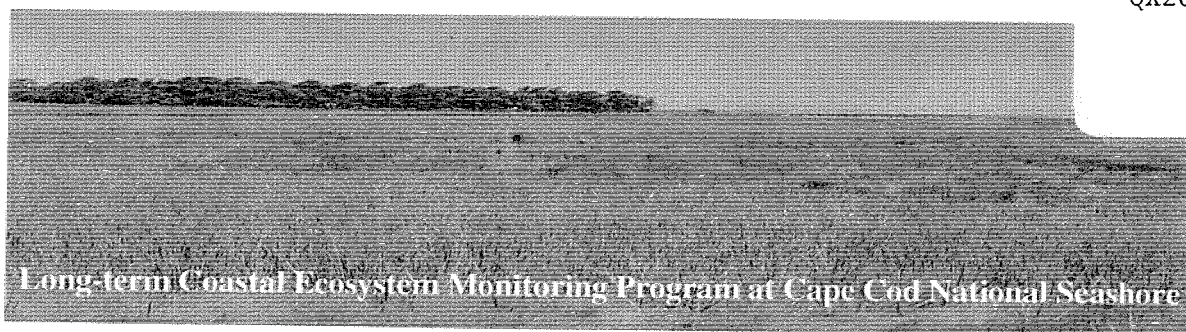
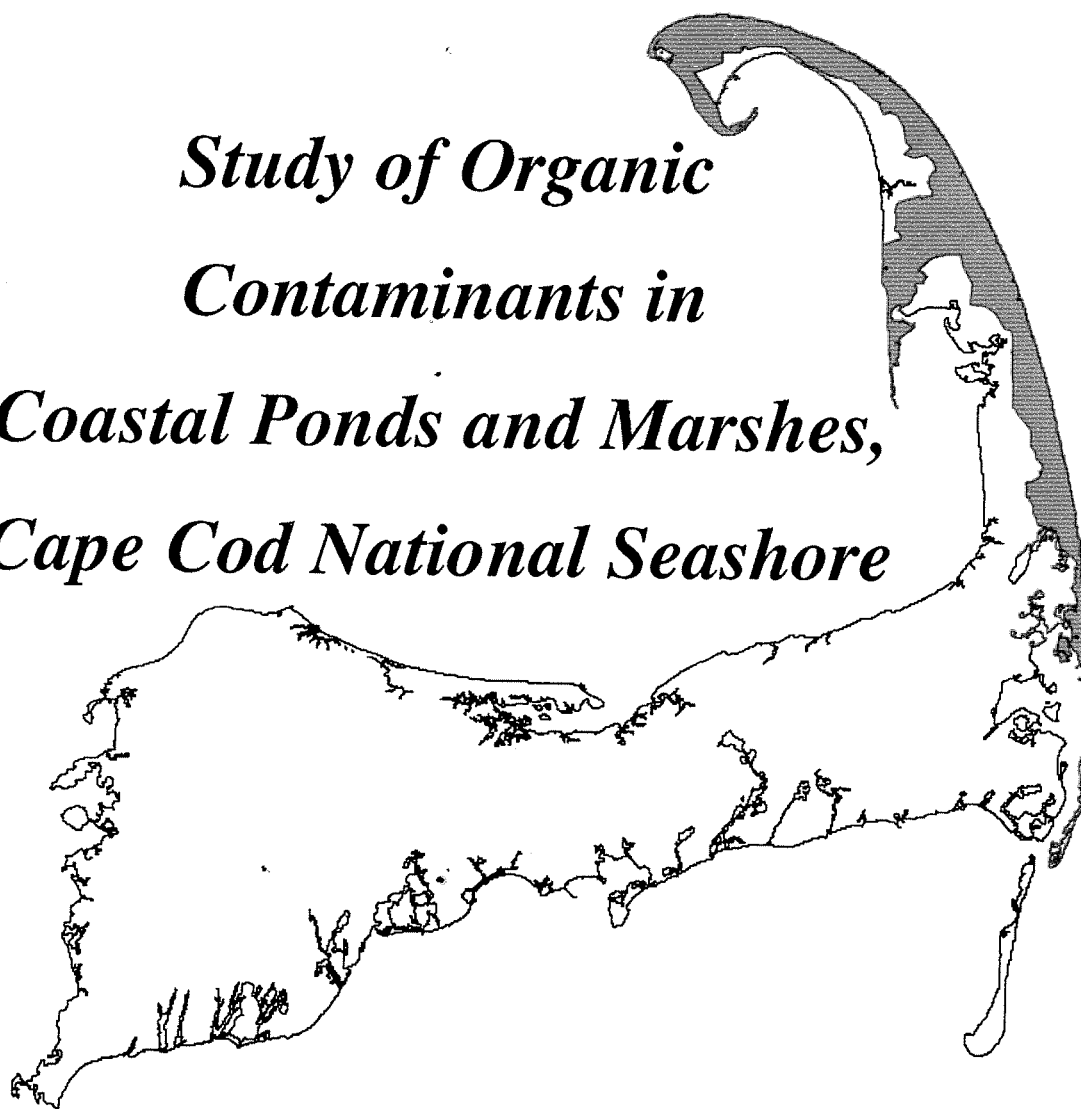




*Study of Organic
Contaminants in
Coastal Ponds and Marshes,
Cape Cod National Seashore*



USGS Patuxent Wildlife Research Center



Cape Cod National Seashore

*(Study of Organic Contaminants in
Coastal Ponds and Marshes,
Cape Cod National Seashore)*

QX 2001-17

James G. Quinn
Robert W. Cairns
Paul C. Hartman
John W. King

Graduate School of Oceanography
University of Rhode Island
Narragansett, RI 02882

July 2001

Long-term Coastal Ecosystem Monitoring Program
Cape Cod National Seashore
Wellfleet, MA 02667



SUMMARY

As part of the long-term Coastal Ecosystem Monitoring Program at Cape Cod National Seashore, MA, a baseline study of organic contaminants was conducted during 1999-2000. The investigation focused on total petroleum hydrocarbons (TPHs), polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and organochlorine pesticides (OCPs) in sediments and bivalves from coastal ponds and marshes of the National Seashore.

All but one surface sediment had contaminant concentrations below the effects range – median (ERM) values. The exception was from Hatches Harbor Marsh and it exceeded the ERM guidelines for total PCBs and total DDTs, although two nearby stations were considerably lower in concentration for these contaminants. Overall, however, the contaminant concentrations in the samples were low and indicative of a healthy environment.

Sediment cores from Town Cove and Salt Pond in the Nauset Marsh Estuary showed similar trends of decreasing contaminant concentrations with depth corresponding to the date of contaminant introduction to the environment. Based on radiometric and magnetic susceptibility dating of the cores, the sedimentation rates ranged from about 1.0-1.7 cm/yr.

Tissue samples of mussels and oysters had low to moderate concentrations of all contaminants. In general, these values were similar to the annual median concentrations of contaminants in mollusks found throughout U.S. coastal waters as reported by the NOAA Mussel Watch Program.

TABLE OF CONTENTS

SUMMARY	1
TABLE OF CONTENTS	2
INTRODUCTION	3
MATERIALS AND METHODS.....	4
Field Collection	4
Laboratory Analyses	6
RESULTS AND DISCUSSION	7
Surface Sediments	7
Sediment Cores	10
Bivalve Tissue	13
CONCLUSIONS	15
ACKNOWLEDGEMENTS	16
REFERENCES	17
ACKNOWLEDGEMENTS	16

INTRODUCTION

Benthic estuarine habitats are sinks for the accumulation of many anthropogenic contaminants including petroleum hydrocarbons and polycyclic aromatic hydrocarbons (Deskalakis and O'Connor, 1995). Potential sources of hydrocarbons include chronic inputs from rivers, waste water treatment facilities, combined sewer overflows, street runoff, atmospheric deposition, and boating activities (e.g. Latimer and Quinn, 1996). In addition, catastrophic events such as oil spills (e.g. Teal *et al.*, 1992; Reddy and Quinn, 1999) can also introduce large quantities of hydrocarbons into the nearshore marine environment. These pollutants are relatively stable in marsh and estuarine sediments and can bioaccumulate in benthic fauna such as mussels and oysters (O'Connor, 1998, Teal *et al.*, 1992) where they can have adverse effects on the organisms themselves (e.g. Long *et al.*, 1995) as well as higher trophic consumers.

Cape Cod National Seashore estuaries are within watersheds of complex land use patterns, ranging from undeveloped forested areas within the Seashore, to dense residential/commercial areas on lands adjacent to the Seashore. In association with these development patterns, there is a potential for chronic inputs of petroleum hydrocarbons from road runoff and boating activity. Oil spills associated with offshore shipping also represent a threat. Very little information is available on the distribution of hydrocarbons or any other organic contaminants in the coastal ponds and harbors of the Seashore. Given the potential for both chronic and catastrophic events it seems prudent that the Seashore begin to assemble a baseline data set on organic contaminants within its estuarine environments and initiate a long-term monitoring program for these components.

As part of the long-term Coastal Ecosystem Monitoring Program at Cape Cod National Seashore, a baseline study of organic contaminants was conducted during 1999-2000. The investigation focused on total petroleum hydrocarbons (TPHs), polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and organochlorine pesticides (OCPs) in sediments and bivalves from coastal ponds and marshes of the National Seashore.

MATERIALS AND METHODS

Field Collection (See Figure 1)

Samples were collected from 6 locations in the Nauset Marsh Estuary including 3 basins: Town Cove (surface sediments, a sediment core and mussels), Mill Pond (surface sediments and mussels) and Salt Pond (surface sediments, a sediment core and mussels). In addition, samples were collected from marsh sediments in this estuary. Samples were also collected from Pleasant Bay, in Orleans (marsh and mussels); Herring River, in Wellfleet (marsh and intertidal surface sediments, mussels and oysters); as well as Provincetown Harbor (mussels and oysters) and Hatches Harbor, in Provincetown (marsh and intertidal surface sediments and mussels). (See Appendix I for details) Sites with a high potential for contamination were selected for the initial survey. They included: deep coves with high sediment accumulation rates, locations with fine-grained sediments, shoreline area adjacent to various commercial and residential developments, and sites potentially impacted by road runoff and oil spills.

Surface sediments (0-2 cm) were collected by Graduate School of Oceanography personnel, with assistance from Seashore Park staff. Surface samples from intertidal areas were collected at low tide by using a hand tool (e.g. trowel). Several deep-water surface sediment and core samples (0-30 cm or longer) were collected using a pontoon boat, Smith MacIntyre grab sampler and piston corer. Sediment cores were kept in the core liners until returned to the laboratory where they were sectioned and then frozen (-20°C). Mussel (blue mussel, *Mytilus edulis* and ribbed mussel, *Geukensia demissa*) and oyster (*Crassostrea virginica*) samples were collected by hand and depurated for 24 hours in estuarine water by Seashore Park staff. All surface sediment and bivalve samples were stored in glass or aluminum foil and kept on ice in the dark until they were transferred to a freezer (-20°C) in the laboratory.

One of the sediment cores was radiometrically dated by Dr. Peter Appleby at the University of Liverpool. Dr. John King (GSO) measured the magnetic susceptibility on all cores and these analyses were used to provide approximate age dates for the undated core(s) by comparison to the dated core.

The initial samples were collected in October and November 1999 and analyzed over the following several months. Based on the results of these analyses, additional samples were collected in June and July 2000 in order to confirm the earlier results, look for temporal variations in samples, and focus on contaminated sites.

This study was designed as an initial baseline survey. Some specific sample locations were identified (i.e. not selected in a random manner), and thus, statistical comparisons among sites were not attempted in this report.

Laboratory Analyses

The organic contaminants measured in this investigation included all of the PCBs and PAHs as well as 13 of the OCPs recommended by the NOAA Status and Trends Program for Estuarine and Coastal Monitoring (Appendix II). TPHs (boiling range of nC_{12} to nC_{34}) were measured in the sediment samples; however, they were not measured in the tissue samples because of analytical interferences from biogenic material. The sum of the 24 PCB congeners multiplied by two is equal to the total PCBs (Σ PCBs; Quinn et al., 1998). This value is approximately equal to total Aroclors such as the sum of Ar 1242, Ar 1254, and Ar 1260. The sum of the 24 PAHs is the total PAHs (Σ PAHs). In addition, the sum of the 5 DDT compounds is reported as total DDTs (Σ DDTs).

Samples were extracted with organic solvents, the extract fractionated by silica gel column chromatography, and the fractions analyzed by capillary column gas chromatography for PCBs/OCPs using an electron capture detector, and for TPHs/PAHs using a mass selective detector (MSD). The PCBs/OCPs in several high level samples were confirmed with the MSD. Details of the analytical procedures are available in Latimer and Quinn (1996) and Reddy and Quinn (1999), as well as in Appendix II. Sediment organic carbon (OC) values were determined using a CHN analyzer and mussel total lipids were estimated by weighing extract residues after evaporation of solvent. All values are reported on an average dry weight basis or normalized basis. Information on the % moisture, % organic carbon and % lipids is given in Appendix I. A detailed description of the quality control (QC) procedures is contained in Appendix II and results

of the QC samples (blanks, duplicates, spikes and standard reference materials) are shown with the field data in Appendix III.

RESULTS AND DISCUSSION

a) Surface Sediments

The concentrations of organic contaminants in surface sediments (0-2 cm) from selected coastal ponds and marshes of the Cape Cod National Seashore are shown in Figure 2a. In general, the marsh sediments have higher values than the pond sediments. Hatches Harbor Marsh station 5 (HH-5) showed the highest levels of PAHs, PCBs and DDTs with values exceeding the ERM guidelines for PCBs and DDTs. The latter values were obtained by matching biological and chemical data compiled from numerous modeling, laboratory and field studies performed using marine and estuarine sediments (Long et al., 1995). Using these data, the authors determined two guideline values: an effects range-low (ERL-corresponding to the 10th percentile) and an effects range-median (ERM-corresponding to the 50th percentile) for various metal and organic contaminants. These two values defined concentration ranges that were rarely (<ERL), occasionally (ERL), or frequently (ERM) associated with adverse biological effects. Thus, of the surface sediments analyzed in this study, only one sample (HH-5) exceeded the ERM guidelines for PCBs and DDTs and the values in this sample were confirmed with the MSD. However, most of the samples had PCB and DDT concentrations exceeding their respective ERL values. There are no guidelines for TPHs and the concentrations found in this study are relatively low compared to values from urban estuaries (e.g. Narragansett

Bay, Quinn et al., 1998), but similar to those from Rhode Island coastal ponds (Table 1). Teal et al. (1992) reported the concentration of the Σ PAHs in surface sediments (0-5 cm) from a control station in Sippewissett Marsh, MA to be 676 ng/g (dry wt). These hydrocarbons were mainly pyrogenic in origin (produced in combustion processes) and the concentration is similar to that in many of the surface sediments in this investigation. Table 1 provides a comparison of the contaminant levels found in this study with values from other investigations.

Normalizing organic contaminant concentrations to OC in surface sediments tends to smooth out many data sets because most of these contaminants are associated with the organic fraction of sediments. Since the OC is usually associated with fine-grained sediments, normalization to grain size can also reduce the organic contaminant variability. In the present study, normalization of surface contaminants to OC reduced some of the variability but station HH-5 still showed high values for PAHs, PCBs and DDTs (Figure 2b). This indicates that these contaminants were not elevated at this station solely due to a high OC concentration; rather, the data indicate that the two parameters are somewhat unrelated and there is an additional source for contaminants at this particular site. Station HH-5 was collected from a tide restricted salt marsh with reduced tidal flushing (Figure 1b). This may have allowed some of the contaminants to accumulate relative to well-flushed stations such as HH-2 and HH-3. However, stations HH-4 and HH-7 are also from the same restricted marsh area and they were considerably lower in most contaminants than station HH-5. At this point, we can not account for the high PAH, PCB and DDT values at station HH-5, especially when the surrounding stations were considerably lower in concentration for these contaminants.

Over 60 different organic analytes were measured on every sample in this study (Appendix II and III). Figure 3a shows the distribution of individual PAHs, PCBs and OCPs in surface sediments from station HH-5, the site showing the highest overall surface sediment contaminant concentrations. The major PAHs included fluoranthene, chrysene, benzo (b, j, k) fluoranthene and benzo (e) pyrene. None of the individual PAHs exceeded the ERM values (Long et al., 1995) and most were less than the ERLs. These 4 and 5 ringed PAHs are found in some petroleum products (petrogenic sources; e.g. #6 fuel oil) and can also be formed through combustion processes (pyrogenic sources; e.g. produced in the burning of coal, petroleum and wood). The PAH alkyl homolog distribution for this sample, showed a strong preference for the parent hydrocarbon indicating a predominantly pyrogenic source for these compounds (Figure 3b).

The PCB congener distribution indicated high levels of CB153, CB138, CB187, CB180 and CB170 in sample HH-5 (Figure 3a). There are no values for individual congeners in Long et al., 1995. These congeners are relatively high molecular weight compounds containing 6 or 7 chlorine atoms per biphenyl and they have a pattern similar to that of a commercial PCB mixture, Aroclor 1260 (Figure 3c). PCBs were widely used synthetic compounds (U.S. production ended in the 1970s) and there are several possible sources to the environment including atmospheric particulate material and inappropriate disposal/storage procedures of industrial equipment containing these components. The major OCP components in sample HH-5 were p,p'-DDE and p,p'-DDD. (The ERM for pp'-DDE is 27 ppb, Long et al., 1995.) These compounds are metabolites of p,p'-DDT (e.g. Quensen et al., 1998) which was probably used for mosquito control in the marsh areas prior to its ban in the U.S. during the 1970s. Masters and Inman (2000) reported

values for the Σ DDTs (11 to 162 ng/g dry wt) and Aroclor 1260 (15 ng/g dry wt) in surface sediments (0-5 cm) from salt marsh sediments in CA. The major DDT metabolite was DDE. The PCB value is close to the lowest concentration observed in this study, but the Σ DDTs are generally higher than most of the corresponding concentrations in Figure 2a.

b) Sediment Cores

Contaminant concentrations in a sediment core from Town Cove are shown in Figure 4. With increasing depth in the core, the levels of contaminants generally decrease from the present time (surface 0-2 cm) to the past (bottom) where the discharges of contaminants were less or non-existent. In this core, however the concentrations of PAHs (not including perylene due to possible biogenic sources for this compound) and TPHs were relatively uniform with depth (~1000-1200 ng/g for PAHs and 70-90 μ g/g for TPHs) with the exception of several sections where higher levels are evident. Thus, this core is not long enough to show the drop-off to near zero concentrations for PAHs and TPHs which usually occurs at a depth corresponding to ~1880 when petroleum first started to be widely used in the U.S. (Latimer and Quinn, 1996). It should be noted that values of PAHs do not usually reach zero concentration because pyrogenic PAHs have been entering the environment throughout history due to the anthropogenic burning of coal, petroleum and wood as well as natural forest and grass fires.

For the PCBs, the concentrations remained fairly uniform (~35-45 ng/g; exception at 40-42 cm) down to 50-52 cm and then decreased to a lower level at 70-72 cm and 80-82 cm (Figure 4). The DDT level increased with depth to a maximum at 50-52 cm and then

decreased to low levels at 70-72 and 80-82 cm. PCBs were introduced to the environment in ~1930 and DDTs in ~1940. The average of the two dates is 1935 and it is assigned to the depth of which relatively constant background values were observed (70-72 cm). Assuming a linear input, an estimate of the sedimentation rate can be made by using, the number of years in the environment (1999-1935, ~64 yrs.) and the background core depth (71 cm) to obtain a value of approximately 1.1 cm/yr for the Town Cove core. This core was radiometrically dated by Dr. P.G. Appleby of the University of Liverpool and his report is presented in Appendix IV. Based on this analysis, there was a relatively uniform sedimentation rate up to 1963 of about 0.44 cm/yr. During the past 36 years of accumulation, sedimentation rates have been substantially higher, with a mean value for this period of about 1.1 cm/yr. This may be related to a number of factors including increased development in the area over this time period. Others have commented on the role of a migrating Nauset Inlet in altering sedimentation processes throughout the Nauset Marsh estuary, including Town Cove (Aubrey and Speer 1984, Roman et al. 1997). Thus, the estimate from organic contaminant markers and the radiometric dating are in good agreement for the top ~33 cm of the core. However given the low unsupported ^{210}Pb activity, the accuracy of the ^{210}Pb dating is subject to question prior to 1963. The sedimentation rate of approximately 1.1 cm/year estimated from the organic contaminants is probably more accurate back to 1935. Lower sedimentation rates prior to 1935 may be indicated by the radiometric dating, but given the low ^{210}Pb activity, this interpretation is speculative.

Figure 5 shows the distribution of individual PAHs in the various sections of the Town Cove core. In all cases, the 4 and 5 ringed compounds were high in all sections,

suggesting a pyrogenic source of these hydrocarbons. In addition, the alkyl homolog distribution of the 50-52 cm section clearly shows a pyrogenic origin for the PAHs (Figure 3b). Also note the increasing contribution of the PAH perylene (PER) with depth in the core (Figure 5). This compound is formed in the sediments from plant material precursors through diagenetic reactions. The 20-22 cm section was the only one to have significant levels of the 2 ring naphthalenes indicating a small petrogenic source in addition to pyrogenic inputs at that depth.

The concentrations of individual PCB congeners in the Town Cove core sections are presented in Figure 6. In general, the congeners had a fairly wide distribution ranging from compounds with 3 (CB018) to 10 (CB209) chlorine atoms per biphenyl. Lower in the core at sections 60-62 cm to 80-82 cm, CB138 (6 chlorine atoms) is the major congener; however, only very low levels of the PCBs are in these sections. Possible sources of the PCBs in the upper sections are commercial PCB mixtures such as Aroclor 1242, Aroclor 1254 and Aroclor 1260.

Figure 7 shows the distribution of individual OCPs in the Town Cove core. In the upper section, p,p'-DDD (a metabolite of DDT) is the major compound suggesting a reductive dechlorination reaction (Quensen et al., 1998). In general, the ratio of p,p'-DDE to p,p'-DDD is relatively constant with depth in the core until 80-82 cm where the former becomes the major metabolite. This compound results from the dehydrochlorination of DDT to DDE.

Figure 8 presents the distribution of contaminants in a core from Salt Pond. The concentrations of PAHs and DDTs were considerably lower in this core compared to the one from Town Cove (Figure 4). However, in both cores, the level of DDT increased to a

maximum value at 50-52 cm. TPHs and PCBs were highest at the surface and generally vary with depth to the deepest section at 50-52 cm. The 20-22 cm section had low values). Fewer sections from this core were analyzed and it was not dated radiometrically due to limited funds for the project. Also, it was not possible to estimate the sedimentation rate using organic contaminant markers. However, based on a comparison of the PCB and DDT increases at 50-52 cm in this core and that in the Town Cove core, the sedimentation rates may be similar. In addition, the magnetic susceptibility dating of cores (Appendix IV) shows that the overall sedimentation rates in Salt Pond and Town Cove are somewhat similar to one another. This is fortuitous as sedimentation rates can certainly vary within a given estuary (e.g. Latimer and Quinn, 1996).

c) Bivalve Tissues

Figure 9a shows the concentration of contaminants in bivalve tissue samples on a dry weight basis (ng/g dry wt.). The sample with the highest level of PAHs was NI-TI (Nauset Inlet; ~5300 ng/g or 5.3 ppm dry wt.), highest PCBs were in NB-1 (Nauset Bay; ~180 ng/g or 0.18 ppm dry wt.) and highest DDTs were found in HR-2 (Herring River; ~45 ng/g or 0.045 ppm dry wt.). There are no federal guidelines for TPHs and PAHs in fish and shellfish. Sample HR-1 was analyzed for its alkyl homolog distribution and showed evidence of petrogenic hydrocarbons (Figure 3b). Sample NI-TI also had evidence of recent petroleum contamination based on high levels of 2 ring PAHs. The EPA legal limits (for U.S. human health risks) on the contaminants measured in this study are PCBs = 2.0 ppm wet wt. and DDT/metabolites = 5.0 ppm wet wt. each (EPA, 1989). Thus, none of the samples analyzed in this investigation exceeded the limits; in fact, the

PCBs and DDTs in the highest samples were only a small fraction of the guideline values. Teal et al. (1992) reported Σ PAH values for a sample of marsh mussels, *Geukensia demissa*, from the Sippewissett Marsh, MA control site as 303 ng/g dry weight. This value is in the mid range of those reported in Figure 9a for bivalves analyzed in this study. O'Connor (1998) reported the annual median concentrations of organic contaminants in mussels (two species) and oysters (two species) from the U.S. coastal areas with no distinction made as to bivalve or species. The values for 1996 (most recent year) were t DDT = 28 ng/g (dry wt), t PCB = 119 ng/g and t PAH = 254 ng/g (Table 1). These U.S. values are similar to the average concentrations for DDTs and PCBs found in this study, but considerably lower than the value for PAHs; however, 9 of the 13 samples were very close to the US median PAH value.

Figure 9b presents the concentration of contaminants normalized to lipid content (ng/g liquid weight). This approach tends to smooth out the data sets as in the case of organic carbon normalization for sediments because these contaminants are lipophilic. The samples with the highest concentration in Figure 9a are still among the highest stations in Figure 9b. Thus, lipid normalization does not account for the previously discussed high levels seen on a dry weight basis.

Since this was a baseline survey, it was not designed to compare sediment and tissue samples from the same station. However, the biota – sediment accumulation factor (BSAF) for the contaminants were calculated for the five closest matched stations (Table 2) by plotting the dry weight bivalve tissue concentration normalized to lipid content vs. the dry weight sediment concentration normalized to organic carbon. The resulting value for the total PCBs ($2.95; y = 2.95x + 371, R^2 = 0.798$) is close to the median BSAF value

for bivalves (2.7) reported by Wong et al., 2001. Thus, knowing the sediment concentration and organic carbon content, it is possible to estimate the bivalve concentration assuming an average lipid content of about 5% (Appendix I). The corresponding values for total DDTs ($y = 3.45x + 80.5$, $R^2 = 0.472$) and total PAHs ($y = -57.1x + 15,000$, $R^2 = 0.004$) do not show a significant relationship between biota - sediment concentrations in this study.

CONCLUSIONS

1) All but one surface sediment had contaminant concentrations below the effects range – median (ERM) values. The exception was from Hatches Harbor Marsh and it exceeded the ERM guidelines for total PCBs and total DDTs, although two nearby stations were considerably lower in concentration for these contaminants. Overall, however, the contaminant concentrations in the samples were low and indicative of a healthy environment.

2) Sediment cores from Town Cove and Salt Pond in the Nauset Marsh Estuary showed similar trends of decreasing contaminant concentrations with depth corresponding to the date of contaminant introduction to the environment. Based on radiometric and magnetic susceptibility dating of the cores, the sedimentation rates ranged from about 1.0-1.7 cm/yr.

3) Tissue samples of mussels and oysters had low to moderate concentrations of all contaminants. In general, these values were similar to the annual median

concentrations of contaminants in mollusks found throughout U.S. coastal waters as reported by the NOAA Mussel Watch Program.

4) The findings presented in this report should provide a useful baseline for comparison of future studies that may be conducted in response to an acute discharge (e.g. oil spill) or at periodic intervals in order to determine if chronic inputs of contaminants are a problem within the seashore.

ACKNOWLEDGEMENTS

We thank Kathryn Ford, as well as the Seashore Park staff for help in the collection of samples. Carol Gibson helped with the analysis of sediment cores, and Erin Wilkes and Andrew Cyhan helped in the analysis of organic contaminants. Mary-Jane James-Pirri prepared the GIS images. Charles Roman, the USGS project officer for this study, helped in all phases of the investigation from collection of samples to reviewing the draft report.

REFERENCES

- Aubrey, D.G. and P.E. Speer, 1984. Updrift migration of tidal inlets, *Jour. Geol.*, 92: 531-545.
- Daskalakis, K.D. and T.P. O'Connor, 1995. Distribution of chemical concentrations in U.S. coastal and estuarine sediment, *Mar. Environ. Res.*, 40: 381-398.
- EPA, 1989. Assessing human health risks from chemically contaminated fish and shellfish: A Guidance Manual, EPA, 136 pp.
- Latimer, J.S. and J.G. Quinn, 1996. Historical trends and current inputs of hydrophobic organic compounds in an urban estuary: The sedimentary record, *Environ. Sci. Technol.*, 30: 623-633.
- Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder, 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments, *Environ. Mgmt.*, 19: 81-97.
- Masters, P.M. and D.L. Inman, 2000. Transport and fate of organochlorines discharged to the salt marsh at upper Newport Bay, California, USA, *Environ. Toxicol. Chem.*, 19: 2076-2084.

O'Connor, T.P., 1998. Mussel Watch Results from 1986 to 1996, *Mar. Poll. Bull.*, 37: 14-19.

Quensen III, J.F., S.A. Mueller, M.K. Jain and J.M. Tiedje, 1998. Reductive dechlorination of DDE to DDMU in marine sediment microcosms, *Science*, 280: 722-724.

Quinn, J.G., R.W. Cairns, P.C. Hartmann, M.W. Kittredge and A.R. Aukerman, 1998. Organic contaminants in the sediments of Narragansett Bay, Final report to the URI/CMER Program, 45pp.

Quinn, J.G., R.W. Cairns, P.C. Hartmann and M.W. Kittredge, 1999. Organic contaminants in Rhode Island pond sediments, Final report to the URI/CMER Program, 20pp.

Reddy, C.M., and J.G. Quinn, 1999. GC-MS analysis of total petroleum hydrocarbons and polycyclic aromatic hydrocarbons in seawater samples after the *North Cape* oil spill, *Mar. Poll. Bull.*, 38: 126-135.

Roman, C.T., J.A. Peck, J.R. Allen, J.W. King and P.G. Appleby, 1997. Accretion of a New England (USA) salt marsh in response to inlet migration, storms, and sea-level rise, *Estuarine, Coastal and Shelf Sci.*, 45: 717-727.

Teal, J.M., J.W. Farrington, J.J. Stegeman, B.W. Tripp, B. Woodin, and C. Phinney, 1992. The West Falmouth oil spill after 20 years: Fate of fuel oil compounds and effects on animals, *Mar. Poll. Bull.*, 24: 607-614.

Wong, C.S., P.D. Capel and L.H. Nowell, 2001. National-scale, field-based evaluation of the biota – sediment accumulation factor model, *Environ. Sci. Technol.*, 35: 1709-1715.

Table 1. Organic contaminant values in surface sediments and mollusks.

		Σ DDTs (ng/g dry)	Σ PAHs (ng/g dry)	Σ PCBs (ng/g dry)	TPHs (μ g/g dry)
<u>Sediments</u>					
Rhode Island ^a	Range	7–30	588–3690	41–97	37–82
Coastal Ponds (n = 3)	Mean	16	1150	62	54
Cape Cod ^b	Range	3–11	297–1270	15–46	48–146
National Seashore Ponds (n = 9)	Mean	7	696	32	84
Cape Cod ^b	Range	1–227	104–3320	5–219	27–262
National Seashore Marshes (n = 17)	Mean	22	772	59	109
<u>Mollusks</u>					
U.S. Coastal ^c Waters (1996) (n = 196)	Mean	28	254	119	N/A ^d
Cape Cod ^b	Range	5–44	173–5310	53–168	N/A ^d
(n = 13)	Mean	24	931	116	

^a =Quinn et al., 1999

^b =this study

^c =O'Connor, 1998; annual median concentration

^d =not analyzed

Table 2. Organic contaminant concentrations in bivalve tissues normalized to lipid and in sediments normalized to organic carbon.

Station	Σ PAHs/ Lipid	Σ PCBs/ Lipid	Σ DDTs/ Lipid	Σ PAHs/ OC	Σ PCBs/ OC	Σ DDTs/ OC
Tiss/Sed	ng/gm. dry wt.	----->				
TC-4/6	4260	1120	116	4061	213	27.1
TC-5/2	10,500	1870	479	50,000	770	218
MP-4/5	5040	2170	448	10,210	497	109
HR-1/3	42,200	2120	619	11,184	634	154
HR-2/4	7660	4030	1150	14,487	1091	190

Figure 1: Sample Locations for Organic Contaminants in Coastal Ponds and Marshes in the Cape Cod National Seashore (bm=blue mussel, rm=ribbed mussel, oys= American oyster, U=unrestricted, R=Restricted).

