar treatment under the law. U.S. Const. amend. XIV, §1; Cal. Const. art. I, §§ 7, 15.

Over the past decade, the Board has prescribed cleanup levels for sediments at shipyard and boatyard locations on San Diego Bay with nearly identical discharges and beneficial uses. *See, e.g.,* Barker Depo, at 362:15-365:5; Barker Depo, Exs. 1209, 1210 at Exhibit A, 1211-1219. Despite substantial similarities between these sites and NASSCO, however, the TCAO would impose radically more stringent cleanup levels upon NASSCO. This departure from precedent violates Resolution 92-49's consistency rule, and due process and equal protection principles. TCAO, at ¶ 32, DTR, at 32-1.

For example, Staff calculated cleanup levels for the Campbell Shipyard using an apparent effects approach, but used the *lowest* apparent effects threshold (with an additional 40% "safety" buffer to further reduce the cleanup levels) to reach exceptionally low cleanup levels at NASSCO compared to other sites in the Bay, and nationwide. Barker Depo, 373:14-374:22; 944:18-949:21. The requirement that similar sites be treated similarly is rendered meaningless if a site like the Campbell *Shipyard*—located less than a mile from the NASSCO *Shipyard*, operating during similar time-frames, discharging the same types of pollutants to the same water body, and subject to the same beneficial uses—is not considered a "similar site."

2. The Proposed Dredging Is Not Economically Feasible Within The Meaning of Resolution No. 92-49

The Water Code recognizes competing demands on San Diego Bay, including marine industrial uses. For this reason, the Water Code and Resolution 92-49 explicitly require

Regional Boards to "consider[] all demands being made and to be made on [the Bay] and the total values involved," and to ensure that recommended cleanups are economically feasible and cost-effective. Cal. Water Code § 13000; Resolution 92-49, at III.G. The Board must objectively "balanc[e] . . . the incremental benefit of attaining further reduction in the concentrations of primary [contaminants of concern] [against] the incremental cost of achieving those reductions." DTR, at 31-1.

By this standard, the incremental benefits of dredging, if any, do not justify the increased cost when compared to MNA. First, the TCAO recommends dredging expected to cost $60 to $72 million. Yet experts agree that human health, aquatic-dependent wildlife, and aquatic life beneficial uses are not impaired when assessed using conservative, real-world assumptions. Dredging will reduce chemical concentrations in sediment faster than MNA, but will offer no long-term improvement to beneficial uses because they *already* meet reference conditions at NASSCO. It is not economically feasible or cost-effective to spend tens of millions for little to no improvement in beneficial uses, especially when the same result can be achieved through MNA at substantially less cost, with substantially less community and environmental impacts.

Second, the DTR's economic feasibility analysis confirms that the TCAO violates Resolution 92-49's cost-effectiveness requirement, even when the "benefits" of cleanup are assessed using the DTR's flawed, excessively conservative, unrealistic impairment analyses. DTR, at 31-4. The DTR indicates that any cleanup beyond $24 million is not economically feasible because "[t]he highest net benefit per remedial dollar spent occurs for the first $24 million (12 polygons) [but] [b]eyond $24 million . . . exposure reduction drops consistently as the cost of remediation increases." *Id.* When Site polygons are ranked on a "worst-first" basis, only NA06 and NA17 fall among the 12 "worst" polygons for which dredging is economically feasible. Accordingly, the TCAO illegally requires dredging of NA09, NA15, and NA19, even though the DTR's excessively conservative, unrealistic analysis clearly shows that the additional benefits to be gained by dredging those polygons, if any, are not justified. DTR, Table A-31-4.

B. Monitored Natural Attenuation Must Be Adopted Because It Is Substantially Likely To Achieve Cleanup Goals Within A Reasonable Time

Under Water Code Section 13360, the Board may not specify the particular manner by which dischargers cleanup or abate the effects of their wastes, and a person subject to an order under Water Code Section 13304 may comply with it in any lawful manner. "To ensure that dischargers have the opportunity to select cost-effective methods for cleaning up and abating their discharges, the . . . Board must concur with any cleanup and abatement proposal which the dischargers have demonstrated has a substantial likelihood of achieving compliance with cleanup goals and objectives within a reasonable timeframe." Response To Comments Report, at 1-26 (emphasis omitted).

MNA is a recognized, scientifically-sound remedy that has been used by the Board, and comports with both the Water Code and Resolution 92-49. Barker Depo, 262:23-263:21, Ex. 1226; Gibson Depo, at 149:9-20. For example, Water Code Section 13304, which requires a discharger to "cleanup *or abate the effects* of the waste," makes clear that wastes need not be actively dredged if the effects can be abated. *Id.* (emphasis added). Likewise, Resolution 92-49 supports the use of MNA, provided there is evidence that the requisite cleanup levels will be attained "within a reasonable time frame" after site closure. *Id.* at III.A.

The dischargers have long proposed MNA because the record demonstrates that MNA has a substantial likelihood of achieving compliance with cleanup goals within a reasonable timeframe. *See* Resolution 92-49; Cal. Water Code § 13304; Barker Depo, Exs. 1212-1218, 1225-1228; Gibson Depo, Ex. 1304. Accordingly, the Board is legally obligated to concur.

C. Monitored Natural Attenuation Has Been The Preferred Remedy Since 2003

Sediment experts have recommended MNA as the best remedy for the Site since 2003. Shipyard Report, at 19-13. This is because dredging will provide minimal, if any, incremental benefit, at a very high cost, will also destroy the Site's healthy, mature benthic communities, and risk altering the habitat in ways that can affect the health or type of community to be established after dredging (e.g., altering habitat in ways that prevent re-colonization, or create potential for re-colonization by invasive species). *Id.* at 15-10. By contrast, MNA risks no negative impacts and, once off-site sources are controlled, the "natural recovery of benthic macroinvertebrate communities would be expected to occur within a 3-5 year period." *Id.* at 15-3.

D. Site-Specific Conditions Strongly Support Monitored Natural Attenuation

NASSCO meets the criteria defined in the DTR to identify when a site is "particularly conducive" to MNA. *See* DTR, at 30-2. First, the Site contaminants have limited bioavailability, and toxicity to benthic organisms is extremely low.

Second, recent testing in 2009 (by Exponent) and 2010 (by AMEC for BAE) provide evidence that natural attenuation is already occurring. The "dead zone" that existed pre-1960 has rebounded to support mature benthic communities, according to both Sediment Profile Imaging (more than one hundred photographs taken of benthic conditions) and benthic community analyses. Further, Surface-Weighted Area Concentrations ("SWACs") for each of the five primary contaminants of concern have decreased substantially since 2001-02, and in many cases, are only slightly higher than the post-remedial SWACS prescribed by the TCAO. Barker Depo, Ex. 1228. This suggests that the TCAO's cleanup goals can be achieved in a reasonable time through MNA. In fact, for the locations sampled in 2009 (which were selected to be representative of site-wide conditions), three of the five SWACs for primary contaminants of concern *have already attained the post-remedial SWACs that would be required by the TCAO*, and SWACs for the remaining two are only slightly higher than would be required by the TCAO. Barker Depo, at 280:9-19, 336:11-337:13, Ex. 1228.

Finally, NASSCO's strict access controls will prevent public exposure to sediments during the recovery period. NASSCO is a secure military industrial facility that does not permit fishing, swimming, or recreational uses, and will remain so until at least 2040 under the terms of its current lease. This time period is more than sufficient to allow natural attenuation to occur.

E. Dredging Cannot Control Site Recontamination From Chollas Creek

The DTR notes that MNA is not recommended because "[c]omplete control of site sources has not been fully demonstrated to a level that would assure adequate rates of recovery." DTR, at 30-3. Board staff testified logically, however, that re-contamination from off-site sources, such as Chollas Creek, would affect *all* potential remedies. Barker Depo, at 276:9-279:2. Thus, lack of source control is not a basis to reject MNA as a remedy.

///

In fact, the lack of Chollas Creek source control favors MNA, as it makes little sense to spend tens of millions to dredge to unprecedented cleanup levels when ongoing Chollas Creek discharges continue to impact the Site, and are not expected to be controlled for at least 20 years. It is axiomatic that source control be achieved prior to dredging, and common sense dictates that it is a waste of resources to dredge a site at risk of recontamination. It is also technologically infeasible to require compliance with the exceptionally stringent cleanup levels proposed in the TCAO while the Site continues to be impacted by uncontrolled Chollas Creek discharges.

V. CONCLUSION

When excessively conservative, unrealistic assumptions throughout the Draft Technical Report are replaced by conservative but real-world assumptions and actual evidence collected at the Site, the support for the Tentative Order's findings of impairment to human health, aquatic-dependent wildlife, and aquatic life beneficial uses falls away. Furthermore, the minimal benefit to be gained by achieving the Tentative Order's cleanup goals a few years earlier by dredging pales in comparison to the $60-72 million cost (which can be expressed as more than a 1,000 blue collar San Diego jobs), the destruction of the Site's mature and thriving benthic community, and associated community and environmental impacts.

Water Code Section 13360, State Board Resolution 92-49, and principles of due process and equal protection shape the Board's discretion to adopt a Cleanup and Abatement Order. When scientific and economic considerations are weighed appropriately, the most appropriate remedy is Monitored Natural Attenuation, which will ensure that Site conditions remain protective of beneficial uses while sediment chemical concentrations attenuate. NASSCO submits that the remedy selected in the Tentative Order must be amended accordingly.

Dated: October 19, 2011

LATHAM & WATKINS LLP

By _____
Kelly E. Richardson
Attorneys for Designated Party
NATIONAL STEEL AND
SHIPBUILDING COMPANY

PROOF OF SERVICE

I am employed in the County of San Diego, State of California. I am over the age of 18 years and not a party to this action. My business address is Latham & Watkins LLP, 600 West Broadway, Suite 1800, San Diego, CA 92101-3375.

On **October 19, 2011**, I served the following document described as:

NATIONAL STEEL AND SHIPBUILDING COMPANY'S HEARING BRIEF

by serving a true copy of the above-described document in the following manner:

BY ELECTRONIC MAIL

Upon written agreement by the parties, the above-described document was transmitted via electronic mail to the parties noted below on **October 19, 2011**.

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I am familiar with the office practice of Latham & Watkins LLP for collecting and processing documents for hand delivery by a messenger courier service or a registered process server. Under that practice, documents are deposited to the Latham & Watkins LLP personnel responsible for dispatching a messenger courier service or registered process server for the delivery of documents by hand in accordance with the instructions provided to the messenger courier service or registered process server; such documents are delivered to a messenger courier service or registered process server on that same day in the ordinary course of business. I caused a sealed envelope or package containing the above-described document and addressed as set forth below in accordance with the office practice of Latham & Watkins LLP for collecting and processing documents for hand delivery by a messenger courier service or a registered process server.

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I declare that I am employed in the office of a member of the Bar of, or permitted to practice before, this Court at whose direction the service was made and declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed on **October 19, 2011**, at San Diego, California.

Andrea Rasco

Certification of Authenticity of Electronic Submittal

I, Kelly E. Richardson, declare:

I am a partner at Latham & Watkins LLP, counsel of record for National Steel and Shipbuilding Company ("NASSCO") in the Matter of Tentative Cleanup and Abatement Order R9-2011-0001 before the San Diego Regional Water Quality Control Board ("Water Board"). I am licensed to practice law in the State of California and make this declaration as an authorized representative for NASSCO. I declare under penalty of perjury under the laws of the State of California that the electronic version of National Steel and Shipbuilding Company's Hearing Brief, submitted to the "Water Board" and served on the Designated Parties by e-mail on October 19, 2011, is a true and accurate copy of the submitted signed original. Executed this 19th day of October 2011, in San Diego, California.

Kelly E. Richardson

FIGURES

FIGURES

1. Figure F-1, Toxicity and Benthic Community Results for NASSCO Stations Within The Remedial Footprint, Exhibit 1123 to the Deposition of Tom Alo.

2. Figure F-2, NASSCO Remedial Stations by Triad Designation.

FIGURE F-1

Toxicity and Benthic Community Results for NASSCO Stations Within the Remedial Footprint

NA06

Station	Amphipod Survival	Larval Development	Bivalve Development	PAHs	Benthic Community Abundance	Benthic Community Taxa	Benthic Community Diversity
Reference	73% (95% LPL)	42% (95% LPL)	37% (95% LPL)	57.7 (95% UPL)	239 (95% LPL)	22 (95% LPL)	1.8 (95% LPL)
NA06	78%	103%	74%	54.4	611	37	2.7
As Protective As Reference/Background?	Yes	Yes	Yes	Yes	Yes	Yes	Yes

[1] Data from Table 18-8, Draft Technical Report for Tentative Cleanup and Abatement Order R9-2011-01

[2] Data from Table 18-12, Draft Technical Report for Tentative Cleanup and Abatement Order R9-2011-01

Toxicity and Benthic Community Results for NASSCO Stations Within the Remedial Footprint

NA09

Station	Toxicity			Benthic Community			
	Amphipod Survival	Urchin Fertilization	Bivalve Development	BRI	Abundance	Taxa	S-W Diversity
Reference	73% (95% LPL)	42% (95% LPL)	37% (95% LPL)	57.7 (95% UPL)	239 (95% LPL)	22 (95% LPL)	1.8 (95% LPL)
NA09	88%	99%	1%	51.1	862	44	2.6
As Protective As Reference/Background?	Yes	Yes	No	Yes	Yes	Yes	Yes

[1] Data from Table 18-8, Draft Technical Report for Tentative Cleanup and Abatement Order R9-2011-01

[2] Data from Table 18-12, Draft Technical Report for Tentative Cleanup and Abatement Order R9-2011-01

B

Toxicity and Benthic Community Results for NASSCO Stations Within the Remedial Footprint

NA15

Station	Amphipod Survival	Echinoderm Fertilization	Echinoderm Development	BRI	Benthic Community Abundance	Benthic Community Richness	Benthic Community Diversity
Reference	73% (95% LPL)	42% (95% LPL)	37% (95% LPL)	57.7 (95% UPL)	239 (95% LPL)	22 (95% LPL)	1.8 (95% LPL)
NA15	97	88	93	51.0	306	26	2.3
As Protective As Reference/Background?	Yes	Yes	Yes	Yes	Yes	Yes	Yes

[1] Data from Table 18-8, Draft Technical Report for Tentative Cleanup and Abatement Order R9-2011-01

[2] Data from Table 18-12, Draft Technical Report for Tentative Cleanup and Abatement Order R9-2011-01

Toxicity and Benthic Community Results for NASSCO Stations Within the Remedial Footprint

NA17

Station	Toxicity			Benthic Community			
	Amphipod Survival	Urchin Fertilization	Bivalve Development	B-IBI	Benthic Community Guidance	Taxa	S-W Diversity
Reference	73% (95% LPL)	42% (95% LPL)	37% (95% LPL)	57.7 (95% UPL)	239 (95% LPL)	22 (95% LPL)	1.8 (95% LPL)
NA17	95%	88%	80%	55.3	418	33	2.7
As Protective As Reference/Background?	Yes	Yes	Yes	Yes	Yes	Yes	Yes

[1] Data from Table 18-8, Draft Technical Report for Tentative Cleanup and Abatement Order R9-2011-01

[2] Data from Table 18-12, Draft Technical Report for Tentative Cleanup and Abatement Order R9-2011-01

Toxicity and Benthic Community Results for NASSCO Stations Within the Remedial Footprint

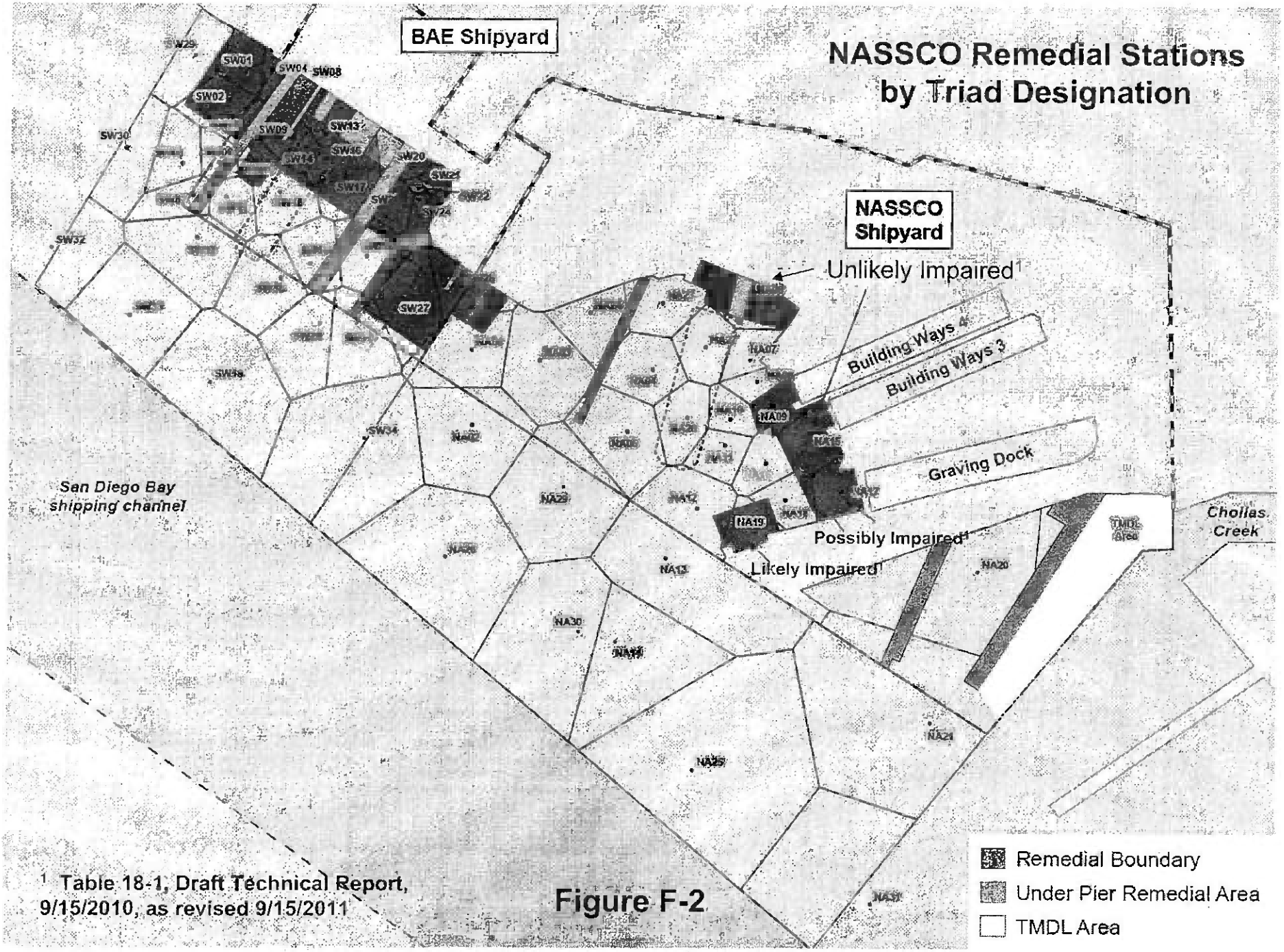
NA19

Station	Toxicity			Benthic Community			
	Amphipod Survival	Urchin Fertilization	Bivalve Development	RPI	Abundance	# Taxa	Sen' Diversity
Reference	73% (95% LPL)	42% (95% LPL)	37% (95% LPL)	57.7 (95% UPL)	239 (95% LPL)	22 (95% LPL)	1.8 (95% LPL)
NA19	89	72	2	46.7	828	43	2.7
As Protective As Reference/Background?	Yes	Yes	No	Yes	Yes	Yes	Yes

[1] Data from Table 18-8, Draft Technical Report for Tentative Cleanup and Abatement Order R9-2011-01

[2] Data from Table 18-12, Draft Technical Report for Tentative Cleanup and Abatement Order R9-2011-01

FIGURE F-2



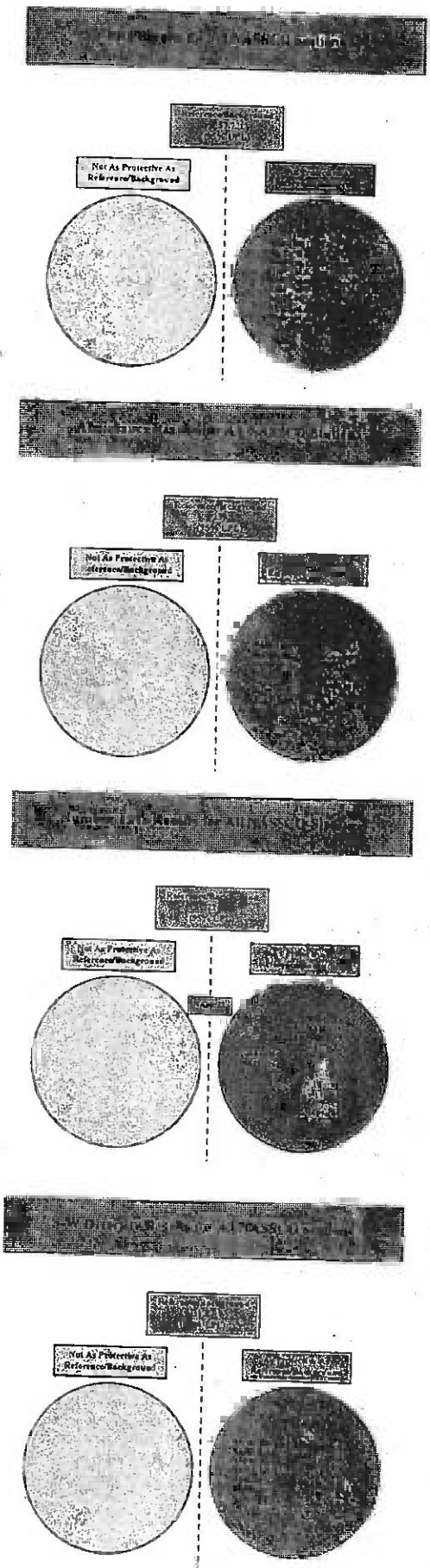
[1] Table 18-1, Draft Technical Report, 9/15/2010, as revised 9/15/2011

Figure F-2

FIGURE F-3

FIGURE F-3

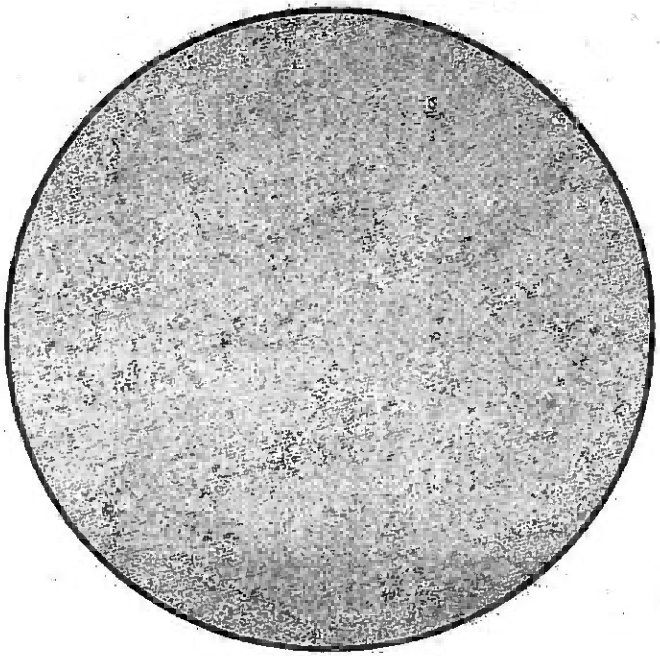
Benthic Community



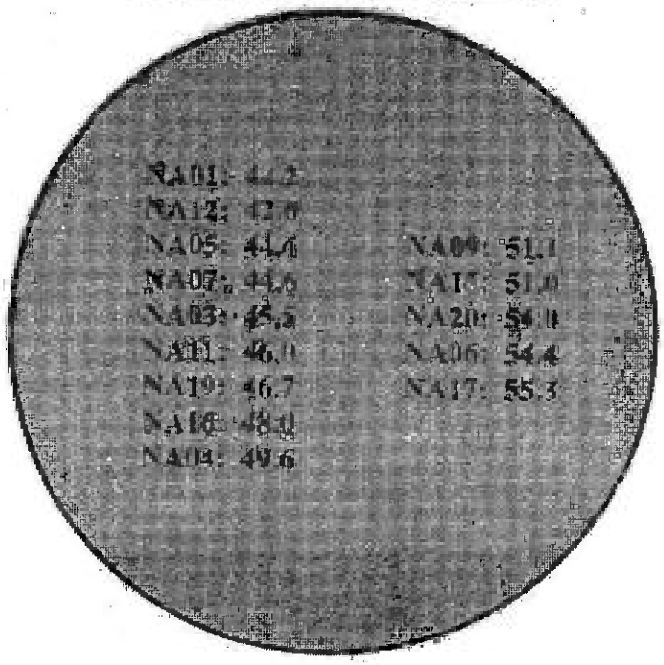
BRI Results for All NASSCO Stations

Reference/Background
CT =
(95% UPL)

