

DTIC FILE COPY

4

AD-A213 027

Technical Report 1293
April 1989

Butyltin Concentration Measurements in Pearl Harbor, Hawaii

April 1986 to January 1988
Pearl Harbor Case Study

J.G. Grovhoug
P.F. Seligman
Naval Ocean Systems Center

R.L. Fransham
S.Y. Cola, M.O. Stallard
P.M. Stang, A.O. Valkirs
Computer Sciences Corporation

DTIC
ELECTE
OCT 02 1989
S B D

Approved for public release; distribution is unlimited.

89 10 2 029

NAVAL OCEAN SYSTEMS CENTER

San Diego, California 92152-5000

E. G. SCHWEIZER, CAPT, USN
Commander

R. M. HILLYER
Technical Director

ADMINISTRATIVE INFORMATION

The work described here was performed by the Environmental Sciences Division, Marine Environment Branch, Code 522, Naval Ocean Systems Center, for the David Taylor Research Center, Code 2759, under sponsorship of the Office of Chief of Naval Research, Code 123. Contractual support for analytical services was provided under the leadership of R.L. Fransham, Computer Sciences Corporation (project number N66001-87-D-0074), Applied Technology Division, and the San Diego State University Foundation.

Released by
P.F. Seligman, Head
Marine Environment Branch

Under authority of
S. Yamamoto, Head
Environmental
Sciences Division

ACKNOWLEDGMENTS

We extend our special appreciation for contributions to this study, including planning assistance, field sampling, sample preparation, considerable chemical analysis efforts, data recording and reduction, manuscript review and editing, and illustration assistance made by the following: D. Bower, B. Davidson, S. Frank, J. Groves, M. Guidry, R.K. Johnston, R.S. Henderson, M. Kram, and G. Vafa.

We extend, as well, our gratitude to the many detachment members of Mobile Diving and Salvage Unit One and the MCAS Kaneohe Bay Air-Sea Rescue Team, who provided valuable field support in terms of survey vessels and personnel.

We would also like to thank the various members of the Pearl Harbor Naval Station, Pearl Harbor Naval Shipyard, Rainbow Bay Marina, and the officers and crew of USS *Badger*, USS *Beaufort*, USS *Brewton*, USS *Davidson*, USS *Leftwich*, and USS *Omaha* for their assistance and cooperation in these efforts.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED			1b. RESTRICTIVE MARKINGS		
2a. SECURITY CLASSIFICATION AUTHORITY			3. DISTRIBUTION/AVAILABILITY OF REPORT		
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE			Approved for public release; distribution is unlimited.		
4. PERFORMING ORGANIZATION REPORT NUMBER(S) Technical Report 1293			5. MONITORING ORGANIZATION REPORT NUMBER(S)		
6a. NAME OF PERFORMING ORGANIZATION Naval Ocean Systems Center		6b. OFFICE SYMBOL (if applicable) Code 522		7a. NAME OF MONITORING ORGANIZATION	
6c. ADDRESS (City, State and ZIP Code) San Diego, California 92152-5000		7b. ADDRESS (City, State and ZIP Code)			
8a. NAME OF FUNDING/SPONSORING ORGANIZATION David Taylor Research Center		8b. OFFICE SYMBOL (if applicable) 2759		9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER N66001-87-D-0074	
8c. ADDRESS (City, State and ZIP Code) Annapolis, MD 21402		10. SOURCE OF FUNDING NUMBERS			
		PROGRAM ELEMENT NO. 63724N		PROJECT NO. R0829	AGENCY ACCESSION NO. ME38 DN888 749
11. TITLE (include Security Classification) BUTYLTIN CONCENTRATION MEASUREMENTS IN PEARL HARBOR, HAWAII April 1986 to January 1988, Pearl Harbor Case Study					
12. PERSONAL AUTHOR(S) J.G. Grovhoug, P.F. Seligman (NOSC) R.L. Fransham, S.Y. Cola, M.O. Stallard, P.M. Stang, A.O. Valkirs (CSC)					
13a. TYPE OF REPORT Final		13b. TIME COVERED FROM Apr 1986 TO Jan 1988		14. DATE OF REPORT (Year, Month, Day) April 1989	
				15. PAGE COUNT 104	
16. SUPPLEMENTARY NOTATION					
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)		
FIELD	GROUP	SUB-GROUP	antifouling coatings		
19. ABSTRACT (Continue on reverse if necessary and identify by block number)					
✓ This report summarizes environmental butyltin concentrations in marine samples collected from the Pearl Harbor area during April 1986 through January 1988 as part of a series of follow-up studies to the baseline survey of March to April 1984. Additionally, studies to evaluate the loading of tributyltin in Pearl Harbor from naval activities were conducted as part of the testing and monitoring program mandated by Congress prior to approval for fleetwide implementation of tributyltin-based antifouling coatings. Analytical results for mono-, di-, and tributyltin concentrations in seawater, sediment, and oyster tissue samples are reported with supporting field collection information. <i>Outfouling and antifouling coatings water pollution</i>					
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT			21. ABSTRACT SECURITY CLASSIFICATION		
☐ UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT ☐ DTIC USERS			UNCLASSIFIED		
22a. NAME OF RESPONSIBLE INDIVIDUAL J. G. Grovhoug			22b. TELEPHONE (include Area Code) (808) 257-1540		22c. OFFICE SYMBOL Code 522

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

SUMMARY

This report summarizes environmental butyltin concentrations in marine samples collected from the Pearl Harbor area from April 1986 through January 1988 as part of a series of follow-up studies to the baseline survey of March to April 1984. In addition, studies to evaluate the loading of tributyltin in Pearl Harbor from naval activities were conducted as part of the testing and monitoring program mandated by Congress prior to approval for fleetwide implementation of tributyltin-based antifouling coatings. Analytical results for mono-, di-, and tributyltin concentrations in seawater, sediment, and oyster tissue samples are reported with supporting field collection information. Pearl Harbor was selected as a test site for butyltin monitoring studies because it is almost entirely a Navy port with relatively unambiguous tributyltin sources. Though not a prescribed aspect of the Pearl Harbor Case Study, surveys of Honolulu Harbor and vicinity were conducted to provide a comparison with commercial and recreational vessel inputs of tributyltin in Hawaiian waters.

Tributyltin (TBT) was measured in water during eight sampling periods in sediment and oyster tissue samples from four collections in Pearl Harbor and several times from Honolulu Harbor. Analytical capabilities which permit water sample TBT detection levels as low as 0.3 ngL^{-1} (parts per trillion) have increased the ability to detect environmental butyltins in areas where previous detection limitations made measurements impossible. Average surface water TBT levels in Pearl Harbor ranged from undetectable to 3.4 ngL^{-1} in West Loch, undetectable to 3.5 ngL^{-1} in Middle Loch, undetectable to 4.9 ngL^{-1} at Waiau Shoal in upper East Loch, 2.0 to 5.0 ngL^{-1} in the North Channel, undetectable to 9.9 ngL^{-1} in the Entrance Channel, 2.2 to 6.5 ngL^{-1} in the South Channel, and 2.5 to 21 ngL^{-1} in Southeast Loch. Honolulu Harbor surface water samples exhibited average TBT levels ranging from 4.8 to 580 ngL^{-1} over the same period.

Over the course of this study, regional sediment TBT concentrations averaged from 10.0 to 48 ng/g (dry weight) in West Loch, 27 to 120 ng/g in Middle Loch, 15 to 100 ng/g in upper East Loch, 21 to 1000 in North Channel, 24 to 53 in the Entrance Channel, 60 to 420 in South Channel, and 230 to 420 in Southeast Loch. Sediment samples collected near Drydock #2, the most frequently used site for TBT paint application in Pearl Harbor Naval Shipyard, showed elevated butyltin concentrations (by a factor of 10) greater than the harbor average for TBT. Sediment samples collected before and after painting operations in Drydock #4, which is separated physically from major influences of the naval shipyard area by Hospital Point, showed only slightly elevated TBT levels. On an average basis, Honolulu Harbor shipyard region sediment samples contained three times the TBT concentrations as seen in comparable Pearl Harbor shipyard areas.

Tissue samples from three species of oysters were collected from those areas in Pearl Harbor where available and analyzed for di- and tributyltin content. Measured butyltin concentration patterns were consistent with the locational trends in ambient waters and ranged from nondetectable ($< 25 \text{ ng/g}$) in West Loch to 360 ng/g TBTCI (wet weight) within the confines of Rainbow Bay Marina. Tributyltin concentrations in Honolulu Harbor oyster tissues averaged twice the maximum levels seen in any oysters collected from Pearl Harbor.

As part of the case study at Pearl Harbor, three Navy frigates were painted with a low-release-rate TBT paint in 1987: USS *Badger* (FF 1071) undocked in March



For	☒
	☐
	☐
on/	
ity Codes	
Avail and/or	
Special	

Dist
A-1

1987; USS *Brewton* (FF 1086), undocked in August 1987; and USS *Davidson* (FF 1045), undocked in September 1987. Intensive harbor monitoring studies were performed during each test ship painting and subsequent undocking period. These efforts collected data from both near- and far-field harbor areas, which showed only slightly elevated butyltin values in the immediate vicinity of painting and undocking facilities. In addition, data supplied by David Taylor Research Center (DTRC) (technical report in preparation) suggest that total drydock releases were less than 20 g and, as such, represent only a very minor, intermittent input.

In-situ release rates were measured from the hulls of *Badger*, *Brewton*, and *Davidson* in March 1988. At this time steady-state release rates were determined as 0.37, 0.10, and 0.11 $\mu\text{g}/\text{cm}^2/\text{day}$ respectively. These data were used to estimate total harbor TBT loading values from test ships. When measurements from the three older test vessels (USS *Leftwich*, USS *Beaufort*, and USS *Omaha*) are included in these estimates with their higher release rate paints, it is estimated that Pearl Harbor has been exposed to TBT loadings as high as, or higher than, expected under full fleet implementation using the lower leach rate (0.1 $\mu\text{g}/\text{cm}^2/\text{day}$) paints. It is estimated from empirical data that full surface fleet implementation with the lowest release rate paints would result in average regional concentrations at, or below, 5 ngL^{-1} in Southeast Loch and less than 2 ngL^{-1} in other regions of the harbor. This assumes continued appropriate environmental management of drydock effluents as demonstrated during the study.

An empirical model was thus provided by the three-ship Pearl Harbor experiment in 1987 and the three previous painted vessels. Three major objectives of the Pearl Harbor Case Study were met during this period: (1) demonstration that the Navy can reasonably predict the ambient TBT concentrations resulting from its use of TBT paints, (2) collection and evaluation of pertinent exposure data for the determination of Navy ship TBT effects on the Pearl Harbor estuary (TBT risk assessment using field and microcosm data), and (3) quantification of TBT discharges from Navy drydocks during each test ship painting and subsequent undocking operation.

The environmental data presented in this report are part of a long-term monitoring effort by the Navy to provide necessary information regarding organotin loading in Pearl Harbor as antifouling coating testing or implementation progresses. The data provided by these sampling efforts have also aided various federal, state, and local agencies in their efforts to realistically address environmental butyltin concerns.

CONTENTS

BACKGROUND	1
INTRODUCTION	2
General Site Description	2
General Survey Description	4
PROCEDURES	6
Harbor Monitoring	6
Pearl Harbor Monitoring Survey Series	6
Test-Ship Undocking Phase Surveys	9
48-hour Tidal Cycle Study	12
In-situ Ship Hull Release Rate Study	12
Near-hull Butyltin Concentration Gradient Study	12
Sample Analysis	14
Water Sample Analysis	14
Sediment and Oyster Tissue Sample Analysis	14
RESULTS	16
Pearl Harbor Monitoring Survey Series	16
Test-Ship Undocking Phase Surveys	21
48-hour Tidal Cycle Study	24
In-situ Ship Hull Release Rate Study	25
Near-hull Butyltin Concentration Gradient Study	25
DISCUSSION	28
Pearl Harbor	28
Honolulu Harbor Complex	35
CONCLUSIONS	37
REFERENCES	38
ABBREVIATIONS AND SYMBOLS	40
APPENDICES:	
A: Measurement of Environmental Butyltins in Honolulu Harbor, Hawaii, April 1986 to January 1988	A-1
B: Pearl Harbor Station Locations	B-1
C: Estimated Organotin Loading in Honolulu Harbor, Ala Wai Boat Harbor, and Rainbow Bay Marina (Pearl Harbor).....	C-1
D: Pearl Harbor and Honolulu Harbor Complex Sample Records	D-1
E: Organotin Sample Database Records	E-1

FIGURES

1.	Pearl Harbor station locations.	3
2.	Pearl Harbor Southeast Loch and vicinity station locations.	7
3.	Pearl Harbor area sample regions.	8
4.	Pearl Harbor water sample summary, April 1986 to January 1988.	10
5.	Pearl Harbor sediment sample summary, April 1986 to January 1988.	11
6.	Sample transects. <i>Badger</i> (FF 1071) near-hull butyltin concentration gradient study.	13
7.	<i>Badger</i> surface (upper) and deep (lower) water tributyltin concentration curves.	27
8.	In-port periods of Navy organotin-bearing antifouling paint test ships: August 1985 to April 1988.	29
9A.	Least-squares linear regression analysis curves for regional mean surface water tributyltin chloride concentrations versus total per diem Southeast Loch test-ship load factor.	30
9B.	Least-squares linear regression analysis curves for regional mean surface water tributyltin chloride concentrations versus total per diem Southeast Loch test-ship load factor.	31
A-1.	Honolulu Harbor Complex station locations.	A-3
A-2.	Honolulu Harbor Complex sample regions.	A-4
A-3.	Honolulu Harbor Complex water sample summary, April 1986 to January 1988.	A-9
A-4.	Honolulu Harbor Complex sediment sample summary, January 1988.	A-10

TABLES

1.	Pearl Harbor sample regions.	6
2.	Pearl Harbor 48-hour cycle study tidal conditions.	12
3.	Water column concentration summary for Pearl Harbor sample regions.	16
4.	Sediment concentration summary for the Pearl Harbor sample regions.	17
5.	Pearl Harbor oyster tissue butyltin concentration summary.	20
6.	Combined mean regional water column tributyltin concentrations, test-ship undocking-phase surveys.	23
7.	Integrated 48-hour tidal cycle water sample tributyltin concentrations: 12 to 14 May 1987.	24
8.	Dates and release rates of Navy vessels painted with TBT-containing paint . .	25
9.	<i>Badger</i> near-hull butyltin concentration gradient study data.	26
10.	Estimates of Navy paint test vessels tributyltin load factors in Pearl Harbor.	32
11.	Tributyltin test-ship port periods.	32
12.	Estimated test-ship tributyltin loading in Southeast Loch.	32
A-1.	Honolulu Harbor Complex sample regions.	A-2
A-2.	Water column concentration summary for the Honolulu Harbor Complex sample regions.	A-5
A-3.	Sediment concentration summary for the Honolulu Harbor Complex sample regions.	A-6
A-4.	Honolulu Harbor oyster tissue butyltin concentration summary.	A-8

BACKGROUND

In support of the Navy's proposed implementation of tributyltin (TBT) anti-fouling paints, the Naval Ocean Systems Center (NOSC) performed a series of baseline surveys at 15 major harbors in the United States over a 3-year period from 1984 to 1986. Subsequent monitoring surveys were designed and performed for the San Diego Bay, Pearl Harbor, and Norfolk Harbor/Hampton Roads/Elizabeth River areas. The 1986 to 1989 Congressional Appropriations Bill has limited Navy use of organotin coatings to a test involving two harbors only, with a maximum of 15 steel-hulled vessels eligible for painting. Accordingly, the Navy initiated a Two-Harbor Case Study, jointly developed by the David Taylor Research Center (DTRC) and NOSC, to more fully understand the environmental loading and effects resulting from the application of organotin-based antifouling paints. Three ships participated in the Pearl Harbor phase of this investigation, which called for monitoring the drydock discharge after the painting of each test ship, harbor modeling, environmental fate and effects evaluation, hull-release measurements, and the monitoring of butyltin concentrations. This report describes the results of the surveys performed in the Pearl Harbor region during April 1986 and February 1987 as part of the Navy's original organotin research plan, and during March 1987, April 1987, May 1987, July 1987, October 1987, and January 1988 under the Pearl Harbor Case Study. Separate reports are in preparation which will cover the drydock operations studies and the fate and effects studies.

INTRODUCTION

In 1986, Pearl Harbor, Hawaii, and Mayport Basin, Florida, were selected by the Navy as potential test sites for a Two-Harbor Case Study. Both harbors are under the control of the U.S. Navy and primarily used by Navy vessels, which facilitates regulation and monitoring of tributyltin inputs from antifouling paints and other sources. The Mayport phase of the study was subsequently dropped due to the lack of eligible ships able to participate during the specified time period. Thus, Pearl Harbor became the exclusive study site for the test. During the Organotin Harbor Baseline Survey of March to April 1984, tributyltin was undetectable in water samples ($< 5 \text{ ngL}^{-1}$), sediment samples ($< 50 \text{ ng/g}$), and oyster tissue samples ($< 400 \text{ ng/g}$) obtained from Pearl Harbor. During this same period, Honolulu Harbor water samples exhibited tributyltin levels averaging 97 ngL^{-1} . Elevated butyltin levels were also observed in oyster tissues and sediment samples collected from Honolulu Harbor.

GENERAL SITE DESCRIPTION

Pearl Harbor is located midway along the southern side of the island of Oahu in the Hawaiian Islands. The entire harbor is under the jurisdiction of the Navy and contains a naval shipyard, naval station, submarine base, naval supply center, and an inactive ship maintenance facility. Pearl Harbor is divided into three primary regions: East, Middle, and West Lochs (see figure 1). Adjoining East Loch is the smaller Southeast Loch basin, which is, along with the adjacent areas, the most heavily used area within the harbor. Civilian vessels visiting the harbor include freighters and tankers to Naval Supply Center piers (adjacent to Southeast Loch), tuna fishing boats collecting baitfish, and daily commercial harbor tour vessels from Kewalo Basin in Honolulu. Rainbow Marina, a small boat facility with a capacity of about 70 vessels, is located in the Aiea Bay area in the northeastern corner of East Loch.

Tidal flow and circulation is weak and variable with a maximum ebb flow of about one-half knot. Surface water circulation is primarily driven by the predominant northeasterly trade winds. Freshwater inputs are irregular from eight major streams, which drain stormwater runoff into West, Middle, and East Lochs. Measured salinities in the harbor during a previous survey ranged from 14.1 to 37.5 parts per thousand, with an average of approximately 32.8 parts per thousand.¹ The drainage area of the harbor is approximate 110 square miles. Tidal currents are weak and variable. The mean tidal current velocity at the harbor entrance averages less than 0.3 knot, with a maximum velocity of 0.6 knot (U.S. Department of Commerce, 1986a, 1986b). Tides are mixed with a mean range of 1.2 feet (0.4 meter). The bottom areas consist primarily of grey or black mud and silt, with coral rubble, gravel, sand, and mud present along the sides of dredged channels. A fringing coral reef is located outside the entrance to the harbor; however, live coral is absent inside Pearl Harbor. Local water quality is dependent on immediate circumstances and level of industrial and/or shipboard activities.

¹ Evans, E.C. III (ed.). 1974. *Pearl Harbor Biological Survey*. NUC Technical Note 1128. Naval Undersea Center, San Diego, CA. §3.2, p. 26. Technical notes are working documents and are not distributed outside of NOSC. For further information, contact Naval Ocean Systems Center, Code 522.

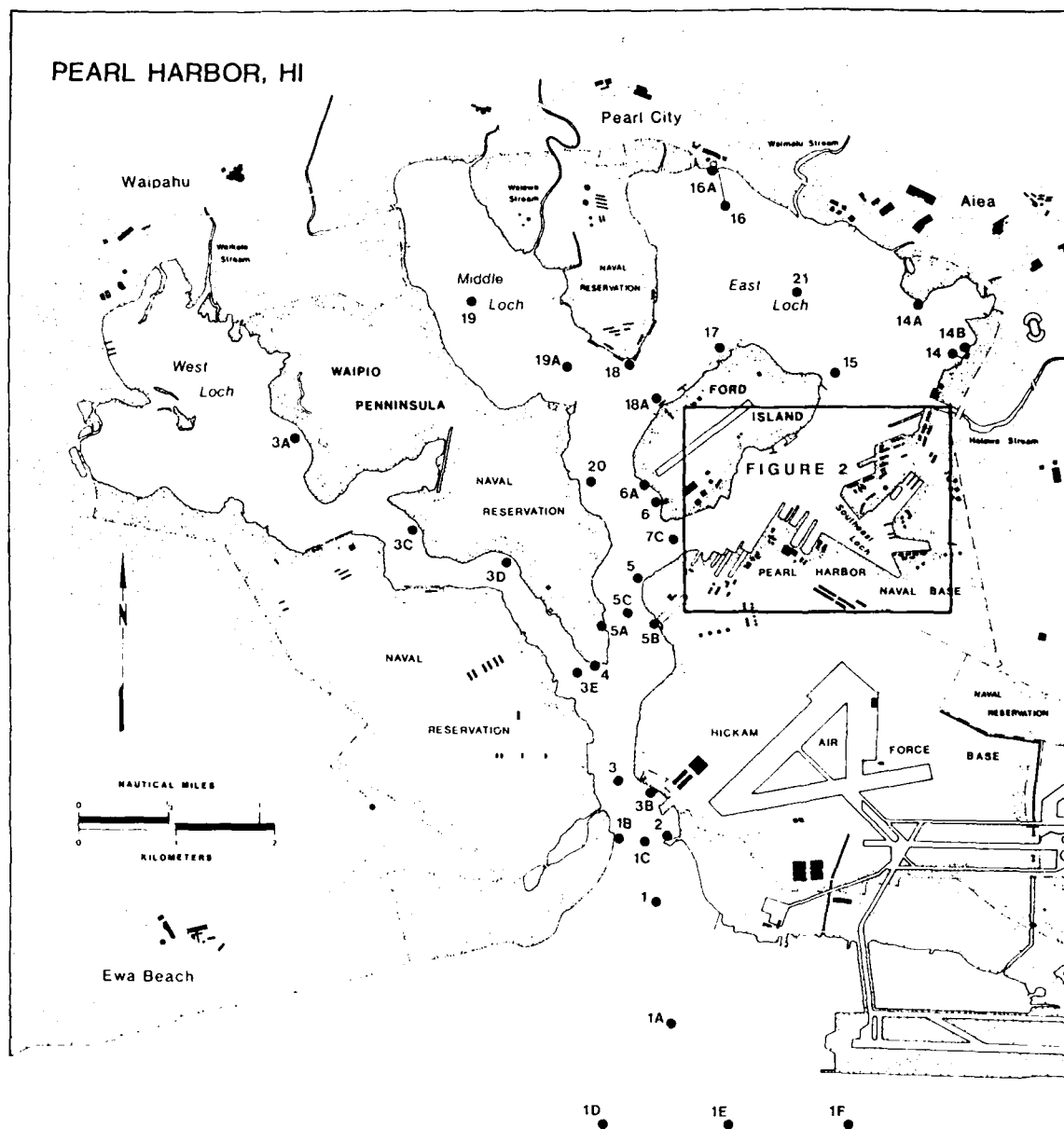


Figure 1. Pearl Harbor station locations. Southeast Loch station locations in figure A-2.
Note: This is a composite diagram—various stations were sampled during each individual survey. See appendix B for detailed information.

The harbor is characterized by high biological complexity and productivity, with occasional occurrences of red tide blooms. Biological patchiness is demonstrated throughout different regions of the harbor, with the most environmentally stressed communities located within Southeast Loch, Middle Loch, and in those areas of the main channel adjacent to the naval shipyard.² Plankton and larval fish populations are generally diverse. The harbor serves as an important nursery ground for many marine species, and several important commercial nearshore fish species frequent the harbor, particularly within the North Channel, Middle Loch, and Entrance Channel regions.³ Pearl Harbor sustains economically important bait fisheries (predominately based on the Hawaiian anchovy, *Stolephorus purpureus*) and critical estuarine feeding and nesting habitats for three endangered species of birds in the area surrounding West Loch: the Hawaiian stilt, *Himantopus himantopus knudseni*; the Hawaiian gallinule, *Gallinula chloropus sandwicensis*; and the Hawaiian coot, *Fulica americana alai* (U.S. Department of the Interior, 1970, 1978).

GENERAL SURVEY DESCRIPTION

Six Pearl Harbor monitoring surveys were conducted to evaluate overall butyltin concentrations throughout the harbor. During this period, the Navy also had based in Pearl Harbor three additional test ships (not included in the Pearl Harbor phase of the Two-Harbor Case Study) coated with organotin antifouling paints prior to 1986: the USS *Beaufort* [ATS 2], the USS *Leftwich* [DD 984], and the USS *Omaha* [SSN 692]. These vessels were occasionally moored at berths where sample stations had been established. Seawater samples were collected adjacent to these vessels in order to better understand tributyltin inputs into the environment from a single hull source. (The overall movements of these vessels are shown in figure 8 later in this report.) Other TBT sources, independent of Navy control, such as U.S. Coast Guard ships, foreign naval vessels, and civilian merchant craft visiting the harbor, periodically contributed to harbor loadings; however, these sporadic inputs were not specifically monitored or detected during this study.

During the undocking period of the USS *Badger* (FF 1071), a study was performed to determine environmental tributyltin levels in various regions of Pearl Harbor. Vertical profile samples for water column TBT concentration determinations were collected from several stations at various depths and at various times using specialized equipment designed by NOSC. This transportable system is designed for installation aboard a suitable support craft, which can then be used to gather real-time physical and chemical data while anchored on station or while in transit between locations. This study was repeated in a modified, less-intensive version during the undocking of the USS *Brewton* [FF 1086] and the USS *Davidson* [FF 1045], the next two ships painted in this test series.

An intensive 48-hour sampling series was performed in Pearl Harbor to evaluate short-term temporal variability of TBT levels in the water column. Butyltin concentration gradients were measured near the hull of the *Badger*, the first of three ships to be painted under the test case protocol. Specific accounts for each of the four major tasks is contained in the following sections of this report, including specific sample sites, number of samples, and sampling activity timing.

² Evans, E.C. III (ed.). 1974. *ibid.* §1.0, pp. 3-5, §4.1, pp. 11-16.

³ Evans, E.C. III (ed.). 1974. *ibid.* §2.1, pp. 21-51.

Although not specified as part of the Navy's Pearl Harbor Case Study, harbor-wide monitoring surveys were conducted in Honolulu Harbor, concurrent with several of the Pearl Harbor monitoring efforts, to provide data from a commercial harbor for comparison. These surveys are described in appendix A.

PROCEDURES

HARBOR MONITORING

Pearl Harbor Monitoring Survey Series

Monitoring surveys were conducted during April 1986, February 1987, April 1987, July 1987, October 1987, and January 1988. During each of the six Pearl Harbor field monitoring surveys, sample sites were adjusted to reflect prevailing conditions and concerns, but were selected from the list of stations sampled during the baseline survey of March and April 1986 wherever possible. Oyster tissue samples were not collected during the April 1987 survey, and sediment samples were not included in the July and October 1987 monitoring efforts. The stations surveyed during this series are shown in figures 1 and 2. The station locations for each of the Pearl Harbor monitoring surveys are described in greater detail in appendix B.

The Pearl Harbor survey area was subdivided into several geographic/use-pattern regions to allow for easier evaluation. These consist of the Entrance Channel Region, South Channel, North Channel, Southeast Loch, Rainbow Marina (Aiea Bay in northeast East Loch), Waiau Shoal (in upper East Loch), Middle Loch, West Loch, Drydock #2, and Drydock #4. The regional boundaries are defined by one or more of the following factors: geographic features (West Loch, Middle Loch, Rainbow Marina/Aiea Bay, East Loch/Waiau Shoal), dredged channel limits (Entrance Channel, North Channel, South Channel), and the vessel use-pattern (Southeast Loch, Drydock #2, Drydock #4, Rainbow Marina/Aiea Bay). Stations incorporated into these areas are listed in table 1, and are illustrated in figure 3. Data from stations located at berths or piers occupied by one, or more, of the six Navy test ships (point sources) painted with butyltin antifouling coatings (*Badger*, *Beaufort*, *Brewton*, *Davidson*, *Leftwich*, and *Omaha*; see also table 10, table 11) were considered separately. When those stations were not occupied by a test ship, the data were included in regional mean calculations.

Table 1. Pearl Harbor sample regions.

<u>Region</u>	<u>Stations</u>
Entrance Channel	1, 1A-F, 2, 3, 3B, 5, 5A, 5C
South Channel	7A-C, 8B, 8C, 9A, 13
North Channel	6, 6A, 15, 17, 18, 18A, 20, 21
Southeast Loch	8, 8A, 9, 9B, 10, 10A-C, 11, 11A, 12
Drydock #2	7
Drydock #4	5B
Rainbow Marina	14, 14A, 14B
Waiau Shoal	16
Middle Loch	19, 19A
West Loch	3A, 3C-E, 4

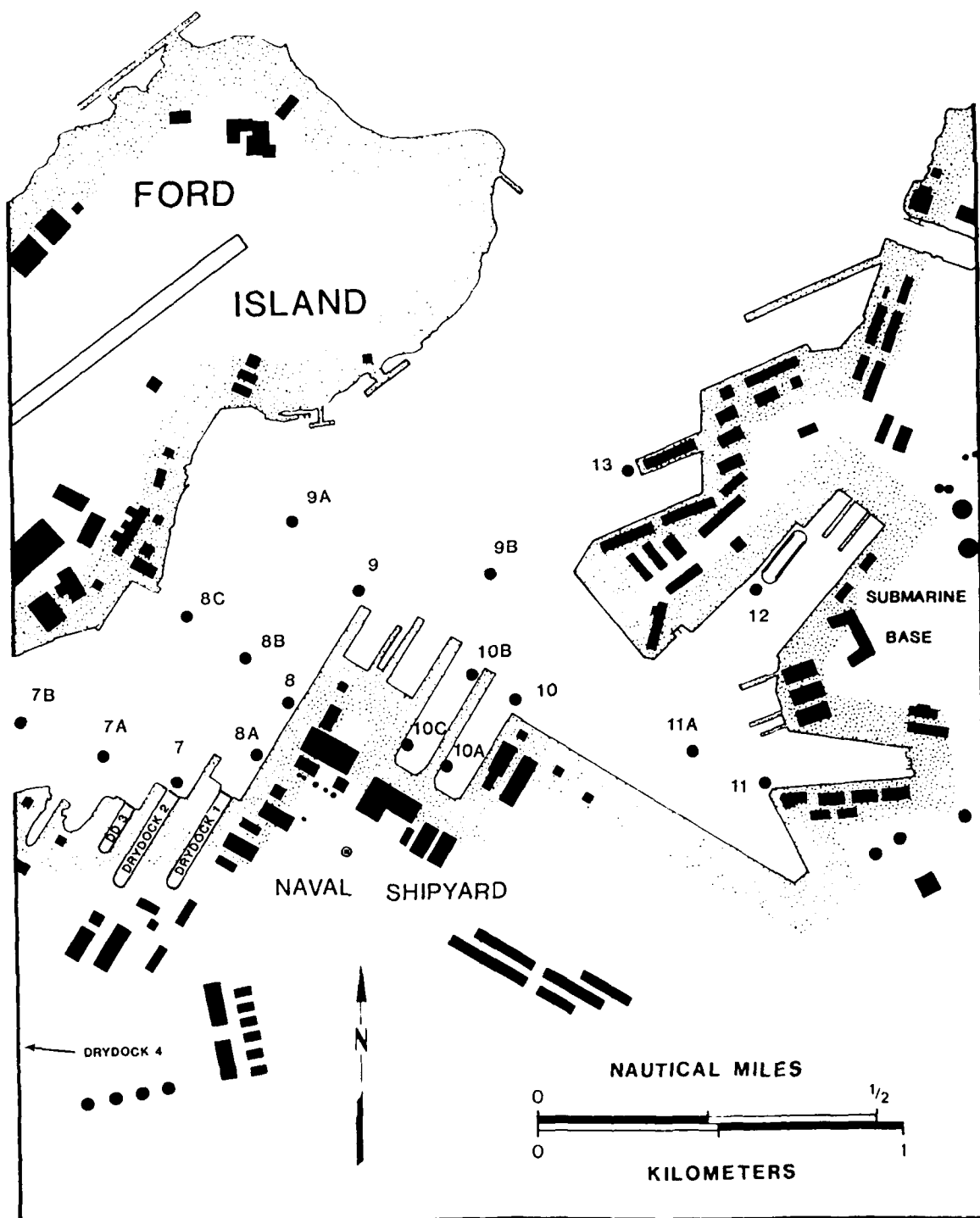


Figure 2. Pearl Harbor Southeast Loch and vicinity station locations.
 Note: This is a composite diagram – various stations were sampled during each individual survey. See appendix B for detailed information.

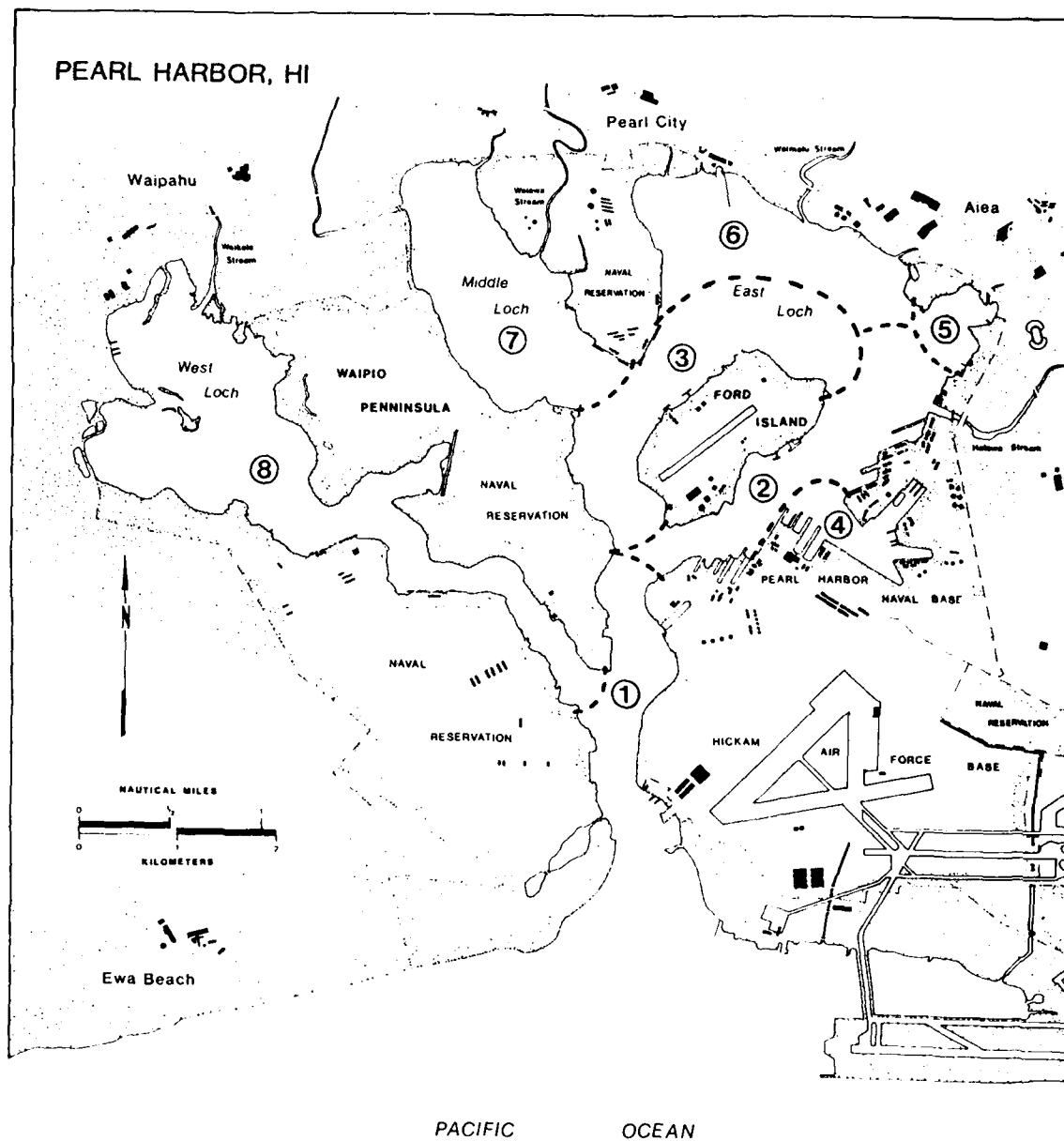


Figure 3. Pearl Harbor area sample regions. Regional identification key numbers for illustrative purposes only. Drydock regions not displayed.

All seawater samples collected during the monitoring survey series were obtained at one-half meter below the surface and at 1 meter above the bottom. Extra caution was exercised to avoid adulteration of the water samples by inclusion of the surface microlayer which can exhibit high concentrations of butyltins (Maguire and Tkacz, 1987). Water samples were collected in 1.0-liter polycarbonate bottles and placed in ice in insulated field sample storage chests until moved (within 8 hours) into the laboratory freezer for storage until analyzed. The analysis of seawater samples was assigned precedence over sediment and tissue sample workup because the Navy's environmental monitoring plans, as well as state and federal government regulatory criteria and standards, primarily address water values.

Sediment samples were obtained with a stainless steel Van Veen grab sampler, which collected approximately 3 to 4 liters of sediment. About 150 ml of sediment from the uppermost 2-cm layer of each grab was carefully removed and placed into 250-ml, high-density polyethylene bottles. Three samples were obtained at each station sampled, and the samples were then handled in the same manner as the water samples until analysis (figures 4 and 5).

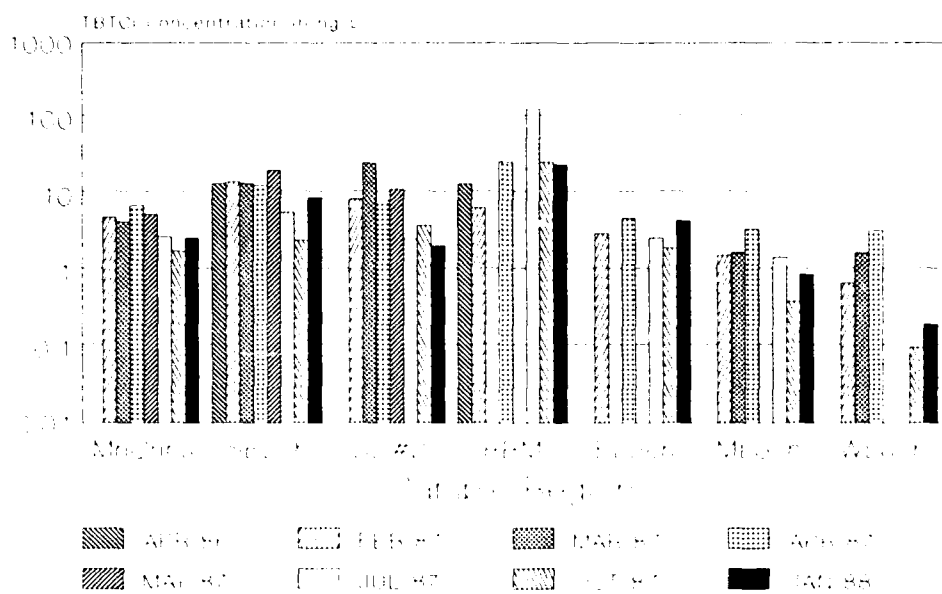
Oyster tissue samples were obtained by collecting 3 to 30 individuals (depending on available size), which were placed on ice until processed. The eastern oyster (*Crassostrea virginica*) or two species of saddle oysters (*Ostrea sandvicensis* and *O. hanleyana*) were collected from available substrata at approximately the same tidal height at each station whenever possible. Lengths of the individual oysters were recorded in the data log for reference. The individual soft tissues were excised using stainless steel and Teflon implements and were pooled to obtain sufficient mass to provide three samples. The pooled tissues were placed within 85-ml polycarbonate centrifuge tubes and frozen until analyzed.

Test-Ship Undocking Phase Surveys

Stations were selected for an intensive 3-day water sampling survey during the undocking period of the *Badger* to evaluate the impact of the Naval Shipyard's undocking procedures on harbor tributyltin concentrations. Most of the stations were located in the immediate area of the drydock region, although outlying areas were also sampled. Water samples were collected using the Marine Environmental Support Craft (MESC), which consists of shipborne, automated sampling and analysis equipment developed in San Diego. In addition, the procedures used for the Pearl Harbor monitoring surveys, described previously, were employed. These studies were performed in conjunction with personnel from the DTRC.

The second and third surveys in this series were modified after reviewing the data obtained during the undocking of the *Badger* and the subsequent Pearl Harbor monitoring survey data. It was decided to examine more closely the outlying areas of the harbor during test ship undocking intervals. Six stations were selected from these regions and comprised far-field stations. The far-field stations were sampled by NOSC personnel on the first and third days following the undocking of each of the next two test ships. The sampling equipment and approach followed during the Pearl Harbor monitoring surveys were used for these two sample periods. These stations were sampled in the same order over each of the 72-hour periods. Triplicate water samples were obtained at each of two depths at each station: at one-half meter below the surface and at 1 meter above the bottom.

Mean Surface Water TBTCI Concentrations



Mean Deep Water TBTCI Concentrations

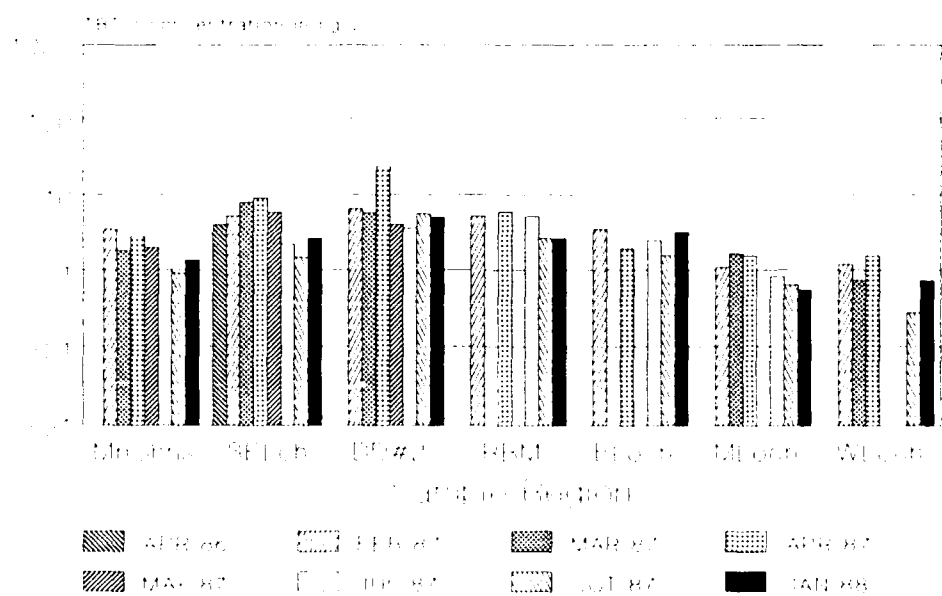


Figure 4. Pearl Harbor water sample summary, April 1986 to January 1988.
Mean surface (upper) and deep (lower) water tributyltin concentrations in ngL^{-1} TBTCI. Point sources (i.e., stations with specific TBT AF-paint test ship present) not included in calculations.

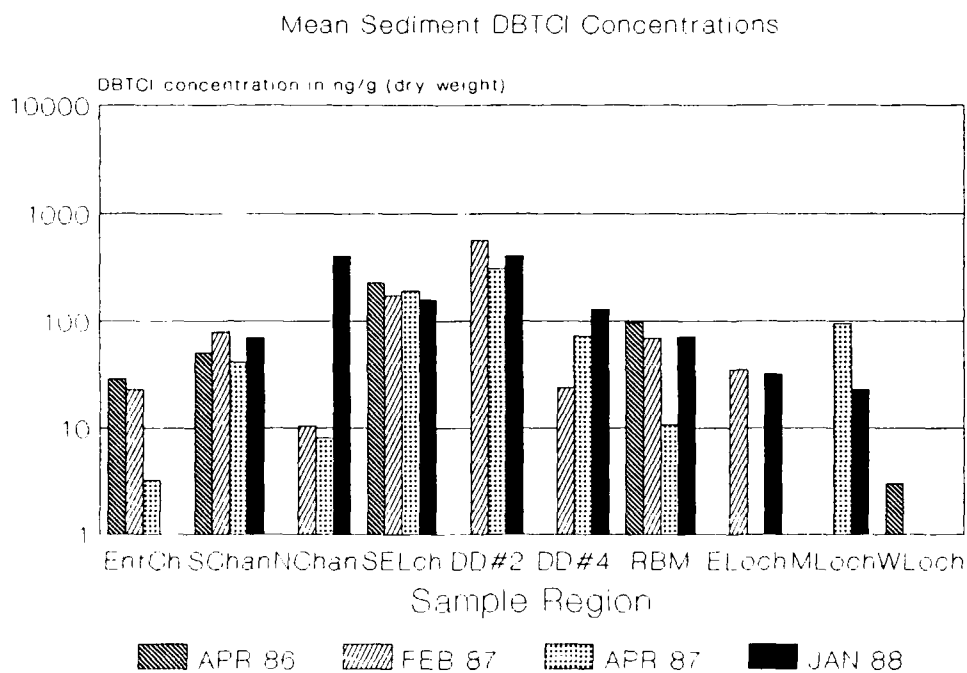
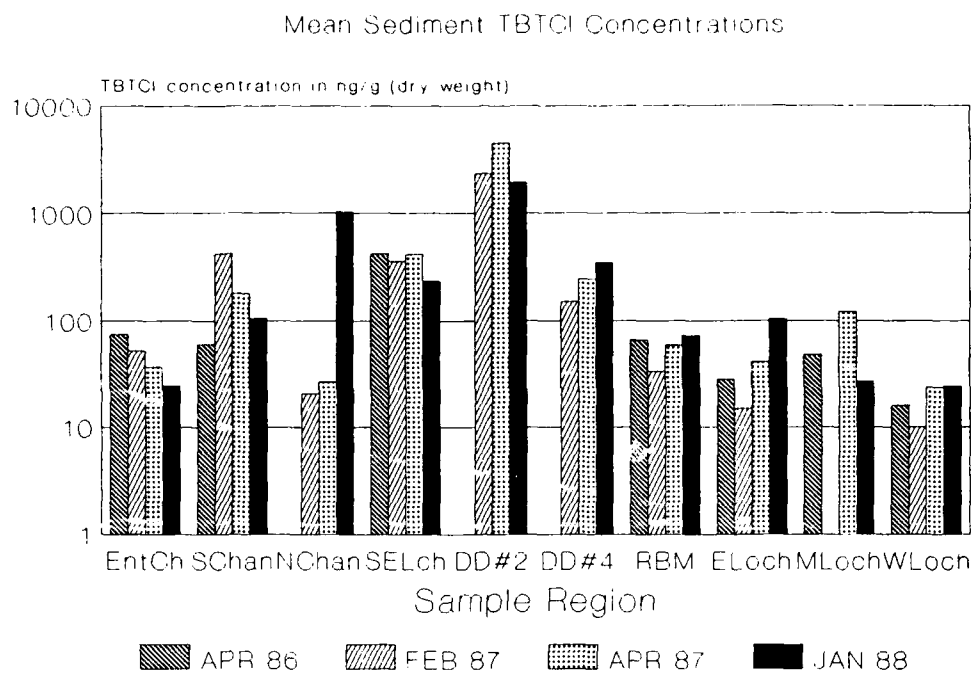


Figure 5. Pearl Harbor sediment sample summary, April 1986 to January 1988. Mean sediment di- (lower) and tri- (upper) butyltin concentrations (as chlorides) in ng/g dry weight.

48-HOUR TIDAL CYCLE STUDY

A 48-hour survey was conducted on 12 to 14 May 1987 to determine short-term variability of tributyltin concentrations in the primary use area of Pearl Harbor. The stations selected were sampled in the same order, approximately every 6 hours. The tidal state and height for each sampling run are shown in table 2. The seawater samples were collected in 1.0-liter polycarbonate bottles in the same manner as the quarterly monitoring surveys and were placed in ice chests until returned to the laboratory where they were frozen.

Table 2. Pearl Harbor 48-hour cycle study tidal conditions.

<u>Sample Period</u>	<u>Tidal State</u>	<u>Tidal Height</u>
1 (121000 MAY)	LOSLK	-0.001 m
2 (121600 MAY)	HISLK	0.676 m
3 (122300 MAY)	LOSLK	0.055 m
4 (130700 MAY)	LOSLK	-0.004 m
5 (131200 MAY)	INCMG	0.179 m
6 (131700 MAY)	HISLK	0.695 m
7 (132400 MAY)	LOSLK	0.050 m
8 (140900 MAY)	LOSLK	-0.071 m

IN-SITU SHIP HULL RELEASE RATE STUDY

The TBT release rates from the test vessels were determined by using enclosed, recirculating, diver-placed dome systems. A partial vacuum is created on a 30-cm-diameter polycarbonate dome fitted with a double knife-edge rubber gasket by placing the dome against the hull and evacuating water from the system via a surface-controlled peristaltic pump. When sufficient vacuum is attained to keep the dome affixed to the hull, water is circulated through the dome and attendant lines via the pump. Six water samples of 20 ml each are collected from the system at 10- to 15-minute intervals without compromising the vacuum or allowing ambient harbor water to enter the enclosed system. The samples are placed immediately on ice, frozen at the end of the day, and analyzed by HD/AAS (Stallard, Cola, and Dooley, 1989) for TBT concentration. Three separate dome systems are normally situated at three separate stations on a given vessel. With knowledge of the dome system volume, hull area enclosed, time of sample collection, and sample concentration, a TBT release rate can be calculated in $\mu\text{g TBT}/\text{cm}^2/\text{day}$. This method has been described in greater detail by Lieberman, Homer, and Seligman (1985).

NEAR-HULL BUTYLTIN CONCENTRATION GRADIENT STUDY

Field measurements of the TBT release rate of the antifouling coating applied to the *Badger* were collected on 14 April 1987 while the ship was moored in Southeast Loch. Concurrent with this procedure, seawater samples were collected along five transects extending away from the port side of the hull at distances of 0.5, 2.0, 5.0, 20, and 50 meters. Single samples were collected at one-half meter below the surface and at 1 meter above the bottom using the same apparatus and procedures employed during the Pearl Harbor monitoring survey series. Deep-water sample depths ranged from 12 to 13 meters. The transects surveyed are depicted in figure 6.