<u>Station</u>	<u>Location</u>	<u>type</u>
TC-1	Town Cove	surface
TC-2	Town Cove	surface
TC-3	Town Cove	core/surface
TC-4	Town Cove	tissue-bm
TC-5	Town Cove	tissue-bm
TC-6	Town Cove	marsh
SP-1	Salt Pond	core/surface
SP-2	Salt Pond	surface
SP-3	Salt Pond	surface
SP-4	Salt Pond	tissue-bm
SP-5	Salt Pond	marsh
NB-1	Nauset Bay	tissue-bm
MP-1	Mill Pond	core/surface
MP-2	Mill Pond	surface
MP-3	Mill Pond	surface
MP-4	Mill Pond	tissue-bm
MP-5	Mill Pond	marsh
SS-1	Snow Shore	tissue-bm
NI-S2	Nauset Inlet	marsh
NI-T1	Nauset Inlet	tissue-rm
PB-S1	Pleasant Bay	marsh
PB-S2	Pleasant Bay	marsh
PB-S3	Pleasant Bay	marsh
PB-T1	Pleasant Bay	tissue-rm
HH-1	Hatches Harbor U	tissue-bm
HH-2	Hatches Harbor U	marsh
HH-3	Hatches Harbor U	marsh
HH-4	Hatches Harbor R	marsh
HH-5	Hatches Harbor R	marsh
HH-7	Hatches Harbor R	marsh
HH-8	Hatches Harbor U	core
PT-1	Provincetown	tissue-bm
PT-2	Provincetown	tissue-bm
HR-1	Herring River U	tissue-rm
HR-2	Herring River	tissue-oys
HR-3	Herring River U	marsh

Station

HR-4

HR-5

HR-6

Location

Herring River U

Herring River R

Herring River R

type

marsh

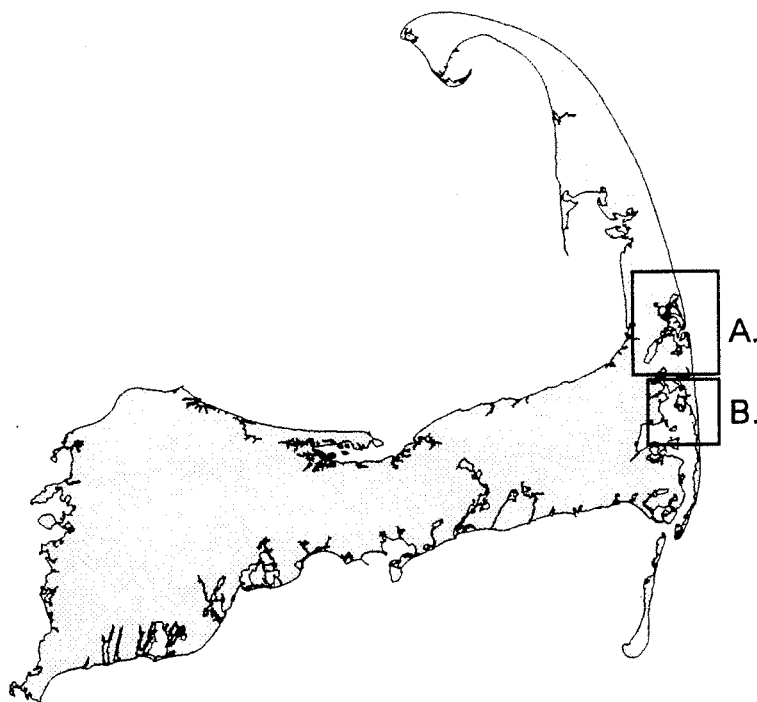
marsh

marsh



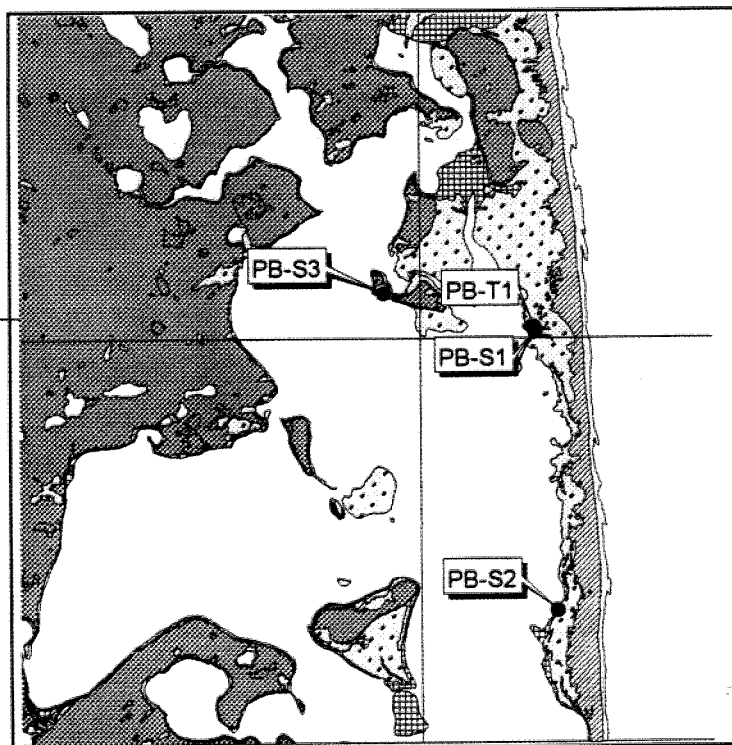
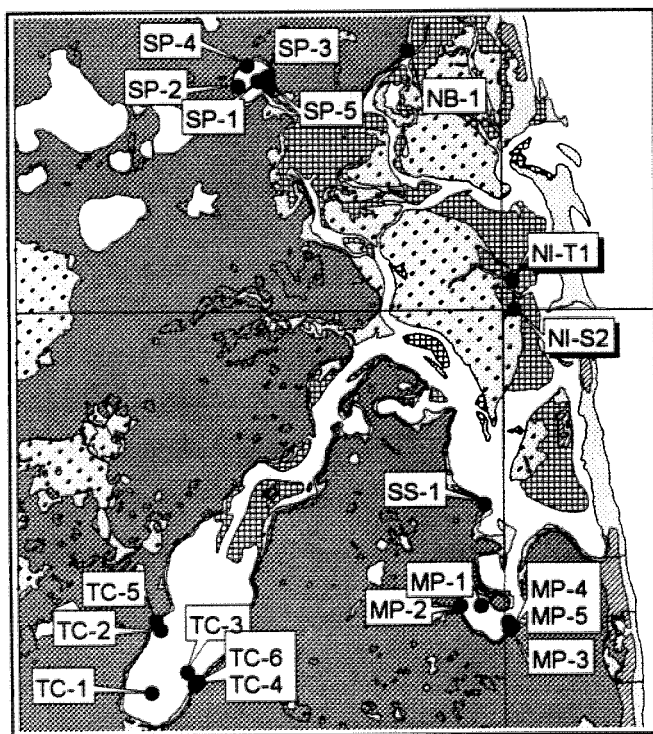
Figure 1a:
Sample Locations for Organic
Contaminants in Nauset Marsh
Estuary and Pleasant Bay

- Sample Locations
- BARRIER BEACH
- ▨ DUNE
- ▤ MARSH
- ▧ TIDAL FLAT
- OPEN WATER
- ▩ UPLAND



A. Nauset Marsh Estuary

B. Pleasant Bay



1000 0 1000 Meters

1000 0 1000 Meters



Figure 1b:
Sample Locations for Organic Contaminants
Hatches Harbor & Provincetown

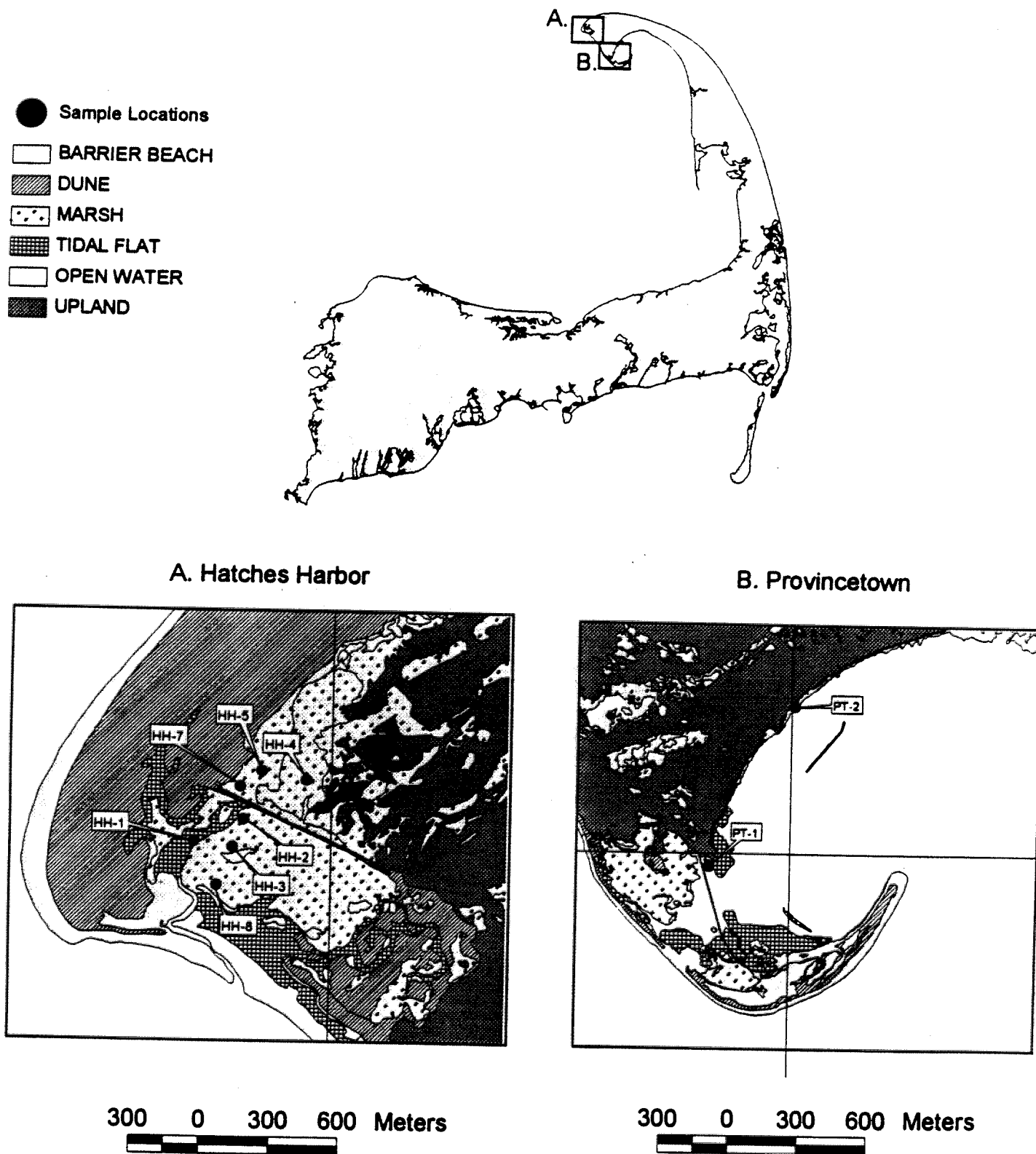
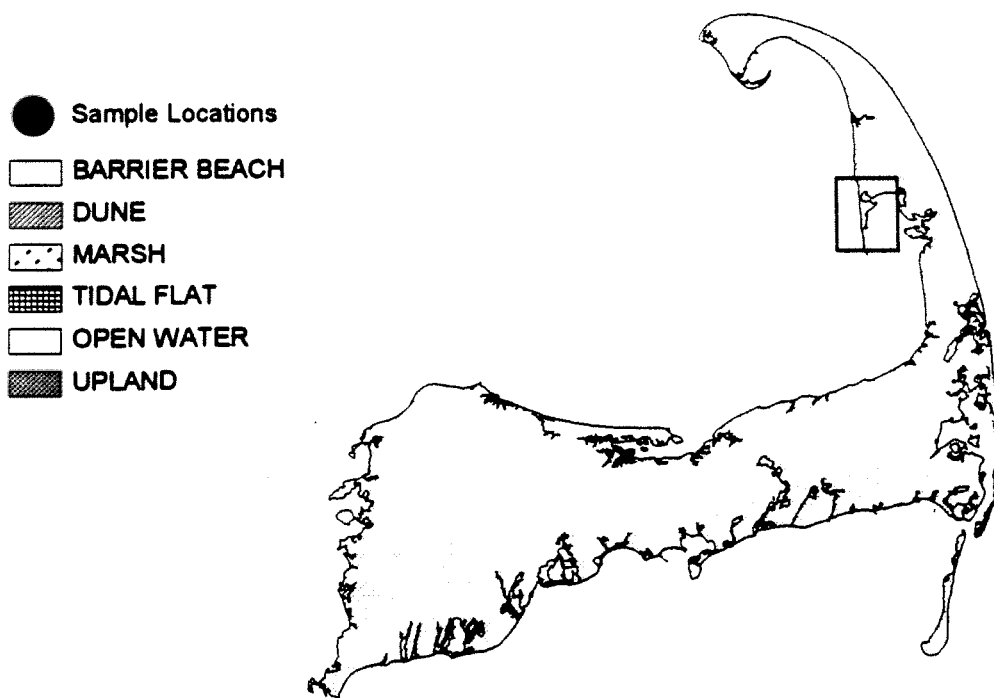
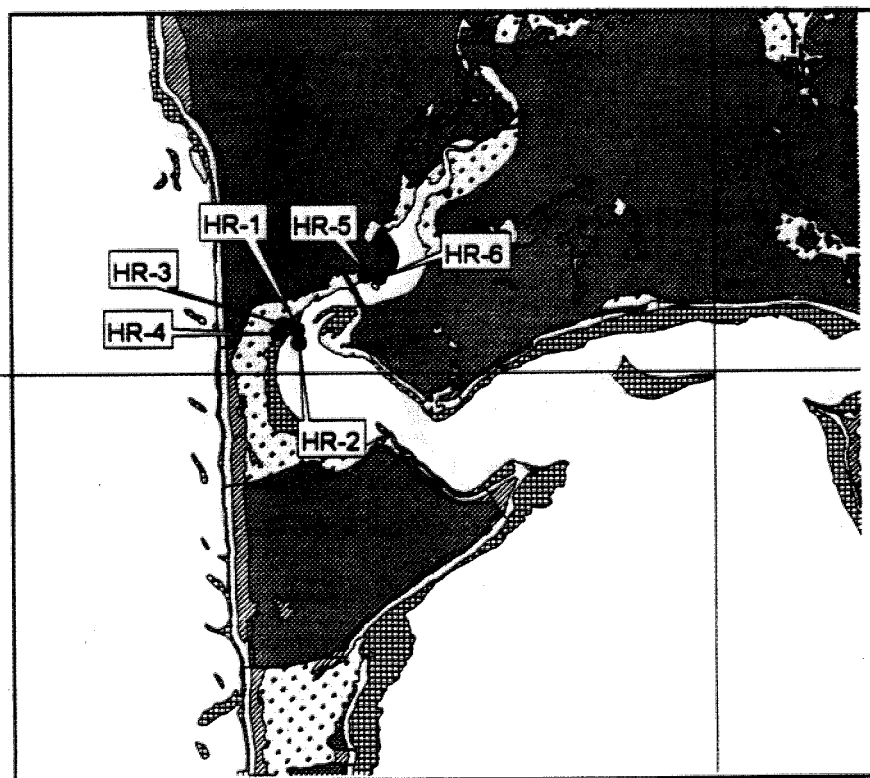




Figure 1c:
Sample Locations for Organic
Contaminants Herring River



Herring River



1000 0 1000 2000 Meters

Concentration

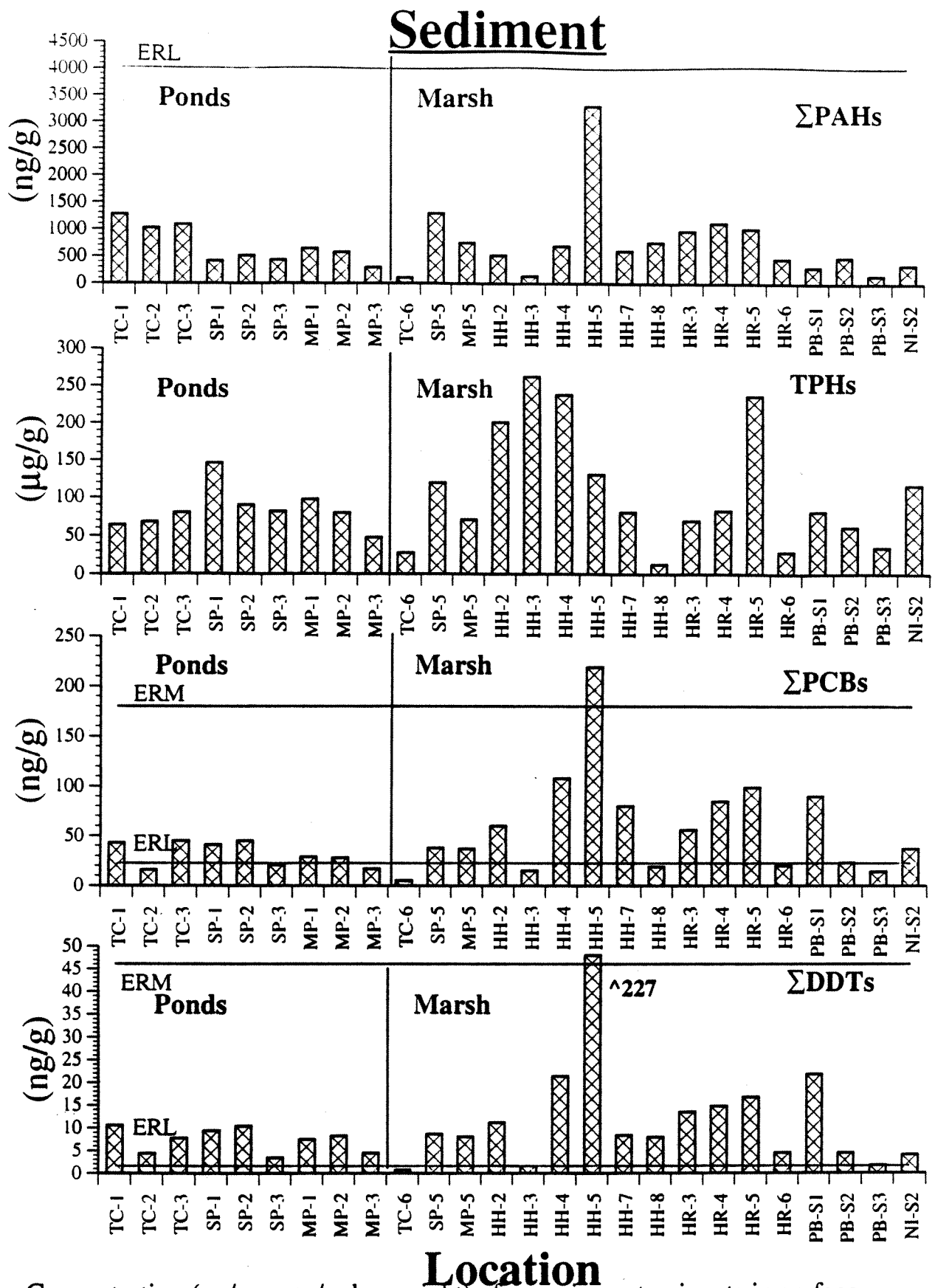


Figure 2a. Concentration (ng/g or μg/g dry weight) of organic contaminants in surface sediments(0-2 cm.) from coastal ponds and marshes of Cape Cod National Seashore. The horizontal lines are the ERL and ERM guidelines, respectively (Long et al., 1995; total PAHs: 4020, 44800; total PCBs: 22.7, 180; total DDTs: 1.6, 46.1 ppb dry weight). HH-8 is a core section(8-14 cm. deep).

Concentration

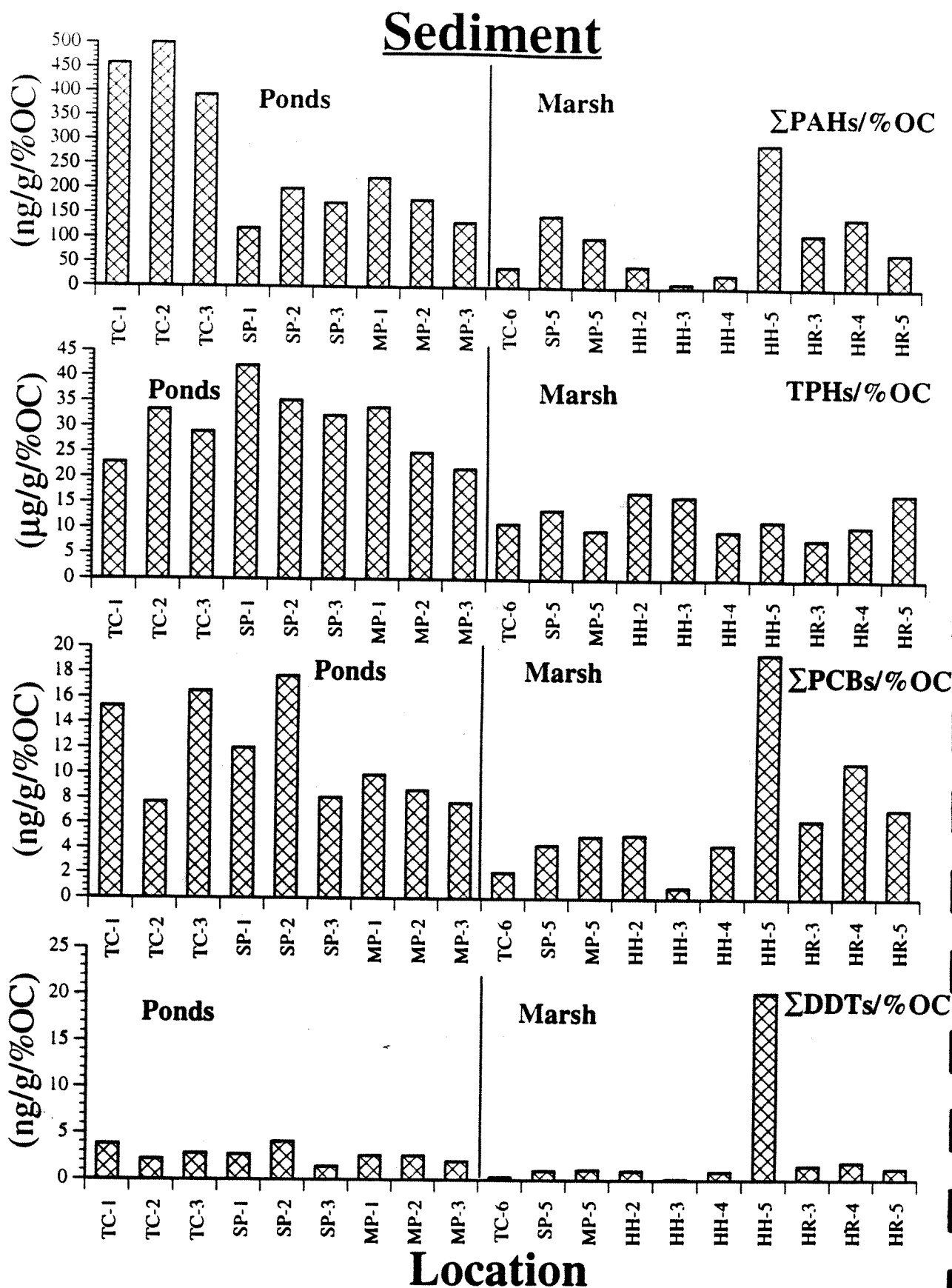


Figure 2b. Concentration (ng/g or μg/g dry weight) of organic contaminants in surface sediments(0-2 cm.) from coastal ponds and marshes of Cape Cod National Seashore normalized to percent organic carbon content for that sample.

Concentration

Site HH-5

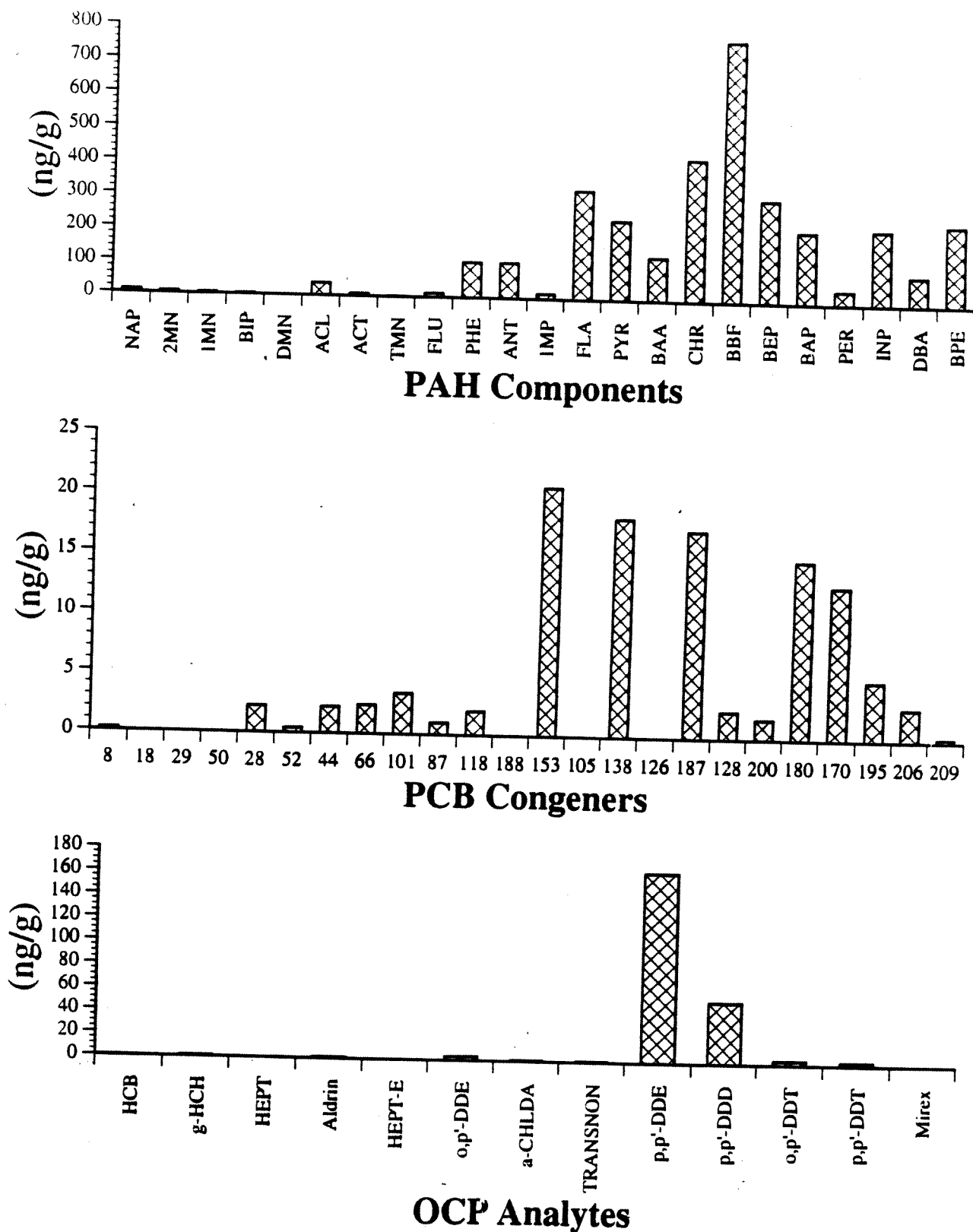


Figure 3a. Concentration (ng/g dry weight sediment) of organic contaminants in surface sediment(0-2 cm.) from Hatches Harbor- restricted marsh pool(HH-5)- of the Cape Cod National Seashore.

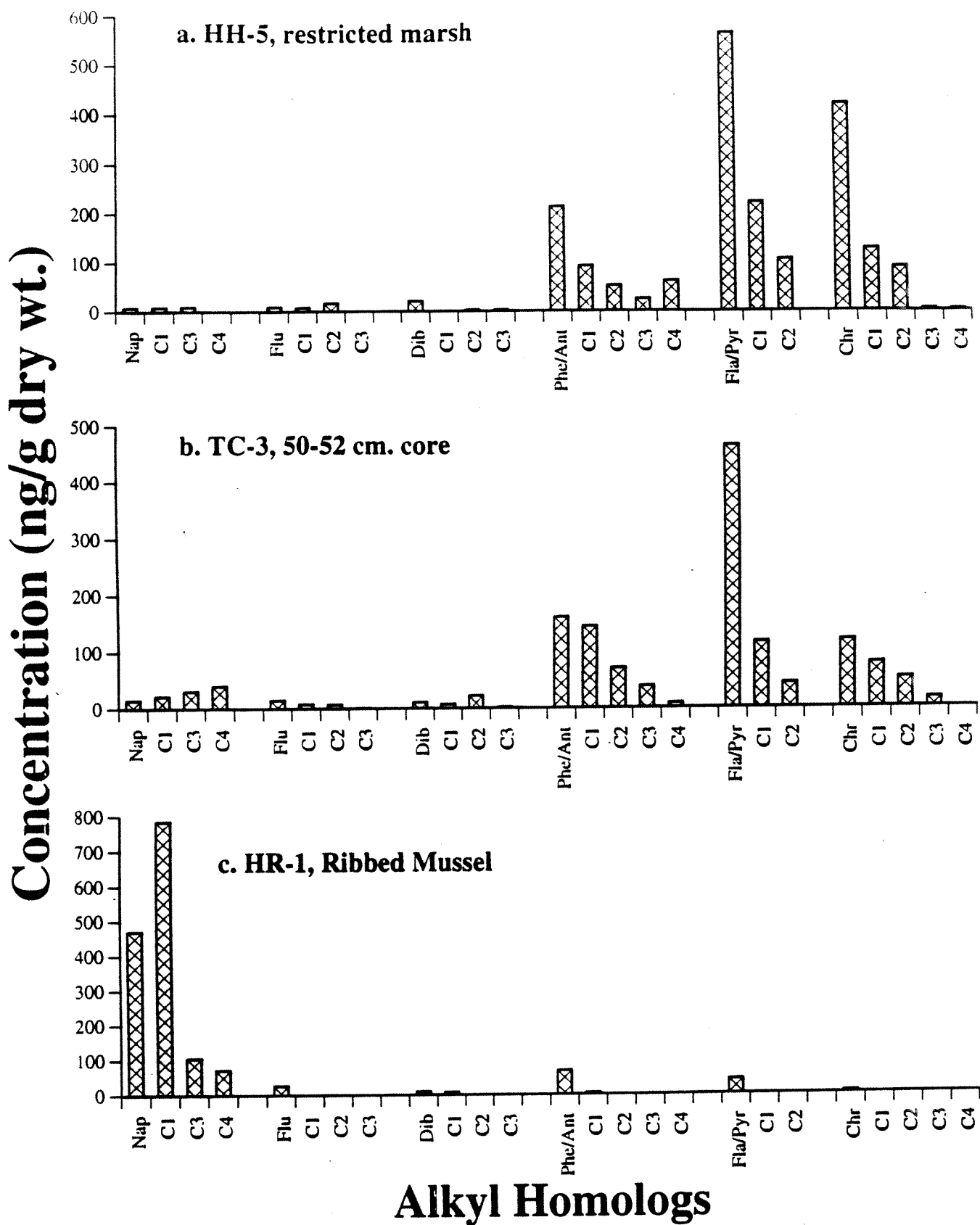
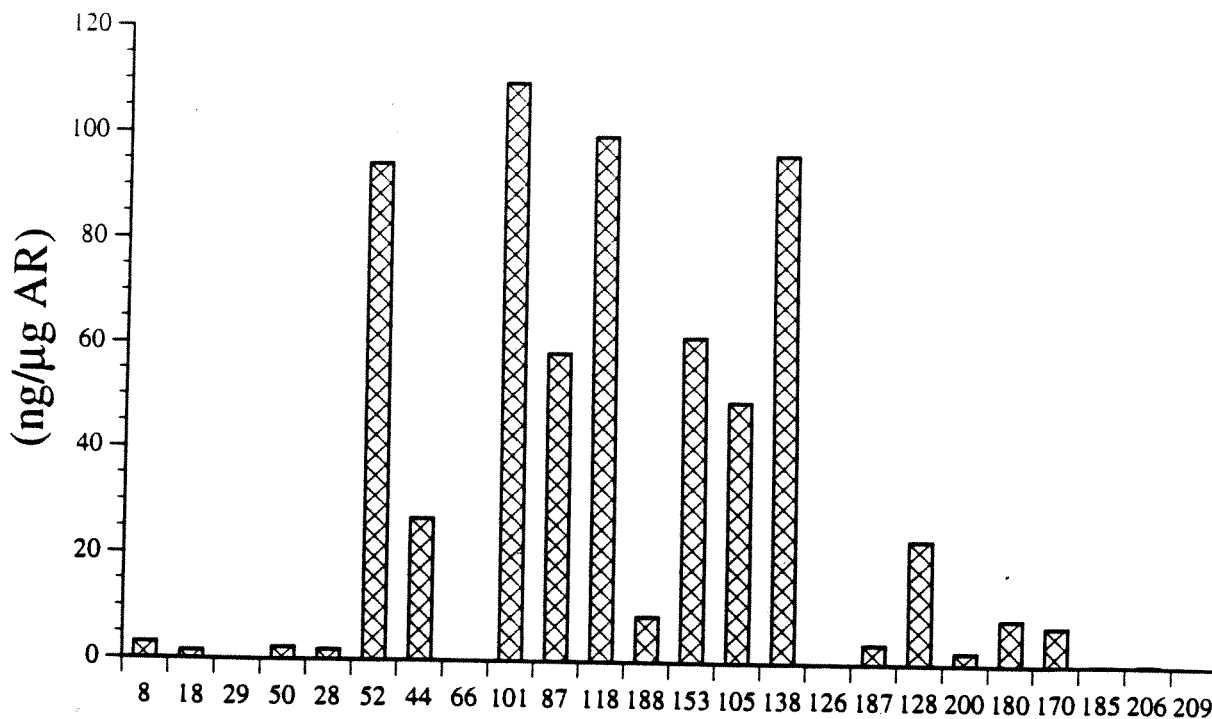


Figure 3b. PAH alkyl homolog distribution for:

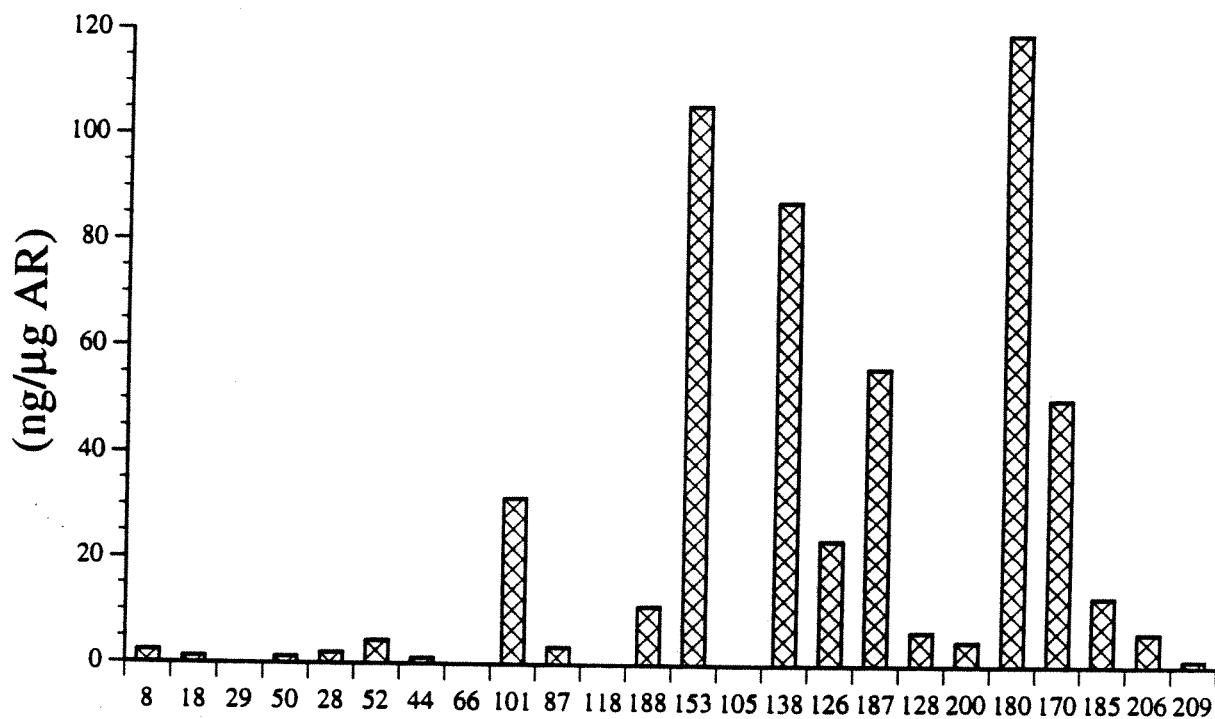
- a. HH-5, restricted marsh sediment,
- b. TC-3, 50-52 cm. sediment core,
- c. HR-1, Ribbed Mussel Tissue.

Concentration

Aroclor 1254



Aroclor 1260



PCB Congeners

Figure 3c. Concentration (ng/μg of Aroclor) of individual PCB congeners in Aroclors 1254 and 1260.

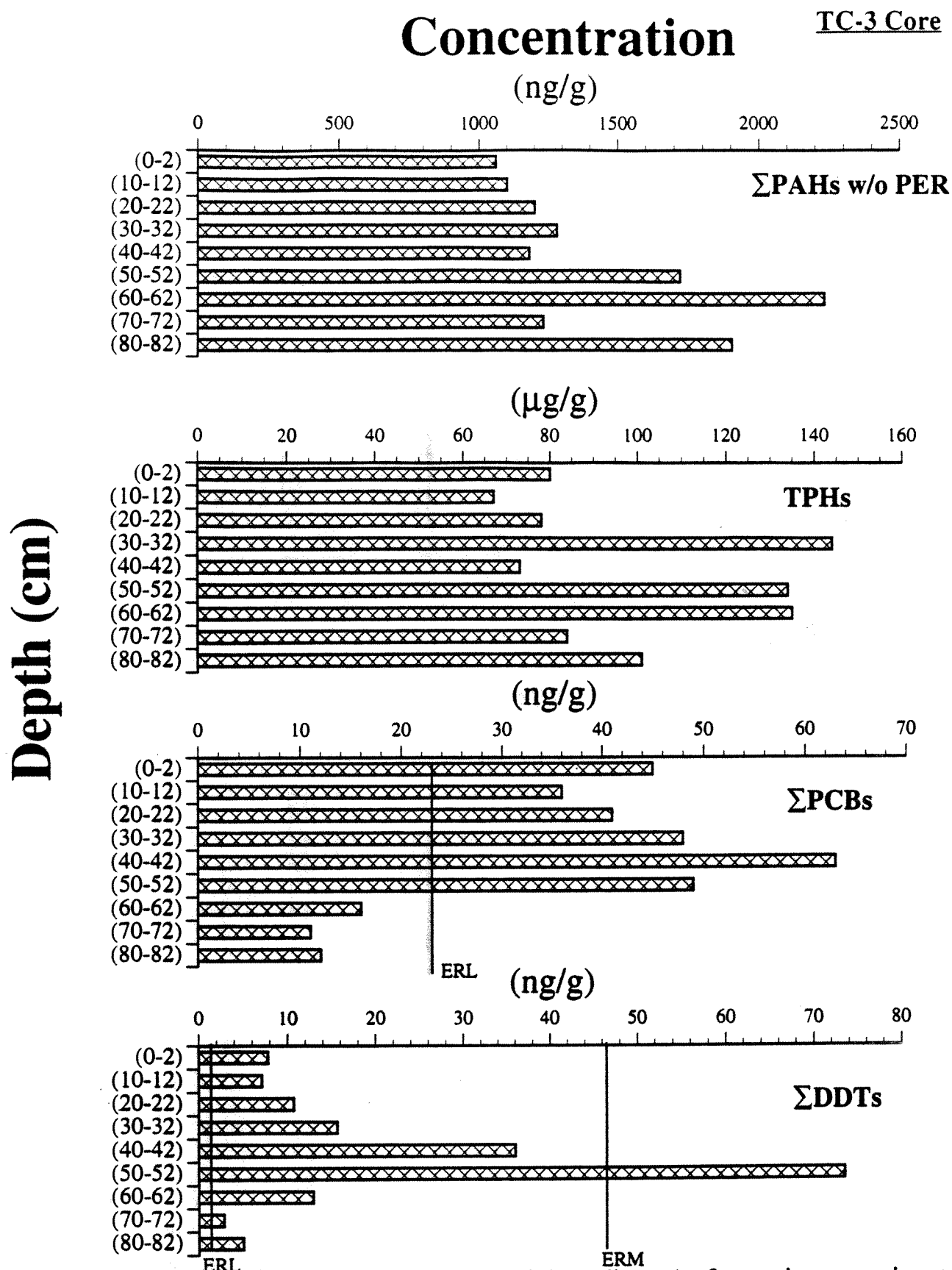


Figure 4. Concentration (ng/g or μg/g dry weight sediment) of organic contaminants in the sediment core from the Town Cove(TC-3) area of Cape Cod National Seashore's Nauset Marsh. The vertical lines are the ERL and ERM guideline, respectively (Long et al., 1995; total PAHs: 4020, 44800; total PCBs: 22.7, 180; total DDTs: 1.6, 46.1 ppb dry weight). Perylene(PER) is not included in the ΣPAHs.