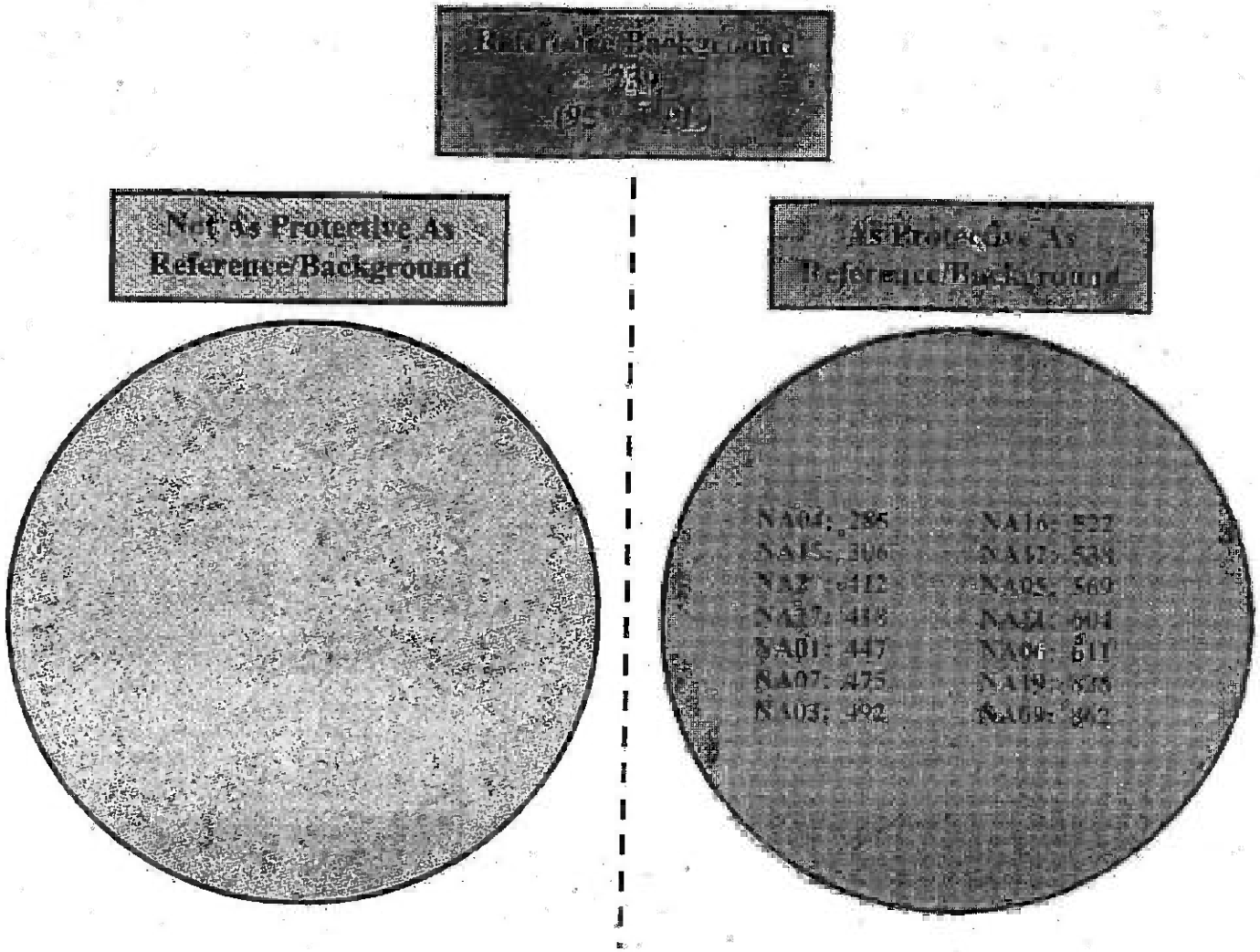
Not As Protective As Reference/Background



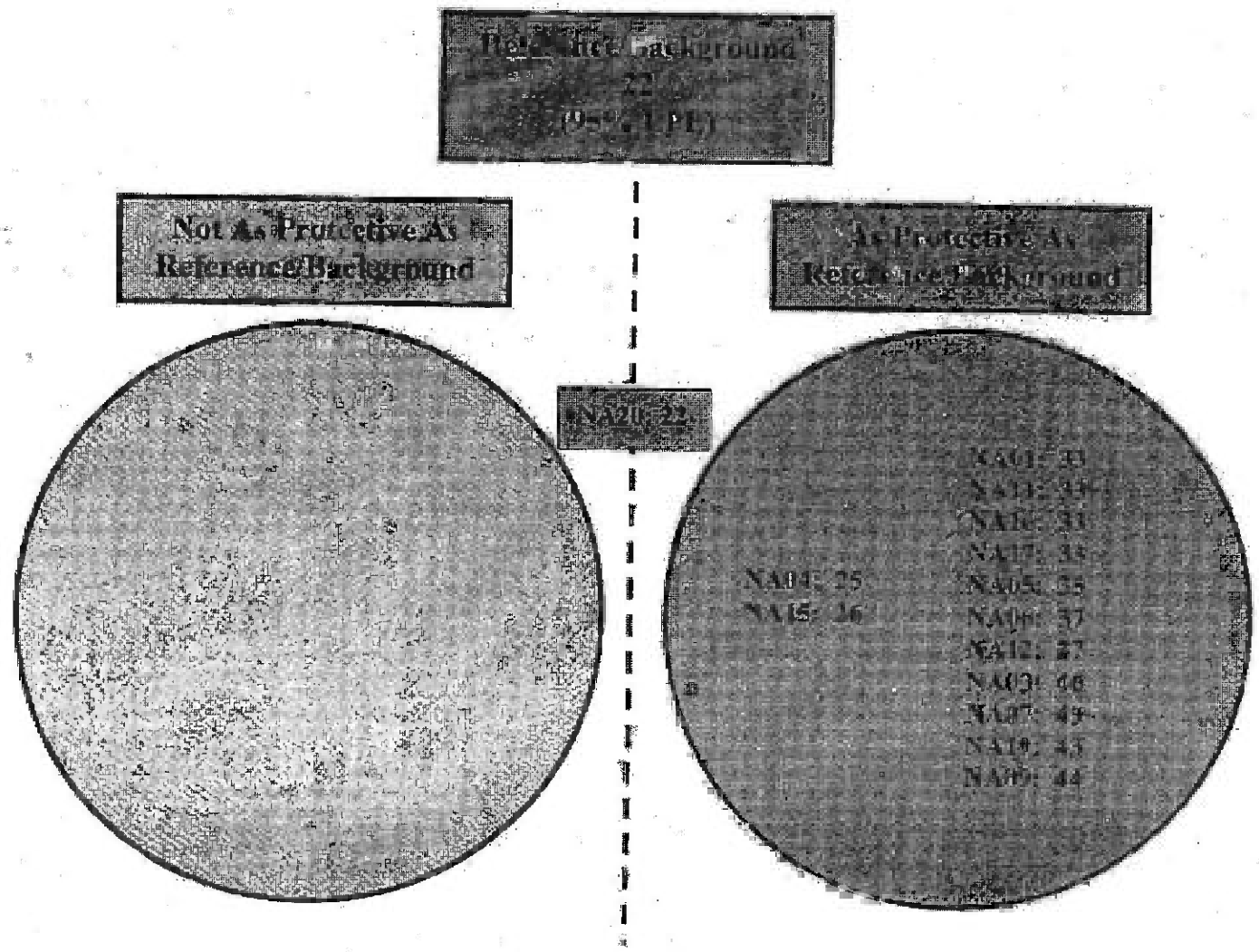
As Protective As Reference/Background



Abundance Results for All NASSCO Stations



Number Test Results for All NASSCO Stations

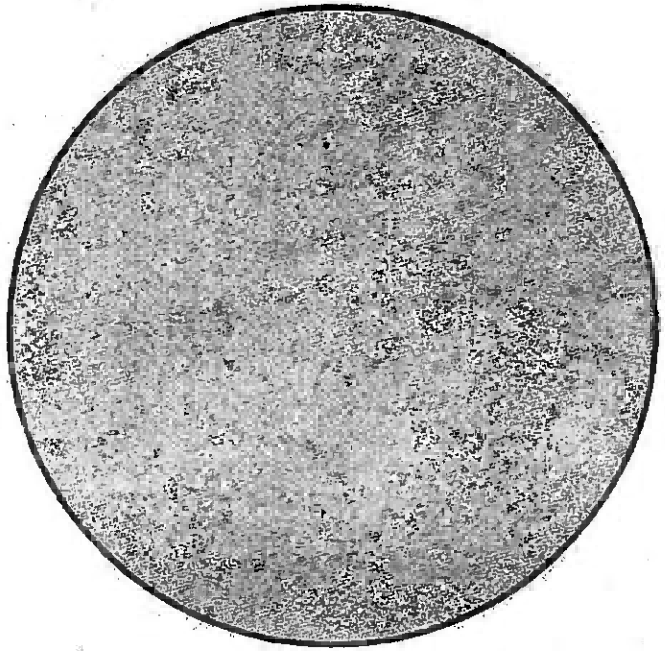


B

S-W Diversity Results for All NASSCO Stations

Reference/Background
1.8
(95% PI)

Not As Protective As Reference/Background



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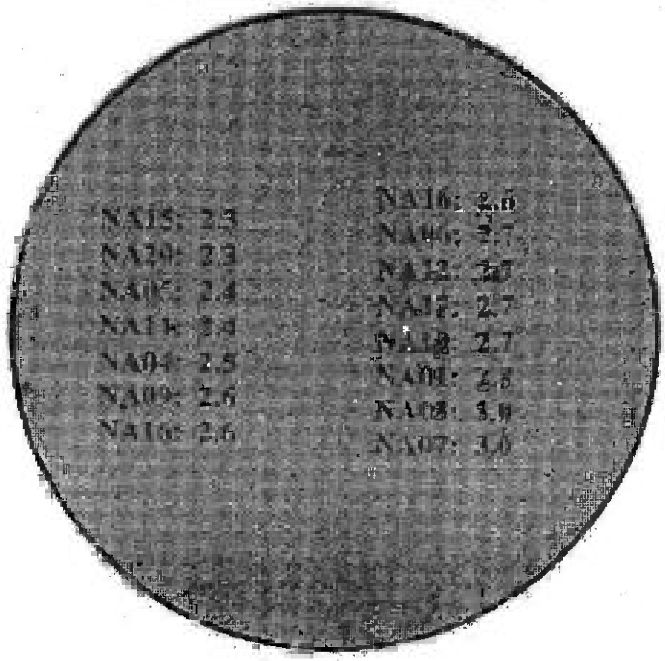
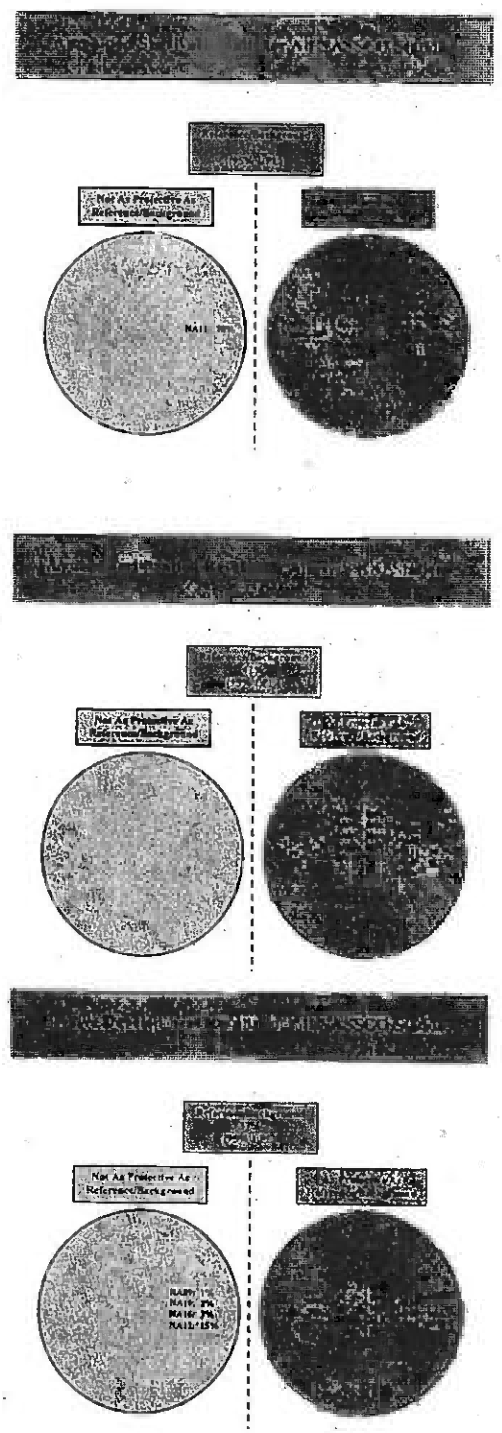


C

Toxicity



Amphipod Survival Results for All NASSCO Stations

Reference Background
73%
(85%-1.1*1)

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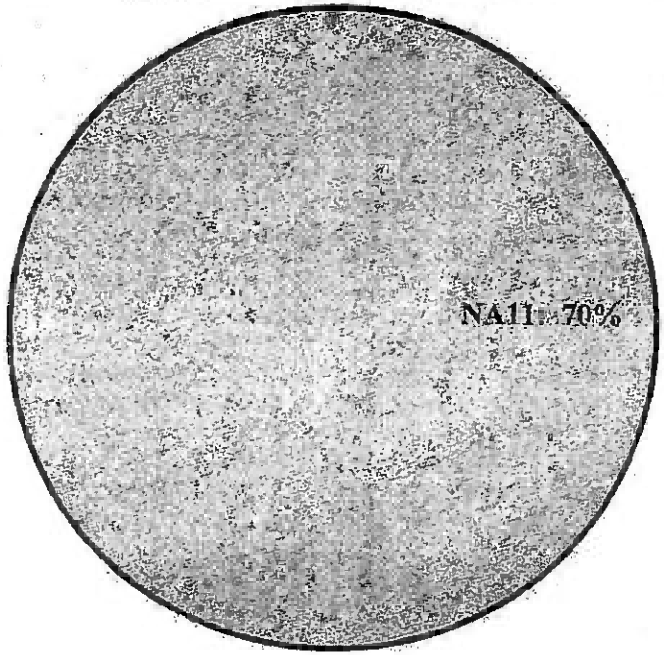

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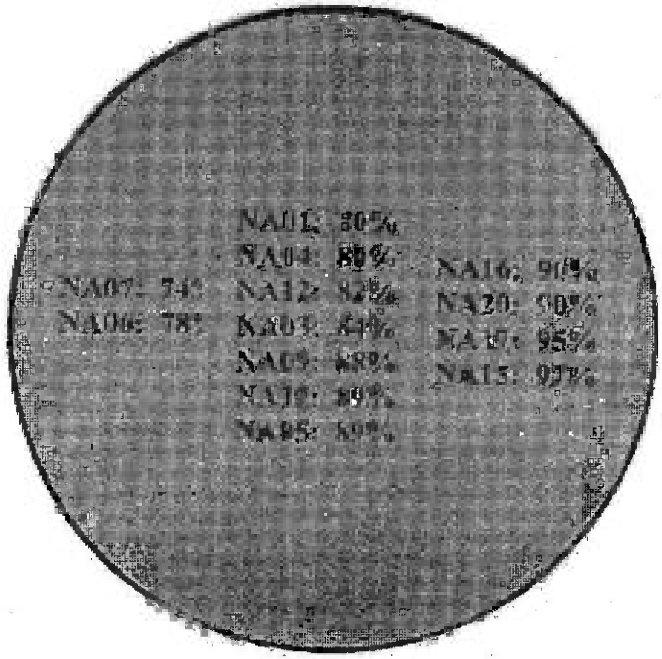
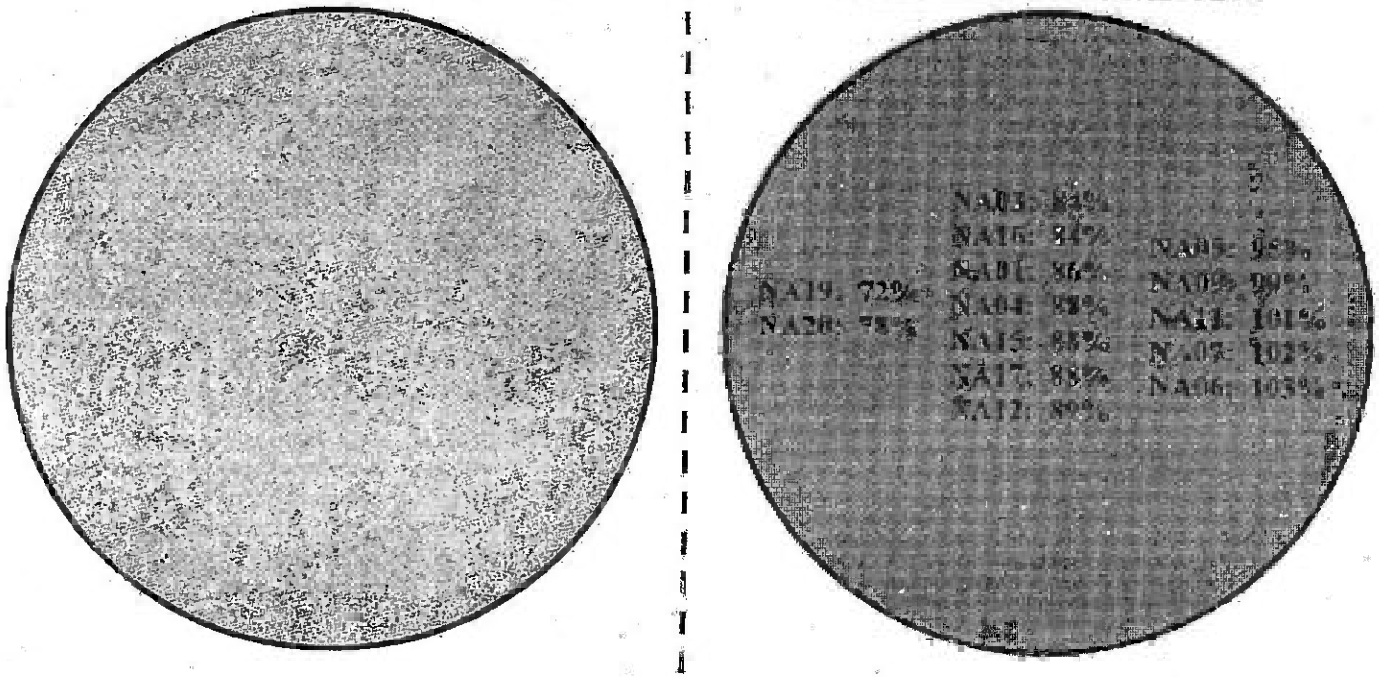


Ecolin Revalidation Results for All NASSCO Stations

Reference Background
<2%
(95% LPL)

Not As Protective As Reference Background

As Protective As Reference Background



Bivalve Development Results for All NASSCO Stations

Reference Background
(95% LPL)

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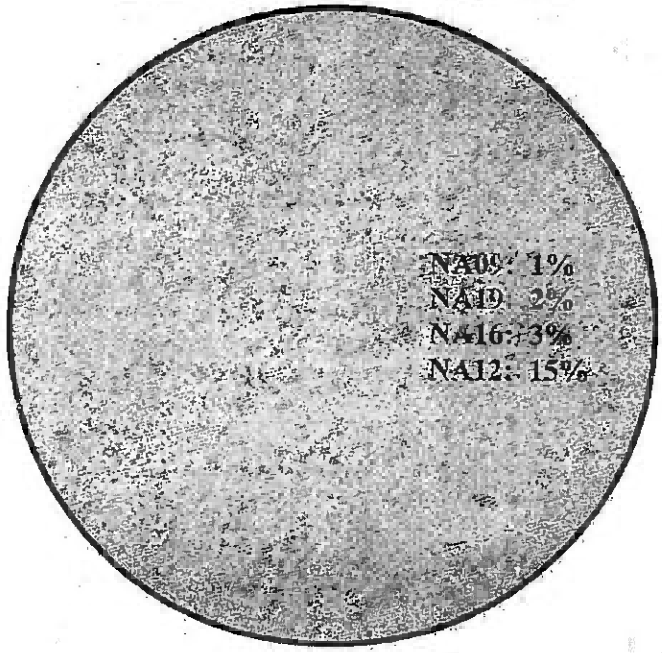

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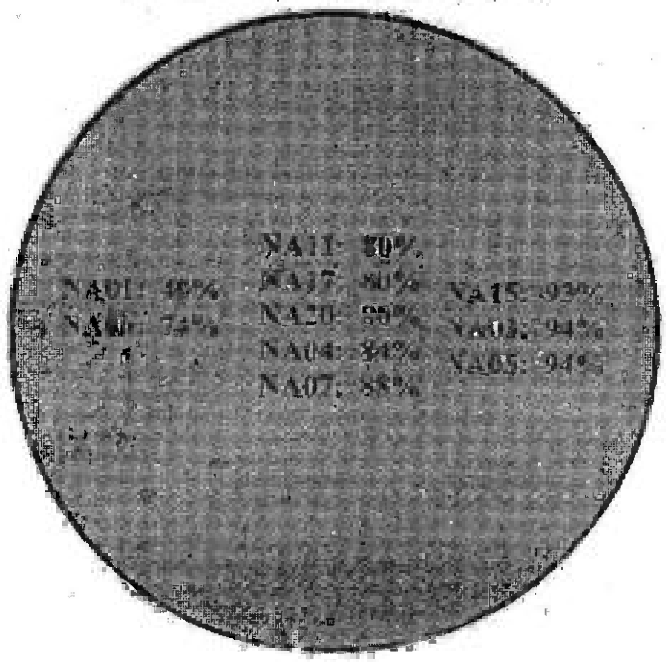


REFERENCES

REFERENCES

Hearing Brief Section	Reference Description	Pages
I	Deposition of Tom Alo, taken In the Matter of Tentative Cleanup and Abatement Order No. R9-2011-0001 on February 16-17, 2011, and Exhibits thereto (submitted to the administrative record on May 26, 2011).	R-4
	California Regional Water Quality Control Board, San Diego Region, Draft Technical Report (September 15, 2010 [SAR382520-SAR384585], as amended on September 15, 2011).	R-7
II	Deposition of David Barker, taken In the Matter of Tentative Cleanup and Abatement Order No. R9-2011-0001 on March 1, 2, 3, and 10, 2011, and Exhibits thereto (submitted to the administrative record on May 26, 2011).	R-9
	Exponent, NASSCO and Southwest Marine Detailed Sediment Investigation (October 10, 2003) [SAR105417-SAR106742].	R-11
	California Regional Water Quality Control Board, San Diego Region, Draft Technical Report (September 15, 2010 [SAR382520-SAR384585], as amended on September 15, 2011).	R-22
III	California Regional Water Quality Control Board, San Diego Region, Tentative Cleanup and Abatement Order No. R9-2011-0001 (September 15, 2010 [SAR382474-382519], as amended on September 15, 2011).	R-24
	California Regional Water Quality Control Board, San Diego Region, Draft Technical Report (September 15, 2010 [SAR382520-SAR384585], as amended on September 15, 2011).	R-26
III-A	California Regional Water Quality Control Board, San Diego Region, Draft Technical Report (September 15, 2010 [SAR382520-SAR384585], as amended on September 15, 2011).	R-31
	Ginn, Thomas Ph.D., Evaluation of Draft Technical Report for Tentative Cleanup and Abatement Order No. R9-2011-0001 for the NASSCO Shipyard Sediment Site (March 11, 2011).	R-36
	Deposition of Tom Alo, taken In the Matter of Tentative Cleanup and Abatement Order No. R9-2011-0001 on February 16-17, 2011, and Exhibits thereto (submitted to the administrative record on May 26, 2011).	R-42
	Finley, Brent Ph.D., Expert Opinion Letter Regarding Draft Technical Report for Tentative Cleanup and Abatement Order No. R9-2011-0001 (March 11, 2011).	R-49

III-B	California Regional Water Quality Control Board, San Diego Region, Draft Technical Report (September 15, 2010 [SAR382520-SAR384585], as amended on September 15, 2011).	R-59
	Ginn, Thomas Ph.D., Evaluation of Draft Technical Report for Tentative Cleanup and Abatement Order No. R9-2011-0001 for the NASSCO Shipyard Sediment Site (March 11, 2011).	R-63
	Deposition of Tom Alo, taken In the Matter of Tentative Cleanup and Abatement Order No. R9-2011-0001 on February 16-17, 2011, and Exhibits thereto (submitted to the administrative record on May 26, 2011).	R-71
III-C	California Regional Water Quality Control Board, San Diego Region, Draft Technical Report (September 15, 2010 [SAR382520-SAR384585], as amended on September 15, 2011).	R-82
	Deposition of Tom Alo, taken In the Matter of Tentative Cleanup and Abatement Order No. R9-2011-0001 on February 16-17, 2011, and Exhibits thereto (submitted to the administrative record on May 26, 2011).	R-114
	Ginn, Thomas Ph.D., Evaluation of Draft Technical Report for Tentative Cleanup and Abatement Order No. R9-2011-0001 for the NASSCO Shipyard Sediment Site (March 11, 2011).	R-139
	Deposition of David Gibson taken In the Matter of Tentative Cleanup and Abatement Order No. R9-2011-0001 on March 11, 2011, and Exhibits thereto (submitted to the administrative record on May 26, 2011).	R-145
	Allen, Herbert Ph.D., Importance of Bioavailability for Risk Assessment of Sediment Contaminants at the NASSCO Site—San Diego Bay (March 11, 2011).	R-147
	Deposition of David Barker, taken In the Matter of Tentative Cleanup and Abatement Order No. R9-2011-0001 on March 1, 2, 3, and 10, 2011, and Exhibits thereto (submitted to the administrative record on May 26, 2011).	R-149
IV	State Water Resources Control Board, Resolution 92-49 (as Amended on April 21, 1994 and October 2, 1996), Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code Section 13304 [SAR286333-286353]	R-152
	Deposition of David Barker, taken In the Matter of Tentative Cleanup and Abatement Order No. R9-2011-0001 on March 1, 2, 3, and 10, 2011, and Exhibits thereto (submitted to the administrative record on May 26, 2011).	R-157
	California Regional Water Quality Control Board, San Diego Region, Tentative Cleanup and Abatement Order No. R9-2011-0001 (September 15, 2010 [SAR382474-382519], as amended on September 15, 2011).	R-214

	California Regional Water Quality Control Board, San Diego Region, Draft Technical Report (September 15, 2010 [SAR382520-SAR384585], as amended on September 15, 2011).	R-218
	California Regional Water Quality Control Board, San Diego Region, Response to Comments Report, Tentative Cleanup and Abatement Order No. R9-2011-0001 and Draft Technical Report for the Shipyard Sediment Site, San Diego Bay (August 23, 2011).	R-230
	Deposition of David Gibson taken In the Matter of Tentative Cleanup and Abatement Order No. R9-2011-0001 on March 11, 2011, and Exhibits thereto (submitted to the administrative record on May 26, 2011).	R-232
	Exponent, NASSCO and Southwest Marine Detailed Sediment Investigation (October 10, 2003) [SAR105417-SAR106742].	R-236

I. INTRODUCTION

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

SAN DIEGO REGION

IN THE MATTER OF:	)	
	)	Order No.
TENTATIVE CLEANUP AND ABATEMENT	)	R9-2011-001
	)	
	)	

DEPOSITION OF TOM ALO

VOLUME I, PAGES 1 THROUGH 210

FEBRUARY 16, 2011

SAN DIEGO, CALIFORNIA

REPORTED BY: JULIE A. MCKAY, CSR NO. 9059

page 28-19 of the DTR.

Do you see that table?

A. Yes, I do.

Q. Mr. Alo, what was the concentration of mercury in spotted sand bass in the reference areas?

A. According to Table 28-9 of the DTR, the mercury -- total mercury concentration in spotted sand bass collected at reference was 0.19 milligrams per kilogram.

Q. And what was the result for mercury in spotted sand bass within the NASSCO leasehold?

A. 0.12 milligrams per kilogram.

Q. So do you agree that mercury in fish captured within the NASSCO leasehold was lower than reference conditions?

MR. CARRIGAN: Document speaks for itself.

THE WITNESS: Yes, according to Table 28-9.