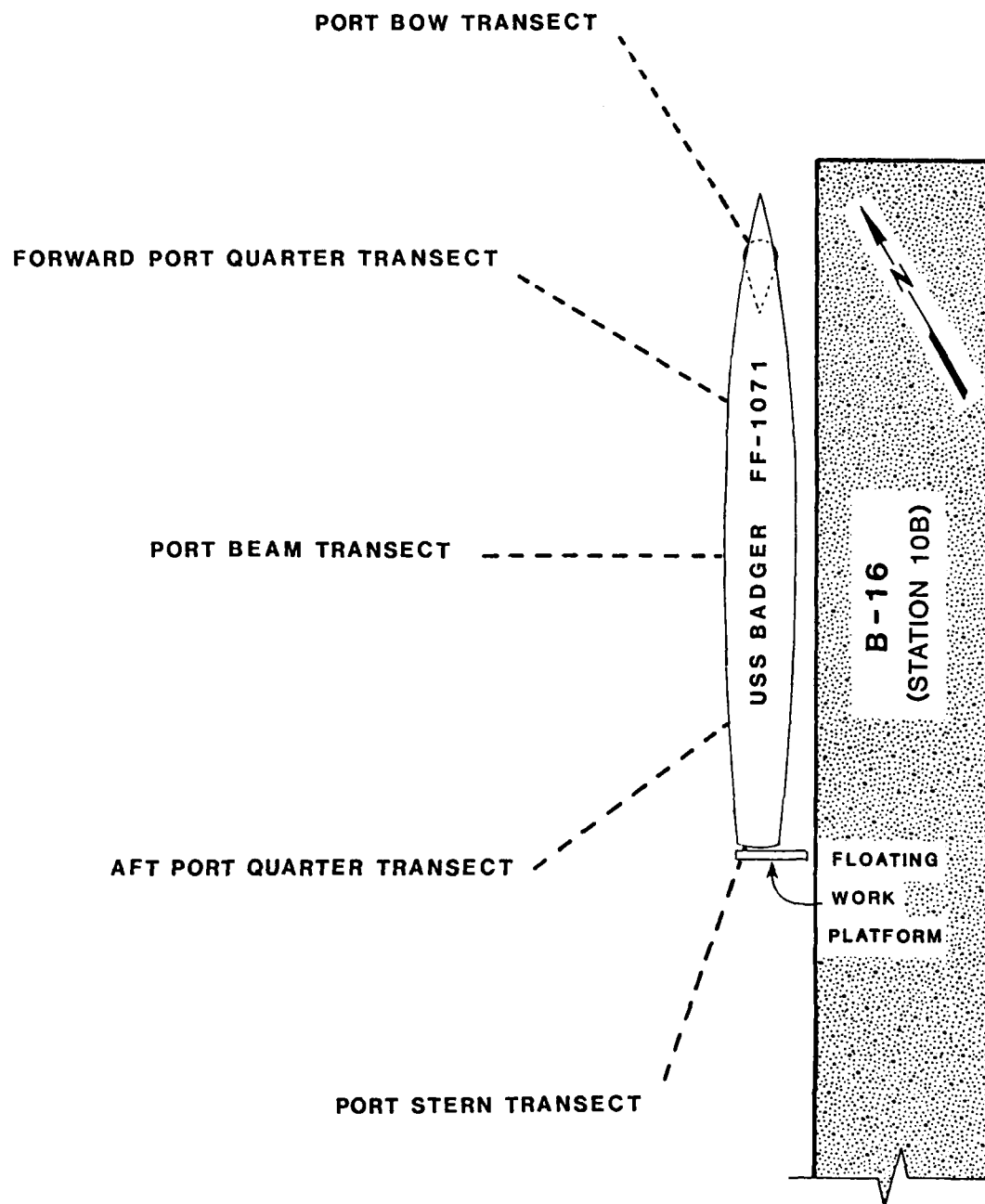


Figure 6. Sample transects. *Badger* (FF 1071) near-hull butyltin concentration gradient study.

SAMPLE ANALYSIS

Water Sample Analysis

Direct determination and speciation of butyltins in seawater was achieved by hydride derivatization followed by purging and trapping the evolved hydrides. The tin hydrides are then volatilized and detected by hydrogen flame atomic absorption spectroscopy (AAS) in a quartz burner.

The method of hydride derivatization and atomic absorption spectroscopic detection (HDAA) was used for measurement of tributyltin (TBT) and its degradation products, dibutyltin (DBT) and monobutyltin (MBT). This was similar to that used for water sample analysis during the baseline surveys of 1984 to 1986 reported in Grovhoug, Fransham, and Seligman (1987). The HDAA technique is described in greater detail in Braman and Tompkins (1979), Hodge, Seidel, and Goldberg (1979), and Valkirs et al. (1985, 1986, and 1987). However, recent optimizations of the method have resulted in a tenfold increase in the sensitivity to 0.3 ng/L of TBT (as the cation). This increased sensitivity allows detection of TBT, DBT, and MBT at much lower levels than was previously possible. The optimizations consist primarily of a new closed end quartz burner design and removal of active sites from the cryogenic trap by careful silanization. These are described in detail in Stallard et al. (1989). Samples collected after January 1987 were analyzed using the optimized system. Care must be taken, therefore, in comparing low-level data from earlier surveys due to this increase in detection limits. Analysis of samples for TBT by HDAA has been validated at NOSC with reference samples in distilled water provided by the National Bureau of Standards, Washington, DC (Blair, Olson, Brinckman, Paule, and Becker, 1986).

All water sample analysis data presented in this report consider only the hydride-reducible portion of the sample, since any sample may contain butyltins unavailable for derivatization by sodium borohydride. All butyltin values in this document are reported as the chlorides for each species (e.g., $\text{Bu}_3\text{Sn} + \text{Cl}$). Interferences with the hydride derivatization process may be caused by compounds occurring in the sample such as diesel fuels, or other hydrocarbon compounds, and high levels of sulfides. In general, however, matrix interference has not been a significant problem.

Sediment and Oyster Tissue Sample Analysis

Frozen tissue samples are thawed and homogenized in centrifuge tubes with a Tekmar TissueMizer. Extractions are performed in 50-ml polypropylene centrifuge tubes. Ten ml of 50-percent HCl and 20 ml of methylene chloride are added to approximately 5- to 10-g homogenized tissue or sediment. The solvent mix is vortexed for 2 minutes and placed on a reciprocating shaker for 3 hours. After centrifugation, a 2-ml aliquot of the methylene chloride layer is removed from each sample and dried under a gentle air stream. The extracts are reconstituted in hexane and 10 μl of internal standard is added. The extracts are then derivatized with 250- μl hexyl magnesium bromide. After 15 minutes, 0.4N H_2SO_4 is added to hydrolyze the remaining Grignard reagent. After centrifuging, the top layer is removed and passed through a SUPELCO florisil column rinsed with hexane. The cleaned extracts are dried under air and

reconstituted in 200- μ l hexane. The butyltin concentrations are quantified using a gas chromatograph equipped with a flame photometric detector. The sensitivity at the detector is 0.1 ng for TBT (Stallard, et al., 1989).

RESULTS

PEARL HARBOR MONITORING SURVEY SERIES

April 1986

Water samples were collected from 18 stations in Pearl Harbor during the initial monitoring surveys performed during April 1986. Samples obtained from stations in Southeast Loch exhibited a mean surface water TBT value of 13.8 ngL^{-1} . Deep-water samples from Southeast Loch averaged 4.3 ngL^{-1} TBT. Mean tributyltin concentrations in Rainbow Marina surface water (stations 14 and 14B) were $19 \pm 1.2 \text{ ngL}^{-1}$ at the main pier and $5.0 \pm 7.1 \text{ ngL}^{-1}$ along the shoreline, with an area mean of 14 ngL^{-1} . Water samples from West Loch, Middle Loch, and the remaining regions in Pearl Harbor contained no detectable tributyltin. Regional water column TBT levels for Pearl Harbor during April 1986 are listed in table 3 and illustrated in figure 4.

Table 3. Water column concentration summary for Pearl Harbor sample regions. Surface and deep water tributyltin levels (as chlorides) in ngL^{-1} (mean $\pm$ sd). Point source data (i.e., stations with specific Navy TBT test ship present) not included in calculations. {-} = no data.

Region	Layer	Apr 1986	Feb 1987	Mar 1987	Apr 1987	May 1987	Jul 1987	Oct 1987	Jan 1988
Entrance	S	0.0 ± 0.0	3.6 ± 1.3	4.1 ± 3.4	9.9 ± 3.2	4.7 ± 1.9	2.7 ± 1.0	1.0 ± 0.7	2.8 ± 2.0
Channel	D	0.0 ± 0.0	2.1 ± 0.3	1.7 ± 0.8	1.8 ± 0.4	2.3 ± 1.2	0.8 ± 0.2	0.5 ± 0.5	1.5 ± 0.9
South	S	-	6.0 ± 3.5	6.5 ± 4.7	4.0 ± 4.1	-	2.3 ± 0.6	2.2 ± 0.7	4.8 ± 1.1
Channel	D	-	4.3 ± 2.8	2.7 ± 1.1	4.6 ± 1.8	-	1.3 ± 0.2	1.8 ± 1.3	2.4 ± 1.5
North	S	-	3.3 ± 1.7	3.9 ± 1.4	4.3	5.0 ± 2.5	3.6 ± 0.2	2.0 ± 1.1	2.0 ± 0.9
Channel	D	-	1.7 ± 0.4	1.8 ± 0.7	1.9	2.0 ± 0.8	1.7 ± 0.6	0.8 ± 0.8	1.0 ± 0.4
Southeast	S	14 ± 10	15 ± 8.3	14 ± 5.3	13 ± 5.3	21 ± 12	5.8 ± 2.4	2.5 ± 1.3	9.2 ± 3.6
Loch	D	4.3 ± 4.1	5.6 ± 1.2	8.5 ± 7.2	9.7 ± 5.1	6.3 ± 3.3	2.4 ± 0.6	1.6 ± 0.4	2.9 ± 0.5
Drydock #2	S	-	8.7 ± 3.3	26 ± 25	8.3 ± 0.4	12 ± 6.3	2.6 ± 0.2	3.9 ± 3.4	2.1 ± 0.2
(Shipyard)	D	-	7.0 ± 3.7	6.3 ± 2.0	25 ± 17	4.4 ± 1.8	3.9 ± 1.3	6.1 ± 4.5	5.4 ± 0.7
Drydock #4	S	-	5.7 ± 1.7	-	3.4 ± 0.6	-	2.5 ± 0.3	1.8 ± 1.3	1.5 ± 0.6
(Shipyard)	D	-	3.7 ± 2.1	-	1.2 ± 0.9	-	1.7 ± 0.2	0.4 ± 0.1	1.6 ± 0.4
Rainbow	S	14 ± 3.6	6.7 ± 0.2	-	27 ± 1.3	-	$130 \pm 61^{(1)}$	26 ± 10	25 ± 14
Marina	D	0.0 ± 0.0	5.6 ± 1.2	-	6.4 ± 1.8	-	$5.6 \pm 5.7^{(1)}$	2.9 ± 1.0	2.9 ± 0.8
Wai'au Shoal	S	0.0 ± 0.0	3.1 ± 0.8	-	4.9 ± 0.8	-	2.7	2.0 ± 0.4	4.6 ± 2.4
(East Loch)	D	0.0 ± 0.0	3.8 ± 1.2	-	2.1 ± 0.6	-	2.7	1.7 ± 0.7	3.5 ± 0.8
Middle	S	0.0 ± 0.0	1.6 ± 0.6	1.7 ± 0.5	3.5 ± 2.1	-	1.5 ± 0.2	0.4 ± 0.6	0.9 ± 0.8
Loch	D	0.0 ± 0.0	1.2 ± 1.3	1.8 ± 1.2	1.7 ± 0.2	-	0.9 ± 0.6	0.7 ± 0.8	0.6 ± 0.5
West	S	0.0 ± 0.0	0.7 ± 0.5	1.7 ± 1.7	$3.4 \pm 0.6^{(2)}$	-	0.0 ± 0.0	0.1 ± 0.1	0.2 ± 0.3
Loch	D	-	1.3 ± 1.1	0.8 ± 0.2	$1.7 \pm 0.6^{(2)}$	-	0.0 ± 0.0	0.3 ± 0.2	0.8 ± 0.6

Notes: (1) Two 35-40 ft sailboats present at RBM guest dock (approx. 80 m S of station 14) with new TBT AF paint (personal communication with owners).
(2) Samples collected at center of West Loch entrance (station 3E) only, adjacent to main Entrance Channel, due to operational considerations.

Sediments were collected from the same locations as were the water samples. Mean regional TBT values ranged from 16.0 to 420 ng/g, with the highest levels recorded from the Southeast Loch region and the lowest from West Loch. The South Channel, Entrance Channel, and Rainbow Marina areas averaged TBT concentrations

between 60 and 75 ng/g. East Loch (Waiiau Shoal) and Middle Loch samples averaged 28.0 and 48.0 ng/g respectively. These data are summarized in table 4.

Table 4. Sediment concentration summary for the Pearl Harbor sample regions. Di- and tributyltin levels (as chlorides) in ng/g dry weight (mean $\pm$ standard deviation). {-} = no data.

Region	Butyltin Species	Apr 1986	Feb 1987	Apr 1987	Jan 1988
Entrance	TBTCl	74 $\pm$ 59	52 $\pm$ 56	37 $\pm$ 28	24 $\pm$ 15
Channel	DBTCl	29 $\pm$ 30	23 $\pm$ 32	3.2 $\pm$ 6.0	0.0 $\pm$ 0.0
South	TBTCl	60 $\pm$ 17	420 $\pm$ 430	180 $\pm$ 220	110 $\pm$ 67
Channel	DBTCl	51 $\pm$ 23	79 $\pm$ 62	42 $\pm$ 55	70 $\pm$ 65
North	TBTCl	-	21 $\pm$ 17	26 $\pm$ 15	1000 $\pm$ 780
Channel	DBTCl	-	10 $\pm$ 16	8.0 $\pm$ 12	400 $\pm$ 290
Southeast	TBTCl	420 $\pm$ 300	360 $\pm$ 390	420 $\pm$ 500	230 $\pm$ 120
Loch	DBTCl	230 $\pm$ 150	170 $\pm$ 190	190 $\pm$ 220	160 $\pm$ 97
Drydock #2	TBTCl	-	2300 $\pm$ 920	4500 $\pm$ 280	1900 $\pm$ 330
(Shipyards)	DBTCl	-	570 $\pm$ 200	310 $\pm$ 21	400 $\pm$ 290
Drydock #4	TBTCl	-	150 $\pm$ 51	240 $\pm$ 6.0	350 $\pm$ 85
(Shipyards)	DBTCl	-	24 $\pm$ 23	73 $\pm$ 5.8	130 $\pm$ 18
Rainbow	TBTCl	66 $\pm$ 8.4	33 $\pm$ 5.0	59 $\pm$ 11	72
Marina	DBTCl	98 $\pm$ 31	69 $\pm$ 4.2	11 $\pm$ 18	72
Waiiau Shoal	TBTCl	28 $\pm$ 5.6	15 $\pm$ 4.2	41 $\pm$ 3.0	100
(East Loch)	DBTCl	0.0 $\pm$ 0.0	35 $\pm$ 33	0.0 $\pm$ 0.0	32
Middle	TBTCl	48	-	120 $\pm$ 78	27 $\pm$ 38
Loch	DBTCl	0.0	-	95 $\pm$ 65	23 $\pm$ 33
West	TBTCl	16 $\pm$ 6.0	10 $\pm$ 8.8	23 $\pm$ 21	24 $\pm$ 17
Loch	DBTCl	3.0 $\pm$ 4.2	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0

Notes: Includes samples collected adjacent to U.S. Army 5th Transportation Company Heavy Boat facility, Ford Island.

Oyster tissue samples from Pearl Harbor collected during the April 1986 monitoring survey exhibited tributyltin levels ranging from undetectable to 520 ng/g. The highest TBT levels were observed in samples from Rainbow Marina with a mean content of 350 ng/g. Samples collected from the Entrance Channel region exhibited a mean of 45 ng/g, while oysters collected from West Loch contained no detectable tributyltin. Mean butyltin concentrations from oyster tissue and ambient surface water samples are recorded in table 5.

February 1987

The second Pearl Harbor monitoring survey of February 1987 was timed to provide a pre-test series of samples prior to the painting and departure from drydock of the *Badger*, the first of the three test ships of the Two-Harbor Case Study. Regional Pearl Harbor water TBT concentration means for February 1987 are listed in table 3, and illustrated in figure 4. The lowest TBT levels were observed in West Loch and Middle Loch. Southeast Loch exhibited a mean surface water TBT concentration of 15 ngL⁻¹. All other areas in Pearl Harbor averaged surface TBT concentrations between 3.0 and 9.0 ngL⁻¹. Deep-water concentrations for all regions averaged 7.0 ngL⁻¹, or less.

Additional stations were included in the water sampling regimen to provide data along concentric arcs extending away from the drydock which held the *Badger*. These arcs were formed by stations 7A-8B (inner arc), and 7B-8C-9A (outer arc) with the focus located at station 7 (adjacent to the caisson of drydock #2; see also figure 2). Mean TBT content along the inner arc was 8.3 ngL^{-1} at the surface and 6.7 ngL^{-1} near the bottom (mean depth = 12.7 meters). The outer curve exhibited mean levels of 4.5 ngL^{-1} at the surface and 2.7 ngL^{-1} at 14.8 meters average depth. Waters adjacent to the drydock caisson exhibited mean TBT levels of 8.7 ngL^{-1} at 0.5 meters and 7.0 ngL^{-1} at 15.5 meters.

Sediment samples from the outer regions (Entrance Channel, North Channel, Rainbow Marina, East Loch, and West Loch) exhibited mean TBT concentrations ranging from 10 to 52 ng/g. Middle Loch samples exhibited matrix interference effects during chemical analysis and were not quantifiable. The Southeast Loch and South Channel regions showed TBT levels of 360 and 420 ng/g respectively. The two drydocks exhibited sediment TBT levels of 2300 ng/g at Drydock #2 and 150 ng/g at Drydock #4. These data are recapitulated in table 4.

Oyster tissue samples were collected from six sample regions in Pearl Harbor during the second monitoring survey. Oyster tissues exhibited mean tributyltin concentrations ranging from < 70 to 360 ng/g wet weight. Mean oyster tissue TBT and DBT concentrations and the corresponding surface water levels are listed in table 5. Oyster tissues from Rainbow Marina exhibited the highest mean TBT concentration observed during this survey at 360 ng/g. Samples from Drydock #2 (station 7) displayed an average of 240 ng/g. Oyster tissue samples from Waiau Shoal exhibited a mean TBT concentration of 160 ng/g, while those from station 6 in the North Channel region averaged 110 ng/g. Oysters from the Entrance Channel region exhibited a mean TBT level of 41 ng/g. Oyster tissues from the West Loch region contained no detectable TBT.

April 1987

The first of the quarterly case study monitoring surveys (the third Pearl Harbor monitoring survey overall) planned under the Pearl Harbor Case Study was performed during 15 to 16 April 1987. Eighty-two water samples were collected from 25 stations for butyltin analysis. The stations surveyed followed the pattern established during the monitoring survey of February 1987. Two stations located on Ford Island in the North Channel sample region were occupied by vessels with organotin-based AF coatings. The *Beaufort* and the *LTCOL John U.D. Page*, a 338-foot-long Base Discharge Lighter coated with SPC-4 (an organotin-based AF paint) belonging to the U.S. Army Transportation Command 5th Transportation Company Heavy Boat.⁴ Data obtained from samples collected at stations adjacent (i.e., less than 10 m) to any of the AF-paint test ships (point sources) were excluded from regional calculations.

Regional tributyltin concentrations in Pearl Harbor surface waters ranged from 3.4 ngL^{-1} in West Loch to 27 ngL^{-1} in Rainbow Marina. Deep-water samples during this period averaged 1.2 to 25 ngL^{-1} TBT. The Drydock #4, Entrance Channel, North Channel, Middle Loch, and West Loch regions all exhibited deep-water TBT

⁴ The *LTCOL John U.D. Page* was later decommissioned prior to the commencement of the January 1989 monitoring survey.

concentrations less than 2.0 ngL^{-1} . Pearl Harbor water sample region TBT concentration means for April 1987 are listed in table 3 and illustrated in figure 4.

Sediment samples from Pearl Harbor exhibited mean TBT concentrations extending from 23 to 4500 ng/g; the most elevated levels being observed at Drydock #2. The Drydock #4 and Southeast Loch regions exhibited average TBT concentrations of 240 and 420 ng/g respectively. All other regions in Pearl Harbor displayed mean sediment TBT concentrations of less than 180 ng/g (see table 4 for details).

July 1987

The second quarterly (fourth overall) monitoring survey of Pearl Harbor was performed on 28 July 1987. The sampling scheme was slightly modified based upon information gathered during the previous survey efforts, with 18 stations being sampled. A total of 72 water samples represented each of the sample regions within Pearl Harbor. The highest tributyltin concentrations were observed in surface water samples obtained at Rainbow Marina, which exhibited a mean level of 130 ngL^{-1} TBT. This seemed to coincide with the recent appearance in the marina of two large (35 to 40 ft) sailing vessels, both of which had been freshly painted with TBT AF paint (personal communication with owners). These data were not, however, excluded from regional data calculations, as the guest dock where the vessels were moored was over 75 meters distant from the sample site; thus, these vessels were not regarded as a point source. No comparably elevated levels were seen at any other station location within Pearl Harbor. Mean surface water TBT concentrations throughout the rest of the harbor ranged from undetectable, in West Loch, to 5.8 ngL^{-1} in Southeast Loch. Regional water TBT levels during this period are listed in table 3 and illustrated in figure 4.

Oyster tissues were collected from West Loch, Drydock #2, and from McGrew Point across Aiea Bay from Rainbow Marina (the oyster population at the regular Rainbow Marina sample station was severely depleted at this time) during the July 1987 monitoring survey effort. Tributyltin levels in tissue samples ranged from <25 to 60 ng/g. Tissue sample data from the Drydock #2 region and McGrew Point were not notably different, while samples from the West Loch region displayed no detectable TBT in any of the samples collected. Dibutyltin was not detectable in any of the samples from Pearl Harbor. Mean TBT and DBT tissue concentration data for this period, along with the corresponding surface water sample data, are listed in table 5.

Table 5. Pearl Harbor oyster tissue butyltin concentration summary. Mean tissue TBT and DBT concentrations in ng/g (wet weight as chlorides). Corresponding mean ambient surface water TBT and DBT levels in ngL^{-1} . {-} = no data.

Tissue Samples			Water Samples	
Station [Date]	TBTCl	DBTCl	TBTCl	DBTCl
03A [Apr 1986]	< 70	-	0.0 ± 0.0	0.0 ± 0.0
03A [Feb 1987]	< 70	< 70	0.5 ± 0.5	0.9 ± 0.4
03A [Jul 1987]	< 25	< 25	0.0 ± 0.0	0.5 ± 0.2
03A [Jan 1988]	< 25	< 25	0.1 ± 0.2	1.1 ± 0.7
05A [Apr 1986]	< 90	-	0.0 ± 0.0	0.0 ± 0.0
05A [Feb 1987]	41 ± 37	130 ± 140	$4.1 \pm 0.5^{(1)}$	$6.8 \pm 1.8^{(1)}$
06 [Feb 1987]	110 ± 100	66 ± 85	4.7 ± 1.2	6.8 ± 4.5
07 [Feb 1987]	240 ± 37	460 ± 170	8.7 ± 3.3	11 ± 9.1
07 [Jul 1987]	63 ± 15	< 25	2.6 ± 0.2	6.4 ± 0.3
07 [Jan 1988]	88 ± 15	74 ± 26	2.1 ± 0.2	4.5 ± 0.4
14B [Apr 1986]	350 ± 150	-	5.0 ± 7.1	4.0 ± 0.0
14B [Feb 1987] ⁽²⁾	360 ± 170	410 ± 130	6.7 ± 0.2	7.8 ± 1.6
14A [Jul 1987] ⁽²⁾	60 ± 17	< 25	130 ± 60	15 ± 4.2
14A [Jan 1988]	190 ± 36	< 30	25 ± 14	14 ± 7.3
16 [Feb 1987]	160 ± 41	< 70	3.1 ± 0.8	5.7 ± 1.5
16 [Jan 1988]	140 ± 33	< 25	4.6 ± 2.3	6.3 ± 0.7

Notes: (1) Water sample data from Station 5
 (2) Oyster tissues from 14B not available (see text)

October 1987

The fifth harborwide monitoring (third quarterly) survey of Pearl Harbor was conducted on 15 and 16 October 1987. Water samples (only) were collected at 18 stations, which provided double station coverage of West Loch, Middle Loch, the Entrance Channel, and South Channel. Triple station coverage was established in the North Channel sample region and in Southeast Loch. Single station coverage was provided for Drydocks #2 and #4, Waiau Shoal, and Rainbow Marina, as previously practiced. Average surface water tributyltin concentrations ranged from 0.1 ngL^{-1} to 26 ngL^{-1} . Water collected from the Entrance Channel (mean level: 1.0 ngL^{-1}), West Loch (mean level: 0.1 ngL^{-1}), and the Middle Loch (mean level: 0.4 ngL^{-1}) sample regions exhibited total TBT concentrations less than, or equal to, 1.0 ngL^{-1} . Seventy-five percent of the samples from the upper reaches of West Loch and 50 percent of the Middle Loch samples contained no detectable TBT concentrations.

The highest overall levels of TBT (15 ngL^{-1}) were found in Rainbow Marina. While significantly lower than levels encountered during the survey of July 1987, the surface water TBT concentration at Rainbow Marina remained 10 times that seen in Southeast Loch. Overall levels of TBT in the remaining sample regions of Pearl Harbor ranged from 1.1 ngL^{-1} at Drydock #4 to 5.0 ngL^{-1} at Drydock #2. Mean water sample TBT concentrations for the October 1987 survey are summarized in table 3 and illustrated in figure 4.

January 1988

The sixth harborwide monitoring (fourth quarterly) survey of Pearl Harbor was conducted on 19 and 20 January 1988. Water and sediment samples were

collected at 18 stations, which provided double station coverage of West Loch, Middle Loch, the Entrance Channel, and South Channel. Triple station coverage was provided for the North Channel sample region and within Southeast Loch. Single station coverage was provided for Drydocks #2 and #4, Waiau Shoal, and Rainbow Marina. Surface water sample means ranged in tributyltin concentration from undetectable to 25 ngL^{-1} . Water collected from West Loch and Middle Loch exhibited mean total TBT concentrations lower than 1.0 ngL^{-1} . The highest overall levels of TBT were displayed in Rainbow Marina, which exhibited a surface water mean TBT concentration three times higher than Southeast Loch and approximately 10 times that of the rest of Pearl Harbor. Both drydock stations showed no apparent change in water column TBT concentrations from October 1987 levels. The Southeast Loch surface water mean, while approximately three times the October 1987 level, was still less than one-half that exhibited in the region throughout the entire series of environmental surveys performed to date. Mean water sample TBT concentrations for January 1988 are summarized in table 3 and are illustrated in figure 4.

Sediment samples from Pearl Harbor exhibited mean TBT concentrations ranging from 24 to 1900 ng/g; the most elevated levels being observed at Drydock #2. The Drydock #4 and Southeast Loch regions exhibited average TBT concentrations of 350 and 230 ng/g respectively. Sediments from the North Channel region included samples collected adjacent to the U.S. Army 5th Transportation Company Heavy Boat facility at Ford Island (near the berth used for many years by the *LTCOL John U.D. Page*) adjacent to the associated small boat maintenance activity. These samples contributed to the North Channel's mean regional TBT concentration of 1000 ng/g. All other regions in Pearl Harbor displayed mean sediment TBT concentrations of less than 110 ng/g (see table 4 for details).

Tissue samples were collected from stations in the West Loch, Waiau Shoal (East Loch), Drydock #2, and from McGrew Point across Aiea Bay from Rainbow Marina (the oyster population at the regular Rainbow Marina sample station continued to be severely limited at this time) during the January 1988 survey. Tributyltin levels in individual (pooled) tissue samples ranged from 0.0 to 210 ng/g. Tissue sample data from the Drydock #2 region and those from Waiau Shoal in upper East Loch were not significantly different from those collected in these regions during July 1987, although DBT levels were moderately higher.

Oyster samples from McGrew Point (in the Rainbow Marina region) exhibited a mean TBT level three times greater than did samples collected from the same area six months earlier. Dibutyltin levels were also notably higher in tissues during January 1988 as opposed to July 1987, but were still far lower than levels recorded from tissues collected at the primary Rainbow Marina station (see table 5). Tissue samples from the West Loch region displayed no detectable butyltin (either TBT or DBT). Oyster populations in the West Loch region were noted to be ample and individuals apparently vigorous (observation only). Mean TBT and DBT tissue concentration data, along with the corresponding surface water sample data, are listed in table 5.

TEST-SHIP UNDOCKING PHASE SURVEYS

On 2 March 1987, immediately prior to the undocking of the *Badger*, water samples from the center of Southeast Loch exhibited TBT concentrations of 16 ngL^{-1}

at the surface (1.0 meter), 19 ngL^{-1} at 3.9 meters, and 2.1 ngL^{-1} at 8.2 meters. On 3 March 1987, during the de-watering and cleanup of the drydock and transfer of the *Badger* to her assigned berth, stations 1C, 3E, 5C, 7, 7C, and 9A were profiled. The highest surface water tributyltin levels were exhibited at station 7 (adjacent to the drydock caisson), which showed average levels of 13.1 ngL^{-1} at the surface, 9.1 ngL^{-1} at 7.0 meters, 10 ngL^{-1} at 10.2 meters, and 4.9 ngL^{-1} at 14.0 meters. The lowest overall TBT levels were exhibited at stations 1C, in the entrance channel, and station 3E, at the entrance to West Loch. Station 1C (located near the outfall of a sewage treatment plant) exhibited mean TBT concentrations of 1.9, 2.8, and 1.7 ngL^{-1} at depths of 1.0, 6.2, and 11.0 meters respectively. Samples collected at station 3E showed TBT levels of 2.1 ngL^{-1} at a depth of 1.0 meter, 1.7 ngL^{-1} at 5.8 meters, and 0.8 ngL^{-1} at 12.6 meters.

Stations 5C, 7C, and 9A were sampled to provide a transect along the main channel extending from approximately 1.2 km south of the drydock to 0.8 km to the north of the drydock. Surface water samples at both stations 7C and 9A exhibited TBT concentrations of 6.2 ngL^{-1} , while water samples at station 5C showed a mean TBT level of 4.1 ngL^{-1} at the surface. Samples at stations 7C and 9A showed TBT levels of 6.9 and 6.5 ngL^{-1} (midwater) and 4.9 and 3.8 ngL^{-1} (deepwater) respectively. Tributyltin concentrations at station 5C were 3.1 ngL^{-1} (at 5.1 meters), 4.2 ngL^{-1} (at 8.9 meters), and 1.5 ngL^{-1} (at 14.2 meters).

On 4 March 1987, water samples were again collected from the center of Southeast Loch. The surface water TBT concentration was 13.0 ngL^{-1} . Tributyltin concentrations were 14.6 ngL^{-1} at a depth of 5.2 meters and 17.8 ngL^{-1} at 11.3 meters. On 5 March 1987, water samples collected at Drydock #2 showed TBT levels of 27.0 ngL^{-1} at the surface, 1.9 ngL^{-1} at a depth of 3.8 meters, 3.1 ngL^{-1} at 11.3 meters, and 5.3 ngL^{-1} at 15.4 meters. Water samples from station 7C showed TBT levels of 5.8 ngL^{-1} , 9.3 ngL^{-1} , and 2.7 ngL^{-1} from surface to bottom. Station 9A exhibited similar concentrations. Both of these stations are located in the South Channel region. Integrated means for the period surrounding the undocking of *Badger* (including background samples acquired prior to undocking) are summarized in table 3. Data for the 72-hour period from 3 to 5 March (Day 1 and Day 3 after undocking are combined under the "Post" column) are summarized in table 6.

Table 6. Combined mean regional water column tributyltin concentrations, test-ship undocking-phase surveys. *Badger* pre-undocking data compiled from special sample series. *Brewton* and *Davidson* pre-undocking data derived from July 1987 harborwide monitoring survey (except as noted). Post-undocking regional data derived from samples collected from 1 and 3 days (combined) following undocking event. Water column levels in ngL⁻¹ TBTCI (mean $\pm$ s.d.). {-} = no data.

Sample Region	Layer	<i>Badger</i>		Test Ship <i>Brewton</i>		<i>Davidson</i>	
		Pre-	Post-	Pre-	Post- ⁽²⁾	Pre-	Post- ⁽²⁾
Drydock ⁽¹⁾	S	11 $\pm$ 4.9	34 $\pm$ 29	2.6 $\pm$ 0.2	6.0 ⁽²⁾	2.6 $\pm$ 0.2	73 ⁽²⁾
	D	6.5 $\pm$ 2.1	6.2 $\pm$ 1.8	3.9 $\pm$ 1.3	0.0 ⁽²⁾	3.9 $\pm$ 1.3	5.0 ⁽²⁾
Southeast Loch	S	22 $\pm$ 23	13 $\pm$ 5.9	5.8 $\pm$ 2.4	-0.0 ⁽²⁾	5.8 $\pm$ 2.4	-
	D	7.5 $\pm$ 6.4	8.5 $\pm$ 7.2	2.4 $\pm$ 0.6 ⁽²⁾	4.0	2.4 $\pm$ 0.6	-
South Channel	S	6.3 $\pm$ 5.1	6.9 $\pm$ 4.5	0.0 $\pm$ 0.0 ⁽²⁾	0.0 $\pm$ 0.0 ⁽²⁾	0.0 ⁽²⁾	4.0 ⁽²⁾
	D	13 $\pm$ 8.5	2.9 $\pm$ 1.2	3.5 $\pm$ 0.7	6.7 $\pm$ 4.2 ⁽²⁾	4.0 ⁽²⁾	2
North Channel	S	4.0 $\pm$ 2.8	2.4	5.0 $\pm$ 2.5	1.3 $\pm$ 0.6	5.0 $\pm$ 2.5	0.4 $\pm$ 0.3
	D	17 $\pm$ 9.9	1.1	2.0 $\pm$ 0.8	1.2 $\pm$ 0.8	2.0 $\pm$ 0.8	1.2 $\pm$ 1.2
Entrance Channel	S	9.0 $\pm$ 8.5	3.9 $\pm$ 2.1	2.7 $\pm$ 1.0	0.90.9	2.7 $\pm$ 1.0	0.8 $\pm$ 1.7
	D	6.5 $\pm$ 2.1	1.7 $\pm$ 0.8	0.8 $\pm$ 0.2	1.0 $\pm$ 0.6	0.8 $\pm$ 0.2	0.5 $\pm$ 0.5
West Loch	S	-	2.1 $\pm$ 1.9	0.0 $\pm$ 0.0	0.3 $\pm$ 0.9	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0
	D	-	0.8 $\pm$ 0.2	0.0 $\pm$ 0.0	0.7 $\pm$ 0.4	0.0 $\pm$ 0.0	0.2 $\pm$ 0.2
Middle Loch	S	-	2.2	1.5 $\pm$ 0.2	1.4 $\pm$ 1.3	1.5 $\pm$ 0.2	0.2 $\pm$ 0.3
	D	-	3.2	0.9 $\pm$ 0.6	0.7 $\pm$ 0.5	0.9 $\pm$ 0.6	0.4 $\pm$ 0.4
Waiau Shoal (East Loch)	S	-	-	2.7	1.3 $\pm$ 1.1	2.7	-
	D	-	-	2.7	1.3 $\pm$ 0.9	2.7	-

Notes: (1) Drydock #2, except *Davidson* (Drydock #4)

(2) Data provided by Carl Adema, DTRC (technical report in preparation).

The far-field regions were sampled during the period after the release from drydock of *Brewton* (on 21 August 1987) according to the modified sample protocol introduced for the next two test ships. Mean TBT concentrations in these regions after a 24-hour period ranged from undetectable to 4.0 ngL⁻¹. The upper East Loch station at Waiau Shoal exhibited a mean TBT concentration of 1.3 ngL⁻¹ over the sample period. The Entrance Channel region exhibited a mean surface water TBT level of 0.7 ngL⁻¹ and a mean deep-water level of 0.8 ngL⁻¹.

After 2 days, the tributyltin levels in the Entrance Channel were 1.1 ngL⁻¹ and 1.1 ngL⁻¹, at 0.5 meter below the surface and at 1.0 meter above the bottom respectively. Total water column samples from other regions averaged 1.3 ngL⁻¹ in North Channel, 1.1 ngL⁻¹ in Middle Loch, and 0.5 ngL⁻¹ in West Loch overall. No significant differences (Student's *t*, *p* < .05) were found at any station between water samples collected during the first sample period (on the day following the undocking of *Brewton*) and water samples collected 2 days later, at either depth. The data collected from the Day 1 and Day 3 sampling periods following test-ship undocking were compiled into regional means, and the combined means are summarized in table 6.

Surface water samples taken prior to the undocking of *Davidson* (on 11 September 1987) ranged from undetectable to 5.8 ngL⁻¹ in TBT concentration. Far-field seawater samples collected during the period following the undocking exhibited individual tributyltin concentrations ranging from undetectable to 7.4 ngL⁻¹. The Waiau Shoal station in upper East Loch was replaced during this survey by an extra

Entrance Channel station. *Davidson* was painted in Drydock #4, which opens into the Entrance Channel, unlike the previous two test ships painted in Drydock #2, which opens into the South Channel region near Southeast Loch. The extra Entrance Channel station was added to this series to quantify more readily any concentration gradients that might occur as a result of drydock operations.

The Entrance Channel region exhibited a mean surface water TBT level of 1.3 ngL^{-1} and a mean deep-water level of 0.4 ngL^{-1} on the day after *Davidson* exited the drydock. Two days later, the levels in the Entrance Channel were 0.2 ngL^{-1} and 0.8 ngL^{-1} respectively. The Entrance Channel sample region exhibited a mean TBT concentration of 0.9 ngL^{-1} . Seawater samples from other regions averaged 0.8 ngL^{-1} in North Channel, 0.3 ngL^{-1} in Middle Loch, and 0.1 ngL^{-1} in West Loch over the sample period. No significant differences were found at any station between samples collected during the first sample period and samples collected 2 days later at either depth. Sample data from this period were also combined and summarized in table 6 and treated in the same manner as for the data from the *Brewton* series.

48-HOUR TIDAL CYCLE STUDY

During the 48-hour tidal cycle study (12 to 14 May 1987), all four of the organotin test ships then based in Pearl Harbor were docked at berths within Southeast Loch. None of the tributyltin-based AF-paint test ships were present at, or adjacent to, any of the stations sampled. Surface water samples obtained in the center of Southeast Loch averaged 29.0 ngL^{-1} TBTCl, and deep water samples exhibited a mean of 9.4 ngL^{-1} TBTCl. Water samples collected at the entrance to Southeast Loch displayed a mean TBT level of 12.1 ngL^{-1} at the surface and 5.2 ngL^{-1} at depth over the 48-hour period. Data from the water samples collected during the 48-hour tidal cycle are recorded in table 7.

Table 7. Integrated 48-hour tidal cycle water sample tributyltin concentrations: 12 to 14 May 1987. Water column levels in ngL^{-1} TBTCl (mean $\pm$ s d). Sample size in parentheses.

Station	Layer	LOSLK	Tidal State INCMG	HISLK	Integrated Mean
5C	S	5.0 ± 2.3 (4)	2.9 (1)	5.1 ± 1.6 (2)	4.7 ± 1.9
	D	2.1 ± 1.4 (5)	2.8 (1)	2.3 ± 1.3 (2)	2.3 ± 1.2
7	S	13 ± 6.2 (5)	6.5 (1)	12 ± 9.7 (2)	12 ± 6.3
	D	4.3 ± 1.9 (4)	6.6 (1)	3.4 ± 1.6 (2)	4.4 ± 1.8
9B	S	13 ± 7.2 (15)	3.7 ± 1.2 (3)	15 ± 5.7 (6)	12 ± 7.3
	D	4.9 ± 1.7 (5)	4.7 ± 1.7 (3)	6.3 ± 3.9 (6)	5.2 ± 2.4
11A	S	26 ± 10 (5)	31 (1)	35 ± 4.6 (2)	29 ± 9.0
	D	9.1 ± 4.6 (5)	9.7 (1)	10 ± 4.3 (2)	9.4 ± 3.9
15	S	5.7 ± 2.6 (5)	2.2 (1)	4.7 ± 2.3 (2)	5.0 ± 2.5
	D	1.9 ± 0.6 (4)	3.4 (1)	1.7 ± 0.4 (2)	2.0 ± 0.8

Overall, variability in tributyltin concentrations due to tidal influences was inconsequential over the course of the 48-hour sample period. No apparent differences in mean TBT concentration were exhibited between high-tide and low-tide water samples from the same station. The mean standard deviation at the entrance to Southeast Loch (Station 9B) was 3.3 ngL^{-1} (27.3 percent of the sample mean) at the surface and 1.8 ngL^{-1} (35.1 percent of the sample mean) at depth. The mean of the

standard deviations of all surface water sample means was 47.0 percent, with a range of 31.0 to 60.3 percent. Deep-water samples exhibited a mean standard deviation of 44.1 percent, with a range of 40.0 percent to 52.2 percent. The data were also compiled into regional means and are included in table 3 and illustrated in figure 4.

IN-SITU SHIP HULL RELEASE RATE STUDY

In-situ release rate determinations of TBT from the test ships were conducted from February 1987 to March 1988. The dates of surveys, vessels, and release rates are presented in table 8. The TBT release rates from the hull of *Badger* were conducted five times during the 12-month period immediately after the undocking. A steady-state release rate appears to have been reached by 14 April 1987, or 44 days after undocking, as the release rates from this time through 1 year are not significantly different. Consequently, the steady-state release rate, as shown in table 10, was determined to be the mean of the three release rate calculations between 14 April 1987 and 15 March 1988. *Brewton* and *Davidson* were surveyed approximately 6 months after undocking. From the results of the multiple surveys of *Badger*, it appears that sufficient time was allowed for steady-state release rates to be achieved.

Table 8. Dates and release rates of Navy vessels painted with TBT-containing paint.

<u>Vessel</u>	<u>Paint Type</u>	<u>Date</u>	TBTCl Release Rate
			<u>ug/cm²/day</u>
USS <i>Badger</i>	ABC-2	03 MAR 87	0.47±0.20
		05 MAR 87	0.54±0.18
		14 APR 87	0.31±0.14
		02 SEP 87	0.28±0.03
		15 MAR 88	0.37±0.05
USS <i>Brewton</i>	ABC-2	16 MAR 88	0.10±0.02
USS <i>Davidson</i>	ABC-2	17 MAR 88	0.11±0.01
USS <i>Beaufort</i>	IPC-Hisol	28 FEB 87	0.86±0.17
USS <i>Omaha</i>	F-170/IPC SPC-4	06 MAY 87	2.77±0.27

Beaufort was surveyed on 28 February 1987, and the release rate and total TBT ship load factor are shown in table 10. This leach rate was also used to determine the ship load factor for *Leftwich*, as both vessels are coated with the same paint but only *Beaufort* was surveyed. *Omaha's* F-170 paint system above maximum beam was surveyed on 6 May 1987. Another TBT-containing paint system (IPC SPC-4) present on the vessel below maximum beam was not surveyed due to the release rate equipment's failure to effect a vacuum against the hull. This unsurveyed paint release rate was estimated to be the same rate as previous release rate calculations determined for this paint on other Navy vessels (Lieberman, et al., 1985).

NEAR-HULL BUTYLTIN CONCENTRATION GRADIENT STUDY

Water samples were collected at various distances from the hull of *Badger* over a 2-1/2-hour period on 14 April 1987. The analytical results are shown in table 9. A water sample collected at the surface on the port stern transect at 0.5 meter exhibited exceptionally high tributyltin levels due to the unavoidable inclusion of

AF-coating paint chips being generated by a work detail at the stern of *Badger*. This sample was not included in mean water column TBT concentration calculations. The deep-water sample obtained at 2.0 meters along the port bow transect was also excluded from calculations due to possible contamination through inadvertent contact with the ship's hull during sample acquisition.

Table 9. *Badger* near-hull butyltin concentration gradient study data. Water column butyltin content in ngL^{-1} (mean $\pm$ standard deviation).

<u>Distance from Hull</u>	<u>TBTCl Concentration</u>	
	<u>Surface</u>	<u>Deep</u>
0.5 m	35 $\pm$ 17	14 $\pm$ 7.4
2.0 m	30 $\pm$ 7.1	9.9 $\pm$ 3.0
5.0 m	27 $\pm$ 11	13 $\pm$ 4.3
20.0 m	34 $\pm$ 24	9.9 $\pm$ 4.1
50.0 m	16 $\pm$ 8.5	11 $\pm$ 7.1

The tributyltin leach rate of the AF-paint at this time (44 days after application) was measured at $0.31 \mu\text{g}/\text{cm}^2/\text{day}$. The relationship of TBT concentration from deep-water samples as a function of distance from the hull of *Badger* was demonstrated by least-squares linear regression to be very low. These samples exhibited a concentration gradient of $-0.02 \text{ ngL}^{-1}/\text{m}$ with a correlation coefficient of 0.24. The mean of the deep water samples was 11.7 ngL^{-1} .

The surface water samples showed somewhat greater correlation of tributyltin concentration with distance from the hull. A concentration gradient of $-0.30 \text{ ngL}^{-1}/\text{m}$ (with a "zero-distance" concentration of 33.0 ngL^{-1}) was displayed for the surface water samples with a coefficient of correlation of 0.81 and a standard error of 5.3. If the "noisy" 20-meter sample mean is excluded, a correlation coefficient of 0.94 is generated for a concentration gradient of $-0.32 \text{ ngL}^{-1}/\text{m}$ (standard error of the estimate: 3.5). Geometric regression analysis of the surface water data (excluding the 20-meter mean) by the least-squares method resulted in a gradient equation of $f(x) = 33.0(x^{-.18}) \text{ ngL}^{-1}/\text{m}$, $r = 0.98$, with a standard error of the estimate of 0.086 (see figure 7).

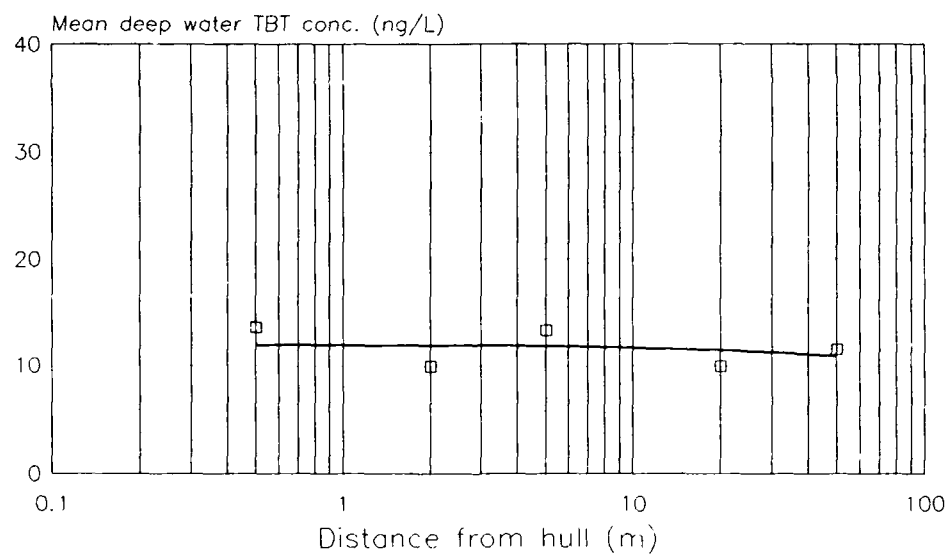
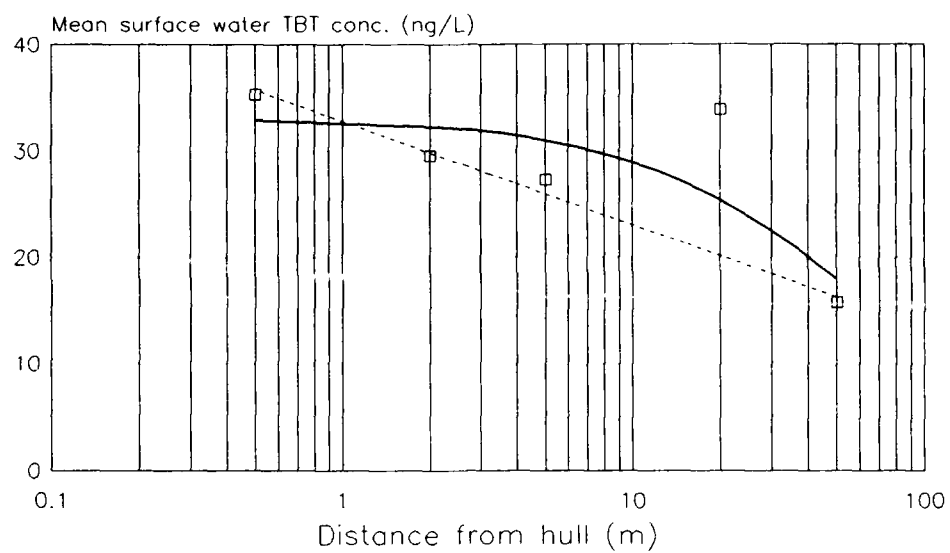


Figure 7. *Badger* surface (upper) and deep (lower) water tributyltin concentration curves. Least-squares linear (solid line) and logarithmic (broken line) regression analyses. See text for regression equations and further information.

DISCUSSION

PEARL HARBOR

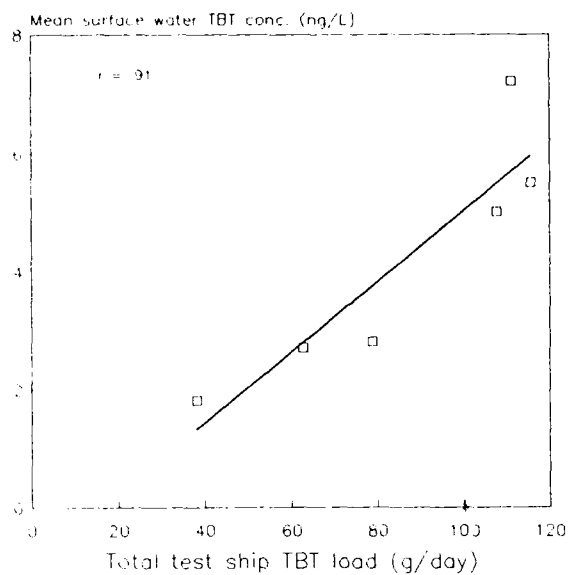
Butyltin concentrations in water have been measured from a composite total of 50 Pearl Harbor locations during the period April 1986 to January 1988. Increased analytical sensitivities have provided the capability to measure levels down to 0.3 nanograms per liter and data are now available from regions of the harbor previously reported as below detection limits. While butyltin levels have appeared to increase from baseline levels measured in 1984 (Grovhough, et al., 1987), part of this apparent increase is due to enhanced analytical sensitivity. Environmental TBT levels in specific areas appear attributable to the presence of TBT test ships within the harbor (see figure 8).

