Comprehensive Long-Term Environmental Action Navy

CLEAN

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REMEDIAL INVESTIGATION (RI) REPORT
(DRAFT)
FOR
NAVAL AIR FACILITY (NAF)
MIDWAY ISLAND

VOLUME I: TECHNICAL REPORT

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LIST OF ACRONYMS

µg/kg	micrograms per kilogram
µg/kg-d	micrograms per kilogram per day
µg/L	micrograms per liter
%R	Percent Recovery
ψ	Seasonability Factor
ADD	Applied Daily Doses
$ADD_{(d)}$	Applied Daily Doses based on $EC_{(d)}$
$ADD_{(p)}$	Applied Daily Doses based on the maximum concentration
ARARs	Applicable or Relevant and Appropriate Requirements
ASTs	Aboveground Fuel Storage Tanks
ATSDR	Agency for Toxic Substances and Disease Registry
AWQC	Ambient Water Quality Criteria
BCT	BRAC Cleanup Team
BERA	Baseline Ecological Risk Assessment
bgs	below ground surface
BOS	Base Operating Services
BRAC	Base Realignment and Closure
BWLF	Bulky Waste Landfill
CAMU	Corrective Action Management Unit
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-Term Environmental Action Navy
CLP	Contract Laboratory Program
cm	centimeter
cm^2	square centimeter
COC	Chemical of Concern
CPEC	Contaminants of Potential Ecological Concern
CTO	Contract Task Order
CWA	Clean Water Act
d^{-1}	per day
DOT	Department of Transportation

EBS	Environmental Baseline Survey
EC	Environmental Concentration
ECD	Electron Capture Detector
EC_a	Area-wide Environmental Concentration
EC_d	Distribution of area-wide Environmental Concentrations
EC_p	Hot Spot Environmental Concentration
EPA	U.S. Environmental Protection Agency
EPV	Exposure Point Value
ESA	Endangered Species Act
ft	foot
ft/day	feet per day
ft/ft	feet per feet
ft/min	feet per minute
ft^2	square feet
g/mol	grams per mole
Gal	gallon
GC/MS	Gas Chromatography and Mass Spectrometry
HSP	Health and Safety Plan
ICAP	Inductively Coupled Argon Plasma
ID	Identification
IDW	Investigation-Derived Waste
IR	Installation Restoration
K	Kelvin
kg	kilogram
kg/d	kilograms per day
kg/g	kilograms per gram
kg/m^3	kilograms per cubic meter
kg/mg	kilograms per milligrams
km	kilometer
K_{ow}	Octanol-Water Partition Coefficient
K_{oc}	Soil Sorption Coefficient
L	liter
LCS	Laboratory Control Sample
L/kg	liters per kilogram

MBTA	Migratory Bird Treaty Act
MEM	Measure of Effect Model
mg/kg	milligrams per kilogram
mg/kg-d	milligrams per kilogram per day
mg/L	milligrams per liter
MLLW	Mean Low Low Water
ml	milliliter
mm	millimeter
MOGAS	Motor Gasoline
MS	Matrix Spike
MSDs	Matrix Spike Duplicates
MSL	Mean Sea Level
MW	Molecular Weight
MWR	Morale, Welfare, and Recreation
NAF	Naval Air Facility
NAWQC	National Ambient Water Quality Criteria
NEESA	Naval Energy and Environmental Support Activity
NOAA	National Oceanic and Atmospheric Administration
NOAEL	No-Observed-Adverse-Effect-Level
OVA	Organic Vapor Analyzer
PA	Preliminary Assessment
PACNAVFACENGCOM	Pacific Division, Naval Facilities Engineering Command
PAHs	Polynuclear Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
PDF	Probability Density Function
PE	Performance Evaluation
PMC	Piquniq Management Corporation
PPE	Personal Protective Equipment
PRE	Preliminary Risk Evaluation
PSEP	Puget Sound Estuary Program
QAPjP	Quality Assurance Project Plan
QC	Quality Control
RAC	Remedial Action Contractor
RCRA	Resource Conservation and Recovery Act

RI	Remedial Investigation
RLF	Runway Landfill
RPD	Relative Percent Difference
SAP	Sampling and Analysis Plan
SERA	Screening Ecological Risk Assessment
SI	Site Inspection
SQL	Sample Quantification Limit
SVOCs	Semi-Volatile Organic Compounds
TBC	To-Be Considered
TCDD	Tetrachlorodibenzo-P-Dioxin
TEF	Toxic Equivalency Factor
TEQ	Toxicity Equivalent
TQ	Toxicity Quotient
TQ_a	Area-wide Toxicity Quotient
TQ_d	Area-wide 95% distribution of Toxicity Quotients
TQ_p	Toxicity Quotient for Maximum Exposure
TRVs	Toxicity Reference Values
TSCA	Toxic Substances Control Act
UCL	Upper Confidence Limit
UCL95	95th Percentile Upper Confidence Limit
USC	United States Code
USCS	Unified Soil Classification System
USFWS	U.S. Fish and Wildlife Service
USEPA	U.S. Environmental Protection Agency

EXECUTIVE SUMMARY

This document presents the results of a Remedial Investigation (RI) and Baseline Ecological Risk Assessment (BERA) conducted at Naval Air Facility (NAF) Midway Island on Midway Atoll. The RI and BERA evaluated the following areas:

- The terrestrial environment (soils and ground water) at the Bulky Waste Landfill (BWLF), a former disposal site for base construction debris, scrap metal, salvaged vehicles, and other wastes.
- The marine environment adjacent to the BWLF (Installation Restoration [IR] Site 01) and the Runway Landfill (IR Site 02), the former and current base municipal landfill; this marine area is hereafter referred to as "the Landfills" site.
- The marine environment in the Inner Harbor (IR Sites 08 and 99).

Site Background

The RI was designed to further investigate the presence of Contaminants of Potential Ecological Concern (CPECs) identified in soils, ground water, marine sediments, seawater, and marine tissues during a Site Inspection (SI) and Screening Ecological Risk Assessment (SERA) performed in 1994. The identified CPECs consist of Semi-Volatile Organic Compound (SVOCs), organochlorine (OC) pesticides (primarily DDT and DDE) and polychlorinated biphenyls (PCBs). These CPECs were identified during the SI, as having the potential to cause an adverse effect to the target receptors, seabirds, green sea turtles (*Chelonia mydas agassizi*) and/or Hawaiian monk seals (*Monachus schauinslandi*).

RI Field Activities

To assess the terrestrial environment at the BWLF, 20 trenches were excavated within a 450,000 square foot sampling grid compartmentalized into 20, 150-foot square cells. One sampling trench was randomly located within each 150-foot square cell for a total of 20 trenches. Based on the total area of the BWLF, the 20 sampling locations within the square grid created an estimated 90 percent statistical probability of encountering a "hot spot" with a radius of 85 feet or greater. Forty-four soil samples were collected from the

trenches and analyzed for SVOCs, OC pesticides, and PCBs. An additional 26 test pits were excavated at grid nodes, and soil samples collected from the test pits were screened in the field by immunoassay test kits for PCBs. One ground-water sample was collected from each of five existing monitoring wells at the BWLF and analyzed for SVOCs, OC pesticides and PCBs.

To facilitate investigations of the marine environment, square sampling grids were established at the Landfills and in the Inner Harbor. Marine sediments, seawater, and tissue samples (algae, invertebrates, herbivorous and carnivorous fish) were collected in the sampling grids. Landfill grid cell dimensions were approximately 650 feet by 650 feet, while the Inner Harbor grid cells were approximately 540 feet by 540 feet (no marine sediment or carnivorous fish were collected from the Inner Harbor). Grid locations were chosen to maximize spatial coverage of the Landfill and Inner Harbor sites while also investigating potential sources of contaminants (e.g., marine debris and existing sewer outfalls). To establish background marine concentrations, four reference sampling stations were located in Midway Atoll lagoon. All marine samples were analyzed for OC pesticides and PCBs.

Nature and Extent of Contamination

Subsurface Soil

Fluoranthene and pyrene were the SVOCs most frequently detected in the subsurface soil samples. Moreover, these SVOCs were detected at the highest concentrations, 19,000 micrograms per kilogram (µg/kg) for each analyte. The site-wide geometric means for all SVOC target compounds were less than 1,000 µg/kg. 4,4'-DDT, 4,4'-DDE, and 4,4'-DDD were the most frequently detected OC pesticides. The maximum concentration of 4,4'-DDT detected in the subsurface soil was 890 µg/kg. With the exception of DDT and its metabolites, OC pesticides were detected in less than 40 percent of the samples. The site-wide geometric mean for each OC pesticide target compound was less than 10 µg/kg. The maximum concentration of the PCB Aroclor-1260, 19,000 µg/kg, was detected in a subsurface soil sample taken from a test pit located in the northern central portion of the site. The site-wide geometric mean for Aroclor-1260 was less than 600 µg/kg.

Ground Water

One ground-water sample was collected from each of the five monitoring wells at the BWLF. Twenty-four of the 41 SVOC target analytes tested for in ground water were detected in each well. Naphthalene and its alkyl-substituted forms were present in the highest concentrations, 1.5 micrograms per liter (µg/L) and 7.6 µ/L, in Monitoring Wells 03 and 04, respectively. The analytes 2,4'-DDD and 4,4'-DDD were the most frequently detected OC pesticides. The maximum OC pesticide concentration, 0.098 µg/L for 4,4'-DDD, was detected in Monitoring Well 05. 4,4'-DDT was not detected in any of the samples analyzed. Detected concentrations of other pesticides were less than 0.05 µg/L. In general, the pesticide concentrations detected in the ground-water samples collected during the 1996 RI were approximately one-half the concentrations detected during the 1994 SI. PCB congeners 138, 153, and 180 were detected in each of the five monitoring wells. The maximum PCB congener concentration, 0.02 µg/L for PCB-138, was detected in Monitoring Well 04. The 1996 concentrations of PCB-138, PCB-153, and PCB-180 were generally one-half to one-tenth of the concentrations reported in the same wells in 1994.

Marine Sediment

The maximum concentration of 4,4'-DDE detected in Landfill sediments was 9.00 µg/kg at Grid 01 (adjacent to the northeast corner of the BWLF). The maximum total PCB concentration for Landfill sediments was 508.9 µg/kg at Grid 01. Analytical results indicate that concentrations of total PCBs and OC pesticides decreased with increasing distance from the sheetpiling and the northeast corner of the BWLF. Marine sediment samples were not collected in the Inner Harbor.

Seawater

Hexachlorobenzene, PCB-18, PCB-153, PCB-180, and PCB-187 were the only target analytes detected in Landfill seawater samples. Hexachlorobenzene concentrations were similar to those found at the reference sites. The maximum total PCB concentration for Landfill seawater was 0.0082 µg/kg at Grid 01. Hexachlorobenzene and PCB-209 were the only target analytes detected in the Inner Harbor seawater samples. PCB-209, the only congener detected in the Inner Harbor, was reported at a concentration of 0.000051 µg/L.

Marine Tissue

The overall trend for sampled marine tissue was a biomagnification of OC pesticide and PCB concentrations up the food chain, from seawater to algae to herbivorous fish and from sediment to benthic invertebrates to carnivorous fish. For the Landfills, the highest concentrations of analytes in tissue were found in Grids 01 and 02 adjacent to the northeast corner of the BWLF. However, different species tended to accumulate contaminants to different levels. Concentrations in algal tissue were more varied throughout the Site and did not follow the same trend as those found in fish tissue. Concentrations in herbivorous fish tissue were generally higher than those in carnivorous fish, which may be due to the site-specificity of the herbivorous damselfish versus the more mobile carnivorous goatfish.

Concentrations of analytes in tissue samples obtained from the Inner Harbor, while exhibiting a similar species distribution, were more varied spatially than those from the Landfills Site. No single hot spot area was observed for all species collected. Concentrations of analytes in tissues indicate that PCBs and pesticides are biologically available, but that uptake occurs to differing degrees depending exposure route, feeding behavior and preferences, and receptor lipid fraction.

Baseline Ecological Risk Assessment

BWLF

Based on the results of the BERA, the overall site-wide risk of an adverse effect on burrowing birds is negligible. However, a low to moderate risk to burrowing birds was identified from the maximum onsite concentrations or hot spots of the following CPECs: benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, phenanthrene, endrin aldehyde, PCBs, and 4,4'-DDE. CPECs detected in ground water at the BWLF present a negligible risk to ecological receptors.

Landfills-Marine Environment

The results of the BERA indicate that the site-wide risk to benthic invertebrates, monk seals, and sea turtles are negligible for all detected CPECs. This finding is supported by the negative toxicity results of the bioassay performed on the sediment sample containing the highest concentrations of CPECs; therefore, no adverse effects are expected for benthic invertebrate communities. Although fish, invertebrate, and algal tissues contained

detectable concentrations of many PCBs and pesticides, no adverse effects were observed or predicted by the risk estimate ($TQ_{(d)}$). Low to moderate risks to seals and benthic invertebrates were identified for some of the CPECs at the reasonable maximum exposure ($TQ_{(a)}$) (i.e., ingesting prey with the highest concentrations of CPECs).

Inner Harbor-Marine Environment

No adverse effects on monk seals and green sea turtles in the Inner Harbor are expected on the basis of the detected CPECs. Negligible risks to seals and turtles were identified in the site-wide risk assessment; however, a low risk to seals was identified for the reasonable maximum exposure of PCBs to seals. This is a result of elevated PCB concentrations in herbivorous fish in the Inner Harbor.

Recommendations

BWLF

To reduce the possibility of an adverse effect on burrowing birds from the maximum concentrations of the CPECs detected in soils onsite, the BWLF was covered with at least 2.5 feet of clean soil and revegetated. This soil cover will reduce the possibility that burrowing birds (which burrow to a maximum depth of about 3 feet) will contact soil within the landfill. No further investigation or action is recommended.

Landfills-Marine Environment

The large amount of underwater debris immediately adjacent to the BWLF may have been a possible source of contaminants. A removal action completed in August 1996 focused on removing potential sources in this area, as well as throughout the rest of the Landfill Site. Because the potential contaminant sources have been removed, and because negligible risk to target receptors was identified in the BERA, no further investigation or action is recommended for the marine environment at the Landfills.

Inner Harbor-Marine Environment

The underwater debris that may have contained potential sources of contaminants was removed from the Inner Harbor in August 1996. A sewer outfall that discharges to the Inner Harbor is known to contain petroleum product; this outfall is currently scheduled to be sealed. The petroleum product present in sewer lines leading to this outfall will be removed and the lines cleaned to minimize recontamination. Because negligible risk to ecological receptors was identified in the BERA and remedial actions are underway or

have been taken to eliminate potential sources of contaminants, no further investigation or action is recommended for the marine environment in the Inner Harbor.

Section 1

SECTION 1
INTRODUCTION

This document presents the results of a Remedial Investigation (RI) conducted at Naval Air Facility (NAF) Midway Island on Midway Atoll. This RI was conducted in accordance with the *Remedial Investigation (RI) Sampling and Analysis Plan for Naval Air Facility (NAF) Midway Island* (Ogden 1996a).

The RI was performed for the Pacific Division, United States Naval Facilities Engineering Command (PACNAVFACENGCOM), under Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract Task Order (CTO) Number 0136.

NAF Midway Island was identified for closure by June 1997 pursuant to the Defense Base Realignment and Closure Act (BRAC) of 1990 (Public Law 101-510). The signing of Executive Order No. 11048 on November 7, 1996 completed the transfer of Midway from the U.S. Navy to the U.S. Fish and Wildlife Service (USFWS). The USFWS intends to continue use of Midway as a National Wildlife Refuge and, through a subcontractor, develop an eco-tourism business there.

1.1 SITE DESCRIPTIONS

Midway Atoll is located approximately 1,100 miles northwest of Pearl Harbor, Hawaii, at the northwestern end of the Hawaiian Island chain (Figure 1-1). The geographical location of Midway is 28° 12' 35" N latitude, 177° 22' 47" W longitude. The atoll is a coral reef, approximately 5 miles in diameter, and consists of two main islands, Sand and Eastern, and several smaller islets. NAF Midway Island (hereafter referred to as Midway) is located on Sand Island, which has an area of approximately 1,200 acres. Eastern Island, the smaller of the two main islands, comprises approximately 335 acres and is currently uninhabited, although it was used extensively by the Navy in the past.

The four study sites addressed in this RI are on Sand Island. They include the Bulky Waste Landfill ([BWLF] Installation Restoration [RI] Site 01), the Runway Landfill ([RLF] IR Site 02), the Abandoned Power Plant (Site 08), and the Inner Harbor (Site 99), as illustrated in Figure 1-2. Although these site designations were also used in the Site Inspection ([SI], Ogden 1996b), this RI focused not on site-specific investigations, but on

a terrestrial investigation at the BWLF, and marine monitoring in the Inner Harbor and around both the BWLF and RLF (see Figure 1-3).

Terrestrial Investigation at the BWLF (Site 01)

- Subsurface soil sampling
- Ground-water sampling

Marine Monitoring at Landfill Sites (Sites 01 and 02)

- Marine tissue sampling (fish, algae, and benthic invertebrate)
- Sediment sampling
- Seawater sampling

Marine Monitoring at the Inner Harbor (Sites 08 and 99)

- Tissue sampling (fish and algae)
- Seawater sampling

1.2 PROJECT OBJECTIVES

The objectives of the RI were to

- Conduct a sampling program to evaluate the nature and extent of contamination.
- Assess potential contaminant transport pathways and potential receptor populations on the basis of the identified contaminants and affected media.
- Perform a baseline ecological risk assessment (BERA) and assess risk to ecological receptors.
- Assess remedial options if remediation is considered warranted.

1.3 PROJECT HISTORY AND PREVIOUS INVESTIGATIONS

Information gathered during previous environmental investigations on Midway is reported in the following documents:

- *Preliminary Assessment (PA), NAF Midway Island* (ERCE 1991)
- *Environmental Baseline Survey (EBS), NAF Midway Island* (Ogden 1994a)
- *Site Inspection (SI) Report NAF Midway Island* (Ogden 1996b)

- *Dye Trace Study of Ground Water at the Bulky Waste Landfill (Site 01), NAF Midway Island* (Ogden 1996c)

As a part of the SI (Ogden 1996b), Screening Ecological Risk Assessments (SERAs) and Preliminary Human Health Risk Evaluations (PREs) were performed at each of the sites investigated by this RI. The PREs determined that negligible risk to human health was posed by the chemicals identified in environmental media at the Sites. A brief summary of the SERA results for the RI sites is presented below.

Terrestrial Investigation at the BWLF - Site 01

Pesticides, polychlorinated biphenyls (PCBs), and metals were detected in tested environmental media. SERA results indicated that risk to terrestrial wildlife from exposure to these compounds in surface soil is minimal. However, moderate risk to burrowing birds may develop when they burrow in subsurface soils and come in contact with these compounds. A detailed RI of subsurface soil and ground water was recommended.

Marine Investigation at Landfills - Sites 01 and 02

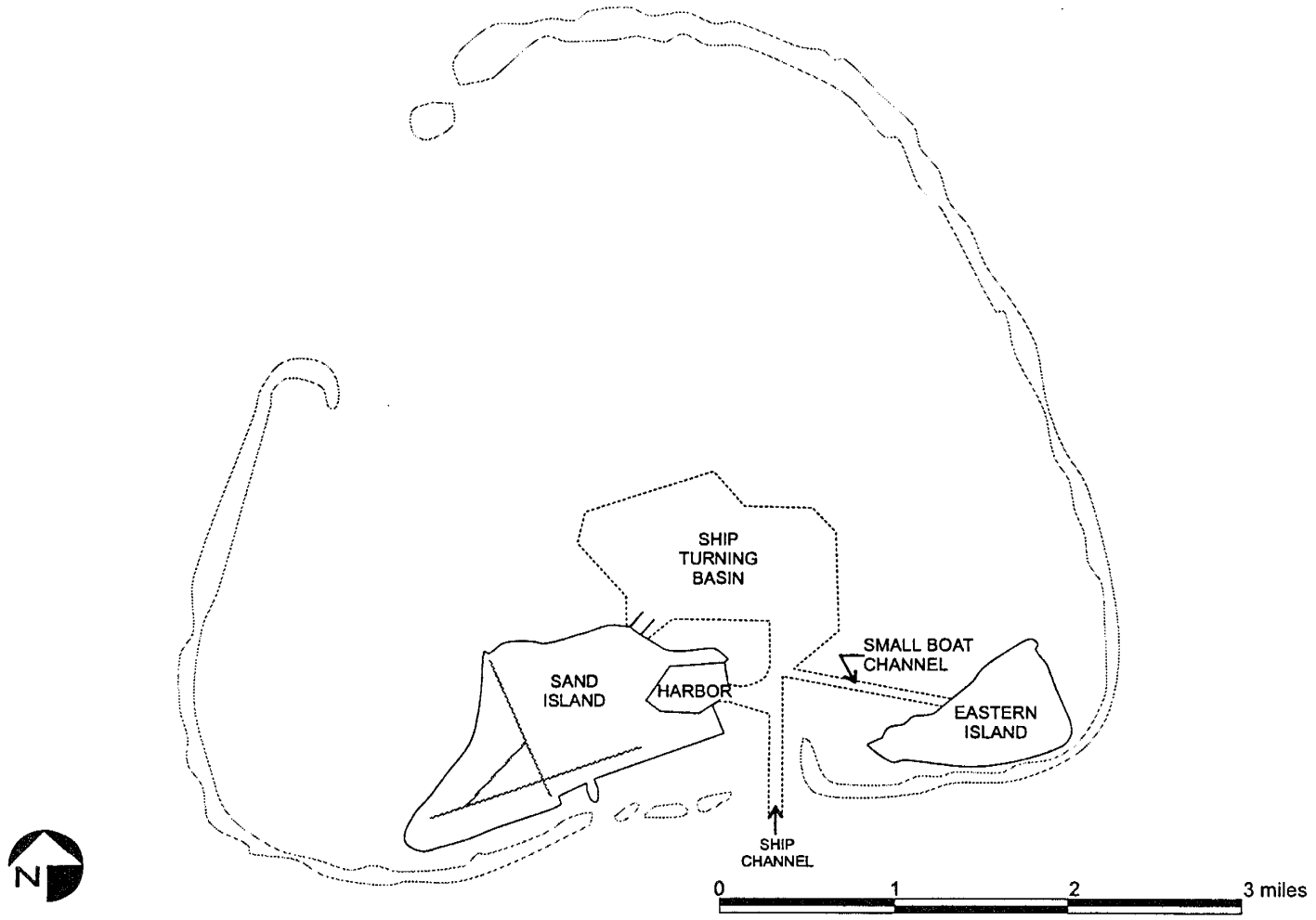
SI and SERA results indicated that benthic communities and monk seals may be at risk from exposure to PCBs in marine sediments, seawater, and tissues, particularly in areas adjacent to the northeast corner of the BWLF (Site 01). It was recommended that potentially hazardous debris be removed from the marine environment (e.g. submerged drums, vehicles, tanks, etc.) adjacent to the Landfills, and that additional marine sampling be conducted to further evaluate risks to ecological receptors.

Marine Investigation at the Inner Harbor - Sites 08 and 99

Marine sediment samples contained concentrations of polynuclear aromatic hydrocarbons (PAHs), lead, manganese, mercury, and PCBs. On the bases of the SERA results, it was determined that PCBs are present at levels that could induce chronic effects in benthic marine invertebrates. The SERA did not indicate a risk to monk seals; risk to sea turtles was considered minimal as this species is generally excluded from the area due to lack of food sources. It was recommended that potentially hazardous debris be removed from the Inner Harbor and that storm drain/sewer outfalls terminating in the Inner Harbor be sealed to eliminate discharges of potentially hazardous chemicals. Additional marine sampling was also recommended to further evaluate risks to ecological receptors.

Figures

Source: NAVFACENGCOM Dwg. No. 1038656, 1993



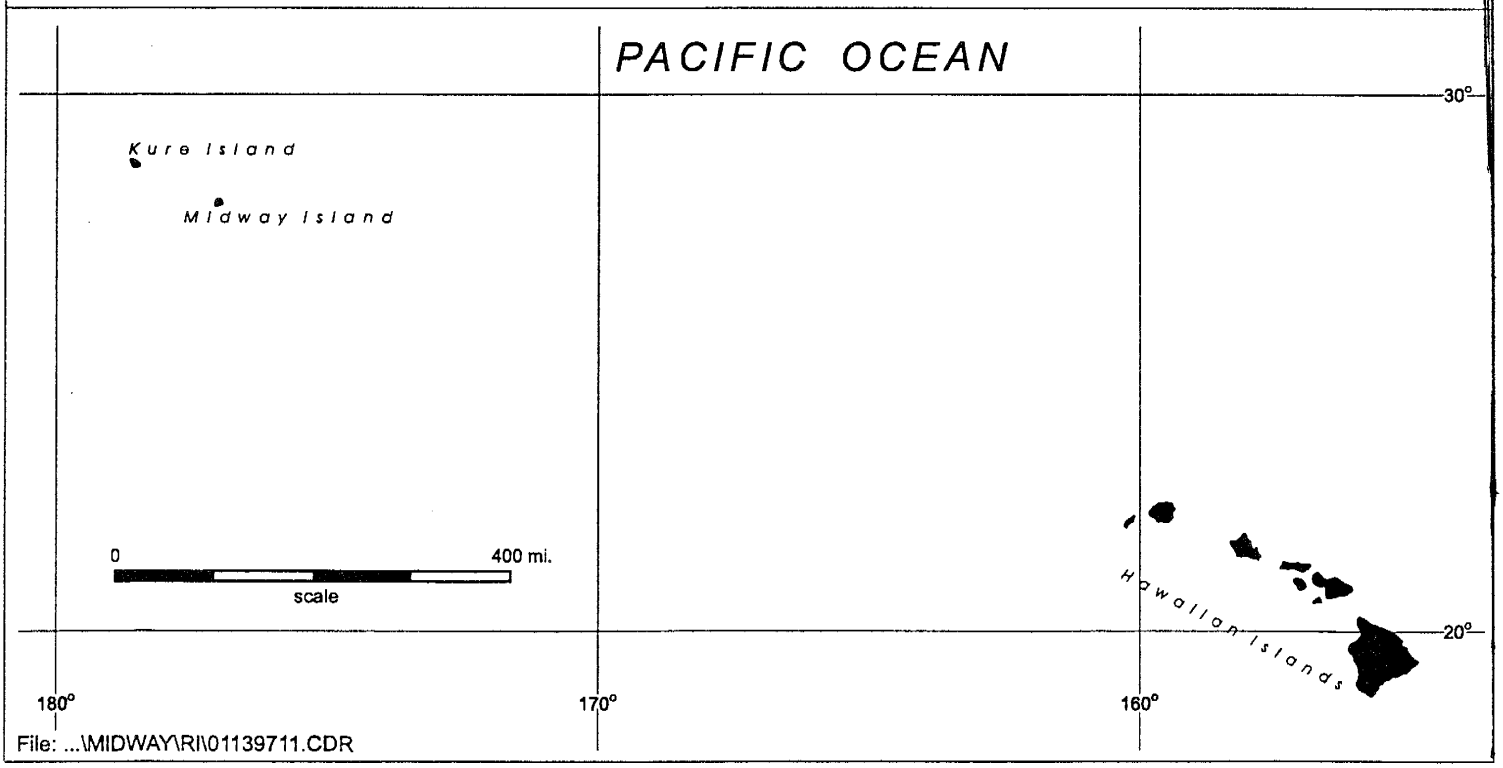


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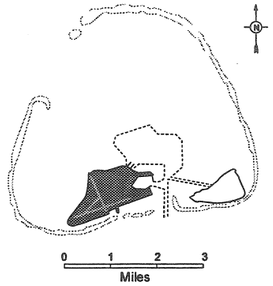
FIGURE

REGIONAL LOCATION MAP
MIDWAY ATOLL

1-1



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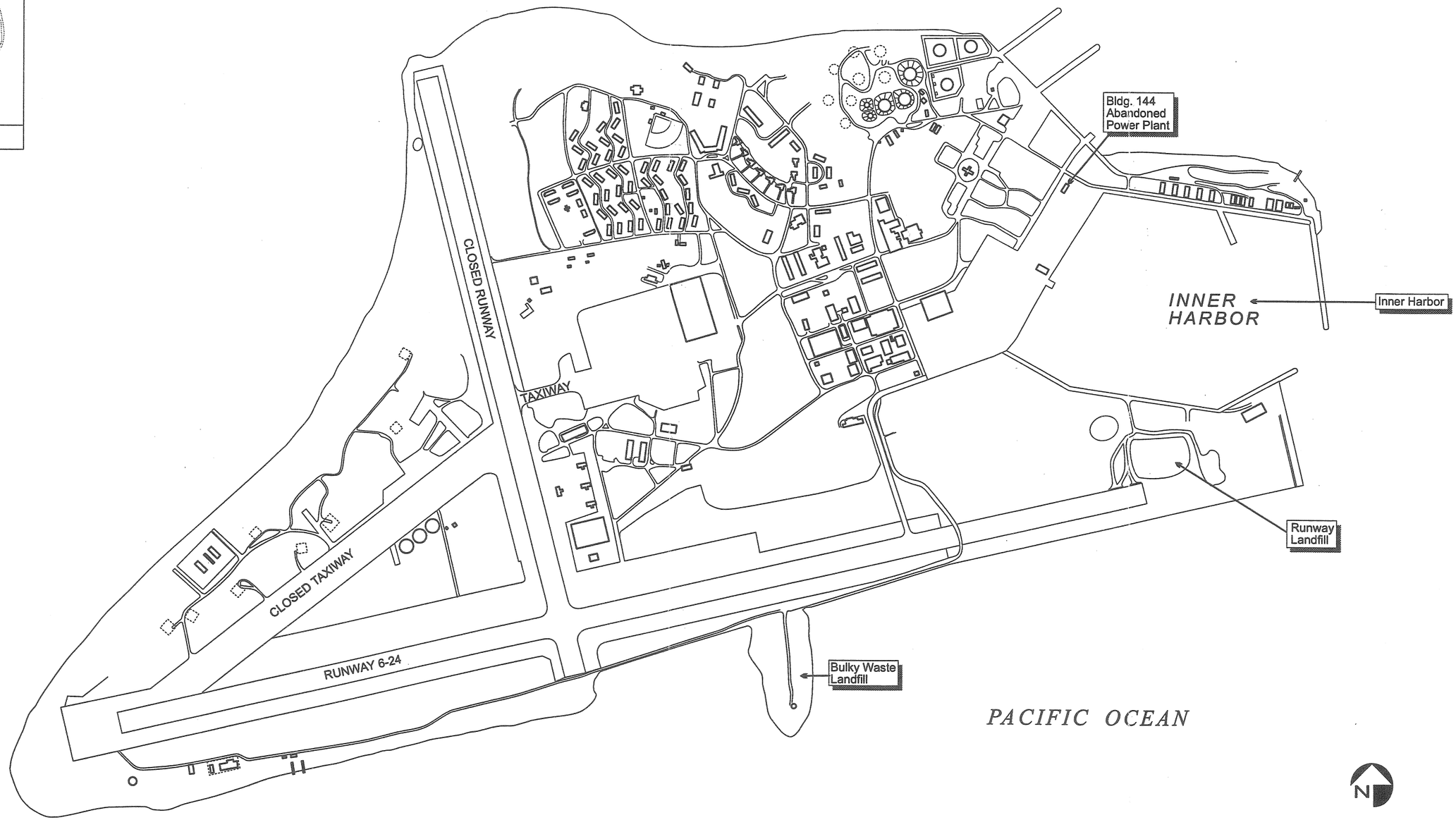

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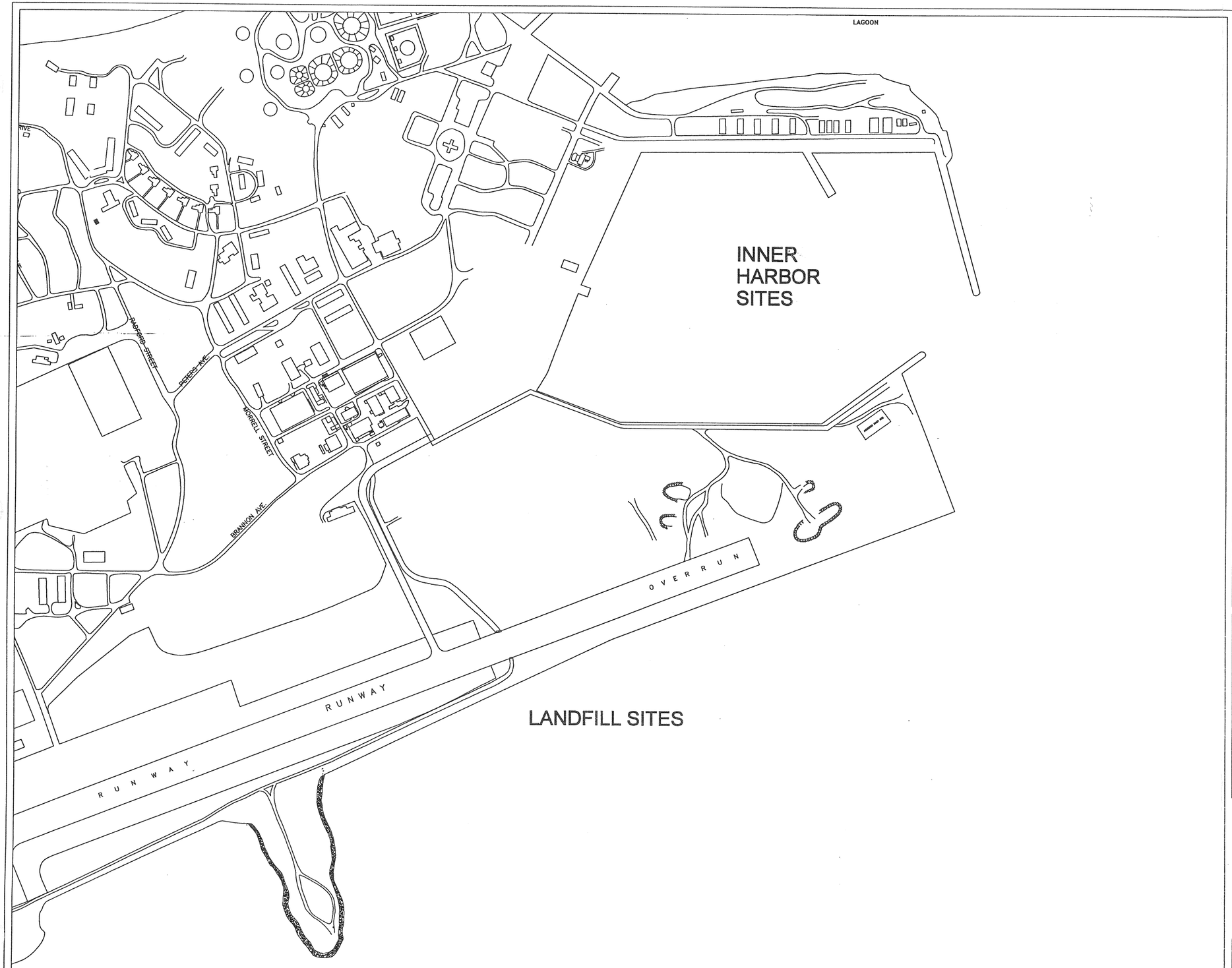
REMEDIAL INVESTIGATION AREAS
NAF MIDWAY ISLAND

FIGURE

1-2



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NOTES

1. THE ACCURACY OF THIS DOCUMENT IS LIMITED TO THE QUALITY OF THE SOURCE INFORMATION AND IS NOT SUITABLE FOR MAPPING ENGINEERING APPLICATIONS AND IS NOT TO BE USED FOR "AS BUILT"
2. HORIZONTAL CONTROL POINT ESTABLISHED BY USNS ON SITE WAS USED AS BASIS OF DRAWING
3. VERTICAL CONTROL WAS BASED ON BM#11 WITH AN ELEVATION OF 8.52 FEET (MLLW)
4. PLANE COORDINATE SYSTEM FOR SAND AND EASTERN ISLANDS, ES-217, DRAWING NO.: SUR-6, USNS MIDWAY ISLAND
5. PROJECT NUMBER: 110190136
6. FILE : ..\MIDWAY\RI_PLAN\01139711.DWG DATE: 01-13-97

SOURCES

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TITLE

MARINE SAMPLING AREAS
NAF MIDWAY ISLAND

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DATE	REV.	DRWN.	INIT.	CHKD.	INIT.	APPR.	INIT.
3-7-96		HFP		BW		JMC	
1-9-97		JCS		BW		JMC	

FIGURE
1-3

Section 2

SECTION 2
FIELD INVESTIGATIONS

This section describes the RI field program at NAF Midway Island, which was conducted in two phases. The first phase, terrestrial sampling, was conducted between June 20 and July 4, 1996. The second phase, marine sampling, was conducted from September 5 through September 26, 1996. All field work was completed by Ogden personnel. The terrestrial field effort was also supported by the Navy Base Operations Support (BOS) Contractor, Piquniq Management Corporation, Inc. (PMC), who provided land surveying and heavy equipment services (rubber-tire backhoe and operator). The marine field effort was assisted by personnel from the Navy Morale, Welfare, and Recreation (MWR) department on Midway who provided a boat and fuel for the use of the Ogden divers. Specific field activities are discussed below.

2.1 TERRESTRIAL INVESTIGATION

The terrestrial investigation was conducted at the BWLF, Site 01 from June 20 through July 5, 1996. The field work involved subsurface soil and ground-water sampling.

2.1.1 Pre-Investigation Activities

Prior to the initiation of field sampling activities, a prework conference of personnel from Ogden, the Navy, the USFWS, and PMC was held on Midway. During the conference, the CTO 0136 RI Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPjP) requirements were reviewed, and field work logistics and personnel requirements were coordinated. A "kick-off" health and safety meeting was also held for all field personnel to review and sign the site-specific Health and Safety Plan (HSP). Field sampling activities were coordinated with onsite USFWS personnel to minimize the impact of intrusive field activities on wildlife and critical habitats.

2.1.2 Land Survey and Soil Sampling Layout

A land survey was conducted by PMC surveyors to lay out the sampling grid designed in the SAP. The sampling grid consisted of a 150-foot square grid originating at monitoring well MW01 at the northwest corner of the Site (Figure 2-1). As described in the SAP, a

450,000 square foot sampling grid compartmentalized into 20, 150-foot square cells was established across the BWLF. One sampling trench was randomly located within each 150-foot square cell for a total of 20 trenches. Based on the total area of the BWLF, the 20 sampling locations within the square grid created an estimated 90% statistical probability of encountering a "hot spot" with a radius of 85 feet or greater if a sample is collected from each trench (Gilbert 1987).

PMC surveyors located each node at the intersections of the grid and marked it with a stake. The trench location within each grid cell was also located and marked. Coordinates were referenced to the existing site maps prepared during the SI investigation (Ogden 1996b).

Twenty trenches were planned for excavation at the Site. Following completion of the land survey, some proposed trench locations were modified slightly due to the physical conditions of the Site. Trenches that were located in areas inaccessible to the backhoe because of waste and debris were relocated immediately adjacent to the debris area. Other trenches were relocated based upon the judgment of the field manager to provide optimal coverage of the Site. Figure 2-1 illustrates the proposed and actual trench locations.

An additional 26 test pits (small trenches typically 3-4 feet long by 2 feet wide by 3 feet deep) were also excavated. The test pits were excavated at the intersections of the sampling grid, in areas judged by the field manager to be potential contaminant sources, or in areas that had not been investigated previously. Figure 2-2 illustrates the locations of the trenches and test pits.

After excavating and sampling at each trench or test pit, the trench was backfilled to grade and the location was marked with stakes. After all field sampling was accomplished, an "as built" survey was conducted of the actual excavated trenches at the Site.

2.1.3 Subsurface Soil Sampling

Trenches

Twenty trenches were excavated at the locations illustrated in Figure 2-2. The trenches were dug with a backhoe to depths of 4 to 6 feet below ground surface (bgs), lengths of 20 to 40 feet, and widths of 2 to 3 feet. Each trench was logged by the onsite geologist to describe the soils, physical characteristics, and type of landfilled material encountered in

accordance with procedure FP-C-1, *Soil and Rock Classification* (Ogden 1994b). Appendix A presents the field trench logs and a geologic cross section of each trench illustrating the sample locations. The soils were visually examined and classified in accordance with the Unified Soil Classification System (USCS).

All analytical soil sampling methods were used in accordance with procedure FP-C-2, *Soil Sampling* (Ogden 1994b). Two soil sampling locations were selected from each trench on the basis of visual observations (stained soil or other indication of potential contamination) and/or elevated organic vapor analyzer (OVA) readings. In the absence of evidence of contamination, the soil samples were collected from both ends of the trench to provide maximum spatial coverage.

Generally each sample was collected using a stainless steel hand trowel and a clean, disposable bucket liner. Undisturbed soil was collected from the side wall of the trench at a depth of 3 to 6 feet bgs. The soil was placed in the bucket liner and homogenized. The soil sample was divided after homogenization and one onsite (field test kit) and one offsite (laboratory) analytical sample were collected from the homogenized soil at each location. Forty-four laboratory soil samples (including four duplicate samples) and 46 field test kit soil samples (including three duplicate samples) were collected from the trench locations. The laboratory soil samples were placed in laboratory-supplied glass jars, labeled, and placed in a cooler containing ice for shipment to the analytical laboratory subcontractor (Ceimic Corporation of San Diego California). The field test kit soil samples were placed in clean disposable plastic vials and analyzed for PCBs later that day using Ohmicron Field Test Kits.

Test-Pits

Twenty-six test pits were excavated as illustrated in Figure 2-2. The majority of the test pits were dug at the intersections of the sampling grid. Based on the onsite test results, additional test pits were dug around monitoring wells M01MW03, M01MW04, trench M01TS02, and test pit M01TP11. Test pits were excavated to collect soil samples for onsite analysis for PCBs using field test kits. The test pits were typically 3 feet deep and 4 feet long by 4 feet wide. A total of 32 test kit samples (including 1 duplicate sample) and one laboratory sample were collected from the test pit locations.

2.1.4 Equipment Decontamination

To the extent feasible, dedicated or disposable sampling equipment was used to preclude the need for equipment decontamination. Non-disposable equipment used during sample acquisition was decontaminated in accordance with procedure FP-D-5, *Equipment* Decontamination (Ogden 1994b). The backhoe bucket was decontaminated by steam cleaning before trenching activities started, and between each trench or test pit. Overspray was collected in a plastic-lined basin and bailed into 55-gallon drums.

Stainless steel hand trowels, sample sleeves, and mixing bowls were decontaminated by this six-step process: (1) wash with Alconox detergent in purified water in a 5-gallon bucket, (2) rinse with purified water in a 5-gallon bucket, (3) spray with isopropyl alcohol, (4) rinse again with purified water in a 5-gallon bucket, (5) spray again with purified water, (6) air dry in a clean 5-gallon bucket. Decontamination fluids were collected at the end of each day in 55-gallon drums.

2.1.5 Ground-Water Sampling

One ground-water sample was collected from each of the five existing monitoring wells at the BWLF (Figure 2-2). The wells were installed, developed, and sampled previously in October, 1994.

Each monitoring well was purged and sampled in accordance with procedure FP-D-3, *Monitoring Well Sampling* (Ogden 1994b). Prior to sampling, the wells were purged using dedicated, 2-inch diameter submersible pumps to facilitate collection of ground-water samples representative of the aquifer conditions. Measurements of the ground-water temperature, pH, redox potential, dissolved oxygen, turbidity, and specific conductance were recorded at regular intervals throughout the purging process. The dissolved oxygen probe did not function properly due to the high chloride content of the ground water. Purging continued until these parameters stabilized. Samples were collected using the submersible pumps after well purging was completed and in accordance with procedures FP-D-3, *Monitoring Well Sampling* and FP-F-2 *Field QC Samples (Water, Soil)* (Ogden 1994b). Dedicated sampling pumps precluded the need for sampling equipment decontamination. Copies of the ground-water purging and sampling field logs are presented in Appendix B.

A cooler containing the ground-water sample collected from monitoring well MW01 and a water performance evaluation (PE) sample was lost during shipment to the analytical laboratory. The loss was not reported to Ogden until the field sampling crew had demobilized from Midway. A duplicate sample had been collected from the same well, however, and was received in good condition by the laboratory. Another PE sample was obtained and submitted to the laboratory later in the project (see Section 2.5.3); therefore, the overall objectives of the field sampling program were not adversely impacted.

2.2 MARINE INVESTIGATION

The marine investigations were conducted in the marine environment immediately adjacent to the BWLF, the RLF, and in the Inner Harbor. To streamline sample labeling and data management, Sites 01 and 02 were collectively referred to as the Landfills and Sites 08 and 99 were collectively referred to as the Inner Harbor (Figure 1-3). The marine sampling phase was conducted from September 5 through September 26, 1996.

2.2.1 Pre-Investigation Activities

Prior to the initiation of field sampling activities, a prework conference of personnel from Ogden, the Navy, the USFWS, and PMC was held on Midway. During the conference, the SAP and QAPjP requirements were reviewed, and field work logistics and personnel requirements were coordinated. A "kick-off" health and safety meeting was also held for field personnel to review and sign the site-specific HSP and Dive Plan.

2.2.2 Marine Sampling Grid Layout

The sampling locations for marine samples were based on the grids illustrated in Figure 2-3 for the Landfills and Figure 2-4 for the Inner Harbor. Ogden personnel set up and marked the grids on the seawalls with waterproof paint and marked the grids in the water with buoys. The Landfill grid cells were approximately 650 feet by 650 feet, while the Inner Harbor grid cells were approximately 540 feet by 540 feet.

These locations were chosen to maximize spatial coverage of the Landfill and Inner Harbor sites while also investigating potential sources of contaminants (e.g., marine debris and sewer outfalls). Inner Harbor sampling stations were preferentially located away from

the center of the harbor because very few organisms were observed in this area during the previous SI sampling.

In accordance with the SAP, algal (*Dictyota* sp. or *Halimeda opuntia*), herbivorous fish (*Stegastes fasciolatus*), invertebrate (urchin *Echinometra mathaei*) and sediment samples were to be collected at each of the 12 Landfill stations. One additional sediment sample was collected at Station 1 for bioassay analysis, as discussed in the SAP. Algae and herbivorous fish were not collected at Station 10 (Figure 2-3) due to a paucity of organisms. Adverse weather and poor water visibility conditions contributed to the difficulty of sampling at this station. Subsequent to completion of the SAP, it was decided to collect additional invertebrates (sea cucumbers, *Holothuria* sp.) at the stations surrounding the BWLF (Stations 1, 8, 9 and 10). This was accomplished at all stations, with the exception of Station 1, where no sea cucumbers were found despite an extensive search of the area. Carnivorous fish (*Mulloidichthys flavolineatus*) and seawater samples were collected at odd numbered stations as planned in the SAP (Figure 2-3). In the Inner Harbor, algal, herbivorous fish, and invertebrate (urchin) samples were collected at each of the 8 stations; seawater samples were collected at odd numbered stations (Figure 2-4).

2.2.3 Reference Sampling

The SAP called for four reference stations to be located in Midway Atoll lagoon. Due to logistics, patchiness of organisms, difficulty in locating sufficient quantities of the desired species, and adverse weather conditions, reference samples were collected at five stations in the lagoon, as illustrated in Figure 2-5. Four reference samples consisting of algae, herbivorous fish, invertebrates (urchins) and sediment were to be collected; this was generally accomplished except that algae was not present at reference Station 01 (Figure 2-5). Dangerous water conditions at reference Station 03 precluded the collection of tissue samples; therefore, an alternate Station 03 was established in a calmer location (Figure 2-5). Two reference samples consisting of carnivorous fish and seawater were collected from the lagoon as planned. Four invertebrate (sea cucumbers) reference samples were collected in addition to the samples planned in the SAP.

2.2.4 Marine Sediment Sampling

Eighteen sediment samples, including two duplicates were collected during the RI at the Landfill and reference sites (Figures 2-3 and 2-5). Two additional sediment samples,

including one duplicate, were collected at Landfill Grid 01 for toxicity testing. Marine sediments were collected by divers in accordance with procedure FP-C-5, *Subaqueous Sediment Sampling* (Ogden 1994b). The divers pushed a 6-inch long by 2-inch diameter acetate tube (already sealed at one end with a Teflon liner sheet and a plastic end cap) horizontally across the sediment surface (within the top 6 inches) until filled. After being filled, the sample tube was brought to the surface, where excess seawater was decanted. The open end of the sample tube was then covered with a Teflon liner sheet and plastic end cap; the caps were then taped in place. The sample tube was then labeled and placed in a cooler with frozen blue ice. Upon returning to the field office, the samples were stored in a dedicated refrigerator until being shipped to the analytical laboratory for chemical analysis. Duplicate sediment samples were obtained by homogenizing and splitting sediment collected from one location into two or more sample tubes.

2.2.5 Marine Seawater Sampling

Seven seawater samples, including one duplicate, were collected from the Landfill sites; five samples, including one duplicate, were collected from the Inner Harbor; and three samples, including one duplicate, were collected from the reference sites (Figures 2-3, 2-4, and 2-5).

Seawater was collected in accordance with procedure FP-C-4, *Surface Water Sampling* (Ogden 1994b). Divers collected water samples at mid-depth in the water column (generally at three to four feet below the surface). Sample bottles were taken to the desired depth while capped, then opened, filled, and recapped before returning to the water surface. Upon reaching the surface, the samples were labeled and placed immediately in a cooler with frozen blue ice. Upon returning to the field office, the samples were stored in a dedicated refrigerator until being shipped to the analytical laboratory for chemical analysis.

2.2.6 Marine Tissue Sampling

Ninety-six tissue samples, including 12 duplicates, were collected from the Landfills, Inner Harbor, and reference sites during the RI. Tissue samples were collected by divers in accordance with procedure FP-E-3, *Biological Tissue Sample Collection* (Ogden 1994b). Tissues consisted of fish, alga, and invertebrate samples. They were collected in sufficient quantity to meet the biomass requirements of the analytical laboratory for the chemical

analyses (at least 100 grams). Tissue samples were collected either by hand or with collection spears (fish only). After collection, alga, fish, and invertebrate tissue samples were immediately placed in labeled, 1-gallon resealable plastic Ziploc® bags and placed in a cooler with frozen blue ice. Upon returning to the field office, each bag with tissue samples was double-bagged and labeled, then frozen in a dedicated sample freezer until shipment to the analytical laboratory.

The divers collected the algal samples by hand while wearing disposable nitrile gloves. Algal species collected were *Dictyota* sp. (brown algae) and *Halimeda opuntia* (green algae). These species were selected because of their presence at sampling stations and because they may be eaten by either fish or sea turtles.

The divers collected fish by spearing while wearing disposable nitrile gloves. The damselfish (*Stegastes fasciolatus*) found at all collection stations, was the herbivorous fish preferred for collection. Typically, four to seven individuals were collected per sample. The goatfish (*Mulloidichthys flavolineatus*), found at all sampling stations, was the carnivorous fish preferred for collection. Typically, at least three individuals were collected per sample.

The divers collected the invertebrate samples by hand while wearing disposable nitrile gloves. The sea urchin *Echinometra mathaei* was the preferred invertebrate sampled at all sites; sea cucumbers (*Holothuria* sp.) were collected at three grid locations at the Landfills and four reference stations. An octopus (*Octopus* sp.) was collected at one Landfill grid location and one reference station.

2.2.7 Equipment Decontamination

Disposable nitrile gloves were the primary sampling device used by the divers. Acetate sleeves, plastic end caps, and steel mixing bowls used for sediment sampling were decontaminated prior to use by the six-step process outlined previously in Section 2.1.4. Following decontamination, the sleeves, caps, and bowls were stored until use in a sealed cooler lined with clean plastic. Collection spears used for fish sampling were cleaned with isopropyl alcohol and purified water between sampling events.

2.3 INVESTIGATION-DERIVED WASTE (IDW) MANAGEMENT

IDW generated during the RI consisted of purged ground water, decontamination fluids, used personal protective equipment (PPE), and used disposable sampling equipment. All decontamination fluids and purged ground water generated during the RI were placed into Department of Transportation (DOT) approved 55-gallon drums. These were labeled, placed on wooden pallets, and stored in a bunker for later disposal pending evaluation of analytical data, in accordance with *Management of Investigation-Derived Wastes During Site Inspections* (USEPA 1991). Used PPE and disposable sampling equipment was decontaminated as necessary and placed in the Midway municipal landfill for incineration and burial. Appendix C contains a list of all IDW generated to date during all phases of field work on Midway.

2.4 SAMPLE HANDLING, LABELING, AND MANAGEMENT

All sample naming, sample handling, and sample labeling were performed in accordance with procedures FP-B-10, *Sample Naming;* FP-F-6, *Record Keeping, Sample Labeling, and Chain-of-Custody;* and FP-F-7, *Sample Handling, Storage, and Shipping* (Ogden 1994b). The following sections briefly describe the specific sample-naming conventions and sample management procedures.

2.4.1 Sample Handling and Labeling

Samples collected for chemical analysis were tracked using two identification (ID) systems. The first system, referred to as an EPA sample ID number, consisted of two letters followed by three numbers. It was intended to identify each sample by a unique number that would give the laboratory no information about its origin. The two letters for the RI investigation sites were MA (M - Midway, A - background or reference sites); MC (C - Site 01, Bulky Waste Landfill); MV (V for Inner Harbor sites). Samples were generally numbered consecutively in the order collected.

The second sample ID system, referred to as the Ogden ID number, was designed as a code for specific information about the sample type, location, and matrix. This code enables rapid querying of the electronic database for information about specific sample types. This system is illustrated by the following example of a subsurface soil sample:

M01-TS03-S01-D2.5

where:

M01 identifies the Midway project and the two-digit Midway IR Site number

TS is the type of sample and matrix (see Table 2-1)

03 is the sample location number or marine grid location number

S01 is the chronological sample number from a particular sampling location (for marine tissue samples this designator identified various marine species as shown in Table 2-1)

D2.5 indicates depth in feet bgs to the nearest tenth of 1 foot.

For example, the first soil sample, collected at a depth of 2.5 feet from the third trench at the BWLF (Site 01), is designated M01-TS03-S01-D2.5. Duplicate samples were designated by a "D." For example, a duplicate of the above sample would be named "M01-TS03-D01-D2.5."

Samples were placed in the appropriate containers and labeled immediately after collection. The following information was recorded on the sample labels using a waterproof marker:

- Project name and location
- Project number
- Sample designation ID
- Date and time of collection
- Analyses to be performed

2.4.2 Sample Storage, Custody, and Shipment

Samples were collected in containers as follows:

- Soil and marine sediment — 6-inch by 2-inch acetate sleeves capped with Teflon and plastic end caps or wide mouth glass jars with Teflon lids
- Ground water and seawater — 1 liter amber glass bottles
- Marine tissue — 1-gallon Ziploc® bags (double) or 32-ounce wide mouth glass jars

Table 2-1
SAMPLE TYPE AND MATRIX
NAF MIDWAY ISLAND RI

Identifier	Sample Type	Matrix
TS	Trench Soil	Soil
TP	Test Pit Soil	Soil
MW	Monitoring Well	Water
SW	Seawater	Water
MS	Marine Sediment	Sediment
EW	Sediment Elutriate	Water
MT	Marine Tissue	Tissue
	Marine Tissue Designations	
MTxx-S01	Invertebrate	Urchin
MTxx-S02	Fish	Herbivorous
MTxx-S03	Open	Open
MTxx-S04	Fish	Carnivorous
MTxx-S05	Algae	Brown Algae
MTxx-S06	Algae	Green algae
MTxx-S07	Invertebrate	Sea Cucumber
MTxx-S08	Invertebrate	Octopus

Note: xx = Sample location no.

After collecting and labeling the samples, they were immediately placed in coolers with frozen blue ice for transport to the Ogden field office where they were stored in a dedicated sample refrigerator or freezer (marine tissue only) until being packed for shipment to the laboratory.

Upon delivery of the samples to the field office each day, sample information was immediately logged into a field chain-of-custody (COC) logbook and entered into an electronic COC database. The COC database consisted of the EPA and Ogden IDs, sample matrix, collection date and time, requested analyses, and comments as necessary.

Because Midway is visited only once per week by a U.S. Air Force cargo plane, the samples were stored in the dedicated refrigerator/freezer until the scheduled day of the cargo flight. On that day, the samples were packed into coolers with frozen blue ice and plastic bubble wrap to minimize container breakage. The COC form was signed and placed in the cooler, and the cooler was sealed with tape and signed COC seals to enable detection of tampering. Ogden personnel then accompanied the coolers on the Air Force flight from Midway to Hickam Air Force Base, Hawaii where the coolers were processed through customs and agricultural inspections.

Once in Hawaii, the coolers were delivered to either DHL or Federal Express for overnight shipment to the analytical laboratory. In some cases, when the Air Force flight was delayed or arrived in Hawaii too late to meet the delivery deadline for overnight shipment, the coolers were opened and the blue ice was refreshed to maintain preservation temperatures; the COC form was then signed and the coolers were resealed with new tape and COC stickers prior to delivery to the overnight shipper. The samples were always in the custody of Ogden personnel until they were relinquished to the overnight shipper for delivery to the laboratory.

2.5 Field Quality Control Samples

Field quality control (QC) samples collected during the project included field duplicates, equipment rinsates, field blanks, and PE samples, as shown in Table 2-2. Field QC samples were collected in accordance with Naval Energy and Environmental Support Activity (NEESA) Level D QC requirements and procedure FP-F-2, *Field QC Samples* (Ogden 1994b). A summary of specific field QC samples is provided below.

2.5.1 Duplicate Samples

Duplicate samples of all matrices were collected at a frequency of at least one for every ten samples collected (10%). The locations from which the duplicate samples were collected were randomly chosen. Soil and sediment duplicates were homogenized and

split (replicates); water and tissue duplicate samples were collected concurrently at the same location.

Table 2-2
FIELD QC SAMPLE
REMEDIAL INVESTIGATION
NAF MIDWAY ISLAND

Identifier	QC Sample Type	Description
Mxx-TSyy-Dzz	Soil Duplicate	Homogenized Split
Mxx-MWyy-Dzz	Ground-Water Duplicate	Collocated Duplicate
Mxx-SWyy-Dzz	Seawater Duplicate	Collocated Duplicate
Mxx-MSyy-Dzz	Sediment Duplicate	Homogenized Split
Mxx-MTyy-Dzz	Tissue Duplicate	Collocated Duplicate
Mxx-QWyy-Ezz	Equipment Rinsate	Purified Water
Mxx-QWyy-Fzz	Field Blank	Purified Water
Mxx-PWyy-Szz	Performance Eval. Water	Blind Spike Water
Mxx-PSyy-Szz	Performance Eval. Soil	Blind Spike Soil
Mxx-EWyy-Dzz	Sediment Elutriate Duplicate	Elutriate Water

Notes: xx = IR Site Designation
yy = Location Designation
zz = Sample Number Designation

2.5.2 Field Blanks and Equipment Rinsate Samples

A temperature blank consisting of a sealed 40 milliliter (ml) vial containing purified water was included in each sample cooler when the cooler was packed on Midway. The analytical laboratory was instructed to measure the temperature of the blank immediately

upon receipt of the coolers to determine if the cooler temperature was within acceptable QC limits.

One field blank consisting of the purified water used for equipment decontamination was collected at the start of both terrestrial and marine field activities. The blank sample was analyzed for the same parameters as the samples being collected. The field blanks were taken from the water source (i.e., purified bottled water) used to generate the equipment rinsate sample. An equipment rinsate sample was collected every other sampling day. Rinsate samples were collected by pouring purified water over decontaminated sampling equipment (e.g., hand trowels, acetate tubes, collection spears) and collecting the water in sample bottles to be analyzed for the same parameters as the samples being collected.

2.5.3 Performance Evaluation Samples

Soil and water PE samples (one each) were disguised as field samples in accordance with procedure FP-F-8, *Performance Evaluation Samples* (Ogden 1994b). The soil sample was submitted along with other soil samples to Ceimic Corporation laboratory near the onset of the terrestrial sampling event and analyzed for the analytes of concern. The results from the soil PE sample were used to assess the overall laboratory accuracy for each class of compounds.

A water PE sample was submitted along with ground-water samples to Arthur D. Little laboratory. The cooler containing the ground-water and PE samples was lost by the overnight shipper. As stated previously in Section 2.1.5, the ground-water sample was replaced by a duplicate sample. A new water PE sample was procured and submitted to the laboratory along with seawater samples at the onset of the marine sampling phase.

2.6 Analytical Program

Potential contaminant compounds identified from the SI and SERA included organochlorine pesticides, PCBs, and semivolatile organic compounds (SVOCs). Table 2-3 summarizes the RI analytical plan, listing all samples collected and the analyses performed on each. Soil samples collected at the BWLF for offsite chemical analysis were analyzed by Ceimic Corporation of San Diego, California. All ground-water, seawater, sediment, and tissue samples for chemical analysis were analyzed by Arthur D. Little, Inc.

of Cambridge, Massachusetts. Sediment samples for toxicity testing were analyzed by Ogden Bioassay Laboratory in San Diego, California.

Soils were analyzed using the following methods to evaluate the presence of contaminants of concern:

- EPA Contract Laboratory Program (CLP) Method OLM03.1B for SVOCs using gas chromatography and mass spectrometry (GC/MS)
- CLP Method OLM03.1P for Organochlorine Pesticides and PCBs using GC with an electron capture detector (ECD)

Ground water, seawater, sediments, tissues, and sediment elutriate were analyzed using the following methods to evaluate the presence of contaminants of concern:

- National Oceanic and Atmospheric Administration (NOAA) National Status and Trends Program Method STIV141A for Low Detection Level SVOCs using GC/MS
- NOAA National Status and Trends Program Method STIV141C for Low Detection Level PCBs using GC/ECD
- NOAA National Status and Trends Program Method STIV141E for Low Detection Level Organochlorine Pesticides using GC/ECD
- CLP Method ILM03.0 for 23 Metals using inductively coupled argon plasma (ICAP) and flame atomic adsorption (sediment elutriate only)
- Toxicity testing of marine sediment using echinoderm development bioassay protocols by Puget Sound Estuary Program (PSEP) (PSEP 1991)

2.7 Deviations From Planned Field Activities

Several minor deviations from the SAP occurred during the RI. As described in Section 2.1.2, some trench locations were modified because of conditions encountered in the field and/or the judgment of the field manager. An additional 26 test pits were excavated to provide increased coverage of the BWLF in areas not investigated by the trench sampling.

The marine sampling plan for sediments and seawater was implemented generally as described in the SAP. Marine tissue samples of algae and herbivorous fish (see Section 2.2.2) were not collected from Station 10 near the BWLF due to an absence of these organisms. At reference Station 03 dangerous ocean conditions precluded collection of tissue samples, so an alternate sampling station was established at a calmer area within the lagoon.

Tables

Table 2-3
ANALYTICAL PLAN SUMMARY
REMEDIAL INVESTIGATION
NAF MIDWAY
(Page 1 of 7)

						ANALYSES REQUESTED							
EPA NO	OGDEN ID	DATE SAMPLED	SITE NAME	LOCATION	DEPTH (FT)	CLP SVOCs	CLP PEST/PCB	STIV141E PEST	STIV141A SVOCs	STIV141C LL PCB	CLP METALS	COMMENTS
SOIL SAMPLES - BULKY WASTE LANDFILL												
MC100	M01TS01S01	6/24/96	BWLF	TRENCH 01	3.0	X	X					
MC101	M01TS01S02	6/24/96	BWLF	TRENCH 01	3.0	X	X					
MC102	M01TS02S01	6/24/96	BWLF	TRENCH 02	3.0	X	X					
MC103	M01TS02S02	6/24/96	BWLF	TRENCH 02	4.0	X	X					
MC104	M01TS03S01	6/24/96	BWLF	TRENCH 03	3.0	X	X					
MC105	M01TS03S02	6/24/96	BWLF	TRENCH 03	4.0	X	X					
MC106	M01TS04S01	6/24/96	BWLF	TRENCH 04	4.0	X	X					
MC107	M01TS04S02	6/24/96	BWLF	TRENCH 04	3.5	X	X					
MC108	M01TS05S01	6/24/96	BWLF	TRENCH 05	4.0	X	X					
MC109	M01TS05D01	6/24/96	BWLF	TRENCH 05	4.0	X	X					DUPLICATE OF MC108
MC110	M01TS05S02	6/24/96	BWLF	TRENCH 05	2.5	X	X					
MC111	M01TS06S01	6/25/96	BWLF	TRENCH 06	3.0	X	X					
MC112	M01TS06S02	6/25/96	BWLF	TRENCH 06	4.0	X	X					
MC113	M01TS07S01	6/25/96	BWLF	TRENCH 07	3.5	X	X					
MC114	M01TS07S02	6/25/96	BWLF	TRENCH 07	6.0	X	X					
MC115	M01TS08S01	6/25/96	BWLF	TRENCH 08	4.0	X	X					
MC116	M01TS08S02	6/25/96	BWLF	TRENCH 08	3.0	X	X					
MC117	M01TS08D02	6/25/96	BWLF	TRENCH 08	3.0	X	X					DUPLICATE OF MC116
MC118	M01TS09S01	6/25/96	BWLF	TRENCH 09	2.0	X	X					
MC119	M01TS09S02	6/25/96	BWLF	TRENCH 09	3.5	X	X					
MC120	M01TS10S01	6/25/96	BWLF	TRENCH 10	4.5	X	X					
MC121	M01TS10S02	6/25/96	BWLF	TRENCH 10	5.0	X	X					
MC122	M01TS11S01	6/25/96	BWLF	TRENCH 11	2.0	X	X					
MC123	M01TS11S02	6/25/96	BWLF	TRENCH 11	2.0	X	X					
MC124	M01TS12S01	6/26/96	BWLF	TRENCH 12	3.0	X	X					
MC125	M01TS12S02	6/26/96	BWLF	TRENCH 12	2.5	X	X					
MC126	M01TS13S01	6/26/96	BWLF	TRENCH 13	4.0	X	X					
MC127	M01TS13D01	6/26/96	BWLF	TRENCH 13	4.0	X	X					DUPLICATE OF MC126
MC128	M01TS13S02	6/26/96	BWLF	TRENCH 13	5.5	X	X					
MC129	M01TS14S01	6/26/96	BWLF	TRENCH 14	4.5	X	X					
MC130	M01TS14S02	6/26/96	BWLF	TRENCH 14	4.5	X	X					

Table 2-3
ANALYTICAL PLAN SUMMARY
REMEDIAL INVESTIGATION
NAF MIDWAY
(Page 2 of 7)

						ANALYSES REQUESTED							
EPA NO	OGDEN ID	DATE SAMPLED	SITE NAME	LOCATION	DEPTH (FT)	CLP SVOCs	CLP PEST/PCB	STIV141E PEST	STIV141A SVOCs	STIV141C LL PCB	CLP METALS	COMMENTS
SOIL SAMPLES - BULKY WASTE LANDFILL (continued)												
MC131	M01TS15S01	6/27/96	BWLF	TRENCH 15	5.0	X	X					
MC132	M01TS15S02	6/27/96	BWLF	TRENCH 15	4.0	X	X					
MC133	M01TS16S01	6/28/96	BWLF	TRENCH 16	4.0	X	X					
MC134	M01TS16S02	6/28/96	BWLF	TRENCH 16	2.0	X	X					
MC135	M01TS17S01	6/28/96	BWLF	TRENCH 17	6.0	X	X					
MC136	M01TS17S02	6/28/96	BWLF	TRENCH 17	5.0	X	X					
MC137	M01TS18S01	6/28/96	BWLF	TRENCH 18	3.5	X	X					
MC138	M01TS18S02	6/28/96	BWLF	TRENCH 18	4.0	X	X					
MC139	M01TS19S01	6/28/96	BWLF	TRENCH 19	2.5	X	X					
MC140	M01TS19S02	6/28/96	BWLF	TRENCH 19	3.0	X	X					
MC141	M01TS20S01	6/28/96	BWLF	TRENCH 20	3.5	X	X					
MC142	M01TS20S02	6/28/96	BWLF	TRENCH 20	3.0	X	X					
MC143	M01TS20D02	6/28/96	BWLF	TRENCH 20	3.0	X	X					DUPLICATE OF MC142
MC148	M01TP11S02	7/1/96	BWLF	TEST PIT	3.0	X	X					
GROUND-WATER SAMPLES - BULKY WASTE LANDFILL												
MC157	M01MW01S01	7/3/96	BWLF	MONITORING WELL 01	NA			X	X	X		SAMPLE LOST BY SHIPPER
MC158	M01MW01D01	7/3/96	BWLF	MONITORING WELL 01	NA			X	X	X		DUPLICATE OF MC157
MC159	M01MW02S01	7/3/96	BWLF	MONITORING WELL 02	NA			X	X	X		
MC160	M01MW03S01	7/3/96	BWLF	MONITORING WELL 03	NA			X	X	X		
MC161	M01MW04S01	7/3/96	BWLF	MONITORING WELL 04	NA			X	X	X		
MC162	M01MW05S01	7/3/96	BWLF	MONITORING WELL 05	NA			X	X	X		
MARINE SEDIMENT SAMPLES												
MA700	M00MS01S01	9/12/96	REFERENCE	GRID 01	0.5			X		X		
MA701	M00MS02S01	9/12/96	REFERENCE	GRID 02	0.5			X		X		
MA702	M00MS02D01	9/12/96	REFERENCE	REF 02	0.5			X		X		DUPLICATE OF MA701
MA703	M00MS03S01	9/12/96	REFERENCE	REF 03	0.5			X		X		
MA704	M00MS04S01	9/12/96	REFERENCE	REF 04	0.5			X		X		
MC165	M01MS01S01	9/9/96	LANDFILLS	GRID 01	0.5			X		X		SUBMITTED FOR TOXICITY TESTING
MC166	M01MS01D01	9/9/96	LANDFILLS	GRID 01	0.5			X		X		SUBMITTED FOR TOXICITY TESTING, DUPLICATE OF MC165
MC167	M01MS02S01	9/9/96	LANDFILLS	GRID 02	0.5			X		X		

Table 2-3
ANALYTICAL PLAN SUMMARY
REMEDIAL INVESTIGATION
NAF MIDWAY
(Page 3 of 7)

						ANALYSES REQUESTED							
EPA NO	OGDEN ID	DATE SAMPLED	SITE NAME	LOCATION	DEPTH (FT)	CLP SVOCs	CLP PEST/PCB	STIV141E PEST	STIV141A SVOCs	STIV141C LL PCB	CLP METALS	COMMENTS
MARINE SEDIMENT SAMPLES (continued)												
MC168	M01MS03S01	9/9/96	LANDFILLS	GRID 03	0.5			X		X		
MC169	M01MS04S01	9/9/96	LANDFILLS	GRID 04	0.5			X		X		
MC170	M01MS05S01	9/9/96	LANDFILLS	GRID 05	0.5			X		X		
MC171	M01MS06S01	9/9/96	LANDFILLS	GRID 06	0.5			X		X		
MC172	M01MS07S01	9/9/96	LANDFILLS	GRID 07	0.5			X		X		
MC173	M01MS08S01	9/9/96	LANDFILLS	GRID 08	0.5			X		X		
MC174	M01MS09S01	9/9/96	LANDFILLS	GRID 09	0.5			X		X		
MC175	M01MS10S01	9/9/96	LANDFILLS	GRID 10	0.5			X		X		
MC176	M01MS11S01	9/9/96	LANDFILLS	GRID 11	0.5			X		X		
MC177	M01MS12S01	9/9/96	LANDFILLS	GRID 12	0.5			X		X		
SEDIMENT ELUTRIATE SAMPLES												
MC185	M01EW01S01	-	LANDFILLS	LF GRID 01	NA			X	X	X	X	SEDIMENT ELUTRIATE
MC186	M01EW01D01	-	LANDFILLS	LF GRID 01	NA			X	X	X	X	SEDIMENT ELUTRIATE, DUPLICATE OF MC185
SEAWATER SAMPLES												
MA705	M00SW01S01	9/12/96	REFERENCE	REF 01	NA			X		X		
MA706	M00SW03S01	9/12/96	REFERENCE	REF 03	NA			X		X		
MA715	M00SW03D01	9/12/96	REFERENCE	REF 03	NA			X		X		DUPLICATE OF MA706
MC178	M01SW01S01	9/18/96	LANDFILLS	LF GRID 01	5.0			X		X		
MC179	M01SW03S01	9/18/96	LANDFILLS	LF GRID 03	5.0			X		X		
MC180	M01SW05S01	9/18/96	LANDFILLS	LF GRID 05	5.0			X		X		
MC181	M01SW07S01	9/18/96	LANDFILLS	LF GRID 07	5.0			X		X		
MC182	M01SW07D01	9/18/96	LANDFILLS	LF GRID 07	5.0			X		X		DUPLICATE OF MC181
MC183	M01SW09S01	9/12/96	LANDFILLS	LF GRID 09	5.0			X		X		
MC184	M01SW011S01	9/12/96	LANDFILLS	LF GRID 11	5.0			X		X		
MV005	M99SW01S01	9/18/96	INNER HARBOR	IH GRID 01	5.0			X		X		
MV006	M99SW03S01	9/18/96	INNER HARBOR	IH GRID 03	5.0			X		X		
MV007	M99SW03D01	9/18/96	INNER HARBOR	IH GRID 03	5.0			X		X		DUPLICATE OF MV006
MV008	M99SW05S01	9/18/96	INNER HARBOR	IH GRID 05	5.0			X		X		
MV009	M99SW07S01	9/18/96	INNER HARBOR	IH GRID 07	5.0			X		X		

Table 2-3
ANALYTICAL PLAN SUMMARY
REMEDIAL INVESTIGATION
NAF MIDWAY
(Page 4 of 7)

						ANALYSES REQUESTED							
EPA NO	OGDEN ID	DATE SAMPLED	SITE NAME	LOCATION	DEPTH (FT)	CLP SVOCs	CLP PEST/PCB	STIV141E PEST	STIV141A SVOCs	STIV141C LL PCB	CLP METALS	COMMENTS
MARINE TISSUE SAMPLES - REFERENCE SITES												
MA707	M00MT01S01	9/8/96	REFERENCE	REF 01	NA			X		X		URCHINS
MA708	M00MT01D01	9/8/96	REFERENCE	REF 01	NA			X		X		URCHINS, DUPLICATE OF MA707
MA709	M00MT01S02	9/8/96	REFERENCE	REF 01	NA			X		X		HERBIVOROUS FISH
MA710	M00MT01D02	9/8/96	REFERENCE	REF 01	NA			X		X		HERBIVOROUS FISH, DUPLICATE OF MA709
MA713	M00MT01S04	9/8/96	REFERENCE	REF 01	NA			X		X		CARNIVOROUS FISH
MA714	M00MT01D04	9/8/96	REFERENCE	REF 01	NA			X		X		CARNIVOROUS FISH, DUPLICATE OF MA714
MA716	M00MT04S01	9/10/96	REFERENCE	REF 03	NA			X		X		URCHINS
MA717	M00MT04S02	9/10/96	REFERENCE	REF 04	NA			X		X		HERBIVOROUS FISH
MA718	M00MT04S04	9/10/96	REFERENCE	REF 04	NA			X		X		CARNIVOROUS FISH
MA719	M00MT04S05	9/10/96	REFERENCE	REF 04	NA			X		X		BROWN ALGAE
MA720	M00MT04D05	9/10/96	REFERENCE	REF 04	NA			X		X		BROWN ALGAE, DUPLICATE OF MA719
MA721	M00MT04S07	9/10/96	REFERENCE	REF 04	NA			X		X		SEA CUCUMBER
MA722	M00MT04D07	9/10/96	REFERENCE	REF 04	NA			X		X		SEA CUCUMBER, DUPLICATE OF MA721
MA723	M00MT01S08	9/8/96	REFERENCE	REF 01	NA			X		X		OCTOPUS
MA724	M00MT02S01	9/19/96	REFERENCE	REF 02	NA			X		X		URCHINS
MA725	M00MT02S02	9/19/96	REFERENCE	REF 02	NA			X		X		HERBIVOROUS FISH
MA726	M00MT02S06	9/19/96	REFERENCE	REF 02	NA			X		X		GREEN ALGAE
MA727	M00MT03S01	9/25/96	REFERENCE	REF 03	NA			X		X		URCHINS
MA728	M00MT03S02	9/25/96	REFERENCE	REF 03	NA			X		X		HERBIVOROUS FISH
MA729	M00MT03S05	9/25/96	REFERENCE	REF 03	NA			X		X		BROWN ALGAE
MA730	M00MT03S06	9/25/96	REFERENCE	REF 03	NA			X		X		GREEN ALGAE
MARINE TISSUE SAMPLES - LANDFILLS												
MC188	M01MT05S01	9/9/96	LANDFILLS	LF GRID 05	NA			X		X		URCHINS
MC189	M01MT05D01	9/9/96	LANDFILLS	LF GRID 05	NA			X		X		URCHINS, DUPLICATE OF MC188
MC190	M01MT05S02	9/9/96	LANDFILLS	LF GRID 05	NA			X		X		HERBIVOROUS FISH
MC191	M01MT05S04	9/9/96	LANDFILLS	LF GRID 05	NA			X		X		CARNIVOROUS FISH
MC192	M01MT05D04	9/9/96	LANDFILLS	LF GRID 05	NA			X		X		CARNIVOROUS FISH, DUPLICATE OF MC192
MC193	M01MT06S05	9/13/96	LANDFILLS	LF GRID 06	NA			X		X		BROWN ALGAE
MC194	M01MT06S02	9/13/96	LANDFILLS	LF GRID 06	NA			X		X		HERBIVOROUS FISH
MC195	M01MT06S01	9/13/96	LANDFILLS	LF GRID 06	NA			X		X		URCHINS
MC196	M01MT09S01	9/13/96	LANDFILLS	LF GRID 09	NA			X		X		URCHINS

Table 2-3
ANALYTICAL PLAN SUMMARY
REMEDIAL INVESTIGATION
NAF MIDWAY
(Page 5 of 7)

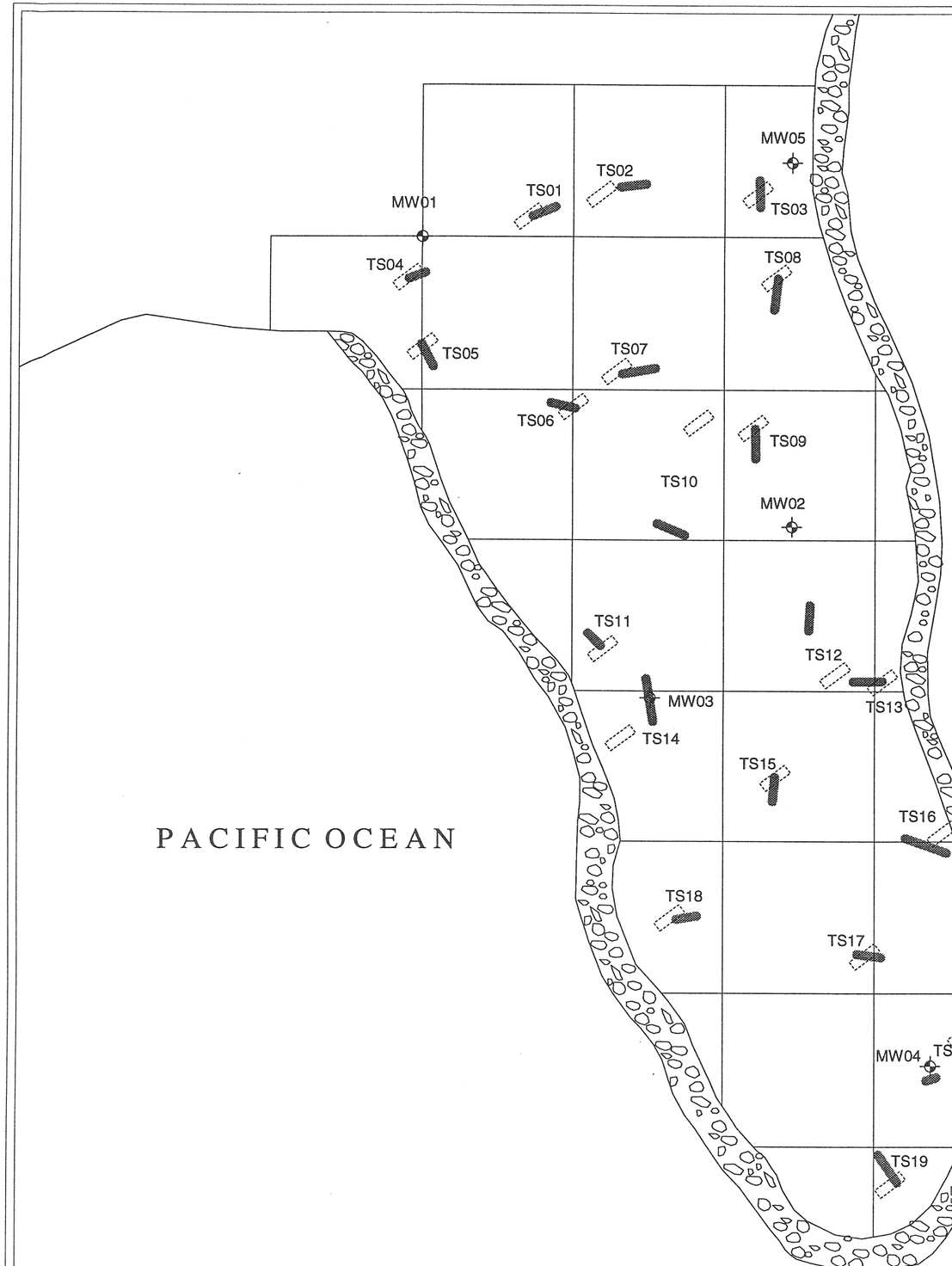
						ANALYSES REQUESTED							
EPA NO	OGDEN ID	DATE SAMPLED	SITE NAME	LOCATION	DEPTH (FT)	CLP SVOCs	CLP PEST/PCB	STIV141E PEST	STIV141A SVOCs	STIV141C LL PCB	CLP METALS		COMMENTS
MARINE TISSUE SAMPLES - LANDFILLS (continued)													
MC197	M01MT09S06	9/13/96	LANDFILLS	LF GRID 06	NA			X		X			GREEN ALGAE
MC198	M01MT09S07	9/13/96	LANDFILLS	LF GRID 09	NA			X		X			SEA CUCUMBER
MC199	M01MT09S02	9/13/96	LANDFILLS	LF GRID 09	NA			X		X			HERBIVOROUS FISH
MC200	M01MT09S04	9/13/96	LANDFILLS	LF GRID 09	NA			X		X			CARNIVOROUS FISH
MC201	M01MT04S01	9/16/96	LANDFILLS	LF GRID 04	NA			X		X			URCHINS
MC202	M01MT04S02	9/16/96	LANDFILLS	LF GRID 04	NA			X		X			HERBIVOROUS FISH
MC203	M01MT04S05	9/16/96	LANDFILLS	LF GRID 04	NA			X		X			BROWN ALGAE
MC204	M01MT03S05	9/16/96	LANDFILLS	LF GRID 03	NA			X		X			BROWN ALGAE
MC205	M01MT03D05	9/16/96	LANDFILLS	LF GRID 03	NA			X		X			BROWN ALGAE, DUPLICATE OF MC204
MC206	M01MT03S02	9/16/96	LANDFILLS	LF GRID 03	NA			X		X			HERBIVOROUS FISH
MC207	M01MT03S04	9/16/96	LANDFILLS	LF GRID 03	NA			X		X			CARNIVOROUS FISH
MC208	M01MT03S01	9/16/96	LANDFILLS	LF GRID 03	NA			X		X			URCHINS
MC209	M01MT05S08	9/16/96	LANDFILLS	LF GRID 05	NA			X		X			OCTOPUS
MC210	M01MT05S05	9/16/96	LANDFILLS	LF GRID 05	NA			X		X			BROWN ALGAE
MC211	M01MT07S05	9/17/96	LANDFILLS	LF GRID 07	NA			X		X			BROWN ALGAE
MC212	M01MT07S01	9/17/96	LANDFILLS	LF GRID 07	NA			X		X			URCHINS
MC213	M01MT07S04	9/17/96	LANDFILLS	LF GRID 07	NA			X		X			CARNIVOROUS FISH
MC214	M01MT07S02	9/17/96	LANDFILLS	LF GRID 07	NA			X		X			HERBIVOROUS FISH
MC215	M01MT11S02	9/19/96	LANDFILLS	LF GRID 11	NA			X		X			HERBIVOROUS FISH
MC216	M01MT11D02	9/19/96	LANDFILLS	LF GRID 11	NA			X		X			HERBIVOROUS FISH, DUPLICATE OF MC215
MC217	M01MT11S06	9/19/96	LANDFILLS	LF GRID 11	NA			X		X			GREEN ALGAE
MC218	M01MT11S01	9/19/96	LANDFILLS	LF GRID 11	NA			X		X			URCHINS
MC219	M01MT11S04	9/19/96	LANDFILLS	LF GRID 11	NA			X		X			CARNIVOROUS FISH
MC220	M01MT12S06	9/19/96	LANDFILLS	LF GRID 12	NA			X		X			GREEN ALGAE
MC221	M01MT12S02	9/19/96	LANDFILLS	LF GRID 12	NA			X		X			HERBIVOROUS FISH
MC222	M01MT12S01	9/19/96	LANDFILLS	LF GRID 12	NA			X		X			URCHINS
MC223	M01MT02S01	9/20/96	LANDFILLS	LF GRID 02	NA			X		X			URCHINS
MC224	M01MT02S02	9/20/96	LANDFILLS	LF GRID 02	NA			X		X			HERBIVOROUS FISH
MC225	M01MT02S06	9/20/96	LANDFILLS	LF GRID 02	NA			X		X			GREEN ALGAE
MC226	M01MT08S01	9/20/96	LANDFILLS	LF GRID 08	NA			X		X			URCHINS
MC227	M01MT08S02	9/20/96	LANDFILLS	LF GRID 08	NA			X		X			HERBIVOROUS FISH