TC-3 Core PAHs

Concentration

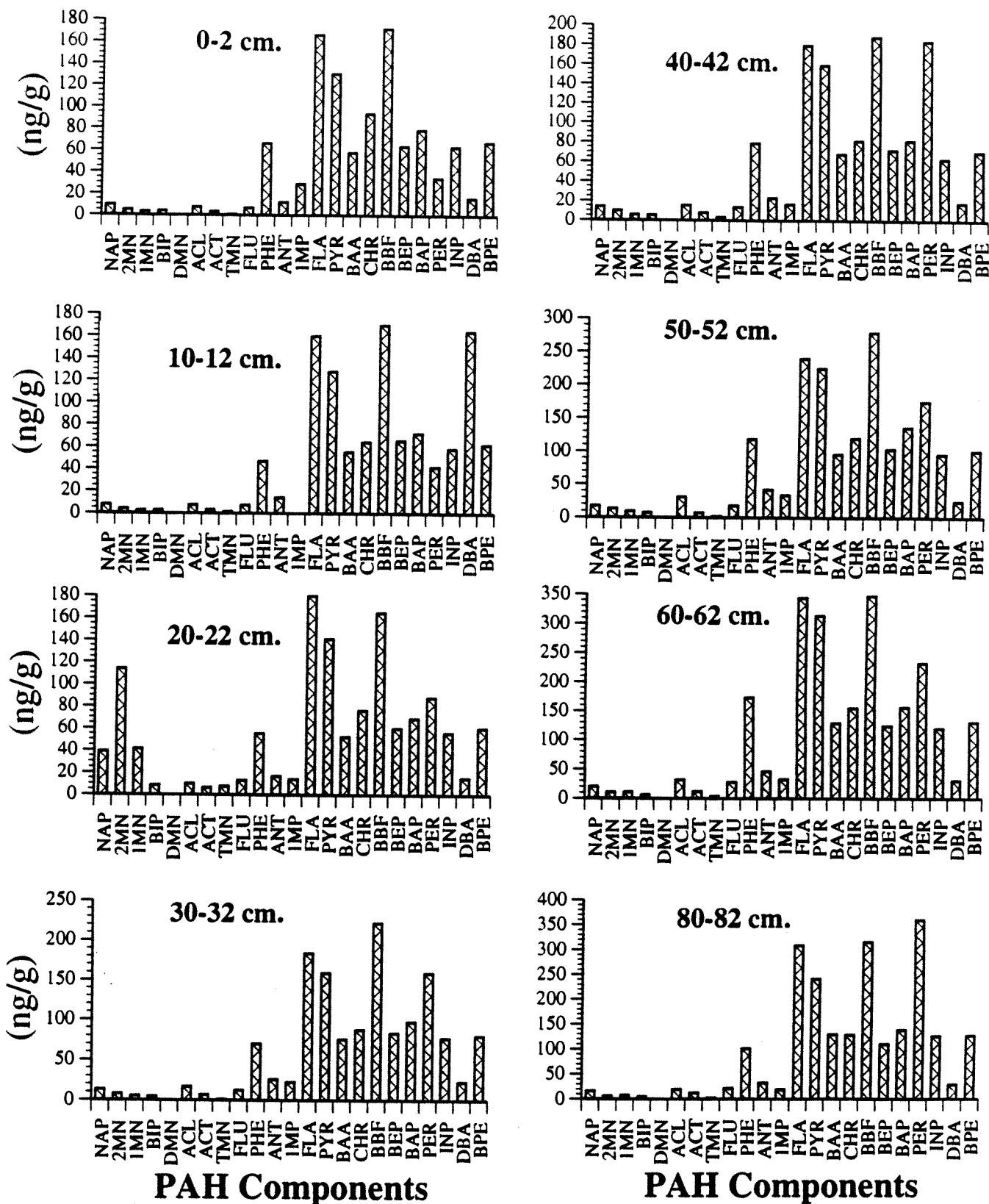
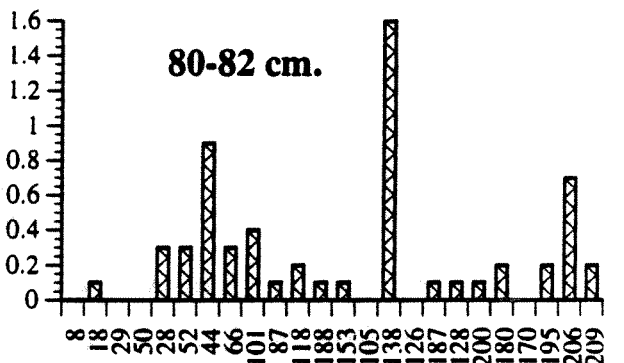
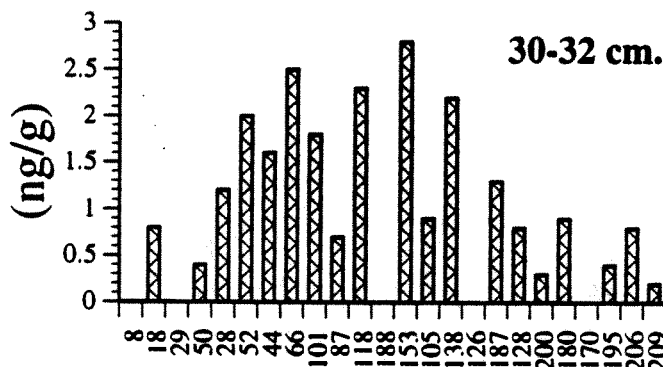
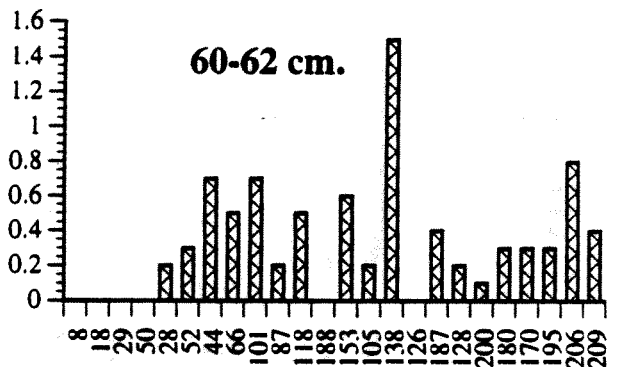
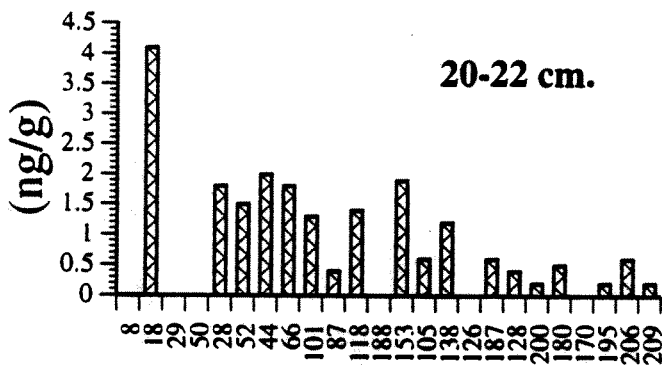
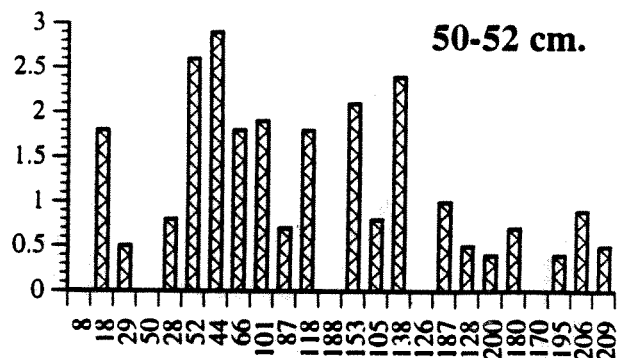
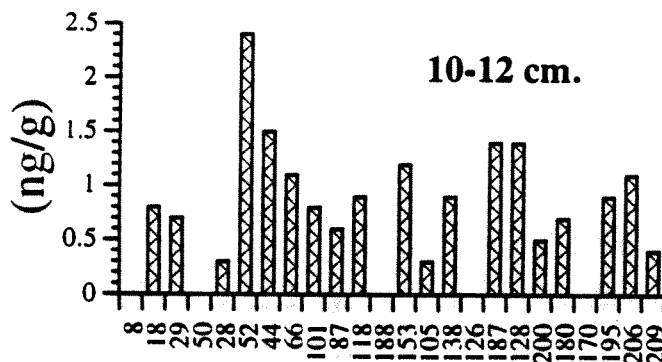
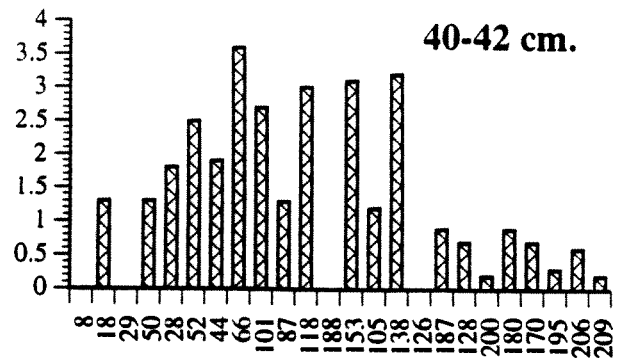
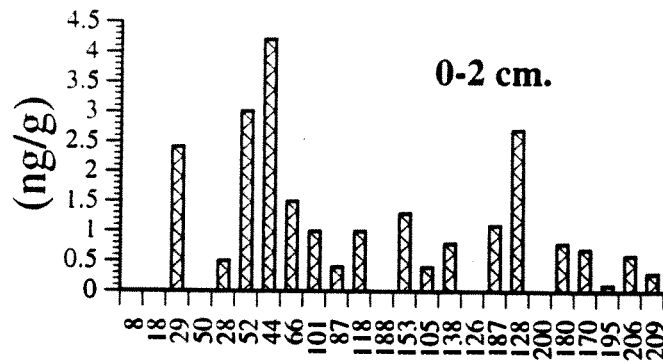


Figure 5. Concentration (ng/g dry weight sediment) of PAHs in the sediment core from the Town Cove(TC-3) area of Cape Cod National Seashore's Nauset Harbor.

TC-3 Core PCBs

Concentration



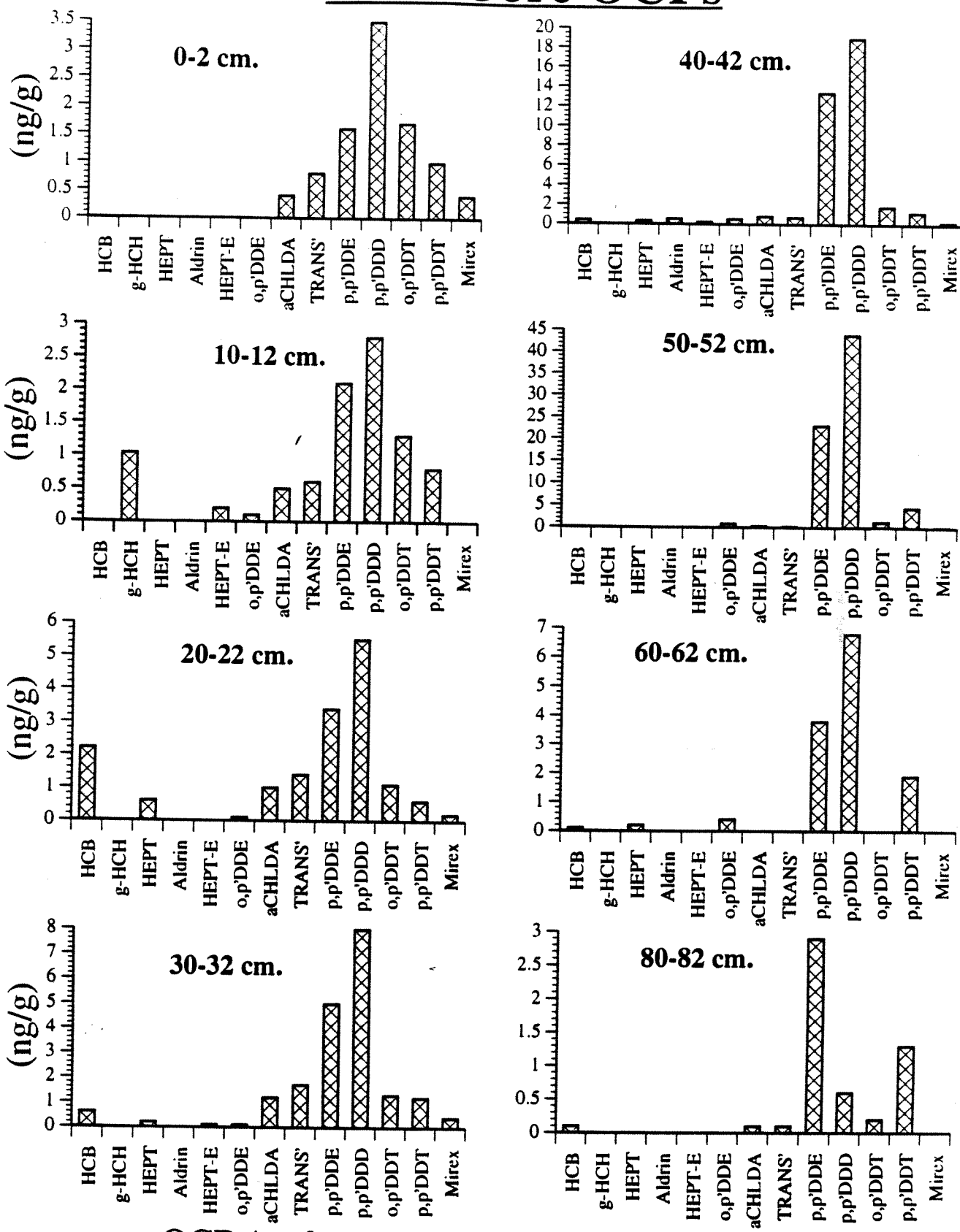
PCB Congeners

PCB Congeners

Figure 6. Concentration (ng/g dry weight sediment) of PCBs in the sediment core from the Town Cove(TC-3) area of Cape Cod National Seashore's Nauset Harbor.

Concentration

TC-3 Core OCPs



OCP Analytes

OCP Analytes

Figure 7. Concentration (ng/g dry weight sediment) of OCPs in the sediment core from the Town Cove(TC-3) area of Cape Cod National Seashore's Nauset Harbor.

Concentration

Tissue

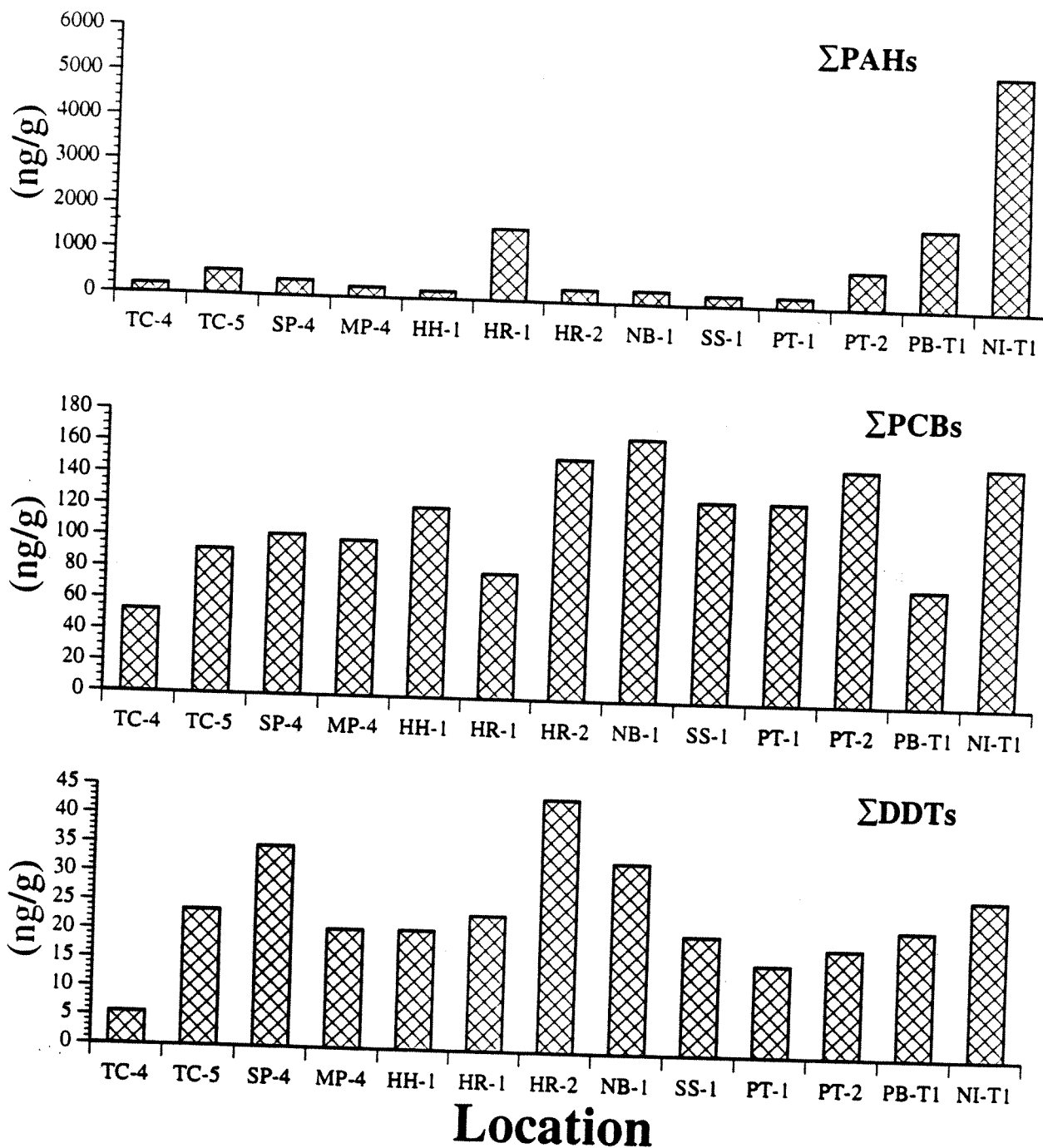


Figure 9a. Concentration (ng/g dry weight) of organic contaminants in tissue samples (oysters(HR-2), ribbed mussels(HR-1,PB-T1 and NI-T1) and blue mussels(all others)) from coastal ponds and marshes of the Cape Cod National Seashore.

Concentration

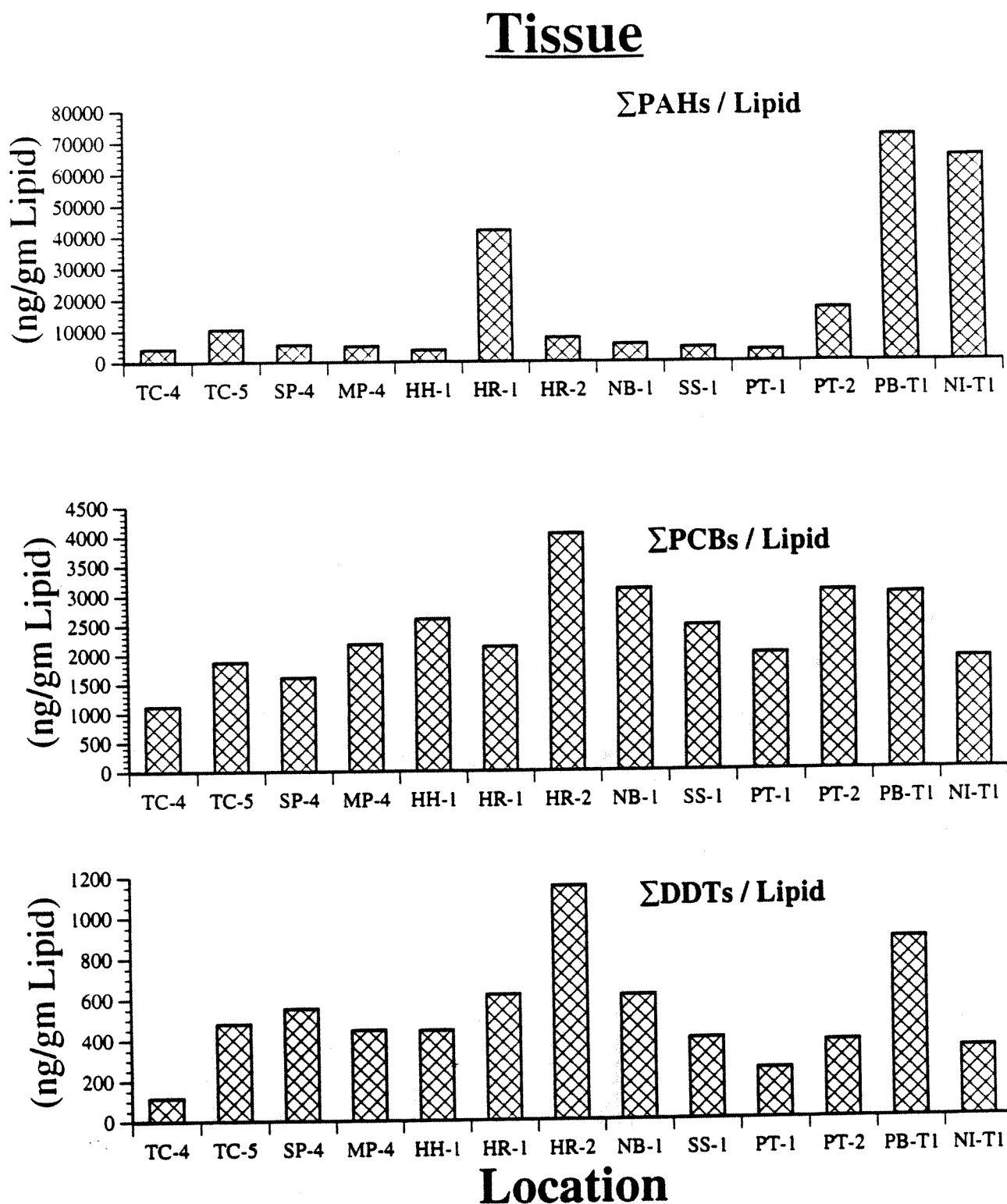


Figure 9b. Concentration (ng/g lipid weight) of organic contaminants normalized to lipid in tissue samples (oysters(HR-2), ribbed mussels(HR-1,PB-T1 and NI-T1) and blue mussels(all others)) from coastal ponds and marshes of the Cape Cod National Seashore.

Appendix I

Sample Information

USGS -Cape Cod 1999- Project Sample IDs

<u>SAMPLE ID</u>	<u>DESCRIPTION</u>	<u>MATRIX</u>	<u>OGL LAB ID</u>
<u>PONDS</u>			
TC-1	0-2 cm.	Surface Sediment	NP02
TC-2	0-2 cm.	Surface Sediment	NP03
TC-3	0-2 cm.	Surface Sediment	NP04
SP-1	0-2 cm.	Surface Sediment	NP05
SP-1	0-2 cm.,repeat NP05.	Surface Sediment	NP40
SP-2	0-2 cm.	Surface Sediment	NP06
SP-3	0-2 cm.	Surface Sediment	NP07
MP-1	0-2 cm.	Surface Sediment	NP25
MP-2	0-2 cm.	Surface Sediment	NP08
MP-3	0-2 cm.	Surface Sediment	NP09
<u>CORES</u>			
TC-3	10-12 cm.	Sediment Core	NP12
TC-3	20-22 cm.	Sediment Core	NP13
TC-3	30-32 cm.	Sediment Core	NP14
TC-3	40-42 cm.	Sediment Core	NP15
TC-3	50-52 cm.	Sediment Core	NP21
TC-3	60-62 cm.	Sediment Core	NP62
TC-3	70-72 cm.	Sediment Core	NP63
TC-3	80-82 cm.	Sediment Core	NP64
SP-1	10-12 cm.	Sediment Core	NP16
SP-1	20-22 cm.	Sediment Core	NP17
SP-1	30-32 cm.	Sediment Core	NP18
SP-1	40-42 cm.	Sediment Core	NP19
SP-1	50-52 cm.	Sediment Core	NP23
<u>MARSHES</u>			
TC-6	Driftwood (TC#1)	Marsh Sediment	NP22
SP-5	(SP#1, marsh)	Marsh Sediment	NP24
MP-5	Grandview (MP#1)	Marsh Sediment	NP26
HH-2	(HH#1, unrstrd. marsh)	Marsh Sediment	NP27
HH-3	(HH#2,edge marsh pool)	Marsh Sediment	NP32
HH-4	(HH#3, restricted marsh next sed'n. station)	Marsh Sediment	NP33
HH-5	(HH#4, rstrctd.marsh pool)	Marsh Sediment	NP41
HH-7	(rstrctd. marsh pool edge)	Marsh Sediment	NP75
HH-8	(unrstrctd., 8-14 cm.)	Marsh Core	NP76
HR-3	(HR#1, unrstrd. marsh)	Marsh Sediment	NP28
HR-4	(HR#2, unrstrd. creek)	Marsh Sediment	NP34
HR-5	(HR#3, restricted marsh)	Marsh Sediment	NP35
HR-6	(HR#4, restricted tidal crk.)	Marsh Sediment	NP42
PB-S1	Pleasant Bay #1	Marsh Sediment	NP68
PB-S2	Pleasant Bay #2	Marsh Sediment	NP69
PB-S3	Pleasant Bay, Hog Is.	Marsh Sediment	NP74
NI-S2	Nauset Inlet #2	Marsh Sediment	NP73

USGS -Cape Cod 1999- Project Sample IDs

<u>SAMPLE ID</u>	<u>DESCRIPTION</u>	<u>MATRIX</u>	<u>OGL LAB ID</u>
<u>TISSUES</u>			
TC-4	Blue Mussel	Tissue	NP49
TC-5	Blue Mussel	Tissue	NP50
SP-4	Blue Mussel	Tissue	NP57
MP-4	Blue Mussel	Tissue	NP51
HH-1	Blue Mussel	Tissue	NP58
HR-1	Ribbed Mussel	Tissue	NP56
HR-1a	Ribbed Mussel	Tissue	NP65
HR-2	Oysters	Tissue	NP66
NB-1	Blue Mussel	Tissue	NP53
SS-1	Blue Mussel	Tissue	NP52
PT-1	Blue Mussel	Tissue	NP59
PT-2	Blue Mussel	Tissue	NP60
PB-T1	Plsnt. B. #1, Ribbed Mssl.	Tissue	NP71
NI-T1	Nauset Inlet, Ribbed Mssl.	Tissue	NP72
<u>QA/OC SAMPLES</u>			
OGL Lab Blank		Sediment Lab Blank	SB01
OGL Lab Blank		Sediment Lab Blank	SB10
OGL Lab Blank		Sediment Lab Blank	SB20
OGL Lab Blank		Sediment Lab Blank	SB29
OGL Lab Blank		Sediment Lab Blank	SB36
OGL Lab Blank		Sediment Lab Blank	SB67
OGL Lab Blank		Tissue Lab Blank	SB43
OGL Lab Blank		Tissue Lab Blank	SB48
OGL Lab Blank		Tissue Lab Blank	SB54
OGL Lab Blank		Tissue Lab Blank	SB61
OGL Lab Blank		Tissue Lab Blank	SB70
OGL Lab Blank Spike		Sediment Lab Blank Spike	SB11
NIST SRM-1941a		Reference Marine Sediment	NS30
NIST SRM-1941a		Reference Marine Sediment	NS37
NIST QA99SED9	bottle #153	Marine Sediment	NS31
NIST QA99SED9	bottle #156	Marine Sediment	NS38
NIST QA99SED9	bottle #160	Marine Sediment	NS39
NIST QA93FSH1		Fish Tissue	NF44
NIST QA99FSH4	bottle #127	Fish Tissue	NF45
NIST QA99FSH4	bottle #161	Fish Tissue	NF46
NIST QA99FSH4	bottle #167	Fish Tissue	NF47
NIST QA97TIS8	bottle #153	Mussel Tissue	NM55

USGS-Cape Cod 1999-Project BATCH/QUALITY ASSURANCE RECORD

LAB ID	MATRIX	SAMPLE SITE	QA/QC TYPE	NOTES & COMMENTS
1. BATCH EXTRACTED ON 10/13/99.				
SB01	Sediment	Laboratory	OGL Lab Blank	Muffled sea sand (reddish).
NP02	Sediment	TC-1		Surface Sediment Samples (0-2 cm.) collected 10/06/99.
NP03	Sediment	TC-2		
NP04	Sediment	TC-3		Core location.
NP05	Sediment	SP-1		Core location.
NP06	Sediment	SP-2		
NP07	Sediment	SP-3		
NP08	Sediment	MP-2		
NP09	Sediment	MP-3		
2. BATCH EXTRACTED ON 10/25/99.				
SB10	Sediment	Laboratory	OGL Lab Blank	Muffled sea sand (reddish).
SB11	Sediment	Laboratory	OGL Lab Blank Spike	Muffled sea sand (reddish).
NP12	Core	TC-3, 10-12 cm.		Core Samples collected 10/06/99, subsampled 10/13/99.
NP13	Core	TC-3, 20-22 cm.		
NP14	Core	TC-3, 30-32 cm.		
NP15	Core	TC-3, 40-42 cm.		
NP16	Core	SP-1, 10-12 cm.		
NP17	Core	SP-1, 20-22 cm.		
NP18	Core	SP-1, 30-32 cm.		
NP19	Core	SP-1, 40-42 cm.		
3. BATCH EXTRACTED ON 12/06/99.				
SB20	Sediment	Laboratory	OGL Lab Blank	Muffled sea sand (reddish).
NP21	Core	TC-3, 50-52 cm.		Core Sample collected 10/06/99, subsampled 10/13/99.
NP22	Sediment	TC-6		Marsh Sediment Sample (0-2 cm.) collected 11/01/99.
NP23	Core	SP-1, 50-52 cm.		Core Sample collected 10/06/99, subsampled 10/13/99.
NP24	Sediment	SP-5		Marsh Sediment Sample (0-2 cm.) collected 11/01/99.
NP25	Sediment	MP-1		Surface Sediment Sample (0-2 cm.) collected 10/06/99.
NP26	Sediment	MP-5		Marsh Sediment Sample (0-2 cm.) collected 11/01/99.
NP27	Sediment	HH-2		Marsh Sediment Sample (0-2 cm.) collected 11/01/99.
NP28	Sediment	HR-3		Marsh Sediment Sample (0-2 cm.) collected 11/01/99.
4. BATCH EXTRACTED ON 01/20/00.				
SB29	Sediment	Laboratory	OGL Lab Blank	Muffled sea sand (reddish).
NS30	Sediment	NIST	SRM 1941a	Standard Reference Material (Marine sediment).
NS31	Sediment	NIST	QA99SED9	(intercomparison, bottle #153).
NP32	Sediment	HH-3		Marsh Pool Sample(0-2 cm.) collected 11/01/99.
NP33	Sediment	HH-4		Restricted Marsh(Sedn.Stat.)(0-2 cm.)coll'ed.11/01/99.
NP34	Sediment	HR-4		Unrestricted Creek (0-2 cm.) collected 11/01/99.
NP35	Sediment	HR-5		Restricted Marsh (0-2 cm.) collected 11/01/99.
5. BATCH EXTRACTED ON 02/04/00.				
SB36	Sediment	Laboratory	OGL Lab Blank	Muffled sea sand (reddish).
NS37	Sediment	NIST	SRM 1941a	Standard Reference Material (Marine sediment).
NS38	Sediment	NIST	QA99SED9	(intercomparison, bottle #156).
NS39	Sediment	NIST	QA99SED9	(intercomparison, bottle #160).
NP40	Sediment	SP-1	Replicate NP05	Core location.
NP41	Sediment	HH-5		Restricted Marsh Pool (0-2 cm.) collected 11/01/99.
NP42	Sediment	HR-6		Restricted Tidal Creek (0-2 cm.) collected 11/01/99.

USGS-Cape Cod 1999-Project BATCH/QUALITY ASSURANCE RECORD

LAB ID	MATRIX	SAMPLE SITE	QA/QC TYPE	NOTES & COMMENTS
6. BATCH EXTRACTED ON 02/28/00.				
SB43	Tissue	Laboratory	OGL Lab Blank	Milli-Q® water.
NF44	Tissue	NIST	QA93FSH1	(intercomparison also known as NRC CARP-1).
NF45	Tissue	NIST	QA99FSH4	(intercomparison, bottle #127).
NF46	Tissue	NIST	QA99FSH4	(intercomparison, bottle #161).
NF47	Tissue	NIST	QA99FSH4	(intercomparison, bottle #167).
7. BATCH EXTRACTED ON 03/14/00.				
SB48	Tissue	Laboratory	OGL Lab Blank	Milli-Q® water.
NP49	Tissue	TC-4		Town Cove, Blue Mussels, collected 10/20/99.
NP50	Tissue	TC-5		Town Cove, Blue Mussels, collected 10/20/99.
NP51	Tissue	MP-4		Mill Pond, Blue Mussels, collected 10/20/99.
NP52	Tissue	SS-1		Snow Shores, Blue Mussels, collected 10/20/99.
NP53	Tissue	NB-1		Nauset Bay, Blue Mussels, collected 10/20/99.
8. BATCH EXTRACTED ON 03/24/00.				
SB54	Tissue	Laboratory	OGL Lab Blank	Milli-Q® water.
NM55	Tissue	NIST	QA97TIS8	(intercomparison, previously opened bottle #153).
NP56	Tissue	HR-1	Blended-03/03/00	Herring River, Ribbed Mussels, collected 10/20/99.
NP57	Tissue	SP-1		Salt Pond, Blue Mussels, collected 10/26/99.
NP58	Tissue	HH-1		Hatches Harbor, Blue Mussels, collected 10/27/99.
NP59	Tissue	PT-1		Provincetown Brkwtr., Blue Mussels, collected 10/27/99.
NP60	Tissue	PT-2		Provincetown Harbor, Blue Mussels, collected 10/27/99.
9. BATCH EXTRACTED ON 05/02/00.				
SB61	Tissue	Laboratory	OGL Lab Blank	Milli-Q® water.
NP62	Core	TC-3, 60-62 cm.		Core Sample collected 10/06/99, subsampled 10/13/99.
NP63	Core	TC-3, 70-72 cm.		Core Sample collected 10/06/99, subsampled 10/13/99.
NP64	Core	TC-3, 80-82 cm.		Core Sample collected 10/06/99, subsampled 10/13/99.
NP65	Tissue	HR-1a	New Blending-05/01/00	Herring River, Ribbed Mussels, collected 10/20/99.
NP66	Tissue	HR-2	Blended-05/01/00	Herring River, Oysters, collected 10/20/99.
10. BATCH EXTRACTED ON 06/09/00.				
SB67	Sediment	Laboratory	OGL Lab Blank	Muffled sea sand (reddish).
NP68	Sediment	PB-S1; Pleasant Bay #1		Marsh Sediment Sample (0-2 cm.) collected 06/02/00.
NP69	Sediment	PB-S2; Pleasant Bay #2		Marsh Sediment Sample (0-2 cm.) collected 06/02/00.
11. BATCH EXTRACTED ON 08/03/00.				
SB70	Tissue	Laboratory	OGL Lab Blank	Milli-Q® water.
NP71	Tissue	PB-T1; Pleasant Bay #1		Pleasant Bay, Ribbed Mussels, collected 06/02/00.
NP72	Tissue	NI-T1		Nauset Inlet, Ribbed Mussels, collected 07/11/00.
NP73	Sediment	NI-S2		Nauset Inlet, Marsh Sediment #2, collected 07/11/00.
NP74	Sediment	PB-S3		Pleasant Bay-Hog Island Marsh, collected 06/16/00.
NP75	Sediment	HH-7, Hatches Hbr.		Restricted Marsh -pool edge, collected 07/10/00.
NP76	Core, 0-25cm.	HH-8, Hatches Hbr., 8-14 cm.		Unrestricted Marsh -near Inlet, collected 07/10/00.