BY MR. RICHARDSON:

Q. Is there any reason to believe that Table 28-9 is incorrect?

A. No.

Q. Mr. Alo, the concentration of fish inside the NASSCO leasehold that you've described as 0.12 -- strike that.

Mr. Alo, on page 28-18, the DTR cites U.S. EPA

advisory levels and recommends eating fish listed as having lower levels of mercury.

Do you see that on Section 28.3?

A. Which paragraph?

Q. Paragraph beginning the "2004 U.S. EPA Advisory" --

A. Okay. Yes.

Q. Mr. Alo, if I understand this paragraph correctly, EPA recommends eating lower levels of mercury -- fish with lower levels of mercury such as light canned tuna with concentrations of .12 milligrams per kilogram; is that correct?

A. Yes.

Q. Mr. Alo, isn't that precisely the data for the fish fillets within the NASSCO leasehold?

A. Yes.

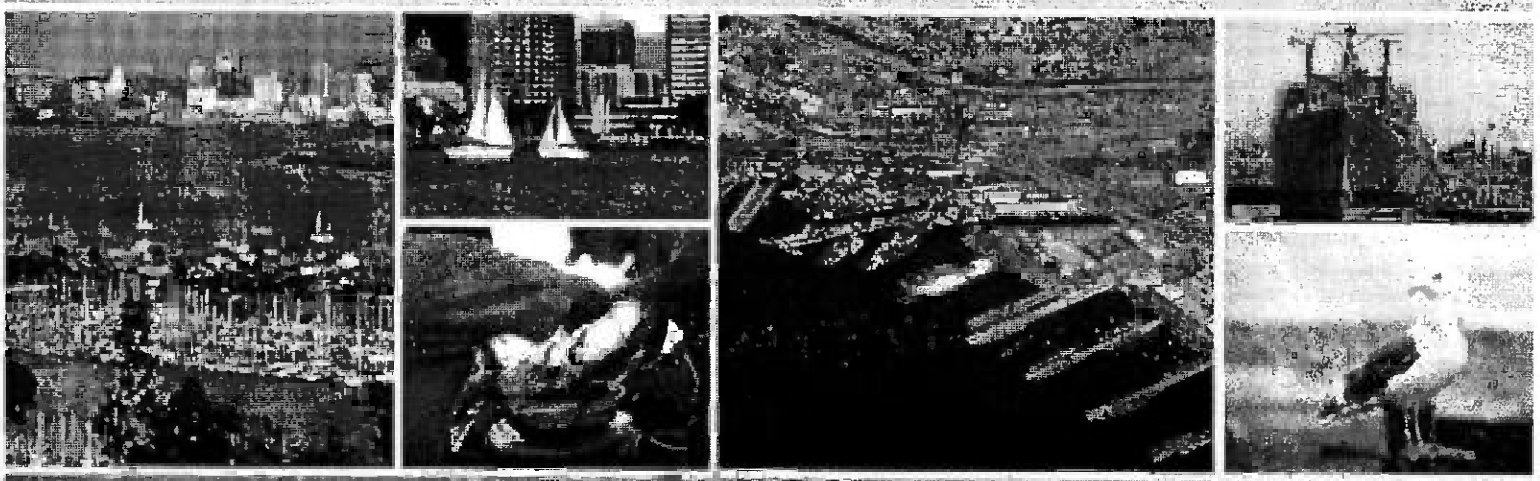
Q. So wouldn't you agree that mercury -- that fish within the leasehold are not impacted for mercury at unsafe levels?

A. Yes. However, based on the results for the Tier 2 risk assessment, the chemicals posing theoretical increased cancer risk include mercury.

Q. Okay, Mr. Alo, we'll come back to that.

A. Okay.

Q. If you look at Table 28-9 again, Mr. Alo, for



DRAFT TECHNICAL REPORT FOR TENTATIVE CLEANUP AND ABATEMENT ORDER NO. R9-2011-0001

FOR THE SHIPYARD SEDIMENT SITE · SAN DIEGO BAY, SAN DIEGO, CA

SEPTEMBER 15, 2010

Water Boards

STATE WATER RESOURCES CONTROL BOARD

REGIONAL WATER QUALITY CONTROL BOARDS

R-7

oil consisted of various waste petroleum, oils, and lubricants. In addition, containers of electrical insulating oils were stored at the site during the 1970s. Some of the containers reportedly leaked but no estimated quantities are available. The storage yard was paved with asphalt in 1975 and is currently used for parking and boat storage. Potential pollutant pathways to Paleta Creek and San Diego Bay during the storage yard's years of operation would have included surface water runoff and pollutant movement through the highly to moderately permeable (10^{-2} to 10^{-3} cm/sec) fill material underlying the site. Part of the storage yard was located adjacent to Paleta Creek along its southern edge, which flows into San Diego Bay approximately 1400 feet west of the storage yard site. Chemical constituents identified at the Salvage Yard Site in the U.S. Navy's 1990s IR Program site investigations have included petroleum, PCBs, and metals.

10.4.1.5. City of San Diego Sewage Treatment Plant

Between the years 1943 through 1963 the City of San Diego owned and operated its main sewage treatment plant at a location in NBSD bounded on the east by Harbor Drive, on the south by Vesta Street, and on the north by Knowlton Williams Road. During its initial years of operation from 1943 to 1950, the 14 million gallon per day (MGD) capacity plant was known as the 32nd Street Sewage Treatment Plant. In 1950 the plant capacity was expanded to 40 MGD capacity to accommodate increasing sewage flows resulting from San Diego's rapidly increasing population. The plant was renamed the Bayside Treatment Plant and was also sometimes referred to as the Harbor Drive Treatment Plant. The sewage treatment plant facilities consisted of maintenance and administration buildings, anaerobic digesters, clarifiers, elutriation tanks, sludge handling facilities, and other associated facilities. Effluent from the sewage treatment plant was discharged into an outfall pipeline and conveyed into San Diego Bay at a point 35 feet below the water line near present day Pier 5, approximately 0.9 miles south of the Shipyard Sediment Site. The Bayside Treatment Plant discharge would typically have included pollutants such as biochemical oxygen demand, suspended solids, grease and oils, metals, bacteria, and pathogens.

San Diego Bay water quality conditions drastically deteriorated during the years 1951-1963 due to the pollution effects caused by Bayside Treatment Plant discharge and other sewage, sludge, and industrial waste discharges entering the bay from various sources (Fairey et al 1996). Dissolved oxygen concentrations in the Bay declined to about half normal levels and turbidity in the water resulted in a visibility of less than 1 meter. Bait and game fish had virtually disappeared from the Bay. Coliform bacteria were routinely isolated from the Bay at significant levels. In 1955, the State Board of Public Health and the San Diego Department of Public Health declared much of the Bay contaminated, and posted quarantine and warning signs along 10 miles of shoreline. By 1963, sludge deposits from the treatment plant outfall were two meters deep, extended 200 meters seaward, and along 9000 meters of the shoreline. In 1960 the U.S. Navy began to complain that the Bayside Treatment Plant discharge was causing advanced corrosion to the hulls of naval ships while in port and that the sewage plant should be moved.[70] (Jamieson, 2002)

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[70] The ship hull corrosion was reportedly caused by electrolysis of the very high levels of organic matter present in San Diego Bay waters at the time. The U.S. Navy estimated at the time that the excessive corrosion was costing $1.5 million dollars a year in repairs.

II. UNPRECEDENTED INVESTIGATION

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

SAN DIEGO REGION

IN RE THE MATTER OF)
)
TENTATIVE CLEANUP AND ABATEMENT)
ORDER NO. R9-2011-0001)
)
)
)

VIDEOTAPED DEPOSITION OF DAVID BARKER

Volume I, Pages 1 - 208

San Diego, California

March 1, 2011

Reported By: Anne M. Zarkos, RPR, CRR,
CSR No. 13095

BY MR. RICHARDSON: 11:30:38

Q. Did the board staff approve of the quality assurance reports? 11:30:38 11:30:40

A. Yes. 11:30:42

Q. The CAO calls the investigation detailed. It sounds like you agree; correct? 11:30:45 11:30:48

A. Yes. 11:30:50

Q. Would you also agree that this sediment investigation conducted at the shipyards is the most extensive sediment investigation ever conducted for a site in San Diego Bay? 11:30:55 11:30:58 11:31:01 11:31:04

A. Yes. 11:31:05

Q. Anywhere else in the state that you're aware of where a more extensive study was conducted for a site? 11:31:08 11:31:10

A. I am not aware of it. 11:31:14

Q. Was the public involved in the development of the study? 11:31:16 11:31:18

A. Very much so, yes. 11:31:20

Q. So the board staff sought -- considered substantial public input from a variety of stakeholders; correct? 11:31:27 11:31:29 11:31:36

MR. CARRIGAN: Vague. 11:31:37

THE WITNESS: Yes. 11:31:37

BY MR. RICHARDSON: 11:31:38

Q. This is referred to in Exhibit 2, Master 11:31:38

Exponent

NASSCO and Southwest Marine Detailed Sediment Investigation

Volume I

Prepared for

NASSCO and Southwest Marine
San Diego, California

Bight '98 Stations 2241, 2256, and 2257 are all included in the final reference pool, and all of these stations are located in the same area of San Diego Bay (south of the shipyards, on the other side of the channel). Bight '98 Station 2258 is also located in this area of the bay, but is not included in the final reference pool.

The inconsistencies in the data selected for the final reference pool clearly indicate that those data were not selected by identifying appropriate reference locations on the basis of proximity to the shipyards, physical conditions, and absence of local sources. Because Regional Board staff have not provided any specific and detailed rationale for the selections, the method by which the final reference pool data were selected is unknown. However, by comparing the final reference pool samples with other data from the same locations, it is apparent that the final reference pool was selected by choosing data points with the lowest available chemistry concentrations, and the lowest available levels of biological responses. As a result, the final reference pool is biased toward the cleanest conditions available anywhere in San Diego Bay, and is not appropriate as a set of site-specific reference stations for the shipyard investigation.

3.2.4 Use of Reference Data for the Shipyard Investigation

Notwithstanding the inappropriateness of the final reference pool, these data have been used to evaluate shipyard conditions, following the direction of Regional Board staff. Because of the bias in the final reference pool, the results of evaluations using those data are biased toward overestimation of potential adverse effects at the shipyards.

The final reference pool is composed predominantly of Bight '98 stations, and there are some technical issues related to use of those data. Several groups of chemicals that were included in the shipyard investigation were not included in the Bight '98 study (and some were also not included in the Navy study). These chemicals include the butyltins, PCB Aroclors®, PCTs, and petroleum hydrocarbons. For these chemicals, reference conditions were characterized by only the Phase 1 data points that were included in the final reference pool. The Bight '98 study had elevated detection limits for PCBs (only selected congeners were measured) and PAHs, and these chemicals were ordinarily undetected. The Bight '98 study reported nondetected values at

using several of the more potent Aroclors®, specifically 1248 or 1254. To the extent that less potent Aroclors® constitute a significant proportion of the total PCB content, such as in the case of forage fish and spotted sand bass where Aroclor® 1260 was detected in all samples, this approach represents a conservative estimate of the potential toxicity resulting from exposure of receptors to PCBs.

10.8.3.3 Polycyclic Aromatic Hydrocarbons

The availability of toxicity data on individual PAHs, particularly with regard to effects on ecologically relevant endpoints such as reproduction, is extremely limited. Therefore, exposure to PAHs was quantified based upon total PAH concentrations. Total PAH was computed as the sum of the concentrations of the following compounds: 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, phenanthrene, benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[j]fluoranthene, benzo[ghi]perylene, benzo[k]fluoranthene, chrysene, fluoranthene, indeno[1,2,3-cd]pyrene, and pyrene. Total PAH concentrations were compared to TRVs developed from studies where animals were only exposed to benzo[a]pyrene. Because benzo[a]pyrene is among the more potent PAHs, comparison of total PAH concentrations to a compound-specific TRV represents a conservative estimate of the potential toxicity resulting from exposure of receptors to PAHs.

10.9 Interpretation of Ecological Significance

Aquatic-dependent wildlife was modeled using conservative, ecologically relevant exposure assumptions to develop representative estimates of risk to receptors foraging near the shipyards. Exposure models indicate that no exposure estimates, for any chemical, exceed either no-effect (i.e., NOAEL-based) or lowest effects (i.e., LOAEL-based) TRVs for any receptor at any of the assessment units. Even under hypothetical, but ecologically unlikely, scenarios that maximize exposure by assuming receptors forage exclusively within an assessment unit, the likelihood of adverse effects is minimal, especially when considering uncertainty associated with exposure estimates and effects thresholds used in the exposure models. Overall, the results of this risk evaluation indicate that chemical concentrations measured in prey and sediment of the

NASSCO and Southwest Marine leaseholds are very unlikely to constitute an unacceptable risk to populations of aquatic-dependent wildlife potentially foraging at these locations. Therefore, the current conditions at the shipyards are protective of beneficial uses associated with aquatic-dependent wildlife.

exceeds the percentage of inorganic arsenic found in fish and shellfish reported in all but a few studies.

11.6 Summary and Conclusions

Chemical concentrations in fish and lobster tissue were screened against TRGs protective for human consumption. Two chemicals, PCBs in both fish and lobster, and mercury in lobster only, exceeded screening TRGs. Concentrations of these two chemicals were further screened against chemical concentrations in fish and lobster from reference areas. Within the NASSCO leasehold, maximum concentrations of mercury in lobster exceeded reference concentrations. Within the Southwest Marine leasehold, maximum concentrations of PCBs in fish and lobster exceeded reference concentrations. Outside the Southwest Marine leasehold, maximum concentrations of PCBs in fish exceeded reference concentrations. These chemicals were selected for evaluation in the human health risk assessment.

Estimated cancer risks associated with PCB exposure were:

- **Inside Southwest Marine Leasehold**—2×10^{-6} for fish consumption and 1×10^{-7} for lobster consumption
- **Outside Southwest Marine Leasehold**—6×10^{-8} for lobster consumption.

The estimated hazard index associated with mercury exposure was:

- **Inside NASSCO Leasehold**—0.05 for lobster consumption

In no case do risks exceed target risk levels. The existing conditions at the shipyards are protective of beneficial uses associated with human health. Therefore, it is unnecessary to derive cleanup levels for protection of human health at the site.

19.3.3 Effects on Recreational and Commercial Uses of Aquatic Resources

Alternative C is the only remedial alternative that is expected to have an effect on sport or commercial angling, shellfish harvesting, or recreational uses. Remedial activities associated with all other alternatives occur only within the leasehold boundaries where these uses are all prohibited. The dredging and barging activities performed outside the leasehold boundaries under Alternative C will interrupt these activities but is not expected to have a significant effect because of the short duration of active remedial operations in this area (estimated at approximately 5–6 months) and the ability of these users to avoid these remediation operations.

Ranking scores for the alternatives with respect to effects on recreational and commercial uses of aquatic resources are 0 for Alternatives A, B1, and B2 and –1 for Alternative C.

19.3.4 Summary of Economic Feasibility Rankings

A summary of the ranking scores for each of the alternatives under the economic feasibility evaluation criteria is presented in the table below.

Comparative summary of economic feasibility

	Alternative A	Alternative B1	Alternative B2	Alternative C
Shipyards and shipyard customers	0	–3[a]	–3[a]	–5[a]
Local quality-of-life effects on businesses and residents	0	–2	–1	–5
Recreational and commercial users of aquatic resources	0	0	0	–1

[a] Estimated economic effects on shipyard and shipyard customers s for Alternatives B1, B2, and C are provided for comparative purposes only. These evaluations are based on the unrealistic assumptions that cost and schedule implications can be ignored in favor of minimizing conflicts with shipyard operations.

19.4 Feasibility Study Summary

The results of the feasibility study show that Alternative A, monitored natural recovery, is the only alternative that provides acceptable effects on beneficial uses and is technically and

economically feasible. Overall, aquatic life, aquatic-dependent wildlife, and human health beneficial uses are at approximately 95 percent of ideal conditions, and active remedial alternatives will result in improvements that are minimal—on the order of only a percent or so. Thus, Alternatives B1 (offsite disposal) and B2 (onsite CDF disposal), which involve removal of sediments to the site-specific LAET criteria, provide little or no incremental benefit over baseline conditions but impose significant impacts on shipyard operations and on the local community, and do so at a high cost. Alternative C, remediation to final reference pool chemical conditions, similarly provides little long-term benefit and imposes even more severe impacts on shipyard operations and on the local community; this alternative is consequently technically and economically infeasible to implement. Because there are uncontrolled contaminant sources nearby (Chollas Creek and municipal storm drains), and because physical sediment disturbance associated with shipyard operations will continue indefinitely, sediment conditions are likely to return to current conditions even if extensive dredging were to be conducted. Monitored natural recovery is therefore the most technically and economically feasible approach to addressing current sediment conditions at the shipyards.

Table 2-2. Summary of analyses by station

Station	Coordinates[a] Latitude	Coordinates[a] Longitude	Phase 1 Triad Analyses[b]	Phase 1 Additional Surface Sediment	Phase 1 Bioaccum-ulation	Phase 2 Core for Chemical Analysis	Phase 2 Pore Water	Phase 2 Additional Surface Sediment	Phase 2 Core for Engineering Properties
NASSCO									
NA01	3616867.150000	486618.000000	X			X			
NA02	3616775.020000	486619.220000		X		X			
NA03	3616854.678703	486700.993722	X						
NA04	3616843.990000	486840.440000	X			X	X	X[c]	
NA05	3616767.512513	486809.931465	X						
NA06	3616932.510000	486961.610000	X		X	X	X		X
NA07	3616855.259861	486959.722777	X[d]						
NA08	3616829.389691	486968.273321		X					
NA09	3616800.390000	486988.960000	X			X			X
NA10	3616783.096101	486936.176432		X					
NA11	3616750.797778	486930.303333	X		X			X[c]	
NA12	3616672.986217	486896.831631	X		X				
NA13	3616611.410000	486858.480000		X		X	X		X
NA14	3616508.047784	486797.087827		X					
NA15	3616753.183215	487028.646327	X						
NA16	3616728.900000	486979.600000	X			X	X		
NA17	3616693.610000	487073.710000	X			X	X		X
NA18	3616684.027819	487004.073697		X					
NA19	3616643.220000	486967.900000	X			X			
NA20	3616594.920000	487240.400000	X		X	X			
NA21	3616407.690000	487183.990000		X		X			
NA22	3616582.832500	487379.712500	X					X[c]	
NA23	3616925.030000	486852.600000				X		X	
NA24	3616912.580000	486762.720000				X		X	X
NA25	3616349.260000	486892.940000				X		X	
NA26	3616612.940000	486587.140000				X		X	
NA27	3616871.251559	486905.328588						X	
NA28	3616784.712792	486883.693896						X	
NA29	3616699.320000	486731.150000				X		X	
NA30	3616520.060000	486751.000000				X		X	
NA31	3616184.210000	487111.930000				X		X	

Table 2-2. (cont.)

Station	Coordinates[a] Latitude	Longitude	Phase 1 Triad Analyses[b]	Phase 1 Additional Surface Sediment	Phase 1 Bioaccum-ulation	Phase 2 Core for Chemical Analysis	Phase 2 Pore Water	Phase 2 Additional Surface Sediment	Phase 2 Core for Engineering Properties
Southwest Marine									
SW01	3617206.990000	486339.470000		X		X	X		X
SW02	3617173.880000	486320.790000	X			X	X		
SW03	3617095.051914	486264.049842	X						
SW04	3617202.830000	486380.920000	X[d]		X	X	X	X[c]	
SW05	3617141.991289	486339.873319		X					
SW06	3617096.656107	486308.430201		X					
SW07	3617056.615892	486276.873082		X					
SW08	3617198.370000	486415.190000	X		X	X	X		
SW09	3617128.147179	486381.270040	X						
SW10	3617101.970000	486352.020000		X		X			X
SW11	3617054.405921	486317.050697	X						
SW12	3617004.710000	486281.940000		X		X	X		
SW13	3617131.839371	486437.518825	X		X				
SW14	3617115.959411	486413.953396		X					
SW15	3617061.139224	486382.842764	X						
SW16	3617102.528070	486440.262208		X					
SW17	3617080.840000	486463.100000	X			X			X
SW18	3616972.897179	486420.053694	X						
SW19	3616827.460000	486299.010000		X		X			
SW20	3617090.190000	486545.510000		X		X			
SW21	3617072.473283	486562.393409	X		X				
SW22	3617065.955876	486551.644511	X						
SW23	3617054.105245	486537.339936	X						
SW24	3617050.990000	486553.400000		X		X	X		X
SW25	3616981.930000	486488.740000	X			X	X		
SW26	3616899.257878	486431.954162		X					
SW27	3616932.220000	486547.400000	X			X			
SW28	3616945.190000	486604.420000		X	X	X	X		
SW29	3617228.400000	486278.860000				X		X	
SW30	3617114.480000	486195.450000				X		X	X
SW31	3616896.510000	486461.560000				X		X	X
SW32	3616992.440000	486104.400000				X		X	
SW33	3616909.220000	486200.080000				X		X	
SW34	3616758.500000	486487.120000				X		X	
SW36	3616955.330000	486384.480000				X		X	

Table 2-2. (cont.)

Station	Coordinates[a] Latitude	Longitude	Phase 1 Triad Analyses[b]	Phase 1 Additional Surface Sediment	Phase 1 Bioaccumulation	Phase 2 Core for Chemical Analysis	Phase 2 Pore Water	Phase 2 Additional Surface Sediment	Phase 2 Core for Engineering Properties
Reference									
2229	3619035.560536	483501.910215						X	
2230	3618324.650116	483255.473513						X	
2231	3617448.642000	485325.876000	X		X		X	X	
2240	3614441.124194	485552.428884						X	
2241	3614741.868181	487203.077910						X	
2243	3614105.548000	486625.544000	X		X		X	X	
2244	3613571.802548	487639.180461						X	
2265	3616251.802897	486847.215393						X	
2433	3620528.253988	480397.853986	X		X		X	X	
2435	3619330.202811	479108.531823						X	
2440	3620092.082000	483620.208000	X		X		X	X	
2441	3617113.053991	477860.015961	X		X		X	X	

Note: PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl
TBT - tributyltin

[a] Universal Transverse Mercator Zone 18, North American Datum 1983.

[b] Surface sediment chemistry; amphipod, echinoderm, and bivalve toxicity tests; and benthic macroinvertebrates.

[c] Organophosphate pesticide analysis only.

[d] Includes serial dilution toxicity test.

Table 2-3. Relative effort of sediment investigations

Geographic Location	Acres	Study	Number of Stations										
			Amphipod Bioassay	Sediment Chemistry	Benthic Community	Echinoderm Bioassay	Bivalve Bioassay	Bioaccum-ulation Test	Lobster Tissue Chemistry	Mussel Tissue Chemistry	Fish Tissue Chemistry	Fish Histo-pathology	Fish Bile
NASSCO and Southwest Marine[a]	143	Exponent	30	66	30	30	30	10	2	2	4	4	4
Chollas and Paleta Creeks TMDL[b]		Navy 2001	17	31	31	17							
San Diego Bay	11,231	Bight '98	46	46	46								
San Diego Bay	11,231	BPTCP		158	22								
Ventura Harbor	154	Bight '98	1	1									
Channel Islands Harbor	148	Bight '98	4	4									
Marina del Rey	417	Bight '98	7	7									
San Pedro Bay	12,444	Bight '98											
Anaheim Bay	604	Bight '98	3	3									
Newport Bay	1,202	Bight '98	11	11									
Mission Bay	2,315	Bight '98	3	3									
Mission Bay	2,315	BPTCP			3								
Dana Point Harbor	170	Bight '98	3	3									
Los Angeles Harbor	7,000	Bight '98	36	36									

Note: BPTCP - Bay Protection and Toxic Cleanup Program
TMDL - total maximum daily load

[a] Includes areas out to the ship channel; counts of samples do not include reference areas.

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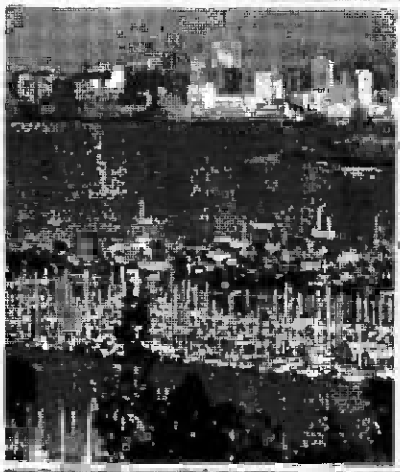
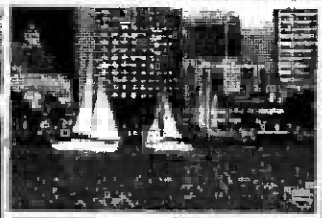


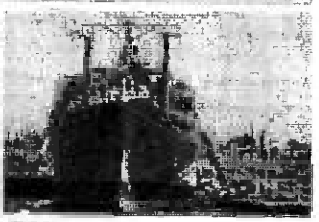


DRAFT TECHNICAL REPORT FOR TENTATIVE CLEANUP AND ABATEMENT ORDER NO. R9-2011-0001

FOR THE SHIPYARD SEDIMENT SITE • SAN DIEGO BAY, SAN DIEGO, CA

SEPTEMBER 15, 2010

Water Boards

STATE WATER RESOURCES CONTROL BOARD

REGIONAL WATER QUALITY CONTROL BOARDS

R-22
SAR382893

17. Finding 17: Reference Sediment Quality Conditions

Finding 17 of CAO No. R9-2011-0001 states:

The San Diego Water Board selected a group of reference stations from three independent sediment quality investigations to contrast pollution conditions at the Shipyard Sediment Site with conditions found in other relatively cleaner areas of San Diego Bay not affected by the Shipyard Sediment Site: (1) Southern California Bight 1998 Regional Monitoring Program (Bight 98), (2) 2001 Mouth of Chollas Creek and Mouth of Paleta Creek TMDL studies, and (3) 2001 NASSCO and BAE Systems Detailed Sediment Investigation. Stations from these studies were selected to represent selected physical, chemical, and biological characteristics of San Diego Bay. Criteria for selecting acceptable reference stations included low levels of anthropogenic pollutant concentrations, locations remote from pollution sources, similar biological habitat to the Shipyard Sediment Site, sediment total organic carbon (TOC) and grain size profiles similar to the Shipyard Sediment Site, adequate sample size for statistical analysis, and sediment quality data comparability. The reference stations selected for the Reference Sediment Quality Conditions are identified below.

Reference Stations Used To Establish Reference Sediment Quality Conditions

2001 Chollas/Paleta Reference Station Identification Number	2001 NASSCO/BAE Systems Reference Station Identification Number	1998 Bight '98 Reference Station Identification Number
2231	2231	2235
2243	2243	2241
2433	2433	2242
2441	2441	2243
2238		2256
		2257
		2258
		2260
		2265

III. SITE UNIMPAIRED

TENTATIVE

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

TENTATIVE CLEANUP AND ABATEMENT ORDER
NO. R9-2011-0001

NATIONAL STEEL AND SHIPBUILDING COMPANY

BAE SYSTEMS SAN DIEGO SHIP REPAIR, INC.

