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13

14 UNITED STATES DISTRICT COURT  
15 NORTHERN DISTRICT OF CALIFORNIA

16	UNITED STATES OF AMERICA,	)	NO.
		)	
17		)	
	Plaintiff,	)	CONSENT DECREE
18		)	[Miscellaneous Defendants
	v.	)	Group]
19		)	
	MONTROSE CHEMICAL CORPORATION	)	
20	OF CALIFORNIA, et al.,	)	
		)	
21	Defendants.	)	
		)	
22	<hr/>		
	AND RELATED ACTIONS	)	
23	<hr/>		

24  
25  
26  
27  
28 DECREE - MISCELLANEOUS DEFENDANTS

1 This Consent Decree ("Decree") is made and entered into by  
2 and among the United States of America (the "United States"), on  
3 behalf of the Environmental Protection Agency, National Oceanic  
4 and Atmospheric Administration, the Department of the Interior  
5 and the Settling Federal Agencies; and the "Settling Defendants"  
6 identified in Appendix A hereto.

7 INTRODUCTION

8 A. The United States, on behalf of the Administrator of  
9 the Environmental Protection Agency ("EPA"), the Secretary of  
10 Commerce and the Secretary of the Interior, has filed a civil  
11 action for recovery of response costs and natural resource  
12 damages, and for injunctive and declaratory relief, pursuant to  
13 Sections 106 and 107 of the Comprehensive Environmental Response,  
14 Compensation, and Liability Act ("CERCLA"), 42 U.S.C. §§ 9606,  
15 9607, with respect to releases of hazardous substances from a  
16 former pesticide formulating and packaging facility now known as  
17 the United Heckathorn NPL Site in the City of Richmond, County of  
18 Contra Costa, State of California.

19 B. Before the United States filed suit in this matter,  
20 several related actions had been pending in this Court arising  
21 out of the release or threat of release of hazardous substances  
22 from the Site, namely Levin Metals Corporation v. Parr-Richmond  
23 Terminal Co. and related actions, Case Nos. C 84 6273; C 84 6324;  
24 and C 85 4776 ("Private Party Litigation"). The Honorable  
25 Claudia Wilken ordered the parties in the Private Party  
26 Litigation, and invited EPA, to engage in mediation to attempt to  
27 settle matters. From October 1994 through January 1995, EPA, the

1 Settling Federal Agencies and the private litigants participated  
2 in alternative dispute resolution ("ADR") mediated by Judge  
3 Coleman Fannin (Ret.) and Lester Levy of J.A.M.S. Endispute, a  
4 private firm offering ADR services. This mediation process  
5 involved sustained, vigorous and substantial negotiation among  
6 the parties. As a result of the mediation and subsequent  
7 negotiations, the United States has reached four inter-dependent  
8 settlement agreements with regard to the Site ("Four Decrees"),  
9 including this Decree.

10 C. The Settling Defendants do not admit any liability to  
11 the Plaintiff arising out of the transactions or occurrences  
12 alleged in the complaint.

13 D. The United States, on behalf of the Settling Federal  
14 Agencies, does not admit any liability arising out of the  
15 transactions or occurrences alleged in any claim or counterclaim  
16 asserted by the Settling Defendants.

17 E. Pursuant to Section 105 of CERCLA, 42 U.S.C. § 9605,  
18 EPA placed the Site on the National Priorities List, set forth at  
19 40 C.F.R. Part 300, Appendix B, by publication in the Federal  
20 Register on March 14, 1990, 55 Fed. Reg. 9,688.

21 F. In response to a release or a substantial threat of a  
22 release of hazardous substances at or from the Site, EPA  
23 commenced on December 5, 1991, a Remedial Investigation and  
24 Feasibility Study ("RI/FS") for the Site pursuant to 40 C.F.R.  
25 § 300.430.

26 G. EPA completed a Remedial Investigation ("RI") Report in  
27 February 1994, and EPA completed a Feasibility Study ("FS")

1 Report on July 5, 1994.

2 H. Pursuant to Section 117 of CERCLA, 42 U.S.C. § 9617,  
3 EPA published notice of the completion of the FS and of the  
4 proposed plan for remedial action on July 15, 1994, in a major  
5 local newspaper of general circulation. EPA provided an  
6 opportunity for written and oral comments from the public on the  
7 proposed plan for remedial action. A copy of the transcript of  
8 the public meeting is available to the public as part of the  
9 administrative record upon which the Regional Administrator based  
10 the selection of the response action.

11 I. The decision by EPA on the remedial action to be  
12 implemented at the Site is embodied in a Record of Decision  
13 ("ROD"), executed on October 26, 1994, to which the State of  
14 California ("State") has given its concurrence. The ROD includes  
15 a summary of responses to the public comments. Notice of the  
16 final plan was published in accordance with Section 117(b) of  
17 CERCLA. A copy of the ROD is attached as Appendix E to this  
18 Decree.

19 J. Pursuant to consent decrees, the Remedial Action at the  
20 Site will be implemented by the Montrose Group and the Levin  
21 Group. The United States intends to use certain payments made by  
22 Settling Defendants and Settling Federal Agencies pursuant to  
23 this Decree first to pay the cost of certain portions of the  
24 Remedial Action and for EPA's oversight costs associated with the  
25 Remedial Action, and then, to the extent funds remain available,  
26 to pay EPA's response costs.

27 K. The Parties recognize, and the Court by entering this

1 Consent Decree finds, that this Consent Decree has been  
2 negotiated by the Parties in good faith and implementation of  
3 this Consent Decree will expedite the cleanup of the Site and  
4 will avoid prolonged and complicated litigation between the  
5 Parties, and that this Consent Decree is fair, reasonable, and in  
6 the public interest.

7 THEREFORE, with the consent of the Parties to this Decree,  
8 it is ORDERED, ADJUDGED, AND DECREED:

9 JURISDICTION AND VENUE

10 1. This Court has jurisdiction over the subject matter of  
11 this action pursuant to 28 U.S.C. §§ 1331 and 1345, and 42 U.S.C.  
12 §§ 9607 and 9613(b), and personal jurisdiction over the Settling  
13 Defendants. The Settling Defendants will not challenge the terms  
14 of this Decree, the venue in this District or this Court's  
15 jurisdiction to enter and enforce this Decree.

16 PARTIES BOUND

17 2. This Consent Decree is binding upon the United States  
18 and upon the Settling Defendants and their successors and  
19 assigns. Any change in ownership or corporate or other legal  
20 status, including but not limited to any transfer of assets or  
21 real or personal property, shall in no way alter the status or  
22 responsibilities of the Settling Defendants under this Consent  
23 Decree.

24 CONDITION PRECEDENT

25 3. This Decree will be effective to bind the Parties only  
26 upon entry by this Court of all Four Decrees, which terms were  
27 negotiated as described in Paragraph B (Introduction) above and

1 which are contemplated for simultaneous lodging with and entry by  
2 the Court.

3 DEFINITIONS

4 4. Unless otherwise expressly provided herein, terms used  
5 in this Consent Decree which are defined in CERCLA or in  
6 regulations promulgated under CERCLA shall have the meaning  
7 assigned to them in CERCLA or in such regulations. Whenever  
8 terms listed below are used in this Consent Decree or in the  
9 appendices attached hereto and incorporated hereunder, the  
10 following definitions shall apply:

11 a. "Damage Assessment Costs" shall mean NOAA's and DOI's  
12 costs incurred in connection with activities and studies  
13 performed to determine injury to or loss of natural resources,  
14 including lost interim uses, resulting from releases of hazardous  
15 substances from the United Heckathorn NPL Site.

16 b. "EPA" shall mean the United States Environmental  
17 Protection Agency and any successor departments, agencies or  
18 instrumentalities of the United States.

19 c. "DOI" shall mean the United States Department of the  
20 Interior and any successor departments, agencies or  
21 instrumentalities of the United States.

22 d. "Levin Group" shall mean Levin Enterprises, Inc. and  
23 Levin Richmond Terminal, Inc., which have agreed, in a related  
24 Consent Decree to be lodged simultaneously with this Decree in  
25 this matter, to construct a cap around the former Heckathorn  
26 plant to prevent erosion, as called for in the ROD.

27 e. "Marine Remedial Action" shall mean those response

1 actions selected in the ROD for the Lauritzen Channel and Parr  
2 Canal.

3 f. "Marine Response Costs" shall mean all expenses, fees  
4 and costs that must be paid by the Montrose Group related to the  
5 Marine Remedial Action that are recoverable under Sections 107  
6 and 113 of CERCLA, 42 U.S.C. §§ 9607 and 9613. Examples of  
7 "Marine Response Costs" include but are not limited to:

8 - a payment to EPA for Interim Response Costs, as defined in  
9 Paragraph 37 of the Montrose Group Consent Decree;

10 - costs to identify and select consultants/contractors to  
11 implement the Marine Remedial Action at the Site;

12 - costs of consultants/contractors to implement the Marine  
13 Remedial Action;

14 - costs of consultants/contractors to meet with EPA and or  
15 State agencies as required to, inter alia, finalize  
16 documents, discuss the Marine Remedial Action, project  
17 status and schedule;

18 - costs of consultants/contractors for development and  
19 finalization of documents, work plans, and reports required  
20 by the Montrose Group Consent Decree;

21 - any costs of an escrow agent to administer the United  
22 Heckathorn Site Escrow;

23 - fees and taxes that the Montrose Group must pay to remove  
24 Waste Material from the Site and dispose of it in a licensed  
25 landfill elsewhere.

26 Marine Response Costs shall not include:

27 - any legal fees incurred by the Montrose Group;

28 - any costs of the Montrose Group to communicate between  
themselves or costs of the Montrose Group incurred for  
internal organizational purposes;

- any civil penalties assessed against the Montrose Group.

g. "Montrose Group" shall mean that group of defendants  
which has agreed, in a related Consent Decree to be lodged

1 | simultaneously with this Decree in this matter, to dredge soft  
2 | bay mud from the Lauritzen Channel and Parr Canal and to dispose  
3 | of the dredged material offsite, all as called for in the ROD.  
4 | The Montrose Group is specifically identified in Appendix B  
5 | hereto.

6 |       h. "Natural Resource Damages" shall mean damages,  
7 | including Damage Assessment Costs and lost use value, recoverable  
8 | under Section 107 of CERCLA, 42 U.S.C. § 9607, for injury to,  
9 | destruction of, or loss of any and all Natural Resources at the  
10 | United Heckathorn Site.

11 |       i. "Natural Resources" shall have the meaning provided in  
12 | Section 101(16) of CERCLA, 42 U.S.C. § 9601(16).

13 |       j. "NOAA" shall mean the National Oceanic and Atmospheric  
14 | Administration, an agency of the United States Department of  
15 | Commerce, and any successor departments, agencies or  
16 | instrumentalities of the United States.

17 |       k. "Parties" shall mean the United States, including the  
18 | Settling Federal Agencies, and the Settling Defendants.

19 |       l. "Remedial Action" shall mean those activities, except  
20 | for operation and maintenance, to be undertaken, or which have  
21 | been undertaken, to implement the ROD.

22 |       m. "Response Costs" shall mean all costs of response as  
23 | provided in Section 107(a)(1-4)(A) of CERCLA, 42 U.S.C.  
24 | §§ 9607(a)(1-4)(A), and as defined in Section 101(25) of CERCLA,  
25 | 42 U.S.C. § 9601(25), including oversight costs, that the United  
26 | States has incurred or will incur with respect to the United  
27 | Heckathorn NPL Site.



1 n. "Settling Defendants" or the "Miscellaneous Defendants  
2 Group" shall mean those entities identified in Appendix A hereto.

3 o. "Settling Federal Agencies" shall mean the General  
4 Services Administration and the Agency for International  
5 Development, and any successor departments, agencies or  
6 instrumentalities of the United States.

7 p. "Site" or the "United Heckathorn NPL Site" shall mean:  
8 the northern half of the Levin Richmond Terminal property bounded  
9 by the Lauritzen Channel, Cutting Boulevard, and South Fourth  
10 Street in Richmond, California, depicted as a cross-hatched area  
11 in the map attached hereto as Appendix C; and the Lauritzen  
12 Channel, the Santa Fe Channel, the Parr Canal and the Richmond  
13 Inner Harbor Channel, all as depicted in Appendix D hereto.

14 q. "United States" shall mean the United States of  
15 America, including all of its departments, agencies and  
16 instrumentalities.

17 r. "Waste Material" shall mean (1) any "hazardous  
18 substance" under Section 101(14) of CERCLA, 42 U.S.C. § 9601(14);  
19 (2) any pollutant or contaminant under Section 101(33) of CERCLA,  
20 42 U.S.C. § 9601(33); (3) any "solid waste" under Section  
21 1004(27) of the Resource Conservation and Recovery Act, 42 U.S.C.  
22 § 6903(27); and (4) any "hazardous waste" under 22 Cal. Code of  
23 Regulations Section 66600 et seq.

24 SETTLING DEFENDANTS' PAYMENTS INTO THE GROUP ESCROW

25 5. On or before May 31, 1996, Settling Defendants shall  
26 establish an escrow account (the "Group Escrow"). Settling  
27 Defendants shall deposit into the Group Escrow \$2,680,535.28, in

1 settlement of EPA's claims, and \$102,190.44, in settlement of the  
2 United States' Natural Resource Damages claims. The allocation  
3 to Settling Defendants of \$102,190.44, out of the United States'  
4 total Natural Resource Damages recovery of \$400,000 from  
5 defendants which are parties to the Four Decrees, was determined  
6 solely by potentially responsible parties, including Settling  
7 Defendants.

8 6. On May 31, 1996, Settling Defendants shall send to the  
9 United States, as provided in Paragraph 38, a copy of the  
10 correspondence that establishes and funds the escrow account,  
11 including, but not limited to, information containing the  
12 identity of the bank and the bank account under which the escrow  
13 is established, as well as a bank statement showing the initial  
14 balance of the Group Escrow account. Thereafter, if requested to  
15 do so by the United States, Settling Defendants shall provide all  
16 other documentation concerning the account, including any  
17 agreement concerning the determination of interest rates.

18 7. Settling Defendants shall bear all costs of  
19 establishing, administering and terminating the Group Escrow.

20 8. Settling Defendants' failure to establish and fund the  
21 Group Escrow by May 31, 1996 shall constitute a material default,  
22 for which this Decree may be voidable by the United States.

23 PAYMENTS FROM THE GROUP ESCROW

24 9. Within 10 days after entry of this Decree, Settling  
25 Defendants shall transfer the funds in the Group Escrow as  
26 follows:

27 a. Pay to the EPA Hazardous Substance Superfund

1 \$380,535.28, in reimbursement of Response Costs, by FedWire  
2 Electronic Funds Transfer to the U.S. Department of Justice  
3 account in accordance with current electronic funds transfer  
4 procedures, referencing U.S.A.O. file number 9600022, EPA Region  
5 9 and Site/Spill ID #09R3, and DOJ case number 90-11-3-598. This  
6 payment shall be made in accordance with instructions provided to  
7 the Settling Defendants by the Financial Litigation Unit of the  
8 United States Attorney's Office for the Northern District of  
9 California, following lodging of this Decree. Settling  
10 Defendants shall send notice that such payment has been made to  
11 the United States as specified in Paragraph 38 and to David Wood,  
12 Chief, Cost Accounting Section, EPA Region 9, 75 Hawthorne  
13 Street, San Francisco, CA 94105.

14 b. Transfer to an escrow set up by the Montrose Group, in  
15 part to pay for the Remedial Action (the "United Heckathorn Site  
16 Escrow"), \$2,300,000, plus accrued interest allocable to the  
17 principal amount of \$2,680,535.28, referenced in Paragraph 5 of  
18 this Decree. Settling Defendants shall send notice that such  
19 payment has been made to the United States as specified in  
20 Paragraph 38. Within 10 days after entry of this Decree, the  
21 United States will provide to Settling Defendants information  
22 about the United Heckathorn Site Escrow to enable Settling  
23 Defendants to make the transfer required herein.

24 c. Pay \$15,000.00 to DOI, as reimbursement for Damage  
25 Assessment Costs. Payment shall be made by certified check made  
26 payable to Secretary of the Interior and delivered to Chief,  
27 Division of Finance, U.S. Fish and Wildlife Service, 4401 North

1 | Fairfax Drive, Room 380, Arlington, VA 22203. The check shall  
2 | reflect that it is a payment to the "Natural Resource Damage  
3 | Assessment and Restoration Fund, Account No. 14X5198 --  
4 | Assessment Cost Reimbursement" and reference the "Levin  
5 | Richmond/United Heckathorn Superfund Site."

6 |       d. Pay \$20,000 to NOAA, as reimbursement for Damage  
7 | Assessment Costs. Payment shall be made by certified check made  
8 | payable to NOAA, Department of Commerce. The check shall  
9 | indicate that the payment is for "reimbursement of damage  
10 | assessment costs for the United Heckathorn Superfund Site." The  
11 | check shall be delivered to Chief, Damage Assessment Center, NOS,  
12 | NOAA, Room 10218, 1305 East West Highway, Silver Spring, MD  
13 | 20910.

14 |       e. Pay \$67,190.44, plus accrued interest allocable to the  
15 | principal amount of \$102,190.44 referenced in Paragraph 5 of this  
16 | Decree, to DOI. The check shall be made payable to the Secretary  
17 | of the Interior and delivered to Chief, Division of Finance  
18 | Division, United States Fish and Wildlife Service, 4401 North  
19 | Fairfax Drive, Room 380, Arlington, VA, 22203 (phone (703) 358-  
20 | 1742). The check shall reflect that it is a payment to the  
21 | "Natural Resource Damage Assessment and Restoration Fund, Account  
22 | No. 14X5198" and reference the "Levin Richmond/United Heckathorn  
23 | Site." DOI will assign these funds a special project number to  
24 | allow the funds to be maintained as a segregated account within  
25 | the DOI Natural Resource Damage Assessment and Restoration Fund,  
26 | Account No. 14X5198 ("Trustees Account"). DOI intends to, in  
27 | accordance with law, manage and invest funds in the Trustees

1 Account and segregate in the Account any return on investments or  
2 interest accrued for use by the natural resource Trustees. DOI  
3 will not make any charge against the Account for any investment  
4 or management services provided. DOI will hold all funds in the  
5 Account, including return on investments or accrued interest,  
6 subject to the provisions of this Decree and any agreement DOI  
7 and NOAA may reach regarding the use of the funds. DOI's failure  
8 to discharge its obligations under this subparagraph e shall not  
9 affect the United States' covenants.

10 PAYMENTS BY SETTLING FEDERAL AGENCIES

11 10. As soon as practicable after entry of this Consent  
12 Decree, the United States, on behalf of the Settling Federal  
13 Agencies, shall cause to be transferred to the United Heckathorn  
14 Site Escrow the sum of \$300,000, in settlement of EPA's claims.

15 11. As soon as practicable after entry of this Consent  
16 Decree, the United States, on behalf of the Settling Federal  
17 Agencies, shall pay \$11,678.17 to DOI, in settlement of the  
18 United States' Natural Resource Damages claims. Payment shall be  
19 made in the manner specified in Paragraph 9.e. The allocation to  
20 Settling Federal Agencies of \$11,678.17, out of the United  
21 States' total Natural Resource Damages recovery of \$400,000 from  
22 defendants which are parties to the Four Decrees, was determined  
23 solely by potentially responsible parties, including Settling  
24 Federal Agencies.

25 12. Notwithstanding any other provisions of this Consent  
26 Decree, the Parties to this Consent Decree recognize and  
27 acknowledge that the payment obligations imposed upon the

1 Settling Federal Agencies by this Consent Decree can only be paid  
2 from appropriated funds legally available for such purpose.

3 Nothing in this Consent Decree shall be interpreted or construed  
4 as a commitment or requirement that any Settling Federal Agency  
5 obligate or pay funds in contravention of the Anti-Deficiency  
6 Act, 31 U.S.C. § 1341, or any other applicable provision of law.

7 CONTINGENT PAYMENT BY SHELL OIL CO.

8 13. Within 10 days of receiving written notice from the  
9 Montrose Group that Marine Response Costs are expected to exceed  
10 \$8.1 million, Shell Oil Company ("Shell") shall deposit an  
11 additional \$500,000.00 into the United Heckathorn Site Escrow, to  
12 be used only if the total of the following amounts, as calculated  
13 by EPA, exceeds \$8.9 million:

14 (i) all Marine Response Costs incurred by the Montrose  
15 Group and paid to third parties related to the Marine  
16 Remedial Action;

17 (ii) the costs incurred or to be incurred by the Levin  
18 Group for constructing, maintaining and overseeing a  
19 cap around the former Heckathorn plant property, as  
20 called for in the ROD, which for the purpose of this  
21 calculation shall be in the sum of \$500,000; and

22 (iii) all Response Costs incurred by EPA in performing  
23 marine monitoring to determine the effectiveness of the  
24 remedy called for in the ROD or in overseeing the work  
25 performed by the Levin Group or the Montrose Group,  
26 which for the purpose of this calculation shall be in  
27 the sum of \$300,000.

1 If, under the terms of the Montrose Group Consent Decree, this  
2 \$500,000 is not fully used for the Marine Remedial Action  
3 performed by the Montrose Group, the balance, together with any  
4 accrued interest, shall be returned to Shell in accordance with  
5 the terms of the Montrose Group Consent Decree.

6 On or before August 1, 1996, Shell shall also establish an  
7 irrevocable letter of credit in the amount of \$500,000 that the  
8 Escrow Agent for the United Heckathorn Site Escrow may draw upon  
9 in the event that Shell fails to deposit \$500,000 in the United  
10 Heckathorn Site Escrow within 10 days of receiving notice from  
11 the Montrose Group as set out above. Provided that Shell has not  
12 previously received such notice from the Montrose Group, Shell  
13 may terminate the letter of credit following EPA issuance of a  
14 Certification of Completion to the Montrose Group as provided in  
15 Paragraph 50(c) of the Montrose Group Consent Decree. Otherwise,  
16 Shell may terminate the letter of credit following the  
17 termination of the United Heckathorn Site Escrow (as provided in  
18 Paragraph 47 of the Montrose Group Consent Decree) or when the  
19 Escrow Agent for the United Heckathorn Site Escrow has drawn on  
20 the letter of credit up to the limit of the letter of credit,  
21 \$500,000.

22 FAILURE TO MAKE TIMELY PAYMENTS

23 14. In the event Settling Defendants fail to make timely  
24 payments, Settling Defendants shall pay a stipulated penalty as  
25 follows:

26 a. For failure to fund the Group Escrow with \$2,680,535.28  
27 (i.e., the EPA settlement) as set forth in Paragraph 5 or for

1 failure to make the transfer of funds as set forth in Paragraph  
2 9.b, Settling Defendants shall pay a total of \$25,000 for any  
3 delay of up to seven days and \$5,000 each day thereafter.

4 b. For failure to make the transfer of funds as set forth  
5 in Paragraph 9.a, Settling Defendants shall pay \$200 for each day  
6 of delay.

7 c. For failure to pay the amounts required by Paragraph  
8 13, Shell shall pay a total of \$25,000 for any delay of up to  
9 seven days and \$5,000 each day thereafter.

10 d. Stipulated penalties are due within 30 days following  
11 receipt by the Settling Defendants of a written demand by the  
12 United States for payment of such stipulated penalties.

13 e. Stipulated penalties shall be paid by certified or  
14 cashier's check made payable to "EPA Hazardous Substance  
15 Superfund;" shall be mailed to U.S. EPA, Region IX, Attention:  
16 Superfund Accounting, P.O. Box 360863M, Pittsburgh, PA 15251;  
17 shall indicate that the payment is for stipulated penalties; and  
18 shall reference the EPA Region and Site/Spill ID #09R3, the DOJ  
19 Case Number 90-11-3-598, and the name and address of the party  
20 making payment. Copies of any checks paid pursuant to this  
21 subparagraph and accompanying transmittal letters shall be sent  
22 to the United States as provided in Paragraph 38 (Notice).

23 f. Payment of any stipulated penalty pursuant to this  
24 Paragraph shall be in addition to any other remedy or sanction  
25 available to the United States for the failure of the Settling  
26 Defendants to make timely payment of the settlement amounts.

27 g. Notwithstanding any other provision of this paragraph,



1 the United States may, in its unreviewable discretion, waive any  
2 portion of stipulated penalties that have accrued pursuant to  
3 this Consent Decree.

4 15. If Settling Defendants do not timely pay the amount  
5 specified in Paragraph 9.c-e (Natural Resource Damages), this  
6 Consent Decree shall be considered an enforceable judgment, under  
7 Rule 69 of the Federal Rules of Civil Procedure and other  
8 applicable statutory authority, for purposes of post-judgment  
9 collection of the amount due the Trustees, without further order  
10 of this Court. Interest shall be assessed at the annual rate  
11 established pursuant to 31 U.S.C. § 3717 on the overdue amount  
12 from the due date set forth in Paragraph 9 through the date of  
13 payment. In addition, in the event the United States takes  
14 action to enforce the judgment, defaulting Settling Defendants  
15 shall reimburse the United States for costs and reasonable  
16 attorney's fees incurred in enforcing Settling Defendants'  
17 obligation.

18 16. The obligations of Settling Defendants to pay amounts  
19 owed the United States under this Consent Decree are joint and  
20 several, with the exception of Shell's obligations set forth in  
21 Paragraphs 13 and 14.d, which are those of Shell only. In the  
22 event of the failure of any one or more Settling Defendants to  
23 make the payments required under this Consent Decree, the other  
24 Settling Defendants shall be responsible for such payments.

25 17. In the event the United States must bring an action to  
26 collect any payment required under this Decree, defaulting  
27 Settling Defendants shall reimburse the United States for all

1 costs of such action, including but not limited to attorney's  
2 fees, except as set forth in Paragraph 15.

3 18. In the event one or more Settling Defendants must bring  
4 an action against any other Settling Defendant for the latter's  
5 failure to make any payment required under this Decree, the  
6 latter shall reimburse the Settling Defendants which brought suit  
7 for all costs of such action, including but not limited to  
8 attorney's fees and for all costs or fees incurred in any action  
9 brought by the EPA under this Consent Decree.

10 COVENANT NOT TO SUE OR TAKE ADMINISTRATIVE ACTION

11 BY THE UNITED STATES AND RESERVATION OF RIGHTS

12 19. In consideration of the payments to be made by the  
13 Settling Defendants and Settling Federal Agencies under the terms  
14 of this Decree and except as specifically provided in Paragraphs  
15 20-27 of this Decree, the United States hereby covenants not to  
16 sue or take administrative action against any of the Settling  
17 Defendants, and the Settling Defendants' past and present  
18 officers, directors and employees acting in such respective  
19 capacities for the Settling Defendants, and EPA, DOI and NOAA  
20 covenant not to take any action against any of the Settling  
21 Federal Agencies, pursuant to Sections 106, 107(a) and (f), and  
22 113(f) of CERCLA, 42 U.S.C. §§ 9606, 9607(a) and (f), 9613(f),  
23 relating to hazardous substances present at the Site. These  
24 covenants are conditioned upon the satisfactory performance by  
25 Settling Defendants and Settling Federal Agencies of their  
26 obligations under this Consent Decree. These covenants do not  
27 extend to persons other than Settling Defendants, and the

1 Settling Defendants' past and present officers, directors and  
2 employees acting in such respective capacities for the Settling  
3 Defendants, and Settling Federal Agencies.