SAMPLE INVENTORY AND DATA ANALYSIS INFORMATION

"ANALYTICAL SERVICES"

USGS Patuxent Wildlife Research Center
GRADUATE SCHOOL of OCEANOGRAPHY
NARRAGANSETT BAY CAMPUS, RHODE ISLAND

"THE STUDY OF ANTHROPOGENIC HYDROCARBONS IN COASTAL PONDS AND HARBORS IN THE CAPE COD NATIONAL SEASHORE"

Item	Sample			Organic Geochemistry Lab			Preservation		Preparation/Extraction/Analysis						Calculation Date
	Field I.D.	Matrix	Sampling Date	Chain of Custody No.	Date Received	I.D.	Freezer* Storage Date (at -20°C)	Any Sample Remnant?	% Solid (Dry:Wet Wt. Ratio)	Sample Dry Wt. gm.	Solvent Extraction Date	Column Chromatog. Date	PCB Analysis Date	PAH Analysis Date	
1	TC-1 (TOWN COVE)	SED	10/06/99	10/07/99	10/07/99	NP02	10/07/99	yes	32.59%	5.4258	10/13/99	10/18/99	11/03/99	10/20/99	11/03/99
2	TC-2	SED	10/06/99	10/07/99	10/07/99	NP03	10/07/99	yes	37.61%	6.2092	10/13/99	10/18/99	11/05/99	10/20/99	11/05/99
3	TC-3	SED	10/06/99	10/07/99	10/07/99	NP04	10/07/99	yes	27.61%	4.1393	10/13/99	10/18/99	11/05/99	10/20/99	11/05/99
4	SP-1(SALT POND)	SED	10/06/99	10/07/99	10/07/99	NP05 NP40	10/07/99	yes	25.57% 25.89%	4.1499 4.5697	10/13/99 02/04/00	10/18/99 02/09/00	11/05/99 02/16/00	10/21/99 03/06/00	11/05/99 03/06/00
5	SP-2	SED	10/06/99	10/07/99	10/07/99	NP06	10/07/99	yes	32.42%	5.2843	10/13/99	10/18/99	11/15/99	10/21/99	11/15/99
6	SP-3	SED	10/06/99	10/07/99	10/07/99	NP07	10/07/99	yes	32.40%	6.0487	10/13/99	10/18/99	11/17/99	10/21/99	11/17/99
7	MP-1(MILL POND)	SED	10/06/99	10/07/99	10/07/99	NP25	10/07/99	yes	22.74%	4.5567	12/06/99	12/14/99	12/29/99	12/16/99	01/06/00
8	MP-2	SED	10/06/99	10/07/99	10/07/99	NP08	10/07/99	yes	30.71%	5.1340	10/13/99	10/18/99	11/17/99	10/21/99	11/17/99
9	MP-3	SED	10/06/99	10/07/99	10/07/99	NP09	10/07/99	yes	37.81%	5.9174	10/13/99	10/18/99	11/17/99	10/21/99	11/17/99
10	TC-3 core, 10-12cm.	COFE	10/13/99	10/13/99	10/13/99	NP12	10/13/99	yes	37.84%	6.7084	10/25/99	11/01/99	11/24/99	11/03/99	11/24/99
11	TC-3 core, 20-22cm.	COFE	10/13/99	10/13/99	10/13/99	NP13	10/13/99	yes	31.43%	6.1752	10/25/99	11/01/99	11/23/99	11/03/99	11/24/99
12	TC-3 core, 30-32cm.	COFE	10/13/99	10/13/99	10/13/99	NP14	10/13/99	yes	38.85%	7.3275	10/25/99	11/01/99	11/24/99	11/15/99	11/24/99
13	TC-3 core, 40-42cm.	COFE	10/13/99	10/13/99	10/13/99	NP15	10/13/99	yes	40.45%	7.4223	10/25/99	11/01/99	11/24/99	11/15/99	11/24/99
14	TC-3 core, 50-52cm.	COFE	10/13/99	10/13/99	10/13/99	NP21	10/13/99	yes	44.05%	8.7882	12/06/99	12/14/99	12/21/99	12/15/99	12/23/99
15	TC-3 core, 60-62cm.	COFE	10/13/99	10/13/99	10/13/99	NP62	10/13/99	yes	45.14%	9.8637	05/02/00	05/04/00	05/09/00	05/08/00	05/17/00
16	TC-3 core, 70-72cm.	COFE	10/13/99	10/13/99	10/13/99	NP63	10/13/99	yes	49.23%	10.8500	05/02/00	05/04/00	05/09/00	05/08/00	05/17/00
17	TC-3 core, 80-82cm.	COFE	10/13/99	10/13/99	10/13/99	NP64	10/13/99	yes	43.65%	9.6369	05/02/00	05/04/00	05/09/00	05/08/00	05/17/00

SAMPLE INVENTORY AND DATA ANALYSIS INFORMATION

"ANALYTICAL SERVICES"

USGS Patuxent Wildlife Research Center
GRADUATE SCHOOL of OCEANOGRAPHY
NARRAGANSETT BAY CAMPUS, RHODE ISLAND

"THE STUDY OF ANTHROPOGENIC HYDROCARBONS IN COASTAL PONDS AND HARBORS IN THE CAPE COD NATIONAL SEASHORE"

Item	Sample				Organic Geochemistry Lab		Preservation		Preparation/Extraction/Analysis						
	Field I.D.	Matrix	Sampling Date	Chain of Custody No.	Date Received	Lab I.D.	Freezer* Storage Date (at -20°C)	Any Sample Remain?	% Solid (Dry:Wet Wt. Ratio)	Sample Dry Wt. gm.	Solvent Extraction Date	Column Chromatolog. Date	POB Analysis Date	PAH Analysis Date	Calculation Date
18	SP-1 core, 10-12cm.	COFE	10/13/99	10/13/99	10/13/99	NP16	10/13/99	yes	39.97%	6.8345	10/25/99	11/01/99	12/01/99	11/15/99	12/03/99
19	SP-1 core, 20-22cm.	COFE	10/13/99	10/13/99	10/13/99	NP17	10/13/99	yes	52.01%	9.9447	10/25/99	11/01/99	12/01/99	11/17/99	12/03/99
20	SP-1 core, 30-32cm.	COFE	10/13/99	10/13/99	10/13/99	NP18	10/13/99	yes	44.49%	8.5284	10/25/99	11/01/99	12/03/99	11/17/99	12/03/99
21	SP-1 core, 40-42cm.	COFE	10/13/99	10/13/99	10/13/99	NP19	10/13/99	yes	43.47%	8.3638	10/25/99	11/01/99	12/03/99	11/17/99	12/03/99
22	SP-1 core, 50-52cm.	COFE	10/13/99	10/13/99	10/13/99	NP23	10/13/99	yes	38.84%	6.9416	12/06/99	12/14/99	12/21/99	12/16/99	12/23/33
23	SP-1 core, 60-62cm.	COFE	10/13/99	10/13/99	10/13/99		10/13/99	yes							
24	SP-1 core, 70-72cm.	COFE	10/13/99	10/13/99	10/13/99		10/13/99	yes							
25	SP-1 core, 80-82cm.	COFE	10/13/99	10/13/99	10/13/99		10/13/99	yes							
26	TC-4 BM	TIS	10/20/99	10/21/99	10/21/99	NP49	10/21/99	yes	7.82%	1.6256	03/14/00	03/15/00	03/21/00	03/22/00	03/22/00
27	TC-5 BM	TIS	10/20/99	10/21/99	10/21/99	NP50	10/21/99	yes	9.01%	1.8763	03/14/00	03/15/00	03/21/00	03/22/00	03/22/00
28	HR-1 RM (HERRING RIVER) HR-1a RM	TIS	10/20/99	10/21/99	10/21/99	NP56 NP65	10/21/99	yes	8.19% 10.71%	1.6964 2.5124	03/24/00 05/02/00	03/28/00 05/05/00	04/04/00 05/10/00	03/29/00 05/09/00	04/11/00 05/22/00
29	HR-2 OY	TIS	10/20/99	10/21/99	10/21/99	NP66	10/21/99	yes	10.15%	2.7511	05/02/00	05/05/00	05/22/00	05/09/00	05/22/00
30	MP-4 BM	TIS	10/20/99	10/21/99	10/21/99	NP51	10/21/99	yes	7.20%	1.4377	03/14/00	03/16/00	03/22/00	03/22/00	04/04/00
31	SS-1 BM (SNOW SHORES)	TIS	10/20/99	10/21/99	10/21/99	NP52	10/21/99	yes	9.49%	1.9484	03/14/00	03/16/00	03/22/00	03/22/00	04/05/00
32	NB-1 BM (NAUSET BAY)	TIS	10/20/99	10/21/99	10/21/99	NP53	10/21/99	yes	9.40%	1.9552	03/14/00	03/16/00	03/22/00	03/22/00	04/05/00
33	SP-4 BM	TIS	10/26/99	10/29/99	10/29/99	NP57	10/29/99	yes	10.89%	2.2199	03/24/00	03/28/00	04/04/00	03/29/00	04/11/00
34	HH-1 BM (HATCHES HARBOR)	TIS	10/27/99	10/29/99	10/29/99	NP58	10/29/99	yes	8.55%	1.7455	03/24/00	03/29/00	04/05/00	03/29/00	04/11/00

SAMPLE INVENTORY AND DATA ANALYSIS INFORMATION
 "ANALYTICAL SERVICES"
 USGS Patuxent Wildlife Research Center
 GRADUATE SCHOOL of OCEANOGRAPHY
 NARRAGANSETT BAY CAMPUS, RHODE ISLAND

"THE STUDY OF ANTHROPOGENIC HYDROCARBONS IN COASTAL PONDS AND HARBORS IN THE CAPE COD NATIONAL SEASHORE"

Item	Sample				Preservation		Preparation/Extraction/Analysis								Calculation Date
	Field I.D.	Matrix	Sampling Date	Organic Chain of Custody No.	Geochemistry Lab Date Received	I.D.	Freezer* Storage Date (at -20°C)	Any Sample Remain?	% Solid (Dry:Wet Wt. Ratio)	Sample Dry Wt. gm.	Solvent Extraction Date	Column Chromatog. Date	ROB Analysis Date	PAH Analysis Date	
35	PT-1 BM (PROVINCETOWN)	TIS	10/27/99	10/29/99	10/29/99	NP59	10/29/99	yes	11.72%	2.4320	03/24/00	03/29/00	04/05/00	03/29/00	04/12/00
36	PT-2 BM	TIS	10/27/99	10/29/99	10/29/99	NP60	10/29/99	yes	11.39%	2.3593	03/24/00	03/29/00	04/05/00	03/29/00	04/12/00
37	PT-3 OY	TIS	10/27/99	10/29/99	10/29/99		10/29/99	yes							
38	PT-4 OY	TIS	10/27/99	10/29/99	10/29/99		10/29/99	yes							
39	SP-5 (S.P.#1, marsh)	SED	11/01/99	11/01/99	11/01/99	NP24	11/01/99	yes	26.05%	4.0060	12/06/99	12/14/99	12/21/99	12/16/99	12/23/00
40	MP-5 (M.P.#1, marsh, "Grandview")	SED	11/01/99	11/01/99	11/01/99	NP26	11/01/99	yes	36.39%	5.7572	12/06/99	12/14/99	12/22/99	12/16/99	01/05/00
41	TC-6 (T.C.#1, marsh, "Driftwood")	SED	11/01/99	11/01/99	11/01/99	NP22	11/01/99	yes	91.01%	14.5438	12/06/99	12/14/99	12/20/99	12/15/99	12/23/99
42	HR-3 (H.R.#1, unrestricted marsh)	SED	11/01/99	11/01/99	11/01/99	NP28	11/01/99	yes	19.14%	3.4003	12/06/99	12/14/99	12/22/99	12/16/99	01/05/00
43	HR-4 (H.R.#2, unrestricted creek)	SED	11/01/99	11/01/99	11/01/99	NP34	11/01/99	yes	9.64%	1.8655	01/20/00	01/24/00	02/01/00	03/06/00	03/06/00
44	HR-5 (H.R.#3, restricted marsh)	SED	11/01/99	11/01/99	11/01/99	NP35	11/01/99	yes	12.47%	2.3987	01/20/00	01/24/00	02/02/00	03/06/00	03/06/00
45	HR-6 (H.R.#4, restricted creek)	SED	11/01/99	11/01/99	11/01/99	NP42	11/01/99	yes	45.07%	9.1077	02/04/00	02/09/00	02/17/00	03/06/00	03/06/00
46	HH-2 (H.H.#1, unrestricted marsh)	SED	11/01/99	11/01/99	11/01/99	NP27	11/01/99	yes	24.87%	4.0193	12/06/99	12/14/99	12/22/99	12/16/99	01/05/00
47	HH-3 (H.H.#2, edge marsh pool)	SED	11/01/99	11/01/99	11/01/99	NP32	11/01/99	yes	33.08%	6.0939	01/20/00	01/24/00	02/01/00	01/25/00	02/23/00
48	HH-4 (H.H.#3, restricted marsh)	SED	11/01/99	11/01/99	11/01/99	NP33	11/01/99	yes	12.17%	2.2372	01/20/00	01/24/00	02/01/00	03/06/00	03/06/00
49	HH-5 (H.H.#4, restricted marsh)	SED	11/01/99	11/01/99	11/01/99	NP41	11/01/99	yes	19.94%	4.1715	02/04/00	02/09/00	02/17/00	03/06/00	03/06/00
50	PB-S1, Pleasant Bay #1	SED	06/02/00	06/05/00	06/05/00	NP68	06/05/00	yes	18.80%	3.7447	06/09/00	06/14/00	07/17/00	06/30/00	07/17/00
51	PB-S2, Pleasant Bay #2	SED	06/02/00	06/05/00	06/05/00	NP69	06/05/00	yes	23.49%	5.1372	06/06/00	06/14/00	07/18/00	06/30/00	07/18/00

SAMPLE INVENTORY AND DATA ANALYSIS INFORMATION
 "ANALYTICAL SERVICES"
 USGS Patuxent Wildlife Research Center
 GRADUATE SCHOOL of OCEANOGRAPHY
 NARRAGANSETT BAY CAMPUS, RHODE ISLAND

"THE STUDY OF ANTHROPOGENIC HYDROCARBONS IN COASTAL PONDS AND HARBORS IN THE CAPE COD NATIOL SEASHORE"

Item	Sample			Organic Geochemistry Lab		Preservation		Preparation/Extraction/Analysis					PAH Analysis Date	Calculation Date
	Field I.D.	Matrix	Sampling Date	Chain of Custody No.	Date Received	I.D.	Freezer* Storage Date (at -20°C)	Any Sample Remain?	% Solid (Dry:Wet Wt. Ratio)	Sample Dry Wt. gm.	Solvent Extraction Date	Column Chromatog. Date	PCB Analysis Date	
52	PB-T1, Pleasant Bay #1, RM	TIS	06/02/00	06/05/00	06/05/00	NP71	06/05/00	yes	8.36%	1.5980	08/03/00	08/07/00	08/09/00	08/08/00
53	PB-T2, Pleasant Bay #2, RM	TIS	06/02/00	06/05/00	06/05/00		06/05/00	yes						
54	PB-S3, Pleasant B., Hog Is., S. of Money P.	SED	06/16/00	-	06/23/00	NP74	06/23/00	yes	42.45%	9.5641	08/03/00	08/08/00	08/10/00	08/09/00
55	HR-7, Herring R., Ribbed Mssl. at gut	TIS	07/10/00	07/12/00	07/12/00		07/12/00	yes						08/10/00
56	HH-6, Hatches H., restr. near SET st.#1	SED	07/10/00	07/12/00	07/12/00		07/12/00	yes						
57	HH-7, Hatches H., restr. nrsh. pool edge	SED	07/10/00	07/12/00	07/12/00	NP75	07/12/00	yes	48.26%	7.1421	08/03/00	08/08/00	08/10/00	08/09/00
58	HH-8, Hatches H., unrestr. (0-25 cm)	COFE	07/10/00	07/12/00	07/12/00	NP76	07/12/00	yes	61.92%	7.8084	08/03/00	08/08/00	08/10/00	08/09/00
59	HH-9, Hatches H., restr. near SET st.#2	SED	07/10/00	07/12/00	07/12/00		07/12/00	yes						
60	NI-T1, Nauset Inlet, Ribbed Mssl.	TIS	07/11/00	07/12/00	07/12/00	NP72	07/12/00	yes	11.69%	2.3550	08/03/00	08/07/00	08/10/00	08/09/00
61	NI-S1, Nauset Inlet, marsh #1.	SED	07/11/00	07/12/00	07/12/00		07/12/00	yes						
62	NI-S2, Nauset Inlet, marsh #2.	SED	07/11/00	07/12/00	07/12/00	NP73	07/12/00	yes	18.73%	2.6406	08/03/00	08/08/00	08/09/00	08/09/00
63	NI-S3, Nauset Inlet, marsh #3.	SED	07/11/00	07/12/00	07/12/00		07/12/00	yes						08/10/00
64														
65														
66														
67														
68														

USGS -Cape Cod 1999- Project Sample Weights

LAB ID	SAMPLE ID# EXTRACT DATE	SAMPLE Type	No.	Tare Wt.(g)	Total Wet Wt.(g)	1st Total Drv Wt.(g)	2nd Total Drv Wt.(g)	Wet Wt.(g)	Dry Wt.(g)	% Dry Weight	Mean %D/W	SD %	RSD %	Wet Wt. gm.	Dry Wt. gm.
SB01	Sediment Lab Blank 10/13/99	Sed	E	57.64	67.74	-	-	10.10	(Muffled Sea Sand)	100%				10.10	10.10
NP02	TC-1, 0-2 cm. 10/13/99	Sed	A	1.2912	2.9973	1.8468	1.8449	1.7061	0.5547	32.51%	32.59%	0.11%	0.34%	16.65	5.4258
			B	1.2920	2.7564	1.7712	1.7695	1.4644	0.4784	32.67%					
			E	91.5	108.15			16.65							
NP03	TC-2, 0-2 cm. 10/13/99	Sed	A	1.2964	2.7596	1.8491	1.8487	1.4632	0.5525	37.76%	37.61%	0.21%	0.57%	16.51	6.2092
			B	1.3027	3.0559	1.9604	1.9584	1.7532	0.6567	37.46%					
			E	58.46	74.97			16.51							
NP04	TC-3, 0-2 cm. 10/13/99	Sed	A	1.2901	2.5635	1.6461	1.6453	1.2734	0.3556	27.93%	27.61%	0.44%	1.59%	14.99	4.1393
			B	1.3041	2.8402	1.7236	1.7234	1.5361	0.4194	27.30%					
			E	85.65	100.64			14.99							
NP05	SP-1, 0-2 cm. 10/13/99	Sed	A	1.2981	2.9562	1.7232	1.7205	1.6581	0.4238	25.56%	25.57%	0.02%	0.07%	16.23	4.1499
			B	1.3037	2.9279	1.7142	1.7242	1.6242	0.4155	25.58%					
			E	56.3	72.53			16.23							
NP06	SP-2, 0-2 cm. 10/13/99	Sed	A	1.2902	2.6807	1.7427	1.7412	1.3905	0.4518	32.49%	32.42%	0.10%	0.30%	16.30	5.2843
			B	1.2940	3.0569	1.8644	1.8642	1.7629	0.5703	32.35%					
			E	57.82	74.12			16.30							
NP07	SP-3, 0-2 cm. 10/13/99	Sed	A	1.2917	3.6197	2.0537	2.0519	2.3280	0.7611	32.69%	32.40%	0.42%	1.29%	18.67	6.0487
			B	1.2949	2.9390	1.8242	1.8212	1.6441	0.5278	32.10%					
			E	95.66	114.33			18.67							
NP08	MP-2, 0-2 cm. 10/13/99	Sed	A	1.2903	2.9065	1.7864	1.7832	1.6162	0.4945	30.60%	30.71%	0.15%	0.50%	16.72	5.1340
			B	1.2915	3.2352	1.8915	1.8894	1.9437	0.5990	30.81%					
			E	91.85	108.57			16.72							
NP09	MP-3, 0-2 cm. 10/13/99	Sed	A	1.2899	2.4671	1.7361	1.7339	1.1772	0.4451	37.81%	37.81%	0.00%	0.00%	15.65	5.9174
			B	1.2901	3.2788	2.0440	2.0401	1.9887	0.7520	37.81%					
			E	61.10	76.75			15.65							
SB10	Sediment Lab Blank 10/25/99	Sed	E	59.05	72.09			13.04	(Muffled Sea Sand)	100%				13.04	13.04
SB11	Lab Blank Spike 10/25/99	Sed	E	89.51	101.38			11.87	(Muffled Sea Sand)	100%				11.87	11.87
NP12	TC-3, 10-12 cm. 10/25/99	Core	A	1.2927	3.1432	1.9876	1.9865	1.8505	0.6944	37.52%	37.84%	0.44%	1.17%	17.73	6.7084
			B	1.2912	2.3191	1.6843	1.6824	1.0279	0.3922	38.15%					
			E	56.95	74.68			17.73							
NP13	TC-3, 20-22 cm. 10/25/99	Core	A	1.2961	3.2050	1.8967	1.8957	1.9089	0.6001	31.44%	31.43%	0.02%	0.05%	19.65	6.1752
			B	1.2933	3.2064	1.8943	1.8943	1.9131	0.6010	31.41%					
			E	88.66	108.31			19.65							
NP14	TC-3, 30-32 cm. 10/25/99	Core	A	1.3009	3.5516	2.1715	2.1689	2.2507	0.8693	38.62%	38.85%	0.32%	0.83%	18.86	7.3275
			B	1.2996	3.3254	2.0923	2.0903	2.0258	0.7917	39.08%					
			E	93.98	112.84			18.86							
NP15	TC-3, 40-42 cm. 10/25/99	Core	A	1.2939	2.8776	1.9358	1.9355	1.5837	0.6418	40.52%	40.45%	0.10%	0.26%	18.35	7.4223
			B	1.2952	2.3103	1.7057	1.7044	1.0151	0.4099	40.38%					
			E	94.60	112.95			18.35							
NP16	SP-1, 10-12 cm. 10/25/99	Core	A	1.2996	2.5396	1.7937	1.7942	1.2400	0.4944	39.87%	39.97%	0.14%	0.36%	17.10	6.8345
			B	1.2933	2.6697	1.8452	1.8444	1.3764	0.5515	40.07%					
			E	59.24	76.34			17.10							
NP17	SP-1, 20-22 cm. 10/25/99	Core	A	1.2949	2.9312	2.1393	2.1393	1.6363	0.8444	51.60%	52.01%	0.58%	1.11%	19.12	9.9447
			B	1.3018	2.7852	2.0792	2.0796	1.4834	0.7776	52.42%					
			E	84.75	103.87			19.12							
NP18	SP-1, 30-32 cm. 10/25/99	Core	A	1.2921	2.9035	2.0190	2.0171	1.6114	0.7260	45.05%	44.49%	0.80%	1.79%	19.17	8.5284
			B	1.2946	2.7615	1.9391	1.9388	1.4669	0.6444	43.93%					
			E	61.05	80.22			19.17							
NP19	SP-1, 40-42 cm. 10/25/99	Core	A	1.2888	3.7083	2.3488	2.3472	2.4195	1.0592	43.78%	43.47%	0.43%	1.00%	19.24	8.3638
			B	1.2927	2.6897	1.8964	1.8950	1.3970	0.6030	43.16%					
			E	95.31	114.55			19.24							

USGS -Cape Cod 1999- Project Sample Weights

LAB ID	SAMPLE ID# EXTRACT DATE	SAMPLE Type	No	Tare Wt.(g)	Total Wet Wt.(g)	1st Total Dry Wt.(g)	2nd Total Dry Wt.(g)	Wet Wt.(g)	Dry Wt.(g)	% Dry Weight	Mean %D/W	SD %	RSD %	Wet Wt. gm.	Dry Wt. gm.
SB20	Sediment Lab Blank 12/06/99	Sed	E	85.52	95.90			10.38	(Muffled Sea Sand)	100%				10.38	10.38
NP21	TC-3, 50-52 cm. 12/06/99	Core	A	1.2995	3.1657	2.1223	2.1211	1.8662	0.8222	44.06%	44.05%	0.01%	0.02%	19.95	8.7882
			B	1.3007	3.3619	2.2093	2.2078	2.0612	0.9079	44.04%					
			E	59.38	79.33			19.95							
NP22	TC-6, marsh 12/06/99	Sed	A	1.2953	2.9646	2.8171	2.8157	1.6693	1.5211	91.12%	91.01%	0.15%	0.17%	15.98	14.5438
			B	1.2994	2.9351	2.7870	2.7856	1.6357	1.4869	90.90%					
			E	58.75	74.73			15.98							
NP23	SP-1, 50-52 cm. 12/06/99	Core	A	1.3052	3.3761	2.1110	2.1089	2.0709	0.8048	38.86%	38.84%	0.02%	0.05%	17.87	6.9416
			B	1.2959	2.9427	1.9358	1.9349	1.6468	0.6395	38.83%					
			E	97.22	115.09			17.87							
NP24	SP-5, marsh 12/06/99	Sed	A	1.2859	2.8039	1.6805	1.6769	1.5180	0.3928	25.88%	26.05%	0.24%	0.93%	15.38	4.0060
			B	1.3039	3.0640	1.7671	1.7636	1.7601	0.4615	26.22%					
			E	89.81	105.19			15.38							
NP25	MP-1, 0-2 cm. 12/06/99	Sed	A	1.3020	3.4812	1.8002	1.7987	2.1792	0.4975	22.83%	22.74%	0.13%	0.55%	20.04	4.5567
			B	1.2969	3.0559	1.6961	1.6945	1.7590	0.3984	22.65%					
			E	95.68	115.72			20.04							
NP26	MP-5, marsh 12/06/99	Sed	A	1.3021	2.7360	1.8303	1.8277	1.4339	0.5269	36.75%	36.39%	0.50%	1.38%	15.82	5.7572
			B	1.2797	3.1239	1.9459	1.9427	1.8442	0.6646	36.04%					
			E	96.66	112.48			15.82							
NP27	HH-2, unrestr. marsh 12/06/99	Sed	A	1.3049	3.8935	1.9403	1.9349	2.5886	0.6327	24.44%	24.87%	0.61%	2.45%	16.16	4.0193
			B	1.2972	3.1097	1.7577	1.7539	1.8125	0.4586	25.30%					
			E	56.57	72.73			16.16							
NP28	HR-3, unrestr. marsh 12/06/99	Sed	A	1.2833	3.7194	1.7509	1.7457	2.4361	0.4650	19.09%	19.14%	0.07%	0.35%	17.77	3.4003
			B	1.3012	3.9974	1.8218	1.8150	2.6962	0.5172	19.18%					
			E	92.17	109.94			17.77							
SB29	Sediment Lab Blank 01/20/00	Sed	E	59.16	69.33			10.17	(Muffled Sea Sand)	100%				10.17	10.17
NS30	NIST SRM-1941a 01/20/00	Sed Marine	A	1.2814	1.8403	1.8238	1.8246	0.5589	0.5428	97.12%	97.21%	0.12%	0.13%	2.34	2.2746
			B	1.2855	1.9763	1.9565	1.9587	0.6908	0.6721	97.29%					
			E	90.95	93.29			2.34							
NS31	NIST QA99SED9 bottle #153. 01/20/00	Sed Marine	A	1.2849	3.4796	2.4630	2.4653	2.1947	1.1793	53.73%	53.86%	0.18%	0.34%	8.34	4.4919
			B	1.2851	2.9799	2.1986	2.2016	1.6948	0.9150	53.99%					
			E	94.98	103.32			8.34							
NP32	HH-3, marsh pool. 01/20/00	Sed	A	1.2806	3.7585	2.0849	2.0879	2.4779	0.8058	32.52%	33.08%	0.80%	2.41%	18.42	6.0939
			B	1.2849	3.7627	2.1185	2.1187	2.4778	0.8337	33.65%					
			E	94.85	113.27			18.42							
NP33	HH-4, restricted marsh next sed'n. station. 01/20/00	Sed	A	1.2832	2.5331	1.4332	1.4348	1.2499	0.1508	12.06%	12.17%	0.15%	1.24%	18.38	2.2372
			B	1.2843	3.0084	1.4951	1.4969	1.7241	0.2117	12.28%					
			E	91.81	110.19			18.38							
NP34	HR-4, unrestr. creek 01/20/00	Sed	A	1.2818	2.3513	1.3775	1.3785	1.0695	0.0962	8.99%	9.64%	0.18%	1.86%	19.35	1.8655
			B	1.2850	2.4954	1.4260	1.4279	1.2104	0.1420	11.73%					
			C	1.2952	2.3011	1.3930	1.3939	1.0059	0.0983	9.77%					
			D	1.2828	2.4742	1.3968	1.3955	1.1914	0.1134	9.51%					
			E	93.52	112.87			19.35							
NP35	HR-5, restricted marsh 01/20/00	Sed	A	1.2844	2.7118	1.4603	1.4627	1.4274	0.1771	12.41%	12.47%	0.08%	0.68%	19.24	2.3987
			B	1.2816	2.9839	1.4931	1.4966	1.7023	0.2133	12.53%					
			E	94.24	113.48			19.24							
SB36	Sediment Lab Blank 02/04/00	Sed	E	91.12	99.64			8.52	(Muffled Sea Sand)	100%				8.52	8.52
NS37	NIST SRM-1941a 02/04/00	Sed Marine	E	91.24	93.36			2.12	%D/W from NS30=	97.21%				2.12	2.0608

USGS -Cape Cod 1999- Project Sample Weights

LAB ID	SAMPLE ID# EXTRACT. DATE	SAMPLE Type	No.	Tare Wt.(g)	Total Wet Wt.(g)	1st Total Dry Wt.(g)	2nd Total Dry Wt.(g)	Wet Wt.(g)	Dry Wt.(g)	% Dry Weight	Mean %D/W	SD %	RSD %	Wet Wt. gm.	Dry Wt. gm.
NS38	NIST QA99SED9 bottle #156. 02/04/00	Sed Marine	A B E	1.3054 1.3011 93.63	2.3117 2.0418 103.37	1.8410 1.6980	1.8411 1.6978	1.0063 0.7407 9.74	0.5357 0.3968	53.23% 53.57%	53.40%	0.24%	0.45%	9.74	5.2012
NS39	NIST QA99SED9 bottle #160. 02/04/00	Sed Marine	A B E	1.3011 1.2990 84.16	2.5397 3.2496 92.77	1.9612 2.3480	1.9615 2.3462	1.2386 1.9506 8.61	0.6603 1.0481	53.31% 53.73%	53.52%	0.30%	0.56%	8.61	4.6080
NP40	SP-1. 0-2 cm. repeat NP05. 02/04/00	Sed	A B E	1.2969 1.3045 56.29	2.2394 2.2596 73.94	1.5413 1.5519	1.5409 1.5513	0.9425 0.9551 17.65	0.2442 0.2471	25.91% 25.87%	25.89%	0.03%	0.10%	17.65	4.5697
NP41	HH-5. restricted marsh pool. 02/04/00	Sed	A B E	1.2861 1.2952 91.79	2.6528 3.2251 112.71	1.5514 1.6903	1.5515 1.6900	1.3667 1.9299 20.92	0.2654 0.3950	19.42% 20.46%	19.94%	0.74%	3.72%	20.92	4.1715
NP42	HR-6. restricted tidal creek. 02/04/00	Sed	A B C D E	1.2904 1.2856 1.3132 1.2864 94.94	4.0473 4.0215 2.9578 2.8449 115.15	2.5210 2.6403 2.0454 2.0057	2.5203 2.6401 2.0437 2.0041	2.7569 2.7359 1.6446 1.5585 20.21	1.2303 1.3546 0.7314 0.7185	44.62% 49.51% 44.47% 46.10%	45.07%	0.90%	2.00%	20.21	9.1077
SB43	Tissue Lab Blank 02/28/00	Tiss	E	91.71	100.44			8.73	(Milli-Q distilled water)					8.73	<u>wet weight</u> 8.73
NF44	NIST QA93FSH1 02/28/00	Tiss	E	90.83	99.75			8.92						8.92	<u>wet weight</u> 8.92
NF45	NIST QA99FSH4 Bottle #127 02/28/00	Tiss	E	84.51	92.29			7.78						7.78	<u>wet weight</u> 7.78
NF46	NIST QA99FSH4 Bottle #161 02/28/00	Tiss	E	93.84	103.51			9.67						9.67	<u>wet weight</u> 9.67
NF47	NIST QA99FSH4 Bottle #167 02/28/00	Tiss	E	91.32	100.04			8.72						8.72	<u>wet weight</u> 8.72
SB48	Tissue Lab Blank 03/14/00	Tiss	E	91.63	102.40			10.77	(Milli-Q distilled water from wash bottle)					10.77	10.77
NP49	TC-4. Blue Mssl. 03/14/00	Tiss	A B E Lipid	1.2850 1.2847 84.34 1.3018	2.1184 2.3008 105.13	1.3508 1.3636	1.3506 1.3634	0.8334 1.0161 20.79	0.0657 0.0788	7.88% 7.76%	7.82%	0.09%	1.16%	20.79	1.6256
						1.3171	1.3176	0.0156				0.035%	0.74%	<u>Lipid=</u>	<u>4.8%</u>
NP50	TC-5. Blue Mssl. 03/14/00	Tiss	A B E Lipid	1.2905 1.2951 56.33 1.3019	2.3213 2.7688 77.16	1.3833 1.4291	1.3822 1.4283	1.0308 1.4737 20.83	0.0923 0.1336	8.95% 9.07%	9.01%	0.08%	0.91%	20.83	1.8763
						1.3202	1.3205	0.0184				0.021%	0.43%	<u>Lipid=</u>	<u>4.9%</u>
NP51	MP-4. Blue Mssl. 03/14/00	Tiss	A B E Lipid	1.2945 1.2921 91.12 1.3021	2.7354 2.9223 111.10	1.3975 1.4102	1.3978 1.4098	1.4409 1.6302 19.98	0.1032 0.1179	7.16% 7.23%	7.20%	0.05%	0.72%	19.98	1.4377
						1.3150	1.3156	0.0132				0.042%	0.92%	<u>Lipid=</u>	<u>4.6%</u>
NP52	SS-1. Blue Mssl. 03/14/00	Tiss	A B E Lipid	1.2909 1.2981 91.11 1.3029	2.7103 2.9634 111.64	1.4267 1.4573	1.4245 1.4550	1.4194 1.6653 20.53	0.1347 0.1581	9.49% 9.49%	9.49%	0.00%	0.01%	20.53	1.9484
						1.3229	1.3235	0.0203				0.042%	0.81%	<u>Lipid=</u>	<u>5.2%</u>
NP53	NB-1. Blue Mssl. 03/14/00	Tiss	A B E Lipid	1.2968 1.3032 95.19 1.3068	2.9367 3.5891 115.99	1.4504 1.5193	1.4498 1.5192	1.6399 2.2859 20.80	0.1533 0.2161	9.35% 9.45%	9.40%	0.07%	0.78%	20.80	1.9552
						1.3274	1.3284	0.0211				0.071%	1.31%	<u>Lipid=</u>	<u>5.4%</u>
SB54	Tissue Lab Blank 03/24/00	Tiss	E	91.53	103.46			11.93	(Milli-Q distilled water from bottle)					11.93	11.93

USGS -Cape Cod 1999- Project Sample Weights

LAB ID	SAMPLE ID# EXTRACT. DATE	SAMPLE Type	No.	Tare Wt.(g)	Total Wet Wt.(g)	1st Total Dry Wt.(g)	2nd Total Dry Wt.(g)	Wet Wt. (g)	Dry Wt.(g)	% Dry Weight	Mean %D/W	SD %	RSD %	Wet Wt. gm.	Dry Wt. gm.
NM55	QA97TIS8 Bottle #153 03/24/00	Tiss	A	1.2821	2.2815	2.1569	2.1607	0.9994	0.8767	87.72%	87.73%	0.01%	0.01%	3.66	3.2109
			B	1.2808	2.7220	2.5433	2.5472	1.4412	1.2645	87.74%					
			E	57.67	61.33			3.66							
		Lipid		1.2694		1.3172	1.3179		0.0481			0.049%	0.66%	Lipid=	7.5%
NP56	HR-1. Ribbed Mssl. 03/24/00	Tiss	A	1.2801	2.7015	1.3961	1.3961	1.4214	0.1160	8.16%	8.19%	0.04%	0.52%	20.71	1.6964
			B	1.2754	2.5969	1.3842	1.3839	1.3215	0.1087	8.22%					
			E	56.05	76.76			20.71							
		Lipid		1.2672		1.2795	1.2806		0.0129			0.078%	2.05%	Lipid=	3.8%
NP57	SP-4. Blue Mssl. 03/24/00	Tiss	A	1.2736	2.4296	1.4007	1.4004	1.1560	0.1270	10.98%	10.89%	0.13%	1.23%	20.39	2.2199
			B	1.2740	3.5140	1.5160	1.5155	2.2400	0.2418	10.79%					
			E	55.96	76.35			20.39							
		Lipid		1.2658		1.2932	1.2943		0.0279			0.078%	1.24%	Lipid=	6.3%
NP58	HH-1. Blue Mssl. 03/24/00	Tiss	A	1.2748	2.9828	1.4235	1.4216	1.7080	0.1478	8.65%	8.55%	0.14%	1.62%	20.41	1.7455
			B	1.2761	2.8653	1.4105	1.4104	1.5892	0.1344	8.45%					
			E	93.45	113.86			20.41							
		Lipid		1.2784		1.2943	1.2950		0.0162			0.049%	1.06%	Lipid=	4.7%
NP59	PT-1. Blue Mssl. 03/24/00	Tiss	A	1.2721	2.5461	1.4231	1.4217	1.2740	0.1503	11.80%	11.72%	0.11%	0.93%	20.75	2.4320
			B	1.2711	2.3816	1.4016	1.3992	1.1105	0.1293	11.64%					
			E	59.16	79.91			20.75							
		Lipid		1.2739		1.3049	1.3059		0.0315			0.071%	1.09%	Lipid=	6.5%
NP60	PT-2. Blue Mssl. 03/24/00	Tiss	A	1.2695	2.6420	1.4262	1.4255	1.3725	0.1564	11.39%	11.39%	0.01%	0.06%	20.72	2.3593
			B	1.2717	3.0316	1.4729	1.4711	1.7599	0.2003	11.38%					
			E	95.06	115.78			20.72							
		Lipid		1.2707		1.2936	1.2945		0.0234			0.064%	1.29%	Lipid=	4.9%
SB61(2)	Tissue Lab Blank 05/02/00	Tiss	E	89.99	106.08			16.09	(Extracted & Blended Milli-Q distilled water)					16.09	16.09
NP62	TC-3. 60-62 cm. 05/02/00	Core	A	1.2959	3.4202	2.2556	2.2551	2.1243	0.9595	45.17%	45.14%	0.03%	0.07%	21.85	9.8637
			B	1.2923	2.5802	1.8729	1.8739	1.2879	0.5811	45.12%					
			E	84.44	106.29			21.85							
NP63	TC-3. 70-72 cm. 05/02/00	Core	A	1.2837	3.6640	2.4529	2.4518	2.3803	1.1687	49.10%	49.23%	0.19%	0.38%	22.04	10.8500
			B	1.2875	3.3514	2.3063	2.3062	2.0639	1.0188	49.36%					
			E	92.69	114.73			22.04							
NP64	TC-3. 80-82 cm. 05/02/00	Core	A	1.2896	2.8514	1.9726	1.9720	1.5618	0.6827	43.71%	43.65%	0.09%	0.22%	22.08	9.6369
			B	1.2816	2.9744	2.0192	2.0194	1.6928	0.7377	43.58%					
			E	91.43	113.51			22.08							
NP65	HR-1a. Ribbed Mssl. 05/02/00	Tiss	A	1.2851	2.8779	1.4566	1.4560	1.5928	0.1712	10.75%	10.71%	0.05%	0.46%	23.45	2.5124
			B	1.2787	2.4375	1.4030	1.4019	1.1588	0.1238	10.68%					
			E	59.17	82.62			23.45							
		Lipid		1.2955		1.3262	1.3260		0.0306			0.014%	0.23%	Lipid=	6.1%
NP66	HR-2. Oysters 05/02/00	Tiss	A	1.2775	2.3996	1.3939	1.3913	1.1221	0.1151	10.26%	10.15%	0.15%	1.48%	27.1	2.7511
			B	1.2777	2.5539	1.4065	1.4053	1.2762	0.1282	10.05%					
			E	57.87	84.97			27.10							
		Lipid		1.2765		1.2974	1.2975		0.0210			0.007%	0.19%	Lipid=	3.8%
SB67	Sediment Lab Blank 06/09/00	Sed	E	92.52	102.98			10.46	(Muffled Sea Sand)					10.46	10.46
NP68	Pleasant Bay #1 PB-S1 06/09/00	Sed	A	1.2822	2.1756	1.4438	1.4445	0.8934	0.1620	18.13%	18.80%	0.95%	5.05%	19.92	3.7447
			B	1.2793	2.4819	1.5135	1.5134	1.2026	0.2342	19.47%					
			E	88.93	108.85			19.92							
NP69	Pleasant Bay #2 PB-S2 06/09/00	Sed	A	1.2854	3.5413	1.8209	1.8214	2.2559	0.5358	23.75%	23.49%	0.37%	1.56%	21.87	5.1372
			B	1.2911	3.9305	1.9041	1.9044	2.6394	0.6132	23.23%					
			E	97.77	119.64			21.87							
SB70	Tissue Lab Blank 08/03/00	Tiss	E	58.49	78.13			19.64	(Extracted 2x & Blended Milli-Q distilled water)					19.64	1.964