CITY OF SAN DIEGO

STAR & CRESCENT BOAT COMPANY

CAMPBELL INDUSTRIES

SAN DIEGO GAS AND ELECTRIC

UNITED STATES NAVY

SAN DIEGO UNIFIED PORT DISTRICT

SHIPYARD SEDIMENT SITE
SAN DIEGO BAY
SAN DIEGO, CALIFORNIA

Daily Load program) is the appropriate regulatory tool to use for correcting the impairment at the Shipyard Sediment Site.

13. **SEDIMENT QUALITY INVESTIGATION.** NASSCO and BAE Systems conducted a detailed sediment investigation at the Shipyard Sediment Site in San Diego Bay within and adjacent to the NASSCO and BAE Systems leaseholds. Two phases of fieldwork were conducted, Phase I in 2001 and Phase II in 2002. The results of the investigation are provided in the Exponent report *NASSCO and Southwest Marine Detailed Sediment Investigation, September 2003 (Shipyard Report, Exponent 2003)*. Unless otherwise explicitly stated, the San Diego Water Board's finding and conclusions in this CAO are based on the data and other technical information contained in the Shipyard Report prepared by NASSCO's and BAE Systems' consultant, Exponent.

The Shipyard Sediment Site is exempt from the Phase I Sediment Quality Objectives promulgated by the State Water ~~Resources Control~~ Board ~~(State Water Board)~~ because a site assessment (the Shipyard Report) was completed and submitted to the San Diego Water Board on October 15, 2003. See State Water Board, *Water Quality Control Plan for Enclosed Bays and Estuaries – Part 1 Sediment Quality*, II.B.2 (August 25, 2009).

IMPAIRMENT OF AQUATIC LIFE BENEFICIAL USES

14. **AQUATIC LIFE IMPAIRMENT.** Aquatic life beneficial uses designated for San Diego Bay are impaired due to the elevated levels of pollutants present in the marine sediment at the Shipyard Sediment Site. Aquatic life beneficial uses include: Estuarine Habitat (EST), Marine Habitat (MAR), and Migration of Aquatic Organisms (MIGR). This finding is based on the considerations described below in this *Impairment of Aquatic Life Beneficial Uses* section of the CAO.

15. **WEIGHT-OF-EVIDENCE APPROACH**. The San Diego Water Board used a weight-of-evidence approach based upon multiple lines of evidence to evaluate the potential risks to aquatic life beneficial uses from pollutants at the Shipyard Sediment Site. The approach focused on measuring and evaluating exposure and adverse effects to the benthic macroinvertebrate community and to fish using data from multiple lines of evidence and best professional judgment. Pollutant exposure and adverse effects to the benthic macroinvertebrate community were evaluated using sediment quality triad measurements, and bioaccumulation analyses, and interstitial water (i.e., pore water) analyses. The San Diego Water Board evaluated pollutant exposure and adverse effects to fish using fish histopathology analyses and analyses of PAH breakdown products in fish bile.

16. **SEDIMENT QUALITY TRIAD MEASURES**. The San Diego Water Board used lines of evidence organized into a sediment quality triad, to evaluate potential risks to the benthic community from pollutants present in the Shipyard Sediment Site. The sediment quality triad provides a "weight-of-evidence" approach to sediment quality assessment by integrating synoptic measures of sediment chemistry, toxicity, and benthic community composition. All three measures provide a framework of complementary evidence for assessing the degree of pollutant-induced degradation in the benthic community.

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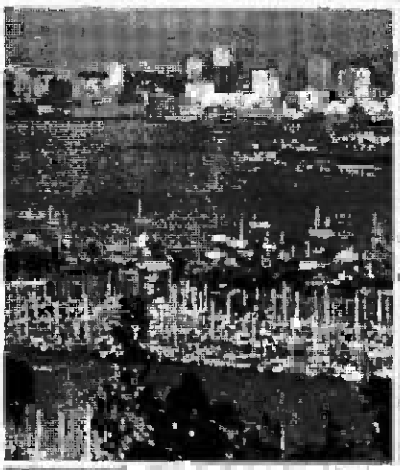
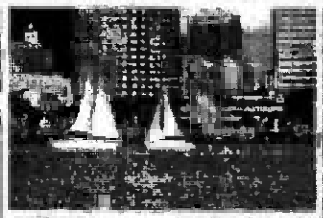


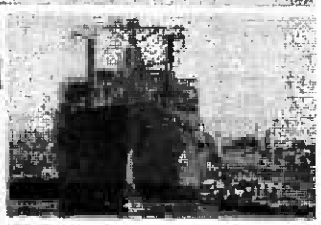
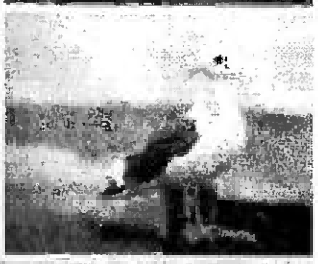

DRAFT TECHNICAL REPORT FOR TENTATIVE CLEANUP AND ABATEMENT ORDER NO. R9-2011-0001

FOR THE SHIPYARD SEDIMENT SITE, SAN DIEGO BAY, SAN DIEGO, CA

SEPTEMBER 15, 2010

California Water Boards

STATE WATER RESOURCES CONTROL BOARD

REGIONAL WATER QUALITY CONTROL BOARDS

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13. Finding 13: Sediment Quality Investigation

Finding 13 of CAO No. R9-2011-0001 states:

NASSCO and BAE Systems conducted a detailed sediment investigation at the Shipyard Sediment Site in San Diego Bay within and adjacent to the NASSCO and BAE Systems leaseholds. Two phases of fieldwork were conducted, Phase I in 2001 and Phase II in 2002. The results of the investigation are provided in the Exponent report *NASSCO and Southwest Marine Detailed Sediment Investigation, September 2003 (Shipyard Report, Exponent 2003)*. Unless otherwise explicitly stated, the San Diego Water Board's finding and conclusions in this CAO are based on the data and other technical information contained in the Shipyard Report prepared by NASSCO's and BAE Systems' consultant, Exponent.

The Shipyard Sediment Site is exempt from the Phase I Sediment Quality Objectives promulgated by the State Water ~~Resources Control~~ Board ~~(State Water Board)~~ because a site assessment (the Shipyard Report) was completed and submitted to the San Diego Water Board on October 15, 2003. See State Water Board, *Water Quality Control Plan for Enclosed Bays and Estuaries – Part 1 Sediment Quality*, II.B.2 (August 25, 2009).

13.1. NASSCO and Southwest Marine Detailed Sediment Investigation

On February 21, 2001, the San Diego Water Board adopted Resolution Nos. 2001-02 and -03 directing the Executive Officer to issue ~~CWC~~ Water Code section 13267 letters to NASSCO and BAE Systems requiring the submission of a site-specific study to develop sediment cleanup levels and identify sediment cleanup alternatives.

On June 1, 2001, the San Diego Water Board Executive Officer directed, under the authority provided in ~~CWC~~ Water Code section 13267, NASSCO and BAE Systems to conduct a site-specific study to develop sediment cleanup levels and identify sediment cleanup alternatives. The study was conducted in accordance with the San Diego Water Board document, *Guidelines for Assessment and Remediation of Contaminated Sediments in San Diego Bay at NASSCO and Southwest Marine Shipyards, June 1, 2001.*

As a first step, NASSCO and BAE Systems developed and submitted to the San Diego Water Board a Work Plan (Exponent, 2001a) and time schedule for performance of a site assessment and development of sediment cleanup levels, sediment cleanup alternatives, and cleanup costs. Following San Diego Water Board concurrence with the work plan NASSCO and BAE Systems conducted the two phase sediment investigation at the Shipyard Sediment Site in San Diego Bay within and adjacent to the NASSCO and BAE Systems leaseholds. The results of the investigation are provided in the Shipyard Report.

13.2. Data Quality

The Work Plan for the Detailed Sediment Investigation included a field sampling plan (FSP) (Appendix A, Exponent, 2001a). The FSP presented the sampling methods that would be used during the investigation, including field sampling locations and procedures, the use of quality control samples, field data reporting and field custody procedures, and sample packaging and shipping requirements.

The Work Plan also included a quality assurance project plan (QAPP) (Appendix B, Exponent, 2001a) to ensure that the quality of the data was sufficiently high to support its intended use of determining the nature and extent of contamination, determining biological effects, assessing ecological and human health risks, and establishing remediation measures for the Shipyard Sediment Site. The QAPP described the procedures for field collection of samples, sample handling and custody (including preservation and holding time requirements), analytical methods, field and laboratory quality control, instrument maintenance and calibration, data validation methods, and data management. Data validation methods were provided for field procedures, chemical analyses, toxicity tests and laboratory bioaccumulation, and benthic macroinvertebrate identification.

The Shipyard Report presented a Quality Assurance Report for Chemistry Data that provided a data quality review (data validation and data quality assessment) of the data collected during the Detailed Sediment Investigation. The review verified that quality assurance and quality control (QA/QC) procedures were completed and documented as required by the QAPP. The data quality of chemistry data was determined by Exponent to be sufficiently high and no data were rejected. (Appendix F, Exponent, 2003)

Quality Assurance Reports were also provided for Toxicity Tests (Amphipod Toxicity, Echinoderm Toxicity, Sediment-Water Interface Toxicity, and Dilution Series Toxicity), Bioaccumulation Tests, and Benthic Macroinvertebrate Identification. The quality assurance reviews identified whether results met applicable performance standards, whether any deviations or inconsistencies with the specifications of the statement of work (with each contracted laboratory) occurred and then assessed whether there were any resulting affects on the quality of the data. Exponent determined that the data generated from the Detailed Sediment Investigation were acceptable for their intended use. (Appendices H, J, and L, Exponent, 2003)

13.3. Stakeholder Involvement

The San Diego Water Board conducted a series of stakeholder meetings and public workshops during the course of NASSCO's and BAE Systems' sediment investigation and received valuable input, which was factored into the investigation. At the meetings and workshops, experts, and interested parties representing the shipyards and a diverse group of stakeholders had the opportunity to provide critical input and share knowledge on various aspects of the Shipyard Sediment Site investigation, including review of the work plan. The stakeholder group included representatives from the Audubon Society; California Department of Fish and Game (DFG); City of San Diego, Environmental Health Coalition; National Oceanic and Atmospheric Administration (NOAA); San Diego Baykeeper; SDUPD; Sierra Club; Southern California

Coastal Water Research Project (SCCWRP); Surfrider Foundation; University of California, Davis, Marine Pollution Studies Laboratory; U.S. Fish and Wildlife (U.S. FWS); and U.S. Navy.

A summary of the meetings, workshops, and significant documents for the Shipyard Sediment Site investigation are listed in the Table 13-1 below.

Table 13-1 List of Meetings, Workshops, and Significant Documents

	Item or Event	Date
1	Adopt Resolution Nos. 2001-002 and 2001-003	2/21/2001
2	Issue CWC section 13267 letters to NASSCO and BAE Systems	6/01/2001
3	Issue Guidelines for Assessment and Remediation of Contaminated Sediments in San Diego Bay at NASSCO and BAE Systems Shipyards.	6/01/2001
4	Public Workshop #1	8/03/2001
5	Stakeholder Meeting #1	10/12/2001
6	Stakeholder Meeting #2	1/29 - 30/2002
7	Stakeholder Meeting #3	3/28 - 29/2002
8	Public Workshop #2	6/18/2002
9	Stakeholder Meeting #4	8/22/2002
10	Technical Meeting #1	12/12/2002
11	Technical Meeting #2	1/22 - 23/2003
12	San Diego Water Board Meeting – Status Report #1	9/10/2003
13	NASSCO and BAE Systems Detailed Sediment Investigation released for review.	10/10/2003
14	San Diego Water Board Meeting – Status Report #2	11/12/2003
15	Public Workshop #3	11/14/2003
16	Release Tentative CAO R9-2005-0126	5/1/2005
17	Public Workshop #4	6/29/2005
18	San Diego Water Board Meeting – Status Report #3	8/10/2005
19	Pre-Hearing Conference #1	8/26/2005
20	Pre-Hearing Conference #2	12/06/2005
21	Advisory Team / Cleanup Team public meeting	12/12/2005

It is anticipated that the San Diego Water Board will conduct additional prehearing conferences and workshops and at least one San Diego Water Board public hearing in considering the issuance of a final Cleanup and Abatement Order.

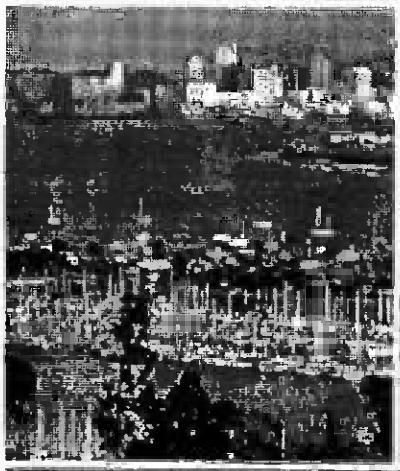
13.4. Conclusion

The San Diego Water Board's findings in the Tentative Cleanup and Abatement Order and conclusions in this Technical Report are based primarily on the data and other technical information provided in the Shipyard Report. The San Diego Water Board has reviewed the Quality Assurance Reports and found that the data reported in the Shipyard Report are found to be of sufficient quality to be used to develop the San Diego Water Board's findings and conclusions.

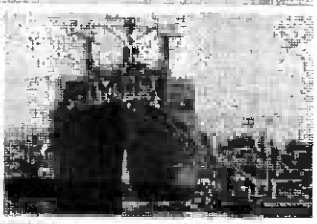
The San Diego Water Board's Technical Report identifies those instances where other data and technical information, in addition to that provided in the Shipyard Report, are used to support the Findings in the tentative Cleanup and Abatement Order and for the San Diego Water Board's management decisions.

III-A. HUMAN HEALTH RISK

VOLUME II





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FOR THE SHIPYARD SEDIMENT SITE - SAN DIEGO BAY, SAN DIEGO, CA

SEPTEMBER 15, 2010

California Water Boards

STATE WATER RESOURCES CONTROL BOARD

REGIONAL WATER QUALITY CONTROL BOARDS

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26. Finding 26: Risk Assessment Approach for Human Health

Finding 26 of CAO No. R9-2011-0001 states:

The San Diego Water Board evaluated potential risks to human health from chemical pollutants present in the sediment at the Shipyard Sediment Site based on a two-tier approach. The Tier I screening level risk assessment was based on tissue data derived from the exposure of the clam *Macoma nasuta* to site sediments for 28 days using ASTM protocols. The Tier II baseline comprehensive risk assessment was based on tissue data derived from resident fish and shellfish caught within and adjacent to the Shipyard Sediment Site. Two types of receptors (i.e., members of the population or individuals at risk) were evaluated:

a. Recreational Anglers – Persons who eat the fish and/or shellfish they catch recreationally; and

b. Subsistence Anglers – Persons who fish for food, for economic and/or cultural reasons, and for whom the fish and/or shellfish caught is a major source of protein in their diet.

26.1. Human Health Risk Assessment Approach

A two-tiered approach was used to evaluate potential risks to human health from chemical pollutants present at the Shipyard Sediment Site. The Tier I screening level risk assessment used conservative exposure and effects assumptions to support risk management decisions. The Tier II comprehensive risk assessment (i.e., baseline risk assessment) more accurately characterized potential risk to receptors of concern primarily by replacing the conservative assumptions required by Tier I with site-specific exposure parameters.

The approach used in Tiers I and II was conducted in accordance with U.S. EPA's "Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A)" (U.S. EPA, 1989b). The approach consists of the following key elements:

- Identification of Chemicals of Potential Concern;
- Exposure Assessment;
- Toxicity Assessment;
- Risk Characterization;
- Risk Management; and
- Uncertainties Related to Risk Estimates.

These elements are discussed in more detail in Section 27 – Tier I Screening Level Risk Assessment for Human Health and Section 28 – Tier II Baseline Risk Assessment for Human Health of this Technical Report.

- **Spiny Lobsters (*Panulirus interruptusi*)** – Chemical concentrations in edible tissue (all soft tissue, including hepatopancreas) and the entire organism, including the shell, were used to estimate exposure to chemicals in food for the recreational angler and subsistence angler, respectively.

Human exposure to contaminants in fish and shellfish collected at the Shipyard Sediment Site was estimated using the following simple exposure model consistent with U.S. EPA (1998b) guidance (Exponent, 2003):

$$\text{Intake (in mg/kg - day)} = \frac{(C * CR * FI * ED * EF)}{(BW * AT * CF)}$$

where:

C	=	tissue chemical concentration in spotted sand bass and spiny lobster (µg/kg-wet weight)
CR	=	fish consumption rate (kg/day)
FI	=	fraction ingested from the site (unitless)
ED	=	exposure duration (years)
EF	=	exposure frequency (days/year)
BW	=	body weight (kg)
AT	=	averaging time (days) - non-carcinogens: exposure duration x 365 days - carcinogens: 70-year lifetime x 365 days
CF	=	conversion factor (1,000 µg/mg)

According to U.S. EPA guidance, exposures should be based on an estimate of the reasonable maximum exposure (RME) expected to occur under both current and future conditions at the site. The RME is defined as the highest exposure that is reasonably expected to occur at a site. The assumptions used by the San Diego Water Board to estimate the RME at the Shipyard Sediment Site are shown below in Table 28-7 and the exposure estimate calculations using these assumptions are provided in the Appendix for Section 28.

Table 28-7 Reasonable Maximum Exposure (RME) Assumptions for Recreational and Subsistence Anglers

Parameter		Units	Recreational Angler	Subsistence Angler
Tissue Chemical Concentration	C	µg/kg-wet wt	Maximum	Maximum
Fish or Shellfish Consumption Rate	CR	kg/day	0.021[1]	0.161[2]
Body Weight	BW	kg	70	70
Exposure Duration	ED	years	30	30
Exposure Frequency	EF	days/year	365	365
Fraction Ingested from Site or Reference	FI	unitless	1	1
Averaging Time for Carcinogens	AT_c	days	25,550	25,550
Averaging Time for Noncarcinogens	AT_n	days	10,950	10,950
Conversion Factor	CF	µg/mg	1,000	1,000

1. OEHHA 2001
2. SCCWRP and MBC 1994

28.2.3. Toxicity Assessment

The toxicity assessment identifies toxicity values for each chemical pollutant of concern and discusses their potential adverse effects to humans (U.S. EPA, 1989b). Two types of toxicity values are evaluated: CSFs for carcinogenic chemicals and RfDs for non-carcinogenic chemicals.

CSFs and RfDs from U.S. EPA's Integrated Risk Information System (IRIS) were used in the baseline risk assessment (U.S. EPA, 2003a). The CSFs and RfDs for the CoPCs identified in Section 28.2.1 are listed in Table 28-8 below.

Table 28-8 Cancer Slope Factors and Reference Doses for Chemicals of Potential Concern

Chemical	CSF (mg/kg-day)$^{-1}$	RfD (mg/kg-day)	Source
Metals			
Arsenic, inorganic	1.5	0.0003	U.S. EPA (2003a)
Cadmium	NA	0.0005	U.S. EPA (2003a)
Copper	NA	0.037	U.S. EPA (2003a)
Mercury, total	NA	0.0001	U.S. EPA (2003a)
Polychlorinated Biphenyls			
Total PCBs	2	NA	U.S. EPA (2003a)
Total PCBs (as Aroclor 1254)	NA	0.00002	U.S. EPA (2003a)

28.2.6. Uncertainties Related to Risk Estimates

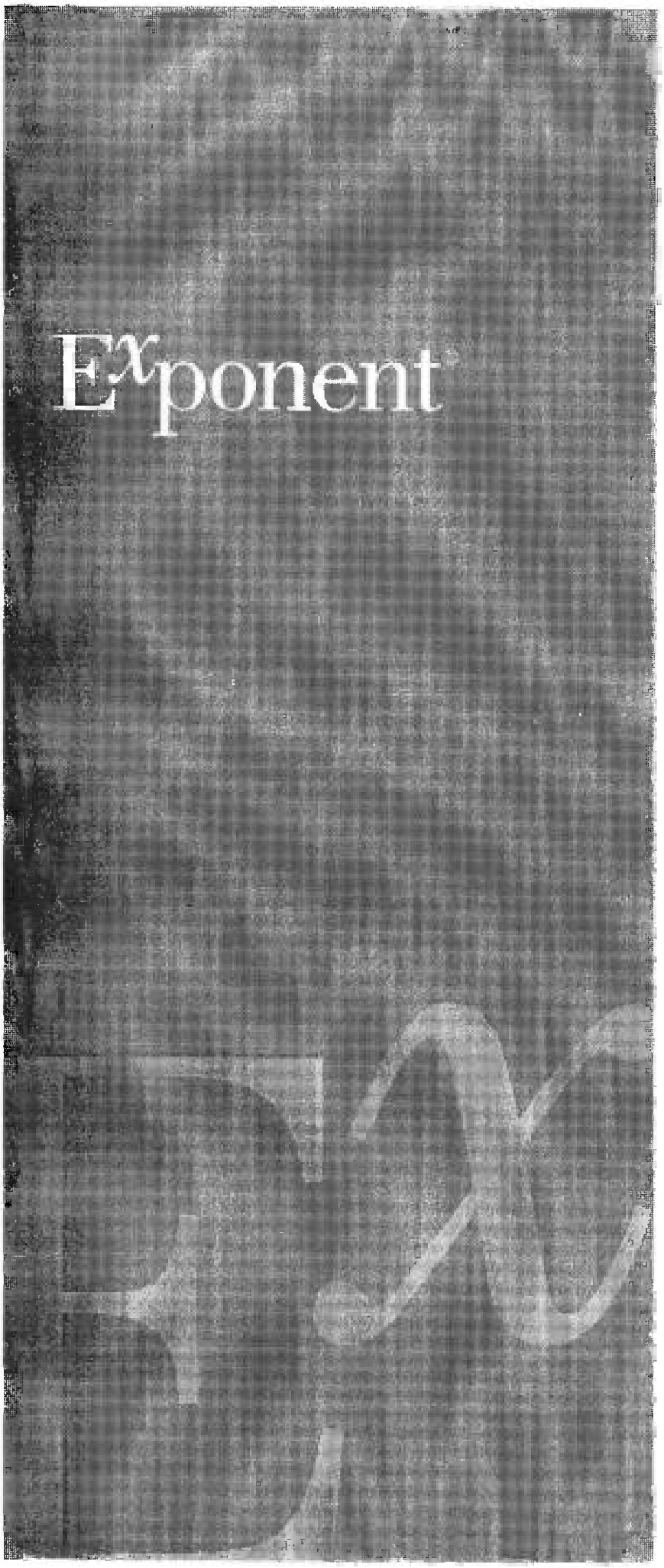
The process of evaluating human health cancer risk and non-cancer hazard indices involves multiple steps. Inherent in each step of the risk assessment process are uncertainties that ultimately affect the risk estimates. Uncertainties may exist in numerous areas such as estimation of potential site exposures and derivation of toxicity values. The most significant uncertainties in the Tier II risk analysis for the Shipyard Sediment Site are discussed below.

Fractional Intake. Exponent (2003) used the following fractional intake assumptions for the human health risk assessment: Inside NASSCO = 0.034 (or 3.4 percent), Outside NASSCO = 0.005 (or 0.5 percent), Inside BAE Systems = 0.023 (or 2.3 percent), and Outside BAE Systems = 0.002 (or 0.2 percent). In contrast, the San Diego Water Board initially used a conservative fractional intake of 1 based on the assumption that 100% of the fish and shellfish caught and consumed by recreational and subsistence anglers is from the Shipyard Sediment Site. Since it is likely that anglers catch at least a portion of their seafood from other locations in San Diego Bay and/or the fish caught from the Shipyard Sediment Site comes from elsewhere, the actual site fractional intake is likely to be less than 100 percent.

Exposure Concentration. U.S. EPA guidance recommends that the tissue chemical concentrations used in the intake equation be either the 95 percent upper confidence limit (UCL) on the arithmetic average concentration or the maximum concentration, whichever is lesser (U.S. EPA, 1989b). In order to simplify the risk calculations, the San Diego Water Board only used the maximum concentration observed in spotted sand bass (fillet and whole body) and lobster (edible tissue and whole body) to estimate risks at each of the four assessment units and at the two reference areas. This may result in an under- or overestimation of risks at the Shipyard Sediment Site.

Spotted Sand Bass Home Range. Spotted sand bass were collected in four discrete assessment units at the Shipyard Sediment Site: inside NASSCO leasehold, outside NASSCO leasehold, inside BAE Systems leasehold, and outside BAE Systems leasehold. It is assumed that the assessment units bound the home range for these spotted sand bass and that the observed tissue chemical concentrations are based exclusively from exposure within these areas. This may, however, not be indicative of their actual exposures because these fish may feed beyond the assessment unit boundaries. Therefore, the estimated risk to the recreational and subsistence anglers ingesting the fish is considered conservative and does not characterize actual exposures to the Shipyard Sediment Site.

PCB Cooking Losses. Numerous studies have evaluated the loss of PCBs from fish during preparation and cooking (Exponent, 2003). Reductions of PCBs ranged from 26 to 90 percent using cooking methods such as microwaving, boiling, and frying. For this assessment, a 50 percent reduction factor for PCBs in spotted sand bass fillets was used to assess potential risks to recreational anglers (Brodberg, 2004). A PCB cooking loss factor was not applied to spotted sand bass whole bodies because of the various preparation and cooking methods (such as boiling the entire fish to make a soup) and other related habits (such as consuming pan drippings from frying) potentially used by subsistence anglers. These cooking loss factor assumptions may underestimate or overestimate PCB cancer risks and PCB non-cancer hazards.



Evaluation of Draft Technical Report for Tentative Cleanup and Abatement Order No. R9-2011-0001 for the NASSCO Shipyard Sediment Site

Expert Report of
Thomas C. Ginn, Ph.D.

Exponent

Evaluation of Draft Technical Report for Tentative Cleanup and Abatement Order No. R9-2011-0001 for the NASSCO Shipyard Sediment Site

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March 11, 2011

Unrealistic Exposure Assumptions in the Risk Assessment

As indicated previously, the overly-conservative assumptions used in the Tier II baseline risk assessment result in a meaningless and implausible assessment that is constructed under the guise of being "conservative." These overly-conservative and unsubstantiated assumptions have a dramatic effect on the resultant risk calculations. In effect, the DTR is combining a series of extreme assumptions, which result in a multiplicative effect on the final risk calculations:

1. All of the fish or shellfish tissue consumed each day comes from the shipyard site (i.e., FI = 1.0)
2. Four percent of the arsenic in seafood is in the inorganic form.
3. Risks for subsistence anglers are unrealistic
   a. The only species consumed are spotted sand bass and spiny lobster.
   b. The theoretical subsistence angler consumes only the whole-bodies of the fish and invertebrate species
4. Anglers have complete access to the highly-restricted shipyard site.