4 20. Reservation. Notwithstanding any other provision of  
5 this Decree, the United States reserves, and this Decree is  
6 without prejudice to, the right to institute proceedings in this  
7 action or in a new action, or to issue an administrative order  
8 seeking to compel Settling Defendants, and the United States  
9 reserves the right to issue an administrative order seeking to  
10 compel Settling Federal Agencies, to perform response actions  
11 relating to the Site or to reimburse the United States for  
12 additional response costs if:

13 (i) conditions at the Site, previously unknown to EPA,  
14 are discovered, or

15 (ii) information, previously unknown to EPA, is  
16 received, in whole or in part,

17 and these previously unknown conditions or information together  
18 with any other relevant information indicate that the Remedial  
19 Action is not protective of human health or the environment.

20 21. For purposes of Paragraph 20, the information and the  
21 conditions known to EPA shall include only that information and  
22 those conditions set forth in (1) the Record of Decision for the  
23 Site, (2) the administrative record supporting the Record of  
24 Decision, and (3) records relating to the Site, generated or  
25 received by EPA after issuance of the Record of Decision, which  
26 are in the EPA Site file as of December 31, 1995, as reflected in  
27 the Site file index.

1           22.   Reservation Concerning Natural Resource Damages.

2   Notwithstanding any other provision of this Decree, the United  
3   States, on behalf of its natural resource Trustees, reserves, and  
4   this Decree is without prejudice to, the right to bring an action  
5   against any Settling Defendant in this action or in a new action  
6   to seek recovery of Natural Resource Damages, based on (i)  
7   conditions with respect to the Site unknown to the Trustees as of  
8   the date this Decree is lodged with the court, that result in or  
9   contribute to injury to, destruction of or loss of natural  
10  resources; or (ii) information received by the Trustees after the  
11  date the Decree is lodged with the court which indicates that  
12  there is injury to, destruction of, or loss of natural resources  
13  of a type unknown, or a magnitude greater than was known, to the  
14  Trustees.

15           23.   Dollar Limit.   Notwithstanding any other provision of  
16  this Decree, the United States reserves, and this Decree is  
17  without prejudice to, the right to institute proceedings in this  
18  action or in a new action, or to issue an administrative order  
19  seeking to compel Settling Defendants, and the United States  
20  reserves the right to issue an administrative order seeking to  
21  compel the Settling Federal Agencies, to perform response actions  
22  relating to the Site or to reimburse the United States for  
23  response costs, including all past costs unreimbursed by  
24  potentially responsible parties at the Site, if the total of the  
25  following costs, as calculated by EPA, exceeds \$12.8 million:

- 26                   (i) EPA's past response costs (including, but not  
27                   limited to, direct and indirect costs) incurred for

1 response actions at the Site, which for the purpose of  
2 this calculation shall be in the sum of \$2,693,428.22,  
3 as reflected in EPA's cost summary dated August 30,  
4 1994;

5 (ii) The costs incurred or to be incurred by the Levin  
6 Group for constructing, maintaining and overseeing a  
7 cap around the former Heckathorn plant, as called for  
8 in the ROD, which for the purpose of this calculation  
9 shall be the sum of \$500,000;

10 (iii) all Marine Response Costs incurred by the  
11 Montrose Group and paid to third parties related to the  
12 Marine Remedial Action; and

13 (iv) all response costs incurred by EPA in performing  
14 marine monitoring to verify the effectiveness of the  
15 remedy called for in the ROD or in overseeing the work  
16 performed by the Levin Group and the Montrose Group or  
17 in overseeing the work performed by the Levin Group or  
18 the Montrose Group, which for the purpose of this  
19 calculation shall be the sum of \$300,000.

20 24. For purposes of calculating whether the \$8.9 million  
21 limit has been reached pursuant to Paragraph 13 or whether the  
22 \$12.8 million limit has been reached pursuant to Paragraph 23,  
23 the category of costs enumerated therein shall not be reduced  
24 even if the costs are not consistent with the NCP or "necessary,"  
25 within the meaning of Section 107(a)(4)(A-B) of CERCLA, 42 U.S.C.  
26 § 9607(a)(4)(A-B).

27 25. Notwithstanding any other provision of this Decree, the

1 United States reserves, and this Decree is without prejudice to,  
2 the right to institute proceedings in this action or in a new  
3 action, or to issue an administrative order seeking to compel  
4 Settling Defendants, and the United States reserves the right to  
5 issue an administrative order seeking to compel the Settling  
6 Federal Agencies, to perform response actions relating to the  
7 Site or to reimburse the United States for response costs,  
8 including all past costs unreimbursed by potentially responsible  
9 parties at the Site, if EPA determines, through an amendment to  
10 the ROD, that the Remedial Action is not protective of human  
11 health and the environment and EPA selects further response  
12 actions at the Site.

13 26. General Reservation of Rights. The covenants not to  
14 sue or to take administrative action set forth above do not  
15 pertain to any matters other than those expressly specified in  
16 Paragraph 19. Notwithstanding any other provision of this  
17 Decree, the United States reserves, and with respect to Settling  
18 Federal Agencies, EPA and federal natural resource Trustees  
19 reserve, and this Consent Decree is without prejudice to, all  
20 rights against Settling Defendants and Settling Federal Agencies  
21 with respect to all other matters, including but not limited to,  
22 the following:

23 (1) claims based on a failure by Settling Defendants  
24 or Settling Federal Agencies to meet a requirement of this  
25 Consent Decree;

26 (2) liability arising from the past, present, or  
27 future disposal, release, or threat of release of Waste

1 Materials outside of the Site, including liability for  
2 damages for injury to, destruction of, or loss of natural  
3 resources occurring outside of the Site, and for the costs  
4 of any natural resource damage assessments;

5 (3) liability for future disposal of Waste Material at  
6 the Site, other than as provided in the ROD or otherwise  
7 ordered by EPA;

8 (4) criminal liability; and

9 (5) liability for violations of federal or state law  
10 by Settling Defendants which occur during or after  
11 implementation of the Remedial Action at the Site.

12 COVENANTS BY SETTLING DEFENDANTS

13 27. Each of the Settling Defendants covenants not to sue  
14 and agrees not to assert any claims or causes of action against  
15 the United States, or any employee, officer, department, agency  
16 or instrumentality thereof, with respect to any matters relating  
17 to the United Heckathorn NPL Site or this Consent Decree,  
18 including but not limited to:

19 a. any direct or indirect claim for reimbursement from the  
20 Hazardous Substance Superfund (established pursuant to the  
21 Internal Revenue Code, 26 U.S.C. § 9507) through CERCLA Sections  
22 106(b)(2), 107, 111, 112, 113 or any other provision of law;

23 b. any claims against the United States under CERCLA  
24 Sections 107 or 113 related to the Site; or

25 c. any claims arising out of response activities at the  
26 Site, including claims based on EPA's selection of response  
27 actions, oversight of response activities or approval of plans

1 for such activities.

2 The Settling Defendants reserve the right to assert any  
3 counterclaims against the United States arising out of any action  
4 filed by the United States pursuant to Paragraphs 20, 22, 23 or  
5 25.

6 28. Nothing in this Decree shall be deemed to constitute  
7 preauthorization of a claim within the meaning of Section 111 of  
8 CERCLA, 42 U.S.C. § 9611 or 40 C.F.R. § 300.700(d).

9 EFFECT OF SETTLEMENT; CONTRIBUTION PROTECTION

10 29. Nothing in this Consent Decree shall be construed to  
11 create any rights in, or grant any cause of action to, any person  
12 not a Party to this Consent Decree. The preceding sentence shall  
13 not be construed to waive or nullify any rights that any person  
14 not a signatory to this decree may have under applicable law.  
15 Each of the Parties expressly reserves any and all rights  
16 (including, but not limited to, any right to contribution),  
17 defenses, claims, demands, and causes of action which each Party  
18 may have with respect to any matter, transaction, or occurrence  
19 relating in any way to the Site against any person not a Party  
20 hereto.

21 30. The Parties agree, and by entering this Consent Decree  
22 this Court finds, that Settling Defendants and Settling Federal  
23 Agencies are entitled, as of the effective date of this Consent  
24 Decree, to protection from contribution actions or claims as  
25 provided by CERCLA Section 113(f)(2), 42 U.S.C. § 9613(f)(2), for  
26 matters addressed in this Consent Decree. "Matters addressed in  
27 this Decree" shall mean Natural Resource Damages and all response



1 costs incurred or to be incurred by the United States or any  
2 other person or entity at the Site, but do not include natural  
3 resource damages and response costs incurred or to be incurred in  
4 connection with the presence, release or threatened release of a  
5 hazardous substance outside the Site. Any rights Settling  
6 Defendants or Settling Federal Agencies may have to obtain  
7 contribution or otherwise recover costs or damages from persons  
8 not party to this Decree are preserved.

9 31. The Settling Defendants agree that, with respect to any  
10 suit or claim for contribution brought by them for matters  
11 related to this Consent Decree, they will notify the United  
12 States in writing no later than 60 days prior to the initiation  
13 of such suit or claim.

14 32. The Settling Defendants also agree that, with respect  
15 to any suit or claim for contribution brought against them for  
16 matters related to this Consent Decree, they will notify the  
17 United States in writing within 10 days of service of the  
18 complaint on them. In addition, Settling Defendants shall notify  
19 the United States within 10 days of service or receipt of any  
20 Motion for Summary Judgment and within 10 days of receipt of any  
21 order from a court setting a case for trial.

22 33. In any subsequent administrative or judicial proceeding  
23 initiated by the United States for injunctive relief, recovery of  
24 response costs or Natural Resource Damages, or other appropriate  
25 relief relating to the Site, Settling Defendants shall not  
26 assert, and may not maintain, any defense or claim against the  
27 United States based upon the principles of waiver, res judicata,

1 collateral estoppel, issue preclusion, claim-splitting, or other  
2 defenses based upon any contention that the claims raised by the  
3 United States in the subsequent proceeding were or should have  
4 been brought in the instant case; provided, however, that nothing  
5 in this Paragraph affects the enforceability of the covenants not  
6 to sue set forth in Paragraph 19.

7 RETENTION OF RECORDS

8 34. Until seven years after the issuance of the  
9 Certification of Completion of the Remedial Action, each Settling  
10 Defendant shall preserve and retain one set of all records and  
11 documents (originals or, if originals do not exist, copies) now  
12 in its possession or control or which come into its possession or  
13 control, that relate in any manner to activities at the Site or  
14 to transactions between Settling Defendants and the pesticide  
15 formulators who operated at the Site, including, but not limited  
16 to, documents produced by Settling Defendants in the Private  
17 Party Litigation, regardless of any corporate retention policy to  
18 the contrary.

19 35. At the conclusion of this document retention period,  
20 each Settling Defendant shall notify the United States at least  
21 90 days prior to the destruction of any such records or  
22 documents, and upon request by the United States, each Settling  
23 Defendant shall make available any such records or documents at a  
24 location within Region IX of EPA designated by the United States.  
25 Each Settling Defendant may assert that certain documents,  
26 records and other information are privileged under attorney  
27 client privilege, or any other privilege recognized under state

1 or federal law. In connection with the assertion of any such  
2 claim of privilege, the Settling Defendant shall provide the  
3 United States with the following: (1) title of document or  
4 record; (2) date of document or record; (3) name and position of  
5 the author of the document or record; (4) description of the  
6 subject of the document or record; and (5) the specific basis for  
7 the privilege asserted.

8 36. Each Settling Defendant hereby certifies individually  
9 that, to the best of its knowledge and belief, after thorough  
10 inquiry, it has not altered, mutilated, discarded, destroyed or  
11 otherwise disposed of any original records, documents or other  
12 information (or where originals did not exist, the last copy of  
13 such records, documents or other information) relating to its  
14 activities at the Site or to transactions between Settling  
15 Defendants and the pesticide formulators who operated at the Site  
16 since notification of potential liability by the United States  
17 and that it has fully complied with any and all EPA requests for  
18 information pursuant to Sections 104(e) and 122(e) of CERCLA, 42  
19 U.S.C. §§ 9604(e) and 9622(e), and Section 3007 of the Resource  
20 Conservation and Recovery Act, 42 U.S.C. § 6927.

21 NOTICE

22 37. Any notice required hereunder shall be in writing and  
23 shall be delivered by hand, facsimile or overnight mail as  
24 follows:  
25  
26  
27

1 United States:

2 Chief, Environmental Enforcement Section  
3 Environment and Natural Resources Division  
4 U.S. Department of Justice  
5 P.O. Box 7611  
6 Ben Franklin Station  
7 Washington, D.C. 20044  
8 Re: DJ # 90-11-3-598

6 Chief, Environmental Defense Section  
7 U.S. Department of Justice  
8 Environment and Natural Resources Division  
9 Environmental Defense Section  
10 P.O. Box 23986  
11 Washington, D.C. 20026-20531  
12 Re: DJ # 90-11-3-1291

10 EPA:

11 Regional Counsel  
12 Office of Regional Counsel  
13 United States EPA  
14 Region IX  
15 75 Hawthorne Street  
16 San Francisco, CA 94105

15 Settling Defendants:

16 Elf Atochem North America  
17 Andrew C. Peterson, Esq.  
18 Morgan, Lewis & Bockius  
19 801 South Grand Avenue, Suite 2100  
20 Los Angeles, CA 90071-3189

19 Olin Corporation (John Powell & Company)  
20 Ken Wright, Esq.  
21 Morgan, Lewis & Bockius  
22 801 South Grand Ave., Suite 2100  
23 Los Angeles, CA 90017-3189

22 Prentiss Incorporated (R.J. Prentiss & Company)  
23 Anthony C. Ching, Esq.  
24 Graham & James  
25 801 South Figueroa St., 14th Fl.  
26 Los Angeles, CA 90017-5554

25 Puregro Company  
26 April V. Pearson, Esq.  
27 Unocal Corporation  
28 376 S. Valencia Avenue  
Brea, CA 92621

1 Shell Oil Company  
2 Randy Heldt, Esq.  
3 Shell Oil Company  
4 One Shell Plaza  
5 P.O. Box 2463  
6 Houston, TX 77252-2463

7 The Sherwin-Williams Company  
8 Mark E. Robson, Esq.  
9 Littler, Mendelson, Fastiff, Tichy & Mathiason  
10 2175 North California Blvd., Suite 835  
11 Walnut Creek, CA 94596

12 Wilmington Securities, Inc.  
13 Richard Patch  
14 Coblentz, Cahen, McCabe & Breyer  
15 222 Kearny Street, 7th Floor  
16 San Francisco, CA 94108

17 Each Party to this Decree may change the person(s) it has  
18 designated to receive notice for that Party, or the addresses for  
19 such notice, by filing a written notice of such change with the  
20 Court and serving said notice on the Parties.

#### 21 EFFECTIVE DATE

22 38. The effective date of this Consent Decree shall be the  
23 date upon which this Consent Decree is entered by the Court,  
24 except as otherwise provided herein.

#### 25 RETENTION OF JURISDICTION

26 39. The Court shall retain jurisdiction of this matter for  
27 the purpose of entering such further order, direction, or relief  
28 as may be necessary or appropriate for the construction,  
implementation, or enforcement of this Decree.

#### 29 AUTHORIZED REPRESENTATIVE

30 40. Each undersigned representative of Setting Defendants  
31 and the Assistant Attorney General, for the United States,  
32 certifies that he or she is fully authorized to enter into the

1 terms and conditions of this Decree and to legally execute and  
2 bind that Party to this Decree.

3 MODIFICATION

4 41. The terms of this Decree may be modified only by a  
5 subsequent written agreement signed by all of the Parties  
6 signatory hereto, and approved by the Court as a modification to  
7 this Decree.

8 PUBLIC COMMENT

9 42. The Parties agree that this Decree will be subject to a  
10 30-day public comment period as provided in 28 C.F.R. § 50.7.  
11 The United States reserves the right to withdraw its consent to  
12 this Decree if comments received disclose facts or considerations  
13 which show that this Decree is inappropriate, improper, or  
14 inadequate. The Settling Defendants consent to the entry of this  
15 Decree by the Court without further notice.

16 ENTIRE AGREEMENT

17 43. This Consent Decree contains the entire agreement  
18 between the United States and Settling Defendants with respect to  
19 the Site. Any oral representations or modifications concerning  
20 this Decree shall be of no force unless contained in a subsequent  
21 modification signed by the Parties.

22 TERMINATION DATE

23 44. The Settling Defendants may jointly move to terminate  
24 this Decree, but only after demonstrating to the Court that they  
25 have fulfilled all of their obligations under this Decree and  
26 after giving the United States 45 days' notice of their intent to  
27 so move. Termination of this Decree shall not affect the

1 provisions herein for contribution protection, document  
2 retention, the covenants not to sue and reservations of rights,  
3 which shall remain in effect as an agreement among the Parties.

4 45. The following appendices are attached to and  
5 incorporated into this Consent Decree:

6 "Appendix A" is the complete list of the Miscellaneous Group  
7 Settling Defendants.

8 "Appendix B" is the complete list of the Montrose Group.

9 "Appendix C" is the map of the land portion of the Site.

10 "Appendix D" is the map of the marine portion of the Site.

11 "Appendix E" is the ROD.

12 COUNTERPARTS

13 46. This Decree may be executed in any number of  
14 counterparts, and each executed counterpart shall have the same  
15 force and effect as an original instrument.

16 ORDER

17 THE FOREGOING Consent Decree is hereby APPROVED. There  
18 being no just reason for delay, this Court expressly directs,  
19 pursuant to Rule 54(b), Federal Rules of Civil Procedure, ENTRY  
20 OF FINAL JUDGMENT in accordance with the terms of this Consent

21  
22 Decree this \_\_\_\_\_ DAY of \_\_\_\_\_, 1996, each party  
23 to bear its own costs and attorney's fees, except as specifically  
24 provided herein.

25  
26 \_\_\_\_\_  
United States District Judge  
CLAUDIA WILKEN

1 THE UNDERSIGNED PARTIES enter into this Consent Decree in the  
2 matter of United States v. Montrose Chemical Corporation of  
California, relating to the United Heckathorn Superfund Site.

3 FOR THE UNITED STATES OF AMERICA

4 Date: July 9, 1996

Lois J. Schiffer  
5 LOIS J. SCHIFFER  
6 Assistant Attorney General  
7 Environment and Natural Resources  
8 Division  
U.S. Department of Justice  
Washington, D.C. 20530

9 Date: \_\_\_\_\_

\_\_\_\_\_  
10 HELEN H. KANG  
11 Environmental Enforcement Section  
12 Environment and Natural Resources  
13 Division

13 Date: \_\_\_\_\_

\_\_\_\_\_  
14 S. RANDALL HUMM  
15 Environmental Defense Section  
16 Environment & Natural Resources  
17 Division  
P.O. Box 23986  
Washington, D.C. 20026-3986  
(202) 514-3097

19 Date: \_\_\_\_\_

\_\_\_\_\_  
20 MICHAEL J. YAMAGUCHI  
21 United States Attorney  
22 Northern District of California  
23 PATRICK RAMIREZ S. BUPARA  
24 Assistant United States Attorney



1 THE UNDERSIGNED PARTIES enter into this Consent Decree in the  
2 matter of United States v. Montrose Chemical Corporation of  
California, relating to the United Heckathorn Superfund Site.

3 FOR THE UNITED STATES OF AMERICA

4 Date: \_\_\_\_\_

5 \_\_\_\_\_  
6 LOIS J. SCHIFFER  
7 Assistant Attorney General  
8 Environment and Natural Resources  
9 Division  
10 U.S. Department of Justice  
11 Washington, D.C. 20530

12 Date: June 3, 1996

13 \_\_\_\_\_  
14 *Mellen M. 7Cf*  
15 HELEN H. KANG  
16 Environmental Enforcement Section  
17 Environment and Natural Resources  
18 Division

19 Date: June 3, 1996

20 \_\_\_\_\_  
21 *S. Randall Humm/My*  
22 *Mellen M. 7Cf*  
23 S. RANDALL HUMM  
24 Environmental Defense Section  
25 Environment & Natural Resources  
26 Division  
27 P.O. Box 23986  
28 Washington, D.C. 20026-3986  
(202) 514-3097

29 Date: 5-29-96

30 \_\_\_\_\_  
31 *Michael J. Yamaguchi*  
32 MICHAEL J. YAMAGUCHI  
33 United States Attorney  
34 Northern District of California  
35 PATRICK RAMIREZ S. BUPARA  
36 Assistant United States Attorney

1 THE UNDERSIGNED PARTIES enter into this Consent Decree in the  
2 matter of United States v. Montrose Chemical Corporation of  
California, relating to the United Heckathorn Superfund Site.

3 FOR THE UNITED STATES OF AMERICA

4  
5 Date: 6-6-96

Keith Takata  
6 KEITH TAKATA  
7 Director  
8 Hazardous Waste Management Division  
9 Region 9  
U.S. Environmental Protection  
Agency

10 Date: June 6, 1996


John J. Lyons  
11 JOHN J. LYONS  
12 Assistant Regional Counsel  
13 Region 9  
14 U.S. Environmental Protection  
15 Agency

1 THE UNDERSIGNED PARTIES enter into this Consent Decree in the  
2 matter of United States v. Montrose Chemical Corporation of  
3 California, relating to the United Heckathorn Superfund Site.

4 FOR SETTLING DEFENDANT

5 ELF ATOCHEM NORTH AMERICA

6 Date: May 16, 1996

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8 FRANK B. FRIEDMAN  
9 Senior Vice President  
10 Health, Environment and Safety

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THE UNDERSIGNED PARTIES enter into this Consent Decree in the matter of United States v. Montrose Chemical Corporation of California, relating to the United Heckathorn Superfund Site.

FOR SETTLING DEFENDANT

*MP* OLIN CORPORATION

Date: May 15, 1996

*Kosche*  
[NAME, TITLE]

Peter C. Kosche  
Senior VP Corporate Affairs

1 THE UNDERSIGNED PARTIES enter into this Consent Decree in the  
2 matter of United States v. Montrose Chemical Corporation of  
California, relating to the United Heckathorn Superfund Site.

3 FOR SETTLING DEFENDANT

4 PRENTISS, INC.

5 Date: \_\_\_\_\_

5/15/96

*Richard A. White, President*  
[NAME, TITLE]

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1 THE UNDERSIGNED PARTIES enter into this Consent Decree in the  
2 matter of United States v. Montrose Chemical Corporation of  
3 California, relating to the United Heckathorn Superfund Site.

4 FOR SETTLING DEFENDANT

5 PUREGRO COMPANY

6 Date: 14 May 96

7 *April V Pearson*

8 [NAME, TITLE]

9 April V Pearson

10 Asst. Secretary

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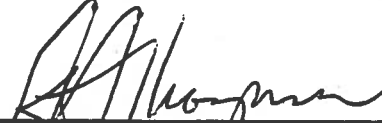
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1 THE UNDERSIGNED PARTIES enter into this Consent Decree in the  
2 matter of United States v. Montrose Chemical Corporation of  
3 California, relating to the United Heckathorn Superfund Site.

4 FOR SETTLING DEFENDANTS

5 SHELL OIL COMPANY

6 Date: MAY 9, 1996

7   
8 \_\_\_\_\_  
9 [NAME, TITLE]

10 MGR REMEDIATION

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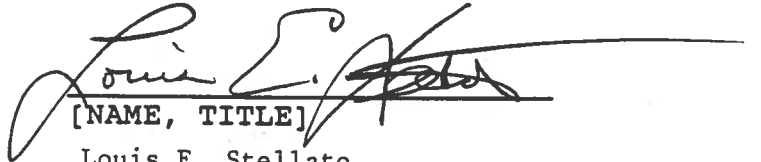
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1 THE UNDERSIGNED PARTIES enter into this Consent Decree in the  
2 matter of United States v. Montrose Chemical Corporation of  
California, relating to the United Heckathorn Superfund Site.

3 FOR SETTLING DEFENDANT

4 THE SHERWIN-WILLIAMS COMPANY

5  
6 Date: May 9, 1996

  
[NAME, TITLE]

7 Louis E. Stellato  
8 Vice President, General Counsel & Secretary

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1 THE UNDERSIGNED PARTIES enter into this Consent Decree in the  
2 matter of United States v. Montrose Chemical Corporation of  
California, relating to the United Heckathorn Superfund Site.

3 FOR SETTLING DEFENDANT  
4 WILMINGTON SECURITIES, INC.

5  
6 Date: 5/9/96

*Dorlene Clarke*  
7 [NAME, TITLE] *Dorlene Clarke* Vice President

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Miscellaneous Defendants Group Consent Decree  
Appendix A  
Settling Defendants

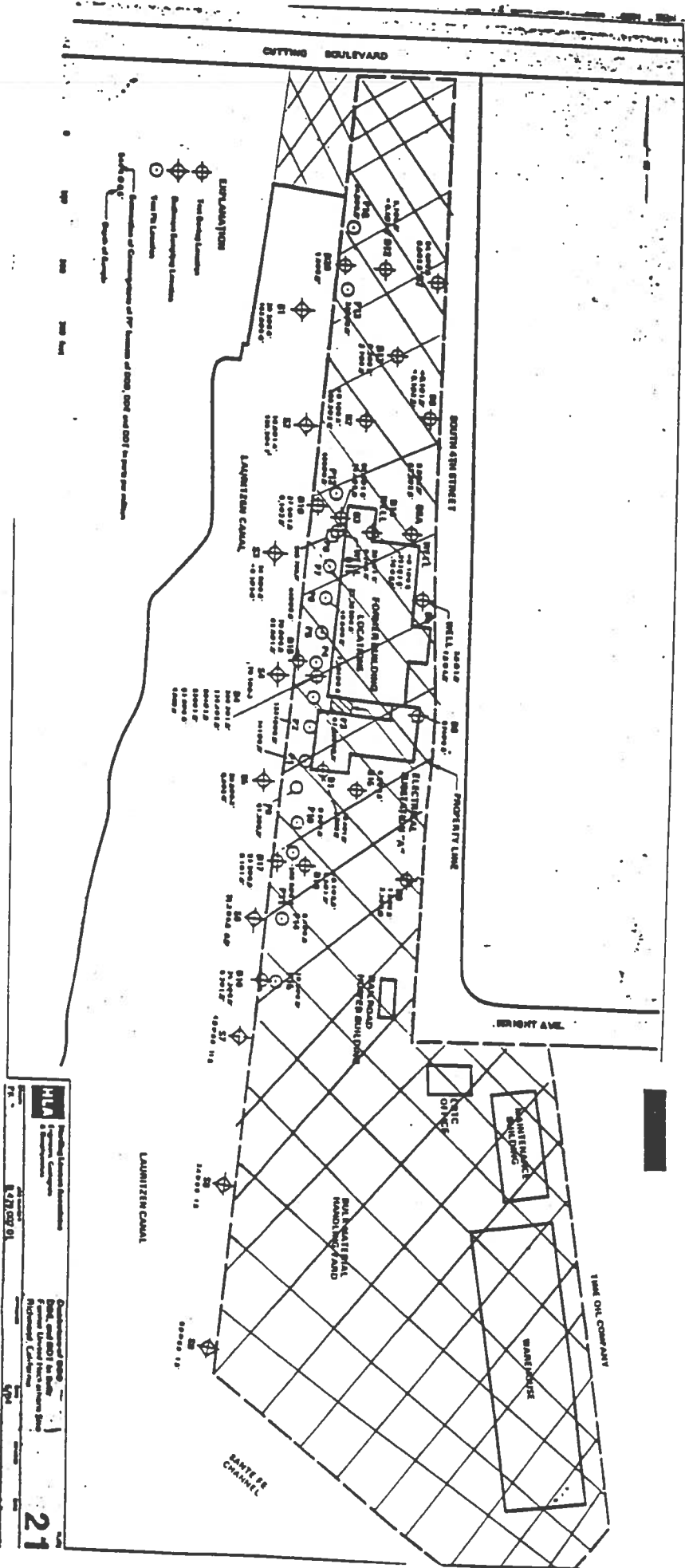
- Elf Atochem North America (Pennsylvania Salt Manufacturing Co.)
- Olin Corporation (John Powell & Company, Inc.)
- Prentiss, Inc. (R.J. Prentiss & Company)
- Puregro Company
- Shell Oil Company (Shell Chemical Company)
- The Sherwin-Williams Company
- Wilmington Securities, Inc.