Table 2-3
ANALYTICAL PLAN SUMMARY
REMEDIAL INVESTIGATION
NAF MIDWAY
(Page 6 of 7)

						ANALYSES REQUESTED							
EPA NO	OGDEN ID	DATE SAMPLED	SITE NAME	LOCATION	DEPTH (FT)	CLP SVOCs	CLP PEST/PCB	STIV141E PEST	STIV141A SVOCs	STIV141C LL PCB	CLP METALS		COMMENTS
MARINE TISSUE SAMPLES - LANDFILLS (continued)													
MC228	M01MT08S06	9/20/96	LANDFILLS	LF GRID 08	NA			X		X			GREEN ALGAE
MC229	M01MT08S07	9/20/96	LANDFILLS	LF GRID 08	NA			X		X			SEA CUCUMBER
MC230	M01MT01S01	9/20/96	LANDFILLS	LF GRID 01	NA			X		X			URCHINS
MC231	M01MT01S02	9/20/96	LANDFILLS	LF GRID 01	NA			X		X			HERBIVOROUS FISH
MC232	M01MT01S04	9/20/96	LANDFILLS	LF GRID 01	NA			X		X			CARNIVOROUS FISH
MC233	M01MT01S05	9/20/96	LANDFILLS	LF GRID 01	NA			X		X			BROWN ALGAE
MC234	M01MT01S06	9/20/96	LANDFILLS	LF GRID 01	NA			X		X			GREEN ALGAE
MC235	M01MT10S01	9/23/96	LANDFILLS	LF GRID 10	NA			X		X			URCHINS
MC237	M01MT10S07	9/24/96	LANDFILLS	LF GRID 10	NA			X		X			SEA CUCUMBER
MARINE TISSUE SAMPLES - INNER HARBOR													
MV016	M99MT03S01	9/9/96	INNER HARBOR	IH GRID 03	NA			X		X			URCHINS
MV017	M99MT03D01	9/9/96	INNER HARBOR	IH GRID 03	NA			X		X			URCHINS, DUPLICATE OF MV016
MV018	M99MT03S02	9/9/96	INNER HARBOR	IH GRID 03	NA			X		X			HERBIVOROUS FISH
MV019	M99MT03S05	9/9/96	INNER HARBOR	IH GRID 03	NA			X		X			BROWN ALGAE
MV020	M99MT03D05	9/9/96	INNER HARBOR	IH GRID 03	NA			X		X			BROWN ALGAE, DUPLICATE OF MV019
MV021	M99MT04S01	9/12/96	INNER HARBOR	IH GRID 04	NA			X		X			URCHINS
MV022	M99MT04S02	9/12/96	INNER HARBOR	IH GRID 04	NA			X		X			HERBIVOROUS FISH
MV023	M99MT04D02	9/12/96	INNER HARBOR	IH GRID 04	NA			X		X			HERBIVOROUS FISH, DUPLICATE OF MV022
MV024	M99MT04S05	9/12/96	INNER HARBOR	IH GRID 04	NA			X		X			BROWN ALGAE
MV025	M99MT08S02	9/17/96	INNER HARBOR	IH GRID 08	NA			X		X			HERBIVOROUS FISH
MV026	M99MT08S01	9/18/96	INNER HARBOR	IH GRID 08	NA			X		X			URCHINS
MV027	M99MT08S05	9/18/96	INNER HARBOR	IH GRID 08	NA			X		X			BROWN ALGAE
MV028	M99MT01S02	9/17/96	INNER HARBOR	IH GRID 01	NA			X		X			HERBIVOROUS FISH
MV029	M99MT01S05	9/17/96	INNER HARBOR	IH GRID 01	NA			X		X			BROWN ALGAE
MV030	M99MT01S01	9/17/96	INNER HARBOR	IH GRID 01	NA			X		X			URCHINS
MV031	M99MT06S01	9/18/96	INNER HARBOR	IH GRID 06	NA			X		X			URCHINS
MV032	M99MT06S02	9/18/96	INNER HARBOR	IH GRID 06	NA			X		X			HERBIVOROUS FISH
MV033	M99MT06S05	9/18/96	INNER HARBOR	IH GRID 06	NA			X		X			BROWN ALGAE
MV034	M99MT07S01	9/18/96	INNER HARBOR	IH GRID 07	NA			X		X			URCHINS
MV035	M99MT07S02	9/18/96	INNER HARBOR	IH GRID 07	NA			X		X			HERBIVOROUS FISH
MV036	M99MT07S05	9/18/96	INNER HARBOR	IH GRID 07	NA			X		X			BROWN ALGAE

Table 2-3
ANALYTICAL PLAN SUMMARY
REMEDIAL INVESTIGATION
NAF MIDWAY
(Page 7 of 7)

						ANALYSES REQUESTED							
EPA NO	OGDEN ID	DATE SAMPLED	SITE NAME	LOCATION	DEPTH (FT)	CLP SVOCs	CLP PEST/PCB	STIV141E PEST	STIV141A SVOCs	STIV141C LL PCB	CLP METALS	COMMENTS
MARINE TISSUE SAMPLES - INNER HARBOR (continued)												
MV037	M99MT05S01	9/18/96	INNER HARBOR	IH GRID 05	NA			X		X		URCHINS
MV038	M99MT05S02	9/18/96	INNER HARBOR	IH GRID 05	NA			X		X		HERBIVOROUS FISH
MV039	M99MT05S05	9/18/96	INNER HARBOR	IH GRID 05	NA			X		X		BROWN ALGAE
MV040	M99MT02S01	9/20/96	INNER HARBOR	IH GRID 02	NA			X		X		URCHINS
MV041	M99MT02S02	9/20/96	INNER HARBOR	IH GRID 02	NA			X		X		HERBIVOROUS FISH
MV042	M99MT02S05	9/20/96	INNER HARBOR	IH GRID 02	NA			X		X		BROWN ALGAE
FIELD BLANK AND EQUIPMENT RINSATE SAMPLES												
MC145	M01QW02E02	6/24/96	BWLF	-	NA	X	X					EQUIPMENT RINSATE - HAND TROWEL
MC146	M01QW14E02	6/26/96	BWLF	-	NA	X	X					EQUIPMENT RINSATE - HAND TROWEL
MC147	M01QW17E02	6/28/96	BWLF	-	NA	X	X					EQUIPMENT RINSATE - HAND TROWEL
MC155	M01QW01F01	6/26/96	BWLF	-	NA	X	X					FIELD BLANK - PURIFIED WATER
MC187	M01QW01E01	9/10/96	LANDFILLS	-	NA			X		X		EQUIPMENT RINSATE - ACETATE SLEEVES
MV010	M99QW01F01	9/10/96	INNER HARBOR	-	NA			X		X		FIELD BLANK - PURIFIED WATER
MV011	M99QW01E01	9/10/96	INNER HARBOR	-	NA			X		X		EQUIPMENT RINSATE - COLLECTION SPEAR
MV012	M99QW02E01	9/17/96	INNER HARBOR	-	NA			X		X		EQUIPMENT RINSATE - COLLECTION SPEAR
MV013	M99QW03E01	9/19/96	INNER HARBOR	-	NA			X		X		EQUIPMENT RINSATE - COLLECTION SPEAR
SOIL PERFORMANCE EVALUATION SAMPLES												
MC144	M01PS01S01	6/26/96	BWLF	-	NA	X	X					PERFORMANCE EVALUATION SAMPLE
MC144A	M01PS01S01	6/26/96	BWLF	-	NA	X	X					PERFORMANCE EVALUATION SAMPLE
WATER PERFORMANCE EVALUATION SAMPLES												
MC163	M01PW01S01	7/5/96	BWLF	-	NA			X	X	X		SAMPLE LOST BY SHIPPER
MV015	M99PW02S01	9/13/96	BWLF	-	NA			X		X		PERFORMANCE EVALUATION SAMPLE



LEGEND

TS01	TRENCH NUMBER
▬	ACTUAL TRENCH LOCATION
▭	PROPOSED TRENCH LOCATION
MW01	MONITORING WELL NUMBER
⊕	MONITORING WELL LOCATION

NOTES

1. THE ACCURACY OF THIS DOCUMENT IS LIMITED TO THE QUALITY OF THE SOURCE INFORMATION AND IS NOT A LEGAL REPRESENTATION OF THE ORIGINAL SURVEY
2. HORIZONTAL CONTROL POINT ESTABLISHED BY USNS ON SITE, WAS USED AS BASIS OF DRAWING
3. VERTICAL CONTROL WAS BASED ON BM#11 WITH AN ELEVATION OF 8.52 FEET (MLLW)
4. PLANE COORDINATE SYSTEM FOR SAND AND EASTERN ISLANDS, ES-217, DRAWING NO.: SUR-6, USNS MIDWAY ISLAND
5. PROJECT NUMBER 314790001
6. FILE :g:\midway\ri\bulkwast.apr 1-17-97

SOURCES

PERRY ASSOCIATES INC., HOWARD LAWSON & ASSOC.
US S. NAVAL STATION, MIDWAY ISLAND, DWG NO.: #1038656, #1038657

TITLE

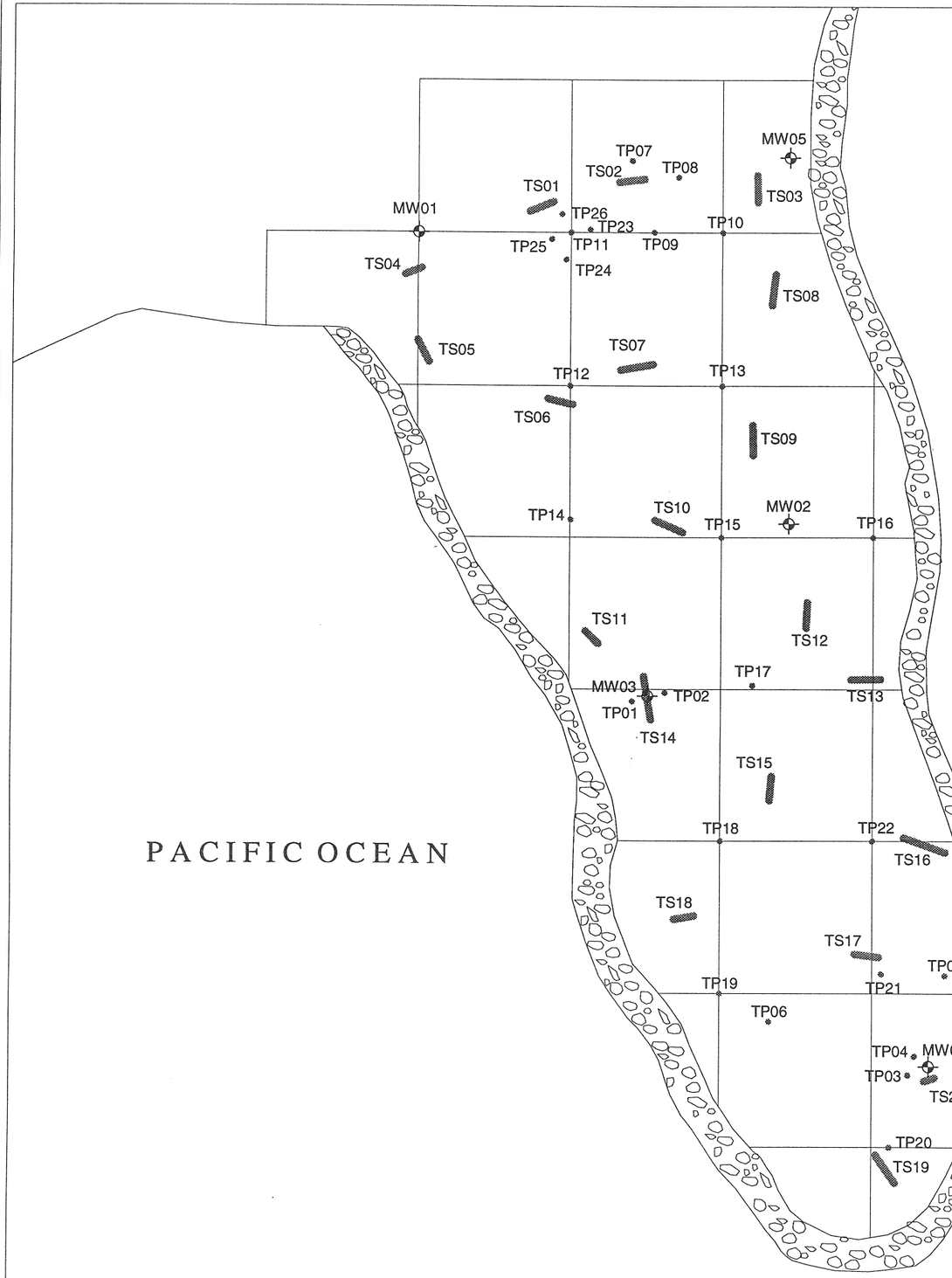
PROPOSED AND ACTUAL TRENCH LOCATIONS
BULKY WASTE LANDFILL
NAF MIDWAY ISLAND

N

100 0 100 200 300 Feet

DATE	REV	DRWN	INT	CHKD	INT	APPR	INT
11/18/96		HFP		BW			

FIGURE
2-1



LEGEND

TS01	TRENCH NUMBER
▬	TRENCH LOCATION
TP01	TEST PIT NUMBER
●	TEST PIT LOCATION
MW01	MONITORING WELL NUMBER
⊕	MONITORING WELL LOCATION

NOTES

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5. PROJECT NUMBER 314790001
6. FILE :g:\midway\ri\bulkwast.apr 1-17-97

SOURCES

PERRY ASSOCIATES INC., HOWARD LAWSON & ASSOC.
US S. NAVAL STATION, MIDWAY ISLAND, DWG NO.: #1038656, #1038657

TITLE

TRENCH AND TEST PIT LOCATIONS
BULKY WASTE LANDFILL
NAF MIDWAY ISLAND

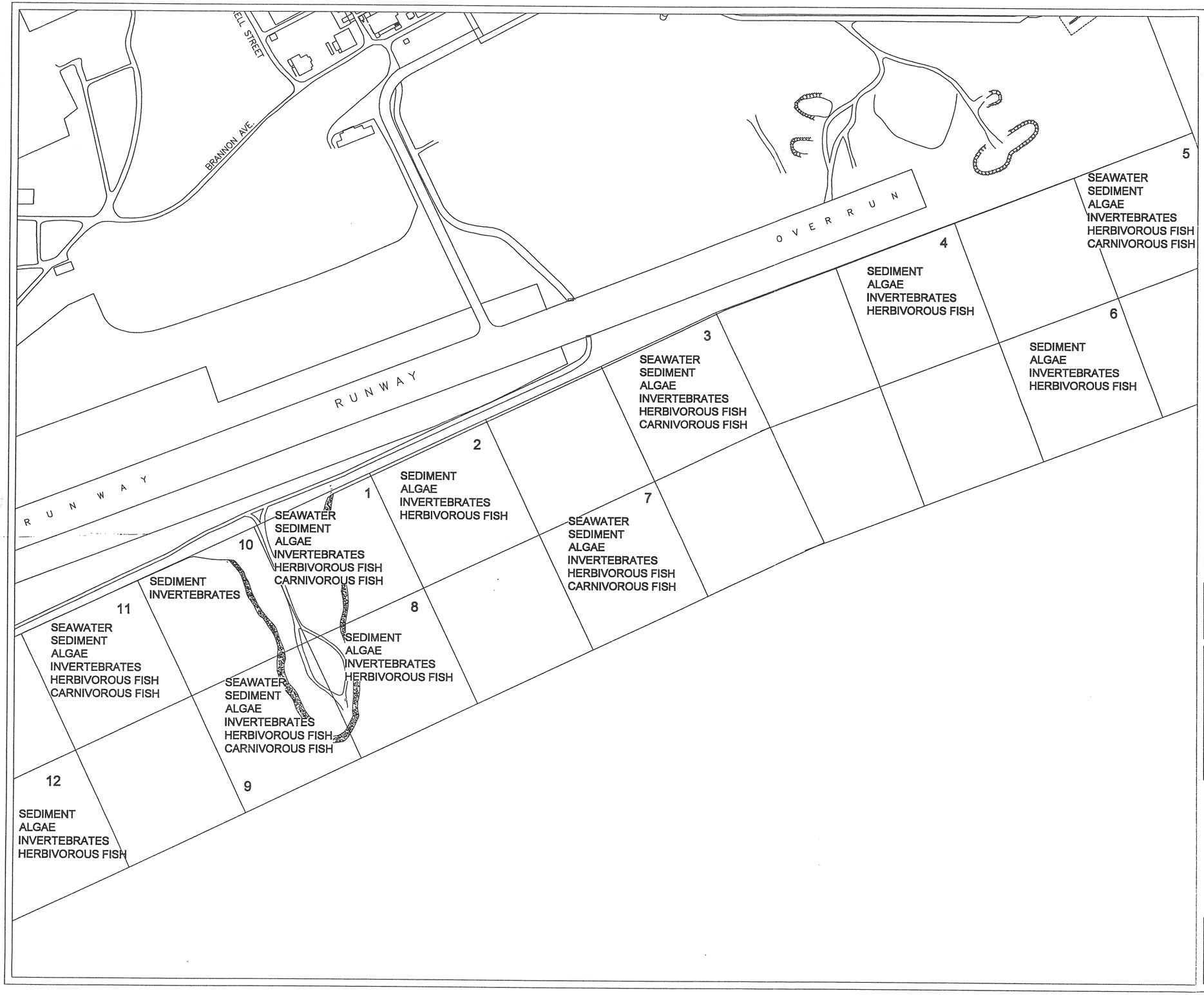
N

100 0 100 200 300 Feet

DATE	REV	DRWN	INT	CHKD	INT	APPR	INT
11/18/96		HFP		BW			

FIGURE

2-2



LEGEND

MARINE SAMPLE GRID

OUTFALL

1 GRID NUMBER

NOTES

1. THE ACCURACY OF THIS DOCUMENT IS LIMITED TO THE QUALITY OF THE SOURCE INFORMATION AND IS NOT SUITABLE FOR MAPPING ENGINEERING APPLICATIONS AND IS NOT TO BE USED FOR "AS BUILT"
2. HORIZONTAL CONTROL POINT ESTABLISHED BY USNS ON SITE WAS USED AS BASIS OF DRAWING
3. VERTICAL CONTROL WAS BASED ON BM#11 WITH AN ELEVATION OF 8.52 FEET (MLLW)
4. PLANE COORDINATE SYSTEM FOR SAND AND EASTERN ISLANDS, ES-217, DRAWING NO.: SUR-6, USNS MIDWAY ISLAND
5. PROJECT NUMBER: 110190136
6. FILE : G:\MIDWAY\RI\01179701.DWG DATE: 1-17-97

SOURCES

PERRY ASSOCIATES INC.,
U. S. NAVAL STATION, MIDWAY ISLAND
DWG. #1038656 DWG. #1038657

TITLE

MARINE SAMPLING GRID AND SAMPLES COLLECTED LANDFILLS NAF MIDWAY ISLAND

N

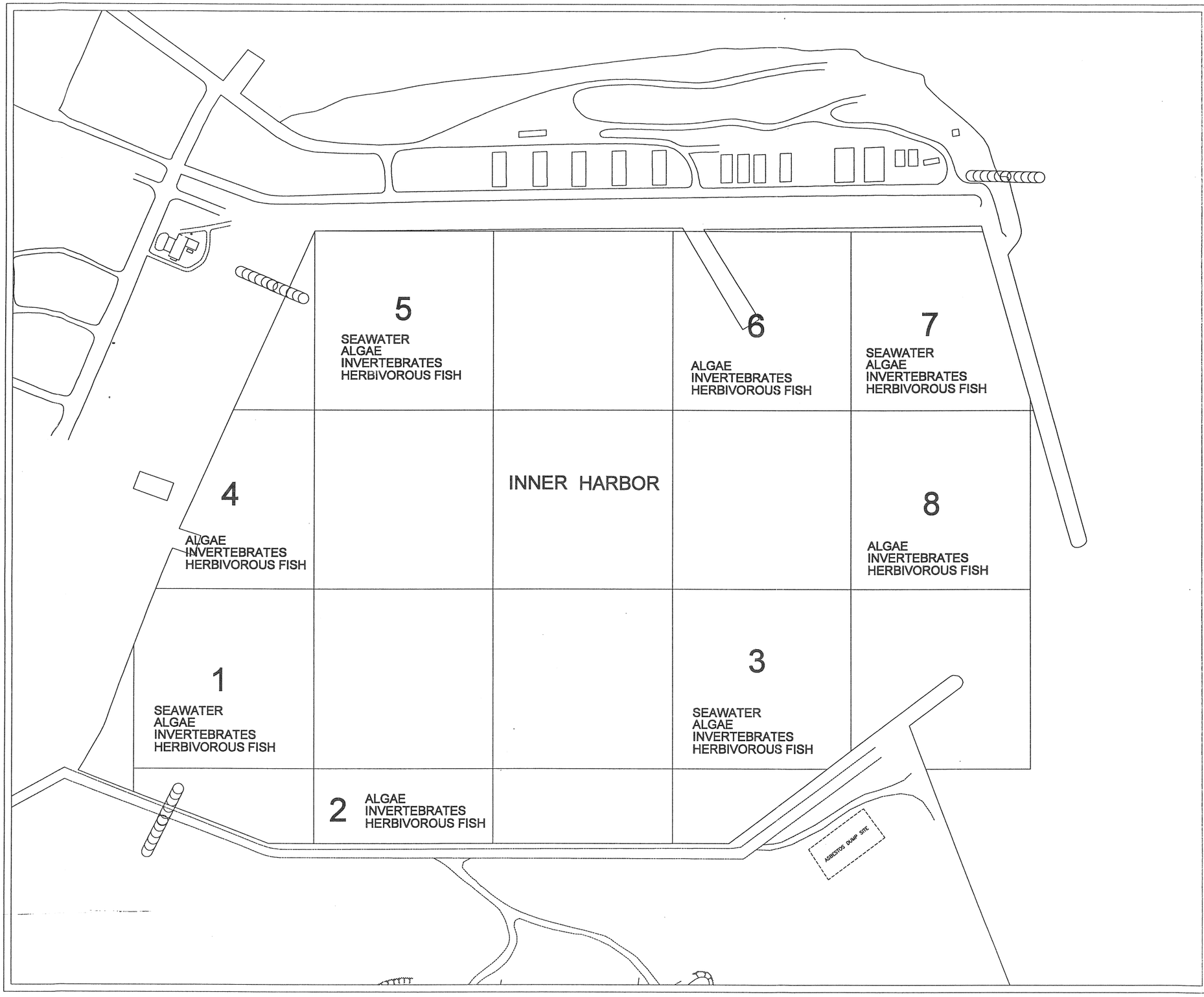
FEET

250 0 500 1000

DATE	REV	DRWN	INIT	CHKD	INIT	APPR	INIT
5-29-96		HFP		BW		JMC	
1-17-97		HFP		BW		JMC	

FIGURE

2-3



LEGEND

MARINE SAMPLE GRID

OUTFALL

1 GRID NUMBER

NOTES

1. THE ACCURACY OF THIS DOCUMENT IS LIMITED TO THE QUALITY OF THE SOURCE INFORMATION AND IS NOT SUITABLE FOR MAPPING ENGINEERING APPLICATIONS AND IS NOT TO BE USED FOR "AS BUILT"
2. HORIZONTAL CONTROL POINT ESTABLISHED BY USNS ON SITE WAS USED AS BASIS OF DRAWING
3. VERTICAL CONTROL WAS BASED ON BM#11 WITH AN ELEVATION OF 8.52 FEET (MLLW)
4. PLANE COORDINATE SYSTEM FOR SAND AND EASTERN ISLANDS, ES-217, DRAWING NO.: SUR-6, USNS MIDWAY ISLAND
5. PROJECT NUMBER: 110190136
6. FILE : G:\MIDWAY\RI\01139718.DWG DATE: 1-14-97

SOURCES

PERRY ASSOCIATES INC.,
U. S. NAVAL STATION, MIDWAY ISLAND
DWG. #1038656 DWG. #1038657

TITLE

MARINE SAMPLING GRID AND SAMPLES COLLECTED INNER HARBOR NAF MIDWAY ISLAND

N

FEET

150 0 300 600

DATE	REV	DRWN	INIT	CHKD	INIT	APPR	INIT
5-29-96		HFP		BW		JMC	
1-14-97		JCS		BW		JMC	

FIGURE

2-4

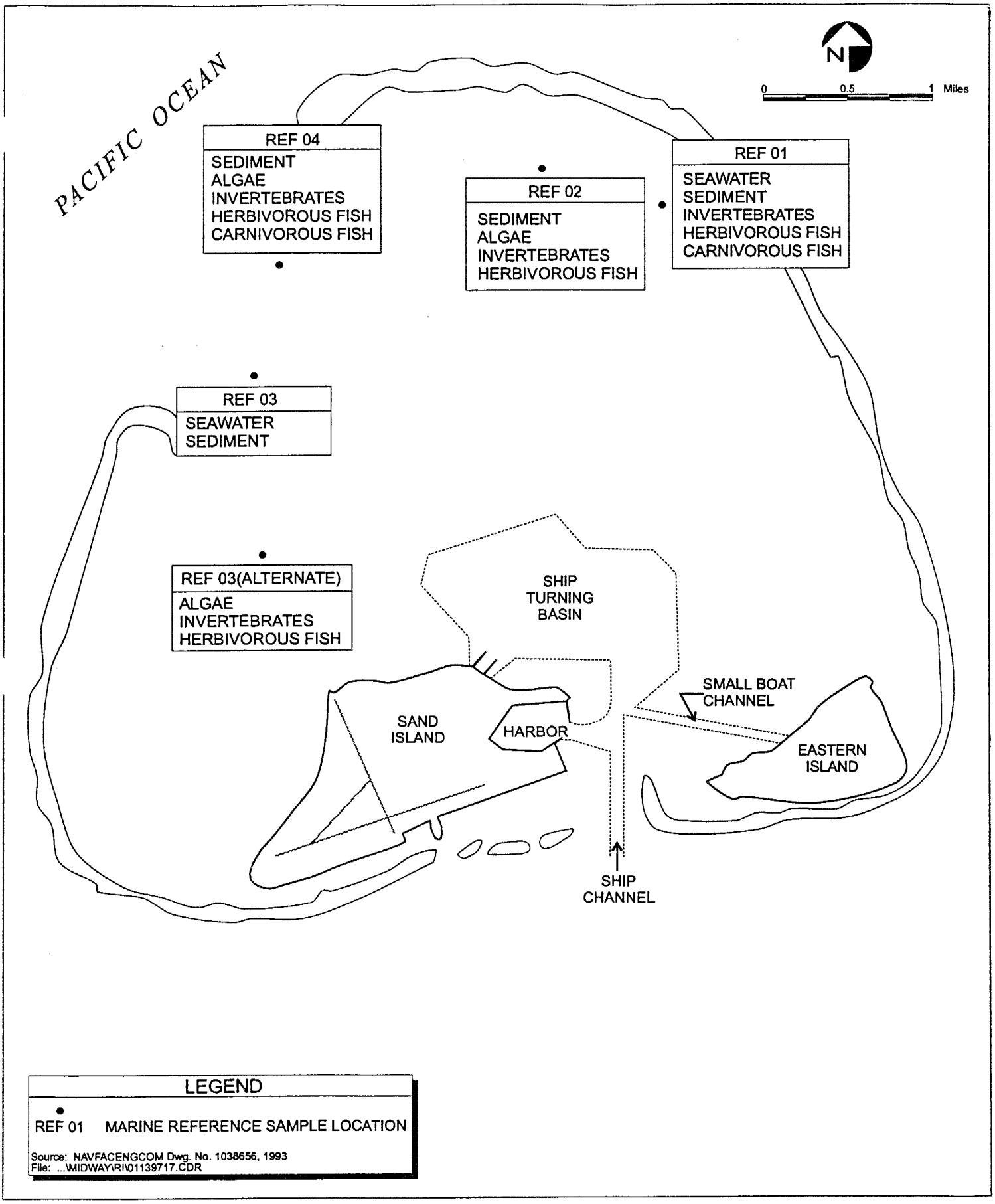


FIGURE 2-5

MARINE REFERENCE SAMPLE LOCATIONS AND SAMPLES COLLECTED NAF MIDWAY ISLAND

Section 3

SECTION 3
PHYSICAL CHARACTERISTICS

The following sections summarize the physical characteristics of the RI sites. The information presented was obtained from the current RI as well as previous investigations.

3.1 PHYSIOGRAPHY AND CLIMATE

Although no topographic map exists for Midway Atoll, a visual inspection indicates that the islands are generally flat and low lying. The only relief on Sand Island are low hills and dunes, none of which rise more than 45 feet above mean sea level (MSL) and many of which are man-made. The average elevation of Sand Island is approximately 10 feet above MSL.

Because of its low profile and small size, Midway Atoll has no effect on its own climate; rather the climate is that of the surrounding ocean environment. The mean monthly temperature ranges from 65°F to 78°F, with a mean annual temperature of 72°F. The mean relative humidity is 76 percent. The mean annual rainfall is 42 inches (PACNAVFACENGCOM 1985).

East-northeasterly trade winds, averaging about 10 knots, predominate from March through November, and are generally accompanied by fair weather. From November through February, the weather can be quite variable, ranging from southwesterly winds accompanied by rain and squalls, to gale-force northwesterly winds. Midway lies well north of normal hurricane areas and has not been struck by a hurricane in recorded history (PACNAVFACENGCOM 1985).

3.2 TERRESTRIAL ENVIRONMENT (SITE 01)

Site 01, the BWLF, is a man-made peninsula and groin first built in the late 1950s to protect the south shoreline of the Sand Island runway from erosion. As the peninsula grew seaward by the dumping of trash, bulky metal wastes, salvaged vehicles, construction debris, and scrap material, a beneficial effect of reduction of strong cross-lateral currents in the ship entrance channel (Figure 1-1) was noticed. Beginning in about 1969 the landfill was extended all the way to the fringing reef (PACNAVFACENGCVOM

1969). By 1985, the landfill was approximately 1,000 feet long, by 300 feet wide, by 23 feet high. Runway 6-24, located north of the landfill, was out of compliance with Navy regulations because obstructions within 750 feet of the runway center line are prohibited. In 1985, the Navy received approval to level and grade the landfill. As a result, the landfill was lengthened and widened and concrete rip-rap was placed around the three sides of the landfill exposed to the ocean.

Flammable materials such as gasoline, off-specification fuels (JP-5, motor gasoline [MOGAS], etc.), sludge from the cleaning of active fuel storage tanks, waste oil, kerosene, and non-halogenated cleaning solvents were formerly burned in a partially buried, 15-foot diameter by 10-foot deep steel burn tank located at the southern end of the BWLF. Other burning operations were conducted periodically at the BWLF to incinerate wooden debris and vegetation. The burn tank was removed by the Navy Remedial Action Contractor (RAC) in late 1995 and the BWLF was operationally closed in March 1996.

3.2.1 Topography

The BWLF is an artificial peninsula about 1,210 feet long and 320 feet wide, extending from the south side of Sand Island adjacent to Runway 6-24. The Site is protected from the sea by a concrete rip-rap barrier, and is approximately level with the adjacent runway at 4 to 7 feet above MSL.

3.2.2 Geology, Soils , and Hydrogeology

During the 1994 SI field investigation, four exploratory geologic soil borings were drilled to depths of 15 to 16 feet bgs and completed as monitoring wells. A fifth monitoring well was completed in the northeast corner of the site in 1995. Information on the deeper subsurface can be found in the SI report (Ogden 1996b). During the RI, 20 trenches and 26 test pits were excavated to a depth of 4 to 6 feet bgs for collecting subsurface soil samples. A description of the subsurface soils and materials observed in the trenches and test pits, follows.

Because the BWLF is a man-made peninsula, all material encountered was fill. The lithology from the ground surface to approximately six feet bgs is calcareous sand, well sorted, fine- to medium-grained, pale yellow (Munsell color 2.5Y 7/3), dry, loose, and subrounded to rounded. In several of the trenches brownish gray sand was encountered

from two to four feet bgs. During trenching, miscellaneous landfill debris were observed, including copper wire, steel piping, sheet metal, auto parts, housing material, decomposed drums, wood, and glass. Geologic trench logs and a cross section of each trench are presented in Appendix A.

Ground water observed in the five monitoring wells installed at the BWLF exists under unconfined conditions within the calcareous sand formation. The observed water table level in the five wells ranged from 0.69 to 1.22 feet above mean low low water (MLLW), or 4 to 5 feet bgs. The ground-water table was observed to vary in response to tidal fluctuations.

A dye trace study was conducted from November 1995 through January 1996 at the BWLF (Ogden 1996c). Hydrogeologic and tidal monitoring data were collected at this time to evaluate the ground-water gradient and elevations. Tidal variations in ground-water levels were averaged to calculate a mean hydraulic gradient, where the mean (time-averaged) gradient is a function of the difference between the mean hydraulic head in the wells and the mean tide along the shoreline. The gradient was calculated to be 0.0006 feet (ft)/ft generally in a seaward direction. The hydraulic conductivity (K) was estimated based on tidal lag and tidal efficiency. The average K estimated by this method was 17.0 ft/day. Using this value, an average ground-water pore velocity was calculated at 0.04 ft/day.

3.3 MARINE ENVIRONMENT (SITES 01, 02, 08, 99)

The marine investigations were divided into two areas. One area extends along the BWLF and the RLF (Sites 01 and 02). This area is collectively referred to as the Landfill Sites (Figure 2-3). The second area is referred to as the Inner Harbor (Figure 2-4), which includes the two sites in the Inner Harbor (Sites 08 and 99). The characteristics of the marine environment at these sites are briefly described below.

3.3.1 Landfill Sites (Sites 01, 02)

The marine environment on the eastern side of the BWLF peninsula differs considerably from that on the western side. The eastern side of the peninsula is characterized by the presence of a large amount of debris. Potentially hazardous material containing debris (intact drums, cylinders, vehicle engines and chassis, etc.) was removed by the Navy RAC

contractor in August 1996, prior to the initiation of marine sampling activities (OHM 1996a). A small tug boat and barge are grounded at the eastern shoreward corner of the peninsula. Numerous deteriorated drums, vehicle parts and other debris are located within 100 yards (yds) east of the shoreward two thirds of the peninsula. The natural substrate on the eastern side includes areas of sand, scattered coral rubble on sand, patches of coral rubble, and small areas of flat limestone pavement with scattered heads of the coral *Pocillopora meandrina.*

In contrast, few debris were present on the sea floor on the western side of the peninsula. The inshore area on the western side is covered nearly 100 percent by sand with a few limestone rocks that supported a thick layer of the tube-building polychaete *Pseudopolydora* sp. The bottom of the offshore area is composed of flat limestone pavement, reef, and coral rubble.

The marine environment along the south shore of the RLF is bordered by sheetpiling exposed to the sea and swells. Metal debris of varying size was observed all along the south side of the landfill close to the sheetpiling. Sand with patches of hard substrate occurs near the sheetpiling, while large sand areas predominate further away. There are scattered patch reefs between the sheetpiling and the outer atoll reef.

3.3.2 Inner Harbor Sites (Sites 08, 99)

The Inner Harbor is about 2,000 feet long (east-west) and 1,500 feet wide (north-south) (Figure 1-3). The central portion is approximately 35 feet deep. The sea floor in this area consists of fine silt and clay. Since the Inner Harbor is man-made, it constitutes a disturbed environment. Potentially hazardous material containing debris (batteries, intact cylinders, vehicle engines and chassis, etc.) was removed from the Inner Harbor by the Navy RAC contractor in August 1996, prior to the initiation of marine sampling activities (OHM 1996a).

The substrate was comprised of 50 percent sand and 50 percent rubble mixed with sand, with coral rubble and outcroppings. The substrate was located in a 50-foot wide band along the quay wall (depth from about 10 to 16 feet). Approximately 50 feet away from the seawall, the bottom sloped steeply into the harbor reaching a depth of about 35 feet.

Small amounts of various types of metal debris were scattered around the perimeter of the entire harbor. A seawater intake pipe from the abandoned power plant (Site 08) and an old sewer line (Site 25 outfall 6) are located in the northwestern and southwestern ends of the Inner Harbor, respectively (Figure 2-4). The northern side of the Runway Landfill (Site 02) borders the Inner Harbor.

3.4 NATURAL RESOURCE FEATURES

3.4.1 Terrestrial Environment

The BWLF is sparsely vegetated with non-native herb habitat dominated by golden crown-beard (*Verbesina encelioides*) with some small ironwood trees (*Casuarina equisetifolia*) in the central western portion of the peninsula. Small areas of disturbed habitat, coastal strand vegetation, and sandy beach are also found on, or adjacent to, the Site.

Several migratory bird species commonly nest onsite including Laysan albatross (*Diomedea immutabilis*), black-footed albatross (*Diomedea nigripes*), red-tailed tropicbird (*Phaethon rubricauda*), Bonin petrel (*Pterodroma hypoleuca*), wedge-tailed shearwaters (*Puffinus pacificus*), and the Pacific golden-plover (*Pluvialis fulva*). White terns (*Gygis alba*) are often seen gliding over the landfill. Due to the exposed nature of the landfill, seabird nesting densities are lower here than on most open habitat on island.

3.4.2 Marine Environment

Landfills

The marine environment on the eastern side of the BWLF has a diverse marine community. Large schools of small fish, primarily Hawaiian flagtail (*Kuhlia sandvicensis*), swam in the area around the sunken barge. The rip-rap areas had moderate densities of territorial Pacific damselfish (*Stegastes fasciolatus*) and several species of surgeonfish including convict tang (*Acanthurus triostegus*), whitebar surgeonfish (*A. leucopareius*), and bluelined surgeonfish (*A. nigroris*). The sand and coral rubble areas away from the rip-rap had occasional schools of several species of goatfish and butterflyfish. A filamentous brown alga (*Giffordia breviarticulata*) was common on the rip-rap. The small brown algae (*Dictyota* sp.) and the calcareous green alga (*Halimeda opuntia*) were also observed in limited numbers along the eastern side of the landfill. Common invertebrates encountered were the small polychaete *Pseudopolydora* sp.; its sand-covered

tubes formed a thick turf on hard substrate in the inshore area. Small heads of the corals *Pocillopora meandrina* and *P. damicornis* occurred occasionally on hard substrate in the area. The most abundant invertebrate was the sea urchin *Echinometra mathaei.*

The western side of the BWLF and along the southern side of the RLF was more sparsely inhabited than the eastern side of the BWLF. Small heads of the coral *Pocillopora damicornis* were present but the most common invertebrate was the sea urchin *Echinometra mathaei.* Common algal species present away from the rip-rap were brown alga *Padina* spp. and the calcareous green alga *Halimeda opuntia.* In deeper water, patches of *Dictyota* sp. were common. Fish were found primarily along the rip-rap and over the offshore reef areas. Most commonly encountered were several species of surgeonfish, Pacific damselfish, sea chubs (*Kyphosus* spp.), and flagtails (*Kuhlia* spp.) near the rip-rap, reefs, and seawall, and yellowstripe goatfish (*Mulloidichthys flavolineatus*) over the sand. Hawaiian monk seals (*Monachus schauinslandi*) and green sea turtles (*Chelonia mydas agassizi*) were often observed all around the Landfills Site.

Inner Harbor

Within the harbor, more species of corals (*Pocillopora damicornis*; *P. meandrina*; *Porites compressa*; *P. lobata*) were present on the eastern portion of the quay wall, than at the western portion of the harbor. The attached bivalve *Chama iostoma* and the sea urchin *Echinometra mathaei* were on the quay wall at both locations. Adjacent to the coral rubble and debris zone and away from the quay wall, dense beds of the seagrass *Halophila ovalis*, the green alga *Caulerpa* sp., and the small brown alga *Dictyota* sp. were common. The soft substrate in this area was characterized by numerous burrows probably inhabited by snapping shrimp (alpheids) and mantis shrimp (stomatopods).

The most common fish observed within the harbor were hawkfish (*Cirrhitops* spp.), damselfish (*Dascyllus* spp., *Stegastes* spp.), moray eel (*Gymnothorax* spp.), gobies (*Psilogobius* spp.), and wrasse (*Thalassoma* spp.). Pacific green sea turtles were observed on numerous occasions throughout the harbor.

3.4.3 Sensitive Habitats

Terrestrial

Along the coastal strand of Sand and Eastern Islands dune-building plant species (naupaka [*Scaevola sericea*] and tree heliotrope [*Tournefortia argentea*]) have been substantially

reduced. Shading from ironwoods and grazing by herbivorous rats have had a major impact on this community. When dune-binding plants are eliminated, beach erosion usually increases. A coastal strand community, subject to erosion, exists to the west of the BWLF.

Marine

Under the Endangered Species Act (ESA), all of Midway Atoll, except Sand Island and its harbor, are designated critical habitat for Hawaiian monk seals. This applies to "all beach areas, sand spits and islets, including all beach crest vegetation to its deepest extent inland, lagoon waters, inner reef waters, and ocean waters out to a depth of 20 fathoms."

3.4.4 Sensitive Wildlife

Terrestrial

Wildlife represented on Midway Atoll include seabirds that are federally protected under the ESA or Migratory Bird Treaty Act (MBTA). Most nest directly on the ground. Migratory bird species known or expected to be present at the BWLF, including Laysan albatross, black-footed albatross, red-tailed tropicbird, Bonin petrel, wedge-tailed shearwaters, and the Pacific golden-plover.

Marine

Threatened green sea turtles and the endangered Hawaiian monk seal are known to frequent the waters of both the Landfill Sites and the Inner Harbor. Seals have been observed hauled out on the beach to the west of the BWLF, as well as on the boat ramp of the Inner Harbor.

Endemic to the Hawaiian Island archipelago, endangered Hawaiian monk seals are found at Midway in small numbers throughout the year. The seals forage in shallow water around the islands, haul out on sandspits and beaches around the atoll, and pup on permanent sand islets or beaches above high tide. A recent population estimate for Necker, Nihoa, and Midway Atolls combined is 131 individuals (Ragen 1993). The seal population at Midway was found to have declined significantly from previous years, and shows no signs of recovery (Ragen 1993).

Section 4

SECTION 4
NATURE AND EXTENT OF CONTAMINATION

This section presents the results of laboratory analyses of the subsurface soil and ground-water samples collected from the terrestrial environment, and of the seawater, sediment, and tissue samples collected from the marine environment. The analytical results are keyed to the sample identification system described in Section 2.4. Undetected concentrations in all tables are represented by the sample quantitation limit (SQL). For summary figures in this section, undetected sample concentrations were included in the sum as one half the SQL. The tables in Appendix D summarize the complete analytical data packages from the Ceimic laboratory for the soil samples. Appendix E contains tables from the Arthur D. Little laboratory, summarizing the low-level analyses. Validation reports for all analytical data are presented in Appendix F.

4.1 SUMMARY OF ANALYTICAL RESULTS - TERRESTRIAL INVESTIGATIONS

Analytical results for SVOCs, pesticides, and PCBs in soil are summarized in Table 4-1. Table 4-2 summarizes the results of soil samples screened for PCBs using Ohmicron® field test kits. The table presents concentrations detected in three ranges: less than 0.5 milligrams (mg)/kilogram (kg), 1.0 to 25.0 mg/kg, and 25.0 to 100.0 mg/kg. The field test kits were calibrated to an Aroclor-1254 standard. The results of analyses for SVOCs, pesticides, and PCBs in ground water are summarized in Table 4-3. These three tables present the results by laboratory method and analyte, and list the total number of samples collected, the number of samples with detected concentrations, the number of samples rejected during data validation, the minimum and maximum concentrations detected, and the Ogden sample ID for the sample with the maximum detected concentration.

4.1.1 Subsurface Soils

Forty-one subsurface soil samples and four duplicate samples were collected from the BWLF. Subsurface soil sampling was used to identify potential sources of contamination that may pose a risk to seabirds.

4.1.1.1 Semi-volatile Organic Compounds

SVOCs were detected in less than two-thirds of the soil samples (Figure 4-1). Fluoranthene and pyrene were the SVOCs most commonly detected. Moreover, these SVOCs were detected at the highest concentrations, 19,000 micrograms (µg)/kg for each analyte, at trench location TS03S01 (Table 4-1). The majority of the maximum SVOC concentrations were reported in TS03. In general, concentrations in the other trenches were lower than those in trench TS03. The geometric mean concentration for each SVOC was less than 1,000 µg/kg.

4.1.1.2 Organochlorine Pesticides

The most frequently detected organochlorine pesticides were 4,4'-DDT, 4,4'-DDE, and 4,4'-DDD (Figure 4-2). A maximum concentration of 400 µg/kg of 4,4'-DDD was detected at trench location TS03 (Table 4-1). A maximum concentration of 480 µg/kg of 4,4'-DDE was detected at trench location TS01 (Table 4-1). A maximum concentration of 890 µg/kg of 4,4'-DDT was detected at trench location TS03 (Table 4-1). With the exception of DDT and its metabolites, organochlorine pesticides were detected in fewer than 40 percent of the samples. The geometric mean concentration for each pesticide was less than 10 µg/kg.

4.1.1.3 PCBs

PCBs were reported in concentrations ranging from non-detect to 19,000 µg/kg (Figure 4-2). Thirty-nine samples reported PCB concentrations above 100 µg/kg; 1 sample contained Aroclor-1248, 4 samples contained Aroclor-1254, and 34 samples revealed Aroclor-1260. The maximum concentration of Aroclor-1260, 19,000 µg/kg, was detected in a soil sample taken from test pit location TP11 (Table 4-1). The maximum concentration of Aroclor-1254, 3,200 µg/kg, was detected at trench location TS01S01 (Table 4-1). The geometric mean for Aroclor-1260 onsite was less than 600 µg/kg.

Concentrations of Aroclor-1260 varied throughout the Landfill as shown by the Thiessen polygons in Figure 4-3. The highest concentrations of Aroclor-1260 were identified in the northern half of the landfill. Thiessen polygons are created by connecting every sample point to its nearest neighbor and then bisecting those lines at 90°. These bisecting lines are connected at the points where they intersect thus creating polygons. The polygons

estimate area-distributed concentration ranges, concentrations ranges that are represented by different colors.

4.1.1.4 Field Test Kit Results

Forty-four soil samples and three duplicate samples were collected from the trenches, and 32 soil samples and one duplicate sample were collected from the test pits for testing using Ohmicron® immunoassay field test kits. The kit detected total PCB concentrations (calibrated to Aroclor-1254) in three ranges (see Table 4-2). One sample and one duplicate sample from Test Pit 11 reported concentrations greater than 25 mg/kg at (31.6 and 27 mg/kg, respectively). These samples were homogenized, split and shipped to the offsite laboratory for confirmation analysis. The offsite laboratory reported confirmation sample concentrations for Aroclor-1260 at 19 mg/kg and Aroclor-1248 at 1.4 mg/kg (Table 4-1). Sixteen field test kit samples contained PCB concentrations between 1.0 and 25 mg/kg (maximum 4.64 mg/kg). Eight samples contained concentrations between 0.5 and 1.0 mg/kg. The remaining samples contained less than the 0.5 mg/kg detection limit (Table 4-2).

4.1.2 Ground Water

Five ground-water samples, and one duplicate sample were collected from the five existing monitoring wells at the BWLF. The cooler containing the duplicate sample was lost by the overnight shipper while in transit to the analytical laboratory. All other samples arrived intact.

4.1.2.1 Semi-volatile Organic Compounds

Twenty-four of the 41 SVOC target compounds tested for in ground water were found in each well (Figure 4-4). Naphthalene and its alkyl-substituted forms were present in the highest concentrations, 1.5 micrograms per liter (µg/L) and 7.6 µg/L, in Monitoring Wells 3 and 4, respectively (Table 4-3).

4.1.2.2 Organochlorine Pesticides

The organochlorine pesticides, 2,4'-DDD and 4,4'-DDD were the most frequently detected pesticide. They were detected in greatest concentrations in Monitoring Wells 4 and 5 (Figure 4-5). DDT was not detected in the ground-water samples analyzed. The

maximum pesticide concentration, 0.098 µg/L for 4,4'-DDD, was detected in Monitoring Well MW05 (Table 4-3). Detected concentrations of other pesticides were less than 0.05 µg/L (Table 4-3). In general, the pesticide concentrations detected in the ground-water samples collected during the 1996 RI were lower than the concentrations detected during the 1994 SI. In most of the wells, the concentrations of DDE and DDD found in 1996 were approximately one half the concentrations found in 1994 (concentrations decreased the most in the wells with the highest concentrations in 1994).

4.1.2.3 PCBs

PCB congeners 138, 153, and 180 were detected in all five of the wells, usually at concentrations less than 0.005 µg/L (Figure 4-6). The maximum PCB congener concentration, 0.02 µg/L for PCB-138, was detected in Monitoring Well MW04 (Table 4-3). The 1996 concentrations of PCB-138, PCB-153, and PCB-180 were generally one-half to one-tenth of the concentrations reported in the same wells in 1994. The greatest change occurred in Monitoring Well MW04, where the concentrations of PCB-138, PCB-153, and PCB-180 moved from 0.17 µg/L, 0.20 µg/L, and 0.16 µg/L in 1994 to 0.022 µg/L, 0.0081 µg/L, and 0.0027 µg/L in 1996, respectively.

4.2 Summary of Analytical Results - Marine Investigations

Marine sediment, seawater, and tissue samples were collected from the Landfills Site, Inner Harbor, and reference locations in the atoll lagoon. Marine samples were analyzed only for organochlorine pesticides and PCBs (20 congeners). No samples of sediment or carnivorous fish were collected from the Inner Harbor. Sample locations are presented in Section 2.2.

Tables summarizing the analytical data for each site and each medium/species are referenced below. Total PCB concentrations at each sample location were calculated by adding the concentrations of the 20 PCB congeners together using one half the SQL for undetected congeners. In the summary tables, data from the reference sites is summarized adjacent to the onsite data for each media/species. These tables list, by laboratory method and analyte, the total number of samples collected, the number of samples containing detected concentrations, the number of samples rejected during data validation, the minimum and maximum concentration detected, and the Ogden sample ID corresponding to the maximum detected concentration. The geometric mean of analyte concentrations

detected in at least one of the reference samples for each media is also presented. Undetected concentrations for samples in the same media were included in the geometric mean calculation at one half the SQL. All marine samples were analyzed by Arthur D. Little, Inc., in Cambridge, Massachusetts.

4.2.1 Reference Sites

Sediment, seawater, and tissue samples were collected from four reference sites in the atoll lagoon and analyzed for organochlorine pesticides and PCBs using low-detection level techniques (Figure 2-5). 2,4'-DDE and PCB-138 were the only analytes detected in the sediment samples (Figure 4-7). 2,4'-DDE was detected in one sample at 0.13 µg/kg, while PCB-138 was detected in all of the samples at a maximum concentration of 0.076 µg/kg (Table 4-4).

Hexachlorobenzene, which was detected at a concentration of 0.00017 µg/L at Reference Location 3, was the only contaminant detected in seawater at the reference sites (Figure 4-8). Total PCB concentrations in seawater, sediment, and tissue samples are illustrated in Figure 4-9. Reference analytical data for seawater, sediment, and tissue concentrations are summarized in Tables 4-4 through 4-15 and are compared to the concentrations detected in the samples from the Landfills and Inner Harbor Sites.

4.2.2 Landfills Site

Marine sediment, seawater, and tissue samples were collected from the grid locations illustrated in Figure 2-3. These samples were analyzed for organochlorine pesticides and PCBs.

4.2.2.1 Marine Sediment

Organochlorine Pesticides

Twelve sediment samples were collected from the Landfill Site. Twelve organochlorine pesticides were detected in these samples. With the exception of lindane, the maximum concentration for all pesticides occurred in Grid 01 (Table 4-4). DDT, DDE, and DDD were detected at the highest concentrations of any of the target analytes. The maximum concentration of 4,4'-DDE detected in Landfill sediments was 9.00 µg/kg at Grid 01, and the minimum concentration was 0.02 µg/kg at Grids 06 and 12 (Figure 4-10).

PCBs

All PCB congeners, except the two most toxic (PCB-77 and PCB-126), were detected in at least one of the sediment samples (Figure 4-11). Sample MS01 contained the maximum concentrations of all of the congeners with the exception of PCB-28, PCB-44, and PCB-209 (Table 4-4). All PCB concentrations detected in sediments exceeded those at the reference sites, where only PCB-138 was detected. The maximum total PCB concentration for Landfill sediments was 508.9 µg/kg at Grid 01; the minimum was 0.6 µg/kg at Grid 11.

The Thiessen polygons shown in Figure 4-12 indicate that concentrations of total PCBs decreased with increasing distance from the sheetpiling and the northeast corner of the BWLF. The pattern of Thiessen polygons depicting 4,4'-DDE concentrations is similar to the pattern for total PCBs (Figure 4-13).

4.2.2.2 Seawater

Six seawater samples were collected from within the odd-numbered grids at the Landfill Site. Hexachlorobenzene, PCB-18, PCB-153, PCB-180, and PCB-187 were the only target analytes detected in seawater samples onsite (Figure 4-14). Hexachlorobenzene concentrations were similar to those found at the reference sites (Table 4-5). The PCB congeners were each detected in one sample from Grids 01 and 09 (Figure 4-14). The maximum total PCB concentration for Landfill seawater was 0.0082 µg/kg at Grid 01. Total PCB concentrations were calculated by taking the sum of one-half the SQL for each of the 20 non-detected congeners.

4.2.2.3 Marine Tissue Samples

The concentrations of individual tissue types taken from the Landfill Site are discussed below. The analytical results of analyses for organochlorine pesticides and PCBs in tissues are summarized by species in Tables 4-6 to 4-12.

4.2.2.3.1 Algae

Two species of algae were collected at the Landfill Site. Because the brown algae (*Dictyota* sp.), which was collected at most locations, did not occur in amounts sufficient for collection at the grids located adjacent to the BWLF (Table 4-6), a filamentous green

algae (*Halimeda opuntia*) was collected at these locations (Table 4-7). Twelve algae samples were collected from the Landfill Site, with no sample collected at Grid 10 and both algal species collected at Grid 01. Total PCB concentrations were calculated for both species.

The maximum total PCB concentration found in Landfill algae was 819.32 µg/kg (brown algae) at Grid 01; the minimum concentration was 8.6 µg/kg (green algae) at Grids 11 and 12. In general, analyte concentrations found in green algae were lower than those found in brown algae. Total PCB concentrations at Grid 01 were 819.3 µg/kg for brown algae and 208.1 µg/kg for green algae.

Although analyte concentrations in algae were found to differ by species, in general, total PCB and 4,4'-DDE concentrations nonetheless decreased with increasing distance from the northeast corner of the BWLF (Figures 4-15 and 4-16). However, the fourth highest concentration was observed in samples obtained from Grid 06, which is the grid most distant from the northeast corner of the BWLF. PCB congeners patterns in the algae samples differ from those found in other tissue and sediment samples. Specifically, the most toxic congeners, PCB-77, PCB-126, and PCB-105, were detected in several algae samples, but only rarely in the other media. Also, the two most commonly detected congeners in other media, PCB-138 and PCB-153, were detected only rarely in the algae samples.

Tissue samples of both algae species revealed concentrations of total PCB and 4,4'-DDE, as well as most other analytes, higher than those found in samples of sea urchin tissue (Figure 4-15 and 4-16). The concentrations of these analytes in algae were lower than those detected in both herbivorous and carnivorous fish samples.

4.2.2.3.2 Invertebrates

Several types of invertebrate samples were collected during the RI. Sea urchins were collected at every grid location. Additionally, three samples of sea cucumber (*Holothuria* sp.) were collected at Grids 08, 09, and 10, and one octopus (*Octopus* sp.) sample was collected at Grid 05. Tables 4-8, 4-9, and 4-10 summarize the analytical data for these samples.

The sea cucumber and octopus samples contained concentrations of analytes higher than those found in the urchins. However, because these two species are neither abundant nor ubiquitous across the sites, spatial comparisons cannot be made (Tables 4-8, 4-9, and 4-10). The octopus and sea cucumber data were included with the sea urchin data for use in the exposure models in the BERA (see Section 7). Only the sea urchin data are shown in Figures 4-15 and 4-16.

PCBs

The maximum total PCB concentration reported in sea urchins was 240.3 µg/kg in Grid 01, followed by 196.7 µg/kg in Grid 02 (Figure 4-15). Total PCB concentrations in sea urchins followed the same pattern of concentrations found in the sediment, i.e., the highest concentrations were found near the northeast corner of the BWLF, with concentrations decreasing as the distance from the sheetpiling and from the corner increased (Figure 4-15). PCB-138 and PCB-153 were detected most often and at the highest concentrations, 51 µg/kg and 67 µg/kg, respectively, of any of the congeners in sea urchin tissues (Table 4-10).

Organochlorine Pesticides

Twelve of the target pesticides were detected in sea urchin tissues. Mirex and lindane concentrations were comparable to those found in the reference sea urchins (Table 4-10). The highest pesticide concentrations were 2,4'-DDD, 4,4'-DDE, and 4,4'-DDD at 6.7 µg/kg, 11 µg/kg, and 2.1 µg/kg, respectively. Concentrations of 4,4'-DDE decreased as the distance from the northeast corner of the BWLF grew (Figure 4-16). The sea urchin samples exhibited the lowest analyte concentrations of organochlorine pesticides of all other tissue samples collected.

4.2.2.3.3 Herbivorous Fish

Eleven herbivorous fish samples were collected from the Landfill Site, one in each Grid, except for Grid 10, which had poor visibility. The Pacific damselfish (*Stegastes fasciolatus*) was the species of herbivorous fish sampled.

PCBs

When compared with tissue samples from other species, samples of herbivorous fish exhibited the highest concentrations of most target analytes (Table 4-11). The maximum total PCB concentration found in Landfill herbivorous fish was 42,383 µg/kg at Grid 01;

the minimum concentration of 40.4 µg/kg was found at Grid 12 (Figure 4-15). The total PCB concentrations decreased substantially with distance away from Grids 01 and 02. Samples collected in the grids away from the sheetpiling and on the west side of the BWLF had significantly lower PCB concentrations than those collected from Grids 01 and 02.

Organochlorine Pesticides

Sixteen pesticides were detected in herbivorous fish samples. Concentrations of most analytes were less than 10 µg/kg, with the exception of DDD, DDE, and DDT. The maximum 4,4'-DDE concentration for Landfill herbivorous fish was 320.0 µg/kg at Grid 01, with a minimum of 1.7 µg/kg at Grid 06 (Figure 4-16). 4,4'-DDE was detected in all 11 samples, with concentrations again decreasing away from Grids 01 and 02.

4.2.2.3.4 Carnivorous Fish

The yellowstripe goatfish (*Mulloidichthys flaviolineatus*) was the carnivorous fish sampled. Carnivorous fish samples were collected at odd-numbered grids only.

PCBs

The maximum total PCB concentration found in Landfill carnivorous fish was 19,370 µg/kg at Grid 01, with a minimum of 52.9 µg/kg at Grid 11 (Table 4-12). Congeners PCB-153, PCB-180, and PCB-187 contained the highest concentrations of any of the PCBs with 4,800 µg/kg, 4,800 µg/kg, and 2,800 µg/kg, respectively (Table 4-12). Goatfish are more mobile and may swim to other parts of the site to feed, while damselfish are site tenacious, farming algae in one area. This may explain why total PCB concentrations for carnivorous fish are lower than those for the herbivorous fish (Figure 4-15).

Organochlorine Pesticides

Fourteen pesticides were detected in carnivorous fish tissues (Table 4-12). Most of the pesticide concentrations were higher than those in reference samples. The maximum pesticide concentration was 230 µg/kg for 4,4'-DDE, at Grid 01. Concentrations of 4,4'-DDD were also elevated with a maximum detection of 140.0 µg/kg at Grid 01. Concentrations of 4,4'-DDE decreased away from Grid 01, with the lowest concentration observed at Grid 09 (Figure 4-16).

4.2.2.4 Temporal Variation in Marine Analytical Data

Analytical data collected during the 1996 RI were compared with analytical data from the previous 1994 SI. Figures 4-17 and 4-18 illustrate total concentrations of PCB and 4,4'-DDE observed during the 1994 and 1996 sampling events. Because some species collected for tissue analysis in 1994 differed from those collected in 1996, all of the tissue data are not directly comparable, for example, algae in Grids 01 and 10, invertebrates in Grids 1 and 10, and herbivorous fish in Grid 10. Nonetheless, Figures 4-17 and 4-18 suggest some general trends and can be used for approximate comparisons.

Total PCB concentrations in two of the three seawater samples collected in both investigations at the Landfills Site were unchanged except at Grid 01, where concentrations in 1996 were an order of magnitude lower than those observed in 1994 (Figure 4-17). PCB concentrations in sediment were slightly lower in 1996 than in 1994; the largest changes occurred in Grids 08, 09, 10, and 12 (Figure 4-17). Temporal variation in seawater concentrations may be due in part to the marine debris removal action conducted prior to sampling in 1996. That action focused on removing potential sources of contamination. The changes in PCB concentrations in sediment probably do not reflect the debris removal, because insufficient time had passed (1 month) to allow total PCB concentrations in sediment to decrease through insitu degradation.

Total PCB concentrations in tissue in 1996 were generally similar to, or slightly lower than, in 1994, with one notable exception: herbivorous fish tissues concentrations increased slightly from 37,738 µg/kg in 1994 to 42,384 µg/kg in 1996 (Figure 4-17). This 12 percent increase may be due either to sample variability or a longer period of time for bioaccumulation.

A comparison of 4,4'-DDE concentrations for 1996 with those from 1994 revealed that concentrations in 1996 had decreased in all sampled media except algae (Figure 4-18). Concentrations in algae in Grid 01 increased, possibly due to the different species collected. The brown algae (*Dictyota* sp.) and green algae (*Halimeda opuntia*) collected in 1996 contained 60 ug/kg and 5.6 ug/kg, respectively of 4,4'-DDE. The red algae (*Giffordia breviarticulata*) collected in 1994 at Grid 01 contained 2.3 ug/kg 4,4'-DDE. Changes in 4,4'-DDE concentrations were not as pronounced as those observed in total PCB concentrations.

4.2.3 Inner Harbor

Samples of seawater, invertebrates, algae, and herbivorous fish were collected from the sample grids in the Inner Harbor (Figure 2-4). Analytical data from these samples are summarized below.

4.2.3.1 Seawater

Four seawater samples were collected from odd-numbered grids within the Inner Harbor. Only hexachlorobenzene and PCB-209 were detected in these samples (Figure 4-19 and Table 4-13). Hexachlorobenzene was detected in all five samples at concentrations ranging from 0.00034 to 0.00045 µg/L (Figure 4-19). These values are within the same range as the reference values (Table 4-12). PCB-209 was only detected in Grid 05 at a concentration of 0.000051 µg/L (Figure 4-19).

4.2.3.2 Marine Tissue Samples

Algae (*Dictyota* sp.), invertebrates (sea urchins), and herbivorous fish (Pacific damselfish) were collected in all eight grids, with no species substitutions. All samples were analyzed for low-level organochlorine pesticides and PCBs. Figures 4-20 and 4-21 illustrate some of the concentrations detected in the various tissue samples.

4.2.3.2.1 Algae

PCBs

All PCB congeners were detected in Inner Harbor algae samples with the exception of PCB-44, PCB-66, and PCB-77 (Table 4-14). The maximum total PCB concentration in Inner Harbor algae was found at Grid 03, 145.2 µg/kg, with a minimum of 18.8 µg/kg at Grid 4 (Figure 4-20). The algae samples did not exhibit maximums at Grid 01 as did the invertebrate and fish tissues (Figure 4-20).

Organochlorine Pesticides

Seventeen organochlorine pesticides were detected in the algae samples. The highest detected concentrations were reported for 2,4'-DDT, endosulfan I, and heptachlor in Grids 01 and 03 (Table 4-14). The maximum concentration of 4',4' DDE found in Inner Harbor algae was 6.80 µg/kg at Grid 01; the minimum concentration was 0.15 µg/kg at Grid 04 (Figure 4-21). In general, concentrations of organochlorine pesticides in algae

were higher than those in invertebrates and lower than those in fish. However, the highest concentrations of organochlorines in algae were found in different locations than those containing the highest concentrations of these analytes in invertebrates or fish (Figure 4-20 and 4-21).

4.2.3.2.2 Invertebrates

PCBs

The same PCB congeners detected in the algae samples were detected in the invertebrate tissues, except that PCB-126 was not detected in invertebrates (Table 4-15). The maximum total PCB concentration for Inner Harbor invertebrates was 29.51 µg/kg at Grid 01, with a minimum of 14.95 µg/kg at Grid 07. In contrast to the wide variability observed in the algae and herbivorous fish data (Figure 4-20), total PCB concentrations in invertebrates were similar to all grids.

Organochlorine Pesticides

Sixteen pesticides were detected in invertebrate samples. 4,4'-DDD, 4,4'-DDE, and endosulfan I were detected at the highest concentrations, 2.5 µg/kg, 1.8 µg/kg, and 1.7 µg/kg, respectively. The maximum 4,4'-DDE concentration was reported from Grid 04, unlike the algae and herbivorous fish data, where the maximum occurred in Grid 01 (Figure 4-21). Grid 01 had the lowest 4,4'-DDE concentration, 0.3 µg/kg, for invertebrates in the Inner Harbor (Figure 4-21).

4.2.3.2.3 Herbivorous Fish

PCBs

All PCB congeners except PCB-77 and PCB-126 were detected in herbivorous fish samples (Table 4-16). The maximum total PCB concentration for Inner Harbor herbivorous fish was 7,637 µg/kg at Grid 01, with a minimum of 600.1 µg/kg at Grid 05 (Figure 4-20). Five of the eight samples had total PCB concentrations greater than 1,000 µg/kg (Figure 4-20).

Organochlorine Pesticides

Seventeen organochlorine pesticides were detected in herbivorous fish tissues. A few levels were only slightly elevated compared with those for the reference fish (Table 4-16). 4,4'-DDE, 4,4'-DDT, and 4,4'-DDD were detected at the highest concentrations, 120

µg/kg, 22 µg/kg, and 19 µg/kg, respectively. The maximum 4',4' DDE concentration for Inner Harbor herbivorous fish was 120 µg/kg at Grid 01 with a minimum of 36.0 µg/kg at Grids 03 and 05 (Figure 4-21).

4.2.3.3 Temporal Variation in Marine Analytical Data

Some analyte concentrations in fish and algae increased considerably between 1994 and 1996 (Figures 4-22 and 4-23). For example, the data for total PCB concentrations in damselfish were an order of magnitude higher than the same data for the manini (*Acanthurus triostegas*) collected in 1994 (Figure 4-22). The manini is more mobile than the Pacific damselfish however, and did not accumulate PCBs to levels found in damselfish. Total PCB concentrations did not change substantially for seawater and invertebrates between 1994 and 1996. The data for total PCBs in algae show that concentrations at some locations increased while others decreased between 1994 and 1996. This phenomenon may be due to sample variability (Figure 4-22).

The data for 4,4'-DDE in seawater did not change substantially (Figure 4-23). Concentrations of 4,4'-DDE in herbivorous fish seemed increased in 1996. This phenomenon, however, is probably due to the differences in site tenacity and accumulation rates between damselfish and manini. Concentrations of 4,4'-DDE in algae increased between 1994 and 1996 (Figure 4-23), while concentrations of 4,4'-DDE in invertebrates dropped markedly at Grid 01 and minimally at other locations (Figure 4-23).

4.3 Data Validation Summary

This section summarizes the data validation results and uses them to assess the quality of the data presented in previous sections. A detailed data quality assessment and complete Ogden data validation reports for all RI samples are provided in Appendix F.

Analytical results were validated to evaluate compliance with the specified analytical methods and the data quality objectives outlined in the RI QAPjP for Midway Island (Ogden 1996d). As specified in the QAPjP, all analytical data obtained under CTO 0136 were validated according to Ogden Level D data validation procedures. In general, Level D data validation procedures require the review of Form I data summary sheets and raw data with regards to sample management, instrument performance and calibration, field and laboratory QC samples, and internal standards performance. Specific Ogden Level D

data validation requirements are identified in procedure DVP-1, *Data Validation Presentation* (Ogden 1994b).

When the analytical data did not meet the required QC criteria or when special consideration by the data user was required, standard "data qualifiers" were applied to the specific analytical results. Data qualifiers are defined in the *USEPA Contract Laboratory Program National Functional Guidelines For Organic Data Review* (USEPA 1994). In addition, standard "qualification codes" were applied to explain the use of data qualifiers and to identify possible limitations of data use.

4.3.1 Data Quality Assessment

This section summarizes the data validation methodology and results in terms of data precision, accuracy, representativeness, completeness, and comparability. Each of these data quality parameters is evaluated through review of Form I's and associated field and/or laboratory QC sample results. A detailed discussion of the data quality assessment can be found in Appendix F. The overall usability of the analytical data is discussed below with regard to each data quality parameter.

4.3.1.1 Precision

Precision was determined by the relative percent differences (RPDs) of both the field duplicates and matrix spike duplicates (MSDs). In general, the precision results from the field duplicates and the MSDs fell within the QC criteria established by the laboratory and/or the QAPjP (Ogden 1996d) and were considered acceptable. The instances where precision data did not meet QC criteria are attributable to nonhomogeneity of the sample or to having relatively few data points to determine correlations and draw conclusions.

4.3.1.2 Accuracy

Accuracy was determined by the percent recoveries (%R) of the matrix spike samples (MS) and blank spike or laboratory control samples (LCS). The accuracy results from all matrices except soil were within the QC criteria established by the laboratory and/or the QAPjP and were considered acceptable. Two of the three soil MS/MSDs had percent recoveries of 0 due to dilutions, thus skewing overall average percent recoveries. No

qualifications were assigned to the data because of the dilutions. The analyte-specific average LCS percent recoveries were considered acceptable.

4.3.1.3 Representativeness

Representativeness was determined by evaluating overall sample management (sample collection, handling, and documentation) and method-specific issues (calibration and surrogate recovery). With the exception of the soil analytical data for pesticides/PCBs, the overall usability of the data was acceptable with respect to representativeness. Some qualifications were applied to the soil pesticide/PCB data due to method modifications performed by the laboratory, which produced data that may not be wholly representative of the site.

4.3.1.4 Completeness

Completeness was determined from both the sampling program (number of samples planned vs. number of samples collected) and the analytical program (total number of analytes vs. number of analytes rejected). The completeness of both the sampling and analytical program was determined to be acceptable.

4.3.1.5 Comparability

Comparability was determined using considerations such as the consistency of the sampling plan and consistency in the sample analysis. The comparability of both the sampling and analysis was determined to be acceptable.

Tables

Table 4-1
SUMMARY OF SUBSURFACE SOIL SAMPLES
BULKY WASTE LANDFILL (SITE 01)
(Page 1 of 4)

METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	DEPTH (FEET)	FL
CLP SEMI VOLATILES												
OLM03.1B	1,2,4-TRICHLOROBENZENE	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	1,2-DICHLOROBENZENE	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	1,3-DICHLOROBENZENE	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	1,4-DICHLOROBENZENE	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	2,2'OXYBIS(1-CHLOROPROPANE)	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	2,4,5-TRICHLOROPHENOL	UG/KG	0	46	1	860	2,000			No Detects		
OLM03.1B	2,4,6-TRICHLOROPHENOL	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	2,4-DICHLOROPHENOL	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	2,4-DIMETHYLPHENOL	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	2,4-DINITROPHENOL	UG/KG	0	46	1	860	2,000			No Detects		
OLM03.1B	2,4-DINITROTOLUENE	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	2,6-DINITROTOLUENE	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	2-CHLORONAPHTHALENE	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	2-CHLOROPHENOL	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	2-METHYLNAPHTHALENE	UG/KG	2	46	1	340	800	190	900	M01TS07S02	6.0	
OLM03.1B	2-METHYLPHENOL	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	2-NITROANILINE	UG/KG	0	46	1	860	2,000			No Detects		
OLM03.1B	2-NITROPHENOL	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	3,3'-DICHLOROBENZIDINE	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	3-NITROANILINE	UG/KG	0	46	1	860	2,000			No Detects		
OLM03.1B	4,6-DINITRO-2-METHYLPHENOL	UG/KG	0	46	1	860	2,000			No Detects		
OLM03.1B	4-BROMOPHENYL-PHENYLETHER	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	4-CHLORO-3-METHYLPHENOL	UG/KG	1	46	1	340	800	160	160	M01TS07S02	6.0	J
OLM03.1B	4-CHLOROANILINE	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	4-CHLOROPHENYL-PHENYLETHER	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	4-METHYLPHENOL	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	4-NITROANILINE	UG/KG	0	46	1	860	2,000			No Detects		

Notes:

OLM03.1B =CLP Semi Volatiles

#D = No. of Detects

#S = Total No. of Samples

#R = No. of Samples Rejected During Data Validation

FL = Data Validation Qualifier (Flag)

J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)

NJ = Presumptive Evidence of the Presence of the Material at an Estimated Quantity

Table 4-1
SUMMARY OF SUBSURFACE SOIL SAMPLES
BULKY WASTE LANDFILL (SITE 01)
(Page 2 of 4)

METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	DEPTH (FEET)	FL
CLP SEMI VOLATILES - continued												
OLM03.1B	4-NITROPHENOL	UG/KG	0	46	1	860	2,000			No Detects		
OLM03.1B	ACENAPHTHENE	UG/KG	4	46	1	340	800	180	2,600	M01TS03S02	4.0	
OLM03.1B	ACENAPHTHYLENE	UG/KG	2	46	1	340	800	310	350	M01TS07S02	6.0	J
OLM03.1B	ANTHRACENE	UG/KG	7	46	1	340	800	210	4,100	M01TS03S02	4.0	
OLM03.1B	BENZO(A)ANTHRACENE	UG/KG	19	46	1	340	800	150	11,000	M01TS03S01	3.0	
OLM03.1B	BENZO(A)PYRENE	UG/KG	18	46	1	340	800	150	8,600	M01TS03S01	3.0	
OLM03.1B	BENZO(B)FLUORANTHENE	UG/KG	24	46	1	340	800	79	8,500	M01TS03S01	3.0	
OLM03.1B	BENZO(G,H,I)PERYLENE	UG/KG	6	46	1	340	800	150	520	M01TS13S02	5.5	
OLM03.1B	BENZO(K)FLUORANTHENE	UG/KG	23	46	1	340	800	150	6,500	M01TS03S01	3.0	
OLM03.1B	BIS(2-CHLOROETHOXY)METHANE	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	BIS(2-CHLOROETHYL)ETHER	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	6	46	1	340	1,300	150	380	M01TS12S02	2.5	
OLM03.1B	BUTYLBENZYLPHTHALATE	UG/KG	2	46	1	340	800	100	4,500	M01TS03S01	3.0	
OLM03.1B	CARBAZOLE	UG/KG	4	46	1	340	800	170	2,500	M01TS03S02	4.0	
OLM03.1B	CHRYSENE	UG/KG	24	46	1	340	800	150	10,000	M01TS03S01	3.0	
OLM03.1B	DI-N-BUTYLPHTHALATE	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	DI-N-OCTYL PHTHALATE	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	DIBENZ(A,H)ANTHRACENE	UG/KG	4	46	1	340	800	160	1,300	M01TS03S01	3.0	
OLM03.1B	DIBENZOFURAN	UG/KG	2	46	1	340	800	420	890	M01TS03S02	4.0	
OLM03.1B	DIETHYLPHTHALATE	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	DIMETHYLPHTHALATE	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	FLUORANTHENE	UG/KG	30	46	1	340	800	82	19,000	M01TS03S01	3.0	
OLM03.1B	FLUORENE	UG/KG	3	46	1	340	800	620	1,900	M01TS03S02	4.0	J
OLM03.1B	HEXACHLOROBENZENE	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	HEXACHLOROBUTADIENE	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	HEXACHLOROCYCLOPENTADIENE	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	HEXACHLOROETHANE	UG/KG	0	46	1	340	800			No Detects		

Notes:

OLM03.1B =CLP Semi Volatiles

#D = No. of Detects

#S = Total No. of Samples

#R = No. of Samples Rejected During Data Validation

FL = Data Validation Qualifier (Flag)

J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)

NJ = Presumptive Evidence of the Presence of the Material at an Estimated Quantity

Table 4-1
SUMMARY OF SUBSURFACE SOIL SAMPLES
BULKY WASTE LANDFILL (SITE 01)
(Page 3 of 4)

METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	DEPTH (FEET)	FL
CLP SEMI VOLATILES - continued												
OLM03.1B	INDENO(1,2,3-CD)PYRENE	UG/KG	10	46	1	340	800	67	2,300	M01TS03S01	3.0	
OLM03.1B	ISOPHORONE	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	N-NITROSO-DI-N-PROPYLAMINE	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	N-NITROSODIPHENYLAMINE (1)	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	NAPHTHALENE	UG/KG	1	46	1	340	800	790	790	M01TS07S02	6.0	
OLM03.1B	NITROBENZENE	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	PENTACHLOROPHENOL	UG/KG	0	46	1	860	2,000			No Detects		
OLM03.1B	PHENANTHRENE	UG/KG	16	46	1	340	800	160	15,000	M01TS03S02	4.0	
OLM03.1B	PHENOL	UG/KG	0	46	1	340	800			No Detects		
OLM03.1B	PYRENE	UG/KG	31	46	1	340	800	130	19,000	M01TS03S01	3.0	
CLP PESTICIDE / PCB												
OLM03.1P	4,4'-DDD	UG/KG	18	54	9	3.5	350	7.4	400	M01TS03S01	3.0	NJ
OLM03.1P	4,4'-DDE	UG/KG	39	54	9	36	350	3.1	480	M01TS01S02	3.0	J
OLM03.1P	4,4'-DDT	UG/KG	28	54	9	3.7	350	24	890	M01TS03S01	3.0	NJ
OLM03.1P	ALDRIN	UG/KG	4	54	9	1.8	180	1.9	79	M01TP11S02	3.0	NJ
OLM03.1P	ALPHA-BHC	UG/KG	0	54	9	1.8	180			No Detects		
OLM03.1P	ALPHA-CHLORDANE	UG/KG	18	54	9	1.8	180	2.2	470	M01TS11S02	2.0	
OLM03.1P	AROCLOR-1016	UG/KG	0	54	9	35	3,600			No Detects		
OLM03.1P	AROCLOR-1221	UG/KG	0	54	9	70	7,300			No Detects		
OLM03.1P	AROCLOR-1232	UG/KG	0	54	9	35	3,600			No Detects		
OLM03.1P	AROCLOR-1242	UG/KG	0	54	9	35	3,600			No Detects		
OLM03.1P	AROCLOR-1248	UG/KG	1	54	9	35	3,600	1,400	1,400	M01TP11S02	3.0	NJ
OLM03.1P	AROCLOR-1254	UG/KG	5	54	9	35	3,600	130	3,500	M01TS05D01	4.0	J
OLM03.1P	AROCLOR-1260	UG/KG	36	54	9	37	1,700	51	19,000	M01TP11S02	3.0	J
OLM03.1P	BETA-BHC	UG/KG	0	54	9	1.8	180			No Detects		
OLM03.1P	DELTA-BHC	UG/KG	0	54	9	1.8	180			No Detects		
OLM03.1P	DIELDRIN	UG/KG	12	54	9	3.5	360	4.1	130	M01TS05D01	4.0	NJ

Notes:

OLM03.1B =CLP Semi Volatiles

OLM03.1P =CLP Pesticides / PCBs

#D = No. of Detects

#S = Total No. of Samples

#R = No. of Samples Rejected During Data Validation

FL = Data Validation Qualifier (Flag)

J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)

NJ = Presumptive Evidence of the Presence of the Material at an Estimated Quantity

Table 4-1
SUMMARY OF SUBSURFACE SOIL SAMPLES
BULKY WASTE LANDFILL (SITE 01)
(Page 4 of 4)

METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	DEPTH (FEET)	FL
CLP PESTICIDE / PCB - continued												
OLM03.1P	ENDOSULFAN I	UG/KG	0	54	9	1.8	180			No Detects		
OLM03.1P	ENDOSULFAN II	UG/KG	6	54	9	3.5	360	4.6	280	M01TP11S02	3.0	NJ
OLM03.1P	ENDOSULFAN SULFATE	UG/KG	0	54	9	3.5	360			No Detects		
OLM03.1P	ENDRIN	UG/KG	10	54	9	3.5	360	6	200	M01TP11S02	3.0	NJ
OLM03.1P	ENDRIN ALDEHYDE	UG/KG	16	54	9	3.7	360	5.2	370	M01TP11S02	3.0	NJ
OLM03.1P	ENDRIN KETONE	UG/KG	1	54	9	3.5	360	8.4	8.4	M01TS18S01	3.5	NJ
OLM03.1P	GAMMA-BHC (LINDANE)	UG/KG	0	54	9	1.8	180			No Detects		
OLM03.1P	GAMMA-CHLORDANE	UG/KG	15	54	9	1.8	180	2.3	500	M01TS11S02	3.0	J
OLM03.1P	HEPTACHLOR	UG/KG	0	54	9	1.8	180			No Detects		
OLM03.1P	HEPTACHLOR EPOXIDE	UG/KG	2	54	9	1.8	180	47	67	M01TP11S02	3.0	NJ
OLM03.1P	METHOXYCHLOR	UG/KG	2	54	9	18	1,800	23	63	M01TS18S01	3.5	J
OLM03.1P	TOXAPHENE	UG/KG	0	54	9	180	18,000			No Detects		

Notes:

OLM03.1P =CLP Pesticides / PCBs

#D = No. of Detects

#S = Total No. of Samples

#R = No. of Samples Rejected During Data Validation

FL = Data Validation Qualifier (Flag)

J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)

NJ = Presumptive Evidence of the Presence of the Material at an Estimated Quantity

Table 4-2
SUMMARY OF SUBSURFACE SOIL SAMPLES
FIELD TEST KIT RESULTS FOR PCBs
BULKY WASTE LANDFILL (SITE 01)
(Page 1 of 2)

		Sample	Collection	Total PCBs (mg/kg)		
Location ID	Sample ID	Depth	Date	>0.5 ≤ 1	> 1 ≤ 25	> 25 ≤ 100
Trenches						
M01TS01	M01TK01S01	3.0	6/24/96		1.24	
M01TS01	M01TK01S02	3.0	6/24/96		1.20	
M01TS02	M01TK02S01	3.0	6/24/96		3.52	
M01TS02	M01TK02S02	4.0	6/24/96		1.59	
M01TS03	M01TK03S01	3.0	6/24/96		2.65	
M01TS03	M01TK03S02	4.0	6/24/96		1.98	
M01TS04	M01TK04S01	4.0	6/24/96	ND (<0.5)		
M01TS04	M01TK04S02	3.5	6/24/96		1.09	
M01TS05	M01TK05S01	4.0	6/24/96		2.18	
M01TS05	M01TK05S02	2.5	6/24/96	0.60		
M01TS06	M01TK06S01	3.0	6/25/96	0.54		
M01TS06	M01TK06S02	4.0	6/25/96	ND (<0.5)		
M01TS07	M01TK07S01	3.5	6/25/96	0.52		
M01TS07	M01TK07S02	6.0	6/25/96	ND (<0.5)		
M01TS07	M01TK07S03	4.5	6/25/96		1.30	
M01TS08	M01TK08S01	4.0	6/25/96		1.50	
M01TS08	M01TK08S02	3.0	6/25/96	ND (<0.5)		
M01TS08	M01TK08D02	3.0	6/25/96	ND (<0.5)		
M01TS09	M01TK09S01	2.0	6/25/96	ND (<0.5)		
M01TS09	M01TK09S02	3.5	6/25/96	0.83		
M01TS10	M01TK10S01	4.5	6/25/96	0.58		
M01TS10	M01TK10S02	5.0	6/25/96	ND (<0.5)		
M01TS11	M01TK11S01	2.0	6/25/96	ND (<0.5)		
M01TS11	M01TK11S02	2.0	6/25/96	ND (<0.5)		
M01TS12	M01TK12S01	3.0	6/26/96	ND (<0.5)		
M01TS12	M01TK12S02	2.5	6/26/96	ND (<0.5)		
M01TS13	M01TK13S01	4.0	6/26/96	ND (<0.5)		
M01TS13	M01TK13D01	4.0	6/26/96	ND (<0.5)		
M01TS13	M01TK13S02	5.5	6/26/96	ND (<0.5)		
M01TS14	M01TK14S01	4.5	6/26/96	ND (<0.5)		
M01TS14	M01TK14S02	4.5	6/26/96	ND (<0.5)		
M01TS15	M01TK15S01	5.0	6/27/96	ND (<0.5)		
M01TS15	M01TK15S02	4.0	6/27/96	ND (<0.5)		
M01TS16	M01TK16S01	4.0	6/28/96	ND (<0.5)		
M01TS16	M01TK16S02	2.0	6/28/96	ND (<0.5)		
M01TS17	M01TK17S01	6.0	6/28/96	ND (<0.5)		
M01TS17	M01TK17S02	5.0	6/28/96	ND (<0.5)		
M01TS18	M01TK18S01	3.5	6/28/96	ND (<0.5)		
M01TS18	M01TK18S02	4.0	6/28/96	ND (<0.5)		
M01TS19	M01TK19S01	2.5	6/28/96	ND (<0.5)		
M01TS19	M01TK19S02	3.0	6/28/96	ND (<0.5)		
M01TS20	M01TK20S01	3.5	6/28/96	ND (<0.5)		
M01TS20	M01TK20S02	3.0	6/28/96	ND (<0.5)		
M01TS20	M01TK20D02	3.0	6/28/96	ND (<0.5)		
M01TS20	M01TK20S03	2.5	6/28/96	ND (<0.5)		
M01TS20	M01TK20S04	2.5	6/28/96	ND (<0.5)		

ND (<0.5) = Not Detected at or above the 0.5 mg/kg detection limit.