By using these assumptions, the Staff has constructed a highly-conservative, screening-level assessment of risk that bears no resemblance to a Tier II baseline risk assessment, which would incorporate some more realistic, but nonetheless conservative, assumptions. The following sections of my report discuss each of these unrealistically conservative assumptions and how they bias the results of the DTR risk assessment.

Fractional Intake (FI) is 1.0

The most unrealistic assumption used in the DTR Tier II assessment is the FI. FI represents the portion of the seafood diet that an angler would receive directly from the assessment area. In the DTR, FI is set to 100 percent, the same value used in the Tier I screening-level assessment. In other words, the baseline risk assessment (and determination of need for remediation) is entirely

concentration of 44 μg/g wet weight. It is recognized that demersal crustaceans such as crabs and lobsters may have higher levels of inorganic arsenic in tissue because of potentially ingesting these forms of arsenic in the diet (e.g., algae, small invertebrates and associated sediments). In a study of lobster, prawns, and crab, Edmonds and Francesconi (1993) reported that the percentage of inorganic arsenic in muscle tissue ranged from 0.6 to 1.7. In the Sloth et al. (2005) survey, the highest inorganic arsenic concentrations in lobster were measured in meat from the head and thorax (0.037 μg/g wet weight), but this represented only 0.2 percent of the total arsenic in that tissue (22 μg/g wet weight).

The above studies show that the use of the assumption of 4 percent inorganic arsenic in fish fillets and edible lobster is most likely overly conservative, and the actual percentage of inorganic arsenic may be substantially less than this value. Moreover, as was demonstrated in a previous section of my report, there is no significant difference between the arsenic concentrations measured in edible lobster at NASSCO and the reference area, or between sand bass fillets from outside the NASSCO leasehold and the reference area. For the Staff to conclude in the DTR (Table 28-1) that arsenic risks are higher for recreational anglers consuming sand bass fillets from outside the NASSCO leasehold, compared to reference, is especially disingenuous given that the mean arsenic concentrations for those two areas are 0.42 and 0.36 mg/kg, respectively.

In summary, the DTR's conclusion that inorganic arsenic in seafood theoretically harvested at the NASSCO site "poses a theoretical increased" cancer risk when compared to reference areas is not valid, and does not form the basis for concluding that beneficial uses are impaired or that any active remediation of sediments would be required to reduce arsenic exposure.

Risks for Subsistence Anglers

The DTR includes risk calculations for so-called "subsistence anglers;" however, the definition of these kinds of anglers is neither specified nor otherwise justified in the DTR. In Table 28-7 of the DTR, the exposure assumptions are provided and indicate that the only difference between recreational anglers and subsistence anglers is that the latter group has a consumption

rate of 161 g/day versus 21 g/day. The other significant difference between recreational and subsistence anglers, as assessed in the DTR, is that subsistence anglers are always assumed to eat the entire organism, either sand bass or lobster. The DTR provides no justification for this important assumption.

First, there is no basis for assuming that all anglers of this theoretical category would consume only whole-body organisms for the entire 30-year period. I would agree that certain ethnic groups (primarily Asians) may use whole bodies of harvested fish or invertebrates in soups or stews. The staff should have assumed that a certain proportion of harvested seafood was prepared in this manner. For the proportion of the diet that was assumed to be consumed as a whole body, the DTR should have apportioned the species according to expected catch rates. For example, the DSI included the sampling of smaller species of fish for use in the aquatic-dependent wildlife risk assessment. These species (e.g., topsmelt, *Atherinops affinis*) contained significantly lower concentrations of PCBs in whole bodies when compared with spotted sand bass. The maximum PCB concentrations in whole-body topsmelt inside the NASSCO area were less than 20 percent of the corresponding maximum concentrations of PCBs in spotted sand bass. Moreover, the maximum PCB concentration in topsmelt collected inside NASSCO was only about 40 percent higher than the reference concentration. This is an important consideration because:

1. Topsmelt and the closely related jacksmelt (*Atherinops californiensis*) are among the most abundant fishes available to shore and pier anglers in southern California and they make up a large proportion of the sport catch in such areas (CA DFG 2001)

2. Because of their abundance and ease of catch, topsmelt and jacksmelt would be much more available to shore or near-shore anglers than the larger sand bass. If "subsistence" anglers actually could operate at the shipyard site, these *Atherinops* species would most likely constitute a significant part of the catch.

Therefore, by using only spotted sand bass data, the DTR has substantially overestimated the concentrations of PCBs that may occur in fish species harvested in San Diego Bay.

Another significant error in the DTR assessment results from the assumption that all subsistence anglers consume the entire body of harvested fish. Whole body analyses were conducted in the DSI for use in the wildlife risk assessment because predators such as sea lions and birds consume the entire fish. The consumption of entire fish by humans, including guts, kidneys, and livers, is relatively rare. Even if whole fish are added to soups or stews, the fish is typically gutted, thereby removing the liver and other soft internal organs. For example, in the Santa Monica Bay seafood consumption study (SCCWRP and MBC 1994), which was the basis for the DTR consumption rates, only 1 percent of surveyed anglers consumed whole fish that were not gutted. Even among Hispanic and Asian anglers, only about 1 percent consumed whole fish that were not gutted. Alternatively, about 33 percent of anglers consumed whole fish that had been gutted. This is an important distinction because it is well-established that the liver and other fatty internal organs in fishes contain much higher concentrations of hydrophilic substances such as PCBs than muscle tissue (OEHHA 2010). Finley (2011) also criticizes the use of whole-body tissue concentrations for all subsistence anglers and indicates that the DTR could have assumed a fixed percentage of anglers that consume the entire fish.

Finally, there is simply no basis for the DTR assumption that subsistence anglers could harvest sufficient lobsters from the shipyard site to maintain a 30-year daily consumption rate of 161 g/day and that all of these lobsters would be eaten whole (i.e., shell, internal organs, and meat). I have discussed previously the problems associated with DTR exposure assessment for so-called "subsistence anglers." In the case of lobsters for which the DTR claims significant risks from arsenic for recreational anglers but not for subsistence anglers) the exposure assumptions are overestimated because of the Staff's failure to consider the degree to which lobsters could actually be harvested in San Diego Bay. As noted previously, the DTR assumes that recreational and subsistence anglers would consume 21 and 161 g/day, respectively, of lobster tissue every year for a lifetime. However, it is important to note that the lobster fishery in California is highly regulated as to size, numbers, and seasons during which lobsters can be harvested. The current regulations (CA DFG 2010) specify that lobsters can be harvested only from October 2, 2010 to March 16, 2011. The same season length occurred in 2009/2010. Thus, lobsters can be harvested for less than half of the year in California, further invalidating the overly-conservative exposure assumptions used in the DTR.

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CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

SAN DIEGO REGION

IN THE MATTER OF:	)	
	)	Order No.
TENTATIVE CLEANUP AND ABATEMENT	)	R9-2011-001
	)	
	)	

DEPOSITION OF TOM ALO

VOLUME I, PAGES 1 THROUGH 210

FEBRUARY 16, 2011

SAN DIEGO, CALIFORNIA

REPORTED BY: JULIE A. MCKAY, CSR NO. 9059

BY MR. RICHARDSON:

Q. Are you aware of any agency inspection reports that indicate someone is fishing at NASSCO?

A. No, I'm not aware of it.

Q. Mr. Alo, in light of your prior testimony that the administrative record is voluminous and that you are not aware of any CAO proceeding with a larger record, and because there is no evidence in this voluminous record that anyone has fished at the NASSCO site, and in light of the security measures that we just reviewed and the photographs that you saw and the discussion on page 28-10, wouldn't you agree that it's an unrealistic assumption to assume that someone fishes at the shipyard for 30 years and eats only fish caught at the shipyard?

MR. CARRIGAN: I'm going to object as vague.

But you can answer, if you understood the question.

THE WITNESS: I agree. However, the third bullet on page 28-11 of the DTR states that "It's the Water Board's statutory responsibility to protect the current and reasonably anticipated beneficial uses designated for the Bay. The beneficial uses pertaining to human health are commercial and sportfishing and shellfish harvesting. Common shell are to be protected at all times regardless of the current site access

measures that prevent the uses from occurring."

And, also, the first bullet, "Although NASSCO and BAE Systems have long-term leases, it is possible they may not occupy the site in the future and future site usage may allow for fishing," which, you know, this scenario has recently occurred at the former shipyard, Campbell Shipyards, located in the Bay just north of the Shipyard Sediment Site.

BY MR. RICHARDSON:

Q. Great. Thank you for that clarification.

Mr. Alo, if I refer you to page 28-17 of the DTR. Give you a moment to refresh your memory on this page. I'm sorry, Mr. Alo. Under the "Fractional intake" paragraph.

A. Sorry.

(Witness reviews document.)

Q. Have you reviewed that paragraph?

A. Yes, I have.

Q. So don't you agree that even the DTR indicates that the actual site fractional intake for NASSCO is less than a hundred percent?

MR. CARRIGAN: Document speaks for itself. You can answer.

THE WITNESS: Yes.

BY MR. RICHARDSON:

Q. And wouldn't you agree that that's at least an extremely conservative assumption?

A. Yes.

Q. And why, in your view, is that conservative?

A. As stated in the DTR, page 28-17, it's likely that anglers catch at least a portion of their seafood from other locations in the Bay and/or fish caught from the Shipyard Sediment Site comes from elsewhere. The actual site fractional intake is less -- likely to be less than a hundred percent.

Q. Great. Thank you.

We recently discussed Exhibit 1104, EPA's Risk Assessment Guidance for Superfund Sites, which suggest that site-specific factors should be used in the Tier 2 risk assessment, correct?

A. Correct.

Q. Isn't the fractional intake a site-specific factor?

MR. CARRIGAN: Incomplete hypothetical. Vague.

THE WITNESS: Repeat the question.

BY MR. RICHARDSON:

Q. Isn't the fractional intake a site-specific factor?

A. Yes.

THE WITNESS: I don't know.

BY MR. RICHARDSON:

Q. Do you believe it would be reasonable to assume that there are subsistence anglers of NASSCO employees at the shipyard?

MR. CARRIGAN: Same objection.

THE WITNESS: I don't know. There may be.

BY MR. RICHARDSON:

Q. That is, you don't know?

A. I don't know.

Q. Navy personnel?

MR. CARRIGAN: Same objections.

THE WITNESS: There is a potential. There could be a potential.

BY MR. RICHARDSON:

Q. Okay. I'll ask a clearer question. I want to make sure the record is clear on this.

A. Okay.

Q. Is it reasonable to assume under current site uses that there is a subsistence angler that fishes for 30 years within the NASSCO leasehold?

MR. CARRIGAN: Incomplete hypothetical.

THE WITNESS: Probably not.

BY MR. RICHARDSON:

Q. You previously testified that there may be

suggesting that these numbers are not accurate?

A. Repeat the question, please.

MR. RICHARDSON: Could you repeat the question.

(Record read.)

THE WITNESS: The numbers appear to be accurate. However, we used a different consumption rate in our Tier 2 baseline risk assessment.

BY MR. RICHARDSON:

Q. Okay. And what consumption rate did you use for your Tier 2 assessment?

A. We used for recreational angler would be -- conversion would be 21 grams per day. And for subsistence angler, we used 161 grams per day.

Q. Would you agree, Mr. Alo, that those are significantly higher numbers than those stated in Table 10-52?

A. Yes.

Q. Do you have any site-specific data suggesting that an angler would consume a whole fish or whole lobster at NASSCO?

A. No.

Q. Do you have any site-specific data that they would consume a whole fish and a whole lobster daily for 30 years?

A. No.

MR. CARRIGAN: Document speaks for itself.

THE WITNESS: Yes.

BY MR. RICHARDSON:

Q. And that only six percent of the total anglers fish on a daily basis?

MR. CARRIGAN: Same objection.

THE WITNESS: I see that.

BY MR. RICHARDSON:

Q. So with this site-specific study on San Diego Bay, is it unrealistic or overly conservative to assume that someone fishes every day at the shipyard for 30 years?

MR. CARRIGAN: Incomplete hypothetical.

THE WITNESS: Yes.

BY MR. RICHARDSON:

Q. The County survey also provided some data on the number of anglers expected to eat the whole body of the fish. Refer you to page 417, the very first paragraph. I'll give you a moment to review the paragraph.

A. Which paragraph again?

Q. The very top paragraph on page 417 that begins "Parts of fish consumed."

A. (Witness reviews document.)

Okay.

Expert Report of
Brent L. Finley, Ph.D., DABT

Prepared in Regards to the California Regional Water Quality Control Board's Draft Technical Report for Tentative Cleanup and Abatement Order No. R9-2011-0001 (San Diego Bay)

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March 11, 2011

the range of measured concentrations. Instead, the RWQCB selected the highest measured concentrations and presented the subsequent risk estimates as plausible and representative.

This was an arbitrary assumption with no scientific or regulatory support. No discussion is offered in the RWQCB assessment as to why use of the maximum, and only the maximum measured levels, is appropriate in this case. Reliance on a single point estimate of chemical concentration also gives no insight as to the potential variability in the risk estimates as a function of the range and frequency of measured contaminant levels. In essence, each of the risk estimates presented by the RWQCB relies on a single measured (in this case, maximum) value, which can yield a highly biased risk estimate, particularly if the underlying data set is skewed.

I will quote again from recent (2005) EPA risk assessment guidance:

> ...significant risk management decisions will often benefit from a more comprehensive assessment...such assessments *should provide central estimates of potential risks in conjunction with lower and upper bounds (e.g., confidence limits)* and a clear statement of the uncertainty associated with these estimates" ((USEPA 2005); p. 1-9 – 1-10). [emphasis added]

At the very least, if the RWQCB wished to include a point risk estimate based on maximum concentrations they should have also presented risk estimates based on: 1) measures of central tendency (e.g., means or averages) and/or 2) distributions of the underlying measured concentrations. Indeed, in the SDCDHS Health Risk Study, risk estimates were presented based on maximum and average chemical concentrations (County of San Diego, 1990). Presenting risk estimates associated with each of these values would allow the reader to understand the relative impact of the concentrations used in the risk calculations.

c) Considering the lack of access and industrial nature of the shipyard leasehold, the use of unmodified fish consumption rates from the Santa Monica Bay Study, which was conducted in a highly accessible recreational area, is inappropriate and inconsistent with EPA guidance

In the United States, the primary sources of fish consumption information include the following: 1) per capita estimates for fishery products (disappearance into the commercial marketing system); 2) national consumption surveys (which can be on a per capita basis, or focus exclusively on fish consumers); and 3) creel-angler surveys (which can include recreational or subsistence fishers, or both) (USEPA 1997b; OEHHA 2001).

Results from one survey may not be applicable in a different setting. The most relevant sources of fish consumption data for a specific setting (e.g., San Diego Bay) are creel/angler surveys, wherein the catch/consumption habits of local anglers are assessed via interviews. These studies vary in many respects, including methodology, the target population evaluated, whether fishing occurs in fresh or marine waters, and whether consumption of commercially purchased products are included in the consumption estimates, to name a few. Obviously, a daily consumption rate determined for an angler catching/consuming pike in Lake Michigan may not be an accurate

barriers such as buildings or 8-foot fences with razor wire), permanent obstructions in the water prevent boaters from accessing the leasehold. As mentioned previously, these measures are enforced in a number of ways, including video surveillance, requirements for identification for anyone entering or exiting the premises, alarm systems, and the use of security personnel (NASSCO 2006).

In analyzing site security, I reviewed the security footage overlooking the NASSCO facility from several months in late 2007. The footage provided 24 hour surveillance, seven days a week. The video revealed that approximately half of the security cameras view the shipyard docks and surrounding water, while half view the perimeter, entrance gates and facility property. Cameras are placed at main entrances and exits and in areas with high risk and/or high value cargo. They have the capability to monitor all perimeter barriers, water line, perimeter security boom/buoy early warning system, and numerous locations throughout the facility (NASSCO 2006).

The security cameras are functional in high and low light situations and have the ability to pan, tilt, zoom and focus manually for increased surveillance in specific areas. Increased surveillance and manual focusing were observed when activity occurred in the camera view. Throughout the viewed footage, employees were seen performing work on vessels within the facility as well as entering and exiting the perimeter. No unauthorized vessels were seen attempting to gain access to the facility waters. Additionally, no fishing or attempted fishing was observed in or around the facility. The cameras view the entire shoreline and surrounding waters and would certainly have captured fishing attempts.

Full details of how entry was made as well as accounts of why the individual was present are taken and recorded. Security remains especially strict because of NASSCO's work with naval vessels. Due to this fact, during times of threat, measures are in place to increase security and limit facility access (NASSCO 2002). Additionally, security measures are reviewed through audits and revised to remain up to date with current issues (NASSCO 2007).

The Santa Monica Bay study assessed anglers in an area where fishing is freely allowed via party or private boats, numerous piers and/or jetties, and the beach. Given the severe access restrictions of the NASSCO shipyard from land (the shore or from piers/jetties) and water (anglers on boats), it is obvious that fish consumption rates in the NASSCO leasehold are not comparable to those in Santa Monica Bay.

Finally, and perhaps most importantly, I will note that it is well understood that, like all short-term creel/angler surveys of highly populated areas, the Santa Monica Bay angler data have a significant source of bias that must be accounted for before the data can properly be used to estimate angler consumption rates for risk assessment purposes. The bias is known as "avidity bias," which refers to the fact that that repeat anglers, who are more likely to be interviewed, have higher consumption rates than those who visit the area less frequently. In short-term surveys where anglers are interviewed on multiple occasions (such as the Santa Monica Bay, a 28-day study), probability factors are typically applied to counter this bias. The Santa Monica Bay data were not adjusted for this bias before they were published, and proper adjustment for avidity bias will result in daily consumption rates far lower than those presented in the Santa Monica Bay report.

EPA clearly states that high-end exposure assumptions are intended to be plausible estimates that characterize a definable, high-end segment of the exposed population (usually above the 90th percentile) (USEPA 1992; USEPA 1995). From a purely statistical perspective, combination of multiple high-end exposure factor values (e.g., 90th or 95th percentiles) can often produce results that are more extreme than any one of the individual values. As noted by EPA ((EPA 1992); p. 27):

> "The term 'worst case exposure' has historically meant the maximum possible exposure, or where everything that can plausibly happen to maximize exposure, happens. While in actuality, this worst case exposure may fall on the uppermost point of the population distribution, in most cases, it will be somewhat higher than the individual in the population with the highest exposure. The worst case represents a hypothetical individual and an extreme set of conditions; *this will usually not be observed in the actual population.*" [emphasis added]

As I've noted throughout this opinion, the impacts of the various assumptions made by RWQCB are not well characterized or discussed. The RWQCB did not conduct any sort of quantitative uncertainty analysis, nor did they provide a comparison of risk estimates derived using different point estimates (e.g., mean vs. upper bound) in a deterministic risk assessment. As noted previously, the use of probabilistic techniques is an ideal method for quantifying the uncertainty associated with each of the parameters used in risk calculations, which can then be used to determine the contribution of uncertainty associated with each parameter to the overall risk estimate. In general, sources of uncertainty include measurement errors, sampling errors, variability, and the use of generic or surrogate data ((EPA 1992); p. 93). Either approach can provide a way to quantitatively understand the impact of using one value verses another.

d) A refined yet conservative risk assessment indicates that consumption of fish and shellfish from the NASSCO leasehold is not associated with an increased risk of cancer or non-cancer health effects.

Above I have given a few examples of the degree to which the RWQCB risk estimates change by simply substituting one of their highly conservative and implausible assumptions with a more reasonable assumption (i.e., a semi-quantitative sensitivity analysis). Below I present my own estimates of risk by incorporating specific refined assumptions (Tables 1-3). The purpose of this exercise is to 1) demonstrate how much uncertainty and conservatism is actually present in the RWQCB risk estimates, and 2) provide a more scientifically valid and plausible estimate of potential angler risk. This analysis is representative of the "comprehensive" assessment that the RWQCB claimed to have conducted (but did not). Specific changes include the following:

- **Use of mean and 95% upper confidence limit (UCL) fish and shellfish tissue concentrations instead of maximum values.** Risk assessments are commonly performed using a central tendency estimate (arithmetic mean), as well as the 95% upper confidence limit (UCL) of the arithmetic mean. The 95% UCL is the value that when calculated for a random data set equals or exceeds the true mean 95% of the time. Both values are often used in risk assessment because of the uncertainties that may be associated with estimating the arithmetic mean. This approach is consistent with EPA

guidance for non-screening level assessments and provides a far more informed estimate of the distribution of chemical contaminants among the local fish and shellfish populations of interest.

- **Use of fish consumption rates that reflect the lack of access and industrial nature of the NASSCO shipyard.** As noted previously, the importance of representative data is clearly described in several EPA documents, as well as OEHHA's 2001 report regarding fish consumption in California. Based on my experience and as described in several recent publications, characterizing angling and fish consumption patterns in highly urbanized areas with relatively little public access can be useful in conducting risk assessments in similar settings. The fish consumption rates of 0.42 g/day (estimate of central tendency) and 1.8 g/day (95^{th} percentile) reported in a study of anglers in a highly industrialized waterway with limited access were used in risk calculations for recreational anglers (the 95^{th} percentile was used as an upper bound estimate) for both fish and shellfish (Ray, Craven et al. 2007a).

- **Assume that anglers would only consume the edible portions of any fish or shellfish.** Consistent with EPA guidance, edible tissue data were used for both the recreational and upper bound scenarios.

- **Utilization of a reference dose for dietary ingestion in estimating risk from cadmium.** There is no basis for the RWQCB's use of a drinking water reference dose for cadmium considering there is a reference dose for cadmium based on ingestion. In my updated assessment, I utilized the EPA recommended reference dose for cadmium consistent with dietary ingestion.

- **Use of an exposure duration of 9 years**. I used the central estimate of 9 years for the amount of time that potential exposure could occur, as recommended by EPA guidance ((USEPA 1989b); p. 6-22).

- **Use of a cooking loss factor for PCBs.** Cooking results in a reduction in total PCBs because they accumulate in the fat. Because the reductions vary by cooking method (e.g., pan-frying, steaming, deep-frying), a weighted average of the median fish fractional loss was used for the deterministic analysis, while a distribution was used for the probabilistic analysis (Wilson, Shear et al. 1998). The fish fractional cooking loss was weighted by the probability of using each method and cooking methods were grouped according to their cooking loss distributions. For shellfish, the mean shellfish cooking loss value was calculated from averaging PCB cooking losses from steaming and boiling (with and without hepatopancreas) whole blue crab (Zabik, Harte et al. 1992).

- **Incorporation of a probabilistic risk assessment for cancer risk for PCBs (Aroclor 1260) and arsenic.** The purpose of this assessment was to quantify uncertainty associated with the exposure parameters, as well as provide as more accurate estimation of the true cancer risk using a more refined technique (i.e., Monte Carlo analysis).

I performed two sets of risk calculations. First, I used the same equations described in the RWQCB's draft technical report, but with refined assumptions (CRWQCB 2010a). This approach was used to evaluate cancer and non-cancer risks for the chemicals identified by the RWQCB.

Second, I performed a probabilistic risk assessment ("Monte Carlo analysis") to evaluate cancer risk for a subset of chemicals (arsenic and PCBs). As mentioned previously, the Monte Carlo technique can be used to derive an estimate of the distribution of exposures or doses in a population. I also used this technique to perform a quantitative uncertainty analysis.

Tissue concentration data for the contaminants of concern (sand bass and lobster) were obtained from Exponent, and were the same tissue data upon which the RWQCB's risk assessment is based. Cancer and non-cancer risk was calculated separately for inside the NASSCO leasehold, outside the NASSCO leasehold, and for the reference locations 2230 and 2240. The specific calculations and exposure assumptions are described in greater detail in Appendix A.

Results for cancer risk using a refined deterministic model are summarized in Appendix A, Tables 4 and 5. Risk estimates using mean tissue concentrations (fish or shellfish) ranged from 1.67×10^{-8} to 1.62×10^{-6} for inorganic arsenic and from 1.17×10^{-8} to 1.62×10^{-7} for PCBs. Using the 95% UCL tissue concentrations, risk estimates ranged from 1.85×10^{-8} to 2.58×10^{-6} for inorganic arsenic and from 1.17×10^{-8} to 2.08×10^{-7} for PCBs.

As a point of comparison, if one uses my exposure assumptions but employs the method used by Exponent, wherein the more conservative fish consumption rates used by the RWQCB are used (21 g/day and 161 g/day for recreational and subsistence anglers, respectively) but a fractional intake factor is applied to account for the fact that only a 3.4% of the total shoreline of the San Diego Bay is occupied by the NASSCO shipyard, cancer risks for inorganic arsenic ranged from 2.17×10^{-7} to 7.48×10^{-6} when mean tissue concentrations were used (fish or shellfish), while cancer risk for PCBs ranged from 1.99×10^{-8} to 6.33×10^{-7}.

Furthermore, if only the fractional intake is adjusted to account for the fact that 3.4% of the total shoreline is occupied by NASSCO, all risks from all chemicals in edible tissue fall significantly below regulatory concern. Using either approach, the cancer risk estimates derived using more reasonable exposure assumptions are orders of magnitude less than those reported by the RWQCB.

Based on more realistic and appropriate exposure assumptions, risk estimates for both consumption of lobster and sea bass were well below the *de minimus* risk levels of 1 in 100,000 (1×10^{-5}) defined by CalEPA (OEHHA 2006). More recently, in June, 2008, OEHHA published a report titled "Development of Fish Contaminant Goals and Advisory Tissue Levels for Common Contaminants in California Sport Fish: Chlordane, DDTs, Dieldrin, Methylmercury, PCBs, Selenium, and Toxaphene." This report addresses the general concept that "the advisory process should be expanded beyond a simple risk paradigm, as is used in criteria development, in order to best promote the overall health of the fish consumer" (p.2). In this report, OEHHA specifically states that 1×10^{-4} is an acceptable risk level when developing fish consumption advisories (OEHHA also cites several EPA regulatory criteria that rely on this same value). In

fact, this report goes as far as to state that "setting the risk level at $1x10^{-5}$ or $1x10^{-6}$ would restrict fish consumption to the extent that it could largely deny fishers the numerous health benefits that can be accrued through fish consumption" (p. 55).