USGS -Cape Cod 1999- Project Sample Weights

LAB ID	SAMPLE ID# EXTRACT. DATE	SAMPLE Type	No.	Tare Wt.(g)	Total Wet Wt.(g)	1st Total Dry Wt.(g)	2nd Total Dry Wt.(g)	Wet Wt. (g)	Dry Wt.(g)	% Dry Weight	Mean %D/W	SD %	RSD %	Wet Wt. gm.	Dry Wt. gm.
NP71	Pleasant Bay #1 PB-T1. Ribbed Mssl. 08/03/00	Tiss	A	1.2726	2.7912	1.3984	1.3984	1.5186	0.1258	8.28%	8.36%	0.11%	1.32%	19.11	1.5980
			B	1.2713	3.1765	1.4325	1.4317	1.9052	0.1608	8.44%					
			E	61.37	80.48			19.11							
			Lipid	1.2729		1.2811	1.2807	0.0080				0.028%	1.13%	Lipid=	2.5%
NP72	Nauset Inlet NI-T1. Ribbed Mssl. 08/03/00	Tiss	A	1.2685	3.8182	1.5693	1.5682	2.5497	0.3003	11.78%	11.69%	0.13%	1.07%	20.15	2.3550
			B	1.2705	3.4565	1.5238	1.5243	2.1860	0.2536	11.60%					
			E	95.39	115.54			20.15							
			Lipid	1.2674		1.3060	1.3051	0.0381				0.064%	0.79%	Lipid=	8.1%
NP73	Nauset Inlet #2 NI-S2 08/03/00	Sed	A	1.2679	3.9777	1.7803	1.7824	2.7098	0.5135	18.95%	18.73%	0.31%	1.66%	14.1	2.6406
			B	1.2712	3.3377	1.6535	1.6538	2.0665	0.3825	18.51%					
			E	88.11	102.21			14.10							
NP74	Pleasant Bay. Hog Is. PB-S3 08/03/00	Sed	A	1.2714	3.7108	2.3306	2.3316	2.4394	1.0597	43.44%	42.45%	1.40%	3.30%	22.53	9.5641
			B	1.2708	2.8704	1.9341	1.9339	1.5996	0.6632	41.46%					
			E	90.15	112.68			22.53							
NP75	Hatches Hr., restricted pool edge. HH-7 08/03/00	Sed	A	1.2746	3.9325	2.5563	2.5554	2.6579	1.2813	48.21%	48.26%	0.07%	0.15%	14.80	7.1421
			B	1.2701	4.3437	2.7546	2.7553	3.0736	1.4849	48.31%					
			E	93.56	108.36			14.80							
NP76	Hatches Hr., unrestr. HH-8, 8-14cm. 08/03/00	Core	A	1.2718	3.3279	2.5208	2.5219	2.0561	1.2496	60.77%	61.92%	1.63%	2.63%	12.61	7.8084
			B	1.2688	3.1082	2.4286	2.4293	1.8394	1.1602	63.07%					
			E	94.81	107.42			12.61							

USGS-Cape Cod 1999-Project SURFACE, MARSH SEDIMENTS
ORGANIC CARBON

	Location	%Organic Carbon
PONDS	TC-1	2.78
	TC-2	2.04
	TC-3	2.76
	SP-1	3.47
	SP-2	2.55
	SP-3	2.53
	MP-1	2.89
	MP-2	3.21
	MP-3	2.22
MARSH	TC-6	2.56
	SP-5	8.82
	MP-5	7.46
	HH-2	11.7
	HH-3	16.0
	HH-4	25.0
	HH-5	11.2
	HR-3	8.76
	HR-4	7.80
	HR-5	13.8

Appendix II

Methods and Quality Assurance Information

Methods

Approximately 15 g wet weight of each sample was weighed into a 60 ml Teflon centrifuge tube. One to two ml of DBOFB 0.09 ug/ml, CB103 0.09 ug/ml, and CB198 0.10 ug/ml were added as internal standards. Acetonitrile was then added to bring the total volume to 15 ml. The sample was hand agitated and 10 ml of hexane added. The centrifuge tube was then shaken vigorously by hand and then placed on the metabolic shaker for 1 hour at 50°C. After cooling to room temperature, 10 ml of Milli-Q water was added and then shaken vigorously. The sample was then centrifuged for 4 minutes to separate the hexane layer from the water/acetonitrile layer. The top hexane layer (~8 ml) was drawn off with a Pasteur pipette, with care being taken not to draw up any water, and placed into a 50 ml round bottom flask. The sample was extracted two more times by adding 10 ml of hexane, shaking, centrifugation, and drawing off the hexane layer into the round bottom flask. The combined hexane fraction (~27 ml) was roto-evaporated down to ~1 ml at which point 2 g of activated copper powder were added and allowed to stand over night for the removal of elemental sulfur. A Pasteur pipette was used to draw off the hexane from the copper powder and then charge it onto a fully activated silica gel column (8 x 0.6 cm, 200-350 mesh). The copper powder was rinsed with an additional 1 ml of hexane, which was added to the column. The sample was then eluted with 20 ml of 70:30, hexane methylene chloride into a 25 ml graduated cylinder in order to eliminate the most polar compound while allowing the analytes of interest to pass. The eluent includes PAHs, TPHs, PCBs and OCPs. The volume was then brought up to 25 ml with hexane, mixed with a pasture pipette, and then split into a PCB/OCP fraction (32%) and a PAH/TPH fraction (68%). The PCB/OCP fraction was then placed in a 25 ml pear shaped

flask, solvent exchanged with hexane on the rotary evaporator to remove the methylene chloride and then reduced to 0.5 ml. The sample was then rinsed with 0.5 ml of hexane into to a 12 ml conical shaped glass centrifuge tube containing 1 ml of concentrated H_2SO_4 . The sample was mixed with a vortex mixer and allowed to stand at least one hour at room temperature until the two phases separate and the top hexane phase was colorless. The hexane layer containing the sample was transferred to a second centrifuge tube with a pasture pipette. The centrifuge tube with the acid was extracted two more times with 2 ml of hexane. Five ml of methylene chloride extracted milli-Q water was added to the combined hexane extracts in the second centrifuge tube, shaken, centrifuged and then the bottom aqueous layer drawn off and discarded. This water-washing step to remove any acid was repeated once. The hexane was then transferred to a 25 ml pear shaped flask and evaporated to ~100 ul for injection on the GC-ECD. Twenty-five μl of CB100 (0.8 ng/ μl) was added as an external standard and 1-2 drops of methylene chloride were added to prevent analytes from sticking to the walls of the flask. PCBs/OCPs were analyzed on a Hewlett Packard HP5890 gas chromatograph with an ECD. A J&W Scientific Durabond DB-5 60 m fused silica capillary column, 0.25 mm i.d. and 0.25 μm film thickness was used with helium as the carrier gas at 55 kPa. Injection port was maintained at 315°C and the sample was injected in splitless mode. Column temperature was held at 100°C for initial 1.0 min, and then programmed at 5°C /min to 140°C, held for 1 minute, ramped at 1.1°C/min to 250°C, held for 1 min, ramped at 30°C/min to 320°C and held for 1.6 min. The peaks were identified by matching the retention time of the peaks in the sample with those of the calibration solution.

Calibration and quality control was rigorous throughout the study. A three-point calibration curve was used for 23 PCBs and 15 OCPs covering the range of material expected in the samples. The mid level calibration solution was injected on a weekly basis to ensure the response factors remained constant. Quality control for the analysis was done by analyzing blanks, spiked samples, duplicates and analyzing a standard reference material, SRM1941a marine sediment, with certified values. One or more of these was done with each batch of samples with a minimum of four per twenty field samples. The PCB and OCPs in selected samples were confirmed by GC/MS.

The PAH/TPH fraction was stored in the dark until analyzed at which point a portion of it was rinsed with hexane into a 25 ml pear shaped flask and roto-evaporated down to ~100 μ l. Twenty μ l of o-terphenyl (64.64 ng/ μ l) was added as an external standard and 1-2 drops of methylene chloride added to prevent analytes from sticking to the walls of the flask. PAHs/TPHs were analyzed on a Hewlett Packard 5971A quadrupole mass spectrometer fitted with HP5890 gas chromatograph. A J&W Scientific Durabond DB-XLB 30 m fused silica capillary column, 0.25 mm i.d. and 0.25 μ m film thickness was used with helium as the carrier gas at 55 kPa. GC-MS operating conditions were set at 70 eV ionization potential with the source at 190°C and electron multiplier voltage at ~2300 eV. Injection port was maintained at 325°C and the sample was injected in splitless mode. Column temperature was held at 70°C for initial 1.5 min, and then programmed at 10 degree/min to 320°C, taking 24 minutes. Data was collected using selected ion monitoring (SIM), quantified on the primary ion and confirmed with secondary and tertiary ions for the PAHs and ion 55 for the TPHs.

Calibration and quality control was rigorous throughout the study. A four point calibration curve was used for 25 individual PAHs covering the range of material expected in the samples and a three point curve was used for TPHs. Internal standard recoveries ranged from 30-130%. Quality control for the analyses was done by analyzing blanks, spiked samples, duplicates and a standard reference material with certified values. One or more of these was done with each batch of samples with a minimum of four per twenty field samples. (See quality assurance information in this appendix).

TABLE 1
List of Organic Contaminants
Analyzed in this Investigation

Abbrev.	Component Name	[CAS]
Polycyclic Aromatic Hydrocarbons (PAHs)		
ACL:	acenaphthylene	208-96-8
ACT:	acenaphthene	83-32-9
ANT:	anthracene	120-12-7
BAA:	benzo (a) anthracene	56-55-3
BAP:	benzo (a) pyrene	50-32-8
BBF:	benzo (b) fluoranthene	205-99-2
BEP:	benzo (e) pyrene	192-97-2
BIP:	biphenyl	92-52-4
BKF:	benzo (k) fluoranthene	207-08-9
BPE:	benzo [ghi] perylene	191-245-2
CHR:	chrysene	218-01-9
DBA:	dibenzo [a,h] anthracene	53-70-3
FLA:	fluoranthene	206-44-0
FLU:	fluorene	86-73-7
INP:	indeno [1,2,3-cd] pyrene	193-39-5
NAP:	naphthalene	91-20-3
1MN:	1-methylnaphthalene	90-12-0
2MN:	2-methylnaphthalene	91-57-6
DMN:	2,6-dimethylnaphthalene	581-42-0
TMN:	2,3,5-trimethylnaphthalene	2245-38-7
PHE:	phenanthrene	85-01-08
1MP:	1-methylphenanthrene	832-69-9
PER:	perylene	198-55-0
PYR:	pyrene	129-00-0
Σ PAHs:	sum of the 24 polycyclic aromatic hydrocarbons	
Polychlorinated Biphenyls (PCBs)		
CB008:	2,4'-dichlorobiphenyl	34883-43-7
CB018:	2,2',5-trichlorobiphenyl	37680-65-2
CB029:	2,4,5-trichlorobiphenyl	15862-07-4
CB050:	2,2',4,6-tetrachlorobiphenyl	62796-65-0
CB028:	2,4,4'-trichlorobiphenyl	7012-37-5
CB052:	2,2',5,5'-tertrachlorobiphenyl	35693-99-3
CB044:	2,2',3,5-tetrachlorobiphenyl	41464-39-5
CB066:	2,3',4,4'-tetrachlorobiphenyl	32598-10-0
CB101:	2,2',4,5,5'-pentachlorobiphenyl	37680-73-2
CB087:	2,2',3,4,5'-pentachlorobiphenyl	38380-02-8
CB118:	2,3',4,4',5-pentachlorobiphenyl	31508-00-6
CB188:	2,2',3,4',5,6,6'-heptachlorobiphenyl	74487-85-7

List (Continued)

Abbrev.	Component Name	[CAS]
CB153:	2,2',4,4',5,5'-hexachlorobiphenyl	35065-27-1
CB105:	2,3,3',4,4'-pentachlorobiphenyl	32598-14-4
CB138:	2,2',3,4,4',5'-hexachlorobiphenyl	35065-28-2
CB126:	3,3',4,4',5-pentachlorobiphenyl	57465-28-8
CB187:	2,2',3,4',5,5',6-heptachlorobiphenyl	52663-68-0
CB128:	2,2',3,3',4,4'-hexachlorobiphenyl	38380-07-3
CB200:	2,2',3,3',4,5,6,6'-octachlorobiphenyl	512663-73-7
CB180:	2,2',3,4,4',5,5'-heptachlorobiphenyl	35065-29-3
CB170:	2,2',3,3',4,4',5-heptachlorobiphenyl	35065-30-6
CB195:	2,2',3,3',4,4',5,6-octachlorobiphenyl	52663-78-2
CB206:	2,2',3,3',4,4',5,5',6-nonachlorobiphenyl	40186-72-9
CB209:	2,2',3,3',4,4',5,5',6,6'-decachlorobiphenyl	2051-24-3
Σ CBs:	sum of the 24 chlorobiphenyls	
Σ PCBs	Σ CBs x 2.0	

Organo-Chlorine Pesticides (OCPs)

p,p'-DDD:	p,p'-(dichlorodiphenyldichloro)ethane	72-54-8
o,p'-DDE:	o,p'-(dichlorodiphenyldichloro)ethene	3424-82-6
p,p'-DDE:	p,p'-(dichlorodiphenyldichloro)ethene	72-55-9
o,p'-DDT:	o,p'-(dichlorodiphenyltrichloro)ethane	789-02-6
p,p'-DDT:	p,p'-(dichlorodiphenyltrichloro)ethane	50-29-3
g-HCH:	1a,2a,3B,4a,5a,6B-hexachlorocyclohexane (lindane)	58-89-9
a-CHLDA	cis-chlordane	510-37-19
ALDRIN	aldrin	309-00-2
HEPT	heptachlor	76-44-8
HEPT E	heptachlor epoxide	102-457-3
HCB	hexachlorobenzene	118-74-1
MIREX	mirex	238-585-5
TRANSNON	trans-nonachlor	39765-80-5

Please note that the following are typically reported as the sums of the indicated components:

PAH

chrysene + triphenylene
benzo[b]- + benzo[j]- + benzo[k]fluoranthene
dibenz[a,h]anthracene + dibenz[a,c]anthracene

PCB congeners

PCB 66 + PCB 95
PCB 101 + PCB 90
PCB 138 + PCB 163 + PCB 164
PCB 187 + PCB 182 + PCB 159
PCB 170 + PCB 190

TABLE 2-CHEMISTRY QUALITY CONTROL PROCEDURES

There are many quality assurance checks and quality control procedures that are routinely performed during all phases of chemistry sample collection and analyses. A general description of some of the analytical QC procedures is provided below.

Organic Contaminants

Laboratory blank analyses are conducted with every 20 sediment or tissue samples. Field blanks (water rinsings from clean collection apparatus) are also conducted for surface sediment samples at the rate of one per 20 field samples. These analyses are carried out as usual including the addition of surrogate internal standards followed by extraction and column chromatography. Target organic analytes detected in samples at less than three times the level detected in the blanks are treated as unreliable.

Extraction efficiencies are measured by conducting spike and recovery analyses using standard mixtures of the analytes added to blank and/or field samples. The spiking levels are similar to those measured in samples from low level and moderately contaminated sites. Background levels of these compounds are also measured in unspiked samples for subtraction from the spiked samples. The recoveries are 50% to 150% for at least 70% of the spike analytes relative to the surrogate internal standards added at the start of the analyses. Recoveries of surrogate internal standards are 30% to 130% based on recovery internal standards added to all samples just before GC injection.

The **instrumental detection** limits for the GC-ECD and GC-MSD analyses are between 1 pg and 1 ng per component on column depending on the specific instrument and analyte in question. The MDLs (Method Detection Limits) for individual PCBs and OCPs are about 5 ng/L for aqueous samples (minimum of 3L), 1 ng/g for sediment (minimum of 10 g dry weight), and 2 ng/g for tissue (minimum of 2 g dry weight). The corresponding values for PAHs are about 10 ng/L aqueous sample, 10 ng/g sediment and 20 ng/g tissue. Actual values are given in the MDL table.

Instrument variability is determined by replicate injections of standard mixtures or samples; the values for all analytes range between 1 and 5% RSD (Relative Standard Deviation) for the standards, and between 1 and 10% RSD for the samples. Overall analytical precision is determined by processing duplicates of a randomly chosen field sample (e.g., two analyses of a sample from the same glass storage container). The relative percent difference is 35% or less for 70% of the analytes whose concentrations are 10 x MDL.

Analytical accuracy is determined by the analysis of a standard reference material obtained from the National Institute of Standards and Technology (e.g. sediment SRM 1941a and tissue SRM 1974a). In addition, we routinely participate in the NOAA Status and Trends Intercalibration Exercises conducted by the NIST. The repeated analysis of these certified materials allows a check on the accuracy of our analyses, which is $\pm 30\%$ of the certified concentration range for 70% of the analytes whose concentrations are 10 x MDL.

METHOD DETECTION LIMIT

	Method Detection Limit: PAHs																							
	NAP	2MN	1MN	BIP	DMN	ACL	ACT	TMN	FLU	PHE	ANT	IMP	FLA	PYR	BAA	CHR	BBJK	F	BEP	BAP	PER	INP	DBA	BPE
	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g
Sediment	3.6	3.6	7.1	6.4	8.6	4.6	8.2	4.8	7.0	10.0	8.4	6.2	9.2	7.6	7.7	9.9	8.8	6.0	3.0	2.7	4.7	2.8	4.7	
Tissue	5.1	15.3	10.3	3.2	4.6	6.4	4.7	5.7	4.2	3.3	12.0	4.4	3.9	4.6	3.2	11.0	13.0	7.2	4.3	6.5	6.1	3.6	5.8	
	Method Detection Limit: PCB Congeners																							
	8	18	29	50	28	52	44	66	101	87	118	188	153	105	138	126	187	128	200	180	170	195	206	209
	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g
Sediment + Tissue	0.32	0.69	0.67	0.45	0.72	0.73	0.49	0.53	0.59	0.55	0.71	0.57	0.44	0.56	0.58	0.48	0.47	0.44	0.51	0.53	0.53	0.57	0.51	0.52
	Method Detection Limit: OCPs																							
	HCB	g-HCH	HEPT	ALDRIN	HEPT E	o,p'-DDE	a Chl	da	Transnon	p,p'-DDE	p,p'-DDD	o,p'-DDT	p,p'-DDT	MIREX										
	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g										
Sediment + Tissue	0.41	0.62	0.47	0.73	0.48	0.78	0.79	0.75	0.91	0.85	0.95	0.63	0.55											

QUALITY CONTROL SAMPLE DATA QUALITY OBJECTIVES

	Organic Contaminants
Surrogate recovery (absolute recovery) ^a	30–130%
Blank spike analyte (relative recovery) ^b	70–130%
Matrix spike analyte (relative recovery) ^b	50–150%
Sample duplicate quantification precision	35% RPD ^c
SRM quantification accuracy	70–130% of range ^d
Procedural blank	<33 % of sample analyte

^a Absolute recovery of surrogate internal standards is determined relative to the recovery internal standard.

^b Relative recovery of analytes is determined relative to the surrogate internal standard, < 30% can exceed limits.

^c Relative percent difference in the duplicate determinations of analytes at 10 x MDL, <30% can exceed limits.

^d Accuracy of determinations of target analytes for which certified values exist at 10 x MDL, <30% can exceed limits.

Data Qualifiers for Organic Analytical Data

- J = analyte detected but the measured concentration was below the MDL
- Q = measurements are outside of QA limits as specified in the DQOs
- ND = analyte was not detected; these values are reported as < MDL for that analyte/matrix
- I = analytical interference with the analyte
- NA = data was not applicable to the specified analyte

Appendix III

Data Tables

Chain of Custody		MDL Sed.	TC-1, 0-2 cm. 10/13/99	TC-2, 0-2 cm. 10/13/99	TC-3, 0-2 cm. 10/13/99	SP-1, 0-2 cm. 10/13/99	SP-2, 0-2 cm. 10/13/99	SP-3, 0-2 cm. 10/13/99	MP-2, 0-2 cm. 10/13/99	MP-3, 0-2 cm. 10/13/99	TC-6, marsh 12/06/99	SP-5, marsh 12/06/99
OGL Lab ID		NP02	NP03	NP04	NP05	NP06	NP07	NP08	NP09	NP22	NP24	
PCBs/OCs		Sediment										
	units											
2,4'-dichlorobiphenyl (CB008)	ng/g	0.32	<0.3 nd	<0.3 nd	<0.3 nd	<0.3 nd	<0.3 nd	<0.3 nd	<0.3 nd	<0.3 nd	<0.3 nd	0.4 1
2,2',5-trichlorobiphenyl (CB018)	ng/g	0.69	2.2	<0.7 nd	1.2	1.9	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	0.8
2,4,5-trichlorobiphenyl (CB029)	ng/g	0.67	<0.7 nd	<0.7 nd	<0.7 nd	1.6	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd
2,2',4,6-tetrachlorobiphenyl (CB050)	ng/g	0.45	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd
2,4,4'-trichlorobiphenyl (CB028)	ng/g	0.72	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd
2,2',5,5'-tetrachlorobiphenyl (CB052)	ng/g	0.73	1.4	0.7	1.9	1.6	1.0	0.9	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd
2,2',3,5-tetrachlorobiphenyl (CB044)	ng/g	0.49	3.6	0.9	1.9	1.8	0.8	1.0	0.8	0.6	2.9	1.0
2,3',4,4'-tetrachlorobiphenyl (CB066/095)	ng/g	0.53	2.5	0.8	2.7	2.1	1.5	0.9	0.5	<0.5 nd	<0.5 nd	1.7
2,2',4,5,5'-pentachlorobiphenyl (CB101/90)	ng/g	0.59	1.7	0.7	1.2	1.5	0.6	0.8	0.8	<0.6 nd	<0.6 nd	<0.6 nd
2,2',3,4,5'-pentachlorobiphenyl (CB087)	ng/g	0.55	<0.6 nd	<0.6 nd	1.0	0.6	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd
2,3',4,4',5-pentachlorobiphenyl (CB118)	ng/g	0.71	1.0	<0.7 nd	0.8	1.5	<0.7 nd	1.3	0.8	<0.7 nd	<0.7 nd	1.7
2,2',3,4',5,6,6'-heptachlorobiphenyl (CB188)	ng/g	0.57	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd
2,2',4,4',5,5'-hexachlorobiphenyl (CB153)	ng/g	0.44	2.3 1	0.9 1	1.4	1.8 1	0.7	2.1 1	1.0 1	<0.4 nd	<0.4 nd	1.3 1
2,3,3',4,4'-pentachlorobiphenyl (CB105)	ng/g	0.56	0.9 1	<0.6 nd	0.6	0.7 1	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	2.7 1
2,2',3,4,4',5'-hexachlorobiphenyl (CB138/163/164)	ng/g	0.58	1.2	<0.6 nd	3.6	0.9	1.1	1.1	0.7	<0.6 nd	<0.6 nd	1.5
3,3',4,4',5-pentachlorobiphenyl (CB126)	ng/g	0.48	<0.5 nd	<0.5 nd	<0.5 nd	0.8	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd
2,2',3,4',5,5',6-heptachlorobiphenyl (CB187/182/159)	ng/g	0.47	1.3	0.3 1	<0.5 nd	1.3	<0.5 nd	<0.5 nd	1.1	<0.5 nd	<0.5 nd	<0.5 nd
2,2',3,3',4,4'-hexachlorobiphenyl (CB128)	ng/g	0.44	0.8	<0.4 nd	<0.4 nd	1.0	<0.4 nd	0.7	<0.4 nd	<0.4 nd	<0.4 nd	<0.4 nd
2,2',3,3',4,5,6,6'-octachlorobiphenyl (CB200)	ng/g	0.51	<0.5 nd	<0.5 nd	<0.5 nd	0.5 1	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd
2,2',3,4,4',5,5'-heptachlorobiphenyl (CB180)	ng/g	0.53	0.5	<0.5 nd	1.9	0.8	1.0	0.8	<0.5 nd	<0.5 nd	<0.5 nd	0.8
2,2',3,3',4,4',5-heptachlorobiphenyl (CB170/190)	ng/g	0.53	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd
2,2',3,3',4,4',5,6-octachlorobiphenyl (CB195)	ng/g	0.57	<0.6 nd	<0.6 nd	nc 1	<0.6 nd	<0.6					

USGS -Cape Cod 1999- Project SURFACE SEDIMENTS-PCB/OCPs

Chain of Custody		MDL Sed.	TC-1, 0-2 cm. 10/13/99	TC-2, 0-2 cm. 10/13/99	TC-3, 0-2 cm. 10/13/99	SP-1, 0-2 cm. 10/13/99	SP-2, 0-2 cm. 10/13/99	SP-3, 0-2 cm. 10/13/99	MP-2, 0-2 cm. 10/13/99	MP-3, 0-2 cm. 10/13/99	TC-6, marsh 12/06/99	SP-5, marsh 12/06/99
OGL Lab ID		NP02	NP03	NP04	NP05	NP06	NP07	NP08	NP09	NP22	NP24	
PCBs/OCPs		Sediment										
units												
ng/g		0.41	<0.4 nd	<0.4 nd	<0.4 nd	1.7	<0.4 nd	<0.4 nd	<0.4 nd	<0.4 nd	<0.4 nd	<0.4 nd
ng/g		0.62	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd
ng/g		0.47	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd
ng/g		0.73	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd
ng/g		0.48	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd
ng/g		0.78	0.8	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd
ng/g		0.79	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd
ng/g		0.75	1.1	<0.8 nd	0.8	1.9	1.1	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	1.3
ng/g		0.91	2.2	1.1	1.6	1.9	1.9	1.0	1.4	1.0	<0.9 nd	3.2
ng/g		0.85	3.1	1.9	3.5	2.3	3.4	1.1	2.3	1.4	<0.9 nd	1.5
ng/g		0.95	1.8	<1.0 nd	1.7	<1.0 nd	2.3	0.8	1.8	1.1	<1.0 nd	2.9
ng/g		0.63	2.8	0.6	1.0	4.5	2.0	0.6	2.5	0.9	<0.6 nd	1.1
ng/g		0.55	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	0.7	0.7	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd
ng/g		2.5	1.8 J	0.6 J	1.2 J	2.6	2.0 J	0.3 J	0.5 J	0.5 J	0.3 J	2.1 J
ng/g		4.1	10.6	4.4	7.8	9.4	10.4	3.4 J	8.3	4.5	0.7 J	8.7
Percent Recovery		ISTD										
dibromooctafluorobiphenyl(DBOBFB)		42	69	70	79	48	72	60	65	44	71	
2,2',4,5',6-pentachlorobiphenyl(CB103)		41	73	68	71	63	71	70	68	45	71	
2,2',3,3',4,5,5',6-octachlorobiphenyl(CB198)		41	78	75	127	61	70	60	70	32	68	

USGS -Cape Cod 1999- Project SURFACE SEDIMENTS-PCB/OCPs

Chain of Custody	MDL Sed.	MP-1, 0-2 cm. 12/06/99	MP-5, marsh 12/06/99	HH-2, un-restr. marsh 12/06/99	HR-3, un-restr. marsh 12/06/99	HH-3, marsh pool. 01/20/00	HH-4, restr-'ted marsh sed'n. statn. 01/20/00	HR-4, un-restr. creek. 01/20/00	HR-5, restr-'ted marsh 01/20/00	HH-5, restr-'ted marsh pool. 02/04/00	HR-6, restr-'ted tidal creek. 02/04/00													
												OGL Lab ID	units	Sediment-->	NP25	NP26	NP27	NP28	NP32	NP33	NP34	NP35	NP41	NP42

USGS -Cape Cod 1999- Project SURFACE SEDIMENTS-PCB/OCPs

Chain of Custody		MDL Sed.	MP-1, 0-2 cm. 12/06/99	MP-5, marsh 12/06/99	HH-2, un-restr. marsh 12/06/99	HR-3, un-restr. marsh 12/06/99	HH-3, marsh pool. 01/20/00	HH-4, restr-'ted marsh sed'n. statn. 01/20/00	HR-4, un-restr. creek. 01/20/00	HR-5, restr-'ted marsh 01/20/00	HH-5, restr-'ted marsh pool. 02/04/00	HR-6, restr-'ted tidal creek. 02/04/00		
													OGL Lab ID	
													PCBs/OCPs	units
hexachlorobenzene (HCB) 1a,2a,3B,4a,5a,6B-hexachlorocyclohexane(g-HCH) heptachlor (HEPT) aldrin (Aldrin) heptachlor epoxide (HEPT E) o,p'-(dichlorodiphenyldichloro)ethene (o,p'-DDE) cis-chlordane (a-CHLDA) trans-nonachlor (TRANSNON) p,p'-(dichlorodiphenyldichloro)ethene (p,p'-DDE) p,p'-(dichlorodiphenyldichloro)ethane (p,p'-DDD) o,p'-(dichlorodiphenyltrichloro)ethane (o,p'-DDT) p,p'-(dichlorodiphenyltrichloro)ethane (p,p'-DDT) mirex (Mirex) ΣChlorodanes ΣDDTs		0.41	<0.4 nd	0.5	0.7	<0.4 nd	<0.4 nd	<0.4 nd	<0.4 nd	<0.4 nd	<0.4 nd	<0.4 nd		
		0.62	9.6	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	1.6	16.2	1.0	<0.6 nd	
		0.47	0.7	0.6	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	
		0.73	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	1.1	<0.7 nd	
		0.48	0.9	1.1	0.9	<0.5 nd	0.5	0.5	2.1	1.0	<0.5 nd	<0.5 nd	<0.5 nd	
		0.78	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	3.4	<0.8 nd	
		0.79	<0.8 nd	1.1	1.0	1.0	<0.8 nd	1.1	1.4	<0.8 nd	<0.8 nd	1.0	<0.8 nd	
		0.75	<0.8 nd	1.0	1.3	1.3	<0.8 nd	1.3	1.7	0.9	0.9	0.9	<0.8 nd	
		0.91	1.7	3.0	4.8	<0.9 nd	12.6	5.1	5.1	4.2	4.2	164	1.7	
		0.85	2.3	4.0 1	3.9	<0.9 nd	5.9	4.4	4.4	6.4	6.4	53.0	1.6	
		0.95	2.0	2.1 1	3.1	<1.0 nd	2.8	3.0	3.0	2.7	2.7	3.8	<1.0 nd	
		0.63	1.6	2.1	1.7	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	2.3	3.6	3.0	<0.6 nd	
		0.55	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	1.8	<0.6 nd	<0.6 nd	<0.6 nd	
		2.5	2.7	2.4 J	3.2	0.6 J	2.9	5.2	2.6	1.9 J	0.6 J	0.6 J		
4.1	7.5	8.1	13.5	1.6 J	21.4	14.8	16.8	227	4.5	4.5				
Percent Recovery ISTD														
dibromooctafluorobiphenyl(DBOFB) 2,2',4,5',6-pentachlorobiphenyl(CB103) 2,2',3,3',4,5,5',6-octachlorobiphenyl(CB198)			72	56	61	69	78	74	73	87	39	64		
			72	73	69	77	84	68	73	79	48	69		
			67	51	57	67	77	59	68	66	39	62		

USGS -Cape Cod 1999- Project SURFACE SEDIMENTS-PCB/OCPS

Chain of Custody	MDL Sed.	PB-S1, Pleasant Bay #1.	PB-S2, Pleasant Bay #2.	NI-S2, Nauset Inlet #2.	PB-S3, Pleasant Bay Hog Is.	HH-7, restricted marsh pool.	HH-8 unrestricted 8-14 cm core.
OGC Lab ID	units	NP68	NP69	NP73	NP74	NP75	NP76
		Sediment					core
2,4'-dichlorobiphenyl (CB008)	ng/g	<0.3 nd	<0.3 nd	<0.3 nd	0.8	<0.3 nd	<0.3 nd
2,2',5-trichlorobiphenyl (CB018)	ng/g	2.0 I	<0.7 nd	1.6	<0.7 nd	<0.7 nd	<0.7 nd
2,4,5-trichlorobiphenyl (CB029)	ng/g	<0.7 nd	<0.7 nd	1.2	<0.7 nd	<0.7 nd	<0.7 nd
2,2',4,6-tetrachlorobiphenyl (CB050)	ng/g	1.9	<0.5 nd	1.6	<0.5 nd	<0.5 nd	<0.5 nd
2,4,4'-trichlorobiphenyl (CB028)	ng/g	3.3	<0.7 nd	1.5	<0.7 nd	<0.7 nd	<0.7 nd
2,2',5,5'-tetrachlorobiphenyl (CB052)	ng/g	2.5	<0.7 nd	1.7	<0.7 nd	<0.7 nd	<0.7 nd
2,2',3,5-tetrachlorobiphenyl (CB044)	ng/g	<0.5 nd	0.5	1.8	<0.5 nd	0.5	<0.5 nd
2,3',4,4'-tetrachlorobiphenyl (CB066/095)	ng/g	2.5	1.0	1.6	<0.5 nd	1.0	<0.5 nd
2,2',4,5,5'-pentachlorobiphenyl (CB101/90)	ng/g	1.4	0.9	1.6	<0.6 nd	1.0	0.6
2,2',3,4,5'-pentachlorobiphenyl (CB087)	ng/g	1.5	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd
2,3',4,4',5-pentachlorobiphenyl (CB118)	ng/g	2.9	1.0	1.3 I	<0.7 nd	<0.7 nd	1.4
2,2',3,4',5,6,6'-heptachlorobiphenyl (CB188)	ng/g	0.57	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd
2,2',4,4',5,5'-hexachlorobiphenyl (CB153)	ng/g	0.44	1.1	1.0	0.7	5.4	1.1
2,3,3',4,4'-pentachlorobiphenyl (CB105)	ng/g	0.56	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd
2,2',3,4,4',5'-hexachlorobiphenyl (CB138/163/164)	ng/g	0.58	1.0	<0.6 nd	<0.6 nd	8.6	1.5
3,3',4,4',5-pentachlorobiphenyl (CB126)	ng/g	0.48	<0.5 nd	<0.5 nd	<0.5 nd	2.5	<0.5 nd
2,2',3,4',5,5',6-heptachlorobiphenyl (CB187/182/159)	ng/g	0.47	3.2	<0.5 nd	0.5	8.2	0.7
2,2',3,3',4,4'-hexachlorobiphenyl (CB128)	ng/g	0.44	<0.4 nd	<0.4 nd	<0.4 nd	0.5	<0.4 nd
2,2',3,3',4,5,6,6'-octachlorobiphenyl (CB200)	ng/g	0.51	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd
2,2',3,4,4',5,5'-heptachlorobiphenyl (CB180)	ng/g	0.53	0.6	<0.5 nd	<0.5 nd	4.1	<0.5 nd
2,2',3,3',4,4',5-heptachlorobiphenyl (CB170/190)	ng/g	0.53	<0.5 nd	<0.5 nd	<0.5 nd	2.2	<0.5 nd
2,2',3,3',4,4',5,6-octachlorobiphenyl (CB195)	ng/g	0.57	<0.6 nd	<0.6 nd	<0.6 nd	1.8	<0.6 nd
2,2',3,3',4,4',5,5',6-nonachlorobiphenyl (CB206)	ng/g	0.51	0.6	0.8	<0.5 nd	1.6	<0.5 nd
2,2',3,3',4,4',5,5',6,6'-decachlorobiphenyl (CB209)	ng/g	0.52	0.9	1.0	<0.5 nd	<0.5 nd	<0.5 nd
ΣCBs	ng/g	45	12	19	7	40	10
ΣPCBs	ng/g	90	23	37	14	80	19