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Miscellaneous Group Consent Decree  
Appendix B  
Montrose Group

Montrose Chemical Corporation of California  
Rhone-Poulenc, Inc.  
Stauffer Management Company  
Chris-Craft Industries, Inc.

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<p>HLA                  Planning, Architecture &amp; Engineering                  100 State Street                  Boston, MA 02109                  TEL: 617.552.1100                  FAX: 617.552.1101</p>	<p>Development of 1000                  State Street                  Boston, MA 02109                  Project No. 1000                  Date: 10/15/91</p>
--	--

Miscellaneous Defendants Group  
Consent Decree  
Appendix D

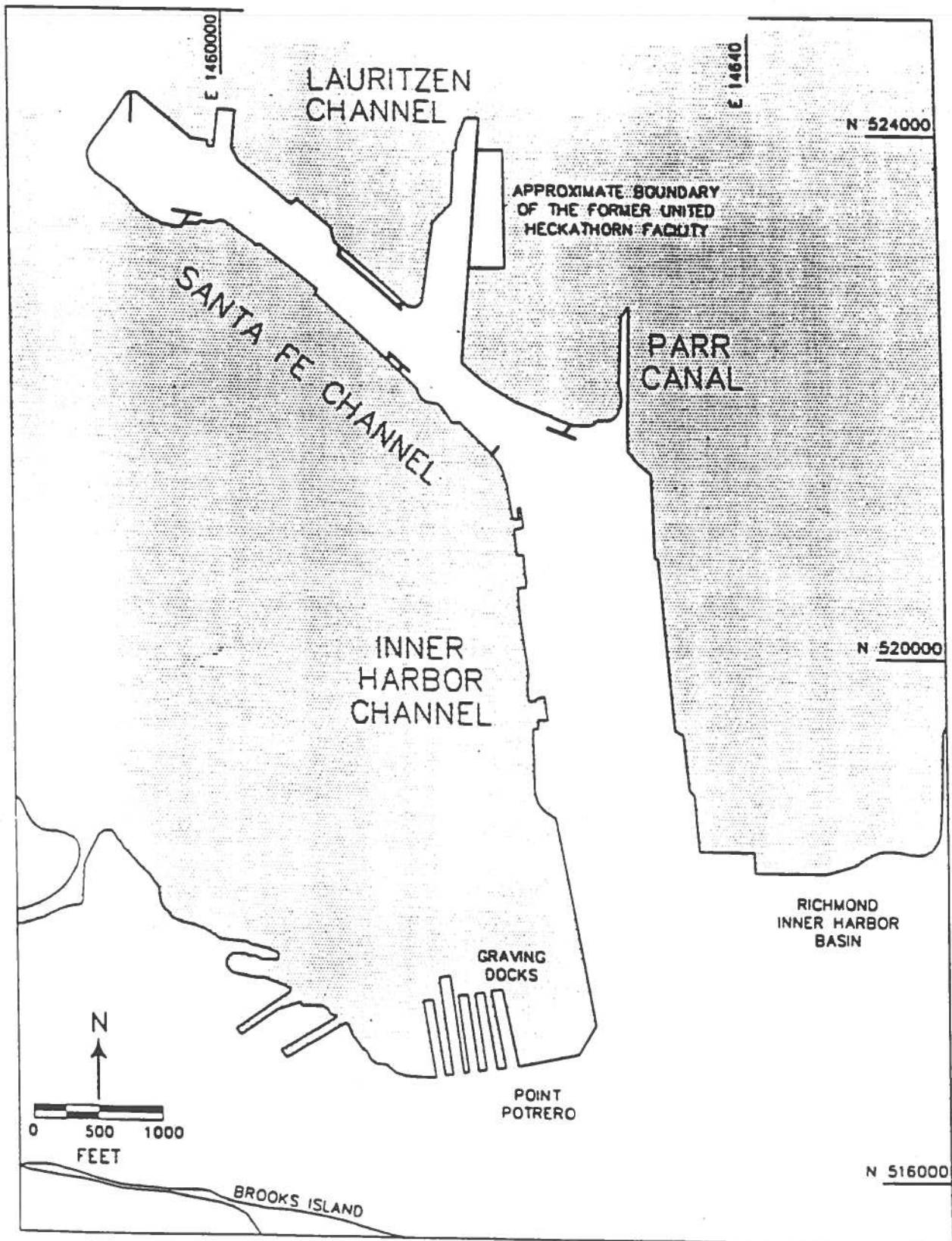


Figure 2. Map of Richmond Harbor.

**RECORD OF DECISION**

United Heckathorn Superfund Site  
Richmond, California

EPA ID# CAD981436363

**PART I - DECLARATION**

**Statement of Basis and Purpose**

This Record of Decision ("ROD") presents the selected remedial action for the United Heckathorn Superfund Site ("the Site") in Richmond, California. This document was developed in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980, ("CERCLA"), as amended by the Superfund Amendments and Reauthorization Act of 1986 ("SARA"), 42 U.S.C. §§9601 et seq., and, to the extent practicable, in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"), 40 C.F.R. Part 300, and the laws of the State of California. This decision is based on the Administrative Record for the Site. The administrative record index identifies the documents upon which the selection of the remedial action is based.

**Assessment of the Site**

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

**Description of the Remedy**

The United Heckathorn Superfund Site in Richmond, California, was used to formulate pesticides from approximately 1947 to 1966. Soils at the Site and sediments in Richmond Harbor were contaminated with various chlorinated pesticides, primarily DDT, as a result of these pesticide formulation activities. At the time of Site listing in 1990, a visible deposit of pesticide residue containing up to 100% DDT was present on the Lauritzen Channel embankment. Several response actions have already been taken to cleanup the most contaminated upland areas of the Site, including the embankment. Under EPA Removal Order 90-22, a group of Potentially Responsible Parties (PRPs) excavated the embankment deposit and transported it offsite to a permitted disposal facility. During subsequent actions through 1993 pursuant to the removal order, all known additional upland soil deposits containing high levels of pesticides were removed, as were piles of contaminated soils generated in earlier actions.

The final remedy addresses remaining hazardous substances, primarily in the marine environment. The major components of the selected remedy include:

- Dredging of all soft bay mud from the Lauritzen Channel and Parr Canal, with offsite disposal of dredged material.
- Placement of clean material after dredging.
- Construction of a cap around the former Heckathorn facility to prevent erosion.
- A deed restriction limiting use of the property at the former Heckathorn facility location to

non-residential uses.

- Marine monitoring to verify the effectiveness of the remedy.

**Statutory Determinations**

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate ("ARARs") to the remedial action, and is cost effective. The selected remedy uses engineering controls and institutional controls to address remaining hazardous substances at the Site. Concentrated wastes at the upland portion of the Site were addressed by previous removal actions.

Because this remedy will result in hazardous substances remaining onsite, a review will be conducted within five years after the commencement of remedial action, and every five years thereafter, to ensure that the remedy continues to provide adequate protection of human health and the environment.

*John Wise*

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Felicia Marcus *fa*  
Regional Administrator

*10.26.94*

\_\_\_\_\_  
Date

**PART II - DECISION SUMMARY**

**United Heckathorn Superfund Site  
Richmond, California**

**1. Site Name, Location, and Description.**

The United Heckathorn Site is located in Richmond Harbor, on the east side of San Francisco Bay (Figures 1 and 2) in Contra Costa County, California. The location of the former United Heckathorn facility (Figure 3) is currently being used as a marine shipping terminal operated by the Levin Richmond Terminal Corporation (LRTC). The area of contamination at the Site includes the northern five acres of the terminal and marine sediments in harbor channels including the Lauritzen, which is immediately adjacent to the location of the former Heckathorn facility, the Santa Fe, the Parr Canal, and the Inner Harbor Channel.

The upland area of the Site is currently fenced and occupied. Current and expected future zoning of the upland area of the Site permits only industrial use. Land use restrictions selected as part of the Site remedy will also permit only nonresidential, industrial or commercial uses in the future.

**2. Site History and Enforcement Activities.**

The upland area of the Site is currently owned by Levin Enterprises, Inc. The Site was used from approximately 1947 to 1966 by several operators, including the R.J. Prentiss Company, Heckathorn and Company, United Heckathorn, United Chemetrics, and Chemwest Incorporated (hereafter collectively referred to as "United Heckathorn") to formulate and package pesticides. No chemicals were manufactured onsite.

Documents from the 1950s and 1960s indicate that approximately 95% of Heckathorn's operations entailed processing the pesticide, DDT. The processing activities included mixing, blending, grinding, and packaging. Various solvents, including xylenes, were used to dissolve DDT and other pesticides into liquid formulations. Powder formulations were also prepared.

United Heckathorn employees apparently routinely washed out equipment containing pesticide residues. The wash water was permitted to either run through drains that discharged to the Lauritzen Channel, or to seep into the ground adjacent to the Site (Levine-Fricke, 1990). Later, settling tanks were used to recover pesticide residues from wash water; however, overflow and leakage from these tanks also occurred. In addition, accidental spills, leaks, and releases also occurred during the processing of liquid and dry pesticide formulations, which were conducted both inside and outside the United Heckathorn buildings.

In 1960, the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB) inspected the facility and cited United Heckathorn for the release of DDT-laden wastewater into the Lauritzen Channel. In 1965, California Department of Fish and Game staff identified a discharge of wastewater overflow into the Lauritzen Channel and leakage from the pesticide settling tanks.

Pesticide processing activities at the Site ended in approximately 1966. Between 1966 and 1970, the United Heckathorn facility buildings were demolished and cleared from the Site. In the 1970s, the Site was apparently used primarily for bulk material storage. In 1981, the Levin Metals Corporation purchased the property from the Parr-Richmond Terminal Company and has been



operating the Site since that time as a bulk shipping facility.

In 1980, the United Heckathorn Site was inspected and sampled by CDHS as part of the Abandoned Sites Project. Chlorinated pesticides and metals were detected in soil samples, and the area was designated a state Superfund Site in March 1982. EPA listed the United Heckathorn Site on the CERCLA National Priorities List (NPL) in March 1990, and took over as lead agency in August 1990.

Interim response actions were conducted from 1982 to 1993 in the upland and embankment areas of the United Heckathorn Site. As early as 1982, contaminated soil, asphalt, and concrete from the United Heckathorn Site were excavated by the current landowner and moved to a nearby lot adjacent to the Parr Canal. These materials were subsequently transported to several hazardous waste disposal facilities. In 1983, soils containing high levels of pesticides were removed by the current landowner during routine maintenance and extension of onsite railroad lines. A 6-in. to 8-in. layer of gravel was placed over the surface of the Site, including a 6-in. layer of ballast rock over the Lauritzen Channel embankment and selected areas of high DDT concentrations. In 1986, during excavation for the construction of a train scale, high levels of pesticides were detected and approximately 60 cubic yards (yd<sup>3</sup>) of soil were removed by the current landowner.

In November 1990, pursuant to EPA Removal Order 90-22, approximately 1500 yd<sup>3</sup> of soil and visible pesticide residue containing up to 100% DDT were excavated by several PRPs (Levin, Montrose, Parr, Shell, and Stauffer) from the Lauritzen Channel embankment. This excavation was taken back to the foundation of the former Heckathorn building 1, where a pesticide deposit approximately 3 ft thick was revealed beneath the foundation. Samples of this deposit contained approximately 30% DDT. An additional 1800 yd<sup>3</sup> of pesticide residue and contaminated soil were excavated by the same PRPs from this area in April 1991. The excavated material and stockpiles that had been placed onsite in the 1980s were hauled offsite by truck to permitted hazardous waste disposal facilities. A final soil removal action was completed in May 1993 by the same PRPs as well as Prentiss and Sherwin Williams. Assuming that the embankment deposit contained 30% DDT, over 99% of the mass of pesticides has been removed from the upland portion of the Site since 1990.

Marine sediment has not been the subject of prior removal actions or otherwise been remediated. However, as shown on Figure 3, the southeastern area of the Lauritzen Channel was last dredged for berth maintenance in 1985.

### 3. Highlights of Community Participation.

Six fact sheets have been released describing activities at the Site. In July, 1994 EPA released a proposed plan and the Administrative Record for the Site. Site documents were made available at the agency Superfund Records Center and at the Richmond Public Library, and a public notice was published allowing 30 days for public comment on the Proposed Plan. A public meeting was held on August 2, 1994 to describe the proposed remedy and receive comments. The public comment period was then extended an additional 30 days at the request of PRPs. Three persons made comments at the public meeting, and six written comments on the proposed plan were received during the comment period. Responses to all significant comments received during this period are contained in the attached "Analysis of Public Comments." The decision for this Site is based upon the Administrative Record.

#### **4. Scope and Role of Remedial Actions.**

The remedial actions selected in this Record of Decision are expected to be the final response actions performed at the Site. As described in the Site history above, significant interim response measures were performed at the Site in the past. These removal actions addressed the principal threats at the upland portion of the Site.

The selected remedy addresses the contaminants remaining in sediments at the Site, as well as the low levels of contaminants remaining in soils at the Site.

#### **5. Site Characteristics.**

The nature and extent of contamination at the United Heckathorn Site has been delineated by the combination of state-ordered Site investigations which occurred prior to NPL listing, and EPA's subsequent Remedial Investigation (Battelle, 1994). As discussed above, large deposits of extremely high levels of pesticides remained in upland soils after United Heckathorn ceased operations in 1966. These have been the subject of extensive excavation and removal actions over the past three years.

A soils database representing current Site conditions was compiled in EPA's Human Health Risk Assessment (ICF Technology, 1994) from the previous Site studies and removal action reports. A conservative estimate of the remaining mean Site soil concentrations of the primary Contaminants of Concern (COCs), DDT (total) and dieldrin, are 64 and 5.7 milligrams per kilogram (mg/kg), respectively. These estimates are conservative because the soils database includes the large number of additional samples which were taken to delineate the hot-spot areas for the removal actions. The actual mean Site concentrations are likely to be lower.

DDT at levels exceeding 1 mg/kg in upland soils extends over the upland portion of the Site as shown in Figure 4. The total mass of these upland soils is approximately 95,000 tons (Levine-Fricke, 1993). Confirmation sampling performed during the excavations of the most contaminated soil areas indicated that the concentrations drop to nondetectable levels in the younger bay mud immediately below the upland soils, demonstrating that the homogeneous silty-clay bay mud underlying the Site is an effective barrier to downward migration of Site chemicals.

Due to the Site's proximity to San Francisco Bay, the shallow groundwater at the Site is naturally saline and is not a source of drinking water under state or federal law.

In 1992, EPA performed a screening assessment of offsite soils (ICF Technology, 1994) in order to determine whether the historic operations of United Heckathorn could have released pesticides into the air in sufficient quantities to cause current levels of concern in nearby off-site residential soils. Sampling locations were chosen along Cutting Boulevard and immediately north of Highway 580, because the meteorological analysis for EPA's 1988 air monitoring program indicated that the strongest prevailing winds at the Site blow due north. The sampling program was therefore deliberately biased to target the area which would have had the highest levels of pesticides, had Heckathorn caused contamination. All off-site soil sampling results were well within acceptable levels for protection of human health.

The results of the RI of marine sediment, however, indicate that the occurrence of pesticides at the Site, particularly the Contaminants of Concern, DDT and dieldrin, is more widespread and at concentrations orders of magnitude higher relative to San Francisco Bay background levels than other detected contaminants. The areal and vertical distribution of marine contamination is summarized below.

Vertical core segments and channel edge grab samples were analyzed for chlorinated pesticides to delineate the areal and vertical extent of marine contamination. Results indicated that significant pesticide contamination was limited to the soft geologically recent "younger bay mud"; samples from the hard underlying "older bay mud" generally contained only traces of pesticides. Figure 5 presents the average total DDT concentration in the younger bay mud in the inner Richmond Harbor. It is significant to note that the concentration contours on this figure must be presented on a log scale in order to depict the gradient of six orders of magnitude between the Lauritzen Channel and Point Potrero. The maximum and median total DDT and maximum dieldrin concentrations throughout the study area are also shown.

Pesticide concentrations were highest in the Lauritzen Channel, and decreased with increasing distance from the former United Heckathorn Site, clearly indicating that Heckathorn was the source of contamination. The highest total DDT concentration of 633,000 micrograms per kilogram ( $\mu\text{g}/\text{kg}$ ) dry wt was measured in a sample from 1 ft to 3 ft below the mudline in the center of the channel. Pesticide concentrations of greater than 100,000  $\mu\text{g}/\text{kg}$  were detected in sediment from the northern and western portions of the channel. The median total DDT concentration was approximately 47,000  $\mu\text{g}/\text{kg}$  at the head of the Lauritzen Channel, which has not been dredged in a number of years. The median concentration of total DDT decreased to about 14,000  $\mu\text{g}/\text{kg}$  in the western, undredged portion of the channel, and to 1500  $\mu\text{g}/\text{kg}$  in the dredged portion of the channel near the Levin terminal. Dieldrin concentrations were lower (maximum concentration of 16,000  $\mu\text{g}/\text{kg}$ ), but exhibited the same spatial trend in relative concentration.

Total DDT concentrations in sediment decreased by at least two orders of magnitude from the Lauritzen Channel to the Santa Fe Channel. The median concentration of total DDT in the younger bay mud was 110  $\mu\text{g}/\text{kg}$  in the upper Santa Fe Channel and 210  $\mu\text{g}/\text{kg}$  in the federally maintained portion of the channel. DDT and dieldrin concentrations were higher in the federally maintained portion of the Santa Fe Channel, which includes the area downstream of the Lauritzen Channel. Total DDT and dieldrin concentrations decreased by another order of magnitude from the Santa Fe Channel to the Inner Harbor Channel. The median total DDT concentration was 60  $\mu\text{g}/\text{kg}$  in the upper Inner Harbor Channel, and 10  $\mu\text{g}/\text{kg}$  in the lower Inner Harbor Channel. The maximum total DDT concentration near Point Potrero was 19  $\mu\text{g}/\text{kg}$ , which is approximately equal to the median DDT concentration for the periphery of San Francisco Bay, excluding the Lauritzen Channel (Long et al., 1988).

Pesticide concentrations in Parr Canal sediment were lower than those measured in the Lauritzen Channel but greater than those measured in Santa Fe or Inner Harbor Channels. The maximum and median total DDT concentrations measured in Parr Canal sediment were 4080  $\mu\text{g}/\text{kg}$  and 840  $\mu\text{g}/\text{kg}$ , respectively. The maximum dieldrin concentration was 170  $\mu\text{g}/\text{kg}$ . The Parr Canal is significantly narrower than it was in the 1940's, due to filling which (based on aerial photographs) occurred sometime between 1958 and 1968. Some of the material used to fill the canal may have been dredged from the harbor, possibly explaining the elevated levels of pesticides in Parr Canal sediments.

Grab samples collected from channel edges throughout the study area showed the same spatial trend in pesticide concentrations as the core samples. The total DDT concentrations in channel edge samples were consistent with the median concentration measured in core samples from that area.

Contaminant concentrations in the younger bay mud were generally not well stratified. In the shallow portions of the Lauritzen Channel, contaminant concentrations increased, and then decreased with increasing depth. The most highly contaminated sediment was generally found from 1 ft to 5 ft below the mudline. In the Santa Fe Channel, the most contaminated sediment was

found down-channel of the mouth of the Lauritzen Channel in the surface sediment, and just up-channel of the mouth in deeper sediment. Contaminant concentrations were generally higher in deeper sediment in the Inner Harbor Channel. Analysis of the volumes of contaminated sediments and the average concentrations in harbor channels indicates that 98% of the mass of DDT in harbor sediments is confined to the Lauritzen Channel.

Selected core samples collected during the marine RI were analyzed for polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), metals, and butyltins. In general, sediment from the upper Lauritzen Channel and Parr Canal had higher concentrations of PAHs, PCBs, and metals than sediment from the Santa Fe and Inner Harbor Channels. This is probably because the larger channels have been routinely dredged for navigation, whereas the northern Lauritzen and Parr have not. Only the pesticides, DDT and dieldrin, are consistently found in sediments and biota at levels orders of magnitude higher than the regional background levels.

#### 6. Applicable or Relevant and Appropriate Requirements (ARARs)

Federal and state environmental laws which have been determined to be ARARs for the remedy are summarized below. Chemical-specific ARARs are discussed first, followed by other requirements.

Surface Waters: ARARs for surface water include EPA's ambient water quality criteria for DDT and dieldrin. These are the primary basis for the Site remediation goals.

EPA Ambient Water Quality Criteria. Section 304 of the Clean Water Act required EPA to publish criteria for water quality that accurately reflect the latest scientific knowledge on the kind and extent of all identifiable effects on health and welfare, including effects on plankton, fish, shellfish, wildlife, and plant life, which may be expected from the presence of pollutants in any body of water, based on the substances' whole-water concentration. The ambient water quality criteria for DDT and dieldrin were published in October 1980. The human health values have been updated since the original criteria publications in 1980 to reflect revised carcinogenic potency values from EPA's Integrated Risk Information System (IRIS) database (see Final Rule, 40 CFR Part 131, 57 FR 60848, December 22, 1992).

The derivation of EPA's ambient water quality criteria is discussed at length in the ecological assessment (EPA, 1994). Criteria for the protection of saltwater aquatic life are, for most pollutants, based upon toxic effects data for water-column organisms. However, for DDT and its metabolites, which bioaccumulate to high levels and may cause toxicity to organisms at higher trophic levels, it was determined that more restrictive criteria were necessary to protect fish-eating birds. The chronic marine aquatic life criterion is 1 ng/L ( $10^{-9}$  g/l, EPA 1980, EPA 440/5-80-038)). The water quality criterion for the protection of human health from the consumption from the bioaccumulation of DDT in fish is 0.59 ng/l, based on achieving a  $1 \times 10^{-6}$  lifetime excess cancer risk level.

The chronic marine aquatic life criterion for dieldrin of 1.9 ng/l is also residue-based, and was set at the level which would result in the achievement of the Food and Drug Administration's (FDA) action level in fish oil after bioaccumulation (EPA 1980, EPA 440/5-80-019)). This criterion is protective of sensitive aquatic organisms. The water quality criterion for the protection of human health from the consumption from the bioaccumulation of dieldrin in fish is 0.14 ng/l, based on achieving a  $1 \times 10^{-6}$  lifetime excess cancer risk level. The EPA aquatic life and human health water quality criteria for DDT and dieldrin are listed in Table 1.

**TABLE 1. EPA Ambient Water Quality Criteria**

Chemicals	Saltwater Aquatic Life (ng/L) 24-hour average	Human Health (ng/L)
DDT <sup>(a)</sup>	1.0	0.59
Dieldrin	1.9	0.14

(a) The sum of the 4,4'- and 2,4'- isomers of DDT, DDD (TDE), and DDE.

Section 121(d)(2)(A)(ii) of CERCLA requires that remedial actions meet federal Water Quality Criteria established under Section 304 or 303 of the Clean Water Act where such WQC are determined by EPA to be relevant and appropriate to remedial actions at the Site. See 42 U.S.C. § 9621(d)(2)(A)(ii) and 40 C.F.R. § 300.430(e)(2)(i)(G). In evaluating whether specific WQC are relevant and appropriate to remedial actions at Superfund Site, CERCLA requires EPA to consider four criteria: 1. the uses of the receiving water body; 2) the media affected; 3) the purposes of the criteria and 4) current information. See 42 U.S.C. § 9621(d)(B)(i). See also U.S. EPA, CERCLA Compliance with Other Laws Manual - CERCLA Compliance with the CWA and SDWA (OSWER Pub. 9234.2-06/FS, Feb. 1990).

EPA guidance concerning determinations that WQC are relevant and appropriate to remedial action at a Superfund Site provides that:

A water quality criteria component for aquatic life may be relevant and appropriate when there are environmental factors that are being considered at a Site, such as protection of aquatic organisms. With respect to the use of water quality criteria for the protection of human health, levels are provided for exposure both from drinking the water and from consuming aquatic organisms (primarily fish) and from fish consumption alone. Whether a water quality criterion is appropriate depends on the likely routes of exposure.

U.S. EPA, CERCLA Compliance With Other Laws Manual: Interim Final at 1-15 (EPA 540-G-89-006, Aug. 1989).

Both the marine chronic and human health WQC for DDT and dieldrin are relevant and appropriate to remedial actions at this Site since both aquatic and wildlife and humans may be exposed to these contaminants either directly or through consumption of contaminated organisms. As discussed in the Ecological Risk Assessment, aquatic organisms are present in all channels at the Site, which are a part of San Francisco Bay. Fish eating-birds feed in all channels in the harbor. In fact, the particular bird upon which the marine chronic water quality criterion for DDT was based is the California brown pelican, an endangered species, which has been observed feeding in the most contaminated channels at the Site. As discussed in the Human Health Risk Assessment, fishermen catch and consume fish from the Inner Richmond Harbor channels. In 1986, the State of California Department of Health Services ordered the posting of the Lauritzen Channel to warn fishermen of the fish and shellfish contamination. On April 7, 1994, the Cal-EPA Department of Toxic Substances Control issued an advisory against consuming any resident bottom fish, such as white croaker, from anywhere in the Inner Richmond Harbor.

The beneficial uses designated by the State of California for central San Francisco Bay waters, which are discussed below, include fishing, wildlife habitat, preservation of rare and endangered species, fish migration, fish spawning, shellfish harvesting, and estuarine habitat.

EPA's Ambient Water Quality Criteria were specifically developed to protect beneficial uses such as these.

Porter-Cologne Water Quality Act, San Francisco Bay Regional Basin Plan, and Fish and Game Code. The release of hazardous substances to surface waters is controlled under the Porter-Cologne Water Quality Control Act and implementing regulations, and the state Fish and Game Code §5650.