Results for non-cancer risk are summarized in Appendix A, Tables 6-10. The hazard indices for all contaminants at both consumption levels were well below 1, indicating that using more realistic and appropriate exposure assumptions results in estimated daily exposures below the levels that are considered safe by the U.S. and California Environmental Protection Agencies. Even using the 95% UCL tissue concentrations for upper bound consumers, the hazard indices did not exceed 0.013, 0.012, 0.04 0.004, and 0.0004 for inorganic arsenic, total PCBs, mercury, copper, and cadmium, respectively.

The risk assessment described above mirrors the deterministic analysis performed by the RWQCB, the only difference being the values used in the exposure assumptions. As noted previously, there are additional techniques available that provide more statistically robust and informative risk estimates. Thus, for purposes of comparison, I also performed a probabilistic analysis of the cancer risk associated with consumption of fish and shellfish caught in the NASSCO leasehold.

The probabilistic assessment addressed Aroclor 1260 and arsenic, which were the primary drivers of cancer risk in the RWQCB assessment. It should be noted that Aroclor 1260 was the only PCB mixture that had detectible concentrations. The distributions associated with each of the exposure parameters are summarized in Table 11. These were generally derived from the same sources as my refined, deterministic calculations, although the Monte Carlo analysis also included a range of values for the percent of inorganic arsenic (0-4%) and the cancer slope factor associated with Aroclor 1260 (0.07, 0.4, and 2 per mg/kg-day). Regarding the loss of PCBs through cooking, the distribution of percent losses for fish and shellfish were based on prior empirical studies and vary by cooking method (Zabik, Harte et al. 1992; Wilson, Shear et al. 1998).

The cancer risk estimates based on this analysis are presented in Table 12. Cancer risks were within the same order of magnitude across all locations considered (inside NASSCO vs. outside NASSCO vs. reference), which is consistent with my observation that there is not a statistically significant difference in fish tissue concentrations between the shipyard and the general background in the bay (described in more detail in the next opinion).

Based on the probabilistic assessment, cancer risks for Aroclor 1260 ranged from 4.69×10^{-13} to 2.17×10^{-12} (50^{th} percentile). Risks for the extreme upper bound of the population (99^{th} percentile) were still well below what is considered *de minimus* risk (8.55×10^{-8} to 4.82×10^{-7} for fish and shellfish, across all locations). For inorganic arsenic, risks for the 50^{th} percentile were in the 10^{-11} to 10^{-12} range, while at the uppermost portion of the population (99^{th} percentile), risks ranged from 4×10^{-6} to 3×10^{-7} for fish and shellfish.

In addition to preparation of additional risk estimates, the Monte Carlo technique also allows one to quantify the uncertainty associated with parameters used in the risk calculations. I will note that there was no difference in parameter sensitivity between the various locations considered

(inside NASSCO, outside NASSCO, reference). For Aroclor 1260 cancer risk, fish or shellfish ingestion rate contributed from 86.3 to 87.4% of the total variance of the risk estimates.

Exposure duration and the Aroclor 1260 cancer slope factor (CSF) contributed to total variance with exposure duration having contributions from 4.7 to 5.2% and CSF having contributions of 7.0 to 7.6%. Adult body weight and cooking method both contributed less than 0.1% to the total variance for Aroclor and arsenic cancer risks. For arsenic cancer risk, fish and shellfish ingestion contributed about 90% to the total variance with exposure duration contributing between 4.6 to 5.1% and fraction of inorganic arsenic contributing about 2.6%.

Taken together, the uncertainty analysis highlights the importance of the fish consumption rate in the overall risk assessment, and as I have described in considerable detail above, use of the most appropriate fish consumption rate (i.e., reflective of the complete lack of access to the NASSCO leasehold) is *critical* in properly characterizing risk.

Risk Characterization

I will note that my risk estimates presented above, although reasonable, are still very conservative. They are based on the following assumptions:

1. An individual will gain access to the NASSCO leasehold and catch and consume fish and shellfish tissue for 9 years,
2. The filter organs (hepatopancreas) of the lobster will always be consumed along with the edible tissue,
3. NASSCO sediments are the source of all of the chemicals in the fish/lobster, and
4. 4% of the arsenic in the fish/lobster tissue is inorganic.

Any one of these assumptions is arguably implausible. Yet even if this individual consumes fish/shellfish tissues at the highest rate (1.8 g/day) and only eats tissues containing the upper-bound (95th UCL) chemical concentrations, the risks are below levels that typically warrant regulatory concern. Finally, I will mention that PCBs are not even considered by the USEPA to be known human carcinogens (USEPA 2010).

Additionally, I will note that the risk estimates published by the County of San Diego in their Health Risk Study (the SDCDHS study) were also generally below levels of regulatory concern, particularly when more refined assumptions (e.g., average contaminant concentration values, average fish consumption rate, species-specific fish consumption rate) were used in the risk calculations. In their report, the County of San Diego concluded that "the estimated excess lifetime cancer risk resulting from a typical consumption of fish from San Diego Bay falls between the estimated risks resulting from the consumption of four tablespoons of peanut butter per day (5.6×10^{-4}) and from the average saccharin consumption in the U.S. or drinking one pint of milk per day (both at 1.4×10^{-4}) ((County of San Diego, 1990); p. xxv).

Like my refined assessment, the San Diego Bay Health Risk Study notes that a degree of conservatism remains even in their refined risk estimates: "Due to the conservative nature of

quantitative risk assessments, the actual risk may be several orders or magnitude lower or could even be zero" ((County of San Diego, 1990); p. xx).

Another common risk characterization technique involves comparisons of the estimated doses to "background" doses of the chemicals of interest. This type of analysis was clearly described in Wilson et al. (2001), wherein pharmacokinetic models were used to estimate the daily uptake of PCBs based on concentrations measured in the blood and adipose tissue. A back-calculation was performed in order to determine the amount of PCBs that would have to be consumed in the diet to correspond to levels measured in the blood and/or tissues of the American general population, which were reported to be 5 μg/kg in blood serum and 0.82 mg/kg in adipose tissue (Wilson, Price et al. 2001).

Assuming a half-life of seven years, one would need to consume 44 ng/kg-d of PCBs in order to achieve and maintain 6 μg/kg in the blood serum. As a point of comparison, the mean estimated lifetime average daily dose for recreational anglers consuming fish from the NASSCO leasehold was 0.0251 ng/kg-d, while the upper end estimate was 0.108 ng/kg-d. These doses are equivalent to 0.06% and 0.25% of the background doses received from dietary sources.

e) **The RWQCB's risk assessment and the Tentative Order fail to acknowledge that the fish/shellfish contaminant levels measured in the NASSCO leasehold are 1) statistically indistinguishable from those measured outside the leasehold,** *including the background reference locations specifically selected by the RWQCB,* **and 2) for PCBs, no different from background levels that have been measured around the U.S. Clearly, such findings are inconsistent with the assertions that NASSCO operations are a "chemical source" or that remediation of NASSCO sediments will reduce human health risk.**

It is important to note that all of the chemicals of interest in the San Diego Bay risk assessments are ubiquitous and are typically present at measurable levels in sediments and fish tissues. This is obviously true for the metals, all of which occur naturally, but is also true for PCBs, which bioaccumulate easily and do not degrade quickly in the environment. Accordingly, the mere presence of metals or Aroclor 1260 in NASSCO fish tissues does not indicate that NASSCO is the source of these chemicals; I believe these chemicals would be present at measurable levels even if NASSCO had never conducted operations in the leasehold.

A statistical comparison of the mean chemical concentrations measured in edible fish and lobster tissues collected inside the NASSCO leasehold vs. those measured at reference locations indicates no significant difference (Tables 13 and 14). By definition, a chemical "source" results in levels of environmental contaminants that are higher than regional and/or national background levels. However, the fish tissue data collected from the NASSCO leasehold are no different from tissue concentrations collected in the selected reference station, which strongly suggests that the discharges from the leasehold do not appear to have influenced fish tissue concentrations.

I will note that the reference locations were specifically chosen by the RWQCB to represent "background." Further, the mean chemical concentrations measured in the edible fish tissues

Again, it should be emphasized that the similarity across sampling locations for PCBs is consistent with what has been reported in the past in other surveys (County of San Diego, 1990; Table IV-I). With respect to #3, Tables 4-10 summarize the risks I have calculated for the reference, "inside NASSCO," and "outside NASSCO" locations. The risks calculated for locations outside the NASSCO leasehold (reference and "outside NASSCO" locations) are always a significant fraction of the "inside NASSCO" risks and in fact in many cases (e.g., for Arcolor 1260) the risks *always* exceed those in the leasehold.

Clearly, these findings are inconsistent with the RWQCB's apparent belief that remediation of sediments in the NASSCO leasehold will yield meaningful reduction in potential health risks associated with consumption of fish from the San Diego Bay. .

V. CLOSING COMMENTS

I submit these opinions and am prepared to support them in both deposition and/or courtroom testimony. I may supplement this report if additional information becomes available or I am asked to address other issues.

Respectfully,

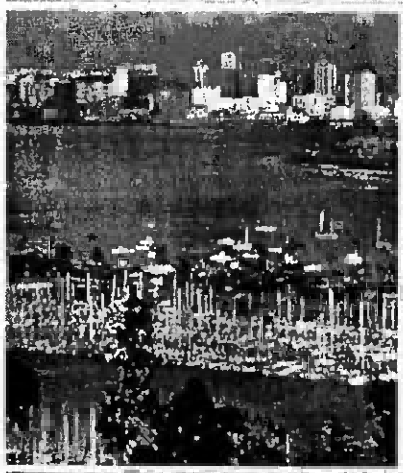
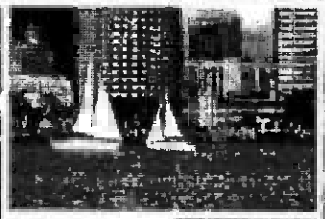
March 11, 2011

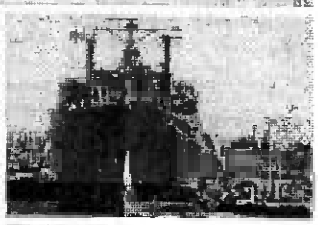
Brent L. Finley
Ph.D., DABT
Principal Health Scientist

Date

III-B. AQUATIC-DEPENDENT WILDLIFE RISK

VOLUME II


DRAFT TECHNICAL REPORT FOR TENTATIVE CLEANUP AND ABATEMENT ORDER NO. R9-2011-0001

FOR THE SHIPYARD SEDIMENT SITE | SAN DIEGO BAY, SAN DIEGO, CA

SEPTEMBER 15, 2010

Water Boards

STATE WATER RESOURCES CONTROL BOARD

REGIONAL WATER QUALITY CONTROL BOARDS

Table 24-3 Summary of Tier II Risk Assessment Hazard Quotients (continued)

Receptor Location	Benzo[a]pyrene		PCBs		TBT	
	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ
Brown Pelican						
Inside NASSCO	0.24	0.024	3.3	0.23	0.0094	0.00015
Outside NASSCO	0.2	0.02	1.5	0.11	0.018	0.00028
Inside SWM	0.35	0.035	3.5	0.25	0.015	0.00024
Outside SWM	0.2	0.02	2.1	0.15	0.014	0.00022
Reference	0.18	0.018	1.2	0.088	0.0044	0.00007
Green Turtle						
Inside NASSCO	0.029	0.0029	0.0033	0.00023	0.00007	1.1E-06
Inside SWM	0.09	0.009	0.0092	0.00065	0.00024	3.7E-06
Reference	0.014	0.0014	0.002	0.00014	0.000017	2.8E-07
Least Tern						
Inside NASSCO	0.29	0.029	2	0.14	0.0052	0.000082
Outside NASSCO	0.29	0.029	2.4	0.17	0.0069	0.00011
Inside SWM	0.52	0.052	3	0.21	0.012	0.00019
Outside SWM	0.32	0.032	2.3	0.16	0.02	0.00032
Reference	0.22	0.022	1.3	0.093	0.0052	0.000082
Sea Lion						
Inside NASSCO	0.0066	0.00026	0.22	0.061	0.0071	0.00012
Outside NASSCO	0.0055	0.00022	0.098	0.028	0.013	0.00022
Inside SWM	0.0099	0.00039	0.23	0.065	0.011	0.00019
Outside SWM	0.0057	0.00023	0.14	0.039	0.01	0.00017
Reference	0.0049	0.0002	0.081	0.023	0.0034	0.000056
Surf Scoter						
Inside NASSCO	0.75	0.075	0.37	0.026	0.032	0.00051
Inside SWM	2.1	0.21	0.57	0.04	0.04	0.00063
Reference	0.3	0.03	0.44	0.031	0.011	0.00017
Western Grebe						
Inside NASSCO	0.17	0.017	0.062	0.88	0.000043	0.0027
Outside NASSCO	0.15	0.015	1.0	0.074	0.0032	0.000051
Inside SWM	0.38	0.038	1.4	0.096	0.0064	0.0001
Outside SWM	0.16	0.016	1.0	0.073	0.0088	0.00014
Reference	0.1	0.01	0.57	0.041	0.0023	0.000036

Note: Reference HQs are based on samples collected in the vicinity of Station 2240.

Table 24-6 Exposure Parameters for Tier II Baseline Risk Assessment

Receptor	Prey Tissue Concentration (mg/kg dry wt)	Sediment Chemical Concentration (mg/kg dry wt)	Body Weight[1] (kg)	Food Ingestion Rate (kg/day dry wt)	Sediment Ingestion Rate[1] (kg/day dry wt)	Area Use Factor[1]	Absorption Efficiency[1]
California brown pelican	Mean Detected Value	Mean Detected Value	3.174	0.25	0.005	1	1
California least tern	Mean Detected Value	Mean Detected Value	0.045	0.0053	0.00011	1	1
Western grebe	Mean Detected Value	Mean Detected Value	1.2	0.062	0.0031	1	1
Surf scoter	Mean Detected Value	Mean Detected Value	1.05	0.056	0.0028	1	1
California sea lion	Mean Detected Value	Mean Detected Value	75	1.54	0.0308	1	1
East Pacific green turtle	Mean Detected Value	Mean Detected Value	95	0.35	0.0186	1	1

1. Exponent, 2003

24.2.3. Effects Characterization

Characterizing potential adverse effects to the receptors of concern requires a comparison of the receptor-specific exposure estimates to an appropriate toxicity reference value (TRV). As recommended by the Natural Resource Trustee Agencies, exposure estimates for the baseline risk assessment were compared to TRVs developed by BTAG (DTSC, 2000). The BTAG TRVs were developed jointly by the U.S. Navy, Navy consultants, and regulatory agencies, including the U.S. EPA, DTSC – Human and Ecological Risk Division, San Diego Water Board, NOAA, U.S. FWS, Cal/EPA Office of Environmental Health Hazard Assessment (OEHHA), and DFG. The U.S. EPA, DTSC, and the other agencies endorse and recommend the use of the BTAG TRVs for ecological risk assessments conducted in California and in U.S. EPA Region 9.

The BTAG TRVs are presented as an upper and lower estimate of effects thresholds. The low-TRV is based on no-adverse-effects-levels (NOAELs) and represents a threshold below which no adverse effects are expected. The high-TRV is based on an approximate midpoint of the range of effects levels and represents a threshold above which adverse effects are likely to occur. The BTAG low and high TRVs for birds and mammals (site CoPCs only) are shown in Table 24-7 below. Because BTAG TRVs are not available for BAP for birds and chromium for birds and mammals, the NOAELs and low-adverse-effects-levels (LOAELs) identified by Exponent (2003) were used (Table 24-8). It should be noted that suitable reptilian TRVs were not found in the literature (Exponent, 2003). Therefore, avian TRVs were used to estimate potential adverse effects to the East Pacific green turtle.

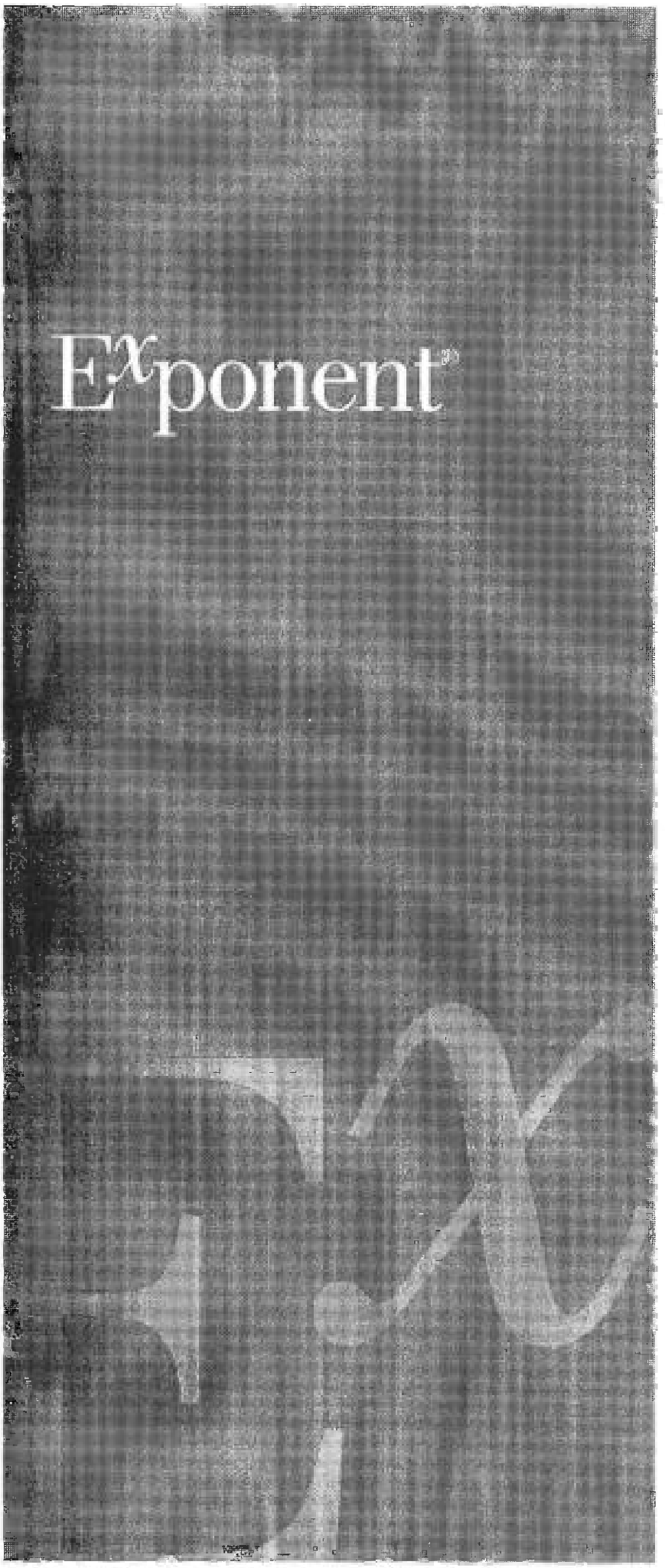
HQ	=	hazard quotient (unitless)
$IR_{chemical}$	=	total ingestion rate of the chemical (mg/kg body weight-day)
TRV	=	BTAG low or high toxicity reference value (mg/kg body weight-day)

An HQ value less than 1.0 indicates that the chemical is unlikely to exceed the TRV for the receptor of concern. An HQ value greater than 1.0 indicates that the receptor's exposure to the chemical pollutant is predicted to exceeded the TRV, which could indicate that there is a potential that some fraction of the population may experience an adverse effect (Exponent, 2003). The significance of any HQ greater than 1.0 depends in large part on the relevance of the TRV. In this assessment, HQs were calculated for two risk thresholds. The TRV_{low} is a no-effect level (i.e., a level at which no effects are predicted). The TRV_{high} is a demonstrated effect level. The actual threshold of adverse effects is predicted to lie somewhere between these two thresholds. The HQ calculations and risk characterization results for each receptor of concern at each assessment unit are provided in the Appendix for Section 24 and summarized in Table 24-3.

In addition to characterizing the risks at the Shipyard Sediment Site, risks were also characterized at a reference area to determine whether or not the site poses a greater risk to the receptors of concern than reference conditions in San Diego Bay. The reference area, located in the vicinity of Reference Station 2240, is located across the bay from the Shipyard Sediment Site (Exponent, 2003). Spotted sand bass, topsmelt, anchovies, benthic mussels, and eelgrass were collected from this reference area and the chemical concentrations from these prey items were used to estimate exposure to the receptors of concern. Risks at the reference area were calculated using the same CoPCs, exposure assumptions, and TRVs as those identified above for the Shipyard Sediment Site. The HQ calculations and risk characterization results for the reference area are provided in the Appendix for Section 24.

24.2.5. Risk Management

The San Diego Water Board identified two risk management decisions: (1) Current site conditions pose acceptable risks and no further action is warranted, and (2) Current site conditions pose unacceptable risks that require remedial action. These two management decisions are based on the risk characterization results at the Shipyard Sediment Site and at the reference area. A flow diagram showing how each management decision is triggered is shown below in Figure 24-1.



Evaluation of Draft Technical Report for Tentative Cleanup and Abatement Order No. R9-2011-0001 for the NASSCO Shipyard Sediment Site

Expert Report of
Thomas C. Ginn, Ph.D.

Exponent®

Evaluation of Draft Technical Report for Tentative Cleanup and Abatement Order No. R9-2011-0001 for the NASSCO Shipyard Sediment Site

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March 11, 2011

Failure to Consider Actual Habitat Use

One of the primary risk-driving assumptions made by the Staff in their exposure assessment is selection of an area use factor (AUF) of 1.0 for all receptors. In other words, for purposes of risk evaluation, it is assumed by the Staff that all modeled receptors obtain 100 percent of their diet from within the confines of the NASSCO leasehold, and that prey items sampled at NASSCO stations are therefore representative of the entire diet for each receptor. This assumption is clearly unrealistic, and the resulting conclusions based on this model are an inaccurate representation of actual wildlife exposure and risk.

As described in the DSI (Exponent 2003), the NASSCO leasehold is far too small to serve as the sole foraging habitat of any of the modeled receptor species. Based on an examination of the habitat present throughout San Diego Bay and the best available scientific literature on the foraging preferences and behavior of the modeled species, the tern, pelican, grebe, scoter, and sea lion are all estimated to obtain at most 0.4 percent of their diet from the area of the NASSCO leasehold. The green turtle is estimated to obtain no more than 1.1 percent of its diet from the NASSCO leasehold (Exponent 2003). These estimates should actually be considered as maximum area use estimates because it is assumed in their derivation that the shipyard would be as attractive to these species as the rest of San Diego Bay. In fact, the heavy industrial activities at the shipyard would most likely deter birds and other species from foraging at the shipyard, thus reducing their actual area uses below these conservative (i.e., protective) estimates.

The Staff acknowledges the uncertainties associated with wildlife area use in the DTR (Section 24.2.6). Yet they make no attempt to estimate realistic area use values for incorporation into their exposure and risk estimates. Rather than estimating AUF based on scientific evidence, as is standard practice in ERA, the Staff assumes a theoretical maximum exposure of 100 percent. No justification for this extreme assumption is provided.

In effect, the Staff is asserting an arbitrary policy that site-specific habitat usage by wildlife is irrelevant to exposure assessment, and by extension to the decision on sediment cleanup

requirements at NASSCO. This policy is neither typical of standard ERA practice at other sites, nor is it justified in the CAO.

As demonstrated in the 2003 DSI, use of realistic AUFs in food web models for all representative receptors results in a finding of insignificant risk from dietary exposure, because the habitat quality within the NASSCO leasehold is low for all representative species (Table 6). If habitat usage is low, then exposure to sediment contaminants and resultant risk are correspondingly low. Were the Staff to incorporate realistic habitat usage values into their assessment, they would conclude that there are not any impaired beneficial uses for aquatic-dependent wildlife resulting from sediment contamination in the NASSCO leasehold. The entire assertion of impairment by the Staff for this LOE is therefore driven by a single policy decision that is not scientifically based and is contrary to regulatory guidance. This policy also deviates from technical decisions approved by the Staff during the sediment investigation. The use of an AUF derived for the shipyards was established in the 2001 sediment investigation work plan (Exponent 2001a), in the work plan revisions issued at the request of Staff later that year (Exponent 2001b), and again in the 2002 technical memorandum that described receptor species and receptor parameters for the ERA (Exponent 2002), all of which were reviewed and approved by the Staff. The Staff has not published any justification for eliminating consideration of actual habitat use prior to the CAO. As discussed in the following section, this unrealistic and scientifically unsupportable policy decision is also contrary to relevant ERA guidance and standards of practice.

Table 6. Dependence of hazard quotient on habitat usage

Receptor	San Diego Bay Habitat (acres)	Maximum NASSCO AUF[a]	Maximum Hazard Quotient for Receptor: DTR AUF = 1.0[b]	Maximum Hazard Quotient for Receptor: Maximum NASSCO AUF[c]
East Pacific green turtle	3,734	0.011	6.8	0.07
California least tern	13,374	0.003	25	0.08
California brown pelican	11,219	0.004	20	0.07
Western grebe	11,219	0.004	25	0.09
Surf scoter	11,375	0.004	50	0.18
California sea lion	10,396	0.004	1.0	0.0039

Note: AUF - area use factor
DTR - Detailed Technical Report (RWQCB 2010)

[a] Assumes that entire forage range is limited to habitat in San Diego Bay. Area of aquatic habitat within NASSCO leasehold is 43 acres.

[b] Value from DTR.

[c] All parameters from DTR, except AUF.

Regulatory Guidance and Standards for AUF Application

Federal Guidance on AUFs

The most comprehensive regulatory guidance for ecological risk assessment is the EPA Ecological Risk Assessment Guidance for Superfund (ERAGS, U.S. EPA 1997). This multi-volume manual, which is widely cited and followed in jurisdictions throughout the U.S., includes detailed guidance for every aspect of ERA, from preliminary site assessment and screening to final risk characterization. As noted above, the CAO ERA is stated to be ERAGS-compliant. ERAGS describes the use of dietary exposure modeling in detail, including application of AUFs. A clear distinction is made between AUF application in Tier I screening assessment and Tier II comprehensive risk assessment. ERAGS states:

> For the screening level exposure estimate for terrestrial animals, assume that the home range of one or more animals is entirely within the contaminated area, and thus the animals are exposed 100 percent of the time. This is a conservative assumption and, as an assumption, is only applicable to the screening-level phase of the risk assessment. Species- and site-specific home range information would be needed later, in Step 6, to estimate more accurately the percentage of time an animal would use a contaminated area. Also evaluate the possibility that some species might actually focus their activities in contaminated areas of the site. For example, if contamination has reduced emergent vegetation in a pond, the pond

> the shipyard site had a value less than 1.0 (Table 32-8), indicating that the COCs are unlikely to cause adverse ecological effects and that the post-remedial sediment chemistry conditions are protective of aquatic-dependent wildlife and their associated beneficial uses. (RWQCB 2010, p. 32-15)

Based on the Tier II risk assessment decision tree shown in Figure 24-1, any hazard quotient (presumably low or high) greater than 1.0 results in a requirement for remedial action if the modeled exposure is also higher than the reference exposure. The rationale behind such a decision framework is not explained in the DTR, and is directly contradictory to the interpretation of high and low TRVs provided in the discussion of alternative cleanup levels, which clearly states that the protective threshold is some exposure level above the NOAEL. The biased risk characterization approach of the Tier II ERA is neither justified nor explained in the CAO, nor is it typical of ERA practice or regulatory guidance.

