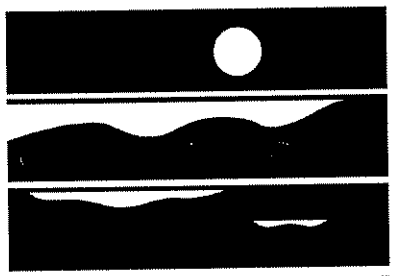

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DEPARTMENT OF
ECOLOGY

Survey for Petroleum and Other Chemical Contaminants in the Sediments of Fidalgo Bay

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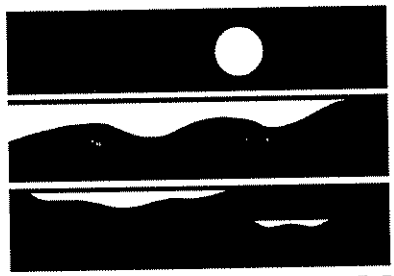

Survey for Petroleum and Other Chemical Contaminants in the Sediments of Fidalgo Bay

by
Art Johnson, Dave Serdar, and Dale Davis

Environmental Investigations and Laboratory Services Program
Olympia, Washington 98504-7710

Conducted for the Washington State Department of Natural Resources
Aquatic Resources Division
Phil Hertzog, Project Manager

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Abstract

A history of oil releases and other spills was the impetus for a sediment quality survey conducted in North Puget Sound's Fidalgo Bay and vicinity during April 1997. The objectives were to determine if the sediments were contaminated with petroleum and if sediment quality standards were exceeded. Results are reported on total petroleum hydrocarbons in sediment samples from 30 sites; on a subset of 14 sites analyzed for metals, semi-volatile organic compounds, and PCBs; and on five sites analyzed for tributyltins. With the exception of one nearshore area in the inner bay contaminated with motor oil and polyaromatic hydrocarbons (PAH), there was little evidence of significant contamination.

Acknowledgments

◊ The work of Ecology/EPA Manchester Laboratory staff in analyzing sediment samples for this survey is very much appreciated. Special thanks to Myrna McIntosh (TPH analysis); Randy Knox, Jim Ross, and Sally Cull (metals analysis); Peggy Knight (semivolatiles analysis); Bob Rieck (PCB analysis); and Dickey Huntamer (TBT analysis).

◊ This report benefited from review comments by Phil Hertzog, Bill Graeber, Brenden McFarland, Larry Goldstein, and Dale Norton.

◊ The final report was proofread and formatted by Joan LeTourneau.

Summary

The Washington State Department of Ecology (Ecology) Environmental Investigations and Laboratory Services Program surveyed sediment quality in Fidalgo Bay in April 1997 in response to the state natural resource agencies seeking a settlement with the Texaco USA oil refinery for damages related to oil spills in the bay. A large spill of up to 20,000 gallons of North Slope crude had occurred in February 1991.

The trustees wanted to determine if there was widespread sediment contamination, if the bay's resources were threatened, and if the benefits of habitat restoration efforts could potentially be compromised. Survey objectives were to determine if the sediments were contaminated with oil and if they met chemical criteria set by the Ecology Marine Sediment Management Standards (WAC 173-204-420). The Washington State Department of Natural Resources (DNR) Aquatic Resources Division initiated and funded the sediment survey.

Sediment samples for the Ecology/DNR survey were collected from 27 sites between the head of Fidalgo Bay and the east side of March Point; three reference sites were included in Padilla Bay. Each sample consisted of a composite from three individual grabs. The top 10 cm layer, which Ecology considers to be the "biologically active zone," was analyzed.

Total petroleum hydrocarbons (TPH) were measured in all samples. Sediments from a subset of 14 sites were analyzed for metals (zinc, chromium, copper, arsenic, lead, cadmium, silver, mercury), 75 semivolatile organic compounds, polychlorinated biphenyls (PCBs), grain size, and total organic carbon. Five sites in the outer bay were screened for butyltins.

Visual examination of the grabs while in the field showed no oil or sheen. Chromatograms from the TPH analysis (WTPH-Dx method) did not match crude oil. No diesel range hydrocarbons were detected at reporting limits of 8 - 30 mg/Kg, dry weight (ppm). Motor oil was found in sediments from one nearshore site, #3, midway up the eastside of Fidalgo Bay. This may be due to street runoff from a nearby culvert running under March Point Road. The culvert at site #3 was the discharge point for the 1991 crude oil spill at Texaco.

Zinc and chromium concentrations in inner bay sediments were significantly higher than in the outer bay, but the overall range of these and other metals in the study area was less than a factor of 2. The most frequently detected organic compounds were polyaromatic hydrocarbons (PAH), retene, dibenzofuran, and 4-methylphenol. These are among the most commonly reported chemical contaminants in Puget Sound urban/industrial areas. In most cases, concentrations of individual PAH were in the

range of 10 - 100 ug/Kg, dry weight (ppb). Retene, dibenzofuran, and 4-methylphenol were generally at or below 20 - 30 ug/Kg. PCBs were detectable at only two inner bay sites at 9.0 and 10 ug/Kg total PCBs. Tributyltin was detected at 0.1 - 1.9 ug/Kg at three of the five outer bay sites analyzed.

The sediments from site #3 exceeded sediment quality standards (SQS) for total high molecular weight PAH (HPAH) and for the individual PAH compounds chrysene and fluoranthene. However, none of the PAHs at site #3 exceeded cleanup screening levels (CSLs). The metals and other organics detected here and elsewhere in the bay were within sediment quality standards by factors of 10 or better. The concentrations of tributyltin seen in the outer bay are typical of background in Puget Sound sediments.

Except for PAH compounds, the levels of metals and organic compounds in Fidalgo Bay sediments are comparable to or lower than sediments from reference areas in Puget Sound removed from sources of contamination. PAH concentrations over much of the bay are two to four times higher than reported from reference areas, indicating there has been some degradation of sediment quality with regard to these constituents. Although spilled oil may have contributed to these PAH levels, the pattern seen in the sediments points to combustion sources rather than petroleum. The detection of carbazole at site #3 suggests creosote as an additional source of PAH here.

Two other findings of potential interest were the unusual detection of 4-nitrophenol (46 ug/Kg) and bis(2-chloroethyl)ether (1.0 ug/Kg) at site #15 in the center of the inner bay, and the detection of coprostanol at sites #1 and #20, also in the inner bay. 4-Nitrophenol may be present as a breakdown product of the insecticide parathion. It is not known if the findings at site #15 have any biological significance. Coprostanol is an indicator of human or animal fecal matter.

Sampling sites #10, 11 and 20 were selected in part because of DNR concerns about herring embryo mortality in these areas. Although there were some indications of chemical contamination in the vicinity of site #20, including the detection of coprostanol, survey results did not clearly identify any chemical contaminant that could be linked to adverse effects on herring.

Introduction

During April 1997, the Washington State Department of Ecology (Ecology) Environmental Investigations and Laboratory Services Program conducted a survey of sediment quality in Fidalgo Bay, North Puget Sound. The survey was in response to the state natural resource agencies seeking a settlement with the Texaco USA oil refinery for damages related to oil spills in the bay. A large spill of up to 20,000 gallons of North Slope crude had occurred in February 1991.

The trustees wanted to determine if widespread sediment contamination existed, if the contamination posed a threat to Fidalgo Bay resources, and if the benefits of habitat restoration efforts could potentially be compromised. The trustees' concerns stemmed from a history of releases of oil and other contaminants, combined with recent evidence of adverse effects on herring embryos incubating in the vicinity of March Point and in inner Fidalgo Bay (Bill Graeber, personal communication).

The Washington State Department of Natural Resources (DNR) Aquatic Resources Division, on behalf of the trustees, initiated and funded the sediment survey. The objectives were to:

1) Determine if the sediments are contaminated with oil

2) Determine if the sediments approach or exceed chemical criteria set by the Ecology Marine Sediment Management Standards (WAC 173-204-420; Ecology, 1995a)

The study area included:

- Fidalgo Bay out to the 5 fathom depth contour, except a southwest portion of the inner bay and the west side of the outer bay as delineated by DNR
- Nearshore area off the north and east sides of March Point
- Reference sites in Padilla Bay

Previous Studies

Tetra Tech (1988) reviews information on potential contaminant sources to the Fidalgo Bay area. In addition to Texaco these include, but are not limited to, the Shell Oil Co. refinery, Northwest Petrochemical Co. (now Technol), General Chemical, Scott Paper Co. (now closed), the abandoned Skagit County March Point landfill, historical lumber and logging companies, agriculture, boatyards, and marinas.

Table 1 lists the recent studies that have been done on sediment chemistry in Fidalgo Bay and vicinity, showing the type of data obtained. The general locations of sampling sites for these efforts are illustrated in Figure 1.

Table 1. Previous Studies on Sediment Chemistry in Fidalgo Bay and Vicinity

Identification No. in Fig. 1	Reference	Investigator	Analyses							
			petroleum hydrocarbons	metals	polyaromatic hydrocarbons	semivolatile organics	PCBs & pesticides	butyltins	volatile organics	dioxins & furans
1	Dutch et al. (1993)	Ecology		x	x	x	x		x	
2	USFWS (1994)	USFWS	x	x	x		x			
3	Rief (1990a,b)	Ecology		x	x	x	x		x	
4	Hoyle-Dodson (1995)	Ecology		x	x	x	x		x	
4	H.Dodson & Stasch (1995)	Ecology		x	x	x	x		x	
5	CH2M Hill (1992a,b)	Shell/Texaco		x	x	x	x		x	x
6	Johnson (1989)	Ecology				x	x			
7	Barrick & Prahl (1987)	UW/EPA			x					
8	Brown et al. (1979,81)	NOAA/EPA	x							
9	Malins et al. (1985)	NOAA		x	x	x	x			
10	Hoff (1995)	NOAA	x							
11	Crecelius (1986)	Battelle/ACE		x	x					
12	Crecelius et al. (1989)	Battelle/EPA		x	x			x		
13	Tetra Tech (1991)	DNR		x	x	x	x			
14	Meyer & Elkins (1990)	WW Univ.					x			
15	Parametrix (1995)	TBT Consortium						x		

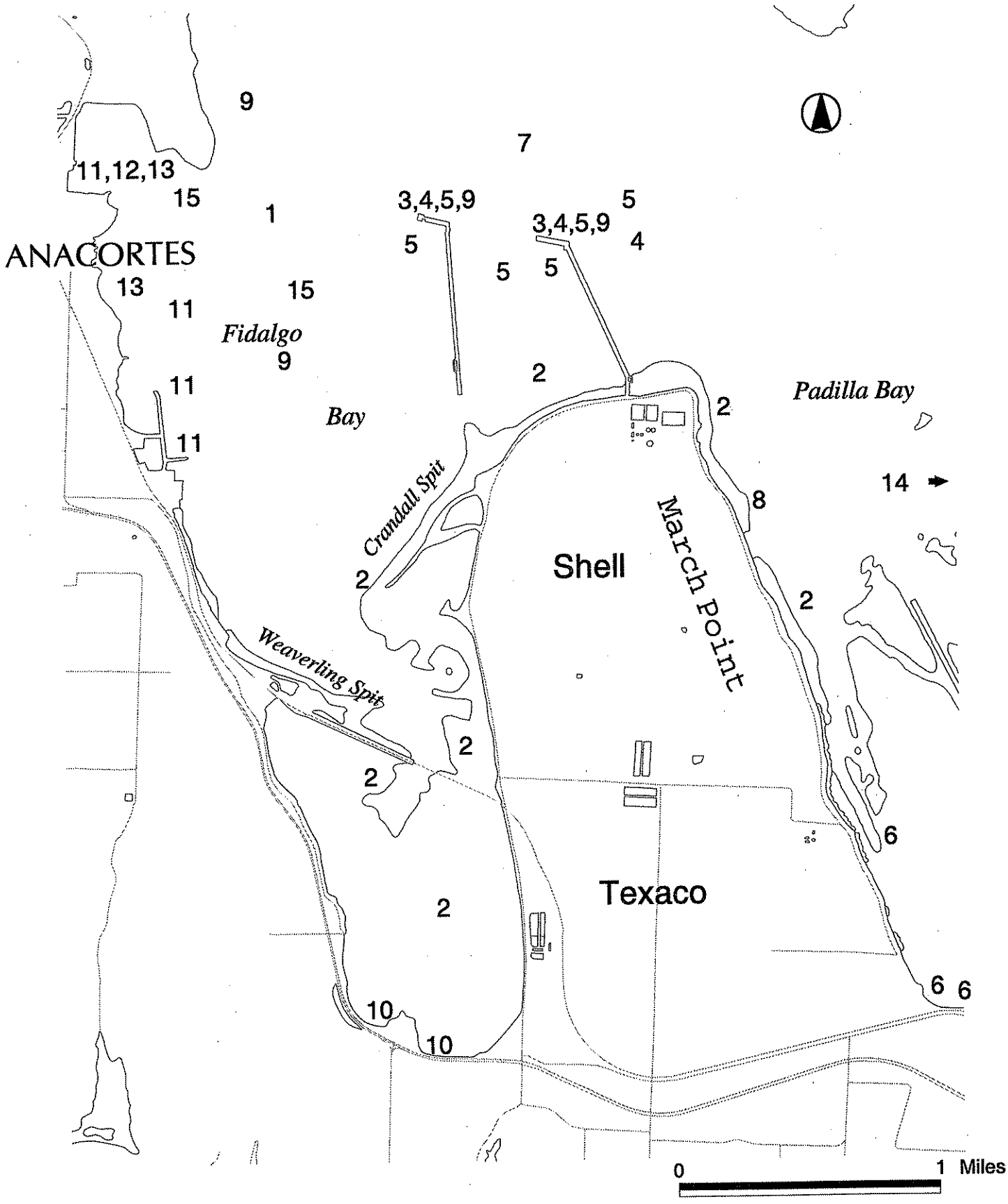


Figure 1 Approximate Sediment Sampling Locations of Previous Studies (see Table 1 for references)

Most of the previous work has focused on March Point and Padilla Bay (Brown et al., 1979,1981; Malins, 1985; Barrick and Prahl, 1987; Meyer and Elkins, 1990; Reif, 1990a,b; CH2M Hill, 1992a,b; Johnson, 1989; USFWS, 1994; Hoyle-Dodson, 1995; Hoyle-Dodson and Stasch, 1995). For the most part, these studies have not found significant contamination in the sediments around March Point. Historically, some elevations in the level of aromatic hydrocarbons have been detected. More recently, sediment samples at the Texaco and Shell Oil refinery outfalls off the north end of March Point have been shown to exceed sediment standards for cadmium, phenanthrene, fluoranthene, and bis(2-ethylhexyl)phthalate. In general, the level of sediment contamination in Padilla Bay is low.

Only limited sampling has taken place in Fidalgo Bay. As part of a larger investigation into potential oil spill impacts on Padilla Bay, the U.S. Fish and Wildlife Service (USFWS) (1994) analyzed aromatic hydrocarbons, organochlorines, and metals at four locations in Fidalgo Bay in 1988. None of the samples exceeded standards. Ecology has monitored sediment quality at a station in outer Fidalgo Bay since 1990 as part of the Puget Sound Ambient Monitoring Program (PSAMP). No significant chemical contamination has been detected, other than a modest elevation in nickel (Dutch et al., 1993; unpublished 1993-95 data).

The National Oceanic and Atmospheric Administration (NOAA) has been following the recovery of the salt marsh at the extreme south end of Fidalgo Bay, heavily oiled during the 1991 spill (Hoff, 1995). They continue to observe some oil in the marsh (Rebecca Hoff, personal communication). NOAA monitoring sites are outside the study area of the present survey.

Fidalgo Bay is included in a nationwide monitoring program for the antifouling agent tributyltin (TBT), conducted for a consortium of TBT manufacturers (Parametrix, 1995). The bay was selected as an ecologically sensitive area having a large marina, boatyards, and oil tankers as potential TBT sources. Sediments from three stations in the outer bay have been analyzed but the data are not presently available (Jesse Bennett, personal communication).

DNR, the U.S. Environmental Protection Agency (EPA), and the U.S. Army Corps of Engineers have sponsored several investigations into sediment quality in or near marinas, boatyards and the dredged channel (Cap Sante Waterway) along the western shore of Fidalgo Bay. Sediments in this part of the bay have elevated concentrations of metals (cadmium, copper, lead, and zinc), as well as tributyltins; some samples have exceeded standards for polyaromatic hydrocarbons (PAH) (Crecelius, 1986; Crecelius et al., 1989; Tetra Tech, 1991).

NOAA, Ecology, and the Washington Department of Fish and Wildlife conducted sediment sampling this past summer in Fidalgo and Padilla Bays as part of a three-year study on biological effects of toxicants in Puget Sound. The sediments are being analyzed for a wide range of metals and organic compounds.

Survey Description

Sediment samples for the Ecology/DNR 1997 Fidalgo Bay survey were collected during April 2-4 from the 30 sites shown in Figure 2. Most of the sampling effort was focused on the inner bay because the February 1991 spill was largely confined to this area.

Three habitats were sampled: perimeter salt marsh, intertidal mudflat, and the subtidal. One sampling site was located in or near each of the three small salt marshes along the bay's east shoreline (sites #1-3). Other samples were collected along a transect of nearshore (#4-14) and offshore (#19-27) sites, arranged to include locations where DNR observed herring embryo mortality (#10, 11, and 20). Additional subtidal samples were located in the Fidalgo Bay main drainage channel (#15-18). Reference samples were collected from nearshore and offshore areas of Padilla Bay (#28-30).

Each sample consisted of a composite from three individual grabs. The top 10 cm layer was sampled from each grab. Ecology considers the upper 10 cm to represent the "biologically active zone" (Ecology, 1995b).

Total petroleum hydrocarbon (TPH) concentrations were measured in all samples. Sediments from a subset of 14 sites (indicated by an asterisk in Figure 2) were analyzed for metals (zinc, chromium, copper, arsenic, lead, cadmium, silver, and mercury), 75 semivolatile organic compounds, polychlorinated biphenyls (PCBs), and the normalizing parameters grain size and total organic carbon (TOC). These analyses include the 47 chemical parameters addressed in the sediment standards. Five sites nearest potential TBT sources (#10, 11, 25, 26, and 27) were screened for butyltins. Because reference area data are not needed to determine compliance with chemical standards, no detailed chemical analyses were done on Padilla Bay samples.

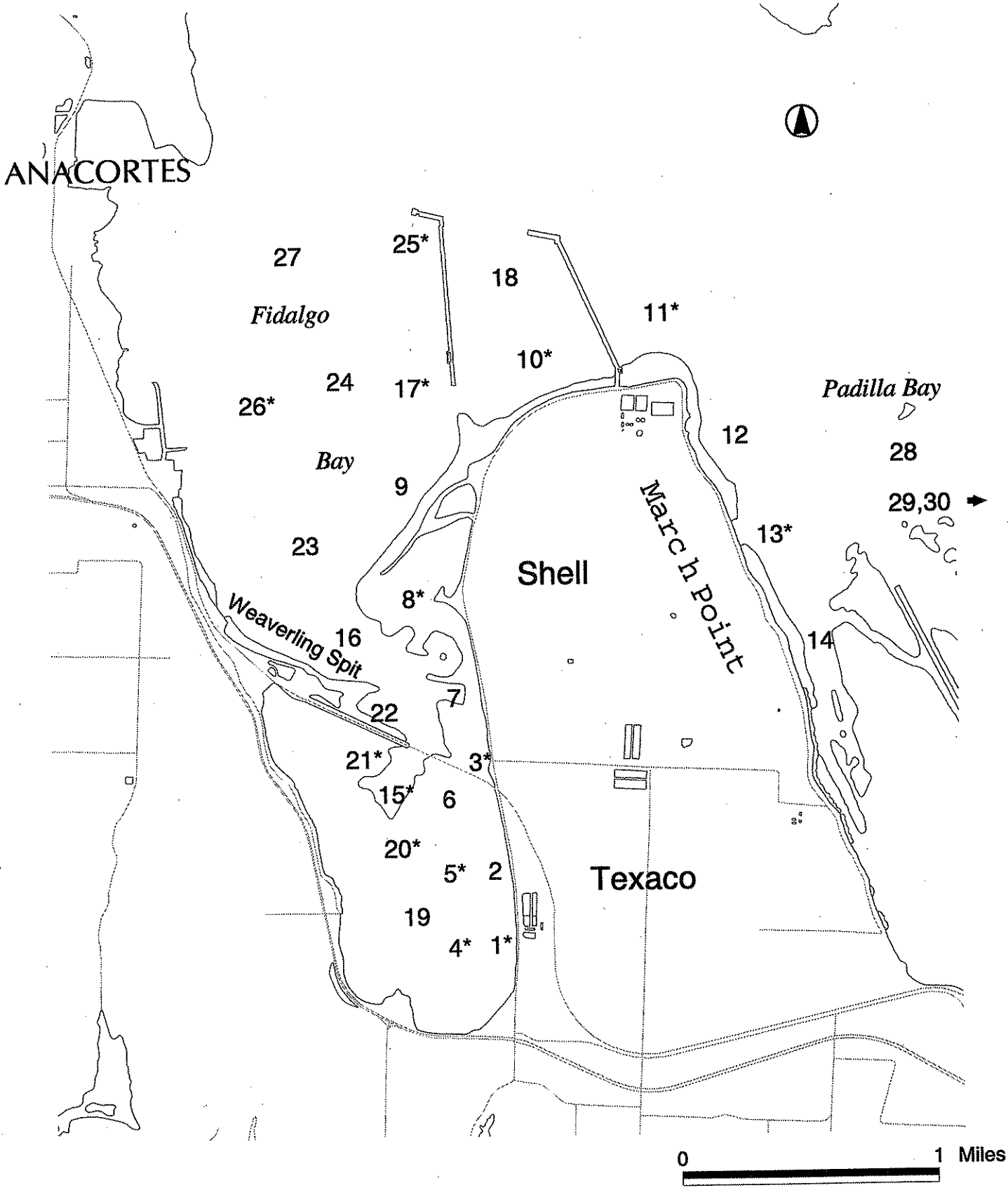


Figure 2. Location of Ecology/DNR 1997 Sediment Samples

(asterisk indicates samples for detailed chemical analysis)

Sampling Methods

Sampling methods followed PSEP protocols (EPA, 1996) and requirements in the Sediment Management Standards (Ecology, 1995a,b). Sampling sites were located and positions recorded using a differentially-corrected Magellan GPS (Appendix A). Sediments were collected with a 0.1 m^2 stainless steel Van Veen grab or, for salt marsh samples, by hand with stainless steel scoops. A grab was considered acceptable if not over-filled with sediment, overlying water was present and not excessively turbid, the sediment surface relatively flat, and desired depth penetration had been achieved.

After siphoning off overlying water, the top 10 cm of sediment from each of three grabs was removed with stainless steel scoops, placed in a stainless steel bucket, and homogenized by stirring. Material touching the side walls of the grab was not taken.

Subsamples of the homogenized sediment were placed in glass jars with teflon lid liners, cleaned to EPA QA/QC specifications (EPA, 1990), or Whirl-Pak bags for grain size. Separate 8-oz jars were used for TPH, semivolatiles, PCBs, metals, and excess sample for archiving; 4-oz jars were used for TOC and TBT.

Stainless steel scoops and buckets used to manipulate the sediments were cleaned by washing with Liquinox detergent, followed by sequential rinses with tap water, dilute nitric acid, deionized water, and pesticide-grade acetone. The equipment was then air-dried and wrapped in aluminum foil. The same procedures were used to pre-clean the grab before going into the field. Between-sample cleaning of the grab consisted of thorough brushing and rinsing with on-site water.

The sediment samples were put in individual polyethylene bags and placed on ice immediately after collection. They were transported to the Ecology Manchester Environmental Laboratory (MEL) within one to two days. Chain-of-custody was maintained (Appendix B).

Analytical Methods

Sample analysis was conducted by MEL, except for grain size which was done at Rosa Environmental, a certified contract laboratory selected by MEL. The analytical methods used are shown in Table 2.

Table 2. Analytical Methods for Ecology/DNR 1997 Survey of Fidalgo Bay Sediments

Analysis	Method	Reference	Laboratory
TPH	GC/FID - Method WTPH-Dx	Carrell (1997)	Manchester
Semivolatiles	GC/MS - Method 8270	EPA (1986a)	Manchester
As,Cd,Cr,Cu,Pb,Zn	ICP - Method 200.7	EPA (1986a)	Manchester
Ag	GFAA - Method 272.2	EPA (1986a)	Manchester
Hg	CVAA - Method 245.5	EPA (1986a)	Manchester
PCBs	GC/ECD - Method 8080	EPA (1986a)	Manchester
Butyltins	GC/MS (SIM) - PSEP Method	EPA (1996)	Manchester
TOC	PSEP Methods	EPA (1986b, 1996)	Manchester
Grain Size	PSEP Method	EPA (1996)	Rosa Environmental

Quality of the Data

Appendix C has complete results from the sediment sample analyses, along with QA reviews of the data, prepared by MEL. The reviews include an assessment of sample condition on receipt at the laboratory, compliance with holding times, as well as results for instrument calibration, procedural blanks, laboratory control samples and reference material, surrogates, matrix spikes, and matrix spike duplicates. Overall, the quality of the data is good. The following problems were encountered.

- Metals - Matrix spike recoveries of chromium were slightly lower than EPA Contract Laboratory Program (CLP) control limits (73-74% vs. 75%); the sample data for chromium are qualified as estimates. The arsenic and silver data are also qualified as estimates due to high variability of replicates (arsenic) and low recovery of silver (72%) in a laboratory control sample.

- Semivolatiles - A number of problems arose during the initial analysis for semivolatiles that resulted in the re-analysis of approximately half of the sediment samples. Blank contamination with pentachlorophenol and possible carryover to samples occurred in the Gel Permeation Chromatography procedure. Matrix spikes for pentachlorophenol and benzoic acid were low or not recovered (sample #148252, site 20). Both of these compounds are covered by the sediment standards. Matrix spike recoveries were also low for several other compounds not regulated by the standards.