Total tributyltin loading in Southeast Loch is estimated from wetted hull area data provided by DTRC. The means of AF-paint TBT release rates at steady-state were calculated for each of the six TBT-AF paint test ships. These data were used to compute the individual daily TBT loadings from each vessel, and these are recorded in table 10. The total and average surface area for the fleet homeported in Pearl Harbor is also given in table 10. Assuming the entire fleet was coated with the lowest release-rate paint (0.1 percent $\mu\text{g}/\text{cm}^2/\text{day}$), the daily TBT loading would average 37 g and with the full surface fleet in port would release about 53 grams per day. This is less than that released by the *Omaha* alone, and from the empirical model presented in figures 9A and 9B, would result in concentrations of less than 5 ngL^{-1} in Southeast Loch and generally less than 2 ngL^{-1} in other regions of Pearl Harbor. Based on the individual daily ship TBT loading figures, the total per diem TBT loading into Southeast Loch during each of the environmental surveys was calculated. These were adjusted for the interval of port stay of the test ships within Southeast Loch (see table 11) for a 2-week interval prior to, and the duration of, each survey period.

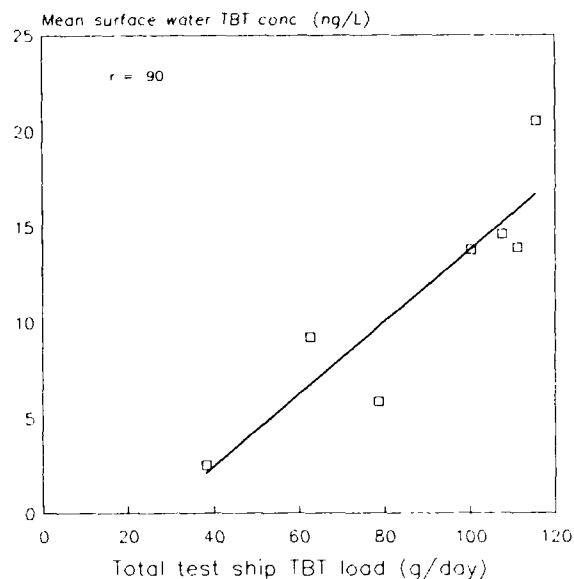
During the 48-Hour Tidal Cycle Study (when four of the test vessels were present within Southeast Loch), for example, the total TBT loading of Southeast Loch was calculated to be 71 g per day. The average surface water TBT concentration in Southeast Loch during this same period was 21 ngL^{-1} , approximately one and one-half times that seen during the preceding four monitoring surveys. Deep-water TBT concentrations at this time were similar to levels observed during the previous surveys. Water levels from other Pearl Harbor regions during the 48-hour series were noted to be commensurate with the previous monitoring surveys. The calculated TBT load of Southeast Loch for each of the environmental surveys and the corresponding mean Southeast Loch water column TBT concentrations are outlined in table 12.

Analysis of these data revealed the greatest surface water concentration correlation to be expressed by the regression function: $f(x) = 6.69 \cdot 10^{-3} (x_{\text{load}})^{1.65}$ with a coefficient of determination (r^2) of 0.86, a coefficient of correlation of 0.93, with a standard error of the estimate (SE) of 0.287 (see figures 9A and 9B). Least-squares linear regression analysis established an Environmental TBT Concentration: Total TBT Loading relationship of $-5.1 + 0.19 x_{\text{load}}$ with a coefficient of determination (r^2) of 0.81, a coefficient of correlation of 0.90 (SE = 2.87; see also figures 9A and 9B). Similar testing to determine the relationship between the calculated test-ship tributyltin loading and the surface water TBT concentration data from other regions

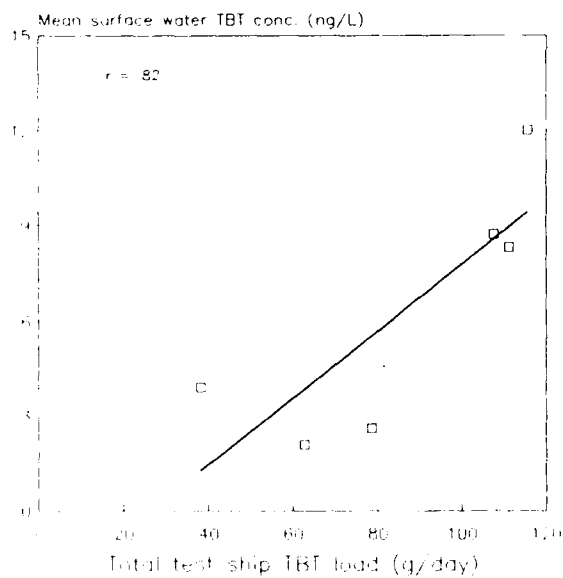
Main Channels (Combined)



Southeast Loch



DryDock #2



DryDock #4

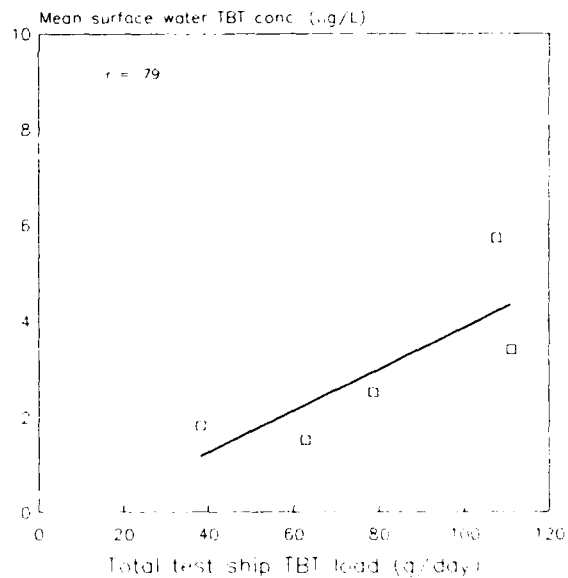
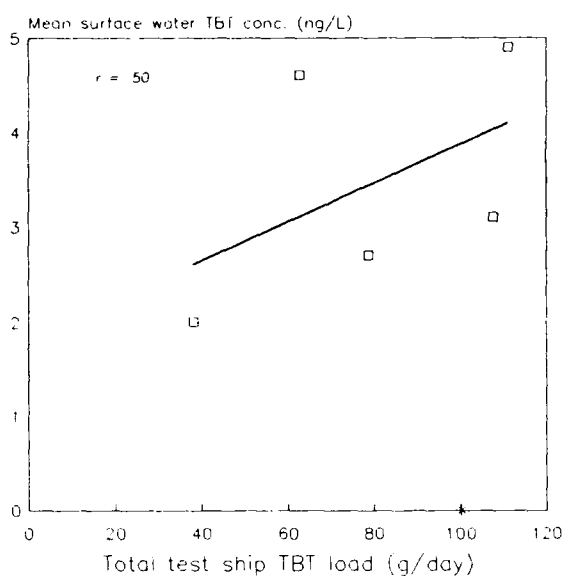
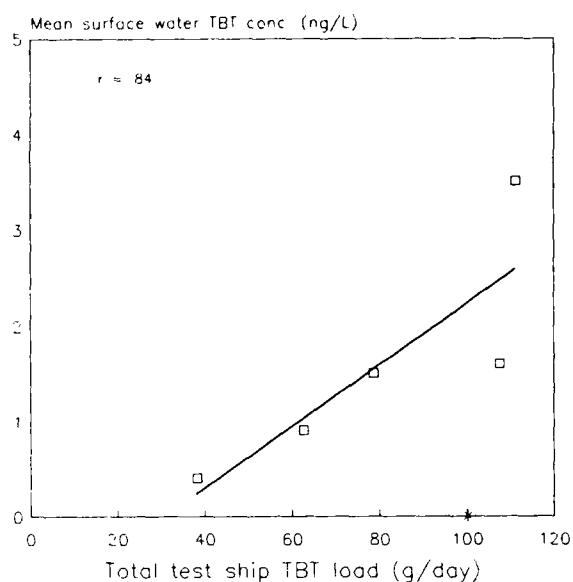


Figure 9A. Least-squares linear regression analysis curves for regional mean surface water tributyltin chloride concentrations versus total per diem Southeast Loch test-ship load factor. * = April 1986 "zero" data mean not included in regression analysis due to higher detection limit.

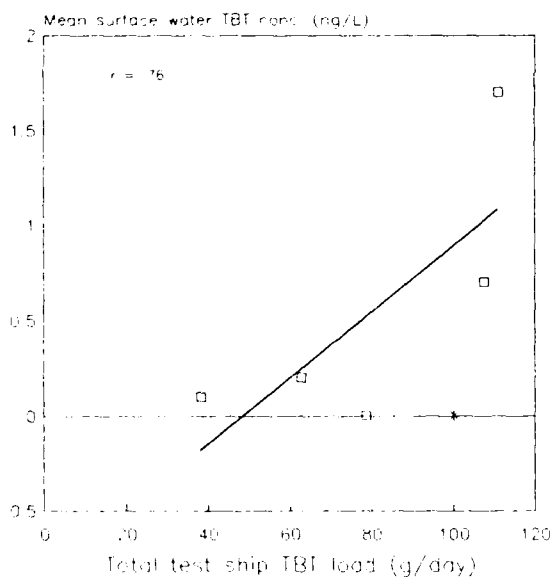
East Loch (Waiau Shoal)



Middle Loch



West Loch



Rainbow Bay Marina

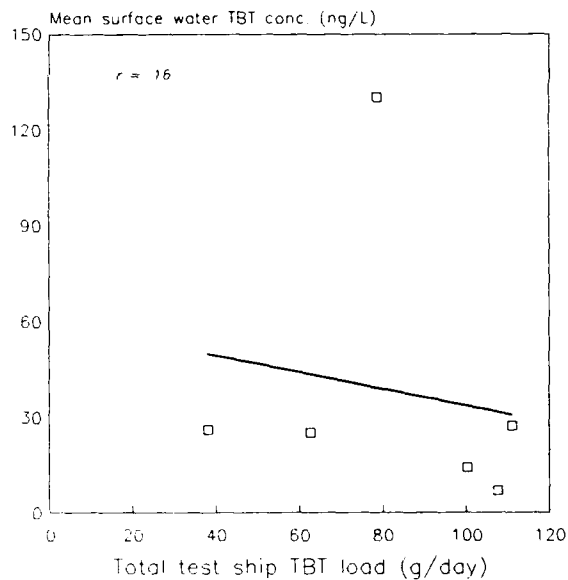


Figure 9B. Least-squares linear regression analysis curves for regional mean surface water tributyltin chloride concentrations versus total per diem Southeast Loch test-ship load factor. * = April 1986 "zero" data mean not included in regression analysis due to higher detection limit.

Table 10. Estimates of Navy paint test vessels tributyltin load factors in Pearl Harbor based on wetted hull areas and measured leach rates. *Omaha* wetted hull area corrected for specific TBT-bearing fractions.

Hull Number	Test Ship	Date Painted	Wetted Hull Area ft ² /m ²	Paint Type	TBTCl Release Rate μg/cm ² /day	Calculated Ship TBT Load Factor
ATS 2	<i>Beaufort</i>	SEP 85	14820/1336.8	IPC HiSol	0.86 ± 0.17	11.5 g/day
DD 984	<i>Leftwich</i>	DEC 85	35745/3320.8	IPS HiSol	0.86 ± 0.17	28.6 g/day
FF 1045	<i>Davidson</i>	SEP 87	20220/1878.5	ABC-2	0.11 ± 0.02	2.1 g/day
FF 1071	<i>Badger</i>	MAR 87	22645/2103.8	ABC-2	0.32 ± 0.05 ⁽¹⁾	6.7 g/day
FF 1086	<i>Brewton</i>	AUG 87	22645/2103.8	ABC-2	0.11 ± 0.01	2.3 g/day
SSN 692	<i>Omaha</i>	JAN 82	34765/3264.4	SPC-4/F-170	2.62 ⁽²⁾	77.5 g/day

Total Projected Surface Fleet⁽³⁾ 595361/55309.0⁽³⁾ 0.10⁽³⁾ 55.3 g/day

Notes: (1) Mean steady-state release rate

(2) Composite leach rate based on 1643.3 m² of SPC-4 AF-paint coverage (TBT leach rate: 2.5 μg/cm²/day and 1314.6 cm² of F-170 AF-paint coverage (TBT leach rate: 2.77 ± 0.27 μg/cm²/day). See text for details.

(3) Based on full surface Fleet implementation with proposed low release rate TBT AF-paint; 100% Fleet presence in port. Pearl Harbor homeport surface Fleet data (combatants and fleet auxiliaries) as of September 1987.

Table 11. Tributyltin test-ship port periods. Percentage of port interval at Southeast Loch berth from survey-start minus 14 days to survey-end (number of days/total days in parentheses) {-} = vessel no present in Southeast Loch.

Survey Period	<i>Badger</i>	<i>Beaufort</i>	<i>Brewton</i>	<i>Davidson</i>	<i>Leftwich</i>	<i>Omaha</i>
08APR86-17APR86	-	-	-	-	79.2 (19/24)	100.0 (24/24)
09FEB87-10FEB87	-	12.5 (2/16)	-	-	100.0 (16/16)	100.0 (16/16)
15APR-16APR87	100.0 (16/16)	-	-	-	93.7 (15/15)	100.0 (16/16)
12MAY87-14MAY87	100.0 (17/17)	82.4 (14/17)	-	-	76.5 (13/17)	100.0 (17/17)
28JUL87	93.3 (14/15)	-	-	-	-	93.3 (14/15)
15OCT87-16OCT87	75.0 (12/16)	-	81.3 (13/16)	100.0 (16/16)	-	37.5 (16/16)
19JAN88-20JAN88	100.0 (16/16)	-	43.7 (7/16)	100.0 (16/16)	100.0 (16/16)	31.3 (5/16)

Table 12. Estimated test-ship tributyltin loading in Southeast Loch. Load estimates adjusted for percentage (days) of duration of test ship assignment at any Southeast Loch berth for 2 weeks prior to, and the duration of, each survey period (see table 11 for details).

Survey Period	Test Ships Present	Total TBT Loading (g/day)	Mean Surface Water Concentration (ngL ⁻¹)
08APR86-17APR86	<i>Leftwich, Omaha</i>	100.1	13.8 ± 10.4
09FEB87-10FEB87	<i>Beaufort, Leftwich, Omaha</i>	107.5	14.6 ± 8.3
15APR-16APR87	<i>Badger, Leftwich, Omaha</i>	111.0	13.9 ± 5.3
12MAY87-14MAY87	<i>Badger, Beaufort, Leftwich, Omaha</i>	115.5	20.5 ± 11.7
28JUL87	<i>Badger, Omaha</i>	78.6	5.8 ± 2.5
15OCT87-16OCT87	<i>Badger, Brewton, Davidson, Omaha</i>	38.1	2.5 ± 1.3
19JAN88-20JAN88	<i>Badger, Brewton, Davidson, Leftwich, Omaha</i>	62.6	9.2 ± 3.6

in Pearl Harbor produced equations with r^2 values of 0.58, 0.70, and 0.25 for the upper West Loch, Middle Loch, and East Loch (at Waiau Shoal) areas respectively; 0.68 for Drydock #2; 0.77 for the North Channel region; 0.51 for the Entrance Channel; and 0.39 for the South Channel sample region.

The undocking operations of *Badger* in March 1987 produced no discernible changes in tributyltin concentrations throughout Pearl Harbor, with only short-term increases seen in the vicinity of Drydock #2. Mean TBT levels in surface water at the entrance to Drydock #2 showed a modest increase coincident with the painting of the *Badger*; however, follow-up sampling 1 month later demonstrated that TBT concentrations had returned to previous levels. The deeper waters at the entrance to the drydock, while not showing an increase in TBT levels during the undocking period, exhibited an elevation in TBT concentration during the survey that followed. During the next survey period the following month, the deep-water TBT level at Drydock #2 was observed to have returned to levels seen during previous monitoring surveys. Tributyltin levels at Drydock #2 during July 1987 decreased to levels comparable to those found in other regions in the harbor.

Tributyltin levels in both the near-field areas adjacent to the shipyard (including Southeast Loch) and the outlying (far-field) regions of the harbor (West Loch, Middle Loch, upper East Loch, and the Entrance Channel), have essentially remained steady throughout the survey period as seen by comparing data in table 3 with that in table 6. Localized elevations in TBT concentrations were observed in near-field water samples collected from the immediate vicinity of drydocks during the first several days after undocking. These levels returned to ambient concentrations within a week of undocking. Far-field water samples consistently exhibited TBT concentrations approximately one-fifth of those found in Southeast Loch.

These investigations were continued with the undocking of *Brewton* and *Davidson* (the second and third test ships of the Pearl Harbor Case Study) and survey data have shown that painting operations have had no appreciable effect on environmental butyltin concentrations throughout any of the outer regions of the harbor. A slightly elevated TBT concentration (7.4 ngL^{-1}) was noted in a solitary sample acquired at the surface in the Entrance Channel region following the undocking of *Davidson*; however, this individual number was not remarkably greater than the normal concentration range for that area.

The individual movements of test ships into these areas have resulted in temporary, highly localized, increases in water TBT concentrations at specific stations, which soon returned to previous levels after the vessel departed. With the exception of the Rainbow Marina area, water samples collected during the July 1987 monitoring effort exhibited consistently lower butyltin concentrations throughout the harbor than during April and May 1987. The elevated levels seen in the Rainbow Marina water samples during this period may be due to the observed presence of two large transient yachts which were moored at the marina at this time, as no other region in the harbor demonstrated similar water TBT concentrations.

Tributyltin levels in Pearl Harbor waters were positively correlated with the proximity to TBT-coated vessels, as seen in the Southeast Loch region data, and the highest levels are usually observed in water samples obtained immediately adjacent (less than 10 meters) to a test ship. However, these elevated concentrations were not

observed in areas only slightly removed from the source. Even with the presence of four of these test vessels in Southeast Loch during the 48-hour tidal cycle study, tributyltin levels in the immediate region were not as great as those routinely seen in Rainbow Marina and were only slightly higher than concentrations observed in the Southeast Loch region during the preceding year.

During the October 1987 monitoring survey, four TBT-coated test ships were again present in Southeast Loch (see table 11), three of these being those vessels painted in the Pearl Harbor Case Study. The level of water column TBT during this period was even lower than that observed during the 48-hour cycle study. This may be partially due to the type of paint the Navy used during the tests. Overall TBT (2.5 ngL^{-1}) and DBT (1.6 ngL^{-1}) levels in Southeast Loch were low during October 1987 and were not significantly different (Student's t , $p < 0.05$) than levels found in the Entrance Channel, South Channel, North Channel, Drydocks #2 and #4, and the East Loch sample regions (see table 3). This low concentration correlates well with the low TBT loading factor of approximately 38 g per day.

The consistent level of tributyltin at depth would appear to suggest the possibility that long-term elevated inputs of organotin into the basin may have created a "reservoir" of organotin in the sediments that slowly rediffuses into the deeper waters of the harbor. This deep-water concentration would then frequently be overshadowed by substantially raised butyltin inputs from sources near or at the surface. Langston, Burt, and Mingjiang (1987), however, reported that up to 99 percent of the TBT present in the water column may be removed into the sediments, with little subsequent desorption back into the water column.

The extent of migration of the suspended particulate material can be inferred from the sediment samples collected during the January 1988 survey series. Drydock #4 in the Pearl Harbor Naval Shipyard opens directly into the northern end of the Entrance Channel, and sediment samples taken adjacent to the caisson exhibited an average TBT concentration of 350 ng/g. At 350 meters to the northwest, in the upper end of the Entrance Channel, sediment samples averaged 34 ng/g TBT. At approximately 1700 meters to the south, at about the center of the Entrance Channel reach, a sediment TBT concentration of 20 ng/g was seen. No butyltin compounds were detected in the sediment collected from the lower end of the Entrance Channel (Station 1), at a distance of roughly 2700 meters to the south of the drydock caisson. Sediment migration appears to be minimal in most areas of Pearl Harbor. Water samples collected from these regions did not show a similar gradient in TBT concentrations. Sediment samples collected off the caisson to Drydock #2 contained the highest TBT concentrations in the harbor. However, January 1988 values were less than half of the TBT loading seen in April 1987 samples, suggesting considerable degradation has occurred at this site.

Gradual degradation of TBT adsorbed in the sediment layer to monobutyltin was demonstrated to occur with a half-life of 162 days (Stang and Seligman, 1986) in tests conducted with San Diego Bay sediments. Langston, et al. (1987), also reported that, once adsorbed to the sediment, TBT is not released back into the water but is rapidly degraded and converted through debutylation to DBT, MBT, and finally inorganic tin. This coincided with a seasonal decrease in the input of TBT into the sediment as boating activity in the study areas declined. The inputs which occur primarily as a result of the release of antifouling paint from ship hulls would thus

seem to have a greater influence on the level of butyltins seen in the water column and not on sediment concentrations. Microcosm tests revealed that sediments exposed to SPC-4 painted panels rapidly released about 50 percent of the accumulated tin burden after approximately 40 days of depuration, with a slower rate continuing afterwards (Henderson, 1988). The greatly elevated sediment loadings seen at drydock facilities would, therefore, appear to be associated with the discharge of particulate material bearing butyltin compounds and paint chips, rather than butyltins dissolved in the liquid portion of the effluent. This material would then settle onto the sediment layer at the bottom of the immediate area after remaining temporarily suspended in the water column for a short period of time. At the drydock facility in Honolulu Harbor, sediment TBT load during January 1988 was seen to be over 10 times that of the rest of the harbor basin; while water column TBT concentrations were nearly identical at both depths tested.

HONOLULU HARBOR COMPLEX

In general, water column TBT concentrations in the Honolulu Harbor Complex were an order of magnitude greater than those found in Pearl Harbor. We believe this results from the previously unregulated use of TBT coatings and drydock operations. The main basin of Honolulu Harbor during March 1987 exhibited an overall decrease in tributyltin concentration at the surface similar to concentrations seen in Southeast Loch (see appendix A for the account of Honolulu Harbor surveys). The greatest reduction was seen at the entrance to the harbor which showed a decrease of 89.1 percent. The stations located near the Dillingham drydock facility and the Matson containership facility showed less of a drop in surface TBT concentrations with decreases of 63.2 and 44.3 percent respectively. Mean surface water levels during July 1987 rose again to levels approximating those seen during the first monitoring survey in April 1986. Deep-water samples throughout this period, however, have remained at a near-constant average level. An overall estimated yearly loading of organotin compounds leaching from the hulls of vessels into the water column of Honolulu Harbor's main basin was calculated based on data supplied by the U.S. Coast Guard and the Honolulu Harbormaster's Office and is detailed in appendix C, with similar approximations for the Ala Wai Boat Harbor and Rainbow Bay Marina (in Pearl Harbor) for comparison.

The influence of maintenance activities on sediment butyltin concentrations is also suggested in the data compiled from the Kewalo and Ala Wai boat basins taken in January 1988. Sediment samples collected from within the Ala Wai Yacht Harbor show mean TBT and DBT levels not significantly different (Student's t , $p < 0.05$) from those seen in the main basin of Honolulu Harbor, although the mean surface water TBT concentration was nearly four times higher than the mean concentration of surface water samples collected from the Honolulu Harbor basin. The small boat maintenance facility in the area is located near the entrance to the basin adjacent to a major drainage canal which leads directly into the entrance channel of the harbor (see appendix A, figure A-1). It is likely that a substantial portion of any particulate material discharged from this facility would be flushed directly into the channel and out to sea, rather than circulating and settling within the basin, although this supposition was not tested.

No large drainage canal empties into Kewalo Basin, as at Ala Wai, and any material emanating from the shipyard within Kewalo Basin would conceivably have

added opportunity to settle within the confines of the harbor. Sediment samples collected within the center of Kewalo Basin were seen to contain twice the concentration of TBT than seen in samples from the Ala Wai Boat Harbor. Surface water samples from Kewalo Basin, however, contained about one-fourth the amount of TBT as seen at Ala Wai, suggesting that the total TBT loading from ship hulls docked in Kewalo Basin is notably lower than the total loading from the vessels within the Ala Wai Boat Harbor.

Sediment samples from the immediate vicinity of the drydock facility in Honolulu Harbor averaged 7000 ng/g TBT. At about 500 meters to the south, across the basin, sediment samples exhibited a mean of 420 ng/g. At a distance of around 650 meters to the southwest, the mean sediment TBT concentration was 690 ng/g. In the center of the harbor, approximately 1450 meters to the southeast of the drydock facility, mean sediment TBT loading was 300 ng/g. Surface water TBT concentrations at these areas averaged between 77 ngL⁻¹ and 95 ngL⁻¹. Note that two of the areas discussed above are located adjacent to major pier complexes: one at the Matson Navigation Company containership facility and the other at the U.S. Coast Guard Base. Both of these areas are occasionally occupied by ships painted with organotin-bearing antifouling formulations.⁵

⁵ At the time of these surveys, four of the nine Medium- and High-Endurance Cutters and Tenders based at the Sand Island facility were coated with AF-paints containing butyltins. The U.S. Coast Guard is discontinuing the application of OT-bearing AF paints and is presently removing them from already coated hulls on an individual basis as each is routinely drydocked for scheduled maintenance (U.S. Coast Guard, unpublished data).

CONCLUSIONS

- Regional water column TBT concentrations generally correlate with calculated TBT loading from ship hull releases documenting that the test ship hulls were the principal source of the compound.
- Rapid changes in harbor concentration based on presence or absence of test ships suggest that a combination of flushing and degradation can effectively remove TBT from the harbor.
- Predictions of TBT concentrations from full surface fleet use of the lowest release rate paint ($0.10 \mu\text{g}/\text{cm}^2/\text{day}$) suggest that average regional TBT levels would be at or below 5 ngL^{-1} in Southeast Loch with all ships in port and generally less than 2 ngL^{-1} in other regions of Pearl Harbor. This would be well within the Environmental Protection Agency's proposed water quality criteria.
- The outer regions of Pearl Harbor, West Loch, Middle Loch, East Loch, and the North Channel, consistently exhibited minimal TBT elevation in water and sediments during the three test-ship undocking-phase studies. The Navy has demonstrated that through proper paint application practices, it can minimize TBT inputs into these outer regions which contain important habitat and nursery areas for waterfowl and marine fishes.
- The areas in Pearl Harbor not under direct Navy management, Rainbow Bay Marina and the Army Heavy Boat activity, were observed to be sources of TBT input into the harbor throughout the study period.
- Sediment TBT concentrations were most closely correlated with maintenance activities involving TBT-coated vessels. Samples collected adjacent to drydocks during three TBT test-ship undocking periods showed only slightly elevated levels. The Navy's ability to contain TBT residues and reduce input to the harbor was demonstrated.
- Tissue TBT burdens correlated with the proximity of TBT sources (test ship hulls, drydocks, and marinas); however, because of their integrative response, they do not show the same trends relative to ship hull loading factor as seen with the water data.
- No significant variation was seen in water column TBT levels over the course of two complete tidal cycles. This obviated the necessity for aligning the sampling design to the tidal periods in Pearl Harbor.
- The TBT concentration in the water column of Honolulu Harbor and adjacent regions in general was an order of magnitude higher than in Pearl Harbor. Sediment and tissue TBT burdens were likewise higher. This suggests that the overall TBT loading was substantially greater in the civilian sector, presumably based on the unregulated use of higher release rate paints and drydock discharges.

REFERENCES

- Blair, W.R., G.J. Olson, F.E. Brinckman, R.C. Paule, and D.A. Becker. 1986. *An International Butyltin Measurement Methods Intercomparison: Sample Preparation and Results of Analyses*. NBSIR 86-3321, National Bureau of Gaithersburg, MD.
- Braman, R.S., and M.A. Tompkins. 1979. "Separation and determination of nanogram amounts of inorganic tin and methyltin compounds in the environment." *Anal. Chem.*, 51(1): 12-19.
- Grovhoug, J.G., R.I. Fransham, and P.F. Seligman. 1987. *Butyltin Concentrations in Selected US Harbor Systems: A Baseline Assessment*. Technical Report 1155. Naval Ocean Systems Center, San Diego, CA. 65 pp.
- Henderson, R.S. 1988. *Marine Microcosm Experiments on Effects of Copper and Tributyltin-Based Antifouling Paint Leachates*. Technical Report 1060. Naval Ocean Systems Center, San Diego, CA. 42 pp.
- Hodge, V.F., S.L. Seidel, and E.D. Goldberg. 1979. "Determination of Tin (IV) and Organotin Compounds in Natural Waters, Coastal Sediments, and Macro Algae by Atomic Absorption Spectrometry." *Anal. Chem.*, 51: 1256-1259.
- Langston, W.J., G.R. Burt, and Zhou Mingjiang. 1987. "Tin and Organotin in Water, Sediments, and Benthic Organisms of Poole Harbor." *Marine Pollution Bulletin*, 18(12): 634-639.
- Lieberman, S.H., V. Homer, and P.F. Seligman. 1985. *In Situ Determination of Butyltin Release Rates from Antifouling Coatings on Navy Test Ships*. Technical Report 1027. Naval Ocean Systems Center, San Diego, CA. 17 pp.
- Maguire, R.J., and R.J. Tkacz. 1987. "Concentration of Tributyltin in the Surface Microlayer of Natural Waters." *Water Poll. Res. J. Canada*, 22(2): 227-233.
- Stallard, M.O., S.Y. Cola, and C.A. Dooley. 1989. "Optimization of Butyltin Measurements for Seawater, Sediment and Tissue Samples." *Appl. Organometal. Chem.*, [in press].
- Stang, P.M., and P.F. Seligman. 1986. "Distribution and Fate of Butyltin Compounds in the Sediment of San Diego Bay." in *Oceans 86*. Conference Record. Volume 4. Organotin Symposium, pp. 1196-1201. New York Institute of Electrical and Electronics Engineers.
- U.S. Department of Commerce. 1986a. *United States Coast Pilot: California, Oregon, Washington, and Hawaii*. 22nd Edition. National Oceanic and Atmospheric Administration, National Ocean Service, Washington, D.C. 421 pp.
- U.S. Department of Commerce. 1986b. *Tidal Current Tables 1987 - Pacific Coast of North America and Asia*. Issued September 1986. National Oceanic and Atmospheric Administration, National Ocean Service, Washington, DC. 279 pp.
- U.S. Department of the Interior. 1970. *Hawaii's Endangered Waterbirds*. Fish and Wildlife Service, Bureau of Sports Fisheries and Wildlife, Portland OR. 32 pp.

REFERENCES (continued)

- U.S. Department of the Interior. 1978. "List of Endangered and Threatened Wildlife and Plants - Republication." Fish and Wildlife Service. *Federal Register*, Vol. 43, No. 238 - Monday, 11 December 1978. pp. 58029-58048.
- Valkirs, A.O., P.F. Seligman, G. Vafa, P.M. Stang, V. Homer, and S.H. Lieberman. 1985. *Speciation of Butyltins and Methyltins in Seawater and Marine Sediments by Hydride Derivatization and Atomic Absorption Detection*. Technical Report 1037. Naval Ocean Systems Center, San Diego, CA.
- Valkirs, A.O., P.F. Seligman, P.M. Stang, V. Homer, S.H. Lieberman, G. Vafa, and C.A. Dooley. 1986. "Measurement of Butyltin Compounds in San Diego Bay." *Marine Pollution Bulletin*, 17(17): 319-324.
- Valkirs, A.O., P.F. Seligman, G.J. Olson, F.E. Brinckman, C.L. Matthias, and J.M. Bellama. 1987. "Di- and Tributyltin Species in Marine and Estuarine Waters: Interlaboratory Comparison of Two Ultratrace Analytical Methods Employing Hybridization and Atomic Absorption or Flame Photometric Detection." *Analyst*, 112: 17-21.

ABBREVIATIONS AND SYMBOLS

AAS	atomic absorption spectrophotometry
ABC-2	Devoe Marine Coatings Company tributyltin-based copolymer antifouling paint
AF	antifouling
Bu ₃ Sn ⁺ Cl ⁻	tributyltin chloride
DBT	dibutyltin
DBTCl	dibutyltin chloride
DTRC	David Taylor Research Center
F-170	Navy tributyltin-based antifouling paint MIL SPEC Formula 170
g	gram
g/day	grams per day
HDAA	hydride derivatization and atomic absorption
HD/AAS	hydride derivatization and atomic absorption spectrophotometry
HCl	hydrochloric acid
H ₂ SO ₄	sulfuric acid
IPC-Hisol	International Paint Company tributyltin-based copolymer antifouling paint
IPC SPC-4	International Paint Company tributyltin-based self-polishing copolymer antifouling paint
m	meter
MBT	monobutyltin
MESC	Marine Environmental Support Craft
μg/cm ² /day	micrograms per centimeter squared per day
ml	milliliter
μl	microliter
ng	nanogram
ng/g	nanograms per gram (parts per billion)
ngL ⁻¹	nanograms per liter (parts per trillion)
ng/L	nanograms per liter (parts per trillion) – figure legends, database records only
ngL ⁻¹ /m	nanograms per liter per meter
NOSC	Naval Ocean Systems Center
OT	organotin
r ²	coefficient of determination
SE	standard error [of the estimate]
sd	standard deviation
TBT	tributyltin
TBT-AF	tributyltin-based antifouling [paint]
TBTCl	tributyltin chloride

APPENDIX A

MEASUREMENT OF ENVIRONMENTAL BUTYLTINS IN HONOLULU HARBOR, HAWAII, APRIL 1986 TO JANUARY 1988

INTRODUCTION

Honolulu Harbor is the primary commercial port of the State of Hawaii, is located east of Pearl Harbor, and is composed of two broadly connected basins bordered on the seaward side by Sand Island (see figure A-1). The main basin contains most of the harbor's commercial piers and wharves along its northern rim. The Kapalama basin contains a large containership port and two commercial drydock facilities. Kewalo Basin is located immediately to the east of Honolulu Harbor and is used exclusively by cruise boats, charter, and commercial fishing vessels. It contains a shipyard with a marine railway capable of handling vessels up to 92 feet (28 meters) in length and 8.5 feet (2.6 meters) in draft. The Ala Wai Boat Harbor is the state's largest yacht harbor, berthing up to 700 vessels.

The diurnal tidal range in Honolulu Harbor is 0.6 meter, with a mean range of 0.4 meter. The harbor is usually free of surge, and tidal current velocities are usually less than 1 knot. Fresh water inputs are received from two large drainage canals and vary with stormwater runoff levels. The bottom is mainly composed of black and grey mud and silt, with coral and rock present along the edges of the dredged channel entrances. Honolulu Harbor does not exhibit the same level of biological diversity and abundance seen in Pearl Harbor; however, several important commercial nearshore fish species frequent the harbor, providing for ample recreational fishing activities. The harbor also serves as a nursery ground for several marine species.

PROCEDURES

Four monitoring surveys in Honolulu Harbor were performed during April 1986, March 1987, July 1987, and January 1988. Only water samples were obtained during the March 1987 monitoring survey effort, and water and oyster tissue samples only were collected during the July 1987 survey. Water, sediment, and oyster tissue samples were collected during the January 1988 survey. All samples were collected and analyzed in the same manner as those obtained in Pearl Harbor. The Honolulu Harbor stations sampled are illustrated in figure A-1, and the station locations for each of the Honolulu Harbor monitoring survey efforts are also recorded in greater detail in appendix B.

The Honolulu Harbor Complex survey area was also separated into several geographic/use-pattern regions as done for the Pearl Harbor area. Honolulu Harbor itself was divided into Entrance Channel, Main Basin, and Dillingham Drydock Facility regions. Three smaller peripheral boat basins were also considered during the Honolulu Harbor surveys. These small harbors are beyond the limits of Honolulu Harbor and were, therefore, deemed to be sample regions in, and of, themselves. The sample station regions of the Honolulu Harbor Complex are listed in table A-1 and are depicted in figure A-2.

Table A-1. Honolulu Harbor Complex sample regions.

<u>Region</u>	<u>Stations</u>
Entrance channel	5, 12
Main harbor basin	1, 3, 4, 9, 13
Dillingham Drydock Facility	2
Keehi Lagoon	
Small Boat Harbor	10
Kewalo Basin	6, 7, 8
Ala Wai Boat Harbor	11

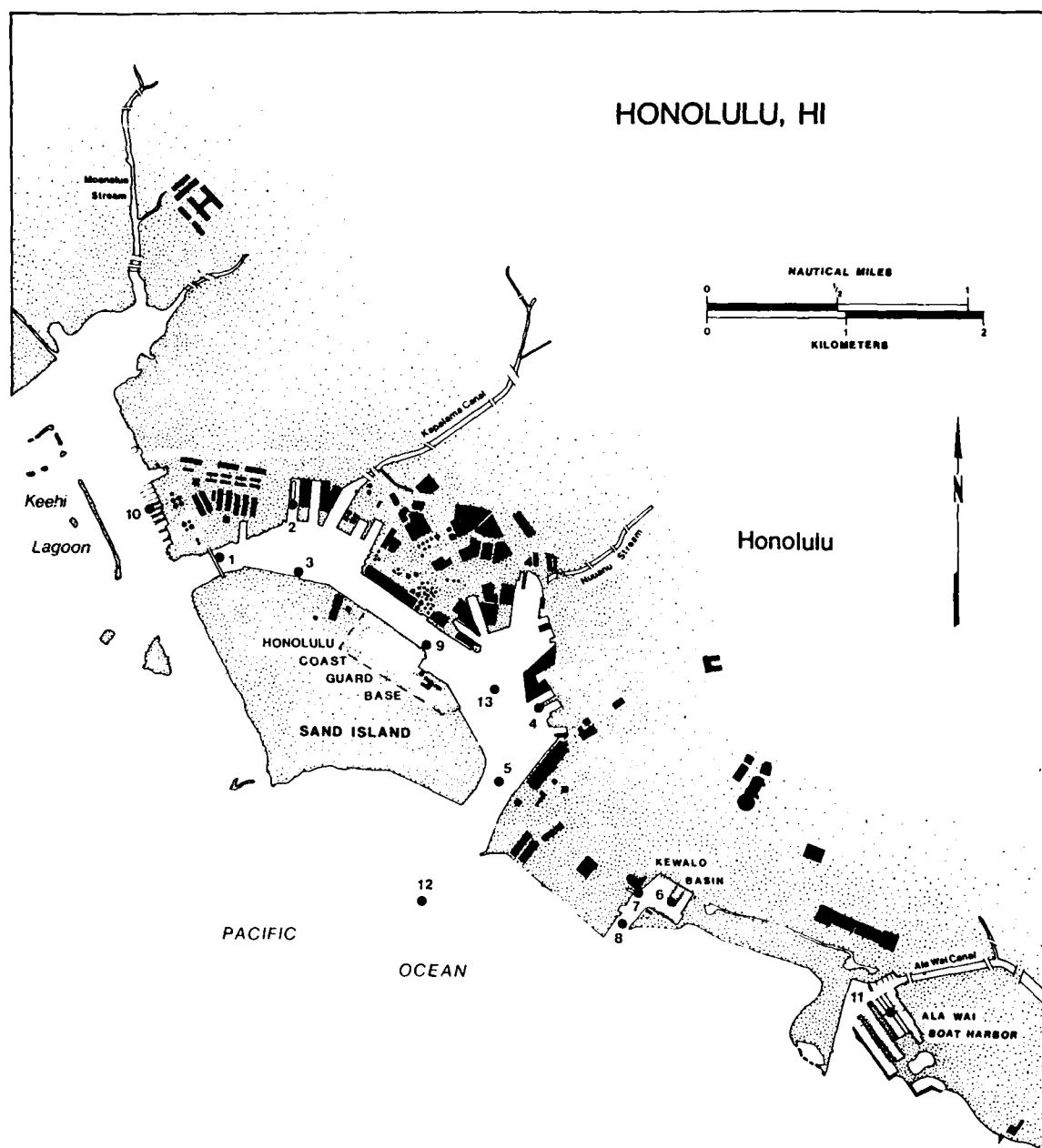


Figure A-1. Honolulu Harbor Complex station locations. Note: This is a composite diagram—various stations were sampled during each individual survey. See appendix B for detailed information.

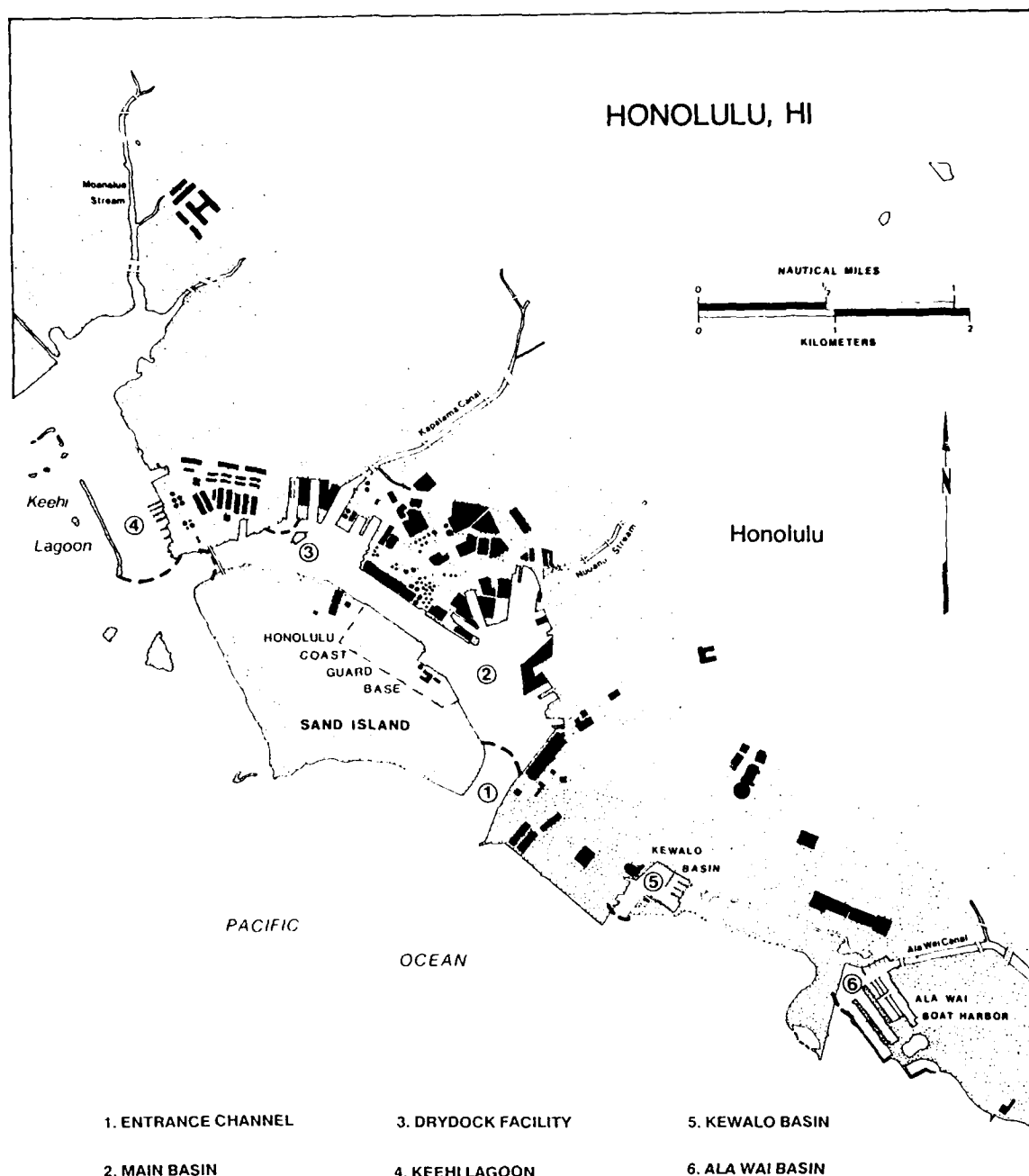


Figure A-2. Honolulu Harbor Complex sample regions. Regional identification key numbers for illustrative purposes only.

RESULTS

Water samples collected during April 1986 from areas in and around Honolulu Harbor exhibited an overall mean tributyltin concentration of 98 ngL^{-1} , with deep water samples averaging 26 ngL^{-1} . The highest values were observed at the Ala Wai Yacht Harbor basin and adjacent to the Dillingham Marine floating drydock, with mean surface water TBT levels of 390 ± 41 and $92 \pm 22 \text{ ngL}^{-1}$ respectively. The lowest levels were seen in Kewalo Basin and in Keehi Lagoon Boat Harbor, with surface water levels of 11 ± 1.0 and $27 \pm 5.1 \text{ ngL}^{-1}$ TBT respectively. Sampling at Kewalo Basin coincided with the reconstruction of several of the main piers, which precluded the presence of many tenant vessels. The main basin of Honolulu Harbor exhibited overall mean water TBT levels of 72 ngL^{-1} at the surface and 31 ngL^{-1} at depth. Mean TBT concentrations for the Honolulu Harbor complex during April 1986 are listed in table A-2 and illustrated in figure A-3.

Table A-2. Water column concentration summary for the Honolulu Harbor Complex sample regions. Surface and deep water tributyltin levels (as chlorides) in ngL^{-1} (mean $\pm$ standard deviation). {-} = no data.

Region	Layer	Apr 1986	Mar 1987	Jul 1987	Jan 1988
Entrance	S	64 ± 7.6	4.8 ± 4.5	22	29 ± 6.5
Channel	D	5.7 ± 5.1	—	5.6	4.5 ± 0.9
Main	S	68 ± 17	23 ± 16	57 ± 11	83 ± 13
Basin	D	30 ± 9.6	27 ± 12	43 ± 49	48 ± 17
Drydock	S	92 ± 21	34 ± 13	580	94 ± 14
Facility	D	60 ± 27	35 ± 13	170	54 ± 16
Keehi	S	27 ± 5.1	—	72	74 ± 6.6
Lagoon	D	13 ± 4.5	—	55	20 ± 3.6
Kewalo	S	11 ± 1.0	—	27 ± 1.7	83 ± 14
Basin	D	4.3 ± 7.5	—	17 ± 7.0	13 ± 2.1
Ala Wai	S	390 ± 46	—	190 ± 74	320 ± 95
Harbor	D	31 ± 7.5	—	24 ± 3.8	18 ± 0.0

An abbreviated survey was conducted in Honolulu Harbor on 5 March 1987 using the automated water column profiling systems employed in Pearl Harbor. Water samples collected in Honolulu Harbor contained an average tributyltin concentration of 20 ngL^{-1} at the surface, 33 ngL^{-1} at an average depth of 4.5 meters, and 30 ngL^{-1} at the bottom. The average TBT level for Honolulu Harbor is listed in table A-2 and illustrated in figure A-3. Individual stations exhibited mean surface water TBT concentrations ranging from $1.1 \pm 0.8 \text{ ngL}^{-1}$ outside of the harbor at the mouth of the entrance channel to $42 \pm 9.7 \text{ ngL}^{-1}$ at the Matson Navigation Company containership facility pier. Tributyltin levels at Station 2 (adjacent to the Dillingham Marine floating drydock facility) were 34 ngL^{-1} at the surface, 52 ngL^{-1} at a depth of 4.5 meters, and 34 ngL^{-1} at 8.0 meters. Water samples collected in the center of the main basin (at Station 13) exhibited surface levels of 9.5 ngL^{-1} . Bottom water (13.5 meters) samples at the same station exhibited an average TBT concentration of 20 ngL^{-1} , and the level at 5.2 meters was 14 ngL^{-1} .

Replicate water samples from Pearl Harbor and Honolulu Harbor were also collected during this period and delivered to State of Hawaii, Department of Health

personnel observing water sampling procedures to assist in their efforts to develop an environmental butyltin monitoring capability.

The third Honolulu Harbor monitoring survey was conducted on 30 July 1987 in the Honolulu Harbor complex which included stations located at Keehi Lagoon, Kewalo Basin, and the Ala Wai Boat Basin, as well as the main basin of Honolulu Harbor itself. Water samples were collected from the eight primary stations established in the harbor complex during the first monitoring survey. Elevated levels of tributyltin were seen in water samples obtained within the area of the Dillingham drydock facility. The surface water TBT level at this station was 580 ngL^{-1} , and the deep water concentration was 170 ngL^{-1} . Elevated levels of TBT were also exhibited at the Matson Containership Facility, which displayed levels of 64 ngL^{-1} and 130 ngL^{-1} at the surface and at depth respectively. Tributyltin levels in Kewalo Basin were 27 ngL^{-1} at the surface and 17 ngL^{-1} at depth. Water samples from the Ala Wai Yacht Harbor displayed mean water levels of 190 ngL^{-1} TBTCI at the surface and 24 ngL^{-1} TBTCI at depth. The TBT concentration mean for Honolulu Harbor during July 1987 is listed in table A-2 and illustrated in figure A-3.

Oyster samples were obtained from two stations (Stations 1 and 9) within Honolulu Harbor's main basin on 30 July 1987, concurrent with the monitoring survey water sampling. Population considerations and individual size limitations prevented the accumulation of sufficient individual specimens to provide a pooled tissue mass suitable for more than a single sample from each station. The tributyltin levels in the tissue samples ranged from 440 to 610 ng/g. The Honolulu Harbor tissue and surface water sample mean is listed in table A-3.

Table A-3. Sediment concentration summary for the Honolulu Harbor Complex sample regions. Di- and tributyltin levels (as chlorides) in ng/g dry weight (mean $\pm$ standard deviation). {-} = no data; NA = data not available at time of printing.

Region	Butyltin Species	April 1986	February 1987	April 1987	January 1988
Entrance	TBTCI	NA	-	-	100
Channel	DBTCI	NA	-	-	20
Main	TBTCI	NA	-	-	490 ± 180
Basin	DBTCI	NA	-	-	150 ± 50
Drydock	TBTCI	NA	-	-	7000 ± 2800
Facility	DBTCI	NA	-	-	2900 ± 660
Keehi	TBTCI	NA	-	-	160
Lagoon	DBTCI	NA	-	-	68
Kewalo	TBTCI	NA	-	-	2840 ± 440
Basin	DBTCI	NA	-	-	2320 ± 45
Ala Wai	TBTCI	NA	-	-	550 ± 46
Harbor	DBTCI	NA	-	-	420 ± 47

Immediately following the January 1988 Pearl Harbor monitoring survey, the fourth monitoring survey of the Honolulu Harbor Complex was undertaken to provide data for possible comparison. The stations sampled were those investigated during the Honolulu Harbor survey of July 1987. Water and sediment samples were collected from each of the station locations surveyed; oyster tissue samples were

Station 1, at the entrance to the Kalihi Channel at the western end of Honolulu Harbor, and at Station 9, at the center of the U.S. Coast Guard Station pier complex on Sand Island. Surface water sample tributyltin levels ranged from 23 to 430 ngL^{-1} , and deep water sample TBT levels ranged from 3.9 to 72 ngL^{-1} . The highest single station average surface water concentration was exhibited in samples collected from the center of the Ala Wai Boat Harbor with a mean of 320 ngL^{-1} TBT; the lowest average being seen at the main entrance to Honolulu Harbor at 29 ngL^{-1} .