Table 4-2
SUMMARY OF SUBSURFACE SOIL SAMPLES
FIELD TEST KIT RESULTS FOR PCBs
BULKY WASTE LANDFILL (SITE 01)
(Page 2 of 2)

		Sample	Collection	Total PCBs (mg/kg)		
Location ID	Sample ID	Depth	Date	>0.5 ≤ 1	> 1 ≤ 25	> 25 ≤ 100
Test Pits						
M01TP01	M01TP01S01	3.0	6/26/96	ND (<0.5)		
M01TP01	M01TP02S01	3.0	6/26/96	0.58		
M01TP03	M01TP03S01	1.5	6/27/96	ND (<0.5)		
M01TP03	M01TP03S02	3.5	6/27/96	ND (<0.5)		
M01TP04	M01TP04S01	1.5	6/27/96	ND (<0.5)		
M01TP04	M01TP04S02	3.0	6/27/96	0.74		
M01TP05	M01TP05S01	1.5	6/27/96	ND (<0.5)		
M01TP06	M01TP06S01	3.0	6/27/96	ND (<0.5)		
M01TP06	M01TP06S02	4.5	6/27/96	ND (<0.5)		
M01TP07	M01TP07S01	3.0	6/29/96	ND (<0.5)		
M01TP08	M01TP08S01	3.5	6/29/96		1.62	
M01TP09	M01TP09S01	3.5	6/29/96	ND (<0.5)		
M01TP10	M01TP10S01	3.5	6/29/96		1.51	
M01TP11	M01TP11S01	3.0	6/29/96			31.6
M01TP11	M01TP11D01	3.0	6/29/96			27
M01TP11	M01TP11S02	3.0	7/1/96		4.64	
M01TP11	M01TP11S03	1.5	7/1/96	0.99		
M01TP11	M01TP11S04	4.5	7/1/96	ND (<0.5)		
M01TP12	M01TP12S01	3.0	6/29/96	ND (<0.5)		
M01TP13	M01TP13S01	3.5	6/29/96	ND (<0.5)		
M01TP14	M01TP14S01	2.5	6/29/96	ND (<0.5)		
M01TP15	M01TP15S01	2.5	6/29/96		1.02	
M01TP16	M01TP16S01	2.0	6/29/96	ND (<0.5)		
M01TP17	M01TP17S01	2.0	6/29/96	ND (<0.5)		
M01TP18	M01TP18S01	2.0	6/29/96	ND (<0.5)		
M01TP19	M01TP19S01	4.0	6/29/96	ND (<0.5)		
M01TP20	M01TP20S01	4.5	6/29/96	ND (<0.5)		
M01TP21	M01TP21S01	6.5	6/29/96	ND (<0.5)		
M01TP22	M01TP22S01	2.0	6/29/96	ND (<0.5)		
M01TP23	M01TP23S01	3.5	7/1/96	ND (<0.5)		
M01TP24	M01TP24S01	2.5	7/1/96	ND (<0.5)		
M01TP25	M01TP25S01	2.5	7/1/96		1.72	
M01TP26	M01TP26S01	2.5	7/1/96		3.03	

ND (<0.5) = Not Detected at or above the 0.5 mg/kg detection limit.

Table 4-3
SUMMARY OF GROUND WATER SAMPLES
BULKY WASTE LANDFILL (SITE 01)
(Page 1 of 4)

METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	FL
NOAA STATUS AND TRENDS SEMI VOLATILES											
STIV141A	1,2,4-TRICHLOROBENZENE	UG/L	0	6	1	0.0047	0.0088			No Detects	
STIV141A	1,3,5-TRICHLOROBENZENE	UG/L	3	6	1	0.0048	0.0049	0.01	0.55	M01MW04S01	
STIV141A	2,4,5-TRICHLOROPHENOL	UG/L	0	6	1	7.5	14			No Detects	
STIV141A	2,4,6-TRICHLOROPHENOL	UG/L	0	6	1	7.5	14			No Detects	
STIV141A	2,4-DINITROPHENOL	UG/L	0	6	1	38	70			No Detects	
STIV141A	ACENAPHTHENE	UG/L	5	6	1			0.036	1.5	M01MW05S01	
STIV141A	ACENAPHTHYLENE	UG/L	2	6	1	0.0039	0.0073	0.0052	0.027	M01MW04S01	
STIV141A	ANTHRACENE	UG/L	5	6	1			0.0067	0.24	M01MW05S01	J
STIV141A	BENZO(A)ANTHRACENE	UG/L	4	6	1	0.015	0.015	0.011	0.026	M01MW05S01	
STIV141A	BENZO(A)PYRENE	UG/L	4	6	1	0.012	0.012	0.002	0.0054	M01MW02S01	J
STIV141A	BENZO(B)FLUORANTHENE	UG/L	5	6	1			0.0016	0.0083	M01MW02S01	J
STIV141A	BENZO(E)PYRENE	UG/L	4	6	1	0.013	0.013	0.0024	0.0056	M01MW02S01	J
STIV141A	BENZO(G,H,I)PERYLENE	UG/L	3	6	1	0.008	0.015	0.0012	0.0034	M01MW02S01	J
STIV141A	BENZO(K)FLUORANTHENE	UG/L	5	6	1			0.0015	0.0037	M01MW02S01	J
STIV141A	BIPHENYL	UG/L	4	6	1	0.0059	0.0059	0.015	1	M01MW04S01	
STIV141A	BIS(2-ETHYLHEXYL)PHTHALATE	UG/L	0	6	1	0.26	2.4			No Detects	
STIV141A	CHRYSENE	UG/L	5	6	1			0.0027	0.026	M01MW05S01	
STIV141A	CHRYSENES, C1-ALKYL-SUBSTITUTE	UG/L	4	6	1	0.0057	0.0057	0.0032	0.011	M01MW03S01	
STIV141A	CHRYSENES, C2-ALKYL-SUBSTITUTE	UG/L	2	6	1	0.0031	0.0057	0.015	0.024	M01MW03S01	
STIV141A	CHRYSENES, C3-ALKYL-SUBSTITUTE	UG/L	1	6	1	0.003	0.0057	0.013	0.013	M01MW03S01	
STIV141A	CHRYSENES, C4-ALKYL-SUBSTITUTE	UG/L	0	6	1	0.003	0.0057			No Detects	
STIV141A	DIBENZO(A,H)ANTHRACENE	UG/L	3	6	1	0.0078	0.014	0.00075	0.0015	M01MW02S01	J
STIV141A	DIBENZOTHIOPHENE	UG/L	5	6	1			0.011	0.25	M01MW03S01	
STIV141A	DIBENZOTHIOPHENES, C1-ALKYL-SU	UG/L	5	6	1			0.011	1	M01MW03S01	
STIV141A	DIBENZOTHIOPHENES, C2-ALKYL-SU	UG/L	5	6	1			0.019	1.1	M01MW03S01	
STIV141A	DIBENZOTHIOPHENES, C3-ALKYL-SU	UG/L	5	6	1			0.0096	0.52	M01MW03S01	
STIV141A	FLUORANTHENE	UG/L	5	6	1			0.043	1.2	M01MW05S01	
STIV141A	FLUORANTHENES+PYRENES, C1-ALKY	UG/L	5	6	1			0.015	0.25	M01MW02S01	

Notes:

STIV141A =NOAA Status and Trends Semi Volatiles

#D = No. of Detects

#S = Total No. of Samples

#R = No. of Samples Rejected During Data Validation

FL = Data Validation Qualifier (Flag)

J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)

Table 4-3
SUMMARY OF GROUND WATER SAMPLES
BULKY WASTE LANDFILL (SITE 01)
(Page 2 of 4)

METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	FL
NOAA STATUS AND TRENDS SEMI VOLATILES - continued											
STIV141A	FLUORANTHENES+PYRENES, C2-ALKY	UG/L	4	6	1	0.0044	0.0044	0.016	0.079	M01MW02S01	
STIV141A	FLUORANTHENES+PYRENES, C3-ALKY	UG/L	3	6	1	0.0024	0.0044	0.011	0.031	M01MW03S01	
STIV141A	FLUORENE	UG/L	5	6	1			0.0038	0.86	M01MW04S01	
STIV141A	FLUORENES, C1-ALKYL-SUBSTITUTE	UG/L	5	6	1			0.012	0.33	M01MW03S01	
STIV141A	FLUORENES, C2-ALKYL-SUBSTITUTE	UG/L	5	6	1			0.017	0.35	M01MW03S01	
STIV141A	FLUORENES, C3-ALKYL-SUBSTITUTE	UG/L	2	6	1	0.003	0.0055	0.079	0.25	M01MW03S01	
STIV141A	HEXACHLOROBUTADIENE	UG/L	0	6	1	0.0044	0.0082			No Detects	
STIV141A	INDENO(1,2,3-CD)PYRENE	UG/L	3	6	1	0.0063	0.012	0.0013	0.0036	M01MW02S01	J
STIV141A	NAPHTHALENE	UG/L	5	6	1			0.016	4.6	M01MW04S01	
STIV141A	NAPHTHALENES, C1-ALKYL-SUBSTIT	UG/L	5	6	1			0.006	1.7	M01MW04S01	
STIV141A	NAPHTHALENES, C2-ALKYL-SUBSTIT	UG/L	5	6	1			0.011	7.6	M01MW04S01	
STIV141A	NAPHTHALENES, C3-ALKYL-SUBSTIT	UG/L	5	6	1			0.02	3.7	M01MW03S01	
STIV141A	NAPHTHALENES, C4-ALKYL-SUBSTIT	UG/L	5	6	1			0.019	1.5	M01MW03S01	
STIV141A	PERYLENE	UG/L	4	6	1	0.012	0.012	0.00099	0.002	M01MW02S01	J
STIV141A	PHENANTHRENE	UG/L	5	6	1			0.0081	1.3	M01MW04S01	
STIV141A	PHENANTHRENES+ANTHRACENES, C1-	UG/L	5	6	1			0.0075	0.25	M01MW03S01	
STIV141A	PHENANTHRENES+ANTHRACENES, C2-	UG/L	5	6	1			0.016	0.28	M01MW03S01	
STIV141A	PHENANTHRENES+ANTHRACENES, C3-	UG/L	5	6	1			0.012	0.14	M01MW03S01	
STIV141A	PHENANTHRENES+ANTHRACENES, C4-	UG/L	2	6	1	0.0017	0.0032	0.038	0.085	M01MW03S01	
STIV141A	PYRENE	UG/L	5	6	1			0.047	0.76	M01MW05S01	
NOAA STATUS AND TRENDS PESTICIDES											
STIV141E	2,4'-DDD	UG/L	4	5	0	0.00068	0.00068	0.00089	0.033	M01MW05S01	
STIV141E	2,4'-DDE	UG/L	0	5	0	0.00031	0.00058			No Detects	
STIV141E	2,4'-DDT	UG/L	0	5	0	0.00028	0.00052			No Detects	
STIV141E	4,4'-DDD	UG/L	4	5	0	0.00044	0.00044	0.0037	0.098	M01MW05S01	
STIV141E	4,4'-DDE	UG/L	3	5	0	0.00018	0.00033	0.0018	0.0032	M01MW02S01	
STIV141E	4,4'-DDT	UG/L	0	5	0	0.00065	0.0012			No Detects	
STIV141E	ALDRIN	UG/L	0	5	0	0.00049	0.00091			No Detects	

Notes:

STIV141A =NOAA Status and Trends Semi Volatiles

STIV141E =NOAA Status and Trends Pesticides

#D = No. of Detects

#S = Total No. of Samples

#R = No. of Samples Rejected During Data Validation

FL = Data Validation Qualifier (Flag)

J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)

Table 4-3
SUMMARY OF GROUND WATER SAMPLES
BULKY WASTE LANDFILL (SITE 01)
(Page 3 of 4)

METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	FL
NOAA STATUS AND TRENDS PESTICIDES - continued											
STIV141E	ALPHA-BHC	UG/L	1	5	0	0.00037	0.00068	0.00018	0.00018	M01MW03S01	J
STIV141E	ALPHA-CHLORDANE	UG/L	3	5	0	0.00043	0.00044	0.00019	0.0011	M01MW02S01	
STIV141E	BETA-BHC	UG/L	1	5	0	0.00024	0.00045	0.0032	0.0032	M01MW02S01	
STIV141E	CIS-NONACHLOR	UG/L	0	5	0	0.0003	0.00057			No Detects	
STIV141E	DELTA-BHC	UG/L	0	5	0	0.00028	0.00052			No Detects	
STIV141E	DIELDRIN	UG/L	3	5	0	0.00036	0.00036	0.0007	0.002	M01MW05S01	
STIV141E	ENDOSULFAN I	UG/L	2	5	0	0.00055	0.001	0.00037	0.00073	M01MW03S01	
STIV141E	ENDOSULFAN II	UG/L	0	5	0	0.00054	0.001			No Detects	
STIV141E	ENDOSULFAN SULFATE	UG/L	0	5	0	0.00054	0.001			No Detects	
STIV141E	ENDRIN	UG/L	0	5	0	0.00051	0.00095			No Detects	
STIV141E	ENDRIN ALDEHYDE	UG/L	0	5	0	0.00028	0.00053			No Detects	
STIV141E	ENDRIN KETONE	UG/L	0	5	0	0.00028	0.00053			No Detects	
STIV141E	GAMMA-BHC (LINDANE)	UG/L	2	5	0	0.00027	0.0005	0.0017	0.0063	M01MW02S01	
STIV141E	GAMMA-CHLORDANE	UG/L	0	5	0	0.0002	0.00037			No Detects	
STIV141E	HEPTACHLOR	UG/L	0	5	0	0.0004	0.00075			No Detects	
STIV141E	HEPTACHLOR EPOXIDE	UG/L	0	5	0	0.00074	0.00139			No Detects	
STIV141E	HEXACHLOROBENZENE	UG/L	3	5	0	0.00033	0.00061	0.00017	0.00089	M01MW02S01	
STIV141E	METHOXYCHLOR	UG/L	0	5	0	0.00073	0.0014			No Detects	
STIV141E	MIREX	UG/L	1	5	0	0.00021	0.0004	0.00016	0.00016	M01MW05S01	J
STIV141E	TRANS-NONACHLOR	UG/L	0	5	0	0.0003	0.00057			No Detects	
NOAA STATUS AND TRENDS PCBs											
STIV141C	PCB-101 (2,2',3,5,5')	UG/L	3	5	0	0.00035	0.00036	0.0016	0.0046	M01MW05S01	
STIV141C	PCB-105 (2,3,3',4,4')	UG/L	0	5	0	0.00051	0.00096			No Detects	
STIV141C	PCB-118 (2,3',4,4',5)	UG/L	2	5	0	0.00033	0.00061	0.00053	0.0023	M01MW02S01	
STIV141C	PCB-126 (3,3',4,4',5)	UG/L	0	5	0	0.00042	0.00079			No Detects	
STIV141C	PCB-128 (2,2',3,3',4,4')	UG/L	0	5	0	0.00028	0.00053			No Detects	
STIV141C	PCB-138 (2,2',3,4,4',5')	UG/L	5	5	0			0.0016	0.022	M01MW04S01	
STIV141C	PCB-153 (2,2',4,4',5,5')	UG/L	5	5	0			0.00071	0.0081	M01MW04S01	

Notes:

STIV141E =NOAA Status and Trends Pesticides

STIV141C =NOAA Status and Trends PCBs

#D = No. of Detects

#S = Total No. of Samples

#R = No. of Samples Rejected During Data Validation

FL = Data Validation Qualifier (Flag)

J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)

Table 4-3
SUMMARY OF GROUND WATER SAMPLES
BULKY WASTE LANDFILL (SITE 01)
(Page 4 of 4)

METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	FL
NOAA STATUS AND TRENDS PCBs - continued											
STIV141C	PCB-170 (2,2',3,3',4,4',5)	UG/L	3	5	0	0.0025	0.0047	0.00029	0.0038	M01MW04S01	
STIV141C	PCB-18 (2,2',5)	UG/L	2	5	0	0.00044	0.00082	0.0054	0.006	M01MW02S01	
STIV141C	PCB-180 (2,2',3,4,4',5,5')	UG/L	5	5	0			0.00048	0.0027	M01MW04S01	
STIV141C	PCB-187 (2,2',3,4',5,5',6)	UG/L	2	5	0	0.00053	0.00099	0.00065	0.00079	M01MW05S01	
STIV141C	PCB-195 (2,2',3,3',4,4',5,6)	UG/L	2	5	0	0.00053	0.001	0.00023	0.00051	M01MW04S01	J
STIV141C	PCB-206 (2,2',3,3',4,4',5,5',6)	UG/L	0	5	0	0.00041	0.00077			No Detects	
STIV141C	PCB-209 (2,2',3,3',4,4',5,5',6,6')	UG/L	1	5	0	0.00049	0.00092	0.0027	0.0027	M01MW02S01	
STIV141C	PCB-28 (2,4,4')	UG/L	2	5	0	0.00092	0.0017	0.00027	0.00032	M01MW05S01	J
STIV141C	PCB-44 (2,2',3,5')	UG/L	2	5	0	0.00029	0.00055	0.0009	0.0044	M01MW02S01	
STIV141C	PCB-52 (2,2',5,5')	UG/L	2	5	0	0.00034	0.00064	0.0022	0.0033	M01MW05S01	
STIV141C	PCB-66 (2,3',4,4')	UG/L	3	5	0	0.00028	0.00028	0.00084	0.012	M01MW04S01	
STIV141C	PCB-77 (3,3',4,4')	UG/L	0	5	0	0.0005	0.00094			No Detects	
STIV141C	PCB-8 (2,4')	UG/L	3	5	0	0.00033	0.00061	0.00077	0.0076	M01MW03S01	

Notes:

STIV141C =NOAA Status and Trends PCBs

#D = No. of Detects

#S = Total No. of Samples

#R = No. of Samples Rejected During Data Validation

FL = Data Validation Qualifier (Flag)

J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)

Table 4-4
SUMMARY OF MARINE SEDIMENT SAMPLES
LANDFILLS AND REFERENCE SITES
(Page 1 of 2)

		LANDFILLS										REFERENCE							
METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	FL	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MEAN CONC
NOAA STATUS AND TRENDS PESTICIDES																			
STIV141E	2,4'-DDD	UG/KG	7	16	3	0.036	0.048	0.2	11	M01MS01S01		0	5	0	0.035	0.038			
STIV141E	2,4'-DDE	UG/KG	4	16	3	0.04	0.056	0.066	2.3	M01MS01S01		1	5	0	0.042	0.045	0.13	0.13	0.0309
STIV141E	2,4'-DDT	UG/KG	8	16	3	0.056	0.061	0.03	3.3	M01MS01S01		0	5	0	0.054	0.06			
STIV141E	4,4'-DDD	UG/KG	11	16	3	0.063	0.065	0.064	17	M01MS01S01		0	5	0	0.06	0.066			
STIV141E	4,4'-DDE	UG/KG	11	16	3	0.035	0.036	0.052	9	M01MS01S01		0	5	0	0.033	0.037			
STIV141E	4,4'-DDT	UG/KG	7	16	3	0.047	0.054	0.11	7.5	M01MS02S01		0	5	0	0.048	0.052			
STIV141E	ALDRIN	UG/KG	0	16	3	0.035	0.05			No Detects		0	5	0	0.036	0.04			
STIV141E	ALPHA-BHC	UG/KG	1	16	3	0.027	0.038	0.036	0.036	M01MS06S01		0	5	0	0.027	0.03			
STIV141E	ALPHA-CHLORDANE	UG/KG	7	16	3	0.034	0.039	0.053	1	M01MS01D01		0	5	0	0.034	0.038			
STIV141E	BETA-BHC	UG/KG	0	16	3	0.048	0.068			No Detects		0	5	0	0.05	0.055			
STIV141E	DELTA-BHC	UG/KG	0	16	3	0.028	0.039			No Detects		0	5	0	0.028	0.031			
STIV141E	DIELDRIN	UG/KG	3	16	3	0.044	0.062	0.027	2.1	M01MS01D01		0	5	0	0.045	0.05			
STIV141E	ENDOSULFAN I	UG/KG	0	16	3	0.051	0.072			No Detects		0	5	0	0.052	0.058			
STIV141E	ENDOSULFAN II	UG/KG	0	16	3	0.051	0.072			No Detects		0	5	0	0.053	0.058			
STIV141E	ENDOSULFAN SULFATE	UG/KG	0	16	3	0.051	0.072			No Detects		0	5	0	0.052	0.058			
STIV141E	ENDRIN	UG/KG	0	16	3	0.012	0.017			No Detects		0	5	0	0.013	0.014			
STIV141E	ENDRIN ALDEHYDE	UG/KG	0	16	3	0.029	0.041			No Detects		0	5	0	0.03	0.033			
STIV141E	ENDRIN KETONE	UG/KG	0	16	3	0.029	0.041			No Detects		0	5	0	0.03	0.033			
STIV141E	GAMMA-BHC (LINDANE)	UG/KG	1	16	3	0.035	0.049	0.023	0.023	M01MS12S01	J	0	5	0	0.035	0.039			
STIV141E	GAMMA-CHLORDANE	UG/KG	9	16	3	0.038	0.042	0.02	1.2	M01MS01D01		0	5	0	0.037	0.041			
STIV141E	HEPTACHLOR	UG/KG	0	16	3	0.038	0.054			No Detects		0	5	0	0.039	0.043			
STIV141E	HEPTACHLOR EPOXIDE	UG/KG	0	16	3	0.046	0.064			No Detects		0	5	0	0.047	0.052			
STIV141E	HEXACHLOROBENZENE	UG/KG	0	16	3	0.04	0.056			No Detects		0	5	0	0.041	0.045			
STIV141E	METHOXYCHLOR	UG/KG	0	16	3	0.17	0.24			No Detects		0	5	0	0.18	0.2			
STIV141E	MIREX	UG/KG	0	16	3	0.04	0.056			No Detects		0	5	0	0.041	0.045			
STIV141E	TRANS-NONACHLOR	UG/KG	6	16	3	0.02	0.023	0.034	0.85	M01MS01D01		0	5	0	0.021	0.023			
NOAA STATUS AND TRENDS PCBs																			
STIV141C	PCB-101 (2,2',3,5,5')	UG/KG	10	16	3	0.026	0.029	0.075	28	M01MS01S01		0	5	0	0.025	0.028			
STIV141C	PCB-105 (2,3,3',4,4')	UG/KG	8	16	3	0.028	0.039	0.019	1.7	M01MS01D01		0	5	0	0.028	0.031			
STIV141C	PCB-118 (2,3',4,4',5)	UG/KG	9	16	3	0.04	0.044	0.05	5.4	M01MS01S01		0	5	0	0.039	0.043			
STIV141C	PCB-126 (3,3',4,4',5)	UG/KG	0	16	3	0.075	0.11			No Detects		0	5	0	0.077	0.085			

Notes:

STIV141E =NOAA Status and Trends Pesticides

STIV141C =NOAA Status and Trends PCBs

#D = No. of Detects

#S = Total No. of Samples

#R = No. of Samples Rejected During Data Validation

FL = Data Validation Qualifier (Flag)

J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)

Mean Conc = Geometric Mean

Table 4-4
SUMMARY OF MARINE SEDIMENT SAMPLES
LANDFILLS AND REFERENCE SITES
(Page 2 of 2)

			LANDFILLS									REFERENCE							
METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	FL	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MEAN CONC
NOAA STATUS AND TRENDS PCBs - continued																			
STIV141C	PCB-128 (2,2',3,3',4,4')	UG/KG	8	16	3	0.034	0.046	0.02	4.3	M01MS01S01		0	5	0	0.033	0.037			
STIV141C	PCB-138 (2,2',3,4,4',5')	UG/KG	13	16	3			0.11	84	M01MS01S01		5	5	0			0.045	0.076	0.0632
STIV141C	PCB-153 (2,2',4,4',5,5')	UG/KG	12	16	3	0.033	0.033	0.045	110	M01MS01S01		0	5	0	0.032	0.036			
STIV141C	PCB-170 (2,2',3,3',4,4',5)	UG/KG	12	16	3	0.13	0.13	0.014	63	M01MS01S01		0	5	0	0.13	0.14			
STIV141C	PCB-18 (2,2',5)	UG/KG	2	16	3	0.088	0.123	0.54	0.56	M01MS08S01		0	5	0	0.09	0.099			
STIV141C	PCB-180 (2,2',3,4,4',5,5')	UG/KG	12	16	3	0.038	0.038	0.066	120	M01MS01S01		0	5	0	0.037	0.041			
STIV141C	PCB-187 (2,2',3,4',5,5',6)	UG/KG	12	16	3	0.06	0.06	0.033	69	M01MS01S01		0	5	0	0.058	0.064			
STIV141C	PCB-195 (2,2',3,3',4,4',5,6)	UG/KG	12	16	3	0.027	0.027	0.019	14	M01MS01S01		0	5	0	0.026	0.029			
STIV141C	PCB-206 (2,2',3,3',4,4',5,5',6)	UG/KG	10	16	3	0.024	0.026	0.027	5.7	M01MS01S01		0	5	0	0.023	0.025			
STIV141C	PCB-209 (2,2',3,3',4,4',5,5',6,6')	UG/KG	7	16	3	0.027	0.031	0.0063	0.52	M01MS04S01		0	5	0	0.027	0.03			
STIV141C	PCB-28 (2,4,4')	UG/KG	6	16	3	0.06	0.084	0.11	0.96	M01MS08S01		0	5	0	0.061	0.067			
STIV141C	PCB-44 (2,2',3,5')	UG/KG	8	16	3	0.031	0.041	0.038	1.2	M01MS08S01		0	5	0	0.03	0.033			
STIV141C	PCB-52 (2,2',5,5')	UG/KG	9	16	3	0.027	0.035	0.02	2	M01MS01S01		0	5	0	0.026	0.029			
STIV141C	PCB-66 (2,3',4,4')	UG/KG	7	16	3	0.034	0.045	0.12	1.4	M01MS01D01		0	5	0	0.033	0.036			
STIV141C	PCB-77 (3,3',4,4')	UG/KG	0	16	3	0.048	0.067			No Detects		0	5	0	0.049	0.054			
STIV141C	PCB-8 (2,4')	UG/KG	4	16	3	0.042	0.059	0.061	0.42	M01MS08S01		0	5	0	0.043	0.048			

Notes:

STIV141C =NOAA Status and Trends PCBs

#D = No. of Detects

#S = Total No. of Samples

#R = No. of Samples Rejected During Data Validation

FL = Data Validation Qualifier (Flag)

J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)

Mean Conc = Geometric Mean

Table 4-5
SUMMARY OF SEAWATER SAMPLES
LANDFILLS AND REFERENCE SITES
(Page 1 of 2)

		LANDFILLS										REFERENCE							
METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	FL	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MEAN CONC
NOAA STATUS AND TRENDS PESTICIDES																			
STIV141E	2,4'-DDD	UG/L	0	7	0	0.00067	0.00084			No Detects		0	3	0	0.00067	0.00067			
STIV141E	2,4'-DDE	UG/L	0	7	0	0.00031	0.00039			No Detects		0	3	0	0.00031	0.00032			
STIV141E	2,4'-DDT	UG/L	0	7	0	0.00028	0.00035			No Detects		0	3	0	0.00028	0.00028			
STIV141E	4,4'-DDD	UG/L	0	7	0	0.00043	0.00054			No Detects		0	3	0	0.00043	0.00044			
STIV141E	4,4'-DDE	UG/L	0	7	0	0.00018	0.00022			No Detects		0	3	0	0.00018	0.00018			
STIV141E	4,4'-DDT	UG/L	0	7	0	0.00065	0.00082			No Detects		0	3	0	0.00065	0.00066			
STIV141E	ALDRIN	UG/L	0	7	0	0.00049	0.00062			No Detects		0	3	0	0.00049	0.00049			
STIV141E	ALPHA-BHC	UG/L	0	7	0	0.00037	0.00046			No Detects		0	3	0	0.00037	0.00037			
STIV141E	ALPHA-CHLORDANE	UG/L	0	7	0	0.00043	0.00054			No Detects		0	3	0	0.00043	0.00043			
STIV141E	BETA-BHC	UG/L	0	7	0	0.00024	0.0003			No Detects		0	3	0	0.00024	0.00024			
STIV141E	DELTA-BHC	UG/L	0	7	0	0.00028	0.00035			No Detects		0	3	0	0.00028	0.00028			
STIV141E	DIELDRIN	UG/L	0	7	0	0.00036	0.00045			No Detects		0	3	0	0.00036	0.00036			
STIV141E	ENDOSULFAN I	UG/L	0	7	0	0.00054	0.00068			No Detects		0	3	0	0.00054	0.00055			
STIV141E	ENDOSULFAN II	UG/L	0	7	0	0.00054	0.00068			No Detects		0	3	0	0.00054	0.00055			
STIV141E	ENDOSULFAN SULFATE	UG/L	0	7	0	0.00054	0.00068			No Detects		0	3	0	0.00054	0.00055			
STIV141E	ENDRIN	UG/L	0	7	0	0.00051	0.00064			No Detects		0	3	0	0.00051	0.00051			
STIV141E	ENDRIN ALDEHYDE	UG/L	0	7	0	0.00028	0.00036			No Detects		0	3	0	0.00028	0.00029			
STIV141E	ENDRIN KETONE	UG/L	0	7	0	0.00028	0.00036			No Detects		0	3	0	0.00028	0.00029			
STIV141E	GAMMA-BHC (LINDANE)	UG/L	0	7	0	0.00026	0.00033			No Detects		1	3	0	0.00026	0.00027	0.00032	0.00032	0.00018
STIV141E	GAMMA-CHLORDANE	UG/L	0	7	0	0.0002	0.00025			No Detects		0	3	0	0.0002	0.0002			
STIV141E	HEPTACHLOR	UG/L	0	7	0	0.0004	0.0005			No Detects		0	3	0	0.0004	0.0004			
STIV141E	HEPTACHLOR EPOXIDE	UG/L	0	7	0	0.00074	0.00094			No Detects		0	3	0	0.00074	0.00075			
STIV141E	HEXACHLOROBENZENE	UG/L	7	7	0			0.0002	0.00063	M01SW07S01		2	3	0	0.00034	0.00034	0.00025	0.00032	0.00024
STIV141E	METHOXYCHLOR	UG/L	0	7	0	0.00073	0.00092			No Detects		0	3	0	0.00073	0.00074			
STIV141E	MIREX	UG/L	0	7	0	0.00021	0.00027			No Detects		0	3	0	0.00021	0.00022			
STIV141E	TRANS-NONACHLOR	UG/L	0	7	0	0.00031	0.00039			No Detects		0	3	0	0.00031	0.00031			
NOAA STATUS AND TRENDS PCBs																			
STIV141C	PCB-101 (2,2',3,5,5')	UG/L	0	7	0	0.00035	0.00044			No Detects		0	3	0	0.00035	0.00036			
STIV141C	PCB-105 (2,3,3',4,4')	UG/L	0	7	0	0.00052	0.00064			No Detects		0	3	0	0.00052	0.00052			
STIV141C	PCB-118 (2,3',4,4',5)	UG/L	0	7	0	0.00033	0.00041			No Detects		0	3	0	0.00033	0.00033			
STIV141C	PCB-126 (3,3',4,4',5)	UG/L	0	7	0	0.00043	0.00054			No Detects		0	3	0	0.00043	0.00043			

Notes:

STIV141E =NOAA Status and Trends Pesticides

STIV141C =NOAA Status and Trends PCBs

#D = No. of Detects

#S = Total No. of Samples

#R = No. of Samples Rejected During Data Validation

FL = Data Validation Qualifier (Flag)

J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)

Mean Conc = Geometric Mean

Table 4-5
SUMMARY OF SEAWATER SAMPLES
LANDFILLS AND REFERENCE SITES
(Page 2 of 2)

METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	FL	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MEAN CONC
NOAA STATUS AND TRENDS PCBs - continued																			
STIV141C	PCB-128 (2,2',3,3',4,4')	UG/L	0	7	0	0.00029	0.00036			No Detects		0	3	0	0.00029	0.00029			
STIV141C	PCB-138 (2,2',3,4,4',5')	UG/L	0	7	0	0.00062	0.0011			No Detects		0	3	0	0.0006	0.00085			
STIV141C	PCB-153 (2,2',4,4',5,5')	UG/L	1	7	0	0.00023	0.00029	0.0011	0.0011	M01SW01S01		0	3	0	0.00023	0.00023			
STIV141C	PCB-170 (2,2',3,3',4,4',5)	UG/L	0	7	0	0.0025	0.0032			No Detects		0	3	0	0.0025	0.0025			
STIV141C	PCB-18 (2,2',5)	UG/L	1	7	0	0.00044	0.00055	0.0014	0.0014	M01SW09S01		0	3	0	0.00044	0.00044			
STIV141C	PCB-180 (2,2',3,4,4',5,5')	UG/L	1	7	0	0.00067	0.00084	0.00083	0.00083	M01SW01S01		0	3	0	0.00067	0.00067			
STIV141C	PCB-187 (2,2',3,4',5,5',6)	UG/L	1	7	0	0.00053	0.00067	0.00047	0.00047	M01SW01S01	J	0	3	0	0.00053	0.00054			
STIV141C	PCB-195 (2,2',3,3',4,4',5,6)	UG/L	0	7	0	0.00054	0.00068			No Detects		0	3	0	0.00054	0.00054			
STIV141C	PCB-206 (2,2',3,3',4,4',5,5',6)	UG/L	0	7	0	0.00041	0.00052			No Detects		0	3	0	0.00041	0.00042			
STIV141C	PCB-209 (2,2',3,3',4,4',5,5',6,6')	UG/L	0	7	0	0.00049	0.00062			No Detects		0	3	0	0.0005	0.0005			
STIV141C	PCB-28 (2,4,4')	UG/L	0	7	0	0.00092	0.0012			No Detects		0	3	0	0.00092	0.00093			
STIV141C	PCB-44 (2,2',3,5')	UG/L	0	7	0	0.00029	0.00037			No Detects		0	3	0	0.00029	0.0003			
STIV141C	PCB-52 (2,2',5,5')	UG/L	0	7	0	0.00034	0.00043			No Detects		0	3	0	0.00034	0.00035			
STIV141C	PCB-66 (2,3',4,4')	UG/L	0	7	0	0.00028	0.00035			No Detects		0	3	0	0.00028	0.00028			
STIV141C	PCB-77 (3,3',4,4')	UG/L	0	7	0	0.00051	0.00064			No Detects		0	3	0	0.00051	0.00051			
STIV141C	PCB-8 (2,4')	UG/L	0	7	0	0.00033	0.00041			No Detects		0	3	0	0.00033	0.00034			

Notes:

STIV141C =NOAA Status and Trends PCBs

#D = No. of Detects

#S = Total No. of Samples

#R = No. of Samples Rejected During Data Validation

FL = Data Validation Qualifier (Flag)

J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)

Mean Conc = Geometric Mean

Table 4-6
SUMMARY OF BROWN ALGAE TISSUE SAMPLES
LANDFILLS AND REFERENCE SITES
(Page 1 of 2)

			LANDFILLS									REFERENCE							
METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	FL	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MEAN CONC
NOAA STATUS AND TRENDS PESTICIDES																			
STIV141E	2,4'-DDD	UG/KG	3	8	1	0.48	1.2	11	40	M01MT01S05		0	3	0	0.43	0.88			
STIV141E	2,4'-DDE	UG/KG	0	8	1	0.27	1.3			No Detects		3	3	0			4.7	5.1	4.83
STIV141E	2,4'-DDT	UG/KG	1	8	1	0.28	0.83	12	12	M01MT01S05		0	3	0	0.25	0.5			
STIV141E	4,4'-DDD	UG/KG	2	8	1	1.2	3.5	6	66	M01MT01S05		0	3	0	1	2.2			
STIV141E	4,4'-DDE	UG/KG	3	8	1	1.9	4.7	4.6	60	M01MT01S05		0	3	0	1.7	3.4			
STIV141E	4,4'-DDT	UG/KG	1	8	1	0.43	1.3	37	37	M01MT01S05		1	3	0	0.37	0.78	7.9	7.9	0.829
STIV141E	ALDRIN	UG/KG	0	8	1	0.48	2.4			No Detects		0	3	0	0.7	1.4			
STIV141E	ALPHA-BHC	UG/KG	4	8	1	0.67	0.81	0.78	2.9	M01MT03S05		1	3	0	0.24	0.47	1.3	1.3	0.332
STIV141E	ALPHA-CHLORDANE	UG/KG	2	8	1	0.44	1.3	0.99	3.3	M01MT01S05		0	3	0	0.38	0.8			
STIV141E	BETA-BHC	UG/KG	3	8	1	0.22	0.65	0.5	1.2	M01MT03S05		0	3	0	0.19	0.4			
STIV141E	DELTA-BHC	UG/KG	4	8	1	0.18	0.44	0.46	2.3	M01MT06S05	J	0	3	0	0.16	0.32			
STIV141E	DIELDRIN	UG/KG	1	8	1	0.29	0.86	28	28	M01MT01S05		0	3	0	0.25	0.52			
STIV141E	ENDOSULFAN I	UG/KG	0	8	1	0.35	1.7			No Detects		1	3	0	1	1	1.3	1.3	0.688
STIV141E	ENDOSULFAN II	UG/KG	1	8	1	0.35	1.7	48	48	M01MT06S05		0	3	0	0.51	1			
STIV141E	ENDOSULFAN SULFATE	UG/KG	1	8	1	0.35	1.7	1.1	1.1	M01MT07S05		0	3	0	0.51	1			
STIV141E	ENDRIN	UG/KG	3	8	1	0.16	0.48	2.6	5.6	M01MT06S05		0	3	0	0.14	0.29			
STIV141E	ENDRIN ALDEHYDE	UG/KG	2	8	1	0.24	1.2	3.9	5.9	M01MT05S05		1	3	0	0.35	0.71	1.9	1.9	0.491
STIV141E	ENDRIN KETONE	UG/KG	0	8	1	0.24	1.2			No Detects		0	3	0	0.35	0.71			
STIV141E	GAMMA-BHC (LINDANE)	UG/KG	2	8	1	0.22	0.67	1.3	4.4	M01MT06S05		0	3	0	0.2	0.41			
STIV141E	GAMMA-CHLORDANE	UG/KG	3	8	1	0.78	2.3	2.1	8.7	M01MT03S05		0	3	0	0.69	1.4			
STIV141E	HEPTACHLOR	UG/KG	0	8	1	0.09	0.44			No Detects		0	3	0	0.13	0.26			
STIV141E	HEPTACHLOR EPOXIDE	UG/KG	3	8	1	0.17	0.81	0.47	0.64	M01MT07S05		0	3	0	0.24	0.49			
STIV141E	HEXACHLOROBENZENE	UG/KG	0	8	1	0.11	0.53			No Detects		0	3	0	0.16	0.33			
STIV141E	METHOXYCHLOR	UG/KG	1	8	1	0.34	1	0.13	0.13	M01MT01S05	J	0	3	0	0.3	0.62			
STIV141E	MIREX	UG/KG	5	8	1	0.27	0.36	0.84	13	M01MT06S05		3	3	0			1.8	3.3	2.36
STIV141E	TRANS-NONACHLOR	UG/KG	1	8	1	0.25	1.2	2.2	2.2	M01MT04S05		0	3	0	0.36	0.75			
NOAA STATUS AND TRENDS PCBs																			
STIV141C	PCB-101 (2,2',3,5,5')	UG/KG	3	8	1	1.1	3.3	0.68	46	M01MT01S05		0	3	0	0.93	1.9			
STIV141C	PCB-105 (2,3,3',4,4')	UG/KG	2	8	1	0.15	0.62	5.6	7	M01MT04S05		2	3	0	0.45	0.45	1.3	2.3	0.876
STIV141C	PCB-118 (2,3',4,4',5)	UG/KG	2	8	1	1.2	3.6	8.4	12	M01MT04S05		0	3	0	1.1	2.2			
STIV141C	PCB-126 (3,3',4,4',5)	UG/KG	2	8	1	0.23	1.1	10	13	M01MT05S05	J	3	3	0			9.4	23	13.7

Notes:

STIV141E =NOAA Status and Trends Pesticides

STIV141C =NOAA Status and Trends PCBs

#D = No. of Detects

#S = Total No. of Samples

#R = No. of Samples Rejected During Data Validation

FL = Data Validation Qualifier (Flag)

J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)

Mean Conc = Geometric Mean

Table 4-6
SUMMARY OF BROWN ALGAE TISSUE SAMPLES
LANDFILLS AND REFERENCE SITES
(Page 2 of 2)

			LANDFILLS									REFERENCE							
METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	FL	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MEAN CONC
NOAA STATUS AND TRENDS PCBs - continued																			
STIV141C	PCB-128 (2,2',3,3',4,4')	UG/KG	2	8	1	0.6	1.8	1.1	5.6	M01MT01S05		0	3	0	0.53	1.1			
STIV141C	PCB-138 (2,2',3,4,4',5')	UG/KG	2	8	1	2.4	7.1	22	120	M01MT01S05		1	3	0	4.3	4.4	3.3	3.3	2.5
STIV141C	PCB-153 (2,2',4,4',5,5')	UG/KG	2	8	1	1.9	5.6	30	210	M01MT01S05		0	3	0	1.7	3.4			
STIV141C	PCB-170 (2,2',3,3',4,4',5)	UG/KG	7	8	1			0.95	89	M01MT01S05		3	3	0			0.36	1.4	0.66
STIV141C	PCB-18 (2,2',5)	UG/KG	4	8	1	0.33	0.63	2.9	8	M01MT06S05		0	3	0	0.22	0.46			
STIV141C	PCB-180 (2,2',3,4,4',5,5')	UG/KG	7	8	1			1.2	160	M01MT01S05		2	3	0	0.85	0.85	0.56	2.3	0.818
STIV141C	PCB-187 (2,2',3,4',5,5',6)	UG/KG	5	8	1	2.1	2.5	1.1	130	M01MT01S05		0	3	0	0.76	1.5			
STIV141C	PCB-195 (2,2',3,3',4,4',5,6)	UG/KG	5	8	1	0.42	1.2	0.34	16	M01MT01S05		2	3	0	0.77	0.77	0.67	0.95	0.626
STIV141C	PCB-206 (2,2',3,3',4,4',5,5',6)	UG/KG	4	8	1	0.35	0.58	0.81	10	M01MT01S05		3	3	0			1.6	2.6	1.88
STIV141C	PCB-209 (2,2',3,3',4,4',5,5',6,6')	UG/KG	2	8	1	0.2	0.57	0.53	2.3	M01MT04S05		0	3	0	0.17	0.35			
STIV141C	PCB-28 (2,4,4')	UG/KG	3	8	1	0.24	0.72	2	6.8	M01MT06S05		0	3	0	0.22	0.44			
STIV141C	PCB-44 (2,2',3,5')	UG/KG	1	8	1	0.12	0.6	7.4	7.4	M01MT04S05		0	3	0	0.18	0.37			
STIV141C	PCB-52 (2,2',5,5')	UG/KG	4	8	1	0.73	1.3	3.1	13	M01MT04S05	J	0	3	0	0.78	30			
STIV141C	PCB-66 (2,3',4,4')	UG/KG	1	8	1	0.34	1	4.8	4.8	M01MT01S05		0	3	0	0.3	0.62			
STIV141C	PCB-77 (3,3',4,4')	UG/KG	2	8	1	0.28	1.4	2.6	13	M01MT06S05		0	3	0	0.4	0.82			
STIV141C	PCB-8 (2,4')	UG/KG	4	8	1	0.48	0.58	0.53	1.1	M01MT01S05		0	3	0	0.17	0.35			

Notes:

STIV141C =NOAA Status and Trends PCBs

#D = No. of Detects

#S = Total No. of Samples

#R = No. of Samples Rejected During Data Validation

FL = Data Validation Qualifier (Flag)

J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)

Mean Conc = Geometric Mean

Table 4-7
SUMMARY OF GREEN ALGAE TISSUE SAMPLES
LANDFILLS AND REFERENCE SITES
(Page 1 of 2)

		LANDFILLS										REFERENCE							
METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	FL	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MEAN CONC
NOAA STATUS AND TRENDS PESTICIDES																			
STIV141E	2,4'-DDD	UG/KG	2	8	2	0.43	0.48	4	4.3	M01MT01S06		1	2	0	0.23	0.23	21	21	1.55
STIV141E	2,4'-DDE	UG/KG	0	8	2	0.39	0.49			No Detects		0	2	0	0.45	0.49			
STIV141E	2,4'-DDT	UG/KG	0	8	2	0.25	0.31			No Detects		0	2	0	0.29	0.31			
STIV141E	4,4'-DDD	UG/KG	2	8	2	1	1.2	3	5.3	M01MT01S06		0	2	0	1.2	1.3			
STIV141E	4,4'-DDE	UG/KG	3	8	2	1.7	1.8	0.32	5.6	M01MT01S06		0	2	0	2	2.1			
STIV141E	4,4'-DDT	UG/KG	1	8	2	0.38	0.42	1.8	1.8	M01MT01S06		0	2	0	0.44	0.48			
STIV141E	ALDRIN	UG/KG	0	8	2	0.7	0.88			No Detects		0	2	0	0.82	0.88			
STIV141E	ALPHA-BHC	UG/KG	0	8	2	0.24	0.3			No Detects		2	2	0			1.2	2	1.55
STIV141E	ALPHA-CHLORDANE	UG/KG	0	8	2	0.39	0.49			No Detects		0	2	0	0.45	0.49			
STIV141E	BETA-BHC	UG/KG	0	8	2	0.19	0.24			No Detects		0	2	0	0.22	0.24			
STIV141E	DELTA-BHC	UG/KG	1	8	2	0.16	0.2	0.15	0.15	M01MT08S06	J	2	2	0			0.11	0.16	0.133
STIV141E	DIELDRIN	UG/KG	0	8	2	0.26	0.32			No Detects		0	2	0	0.3	0.32			
STIV141E	ENDOSULFAN I	UG/KG	0	8	2	0.52	0.65			No Detects		1	2	0	0.64	0.64	0.55	0.55	0.42
STIV141E	ENDOSULFAN II	UG/KG	1	8	2	0.53	0.65	1.3	1.3	M01MT11S06		0	2	0	0.6	0.65			
STIV141E	ENDOSULFAN SULFATE	UG/KG	0	8	2	0.52	0.65			No Detects		0	2	0	0.6	0.65			
STIV141E	ENDRIN	UG/KG	1	8	2	0.14	0.18	0.24	0.24	M01MT09S06		1	2	0	0.18	0.18	0.21	0.21	0.137
STIV141E	ENDRIN ALDEHYDE	UG/KG	0	8	2	0.35	0.45			No Detects		0	2	0	0.41	0.45			
STIV141E	ENDRIN KETONE	UG/KG	0	8	2	0.35	0.45			No Detects		0	2	0	0.41	0.45			
STIV141E	GAMMA-BHC (LINDANE)	UG/KG	2	8	2	0.2	0.22	1.4	1.5	M01MT02S06		0	2	0	0.23	0.25			
STIV141E	GAMMA-CHLORDANE	UG/KG	0	8	2	0.69	0.87			No Detects		0	2	0	0.8	0.87			
STIV141E	HEPTACHLOR	UG/KG	3	8	2	0.14	0.17	0.48	1.5	M01MT12S06		0	2	0	0.15	0.17			
STIV141E	HEPTACHLOR EPOXIDE	UG/KG	1	8	2	0.24	0.27	2.1	2.1	M01MT01S06		2	2	0			0.84	1	0.917
STIV141E	HEXACHLOROBENZENE	UG/KG	2	8	2	0.16	0.18	1.9	7.6	M01MT01S06		0	2	0	0.19	0.2			
STIV141E	METHOXYCHLOR	UG/KG	0	8	2	0.3	0.38			No Detects		0	2	0	0.35	0.38			
STIV141E	MIREX	UG/KG	6	8	2			0.8	5.6	M01MT08S06		2	2	0			2.2	12	5.14
STIV141E	TRANS-NONACHLOR	UG/KG	0	8	2	0.36	0.46			No Detects		0	2	0	0.42	0.46			
NOAA STATUS AND TRENDS PCBs																			
STIV141C	PCB-101 (2,2',3,5,5')	UG/KG	0	8	2	0.94	1.2			No Detects		0	2	0	1.1	1.2			
STIV141C	PCB-105 (2,3,3',4,4')	UG/KG	2	8	2	0.22	0.25	1.8	2.5	M01MT02S06		0	2	0	0.26	0.28			
STIV141C	PCB-118 (2,3',4,4',5)	UG/KG	2	8	2	1.1	1.2	4.2	11	M01MT02S06		0	2	0	1.3	1.4			
STIV141C	PCB-126 (3,3',4,4',5)	UG/KG	1	8	2	0.34	0.45	23	23	M01MT02S06	J	0	2	0	0.38	0.41			

Notes:

STIV141E =NOAA Status and Trends Pesticides

STIV141C =NOAA Status and Trends PCBs

#D = No. of Detects

#S = Total No. of Samples

#R = No. of Samples Rejected During Data Validation

FL = Data Validation Qualifier (Flag)

J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)

Mean Conc = Geometric Mean

Table 4-7
SUMMARY OF GREEN ALGAE TISSUE SAMPLES
LANDFILLS AND REFERENCE SITES
(Page 2 of 2)

			LANDFILLS									REFERENCE							
METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	FL	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MEAN CONC
NOAA STATUS AND TRENDS PCBs - continued																			
STIV141C	PCB-128 (2,2',3,3',4,4')	UG/KG	2	8	2	0.53	0.59	2.9	7.1	M01MT02S06		0	2	0	0.62	0.67			
STIV141C	PCB-138 (2,2',3,4,4',5')	UG/KG	3	8	2	2.2	2.3	0.86	130	M01MT02S06		0	2	0	2.5	2.7			
STIV141C	PCB-153 (2,2',4,4',5,5')	UG/KG	3	8	2	1.7	1.9	1.5	180	M01MT02S06		0	2	0	2	2.1			
STIV141C	PCB-170 (2,2',3,3',4,4',5)	UG/KG	6	8	2			0.12	74	M01MT02S06		2	2	0			0.31	0.42	0.361
STIV141C	PCB-18 (2,2',5)	UG/KG	0	8	2	0.23	0.28			No Detects		0	2	0	0.26	0.28			
STIV141C	PCB-180 (2,2',3,4,4',5,5')	UG/KG	6	8	2			1.6	130	M01MT02S06		0	2	0	0.49	0.53			
STIV141C	PCB-187 (2,2',3,4',5,5',6)	UG/KG	6	8	2			0.26	99	M01MT02S06		0	2	0	0.89	0.96			
STIV141C	PCB-195 (2,2',3,3',4,4',5,6)	UG/KG	2	8	2	0.38	0.42	6.5	16	M01MT02S06		0	2	0	0.43	0.47			
STIV141C	PCB-206 (2,2',3,3',4,4',5,5',6)	UG/KG	2	8	2	0.31	0.35	2.8	7.9	M01MT02S06		1	2	0	0.39	0.39	0.13	0.13	0.13
STIV141C	PCB-209 (2,2',3,3',4,4',5,5',6,6')	UG/KG	2	8	2	0.17	0.19	0.11	0.21	M01MT02S06		0	2	0	0.2	0.22			
STIV141C	PCB-28 (2,4,4')	UG/KG	0	8	2	0.22	0.27			No Detects		0	2	0	0.25	0.27			
STIV141C	PCB-44 (2,2',3,5')	UG/KG	0	8	2	0.18	0.23			No Detects		0	2	0	0.21	0.23			
STIV141C	PCB-52 (2,2',5,5')	UG/KG	4	8	2	0.39	0.42	1.2	11	M01MT01S06	J	0	2	0	0.46	0.5			
STIV141C	PCB-66 (2,3',4,4')	UG/KG	0	8	2	0.3	0.38			No Detects		0	2	0	0.35	0.38			
STIV141C	PCB-77 (3,3',4,4')	UG/KG	1	8	2	0.42	0.51	0.48	0.48	M01MT11S06		0	2	0	0.47	0.51			
STIV141C	PCB-8 (2,4')	UG/KG	0	8	2	0.17	0.22			No Detects		0	2	0	0.2	0.22			

Notes:
STIV141C =NOAA Status and Trends PCBs

#D = No. of Detects
#S = Total No. of Samples
#R = No. of Samples Rejected During Data Validation
FL = Data Validation Qualifier (Flag)

J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)
Mean Conc = Geometric Mean

Table 4-8
SUMMARY OF OCTOPUS TISSUE SAMPLES
LANDFILLS AND REFERENCE SITES
(Page 1 of 2)

			LANDFILLS									REFERENCE							
METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	FL	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MEAN CONC
NOAA STATUS AND TRENDS PESTICIDES																			
STIV141E	2,4'-DDD	UG/KG	0	2	1	1.3	1.3			No Detects		0	2	1	0.41	0.41			
STIV141E	2,4'-DDE	UG/KG	0	2	1	1.2	1.2			No Detects		0	2	1	0.38	0.38			
STIV141E	2,4'-DDT	UG/KG	0	2	1	0.78	0.78			No Detects		0	2	1	0.24	0.24			
STIV141E	4,4'-DDD	UG/KG	0	2	1	3.3	3.3			No Detects		0	2	1	1	1			
STIV141E	4,4'-DDE	UG/KG	0	2	1	5.3	5.3			No Detects		0	2	1	1.6	1.6			
STIV141E	4,4'-DDT	UG/KG	0	2	1	1.2	1.2			No Detects		0	2	1	0.37	0.37			
STIV141E	ALDRIN	UG/KG	0	2	1	2.2	2.2			No Detects		0	2	1	0.68	0.68			
STIV141E	ALPHA-BHC	UG/KG	0	2	1	0.75	0.75			No Detects		0	2	1	0.22	0.22			
STIV141E	ALPHA-CHLORDANE	UG/KG	0	2	1	1.2	1.2			No Detects		0	2	1	0.38	0.38			
STIV141E	BETA-BHC	UG/KG	0	2	1	0.61	0.61			No Detects		0	2	1	0.19	0.19			
STIV141E	DELTA-BHC	UG/KG	0	2	1	0.49	0.49			No Detects		0	2	1	0.15	0.15			
STIV141E	DIELDRIN	UG/KG	0	2	1	0.8	0.8			No Detects		0	2	1	0.25	0.25			
STIV141E	ENDOSULFAN I	UG/KG	0	2	1	1.6	1.6			No Detects		0	2	1	0.5	0.5			
STIV141E	ENDOSULFAN II	UG/KG	0	2	1	1.6	1.6			No Detects		0	2	1	0.5	0.5			
STIV141E	ENDOSULFAN SULFATE	UG/KG	0	2	1	1.6	1.6			No Detects		0	2	1	0.5	0.5			
STIV141E	ENDRIN	UG/KG	0	2	1	0.45	0.45			No Detects		0	2	1	0.14	0.14			
STIV141E	ENDRIN ALDEHYDE	UG/KG	0	2	1	1.1	1.1			No Detects		0	2	1	0.34	0.34			
STIV141E	ENDRIN KETONE	UG/KG	0	2	1	1.1	1.1			No Detects		0	2	1	0.34	0.34			
STIV141E	GAMMA-BHC (LINDANE)	UG/KG	0	2	1	0.62	0.62			No Detects		0	2	1	0.19	0.19			
STIV141E	GAMMA-CHLORDANE	UG/KG	0	2	1	2.2	2.2			No Detects		0	2	1	0.67	0.67			
STIV141E	HEPTACHLOR	UG/KG	0	2	1	0.41	0.41			No Detects		0	2	1	0.13	0.13			
STIV141E	HEPTACHLOR EPOXIDE	UG/KG	0	2	1	0.75	0.75			No Detects		0	2	1	0.23	0.23			
STIV141E	HEXACHLOROBENZENE	UG/KG	0	2	1	0.5	0.5			No Detects		0	2	1	0.15	0.15			
STIV141E	METHOXYCHLOR	UG/KG	0	2	1	0.94	0.94			No Detects		0	2	1	0.29	0.29			
STIV141E	MIREX	UG/KG	0	2	1	0.76	0.76			No Detects		0	2	1	0.23	0.23			
STIV141E	TRANS-NONACHLOR	UG/KG	0	2	1	1.1	1.1			No Detects		0	2	1	0.35	0.35			
NOAA STATUS AND TRENDS PCBs																			
STIV141C	PCB-101 (2,2',3,5,5')	UG/KG	1	2	1			1.6	1.6	M01MT05S08	J	0	2	1	0.9	0.9			
STIV141C	PCB-105 (2,3,3',4,4')	UG/KG	1	2	1			1.7	1.7	M01MT05S08		0	2	1	0.22	0.22			
STIV141C	PCB-118 (2,3',4,4',5)	UG/KG	1	2	1			3.1	3.1	M01MT05S08	J	0	2	1	1	1			
STIV141C	PCB-126 (3,3',4,4',5)	UG/KG	0	2	1	1	1			No Detects		0	2	1	0.32	0.32			

Notes:

STIV141E =NOAA Status and Trends Pesticides

STIV141C =NOAA Status and Trends PCBs

#D = No. of Detects

#S = Total No. of Samples

#R = No. of Samples Rejected During Data Validation

FL = Data Validation Qualifier (Flag)

J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)

Mean Conc = Geometric Mean

Table 4-8
SUMMARY OF OCTOPUS TISSUE SAMPLES
LANDFILLS AND REFERENCE SITES
(Page 2 of 2)

			LANDFILLS									REFERENCE							
METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	FL	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MEAN CONC
NOAA STATUS AND TRENDS PCBs - continued																			
STIV141C	PCB-128 (2,2',3,3',4,4')	UG/KG	1	2	1			0.87	0.87	M01MT05S08	J	0	2	1	0.51	0.51			
STIV141C	PCB-138 (2,2',3,4,4',5')	UG/KG	1	2	1			18	18	M01MT05S08		0	2	1	2.04	2.04			
STIV141C	PCB-153 (2,2',4,4',5,5')	UG/KG	1	2	1			33	33	M01MT05S08		0	2	1	1.63	1.63			
STIV141C	PCB-170 (2,2',3,3',4,4',5)	UG/KG	1	2	1			13	13	M01MT05S08		0	2	1	0.25	0.25			
STIV141C	PCB-18 (2,2',5)	UG/KG	0	2	1	0.71	0.71			No Detects		1	2	1			0.15	0.15	0.15
STIV141C	PCB-180 (2,2',3,4,4',5,5')	UG/KG	1	2	1			35	35	M01MT05S08		1	2	1			0.24	0.24	0.24
STIV141C	PCB-187 (2,2',3,4',5,5',6)	UG/KG	1	2	1			21	21	M01MT05S08		0	2	1	0.74	0.74			
STIV141C	PCB-195 (2,2',3,3',4,4',5,6)	UG/KG	1	2	1			4	4	M01MT05S08		0	2	1	0.36	0.36			
STIV141C	PCB-206 (2,2',3,3',4,4',5,5',6)	UG/KG	1	2	1			1.6	1.6	M01MT05S08		0	2	1	0.3	0.3			
STIV141C	PCB-209 (2,2',3,3',4,4',5,5',6,6')	UG/KG	0	2	1	0.55	0.55			No Detects		0	2	1	0.17	0.17			
STIV141C	PCB-28 (2,4,4')	UG/KG	0	2	1	0.68	0.68			No Detects		0	2	1	0.21	0.21			
STIV141C	PCB-44 (2,2',3,5')	UG/KG	0	2	1	0.57	0.57			No Detects		0	2	1	0.18	0.18			
STIV141C	PCB-52 (2,2',5,5')	UG/KG	0	2	1	1.2	1.2			No Detects		0	2	1	0.38	0.38			
STIV141C	PCB-66 (2,3',4,4')	UG/KG	0	2	1	0.96	0.96			No Detects		0	2	1	0.29	0.29			
STIV141C	PCB-77 (3,3',4,4')	UG/KG	0	2	1	1.3	1.3			No Detects		0	2	1	0.39	0.39			
STIV141C	PCB-8 (2,4')	UG/KG	0	2	1	0.54	0.54			No Detects		0	2	1	0.17	0.17			

Notes:

STIV141C =NOAA Status and Trends PCBs

#D = No. of Detects

#S = Total No. of Samples

#R = No. of Samples Rejected During Data Validation

FL = Data Validation Qualifier (Flag)

J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)

Mean Conc = Geometric Mean

Table 4-9
SUMMARY OF SEA CUCUMBER TISSUE SAMPLES
LANDFILLS AND REFERENCE SITES
(Page 1 of 2)

			LANDFILLS									REFERENCE							
METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	FL	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MEAN CONC
NOAA STATUS AND TRENDS PESTICIDES																			
STIV141E	2,4'-DDD	UG/KG	2	5	2	1.4	1.4	0.67	0.95	M01MT09S07	J	0	2	0	0.97	1.1			
STIV141E	2,4'-DDE	UG/KG	0	5	2	0.82	1.4			No Detects		0	2	0	0.88	1			
STIV141E	2,4'-DDT	UG/KG	0	5	2	0.52	0.89			No Detects		0	2	0	0.56	0.64			
STIV141E	4,4'-DDD	UG/KG	1	5	2	2.2	3.4	1.2	1.2	M01MT09S07	J	0	2	0	2.4	2.7			
STIV141E	4,4'-DDE	UG/KG	2	5	2	5.27	5.27	2	5	M01MT09S07	J	0	2	0	3.8	4.3			
STIV141E	4,4'-DDT	UG/KG	2	5	2	1.2	1.2	0.59	1.1	M01MT09S07	J	0	2	0	0.86	0.98			
STIV141E	ALDRIN	UG/KG	0	5	2	1.5	2.5			No Detects		0	2	0	1.6	1.8			
STIV141E	ALPHA-BHC	UG/KG	0	5	2	0.5	0.86			No Detects		0	2	0	0.54	0.62			
STIV141E	ALPHA-CHLORDANE	UG/KG	0	5	2	0.82	1.4			No Detects		0	2	0	0.88	1			
STIV141E	BETA-BHC	UG/KG	0	5	2	0.4	0.69			No Detects		1	2	0	0.5	0.5	0.25	0.25	0.25
STIV141E	DELTA-BHC	UG/KG	0	5	2	0.33	0.56			No Detects		0	2	0	0.35	0.41			
STIV141E	DIELDRIN	UG/KG	0	5	2	0.54	0.91			No Detects		0	2	0	0.58	0.66			
STIV141E	ENDOSULFAN I	UG/KG	0	5	2	1.1	1.8			No Detects		0	2	0	1.2	1.3			
STIV141E	ENDOSULFAN II	UG/KG	0	5	2	1.1	1.8			No Detects		0	2	0	1.2	1.3			
STIV141E	ENDOSULFAN SULFATE	UG/KG	0	5	2	1.1	1.8			No Detects		0	2	0	1.2	1.3			
STIV141E	ENDRIN	UG/KG	0	5	2	0.3	0.51			No Detects		0	2	0	0.32	0.37			
STIV141E	ENDRIN ALDEHYDE	UG/KG	0	5	2	0.74	1.3			No Detects		0	2	0	0.8	0.91			
STIV141E	ENDRIN KETONE	UG/KG	0	5	2	0.74	1.3			No Detects		0	2	0	0.8	0.91			
STIV141E	GAMMA-BHC (LINDANE)	UG/KG	0	5	2	0.42	0.71			No Detects		1	2	0	0.51	0.51	0.32	0.32	0.286
STIV141E	GAMMA-CHLORDANE	UG/KG	0	5	2	1.4	2.5			No Detects		0	2	0	1.6	1.8			
STIV141E	HEPTACHLOR	UG/KG	0	5	2	0.27	0.47			No Detects		0	2	0	0.3	0.34			
STIV141E	HEPTACHLOR EPOXIDE	UG/KG	0	5	2	0.5	0.86			No Detects		0	2	0	0.54	0.62			
STIV141E	HEXACHLOROBENZENE	UG/KG	0	5	2	0.33	0.55			No Detects		0	2	0	0.36	0.41			
STIV141E	METHOXYCHLOR	UG/KG	0	5	2	0.63	1.1			No Detects		0	2	0	0.67	0.77			
STIV141E	MIREX	UG/KG	2	5	2	0.78	0.78	0.66	0.88	M01MT08S07		2	2	0			0.11	0.54	0.244
STIV141E	TRANS-NONACHLOR	UG/KG	1	5	2	1.2	1.3	0.27	0.27	M01MT08S07	J	0	2	0	0.82	0.94			
NOAA STATUS AND TRENDS PCBs																			
STIV141C	PCB-101 (2,2',3,5,5')	UG/KG	2	5	2	3	3	1.7	2.6	M01MT09S07	J	0	2	0	2.1	2.4			
STIV141C	PCB-105 (2,3,3',4,4')	UG/KG	2	5	2	0.72	0.72	1.2	1.6	M01MT08S07		1	2	0	0.58	0.58	1.3	1.3	0.614
STIV141C	PCB-118 (2,3',4,4',5)	UG/KG	1	5	2	2.3	3.5	2.5	2.5	M01MT09S07	J	0	2	0	2.4	2.8			
STIV141C	PCB-126 (3,3',4,4',5)	UG/KG	0	5	2	0.69	1.2			No Detects		0	2	0	0.74	0.85			

Notes:

STIV141E =NOAA Status and Trends Pesticides

STIV141C =NOAA Status and Trends PCBs

#D = No. of Detects

#S = Total No. of Samples

#R = No. of Samples Rejected During Data Validation

FL = Data Validation Qualifier (Flag)

J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)

Mean Conc = Geometric Mean

Table 4-9
SUMMARY OF SEA CUCUMBER TISSUE SAMPLES
LANDFILLS AND REFERENCE SITES
(Page 2 of 2)

			LANDFILLS									REFERENCE							
METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	FL	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MEAN CONC
NOAA STATUS AND TRENDS PCBs - continued																			
STIV141C	PCB-128 (2,2',3,3',4,4')	UG/KG	2	5	2	1.7	1.7	0.88	1.1	M01MT09S07	J	0	2	0	1.2	1.4			
STIV141C	PCB-138 (2,2',3,4,4',5')	UG/KG	2	5	2	3.33	3.33	11	16	M01MT09S07		1	2	0	5.55	5.55	3.3	3.3	3.03
STIV141C	PCB-153 (2,2',4,4',5,5')	UG/KG	2	5	2	2.67	2.67	16	17	M01MT09S07		0	2	0	3.81	4.44			
STIV141C	PCB-170 (2,2',3,3',4,4',5)	UG/KG	2	5	2	0.84	0.84	0.83	2.3	M01MT09S07		0	2	0	0.57	0.67			
STIV141C	PCB-18 (2,2',5)	UG/KG	0	5	2	0.48	0.8			No Detects		2	2	0			0.86	2	1.31
STIV141C	PCB-180 (2,2',3,4,4',5,5')	UG/KG	3	5	2			0.74	46	M01MT08S07		1	2	0	1.11	1.11	0.91	0.91	0.711
STIV141C	PCB-187 (2,2',3,4',5,5',6)	UG/KG	3	5	2			2.4	22	M01MT08S07		0	2	0	1.7	2			
STIV141C	PCB-195 (2,2',3,3',4,4',5,6)	UG/KG	2	5	2	1.2	1.2	1.9	2.1	M01MT08S07		0	2	0	0.86	0.97			
STIV141C	PCB-206 (2,2',3,3',4,4',5,5',6)	UG/KG	3	5	2			0.59	0.77	M01MT08S07		0	2	0	0.71	0.8			
STIV141C	PCB-209 (2,2',3,3',4,4',5,5',6,6')	UG/KG	0	5	2	0.36	0.61			No Detects		0	2	0	0.39	0.45			
STIV141C	PCB-28 (2,4,4')	UG/KG	0	5	2	0.45	0.77			No Detects		0	2	0	0.49	0.56			
STIV141C	PCB-44 (2,2',3,5')	UG/KG	0	5	2	0.38	0.65			No Detects		0	2	0	0.41	0.47			
STIV141C	PCB-52 (2,2',5,5')	UG/KG	0	5	2	0.83	1.41			No Detects		0	2	0	0.9	1.06			
STIV141C	PCB-66 (2,3',4,4')	UG/KG	0	5	2	0.64	1.1			No Detects		0	2	0	0.69	0.79			
STIV141C	PCB-77 (3,3',4,4')	UG/KG	0	5	2	0.84	1.4			No Detects		0	2	0	0.91	1			
STIV141C	PCB-8 (2,4')	UG/KG	0	5	2	0.36	0.62			No Detects		0	2	0	0.39	0.45			

Notes:

STIV141C =NOAA Status and Trends PCBs

#D = No. of Detects

#S = Total No. of Samples

#R = No. of Samples Rejected During Data Validation

FL = Data Validation Qualifier (Flag)

J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)

Mean Conc = Geometric Mean

Table 4-10
SUMMARY OF SEA URCHIN TISSUE SAMPLES
LANDFILLS AND REFERENCE SITES
(Page 1 of 2)

		LANDFILLS										REFERENCE							
METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	FL	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MEAN CONC
NOAA STATUS AND TRENDS PESTICIDES																			
STIV141E	2,4'-DDD	UG/KG	5	15	2	0.033	0.302	0.2	6.7	M01MT01S01		1	5	0	0.23	0.3	0.13	0.13	0.122
STIV141E	2,4'-DDE	UG/KG	1	15	2	0.22	0.303	1.2	1.2	M01MT07S01		0	5	0	0.21	0.27			
STIV141E	2,4'-DDT	UG/KG	3	15	2	0.14	0.18	0.6	1.9	M01MT01S01		0	5	0	0.13	0.17			
STIV141E	4,4'-DDD	UG/KG	2	15	2	0.6	0.74	0.27	2.1	M01MT01S01		0	5	0	0.57	0.73			
STIV141E	4,4'-DDE	UG/KG	7	15	2	0.962	1.2	0.55	11	M01MT01S01		0	5	0	0.91	1.2			
STIV141E	4,4'-DDT	UG/KG	3	15	2	0.22	0.27	0.72	1.2	M01MT01S01		0	5	0	0.21	0.26			
STIV141E	ALDRIN	UG/KG	0	15	2	0.054	0.49			No Detects		0	5	0	0.38	0.49			
STIV141E	ALPHA-BHC	UG/KG	3	15	2	0.139	0.187	0.041	0.37	M01MT02S01	J	1	5	0	0.11	0.167	0.12	0.12	0.0773
STIV141E	ALPHA-CHLORDANE	UG/KG	0	15	2	0.03	0.28			No Detects		0	5	0	0.21	0.27			
STIV141E	BETA-BHC	UG/KG	0	15	2	0.015	0.14			No Detects		1	5	0	0.1	0.123	0.06	0.06	0.0548
STIV141E	DELTA-BHC	UG/KG	0	15	2	0.089	0.12			No Detects		0	5	0	0.085	0.11			
STIV141E	DIELDRIN	UG/KG	0	15	2	0.02	0.18			No Detects		0	5	0	0.14	0.18			
STIV141E	ENDOSULFAN I	UG/KG	0	15	2	0.04	0.36			No Detects		0	5	0	0.28	0.36			
STIV141E	ENDOSULFAN II	UG/KG	0	15	2	0.04	0.36			No Detects		0	5	0	0.28	0.36			
STIV141E	ENDOSULFAN SULFATE	UG/KG	0	15	2	0.04	0.36			No Detects		0	5	0	0.28	0.36			
STIV141E	ENDRIN	UG/KG	4	15	2	0.081	0.112	0.21	0.88	M01MT12S01		0	5	0	0.077	0.099			
STIV141E	ENDRIN ALDEHYDE	UG/KG	0	15	2	0.027	0.25			No Detects		0	5	0	0.19	0.25			
STIV141E	ENDRIN KETONE	UG/KG	0	15	2	0.027	0.25			No Detects		0	5	0	0.19	0.25			
STIV141E	GAMMA-BHC (LINDANE)	UG/KG	6	15	2	0.112	0.14	0.025	0.3	M01MT04S01	J	2	5	0	0.11	0.127	0.1	0.92	0.114
STIV141E	GAMMA-CHLORDANE	UG/KG	0	15	2	0.054	0.49			No Detects		0	5	0	0.37	0.48			
STIV141E	HEPTACHLOR	UG/KG	1	15	2	0.01	0.093	0.27	0.27	M01MT01S01		0	5	0	0.071	0.091			
STIV141E	HEPTACHLOR EPOXIDE	UG/KG	0	15	2	0.019	0.17			No Detects		0	5	0	0.13	0.17			
STIV141E	HEXACHLOROBENZENE	UG/KG	1	15	2	0.012	0.11	0.014	0.014	M01MT05S01	J	0	5	0	0.086	0.11			
STIV141E	METHOXYCHLOR	UG/KG	0	15	2	0.023	0.21			No Detects		0	5	0	0.16	0.21			
STIV141E	MIREX	UG/KG	7	15	2	0.14	0.17	0.11	0.76	M01MT08S01		2	5	0	0.15	0.16	0.14	0.56	0.129
STIV141E	TRANS-NONACHLOR	UG/KG	0	15	2	0.028	0.26			No Detects		0	5	0	0.2	0.25			
NOAA STATUS AND TRENDS PCBs																			
STIV141C	PCB-101 (2,2',3,5,5')	UG/KG	7	15	2	0.559	0.68	0.27	15	M01MT01S01		0	5	0	0.51	0.65			
STIV141C	PCB-105 (2,3,3',4,4')	UG/KG	6	15	2	0.13	0.16	0.13	2.4	M01MT02S01		0	5	0	0.12	0.16			
STIV141C	PCB-118 (2,3',4,4',5)	UG/KG	7	15	2	0.63	0.76	0.52	8.7	M01MT02S01		0	5	0	0.58	0.75			
STIV141C	PCB-126 (3,3',4,4',5)	UG/KG	0	15	2	0.188	0.257			No Detects		0	5	0	0.18	0.23			

Notes:

STIV141E =NOAA Status and Trends Pesticides

STIV141C =NOAA Status and Trends PCBs

#D = No. of Detects

#S = Total No. of Samples

#R = No. of Samples Rejected During Data Validation

FL = Data Validation Qualifier (Flag)

J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)

Mean Conc = Geometric Mean

Table 4-10
SUMMARY OF SEA URCHIN TISSUE SAMPLES
LANDFILLS AND REFERENCE SITES
(Page 2 of 2)

			LANDFILLS									REFERENCE							
METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	FL	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MEAN CONC
NOAA STATUS AND TRENDS PCBs - continued																			
STIV141C	PCB-128 (2,2',3,3',4,4')	UG/KG	6	15	2	0.305	0.38	0.28	3.2	M01MT02S01		0	5	0	0.29	0.37			
STIV141C	PCB-138 (2,2',3,4,4',5')	UG/KG	7	15	2	0.64	1.51	1	51	M01MT01S01		1	5	0	1.2	1.49	0.065	0.065	0.065
STIV141C	PCB-153 (2,2',4,4',5,5')	UG/KG	8	15	2	0.993	1.21	0.088	67	M01MT01S01		0	5	0	0.92	1.2			
STIV141C	PCB-170 (2,2',3,3',4,4',5)	UG/KG	6	15	2	0.15	0.18	0.5	7	M01MT02S01		0	5	0	0.14	0.18			
STIV141C	PCB-18 (2,2',5)	UG/KG	7	15	2	0.127	0.159	0.3	1.4	M01MT09S01		3	5	0	0.144	0.16	0.29	0.73	0.212
STIV141C	PCB-180 (2,2',3,4,4',5,5')	UG/KG	13	15	2			0.6	14	M01MT02S01		0	5	0	0.23	0.294			
STIV141C	PCB-187 (2,2',3,4',5,5',6)	UG/KG	12	15	2	0.46	0.46	0.4	64	M01MT01S01		0	5	0	0.41	0.53			
STIV141C	PCB-195 (2,2',3,3',4,4',5,6)	UG/KG	5	15	2	0.029	0.26	0.16	1.9	M01MT02S01		0	5	0	0.2	0.26			
STIV141C	PCB-206 (2,2',3,3',4,4',5,5',6)	UG/KG	3	15	2	0.024	0.22	0.24	0.82	M01MT01S01		0	5	0	0.17	0.22			
STIV141C	PCB-209 (2,2',3,3',4,4',5,5',6,6')	UG/KG	1	15	2	0.013	0.12	0.05	0.05	M01MT01S01	J	0	5	0	0.094	0.12			
STIV141C	PCB-28 (2,4,4')	UG/KG	4	15	2	0.13	0.15	0.43	1.1	M01MT02S01		0	5	0	0.12	0.15			
STIV141C	PCB-44 (2,2',3,5')	UG/KG	1	15	2	0.014	0.13	0.39	0.39	M01MT01S01		0	5	0	0.098	0.13			
STIV141C	PCB-52 (2,2',5,5')	UG/KG	8	15	2	0.23	0.26	0.29	2.9	M01MT07S01		0	5	0	0.214	0.275			
STIV141C	PCB-66 (2,3',4,4')	UG/KG	6	15	2	0.176	0.21	0.42	7.3	M01MT01S01		0	5	0	0.16	0.21			
STIV141C	PCB-77 (3,3',4,4')	UG/KG	1	15	2	0.031	0.28	0.3	0.3	M01MT08S01		0	5	0	0.22	0.28			
STIV141C	PCB-8 (2,4')	UG/KG	3	15	2	0.098	0.133	0.088	0.17	M01MT02S01	J	0	5	0	0.0925	0.119			

Notes:

STIV141C =NOAA Status and Trends PCBs

#D = No. of Detects

#S = Total No. of Samples

#R = No. of Samples Rejected During Data Validation

FL = Data Validation Qualifier (Flag)

J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)

Mean Conc = Geometric Mean

Table 4-11
SUMMARY OF HERBIVOROUS FISH TISSUE SAMPLES
LANDFILLS AND REFERENCE SITES
(Page 1 of 2)