  Table 3 compares the pentachlorophenol and benzoic acid results from the first and second analyses (conducted on separate samples archived frozen, except #148239 which was refrigerated excess from the first analysis). The re-analysis had acceptable matrix spike recoveries for both compounds and there was no blank contamination with pentachlorophenol. Quantitation limits were also improved. As in the initial analysis, recovery of surrogate compounds was acceptable in all samples. Hexachlorocylcopentadiene, 2- and 3-nitroaniline, and aniline were not recovered and are flagged as rejected (REJ) in the matrix spike source sample (#148252).

  Table 4 shows the semivolatile compound detected in three of the samples that were re-analyzed. These samples were selected to illustrate the kind of results achieved over a range of chemicals and concentration levels. The two data sets are in extremely close agreement, as was the case for all other re-analyzed samples (Appendix C).

  The re-analyzed data are used in the Results and Discussion section of this report. For samples that were not re-analyzed, the data for pentachlorophenol and benzoic

Table 3. Comparison of Benzoic Acid and Pentachlorophenol Results in Re-Analyzed Fidalgo Bay Sediment Samples (ug/Kg, dry weight; ppb)

Sample Number (97-)	Station Number	Analysis Date (1997)	Benzoic Acid	Pentachlorophenol
Sample Results				
148232	3	16-May	290 U	145 UJ
		21-August	**150**	76 U
148235	5	16-May	342 UJ	171 UJ
		21-August	95 UJ	91 U
148239	8	17-May	330 UJ	194 UJ
		21-August	95 UJ	80 U
148241	10	17-May	302 U	151 UJ
		21-August	106 UJ	77 U
148243	11	17-May	605 U	303 U
		21-August	114 UJ	78 U
148245	13	17-May	603 U	302 U
		21-August	100 UJ	74 U
148252	20	17-May	REJ	202 U
		21-August	133 UJ	100 U
148258	26	17-May	319 U	159 UJ
		21-August	78 UJ	73 U
Matrix Spike Recoveries				
148252MS	20	17-May	REJ	3%
148252MSD			REJ	3%
148252MS	20	21-August	57%	80%
148252MSD			61%	79%
Laboratory Blanks				
BLN71188	- -	16-May	**120** J	200 U
BLN71189	- -	16-May	**123** J	**81** J
BLN72276	- -	21-August	**80** J	100 U
BLN72277	- -	21-August	**67** J	100 U

Data Qualifiers:
Bold = analyte present in sample; visual aid to locating data of interest
U = not detected at or above reported value (quantitation limit)
J = positively identified; numerical value is an estimate
UJ = not detected at or above reported estimated value
REJ = data are unusable for all purposes

Table 4. Comparison of Results from Re-Analysis of Semivolatiles; Compounds Detected in Selected Samples (ug/Kg, dry weight; ppb)

Station Number:	3		8		20	
Sample Number (97-):	148232		148239		148252	
Analysis Date (97-):	16-May	21-Aug	17-May	21-Aug	17-May	21-Aug
Polyaromatic Hydrocarbons						
Naphthalene	**66**	**45**	**54**	**53**	**51**	**50**
1-Methylnaphthalene	**27 J**	**23**	**12 J**	**9.7 J**	**14 J**	**12 J**
2-Methylnaphthalene	**30**	**37**	**14 J**	**15 J**	**15 J**	**16 J**
Acenaphthylene	**328 J**	**376**	**21**	**16 J**	**13 J**	**14 J**
Acenaphthene	**105 J**	**101**	**8.6 J**	**8.2 J**	**6.2 J**	**7.1 J**
Fluorene	**121 J**	**115**	**14 J**	**13 J**	**14 J**	**14 J**
Phenanthrene	**1190**	**625**	**69**	**63**	**83 J**	**68**
Anthracene	**328**	**442**	**26**	**27**	**25**	**23**
Fluoranthene	**9190**	**10600**	**146**	**146**	**177**	**129**
Pyrene	**7280**	**7340**	**122**	**128**	**145**	**100**
Benzo[a]anthracene	**966**	**907**	**35**	**35**	**17 J**	**31**
Chrysene	**2940 E**	**2520**	**53**	**56**	**86**	**47**
Benzo(b)fluoranthene	**1780**	**1450**	**52**	**53**	**77**	**51**
Benzo(k)fluoranthene	**634**	**547**	**17**	**20**	**30**	**20 J**
Benzo[a]pyrene	**562**	**517**	**32**	**28**	**39**	**26**
Indeno[1,2,3-c,d]pyrene	**268**	**268**	**18**	**32**	**21**	**36 J**
Dibenzo[a,h]anthracene	**60**	**80**	17 U	32 U	20 U	40 U
Benzo[g,h,i]perylene	**208**	**186**	**21**	**22**	**24**	**23**
Miscellaneous Compounds						
Retene	**175**	**100**	**12 J**	**22**	**17 J**	**28**
Dibenzofuran	**75**	**50**	**13 J**	**15 J**	**13 J**	**14 J**
Carbazole	**269**	**310**	165 U	16 U	202 U	20 U
Benzoic acid	290 U	**150**	330 U	95 UJ	REJ	133 UJ
Benzyl alcohol	15 U	**12 J**	17 U	32 U	20 U	40 U
Isophorone	15 U	15 U	17 U	**7.9 J**	20 U	20 U
Coprostanol	290 U	61 U	165 UJ	64 U	404 U	**234**
Phenols						
2-Methylphenol	**8.4 J**	**6.5 J**	17 U	32 U	20 U	40 U
4-Methylphenol	**40**	**48**	**18**	**30**	**25**	**38**
2,4-Dimethylphenol	**21**	15 U	17 U	16 U	20 U	20 U
Pentachlorophenol	173 U	76 U	194 U	80 U	202 U	100 U

Data Qualifiers:

Bold = analyte present in sample; visual aid to locating data of interest
U = not detected at or above reported value (quantitation limit)
J = positively identified; numerical value is an estimate
UJ = not detected at or above reported estimated value
E = concentration exceeds known calibration range
REJ = data are unusable for all purposes

acid are considered acceptable because: 1) all surrogate recoveries in all samples were within CLP limits, and 2) results showed the GC/MS instrument was capable of detecting pentachlorophenol and benzoic acid at levels below the reported quantitation limit, indicating the instrument's sensitivity was appropriate for evaluating compliance with sediment quality standards. Neither of these compounds is reported as being detected in the first round samples because the EPA "five times" rule was applied to all compounds found in laboratory blanks. This rule states that sample concentrations must be five times higher than the blank in order to be considered a valid result.

- Tributyltins - Although not detected in procedural blanks, the monobutyltin reported as being present at trace levels in the sediment samples is potentially an artifact from the derivitizing agent used in the analysis; these data should be viewed with caution. Also, matrix spike recoveries for monobutyltin were low and all results are qualified as estimates.

  Results for one of the TBT reference materials analyzed, PACS-1, were low for tri- and dibutyltin, but high for monobutyltin. However, Battelle Marine Sciences Laboratory has now been determined that PACS-1 is unstable (Huntamer, personal communication). Recoveries of butyltins in other reference material analyzed were acceptable.

The overall precision of the sediment chemistry data for Fidalgo Bay can be assessed from results on duplicate samples prepared in the field (Table 5). Agreement between duplicates was better than 30% for most parameters. Results for some analytes appear to show poor precision (e.g., PCBs), but in most cases this is due to concentrations being near the detection limit. Total petroleum hydrocarbons and a number of semivolatile compounds were below detection limits in the samples selected for duplicate analysis.

Samples from the following sites were split with Brian Rhodes of Texaco USA, Anacortes: #2, 3, 4, 8, 9, 10, 11, 17, 18, 19, 22, 25, 27, 28, and 29. Texaco conducted independent analyses for the same chemical parameters analyzed by Ecology. These data were not requested for use in the present report.

Table 5. Precision on Field Duplicate Sediment Samples (relative percent difference*)

Station Number:	4/4A	7/7A	10/10A	25/25A
Sample Number (97-):	148233/34	148237/38	148241/42	148257
General Physical/Chemical (%)				
Gravel	0%	na	0%	na
Sand	>200%	na	2%	na
Silt	1%	na	2%	na
Clay	14%	na	0%	na
TOC	0%	na	0%	na
Solids	1%	na	2%	na
Total Petroleum Hydrocarbons (mg/Kg, dry weight; ppm)				
TPH	ND	ND	ND	na
Metals (mg/Kg, dry weight; ppm)				
Arsenic	24%	na	34%	na
Cadmium	>29%	na	13%	na
Chromium	19%	na	0%	na
Copper	0%	na	0%	na
Lead	12%	na	29%	na
Mercury	0%	na	0%	na
Silver	13%	na	0%	na
Zinc	2%	na	5%	na
Semivolatiles (ug/Kg, dry weight; ppb)				
Total LPAH	8%	na	18%	na
Total HPAH	8%	na	24%	na
Bis(2-ethylhexyl)phthalate	ND	na	>43%	na
Retene	8%	na	11%	na
Dibenzofuran	ND	na	>42%	na
Phenol	ND	na	>74%	na
4-Methylphenol	37%	na	ND	na
Polychlorinated Biphenyls (ug/Kg, dry weight; ppb)				
Total PCBs	>67%	na	ND	na
Organotins (ug/Kg, dry weight; ppb)				
Tributyltin chloride	na	na	na	47%
Monobutyltin chloride	na	na	na	73%

*(duplicate range/duplicate mean) x 100
ND = not detected
na = not analyzed

Results and Discussion

General Physical/Chemical Characteristics

Table 6 summarizes results for grain size, TOC, and percent solids in Fidalgo Bay sediments. These parameters were run only on samples submitted for detailed chemical analysis.

Sediments in the study area are predominantly composed of sands and silts, with inner Fidalgo Bay having a greater percentage of fines than the outer bay. Eelgrass, shell, and wood fragments were variously noted (Appendix A) in sediment samples from the center bay drainage channel (sites #15, 16, and 20) and off the north and east sides of March Point (#10, 13, 17, and 18). Each grab was examined for the presence of oil or sheen and none was found (Appendix A).

Table 6. General Physical/Chemical Characteristics of Fidalgo Bay Sediment Samples

Station Number	Sample Number (97-)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	TOC (70°C)	TOC (104°C)	Solids (%)
Inner Fidalgo Bay								
1	148230	0	27	51	22	1.4	1.4	54.1
3	148232	0	66	24	10	1.1	1.1	64.3
4	148233	0	2	78	20	1.4	1.4	50.7
4 dup.	148234	0	0	77	23	1.4	1.4	51.2
5	148235	0	5	78	17	1.0	1.0	52.4
8	148239	0	26	58	16	1.4	1.4	57.5
15	148247	9	16	55	20	1.6	1.6	46.9
20	148252	0	9	68	23	1.6	1.7	47.5
21	148253	0	7	72	20	1.6	1.6	47.2
Outer Fidalgo Bay								
10	148241	0	48	42	10	0.9	0.9	59.6
10 dup.	148242	0	47	43	10	0.9	0.9	58.5
11	148243	0	59	33	8	0.8	0.8	60.7
17	148249	1	19	65	15	1.7	1.7	48.4
25	148257	0	52	35	13	1.2	1.2	54.5
26	148258	0	18	71	11	1.0	1.1	60.3
East side March Point								
13	148245	0	53	40	7	0.8	0.9	60.6

The organic carbon content of the sediments showed only slight variation within the bay, ranging from 0.8 - 1.7 % TOC. The highest levels (1.6 - 1.7 %) were seen in the Fidalgo main drainage channel (#15, 17, 20, and 21). These values are typical for areas of Puget Sound not suffering from organic enrichment (WAC 173-204; PTI, 1991a).

Table 6 has two sets of TOC data, one based on dry weight at 70^0C, as done routinely in the past, and the other dried at 104^0C, as recommended in the revised Puget Sound Protocols (1996). There were no significant differences in the results obtained using the two methods.

Total Petroleum Hydrocarbons

Chromatograms from the TPH analysis did not show a pattern matching crude oil at any of the Fidalgo Bay sampling sites. The results were quantitated for both diesel and lubricating oil range petroleum hydrocarbons (Table 7). No diesel range hydrocarbons were detected above the reporting limit of 7 - 30 mg/Kg, dry weight (ppm).

The sediments from site #3 contained motor oil at 170 mg/Kg. This site is located immediately north of the east end of the railroad bridge between Weaverling Spit and March Point. A culvert running under March Point Road discharges to the area where the site #3 sample was collected. This culvert is the route by which the 1991 crude oil spill at Texaco reached Fidalgo Bay (Phil Hertzog, personal communication). TPH analysis of the sediment sample from site #3 did not show evidence of residual crude oil. Street runoff may be the source of the motor oil detected.

No other sites showed the presence of motor oil. Non-petroleum hydrocarbons in the samples interfered with those in the lubricating oil range. For this reason, reporting limits are higher for lube-oil based TPH (18 - 130 mg/Kg) than for diesel range hydrocarbons.

Metals

Metal concentrations in the sediments followed the pattern normally encountered in Puget Sound, i.e., zinc, chromium > copper > arsenic > lead > cadmium > silver, mercury (Table 8). Concentrations of zinc and chromium were significantly higher in the inner bay compared to the outer bay and eastside of March Point (Mann-Whitney, $p<0.10$). The inner bay also tended to have the higher arsenic concentrations, but the differences were not significant. Whether this is a natural occurrence – perhaps related to the finer sediments of the inner bay – due to runoff or other sources is unknown. In any event, the overall range in concentrations of these and other metals across the study area was generally not more than a factor of 2.

Table 7. Total Petroleum Hydrocarbons in Fidalgo Bay Sediment Samples (mg/Kg, dry weight; ppm)

Inner Fidalgo Bay		Outer Fidalgo Bay		East side March Point		Padilla Bay	
Station No.	TPH	Station No.	TPH	Station No.	TPH	Station No.	TPH
Diesel Range Hydrocarbons							
1	11 U	9	8.9 U	12	11 U	28	13 U
2	7.3 U	10	8.1 U	13	14 U	29	19 U
3	7.9 U	10 dup.	8.1 U	14	11 U	30	8.5 U
4	15 U	11	10 U				
4 dup.	22 U	17	19 U				
5	21 U	18	14 U				
6	13 U	23	22 U				
7	18 U	24	16 U				
7 dup.	15 U	25	15 U				
8	19 U	26	11 U				
15	20 U	27	16 U				
16	13 U						
19	18 U						
20	17 U						
21	21 U						
22	30 U						
Lube Oil Range Hydrocarbons							
1	38 U	9	61 U	12	47 U	28	27 U
2	19 U	10	42 U	13	32 U	29	56 U
3	**170**	10 dup.	29 U	14	28 U	30	18 U
4	53 U	11	38 U				
4 dup.	64 U	17	86 U				
5	57 U	18	56 U				
6	26 U	23	52 U				
7	41 U	24	34 U				
7 dup.	70 U	25	30 U				
8	39 U	26	22 U				
15	76 U	27	41 U				
16	61 U						
19	80 U						
20	91 U						
21	81 U						
22	130 U						

Data Qualifiers:
Bold = analyte present in sample; visual aide to locating data of interest
U = not detected at or above reported value (quantitation limit)

The only other metals data on inner Fidalgo Bay sediments are from a USFWS 1988 study (Table 1/Figure 1). Their results, based on four samples, show comparable levels of chromium and zinc, but lower arsenic (an average of 5.3 mg/Kg vs. 12 mg/Kg) (USFWS, 1994).

As noted earlier in this report, cadmium concentrations have been reported to exceed sediment quality standards in sampling done at the Shell refinery outfall off March Point (CH2M Hill, 1992b). Results of the Ecology/DNR survey showed no evidence of widespread cadmium contamination in this area (sites #10,11,17, and 25).

Table 8. Metal Concentrations in Fidalgo Bay Sediment Samples (mg/Kg, dry weight; ppm)

Station Number	Sample Number (97-)	Zinc	Chromium	Copper	Arsenic	Lead	Cadmium	Silver	Mercury
Inner Fidalgo Bay									
1	148230	**59**	**43 J**	**18**	**8.3 J**	**11**	**0.3**	**0.07 J**	**0.04**
3	148232	**51**	**20 J**	**15**	**7.0 J**	**7.7**	0.3 U	0.05 UJ	**0.07**
4	148233	**56**	**33 J**	**16**	**9.4 J**	**7.3**	**0.4**	**0.07 J**	**0.03**
4 dup	148234	**55**	**40 J**	**16**	**12 J**	**6.5**	0.3 U	**0.08 J**	**0.03**
5	148235	**48**	**40 J**	**14**	**12 J**	**5.7**	0.3 U	**0.07 J**	**0.03**
8	148239	**46**	**30 J**	**14**	**10 J**	**6.3**	**0.4**	**0.07 J**	**0.04**
15	148247	**57**	**29 J**	**21**	**16 J**	**7.6**	**0.6**	**0.09 J**	**0.05**
20	148252	**57**	**43 J**	**19**	**16 J**	**8.5**	**0.4**	**0.11 J**	**0.06**
21	148253	**57**	**43 J**	**19**	**13 J**	**7.5**	**0.6**	**0.17 J**	**0.05**
Outer Fidalgo Bay									
10	148241	**42**	**19 J**	**12**	**10 J**	**3.8**	**0.8**	**0.05 J**	**0.05**
10 dup	148242	**44**	**19 J**	**12**	**7.1 J**	**5.1**	**0.7**	**0.05 J**	**0.05**
11	148243	**40**	**18 J**	**11**	**9.0 J**	**5.4**	**0.6**	**0.06 J**	**0.06**
17	148249	**59**	**28 J**	**20**	**9.3 J**	**8.1**	**0.7**	**0.09 J**	**0.06**
25	148257	**48**	**23 J**	**16**	**8.1 J**	**6.6**	0.3 U	**0.07 J**	**0.05**
26	148258	**44**	**21 J**	**12**	**9.4 J**	**4.6**	**0.5**	**0.06 J**	**0.04**
East side March Point									
13	148245	**37**	**18 J**	**11**	**3.8 J**	**3.7**	**0.7**	0.05 UJ	**0.04**

Data Qualifiers:
Bold = analyte present in sample; visual aid to locating data of interest
U = not detected at or above reported value (quantitation limit)
J = positively identified; numerical value is an estimate
UJ = not detected at or above reported estimated value

Semivolatiles

Table 9 shows the 35 compounds detected in the analysis for semivolatiles. Appendix C has results for the remaining 40 semivolatiles analyzed but not detected. As described in the preceding section on data quality, eight of the samples were re-analyzed because of data quality concerns; the second set of results are used in Table 9.

PAH, retene, dibenzofuran, and 4-methylphenol were detected at all or most sampling sites in Fidalgo Bay (Figure 3). These are among the most commonly detected chemical contaminants in Puget Sound (PTI, 1991a; PTI and Tetra Tech, 1988a,b). The highest levels occurred in the inner bay, and the lowest were found to the northeast and east of March Point (sites #11 and 13). In most areas, concentrations of individual PAH compounds were in the approximate range of 10 - 100 ug/Kg (ppb), while retene, dibenzofuran, and 4-methylphenol were generally at or below 20 - 30 ug/Kg.

PAH compounds are found in fossil fuels or formed during their combustion. Both retene and 4-methylphenol are associated with wood wastes and pulp mill discharges (PTI, 1991a; PTI and Tetra Tech, 1988a). Coal fragments are a major natural source of retene in Puget Sound (Barrick and Prahl, 1987). 4-Methylphenol is also a constituent of coal tar and petroleum, and is released during petroleum refining (Windholz et al., 1983; PTI, 1991a). Sources of dibenzofuran are less well known, but its distribution in Puget Sound correlates with PAH, suggesting similar sources (PTI and Tetra Tech, 1988a).

There appeared to be a region of elevated concentrations of high molecular weight PAH (462 - 24,415 ug/Kg total HPAH) extending from the middle of the inner bay (sites #15 and 20) north along the west shoreline of March Point to the end of the Texaco wharf (#3, 8, 17, and 25) (Figure 4). This pattern holds when the data are normalized to TOC.

Elevated concentrations of HPAH are generally attributed to combustion of fossil fuels, while high concentrations of LPAH are generally considered to be indicative of petroleum (Prahl and Carpenter, 1984; Tetra Tech, 1985). Barrick and Prahl (1987) concluded the PAH patterns they observed in the sediments around March Point were due to combustion sources, possibly from the refinery flare towers. As earlier noted, fluoranthene, an HPAH, and phenanthrene, an LPAH, have exceeded sediment standards at the edge of Shell Oils' dilution zone (CH2M Hill, 1992b).

The extent to which spilled petroleum has contributed to the PAH levels observed in Fidalgo Bay is uncertain. Priority pollutants (analyzed here) make up a small percentage of the PAH in petroleum, and the higher PAHs are generally not detected in most crude or refined oils (Sauer and Boehm, 1994). Petroleum sources have a higher percentage of alkly substituted LPAH (methylnapthalenes in the present analysis) compared to the parent compounds, but the lighter PAH and their alkly homologues are severely degraded or lost in weathered oil (Lake, et al., 1979; Wang and Fingas, 1995). Methylnaphthalenes were

Table 9. Semivolatiles Detected in Fidalgo Bay Sediment Samples (ug/Kg, dry weight; ppb)

	Inner Fidalgo Bay								
Station Number:	1	3	4	4 dup.	5	8	15	20	21
Sample Number (97-):	148230	148232	148233	148234	148235	148239	148247	148252	148253
Analysis Date (97-):	16-May	21-Aug	16-May	16-May	21-Aug	21-Aug	17-May	21-Aug	17-May
Low Molecular Weight Polyaromatic Hydrocarbons									
Naphthalene	48	45	30	33	27 J	53	47	50	43
1-Methylnaphthalene	14 J	23	16 J	16 J	9.9 J	9.7 J	11 J	12 J	12 J
2-Methylnaphthalene	19	37	16 J	16 J	15 J	15 J	20	16 J	16 J
Acenaphthylene	14 J	376	14 J	13 J	11 J	16 J	18 J	14 J	21 UJ
Acenaphthene	8.1 J	101	3.2 J	3.2 J	4.6 J	8.2 J	10 J	7.1 J	6.4 J
Fluorene	14 J	115	13 J	13 J	8.6 J	13 J	18 J	14 J	9.6 J
Phenanthrene	63	625	54	51	38	63	131	68	60
Anthracene	16	442	20	16 J	11 J	27	42	23	17 J
Total LPAH	196	1764	166	161	125	205	297	204	164
High Molecular Weight Polyaromatic Hydrocarbons									
Fluoranthene	122	10600	122	101	68	146	535	129	107
Pyrene	104	7340	100	83	60	128	339	100	88
Benzo[a]anthracene	17 U	907	22	19 U	19	35	106	31	21 U
Chrysene	42	2520	33	35	28	56	112	47	45
Benzo(b)fluoranthene	43	1450	30	34	30	53	203	51	51
Benzo(k)fluoranthene	16 J	547	11 J	9.2	11 J	20	11 J	20 J	15 J
Benzo[a]pyrene	22	517	15 J	17 J	15 J	28	91	26	27
Indeno[1,2,3-c,d]pyrene	20	268	13 J	13 J	27 J	32	8.8 J	36 J	15 J
Dibenzo[a,h]anthracene	17 U	80	18 U	19 U	36 U	32 U	15 J	40 U	21 U
Benzo[g,h,i]perylene	26	186	16 J	16 J	16 J	22	43	23	19 J
Total HPAH	395	24415	362	308	273	520	1464	462	367

Table 9 (continued). Semivolatiles Detected in Fidalgo Bay Sediment Samples (ug/kg, dry weight; ppb)

	Outer Fidalgo Bay							E. side March Pt.
Station Number:	10	10 dup.	10	11	17	25	26	13
Sample Number (97-):	148241	148242	148241	148243	148249	148257	148258	148245
Analysis Date (97-):	17-May	17-May	21-Aug	21-Aug	17-May	17-May	21-Aug	21-Aug
Low Molecular Weight Polyaromatic Hydrocarbons								
Naphthalene	**14** J	**23**	**12** J	**12** J	**34**	**20**	**115**	30 U
1-Methylnaphthalene	**5.5** J	**8.2** J	**5.6** J	**5.5** J	**13** J	**11** J	**8.8** J	**3.3** J
2-Methylnaphthalene	**9.0** J	**10** J	**8.9** J	**8.2** J	**19** J	**15** J	**14** J	**5.4** J
Acenaphthylene	15 U	**9.2** J	**7.6** J	**3.5** J	19 UJ	16 UJ	**22**	15 U
Acenaphthene	15 U	15 U	**4.3** J	**1.9** J	**6.9** J	**6.8** J	**9.1** J	15 U
Fluorene	**6.0** J	**7.8** J	**6.0**	**5.4** J	**13** J	**14** J	**11** J	15 U
Phenanthrene	**32**	**43**	**33**	**26**	**76**	**76**	**64**	**9.8** J
Anthracene	**9.2** J	**12** J	**12** J	**5.1** J	**24**	**22**	**15**	15 U
Total LPAH	**76**	**113**	**89**	**68**	**186**	**165**	**259**	**18**
High Molecular Weight Polyaromatic Hydrocarbons								
Fluoranthene	**74**	**94**	**72**	**38**	**141**	**181**	**88**	**18**
Pyrene	**59**	**83**	**68**	**27**	**137**	**125**	**72**	**13** J
Benz[a]anthracene	15 U	**27**	**18**	**11** J	**43**	16 U	**16**	15 U
Chrysene	**28**	**38**	**29**	**14** J	**98**	**68**	**21**	**6.3** J
Benzo(b)fluoranthene	**23**	**34**	**28**	**15** J	**64**	**52**	**22**	**8.0** J
Benzo(k)fluoranthene	**14** J	**14** J	**11** J	**4.8** J	**23**	**25**	**10** J	**4.1** J
Benzo[a]pyrene	**11** J	**24**	**14** J	**6.1** J	**32**	**27**	**12** J	**4.1** J
Indeno[1,2,3-c,d]pyrene	**8.2** J	**13** J	**20** J	**16** J	**17** J	**13** J	**21** J	30 U
Dibenzo[a,h]anthracene	15 U	3.8 UJ	31 U	31 U	19 U	16 U	29 U	30 U
Benzo[g,h,i]perylene	**9.8** J	**13** J	**11** J	**7.4** J	**18** J	**13** J	**13** J	15 U
Total HPAH	**227**	**340**	**271**	**138**	**573**	**504**	**275**	**54**

Table 9 (continued). Semivolatiles Detected in Fidalgo Bay Sediment Samples (ug/Kg, dry weight; ppb)