The deep-water sample means ranged from 4.5 ngL^{-1} , at the Honolulu Harbor main entrance, to 60 ngL^{-1} , at the Coast Guard Station in the center of the harbor. Interestingly, the deep-water samples obtained from the center of the Ala Wai Boat Harbor averaged 18 ngL^{-1} TBT, less than 0.06 times the surface mean value; the deep-water samples from the center of Kewalo Basin averaged 13 ngL^{-1} , less than 0.16 times the mean surface value of 83 (sd 14). The mean TBT level for the main basin of Honolulu Harbor was 39 ngL^{-1} . The water column TBT content mean for Honolulu Harbor during January 1988 is listed in table A-2 and illustrated in figure A-3.

Sediment samples were collected from each station in the Honolulu Harbor Complex during the January 1988 survey. The data from the analysis of these samples were compiled into regional means and are listed in table A-3 and are illustrated in figure A-4.

Oyster samples were obtained from two stations (Stations 1 and 9) within Honolulu Harbor's main basin concurrent with water sampling. Oyster populations were observed to be somewhat more plentiful than when last sampled in July 1987 and were able to provide for a normal sample size from each station. The mean tributyltin level in oyster tissues collected from Honolulu Harbor showed an increase of about 45 percent over the last sample period (July 1987) with individual tissue samples containing from 650 to 1100 ng/g . The mean tissue dibutyltin level exhibited an increase of about 130 percent for the same period.

Tissues from the immediate vicinity of the U.S. Coast Guard Station on Sand Island showed mean TBT and DBT levels of 1000 and 650 ng/g respectively; while surface water samples from the same station exhibited a mean TBT level of 77 ngL^{-1} . Oysters collected at the junction of the Kalihi Channel and the main basin showed mean TBT and DBT levels of 800 and 480 ng/g respectively, with a surface water mean concentration of 89 ngL^{-1} . The overall Honolulu Harbor tissue and surface water sample mean is listed in table A-4.

Table A-4. Honolulu Harbor oyster tissue butyltin concentration summary. Mean tissue TBT and DBT concentrations in ng/g (wet weight as chlorides). Corresponding mean ambient surface water TBT and DBT levels in ngL⁻¹. NA = data not available at time of printing.

Station [Date]	Tissue Samples		Water Samples	
	TBTCl	DBTCl	TBTCl	DBTCl
01 [Apr 1986]	NA	NA	54 ± 9.6	22 ± 4.0
01 [Jul 1987]	610	250	68	17
01 [Jan 1988]	800 ± 130	480 ± 51	89 ± 18	29 ± 1.7
09 [Apr 1986]	NA	NA	74 ± 12	21 ± 2.6
09 [Jul 1987]	440	240	51 ± 10	12 ± 1.7
09 [Jan 1988]	1000 ± 120	650 ± 84	77 ± 6.7	11 ± 5.3
10 [Apr 1986]	NA	NA	27 ± 5.1	20 ± 0.6

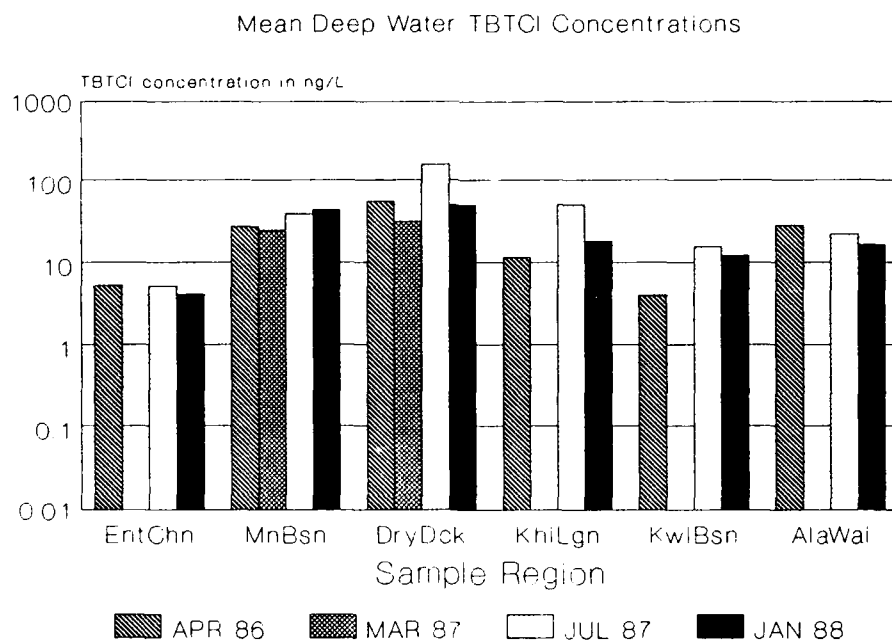
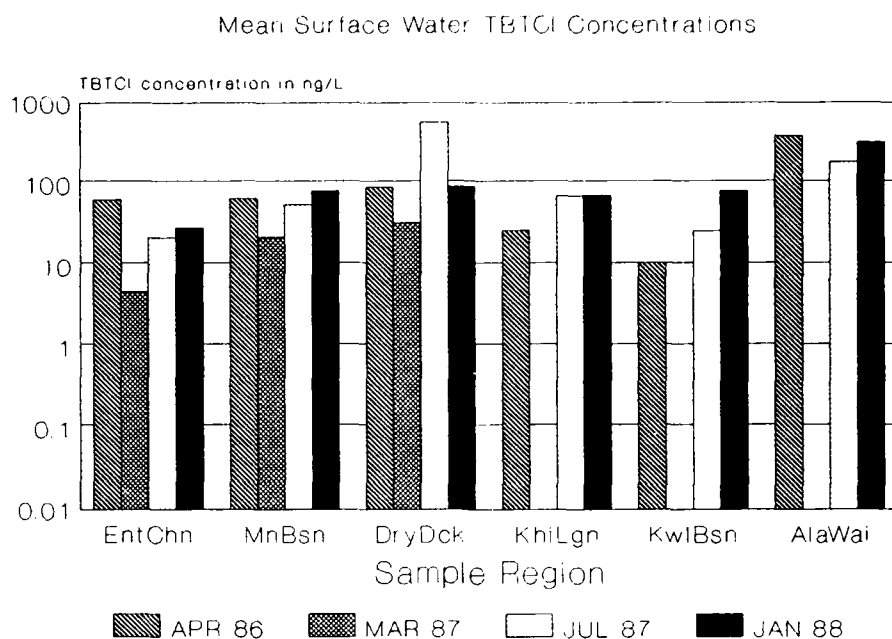


Figure A-3. Honolulu Harbor Complex water sample summary, April 1986 to January 1988. Mean surface (upper) and deep (lower) water tributyltin concentrations in ngL^{-1} TBTCI.

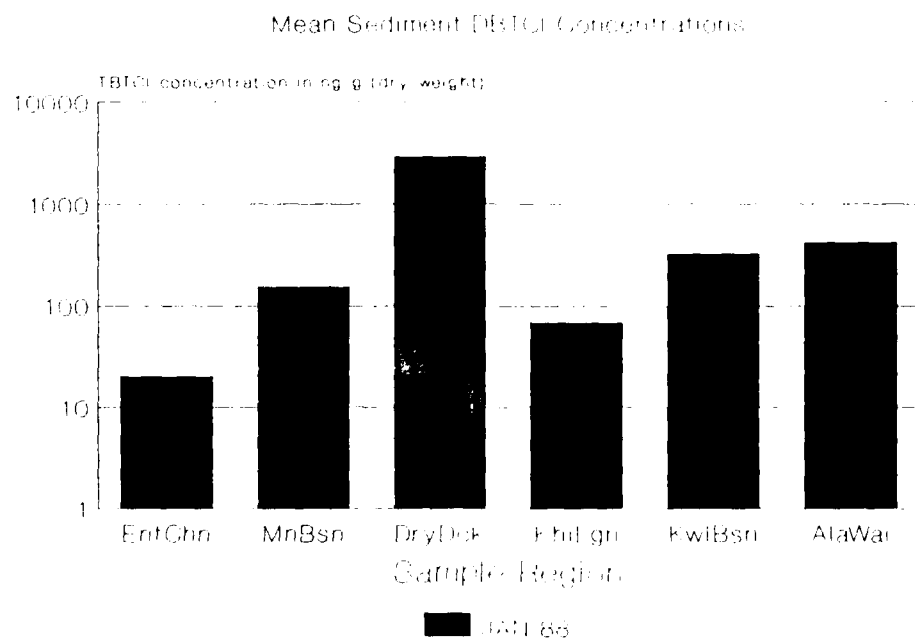
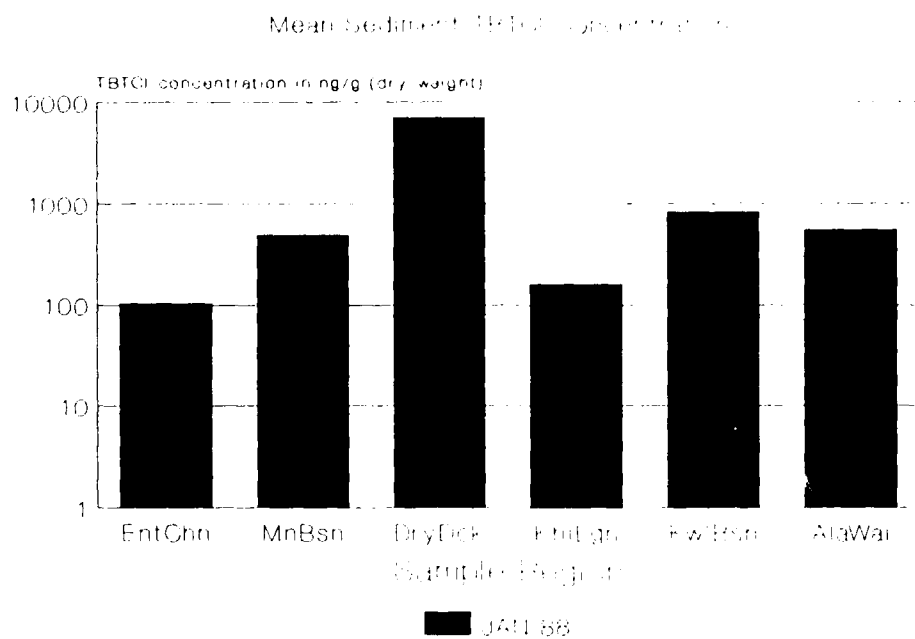


Figure A-4. Honolulu Harbor Complex sediment sample summary, January 1988. Mean sediment di- (lower) and tri- (upper) butyltin concentrations (as chlorides) in ng/g dry weight.

APPENDIX B

PEARL HARBOR STATION LOCATIONS

<u>Station</u>	<u>N Latitude</u>	<u>W Longitude</u>	<u>Station Description</u>
01	21°19'18.4"	157°58'00.8"	EntrChnAdjNENetPtfm
01A	21°18'30.2"	157°57'50.6"	EntrChannelAdjMkr#3
01B	21°19'29.5"	157°58'10.8"	OppAbdnFrySlpFtKam
01B	21°19'29.5"	157°58'04.0"	MidChn@FrySlpFtKam
01D	21°17'54.0"	157°58'01.3"	EntrChn1050mWMkr#1
01E	21°17'54.2"	157°57'19.8"	MidEntrChnAdjMkr#1
01F	21°17'54.6"	157°57'52.0"	EntrChn1050mEMkr#1
02	21°19'33.0"	157°57'57.5"	AdjAbdnFrySlpFtKam
03	21°19'51.0"	157°58'11.0"	MidEntrChnBishopPt
03A	21°21'44.8"	158°00'07.0"	WLochEShoreLandfill
03B	21°19'48.0"	157°58'00.4"	AdjATS2AlphDkBrthA3
03C	21°21'18.7"	157°59'20.9"	WLochEShrOppPowdrPt
03D	21°21'05.6"	157°58'54.9"	WLochEShrOppKekaaPt
03E	21°20'26.1"	157°58'27.7"	EntrWestLochMidChan
04	21°20'27.5"	157°58'20.5"	AdjBerthW20WaipioPt
05	21°20'56.0"	157°58'06.6"	AdjChnMkr#16HospPt
05A	21°20'43.1"	157°58'18.5"	EmbymtOppEntrDDk#4
05B	21°20'43.8"	157°58'00.0"	EntrDryDock#4PHNSY
05C	21°20'50.5"	157°59'09.1"	MidEntrChan@Mkr#15
06	21°21'25.5"	157°58'04.5"	75mWOffSEndFordIs
06A	21°21'30.5"	157°58'05.0"	AdjAbnRmpSWEndFordI
07	21°21'09.5"	157°57'33.0"	EntrDryDock#2PHNSY
07A	21°21'12.8"	157°57'40.9"	SChn225mNWDryDock#2
07B	21°21'15.5"	157°57'45.0"	SChn400mNWDryDock#2
07C	21°21'12.6"	157°57'51.6"	MidSouthChan@Mkr#20
08	21°21'15.0"	157°57'23.0"	AdjBerthB2PHNSY
08A	21°21'11.9"	157°57'24.9"	AdjBerthB1 5PHNSY
08B	21°21'18.4"	157°57'29.1"	SChan200mNWBrthB1 5
08C	21°21'21.5"	157°57'34.9"	SChan400mNWBrthB1 5
09	21°21'26.1"	157°57'14.8"	30mNEOffEnd1010Dock
09A	21°21'25.5"	157°57'23.2"	SChan250mNW1010Dock
09B	21°21'26.6"	157°57'03.2"	SELochMidEntrBasin
10	21°21'16.3"	157°57'02.5"	25mOffBrthB22NAVSTA
10A	21°21'11.5"	157°57'07.0"	AdjBerthB18PHNAVSTA
10B	21°21'17.9"	157°57'06.0"	AdjBerthB16PHNAVSTA
10C	21°21'13.8"	157°57'11.2"	AdjBerthB13PHNAVSTA
11	21°21'08.4"	157°56'40.2"	SELochAdjEndMerryPt
11A	21°21'48.7"	157°56'42.2"	CentrSoutheastLoch

<u>Station</u>	<u>N Latitude</u>	<u>W Longitude</u>	<u>Station Description</u>
12	21°21'25.3"	157°56'39.1"	50mSWAFDM6SUBASE
13	21°21'36.4"	157°56'50.9"	30SWBrthK8NAVSupCen
14	21°22'13.3"	157°56'14.9"	EndMnPierRnbwMarina
14A	21°22'30.0"	157°56'29.0"	AdjNSpitMcGrewPoint
14B	21°22'15.6"	157°56'11.6"	ShrAdjRnbwMarNRamp
15	21°22'09.0"	157°56'52.0"	NorthChnAdjBuoy#23
16	21°22'59.2"	157°57'39.4"	SEndHECOSheetPiling
16A	21°23'14.5"	157°57'40.0"	AdjHECODischrgVent
17	21°22'14.5"	157°57'37.5"	MidPierF12/F13FordI
18	21°22'09.0"	157°58'10.0"	BtnPierV2/V3PCPenn
18A	21°21'58.2"	157°58'00.0"	MidPierF9FordIsland
19	21°22'32.7"	157°59'07.0"	MiddleLchAdjBuoyD8N
19A	21°22'12.0"	157°58'36.3"	CentrEntrMiddleLoch
20	21°21'29.0"	157°58'22.0"	NorthChanAdjMkr#36
21	21°22'32.0"	157°57'14.9"	NChanBtnMkr#29/ 9S

STATION SAMPLE SUMMARY

<u>Station</u>	<u>Sample Region</u>	<u>Survey</u>	<u>Sample Types</u>
01	Entrance Channel	PH1 (27MAR84-09APR84)	Water/Sediment
		PHM (08APR86-17APR86)	Water/Sediment
		PHM2 (09FEB87-10FEB87)	Water/Sediment
		PHM3 (15APR87-16APR87)	Water/Sediment
		PHM4 (28JUL87)	Water
		PHM5 (15OCT87-16OCT87)	Water
		PHM6 (19JAN88-20JAN88)	Water/Sediment
01A	Entrance Channel	PHM2 (09FEB87-10FEB87)	Water
01B	Entrance Channel	PHM2 (09FEB87-10FEB87)	Water
01C	Entrance Channel	PHM2 (09FEB87-10FEB87)	Water
01D	Entrance Channel	PHM2(09FEB87-10FEB87)	Water
01E	Entrance Channel	PHM2 (09FEB87-10FEB87)	Water
01F	Entrance Channel	PHM2 (09FEB87-10FEB87)	Water
02	Entrance Channel	PH1 (27MAR84-09APR84)	Water/Sediment
		PHM2 (09FEB87-10FEB87)	Water
03	Entrance Channel	PH1 (27MAR84-09APR84)	Water/Sediment
		PHM2 (09FEB87-10FEB87)	Water
		PHM3 (15APR87-16APR87)	Water
		PHM4 (28JUL87)	Water
		PHM6 (19JAN88-20JAN88)	Sediment
03A	West Loch	PH1 (27MAR84-09APR84)	Tissue
		PHM (08APR86-17APR86)	Water/Sed/Tissue

<u>Station</u>	<u>Sample Region</u>	<u>Survey</u>	<u>Sample Types</u>
		PHM2 (09FEB87-10FEB87)	Water/Sed /Tissue
		PHM3 (15APR87-16APR87)	Water/Sediment
		PHM4 (28JUL87)	Water/Tissue
		PHM5 (15OCT87-16OCT87)	Water
		PHM6 (19JAN88-20JAN88)	Water/Sed /Tissue
03B	Entrance Channel	PHM (08APR86-17APR86)	Water
03C	West Loch	PHM2(09FEB87-10FEB87)	Water
03D	West Loch	PHM2 (09FEB87-10FEB87)	Water
		PHM5 (15OCT87-16OCT87)	Water
		PHM6 (19JAN88-20JAN88)	Water/Sediment
03E	West Loch	PHM3 (15APR87-16APR87)	Water
04	West Loch	PH1 (27MAR84-09APR84)	Water/Sediment
05	Entrance Channel	PH1 (27MAR84-09APR84)	Water/Sediment
		PHM (08APR86-17APR86)	Water/Sediment
		PHM2 (09FEB87-10FEB87)	Water/Sediment
		PHM3 (15APR87-16APR87)	Water/Sediment
		PHM4 (28JUL87)	Water
05A	Entrance Channel	PH1 (27MAR84-09APR84)	Tissue
		PHM (08APR86-17APR86)	Tissue
		PHM2 (09FEB87-10FEB87)	Tissue
05B	Drydock #4	PHM2 (09FEB87-10FEB87)	Water/Sediment
		PHM3 (15APR87-16APR87)	Water/Sediment
		PHM4 (28JUL87)	Water
		PHM5 (15OCT87-16OCT87)	Water
		PHM6 (19JAN88-20JAN88)	Water/Sediment
05C	Entrance Channel	PHM2 (09FEB87-10FEB87)	Water
		PHM5 (15OCT87-16OCT87)	Water
		PHM6 (19JAN88-20JAN88)	Water/Sediment
06	North Channel	PH1(27MAR84-09APR84)	Water/Sediment
		PHM2 (09FEB87-10FEB87)	Water/Sed/Tissue
		PHM3 (15APR87-16APR87)	Water/Sediment
		PHM4 (28JUL87)	Water
06A	North Channel	PH1(27MAR84-09APR84)	Tissue
07	Drydock #2	PH1(27MAR84-09APR84)	Water/Sediment
		PHM2 (09FEB87-10FEB87)	Water/Sed /Tissue
		PHM3 (15APR87-16APR87)	Water/Sediment
		PHM4 (28JUL87)	Water/Tissue
		PHM5 (15OCT87-16OCT87)	Water
		PHM6 (19JAN88-20JAN88)	Water/Sed /Tissue
07A	South Channel	PHM2(09FEB87-10FEB87)	Water/Sediment
		PHM3 (15APR87-16APR87)	Water/Sediment

<u>Station</u>	<u>Sample Region</u>	<u>Survey</u>	<u>Sample Types</u>
07B	South Channel	PHM2 (09FEB87-10FEB87)	Water/Sediment
		PHM3 (15APR87-16APR87)	Water/Sediment
		PHM4 (28JUL87)	Water
		PHM5 (15OCT87-16OCT87)	Water
		PHM6 (19JAN88-20JAN88)	Water/Sediment
07C	South Channel	PHM2 (09FEB87-10FEB87)	Water
08	Southeast Loch	PH1 (27MAR84-09APR84)	Water/Sediment
08A	Southeast Loch	PHM(08APR86-17APR86)	Water/Sediment
08B	South Channel	PHM2(09FEB87-10FEB87)	Water/Sediment
		PHM3 (15APR87-16APR87)	Water/Sediment
		PHM4 (28JUL87)	Water
08C	South Channel	PHM2(09FEB87-10FEB87)	Water/Sediment
		PHM3 (15APR87-16APR87)	Water/Sediment
09	Southeast Loch	PH1(27MAR84-09APR84)	Water/Sediment
		PHM (08APR86-17APR86)	Water/Sediment
		PHM2 (09FEB87-10FEB87)	Water/Sediment
		PHM3 (15APR87-16APR87)	Water/Sediment
		PHM4 (28JUL87)	Water
09A	South Channel	PHM2 (09FEB87-10FEB87)	Water/Sediment
		PHM3 (15APR87-16APR87)	Water/Sediment
		PHM5 (15OCT87-16OCT87)	Water
		PHM6 (19JAN88-20JAN88)	Water/Sediment
09B	Southeast Loch	PHM2 (09FEB87-10FEB87)	Water/Sediment
		PHM3 (15APR87-16APR87)	Water/Sediment
		PHM4 (28JUL87)	Water
		PHM5 (15OCT87-16OCT87)	Water
		PHM6 (19JAN88-20JAN88)	Water/Sediment
10	Southeast Loch	PH1(27MAR84-09APR84)	Water/Sediment
		PHM (08APR86-17APR86)	Water/Sediment
		PHM2 (09FEB87-10FEB87)	Water/Sediment
		PHM3 (15APR87-16APR87)	Water/Sediment
		PHM4 (28JUL87)	Water
		PHM5 (15OCT87-16OCT87)	Water
		PHM6 (19JAN88-20JAN88)	Water/Sediment
10A	Southeast Loch	PHM (08APR86-17APR86)	Water/Sediment
10B	Southeast Loch	PHM(08APR86-17APR86)	Water
		PHM3 (15APR87-16APR87)	Water/Sediment
10C	Southeast Loch	PHM(08APR86-17APR86)	Sediment
		PHM2 (09FEB87-10FEB87)	Water/Sediment
11	Southeast Loch	PH1 (27MAR84-09APR84)	Water/Sediment
		PHM (08APR86-17APR86)	Water/Sediment

<u>Station</u>	<u>Sample Region</u>	<u>Survey</u>	<u>Sample Types</u>
		PHM2 (09FEB87-10FEB87)	Water/Sediment
		PHM3 (15APR87-16APR87)	Water/Sediment
		PHM4 (28JUL87)	Water
11A	Southeast Loch	PHM5 (15OCT87-16OCT87)	Water
		PHM6 (19JAN88-20JAN88)	Water/Sediment
12	Southeast Loch	PH1(27MAR84-09APR84)	Water/Sediment
		PHM (08APR86-17APR86)	Sediment
13	South Channel	PH1 (27MAR84-09APR84)	Water/Sediment
14	Rainbow Marina	PH1 (27MAR84-09APR84)	Water/Sediment
		PHM (08APR86-17APR86)	Water/Sediment
		PHM2 (09FEB87-10FEB87)	Water/Sediment
		PHM3 (15APR87-16APR87)	Water/Sediment
		PHM4 (28JUL87)	Water
		PHM5 (15OCT87-16OCT87)	Water
		PHM6 (19JAN88-20JAN88)	Water/Sediment
14A	Rainbow Marina	PH1 (27MAR84-09APR84)	Tissue
		PHM4 (28JUL87)	Tissue
		PHM6 (19JAN88-20JAN88)	Tissue
14B	Rainbow Marina	PHM(08APR86-17APR86)	Tissue
		PHM2 (09FEB87-10FEB87)	Tissue
15	North Channel	PH1 (27MAR84-09APR84)	Water/Sediment
		PHM3 (15APR87-16APR87)	Water/Sediment
		PHM4 (28JUL87)	Water
16	Waiau Shoal	PH1 (27MAR84-09APR84)	Water/Sed /Tissue
		PHM (08APR86-17APR86)	Water/Sediment
		PHM2 (09FEB87-10FEB87)	Water/Sed /Tissue
		PHM3 (15APR87-16APR87)	Water/Sediment
		PHM4 (28JUL87)	Water
		PHM5 (15OCT87-16OCT87)	Water
		PHM6 (19JAN88-20JAN88)	Water/Sed /Tissue
16A	Waiau Shoal	PH1 (27MAR84-09APR84)	Water
17	North Channel	PH1 (27MAR84-09APR84)	Water/Sediment
		PHM3 (15APR87-16APR87)	Water
18	North Channel	PH1 (27MAR84-09APR84)	Water/Sediment
18A	North Channel	PHM3 (15APR87-16APR87)	Water
		PHM4 (28JUL87)	Water
		PHM5 (15OCT87-16OCT87)	Water
		PHM6 (19JAN88-20JAN88)	Water/Sediment
19	Middle Loch	PH1 (27MAR84-09APR84)	Water/Sediment
		PHM (08APR86-17APR86)	Water/Sediment
		PHM2 (09FEB87-10FEB87)	Water/Sediment

<u>Station</u>	<u>Sample Region</u>	<u>Survey</u>	<u>Sample Types</u>
19A	Middle Loch	PHM3 (15APR87-16APR87)	Water/Sediment
		PHM4 (28JUL87)	Water
		PHM5 (15OCT87-16OCT87)	Water
		PHM6 (19JAN88-20JAN88)	Water/Sediment
		PHM2(09FEB87-10FEB87)	Water
		PHM5 (15OCT87-16OCT87)	Water
20	North Channel	PHM6 (19JAN88-20JAN88)	Water/Sediment
		PH1 (27MAR84-09APR84)	Water/Sediment
		PHM5 (15OCT87-16OCT87)	Water
		PHM6 (19JAN88-20JAN88)	Water/Sediment
21	North Channel	PHM2 (09FEB87-10FEB87)	Water
		PHM5 (15OCT87-16OCT87)	Water
		PHM6 (19JAN88-20JAN88)	Water/Sediment

SURVEY STATION SUMMARY

<u>Survey</u>	<u>Stations</u>
PH1 (27MAR84-09APR84)	01, 02, 03, 03A, 04, 05, 05A, 06, 06A, 07, 08, 09, 10, 11, 12, 13, 14, 14A, 15, 16, 17, 18, 19, 20
PHM (08APR86-17APR86)	01, 03A, 05, 05A, 08A, 09, 10, 10A, 10B, 10C, 11, 12, 14, 14B, 16, 19
PHM2 (09FEB87-10FEB87)	01, 01A, 01B, 01C, 01D, 01E, 01F, 02, 03, 03A, 03C, 03D, 05, 05A, 05B, 05C, 06, 06A, 07, 07A, 07B, 07C, 08B, 08C, 09, 09A, 09B, 10, 10C, 11, 14, 14B, 16, 19, 19A, 21
PHM3 (15APR87-16APR87)	01, 03, 03A, 03E, 05, 05B, 05C, 06, 07, 07A, 07B, 08B, 08C, 09, 09A, 09B, 10, 10B, 11, 14, 16, 17, 18A, 19
PHM4 (28JUL87)	01, 03, 03A, 05, 05B, 05C, 06, 07, 07B, 08B, 09, 09B, 10, 11, 14, 15, 16, 18A, 19
PHM5 (15OCT87-16OCT87)	01, 03A, 03D, 05B, 05C, 07, 07B, 09A, 09B, 10, 11A, 14, 16, 18A, 19, 20, 21
PHM6 (19JAN88-20JAN88)	01, 03, 03A, 03D, 05B, 05C, 07, 07B, 09A, 09B, 10, 11A, 14, 16, 18A, 19, 20, 21

HONOLULU HARBOR STATION LOCATIONS

<u>Station</u>	<u>N Latitude</u>	<u>W Longitude</u>	<u>Station Description</u>
01	21°19'04.8"	157°53'25.1"	AdjBrdgNEndSandIs
02	21°19'18.2"	157°53'12.1"	20mSDillnghmFlDryDk
03	21°19'01.0"	157°53'13.6"	AdjMatsonPierSandIs
04	21°18'30.0"	157°52'02.5"	AdjEndPier#7
05	21°18'12.4"	157°52'14.5"	MidEntrCh150mEMkr#7

<u>Station</u>	<u>N Latitude</u>	<u>W Longitude</u>	<u>Station Description</u>
06	21°17'43.7"	157°51'32.8"	CenterKewaloBasin
07	21°17'16.5"	157°51'41.0"	TunaPkrsRRKewaloBsn
08	21°17'10.0"	157°51'45.5"	MidEntrChnKewaloBsn
09	21°18'43.3"	157°52'33.3"	CentrUSCGPierSandIs
10	21°19'17.4"	157°53'43.0"	CntrKeehiLgnBoatHbr
11	21°17'26.6"	157°50'38.9"	CenterAlaWaiBoatHbr
12	21°17'40.3"	157°52'34.1"	MidEntrChBtnBy#1/#2
13	21°18'33.2"	157°52'16.9"	CntrHonHarbrMainBsn

STATION SAMPLE SUMMARY

<u>Station</u>	<u>Sample Region</u>	<u>Survey</u>	<u>Sample Types</u>
01	Main Basin	HH (05APR84)	Water/Sed/Tissue
		HHM (15APR86)	Water/Sed/Tissue
		HHM3 (30JUL87)	Water/Tissue
		HHM4 (21JAN88)	Water/Sed/Tissue
02	Dry Dock	HH(05APR84)	Water/Sediment
		HHM (15APR86)	Water/Sediment
		HHM2 (05MAR87)	Water
		HHM3 (30JUL87)	Water
03	Main Basin	HHM4 (21JAN88)	Water/Sediment
		HH (05APR84)	Water/Sediment
		HHM (15APR86)	Water/Sediment
		HHM2 (05MAR87)	Water
04	Main Basin	HHM3 (30JUL87)	Water
		HHM4 (21JAN88)	Water/Sediment
		HH (05APR84)	Water/Sediment
		HHM2 (05MAR87)	Water
05	Entrance Channel	HH (05APR84)	Water/Sediment
		HHM (15APR86)	Water/Sediment
		HHM2 (05MAR87)	Water
		HHM3 (30JUL87)	Water
06	Kewalo Basin	HHM4 (21JAN88)	Water/Sediment
		HH (05APR84)	Water/Sediment
		HHM (15APR86)	Water/Sediment
		HHM3 (30JUL87)	Water
07	Kewalo Basin	HHM4 (21JAN88)	Water/Sediment
		HH (05APR84)	Water/Sediment
		HHM2 (05MAR87)	Water
		HHM3 (30JUL87)	Water
08	Kewalo Basin	HH (05APR84)	Water/Sediment

<u>Station</u>	<u>Sample Region</u>	<u>Survey</u>	<u>Sample Types</u>
09	Main Basin	HHM (15APR86)	Water/Sed/Tissue
		HHM2 (05MAR87)	Water
		HHM3 (30JUL87)	Water/Tissue
		HHM4 (21JAN88)	Water/Sed/Tissue
10	Keehi Lagoon	HHM (15APR86)	Water/Sed/Tissue
		HHM3 (30JUL87)	Water
		HHM4 (21JAN88)	Water/Sediment
11	Ala Wai Harbor	HHM (15APR86)	Water/Sediment
		HHM3 (30JUL87)	Water
		HHM4 (21JAN88)	Water/Sediment
12	Entrance Channel	HHM2 (05MAR87)	Water
13	Main Basin	HHM2 (05MAR87)	Water

SURVEY STATION SUMMARY

<u>Survey</u>	<u>Stations</u>
HH (05APR84)	01, 02, 03, 04, 05, 06, 07, 08
HHM (15APR86)	01, 02, 03, 05, 06, 09, 10, 11
HHM2 (05MAR87)	02, 03, 04, 05, 09, 12, 13
HHM3 (30JUL87)	01, 02, 03, 05, 06, 09, 10, 11
HHM4 (21JAN88)	01, 02, 03, 05, 06, 09, 10, 11

APPENDIX C **ESTIMATED ORGANOTIN LOADING IN HONOLULU** **HARBOR, ALA WAI BOAT HARBOR, AND RAINBOW BAY** **MARINA (PEARL HARBOR)**

HONOLULU HARBOR

United States Coast Guard Vessels ^(a)

Total number of vessels = 9

Number of vessels painted with OT-bearing coatings = 4^(a)

Total OT-coated hull area = 30,000.0 ft² (2,787.09 m²)

OT leach rate = 1.0 µg/cm²/day

Estimated total time in port = 182.5 days per year

OT Harbor Load Fraction Estimate	=	27.87 grams per day
	=	5,086.27 grams per year

Commercial Vessels ^(b)

Mean number of vessels in port per month	=	45
--	---	----

Minimum	=	41
---------	---	----

Maximum	=	48
---------	---	----

Mean number of days in port per vessel per month	=	1.46 days
--	---	-----------

Minimum	=	0.17 Days
---------	---	-----------

Maximum	=	29.60 days
---------	---	------------

Mean wetted hull area per vessel	=	53,464.82 ft ² (4,967.04 m ²)
----------------------------------	---	--

Minimum	=	3,595.15 ft ² (334.0 m ²)
---------	---	--

Maximum	=	98,177.62 ft ² (9,120.7 m ²)
---------	---	---

Estimated OT use = 25 percent

Mean total OT-coated hull area	=	601,479.23 ft ² (55,879.25 m ²)
--------------------------------	---	--

OT leach rate	=	1.0 µg/cm ² /day
---------------	---	-----------------------------

Mean total time in port	=	17.52 days per year
-------------------------	---	---------------------

OT Harbor Load Fraction Estimate	=	558.77 grams per day
	=	9,789.72 grams per year

If mean total time in port = 36.5 days per year (10 percent, as per 1986 NAVSEA estimates); organotin harbor load fraction = 20,395.11 grams per year.

NOTES:

^(a) Based on unpublished 1984 USCG data.

^(b) Based on unpublished 1983 Honolulu Harbormaster's Office data.

HONOLULU HARBOR (cont.)

Fishing Vessels ^(b)

Mean number of vessels in port per month	=	28
Minimum	=	24
Maximum	=	31
Mean number of days in port per vessel per month	=	0.73 days
Minimum	=	0.08 days
Maximum	=	9.74 days
Mean wetted hull area per vessel	=	5,569.22 ft ² (517.40 m ²)
Minimum	=	2,658.69 ft ² (247.0 m ²)
Maximum	=	15,403.16 ft ² (1431.0 m ²)
Estimated OT use	=	70 percent
Mean total OT-coated hull area	=	155,938.09 ft ² (14,487.12 m ²)
OT leach rate	=	1.0 µg/cm ² /day
Mean total time in port	=	8.72 days per year
OT Harbor Load Fraction Estimate	=	144.87 grams per day
	=	1,263.24 grams per year

If mean total time in port = 182.5 days per year (50 percent, as per 1986 NAVSEA estimates); organotin harbor load fraction = 26,438.13 grams per year.

Estimated Total Honolulu Harbor Organotin Loading:

16,139.23 – 51,919.51 grams per year

NOTES:

^(a) Based on unpublished 1984 USCG data.

^(b) Based on unpublished 1983 Honolulu Harbormaster's Office data.

ALA WAI BOAT HARBOR ^(c)

Mean number of vessels in port	=	624
Mean number of days in port per vessel per year	=	346.75 days
Mean length per vessel	=	38.5 ft (11.7 m)
Minimum	=	20.0 ft (6.1 m)
Maximum	=	85.0 ft (25.9 m)
Mean wetted hull area per vessel	=	294.65 ft ² (27.47 m ²)
Minimum	=	80.00 ft ² (7.43 m ²)
Maximum	=	1,445.00 ft ² (134.24 m ²)
Estimated OT use = 30 percent		
Mean total OT-coated hull area	=	55,158.48 ft ² (5124.39 m ²)
OT leach rate	=	2.0 µg/cm ² /day
Mean total time in port	=	346.75 days per year
OT Total Harbor Load Estimate	=	102.48 grams per day
	=	35,536.49 grams per year

If mean total time in port = 365 days per year (100 percent, as per 1986 NAV-SEA estimates); organotin total harbor load = 37,406.83 grams per year.

RAINBOW BAY MARINA (RBM), AIEA BAY, PEARL HARBOR

Mean number of vessels in port	=	70 ^(d)
Mean number of days in port per vessel per year	=	346.75 ^(c)
Mean length per vessel	=	30.0 ft (9.14 m) ^(c)
Mean wetted hull area per vessel	=	145.9 ft ² (13.47 m ²) ^(b)
Estimated OT use	=	30 percent ^(a)
Mean total OT-coated hull area	=	3045 ft ² (282.87 m ²)
OT leach rate	=	2.0 µg/cm ² /day ^(a)
Mean total time in port	=	346.75 ^(c) days per year
OT Harbor Load Fraction Estimate	=	5.66 g per day
	=	1961.70 g per year

If mean total time in port = 365 days per year (100 percent, as per 1986 NAVSEA estimates); organotin harbor load fraction = 2064.95 grams per year.

NOTES:

- ^(a) Based on unpublished 1984 USCG data.
- ^(b) Based on unpublished 1983 Honolulu Harbormaster's Office data.
- ^(c) Based on 1986 Ala Wai Boat Harbormaster's Office data.
- ^(d) Estimate based on two separate counts by NOSC c/522HI personnel.

APPENDIX D **PEARL HARBOR AND HONOLULU HARBOR COMPLEX** **SAMPLE RECORDS**

Pearl Harbor

Total Number of Water Samples Collected

Station	Apr86	Feb87	Mar87	Apr87	May8	Jul87	Aug87	Sep87	Oct87	Jan88	Total
01	4	6		6		6		13	6	6	47
01A		3	6								9
01B		3	2								5
01C		3	19								22
01D			4								4
01E			6								6
01F		3	2								5
02		3	2								5
03			6	2		2	12	16			38
03A	3	6				6			6	6	27
03B	3	3									6
03C		3	2								5
03D		3	2				12	13	6	6	42
03E		5	18	6				3			32
04											
05	6	6		2		2	2	3			21
05A	2										2
05B		6		6		6			6	6	30
05C		3	15		16		12	13	6	6	71
06		6		2		2					10
07		6	27	6	16	6			6	6	73
07A		6									6
07B		6		2		2	3		6	6	25
07C		3	18								21
08											
08A	6										6
08B		6	2	2							10
08C		6									6
09	3	6		2		2					13
09A		9	18	2			1		6	6	42
09B		6		6	48	6			6	6	78
10	3	6		2		6			6	6	29
10A	6										6
10B	3			2							5
10C		6									6
11	6	6	6	6		6					30
11A			11		16				6	6	39
12											
13											
14	6	6		6		6			6	6	36
14A											
14B	3										3
15		6		2	16	2	14	13			53
16	6	6		6		2	12		6	6	44
16A											
17				2							2
18											
18A				6		2			6	6	20
19	6	6		6		6			6	6	36
19A			8				12	13	6	6	45
20									6	6	12
21			8						6	6	20
TOTAL	66	155	182	82	112	72	80	87	108	108	1052

Pearl Harbor (continued)

Total Number of Sediment and Tissue Samples Collected

Station	SEDIMENT					TISSUE				
	Apr86	Feb87	Apr87	Jan88	Total	Apr86	Feb87	Aug87	Jan88	Total
01	3	3	3	3	12					
01A										
01B										
01C										
01D										
01E										
01F										
02										
03				3	3					
03A	3	3	3	3	12	5	3	3	3	14
03B										
03C										
03D				3	3					
03E										
04										
05	3	3	3		9					
05A						3	3			6
05B		3	3	3	9					
05C				3	3					
06		3	3		6		3			3
07		3	3	3	9		3	3	3	9
07A		3	3		6					
07B		3	3	3	9					
07C										
08										
08A	3				3					
08B		3	3		6					
08C		3	3		6					
09	3	3	3		9					
09A		3	3	3	9					
09B		3	3	3	9					
10	3	3	3	3	12					
10A	3				3					
10B			3		3					
10C	3	3			6					
11	3	3	3		9					
11A				3	3					
12	3				3					
13	3				3					
14	3	3	3	3	12					
14A								3	3	6
14B						3	3			6
15		3	3		6					
16	3	3	3	3	12		3		3	6
16A										
17										
18										
18A										
19	3	3	3	3	12					
19A				3	3					
20				3	3					
21				3	3					
TOTAL	42	60	60	54	216	11	18	9	12	50

HONOLULU HARBOR COMPLEX

Total Number of Water Samples Collected

Station	Apr86	Feb87	Mar87	Apr87	May88	Jul87	Aug88	Sep87	Oct87	Jan88	Total
01	6					2				6	14
02	6		7			2				6	21
03	6		9			2				6	23
04			4								4
05	6		4			2				6	18
06	6					6				6	18
07											
08											
09	6					6				6	18
10	6					2				6	18
11	6					6				6	18
12			3								3
13			8								8
TOTAL	48		35			28				48	159

Total Number of Sediment and Tissue Samples Collected

Sediment						Tissue				
Station	Apr86	Mar87	Jul87	Jan88	Total	Apr86	Mar87	Jul87	Jan88	Total
01	3			3	6	3		1	3	7
02	3			3	6					
03	3			3	6					
04										
05	3			3	6					
06	3			3	6					
07										
08										
09	3			3	6	3		1	3	7
10	3			3	6	3				3
11	3			3	6					
12										
13										
TOTAL	24			24	48	9		2	6	17

APPENDIX E ORGANOTIN SAMPLE DATABASE RECORDS

Pearl Harbor Water Column Organotin Database

Sample	Type	Station	Layer	Rep	Date	Time	Depth	Tidal State	Date Analyzed	Concentration in ng/L		
										MTCL	DTCL	TBCL
PH2 -01A-SW-1	2	01A	S	1	1Mar87	131754	0.5	INCMG	14Jul87	2.2	0.8	1.1
PH2 -01A-SW-1	2	01A	S	1	4Mar87	113200	0.5	OUTGO	23Jul87	2.4	1.3	2.4
PH2 -01A-SW-2	2	01A	S	2	4Mar87	113200	0.5	OUTGO	23Jun87	3.7	2.7	4.3
PH2 -01A-SW-3	2	01A	S	3	4Mar87	113200	0.5	OUTGO	24Jul87	5.1	1.4	4.1
PH2 -01A-DW-1	2	01A	D	1	4Mar87	112800	4.0	OUTGO	20Jul87	1.7	1.2	2.0
PH2 -01A-DW-2	2	01A	D	2	4Mar87	112800	4.0	OUTGO	23Jul87	1.4	1.6	1.2
PH2 -01A-DW-3	2	01A	D	3	4Mar87	112800	4.0	OUTGO	24Jul87	2.4	1.0	1.6
PH2 -01B-SW-1	2	01B	S	1	4Mar87	115400	0.5	OUTGO	24Jul87	3.4	3.0	8.4
PH2 -01B-DW-1	2	01B	D	1	4Mar87	115300	11.5	OUTGO	6Apr87	1.9	1.0	1.5
PH2 -01C-SW-1	2	01C	S	1	1Mar87	135356	0.5	INCMG	14Jul87	5.0	2.4	2.1
PH2 -01C-SW-2	2	01C	S	2	1Mar87	135356	0.5	INCMG	14Jul87	3.9	1.9	2.1
PH2 -01C-SW-3	2	01C	S	3	1Mar87	135356	0.5	INCMG	14Jul87	2.4	2.4	2.1
PH2 -01C-DW-1	2	01C	D	1	1Mar87	134358	15.0	INCMG	21Jul87	2.3	0.2	0.5
PH2 -01C-DW-2	2	01C	D	2	1Mar87	134358	15.0	INCMG	14Jul87	1.9	0.4	0.5
PH2 -01C-DW-3	2	01C	D	3	1Mar87	134358	15.0	INCMG	14Jul87	2.3	1.9	2.7
PH2 -01C-SW-1	2	01C	S	1	4Mar87	114300	0.5	OUTGO	24Jul87	2.6	2.1	4.3
PH2 -01C-SW-2	2	01C	S	2	4Mar87	114300	0.5	OUTGO	6Apr87	2.0	2.2	3.0
PH2 -01C-SW-3	2	01C	S	3	4Mar87	114300	0.5	OUTGO	16Jul87	4.7	12.0	7.8
PH2 -01C-DW-1	2	01C	D	1	4Mar87	114000	16.5	OUTGO	24Jul87	0.8	0.5	1.3
PH2 -01C-DW-2	2	01C	D	2	4Mar87	114000	16.5	OUTGO	21Jul87	5.4	0.5	1.3
PH2 -01C-DW-3	2	01C	D	3	4Mar87	114000	16.5	OUTGO	16Jul87	1.8	2.2	0.9
PH2 -01D-SW-1	2	01D	S	1	1Mar87	115600	0.5	LOSLK	9Jul87	3.9	1.3	8.2
PH2 -01D-SW-1D	2	01D	S	1D	1Mar87	115800	1.0	LOSLK	14Jul87	3.6	25.0	15.0
PH2 -01D-SW-2	2	01D	S	2	1Mar87	115600	0.5	LOSLK	9Jul87	21.0	1.6	9.2
PH2 -01D-SW-3	2	01D	S	3	1Mar87	115600	0.5	LOST>				
PH2 -01E-SW-1	2	01E	S	1	1Mar87	125237	0.5	INCMG	24Jul87	2.1	1.2	3.0
PH2 -01E-SW-1D	2	01E	S	1D	1Mar87	125237	0.5	INCMG	14Jul87	1.6	1.2	1.4
PH2 -01E-SW-1D	2	01E	S	1D	1Mar87	125330	1.0	INCMG	3Mar87	4.2	12.0	14.0
PH2 -01E-SW-1D	2	01E	S	1D	1Mar87	125915	0.5	INCMG	3Mar87	3.2	9.8	6.0
PH2 -01E-SW-2	2	01E	S	2	1Mar87	125237	0.5	INCMG	13Jul87	1.6	0.2	0.4
PH2 -01E-SW-3	2	01E	S	3	1Mar87	125237	0.5	INCMG	22Jul87	2.4	1.2	0.8
PH2 -01F-SW-1	2	01F	S	1	1Mar87	123206	0.5	INCMG	14Jul87	5.8	0.6	0.8
PH2 -01F-SW-1D	2	01F	S	1D	1Mar87	123256	1.0	INCMG	15Jul87	27.0	17.0	2.1
PH2 -01F-SW-2	2	01F	S	2	1Mar87	123206	0.5	INCMG	15Jul87	4.6	0.5	1.0
PH2 -01F-SW-3	2	01F	S	3	1Mar87	123206	0.5	INCMG	14Jul87	3.2	1.0	0.6
PH2 -02 -SW-1	2	02	S	1	4Mar87	114900	0.5	OUTGO	6Apr87	3.4	3.8	5.2
PH2 -02 -DW-1	2	02	D	1	4Mar87	114800	10.5	OUTGO	16Jul87	0.8	1.6	2.1
PH2 -03B-SW-1	2	03B	S	1	4Mar87	120300	0.5	LOSLK	22Jul87	3.2	2.8	3.4
PH2 -03B-SW-2	2	03B	S	2	4Mar87	120300	0.5	LOSLK	22Jul87	2.6	3.1	3.8
PH2 -03B-SW-3	2	03B	S	3	4Mar87	120300	0.5	LOSLK	24Jul87	3.4	2.8	7.9
PH2 -03B-DW-1	2	03B	D	1	4Mar87	120000	12.5	LOSLK	23Jun87	2.1	0.0	0.9
PH2 -03B-DW-2	2	03B	D	2	4Mar87	120000	12.5	LOSLK	9Jul87	2.4	1.5	2.8
PH2 -03B-DW-3	2	03B	D	3	4Mar87	120000	12.5	LOSLK	16Jul87	3.6	2.1	2.2
PH2 -03C-SW-1	2	03C	S	1	24Feb87	151800	0.5	OUTGO	27Feb87	11.0	3.2	1.1
PH2 -03C-SW-2	2	03C	S	2	24Feb87	151810	0.5	OUTGO	3Mar87	19.0	3.9	0.6
PH2 -03C-SW-3	2	03C	S	3	24Feb87	151823	0.5	OUTGO	27Feb87	0.2	4.9	1.2
PH2 -03C-SW-1	2	03C	S	1	4Mar87	123100	0.5	LOSLK	11Jun87	2.1	0.2	0.4
PH2 -03C-DW-1	2	03C	D	1	4Mar87	123000	10.5	LOSLK	23Jul87	1.4	0.4	0.5
PH2 -03D-SW-1	2	03D	S	1	24Feb87	153645	0.5	OUTGO	28Feb87	1.5	1.2	0.4
PH2 -03D-SW-2	2	03D	S	2	24Feb87	153704	0.5	OUTGO	1Mar87	1.3	1.2	0.0
PH2 -03D-SW-3	2	03D	S	3	24Feb87	153727	0.5	OUTGO	3Mar87	2.7	1.5	0.5