USGS -Cape Cod 1999- Project SURFACE SEDIMENTS-PCB/OCPs

Chain of Custody		MDL Sed.	PB-S1, Pleasant Bay #1.	PB-S2, Pleasant Bay #2.	NI-S2, Nauset Inlet #2.	PB-S3, Pleasant Bay Hog Is.	HH-7, restricted marsh pool.	HH-8 unrestricted 8-14 cm core.						
										OGL Lab ID				
										PCBs/OCPs	units			
hexachlorobenzene (HCB)			ng/g	0.41	Sediment		NP68	NP69	NP73	NP74	NP75	NP76		
1a,2a,3B,4a,5a,6B-hexachlorocyclohexane(g-HCH)			ng/g	0.62	1.4	<0.4 nd	0.7	<0.4 nd	<0.4 nd	<0.4 nd	<0.4 nd	<0.4 nd	<0.4 nd	<0.4 nd
heptachlor (HEPT)			ng/g	0.47	7.0	<0.6 nd	1.7	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd
aldrin (Aldrin)			ng/g	0.47	<0.5 nd	<0.5 nd	<0.5 nd	0.6	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd
heptachlor epoxide (HEPT E)			ng/g	0.73	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd
o,p'-(dichlorodiphenyldichloro)ethene (o,p'-DDE)			ng/g	0.48	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd
cis-chlordane (a-CHLDA)			ng/g	0.78	3.8	1.7	1.7	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd
trans-nonachlor (TRANSNON)			ng/g	0.79	0.9	<0.8 nd	1.2	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd
p,p'-(dichlorodiphenyldichloro)ethene (p,p'-DDE)			ng/g	0.75	1.0	<0.8 nd	0.8	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd
p,p'-(dichlorodiphenyldichloro)ethane (p,p'-DDD)			ng/g	0.91	3.8	1.0	1.0	<0.9 nd	<0.9 nd	<0.9 nd	<0.9 nd	<0.9 nd	<0.9 nd	<0.9 nd
o,p'-(dichlorodiphenyltrichloro)ethane (o,p'-DDT)			ng/g	0.85	5.5	<0.9 nd	<0.9 nd	<0.9 nd	<0.9 nd	<0.9 nd	<0.9 nd	<0.9 nd	<0.9 nd	<0.9 nd
p,p'-(dichlorodiphenyltrichloro)ethane (p,p'-DDT)			ng/g	0.95	4.2	<1.0 nd	<1.0 nd	<1.0 nd	<1.0 nd	<1.0 nd	<1.0 nd	<1.0 nd	<1.0 nd	<1.0 nd
p,p'-(dichlorodiphenyltrichloro)ethane (p,p'-DDT)			ng/g	0.63	4.5	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd
mirex (Mirex)			ng/g	0.55	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd
ΣChlorodanes			ng/g	2.5	1.9	1.2	2.0	1.3	1.0	0.5	0.5	0.5	0.5	0.5
ΣDDTs			ng/g	4.1	21.8	4.5	4.1	1.7	8.4	8.0	8.0	8.0	8.0	8.0
Percent Recovery ISTD														
dibromooctafluorobiphenyl(DBOFB)			68	67	70	76	77	78						
2,2',4,5',6-pentachlorobiphenyl(CB103)			75	75	81	81	87	76						
2,2',3,3',4,5,5',6-octachlorobiphenyl(CB198)			52	59	53	60	58	63						

USGS -Cape Cod 1999- Project CORES-PCB/OCs

Chain of Custody	MDL Sed.	TC-3, 0-2 cm.	10/13/99	TC-3, 10-12 cm.	10/25/99	TC-3, 20-22 cm.	10/25/99	TC-3, 30-32 cm.	10/25/99	TC-3, 40-42 cm.	10/25/99	TC-3, 50-52 cm.	12/06/99	TC-3, 60-62 cm.	05/02/00	TC-3, 70-72 cm.	05/02/00	TC-3, 80-82 cm.	05/02/00
OGL Lab ID		NP04	NP12	NP13	NP14	NP15	NP21	NP62	NP63	NP64									
PCBs/OCPs		Sediment	Core																
units	ng/g	<0.3 nd	<0.3 nd	<0.3 nd	<0.3 nd	<0.3 nd	<0.3 nd	<0.3 nd	<0.3 nd	<0.3 nd	<0.3 nd	<0.3 nd	<0.3 nd	<0.3 nd	<0.3 nd	<0.3 nd	<0.3 nd	<0.3 nd	
2,4'-dichlorobiphenyl (CB008)	ng/g	<0.7 nd	0.8	4.1	0.8	1.3	1.8	0.7	1.3	0.9	1.8	1.8	1.8	0.7	0.7	0.7	0.7	0.7	
2,2',5-trichlorobiphenyl (CB018)	ng/g	2.4	0.7	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	
2,4,5-trichlorobiphenyl (CB029)	ng/g	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	
2,2',4,6-tetrachlorobiphenyl (CB050)	ng/g	<0.7 nd	<0.7 nd	1.8	1.2	1.8	1.2	1.8	1.8	1.8	1.8	0.8	0.8	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	
2,4,4'-trichlorobiphenyl (CB028)	ng/g	3.0	2.4	1.5	2.0	2.5	2.0	2.5	2.5	2.5	2.5	2.6	2.6	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	
2,2',5,5'-tetraclorobiphenyl (CB052)	ng/g	4.2	1.5	2.0	1.6	1.9	1.6	1.9	1.9	1.9	1.9	2.9	2.9	0.7	0.7	0.7	0.7	0.9	
2,2',3,5-tetrachlorobiphenyl (CB044)	ng/g	1.5	1.1	1.8	2.5	3.6	2.5	3.6	3.6	3.6	3.6	1.8	1.8	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	
2,3',4,4'-tetrachlorobiphenyl (CB066/095)	ng/g	1.0	0.8	1.3	1.8	2.7	1.8	2.7	2.7	2.7	2.7	1.9	1.9	0.7	0.7	<0.6 nd	<0.6 nd	<0.6 nd	
2,2',4,5,5'-pentachlorobiphenyl (CB101/90)	ng/g	<0.6 nd	0.6	<0.6 nd	0.7	1.3	0.7	1.3	1.3	1.3	1.3	0.7	0.7	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	
2,2',3,4,5'-pentachlorobiphenyl (CB087)	ng/g	1.0	0.9	1.4	2.3	3.0	2.3	3.0	3.0	3.0	3.0	1.8	1.8	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	
2,3',4,4',5-pentachlorobiphenyl (CB118)	ng/g	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	
2,2',3,4',5,6'-heptachlorobiphenyl (CB188)	ng/g	1.3	1.2	1.9	2.8	3.1	2.8	3.1	3.1	3.1	3.1	2.1	2.1	0.6	0.6	<0.4 nd	<0.4 nd	<0.4 nd	
2,2',4,4',5,5'-hexachlorobiphenyl (CB153)	ng/g	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	0.8	0.8	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	
2,3,3',4,4'-pentachlorobiphenyl (CB105)	ng/g	0.8	0.9	1.2	2.2	3.2	2.2	3.2	3.2	3.2	3.2	2.4	2.4	1.5	1.5	1.3	1.6	1.6	
2,2',3,4,4',5'-hexachlorobiphenyl (CB138/163/164)	ng/g	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	
3,3',4,4',5-pentachlorobiphenyl (CB126)	ng/g	1.1	1.4	0.6	1.3	0.9	1.3	0.9	0.9	0.9	0.9	1.0	1.0	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	
2,2',3,4',5,5',6-heptachlorobiphenyl (CB187/182/159)	ng/g	2.7	1.4	<0.4 nd	0.8	0.7	0.8	0.7	0.7	0.7	0.7	0.5	0.5	<0.4 nd	<0.4 nd	<0.4 nd	<0.4 nd	<0.4 nd	
2,2',3,3',4,4'-hexachlorobiphenyl (CB128)	ng/g	<0.5 nd	0.5	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	
2,2',3,3',4,5,6,6'-octachlorobiphenyl (CB200)	ng/g	0.8	0.7	0.5	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.7	0.7	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	
2,2',3,4,4',5,5'-heptachlorobiphenyl (CB180)	ng/g	0.7	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	
2,2',3,3',4,4',5-heptachlorobiphenyl (CB170/190)	ng/g	<0.6 nd	0.9	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	
2,2',3,3',4,4',5,6-octachlorobiphenyl (CB195)	ng/g	0.6	1.1	0.6	0.8	0.6	0.8	0.6	0.6	0.6	0.6	0.9	0.9	0.8	0.8	<0.5 nd	<0.5 nd	<0.5 nd	
2,2',3,3',4,4',5,5',6-nonachlorobiphenyl (CB206)	ng/g	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	0.5	0.5	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	
2,2',3,3',4,4',5,5',6,6'-decachlorobiphenyl (CB209)	ng/g	23	18	21	24	31	24	24	31	31	24	24	24	8	5	5	6	6	
ΣCBs		45	36	41	48	63	49	48	63	63	49	49	49	16	11	11	12	12	
ΣPCBs																			

USGS -Cape Cod 1999- Project CORES-PCB/OCPS

Chain of Custody	MDL Sed.	SP-1, 0-2 cm. 10/13/99	SP-1, 10-12 cm. 10/25/99	SP-1, 20-22 cm. 10/25/99	SP-1, 30-32 cm. 10/25/99	SP-1, 40-42 cm. 10/25/99	SP-1, 50-52 cm. 12/06/99
PCBs/OCPS	units	NP05	NP16	NP17	NP18	NP19	NP23
hexachlorobenzene (HCB)	ng/g	1.7	<0.4 nd	<0.4 nd	<0.4 nd	<0.4 nd	<0.4 nd
1a,2a,3B,4a,5a,6B-hexachlorocyclohexane(g-HCH)	ng/g	<0.6 nd	1.5	<0.6 nd	1.6	2.2	<0.6 nd
heptachlor (HEPT)	ng/g	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd
aldrin (Aldrin)	ng/g	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd
heptachlor epoxide (HEPT E)	ng/g	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd
o,p'-(dichlorodiphenyldichloro)ethene (o,p'-DDE)	ng/g	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd
cis-chlordane (a-CHLDA)	ng/g	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd
trans-nonachlor (TRANSON)	ng/g	1.9	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd
p,p'-(dichlorodiphenyldichloro)ethene (p,p'-DDE)	ng/g	1.6	2.0	<0.9 nd	2.0	2.5	3.9
p,p'-(dichlorodiphenyldichloro)ethane (p,p'-DDD)	ng/g	2.3	2.8	1.5	2.4	2.5	3.3
o,p'-(dichlorodiphenyltrichloro)ethane (o,p'-DDT)	ng/g	<1.0 nd	1.5	<1.0 nd	1.1	1.0	1.3
p,p'-(dichlorodiphenyltrichloro)ethane (p,p'-DDT)	ng/g	4.5	1.0	0.8	1.0	0.6 J	1.8 I
mirex (Mirex)	ng/g	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd
ΣChlorodanes	ng/g	2.6	1.5 J	0.8 J	0.5 J	0.7 J	1.4 J
ΣDDTs	ng/g	9.4	7.4	3.7 J	6.5	6.8	10.4
Percent Recovery ISTD							
dibromooctafluorobiphenyl(DBOFB)		79	54	40	62	53	72
2,2',4,5',6-pentachlorobiphenyl(CB103)		71	64	67	70	52	77
2,2',3,3',4,5,5',6-octachlorobiphenyl(CB198)		127	62	72	74	54	72

USGS -Cape Cod 1999- Project TISSUE -PCB/OCPs

Chain of Custody	MDL Tissue	TC-4, BM	03/14/00	TC-5, BM	03/14/00	MP-4, BM	03/14/00	SS-1, BM	03/14/00	NB-1, BM	03/14/00	HR-1, RM	03/24/00	SP-4, BM	03/24/00	HH-1, BM	03/24/00	PT-1, BM	03/24/00	PT-2, BM	03/24/00												
																						OGL Lab ID	units	NP49	NP50	NP51	NP52	NP53	NP56	NP57	NP58	NP59	NP60
PCBs/OCPs	2,4'-dichlorobiphenyl (CB008)	0.32	<0.3 nd	1.1	0.9	1.0	1.4	1.7	4.8	<0.3 nd	10.0	8.7																					
	2,2',5-trichlorobiphenyl (CB018)	0.69	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd																					
	2,4,5-trichlorobiphenyl (CB029)	0.67	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd																					
	2,2',4,6-tetrachlorobiphenyl (CB050)	0.45	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd																					
	2,4,4'-trichlorobiphenyl (CB028)	0.72	2.2	1.4	1.6 I	5.4	4.9	3.5	<0.7 nd	4.4	5.3	1.4 I																					
	2,2',5,5'-tettrachlorobiphenyl (CB052)	0.73	3.7	1.9	3.9	5.4	7.1	3.1 I	3.0 I	3.2	4.5 I	4.4 I																					
	2,2',3,5-tetrachlorobiphenyl (CB044)	0.49	3.0	2.1	3.0	3.5	3.1	2.3	3.4	4.0	2.1	4.8																					
	2,3',4,4'-tetrachlorobiphenyl (CB066/095)	0.53	2.4	4.1	4.9	7.7	7.5	4.1	4.1	5.5	5.4	7.7																					
	2,2',4,5,5'-pentachlorobiphenyl (CB101/90)	0.59	2.9	5.1	4.9	5.7	6.7	5.8	5.4	4.4	5.5	7.5																					
	2,2',3,4,5'-pentachlorobiphenyl (CB087)	0.55	1.5	1.2	1.8	2.3	3.3	0.9	1.8	1.7 I	2.0	2.9																					
	2,3',4,4',5-pentachlorobiphenyl (CB118)	0.71	nc I	nc I	nc I	nc I	nc I	nc I	nc I	nc I	nc I	nc I																					
	2,2',3,4',5,6,6'-heptachlorobiphenyl (CB188)	0.57	<0.6 nd	<0.6 nd	1.1	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd																					
	2,2',4,4',5,5'-hexachlorobiphenyl (CB153)	0.44	1.1	8.5 I	7.2 I	7.5 I	9.7 I	5.4 I	8.8 I	10.3 I	5.2 I	10.3 I																					
	2,3,3',4,4'-pentachlorobiphenyl (CB105)	0.56	0.7	1.5 I	0.8 I	0.8 I	1.6 I	0.8 I	1.5 I	1.0 I	1.1 I	2.1 I																					
	2,2',3,4,4',5'-hexachlorobiphenyl (CB138/163/164)	0.58	6.0	9.1	9.9	10.3	17.1	6.7	10.5	13.8	11.9	14.8																					
	3,3',4,4',5-pentachlorobiphenyl (CB126)	0.48	<0.5 nd	2.9	2.5	4.8	4.5	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd																					
	2,2',3,4',5,5',6-heptachlorobiphenyl (CB187/182/159)	0.47	0.5	2.9	3.0	3.7	6.6	1.9	3.3	5.9	3.1	4.3																					
2,2',3,3',4,4'-hexachlorobiphenyl (CB128)	0.44	nc I	1.2	1.6	2.1	4.5	1.4	2.1	2.3	2.6	3.1																						
2,2',3,3',4,5,6,6'-octachlorobiphenyl (CB200)	0.51	<0.5 nd	0.5	0.7	0.7	2.4	1.0	0.6	0.8	0.5	<0.5 nd																						
2,2',3,4,4',5,5'-heptachlorobiphenyl (CB180)	0.53	0.7	1.6	1.2	2.2	3.3	1.3	1.2	3.0	3.2	3.7																						
2,2',3,3',4,4',5-heptachlorobiphenyl (CB170/190)	0.53	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd																						
2,2',3,3',4,4',5,6-octachlorobiphenyl (CB195)	0.57	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd																						
2,2',3,3',4,4',5,5',6-nonachlorobiphenyl (CB206)	0.51	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd																						
2,2',3,3',4,4',5,5',6,6'-decachlorobiphenyl (CB209)	0.52	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd																						
ΣCBs	ng/g	27	46	50	65	84	40	51	61	64	76																						
ΣPCBs	ng/g	53	92	99	129	168	80	102	121	129	151																						

USGS -Cape Cod 1999- Project TISSUE -PCB/OCPs

Chain of Custody	MDL Tiss.	TC-4, BM	03/14/00	TC-5, BM	03/14/00	MP-4, BM	03/14/00	SS-1, BM	03/14/00	NB-1, BM	03/14/00	HR-1, RM	03/24/00	SP-4, BM	03/24/00	HH-1, BM	03/24/00	PT-1, BM	03/24/00	PT-2, BM	03/24/00																						
																						OGL Lab ID		NP49		NP50		NP51		NP52		NP53		NP56		NP57		NP58		NP59		NP60	
																						PCBs/OCPs		Tissue		Tissue		Tissue		Tissue		Tissue		Tissue		Tissue		Tissue		Tissue		Tissue	
																						units		ng/g		ng/g		ng/g		ng/g		ng/g		ng/g		ng/g		ng/g		ng/g		ng/g	
																						hexachlorobenzene (HCB)		0.41		<0.4 nd		<0.4 nd		<0.4 nd		0.7		<0.4 nd		0.4 I		0.8		0.7		0.9	
																						1a,2a,3B,4a,5a,6B-hexachlorocyclohexane(g-HCH)		0.62		<0.6 nd		<0.6 nd		<0.6 nd		1.0		2.9		<0.6 nd		1.1 I		<0.6 nd		1.1	
																						heptachlor (HEPT)		0.47		1.1 I		<0.5 nd		<0.5 nd		<0.5 nd		3.2		<0.5 nd		2.9		3.1		0.9	
																						aldrin (Aldrin)		0.73		<0.7 nd		<0.7 nd		<0.7 nd		<0.7 nd		4.2		2.4		<0.7 nd		<0.7 nd		<0.7 nd	
																						heptachlor epoxide (HEPT E)		0.48		<0.5 nd		<0.5 nd		<0.5 nd		<0.5 nd		<0.5 nd		<0.5 nd		<0.5 nd		<0.5 nd		<0.5 nd	
																						o,p'-(dichlorodiphenyldichloro)ethene (o,p'-DDE)		0.78		<0.8 nd		<0.8 nd		<0.8 nd		<0.8 nd		<0.8 nd		5.2		<0.8 nd		2.9		<0.8 nd	
cis-chlordane (a-CHLDA)		0.79		<0.8 nd		1.8		2.2		2.0		2.8		1.4		1.4		1.2		1.5																							
trans-nonachlor (TRANSNON)		0.75		1.4		2.6		2.7		4.1		4.1		2.2		2.5		2.1		2.9																							
p,p'-(dichlorodiphenyldichloro)ethene (p,p'-DDE)		0.91		1.5		9.7		7.6		9.0		15.7		8.2		17.0		8.7		7.7																							
p,p'-(dichlorodiphenyldichloro)ethane (p,p'-DDD)		0.85		2.2		9.5		6.8		5.9		8.4		7.8		8.9 I		6.0		7.1																							
o,p'-(dichlorodiphenyltrichloro)ethane (o,p'-DDT)		0.95		1.2 I		2.4		4.0		3.9		4.5 I		4.1		3.8		6.0		4.0																							
p,p'-(dichlorodiphenyltrichloro)ethane (p,p'-DDT)		0.63		<0.6 nd		1.9		2.3		1.9		4.4		3.3		<0.6 nd		<0.6 nd		<0.6 nd																							
mirex (Mirex)		0.55		<0.6 nd		0.7		0.8		<0.6 nd		3.7		<0.6 nd		0.6		0.9		0.8																							
ΣChlorodanes		2.5		4.4		4.8		6.1		6.9		6.8		4.3		6.5		6.4		5.2																							
ΣDDTs		4.1		23.6		20.6		20.7		33.1		23.5		34.8		20.7		15.9		18.8																							
Percent Recovery ISTD																																											
dibromooctafluorobiphenyl(DBOFB)																																											
2,2',4,5',6-pentachlorobiphenyl(CB103)																																											
2,2',3,3',4,5',6-octachlorobiphenyl(CB198)																																											

USGS -Cape Cod 1999- Project TISSUE -PCB/OCPs

Chain of Custody	MDL Tiss.	HR-1a RM	HR-2, Oysters	PB- T1, RM	NI- T1, RM
OGL Lab ID	NP65	NP66	NP71	NP72	
PCBs/OCPs	Tissue				
2,4'-dichlorobiphenyl (CB008)	ng/g	3.2	<0.3 nd	<0.3 nd	<0.3 nd
2,2',5-trichlorobiphenyl (CB018)	ng/g	<0.7 nd	<0.7 nd	3.2	2.9
2,4,5-trichlorobiphenyl (CB029)	ng/g	<0.7 nd	<0.7 nd	3.3	4.6
2,2',4,6-tetrachlorobiphenyl (CB050)	ng/g	<0.5 nd	<0.5 nd	2.3 I	3.7
2,4,4'-trichlorobiphenyl (CB028)	ng/g	15.1	4.8	1.9 I	4.1
2,2',5,5'-tetrachlorobiphenyl (CB052)	ng/g	6.1	8.3	1.1	2.2 I
2,2',3,5-tetrachlorobiphenyl (CB044)	ng/g	4.0	3.8	1.2 I	12.5
2,3',4,4'-tetrachlorobiphenyl (CB066/095)	ng/g	6.9	5.3	3.5	6.0
2,2',4,5,5'-pentachlorobiphenyl (CB101/90)	ng/g	4.6	5.3	3.5	6.5
2,2',3,4,5'-pentachlorobiphenyl (CB087)	ng/g	2.0	2.9	1.2	2.6
2,3',4,4',5-pentachlorobiphenyl (CB118)	ng/g	nc I	nc I	nc I	nc I
2,2',3,4',5,6,6'-heptachlorobiphenyl (CB188)	ng/g	2.2	<0.6 nd	<0.6 nd	<0.6 nd
2,2',4,4',5,5'-hexachlorobiphenyl (CB153)	ng/g	7.4	8.0 I	4.5	7.4
2,3,3',4,4'-pentachlorobiphenyl (CB105)	ng/g	1.9	1.1 I	<0.6 nd	3.6
2,2',3,4,4',5'-hexachlorobiphenyl (CB138/163/164)	ng/g	15.4	25.0	3.1	6.5
3,3',4,4',5-pentachlorobiphenyl (CB126)	ng/g	<0.5 nd	<0.5 nd	1.4	2.0
2,2',3,4',5,5',6-heptachlorobiphenyl (CB187/182/159)	ng/g	4.6	3.7	3.0	3.9
2,2',3,3',4,4'-hexachlorobiphenyl (CB128)	ng/g	4.3	1.3	<0.4 nd	1.8
2,2',3,3',4,5,6,6'-octachlorobiphenyl (CB200)	ng/g	1.8	1.2	<0.5 nd	<0.5 nd
2,2',3,4,4',5,5'-heptachlorobiphenyl (CB180)	ng/g	2.1	1.2	1.0	0.8
2,2',3,3',4,4',5-heptachlorobiphenyl (CB170/190)	ng/g	<0.5 nd	<0.5 nd	1.1	0.9
2,2',3,3',4,4',5,6-octachlorobiphenyl (CB195)	ng/g	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd
2,2',3,3',4,4',5,5',6-nonachlorobiphenyl (CB206)	ng/g	<0.5 nd	<0.5 nd	1.2	2.5
2,2',3,3',4,4',5,5',6,6'-decachlorobiphenyl (CB209)	ng/g	<0.5 nd	0.9 I	0.9	2.2
ΣCBs	ng/g	79	77	38	77
ΣPCBs	ng/g	158	154	75	154

USGS -Cape Cod 1999- Project TISSUE -PCB/OCPs

Chain of Custody	MDL Tiss.	HR-1a RM	05/02/00	HR-2, Oysters	05/02/00	PB- T1, RM	00/03/80	NI- T1, RM	00/03/80
	OGL Lab ID		NP65	NP66	NP71	NP72			
	PCBs/OCPs		Tissue						
	hexachlorobenzene (HCB)	units	0.41	<0.4 nd	<0.4 nd	0.5	0.7		
	1a,2a,3B,4a,5a,6B-hexachlorocyclohexane(g-HCH)	ng/g	0.62	<0.6 nd	<0.6 nd	9.3 I	3.7		
	heptachlor (HEPT)	ng/g	0.47	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd		
	aldrin (Aldrin)	ng/g	0.73	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd		
	heptachlor epoxide (HEPT E)	ng/g	0.48	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd		
	o,p'-(dichlorodiphenyldichloro)ethene (o,p'-DDE)	ng/g	0.78	<0.8 nd	5.6	2.3 I	4.0 I		
cis-chlordane (a-CHLDA)	ng/g	0.79	1.7	1.9	2.5	4.3			
trans-nonachlor (TRANSNON)	ng/g	0.75	3.2	2.3	2.6	4.1			
p,p'-(dichlorodiphenyldichloro)ethene (p,p'-DDE)	ng/g	0.91	12.3	11.2	6.4	9.2			
p,p'-(dichlorodiphenyldichloro)ethane (p,p'-DDD)	ng/g	0.85	15.3	5.0	2.6	6.8			
o,p'-(dichlorodiphenyltrichloro)ethane (o,p'-DDT)	ng/g	0.95	<1.0 nd	1.5	6.8	4.4			
p,p'-(dichlorodiphenyltrichloro)ethane (p,p'-DDT)	ng/g	0.63	7.4	20.5 I	4.0	3.4			
mirex (Mirex)	ng/g	0.55	<0.6 nd	1.0 I	0.9	<0.6 nd			
ΣChlorodanes	ng/g	2.5	4.9	4.1	5.2	8.4			
ΣDDTs	ng/g	4.1	35.0	43.9	22.2	27.7			
Percent Recovery ISTD									
dibromooctafluorobiphenyl(DBOFB)									
2,2',4,5',6-pentachlorobiphenyl(CB103)									
2,2',3,3',4,5,5',6-octachlorobiphenyl(CB198)									
57									
61									
44									
57									
62									
39									
81									
84									
66									
59									
64									
43									

USGS -Cape Cod 1999- Project LAB BLANKS -PCB/OCPs

Chain of Custody	MDL Sedi- ment & Tiss.	USGS -99 Lab Blank	10/13/99	USGS -99 Lab Blank	10/25/99	USGS -99 Lab Blank	USGS -99 Lab Blank	USGS -99 Lab Blank	USGS -99 Lab Blank	USGS -99 Lab Blank	USGS -99 Lab Blank	USGS -99 Lab Blank	USGS -99 Lab Blank	USGS -99 Tissue Lab Blank	USGS -99 Tissue Lab Blank	USGS -99 Tissue Lab Blank
PCBs/OCPs																
units			Sediment	SB01	SB10	SB20	SB29	SB36	SB67	SB61	SB70					
ng/g	0.32	0.2 J	<0.3 nd	<0.3 nd	0.1 J	<0.3 nd	0.1 J	0.1 J	0.1 J	<0.3 nd	<0.3 nd	<0.3 nd	<0.3 nd	<0.3 nd	<0.3 nd	<0.3 nd
ng/g	0.69	0.1 J	0.2 J	0.2 J	0.1 J	0.2 J	0.1 J	0.2 I,J	0.1 J	<0.7 nd	5.5	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd
ng/g	0.67	0.1 J	0.1 J	0.2 J	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	1.7 I	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd
ng/g	0.45	0.1 J	0.2 J	0.2 J	0.2 J	0.2 J	0.1 I,J	<0.7 nd	0.1 J	0.5 J	2.5	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd
ng/g	0.72	0.1 J	0.2 J	0.2 J	0.2 J	0.2 J	<0.7 nd	<0.7 nd	0.2 J	1.3	0.9	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd
ng/g	0.73	0.3 J	0.1 J	0.2 J	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	0.2 J	2.2	0.3 J	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd
ng/g	0.49	0.5 J	0.4 J	0.1 J	0.2 J	0.2 J	<0.5 nd	<0.5 nd	0.2 J	0.7	0.8	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd
ng/g	0.53	0.3 J	0.1 J	0.2 J	0.2 J	0.2 J	0.3 J	0.3 J	0.3 J	2.1	1.5	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd
ng/g	0.59	0.3 J	0.1 J	0.2 J	0.2 J	0.2 J	0.1 J	0.1 J	0.1 J	<0.6 nd	0.4 J	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd
ng/g	0.55	0.1 J	<0.6 nd	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	<0.6 nd	0.7 J	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd
ng/g	0.71	0.1 J	<0.7 nd	0.1 J	0.1 J	0.1 J	<0.7 nd	<0.7 nd	0.2 J	<0.7 nd	0.7 J	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd
ng/g	0.57	0.1 J	<0.6 nd	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	<0.6 nd	0.6	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd
ng/g	0.44	<0.4 nd	0.1 J	<0.4 nd	0.1 J	0.1 J	0.1 J	0.1 J	1.0	0.4 I,J	0.5	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd
ng/g	0.56	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	<0.6 nd	<0.6 nd	0.8	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd
ng/g	0.58	0.1 I,J	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	0.1	<0.6 nd	0.1 J	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd
ng/g	0.48	0.1 J	0.1 J	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	0.1 I,J	<0.5 nd	0.2 J	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd
ng/g	0.47	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	0.6	0.3 J	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd
ng/g	0.44	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	<0.4 nd	<0.4 nd	<0.4 nd	<0.4 nd	<0.4 nd	<0.4 nd	<0.4 nd
ng/g	0.51	<0.5 nd	0.1 J	0.1 J	0.2 J	0.2 J	0.1 J	0.1 J	0.1 I,J	<0.5 nd	0.2 J	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd
ng/g	0.53	<0.5 nd	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	0.2 J	0.2 J	0.2 J	0.1 J	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd
ng/g	0.53	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	0.1 J	<0.5 nd	0.6	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd
ng/g	0.57	<0.6 nd	0.1 J	0.1 J	<0.6 nd	<0.6 nd	0.1 J	0.1 J	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd
ng/g	0.51	0.2 I,J	0.1 I,J	0.1 I,J	0.1 I,J	0.1 I,J	<0.5 nd	<0.5 nd	0.3 J	<0.5 nd	0.6	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd
ng/g	0.52	<0.5 nd	0.1 J	0.1 J	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	0.1 J	<0.5 nd	0.2 J	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd
ng/g		3	2	2	2	2	2	2	5	9	17	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd
ng/g		6	5	5	5	4	4	4	9	17	33	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd
ng/g																
ng/g																

USGS -Cape Cod 1999- Project LAB BLANKS -PCB/OCPs

Chain of Custody	MDL Sedi- ment & Tiss.	USGS -99 Lab Blank	10/13/99	USGS -99 Lab Blank	12/06/99	USGS -99 Lab Blank	01/20/00	USGS -99 Lab Blank	USGS -99 Lab Blank	USGS -99 Tissue Lab Blank	USGS -99 Tissue Lab Blank	USGS -99 Tissue Lab Blank
PCBs/OCPs	units	Sediment	SB01	SB10	SB20	SB29	SB36	SB67	SB61	SB70		
	ng/g	0.41	<0.4 nd	<0.4 nd	<0.4 nd	<0.4 nd	<0.4 nd	<0.4 nd	<0.4 nd	0.2 J	0.4	
	ng/g	0.62	<0.6 nd	0.1 J	<0.6 nd	<0.6 nd	<0.6 nd	0.1 J	0.2 J	<0.6 nd	2.9	
	ng/g	0.47	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	0.2 J	<0.5 nd	
	ng/g	0.73	<0.7 nd	<0.7 nd	<0.7 nd	0.2 J	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	<0.7 nd	
	ng/g	0.48	<0.5 nd	0.1 J	0.3 J	0.1 J	<0.5 nd	<0.5 nd	<0.5 nd	<0.5 nd	0.2 J	
	ng/g	0.78	0.1 J	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	<0.8 nd	
	ng/g	0.79	0.1 J	<0.8 nd	0.1 J	0.1 J	0.1 J	0.1 J	<0.8 nd	<0.8 nd	0.4 J	
	ng/g	0.75	0.1 J	<0.8 nd	0.1 J	0.1 J	0.1 J	0.1 J	<0.8 nd	0.4 J	0.2 J	
	ng/g	0.91	0.1 J	<0.9 nd	0.1 J	0.1 J	0.1 J	0.2 J	<0.9 nd	0.9 J	<0.9 nd	
PCBs/OCPs	ng/g	0.85	<0.9 nd	0.1 J	<0.9 nd	<0.9 nd	<0.9 nd	<0.9 nd	0.2 J	<0.9 nd	0.1 J	
	ng/g	0.95	0.2 J	0.1 J	0.2 J	0.2 J	0.3 J	0.3 J	<1.0 nd	1.2	0.1 J	
	ng/g	0.63	0.1 J	0.1 J	<0.6 nd	<0.6 nd	0.3 J	0.3 J	<0.6 nd	<0.6 nd	<0.6 nd	
	ng/g	0.55	<0.6 nd	0.1 J	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	<0.6 nd	0.1 J	<0.6	
	ng/g	2.5	0.2 J	0.1 J	0.4 J	0.3 J	0.3 J	0.2 J	<2.5 nd	0.6 J	0.8 J	
	ng/g	4.1	0.5 J	0.3 J	0.3 J	0.6 J	0.6 J	0.7 J	0.2 J	2.0 J	0.1 J	
	Percent Recovery ISTD											
	dibromooctafluorobiphenyl(DBOFB)											
	2,2',4,5',6-pentachlorobiphenyl(CB103)											
	2,2',3,3',4,5,5',6-octachlorobiphenyl(CB198)											

USGS -Cape Cod 1999- Project BLANK SPIKE -PCB/OCPs

Chain of Custody	MDL Sedi ment	USGS -99 Lab Blank	USGS 10/25/99	USGS -99 Lab Blank Spike	DIFFERENCE	ng in 11.87grams	ng. EXPECTED	% RECOVERY					
									OGL Lab ID	SB10	SB11		
												units	Sediment
PCBs/OCPs													
2,4'-dichlorobiphenyl (CB008)		ng/g	0.32	<0.3 nd	3.3	39.1	41.6	94.0					
2,2',5-trichlorobiphenyl (CB018)		ng/g	0.69	0.2 J	3.8	43.6	41.6	105					
2,4,5-trichlorobiphenyl (CB029)		ng/g	0.67	0.1 J	3.9	45.3	41.6	109					
2,2',4,6-tetrachlorobiphenyl (CB050)		ng/g	0.45	<0.5 nd	3.7	43.8	41.8	105					
2,4,4'-trichlorobiphenyl (CB028)		ng/g	0.72	0.2 J	3.8	42.9	41.6	103					
2,2',5,5'-tetrachlorobiphenyl (CB052)		ng/g	0.73	0.1 J	3.9	45.1	41.6	108					
2,2',3,5-tetrachlorobiphenyl (CB044)		ng/g	0.49	0.4 J	3.4	35.5	41.6	85.4					
2,3',4,4'-tetrachlorobiphenyl (CB066/95)		ng/g	0.53	0.1 J	3.7	42.8	41.6	103					
2,2',4,5,5'-pentachlorobiphenyl (CB101/90)		ng/g	0.59	0.1 J	3.6	41.2	41.6	99.0					
2,2',3,4,5'-pentachlorobiphenyl (CB087)		ng/g	0.55	<0.6 nd	3.3	39.5	41.6	95.0					
2,3',4,4',5'-pentachlorobiphenyl (CB118)		ng/g	0.71	<0.7 nd	3.8	45.2	41.8	108					
2,2',3,4',5,6,6'-heptachlorobiphenyl (CB188)		ng/g	0.57	<0.6 nd	3.6	42.7	41.8	102					
2,2',4,4',5,5'-hexachlorobiphenyl (CB153)		ng/g	0.44	0.1 J	3.6	41.6	41.8	99.4					
2,3,3',4,4'-pentachlorobiphenyl (CB105)		ng/g	0.56	0.1 J	4.1	47.9	41.6	115					
2,2',3,4,4',5'-hexachlorobiphenyl (CB138/163/164)		ng/g	0.58	0.1 J	2.9	33.2	41.6	79.8					
3,3',4,4',5-pentachlorobiphenyl (CB126)		ng/g	0.48	0.1 J	3.2	37.3	41.6	89.7					
2,2',3,4',5,5',6-heptachlorobiphenyl (CB187/182/159)		ng/g	0.47	0.1 J	3.3	38.2	41.8	91.4					
2,2',3,3',4,4'-hexachlorobiphenyl (CB128)		ng/g	0.44	0.1 J	3.5	40.6	41.6	97.6					
2,2',3,3',4,5,6,6'-octachlorobiphenyl (CB200)		ng/g	0.51	0.1 J	3.4	38.6	41.6	92.8					
2,2',3,4,4',5,5'-heptachlorobiphenyl (CB180)		ng/g	0.53	0.1 J	2.9	33.1	41.6	79.5					
2,2',3,3',4,4',5-heptachlorobiphenyl (CB170/190)		ng/g	0.53	<0.5 nd	4.0	47.0	41.8	112					
2,2',3,3',4,4',5,6-octachlorobiphenyl (CB195)		ng/g	0.57	0.1 J	3.6	41.8	41.6	101					
2,2',3,3',4,4',5,5',6-nonachlorobiphenyl (CB206)		ng/g	0.51	0.1 J	3.3	37.5	40.8	91.9					
2,2',3,3',4,4',5,5',6,6'-decachlorobiphenyl (CB209)		ng/g	0.52	0.1 J	3.7	42.6	41.6	102					
ΣCBs		ng/g		2	85	986	999	99					
ΣPCBs		ng/g		5	171								

USGS -Cape Cod 1999- Project BLANK SPIKE -PCB/OCPs

Chain of Custody	MDL Sedi ment	USGS -99 Lab Blank	USGS -99 Lab Blank Spike	DIFFERENCE	ng in 11.87 grams	ng EXPECTED	% RECOVERY
PCBs/OCPs	OGL Lab ID	SB10	SB11				
hexachlorobenzene (HCB)	units						
1a,2a,3B,4a,5a,6B-hexachlorocyclohexane(g-HCH)	ng/g	<0.4 nd	3.3	3.3	38.7	39.4	98.2
heptachlor (HEPT)	ng/g	0.1 J	2.2	2.1	24.9	39.4	63.0 Q
aldrin (Aldrin)	ng/g	<0.5 nd	1.8	1.8	21.9	39.5	55.3 Q
heptachlor epoxide (HEPT E)	ng/g	<0.7 nd	2.8	2.8	33.7	39.7	85.0
o,p'-(dichlorodiphenyldichloro)ethene (o,p'-DDE)	ng/g	0.1 J	2.4	2.2	26.6	39.5	67.3 Q
cis-chlordane (a-CHLDA)	ng/g	<0.8 nd	3.5	3.5	41.0	39.5	104
trans-nonachlor (TRANSNON)	ng/g	<0.8 nd	3.5	3.5	41.2	39.4	105
p,p'-(dichlorodiphenyldichloro)ethene (p,p'-DDE)	ng/g	<0.8 nd	3.6	3.6	42.4	39.7	107
p,p'-(dichlorodiphenyldichloro)ethane (p,p'-DDD)	ng/g	<0.9 nd	3.6	3.6	43.0	39.5	109
o,p'-(dichlorodiphenyltrichloro)ethane (o,p'-DDT)	ng/g	0.1 J	3.8	3.7	43.8	39.8	110
p,p'-(dichlorodiphenyltrichloro)ethane (p,p'-DDT)	ng/g	0.1 J	4.4	4.2	50.3	39.2	128
mirex (Mirex)	ng/g	0.1 J	3.5	3.4	40.0	39.3	102
Σ Chlorodanes	ng/g	0.1 J	3.4	3.3	39.1	39.8	98.3
Σ DDTs	ng/g	0.1 J	11.2	11.1	132	158	83.5
	ng/g	0.3 J	18.6	18.4	218	197	110
Percent Recovery ISTD							
dibromooctafluorobiphenyl(DBOFB)		79	78				
2,2',4,5',6-pentachlorobiphenyl(CB103)		84	83				
2,2',3,3',4,5',6-octachlorobiphenyl(CB198)		91	87				