	Inner Fidalgo Bay								
Station Number:	1	3	4	4 dup.	5	8	15	20	21
Sample Number (97-):	148230	148232	148233	148234	148235	148239	148247	148252	148253
Analysis Date (97-):	16-May	21-Aug	16-May	16-May	21-Aug	21-Aug	17-May	21-Aug	17-May
Miscellaneous Compounds									
Retene	**10** J	**100**	**12** J	**13** J	**16** J	**22**	**22**	**28**	**18** J
Dibenzofuran	**16** J	**50**	**11** J	**12** J	**7.8** J	**15** J	**16** J	**14** J	**11** J
Carbazole	173 U	**310**	178 U	189 U	18 U	16 U	98 U	20 U	206 U
Benzoic acid	346 U	**150**	355 U	379 U	95 UJ	95 UJ	393 U	133 UJ	412 U
Benzyl alcohol	17 U	**12** J	18 U	19 U	36 U	32 U	39 U	40 U	21 U
Isophorone	17 U	153 U	18 U	19 U	18 U	**7.9** J	**157**	20 U	21 U
Bis(2-chloroethyl)ether	17 U	76 U	18 U	19 U	91 U	80 U	**1.0** J	100 U	21 U
Caffeine	17 U	15 U	18 U	19 U	18 U	16 U	**5.2** J	20 U	21 U
Coprostanol	**213** J	61 U	355 UJ	379 UJ	73 U	64 U	196 UJ	**234**	103 UJ
Phenols									
Phenol	17 U	49 UJ	18 U	19 U	91 UJ	32 U	**30**	48 U	21 U
2-Methylphenol	17 U	**6.5** J	18 U	19 U	36 U	32 U	20 U	40 U	21 U
4-Methylphenol	**20**	**48**	**16** J	**11** J	**9.3** J	**30**	20 U	**38**	**38**
2,4-Dimethylphenol	17 U	15 U	18 U	19 U	18 U	16 U	**1.0** J	20 U	21 U
4-Nitrophenol	87 U	76 UJ	89 U	95 U	91 UJ	80 UJ	**46** J	100 UJ	103 U
Phthalate Esters									
Diethyl phthalate	17 UJ	45 UJ	18 UJ	19 U	18 U	16 U	20 UJ	20 U	21 U
Di-N-butyl phthalate	35 UJ	124 UJ	36 UJ	19 U	46 UJ	168 UJ	196 UJ	123 UJ	462 UJ
Bis(2-ethylhexyl)phthalate	35 UJ	36 UJ	36 UJ	38 U	36 UJ	64 UJ	196 UJ	40 UJ	41 UJ

Table 9 (continued). Semivolatiles Detected in Fidalgo Bay Sediment Samples (ug/Kg, dry weight; ppb)

	Outer Fidalgo Bay							E. side March Pt.
Station Number:	10	10 dup.	10	11	17	25	26	13
Sample Number (97-):	148241	148242	148241	148243	148249	148257	148258	148245
Analysis Date (97-):	17-May	17-May	21-Aug	21-Aug	17-May	17-May	21-Aug	21-Aug
Miscellaneous Compounds								
Retene	**7.8** J	**8.7** J	**13** J	**13** J	**25**	**12** J	**20**	**9.7** J
Dibenzofuran	15 UJ	**6.7** J	**4.5** J	**4.3** J	**11** J	**11** J	**12** J	15 U
Carbazole	151 UJ	154 U	15 U	16 U	193 U	157 U	15 U	15 U
Benzoic acid	302 U	309 U	106 UJ	114 UJ	386 U	314 U	78 UJ	100 UJ
Benzyl alcohol	15 U	15 U	31 U	31 U	19 U	16 U	29 U	30 U
Isophorone	15 U	15 U	15 U	16 U	19 U	16 U	15 U	15 U
Bis(2-chloroethyl)ether	15 U	15 U	77 U	78 U	19 U	16 U	73 U	74 U
Caffeine	15 U	15 U	15 U	16 U	19 U	16 U	15 U	15 U
Coprostanol	151 UJ	154 UJ	62 U	62 U	193 UJ	314 U	59 U	59 U
Phenols								
Phenol	15 U	**77**	15 UJ	31 UJ	19 U	16 U	29 U	30 UJ
2-Methylphenol	15 U	15 U	31 U	31 U	19 U	16 U	29 U	30 U
4-Methylphenol	15 U	15 U	**22**	**11** J	19 U	16 U	**35**	**23**
2,4-Dimethylphenol	15 U	15 U	15 U	16 U	19 U	16 U	15 U	15 U
4-Nitrophenol	75 U	77 U	77 UJ	78 UJ	97 U	79 U	73 UJ	74 UJ
Phthalate Esters								
Diethyl phthalate	15 UJ	15 U	15 U	16 U	19 U	**5.0** J	15 U	23 UJ
Di-N-butyl phthalate	15 UJ	40 UJ	56 UJ	16 U	75 UJ	**419**	15 UJ	55 UJ
Bis(2-ethylhexyl)phthalate	**9.5** J	15 UJ	31 UJ	31 UJ	39 UJ	79 UJ	15 UJ	15 UJ

Data Qualifiers:

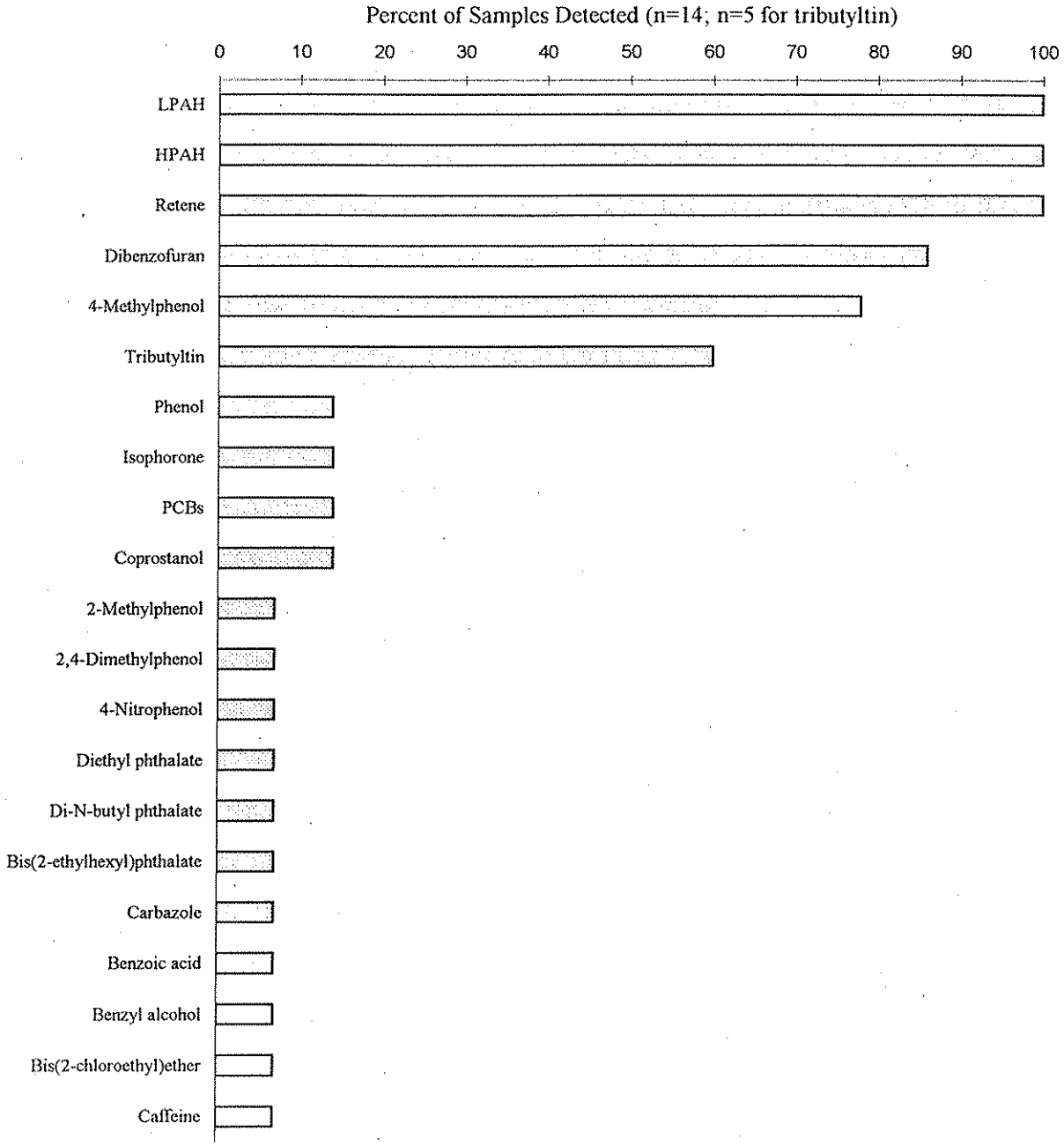
Bold = analyte present in sample; visual aid to locating data of interest

U = not detected at or above reported value (quantitation limit)

J = positively identified; numerical value is an estimate

UJ = not detected at or above reported estimated value

Figure 3. Detection Frequency of Organic Compounds in Ecology/DNR 1997 Fidalgo Bay Sediment Samples



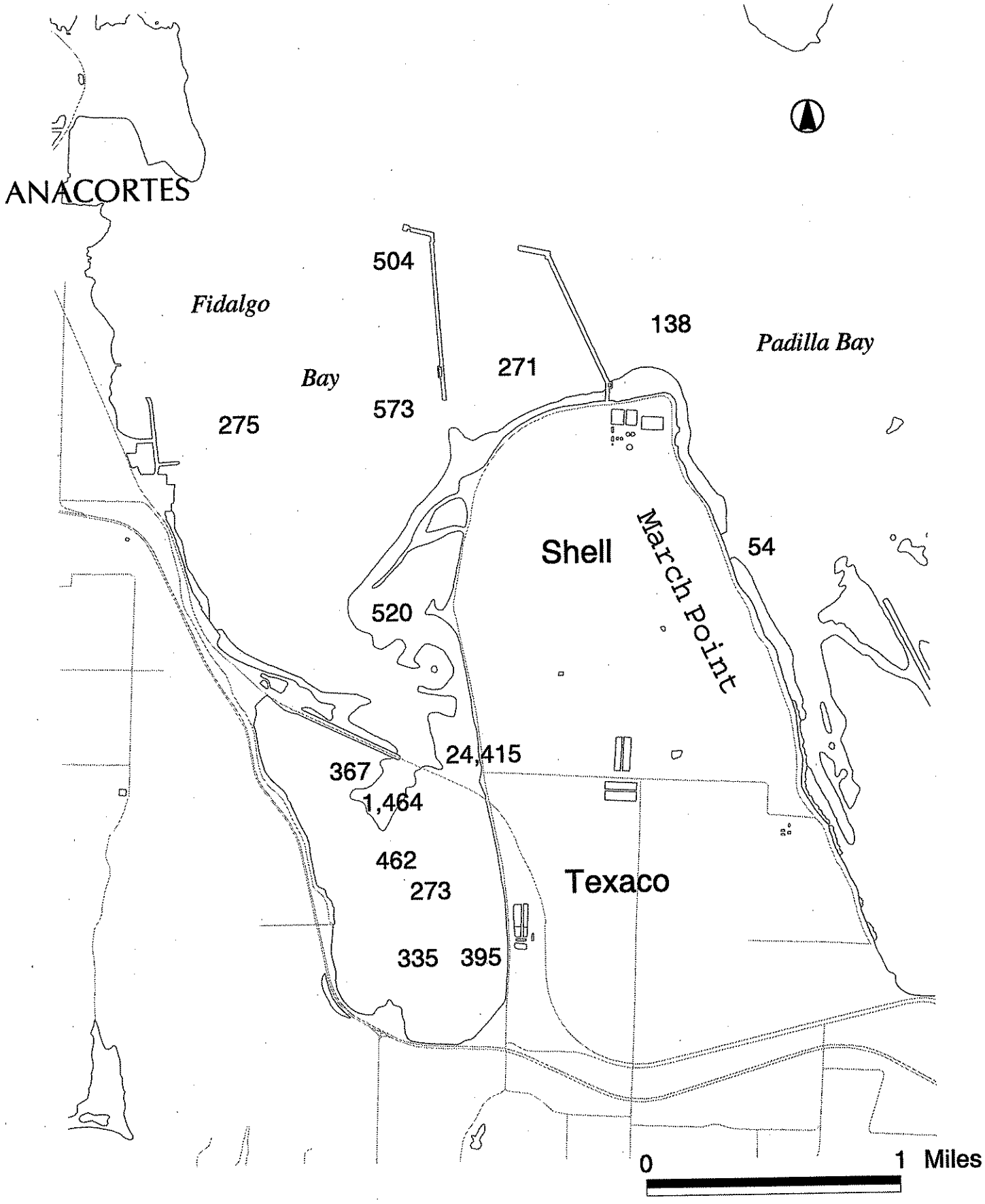


Figure 4. Total HPAH Concentrations in Sediment Samples (ug/Kg)

not elevated relative to naphthalene in the Fidalgo samples (Table 9). It is difficult and sometimes impossible to identify degraded oil through recognition of priority pollutant PAH distribution patterns (Sauer and Boehm, 1994; Wang and Fingas, 1995).

Site #3 had relatively high PAH levels. Total LPAH and total HPAH (1,764 and 24,415 ug/Kg, respectively) were several orders of magnitude above concentrations at other locations. Highway runoff to this site is a likely source of the HPAH. The only other previous analysis of PAH in this area was the USFWS 1988 study (USFWS, 1994). Their results, although not directly comparable to the analysis done for the present survey, showed elevated concentrations of HPAH in the region of site #3 compared to other areas sampled in Fidalgo Bay and off March Point.

The detection of benzoic acid, carbazole, benzyl alcohol, and 2-methylphenol was unique to site #3. Benzyl alcohol and 2-methylphenol, formed in gasoline exhaust (Verschueren, 1983), are consistent with the presence of highway runoff. Creosote contamination, perhaps from the adjacent Weaverling Spit railroad bridge, may also be indicated at this site, since methylphenols and, especially, carbazole are among its major constituents (Black and Veatch, 1986; Krone et al., 1986; Verschueren, 1983). Urban bays of Puget Sound, not in the immediate vicinity of creosote sources, have carbazole levels reaching approximately 1,000 ug/Kg, compared to 310 ug/Kg at site #3 (Black and Veatch, 1986; PTI and Tetra Tech, 1988b).

Benzoic acid has natural plant and animal sources, and wide use in chemical manufacturing and as a food preservative (Verschueren, 1983). No information was found relating it to highway runoff, creosote, or petroleum. Sediment concentrations in Puget Sound reference areas have exceeded the level of 150 ug/Kg seen at site #3 (PTI, 1991b).

The second highest concentration of HPAH (1,464 ug/Kg total HPAH) was found at site #15 in the deepest part of the inner bay, just inside Weaverling Spit. Six additional compounds were detected only at this site: isophorone, bis(2-chloroethyl)ether, phenol, 2,4-dimethylphenol, and 4-nitrophenol. A trace of caffeine was also present. Although the detection of isophorone, phenol, and 2,4-dimethylphenol is not unusual in urban sediments, bis(2-chloroethyl)ether and 4-nitrophenol are rarely reported and have no natural sources (USPHS, 1989; Verschueren, 1983). Only a trace amount of bis(2-chloroethyl)ether was detected, 1.0 ug/Kg, but the 4-nitrophenol concentration was relatively substantial at 46 ug/Kg.

Bis(2-chloroethyl)ether has a range of uses that include fumigants, solvents, as a constituent of paints, and in manufacture of textiles, medicines, and insecticides (Windholz et al., 1983; Verschueren, 1983). 4-Nitrophenol uses are more limited. Given the land use and types of municipal/industrial facilities around Fidalgo Bay, the most probable source of 4-nitrophenol is as a degradation product/impurity of the insecticide parathion. Parathion has been attributed as the source of 4-nitrophenol detected in water samples from several Puget Sound tributaries (Davis, 1996). Parathion is no longer

registered for use in Washington. An additional possible source of one or more of the suite of chemicals detected at site #15 is due to spills that have occurred on the railroad lines that cross this part of the bay (Dick Logan, personal communication).

The only other detection of isophorone, in addition to site #15, was at adjacent site #8, to the northeast inside Crandall Spit. The concentrations were 157 and 7.9 ug/Kg, respectively. As far as can be determined, the only area in Puget Sound where isophorone has consistently been detected in sediments is Eagle Harbor, which is contaminated with creosote (Black and Veatch, 1986). Isophorone was detected in 13 of 34 samples analyzed, at concentrations of 19 -120 ug/Kg. Black and Veatch did not address what the source of isophorone might be and could not determine if these concentrations were of concern. Isophorone uses include as a solvent, especially in vinyl coatings and inks, in some herbicide and pesticide formulations, and adhesives (Verschueren, 1983). It is persistent and detectable in a variety of media in and around urban centers (USPHS, 1989).

Phthalates were detected only in the vicinity of the refinery wharves. A previous Ecology sediment sample collected at the end of Texaco's wharf exceeded sediment standards for bis(2-ethylhexyl)phthalate (Hoyle-Dodson and Stasch, 1995). Of the four sites analyzed in this area during the present study, bis(2-ethylhexyl)phthalate was detected at one, site #10 between the two wharves, but the concentration was low, 9.5 ug/Kg. Site #25, closest to Texaco's outfall, had no bis(2-ethylhexyl)phthalate detectable, although 419 ug/Kg of di-N-butyl phthalate and 5.0 ug/Kg of diethyl phthalate were found. These results suggest that phthalate contamination is not widespread here.

Coprostanol was detected at sites #1 and #20 in the inner bay at similar concentrations of 213 - 234 ug/Kg. This is an environmentally persistent steroid formed in the digestive tract of mammals. Its presence indicates inputs of human and/or animal fecal matter. Shigenaka and Price (1988) reported a mean value for coprostanol of 3,340 ug/Kg in sediments of the NE Pacific coastal region. Concentrations up to 2,800 ug/Kg have been measured in Commencement Bay sediments (Tetra Tech, 1985)

Tentatively Identified Compounds

A number of additional non-target compounds were tentatively identified in the analysis for semivolatiles (Appendix C). Most of them are naturally occurring, e.g., fatty acids, cholesterol, vitamin E, and phytol.

However, site #3 and, to a lesser extent, site #15 appeared to contain some additional aromatic hydrocarbons, including nitrogen, sulfur, and oxygen-containing compounds, that have some potential for toxicity. These are listed in Table 10.

Table 10. Semivolatile Compounds Tentatively Identified in Fidalgo Bay Sediments
(ug/Kg, dry weight, ppb)

CAS Number	Chemical	Estimated Concentration
	Site #3	
1008383	m-Xylene	24
612942	2-Phenylnaphthalene	1520
26137531	1,2,3-Trimethyl-4-propenylnaphthalene	487
3442782	2-Methylpyrene	1540
132650	Dibenzothiophene	384
243425	Benzo[b]naphtho[2,3-d]furan	1990
	Site #15	
106978	Butane	1040
108883	Toluene	305
1613372	Quinoline, 1-oxide	595

PCBs

Although very low detection limits were achieved in this analysis (2.9 - 4.1 ug/Kg), only two sites, both in the nearshore, inner bay, had detectable levels of PCBs (Table 11). These were, again, site #3 which had 10 ug/Kg total PCBs, and site #4 at the head of the bay which had 9.0 ug/Kg total PCBs. A PCB concentration less than 9.0 ug/Kg may be more representative of site #4 as its detection was not confirmed in a field duplicate sample.

The PCB mixtures at these two sites appeared slightly different. Site #4 resembled PCB-1242 and site #3 the more chlorinated PCB-1254 and 1260. The most commonly reported mixture from historical use of PCBs in Puget Sound is -1254. Analyses for previous sediment surveys in Fidalgo Bay have not detected PCBs.

Comparison with Standards

Results from the Fidalgo Bay sediment survey are compared in Table 12 to the marine sediment quality standards (SQS) and cleanup screening levels (CSL) chemical criteria established by the Ecology Sediment Management Standards (WAC-173-204-420). Chemicals meeting SQS criteria are not expected to cause adverse effects on biological resources. Chemicals exceeding CSLs may require further investigation and remediation.

Table 11. PCB Concentrations in Fidalgo Bay Sediment Samples (ug/Kg, dry weight; ppm)

Station Number	Sample Number (97-)	PCB -1016	PCB -1221	PCB -1232	PCB 1242	PCB -1248	PCB -1254	PCB -1260	Total PCBs
Inner Fidalgo Bay									
1	148230	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	ND
3	148232	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	**7.4**	**3.0**	**10**
4	148233	3.6 U	3.6 U	3.6 U	**6.1**	3.6 U	**2.9** J	3.6 U	**9.0**
4 dup	148234	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	ND
5	148235	3.4 U	3.4 U	3.4 U	3.4 U	3.4 U	3.4 U	3.4 U	ND
8	148239	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	ND
15	148247	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	ND
20	148252	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	ND
21	148253	4.1 U	4.1 U	4.1 U	4.1 U	4.1 U	4.1 U	4.1 U	ND
Outer Fidalgo Bay									
10	148241	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	ND
10 dup	148242	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	ND
11	148243	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	ND
17	148249	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	ND
25	148257	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	ND
26	148258	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	ND
East side March Point									
13	148245	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	ND

Data Qualifiers:
Bold = analyte present in sample; visual aid to locating data of interest
U = not detected at or above reported value (quantitation limit)
J = positively identified; numerical value is an estimate
ND = not detected

For comparison to the standards, concentrations of non-ionizable organic compounds (e.g., PAH, phthalates, and PCBs) are normalized to the organic carbon content of the sample in question (dry weight concentration divided by the decimal fraction representing percent TOC). As directed in the WAC, only detected concentrations were used to calculate total LPAH and total HPAH, and methylnaphthalenes were not included. For individual undetected compounds the detection limit is used in normalizing.

Thirty-seven of the 47 sediment standard parameters were quantified in the sediment samples. SQS chemicals not detected in Fidalgo Bay were 1,2-, 1,4-, and 1,2,4-dichlorobenzene, hexachlorobenzene, dimethyl phthalate, butylbenzyl phthalate, di-N-octyl phthalate, hexachlorobutadiene, N-nitrosodiphenylamine, and pentachlorophenol.

Table 12. Fidalgo Bay Sediment Chemistry Compared to Sediment Management Standards

Chemical Parameter	Fidalgo Bay Sediments (n = 14) Min.	Median	90th Percentile	Max.	SQS	CSL	Locations Exceeding Standards
Metals (mg/Kg, dry weight; ppm)							
Arsenic	**3.8**	**9.4**	**14**	**16**	57	93	none
Cadmium	0.3 U	**0.5**	**0.7**	**0.8**	5.1	6.7	none
Chromium	**18**	**29**	**43**	**4**	260	270	none
Copper	**11**	**16**	**20**	**21**	390	390	none
Lead	**3.7**	**6.6**	**8.3**	**11**	450	530	none
Mercury	**0.03**	**0.05**	**0.06**	**0.07**	0.41	0.59	none
Silver	0.05 U	**0.07**	**0.10**	**0.17**	6.1	6.1	none
Zinc	**37**	**50**	**58**	**59**	410	960	none
Nonionizable Organic Compounds (mg/Kg TOC; ppm)							none
Polyaromatic Hydrocarbons							
Total LPAH[a]	**1.7**	**10**	**20**	**155**	370	780	none
Naphthalene	**1.3**	**2.8**	**4.0**	**10**	99	170	none
Acenaphthylene	**0.4**	**1.1**	**1.9**	**34**	66	66	none
Acenaphthene	**0.2**	**0.5**	**1.4**	**9.2**	16	57	none
Fluorene	**0.6**	**0.9**	**1.5**	**10**	23	79	none
Phenanthrene	**1.1**	**4.2**	**7.6**	**57**	100	480	none
Anthracene	**0.6**	**1.4**	**2.4**	**40**	220	1200	none
2-Methylnaphthalene	**0.6**	**1.1**	**1.5**	**3.4**	38	64	none
Total HPAH[b]	**5.9**	**28**	**77**	**2,220**	960	5300	Site #3
Fluoranthene	**2.0**	**8.0**	**28**	**964**	160	1200	Site #3
Pyrene	**1.4**	**7.0**	**18**	**667**	1,000	1400	none
Benzo[a]anthracene	**1.2**	**1.7**	**5.4**	**82**	110	270	none
Chrysene	**0.7**	**2.9**	**6.6**	**229**	110	460	Site #3
Tot. Benzofluoranthenes	**1.3**	**4.2**	**11**	**182**	230	450	none
Benzo[a]pyrene	**0.5**	**1.6**	**4.7**	**47**	99	210	none
Indeno[1,2,3-c,d]pyrene	**0.6**	**2.0**	**3.1**	**24**	34	88	none
Dibenzo[a,h]anthracene	**0.9**	**2.3**	**3.8**	**7.3**	12	33	none
Benzo[g,h,i]perylene	**0.9**	**1.3**	**2.4**	**17**	31	78	none
Chlorinated Benzenes							
1,2-Dichlorobenzene	1.1 U	5.8 U	8.9 U	9.8 U	2.3	2.3	none
1,4-Dichlorobenzene	1.1 U	5.8 U	8.9 U	9.8 U	3.1	9	none
1,2,4-Dichlorobenzene	1.1 U	5.8 U	8.9 U	9.8 U	0.81	1.8	none
Hexachlorobenzene	1.1 U	1.3 U	1.8 U	2.0 U	0.38	2.3	none

[a]naphthalene+acenaphthylene+acenaphthene+fluorene+phenanthrene+anthracene

[b]fluoranthene+pyrene+benzo[a]anthracene+chrysene+total benzofluoranthenes+benzo[a]pyrene indeno[1,2,3-c,d]pyrene+dibenzo[a,h]anthracene+benzo[g,h,i]perylene

Table 12 (cont.). Fidalgo Bay Sediment Chemistry Compared to Sediment Management Standards

Chemical Parameter	Fidalgo Bay Sediments (n = 14) Min.	Median	90th Percentile	Max.	SQS	CSL	Locations Exceeding Standards
Nonionizable Organic Compounds (mg/Kg TOC; ppm)							
Phthalate Esters							
Dimethyl phthalate	1.1 U	1.7 U	2.6 U	2.6 U	53	53	none
Diethyl phthalate	1.1 U	1.3 U	2.4 U	**0.4**	61	110	none
Di-N-butyl phthalate	1.4 U	6.2 U	24 U	**35**	220	1700	none
Butylbenzyl phthalate	1.1 U	1.3 U	1.8 U	2.0 U	4.9	64	none
Bis(2-ethylhexyl)phthalate	1.4 U	2.9 U	6.0 U	**3.4**	47	78	none
Di-N-Octyl phthalate	1.1 U	1.9 U	13 U	13 U	58	4500	none
Miscellaneous							
Dibenzofuran	**0.5**	**0.9**	**1.5**	**4.5**	15	58	none
Hexachlorobutadiene	1.1 U	5.8 U	8.9 U	9.8 U	3.9	6.2	none
N-Nitrosodiphenylamine	1.1 U	1.3 U	1.8 U	2.0 U	11	11	none
Total PCBs	0.2 U	0.3 U	**0.6**	**1.8**	12	65	none
Ionizable Organic Compounds (ug/Kg, dry weight; ppb)							
Phenol	15 U	29 U	**30**	**77**	420	1200	none
2-Methylphenol	6.5 U	25 U	35 U	**6.5**	63	63	none
4-Methylphenol	**9.3**	**21**	**38**	**48**	670	670	none
2,4-Dimethylphenol	15 U	16 U	20 U	**1.0**	29	29	none
Pentachlorophenol	73 U	96 U	195 U	206 U	360	690	none
Benzyl alcohol	15 U	30 U	38 U	**12**	57	73	none
Benzoic acid	78 U	142 U	391 U	**150**	650	650	none

Data Qualifiers:
BOLD = analyte present in samples; visual aid to locating data of interest
U = not detected at or above reported value

Of the 14 sites analyzed, only site #3 on the west shore of March Point exceeded SQS standards and only for HPAH compounds. Concentrations of total HPAH and chrysene at this site were twice the SQS standard (2,220 and 229 mg/Kg TOC vs. 960 and 110 mg/Kg TOC). The fluoranthene concentration was six times above the SQS standard (964 mg/Kg TOC vs. 160 mg/Kg TOC). However, none of the PAHs at site #3 exceeded CSLs. Although nearby sites also showed some elevation in HPAH, concentrations were one to two orders of magnitude lower than sediment quality standards. Other chemicals detected, here and elsewhere in Fidalgo Bay, were also within standards by a factor of 10 or better.