Beneficial uses of surface waters were designated in the Water Quality Control Plan for the San Francisco Basin (the Basin Plan) adopted by the Regional Water Quality Control Board (SFBRWQCB, 1986). The Basin Plan designates the following beneficial uses of Central San Francisco Bay, which includes the waters at the Site:

- Industrial Service Supply
- Industrial Process Supply
- Navigation
- Water Contact Recreation
- Non-contact Water Recreation
- Commercial and Sport Fishing
- Wildlife Habitat
- Preservation of Rare and Endangered Species
- Fish Migration
- Fish Spawning
- Shellfish Harvesting
- Estuarine Habitat

The Basin Plan also contains the following narrative objective:

"All waters shall be maintained free of toxic substances in concentrations that are lethal to or that produce detrimental responses in aquatic organisms. Detrimental responses include, but are not limited to, decreased growth rate and decreased reproductive success of resident or indicator species and/or significant alterations in population or community ecology or receiving water biota. Other relevant biological measures will be considered by the Regional Board in evaluating compliance with this objective. Additionally, effects on human health due to bioconcentration will be considered."

Resolution 68-16: Statement of Policy with Respect to Maintaining High Quality of Waters in California. The State Water Resources Control Board adopted Resolution 68-16 on October 28, 1968. The Basin Plan, discussed above, states: "Whenever the existing quality of water is better than the quality of water established herein as objectives, such existing water quality shall be maintained unless otherwise provided by State Water Resources Control Boards Resolution 68-16." The SFBRWQCB has identified Resolution 68-16 as a potential ARAR for the United Heckathorn Site. While EPA does not agree that Resolution 68-16 is an ARAR, EPA and the State agree that achieving the water quality criteria identified above would meet the requirements of 68-16 regardless of whether or not it is an ARAR.

#### Soils and Sediments

No chemical-specific ARARs were identified as remedial goals for soils or sediments at the Site. Based on the results of the ecological assessment, mean sediment levels were calculated to prevent violations of the ARARs for surface waters, and to meet the National Academy of Sciences

(NAS) action level for DDT in fish to ensure protection of fish-eating birds, including endangered species (see discussion below).

California Code of Regulations, Title 22. The state of California has developed chemical-specific regulatory criteria for the identification of hazardous and extremely hazardous wastes, based on Total Threshold Limit Concentration (TTLC) and Soluble Threshold Limit Concentration (STLC) values (California Code of Regulations, Title 22, Sections 66699 and 66723). Any waste containing a substance at a concentration equal to or exceeding a listed TTLC is classified as a hazardous waste by the California Department of Toxic Substances Control (DTSC). Extremely hazardous wastes are also classified by DTSC using TTLCs. STLCs are related to the Waste Extraction Test (WET), also described in Title 22. Any waste which produces an extract in the WET test the concentration of which exceeds an STLC, is classified as a hazardous waste by DTSC. The TTLCs and STLCs for the major COCs at the Site, DDT and dieldrin, are listed in Table 2.

**TABLE 2. State of California Hazardous Waste Limits**

Chemicals	TTLC (mg/kg wet wt)	STLC (mg/kg wet wt)
DDT, DDD, DDE	1.0	0.1
Dieldrin	8.0	0.8

All materials known to contain concentrations of substances exceeding the limits which classify extremely hazardous wastes have been removed from the Site. Based on the results of previous investigations and the marine RI, approximately 95,000 tons of soils in the upland area of the Site and approximately 65,000 yd<sup>3</sup> of sediments in the Lauritzen Channel and Parr Canal exceed the California TTLC for DDT. No sediments outside these channels exceed the levels listed in Table 2. Although the TTLCs and STLCs do not represent cleanup levels, soils and sediments with chemical concentrations higher than the TTLCs or STLCs would be classified as hazardous under California law if they were dredged or excavated at the Site.

EPA has developed chemical-specific criteria for the identification of hazardous waste under the Resource Conservation and Recovery Act (RCRA). For the COCs at this Site, the criteria are not concentration-based, but are instead based on the source of the constituents (40 CFR 261.33). Product spills, for example, are RCRA-regulated, but generally releases of chemicals contained in process waste streams are not (40 CFR 261.33(d)(comment)). Based on a review of historical documents, the presence of COCs in marine sediments and remaining soils appears to be due to releases contained in waste streams from United Heckathorn's processes. Therefore, EPA has determined that the contaminated soils and marine sediments are not hazardous wastes regulated under RCRA.

Groundwater. There are no chemical-specific ARARs for the concentration of COCs in Site groundwater. Previous investigations found that salinity levels exceed federal (40 CFR 144.3) and state (SWRCB Resolution No. 88-63) limits for underground sources of drinking water. Consequently, the shallow groundwater at the Site is not considered a potential source of drinking water as defined under state and federal law.

The water quality criteria for surface waters discussed above do not apply to groundwater, although they might provide a basis for developing remediation goals in groundwater if there was a

complete pathway by which contaminants in groundwater caused violations of the criteria in surface water. However, as discussed in the previous chapter, an analysis of groundwater transport to the bay was made in 1986 as part of the initial state-ordered Site investigation. Although extremely high levels of pesticides were present in soils at that time, there were only sporadic detections of low levels of pesticides in groundwater samples, and modeling indicated that this potential pathway would not cause violations of state surface water quality objectives. Based on this analysis, groundwater monitoring was not required in subsequent state-ordered Site investigations. Subsequently, all highly contaminated soils containing approximately 99% of the mass of pesticides were removed from Site soils, further reducing any potential threat.

Air. There are no chemical-specific ARARs, such as National Ambient Air Quality Standards (NAAQS) or National Emission Standards for Hazardous Air Pollutants (NESHAPS), for the concentrations of Site COCs in the air. Air monitoring was performed at the Site prior to the removal of extremely high levels of exposed pesticides from Site soils. Even under those conditions, the concentrations in onsite and offsite air were well below levels of concern.

Fish and Shellfish. There are no chemical-specific ARARs for the concentration of COCs in fish and shellfish. The NAS saltwater action levels are TBCs, which provide an additional level of protection to fish-eating birds beyond the level that is the basis of the surface water ARARs for aquatic life. The FDA action levels for the marketability of fish and shellfish are also TBCs for protecting human health, but they are much less stringent than the levels that would be achieved by meeting the surface water ARARs discussed above.

The NAS and National Academy of Engineering published recommendations in 1972 for pollutant residues in composite samples of 25 or more whole fish of any species within the same size range as those consumed by any bird or mammal in the marine environment (EPA-R3-73-033, March 1973). The document cites studies demonstrating DDE induced shell thinning in mallards, American kestrels, Japanese quail and ring doves, and an inverse relationship between shell thickness and concentrations of DDE in eggs of wild populations of herring gulls, double-crested cormorants, great blue herons, white pelicans, brown pelicans, and peregrine falcons. The document concludes that a wet weight tissue range of 0.1 mg/kg to 0.5 mg/kg (100 µg/kg to 500 µg/kg) is "evidently higher than one which would permit successful reproduction of several fish-eating and raptorial birds." The criterion for DDT is 50 µg/kg, which is one-third the level which was the basis for the EPA water quality criteria discussed above.

Since the US Fish and Wildlife Service raised concerns that the EPA criteria for DDT might not be stringent enough for the protection of fish-eating birds, and an endangered species (the brown pelican) has been observed feeding at the Site, the NAS action level was retained as a TBC to help determine the protectiveness of remediation (see 55 FR 8745).

#### Other Requirements

Endangered Species Act. The Endangered Species Act of 1973, 16 USC §1531 et seq., requires the conservation of species of fish, wildlife and plants that are threatened with extinction. Compliance with the act at Superfund Sites requires the identification of any threatened or endangered species or of its critical habitat that would be affected by a proposed remedial action.

The U.S. Fish and Wildlife Service (FWS), which is the federal trustee for the protection of migratory birds, provided a list of endangered species that are known to nest in central or northern San Francisco Bay, or are likely to feed regularly in the immediate vicinity of Richmond Harbor (Table 3). Among these, the California brown pelican has been observed by EPA personnel feeding in all channels in Richmond Harbor, including the most contaminated waterways.



The FWS raised the concern that the tissue residue basis (0.15 mg/kg DDT in prey) of the surface water ARARs resulted in reproductive levels in pelicans that were still 10% to 30% below the levels needed to maintain a stable population, described in the 1976 study used to set the criteria. It should be emphasized, however, that the reproductive effects occurred when contamination was widespread in the birds' range, and that the contamination in Richmond Harbor is restricted to a small area. Nevertheless, the selected remedy is expected to also achieve the NAS saltwater action level for DDT in fish (0.05 mg/kg), which was identified as a TBC for determining the protectiveness of remediation.

**TABLE 3. Endangered Species**

Common Name	Nests In SF or San Pablo Bays	Feeds In/Around Richmond Harbor	Prey
Brown Pelican		Y	Fish <sup>(a)</sup>
Bald Eagle			Omni. <sup>(b)</sup>
Peregrine Falcon	Y	Y	Bird <sup>(c)</sup>
Clapper Rail	Y		Invert. <sup>(d)</sup>
Least Tern	Y	Y	Fish

(a) Fish: consumes primarily fish.  
 (b) Bird: consumes primarily birds.  
 (c) Omni.: diet usually omnivorous/scavenger.  
 (d) Invert.: consumes primarily small- to medium-sized invertebrates.

**California Endangered Species Act.** The goal of the California Endangered Species Act (California Fish and Game Code §2050) is to conserve, protect, restore and enhance any endangered or threatened species and its habitat. Among the birds likely to nest or feed in the area, most of those that are listed as endangered or threatened by the state are also listed federally. The one exception is the California black rail, a state threatened species.

CDFG submitted the names of two potentially-affected plant species, both of which are listed as rare and have distributions in the north Bay and delta. They are Mason's lilaepsis, a minute, turf-forming perennial plant in the carrot family, and soft bird's-beak, a sparingly-branched, semi-parasitic herbaceous annual plant in the figwort family. The known distribution of Mason's lilaepsis, which is found on saturated clay soils regularly inundated by waves and tidal action, appears to be limited to the bay delta. Soft bird's-beak occurs in the coastal salt marshes and brackish marshes of northern San Francisco and Suisun Bays.

The surface water ARARs discussed previously are five orders of magnitude more stringent than the levels necessary to protect aquatic plants. None of the potential remedies would involve destruction of rare plants or their habitat.

**Coastal Zone Management Act (CZMA).** Section 307(c)(1) of the CZMA requires that federal agencies conducting or supporting activities directly affecting the coastal zone conduct or support those activities in a manner that is consistent with approved state coastal zone management programs. All remedial alternatives analyzed would affect the coastal zone. Under CERCLA Section 121(e), 42 U.S.C. § 9621(e), onsite activities are not subject to administrative review or permitting

processes, but they must be consistent with the substantive requirements of the coastal zone management plan. The approved coastal zone management program for San Francisco Bay includes the McAteer-Petris Act and the San Francisco Bay Plan, and is administered by Bay Conservation and Development Commission (BCDC).

The McAteer-Petris Act and the Bay Plan were developed primarily to halt uncontrolled development and filling of the bay. Their broad goals include reducing bay fill and disposal of dredged materials in the bay, and maintaining water quality and the ecological integrity of the bay. Generally, filling of the bay is allowable only when public benefits exceed public detriment from the loss of water areas, the filling is for a water-oriented use, and there is no alternative upland location available.

Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbor Act, 42 U.S.C § 1344, regulates dredging and filling in waters of the United States. Several of the remedial alternatives analyzed include dredging contaminated sediments. Some of the potential disposal options include filling in waters of the United States. The United States Army Corps of Engineers (USACE) usually issues permits to conduct the above activities; however, since the actions analyzed would all occur onsite, permits would not be required pursuant to Section 121(e) of CERCLA, although the substantive requirements of the laws would still have to be met.

The determination of the acceptability of fill in waters of the United States is made under the Clean Water Act Section 404(b)(1) guidelines, which were promulgated in 40 CFR Part 230. The discharge of dredged or fill material is prohibited if there is a practicable alternative to the proposed discharge that would have less impact on the ecosystem, so long as the alternative does not have other significant adverse environmental consequences.

California Hazardous Waste Control Law. California's hazardous waste facility closure requirements, 22 California Code of Regulations, Chapters 14 and 15, "Closure and Post Closure," are not ARARs with respect to the upland portions of the United Heckathorn Site because it is neither a hazardous waste facility nor a landfill. Some of the remedial alternatives analyzed would involve the consolidation and onsite containment of contaminated sediment. In the analysis of alternatives, operational requirements found in Title 22 of the California Code of Regulations are discussed, including limited long-term management, Site and cover maintenance, and institutional controls, including land use restrictions.

## 7. Summary of Site Risks and Remediation Levels.

Risk assessments were conducted by EPA to evaluate the threat to human health and the environment posed by contamination from the United Heckathorn Site. Results of these assessments and the final remediation levels established to address Site risks are summarized below.

Human Health Risk Assessment. The Baseline Human Health Risk Assessment for the Site was performed by ICF Technology Inc. for EPA (ICF Technology, 1994). The results indicate that among the various potential exposure pathways for Site contaminants, only the consumption of fish poses risks that are above EPA's acceptable risk range.

COCs at the Site were selected for evaluation in the risk assessment using the Site soil and sediment data collected by HLA (1986), Levine-Fricke (1990, 1991, 1993), and Weston (1993). The COCs selected for onsite soils were DDT (and metabolites), dieldrin, aldrin, endrin, and lead. Of

these, DDT and dieldrin are the most prevalent contaminants and are the primary contributors to risk. COCs selected for sediments were DDT and dieldrin.

Six exposure pathways were identified as potential concerns at the Site, as follows:

- ingestion and dermal adsorption of chemicals in onsite surface soils by workers at the Site;
- inhalation of fugitive dust from surface soils by onsite workers;
- ingestion and dermal adsorption of chemicals in onsite surface and subsurface soils by temporary construction workers at the Site;
- inhalation of fugitive dust from soils by temporary construction workers at the Site;
- incidental ingestion and dermal adsorption of chemicals in offsite soils by nearby residents, and;
- ingestion of contaminants in fish and shellfish from the Lauritzen, Santa Fe, and Inner Richmond Harbor Channels by fishermen and their families.

The onsite exposure pathways assume that the Site will continue to be used for commercial or industrial uses in the future. This is in accordance with the Bay Conservation and Development Commission's (BCDC) San Francisco Bay Plan which designates the area for port priority or water-related industry use, and the City of Richmond's M-3 (heavy industry) zoning of the Site and surrounding properties.

The six potential exposure pathways were evaluated according to EPA guidance, which uses conservative estimates of chemical toxicity and exposure, and cumulative risk from the addition of pathways. Chemical concentrations used in the risk assessment included both average and either Reasonable Maximum Estimates (RME) of Site concentrations or maximum measured values. EPA baseline human health risk assessments intentionally present conservative (i.e. health-protective) estimates of Site risks. Actual risks are likely to be lower and may in fact be zero.

The assessments for onsite worker exposure and offsite residential exposure are more conservative than usual because the soils databases in both cases were influenced toward higher values. The onsite soils database was skewed by the high number of samples taken to delineate the hot-spot excavation areas. Offsite soil screening samples were intentionally taken only in the immediate downwind area, which would have had the highest concentration had contamination occurred.

The cumulative risks calculated for the onsite soil exposure scenarios indicate that the removal actions that have occurred to date have reduced upland Site concentrations of chlorinated pesticides to acceptable levels. The highest RME cancer risk calculated for the various onsite upland worker scenarios (ingestion, dermal adsorption and inhalation of fugitive dusts from surface soils by a permanent worker) is  $1 \times 10^{-4}$ , and the maximum Hazard Index (HI) for noncarcinogenic effects is 1. More probable estimates for the same exposure scenario are  $2 \times 10^{-5}$  and  $< 1$ . Risks for other onsite worker scenarios are lower. Since the onsite soils database is skewed to produce conservative results and EPA's acceptable risk range is  $10^{-4}$  to  $10^{-6}$ , onsite risks associated with chlorinated pesticides are acceptable.

Onsite risks for occupational exposure to lead were evaluated using EPA's 500 mg/kg to 1000 mg/kg acceptable range for residential exposure, and the state of California's draft procedure for the assessment of adult exposure to lead in soil. Mean onsite lead levels are below 500 mg/kg, and the RME lead concentration results in a 95th percentile adult blood lead level below the target concentration of 10 micrograms per deciliter ( $\mu\text{g}/\text{dL}$ ) using the state's draft procedures. Therefore, onsite lead levels are acceptable.

Offsite residential risks for COCs in nearby soils were evaluated using the maximum values obtained in EPA's soil screening survey and conservative exposure assumptions, including childhood exposure. All results were well within the acceptable risk range for carcinogenic effects and below an HI of 1 for noncarcinogenic effects. (i.e., the maximum values measured were below a Hazard Index of 1 for noncarcinogenic effects, and below a lifetime excess cancer risk level of  $10^{-4}$  for carcinogenic effects).

Risks to fishermen and their families who consume fish caught in the inner Richmond Harbor were evaluated using information from two sources: fish tissue data generated as part of EPA's ecological assessment of the Site, and community interviews with individuals who fish or are familiar with fishing practices in Richmond Harbor. The community interviews confirmed that fishing occurs regularly in Richmond Harbor, particularly at a Site in the Inner Harbor Channel near the Parr Canal that has unrestricted access. Although it could not be determined from the limited interviews performed whether fishing at subsistence rates occurs in the harbor, it is clear that the fishermen are from poor, minority communities, and that the fish are caught for consumption. Fishing in the Lauritzen Channel is restricted because it is surrounded by fenced industrial facilities, and fishing from boats is discouraged by warning signs in English, Spanish, Vietnamese and Laotian, posted under a 1986 order of the CDHS. Baseline risk assessments, however, assume that institutional controls, such as fences and posting, will be ineffective or not maintained. In fact, a person was photographed fishing from an industrial facility on the Lauritzen Channel during the EPA field sampling for the ecological assessment.

The results of the risk calculations indicate that the risks from long-term consumption of either whole fish or fillets of fish caught in the Lauritzen Channel are unacceptable. Using the exposure scenario which is the basis of EPA's water quality criteria for fish consumption, the lifetime excess cancer risk associated with Site COCs is above  $10^{-3}$  for consumption of whole fish, and above  $10^{-4}$  for fillets. In the Santa Fe and Richmond Inner Harbor Channels, lifetime excess cancer risks are within the acceptable range using the same exposure scenario. If consumption were to occur at subsistence rates, the associated risks would be approximately 10 fold higher. The proposed remedy is expected to achieve protective levels for contaminants of concern under either exposure scenario.

On April 7, 1994, the California Department of Toxic Substances Control issued an advisory against consuming any resident bottom fish, such as white croaker, from anywhere in the Inner Richmond Harbor. The State's advisory was based on levels of contaminants found in fish purchased from resident fishermen at the Parr Canal area. These fish were larger than those in EPA's studies and had slightly higher contaminant levels. The primary risk associated with the consumption of fish caught outside the Lauritzen Channel is due to contamination with polychlorinated biphenyls (PCBs), although the State would have issued the advisory based upon DDT and dieldrin contamination alone. The source of PCBs is unknown. PCBs are not related to the United Heckathorn Site, and may be present in fish throughout the bay. PCB levels in Richmond Harbor sediments are not elevated relative to typical levels in the bay.

Ecological Assessment. The Ecological Risk Assessment for the United Heckathorn Site was performed by EPA (EPA, 1994). The operations of United Heckathorn from 1947 to 1966 resulted in the release of DDT and other pesticides to and from the shoreline of the Lauritzen Channel and to San Francisco Bay. Today, in the waters of Richmond Harbor near the former plant, high levels of DDT and dieldrin remain in marine sediments. DDT and dieldrin bioaccumulate in marine organisms to the highest levels found in the state of California.

The goals of EPA's ecological assessment were to assess the threats posed to the environment by the contaminants released from United Heckathorn and to determine cleanup levels

protective of the beneficial uses of San Francisco Bay.

The waters of Richmond Harbor are part of San Francisco Bay, the West Coast's largest estuary. The estuary sustains a complex ecosystem containing thousands of species of fish, invertebrates, birds, mammals, insects, amphibians, plants and other life, as well as nearly half the waterfowl and shorebirds migrating along the Pacific flyway. Fish-eating birds, including cormorants, grebes, loons, kingfishers, and California brown pelicans (an endangered species) feed in the most contaminated channels at the Site.

The initial components of EPA's ecological assessment included a review of previous studies in the area. Highlights of this review included the findings that sediment concentrations of DDT are elevated to acutely toxic levels in the Lauritzen Channel and decline by over four orders of magnitude to near background levels in the vicinity of Point Potrero. DDT and dieldrin concentrations are extremely elevated in transplanted mussels and resident invertebrates in the Lauritzen Channel and decline by two orders of magnitude in the Inner Richmond Harbor Channel. Fish caught in the Lauritzen Channel in 1986 contained extremely high levels of DDT, which were comparable to the levels measured in 1960. Finally, a study of migratory waterfowl in San Francisco Bay found that only those which wintered in Richmond Harbor significantly accumulated metabolites of DDT. Although other chemicals are present in Richmond Harbor, they are not consistently found at levels notably above background or above levels that are likely to cause toxicity, in marked contrast to DDT and dieldrin, which are many orders of magnitude above background and were selected as the COCs for the study.

The next preliminary phase of the study was a review of the available standards, criteria, and scientific literature regarding ecological impacts of the COCs to determine as far as possible the contaminant levels in various media that could adversely impact sensitive organisms. This review indicated the ecological receptors likely to be the most sensitive and helped guide the selection of field and laboratory studies. EPA's ambient water quality criteria for DDT and dieldrin were identified as applicable to the Site. The marine chronic criteria for DDT (1 nanogram per liter, ng/L) is based upon preventing bioaccumulation in fish to levels harmful to sensitive marine birds.

The major phase of the study involved field and laboratory measurements of contaminant concentrations in various media and the performance of standard benthic tests for determining impacts from contaminated sediments. Most of the field samples were taken in October 1991. Additional fish and shellfish samples were taken in April 1992. The studies included bulk sediment toxicity testing, benthic community analyses, bioaccumulation testing, and chemical analyses in sediments, surface waters, and tissues of benthic organisms and fish and shellfish collected in trawls. An additional goal of these studies was the determination of the relationship between sediment contaminant concentrations and the concentrations in other media so that a sediment cleanup concentration could be determined which would result in the attainment of water quality criteria and protective contaminant levels in fish and shellfish tissues.

The results of the studies are summarized below. The total DDT levels measured in surface water from the Lauritzen, Santa Fe and lower Richmond Inner Harbor Channels were 50 ng/L, 9 ng/L, and 1 ng/L, respectively. The dieldrin concentrations were 18 ng/L, 2 ng/L, and nondetectable, respectively. These results indicate that the water quality criteria are violated in the Lauritzen and Santa Fe Channels, but are achieved (within the uncertainty of the analysis) or not detectable in the lower Inner Harbor Channel. Analysis of water-to-sediment ratios indicates that the Lauritzen is a source of contamination to the other channels.

Sediment concentrations of total DDT declined from over 50 mg/kg in the Lauritzen Channel to 12  $\mu$ g/kg near Point Potrero. Dieldrin concentrations declined from 570  $\mu$ g/kg in the Lauritzen to

nondetectable levels in the Inner Harbor Channel. These results are consistent with those of previous researchers, and with the more extensive RI of marine sediments (White et. al 1994).

In 28-day bioaccumulation tests using *Macoma nasuta*, tissue levels of DDT over 50 mg/kg (dry wt) and 1.5 mg/kg dieldrin were obtained using Lauritzen Channel sediments. Tissue levels declined to 80 µg/kg DDT and undetectable levels of dieldrin using sediments from the vicinity of Point Potrero. These results are consistent with those of previous researchers. Further studies revealed that the tissue concentrations obtained at 28 days were approximately half those obtained after a 90-day exposure. Tissue residues of DDT and dieldrin measured in field-collected benthic infauna were as high as 46 mg/kg and 2.5 mg/kg (dry wt), respectively, in the Lauritzen Channel. Concentrations dropped by about two orders of magnitude in the Inner Harbor Channel.

Tissue residues of DDT and dieldrin measured in mussels (*Mytilus sp.*) were 2.6 mg/kg and 97 µg/kg (wet wt) in the Lauritzen Channel, and declined to 40 µg/kg and 5 µg/kg in the lower Richmond Inner Harbor Channel. These results are consistent with those of the State Mussel Watch program. Tissue levels in the lower Inner Harbor Channel are higher than would be predicted from the underlying sediment concentration, again indicating that there is water-column transport of pesticides from the Lauritzen to less contaminated areas.

Tissue residues of DDT measured in whole fish (shiner perch) were over 10 mg/kg in the Lauritzen Channel, roughly 1 mg/kg in the Santa Fe Channel, and roughly 0.1 mg/kg in the Richmond Inner Harbor Channel. Dieldrin levels were roughly 0.6 mg/kg, 0.04 mg/kg, and 0.002 mg/kg in the respective channels. The contaminant concentrations in fish from the Lauritzen Channel are in the same range as those measured in the 1960s, and exceed the levels that may cause adverse impacts to sensitive predatory birds by orders of magnitude. A sensitive bird, which had no other source of DDT in its diet and which consumed more than 0.5% to 1.5% of its diet from the Lauritzen Channel, could be adversely affected. These concentrations may also cause direct toxic impacts such as reduced fry survival in fish. The results for the Santa Fe Channel are an order of magnitude lower, but still exceed levels that may cause adverse impacts to sensitive fish-eating birds. A sensitive bird that consumed more than 5% to 15% of its diet from the Santa Fe Channel might be adversely affected.

Sediment toxicity tests using the amphipod, *Eohaustorius estuarius*, indicated significant acute toxicity in sediments from the Lauritzen Channel. Sediments from the Santa Fe Channel displayed lower but significant toxicity relative to the amphipod's native Yaquina Bay, Oregon, sediment, but were not significantly different from those in the Inner Harbor Channel or other San Francisco Bay locations. DDT was determined to be the primary cause of toxicity in the Lauritzen Channel.

Additional toxicity tests conducted during the RI using the amphipod *Rhepoxynius abronius* confirmed the acute toxicity of Lauritzen Channel sediments. In four of five Lauritzen Channel compoSite samples, there was no survival of test organisms, an extremely rare occurrence indicating severe toxicity. Amphipod survival in samples beginning at the southern end of the Lauritzen Channel and proceeding out the harbor was not significantly different than survival in the San Francisco Bay fine-grained sediment control, indicating that the toxicity is confined to the Lauritzen.

An analysis of benthic infauna indicated that amphipod abundance (with the exception of the pollutant-tolerant *Grandidierella japonica*) was inversely related to DDT concentration. The minimum benthic ecological effects concentration was determined to be 100 µg DDT/g organic carbon (equivalent to 1.9 mg/kg, dry wt, at 1.9% organic carbon).