USGS -Cape Cod 1999- Project SURFACE SEDIMENT DUPLICATE-PCB/OCPS

Chain of Custody	MDL Sed.	SP-1, 0-2 cm. rpt. NP05.	SP-1, 0-2 cm. rpt. NP05.	AVERAGE RELATIVE DIFFERENCE	OGL Lab ID	
					PCBs/OCPS	
					units	Sediment
2,4'-dichlorobiphenyl (CB008)	ng/g	0.32	<0.3 nd	-	ng/g	<0.3 nd
2,2',5'-trichlorobiphenyl (CB018)	ng/g	0.69	1.2	1.2	ng/g	<0.7 nd
2,4,5'-trichlorobiphenyl (CB029)	ng/g	0.67	<0.7 nd	-	ng/g	<0.7 nd
2,2',4,6-tetrachlorobiphenyl (CB050)	ng/g	0.45	<0.5 nd	-	ng/g	<0.5 nd
2,4,4'-trichlorobiphenyl (CB028)	ng/g	0.72	<0.7 nd	-	ng/g	<0.7 nd
2,2',5,5'-tetrachlorobiphenyl (CB052)	ng/g	0.73	1.9	1.9	ng/g	<0.7 nd
2,2',3,5-tetrachlorobiphenyl (CB044)	ng/g	0.49	1.9	1.7	ng/g	1.5
2,3',4,4'-tetrachlorobiphenyl (CB066/095)	ng/g	0.53	2.7	2.2	ng/g	1.6
2,2',4,5,5'-pentachlorobiphenyl (CB101/90)	ng/g	0.59	1.2	1.2	ng/g	1.3
2,2',3,4,5'-pentachlorobiphenyl (CB087)	ng/g	0.55	1.0	1.0	ng/g	<0.6 nd
2,3',4,4',5-pentachlorobiphenyl (CB118)	ng/g	0.71	0.8	0.9	ng/g	1.0
2,2',3,4',5,6,6'-heptachlorobiphenyl (CB188)	ng/g	0.57	<0.6 nd	-	ng/g	<0.6 nd
2,2',4,4',5,5'-hexachlorobiphenyl (CB153)	ng/g	0.44	1.4	1.5	ng/g	1.6
2,3,3',4,4'-pentachlorobiphenyl (CB105)	ng/g	0.56	0.6	0.6	ng/g	<0.6 nd
2,2',3,4,4',5'-hexachlorobiphenyl (CB138/163/164)	ng/g	0.58	3.6	2.3	ng/g	1.1
3,3',4,4',5-pentachlorobiphenyl (CB126)	ng/g	0.48	<0.5 nd	107%	ng/g	<0.5 nd
2,2',3,4',5,5',6-heptachlorobiphenyl (CB187/182/159)	ng/g	0.47	<0.5 nd	-	ng/g	0.7
2,2',3,3',4,4'-hexachlorobiphenyl (CB128)	ng/g	0.44	<0.4 nd	0.7	ng/g	0.7
2,2',3,3',4,5,6,6'-octachlorobiphenyl (CB200)	ng/g	0.51	<0.5 nd	-	ng/g	<0.5 nd
2,2',3,4,4',5,5'-heptachlorobiphenyl (CB180)	ng/g	0.53	1.9	1.2	ng/g	0.6
2,2',3,3',4,4',5-heptachlorobiphenyl (CB170/190)	ng/g	0.53	<0.5 nd	101%	ng/g	<0.5 nd
2,2',3,3',4,4',5,6-octachlorobiphenyl (CB195)	ng/g	0.57	nc I	-	ng/g	<0.6 nd
2,2',3,3',4,4',5,5',6-nonachlorobiphenyl (CB206)	ng/g	0.51	1.0	-	ng/g	<0.5 nd
2,2',3,3',4,4',5,5',6,6'-decachlorobiphenyl (CB209)	ng/g	0.52	<0.5 nd	-	ng/g	<0.5 nd
ΣCBs	ng/g		21	17.3	ng/g	14
ΣPCBs	ng/g		41	39.9%	ng/g	28

USGS -Cape Cod 1999- Project SURFACE SEDIMENT DUPLICATE-PCB/OCPs

Chain of Custody	OGL Lab ID	MDL Sed.	SP-1, 0-2 cm. 10/13/99	SP-1, 0-2 cm. rpt. NP05. 02/04/00	AVERAGE RELATIVE DIFFERENCE %
PCBs/OCPs	units		Sediment	NP40	
hexachlorobenzene (HCB)	ng/g	0.41	1.7	<0.4 nd	1.7
1a,2a,3B,4a,5a,6B-hexachlorocyclohexane(g-HCH)	ng/g	0.62	<0.6 nd	<0.6 nd	-
heptachlor (HEPT)	ng/g	0.47	<0.5 nd	<0.5 nd	-
aldrin (Aldrin)	ng/g	0.73	<0.7 nd	<0.7 nd	-
heptachlor epoxide (HEPT E)	ng/g	0.48	<0.5 nd	0.5	0.5
o,p'-(dichlorodiphenyldichloro)ethene (o,p'-DDE)	ng/g	0.78	<0.8 nd	<0.8 nd	-
cis-chlordane (a-CHLDA)	ng/g	0.79	<0.8 nd	<0.8 nd	-
trans-nonachlor (TRANSNON)	ng/g	0.75	1.9	<0.8 nd	1.9
p,p'-(dichlorodiphenyldichloro)ethene (p,p'-DDE)	ng/g	0.91	1.6	2.1 1	1.8
p,p'-(dichlorodiphenyldichloro)ethane (p,p'-DDD)	ng/g	0.85	2.3	2.6 1	2.5
o,p'-(dichlorodiphenyltrichloro)ethane (o,p'-DDT)	ng/g	0.95	<1.0 nd	1.2	1.2
p,p'-(dichlorodiphenyltrichloro)ethane (p,p'-DDT)	ng/g	0.63	4.5	1.3	2.9
mirex (Mirex)	ng/g	0.55	<0.6 nd	<0.6 nd	-
ΣChlorodanes	ng/g	2.5	2.6	2.2 J	2.4
ΣDDTs	ng/g	4.1	9.4	7.2	8.3
Percent Recovery ISTD					
dibromooctafluorobiphenyl(DBOBF)			79	78	
2,2',4,5',6-pentachlorobiphenyl(CB103)			71	77	
2,2',3,3',4,5,5',6-octachlorobiphenyl(CB198)			127	71	

Organic Geochemistry Laboratory NIST SRM1941a SEDIMENT -PCB/OCPs

Chain of Custody		MDL Sed.	SRM: 1941a conc. cert./ ≠cert.	std. deviation	lower -30%	upper +30%	SRM NIST 1941a USGS interc.	SRM NIST 1941a USGS interc.	Average	Std. Deviation	% RSD
OGL Lab ID							NS30 45	NS37 45			
PCBs/OCPs	units										
2,4'-dichlorobiphenyl (CB008)	ng/g	0.32 ≠	1.4	0.2	0.8	2.1	4.0	3.7	3.9	0.2	5.3
2,2',5-trichlorobiphenyl (CB018)	ng/g	0.69 ≠	1.2	0.2	0.7	1.7	4.5	5.1	4.8	0.4	8.4
2,4,4'-trichlorobiphenyl (CB028)	ng/g	0.72 ≠	9.8	3.7	4.3	17.6	9.2 I	9.1 I	9.1	0.1	0.9
2,2',5,5'-tertrachlorobiphenyl (CB052)	ng/g	0.73	6.9	0.6	4.4	9.7	10.5 I	9.7 I	10.1	0.6	5.8
2,2',3,5-tetrachlorobiphenyl (CB044)	ng/g	0.49	4.8	0.6	2.9	7.0	6.9	15.0 Q	11.0	5.7	52.2
2,3',4,4'-tetrachlorobiphenyl (CB066/095)	ng/g	0.53	14.3	1.8	8.8	20.9	15.1	14.0	14.5	0.8	5.2
2,2',4,5,5'-pentachlorobiphenyl (CB101/90)	ng/g	0.59	11.0	1.6	6.6	16.4	13.7	13.6	13.7	0.1	1.0
2,2',3,4,5'-pentachlorobiphenyl (CB087)	ng/g	0.55	6.7	0.4	4.4	9.2	3.8 Q	3.8 Q	3.8	0.0	0.7
2,3',4,4',5-pentachlorobiphenyl (CB118)	ng/g	0.71	10.0	1.1	6.2	14.4	9.2	9.0	9.1	0.2	2.2
2,2',4,4',5,5'-hexachlorobiphenyl (CB153)	ng/g	0.44	17.6	1.9	11.0	25.4	17.3 I	17.8 I	17.5	0.4	2.1
2,3,3',4,4'-pentachlorobiphenyl (CB105)	ng/g	0.56	3.7	0.3	2.4	5.1	3.1 I	3.1 I	3.1	0.0	0.8
2,2',3,4,4',5'-hexachlorobiphenyl (CB138/163/164)	ng/g	0.58	13.4	1.0	8.7	18.7	14.8	14.1	14.5	0.5	3.3
2,2',3,4',5,5',6-heptachlorobiphenyl (CB187/182/159)	ng/g	0.47 ≠	7.0	2.6	3.1	12.5	8.5	8.4	8.5	0.0	0.5
2,2',3,3',4,4'-hexachlorobiphenyl (CB128)	ng/g	0.44	1.9	0.3	1.1	2.8	2.0	1.9	2.0	0.1	4.0
2,2',3,4,4',5,5'-heptachlorobiphenyl (CB180)	ng/g	0.53	5.8	0.6	3.7	8.3	10.4 Q	10.6 Q	10.5	0.2	1.7
2,2',3,3',4,4',5-heptachlorobiphenyl (CB170/190)	ng/g	0.53	3.0	0.5	1.8	4.5	4.0	12.7	8.3	6.2	74.3
2,2',3,3',4,4',5,6-octachlorobiphenyl (CB195)	ng/g	0.57	-	nd			3.2	3.3	3.2	0.0	0.8
2,2',3,3',4,4',5,5',6-nonachlorobiphenyl (CB206)	ng/g	0.51	3.7	0.9	2.0	5.9	4.3	4.6	4.5	0.2	4.5
2,2',3,3',4,4',5,5',6,6'-decachlorobiphenyl (CB209)	ng/g	0.52	8.3	0.5	5.5	11.5	11.5	12.7 Q	12.1	0.8	6.8
ΣCBs	ng/g		130		78	194	156	172	164	11.3	6.9
ΣPCBs	ng/g		261		157	387	312	344			
hexachlorobenzene (HCB)	ng/g	0.41	70.0	25	31.5	124	49.6	54.4	52.0	3.4	6.6
1a,2a,3B,4a,5a,6B-hexachlorocyclohexane(g-HCH)	ng/g	0.62	-	nd			1.6	4.1	2.9	1.8	62.6
heptachlor (HEPT)	ng/g	0.47	-	nd			4.4	4.1	4.3	0.2	4.7
aldrin (Aldrin)	ng/g	0.73	-	nd			<0.7 nd	<0.7 nd	-	-	-
heptachlor epoxide (HEPT E)	ng/g	0.48	-	nd			<0.5 nd	<0.5 nd	-	-	-
o,p'-(dichlorodiphenyldichloro)ethene (o,p'-DDE)	ng/g	0.78	0.7	0.1	0.4	1.1	2.1	1.3	1.7	0.5	32.2
cis-chlordane (a-CHLDA)	ng/g	0.79	2.3	0.6	1.2	3.8	2.9	3.0	3.0	0.1	2.0
trans-nonachlor (TRANSON)	ng/g	0.75	1.3	0.1	0.8	1.8	1.1	1.0	1.1	0.0	0.9
p,p'-(dichlorodiphenyldichloro)ethene (p,p'-DDE)	ng/g	0.91	6.6	0.6	4.2	9.3	6.8	6.3	6.5	0.3	4.6
p,p'-(dichlorodiphenyldichloro)ethane (p,p'-DDD)	ng/g	0.85	5.1	0.6	3.1	7.3	8.3	8.9	8.6	0.5	5.6
o,p'-(dichlorodiphenyltrichloro)ethane (o,p'-DDT)	ng/g	0.95	-	nd			2.7	2.9	2.8	0.1	5.1
p,p'-(dichlorodiphenyltrichloro)ethane (p,p'-DDT)	ng/g	0.63 ≠	1.3	0.1	0.8	1.8	<0.6 nd	<0.6 nd	-	-	-
mirex (Mirex)	ng/g	0.55	-	nd			0.7	0.8	0.7	0.1	10.9
ΣChlorodanes	ng/g	2.5	3.6				8.4	8.2	8.3		
ΣDDTs	ng/g	4.1	13.6				19.8	19.5	19.7		
Percent Recovery ISTD			≠ means non certified value								
dibromooctafluorobiphenyl(DBOFB)							89	79			
2,2',4,5',6-pentachlorobiphenyl(CB103)							83	76			
2,2',3,3',4,5,5',6-octachlorobiphenyl(CB198)							79	69			

USGS-Cape Cod 1999-Project SURFACE SEDIMENTS-PAHs

Chain of Custody	MDL Sed.	TC-1, 0-2 cm. 10/13/99	TC-2, 0-2 cm. 10/13/99	TC-3, 0-2 cm. 10/13/99	SP-1, 0-2 cm. 10/13/99	SP-2, 0-2 cm. 10/13/99	SP-3, 0-2 cm. 10/13/99	MP-2, 0-2 cm. 10/13/99	MP-3, 0-2 cm. 10/13/99	TC-6, marsh. 12/06/99	SP-5, marsh. 12/06/99										
												OGIL Lab ID	NP02	NP03	NP04	NP05	NP06	NP07	NP08	NP09	NP22
• naphthalene (NAP) • 2-methylnaphthalene (2MN) 1-methylnaphthalene (1MN) biphenyl (BIP) 2,6- dimethylnaphthalene (DMN) • acenaphthylene (ACL) • acenaphthene (ACT) 2,3,5-trimethylnaphthalene (TMN) • fluorene (FLU) • phenanthrene (PHE) • anthracene (ANT) 1-methylphenanthrene (1MP) † fluoranthene (FLA) † pyrene (PYR) † benzo (a) anthracene (BAA) † chrysene/triphenylene (CHR) benzo (b+j+k) fluoranthene (BBF) benzo (e) pyrene (BEP) † benzo (a) pyrene (BAP) perylene (PER) indeno [1,2,3-cd] pyrene (INP) † dibenzo [a,h+a,c] anthracene (DBA) benzo [ghi] perylene (BPE)	3.6	5.9	7.1	9.6	14.1	7.8	7.9	9.0	4.9	<3.6 nd	6.9										
	ng/g	4.1	6.0	4.9	4.4	3.7	5.1	7.4	<3.6 nd	<3.6 nd	4.4										
	ng/g	<7.1 nd	<7.1 nd	<7.1 nd	<7.1 nd	<7.1 nd	<7.1 nd	<7.1 nd	<7.1 nd	<7.1 nd	<7.1 nd										
	ng/g	<6.4 nd	<6.4 nd	<6.4 nd	<6.4 nd	<6.4 nd	<6.4 nd	<6.4 nd	<6.4 nd	<6.4 nd	<6.4 nd										
	ng/g	nc I	nc I	nc I	nc I	nc I	nc I	nc I	nc I	<8.6 nd	<8.6 nd										
	ng/g	6.5	6.3	7.5	<4.6 nd	<4.6 nd	<4.6 nd	<4.6 nd	<4.6 nd	<4.6 nd	7.1										
	ng/g	<8.2 nd	<8.2 nd	<8.2 nd	<8.2 nd	<8.2 nd	<8.2 nd	<8.2 nd	<8.2 nd	<8.2 nd	<8.2 nd										
	ng/g	<4.8 nd	<4.8 nd	<4.8 nd	<4.8 nd	<4.8 nd	<4.8 nd	<4.8 nd	<4.8 nd	<4.8 nd	<4.8 nd										
	ng/g	<7.0 nd	<7.0 nd	<7.0 nd	<7.0 nd	<7.0 nd	<7.0 nd	<7.0 nd	<7.0 nd	<7.0 nd	<7.0 nd										
	ng/g	10.0	65.2	50.2	66.0	24.8	28.5	24.3	29.6	16.5	<10.0 nd	57.5									
	ng/g	8.4	13.8	12.6	12.0	<8.4 nd	<8.4 nd	<8.4 nd	9.6	<8.4 nd	<8.4 nd	10.4									
	ng/g	6.2	24.3	20.2	28.8	21.1	11.2	10.1	17.8	<6.2 nd	<6.2 nd	<6.2 nd									
	ng/g	9.2	200	158	166	54.6	73.3	59.6	76.1	40.3	17.2	186									
	ng/g	7.6	159	129	130	46.1	60.2	49.7	65.4	33.5	13.0	145									
	ng/g	7.7	63.5	57.0	57.9	20.8	28.8	24.8	32.3	15.9	<7.7 nd	62.8									
	ng/g	9.9	89.2	98.8	93.7	32.5	46.3	34.9	44.8	23.7	<9.9 nd	97.1									
	ng/g	8.8	231	166	172	60.7	83.3	70.5	93.9	47.6	18.2	266									
	ng/g	6.0	81.2	58.9	63.7	20.8	29.5	25.1	33.1	17.0	<6.0 nd	92.1									
	ng/g	3.0	95.9	71.6	78.8	29.1	36.4	31.3	42.0	21.2	7.1	124									
	ng/g	2.7	47.5	32.1	34.6	15.7	18.1	16.5	21.7	14.3	<2.7 nd	36.7									
ng/g	4.7	69.9	56.9	63.3	20.8	28.1	23.1	33.1	17.9	4.8	75.9										
ng/g	2.8	19.0	15.8	16.2	5.4	8.4	6.3	8.9	4.6	<2.8 nd	23.1										
ng/g	4.7	74.6	57.7	67.8	19.9	25.6	23.4	31.1	17.4	5.5	86.3										
Sum PAHs (NOAA Status & Trends)		ng/g	1270	1020	1090	416	513	436	578	297	104	1300									
Sum PAHs (7 Low Molecular Weight *)		ng/g	104	92	110	58	57	53	68	35	12	93									
Sum PAHs (6 High Molecular Weight †)		ng/g	626	530	542	189	253	207	269	139	53	637									
Total Petroleum Hydrocarbons (m/z 55)		ug/g	64	68	80	146	90	82	80	48	28	120									
Percent Recovery ISTD																					
naphthalene-d8		45.7	45.1	37.8	40.5	35.6	37.6	37.6	45.5	48.4	28.9 Q	34.5									
acenaphthene-d10		75.1	69.1	61.1	62.1	54.8	61.5	61.5	65.9	73.4	42.3	53.9									
anthracene-d10		103	101	94.5	92.0	80.6	88.3	88.3	91.6	107	73.9	93.7									
benzo[a]pyrene-d12		54.1	75.9	74.8	72.3	70.7	69.7	69.7	75.1	87.1	71.0	76.6									
C ₁₂ -d50		76.1	72.6	64.8	67.6	71.4	73.2	73.2	78.0	84.5	27.9 Q	79.3									

USGS-Cape Cod 1999-Project SURFACE SEDIMENTS-PAHs

Chain of Custody	MDL Sed.	MP-1, 0-2 cm.	12/06/99	MP-5, marsh.	12/06/99	HH-2, unestr. marsh.	12/06/99	HR-3, unestr. marsh.	12/06/99	HH-3, marsh pool.	01/20/00	HH-4, restr'd marsh sed'n. statn.	HR-4, unestr. creek.	01/20/00	HR-5, restr'd marsh.	01/20/00	HH-5, restr'd marsh pool.	02/04/00	HR-6, restr'd tidal creek.			
																				OGL Lab ID	PAHs	units
	3.6	11.8	4.9	6.1	8.3	<3.6 nd	24.6	24.4	21.9	9.4	<3.6 nd	<3.6 nd	24.4	21.9	12.1	<6.1 nd	<3.6 nd	<3.6 nd				
• naphthalene (NAP)	ng/g	3.6	5.6	<3.6 nd	<3.6 nd	<3.6 nd	<3.6 nd	<3.6 nd	<3.6 nd	<3.6 nd	<3.6 nd	<3.6 nd	<3.6 nd	<3.6 nd	<3.6 nd	<3.6 nd	<3.6 nd	<3.6 nd				
• 2-methylnaphthalene (2MN)	ng/g	7.1	<7.1 nd	<7.1 nd	<7.1 nd	<7.1 nd	<7.1 nd	<7.1 nd	<7.1 nd	<7.1 nd	<7.1 nd	<7.1 nd	<7.1 nd	<7.1 nd	<7.1 nd	<7.1 nd	<7.1 nd	<7.1 nd				
1-methylnaphthalene (1MN)	ng/g	6.4	<6.4 nd	<6.4 nd	<6.4 nd	<6.4 nd	<6.4 nd	<6.4 nd	<6.4 nd	<6.4 nd	<6.4 nd	<6.4 nd	<6.4 nd	<6.4 nd	<6.4 nd	<6.4 nd	<6.4 nd	<6.4 nd				
biphenyl (BIP)	ng/g	8.6	nc 1	<8.6 nd	nc 1	nc 1	nc 1	nc 1	nc 1	nc 1	<8.6 nd	<8.6 nd	<8.6 nd	<8.6 nd	<8.6 nd	<8.6 nd	<8.6 nd	<8.6 nd				
2,6-dimethylnaphthalene (DMN)	ng/g	4.6	7.2	7.1	9.2	12.3	<4.6 nd	9.4	13.8	12.5	37.2	6.4	13.8	12.5	37.2	6.4	37.2	6.4				
• acenaphthylene (ACL)	ng/g	8.2	<8.2 nd	<8.2 nd	<8.2 nd	<8.2 nd	<8.2 nd	<8.2 nd	<8.2 nd	<8.2 nd	<8.2 nd	<8.2 nd	<8.2 nd	<8.2 nd	<8.2 nd	<8.2 nd	<8.2 nd	<8.2 nd				
• acenaphthene (ACT)	ng/g	4.8	<4.8 nd	<4.8 nd	<4.8 nd	<4.8 nd	<4.8 nd	<4.8 nd	<4.8 nd	<4.8 nd	<4.8 nd	<4.8 nd	<4.8 nd	<4.8 nd	<4.8 nd	<4.8 nd	<4.8 nd	<4.8 nd				
2,3,5-trimethylnaphthalene (TMN)	ng/g	7.0	<7.0 nd	<7.0 nd	<7.0 nd	<7.0 nd	<7.0 nd	<7.0 nd	<7.0 nd	<7.0 nd	<7.0 nd	<7.0 nd	<7.0 nd	<7.0 nd	<7.0 nd	<7.0 nd	<7.0 nd	<7.0 nd				
• fluorene (FLU)	ng/g	10.0	29.8	31.5	19.0	43.3	<10.0 nd	26.4	51.0	48.2	107	26.9	51.0	48.2	107	26.9	107	26.9				
• phenanthrene (PHE)	ng/g	8.4	8.7	<8.4 nd	8.9	13.0	<8.4 nd	<8.4 nd	<8.4 nd	<8.4 nd	<8.4 nd	<8.4 nd	<8.4 nd	<8.4 nd	<8.4 nd	<8.4 nd	<8.4 nd	<8.4 nd				
• anthracene (ANT)	ng/g	6.2	21.0	<6.2 nd	<6.2 nd	<6.2 nd	<6.2 nd	<6.2 nd	<6.2 nd	<6.2 nd	<6.2 nd	<6.2 nd	<6.2 nd	<6.2 nd	<6.2 nd	<6.2 nd	<6.2 nd	<6.2 nd				
1-methylphenanthrene (1MP)	ng/g	9.2	75.4	104	62.6	145	15.8	88.3	131	143	326	68.1	131	143	326	68.1	326	68.1				
† fluoranthene (FLA)	ng/g	7.6	61.5	84.3	51.3	121	13.6	61.2	110	123	239	59.8	110	123	239	59.8	239	59.8				
† pyrene (PYR)	ng/g	7.7	25.2	34.8	23.7	48.5	<7.7 nd	23.1	42.8	42.5	131	25.2	42.8	42.5	131	25.2	131	25.2				
† benzo (a) anthracene (BAA)	ng/g	9.9	41.6	60.3	38.6	69.4	<9.9 nd	54.0	66.3	64.0	423	32.0	66.3	64.0	423	32.0	423	32.0				
† chrysene/triphenylene (CHR)	ng/g	8.8	127	155	111	195	25.9	139	234	170	774	82.2	234	170	774	82.2	774	82.2				
benzo (b+j+k) fluoranthene (BBF)	ng/g	6.0	43.6	55.5	38.3	65.9	8.1	47.9	80.3	74.0	309	29.4	80.3	74.0	309	29.4	309	29.4				
benzo (e) pyrene (BEP)	ng/g	3.0	53.9	70.7	59.6	91.0	11.6	62.6	106	99.0	216	42.2	106	99.0	216	42.2	216	42.2				
† benzo (a) pyrene (BAP)	ng/g	2.7	30.8	19.6	12.5	18.3	2.8	11.9	28.1	19.4	41.4	9.9	28.1	19.4	41.4	9.9	41.4	9.9				
perylene (PER)	ng/g	4.7	35.4	45.4	31.3	53.6	8.5	46.2	76.3	58.5	224	23.7	76.3	58.5	224	23.7	224	23.7				
indeno [1,2,3-cd] pyrene (INP)	ng/g	2.8	13.1	14.2	10.3	15.9	3.9	13.5	25.1	17.4	88.2	9.5	25.1	17.4	88.2	9.5	88.2	9.5				
† dibenzo [a,h+a,c] anthracene (DBA)	ng/g	4.7	35.9	51.7	31.6	54.7	9.4	44.2	85.0	60.6	242	25.6	85.0	60.6	242	25.6	242	25.6				
benzo [ghi] perylene (BPE)	ng/g		646	762	528	980	141	692	1130	1020	3320	465	1130	1020	3320	465	3320	465				
Sum PAHs (NOAA Status & Trends)	ng/g																					
Sum PAHs (7 Low Molecular Weight *)	ng/g		70	59	51	91	22	81	126	118	286	51	126	118	286	51	286	51				
Sum PAHs (6 High Molecular Weight †)	ng/g		271	369	246	490	61	303	481	489	1420	237	481	489	1420	237	1420	237				
Total Petroleum Hydrocarbons (m/z 55)	ug/g		98	71	201	70	262	238	83	236	131	29	83	236	131	29	131	29				
Percent Recovery ISTD																						
naphthalene-d8		39.9	41.1	38.0	41.1	41.1	46.8	30.1	25.6 Q	35.0	34.7	43.7										
acenaphthene-d10		61.3	63.8	56.2	63.8	56.2	67.4	59.1	50.8	65.9	46.0	62.3										
anthracene-d10		98.2	98.7	96.9	113	96.9	105	87.7	91.6	88.5	52.4	88.1										
benzo[a]pyrene-d12		88.4	97.7	96.9	104	96.9	96.7	50.2	47.6	59.4	42.5	71.7										
ΣC ₁₇ -d50		94.0	91.0	82.9	104	82.9	57.8	83.0	84.4	79.4	19.1 Q	31.4										

USGS-Cape Cod 1999-Project SURFACE SEDIMENTS-PAHs

Chain of Custody	MDL Sed.	PB-S1, Pleasant Bay #1.	PB-S2, Pleasant Bay #2.	NI-S2, Nauset Inlet #2.	PB-S3, Pleasant Bay, Hog Is.	HH-7, restricted marsh pool.	HH-8 unrestricted 8-14 cm core.			
OGL Lab ID		NP68	NP69	NP73	NP74	NP75	NP76			
PAHs		Sediment							Core	
	units									
* naphthalene (NAP)	ng/g	3.6	5.7	7.0	6.5	<3.6 nd	4.1	7.8		
* 2-methylnaphthalene (2MN)	ng/g	3.6	<3.6 nd	4.7	7.6	<3.6 nd	<3.6 nd	7.6		
1-methylnaphthalene (1MN)	ng/g	7.1	<7.1 nd	<7.1 nd	<7.1 nd	<7.1 nd	<7.1 nd	<7.1 nd		
biphenyl (BIP)	ng/g	6.4	<6.4 nd	<6.4 nd	<6.4 nd	<6.4 nd	<6.4 nd	<6.4 nd		
2,6- dimethylnaphthalene (DMN)	ng/g	8.6	<8.6 nd	<8.6 nd	<8.6 nd	<8.6 nd	<8.6 nd	<8.6 nd		
* acenaphthylene (ACL)	ng/g	4.6	<4.6 nd	4.7	<4.6 nd	<4.6 nd	9.3	24.2		
* acenaphthene (ACT)	ng/g	8.2	<8.2 nd	<8.2 nd	<8.2 nd	<8.2 nd	<8.2 nd	<8.2 nd		
2,3,5-trimethylnaphthalene (TMN)	ng/g	4.8	<4.8 nd	<4.8 nd	<4.8 nd	<4.8 nd	<4.8 nd	<4.8 nd		
* fluorene (FLU)	ng/g	7.0	<7.0 nd	<7.0 nd	<7.0 nd	<7.0 nd	<7.0 nd	<7.0 nd		
* phenanthrene (PHE)	ng/g	10.0	19.8	25.7	20.5	<10.0 nd	18.8	43.9		
* anthracene (ANT)	ng/g	8.4	<8.4 nd	<8.4 nd	<8.4 nd	<8.4 nd	14.1	17.9		
1-methylphenanthrene (1MP)	ng/g	6.2	<6.2 nd	<6.2 nd	<6.2 nd	<6.2 nd	<6.2 nd	7.7		
† fluoranthene (FLA)	ng/g	9.2	46.1	67.0	41.2	16.4	49.7	95.2		
† pyrene (PYR)	ng/g	7.6	33.8	52.3	34.5	15.4	39.0	86.2		
† benzo (a) anthracene (BAA)	ng/g	7.7	13.2	24.0	12.2	<7.7 nd	22.1	34.0		
† chrysene/triphenylene (CHR)	ng/g	9.9	18.7	38.8	22.8	10.2	60.5	54.0		
benzo (b+j+k) fluoranthene (BBF)	ng/g	8.8	56.9	88.0	57.5	28.8	139	129		
benzo (e) pyrene (BEP)	ng/g	6.0	19.6	32.2	19.9	10.3	51.4	45.8		
† benzo (a) pyrene (BAP)	ng/g	3.0	25.3	38.5	30.7	13.8	62.4	62.3		
perylene (PER)	ng/g	2.7	10.1	13.4	13.9	4.3	12.9	14.0		
indeno [1,2,3-cd] pyrene (INP)	ng/g	4.7	18.6	31.2	25.2	11.2	50.0	52.8		
† dibenzo [a,h+a,c] anthracene (DBA)	ng/g	2.8	3.4	9.5	7.4	3.5	16.9	17.3		
benzo [ghi] perylene (BPE)	ng/g	4.7	17.2	32.9	24.2	11.8	46.5	54.3		
Sum PAHs (NOAA Status & Trends)	ng/g	310	490	349	155	610	770			
Sum PAHs (7 Low Molecular Weight *)	ng/g	40	53	47	19	53	107			
Sum PAHs (6 High Molecular Weight †)	ng/g	141	230	149	65	251	349			
Total Petroleum Hydrocarbons (m/z 55)	ug/g	82	62	117	35	81	13			
Percent Recovery ISTD										
naphthalene-d8		43.2	42.5	35.4	34.2	43.4	36.8			
acenaphthene-d10		65.6	64.4	60.0	62.1	68.3	60.0			
anthracene-d10		85.6	82.8	87.5	87.2	89.8	94.2			
benzo[a]pyrene-d12		61.2	68.0	81.1	78.0	81.9	82.8			
C ₁₂ -d50		189 Q	171 Q	60.7	44.2	62.2	97.5			

USGS -Cape Cod 1992- Project SEDIMENT CORES-PAHs

Chain of Custody	MDL Sed.	TC-3, 0-2 cm.	10/13/99	TC-3, 10-12 cm.	10/25/99	TC-3, 20-22 cm.	10/25/99	TC-3, 30-32 cm.	10/25/99	TC-3, 40-42 cm.	10/25/99	TC-3, 50-52 cm.	12/06/99	TC-3, 60-62 cm.	05/02/00	TC-3, 70-72 cm.	05/02/00	TC-3, 80-82 cm.	05/02/00																	
																				NP04	NP12	NP13	NP14	NP15	NP21	NP62	NP63	NP64								
																													Sediment	Core	nc I	nc I	nc I	nc I	nc I	nc I
OGL Lab ID		units																																		
PAHs		ng/g	3.6	7.7	39.0	13.4	13.8	17.4	20.0	11.7	16.4																									
* naphthalene (NAP)		ng/g	3.6	4.1	114	8.1	9.9	13.2	10.5	4.4	6.4																									
* 2-methylnaphthalene (2MN)		ng/g	7.1	<7.1 nd	41.4	<7.1 nd	<7.1 nd	9.1	10.9	<7.1 nd	7.8																									
1-methylnaphthalene (1MN)		ng/g	6.4	<6.4 nd	8.5	<6.4 nd	<6.4 nd	7.0	<6.4 nd	<6.4 nd	<6.4 nd																									
biphenyl (BIP)		ng/g	8.6	nc I	nc I	nc I	nc I	nc I	nc I	nc I	nc I																									
2,6- dimethylnaphthalene (DMN)		ng/g	4.6	7.4	10.0	16.9	15.6	30.8	31.6	10.9	19.6																									
* acenaphthylene (ACL)		ng/g	8.2	<8.2 nd	<8.2 nd	<8.2 nd	<8.2 nd	<8.2 nd	11.8	<8.2 nd	12.3																									
* acenaphthene (ACT)		ng/g	4.8	<4.8 nd	7.5	<4.8 nd	<4.8 nd	<4.8 nd	<4.8 nd	<4.8 nd	<4.8 nd																									
2,3,5-trimethylnaphthalene (TMN)		ng/g	7.0	<7.0 nd	12.9	12.4	13.9	17.5	27.7	14.0	21.2																									
* fluorene (FLU)		ng/g	10.0	46.9	55.2	70.3	79.1	118	173	73.4	101																									
* phenanthrene (PHE)		ng/g	8.4	13.9	16.8	25.9	23.3	41.6	46.0	19.6	32.0																									
* anthracene (ANT)		ng/g	6.2	<6.2 nd	13.9	22.3	16.7	33.5	32.6	14.7	19.0																									
1-methylphenanthrene (IMP)		ng/g	9.2	160	180	184	179	240	344	200	309																									
† fluoranthene (FLA)		ng/g	7.6	128	141	159	159	225	313	163	241																									
† pyrene (PYR)		ng/g	7.7	55.2	52.4	75.8	68.5	96.0	129	78.7	129																									
† benzo (a) anthracene (BAA)		ng/g	9.9	64.3	76.4	87.6	82.2	120	155	78.6	128																									
† chrysene/triphenylene (CHR)		ng/g	8.8	170	165	222	188	279	347	204	316																									
benzo (b+j+k) fluoranthene (BBF)		ng/g	6.0	65.7	60.2	83.4	72.6	103	124	70.9	110																									
benzo (c) pyrene (BEP)		ng/g	3.0	72.2	69.1	97.5	82.0	136	156	89.0	138																									
† benzo (a) pyrene (BAP)		ng/g	2.7	41.8	88.1	159	184	175	232	261	360																									
perylene (PER)		ng/g	4.7	58.3	56.0	77.4	63.3	95.7	120	76.0	126																									
Indeno [1,2,3-cd] pyrene (INP)		ng/g	2.8	164	15.3	22.9	18.3	24.5	30.9	18.5	28.9																									
† dibenzo [a,h+a,c] anthracene (DBA)		ng/g	4.7	62.1	60.4	80.7	70.5	101	131	80.6	127																									
benzo [ghi] perylene (BPE)		ng/g																																		
Sum PAHs (NOAA Status & Trends)		ng/g	1090	1140	1290	1440	1360	1890	2460	1490	2260																									
Sum PAHs (7 Low Molecular Weight *)		ng/g	110	90	254	154	164	246	321	142	209																									
Sum PAHs (6 High Molecular Weight †)		ng/g	542	643	534	627	589	842	1130	628	974																									
Total Petroleum Hydrocarbons (m/z 55)		ug/g	80	67	78	144	73	134	135	84	101																									
Percent Recovery ISTD																																				
naphthalene-d8			37.8	39.2	46.0	54.6	41.4	43.4	36.7	61.7	48.4																									
acenaphthene-d10			61.1	64.9	75.3	80.6	66.5	67.3	48.2	76.2	60.8																									
anthracene-d10			94.5	89.1	109	112	103	99.2	72.1	106	93.1																									
benzo[a]pyrene-d12			74.8	70.6	73.4	79.8	68.8	85.0	56.8	82.3	83.5																									
C ₂₀ -d50			64.8	84.1	79.5	101	94.0	104	40.6	62.6	75.4																									