Comparison with Reference Areas

The levels and detection frequencies of the metals and organic compounds identified in Fidalgo Bay sediments are compared in Table 13 to similar data on reference areas in Puget Sound removed from sources of chemical contamination (PTI, 1991a,b; PTI and Tetra Tech, 1988a). Several conclusions follow with respect to overall sediment quality conditions in the bay:

- Metals concentrations in Fidalgo Bay are comparable to or slightly less than those found in reference areas.

- PAH concentrations are two to four times higher than reference areas, indicating there has been some degradation of sediment quality with regard to these compounds. PAHs were also more frequently detected in Fidalgo Bay than in reference area sediments, but this is probably due to the low-level analysis employed for the present survey.

- Retene and dibenzofuran are frequently detected (using a low-level analysis) but not elevated compared to reference sediments.

- Phenol, 4-methylphenol, bis(2-ethylhexyl)phthalate, total PCBs, benzoic acid, and benzyl alcohol have lower concentrations and are less frequently detected in Fidalgo sediments than in reference areas.

- The remaining compounds, detecting in only one or two Fidalgo Bay samples, have either not been detected in reference areas – 2-methylphenol, 2,4-dimethylphenol, 4-nitrophenol, diethyl phthalate, di-N-butyl phthalate, carbazole, isophorone, and bis(2-chloroethyl)ether – or there are no reference area data available – caffeine and coprostanol.

Table 13. Fidalgo Bay Sediment Chemistry Compared to Puget Sound Reference Areas

[metals in mg/Kg, organics in ug/Kg; dry weight]

Chemical	Fidalgo Bay Sediments (n=14)			Reference Area Sediment		
	Median	90th Percentile	Detection Frequency	Median	90th Percentile	Detection Frequency
Metals						
Arsenic	9.4	14	100%	7.0	17	86%
Cadmium	0.5	0.7	71%	0.42	1.6	87%
Chromium	29	43	100%	49	142	100%
Copper	16	20	100%	27	53	99%
Lead	6.6	8.3	100%	12	28	94%
Mercury	0.05	0.06	100%	0.08	0.18	87%
Silver	0.07	0.10	86%	0.14	0.38	87%
Zinc	50	58	100%	64	100	100%
Polyaromatic Hydrocarbons						
Total LPAH[a]	176	286	100%	42	160	69%
Total HPAH[a]	381	1,197	100%	120	420	77%
Phenols						
Phenol	< 30	77*	14%	53	510	35%
2-Methylphenol	nd	6.5*	7%	< 6 - < 22 (range)		0%
4-Methylphenol	< 21	48*	78%	120	1400	34%
2,4-Dimethylphenol	nd	1.0*	7%	< 21 - < 70 (range)		0%
4-Nitrophenol	nd	46*	7%	< 12 - < 44 (range)		0%
Phthalate Esters						
Diethyl phthalate	nd	5.0*	7%	< 6 - < 22 (range)		0%
Di-N-butyl phthalate	nd	419*	7%	< 6 - < 22 (range)		0%
Bis(2-ethylhexyl)phthalate	< 36	9.5*	7%	62	2000	23%
Polychlorinated Biphenyls						
Total PCBs	<3.0	10*	14%	7.2	37	25%
Miscellaneous Semivolatiles						
Retene	17	27	100%	nd - 130 (range)		62%
Dibenzofuran	12	16	86%	14	130*	12%
Carbazole	nd	310*	7%	< 6 - < 22 (range)		0%
Benzoic acid	nd	150*	7%	180	353	100%
Benzyl alcohol	nd	12*	7%	9	33*	56%
Isophorone	nd	157*	14%	< 0.5- < 130 (range)		0%
Bis(2-chloroethyl)ether	nd	1.0*	7%	< 6 - < 22 (range)		0%
Caffeine	nd	5.2*	7%	--	--	0%
Coprostanol	nd	234*	14%	--	--	--

[a]from Table 9 *maximum nd = not detected

Tributyltins

Analysis for butyltins was limited to selected samples collected near the refinery wharves (sites #10, 11, and 25) and on the west side of the bay where marinas and boatyards are located (#26 and 27). Results (Table 14) showed low concentrations of 0.1 - 1.9 ug tributyltin/Kg* at sites #25, 26 and 27. Traces of monobutyltin were detected in all samples but, as mentioned earlier, may be an analytical artifact.

The levels of tributyltin found in the Fidalgo Bay samples are typical of background concentrations. PTI (1988) reported a "baseline" of 1-3 ug tributyltin/Kg in fine-grained Puget Sound sediments. Samples from a "clean reference site" in Puget Sound (off President Point) had no tributyltin detectable (<1.5 ug/Kg; Krone et al., 1989).

Variable and often high concentrations of tributyltin occur in sediments from Puget Sound marinas and waterways. The National Marine Fisheries Service found 21-3,300 ug/Kg at locations in Duwamish Waterway, Everett, Shilshole, and Bellingham Bay (Varanasi et al., 1988). Battelle analyzed sediments at the Anacortes Cap Sante Marina in 1988 (Crecelius et al., 1989). Tributyltin levels were 14 - 80 ug/Kg inside the marina and <1 - 6 ug/Kg outside.

Table 14. Organotins in Fidalgo Bay Sediment Samples (ug/Kg, dry weight; ppb)

	Outer Fidalgo Bay					
Station Number:	10	11	25	25 dup.	26	27
Sample Number (97-):	148241	148243	148257	148257	148258	148259
Tetrabutyltin chloride	8.7 U	8.6 U	7.1 U	19 U	9.0 U	7.5 U
Tributyltin chloride	8.6 U	8.6 U	**1.3** J	**2.1** J	**0.3** J	**0.1** J
Dibutyltin chloride	8.9 U	8.8 U	7.3 U	20 U	9.2 U	7.6 U
Monbutyltin chloride	**7.3** J	**1.1** J	**6.9** J	**3.2** J	**2.6** J	**1.8** J
Tributyltin (as TBT+)	- -	- -	**1.2** J	**1.9** J	**0.3** J	**0.1** J

Data Qualifiers:
BOLD = analyte present in samples; visual aid to locating data of interest
U = not detected at or above reported value
J = positively identified; numerical value is an estimate

*The tributyltin results in Table 14 are shown converted from tributyltin chloride, as analyzed by MEL, to tributyltin ion (TBT^+), the form reported in most Puget Sound studies.

Currently, there are no sediment standards for tributyltin. PSDDA had a screening level of 73 ug tributyltin/Kg, but interagency sediment programs are no longer using bulk sediment chemistry for tributyltin because of the poor relationship to toxicity (Teresa Michelsen, personal communication). The PSDDA value has now been replaced by an interstitial water concentration.

Herring Embryo Mortality

As already noted, sites #10, 11 and 20 were selected partly because of concerns DNR had about mortality observed on herring embryos in these areas. Because of a lack of information on the precise location of the herring study sites, the samples for the Ecology/DNR sediment survey may not have coincided exactly.

Survey results did not identify any chemical contaminant that could clearly be linked to adverse effects on herring. Sediment samples from sites #10 and 11 were among the least contaminated in the survey. All three of these sites met sediment quality standards and no petroleum was detected. Tributyltin was analyzed for sites #10 and 11 but not detected.

There were some indications of chemical contamination in the area around site #20. The sediments at site #20 were moderately elevated in HPAH and this was one of two sites where coprostanol, an indicator of fecal matter, was found. Results from nearby site #15 showed substantially elevated HPAH and the unusual detection of 4-nitrophenol and bis(2-chloroethyl)ether. Isophorone, phenol, and 2,4-dimethylphenol were also unique to site #15.

Conclusions

Results of this survey show the chemical quality of the sediments in Fidalgo Bay to be generally good. With one exception, petroleum was not observed in the sediments. PAH concentrations are moderately elevated through much of the bay; combustion sources are primarily indicated. The levels of other semivolatiles, metals, PCBs, and tributyltins are low to non-detectable.

Site #3 on the west shore of March Point was contaminated with motor oil and exceeds sediment quality standards but not cleanup screening levels for HPAH. The contamination appears to be from highway runoff and, perhaps, creosote, and not clearly related to past oil spills. An unusual suite of chemicals, including 4-nitrophenol and bis(2-chloroethyl)ether, was detected in the sediments at site #15 in the center of inner Fidalgo Bay. It is not known if this finding has any biological significance.

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Appendices

APPENDIX A

Sampling Site Information

Appendix A. Locations of Ecology/DNR Sediment Samples from Fidalgo Bay and Vicinity

Station Number	Sample Number	Date (April 1997)	Latitude (48°N)	Longitude (122°W)	Depth (ft. @mllw)	Remarks	Oil or sheen visible?
Inner Fidalgo Bay							no
1	148230	3	28.087'	34.193'	dry	mud	no
2	148231	3	28.389'	31.186'	dry	mud	no
3	148232	3	28.730'	34.330'	dry	mud	no
4	148233	3	28.095'	34.427'	dry	mud	no
5	148235	3	28.298'	34.430'	dry	mud	no
6	148236	3	28.599'	34.462'	dry	mud	no
7	148237	3	28.865'	34.495'	dry	mud	no
8	148239	3	29.243	34.815'	dry	mud	no
15	148247	3	28.678'	34.707'	8	mud/shell	no
16	148248	2	29.250'	35.171'	18	mud/shell	no
19	148251	3	28.193'	34.650'	dry	mud	no
20	148252	3	28.551'	34.789'	dry	mud/eelgrass	no
21	148253	3	28.761'	34.936'	dry	mud	no
22	148254	3	28.866'	34.840'	1	mud	no
Outer Fidalgo Bay							no
9	148240	2	29.666'	34.797'	6	mud	no
10	148241	2	30.106'	34.207'	5	mud/eelgrass/shell	no
11	148243	2	30.326'	33.686'	5	mud	no
17	148249	2	29.892'	34.824'	17	mud/wood fragments	no
18	148250	2	30.387'	34.397'	18	mud	no
23	148255	4	29.589'	35.436'	7	mud/shell	no
24	148256	4	30.045'	35.128'	8	mud	no
25	148257	4	30.451'	34.926'	17	mud	no
26	148258	4	29.902'	35.626'	7	mud	no
27	148259	4	30.342'	35.417'	8	mud	no
E. side March Point							no
12	148244	2	29.810'	33.038'	2	muddy sand	no
13	148245	2	29.447'	32.739'	1	mud/eelgrass	no
14	148246	2	29.110'	32.423'	dry	sand	no
Padilla Bay							no
28	148260	2	29.493'	31.107'	3	muddy sand	no
29	148261	3	28.750'	28.270'	dry	mud	no
30	148262	3	29.220'	28.780'	dry	mud	no

APPENDIX B

Chain of Custody

Page 1 of 3

Laboratory Analyses Required

Project Name: FIDALGO BAY SEDIMENTS

PIC: D3415 **Program:** EILS

Send Results to: Art Johnson **Mail Stop:** 419

☑ Preliminary Investigation ☐ For HW Designation
☐ Monitoring ☒ For NPDES

Date Results needed by:
☑ There is a QAPP for this project

Sampling: Date (Year: 1997) Mo	Da	Time Hr	Mn	Field Station Identification	Lab Sample Number	Matrix Code	Source Code	No. of Containers	General Chemistry	Micro	Metals	Organic Chemistry
04	03				1	148230	40	14	6		X	X
	03				2	31	″	″	2			X
	03				3	32			6		X	X
	03				4	33			6		X	X
	03				4A	34			5		X	X
	03				5	35			6		X	X
	03				6	36			2			X
	03				7	37			2			X
	03				7A	38			1			X
	03				8	39			6		X	X
	02				9	40			2			X
↓	02				10	41	↓	↓	6		X	X

Project Officer: Art Johnson
Phone number: 407 6766
Samplers: Art Johnson, Dave Serdar

Recorder: Art Johnson
Date: 3/27/97

Chain of Custody Record

Relinquished By:	Received By:	Yr	Mo	Da	Hr	Mn	Seal I.D.	Condition of Seals	Comments
Art Johnson	HQ Walk-in	97	04	04	19	35	0006731		
	Pam Ellis	97	04	07	10	00	0006731	Intact	
							0006251		
							0007688		

Comments: (1) PNA - by low-level method (5-25 ppb)
(2) No of containers includes one with excess sample (except stations 4A and 7A)
(3) Save samples until July 1 1997
(4) Analyze butyltins in SRM HISS-1, if available, in conjunction with the Fidalgo samples

ECY 040-115 Rev. 4/96

Laboratory Analyses Required

Project Name: FIDALGO BAY SEDIMENTS

PIC: D3415 **Program:** EILS

Send Results to: Art Johnson **Mail Stop:** HQ

☑ Preliminary Investigation ☐ Monitoring ☐ For HW Designation ☐ For NPDES

Date Results needed by: ______ ☑ There is a QAPP for this project.

Year: 1997

Mo	Da	Hr	Mn	Field Station Identification	Lab Sample Number	Matrix Code	Source Code	No. of Containers	%Solids	TOC	Grain size	Mercury (Hg)	As, Ag, Cd, Cr, Cu, Pb, Zn	BNA	PCB's only	WTPH-D	Butyltins
04	02			10A	148242	40	14	1	X X	X X	X X	X X	X X	X X	X X	X X	X
	02			11	43			6								X	
	02			12	44			2				X	X	X	X	X	
	02			13	45			6	X	X	X					X	
	02			14	46			2				X	X	X	X	X	
	03			15	47			6	X	X	X					X	
	02			16	48			2				X	X	X	X	X	
	02			17	49			6	X	X	X					X	
	02			18	50			2								X	
	03			19	51			2				X	X	X	X	X	
	03			20	52			6	X	X	X						
	03			21	53			6	X	X	X	X	X	X	X	X	

General Chemistry: Alkalinity, Conductivity, Hardness, pH, Turbidity, ☐ Chloride ☐ Sulfate, Cyanide ☐ Total ☐ Weak, Total Solids, Total Nonvolatile Solids, Total Suspended Solids, Total Nonvol. Suspend., Total Dissolved Solids, ☑ %Solids ☐ %Vol. Solids, TOC, BOD (5-day), Oil & Grease, Ammonia, Nitrate-Nitrite, Total Phos. ☐ low level, Orthophos. ☐ low level, Nitrate, Nitrite, ☐ TPN ☐ TKN, Chlorophyll ☐ filters, Grain size

Micro: Fecal Coliforms ☐ MF ☐ MPN, Total Coliforms ☐ MF ☐ MPN, E-Coli ☐ MF ☐ MPN, %Klebsiella

Metals: ICP Scan, ICP/MS scan, PP Metals, TCLP-Metals, Mercury (Hg), GFAA list individually, As, Ag, Cd, Cr, Cu, Pb, Zn; ☐ Total ☐ Total Rec. ☐ Dissolved

Organic Chemistry: BNA ☐ w/extensive TIC's, PAH's, VOA ☐ w/extensive TIC's, BTEX, Pests/PCB's, PCB's only, OP- Pests, Herbicides, WTPH-HCID, WTPH-G, WTPH-D, WTPH-418.1 Modified, HCID Only, Butyltins

Project Officer: Art Johnson

Phone number: 407 6766

Samplers: Art Johnson, Dave Serdar

Recorder: Art Johnson

Date: 3/27/97

Chain of Custody Record

Relinquished By:	Received By:	Yr	Mo	Da	Hr	Mn	Seal I.D.	Condition of Seals	Comments
Art Johnson	HQ walk-in	97	04	04	15	35	0067488		
	Kim Curley	97	04	07	10	00			

Comments: see page 1

ECY 040-115 Rev. 4/96

Laboratory Analyses Required

Project Name: FIDALGO BAY SEDIMENTS

PIC: D 2415 **Program:** EILS

Send Results to: Art Johnson **Mail Stop:** HQ

☑ Preliminary Investigation
☐ Monitoring
☐ For HW Designation
☐ For NPDES

Date Results needed by: ______
☑ There is a QAPP for this project

Analysis columns on the form:

- General Chemistry: Alkalinity, Conductivity, Hardness, pH, Turbidity, ☐ Chloride ☐ Sulfate, Cyanide ☐ Total ☐ Weak, Total Solids, Total Nonvolatile Solids, Total Suspended Solids, Total Nonvol Suspend, Total Dissolved Solids, ☑ %Solids ☐ %Vol. Solids, TOC, BOD (5 day), Oil & Grease, Ammonia, Nitrate-Nitrite, Total Phos. ☐ low level, Orthophos. ☐ low level, Nitrate, Nitrite, ☐ TPN ☐ TKN, Chlorophyll ☐ filters, Grain size
- Micro: Fecal Coliforms ☐ MF ☐ MPN, Total Coliforms ☐ MF ☐ MPN, E-Coli ☐ MF ☐ MPN, %Klebsiella
- Metals: ICP Scan, ICP/MS scan, PP Metals, TCLP Metals, Mercury (Hg), GFAA list individually: As, Ag, Cd, Cr, Cu, Pb, Zn; ☐ Total ☐ Total Rec. ☐ Dissolved
- Organic Chemistry: BNA ☐ w/extensive TIC's, PAH's, VOA ☐ w/extensive TIC's, BTEX, Pests/PCB's, PCB's only, OP- Pests, Herbicides, WTPH-HCID, WTPH-G, WTPH-D, WTPH-418.1 Modified, HCID Only, Butyltins

Date Mo	Date Da (Year: 1997)	Time Hr	Time Mn	Field Station Identification	Lab Sample Number	Matrix Code	Source Code	No. of Containers	%Solids	TOC	Grain size	Mercury (Hg)	GFAA (As, Ag, Cd, Cr, Cu, Pb, Zn)	BNA	PCB's only	WTPH-D	Butyltins
04	03			22	148254	40	14	2								X	
	04			23	55			2								X	
	04			24	56			2								X	
	04			25	57			6	X	X	X	X	X	X	X	X	X
	04			26	58			6	X	X	X	X	X	X	X	X	X
	04			27	59			3								X	X
	02			28	60			2								X	
	03			29	61			2								X	
	02			30	62			2								X	

Project Officer: Art Johnson
Phone number: 407 6766
Samplers: Art Johnson, Dave Serdar

Recorder: Art Johnson
Date: 3/27/97

Chain of Custody Record

Relinquished By:	Received By:	Yr	Mo	Da	Hr	Mn	Seal I.D.	Condition of Seals	Comments
Art Johnson	HQ walk-in	97	04	04	15	35	0006251		
	Pam Covey	97	04	07	10	00			

Comments: see page 1

ECY 040-115 Rev. 4/95

APPENDIX C

Complete Chemical Data and QA Reviews

State of Washington Department of Ecology
Manchester Environmental Laboratory
7411 Beach Dr. East Port Orchard WA. 98366

May 12, 1997

Project: Fidalgo Bay Sediments

Samples: 14-8230, 32-35, 39, 41-43, 45, 47, 49, 52-53, 57-58

Laboratory: Columbia Analytical

By: Pam Covey

Case Summary

These samples required sixteen (16) Grain Size analyses on sediment using Puget Sound EstuaryProtocol (PSEP) method for gravel, sand, silt, and clay only.

The samples were received at the Manchester Environmental Laboratory on April 7, 1997 and transported to Rosa Entironmental on April 14, 1997 for Grain Size analyses.

The analyses were reviewed for qualitative and quantitative accuracy, validity and usefulness.

The results are acceptable for use as reported.

Rosa Environmental & Geotechnical Laboratory, LLC.

Washington Department of Ecology
Fidalgo Bay Project

Table 1. Summary of Apparent Grain Size Test Results

Sample Number	% Gravel	% Sand	% Silt	% Clay
148230	0	27	51	22
148232 Dup-1	0	66	24	10
148232 Dup-2	1	65	23	11
148233	0	2	78	20
148234	0	0	77	23
148235	0	5	78	17
148239	0	26	58	16
148241	0	48	42	10
148242	0	47	43	10
148243	0	59	33	8
148245	0	53	40	7
148247	9	16	55	20
148249	1	19	65	15
148252	0	9	68	23
148253	0	7	72	20
148257	0	52	35	13
148258	0	18	71	11

Narrative

The samples were analyzed using a modified Puget Sound Estuary Program grain size protocol. The protocol was modified to only identify the major components (i.e., gravel, sand, silt, and clay). The test results are labeled "apparent" as no efforts were made to remove the organic constituents of the sediments. The samples were uniform and consistent, with no anomalies encountered. During the analysis, no anomalies were encountered.

Raw data was recorded on the data sheet. This was then input to an Excel worksheet for calculation of the various parameters. Calculated results are then entered on the data sheet. These are randomly checked by hand calculation to ensure the worksheet has not been modified.

Various checks are conducted during the analysis to ensure that the test is progressing normally. The first check is to ensure that the amount of material in the pipette portion is between 5 and 25 grams mass, as specified by the protocol. All samples were within this range. The second check is that the ratio of the total sample mass as calculated from the moisture content and wet weight ("before") to the weight of sediment "after" (the sum of the material in the 20 second pipette reading and the mass used in the sieve portion) is less than 5%. All of the samples were within this range. the last check is that the sum of all the components (gravel, sand, silt, and clay) add up to 100%.

Washington State Department of Ecology
Manchester Laboratory

April 24, 1997

TO: Art Johnson

FROM: Debbie Lacroix, Chemist

SUBJECT: General Chemistry Quality Assurance memo for the Fidalgo Bay Sediments Project

SUMMARY

The data generated by the analysis of these samples can be used without qualification. Total organic carbon (TOC) data is reported at 70°C and 104°C.

SAMPLE INFORMATION

Samples 97147230-58 from the Fidalgo Bay Sediments project were received by the Manchester Laboratory on 4-7-97 in good condition.

HOLDING TIMES

All analyses were performed within applicable EPA holding times.

ANALYSIS PERFORMANCE

Instrument Calibration

Where applicable, instrument calibration was performed before each analysis and verified by initial and verification standards and blanks. All initial and continuing calibration verification standards were within the relevant EPA control limits. A correlation of 0.995 or greater was met as stated in CLP calibration requirements. All balances are calibrated yearly with calibration verification occurring monthly.

Procedural Blanks

All procedural blanks were within acceptable limits.