The exposure threshold used in the DTR to justify the alternative cleanup levels is the geometric mean of the NOAEL/low and LOAEL/high TRVs:

> The toxicity reference values (TRVs) presented in Table 32-7 are based on the geometric mean of the TRVs (BTAG, NOAELs, and LOAELs) presented in Tables 24-7 and 24-8 of Section 24. The geometric mean addresses the region of uncertainty between the NOAEL and LOAEL. At the NOAEL, no effects are observed. At the LOAEL, effects are observed. Between these two values there is often a significant range over which the effects are uncertain because the data do not exist. The uncertainty is handled by taking an intermediate value that is biased toward the NOAEL by using the geometric mean. (RWQCB 2010, p. 32-15).

While the geometric mean TRV is an arbitrary selection within the NOAEL-LOAEL range, it is protectively biased, in the sense that it is lower than the midpoint of the range, and it has been recommended as a reasonable preliminary remediation goal by leading ecological risk assessors at U.S. EPA (Charters and Greenberg 2004, Greenberg and Charters 2005). Had the Staff used a geometric mean TRV in the Tier II wildlife risk assessment, as they did in the post-remedial protectiveness evaluation, their conclusions would have been quite different (Table 7). In fact, the only evaluated chemical for which any hazard quotient for any receptor exceeded 1.0 would have been lead. Based on this change alone, copper, mercury, HPAHs, PCBs, and TBT would have been eliminated as risk drivers. This conclusion would have been reached notwithstanding the highly conservative assumption of an AUF = 1.0.

Furthermore, the lead geometric mean hazard quotient would have exceeded 1.0 only for least tern inside SWM, and for surf scoter inside NASSCO and inside SWM. Had this more reasonable approach been employed in the Tier II risk level, the conclusions in the CAO about potential beneficial use impairment would have been quite different, even if no other risk-driving assumptions were modified. It should also be noted that lead was not selected as a primary COC for the shipyard site and no alternative cleanup level for lead is proposed in the DTR.

Regulatory Guidance on Risk Characterization

The federal ERAGS describes the risk characterization process as follows:

> Risk characterization integrates the results of the exposure profile and exposure-response analyses, and is the final phase of the risk assessment process. It consists of risk estimation and risk description, which together provide information to help judge the ecological significance of risk estimates in the absence of remedial activities. The risk description also identifies a threshold for effects on the assessment endpoint as a range between contamination levels identified as posing no ecological risk and the lowest contamination levels identified as likely to produce adverse ecological effects. To ensure that the risk characterization is transparent, clear, and reasonable, information regarding the strengths and limitations of the assessment must be identified and described (U.S. EPA 1997).

The approach taken in the DTR fails to fully comply with the regulatory standard for risk estimation. Risk description, as described by federal ERA guidance, is completely missing from the Staff's approach. California guidance for risk characterization is similar: "[r]isk characterization would include comparison of the estimated exposure via all pathways with the selected toxicity criteria. In general, this would include an estimate of the range of uncertainty and the probability of adverse effects at the calculated exposure level" (DTSC 1996). The DTR Tier II ERA is completely lacking any consideration of probability of adverse effects.

Federal ERA guidance recommends consideration of highly conservative assumptions and NOAEL effect thresholds only when considered in conjunction with more realistic exposure and effect scenarios.

> Key outputs of the risk characterization step are contaminant concentrations in each environmental medium that bound the threshold for estimated adverse ecological effects given the uncertainty inherent in the data and models used. The lower bound of the threshold would be based on consistent conservative assumptions and NOAEL toxicity values. The upper bound would be based on observed impacts or predictions that ecological impacts could occur. This upper bound would be developed using consistent assumptions, site-specific data, LOAEL toxicity values, or an impact evaluation (U.S. EPA 1997).

Similarly, California ERA guidance recommends consideration of a range of hazard quotients with different TRV thresholds and exposure assumptions to properly characterize risk and make risk management decisions (DTSC 1999). One consistent aspect of state and federal regulatory guidance on ecological risk characterization is the need for critical examination of predicted risk, including consideration of alternative exposure and adverse effect threshold assumptions: "[w]ell-balanced risk characterizations present risk conclusions and information regarding the strengths and limitations of the assessment for other risk assessors, EPA decision-makers, and the public" U.S. EPA 1995). The DTR approach fails to comply with this basic requirement.

Risk from Lead

As noted above, the highest hazard quotients in the Tier II wildlife risk assessment, and the only hazard quotients that would exceed 1.0 using a geometric mean TRV, are those based on the lead NOAEL for birds (also used to assess risk to green turtle). Lead was the only evaluated chemical for which a NOAEL TRV was exceeded by a factor greater than 10 in the flawed DTR assessment. This finding is a result of the use by the RWQCB of an inappropriate and ecologically irrelevant TRV.

The NOAEL TRV for lead used by the RWQCB (0.014 mg/kg-day) is based on a 10 percent reduction in egg laying in Japanese quail, as reported by Edens et al. (1976). Extrapolation of such an endpoint to wild bird species is highly questionable, given that quail have been selectively bred to have unnaturally high egg production rates. The quail in which egg laying was judged to be "impacted" in this study were laying 5.4 eggs per week, as opposed to 6 eggs per week in controls. No wild bird species approaches this rate of continuous egg production,

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

SAN DIEGO REGION

IN THE MATTER OF:	
TENTATIVE CLEANUP AND ABATEMENT	Order No. R9-2011-001

VIDEOTAPED

DEPOSITION OF TOM ALO

VOLUME II PAGES 211 THROUGH 410

FEBRUARY 17, 2011

SAN DIEGO, CALIFORNIA

REPORTED BY: JULIE A. MCKAY, CSR NO. 9059

A. Correct. 13:53

Q. And so, to be clear, that means that the assumption is a hundred percent of the prey items for each of the these species were caught and consumed by these receptors from the shipyard? 13:53

A. Correct.

Q. Why was a hundred percent used?

A. To ensure beneficial use protection. It was a risk management decision on our end.

Q. And who made that risk management policy decision? 13:54

A. That would be the members of the Cleanup Team.

Q. Did any one individual Cleanup Team member make that policy decision?

A. That would be David Barker. 13:54

Q. The assumption that a hundred percent of the prey comes from the shipyard for all these species is very conservative. Would you agree?

A. I would agree.

Q. Is it likely that there is a pet brown pelican at the shipyards that spends all of its time there? 13:54

MR. CARRIGAN: Vague. Incomplete hypothetical.

THE WITNESS: Yeah, I don't know.

MR. CARRIGAN: Wouldn't it be shot by the Navy? Strike that. 13:54

100-percent AUF for Tier 2 assessment. Correct? 13:58

A. Correct.

Q. So on this same page it says that, the sentence above it: "It's possible that these receptors could catch their prey from other locations in San Diego Bay, 13:58 thus reducing their area use factor."

Do you see that?

A. I see that.

Q. Do you agree with this statement?

A. Yes. 13:59

Q. Why is that?

A. Because as written, I agree with it as written.

Q. Okay. So it's possible that species could eat prey outside of the shipyards?

A. Correct. 13:59

Q. Would you agree it's actually probable that they eat some amount of their diet outside of the shipyard?

A. Yes.

Q. Are you aware of any support for the notion 13:59 that a bird species would choose to spend all of its time, its foraging time, in an area the size of the shipyard site?

MR. CARRIGAN: Overbroad. Calls for speculation. 14:00

THE WITNESS: I don't know. 14:00

BY MR. RICHARDSON:

Q. Okay. Same question for all the other receptors. Is there any reason to believe that they would spend a hundred percent of their foraging time within the shipyard? 14:00

A. I don't know.

Q. Are any of the species used in the aquatic dependent wildlife risk assessment migratory?

A. Yes. 14:00

Q. In other words, they are not permanent residents of San Diego Bay. Correct?

A. Correct.

Q. So the least terns nest in the bay and are present only during the breeding season. Correct? 14:00

A. Correct.

Q. For the brown pelicans, surf scoters, Western grebes, they are all winter residents of the bay but migrate away to breed. Correct?

A. I believe so. 14:01

Q. Finally, sea lions breed away from San Diego Bay in offshore work areas. Correct?

A. I believe so.

Q. That being the case, they could not possibly have 100 percent of their diet from the shipyard site. 14:01

Correct?

MR. CARRIGAN: Incomplete hypothetical.

THE WITNESS: Correct. But got to remember that we're using these receptors as representative of other receptors that, say, for the brown pelican, representative marine birds that may feed on small to medium-size fish.

BY MR. RICHARDSON:

Q. And so do any of those other potential receptor species feed entirely within the Shipyard Sediment Site?

A. I don't know.

Q. Isn't it the policy of EPA and the State of California to use site-specific area use factors in connection with Tier 2 aquatic dependent wildlife risk assessments?

A. Repeat the question.

MR. RICHARDSON: Can you read it back.

(Record read.)

MR. CARRIGAN: Calls for a legal conclusion.

THE WITNESS: I would have to look at the guidance documents for OEHHA or the EPA guidance manual.

MR. RICHARDSON: Okay. Then let's do that. I'll introduce as Exhibit 1127 this document.

Counsel, for you.

(Exhibit 1127 marked for identification.)

foundation.

You can answer if you know.

THE WITNESS: Sure.

BY MR. RICHARDSON:

Q. Are you aware of any EPA ecological risk risk assessment guidance in any context, superfund or otherwise, where they suggest using an area use factor of a hundred percent even in Tier 2 risk assessment?

A. Not that I'm aware of.

MR. RICHARDSON: Would you mark this as Exhibit 1128.

(Exhibit 1128 marked for identification.)

BY MR. RICHARDSON:

Q. Mr. Alo, I've handed you a document from the California Department of Toxic Substances Control, Human and Ecological Risk Division, entitled HERD Ecological risk assessment Note dated December 8, 2000.

Do you see that?

A. Yes, I do.

Q. If I can draw your attention to Page 9, Paragraph C, of the document and Paragraph D of the document. After you've had a chance to review both of those, let me know.

A. Okay.

Q. Mr. Alo, the equation in Paragraph D is vaguely

14:06 14:06 14:06 14:07 14:07 14:08

Q. By approximately a hundredfold. Correct? 14:16

A. (Witness nods head.)

Q. I'm sorry?

A. Yes.

Q. The reporter can't take down a head nod. 14:16

That difference can be significant, right? I mean, it could be the difference between triggering a threshold and not triggering a threshold?

A. That's correct.

Q. Did the Cleanup Team conduct any study of the 14:16 actual use of these receptors or other receptors at the shipyard?

A. No, we did not.

Q. Did the Cleanup Team calculate any site-specific area use factors for any species at the 14:16 shipyard?

A. No, we did not.

Q. You just used the default assumption of a hundred percent?

A. Correct, for protection of beneficial uses. 14:17

Q. You're reading my notes. I said to be conservative. Right?

A. I can see that far.

Q. So these are based on very conservative theoretical assumptions, not based on the site-specific 14:17

BY MR. RICHARDSON: 14:50

Q. The lowest observed adverse effects threshold is that concentration that you would expect to see an adverse effect. Correct?

A. Correct. 14:51

Q. So wouldn't that be an appropriate measure to use for determining if there is potential risk at the site?

A. Yes. And also there could be adverse effects above the NOAELs between. 14:51

Q. Less than the LOAEL.

A. Yeah, between the NOAELs and the LOAELs.

Q. Are you aware of any agency guidance document or agency policy that indicates that a no adverse effects threshold should be used for making any cleanup 14:51 decisions as part ecological risk assessment?

A. Not that I'm aware of.

Q. Are you aware of any agency guidance document that indicates that an exceedance of a NOAEL or TRV represents an unacceptable risk in the Tier 2 risk 14:51 assessment?

A. Not that I'm aware of.

Q. So you would agree that the actual threshold for adverse effects always occurs at an exposure level greater than the no adverse effects level. Correct? 14:52

A. Correct.

Q. I want to discuss the toxicity reference values developed by the Navy and the EPA Biological Technical Assistance Group. I understand that's frequently referred to as BTAG. Is that correct? 14:52

A. That's correct.

Q. Just one more acronym for us to use today.

A. I warned her it was coming.

Q. Let's look at DTR Page 24-10.

What is a TRV high exceedance? 14:52

A. The high TRV?

Q. Yes.

A. That would be equivalent to a LOAEL.

Q. And what about a TRV low exceedance?

A. That would be equivalent to a NOAEL. 14:53

Q. Who selected the TRVs that were used in this analysis?

A. That would be based on consultation with the resource agencies.

Q. Do you recall who in particular at the resource agencies were involved in that decision making? 14:53

A. No, I don't. It was group effort.

Q. I'm sorry?

A. It was the group.

Q. Did you evaluate independently whether those 14:53

THE WITNESS: We used it, if it exceeded the NOAEL or if it even exceeded a LOAEL, we concluded that there is a potential risk to the receptors of concern based on the Tier 2 analysis. 14:55

BY MR. RICHARDSON:

Q. So do you agree that an exceedance of a NOAEL where there's not an exceedance of a LOAEL does not mean that there's necessarily an impact on aquatic dependent wildlife? 14:56

A. Correct. But there is a potential. 14:56

Q. Has the Cleanup Team made a policy decision to find impairment to aquatic dependent wildlife even where there are no exceedances to the LOAEL?

A. Made it a -- Cleanup Team made it a policy?

Q. Do you want her to read back the question? 14:56

A. Yeah, read back the question. Sorry.

(Record read.)

THE WITNESS: Yes, we made a decision.

BY MR. RICHARDSON:

Q. Would you agree that that decision is extremely conservative and protective? 14:57

MR. CARRIGAN: Vague.

You can answer.

THE WITNESS: Protective.

BY MR. RICHARDSON: 14:57

Q. So you agree it is conservative and protective?

A. It provides protection of beneficial uses.

Q. But it's conservative because it's less than the lowest concentration that there has been an observed 14:57 effect. Correct?

A. Correct.

Q. In evaluating the post-remedial conditions related to aquatic dependent wildlife, did the DTR use the geometric mean between the NOAEL and LOAEL to 14:57 evaluate risks for selected receptors?

MR. CARRIGAN: This is beyond this witness's topic as a designated expert as it deals with the alternative cleanup levels.

So we'll ask this of Mr. Alo -- 14:57

MR. RICHARDSON: I will ask Mr. Alo --

MR. CARRIGAN: -- based on his expertise?

BY MR. RICHARDSON:

Q. Yeah, based on your expertise.

A. Based on my expertise, did we use the geometric 14:58 mean between the NOAEL and the LOAEL?

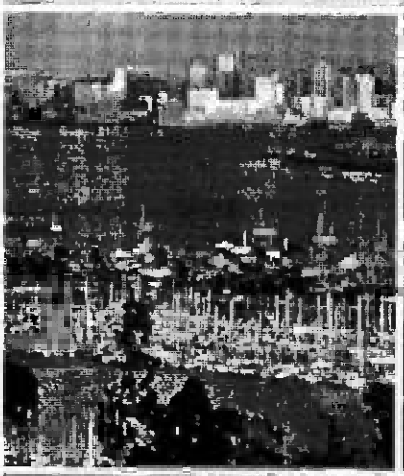
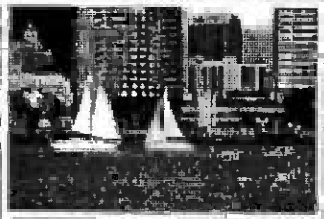
Q. In evaluating post-remedial conditions.

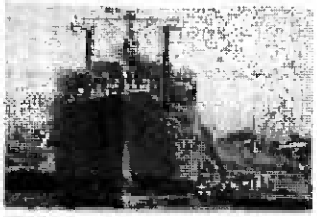
A. Yes, we did.

Q. And I'll bring that back around to the aquatic dependent wildlife analysis. 14:58

III-C. AQUATIC LIFE RISK

VOLUME I


DRAFT TECHNICAL REPORT FOR TENTATIVE CLEANUP AND ABATEMENT ORDER NO. R9-2011-0001

FOR THE SHIPYARD SEDIMENT SITE · SAN DIEGO BAY, SAN DIEGO, CA

SEPTEMBER 15, 2010

California Water Boards

STATE WATER RESOURCES CONTROL BOARD

REGIONAL WATER QUALITY CONTROL BOARDS

R-82
SAR382893

15. Finding 15: Multiple Lines of Evidence Weight-of-Evidence Approach

Finding 15 of CAO No. R9-2011-0001 states:

The San Diego Water Board used a weight-of-evidence approach based upon multiple lines of evidence to evaluate the potential risks to aquatic life beneficial uses from pollutants at the Shipyard Sediment Site. The approach focused on measuring and evaluating exposure and adverse effects to the benthic macroinvertebrate community and to fish using data from multiple lines of evidence and best professional judgment. Pollutant exposure and adverse effects to the benthic macroinvertebrate community were evaluated using sediment quality triad measurements, and bioaccumulation analyses, and interstitial water (i.e., pore water) analyses. The San Diego Water Board evaluated pollutant exposure and adverse effects to fish using fish histopathology analyses and analyses of PAH breakdown products in fish bile.

15.1. No Single Method Can Measure the Effects of Contaminated Sediment

Pollutants in sediment can cause adverse effects either through direct toxicity to benthic organisms or through bioaccumulation and food chain transfer to human and wildlife consumers of fish and shellfish. As noted by U.S. EPA (1992a), there is no single method that will measure all contaminated sediment effects at all times and to all biological organisms. For example, sediment chemistry provides unambiguous measurements of pollutant levels in marine sediment, but provides inadequate information to predict biological impact. Benthic communities can provide a direct measurement of community impacts, but are subject to disturbances that are not necessarily caused by pollutant driven sediment toxicity (e.g. low dissolved oxygen). Measurements of sediment toxicity directly measure biological impacts and integrate the effect(s) of various pollutant mixtures, but are subject to test imprecision and lack of consistent correlations with biological community effects. In addition, the toxicity test organisms may not adequately reflect the sensitivity of the full range of species comprising the benthic community. Reliance on any one of these measurement endpoints (chemistry, benthic communities and toxicity) to evaluate exposure and effects is problematic for characterizing risk from sediment pollutants. In contrast, a weight of evidence assessment using all three measurement endpoints gives the assessor much more information to reach conclusions.

15.2. Weight-Of-Evidence Approach

Based on these considerations, the assessment of potential adverse effects from contaminated sediment is best performed using a "weight-of-evidence approach." The central tenet of a weight-of-evidence approach is that "multiple lines of evidence" should support decision-making. The corollary is that no single line of evidence should drive decision-making (unless a single line of evidence gives all the information necessary, and decision makers are willing to accept the outcome). The weight-of-evidence approach is commonly defined in the literature as a determination related to possible ecological impacts based upon multiple lines of evidence,

which contribute to an overall evaluation and conclusion. This determination incorporates judgments referred to as "best professional judgment" (BPJ) concerning the quality, extent, and congruence of the data contained in the different lines of evidence. BPJ comprises the use of expert opinion and judgment based on available data and site-situation specific conditions to determine, for example, environmental status or risk. BPJ can be initiated in cases where there are extensive data but few uncertainties and in cases where there are few data and many uncertainties.

15.3. San Diego Water Board Approach

The San Diego Water Board applied the weight-of-evidence approach principles to evaluate potential risks to aquatic life beneficial uses from the existing levels of pollutants at the Shipyard Sediment Site. The approach focused on evaluating the exposure and adverse impacts to the benthic macroinvertebrate community and to fish using multiple lines of evidence including sediment and pore water chemistry, laboratory studies of toxicity and bioaccumulation, benthic community evaluation, fish histopathology analyses and analyses of PAH breakdown products in fish bile. The details regarding pore water, fish histopathology, and fish bile analyses can be found in the Appendix for Section 15. The data used to establish these lines of evidence are contained in the NASSCO and BAE Systems' report (Exponent, 2003) referenced in Section 13 of this Technical Report. The San Diego Water Board's evaluation of these data and multiple lines of evidence are discussed in Sections 16 through 19 of this Technical Report.

15.4. State Water Resources Control Board's Sediment Quality Objectives

The State Water Board's *Water Quality Control Plan for Enclosed Bays and Estuaries – Part 1. Sediment Quality* was effective on August 25, 2009 (SWRCB, 2009).

This plan contains sediment quality objectives (SQOs) for direct (benthic communities) and indirect (human health) effects, and a plan of implementation for direct effects. The SQOs are designed to provide the State and Regional Water Boards, stakeholders, and interested parties with a process to differentiate sediments impacted by toxic pollutants from those that are not. To protect benthic communities in bays and estuaries of California, the SQO describes a multiple lines of evidence (MLOE) approach that integrates sediment toxicity, sediment chemistry, and benthic community analysis into a station level assessment.

The State Water Board's MLOE approach, sometimes referred to as the Triad approach, is similar to the San Diego Water Board's approach identified in Section 15.3 above. Both methodologies evaluate the potential for the pollutants in the sediment to impact benthic communities by integrating sediment toxicity, sediment chemistry, and benthic community data.

The results of the station level MLOE assessment classify the impacts to the benthic communities into one of the following 6 categories:

a. Unimpacted;
b. Likely Unimpacted;
c. Possibly Impacted;
d. Likely Impacted;
e. Clearly Impacted; or
f. Inconclusive.

The SQO recommends a dividing line between "Likely Unimpacted" and "Possibly Impacted." Protected sediments are defined by the categories "Unimpacted" and "Likely Unimpacted." All other categories would be considered as not representing the protective condition.

The Principal Scientist on the project was Mr. Steve Bay, with SCCWRP. Mr. Bay evaluated a number of stations within San Diego Bay utilizing the MLOE approach in the SQO. This evaluation included 27 stations at the Shipyard Sediment Site, (Bay, 2007). The results are presented in Table 32-17 in Section 32.5.1 Analysis for Aquatic Life at Triad Stations.

The Shipyard Sediment Site is exempt from the Phase I Sediment Quality Objectives promulgated by the State Water Resources Control Board (State Water Board) because a site assessment (the Shipyard Report) was completed and submitted to the San Diego *Water Board on October 15, 2003. See State Water Board, Water Quality Control Plan for Enclosed Bays and Estuaries – Part 1 Sediment Quality*, II.B.2 (August 25, 2009).

18. Finding 18: Sediment Quality Triad Results

Finding 18 of CAO No. R9-2011-0001 states:

The San Diego Water Board categorized 6 of 30 sediment quality triad sampling stations at the Shipyard Sediment Site as having sediment pollutant levels "Likely" to adversely affect the health of the benthic community. The remaining triad stations were classified as "Possible" (13) and "Unlikely" (11). These results are based on the synoptic measures of sediment chemistry, toxicity, and benthic community structure at the Shipyard Sediment Site.

18.1. Sediment Quality Triad Results

Based on the results of the Triad lines of evidence, 6 of 30 stations sampled at the Shipyard Sediment Site are categorized as "Likely" impacted, which means it is likely that the CoPCs are adversely impacting the health of the benthic community (Table 18-1). The process used to assign the "Low," "Moderate," and "High" classifications to each line of evidence, and the "Unlikely," "Possible," and "Likely" categories for the weight-of-evidence conclusions are described below.

The results presented in Table 18-1 are based on a comparative analysis using a set of reference stations that characterize the Reference Sediment Quality Conditions described in Section 17 of this Technical Report. This reference condition can be used to represent contemporary background chemical and biological characteristics of San Diego Bay and is reflective of conditions that would exist in the marine sediment in the absence of the Shipyard Sediment Site discharges. This condition reflects the presence of existing background anthropogenic levels of pollutants from non-shipyard related discharges (e.g., urban watershed loading in San Diego Bay), as well as natural variability in marine sediment toxicity and benthic community condition. A description of the Reference Sediment Quality Conditions, including a list of the reference stations, is provided in Section 17 of this Technical Report.

Table 18-1 Results of the Sediment Quality Triad Lines-of-Evidence

Site	Station	Sediment Chemistry[1]	Toxicity[2]	Benthic Community[3]	Weight-of-Evidence Category[4]
NASSCO	NA01	Moderate	Low	Low	Unlikely
	NA03	Moderate	Low	Low	Unlikely
	NA04	Moderate	Low	Low	Unlikely
	NA05	Moderate	Low	Low	Unlikely
	NA06	Moderate	Low	Low	Unlikely
	NA07	Moderate	Low	Low	Unlikely
	NA09	Moderate	Moderate	Low	Possible

Site	Station	Sediment Chemistry[1]	Toxicity[2]	Benthic Community[3]	Weight-of-Evidence Category[4]
	NA11	Moderate	Moderate	Low	Possible
	NA12	Moderate	Moderate	Low	Possible
	NA15	Moderate	Low	Low	Unlikely
	NA16	Moderate	Moderate	Low	Possible
	NA17	High	Low	Low	Possible
	NA19	High	Moderate	Low	Likely
	NA20	Low	Low	Moderate	Unlikely
	NA22[5]	Moderate	Moderate	Moderate	Likely
BAE Systems	SW02	High	Low	Low	Possible
	SW03	Moderate	Low	Low	Unlikely
	SW04	High	Low	Moderate	Likely
	SW08	High	Low	Low	Possible
	SW09	High	Low	Low	Possible
	SW11	Moderate	Low	Low	Unlikely
	SW13	High	Moderate	Low	Likely
	SW15	Moderate	Moderate	Low	Possible
	SW17	Moderate	Moderate	Low	Possible
	SW18	Moderate	Low	Low	Unlikely
	SW21	High	Low	Low	Possible
	SW22	High	Moderate	Low	Likely
	SW23	High	Moderate	Low	Likely
	SW25	Moderate	Moderate	Low	Possible
	SW27	Moderate	Moderate	Low	Possible

1. Relative likelihood that the chemicals present in the sediment is adversely impacting organisms living in or on the sediment (i.e., benthic community).
2. Relative likelihood of toxic effects based on the combined toxic response from three tests: amphipod survival, sea urchin fertilization, and bivalve development.
3. Relative likelihood of benthic community degradation based on four metrics: total abundance, total number of species, Shannon-Wiener Diversity Index, and the Benthic Response Index.
4. Relative likelihood (Likely, Possible, or Unlikely) that the health of the benthic community is adversely impacted based on the three lines of evidence: sediment chemistry, toxicity, and benthic community.
5. NA22 was omitted from this analysis because it falls within an area that is being evaluated as part of the TMDLs for Toxic Pollutants in Sediment at the Mouth of Chollas Creek TMDL and is not considered part of the Shipyard Sediment Site for purposes of the CAO.