Overall, the results indicate that the gross contaminant levels in the Lauritzen Channel threaten a variety of ecological receptors at various trophic levels, including benthic and water-column organisms and fish-eating birds. Effects are likely to be much less severe in the Santa Fe Channel, although the contaminant levels in fish are significantly higher than the levels that may threaten sensitive fish-eating birds. In the Richmond Inner Harbor Channel, the DDT levels in fish (100  $\mu\text{g}/\text{kg}$ ) are between the level that is the basis of EPA's chronic marine water quality criteria intended to protect marine birds (150  $\mu\text{g}/\text{kg}$ ), and the National Academy of Sciences (NAS) recommendation (50  $\mu\text{g}/\text{kg}$ ) for protecting marine birds. It is clear from the results above that the most sensitive ecological receptors to sediment organochlorines in Richmond Harbor are likely to be fish-eating marine birds.

The only contaminated medium for which applicable regulatory criteria were identified is surface water. Nonregulatory or surrogate criteria were also identified for fish and shellfish tissues and sediments. Fortunately, surface water concentrations were found to be quite consistent during different tidal cycles and seasons in each of the three channels sampled. In addition, the concentrations measured in the water column and the concentrations measured in whole fish were found to agree remarkably with the concentrations predicted by the applicable EPA marine chronic water quality criteria. This demonstrates that total DDT present in surface waters is bioavailable, and that it accumulates as predicted by the applicable marine chronic criteria.

The analysis of surface water pesticide concentrations in the three channels indicates that the concentrations in the Santa Fe and Richmond Inner Harbor Channels are likely elevated by approximately one order of magnitude over the concentrations that would result from the respective local sediment concentrations, due to the flux of contaminated water from the Lauritzen Channel. This indicates that remediation of the Lauritzen would have beneficial effects throughout the Inner Harbor.

Site Remediation Goals. The final goal of the ecological assessment was to provide sufficient information to develop Site remediation goals for contaminated marine sediments containing the COCs, DDT and dieldrin, which would be protective of the environment and human health. The DDT and dieldrin water quality criteria are near or below the levels which can be quantified by the best laboratories. Protective levels in sediments are much more readily measureable, particularly for DDT. Although DDT and dieldrin co-occur, the DDT concentration is generally 10 to 100 times higher, and DDT was detected in sediment samples over a wider area. Sediment remediation goals, which are expected to attain protective levels for both contaminants, have therefore been established based on DDT concentration.

As indicated above, it was determined that the minimum ecological effects concentration for benthic organisms was 100  $\mu\text{g}$  DDT/g of organic carbon, which is equivalent to 1,900  $\mu\text{g}/\text{kg}$  (dry wt) at 1.9% organic carbon. Sediment concentrations exceeding this value might cause local chronic adverse impacts to benthic organisms. EPA has reviewed data for other DDT-contaminated Sites, and found a similar threshold for benthic effects. Sediments in the Lauritzen Channel and Parr Canal exceed this level. The maximum concentrations outside these channels are below this level.

The EPA marine chronic water quality criteria of 1 ng/L DDT is likely to be achieved if the average channel sediment concentration is below 1,000  $\mu\text{g}/\text{kg}$  DDT (dry wt); and the human health criteria of 0.6 ng/L is likely to be achieved if the average sediment concentration is below 590  $\mu\text{g}/\text{kg}$  DDT.

**TABLE 4. Remediation Levels**

Final Remediation Levels				Cancer Risk Level
Medium	Chemical	Level	Basis	
Surface Water	DDT	0.59 ng/l	EPA AWQC	1 X 10 <sup>-6</sup>
	Dieldrin	0.14 ng/l		1 X 10 <sup>-6</sup>
Sediment	DDT	Avg: 590 µg/kg	Ecological Assessment	1 X 10 <sup>-6</sup>

The average sediment concentrations in the Lauritzen Channel and Parr Canal exceed the 590 µg/kg DDT level, while the average concentrations in the Santa Fe and Inner Harbor Channels are below the level. Therefore the remediation of sediments will be limited to the Lauritzen Channel and Parr Canal. Although the concentrations of pesticides in upland soils are acceptable for human exposure, they exceed the protective levels for sediments in the adjacent channels, indicating that erosion of upland soils and stormwater runoff to the marine environment should be prevented.

The NAS action level for the concentration of DDT in fish to protect fish-eating birds is not an ARAR but was identified as a TBC to assist in determining the protectiveness of remediation. The NAS action level is likely to be achieved if the average channel DDT sediment concentration is below 420 µg/kg. Since the average concentrations of DDT in the Santa Fe and Inner Harbor Channels are below this level, cleanup of sediments in the Lauritzen Channel and Parr Canal is expected to result in achievement of the NAS action level.

**8. Description of Alternatives.**

The environmental media requiring remediation are soft marine sediments (young bay muds) in the Lauritzen Channel and Parr Canal. Contamination is confined to softer younger bay mud, and has not migrated into the underlying older bay mud. The volume of contaminated sediment in the Lauritzen Channel and Parr Canal is approximately 65,000 yd<sup>3</sup>. Remediation of this sediment is expected to result in achievement of the remedial action goals. In addition, erosion of upland soils containing DDT at concentrations exceeding the final remediation level for sediments must be prevented. No action will be taken in other areas in Richmond Harbor, such as the Santa Fe Channel and Inner Harbor Channel, because sediment levels are below the remediation levels established above.

The action alternatives presented below all include dredging of contaminated sediments and paving of upland soils on the northern half of the Levin Richmond Terminal. The principal difference among these alternatives is in the location chosen for disposal of dredged sediments. In addition, the "no action" alternative has been retained as a baseline for comparison with the other alternatives, as required by the National Contingency Plan, 40 C.F.R. § 300.430(e)(6). The four alternatives are summarized below:



- Alternative 1: no action
- Alternative 2: confined disposal of marine sediment in the Port of Richmond's Point Potrero graving docks, and capping of upland areas
- Alternative 3: confined disposal of marine sediment in the Lauritzen Channel, and capping of upland areas
- Alternative 4: offsite disposal of marine sediment by rail, and capping of upland areas.

With the exception of "no action," all of the alternatives have been developed to meet the remedial action goals. In addition to the components listed above, each action alternative includes environmental monitoring to evaluate the effectiveness of the remedy, and institutional measures to limit future Site uses to those considered in the human health risk assessment.

#### Common Elements

Elements which are common to two or more alternatives, including dredging, monitoring, paving of upland areas, and institutional controls, are discussed below.

Dredging. Alternatives 2 through 4 would involve dredging of the younger bay mud from the Lauritzen Channel and Parr Canal. The total volume of these sediments is estimated to be 65,000 yd<sup>3</sup>, although if Alternative 2 were selected, some of the most contaminated sediments would remain in place in the Lauritzen Channel within a Confined Disposal Facility (CDF). In areas to be dredged, all soft sediments down to the hard older bay mud contact would be removed.

Silt curtains would be erected across the mouths of the channels prior to dredging to prevent transport of sediment disturbed by the dredging process out of the excavation area. In addition, control measures would be implemented to prevent or minimize the runoff or return of sediment back to the excavation areas. The surface water ARARs for the concentrations of COCs are not currently achieved, and would not be expected to be achieved in the Lauritzen Channel and Parr Canal during the dredging phase of remediation at the Site. The surface water ARARs are remedial action goals which are expected to be achieved after the dredging is completed.

Two sunken barges, one small tank, and other debris (see Figure 3) would have to be removed from the Lauritzen Channel prior to dredging under Alternatives 2 through 4. In one of the configurations of Alternative 3, a CDF would be constructed in the northern end of the channel, allowing one barge and the small tank to remain in place. Samples of sediment taken by EPA divers from inside the barge and tank indicated that they are not sources of contamination.

Monitoring. In order to determine the effectiveness of the remedial action, a post-remedial monitoring program would be required. Monitoring would be expected to occur annually for at least five years or until it was demonstrated that the remediation goals had been achieved, and could continue at longer intervals (e.g., once every five years) for an additional period of time. The monitoring program would also be implemented as part of the "no action" alternative.

The post-remedial monitoring program would include surface water and biological monitoring components. Periodic collection and analysis of surface water samples would determine compliance with EPA ambient water quality criteria, which are ARARs. Bioaccumulation could be monitored through the periodic deployment and subsequent collection and analysis of mussels, as is done in the State Mussel Watch program. Mussels provide the most consistent, readily obtainable biological data. These data can be compared to the historic State Mussel Watch bioaccumulation

database for Richmond Harbor to confirm reductions in tissue residues. Sampling locations to confirm the effectiveness of the remedy would be in the Lauritzen, Santa Fe and Richmond Inner Harbor Channels. Additional sampling might be required based on the remedy selected. For example, if confined disposal at the Port of Richmond's graving docks were selected, an additional monitoring station would be established outside the facility.

Capping of Upland Area. The results of the human health risk assessment indicate that the removal actions performed at the Site between 1990 and 1993 reduced contaminant concentrations in upland soils to levels that are acceptable for current and expected future commercial or industrial uses. Nevertheless, roughly 95,000 tons of soils over a large area of the Site exceed the much lower remedial action goal for marine sediments. Therefore, a remediation goal of erosion prevention was established for upland soils. The northern half of the Levin Richmond Terminal, which is where the United Heckathorn facility was located and where concentrations exceed 1 mg/kg DDT, is currently unpaved. Each of the action alternatives includes paving this area with asphalt. The area of the upland asphalt cap is shown in Figure 6. The cost of capping this area was estimated in the FS performed by Levine-Fricke (1991). The estimate of \$400,000 includes a 20% contingency. This cost is included in the estimates generated for each remedial alternative except "no action."

Institutional Controls. The human health risk assessment concluded that the concentrations of COCs in upland soils at the Levin Richmond Terminal had been reduced to acceptable levels for current and expected future industrial uses. This is consistent with the San Francisco Bay Plan under which the area is zoned for port priority or water-related industrial use. In order to provide an additional measure of assurance that the Site could not be converted to other use, such as residential, without further study and possibly further remediation, a deed restriction on the property will be included as part of Alternatives 2 through 4.

The Lauritzen Channel is currently posted with signs warning fishermen that fish and shellfish may be contaminated with DDT and other pesticides. These signs will remain in place until post-remedial monitoring confirms that concentrations of the COCs have been reduced to acceptable levels.

Alternative 1: No Action with Monitoring. The NCP requires the analysis of no action as an alternative (40 CFR 300.430(e)(6)). Under no action, no further remediation would be conducted at the Site, although the monitoring program would still be performed to evaluate the effects of the remaining contamination. The existing institutional controls would remain in place.

The no action alternative does not meet either of the two threshold criteria described below (overall protection of human health and the environment, and compliance with ARARs). Because the threshold criteria are not met, this alternative is not eligible for selection.

Alternative 2: Dredging with Containment at the Point Potrero Graving Docks. The major components of this alternative are dredging approximately 65,000 yd<sup>3</sup> of contaminated sediment from the Lauritzen Channel and Parr Canal, and disposing of the sediment in a CDF constructed at the Port of Richmond's graving docks.

The graving docks are located at Point Potrero, at the southern end of the Richmond Inner Harbor Channel, approximately one mile from the location of the former United Heckathorn facility (see Figure 2). A sediment containment facility constructed at the graving docks could be determined to be "onsite" under the definition of the NCP, which includes all locations within the areal extent of contamination and all suitable areas in very close proximity necessary for implementation of the response action (40 CFR 300.5).

Graving docks are concrete box structures used to drydock ships. The Point Potrero graving docks were built during World War II and, due to their relatively small size, are obsolete for modern vessels. The Port of Richmond suggested that the graving docks be analyzed as a potential disposal Site for contaminated sediments because they have the capacity to effectively contain very large volumes. Depending on the configuration and number of basins used, the facility could contain between 89,000 yd<sup>3</sup> and 500,000 yd<sup>3</sup> of sediment. The facility would not be simply a disposal Site, but would be constructed so that it would be suitable for use as a marine shipping terminal. Use of the graving docks would not be offered by the Port of Richmond for disposal alone. The Port has analyzed a number of alternative configurations which would accommodate varying volumes of dredged material and provide the Port an additional berth or pier of at least 600 ft. The Port's cost estimates for each of the various configurations include the costs of preparing the basins to receive dredged material, and the costs of enhancing the facility for Port use.

The configuration chosen for analysis would entail filling Basin 1 with approximately 65,000 yd<sup>3</sup> of sediment dredged from the Lauritzen Channel and Parr Canal, and 24,000 yd<sup>3</sup> of additional material to produce a total of 89,000 yd<sup>3</sup>. This is the lowest cost configuration which would provide sufficient volume to contain sediments dredged from the Lauritzen Channel and Parr Canal. Prior to receiving sediment, Basin 1 would be inspected and repaired if necessary, and then sealed with a concrete bulkhead. Wick drains would be installed for dewatering. The pier between Basins 2 and 3 would be removed, and Basin 3 would be lengthened from 500 ft to 750 ft, creating a new berth for large ships.

Dredged sediment would be barged to the drydock and deposited by mechanical means in order to minimize entrainment of water. It is estimated that consolidation of the sediment within the basin would take a minimum of four years. If hydraulic dredging were used, consolidation would probably take longer. The average concentration of DDT in the sediment would be 30 mg/kg wet wt. Based on the results of the treatability testing performed during the marine RI, it is expected that treatment by filtration and carbon adsorption would be required before effluent produced by dewatering could be discharged from the basin to the bay. Although a Waste Discharge Permit would not be required under CERCLA, substantive requirements would have to be achieved, including toxicity limits and compliance with numeric water quality criteria. A possible alternative would be to discharge effluent to a sanitary sewer under permit from the local agency. Discharges to the sewer system would be "offsite" and require permitting.

In addition to the actions described above, this alternative would include the post-remedial monitoring program, removal of the sunken barges and other debris from the Lauritzen Channel, asphalt paving of the northern half of the Levin Richmond Terminal, and institutional controls. The estimated cost of this alternative included roughly \$700,000 to prepare Basin 1 and close it after filling, and roughly \$1.8 million to remove the pier between Basins 2 and 3, and lengthen Basin 3 to produce a 750-ft berth. Annual overhead and maintenance costs include evaluation and repair of the graving docks, operation and maintenance of an effluent treatment system for dewatering sediment, and post-remediation monitoring. The total estimated cost for this alternative is \$5.6 million. This estimate does not include the costs, which could be substantial, of obtaining an agreement among various parties regarding the use of the facility and future liability. In addition, state and federal agencies have indicated that they might seek mitigation to compensate for the fill associated with this alternative. The costs of mitigation would also significantly increase the total cost of this alternative.

This alternative would be expected to meet the remedial action goals defined in Table 4 and provide effective long-term protection of human health and the environment. It is unclear, however, whether it would comply with ARARs related to bay fill unless an upland alternative were unavailable. Dredging would cause short-term impacts within the excavation areas. Because the

dredged sediment would be classified as hazardous waste pursuant to State of California regulations, this alternative would require agreements between a number of government and private parties regarding long-term liability and operations and maintenance, limiting its implementability.

Alternative 3: Dredging with Containment at Lauritzen Canal. The major components of this alternative would be dredging between 44,000 yd<sup>3</sup> and 52,000 yd<sup>3</sup> of contaminated sediment from the Lauritzen Channel and Parr Canal, and depositing it in a CDF constructed within the Lauritzen Channel. Two variations of CDFs were analyzed for this alternative based on alternatives developed by Levine-Fricke (1991). The first consists of a steel sheetpile wall approximately 1300 ft long constructed along the eastern shoreline of the channel. The sheetpile wall would be tied to anchors placed in the soil at the Levin Richmond Terminal. This configuration does not interfere with either the storm drain at the northern end of the channel, or with properties across the channel from Levin.

The second variation of a CDF in the Lauritzen would consist of a rock dam across the northern end of the Lauritzen Channel. Advantages of this configuration are that it would minimize the dredging of the most contaminated sediments in the channel; the barge, tank, and debris in the northern end of the channel could remain in place; it would require less maintenance than a steel sheetpile wall; and it would be less costly to construct.

Dredged sediment could be deposited in the CDF by mechanical means, or by hydraulic dredging. Consolidation of the sediment within the basin would take several years. The average concentration of DDT in the sediment would be 30 mg/kg wet wt. Based on the results of the treatability testing performed during the marine RI, it is expected that treatment by filtration and carbon adsorption would be required before effluent produced by dewatering could be discharged from the basin to the bay. Although under CERCLA a Waste Discharge Permit need not be obtained, substantive requirements would have to be achieved, including toxicity limits and compliance with numeric water quality criteria. A possible alternative would be to discharge effluent to a sanitary sewer under permit from the local agency. Discharges to the sewer system in this case would be "offsite" and require permitting.

In addition to the actions described above, this alternative would include the post-remedial monitoring program, asphalt paving of the northern half of the Levin Richmond Terminal, removal of at least one sunken barge from the Lauritzen Channel, and institutional controls. Annual overhead and maintenance costs include evaluation and repair of the CDF, operation and maintenance of an effluent treatment system for dewatering sediment; and post-remediation monitoring. The cost of dredging the sediment for this alternative would be slightly lower than the costs described for the previous alternative since some of the sediment would remain in place and transportation would not be required. The estimated cost range is \$13 million for the sheet-pile wall variation and \$4.3 million for the rock dam. In addition, state and federal agencies and the Port of Richmond have indicated that they might seek mitigation to compensate for the fill associated with this alternative. The cost of mitigation would also significantly increase the total cost of this alternative.

This alternative would be expected to meet the remedial action goals defined in Table 4 and provide effective long-term protection of human health and the environment. It is unclear, however, whether it would comply with ARARs related to bay fill unless an upland alternative were unavailable. This alternative would require the least amount of dredging, which would minimize short-term impacts within the excavation areas. The rock dam variation of this alternative would have an impact on adjacent property owners, which could hinder implementability. In addition, because the dredged sediment would be classified as hazardous waste pursuant to State of California regulations, this alternative would require agreements between a number of government and private parties regarding long term liability and operations and maintenance, limiting the

implementability of this alternative.

**Alternative 4: Dredging with Offsite Disposal.** The major components of this alternative are dredging approximately 65,000 yd<sup>3</sup> of contaminated sediment from the Lauritzen Channel and Parr Canal, and transportation of the sediment by rail to a permitted offsite disposal facility. Transport by rail offers several significant advantages. The Levin Richmond Terminal is a rail facility with lines running the length of the shoreline of the Lauritzen Channel. Since dredging can produce very large volumes of sediment very quickly, the limiting factor in removing sediment from the Site would be the time required to load it for transport. Watertight rail cars would be used to prevent releases during transportation. A rail car can carry 100 tons, and a single train can transport approximately 8000 tons. It is estimated that the entire project could be accomplished in about two months.

In addition to the actions described above, this alternative would include the post-remedial monitoring program, asphalt paving of the northern half of the Levin Richmond Terminal, removal of barges and debris from the Lauritzen Channel, and institutional controls. The estimated cost for this alternative is \$7.3 million. Since the sediments would be transported offsite to a permitted disposal facility, long-term operations and maintenance costs are only those associated with the monitoring program and maintenance of the asphalt paving at the Site. The estimated disposal cost for this alternative includes transportation by rail and was provided by the East Carbon Development Corporation, a facility in eastern Utah which is permitted to receive non-RCRA wastes.

This alternative would be expected to meet the remedial action goals defined in Table 4, provide effective long-term protection of human health and the environment, and comply with all ARARs. Dredging would cause short-term impacts within the excavation areas. Disposal of sediments at an offsite facility would require no bay fill, and would minimize long-term maintenance costs and liabilities. Offsite disposal by rail appears to be implementable at a reasonable cost.

#### 9. Summary of Comparative Analysis of Alternatives.

The alternatives were analyzed using the nine criteria of the NCP (see 40 CFR 300.430(f)(5)(ii)). The comparative analysis with respect to each criteria is summarized below. Overall, it was determined that Alternative 4, Dredging with Off-Site Disposal provides the best balance among the alternatives with respect to the evaluation criteria.

Overall Protection of Human Health and the Environment: All of the alternatives except "no action" are expected to provide adequate protection of human health and the environment. The risks associated with the COCs are due to their current location in or near the aquatic environment. Alternatives 2 and 3 would achieve protection by isolating the contaminants from the aquatic environment in onsite confined disposal facilities which would require perpetual maintenance to ensure that contaminants were not re-released to the marine environment. Alternative 4 would achieve protection by transporting contaminants offsite.

Compliance with ARARs: The "no action" alternative would not result in compliance with ARARs. Alternative 2, confinement in the Port of Richmond's graving docks, relies on the dual purpose of the remedy to create a port facility in order to achieve consistency with the CZMA and compliance with the Clean Water Act. Alternative 3, confinement in the Lauritzen Channel, would probably not be consistent with the CZMA or the Clean Water Act unless it was determined that there was no practicable alternative. Alternative 4, offsite disposal, complies with all ARARs, and appears to be practicable.

Long-term Effectiveness and Permanence: Alternatives 2 through 4 are all expected to provide adequate long-term effectiveness and permanence. Concrete vaults and shoreline CDFs have been

used successfully at other Sites to contain contaminated sediments, although they require perpetual maintenance. Alternative 4, offsite disposal, provides the highest degree of permanence because the contaminated sediments would be stored far from the aquatic environment. Although the contaminated sediment presents an unacceptable threat to human health and the environment because of its current location which allows exposure to marine organisms and biomagnification in the food chain, the expected average concentration after dredging of approximately 30 mg/kg is well within the acceptable range for direct human exposure, and would not present a direct threat when contained in a disposal facility.

**Reduction of Toxicity, Mobility, or Volume through Treatment:** None of the alternatives employs treatment. Alternatives 2 through 4 meet the expectation of the NCP for containment of high volumes of waste which have relatively low contaminant concentrations. Based on the process screening conducted in the FS, treatment of the COCs in Site sediments would not be practicable. Site upland soils which contained extremely high levels of contaminants were addressed in previous removal actions.

**Short-term Effectiveness:** None of the alternatives would be expected to cause short-term risks to the community. The risks to workers are expected to be primarily those associated with construction, transportation, dredging, and solids handling. All of the dredging alternatives would cause short-term impacts within the excavation areas, and would remove the existing benthic communities from the bottoms of the Lauritzen Channel and Parr Canal. However, it is expected that the channel bottoms would be recolonized by more diverse populations. Alternative 4, offsite disposal, would achieve protection in the shortest amount of time.

**Implementability:** Alternative 4 is the most readily implementable. It would require the least amount of onsite construction and preparation, and should have no administrative impediments. Alternative 2, consolidation at the Port of Richmond's graving docks, would require a complex agreement between the City of Richmond and other parties regarding ownership, operations, and liability. Alternative 3, consolidation in a CDF in the Lauritzen Channel, would likely encounter state opposition, and could require agreements among adjacent property owners regarding loss of shoreline and access, as well as agreements with PRPs and several government agencies, including the City of Richmond, DTSC and EPA.

**Cost:** The estimated costs for all of the alternatives are comparable. The cost for Alternative 4, offsite disposal, while not the lowest, is the most certain. The estimated costs for Alternative 2, confinement at the Port of Richmond's graving docks, and Alternative 3, confinement at the Lauritzen Channel, would be more likely to change given the need for agreements among parties regarding ownership, maintenance and liability for facilities containing wastes exceeding state hazardous levels. The costs for construction, dewatering, effluent disposal, and hazardous waste storage are also less certain than the offsite transportation and disposal costs. In addition, the cost estimates for alternatives 2 and 3 did not include possibly significant costs for mitigation of bay fill, which had been proposed by state and local agencies.

**State Acceptance:** The Department of Toxic Substances Control of Cal-EPA, which is the lead state agency for oversight at this Superfund Site, agrees with the selected remedy. In addition, the San Francisco Bay Regional Water Quality Control Board and the San Francisco Bay Conservation and Development Commission also agree with the selected remedy.

**Community Acceptance:** Based on the comments received during the Proposed Plan comment period, it is evident that the selected remedy is acceptable to the community. No comments were received from the community opposing the selected remedy or supporting other alternatives.

#### 10. Selected Remedy.

The selected alternative is dredging with off-site disposal. Components of the selected remedy include:

- Dredging of all soft bay mud from the Lauritzen Channel and Parr Canal, with off-site disposal by rail of dredged material.
- Placement of clean sediment after dredging.
- Capping of areas around the former Heckathorn facility, shown in Figure 6.
- A deed restriction or notice limiting use of the Levin-Richmond terminal to the current industrial classification.
- Marine monitoring to determine the effectiveness of the remedy.

The remedy will involve dredging of the younger bay mud from the Lauritzen Channel and Parr Canal. The total volume of these sediments is estimated to be 65,000 yd<sup>3</sup>. In areas to be dredged, all soft sediments down to the hard older bay mud contact would be removed. Two sunken barges, one small tank, and other debris (see Figure 3) would be removed from the Lauritzen Channel prior to dredging. In limited areas dredging may be impractical or of limited effectiveness in removing all contaminated sediments because of obstructions such as rip-rap and capping may be required.

Silt curtains will be erected across the mouths of the channels prior to dredging to prevent transport of sediment disturbed by the dredging process out of the excavation area. Dredged material will either be loaded directly onto rail cars or stockpiled on a barge or on land to facilitate loading. Excess water, if any, produced during dredging and initial handling will be returned to the dredging area inside the silt curtains. However, control measures, such as physical separation or filtration, will be implemented to prevent or minimize the runoff or return of sediment back to the excavation areas. The surface water ARARs for the concentrations of COCs are not currently achieved, and would not be expected to be achieved in the Lauritzen Channel and Parr Canal during the remediation. The surface water ARARs are remedial action goals which are expected to be achieved after the remediation is complete.

The dredged material will be transported by rail to a permitted land disposal facility which meets the requirements of the CERCLA offsite policy. The expected average concentration of approximately 30 mg/kg, is well within the acceptable range for direct human exposure, and will not present a long-term threat at a disposal facility. Monitoring of surface water and biota will occur for at least five years or until it is demonstrated that the remediation goals have been achieved, and could continue for a longer period of time. To promote the return of flora and fauna to the dredged areas, a 1/2 foot layer of clean material will be placed after dredging. The material will not significantly alter the existing bathymetry or impede navigation. The estimated cost for the selected remedy is \$7 million.

The selected remedy provides overall protection of human health and the environment, complies with ARARs, and provides the best overall balance of alternatives under the nine selection criteria of the NCP.

### **11. Statutory Determinations**

The selected remedy is protective of human health and the environment, complies with ARARs, and is cost effective. The principal threats at the Site were addressed by removal actions. Because this remedy will result in hazardous materials remaining onsite, a review will be conducted five years after the commencement of remedial action, and every five years thereafter, to ensure that the remedy continues to provide adequate protection of human health and the environment.

### **12. Documentation of Significant Changes.**

The proposed plan for the Site was released for public comment in July, 1994. The proposed plan identified alternative 4, dredging with offsite disposal as the preferred alternative. EPA reviewed all written and oral comments submitted during the comment period. Upon review of these comments, EPA determined that no significant changes to the remedy, as it was originally identified in the proposed plan, were necessary.

During the proposed plan comment period, the National Oceanic and Atmospheric Administration and the U.S. Fish and Wildlife Service recommended that a layer of clean material be placed in the channels after dredging for restoration. The material would promote the return of habitat and fauna to the dredged areas. The proposed plan included the placement of clean fill in limited areas. The final remedy includes placement of a 1/2 foot layer of clean material after dredging in the Lauritzen Channel and Parr Canal. The cost of placing clean material, which would apply to all alternatives except "no action," was not included in the estimates contained in the FS or proposed plan. The estimated cost is \$200,000, which increases the total estimated cost from \$6.8 million in the proposed plan to \$7 million for the final remedy.