			LANDFILLS									REFERENCE							
METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	FL	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MEAN CONC
NOAA STATUS AND TRENDS PESTICIDES																			
STIV141E	2,4'-DDD	UG/KG	11	19	7	0.46	0.46	0.42	130	M01MT01S02		5	5	0			0.83	14	4.01
STIV141E	2,4'-DDE	UG/KG	8	19	7	0.43	0.49	0.049	25	M01MT01S02		2	5	0	0.2	0.25	0.17	0.25	0.145
STIV141E	2,4'-DDT	UG/KG	3	19	7	0.24	0.31	1	83	M01MT02S02		0	5	0	0.13	0.16			
STIV141E	4,4'-DDD	UG/KG	10	19	7	1.2	1.3	0.75	62	M01MT01S02	J	3	5	0	0.57	0.66	0.38	1.7	0.592
STIV141E	4,4'-DDE	UG/KG	12	19	7			1.7	320	M01MT01S02	J	4	5	0	1.05	1.05	1.3	18	2.44
STIV141E	4,4'-DDT	UG/KG	10	19	7	0.15	0.47	2.1	15	M01MT02S02		4	5	0	0.21	0.21	0.29	2.3	0.546
STIV141E	ALDRIN	UG/KG	0	19	7	0.41	0.88			No Detects		0	5	0	0.082	0.44			
STIV141E	ALPHA-BHC	UG/KG	12	19	7			0.13	0.89	M01MT07S02		5	5	0			0.21	0.43	0.287
STIV141E	ALPHA-CHLORDANE	UG/KG	8	19	7	0.38	0.49	0.099	6.1	M01MT01S02		2	5	0	0.21	0.24	0.15	0.4	0.151
STIV141E	BETA-BHC	UG/KG	0	19	7	0.11	0.24			No Detects		1	5	0	0.1	0.12	0.18	0.18	0.0695
STIV141E	DELTA-BHC	UG/KG	0	19	7	0.092	0.19			No Detects		2	5	0	0.02	0.096	0.45	0.5	0.0858
STIV141E	DIELDRIN	UG/KG	0	19	7	0.15	0.32			No Detects		1	5	0	0.1	0.16	1.6	1.6	0.124
STIV141E	ENDOSULFAN I	UG/KG	0	19	7	0.3	0.65			No Detects		4	5	0	0.32	0.32	0.16	0.58	0.215
STIV141E	ENDOSULFAN II	UG/KG	0	19	7	0.3	0.65			No Detects		0	5	0	0.27	0.32			
STIV141E	ENDOSULFAN SULFATE	UG/KG	0	19	7	0.3	0.65			No Detects		2	5	0	0.27	0.32	0.34	0.45	0.215
STIV141E	ENDRIN	UG/KG	2	19	7	0.084	0.18	0.32	3.1	M01MT03S02	J	1	5	0	0.074	0.09	0.077	0.077	0.0465
STIV141E	ENDRIN ALDEHYDE	UG/KG	0	19	7	0.21	0.44			No Detects		0	5	0	0.18	0.22			
STIV141E	ENDRIN KETONE	UG/KG	0	19	7	0.21	0.44			No Detects		0	5	0	0.18	0.22			
STIV141E	GAMMA-BHC (LINDANE)	UG/KG	12	19	7			0.37	2.8	M01MT03S02	J	3	5	0	0.11	0.12	0.56	1.5	0.281
STIV141E	GAMMA-CHLORDANE	UG/KG	7	19	7	0.74	0.86	0.23	0.81	M01MT01S02		1	5	0	0.36	0.43	0.12	0.12	0.12
STIV141E	HEPTACHLOR	UG/KG	1	19	7	0.077	0.16	0.2	0.2	M01MT12S02		0	5	0	0.068	0.082			
STIV141E	HEPTACHLOR EPOXIDE	UG/KG	2	19	7	0.14	0.3	0.73	1.6	M01MT06S02		4	5	0	0.15	0.15	0.29	0.59	0.278
STIV141E	HEXACHLOROBENZENE	UG/KG	12	19	7			0.31	0.75	M01MT01S02		5	5	0			0.22	0.49	0.368
STIV141E	METHOXYCHLOR	UG/KG	0	19	7	0.18	0.37			No Detects		0	5	0	0.16	0.19			
STIV141E	MIREX	UG/KG	12	19	7			0.23	8.2	M01MT02S02		1	5	0	0.13	0.15	0.48	0.48	0.103
STIV141E	TRANS-NONACHLOR	UG/KG	10	19	7	0.4	0.42	0.8	14	M01MT01S02		2	5	0	0.19	0.23	2.3	3.5	0.388
NOAA STATUS AND TRENDS PCBs																			
STIV141C	PCB-101 (2,2',3,5,5')	UG/KG	12	19	7			1.1	2,000	M01MT01S02		5	5	0			0.59	3.4	1.28
STIV141C	PCB-105 (2,3,3',4,4')	UG/KG	10	19	7	0.13	0.24	0.37	430	M01MT01S02		4	5	0	0.12	0.12	0.24	0.77	0.26
STIV141C	PCB-118 (2,3',4,4',5)	UG/KG	10	19	7	1.2	1.3	0.97	1,200	M01MT01S02		1	5	0	0.56	0.68	1.4	1.4	0.419
STIV141C	PCB-126 (3,3',4,4',5)	UG/KG	0	19	7	0.19	0.41			No Detects		0	5	0	0.17	0.21			

Notes:

STIV141E =NOAA Status and Trends Pesticides

STIV141C =NOAA Status and Trends PCBs

#D = No. of Detects

#S = Total No. of Samples

#R = No. of Samples Rejected During Data Validation

FL = Data Validation Qualifier (Flag)

J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)

Mean Conc = Geometric Mean

Table 4-11
SUMMARY OF HERBIVOROUS FISH TISSUE SAMPLES
LANDFILLS AND REFERENCE SITES
(Page 2 of 2)

			LANDFILLS									REFERENCE							
METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	FL	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MEAN CONC
NOAA STATUS AND TRENDS PCBs - continued																			
STIV141C	PCB-128 (2,2',3,3',4,4')	UG/KG	11	19	7	0.66	0.66	0.2	440	M01MT01S02		5	5	0			0.15	0.35	0.224
STIV141C	PCB-138 (2,2',3,4,4',5')	UG/KG	12	19	7			4.5	6,300	M01MT01S02		5	5	0			1.2	4.8	2.4
STIV141C	PCB-153 (2,2',4,4',5,5')	UG/KG	11	19	8			8	9,400	M01MT01S02		5	5	0			1.8	8.6	3.45
STIV141C	PCB-170 (2,2',3,3',4,4',5)	UG/KG	12	19	7			2.4	4,300	M01MT01S02		4	5	0	0.22	0.22	0.28	3	0.457
STIV141C	PCB-18 (2,2',5)	UG/KG	10	19	7	0.22	0.26	0.68	7.8	M01MT01S02	J	2	5	0	0.12	0.15	1	2.6	0.234
STIV141C	PCB-180 (2,2',3,4,4',5,5')	UG/KG	12	19	7			7.3	9,800	M01MT01S02		5	5	0			1	7.8	1.88
STIV141C	PCB-187 (2,2',3,4',5,5',6)	UG/KG	12	19	7			5.8	5,800	M01MT01S02		4	5	0	0.4	0.4	1.5	5.2	1.51
STIV141C	PCB-195 (2,2',3,3',4,4',5,6)	UG/KG	12	19	7			0.8	1,300	M01MT01S02		5	5	0			0.22	0.84	0.351
STIV141C	PCB-206 (2,2',3,3',4,4',5,5',6)	UG/KG	12	19	7			1.1	820	M01MT01S02		3	5	0	0.16	0.19	0.21	0.56	0.185
STIV141C	PCB-209 (2,2',3,3',4,4',5,5',6,6')	UG/KG	12	19	7			0.15	11	M01MT01S02		1	5	0	0.091	0.11	0.11	0.11	0.0591
STIV141C	PCB-28 (2,4,4')	UG/KG	7	19	7	0.21	0.27	1.1	21	M01MT01S02		1	5	0	0.11	0.14	0.19	0.19	0.0778
STIV141C	PCB-44 (2,2',3,5')	UG/KG	6	19	7	0.18	0.23	2.2	62	M01MT01S02		0	5	0	0.094	0.11			
STIV141C	PCB-52 (2,2',5,5')	UG/KG	8	19	7	0.38	0.49	0.87	310	M01MT01S02		3	5	0	0.21	0.22	1.3	1.8	0.54
STIV141C	PCB-66 (2,3',4,4')	UG/KG	7	19	7	0.3	0.38	1	180	M01MT01S02		0	5	0	0.16	0.19			
STIV141C	PCB-77 (3,3',4,4')	UG/KG	0	19	7	0.24	0.51			No Detects		0	5	0	0.21	0.25			
STIV141C	PCB-8 (2,4')	UG/KG	12	19	7			0.96	5.7	M01MT07S02		5	5	0			1.3	2.7	1.9

Notes:

STIV141C =NOAA Status and Trends PCBs

#D = No. of Detects

#S = Total No. of Samples

#R = No. of Samples Rejected During Data Validation

FL = Data Validation Qualifier (Flag)

J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)

Mean Conc = Geometric Mean

Table 4-12
SUMMARY OF CARNIVOROUS FISH TISSUE SAMPLES
LANDFILLS AND REFERENCE SITES
(Page 1 of 2)

			LANDFILLS										REFERENCE							
METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	FL	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MEAN CONC
NOAA STATUS AND TRENDS PESTICIDES																			
STIV141E	2,4'-DDD	UG/KG	6	12	5	0.53	0.53	0.38	140	M01MT01S04		1	3	0	0.54	0.57	0.35	0.35	0.3
STIV141E	2,4'-DDE	UG/KG	1	12	5	0.44	0.54	28	28	M01MT01S04	J	2	3	0	0.52	0.52	0.73	0.95	0.565
STIV141E	2,4'-DDT	UG/KG	3	12	5	0.28	0.34	1.4	20	M01MT03S04		2	3	0	0.29	0.29	0.37	0.54	0.307
STIV141E	4,4'-DDD	UG/KG	7	12	5			0.89	52	M01MT01S04	J	0	3	0	1.2	1.4			
STIV141E	4,4'-DDE	UG/KG	7	12	5			5.1	230	M01MT01S04	J	1	3	0	1.9	2.2	2.1	2.1	1.3
STIV141E	4,4'-DDT	UG/KG	6	12	5	0.47	0.47	1.8	16	M01MT01S04	J	1	3	0	0.43	0.51	0.46	0.46	0.293
STIV141E	ALDRIN	UG/KG	0	12	5	0.69	0.96			No Detects		0	3	0	0.8	0.93			
STIV141E	ALPHA-BHC	UG/KG	7	12	5			0.17	0.36	M01MT05S04		3	3	0			0.15	0.3	0.208
STIV141E	ALPHA-CHLORDANE	UG/KG	6	12	5	0.49	0.49	0.26	6.8	M01MT01S04	J	0	3	0	0.45	0.52			
STIV141E	BETA-BHC	UG/KG	6	12	5	0.26	0.26	0.11	0.19	M01MT05S04	J	0	3	0	0.22	0.26			
STIV141E	DELTA-BHC	UG/KG	0	12	5	0.15	0.64			No Detects		0	3	0	0.18	0.21			
STIV141E	DIELDRIN	UG/KG	0	12	5	0.25	0.35			No Detects		0	3	0	0.29	0.34			
STIV141E	ENDOSULFAN I	UG/KG	0	12	5	0.51	0.71			No Detects		0	3	0	0.59	0.69			
STIV141E	ENDOSULFAN II	UG/KG	0	12	5	0.51	0.71			No Detects		0	3	0	0.59	0.69			
STIV141E	ENDOSULFAN SULFATE	UG/KG	0	12	5	0.51	0.71			No Detects		0	3	0	0.59	0.69			
STIV141E	ENDRIN	UG/KG	0	12	5	0.14	0.2			No Detects		1	3	0	0.18	0.19	0.084	0.084	0.084
STIV141E	ENDRIN ALDEHYDE	UG/KG	0	12	5	0.35	0.49			No Detects		0	3	0	0.4	0.47			
STIV141E	ENDRIN KETONE	UG/KG	0	12	5	0.35	0.49			No Detects		0	3	0	0.4	0.47			
STIV141E	GAMMA-BHC (LINDANE)	UG/KG	5	12	5	0.25	0.26	0.14	0.28	M01MT07S04		2	3	0	0.26	0.26	0.063	0.13	0.0905
STIV141E	GAMMA-CHLORDANE	UG/KG	2	12	5	0.78	0.95	0.53	2	M01MT01S04	J	0	3	0	0.79	0.92			
STIV141E	HEPTACHLOR	UG/KG	0	12	5	0.13	0.18			No Detects		0	3	0	0.15	0.17			
STIV141E	HEPTACHLOR EPOXIDE	UG/KG	0	12	5	0.24	0.33			No Detects		0	3	0	0.28	0.32			
STIV141E	HEXACHLOROBENZENE	UG/KG	7	12	5			0.17	0.6	M01MT11S04		3	3	0			0.12	0.2	0.15
STIV141E	METHOXYCHLOR	UG/KG	0	12	5	0.29	0.41			No Detects		0	3	0	0.34	0.4			
STIV141E	MIREX	UG/KG	7	12	5			0.24	4.4	M01MT01S04	J	3	3	0			0.14	0.24	0.186
STIV141E	TRANS-NONACHLOR	UG/KG	7	12	5			0.52	11	M01MT01S04	J	1	3	0	0.42	0.48	0.3	0.3	0.247
NOAA STATUS AND TRENDS PCBs																			
STIV141C	PCB-101 (2,2',3,5,5')	UG/KG	7	12	5			0.94	630	M01MT01S04		0	3	0	0.12	1.3			
STIV141C	PCB-105 (2,3,3',4,4')	UG/KG	7	12	5			0.53	190	M01MT01S04		1	3	0	0.26	0.3	0.36	0.36	0.191
STIV141C	PCB-118 (2,3',4,4',5)	UG/KG	7	12	5			2.5	420	M01MT01S04		0	3	0	1.2	1.4			
STIV141C	PCB-126 (3,3',4,4',5)	UG/KG	0	12	5	0.32	0.45			No Detects		0	3	0	0.38	0.44			

Notes:

STIV141E =NOAA Status and Trends Pesticides

STIV141C =NOAA Status and Trends PCBs

#D = No. of Detects

#S = Total No. of Samples

#R = No. of Samples Rejected During Data Validation

FL = Data Validation Qualifier (Flag)

J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)

Mean Conc = Geometric Mean

Table 4-12
SUMMARY OF CARNIVOROUS FISH TISSUE SAMPLES
LANDFILLS AND REFERENCE SITES
(Page 2 of 2)

			LANDFILLS									REFERENCE							
METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	FL	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MEAN CONC
NOAA STATUS AND TRENDS PCBs - continued																			
STIV141C	PCB-128 (2,2',3,3',4,4')	UG/KG	7	12	5			0.65	120	M01MT01S04		0	3	0	0.61	0.71			
STIV141C	PCB-138 (2,2',3,4,4',5')	UG/KG	7	12	5			7	2,400	M01MT01S04		2	3	0	2.9	2.9	1.5	3.6	1.99
STIV141C	PCB-153 (2,2',4,4',5,5')	UG/KG	7	12	5			13	4,800	M01MT01S04		3	3	0			0.98	6.4	2.66
STIV141C	PCB-170 (2,2',3,3',4,4',5)	UG/KG	7	12	5			4.5	1,900	M01MT01S04		3	3	0			0.18	1.7	0.615
STIV141C	PCB-18 (2,2',5)	UG/KG	5	12	5	0.28	0.3	0.79	14	M01MT01S04	J	1	3	0	0.28	0.3	0.27	0.27	0.178
STIV141C	PCB-180 (2,2',3,4,4',5,5')	UG/KG	7	12	5			11	4,800	M01MT01S04		3	3	0			0.68	3.8	1.89
STIV141C	PCB-187 (2,2',3,4',5,5',6)	UG/KG	7	12	5			7	2,800	M01MT01S04		2	3	0	1	1	1.4	2	1.12
STIV141C	PCB-195 (2,2',3,3',4,4',5,6)	UG/KG	7	12	5			1.2	600	M01MT01S04		2	3	0	0.5	0.5	0.33	0.39	0.318
STIV141C	PCB-206 (2,2',3,3',4,4',5,5',6)	UG/KG	7	12	5			1.2	420	M01MT01S04		3	3	0			0.22	0.38	0.305
STIV141C	PCB-209 (2,2',3,3',4,4',5,5',6,6')	UG/KG	7	12	5			0.34	5.4	M01MT01S04	J	0	3	0	0.2	0.23			
STIV141C	PCB-28 (2,4,4')	UG/KG	6	12	5	0.27	0.27	0.51	44	M01MT01S04		0	3	0	0.24	0.29			
STIV141C	PCB-44 (2,2',3,5')	UG/KG	3	12	5	0.2	0.25	0.18	15	M01MT01S04	J	0	3	0	0.21	0.24			
STIV141C	PCB-52 (2,2',5,5')	UG/KG	7	12	5			0.23	130	M01MT01S04	J	0	3	0	0.45	0.52			
STIV141C	PCB-66 (2,3',4,4')	UG/KG	6	12	5	0.38	0.38	0.35	79	M01MT01S04		0	3	0	0.35	0.41			
STIV141C	PCB-77 (3,3',4,4')	UG/KG	0	12	5	0.4	0.56			No Detects		0	3	0	0.46	0.54			
STIV141C	PCB-8 (2,4')	UG/KG	7	12	5			0.9	2.2	M01MT01S04	J	3	3	0			0.41	0.82	0.544

Notes:
STIV141C =NOAA Status and Trends PCBs

#D = No. of Detects
#S = Total No. of Samples
#R = No. of Samples Rejected During Data Validation
FL = Data Validation Qualifier (Flag)

J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)
Mean Conc = Geometric Mean

Table 4-13
SUMMARY OF SEAWATER SAMPLES
INNER HARBOR AND REFERENCE SITES
(Page 1 of 2)

		INNER HARBOR										REFERENCE							
METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	FL	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MEAN CONC
NOAA STATUS AND TRENDS PESTICIDES																			
STIV141E	2,4'-DDD	UG/L	0	5	0	0.00077	0.00082			No Detects		0	3	0	0.00067	0.00067			
STIV141E	2,4'-DDE	UG/L	0	5	0	0.00036	0.00039			No Detects		0	3	0	0.00031	0.00032			
STIV141E	2,4'-DDT	UG/L	0	5	0	0.00033	0.00035			No Detects		0	3	0	0.00028	0.00028			
STIV141E	4,4'-DDD	UG/L	0	5	0	0.0005	0.00053			No Detects		0	3	0	0.00043	0.00044			
STIV141E	4,4'-DDE	UG/L	0	5	0	0.0002	0.00022			No Detects		0	3	0	0.00018	0.00018			
STIV141E	4,4'-DDT	UG/L	0	5	0	0.00075	0.0008			No Detects		0	3	0	0.00065	0.00066			
STIV141E	ALDRIN	UG/L	0	5	0	0.00057	0.00061			No Detects		0	3	0	0.00049	0.00049			
STIV141E	ALPHA-BHC	UG/L	0	5	0	0.00043	0.00045			No Detects		0	3	0	0.00037	0.00037			
STIV141E	ALPHA-CHLORDANE	UG/L	0	5	0	0.0005	0.00053			No Detects		0	3	0	0.00043	0.00043			
STIV141E	BETA-BHC	UG/L	0	5	0	0.00028	0.0003			No Detects		0	3	0	0.00024	0.00024			
STIV141E	DELTA-BHC	UG/L	0	5	0	0.00033	0.00035			No Detects		0	3	0	0.00028	0.00028			
STIV141E	DIELDRIN	UG/L	0	5	0	0.00042	0.00044			No Detects		0	3	0	0.00036	0.00036			
STIV141E	ENDOSULFAN I	UG/L	0	5	0	0.00063	0.00067			No Detects		0	3	0	0.00054	0.00055			
STIV141E	ENDOSULFAN II	UG/L	0	5	0	0.00063	0.00067			No Detects		0	3	0	0.00054	0.00055			
STIV141E	ENDOSULFAN SULFATE	UG/L	0	5	0	0.00063	0.00067			No Detects		0	3	0	0.00054	0.00055			
STIV141E	ENDRIN	UG/L	0	5	0	0.00059	0.00063			No Detects		0	3	0	0.00051	0.00051			
STIV141E	ENDRIN ALDEHYDE	UG/L	0	5	0	0.00033	0.00035			No Detects		0	3	0	0.00028	0.00029			
STIV141E	ENDRIN KETONE	UG/L	0	5	0	0.00033	0.00035			No Detects		0	3	0	0.00028	0.00029			
STIV141E	GAMMA-BHC (LINDANE)	UG/L	0	5	0	0.00031	0.00033			No Detects		1	3	0	0.00026	0.00027	0.00032	0.00032	0.000178
STIV141E	GAMMA-CHLORDANE	UG/L	0	5	0	0.00023	0.00024			No Detects		0	3	0	0.0002	0.0002			
STIV141E	HEPTACHLOR	UG/L	0	5	0	0.00046	0.0005			No Detects		0	3	0	0.0004	0.0004			
STIV141E	HEPTACHLOR EPOXIDE	UG/L	0	5	0	0.00086	0.00092			No Detects		0	3	0	0.00074	0.00075			
STIV141E	HEXACHLOROBENZENE	UG/L	5	5	0			0.00034	0.00045	M99SW07S01		2	3	0	0.00034	0.00034	0.00025	0.00032	0.000239
STIV141E	METHOXYCHLOR	UG/L	0	5	0	0.00085	0.0009			No Detects		0	3	0	0.00073	0.00074			
STIV141E	MIREX	UG/L	0	5	0	0.00025	0.00026			No Detects		0	3	0	0.00021	0.00022			
STIV141E	TRANS-NONACHLOR	UG/L	0	5	0	0.00035	0.00038			No Detects		0	3	0	0.00031	0.00031			
NOAA STATUS AND TRENDS PCBs																			
STIV141C	PCB-101 (2,2',3,5,5')	UG/L	0	5	0	0.00041	0.00043			No Detects		0	3	0	0.00035	0.00036			
STIV141C	PCB-105 (2,3,3',4,4')	UG/L	0	5	0	0.0006	0.00064			No Detects		0	3	0	0.00052	0.00052			
STIV141C	PCB-118 (2,3',4,4',5)	UG/L	0	5	0	0.00038	0.00041			No Detects		0	3	0	0.00033	0.00033			
STIV141C	PCB-126 (3,3',4,4',5)	UG/L	0	5	0	0.00049	0.00053			No Detects		0	3	0	0.00043	0.00043			

Notes:

STIV141E =NOAA Status and Trends Pesticides

STIV141C =NOAA Status and Trends PCBs

#D = No. of Detects

#S = Total No. of Samples

#R = No. of Samples Rejected During Data Validation

FL = Data Validation Qualifier (Flag)

J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)

Mean Conc = Geometric Mean

Table 4-13
SUMMARY OF SEAWATER SAMPLES
INNER HARBOR AND REFERENCE SITES
(Page 2 of 2)

			INNER HARBOR									REFERENCE							
METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	FL	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MEAN CONC
NOAA STATUS AND TRENDS PCBs - continued																			
STIV141C	PCB-128 (2,2',3,3',4,4')	UG/L	0	5	0	0.00033	0.00035			No Detects		0	3	0	0.00029	0.00029			
STIV141C	PCB-138 (2,2',3,4,4',5')	UG/L	0	5	0	0.00066	0.00077			No Detects		0	3	0	0.0006	0.00085			
STIV141C	PCB-153 (2,2',4,4',5,5')	UG/L	0	5	0	0.00026	0.00028			No Detects		0	3	0	0.00023	0.00023			
STIV141C	PCB-170 (2,2',3,3',4,4',5)	UG/L	0	5	0	0.0029	0.0031			No Detects		0	3	0	0.0025	0.0025			
STIV141C	PCB-18 (2,2',5)	UG/L	0	5	0	0.00051	0.00054			No Detects		0	3	0	0.00044	0.00044			
STIV141C	PCB-180 (2,2',3,4,4',5,5')	UG/L	0	5	0	0.00077	0.00082			No Detects		0	3	0	0.00067	0.00067			
STIV141C	PCB-187 (2,2',3,4',5,5',6)	UG/L	0	5	0	0.00062	0.00066			No Detects		0	3	0	0.00053	0.00054			
STIV141C	PCB-195 (2,2',3,3',4,4',5,6)	UG/L	0	5	0	0.00062	0.00066			No Detects		0	3	0	0.00054	0.00054			
STIV141C	PCB-206 (2,2',3,3',4,4',5,5',6)	UG/L	0	5	0	0.00048	0.00051			No Detects		0	3	0	0.00041	0.00042			
STIV141C	PCB-209 (2,2',3,3',4,4',5,5',6,6')	UG/L	1	5	0	0.00059	0.00061	0.000051	0.000051	M99SW05S01	J	0	3	0	0.0005	0.0005			
STIV141C	PCB-28 (2,4,4')	UG/L	0	5	0	0.0011	0.0011			No Detects		0	3	0	0.00092	0.00093			
STIV141C	PCB-44 (2,2',3,5')	UG/L	0	5	0	0.00034	0.00036			No Detects		0	3	0	0.00029	0.0003			
STIV141C	PCB-52 (2,2',5,5')	UG/L	0	5	0	0.0004	0.00042			No Detects		0	3	0	0.00034	0.00035			
STIV141C	PCB-66 (2,3',4,4')	UG/L	0	5	0	0.00033	0.00035			No Detects		0	3	0	0.00028	0.00028			
STIV141C	PCB-77 (3,3',4,4')	UG/L	0	5	0	0.00059	0.00063			No Detects		0	3	0	0.00051	0.00051			
STIV141C	PCB-8 (2,4')	UG/L	0	5	0	0.00038	0.00041			No Detects		0	3	0	0.00033	0.00034			

Notes:

STIV141C =NOAA Status and Trends PCBs

#D = No. of Detects

#S = Total No. of Samples

#R = No. of Samples Rejected During Data Validation

FL = Data Validation Qualifier (Flag)

J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)

Mean Conc = Geometric Mean

Table 4-14
SUMMARY OF BROWN ALGAE TISSUE SAMPLES
INNER HARBOR AND REFERENCE SITES
(Page 1 of 2)

		INNER HARBOR										REFERENCE							
METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	FL	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MEAN CONC
NOAA STATUS AND TRENDS PESTICIDES																			
STIV141E	2,4'-DDD	UG/KG	6	10	1	0.36	2.1	0.88	3.5	M99MT07S05		0	3	0	0.43	0.88			
STIV141E	2,4'-DDE	UG/KG	0	10	1	0.33	2			No Detects		3	3	0			4.7	5.1	4.83
STIV141E	2,4'-DDT	UG/KG	3	10	1	0.39	1.2	0.16	10	M99MT03S05		0	3	0	0.25	0.5			
STIV141E	4,4'-DDD	UG/KG	4	10	1	0.24	5.3	0.15	4.9	M99MT01S05		0	3	0	1	2.2			
STIV141E	4,4'-DDE	UG/KG	3	10	1	2.2	8.3	0.15	6.8	M99MT01S05		0	3	0	1.7	3.4			
STIV141E	4,4'-DDT	UG/KG	1	10	1	0.32	1.9	42	42	M99MT01S05		1	3	0	0.37	0.78	7.9	7.9	0.829
STIV141E	ALDRIN	UG/KG	0	10	1	0.59	3.5			No Detects		0	3	0	0.7	1.4			
STIV141E	ALPHA-BHC	UG/KG	6	10	1	0.44	0.99	0.41	2.5	M99MT05S05		1	3	0	0.24	0.47	1.3	1.3	0.332
STIV141E	ALPHA-CHLORDANE	UG/KG	0	10	1	0.33	2			No Detects		0	3	0	0.38	0.8			
STIV141E	BETA-BHC	UG/KG	8	10	1	0.43	0.43	0.12	2	M99MT06S05		0	3	0	0.19	0.4			
STIV141E	DELTA-BHC	UG/KG	9	10	1			0.34	2.3	M99MT07S05	J	0	3	0	0.16	0.32			
STIV141E	DIELDRIN	UG/KG	1	10	1	0.22	1.3	5.5	5.5	M99MT03S05		0	3	0	0.25	0.52			
STIV141E	ENDOSULFAN I	UG/KG	3	10	1	0.44	2.6	0.52	8.2	M99MT01S05		1	3	0	1	1	1.3	1.3	0.688
STIV141E	ENDOSULFAN II	UG/KG	0	10	1	0.44	2.6			No Detects		0	3	0	0.51	1			
STIV141E	ENDOSULFAN SULFATE	UG/KG	0	10	1	0.44	2.6			No Detects		0	3	0	0.51	1			
STIV141E	ENDRIN	UG/KG	0	10	1	0.12	0.72			No Detects		0	3	0	0.14	0.29			
STIV141E	ENDRIN ALDEHYDE	UG/KG	6	10	1	0.3	1.5	0.7	2.4	M99MT02S05		1	3	0	0.35	0.71	1.9	1.9	0.491
STIV141E	ENDRIN KETONE	UG/KG	0	10	1	0.3	1.8			No Detects		0	3	0	0.35	0.71			
STIV141E	GAMMA-BHC (LINDANE)	UG/KG	8	10	1	0.45	0.45	0.13	6.2	M99MT03S05		0	3	0	0.2	0.41			
STIV141E	GAMMA-CHLORDANE	UG/KG	2	10	1	0.59	3.5	1.5	1.6	M99MT08S05		0	3	0	0.69	1.4			
STIV141E	HEPTACHLOR	UG/KG	2	10	1	0.2	0.64	0.28	8.6	M99MT03S05		0	3	0	0.13	0.26			
STIV141E	HEPTACHLOR EPOXIDE	UG/KG	0	10	1	0.2	1.2			No Detects		0	3	0	0.24	0.49			
STIV141E	HEXACHLOROBENZENE	UG/KG	2	10	1	0.13	0.8	0.14	0.99	M99MT06S05		0	3	0	0.16	0.33			
STIV141E	METHOXYCHLOR	UG/KG	0	10	1	0.25	1.5			No Detects		0	3	0	0.3	0.62			
STIV141E	MIREX	UG/KG	9	10	1			0.38	13	M99MT08S05		3	3	0			1.8	3.3	2.36
STIV141E	TRANS-NONACHLOR	UG/KG	2	10	1	0.31	1.8	0.27	7.1	M99MT03S05		0	3	0	0.36	0.75			
NOAA STATUS AND TRENDS PCBs																			
STIV141C	PCB-101 (2,2',3,5,5')	UG/KG	9	10	1			0.91	23	M99MT02S05		0	3	0	0.93	1.9			
STIV141C	PCB-105 (2,3,3',4,4')	UG/KG	4	10	1	0.19	1.1	1.5	5.1	M99MT02S05		2	3	0	0.45	0.45	1.3	2.3	0.876
STIV141C	PCB-118 (2,3',4,4',5)	UG/KG	5	10	1	0.9	5.5	0.69	2.1	M99MT03D05		0	3	0	1.1	2.2			
STIV141C	PCB-126 (3,3',4,4',5)	UG/KG	1	10	1	0.28	1.7	9.7	9.7	M99MT03S05		3	3	0			9.4	23	13.7

Notes:

STIV141E =NOAA Status and Trends Pesticides

STIV141C =NOAA Status and Trends PCBs

#D = No. of Detects

#S = Total No. of Samples

#R = No. of Samples Rejected During Data Validation

FL = Data Validation Qualifier (Flag)

J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)

Mean Conc = Geometric Mean

Table 4-14
SUMMARY OF BROWN ALGAE TISSUE SAMPLES
INNER HARBOR AND REFERENCE SITES
(Page 2 of 2)

		INNER HARBOR										REFERENCE							
METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	FL	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MEAN CONC
NOAA STATUS AND TRENDS PCBs - continued																			
STIV141C	PCB-128 (2,2',3,3',4,4')	UG/KG	3	10	1	0.45	2.7	0.32	7.9	M99MT03S05		0	3	0	0.53	1.1			
STIV141C	PCB-138 (2,2',3,4,4',5')	UG/KG	8	10	1	1.8	1.8	3.1	8.8	M99MT06S05	J	1	3	0	4.3	4.4	3.3	3.3	2.5
STIV141C	PCB-153 (2,2',4,4',5,5')	UG/KG	8	10	1	3.9	3.9	3.3	16	M99MT03S05		0	3	0	1.7	3.4			
STIV141C	PCB-170 (2,2',3,3',4,4',5)	UG/KG	9	10	1			0.66	4.9	M99MT03S05		3	3	0			0.36	1.4	0.66
STIV141C	PCB-18 (2,2',5)	UG/KG	8	10	1	0.51	0.51	0.6	3.8	M99MT06S05		0	3	0	0.22	0.46			
STIV141C	PCB-180 (2,2',3,4,4',5,5')	UG/KG	9	10	1			2.4	17	M99MT03S05		2	3	0	0.85	0.85	0.56	2.3	0.818
STIV141C	PCB-187 (2,2',3,4',5,5',6)	UG/KG	8	10	1	1.7	1.7	3.2	25	M99MT07S05		0	3	0	0.76	1.5			
STIV141C	PCB-195 (2,2',3,3',4,4',5,6)	UG/KG	9	10	1			0.39	5.3	M99MT06S05		2	3	0	0.77	0.77	0.67	0.95	0.626
STIV141C	PCB-206 (2,2',3,3',4,4',5,5',6)	UG/KG	9	10	1			0.45	9.4	M99MT03S05		3	3	0			1.6	2.6	1.88
STIV141C	PCB-209 (2,2',3,3',4,4',5,5',6,6')	UG/KG	9	10	1			4.1	64	M99MT01S05		0	3	0	0.17	0.35			
STIV141C	PCB-28 (2,4,4')	UG/KG	1	10	1	0.18	1.1	7.1	7.1	M99MT03S05		0	3	0	0.22	0.44			
STIV141C	PCB-44 (2,2',3,5')	UG/KG	0	10	1	0.15	0.91			No Detects		0	3	0	0.18	0.37			
STIV141C	PCB-52 (2,2',5,5')	UG/KG	3	10	1	0.72	2	0.43	17	M99MT03S05	J	0	3	0	0.78	30			
STIV141C	PCB-66 (2,3',4,4')	UG/KG	0	10	1	0.26	1.5			No Detects		0	3	0	0.3	0.62			
STIV141C	PCB-77 (3,3',4,4')	UG/KG	0	10	1	0.34	2			No Detects		0	3	0	0.4	0.82			
STIV141C	PCB-8 (2,4')	UG/KG	1	10	1	0.15	0.88	6.9	6.9	M99MT03S05		0	3	0	0.17	0.35			

Notes:
STIV141C =NOAA Status and Trends PCBs

#D = No. of Detects
#S = Total No. of Samples
#R = No. of Samples Rejected During Data Validation
FL = Data Validation Qualifier (Flag)

J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)
Mean Conc = Geometric Mean

Table 4-15
SUMMARY OF SEA URCHIN TISSUE SAMPLES
INNER HARBOR AND REFERENCE SITES
(Page 1 of 2)

		INNER HARBOR										REFERENCE							
METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	FL	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MEAN CONC
NOAA STATUS AND TRENDS PESTICIDES																			
STIV141E	2,4'-DDD	UG/KG	7	8	0	0.15	0.15	0.39	0.89	M99MT03S01		1	5	0	0.23	0.3	0.13	0.13	0.122
STIV141E	2,4'-DDE	UG/KG	1	8	0	0.13	0.16	0.12	0.12	M99MT06S01	J	0	5	0	0.21	0.27			
STIV141E	2,4'-DDT	UG/KG	2	8	0	0.086	0.12	0.21	0.33	M99MT05S01		0	5	0	0.13	0.17			
STIV141E	4,4'-DDD	UG/KG	1	8	0	0.36	0.44	2.5	2.5	M99MT01S01		0	5	0	0.57	0.73			
STIV141E	4,4'-DDE	UG/KG	7	8	0	0.6	0.6	0.51	1.8	M99MT04S01		0	5	0	0.91	1.2			
STIV141E	4,4'-DDT	UG/KG	1	8	0	0.13	0.16	0.16	0.16	M99MT04S01		0	5	0	0.21	0.26			
STIV141E	ALDRIN	UG/KG	0	8	0	0.24	0.29			No Detects		0	5	0	0.38	0.49			
STIV141E	ALPHA-BHC	UG/KG	3	8	0	0.079	0.11	0.073	0.27	M99MT03S01	J	1	5	0	0.11	0.167	0.12	0.12	0.0773
STIV141E	ALPHA-CHLORDANE	UG/KG	0	8	0	0.13	0.16			No Detects		0	5	0	0.21	0.27			
STIV141E	BETA-BHC	UG/KG	1	8	0	0.065	0.091	0.45	0.45	M99MT01S01		1	5	0	0.1	0.123	0.06	0.06	0.0548
STIV141E	DELTA-BHC	UG/KG	1	8	0	0.037	0.074	0.39	0.39	M99MT01S01	J	0	5	0	0.085	0.11			
STIV141E	DIELDRIN	UG/KG	0	8	0	0.087	0.11			No Detects		0	5	0	0.14	0.18			
STIV141E	ENDOSULFAN I	UG/KG	1	8	0	0.18	0.21	1.7	1.7	M99MT01S01		0	5	0	0.28	0.36			
STIV141E	ENDOSULFAN II	UG/KG	0	8	0	0.18	0.21			No Detects		0	5	0	0.28	0.36			
STIV141E	ENDOSULFAN SULFATE	UG/KG	0	8	0	0.18	0.21			No Detects		0	5	0	0.28	0.36			
STIV141E	ENDRIN	UG/KG	4	8	0	0.048	0.059	0.064	0.14	M99MT06S01		0	5	0	0.077	0.099			
STIV141E	ENDRIN ALDEHYDE	UG/KG	0	8	0	0.12	0.15			No Detects		0	5	0	0.19	0.25			
STIV141E	ENDRIN KETONE	UG/KG	0	8	0	0.12	0.15			No Detects		0	5	0	0.19	0.25			
STIV141E	GAMMA-BHC (LINDANE)	UG/KG	6	8	0	0.068	0.094	0.046	0.55	M99MT01S01		2	5	0	0.11	0.127	0.1	0.92	0.114
STIV141E	GAMMA-CHLORDANE	UG/KG	1	8	0	0.23	0.29	0.28	0.28	M99MT04S01		0	5	0	0.37	0.48			
STIV141E	HEPTACHLOR	UG/KG	0	8	0	0.045	0.062			No Detects		0	5	0	0.071	0.091			
STIV141E	HEPTACHLOR EPOXIDE	UG/KG	0	8	0	0.082	0.1			No Detects		0	5	0	0.13	0.17			
STIV141E	HEXACHLOROBENZENE	UG/KG	1	8	0	0.056	0.075	0.052	0.052	M99MT07S01	J	0	5	0	0.086	0.11			
STIV141E	METHOXYCHLOR	UG/KG	0	8	0	0.1	0.12			No Detects		0	5	0	0.16	0.21			
STIV141E	MIREX	UG/KG	4	8	0	0.079	0.085	0.081	1.2	M99MT01S01		2	5	0	0.15	0.16	0.14	0.56	0.129
STIV141E	TRANS-NONACHLOR	UG/KG	1	8	0	0.12	0.15	1.6	1.6	M99MT01S01		0	5	0	0.2	0.25			
NOAA STATUS AND TRENDS PCBs																			
STIV141C	PCB-101 (2,2',3,5,5')	UG/KG	7	8	0	0.33	0.33	0.73	1.2	M99MT03S01		0	5	0	0.51	0.65			
STIV141C	PCB-105 (2,3,3',4,4')	UG/KG	7	8	0	0.087	0.087	0.25	0.65	M99MT05S01		0	5	0	0.12	0.16			
STIV141C	PCB-118 (2,3',4,4',5)	UG/KG	7	8	0	0.38	0.38	0.68	1.1	M99MT03S01		0	5	0	0.58	0.75			
STIV141C	PCB-126 (3,3',4,4',5)	UG/KG	0	8	0	0.11	0.14			No Detects		0	5	0	0.18	0.23			

Notes:

STIV141E =NOAA Status and Trends Pesticides

STIV141C =NOAA Status and Trends PCBs

#D = No. of Detects

#S = Total No. of Samples

#R = No. of Samples Rejected During Data Validation

FL = Data Validation Qualifier (Flag)

J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)

Mean Conc = Geometric Mean

Table 4-15
SUMMARY OF SEA URCHIN TISSUE SAMPLES
INNER HARBOR AND REFERENCE SITES
(Page 2 of 2)

			INNER HARBOR									REFERENCE							
METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	FL	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MEAN CONC
NOAA STATUS AND TRENDS PCBs - continued																			
STIV141C	PCB-128 (2,2',3,3',4,4')	UG/KG	8	8	0			0.29	0.47	M99MT07S01		0	5	0	0.29	0.37			
STIV141C	PCB-138 (2,2',3,4,4',5')	UG/KG	8	8	0			3.5	5.3	M99MT05S01		1	5	0	1.2	1.49	0.065	0.065	0.065
STIV141C	PCB-153 (2,2',4,4',5,5')	UG/KG	8	8	0			4.5	7.3	M99MT01S01		0	5	0	0.92	1.2			
STIV141C	PCB-170 (2,2',3,3',4,4',5)	UG/KG	8	8	0			0.21	0.56	M99MT01S01		0	5	0	0.14	0.18			
STIV141C	PCB-18 (2,2',5)	UG/KG	5	8	0	0.082	0.084	0.18	0.34	M99MT07S01	J	3	5	0	0.144	0.16	0.29	0.73	0.212
STIV141C	PCB-180 (2,2',3,4,4',5,5')	UG/KG	8	8	0			0.62	2.6	M99MT03D01		0	5	0	0.23	0.294			
STIV141C	PCB-187 (2,2',3,4',5,5',6)	UG/KG	7	8	0	0.27	0.27	2.6	4.2	M99MT03S01		0	5	0	0.41	0.53			
STIV141C	PCB-195 (2,2',3,3',4,4',5,6)	UG/KG	8	8	0			0.078	0.82	M99MT01S01		0	5	0	0.2	0.26			
STIV141C	PCB-206 (2,2',3,3',4,4',5,5',6)	UG/KG	7	8	0	0.12	0.12	0.059	1.2	M99MT01S01		0	5	0	0.17	0.22			
STIV141C	PCB-209 (2,2',3,3',4,4',5,5',6,6')	UG/KG	8	8	0			0.22	8.6	M99MT01S01		0	5	0	0.094	0.12			
STIV141C	PCB-28 (2,4,4')	UG/KG	2	8	0	0.072	0.083	0.065	0.14	M99MT03D01		0	5	0	0.12	0.15			
STIV141C	PCB-44 (2,2',3,5')	UG/KG	0	8	0	0.062	0.076			No Detects		0	5	0	0.098	0.13			
STIV141C	PCB-52 (2,2',5,5')	UG/KG	8	8	0			0.13	3.1	M99MT01S01		0	5	0	0.214	0.275			
STIV141C	PCB-66 (2,3',4,4')	UG/KG	0	8	0	0.1	0.13			No Detects		0	5	0	0.16	0.21			
STIV141C	PCB-77 (3,3',4,4')	UG/KG	0	8	0	0.14	0.17			No Detects		0	5	0	0.22	0.28			
STIV141C	PCB-8 (2,4')	UG/KG	3	8	0	0.059	0.068	0.069	0.26	M99MT03S01	J	0	5	0	0.0925	0.119			

Notes:

STIV141C =NOAA Status and Trends PCBs

#D = No. of Detects

#S = Total No. of Samples

#R = No. of Samples Rejected During Data Validation

FL = Data Validation Qualifier (Flag)

J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)

Mean Conc = Geometric Mean

Table 4-16
SUMMARY OF HERBIVOROUS FISH TISSUE SAMPLES
INNER HARBOR AND REFERENCE SITES
(Page 1 of 2)

		INNER HARBOR										REFERENCE							
METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	FL	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MEAN CONC
NOAA STATUS AND TRENDS PESTICIDES																			
STIV141E	2,4'-DDD	UG/KG	9	18	9			6.3	13	M99MT06S02		5	5	0			0.83	14	4.01
STIV141E	2,4'-DDE	UG/KG	8	18	9	0.26	0.26	1.1	2.4	M99MT06S02		2	5	0	0.2	0.25	0.17	0.25	0.145
STIV141E	2,4'-DDT	UG/KG	7	18	9	0.16	0.17	3.6	9.9	M99MT06S02		0	5	0	0.13	0.16			
STIV141E	4,4'-DDD	UG/KG	9	18	9			3.6	19	M99MT01S02		3	5	0	0.57	0.66	0.38	1.7	0.592
STIV141E	4,4'-DDE	UG/KG	9	18	9			36	190	M99MT04D02		4	5	0	1.05	1.05	1.3	18	2.44
STIV141E	4,4'-DDT	UG/KG	9	18	9			1.8	22	M99MT04D02		4	5	0	0.21	0.21	0.29	2.3	0.546
STIV141E	ALDRIN	UG/KG	0	18	9	0.36	0.9			No Detects		0	5	0	0.082	0.44			
STIV141E	ALPHA-BHC	UG/KG	8	18	9	0.16	0.16	0.21	0.55	M99MT02S02		5	5	0			0.21	0.43	0.287
STIV141E	ALPHA-CHLORDANE	UG/KG	2	18	9	0.23	0.5	0.27	0.5	M99MT04D02		2	5	0	0.21	0.24	0.15	0.4	0.151
STIV141E	BETA-BHC	UG/KG	0	18	9	0.1	0.25			No Detects		1	5	0	0.1	0.12	0.18	0.18	0.0695
STIV141E	DELTA-BHC	UG/KG	0	18	9	0.082	0.11			No Detects		2	5	0	0.02	0.096	0.45	0.5	0.0858
STIV141E	DIELDRIN	UG/KG	0	18	9	0.13	0.33			No Detects		1	5	0	0.1	0.16	1.6	1.6	0.124
STIV141E	ENDOSULFAN I	UG/KG	0	18	9	0.26	0.66			No Detects		4	5	0	0.32	0.32	0.16	0.58	0.215
STIV141E	ENDOSULFAN II	UG/KG	1	18	9	0.31	0.66	0.57	0.57	M99MT04D02		0	5	0	0.27	0.32			
STIV141E	ENDOSULFAN SULFATE	UG/KG	0	18	9	0.26	0.66			No Detects		2	5	0	0.27	0.32	0.34	0.45	0.215
STIV141E	ENDRIN	UG/KG	2	18	9	0.073	0.18	2.9	6.1	M99MT03S02		1	5	0	0.074	0.09	0.077	0.077	0.0465
STIV141E	ENDRIN ALDEHYDE	UG/KG	0	18	9	0.18	0.45			No Detects		0	5	0	0.18	0.22			
STIV141E	ENDRIN KETONE	UG/KG	0	18	9	0.18	0.45			No Detects		0	5	0	0.18	0.22			
STIV141E	GAMMA-BHC (LINDANE)	UG/KG	5	18	9	0.1	0.13	0.46	1.9	M99MT03S02		3	5	0	0.11	0.12	0.56	1.5	0.281
STIV141E	GAMMA-CHLORDANE	UG/KG	7	18	9	0.77	0.88	0.12	0.36	M99MT04D02		1	5	0	0.36	0.43	0.12	0.12	0.12
STIV141E	HEPTACHLOR	UG/KG	2	18	9	0.025	0.17	0.26	0.72	M99MT04S02		0	5	0	0.068	0.082			
STIV141E	HEPTACHLOR EPOXIDE	UG/KG	1	18	9	0.12	0.31	0.14	0.14	M99MT03S02	J	4	5	0	0.15	0.15	0.29	0.59	0.278
STIV141E	HEXACHLOROBENZENE	UG/KG	9	18	9			0.42	2.1	M99MT04D02		5	5	0			0.22	0.49	0.368
STIV141E	METHOXYCHLOR	UG/KG	0	18	9	0.15	0.38			No Detects		0	5	0	0.16	0.19			
STIV141E	MIREX	UG/KG	9	18	9			0.34	5	M99MT04D02		1	5	0	0.13	0.15	0.48	0.48	0.103
STIV141E	TRANS-NONACHLOR	UG/KG	9	18	9			1.1	19	M99MT04D02		2	5	0	0.19	0.23	2.3	3.5	0.388
NOAA STATUS AND TRENDS PCBs																			
STIV141C	PCB-101 (2,2',3,5,5')	UG/KG	9	18	9			19	66	M99MT06S02	J	5	5	0			0.59	3.4	1.28
STIV141C	PCB-105 (2,3,3',4,4')	UG/KG	9	18	9			5.1	17	M99MT01S02		4	5	0	0.12	0.12	0.24	0.77	0.26
STIV141C	PCB-118 (2,3',4,4',5)	UG/KG	9	18	9			18	65	M99MT06S02		1	5	0	0.56	0.68	1.4	1.4	0.419
STIV141C	PCB-126 (3,3',4,4',5)	UG/KG	0	18	9	0.17	0.42			No Detects		0	5	0	0.17	0.21			

Notes:

STIV141E =NOAA Status and Trends Pesticides

STIV141C =NOAA Status and Trends PCBs

#D = No. of Detects

#S = Total No. of Samples

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J = The Associated Numerical Value is an Estimated Quantity (Data Validator Qualification)

Mean Conc = Geometric Mean

Table 4-16
SUMMARY OF HERBIVOROUS FISH TISSUE SAMPLES
INNER HARBOR AND REFERENCE SITES
(Page 2 of 2)

			INNER HARBOR									REFERENCE							
METHOD	ANALYTE	UNITS	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MAX SAMPLE	FL	#D	#S	#R	MIN UNDETECT	MAX UNDETECT	MIN DETECT	MAX DETECT	MEAN CONC
NOAA STATUS AND TRENDS PCBs - continued																			
STIV141C	PCB-128 (2,2',3,3',4,4')	UG/KG	9	18	9			6.7	18	M99MT06S02		5	5	0			0.15	0.35	0.224
STIV141C	PCB-138 (2,2',3,4,4',5')	UG/KG	9	18	9			81	280	M99MT06S02		5	5	0			1.2	4.8	2.4
STIV141C	PCB-153 (2,2',4,4',5,5')	UG/KG	9	18	9			150	560	M99MT06S02		5	5	0			1.8	8.6	3.45
STIV141C	PCB-170 (2,2',3,3',4,4',5)	UG/KG	9	18	9			51	190	M99MT06S02		4	5	0	0.22	0.22	0.28	3	0.457
STIV141C	PCB-18 (2,2',5)	UG/KG	4	18	9	0.14	0.9	0.68	1.6	M99MT03S02	J	2	5	0	0.12	0.15	1	2.6	0.234
STIV141C	PCB-180 (2,2',3,4,4',5,5')	UG/KG	9	18	9			120	820	M99MT01S02		5	5	0			1	7.8	1.88
STIV141C	PCB-187 (2,2',3,4',5,5',6)	UG/KG	9	18	9			66	710	M99MT01S02		4	5	0	0.4	0.4	1.5	5.2	1.51
STIV141C	PCB-195 (2,2',3,3',4,4',5,6)	UG/KG	9	18	9			9.6	210	M99MT01S02		5	5	0			0.22	0.84	0.351
STIV141C	PCB-206 (2,2',3,3',4,4',5,5',6)	UG/KG	9	18	9			17	1,800	M99MT01S02		3	5	0	0.16	0.19	0.21	0.56	0.185
STIV141C	PCB-209 (2,2',3,3',4,4',5,5',6,6')	UG/KG	9	18	9			39	3,200	M99MT01S02		1	5	0	0.091	0.11	0.11	0.11	0.0591
STIV141C	PCB-28 (2,4,4')	UG/KG	9	18	9			2	2.6	M99MT04S02		1	5	0	0.11	0.14	0.19	0.19	0.0778
STIV141C	PCB-44 (2,2',3,5')	UG/KG	8	18	9	0.11	0.11	0.77	2.3	M99MT01S02		0	5	0	0.094	0.11			
STIV141C	PCB-52 (2,2',5,5')	UG/KG	9	18	9			3.7	13	M99MT01S02		3	5	0	0.21	0.22	1.3	1.8	0.54
STIV141C	PCB-66 (2,3',4,4')	UG/KG	9	18	9			1.9	8.1	M99MT06S02		0	5	0	0.16	0.19			
STIV141C	PCB-77 (3,3',4,4')	UG/KG	0	18	9	0.21	0.52			No Detects		0	5	0	0.21	0.25			
STIV141C	PCB-8 (2,4')	UG/KG	9	18	9			1.6	4.2	M99MT02S02		5	5	0			1.3	2.7	1.9

Notes:
STIV141C =NOAA Status and Trends PCBs

#D = No. of Detects
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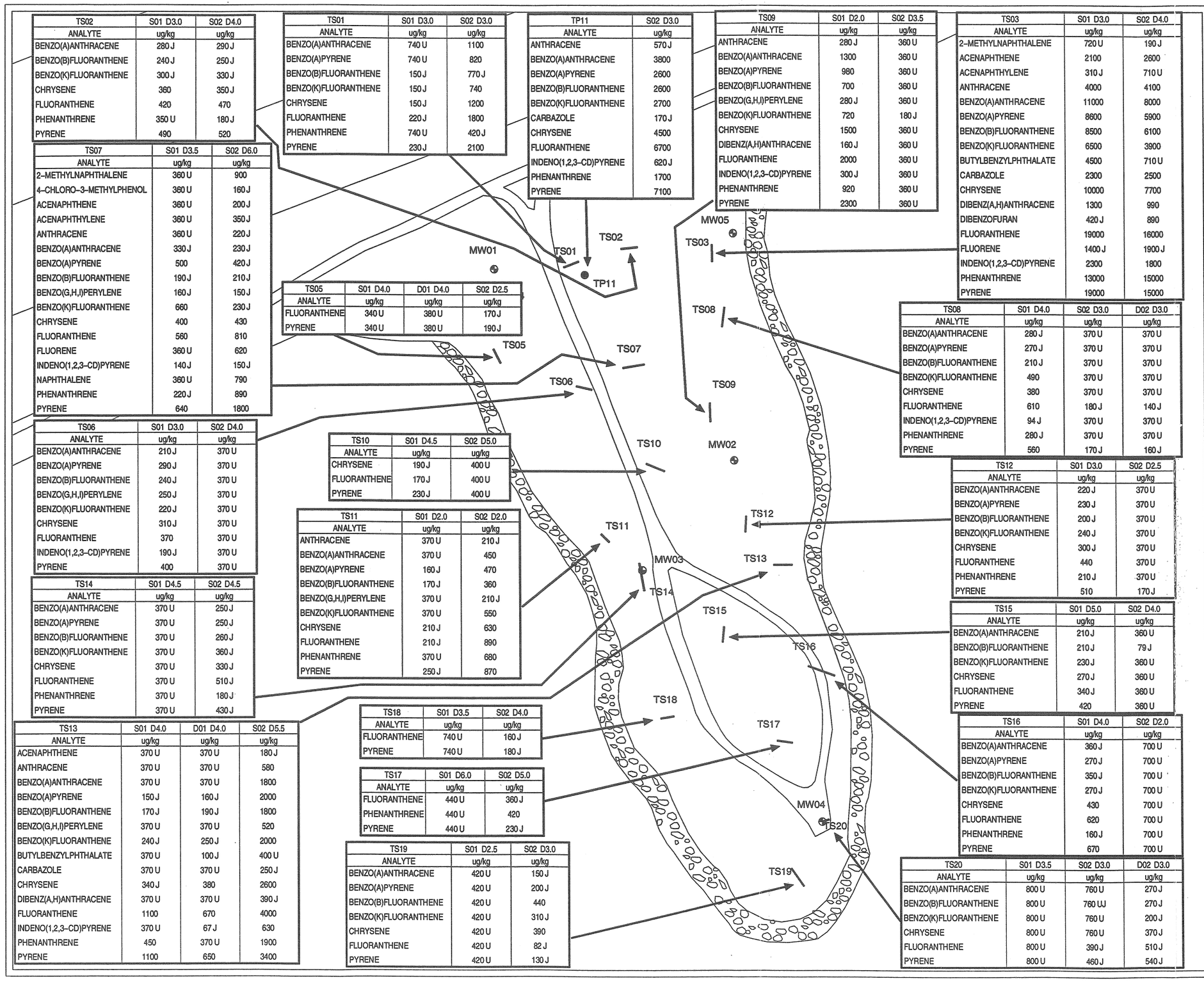
Figures



TS02	S01 D3.0	S02 D4.0
ANALYTE	ug/kg	ug/kg
BENZO(A)ANTHRACENE	280 J	290 J
BENZO(B)FLUORANTHENE	240 J	250 J
BENZO(K)FLUORANTHENE	300 J	330 J
CHRYSENE	360	350 J
FLUORANTHENE	420	470
PHENANTHRENE	350 U	180 J
PYRENE	490	520

TS01	S01 D3.0	S02 D3.0
ANALYTE	ug/kg	ug/kg
BENZO(A)ANTHRACENE	740 U	1100
BENZO(A)PYRENE	740 U	820
BENZO(B)FLUORANTHENE	150 J	770 J
BENZO(K)FLUORANTHENE	150 J	740
CHRYSENE	150 J	1200
FLUORANTHENE	220 J	1800
PHENANTHRENE	740 U	420 J
PYRENE	230 J	2100

TP11	S02 D3.0
ANALYTE	ug/kg
ANTHRACENE	570 J
BENZO(A)ANTHRACENE	3800
BENZO(A)PYRENE	2600
BENZO(B)FLUORANTHENE	2600
BENZO(K)FLUORANTHENE	2700
CARBAZOLE	170 J
CHRYSENE	4500
FLUORANTHENE	6700
INDENO(1,2,3-CD)PYRENE	620 J
PHENANTHRENE	1700
PYRENE	7100

TS09	S01 D2.0	S02 D3.5
ANALYTE	ug/kg	ug/kg
ANTHRACENE	280 J	360 U
BENZO(A)ANTHRACENE	1300	360 U
BENZO(A)PYRENE	980	360 U
BENZO(B)FLUORANTHENE	700	360 U
BENZO(G,H,I)PERYLENE	280 J	360 U
BENZO(K)FLUORANTHENE	720	180 J
CHRYSENE	1500	360 U
DIBENZ(A,H)ANTHRACENE	160 J	360 U
FLUORANTHENE	2000	360 U
INDENO(1,2,3-CD)PYRENE	300 J	360 U
PHENANTHRENE	920	360 U
PYRENE	2300	360 U

TS03	S01 D3.0	S02 D4.0
ANALYTE	ug/kg	ug/kg
2-METHYLNAPHTHALENE	720 U	190 J
ACENAPHTHENE	2100	2600
ACENAPHTHYLENE	310 J	710 U
ANTHRACENE	4000	4100
BENZO(A)ANTHRACENE	11000	8000
BENZO(A)PYRENE	8600	5900
BENZO(B)FLUORANTHENE	8500	6100
BENZO(K)FLUORANTHENE	6500	3900
BUTYLBENZYLPHTHALATE	4500	710 U
CARBAZOLE	2300	2500
CHRYSENE	10000	7700
DIBENZ(A,H)ANTHRACENE	1300	990
DIBENZOFURAN	420 J	890
FLUORANTHENE	19000	16000
FLUORENE	1400 J	1900 J
INDENO(1,2,3-CD)PYRENE	2300	1800
PHENANTHRENE	13000	15000
PYRENE	19000	15000

TS07	S01 D3.5	S02 D6.0
ANALYTE	ug/kg	ug/kg
2-METHYLNAPHTHALENE	360 U	900
4-CHLORO-3-METHYLPHENOL	360 U	160 J
ACENAPHTHENE	360 U	200 J
ACENAPHTHYLENE	360 U	350 J
ANTHRACENE	360 U	220 J
BENZO(A)ANTHRACENE	330 J	230 J
BENZO(A)PYRENE	500	420 J
BENZO(B)FLUORANTHENE	190 J	210 J
BENZO(G,H,I)PERYLENE	160 J	150 J
BENZO(K)FLUORANTHENE	660	230 J
CHRYSENE	400	430
FLUORANTHENE	560	810
FLUORENE	360 U	620
INDENO(1,2,3-CD)PYRENE	140 J	150 J
NAPHTHALENE	360 U	790
PHENANTHRENE	220 J	890
PYRENE	640	1800

TS05	S01 D4.0	D01 D4.0	S02 D2.5
ANALYTE	ug/kg	ug/kg	ug/kg
FLUORANTHENE	340 U	380 U	170 J
PYRENE	340 U	380 U	190 J

TS08	S01 D4.0	S02 D3.0	D02 D3.0
ANALYTE	ug/kg	ug/kg	ug/kg
BENZO(A)ANTHRACENE	280 J	370 U	370 U
BENZO(A)PYRENE	270 J	370 U	370 U
BENZO(B)FLUORANTHENE	210 J	370 U	370 U
BENZO(K)FLUORANTHENE	490	370 U	370 U
CHRYSENE	380	370 U	370 U
FLUORANTHENE	610	180 J	140 J
INDENO(1,2,3-CD)PYRENE	94 J	370 U	370 U
PHENANTHRENE	280 J	370 U	370 U
PYRENE	560	170 J	160 J

TS06	S01 D3.0	S02 D4.0
ANALYTE	ug/kg	ug/kg
BENZO(A)ANTHRACENE	210 J	370 U
BENZO(A)PYRENE	290 J	370 U
BENZO(B)FLUORANTHENE	240 J	370 U
BENZO(G,H,I)PERYLENE	250 J	370 U
BENZO(K)FLUORANTHENE	220 J	370 U
CHRYSENE	310 J	370 U
FLUORANTHENE	370	370 U
INDENO(1,2,3-CD)PYRENE	190 J	370 U
PYRENE	400	370 U

TS10	S01 D4.5	S02 D5.0
ANALYTE	ug/kg	ug/kg
CHRYSENE	190 J	400 U
FLUORANTHENE	170 J	400 U
PYRENE	230 J	400 U

TS12	S01 D3.0	S02 D2.5
ANALYTE	ug/kg	ug/kg
BENZO(A)ANTHRACENE	220 J	370 U
BENZO(A)PYRENE	230 J	370 U
BENZO(B)FLUORANTHENE	200 J	370 U
BENZO(K)FLUORANTHENE	240 J	370 U
CHRYSENE	300 J	370 U
FLUORANTHENE	440	370 U
PHENANTHRENE	210 J	370 U
PYRENE	510	170 J

TS11	S01 D2.0	S02 D2.0
ANALYTE	ug/kg	ug/kg
ANTHRACENE	370 U	210 J
BENZO(A)ANTHRACENE	370 U	450
BENZO(A)PYRENE	160 J	470
BENZO(B)FLUORANTHENE	170 J	360
BENZO(G,H,I)PERYLENE	370 U	210 J
BENZO(K)FLUORANTHENE	370 U	550
CHRYSENE	210 J	630
FLUORANTHENE	210 J	890
PHENANTHRENE	370 U	680
PYRENE	250 J	870

TS15	S01 D5.0	S02 D4.0
ANALYTE	ug/kg	ug/kg
BENZO(A)ANTHRACENE	210 J	360 U
BENZO(B)FLUORANTHENE	210 J	79 J
BENZO(K)FLUORANTHENE	230 J	360 U
CHRYSENE	270 J	360 U
FLUORANTHENE	340 J	360 U
PYRENE	420	360 U

TS14	S01 D4.5	S02 D4.5
ANALYTE	ug/kg	ug/kg
BENZO(A)ANTHRACENE	370 U	250 J
BENZO(A)PYRENE	370 U	250 J
BENZO(B)FLUORANTHENE	370 U	260 J
BENZO(K)FLUORANTHENE	370 U	360 J
CHRYSENE	370 U	330 J
FLUORANTHENE	370 U	510 J
PHENANTHRENE	370 U	180 J
PYRENE	370 U	430 J

TS16	S01 D4.0	S02 D2.0
ANALYTE	ug/kg	ug/kg
BENZO(A)ANTHRACENE	360 J	700 U
BENZO(A)PYRENE	270 J	700 U
BENZO(B)FLUORANTHENE	350 J	700 U
BENZO(K)FLUORANTHENE	270 J	700 U
CHRYSENE	430	700 U
FLUORANTHENE	620	700 U
PHENANTHRENE	160 J	700 U
PYRENE	670	700 U

TS18	S01 D3.5	S02 D4.0
ANALYTE	ug/kg	ug/kg
FLUORANTHENE	740 U	160 J
PYRENE	740 U	180 J

TS17	S01 D6.0	S02 D5.0
ANALYTE	ug/kg	ug/kg
FLUORANTHENE	440 U	360 J
PHENANTHRENE	440 U	420
PYRENE	440 U	230 J

TS13	S01 D4.0	D01 D4.0	S02 D5.5
ANALYTE	ug/kg	ug/kg	ug/kg
ACENAPHTHENE	370 U	370 U	180 J
ANTHRACENE	370 U	370 U	580
BENZO(A)ANTHRACENE	370 U	370 U	1800
BENZO(A)PYRENE	150 J	160 J	2000
BENZO(B)FLUORANTHENE	170 J	190 J	1800
BENZO(G,H,I)PERYLENE	370 U	370 U	520
BENZO(K)FLUORANTHENE	240 J	250 J	2000
BUTYLBENZYLPHTHALATE	370 U	100 J	400 U
CARBAZOLE	370 U	370 U	250 J
CHRYSENE	340 J	380	2600
DIBENZ(A,H)ANTHRACENE	370 U	370 U	390 J
FLUORANTHENE	1100	670	4000
INDENO(1,2,3-CD)PYRENE	370 U	67 J	630
PHENANTHRENE	450	370 U	1900
PYRENE	1100	650	3400

TS19	S01 D2.5	S02 D3.0
ANALYTE	ug/kg	ug/kg
BENZO(A)ANTHRACENE	420 U	150 J
BENZO(A)PYRENE	420 U	200 J
BENZO(B)FLUORANTHENE	420 U	440
BENZO(K)FLUORANTHENE	420 U	310 J
CHRYSENE	420 U	390
FLUORANTHENE	420 U	82 J
PYRENE	420 U	130 J

TS20	S01 D3.5	S02 D3.0	D02 D3.0
ANALYTE	ug/kg	ug/kg	ug/kg
BENZO(A)ANTHRACENE	800 U	760 U	270 J
BENZO(B)FLUORANTHENE	800 U	760 UJ	270 J
BENZO(K)FLUORANTHENE	800 U	760 U	200 J
CHRYSENE	800 U	760 U	370 J
FLUORANTHENE	800 U	390 J	510 J
PYRENE	800 U	460 J	540 J

LEGEND

MW01 ⊕	MONITORING WELL LOCATION AND NUMBER
TP01 ●	TEST PIT LOCATION AND NUMBER
TS01 —	TRENCH LOCATION AND NUMBER
S02 D3.0	SAMPLE NUMBER AND DEPTH IN FEET
D01 D4.0	DUPLICATE SAMPLE NUMBER AND DEPTH IN FEET
800	ANALYTE CONCENTRATION
ug/kg	MICROGRAMS PER KILOGRAM
J	NUMERICAL VALUE IS AN ESTIMATED QUANTITY
U	ANALYTE NOT DETECTED ABOVE ASSOCIATED NUMERICAL VALUE
UJ	ANALYTE NOT DETECTED ABOVE ASSOCIATED ESTIMATED NUMERICAL VALUE

NOTES

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2. HORIZONTAL CONTROL POINT ESTABLISHED BY USNS ON SITE WAS USED AS BASIS OF DRAWING
3. VERTICAL CONTROL WAS BASED ON BM#11 WITH AN ELEVATION OF 8.52 FEET (MLLW)
4. PLANE COORDINATE SYSTEM FOR SAND AND EASTERN ISLANDS, ES-217, DRAWING NO.: SUR-6, USNS MIDWAY ISLAND
3. PROJECT NUMBER 110190135
4. FILE: /apps/hm/cto136/maps/m1112897

SOURCES

PERRY AND ASSOCIATES INC.,
U. S. NAVAL STATION, MIDWAY ISLAND
DRAWING NO.: 103856 & 1038657

TITLE

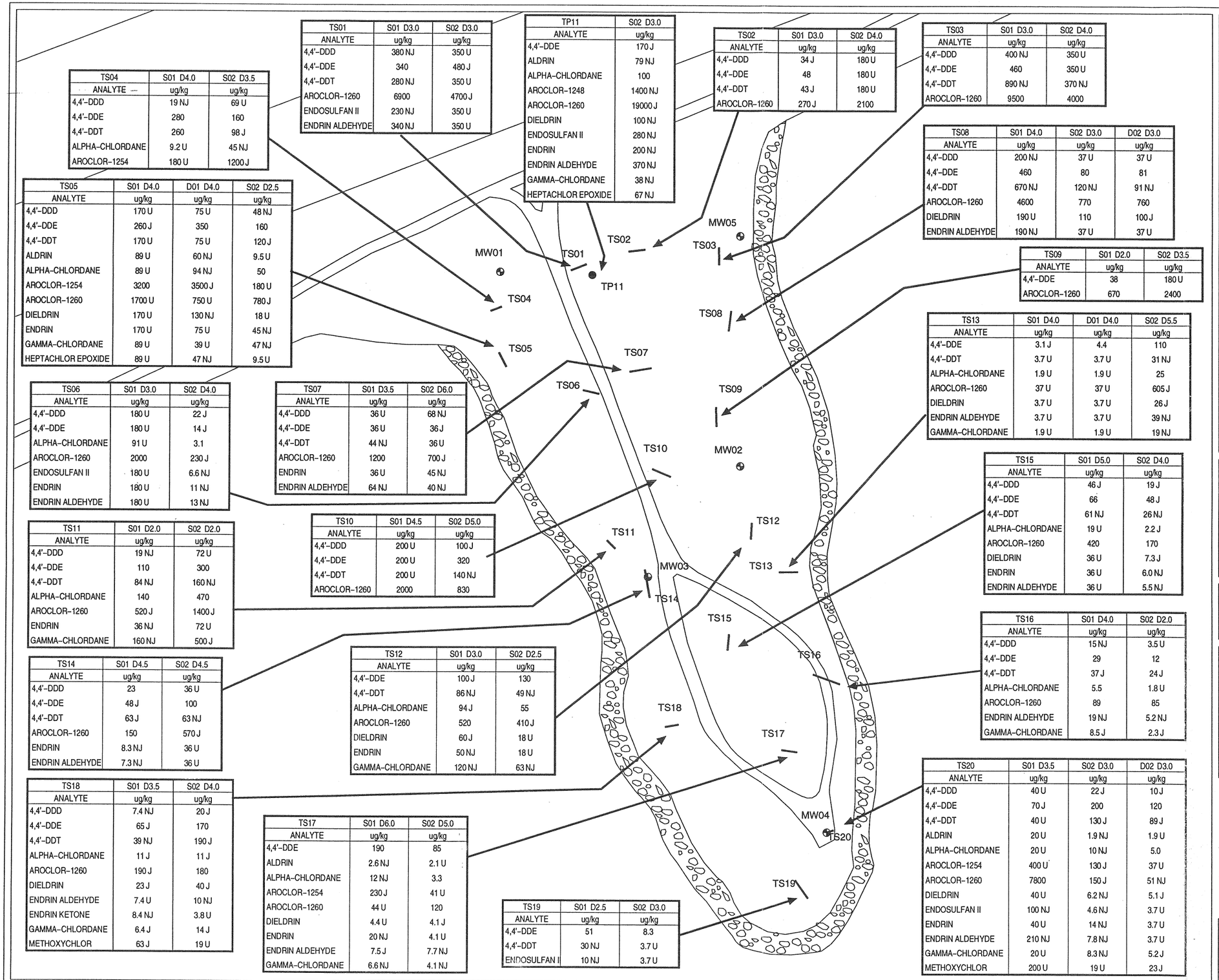
SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES BULKY WASTE LANDFILL NAF MIDWAY ISLAND

FEET

0 75 150 300 450

DATE	REV.	DRWN.	INIT.	CHKD.	INIT.	APPR.	INIT.
02/05/97	1	CMF		HFP		JMC	

FIGURE 4-1



TS01	S01 D3.0	S02 D3.0
ANALYTE	ug/kg	ug/kg
4,4'-DDD	380 NJ	350 U
4,4'-DDE	340	480 J
4,4'-DDT	280 NJ	350 U
AROCLOR-1260	6900	4700 J
ENDOSULFAN II	230 NJ	350 U
ENDRIN ALDEHYDE	340 NJ	350 U

TP11	S02 D3.0
ANALYTE	ug/kg
4,4'-DDE	170 J
ALDRIN	79 NJ
ALPHA-CHLORDANE	100
AROCLOR-1248	1400 NJ
AROCLOR-1260	19000 J
DIELDRIN	100 NJ
ENDOSULFAN II	280 NJ
ENDRIN	200 NJ
ENDRIN ALDEHYDE	370 NJ
GAMMA-CHLORDANE	38 NJ
HEPTACHLOR EPOXIDE	67 NJ

TS02	S01 D3.0	S02 D4.0
ANALYTE	ug/kg	ug/kg
4,4'-DDD	34 J	180 U
4,4'-DDE	48	180 U
4,4'-DDT	43 J	180 U
AROCLOR-1260	270 J	2100

TS03	S01 D3.0	S02 D4.0
ANALYTE	ug/kg	ug/kg
4,4'-DDD	400 NJ	350 U
4,4'-DDE	460	350 U
4,4'-DDT	890 NJ	370 NJ
AROCLOR-1260	9500	4000

TS04	S01 D4.0	S02 D3.5
ANALYTE	ug/kg	ug/kg
4,4'-DDD	19 NJ	69 U
4,4'-DDE	280	160
4,4'-DDT	260	98 J
ALPHA-CHLORDANE	9.2 U	45 NJ
AROCLOR-1254	180 U	1200 J

TS05	S01 D4.0	D01 D4.0	S02 D2.5
ANALYTE	ug/kg	ug/kg	ug/kg
4,4'-DDD	170 U	75 U	48 NJ
4,4'-DDE	260 J	350	160
4,4'-DDT	170 U	75 U	120 J
ALDRIN	89 U	60 NJ	9.5 U
ALPHA-CHLORDANE	89 U	94 NJ	50
AROCLOR-1254	3200	3500 J	180 U
AROCLOR-1260	1700 U	750 U	780 J
DIELDRIN	170 U	130 NJ	18 U
ENDRIN	170 U	75 U	45 NJ
GAMMA-CHLORDANE	89 U	39 U	47 NJ
HEPTACHLOR EPOXIDE	89 U	47 NJ	9.5 U

TS08	S01 D4.0	S02 D3.0	D02 D3.0
ANALYTE	ug/kg	ug/kg	ug/kg
4,4'-DDD	200 NJ	37 U	37 U
4,4'-DDE	460	80	81
4,4'-DDT	670 NJ	120 NJ	91 NJ
AROCLOR-1260	4600	770	760
DIELDRIN	190 U	110	100 J
ENDRIN ALDEHYDE	190 NJ	37 U	37 U

TS09	S01 D2.0	S02 D3.5
ANALYTE	ug/kg	ug/kg
4,4'-DDE	38	180 U
AROCLOR-1260	670	2400

TS13	S01 D4.0	D01 D4.0	S02 D5.5
ANALYTE	ug/kg	ug/kg	ug/kg
4,4'-DDE	3.1 J	4.4	110
4,4'-DDT	3.7 U	3.7 U	31 NJ
ALPHA-CHLORDANE	1.9 U	1.9 U	25
AROCLOR-1260	37 U	37 U	605 J
DIELDRIN	3.7 U	3.7 U	26 J
ENDRIN ALDEHYDE	3.7 U	3.7 U	39 NJ
GAMMA-CHLORDANE	1.9 U	1.9 U	19 NJ

TS06	S01 D3.0	S02 D4.0
ANALYTE	ug/kg	ug/kg
4,4'-DDD	180 U	22 J
4,4'-DDE	180 U	14 J
ALPHA-CHLORDANE	91 U	3.1
AROCLOR-1260	2000	230 J
ENDOSULFAN II	180 U	6.6 NJ
ENDRIN	180 U	11 NJ
ENDRIN ALDEHYDE	180 U	13 NJ

TS07	S01 D3.5	S02 D6.0
ANALYTE	ug/kg	ug/kg
4,4'-DDD	36 U	68 NJ
4,4'-DDE	36 U	36 J
4,4'-DDT	44 NJ	36 U
AROCLOR-1260	1200	700 J
ENDRIN	36 U	45 NJ
ENDRIN ALDEHYDE	64 NJ	40 NJ

TS15	S01 D5.0	S02 D4.0
ANALYTE	ug/kg	ug/kg
4,4'-DDD	46 J	19 J
4,4'-DDE	66	48 J
4,4'-DDT	61 NJ	26 NJ
ALPHA-CHLORDANE	19 U	2.2 J
AROCLOR-1260	420	170
DIELDRIN	36 U	7.3 J
ENDRIN	36 U	6.0 NJ
ENDRIN ALDEHYDE	36 U	5.5 NJ

TS10	S01 D4.5	S02 D5.0
ANALYTE	ug/kg	ug/kg
4,4'-DDD	200 U	100 J
4,4'-DDE	200 U	320
4,4'-DDT	200 U	140 NJ
AROCLOR-1260	2000	830

TS11	S01 D2.0	S02 D2.0
ANALYTE	ug/kg	ug/kg
4,4'-DDD	19 NJ	72 U
4,4'-DDE	110	300
4,4'-DDT	84 NJ	160 NJ
ALPHA-CHLORDANE	140	470
AROCLOR-1260	520 J	1400 J
ENDRIN	36 NJ	72 U
GAMMA-CHLORDANE	160 NJ	500 J

TS12	S01 D3.0	S02 D2.5
ANALYTE	ug/kg	ug/kg
4,4'-DDE	100 J	130
4,4'-DDT	86 NJ	49 NJ
ALPHA-CHLORDANE	94 J	55
AROCLOR-1260	520	410 J
DIELDRIN	60 J	18 U
ENDRIN	50 NJ	18 U
GAMMA-CHLORDANE	120 NJ	63 NJ

TS16	S01 D4.0	S02 D2.0
ANALYTE	ug/kg	ug/kg
4,4'-DDD	15 NJ	3.5 U
4,4'-DDE	29	12
4,4'-DDT	37 J	24 J
ALPHA-CHLORDANE	5.5	1.8 U
AROCLOR-1260	89	85
ENDRIN ALDEHYDE	19 NJ	5.2 NJ
GAMMA-CHLORDANE	8.5 J	2.3 J

TS14	S01 D4.5	S02 D4.5
ANALYTE	ug/kg	ug/kg
4,4'-DDD	23	36 U
4,4'-DDE	48 J	100
4,4'-DDT	63 J	63 NJ
AROCLOR-1260	150	570 J
ENDRIN	8.3 NJ	36 U
ENDRIN ALDEHYDE	7.3 NJ	36 U

TS18	S01 D3.5	S02 D4.0
ANALYTE	ug/kg	ug/kg
4,4'-DDD	7.4 NJ	20 J
4,4'-DDE	65 J	170
4,4'-DDT	39 NJ	190 J
ALPHA-CHLORDANE	11 J	11 J
AROCLOR-1260	190 J	180
DIELDRIN	23 J	40 J
ENDRIN ALDEHYDE	7.4 U	10 NJ
ENDRIN KETONE	8.4 NJ	3.8 U
GAMMA-CHLORDANE	6.4 J	14 J
METHOXYCHLOR	63 J	19 U

TS17	S01 D6.0	S02 D5.0
ANALYTE	ug/kg	ug/kg
4,4'-DDE	190	85
ALDRIN	2.6 NJ	2.1 U
ALPHA-CHLORDANE	12 NJ	3.3
AROCLOR-1254	230 J	41 U
AROCLOR-1260	44 U	120
DIELDRIN	4.4 U	4.1 J
ENDRIN	20 NJ	4.1 U
ENDRIN ALDEHYDE	7.5 J	7.7 NJ
GAMMA-CHLORDANE	6.6 NJ	4.1 NJ

TS19	S01 D2.5	S02 D3.0
ANALYTE	ug/kg	ug/kg
4,4'-DDE	51	8.3
4,4'-DDT	30 NJ	3.7 U
ENDOSULFAN I	10 NJ	3.7 U

TS20	S01 D3.5	S02 D3.0	D02 D3.0
ANALYTE	ug/kg	ug/kg	ug/kg
4,4'-DDD	40 U	22 J	10 J
4,4'-DDE	70 J	200	120
4,4'-DDT	40 U	130 J	89 J
ALDRIN	20 U	1.9 NJ	1.9 U
ALPHA-CHLORDANE	20 U	10 NJ	5.0
AROCLOR-1254	400 U	130 J	37 U
AROCLOR-1260	7800	150 J	51 NJ
DIELDRIN	40 U	6.2 NJ	5.1 J
ENDOSULFAN II	100 NJ	4.6 NJ	3.7 U
ENDRIN	40 U	14 NJ	3.7 U
ENDRIN ALDEHYDE	210 NJ	7.8 NJ	3.7 U
GAMMA-CHLORDANE	20 U	8.3 NJ	5.2 J
METHOXYCHLOR	200 U	19 U	23 J

LEGEND

MW01 ⊕	MONITORING WELL LOCATION AND NUMBER
TP01 ●	TEST PIT LOCATION AND NUMBER
TS01 —	TRENCH LOCATION AND NUMBER
S02 D3.0	SAMPLE NUMBER AND DEPTH IN FEET
D01 D4.0	DUPLICATE SAMPLE NUMBER AND DEPTH IN FEET
400	ANALYTE CONCENTRATION
ug/kg	MICROGRAMS PER KILOGRAM
J	NUMERICAL VALUE IS AN ESTIMATED QUANTITY
NJ	PRESUMPTIVE EVIDENCE OF THE ANALYTE AT AN ESTIMATED QUANTITY
U	ANALYTE NOT DETECTED ABOVE ASSOCIATED NUMERICAL VALUE

NOTES

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3. VERTICAL CONTROL WAS BASED ON BM#11 WITH AN ELEVATION OF 8.52 FEET (MLLW)
4. PLANE COORDINATE SYSTEM FOR SAND AND EASTERN ISLANDS, ES-217, DRAWING NO.: SUR-8, USNS MIDWAY ISLAND
3. PROJECT NUMBER 110190136
4. FILE: /apps/hm/cto136/maps/m1122897

SOURCES

PERRY AND ASSOCIATES INC.,
U. S. NAVAL STATION, MIDWAY ISLAND
DRAWING NO.: 103856 & 1038657

TITLE

ORGANOCHLORINE PESTICIDES AND PCBS DETECTED IN SOIL SAMPLES BULKY WASTE LANDFILL NAF MIDWAY ISLAND

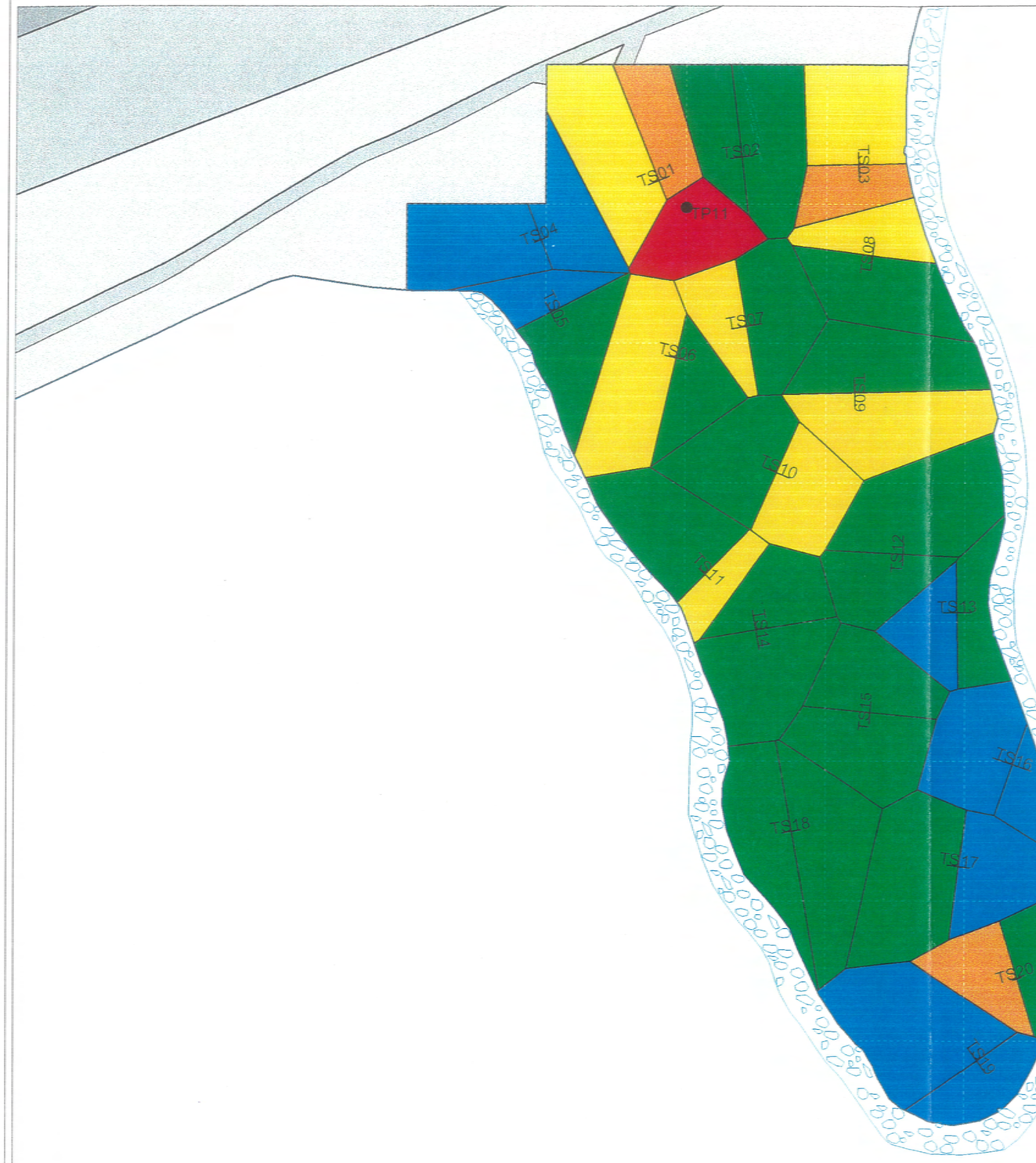
FEET

0 75 150 300 450

DATE	REV.	DRWN.	INIT.	CHKD.	INIT.	APPR.	INIT.
02/05/97	1	CMF		HFP		JMC	

FIGURE

4-2



LEGEND

THIESSEN POLYGONS
AROCLOR 1260 CONCENTRATIONS

- ≤ 0.1 mg/kg
- > 0.1 ≤ 1.0 mg/kg
- > 1.0 ≤ 5.0 mg/kg
- > 5.0 ≤ 10 mg/kg
- > 10 ≤ 20 mg/kg

EACH REGION, THIESSEN POLYGON, HAS THE UNIQUE PROPERTY THAT ANY POINT WITHIN A REGION IS CLOSER TO THE REGION'S SAMPLING LOCATION THAN ANY OTHER REGION.