18.2. Sediment Chemistry Ranking Criteria

The low, moderate, and high classifications assigned to the sediment chemistry line-of-evidence are determined by comparing the bulk sediment chemical concentrations from each site station to sediment quality guidelines (SQGs) and to Reference Condition as follows:

- **Sediment Quality Guidelines** – Sediment quality guidelines (SQGs) are reference values above which sediment pollutant concentrations could pose a significant threat to aquatic life and can be used to evaluate sediment chemistry data. SQGs are considered one of the most effective methods for attempting to relate sediment chemistry to observed toxic effects and determine whether contaminants are present in amounts that could cause or contribute to adverse effects (Long et al., 1995; Long et al., 1998). SQGs have been used by regulatory agencies, research institutions, and environmental organizations throughout the United States to identify contamination hot spots, characterize the suitability of dredge material for disposal, and establish goals for sediment cleanup and source control (Vidal and Bay, 2005). SQGs are often used as a tool to interpret chemical data from analyses of sediment, identify data gaps, and screen CoPCs. SQGs are helpful in determining whether marine sediment contaminants warrant further assessment or are at a level that requires no further evaluation.

  Several different approaches, based on empirical or causal correlative methodologies, have been developed for deriving SQG screening levels. Each of these approaches attempts to predict pollutant concentration levels that could result in adverse effects to benthic species, which are extrapolated to represent the entire aquatic community. Examples of empirical SQGs include the ERL and ERM values, which are concentrations corresponding to the 10th and 50th percentiles of the distribution observed in toxic samples, respectively (Vidal and Bay, 2005). Examples of causal SQGs include the equilibrium partitioning (EqP) approach which uses partitioning theory to relate the dry-weight sediment concentration of a particular chemical that causes an adverse biological effect to the equivalent free chemical concentration in pore water and to the concentration sorbed to sediment organic carbon or bound to sulfide. The theoretical causal resolution of chemical bioavailability in relation to chemical toxicity in different sediments differentiates equilibrium partitioning approaches from purely empirical correlative assessment methods (U.S. EPA 1998d). Causal SQGs have a greater ability relative to empirical SQGs to determine the specific contaminants responsible for toxicity. However causal SQGs require more extensive data sets and published values are not available for many contaminants relative to empirical SQGs. By comparison, empirical SQGs can be calculated for a large number of contaminants and only require routine chemical analyses (Vidal and Bay, 2005).

It is important to note that SQGs are not promulgated as regulatory sediment quality criteria or standards in California nor are they intended as cleanup or remediation targets (Buchman, 1999). The SQGs used to classify the Shipyard Sediment Site stations include:

- ERM for metals (Long et al., 1998),
- Consensus midrange effects concentration for PAHs and PCBs (Swartz, 1999; MacDonald et al., 2000), and
- Sediment Quality Guideline Quotient (SQGQ) for chemical mixtures (Fairey et al., 2001).

- **Reference Sediment Quality Conditions** – A key step to evaluating each line-of-evidence comprising the Triad of data is to determine if there are statistically significant differences between a contaminated marine sediment site and reference station sites. To accomplish this it is necessary to specify the appropriate statistical procedure to estimate the level of confidence obtained when differentiating between reference and the contaminated marine sediment site conditions. The statistical procedure used by the San Diego Water Board in the Shipyard Sediment Site investigation to identify stations where conditions are significantly different from the Reference Sediment Quality Conditions consisted of identifying station sample values outside boundaries established by the 95% upper predictive limit reference pool of data for each contaminant of concern. The 95% upper predictive limit allows a one-to-one comparison to be performed between a single Shipyard Sediment Site station and the pool of reference stations used to establish "Reference Sediment Quality Conditions" for the Shipyard Sediment Site (Reference Pool). Although multiple comparisons are made to the Reference Pool prediction limits, the San Diego Water Board made a decision to not correct for multiple comparisons so that the Shipyard Site/Reference comparisons would remain conservative and more protective. Metals characteristics and summary statistics for the Reference Pool are shown in Table 18-2. The 95% upper predictive limit for metals was dependent on the fines content at each station to help identify concentrations of metals that were enriched at the Shipyard Sediment Site (Table 18-3). In general, this means that stations with higher fines content will have a higher 95% upper predictive limit. For example, the 95% upper predictive limit for copper ranged from 85.9 mg/kg for a fines content of 25% to 159.5 mg/kg for a fines content of 75%. Summary statistics and the 95% upper predictive limits for organic contaminants and the SQGQ1 for the Reference Pool are shown in Tables 18-4 and 18-5, respectively.

- **Tributyltin (TBT) Considerations** - TBT is not specifically considered in the sediment chemistry line of evidence (LOE) analysis because 1) it is not incorporated in the combination of chemicals used in the SQGQ1 calculation and 2) there are no published empirical SQGs or consensus MEC values for TBT effects on benthic community health. The SQGQ1 metric, documented in Fairey et. al., (2001) and used in the analysis, is a central tendency indicator of the potential for adverse biological effects from chemical mixtures in a complex sediment matrix. Under the Fairey et. al., (2001) methodology, the SQGQ1 value for a sediment is calculated by dividing concentrations of cadmium, copper, lead, silver, zinc, total chlordane, dieldrin, total PAHs (normalized by sediment organic carbon content), and total PCBs (sum of 18 congeners) in sediment by each chemical's empirical SQG and subsequently averaging the individual quotients. The combination of chemicals used in the SQGQ1 calculation, which does not include TBT, are assumed to be representative of, or the surrogates of, the toxicologically significant chemical mixture regardless of which chemicals

were quantified in the sediment chemistry analyses. This is not only a well-accepted, but also a reasonable approach given the seemingly infinite number of chemicals present in marine sediment and for this reason it is not at all uncommon to exclude a specific chemical(s), such as TBT, in the chemistry LOE analysis for determining the likelihood of benthic community impairment.

Table 18-2 Individual Station Characteristics and Summary Statistics for Physical Properties (%) and Metals (mg/kg) in the Reference Pool

Station	%Fines	%TOC	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Zn
CP 2231	41.2	1.0	0.288	7.78	0.025	46.6	71.1	0.364	11.5	40.3	129
CP 2238	69.0	1.0	0.510	7.8	0.133	59.2	71.0	0.262	16.5	28.8	214
CP 2243	30.3	0.6	0.651	5.94	0.143	40.2	56.4	0.332	10.2	30.7	125
CP 2433	38.4	0.5	0.385	5.55	0.288	42.2	43.3	0.251	11.2	23.3	115
CP 2441	82.8	1.8	0.388	8.82	0.411	54.0	78.4	0.238	17.5	26.7	143
SY 2231	45.0	1.3	0.260	8.3	0.100	37.0	82.0	0.430	10.0	42.0	120
SY 2243	28.0	0.5	0.560	4.3	0.120	23.0	47.0	0.250	5.6	21.0	93.0
SY 2433	41.0	0.7	0.390	4.6	0.290	24.0	40.0	0.210	7.4	19.0	92.0
SY 2441	41.0	1.1	0.240	5.4	0.290	22.0	37.0	0.160	9.9	13.0	80.0
2235	45.0	0.6	0.476	6.4	0.095	37.5	58.2	0.239	10.7	21.3	136
2241	18.0	0.5	0.538	4.53	0.088	27.5	59.2	0.213	7.3	26.3	104
2242	31.0	0.7	0.493	4.27	0.096	25.4	42.0	0.300	6.8	17.8	89.8
2243	35.0	0.5	0.504	3.66	0.101	20.8	38.8	0.239	5.1	19.9	81.2
2256	67.0	1.3	1.29	7.47	0.200	54.3	128	0.632	14.3	54.1	197
2257	77.0	1.6	1.25	9.08	0.175	66.7	157	0.511	18.7	64.1	233
2258	71.0	1.4	0.954	7.75	0.161	60.0	143	0.664	16.4	53.0	211
2260	27.0	0.5	0.452	4.06	0.092	23.9	50.8	0.216	7.1	20.4	87.5
2265	13.0	0.4	0.192	2.48	0.069		18.0	0.065	1.5	12.0	43.2
N	18	18	18	18	18	18	18	18	18	18	18
Minimum	13.0	0.4	0.192	2.48	0.025	20.8	18.0	0.065	1.5	12	43.2
Maximum	82.8	1.8	1.29	9.08	0.411	66.7	157	0.664	18.7	64.1	233
Mean	44.5	0.9	0.546	6.01	0.160	39.1	67.8	0.310	10.4	29.6	127.4
Std Dev	20.5	0.4	0.315	1.98	0.100	15.4	38.3	0.158	4.7	15.0	53.4
RSD	46.1%	49.6%	57.8%	33.0%	62.5%	39.4%	56.4%	50.9%	45.5%	50.6%	41.9%
ERM	NA	NA	3.7	70	9.6	370	270	0.71	51.6	218	410

SCCWRP and U.S. Navy, 2005b

Table 18-3 Metal Threshold Values (mg/kg) Derived from the Fines-Metals Regression as a Function of Percent Fines for the Reference Pool

% Fines	Ag[1]	As[1]	Cd[1]	Cr[1]	Cu[1]	Hg[1]	Ni[1]	Pb[1]	Zn[1]
0	0.73	3.4	0.23	25.2	54.4	0.36	4.4	31.7	87.6
5	0.76	3.8	0.24	28.1	60.4	0.38	5.4	33.6	97.3
10	0.79	4.2	0.25	31.1	66.6	0.39	6.4	35.5	107.2
15	0.82	4.6	0.26	34.1	72.9	0.41	7.4	37.5	117.2
20	0.85	5	0.27	37.1	79.4	0.43	8.4	39.6	127.4
25	0.89	5.4	0.28	40.2	85.9	0.45	9.5	41.7	137.7
30	0.92	5.8	0.29	43.4	92.6	0.47	10.5	43.9	148.2
35	0.96	6.2	0.3	46.6	99.5	0.5	11.6	46.1	158.8
40	1	6.6	0.31	49.8	106.5	0.52	12.6	48.4	169.6
45	1.04	7.1	0.32	53.2	113.6	0.54	13.7	50.8	180.6
50	1.08	7.5	0.33	56.5	120.9	0.57	14.8	53.2	191.8
55	1.13	7.9	0.35	60	128.3	0.59	15.9	55.8	203.1
60	1.17	8.3	0.36	63.5	135.9	0.62	17	58.3	214.6
65	1.22	8.8	0.37	67	143.6	0.64	18.1	61	226.2
70	1.27	9.2	0.39	70.6	151.5	0.67	19.2	63.7	238.1
75	1.32	9.7	0.4	74.3	159.5	0.7	20.3	66.5	250
80	1.37	10.1	0.42	78	167.6	0.72	21.5	69.3	262.1
85	1.42	10.6	0.43	81.7	175.9	0.75	22.6	72.2	274.4
90	1.48	11	0.45	85.5	184.2	0.78	23.8	75.1	286.8
95	1.53	11.5	0.46	89.3	192.7	0.81	24.9	78.1	299.3
100	1.59	11.9	0.48	93.2	201.2	0.84	26.1	81.1	311.9

SCCWRP and U.S. Navy, 2005b

1. Sediment metal concentrations exceeding these thresholds are considered enriched.

Table 18-4 Individual Station Characteristics, Summary Statistics, and 95% Upper Predictive Limits for Organic Contaminants in the Reference Pool

Station	PP-PAHs[1] µg/kg	PCBs[2] µg/kg	HPAHs[3] µg/kg	TBT[4] µg/kg
CP 2231	1,063	42.7	536.0	
CP 2238	199	11.4	199.0	
CP 2243	267	20.7	118.0	
CP 2433	780	27.1	415.0	
CP 2441	2,143	33.5	1,210.0	
SY 2231	687	77.1	235.0	15.0
SY 2243	204	22.4	56.0	2.6
SY 2433	486	20.8	169.5	3.3
SY 2441	343	10.5	117.2	3.7
2235	234	49.8	76.5	
2241	234	49.8	76.5	
2242	359	49.8	126.8	
2243	234	49.8	76.5	
2256	424	49.8	174.4	
2257	505	50.9	215.9	
2258	463	49.8	197.9	
2260	234	49.8	76.5	
2265	234	49.8	76.5	
N	18	9	18	4
Minimum	199	10.5	56	2.60
Maximum	2,143	77.1	1,210	15.00
Mean	505	29.6	231	6.15
Std Dev	471	20.5	275	5.92
RSD	93%	69%	119%	96%
95% PL[5]	**1,264**	**84**	**663**	**21.7**

1. PP-PAHs = Priority Pollutant Polynuclear Aromatic Hydrocarbons, sum of 16 PAHs: naphthalene, acenaphthylene, acenaphthene, fluorene, anthracene, phenanthrene, fluoranthene, pyrene, benz[a]anthracene, chrysene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, indeno[123-cd]pyrene, dibenz[ah]anthracene, and benzo[ghi]perylene.
2. PCBs = Polychlorinated Biphenyls. "PCBs" is the sum of 41 congeners unless otherwise stated: 18, 28, 37, 44, 49, 52, 66, 70, 74, 77, 81, 87, 99, 101, 105, 110, 114, 118, 119, 123, 126, 128, 138, 149, 151, 153, 156, 157, 158, 167, 168, 169, 170, 177, 180, 183, 187, 189, 194, 201, and 206.
3. HPAHs = High Molecular Weight Polynuclear Aromatic Hydrocarbons, sum of 6 PAHs: Fluoranthene, Perylene, Benzo(a)anthracene, Chrysene, Benzo(a)pyrene, and Dibenzo(a,h)anthracene.
4. TBT = Tributyltin

5. The 95% upper predictive limits are calculated using the same methodology described in SCCWRP and U.S. Navy, 2005b. The supporting calculations are provided in the Appendix for Section 18.

Table 18-5 Calculated SQGQ1, Summary Statistics and 95% Upper Predictive Limit for the Reference Pool

Station	SQGQ1[1]
CP 2231	0.18
CP 2238	0.20
CP 2243	0.18
CP 2433	0.15
CP 2441	0.19
SY 2231	0.21
SY 2243	0.15
SY 2433	0.13
SY 2441	0.10
2235	0.16
2241	0.16
2242	0.13
2243	0.13
2256	0.33
2257	0.37
2258	0.31
2260	0.14
2265	0.07
N	18
Minimum	0.07
Maximum	0.37
Mean	0.18
Std Dev	0.08
RSD	42%
95% PL[2]	**0.35**

1. SQGQ1 = Sediment Quality Guideline Quotient 1. The SQGQ1 value for a sediment is calculated by dividing concentrations of cadmium, copper, lead, silver, zinc, total chlordane, dieldrin, total PAHs (normalized by sediment organic carbon content), and total PCBs (sum of 18 congeners) in sediment by each chemical's empirical SQG and subsequently averaging the individual quotients. Individual quotients for total chlordane and dieldrin quotients are excluded in the SQGQ1 supporting calculations because these constituents were not included in the list of minimum analytes required to assess exposure at the Shipyard Sediment Site.

2. The 95% upper predictive limit is calculated using the same methodology described in SCCWRP and U.S. Navy, 2005b. The supporting calculations are provided in the Appendix for Section 18.

The relative potential for adverse effects attributable to sediment chemistry is classified as low, moderate, or high based on comparisons made to published sediment quality guidelines where increasing weight is given by the number and magnitude of chemicals exceeding a threshold, similar to the method used by Long et al. (1998). The breakpoints in the ranking levels are established using best professional judgment (BPJ) and followed Long et al. (1998) and Fairey et al., (2001). The San Diego Water Board's decision process for sediment chemistry evaluation is outlined in Figure 18-1 and the supporting calculations are provided in the Appendix for Section 18. The sediment chemistry line-of-evidence results for each Shipyard Sediment Site stations are shown in Table 18-6 and the supporting calculations are provided in the Appendix for Section 18.

Figure 18-1 Flow Diagram for the Sediment Chemistry Ranking Criteria (Low, Moderate, and High)

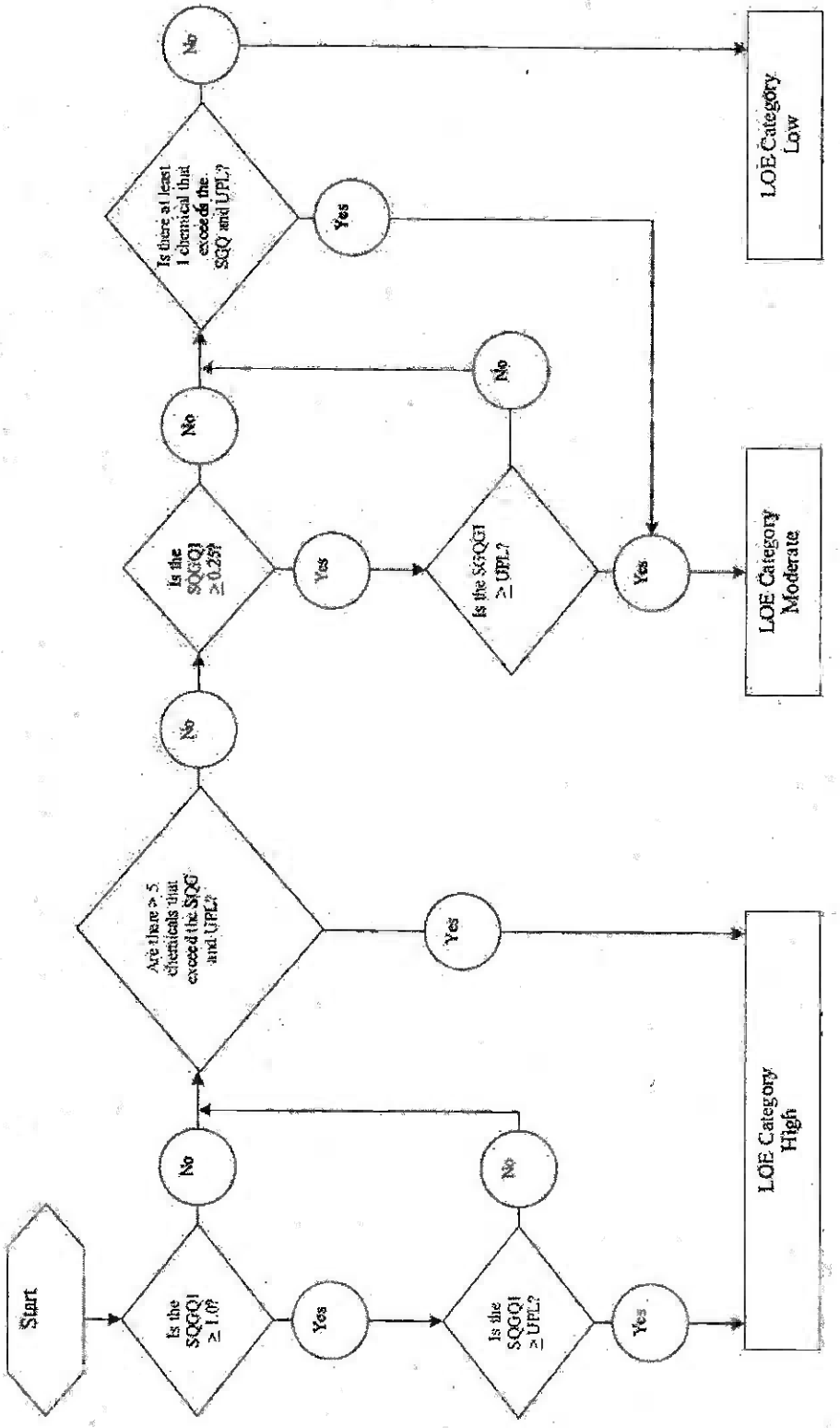


Table 18-6 Sediment Chemistry Line-of-Evidence Results

Site	Station	SQGQ1[1]			SQGQ1 ≥ UPL	# Chemicals > SQG and UPL	LOE Category[2]
		0.25	0.25 to 1.0	≥1.0			
NASSCO	NA01		X		Yes	2	Moderate
	NA03		X		Yes	2	Moderate
	NA04		X		Yes	1	Moderate
	NA05		X		Yes	0	Moderate
	NA06		X		Yes	3	Moderate
	NA07		X		Yes	2	Moderate
	NA09		X		Yes	2	Moderate
	NA11		X		Yes	1	Moderate
	NA12		X		Yes	0	Moderate
	NA15		X		Yes	2	Moderate
	NA16		X		Yes	2	Moderate
	NA17			X	Yes	4	High
	NA19			X	Yes	4	High
	NA20		X		No	0	Low
	NA22[3]		X		Yes	0	Moderate
BAE Systems	SW02			X	Yes	6	High
	SW03		X		Yes	2	Moderate
	SW04			X	Yes	6	High
	SW08			X	Yes	5	High
	SW09			X	Yes	5	High
	SW11		X		Yes	1	Moderate
	SW13			X	Yes	4	High
	SW15		X		Yes	2	Moderate
	SW17		X		Yes	3	Moderate
	SW18		X		Yes	2	Moderate
	SW21			X	Yes	2	High
	SW22			X	Yes	2	High
	SW23			X	Yes	3	High
	SW25		X		Yes	2	Moderate
	SW27		X		Yes	0	Moderate

1. SQGQ1 = Sediment Quality Guideline Quotient 1 (Fairey et al., 2001)
2. The supporting calculations are provided in the Appendix for Section 18.
3. NA22 was omitted from this analysis because it falls within an area that is being evaluated as part of the TMDLs for Toxic Pollutants in Sediment at the Mouth of Chollas Creek TMDL and is not considered part of the Shipyard Sediment Site for purposes of the CAO.

The sediment chemistry ranking criteria was originally developed for the sediment quality site assessment work for the mouth of Chollas Creek and Paleta Creek TMDLs (SCCWRP and U.S. Navy, 2005b). The criteria were developed by SCCWRP, U.S. Navy, and the San Diego Water

Board with input from DFG, U.S. FWS, DTSC, and NOAA; collectively referred to as the Natural Resource Trustee Agencies (NRTAs), non governmental environmental groups, SDUPD, and the City of San Diego (City).

The low, moderate, and high sediment chemistry ranking criteria are based on the following two key assumptions (SCCWRP and U.S. Navy, 2005b):

1. A Shipyard Sediment Site sample station is ranked as having a low likelihood of impact from sediment CoPCs when all chemicals at a station are less than relatively low SQGs and less than the established Reference Condition; and

2. A Shipyard Sediment Site sample station is ranked as having a high likelihood of impact from sediment CoPCs when many of the chemicals at a station exceed a relatively high SQG, and exceed the Reference Condition sediment chemistry levels.

The specific sediment chemistry line of evidence category ranking from the SCCWRP and U.S. Navy (2005b) report are presented below and in Figure 18-1of this report. The same sediment chemistry ranking criteria from the SCCWRP and U.S. Navy (2005b) report is used to evaluate the sediment chemistry data to the Shipyard Sediment Site sample stations.

Low Potential for Adverse Effects: The mean SQGQ1 is less than 0.25 or all chemicals were less than the 95% predictive limit calculated from the Reference Pool. Additionally, there must not be any single chemical that exceeded either its SQG or Reference Pool predictive limit value whichever was higher. To meet this category, all chemicals present at the site station, either individually or when summed, must be lower than a relatively low SQG and below the Reference Condition.

Moderate Potential for Adverse Effects: The mean SQGQ1 is between 0.25 and 1.0 and greater than the 95% predictive limit calculated from the Reference Pool. Additionally, a station is classified under this category if there are five or less individual chemicals that exceed their respective SQG and Reference Pool predictive limit. To meet this category, some (five or less) chemicals either individually or when summed exceed a moderate level SQG and/or the Reference Condition.

High Potential for Adverse Effects: The mean SQGQ1 for all chemicals is greater than or equal to 1.0 and is greater than the 95% predictive limit calculated from the Reference Pool. This category is also assigned if more than five chemicals exceed their individual SQG or the Reference Condition, whichever is higher. To meet this category, the Reference Condition as well as a relatively high SQG is exceeded when chemicals are considered as a group, or there are at least six individual chemicals exceeding a SQG or Reference Condition.

To determine the likelihood of impairment (Likely, Possible, or Unlikely) in the overall weight of evidence, each line of evidence ranking (Low, Moderate, or High) is put into the Weight-of-Evidence Analysis framework described in Section 18.5 below.

18.3. Toxicity Ranking Criteria

The low, moderate, and high classifications assigned to the toxicity line-of-evidence are determined by comparing the results of the three toxicity tests to their negative controls[10] and to the Reference Pool described in Section 17 of this Technical Report:

- **Negative Controls** – The first key step in the toxicity line-of-evidence is to determine whether there are statistically significant differences between toxicity observed at the Shipyard Sediment Site and toxicity observed in the laboratory control condition. Three types of sediment toxicity tests were conducted at each Shipyard Site station: (1) 10-day amphipod survival test using *Eohaustorius estuarius* exposed to whole sediment, (2) 48-hour bivalve larva development test using the mussel *Mytilus galloprovincialis* exposed to whole sediment at the sediment-water interface, and (3) 40-minute echinoderm egg fertilization test using the purple sea urchin *Strongylocentrotus purpuratus* exposed to sediment pore water. The results of these toxicity tests were compared statistically to their respective negative controls using a one-tailed Student t-test ($\alpha = 0.05$). The supporting calculations are provided in the Appendix for Section 18.

- **Reference Sediment Quality Conditions** – The second key step in the toxicity line-of-evidence is to determine whether there are statistically significant differences between toxicity observed at the Shipyard Site and toxicity observed at the Reference Pool. The statistical procedure used to identify these differences consisted of the 95% lower predictive limit. The 95% lower predictive limit allows a one-to-one comparison to be performed between a single Shipyard Site station and the Reference Pool. The 95% lower predictive limit computes a single threshold value for each toxicity test in the Reference Pool (e.g., amphipod survival) from which each Shipyard Site station toxicity result is compared. Although multiple comparisons are made to the Reference Pool prediction limits, the San Diego Water Board made a decision to not correct for multiple comparisons so that the Shipyard Site/reference comparisons would be more conservative and protective. The 95% lower predictive limits for the three toxicity tests are shown in Table 18-7.

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[10] The term "controls" refers to a treatment in a toxicity test that duplicates all of the conditions of the exposure treatments but contains no test material. The control is used to determine the absence of toxicity of basic test conditions (e.g. health of test organisms, quality of dilution water). "Control sediment" is sediment that is (1) essentially free of contaminants, (2) used routinely to assess the acceptability of a test, and (3) not necessarily collected near the site of concern. Control sediment provides a measure of test acceptability, evidence of test organism health, and a basis for interpreting data obtained from test sediments. "Negative Control" is a type of control used to determine the inherent background effects in the toxicity test, such as effects related to the health of the test organisms and the quality of the dilution water. It provides a baseline and a point of correction for interpreting the sediment toxicity test results.