* Organotin AF-paint test ship present at station

F = filtered

D = duplicate

Sample	Type	Station	Layer	Rep	Date	Time	Depth	Tidal State	Date Analyzed	Concentration in ng/L		
										MBTCL	DBTCL	TBTCL
PH2 -03D-SW-1	2	03D	S	1	4Mar87	122100	0.5	LOSLK	20Jul87	1.1	0.4	0.4
PH2 -03D-DW-1	2	03D	D	1	4Mar87	122000	14.0	LOSLK	24Jul87	0.8	1.8	1.0
PH2 -03E-SW-1	2	03E	S	1	24Feb87	154823	0.5	OUTGO	1Mar87	3.1	2.0	0.6
PH2 -03E-SW-1D	2	03E	S	1D	24Feb87	154823	0.5	OUTGO	1Mar87	6.1	2.6	0.7
PH2 -03E-SW-1F	2	03E	S	1F	24Feb87	154823	0.5	OUTGO	1Mar87	12.0	5.2	1.8
PH2 -03E-SW-2	2	03E	S	2	24Feb87	155041	0.5	OUTGO	1Mar87	1.5	2.0	0.0
PH2 -03E-SW-3	2	03E	S	3	24Feb87	155124	0.5	OUTGO	1Mar87	0.8	2.0	0.6
PH2 -03E-SW-1	2	03E	S	1	1Mar87	163100	0.5	INCMG	3Mar87	5.4	3.9	0.8
PH2 -03E-SW-2	2	03E	S	2	1Mar87	163100	0.5	INCMG	3Mar87	4.6	3.5	0.8
PH2 -03E-SW-3	2	03E	S	3	1Mar87	163100	0.5	INCMG	3Mar87	7.5	3.5	1.1
PH2 -03E-DW-1	2	03E	D	1	1Mar87	162900	15.5	INCMG	3Mar87	2.9	1.7	0.8
PH2 -03E-DW-2	2	03E	D	2	1Mar87	162900	15.5	INCMG	4Mar87	1.6	1.1	0.8
PH2 -03E-DW-3	2	03E	D	3	1Mar87	162900	15.5	INCMG	2Mar87	5.6	1.8	0.7
PH2 -03E-SW-1	2	03E	S	1	4Mar87	121000	0.5	LOSLK				
PH2 -03E-SW-2	2	03E	S	2	4Mar87	121000	0.5	LOSLK	23Jul87	2.9	1.0	1.5
PH2 -03E-SW-3	2	03E	S	3	4Mar87	121000	0.5	LOSLK	16Jul87	3.8	3.2	6.0
PH2 -03E-DW-1	2	03E	D	1	4Mar87	121300	14.0	LOSLK	23Jul87	2.1	0.9	0.8
PH2 -03E-DW-2	2	03E	D	2	4Mar87	121300	14.0	LOSLK				
PH2 -03E-DW-3	2	03E	D	3	4Mar87	121300	14.0	LOSLK	24Jul87	3.4	0.5	1.0
PH2 -05C-SW-1	2	05C	S	1	1Mar87	164500	0.5	INCMG	2Mar87	5.8	4.6	1.6
PH2 -05C-DW-1	2	05C	D	1	1Mar87	165000	15.0	INCMG	3Mar87	2.9	2.3	1.7
PH2 -05C-SW-1	2	05C	S	1	4Mar87	125300	0.5	LOSLK	11Jun87	6.1	3.5	2.9
PH2 -05C-SW-2	2	05C	S	2	4Mar87	125300	0.5	LOSLK	11Jun87	5.8	3.2	2.9
PH2 -05C-SW-3	2	05C	S	3	4Mar87	125300	0.5	LOSLK	23Jun87	5.8	8.1	4.3
PH2 -05C-DW-1	2	05C	D	1	4Mar87	125000	16.5	LOSLK	11Jun87	6.8	1.3	2.5
PH2 -05C-DW-2	2	05C	D	2	4Mar87	125000	16.5	LOSLK	24Jul87	2.4	1.0	3.2
PH2 -05C-DW-3	2	05C	D	3	4Mar87	125000	16.5	LOSLK	23Jun87	2.1	1.6	0.4
PH2 -07 -SW-1	2	07	S	1	1Mar87	155800	0.5	INCMG	3Mar87	4.7	10.0	8.1
PH2 -07 -SW-2	2	07	S	2	1Mar87	155800	0.5	INCMG	2Mar87	3.9	14.0	15.0
PH2 -07 -SW-3	2	07	S	3	1Mar87	155800	0.5	INCMG	2Mar87	4.3	13.0	15.0
PH2 -07 -DW-1	2	07	D	1	1Mar87	155700	17.0	INCMG	3Mar87	1.8	2.9	4.8
PH2 -07 -DW-2	2	07	D	2	1Mar87	155700	17.0	INCMG	4Mar87	4.2	5.4	8.8
PH2 -07 -DW-3	2	07	D	3	1Mar87	155700	17.0	INCMG	3Mar87	3.5	4.9	4.3
PH2 -07 -SW-1	2	07	S	1	2Mar87	153500	0.5	INCMG	4Mar87	8.4	22.0	9.8
PH2 -07 -SW-1	2	07	S	1	4Mar87	141600	0.5	INCMG	28Jul87	25.0	26.0	88.0
PH2 -07 -SW-2	2	07	S	2	4Mar87	141600	0.5	INCMG	28Jul87	22.0	20.0	54.0
PH2 -07 -SW-3	2	07	S	3	4Mar87	141600	0.5	INCMG	23Jul87	8.6	14.0	30.0
PH2 -07 -DW-1	2	07	D	1	4Mar87	141300	15.5	INCMG	23Jul87	2.4	2.3	6.2
PH2 -07 -DW-2	2	07	D	2	4Mar87	141300	15.5	INCMG	21Jul87	5.2	3.7	5.3
PH2 -07 -DW-3	2	07	D	3	4Mar87	141300	15.5	INCMG	21Jul87	6.7	3.9	9.2
PH2 -07C-SW-1	2	07C	S	1	1Mar87	160900	0.5	INCMG	3Mar87	15.0	7.7	2.5
PH2 -07C-DW-1	2	07C	D	1	1Mar87	160800	17.0	INCMG	3Mar87	5.9	4.2	2.1
PH2 -07C-SW-1	2	07C	S	1	4Mar87	142300	0.5	INCMG	28Jul87	5.5	6.5	6.7
PH2 -07C-SW-2	2	07C	S	2	4Mar87	142300	0.5	INCMG	28Jul87	11.0	7.4	8.1
PH2 -07C-SW-3	2	07C	S	3	4Mar87	142300	0.5	INCMG	28Jul87	18.0	10.0	23.0
PH2 -07C-DW-1	2	07C	D	1	4Mar87	142000	16.0	INCMG	28Jul87	1.2	1.3	1.8
PH2 -07C-DW-2	2	07C	D	2	4Mar87	142000	16.0	INCMG	23Jul87	1.6	1.0	2.6
PH2 -07C-DW-3	2	07C	D	3	4Mar87	142000	16.0	INCMG	23Jul87	1.9	1.3	1.7
PH2 -09A-SW-1	2	09A	S	1	1Mar87	154400	0.5	INCMG	3Mar87	6.0	4.1	1.9
PH2 -09A-DW-1	2	09A	D	1	1Mar87	154300	15.0	INCMG	3Mar87	2.3	3.1	2.2
PH2 -09A-SW-1	2	09A	S	1	4Mar87	140600	0.5	INCMG	23Jun87	9.8	5.8	6.5
PH2 -09A-SW-2	2	09A	S	2	4Mar87	140600	0.5	INCMG	6Apr87	2.2	4.6	3.7
PH2 -09A-SW-3	2	09A	S	3	4Mar87	140600	0.5	INCMG	11Jun87	4.6	3.9	3.3
PH2 -09A-DW-1	2	09A	D	1	4Mar87	140300	12.5	INCMG	13Jul87	4.7	4.0	3.6
PH2 -09A-DW-2	2	09A	D	2	4Mar87	140300	12.5	INCMG	11Jun87	4.0	1.3	1.1
PH2 -09A-DW-3	2	09A	D	3	4Mar87	140300	12.5	INCMG	23Jun87	14.0	5.1	2.5
PH2 -11 -SW-1	2	11	S	1	4Mar87	135600	0.5	INCMG	11Jun87	6.0	24.0	6.6
PH2 -11 -SW-2	2	11	S	2	4Mar87	135600	0.5	INCMG	23Jun87	14.0	25.0	21.0
PH2 -11 -SW-3	2	11	S	3	4Mar87	135600	0.5	INCMG	24Jul87	16.0	30.0	13.0

* Organotin AF-paint test ship present at station

F = filtered

D = duplicate

Sample	Type	Station	Layer	Rep	Date	Time	Depth	Tidal State	Date Analyzed	Concentration in ng/L		
										MBTCL	DBTCL	TBTCL
PH2 -11 -DW-1	2	11	D	1	4Mar87	135300	12.5	INCMG	23Jun87	7.2	6.2	5.4
PH2 -11 -DW-2	2	11	D	2	4Mar87	135300	12.5	INCMG	11Jun87	2.0	2.9	2.3
PH2 -11 -DW-3	2	11	D	3	4Mar87	135300	12.5	INCMG	11Jun87	3.6	3.5	2.5
PH2 -19A-SW-1	2	19A	S	1	1Mar87	171400	0.5	INCMG	14Jul87	4.8	1.6	1.0
PH2 -19A-SW-2	2	19A	S	2	1Mar87	171400	0.5	INCMG	15Jul87	9.3	3.3	1.9
PH2 -19A-SW-3	2	19A	S	3	1Mar87	171400	0.5	INCMG	15Jul87	4.4	1.4	1.7
PH2 -19A-DW-1	2	19A	D	1	1Mar87	171300	13.0	INCMG	2Mar87	3.0	3.3	2.2
PH2 -19A-DW-2	2	19A	D	2	1Mar87	171300	13.0	INCMG	3Mar87	7.5	3.7	1.3
PH2 -19A-DW-3	2	19A	D	3	1Mar87	171300	13.0	INCMG	3Mar87	1.8	1.7	0.5
PH2 -19A-SW-1	2	19A	S	1	4Mar87	130700	0.5	INCMG	11Jun87	2.7	1.1	2.2
PH2 -19A-DW-1	2	19A	D	1	4Mar87	130600	11.0	INCMG	8Jul87	35.0	3.2	3.2
PH2 -21 -SW-1	2	21	S	1	1Mar87	173700	0.5	HISLK	9Jul87	7.0	3.7	5.6
PH2 -21 -SW-2	2	21	S	2	1Mar87	173700	0.5	HISLK	15Jul87	12.0	3.6	4.5
PH2 -21 -SW-3	2	21	S	3	1Mar87	173700	0.5	HISLK	15Jul87	7.5	2.5	3.3
PH2 -21 -DW-1	2	21	D	1	1Mar87	173500	14.5	HISLK	14Jul87	3.2	2.0	2.1
PH2 -21 -DW-2	2	21	D	2	1Mar87	173500	14.5	HISLK	14Jul87	3.6	2.5	1.5
PH2 -21 -DW-3	2	21	D	3	1Mar87	173500	14.5	HISLK	14Jul87	3.3	2.5	2.6
PH2 -21 -SW-1	2	21	S	1	4Mar87	132100	0.5	INCMG	7Apr87	2.7	2.6	2.4
PH2 -21 -DW-1	2	21	D	1	4Mar87	132000	12.5	INCMG	11Jun87	1.9	1.6	1.1
PHM -01 -SW-1	M	01	S	1	9Apr86	133500	1.0	INCMG				
PHM -01 -SW-2	M	01	S	2	9Apr86	133600	1.0	INCMG				
PHM -01 -SW-3	M	01	S	3	9Apr86	133700	1.0	INCMG	28Jul86	10.0	2.0	0.0
PHM -01 -DW-1	M	01	D	1	9Apr86	133000	9.0	INCMG	28Jul86	0.0	0.0	0.0
PHM -01 -DW-2	M	01	D	2	9Apr86	133100	9.0	INCMG	28Jul86	0.0	0.0	0.0
PHM -01 -DW-3	M	01	D	3	9Apr86	133200	9.0	INCMG	28Jul86	0.0	0.0	0.0
PHM -03A-SW-1	M	03A	S	1	9Apr86	125500	0.5	INCMG	29Jul86	0.0	0.0	0.0
PHM -03A-SW-2	M	03A	S	2	9Apr86	125600	0.5	INCMG	29Jul86	0.0	0.0	0.0
PHM -03A-SW-3	M	03A	S	3	9Apr86	125700	0.5	INCMG	29Jul86	0.0	0.0	0.0
PHM -03B-SW-1*	M	03B	S	1*	17Apr86	110800	1.0	SLACK	29Jul86	11.0	7.0	39.0
PHM -03B-SW-2*	M	03B	S	2*	17Apr86	110900	1.0	SLACK	29Jul86	6.0	8.0	38.0
PHM -03B-SW-3*	M	03B	S	3*	17Apr86	111000	1.0	SLACK	29Jul86	7.0	7.0	32.0
PHM -05 -SW-1	M	05	S	1	9Apr86	120300	1.0	INCMG	29Jul86	0.0	0.0	0.0
PHM -05 -SW-2	M	05	S	2	9Apr86	120400	1.0	INCMG				
PHM -05 -SW-3	M	05	S	3	9Apr86	120500	1.0	INCMG	29Jul86	0.0	0.0	0.0
PHM -05 -DW-1	M	05	D	1	9Apr86	115600	14.0	INCMG	29Jul86	0.0	0.0	0.0
PHM -05 -DW-2	M	05	D	2	9Apr86	115700	14.0	INCMG	29Jul86	0.0	0.0	0.0
PHM -05 -DW-3	M	05	D	3	9Apr86	115800	14.0	INCMG	29Jul86	0.0	0.0	0.0
PHM -05A-SW-1	M	05A	S	1	9Apr86				29Jul86	0.0	0.0	0.0
PHM -05A-SW-2	M	05A	S	2	9Apr86				29Jul86	4.0	0.0	0.0
PHM -08A-SW-1	M	08A	S	1	8Apr86	122300	1.0	INCMG	5Aug86	5.0	9.0	12.0
PHM -08A-SW-2	M	08A	S	2	8Apr86	122400	1.0	INCMG				
PHM -08A-SW-3	M	08A	S	3	8Apr86	122500	1.0	INCMG	5Aug86	5.0	4.0	10.0
PHM -08A-DW-1	M	08A	D	1	8Apr86	121500	11.5	INCMG	5Aug86	0.0	0.0	0.0
PHM -08A-DW-2	M	08A	D	2	8Apr86	121600	11.5	INCMG	5Aug86	0.0	0.0	0.0
PHM -08A-DW-3	M	08A	D	3	8Apr86	121700	11.5	INCMG	5Aug86	0.0	0.0	0.0
PHM -09 -SW-1	M	09	S	1	17Apr86	104500	1.0	HISLK	31Jul86	8.0	4.0	13.0
PHM -09 -SW-2	M	09	S	2	17Apr86	104600	1.0	HISLK	31Jul86	0.0	4.0	8.0
PHM -09 -SW-3	M	09	S	3	17Apr86	104700	1.0	HISLK	31Jul86	8.0	4.0	12.0
PHM -10 -SW-1	M	10	S	1	17Apr86	103000	1.0	INCMG	30Jul86	5.0	8.0	35.0
PHM -10 -SW-2	M	10	S	2	17Apr86	103100	1.0	INCMG	30Jul86	0.0	3.0	0.0
PHM -10 -SW-3	M	10	S	3	17Apr86	103200	1.0	INCMG	30Jul86	4.0	9.0	32.0
PHM -10A-SW-1	M	10A	S	1	8Apr86	115500	1.0	INCMG	31Jul86	8.0	4.0	9.0
PHM -10A-SW-1	M	10A	S	1	8Apr86	115600	1.0	INCMG				
PHM -10A-SW-3	M	10A	S	3	8Apr86	115700	1.0	INCMG	31Jul86	9.0	5.0	17.0
PHM -10A-DW-1	M	10A	D	1	8Apr86	114500	11.0	INCMG	31Jul86	0.0	0.0	7.0
PHM -10A-DW-2	M	10A	D	2	8Apr86	114600	11.0	INCMG				
PHM -10A-DW-3	M	10A	D	3	8Apr86	114700	11.0	INCMG	31Jul86	3.0	3.0	8.0
PHM -10B-SW-1*	M	10B	S	1*	8Apr86	125100	1.0	INCMG	30Jul86	4.0	8.0	32.0
PHM -10B-SW-2*	M	10B	S	2*	8Apr86	125200	1.0	INCMG	30Jul86	5.0	12.0	61.0

* Organotin AF-paint test ship present at station

F = filtered

D = duplicate

Sample	Type	Station	Layer	Rep	Date	Time	Depth	Tidal State	Date Analyzed	Concentration in ng/L		
										MBTCL	DBTCL	TBTCL
PHM -10B-SW-3*	M	10B	S	3*	8Apr86	125300	1.0	INCMG	30Jul86	8.0	13.0	53.0
PHM -11 -SW-1	M	11	S	1	8Apr86	110400	1.0	INCMG	5Aug86	0.0	4.0	11.0
PHM -11 -SW-2	M	11	S	2	8Apr86	110500	1.0	INCMG	5Aug86	0.0	3.0	20.0
PHM -11 -SW-3	M	11	S	3	8Apr86	110600	1.0	INCMG	5Aug86	0.0	0.0	0.0
PHM -11 -DW-1	M	11	D	1	8Apr86	110000	8.0	INCMG	5Aug86	0.0	5.0	9.0
PHM -11 -DW-2	M	11	D	2	8Apr86	110100	8.0	INCMG				
PHM -11 -DW-3	M	11	D	3	8Apr86	110200	8.0	INCMG	5Aug86	0.0	4.0	6.0
PHM -14 -SW-1	M	14	S	1	8Apr86	131500	1.0	INCMG	28Jul86	0.0	9.0	20.0
PHM -14 -SW-2	M	14	S	2	8Apr86	131600	1.0	INCMG	28Jul86	0.0	6.0	20.0
PHM -14 -SW-3	M	14	S	3	8Apr86	131700	1.0	INCMG	28Jul86	0.0	6.0	18.0
PHM -14 -DW-1	M	14	D	1	8Apr86	131000	4.0	INCMG	28Jul86	0.0	4.0	0.0
PHM -14 -DW-2	M	14	D	2	8Apr86	131100	4.0	INCMG				
PHM -14 -DW-3	M	14	D	3	8Apr86	131200	4.0	INCMG	28Jul86	0.0	2.0	0.0
PHM -14B-SW-1	M	14B	S	1	17Apr86	132000	0.5	SLACK	31Jul86	7.0	4.0	0.0
PHM -14B-SW-2	M	14B	S	2	17Apr86	132100	0.5	SLACK				
PHM -14B-SW-3	M	14B	S	3	17Apr86	132200	0.5	SLACK	31Jul86	6.0	4.0	10.0
PHM -16 -SW-1	M	16	S	1	9Apr86	105500	1.0	LOSLK	6Aug86	0.0	0.0	0.0
PHM -16 -SW-2	M	16	S	2	9Apr86	105600	1.0	LOSLK				
PHM -16 -SW-3	M	16	S	3	9Apr86	105700	1.0	LOSLK	6Aug86	0.0	0.0	0.0
PHM -16 -DW-1	M	16	D	1	9Apr86	105000	2.0	LOSLK	6Aug86	0.0	0.0	0.0
PHM -16 -DW-2	M	16	D	2	9Apr86	105100	2.0	LOSLK				
PHM -16 -DW-3	M	16	D	3	9Apr86	105200	2.0	LOSLK	6Aug86	0.0	0.0	0.0
PHM -19 -SW-3	M	19	S	3	9Apr86	113100	1.0	INCMG	5Aug86	0.0	2.0	0.0
PHM -19 -DW-1	M	19	D	1	9Apr86	112500	7.0	INCMG	5Aug86	0.0	0.0	0.0
PHM -19 -DW-2	M	19	D	2	9Apr86	112600	7.0	INCMG				
PHM -19 -DW-3	M	19	D	3	9Apr86	112700	7.0	INCMG	5Aug86	0.0	0.0	0.0
PHM2-01 -SW-1	M2	01	S	1	9Feb87	104600	0.5	LOSLK	23Feb87	5.7	4.1	3.1
PHM2-01 -SW-2	M2	01	S	2	9Feb87	104700	0.5	LOSLK	20Feb87	5.3	6.4	4.7
PHM2-01 -SW-3	M2	01	S	3	9Feb87	104800	0.5	LOSLK	25Feb87	1.2	2.7	1.3
PHM2-01 -DW-1	M2	01	D	1	9Feb87	104900	11.5	LOSLK	20Feb87	2.7	0.8	1.7
PHM2-01 -DW-2	M2	01	D	2	9Feb87	105000	11.5	LOSLK	20Feb87	2.8	0.8	2.1
PHM2-01 -DW-3	M2	01	D	3	9Feb87	105100	11.5	LOSLK	20Feb87	2.0	1.0	2.1
PHM2-01A-SW-1	M2	01A	S	1	21Feb87	150900	0.5	LOSLK	23Feb87	3.5	8.2	4.8
PHM2-01A-SW-2	M2	01A	S	2	21Feb87	151000	0.5	LOSLK	23Feb87	4.6	3.5	2.3
PHM2-01A-SW-3	M2	01A	S	3	21Feb87	151100	0.5	LOSLK	23Feb87	3.5	4.2	2.9
PHM2-01B-SW-1	M2	01B	S	1	21Feb87	152400	0.5	LOSLK	23Feb87	1.5	2.4	1.1
PHM2-01B-SW-2	M2	01B	S	2	21Feb87	152500	0.5	LOSLK	24Feb87	25.0	4.4	4.5
PHM2-01B-SW-3	M2	01B	S	3	21Feb87	152600	0.5	LOSLK	24Feb87	2.7	1.7	0.6
PHM2-01C-SW-1	M2	01C	S	1	21Feb87	152900	0.5	LOSLK	23Feb87	2.8	2.4	2.4
PHM2-01C-SW-2	M2	01C	S	2	21Feb87	153000	0.5	LOSLK	24Feb87	24.0	5.8	4.9
PHM2-01C-SW-3	M2	01C	S	3	21Feb87	153100	0.5	LOSLK	23Feb87	1.7	4.2	2.1
PHM2-02 -SW-1	M2	02	S	1	21Feb87	153400	0.5	LOSLK	24Feb87	8.1	1.9	0.9
PHM2-02 -SW-2	M2	02	S	2	21Feb87	153500	0.5	LOSLK	24Feb87	2.7	1.7	0.6
PHM2-02 -SW-3	M2	02	S	3	21Feb87	153600	0.5	LOSLK	24Feb87	4.5	3.6	1.3
PHM2-03A-SW-1	M2	03A	S	1	10Feb87	101300	0.5	LOSLK	2Mar87	2.5	1.2	1.0
PHM2-03A-SW-2	M2	03A	S	2	10Feb87	101400	0.5	LOSLK	2Mar87	1.9	0.5	0.5
PHM2-03A-SW-3	M2	03A	S	3	10Feb87	101500	0.5	LOSLK	13Jul87	2.4	1.1	0.4
PHM2-03A-DW-1	M2	03A	D	1	10Feb87	101600	4.0	LOSLK	3Mar87	3.4	2.3	0.4
PHM2-03A-DW-2	M2	03A	D	2	10Feb87	101700	4.0	LOSLK	6Apr87	0.9	0.5	1.0
PHM2-03A-DW-3	M2	03A	D	3	10Feb87	101800	4.0	LOSLK	13Jul87	1.9	2.9	2.5
PHM2-03B-SW-1	M2	03B	S	1	21Feb87	154200	0.5	LOSLK	23Feb87	2.0	5.2	2.3
PHM2-03B-SW-2	M2	03B	S	2	21Feb87	154300	0.5	LOSLK	24Feb87	21.0	12.0	5.3
PHM2-03B-SW-3	M2	03B	S	3	21Feb87	154400	0.5	LOSLK	23Feb87	47.0	15.0	8.0
PHM2-05 -SW-1	M2	05	S	1	9Feb87	112100	0.5	LOSLK	21Feb87	1.2	7.6	3.7
PHM2-05 -SW-2	M2	05	S	2	9Feb87	112200	0.5	LOSLK	21Feb87	2.4	8.0	4.1
PHM2-05 -SW-3	M2	05	S	3	9Feb87	112300	0.5	LOSLK	23Feb87	3.2	4.7	4.6
PHM2-05 -DW-1	M2	05	D	1	9Feb87	112400	15.0	LOSLK	23Feb87	2.4	1.8	2.1
PHM2-05 -DW-2	M2	05	D	2	9Feb87	112500	15.0	LOSLK	21Feb87	1.8	2.6	2.2
PHM2-05 -DW-3	M2	05	D	3	9Feb87	112600	15.0	LOSLK	23Feb87	3.8	1.5	2.5

* Organotin AF-paint test ship present at station

F = filtered

D = duplicate

Sample	Type	Station	Layer	Rep	Date	Time	Depth	Tidal State	Date Analyzed	Concentration in ng/L		
										MBTCL	DBTCL	TBTCL
PHM2-05B-SW-1	M2	05B	S	1	9Feb87	111700	0.5	LOSLK	21Feb87	3.7	8.6	5.5
PHM2-05B-SW-2	M2	05B	S	2	9Feb87	111800	0.5	LOSLK	21Feb87	3.1	8.2	4.2
PHM2-05B-SW-3	M2	05B	S	3	9Feb87	111900	0.5	LOSLK	21Feb87	2.8	9.0	7.5
PHM2-05B-DW-1	M2	05B	D	1	9Feb87	111400	16.0	LOSLK	21Feb87	1.8	2.4	2.2
PHM2-05B-DW-2	M2	05B	D	2	9Feb87	111500	16.0	LOSLK	21Feb87	27.0	18.0	6.1
PHM2-05B-DW-3	M2	05B	D	3	9Feb87	111600	16.0	LOSLK	21Feb87	2.2	2.6	2.9
PHM2-05C-SW-1	M2	05C	S	1	21Feb87	154900	0.5	LOSLK	23Feb87	4.9	5.4	1.9
PHM2-05C-SW-2	M2	05C	S	2	21Feb87	155000	0.5	LOSLK	23Feb87	41.0	8.6	2.9
PHM2-05C-SW-3	M2	05C	S	3	21Feb87	155100	0.5	LOSLK	23Feb87	2.6	3.4	1.4
PHM2-06 -SW-1	M2	06	S	1	9Feb87	134300	0.5	LOSLK	2Apr87	1.5	1.7	3.8
PHM2-06 -SW-2	M2	06	S	2	9Feb87	134100	0.5	LOSLK	3Mar87	6.3	10.0	6.1
PHM2-06 -SW-3	M2	06	S	3	9Feb87	134200	0.5	LOSLK	2Mar87	4.2	8.5	4.2
PHM2-06 -DW-1	M2	06	D	1	9Feb87	134500	3.0	LOSLK	2Mar87	19.0	8.5	4.6
PHM2-06 -DW-2	M2	06	D	2	9Feb87	134600	3.0	LOSLK	2Apr87	17.0	5.5	8.7
PHM2-06 -DW-3	M2	06	D	3	9Feb87	134700	3.0	LOSLK	2Apr87	11.0	4.5	5.8
PHM2-07 -SW-1	M2	07	S	1	9Feb87	141400	0.5	LOSLK	2Mar87	29.0	21.0	7.8
PHM2-07 -SW-2	M2	07	S	2	9Feb87	141500	0.5	LOSLK	2Apr87	19.0	6.7	12.0
PHM2-07 -SW-3	M2	07	S	3	9Feb87	141600	0.5	LOSLK	2Apr87	9.8	4.5	6.0
PHM2-07 -DW-1	M2	07	D	1	9Feb87	141700	15.5	LOSLK	2Apr87	0.6	1.4	7.1
PHM2-07 -DW-2	M2	07	D	2	9Feb87	141800	15.5	LOSLK	3Mar87	12.0	4.4	3.3
PHM2-07 -DW-3	M2	07	D	3	9Feb87	141900	15.5	LOSLK	3Mar87	20.0	7.9	11.0
PHM2-07A-SW-1	M2	07A	S	1	9Feb87	140500	0.5	LOSLK	14Jul87	7.7	9.8	11.0
PHM2-07A-SW-2	M2	07A	S	2	9Feb87	140600	0.5	LOSLK	1Mar87	3.6	8.4	3.5
PHM2-07A-SW-3	M2	07A	S	3	9Feb87	140700	0.5	LOSLK	2Mar87	17.0	11.0	6.8
PHM2-07A-DW-1	M2	07A	D	1	9Feb87	140900	12.5	LOSLK	2Apr87	15.0	4.3	6.0
PHM2-07A-DW-2	M2	07A	D	2	9Feb87	141000	12.5	LOSLK	2Mar87	6.0	4.5	3.5
PHM2-07A-DW-3	M2	07A	D	3	9Feb87	141100	12.5	LOSLK	3Mar87	26.0	10.0	11.0
PHM2-07B-SW-1	M2	07B	S	1	9Feb87	135900	0.5	LOSLK	2Apr87	7.0	4.6	4.7
PHM2-07B-SW-2	M2	07B	S	2	9Feb87	140000	0.5	LOSLK	2Mar87	3.9	5.2	3.9
PHM2-07B-SW-3	M2	07B	S	3	9Feb87	140100	0.5	LOSLK	2Mar87	7.1	5.5	3.2
PHM2-07B-DW-1	M2	07B	D	1	9Feb87	140200	15.5	LOSLK	3Apr87	3.9	1.4	2.5
PHM2-07B-DW-2	M2	07B	D	2	9Feb87	140300	15.5	LOSLK	3Mar87	8.0	1.9	1.1
PHM2-07B-DW-3	M2	07B	D	3	9Feb87	140400	15.5	LOSLK	3Apr87	1.0	0.7	3.0
PHM2-07C-SW-1	M2	07C	S	1	21Feb87	155400	0.5	LOSLK	23Feb87	34.0	8.1	9.5
PHM2-07C-SW-2	M2	07C	S	2	21Feb87	155500	0.5	LOSLK	23Feb87	34.0	10.0	7.9
PHM2-07C-SW-3	M2	07C	S	3	21Feb87	155600	0.5	LOSLK	24Feb87	0.2	1.9	1.4
PHM2-08B-SW-1	M2	08B	S	1	9Feb87	142700	0.5	LOSLK	14Jul87	8.5	4.9	5.4
PHM2-08B-SW-2	M2	08B	S	2	9Feb87	142800	0.5	LOSLK	9Jul87	8.7	3.4	11.0
PHM2-08B-SW-3	M2	08B	S	3	9Feb87	142900	0.5	LOSLK	9Jul87	17.0	3.8	12.0
PHM2-08B-DW-1	M2	08B	D	1	9Feb87	142400	13.0	LOSLK	9Jul87	3.6	1.7	5.9
PHM2-08B-DW-2	M2	08B	D	2	9Feb87	142500	13.0	LOSLK	6Apr87	1.3	1.5	3.6
PHM2-08B-DW-3	M2	08B	D	3	9Feb87	142600	13.0	LOSLK	9Jul87	3.7	2.3	10.0
PHM2-08C-SW-1	M2	08C	S	1	9Feb87	143200	0.5	LOSLK	6Apr87	1.7	4.5	3.5
PHM2-08C-SW-2	M2	08C	S	2	9Feb87	143300	0.5	LOSLK	3Mar87	1.9	4.4	2.2
PHM2-08C-SW-3	M2	08C	S	3	9Feb87	143400	0.5	LOSLK	1Mar87	2.6	6.3	2.5
PHM2-08C-DW-1	M2	08C	D	1	9Feb87	143500	14.0	LOSLK	2Mar87	2.5	2.9	3.2
PHM2-08C-DW-2	M2	08C	D	2	9Feb87	143600	14.0	LOSLK	9Jul87	1.9	0.9	4.2
PHM2-08C-DW-3	M2	08C	D	3	9Feb87	143700	14.0	LOSLK	2Mar87	3.0	3.6	2.7
PHM2-09 -SW-1	M2	09	S	1	9Feb87	150500	0.5	LOSLK	20Feb87	3.7	10.0	9.8
PHM2-09 -SW-2	M2	09	S	2	9Feb87	150600	0.5	LOSLK	20Feb87	4.8	9.6	18.0
PHM2-09 -SW-3	M2	09	S	3	9Feb87	150700	0.5	LOSLK	20Feb87	6.2	9.2	7.2
PHM2-09 -DW-1	M2	09	D	1	9Feb87	150200	13.5	LOSLK	20Feb87	3.0	4.0	8.7
PHM2-09 -DW-2	M2	09	D	2	9Feb87	150300	13.5	LOSLK	6Apr87	3.1	1.7	3.6
PHM2-09 -DW-3	M2	09	D	3	9Feb87	150400	13.5	LOSLK	20Feb87	2.8	3.6	5.6
PHM2-09A-SW-1	M2	09A	S	1	9Feb87	145800	0.5	LOSLK	2Mar87	3.9	6.2	3.9
PHM2-09A-SW-2	M2	09A	S	2	9Feb87	145900	0.5	LOSLK	20Feb87	3.8	8.8	11.0
PHM2-09A-SW-3	M2	09A	S	3	9Feb87	150000	0.5	LOSLK	6Apr87	4.1	3.3	5.7
PHM2-09A-DW-1	M2	09A	D	1	9Feb87	145500	14.0	LOSLK	23Jun87	3.1	1.5	1.8
PHM2-09A-DW-2	M2	09A	D	2	9Feb87	145600	14.0	LOSLK	2Mar87	2.5	1.2	2.8

* Organotin AF-paint test ship present at station

F = filtered

D = duplicate

Sample	Type	Station	Layer	Rep	Date	Time	Depth	Tidal State	Date Analyzed	Concentration in ng/L		
										MBTCL	DBTCL	TBTCL
PHM2-09A-DW-3	M2	09A	D	3	9Feb87	145700	14.0	LOSLK	6Apr87	2.9	1.5	3.4
PHM2-09A-SW-1	M2	09A	S	1	21Feb87	155900	0.5	LOSLK	24Feb87	34.0	14.0	29.0
PHM2-09A-SW-2	M2	09A	S	2	21Feb87	160000	0.5	LOSLK	24Feb87	19.0	26.0	13.0
PHM2-09A-SW-3	M2	09A	S	3	21Feb87	160100	0.5	LOSLK	23Feb87	37.0	7.4	6.8
PHM2-09B-SW-1	M2	09B	S	1	9Feb87	154400	0.5	LOSLK	6Apr87	3.7	7.3	12.0
PHM2-09B-SW-2	M2	09B	S	2	9Feb87	154500	0.5	LOSLK	9Jul87	12.0	5.9	19.0
PHM2-09B-SW-3	M2	09B	S	3	9Feb87	154600	0.5	LOSLK	6Apr87	6.2	8.5	13.0
PHM2-09B-DW-1	M2	09B	D	1	9Feb87	154100	13.0	LOSLK	9Jul87	11.0	2.1	5.6
PHM2-09B-DW-2	M2	09B	D	2	9Feb87	154200	13.0	LOSLK	9Jul87	2.8	1.9	5.6
PHM2-09B-DW-3	M2	09B	D	3	9Feb87	154300	13.0	LOSLK	2Mar87	3.5	3.2	2.8
PHM2-10-SW-1*	M2	10	S	1*	9Feb87	153300	0.5	LOSLK	20Feb87	9.6	19.0	110.0
PHM2-10-SW-2*	M2	10	S	2*	9Feb87	153400	0.5	LOSLK	21Feb87	1.8	38.0	100.0
PHM2-10-SW-3*	M2	10	S	3*	9Feb87	153500	0.5	LOSLK	21Feb87	4.6	30.0	85.0
PHM2-10-DW-1*	M2	10	D	1*	9Feb87	153000	12.0	LOSLK	21Feb87	4.2	7.0	10.0
PHM2-10-DW-2*	M2	10	D	2*	9Feb87	153100	12.0	LOSLK	21Feb87	0.6	7.0	7.2
PHM2-10-DW-3*	M2	10	D	3*	9Feb87	153200	12.0	LOSLK	21Feb87	3.3	8.4	12.0
PHM2-10C-SW-1	M2	10C	S	1	9Feb87	151500	0.5	LOSLK	13Jul87	5.7	6.7	7.4
PHM2-10C-SW-2	M2	10C	S	2	9Feb87	151600	0.5	LOSLK	14Jul87	5.2	4.7	6.1
PHM2-10C-SW-3	M2	10C	S	3	9Feb87	151770	0.5	LOSLK	13Jul87	8.1	7.1	8.2
PHM2-10C-DW-1	M2	10C	D	1	9Feb87	151200	11.5	LOSLK	13Jul87	16.0	5.1	5.2
PHM2-10C-DW-2	M2	10C	D	2	9Feb87	151300	11.5	LOSLK	13Jul87	5.5	5.8	6.6
PHM2-10C-DW-3	M2	10C	D	3	9Feb87	151400	11.5	LOSLK	14Jul87	4.1	3.1	4.6
PHM2-11-SW-1	M2	11	S	1	9Feb87	152500	0.5	LOSLK	2Apr87	6.7	12.0	28.0
PHM2-11-SW-2	M2	11	S	2	9Feb87	152600	0.5	LOSLK	2Apr87	6.5	7.8	15.0
PHM2-11-SW-3	M2	11	S	3	9Feb87	152700	0.5	LOSLK	2Mar87	8.8	16.0	32.0
PHM2-11-DW-1	M2	11	D	1	9Feb87	152200	12.0	LOSLK	2Apr87	2.8	0.2	4.2
PHM2-11-DW-2	M2	11	D	2	9Feb87	152300	12.0	LOSLK	2Apr87	2.2	2.2	7.6
PHM2-11-DW-3	M2	11	D	3	9Feb87	152400	12.0	LOSLK	2Mar87	3.5	3.8	7.1
PHM2-14-SW-1	M2	14	S	1	9Feb87	122500	0.5	LOSLK	27Feb87	3.1	9.3	7.0
PHM2-14-SW-2	M2	14	S	2	9Feb87	122600	0.5	LOSLK	27Feb87	2.9	8.0	6.6
PHM2-14-SW-3	M2	14	S	3	9Feb87	122700	0.5	LOSLK	27Feb87	2.6	6.2	6.6
PHM2-14-DW-1	M2	14	D	1	9Feb87	122800	5.5	LOSLK	27Feb87	1.7	7.3	4.5
PHM2-14-DW-2	M2	14	D	2	9Feb87	122900	5.5	LOSLK	27Feb87	4.0	8.0	6.8
PHM2-14-DW-3	M2	14	D	3	9Feb87	123000	5.5	LOSLK	27Feb87	3.1	7.6	5.6
PHM2-15-SW-1	M2	15	S	1	9Feb87	121100	0.5	LOSLK	25Feb87	4.5	7.3	5.2
PHM2-15-SW-2	M2	15	S	2	9Feb87	121200	0.5	LOSLK	25Feb87	2.0	7.3	2.4
PHM2-15-SW-3	M2	15	S	3	9Feb87	121300	0.5	LOSLK	25Feb87	1.0	3.3	2.2
PHM2-15-DW-1	M2	15	D	1	9Feb87	121500	13.0	LOSLK	25Feb87	1.3	2.8	1.6
PHM2-15-DW-2	M2	15	D	2	9Feb87	121600	13.0	LOSLK	27Feb87	3.7	2.4	2.2
PHM2-15-DW-3	M2	15	D	3	9Feb87	121700	13.0	LOSLK	25Feb87	2.1	2.8	1.4
PHM2-16-SW-1	M2	16	S	1	9Feb87	120000	0.5	LOSLK	27Feb87	1.7	6.2	2.7
PHM2-16-SW-2	M2	16	S	2	9Feb87	120100	0.5	LOSLK	25Feb87	2.2	6.9	4.0
PHM2-16-SW-3	M2	16	S	3	9Feb87	120200	0.5	LOSLK	25Feb87	1.5	4.1	2.6
PHM2-16-DW-1	M2	16	D	1	9Feb87	120300	3.5	LOSLK	25Feb87	2.2	8.1	5.2
PHM2-16-DW-2	M2	16	D	2	9Feb87	120400	3.5	LOSLK	25Feb87	1.5	6.3	3.0
PHM2-16-DW-3	M2	16	D	3	9Feb87	120500	3.5	LOSLK	25Feb87	1.0	3.3	3.1
PHM2-19-SW-1	M2	19	S	1	9Feb87	114300	0.5	LOSLK	20Feb87	2.8	4.6	0.9
PHM2-19-SW-2	M2	19	S	2	9Feb87	114400	0.5	LOSLK	25Feb87	2.0	4.0	2.1
PHM2-19-SW-3	M2	19	S	3	9Feb87	114500	0.5	LOSLK	20Feb87	3.1	5.6	1.9
PHM2-19-DW-1	M2	19	D	1	9Feb87	114600	6.0	LOSLK	25Feb87	1.0	1.6	1.8
PHM2-19-DW-2	M2	19	D	2	9Feb87	114700	6.0	LOSLK	25Feb87	0.8	1.9	0.9
PHM2-19-DW-3	M2	19	D	3	9Feb87	114800	6.0	LOSLK	25Feb87	1.7	3.8	0.9
PHV2-V1-SW-1	V2	V1	S	1	24Feb87	172613	1.0	OUTGO	27Feb87	5.5	5.2	2.4
PHV2-V1-MW-1	V2	V1	M	1	24Feb87	165737	1.5	OUTGO				
PHV2-V1-MW-1	V2	V1	M	1	24Feb87	170143	5.0	OUTGO				
PHV2-V1-MW-1	V2	V1	M	1	24Feb87	171510	6.5	OUTGO				
PHV2-V1-MW-1	V2	V1	M	1	24Feb87	172435	6.5	OUTGO				
PHV2-V1-MW-1F	V2	V1	M	1F	24Feb87	172435	6.5	OUTGO	28Feb87	53.0	66.0	4.7
PHV2-V1-MW-1F	V2	V1	M	1F	24Feb87	172435	6.5	OUTGO	1Mar87	45.0	62.0	5.2

* Organotin AF-paint test ship present at station

F = filtered

D = duplicate

Sample	Type	Station	Layer	Rep	Date	Time	Depth	Tidal State	Date Analyzed	Concentration in ng/L		
										MBTCL	DBTCL	TBTCL
PHV2- V1-DW-1	V2	V1	D	1	24Feb87	172550	12.5	OUTGO	1Mar87	38.0	84.0	5.2
PHV2- V2-SW-1	V2	V2	S	1	24Feb87	174840	1.1	OUTGO	27Feb87	53.0	98.0	11.0
PHV2- V2-SW-1F	V2	V2	S	1F	24Feb87	174840	1.1	OUTGO	8Apr87	33.0	44.0	12.0
PHV2- V2-MW-1	V2	V2	M	1	24Feb87	175005	5.3	OUTGO	1Mar87	33.0	110.0	15.0
PHV2- V2-MW-1	V2	V2	M	1	24Feb87	175005	5.3	OUTGO	7Apr87	43.0	51.0	23.0
PHV2- V2-MW-1F	V2	V2	M	1F	24Feb87	175005	5.3	OUTGO				
PHV2- V2-DW-1	V2	V2	D	1	24Feb87	175135	11.2	OUTGO	28Feb87	26.0	62.0	5.4
PHV2- V2-DW-1F	V2	V2	D	1F	24Feb87	175135	11.2	OUTGO	1Mar87	34.0	59.0	0.4
PHV2- V3-MW-1	V2	V3	M	1	24Feb87	180403	1.2	OUTGO	25Feb87	39.0	58.0	18.0
PHV2- V3-MW-1	V2	V3	M	1	24Feb87	180643	7.5	OUTGO	25Feb87	23.0	47.0	12.0
PHV2- V3-MW-1D	V2	V3	M	1D	24Feb87	180643	7.5	OUTGO	8Apr87	29.0	36.0	5.5
PHV2- V3-MW-1F	V2	V3	M	1F	24Feb87	180643	7.5	OUTGO	3Mar87	62.0	56.0	7.4
PHV2- V3-DW-1	V2	V3	D	1	24Feb87	180840	12.5	OUTGO	25Feb87	37.0	32.0	5.5
PHV2-01C-SW-1	V2	01C	S	1	3Mar87	124717	1.0	INCMG	21Jul87	1.8	1.0	1.8
PHV2-01C-SW-2	V2	01C	S	2	3Mar87	124843	1.0	INCMG	5Mar87	20.0	3.0	1.1
PHV2-01C-SW-3	V2	01C	S	3	3Mar87	125011	1.0	INCMG	5Mar87	49.0	5.5	2.8
PHV2-01C-MW-1	V2	01C	M	1	3Mar87	124202	6.2	INCMG	5Mar87	19.0	6.3	2.8
PHV2-01C-DW-1	V2	01C	D	1	3Mar87	123425	11.0	INCMG	5Mar87	34.0	6.1	3.0
PHV2-01C-DW-2	V2	01C	D	2	3Mar87	123538	11.0	INCMG	5Mar87	1.0	1.4	1.1
PHV2-01C-DW-3	V2	01C	D	3	3Mar87	123714	11.0	INCMG	5Mar87	31.0	6.5	1.1
PHV2-03E-SW-1	V2	03E	S	1	3Mar87	132936	1.0	INCMG	23Jul87	5.5	1.3	2.9
PHV2-03E-SW-1F	V2	03E	S	1F	3Mar87	132936	1.0	INCMG	8Apr87	12.0	3.1	2.4
PHV2-03E-SW-2	V2	03E	S	2	3Mar87	133100	1.0	INCMG	22Jul87	7.4	2.4	2.1
PHV2-03E-SW-3	V2	03E	S	3	3Mar87	133223	1.0	INCMG	21Jul87	16.0	1.9	1.4
PHV2-03E-MW-1	V2	03E	M	1	3Mar87	132540	5.8	INCMG	22Jul87	11.0	0.9	1.7
PHV2-03E-DW-1	V2	03E	D	1	3Mar87	132141	12.6	INCMG	22Jul87	18.0	13.0	0.8
PHV2-05C-SW-1	V2	05C	S	1	3Mar87	140511	1.0	INCMG	16Jul87	2.4	3.0	3.3
PHV2-05C-SW-1F	V2	05C	S	1F	3Mar87	140511	1.0	INCMG	4Mar87	19.0	14.0	9.5
PHV2-05C-SW-2	V2	05C	S	2	3Mar87	140634	1.0	INCMG	21Jul87	2.9	2.2	3.6
PHV2-05C-SW-3	V2	05C	S	3	3Mar87	140757	1.0	INCMG	22Jul87	2.7	3.0	5.3
PHV2-05C-MW-1	V2	05C	M	1	3Mar87	135833	8.9	INCMG	22Jul87	19.0	7.3	4.2
PHV2-05C-MW-1	V2	05C	M	1	3Mar87	140228	5.1	INCMG	16Jul87	12.0	3.1	3.1
PHV2-05C-DW-1	V2	05C	D	1	3Mar87	134856	14.2	INCMG	22Jul87	18.0	2.6	1.5
PHV2-07 -SW-1	V2	07	S	1	3Mar87	153942	1.0	INCMG	4Mar87	12.0	30.0	27.0
PHV2-07 -SW-1F	V2	07	S	1F	3Mar87	153942	1.0	INCMG	4Mar87	12.0	14.0	7.8
PHV2-07 -SW-2	V2	07	S	2	3Mar87	154106	1.0	INCMG	4Mar87	3.2	15.0	4.9
PHV2-07 -SW-3	V2	07	S	3	3Mar87	154234	1.0	INCMG	4Mar87	4.2	16.0	7.5
PHV2-07 -SW-4	V2	07	S	4	3Mar87	154449	1.0	INCMG				
PHV2-07 -MW-1	V2	07	M	1	3Mar87	144400	10.2	INCMG	4Mar87	31.0	21.0	10.0
PHV2-07 -MW-1	V2	07	M	1	3Mar87	153321	7.0	INCMG	4Mar87	7.1	15.0	9.1
PHV2-07 -MW-2	V2	07	M	2	3Mar87	153626	7.0	INCMG				
PHV2-07 -DW-1	V2	07	D	1	3Mar87	143436	14.0	INCMG	23Jul87	4.4	2.2	4.9
PHV2-07 -DW-2	V2	07	D	2	3Mar87	143743	14.0	INCMG				
PHV2-07 -SW-1	V2	07	S	1	5Mar87	171849	1.0	INCMG	7Apr87	6.3	16.0	27.0
PHV2-07 -MW-1	V2	07	M	1	5Mar87	171434	11.3	INCMG	8Apr87	2.6	0.9	3.1
PHV2-07 -MW-1	V2	07	M	1	5Mar87	171720	3.8	INCMG	8Apr87	2.0	1.2	1.9
PHV2-07 -DW-1	V2	07	D	1	5Mar87	171230	15.4	INCMG	8Apr87	6.0	3.5	5.3
PHV2-07C-SW-1	V2	07C	S	1	3Mar87	160701	1.0	INCMG	20Jul87	14.0	7.1	7.3
PHV2-07C-SW-1F	V2	07C	S	1F	3Mar87	160701	1.0	INCMG	4Mar87	21.0	6.8	4.9
PHV2-07C-SW-2	V2	07C	S	2	3Mar87	160824	1.0	INCMG	23Jul87	22.0	6.4	6.2
PHV2-07C-SW-3	V2	07C	S	3	3Mar87	160950	1.0	INCMG	23Jul87	3.8	3.4	5.0
PHV2-07C-SW-4	V2	07C	S	4	3Mar87	161330	1.0	INCMG				
PHV2-07C-MW-1	V2	07C	M	1	3Mar87	160421	7.5	INCMG	22Jul87	1.8	3.3	6.5
PHV2-07C-DW-1	V2	07C	D	1	3Mar87	160024	11.8	INCMG	22Jul87	2.5	2.0	3.8
PHV2-07C-SW-1	V2	07C	S	1	5Mar87	165946	1.0	INCMG	8Apr87	2.7	3.8	5.8
PHV2-07C-MW-1	V2	07C	M	1	5Mar87	165756	5.8	INCMG	8Apr87	5.0	9.5	9.3
PHV2-07C-DW-1	V2	07C	D	1	5Mar87	165500	15.0	INCMG	8Apr87	3.9	1.4	2.7
PHV2-09A-SW-1	V2	09A	S	1	3Mar87	165650	1.0	INCMG	16Jul87	11.0	7.8	6.7
PHV2-09A-SW-1F	V2	09A	S	1F	3Mar87	165650	1.0	INCMG	8Apr87	21.0	12.0	14.0