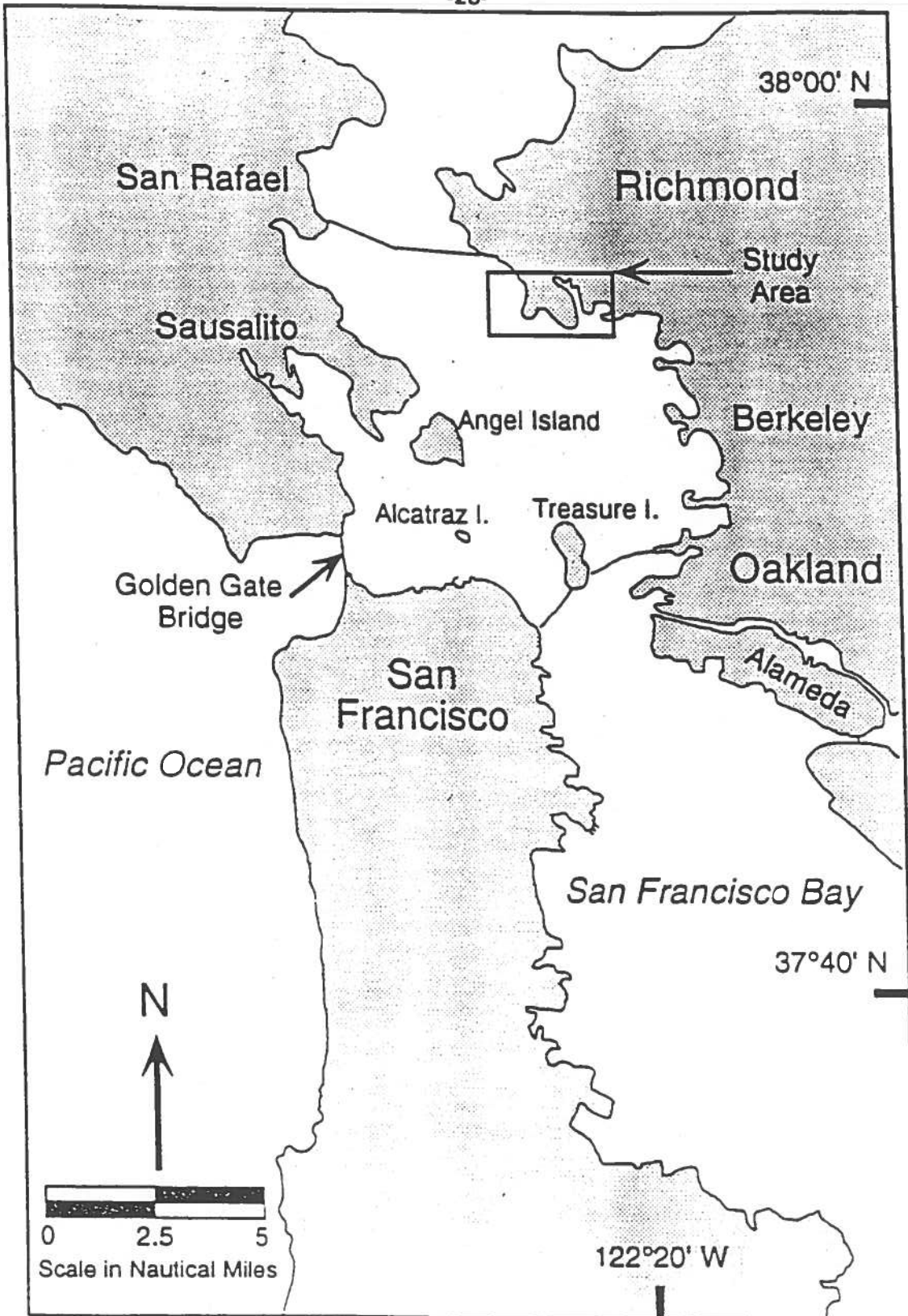


Figure 1. Site location map.

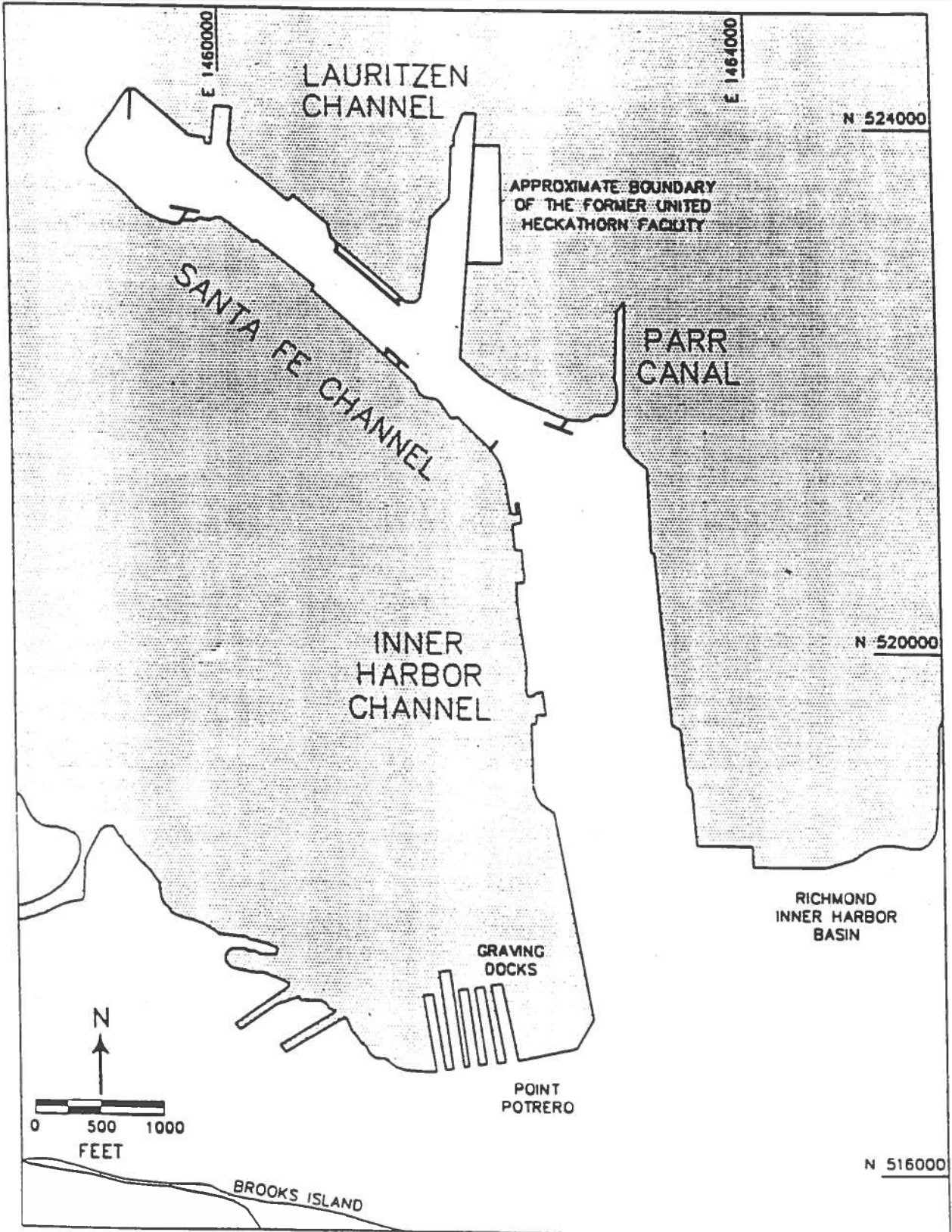


Figure 2. Map of Richmond Harbor.

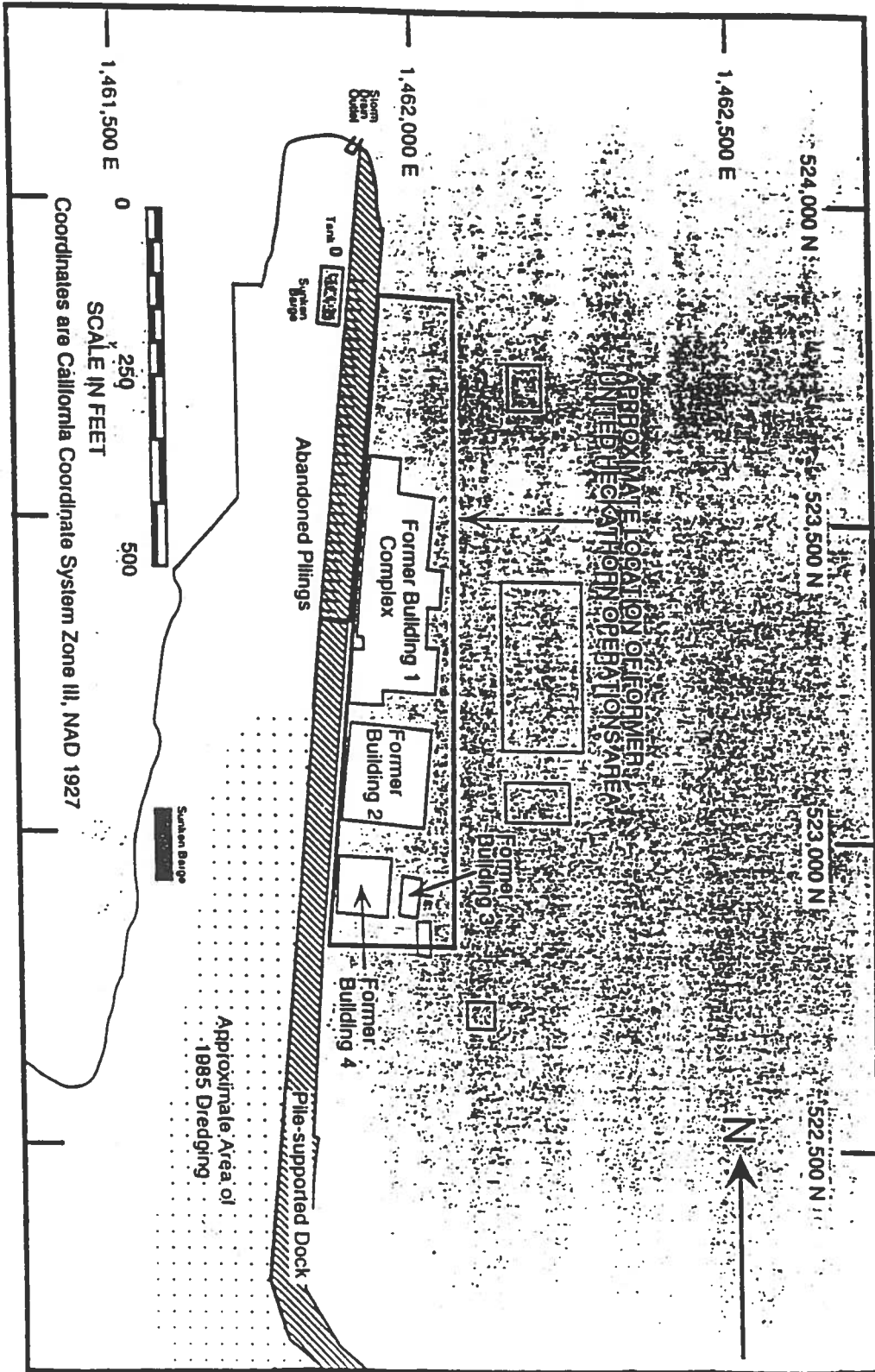
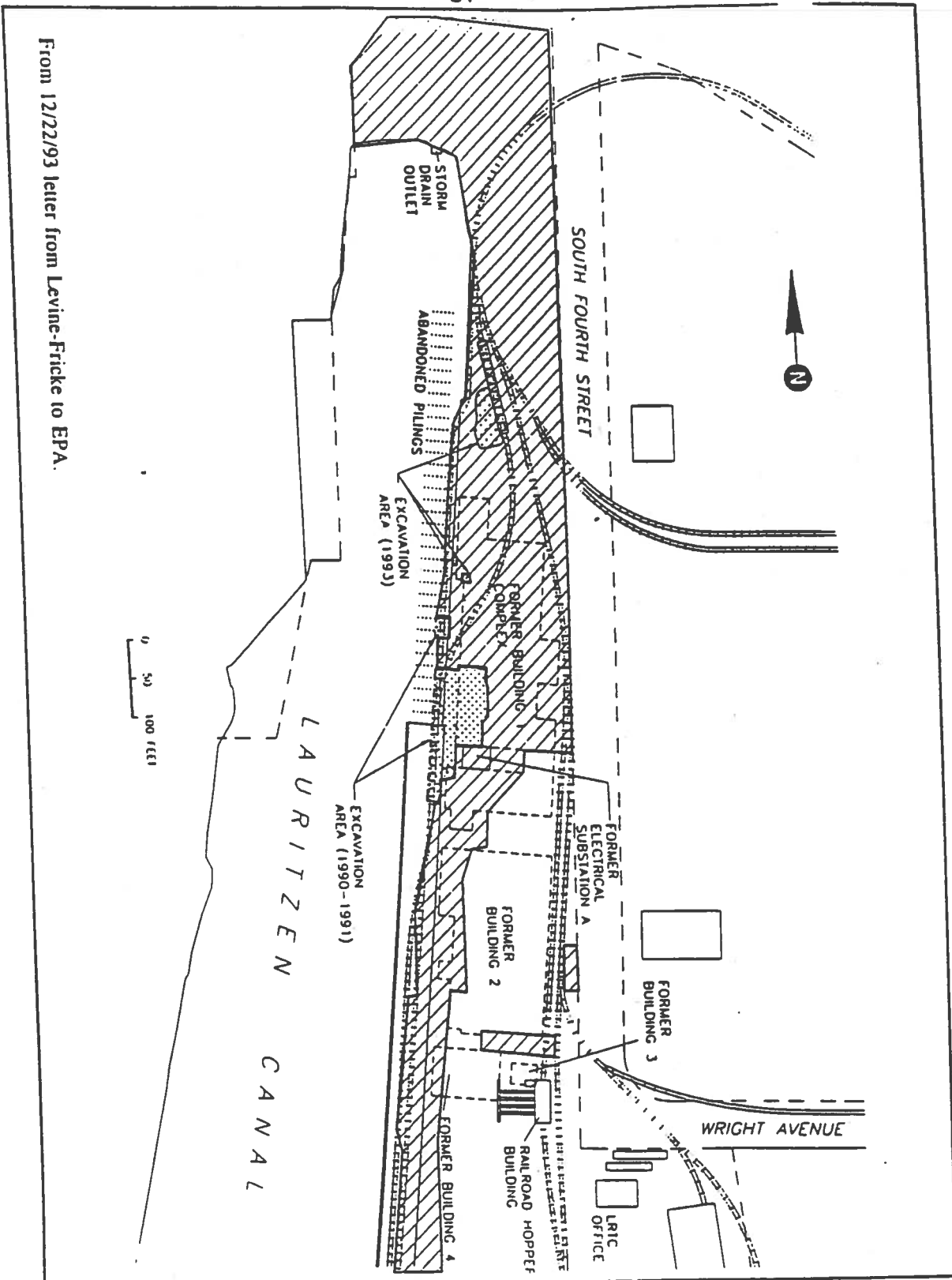


Figure 3. Map of the Lauritzen Channel.



From 12/22/93 letter from Levine-Fricke to EPA.

Figure 4. Upland soils with pesticide concentrations exceeding 1 ppm.

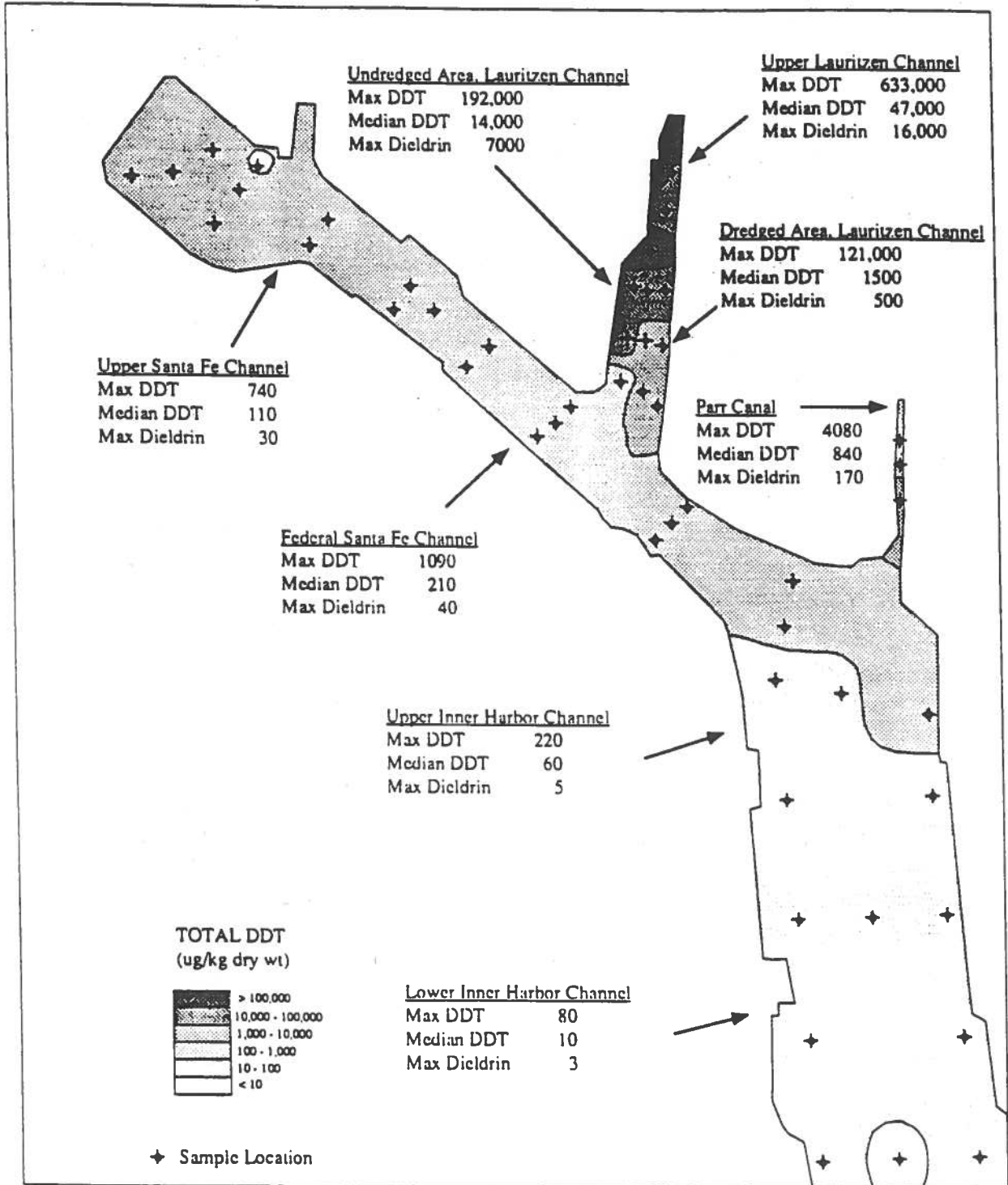


Figure 5. Average total DDT in younger bay mud, Richmond Harbor.

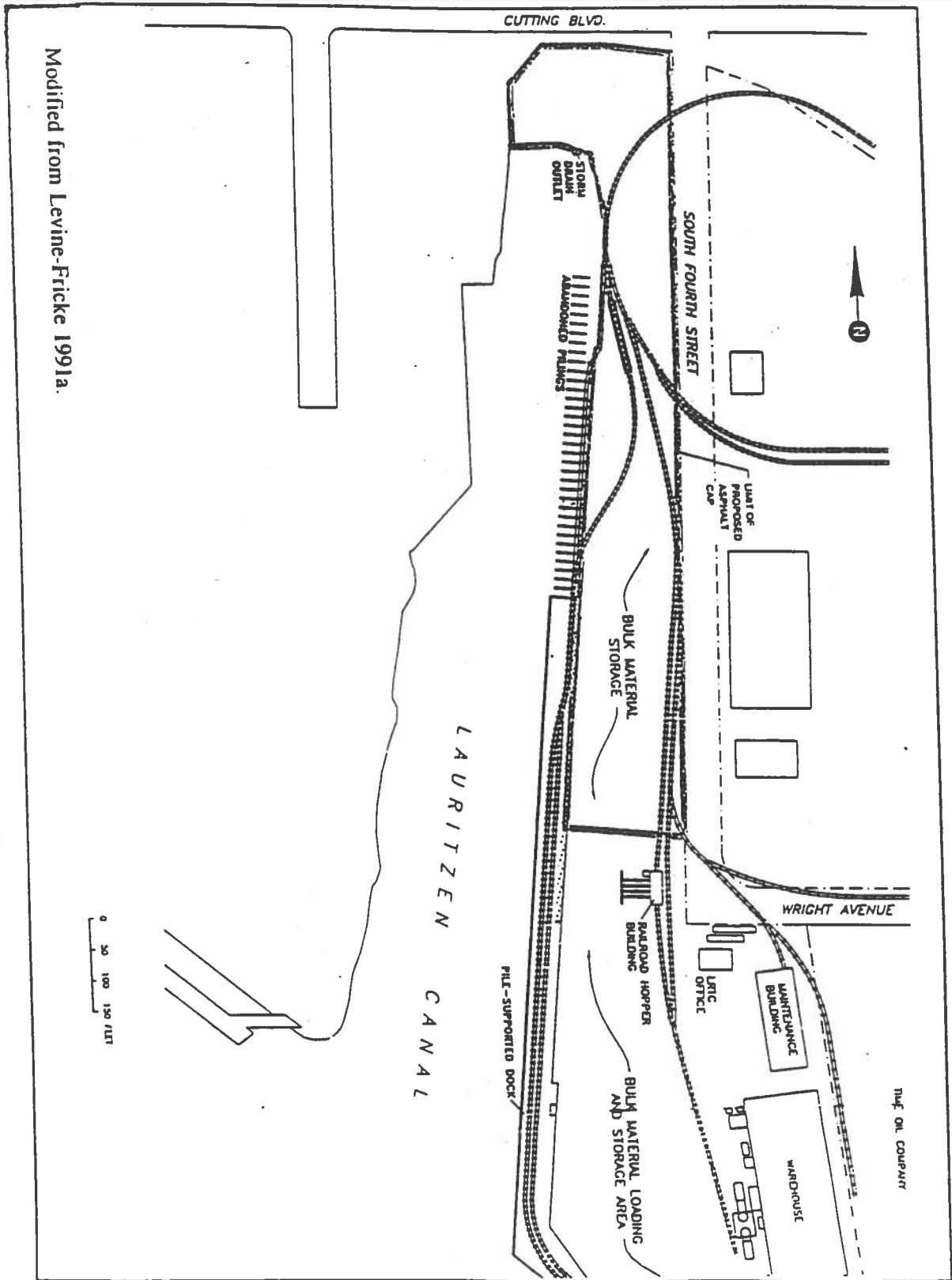


Figure 6. Limit of asphalt cap for upland soils.

## RESPONSE TO COMMENTS

United Heckathorn Superfund Site  
Richmond, California

October 14, 1994

EPA released the Proposed Plan for the United Heckathorn Superfund Site for public comment on July 15, 1994. The comment period included a 30-day extension which was requested by Potentially Responsible Parties (PRPs). Consequently, the public comment period closed on September 14, 1994.

Three persons made comments at the Public Hearing on August 2, 1994, one of which was also submitted in writing. Six additional written comments on the Proposed Plan were submitted during the comment period. The oral and written comments are addressed below in the order in which they were made. Two additional comments, one on the final human health risk assessment and one on the Feasibility Study, were also received during the comment period. These are discussed after the comments on the Proposed Plan.

EPA reviewed all written comments submitted during the public comment period and all oral comments made at the Public Hearing. Upon review of these comments, it was determined that no significant changes to the remedy, as it was originally identified in the Proposed Plan, were necessary. However, a minor change has been made in response to comments from the United States Fish and Wildlife Service and the National Oceanic and Atmospheric Administration. The Proposed Plan included a provision for minor amounts of clean material to be placed in limited areas after dredging. The comments specified that six inches of clean material be placed in dredged areas to promote restoration. The ROD specifies the six-inch layer, and includes a total estimated cost for placement of \$200,000, raising the final remedy cost from the proposed \$6.8 million to \$7 million.

- 1. The Bay Conservation and Development Commission stated that EPA's preferred alternative for remediation "appears to be the most consistent with the Commission's laws and policies (and) best achieves compliance with federal and state environmental laws while ensuring the protection of San Francisco Bay's diverse natural resources, and the health and safety of the surrounding human community." (letter, 7/21/94)*
- 2. The Save San Francisco Bay Association expressed its support for EPA's Proposed Plan, stating that it "is the best way to deal with United Heckathorn's legacy of chemical contamination in the Richmond Harbor. Other proposed alternatives are unacceptable because of the need for bay fill and maintenance." (letter, 7/29/94)*
- 3. The Director of the Port of Richmond spoke at the public hearing and also submitted his comments in writing (8/2/94). Although the Port supports the selected remedy, it is concerned that lower levels of contaminants elsewhere in the harbor may impact disposal options for material dredged for navigation purposes. The Port stated that it would hold EPA responsible for the costs of disposal of any sediments not addressed by the remedy.*

Response: EPA appreciates the Port and the City of Richmond's constructive participation throughout the remedy selection process. Based on the results of the Remedial Investigation and Human Health and Ecological Risk Assessments, EPA concluded that cleanup of those channels



with mean sediment DDT concentrations above 590 ppb is necessary to protect human health and the environment. Channels and private berths outside the cleanup area may still contain sediments with DDT levels below a mean of 590 ppb or with measurable levels of other site-related and/or non site-related contaminants which might affect dredge spoils disposal options. However, based on the results of EPA's RI, HHRA and ERA, contaminant levels in sediment in the Santa Fe Channel and the Inner Richmond Harbor Channel do not pose a significant risk to human health and the environment that would trigger remediation under Superfund. Consequently, EPA in the Record of Decision for the Site has determined that no remedial action is necessary with regard to sediments in the Santa Fe Channel and Inner Richmond Harbor Channel. Under the authority established in CERCLA, particularly in Section 104(a) and Section 121, 42 U.S.C. § 9604(a) and § 9621, EPA is authorized to select remedial actions to protect human health and the environment. EPA is not authorized under CERCLA to make remedial decisions solely to redress economic or property damage that may result or may have resulted from the presence of low levels of hazardous substances or other contaminants. Should the Port incur additional dredge spoil disposal costs because of low level contamination present in the dredged sediment, the City is free to pursue any available legal remedies against parties responsible for the contamination.