- TEST PIT
- SAMPLING GRID
- TRENCH
- POLYGON DIVISION

NOTES

1. THE ACCURACY OF THIS DOCUMENT IS LIMITED TO THE QUALITY OF THE SOURCE INFORMATION AND IS NOT A LEGAL REPRESENTATION OF THE ORIGINAL SURVEY
2. HORIZONTAL CONTROL POINT ESTABLISHED BY USNS ON SITE, WAS USED AS BASIS OF DRAWING
3. VERTICAL CONTROL WAS BASED ON BM#11 WITH AN ELEVATION OF 8.52 FEET (MLLW)
4. PLANE COORDINATE SYSTEM FOR SAND AND EASTERN ISLANDS, ES-217, DRAWING NO.: SUR-6, USNS MIDWAY ISLAND
5. PROJECT NUMBER 110190136
6. FILE :..\MIDWAY\R\CHART.APR

SOURCES

PERRY ASSOCIATES INC., HOWARD LAWSON & ASSOC.
US S. NAVAL STATION, MIDWAY ISLAND, DWG NO.: #1038656, #1038657

TITLE

AROCLOR 1260 CONCENTRATIONS WITHIN THIESSEN POLYGONS FOR SUBSURFACE SOILS AT BULKY WASTE LANDFILL, NAF MIDWAY ISLAND

N

100 0 100 200 300 Feet

DATE	REV	DRWN	INT	CHKD	INT	APPR	INT
02/04/97		HFP		BW			

FIGURE
4-3

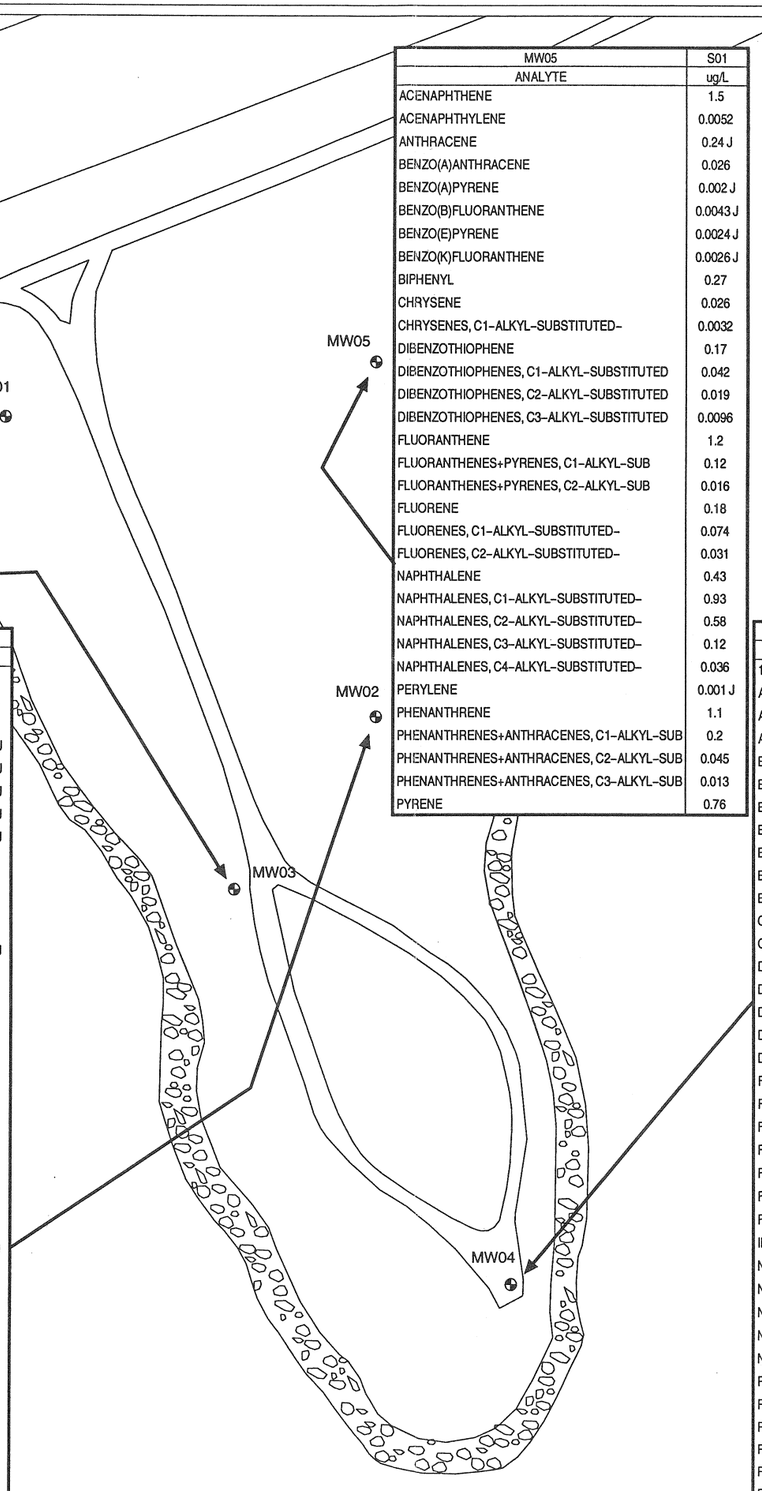
MW01	D01
ANALYTE	ug/L
1,3,5-TRICHLOROBENZENE	0.01
ACENAPHTHENE	0.036
ANTHRACENE	0.0067 J
BENZO(B)FLUORANTHENE	0.0016 J
BENZO(K)FLUORANTHENE	0.0018 J
CHRYSENE	0.0027 J
DIBENZOTHIOPHENE	0.011
DIBENZOTHIOPHENES, C1-ALKYL-SUBSTITUTED	0.011
DIBENZOTHIOPHENES, C2-ALKYL-SUBSTITUTED	0.022
DIBENZOTHIOPHENES, C3-ALKYL-SUBSTITUTED	0.015
FLUORANTHENE	0.043
FLUORANTHENES+PYRENES, C1-ALKYL-SUB	0.015
FLUORENE	0.0038 J
FLUORENES, C1-ALKYL-SUBSTITUTED-	0.012
FLUORENES, C2-ALKYL-SUBSTITUTED-	0.017
NAPHTHALENE	0.016
NAPHTHALENES, C1-ALKYL-SUBSTITUTED-	0.006 J
NAPHTHALENES, C2-ALKYL-SUBSTITUTED-	0.011
NAPHTHALENES, C3-ALKYL-SUBSTITUTED-	0.02
NAPHTHALENES, C4-ALKYL-SUBSTITUTED-	0.019
PHENANTHRENE	0.0081
PHENANTHRENES+ANTHRACENES, C1-ALKYL-SUB	0.0075
PHENANTHRENES+ANTHRACENES, C2-ALKYL-SUB	0.016
PHENANTHRENES+ANTHRACENES, C3-ALKYL-SUB	0.012
PYRENE	0.047

MW03	S01
ANALYTE	ug/L
1,3,5-TRICHLOROBENZENE	0.016
ACENAPHTHENE	0.68
ANTHRACENE	0.14 J
BENZO(A)ANTHRACENE	0.012
BENZO(A)PYRENE	0.0026 J
BENZO(B)FLUORANTHENE	0.0038 J
BENZO(E)PYRENE	0.0045 J
BENZO(G,H,I)PERYLENE	0.0012 J
BENZO(K)FLUORANTHENE	0.0015 J
BIPHENYL	0.026
CHRYSENE	0.017
CHRYSENES, C1-ALKYL-SUBSTITUTED-	0.011
CHRYSENES, C2-ALKYL-SUBSTITUTED-	0.024
CHRYSENES, C3-ALKYL-SUBSTITUTED-	0.013
DIBENZO(A,H)ANTHRACENE	0.0009 J
DIBENZOTHIOPHENE	0.25
DIBENZOTHIOPHENES, C1-ALKYL-SUBSTITUTED	1.0
DIBENZOTHIOPHENES, C2-ALKYL-SUBSTITUTED	1.1
DIBENZOTHIOPHENES, C3-ALKYL-SUBSTITUTED	0.52
FLUORANTHENE	0.25
FLUORANTHENES+PYRENES, C1-ALKYL-SUB	0.072
FLUORANTHENES+PYRENES, C2-ALKYL-SUB	0.047
FLUORANTHENES+PYRENES, C3-ALKYL-SUB	0.031
FLUORENE	0.26
FLUORENES, C1-ALKYL-SUBSTITUTED-	0.33
FLUORENES, C2-ALKYL-SUBSTITUTED-	0.35
FLUORENES, C3-ALKYL-SUBSTITUTED-	0.25
INDENO(1,2,3-CD)PYRENE	0.0013 J
NAPHTHALENE	0.93
NAPHTHALENES, C1-ALKYL-SUBSTITUTED-	0.51
NAPHTHALENES, C2-ALKYL-SUBSTITUTED-	2.7
NAPHTHALENES, C3-ALKYL-SUBSTITUTED-	3.7
NAPHTHALENES, C4-ALKYL-SUBSTITUTED-	1.5
PERYLENE	0.001 J
PHENANTHRENE	0.41
PHENANTHRENES+ANTHRACENES, C1-ALKYL-SUB	0.25
PHENANTHRENES+ANTHRACENES, C2-ALKYL-SUB	0.28
PHENANTHRENES+ANTHRACENES, C3-ALKYL-SUB	0.14
PHENANTHRENES+ANTHRACENES, C4-ALKYL-SUB	0.085
PYRENE	0.19

MW02	S01
ANALYTE	ug/L
ACENAPHTHENE	0.22
ANTHRACENE	0.045 J
BENZO(A)ANTHRACENE	0.011
BENZO(A)PYRENE	0.0054 J
BENZO(B)FLUORANTHENE	0.0083 J
BENZO(E)PYRENE	0.0056 J
BENZO(G,H,I)PERYLENE	0.0034 J
BENZO(K)FLUORANTHENE	0.0037 J
BIPHENYL	0.015
CHRYSENE	0.011
CHRYSENES, C1-ALKYL-SUBSTITUTED-	0.0069
CHRYSENES, C2-ALKYL-SUBSTITUTED-	0.015
DIBENZO(A,H)ANTHRACENE	0.0015 J
DIBENZOTHIOPHENE	0.1
DIBENZOTHIOPHENES, C1-ALKYL-SUBSTITUTED	0.13
DIBENZOTHIOPHENES, C2-ALKYL-SUBSTITUTED	0.15
DIBENZOTHIOPHENES, C3-ALKYL-SUBSTITUTED	0.12
FLUORANTHENE	0.084
FLUORANTHENES+PYRENES, C1-ALKYL-SUB	0.25
FLUORANTHENES+PYRENES, C2-ALKYL-SUB	0.079
FLUORANTHENES+PYRENES, C3-ALKYL-SUB	0.02
FLUORENE	0.033
FLUORENES, C1-ALKYL-SUBSTITUTED-	0.076
FLUORENES, C2-ALKYL-SUBSTITUTED-	0.084
FLUORENES, C3-ALKYL-SUBSTITUTED-	0.079
INDENO(1,2,3-CD)PYRENE	0.0036 J
NAPHTHALENE	0.4
NAPHTHALENES, C1-ALKYL-SUBSTITUTED-	0.13
NAPHTHALENES, C2-ALKYL-SUBSTITUTED-	0.33
NAPHTHALENES, C3-ALKYL-SUBSTITUTED-	0.46
NAPHTHALENES, C4-ALKYL-SUBSTITUTED-	0.26
PERYLENE	0.002 J
PHENANTHRENE	0.053
PHENANTHRENES+ANTHRACENES, C1-ALKYL-SUB	0.054
PHENANTHRENES+ANTHRACENES, C2-ALKYL-SUB	0.064
PHENANTHRENES+ANTHRACENES, C3-ALKYL-SUB	0.053
PHENANTHRENES+ANTHRACENES, C4-ALKYL-SUB	0.038
PYRENE	0.073

MW05	S01
ANALYTE	ug/L
ACENAPHTHENE	1.5
ACENAPHTHYLENE	0.0052
ANTHRACENE	0.24 J
BENZO(A)ANTHRACENE	0.026
BENZO(A)PYRENE	0.002 J
BENZO(B)FLUORANTHENE	0.0043 J
BENZO(E)PYRENE	0.0024 J
BENZO(K)FLUORANTHENE	0.0026 J
BIPHENYL	0.27
CHRYSENE	0.026
CHRYSENES, C1-ALKYL-SUBSTITUTED-	0.0032
DIBENZOTHIOPHENE	0.17
DIBENZOTHIOPHENES, C1-ALKYL-SUBSTITUTED	0.042
DIBENZOTHIOPHENES, C2-ALKYL-SUBSTITUTED	0.019
DIBENZOTHIOPHENES, C3-ALKYL-SUBSTITUTED	0.0096
FLUORANTHENE	1.2
FLUORANTHENES+PYRENES, C1-ALKYL-SUB	0.12
FLUORANTHENES+PYRENES, C2-ALKYL-SUB	0.016
FLUORENE	0.18
FLUORENES, C1-ALKYL-SUBSTITUTED-	0.074
FLUORENES, C2-ALKYL-SUBSTITUTED-	0.031
NAPHTHALENE	0.43
NAPHTHALENES, C1-ALKYL-SUBSTITUTED-	0.93
NAPHTHALENES, C2-ALKYL-SUBSTITUTED-	0.58
NAPHTHALENES, C3-ALKYL-SUBSTITUTED-	0.12
NAPHTHALENES, C4-ALKYL-SUBSTITUTED-	0.036
PERYLENE	0.001 J
PHENANTHRENE	1.1
PHENANTHRENES+ANTHRACENES, C1-ALKYL-SUB	0.2
PHENANTHRENES+ANTHRACENES, C2-ALKYL-SUB	0.045
PHENANTHRENES+ANTHRACENES, C3-ALKYL-SUB	0.013
PYRENE	0.76

MW04	S01
ANALYTE	ug/L
1,3,5-TRICHLOROBENZENE	0.55
ACENAPHTHENE	0.83
ACENAPHTHYLENE	0.027
ANTHRACENE	0.22 J
BENZO(A)ANTHRACENE	0.023
BENZO(A)PYRENE	0.0034 J
BENZO(B)FLUORANTHENE	0.0061 J
BENZO(E)PYRENE	0.0039 J
BENZO(G,H,I)PERYLENE	0.0016 J
BENZO(K)FLUORANTHENE	0.0023 J
BIPHENYL	1.0
CHRYSENE	0.019
CHRYSENES, C1-ALKYL-SUBSTITUTED-	0.0046
DIBENZO(A,H)ANTHRACENE	0.0008 J
DIBENZOTHIOPHENE	0.16
DIBENZOTHIOPHENES, C1-ALKYL-SUBSTITUTED	0.057
DIBENZOTHIOPHENES, C2-ALKYL-SUBSTITUTED	0.043
DIBENZOTHIOPHENES, C3-ALKYL-SUBSTITUTED	0.022
FLUORANTHENE	0.45
FLUORANTHENES+PYRENES, C1-ALKYL-SUB	0.073
FLUORANTHENES+PYRENES, C2-ALKYL-SUB	0.026
FLUORANTHENES+PYRENES, C3-ALKYL-SUB	0.011
FLUORENE	0.86
FLUORENES, C1-ALKYL-SUBSTITUTED-	0.14
FLUORENES, C2-ALKYL-SUBSTITUTED-	0.051
INDENO(1,2,3-CD)PYRENE	0.0019 J
NAPHTHALENE	4.6
NAPHTHALENES, C1-ALKYL-SUBSTITUTED-	1.7
NAPHTHALENES, C2-ALKYL-SUBSTITUTED-	7.6
NAPHTHALENES, C3-ALKYL-SUBSTITUTED-	1.2
NAPHTHALENES, C4-ALKYL-SUBSTITUTED-	0.21
PERYLENE	0.0011 J
PHENANTHRENE	1.3
PHENANTHRENES+ANTHRACENES, C1-ALKYL-SUB	0.16
PHENANTHRENES+ANTHRACENES, C2-ALKYL-SUB	0.052
PHENANTHRENES+ANTHRACENES, C3-ALKYL-SUB	0.022
PYRENE	0.31



LEGEND

MW01 ⊕	MONITORING WELL LOCATION AND NUMBER
S01	SAMPLE NUMBER
D01	DUPLICATE SAMPLE
0.55	ANALYTE CONCENTRATION
ug/L	MICROGRAMS PER LITER
J	NUMERICAL VALUE IS AN ESTIMATED QUANTITY

NOTES

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2. HORIZONTAL CONTROL POINT ESTABLISHED BY USNS ON SITE WAS USED AS BASIS OF DRAWING
3. VERTICAL CONTROL WAS BASED ON BM#11 WITH AN ELEVATION OF 8.52 FEET (MLLW)
4. PLANE COORDINATE SYSTEM FOR SAND AND EASTERN ISLANDS, ES-217, DRAWING NO.: SUR-6, USNS MIDWAY ISLAND
3. PROJECT NUMBER 110190136
4. FILE: /apps/hm/cto136/maps/m1132897

SOURCES

PERRY AND ASSOCIATES INC.,
U. S. NAVAL STATION, MIDWAY ISLAND
DRAWING NO.: 103856 & 1038657

TITLE

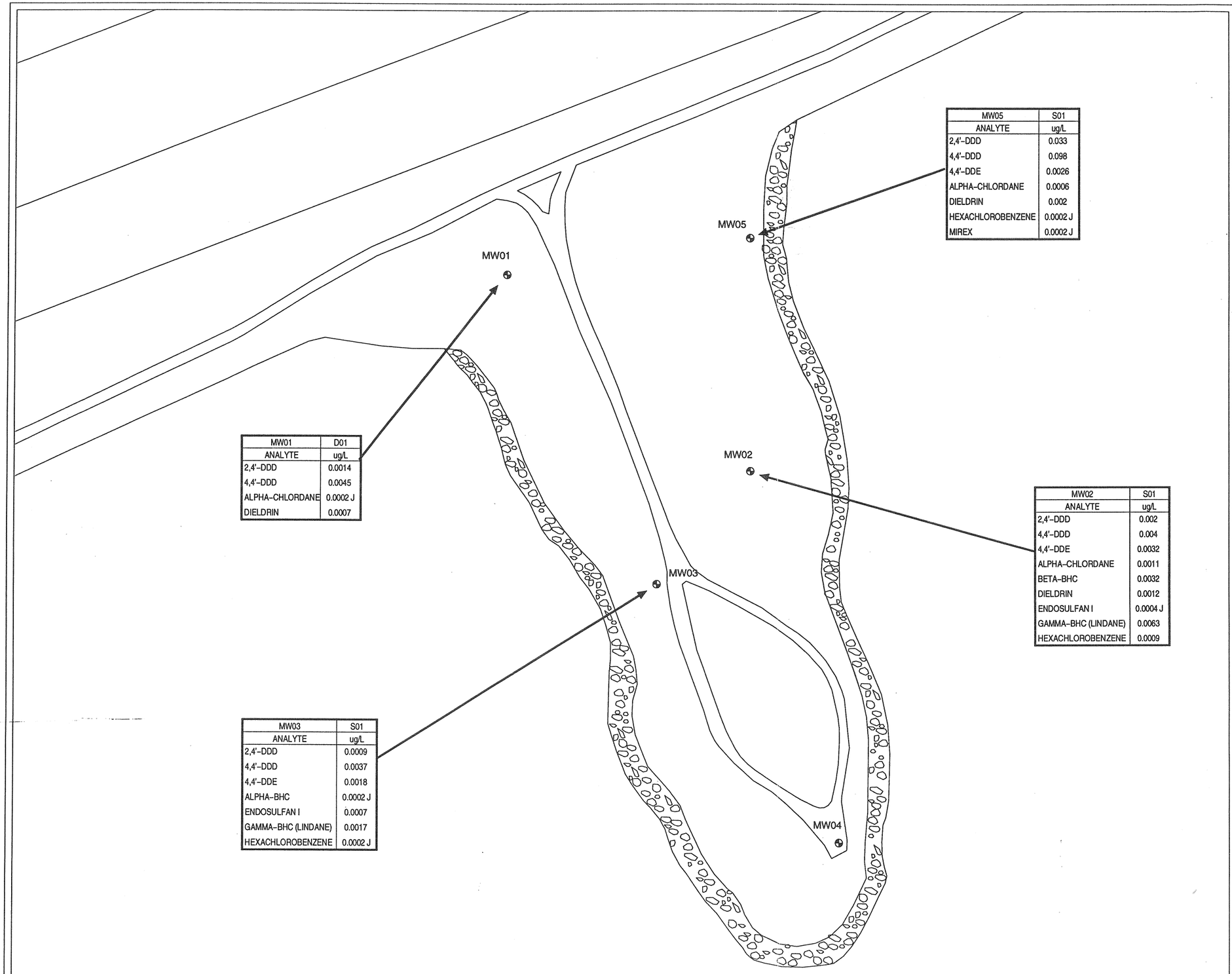
SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN GROUND WATER BULKY WASTE LANDFILL NAF MIDWAY ISLAND

FEET

0 75 150 300 450

DATE	REV.	DRWN.	INIT.	CHKD.	INIT.	APPR.	INIT.
02/05/97	1	CMP		HFP		JMC	

FIGURE 4-4



MW01	D01
ANALYTE	ug/L
2,4'-DDD	0.0014
4,4'-DDD	0.0045
ALPHA-CHLORDANE	0.0002 J
DIELDRIN	0.0007

MW05	S01
ANALYTE	ug/L
2,4'-DDD	0.033
4,4'-DDD	0.098
4,4'-DDE	0.0026
ALPHA-CHLORDANE	0.0006
DIELDRIN	0.002
HEXACHLOROBENZENE	0.0002 J
MIREX	0.0002 J

MW02	S01
ANALYTE	ug/L
2,4'-DDD	0.002
4,4'-DDD	0.004
4,4'-DDE	0.0032
ALPHA-CHLORDANE	0.0011
BETA-BHC	0.0032
DIELDRIN	0.0012
ENDOSULFAN I	0.0004 J
GAMMA-BHC (LINDANE)	0.0063
HEXACHLOROBENZENE	0.0009

MW03	S01
ANALYTE	ug/L
2,4'-DDD	0.0009
4,4'-DDD	0.0037
4,4'-DDE	0.0018
ALPHA-BHC	0.0002 J
ENDOSULFAN I	0.0007
GAMMA-BHC (LINDANE)	0.0017
HEXACHLOROBENZENE	0.0002 J

LEGEND

MW01 ⊕	MONITORING WELL LOCATION AND NUMBER
S01	SAMPLE NUMBER
D01	DUPLICATE SAMPLE
0.033	ANALYTE CONCENTRATION
ug/L	MICROGRAMS PER LITER
J	NUMERICAL VALUE IS AN ESTIMATED QUANTITY

NOTES

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3. VERTICAL CONTROL WAS BASED ON BM#11 WITH AN ELEVATION OF 8.52 FEET (MLLW)
4. PLANE COORDINATE SYSTEM FOR SAND AND EASTERN ISLANDS, ES-217, DRAWING NO.: SUR-6, USNS MIDWAY ISLAND
3. PROJECT NUMBER 110190136
4. FILE: /apps/hm/cto136/maps/m1142897

SOURCES

PERRY AND ASSOCIATES INC.,
U. S. NAVAL STATION, MIDWAY ISLAND
DRAWING NO.: 103856 & 1038657

TITLE

ORGANOCHLORINE PESTICIDES DETECTED IN GROUND WATER BULKY WASTE LANDFILL NAF MIDWAY ISLAND

N

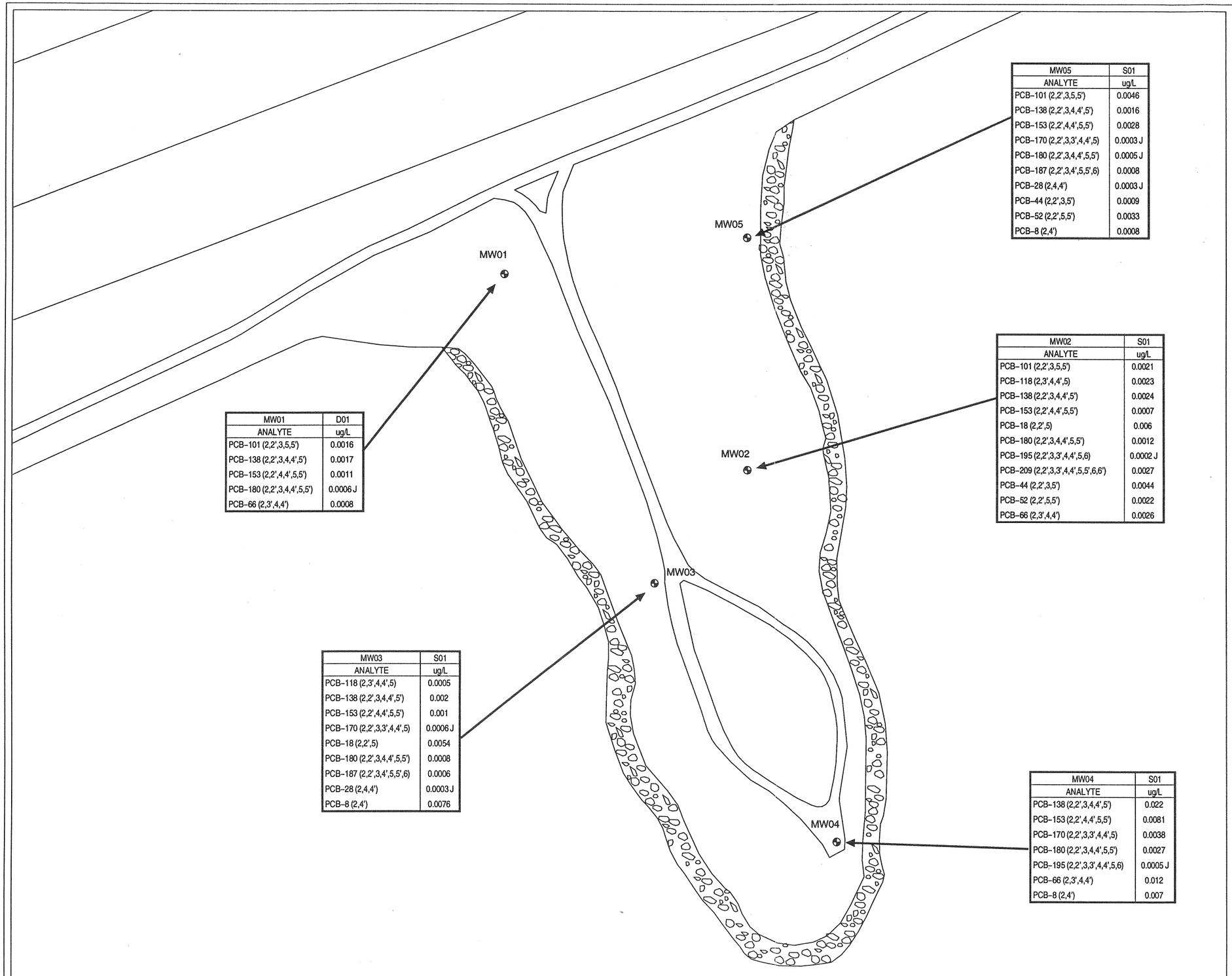
FEET

0 75 150 300 450

DATE	REV.	DRWN.	INIT.	CHKD.	INIT.	APPR.	INIT.
02/05/97	1	CMF		HFP		JMC	

FIGURE

4 – 5



MW01	D01
ANALYTE	ug/L
PCB-101 (2,2',3,5,5')	0.0016
PCB-138 (2,2',3,4,4',5')	0.0017
PCB-153 (2,2',4,4',5,5')	0.0011
PCB-180 (2,2',3,4,4',5,5')	0.0006 J
PCB-66 (2,3',4,4')	0.0008

MW05	S01
ANALYTE	ug/L
PCB-101 (2,2',3,5,5')	0.0046
PCB-138 (2,2',3,4,4',5')	0.0016
PCB-153 (2,2',4,4',5,5')	0.0028
PCB-170 (2,2',3,3',4,4',5)	0.0003 J
PCB-180 (2,2',3,4,4',5,5')	0.0005 J
PCB-187 (2,2',3,4',5,5',6)	0.0008
PCB-28 (2,4,4')	0.0003 J
PCB-44 (2,2',3,5')	0.0009
PCB-52 (2,2',5,5')	0.0033
PCB-8 (2,4')	0.0008

MW02	S01
ANALYTE	ug/L
PCB-101 (2,2',3,5,5')	0.0021
PCB-118 (2,3',4,4',5)	0.0023
PCB-138 (2,2',3,4,4',5')	0.0024
PCB-153 (2,2',4,4',5,5')	0.0007
PCB-18 (2,2',5)	0.006
PCB-180 (2,2',3,4,4',5,5')	0.0012
PCB-195 (2,2',3,3',4,4',5,6)	0.0002 J
PCB-209 (2,2',3,3',4,4',5,5',6,6')	0.0027
PCB-44 (2,2',3,5')	0.0044
PCB-52 (2,2',5,5')	0.0022
PCB-66 (2,3',4,4')	0.0026

MW03	S01
ANALYTE	ug/L
PCB-118 (2,3',4,4',5)	0.0005
PCB-138 (2,2',3,4,4',5')	0.002
PCB-153 (2,2',4,4',5,5')	0.001
PCB-170 (2,2',3,3',4,4',5)	0.0006 J
PCB-18 (2,2',5)	0.0054
PCB-180 (2,2',3,4,4',5,5')	0.0008
PCB-187 (2,2',3,4',5,5',6)	0.0006
PCB-28 (2,4,4')	0.0003 J
PCB-8 (2,4')	0.0076

MW04	S01
ANALYTE	ug/L
PCB-138 (2,2',3,4,4',5')	0.022
PCB-153 (2,2',4,4',5,5')	0.0081
PCB-170 (2,2',3,3',4,4',5)	0.0038
PCB-180 (2,2',3,4,4',5,5')	0.0027
PCB-195 (2,2',3,3',4,4',5,6)	0.0005 J
PCB-66 (2,3',4,4')	0.012
PCB-8 (2,4')	0.007

LEGEND

MW01 ⊕	MONITORING WELL LOCATION AND NUMBER
S01	SAMPLE NUMBER
D01	DUPLICATE SAMPLE
0.0046	ANALYTE CONCENTRATION
ug/L	MICROGRAMS PER LITER
J	NUMERICAL VALUE IS AN ESTIMATED QUANTITY

NOTES

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2. HORIZONTAL CONTROL POINT ESTABLISHED BY USNS ON SITE WAS USED AS BASIS OF DRAWING
3. VERTICAL CONTROL WAS BASED ON BM#11 WITH AN ELEVATION OF 8.52 FEET (MLLW)
4. PLANE COORDINATE SYSTEM FOR SAND AND EASTERN ISLANDS, ES-217, DRAWING NO.: SUR-6, USNS MIDWAY ISLAND
3. PROJECT NUMBER 110190136
4. FILE: /apps/hm/cto136/maps/m1152897

SOURCES

PERRY AND ASSOCIATES INC.,
U. S. NAVAL STATION, MIDWAY ISLAND
DRAWING NO.: 103856 & 1038657

TITLE

PCB CONGENERS DETECTED IN GROUND WATER BULKY WASTE LANDFILL NAF MIDWAY ISLAND

N

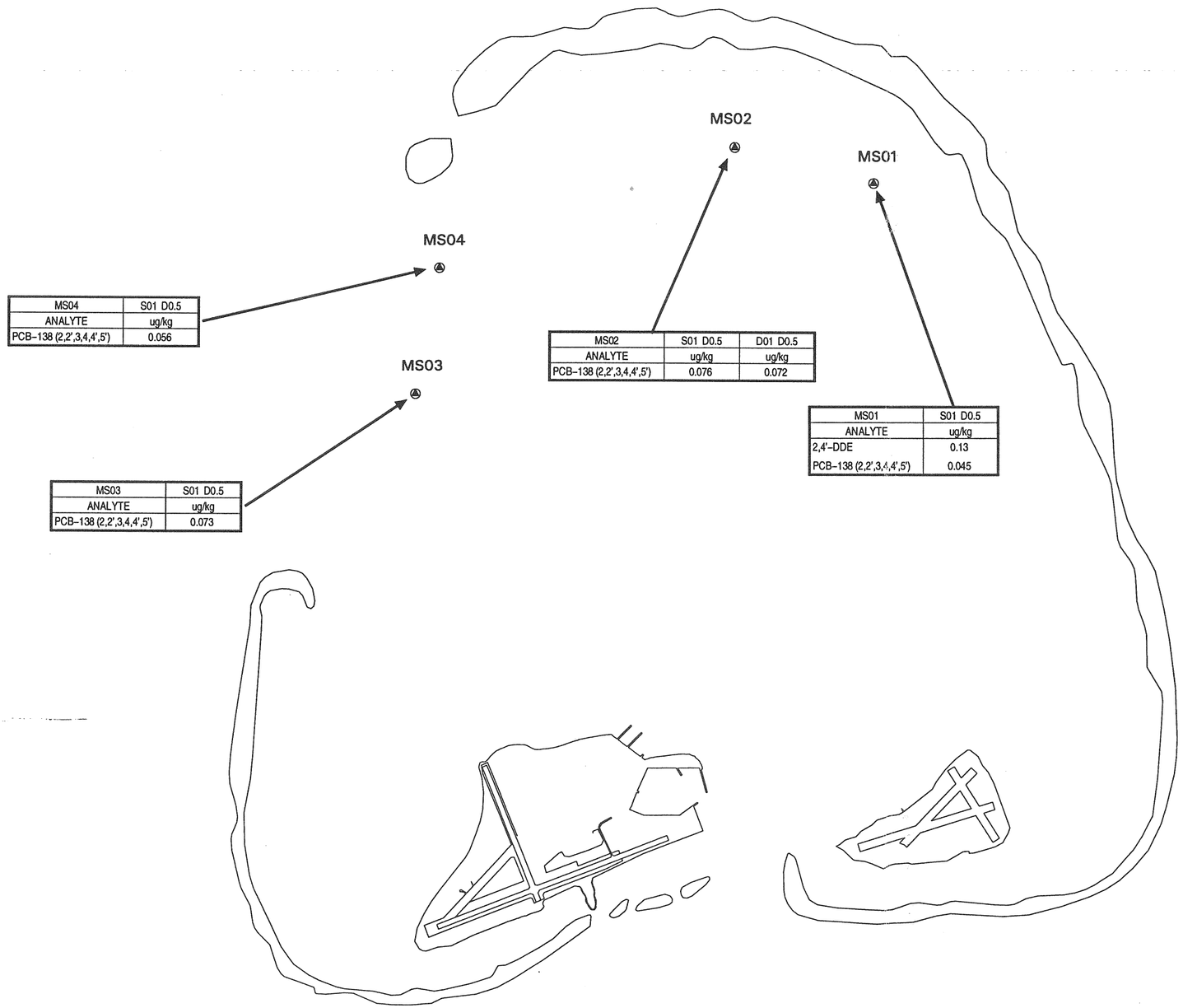
FEET

0 75 150 300 450

DATE	REV.	DRWN.	INIT.	CHKD.	INIT.	APPR.	INIT.
02/05/97	1	CMF		HFP		JMC	

FIGURE

4 – 6



LEGEND

MS01 ▲	MARINE SEDIMENT SAMPLE LOCATION AND NUMBER
S01 D0.5	SAMPLE NUMBER AND DEPTH IN FEET
D01 D0.5	DUPLICATE SAMPLE NUMBER AND DEPTH IN FEET
0.038	ANALYTE CONCENTRATION
ug/kg	MICROGRAMS PER KILOGRAM

NOTES

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4. PLANE COORDINATE SYSTEM FOR SAND AND EASTERN ISLANDS, ES-217, DRAWING NO.: SUR-6, USNS MIDWAY ISLAND
3. PROJECT NUMBER 110190136
4. FILE: /apps/hm/cto136/maps/m1162897

SOURCES

PERRY AND ASSOCIATES INC.,
U. S. NAVAL STATION, MIDWAY ISLAND
DRAWING NO.: 103856 & 1038657

TITLE

ORGANOCHLORINE PESTICIDES AND PCB CONGENERS DETECTED IN SEDIMENT AT REFERENCE SAMPLING STATIONS NAF MIDWAY ISLAND

N

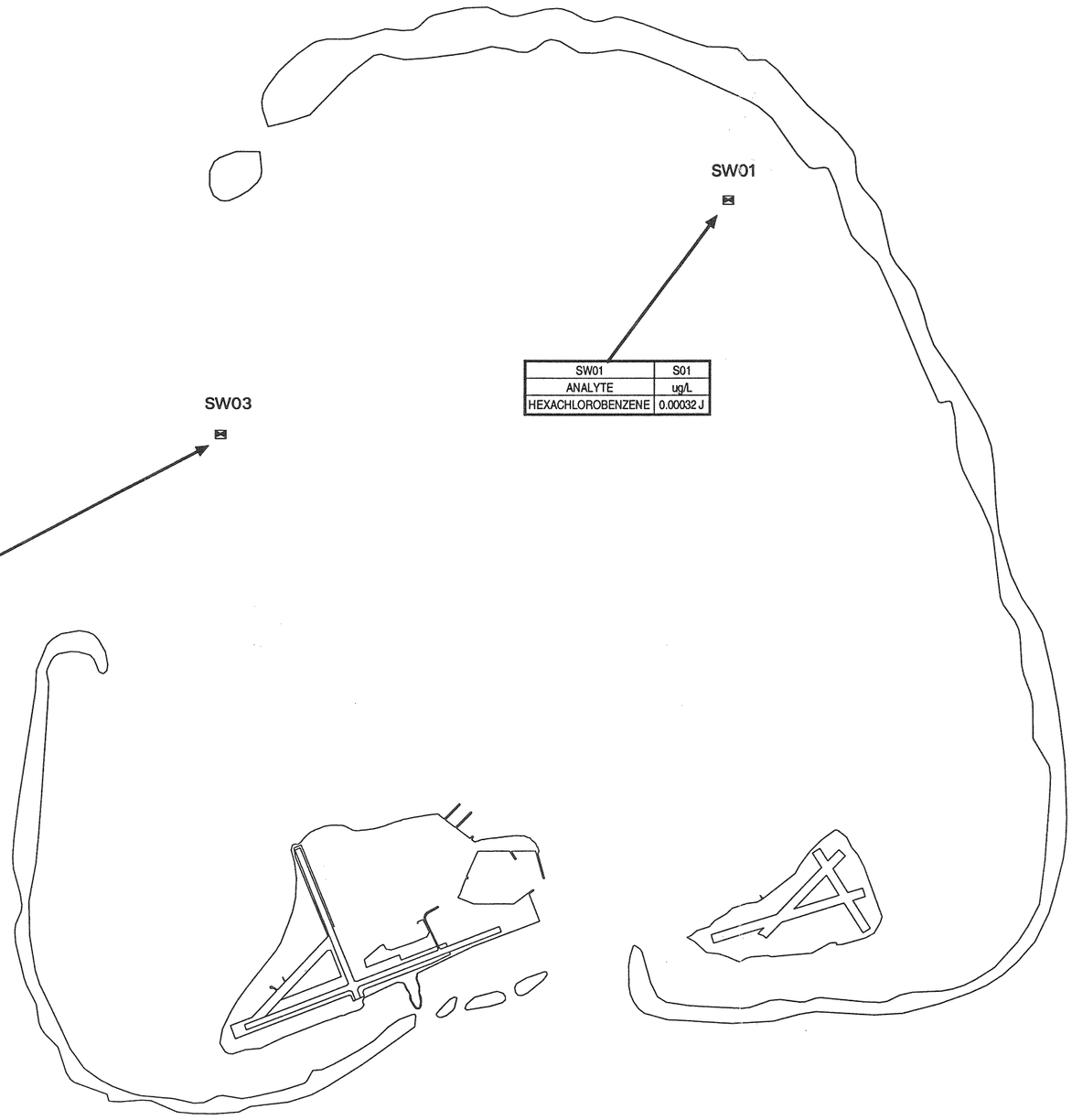
FEET

0 2500 5000 10000 15000

DATE	REV.	DRWN.	INIT.	CHKD.	INIT.	APPR.	INIT.
02/06/97	1	CMF		HFP		JMC	

FIGURE

4-7



SW01	S01
ANALYTE	ug/L
HEXACHLOROBENZENE	0.00032 J

SW03	S01	D01
ANALYTE	ug/L	ug/L
GAMMA-BHC (LINDANE)	0.00027 U	0.00032
HEXACHLOROBENZENE	0.00034 U	0.00025 J

LEGEND

SW01 ⊠	SEAWATER SAMPLE LOCATION AND NUMBER
S01	SAMPLE NUMBER
D01	DUPLICATE SAMPLE
0.00067	ANALYTE CONCENTRATION
ug/L	MICROGRAMS PER LITER
J	NUMERICAL VALUE IS AN ESTIMATED QUANTITY
U	ANALYTE NOT DETECTED ABOVE ASSOCIATED NUMERICAL VALUE

NOTES

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3. VERTICAL CONTROL WAS BASED ON BM#11 WITH AN ELEVATION OF 8.52 FEET (MLLW)
4. PLANE COORDINATE SYSTEM FOR SAND AND EASTERN ISLANDS, ES-217, DRAWING NO.: SUR-6, USNS MIDWAY ISLAND
3. PROJECT NUMBER 110190136
4. FILE: /apps/hm/cto136/maps/m1172897

SOURCES

PERRY AND ASSOCIATES INC.,
U. S. NAVAL STATION, MIDWAY ISLAND
DRAWING NO.: 103856 & 1038657

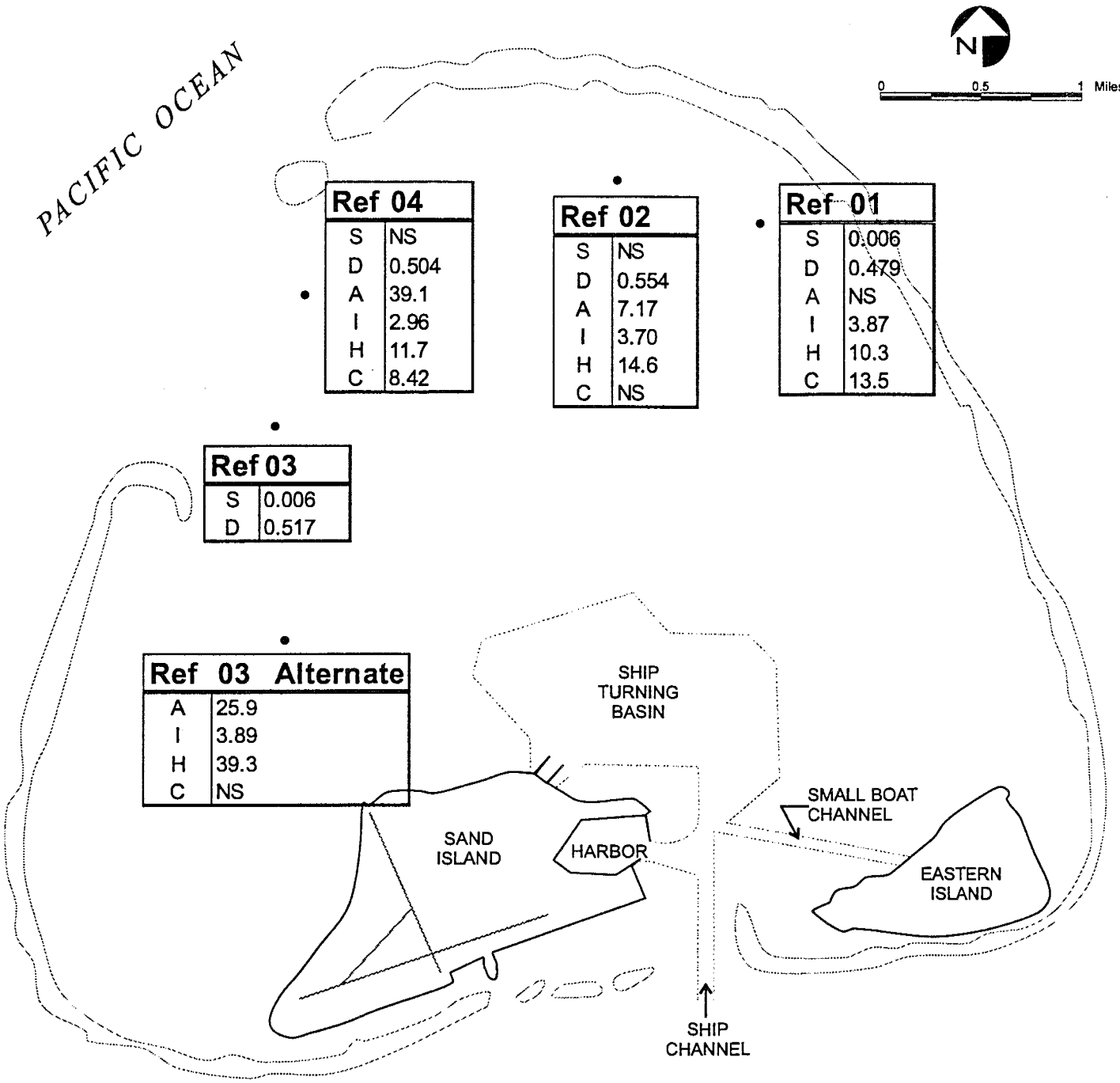
TITLE

ORGANOCHLORINE PESTICIDES AND PCB CONGENERS DETECTED IN SEAWATER AT REFERENCE SAMPLING STATIONS NAF MIDWAY ISLAND

FEET
0 2500 5000 10000 15000

DATE	REV.	DRWN.	INIT.	CHKD.	INIT.	APPR.	INIT.
02/05/97	1	CMF		HFP		JMC	

FIGURE
4-8



LEGEND

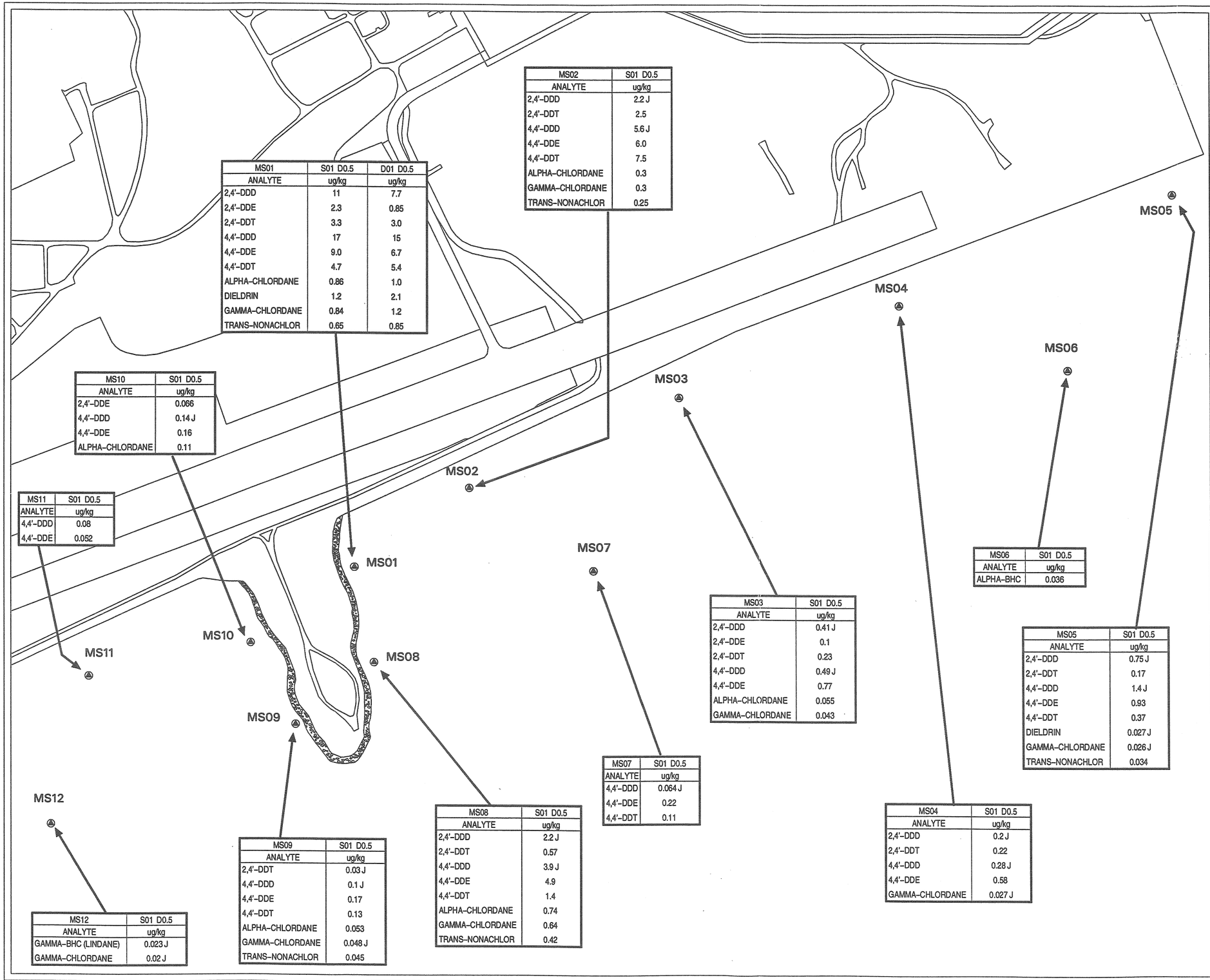
MARINE REFERENCE SAMPLE LOCATION ●

Ref 01		
		Reference Sampling Station
S	0.006	Seawater Concentration (µg/L)
D	0.479	Sediment Concentration (µg/kg)
A	NS	Algae Concentration (µg/kg)
I	3.87	Invertebrate Concentration (µg/kg)
H	10.3	Herbivorous Fish Concentration (µg/kg)
C	13.5	Carnivorous Fish Concentration (µg/kg)
	NS	Not Sampled

File: ...\MIDWAY\RI\01129703.CDR Source: NAVFACENGCOM Dwg. No. 1038656, 1993

TOTAL PCB CONCENTRATIONS IN ALL SAMPLED MEDIA AT REFERENCE SAMPLING STATIONS FOR 1996 SAMPLING EVENT NAF MIDWAY ISLAND

FIGURE 4-9



MS01	S01 D0.5	D01 D0.5
ANALYTE	ug/kg	ug/kg
2,4'–DDD	11	7.7
2,4'–DDE	2.3	0.85
2,4'–DDT	3.3	3.0
4,4'–DDD	17	15
4,4'–DDE	9.0	6.7
4,4'–DDT	4.7	5.4
ALPHA–CHLORDANE	0.86	1.0
DIELDRIN	1.2	2.1
GAMMA–CHLORDANE	0.84	1.2
TRANS–NONACHLOR	0.65	0.85

MS02	S01 D0.5
ANALYTE	ug/kg
2,4'–DDD	2.2 J
2,4'–DDT	2.5
4,4'–DDD	5.6 J
4,4'–DDE	6.0
4,4'–DDT	7.5
ALPHA–CHLORDANE	0.3
GAMMA–CHLORDANE	0.3
TRANS–NONACHLOR	0.25

MS10	S01 D0.5
ANALYTE	ug/kg
2,4'–DDE	0.066
4,4'–DDD	0.14 J
4,4'–DDE	0.16
ALPHA–CHLORDANE	0.11

MS11	S01 D0.5
ANALYTE	ug/kg
4,4'–DDD	0.08
4,4'–DDE	0.052

MS12	S01 D0.5
ANALYTE	ug/kg
GAMMA–BHC (LINDANE)	0.023 J
GAMMA–CHLORDANE	0.02 J

MS09	S01 D0.5
ANALYTE	ug/kg
2,4'–DDT	0.03 J
4,4'–DDD	0.1 J
4,4'–DDE	0.17
4,4'–DDT	0.13
ALPHA–CHLORDANE	0.053
GAMMA–CHLORDANE	0.048 J
TRANS–NONACHLOR	0.045

MS08	S01 D0.5
ANALYTE	ug/kg
2,4'–DDD	2.2 J
2,4'–DDT	0.57
4,4'–DDD	3.9 J
4,4'–DDE	4.9
4,4'–DDT	1.4
ALPHA–CHLORDANE	0.74
GAMMA–CHLORDANE	0.64
TRANS–NONACHLOR	0.42

MS07	S01 D0.5
ANALYTE	ug/kg
4,4'–DDD	0.064 J
4,4'–DDE	0.22
4,4'–DDT	0.11

MS03	S01 D0.5
ANALYTE	ug/kg
2,4'–DDD	0.41 J
2,4'–DDE	0.1
2,4'–DDT	0.23
4,4'–DDD	0.49 J
4,4'–DDE	0.77
ALPHA–CHLORDANE	0.055
GAMMA–CHLORDANE	0.043

MS04	S01 D0.5
ANALYTE	ug/kg
2,4'–DDD	0.2 J
2,4'–DDT	0.22
4,4'–DDD	0.28 J
4,4'–DDE	0.58
GAMMA–CHLORDANE	0.027 J

MS06	S01 D0.5
ANALYTE	ug/kg
ALPHA–BHC	0.036

MS05	S01 D0.5
ANALYTE	ug/kg
2,4'–DDD	0.75 J
2,4'–DDT	0.17
4,4'–DDD	1.4 J
4,4'–DDE	0.93
4,4'–DDT	0.37
DIELDRIN	0.027 J
GAMMA–CHLORDANE	0.026 J
TRANS–NONACHLOR	0.034

LEGEND

MS01 ▲	MARINE SEDIMENT SAMPLE LOCATION AND NUMBER
S01 D0.5	SAMPLE NUMBER AND DEPTH IN FEET
D01 D0.5	DUPLICATE SAMPLE NUMBER AND DEPTH IN FEET
11	ANALYTE CONCENTRATION
ug/kg	MICROGRAMS PER KILOGRAM
J	NUMERICAL VALUE IS AN ESTIMATED QUANTITY

NOTES

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4. PLANE COORDINATE SYSTEM FOR SAND AND EASTERN ISLANDS, ES–217, DRAWING NO.: SUR–6, USNS MIDWAY ISLAND
3. PROJECT NUMBER 110190136
4. FILE: /apps/hm/cto136/maps/m1182897

SOURCES

PERRY AND ASSOCIATES INC.,
U. S. NAVAL STATION, MIDWAY ISLAND
DRAWING NO.: 103856 & 1038657

TITLE

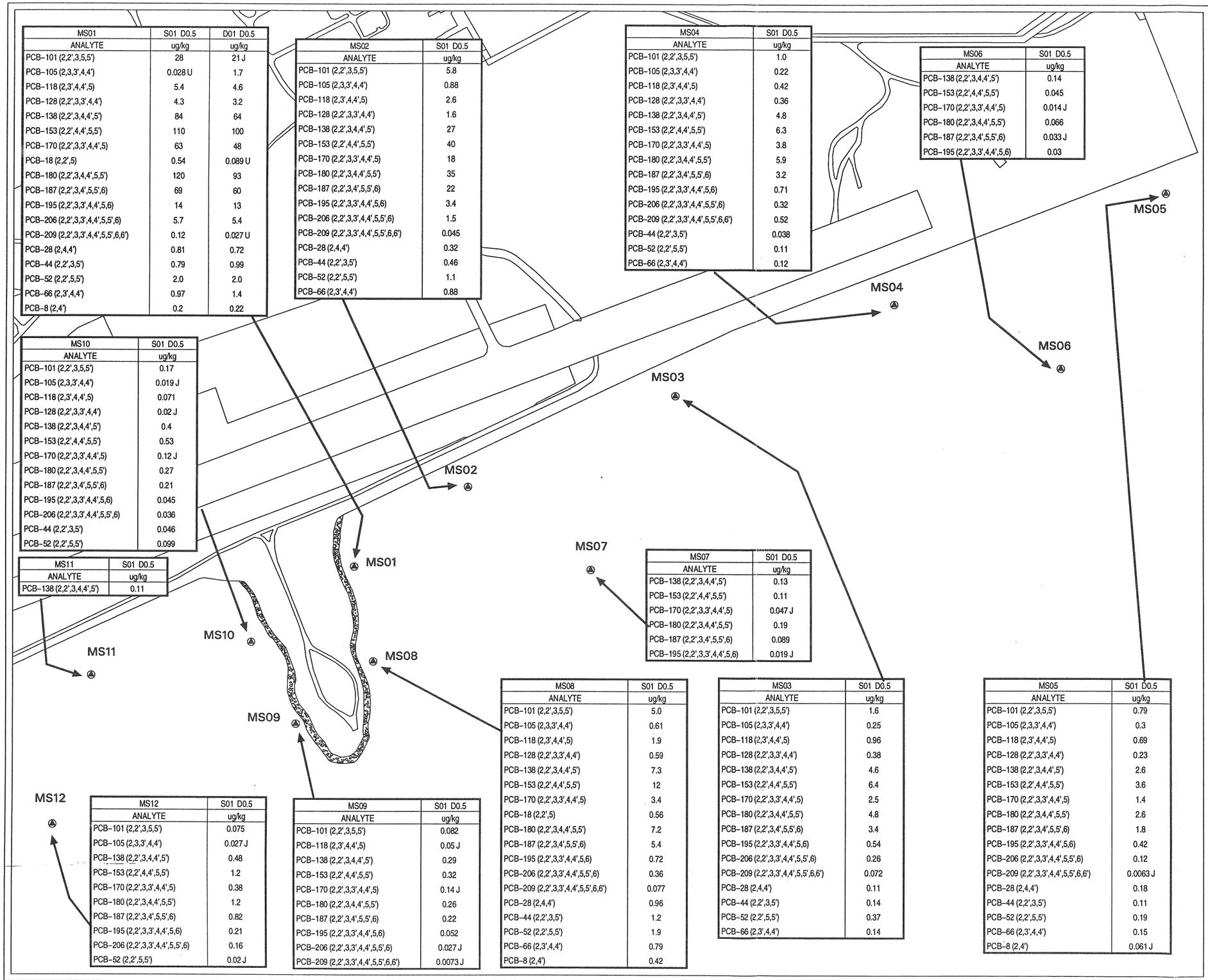
ORGANOCHLORINE PESTICIDES DETECTED IN MARINE SEDIMENTS AT LANDFILLS SAMPLING STATIONS NAF MIDWAY ISLAND

FEET

0 250 500 1000 1500

DATE	REV.	DRWN.	INIT.	CHKD.	INIT.	APPR.	INIT.
02/05/97	1	CMF		HFP		JMC	

FIGURE
4–10



MS01	S01 D0.5	D01 D0.5
ANALYTE	ug/kg	ug/kg
PCB-101 (2,2',3,5,5')	28	21 J
PCB-105 (2,3,3',4,4')	0.028 U	1.7
PCB-118 (2,3',4,4',5)	5.4	4.6
PCB-128 (2,2',3,3',4,4')	4.3	3.2
PCB-138 (2,2',3,4,4',5')	84	64
PCB-153 (2,2',4,4',5,5')	110	100
PCB-170 (2,2',3,3',4,4',5)	63	48
PCB-18 (2,2',5)	0.54	0.089 U
PCB-180 (2,2',3,4,4',5,5')	120	93
PCB-187 (2,2',3,4',5,5',6)	69	60
PCB-195 (2,2',3,3',4,4',5,6)	14	13
PCB-206 (2,2',3,3',4,4',5,5',6)	5.7	5.4
PCB-209 (2,2',3,3',4,4',5,5',6,6')	0.12	0.027 U
PCB-28 (2,4,4')	0.81	0.72
PCB-44 (2,2',3,5')	0.79	0.99
PCB-52 (2,2',5,5')	2.0	2.0
PCB-66 (2,3',4,4')	0.97	1.4
PCB-8 (2,4')	0.2	0.22

MS02	S01 D0.5
ANALYTE	ug/kg
PCB-101 (2,2',3,5,5')	5.8
PCB-105 (2,3,3',4,4')	0.88
PCB-118 (2,3',4,4',5)	2.6
PCB-128 (2,2',3,3',4,4')	1.6
PCB-138 (2,2',3,4,4',5')	27
PCB-153 (2,2',4,4',5,5')	40
PCB-170 (2,2',3,3',4,4',5)	18
PCB-180 (2,2',3,4,4',5,5')	35
PCB-187 (2,2',3,4',5,5',6)	22
PCB-195 (2,2',3,3',4,4',5,6)	3.4
PCB-206 (2,2',3,3',4,4',5,5',6)	1.5
PCB-209 (2,2',3,3',4,4',5,5',6,6')	0.045
PCB-28 (2,4,4')	0.32
PCB-44 (2,2',3,5')	0.46
PCB-52 (2,2',5,5')	1.1
PCB-66 (2,3',4,4')	0.88

MS04	S01 D0.5
ANALYTE	ug/kg
PCB-101 (2,2',3,5,5')	1.0
PCB-105 (2,3,3',4,4')	0.22
PCB-118 (2,3',4,4',5)	0.42
PCB-128 (2,2',3,3',4,4')	0.36
PCB-138 (2,2',3,4,4',5')	4.8
PCB-153 (2,2',4,4',5,5')	6.3
PCB-170 (2,2',3,3',4,4',5)	3.8
PCB-180 (2,2',3,4,4',5,5')	5.9
PCB-187 (2,2',3,4',5,5',6)	3.2
PCB-195 (2,2',3,3',4,4',5,6)	0.71
PCB-206 (2,2',3,3',4,4',5,5',6)	0.32
PCB-209 (2,2',3,3',4,4',5,5',6,6')	0.52
PCB-44 (2,2',3,5')	0.038
PCB-52 (2,2',5,5')	0.11
PCB-66 (2,3',4,4')	0.12

MS06	S01 D0.5
ANALYTE	ug/kg
PCB-138 (2,2',3,4,4',5')	0.14
PCB-153 (2,2',4,4',5,5')	0.045
PCB-170 (2,2',3,3',4,4',5)	0.014 J
PCB-180 (2,2',3,4,4',5,5')	0.066
PCB-187 (2,2',3,4',5,5',6)	0.033 J
PCB-195 (2,2',3,3',4,4',5,6)	0.03

MS10	S01 D0.5
ANALYTE	ug/kg
PCB-101 (2,2',3,5,5')	0.17
PCB-105 (2,3,3',4,4')	0.019 J
PCB-118 (2,3',4,4',5)	0.071
PCB-128 (2,2',3,3',4,4')	0.02 J
PCB-138 (2,2',3,4,4',5')	0.4
PCB-153 (2,2',4,4',5,5')	0.53
PCB-170 (2,2',3,3',4,4',5)	0.12 J
PCB-180 (2,2',3,4,4',5,5')	0.27
PCB-187 (2,2',3,4',5,5',6)	0.21
PCB-195 (2,2',3,3',4,4',5,6)	0.045
PCB-206 (2,2',3,3',4,4',5,5',6)	0.036
PCB-44 (2,2',3,5')	0.046
PCB-52 (2,2',5,5')	0.099

MS11	S01 D0.5
ANALYTE	ug/kg
PCB-138 (2,2',3,4,4',5')	0.11

MS07	S01 D0.5
ANALYTE	ug/kg
PCB-138 (2,2',3,4,4',5')	0.13
PCB-153 (2,2',4,4',5,5')	0.11
PCB-170 (2,2',3,3',4,4',5)	0.047 J
PCB-180 (2,2',3,4,4',5,5')	0.19
PCB-187 (2,2',3,4',5,5',6)	0.089
PCB-195 (2,2',3,3',4,4',5,6)	0.019 J

MS08	S01 D0.5
ANALYTE	ug/kg
PCB-101 (2,2',3,5,5')	5.0
PCB-105 (2,3,3',4,4')	0.61
PCB-118 (2,3',4,4',5)	1.9
PCB-128 (2,2',3,3',4,4')	0.59
PCB-138 (2,2',3,4,4',5')	7.3
PCB-153 (2,2',4,4',5,5')	12
PCB-170 (2,2',3,3',4,4',5)	3.4
PCB-18 (2,2',5)	0.56
PCB-180 (2,2',3,4,4',5,5')	7.2
PCB-187 (2,2',3,4',5,5',6)	5.4
PCB-195 (2,2',3,3',4,4',5,6)	0.72
PCB-206 (2,2',3,3',4,4',5,5',6)	0.36
PCB-209 (2,2',3,3',4,4',5,5',6,6')	0.077
PCB-28 (2,4,4')	0.96
PCB-44 (2,2',3,5')	1.2
PCB-52 (2,2',5,5')	1.9
PCB-66 (2,3',4,4')	0.79
PCB-8 (2,4')	0.42

MS03	S01 D0.5
ANALYTE	ug/kg
PCB-101 (2,2',3,5,5')	1.6
PCB-105 (2,3,3',4,4')	0.25
PCB-118 (2,3',4,4',5)	0.96
PCB-128 (2,2',3,3',4,4')	0.38
PCB-138 (2,2',3,4,4',5')	4.6
PCB-153 (2,2',4,4',5,5')	6.4
PCB-170 (2,2',3,3',4,4',5)	2.5
PCB-180 (2,2',3,4,4',5,5')	4.8
PCB-187 (2,2',3,4',5,5',6)	3.4
PCB-195 (2,2',3,3',4,4',5,6)	0.54
PCB-206 (2,2',3,3',4,4',5,5',6)	0.26
PCB-209 (2,2',3,3',4,4',5,5',6,6')	0.072
PCB-28 (2,4,4')	0.11
PCB-44 (2,2',3,5')	0.14
PCB-52 (2,2',5,5')	0.37
PCB-66 (2,3',4,4')	0.14

MS05	S01 D0.5
ANALYTE	ug/kg
PCB-101 (2,2',3,5,5')	0.79
PCB-105 (2,3,3',4,4')	0.3
PCB-118 (2,3',4,4',5)	0.69
PCB-128 (2,2',3,3',4,4')	0.23
PCB-138 (2,2',3,4,4',5')	2.6
PCB-153 (2,2',4,4',5,5')	3.6
PCB-170 (2,2',3,3',4,4',5)	1.4
PCB-180 (2,2',3,4,4',5,5')	2.6
PCB-187 (2,2',3,4',5,5',6)	1.8
PCB-195 (2,2',3,3',4,4',5,6)	0.42
PCB-206 (2,2',3,3',4,4',5,5',6)	0.12
PCB-209 (2,2',3,3',4,4',5,5',6,6')	0.0063 J
PCB-28 (2,4,4')	0.18
PCB-44 (2,2',3,5')	0.11
PCB-52 (2,2',5,5')	0.19
PCB-66 (2,3',4,4')	0.15
PCB-8 (2,4')	0.061 J

MS12	S01 D0.5
ANALYTE	ug/kg
PCB-101 (2,2',3,5,5')	0.075
PCB-105 (2,3,3',4,4')	0.027 J
PCB-138 (2,2',3,4,4',5')	0.48
PCB-153 (2,2',4,4',5,5')	1.2
PCB-170 (2,2',3,3',4,4',5)	0.38
PCB-180 (2,2',3,4,4',5,5')	1.2
PCB-187 (2,2',3,4',5,5',6)	0.82
PCB-195 (2,2',3,3',4,4',5,6)	0.21
PCB-206 (2,2',3,3',4,4',5,5',6)	0.16
PCB-52 (2,2',5,5')	0.02 J

MS09	S01 D0.5
ANALYTE	ug/kg
PCB-101 (2,2',3,5,5')	0.082
PCB-118 (2,3',4,4',5)	0.05 J
PCB-138 (2,2',3,4,4',5')	0.29
PCB-153 (2,2',4,4',5,5')	0.32
PCB-170 (2,2',3,3',4,4',5)	0.14 J
PCB-180 (2,2',3,4,4',5,5')	0.26
PCB-187 (2,2',3,4',5,5',6)	0.22
PCB-195 (2,2',3,3',4,4',5,6)	0.052
PCB-206 (2,2',3,3',4,4',5,5',6)	0.027 J
PCB-209 (2,2',3,3',4,4',5,5',6,6')	0.0073 J

LEGEND

MS01 ▲	MARINE SEDIMENT SAMPLE LOCATION AND NUMBER
S01 D0.5	SAMPLE NUMBER AND DEPTH IN FEET
D01 D0.5	DUPLICATE SAMPLE NUMBER AND DEPTH IN FEET
28	ANALYTE CONCENTRATION
ug/kg	MICROGRAMS PER KILOGRAM
J	NUMERICAL VALUE IS AN ESTIMATED QUANTITY
U	ANALYTE NOT DETECTED ABOVE ASSOCIATED NUMERICAL VALUE

NOTES

1. THE ACCURACY OF THIS DOCUMENT IS LIMITED TO THE QUALITY OF THE SOURCE INFORMATION AND IS NOT SUITABLE FOR MAPPING ENGINEERING APPLICATIONS AND IS NOT TO BE USED FOR "AS BUILT"
2. HORIZONTAL CONTROL POINT ESTABLISHED BY USNS ON SITE WAS USED AS BASIS OF DRAWING
3. VERTICAL CONTROL WAS BASED ON BM#11 WITH AN ELEVATION OF 8.52 FEET (MLLW)
4. PLANE COORDINATE SYSTEM FOR SAND AND EASTERN ISLANDS, ES-217, DRAWING NO.: SUR-6, USNS MIDWAY ISLAND
3. PROJECT NUMBER 110190136
4. FILE: /apps/hm/cto136/maps/m1192897

SOURCES

PERRY AND ASSOCIATES INC.,
U. S. NAVAL STATION, MIDWAY ISLAND
DRAWING NO.: 103856 & 1038657

TITLE

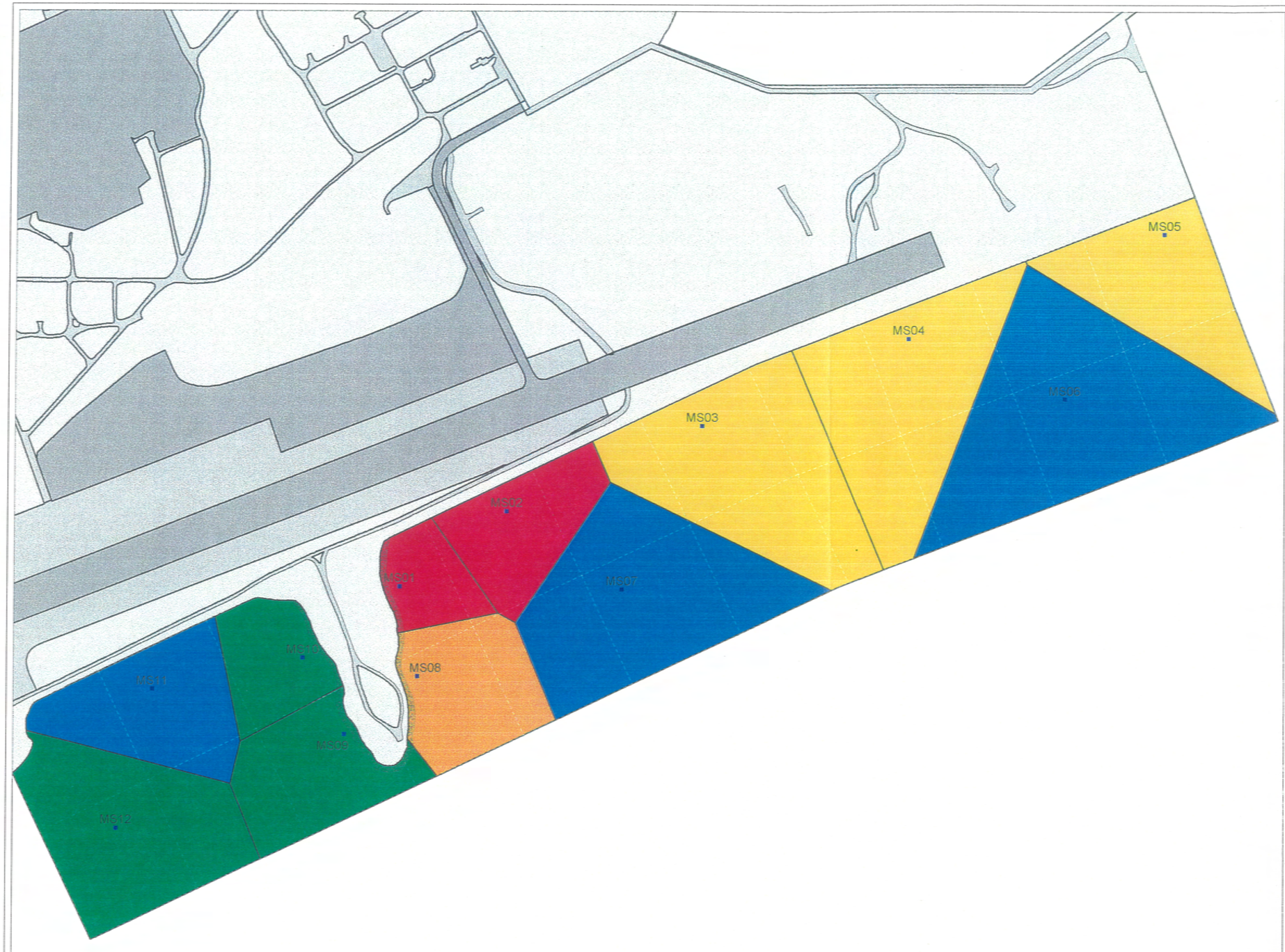
PCB CONGENERS DETECTED IN MARINE SEDIMENTS AT LANDFILLS SAMPLING STATIONS NAF MIDWAY ISLAND

FEET

0 250 500 1000 1500

DATE	REV.	DRWN.	INIT.	CHKD.	INIT.	APPR.	INIT.
02/05/97	1	CMF		HFP		JMC	

FIGURE 4-11



LEGEND

THIESSEN POLYGONS
TOTAL PCB CONCENTRATIONS

- ≤ 1 µg/kg
- > 1 ≤ 15 µg/kg
- > 15 ≤ 30 µg/kg
- > 30 ≤ 100 µg/kg
- > 100 ≤ 509 µg/kg

EACH REGION, THIESSEN POLYGON, HAS THE UNIQUE PROPERTY THAT ANY POINT WITHIN A REGION IS CLOSER TO THE REGION'S SAMPLING LOCATION THAN ANY OTHER REGION.

▪ MARINE SAMPLE LOCATION

SAMPLING GRID

NOTES

1. THE ACCURACY OF THIS DOCUMENT IS LIMITED TO THE QUALITY OF THE SOURCE INFORMATION AND IS NOT A LEGAL REPRESENTATION OF THE ORIGINAL SURVEY
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3. VERTICAL CONTROL WAS BASED ON BM#11 WITH AN ELEVATION OF 8.52 FEET (MLLW)
4. PLANE COORDINATE SYSTEM FOR SAND AND EASTERN ISLANDS, ES-217, DRAWING NO.: SUR-6, USNS MIDWAY ISLAND
5. PROJECT NUMBER 110190136
6. FILE :g:\midway\ri\charts.apr

SOURCES

PERRY ASSOCIATES INC., HOWARD LAWSON & ASSOC.
US S. NAVAL STATION, MIDWAY ISLAND, DWG NO.: #1038656, #1038657

TITLE

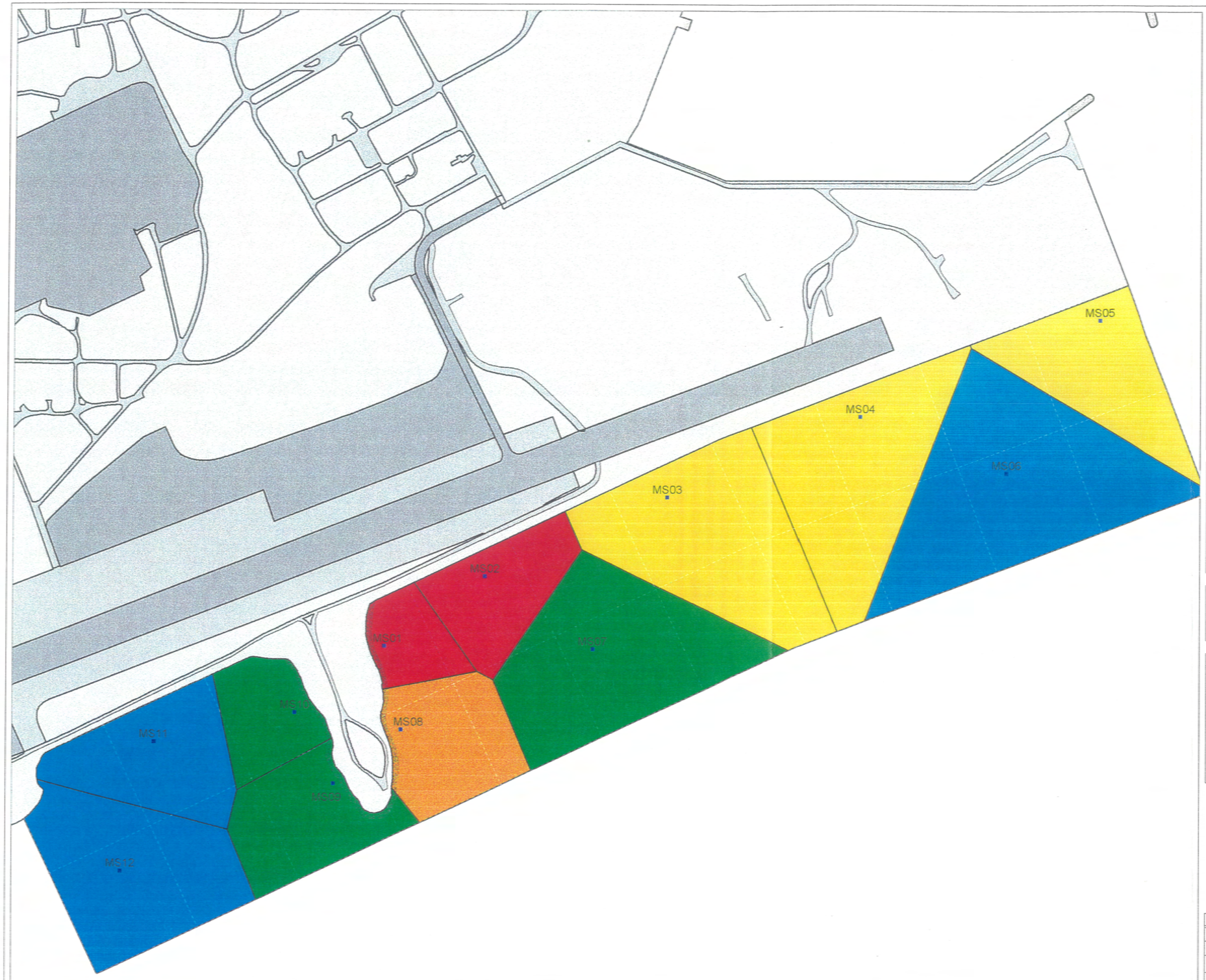
TOTAL PCB CONCENTRATIONS WITHIN THIESSEN POLYGONS IN MARINE SEDIMENTS AT LANDFILL SAMPLING STATIONS, NAF MIDWAY ISLAND

N

360 0 360 720 1080 Feet

DATE	REV	DRWN	INT	CHKD	INT	APPR	INT
02/04/97		HFP		BW			

FIGURE
4-12



LEGEND

THIESSEN POLYGONS
4,4' - DDE CONCENTRATIONS

- ≤ 0.05µg/kg
- > 0.05 ≤ 0.25 µg/kg
- > 0.25 ≤ 1.0 µg/kg
- > 1.0 ≤ 5.0 µg/kg
- > 5.0 ≤ 9 µg/kg

EACH REGION, THIESSEN POLYGON, HAS THE UNIQUE PROPERTY THAT ANY POINT WITHIN A REGION IS CLOSER TO THE REGION'S SAMPLING LOCATION THAN ANY OTHER REGION.