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Total Organic Carbon

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Project Officer: Art Johnson
Date Reported: 23-APR-97

Method: PSEP-TOC
Matrix: Sediment/Soil
Analyte: Total Organic Carbon 70 C dry weight

Sample	QC	Field ID	Result	Qualifier	Units		Received	Analyzed
97148230		1	1.4		%	Dry Wt.	04/07/97	04/17/97
97148232		3	1.1		%	Dry Wt.	04/07/97	04/17/97
97148232	Duplicate		1.1		%	Dry Wt.	04/07/97	04/17/97
97148232	Replicate		1.2		%	Dry Wt.	04/07/97	04/17/97
97148233		4	1.4		%	Dry Wt.	04/07/97	04/17/97
97148234		4A	1.4		%	Dry Wt.	04/07/97	04/17/97
97148235		5	0.98		%	Dry Wt.	04/07/97	04/17/97
97148239		8	1.4		%	Dry Wt.	04/07/97	04/17/97
97148241		10	0.86		%	Dry Wt.	04/07/97	04/17/97
97148242		10A	0.87		%	Dry Wt.	04/07/97	04/17/97
97148243		11	0.80		%	Dry Wt.	04/07/97	04/17/97
97148245		13	0.84		%	Dry Wt.	04/07/97	04/17/97
97148247		15	1.6		%	Dry Wt.	04/07/97	04/17/97
97148249		17	1.7		%	Dry Wt.	04/07/97	04/17/97
97148252		20	1.6		%	Dry Wt.	04/07/97	04/17/97
97148253		21	1.6		%	Dry Wt.	04/07/97	04/17/97
97148257		25	1.2		%	Dry Wt.	04/07/97	04/17/97
97148258		26	1.0		%	Dry Wt.	04/07/97	04/17/97
97148258	Duplicate		1.0		%	Dry Wt.	04/07/97	04/17/97

Authorized By: Debbie Sarason

Release Date: 4-24-97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Total Organic Carbon

Project Name: Fidalgo Bay Sediments **LIMS Project ID:** 1161-97

Project Officer: Art Johnson
Date Reported: 22-APR-97

Method: PSEP-TOC
Matrix: Sediment/Soil
Analyte: Total Organic Carbon 104 C dry weight

Sample	QC	Field ID	Result	Qualifier	Units		Received	Analyzed
97148230		1	1.4		%	Dry Wt.	04/07/97	04/17/97
97148232		3	1.1		%	Dry Wt.	04/07/97	04/17/97
97148233		4	1.4		%	Dry Wt.	04/07/97	04/17/97
97148234		4A	1.4		%	Dry Wt.	04/07/97	04/17/97
97148235		5	0.99		%	Dry Wt.	04/07/97	04/17/97
97148239		8	1.4		%	Dry Wt.	04/07/97	04/17/97
97148241		10	0.87		%	Dry Wt.	04/07/97	04/17/97
97148242		10A	0.90		%	Dry Wt.	04/07/97	04/17/97
97148243		11	0.81		%	Dry Wt.	04/07/97	04/17/97
97148245		13	0.87		%	Dry Wt.	04/07/97	04/17/97
97148247		15	1.6		%	Dry Wt.	04/07/97	04/17/97
97148249		17	1.7		%	Dry Wt.	04/07/97	04/17/97
97148252		20	1.7		%	Dry Wt.	04/07/97	04/17/97
97148253		21	1.6		%	Dry Wt.	04/07/97	04/17/97
97148257		25	1.2		%	Dry Wt.	04/07/97	04/17/97
97148258		26	1.1		%	Dry Wt.	04/07/97	04/17/97
97148258	Duplicate		1.1		%	Dry Wt.	04/07/97	04/17/97

Authorized By: Debbi Sanders Release Date: 4-24-97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Percent solids soil/tissue

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Project Officer: Art Johnson
Date Reported: 10-APR-97

Method: EPA160.3
Matrix: Sediment/Soil
Analyte: Solids

Sample	QC	Field ID	Result	Qualifier	Units	Received	Analyzed
97148230		1	54.0		%	04/07/97	04/09/97
97148230	Duplicate		54.2		%	04/07/97	04/09/97
97148232		3	64.3		%	04/07/97	04/09/97
97148233		4	50.7		%	04/07/97	04/09/97
97148234		4A	51.2		%	04/07/97	04/09/97
97148235		5	52.4		%	04/07/97	04/09/97
97148239		8	57.5		%	04/07/97	04/09/97
97148241		10	59.6		%	04/07/97	04/09/97
97148242		10A	58.5		%	04/07/97	04/09/97
97148243		11	60.7		%	04/07/97	04/09/97
97148245		13	60.6		%	04/07/97	04/09/97
97148247		15	46.9		%	04/07/97	04/09/97
97148249		17	48.4		%	04/07/97	04/09/97
97148252		20	47.5		%	04/07/97	04/09/97
97148253		21	47.2		%	04/07/97	04/09/97
97148257		25	54.5		%	04/07/97	04/09/97
97148258		26	60.3		%	04/07/97	04/09/97
97148258	Duplicate		60.3		%	04/07/97	04/09/97

Authorized By: Debbi Sherrow

Release Date: 4-24-97

Manchester Environmental Laboratory

7411 Beach Dr E, Port Orchard Washington 98366

CASE NARRATIVE

May 21, 1997

Subject:	Fidalgo Bay Sediment Study
Samples:	97148230 - 97148262
Case No.	116197
Officer:	Art Johnson
By:	Myrna McIntosh Organics Analysis Unit

WTPH-Dx Analysis of Fidalgo Bay Sediment Study

SUMMARY:

Samples 97148230 - 97148262 were extracted into methylene chloride using Soxhlet extraction and analyzed by GC-FID. The sample results are quantitated for diesel and lubricating oil range petroleum hydrocarbons. The reference standards used for quantitation are #2 diesel fuel and 30 wt Pennzoil.

There is no evidence of diesel range hydrocarbons above the diesel reporting limit. Sample 97148232 contains lubricating range hydrocarbons and is quantitated against the motor oil standard.

There are non-petroleum hydrocarbons present in the samples. In most of the samples, these hydrocarbons interfere with the lubricating oil range hydrocarbons. The reporting limits have been raised to account for this interference.

All data are usable as reported.

METHODS:

The WTPH-Dx method was used for this analysis which is a modification of EPA SW-846 8000A and 3540A.

BLANKS:

There were no analytes of interest in any of the blanks.

SURROGATES:

Surrogate recoveries are within the control limits of 50 - 150%.

HOLDING TIMES:

Samples were analyzed within recommended holding times.

DUPLICATE SAMPLES:

At the project officer's request, no laboratory duplicates were analyzed.

DATA QUALIFIER CODES:

U	-	The analyte was not detected at or above the reported value.
J	-	The analyte was positively identified. The associated numerical value is an estimate.
UJ	-	The analyte was not detected at or above the reported estimated result.
REJ	-	The data are unusable for all purposes.
NAF	-	Not analyzed for.
N	-	For organic analytes there is evidence the analyte is present in this sample.
NJ	-	There is evidence that the analyte is present. The associated numerical result is an estimate.
E	-	This qualifier is used when the concentration of the associated value exceeds the known calibration range.
bold	-	The analyte was present in the sample. (Visual Aid to locate detected compound on report sheet.)

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

LIMS Project ID: 1161-97

Project Name: Fidalgo Bay Sediments

Sample: 97148230
Field ID: 1
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/16/97
Date Analyzed: 04/21/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	11	U
Lube Oil	38	U

Surrogate Recoveries

Pentacosane	**103**	%

Authorized By: [signature] Release Date: 5/20/97 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148231
Field ID: 2
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/16/97
Date Analyzed: 04/21/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	7.3	U
Lube Oil	19	U

Surrogate Recoveries

Pentacosane	**115**	**%**

Authorized By: _____ Release Date: 5/20/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148232
Field ID: 3
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/16/97
Date Analyzed: 04/21/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	7.9	U
Lube Oil	170	

Surrogate Recoveries

Pentacosane	127	%

Authorized By: _____ Release Date: 5/26/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148233
Field ID: 4
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/16/97
Date Analyzed: 04/21/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	15	U
Lube Oil	53	U

Surrogate Recoveries

Pentacosane	128	%

Authorized By: _____ Release Date: 5/20/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148234
Field ID: 4A
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/16/97
Date Analyzed: 04/21/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	22	U
Lube Oil	64	U

Surrogate Recoveries

Pentacosane	**128**	**%**

Authorized By: _____ Release Date: 5/20/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148235
Field ID: 5
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/16/97
Date Analyzed: 04/21/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	21	U
Lube Oil	57	U

Surrogate Recoveries

Pentacosane	**119**	**%**

Authorized By: _____ Release Date: 5/20/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148236
Field ID: 6
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/16/97
Date Analyzed: 04/21/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	13	U
Lube Oil	26	U

Surrogate Recoveries

Pentacosane	**109**	%

Authorized By: _____ Release Date: 5/20/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148237
Field ID: 7
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/17/97
Date Analyzed: 04/21/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	18	U
Lube Oil	41	U

Surrogate Recoveries

Pentacosane	**118**	%

Authorized By: _____ Release Date: 5/20/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148238
Field ID: 7A
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/17/97
Date Analyzed: 04/21/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	15	U
Lube Oil	70	U

Surrogate Recoveries

Pentacosane	115	%

Authorized By: _____ Release Date: 5/20/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148239
Field ID: 8
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/17/97
Date Analyzed: 04/21/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	19	U
Lube Oil	39	U

Surrogate Recoveries

Pentacosane	**123**	**%**

Authorized By: _____ Release Date: 5/20/97 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148240
Field ID: 9
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/16/97
Date Analyzed: 04/21/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	8.9	U
Lube Oil	61	U

Surrogate Recoveries

Pentacosane	**117**	**%**

Authorized By: _____ Release Date: 5/20/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148241
Field ID: 10
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/16/97
Date Analyzed: 04/21/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	8.1	U
Lube Oil	42	U

Surrogate Recoveries

Pentacosane	**111**	**%**

Authorized By: _____ Release Date: 5/20/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148242
Field ID: 10A
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/16/97
Date Analyzed: 04/21/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	8.1	U
Lube Oil	29	U

Surrogate Recoveries

Pentacosane	111	%

Authorized By: _____ Release Date: 5/20/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148243
Field ID: 11
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/16/97
Date Analyzed: 04/21/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	10	U
Lube Oil	38	U

Surrogate Recoveries

Pentacosane	**130**	**%**

Authorized By: _____ Release Date: 5/20/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148244
Field ID: 12
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/16/97
Date Analyzed: 04/21/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	11	U
Lube Oil	47	U

Surrogate Recoveries

Pentacosane	91	%

Authorized By: _____ Release Date: 5/20/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148245
Field ID: 13
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/16/97
Date Analyzed: 04/21/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	14	U
Lube Oil	32	U

Surrogate Recoveries

Pentacosane	118	%

Authorized By: _____ Release Date: 5/20/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148246
Field ID: 14
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/16/97
Date Analyzed: 04/21/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	11	U
Lube Oil	28	U

Surrogate Recoveries

Pentacosane	**125**	%

Authorized By: Kim Todd Release Date: 5/20/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148247
Field ID: 15
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/16/97
Date Analyzed: 04/21/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	20	U
Lube Oil	76	U

Surrogate Recoveries

Pentacosane	132	%

Authorized By: Kevin Fitzpatrick Release Date: 5/20/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148248
Field ID: 16
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/16/97
Date Analyzed: 04/21/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	13	U
Lube Oil	61	U

Surrogate Recoveries

Pentacosane	**112**	%

Authorized By: _____ Release Date: 5/20/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148249
Field ID: 17
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/16/97
Date Analyzed: 04/22/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	19	U
Lube Oil	86	U

Surrogate Recoveries

Pentacosane	80	%

Authorized By: _____ Release Date: 5/20/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148250
Field ID: 18
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/16/97
Date Analyzed: 04/22/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	14	U
Lube Oil	56	U

Surrogate Recoveries

Pentacosane	**86**	%

Authorized By: _____ Release Date: 5/20/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148251
Field ID: 19
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/17/97
Date Analyzed: 04/22/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	18	U
Lube Oil	80	U

Surrogate Recoveries

Pentacosane	**89**	%

Authorized By: _____ Release Date: 5/20/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148252
Field ID: 20
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/17/97
Date Analyzed: 04/22/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	17	U
Lube Oil	91	U

Surrogate Recoveries

Pentacosane	**80**	**%**

Authorized By: _____ Release Date: 5/20/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148253
Field ID: 21
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/17/97
Date Analyzed: 04/22/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	21	U
Lube Oil	81	U

Surrogate Recoveries

Pentacosane	89	%

Authorized By: [signature]   Release Date: 5/20/97   Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148254
Field ID: 22
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/17/97
Date Analyzed: 04/22/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	30	U
Lube Oil	130	U

Surrogate Recoveries

Pentacosane	88	%

Authorized By: Kim Field

Release Date: 5/20/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148255
Field ID: 23
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/17/97
Date Analyzed: 04/22/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	22	U
Lube Oil	52	U

Surrogate Recoveries

Pentacosane	**88**	%

Authorized By: _____ Release Date: 5/20/97 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148256
Field ID: 24
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/17/97
Date Analyzed: 04/22/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	16	U
Lube Oil	34	U

Surrogate Recoveries

Pentacosane	62	%

Authorized By: _____ Release Date: 5/20/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148257
Field ID: 25
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/17/97
Date Analyzed: 04/22/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	15	U
Lube Oil	30	U

Surrogate Recoveries

Pentacosane	77	%

Authorized By: Kerri Tindall Release Date: 5/20/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148258
Field ID: 26
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/17/97
Date Analyzed: 04/22/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	11	U
Lube Oil	22	U

Surrogate Recoveries

Pentacosane	90	%

Authorized By: _____ Release Date: 5/20/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148259
Field ID: 27
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/17/97
Date Analyzed: 04/22/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	16	U
Lube Oil	41	U

Surrogate Recoveries

Pentacosane	93	%

Authorized By: Kim Todd

Release Date: 5/20/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148260
Field ID: 28
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/16/97
Date Analyzed: 04/22/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	13	U
Lube Oil	27	U

Surrogate Recoveries

Pentacosane	**103**	%

Authorized By: _____ Release Date: 5/20/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148261
Field ID: 29
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/17/97
Date Analyzed: 04/22/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	19	U
Lube Oil	56	U

Surrogate Recoveries

Pentacosane	**81**	**%**

Authorized By: _____ Release Date: 5/20/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148262
Field ID: 30
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/17/97
Date Analyzed: 04/22/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	8.5	U
Lube Oil	18	U

Surrogate Recoveries

Pentacosane	92	%

Authorized By: _____ Release Date: 5/20/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: BLN70981
Blank ID: OBS7105A1
Project Officer: Art Johnson

Date Prepared: 04/16/97
Date Analyzed: 04/21/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	14	U
Lube Oil	27	U

Surrogate Recoveries

Pentacosane	104	%

Authorized By: Kim Tisdale Release Date: 5/20/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Diesel

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: BLN70982
Blank ID: OBS7107A1
Project Officer: Art Johnson

Date Prepared: 04/17/97
Date Analyzed: 04/22/97

Method: WTPH-D
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
#2 Diesel	14	U
Lube Oil	27	U

Surrogate Recoveries

Pentacosane	74	%

Authorized By: _____ Release Date: 5/20/97 Page: 1

April 28, 1997

To: Art Johnson

From: Randy Knox, Metals Chemist RBK

Subject: Fidalgo Bay Sediments Project sediments

QUALITY ASSURANCE SUMMARY

Data quality for this project is generally good with the exception that recovery of chromium matrix spikes of 73% and 74% are slightly lower than the allowed 75%. Silver data was reported from a separate digestion by the 200.9 method, since initial data - with the original digestion - indicated no recovery of silver from the samples and minimal, 12%, from the LCS sample. Recovery of silver from the LCS sample was still slightly low. Also individual replicates of arsenic show considerable variability. No other significant quality assurance issues are noted with the data.

SAMPLE INFORMATION

The samples from the Fidalgo Bay Sediments Project were received by the Manchester Laboratory on 4/07/97 in good condition.

HOLDING TIMES

All analyses were performed within the USEPA Contract Laboratory Program (CLP) holding times for metals analysis (28 days for mercury, 180 days for all other metals).

INSTRUMENT CALIBRATION

Instrument calibration was performed before each analytical run and checked by initial calibration verification standards and blanks. Continuing calibration standards and blanks were analyzed at a frequency of 10% during the run and again at the end of the analytical run. All initial and continuing calibration verification standards were within the relevant USEPA (CLP) control limits. AA calibration gave a correlation coefficient (r) of 0.995 or greater, also meeting CLP calibration requirements.

PROCEDURAL BLANKS

The procedural blanks associated with these samples show no analytically significant levels of analyte except zinc. Zinc levels in the samples are more than ten times the level in the procedure blank and are not qualified.

SPIKED SAMPLES ANALYSIS

Spiked and duplicate spiked sample analysis were performed on this data set. All spike recoveries, except those for chromium, are within the CLP acceptance limits of +/- 25%. Recovery of chromium matrix spikes of 73% and 74% are slightly lower than the allowed 75%. Chromium data is qualified J as estimated. Silver data was reported from a separate digestion by the 200.9 method, since initial data - with the original digestion - indicated no recovery of silver from the samples. Recovery of silver via the 200.9 procedure was acceptable. The 200.9 procedure is a total recoverable metals procedure while the original procedure is a total metals procedure.

PRECISION DATA

The results of the spiked and duplicate spiked samples, or of duplicate samples for hardness, are used to evaluate precision on this sample set. The relative percent difference (RPD) for all analytes is within the 20% CLP acceptance window for duplicate analysis. Data for individual arsenic samples shows a high degree of variability within replicate determinations at the low levels found in the samples. Arsenic data is qualified J as estimated.

SERIAL DILUTION

A fivefold serial diluted sample was analyzed by ICP and the analytical results, corrected for dilution were compared to the original sample analysis as a test for interference. The RPD (relative % difference) for all analytes at levels greater than 50 times the detection level was acceptable, within the allowed 10%.

LABORATORY CONTROL SAMPLE (LCS) ANALYSIS

LCS analyses are within the windows established for each parameter except silver. Recovery of silver was 72% by the 200.9 procedure. Silver data is qualified J as estimated.

Please call Randy Knox at SCAN 360-871-8811 or Jim Ross at SCAN 360-871-8808 to further discuss this project.

RLK:rlk

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148230
Field ID: 1
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/11/97
Date Analyzed: 04/15/97

Method: EPA200.7
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
Arsenic	8.3	J
Cadmium	0.32	
Chromium	43.2	J
Copper	17.6	
Lead	11	
Zinc	59.4	

Authorized By: _____ Release Date: 4/24/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148232
Field ID: 3
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/11/97
Date Analyzed: 04/15/97

Method: EPA200.7
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
Arsenic	**7.0**	**J**
Cadmium	0.3	U
Chromium	**19.9**	**J**
Copper	**14.7**	
Lead	**7.7**	
Zinc	**50.7**	

Authorized By: Jan D R

Release Date: 4/24/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148233
Field ID: 4
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/11/97
Date Analyzed: 04/15/97

Method: EPA200.7
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
Arsenic	9.4	J
Cadmium	0.36	
Chromium	33.1	J
Copper	16.5	
Lead	7.3	
Zinc	55.8	

Authorized By: _____ Release Date: 4/24/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148234
Field ID: 4A
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/11/97
Date Analyzed: 04/15/97

Method: EPA200.7
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
Arsenic	**12**	**J**
Cadmium	0.3	U
Chromium	**40.3**	**J**
Copper	**15.6**	
Lead	**6.5**	
Zinc	**55.1**	

Authorized By: Jan O K

Release Date: 4/24/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148235
Field ID: 5
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/11/97
Date Analyzed: 04/15/97

Method: EPA200.7
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
Arsenic	**12**	**J**
Cadmium	0.3	U
Chromium	**39.6**	**J**
Copper	**14.3**	
Lead	**5.7**	
Zinc	**48.3**	

Authorized By: _____ Release Date: 4/24/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148239
Field ID: 8
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/11/97
Date Analyzed: 04/15/97

Method: EPA200.7
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
Arsenic	10	J
Cadmium	0.40	
Chromium	30.3	J
Copper	14.5	
Lead	6.3	
Zinc	45.5	

Authorized By: Jan D Ra

Release Date: 4/24/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148241
Field ID: 10
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/11/97
Date Analyzed: 04/15/97

Method: EPA200.7
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
Arsenic	10	J
Cadmium	0.81	
Chromium	18.8	J
Copper	12.0	
Lead	3.8	
Zinc	42.0	

Authorized By: _____ Release Date: 4/24/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148242
Field ID: 10A
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/11/97
Date Analyzed: 04/15/97

Method: EPA200.7
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
Arsenic	7.1	J
Cadmium	0.74	
Chromium	18.6	J
Copper	12.2	
Lead	5.1	
Zinc	43.9	

Authorized By: _____ Release Date: 4/24/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148243
Field ID: 11
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/11/97
Date Analyzed: 04/15/97

Method: EPA200.7
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
Arsenic	9.0	J
Cadmium	0.56	
Chromium	17.5	J
Copper	11.1	
Lead	5.4	
Zinc	40.5	

Authorized By: Jan O'Neal

Release Date: 4/24/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148245
Field ID: 13
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/11/97
Date Analyzed: 04/15/97

Method: EPA200.7
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
Arsenic	3.8	J
Cadmium	0.71	
Chromium	18.1	J
Copper	11.1	
Lead	3.7	
Zinc	37.0	

Authorized By: _____ Release Date: 4/24/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148247
Field ID: 15
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/11/97
Date Analyzed: 04/15/97

Method: EPA200.7
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
Arsenic	16	J
Cadmium	0.61	
Chromium	29.3	J
Copper	20.9	
Lead	7.6	
Zinc	57.4	

Authorized By: _____ Release Date: 4/24/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148249
Field ID: 17
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/11/97
Date Analyzed: 04/15/97

Method: EPA200.7
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
Arsenic	9.3	J
Cadmium	0.67	
Chromium	28.4	J
Copper	19.9	
Lead	8.1	
Zinc	58.6	

Authorized By: _____ Release Date: 4/24/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148252
Field ID: 20
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/11/97
Date Analyzed: 04/15/97

Method: EPA200.7
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
Arsenic	16	J
Cadmium	0.35	
Chromium	42.8	J
Copper	19.4	
Lead	8.5	
Zinc	57.3	

Authorized By: _____ Release Date: 4/24/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148252 (Matrix Spike - LMX1)
Field ID: 20
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/11/97
Date Analyzed: 04/15/97

Method: EPA200.7
Matrix: Sediment/Soil
Units: % Recovery

Analyte	Result	Qualifier
Arsenic	89	
Cadmium	89	
Chromium	73	N
Copper	89	
Lead	86	
Zinc	85	

Authorized By: _____ Release Date: 4/24/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148252 (Matrix Spike - LMX2)
Field ID: 20
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/11/97
Date Analyzed: 04/15/97

Method: EPA200.7
Matrix: Sediment/Soil
Units: % Recovery

Analyte	Result	Qualifier
Arsenic	89	
Cadmium	91	
Chromium	74	N
Copper	88	
Lead	85	
Zinc	83	

Authorized By: _____ Release Date: 4/24/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148253
Field ID: 21
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/11/97
Date Analyzed: 04/15/97

Method: EPA200.7
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
Arsenic	13	J
Cadmium	0.63	
Chromium	42.9	J
Copper	19.3	
Lead	7.5	
Zinc	56.6	

Authorized By: _____ Release Date: 4/24/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148257
Field ID: 25
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/11/97
Date Analyzed: 04/15/97

Method: EPA200.7
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
Arsenic	**8.1**	**J**
Cadmium	0.3	U
Chromium	**23.1**	**J**
Copper	**16.4**	
Lead	**6.6**	
Zinc	**48.1**	

Authorized By: _____ Release Date: 4/24/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148258
Field ID: 26
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/11/97
Date Analyzed: 04/15/97

Method: EPA200.7
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
Arsenic	9.4	J
Cadmium	0.51	
Chromium	21.2	J
Copper	12.5	
Lead	4.6	
Zinc	44.2	

Authorized By: _____ Release Date: 4/24/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: BLN70815
Blank ID: M7101SB1
Project Officer: Art Johnson

Date Prepared: 04/11/97
Date Analyzed: 04/15/97

Method: EPA200.7
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
Arsenic	3	U
Cadmium	0.3	U
Chromium	0.5	U
Copper	1	U
Lead	2	U
Zinc	**3.3**	

Authorized By: _____ Release Date: 4/24/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: ERA70816
Blank ID: M7101SL1
Project Officer: Art Johnson

Date Prepared: 04/11/97
Date Analyzed: 04/15/97

Method: EPA200.7
Matrix: Sediment/Soil
Units: mg/Kg Dry Wt.

Analyte	Result	Qualifier
Arsenic	93	%
Cadmium	98	%
Chromium	90	%
Copper	91	%
Lead	101	%
Zinc	90	%

Authorized By: _____ Release Date: 4/24/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Silver

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Project Officer: Art Johnson
Date Reported: 28-APR-97

Method: EPA272.2
Matrix: Sediment/Soil
Analyte: Silver

Sample	QC	Field ID	Result	Qualifier	Units		Received	Analyzed
97148230		1	**0.071**	**J**	mg/Kg	Dry Wt.	04/07/97	04/16/97
97148232		3	0.05	UJ	mg/Kg	Dry Wt.	04/07/97	04/16/97
97148233		4	**0.066**	**J**	mg/Kg	Dry Wt.	04/07/97	04/16/97
97148234		4A	**0.081**	**J**	mg/Kg	Dry Wt.	04/07/97	04/16/97
97148235		5	**0.068**	**J**	mg/Kg	Dry Wt.	04/07/97	04/16/97
97148239		8	**0.069**	**J**	mg/Kg	Dry Wt.	04/07/97	04/16/97
97148241		10	**0.054**	**J**	mg/Kg	Dry Wt.	04/07/97	04/16/97
97148242		10A	**0.049**	**J**	mg/Kg	Dry Wt.	04/07/97	04/16/97
97148243		11	**0.056**	**J**	mg/Kg	Dry Wt.	04/07/97	04/16/97
97148245		13	0.05	UJ	mg/Kg	Dry Wt.	04/07/97	04/16/97
97148247		15	**0.091**	**J**	mg/Kg	Dry Wt.	04/07/97	04/16/97
97148249		17	**0.090**	**J**	mg/Kg	Dry Wt.	04/07/97	04/16/97
97148252		20	**0.11**	**J**	mg/Kg	Dry Wt.	04/07/97	04/16/97
97148253		21	**0.17**	**J**	mg/Kg	Dry Wt.	04/07/97	04/16/97
97148257		25	**0.071**	**J**	mg/Kg	Dry Wt.	04/07/97	04/16/97
97148257	Matrix Spike		**87 %**				04/07/97	04/16/97
97148258		26	**0.055**	**J**	mg/Kg			04/16/97
BLN70882		M7104SB	**0.05**	**U**	mg/Kg	Dry Wt.		04/16/97
ERA70883		M7104SL	**72 %**					04/16/97

Authorized By: Randy J Knox

Release Date: 4/28/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Mercury

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Project Officer: Art Johnson
Date Reported: 12-AUG-97

Method: EPA245.5
Matrix: Sediment/Soil
Analyte: Mercury

Sample	QC	Field ID	Result	Qualifier	Units		Received	Analyzed
97148230		1	0.044		mg/Kg	Dry Wt.	04/07/97	04/17/97
97148232		3	0.066		mg/Kg	Dry Wt.	04/07/97	04/17/97
97148233		4	0.034		mg/Kg	Dry Wt.	04/07/97	04/17/97
97148234		4A	0.035		mg/Kg	Dry Wt.	04/07/97	04/17/97
97148235		5	0.035		mg/Kg	Dry Wt.	04/07/97	04/17/97
97148239		8	0.044		mg/Kg	Dry Wt.	04/07/97	04/17/97
97148241		10	0.046		mg/Kg	Dry Wt.	04/07/97	04/17/97
97148241	Duplicate		0.043		mg/Kg	Dry Wt.	04/07/97	04/17/97
97148241	Matrix Spike		105 %				04/07/97	04/17/97
97148242		10A	0.050		mg/Kg	Dry Wt.	04/07/97	04/17/97
97148243		11	0.058		mg/Kg	Dry Wt.	04/07/97	04/17/97
97148245		13	0.040		mg/Kg	Dry Wt.	04/07/97	04/17/97
97148247		15	0.049		mg/Kg	Dry Wt.	04/07/97	04/17/97
97148249		17	0.062		mg/Kg	Dry Wt.	04/07/97	04/17/97
97148252		20	0.058		mg/Kg	Dry Wt.	04/07/97	04/17/97
97148253		21	0.049		mg/Kg	Dry Wt.	04/07/97	04/17/97
97148257		25	0.048		mg/Kg	Dry Wt.	04/07/97	04/17/97
97148258		26	0.037		mg/Kg	Dry Wt.	04/07/97	04/17/97
27070887		M7106SG	107 %					
BLN70886		M7106SH	0.005	U	mg/Kg			

Authorized By: James Ross

Release Date: 8-13-97

MANCHESTER ENVIRONMENTAL LABORATORY

7411 Beach Drive E , Port Orchard Washington 98366

CASE NARRATIVE

July 2, 1997

Subject: Fildalgo Bay Sediments

Samples: 97-148230, -148232 to -148235, -148239, -148241 to -148243, -148245, -148247, -148249, -148252, and -148258

Case No. 1161-97

Officer: Art Johnson

By: Dickey D. Huntamer
Organics Analysis Unit

SEMIVOLATILE ORGANICS

ANALYTICAL METHODS:

The semivolatile soil samples were extracted with acetone following the Manchester modification of the EPA CLP and SW 846 8270 procedure with capillary GC/MS analysis of the sample extracts. Normal QA/QC procedures were performed with the analyses.