*4. Mr. Richard Oba, vice president of United Anglers of California spoke at the public meeting and expressed support for EPA's proposed alternative, stating, "we would like to see the job finished."*

*5. Ms. V. Peters spoke at the public meeting and expressed concern that EPA does not have a community public alert system already in place, stating, "should there be a railway accident, I think you really should have a plan that you can present to the community."*

**Response:** At the time of the public meeting for a Superfund Proposed Plan, EPA has not yet selected the remedy. In this case, of four alternatives considered, three did not involve offsite transportation and disposal of waste. EPA must solicit and consider comments on all alternatives prior to making a final selection.

EPA efforts to inform and involve the community will continue throughout the period of remedial design and remedial action. A health and safety plan will be prepared and made available to the public prior to initiating any action at the site. This plan will address transportation safety and contain procedures to ensure that the dredged sediment is safely contained during transport and that if a spill occurs specific procedures will be implemented to immediately clean up the spill and minimize any risk that the community could come in contact with the spilled sediment. Transportation of the dredged sediment will be conducted by licensed transporters with oversight by EPA acting in cooperation with local and state authorities.

*6. Mr. Nicholas Pinette, a resident of Richmond, stated that the preferred offsite disposal alternative makes good sense, but questioned where the dredged material would be transported to for disposal and how it would be stored. (letter, 8/7/94)*

**Response:** EPA has not selected a particular landfill as part of this Record of Decision. The dredged material will be transported to a landfill which is permitted to receive the waste and meets the CERCLA offsite policy which requires EPA to determine that the facility is operating in compliance with all federal and state permits prior to shipment. The choice of landfill will be made by the parties who ultimately perform the remedy, subject to the determination of compliance by EPA. The contaminated sediment currently presents a threat because of its location in the marine environment, which allows direct exposure to sensitive aquatic organisms and bioaccumulation in the food chain. Once it is removed and placed in a landfill it should pose no unacceptable risks to the environment or to human health including that of workers at the disposal site.



**7. The Point Richmond Neighborhood Council supported EPA's proposal for offsite disposal stating: "To move this sediment... to any other location within the City of Richmond would be an injustice to the people of the City of Richmond." (letter, 8/10/94)**

**8. The Montrose Chemical Corporation of California, a DDT manufacturer and Potentially Responsible Party (PRP) at the United Heckathorn Site, submitted extensive comments arguing that the proper remedy for the site is no-action. (letter, 9/13/94)**

***I. Without risk, no action is necessary.***

**Response:** The contamination at United Heckathorn presents unacceptable threats to human health and the environment. These threats are summarized in Section 7 of the ROD. It should also be noted that two previous PRP-lead site investigations (Harding Lawson, 1986, and Levine-Fricke, 1991) recommended dredging the Lauritzen Channel and concluded that "no action" would not be protective of the environment.

***II. EPA's Human Health Risk Assessment (HHRA) fails to demonstrate that DDT or dieldrin in sediments in the Lauritzen Channel or Parr Canal pose any significant threat to human health for the following reasons:***

***A. The only significant health risk calculated by EPA was for consumption of fish from the Lauritzen Channel. However, EPA has not established that fishing occurs in the Lauritzen Channel, but only in the Santa Fe Channel near the Parr Canal. The Lauritzen Channel is posted to discourage fishing. All available evidence suggests that significant exposure to fish from the Lauritzen Channel does not occur.***

**Response:** EPA risk assessment guidance assumes that institutional controls will not be maintained, or will be ineffective in the long term in eliminating threats to human health. In addition, EPA believes that institutional controls, such as fences and warning signs, cannot be relied upon at this site to prevent fishing in the Lauritzen Channel and Parr Canal. Fish and shellfish in the Lauritzen Channel contain concentrations of DDT and dieldrin which exceed acceptable levels for human consumption. In 1986, CDHS ordered Levin to post warnings around its property, including the eastern shoreline of the Lauritzen to warn boaters about the DDT contamination in fish and shellfish. In 1991, after EPA personnel observed a person fishing from a facility on the shoreline opposite the former Heckathorn location, EPA immediately advised that facility's manager in writing about the State's 1986 health warning. Recently, the State issued a fishing advisory throughout Richmond Harbor. Signs were posted at the popular harbor fishing location near the Parr Canal where there is unrestricted shoreline access. Despite the signs, State personnel report still finding people catching fish for consumption.

***B. EPA overestimated the risk from fish consumption by assuming consumption rates of 132 mg/day (sic) for subsistence fishermen and 54 mg/day (sic) for recreational fishermen.***

**Response:** EPA's current risk assessment guidance recommends assuming consumption rates of 54 grams per day (g/day) for recreational fishermen, and 132 g/day for subsistence fishermen. Potential risks were calculated by EPA (see HHRA, Table 5-11) using standard exposure assumptions which included both the 132 g/day subsistence rate, and a much lower rate of 6.5 g/day, which was the rate assumed in the development of EPA's Water Quality Criteria for the protection of human health (1980). These criteria are ARARs at the site. The two consumption scenarios are likely to bracket current and potential future exposures. Calculated risks for consumption of fish from the Lauritzen Channel were unacceptable using either exposure assumption. Risks for consumption of fish from the Santa Fe Channel were within EPA's

acceptable risk range using the low consumption rate, but unacceptable using the subsistence rate. Therefore, EPA concluded that consumption of fish from the Santa Fe Channel may be acceptable. EPA expects that remediation of sediments from the Lauritzen Channel will reduce the concentrations of pesticides in Santa Fe Channel fish as well.

Using the responses from EPA's limited fishing survey, Montrose's consultant, Terra, Inc. (August 17, 1994) calculated a consumption rate of 27 g/day for local fishermen. As stated in the HHRA, EPA's survey was intended only to provide general information on local fishing practices. Even with a much larger survey it would be difficult to accurately quantify current, much less future, consumption rates. For these reasons EPA has included the assumptions discussed above in its risk calculations to ensure that a reasonable maximum exposure scenario is evaluated in order to ensure that EPA actions are fully protective of human health.

*C. The risks calculated for fish consumption are also overestimated because they do not account for the effects of cooking. There is no evidence that fishermen eat raw fish. Cooking reduces the concentrations of DDT in fish by 39% to 74%. In addition, absent evidence that whole fish are eaten routinely, EPA should have based its risk calculation on fillets rather than whole fish. EPA guidance states that most humans consume only fillets.*

Response: EPA calculated risks for consumption of both whole and filleted fish from the Lauritzen and Richmond Inner Harbor Channels. Risks for fish from the Lauritzen were unacceptable regardless of whether the fish were whole or fillets. A group of recent Laotian immigrants interviewed by EPA stated that they consume raw fish caught in Richmond Harbor. Small fish, such as shiner surf perch, are mashed whole. When fish are filleted, the carcass is also used in the preparation of soup. In order to be protective of diverse ethnic groups known to fish in Richmond Harbor, it is prudent to assume that fish may be eaten raw and that entire fish may be consumed.

The State of California has written fact sheets for fishermen to encourage practices, such as cooking and draining away fat, which will reduce contaminant concentrations. However, even the reductions in concentrations reported by Montrose would be insufficient to make fish from the Lauritzen suitable for consumption (see previous response to this comment, ICF, May 11, 1994).

*D. EPA compared fish tissue concentrations with the State of California's Water Quality Objectives which were recently held invalid.*

Response: The State of California's Water Quality Objectives for DDT and dieldrin were adopted on April 11, 1991. They were based upon, and are equal to EPA's Ambient Water Quality Criteria, published in 1980. The final HHRA (May, 1994) cited both EPA's criteria, and the equivalent State objectives. EPA's criteria were identified in the July, 1994 Proposed Plan and selected in the ROD as ARARs. It should be noted that although the 1991 State objectives were recently invalidated on procedural grounds, the San Francisco Bay Basin Plan (1986), designated fish and shellfish harvesting and commercial and recreational fishing as beneficial uses of all waters of San Francisco Bay, which supports EPA's determination in the Record of Decision (Section 6) that the federal Ambient Water Quality Criteria are relevant and appropriate ARARs at this site.

*E. EPA's HHRA failed to cite epidemiology studies for DDT.*

Response: EPA has previously responded to this comment. See final HHRA response to comments, May 11, 1994, pp.8 and 9. In addition, there is currently a great deal of research being performed on DDT and related chemicals regarding their estrogenic effects, links with breast cancer and feminization of males. Appendix 1 of this Response to Comments is a timely news article describing some of this research.

**III. EPA's Ecological Risk Assessment of marine sediments (ERA) fails to demonstrate that DDT or dieldrin in sediments in the Lauritzen Channel or Parr Canal pose any significant threat to the environment health for the following reasons:**

**A. In identifying chemicals of concern, EPA improperly excluded from consideration chemical and physical stressors such as PAHs, PCBs, shipping disturbance and industrial activity.**

**Response:** Physical stressors, such as shipping disturbance, were discussed and considered in the ERA, but they are neither site-related, nor are such stressors chemicals and so cannot be identified as "chemicals of concern." Non site-related chemicals, including PAHs and PCBs were also discussed and considered in the ERA. Although PAHs and PCBs are present in Richmond Harbor, they are not consistently elevated above effects thresholds or background concentrations for San Francisco Bay. By contrast, DDT concentrations in sediments in the Lauritzen Channel are on average 10,000 times higher than the San Francisco Bay background level. These facts are graphically illustrated in Figures 8, 9 and 10 of NOAA's March, 1992 evaluation of chemical contaminants in San Francisco Bay, (Technical Memorandum NOS ORCA 64) which are attached as Appendix 2 of this Response to Comments. In viewing Figure 8, it should be noted that if the vertical bar representing the concentration of DDT in the Lauritzen was drawn to the same scale as the bars representing the concentrations of DDT found elsewhere in San Francisco Bay, it would be 2,715 feet, or over a half-mile, high.

**B. EPA has not shown that fish-eating birds are exposed to significant, if any amounts of DDT in the Richmond Inner Harbor. EPA did not analyze any birds or provide dose-response data for individual species. Birds are not feeding in Richmond Harbor. If fish-eating birds are not exposed, the elementary conclusion is that they are not at risk. Andrew Lincoff, Remedial Project Manager stated in a letter dated July 31, 1992 that brown pelicans only feed occasionally in Richmond Harbor.**

**Response:** The US Fish and Wildlife Service (USFWS), which is the federal trustee for avian resources, provided EPA with a list of over 70 species of "birds known to nest in central or northern San Francisco Bay or likely to regularly feed in the immediate vicinity of Richmond Harbor." (EPA, 1994, Table 4-1). While engaged in site investigations, removal actions and other activities at the site, EPA personnel and contractors observed that numerous fish-eating birds including cormorants, western grebes, kingfishers, loons, and California brown pelicans, an endangered species, commonly feed throughout the Richmond Inner Harbor, including the Lauritzen Channel.

The Project Manager's 1992 statement that brown pelicans may only occasionally feed in the harbor was made based on the assertion in a previous PRP Remedial Investigation Report (Levine-Fricke, 1990) that no endangered species had been seen in the vicinity of the site. However, since EPA began working at the site, endangered brown pelicans have been seen commonly in the Inner Richmond Harbor. In response to repeated unsupported claims by Montrose and its consultants that birds would not be found in an industrialized harbor, EPA, with minimal effort (EPA memoranda 12/8/93 and 12/16/93), was able to observe and photograph numerous species of birds in the harbor, including an additional species of shorebird which had not been listed by USFWS. These photographs also include a group of endangered brown pelicans which were feeding at the confluence of the Lauritzen and Santa Fe Channels, and document a brown pelican in the act of plunge-diving for fish at the same location.

It is not subject to any reasonable doubt that DDT in Richmond Harbor accumulates in the food chain and that predatory birds are being exposed. In a 1985 study (Ohlendorf, 1991) the concentration of DDE (a metabolite of DDT) in surf scoters, a migratory shellfish-eating bird which winters in San Francisco Bay, was measured in 39 birds shot in January and compared with the

concentrations in 40 shot in March. The body burdens of birds wintering in Richmond Harbor increased by over four-fold in three months, clearly demonstrating that even birds which feed for only part of the year in and near the harbor can have significant bioaccumulation. No significant increases in concentration occurred in birds which wintered elsewhere in San Francisco Bay.

It is outside the scope of the EPA ecological risk assessment process to conduct new studies to determine dose response information for birds species present at the site. Furthermore, studies of higher organisms, especially birds, are not necessary because criteria are available for their protection (EPA's Ambient Water Quality Criteria and California's Water Quality Objectives) which are based upon achieving much more easily measurable contaminant concentrations in fish and the water column. The primary field sampling for EPA's United Heckathorn ecological assessment took only six days. As discussed in the assessment (Chapter 5), "studies of more mobile species, particularly migratory birds, would require much more effort and would be subject to inherently higher uncertainty regarding pollutant sources and effects than the study of sessile and relatively non-mobile organisms chosen here."

EPA assessed the risks posed by DDT to fish-eating birds using two published criteria for the protection of birds which are based upon contaminant concentrations in fish. EPA's marine chronic Ambient Water Quality Criteria for DDT (1980), which is an ARAR, is based upon a fish tissue residue of 150 ppb. This concentration is a Lowest Observed Adverse Effect Level at which reproduction in California brown pelicans was reduced to a level below that necessary to sustain a stable population. The more protective National Academy of Sciences (NAS) action level for the protection of fish-eating birds is 50 ppb (published by EPA in 1973). The concentration of DDT in fish caught in the Lauritzen Channel is over two orders-of-magnitude (100 times) higher than the NAS level. In the ERA, (Figure 9-19) EPA estimated that if a bird consumed prey from the Lauritzen for more than about one day per year, its annual average diet would exceed the NAS action level. At more than three days per year, it would exceed the level at which reproduction is reduced in pelicans. These calculations may well underestimate risk for a number of reasons, including the fact that they assume that the bird is exposed to no other source of DDT. California brown pelicans, for example, migrate during non-breeding months from nesting areas in southern California (US Department of the Interior, Final Report: California Seabird Ecology Study, MMS 87-0055) where they may be exposed to DDT contaminated prey while feeding in the southern California bight: an area still heavily contaminated from the historic discharges of PRP Montrose's former Torrance, California DDT manufacturing plant.

EPA did not report dose-response data for all species of birds likely to feed in Richmond Harbor because such data does not exist. Dose-response data is available for only a few species of wild birds, including American kestrels, mallard ducks, and a bird which does feed in the most contaminated channels in Richmond Harbor - the California brown pelican. Available effects data is routinely used in developing criteria for the protection of other aquatic organisms and wildlife. Recently, for example, the same effects data discussed above for California brown pelicans were used as the basis of the proposed Wildlife Criteria for DDT to protect fish-eating birds in the Great Lakes (58 FR 20802, April 16, 1993).

*C. The ERA fails to demonstrate that sediment-contained DDT or dieldrin pose any significant risk to benthic invertebrates. The diversity indices for the benthic community structure and number of mollusks actually increase with concentrations of DDT. The poorest community structure was observed at locations with the lowest concentrations of DDT. The predominant effect on benthic community structure is shipping disturbance which the ERA fails to consider as a stressor.*

**Response:** There is ample evidence that DDT contamination in the Lauritzen Channel poses a significant risk to benthic invertebrates. Invertebrate toxicity tests conducted during the ERA indicated that Lauritzen Channel sediments are among the most toxic ever tested by the EPA personnel who developed the standard methods for sediment toxicity tests which are used worldwide. The extraordinarily high levels of DDT were determined in the ERA to be the primary cause of toxicity in the Lauritzen. Additional invertebrate toxicity tests conducted during the RI (Battelle, 1994) found no survival of test organisms throughout most of the Lauritzen Channel.

Although disturbances relating to shipping (including dredging to maintain required depths for navigation and propeller wash from ships) can remove or displace benthic organisms, it does not follow that chemical contamination of the benthos is acceptable. The Richmond Harbor federal channel is dredged annually to maintain a 35 ft navigation depth. The federal channel runs from Point Potrero up the Richmond Inner Harbor and lower Santa Fe Channels, but does not enter the Lauritzen Channel. There is one shipping berth at the mouth of the Lauritzen, which PRP Levin has been unable to dredge since 1985 because of the DDT contamination. Large ships cannot enter the shallower northern Lauritzen Channel which is not maintenance dredged. Absent the very high levels of DDT in the Lauritzen one would expect, based on shipping and dredging history, to find healthy benthic communities there and poorer communities in the navigation channels.

The diversity, number and biomass of mollusks are in fact lower in the shipping channels and increase in the northern Lauritzen, as would be expected from the dredging and shipping history, and the fact that mollusks are known to be insensitive to DDT. The number of amphipods, on the other hand, is opposite of what would be expected from dredging and shipping disturbances, and declines in the Lauritzen Channel because of the DDT (EPA, 1994). Amphipods are crustaceans, which are known to be sensitive to DDT. In the development of the federal water quality criteria for DDT (EPA, 1980), a crustacean was found to be the most sensitive marine aquatic organism. The sensitivity of crustaceans to DDT may be explained by their phylogenetic affinity with insects (both are in the phylum Arthropoda, and DDT's purpose was to eradicate insects). An overall measure of benthic community structure is the Infaunal Index, which is a composite measure of the abundance of pollutant-sensitive and pollutant-tolerant taxa. The Infaunal Index declines significantly as DDT concentrations increase in Richmond Harbor.

Finally, it should be emphasized that even though some taxa, such as mollusks, can survive in areas like the Lauritzen which are heavily contaminated with DDT this does not mean that there is no biological effect resulting from their exposure. The California State Mussel Watch found that by far the highest levels of DDT bioaccumulation in the State occur in the Lauritzen. Bioaccumulated contaminants can move up the food chain and affect animals at higher trophic levels. The levels of DDT in benthic invertebrates, like those in fish, are far above the dietary levels which may cause reproductive impacts to birds.

*D. The ERA fails to provide the required uncertainty analysis.*

**Response:** Uncertainties relating to a myriad of factors are discussed throughout the ERA, consistent with EPA guidance. Those study results and conclusions about which there is the least uncertainty are listed in the executive summary.

*E. The ERA offers no evidence that fish are being affected by DDT or dieldrin.*

**Response:** EPA's 1980 Ambient Water Quality Criteria document for DDT reported that levels of 3 to 6.25 ppm DDT caused reduced survival in the fry of fish tested. The average concentration of fish caught in the Lauritzen is above these levels. Therefore one of the conclusions of the ERA was that the concentrations of DDT in the Lauritzen "may also cause direct chronic effects such as

reduced fry survival in fish." Montrose's complaint stems from the fact that the fish caught in the Lauritzen (mostly shiner surf perch) are not the same species as those which have been used in research. In order to determine the level of DDT which causes reduced fry survival in shiner perch, it would be necessary to start a research project, which, as Montrose also points out, is not the purpose of ecological assessments. The ERA reported numerous species of fish potentially affected by the contamination in Richmond Harbor. Since one cannot assume that the few species which have been tested are likely to be the most sensitive to the toxic effects of DDT, it would be prudent to divide the values for tested species by a factor of 10 or more to account for the uncertainty in extrapolating toxicity data from test species to those fish found in Richmond Harbor. Using this approach, one would conclude that fish in the Santa Fe Channel as well as the Lauritzen may suffer chronic impacts from current levels of DDT contamination.

*F. National Academy of Sciences (NAS) action levels should not be used to demonstrate risk in an ecological assessment because they're not ARARs and do not even qualify as to-be-considered material because NAS is not a state or federal agency. NAS action levels only assume that effects will occur, EPA has not demonstrated that actual effects have occurred. EPA failed to follow NAS sampling recommendations and should have sampled fish from a variety of locations throughout known foraging ranges.*

Response: The National Academy of Sciences action levels were published by EPA as 1972 Water Quality Criteria. The criteria for DDT states:

"It is recommended that DDT concentrations in any sample consisting of a homogenate of 25 or more fish of any species that is consumed by fish eating birds and mammals, within the same size range as the fish consumed by any bird or mammal, be no greater than 50  $\mu\text{g}/\text{kg}$  of the wet weight."

EPA analyzed a total of 23 shiner surf perch from the Lauritzen Channel in the ERA and in support of the HHRA. The average concentration was 9,200  $\mu\text{g}/\text{kg}$  (wet weight), which is over 180 times the NAS action level. Assuming that the two additional fish needed for a sample of 25 contained no DDT, the average would still be 170 times the action level. Looked at another way, even if sufficient time and resources were spent to determine the foraging ranges of the various species of fish-eating birds which feed in Richmond Harbor and to sample fish throughout those ranges, the concentration of DDT in the Lauritzen Channel is so high that a single fish would cause a homogenate of 25 or even 170 fish of equal size to exceed the action level, even if the all of the fish in the rest of the foraging range contained no DDT at all.

In regard to the assertion that the NAS action level only *assumes* that damage will occur from DDT exposure, Montrose, a DDT manufacturer, should recall that DDT was responsible for great reductions in populations of predatory birds over vast areas and the almost complete extirpation of some species. The California brown pelican is endangered because of exposure to DDT (EPA, 1994).

In regard to EPA's not sampling birds or documenting actual damage in this study, it should also be remembered (in addition to the responses to this issue in previous comments) that the purpose of risk assessments is to evaluate risk, not to document or quantify damage. There is ample evidence that the high levels of DDT in Richmond Harbor threaten a variety of ecological receptors at various trophic levels including benthic and water column organisms and fish-eating birds. The benthic community structure analyses in fact are evidence of damage. EPA guidance recommends that when criteria exist, ecological assessments should include monitoring to determine the extent to which those criteria are exceeded by the environmental concentrations at the site. EPA has done this with the NAS action levels.

*III. In the absence of risk, ARARs are irrelevant. EPA's Water Quality Criteria are not ARARs because they are not promulgated. CERCLA § 121(d)(2) states that EPA criteria may be relevant and appropriate considering "the designated or potential use of the surface or groundwater, the environmental media affected, the purposes for which such criteria were developed, and the latest information available." Since the criteria for DDT was set to protect fish-eating birds, and birds are not feeding in the Richmond Inner Harbor the "potential use" of the surface water and the "environmental media affected" do not warrant application of the criteria.*

**Response:** Risks to human health and the environment have been discussed at length above. Section 121(d)(2)(A)(iii) of CERCLA requires that remedial actions meet federal Water Quality Criteria established under Section 304 or 303 of the Clean Water Act where such WQC are determined by EPA to be relevant and appropriate to remedial actions at the site. See 42 U.S.C. § 9621(d)(2)(A)(iii) and 40 C.F.R. § 300.430(e)(2)(i)(G). In evaluating whether specific WQC are relevant and appropriate to remedial actions at Superfund site, CERCLA requires EPA to consider four criteria: 1. the uses of the receiving water body; 2) the media affected; 3) the purposes of the criteria and 4) current information. See 42 U.S.C. § 9621(d)(B)(i). See also U.S. EPA, CERCLA Compliance with Other Laws Manual - CERCLA Compliance with the CWA and SDWA (OSWER Pub. 9234.2-06/FS, Feb. 1990).

EPA guidance concerning determinations that WQC are relevant and appropriate to remedial action at a Superfund site provides that:

A water quality criteria component for aquatic life may be relevant and appropriate when there are environmental factors that are being considered at a site, such as protection of aquatic organisms. With respect to the use of water quality criteria for the protection of human health, levels are provided for exposure both from drinking the water and from consuming aquatic organisms (primarily fish) and from fish consumption alone. Whether a water quality criterion is appropriate depends on the likely routes of exposure.

U.S. EPA, CERCLA Compliance With Other Laws Manual: Interim Final at 1-15 (EPA 540-G-89-006, Aug. 1989).

Both the marine chronic and human health WQC for DDT and dieldrin are relevant and appropriate to remedial actions at this site since both aquatic and wildlife and humans may be exposed to these contaminants either directly or through consumption of contaminated organisms. As discussed in the Ecological Risk Assessment, aquatic organisms are present in all channels at the site, which are a part of San Francisco Bay. Fish eating-birds feed in all channels in the harbor. In fact, the particular bird upon which the marine chronic water quality criterion for DDT was based is the California brown pelican, an endangered species, which has been observed feeding in the most contaminated channels at the site. As discussed in the Human Health Risk Assessment, fishermen catch and consume fish from the Inner Richmond Harbor channels. In 1986, the State of California Department of Health Services ordered the posting of the Lauritzen Channel to warn fishermen of the fish and shellfish contamination. On April 7, 1994, the Cal-EPA Department of Toxic Substances Control issued an advisory against consuming any resident bottom fish, such as white croaker, from anywhere in the Inner Richmond Harbor.

The beneficial uses designated by the State of California for central San Francisco Bay waters, which are listed in Section 6 of the Record of Decision, include fishing, wildlife habitat, preservation of rare and endangered species, fish migration, fish spawning, shellfish harvesting, and estuarine habitat. EPA's Ambient Water Quality Criteria were specifically developed to protect such beneficial uses.

*IV. Background risks to human health and the environment from other stressors exceed the purported risks associated with DDT and dieldrin. The human health risk associated with PCBs found in fish exceed the risks of DDT and dieldrin. Other environmental stressors, including PAHs, PCBs and shipping disturbance are relevant to evaluating the long-term effectiveness of the chosen remedy. If the remedy will not reduce existing risk then it should be rejected in favor of no action.*

**Response:** Both natural and anthropogenic background risks are common at Superfund sites and EPA guidance (EPA/540/1-89/002) states that they may be eliminated from risk assessments. The guidance also allows, however, that they may be considered separately in order to provide information to those potentially exposed. This was done for PCBs in the United Heckathorn risk assessment. As a result of EPA's sampling and risk analysis, the California Department of Health Services conducted a further study of fishing in Richmond Harbor and recently issued an advisory for the entire harbor based on both the Heckathorn contaminants and PCBs.

Recent research suggests PCBs may be present in the water throughout San Francisco Bay. EPA's fish sampling found that PCB mixture Aroclor 1254 is present in fish in Richmond Harbor. There is no cancer potency data available for Aroclor 1254. Therefore risks associated with PCBs were calculated using the potency factor for Aroclor 1260 which likely has higher potency. The human health risks associated with PCBs in fish from Richmond Harbor may be overstated for this reason alone. In addition, absent the distinction between Aroclors 1254 and 1260, Montrose's consultant Terra, Inc. stated that it had independently derived a potency factor for PCBs which indicated that human health risks from PCBs were overstated by "1-2 orders of magnitude." Nevertheless, the human health risk assessment still found that the risks calculated for the sum of site-related chemicals of concern (DDT and dieldrin) in the Lauritzen Channel were 2 to 3 times the risk for PCBs (ICF, 1994, Table 5-11). It should also be noted that fish in the Lauritzen exceed the Food and Drug Administration Action Levels for DDT and dieldrin, but not for PCBs. In the Santa Fe Channel, the calculations indicate that PCBs become a greater human health risk than site contaminants, but again the risk from PCBs may be overestimated.

The selected remedy will remove contaminated sediments from the Lauritzen Channel and Parr Canal and reduce human health risks from DDT and dieldrin exposure throughout Richmond Harbor. The sediments to be remediated also contain non site-related chemicals, including PCBs, although the levels of these contaminants relative to bay background concentrations is minute compared to the relative levels of DDT (see Appendix 2). Nevertheless, since the remedy will result in the removal of PCBs from portions of Richmond Harbor, there may be a reduction in human health risk associated with PCBs as well.