▪ MARINE SAMPLE LOCATION

SAMPLING GRID

NOTES

1. THE ACCURACY OF THIS DOCUMENT IS LIMITED TO THE QUALITY OF THE SOURCE INFORMATION AND IS NOT A LEGAL REPRESENTATION OF THE ORIGINAL SURVEY
2. HORIZONTAL CONTROL POINT ESTABLISHED BY USNS ON SITE, WAS USED AS BASIS OF DRAWING
3. VERTICAL CONTROL WAS BASED ON BM#11 WITH AN ELEVATION OF 8.52 FEET (MLLW)
4. PLANE COORDINATE SYSTEM FOR SAND AND EASTERN ISLANDS, ES-217, DRAWING NO.: SUR-6, USNS MIDWAY ISLAND
5. PROJECT NUMBER 110190136
6. FILE :g:\midway\ri\charts.apr

SOURCES

PERRY ASSOCIATES INC., HOWARD LAWSON & ASSOC.
US S. NAVAL STATION, MIDWAY ISLAND, DWG NO.: #1038656, #1038657

TITLE

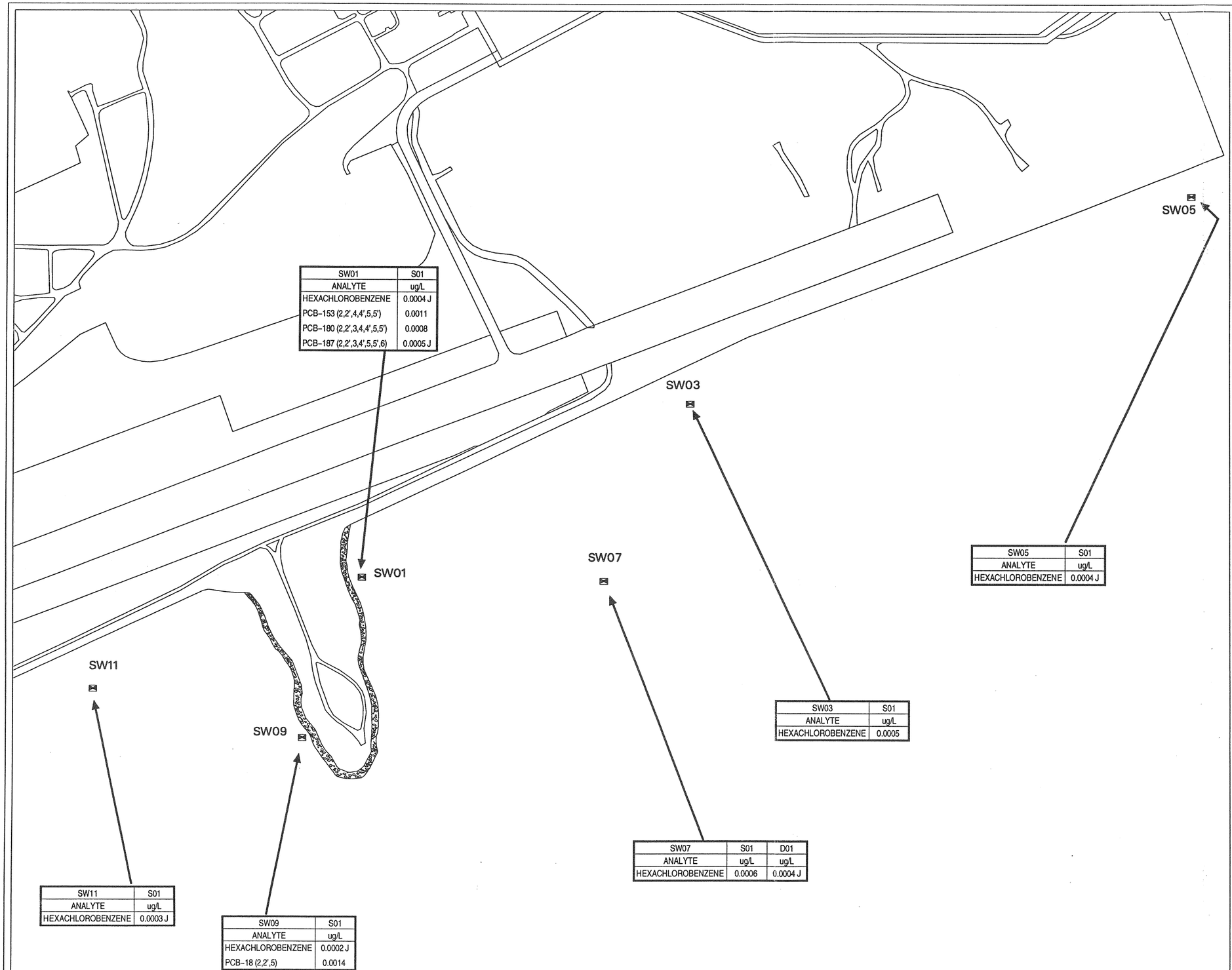
4,4'-DDE CONCENTRATIONS WITHIN THIESSEN POLYGONS IN MARINE SEDIMENTS AT LANDFILL SAMPLING STATIONS, NAF MIDWAY ISLAND

N

400 0 400 800 1200 Feet

DATE	REV	DRWN	INT	CHKD	INT	APPR	INT
02/04/97		HFP		BW			

FIGURE
4-13



SW01	S01
ANALYTE	ug/L
HEXACHLOROBENZENE	0.0004 J
PCB-153 (2,2',4,4',5,5')	0.0011
PCB-180 (2,2',3,4,4',5,5')	0.0008
PCB-187 (2,2',3,4',5,5',6)	0.0005 J

SW05	S01
ANALYTE	ug/L
HEXACHLOROBENZENE	0.0004 J

SW03	S01
ANALYTE	ug/L
HEXACHLOROBENZENE	0.0005

SW07	S01	D01
ANALYTE	ug/L	ug/L
HEXACHLOROBENZENE	0.0006	0.0004 J

SW11	S01
ANALYTE	ug/L
HEXACHLOROBENZENE	0.0003 J

SW09	S01
ANALYTE	ug/L
HEXACHLOROBENZENE	0.0002 J
PCB-18 (2,2',5)	0.0014

LEGEND

SW01 ⊠	SEAWATER SAMPLE LOCATION AND NUMBER
S01	SAMPLE NUMBER
D01	DUPLICATE SAMPLE
0.0008	ANALYTE CONCENTRATION
ug/L	MICROGRAMS PER LITER
J	NUMERICAL VALUE IS AN ESTIMATED QUANTITY

NOTES

1. THE ACCURACY OF THIS DOCUMENT IS LIMITED TO THE QUALITY OF THE SOURCE INFORMATION AND IS NOT SUITABLE FOR MAPPING ENGINEERING APPLICATIONS AND IS NOT TO BE USED FOR "AS BUILT"
2. HORIZONTAL CONTROL POINT ESTABLISHED BY USNS ON SITE WAS USED AS BASIS OF DRAWING
3. VERTICAL CONTROL WAS BASED ON BM#11 WITH AN ELEVATION OF 8.52 FEET (MLLW)
4. PLANE COORDINATE SYSTEM FOR SAND AND EASTERN ISLANDS, ES-217, DRAWING NO.: SUR-6, USNS MIDWAY ISLAND
3. PROJECT NUMBER 110190136
4. FILE: /apps/hm/cto136/maps/m1202897

SOURCES

PERRY AND ASSOCIATES INC.,
U. S. NAVAL STATION, MIDWAY ISLAND
DRAWING NO.: 103856 & 1038657

TITLE

ORGANOCHLORINE PESTICIDES AND PCB CONGENERS DETECTED IN SEAWATER AT LANDFILLS SAMPLING STATIONS NAF MIDWAY ISLAND

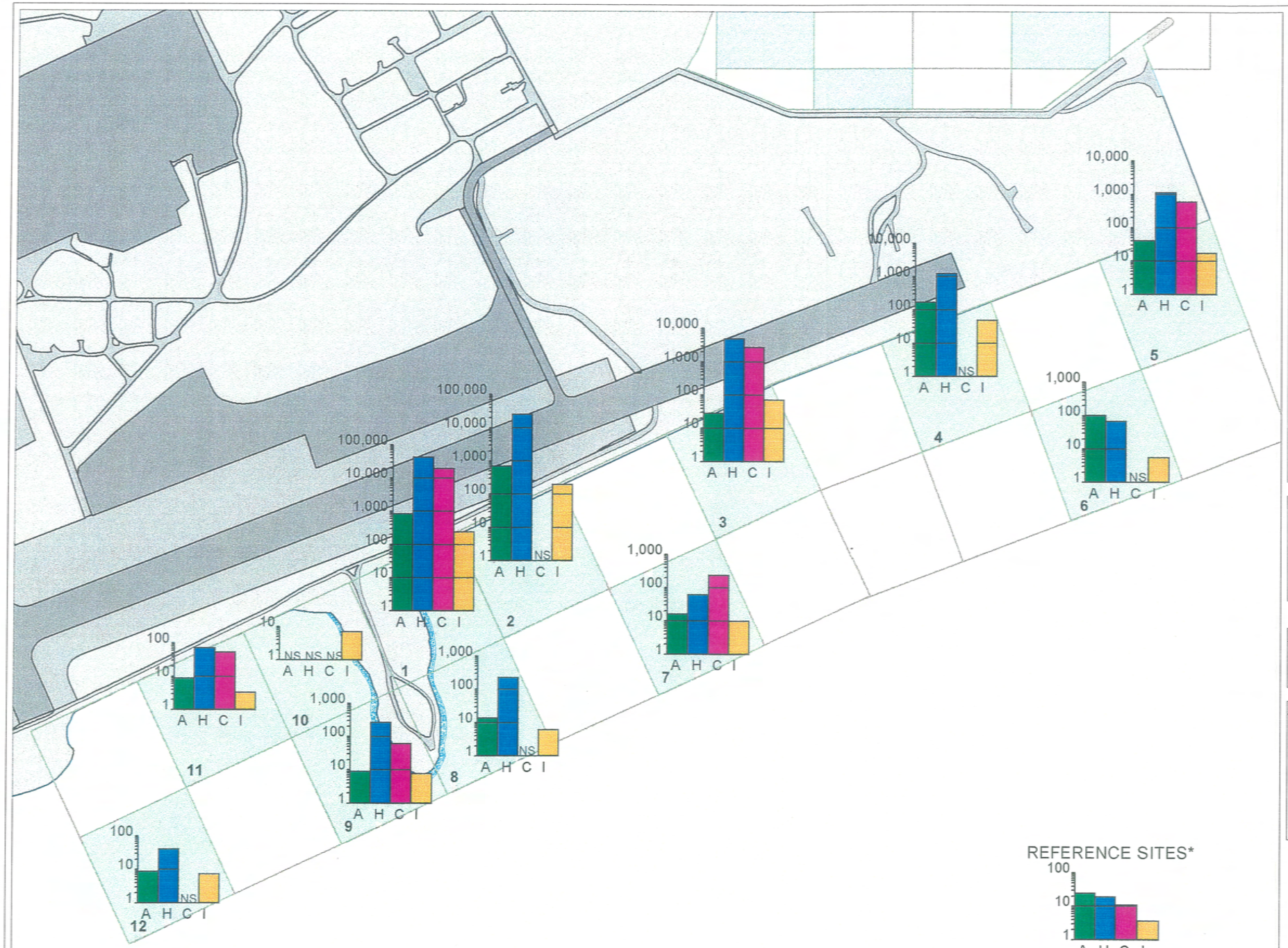
FEET

0 250 500 1000 1500

DATE	REV.	DRWN.	INIT.	CHKD.	INIT.	APPR.	INIT.
02/05/97	I	CMF		HFP		JMC	

FIGURE

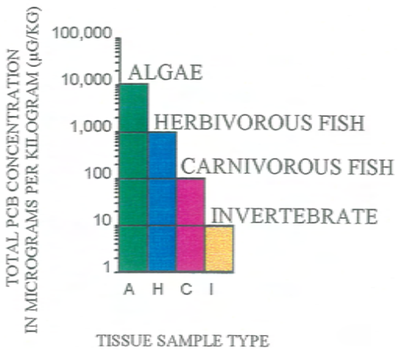
4-14



LEGEND

INNER HARBOR
LANDFILL

NS = NOT SAMPLED



HEIGHT OF BAR INDICATES ARITHMETIC TOTAL OF PCB CONGENERS PLOTTED ON A LOG SCALE, UNDETECTED CONCENTRATIONS WERE ADDED AT 0.5 OF THE SAMPLE QUANTITATION LIMIT

NOTES

1. THE ACCURACY OF THIS DOCUMENT IS LIMITED TO THE QUALITY OF THE SOURCE INFORMATION AND IS NOT A LEGAL REPRESENTATION OF THE ORIGINAL SURVEY
2. HORIZONTAL CONTROL POINTS ESTABLISHED BY USNS ON SITE WERE USED
3. VERTICAL CONTROL WAS BASED ON BM#11 WITH AN ELEVATION OF 8.52 FEET (MLLW)
4. PLANE COORDINATE SYSTEM FOR SAND AND EASTERN ISLANDS, ES-217, DRAWING NO.: SUR-6, USNS MIDWAY ISLAND
5. PROJECT NUMBER 110190136
6. FILE :...\MIDWAY\R\CHARTS.APR

SOURCES

PERRY ASSOCIATES INC., HOWARD LAWSON & ASSOC.
US S. NAVAL STATION, MIDWAY ISLAND, DWG NO.: #1038656, #1038657

TITLE

TOTAL PCB CONCENTRATIONS IN MARINE TISSUES AT LANDFILL SAMPLING STATIONS, NAF MIDWAY ISLAND

REFERENCE SITES*

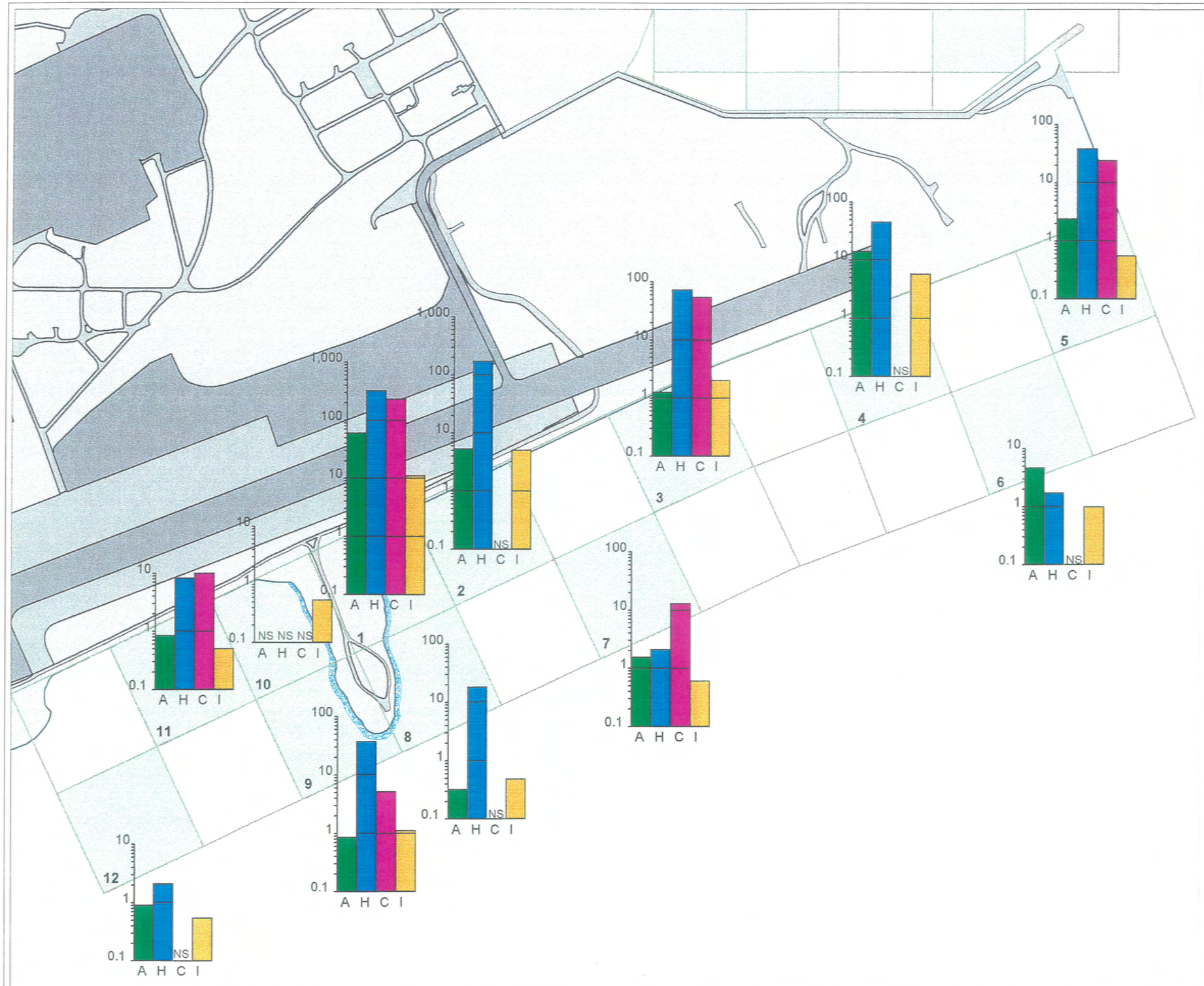
*CONCENTRATIONS ARE AVERAGED ACROSS SPECIES AT DIFFERENT LOCATIONS

N

400 0 400 800 1200 Feet

DATE	REV	DRWN	INT	CHKD	INT	APPR	INT
02/04/97		HFP		BW			

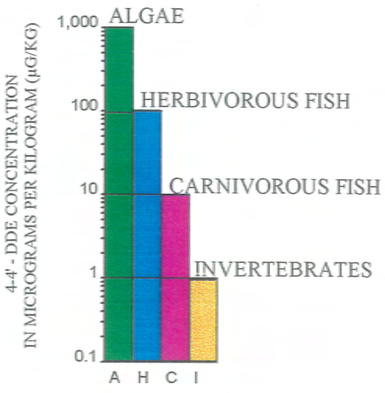
FIGURE 4-15



LEGEND

INNER HARBOR
LANDFILL

NS = NOT SAMPLED



HEIGHT OF BAR INDICATES ARITHMETIC 4,4'-DDE CONCENTRATIONS PLOTTED ON A LOG SCALE, UNDETECTED CONCENTRATIONS WERE ADDED AT 0.5 OF THE SAMPLE QUANTITATION LIMIT

NOTES

1. THE ACCURACY OF THIS DOCUMENT IS LIMITED TO THE QUALITY OF THE SOURCE INFORMATION AND IS NOT A LEGAL REPRESENTATION OF THE ORIGINAL SURVEY
2. HORIZONTAL CONTROL POINTS ESTABLISHED BY USNS ON SITE WERE USED
3. VERTICAL CONTROL WAS BASED ON BM#11 WITH AN ELEVATION OF 8.52 FEET (MLLW)
4. PLANE COORDINATE SYSTEM FOR SAND AND EASTERN ISLANDS, ES-217, DRAWING NO.: SUR-6, USNS MIDWAY ISLAND
5. PROJECT NUMBER 110190136
6. FILE :...\MIDWAY\RI\CHARTS.APR

SOURCES

PERRY ASSOCIATES INC., HOWARD LAWSON & ASSOC.
US S. NAVAL STATION, MIDWAY ISLAND, DWG NO.: #1038656, #1038657

TITLE

4,4'-DDE CONCENTRATIONS IN MARINE TISSUES AT LANDFILL SAMPLING STATIONS, NAF MIDWAY ISLAND

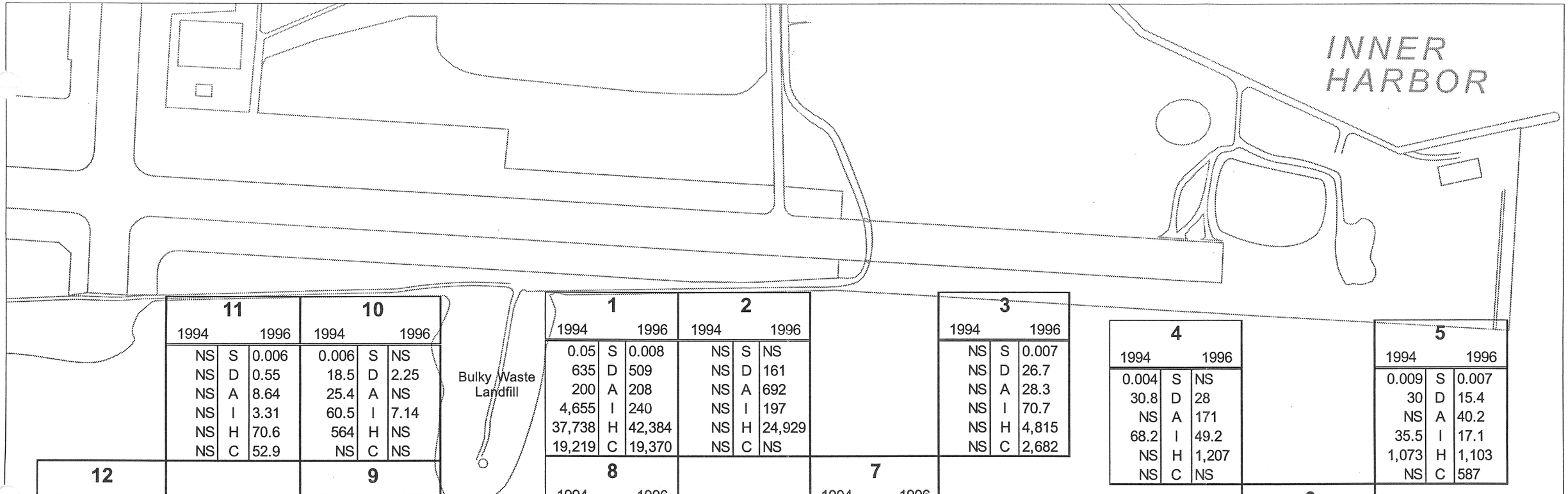
N

400 0 400 800 1200 Feet

DATE	REV	DRWN	INT	CHKD	INT	APPR	INT
02/04/97		HFP		BW			

FIGURE

4-16



11		
1994		1996
NS	S	0.006
NS	D	0.55
NS	A	8.64
NS	I	3.31
NS	H	70.6
NS	C	52.9

10		
1994		1996
0.006	S	NS
18.5	D	2.25
25.4	A	NS
60.5	I	7.14
564	H	NS
NS	C	NS

12		
1994		1996
NS	S	NS
19.6	D	4.83
NS	A	8.64
NS	I	7.28
NS	H	40.4
NS	C	NS

9		
1994		1996
0.006	S	0.007
18.2	D	1.77
NS	A	8.91
NS	I	7.77
NS	H	268
NS	C	61.4

1		
1994		1996
0.05	S	0.008
635	D	509
200	A	208
4,655	I	240
37,738	H	42,384
19,219	C	19,370

2		
1994		1996
NS	S	NS
NS	D	161
NS	A	692
NS	I	197
NS	H	24,929
NS	C	NS

8		
1994		1996
0.006	S	NS
133	D	50.5
NS	A	13.5
NS	I	6.16
NS	H	228
NS	C	NS

7		
1994		1996
NS	S	0.007
NS	D	0.92
NS	A	15.9
NS	I	9.92
NS	H	61.2
NS	C	235

3		
1994		1996
NS	S	0.007
NS	D	26.7
NS	A	28.3
NS	I	70.7
NS	H	4,815
NS	C	2,682

4		
1994		1996
0.004	S	NS
30.8	D	28
NS	A	171
68.2	I	49.2
NS	H	1,207
NS	C	NS

5		
1994		1996
0.009	S	0.007
30	D	15.4
NS	A	40.2
35.5	I	17.1
1,073	H	1,103
NS	C	587

6		
1994		1996
NS	S	NS
NS	D	0.64
NS	A	102
NS	I	5.54
NS	H	66.8
NS	C	NS

LEGEND

1		
1994		1996
0.0003	S	0.0001
8.7	D	9
2.3	A	60
69.00	I	11.00
580	H	320
330	C	230
NS		NS

GRID SAMPLE

TOTAL PCB CONGENER CONCENTRATIONS

Grid Number
Year
Seawater Concentrations (µg/L)
Sediment Concentrations (µg/kg)
Algae Concentrations (µg/kg)
Invertebrate Concentrations (µg/kg)
Herbivorous Fish Concentrations (µg/kg)
Carnivorous Fish Concentrations (µg/kg)
Not Sampled

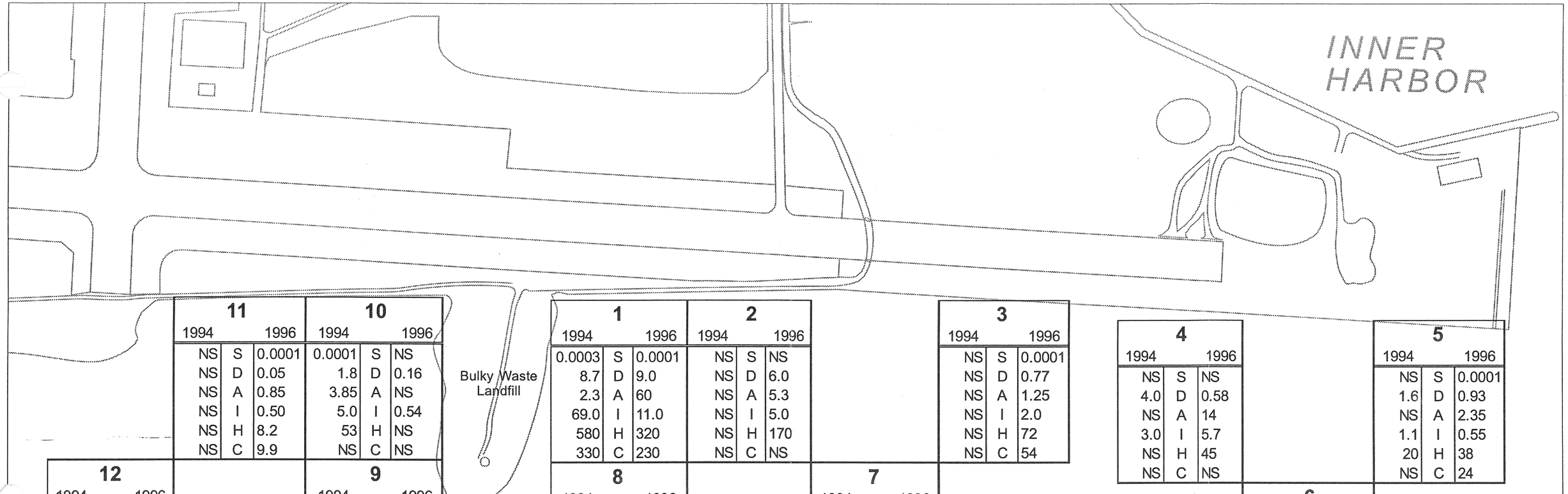
...:\MIDWAY\RI\01299701.CDR

Source: NAVFACENGCOM Dwg. No. 1038656, 1993

Note: Grid locations are schematic and not to scale.

TOTAL PCB CONCENTRATIONS IN ALL SAMPLED MEDIA AT LANDFILL SAMPLING STATIONS FOR 1994 AND 1996 SAMPLING EVENTS NAF MIDWAY ISLAND

FIGURE 4-17



11		
1994		1996
NS	S	0.0001
NS	D	0.05
NS	A	0.85
NS	I	0.50
NS	H	8.2
NS	C	9.9

10		
1994		1996
0.0001	S	NS
1.8	D	0.16
3.85	A	NS
5.0	I	0.54
53	H	NS
NS	C	NS

12		
1994		1996
NS	S	NS
2.2	D	0.02
NS	A	0.9
NS	I	0.54
NS	H	2.1
NS	C	NS

9		
1994		1996
0.0001	S	0.0001
2.4	D	0.17
NS	A	0.85
NS	I	1.10
NS	H	37
NS	C	5.1

1		
1994		1996
0.0003	S	0.0001
8.7	D	9.0
2.3	A	60
69.0	I	11.0
580	H	320
330	C	230

2		
1994		1996
NS	S	NS
NS	D	6.0
NS	A	5.3
NS	I	5.0
NS	H	170
NS	C	NS

8		
1994		1996
0.0001	S	NS
26	D	4.9
NS	A	0.32
NS	I	0.48
NS	H	18
NS	C	NS

7		
1994		1996
NS	S	0.0001
NS	D	0.22
NS	A	1.55
NS	I	0.60
NS	H	2.1
NS	C	13

3		
1994		1996
NS	S	0.0001
NS	D	0.77
NS	A	1.25
NS	I	2.0
NS	H	72
NS	C	54

4		
1994		1996
NS	S	NS
4.0	D	0.58
NS	A	14
3.0	I	5.7
NS	H	45
NS	C	NS

5		
1994		1996
NS	S	0.0001
1.6	D	0.93
NS	A	2.35
1.1	I	0.55
20	H	38
NS	C	24

6		
1994		1996
NS	S	NS
NS	D	0.02
NS	A	4.6
NS	I	0.98
NS	H	1.7
NS	C	NS

LEGEND

GRID SAMPLE	1		
	1994		1996
	0.0003	S	0.0001
	8.7	D	9
	2.3	A	60
4, 4'-DDE CONCENTRATIONS	69.00	I	11.00
	580	H	320
	330	C	230
	NS		NS

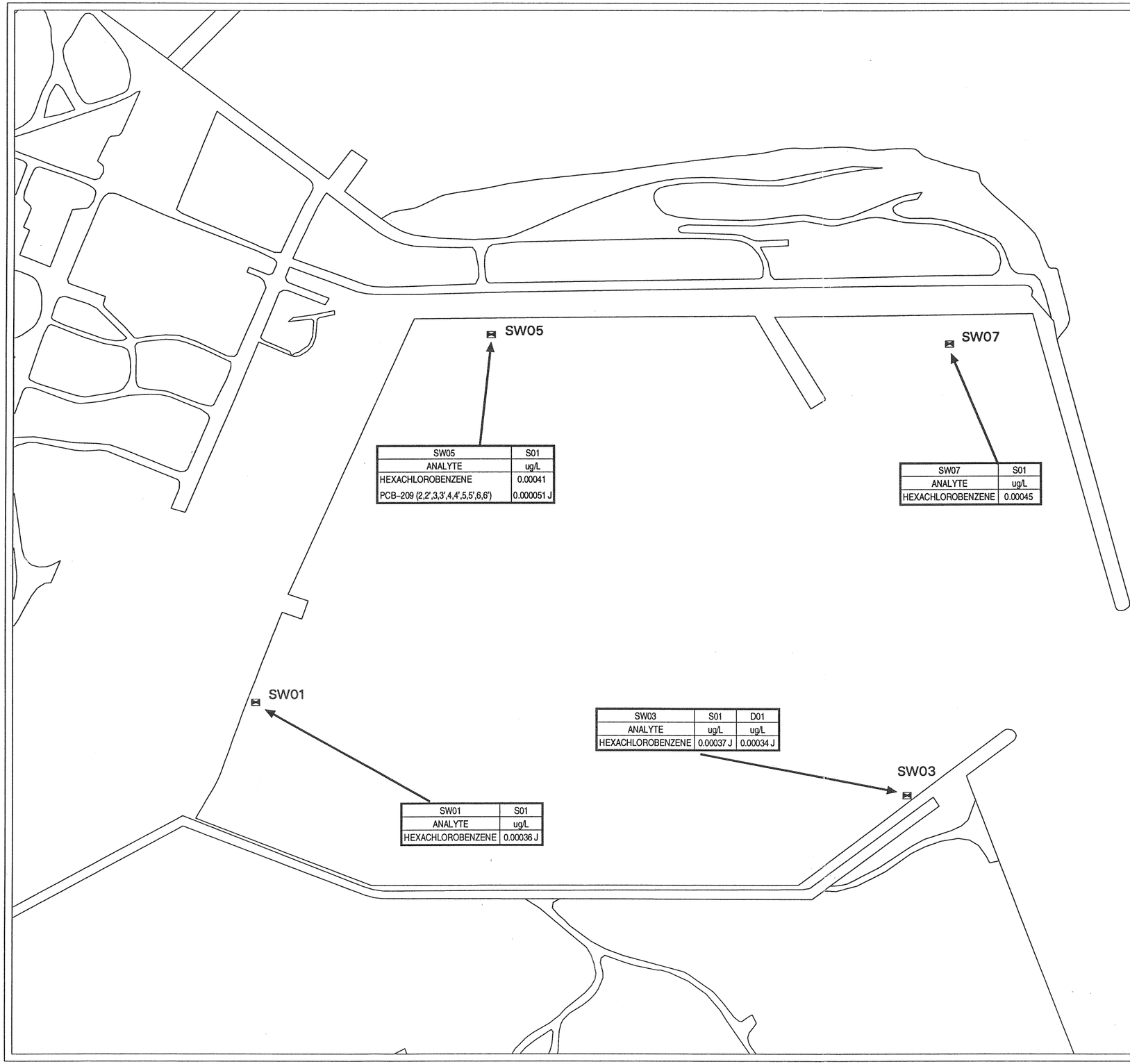
Grid Number
Year
Seawater Concentrations (µg/L)
Sediment Concentrations (µg/kg)
Algae Concentrations (µg/kg)
Invertebrate Concentrations (µg/kg)
Herbivorous Fish Concentrations (µg/kg)
Carnivorous Fish Concentrations (µg/kg)
Not Sampled

...:\MIDWAY\RI\01299701.CDR Source: NAVFACENGCOM Dwg. No. 1038656, 1993

Note: Grid locations are schematic and not to scale.

4, 4'-DDE CONCENTRATIONS IN ALL SAMPLED MEDIA AT LANDFILL SAMPLING STATIONS FOR 1994 AND 1996 SAMPLING EVENTS NAF MIDWAY ISLAND

FIGURE 4-18



SW05	S01
ANALYTE	ug/L
HEXACHLOROBENZENE	0.00041
PCB-209 (2,2',3,3',4,4',5,5',6,6')	0.000051 J

SW07	S01
ANALYTE	ug/L
HEXACHLOROBENZENE	0.00045

SW03	S01	D01
ANALYTE	ug/L	ug/L
HEXACHLOROBENZENE	0.00037 J	0.00034 J

SW01	S01
ANALYTE	ug/L
HEXACHLOROBENZENE	0.00036 J

LEGEND

SW01 ⊠	SEAWATER SAMPLE LOCATION AND NUMBER
S01	SAMPLE NUMBER
D01	DUPLICATE SAMPLE
0.00082	ANALYTE CONCENTRATION
ug/L	MICROGRAMS PER LITER
J	NUMERICAL VALUE IS AN ESTIMATED QUANTITY

NOTES

1. THE ACCURACY OF THIS DOCUMENT IS LIMITED TO THE QUALITY OF THE SOURCE INFORMATION AND IS NOT SUITABLE FOR MAPPING ENGINEERING APPLICATIONS AND IS NOT TO BE USED FOR "AS BUILT"
2. HORIZONTAL CONTROL POINT ESTABLISHED BY USNS ON SITE WAS USED AS BASIS OF DRAWING
3. VERTICAL CONTROL WAS BASED ON BM#11 WITH AN ELEVATION OF 8.52 FEET (MLLW)
4. PLANE COORDINATE SYSTEM FOR SAND AND EASTERN ISLANDS, ES-217, DRAWING NO.: SUR-6, USNS MIDWAY ISLAND
3. PROJECT NUMBER 110190136
4. FILE: /apps/hm/cto136/maps/m1212897

SOURCE

PERRY AND ASSOCIATES INC.,
U. S. NAVAL STATION, MIDWAY ISLAND
DRAWING NO.: 103856 & 1038657

TITLE

ORGANOCHLORINE PESTICIDES AND PCB CONGENERS DETECTED IN SEAWATER AT INNER HARBOR SAMPLING STATIONS NAF MIDWAY ISLAND

N

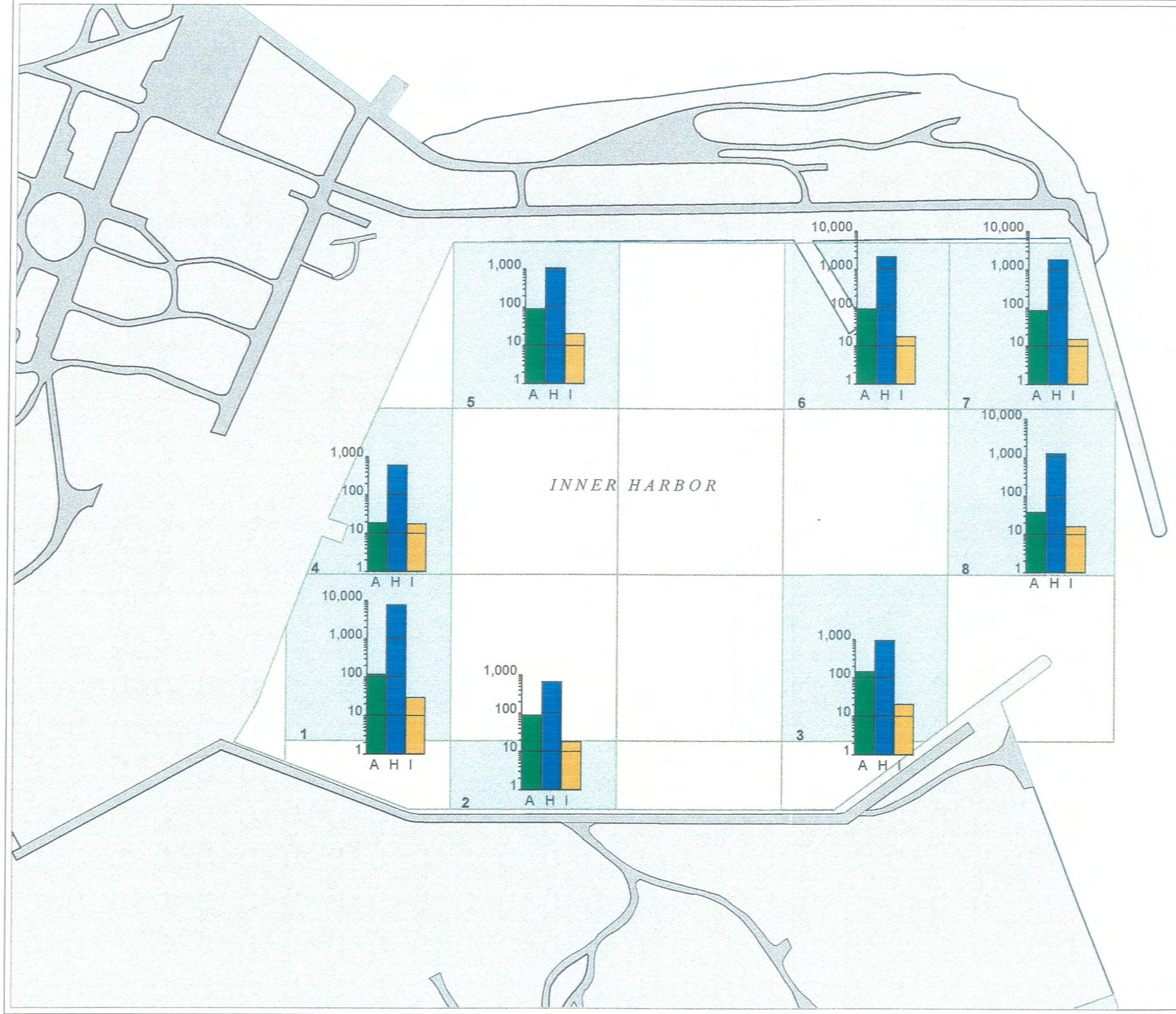
FEET

0 175 350 700 1050

DATE	REV.	DRWN.	INIT.	CHKD.	INIT.	APPR.	INIT.
02/05/97	1	CMF		HFP		JMC	

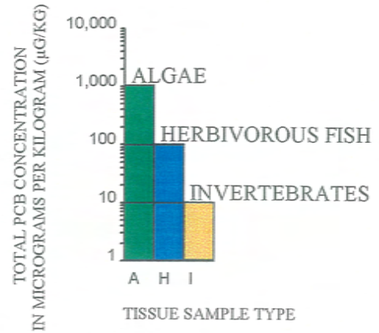
FIGURE

4-19



LEGEND

INNER HARBOR



HEIGHT OF BAR INDICATES ARITHMETIC TOTAL OF PCB CONGENERS PLOTTED ON A LOG SCALE. UNDETECTED CONCENTRATIONS WERE ADDED AT 0.5 OF THE SAMPLE QUANTITATION LIMIT

NOTES

1. THE ACCURACY OF THIS DOCUMENT IS LIMITED TO THE QUALITY OF THE SOURCE INFORMATION AND IS NOT A LEGAL REPRESENTATION OF THE ORIGINAL SURVEY
2. HORIZONTAL CONTROL POINTS ESTABLISHED BY USNS ON SITE WERE USED
3. VERTICAL CONTROL WAS BASED ON BM#11 WITH AN ELEVATION OF 8.52 FEET (MLLW)
4. PLANE COORDINATE SYSTEM FOR SAND AND EASTERN ISLANDS, ES-217, DRAWING NO.: SUR-6, USNS MIDWAY ISLAND
5. PROJECT NUMBER 110190136
6. FILE :...\MIDWAY\RI\CHARTS.APR

SOURCES

PERRY ASSOCIATES INC., HOWARD LAWSON & ASSOC.
US S. NAVAL STATION, MIDWAY ISLAND, DWG NO.: #1038656, #1038657

TITLE

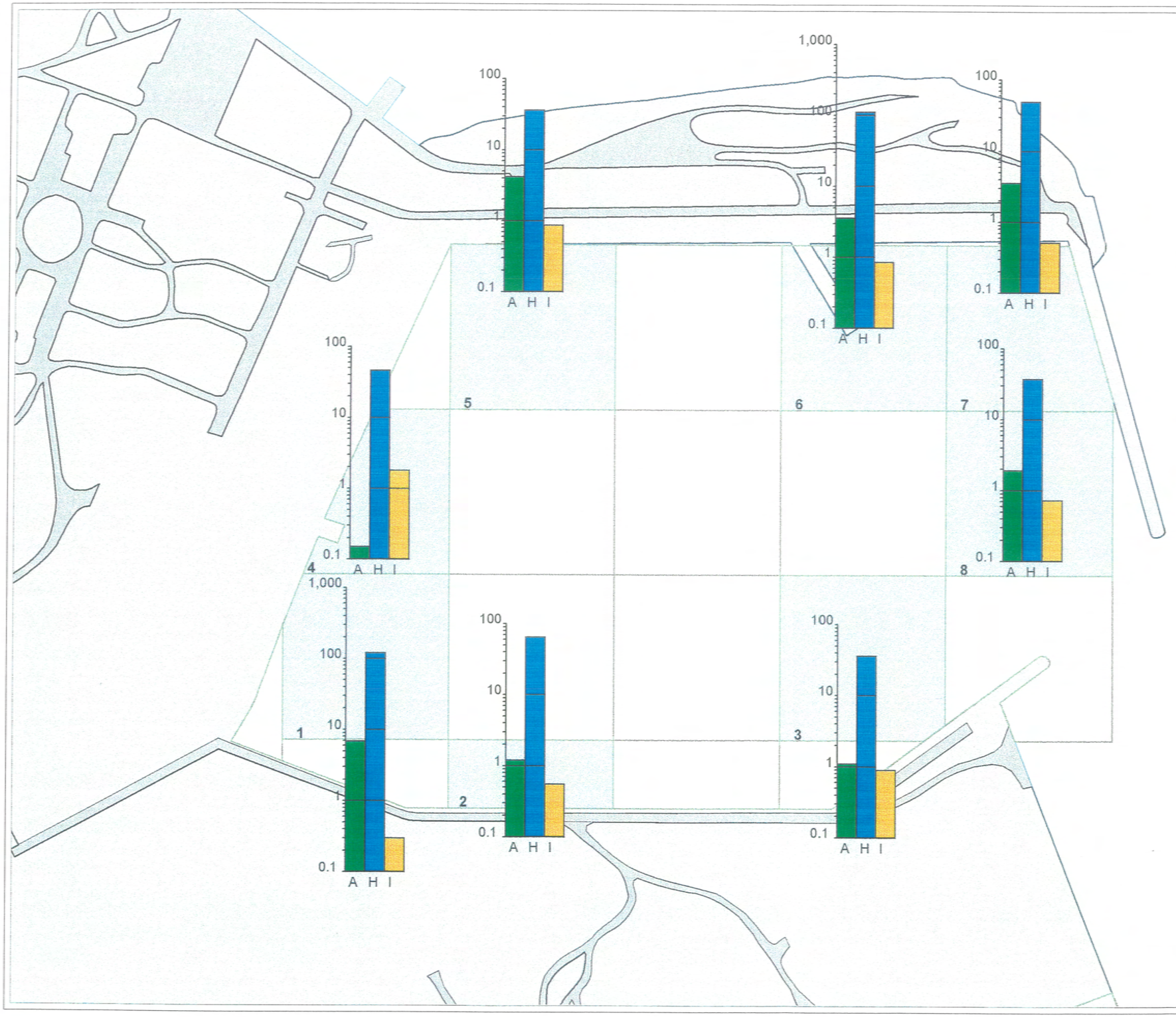
TOTAL PCB CONCENTRATIONS IN MARINE TISSUES AT INNER HARBOR SAMPLING STATIONS, NAF MIDWAY ISLAND

N

200 0 200 400 600 Feet

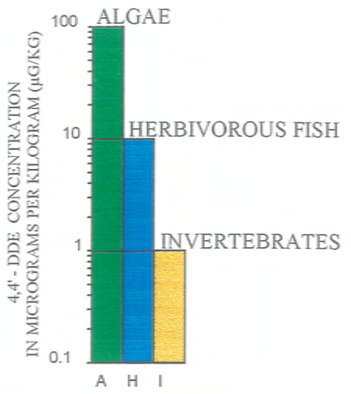
DATE	REV	DRWN	INT	CHKD	INT	APPR	INT
02/04/97		HFP		BW			

FIGURE 4-20



LEGEND

INNER HARBOR



HEIGHT OF BAR INDICATES ARITHMETIC 4,4'-DDE CONCENTRATIONS PLOTTED ON A LOG SCALE, UNDETECTED CONCENTRATIONS WERE ADDED AT 0.5 OF THE SAMPLE QUANTITATION LIMIT

NOTES

1. THE ACCURACY OF THIS DOCUMENT IS LIMITED TO THE QUALITY OF THE SOURCE INFORMATION AND IS NOT A LEGAL REPRESENTATION OF THE ORIGINAL SURVEY
2. HORIZONTAL CONTROL POINTS ESTABLISHED BY USNS ON SITE WERE USED
3. VERTICAL CONTROL WAS BASED ON BM#11 WITH AN ELEVATION OF 8.52 FEET (MLLW)
4. PLANE COORDINATE SYSTEM FOR SAND AND EASTERN ISLANDS, ES-217, DRAWING NO.: SUR-6, USNS MIDWAY ISLAND
5. PROJECT NUMBER 110190136
6. FILE :...\MIDWAY\R\CHARTS.APR

SOURCES

PERRY ASSOCIATES INC., HOWARD LAWSON & ASSOC.
US S. NAVAL STATION, MIDWAY ISLAND, DWG NO.: #1038656, #1038657

TITLE

4,4'-DDE CONCENTRATIONS IN MARINE TISSUES AT INNER HARBOR SAMPLING STATIONS, NAF MIDWAY ISLAND

N

200 0 200 400 600 Feet

DATE	REV	DRWN	INT	CHKD	INT	APPR	INT
02/04/97		HFP		BW			

FIGURE

4-21

5		
1994		1996
0.006	S	0.006
79.2	A	90.0
20.4	I	20.4
360	H	1,058

6		
1994		1996
NS	S	NS
NS	A	91.4
NS	I	17.5
NS	H	2,108

7		
1994		1996
NS	S	0.007
NS	A	85.2
NS	I	15.0
NS	H	1,802

4		
1994		1996
NS	S	NS
NS	A	18.8
NS	I	17.5
NS	H	600

8		
1994		1996
NS	S	NS
NS	A	37.1
NS	I	15.9
NS	H	1,260

INNER HARBOR

1		
1994		1996
0.006	S	0.007
56.8	A	119
16.1	I	29.5
234	H	7,638

3		
1994		1996
0.006	S	0.007
46.0	A	145
20.1	I	20.8
NS	H	954

2		
1994		1996
0.006	S	NS
52.2	A	88.0
20.6	I	18.0
NS	H	665

LEGEND

GRID SAMPLE	1			Grid Number
	1994		1996	Year
TOTAL PCB CONGENER CONCENTRATIONS	0.006	S	0.007	Seawater Concentrations (µg/L)
	56.8	A	119.3	Algae Concentrations (µg/kg)
	16.1	I	29.5	Invertebrate Concentrations (µg/kg)
	234	H	7,638	Herbivorous Fish Concentrations (µg/kg)
	NS		NS	Not Sampled

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Source: NAVFACENGCOM Dwg. No. 1038656, 1993

Note: Grid locations are schematic and not to scale.

FIGURE 4-22

TOTAL PCB CONCENTRATIONS IN ALL SAMPLED MEDIA AT INNER HARBOR SAMPLING STATIONS FOR 1994 AND 1996 SAMPLING EVENTS NAF MIDWAY ISLAND

5		
1994		1996
0.0001	S	0.0001
0.66	A	4.15
0.79	I	0.87
4.00	H	36.0

6		
1994		1996
NS	S	NS
NS	A	3.55
NS	I	0.84
NS	H	110

7		
1994		1996
NS	S	0.0001
NS	A	3.55
NS	I	0.51
NS	H	49.0

4		
1994		1996
NS	S	NS
NS	A	0.15
NS	I	1.80
NS	H	46.0

INNER HARBOR

8		
1994		1996
NS	S	NS
NS	A	1.90
NS	I	0.72
NS	H	37.0

1		
1994		1996
0.0001	S	0.0001
0.49	A	6.80
1.80	I	0.30
8.20	H	120

3		
1994		1996
0.0001	S	0.0001
0.41	A	1.10
0.67	I	0.89
NS	H	36.0

2		
1994		1996
0.0001	S	NS
0.46	A	1.20
0.61	I	0.55
NS	H	65.0

LEGEND

GRID SAMPLE

1		
1994		1996
0.0001	S	0.0001
0.49	A	6.80
1.80	I	0.30
8.20	H	120
NS		NS

4, 4'-DDE CONCENTRATIONS

Grid Number
Year
Seawater Concentrations (µg/L)
Algae Concentrations (µg/kg)
Invertebrate Concentrations (µg/kg)
Herbivorous Fish Concentrations (µg/kg)
Not Sampled

...:\MIDWAY\RI\01299702.CDR

Source: NAVFACENGCOM Dwg. No. 1038656, 1993

Note: Grid locations are schematic and not to scale.

FIGURE

4-23

4, 4'-DDE CONCENTRATIONS IN ALL SAMPLED MEDIA AT INNER HARBOR SAMPLING STATIONS FOR 1994 AND 1996 SAMPLING EVENTS NAF MIDWAY ISLAND

Section 5

SECTION 5
CONTAMINANT FATE AND TRANSPORT

This section discusses contaminant fate and transport information for surface water, unsaturated zone soil, ground water, seawater, marine sediment, and marine tissue. Particular attention is given to information on contaminant persistence and the mechanisms that control transport and attenuation. This assessment of potential routes of migration using physical and analytical data is a key element of the exposure analysis performed during the baseline ecological risk assessment.

5.1 CONTAMINANT PERSISTENCE

Persistence is the ability to remain unchanged in the environment and can be a function of an analyte's degradation half-life and its estimated ability to enter aquatic or terrestrial food webs. Contaminant persistence can be evaluated using information on a contaminant's physical and chemical properties and its interactions with the environment. Table 5-1 lists the most frequently detected compounds from the RI sampling and their associated chemical properties. The following sections discuss the potential behavior of SVOCs, pesticides, and PCBs in soil and water taking these properties into consideration.

Table 5-1
PHYSICAL AND CHEMICAL PROPERTIES

Compound	Molecular Weight (g/mol)	Vapor Pressure (mm Hg @ 20° C)	Log K_{ow}	Log K_{oc}	Water Solubility (mg/L)@ 25°
Fluoranthene	202.3	6.7×10^{-4}	4.78	4.58	0.240
Pyrene	202.3	3.4×10^{-3}	4.90	4.92	0.165
DDT	354.5	5.5×10^{-6}	6.19	5.38	0.0034
DDE	318.0	6.5×10^{-6}	7.00	6.64	0.12
DDD	320.1	1.0×10^{-6}	6.20	5.98	0.16
Aroclor-1254	326.4	1.8×10^{-4}	6.03	6.00	0.30
Aroclor-1260	375.7	4.0×10^{-5}	6.72	6.83	0.08

Notes: Values referenced from ATSDR 1994 and Mackay et al. 1992
g/mol = grams/mole
mm Hg = millimeters of mercury
K_{ow} = octanol-water partition coefficient
K_{oc} = soil sorption coefficient
mg/L = milligrams per liter

5.1.1 PAHs

PAHs generally exhibit a low solubility in water and low vapor pressure. Both solubility and vapor pressure decrease with increasing molecular volume. PAHs strongly adsorb to soil and organic particles. They degrade in air by photooxidation and surface water through photolysis. Microbial degradation in sediment is reduced considerably by anaerobic conditions for the lighter and less structurally complex PAHs. Persistence increases with increasing molecular weight (MW); the half-life for naphthalene (MW = 128.18) in soils is 16 to 48 days and the half-life for benzo(g,h,i)perylene (MW = 276.34) is 1.6 to 2 years. Half-lives for naphthalene and benzo(g,h,i)perylene in surface water are 12 hours to 20 days and 590 to 650 days, respectively (Howard et al. 1991).

5.1.2 Organochlorine Pesticides

Organochlorine pesticides are known for their persistence in the environment with half-lives ranging from months to years. Studies of DDT persistence in soil indicate that its half-life can range from 2 to more than 15 years (Agency for Toxic Substances and Disease Registry (ATSDR) 1994). DDT in soil typically breaks down to form DDE under aerobic conditions and DDD under anaerobic conditions. DDT in water may be converted to DDE by photodegradation (ATSDR 1994). Because DDE also exhibits a similar prolonged half-life, average levels of DDT decline rather slowly, while the ratio of DDE to DDT increases. DDE is minimally volatile while DDD and DDT are extremely nonvolatile. These compounds are only slightly soluble in water and undergo extensive adsorption to soil and sediment. Half-lives of DDT and DDE in surface water are 7 to 350 days and 1 to 6 days, respectively (Howard et al. 1991).

Some of the organochlorine pesticides can be metabolized rapidly in organisms; however, their major metabolites are often persistent and as toxic as the parent compound. DDT breaks down into DDE, which is toxic at lower concentrations than DDT. DDT, DDE, and DDD are highly soluble in lipids and can bioaccumulate in the lipid fraction of tissues as a result of abiotic exposure (incidental soil ingestion) or through ingestion of contaminated prey.

5.1.3 PCBs

Persistence of PCBs is dependent on the degree of chlorination of the biphenyl molecule, with persistence increasing as the degree of chlorination increases. Because PCBs are hydrophobic, they are sorbed to persist in soils, sediments, or attached to other organic matter.

PCBs can be broken down through biodegradation, which can proceed under both aerobic and anaerobic conditions. Biodegradation rates vary depending on a number of factors, including amount of chlorination, temperature, nutrients, concentration, and microbial population.

PCBs are lipophilic, as indicated by log K_{ow} values between 5 and 9, and thus have a high potential to bioaccumulate in organisms and move through the food chain. PCBs also sorb strongly to soil and sediment particles as indicated by log K_{oc} values greater than 6; therefore, they are likely to remain associated with these media for long periods of time. PCBs are thus more likely to be mobile through food chains than through partitioning between abiotic media.

5.2 TRANSPORT AND PARTITIONING

SVOCs, pesticides and PCBs may be transported from one medium to another by solubilization, advective flow, adsorption on particles and entrainment of these particles, and bioaccumulation. These processes are discussed below for the terrestrial and marine environments.

5.2.1 Terrestrial Environment

Potential contaminant transport media at the BWLF include soil, surface water, and ground water. Because organochlorine pesticides and PCBs are not volatile, exhibit low solubilities, and are strongly sorbed to soil and organic material, the primary transport mechanism is through particle entrainment. A landfill cover consisting of approximately 2.5 to 4 feet of clean soil (native sand) placed over the land surface at the Site was constructed in September and October 1996. This soil cover strongly influences the potential transport pathways, as discussed below.

5.2.1.1 Soil Transport Medium

Geotechnical parameters were measured on three soil samples collected from soil borings at the BWLF during the 1994 SI. Pertinent parameters are: moisture content (4.8% to 8.5%), permeability ($1.4x10^{-4}$ to $3.9x10^{-4}$ cm/sec), and total organic carbon (0.11% to 5.5%). SVOCs, DDT and its metabolites, and PCB congeners are bound strongly by adsorption to soil particles (as indicated by a high K_{oc} value), and therefore are highly immobile in soil. Sediment loss and particle loading caused by erosion are the major transport routes for these compounds because of their low solubility. Because the BWLF was covered with clean soil, as noted above, future soil transport by surface erosion is considered insignificant.

5.2.1.2 Surface Water Transport Medium

Because of the clean soil cover on the BWLF, precipitation and any resulting storm water flow can not come in direct contact with the underlying soils. Therefore, loss of surficial soil contaminants due to surface water runoff or erosion is considered insignificant. Because pesticides and PCBs are only slightly soluble in water, and due to low concentrations of these compounds detected, leaching by infiltration is considered to present negligible risk.

5.2.1.3 Ground-Water Transport Medium

Pesticides and PCBs are only slightly soluble in water, are strongly bound to soil, are not easily displaced, and do not tend to leach to ground water. Therefore, appreciable amounts may remain in soil for extended periods of time. Because pesticides are only slightly soluble in water and adhere to soil particles, they do not tend to leach to ground water. PCBs have a low solubility; however, the less-chlorinated congener components of the Aroclors will tend to leach more than their more highly chlorinated congener components.

A treatability study was performed using DDT-contaminated soil from Midway (OHM 1996b). 4,4'-DDT was detected in the soil sample at 3.63 mg/kg; 4,4'-DDE was detected at 3.12 mg/kg in the samples; and 4,4'-DDD was not detected (<0.033 mg/kg). Following TCLP extraction of the soil sample, analytical results indicated a concentration of 0.0004 mg/L for 4,4'-DDT, 0.0002 mg/L for 4,4'-DDE, and 0.0004 mg/L for 4,4'-DDD (OHM

1996b). These analytical results indicate that DDT and its metabolites are not leachable from soil in significant quantities under normal conditions.

A dye trace study was conducted from November 1995 through January 1996 at the BWLF (Ogden 1996c) during which dye was injected in monitoring wells MW02 and MW03. The shoreline was then monitored to detect the possible migration of the dye by ground-water flow. No dye concentrations were detected at the shoreline and it was presumed, based on the ground-water travel time calculated from the measured ground-water gradient, that the dye never reached the shoreline. Hydrogeologic tidal monitoring data were collected at this time; the average ground-water pore velocity was estimated to be 0.04 ft/day. Based upon the estimated velocity, it would take the dye approximately 1,018 days (2.8 years) to reach the shoreline (Ogden 1996c).

5.2.2 Marine Environment

Organochlorine pesticides and PCBs are hydrophobic; therefore, they tend to partition into sediments and organic particulate matter, and as opposed to seawater. Pesticides and PCBs adsorbed to sediment particles may be transported away from a source by ocean currents. Because organochlorine pesticides and PCBs are lipophilic and bioaccumulative they will be readily taken up by marine organisms either through direct contact with sediments and/or seawater or through ingestion of particulate matter. PCBs and pesticides are bioconcentrated as they pass from prey organisms to higher trophic levels up the food chain.

SECTION 6
POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requires that remedial actions be protective of human health and the environment and comply with federal and state Applicable or Relevant and Appropriate Requirements (ARARs). These ARARs are used to determine the extent of site cleanup, to formulate remedial action alternatives, and to govern the implementation and operation of the selected action. Risk assessment-based cleanup levels, health advisories, and other guidelines are used as comparative criteria for screening of site analytical data. To-Be-Considered Criteria (TBCs) are used as non-enforceable guidelines to help determine the protection required for a removal or remedial action. Because Midway is solely governed by federal agencies, and not by state government, only federal ARARs apply.

6.1 DEFINITION OF ARARS

"Applicable" requirements are standards and other substantive environmental protection requirements promulgated under federal or state law that specifically address a circumstance at a CERCLA site, such as a hazardous substance, pollutant, contaminant, remedial action, or location. "Applicability" implies that circumstances at the site satisfy all jurisdictional prerequisites of a requirement.

"Relevant and appropriate" requirements are standards and other substantive environmental protection requirements promulgated under federal or state law that address situations sufficiently similar to a CERCLA site to be of use. "Relevance" implies that the requirement regulates or addresses situations sufficiently similar to those found at the CERCLA site. "Appropriateness" implies that the circumstances of the release or threatened release are such that use of the standard is germane. A requirement may be relevant but not appropriate for a site, in which case it is not an ARAR. TBCs are non-promulgated advisories or guidelines that are not legally binding. Thus, TBCs do not have the status of ARARs.

6.2 SPECIFIC ARARS

Chemical-specific

"Chemical-specific" ARARs are health- or risk-based numerical values or methodologies. These values establish the acceptable amount or concentration of a chemical that may be left in or discharged to the environment. Chemical-specific federal standards identified as potential ARARs are listed in Table 6-1 and consist of:

- The Clean Water Act (CWA)
- The Toxic Substances Control Act (TSCA)

Chemical-specific TBCs were identified for contaminants studied in the SI and were used to identify CPECs on each site. Those used in assessing RI analytical results are presented in Table 6-1. Site-specific and matrix-specific TBC and ARAR values (Table 6-1) were used in the initial screening of the data. A qualitative screening evaluation was performed by nonstatistically comparing the Clean Water Act National Ambient Water Quality Criteria (NAWQC [USEPA 1986]) to the maximum detected concentrations in ground water and seawater (Table 6-2). This screening evaluation indicates that total PCBs (calculated by adding all the PCB congeners) in monitoring well MW04 exhibited a concentration greater than the NAWQC.

Location-specific

"Location-specific" ARARs are restrictions placed on the concentrations of hazardous substances and on the conduct of activities because of their location and its special characteristics. These potential ARARs are selected on the basis of (1) previous data indicating the presence of hazardous materials at a site, or (2) knowledge of the general site vicinity and characteristics that are reasonably expected to exist. Potential location-specific ARARs are presented in Table 6-1 and consist of:

- CWA Section 404
- Fish and Wildlife Coordination Act
- National Wildlife Refuge System Administration Act
- MBTA
- ESA
- Marine Mammal Protection Act
- NOAA Critical Habitat Designation

- Marine Protection, Research, and Sanctuaries Act
- National Historic Preservation Act

These ARARs were taken into consideration while performing the RI sampling and while evaluating recommendations for any necessary remedial actions.

Action-specific

"Action-specific" ARARs are technology- or activity-based requirements or limitations on actions involving the management of hazardous wastes. Potential action-specific ARARs consist of:

- Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management (Subtitle C) and Solid Waste Management (Subtitle D)
- RCRA Corrective Action Management Units

Management of IDW generated by the RI must be in compliance with substantive portions of the federal regulation as indicated in Table 6-1. The final potential action-specific ARAR concerns long-term, on-island management of remediation wastes resulting from removal actions. Under RCRA subparts (40 CFR 264), the Navy may designate a Corrective Action Management Unit (CAMU) on Midway for disposal of the treated soil resulting from the removal action. The CAMU is a waste management tool which allows the Navy to streamline the handling and disposal of this remediation waste. Most significantly, because of placement of wastes in the CAMU does not constitute "land disposal," its use neither triggers the need for rigorous pretreatment land disposal restrictions nor constitutes creation of a unit subject to minimum technology requirements. Within the CAMU, the Navy may include landfills, surface impoundments, and waste piles as regulated units; however, these units must be managed and contained after closure so as to minimize future releases to the extent practicable. This action-specific standard is summarized in Table 6-1.

Tables

Table 6-1
IDENTIFIED POTENTIAL FEDERAL ARARs FOR NAF MIDWAY ISLAND

Regulation	Issues and Requirements	Status (Chemical-, Location-, or Action-Specific)		Applicability to the RI
		Applicable	Relevant and Appropriate	
SURFACE WATER				
CWA National Ambient Water Quality Criteria (33 USC 1251)	Criteria for 95 compounds for exposure from water ingestion and fish consumption and for marine and fresh water acute/chronic impacts; If no criteria exist for a compound for saltwater, the fresh water criteria, if any, were used as a TBC.	No	Yes (chemical-specific)	All waters surrounding Midway Atoll are designated for the protection of fish and wildlife. Criteria used to identify CPECs for ecological risk.
CWA Section 404 (33 CFR Parts 320-330; 40 CFR Parts 122, 123, 125, 131, 230, 231, 233, 400-469)	Prohibits discharge of dredged or fill material into wetlands without permit.	No	Yes (location-specific)	No permit is required under CERCLA; however, all RI activities must follow substantive portions of the law. Potential effects on wetlands must be considered at all stages.
Fish and Wildlife Coordination Act (16 USC 661 *et seq.*; 40 CFR 6.302)	Coordinates activities that propose to modify a body of water or potentially affect fish and wildlife with other regulations, such as ARARs listed in this table.	Yes (location-specific)	No	Remedial alternatives shall take into consideration any modification of a body of water or potential effects on fish or wildlife as necessary.
SOIL				
Toxic Substances Control Act (TSCA); 40 CFR Part 761 Subpart G	Regulate broad classes of chemical substances and mixtures, including PCBs, asbestos, and radon.	No	Yes (chemical-specific)	Cleanup levels for PCBs: 1 ppm for soils at 4 ft bgs or less depth; 25 ppm for soils at greater than 4 ft depth
HABITAT AND WILDLIFE				
National Wildlife Refuge System Administration Act (16 USC 668dd *et seq.*; 40 CFR Part 27)	Only actions allowed under the provisions of 16 USC Section 668 dd(c) may be undertaken in areas that are part of the National Wildlife Refuge System.	Yes (location-specific)	No	All RI activities followed substantive portions of the National Wildlife Refuge provisions.
Migratory Bird Treaty Act (16 USC 703 *et seq.*)	Action to prevent the taking of migratory birds.	Yes (location-specific)	No	All RI activities that may have impacted migratory birds required informal consultation with USFWS. Remedial alternatives shall consider effects on migratory birds.

Table 6-1
IDENTIFIED POTENTIAL FEDERAL ARARs FOR NAF MIDWAY ISLAND
page 2 of 3

Regulation	Issues and Requirements	Status (Chemical-, Location-, or Action-Specific)		Applicability to the RI
		Applicable	Relevant and Appropriate	
HABITAT AND WILDLIFE (Continued)				
Endangered Species Act of 1973 (16 USC 1531 *et seq.*; 50 CFR Parts 81, 200, 225, 402)	Action to conserve endangered or threatened species and their habitats.	Yes (location-specific)	No	All RI activities that may have impacted listed species and/or critical habitats required informal consultation with NOAA and USFWS. Remedial alternatives must consider restrictions in sensitive habitats.
Marine Mammal Protection Act of 1972 (16 USC 1361 *et seq.*)	Action to conserve and protect marine mammals. Provides regulations for the taking of marine mammals.	Yes (location-specific)	No	All RI activities that may have impacted marine mammals required informal consultation with NOAA. Remedial alternatives shall consider potential effects on marine mammals.
NOAA Critical Habitat Designation (50 CFR Part 226)	Federal designation of all beach areas on Midway to a depth of 20 fathoms as critical habitat for the Hawaiian monk seal, excluding Sand Island.	Yes (location-specific)	No	All RI activities that may have impacted the Hawaiian monk seal required informal consultation with NOAA. Remedial alternatives shall consider potential effects on the monk seal.
OCEANIC RESOURCES				
Marine Protection, Research, and Sanctuaries Act of 1972 (33 USC 1401)	Prevents or strictly limits ocean dumping of any material that would adversely affect human health or the marine environment, ecological systems, or economic potentialities.	Yes (location-specific)	No	All RI activities that may have impacted the marine environment followed substantive portions of the law. Remedial alternatives shall consider effects on the marine environment.
CULTURAL RESOURCES				
National Historic Preservation Act (16 USC Section 469; 36 CFR Part 65; 40 CFR 6.301(b))	Action to recover and preserve artifacts if any exist in an area where action may cause their irreparable harm, loss, or destruction.	Yes (location-specific)	No	Informal consultation with the Advisory Council on Historic Preservation was required for activities that may have impacted sites with archeological or historical importance.

Table 6-1
IDENTIFIED POTENTIAL FEDERAL ARARs FOR NAF MIDWAY ISLAND

Regulation	Issues and Requirements	Status (Chemical-, Location-, or Action-Specific)		Applicability to the RI
		Applicable	Relevant and Appropriate	
REMEDIATION WASTES				
RCRA Corrective Action Management Units (CAMU); 40 CFR Part 264.552	For the purpose of implementing corrective actions, one or more CAMUs may be designated at a facility. Landfills, surface impoundments, waste piles, etc. may be included within the CAMU.	No	Yes (action-specific)	Soils containing DDT/DDE resulting from releases at former or current pesticide storage facilities are hazardous waste. The CAMU will allow for streamlined handling and disposal of this waste; placement of wastes in the CAMU does not constitute "land disposal."
INVESTIGATION-DERIVED WASTES				
RCRA Hazardous Waste Management (Subtitle C) and Solid Waste Management (Subtitle D) (40 CFR Parts 240 - 280)	Regulates storage and disposal of Investigation-Derived Wastes (IDW).	No	Yes (action-specific)	If IDW are stored or disposed of offsite, all substantive portions of RCRA regulations must be complied with. If IDW are stored and disposed of onsite within a RCRA Corrective Action Management Unit, substantive portions of regulations must be complied with to the extent practicable.

Key:

ARARs	Applicable or Relevant and Appropriate Requirements
CERCLA	Comprehensive Enviornmental Restoration, Cleanup, and Liability Act
CFR	Code of Federal Regulations
CWA	Clean Water Act
NOAA	National Oceanic and Atmospheric Administration
RI	Remedial Investigation
USC	United States Code
USFWS	United States Fish and Wildlife Service

Table 6-2
APPROPRIATE COMPARATIVE CRITERIA FOR GROUND WATER AND SEAWATER
NAF MIDWAY ISLAND
(Page 1 of 2)

Detected Compound or Parameter	Maximum Ground-Water Concentration (µg/L)	Maximum Seawater Concentration (µg/L)	National Water Quality Criteria for Seawater (µg/L)	
			Acute	Chronic
Semi-Volatile Organic Compounds				
1,3,5-TRICHLOROBENZENE	0.55	NA	NS	NS
ACENAPHTHENE	1.5	NA	970	710
ACENAPHTHYLENE	0.027	NA	NS	NS
ANTHRACENE	0.24 J	NA	NS	NS
BENZO(A)ANTHRACENE	0.026	NA	NS	NS
BENZO(A)PYRENE	0.0054 J	NA	NS	NS
BENZO(B)FLUORANTHENE	0.0083 J	NA	NS	NS
BENZO(E)PYRENE	0.0056 J	NA	NS	NS
BENZO(G,H,I)PERYLENE	0.0034 J	NA	NS	NS
BENZO(K)FLUORANTHENE	0.0037 J	NA	NS	NS
BIPHENYL	1.0	NA	NS	NS
CHRYSENE	0.026	NA	NS	NS
CHRYSENES, C1-ALKYL-SUBSTITUTED-	0.011	NA	NS	NS
CHRYSENES, C2-ALKYL-SUBSTITUTED-	0.024	NA	NS	NS
CHRYSENES, C3-ALKYL-SUBSTITUTED-	0.013	NA	NS	NS
DIBENZO(A,H)ANTHRACENE	0.0015 J	NA	NS	NS
DIBENZOTHIOPHENE	0.25	NA	NS	NS
DIBENZOTHIOPHENES, C1-ALKYL-SUBSTITUTED	1.0	NA	NS	NS
DIBENZOTHIOPHENES, C2-ALKYL-SUBSTITUTED	1.1	NA	NS	NS
DIBENZOTHIOPHENES, C3-ALKYL-SUBSTITUTED	0.52	NA	NS	NS
FLUORANTHENE	1.2	NA	40	16
FLUORANTHENES+PYRENES, C1-ALKYL-SUB	0.25	NA	NS	NS
FLUORANTHENES+PYRENES, C2-ALKYL-SUB	0.079	NA	NS	NS
FLUORANTHENES+PYRENES, C3-ALKYL-SUB	0.031	NA	NS	NS
FLUORENE	0.86	NA	NS	NS
FLUORENES, C1-ALKYL-SUBSTITUTED-	0.33	NA	NS	NS
FLUORENES, C2-ALKYL-SUBSTITUTED-	0.35	NA	NS	NS
FLUORENES, C3-ALKYL-SUBSTITUTED-	0.25	NA	NS	NS
INDENO(1,2,3-CD)PYRENE	0.0036 J	NA	NS	NS
NAPHTHALENE	4.6	NA	2,350	NS
NAPHTHALENES, C1-ALKYL-SUBSTITUTED-	1.7	NA	NS	NS
NAPHTHALENES, C1-ALKYL-SUBSTITUTED-	0.006 J	NA	NS	NS
NAPHTHALENES, C2-ALKYL-SUBSTITUTED-	7.6	NA	NS	NS
NAPHTHALENES, C3-ALKYL-SUBSTITUTED-	3.7	NA	NS	NS
NAPHTHALENES, C4-ALKYL-SUBSTITUTED-	1.5	NA	NS	NS
PERYLENE	0.002 J	NA	NS	NS
PHENANTHRENE	1.3	NA	NS	NS
PHENANTHRENES+ANTHRACENES, C1-ALKYL-SUB	0.25	NA	NS	NS
PHENANTHRENES+ANTHRACENES, C2-ALKYL-SUB	0.28	NA	NS	NS
PHENANTHRENES+ANTHRACENES, C3-ALKYL-SUB	0.14	NA	NS	NS
PHENANTHRENES+ANTHRACENES, C4-ALKYL-SUB	0.085	NA	NS	NS
PYRENE	0.76	NA	NS	NS

Table 6-2
APPROPRIATE COMPARATIVE CRITERIA FOR GROUND WATER AND SEAWATER
NAF MIDWAY ISLAND
(Page 2 of 2)

Detected Compound or Parameter	Maximum Ground-Water Concentration (µg/L)	Maximum Seawater Concentration (µg/L)	National Water Quality Criteria for Seawater (µg/L)	
			Acute	Chronic
Oganochlorine Pesticides				
DDT	ND	ND	0.13	0.001
2,4'-DDD	0.033	ND	NS	NS
4,4'-DDD	0.098	ND	NS	NS
4,4'-DDE	0.0032	ND	14	NS
ALPHA-BHC	0.00018 J	ND	0.34	NS
ALPHA-CHLORDANE	0.0011	ND	13	7.5
BETA-BHC	0.0032	ND	0.34	NS
DIELDRIN	0.002	ND	0.71	0.0019
ENDOSULFAN I	0.00073	ND	0.034	0.0067
GAMMA-BHC (LINDANE)	0.0063	0.00032	0.34	NS
HEXACHLOROBENZENE	0.00089	0.00063	NS	NS
MIREX	0.00016 J	ND	NS	0.001
PCBs				
PCB-101 (2,2',3,5,5')	0.0046	ND	NS	NS
PCB-118 (2,3',4,4',5)	0.0023	ND	NS	NS
PCB-138 (2,2',3,4,4',5')	0.022	ND	NS	NS
PCB-153 (2,2',4,4',5,5')	0.0081	0.0011	NS	NS
PCB-170 (2,2',3,3',4,4',5)	0.0038	ND	NS	NS
PCB-18 (2,2',5)	0.006	0.0014	NS	NS
PCB-180 (2,2',3,4,4',5,5')	0.0027	0.00083	NS	NS
PCB-187 (2,2',3,4',5,5',6)	0.00079	0.00047 J	NS	NS
PCB-195 (2,2',3,3',4,4',5,6)	0.00051 J	ND	NS	NS
PCB-209 (2,2',3,3',4,4',5,5',6,6')	0.0027	0.000051 J	NS	NS
PCB-28 (2,4,4')	0.00032 J	ND	NS	NS
PCB-44 (2,2',3,5')	0.0044	ND	NS	NS
PCB-52 (2,2',5,5')	0.0033	ND	NS	NS
PCB-66 (2,3',4,4')	0.012	ND	NS	NS
PCB-8 (2,4')	0.0076	ND	NS	NS
Total PCBs				
Total PCBs	**0.056**(1)	0.008	10	0.03

Notes: NA = Not Analyzed
ND = Non Detected Value
NS = No Standard
Bold = Value Above Standard
(1) = Total of all detected PCB congeners from monitoring well MW04
J = Estimated Value

SECTION 7
BASELINE ECOLOGICAL RISK ASSESSMENT (BERA)

The SERA completed during the SI (Ogden 1996b) broadly evaluated the risk to selected terrestrial and marine receptors from site-related contaminants. On the basis of its findings (Ogden 1996b) and subsequent discussions, the BRAC Cleanup Team (BCT) decided the following:

- To restrict the RI to four sites: the BWLF, the marine environment near the RLF (hereafter referred to as the Landfills), and two sites within the Inner Harbor.
- To identify two classes of contaminants as Contaminants of Potential Ecological Concern (CPECs): PCBs and organochlorine pesticides at all sites, in addition to SVOCs for the soil in the BWLF.
- To identify assessment endpoints (and associated measurement endpoints) relevant to environmental management and remediation decisions for Midway Atoll.
- To restrict the target ecological receptors (and their associated exposure pathways) to terrestrial and marine species at the BWLF Site and marine species only at the RLF and Inner Harbor sites.

This BERA built on the SERA and the RI sampling program to both identify and reduce uncertainty in the assessment of risks posed by site-related CPECs. This BERA

- Determined the concentrations and spatial distribution of PCB and organochlorine pesticide CPECs within the terrestrial area of the BWLF and within the marine environment surrounding the Landfills and in the Inner Harbor.
- Introduced new data on CPEC concentrations in subsurface soils sampled at the BWLF into the same exposure models used in the SI (Ogden 1996b) to re-evaluate potential risks to special status burrowing birds (Bonin petrels).
- Introduced new data on CPEC concentrations in surface water, sediments, and tissues of marine biota sampled at the Landfills and Inner Harbor into the same

exposure models used in the SI (Ogden 1996b) to re-evaluate potential risks to special status marine species (sea turtles and seals).

- Used new RI data to identify "hot spots," in BWLF subsurface soils requiring removal.

- Improved estimates of exposure and risk.

This BERA included the same components described in Section 4 of the SI Report (Ogden 1996b): Problem Formulation, Exposure Analysis, Ecological Response Analysis, and Risk Characterization.

7.1 PROBLEM FORMULATION

Problem formulation for this BERA was based on the results and observations generated by the SERA (Ogden 1996b). The four elements of problem formulation (contaminants, receptors, pathways, and endpoints) can be summarized as follows:

- CPECs for both terrestrial and marine components of the BWLF, RLF, and the Inner Harbor were PCBs and organochlorine pesticides in all media and SVOCs in soil media at the BWLF only. The first two of these contaminant types are very persistent lipophilic bioaccumulators that move through food webs and can cause toxic effects in ecological receptors at low concentrations.

- Target ecological receptors included burrowing birds, Hawaiian monk seals, and green sea turtles. Because the SERA found that risks to ground-nesting birds and shorebirds from exposure to surface soils were minimal, only burrowing birds, which are potentially exposed to subsurface soils, were included in the BERA.

- Exposure routes for burrowing birds included incidental ingestion of soil and dermal contact with soil. Inhalation exposures were not evaluated further because the SERA estimated inhalation exposure values to be 3 to 6 orders of magnitude lower than those from ingestion and dermal contact. Ingestion of prey was not evaluated because the burrowing birds feed out at sea, not near shore. Monk seals and sea turtles were evaluated for exposure through ingestion of contaminated prey (algae, invertebrates, and fish).

- Successful ecological assessments are based on adequate definition of assessment endpoints and their associated measurement endpoints (Barnthouse et al. 1986; EPA 1989ab, 1992; Norton et al. 1992; Suter 1993).

  - **Assessment endpoints** are formal expressions of the actual environmental values to be protected from risk (Suter 1993). The policy goal applicable to Midway Atoll is protection of special status species (to include threatened and endangered species, as well as migratory birds i.e., seabirds protected under the MBTA) from chronic adverse impacts associated with exposure to site-related CPECs. This goal was used as a basis for defining four assessment endpoints specifically applicable to the Landfills and the Inner Harbor, namely:

    1. Protection of burrowing bird species from reductions in abundance and/or reproductive success caused by exposure, while nesting, to pesticides, PCBs, and SVOCs in subsurface soils within the BWLF.

    2. Protection of green sea turtles from reductions in abundance and/or reproductive success caused by exposure to PCBs and pesticides in the marine environment adjacent to the Landfills and in the Inner Harbor.

    3. Protection of Hawaiian monk seals from reductions in abundance and/or reproductive success caused by exposure to PCBs and pesticides in the marine environment adjacent to the Landfills and in the Inner Harbor.

    4. Maintenance of a benthic infaunal and reef fish community not affected (i.e., no loss of species or assemblage alterations) by acute or chronic exposure to PCBs and pesticides in sediment and seawater in marine environment adjacent to the Landfills and in the Inner Harbor.

  - **Measurement endpoints** are quantitative expressions of an observed or measured effect that must correspond to or predict assessment endpoints. They must be readily measurable phenomena and appropriate for the exposure pathways, temporal dynamics of exposure, and scale of the site being evaluated. For this BERA, two measurement endpoints were defined, as follows:

1. Concentrations of CPECs in subsurface soil at the BWLF Site were used in exposure models and compared to concentrations reported in the scientific literature to be "no observed adverse effect levels" (NOAELs) for birds. This endpoint was not assessed directly but rather was evaluated during risk characterization as the site-wide upper-bound concentration measured in soil → the dose to burrowing birds ingesting soil and dermally exposed → the bird dosage known to induce no adverse effects → the evaluation of measurement endpoint.

2. Direct measurement of CPEC concentrations in algae, invertebrate, and fish species that may be prey for monk seals and sea turtles locations were used in exposure models and compared to levels reported in the scientific literature to be NOAELs for reptiles and mammals.

7.2 EXPOSURE ANALYSIS

Assessing the potential for adverse effects in ecological receptors resulting from contact with environmental contaminants at hazardous waste sites requires the estimation of exposure. Exposure analysis attempts to quantify the magnitude or type of actual and/or potential exposures of ecological receptors to site-specific CPECs. Exposure estimates are also needed to quantitatively evaluate the relative importance of various CPEC sources or pathways when considering clean-up levels or remediation strategies. This section briefly explains the rationale and methods used to identify and quantify CPECs, to identify target ecological receptors, and to determine (either by measurement or modeling) exposure point values (as applied daily doses). Exposures were evaluated using one or more of the following three approaches:

1. Estimation of uptake in higher trophic level receptors using exposure pathway and food chain models. Exposure pathways and endpoints were evaluated using models presented in the SI (Ogden 1996b), and described below.

2. Chemical analysis of tissues from algae, invertebrate, and fish species collected onsite and from a reference site presumed to be beyond contact with any site-related contaminants.

3. Sediment bioassays which provide corroborating evidence about the potential bioavailability of contaminants.

CPEC Quantification

Chemical sampling and analysis provide raw data about the presence and concentrations of analytes in both biotic and abiotic media (soil, ground water, surface water, sediment, and tissues) at the sites. The environmental concentration (EC) for organochlorine pesticides and PCBs in both abiotic and biotic media were calculated for three purposes (as illustrated in Figure 7-1):

- Identification of hot spots at the BWLF. For terrestrial hot spots, the EC at a given point ($EC_{(p)}$) was calculated from a single datum, the maximum detected concentration, for subsurface soils. The $EC_{(p)}$ applied only to the BWLF.
- Estimation of site-wide risks. All data points (the data set) at both terrestrial and marine sites were used to calculate estimates of site-wide exposure concentrations. The central tendency EC was the arithmetic mean of the log transformed data set, and the reasonable maximum EC ($EC_{(a)}$) was the 95th percentile upper confidence limit (UCL95) on the arithmetic mean of the logtransformed data set. $EC_{(a)}$ was the basis for calculating site-wide exposures.
- Calculation of credible risk ranges. To provide additional information to risk managers, the EC term was distributed through the use of an appropriate probability density function (PDF) derived from site- and media-specific data. The resulting EC value ($EC_{(d)}$) was taken as the 95th percentile of the distribution propagated using. a Monte Carlo software program (Crystal Ball®, Decisioneering, Inc.).