* Organotin AF-paint test ship present at station

F = filtered

D = duplicate

Sample	Type	Station	Layer	Rep	Date	Time	Depth	Tidal State	Date Analyzed	Concentration in ng/L		
										MBTCL	DBTCL	TBTCL
PHV2-09A-SW-2	V2	09A	S	2	3Mar87	165814	1.0	INCMG	22Jul87	4.5	6.2	5.5
PHV2-09A-SW-3	V2	09A	S	3	3Mar87	165946	1.0	INCMG	20Jul87	2.9	4.5	6.4
PHV2-09A-SW-4	V2	09A	S	4	3Mar87	170203	1.0	INCMG				
PHV2-09A-MW-1	V2	09A	M	1	3Mar87	165415	8.3	INCMG	20Jul87	5.2	4.6	6.9
PHV2-09A-DW-1	V2	09A	D	1	3Mar87	164818	12.2	INCMG	20Jul87	2.3	3.1	4.9
PHV2-09A-SW-1	V2	09A	S	1	5Mar87	174327	1.0	INCMG	8Apr87	4.7	4.4	5.6
PHV2-09A-MW-1	V2	09A	M	1	5Mar87	174145	5.7	INCMG	8Apr87	3.6	4.9	2.3
PHV2-09A-DW-1	V2	09A	D	1	5Mar87	173743	13.8	INCMG	8Apr87	1.5	1.1	3.9
PHV2-11A-SW-1	V2	11A	S	1	2Mar87	170600	1.0	INCMG	7Apr87	9.8	8.1	16.0
PHV2-11A-SW-1F	V2	11A	S	1F	2Mar87	170600	1.0	INCMG	7Apr87	37.0	22.0	26.0
PHV2-11A-MW-1	V2	11A	M	1	2Mar87	165600	8.2	INCMG	7Apr87	2.6	1.4	2.1
PHV2-11A-MW-1	V2	11A	M	1	2Mar87	170100	3.9	INCMG	7Apr87	17.0	16.0	19.0
PHV2-11A-MW-1F	V2	11A	M	1F	2Mar87	165600	8.2	INCMG	7Apr87	21.0	15.0	9.4
PHV2-11A-MW-1F	V2	11A	M	1F	2Mar87	170100	3.9	INCMG	8Apr87	16.0	15.0	27.0
PHV2-11A-DW-1	V2	11A	D	1	2Mar87	164900	11.7	LOST>				
PHV2-11A-DW-1F	V2	11A	D	1F	2Mar87	164900	11.7	INCMG	4Mar87	19.0	9.2	8.4
PHV2-11A-SW-1	V2	11A	S	1	4Mar87	153607	1.0	INCMG	29Jul87	15.0	17.0	13.0
PHV2-11A-DW-1	V2	11A	D	1	4Mar87	152741	11.3	INCMG	29Jul87	16.0	18.0	18.0
PHV2-11A-DW-1	V2	11A	D	1	4Mar87	153055	5.2	INCMG	29Jul87	14.0	9.8	15.0
PHM3-01 -SW-1	M3	01	S	1	16Apr87	124400	0.5	INCMG	21Aug87	2.2	2.7	6.8
PHM3-01 -SW-2	M3	01	S	2	16Apr87	124500	0.5	INCMG	1Sep87	3.3	3.3	10.0
PHM3-01 -SW-3	M3	01	S	3	16Apr87	124600	0.5	INCMG	21Aug87	2.9	2.4	7.5
PHM3-01 -DW-1	M3	01	D	1	16Apr87	124700	12.5	INCMG	29Aug87	0.5	0.7	1.4
PHM3-01 -DW-2	M3	01	D	2	16Apr87	124800	12.5	INCMG	1Sep87	2.3	1.1	2.1
PHM3-01 -DW-3	M3	01	D	3	16Apr87	124900	12.5	INCMG	29Aug87	1.7	0.5	1.3
PHM3-03 -SW-1	M3	03	S	1	16Apr87	125200	0.5	INCMG	1Sep87	15.0	8.5	15.0
PHM3-03 -DW-1	M3	03	D	1	16Apr87	125300	14.0	INCMG	3Sep87	1.8	0.6	2.0
PHM3-03E-SW-1	M3	03E	S	1	16Apr87	123700	0.5	INCMG	21Aug87	4.2	2.1	3.0
PHM3-03E-SW-2	M3	03E	S	2	16Apr87	123800	0.5	INCMG				
PHM3-03E-SW-3	M3	03E	S	3	16Apr87	123900	0.5	INCMG	3Sep87	6.5	2.1	3.8
PHM3-03E-DW-1	M3	03E	D	1	16Apr87	123400	14.5	INCMG	29Aug87	0.8	0.8	1.2
PHM3-03E-DW-2	M3	03E	D	2	16Apr87	123500	14.5	INCMG	2Sep87	3.0	1.3	2.4
PHM3-03E-DW-3	M3	03E	D	3	16Apr87	123600	14.5	INCMG	1Sep87	4.1	3.0	1.5
PHM3-05 -SW-1	M3	05	S	1	16Apr87	122200	0.5	INCMG	24Jul87	3.4	4.6	10.0
PHM3-05 -DW-1	M3	05	D	1	16Apr87	122000	14.0	INCMG	2Sep87	5.3	2.5	2.1
PHM3-05B-SW-1	M3	05B	S	1	16Apr87	122400	0.5	INCMG		2.2	4.8	3.8
PHM3-05B-SW-2	M3	05B	S	2	16Apr87	122500	0.5	INCMG		2.2	5.8	3.8
PHM3-05B-SW-3	M3	05B	S	3	16Apr87	122600	0.5	INCMG	2Sep87	2.4	2.4	2.7
PHM3-05B-DW-1	M3	05B	D	1	16Apr87	122700	16.5	INCMG		3.3	5.0	1.6
PHM3-05B-DW-2	M3	05B	D	2	16Apr87	122800	16.5	INCMG	24Jul87	1.5	1.0	1.9
PHM3-05B-DW-3	M3	05B	D	3	16Apr87	122900	16.5	INCMG	2Sep87	1.0	1.0	2.2
PHM3-06 -SW-1	M3	06	S	1	16Apr87	121700	0.5	INCMG	29Aug87	4.0	4.0	6.2
PHM3-06 -DW-1	M3	06	D	1	16Apr87	121600	1.5	INCMG	29Aug87	4.0	2.9	3.4
PHM3-07 -SW-1	M3	07	S	1	16Apr87	140300	0.5	INCMG	24Jul87	3.0	4.3	8.7
PHM3-07 -SW-2	M3	07	S	2	16Apr87	140400	0.5	INCMG	3Sep87	10.0	5.0	8.0
PHM3-07 -SW-3	M3	07	S	3	16Apr87	140500	0.5	INCMG	3Sep87	8.1	5.8	8.3
PHM3-07 -DW-1	M3	07	D	1	16Apr87	140000	16.0	INCMG	29Aug87	3.1	4.0	46.0
PHM3-07 -DW-2	M3	07	D	2	16Apr87	140100	16.0	INCMG	19Aug87	1.0	2.2	14.0
PHM3-07 -DW-3	M3	07	D	3	16Apr87	140200	16.0	INCMG	23Jul87	3.8	3.4	17.0
PHM3-07B-SW-1	M3	07B	S	1	16Apr87	135700	0.5	INCMG	2Sep87	1.5	2.3	3.9
PHM3-07B-DW-1	M3	07B	D	1	16Apr87	135600	15.0	INCMG	29Aug87	0.2	1.1	2.6
PHM3-08B-SW-1	M3	08B	S	1	16Apr87	140800	0.5	INCMG		2.5	4.0	0.4
PHM3-08B-DW-1	M3	08B	D	1	16Apr87	140700	14.0	INCMG	19Aug87	4.1	0.8	5.2
PHM3-09 -SW-1	M3	09	S	1	16Apr87	141700	0.5	INCMG	24Jul87	2.9	4.3	8.4
PHM3-09 -DW-1	M3	09	D	1	16Apr87	141600	15.0	INCMG	2Sep87	2.7	2.2	6.0
PHM3-09A-SW-1	M3	09A	S	1	16Apr87	141200	0.5	INCMG	2Sep87	6.5	4.6	7.7
PHM3-09A-DW-1	M3	09A	D	1	16Apr87	141100	13.0	INCMG	2Sep87	3.6	2.0	7.7
PHM3-09B-SW-1	M3	09B	S	1	16Apr87	142500	0.5	INCMG	2Sep87	8.0	5.1	21.0
PHM3-09B-SW-2	M3	09B	S	2	16Apr87	142600	0.5	INCMG	23Jul87	8.1	7.6	11.0

* Organotin AF-paint test ship present at station

F = filtered

D = duplicate

Sample	Type	Station	Layer	Rep	Date	Time	Depth	Tidal State	Date Analyzed	Concentration in ng/L		
										MBTCL	DTCL	TBTCL
PHM3-09B-SW-3	M3	09B	S	3	16Apr87	142700	0.5	INCMG	2Sep87	8.6	6.6	21.0
PHM3-09B-DW-1	M3	09B	D	1	16Apr87	142200	12.0	INCMG	2Sep87	8.6	4.6	8.8
PHM3-09B-DW-2	M3	09B	D	2	16Apr87	142300	12.0	INCMG		4.4	5.8	4.5
PHM3-09B-DW-3	M3	09B	D	3	16Apr87	142400	12.0	INCMG	24Jul87	3.9	4.7	3.5
PHM3-10-SW-1	M3	10	S	1	16Apr87	143600	0.5	INCMG	2Sep87	9.0	7.5	7.2
PHM3-10-DW-1	M3	10	D	1	16Apr87	143400	13.0	INCMG	2Sep87	6.3	4.4	8.7
PHM3-10B-SW-1*	M3	10B	S	1*	16Apr87	143000	0.5	INCMG	24Jul87	11.0	42.0	26.0
PHM3-10B-DW-1*	M3	10B	D	1*	16Apr87	142900	13.0	INCMG	2Sep87	7.0	7.7	13.0
PHM3-11-SW-1	M3	11	S	1	16Apr87	144100	0.5	INCMG	15May87	5.4	10.0	10.0
PHM3-11-SW-2	M3	11	S	2	16Apr87	144200	0.5	INCMG	15May87	3.9	11.0	12.0
PHM3-11-SW-3	M3	11	S	3	16Apr87	144300	0.5	INCMG	24Jul87	5.5	11.0	15.0
PHM3-11-DW-1	M3	11	D	1	16Apr87	143800	12.0	INCMG	15May87	6.1	17.0	18.0
PHM3-11-DW-2	M3	11	D	2	16Apr87	143900	12.0	INCMG	15May87	7.0	16.0	13.0
PHM3-11-DW-3	M3	11	D	3	16Apr87	144000	12.0	INCMG	15May87	7.3	13.0	15.0
PHM3-14-SW-1	M3	14	S	1	16Apr87	150700	0.5	INCMG	24Jul87	5.1	9.5	25.0
PHM3-14-SW-2	M3	14	S	2	16Apr87	150800	0.5	INCMG	2Sep87	19.0	6.7	27.0
PHM3-14-SW-3	M3	14	S	3	16Apr87	150900	0.5	INCMG	1Sep87	9.3	6.8	28.0
PHM3-14-DW-1	M3	14	D	1	16Apr87	150400	6.0	INCMG	2Sep87	4.4	2.8	6.3
PHM3-14-DW-2	M3	14	D	2	16Apr87	150500	6.0	INCMG	1Sep87	8.8	3.6	8.3
PHM3-14-DW-3	M3	14	D	3	16Apr87	150600	6.0	INCMG	2Sep87	4.1	2.1	4.7
PHM3-15-SW-1	M3	15	S	1	16Apr87	145900	0.5	INCMG	2Sep87	4.9	2.8	4.3
PHM3-15-DW-1	M3	15	D	1	16Apr87	145800	13.0	INCMG	2Sep87	3.9	1.7	1.9
PHM3-16-SW-1	M3	16	S	1	16Apr87	114400	0.5	INCMG	2Sep87	4.3	2.7	4.6
PHM3-16-SW-2	M3	16	S	2	16Apr87	114500	0.5	INCMG	21Aug87	5.0	3.9	5.8
PHM3-16-SW-3	M3	16	S	3	16Apr87	114600	0.5	INCMG	2Sep87	3.3	2.8	4.3
PHM3-16-DW-1	M3	16	D	1	16Apr87	114100	4.5	INCMG	2Sep87	3.1	2.3	1.6
PHM3-16-DW-2	M3	16	D	2	16Apr87	114200	4.5	INCMG	21Aug87	3.3	3.4	2.7
PHM3-16-DW-3	M3	16	D	3	16Apr87	114300	4.5	INCMG	2Sep87	3.1	2.7	2.1
PHM3-17-SW-1*	M3	17	S	1*	16Apr87	115000	0.5	INCMG	2Sep87	11.0	4.0	9.4
PHM3-17-DW-1*	M3	17	D	1*	16Apr87	114800	13.5	INCMG				
PHM3-18A-SW-1*	M3	18A	S	1*	16Apr87	115900	0.5	INCMG	21Aug87	3.1	4.1	3.5
PHM3-18A-SW-2*	M3	18A	S	2*	16Apr87	120000	0.5	INCMG	21Aug87	6.1	3.9	5.7
PHM3-18A-SW-3*	M3	18A	S	3*	16Apr87	120100	0.5	INCMG	21Aug87	3.2	3.9	4.3
PHM3-18A-DW-1*	M3	18A	D	1*	16Apr87	115600	14.0	INCMG		4.2	1.1	2.7
PHM3-18A-DW-2*	M3	18A	D	2*	16Apr87	115700	14.0	INCMG	21Aug87	1.2	1.9	3.5
PHM3-18A-DW-3*	M3	18A	D	3*	16Apr87	115800	14.0	INCMG	21Aug87	3.2	2.3	2.8
PHM3-19-SW-1	M3	19	S	1	16Apr87	120700	0.5	INCMG	2Sep87	5.0	2.1	2.5
PHM3-19-SW-2	M3	19	S	2	16Apr87	120800	0.5	INCMG	2Sep87	8.0	1.8	2.1
PHM3-19-SW-3	M3	19	S	3	16Apr87	120900	0.5	INCMG	2Sep87	3.5	2.4	6.0
PHM3-19-DW-1	M3	19	D	1	16Apr87	120400	6.0	INCMG	21Aug87	4.2	2.5	1.5
PHM3-19-DW-2	M3	19	D	2	16Apr87	120500	6.0	INCMG		3.7	3.1	1.9
PHM3-19-DW-3	M3	19	D	3	16Apr87	120600	6.0	INCMG	1Sep87	9.1	14.0	1.8
PHM4-01-SW-1	M4	01	S	1	28Jul87	114400	0.5	INCMG	22Sep87	2.2	3.5	3.8
PHM4-01-SW-2	M4	01	S	2	28Jul87	114500	0.5	INCMG	22Sep87	2.3	2.2	2.8
PHM4-01-SW-3	M4	01	S	3	28Jul87	114600	0.5	INCMG	22Sep87	1.7	2.3	3.2
PHM4-01-DW-1	M4	01	D	1	28Jul87	113900	19.0	INCMG	22Sep87	2.8	1.1	0.7
PHM4-01-DW-2	M4	01	D	2	28Jul87	114000	19.0	INCMG	22Sep87	1.6	1.0	0.8
PHM4-01-DW-3	M4	01	D	3	28Jul87	114100	19.0	INCMG	22Sep87	2.5	0.7	0.6
PHM4-03-SW-1	M4	03	S	1	28Jul87	115500	0.5	INCMG	22Sep87	2.4	1.9	1.1
PHM4-03-DW-1	M4	03	D	1	28Jul87	115300	14.0	INCMG	22Sep87	1.4	0.8	0.6
PHM4-03A-SW-1	M4	03A	S	1	28Jul87	112400	0.5	INCMG	22Sep87	1.9	0.7	0.0
PHM4-03A-SW-2	M4	03A	S	2	28Jul87	112500	0.5	INCMG	22Sep87	0.4	0.4	0.0
PHM4-03A-SW-3	M4	03A	S	3	28Jul87	112600	0.5	INCMG	22Sep87	0.7	0.5	0.0
PHM4-03A-DW-1	M4	03A	D	1	28Jul87	111900	6.0	INCMG	22Sep87	1.0	0.6	0.0
PHM4-03A-DW-2	M4	03A	D	2	28Jul87	112000	6.0	INCMG	22Sep87	1.5	1.1	0.0
PHM4-03A-DW-3	M4	03A	D	3	28Jul87	112100	6.0	INCMG	22Sep87	1.1	0.6	0.0
PHM4-05-SW-1	M4	05	S	1	28Jul87	121500	0.5	INCMG	22Sep87	9.0	6.3	2.8
PHM4-05-DW-1	M4	05	D	1	28Jul87	121300	16.0	INCMG	22Sep87	1.7	1.3	1.1
PHM4-05B-SW-1	M4	05B	S	1	28Jul87	120400	0.5	INCMG	22Sep87	1.7	4.6	2.9

* Organotin AF-paint test ship present at station

F = filtered

D = duplicate

Sample	Type	Station	Layer	Rep	Date	Time	Depth	Tidal State	Date Analyzed	Concentration in ng/L		
										MBTCL	DTCI	TBTCL
PHM4-05B-SW-2	M4	05B	S	2	28Jul87	120500	0.5	INCMG	22Sep87	3.8	4.8	2.3
PHM4-05B-SW-3	M4	05B	S	3	28Jul87	120600	0.5	INCMG	22Sep87	3.0	4.5	2.3
PHM4-05B-DW-1	M4	05B	D	1	28Jul87	120100	16.0	INCMG	22Sep87	2.1	1.3	1.9
PHM4-05B-DW-2	M4	05B	D	2	28Jul87	120200	16.0	INCMG	22Sep87	1.6	1.3	1.6
PHM4-05B-DW-3	M4	05B	D	3	28Jul87	120300	16.0	INCMG	22Sep87	2.7	2.2	1.5
PHM4-06-SW-1	M4	06	S	1	28Jul87	122100	0.5	INCMG	24Sep87	3.2	3.7	2.0
PHM4-06-DW-1	M4	06	D	1	28Jul87	122000	1.0	INCMG	24Sep87	2.6	3.0	1.7
PHM4-07-SW-1	M4	07	S	1	28Jul87	124300	0.5	INCMG	22Sep87	4.1	6.7	2.4
PHM4-07-SW-2	M4	07	S	2	28Jul87	124400	0.5	INCMG	22Sep87	3.7	6.3	2.7
PHM4-07-SW-3	M4	07	S	3	28Jul87	124500	0.5	INCMG	22Sep87	2.4	6.2	2.8
PHM4-07-DW-1	M4	07	D	1	28Jul87	123900	15.0	INCMG	24Sep87	3.8	2.0	5.4
PHM4-07-DW-2	M4	07	D	2	28Jul87	124000	15.0	INCMG	24Sep87	3.6	1.8	2.9
PHM4-07-DW-3	M4	07	D	3	28Jul87	124100	15.0	INCMG	24Sep87	2.0	1.8	3.5
PHM4-07B-SW-1	M4	07B	S	1	28Jul87	123500	0.5	INCMG	24Sep87	3.9	4.1	1.9
PHM4-07B-DW-1	M4	07B	D	1	28Jul87	123400	11.0	INCMG	24Sep87	5.0	2.1	1.2
PHM4-08B-SW-1	M4	08B	S	1	28Jul87	124700	0.5	INCMG	24Sep87	3.5	5.2	2.8
PHM4-08B-DW-1	M4	08B	D	1	28Jul87	124600	13.0	INCMG	24Sep87	6.0	1.9	1.5
PHM4-09-SW-1	M4	09	S	1	28Jul87	125100	0.5	INCMG	24Sep87	2.5	5.5	3.6
PHM4-09-DW-1	M4	09	D	1	28Jul87	125000	13.5	INCMG	24Sep87	2.3	1.5	1.7
PHM4-09B-SW-1	M4	09B	S	1	28Jul87	130700	0.5	INCMG	24Sep87	7.5	12.0	7.4
PHM4-09B-SW-2	M4	09B	S	2	28Jul87	130800	0.5	INCMG	24Sep87	7.4	8.6	4.2
PHM4-09B-SW-3	M4	09B	S	3	28Jul87	130900	0.5	INCMG	24Sep87	6.2	11.0	4.2
PHM4-09B-DW-1	M4	09B	D	1	28Jul87	130400	13.0	INCMG	24Sep87	2.8	2.2	2.6
PHM4-09B-DW-2	M4	09B	D	2	28Jul87	130500	13.0	INCMG	24Sep87	2.7	2.3	3.0
PHM4-09B-DW-3	M4	09B	D	3	28Jul87	130600	13.0	INCMG	24Sep87	2.0	2.0	2.5
PHM4-10-SW-1	M4	10	S	1	28Jul87	125900	0.5	INCMG	24Sep87	6.0	8.4	5.0
PHM4-10-SW-2	M4	10	S	2	28Jul87	130000	0.5	INCMG	24Sep87	3.0	6.4	4.6
PHM4-10-SW-3	M4	10	S	3	28Jul87	130100	0.5	INCMG	24Sep87	6.4	7.3	3.1
PHM4-10-DW-1	M4	10	D	1	28Jul87	125500	12.0	INCMG	24Sep87	2.4	1.4	1.8
PHM4-10-DW-2	M4	10	D	2	28Jul87	125600	12.0	INCMG	24Sep87	1.9	2.1	2.1
PHM4-10-DW-3	M4	10	D	3	28Jul87	125700	12.0	INCMG	24Sep87	3.0	2.4	2.0
PHM4-11-SW-1	M4	11	S	1	28Jul87	144100	0.5	INCMG	24Sep87	11.0	14.0	9.4
PHM4-11-SW-2	M4	11	S	2	28Jul87	144200	0.5	INCMG	24Sep87	12.0	18.0	10.0
PHM4-11-SW-3	M4	11	S	3	28Jul87	144300	0.5	INCMG	24Sep87	6.1	13.0	6.3
PHM4-11-DW-1	M4	11	D	1	28Jul87	143700	12.5	INCMG	25Sep87	2.0	2.5	2.2
PHM4-11-DW-2	M4	11	D	2	28Jul87	143800	12.5	INCMG	25Sep87	2.2	2.1	2.7
PHM4-11-DW-3	M4	11	D	3	28Jul87	143900	12.5	INCMG	25Sep87	5.2	3.2	3.8
PHM4-14-SW-1	M4	14	S	1	28Jul87	154500	0.5	INCMG	25Sep87	7.4	12.0	200.0
PHM4-14-SW-2	M4	14	S	2	28Jul87	154600	0.5	INCMG	25Sep87	5.6	20.0	81.0
PHM4-14-SW-3	M4	14	S	3	28Jul87	154700	0.5	INCMG	25Sep87	7.0	14.0	120.0
PHM4-14-DW-1	M4	14	D	1	28Jul87	154200	5.5	INCMG	25Sep87	4.6	3.0	12.0
PHM4-14-DW-2	M4	14	D	2	28Jul87	154300	5.5	INCMG	25Sep87	2.1	2.4	3.8
PHM4-14-DW-3	M4	14	D	3	28Jul87	154400	5.5	INCMG	25Sep87	2.8	1.8	1.0
PHM4-15-SW-1	M4	15	S	1	28Jul87	153600	0.5	INCMG	24Sep87	2.9	4.0	3.5
PHM4-15-DW-1	M4	15	D	1	28Jul87	153400	13.0	INCMG	24Sep87	1.5	1.1	1.2
PHM4-16-SW-1	M4	16	S	1	28Jul87	152000	0.5	INCMG	26Sep87	4.4	4.2	2.7
PHM4-16-DW-1	M4	16	D	1	28Jul87	152200	1.0	INCMG	26Sep87	3.1	3.4	2.7
PHM4-18A-SW-1	M4	18A	S	1	28Jul87	150800	0.5	INCMG	25Sep87	2.9	3.8	3.7
PHM4-18A-DW-1	M4	18A	D	1	28Jul87	150600	11.5	INCMG	25Sep87	2.1	1.4	2.1
PHM4-19-SW-1	M4	19	S	1	28Jul87	145700	0.5	INCMG	25Sep87	1.5	1.6	1.4
PHM4-19-SW-2	M4	19	S	2	28Jul87	145800	0.5	INCMG	25Sep87	2.4	2.3	1.5
PHM4-19-SW-3	M4	19	S	3	28Jul87	145900	0.5	INCMG	25Sep87	2.1	3.2	1.7
PHM4-19-DW-1	M4	19	D	1	28Jul87	145400	7.0	INCMG	25Sep87	1.4	1.2	0.7
PHM4-19-DW-2	M4	19	D	2	28Jul87	145500	7.0	INCMG	25Sep87	1.9	1.2	0.5
PHM4-19-DW-3	M4	19	D	3	28Jul87	145600	7.0	INCMG	25Sep87	2.7	2.3	1.6
PHM5-01-SW-1	M5	01	S	1	15Oct87	161800	0.5	OUTGO	10Dec87	1.1	3.8	0.4
PHM5-01-SW-2	M5	01	S	2	15Oct87	161900	0.5	OUTGO	18Jan88	2.2	3.2	1.0
PHM5-01-SW-3	M5	01	S	3	15Oct87	162000	0.5	OUTGO	18Jan88	1.7	2.8	1.6
PHM5-01-DW-1	M5	01	D	1	15Oct87	161500	13.0	OUTGO	11Dec87	1.5	0.8	1.5

* Organotin AF-paint test ship present at station

F = filtered

D = duplicate

Sample	Type	Station	Layer	Rep	Date	Time	Depth	Tidal State	Date Analyzed	Concentration in ng/L		
										MTCL	DTCL	TBTCL
PHM5-01 -DW-2	M5	01	D	2	15Oct87	161600	13.0	OUTGO	18Jan88	0.0	1.8	0.8
PHM5-01 -DW-3	M5	01	D	3	15Oct87	161700	13.0	OUTGO	18Jan88	1.9	1.2	1.3
PHM5-03A-SW-1	M5	03A	S	1	15Oct87	152400	0.5	OUTGO	20Jan88	0.3	0.8	0.0
PHM5-03A-SW-2	M5	03A	S	2	15Oct87	152500	0.5	OUTGO	20Jan88	0.0	0.7	0.0
PHM5-03A-SW-3	M5	03A	S	3	15Oct87	152600	0.5	OUTGO	20Jan88	0.0	0.5	0.0
PHM5-03A-DW-1	M5	03A	D	1	15Oct87	152000	6.0	OUTGO	20Jan88	0.2	0.7	0.4
PHM5-03A-DW-2	M5	03A	D	2	15Oct87	152100	6.0	OUTGO	20Jan88	0.5	0.4	0.0
PHM5-03A-DW-3	M5	03A	D	3	15Oct87	152200	6.0	OUTGO	20Jan88	0.9	0.3	0.0
PHM5-03D-SW-1	M5	03D	S	1	15Oct87	154000	0.5	OUTGO	19Jan88	0.9	0.9	0.0
PHM5-03D-SW-2	M5	03D	S	2	15Oct87	154100	0.5	OUTGO	19Jan88	2.1	0.7	0.2
PHM5-03D-SW-3	M5	03D	S	3	15Oct87	154200	0.5	OUTGO	19Jan88	0.6	0.6	0.2
PHM5-03D-DW-1	M5	03D	D	1	15Oct87	153700	15.0	OUTGO	19Jan88	0.7	0.5	0.4
PHM5-03D-DW-2	M5	03D	D	2	15Oct87	153800	15.0	OUTGO	19Jan88	2.6	0.8	0.4
PHM5-03D-DW-3	M5	03D	D	3	15Oct87	153900	15.0	OUTGO	19Jan88	2.0	0.6	0.3
PHM5-05B-SW-1	M5	05B	S	1	15Oct87	150300	0.5	OUTGO	18Jan88	2.9	3.4	0.8
PHM5-05B-SW-2	M5	05B	S	2	15Oct87	150400	0.5	OUTGO	10Dec87	1.5	6.0	1.4
PHM5-05B-SW-3	M5	05B	S	3	15Oct87	150500	0.5	OUTGO	18Jan88	2.4	5.1	3.3
PHM5-05B-DW-1	M5	05B	D	1	15Oct87	145900	16.5	OUTGO	19Jan88	0.7	0.7	0.4
PHM5-05B-DW-2	M5	05B	D	2	15Oct87	150000	16.5	OUTGO	19Jan88	0.4	0.6	0.3
PHM5-05B-DW-3	M5	05B	D	3	15Oct87	150100	16.5	OUTGO	19Jan88	1.1	1.0	0.5
PHM5-05C-SW-1	M5	05C	S	1	15Oct87	163800	0.5	OUTGO	11Dec87	5.6	14.0	2.1
PHM5-05C-SW-2	M5	05C	S	2	15Oct87	163900	0.5	OUTGO	18Jan88	1.2	3.5	0.5
PHM5-05C-SW-3	M5	05C	S	3	15Oct87	164000	0.5	OUTGO	18Jan88	1.6	3.0	0.5
PHM5-05C-DW-1	M5	05C	D	1	15Oct87	163500	15.5	OUTGO	10Dec87	0.2	1.4	0.4
PHM5-05C-DW-2	M5	05C	D	2	15Oct87	163600	15.5	OUTGO	10Dec87	1.0	2.1	0.0
PHM5-05C-DW-3	M5	05C	D	3	15Oct87	163700	15.5	OUTGO	18Jan88	0.8	0.8	0.3
PHM5-07 -SW-1	M5	07	S	1	16Oct87	103200	0.5	HISLK	7Dec87	3.1	12.0	2.2
PHM5-07 -SW-2	M5	07	S	2	16Oct87	103300	0.5	HISLK	8Dec87	4.7	9.1	1.8
PHM5-07 -SW-3	M5	07	S	3	16Oct87	103400	0.5	HISLK	8Dec87	2.8	8.8	7.8
PHM5-07 -DW-1	M5	07	D	1	16Oct87	103500	16.0	HISLK	8Dec87	0.9	3.5	3.7
PHM5-07 -DW-2	M5	07	D	2	16Oct87	103600	16.0	HISLK	16Dec87	4.9	5.9	11.0
PHM5-07 -DW-3	M5	07	D	3	16Oct87	103700	16.0	HISLK	8Dec87	2.1	3.9	3.3
PHM5-07B-SW-1	M5	07B	S	1	16Oct87	103100	0.5	HISLK	7Dec87	2.4	7.9	1.8
PHM5-07B-SW-2	M5	07B	S	2	16Oct87	103200	0.5	HISLK	7Dec87	2.0	6.9	2.2
PHM5-07B-SW-3	M5	07B	S	3	16Oct87	103300	0.5	HISLK	7Dec87	2.0	8.0	1.8
PHM5-07B-DW-1	M5	07B	D	1	16Oct87	102700	15.0	HISLK	7Dec87	1.4	1.3	0.0
PHM5-07B-DW-2	M5	07B	D	2	16Oct87	102800	15.0	HISLK	7Dec87	1.8	2.6	1.3
PHM5-07B-DW-3	M5	07B	D	3	16Oct87	102900	15.0	HISLK	7Dec87	0.2	2.4	1.3
PHM5-09A-SW-1	M5	09A	S	1	16Oct87	104400	0.5	HISLK	9Dec87	4.1	12.0	3.2
PHM5-09A-SW-2	M5	09A	S	2	16Oct87	104500	0.5	HISLK	18Jan88	3.5	6.9	3.0
PHM5-09A-SW-3	M5	09A	S	3	16Oct87	104600	0.5	HISLK	18Jan88	3.1	5.0	1.3
PHM5-09A-DW-1	M5	09A	D	1	16Oct87	104000	13.0	HISLK	9Dec87	1.6	2.6	2.3
PHM5-09A-DW-2	M5	09A	D	2	16Oct87	104100	13.0	HISLK	9Dec87	1.1	2.6	2.3
PHM5-09A-DW-3	M5	09A	D	3	16Oct87	104200	13.0	HISLK	18Jan88	2.2	2.4	3.8
PHM5-09B-SW-1	M5	09B	S	1	16Oct87	112400	0.5	HISLK	14Jan88	3.3	6.7	1.5
PHM5-09B-SW-2	M5	09B	S	2	16Oct87	112500	0.5	HISLK	14Jan88	1.6	4.5	1.0
PHM5-09B-SW-3	M5	09B	S	3	16Oct87	112600	0.5	HISLK	15Jan88	2.0	5.0	1.0
PHM5-09B-DW-1	M5	09B	D	1	16Oct87	112100	13.0	HISLK	14Jan88	1.6	3.5	1.5
PHM5-09B-DW-2	M5	09B	D	2	16Oct87	112200	13.0	HISLK	14Jan88	1.0	1.4	
PHM5-09B-DW-3	M5	09B	D	3	16Oct87	112300	13.0	HISLK	15Jan88	1.2	2.2	1.2
PHM5-10 -SW-1	M5	10	S	1	16Oct87	111800	0.5	HISLK	15Jan88	2.9	15.0	4.4
PHM5-10 -SW-2	M5	10	S	2	16Oct87	111900	0.5	HISLK	15Jan88	5.2	13.0	3.8
PHM5-10 -SW-3	M5	10	S	3	16Oct87	112000	0.5	HISLK	15Jan88	3.9	11.0	2.1
PHM5-10 -DW-1	M5	10	D	1	16Oct87	111500	13.0	HISLK	15Jan88	1.9	5.9	1.7
PHM5-10 -DW-2	M5	10	D	2	16Oct87	111600	13.0	HISLK	15Jan88	2.7	4.1	2.0
PHM5-10 -DW-3	M5	10	D	3	16Oct87	111700	13.0	HISLK	15Jan88	2.0	3.4	2.2
PHM5-11A-SW-1	M5	11A	S	1	16Oct87	110300	0.5	HISLK	14Jan88	5.9	18.0	4.2
PHM5-11A-SW-2	M5	11A	S	2	16Oct87	110400	0.5	HISLK	14Jan88	5.3	18.0	2.8
PHM5-11A-SW-3	M5	11A	S	3	16Oct87	110500	0.5	HISLK	14Jan88	3.9	18.0	2.1

* Organotin AF-paint test ship present at station

F = filtered

D = duplicate

Sample	Type	Station	Layer	Rep	Date	Time	Depth	Tidal State	Date Analyzed	Concentration in ng/L		
										MBTCL	DTCL	TBTCL
PHM5-11A-DW-1	M5	11A	D	1	160ct87	110000	13.0	HISLK	14Jan88	3.2	3.4	1.9
PHM5-11A-DW-2	M5	11A	D	2	160ct87	110100	13.0	HISLK	14Jan88	1.5	2.9	1.3
PHM5-11A-DW-3	M5	11A	D	3	160ct87	110200	13.0	HISLK	14Jan88	1.7	3.4	1.0
PHM5-14-SW-1	M5	14	S	1	160ct87	122800	0.5	HISLK	15Jan88	12.0	26.0	38.0
PHM5-14-SW-2	M5	14	S	2	160ct87	122900	0.5	HISLK	15Jan88	7.3	25.0	19.0
PHM5-14-SW-3	M5	14	S	3	160ct87	123000	0.5	HISLK	15Jan88	5.7	14.0	22.0
PHM5-14-DW-1	M5	14	D	1	160ct87	123100	6.0	HISLK	15Jan88	2.4	8.1	4.1
PHM5-14-DW-2	M5	14	D	2	160ct87	123200	6.0	HISLK	15Jan88	2.3	7.6	2.3
PHM5-14-DW-3	M5	14	D	3	160ct87	123300	6.0	HISLK	15Jan88	2.3	8.6	2.3
PHM5-16-SW-1	M5	16	S	1	150ct87	173300	0.5	OUTGO	20Jan88	1.7	5.8	2.5
PHM5-16-SW-2	M5	16	S	2	150ct87	173400	0.5	OUTGO	20Jan88	2.2	4.3	1.7
PHM5-16-SW-3	M5	16	S	3	150ct87	173500	0.5	OUTGO	20Jan88	3.5	6.1	1.8
PHM5-16-DW-1	M5	16	D	1	150ct87	173000	4.0	OUTGO	20Jan88	0.9	3.7	2.5
PHM5-16-DW-2	M5	16	D	2	150ct87	173100	4.0	OUTGO	20Jan88	0.9	3.7	1.1
PHM5-16-DW-3	M5	16	D	3	150ct87	173200	4.0	OUTGO	20Jan88	2.0	3.7	1.5
PHM5-18A-SW-1	M5	18A	S	1	160ct87	101600	0.5	HISLK	100ec87	2.0	7.0	2.1
PHM5-18A-SW-2	M5	18A	S	2	160ct87	101700	0.5	HISLK	90ec87	2.5	6.5	2.1
PHM5-18A-SW-3	M5	18A	S	3	160ct87	101800	0.5	HISLK	90ec87	7.6	9.4	2.3
PHM5-18A-DW-1	M5	18A	D	1	160ct87	101300	13.0	HISLK	100ec87	0.6	1.9	0.4
PHM5-18A-DW-2	M5	18A	D	2	160ct87	101400	13.0	HISLK	100ec87	0.9	2.4	1.0
PHM5-18A-DW-3	M5	18A	D	3	160ct87	101500	13.0	HISLK	100ec87	0.2	1.4	0.4
PHM5-19-SW-1	M5	19	S	1	150ct87	165800	0.5	OUTGO	160ec87	0.2	3.9	0.0
PHM5-19-SW-2	M5	19	S	2	150ct87	165900	0.5	OUTGO	100ec87	0.2	3.3	0.0
PHM5-19-SW-3	M5	19	S	3	150ct87	170000	0.5	OUTGO	100ec87	0.8	3.3	0.0
PHM5-19-DW-1	M5	19	D	1	150ct87	165400	7.0	OUTGO	110ec87	2.8	5.4	0.0
PHM5-19-DW-2	M5	19	D	2	150ct87	165500	7.0	OUTGO	110ec87	2.1	5.4	0.4
PHM5-19-DW-3	M5	19	D	3	150ct87	165600	7.0	OUTGO	100ec87	1.8	3.5	0.4
PHM5-19A-SW-1	M5	19A	S	1	150ct87	170900	0.5	OUTGO	160ec87	0.2	4.3	0.4
PHM5-19A-SW-2	M5	19A	S	2	150ct87	171000	0.5	OUTGO	110ec87	2.8	7.1	1.6
PHM5-19A-SW-3	M5	19A	S	3	150ct87	171100	0.5	OUTGO	100ec87	0.9	3.6	0.4
PHM5-19A-DW-1	M5	19A	D	1	150ct87	170600	11.0	OUTGO	160ec87	0.2	3.0	2.2
PHM5-19A-DW-2	M5	19A	D	2	150ct87	170700	11.0	OUTGO	160ec87	0.2	1.6	0.4
PHM5-19A-DW-3	M5	19A	D	3	150ct87	170800	11.0	OUTGO	110ec87	2.8	4.0	0.8
PHM5-20-SW-1	M5	20	S	1	160ct87	113500	0.5	HISLK	280ct87	2.0	2.9	1.1
PHM5-20-SW-2	M5	20	S	2	160ct87	113600	0.5	HISLK	280ct87	0.3	1.9	0.7
PHM5-20-SW-3	M5	20	S	3	160ct87	113700	0.5	HISLK	280ct87	2.5	3.8	0.8
PHM5-20-DW-1	M5	20	D	1	160ct87	113800	13.0	HISLK	280ct87	1.1	2.4	2.8
PHM5-20-DW-2	M5	20	D	2	160ct87	113900	13.0	HISLK	280ct87	0.3	1.0	0.6
PHM5-20-DW-3	M5	20	D	3	160ct87	114000	13.0	HISLK	280ct87	0.6	1.1	0.0
PHM5-21-SW-1	M5	21	S	1	160ct87	122100	0.5	HISLK	18Jan88		6.5	2.2
PHM5-21-SW-2	M5	21	S	2	160ct87	122200	0.5	HISLK	18Jan88	3.4	8.3	4.2
PHM5-21-SW-3	M5	21	S	3	160ct87	122300	0.5	HISLK	18Jan88	1.8	4.5	2.2
PHM5-21-DW-1	M5	21	D	1	160ct87	121800	13.5	HISLK	18Jan88	0.3	1.6	0.4
PHM5-21-DW-2	M5	21	D	2	160ct87	121900	13.5	HISLK	18Jan88	0.7	1.6	0.5
PHM5-21-DW-3	M5	21	D	3	160ct87	122000	13.5	HISLK	18Jan88	1.0	1.9	0.9
PHM6-01-SW-1	M6	01	S	1	20Jan88	124200	0.5	LOSLK	8Mar88	5.5	2.2	1.5
PHM6-01-SW-2	M6	01	S	2	20Jan88	124300	0.5	LOSLK		1.4	2.9	6.7
PHM6-01-SW-3	M6	01	S	3	20Jan88	124400	0.5	LOSLK	8Mar88	5.1	2.8	2.1
PHM6-01-DW-1	M6	01	D	1	20Jan88	124500	11.5	LOSLK	4Mar88	1.9	4.9	1.6
PHM6-01-DW-2	M6	01	D	2	20Jan88	124600	11.5	LOSLK	8Mar88	2.8	5.8	1.0
PHM6-01-DW-3	M6	01	D	3	20Jan88	124700	11.5	LOSLK		0.9	0.0	0.0
PHM6-03A-SW-1	M6	03A	S	1	19Jan88	111400	0.5	LOSLK	9Mar88	2.0	1.0	0.0
PHM6-03A-SW-2	M6	03A	S	2	19Jan88	111500	0.5	LOSLK	9Mar88	3.7	1.8	0.0
PHM6-03A-SW-3	M6	03A	S	3	19Jan88	111600	0.5	LOSLK	8Mar88	2.3	0.4	0.4
PHM6-03A-DW-1	M6	03A	D	1	19Jan88	110900	5.5	LOSLK	8Mar88	1.5	0.7	0.4
PHM6-03A-DW-2	M6	03A	D	2	19Jan88	111000	5.5	LOSLK	9Mar88	0.5	1.6	0.4
PHM6-03A-DW-3	M6	03A	D	3	19Jan88	111100	5.5	LOSLK	9Mar88	0.5	1.0	0.5
PHM6-03D-SW-1	M6	03D	S	1	19Jan88	113700	0.5	LOSLK	8Mar88	4.1	0.9	0.6
PHM6-03D-SW-2	M6	03D	S	2	19Jan88	113800	0.5	LOSLK	9Mar88	1.2	0.5	0.0

* Organotin AF-paint test ship present at station

F = filtered

D = duplicate

Sample	Type	Station	Layer	Rep	Date	Time	Depth	Tidal State	Date Analyzed	Concentration in ng/L		
										MTCL	DTCL	TBTCL
PHM6-030-SW-3	M6	030	S	3	19Jan88	113900	0.5	LOSLK	8Mar88	4.0	5.1	10.0
PHM6-030-DW-1	M6	030	D	1	19Jan88	114000	15.5	LOSLK	8Mar88	1.9	0.7	0.5
PHM6-030-DW-2	M6	030	D	2	19Jan88	114100	15.5	LOSLK	8Mar88	0.9	0.8	1.4
PHM6-030-DW-3	M6	030	D	3	19Jan88	114200	15.5	LOSLK	8Mar88	1.8	1.4	1.5
PHM6-058-SW-1	M6	058	S	1	20Jan88	124900	0.5	LOSLK	9Mar88	2.7	4.1	2.1
PHM6-058-SW-2	M6	058	S	2	20Jan88	125000	0.5	LOSLK		1.6	1.6	1.2
PHM6-058-SW-3	M6	058	S	3	20Jan88	125100	0.5	LOSLK	9Mar88	2.0	3.2	1.1
PHM6-058-DW-1	M6	058	D	1	20Jan88	125700	16.5	LOSLK	8Mar88	3.7	4.9	1.9
PHM6-058-DW-2	M6	058	D	2	20Jan88	125800	16.5	LOSLK		1.2	0.9	1.6
PHM6-058-DW-3	M6	058	D	3	20Jan88	125900	16.5	LOSLK	9Mar88	0.7	4.6	1.2
PHM6-05C-SW-1	M6	05C	S	1	20Jan88	130100	0.5	LOSLK	4Mar88	2.4	5.7	1.8
PHM6-05C-SW-2	M6	05C	S	2	20Jan88	120100	0.5	LOSLK	4Mar88	2.8	6.4	2.0
PHM6-05C-SW-3	M6	05C	S	3	20Jan88	130300	0.5	LOSLK	4Mar88	3.5	5.9	2.7
PHM6-05C-DW-1	M6	05C	D	1	20Jan88	130400	15.0	LOSLK	4Mar88	1.5	3.6	1.3
PHM6-05C-DW-2	M6	05C	D	2	20Jan88	130500	15.0	LOSLK	4Mar88	3.7	6.4	1.8
PHM6-05C-DW-3	M6	05C	D	3	20Jan88	130600	15.0	LOSLK	4Mar88	1.7	3.5	2.2
PHM6-07 -SW-1	M6	07	S	1	20Jan88	131900	0.5	LOSLK		4.5	4.8	2.0
PHM6-07 -SW-2	M6	07	S	2	20Jan88	122000	0.5	LOSLK		5.8	4.1	2.0
PHM6-07 -SW-3	M6	07	S	3	20Jan88	132100	0.5	LOSLK		4.0	4.5	2.4
PHM6-07 -DW-1	M6	07	D	1	20Jan88	132200	15.0	LOSLK	2Mar88	3.0	4.1	5.6
PHM6-07 -DW-2	M6	07	D	2	20Jan88	132300	15.0	LOSLK	2Mar88	3.1	6.1	4.6
PHM6-07 -DW-3	M6	07	D	3	20Jan88	132400	15.0	LOSLK	2Mar88	2.2	4.2	5.9
PHM6-07B-SW-1	M6	07B	S	1	20Jan88	134400	0.5	INCMG	2Mar88	3.3	4.3	3.0
PHM6-07B-SW-2	M6	07B	S	2	20Jan88	124500	0.5	INCMG	2Mar88	3.8	5.3	2.0
PHM6-07B-SW-3	M6	07B	S	3	20Jan88	134600	0.5	INCMG	2Mar88	1.4	1.2	3.0
PHM6-07B-DW-1	M6	07B	D	1	20Jan88	134100	15.5	INCMG	2Mar88	1.5	4.0	1.5
PHM6-07B-DW-2	M6	07B	D	2	20Jan88	134200	15.5	INCMG	2Mar88	2.9	7.5	5.3
PHM6-07B-DW-3	M6	07B	D	3	20Jan88	134300	15.5	INCMG	2Mar88	2.1	4.6	1.9
PHM6-09A-SW-1	M6	09A	S	1	20Jan88	134700	0.5	INCMG	2Mar88	3.0	7.4	2.7
PHM6-09A-SW-2	M6	09A	S	2	20Jan88	124800	0.5	INCMG	15Mar88	4.4	4.8	4.9
PHM6-09A-SW-3	M6	09A	S	3	20Jan88	134900	0.5	INCMG	2Mar88	4.2	11.0	5.2
PHM6-09A-DW-1	M6	09A	D	1	20Jan88	135000	12.5	INCMG	15Mar88	2.5	2.1	2.0
PHM6-09A-DW-2	M6	09A	D	2	20Jan88	135100	12.5	INCMG	2Mar88	1.6	3.2	1.5
PHM6-09A-DW-3	M6	09A	D	3	20Jan88	135200	12.5	INCMG	15Mar88	1.7	2.3	2.1
PHM6-09B-SW-1	M6	09B	S	1	20Jan88	135600	0.5	INCMG	2Mar88	7.9	29.0	5.7
PHM6-09B-SW-2	M6	09B	S	2	20Jan88	125700	0.5	INCMG	15Mar88	13.0	19.0	10.0
PHM6-09B-SW-3	M6	09B	S	3	20Jan88	135800	0.5	INCMG	2Mar88	8.2	32.0	8.8
PHM6-09B-DW-1	M6	09B	D	1	20Jan88	135900	12.5	INCMG	2Mar88	2.5	3.5	2.1
PHM6-09B-DW-2	M6	09B	D	2	20Jan88	140000	12.5	INCMG	15Mar88	2.8	2.1	3.2
PHM6-09B-DW-3	M6	09B	D	3	20Jan88	140100	12.5	INCMG	15Mar88	2.8	3.0	2.7
PHM6-10 -SW-1	M6	10	S	1	20Jan88	141100	0.5	INCMG		6.5	23.0	11.0
PHM6-10 -SW-2	M6	10	S	2	20Jan88	141200	0.5	INCMG	2Mar88	4.2	11.0	4.1
PHM6-10 -SW-3	M6	10	S	3	20Jan88	141300	0.5	INCMG	2Mar88	4.0	17.0	8.3
PHM6-10 -DW-1	M6	10	D	1	20Jan88	141400	12.5	INCMG	2Mar88	2.3	5.2	2.3
PHM6-10 -DW-2	M6	10	D	2	20Jan88	141500	12.5	INCMG	2Mar88	2.6	5.0	3.4
PHM6-10 -DW-3	M6	10	D	3	20Jan88	141600	12.5	INCMG	2Mar88	2.2	3.9	2.5
PHM6-11A-SW-1	M6	11A	S	1	20Jan88	142000	0.5	INCMG		12.0	25.0	17.0
PHM6-11A-SW-2	M6	11A	S	2	20Jan88	142100	0.5	INCMG		3.1	5.6	7.9
PHM6-11A-SW-3	M6	11A	S	3	20Jan88	142200	0.5	INCMG		2.5	7.6	10.0
PHM6-11A-DW-1	M6	11A	D	1	20Jan88	141700	13.5	INCMG		2.4	2.0	3.0
PHM6-11A-DW-2	M6	11A	D	2	20Jan88	141800	13.5	INCMG	ar88	2.5	5.3	3.5
PHM6-11A-DW-3	M6	11A	D	3	20Jan88	141900	13.5	INCMG		2.6	1.9	3.0
PHM6-14 -SW-1	M6	14	S	1	20Jan88	145700	0.5	INCMG	4Mar88	4.8	13.0	23.0
PHM6-14 -SW-2	M6	14	S	2	20Jan88	145800	0.5	INCMG		5.8	8.2	12.0
PHM6-14 -SW-3	M6	14	S	3	20Jan88	145900	0.5	INCMG		11.0	22.0	39.0
PHM6-14 -DW-1	M6	14	D	1	20Jan88	150000	5.5	INCMG		2.8	7.9	3.8
PHM6-14 -DW-2	M6	14	D	2	20Jan88	150100	5.5	INCMG		2.4	4.0	2.6
PHM6-14 -DW-3	M6	14	D	3	20Jan88	150200	5.5	INCMG		4.1	9.0	2.3
PHM6-16 -SW-1	M6	16	S	1	20Jan88	104400	0.5	OUTGO	9Mar88	3.2	5.7	3.2

* Organotin AF-paint test ship present at station

F = filtered

D = duplicate

Pearl Harbor NonMonitoring Water Sample Database

Sample	Description	Station	Date	Time	Depth	Flow	Date Analyzed	Concentration in ng/L				
								MBTCL	DBTCL	TBTCL		
PHM6-16 -SW-2	M6	16	S	2	20Jan88	104500	0.5	OUTGO	9Mar88	1.8	7.0	7.4
PHM6-16 -SW-3	M6	16	S	3	20Jan88	104600	0.5	OUTGO	9Mar88	1.2	6.3	3.2
PHM6-16 -DW-1	M6	16	D	1	20Jan88	104100	2.5	OUTGO	8Mar88	3.5	4.7	2.9
PHM6-16 -DW-2	M6	16	D	2	20Jan88	104200	2.5	OUTGO	9Mar88	2.3	4.4	4.4
PHM6-16 -DW-3	M6	16	D	3	20Jan88	104300	2.5	OUTGO	15Mar88	3.1	4.0	3.1
PHM6-18A-SW-1	M6	18A	S	1	20Jan88	115200	0.5	LOSLK	8Mar88	3.7	4.7	1.5
PHM6-18A-SW-2	M6	18A	S	2	20Jan88	115300	0.5	LOSLK		2.8	9.5	2.2
PHM6-18A-SW-3	M6	18A	S	3	20Jan88	115400	0.5	LOSLK	8Mar88	2.9	3.5	2.4
PHM6-18A-DW-1	M6	18A	D	1	20Jan88	115500	12.5	LOSLK	8Mar88	3.1	1.0	0.6
PHM6-18A-DW-2	M6	18A	D	2	20Jan88	115600	12.5	LOSLK	8Mar88	3.2	1.3	1.2
PHM6-18A-DW-3	M6	18A	D	3	20Jan88	115700	12.5	LOSLK		2.3	4.2	1.8
PHM6-19 -SW-1	M6	19	S	1	20Jan88	112800	0.5	OUTGO	9Mar88	2.0	1.7	0.7
PHM6-19 -SW-2	M6	19	S	2	20Jan88	112900	0.5	OUTGO	9Mar88	0.3	1.7	0.4
PHM6-19 -SW-3	M6	19	S	3	20Jan88	113000	0.5	OUTGO	9Mar88	0.6	2.7	0.8
PHM6-19 -DW-1	M6	19	D	1	20Jan88	113100	6.5	OUTGO	9Mar88	1.4	2.1	0.7
PHM6-19 -DW-2	M6	19	D	2	20Jan88	113200	6.5	OUTGO	9Mar88	0.5	1.3	0.5
PHM6-19 -DW-3	M6	19	D	3	20Jan88	113300	6.5	OUTGO	9Mar88	0.7	1.5	0.5
PHM6-19A-SW-1	M6	19A	S	1	20Jan88	114100	0.5	LOSLK		3.4	1.4	0.2
PHM6-19A-SW-2	M6	19A	S	2	20Jan88	114200	0.5	LOSLK	8Mar88	1.9	1.4	0.8
PHM6-19A-SW-3	M6	19A	S	3	20Jan88	114300	0.5	LOSLK	8Mar88	2.3	2.3	2.4
PHM6-19A-DW-1	M6	19A	D	1	20Jan88	114400	11.0	LOSLK		3.7	1.0	0.1
PHM6-19A-DW-2	M6	19A	D	2	20Jan88	114500	11.0	LOSLK	8Mar88	1.0	1.2	1.6
PHM6-19A-DW-3	M6	19A	D	3	20Jan88	114600	11.0	LOSLK		2.4	0.3	0.2
PHM6-20 -SW-1	M6	20	S	1	20Jan88	120400	0.5	LOSLK		12.0	1.5	1.1
PHM6-20 -SW-2	M6	20	S	2	20Jan88	120500	0.5	LOSLK		1.2	0.0	1.5
PHM6-20 -SW-3	M6	20	S	3	20Jan88	120600	0.5	LOSLK		5.4	0.8	0.6
PHM6-20 -DW-1	M6	20	D	1	20Jan88	120800	13.5	LOSLK		3.1	0.0	0.5
PHM6-20 -DW-2	M6	20	D	2	20Jan88	120900	13.5	LOSLK	8Mar88	1.3	0.2	0.8
PHM6-20 -DW-3	M6	20	D	3	20Jan88	121000	13.5	LOSLK		2.0	6.0	1.3
PHM6-21 -SW-1	M6	21	S	1	20Jan88	111400	0.5	OUTGO	8Mar88	4.5	5.7	3.3
PHM6-21 -SW-2	M6	21	S	2	20Jan88	111500	0.5	OUTGO	8Mar88	2.6	4.1	2.6
PHM6-21 -SW-3	M6	21	S	3	20Jan88	111600	0.5	OUTGO	8Mar88	3.2	5.2	3.1
PHM6-21 -DW-1	M6	21	D	1	20Jan88	111100	13.5	OUTGO	8Mar88	2.2	3.3	21.0
PHM6-21 -DW-2	M6	21	D	2	20Jan88	111200	13.5	OUTGO	8Mar88	0.6	1.5	0.6
PHM6-21 -DW-3	M6	21	D	3	20Jan88	111300	13.5	OUTGO	8Mar88	1.6	1.4	0.8