HOLDING TIMES:

All sample and extraction holding times were within the recommended limits.

BLANKS:

Low levels of some target compounds were detected in the laboratory blanks. The EPA five times rule was applied to all target compounds which were found in the blank. Compounds that were found in the sample and in the blank were considered real and not the result of contamination if the levels in the sample are greater than or equal to five times the amount of compounds in the associated method blank.

Pentachlorophenol was detected in the second laboratory blank (OBS7099A2), along with phenol and several other phenolic compounds 2,4-dinitrophenol and 4,6-dinitro-2-methylphenol. None of these compounds were detected in the first laboratory blank (OBS7099A1). A possible source is the Gel Permeation Chromatography (GPC) cleanup step. The run sequence for the GPC had the second blank following a matrix spike sample from the day before. A "dummy" (i.e. blank) run is made on the instrument at the start of each day which would help flush the GPC and this was done between the spike and the blank. Even though the dummy cleanup run was done it appears that carryover occurred for PCP into the following samples. This is discussed further in the analytical comments section below.

SURROGATES:

The normal Manchester Laboratory surrogates were added to the sample prior to extraction. All surrogate recoveries were within acceptable limits except for sample -148258. The high surrogate recoveries are probably related to the low internal standard area counts for that sample. The internal standard area counts were about half the amount expected, the surrogate recoveries are roughly twice the amounts found in the other samples indicating that the results for this sample are high by a factor of about two. The "J" qualifier was added to all results for sample -148258.

MATRIX SPIKE AND MATRIX SPIKE DUPLICATE:

Matrix spike recoveries were low for hexchloroethane, 2-nitrophenol, 3 and 4-nitroanilines, , 2,6-dinitrotoluene, 4,6-dinitro-2 methylphenol. The "J" qualifier was added to the results for these compounds in the matrix spike source sample, -148252. Several other compounds aniline, benzoic acid, hexachlorocylcopentadiene, 4-chloroaniline, and 2,4-dinitrophenol were not recovered and the "R" "rejected" qualifier was added.

ANALYTICAL COMMENTS:

The presence of pentachlorophenol (PCP) in the second laboratory blank (1.6 ng) causes some problems with respect to the EPA five times rule. Although no PCP was detected in the first lab blank it was in the second. Some samples processed through the GPC after the blank also contained PCP but at levels higher than the blank. The subsequent samples ran through the GPC did not show a pattern one would expect from sample carryover or memory effects since the second and third samples were the highest. The samples in question, listed in order of GPC cleanup are: -148235 (2.0 ng), -148239 (4.7 ng), -148258 (3.8 ng, the level may be elevated due to low internal standard areas), -148241 (1.8 ng), and -148232 (1.4 ng). The three other samples in the GPC run were -148249, -148234 and -148242 but no PCP was detected in these samples.

Since all of the results except for -148239 were below the reported quantitation level results are reported as "UJ". The concentrations "found" for these samples are -148235 (88 J ug/Kg), -148239 (194 ug/Kg), -148258 (152 J ug/Kg), -148241 (66 J ug/Kg) and -148232 (52 J ug/Kg).

The data is acceptable for use as qualified and with the caveats discussed above.

DATA QUALIFIER CODES:

U	-	The analyte was not detected at or above the reported value.
J	-	The analyte was positively identified. The associated numerical value is an estimate.
UJ	-	The analyte was not detected at or above the reported estimated result.
REJ	-	The data are unusable for all purposes.
EXP	-	The result is equal to the number before EXP times 10 to the power of the number after EXP. As an example 3EXP6 equals 3×10^6.
NAF	-	Not analyzed for.
N	-	For organic analytes there is evidence the analyte is present in this sample.
NJ	-	There is evidence that the analyte is present. The associated numerical result is an estimate.
E	-	This qualifier is used when the concentration of the associated value exceeds the known calibration range.
bold	-	The analyte was present in the sample. (Visual Aid to locate detected compound on report sheet.)

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148230
Field ID: 1
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/16/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
N-Nitrosodimethylamine	17	U
Pyridine	17	U
Aniline	35	U
Phenol	17	U
Bis(2-Chloroethyl)Ether	17	U
2-Chlorophenol	17	U
1,3-Dichlorobenzene	17	U
1,4-Dichlorobenzene	17	U
1,2-Dichlorobenzene	17	U
Benzyl Alcohol	17	U
2-Methylphenol	17	U
2,2'-Oxybis[1-chloropropane]	17	U
N-Nitroso-Di-N-Propylamine	35	U
4-Methylphenol	**20**	
Hexachloroethane	17	U
Nitrobenzene	17	U
Isophorone	17	U
2-Nitrophenol	87	U
2,4-Dimethylphenol	17	U
Bis(2-Chloroethoxy)Methane	17	U
Benzoic Acid	346	U
2,4-Dichlorophenol	17	U
1,2,4-Trichlorobenzene	17	U
Naphthalene	**48**	
4-Chloroaniline	17	U
Hexachlorobutadiene	17	U
4-Chloro-3-Methylphenol	17	U
2-Methylnaphthalene	**19**	
1-Methylnaphthalene	**14**	**J**
Hexachlorocyclopentadiene	87	U
2,4,6-Trichlorophenol	17	U
2,4,5-Trichlorophenol	87	U
2-Chloronaphthalene	17	U
2-Nitroaniline	35	U
Dimethylphthalate	35	U
2,6-Dinitrotoluene	87	U
Acenaphthylene	**14**	**J**
3-Nitroaniline	17	U
Acenaphthene	**8.1**	**J**
2,4-Dinitrophenol	346	U
4-Nitrophenol	87	U
Dibenzofuran	**16**	**J**
2,4-Dinitrotoluene	35	U
Diethylphthalate	17	UJ
Fluorene	**14**	**J**
4-Chlorophenyl-Phenylether	17	U
4-Nitroaniline	173	U
4,6-Dinitro-2-Methylphenol	173	U
N-Nitrosodiphenylamine	17	U
1,2-Diphenylhydrazine	17	U
4-Bromophenyl-Phenylether	17	U
Hexachlorobenzene	17	U
Pentachlorophenol	173	U
Phenanthrene	**63**	
Anthracene	**16**	**J**
Caffeine	17	U
Carbazole	173	U
Di-N-Butylphthalate	35	UJ
Fluoranthene	**122**	
Benzidine	346	U
Pyrene	**104**	
Retene	**10**	**J**
Butylbenzylphthalate	17	U
Benzo(a)anthracene	17	U
3,3'-Dichlorobenzidine	346	U
Chrysene	**42**	
Bis(2-Ethylhexyl) Phthalate	35	UJ
Di-N-Octyl Phthalate	173	U
Benzo(b)fluoranthene	**43**	
Benzo(k)fluoranthene	**16**	**J**
Benzo(a)pyrene	**22**	
3B-Coprostanol	**213**	**J**
Indeno(1,2,3-cd)pyrene	**20**	
Dibenzo(a,h)anthracene	17	U
Benzo(ghi)perylene	**26**	

Authorized By: _____ Release Date: 6/13/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148230
Field ID: 1
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/16/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Surrogate Recoveries

2-Fluorophenol	84	%
D5-Phenol	89	%
D4-2-Chlorophenol	87	%
1,2-Dichlorobenzene-D4	40	%
D5-Nitrobenzene	63	%
2-Fluorobiphenyl	79	%
D10-Pyrene	86	%
D14-Terphenyl	87	%

Authorized By: _____ Release Date: 6/23/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148230
Field ID: 1
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/16/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
		538	NJ
34314835	*Furan, 2,3-dihydro-4-methyl*	2280	NJ
54965058	*Cyclohexane, 1,1,3-trimethyl-2-(3-methyl*	1020	NJ
544638	*Decanoic Acid, Tetra-*	502	NJ
5989026	*(-)-Loliolide*	1620	NJ
1002842	*Decanoic Acid, Penta-*	702	NJ
*3008001	*Unknown 01*	812	NJ
*3008002	*Unknown 02*	420	NJ
1654860	*Decanoic acid, decyl ester*	974	NJ
*3008003	*Unknown 03*	762	NJ
*3008004	*Unknown 04*	920	NJ
*3008005	*Unknown 05*	4530	NJ
57885	*Cholesterol*		

Authorized By: D. Hanson Release Date: 6/13/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148232
Field ID: 3
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/16/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
N-Nitrosodimethylamine	15	U
Pyridine	15	U
Aniline	29	U
Phenol	30	UJ
Bis(2-Chloroethyl)Ether	15	U
2-Chlorophenol	15	U
1,3-Dichlorobenzene	15	U
1,4-Dichlorobenzene	15	U
1,2-Dichlorobenzene	15	U
Benzyl Alcohol	15	U
2-Methylphenol	**8.4**	**J**
2,2'-Oxybis[1-chloropropane]	15	U
N-Nitroso-Di-N-Propylamine	29	U
4-Methylphenol	**40**	
Hexachloroethane	15	U
Nitrobenzene	15	U
Isophorone	15	U
2-Nitrophenol	73	U
2,4-Dimethylphenol	**21**	
Bis(2-Chloroethoxy)Methane	15	U
Benzoic Acid	290	U
2,4-Dichlorophenol	15	U
1,2,4-Trichlorobenzene	15	U
Naphthalene	**66**	
4-Chloroaniline	15	U
Hexachlorobutadiene	15	U
4-Chloro-3-Methylphenol	15	U
2-Methylnaphthalene	**30**	
1-Methylnaphthalene	**27**	
Hexachlorocyclopentadiene	73	U
2,4,6-Trichlorophenol	15	U
2,4,5-Trichlorophenol	73	U
2-Chloronaphthalene	15	U
2-Nitroaniline	29	U
Dimethylphthalate	29	U
2,6-Dinitrotoluene	73	U
Acenaphthylene	**328**	
3-Nitroaniline	15	U
Acenaphthene	**105**	
2,4-Dinitrophenol	290	U
4-Nitrophenol	73	U
Dibenzofuran	**75**	
2,4-Dinitrotoluene	29	U
Diethylphthalate	15	UJ
Fluorene	**121**	
4-Chlorophenyl-Phenylether	15	U
4-Nitroaniline	145	U
4,6-Dinitro-2-Methylphenol	145	U
N-Nitrosodiphenylamine	15	U
1,2-Diphenylhydrazine	15	U
4-Bromophenyl-Phenylether	15	U
Hexachlorobenzene	15	U
Pentachlorophenol	145	UJ
Phenanthrene	**1190**	
Anthracene	**328**	
Caffeine	15	U
Carbazole	**269**	
Di-N-Butylphthalate	29	UJ
Fluoranthene	**9190**	
Benzidine	290	U
Pyrene	**7280**	
Retene	**175**	
Butylbenzylphthalate	15	U
Benzo(a)anthracene	**966**	
3,3'-Dichlorobenzidine	290	U
Chrysene	**2940**	**E**
Bis(2-Ethylhexyl) Phthalate	72	UJ
Di-N-Octyl Phthalate	145	U
Benzo(b)fluoranthene	**1780**	
Benzo(k)fluoranthene	**634**	
Benzo(a)pyrene	**562**	
3B-Coprostanol	290	U
Indeno(1,2,3-cd)pyrene	**268**	
Dibenzo(a,h)anthracene	**60**	
Benzo(ghi)perylene	**208**	

Authorized By: _____ Release Date: 7/2/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148232
Field ID: 3
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/16/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Surrogate Recoveries

2-Fluorophenol	78	%
D5-Phenol	82	%
D4-2-Chlorophenol	81	%
1,2-Dichlorobenzene-D4	42	%
D5-Nitrobenzene	67	%
2-Fluorobiphenyl	80	%
D10-Pyrene	80	%
D14-Terphenyl	83	%

Authorized By: _____ Release Date: 6/23/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148232
Field ID: 3
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/16/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
		174	NJ
286204	*7-Oxabicyclo[4.1.0]Heptane*	178	NJ
579102	*Acetamide, N-methyl-N-phenyl-*	159	NJ
*3008001	*Unknown 01*	159	NJ
*3008002	*Unknown 02*	487	NJ
26137531	*Naphthalene, 1,2,3-Trimethyl-4-Propenyl-, (E)-*	384	NJ
132650	*Dibenzothiophene*	792	NJ
*30080003	*Unknown 03*	1520	NJ
612942	*Naphthalene, 2-Phenyl-*	733	NJ
629765	*1-Pentadecanol*	1630	NJ
*3008004	*Unknown 04*	3000	NJ
57885	*Cholesterol*		

Authorized By: D Hanson Release Date: 6/13/97

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Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments **LIMS Project ID:** 1161-97

Sample: 97148233 **Date Received:** 04/07/97 **Method:** SW8270
Field ID: 4 **Date Prepared:** 04/09/97 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 05/16/97 **Units:** ug/Kg Dry Wt.

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	18	U	**Acenaphthene**	**3.2**	**J**
Pyridine	18	U	2,4-Dinitrophenol	355	U
Aniline	36	U	4-Nitrophenol	89	U
Phenol	18	U	**Dibenzofuran**	**11**	**J**
Bis(2-Chloroethyl)Ether	18	U	2,4-Dinitrotoluene	36	U
2-Chlorophenol	18	U	Diethylphthalate	18	UJ
1,3-Dichlorobenzene	18	U	**Fluorene**	**13**	**J**
1,4-Dichlorobenzene	18	U	4-Chlorophenyl-Phenylether	18	U
1,2-Dichlorobenzene	18	U	4-Nitroaniline	178	U
Benzyl Alcohol	18	U	4,6-Dinitro-2-Methylphenol	178	U
2-Methylphenol	18	U	N-Nitrosodiphenylamine	18	U
2,2'-Oxybis[1-chloropropane]	18	U	1,2-Diphenylhydrazine	18	U
N-Nitroso-Di-N-Propylamine	36	U	4-Bromophenyl-Phenylether	18	U
4-Methylphenol	**16**	**J**	Hexachlorobenzene	18	U
Hexachloroethane	18	U	Pentachlorophenol	178	U
Nitrobenzene	18	U	**Phenanthrene**	**54**	
Isophorone	18	U	**Anthracene**	**20**	
2-Nitrophenol	89	U	Caffeine	18	U
2,4-Dimethylphenol	18	U	Carbazole	178	U
Bis(2-Chloroethoxy)Methane	18	U	Di-N-Butylphthalate	36	UJ
Benzoic Acid	355	U	**Fluoranthene**	**122**	
2,4-Dichlorophenol	18	U	Benzidine	355	U
1,2,4-Trichlorobenzene	18	U	**Pyrene**	**100**	
Naphthalene	**30**		**Retene**	**12**	**J**
4-Chloroaniline	18	U	Butylbenzylphthalate	18	U
Hexachlorobutadiene	18	U	**Benzo(a)anthracene**	**22**	
4-Chloro-3-Methylphenol	18	U	3,3'-Dichlorobenzidine	355	U
2-Methylnaphthalene	**16**	**J**	**Chrysene**	**33**	
1-Methylnaphthalene	**16**	**J**	Bis(2-Ethylhexyl) Phthalate	36	UJ
Hexachlorocyclopentadiene	89	U	Di-N-Octyl Phthalate	178	U
2,4,6-Trichlorophenol	18	U	**Benzo(b)fluoranthene**	**30**	
2,4,5-Trichlorophenol	89	U	**Benzo(k)fluoranthene**	**11**	**J**
2-Chloronaphthalene	18	U	**Benzo(a)pyrene**	**15**	**J**
2-Nitroaniline	36	U	3B-Coprostanol	355	UJ
Dimethylphthalate	36	U	**Indeno(1,2,3-cd)pyrene**	**13**	**J**
2,6-Dinitrotoluene	89	U	Dibenzo(a,h)anthracene	18	U
Acenaphthylene	**14**	**J**	**Benzo(ghi)perylene**	**16**	**J**
3-Nitroaniline	18	U			

Authorized By: D. Hamilton Release Date: 6/23/97 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148233
Field ID: 4
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/16/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Surrogate Recoveries

2-Fluorophenol	71	%
D5-Phenol	77	%
D4-2-Chlorophenol	78	%
1,2-Dichlorobenzene-D4	40	%
D5-Nitrobenzene	51	%
2-Fluorobiphenyl	73	%
D10-Pyrene	75	%
D14-Terphenyl	76	%

Authorized By: D. Hanson Release Date: 6/23/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

LIMS Project ID: 1161-97

Project Name: Fidalgo Bay Sediments

Sample: 97148233
Field ID: 4
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/16/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
294622	*Cyclododecane (8ci9ci)*	508	NJ
*3008001	*Unknown 01*	1500	NJ
*3005001	*Unknown Hydrocarbon 01*	2420	NJ
544638	*Decanoic Acid, Tetra-*	1190	NJ
1002842	*Decanoic Acid, Penta-*	1750	NJ
*3008002	*Unknown 02*	730	NJ
14237731	*2-Hexadecene, 3,7,11,15-tet*	685	NJ
5129602	*Pentadecanoic Acid, 14-Methyl-, Methyl Ester*	460	NJ
*3008003	*Unknown 03*	6570	NJ
*3008004	*Unknown 04*	9590	NJ
*3008005	*Unknown 05*	907	NJ
*3008006	*Unknown 06*	3910	NJ
59029	*Vitamin E*	1050	NJ
57885	*Cholesterol*	3630	NJ

Authorized By: D. Watson Release Date: 8/23/97

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Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148234
Field ID: 4A
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/16/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
N-Nitrosodimethylamine	19	U
Pyridine	19	U
Aniline	38	U
Phenol	19	U
Bis(2-Chloroethyl)Ether	19	U
2-Chlorophenol	19	U
1,3-Dichlorobenzene	19	U
1,4-Dichlorobenzene	19	U
1,2-Dichlorobenzene	19	U
Benzyl Alcohol	19	U
2-Methylphenol	19	U
2,2'-Oxybis[1-chloropropane]	38	U
N-Nitroso-Di-N-Propylamine	11	J
4-Methylphenol	19	U
Hexachloroethane	19	U
Nitrobenzene	19	U
Isophorone	95	U
2-Nitrophenol	19	U
2,4-Dimethylphenol	19	U
Bis(2-Chloroethoxy)Methane	379	U
Benzoic Acid	19	U
2,4-Dichlorophenol	19	U
1,2,4-Trichlorobenzene	33	
Naphthalene	19	U
4-Chloroaniline	19	U
Hexachlorobutadiene	19	U
4-Chloro-3-Methylphenol	16	J
2-Methylnaphthalene	16	J
1-Methylnaphthalene	95	U
Hexachlorocyclopentadiene	19	U
2,4,6-Trichlorophenol	95	U
2,4,5-Trichlorophenol	19	U
2-Chloronaphthalene	38	U
2-Nitroaniline	38	U
Dimethylphthalate	95	U
2,6-Dinitrotoluene	13	J
Acenaphthylene	19	U
3-Nitroaniline		

Analyte	Result	Qualifier
Acenaphthene	3.2	J
2,4-Dinitrophenol	379	U
4-Nitrophenol	95	U
Dibenzofuran	12	J
2,4-Dinitrotoluene	38	U
Diethylphthalate	19	U
Fluorene	13	J
4-Chlorophenyl-Phenylether	19	U
4-Nitroaniline	189	UJ
4,6-Dinitro-2-Methylphenol	189	U
N-Nitrosodiphenylamine	19	U
1,2-Diphenylhydrazine	19	U
4-Bromophenyl-Phenylether	19	U
Hexachlorobenzene	19	U
Pentachlorophenol	189	U
Phenanthrene	51	
Anthracene	16	J
Caffeine	19	U
Carbazole	189	U
Di-N-Butylphthalate	19	UJ
Fluoranthene	101	
Benzidine	379	U
Pyrene	83	
Retene	13	J
Butylbenzylphthalate	19	U
Benzo(a)anthracene	19	U
3,3'-Dichlorobenzidine	379	U
Chrysene	35	
Bis(2-Ethylhexyl) Phthalate	38	UJ
Di-N-Octyl Phthalate	189	U
Benzo(b)fluoranthene	34	
Benzo(k)fluoranthene	9.2	J
Benzo(a)pyrene	17	J
3B-Coprostanol	379	UJ
Indeno(1,2,3-cd)pyrene	13	J
Dibenzo(a,h)anthracene	19	U
Benzo(ghi)perylene	16	J

Authorized By: D. Hunter Release Date: 6/23/97 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148234
Field ID: 4A
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/16/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Surrogate Recoveries

2-Fluorophenol	78	%
D5-Phenol	78	%
D4-2-Chlorophenol	81	%
1,2-Dichlorobenzene-D4	31	%
D5-Nitrobenzene	58	%
2-Fluorobiphenyl	76	%
D10-Pyrene	81	%
D14-Terphenyl	78	%

Authorized By: D. Newton Release Date: 6/23/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148234
Field ID: 4A
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/16/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
1534083	*Ethanethioic acid, S-methyl*	380	NJ
294622	*Cyclododecane (8ci9ci)*	704	NJ
*3005001	*Unknown Hydrocarbon 01*	485	NJ
544638	*Decanoic Acid, Tetra-*	1360	NJ
5746587	*Tetradecanoic Acid, 12-Methyl-, (S)-*	1750	NJ
*3008001	*Unknown 01*	566	NJ
1002842	*Decanoic Acid, Penta-*	580	NJ
*3008002	*Unknown 02*	426	NJ
*3008003	*Unknown 03*	4980	NJ
*3008004	*Unknown 04*	1380	NJ
*3008005	*Unknown 05*	7320	NJ
*3008006	*Unknown 06*	730	NJ
*3008007	*Unknown 07*	2810	NJ
57885	*Cholesterol*	2750	NJ

Authorized By: D Norton Release Date: 6/23/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148235
Field ID: 5
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/16/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	17	U	**Acenaphthene**	**3.4**	**J**
Pyridine	17	U	2,4-Dinitrophenol	342	U
Aniline	34	U	4-Nitrophenol	86	U
Phenol	17	U	**Dibenzofuran**	**8.9**	**J**
Bis(2-Chloroethyl)Ether	17	U	2,4-Dinitrotoluene	34	U
2-Chlorophenol	17	U	Diethylphthalate	17	U
1,3-Dichlorobenzene	17	U	**Fluorene**	**9.2**	**J**
1,4-Dichlorobenzene	17	U	4-Chlorophenyl-Phenylether	17	U
1,2-Dichlorobenzene	17	U	4-Nitroaniline	171	U
Benzyl Alcohol	17	U	4,6-Dinitro-2-Methylphenol	171	U
2-Methylphenol	17	U	N-Nitrosodiphenylamine	17	U
2,2'-Oxybis[1-chloropropane]	17	U	1,2-Diphenylhydrazine	17	U
N-Nitroso-Di-N-Propylamine	34	U	4-Bromophenyl-Phenylether	17	U
4-Methylphenol	**11**	**J**	Hexachlorobenzene	17	U
Hexachloroethane	17	U	Pentachlorophenol	171	UJ
Nitrobenzene	17	U	**Phenanthrene**	**37**	
Isophorone	17	U	**Anthracene**	**11**	**J**
2-Nitrophenol	86	U	Caffeine	17	U
2,4-Dimethylphenol	17	U	Carbazole	171	U
Bis(2-Chloroethoxy)Methane	17	U	Di-N-Butylphthalate	100	UJ
Benzoic Acid	342	UJ	**Fluoranthene**	**74**	
2,4-Dichlorophenol	17	U	Benzidine	342	U
1,2,4-Trichlorobenzene	17	U	**Pyrene**	**67**	
Naphthalene	**28**		**Retene**	**8.6**	**J**
4-Chloroaniline	17	U	Butylbenzylphthalate	17	U
Hexachlorobutadiene	17	U	Benzo(a)anthracene	17	U
4-Chloro-3-Methylphenol	17	U	3,3'-Dichlorobenzidine	342	U
2-Methylnaphthalene	**16**	**J**	**Chrysene**	**34**	
1-Methylnaphthalene	**10**	**J**	Bis(2-Ethylhexyl) Phthalate	17	UJ
Hexachlorocyclopentadiene	86	U	Di-N-Octyl Phthalate	171	U
2,4,6-Trichlorophenol	17	U	**Benzo(b)fluoranthene**	**32**	
2,4,5-Trichlorophenol	86	U	**Benzo(k)fluoranthene**	**11**	**J**
2-Chloronaphthalene	17	U	**Benzo(a)pyrene**	**17**	
2-Nitroaniline	34	U	3B-Coprostanol	342	U
Dimethylphthalate	34	U	**Indeno(1,2,3-cd)pyrene**	**12**	**J**
2,6-Dinitrotoluene	86	U	Dibenzo(a,h)anthracene	17	U
Acenaphthylene	17	UJ	**Benzo(ghi)perylene**	**14**	**J**
3-Nitroaniline	17	U			