EC values were computed for every data set with a frequency of detection greater than or equal to five percent. Values below the detection limit were included in the calculations at one-half the detection limit. The SQL was considered the detection limit for each analyte in each sample.

Summary statistics of detected CPECs in each abiotic medium at the reference sites, Landfills, and Inner Harbor are given in Tables 7-1, 7-2 through 7-4, 7-12, 7-13, and 7-21. Summary statistics on each tissue species analyzed at each site are reported in Tables 7-5 through 7-11, 7-14 through 7-20, 7-22, 7-23 and 7-24. For sites with fewer than three samples, the data for the samples collected are shown with no summary statistics.

Although summarized separately, these species data were combined when calculating ECs for each site (i.e., all fish and all invertebrate data, regardless of the species collected at the landfill were combined as contaminant fish or invertebrate food concentrations in the exposure calculations). Analytes that were detected in less than 5 percent of the samples or that were considered lab contaminants (e.g., bis-2-ethylhexylphthalate) were not carried through quantitative risk analysis. All analytes detected in ground-water, sediment, seawater, and tissue samples were carried through the quanititative risk analysis because they were detected in greater than 5 percent of the samples. Therefore, a column for CPEC selection was not placed on the summary tables for those media. Summary information for marine reference sites is shown for comparison; it was not used for screening media.

The concentrations of pesticides and PCB congeners detected in sediment, algae, invertebrate, and fish tissues were used for the exposure calculations. The summary statistics on ground-water and seawater data are also shown; however, these data were not used to estimate tissue concentrations (as was done for the SERA) because the actual data on concentration were available for algae and fish prey species. Although 11 pesticides, 15 PCB congeners, and 41 PAHs were detected in ground water at the BWLF, only 1 pesticide and 4 PCB congeners were detected in the seawater adjacent to the landfill. PAHs were not sampled in seawater.

Target Receptors

Because the SERA indicated that risks from surface soils were minimal, only burrowing birds were considered terrestrial target receptors at the BWLF. Two species of burrowing bird occur on Sand Island, wedge-tailed shearwaters (*Puffinus pacificus*) and Bonin petrels (*Pterodroma hypoleuca*). Because Bonin petrels stay in their burrows for longer periods of time and are known to burrow in the BWLF, they were used as the terrestrial target receptor. Green sea turtles are frequently sighted in the Inner Harbor and near the marine areas of the Landfills. Hawaiian monk seals also occur in the Inner Harbor and the vicinity of the Landfills. Both species are protected under the ESA. They were selected as the marine target receptors on the basis of their special status and observed utilization of the sites.

Measures of Effects Models

As a component of the conceptual site model, a measure of effect model (MEM) traces CPEC transport from the primary source to subsequent sources, and from there through the food chain to a measurement endpoint that can affect an associated assessment endpoint. MEMs for each of the selected target ecological receptors are shown in Figures 7-2 through 7-4. All three pathway models apply to the BWLF Site, but the seal and turtle models apply only to the Inner Harbor.

7.2.1 Exposure Estimation

The exposure models used in the SI SERA (Ogden 1996b) and described below were used to calculate exposure doses for burrowing birds, monk seals, and green sea turtles or exposure concentrations for benthic invertebrates. Three applied daily doses (ADD) were calculated for burrowing birds: one based on the maximum detected concentration, $EC_{(p)}$, one based on the $EC_{(a)}$, and one based on the $EC_{(d)}$. To identify hot spot exposures, input to the exposure models was the single $EC_{(p)}$ value, which, when propagated through the exposure models, produces a single estimate of exposure, $ADD_{(p)}$. The $EC_{(a)}$ value was input into models to estimate the reasonable maximum exposure, $ADD_{(a)}$.

To identify a range of site-wide exposures, a Monte Carlo software program (Crystal Ball®, Decisioneering, Inc.) was used to propagate a distribution of environmental concentrations ($EC_{(d)}$) in various media through the exposure models, producing a distribution of potential exposures, described by $ADD_{(d)}$. Applicable EPA guidance was consulted during the Monte Carlo analysis (EPA 1995, 1996). An $EC_{(d)}$ derived from measurements in algae, invertebrate, and fish tissues was used as the concentration in prey items consumed by sea turtles and seals. All other parameters in the exposure model remained single-point estimates. The range of risk estimates is thus entirely a function of the variability and uncertainty in the measurement of EC. The goal of this approach was to provide a range of exposure estimates and ultimately a range of risk estimates to risk managers, thereby making additional information available about the true probability of risk and the uncertainty of the risk estimates.

ADDs for PCBs were normalized to a 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) concentration (toxic equivalent quantity [TEQ]) using appropriate toxic equivalency factor

(TEF) values. TEFs quantify the toxicity of a congener as a fraction equivalent to the known toxicity of TCDD.

PCB congener concentration × TEF = TEQ

Toxic effects to wildlife appear to be correlated more with TEQs than with absolute PCB concentrations. Giesy et al. (1994) proposed the use of TEQ values to determine levels of acceptable risk toward the protection of wildlife. Safe (1990) reported TEFs for mammals for non-, mono- and di-ortho substituted PCBs, which were derived by standardized hepatic microsome enzyme induction assays (Table 7-25). Bosveld et al. (1995) reported TEFs for birds for PCBs (Table 7-25). The bird TEFs were used for sea turtles; there are currently no reported values for reptiles.

7.2.1.1 Burrowing Birds (Bonin Petrel)

Dermal Contact

Dermal exposure could be a significant exposure route for animals that are in frequent contact with soil. The following model estimates exposure based on a terrestrial receptor's dermal contact with contaminated soils, using a contact volume approach:

Equation 7-1

$$ADDd_{bb(a)} = \left(\frac{SA_{bb} \times CD \times P_c \times EC_{ss(a)} \times CF_1 \times \rho_s}{W_{bb}} \right) \times \Psi_{bb} \times \Theta_{bb}$$

Equation 7-2

$$ADDd_{bb(p)} = \left(\frac{SA_{bb} \times CD \times P_c \times EC_{ss(p)} \times CF_1 \times \rho_s}{W_{bb}} \right) \times \Psi_{bb} \times \Theta_{bb}$$

Equation 7-3

$$ADDd_{bb(d)} \sim \left(\frac{SA_{bb} \times CD \times P_c \times EC_{ss(d)} \times CF_1 \times \rho_s}{W_{bb}} \right) \times \Psi_{bb} \times \Theta_{bb}$$

Equation 7-4

$$SA_{bb} = 10 \times W_{bb}^{0.667}$$

where:

$ADDd_{bb(a)}$	=	Applied daily dose to burrowing birds from dermal contact area-wide, milligrams per kilogram per day(mg/kg-d)
$ADDd_{bb(p)}$	=	Applied daily dose to burrowing birds from dermal contact at a single point, mg/kg-d
$ADDd_{bb(d)}$	=	Distribution of applied daily doses to burrowing birds from dermal contact, mg/kg-d
SA_{bb}	=	Receptor surface area, Table 7-26
CD	=	Contact depth, 1 centimeter (cm)
P_c	=	Fraction of bird total surface area in contact with soil, 0.25 per day (d^{-1})
$EC_{ss(a)}$	=	Environmental concentration in subsurface soil site-wide, mg/kg
$EC_{ss(p)}$	=	Environmental concentration in subsurface soil at a specific point, mg/kg
$EC_{ss(d)}$	=	Distribution of environmental concentrations in subsurface soil site-wide, mg/kg
CF_1	=	Conversion factor, 1×10^{-6} kg/mg
ρ_s	=	Site-specific bulk soil density, 1502.2 mg/cm^3 (kg/m^3)
W_{bb}	=	Body weight, Table 7-26
Ψ_{bb}	=	Seasonality, Table 7-26
Θ_{bb}	=	Area use factor, Table 7-26

The proportion of total surface area located on the underside of an animal (P_c) has been estimated to be 0.22 for mammals, based on a *Peromyscus* mouse (Maughan 1993). Professional judgment was used to adjust this proportion upward to 0.25 for birds with brood patches or for unfledged or downy newborns.

When a terrestrial receptor's foraging area exceeds the area of contamination, an area use factor (Θ) is included to account for the effect of a receptor's foraging area on the frequency and duration of contact with contaminated media or prey onsite (DeSesso and Price 1990). This factor is defined as the ratio of the contaminated area to foraging area for a given receptor species, so that $1 \geq \Theta > 0$. An animal whose total home area or foraging range area is equal to or smaller than the contaminated area will have a unitless default area use factor of 1.0. Conservative assumptions were made about the amount of

time a target receptor would use or forage on a particular site. Values for each target receptor are given in Table 7-26.

Because these target receptors are migratory, and thus not continuously present or active throughout the year at a site, a seasonality factor (Ψ) is used to account for the effects of migration. This factor is defined as the fraction of the number of days per year a receptor spends at, or active on, the contaminated area. Year-round, non-hibernating, non-seasonal species will have a unitless default seasonality factor of 1.0 (= 365 days/year). Values for each target receptor are given in Table 7-26.

Incidental Ingestion

Ingestion of contaminants is probably the most commonly exploited exposure route, in terms of both frequency and magnitude. For receptors above the primary producer trophic level, ingestion can include both primary exposure, where contaminated water, sediments, or soil are consumed, and secondary exposure, where contaminated forage or prey is consumed, so that:

Equation 7-5

$$ADDi_{bb(a)} = \left(\frac{EC_{ss(a)} \times F_{bb} \times R_{bb}}{W_{bb}} \right) \times \Psi_{bb} \times \Theta_{bb}$$

Equation 7-6

$$ADDi_{bb(p)} = \left(\frac{EC_{ss(p)} \times F_{bb} \times R_{bb}}{W_{bb}} \right) \times \Psi_{bb} \times \Theta_{bb}$$

Equation 7-7

$$ADDi_{bb(d)} \sim \left(\frac{EC_{ss(d)} \times F_{bb} \times R_{bb}}{W_{bb}} \right) \times \Psi_{bb} \times \Theta_{bb}$$

Equation 7-8

$$R_{bb} = 0.0582 \times W_{bb}^{0.651}$$

where:

$ADDi_{bb(a)}$ = Applied daily dose to burrowing birds from incidental soil ingestion area-wide, mg/kg-d

$ADDi_{bb(p)}$ = Applied daily dose to burrowing birds from incidental soil ingestion at a single point, mg/kg-d

$ADDi_{bb(d)}$ = Distribution of applied daily dose to burrowing birds from incidental soil ingestion, mg/kg-d

R_{bb} = Food intake rate, Table 7-26

F_{bb} = Fraction of soil in diet, Table 7-26

Total applied daily dose

Equation 7-9

$$ADD_{bb(a)} = ADDd_{bb(a)} + ADDi_{bb(a)}$$

Equation 7-10

$$ADD_{bb(p)} = ADDd_{bb(p)} + ADDi_{bb(p)}$$

Equation 7-11

$$ADD_{bb(d)} \sim ADDd_{bb(d)} + ADDi_{bb(d)}$$

where:

$ADD_{bb(a)}$ = Exposure point value for the burrowing bird area-wide, mg/kg-d

$ADD_{bb(p)}$ = Exposure point value for the burrowing bird at a single point, mg/kg-d

$ADD_{bb(d)}$ = Distribution of exposure point values for the burrowing bird, mg/kg-d

EC and ADD values for burrowing birds for each of the three different exposure calculations are summarized in Table 7-27. The 95th percentile of the distributions for the $EC_{(d)}$ and $ADD_{(d)}$ are reported.

7.2.2.2 Benthic Invertebrates

Equation 7-12

$$EPV_{inv(a)} = EC_{pw(a)}$$

Equation 7-13

$$EPV_{inv(d)} = EC_{pw(d)}$$

Equation 7-14

$$EC_{pw(a)} = EC_{sed(a)} / (f_{oc} \times K_{oc})$$

Equation 7-15

$$EC_{pw(d)} = EC_{sed(d)} / (f_{oc} \times K_{oc})$$

where:

$EPV_{inv(a)}$ = Exposure Point Value for benthic invertebrates, area-wide, mg/L

$EPV_{inv(d)}$ = Distribution of exposure point values for the benthic invertebrates, mg/L

$EC_{pw(a)}$ = Environmental concentration in pore water area-wide, mg/L

$EC_{pw(d)}$ = Distribution of environmental concentrations in pore water, mg/L

$EC_{sed(a)}$ = Environmental concentration in sediment area-wide, mg/L

$EC_{sed(d)}$ = Distribution of environmental concentrations in sediment at a specific point, mg/kg

f_{oc} = Soil fractional organic carbon content onsite, unitless

K_{oc} = soil-water partition coefficient normalized for organic carbon, L/kg

EC and EPV values for sediment and benthic invertebrates for each of the two different exposure calculations are summarized in Table 7-28. The 95th percentile of the distributions for the $EC_{(d)}$ and $EPV_{(d)}$ are reported.

7.2.2.3 Green Sea Turtles

Ingestion

Equation 7-16

$$ADD_{st(a)} = \left[\left(\frac{C_{st(a)} \times F_{st} \times R_{st}}{W_{st}}\right)\right] \times \Psi_{st} \times \Theta_{st}$$

Equation 7-17

$$ADD_{st(d)} \sim \left[\left(\frac{C_{st(d)} \times F_{st} \times R_{st}}{W_{st}}\right)\right] \times \Psi_{st} \times \Theta_{st}$$

Equation 7-18

$$R_{st} = \left(0.019 \times W_{st}^{0.841}\right) \times CF_3$$

where:

$ADD_{st(a)}$ = Applied daily dose to green sea turtles from consumption of algae and sea grasses, mg/kg-d

$ADD_{st(d)}$	=	Distribution of applied daily doses to green sea turtles from consumption of algae and sea grasses, mg/kg-d
W_{st}	=	Body weight, Table 7-26
Ψ_{st}	=	Seasonality, Table 7-26
Θ_{st}	=	Area use factor, Table 7-26
R_{st}	=	Food intake rate, Table 7-26
F_{st}	=	Fraction of algae and sea grass in diet, Table 7-26
$C_{st(a)}$	=	Contaminant concentration in food item in diet of sea turtle ($EC_{(a)}$ for algae), mg/kg
$C_{st(d)}$	=	Distribution of contaminant concentration in food item in diet of sea turtle ($EC_{(d)}$ for algae), mg/kg
CF_3	=	Conversion factor, 1 x 10^{-3} kg/g

Because of their limited mobility, abundance in many aquatic systems, and potential to sorb organic substances, aquatic macrophytes provide a route for contaminants to enter the food chain (Gobas et al. 1991). Actual algae tissue concentrations were used in Equations 7-16 and 7-17 to calculate a dose to turtles foraging across the entire Site. While turtles may not forage on the particular algal species collected, these algae tissues serve as surrogate species for algal uptake for this analysis. The ingestion pathway is the major exposure pathway for sea turtles; dermal exposure was judged to be an insignificant pathway.

ECs and ADDs for sea turtles for each of the two exposure calculations for the Landfills and Inner Harbor sites are summarized in Tables 7-29 and 7-30, respectively. The 95th percentile of the distributions for the $EC_{(d)}$ and $ADD_{(d)}$ are reported. All of the algae data for both species were combined to calculate the exposure to turtles at the Landfills.

7.2.2.4 Hawaiian Monk Seals

Ingestion

Equation 7-19

$$ADD_{ms(a)} = \left[\frac{\left\{ \left(C_{i(a)} \times F_i \right) + \left(C_{f(a)} \times F_f \right) \times R_{ms} \right\}}{W_{ms}} \right] \times \Psi_{ms} \times \Theta_{ms}$$

Equation 7-20

$$ADD_{ms(d)} \sim \left[\frac{\left\{\left(C_{i(d)} \times F_i\right)+\left(C_{f(d)} \times F_f\right)\times R_{ms}\right\}}{W_{ms}}\right]\times \Psi_{ms} \times \Theta_{ms}$$

Equation 7-21

$$R_{ms} = 0.0687 \times W_{ms}^{0.822}$$

where:

$ADD_{ms(a)}$	=	Applied daily dose for monk seals from consumption of fish and invertebrates, mg/kg-d
$EPV_{ms(d)}$	=	Distribution of applied daily doses for monk seals from consumption of fish and invertebrates, mg/kg-d
W_{ms}	=	Body weight, Table 7-26
Ψ_{ms}	=	Seasonality, Table 7-26
Θ_{ms}	=	Area use factor, Table 7-26
R_{ms}	=	Food intake rate, Table 7-26
$C_{f(a)}$	=	Contaminant concentration in fish food item in diet of monk seal ($EC_{(a)}$ for fish species), mg/kg
$C_{i(a)}$	=	Contaminant concentration in invertebrate food item in diet of monk seal ($EC_{(a)}$ for invertebrate species), mg/kg
$C_{f(d)}$	=	Distribution of contaminant concentration in fish food item in diet of monk seal ($EC_{(d)}$ for fish species), mg/kg
$C_{i(d)}$	=	Distribution of contaminant concentration in invertebrate food item in diet of monk seal ($EC_{(d)}$ for invertebrate species), mg/kg
F_f	=	Fraction of fish food item in diet of monk seal, 0.5 unitless
F_i	=	Fraction of invertebrate food item in diet of monk seal, 0.5 unitless

Measured concentrations of invertebrate and fish tissues were used in the equation to calculate a dose to seals. The ingestion pathway is the major exposure pathway for seals; dermal exposure was judged to be an insignificant pathway.

ECs and ADDs for monk seals for each of the two exposure calculations for the Landfills and Inner Harbor sites are summarized in Tables 7-31 and 7-32, respectively. ECs for both invertebrates and fish potentially consumed by seals are reported. All of the data pm invertebrate and fish species were combined to calculate seal exposure at the Landfills.

The 95th percentile of the distributions for the $EC_{(d)fish}$, $EC_{(d)inv}$, and $ADD_{(d)}$ are reported in Tables 7-31 and 7-32.

Landfills

Using data on measured concentrations in tissue in the exposure models better estimates the potential risk to receptors foraging onsite, because tissue data indicate which contaminants are bioavailable and bioaccumulative. The tissue data collected at the Landfills indicate both the magnitude of the contaminant concentrations as well as their spatial distribution. The highest concentrations of contaminants in tissue were found in Grids 01 and 02 adjacent to the northeast corner of the BWLF. However, different species tended to accumulate different contaminants to different levels. Concentrations of contaminants in algal tissue varied widely throughout the Site and did not follow the same trend as the fish data. Contaminant concentrations in herbivorous fish tissue were generally higher than those in carnivorous fish, possibly because of the site specificity of the damselfish versus the more mobile goatfish. In general, the brown algae, *Dictyota* sp., contained higher concentrations of contaminants than the green algae, *Halimeda* sp., while octopus and sea cucumbers contained higher concentrations than sea urchins. Although the seal may prefer octopus over the sea cucumber and sea urchin as prey, the octopus is a short-lived creatrue and is not abundant onsite. Sea urchins, which were found throughout the Site and atoll, thus better represent the spatial distribution of contaminants in invertebrates.

Inner Harbor

The spatial distribution of contaminant concentrations in tissue samples from the Inner Harbor varied more widely than did concentrations from tissues samples at the Landfills Site. No single hot spot existed for all species collected. Indeed, when taken as a whole, the tissue concentrations of contaminants in all the tissue types sampled indicate that PCBs and pesticides are biologically widely available, but the degree of uptake depends on a number of factors, including the exposure route, feeding behavior and preferences, and receptor lipid fraction.

7.3 Ecological Effects Analysis

This section describes (1) the methods used to obtain data on chronic toxicological effects resulting from exposure to CPECs and (2) methods for deriving acceptable toxicity

reference values (TRVs) from this data. A TRV is the concentration or dose below which no chronic effects, particularly with respect to reproductive endpoints, are expected for terrestrial and marine target receptor species. TRVs for PCB congeners were normalized to TCDD TEQs using appropriate congener-specific TEF values. Therefore, the TRV for TCDD was used for comparison to the ADDs. TRVs for pesticides and SVOCs were identified from a review of the current literature. TRVs for birds are listed in Table 7-33, and those for marine species are listed in Table 7-34. TRV derivations and toxicity profiles for each type of receptor and each type of CPEC are discussed in detail in the toxicity profiles in Appendix H.

One direct measure of effect performed at the Landfills Site was a sediment bioassay analyses at Grid 1 to determine what effect contaminants may have on benthic invertebrates onsite (Appendix G). Similar bioassays completed on sediment samples collected during the SI found significantly ($P<0.05$) lower mean percent survivorship and normality at the northeast corner of the BWLF. However, bioassay results from the one sample and duplicates collected at Grid 1 during this RI showed 100 percent survival and no significant differences in percent normality between the Site samples and the control (Table 7-35). The sediment elutriate from the bioassay was analyzed to identify the potential source of the toxicity results (Table 7-36). Thirteen metals, three SVOCs, three pesticides, and seven PCBs were detected in the elutriate samples. Concentrations of the organic chemicals were very low, and metals concentrations were within normal ranges for seawater. The lack of observed toxicity strongly suggests that contaminant levels in the elutriate are below the threshold for adverse effects for echinoderms.

7.4 Risk Characterization

Risk characterization is the process of applying numerical methods and professional judgment to determine whether adverse effects are occurring or are likely to occur in target receptors linked to assessment endpoints as a result of site-related CPECs. Risk characterization asks the following questions: (a) Are ecological receptors currently exposed to site-related stressors at levels capable of causing harm, or is future exposure likely? (b) If adverse ecological effects are observed or predicted, what are the types, extent, and severity of effects? and (c) What are the principal uncertainties associated with the risk characterization? Risk characterization involves two components: estimation and description.

Risk Estimation

For this BERA, risk estimation used a quotient methodology (Barnthouse et al. 1986) to identify potential hot spots and to provide both deterministic and probabilistic estimates of site-wide risks. For each of these purposes, species-specific ADD values were divided by appropriate TRVs to calculate toxicity quotients (TQs), so that:

Equation 7-22 (hot spot identification)

$$TQ_{ij(p)} = \frac{ADD_{ij(p)}}{TRV_{ij}}$$

Equation 7-23 (deterministic estimate of site-wide risk)

$$TQ_{ij(a)} = \frac{ADD_{ij(a)}}{TRV_{ij}}$$

Equation 7-24 (estimate of site-wide risk range)

$$TQ_{ij(d)} \sim \frac{ADD_{ij(d)}}{TRV_{ij}}$$

where:

$TQ_{ij(p)}$	=	Hot spot toxicity quotient for the *i*th CPEC for the *j*th target receptor, unitless
$TQ_{ij(a)}$	=	Reasonable maximum exposure toxicity quotient for the *i*th CPEC for the *j*th target receptor, unitless
$TQ_{ij(d)}$	=	Distribution of toxicity quotients for the *i*th CPEC for the *j*th target receptor, unitless
$ADD_{ij(p)}$	=	Hot spot applied daily dose for the *i*th CPEC for the *j*th target receptor
$ADD_{ij(a)}$	=	Site-wide maximum applied daily dose for the *i*th CPEC for the *j*th target receptor
$ADD_{ij(d)}$	=	Distribution of applied daily doses for the *i*th CPEC for the *j*th target receptor
TRV_{ij}	=	Toxicity reference value for the *i*th CPEC for the *j*th target receptor

For benthic invertebrates, EPV replaces ADD in equations 7-22 through 7-24. Such TQ values are used only as one indicator (but not a direct measure) of potential risk from a CPEC. A TQ is not an actual measure of risk, but simply a convenient method for indicating excedence of an acceptable (i.e., TRV) level. A distribution of TQ values only indicates

the probability of exceeding the TRV. The risk of adverse effects is presumed to be directly proportional to the degree of excedence, as follows (after Davis 1994):

- TQ values less than 1 suggest that the potential for an adverse ecotoxicological effect is *negligible.*
- TQ values equal to or greater than 1 but less than 10 suggest that the potential for an adverse ecotoxicological effect is *low to moderate.*
- TQ values equal to or greater than 10 but less than or equal to 100 suggest that the potential for an adverse ecotoxicological effect is *moderate to high.*
- TQ values greater than 100 suggest that the potential for an adverse ecotoxicological effect is *extremely high.*

For development of a credible risk range ($TQ_{ij(d)}$), it was assumed that TRV_{ij} is constant and certain. With this assumption, risk was described as (after Barnthouse et al. 1986)

Equation 7-25

$$Risk = prob\left|EPV > TRV\right| = prob\left|TQ_{ij(d)} > 1\right|$$

Site-wide risk was considered probable if the value of $TQ_{ij(d)}$ for burrowing birds, turtles, or seals exceeded 1 at the 95th percentile or exceeded 1 at the 80th percentile for fish and reef communities. The 95th percentile was used for protection of special status species and is based on the UCL, while the 80th percentile was an acceptable level of risk at a community level. The calculation of the probability that an EPV will exceed the TRV (rather than simply computing a ratio as in the quotient method) is what makes the approach taken in Eq. 7-25 a true risk assessment method.

These approaches best assess the potential for risk to individuals. However, because the target receptors of interest are protected as individuals, this was an appropriate strategy for this BERA. Assessment of potential risk to a population is complicated by a number of factors not included in this calculation, but which were dealt with in a qualitative discussion as part of the risk description.

Risk Description

Risk description involves summarizing and interpreting the ecological significance of any observed or predicted effects and the degree of risk they could pose to ecological receptors. Interpretation of ecological significance takes into account such factors as the nature and magnitude of effects, the spatial and temporal distribution of effects, and the potential for site recovery.

Because no single line of evidence can adequately define risks to complex ecological systems, risk description combines the quantified risk estimate with a formal "weight-of-evidence" approach to present a broader picture of the degree of risk associated with each assessment endpoint (Menzie et al. 1996). Some of the lines of evidence made available by the BERA for this weight-of-evidence analysis of sites on Midway Atoll were as follows:

- Detection of contaminant concentrations in soil, sediment, surface water, and ground water
- Presence of environmental transport mechanisms
- Observations of adverse effects in potentially exposed habitats compared with reference sites, including mortality and morbidity, vegetation stress, habitat degradation, presence or absence of key species
- Presence of endangered species or sensitive habitat
- CPEC concentrations in water, soil, surface water, sediment, or tissues that exceed doses observed to cause chronic or acute toxicity in other areas, species, or media
- Tissue and/or bioaccumulation analyses provide strong evidence of CPEC availability in animals

A qualitative discussion of risks was presented for the Landfills and the Inner Harbor, and included a discussion of toxicological and ecological factors beyond those embodied in the TQ. Risk were described for each CPEC-pathway-receptor combination, i.e., each measurement endpoint.

7.4.1 Landfills

Terrestrial

Twenty-two SVOCs, 13 pesticides, and 3 Aroclor mixtures were detected in the 40 trench soil samples collected. However, only 15 SVOCs, 10 pesticides, and 2 Aroclors were

carried through the exposure analysis to risk characterization, because the other compounds either were detected in less than 5 percent of the samples or were considered laboratory contaminants.

$TQ_{(a)}$ values for all CPECs were less than one (Table 7-37), indicating that the area-wide risk to burrowing birds is negligible. In addition, the site-wide probabilistic risk ($TQ_{(d)}$) for these CPECs were all less than 1 at the 95th percent level, indicating a site-wide negligible risk to birds (Table 7-37). The $TQ_{(p)}$ values, based on the maximum detected concentration onsite, for benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, phenanthrene, 4,4'-DDE, endrin aldehyde, and 2,3,7,8 TCDD (TEQ for PCBs) fall between 1 and 10, indicating a low to moderate risk to burrowing birds at those hot spots (Table 7-37). These maximum concentrations occurred in different locations at depths from 2.5 to 5 feet bgs.

The assessment endpoint for no adverse affects to burrowing birds onsite is expected to be met except potentially in certain hot spot locations. The extensive subsurface investigation of the landfill, which revealed only metal debris, burned wood, and no evidence of leaky drums, supports this finding of negligible risk.

Marine

Sediment CPEC concentrations were used to estimate the potential risk to benthic invertebrates exposed to those sediments. Pore water concentrations, estimated from sediment concentrations assuming equilibrium partitioning conditions, were compared to ambient water quality criteria protective of aquatic invertebrates. $TQ_{(a)}$ values for 2,4'-DDD, 4,4'-DDD, 4,4'-DDE, dieldrin, and TCDD/TEQ were greater than 1 but less than 3.5, indicating a low to moderate risk to benthic invertebrates (Table 7-38). However, the $TQ_{(d)}$ at the 95 percentile was much less than 1 for all of the analytes (Table 7-38). This probabilistic risk agrees with the negative (no toxicity) sediment bioassay results performed on the sediment sample containing the highest concentration. Dieldrin was detected in no invertebrate or tissue samples collected onsite. It is likely that the low level of risk estimated for the benthic invertebrates may be due to the use of Ambient Water Quality Criteria (AWQC) as TRVs. Many AWQC values are based on sensitive freshwater species and would tend to overestimate risks to marine species. Therefore, the risk to benthic species is expected to be minimal.

Twenty-two organochlorine pesticides and several PCB congeners were detected in the algae samples collected throughout the Landfills Site. These algal concentrations were used to estimate exposure and then potential risk to green sea turtles that feed on algae onsite. The site-wide $TQ_{(a)}$ for sea turtles were all less than 0.01 and consequently all $TQ_{(d)}$ were also less than 0.01 at the 95 percent level (Table 7-39).

Toxicity quotients for 17 pesticides and TCDD/TEQ were calculated for monk seals. Although a few of the fish PCB concentrations collected on the northeast side of the BWLF were elevated, the area-wide risk to seals ($TQ_{(a)}$) was only 1.62 (Table 7-40). This indicates a very low potential for an adverse effect on monk seals. Moreover, the site-wide probablistic risk ($TQ_{(d)}$) for TCDD at the 95 percent level was only 0.05, indicating a negligible risk to monk seals (Table 7-40).

Monk seals often haul out on the sandy beach on the west side of the BWLF. Although fish, invertebrates, and algal tissues contained detectable concentrations of many of the pesticides and PCBs, no visible adverse effects to marine species were observed during surveys of the Landfills Site. Species collected for tissue analysis showed no visible deformities. Pesticide and PCB concentrations were generally very low or not detectable in seawater samples, low in sediment samples, and highest in the tissue samples. There was also a marked spatial difference in contaminant concentrations with the highest concentrations in all media in the samples collected from the northeast corner of the BWLF (Grids 01 and 02) and decreasing away from this area (see Section 4). Despite elevated concentrations of contaminants in Grids 01 and 02, more marine species and individuals occur on the east side of the landfill than in other areas sampled. This is most likely due to the habitat created by metal debris and rip rap.

The assessment endpoints for maintenance of the benthic invertebrate and reef fish community and those for no adverse effects to monk seals and green sea turtles, are both expected to be met. The TQ calculations and the lack of any visible indications of adverse effects to the community combine to place the weight-of-evidence behind a finding of negligible risk.

7.4.2 Inner Harbor

Some low to moderate risk was indicated in a few of the Inner Harbor Sites examined during the SI. Therefore, sampling of seawater, algae, invertebrate, and herbivorous fish tissue within a grid was recommended to get a better understanding of the potential risk to monk seals and turtles potentially foraging in the Inner Harbor.

On the basis of the RI sampling, all of the $TQ_{(a)}$ and $TQ_{(d)}$ values for sea turtles exposed to contaminants in algae in the Inner Harbor were less than 1, indicating a negligible risk (Table 7-41). The only $TQ_{(a)}$ value greater than 1 was for TCDD, the value of 1.03 indicating a very low potential risk (Table 7-42). In addition, the risk probability at the 95 percent level was only 0.03, indicating a negligible risk to seals (Table 7-42).

Other lines of evidence also point to a negligible risk to receptors in the harbor. No visible effects of contaminants on fish, invertebrates, seals, or turtles were noted during surveys or sampling. Although species assemblages are not as dense or diverse as in some areas of the atoll, this is most likely attributable not to contamination, but to the depth of the harbor, the dredging of the harbor, and the lack of structure in the harbor.

The assessment endpoint for no adverse effects to special status marine species in the Inner Harbor is expected to be met. The TQs indicate a negligible risk to seals and sea turtles, and the other lines of evidence supports those results.

7.5 Uncertainty Analysis

The use of Monte Carlo techniques allows for a quantitative assessment of some of the uncertainty (here both stochastic variability and knowledge uncertainty) inherent in estimating the risk of impacts to terrestrial and marine wildlife that may result from exposures to contaminants. The parameter values summarized in Table 7-26 bring varying degrees of uncertainty into the models that form the basis of the exposure analyses in this BERA. In addition to the uncertainty captured in the quantitative exposure model, the principal common sources of uncertainty described below should also be considered when evaluating these conclusions and when formulating risk management decisions for any site:

Stressor Selection and Quantification. Uncertainty is introduced in the selection and quantification (i.e., estimation of environmental concentrations) of CPECs due to data set

combination, quality and limitations of background data, and the impact of nondetects and sample quantitation limits. Uncertainty is also introduced by the possibility that detection limits were not adequate to register CPEC concentrations capable of inducing long-term chronic adverse effects in ecological receptors. This could lead to an underestimate of risk to the most sensitive receptors.

Target Receptor Selection. Knowledge of the potential suite of ecological receptors at Midway Atoll is relatively complete for the larger fauna; however, smaller, less obvious, or rarer species could be under-represented in both the terrestrial amd marine species inventories. Target species selected for inclusion in the food web model, as well as the structure of the food web itself, are also sources of uncertainty in that they do not necessarily completely represent ecological relationships on and near the refuge.

Exposure Estimation. Relatively little uncertainty arises from the qualitative selection of exposure pathways, but considerable uncertainty arises from quantitative estimation of contaminant intakes. Factors that might reduce exposure values, such as bioavailability from soil, sediment, or surface water; degradation rates in soil or surface water; metabolic transformation in vegetation or invertebrates; receptor avoidance of contaminated soils, sediments, or surface water; dilution over distance; or frequency of receptor exposure to contaminated media were not fully factored into this analysis.

Response Estimation. The applicability of literature-derived data depends upon the types of results presented and the methods used to arrive at them. Test endpoints produced by laboratory and field tests may be reported as formally defined toxicological endpoints or as less stringently defined measures of mortality or sublethal effect; variations in format introduce a source of error when subsumed into a single TRV. Thus seemingly equivalent TRVs may be significantly different owing to differences in test protocols, test conditions, or responses of individual organisms (Lewis et al. 1990). Uncertainty factors were used to derive TRVs for birds and reptiles from mammal data as described in Appendix H. In addition, the focus of this assessment, i.e., specific contaminants such as PCBs or pesticides, may not be the only source of stress to receptors at or near the sites investigated. Mechanical disturbance and destruction of habitat, close proximity of human activities, and atmospheric deposition of non site-specific contaminants (particularly PAHs) may all contribute to the stresses endured by ecological receptors at and near the Site.

Risk Characterization. The quotient method compares two point estimates, one for exposure and one for effect, to determine their relative position. Each of these single points actually represents a population with a unique set of statistical characteristics, characteristics which strongly influence the assessment of actual risk and the quantification of uncertainty. Risk uncertainty also arises when the uncertainty of the exposure assessment is combined with the uncertainty of the effects assessment. These uncertainties are compensated for to some extent by employing additional risk characterization techniques that utilize credible ranges of exposure and effects data and give some insight into these uncertainties.

7.6 CONCLUSIONS

The assessment endpoint of "less than 5 percent probability of an adverse effect to burrowing birds" is expected to be met because the site-wide risk of an adverse effect to burrowing birds is negligible. There is a low to moderate risk of an adverse effect to burrowing birds nesting in the locations with the maximum concentrations of some of the CPECs.

Landfills

The concentrations of chemical contaminants in the tissues indicate that the chemicals are bioavailable and are being taken up by the organisms. However, the concentrations over most of the Site are still low enough not to present a risk to the target receptors, green sea turtles and monk seals. Therefore, the assessment endpoints for special status marine species and the benthic invertebrate and reef fish communities are expected to be met.

Inner Harbor

Low-level contamination in the Inner Harbor presents a negligible risk to monk seal and green sea turtle receptors foraging within the harbor. Although PCBs and pesticides were identified in tissue samples, concentrations did not pose a risk to seals or turtles, even though conservative exposure models were used.

Tables

Table 7-1
SUMMARY STATISTICS FOR CPECs IN SUBSURFACE SOIL
AT THE BULKY WASTE LANDFILL

Analyte	Frequency of Detection	Minimum Detection mg/kg	Maximum Detection mg/kg	Mean mg/kg	Standard Deviation mg/kg	$EC_{(a)}$ mg/kg	CPEC?
Semi-volatile Organics							
2-Methylnaphthalene	4.9%	0.19	0.90	0.23	1.44	0.26	No(2)
4-Chloro-3-methylphenol	2.4%	0.16	0.16	0.22	1.35	0.25	No(2)
Acenaphthene	9.8%	0.18	2.60	0.24	1.81	0.30	YES
Acenaphthylene	4.9%	0.31	0.35	0.22	1.35	0.25	No(2)
Anthracene	17.1%	0.21	4.10	0.26	2.04	0.34	YES
Benzo(a)Anthracene	43.9%	0.15	11.00	0.34	2.79	0.49	YES
Benzo(a)Pyrene	41.5%	0.15	8.60	0.33	2.61	0.46	YES
Benzo(b)Fluoranthene	53.7%	0.079	8.50	0.31	2.62	0.44	YES
Benzo(g,h,i)perylene	14.6%	0.15	0.52	0.23	1.39	0.26	YES
Benzo(k)Fluoranthene	51.2%	0.15	6.50	0.34	2.43	0.46	YES
bis(2-Ethylhexyl)phthalate	14.6%	0.15	0.38	0.25	1.49	0.29	No(1)
Butylbenzylphthalate	2.4%	4.5	4.50	0.23	1.74	0.29	No(2)
Carbazole	9.8%	0.17	2.50	0.24	1.81	0.30	YES
Chrysene	53.7%	0.15	10.00	0.38	2.80	0.55	YES
Dibenz(a,h)Anthracene	9.8%	0.16	1.30	0.24	1.59	0.28	YES
Dibenzofuran	4.9%	0.42	0.89	0.23	1.45	0.26	No(2)
Fluoranthene	65.9%	0.082	19.00	0.45	3.45	0.71	YES
Fluorene	7.3%	0.62	1.90	0.24	1.72	0.30	YES
Indeno(1,2,3-cd)pyrene	22.0%	0.094	2.30	0.25	1.86	0.31	YES
Naphthalene	2.4%	0.79	0.79	0.23	1.43	0.26	No(2)
Phenanthrene	39.0%	0.16	15.00	0.34	2.89	0.49	YES
Pyrene	68.3%	0.13	19.00	0.48	3.44	0.75	YES
Pesticides							
4,4'-DDD	41.5%	0.0074	0.40	0.03	4.22	0.04	YES
4,4'-DDE	85.4%	0.0031	0.48	0.09	3.08	0.13	YES
4,4'-DDT	63.4%	0.024	0.89	0.05	4.60	0.09	YES
Aldrin	7.3%	0.0019	0.08	0.01	4.83	0.01	YES

Table 7-1 (Continued)
SUMMARY STATISTICS FOR CPECs IN SUBSURFACE SOIL
AT THE BULKY WASTE LANDFILL

Analyte	Frequency of Detection	Minimum Detection mg/kg	Maximum Detection mg/kg	Mean mg/kg	Standard Deviation mg/kg	$EC_{(a)}$ mg/kg	CPEC?
alpha-Chlordane	39.0%	0.0022	0.47	0.02	4.84	0.03	YES
Dieldrin	22.0%	0.0041	0.11	0.02	4.52	0.03	YES
Endosulfan II	14.6%	0.0046	0.28	0.02	5.01	0.03	YES
Endrin	24.4%	0.006	0.20	0.02	4.33	0.03	YES
Endrin aldehyde	39.0%	0.0052	0.37	0.02	4.30	0.04	YES
Endrin ketone	2.4%	0.0084	0.01	0.01	4.76	0.02	No(2)
gamma-Chlordane	34.1%	0.0023	0.50	0.01	4.95	0.03	YES
Heptachlor epoxide	2.4%	0.067	0.07	0.01	4.99	0.01	No(2)
Methoxychlor	2.4%	0.063	0.06	0.07	4.76	0.13	No(2)
PCBs							
Aroclor-1248	2.4%	1.4	1.40	0.14	4.99	0.25	No(2)
Aroclor-1254	9.8%	0.13	3.20	0.17	4.83	0.29	YES
Aroclor-1260	82.9%	0.085	19.00	0.52	5.72	0.99	YES
TCDD/TEQ	82.9%	7.40E-07	3.87E-04	1.56E-05	5.03	2.81E-05	YES

CPEC selection code

YES CPEC
NO(1) Common laboratory contaminant
NO(2) Frequency of detection <=5%

Table 7-2
SUMMARY STATISTICS FOR CPECs IN GROUND WATER
AT THE BULKY WASTE LANDFILL

Analyte	Frequency of Detection	Minimum Detection mg/L	Maximum Detection mg/L	Mean mg/L	Standard Deviation mg/L	$EC_{(a)}$ mg/L
Pesticides						
2,4'-DDD	80%	8.90E-07	3.30E-05	1.95E-06	5.56	2.85E-05
4,4'-DDD	80%	3.70E-06	9.80E-05	4.28E-06	8.66	1.25E-04
4,4'-DDE	60%	1.80E-06	3.20E-06	7.40E-07	5.33	1.01E-05
alpha-BHC	20%	1.80E-07	1.80E-07	2.08E-07	1.32	3.20E-07
beta-BHC	20%	3.20E-06	3.20E-06	2.65E-07	4.13	2.43E-06
gamma-BHC (Lindane)	40%	1.70E-06	6.30E-06	5.47E-07	5.57	8.00E-06
alpha-Chlordane	60%	1.90E-07	1.10E-06	3.56E-07	2.17	1.19E-06
Dieldrin	60%	7.00E-07	2.00E-06	5.59E-07	3.00	3.11E-06
Endosulfan I	40%	3.70E-07	7.30E-07	4.00E-07	1.52	7.68E-07
Hexachlorobenzene	60%	1.70E-07	8.90E-07	2.68E-07	2.05	8.21E-07
Mirex	20%	1.60E-07	1.60E-07	1.31E-07	1.34	2.08E-07
PCBs						
PCB-8	60%	7.70E-07	7.60E-06	1.16E-06	5.87	1.84E-05
PCB-18	40%	5.40E-06	6.00E-06	9.20E-07	5.38	1.28E-05
PCB-28	40%	2.70E-07	3.20E-07	4.35E-07	1.55	8.66E-07
PCB-44	40%	9.00E-07	4.40E-06	4.73E-07	4.26	4.56E-06
PCB-52	40%	2.20E-06	3.30E-06	5.86E-07	4.15	5.42E-06
PCB-66	60%	8.40E-07	1.20E-05	8.75E-07	6.83	1.76E-05
PCB-101	60%	1.60E-06	4.60E-06	8.66E-07	4.47	9.00E-06
PCB-118	40%	5.30E-07	2.30E-06	3.99E-07	2.98	2.20E-06
PCB-138	100%	1.60E-06	2.20E-05	3.10E-06	3.02	1.75E-05
PCB-153	100%	7.10E-07	8.10E-06	1.78E-06	2.69	8.33E-06
PCB-170	60%	2.90E-07	3.80E-06	1.15E-06	2.80	5.74E-06
PCB-180	100%	4.80E-07	2.70E-06	9.48E-07	1.97	2.74E-06
PCB-187	40%	6.50E-07	7.90E-07	4.49E-07	1.65	9.81E-07
PCB-195	40%	2.30E-07	5.10E-07	3.35E-07	1.46	6.07E-07
PCB-209	20%	2.70E-06	2.70E-06	4.53E-07	2.81	2.28E-06
PAHs						
1,3,5-Trichlorobenzene	60%	1.00E-05	5.50E-04	1.83E-05	7.16	3.97E-04
Acenaphthene	100%	3.60E-05	1.50E-03	3.68E-04	4.36	3.68E-03
Acenaphthylene	40%	5.20E-06	2.70E-05	6.90E-06	2.24	2.43E-05
Anthracene	100%	6.70E-06	2.40E-04	7.41E-05	4.48	7.72E-04
Benzo(a)Anthracene	80%	1.10E-05	2.60E-05	1.64E-05	1.47	2.99E-05
Benzo(a)Pyrene	80%	2.00E-06	5.40E-06	4.09E-06	2.02	1.23E-05
Benzo(b)Fluoranthene	100%	1.60E-06	8.30E-06	4.21E-06	1.86	1.11E-05
Benzo(e)Pyrene	80%	2.40E-06	5.60E-06	4.98E-06	1.86	1.31E-05
Benzo(g,h,i)Perylene	60%	1.20E-06	3.40E-06	3.79E-06	2.90	2.00E-05
Benzo(k)Fluoranthene	100%	1.50E-06	3.70E-06	2.27E-06	1.42	3.90E-06
Biphenyl	80%	1.50E-05	1.00E-03	5.74E-05	8.43	1.61E-03
Chrysene	100%	2.70E-06	2.60E-05	1.20E-05	2.43	4.82E-05
Chrysenes, c1-alky	80%	3.20E-06	1.10E-05	5.77E-06	1.58	1.18E-05
Chrysenes, c2-alky	40%	1.50E-05	2.40E-05	7.23E-06	2.54	3.09E-05
Chrysenes, c3-alky	20%	1.30E-05	1.30E-05	4.63E-06	1.89	1.25E-05

Table 7-2
SUMMARY STATISTICS FOR CPECs IN GROUND WATER
AT THE BULKY WASTE LANDFILL

Analyte	Frequency of Detection	Minimum Detection mg/L	Maximum Detection mg/L	Mean mg/L	Standard Deviation mg/L	$EC_{(a)}$ mg/L
Dibenzo(a,h)Anthracene	60%	7.50E-07	1.50E-06	2.54E-06	3.79	2.04E-05
Dibenzothiophene	100%	1.10E-05	2.50E-04	9.44E-05	3.47	6.60E-04
Dibenzothiophenes, c1-alky	100%	1.10E-05	1.00E-03	8.07E-05	5.28	1.09E-03
Dibenzothiophenes, c2-alky	100%	1.90E-05	1.10E-03	7.84E-05	5.40	1.10E-03
Dibenzothiophenes, c3-alky	100%	9.60E-06	5.20E-04	4.56E-05	5.27	6.14E-04
Fluoranth+Pyr, C1-alky	100%	1.50E-05	2.50E-04	7.50E-05	2.81	3.76E-04
Fluoranth+Pyr, C2-alky	80%	1.60E-05	7.90E-05	2.33E-05	3.03	1.32E-04
Fluoranth+Pyr, C3-alky	60%	1.10E-05	3.10E-05	9.36E-06	2.87	4.88E-05
Fluoranthene	100%	4.30E-05	1.20E-03	2.18E-04	3.75	1.72E-03
Fluorene	100%	3.80E-06	8.60E-04	8.72E-05	8.20	2.34E-03
Fluorenes, c1-alky	100%	1.20E-05	3.30E-04	7.92E-05	3.38	5.31E-04
Fluorenes, c2-alky	100%	1.70E-05	3.50E-04	6.02E-05	3.15	3.62E-04
Fluorenes, c3-alky	40%	7.90E-05	2.50E-04	1.58E-05	7.79	3.90E-04
Indeno(1,2,3-cd)Pyrene	60%	1.30E-06	3.60E-06	3.68E-06	2.45	1.49E-05
Naphthalene	100%	1.60E-05	4.60E-03	4.11E-04	7.88	1.04E-02
Naphthalenes, c1-alky	100%	6.00E-06	1.70E-03	2.29E-04	9.47	7.68E-03
Naphthalenes, c2-alky	100%	1.10E-05	7.60E-03	5.33E-04	12.18	2.65E-02
Naphthalenes, c3-alky	100%	2.00E-05	3.70E-03	3.45E-04	7.62	8.25E-03
Naphthalenes, c4-alky	100%	1.90E-05	1.50E-03	1.41E-04	5.65	2.12E-03
Perylene	80%	9.90E-07	2.00E-06	1.92E-06	2.90	1.01E-05
Phenanth+Anthra), C1-alky	100%	7.50E-06	2.50E-04	7.98E-05	4.25	7.66E-04
Phenanth+Anthra, C2-alky	100%	1.60E-05	2.80E-04	5.83E-05	2.79	2.90E-04
Phenanth+Anthra, C3-alky	100%	1.20E-05	1.40E-04	3.03E-05	2.83	1.54E-04
Phenanth+Anthra, C4-alky	40%	3.80E-05	8.50E-05	7.85E-06	6.34	1.41E-04
Phenanthrene	100%	8.10E-06	1.30E-03	1.91E-04	8.82	5.73E-03
Pyrene	100%	4.70E-05	7.60E-04	1.73E-04	3.05	9.88E-04

Table 7-3
SUMMARY STATISTICS FOR CPECs IN SEDIMENT AT THE REFERENCE SITES

Analyte	Frequency of Detection	Minimum Detection mg/kg	Maximum Detection mg/kg	Mean mg/kg	Standard Deviation mg/kg	$EC_{(a)}$ mg/kg
Pesticides						
2,4'-DDE	25%	1.30E-04	1.30E-04	3.39E-05	2.45	2.20E-04
PCBs						
PCB-138	100%	4.50E-05	7.60E-05	6.11E-05	1.28	1.02E-04

Table 7-4
DETECTED CONCENTRATIONS OF CPECs IN THE TWO SEAWATER SAMPLES AT THE REFERENCE SITES

Analyte	SW01S01 mg/L	SW03S01 mg/L
Pesticides		
Hexachlorobenzene	ND	1.70E-07

Table 7-5
DETECTED CONCENTRATIONS OF CPECs IN THE TWO ALGAE (*Dictyota* sp.) SAMPLES SAMPLES AT THE REFERENCE SITES

Analyte	MT03S05 mg/kg	MT04S05 mg/kg
Pesticides		
2,4'-DDE	5.10E-03	4.70E-03
alpha-BHC	1.30E-03	ND
Endosulfan I	ND	1.30E-03
Endrin aldehyde	1.90E-03	ND
Mirex	3.30E-03	1.80E-03
PCBs		
PCB-105	2.30E-03	1.30E-03
PCB-126	9.40E-03	1.20E-02
PCB-138	ND	3.30E-03
PCB-170	5.70E-04	3.60E-04
PCB-180	2.30E-03	5.60E-04
PCB-195	ND	6.70E-04
PCB-206	1.60E-03	2.60E-03

Table 7-6
DETECTED CONCENTRATIONS OF CPECs IN THE TWO ALGAE (*Halimeda opuntia*) SAMPLES AT THE REFERENCE SITES

Analyte	MT02S06 mg/kg	MT03S06 mg/kg
Pesticides		
2,4'-DDD	2.10E-02	ND
alpha-BHC	2.00E-03	1.20E-03
delta-BHC	1.60E-04	1.10E-04
Endosulfan I	ND	5.50E-04
Endrin	ND	2.10E-04
Heptachlor epoxide	1.00E-03	8.40E-04
Mirex	1.20E-02	2.20E-03
PCBs		
PCB-170	3.10E-04	4.20E-04
PCB-206	ND	1.30E-04

Table 7-7
DETECTED CONCENTRATIONS OF CPECs IN THE OCTOPUS (*Octopus* sp.) SAMPLE AT THE REFERENCE SITES

Analyte	MT01S08 mg/L
PCBs	
PCB-18	1.50E-04
PCB-180	2.40E-04

Table 7-8
DETECTED CONCENTRATIONS OF CPECs IN THE SEA CUCUMBER (*Holothuria* sp.) SAMPLE AT THE REFERENCE SITES

Analyte	MT04S07 mg/kg
Pesticides	
Mirex	1.10E-04
PCBs	
PCB-18	8.60E-04

Table 7-9
SUMMARY STATISTICS FOR CPECs IN SEA URCHINS (*Echinometra mathaei*) AT THE REFERENCE SITES

Analyte	Frequency of Detection	Minimum Detection mg/L	Maximum Detection mg/L	Mean mg/L	Standard Deviation mg/L	$EC_{(a)}$ mg/L
Pesticides						
alpha-Chlordane	25%	6.00E-05	6.00E-05	5.77E-05	1.10	7.05E-05
delta-BHC	50%	1.00E-04	9.20E-04	1.34E-04	3.70	2.06E-03
Mirex	50%	1.40E-04	5.60E-04	1.47E-04	2.54	1.03E-03
PCBs						
PCB-18	50%	3.50E-04	7.30E-04	1.96E-04	3.11	2.10E-03
PCB-138	25%	6.50E-05	6.50E-05	3.78E-04	3.24	4.41E-03

Table 7-10
SUMMARY STATISTICS FOR CPECs IN
HERBIVOROUS FISH (*Stegastes fasciolatus*)
AT THE REFERENCE SITES

Analyte	Frequency of Detection	Minimum Detection mg/kg	Maximum Detection mg/kg	Mean mg/kg	Standard Deviation mg/kg	$EC_{(a)}$ mg/kg
Pesticides						
2,4'-DDD	100%	8.30E-04	1.40E-02	3.05E-03	3.97	5.43E-02
2,4'-DDE	50%	1.70E-04	2.50E-04	1.52E-04	1.49	3.48E-04
4,4'-DDD	50%	3.80E-04	1.20E-03	4.55E-04	1.93	1.79E-03
4,4'-DDE	75%	1.30E-03	5.40E-03	1.48E-03	2.62	1.11E-02
4,4'-DDT	75%	2.90E-04	1.00E-03	3.81E-04	2.73	3.09E-03
alpha-BHC	100%	2.10E-04	4.30E-04	3.00E-04	1.44	6.41E-04
alpha-Chlordane	25%	1.50E-04	1.50E-04	1.19E-04	1.18	1.69E-04
beta-BHC	25%	1.80E-04	1.80E-04	7.21E-05	1.85	2.61E-04
delta-BHC	50%	4.50E-04	5.00E-04	9.92E-05	6.71	5.28E-03
Endosulfan I	100%	1.60E-04	5.80E-04	2.31E-04	1.85	8.36E-04
Endosulfan sulfate	50%	3.40E-04	4.50E-04	2.32E-04	1.85	8.37E-04
Endrin	25%	7.70E-05	7.70E-05	4.73E-05	1.40	9.53E-05
gamma-BHC (Lindane)	50%	5.60E-04	1.50E-03	2.29E-04	5.20	7.19E-03
Heptachlor epoxide	75%	2.90E-04	5.90E-04	2.49E-04	2.37	1.51E-03
Hexachlorobenzene	100%	2.20E-04	4.90E-04	3.48E-04	1.41	7.08E-04
Mirex	25%	4.80E-04	4.80E-04	1.11E-04	2.66	8.56E-04
trans-Nonachlor	25%	2.30E-03	2.30E-03	2.24E-04	4.74	5.76E-03
PCBs						
PCB-8	100%	1.30E-03	2.70E-03	1.75E-03	1.37	3.40E-03
PCB-18	25%	2.60E-03	2.60E-03	1.63E-04	6.36	7.76E-03
PCB-28	25%	1.90E-04	1.90E-04	8.14E-05	1.78	2.70E-04
PCB-52	50%	1.30E-03	1.70E-03	4.00E-04	4.58	9.57E-03
PCB-101	100%	5.90E-04	1.70E-03	1.00E-03	1.58	2.60E-03
PCB-105	75%	2.40E-04	4.10E-04	1.98E-04	2.29	1.12E-03
PCB-118	25%	1.40E-03	1.40E-03	4.45E-04	2.16	2.21E-03
PCB-128	100%	1.50E-04	3.50E-04	2.20E-04	1.45	4.81E-04
PCB-138	100%	1.20E-03	4.80E-03	2.09E-03	1.84	7.44E-03
PCB-153	100%	1.80E-03	8.60E-03	3.00E-03	2.05	1.35E-02
PCB-170	75%	2.80E-04	3.00E-03	4.08E-04	4.08	7.70E-03
PCB-180	100%	1.00E-03	7.80E-03	1.79E-03	2.67	1.40E-02
PCB-187	75%	1.50E-03	5.20E-03	1.47E-03	4.15	2.88E-02
PCB-195	100%	2.20E-04	8.40E-04	3.62E-04	1.83	1.28E-03
PCB-206	75%	2.10E-04	5.60E-04	2.18E-04	2.22	1.15E-03
PCB-209	25%	1.10E-04	1.10E-04	6.01E-05	1.51	1.42E-04

Table 7-11
DETECTED CONCENTRATIONS OF CPECs IN THE TWO CARNIVOROUS FISH (Yellowstripe goatfish - *Mulloidichthys flavolineatus*) SAMPLES AT THE REFERENCE SITES

Analyte	MT01S04 mg/kg	MT04S04 mg/kg
Pesticides		
2,4'-DDD	3.50E-04	ND
2,4'-DDE	7.30E-04	ND
2,4'-DDT	ND	3.70E-04
alpha-BHC	2.00E-04	3.00E-04
Endrin	8.40E-05	8.40E-05
gamma-BHC (Lindane)	6.30E-05	6.30E-05
Hexachlorobenzene	1.20E-04	1.40E-04
Mirex	1.40E-04	1.90E-04
PCBs		
PCB-8	4.80E-04	8.20E-04
PCB-18	2.70E-04	ND
PCB-138	1.50E-03	ND
PCB-153	3.00E-03	9.80E-04
PCB-170	7.60E-04	1.80E-04
PCB-180	2.60E-03	6.80E-04
PCB-187	1.40E-03	ND
PCB-195	3.30E-04	ND
PCB-206	3.80E-04	2.20E-04

Table 7-12
SUMMARY STATISTICS FOR CPECs IN SEDIMENT
AT THE LANDFILLS SITE

Analyte	Frequency of Detection	Minimum Detection mg/kg	Maximum Detection mg/kg	Mean mg/kg	Standard Deviation mg/kg	$EC_{(a)}$ mg/kg
Pesticides						
2,4'-DDD	50%	2.00E-04	1.10E-02	1.55E-04	10.59	9.08E-04
2,4'-DDE	25%	6.60E-05	2.30E-03	4.07E-05	3.94	1.14E-04
2,4'-DDT	58%	3.00E-05	3.30E-03	1.32E-04	5.99	5.02E-04
4,4'-DDD	83%	6.40E-05	1.70E-02	3.63E-04	8.35	1.78E-03
4,4'-DDE	83%	5.20E-05	9.00E-03	3.86E-04	8.44	1.90E-03
4,4'-DDT	50%	1.10E-04	7.50E-03	1.42E-04	8.80	7.25E-04
alpha-BHC	8%	3.60E-05	3.60E-05	1.59E-05	1.31	1.96E-05
gamma-BHC (Lindane)	8%	2.30E-05	2.30E-05	1.94E-05	1.11	2.10E-05
alpha-Chlordane	50%	5.30E-05	8.60E-04	6.02E-05	4.50	1.86E-04
gamma-Chlordane	67%	2.00E-05	8.40E-04	5.49E-05	4.19	1.60E-04
Dieldrin	17%	2.70E-05	2.70E-05	3.40E-05	3.08	7.89E-05
trans-Nonachlor	42%	3.40E-05	6.50E-04	3.33E-05	4.96	1.10E-04
PCBs						
PCB-8	25%	6.10E-05	4.20E-04	3.84E-05	2.72	8.12E-05
PCB-18	17%	5.40E-04	5.60E-04	7.26E-05	2.59	1.48E-04
PCB-28	42%	1.10E-04	9.60E-04	8.87E-05	3.78	2.40E-04
PCB-44	58%	3.80E-05	1.20E-03	7.11E-05	5.04	2.39E-04
PCB-52	67%	2.00E-05	2.00E-03	1.09E-04	7.19	4.79E-04
PCB-66	50%	1.20E-04	9.70E-04	8.01E-05	5.35	2.81E-04
PCB-101	75%	7.50E-05	2.80E-02	3.44E-04	13.57	2.42E-03
PCB-105	58%	1.90E-05	8.80E-04	6.35E-05	5.20	2.18E-04
PCB-118	67%	5.00E-05	5.40E-03	2.03E-04	8.52	1.01E-03
PCB-128	58%	2.00E-05	4.30E-03	1.16E-04	7.64	5.32E-04
PCB-138	100%	1.10E-04	8.40E-02	1.47E-03	9.20	7.76E-03
PCB-153	92%	4.50E-05	1.10E-01	1.50E-03	15.20	1.15E-02
PCB-170	92%	1.40E-05	6.30E-02	7.01E-04	13.05	4.79E-03
PCB-180	92%	6.60E-05	1.20E-01	1.37E-03	13.42	9.59E-03
PCB-187	92%	3.30E-05	6.90E-02	9.49E-04	12.03	6.11E-03
PCB-195	92%	1.90E-05	1.40E-02	2.29E-04	8.63	1.15E-03
PCB-206	75%	2.70E-05	5.70E-03	1.20E-04	7.25	5.31E-04
PCB-209	58%	6.30E-06	5.20E-04	3.00E-05	3.69	7.97E-05

Table 7-13
SUMMARY STATISTICS FOR CPECs IN SEAWATER
AT THE LANDFILLS SITE

Analyte	Frequency of Detection	Minimum Detection mg/kg	Maximum Detection mg/kg	Mean mg/kg	Standard Deviation mg/kg	$EC_{(a)}$ mg/kg
Pesticides						
Hexachlorobenzene	100%	2.00E-07	6.30E-07	3.62E-07	1.52	6.21E-07
PCBs						
PCB-18	17%	1.40E-06	1.40E-06	3.42E-07	2.00	8.40E-07
PCB-153	17%	1.10E-06	1.10E-06	1.86E-07	2.40	5.77E-07
PCB-180	17%	8.30E-07	8.30E-07	4.32E-07	1.40	6.66E-07
PCB-187	17%	4.70E-07	4.70E-07	3.25E-07	1.23	4.26E-07

Table 7-14
SUMMARY STATISTICS FOR CPECs IN
ALGAE (*Dictyota* sp.)
AT THE LANDFILLS SITE

Analyte	Frequency of Detection	Minimum Detection mg/kg	Maximum Detection mg/kg	Mean mg/kg	Standard Deviation mg/kg	$EC_{(a)}$ mg/kg
Pesticides						
2,4'-DDD	50%	1.10E-02	4.00E-02	3.18E-03	9.59	5.89E-02
2,4'-DDT	17%	1.20E-02	1.20E-02	5.57E-04	4.66	4.06E-03
4,4'-DDD	33%	6.00E-03	6.60E-02	3.07E-03	5.25	2.61E-02
4,4'-DDE	50%	4.60E-03	6.00E-02	5.10E-03	4.44	3.49E-02
4,4'-DDT	17%	3.70E-02	3.70E-02	9.74E-04	6.14	1.01E-02
alpha-BHC	50%	7.80E-04	2.90E-03	8.20E-04	2.63	2.86E-03
alpha-Chlordane	33%	9.90E-04	3.30E-03	7.26E-04	2.37	2.21E-03
beta-BHC	50%	5.00E-04	1.20E-03	5.05E-04	1.89	1.15E-03
delta-BHC	67%	4.60E-04	2.30E-03	5.34E-04	2.97	2.17E-03
Dieldrin	17%	2.80E-02	2.80E-02	6.60E-04	6.45	7.34E-03
Endosulfan II	17%	4.80E-02	4.80E-02	9.85E-04	7.26	1.27E-02
Endosulfan sulfate	17%	1.10E-03	1.10E-03	5.77E-04	1.99	1.40E-03
Endrin	50%	2.60E-03	5.60E-03	7.74E-04	5.48	6.97E-03
Endrin aldehyde	33%	3.90E-03	5.90E-03	7.22E-04	4.76	5.42E-03
gamma-BHC (Lindane)	33%	1.30E-03	4.40E-03	4.92E-04	3.73	2.70E-03
gamma-Chlordane	50%	2.10E-03	8.70E-03	1.84E-03	2.56	6.19E-03
Heptachlor epoxide	33%	4.70E-04	6.40E-04	3.33E-04	2.02	8.27E-04
Methoxychlor	17%	1.30E-04	1.30E-04	3.06E-04	1.70	6.08E-04
Mirex	83%	8.40E-04	1.30E-02	1.67E-03	4.27	1.09E-02
trans-Nonachlor	17%	2.20E-03	2.20E-03	4.43E-04	2.61	1.53E-03
PCBs						
PCB-8	50%	7.00E-04	1.10E-03	4.76E-04	1.90	1.09E-03
PCB-18	50%	4.30E-03	8.00E-03	1.11E-03	5.98	1.12E-02
PCB-28	50%	2.00E-03	6.80E-03	1.03E-03	4.47	7.14E-03
PCB-44	17%	7.40E-03	7.40E-03	3.02E-04	5.28	2.60E-03
PCB-52	50%	8.40E-03	1.30E-02	2.27E-03	5.25	1.93E-02
PCB-66	17%	4.80E-03	4.80E-03	5.64E-04	2.99	2.33E-03
PCB-77	17%	1.30E-02	1.30E-02	6.55E-04	4.79	4.95E-03
PCB-101	50%	6.80E-04	4.60E-02	2.68E-03	5.84	2.61E-02
PCB-105	33%	5.60E-03	7.00E-03	5.62E-04	6.86	6.75E-03
PCB-118	33%	8.40E-03	1.20E-02	2.45E-03	3.11	1.06E-02
PCB-126	33%	1.00E-02	1.30E-02	9.22E-04	7.49	1.24E-02
PCB-128	33%	1.10E-03	5.60E-03	9.66E-04	2.56	3.25E-03
PCB-138	33%	2.20E-02	1.20E-01	6.69E-03	5.43	5.95E-02
PCB-153	33%	3.00E-02	2.10E-01	6.60E-03	7.70	9.22E-02
PCB-170	100%	1.20E-03	8.90E-02	6.40E-03	5.10	5.25E-02
PCB-180	100%	1.20E-03	1.60E-01	1.37E-02	5.28	1.17E-01
PCB-187	67%	1.10E-03	1.30E-01	4.74E-03	6.91	5.76E-02
PCB-195	83%	3.40E-04	1.60E-02	1.07E-03	4.68	7.86E-03
PCB-206	67%	8.10E-04	1.00E-02	1.31E-03	4.57	9.31E-03
PCB-209	33%	5.30E-04	2.30E-03	3.47E-04	2.85	1.34E-03

Table 7-15
SUMMARY STATISTICS FOR CPECs IN
ALGAE (*Halimeda opuntia*)
AT THE LANDFILLS SITE

Analyte	Frequency of Detection	Minimum Detection mg/kg	Maximum Detection mg/kg	Mean mg/kg	Standard Deviation mg/kg	$EC_{(a)}$ mg/kg
Pesticides						
2,4'-DDD	33%	4.00E-03	4.30E-03	5.94E-04	4.51	4.15E-03
4,4'-DDD	33%	3.00E-03	5.30E-03	1.06E-03	2.83	4.08E-03
4,4'-DDE	50%	3.20E-04	5.60E-03	1.35E-03	3.14	5.95E-03
4,4'-DDT	17%	1.80E-03	1.80E-03	2.91E-04	2.45	9.22E-04
delta-BHC	17%	1.50E-04	1.50E-04	9.41E-05	1.27	1.29E-04
Endosulfan II	17%	1.30E-03	1.30E-03	3.67E-04	1.86	8.21E-04
Endrin	17%	2.40E-04	2.40E-04	9.48E-05	1.59	1.72E-04
gamma-BHC (Lindane)	33%	1.40E-03	1.50E-03	2.50E-04	3.91	1.45E-03
Heptachlor	50%	4.80E-04	1.50E-03	2.62E-04	4.05	1.59E-03
Heptachlor epoxide	17%	2.10E-03	2.10E-03	2.04E-04	3.14	8.92E-04
Hexachlorobenzene	33%	1.90E-03	7.60E-03	3.01E-04	7.48	4.05E-03
Mirex	100%	8.00E-04	5.60E-03	2.07E-03	1.95	4.88E-03
PCBs						
PCB-52	67%	1.20E-03	1.10E-02	1.39E-03	5.82	1.36E-02
PCB-77	17%	4.80E-04	4.80E-04	2.55E-04	1.37	3.84E-04
PCB-105	33%	1.80E-03	2.50E-03	3.08E-04	4.48	2.13E-03
PCB-118	33%	4.20E-03	1.10E-02	1.31E-03	3.71	7.13E-03
PCB-126	17%	2.30E-02	2.30E-02	4.26E-04	7.08	5.33E-03
PCB-128	33%	2.90E-03	7.10E-03	7.08E-04	4.34	4.71E-03
PCB-138	50%	8.60E-04	1.30E-01	4.21E-03	9.02	7.21E-02
PCB-153	50%	1.50E-03	1.80E-01	4.67E-03	10.97	1.03E-01
PCB-170	100%	1.20E-04	7.40E-02	1.90E-03	12.03	4.71E-02
PCB-180	100%	1.60E-03	1.30E-01	7.55E-03	5.82	7.34E-02
PCB-187	100%	2.60E-04	9.90E-02	2.32E-03	13.22	6.52E-02
PCB-195	33%	6.50E-03	1.60E-02	7.38E-04	7.80	1.05E-02
PCB-206	33%	2.80E-03	7.90E-03	5.01E-04	5.85	4.90E-03
PCB-209	33%	1.10E-04	2.10E-04	1.07E-04	1.41	1.66E-04

Table 7-16
DETECTED CONCENTRATIONS OF CPECs IN THE OCTOPUS (*Octopus* sp.) SAMPLE AT THE LANDFILLS SITE

Analyte	MT01S08 mg/kg
PCBs	
PCB-101	1.60E-03
PCB-105	1.70E-03
PCB-118	3.10E-03
PCB-128	8.70E-04
PCB-138	1.80E-02
PCB-153	3.30E-02
PCB-170	1.30E-02
PCB-180	3.50E-02
PCB-187	2.10E-02
PCB-195	4.00E-03
PCB-206	1.60E-03

Table 7-17
SUMMARY STATISTICS FOR CPECs IN
SEA CUCUMBERS (*Holothuria* sp.)
AT THE LANDFILLS SITE

Analyte	Frequency of Detection	Minimum Detection mg/kg	Maximum Detection mg/kg	Mean mg/kg	Standard Deviation mg/kg	$EC_{(a)}$ mg/kg
Pesticides						
2,4'-DDD	67%	6.70E-04	9.50E-04	7.64E-04	1.21	1.51E-03
4,4'-DDD	33%	1.20E-03	1.20E-03	1.31E-03	1.26	2.99E-03
4,4'-DDE	67%	2.00E-03	5.00E-03	2.98E-03	1.60	1.60E-02
4,4'-DDT	67%	5.90E-04	1.10E-03	7.30E-04	1.43	2.60E-03
Mirex	67%	6.60E-04	8.80E-04	6.10E-04	1.51	2.67E-03
trans-Nonachlor	33%	2.70E-04	2.70E-04	4.72E-04	1.63	2.69E-03
PCBs						
PCB-101	67%	1.70E-03	2.60E-03	1.88E-03	1.33	5.28E-03
PCB-105	67%	1.20E-03	1.60E-03	8.84E-04	2.21	1.51E-02
PCB-118	33%	2.50E-03	2.50E-03	1.71E-03	1.48	6.90E-03
PCB-128	67%	8.80E-04	1.10E-03	9.37E-04	1.15	1.55E-03
PCB-138	67%	1.10E-02	1.60E-02	6.64E-03	3.36	5.12E-01
PCB-153	67%	1.60E-02	1.70E-02	7.13E-03	4.27	1.29E+00
PCB-170	67%	8.30E-04	2.30E-03	9.29E-04	2.35	1.99E-02
PCB-180	100%	7.40E-04	4.60E-02	6.86E-03	8.04	1.20E+01
PCB-187	100%	2.40E-03	2.20E-02	8.82E-03	3.18	5.58E-01
PCB-195	67%	1.90E-03	2.10E-03	1.34E-03	2.01	1.62E-02
PCB-206	100%	5.90E-04	7.70E-04	6.98E-04	1.16	1.18E-03

Table 7-18
SUMMARY STATISTICS FOR CPECs IN
SEA URCHINS (*Echinometra mathaei*)
AT THE LANDFILLS SITE

Analyte	Frequency of Detection	Minimum Detection mg/kg	Maximum Detection mg/kg	Mean mg/kg	Standard Deviation mg/kg	$EC_{(a)}$ mg/kg
Pesticides						
2,4'-DDD	42%	2.00E-04	6.70E-03	2.29E-04	4.63	7.21E-04
2,4'-DDE	8%	1.20E-03	1.20E-03	1.46E-04	1.95	2.41E-04
2,4'-DDT	25%	6.00E-04	1.90E-03	1.52E-04	3.57	3.94E-04
4,4'-DDD	17%	2.70E-04	2.10E-03	3.75E-04	1.73	5.65E-04
4,4'-DDE	50%	5.50E-04	1.10E-02	1.19E-03	3.14	2.80E-03
4,4'-DDT	25%	7.20E-04	1.20E-03	1.99E-04	2.58	4.04E-04
alpha-BHC	17%	1.20E-04	3.70E-04	9.03E-05	1.60	1.28E-04
Endrin	33%	2.10E-04	8.80E-04	9.67E-05	3.33	2.38E-04
gamma-BHC (Lindane)	42%	2.50E-05	3.00E-04	6.83E-05	1.76	1.04E-04
Heptachlor	8%	2.70E-04	2.70E-04	3.99E-05	2.35	7.57E-05
Hexachlorobenzene	8%	1.40E-05	1.40E-05	3.68E-05	1.97	6.10E-05
Mirex	58%	1.10E-04	7.60E-04	1.52E-04	2.24	2.78E-04
PCBs						
PCB-8	17%	8.80E-05	1.70E-04	6.18E-05	1.43	8.09E-05
PCB-18	50%	3.00E-04	1.40E-03	2.02E-04	3.32	4.97E-04
PCB-28	33%	4.30E-04	1.10E-03	1.50E-04	3.31	3.67E-04
PCB-44	8%	3.90E-04	3.90E-04	5.57E-05	2.36	1.06E-04
PCB-52	58%	2.90E-04	2.90E-03	4.57E-04	3.97	1.28E-03
PCB-66	42%	4.20E-04	7.30E-03	3.51E-04	5.94	1.33E-03
PCB-77	8%	3.00E-04	3.00E-04	1.12E-04	1.97	1.87E-04
PCB-101	50%	2.70E-04	1.50E-02	9.87E-04	5.03	3.31E-03
PCB-105	42%	1.30E-04	2.40E-03	1.71E-04	3.76	4.61E-04
PCB-118	50%	5.20E-04	8.70E-03	9.36E-04	3.70	2.49E-03
PCB-128	42%	2.80E-04	3.20E-03	3.80E-04	3.29	9.26E-04
PCB-138	50%	1.00E-03	5.10E-02	2.47E-03	6.07	9.51E-03
PCB-153	58%	8.80E-05	6.70E-02	2.22E-03	8.51	1.10E-02
PCB-170	42%	5.00E-04	7.00E-03	3.25E-04	6.35	1.30E-03
PCB-180	100%	6.00E-04	1.40E-02	2.96E-03	2.49	5.86E-03
PCB-187	92%	4.00E-04	6.40E-02	2.06E-03	7.25	9.06E-03
PCB-195	33%	1.60E-04	1.90E-03	1.83E-04	3.87	5.03E-04
PCB-206	25%	2.40E-04	8.20E-04	1.22E-04	2.94	2.74E-04
PCB-209	8%	5.00E-05	5.00E-05	4.44E-05	1.84	7.00E-05

Table 7-19
SUMMARY STATISTICS FOR CPECs IN HERBIVOROUS FISH (*Stegastes fasciolatus*) AT THE LANDFILLS SITE

Analyte	Frequency of Detection	Minimum Detection mg/kg	Maximum Detection mg/kg	Mean mg/kg	Standard Deviation mg/kg	$EC_{(a)}$ mg/kg
Pesticides						
2,4'-DDD	91%	4.20E-04	1.30E-01	3.94E-03	6.05	1.65E-02
2,4'-DDE	73%	4.90E-05	2.50E-02	7.01E-04	6.75	3.19E-03
2,4'-DDT	27%	1.00E-03	8.30E-02	4.48E-04	9.11	2.59E-03
4,4'-DDD	82%	7.50E-04	6.20E-02	3.62E-03	4.94	1.29E-02
4,4'-DDE	100%	1.70E-03	3.20E-01	2.05E-02	6.05	8.58E-02
4,4'-DDT	82%	2.10E-03	1.50E-02	3.14E-03	5.56	1.23E-02
alpha-BHC	100%	1.30E-04	8.90E-04	4.64E-04	1.78	7.33E-04
alpha-Chlordane	73%	9.90E-05	6.10E-03	7.15E-04	3.70	2.02E-03
Endrin	18%	3.20E-04	3.10E-03	1.13E-04	3.38	2.98E-04
gamma-BHC (Lindane)	100%	3.70E-04	2.80E-03	1.48E-03	1.76	2.31E-03
gamma-Chlordane	64%	2.30E-04	8.10E-04	4.08E-04	1.40	5.33E-04
Heptachlor	9%	2.00E-04	2.00E-04	7.26E-05	1.54	1.02E-04
Heptachlor epoxide	18%	7.30E-04	1.60E-03	1.79E-04	2.58	3.81E-04
Hexachlorobenzene	100%	3.10E-04	7.50E-04	4.74E-04	1.26	5.69E-04
Mirex	100%	2.30E-04	8.20E-03	9.99E-04	3.03	2.41E-03
trans-Nonachlor	91%	8.00E-04	1.40E-02	2.20E-03	3.16	5.49E-03
PCBs						
PCB-8	100%	9.60E-04	5.70E-03	2.38E-03	1.71	3.64E-03
PCB-18	82%	6.80E-04	7.80E-03	1.23E-03	3.87	3.62E-03
PCB-28	64%	1.10E-03	2.10E-02	1.46E-03	8.40	7.89E-03
PCB-44	55%	2.20E-03	6.20E-02	1.11E-03	11.40	7.68E-03
PCB-52	73%	8.70E-04	3.10E-01	4.69E-03	12.27	3.43E-02
PCB-66	64%	1.00E-03	1.80E-01	2.48E-03	12.42	1.83E-02
PCB-101	100%	1.30E-03	2.00E+00	2.16E-02	13.19	1.67E-01
PCB-105	82%	3.70E-04	4.30E-01	2.41E-03	12.91	1.84E-02
PCB-118	82%	1.00E-03	1.20E+00	1.47E-02	14.21	1.21E-01
PCB-128	91%	4.40E-04	4.40E-01	5.41E-03	12.84	4.11E-02
PCB-138	100%	4.50E-03	6.30E+00	7.93E-02	12.87	6.03E-01
PCB-153	100%	8.10E-03	9.40E+00	1.38E-01	12.09	9.96E-01
PCB-170	100%	2.80E-03	4.30E+00	5.41E-02	13.42	4.25E-01
PCB-180	100%	8.30E-03	9.80E+00	1.36E-01	12.32	9.96E-01
PCB-187	100%	7.00E-03	5.80E+00	9.10E-02	11.45	6.31E-01
PCB-195	100%	9.40E-04	1.30E+00	1.57E-02	13.19	1.22E-01
PCB-206	100%	1.10E-03	8.20E-01	1.36E-02	11.09	9.21E-02
PCB-209	100%	1.50E-04	1.10E-02	1.12E-03	4.46	3.68E-03

Table 7-20
SUMMARY STATISTICS FOR CPECs IN
CARNIVOROUS FISH (Yellowstripe goatfish - *Mulloidichthys flavolineatus*)
AT THE LANDFILLS SITE

Analyte	Frequency of Detection	Minimum Detection mg/kg	Maximum Detection mg/kg	Mean mg/kg	Standard Deviation mg/kg	$EC_{(a)}$ mg/kg
Pesticides						
2,4'-DDD	100%	3.80E-04	1.40E-01	2.13E-03	9.93	4.12E-02
2,4'-DDE	17%	2.80E-02	2.80E-02	5.50E-04	6.87	6.62E-03
2,4'-DDT	50%	1.40E-03	2.00E-02	8.59E-04	7.87	1.23E-02
4,4'-DDD	100%	8.90E-04	5.20E-02	2.95E-03	4.60	2.12E-02
4,4'-DDE	100%	5.10E-03	2.30E-01	2.41E-02	3.92	1.41E-01
4,4'-DDT	100%	1.80E-03	1.60E-02	3.97E-03	2.15	1.07E-02
alpha-BHC	100%	1.70E-04	3.60E-04	2.58E-04	1.34	3.77E-04
alpha-Chlordane	83%	3.60E-04	6.80E-03	7.18E-04	3.40	3.49E-03
beta-BHC	83%	1.10E-04	1.90E-04	1.42E-04	1.23	1.87E-04
gamma-BHC (Lindane)	67%	1.40E-04	2.80E-04	1.69E-04	1.44	2.71E-04
gamma-Chlordane	33%	5.30E-04	2.00E-03	5.83E-04	1.85	1.29E-03
Hexachlorobenzene	100%	2.90E-04	6.00E-04	4.42E-04	1.29	6.15E-04
Mirex	100%	4.00E-04	4.40E-03	8.24E-04	2.55	2.76E-03
trans-Nonachlor	100%	5.20E-04	1.10E-02	1.42E-03	2.99	5.85E-03
PCBs						
PCB-8	100%	9.30E-04	2.20E-03	1.23E-03	1.36	1.84E-03
PCB-18	67%	7.90E-04	1.40E-02	8.25E-04	5.45	7.37E-03
PCB-28	83%	5.10E-04	4.40E-02	1.56E-03	7.41	2.06E-02
PCB-44	33%	2.80E-03	1.50E-02	4.40E-04	8.60	7.08E-03
PCB-52	100%	2.30E-04	1.30E-01	2.55E-03	10.27	5.17E-02
PCB-66	83%	3.50E-04	7.90E-02	1.93E-03	8.88	3.23E-02
PCB-101	100%	9.40E-04	6.30E-01	9.33E-03	11.91	2.29E-01
PCB-105	100%	5.30E-04	1.90E-01	5.35E-03	8.28	8.21E-02
PCB-118	100%	2.50E-03	4.20E-01	1.80E-02	7.25	2.33E-01
PCB-128	100%	6.50E-04	1.20E-01	5.31E-03	7.77	7.50E-02
PCB-138	100%	7.00E-03	2.40E+00	7.87E-02	9.30	1.40E+00
PCB-153	100%	1.30E-02	4.80E+00	1.34E-01	9.99	2.62E+00
PCB-170	100%	4.50E-03	1.90E+00	4.94E-02	10.78	1.06E+00
PCB-180	100%	1.10E-02	4.80E+00	1.20E-01	10.77	2.59E+00
PCB-187	100%	7.00E-03	2.80E+00	7.14E-02	10.34	1.46E+00
PCB-195	100%	1.20E-03	6.00E-01	1.33E-02	10.90	2.90E-01
PCB-206	100%	1.20E-03	4.20E-01	9.02E-03	9.34	1.62E-01
PCB-209	100%	3.40E-04	5.40E-03	1.07E-03	3.12	4.63E-03

Table 7-21
SUMMARY STATISTICS FOR CPECs IN SEAWATER
AT THE INNER HARBOR SITES

Analyte	Frequency of Detection	Minimum Detection mg/kg	Maximum Detection mg/kg	Mean mg/kg	Standard Deviation mg/kg	$EC_{(a)}$ mg/kg
Pesticides						
Hexachlorobenzene	100%	3.60E-07	4.50E-07	3.96E-07	1.11	4.90E-07
PCBs						
PCB-209	25%	5.10E-08	5.10E-08	1.92E-07	2.42	1.21E-06