Other environmental stressors have been discussed in previous responses. DDT is the primary cause of toxicity in the Lauritzen Channel, and existing threats to benthos, water column organisms, and fish-eating birds are expected to be eliminated by the selected remedy.

*V. Selection of the No-Action alternative is consistent with CERCLA, the NCP, and EPA guidance.*

**Response:** EPA disagrees. As discussed in the Record of Decision, the no-action alternative fails to meet the NCP's threshold criteria for remedy selection. In addition, as mentioned previously, it should be noted that two previous PRP-lead site investigations (Harding Lawson, 1986, and Levine-Fricke, 1991) also recommended dredging the Lauritzen Channel and concluded that "no action" would not be protective of the environment.



*9. The National Oceanic and Atmospheric Administration (NOAA), which is the federal trustee for marine resources, submitted comments (September 14, 1994) supporting EPA's proposed plan. NOAA also recommended: 1) not dredging during the Pacific herring spawning season (December 1 to March 1); 2) the evaluation of dredging techniques to minimize resuspension and avoid spillage during transportation; 3) various types of remedial and post-remedial monitoring, and; 4) the placement of approximately six inches of clean material over dredged areas to help restore the area immediately after implementation of the remedy. (letter, 9/14/94)*

**Response:** EPA appreciates the information provided by NOAA and will ensure that the remedy is not implemented between December 1 and March 1. The detailed selection of dredging and monitoring techniques will be made during the remedial design phase and EPA looks forward to NOAA's participation in that process.

Several commenters before and during the comment period recommended the placement of clean material as part of the remedy. Morrison-Knudsen, consultant to Montrose, recommended the placement of clean material in areas, such as those with rip-rap, in which dredging would be impractical or of limited effectiveness. USFWS (see comment 10, below) recommended placement of clean material after remediation to bury any remaining contaminants and help restore habitat.

The Proposed Plan stated: "Minor capping, which would not significantly alter the existing depths of water, might also be used if determined to be necessary during the remedial design or remedial action phases," although a cost for this activity was not estimated. EPA has contacted Manson Construction, which provided estimates of dredging costs used in the Feasibility Study. Assuming that the total area of the Lauritzen Channel and Parr Canal is 50,000 square yards, a six-inch layer would require approximately 8000 cubic yards of clean material. Manson indicated that the cost of placement is relatively high, and estimated \$25 per yard total. A six-inch layer of clean material would therefore cost approximately \$200,000. This cost has been added to the estimate for the final remedy, bringing the total estimate to \$7 million. There may also be an opportunity to save costs and obtain appropriately sized clean dredged material from the Richmond Harbor deepening project.

### Other Comments

*10. The US Fish and Wildlife Service submitted comments, dated August 15, 1994, on the FS. USFWS supported EPA's preferred alternative, and made the following recommendations: 1) removal of the upper layer of old bay mud to ensure that median DDT levels are below a deleterious effects range; 2) placement of a clean layer of fill after dredging (discussed in comment 9, above), and; 3) hazing to prevent seabirds from entering the dredging area during remediation. (letter, 8/15/94)*

**Response:** The placement of clean fill after dredging has been discussed above. Additional recommendations regarding activities during remediation will be considered in the remedial design phase, in which USFWS is encouraged to participate. The proposed remedy including dredging of all soft sediments down to the Old Bay Mud contact. In practice, this will result in the removal of the top layer of old bay mud. Sampling conducted during the RI indicates that the medial concentration of contaminants in the upper layer of old bay mud is well below the range which may be deleterious to benthic organisms.

*11. Montrose also submitted comments dated August 17, 1994 from its contractor, Terra Inc., on the final human health risk assessment. With the exception of the following comment, Terra's comments were either repeated in Montrose's comments on the proposed plan, discussed above, or were responded to in earlier responses to comments on the draft human health risk assessment. Exposure point concentrations were improperly estimated for upland soils resulting in the overestimation of risk. Due to its overstatement of risk, the final risk assessment cannot be reliably used to develop remedial alternatives or to determine whether there is any necessity to remediate surface soils.*

**Response:** This comment ignores both the conclusions of the risk assessment and EPA's proposed remediation. The EPA human health risk assessment clearly states that conservative estimates were used, and that risks due to exposure to contaminants in upland soils are within EPA's acceptable risk range even using these conservative estimates. EPA has proposed no further remediation to reduce the concentrations of contaminants in site soils. Therefore, the entire discussion of whether the risk estimates for soils are overly conservative is moot.

Two tables in the final risk assessment (Tables 3-2 and 3-3) did in fact contain typographical errors. Corrected tables enclosed with a memo from ICF are provided as Appendix 3 of this Response to Comments. Because none of the risk calculations contained in the assessment were derived from the erroneous values, the errors had no effect on the final conclusions.

**United Heckathorn Response to Comments**

**Appendix 1**

**San Francisco Chronicle, October 4, 1994  
p. A9**

# Clue in Pesticide Link to Breast Cancer

## Exposure to some poisons raises level of 'bad' estrogen

*Associated Press*

New York

Researchers trying to explain the disturbing link between pesticides and breast cancer have discovered that pesticides appear to raise levels of a harmful form of estrogen.

The finding comes as a surprise to the director of the research, who undertook the study expecting to show that pesticides had no effect on estrogen.

"I was wrong," said H. Leon Bradlow, a biochemist with the Strang Cancer Prevention Center at Cornell University Medical School. The study showed that after exposure to pesticides, "your risk ratio is greater than what it was before," Bradlow said yesterday.

Several earlier studies have linked pesticides to an increased

risk of breast cancer, although one study failed to find a link. The new study shows how pesticides may be exerting a harmful effect, Bradlow said.

Penelope Fenner-Crisp, a pharmacologist and pesticide specialist with the Environmental Protection Agency, said the EPA is taking the link between pesticides and hormones very seriously. "We should think about how we might go about encouraging exposure reduction," she said.

The study, which will be published soon in *Environmental Health Perspectives*, a journal of the National Institute of Environmental Health Sciences, builds on Bradlow's previous research showing that there is a "good estrogen" that protects against breast cancer and a "bad estrogen" that is associated with increased risk of the disease.

The researchers exposed human breast cells in the test tube to DDT and other chlorine-containing pesticides. They found that the pesticides' effect on bad estrogen was three to four times as great as that of a known human carcinogen that was used as a comparison.

In a separate study, Bradlow and his colleagues found that women who eat "cruciferous" vegetables — broccoli, cauliflower, brussels sprouts and cabbage — appear to counteract the harmful effects of pesticides. An anti-cancer substance found in these vegetables called indole-3-carbinol was found to increase the ratio of good estrogen to bad estrogen.

Bradlow said a woman who eats such vegetables regularly could significantly reduce her risk of breast cancer, although he cannot yet say precisely how much lower the risk would be.

**United Heckathorn Response to Comments**

**Appendix 2**

**NOAA Technical Memorandum NOS ORCA 64  
Figures 8, 9 and 10**

NOAA Technical Memorandum NOS ORCA 64



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**AN EVALUATION OF THE EXTENT AND MAGNITUDE OF  
BIOLOGICAL EFFECTS ASSOCIATED WITH CHEMICAL  
CONTAMINANTS IN SAN FRANCISCO BAY, CALIFORNIA**

Seattle, Washington  
March 1992

**noaa**

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

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National Ocean Service

# DDT

San Francisco Bay Region

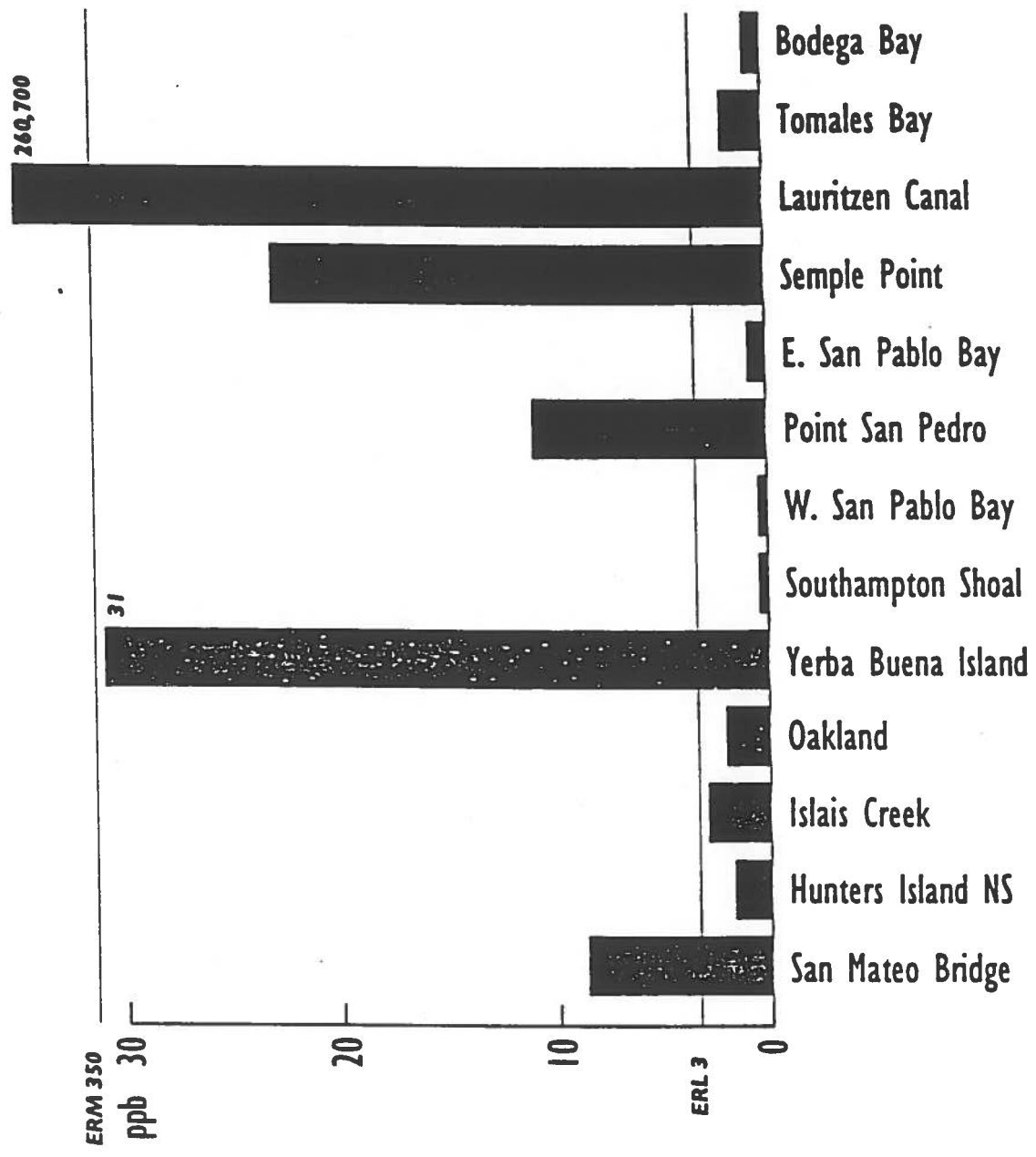


Figure 8. Mean tDDT concentrations at specific sampling sites in San Francisco Bay (from Long et al., 1988) and ERL and ERM values for tDDT (from Long and Morgan, 1990).

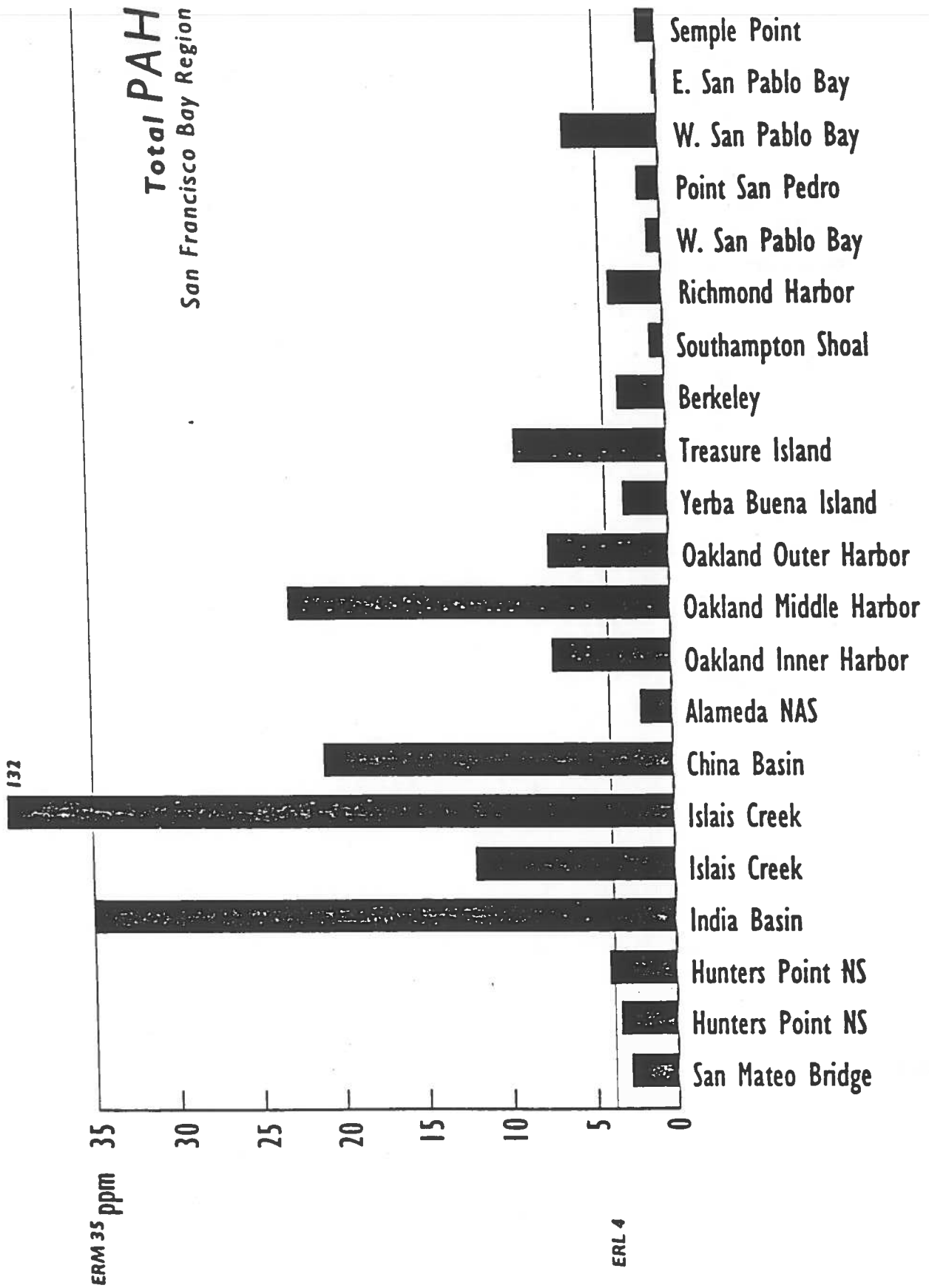


Figure 9. Mean tPAH concentrations (sum of 18 compounds) at specific sampling sites in San Francisco Bay (from Long et al., 1988) and ERL and ERM values for tPAH (from Long and Morgan, 1990).



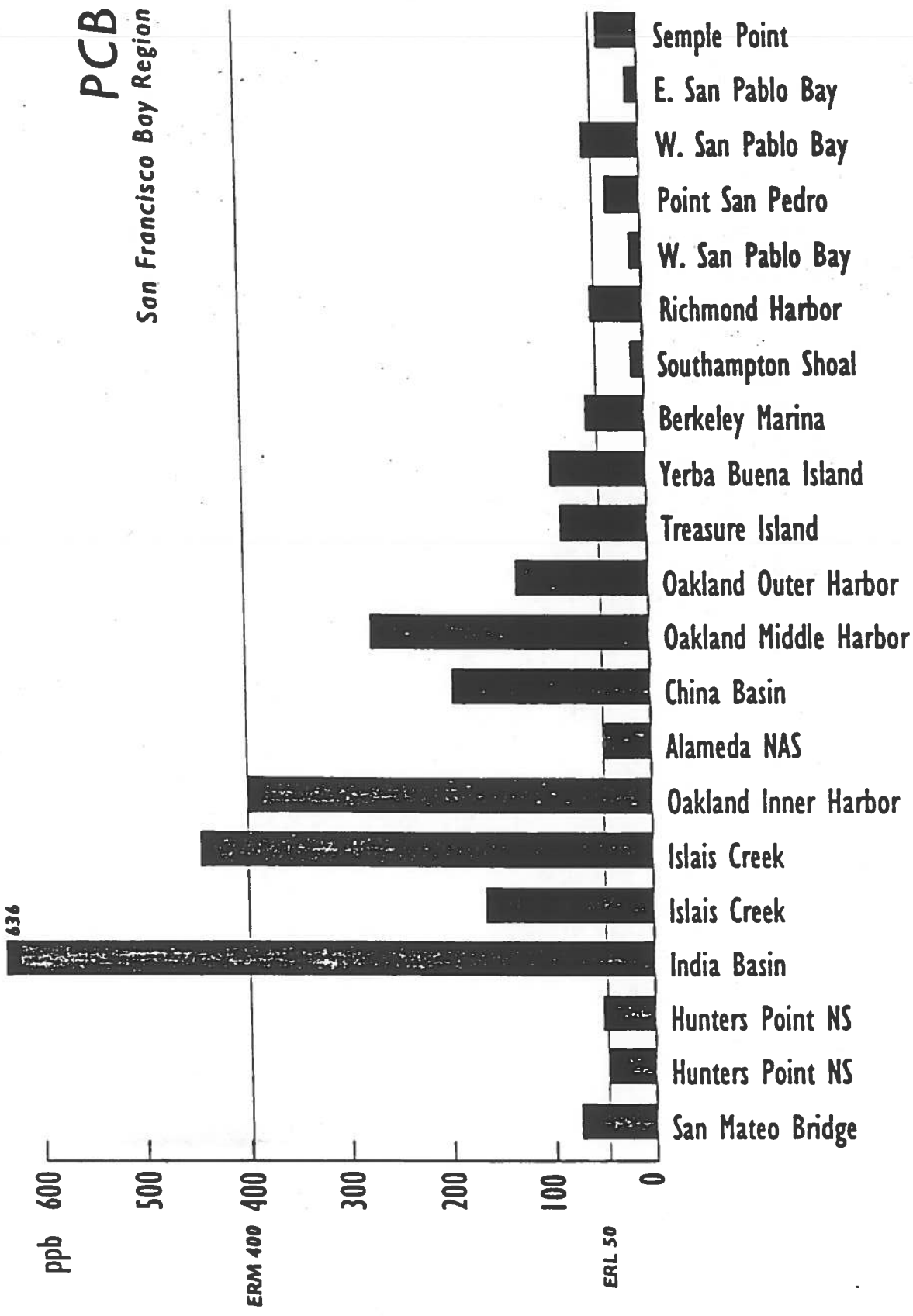


Figure 10. Mean tPCB concentrations at specific sampling sites in San Francisco Bay (from Long et al., 1988) and ERL and ERM values for tPCB (from Long and Morgan, 1990).

**United Heckathorn Response to Comments**

**Appendix 3**

**ICF Kaiser Engineers Memorandum  
September 7, 1994**

1800 Harrison Street  
Oakland, California  
94612-2321

510/419-6000



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## ICF TECHNOLOGY INCORPORATED

### MEMORANDUM

September 7, 1994

TO: Andy Lincoff

FROM: D. Wayne Berman *DWB*

RE: Corrections to the final, "Human Health Risk Assessment for the United Heckathorn Superfund Site, Richmond, California."

In response to the August 17, 1994 comments from Terra Inc. concerning the values reported in Tables 3-2 and 3-3 of the risk assessment report, it appears that a few minor typographical errors were in fact committed. Corrected tables are attached.

First, regarding the column in Table 3-2 in which 95% UCLs are supposed to have been reported, an incorrect direction command in the underlying spreadsheet to the table resulted in the RME exposure point concentrations being repeated in this column rather than the UCLs.

Note that, in no case are the correct UCLs equal to the corresponding maximum detected values, which are reported in the next column of the table. In some cases the correct UCLs are greater than the maximum detected values but this is not unusual for small or highly variable data sets, particularly when the data are adequately described by a lognormal distribution. Because none of the subsequent calculations performed to complete the risk assessment are based on the UCLs reported in this column, no material changes in the risk assessment resulted from this typographical error.

Regarding the column in Table 3-3 in which RME exposure point concentrations in soil were supposed to have been reproduced, a similar direction error in the underlying spreadsheet caused the 95% UCLs to be reported in this column rather than the RME values. Correcting this column of this table changes a small number of other values in this table; however the changes are minor and none of them affect the overall conclusions drawn from this table. Because none of the other calculations in the rest of the risk assessment are derived from the values reported in the corrected column of Table 3-3, no material changes in the risk assessment resulted from this typographical error.

Please call me if you have any further questions concerning these corrections.

*fd*



TABLE 3-3  
ESTIMATED EMISSION RATES AND AIRBORNE EXPOSURE POINT CONCENTRATIONS  
(ASSUMING VARIOUS EMISSION MECHANISMS)

COGs	CS RME Exposure Point Concentration (mg/kg)	Estimated Chemical-specific PM <sub>10</sub> Emission Rates		CA <sub>10</sub> Estimated RME Exposure Point Concentration in Air <sup>2</sup>			
		Wind Erosion (mg/sec)	Vehicular Traffic (mg/sec)	Excavation and Dumping (mg/sec)	Wind Erosion (mg/m <sup>3</sup> )	Vehicular Traffic (mg/m <sup>3</sup> )	Excavation and Dumping (mg/m <sup>3</sup> )
Surface Soil (≤ 1 foot)							
Aldrin	6.6E-01	2.1E-06	1.5E-04	7.5E-05	3.8E-12	2.7E-06	1.4E-06
4,4'-DDD	3.5E+01	1.1E-06	8.1E-03	4.0E-03	2.1E-10	1.5E-06	7.3E-07
4,4'-DDE	5.6E+01	1.8E-06	1.3E-02	6.4E-03	3.3E-10	2.3E-06	1.2E-06
2,4'-DDT <sup>3</sup>	1.2E+02	3.8E-06	2.7E-02	1.4E-02	6.9E-10	4.9E-06	2.4E-06
4,4'-DDT	7.0E+02	2.3E-05	1.6E-01	8.0E-02	4.1E-09	2.9E-05	1.4E-05
DDT (total) <sup>3,4,5</sup>	7.4E+02	2.4E-05	1.7E-01	8.4E-02	4.3E-09	3.1E-05	1.5E-05
Dieldrin	1.7E+01	5.3E-07	3.8E-03	1.9E-03	9.6E-11	6.8E-07	3.4E-07
Endrin	1.2E-01	3.9E-09	2.7E-05	1.4E-05	7.0E-13	5.0E-09	2.5E-09
Lead	1.3E+03	4.2E-05	3.0E-01	1.5E-01	7.6E-09	5.4E-05	2.7E-05
Subsurface Soil (> 1 foot)							
Aldrin	1.9E+00	6.1E-06	4.3E-04	2.2E-04	1.1E-11	7.9E-06	3.9E-06
4,4'-DDD	1.3E+01	4.1E-07	2.9E-03	1.4E-03	7.4E-11	5.3E-07	2.6E-07
4,4'-DDE	1.5E+01	4.9E-07	3.5E-03	1.7E-03	8.9E-11	6.3E-07	3.1E-07
2,4'-DDT <sup>6</sup>	1.9E+01	6.2E-07	4.4E-03	2.2E-03	1.1E-10	7.9E-07	3.9E-07
4,4'-DDT	3.6E+01	1.2E-06	8.2E-03	4.1E-03	2.1E-10	1.5E-06	7.4E-07
DDT (total) <sup>3,4,5</sup>	6.7E+01	1.9E-06	1.3E-02	6.5E-03	3.4E-10	2.4E-06	1.2E-06
Dieldrin	2.3E+01	7.5E-07	5.4E-03	2.7E-03	1.4E-10	9.7E-07	4.8E-07
Endrin	1.7E+01	5.6E-07	4.0E-03	2.0E-03	1.0E-10	7.1E-07	3.6E-07
Lead	9.0E+02	2.9E-05	2.1E-01	1.0E-01	5.3E-09	3.7E-05	1.9E-05
Soil at All Depths							
Aldrin	1.2E+00	3.8E-06	2.7E-04	1.4E-04	7.0E-12	4.9E-06	2.5E-06
4,4'-DDD	1.8E+01	5.7E-07	4.1E-03	2.0E-03	1.0E-10	7.4E-07	3.7E-07
4,4'-DDE	2.9E+01	9.5E-07	6.7E-03	3.3E-03	1.7E-10	1.2E-06	6.0E-07
2,4'-DDT <sup>6</sup>	3.7E+01	1.2E-06	8.5E-03	4.2E-03	2.2E-10	1.5E-06	7.7E-07
4,4'-DDT	1.0E+02	3.4E-06	2.4E-02	1.2E-02	6.1E-10	4.3E-06	2.1E-06
DDT (total) <sup>3,4,5</sup>	1.3E+02	4.3E-06	3.1E-02	1.5E-02	7.8E-10	5.5E-06	2.7E-06
Dieldrin	1.9E+01	6.0E-07	4.3E-03	2.1E-03	1.1E-10	7.8E-07	3.9E-07
Endrin	1.0E+01	3.2E-07	2.3E-03	1.1E-03	5.8E-11	4.1E-07	2.1E-07
Lead	8.2E+02	2.7E-05	1.9E-01	9.3E-02	4.8E-09	3.4E-05	1.7E-05

Methodology for estimating exposure point concentration in air is presented in Appendix C.  
<sup>1</sup> RME Exposure Point Concentration determination: the lesser of the 85% UCL and the Maximum Detected Value. See Table 3-2.  
<sup>2</sup> Exposure Point Concentration in Air (mg/m<sup>3</sup>) = Chemical-specific PM<sub>10</sub> Emission (mg/sec) x 1/WinWind (sec/m)  
<sup>3</sup> 2,4'-DDT was analyzed for in 85% of the samples so that sufficient data is available to include this isomer in our risk analysis. However, because approximately 16% of the sample analyzed for 4,4'-DDT were not also analyzed for the 2,4'-DDT isomer, the 2,4'-DDT isomer could not be properly incorporated into the parameter representing total DDT. Thus, 2,4'-DDT is carried through the risk assessment as a separate analyte. In any case, as demonstrated on these tables, the error contributed to risk if the 2,4'-DDT isomer is ignored is less than 30%, which is small compared to other sources of error in risk assessment.  
<sup>4</sup> The representative concentrations for total DDT were derived by summing 4,4'-DDD, 4,4'-DDE and 4,4'-DDT measured in each individual sample and then deriving separate summary statistics for this parameter. Therefore, the sum of the summary statistics representing 4,4'-DDD, 4,4'-DDE and 4,4'-DDT (presented in this table) do not strictly add to the summary statistic presented for total DDT.  
<sup>5</sup> 2,4'-DDD and 2,4'-DDE were not included in this analysis because fewer than 30% of the samples were analyzed for these isomers. It is expected, however, that the