Authorized By: _____ Release Date: 7/2/98

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148235
Field ID: 5
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/16/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Surrogate Recoveries

2-Fluorophenol	80	%
D5-Phenol	81	%
D4-2-Chlorophenol	83	%
1,2-Dichlorobenzene-D4	45	%
D5-Nitrobenzene	61	%
2-Fluorobiphenyl	77	%
D10-Pyrene	81	%
D14-Terphenyl	80	%

Authorized By: _____ Release Date: 6/23/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148235
Field ID: 5
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/16/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
*3008003	*Unknown 03*	547	NJ
286204	*7-Oxabicyclo[4.1.0]Heptane*	192	NJ
*3008001	*Unknown 01*	232	NJ
*3005001	*Unknown Hydrocarbon 01*	734	NJ
544638	*Decanoic Acid, Tetra-*	317	NJ
2091294	*9-Hexadecenoic Acid*	1500	NJ
150867	*Phytol*	712	NJ
115866	*Triphenyl Phosphate*	348	NJ
19047859	*Phosphonic Acid, Dioctadecyl*	334	NJ
*3008002	*Unknown 02*	506	NJ
*3005002	*Unknown Hydrocarbon 02*	515	NJ
57885	*Cholesterol*	1390	NJ

Authorized By: D. Houston Release Date: 6/23/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148239
Field ID: 8
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	17	U	**Acenaphthene**	**8.6**	**J**
Pyridine	17	U	2,4-Dinitrophenol	330	U
Aniline	33	U	4-Nitrophenol	82	U
Phenol	17	U	**Dibenzofuran**	**13**	**J**
Bis(2-Chloroethyl)Ether	17	U	2,4-Dinitrotoluene	33	U
2-Chlorophenol	17	U	Diethylphthalate	17	UJ
1,3-Dichlorobenzene	17	U	**Fluorene**	**14**	**J**
1,4-Dichlorobenzene	17	U	4-Chlorophenyl-Phenylether	17	U
1,2-Dichlorobenzene	17	U	4-Nitroaniline	165	U
Benzyl Alcohol	17	U	4,6-Dinitro-2-Methylphenol	165	U
2-Methylphenol	17	U	N-Nitrosodiphenylamine	17	U
2,2'-Oxybis[1-chloropropane]	17	U	1,2-Diphenylhydrazine	17	U
N-Nitroso-Di-N-Propylamine	33	U	4-Bromophenyl-Phenylether	17	U
4-Methylphenol	**18**		Hexachlorobenzene	17	U
Hexachloroethane	17	U	Pentachlorophenol	194	UJ
Nitrobenzene	17	U	**Phenanthrene**	**69**	
Isophorone	17	U	**Anthracene**	**26**	
2-Nitrophenol	82	U	Caffeine	17	U
2,4-Dimethylphenol	17	U	Carbazole	165	U
Bis(2-Chloroethoxy)Methane	17	U	Di-N-Butylphthalate	33	UJ
Benzoic Acid	330	UJ	**Fluoranthene**	**146**	
2,4-Dichlorophenol	17	U	Benzidine	330	U
1,2,4-Trichlorobenzene	17	U	**Pyrene**	**122**	
Naphthalene	**54**		**Retene**	**12**	**J**
4-Chloroaniline	17	U	Butylbenzylphthalate	17	U
Hexachlorobutadiene	17	U	**Benzo(a)anthracene**	**35**	
4-Chloro-3-Methylphenol	17	U	3,3'-Dichlorobenzidine	330	U
2-Methylnaphthalene	**14**	**J**	**Chrysene**	**53**	
1-Methylnaphthalene	**12**	**J**	Bis(2-Ethylhexyl) Phthalate	33	UJ
Hexachlorocyclopentadiene	82	U	Di-N-Octyl Phthalate	165	U
2,4,6-Trichlorophenol	17	U	**Benzo(b)fluoranthene**	**52**	
2,4,5-Trichlorophenol	82	U	**Benzo(k)fluoranthene**	**17**	
2-Chloronaphthalene	17	U	**Benzo(a)pyrene**	**32**	
2-Nitroaniline	33	U	3B-Coprostanol	165	UJ
Dimethylphthalate	33	U	**Indeno(1,2,3-cd)pyrene**	**18**	
2,6-Dinitrotoluene	82	U	Dibenzo(a,h)anthracene	17	U
Acenaphthylene	**21**		**Benzo(ghi)perylene**	**21**	
3-Nitroaniline	17	U			

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Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148239
Field ID: 8
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Surrogate Recoveries

2-Fluorophenol	70	%
D5-Phenol	69	%
D4-2-Chlorophenol	72	%
1,2-Dichlorobenzene-D4	40	%
D5-Nitrobenzene	56	%
2-Fluorobiphenyl	71	%
D10-Pyrene	73	%
D14-Terphenyl	71	%

Authorized By: D. Hunter Release Date: 6/23/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148239
Field ID: 8
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
*3008006	*Unknown 06*	307	NJ
*3008001	*Unknown 01*	322	NJ
544638	*Decanoic Acid, Tetra-*	328	NJ
*3008002	*Unknown 02*	370	NJ
109295	*Oxacycloheptadecan-2-one*	1440	NJ
*3008003	*Unknown 03*	671	NJ
74685293	*9-Eicosene, (E)-*	541	NJ
40710427	*1-Hentetracontanol*	764	NJ
57885	*Cholesterol*	1540	NJ
*3008004	*Unknown 04*	366	NJ
*3008005	*Unknown 05*	402	NJ
83476	*Gamma-Sitosterol*	1580	NJ

Authorized By: D. Norton Release Date: 6/23/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148241
Field ID: 10
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
N-Nitrosodimethylamine	15	U
Pyridine	15	U
Aniline	30	U
Phenol	15	U
Bis(2-Chloroethyl)Ether	15	U
2-Chlorophenol	15	U
1,3-Dichlorobenzene	15	U
1,4-Dichlorobenzene	15	U
1,2-Dichlorobenzene	15	U
Benzyl Alcohol	15	U
2-Methylphenol	15	U
2,2'-Oxybis[1-chloropropane]	15	U
N-Nitroso-Di-N-Propylamine	30	U
4-Methylphenol	15	U
Hexachloroethane	15	U
Nitrobenzene	15	U
Isophorone	15	U
2-Nitrophenol	75	U
2,4-Dimethylphenol	15	U
Bis(2-Chloroethoxy)Methane	15	U
Benzoic Acid	302	U
2,4-Dichlorophenol	15	U
1,2,4-Trichlorobenzene	15	U
Naphthalene	**14**	**J**
4-Chloroaniline	15	U
Hexachlorobutadiene	15	U
4-Chloro-3-Methylphenol	15	U
2-Methylnaphthalene	**9**	**J**
1-Methylnaphthalene	**5.5**	**J**
Hexachlorocyclopentadiene	75	U
2,4,6-Trichlorophenol	15	U
2,4,5-Trichlorophenol	75	U
2-Chloronaphthalene	15	U
2-Nitroaniline	30	U
Dimethylphthalate	30	U
2,6-Dinitrotoluene	75	U
Acenaphthylene	15	UJ
3-Nitroaniline	15	U
Acenaphthene	15	U
2,4-Dinitrophenol	302	U
4-Nitrophenol	75	U
Dibenzofuran	15	UJ
2,4-Dinitrotoluene	30	U
Diethylphthalate	15	UJ
Fluorene	**6**	**J**
4-Chlorophenyl-Phenylether	15	U
4-Nitroaniline	151	U
4,6-Dinitro-2-Methylphenol	151	U
N-Nitrosodiphenylamine	15	U
1,2-Diphenylhydrazine	15	U
4-Bromophenyl-Phenylether	15	U
Hexachlorobenzene	15	U
Pentachlorophenol	151	UJ
Phenanthrene	**32**	
Anthracene	**9.2**	**J**
Caffeine	15	U
Carbazole	151	U
Di-N-Butylphthalate	15	UJ
Fluoranthene	**74**	
Benzidine	302	U
Pyrene	**59**	
Retene	**7.8**	**J**
Butylbenzylphthalate	15	U
Benzo(a)anthracene	15	U
3,3'-Dichlorobenzidine	302	U
Chrysene	**28**	
Bis(2-Ethylhexyl) Phthalate	**9.5**	**J**
Di-N-Octyl Phthalate	151	U
Benzo(b)fluoranthene	**23**	
Benzo(k)fluoranthene	**14**	**J**
Benzo(a)pyrene	**11**	**J**
3B-Coprostanol	151	UJ
Indeno(1,2,3-cd)pyrene	**8.2**	**J**
Dibenzo(a,h)anthracene	15	U
Benzo(ghi)perylene	**9.8**	**J**

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Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148241
Field ID: 10
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Surrogate Recoveries

2-Fluorophenol	80	%
D5-Phenol	83	%
D4-2-Chlorophenol	82	%
1,2-Dichlorobenzene-D4	52	%
D5-Nitrobenzene	58	%
2-Fluorobiphenyl	76	%
D10-Pyrene	83	%
D14-Terphenyl	83	%

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Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148241
Field ID: 10
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
*3008005	*Unknown 05*	294	NJ
1534083	*Ethanethioic acid, S-methyl*	354	NJ
4914925	*2-Pentene, 3,4-dimethyl-, (*	648	NJ
544638	*Decanoic Acid, Tetra-*	548	NJ
5746587	*Tetradecanoic Acid, 12-Methyl-, (S)-*	903	NJ
*3008001	*Unknown 01*	371	NJ
2091294	*9-Hexadecenoic Acid*	3340	NJ
*3008002	*Unknown 02*	923	NJ
*3008003	*Unknown 03*	532	NJ
57885	*Cholesterol*	840	NJ
516950	*Epicholestanol*	406	NJ
*3008004	*Unknown 04*	360	NJ
83476	*Gamma-Sitosterol*	1010	NJ

Authorized By: D. Hunter Release Date: 6/23/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148242
Field ID: 10A
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	15	U	Acenaphthene	15	UJ
Pyridine	15	U	2,4-Dinitrophenol	309	U
Aniline	31	U	4-Nitrophenol	77	U
Phenol	**77**		**Dibenzofuran**	**6.7**	**J**
Bis(2-Chloroethyl)Ether	15	U	2,4-Dinitrotoluene	31	U
2-Chlorophenol	15	U	Diethylphthalate	15	U
1,3-Dichlorobenzene	15	U	**Fluorene**	**7.8**	**J**
1,4-Dichlorobenzene	15	U	4-Chlorophenyl-Phenylether	15	U
1,2-Dichlorobenzene	15	U	4-Nitroaniline	154	U
Benzyl Alcohol	15	U	4,6-Dinitro-2-Methylphenol	154	U
2-Methylphenol	15	U	N-Nitrosodiphenylamine	15	U
2,2'-Oxybis[1-chloropropane]	15	U	1,2-Diphenylhydrazine	15	U
N-Nitroso-Di-N-Propylamine	31	U	4-Bromophenyl-Phenylether	15	U
4-Methylphenol	15	U	Hexachlorobenzene	15	U
Hexachloroethane	15	U	Pentachlorophenol	154	U
Nitrobenzene	15	U	**Phenanthrene**	**43**	
Isophorone	15	U	**Anthracene**	**12**	**J**
2-Nitrophenol	77	U	Caffeine	15	U
2,4-Dimethylphenol	15	U	Carbazole	154	U
Bis(2-Chloroethoxy)Methane	15	U	Di-N-Butylphthalate	40	UJ
Benzoic Acid	309	U	**Fluoranthene**	**94**	
2,4-Dichlorophenol	15	U	Benzidine	309	U
1,2,4-Trichlorobenzene	15	U	**Pyrene**	**83**	
Naphthalene	**23**		**Retene**	**8.7**	**J**
4-Chloroaniline	15	U	Butylbenzylphthalate	15	U
Hexachlorobutadiene	15	U	**Benzo(a)anthracene**	**27**	
4-Chloro-3-Methylphenol	15	U	3,3'-Dichlorobenzidine	309	U
2-Methylnaphthalene	**10**	**J**	**Chrysene**	**38**	
1-Methylnaphthalene	**8.2**	**J**	Bis(2-Ethylhexyl) Phthalate	15	UJ
Hexachlorocyclopentadiene	77	U	Di-N-Octyl Phthalate	154	U
2,4,6-Trichlorophenol	15	U	**Benzo(b)fluoranthene**	**34**	
2,4,5-Trichlorophenol	77	U	**Benzo(k)fluoranthene**	**14**	**J**
2-Chloronaphthalene	15	U	**Benzo(a)pyrene**	**24**	
2-Nitroaniline	31	U	3B-Coprostanol	154	UJ
Dimethylphthalate	31	U	**Indeno(1,2,3-cd)pyrene**	**13**	**J**
2,6-Dinitrotoluene	77	U	Dibenzo(a,h)anthracene	3.8	UJ
Acenaphthylene	**9.2**	**J**	**Benzo(ghi)perylene**	**13**	**J**
3-Nitroaniline	15	U			

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Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148242
Field ID: 10A
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Surrogate Recoveries

2-Fluorophenol	69	%
D5-Phenol	72	%
D4-2-Chlorophenol	73	%
1,2-Dichlorobenzene-D4	41	%
D5-Nitrobenzene	53	%
2-Fluorobiphenyl	73	%
D10-Pyrene	72	%
D14-Terphenyl	75	%

Authorized By: D. Hanton Release Date: 6/13/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148242
Field ID: 10A
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
1534083	*Ethanethioic acid, S-methyl*	501	NJ
544638	*Decanoic Acid, Tetra-*	624	NJ
*3008001	*Unknown 01*	415	NJ
1002842	*Decanoic Acid, Penta-*	455	NJ
*3008002	*Unknown 02*	913	NJ
2091294	*9-Hexadecenoic Acid*	2710	NJ
*3008003	*Unknown 03*	664	NJ
*3008004	*Unknown 04*	505	NJ
57885	*Cholesterol*	1170	NJ
516950	*Epicholestanol*	504	NJ
*3008005	*Unknown 05*	499	NJ
83476	*Gamma-Sitosterol*	1230	NJ

Authorized By: D. Hanson Release Date: 6/23/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments **LIMS Project ID:** 1161-97

Sample: 97148243 **Date Received:** 04/07/97 **Method:** SW8270
Field ID: 11 **Date Prepared:** 04/09/97 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 05/17/97 **Units:** ug/Kg Dry Wt.

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	30	U	Acenaphthene	30	U
Pyridine	30	U	2,4-Dinitrophenol	605	U
Aniline	61	U	4-Nitrophenol	151	U
Phenol	30	U	Dibenzofuran	30	U
Bis(2-Chloroethyl)Ether	30	U	2,4-Dinitrotoluene	61	U
2-Chlorophenol	30	U	Diethylphthalate	30	U
1,3-Dichlorobenzene	30	U	Fluorene	30	U
1,4-Dichlorobenzene	30	U	4-Chlorophenyl-Phenylether	30	U
1,2-Dichlorobenzene	30	U	4-Nitroaniline	303	U
Benzyl Alcohol	30	U	4,6-Dinitro-2-Methylphenol	303	U
2-Methylphenol	30	U	N-Nitrosodiphenylamine	30	U
2,2'-Oxybis[1-chloropropane]	30	U	1,2-Diphenylhydrazine	30	U
N-Nitroso-Di-N-Propylamine	61	U	4-Bromophenyl-Phenylether	30	U
4-Methylphenol	30	U	Hexachlorobenzene	30	U
Hexachloroethane	30	U	Pentachlorophenol	303	U
Nitrobenzene	30	U	Phenanthrene	30	UJ
Isophorone	30	U	Anthracene	30	UJ
2-Nitrophenol	151	U	Caffeine	30	U
2,4-Dimethylphenol	30	U	Carbazole	303	U
Bis(2-Chloroethoxy)Methane	30	U	Di-N-Butylphthalate	61	U
Benzoic Acid	605	U	Fluoranthene	30	UJ
2,4-Dichlorophenol	30	U	Benzidine	605	U
1,2,4-Trichlorobenzene	30	U	Pyrene	36	UJ
Naphthalene	30	U	**Retene**	**11**	**J**
4-Chloroaniline	30	U	Butylbenzylphthalate	30	U
Hexachlorobutadiene	30	U	Benzo(a)anthracene	30	U
4-Chloro-3-Methylphenol	30	U	3,3'-Dichlorobenzidine	605	U
2-Methylnaphthalene	**9.4**	**J**	**Chrysene**	**21**	**J**
1-Methylnaphthalene	**5.8**	**J**	Bis(2-Ethylhexyl) Phthalate	61	UJ
Hexachlorocyclopentadiene	151	U	Di-N-Octyl Phthalate	303	U
2,4,6-Trichlorophenol	30	U	**Benzo(b)fluoranthene**	**22**	**J**
2,4,5-Trichlorophenol	151	U	**Benzo(k)fluoranthene**	**12**	**J**
2-Chloronaphthalene	30	U	**Benzo(a)pyrene**	**12**	**J**
2-Nitroaniline	61	U	3B-Coprostanol	605	U
Dimethylphthalate	61	U	Indeno(1,2,3-cd)pyrene	30	U
2,6-Dinitrotoluene	151	U	Dibenzo(a,h)anthracene	30	U
Acenaphthylene	30	UJ	Benzo(ghi)perylene	30	U
3-Nitroaniline	30	U			

Authorized By: _____ Release Date: 6/13/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148243
Field ID: 11
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Surrogate Recoveries

2-Fluorophenol	58	%
D5-Phenol	55	%
D4-2-Chlorophenol	58	%
1,2-Dichlorobenzene-D4	29	%
D5-Nitrobenzene	49	%
2-Fluorobiphenyl	73	%
D10-Pyrene	80	%
D14-Terphenyl	82	%

Authorized By: ____________ Release Date: 6/23/97 Page: 2

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Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148243
Field ID: 11
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
		360	NJ
544638	*Decanoic Acid, Tetra-*	483	NJ
*3008001	*Unknown 01*	426	NJ
*3008002	*Unknown 02*	1400	NJ
2091294	*9-Hexadecenoic Acid*	1120	NJ
150867	*Phytol*	386	NJ
115866	*Triphenyl Phosphate*	546	NJ
*3005001	*Unknown Hydrocarbon 01*	458	NJ
*3005002	*Unknown Hydrocarbon 02*	404	NJ
*3005003	*Unknown Hydrocarbon 03*	2070	NJ
57885	*Cholesterol*	544	NJ
516950	*Epicholestanol*	542	NJ
*3008003	*Unknown 03*	822	NJ
83476	*Gamma-Sitosterol*		

Authorized By: D. Hopkins Release Date: 6/23/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148245
Field ID: 13
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	30	U	Acenaphthene	30	U
Pyridine	30	U	2,4-Dinitrophenol	603	U
Aniline	60	U	4-Nitrophenol	151	U
Phenol	30	U	Dibenzofuran	30	U
Bis(2-Chloroethyl)Ether	30	U	2,4-Dinitrotoluene	60	U
2-Chlorophenol	30	U	Diethylphthalate	30	U
1,3-Dichlorobenzene	30	U	Fluorene	30	U
1,4-Dichlorobenzene	30	U	4-Chlorophenyl-Phenylether	30	U
1,2-Dichlorobenzene	30	U	4-Nitroaniline	302	U
Benzyl Alcohol	30	U	4,6-Dinitro-2-Methylphenol	302	U
2-Methylphenol	30	U	N-Nitrosodiphenylamine	30	U
2,2'-Oxybis[1-chloropropane]	30	U	1,2-Diphenylhydrazine	30	U
N-Nitroso-Di-N-Propylamine	60	U	4-Bromophenyl-Phenylether	30	U
4-Methylphenol	30	U	Hexachlorobenzene	30	U
Hexachloroethane	30	U	Pentachlorophenol	302	U
Nitrobenzene	30	U	Phenanthrene	30	UJ
Isophorone	30	U	Anthracene	30	U
2-Nitrophenol	151	U	Caffeine	30	U
2,4-Dimethylphenol	30	U	Carbazole	302	U
Bis(2-Chloroethoxy)Methane	30	U	Di-N-Butylphthalate	30	UJ
Benzoic Acid	603	U	**Fluoranthene**	**34**	
2,4-Dichlorophenol	30	U	Benzidine	603	U
1,2,4-Trichlorobenzene	30	U	Pyrene	31	UJ
Naphthalene	30	U	**Retene**	**18**	J
4-Chloroaniline	30	U	Butylbenzylphthalate	30	UJ
Hexachlorobutadiene	30	U	Benzo(a)anthracene	30	U
4-Chloro-3-Methylphenol	30	U	3,3'-Dichlorobenzidine	603	U
2-Methylnaphthalene	30	U	**Chrysene**	**24**	J
1-Methylnaphthalene	30	U	Bis(2-Ethylhexyl) Phthalate	30	UJ
Hexachlorocyclopentadiene	151	U	Di-N-Octyl Phthalate	302	U
2,4,6-Trichlorophenol	30	U	Benzo(b)fluoranthene	30	U
2,4,5-Trichlorophenol	151	U	Benzo(k)fluoranthene	30	U
2-Chloronaphthalene	30	U	**Benzo(a)pyrene**	**12**	J
2-Nitroaniline	60	U	3B-Coprostanol	302	UJ
Dimethylphthalate	60	U	Indeno(1,2,3-cd)pyrene	30	U
2,6-Dinitrotoluene	151	U	Dibenzo(a,h)anthracene	30	U
Acenaphthylene	30	U	Benzo(ghi)perylene	30	U
3-Nitroaniline	30	U			

Authorized By: _____ Release Date: 6/23/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148245
Field ID: 13
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Surrogate Recoveries

2-Fluorophenol	65	%
D5-Phenol	51	%
D4-2-Chlorophenol	60	%
1,2-Dichlorobenzene-D4	36	%
D5-Nitrobenzene	48	%
2-Fluorobiphenyl	73	%
D10-Pyrene	78	%
D14-Terphenyl	78	%

Authorized By: D. Hunter Release Date: 6/23/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments **LIMS Project ID:** 1161-97

Sample: 97148245 **Date Received:** 04/07/97 **Method:** SW8270
Field ID: 13 **Date Prepared:** 04/09/97 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 05/17/97 **Units:** ug/Kg Dry Wt.