Table 7-22
SUMMARY STATISTICS FOR CPECs IN
ALGAE (*Dictyota* sp.)
AT THE INNER HARBOR SITES

Analyte	Frequency of Detection	Minimum Detection mg/kg	Maximum Detection mg/kg	Mean mg/kg	Standard Deviation mg/kg	$EC_{(a)}$ mg/kg
Pesticides						
2,4'-DDD	63%	8.80E-04	3.50E-03	1.25E-03	2.87	3.59E-03
2,4'-DDT	38%	1.60E-04	1.00E-02	7.11E-04	4.22	3.02E-03
4,4'-DDD	50%	1.50E-04	4.90E-03	8.76E-04	3.92	3.45E-03
4,4'-DDE	38%	1.50E-04	6.80E-03	1.84E-03	3.30	6.11E-03
4,4'-DDT	13%	4.20E-02	4.20E-02	7.92E-04	5.58	4.46E-03
alpha-BHC	63%	4.10E-04	2.50E-03	6.91E-04	2.58	1.79E-03
beta-BHC	88%	1.20E-04	2.00E-03	5.30E-04	2.54	1.35E-03
delta-BHC	100%	3.40E-04	2.30E-03	9.49E-04	2.08	1.98E-03
Dieldrin	13%	5.50E-03	5.50E-03	4.67E-04	3.17	1.49E-03
Endosulfan I	25%	5.20E-04	8.20E-03	8.64E-04	3.00	2.60E-03
Endrin aldehyde	63%	7.00E-04	2.40E-03	7.65E-04	2.33	1.79E-03
gamma-BHC (Lindane)	88%	1.30E-04	6.20E-03	5.52E-04	3.18	1.76E-03
gamma-Chlordane	25%	1.50E-03	1.60E-03	8.95E-04	1.94	1.74E-03
Heptachlor	25%	2.80E-04	8.60E-03	3.30E-04	3.95	1.31E-03
Hexachlorobenzene	25%	1.40E-04	9.90E-04	2.22E-04	2.28	5.08E-04
Mirex	100%	3.80E-04	1.30E-02	3.95E-03	3.52	1.40E-02
trans-Nonachlor	13%	7.10E-03	7.10E-03	6.52E-04	3.07	2.01E-03
PCBs						
PCB-8	13%	6.90E-03	6.90E-03	3.39E-04	3.84	1.31E-03
PCB-18	88%	6.00E-04	3.80E-03	1.41E-03	2.66	3.76E-03
PCB-28	13%	7.10E-03	7.10E-03	4.16E-04	3.62	1.51E-03
PCB-52	25%	4.30E-04	1.70E-02	8.78E-04	3.51	3.10E-03
PCB-101	100%	9.10E-04	2.30E-02	6.27E-03	3.06	1.93E-02
PCB-105	38%	1.50E-03	5.10E-03	6.27E-04	3.63	2.29E-03
PCB-118	50%	6.90E-04	1.70E-03	1.23E-03	1.83	2.26E-03
PCB-126	13%	9.70E-03	9.70E-03	6.27E-04	3.49	2.20E-03
PCB-128	38%	3.20E-04	7.90E-03	8.59E-04	3.00	2.59E-03
PCB-138	88%	3.10E-03	8.80E-03	4.56E-03	2.06	9.43E-03
PCB-153	88%	3.30E-03	1.60E-02	7.50E-03	2.13	1.60E-02
PCB-170	100%	6.60E-04	4.90E-03	2.60E-03	1.88	4.91E-03
PCB-180	100%	2.40E-03	1.70E-02	7.03E-03	1.78	1.26E-02
PCB-187	88%	3.20E-03	2.50E-02	6.97E-03	2.88	2.02E-02
PCB-195	100%	3.90E-04	5.30E-03	1.63E-03	2.31	3.78E-03
PCB-206	100%	4.50E-04	9.40E-03	2.28E-03	3.27	7.51E-03
PCB-209	100%	4.10E-03	6.40E-02	1.31E-02	2.45	3.22E-02

Table 7-23
SUMMARY STATISTICS FOR CPECs IN
SEA URCHINS (*Echinometra mathaei*)
AT THE INNER HARBOR SITES

Analyte	Frequency of Detection	Minimum Detection mg/kg	Maximum Detection mg/kg	Mean mg/kg	Standard Deviation mg/kg	$EC_{(a)}$ mg/kg
Pesticides						
2,4'-DDD	75%	3.90E-04	8.90E-04	3.84E-04	2.30	8.89E-04
2,4'-DDE	13%	1.20E-04	1.20E-04	8.20E-05	1.35	1.11E-04
2,4'-DDT	25%	2.10E-04	3.30E-04	8.01E-05	2.20	1.77E-04
4,4'-DDD	13%	2.50E-03	2.50E-03	2.88E-04	2.48	7.17E-04
4,4'-DDE	88%	5.10E-04	1.80E-03	7.18E-04	1.68	1.21E-03
4,4'-DDT	13%	1.60E-04	1.60E-04	8.39E-05	1.43	1.20E-04
alpha-BHC	25%	7.30E-05	2.70E-04	6.41E-05	1.91	1.23E-04
beta-BHC	13%	4.50E-04	4.50E-04	5.40E-05	2.44	1.32E-04
delta-BHC	13%	3.90E-04	3.90E-04	4.27E-05	2.59	1.11E-04
Endosulfan I	13%	1.70E-03	1.70E-03	1.49E-04	2.76	4.12E-04
Endrin	50%	6.40E-05	1.40E-04	5.13E-05	1.87	9.62E-05
gamma-BHC (Lindane)	63%	4.60E-05	5.50E-04	7.21E-05	2.36	1.71E-04
gamma-Chlordane	13%	2.80E-04	2.80E-04	1.50E-04	1.43	2.15E-04
Hexachlorobenzene	13%	5.20E-05	5.20E-05	3.53E-05	1.35	4.77E-05
Mirex	38%	8.90E-05	1.20E-03	9.57E-05	3.33	3.21E-04
trans-Nonachlor	13%	1.60E-03	1.60E-03	1.06E-04	3.08	3.29E-04
PCBs						
PCB-8	25%	6.90E-05	2.60E-04	5.39E-05	2.29	1.24E-04
PCB-18	50%	1.80E-04	3.40E-04	1.25E-04	2.56	3.20E-04
PCB-28	13%	6.50E-05	6.50E-05	4.92E-05	1.67	8.22E-05
PCB-52	100%	1.30E-04	3.10E-03	3.19E-04	2.63	8.42E-04
PCB-101	88%	7.30E-04	1.20E-03	8.35E-04	1.97	1.65E-03
PCB-105	75%	2.50E-04	6.50E-04	2.80E-04	2.39	6.72E-04
PCB-118	88%	6.70E-04	1.10E-03	7.34E-04	1.79	1.31E-03
PCB-128	100%	2.20E-04	4.70E-04	3.44E-04	1.28	4.40E-04
PCB-138	100%	3.50E-03	5.30E-03	4.35E-03	1.18	5.13E-03
PCB-153	100%	4.50E-03	7.30E-03	5.43E-03	1.19	6.44E-03
PCB-170	100%	2.10E-04	5.60E-04	2.98E-04	1.40	4.17E-04
PCB-180	100%	6.20E-04	1.20E-03	8.22E-04	1.27	1.04E-03
PCB-187	88%	2.60E-03	4.20E-03	2.10E-03	3.06	6.46E-03
PCB-195	100%	5.80E-05	8.20E-04	1.22E-04	2.26	2.77E-04
PCB-206	88%	5.90E-05	1.20E-03	1.05E-04	2.76	2.91E-04
PCB-209	100%	2.20E-04	8.60E-03	4.89E-04	3.25	1.60E-03

Table 7-24
SUMMARY STATISTICS FOR CPECs IN HERBIVOROUS FISH (*Stegastes fasciolatus*) AT THE INNER HARBOR SITES

Analyte	Frequency of Detection	Minimum Detection mg/kg	Maximum Detection mg/kg	Mean mg/kg	Standard Deviation mg/kg	$EC_{(a)}$ mg/kg
Pesticides						
2,4'-DDD	100%	6.30E-03	1.30E-02	8.75E-03	1.27	1.11E-02
2,4'-DDE	88%	1.10E-03	2.40E-03	1.14E-03	2.49	2.84E-03
2,4'-DDT	75%	3.60E-03	9.90E-03	1.99E-03	7.29	1.47E-02
4,4'-DDD	100%	3.60E-03	1.90E-02	6.85E-03	1.79	1.23E-02
4,4'-DDE	100%	3.60E-02	1.20E-01	5.57E-02	1.63	9.11E-02
4,4'-DDT	100%	1.80E-03	1.70E-02	5.34E-03	2.15	1.15E-02
alpha-BHC	88%	2.10E-04	5.50E-04	3.25E-04	1.91	6.24E-04
alpha-Chlordane	13%	2.70E-04	2.70E-04	1.60E-04	1.44	2.30E-04
Endrin	25%	2.90E-03	6.10E-03	1.66E-04	7.57	1.27E-03
gamma-BHC (Lindane)	50%	4.60E-04	1.90E-03	2.34E-04	4.65	1.10E-03
gamma-Chlordane	75%	1.20E-04	2.10E-04	2.03E-04	1.64	3.33E-04
Heptachlor	13%	7.20E-04	7.20E-04	6.02E-05	3.18	1.92E-04
Heptachlor epoxide	13%	1.40E-04	1.40E-04	9.63E-05	1.40	1.35E-04
Hexachlorobenzene	100%	4.20E-04	1.50E-03	6.55E-04	1.60	1.05E-03
Mirex	100%	3.40E-04	3.00E-03	9.11E-04	2.35	2.15E-03
trans-Nonachlor	100%	1.10E-03	1.00E-02	2.62E-03	2.41	6.35E-03
PCBs						
PCB-8	100%	1.60E-03	4.20E-03	2.76E-03	1.34	3.71E-03
PCB-18	38%	8.20E-04	1.60E-03	2.51E-04	3.87	9.76E-04
PCB-28	100%	2.00E-03	2.60E-03	2.28E-03	1.11	2.52E-03
PCB-44	88%	9.20E-04	2.30E-03	7.97E-04	3.07	2.46E-03
PCB-52	100%	3.70E-03	1.30E-02	5.33E-03	1.52	8.14E-03
PCB-66	100%	1.90E-03	8.10E-03	3.75E-03	1.53	5.73E-03
PCB-101	100%	1.90E-02	6.60E-02	3.52E-02	1.68	5.92E-02
PCB-105	100%	5.10E-03	1.70E-02	8.30E-03	1.51	1.26E-02
PCB-118	100%	1.80E-02	6.50E-02	3.10E-02	1.74	5.42E-02
PCB-128	100%	6.70E-03	1.80E-02	9.82E-03	1.42	1.40E-02
PCB-138	100%	8.10E-02	2.80E-01	1.53E-01	1.56	2.39E-01
PCB-153	100%	1.50E-01	5.60E-01	2.92E-01	1.60	4.67E-01
PCB-170	100%	5.10E-02	1.90E-01	1.01E-01	1.61	1.63E-01
PCB-180	100%	1.20E-01	8.20E-01	2.76E-01	1.90	5.27E-01
PCB-187	100%	6.60E-02	7.10E-01	1.62E-01	2.13	3.45E-01
PCB-195	100%	9.60E-03	2.10E-01	2.77E-02	2.63	7.32E-02
PCB-206	100%	1.70E-02	1.80E+00	4.80E-02	4.67	2.26E-01
PCB-209	100%	3.90E-02	3.20E+00	9.57E-02	4.30	4.14E-01

Table 7-25
TOXIC EQUIVALENCY FACTORS (TEFs) FOR CALCULATING TOXIC EQUIVALENTS TO 2,3,7,8 TETRACHLORO DIBENZODIOXIN (TCDD) FOR PCB CONGENERS AND AROCLORS FOR MAMMALS AND BIRDS

PCBs	TEF_m [1]	TEF_b [2]
PCB-8 (2,4')	0.00002	0.00002
PCB-18 (2,2',5)	0.00002	0.00002
PCB-28 (2,4,4')	0.00002	0.00002
PCB-44 (2,2',3,5')	0.00002	0.00002
PCB-52 (2,2',5,5')	0.00002	0.00002
PCB-66 (2,3',4,4')	0.00002	0.00002
PCB-77 (3,3',4,4')	0.01	0.02
PCB-101 (2,2',3,5,5')	0.00002	0.00002
PCB-105 (2,3,3',4,4')	0.001	0.00005
PCB-118 (2,3',4,4',5)	0.001	0.000004
PCB-126 (3,3',4,4',5)	0.1	0.1
PCB-128 (2,2',3,3',4,4')	0.00002	0.00002
PCB-138 (2,2',3,4,4',5')	0.00002	0.00002
PCB-153 (2,2',4,4',5,5')	0.00002	0.00002
PCB-170 (2,2',3,3',4,4',5)	0.00002	0.00002
PCB-180 (2,2',3,4,4',5,5')	0.00002	0.00002
PCB-187 (2,2',3,4',5,5',6)	0.00002	0.00002
PCB-195 (2,2',3,3',4,4',5,6)	0.00002	0.00002
PCB-206 (2,2',3,3',4,4',5,5',6)	0.00002	0.00002
PCB-209 (2,2',3,3',4,4',5,5',6,6')	0.00002	0.00002
Aroclor 1254	0.00002	0.00002
Aroclor 1260	0.00002	0.00002

1. Toxic Equivalency Factors for PCB congeners for mammals from Safe, S. 1990. Polychlorinated Biphenyls (PCBs), Dibenzo-p-Dioxins (PCDDs), Dibenzofurans (PCDFs) and related Compounds: Environmental and Mechanistic Considerations Which Support the Development of Toxic Equivalent Factors (TEFs). *Toxicology* 21 (1) 51-88.

2. Toxic Equivalency Factors for PCB congeners for birds from Bosveld, A., J. Gradener, A. Murk, A. Brouwer, M. van Kampen, E. Evers, and M Van den Berg. 1995. Effects of PCDDs, PCDFs, and PCBs in common tern (*Sterna hirundo*) breeding in estuarine and coastal colonies in the Netherlands and Belgium. *Environmental Toxicology and Chemistry* 14 (1) 99-115.

Table 7-26
PARAMETERS FOR TARGET RECEPTOR EXPOSURE ESTIMATION

Parameter	Description	Value	Units	Reference
BONIN PETREL (Representative burrowing bird)				
W_{bb}	Mean weights of adult Bonin petrel	0.176	kg	Pettit et. al. 1984
R_{bb}	Calculated food intake rate for adult Bonin petrel	0.0188	kg/d	EPA 1993
SA_{bb}	Calculated surface area of the adult Bonin petrel	314.6	cm^2	EPA 1993
Ψ_{bb}	Seasonality of adult Bonin petrel (fraction of the year spent on Midway by any one adult).	0.44	unitless	USFWS 1991
θ_{bb}	Area use factor for burrowing birds, both species (fraction of time on Midway spent onsite, assumed 100%)	1.0	unitless	Professional judgement and field observations
F_{bb}	Fraction of soil in burrowing bird diet, both species (assumed equivalent to mallard % soil in diet, dry weight))	0.02	unitless	Professional judgement and EPA 1993
IR_{bb}	Calculated inhalation rate for adult Bonin petrel	0.107	m^3/d	EPA 1993
B_{bb}	Fraction of day spent in burrow, both species (assumed all day)	1.0	unitless	Professional judgement
GREEN SEA TURTLE				
W_{st}	Mean weight of the adult green sea turtle at sexual maturity, 25 years	115	kg	Balazs et. al. 1987 Kridler 1985
R_{st}	Calculated food intake rate for the adult green sea turtle	0.343	kg/d	EPA 1993
Ψ_{st}	Seasonality of the green sea turtle (fraction of the year spent on Midway assumed 100%).	1.0	unitless	Professional judgement

Table 7-26 (continued)
PARAMETERS FOR TARGET RECEPTOR EXPOSURE ESTIMATION

Parameter	Description	Value	Units	Reference
θ_{st}	Area use factor for the green sea turtle (fraction of time on Midway spent onsite assumed 100%)	1.0	unitless	Professional judgement
F_{st}	Fraction of algae and seagrass in diet of green sea turtle (assume 100%)	1.0	unitless	Professional judgement
HAWAIIAN MONK SEALS				
W_{ms}	Mean weight of the adult female monk seal	205	kg	Ragen 1994
R_{ms}	Calculated food intake rate for the adult female monk seal	5.46	kg/d	EPA 1993
Ψ_{ms}	Seasonality of the female monk seal (fraction of the year spent on Sand and/or Eastern Islands)	0.5	unitless	Professional judgement
F_{ms}	Fraction of fish in diet of monk seals (assume 100%)	1.0	unitless	Professional judgement
θ_{ms}	Area use factor for the monk seal (fraction of time on Midway spent onsite assumed 50%)	0.5	unitless	Professional judgement

Table 7-27
ENVIRONMENTAL CONCENTRATIONS (ECs) AND APPLIED DAILY DOSES (ADDs)
FOR BURROWING BIRDS AT THE BULKY WASTE LANDFILL

CPEC	$EC_{(p)}$ mg/kg	$EC_{(a)}$ mg/kg	$EC_{(d)}$ mg/kg	$ADD_{(p)}$ mg/kg-d	$ADD_{(a)}$ mg/kg-d	$ADD_{(d)}$ mg/kg-d
Semi-volatile Organics						
Acenaphthene	2.60	0.30	0.66	0.770	0.089	0.195
Anthracene	4.10	0.34	0.73	1.215	0.101	0.215
Benzo(a)Anthracene	11.00	0.49	1.31	3.260	0.146	0.387
Benzo(a)Pyrene	8.60	0.46	1.01	2.548	0.138	0.298
Benzo(b)Fluoranthene	8.50	0.44	0.99	2.519	0.129	0.293
Benzo(g,h,i)perylene	0.52	0.26	0.42	0.237	0.077	0.126
Benzo(k)Fluoranthene	6.50	0.46	1.20	1.926	0.137	0.356
Carbazole	2.50	0.30	0.64	0.741	0.088	0.190
Chrysene	10.00	0.55	1.48	2.963	0.164	0.438
Dibenz(a,h)Anthracene	1.30	0.28	0.51	0.385	0.083	0.150
Fluoranthene	19.00	0.71	2.03	5.630	0.209	0.602
Fluorene	1.90	0.30	0.69	0.563	0.088	0.205
Indeno(1,2,3-cd)pyrene	2.30	0.31	0.56	0.682	0.092	0.166
Phenanthrene	15.00	0.49	1.07	4.445	0.146	0.317
Pyrene	19.00	0.75	1.38	5.630	0.221	0.416
Pesticides						
4,4'-DDD	0.40	0.04	0.03	0.119	0.013	0.008
4,4'-DDE	0.48	0.13	0.11	0.142	0.039	0.032
4,4'-DDT	0.89	0.09	0.07	0.264	0.027	0.021
Aldrin	0.18	0.01	0.01	0.053	0.004	0.002
alpha-Chlordane	0.47	0.03	0.02	0.139	0.008	0.007
Dieldrin	0.36	0.03	0.02	0.107	0.010	0.005
Endosulfan II	0.36	0.03	0.02	0.107	0.009	0.006
Endrin	0.36	0.03	0.02	0.107	0.010	0.005
Endrin aldehyde	0.37	0.04	0.02	0.110	0.012	0.006
gamma-Chlordane	0.50	0.03	0.01	0.148	0.007	0.001
PCBs						
TCDD/TEQ	3.87E-04	2.8E-05	2.4E-07	1.15E-04	8.3E-06	7.0E-08

$EC_{(p)}$ = Environmental concentration calculated as the maximum detected concentration

$EC_{(a)}$ = Environmental concentration calculated as the upper 95% confidence interval (UCL)

$EC_{(d)}$ = Environmental concentration using the 95th percentile of the distribution of the data set of the EC value

$ADD_{(p)}$ = Applied daily dose (ADD) calculated using the EC(p)

$ADD_{(a)}$ = Applied daily dose (ADD) calculated using the EC(a)

$ADD_{(d)}$ = 95th percentile of the ADD calculated using the EC(d) distribution

Table 7-28
ENVIRONMENTAL CONCENTRATIONS (ECs) AND EXPOSURE POINT VALUES (EPVs) FOR BENTHIC INVERTEBRATES AT THE LANDFILLS SITE

CPEC	$EC_{(a)}$ mg/kg	$EC_{(d)}$ mg/kg	$EPV_{(a)}$ mg/kg-d	$EPV_{(d)}$ mg/kg-d
Pesticides				
2,4'-DDD	9.08E-04	2.54E-06	6.89E-07	1.93E-09
2,4'-DDE	1.14E-04	1.10E-06	1.68E-07	1.62E-09
2,4'-DDT	5.02E-04	4.46E-06	4.28E-07	3.80E-09
4,4'-DDD	1.78E-03	2.98E-05	1.35E-06	2.26E-08
4,4'-DDE	1.90E-03	2.98E-05	2.82E-06	4.41E-08
4,4'-DDT	7.25E-04	6.29E-06	6.18E-07	5.35E-09
alpha-BHC	1.96E-05	5.21E-07	2.46E-06	6.56E-08
gamma-BHC (Lindane)	2.10E-05	8.16E-07	2.59E-06	1.00E-07
alpha-Chlordane	1.86E-04	1.41E-06	1.51E-07	1.15E-09
gamma-Chlordane	1.60E-04	8.33E-07	1.30E-07	6.77E-10
Dieldrin	7.89E-05	8.44E-07	3.07E-06	3.28E-08
trans-Nonachlor	1.10E-04	7.25E-07	DG	DG
PCBs				
TCDD/TEQ	8.66E-06	5.66E-08	2.94E-08	1.92E-10

$EC_{(a)}$ = Environmental concentration calculated as the upper 95% confidence interval (UCL)
$EC_{(d)}$ = Environmental concentration using the 95th percentile of the data set
$EPV_{(a)}$ = Exposure point value (EPV) calculated using the $EC_{(a)}$
$EPV_{(d)}$ = 95th percentile of the EPV calculated using the $EC_{(d)}$ distribution
DG = Data Gap

Table 7-29
ENVIRONMENTAL CONCENTRATIONS (ECs) AND APPLIED DAILY DOSES (ADDs) FOR GREEN SEA TURTLES AT THE LANDFILLS SITE

CPEC	$EC_{(a)}$ mg/kg	$EC_{(d)}$ mg/kg	$ADD_{(a)}$ mg/kg-d	$ADD_{(d)}$ mg/kg-d
Pesticides				
2,4'-DDD	6.28E-03	2.11E-04	9.36E-06	3.15E-07
2,4'-DDT	7.15E-04	3.10E-05	1.06E-06	4.62E-08
4,4'-DDD	5.27E-03	5.56E-04	7.85E-06	8.28E-07
4,4'-DDE	7.75E-03	5.80E-04	1.15E-05	8.64E-07
4,4'-DDT	1.64E-03	7.00E-05	2.44E-06	1.04E-07
alpha-BHC	7.81E-04	3.92E-05	1.16E-06	5.83E-08
beta-BHC	4.61E-04	1.58E-05	6.86E-07	2.36E-08
delta-BHC	5.41E-04	2.24E-05	8.06E-07	3.33E-08
gamma-BHC (Lindane)	9.46E-04	2.12E-05	1.41E-06	3.16E-08
alpha-Chlordane	7.52E-04	3.35E-05	1.12E-06	4.99E-08
gamma-Chlordane	1.82E-03	1.94E-04	2.71E-06	2.89E-07
Dieldrin	9.30E-04	2.96E-05	1.38E-06	4.41E-08
Endosulfan II	1.84E-03	6.94E-05	2.74E-06	1.03E-07
Endosulfan sulfate	6.31E-04	4.62E-05	9.40E-07	6.89E-08
Endrin	9.09E-04	1.99E-05	1.35E-06	2.96E-08
Endrin aldehyde	9.58E-04	2.93E-05	1.43E-06	4.37E-08
Heptachlor	4.15E-04	1.12E-05	6.18E-07	1.67E-08
Heptachlor epoxide	5.27E-04	3.11E-05	7.85E-07	4.64E-08
Hexachlorobenzene	6.48E-04	1.21E-05	9.66E-07	1.81E-08
Methoxychlor	3.23E-04	1.97E-05	4.81E-07	2.93E-08
Mirex	4.17E-03	4.32E-04	6.21E-06	6.44E-07
trans-Nonachlor	5.28E-04	3.50E-05	7.87E-07	5.22E-08
PCBs				
TCDD/TEQ	3.60E-04	2.87E-06	5.36E-07	4.28E-09

$EC_{(a)}$ = Environmental concentration calculated as the upper 95% confidence interval (UCL)

$EC_{(d)}$ = Environmental concentration using the 95th percentile of the distribution of the data set

$ADD_{(a)}$ = Applied daily dose (ADD) calculated using the $EC_{(a)}$.

$ADD_{(d)}$ = 95th percentile of the ADD calculated using the $EC_{(d)}$ distribution

Table 7-30
ENVIRONMENTAL CONCENTRATIONS (ECs) AND APPLIED DAILY DOSES (ADDs) FOR GREEN SEA TURTLES AT THE INNER HARBOR

CPEC	$EC_{(a)}$ mg/kg	$EC_{(d)}$ mg/kg	$ADD_{(a)}$ mg/kg-d	$ADD_{(d)}$ mg/kg-d
Pesticides				
2,4'-DDD	3.59E-03	3.03E-04	5.35E-06	4.51E-07
2,4'-DDT	3.02E-03	1.19E-04	4.50E-06	1.77E-07
4,4'-DDD	3.45E-03	1.00E-04	5.14E-06	1.50E-07
4,4'-DDE	6.11E-03	4.54E-04	9.11E-06	6.77E-07
4,4'-DDT	4.46E-03	1.14E-04	6.64E-06	1.70E-07
alpha-BHC	1.79E-03	8.02E-05	2.66E-06	1.20E-07
beta-BHC	1.35E-03	6.25E-05	2.02E-06	9.32E-08
delta-BHC	1.98E-03	1.83E-04	2.95E-06	2.72E-07
gamma-BHC (Lindane)	1.76E-03	9.25E-05	2.62E-06	1.38E-07
gamma-Chlordane	1.74E-03	1.60E-04	2.59E-06	2.39E-07
Dieldrin	1.49E-03	4.87E-05	2.21E-06	7.26E-08
Endosulfan I	2.60E-03	1.73E-04	3.87E-06	2.58E-07
Endrin aldehyde	1.79E-03	1.12E-04	2.67E-06	1.67E-07
Heptachlor	1.31E-03	2.53E-05	1.95E-06	3.77E-08
Hexachlorobenzene	5.08E-04	1.59E-05	7.57E-07	2.37E-08
Mirex	1.40E-02	1.22E-03	2.08E-05	1.82E-06
trans-Nonachlor	2.01E-03	1.11E-04	3.00E-06	1.66E-07
PCBs				
TCDD/TEQ	2.53E-04	2.50E-06	3.76E-07	3.73E-09

$EC_{(a)}$ = Environmental concentration calculated as the upper 95% confidence interval (UCL)
$EC_{(d)}$ = Environmental concentration using the 95th percentile of the distribution of the data set
$ADD_{(a)}$ = Applied daily dose (ADD) calculated using the $EC_{(a)}$.
$ADD_{(d)}$ = 95th percentile of the ADD calculated using the $EC_{(d)}$ distribution

Table 7-31
ENVIRONMENTAL CONCENTRATIONS (ECs) AND APPLIED DAILY DOSES (ADDs) FOR MONK SEALS AT THE LANDFILLS SITE

CPEC	$ECa_{(fish)}$ mg/kg	$EC_{a(inv)}$ mg/kg	$EC_{d(fish)}$ mg/kg	$EC_{d(inv)}$ mg/kg	$ADD_{(a)}$ mg/kg-d	$ADD_{(d)}$ mg/kg-d
Pesticides						
2,4'-DDD	1.02E-02	7.38E-04	7.25E-04	2.98E-05	7.25E-05	6.37E-06
2,4'-DDE	1.96E-03	3.49E-04	7.00E-05	1.53E-05	1.54E-05	7.01E-07
2,4'-DDT	2.01E-03	3.91E-04	3.65E-05	1.31E-05	1.60E-05	5.82E-07
4,4'-DDD	8.42E-03	8.33E-04	1.15E-03	1.01E-04	6.16E-05	8.59E-06
4,4'-DDE	5.73E-02	2.89E-03	2.00E-02	5.52E-04	4.01E-04	1.33E-04
4,4'-DDT	8.03E-03	5.05E-04	8.52E-04	2.47E-05	5.68E-05	5.68E-06
alpha-BHC	5.29E-04	2.01E-04	5.02E-05	6.50E-06	4.86E-06	4.57E-07
beta-BHC	1.35E-04	1.39E-04	8.10E-06	2.90E-06	1.83E-06	9.65E-08
gamma-BHC (Lindane)	1.39E-03	1.64E-04	1.08E-04	8.00E-06	1.04E-05	1.01E-06
alpha-Chlordane	1.51E-03	2.81E-04	9.89E-05	1.06E-05	1.19E-05	8.18E-07
gamma-Chlordane	6.13E-04	4.94E-04	1.22E-04	2.81E-05	7.37E-06	1.27E-06
Endrin	1.85E-04	2.32E-04	4.70E-06	3.90E-06	2.78E-06	1.24E-07
Heptachlor	9.25E-05	1.12E-04	4.20E-06	1.70E-06	1.36E-06	7.53E-08
Heptachlor epoxide	2.64E-04	1.73E-04	1.34E-05	7.10E-06	2.91E-06	1.97E-07
Hexachlorobenzene	5.32E-04	1.09E-04	7.03E-05	1.30E-06	4.27E-06	5.23E-07
Mirex	1.73E-03	3.69E-04	1.14E-04	1.15E-05	1.40E-05	8.11E-07
trans-Nonachlor	3.69E-03	2.52E-04	3.25E-04	1.05E-05	2.62E-05	2.22E-06
PCBs						
TCDD/TEQ	2.12E-04	3.19E-05	2.70E-06	6.00E-07	1.62E-06	3.60E-08

$EC_{a(fish)}$ = Environmental concentration calculated as the upper 95% confidence interval (UCL) for all fish collected

$EC_{a(inv)}$ = Environmental concentration calculated as the upper 95% confidence interval (UCL) for all invertebrates collected

$EC_{d(fish)}$ = Environmental concentration using the 95 percentile of the data set for all fish collected

$EC_{d(inv)}$ = Environmental concentration using the 95th percentile of the data set for all invertebrates collected

$ADD_{(a)}$ = Applied daily dose (ADD) calculated using the $EC_{(a)}$.

$ADD_{(d)}$ = 95th percentile of the ADD calculated using the $EC_{(d)}$ distribution

Table 7-32
ENVIRONMENTAL CONCENTRATIONS (ECs) AND APPLIED DAILY DOSES (ADDs) FOR MONK SEALS AT THE INNER HARBOR

CPEC	$EC_{a(fish)}$ mg/kg	$EC_{a(inv)}$ mg/kg	$EC_{d(fish)}$ mg/kg	$EC_{d(inv)}$ mg/kg	$ADD_{(a)}$ mg/kg-d	$ADD_{(d)}$ mg/kg-d
Pesticides						
2,4'-DDD	1.11E-02	8.89E-04	3.51E-03	6.28E-05	8.00E-05	2.34E-05
2,4'-DDE	2.84E-03	1.11E-04	2.59E-04	4.52E-06	1.96E-05	1.73E-06
2,4'-DDT	1.47E-02	1.77E-04	3.06E-04	4.95E-06	9.89E-05	2.04E-06
4,4'-DDD	1.23E-02	7.17E-04	3.05E-03	2.67E-05	8.68E-05	2.03E-05
4,4'-DDE	9.11E-02	1.21E-03	5.62E-02	9.10E-05	6.15E-04	3.74E-04
4,4'-DDT	1.15E-02	1.20E-04	2.43E-03	5.24E-06	7.76E-05	1.62E-05
alpha-BHC	6.24E-04	1.23E-04	4.44E-05	2.86E-06	4.97E-06	4.06E-07
beta-BHC	9.80E-05	1.32E-04	4.12E-06	1.50E-06	1.53E-06	5.18E-08
delta-BHC	5.24E-05	1.11E-04	2.67E-06	3.06E-06	1.09E-06	6.26E-08
gamma-BHC (Lindane)	1.10E-03	1.71E-04	2.33E-05	3.19E-06	8.43E-06	3.30E-07
alpha-Chlordane	2.30E-04	9.95E-05	1.58E-05	3.74E-06	2.20E-06	1.64E-07
gamma-Chlordane	3.33E-04	2.15E-04	1.56E-05	9.97E-06	3.65E-06	2.64E-07
Endosulfan I	2.59E-04	4.12E-04	1.76E-05	6.42E-06	4.47E-06	2.77E-07
Endrin	1.27E-03	9.62E-05	1.08E-05	2.84E-06	9.07E-06	1.60E-07
Heptachlor	1.92E-04	3.49E-05	1.99E-06	7.21E-07	1.51E-06	2.87E-08
Heptachlor epoxide	1.35E-04	6.18E-05	4.32E-06	1.88E-06	1.31E-06	6.82E-08
Hexachlorobenzene	1.05E-03	4.77E-05	1.51E-04	9.97E-07	7.33E-06	1.01E-06
Mirex	2.15E-03	3.21E-04	1.51E-04	2.91E-06	1.65E-05	1.20E-06
trans-Nonachlor	6.35E-03	3.29E-04	1.24E-03	5.47E-06	4.45E-05	8.24E-06
PCBs						
TCDD/TEQ	1.46E-04	1.52E-05	4.25E-06	1.39E-07	1.08E-06	3.21E-08

$EC_{a(fish)}$ = Environmental concentration calculated as the upper 95% confidence interval (UCL) for all fish collected

$EC_{a(inv)}$ = Environmental concentration calculated as the upper 95% confidence interval (UCL) for all invertebrates collected

$EC_{d(fish)}$ = Environmental concentration using the 95th percentile of the data set for all fish collected

$EC_{d(inv)}$ = Environmental concentration using the 95th percentile of the data set for all invertebrates collected

$ADD_{(a)}$ = Applied daily dose (ADD) calculated using the $EC_{(a)}$ for fish and invertebrates.

$ADD_{(d)}$ = 95th percentile ADDs calculated with using the $EC_{(d)}$ for fish and invertebrates

Table 7-33

TOXICITY REFERENCE VALUES (TRVs) FOR BIRDS[1]

Contaminant of Potential Ecological Concern	BIRDS Test Species	Toxicity Endpoint	Toxicity Endpoint Value	Exposure Route	Endpoint Effect	Interspecies Uncertainty Factor 1	NOAEL Uncertainty Factor 4	Toxicity Reference Value	TRV Units	Reference
Semi-volatile Organics										
Acenaphthene	red-wing blackbird	LD50	101	oral (acute)	death	1	50	2.02	mg/kg/day	Schafer et.al. (1983)
Anthracene	red-wing blackbird	LD50	111	oral (acute)	death	1	50	2.22	mg/kg/day	Schafer et.al. (1983)
Benzo(a)Anthracene	rat	NOAEL	150	oral (acute)	N/A	10	1	15.00	mg/kg/day	ATSDR (1994)
Benzo(a)Pyrene	mouse	NOAEL	10	oral (acute)	N/A	10	1	1.00	mg/kg/day	ATSDR (1994)
Benzo(b)Fluoranthene	rat	LOAEL	40	oral (chronic)	cancer	10	10	0.40	mg/kg/day	Eisler (1987)
Benzo(g,h,i)perylene	mallard duck	LOAEL	4000	oral (intermed.)	hepatomegaly	1	10	400.00	mg/kg/day	value for Total PAH
Benzo(k)Fluoranthene	rat	LOAEL	72	oral (chronic)	cancer	10	10	0.72	mg/kg/day	Eisler (1987)
Carbazole	mouse	LD lo	500	oral (acute)	death	10	10	5.00	mg/kg/day	RTECS (1994)
Chrysene	rat	LOAEL	99	oral (chronic)	cancer	10	10	0.99	mg/kg/day	Eisler (1987)
Dibenz(a,h)Anthracene	mouse	NOAEL	10	oral (acute)	N/A	10	1	1.00	mg/kg/day	value for B(a)P
Fluoranthene	rat	NOAEL	150	oral (acute)	N/A	10	1	15.00	mg/kg/day	ATSDR (1994)
Fluorene	red-wing blackbird	LD50	101	oral (acute)	death	1	50	2.02	mg/kg/day	Schafer et.al. (1983)
Indeno(1,2,3-cd)pyrene	rat	LOAEL	72	oral (chronic)	cancer	10	10	0.72	mg/kg/day	Eisler (1987)
Phenanthrene	red-wing blackbird	LD50	113	oral (acute)	death	1	50	2.26	mg/kg/day	Schafer et.al. (1983)
Pyrene	mouse	NOAEL	75	oral (chronic)	N/A	10	1	7.50	mg/kg/day	IRIS (1994)
Pesticides										
4,4'-DDD	rat	NOAEL	85.0	oral	systemic	1	10	8.50	mg/kg/day	ATSDR, 1994; Table 2-1, item 67
4,4'-DDE	owl	LOAEL	0.4	oral	reproductive	10	1	0.04	mg/kg/day	Mendenhall et al. 1983
4,4'-DDT	kestrel	LOAEL	3.0	oral	reproductive	10	1	0.30	mg/kg/day	Lincer, 1975
Aldrin	mallard	LD50	520	oral	death	1	50	10.40	mg/kg/day	USFWS (1984)
alpha-Chlordane	red-wing blackbird	NOAEL	2.14	oral	repro. failure	1	1	2.14	mg/kg/day	Sample et al. (1996)
Dieldrin	mallard	LD50	381	oral	death	1	50	7.62	mg/kg/day	USFWS (1984)
Endosulfan II	gray partridge	NOAEL	10	oral	repro. failure	1	1	10.00	mg/kg/day	Sample et al. (1996)
Endrin	mallard	LD50	5.64	oral	death	1	50	0.11	mg/kg/day	USFWS (1984)
Endrin aldehyde	mallard	LD50	5.64	oral	death	1	50	0.11	mg/kg/day	USFWS (1984)
gamma-Chlordane	red-wing blackbird	NOAEL	2.14	oral	repro. failure	1	1	2.14	mg/kg/day	Sample et al. (1996)
PCBs										
2,3,7,8-TCDD	ring-necked pheasant	NOAEL	0.000014	injection	repro. failure	1	1	1.40E-05	mg/kg/day	Sample et al. (1996)

1. See Appendix H for description of Uncertainty Factors and derrivation of numbers

LD50 = Lethal Dose to 50 percent of test individuals
LOAEL = Lowest Observed Adverse Effect Level
NOAEL = No Observed Adverse Effect Level

Table 7-34

TOXICITY REFERENCE VALUES (TRVs) FOR MAMMALS, REPTILES, AND INVERTEBRATES[1]

	MAMMALS									
Contaminant of Potential Ecological Concern	Test Species	Toxicity Endpoint	Toxicity Endpoint Value	Exposure Route	Endpoint Effect	Interspecies Uncertainty Factor 1	NOAEL Uncertainty Factor 4	Toxicity Reference Value	TRV Units	Reference
2,4'-DDD	rat	NOAEL	85	oral	systemic	1	1	8.50E+01	mg/kg/day	ATSDR (1994); Table 2-1, item 67
2,4'-DDE	rat	NOAEL	23	oral	systemic	1	1	2.30E+01	mg/kg/day	ATSDR (1994); Table 2-1, item 64
2,4'-DDT	rat	NOAEL	16	oral	systemic	1	1	1.60E+01	mg/kg/day	ATSDR (1994); Table 2-1, item 66
4,4'-DDD	rat	NOAEL	85	oral	systemic	1	1	8.50E+01	mg/kg/day	ATSDR (1994); Table 2-1, item 67
4,4'-DDE	rat	NOAEL	23	oral	systemic	1	1	2.30E+01	mg/kg/day	ATSDR (1994); Table 2-1, item 64
4,4'-DDT	rat	NOAEL	16	oral	systemic	1	1	1.60E+01	mg/kg/day	ATSDR (1994); Table 2-1, item 66
aldrin	rat	NOAEL	0.2	oral	reproductive	1	1	2.00E-01	mg/kg/day	Sample et al. (1996)
alpha-BHC	rat	NOAEL	1.6	oral	reproductive	1	1	1.60E+00	mg/kg/day	Sample et al. (1996); mixed isomers
alpha-chlordane	mouse	NOAEL	4.58	oral	reproductive	1	1	4.58E+00	mg/kg/day	Sample et al. (1996)
beta-BHC	rat	NOAEL	0.4	oral	reproductive	1	1	4.00E-01	mg/kg/day	Sample et al. (1996)
delta-BHC	rat	NOAEL	1.6	oral	reproductive	1	1	1.60E+00	mg/kg/day	Sample et al. (1996); mixed isomers
dieldrin	rat	NOAEL	0.02	oral	reproductive	1	1	2.00E-02	mg/kg/day	Sample et al. (1996)
endosulfan	rat	NOAEL	0.15	oral	reproductive	1	1	1.50E-01	mg/kg/day	Sample et al. (1996)
endosulfan sulfate	rat	LD50	18	oral	death	1	50	3.60E-01	mg/kg/day	RTECS (1994)
endrin	mouse	NOAEL	0.092	oral	reproductive	1	1	9.20E-02	mg/kg/day	Sample et al. (1996)
endrin aldehyde	mouse	NOAEL	0.092	oral	reproductive	1	1	9.20E-02	mg/kg/day	value for endrin
gamma-BHC	rat	NOAEL	8	oral	reproductive	1	1	8.00E+00	mg/kg/day	Sample et al. (1996)
gamma-chlordane	mouse	NOAEL	4.58	oral	reproductive	1	1	4.58E+00	mg/kg/day	Sample et al. (1996)
hepatachlor	mink	NOAEL	0.1	oral	reproductive	1	1	1.00E-01	mg/kg/day	Sample et al. (1996)
heptachlor epox.	mink	NOAEL	0.1	oral	reproductive	1	1	1.00E-01	mg/kg/day	value for heptachlor
Hexachlorobenzene	rat	NOAEL	32	oral	systemic	1	1	3.20E+01	mg/kg/day	ATSDR (1994); Tbl 2-2; item 62
methoxychlor	rat	NOAEL	4	oral	reproductive	1	1	4.00E+00	mg/kg/day	Sample et al. (1996)
mirex	rat	LD50	300	oral	death	1	50	6.00E+00	mg/kg/day	Verschueren (1983)
trans-nonachlor	rat	LD50	500	oral	death	1	50	1.00E+01	mg/kg/day	RTECS (1994)
2,3,7,8-TCDD	rat	NOAEL	0.000001	oral	reproductive	1	1	1.00E-06	mg/kg/day	Sample et al. (1996)

Table 7-34

TOXICITY REFERENCE VALUES (TRVs) FOR MAMMALS, REPTILES, AND INVERTEBRATES[1]

	REPTILES									
Contaminant of Potential Ecological Concern	Test Species	Toxicity Endpoint	Toxicity Endpoint Value	Exposure Route	Endpoint Effect	Interspecies Uncertainty Factor I	NOAEL Uncertainty Factor 4	Toxicity Reference Value	TRV Units	Reference
2,4'-DDD	rat	NOAEL	85	oral	systemic	10	1	8.50E+00	mg/kg/day	ATSDR (1994); Table 2-1, item 67
2,4'-DDE	rat	NOAEL	23	oral	systemic	10	1	2.30E+00	mg/kg/day	ATSDR (1994); Table 2-1, item 64
2,4'-DDT	rat	NOAEL	16	oral	systemic	10	1	1.60E+00	mg/kg/day	ATSDR (1994); Table 2-1, item 66
4,4'-DDD	rat	NOAEL	85	oral	systemic	10	1	8.50E+00	mg/kg/day	ATSDR (1994); Table 2-1, item 67
4,4'-DDE	rat	NOAEL	23	oral	systemic	10	1	2.30E+00	mg/kg/day	ATSDR (1994); Table 2-1, item 64
4,4'-DDT	rat	NOAEL	16	oral	systemic	10	1	1.60E+00	mg/kg/day	ATSDR (1994); Table 2-1, item 66
aldrin	rat	NOAEL	0.2	oral	reproductive	10	1	2.00E-02	mg/kg/day	Sample et al. (1996)
alpha-BHC	rat	NOAEL	1.6	oral	reproductive	10	1	1.60E-01	mg/kg/day	Sample et al. (1996); mixed isomers
alpha-chlordane	mouse	NOAEL	4.58	oral	reproductive	10	1	4.58E-01	mg/kg/day	Sample et al. (1996)
beta-BHC	rat	NOAEL	0.4	oral	reproductive	10	1	4.00E-02	mg/kg/day	Sample et al. (1996)
delta-BHC	rat	NOAEL	1.6	oral	reproductive	10	1	1.60E-01	mg/kg/day	Sample et al. (1996); mixed isomers
dieldrin	rat	NOAEL	0.02	oral	reproductive	10	1	2.00E-03	mg/kg/day	Sample et al. (1996)
endosulfan	rat	NOAEL	0.15	oral	reproductive	10	1	1.50E-02	mg/kg/day	Sample et al. (1996)
endosulfan sulfate	rat	LD50	18	oral	death	10	50	3.60E-02	mg/kg/day	RTECS (1994)
endrin	mouse	NOAEL	0.092	oral	reproductive	10	1	9.20E-03	mg/kg/day	Sample et al. (1996)
endrin aldehyde	mouse	NOAEL	0.092	oral	reproductive	10	1	9.20E-03	mg/kg/day	value for endrin
gamma-BHC	rat	NOAEL	8	oral	reproductive	10	1	8.00E-01	mg/kg/day	Sample et al. (1996)
gamma-chlordane	mouse	NOAEL	4.58	oral	reproductive	10	1	4.58E-01	mg/kg/day	Sample et al. (1996)
hepatachlor	mink	NOAEL	0.1	oral	reproductive	10	1	1.00E-02	mg/kg/day	Sample et al. (1996)
heptachlor epox.	mink	NOAEL	0.1	oral	reproductive	10	1	1.00E-02	mg/kg/day	value for heptachlor
Hexachlorobenzene	rat	NOAEL	32	oral	systemic	10	1	3.20E+00	mg/kg/day	ATSDR (1994); Tbl 2-2; item 62
methoxychlor	rat	NOAEL	4	oral	reproductive	10	1	4.00E-01	mg/kg/day	Sample et al. (1996)
mirex	rat	LD50	300	oral	death	10	50	6.00E-01	mg/kg/day	Verschueren (1983)
trans-nonachlor	rat	LD50	500	oral	death	10	50	1.00E+00	mg/kg/day	RTECS (1994)
2,3,7,8-TCDD	ringed-neck	NOAEL	0.000014	oral	reproductive	10	1	1.40E-06	mg/kg/day	Sample et al. (1996)

Table 7-34

TOXICITY REFERENCE VALUES (TRVs) FOR MAMMALS, REPTILES, AND INVERTEBRATES[1]

Contaminant of Potential Ecological Concern	INVERTEBRATES Test Species	Toxicity Endpoint	Toxicity Endpoint Value	Exposure Route	Endpoint Effect	Interspecies Uncertainty Factor 1	NOAEL Uncertainty Factor 4	Toxicity Reference Value	TRV Units	Reference
2,4'-DDD	fw species	NAWQC	4.20e-07			1	1	4.20e-07	mg/L	Suter et. al. 1992
2,4'-DDE	marine species	NAWQC	1.00e-06			1	1	1.00e-06	mg/L	DDT total
2,4'-DDT	marine species	NAWQC	1.00e-06			1	1	1.00e-06	mg/L	NAWQC
4,4'-DDD	fw species	NAWQC	4.20e-07			1	1	4.20e-07	mg/L	Suter et. al. 1992
4,4'-DDE	marine species	NAWQC	1.00e-06			1	1	1.00e-06	mg/L	DDT total
4,4'-DDT	marine species	NAWQC	1.00e-06			1	1	1.00e-06	mg/L	NAWQC
aldrin								DG		
alpha-BHC	fw species	NAWQC	2.40e-04			1	1	2.40e-04	mg/L	Suter et. al. 1992
alpha-chlordane	marine species	NAWQC	4.00e-06			1	1	4.00e-06	mg/L	NAWQC (total chlordane)
beta-BHC	fw species	NAWQC	2.40e-04			1	1	2.40e-04	mg/L	Suter et al 1992 (BHC)
delta-BHC	fw species	NAWQC	2.40e-04			1	1	2.40e-04	mg/L	Suter et. al. 1992
dieldrin	marine species	NAWQC	1.90e-06			1	1	1.90e-06	mg/L	NAWQC
endosulfan	marine species	NAWQC	8.70e-06			1	1	8.70e-06	mg/L	NAWQC (total endosulfan)
endosulfan sulfate	marine species	NAWQC	8.70e-06			1	1	8.70e-06	mg/L	NAWQC (total endosulfan)
endrin	marine species	NAWQC	2.30e-06			1	1	2.30e-06	mg/L	NAWQC
endrin aldehyde	marine species	NAWQC	2.30e-06			1	1	2.30e-06	mg/L	NAWQC (endrin)
gamma-BHC	fw species	NAWQC	8.00e-05			1	1	8.00e-05	mg/L	Suter et al. 1992
gamma-chlordane	marine species	NAWQC	4.00e-06			1	1	4.00e-06	mg/L	NAWQC (total chlordane)
hepatachlor	marine species	NAWQC	3.60e-06			1	1	3.60e-06	mg/L	NAWQC
heptachlor epox.	marine species	NAWQC	3.60e-06			1	1	3.60e-06	mg/L	NAWQC (heptachlor)
Hexachlorobenzene								DG		
methoxychlor	marine species	NAWQC	3.00e-05			1	1	3.00e-05	mg/L	NAWQC
mirex	marine species	NAWQC	1.00e-06			1	1	1.00e-06	mg/L	NAWQC
trans-nonachlor								DG		
2,3,7,8-TCDD	fw species	NAWQC	1.00e-08			1	1	1.00e-08	mg/L	NAWQC

1. See Appendix H for description of uncertainty factors and derrivation of values

LD50 = Lethal dose to 50 percent of test individuals

NOAEL = No observed adverse effects level

Table 7-35

Echinoderm Embryo-Larval Survival and Development Results from Bioassay[1]

Site	Rep	Number Normal	Number Abnormal	Total Number	Average % Survival	Percent Normal	Average % Normal
Control	A	124	13	137	100	90.5	94.8
	B	122	8	130		93.8	
	C	141	7	148		95.3	
	D	158	4	162		97.5	
	E	142	5	147		96.6	
M01MS01S01	A	113	7	120	100	94.2	90.6
	B	100	8	108		92.6	
	C	100	6	106		94.3	
	D	95	12	107		88.8	
	E	105	21	126		83.3	
M01MS01D01	A	105	2	107	100	98.1	97.1
	B	168	5	173		97.1	
	C	137	3	140		97.9	
	D	106	5	111		95.5	
	E	120	4	124		96.8	
M01MS01D01	A	88	13	101	100	87.1	86.7
	B	93	8	101		92.1	
	C	105	15	120		87.5	
	D	87	18	105		82.9	
	E	122	23	145		84.1	

1. Complete Bioassay Report is included in Appendix G.

Table 7-36
Chemical Concentrations Detected in the Sediment Bioassy Elutriate Samples

ANALYTE	CONCENTRATION (ug/L)	
	MC185	MC186
INORGANIC		
ARSENIC	3.3	ND
CADMIUM	0.66	1.8
CALCIUM	416,000	415,000
COPPER	7.5	7.2
IRON	103	ND
LEAD	15	15
MAGNESIUM	1,370,000	1,360,000
NICKEL	3.9	3.8
POTASSIUM	513,000	509,000
SILVER	2	1.8
SODIUM	11,400,000	11,500,000
VANADIUM	2.5	1.8
ZINC	21.7	22.3
ORGANIC		
ACENAPHTHENE	0.0013	0.0013
ALPHA-BHC	0.0002	0.0014
BIS(2-ETHYLHEXYL)PHTHALATE	1.6	0.37
DELTA-BHC	0.0008	0.0011
MIREX	0.00074	0.00086
NAPHTHALENES, C2-alky	0.003	0.0044
PCB-8	0.0016	ND
PCB-28	0.00025	ND
PCB-101	0.0004	0.00036
PCB-153	0.0034	0.0028
PCB-170	0.0051	0.0026
PCB-180	0.0034	0.0025
PCB-187	0.0024	0.002

ND = Not Detected

Table 7-37

TOXICITY QUOTIENTS (TQs) AND PROBABILITY OF RISK TO BURROWING BIRDS AT THE BULKY WASTE LANDFILL

CPEC	$TQ_{(p)}$	$TQ_{(a)}$	$TQ_{(d)}$	
			50%	95%
Semi-volatile Organics				
Acenaphthene	0.38	0.04	0.01	0.10
Anthracene	0.55	0.05	0.00	0.10
Benzo(a)Anthracene	0.22	0.01	0.00	0.03
Benzo(a)Pyrene	**2.55**	0.14	0.01	0.30
Benzo(b)Fluoranthene	**6.30**	0.32	0.03	0.73
Benzo(g,h,i)perylene	<0.01	<0.01	<0.01	<0.01
Benzo(k)Fluoranthene	**2.68**	0.19	0.02	0.50
Carbazole	0.15	0.02	<0.01	0.04
Chrysene	**2.99**	0.17	0.02	0.44
Dibenz(a,h)Anthracene	0.39	0.08	0.01	0.15
Fluoranthene	0.38	0.01	<0.01	0.04
Fluorene	0.28	0.04	0.01	0.10
Indeno(1,2,3-cd)pyrene	0.95	0.13	0.01	0.23
Phenanthrene	**1.97**	0.07	0.01	0.14
Pyrene	0.75	0.03	<0.01	0.06
Pesticides				
4,4'-DDD	0.01	<0.01	<0.01	<0.01
4,4'-DDE	**3.56**	0.98	0.02	0.80
4,4'-DDT	0.88	0.09	<0.01	0.07
Aldrin	0.01	<0.01	<0.01	<0.01
alpha-Chlordane	0.07	<0.01	<0.01	<0.01
Dieldrin	0.01	<0.01	<0.01	<0.01
Endosulfan II	0.01	<0.01	<0.01	<0.01
Endrin	0.97	0.09	<0.01	0.05
Endrin aldehyde	**1.00**	0.11	<0.01	0.05
gamma-Chlordane	0.07	<0.01	<0.01	<0.01
PCBs				
TCDD/TEQ	**8.19**	0.59	<0.01	<0.01

$TQ_{(p)}$ = Hot spot toxicity quotient

$TQ_{(a)}$ = Reasonable maximum exposure toxicity quotient

$TQ_{(d)}$ = Distribution of toxicity quotients; 50% and 95% probability of a site-wide risk

Table 7-38
TOXICITY QUOTIENTS (TQs) AND PROBABILITY OF RISK TO BENTHIC INVERTEBRATES AT THE LANDFILLS SITE

CPEC	$TQ_{(a)}$	$TQ_{(d)}$	
		50%	95%
Pesticides			
2,4'-DDD	**1.64**	<0.01	0.01
2,4'-DDE	0.17	<0.01	<0.01
2,4'-DDT	0.43	<0.01	0.01
4,4'-DDD	**3.21**	<0.01	0.05
4,4'-DDE	**2.82**	<0.01	0.04
4,4'-DDT	0.62	<0.01	<0.01
alpha-BHC	0.01	<0.01	<0.01
gamma-BHC (Lindane)	0.03	<0.01	<0.01
alpha-Chlordane	0.04	<0.01	<0.01
gamma-Chlordane	0.03	<0.01	<0.01
Dieldrin	**1.62**	<0.01	0.02
trans-Nonachlor	DG	DG	DG
PCBs			
TCDD/TEQ	**2.94**	<0.01	0.02

$TQ_{(a)}$ = Reasonable maximum exposure toxicity quotient

$TQ_{(d)}$ = Distribution of toxicity quotients; 50% and 95% probability of a site-wide risk

Table 7-39
TOXICITY QUOTIENTS (TQs) AND PROBABILITY OF RISK TO GREEN SEA TURTLES AT THE LANDFILLS SITE

CPEC	$TQ_{(a)}$	$TQ_{(d)}$	
		50%	95%
Pesticides			
2,4'-DDD	<0.01	<0.01	<0.01
2,4'-DDT	<0.01	<0.01	<0.01
4,4'-DDD	<0.01	<0.01	<0.01
4,4'-DDE	<0.01	<0.01	<0.01
4,4'-DDT	<0.01	<0.01	<0.01
alpha-BHC	<0.01	<0.01	<0.01
beta-BHC	<0.01	<0.01	<0.01
delta-BHC	<0.01	<0.01	<0.01
gamma-BHC (Lindane)	<0.01	<0.01	<0.01
alpha-Chlordane	<0.01	<0.01	<0.01
gamma-Chlordane	<0.01	<0.01	<0.01
Dieldrin	<0.01	<0.01	<0.01
Endosulfan II	<0.01	<0.01	<0.01
Endosulfan sulfate	<0.01	<0.01	<0.01
Endrin	<0.01	<0.01	<0.01
Endrin aldehyde	<0.01	<0.01	<0.01
Heptachlor	<0.01	<0.01	<0.01
Heptachlor epoxide	<0.01	<0.01	<0.01
Hexachlorobenzene	<0.01	<0.01	<0.01
Methoxychlor	<0.01	<0.01	<0.01
Mirex	<0.01	<0.01	<0.01
trans-Nonachlor	<0.01	<0.01	<0.01
PCBs			
TCDD/TEQ	0.38	<0.01	<0.01

$TQ_{(a)}$ = Reasonable maximum exposure toxicity quotient

$TQ_{(d)}$ = Distribution of toxicity quotients; 50% and 95% probability of a site-wide risk

Table 7-40
TOXICITY QUOTIENTS (TQs) AND PROBABILITY OF RISK TO MONK SEALS AT THE LANDFILLS SITE

CPEC	$TQ_{(a)}$	$TQ_{(d)}$	
		50%	95%
Pesticides			
2,4'-DDD	<0.01	<0.01	<0.01
2,4'-DDE	<0.01	<0.01	<0.01
2,4'-DDT	<0.01	<0.01	<0.01
4,4'-DDD	<0.01	<0.01	<0.01
4,4'-DDE	<0.01	<0.01	<0.01
4,4'-DDT	<0.01	<0.01	<0.01
alpha-BHC	<0.01	<0.01	<0.01
beta-BHC	<0.01	<0.01	<0.01
gamma-BHC (Lindane)	<0.01	<0.01	<0.01
alpha-Chlordane	<0.01	<0.01	<0.01
gamma-Chlordane	<0.01	<0.01	<0.01
Endrin	<0.01	<0.01	<0.01
Heptachlor	<0.01	<0.01	<0.01
Heptachlor epoxide	<0.01	<0.01	<0.01
Hexachlorobenzene	<0.01	<0.01	<0.01
Mirex	<0.01	<0.01	<0.01
trans-Nonachlor	<0.01	<0.01	<0.01
PCBs			
TCDD/TEQ	**1.62**	<0.01	0.04

$TQ_{(a)}$ = Reasonable maximum exposure toxicity quotient

$TQ_{(d)}$ = Distribution of toxicity quotients; 50% and 95% probability of a site-wide risk

Table 7-41
TOXICITY QUOTIENTS (TQs) AND PROBABILITY OF RISK TO GREEN SEA TURTLES AT THE INNER HARBOR

CPEC	$TQ_{(a)}$	$TQ_{(d)}$	
		50%	95%
Pesticides			
2,4'-DDD	<0.01	<0.01	<0.01
2,4'-DDT	<0.01	<0.01	<0.01
4,4'-DDD	<0.01	<0.01	<0.01
4,4'-DDE	<0.01	<0.01	<0.01
4,4'-DDT	<0.01	<0.01	<0.01
alpha-BHC	<0.01	<0.01	<0.01
beta-BHC	<0.01	<0.01	<0.01
delta-BHC	<0.01	<0.01	<0.01
gamma-BHC (Lindane)	<0.01	<0.01	<0.01
gamma-Chlordane	<0.01	<0.01	<0.01
Dieldrin	<0.01	<0.01	<0.01
Endosulfan I	<0.01	<0.01	<0.01
Endrin aldehyde	<0.01	<0.01	<0.01
Heptachlor	<0.01	<0.01	<0.01
Hexachlorobenzene	<0.01	<0.01	<0.01
Mirex	<0.01	<0.01	<0.01
trans-Nonachlor	<0.01	<0.01	<0.01
PCBs			
TCDD/TEQ	0.27	<0.01	<0.01

$TQ_{(a)}$ = Reasonable maximum exposure toxicity quotient

$TQ_{(d)}$ = Distribution of toxicity quotients; 50% and 95% probability of a site-wide risk

Table 7-42

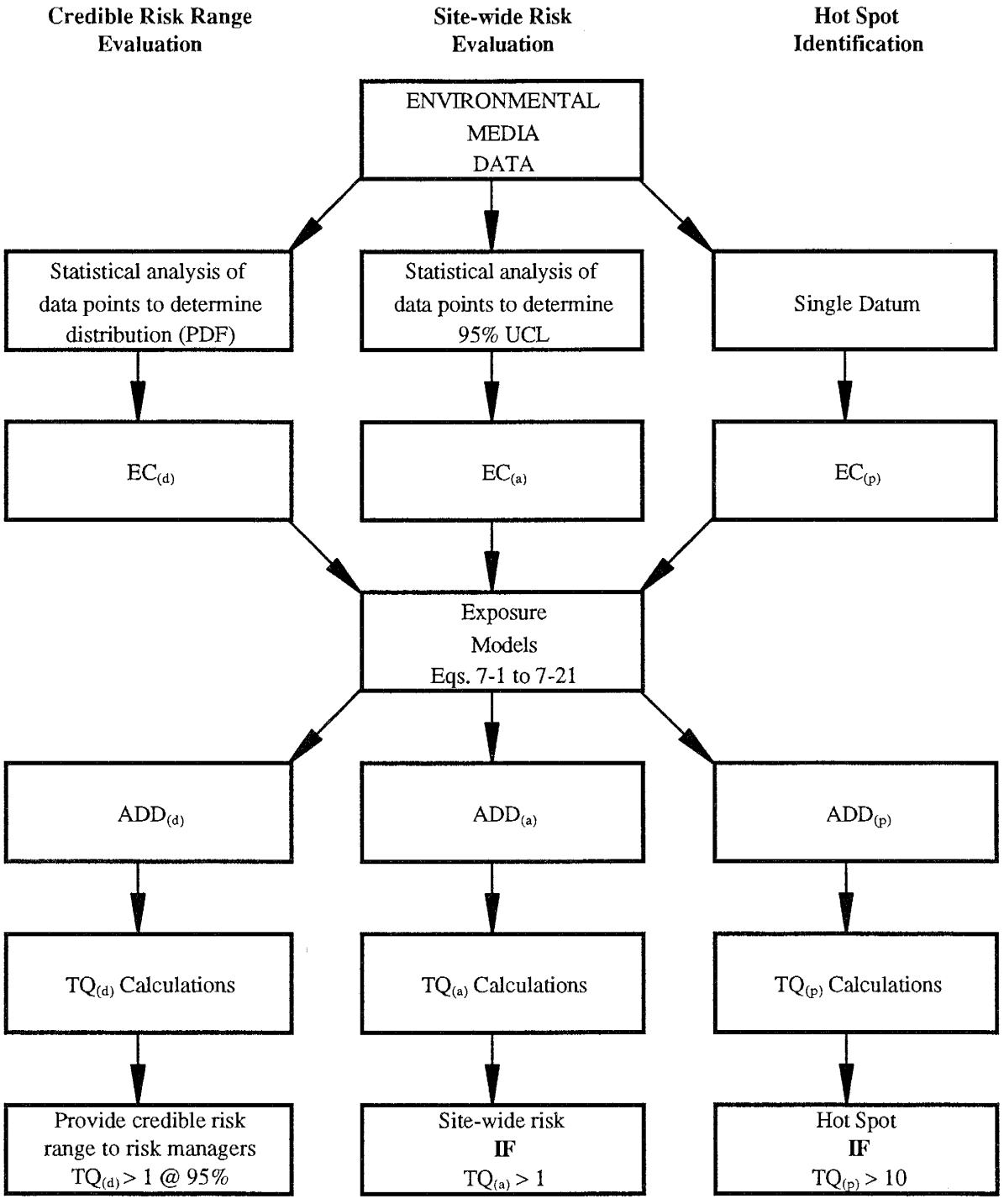
TOXICITY QUOTIENTS (TQs) AND PROBABILITY OF RISK TO MONK SEALS AT THE INNER HARBOR

CPEC	$TQ_{(a)}$	$TQ_{(d)}$	
		50%	95%
Pesticides			
2,4'-DDD	<0.01	<0.01	<0.01
2,4'-DDE	<0.01	<0.01	<0.01
2,4'-DDT	<0.01	<0.01	<0.01
4,4'-DDD	<0.01	<0.01	<0.01
4,4'-DDE	<0.01	<0.01	<0.01
4,4'-DDT	<0.01	<0.01	<0.01
alpha-BHC	<0.01	<0.01	<0.01
beta-BHC	<0.01	<0.01	<0.01
delta-BHC	<0.01	<0.01	<0.01
gamma-BHC (Lindane)	<0.01	<0.01	<0.01
alpha-Chlordane	<0.01	<0.01	<0.01
gamma-Chlordane	<0.01	<0.01	<0.01
Endosulfan I	<0.01	<0.01	<0.01
Endrin	<0.01	<0.01	<0.01
Heptachlor	<0.01	<0.01	<0.01
Heptachlor epoxide	<0.01	<0.01	<0.01
Hexachlorobenzene	<0.01	<0.01	<0.01
Mirex	<0.01	<0.01	<0.01
trans-Nonachlor	<0.01	<0.01	<0.01
PCBs			
TCDD/TEQ	**1.08**	<0.01	0.03

$TQ_{(a)}$ = Reasonable maximum exposure toxicity quotient

$TQ_{(d)}$ = Distribution of toxicity quotients; 50% and 95% probability of a site-wide risk

Figure 7-1
PROCESS FOR EVALUATING SITE-WIDE RISK, HOT SPOTS, AND CREDIBLE RISK RANGES



PDF = Probability Distribution Function
UCL = Upper Confidence Limit
EC = Environmental Concentration
ADD = Applied Daily Dose
TQ = Toxicity Quotient

Figure 7-2
MEASURE OF EFFECT MODEL #1
BURROWING BIRDS

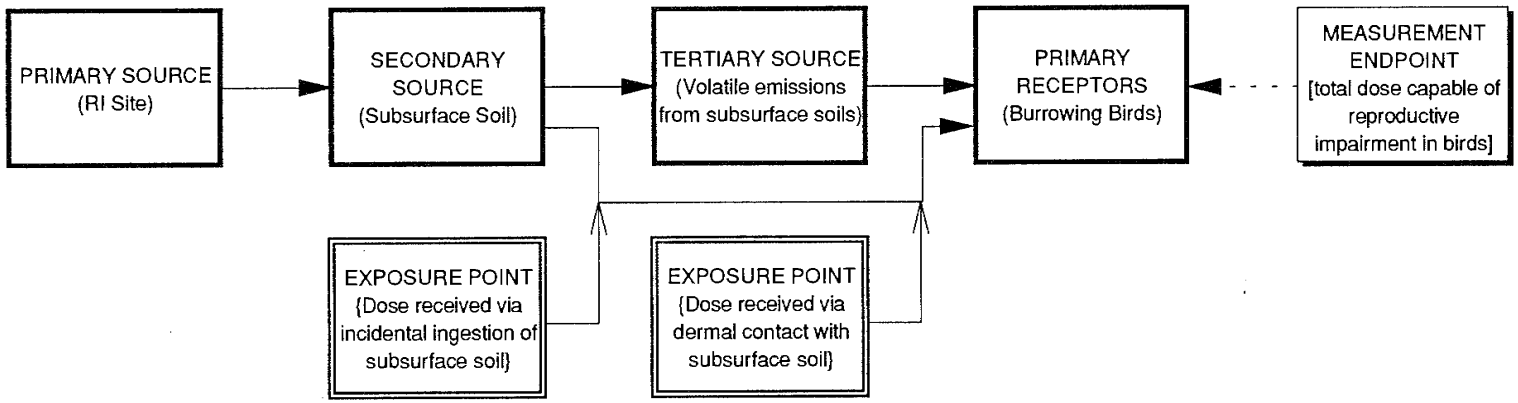


Figure 7-3
MEASURE OF EFFECT MODEL #2
PACIFIC GREEN SEA TURTLES

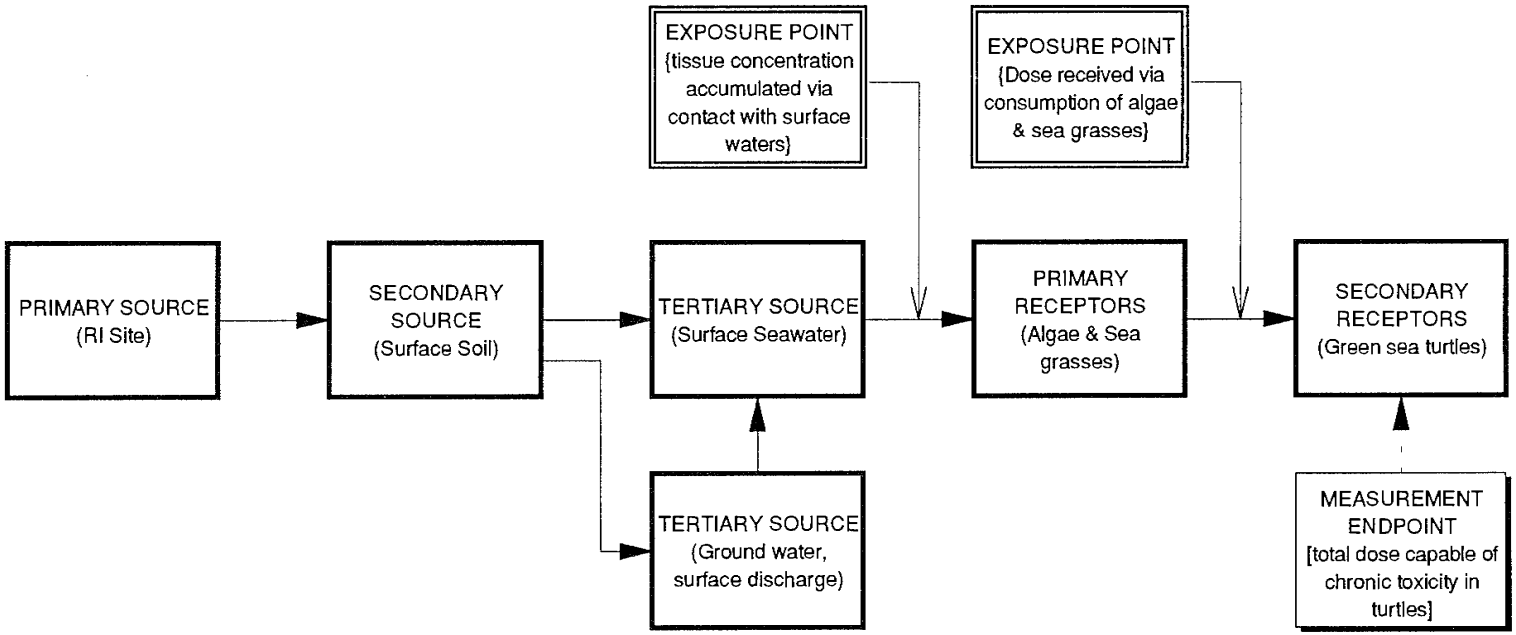
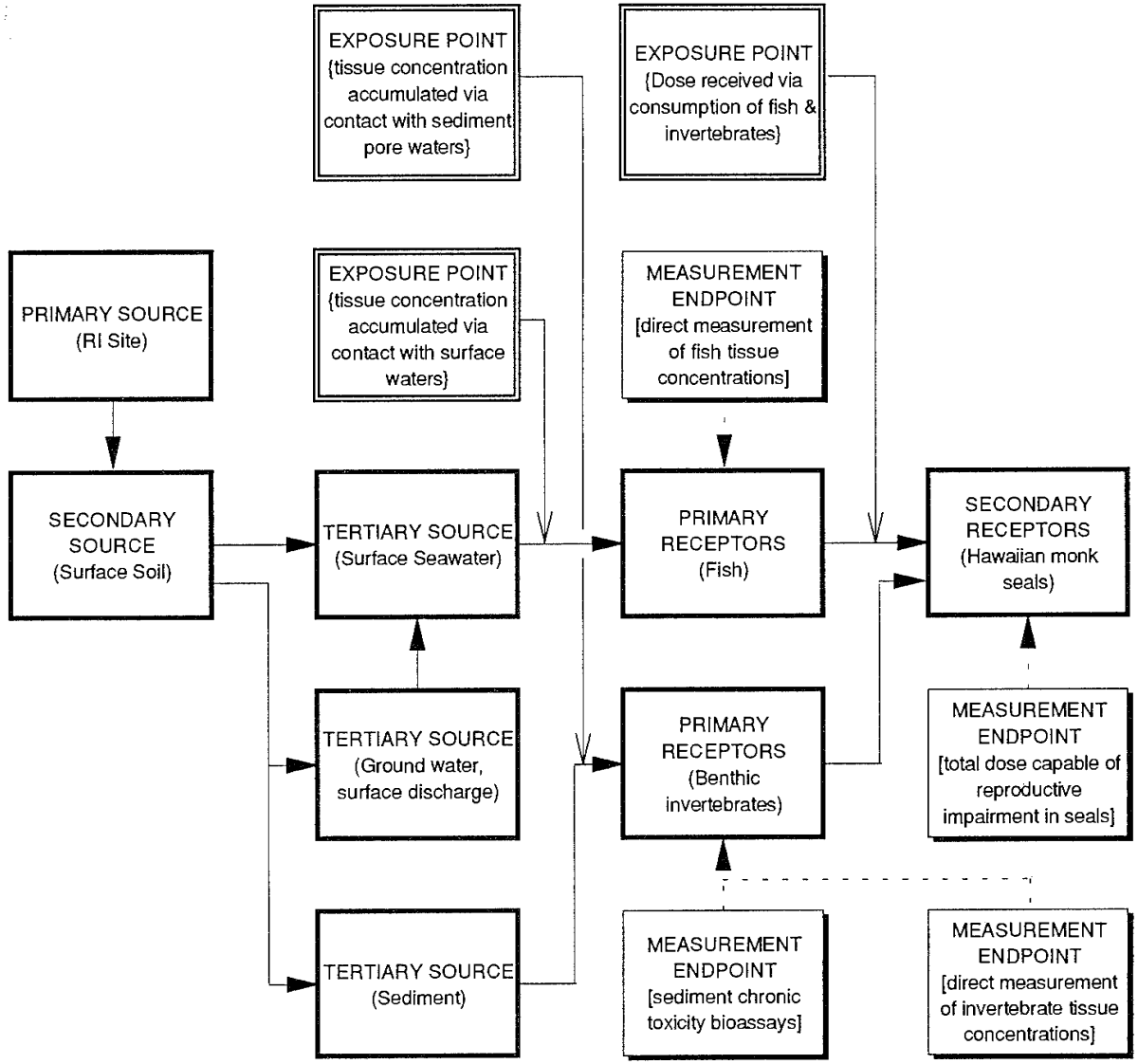


Figure 7-4
MEASURE OF EFFECT MODEL #3
HAWAIIAN MONK SEALS



SECTION 8
CONCLUSIONS AND RECOMMENDATIONS

This section presents the conclusions reached about each site after evaluating all the field and analytical data collected during the RI and considering the results of the BERA. The recommendations pertaining to a particular site immediately follow the conclusions.

8.1 TERRESTRIAL ENVIRONMENT

To facilitate collection of subsurface soil samples, twenty trenches and 26 test pits were excavated at the BWLF within a 450,000 square foot sampling grid compartmentalized into 20, 150-foot square cells. One sampling trench was randomly located within each 150-foot square cell for a total of 20 trenches. Based on the total area of the BWLF, the 20 sampling locations within the square grid created an estimated 90% statistical probability of encountering a "hot spot" with a radius of 85 feet or greater. Forty-four subsurface soil samples (including four duplicate samples) were collected from the trenches and analyzed for SVOCs and organochlorine pesticides/PCBs using USEPA CLP methods. An additional 46 soil samples (including three duplicate samples) were collected from the test pits and analyzed for PCBs using immunoassay field test kits.

One ground-water sample was collected from each of the five existing monitoring wells at the BWLF and chemically analyzed for low-level SVOCs, organochlorine pesticides, and PCBs by NOAA Status and Trends Methods.

8.1.1 BWLF: Conclusions

The subsurface investigation at the BWLF revealed only nonhazardous metallic and nonmetallic debris. No evidence of leaky drums or containers or other potential sources of hazardous materials was encountered.

Analytical data indicate that detectable levels of SVOCs, organochlorine pesticides, and PCBs are present in the subsurface soils at the BWLF, possibly as a result of past disposal activities. Based on the results of the BERA, the site-wide risk of an adverse effect on burrowing birds is negligible ($TQ_{(a)}$ and $TQ_{(d)}$ less than 1). However, a low to moderate risk ($TQ_{(p)}$ greater than 1 but less than 10) to burrowing birds was identified from the maximum concentrations of the following CPECs onsite: benzo(a)pyrene,

benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, phenanthrene, endrin aldehyde, PCBs, and 4,4'-DDE.

Detectable concentrations of SVOCs, pesticides, and PCB congeners in ground water were on the order of parts per trillion or less. Because ground water on Midway is not extracted or used for any purpose, these CPECs are not considered to present a risk to human receptors. A dye trace study performed at the BWLF indicated little or no discharge of ground water from the BWLF to the surrounding marine environment. This information coupled with the concentrations detected indicate that these CPECs are unlikely to present a risk to ecological receptors.

8.1.2 BWLF: Recommendations

Based upon evaluation of preliminary field and analytical data, it was recommended that the BWLF be covered with at least 2.5 feet of clean soil to reduce the possibility of an adverse effect to burrowing birds from the maximum concentrations of the CPECs detected in soils onsite. The cover was installed as recommended during late 1996 in order to take advantage of the time of minimal seabird activity onsite. This soil cover should reduce the possibility that burrowing birds would contact soil within the landfill (they burrow to a maximum depth of about 3 feet). Revegetation of the soil cover is currently underway. No further investigation or action is recommended.

8.2 MARINE ENVIRONMENT

Conclusions and recommendations regarding the two marine investigation sites, Landfill and Inner Harbor, are presented below. Marine sampling stations adjacent to the Landfill and in the Inner Harbor were established in sampling grids. Landfill grid cells were approximately 650 feet by 650 feet, while the Inner Harbor grid cells were about 540 feet by 540 feet. These grid locations were chosen to both maximize spatial coverage of the Landfill and Inner Harbor sites, and include potential sources of contaminants (e.g., marine debris and sewer outfalls).

During the RI, 18 sediment samples, including 2 duplicates, were collected from the Landfill and reference sites; no sediments were sampled in the Inner Harbor. An additional 2 sediment samples, including 1 duplicate, were collected at Landfill Grid 01 for toxicity testing (bioassay). Seven seawater samples, including one duplicate, were

collected from the Landfill sites; five seawater samples, including one duplicate, were collected from the Inner Harbor; and three seawater samples, including one duplicate, were collected from the reference sites. Ninety-six tissue samples, including 12 duplicates, were collected from the Landfills, Inner Harbor, and reference sites during the RI. Marine samples were submitted for chemical analysis for low-level Organochlorine Pesticides and PCBs using NOAA Status and Trends Methods.

In general, the observed overall trend at marine sampling sites was an increase in pesticide and PCB concentrations up the food chain, from seawater to algae to herbivorous fish and from sediment to benthic invertebrates to carnivorous fish. The observed increase is attributed to bioaccumulation of these compounds.

8.2.1 Landfills Site: Conclusions

The highest concentrations of most analytes in all media were collected from Grids 01 and 02 adjacent to the northeast corner of the BWLF. The BERA indicated that site-wide $TQ_{(d)}$ values for benthic invertebrates, monk seals, and sea turtles were less than 1 for all of the CPECs. This risk estimate is supported by the negative toxicity results for the bioassay of the sediment sample containing the highest concentrations of CPECs. This suggests, therefore, that the assessment endpoints for no adverse effects to benthic invertebrate communities, green sea turtles, and monk seals will likely be met. Even though low to moderate risks to seals and benthic invertebrates were identified for some of the CPECs at the reasonable maximum exposure, the risk of site-wide adverse effects on target receptors was negligible on the basis of CPEC concentrations; this conclusion is supported by the bioassay results and lack of observable signs of toxicity onsite.

Overall, concentrations of PCB and 4,4'-DDE in the marine environment do not appear to be directly related to those detected in the subsurface soil and ground water at the BWLF. While subsurface soil concentrations of total PCBs were highest at the north end of the BWLF, the highest total PCB concentrations in ground water were reported at the south end of the BWLF. On the basis of this evidence and the low solubility and high sorption coefficients of PCBs and DDE, it appears unlikely that the BWLF is the source of the contamination found in the marine environment.

The large amount of underwater debris within Grids cells 01, 02, and 08 are suggested as a possible contaminant source. A marine debris removal project completed in August

1996 focused on removing potential sources from these areas and the rest of the Landfill Site. Following this removal, PCB concentrations in seawater in Grid 01 were an order of magnitude lower during the 1996 sampling after this removal than during the 1994 sampling. Tissue and sediment concentrations did not drop markedly; however, PCBs and pesticides are persistent compounds, and concentrations in the system may take a year or more to leave the system. This is based on a half life in soil for the similar compound, dioxin of 1.15 to 1.62 years (Howard et al. 1991), and half lives in rainbow trout for several PCB congeners that range from 670 to 1,000 days (Niimi and Oliver 1983). No sediment or surface water half lives were available for PCBs.

8.2.2 Landfills Site: Recommendations

Because the underwater debris that could contain potential contaminant sources has been removed, and because the BERA identified negligible risk to ecological receptors, no further investigation or action is recommended for the marine environment at the Landfills.

8.2.3 Inner Harbor: Conclusions

The assessment endpoints for no adverse effects to monk seals and green sea turtles in the Inner Harbor are expected to be met. Negligible risks to seals and turtles were identified in the site-wide risk assessment. However, a low risk to seals was identified for the reasonable maximum exposure of PCBs to seals ($TQ_{(a)}$ = 1.03). This is the result of elevated PCB concentrations in herbivorous fish in the Inner Harbor.

No clear patterns of analyte distribution were identified in the Inner Harbor. The highest values for PCBs in invertebrates and herbivorous fish, and the highest values for 4,4'-DDE in algae and herbivorous fish were reported for samples collected in Grid 01, located near the southwest corner of the harbor close to an outfall known to contain petroleum product. The second highest concentration of total PCBs in algae were also reported for samples obtained in this grid. This outfall is scheduled to be sealed. Petroleum product present in storm drain lines leading to it will be removed and the lines cleaned to minimize recontamination. Additionally, the potential source area of petroleum product (Area 354) is currently undergoing remediation. A marine debris removal project completed in August 1996 focused on removing potential contaminant sources from the Inner Harbor Site.

8.2.4 Inner Harbor: Recommendations

The underwater debris that could contain potential contaminant sources has been removed and potential contamination originating from the Inner Harbor outfall will be remediated with the sealing of the outfall and the cleaning of the storm line. Because the BERA identified negligible risk to ecological receptors, no further investigation or action is recommended for the marine environment in the Inner Harbor.

SECTION 9
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