USGS -Cape Cod 1999- Project SEDIMENT CORES-PAHs

CHAIN OF CUSTODY - 1222-1000-000													
--	--	--	--	--	--	--	--	--	--	--	--	--	--

USGS - Cape Cod 1999- Project TISSUES-PAHs

Chain of Custody	MDL TISS.	OGL Lab ID	PAHs	03/14/00															NP60	03/24/00	PT-1, BM	03/24/00	PT-2, BM	03/24/00																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
				units	Tissue	NP49	NP50	MP-4, BM	03/14/00	SS-1, BM	NP52	NP53	NP56	NP57	HH-1, BM	NP58	NP59																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
																		ng/g							ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g

USGS -Cape Cod 1999- Project TISSUES-PAHs

Chain of Custody	MDL Tiss.	HR-1a, RM	HR-2, Oysters	PB-TI, RM	NI-TI, RM					
						OGL Lab ID	NP65	NP66	NP71	NP72
* naphthalene (NAP)	ng/g	5.1	426	85.3	791	2060				
* 2-methylnaphthalene (2MN)	ng/g	15.3	271	18.4	225	1300				
1-methylnaphthalene (1MN)	ng/g	10.3	283	22.1	358	1040				
bipbenyl (BIP)	ng/g	3.2	16.4	16.7	23.0	105				
2,6- dimethylnaphthalene (DMN)	ng/g	4.6	nc l	nc l	nc l	nc l				
* acenaphthylene (ACL)	ng/g	6.4	12.5	<6.4 nd	13.9	38.9				
* acenaphthene (ACT)	ng/g	4.7	41.1	<4.7 nd	17.3	34.9				
2,3,5-trimethylnaphthalene (TMN)	ng/g	5.7	17.3	<5.7 nd	7.2	14.6				
* fluorene (FLU)	ng/g	4.2	24.5	4.4	50.6	59.5				
* phenanthrene (PHE)	ng/g	3.3	65.8	23.9	195	137				
* anthracene (ANT)	ng/g	12.0	<12.0 nd	<12.0 nd	<12.0 nd	17.6				
1-methylphenanthrene (1MP)	ng/g	4.4	6.1	<4.4 nd	10.4	27.1				
† fluoranthene (FLA)	ng/g	3.9	22.5	8.5	22.8	19.2				
† pyrene (PYR)	ng/g	4.6	17.7	3.2 J	32.2	66.6				
† benzo (a) anthracene (BAA)	ng/g	3.2	7.0	<3.2 nd	<3.2 nd	10.1				
† chrysene/triphenylene (CHR)	ng/g	11.0	<11.0 nd	<11.0 nd	<11.0 nd	25.1				
benzo (b-j+k) fluoranthene (BBF)	ng/g	13.0	71.5	27.6	<13.0 nd	103				
benzo (c) pyrene (BEP)	ng/g	7.2	50.9	30.9	11.8	65.7				
† benzo (a) pyrene (BAP)	ng/g	4.3	17.3	5.4	<4.3 nd	39.4				
perylene (PER)	ng/g	6.5	19.2	<6.5 nd	<6.5 nd	35.4				
indeno [1,2,3-cd] pyrene (INP)	ng/g	6.1	35.4	11.7	<6.1 nd	47.8				
† dibenzo [a,h-a,c] anthracene (DBA)	ng/g	3.6	5.8	<3.6 nd	5.4	27.6				
benzo [ghi] perylene (BPE)	ng/g	5.8	10.0	<5.8 nd	19.1	33.5				
Sum PAHs (NOAA Status & Trends)	ng/g		1440	292	1810	5310				
Sum PAHs (7 Low Molecular Weight *)	ng/g		849	145	1300	3650				
Sum PAHs (6 High Molecular Weight †)	ng/g		79	28	66	188				
Percent Recovery ISTD										
naphthalene-d8		79.1		75.9	88.2	58.0				
acenaphthene-d10		76.1		79.9	99.4	81.7				
anthracene-d10		94.8		78.6	117	108				
benzo[a]pyrene-d12		35.3		32.4	91.5	102				
C ₁₂ -d50		122		37.4	55.4	72.7				

USGS -Cape Cod 1999- Project LAB BLANKS-PAHs

Chain of Custody	MDL Sed.	USGS -99 Lab Blank	10/13/99	USGS -99 Lab Blank	10/25/99	USGS -99 Lab Blank	12/06/99	USGS -99 Lab Blank	01/20/00	USGS -99 Lab Blank	02/04/00	USGS -99 Lab Blank	MDL Tiss.	USGS -99 Tissue Lab Blank	05/02/00	USGS -99 Tissue Lab Blank	08/03/00
PAHs	OGL Lab ID	units	SB01	SB10	SB20	SB29	SB36	SB67	SB61	SB70	Sediment	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
• naphthalene (NAP)		ng/g	3.6	0.3 J	0.3 J	0.3 J	0.5 J	0.5 J	0.5 J	0.5 J	0.5 J	0.5 J	5.1	3.7 J	3.7 J	0.9 J	0.9 J
• 2-methylnaphthalene (2MN)		ng/g	3.6	<3.6 nd	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	15.3	1.4 J	1.4 J	<3.6 nd	<3.6 nd
1-methylnaphthalene (1MN)		ng/g	7.1	0.2 J	0.2 J	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	10.3	1.3 J	1.3 J	<7.1 nd	<7.1 nd
biphenyl (BIP)		ng/g	6.4	0.6 J	0.5 J	0.6 J	0.3 J	0.3 J	0.3 J	0.3 J	0.3 J	0.3 J	3.2	1.6 J	1.6 J	2.8 J	2.8 J
2,6-dimethylnaphthalene (DMN)		ng/g	8.6	<8.6 nd	nc 1 J	nc 1 J	nc 1 J	nc 1 J	nc 1 J	nc 1 J	nc 1 J	nc 1 J	4.6	nc 1 J	nc 1 J	<8.6 nd	<8.6 nd
• acenaphthylene (ACL)		ng/g	4.6	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	6.4	0.8 J	0.8 J	0.3 J	0.3 J
• acenaphthene (ACT)		ng/g	8.2	0.6 J	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	4.7	0.6 J	0.6 J	0.7 J	0.7 J
2,3,5-trimethylnaphthalene (TMN)		ng/g	4.8	<4.8 nd	0.1 J	<4.8 nd	<4.8 nd	<4.8 nd	<4.8 nd	<4.8 nd	<4.8 nd	<4.8 nd	5.7	0.5 J	0.5 J	0.4 J	0.4 J
• fluorene (FLU)		ng/g	7.0	<7.0 nd	0.2 J	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	4.2	1.9 J	1.9 J	0.3 J	0.3 J
• phenanthrene (PHE)		ng/g	10.0	0.9 J	0.6 J	0.8 J	1.0 J	1.0 J	1.0 J	1.0 J	1.0 J	1.0 J	3.3	6.3	6.3	5.0	5.0
• anthracene (ANT)		ng/g	8.4	0.1 J	0.1 J	0.1 J	0.2 J	0.2 J	0.2 J	0.2 J	0.2 J	0.2 J	12.0	1.5 J	1.5 J	0.6 J	0.6 J
1-methylphenanthrene (IMP)		ng/g	6.2	0.2 J	0.1 J	0.1 J	<6.2 nd	<6.2 nd	<6.2 nd	<6.2 nd	<6.2 nd	<6.2 nd	4.4	0.7 J	0.7 J	0.1 J	0.1 J
† fluoranthene (FLA)		ng/g	9.2	0.3 J	0.1 J	0.2 J	0.4 J	0.4 J	0.4 J	0.4 J	0.4 J	0.4 J	3.9	1.8 J	1.8 J	1.1 J	1.1 J
† pyrene (PYR)		ng/g	7.6	0.2 J	0.2 J	0.2 J	0.2 J	0.2 J	0.2 J	0.2 J	0.2 J	0.2 J	4.6	4.4 J	4.4 J	3.3 J	3.3 J
† benzo (a) anthracene (BAA)		ng/g	7.7	0.3 J	6.5 J	0.2 J	0.4 J	0.4 J	0.4 J	0.4 J	0.4 J	0.4 J	3.2	2.5 J	2.5 J	2.3 J	2.3 J
† chrysene/triphenylene (CHR)		ng/g	9.9	0.4 J	<9.9 nd	0.2 J	0.6 J	0.6 J	0.6 J	0.6 J	0.6 J	0.6 J	11.0	3.9 J	3.9 J	2.9 J	2.9 J
benzo (b+j+k) fluoranthene (BBF)		ng/g	8.8	1.2 J	3.6 J	0.8 J	1.4 J	1.4 J	1.4 J	1.4 J	1.4 J	1.4 J	13.0	10.3 J	10.3 J	6.6 J	6.6 J
benzo (e) pyrene (BEP)		ng/g	6.0	0.5 J	1.9 J	0.3 J	0.5 J	0.5 J	0.5 J	0.5 J	0.5 J	0.5 J	7.2	2.4 J	2.4 J	2.0 J	2.0 J
† benzo (a) pyrene (BAP)		ng/g	3.0	0.4 J	0.9 J	0.3 J	0.5 J	0.5 J	0.5 J	0.5 J	0.5 J	0.5 J	4.3	1.5 J	1.5 J	1.7 J	1.7 J
perylene (PER)		ng/g	2.7	0.2 J	0.6 J	0.2 J	0.3 J	0.3 J	0.3 J	0.3 J	0.3 J	0.3 J	6.5	0.9 J	0.9 J	1.1 J	1.1 J
Indeno [1,2,3-cd] pyrene (INP)		ng/g	4.7	0.6 J	1.9 J	0.3 J	0.5 J	0.5 J	0.5 J	0.5 J	0.5 J	0.5 J	6.1	<6.1 nd	<6.1 nd	1.5 J	1.5 J
† dibenzo [a,h+a,c] anthracene (DBA)		ng/g	2.8	<2.8 nd	1.5 J	0.1 J	0.5 J	0.5 J	0.5 J	0.5 J	0.5 J	0.5 J	3.6	1.3 J	1.3 J	1.2 J	1.2 J
benzo [ghi] perylene (BPE)		ng/g	4.7	0.6 J	2.8 J	0.3 J	0.4 J	0.4 J	0.4 J	0.4 J	0.4 J	0.4 J	5.8	1.0 J	1.0 J	1.5 J	1.5 J
Sum PAHs (NOAA Status & Trends)		ng/g		8	22	5	8	16	9	36				50	50	36	36
Sum PAHs (7 Low Molecular Weight *)		ng/g		2	2	1	2	3	1	8				16	16	8	8
Sum PAHs (6 High Molecular Weight †)		ng/g		2	9	1	3	6	5	13				15	15	13	13
Total Petroleum Hydrocarbons (m/z 55)		µg/g		5	4	4	9	13	0	15				5	5	15	15
Percent Recovery ISTD																	
naphthalene-d8			26.9 Q	48.5	32.9	30.4	40.5	17.4 Q						35.6	35.6	45.4	45.4
acenaphthene-d10			41.6	71.2	53.5	49.3	58.0	37.5						44.8	44.8	57.1	57.1
anthracene-d10			65.0	104	89.4	91.1	100	69.7						82.7	82.7	100	100
benzo[a]pyrene-d12			61.1	79.7	72.4	94.8	91.9	77.7						75.1	75.1	106	106
•C ₁₂ -d50			59.5	115	126	72.2	41.1	246 Q						118	118	130	130

USGS -Cape Cod 1999- Project BLANK SPIKE-PAHs

Chain of Custody	MDL Sed.	USGS -99 Lab Blank	USGS 10/25/99 Lab Blank Spike	DIFFERENCE	ng in 11.87 grams	ng EXPECTED	% RECOVERY
PAHs	OGL Lab ID	units	SB10	SB11	Sediment		
* naphthalene (NAP)		ng/g	0.3 J	60.9	60.6	719	109
* 2-methylnaphthalene (2MN)		ng/g	0.1 J	53.4	53.3	633	98.9
1-methylnaphthalene (1MN)		ng/g	0.2 J	58.3	58.1	689	105
biphenyl (BIP)		ng/g	0.5 J	72.0	71.5	849	129
2,6- dimethylnaphthalene (DMN)		ng/g	nc 1 J	nc 1		655	
* acenaphthylene (ACL)		ng/g	0.1 J	37.3	37.1	441	70.0
* acenaphthene (ACT)		ng/g	0.1 J	52.7	52.6	624	91.8
2,3,5-trimethylnaphthalene (TMN)		ng/g	0.1 J	50.5	50.4	599	102
* fluorene (FLU)		ng/g	0.2 J	60.7	60.5	719	110
* phenanthrene (PHE)		ng/g	0.6 J	40.5	40.0	474	65.5
* anthracene (ANT)		ng/g	0.1 J	27.5	27.4	325	498
1-methylphenanthrene (IMP)		ng/g	0.1 J	45.0	44.9	533	650
† fluoranthene (FLA)		ng/g	0.1 J	46.2	46.1	547	660
† pyrene (PYR)		ng/g	0.2 J	47.5	47.3	562	660
† benzo (a) anthracene (BAA)		ng/g	6.5 J	45.1	38.6	459	570
† chrysene/triphenylene (CHR)		ng/g	<9.9 nd	53.7	53.7	638	660
benzo (b-j-k) fluoranthene (BBF)		ng/g	3.6 J	95.1	91.4	1085	1310
benzo (e) pyrene (BEP)		ng/g	1.9 J	47.1	45.3	537	655
† benzo (a) pyrene (BAP)		ng/g	0.9 J	37.8	36.9	438	595
perylene (PER)		ng/g	0.6 J	21.5	20.9	249	497
indeno [1,2,3-cd] pyrene (INP)		ng/g	1.9 J	49.0	47.1	559	585
† dibenzo [a,h+a,c] anthracene (DBA)		ng/g	1.5 J	41.8	40.3	479	493
benzo [ghi] perylene (BPE)		ng/g	2.8 J	52.2	49.4	586	585
Sum PAHs (NOAA Status & Trends)		ng/g	22	1100	1078	12792	14900
Sum PAHs (7 Low Molecular Weight *)		ng/g	2	333	331	3934	4420
Sum PAHs (6 High Molecular Weight †)		ng/g	9	272	263	3121	3640
Total Petroleum Hydrocarbons (m/z 55)		µg/g	4	3			
Percent Recovery ISTD							
naphthalene-d8			48.5	38.8			
acenaphthene-d10			71.2	65.5			
anthracene-d10			104	102			
benzo[a]pyrene-d12			79.7	95.2			
ΣC ₁₆ -d50			115	111			

USGS-Cape Cod 1999-Project SURFACE SEDIMENT DUPLICATE-PAHs

Chain of Custody		MDL Sed.	SP-1, 0-2 cm. 10/13/99	SP-1, 0-2 cm. rpt. NP05. 02/04/00	AVERAGE RELATIVE DIFFERENCE %
OXIL Lab ID			NP05	NP40	
PAHs		units	Sediment		
* naphthalene (NAP)	ng/g	3.6	14.1	5.7	9.9 85.4% Q
* 2-methylnaphthalene (2MN)	ng/g	3.6	4.4	3.4 J	3.9 25.7%
1-methylnaphthalene (1MN)	ng/g	7.1	<7.1 nd	<7.1 nd	-
biphenyl (BIP)	ng/g	6.4	<6.4 nd	<6.4 nd	-
2,6- dimethylnaphthalene (DMN)	ng/g	8.6	nc I	nc I	-
* acenaphthylene (ACL)	ng/g	4.6	<4.6 nd	<4.6 nd	-
* acenaphthene (ACT)	ng/g	8.2	<8.2 nd	<8.2 nd	-
2,3,5-trimethylnaphthalene (TMN)	ng/g	4.8	<4.8 nd	<4.8 nd	-
* fluorene (FLU)	ng/g	7.0	<7.0 nd	<7.0 nd	-
* phenanthrene (PHE)	ng/g	10.0	24.8	30.3	27.6 20.0%
* anthracene (ANT)	ng/g	8.4	<8.4 nd	<8.4 nd	-
1-methylphenanthrene (1MP)	ng/g	6.2	21.1	<6.2 nd	21.1 -
† fluoranthene (FLA)	ng/g	9.2	54.6	58.8	56.7 7.4%
† pyrene (PYR)	ng/g	7.6	46.1	48.3	47.2 4.7%
† benzo (a) anthracene (BAA)	ng/g	7.7	20.8	17.5	19.2 17.2%
† chrysene/triphenylene (CHR)	ng/g	9.9	32.5	33.3	32.9 2.4%
benzo (b+j+k) fluoranthene (BBF)	ng/g	8.8	60.7	75.1	67.9 21.1%
benzo (e) pyrene (BEP)	ng/g	6.0	20.8	26.7	23.8 25.0%
† benzo (a) pyrene (BAP)	ng/g	3.0	29.1	33.2	31.2 13.2%
perylene (PER)	ng/g	2.7	15.7	17.3	16.5 10.0%
indeno [1,2,3-cd] pyrene (INP)	ng/g	4.7	20.8	25.3	23.1 19.9%
† dibenzo [a,b+a,c] anthracene (DBA)	ng/g	2.8	5.4	10.2	7.8 62.6% Q
benzo [ghi] perylene (BPE)	ng/g	4.7	19.9	26.5	23.2 28.3%
Sum PAHs (NOAA Status & Trends)	ng/g		416	437	427 5.0%
Sum PAHs (7 Low Molecular Weight *)	ng/g		58	57	57 2.6%
Sum PAHs (6 High Molecular Weight †)	ng/g		189	201	195 6.6%
Total Petroleum Hydrocarbons (m/z 55)	ug/g		146	62	
Percent Recovery ISTD					
naphthalene-d8					
60.5					
acenaphthene-d10					
83.5					
anthracene-d10					
113					
benzo[a]pyrene-d12					
99.4					
C ₂₉ -d50					
40.4					

Organic Geochemistry Laboratory NIST SRM1941a SEDIMENT -PAHs

Chain of Custody		MDL Sed.	SRM 1941a conc. cert./ #cert.	std. deviation	lower range -30%	upper range +30%	SRM NIST 1941a USGS/ interc.	SRM NIST 1941a USGS/ interc.	Average	Std. Deviation	% RSD
OGL Lab ID							NS30	NS37			
PAHs	units										
* naphthalene (NAP)	ng/g	3.6	1010	140	609	1495	659	608 Q	633	36	5.7
* 2-methylnaphthalene (2MN)	ng/g	3.6	-	nd			303	291	297	8.5	2.9
1-methylnaphthalene (1MN)	ng/g	7.1	-	nd			147	137	142	6.9	4.9
biphenyl (BIP)	ng/g	6.4	175	18	110	251	105 Q	97.3 Q	101.2	5.4	5.4
2,6- dimethylnaphthalene (DMN)	ng/g	8.6	-	nd			194	179	187	10.6	5.7
* acenaphthylene (ACL)	ng/g	4.6	37.0	14	16	66	102	81.2	91.7	14.9	16.2
* acenaphthene (ACT)	ng/g	8.2	41.0	10	22	66	33.6	30.2	31.9	2.39	7.5
2,3,5-trimethylnaphthalene (TMN)	ng/g	4.8	-	nd			20.0	20.6	20.3	0.40	2.0
* fluorene (FLU)	ng/g	7.0	97.3	8.6	62	138	62.7	60.2 Q	61.4	1.7	2.8
* phenanthrene (PHE)	ng/g	10.0	489	23	326	666	366	345	355	15.3	4.3
* anthracene (ANT)	ng/g	8.4	184	14	119	257	189	182	186	5.2	2.8
1-methylphenanthrene (1MP)	ng/g	6.2	101	27	52	166	58.0	53.0	55.5	3.5	6.3
† fluoranthene (FLA)	ng/g	9.2	981	78	632	1377	875	887	881	8	0.9
† pyrene (PYR)	ng/g	7.6	811	24	551	1086	716	744	730	20	2.7
† benzo (a) anthracene (BAA)	ng/g	7.7	427	25	281	588	452	420	436	22	5.0
† chrysene/triphenylene (CHR)	ng/g	9.9	577	26	385	784	554	655	604	71	11.8
benzo (b+j+k) fluoranthene (BBF)	ng/g	8.8	1442	114	930	2022	1670	1670	1670	0	0.0
benzo (e) pyrene (BEP)	ng/g	6.0	553	59	346	796	664	662	663	1	0.2
† benzo (a) pyrene (BAP)	ng/g	3.0	628	52	403	884	587	577	582	7	1.3
perylene (PER)	ng/g	2.7	452	58	276	663	428	447	438	13.4	3.1
indeno [1,2,3-cd] pyrene (INP)	ng/g	4.7	501	72	300	745	501	546	524	32.1	6.1
† dibenzo [a,h+a,c] anthracene (DBA)	ng/g	2.8	117	10	75	166	158	182 Q	170	17.1	10.1
benzo [ghi] perylene (BPE)	ng/g	4.7	525	67	321	770	545	593	569	34	6.0
Sum PAHs (NOAA Status & Trends)	ng/g		9148		5816	12985	9390	9470	9430	57	0.6
Sum PAHs (7 Low Molecular Weight *)	ng/g		1858		1154	2688	1720	1600	1660	85	5.1
Sum PAHs (6 High Molecular Weight †)	ng/g		3541		2328	4884	3340	3460	3400	85	2.5
Total Petroleum Hydrocarbons (m/z 55)	µg/g						325	329	327	3	1.0
Percent Recovery ISTD		* means non certified value									
naphthalene-d8					30.0-->	130	29.9 Q	37.3			
acenaphthene-d10					30.0-->	130	56.5	60.3			
anthracene-d10					30.0-->	130	86.6	94.8			
benzo[a]pyrene-d12					30.0-->	130	68.6	77.3			
n-C ₂₄ -d50					30.0-->	130	47.9	34.6			

Appendix IV

- a) Appleby Report on Radiometric Dating of Cores
- b) King Report on Magnetic Susceptibility Dating of Cores

Report on the Radiometric Dating of a Sediment Core from Town Cove, Nauset Marsh

P.G.Appleby
Environmental Radioactivity Research Centre
University of Liverpool

Methods

Sediment samples from Town Cove core TC3 were analysed for ^{210}Pb , ^{226}Ra and ^{137}Cs by direct gamma assay in the Liverpool University Environmental Radioactivity Laboratory, using Ortec HPGe GWL series well-type coaxial low background intrinsic germanium detectors (Appleby *et al.* 1986). ^{210}Pb was determined via its gamma emissions at 46.5keV, and ^{226}Ra by the 295keV and 352keV γ -rays emitted by its daughter isotope ^{214}Pb following 3 weeks storage in sealed containers to allow radioactive equilibration. ^{137}Cs was measured by its emissions at 662keV. The absolute efficiencies of the detectors were determined using calibrated sources and sediment samples of known activity. Corrections were made for the effect of self absorption of low energy γ -rays within the sample (Appleby *et al.* 1992).

Results

Results of the radiometric analyses are given in Table 1 and shown graphically in Figure 1.

Lead-210 Activity

Total ^{210}Pb reached equilibrium with the supporting ^{226}Ra at a depth of c.55 cm (Figure 1a). Since the maximum unsupported ^{210}Pb activity was just 94 Bq kg⁻¹, it is likely that this spans a period of not more than about 4 ^{210}Pb half-lives, i.e., c.90 years. Unsupported ^{210}Pb activity (Figure 1b) declined a little irregularly with depth down c.25 cm, but below this more or less followed an exponential relationship, suggesting relatively uniform sedimentation in the older parts of the core.

Artificial Fallout Radionuclides

The ^{137}Cs activity versus depth profile (Figure 1c) has a reasonably well defined sub-surface peak at between 35-42 cm. This feature almost certainly records the 1963 fallout maximum from the atmospheric testing of nuclear weapons.

Core Chronology

Figure 2 shows ^{210}Pb dates calculated using the CRS model, together with the 1963 depth indicated by the ^{137}Cs stratigraphy. Use of the CIC model was precluded by the almost uniform ^{210}Pb activity above c.20 cm. There is a significant discrepancy between the ^{210}Pb and ^{137}Cs dates that can almost certainly be attributed to errors in estimating the ^{210}Pb inventory due to the low activity. Using the 1963 ^{137}Cs date as a reference point, a corrected ^{210}Pb chronology has been constructed using the methods outlined in Appleby (1998). The results, shown in Figure 2 and given in detail in Table 2, suggest a relatively uniform sedimentation rate up to the mid 1960s of c.0.22 g cm⁻² y⁻¹ (0.44 cm y⁻¹). During the past 30 years accumulation rates have been substantially higher, with a mean value for this period of c.0.48 g cm⁻² y⁻¹ (1.1 cm y⁻¹).

References

- Appleby, P.G., 1998. Dating recent sediments by ^{210}Pb : Problems and solutions. Proc. 2nd NKS/EKO-1 Seminar, Helsinki, 2-4 April 1997, STUK, Helsinki, pp7-24.
- Appleby, P.G., P.J.Nolan, D.W.Gifford, M.J.Godfrey, F.Oldfield, N.J.Anderson & R.W.Battarbee, 1986. ^{210}Pb dating by low background gamma counting. *Hydrobiologia*, **141**:21-27.
- Appleby, P.G. & F.Oldfield, 1978. The calculation of ^{210}Pb dates assuming a constant rate of supply of unsupported ^{210}Pb to the sediment. *Catena*, **5**:1-8
- Appleby, P.G., N.Richardson, & P.J.Nolan, 1992. Self-absorption corrections for well-type germanium detectors. *Nucl. Inst. & Methods B*, **71**: 228-233.

Table 1. Fallout Radionuclide Concentrations in Nauset Marsh core TC3

Depth		²¹⁰ Pb						¹³⁷ Cs	
		Total		Unsupported		Supported			
cm	g cm ⁻²	Bq kg ⁻¹	±	Bq kg ⁻¹	±	Bq kg ⁻¹	±	Bq kg ⁻¹	±
1.0	0.3	103.8	10.6	86.0	10.9	17.8	2.1	0.0	0.0
11.0	4.5	99.2	14.0	73.8	14.3	25.4	2.8	1.2	1.9
16.0	6.7	114.7	10.1	93.7	10.2	21.0	1.9	2.1	1.3
21.0	8.9	88.1	10.8	70.1	11.0	18.1	2.1	0.0	0.0
26.0	11.1	77.6	8.9	54.5	9.1	23.1	1.9	2.5	1.2
31.0	13.4	73.0	9.3	54.1	9.5	18.9	1.8	0.6	1.0
36.0	16.0	65.9	6.1	44.2	6.3	21.7	1.4	6.6	1.0
41.0	18.6	37.0	5.5	19.0	5.6	18.0	1.4	6.2	1.1
51.0	24.3	32.9	5.1	12.5	5.2	20.4	1.2	1.4	0.7
61.0	30.5	9.3	6.4	-8.5	6.6	17.8	1.6	0.0	0.0

Table 2 ²¹⁰Pb chronology of Nauset Marsh core TC3

Depth		Chronology			Sedimentation Rate		
		Date	Age	±	g cm ⁻² y ⁻¹	cm y ⁻¹	± (%)
cm	g cm ⁻²	AD	y				
0.0	0.0	1999	0	0			
5.0	2.0	1996	3	1	0.59	1.43	16.7
10.0	4.0	1992	7	2	0.57	1.25	19.9
15.0	6.2	1988	11	3	0.42	1.00	15.0
20.0	8.4	1982	17	3	0.43	0.91	17.3
25.0	10.7	1977	22	4	0.47	1.00	19.4
30.0	12.9	1972	27	5	0.43	0.81	20.8
35.0	15.5	1965	34	6	0.26	0.55	20.3
40.0	18.1	1954	45	10	0.22	0.43	34.1
45.0	20.9	1941	58	11	0.22	0.39	34.1
50.0	23.8	1928	71	13	0.22	0.38	34.1
55.0	26.8	1915	84	17	0.22	0.37	34.1

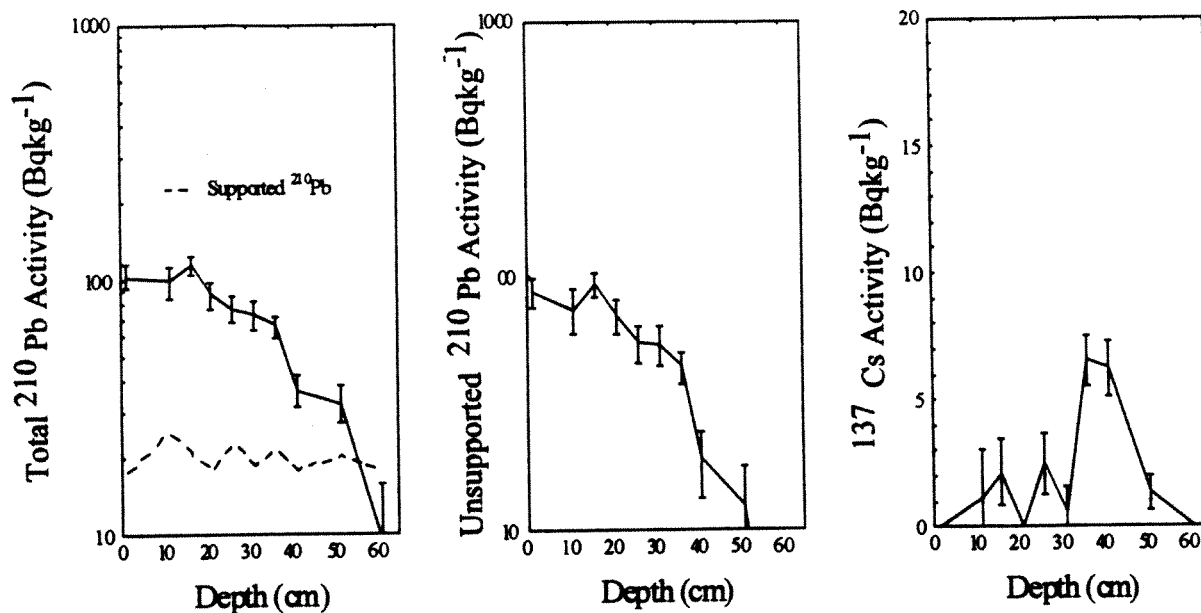


Figure 1. Fallout radionuclide concentrations versus depth in Nauset Marsh core TC3 showing (a) total and supported ^{210}Pb , (b) unsupported ^{210}Pb , (c) ^{137}Cs .

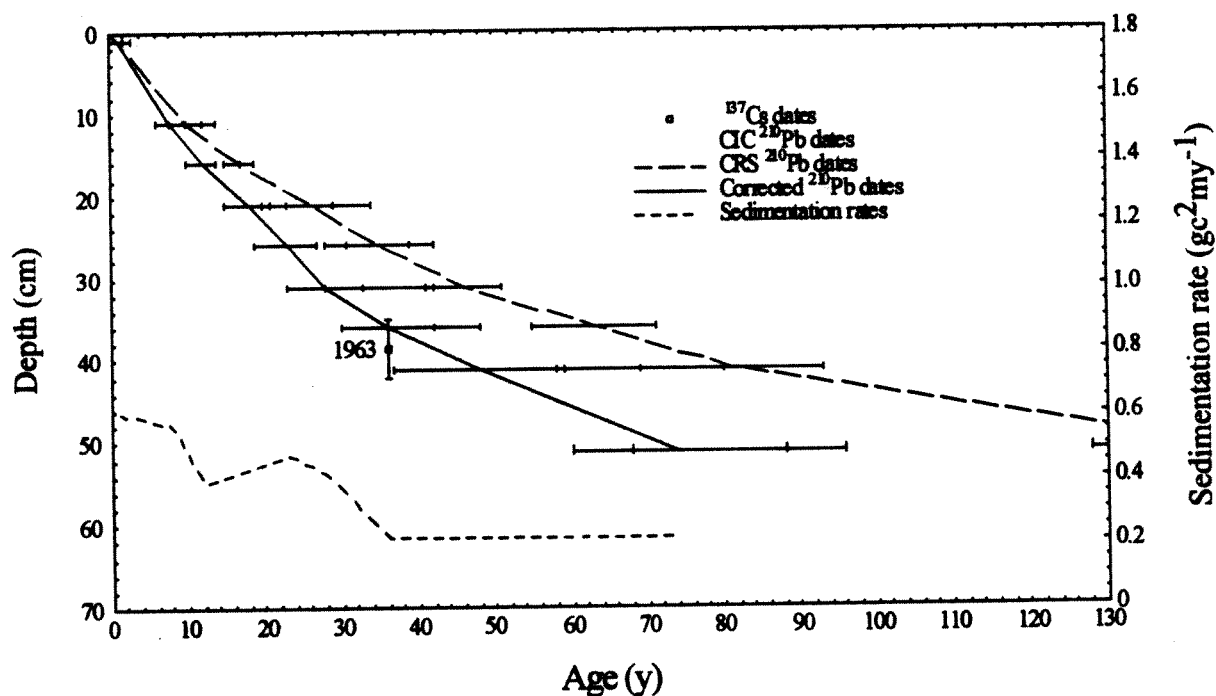


Figure 2. Radiometric chronology of Nauset Marsh core TC3 showing CRS and CIC model ^{210}Pb dates together with the 1963 depth determined from the ^{137}Cs stratigraphy. Also shown are the corrected ^{210}Pb dates calculated using the ^{137}Cs date as a reference point.

Report on the Magnetic Susceptibility Dating of Sediment Cores
John King
URI/GSO

A comparison of the susceptibility records of the three cores obtained from the Nauset area of Cape Cod National Seashore indicates the sedimentation rate of the Salt Pond core is higher than those of either the Town Cove or Mill Pond cores. For example a depth of 53cm in the Salt Pond core corresponds to a depth of 35cm in the Town Cove core (Figure 1). Given that the average sedimentation rate of the Town Cove core is 1.1 cm/year, then the average sedimentation rate in the Salt Pond core is approximately 1.5 cm/year. A similar correlation of the 35cm depth in the Town Cove to the 32cm depth in the Mill Pond core yields an estimated sedimentation rate of 1.0cm/year for Mill Pond. The depth of 35cm in the Town Cove core corresponds to the ¹³⁷Cs peak that is dated as 1963. Therefore these sedimentation rate estimates are good for ~ the last 40 years. Prior to that time, the sedimentation rate in Mill Pond slows relative to those of Salt Pond and Town Cove, whereas the relative sedimentation rates of Salt Pond and Town Cove remain more consistent.

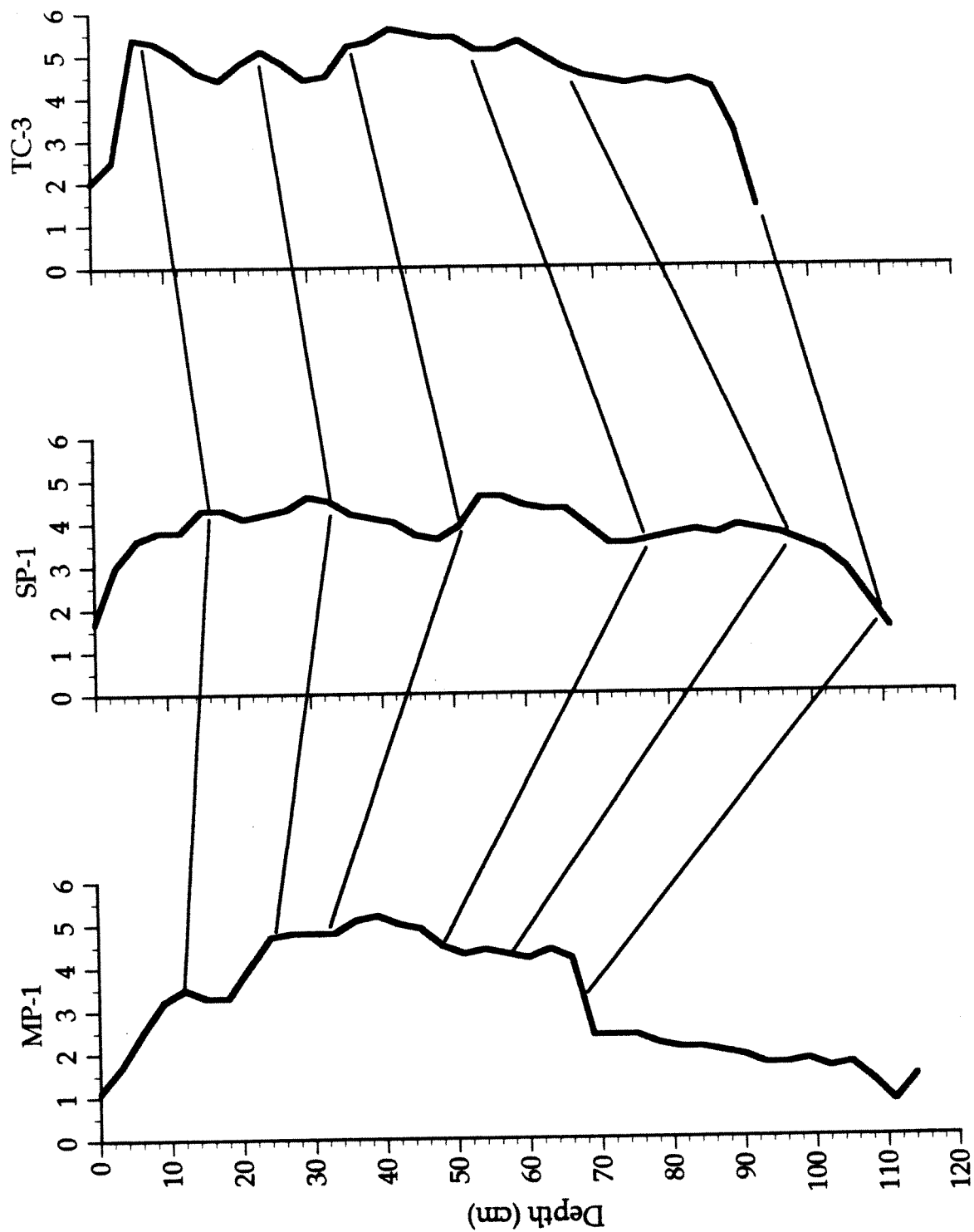


Figure 1: Whole core magnetic susceptibility from Nauset Marsh cores.