* Organotin AF-paint test ship present at station

F = filtered

D = duplicate

Sample	Description	Station	Date	Time	Depth	Flow	Date	Concentration in ng/L		
							Analyzed	MBTCL	DBTCL	TBTCL
PH 101	50mPrtBwFF1071#816		14Apr87	125500	0.5	INCMG	3Aug87	18.0	6.5	13.0
PH 102	50mPrtBwFF1071#816		14Apr87	125700	13.5	INCMG	12Aug87	10.0	1.8	2.6
PH 103	20mPrtBwFF1071#816		14Apr87	130000	0.5	INCMG	3Aug87	9.9	9.0	9.7
PH 104	20mPrtBwFF1071#816		14Apr87	130200	14.0	INCMG	6Aug87	4.8	2.6	4.4
PH 105	5mPrtBowFF1071#816		14Apr87	130400	0.5	INCMG	22Jul87	5.5	9.6	0.0
PH 106	5mPrtBowFF1071#816		14Apr87	130800	13.0	INCMG	6Aug87	1.7	4.9	8.0
PH 107	0.5mPrtBwFF1071#816		14Apr87	131000	0.5	INCMG	26Aug87	41.0	35.0	33.0
PH 108	0.5mPrtBwFF1071#816		14Apr87	131200	13.0	INCMG	22Jul87	4.8	2.4	5.1
PH 109	2mPrtBowFF1071#816		14Apr87	131600	0.5	INCMG	12Aug87	31.0	37.0	34.0
PH 110	2mPrtBowFF1071#816		14Apr87	131700	13.0	INCMG	11Aug87	89.0	350	130
PH 111	50mPrtFwdQtrFF1071		14Apr87	132000	0.5	INCMG	6Aug87	10.0	15.0	14.0
PH 112	50mPrtFwdQtrFF1071		14Apr87	132100	13.0	INCMG	12Aug87	8.3	4.9	8.4
PH 113	20mPrtFwdQtrFF1071		14Apr87	132500	0.5	INCMG	26Aug87	38.0	39.0	58.0
PH 114	20mPrtFwdQtrFF1071		14Apr87	132700	13.5	INCMG	6Aug87	6.2	4.6	8.6
PH 115	5mPrtFwdQtrFF1071		14Apr87	132900	0.5	INCMG	12Aug87	22.0	13.0	35.0
PH 116	5mPrtFwdQtrFF1071		14Apr87	133100	12.5	INCMG	6Aug87	10.0	12.0	20.0
PH 117	2mPrtFwdQtrFF1071		14Apr87	133300	0.5	INCMG	12Aug87	22.0	28.0	22.0
PH 118	2mPrtFwdQtrFF1071		14Apr87	133500	13.0	INCMG	3Aug87	7.1	4.9	7.0
PH 119	0.5mPrtFwdQtrFF1071		14Apr87	133800	0.5	INCMG	6Aug87	9.0	27.0	26.0
PH 120	0.5mPrtFwdQtrFF1071		14Apr87	134000	13.0	INCMG	26Aug87	1.0	8.0	13.0
PH 121	50mAmidshipsFF1071		14Apr87	134500	0.5	INCMG	12Aug87	14.0	11.0	23.0
PH 122	50mAmidshipsFF1071		14Apr87	134600	12.0	INCMG	12Aug87	10.0	9.3	11.0
PH 123	20mAmidshipsFF1071		14Apr87	134900	0.5	INCMG	23Jul87	28.0	38.0	59.0
PH 124	20mAmidshipsFF1071		14Apr87	135100	13.5	INCMG	6Aug87	4.0	8.0	14.0
PH 125	5mAmidshipsFF1071		14Apr87	135300	0.5	INCMG	23Jul87	34.0	15.0	20.0
PH 126	5mAmidshipsFF1071		14Apr87	135500	13.0	INCMG	24Aug87	12.0	10.0	13.0
PH 127	2mAmidshipsFF1071		14Apr87	135700	0.5	INCMG	23Jul87	26.0	27.0	32.0
PH 128	2mAmidshipsFF1071		14Apr87	135800	12.5	INCMG	6Aug87	23.0	4.5	10.0
PH 129	0.5mAmidshipFF1071		14Apr87	135900	0.5	INCMG	6Aug87	37.0	88.0	60.0
PH 130	0.5mAmidshipFF1071		14Apr87	140100	12.5	INCMG	1Sep87	33.0	15.0	25.0
PH 131	50mPrtAftQtrFF1071		14Apr87	144600	0.5	INCMG	12Aug87	10.0	15.0	25.0
PH 132	50mPrtAftQtrFF1071		14Apr87	144700	12.5	INCMG	6Aug87	9.4	18.0	13.0
PH 133	20mPrtAftQtrFF1071		14Apr87	145000	0.5	INCMG	23Jul87	9.1	11.0	14.0
PH 134	20mPrtAftQtrFF1071		14Apr87	145100	13.5	INCMG	12Aug87	11.0	7.1	14.0
PH 135	5mPrtAftQtrFF1071		14Apr87	145200	0.5	INCMG	23Jul87	7.9	14.0	16.0
PH 136	5mPrtAftQtrFF1071		14Apr87	145300	13.0	INCMG	26Aug87	12.0	7.5	14.0
PH 137	2mPrtAftQtrFF1071		14Apr87	145500	0.5	INCMG	26Aug87	11.0	15.0	23.0
PH 138	2mPrtAftQtrFF1071		14Apr87	145700	12.5	INCMG	20Aug87	12.0	8.6	14.0
PH 139	0.5mPrtAftQtrFF1071		14Apr87	145800	0.5	INCMG	12Aug87	23.0	18.0	22.0
PH 140	0.5mPrtAftQtrFF1071		14Apr87	145900	13.0	INCMG	26Aug87	4.0	10.0	16.0
PH 141	50mOffSternFF1071		14Apr87	150300	0.5	INCMG	12Aug87	2.2	2.1	3.5
PH 142	50mOffSternFF1071		14Apr87	150500	13.5	INCMG	1Sep87	17.0	12.0	22.0
PH 143	20mOffSternFF1071		14Apr87	150700	0.5	INCMG	23Jul87	18.0	45.0	29.0
PH 144	20mOffSternFF1071		14Apr87	150800	13.0	INCMG	12Aug87	6.7	3.8	8.7
PH 145	5mOffSternFF1071		14Apr87	151000	0.5	INCMG	25Aug87	34.0	41.0	39.0
PH 146	5mOffSternFF1071		14Apr87	151200	13.0	INCMG	25Aug87	5.1	4.5	12.0
PH 147	0.5mOffSternFF1071		14Apr87	151400	0.5	INCMG	12Aug87	260	280	760
PH 148	0.5mOffSternFF1071		14Apr87	151700	13.0	INCMG	6Aug87	10.0	7.0	10.0
PH 149	2mOffSternFF1071		14Apr87	151800	0.5	INCMG	12Aug87	42.0	49.0	38.0
PH 150	2mOffSternFF1071		14Apr87	152000	13.0	INCMG	12Aug87	15.0	0.2	8.7
PH 169	MidEntrChanMkr#15	05C	12May87	095800	0.5	LOSLK	29Jul87	11.0	3.3	7.4
PH 170	MidEntrChanMkr#15	05C	12May87	095700	15.0	LOSLK	19Aug87	0.0	0.0	0.7
PH 171	EntrDryDock#2PHNSY	07	12May87	100500	0.5	LOSLK	29Jul87	7.2	4.2	17.0
PH 172	EntrDryDock#2PHNSY	07	12May87	100400	15.0	LOSLK	12Aug87	1.8	0.2	1.7
PH 173	CentrSoutheastLoch	11A	12May87	101300	0.5	LOSLK	12Aug87	11.0	24.0	44.0
PH 174	CentrSoutheastLoch	11A	12May87	101200	13.5	LOSLK	12Aug87	4.6	4.3	11.0
PH 175	MidBasinEntrSELoch	09B	12May87	102500	0.5	LOSLK	19Aug87	5.2	6.6	15.0
PH 176	MidBasinEntrSELoch	09B	12May87	102600	0.5	LOSLK	25Aug87	8.1	6.5	11.0

* Organotin AF-paint test ship present at station

F = filtered

D = duplicate

Sample	Description	Station	Date	Time	Depth	Flow	Date	Concentration in ng/L		
							Analyzed	MBTCL	DTCL	TBTCL
PH 177	MidBasinEntrSELoch	09B	12May87	102700	0.5	LOSLK	24Aug87	10.0	12.0	18.0
PH 178	MidBasinEntrSELoch	09B	12May87	102200	12.5	LOSLK	24Aug87	4.6	5.9	6.4
PH 179	MidBasinEntrSELoch	09B	12May87	102300	12.5	LOSLK	29Jul87	3.6	3.3	7.7
PH 180	MidBasinEntrSELoch	09B	12May87	102400	12.5	LOSLK	20Aug87	4.4	2.0	1.5
PH 181	NorthChnAdjBuoy#23	15	12May87	103000	0.5	LOSLK	12Aug87	4.6	2.4	5.4
PH 182	NorthChnAdjBuoy#23	15	12May87	102900	12.5	LOSLK	29Jul87	2.3	1.5	2.6
PH 183	MidEntrChanQMkr#15	05C	12May87	165700	0.5	HISLK	11Aug87	2.6	1.9	6.2
PH 184	MidEntrChanQMkr#15	05C	12May87	165500	15.5	HISLK	12Aug87	2.7	0.6	1.4
PH 185	EntrDryDock#2PHNSY	07	12May87	170100	0.5	HISLK	19Aug87	20.0	9.9	19.0
PH 186	EntrDryDock#2PHNSY	07	12May87	170000	16.0	HISLK	25Aug87	3.7	1.8	4.5
PH 187	CentrSoutheastLoch	11A	12May87	170600	0.5	HISLK	12Aug87	6.1	21.0	39.0
PH 188	CentrSoutheastLoch	11A	12May87	170500	14.0	HISLK	12Aug87	2.6	3.6	7.0
PH 189	MidBasinEntrSELoch	09B	12May87	171300	0.5	HISLK	25Aug87	14.0	9.0	16.0
PH 190	MidBasinEntrSELoch	09B	12May87	171400	0.5	HISLK	25Aug87	7.8	9.5	20.0
PH 191	MidBasinEntrSELoch	09B	12May87	171500	0.5	HISLK	11Aug87	16.0	58.0	23.0
PH 192	MidBasinEntrSELoch	09B	12May87	171000	13.5	HISLK	25Aug87	21.0	12.0	7.9
PH 193	MidBasinEntrSELoch	09B	12May87	171100	13.5	HISLK	11Aug87	5.4	22.0	14.0
PH 194	MidBasinEntrSELoch	09B	12May87	171200	13.5	HISLK	25Aug87	5.3	3.8	4.8
PH 195	NorthChnAdjBuoy#23	15	12May87	171700	0.5	HISLK	25Aug87	2.4	2.2	6.3
PH 196	NorthChnAdjBuoy#23	15	12May87	171600	13.0	HISLK	20Aug87	2.9	1.2	1.9
PH 197	MidEntrChanQMkr#15	05C	12May87	224700	0.5	LOSLK	24Aug87	4.2	1.4	6.4
PH 198	MidEntrChanQMkr#15	05C	12May87	224600	15.5	LOSLK	12Aug87	3.8	4.6	4.4
PH 199	EntrDryDock#2PHNSY	07	12May87	225500	0.5	LOSLK	24Aug87	4.9	4.0	6.1
PH 200	EntrDryDock#2PHNSY	07	12May87	225400	15.0	LOSLK	25Aug87	2.4	1.6	5.2
PH 201	CentrSoutheastLoch	11A	12May87	230500	0.5	LOSLK	24Aug87	24.0	34.0	24.0
PH 202	CentrSoutheastLoch	11A	12May87	230400	13.0	LOSLK	24Aug87	2.4	2.1	3.6
PH 203	MidBasinEntrSELoch	09B	12May87	231000	0.5	LOSLK	25Aug87	9.2	9.2	18.0
PH 204	MidBasinEntrSELoch	09B	12May87	231100	0.5	LOSLK		6.0	8.9	12.0
PH 205	MidBasinEntrSELoch	09B	12May87	231200	0.5	LOSLK	24Aug87	7.6	12.0	13.0
PH 206	MidBasinEntrSELoch	09B	12May87	231300	13.5	LOSLK	24Aug87	3.6	2.0	3.6
PH 207	MidBasinEntrSELoch	09B	12May87	231400	13.5	LOSLK	19Aug87	5.5	2.3	2.6
PH 208	MidBasinEntrSELoch	09B	12May87	231500	13.5	LOSLK	24Aug87	4.4	0.8	4.0
PH 209	NorthChnAdjBuoy#23	15	12May87	232600	0.5	LOSLK	24Aug87	12.0	7.2	5.0
PH 210	NorthChnAdjBuoy#23	15	12May87	232500	13.0	LOSLK		1.8	2.7	2.1
PH 211	MidEntrChanQMkr#15	05C	13May87	072200	0.5	LOSLK	1Sep87	23.0	7.0	15.0
PH 212	MidEntrChanQMkr#15	05C	13May87	072100	14.5	LOSLK	11Aug87	0.9	0.8	1.6
PH 213	EntrDryDock#2PHNSY	07	13May87	072900	0.5	LOSLK	20Aug87	4.1	6.4	16.0
PH 214	EntrDryDock#2PHNSY	07	13May87	072800	15.5	LOSLK				
PH 215	CentrSoutheastLoch	11A	13May87	073600	0.5	LOSLK	26Aug87	7.1	8.6	17.0
PH 216	CentrSoutheastLoch	11A	13May87	073500	13.0	LOSLK	11Aug87	7.6	28.0	8.0
PH 217	MidBasinEntrSELoch	09B	13May87	073700	0.5	LOSLK	13Aug87	8.5	13.0	29.0
PH 218	MidBasinEntrSELoch	09B	13May87	073800	0.5	LOSLK	11Aug87	4.8	5.7	23.0
PH 219	MidBasinEntrSELoch	09B	13May87	073900	0.5	LOSLK	26Aug87	14.0	7.2	19.0
PH 220	MidBasinEntrSELoch	09B	13May87	074000	13.0	LOSLK	26Aug87	5.2	5.8	4.6
PH 221	MidBasinEntrSELoch	09B	13May87	074100	13.0	LOSLK	11Aug87	17.0	35.0	7.0
PH 222	MidBasinEntrSELoch	09B	13May87	074200	13.0	LOSLK	11Aug87	3.0	1.7	5.5
PH 223	NorthChnAdjBuoy#23	15	13May87	074900	0.5	LOSLK	11Aug87	5.6	4.1	9.3
PH 224	NorthChnAdjBuoy#23	15	13May87	074800	12.5	LOSLK				
PH 225	MidEntrChanQMkr#15	05C	13May87	122500	0.5	INCMG	25Aug87	7.4	3.3	2.9
PH 226	MidEntrChanQMkr#15	05C	13May87	122400	15.5	INCMG	24Aug87	0.0	0.8	2.8
PH 227	EntrDryDock#2PHNSY	07	13May87	123600	0.5	INCMG	25Aug87	5.5	2.3	6.5
PH 228	EntrDryDock#2PHNSY	07	13May87	123500	15.5	INCMG	25Aug87	1.4	1.3	6.6
PH 229	CentrSoutheastLoch	11A	13May87	124600	0.5	INCMG	20Aug87	15.0	12.0	31.0
PH 230	CentrSoutheastLoch	11A	13May87	124500	13.5	INCMG	26Aug87	7.2	6.0	9.7
PH 231	MidBasinEntrSELoch	09B	13May87	124800	0.5	INCMG	25Aug87	5.9	6.4	4.8
PH 232	MidBasinEntrSELoch	09B	13May87	124900	0.5	INCMG	24Aug87	3.2	3.0	2.5
PH 233	MidBasinEntrSELoch	09B	13May87	125000	0.5	INCMG	13Aug87	2.2	5.0	3.8
PH 234	MidBasinEntrSELoch	09B	13May87	125100	13.5	INCMG	19Aug87	5.5	1.8	6.2

* Organotin AF-paint test ship present at station

F = filtered

D = duplicate

Sample	Description	Station	Date	Time	Depth	Flow	Date Analyzed	Concentration in ng/L		
								MTCL	DTCL	TBCL
PH 235	MidBasinEntrSELoch	09B	13May87	125200	13.5	INCMG	25Aug87	6.0	2.8	5.2
PH 236	MidBasinEntrSELoch	09B	13May87	125300	13.5	INCMG	24Aug87	1.2	2.4	2.8
PH 237	NorthChnAdjBuoy#23	15	13May87	125900	0.5	INCMG	24Aug87	3.8	2.3	2.2
PH 238	NorthChnAdjBuoy#23	15	13May87	130000	13.0	INCMG	25Aug87	1.8	1.8	3.4
PH 245	MidEntrChanMkr#15	05C	13May87	174100	0.5	HISLK	11Aug87	5.6	1.6	4.0
PH 246	MidEntrChanMkr#15	05C	13May87	174200	15.0	HISLK	13Aug87	0.6	1.4	3.3
PH 247	EntrDryDock#2PHNSY	07	13May87	174700	0.5	HISLK	25Aug87	2.8	4.3	5.2
PH 248	EntrDryDock#2PHNSY	07	13May87	174800	15.5	HISLK	25Aug87	0.0	0.7	2.3
PH 249	CentrSoutheastLoch	11A	13May87	175400	0.5	HISLK	11Aug87	10.0	13.0	32.0
PH 250	CentrSoutheastLoch	11A	13May87	175500	14.0	HISLK	12Aug87	7.2	18.0	13.0
PH 251	MidBasinEntrSELoch	09B	13May87	180300	0.5	HISLK	20Aug87	9.7	6.4	6.4
PH 252	MidBasinEntrSELoch	09B	13May87	180400	0.5	HISLK	13Aug87	6.8	11.0	14.0
PH 253	MidBasinEntrSELoch	09B	13May87	180500	0.5	HISLK	13Aug87	3.1	5.4	5.4
PH 254	MidBasinEntrSELoch	09B	13May87	175900	13.5	HISLK	13Aug87	1.4	2.5	4.6
PH 255	MidBasinEntrSELoch	09B	13May87	180000	13.5	HISLK	13Aug87	1.2	1.7	3.1
PH 256	MidBasinEntrSELoch	09B	13May87	180100	13.5	HISLK	20Aug87	3.1	2.1	3.8
PH 257	NorthChnAdjBuoy#23	15	13May87	180800	0.5	HISLK	20Aug87	10.0	5.4	3.0
PH 258	NorthChnAdjBuoy#23	15	13May87	180900	13.0	HISLK	11Aug87	2.4	0.8	1.4
PH 259	MidEntrChanMkr#15	05C	14May87	004700	0.5	LOSLK	26Aug87	7.2	4.4	3.7
PH 260	MidEntrChanMkr#15	05C	14May87	004800	15.5	LOSLK	25Aug87	0.0	0.5	2.6
PH 261	EntrDryDock#2PHNSY	07	14May87	005800	0.5	LOSLK	25Aug87	6.3	3.0	6.0
PH 262	EntrDryDock#2PHNSY	07	14May87	005700	15.5	LOSLK	26Aug87	7.4	1.5	6.1
PH 263	CentrSoutheastLoch	11A	14May87	010700	0.5	LOSLK	1Sep87	14.0	17.0	23.0
PH 264	CentrSoutheastLoch	11A	14May87	010500	14.0	LOSLK	25Aug87	6.7	4.1	6.8
PH 265	MidBasinEntrSELoch	09B	14May87	011200	0.5	LOSLK	24Aug87	6.1	3.1	3.1
PH 266	MidBasinEntrSELoch	09B	14May87	011300	0.5	LOSLK	26Aug87	12.0	9.2	5.9
PH 267	MidBasinEntrSELoch	09B	14May87	011400	0.5	LOSLK	26Aug87	19.0	15.0	9.9
PH 268	MidBasinEntrSELoch	09B	14May87	011500	13.5	LOSLK	25Aug87	2.5	2.6	3.5
PH 269	MidBasinEntrSELoch	09B	14May87	011600	13.5	LOSLK	25Aug87	6.4	5.0	6.2
PH 270	MidBasinEntrSELoch	09B	14May87	011700	13.5	LOSLK	26Aug87	4.9	1.6	4.4
PH 271	NorthChnAdjBuoy#23	15	14May87	012500	0.5	LOSLK	25Aug87	6.5	2.4	6.6
PH 272	NorthChnAdjBuoy#23	15	14May87	012400	13.0	LOSLK	25Aug87	0.8	0.6	1.2
PH 273	MidEntrChanMkr#15	05C	14May87	094800	0.5	LOSLK	24Aug87	6.8	6.2	2.5
PH 274	MidEntrChanMkr#15	05C	14May87	094900	15.0	LOSLK	24Aug87	1.3	1.4	1.3
PH 275	EntrDryDock#2PHNSY	07	14May87	095500	0.5	LOSLK	19Aug87	20.0	9.9	19.0
PH 276	EntrDryDock#2PHNSY	07	14May87	095400	15.5	LOSLK	24Aug87	6.8	2.5	4.2
PH 277	CentrSoutheastLoch	11A	14May87	100200	0.5	LOSLK	19Aug87	6.7	12.0	23.0
PH 278	CentrSoutheastLoch	11A	14May87	100000	13.0	LOSLK	24Aug87	5.4	6.9	16.0
PH 279	MidBasinEntrSELoch	09B	14May87	100400	0.5	LOSLK	19Aug87	6.9	4.2	8.8
PH 280	MidBasinEntrSELoch	09B	14May87	100500	0.5	LOSLK	19Aug87	4.5	4.2	5.6
PH 281	MidBasinEntrSELoch	09B	14May87	100600	0.5	LOSLK	19Aug87	4.6	4.7	4.7
PH 282	MidBasinEntrSELoch	09B	14May87	100700	12.5	LOSLK	19Aug87	4.7	3.3	6.4
PH 283	MidBasinEntrSELoch	09B	14May87	100800	12.5	LOSLK	19Aug87	12.0	5.4	5.7
PH 284	MidBasinEntrSELoch	09B	14May87	100900	12.5	LOSLK	24Aug87	5.5	4.0	4.4
PH 285	NorthChnAdjBuoy#23	15	14May87	102000	0.5	LOSLK	24Aug87	4.2	3.2	2.1
PH 286	NorthChnAdjBuoy#23	15	14May87	101800	12.5	LOSLK	24Aug87	38.0	25.0	1.6
PH 322	NorthChnAdjBuoy#23	15	22Aug87	091500	13.0	INCMG	9Dec87	6.7	1.3	0.9
PH 323	NorthChnAdjBuoy#23	15	22Aug87	091600	13.0	INCMG	30Dec87	3.6	1.7	0.5
PH 324	NorthChnAdjBuoy#23	15	22Aug87	091700	13.0	INCMG	9Dec87	3.1	2.5	2.7
PH 325	NorthChnAdjBuoy#23	15	22Aug87	092000	0.5	INCMG	10Dec87	2.8	2.1	1.6
PH 326	NorthChnAdjBuoy#23	15	22Aug87	092100	0.5	INCMG	9Dec87	2.3	3.1	1.8
PH 327	NorthChnAdjBuoy#23	15	22Aug87	092200	0.5	INCMG	30Dec87	3.8	4.2	1.1
PH 328	SEndHECOShtPiling	16	22Aug87	093000	4.0	INCMG	10Dec87	0.6	1.8	2.0
PH 329	SEndHECOShtPiling	16	22Aug87	093100	4.0	INCMG	11Dec87	3.8	3.1	1.7
PH 330	SEndHECOShtPiling	16	22Aug87	093200	4.0	INCMG	10Dec87	6.2	5.0	2.4
PH 331	SEndHECOShtPiling	16	22Aug87	093400	0.5	INCMG	10Dec87	0.0	1.1	1.4
PH 332	SEndHECOShtPiling	16	22Aug87	093500	0.5	INCMG	30Dec87	3.5	2.8	1.1
PH 333	SEndHECOShtPiling	16	22Aug87	093600	0.5	INCMG	25Nov87	11.0	3.4	1.0

* Organotin AF-paint test ship present at station

F = filtered

D = duplicate

Sample	Description	Station	Date	Time	Depth	Flow	Date	Concentration in ng/L		
							Analyzed	MTCL	DTCL	TBTCL
PH 334	CentrEntrMiddlelch	19A	22Aug87	094500	12.0	INCMG	24Nov87	5.8	0.4	1.0
PH 335	CentrEntrMiddlelch	19A	22Aug87	094600	12.0	INCMG	24Nov87	7.8	0.0	0.6
PH 336	CentrEntrMiddl:lch	19A	22Aug87	094700	12.0	INCMG	24Nov87	3.8	0.8	0.8
PH 337	CentrEntrMiddlelch	19A	22Aug87	095000	0.5	INCMG	24Nov87	6.0	3.0	1.0
PH 338	CentrEntrMiddlelch	19A	22Aug87	095100	0.5	INCMG	25Nov87	2.4	2.1	1.3
PH 339	CentrEntrMiddlelch	19A	22Aug87	095200	0.5	INCMG	10Dec87	1.2	2.3	0.8
PH 340	MidEntrChanaMkr#15	05C	22Aug87	100300	13.5	INCMG	9Dec87	1.9	0.7	0.9
PH 341	MidEntrChanaMkr#15	05L	22Aug87	100400	13.5	INCMG	9Dec87	1.4	0.0	0.6
PH 342	MidEntrChanaMkr#15	05C	22Aug87	100500	13.5	INCMG	10Dec87	7.7	1.0	1.2
PH 343	MidEntrChanaMkr#15	05C	22Aug87	100700	0.5	INCMG				
PH 344	MidEntrChanaMkr#15	05C	22Aug87	100800	0.5	INCMG	9Dec87	3.3	2.2	2.2
PH 345	MidEntrChanaMkr#15	05C	22Aug87	100900	0.5	INCMG	10Dec87	1.2	0.6	0.4
PH 346	WLochShrOppKekaaPt	03D	22Aug87	101800	16.0	INCMG	25Nov87	3.1	1.2	0.8
PH 347	WLochShrOppKekaaPt	03D	22Aug87	101900	16.0	INCMG	3Dec87	3.8	0.8	1.2
PH 348	WLochShrOppKekaaPt	03D	22Aug87	102000	16.0	INCMG	9Dec87	4.9	0.6	0.0
PH 349	WLochShrOppKekaaPt	03D	22Aug87	102300	0.5	INCMG	9Dec87	7.9	1.3	0.0
PH 350	WLochShrOppKekaaPt	03D	22Aug87	102400	0.5	INCMG	10Dec87	1.0	0.4	0.0
PH 351	WLochShrOppKekaaPt	03D	22Aug87	102500	0.5	INCMG	7Dec87	7.2	1.8	2.1
PH 352	MidEntrChnBishopPt	03	22Aug87	103500	17.0	INCMG	10Dec87	1.8	0.4	0.6
PH 353	MidEntrChnBishopPt	03	22Aug87	103600	17.0	INCMG	10Dec87	3.3	0.4	0.4
PH 354	MidEntrChnBishopPt	03	22Aug87	103700	17.0	INCMG	10Dec87	4.1	1.3	1.0
PH 355	MidEntrChnBishopPt	03	22Aug87	104200	0.5	INCMG	7Dec87	5.3	0.5	0.6
PH 356	MidEntrChnBishopPt	03	22Aug87	104300	0.5	INCMG	7Dec87	5.1	0.8	0.3
PH 357	MidEntrChnBishopPt	03	22Aug87	104400	0.5	INCMG	9Dec87	3.6	1.0	0.4
PH 358	NorthChnAdjBuoy#23	15	24Aug87	085500	12.5	INCMG	7Dec87	4.1	1.0	0.9
PH 359	NorthChnAdjBuoy#23	15	24Aug87	085600	12.5	INCMG	25Nov87	3.5	1.6	0.8
PH 360	NorthChnAdjBuoy#23	15	24Aug87	085700	12.5	INCMG	25Nov87	8.3	1.8	1.3
PH 361	NorthChnAdjBuoy#23	15	24Aug87	085900	0.5	INCMG	25Nov87	4.1	1.8	0.7
PH 362	NorthChnAdjBuoy#23	15	24Aug87	090000	0.5	INCMG	23Nov87	6.0	3.1	2.1
PH 363	NorthChnAdjBuoy#23	15	24Aug87	090100	0.5	INCMG	25Nov87	3.5	1.6	0.8
PH 364	SEndHECOShtPiling	16	24Aug87	090900	4.0	INCMG	9Dec87	1.8	1.3	0.6
PH 365	SEndHECOShtPiling	16	24Aug87	091000	4.0	INCMG	24Nov87	0.4	0.8	0.8
PH 366	SEndHECOShtPiling	16	24Aug87	091100	4.0	INCMG	23Nov87	0.9	0.6	0.0
PH 367	SEndHECOShtPiling	16	24Aug87	091300	0.5	INCMG	23Nov87	6.3	4.5	3.2
PH 368	SEndHECOShtPiling	16	24Aug87	091400	0.5	INCMG	25Nov87	5.8	3.4	1.0
PH 369	SEndHECOShtPiling	16	24Aug87	091500	0.5	INCMG	24Nov87	4.1	2.6	0.0
PH 370	CentrEntrMiddlelch	19A	24Aug87	092300	16.5	INCMG	10Dec87	3.2	1.4	1.6
PH 371	CentrEntrMiddlelch	19A	24Aug87	092400	16.5	INCMG	24Nov87	0.0	0.6	0.0
PH 372	CentrEntrMiddlelch	19A	24Aug87	092500	16.5	INCMG	24Dec87	5.8	0.8	0.4
PH 373	CentrEntrMiddlelch	19A	24Aug87	092800	0.5	INCMG	24Nov87	5.8	2.2	0.8
PH 374	CentrEntrMiddlelch	19A	24Aug87	092900	0.5	INCMG	24Nov87	4.0	2.0	0.4
PH 375	CentrEntrMiddlelch	19A	24Aug87	093000	0.5	INCMG	25Nov87	5.3	4.5	4.0
PH 376	MidEntrChanaMkr#15	05C	24Aug87	093800	13.0	INCMG	24Nov87	5.2	0.8	0.8
PH 377	MidEntrChanaMkr#15	05C	24Aug87	093900	13.0	INCMG	10Dec87	4.6	0.8	0.8
PH 378	MidEntrChanaMkr#15	05C	24Aug87	094000	13.0	INCMG	24Nov87	4.7	1.4	0.6
PH 379	MidEntrChanaMkr#15	05C	24Aug87	094200	0.5	INCMG	24Nov87	2.0	0.8	0.0
PH 380	MidEntrChanaMkr#15	05C	24Aug87	094300	0.5	INCMG	23Nov87	1.2	0.0	0.0
PH 381	MidEntrChanaMkr#15	05C	24Aug87	094400	0.5	INCMG	10Dec87	5.7	5.2	2.1
PH 382	WLochShrOppKekaaPt	03D	24Aug87	095200	16.0	INCMG	7Dec87	3.6	0.5	0.6
PH 383	WLochShrOppKekaaPt	03D	24Aug87	095300	16.0	INCMG	9Dec87	3.3	1.0	0.9
PH 384	WLochShrOppKekaaPt	03D	24Aug87	095400	16.0	INCMG	9Dec87	5.7	0.7	0.6
PH 385	WLochShrOppKekaaPt	03D	24Aug87	095600	0.5	INCMG	9Dec87	2.1	0.6	0.0
PH 386	WLochShrOppKekaaPt	03D	24Aug87	095700	0.5	INCMG	25Nov87	1.4	0.4	0.0
PH 387	WLochShrOppKekaaPt	03D	24Aug87	095800	0.5	INCMG	24Nov87	0.0	0.0	0.0
PH 388	MidEntrChnBishopPt	03	24Aug87	100600	15.0	INCMG	7Dec87	5.0	1.7	2.7
PH 389	MidEnt:ChnBishopPt	03	24Aug87	100700	15.0	INCMG	9Dec87	2.2	0.7	0.9
PH 390	MidEntrChnBishopPt	03	24Aug87	100800	15.0	INCMG	9Dec87	1.9	1.0	1.3
PH 391	MidEntrChnBishopPt	03	24Aug87	101000	0.5	INCMG	25Nov87	2.3	1.6	0.7

* Organotin AF-paint test ship present at station

F = filtered

D = duplicate

Sample	Description	Station	Date	Time	Depth	Flow	Date Analyzed	Concentration in ng/L		
								MTCL	DTCL	TBTCL
PH 392	MidEntrChnBishopPt	03	24Aug87	101100	0.5	INCMG	25Nov87	4.3	1.9	1.3
PH 393	MidEntrChnBishopPt	03	24Aug87	101200	0.5	INCMG	9Dec87	11.0	3.5	2.2
PH 394	400mWEntrDryDck#2	07B	20Aug87	150400	0.5	OUTGO	1Sep87	4.0	6.6	0.8
PH 395	250mWOffEnd10100k	09A	20Aug87	154600	0.5	OUTGO	1Sep87	1.8	6.7	1.1
PH 396	NorthChnAdjBuoy#23	15	20Aug87	162600	0.5	OUTGO	1Sep87	2.2	8.5	1.7
PH 397	AdjChnMkr#15HospPt	05	22Aug87	150300	0.5	OUTGO	2Sep87	4.0	3.2	1.2
PH 398	400mWEntrDryDck#2	07B	22Aug87	161000	0.5	OUTGO	1Sep87	2.0	5.0	1.3
PH 399	NorthChnAdjBuoy#23	15	22Aug87	165200	0.5	OUTGO	2Sep87	1.5	5.1	2.1
PH 400	AdjChnMkr#15HospPt	05	23Aug87	153600	0.5	OUTGO	1Sep87	5.8	3.9	0.8
PH 401	400mWEntrDryDck#2	07B	23Aug87	163000	0.5	OUTGO	2Sep87	3.0	6.9	2.1
PH 402	NorthChnAdjBuoy#23	15	23Aug87	165200	0.5	OUTGO	2Sep87	2.0	4.8	1.7
PH 403	AdjNENetPtfmEntrCh	01	10Sep87	112500	0.5	OUTGO	18Sep87	2.8	2.0	1.2
PH 404	MidEntrChnBishopPt	03	10Sep87	112800	0.5	OUTGO	18Sep87	1.8	2.4	0.9
PH 405	WLochShrOppKekaaPt	03D	10Sep87	113300	0.5	OUTGO	18Sep87	0.5	0.9	0.0
PH 406	NorthChnAdjBuoy#23	15	10Sep87	114500	0.5	OUTGO	18Sep87	1.2	4.1	1.2
PH 407	CentrEntrMiddleLch	19A	10Sep87	115600	0.5	OUTGO	18Sep87	1.0	2.4	0.3
PH 408	MidEntrChanMkr#15	05C	10Sep87	120000	0.5	OUTGO	18Sep87	1.7	2.9	0.7
PH 409	@IntakeStrainrPETS	06	10Sep87	124900	0.5	OUTGO	11Sep87	9.6	5.8	0.0
PH 410	@IntakeStrainrPETS	06	10Sep87	125000	0.5	OUTGO	11Sep87	3.0	5.8	1.0
PH 411	@IntakeStrainrPETS	06	10Sep87	125100	0.5	OUTGO	11Sep87	3.0	6.7	0.0
PH 412	NorthChnAdjBuoy#23	15	12Sep87	090900	13.5	OUTGO	21Sep87	1.9	3.1	1.1
PH 413	NorthChnAdjBuoy#23	15	12Sep87	091000	13.5	OUTGO	18Sep87	1.3	2.1	0.7
PH 414	NorthChnAdjBuoy#23	15	12Sep87	091100	13.5	OUTGO	18Sep87	1.2	3.2	0.7
PH 415	NorthChnAdjBuoy#23	15	12Sep87	091300	0.5	OUTGO	18Sep87	1.2	3.2	0.7
PH 416	NorthChnAdjBuoy#23	15	12Sep87	091400	0.5	OUTGO	21Sep87	0.7	2.4	0.6
PH 417	NorthChnAdjBuoy#23	15	12Sep87	091500	0.5	OUTGO	21Sep87	0.8	3.2	0.7
PH 418	CentrEntrMiddleLch	19A	12Sep87	092600	16.0	OUTGO	18Sep87	1.6	2.6	0.5
PH 419	CentrEntrMiddleLch	19A	12Sep87	092700	16.0	OUTGO	21Sep87	1.0	1.2	0.0
PH 420	CentrEntrMiddleLch	19A	12Sep87	092800	16.0	OUTGO	21Sep87	0.8	1.1	0.2
PH 421	CentrEntrMiddleLch	19A	12Sep87	093000	0.5	OUTGO	21Sep87	0.8	3.2	0.7
PH 422	CentrEntrMiddleLch	19A	12Sep87	093100	0.5	OUTGO	21Sep87	0.6	1.8	0.0
PH 423	CentrEntrMiddleLch	19A	12Sep87	093200	0.5	OUTGO	21Sep87	0.5	1.6	0.2
PH 424	MidEntrChanMkr#15	05C	12Sep87	094000	16.0	OUTGO	21Sep87	1.2	1.2	0.4
PH 425	MidEntrChanMkr#15	05C	12Sep87	094100	16.0	OUTGO	21Sep87	0.9	0.9	0.6
PH 426	MidEntrChanMkr#15	05C	12Sep87	094200	16.0	OUTGO	21Sep87	0.3	0.9	0.4
PH 427	MidEntrChanMkr#15	05C	12Sep87	094500	0.5	OUTGO	21Sep87	0.8	2.1	0.5
PH 428	MidEntrChanMkr#15	05C	12Sep87	094600	0.5	OUTGO	21Sep87	0.7	2.2	0.3
PH 429	MidEntrChanMkr#15	05C	12Sep87	094700	0.5	OUTGO	28Sep87	2.5	3.0	1.0
PH 430	WLochShrOppKekaaPt	03D	12Sep87	095500	15.5	OUTGO	21Sep87	0.5	0.8	0.3
PH 431	WLochShrOppKekaaPt	03D	12Sep87	095600	15.5	OUTGO	21Sep87	0.5	0.6	0.0
PH 432	WLochShrOppKekaaPt	03D	12Sep87	095700	15.5	OUTGO	21Sep87	7.2	1.5	0.3
PH 433	WLochShrOppKekaaPt	03D	12Sep87	095900	0.5	OUTGO	21Sep87	2.7	0.7	0.0
PH 434	WLochShrOppKekaaPt	03D	12Sep87	100000	0.5	OUTGO	28Sep87	2.1	0.4	0.0
PH 435	WLochShrOppKekaaPt	03D	12Sep87	100100	0.5	OUTGO	28Sep87	4.7	0.5	0.0
PH 436	MidEntrChnBishopPt	03	12Sep87	100800	18.0	OUTGO	28Sep87	10.0	1.2	0.4
PH 437	MidEntrChnBishopPt	03	12Sep87	100900	18.0	OUTGO	28Sep87	10.0	0.7	0.5
PH 438	MidEntrChnBishopPt	03	12Sep87	101000	18.0	OUTGO	28Sep87	26.0	1.5	1.4
PH 439	MidEntrChnBishopPt	03	12Sep87	101300	0.5	OUTGO	23Oct87	2.8	1.6	1.2
PH 440	MidEntrChnBishopPt	03	12Sep87	101400	0.5	OUTGO	23Oct87	1.9	1.8	0.0
PH 441	MidEntrChnBishopPt	03	12Sep87	101500	0.5	OUTGO	23Oct87	1.8	1.4	0.0
PH 442	AdjNENetPtfmEntrCh	01	12Sep87	101900	13.0	OUTGO	23Oct87	1.7	0.9	0.0
PH 443	AdjNENetPtfmEntrCh	01	12Sep87	102000	13.0	OUTGO	24Oct87	0.0	0.0	0.0
PH 444	AdjNENetPtfmEntrCh	01	12Sep87	102100	13.0	OUTGO	24Oct87	1.4	0.6	0.3
PH 445	AdjNENetPtfmEntrCh	01	12Sep87	102500	0.5	OUTGO	24Oct87	2.7	1.5	0.5
PH 446	AdjNENetPtfmEntrCh	01	12Sep87	102600	0.5	OUTGO	24Oct87	2.5	2.0	0.8
PH 447	AdjNENetPtfmEntrCh	01	12Sep87	102700	0.5	OUTGO	24Oct87	2.6	2.4	7.4
PH 448	NorthChnAdjBuoy#23	15	14Sep87	081600	12.0	INCMG	26Oct87	1.0	2.3	1.4
PH 449	NorthChnAdjBuoy#23	15	14Sep87	081700	12.0	INCMG	26Oct87	3.5	6.2	3.5

* Organotin AF-paint test ship present at station

F = filtered

D = duplicate

Pearl Harbor Sediment Organotin Database

Sample	Type	Station	Rep	Date	Time	Depth	Tidal State	Date Analyzed	Concentration in ng/L			Notes
									MTCL	DBTCL	TBTCL	
PH 450	NorthChnAdjBuoy#23		15	14Sep87	081800	12.0	INCMG	260ct87	0.0	0.8	0.0	
PH 451	NorthChnAdjBuoy#23		15	14Sep87	081900	0.5	INCMG	270ct87	1.3	1.5	0.5	
PH 452	NorthChnAdjBuoy#23		15	14Sep87	082000	0.5	INCMG	270ct87	1.4	1.0	0.0	
PH 453	NorthChnAdjBuoy#23		15	14Sep87	082100	0.5	INCMG	240ct87	0.0	2.1	0.0	
PH 454	CentrEntrMiddlelch	19A	14Sep87	083400	12.0	INCMG	240ct87	0.7	0.9	0.5		
PH 455	CentrEntrMiddlelch	19A	14Sep87	083500	12.0	INCMG	270ct87	0.0	0.8	1.1		
PH 456	CentrEntrMiddlelch	19A	14Sep87	083600	12.0	INCMG	270ct87	0.0	1.0	0.5		
PH 457	CentrEntrMiddlelch	19A	14Sep87	083700	0.5	INCMG	270ct87	0.6	0.9	0.0		
PH 458	CentrEntrMiddlelch	19A	14Sep87	083800	0.5	INCMG	270ct87	0.6	0.7	0.0		
PH 459	CentrEntrMiddlelch	19A	14Sep87	083900	0.5	INCMG	260ct87	0.5	1.3	0.0		
PH 460	MidEntrChanMkr#15	05C	14Sep87	084500	15.0	INCMG	260ct87	0.9	1.2	0.0		
PH 461	MidEntrChanMkr#15	05C	14Sep87	084600	15.0	INCMG	260ct87	1.1	0.7	0.0		
PH 462	MidEntrChanMkr#15	05C	14Sep87	084700	15.0	INCMG	240ct87	1.1	2.2	0.7		
PH 463	MidEntrChanMkr#15	05C	14Sep87	084900	0.5	INCMG	260ct87	2.1	1.4	0.0		
PH 464	MidEntrChanMkr#15	05C	14Sep87	085000	0.5	INCMG	270ct87	0.6	0.8	0.5		
PH 465	MidEntrChanMkr#15	05C	14Sep87	085100	0.5	INCMG	270ct87	1.2	2.5	0.5		
PH 466	WLochShrOppKekaaPt	03D	14Sep87	090200	16.5	INCMG	240ct87	0.0	0.7	0.0		
PH 467	WLochShrOppKekaaPt	03D	14Sep87	090300	16.5	INCMG	260ct87	1.5	0.9	0.0		
PH 468	WLochShrOppKekaaPt	03D	14Sep87	090400	16.5	INCMG	240ct87	0.9	0.7	0.4		
PH 469	WLochShrOppKekaaPt	03D	14Sep87	090500	0.5	INCMG	240ct87	0.9	0.4	0.0		
PH 470	WLochShrOppKekaaPt	03D	14Sep87	090600	0.5	INCMG	260ct87	0.6	0.6	0.0		
PH 471	WLochShrOppKekaaPt	03D	14Sep87	090700	0.5	INCMG	260ct87	1.7	0.3	0.0		
PH 472	MidEntrChnBishopPt	03	14Sep87	091600	17.0	INCMG	260ct87	2.5	1.0	0.3		
PH 473	MidEntrChnBishopPt	03	14Sep87	091700	17.0	INCMG	260ct87	1.0	0.7	0.0		
PH 474	MidEntrChnBishopPt	03	14Sep87	091800	17.0	INCMG	260ct87	3.4	1.2	1.9		
PH 475	MidEntrChnBishopPt	03	14Sep87	092000	0.5	INCMG	260ct87	1.3	2.0	0.3		
PH 476	MidEntrChnBishopPt	03	14Sep87	092100	0.5	INCMG	260ct87	1.6	0.7	0.0		
PH 477	MidEntrChnBishopPt	03	14Sep87	092200	0.5	INCMG	260ct87	1.9	0.4	0.9		
PH 478	AdjNENetPtfmEntrCh	01	14Sep87	092700	12.0	INCMG	260ct87	1.3	1.7	0.9		
PH 479	AdjNENetPtfmEntrCh	01	14Sep87	092800	12.0	INCMG	270ct87	0.0	0.4	0.0		
PH 480	AdjNENetPtfmEntrCh	01	14Sep87	092900	12.0	INCMG	260ct87	1.3	0.5	0.5		
PH 481	AdjNENetPtfmEntrCh	01	14Sep87	093000	0.5	INCMG	270ct87	1.3	0.9	0.0		
PH 482	AdjNENetPtfmEntrCh	01	14Sep87	093100	0.5	INCMG	270ct87	1.2	1.0	0.0		
PH 483	AdjNENetPtfmEntrCh	01	14Sep87	093200	0.5	INCMG	270ct87	0.0	1.5	0.0		
PH 484	MidEntrChnBishopPt	03	9Sep87	121700	0.5	LOSLK	160ec87	0.0	6.0	0.0		
PH 485	MidChnEntrWestLoch	03E	9Sep87	124200	0.5	LOSLK	160ec87	0.0	7.9	0.0		
PH 486	AdjChnMkr#16HospPt	05	9Sep87	131300	0.5	LOSLK	150ec87	0.0	0.0	0.0		
PH 487	MidEntrChnBishopPt	03	12Sep87	145400	0.5	LOSLK	150ec87	0.0	9.9	0.0		
PH 488	MidChnEntrWestLoch	03E	12Sep87	152000	0.5	LOSLK	150ec87	0.0	1.0	0.0		
PH 489	AdjChnMkr#16HospPt	05	12Sep87	152700	0.5	LOSLK	150ec87	0.0	1.5	0.0		
PH 490	MidEntrChnBishopPt	03	13Sep87	162700	0.5	LOSLK	150ec87	0.0	1.7	0.0		
PH 491	MidChnEntrWestLoch	03E	13Sep87	163600	0.5	LOSLK	150ec87	2.5	1.0	0.0		
PH 492	AdjChnMkr#16HospPt	05	13Sep87	170200	0.5	LOSLK	150ec87	0.0	2.2	0.0		

* Organotin AF-paint test ship present at station

F = filtered

D = duplicate

Pearl Harbor Sediment Organotin Database

Sample	Type	Station	Rep	Date	Time	Depth	Tidal State	Date Analyzed	Concentration in ng/L			Notes
									MBTCL	DTCL	TBTCL	
PHM -01 -S-1	M	01	1	040986	1345	10.0	LOSLK		0.0	0.0	9.0	
PHM -01 -S-2	M	01	2	040986	1347	10.0	LOSLK					
PHM -01 -S-3	M	01	3	040986	1349	10.0	LOSLK		0.0	0.0	6.0	
PHM -03A-S-1	M	03A	1	040986	1301	2.5	LOSLK		0.0	0.0	6.0	
PHM -03A-S-2	M	03A	2	040986	1303	2.5	LOSLK					
PHM -03A-S-3	M	03A	3	040986	1305	2.5	LOSLK		0.0	3.0	10.0	
PHM -05 -S-1	M	05	1	040986	1208	15.0	LOSLK		0.0	26.0	38.0	
PHM -05 -S-2	M	05	2	040986	1210	15.0	LOSLK		0.0	13.0	63.0	
PHM -05 -S-3	M	05	3	040986	1212	15.0	LOSLK		0.0	33.0	70.0	
PHM -08A-S-1	M	08A	1	040886	1235	11.8	LOSLK		81.0	88.0	196.0	
PHM -08A-S-2	M	08A	2	040886	1237	11.8	LOSLK		38.0	72.0	112.0	
PHM -08A-S-3	M	08A	3	040886	1239	11.8	LOSLK		100.0	123.0	292.0	
PHM -09 -S-1	M	09	1	041786	1050	14.0	LOSLK		0.0	0.0	43.0	
PHM -09 -S-2	M	09	2	041786	1052	14.0	LOSLK		0.0	4.0	24.0	
PHM -09 -S-3	M	09	3	041786	1054	14.0	LOSLK		0.0	0.0	47.0	
PHM -10 -S-1	M	10	1	041786	1036	14.0	LOSLK		13.0	75.0	81.0	
PHM -10 -S-2	M	10	2	041786	1038	14.0	LOSLK					<NO TEST
PHM -10 -S-3	M	10	3	041786	1040	14.0	LOSLK		51.0	160.0	580.0	
PHM -10A-S-1	M	10A	1	040886	1202	12.0	LOSLK					<LOST
PHM -10A-S-2	M	10A	2	040886	1204	12.0	LOSLK					<LOST
PHM -10A-S-3	M	10A	3	040886	1206	12.0	LOSLK					<LOST
PHM -10C-S-1	M	10C	1	040886	1256	12.5	LOSLK		57.0	209.0	377.0	
PHM -10C-S-2	M	10C	2	040886	1258	12.5	LOSLK					<NO TEST
PHM -10C-S-3	M	10C	3	040886	1300	12.5	LOSLK		49.0	222.0	325.0	
PHM -11 -S-1	M	11	1	040886	1115	10.0	LOSLK		16.0	98.0	139.0	
PHM -11 -S-2	M	11	2	040886	1117	10.0	LOSLK		23.0	116.0	133.0	
PHM -11 -S-3	M	11	3	040886	1119	10.0	LOSLK		15.0	105.0	145.0	
PHM -12 -S-1	M	12	1	040886	1128	16.0	LOSLK		106.0	200.0	291.0	
PHM -12 -S-2	M	12	2	040886	1130	16.0	LOSLK		89.0	157.0	272.0	
PHM -12 -S-3	M	12	3	040886	1132	16.0	LOSLK		85.0	198.0	292.0	
PHM -13 -S-1	M	13	1	040886	1230	11.0	LOSLK		0.0	22.0	39.0	
PHM -13 -S-2	M	13	2	040886	1232	11.0	LOSLK		0.0	16.0	22.0	
PHM -13 -S-3	M	13	3	040886	1234	11.0	LOSLK		32.0	38.0	29.0	
PHM -14 -S-1	M	14	1	040886	1325	5.0	LOSLK					<LOST
PHM -14 -S-2	M	14	2	040886	1327	5.0	LOSLK		24.0	58.0	30.0	
PHM -14 -S-3	M	14	3	040886	1329	5.0	LOSLK		0.0	38.0	36.0	
PHM -16 -S-1	M	16	1	040986	1105	3.0	LOSLK		16.0	0.0	12.0	
PHM -16 -S-2	M	16	2	040986	1107	3.0	LOSLK					<LOST
PHM -16 -S-3	M	16	3	040986	1109	3.0	LOSLK		0.0	0.0	16.0	
PHM -19 -S-1	M	19	1	040986	1135	7.0	LOSLK		0.0	0.0	24.0	
PHM -19 -S-2	M	19	2	040986	1137	7.0	LOSLK					<LOST
PHM -19 -S-3	M	19	3	040986	1139	7.0	LOSLK					<LOST
PHM2-01 -S-1	M2	01	1	021087	0956	12.5	LOSLK		0.0	0.0	4.0	
PHM2-01 -S-2	M2	01	2	021087	0957	12.5	LOSLK		0.0	0.0	9.0	
PHM2-01 -S-3	M2	01	3	021087	0958	12.5	LOSLK		0.0	0.0	9.0	
PHM2-03A-S-1	M2	03A	1	021087	1019	4.0	LOSLK		0.0	0.0	0.0	
PHM2-03A-S-2	M2	03A	2	021087	1020	4.0	LOSLK		0.0	0.0	7.0	
PHM2-03A-S-3	M2	03A	3	021087	1021	4.0	LOSLK		0.0	0.0	8.0	
PHM2-05 -S-1	M2	05	1	021087	1121	15.0	LOSLK					<LOST
PHM2-05 -S-2	M2	05	2	021087	1122	15.0	LOSLK		0.0	32.0	72.0	
PHM2-05 -S-3	M2	05	3	021087	1123	15.0	LOSLK		0.0	25.0	39.0	
PHM2-05B-S-1	M2	05B	1	021087	1114	17.0	LOSLK		0.0	0.0	94.0	
PHM2-05B-S-2	M2	05B	2	021087	1115	17.0	LOSLK		0.0	13.0	47.0	
PHM2-05B-S-3	M2	05B	3	021087	1116	17.0	LOSLK		0.0	23.0	83.0	
PHM2-06 -S-1	M2	06	1	021087	1129	4.0	LOSLK		0.0	0.0	0.0	
PHM2-06 -S-2	M2	06	2	021087	1130	4.0	LOSLK		0.0	0.0	5.0	
PHM2-06 -S-3	M2	06	3	021087	1131	4.0	LOSLK		0.0	0.0	5.0	

* Organotin AF-paint test ship present at station

F = filtered

D = duplicate

Sample	Type	Station	Rep	Date	Time	Depth	Tidal State	Date Analyzed	Concentration in ng/L			Notes
									MBTCL	DTCL	TBTCL	
PHM2-07 -S-1	M2	07	1	021087	1231	16.0	LOSLK		38.0	214.0	1477.0	
PHM2-07 -S-2	M2	07	2	021087	1232	16.0	LOSLK		22.0	353.0	861.0	
PHM2-07 -S-3	M2	07	3	021087	1233	16.0	LOSLK					
PHM2-07A-S-1	M2	07A	1	021087	1224	12.0	LOSLK		0.0	56.0	142.0	
PHM2-07A-S-2	M2	07A	2	021087	1225	12.0	LOSLK		0.0	58.0	303.0	
PHM2-07A-S-3	M2	07A	3	021087	1226	12.0	LOSLK		16.0	101.0	381.0	
PHM2-07B-S-1	M2	07B	1	021087	1216	16.0	LOSLK		0.0	18.0	37.0	
PHM2-07B-S-2	M2	07B	2	021087	1217	16.0	LOSLK		0.0	12.0	20.0	
PHM2-07B-S-3	M2	07B	3	021087	1218	16.0	LOSLK		0.0	15.0	30.0	
PHM2-08B-S-1	M2	08B	1	021087	1239	13.0	LOSLK		0.0	47.0	290.0	
PHM2-08B-S-2	M2	08B	2	021087	1240	13.0	LOSLK		0.0	68.0	418.0	
PHM2-08B-S-3	M2	08B	3	021087	1241	13.0	LOSLK		0.0	98.0	808.0	
PHM2-08C-S-1	M2	08C	1	021087	1247	14.0	LOSLK		0.0	18.0	157.0	
PHM2-08C-S-2	M2	08C	2	021087	1248	14.0	LOSLK		0.0	18.0	253.0	
PHM2-08C-S-3	M2	08C	3	021087	1249	14.0	LOSLK		0.0	31.0	187.0	
PHM2-09 -S-1	M2	09	1	021087	1301	13.5	LOSLK		0.0	18.0	18.0	
PHM2-09 -S-2	M2	09	2	021087	1302	13.5	LOSLK		0.0	30.0	50.0	
PHM2-09 -S-3	M2	09	3	021087	1303	13.5	LOSLK		0.0	27.0	32.0	
PHM2-09A-S-1	M2	09A	1	021087	1254	13.0	LOSLK		0.0	17.0	43.0	
PHM2-09A-S-2	M2	09A	2	021087	1255	13.0	LOSLK		0.0	14.0	38.0	
PHM2-09A-S-3	M2	09A	3	021087	1256	13.0	LOSLK		0.0	18.0	40.0	
PHM2-09B-S-1	M2	09B	1	021087	1314	13.0	LOSLK		0.0	19.0	49.0	
PHM2-09B-S-2	M2	09B	2	021087	1315	13.0	LOSLK		0.0	12.0	24.0	
PHM2-09B-S-3	M2	09B	3	021087	1316	13.0	LOSLK		0.0	17.0	29.0	
PHM2-10 -S-1	M2	10	1	021087	1330	13.5	LOSLK		0.0	25.0	49.0	
PHM2-10 -S-2	M2	10	2	021087	1331	13.5	LOSLK		0.0	11.0	16.0	
PHM2-10 -S-3	M2	10	3	021087	1332	13.5	LOSLK		22.0	21.0	23.0	
PHM2-10C-S-1	M2	10C	1	021087	1324	11.0	LOSLK		133.0	251.0	441.0	
PHM2-10C-S-2	M2	10C	2	021087	1325	11.0	LOSLK		113.0	216.0	410.0	
PHM2-10C-S-3	M2	10C	3	021087	1326	11.0	LOSLK		21.0	76.0	274.0	
PHM2-11 -S-1	M2	11	1	021087	1338	12.5	LOSLK		42.0	174.0	328.0	
PHM2-11 -S-2	M2	11	2	021087	1339	12.5	LOSLK		73.0	216.0	541.0	
PHM2-11 -S-3	M2	11	3	021087	1340	12.5	LOSLK		45.0	194.0	411.0	
PHM2-14 -S-1	M2	14	1	021087	1346	6.5	LOSLK		24.0	37.0	17.0	
PHM2-14 -S-2	M2	14	2	021087	1347	6.5	LOSLK		22.0	33.0	19.0	
PHM2-14 -S-3	M2	14	3	021087	1348	6.5	LOSLK		18.0	34.0	14.0	
PHM2-15 -S-1	M2	15	1	021087	1159	13.0	LOSLK		0.0	0.0	18.0	
PHM2-15 -S-2	M2	15	2	021087	1200	13.0	LOSLK		0.0	16.0	21.0	
PHM2-15 -S-3	M2	15	3	021087	1201	13.0	LOSLK		0.0	15.0	13.0	
PHM2-16 -S-1	M2	16	1	021087	1149	5.0	LOSLK					
PHM2-16 -S-2	M2	16	2	021087	1150	5.0	LOSLK		11.0	29.0	6.0	
PHM2-16 -S-3	M2	16	3	021087	1151	5.0	LOSLK		12.0	6.0	9.0	
PHM2-19 -S-1	M2	19	1	021087	1139	6.5	LOSLK					<NO TEST
PHM2-19 -S-2	M2	19	2	021087	1140	6.5	LOSLK					<NO TEST
PHM2-19 -S-3	M2	19	3	021087	1141	6.5	LOSLK					<NO TEST
PHM3-01 -S-1	M3	01	1	041587	1131	8.5	INCMG	051888		0.0	13.0	
PHM3-01 -S-2	M3	01	2	041587	1132	8.5	INCMG	052088		0.0	18.0	
PHM3-01 -S-3	M3	01	3	041587	1133	8.5	INCMG	052088		4.0	10.0	
PHM3-03A-S-1	M3	03A	1	041587	1117	7.0	INCMG	060688		0.0	0.0	
PHM3-03A-S-2	M3	03A	2	041587	1118	7.0	INCMG	060688		0.0	21.0	
PHM3-03A-S-3	M3	03A	3	041587	1119	7.0	INCMG	060688		0.0	14.0	
PHM3-05 -S-1	M3	05	1	041587	1149	13.5	INCMG	063088		0.0	47.0	
PHM3-05 -S-2	M3	05	2	041587	1150	13.5	INCMG	063088		15.0	51.0	
PHM3-05 -S-3	M3	05	3	041587	1151	13.5	INCMG	063088		0.0	81.0	
PHM3-05B-S-1	M3	05B	1	041587	1139	16.5	INCMG	060788		38.0	120.0	
PHM3-05B-S-2	M3	05B	2	041587	1140	16.5	INCMG	060788		38.0	122.0	
PHM3-05B-S-3	M3	05B	3	041587	1141	16.5	INCMG	060788		33.0	124.0	
PHM3-06 -S-1	M3	06	1	041587	1056	9.0	INCMG	060188		0.0	14.0	
PHM3-06 -S-2	M3	06	2	041587	1057	9.0	INCMG	052688		0.0	20.0	

* Organotin AF-paint test ship present at station

F = filtered

D = duplicate

Sample	Type	Station	Rep	Date	Time	Depth	Tidal State	Date Analyzed	Concentration in ng/L			Notes
									MBTCL	DBTCL	TBTCL	
PHM3-06 -S-3	M3	06	3	041587	1058	9.0	INCMG	060188		0.0	20.0	
PHM3-07 -S-1	M3	07	1	041587	1204	15.0	INCMG	063088	163.0	2336.0		
PHM3-07 -S-2	M3	07	2	041587	1205	15.0	INCMG	063088	148.0	2170.0		
PHM3-07 -S-3	M3	07	3	041587	1206	15.0	INCMG					<LOST
PHM3-07A-S-1	M3	07A	1	041587	1159	15.0	INCMG	060188	30.0	98.0		
PHM3-07A-S-2	M3	07A	2	041587	1200	15.0	INCMG	060188	31.0	121.0		
PHM3-07A-S-3	M3	07A	3	041587	1201	15.0	INCMG	060188	40.0	138.0		
PHM3-07B-S-1	M3	07B	1	041587	1154	15.5	INCMG	051888	27.0	50.0		
PHM3-07B-S-2	M3	07B	2	041587	1155	15.5	INCMG	052088	0.0	19.0		
PHM3-07B-S-3	M3	07B	3	041587	1156	15.5	INCMG	052088	5.0	33.0		
PHM3-08B-S-1	M3	08B	1	041587	1216	14.5	INCMG	060788	50.0	282.0		
PHM3-08B-S-2	M3	08B	2	041587	1217	14.5	INCMG	060788	96.0	353.0		
PHM3-08B-S-3	M3	08B	3	041587	1218	14.5	INCMG	060788	33.0	153.0		
PHM3-08C-S-1	M3	08C	1	041587	1221	15.0	INCMG	051088	0.0	0.0		
PHM3-08C-S-2	M3	08C	2	041587	1222	15.0	INCMG	051088	0.0	0.0		
PHM3-08C-S-3	M3	08C	3	041587	1223	15.0	INCMG	051088	0.0	98.0		
PHM3-09 -S-1	M3	09	1	041587	1234	14.0	INCMG	060788	0.0	63.0		
PHM3-09 -S-2	M3	09	2	041587	1235	14.0	INCMG	060788	0.0	52.0		
PHM3-09 -S-3	M3	09	3	041587	1236	14.0	INCMG	060788	0.0	62.0		
PHM3-09A-S-1	M3	09A	1	041587	1227	13.5	INCMG	051088	0.0	0.0		
PHM3-09A-S-2	M3	09A	2	041587	1228	13.5	INCMG	051088	0.0	0.0		
PHM3-09A-S-3	M3	09A	3	041587	1229	13.5	INCMG	051088	0.0	0.0		
PHM3-09B-S-1	M3	09B	1	041587	1244	14.0	INCMG	051088	0.0	0.0		
PHM3-09B-S-2	M3	09B	2	041587	1245	14.0	INCMG	051088	0.0	0.0		
PHM3-09B-S-3	M3	09B	3	041587	1246	14.0	INCMG	051088	0.0	0.0		
PHM3-10 -S-1	M3	10	1	041587	1259	13.5	INCMG	051888	74.0	116.0		
PHM3-10 -S-2	M3	10	2	041587	1300	13.5	INCMG	052088	65.0	74.0		
PHM3-10 -S-3	M3	10	3	041587	1301	13.5	INCMG	052088	66.0	86.0		
PHM3-10B-S-1	M3	10B	1	041587	1249	10.5	INCMG	051088	390.0	885.0		
PHM3-10B-S-2	M3	10B	2	041587	1250	10.5	INCMG	051088	173.0	533.0		
PHM3-10B-S-3	M3	10B	3	041587	1251	10.5	INCMG	051088	156.0	310.0		
PHM3-11 -S-1	M3	11	1	041587	1305	12.5	INCMG	060188	173.0	321.0		
PHM3-11 -S-2	M3	11	2	041587	1306	12.5	INCMG	060188	195.0	373.0		
PHM3-11 -S-3	M3	11	3	041587	1307	12.5	INCMG	060188	147.0	228.0		
PHM3-14 -S-1	M3	14	1	041587	1324	6.5	INCMG	060788	0.0	23.0		
PHM3-14 -S-2	M3	14	2	041587	1325	6.5	INCMG	060788	16.0	31.0		
PHM3-14 -S-3	M3	14	3	041587	1326	6.5	INCMG	060688	0.0	34.0		
PHM3-15 -S-1	M3	15	1	041587	1314	12.5	INCMG	051888	11.0	0.0		
PHM3-15 -S-2	M3	15	2	041587	1325	12.5	INCMG	051888	13.0	12.0		
PHM3-15 -S-3	M3	15	3	041587	1316	12.5	INCMG	051888	0.0	13.0		
PHM3-16 -S-1	M3	16	1	041587	1026	4.5	INCMG	063088	0.0	22.0		
PHM3-16 -S-2	M3	16	2	041587	1027	4.5	INCMG	063088	0.0	20.0		
PHM3-16 -S-3	M3	16	3	041587	1028	4.5	INCMG	063088	0.0	19.0		
PHM3-19 -S-1	M3	19	1	041587	1040	7.0	INCMG	052688	85.0	104.0		
PHM3-19 -S-2	M3	19	2	041587	1041	7.0	INCMG	052688	27.0	41.0		
PHM3-19 -S-3	M3	19	3	041587	1042	7.0	INCMG	060188	31.0	35.0		
PHM6-01 -S-1	M6	01	1	011988	1157	13.0	LOSLK	040188	0.0	0.0		
PHM6-01 -S-2	M6	01	2	011988	1158	13.0	LOSLK					
PHM6-01 -S-3	M6	01	3	011988	1159	13.0	LOSLK					
PHM6-03 -S-1	M6	03	1	011988	1205	16.5	LOSLK	040188	0.0	10.0		
PHM6-03 -S-2	M6	03	2	011988	1206	16.5	LOSLK					
PHM6-03 -S-3	M6	03	3	011988	1207	16.5	LOSLK					
PHM6-03A-S-1	M6	03A	1	011988	1117	6.5	LOSLK	040488	0.0	19.0		
PHM6-03A-S-2	M6	03A	2	011988	1118	6.5	LOSLK	041888	0.0	17.0		
PHM6-03A-S-3	M6	03A	3	011988	1119	6.5	LOSLK	041888	0.0	12.0		
PHM6-03D-S-1	M6	03D	1	011988	1145	16.0	LOSLK	040488	0.0	0.0		
PHM6-03D-S-2	M6	03D	2	011988	1146	16.0	LOSLK					
PHM6-03D-S-3	M6	03D	3	011988	1147	16.0	LOSLK					
PHM6-05B-S-1	M6	05B	1	011988	1212	17.0	LOSLK	040188	65.0	127.0		

* Organotin AF-paint test ship present at station

F = filtered

D = duplicate

Sample	Type	Station	Rep	Date	Time	Depth	Tidal State	Date Analyzed	Concentration in ng/L			Notes
									MBTCL	DTCL	TBTCL	
PHM6-05B-S-2	M6	05B	2	011988	1213	17.0	LOSLK	041888		55.0	205.0	
PHM6-05B-S-3	M6	05B	3	011988	1214	17.0	LOSLK	041888		73.0	196.0	
PHM6-05C-S-1	M6	05C	1	011988	1217	14.5	LOSLK	040188		0.0	17.0	
PHM6-05C-S-2	M6	05C	2	011988	1218	14.5	LOSLK	041888		0.0	14.0	
PHM6-05C-S-3	M6	05C	3	011988	1219	14.5	LOSLK	041888		0.0	20.0	
PHM6-07-S-1	M6	07	1	011988	1323	15.0	LOSLK	040188		86.0	795.0	
PHM6-07-S-2	M6	07	2	011988	1324	15.0	LOSLK	041888		157.0	969.0	
PHM6-07-S-3	M6	07	3	011988	1325	15.0	LOSLK	041888		361.0	1129.0	
PHM6-07B-S-1	M6	07B	1	011988	1317	17.0	LOSLK	040188		12.0	29.0	
PHM6-07B-S-2	M6	07B	2	011988	1318	17.0	LOSLK					
PHM6-07B-S-3	M6	07B	3	011988	1319	17.0	LOSLK					
PHM6-09A-S-1	M6	09A	1	011988	1328	14.0	LOSLK	040188		58.0	76.0	
PHM6-09A-S-2	M6	09A	2	011988	1329	14.0	LOSLK					
PHM6-09A-S-3	M6	09A	3	011988	1330	14.0	LOSLK					
PHM6-09B-S-1	M6	09B	1	011988	1332	13.0	LOSLK	040188		31.0	57.0	
PHM6-09B-S-2	M6	09B	2	011988	1333	13.0	LOSLK					
PHM6-09B-S-3	M6	09B	3	011988	1334	13.0	LOSLK					
PHM6-10-S-1	M6	10	1	011988	1335	12.5	LOSLK	040488		24.0	46.0	
PHM6-10-S-2	M6	10	2	011988	1336	12.5	LOSLK					
PHM6-10-S-3	M6	10	3	011988	1337	12.5	LOSLK					
PHM6-11A-S-1	M6	11A	1	011988	1343	13.5	LOSLK	040188		122.0	172.0	
PHM6-11A-S-2	M6	11A	2	011988	1344	13.5	LOSLK	041888		123.0	169.0	
PHM6-11A-S-3	M6	11A	3	011988	1345	13.5	LOSLK	041888		96.0	141.0	
PHM6-14-S-1	M6	14	1	011988	1426	6.5	LOSLK	040188		36.0	36.0	
PHM6-14-S-2	M6	14	2	011988	1427	6.5	LOSLK					
PHM6-14-S-3	M6	14	3	011988	1428	6.5	LOSLK					
PHM6-16-S-1	M6	16	1	011988	1402	3.5	LOSLK	040188		0.0	52.0	
PHM6-16-S-2	M6	16	2	011988	1403	3.5	LOSLK					
PHM6-16-S-3	M6	16	3	011988	1404	3.5	LOSLK					
PHM6-18A-S-1	M6	18A	1	011988	1257	13.0	LOSLK	040488		117.0	967.0	
PHM6-18A-S-2	M6	18A	2	011988	1258	13.0	LOSLK	041888		77.0	492.0	
PHM6-18A-S-3	M6	18A	3	011988	1259	13.0	LOSLK	041888		209.0	581.0	
PHM6-19-S-1	M6	19	1	011988	1303	11.5	LOSLK	040488		23.0	27.0	
PHM6-19-S-2	M6	19	2	011988	1304	11.5	LOSLK					
PHM6-19-S-3	M6	19	3	011988	1305	11.5	LOSLK					
PHM6-19A-S-1	M6	19A	1	011988	1310	11.5	LOSLK	040488		0.0	0.0	
PHM6-19A-S-2	M6	19A	2	011988	1311	11.5	LOSLK					
PHM6-19A-S-3	M6	19A	3	011988	1312	11.5	LOSLK					
PHM6-20-S-1	M6	20	1	011988	1224	14.0	LOSLK					
PHM6-20-S-2	M6	20	2	011988	1225	14.0	LOSLK					
PHM6-20-S-3	M6	20	3	011988	1226	14.0	LOSLK					
PHM6-21-S-1	M6	21	1	011988	1354	13.0	LOSLK	040488		0.0	17.0	
PHM6-21-S-2	M6	21	2	011988	1355	13.0	LOSLK					
PHM6-21-S-3	M6	21	3	011988	1356	13.0	LOSLK					

* Organotin AF-paint test ship present at station

F = filtered

D = duplicate

Pearl Harbor Tissue Organotin Database

Sample	Date	Time	Species	n	Mean		Concentration in ng/g**		
					Length	Depth	MBTCL	DTCL	TBTCL
PHM -03A-T-1	040986	1235	Crassostrea virginica	5	57.5	MLLW			0.0
PHM -03A-T-2	040986	1237	Crassostrea virginica	5	68.9	MLLW			0.0
PHM -03A-T-3	040986	1240	Crassostrea virginica	5	61.1	MLLW			0.0
PHM -03A-T-4	040986	1243	Crassostrea virginica	5	61.3	MLLW			
PHM -03A-T-5	040986	1245	Crassostrea virginica	5	64.2	MLLW			
PHM -05A-T-1	041786	1115	Crassostrea virginica	5	42.6	MLLW			0.0
PHM -05A-T-2	041786	1120	Crassostrea virginica	5	38.9	MLLW			90
PHM -05A-T-3	041786	1125	Crassostrea virginica	5	42.5	MLLW			
PHM -05A-T-4	041786	1130	Crassostrea virginica	5	43.3	MLLW			
PHM -05A-T-5	041786	1135	Crassostrea virginica	5	42.1	MLLW			
PHM -14B-T-1	041786	1300	Crassostrea virginica	10	37.5	MLLW			250
PHM -14B-T-2	041786	1305	Crassostrea virginica	10	35.8	MLLW			520
PHM -14B-T-3	041786	1310	Crassostrea virginica	10	35.6	MLLW			270
PHM2-03A-T-1	021087	1030	Crassostrea virginica	5	71.3	MLLW		0.0	0.0
PHM2-03A-T-2	021087	1031	Crassostrea virginica	5	65.3	MLLW		0.0	0.0
PHM2-03A-T-3	021087	1032	Crassostrea virginica	5	69.3	MLLW		0.0	0.0
PHM2-05A-T-1	031987	1114	Ostrea spp.	15	31.0	MLLW	284.56		71.27
PHM2-05A-T-2	031987	1115	Ostrea spp.	15	30.5	MLLW	119.12		52.50
PHM2-05A-T-3	031987	1116	Ostrea spp.	15	28.3	MLLW		0.0	0.0
PHM2-06 -T-1	031987	1029	Ostrea spp.	12	30.7	MLLW	162.77		131.93
PHM2-06 -T-2	031987	1030	Ostrea spp.	12	32.6	MLLW		0.0	193.30
PHM2-06 -T-3	031987	1031	Ostrea spp.	12	32.9	MLLW		36.25	0.0
PHM2-07 -T-1	022487	1229	Ostrea spp.	20	32.9	MLLW	430.91		276.96
PHM2-07 -T-2	022487	1230	Ostrea spp.	20	32.3	MLLW	304.73		204.19
PHM2-07 -T-3	022487	1231	Ostrea spp.	20	34.6	MLLW	635.71		245.52
PHM2-14B-T-1	031987	1214	Ostrea spp.	15	31.2	MLLW	486.72		450.66
PHM2-14B-T-2	031987	1215	Ostrea spp.	15	31.7	MLLW	475.97		474.49
PHM2-14B-T-3	031987	1216	Ostrea spp.	15	31.8	MLLW	260.72		169.52
PHM2-16 -T-1	031987	0959	Ostrea spp.	10	46.5	MLLW		0.0	196.03
PHM2-16 -T-2	031987	1000	Ostrea spp.	10	43.1	MLLW		0.0	115.16
PHM2-16 -T-3	031987	1001	Ostrea spp.	10	44.6	MLLW		0.0	160.82
PHM4-03A-T-1	080287	1029	Crassostrea virginica	5	51.6	MLLW		0.0	0.0
PHM4-03A-T-2	080287	1030	Crassostrea virginica	5	54.1	MLLW		0.0	0.0
PHM4-03A-T-3	080287	1031	Crassostrea virginica	5	53.5	MLLW		0.0	0.0
PHM4-07 -T-1	082487	1100	Ostrea spp.	15	35.5	MLLW		0.0	50
PHM4-07 -T-2	082487	1107	Ostrea spp.	15	34.5	MLLW		0.0	60
PHM4-07 -T-3	082487	1115	Ostrea spp.	15	35.6	MLLW		0.0	80
PHM4-14A-T-1	082487	1129	Crassostrea virginica	5	51.3	MLLW		0.0	0.0
PHM4-14A-T-2	082487	1130	Crassostrea virginica	5	44.1	MLLW		0.0	0.0
PHM4-14A-T-3	082487	1131	Crassostrea virginica	5	46.2	MLLW		0.0	0.0
PHM6-03A-T-1	011988	1128	Crassostrea virginica	5	76.1	MLLW		0.0	0.0
PHM6-03A-T-2	011988	1130	Crassostrea virginica	5	79.3	MLLW			
PHM6-03A-T-3	011988	1132	Crassostrea virginica	5	75.3	MLLW			
PHM6-07 -T-1	012088	1325	Ostrea spp.	20	25.7	MLLW		44	105
PHM6-07 -T-2	012088	1330	Ostrea spp.	20	26.7	MLLW		86	84
PHM6-07 -T-3	012088	1335	Ostrea spp.	20	28.2	MLLW		91	75
PHM6-14A-T-1	012088	1420	Crassostrea virginica	10	34.0	MLLW		30	144
PHM6-14A-T-2	012088	1425	Crassostrea virginica	10	34.0	MLLW		0.0	198
PHM6-14A-T-3	012088	1430	Crassostrea virginica	10	34.4	MLLW		0.0	213
PHM6-16 -T-1	012088	1100	Crassostrea virginica	5	53.9	MLLW		0.0	174
PHM6-16 -T-2	012088	1105	Crassostrea virginica	5	51.0	MLLW		0.0	117
PHM6-16 -T-3	012088	1110	Crassostrea virginica	5	55.9	MLLW		0.0	116

** Wet weight

Honolulu Harbor Tissue Organotin Database

Sample	Date	Time	Species	N	Mean			Concentration in ng/g**				
					Length	Depth		MBTCL	DBTCL	TBTCL		
HHM2-05 -SW-4	M2	05	S	4	5Mar87	104048	1.0	OUTGO	13Apr87	2.2	3.4	8.2
HHM2-05 -SW-5	M2	05	S	5	5Mar87	104121	1.0	OUTGO	13Apr87	5.9	3.4	8.2
HHM2-05 -SW-6	M2	05	S	6	5Mar87	104157	1.0	OUTGO	9Apr87	3.4	5.9	13.0
HHM2-12 -SW-1	M2	12	S	1	5Mar87	102352	1.0	OUTGO	21Jul87	18.0	2.8	1.7
HHM2-12 -SW-2	M2	12	S	2	5Mar87	102445	1.0	OUTGO	21Jul87	0.4	1.7	1.4
HHM2-12 -SW-3	M2	12	S	3	5Mar87	102538	1.0	OUTGO	21Jul87	3.8	1.1	0.2
HHV2-02 -SW-1	V2	02	S	1	5Mar87	115548	1.0	OUTGO	22Jul87	13.0	17.0	20.0
HHV2-02 -SW-2	V2	02	S	2	5Mar87	115548	1.0	OUTGO	13Apr87	11.0	13.0	47.0
HHV2-02 -SW-3	V2	02	S	3	5Mar87	115548	1.0	OUTGO	9Apr87	5.2	13.0	35.0
HHV2-02 -MW-1	V2	02	M	1	5Mar87	115150	4.5	OUTGO	13Apr87	6.7	17.0	52.0
HHV2-02 -DW-1	V2	02	D	1	5Mar87	114735	8.0	OUTGO	16Jul87	5.8	15.0	20.0
HHV2-02 -DW-2	V2	02	D	2	5Mar87	114735	8.0	OUTGO	8Apr87	11.0	17.0	40.0
HHV2-02 -DW-3	V2	02	D	3	5Mar87	114735	8.0	OUTGO	13Apr87	11.0	25.0	44.0
HHV2-03 -SW-1	V2	03	S	1	5Mar87	122451	1.0	OUTGO	23Jul87	8.6	18.0	33.0
HHV2-03 -SW-2	V2	03	S	2	5Mar87	122451	1.0	OUTGO	8Apr87	8.0	20.0	42.0
HHV2-03 -SW-3	V2	03	S	3	5Mar87	122451	1.0	OUTGO	9Apr87	6.0	20.0	52.0
HHV2-03 -SW-4	V2	03	S	4	5Mar87	122451	1.0	OUTGO				
HHV2-03 -MW-1	V2	03	M	1	5Mar87	122104	4.9	OUTGO	8Apr87	7.0	20.0	32.0
HHV2-03 -DW-1	V2	03	D	1	5Mar87	121607	11.2	OUTGO	23Jul87	8.4	12.0	24.0
HHV2-03 -DW-2	V2	03	D	2	5Mar87	121607	11.2	OUTGO	8Apr87	10.0	22.0	46.0
HHV2-03 -DW-3	V2	03	D	3	5Mar87	121607	11.2	OUTGO	9Apr87	6.8	21.0	42.0
HHV2-03 -DW-4	V2	03	D	4	5Mar87	121607	11.2	OUTGO				
HHV2-13 -SW-1	V2	13	S	1	5Mar87	111955	1.0	OUTGO	22Jul87	6.2	6.0	3.2
HHV2-13 -SW-2	V2	13	S	2	5Mar87	111955	1.0	OUTGO	13Apr87	5.0	4.5	11.0
HHV2-13 -SW-3	V2	13	S	3	5Mar87	111955	1.0	OUTGO	13Apr87	3.3	5.8	15.0
HHV2-13 -MW-1	V2	13	M	1	5Mar87	111600	5.2	OUTGO	13Apr87	4.6	4.8	14.0
HHV2-13 -DW-1	V2	13	D	1	5Mar87	111030	13.5	LOST>	13Apr87			
HHV2-13 -DW-2	V2	13	D	2	5Mar87	111030	13.5	OUTGO	9Apr87	5.2	13.0	24.0
HHV2-13 -DW-3	V2	13	D	3	5Mar87	111030	13.5	OUTGO	9Apr87	8.1	12.0	23.0
HHV2-13 -DW-4	V2	13	D	4	5Mar87	111030	13.5	OUTGO	22Jul87	7.3	12.0	12.0
HHM3-01 -SW-1	M3	01	S	1	30Jul87	110800	0.5	INCMG	27Sep87	6.8	17.0	68.0
HHM3-01 -DW-1	M3	01	D	1	30Jul87	110700	10.0	INCMG	27Sep87	6.6	12.0	32.0
HHM3-02 -SW-1	M3	02	S	1	30Jul87	113500	0.5	INCMG	27Sep87	23.0	70.0	580.0
HHM3-02 -DW-1	M3	02	D	1	30Jul87	113300	9.0	INCMG	27Sep87	16.0	31.0	170.0
HHM3-03 -SW-1	M3	03	S	1	30Jul87	114000	0.5	INCMG	27Sep87	14.0	11.0	64.0
HHM3-03 -DW-1	M3	03	D	1	30Jul87	113800	12.0	INCMG	27Sep87	7.7	19.0	130.0
HHM3-05 -SW-1	M3	05	S	1	30Jul87	121400	0.5	INCMG	27Sep87	4.3	5.2	22.0
HHM3-05 -DW-1	M3	05	D	1	30Jul87	121200	14.5	INCMG	27Sep87	1.7	1.4	5.6
HHM3-06 -SW-1	M3	06	S	1	30Jul87	122400	0.5	INCMG	27Sep87	35.0	23.0	26.0
HHM3-06 -SW-2	M3	06	S	2	30Jul87	122700	0.5	INCMG	27Sep87	30.0	30.0	26.0
HHM3-06 -SW-3	M3	06	S	3	30Jul87	122800	0.5	INCMG	27Sep87	35.0	32.0	29.0
HHM3-06 -DW-1	M3	06	D	1	30Jul87	122900	5.5	INCMG	27Sep87	20.0	22.0	25.0
HHM3-06 -DW-2	M3	06	D	2	30Jul87	123000	5.5	INCMG	27Sep87	14.0	17.0	14.0
HHM3-06 -DW-3	M3	06	D	3	30Jul87	123100	5.5	INCMG	27Sep87	15.0	17.0	12.0
HHM3-09 -SW-1	M3	09	S	1	30Jul87	114800	0.5	INCMG	28Sep87	7.3	11.0	48.0
HHM3-09 -SW-2	M3	09	S	2	30Jul87	114900	0.5	INCMG	28Sep87	12.0	14.0	62.0
HHM3-09 -SW-3	M3	09	S	3	30Jul87	115000	0.5	INCMG	28Sep87	9.1	11.0	42.0
HHM3-09 -DW-1	M3	09	D	1	30Jul87	114500	7.0	INCMG	28Sep87	10.0	4.7	20.0
HHM3-09 -DW-2	M3	09	D	2	30Jul87	114600	7.0	INCMG	28Sep87	7.7	2.4	17.0
HHM3-09 -DW-3	M3	09	D	3	30Jul87	114700	7.0	INCMG	28Sep87	8.6	4.0	15.0
HHM3-10 -SW-1	M3	10	S	1	30Jul87	105900	0.5	INCMG	28Sep87	21.0	16.0	72.0
HHM3-10 -DW-1	M3	10	D	1	30Jul87	105800	4.0	INCMG	28Sep87	8.4	12.0	55.0
HHM3-11 -SW-1	M3	11	S	1	30Jul87	130000	0.5	INCMG	28Sep87	15.0	100.0	130.0
HHM3-11 -SW-2	M3	11	S	2	30Jul87	130100	0.5	INCMG	28Sep87	46.0	120.0	270.0
HHM3-11 -SW-3	M3	11	S	3	30Jul87	130200	0.5	INCMG	28Sep87	30.0	130.0	160.0
HHM3-11 -DW-1	M3	11	D	1	30Jul87	125700	3.0	INCMG	28Sep87	17.0	17.0	27.0
HHM3-11 -DW-2	M3	11	D	2	30Jul87	125800	3.0	INCMG	28Sep87	16.0	14.0	20.0
HHM3-11 -DW-3	M3	11	D	3	30Jul87	125900	3.0	INCMG	28Sep87	19.0	16.0	26.0
HHM4-01 -SW-1	M4	01	S	1	21Jan88	113700	0.5	LOSLK	15Mar88	27.0	27.0	99.0

* Organotin AF-paint test ship present at station

F = filtered

D = duplicate

** Wet Weight

Honolulu Harbor Sediment Organotin Database

Sample	Type	Station	Layer	Rep	Date	Time	Depth	Tidal State	Date Analyzed	Concentration in ng/L			
										MBTCL	DBTCL	TBTCL	
HMM4-01	-SW-2	M4	01	S	2	21Jan88	113800	0.5	LOSLK	15Mar88	31.0	30.0	68.0
HMM4-01	-SW-3	M4	01	S	3	21Jan88	113900	0.5	LOSLK	15Mar88	32.0	30.0	100.0
HMM4-01	-DW-1	M4	01	D	1	21Jan88	113400	10.0	LOSLK	15Mar88	8.1	8.5	35.0
HMM4-01	-DW-2	M4	01	D	2	21Jan88	113500	10.0	LOSLK	15Mar88	8.7	8.5	35.0
HMM4-01	-DW-3	M4	01	D	3	21Jan88	113600	10.0	LOSLK	15Mar88	11.0	13.0	32.0
HMM4-02	-SW-1	M4	02	S	1	21Jan88	122200	0.5	LOSLK	15Mar88	33.0	28.0	88.0
HMM4-02	-SW-2	M4	02	S	2	21Jan88	122300	0.5	LOSLK	15Mar88	26.0	29.0	84.0
HMM4-02	-SW-3	M4	02	S	3	21Jan88	122400	0.5	LOSLK	15Mar88	25.0	24.0	110.0
HMM4-02	-DW-1	M4	02	D	1	21Jan88	121900	10.0	LOSLK	15Mar88	32.0	17.0	42.0
HMM4-02	-DW-2	M4	02	D	2	21Jan88	122000	10.0	LOSLK	15Mar88	27.0	15.0	49.0
HMM4-02	-DW-3	M4	02	D	3	21Jan88	122100	10.0	LOSLK	15Mar88	25.0	17.0	72.0
HMM4-03	-SW-1	M4	03	S	1	21Jan88	120400	0.5	LOSLK	15Mar88	37.0	22.0	76.0
HMM4-03	-SW-2	M4	03	S	2	21Jan88	120500	0.5	LOSLK	15Mar88	35.0	24.0	98.0
HMM4-03	-SW-3	M4	03	S	3	21Jan88	120600	0.5	LOSLK	15Mar88	31.0	22.0	78.0
HMM4-03	-DW-1	M4	03	D	1	21Jan88	120800	12.0	LOSLK	15Mar88	14.0	8.7	40.0
HMM4-03	-DW-2	M4	03	D	2	21Jan88	120900	12.0	LOSLK	15Mar88	24.0	11.0	39.0
HMM4-03	-DW-3	M4	03	D	3	21Jan88	121000	12.0	LOSLK	15Mar88	18.0	15.0	42.0
HMM4-05	-SW-1	M4	05	S	1	21Jan88	131600	0.5	LOSLK	17Mar88	11.0	8.9	29.0
HMM4-05	-SW-2	M4	05	S	2	21Jan88	131700	0.5	LOSLK	17Mar88	13.0	11.0	36.0
HMM4-05	-SW-3	M4	05	S	3	21Jan88	131800	0.5	LOSLK	17Mar88	27.0	9.4	23.0
HMM4-05	-DW-1	M4	05	D	1	21Jan88	131900	13.5	LOSLK	17Mar88	14.0	8.3	5.5
HMM4-05	-DW-2	M4	05	D	2	21Jan88	132000	13.5	LOSLK	17Mar88	11.0	1.2	3.9
HMM4-05	-DW-3	M4	05	D	3	21Jan88	132100	13.5	LOSLK	17Mar88	13.0	8.0	4.2
HMM4-06	-SW-1	M4	06	S	1	21Jan88	134300	0.5	LOSLK	16Mar88	34.0	7.8	80.0
HMM4-06	-SW-2	M4	06	S	2	21Jan88	134400	0.5	LOSLK	16Mar88	25.0	31.0	71.0
HMM4-06	-SW-3	M4	06	S	3	21Jan88	134500	0.5	LOSLK	16Mar88	23.0	34.0	98.0
HMM4-06	-DW-1	M4	06	D	1	21Jan88	134000	5.5	LOSLK	16Mar88	8.8	3.5	11.0
HMM4-06	-DW-2	M4	06	D	2	21Jan88	134100	5.5	LOSLK	16Mar88	6.5	6.0	15.0
HMM4-06	-DW-3	M4	06	D	3	21Jan88	134200	5.5	LOSLK	16Mar88	11.0	2.4	14.0
HMM4-09	-SW-1	M4	09	S	1	21Jan88	124200	0.5	LOSLK	16Mar88	24.0	5.5	84.0
HMM4-09	-SW-2	M4	09	S	2	21Jan88	124300	0.5	LOSLK	16Mar88	13.0	16.0	71.0
HMM4-09	-SW-3	M4	09	S	3	21Jan88	124400	0.5	LOSLK	16Mar88	11.0	12.0	75.0
HMM4-09	-DW-1	M4	09	D	1	21Jan88	123900	9.5	LOSLK	17Mar88	20.0	5.4	45.0
HMM4-09	-DW-2	M4	09	D	2	21Jan88	124000	9.5	LOSLK	16Mar88	17.0	10.0	64.0
HMM4-09	-DW-3	M4	09	D	3	21Jan88	124100	9.5	LOSLK	16Mar88	17.0	13.0	72.0
HMM4-10	-SW-1	M4	10	S	1	21Jan88	112200	0.5	LOSLK	17Mar88	66.0	25.0	75.0
HMM4-10	-SW-2	M4	10	S	2	21Jan88	112300	0.5	LOSLK	29Mar88	17.0	18.0	80.0
HMM4-10	-SW-3	M4	10	S	3	21Jan88	112400	0.5	LOSLK	17Mar88	30.0	18.0	67.0
HMM4-10	-DW-1	M4	10	D	1	21Jan88	111900	3.5	LOSLK	17Mar88	16.0	8.0	19.0
HMM4-10	-DW-2	M4	10	D	2	21Jan88	112000	3.5	LOSLK	17Mar88	18.0	7.9	24.0
HMM4-10	-DW-3	M4	10	D	3	21Jan88	112100	3.5	LOSLK	17Mar88	7.3	7.3	17.0
HMM4-11	-SW-1	M4	11	S	1	21Jan88	140900	0.5	LOSLK	29Mar88	49.0	70.0	290.0
HMM4-11	-SW-2	M4	11	S	2	21Jan88	141000	0.5	LOSLK	29Mar88	31.0	34.0	250.0
HMM4-11	-SW-3	M4	11	S	3	21Jan88	141100	0.5	LOSLK	17Mar88	230.0	140.0	430.0
HMM4-11	-DW-1	M4	11	D	1	21Jan88	141300	3.0	LOSLK	17Mar88	27.0	5.0	18.0
HMM4-11	-DW-2	M4	11	D	2	21Jan88	141400	3.0	LOSLK	17Mar88	22.0	7.0	18.0
HMM4-11	-DW-3	M4	11	D	3	21Jan88	141500	3.0	LOSLK	29Mar88	21.0	3.1	18.0

* Organotin AF-paint test ship present at station

F = filtered

D = duplicate

Honolulu Harbor Sediment Organotin Database

Sample	Type	Station	Rep	Date	Time	Depth	Tidal State	Date Analyzed	Concentration in ng/L			Notes
									MTCL	DTCL	TBTCL	
HHM -01 -S-1	M	01	1	15Apr86	1158	15	LOSLK					
HHM -01 -S-2	M	01	2	15Apr86	1200	15	LOSLK					
HHM -01 -S-3	M	01	3	15Apr86	1202	15	LOSLK					
HHM -02 -S-1	M	02	1	15Apr86	1236	10	LOSLK					
HHM -02 -S-2	M	02	2	15Apr86	1238	10	LOSLK					
HHM -02 -S-3	M	02	3	15Apr86	1240	10	LOSLK					
HHM -03 -S-1	M	03	1	15Apr86	1308	13	LOSLK					
HHM -03 -S-2	M	03	2	15Apr86	1310	13	LOSLK					
HHM -03 -S-3	M	03	3	15Apr86	1312	13	LOSLK					
HHM -05 -S-1	M	05	1	15Apr86	1410	15	LOSLK					
HHM -05 -S-2	M	05	2	15Apr86	1412	15	LOSLK					
HHM -05 -S-3	M	05	3	15Apr86	1414	15	LOSLK					
HHM -06 -S-1	M	06	1	15Apr86	1523	7	LOSLK					
HHM -06 -S-2	M	06	2	15Apr86	1525	7	LOSLK					
HHM -06 -S-3	M	06	3	15Apr86	1527	7	LOSLK					
HHM -09 -S-1	M	09	1	15Apr86	1340	13	LOSLK					
HHM -09 -S-2	M	09	2	15Apr86	1342	13	LOSLK					
HHM -09 -S-3	M	09	3	15Apr86	1344	13	LOSLK					
HHM -10 -S-1	M	10	1	15Apr86	1050	5	LOSLK					
HHM -10 -S-2	M	10	2	15Apr86	1052	5	LOSLK					
HHM -10 -S-3	M	10	3	15Apr86	1054	5	LOSLK					
HHM -11 -S-1	M	11	1	15Apr86	1600	4	LOSLK					
HHM -11 -S-2	M	11	2	15Apr86	1602	4	LOSLK					
HHM -11 -S-3	M	11	3	15Apr86	1604	4	LOSLK					
HHM4-01 -S-1	M4	01	1	21Jan88	1148	11	LOSLK	4Apr88		130	360	
HHM4-01 -S-2	M4	01	2	21Jan88	1150	11	LOSLK	18Apr88		84	310	
HHM4-01 -S-3	M4	01	3	21Jan88	1152	11	LOSLK	18Apr88		97	360	
HHM4-02 -S-1	M4	02	1	21Jan88	1228	10.5	LOSLK	4Apr88		1059	1870	
HHM4-02 -S-2	M4	02	2	21Jan88	1230	10.5	LOSLK	18Apr88		1664	4440	
HHM4-02 -S-3	M4	02	3	21Jan88	1232	10.5	LOSLK	18Apr88		1586	4190	
HHM4-03 -S-1	M4	03	1	21Jan88	1213	13	LOSLK	4Apr88		68	240	
HHM4-03 -S-2	M4	03	2	21Jan88	1215	13	LOSLK	18Apr88		62	190	
HHM4-03 -S-3	M4	03	3	21Jan88	1217	13	LOSLK	18Apr88		73	200	
HHM4-05 -S-1	M4	05	1	21Jan88	1324	14.5	LOSLK	1Apr88		10	52	
HHM4-05 -S-2	M4	05	2	21Jan88	1326	14.5	LOSLK					
HHM4-05 -S-3	M4	05	3	21Jan88	1328	14.5	LOSLK					
HHM4-06 -S-1	M4	06	1	21Jan88	1350	6.5	LOSLK	1Apr88		160	220	
HHM4-06 -S-2	M4	06	2	21Jan88	1352	6.5	LOSLK	18Apr88		140	380	
HHM4-06 -S-3	M4	06	3	21Jan88	1354	6.5	LOSLK	18Apr88		180	650	
HHM4-09 -S-1	M4	09	1	21Jan88	1246	10	LOSLK					
HHM4-09 -S-2	M4	09	2	21Jan88	1248	10	LOSLK	18Apr88		53	150	
HHM4-09 -S-3	M4	09	3	21Jan88	1250	10	LOSLK	4Apr88		53	150	
HHM4-10 -S-1	M4	10	1	21Jan88	1126	4.5	LOSLK	4Apr88		34	80	
HHM4-10 -S-2	M4	10	2	21Jan88	1128	4.5	LOSLK					
HHM4-10 -S-3	M4	10	3	21Jan88	1130	4.5	LOSLK					
HHM4-11 -S-1	M4	11	1	21Jan88	1423	4	LOSLK	1Apr88		230	260	
HHM4-11 -S-2	M4	11	2	21Jan88	1425	4	LOSLK	18Apr88		220	300	
HHM4-11 -S-3	M4	11	3	21Jan88	1427	4	LOSLK	18Apr88		180	260	

* Organotin AF-paint test ship present at station

F = filtered

D = duplicate

Honolulu Harbor Tissue Organotin Database

Sample	Date	Time	Species	Mean			Concentration in ng/g**		
				N	Length	Depth	MBTCL	DBTCL	TBTCL
HMM -01 -T-1	041586	1150	Ostrea spp.	20	25.9	MLLW			
HMM -01 -T-2	041586	1052	Ostrea spp.	20	24.1	MLLW			
HMM -01 -T-3	041586	1154	Ostrea spp.	20	25.4	MLLW			
HMM -10 -T-1	041586	1045	Ostrea spp.	15	30.1	MLLW			
HMM -10 -T-2	041586	1057	Ostrea spp.	15	30.6	MLLW			
HMM -10 -T-3	041586	1100	Ostrea spp.	15	39.6	MLLW			
HMM -09 -T-1	041586	1345	Ostrea spp.	15	26.9	MLLW			
HMM -09 -T-2	041586	1347	Ostrea spp.	15	24.2	MLLW			
HMM -09 -T-3	041586	1349	Ostrea spp.	15	25.1	MLLW			
HMM3-01 -T-1	073087	1125	Ostrea spp.	20	28.7	MLLW	250	610	
HMM3-09 -T-1	073087	1155	Ostrea spp.	20	26.8	MLLW	240	440	
HMM4-01 -T-1	012188	1150	Ostrea spp.	30	20.7	MLLW	452	655	
HMM4-01 -T-2	012188	1155	Ostrea spp.	30	24.2	MLLW	543	901	
HMM4-01 -T-3	012188	1200	Ostrea spp.	30	22.0	MLLW	457	833	
HMM4-09 -T-1	012188	1255	Ostrea spp.	25	24.0	MLLW	736	889	
HMM4-09 -T-2	012188	1300	Ostrea spp.	25	24.0	MLLW	568	1052	
HMM4-09 -T-3	012188	1305	Ostrea spp.	25	24.0	MLLW	651	112	

** Wet Weight