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
*3008005	*Unknown 05*	829	NJ
1534083	*Ethanethioic acid, S-methyl*	287	NJ
544638	*Decanoic Acid, Tetra-*	374	NJ
*3008001	*Unknown 01*	343	NJ
*3008002	*Unknown 02*	310	NJ
*3008003	*Unknown 03*	494	NJ
14237731	*2-Hexadecene, 3,7,11,15-tet*	263	NJ
2091294	*9-Hexadecenoic Acid*	1390	NJ
150867	*Phytol*	926	NJ
*3008004	*Unknown 04*	389	NJ
59029	*Vitamin E*	357	NJ
83476	*Gamma-Sitosterol*	1590	NJ

Authorized By: D. Hunter Release Date: 6/13/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148247
Field ID: 15
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	20	U	**Acenaphthene**	**10**	**J**
Pyridine	39	U	2,4-Dinitrophenol	393	U
Aniline	98	U	**4-Nitrophenol**	**46**	**J**
Phenol	**30**		**Dibenzofuran**	**16**	**J**
Bis(2-Chloroethyl)Ether	**.98**	**J**	2,4-Dinitrotoluene	39	U
2-Chlorophenol	20	U	Diethylphthalate	20	UJ
1,3-Dichlorobenzene	20	U	**Fluorene**	**18**	**J**
1,4-Dichlorobenzene	20	U	4-Chlorophenyl-Phenylether	20	U
1,2-Dichlorobenzene	20	U	4-Nitroaniline	39	U
Benzyl Alcohol	39	U	4,6-Dinitro-2-Methylphenol	196	U
2-Methylphenol	20	U	N-Nitrosodiphenylamine	20	U
2,2'-Oxybis[1-chloropropane]	20	U	1,2-Diphenylhydrazine	20	U
N-Nitroso-Di-N-Propylamine	39	U	4-Bromophenyl-Phenylether	20	U
4-Methylphenol	20	U	Hexachlorobenzene	20	U
Hexachloroethane	20	U	Pentachlorophenol	196	U
Nitrobenzene	20	U	**Phenanthrene**	**131**	
Isophorone	**157**		**Anthracene**	**42**	
2-Nitrophenol	20	U	**Caffeine**	**5.2**	**J**
2,4-Dimethylphenol	**1**	**J**	Carbazole	98	U
Bis(2-Chloroethoxy)Methane	20	U	Di-N-Butylphthalate	196	UJ
Benzoic Acid	393	U	**Fluoranthene**	**535**	
2,4-Dichlorophenol	20	U	Benzidine	393	U
1,2,4-Trichlorobenzene	20	U	**Pyrene**	**339**	
Naphthalene	**47**		**Retene**	**22**	
4-Chloroaniline	98	U	Butylbenzylphthalate	20	U
Hexachlorobutadiene	20	U	**Benzo(a)anthracene**	**106**	
4-Chloro-3-Methylphenol	20	U	3,3'-Dichlorobenzidine	393	U
2-Methylnaphthalene	**20**		**Chrysene**	**112**	
1-Methylnaphthalene	**11**	**J**	Bis(2-Ethylhexyl) Phthalate	196	UJ
Hexachlorocyclopentadiene	98	U	Di-N-Octyl Phthalate	196	U
2,4,6-Trichlorophenol	20	U	**Benzo(b)fluoranthene**	**203**	
2,4,5-Trichlorophenol	98	U	**Benzo(k)fluoranthene**	**11**	**J**
2-Chloronaphthalene	20	U	**Benzo(a)pyrene**	**91**	
2-Nitroaniline	39	U	3B-Coprostanol	196	UJ
Dimethylphthalate	39	U	**Indeno(1,2,3-cd)pyrene**	**8.8**	**J**
2,6-Dinitrotoluene	39	U	**Dibenzo(a,h)anthracene**	**15**	**J**
Acenaphthylene	**18**	**J**	**Benzo(ghi)perylene**	**43**	
3-Nitroaniline	98	U			

Authorized By: D. C. Hunter Release Date: 7/2/97 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148247
Field ID: 15
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Surrogate Recoveries

2-Fluorophenol	73	%
D5-Phenol	58	%
D4-2-Chlorophenol	69	%
1,2-Dichlorobenzene-D4	45	%
D5-Nitrobenzene	48	%
2-Fluorobiphenyl	80	%
D10-Pyrene	80	%
D14-Terphenyl	75	%

Authorized By: D. Hunter Release Date: 7/2/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148247
Field ID: 15
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
		973	NJ
3102338	*3-Penten-2-One, (E)-*	305	NJ
108883	*Toluene*	436	NJ
1534083	*Ethanethioic acid, S-methyl*	882	NJ
141797	*3-Penten-2-One, 4-Methyl-*	1040	NJ
106978	*Butane (8ci9ci)*	20800	NJ
123422	*4-Hydroxy-4-Methylpentan-2-one*	451	NJ
105464	*Acetic acid, 1-methylpropyl*	604	NJ
54833486	*Heptadecane, 2,6,10,15-Tetra*	595	NJ
1613372	*Quinoline, 1-oxide*	1300	NJ
41044648	*1,5-Heptadiene, 2-methyl-, (Z)-*	495	NJ
115866	*Triphenyl Phosphate*	535	NJ
74685339	*3-Eicosene, (E)- (9ci)*	490	NJ
35599770	*Tridecane, 1-iodo-*	964	NJ
7225663	*Tridecane, 7-hexyl*	472	NJ
34874889	*Benzenamine, 3-methoxy-2,4,6-trimethyl-*	2800	NJ
57885	*Cholesterol*	1680	NJ
474679	*Ergosta-5,22-dien-3-ol, (3.beta.,22E)-*	684	NJ
601570	*Cholest-4-en-3-one*	697	NJ
83476	*Gamma-Sitosterol*		

Authorized By: D. Norton Release Date: 6/24/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148249
Field ID: 17
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
N-Nitrosodimethylamine	19	U
Pyridine	19	U
Aniline	39	U
Phenol	19	U
Bis(2-Chloroethyl)Ether	19	U
2-Chlorophenol	19	U
1,3-Dichlorobenzene	19	U
1,4-Dichlorobenzene	19	U
1,2-Dichlorobenzene	19	U
Benzyl Alcohol	19	U
2-Methylphenol	19	U
2,2'-Oxybis[1-chloropropane]	19	U
N-Nitroso-Di-N-Propylamine	39	U
4-Methylphenol	19	U
Hexachloroethane	19	U
Nitrobenzene	19	U
Isophorone	19	U
2-Nitrophenol	97	U
2,4-Dimethylphenol	19	U
Bis(2-Chloroethoxy)Methane	19	U
Benzoic Acid	386	U
2,4-Dichlorophenol	19	U
1,2,4-Trichlorobenzene	19	U
Naphthalene	**34**	
4-Chloroaniline	19	U
Hexachlorobutadiene	19	U
4-Chloro-3-Methylphenol	19	U
2-Methylnaphthalene	**19**	**J**
1-Methylnaphthalene	**13**	**J**
Hexachlorocyclopentadiene	97	U
2,4,6-Trichlorophenol	19	U
2,4,5-Trichlorophenol	97	U
2-Chloronaphthalene	19	U
2-Nitroaniline	39	U
Dimethylphthalate	39	U
2,6-Dinitrotoluene	97	U
Acenaphthylene	19	UJ
3-Nitroaniline	19	U
Acenaphthene	**6.9**	**J**
2,4-Dinitrophenol	386	U
4-Nitrophenol	97	U
Dibenzofuran	**11**	**J**
2,4-Dinitrotoluene	39	U
Diethylphthalate	19	U
Fluorene	**13**	**J**
4-Chlorophenyl-Phenylether	19	U
4-Nitroaniline	193	U
4,6-Dinitro-2-Methylphenol	193	U
N-Nitrosodiphenylamine	19	U
1,2-Diphenylhydrazine	19	U
4-Bromophenyl-Phenylether	19	U
Hexachlorobenzene	19	U
Pentachlorophenol	193	U
Phenanthrene	**76**	
Anthracene	**24**	
Caffeine	19	U
Carbazole	193	U
Di-N-Butylphthalate	75	UJ
Fluoranthene	**141**	
Benzidine	386	U
Pyrene	**137**	
Retene	**25**	
Butylbenzylphthalate	19	U
Benzo(a)anthracene	**43**	
3,3'-Dichlorobenzidine	386	U
Chrysene	**98**	
Bis(2-Ethylhexyl) Phthalate	39	UJ
Di-N-Octyl Phthalate	193	U
Benzo(b)fluoranthene	**64**	
Benzo(k)fluoranthene	**23**	
Benzo(a)pyrene	**32**	
3B-Coprostanol	193	UJ
Indeno(1,2,3-cd)pyrene	**17**	**J**
Dibenzo(a,h)anthracene	19	U
Benzo(ghi)perylene	**18**	**J**

Authorized By: D. Norton Release Date: 6/13/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148249
Field ID: 17
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Surrogate Recoveries

2-Fluorophenol	61	%
D5-Phenol	55	%
D4-2-Chlorophenol	58	%
1,2-Dichlorobenzene-D4	33	%
D5-Nitrobenzene	48	%
2-Fluorobiphenyl	63	%
D10-Pyrene	67	%
D14-Terphenyl	68	%

Authorized By: D. Hunter Release Date: 6/23/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148249
Field ID: 17
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
1115113	*Butenal, 2-Methyl-2-*	309	NJ
286204	*7-Oxabicyclo[4.1.0]Heptane*	231	NJ
*3008001	*Unknown 01*	388	NJ
5989026	*(-)-Loliolide*	316	NJ
2091294	*9-Hexadecenoic Acid*	909	NJ
*3008002	*Unknown 02*	360	NJ
150867	*Phytol*	442	NJ
*3008003	*Unknown 03*	893	NJ
*3008004	*Unknown 04*	1480	NJ
57885	*Cholesterol*	1400	NJ
516950	*Epicholestanol*	403	NJ
83476	*Gamma-Sitosterol*	1410	NJ
*3008005	*Unknown 05*	1180	NJ
*3008006	*Unknown 06*	722	NJ

Authorized By: D. Norton Release Date: 6/23/97 Page: 3

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148252
Field ID: 20
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
N-Nitrosodimethylamine	20	U
Pyridine	20	U
Aniline		**REJ**
Phenol	20	U
Bis(2-Chloroethyl)Ether	20	U
2-Chlorophenol	20	U
1,3-Dichlorobenzene	20	U
1,4-Dichlorobenzene	20	U
1,2-Dichlorobenzene	20	U
Benzyl Alcohol	20	U
2-Methylphenol	20	U
2,2'-Oxybis[1-chloropropane]	20	U
N-Nitroso-Di-N-Propylamine	40	U
4-Methylphenol	**25**	
Hexachloroethane	20	UJ
Nitrobenzene	20	U
Isophorone	20	U
2-Nitrophenol	101	UJ
2,4-Dimethylphenol	20	U
Bis(2-Chloroethoxy)Methane	20	U
Benzoic Acid		**REJ**
2,4-Dichlorophenol	20	U
1,2,4-Trichlorobenzene	20	U
Naphthalene	**51**	
4-Chloroaniline		**REJ**
Hexachlorobutadiene	20	U
4-Chloro-3-Methylphenol	20	U
2-Methylnaphthalene	**15**	**J**
1-Methylnaphthalene	**14**	**J**
Hexachlorocyclopentadiene		**REJ**
2,4,6-Trichlorophenol	20	U
2,4,5-Trichlorophenol	101	U
2-Chloronaphthalene	20	U
2-Nitroaniline	40	U
Dimethylphthalate	40	U
2,6-Dinitrotoluene	101	U
Acenaphthylene	**13**	**J**
3-Nitroaniline	20	UJ
Acenaphthene	**6.2**	**J**
2,4-Dinitrophenol		**REJ**
4-Nitrophenol	101	U
Dibenzofuran	**13**	**J**
2,4-Dinitrotoluene	40	U
Diethylphthalate	20	U
Fluorene	**14**	**J**
4-Chlorophenyl-Phenylether	20	U
4-Nitroaniline	202	UJ
4,6-Dinitro-2-Methylphenol	202	UJ
N-Nitrosodiphenylamine	20	U
1,2-Diphenylhydrazine	20	U
4-Bromophenyl-Phenylether	20	U
Hexachlorobenzene	20	U
Pentachlorophenol	202	U
Phenanthrene	**83**	**J**
Anthracene	**25**	
Caffeine	20	U
Carbazole	202	U
Di-N-Butylphthalate	40	UJ
Fluoranthene	**177**	
Benzidine	404	U
Pyrene	**145**	
Retene	**17**	**J**
Butylbenzylphthalate	20	U
Benzo(a)anthracene	**41**	
3,3'-Dichlorobenzidine	404	U
Chrysene	**86**	
Bis(2-Ethylhexyl) Phthalate	20	UJ
Di-N-Octyl Phthalate	202	U
Benzo(b)fluoranthene	**77**	
Benzo(k)fluoranthene	**30**	
Benzo(a)pyrene	**39**	
3B-Coprostanol	404	U
Indeno(1,2,3-cd)pyrene	**21**	
Dibenzo(a,h)anthracene	20	U
Benzo(ghi)perylene	**24**	

Authorized By: D. Hunter Release Date: 6/13/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148252
Field ID: 20
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Surrogate Recoveries

2-Fluorophenol	78	%
D5-Phenol	74	%
D4-2-Chlorophenol	76	%
1,2-Dichlorobenzene-D4	43	%
D5-Nitrobenzene	44	%
2-Fluorobiphenyl	73	%
D10-Pyrene	83	%
D14-Terphenyl	80	%

Authorized By: D. Hostetler Release Date: 6/23/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148252
Field ID: 20
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
		1450	NJ
*3008005	*Unknown 05*	913	NJ
*3008003	*Unknown 03*	458	NJ
*3008004	*Unknown 04*	531	NJ
1534083	*Ethanethioic acid, S-methyl*	393	NJ
*3008001	*Unknown 01*	790	NJ
*3008002	*Unknown 02*	402	NJ
544638	*Decanoic Acid, Tetra-*	523	NJ
1002842	*Decanoic Acid, Penta-*	689	NJ
19047859	*Phosphonic Acid, Dioctadecyl*	675	NJ
17301278	*Undecane, 2,10-Dimethyl-*	2330	NJ
57885	*Cholesterol*	1130	NJ
83476	*Gamma-Sitosterol*		

Authorized By: D. Hunter Release Date: 6/13/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments **LIMS Project ID:** 1161-97

Sample: 97148252 (Matrix Spike - LMX1) **Date Received:** 04/07/97 **Method:** SW8270
Field ID: 20 **Date Prepared:** 04/09/97 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 05/17/97 **Units:** % Recovery

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	60		Acenaphthene	75	
Pyridine		NAF	2,4-Dinitrophenol		REJ
Aniline		REJ	4-Nitrophenol	58	
Phenol	65		Dibenzofuran	76	
Bis(2-Chloroethyl)Ether	71		2,4-Dinitrotoluene	59	
2-Chlorophenol	69		Diethylphthalate	76	
1,3-Dichlorobenzene	53		Fluorene	79	
1,4-Dichlorobenzene	55		4-Chlorophenyl-Phenylether	79	
1,2-Dichlorobenzene	60		4-Nitroaniline	25	
Benzyl Alcohol	74		4,6-Dinitro-2-Methylphenol	10	
2-Methylphenol	68		N-Nitrosodiphenylamine	59	
2,2'-Oxybis[1-chloropropane]	57		1,2-Diphenylhydrazine	72	
N-Nitroso-Di-N-Propylamine	82		4-Bromophenyl-Phenylether	83	
4-Methylphenol	83		Hexachlorobenzene	84	
Hexachloroethane	10		Pentachlorophenol	3	
Nitrobenzene	67		Phenanthrene	80	
Isophorone	71		Anthracene	82	
2-Nitrophenol	50		Caffeine		NAF
2,4-Dimethylphenol	85		Carbazole		NAF
Bis(2-Chloroethoxy)Methane	85		Di-N-Butylphthalate	80	
Benzoic Acid		REJ	Fluoranthene	78	
2,4-Dichlorophenol	82		Benzidine		NAF
1,2,4-Trichlorobenzene	68		Pyrene	70	
Naphthalene	71		Retene		NAF
4-Chloroaniline		REJ	Butylbenzylphthalate	78	
Hexachlorobutadiene	63		Benzo(a)anthracene	79	
4-Chloro-3-Methylphenol	74		3,3'-Dichlorobenzidine		NAF
2-Methylnaphthalene	75		Chrysene	82	
1-Methylnaphthalene		NAF	Bis(2-Ethylhexyl) Phthalate	75	
Hexachlorocyclopentadiene		REJ	Di-N-Octyl Phthalate	78	
2,4,6-Trichlorophenol	74		Benzo(b)fluoranthene	81	
2,4,5-Trichlorophenol	82		Benzo(k)fluoranthene	86	
2-Chloronaphthalene	79		Benzo(a)pyrene	79	
2-Nitroaniline	71		3B-Coprostanol		NAF
Dimethylphthalate	76		Indeno(1,2,3-cd)pyrene	85	
2,6-Dinitrotoluene	64		Dibenzo(a,h)anthracene	72	
Acenaphthylene	76		Benzo(ghi)perylene	64	
3-Nitroaniline	7				

Authorized By: D. Houston Release Date: 6/23/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148252 (Matrix Spike - LMX1)
Field ID: 20
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: % Recovery

Surrogate Recoveries

2-Fluorophenol	68	%
D5-Phenol	73	%
D4-2-Chlorophenol	70	%
1,2-Dichlorobenzene-D4	38	%
D5-Nitrobenzene	49	%
2-Fluorobiphenyl	70	%
D10-Pyrene	71	%
D14-Terphenyl	70	%

Authorized By: D. Hunter Release Date: 6/23/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148252 (Matrix Spike - LMX2)
Field ID: 20
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: % Recovery

Surrogate Recoveries

2-Fluorophenol	76	%
D5-Phenol	82	%
D4-2-Chlorophenol	79	%
1,2-Dichlorobenzene-D4	38	%
D5-Nitrobenzene	47	%
2-Fluorobiphenyl	71	%
D10-Pyrene	78	%
D14-Terphenyl	78	%

Authorized By: D. Hunter Release Date: 6/13/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments **LIMS Project ID:** 1161-97

Sample: 97148252 (Matrix Spike - LMX2) **Date Received:** 04/07/97 **Method:** SW8270
Field ID: 20 **Date Prepared:** 04/09/97 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 05/17/97 **Units:** % Recovery

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	65		Acenaphthene	79	
Pyridine		NAF	2,4-Dinitrophenol		REJ
Aniline		REJ	4-Nitrophenol	60	
Phenol	74		Dibenzofuran	79	
Bis(2-Chloroethyl)Ether	76		2,4-Dinitrotoluene	61	
2-Chlorophenol	76		Diethylphthalate	80	
1,3-Dichlorobenzene	56		Fluorene	81	
1,4-Dichlorobenzene	58		4-Chlorophenyl-Phenylether	80	
1,2-Dichlorobenzene	65		4-Nitroaniline	24	
Benzyl Alcohol	78		4,6-Dinitro-2-Methylphenol	9	
2-Methylphenol	86		N-Nitrosodiphenylamine	61	
2,2'-Oxybis[1-chloropropane]	62		1,2-Diphenylhydrazine	73	
N-Nitroso-Di-N-Propylamine	88		4-Bromophenyl-Phenylether	86	
4-Methylphenol	92		Hexachlorobenzene	89	
Hexachloroethane	15		Pentachlorophenol	3	
Nitrobenzene	65		Phenanthrene	84	
Isophorone	73		Anthracene	83	
2-Nitrophenol	50		Caffeine		NAF
2,4-Dimethylphenol	85		Carbazole		NAF
Bis(2-Chloroethoxy)Methane	84		Di-N-Butylphthalate	84	
Benzoic Acid		REJ	Fluoranthene	80	
2,4-Dichlorophenol	82		Benzidine		NAF
1,2,4-Trichlorobenzene	68		Pyrene	72	
Naphthalene	71		Retene		NAF
4-Chloroaniline		REJ	Butylbenzylphthalate	86	
Hexachlorobutadiene	66		Benzo(a)anthracene	83	
4-Chloro-3-Methylphenol	71		3,3'-Dichlorobenzidine		NAF
2-Methylnaphthalene	77		Chrysene	88	
1-Methylnaphthalene		NAF	Bis(2-Ethylhexyl) Phthalate	84	
Hexachlorocyclopentadiene		REJ	Di-N-Octyl Phthalate	85	
2,4,6-Trichlorophenol	77		Benzo(b)fluoranthene	85	
2,4,5-Trichlorophenol	83		Benzo(k)fluoranthene	88	
2-Chloronaphthalene	80		Benzo(a)pyrene	83	
2-Nitroaniline	69		3B-Coprostanol		NAF
Dimethylphthalate	80		Indeno(1,2,3-cd)pyrene	92	
2,6-Dinitrotoluene	66		Dibenzo(a,h)anthracene	78	
Acenaphthylene	78		Benzo(ghi)perylene	69	
3-Nitroaniline	7				

Authorized By: D. Hunter Release Date: 7/2/97 Page: 6

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148252 (Matrix Spike - LMX2)
Field ID: 20
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: % Recovery

Surrogate Recoveries

2-Fluorophenol	76	%
D5-Phenol	82	%
D4-2-Chlorophenol	79	%
1,2-Dichlorobenzene-D4	38	%
D5-Nitrobenzene	47	%
2-Fluorobiphenyl	71	%
D10-Pyrene	78	%
D14-Terphenyl	78	%

Authorized By: _____ Release Date: 7/2/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments **LIMS Project ID:** 1161-97

Sample: 97148253
Field ID: 21
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	21	U	**Acenaphthene**	**6.4**	**J**
Pyridine	21	U	2,4-Dinitrophenol	412	U
Aniline	41	U	4-Nitrophenol	103	U
Phenol	21	U	**Dibenzofuran**	**11**	**J**
Bis(2-Chloroethyl)Ether	21	U	2,4-Dinitrotoluene	41	U
2-Chlorophenol	21	U	Diethylphthalate	21	U
1,3-Dichlorobenzene	21	U	**Fluorene**	**9.6**	**J**
1,4-Dichlorobenzene	21	U	4-Chlorophenyl-Phenylether	21	U
1,2-Dichlorobenzene	21	U	4-Nitroaniline	206	U
Benzyl Alcohol	21	U	4,6-Dinitro-2-Methylphenol	206	U
2-Methylphenol	21	U	N-Nitrosodiphenylamine	21	U
2,2'-Oxybis[1-chloropropane]	21	U	1,2-Diphenylhydrazine	21	U
N-Nitroso-Di-N-Propylamine	41	U	4-Bromophenyl-Phenylether	21	U
4-Methylphenol	**38**		Hexachlorobenzene	21	U
Hexachloroethane	21	U	Pentachlorophenol	206	U
Nitrobenzene	21	U	**Phenanthrene**	**60**	
Isophorone	21	U	**Anthracene**	**17**	**J**
2-Nitrophenol	103	U	Caffeine	21	U
2,4-Dimethylphenol	21	U	Carbazole	206	U
Bis(2-Chloroethoxy)Methane	21	U	Di-N-Butylphthalate	462	UJ
Benzoic Acid	412	U	**Fluoranthene**	**107**	
2,4-Dichlorophenol	21	U	Benzidine	412	U
1,2,4-Trichlorobenzene	21	U	**Pyrene**	**88**	
Naphthalene	**43**		**Retene**	**18**	**J**
4-Chloroaniline	21	U	Butylbenzylphthalate	21	U
Hexachlorobutadiene	21	U	Benzo(a)anthracene	21	U
4-Chloro-3-Methylphenol	21	U	3,3'-Dichlorobenzidine	412	U
2-Methylnaphthalene	**16**	**J**	**Chrysene**	**45**	
1-Methylnaphthalene	**12**	**J**	Bis(2-Ethylhexyl) Phthalate	41	UJ
Hexachlorocyclopentadiene	103	U	Di-N-Octyl Phthalate	206	U
2,4,6-Trichlorophenol	21	U	**Benzo(b)fluoranthene**	**51**	
2,4,5-Trichlorophenol	103	U	**Benzo(k)fluoranthene**	**15**	**J**
2-Chloronaphthalene	21	U	**Benzo(a)pyrene**	**27**	
2-Nitroaniline	41	U	3B-Coprostanol	103	UJ
Dimethylphthalate	41	U	**Indeno(1,2,3-cd)pyrene**	**15**	**J**
2,6-Dinitrotoluene	103	U	Dibenzo(a,h)anthracene	21	U
Acenaphthylene	21	UJ	**Benzo(ghi)perylene**	**19**	**J**
3-Nitroaniline	21	U			

Authorized By: D. Kirchner Release Date: 6/23/97 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148253
Field ID: 21
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Surrogate Recoveries

2-Fluorophenol	**76**	%
D5-Phenol	**78**	%
D4-2-Chlorophenol	**77**	%
1,2-Dichlorobenzene-D4	**53**	%
D5-Nitrobenzene	**47**	%
2-Fluorobiphenyl	**79**	%
D10-Pyrene	**83**	%
D14-Terphenyl	**80**	%

Authorized By: ____________ Release Date: 6/23/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments **LIMS Project ID:** 1161-97

Sample: 97148253
Field ID: 21
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
1534083	*Ethanethioic acid, S-methyl*	330	NJ
*3008001	*Unknown 01*	622	NJ
*3008002	*Unknown 02*	484	NJ
2091294	*9-Hexadecenoic Acid*	757	NJ
115866	*Triphenyl Phosphate*	708	NJ
*3008003	*Unknown 03*	797	NJ
*3008004	*Unknown 04*	1010	NJ
57885	*Cholesterol*	2430	NJ
*3008005	*Unknown 05*	1070	NJ
*3008006	*Unknown 06*	584	NJ
83476	*Gamma-Sitosterol*	1090	NJ

Authorized By: D. Hamilton Release Date: 6/13/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148257
Field ID: 25
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	16	U	**Acenaphthene**	**6.8**	**J**
Pyridine	16	U	2,4-Dinitrophenol	314	U
Aniline	31	U	4-Nitrophenol	79	U
Phenol	16	U	**Dibenzofuran**	**11**	**J**
Bis(2-Chloroethyl)Ether	16	U	2,4-Dinitrotoluene	31	U
2-Chlorophenol	16	U	**Diethylphthalate**	**5**	**J**
1,3-Dichlorobenzene	16	U	**Fluorene**	**14**	**J**
1,4-Dichlorobenzene	16	U	4-Chlorophenyl-Phenylether	16	U
1,2-Dichlorobenzene	16	U	4-Nitroaniline	157	U
Benzyl Alcohol	16	U	4,6-Dinitro-2-Methylphenol	157	U
2-Methylphenol	16	U	N-Nitrosodiphenylamine	16	U
2,2'-Oxybis[1-chloropropane]	16	U	1,2-Diphenylhydrazine	16	U
N-Nitroso-Di-N-Propylamine	31	U	4-Bromophenyl-Phenylether	16	U
4-Methylphenol	16	U	Hexachlorobenzene	16	U
Hexachloroethane	16	U	Pentachlorophenol	157	U
Nitrobenzene	16	U	**Phenanthrene**	**76**	
Isophorone	16	U	**Anthracene**	**22**	
2-Nitrophenol	79	U	Caffeine	16	U
2,4-Dimethylphenol	16	U	Carbazole	157	U
Bis(2-Chloroethoxy)Methane	16	U	**Di-N-Butylphthalate**	**419**	
Benzoic Acid	314	U	**Fluoranthene**	**181**	
2,4-Dichlorophenol	16	U	Benzidine	314	U
1,2,4-Trichlorobenzene	16	U	**Pyrene**	**125**	
Naphthalene	**20**		**Retene**	**12**	**J**
4-Chloroaniline	16	U	Butylbenzylphthalate	16	U
Hexachlorobutadiene	16	U	Benzo(a)anthracene	16	U
4-Chloro-3-Methylphenol	16	U	3,3'-Dichlorobenzidine	314	U
2-Methylnaphthalene	**15**	**J**	**Chrysene**	**68**	
1-Methylnaphthalene	**11**	**J**	Bis(2-Ethylhexyl) Phthalate	79	UJ
Hexachlorocyclopentadiene	79	U	Di-N-Octyl Phthalate	157	U
2,4,6-Trichlorophenol	16	U	**Benzo(b)fluoranthene**	**52**	
2,4,5-Trichlorophenol	79	U	**Benzo(k)fluoranthene**	**25**	
2-Chloronaphthalene	16	U	**Benzo(a)pyrene**	**27**	
2-Nitroaniline	31	U	3B-Coprostanol	314	U
Dimethylphthalate	31	U	**Indeno(1,2,3-cd)pyrene**	**13**	**J**
2,6-Dinitrotoluene	79	U	Dibenzo(a,h)anthracene	16	U
Acenaphthylene	16	UJ	**Benzo(ghi)perylene**	**13**	**J**
3-Nitroaniline	16	U			

Authorized By: D. Hanson Release Date: 6/12/97 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148257
Field ID: 25
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Surrogate Recoveries

2-Fluorophenol	75	%
D5-Phenol	68	%
D4-2-Chlorophenol	75	%
1,2-Dichlorobenzene-D4	39	%
D5-Nitrobenzene	56	%
2-Fluorobiphenyl	73	%
D10-Pyrene	79	%
D14-Terphenyl	78	%

Authorized By: D. Hanson Release Date: 6/13/97 Page: 2

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148257
Field ID: 25
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
1534083	*Ethanethioic acid, S-methyl*	183	NJ
*3008001	*Unknown 01*	379	NJ
*3008002	*Unknown 02*	237	NJ
5989026	*(-)-Loliolide*	235	NJ
*3008003	*Unknown 03*	232	NJ
2091294	*9-Hexadecenoic Acid*	456	NJ
115866	*Triphenyl Phosphate*	397	NJ
*3008004	*Unknown 04*	529	NJ
*3008005	*Unknown 05*	596	NJ
*3008006	*Unknown 06*	704	NJ
*3005001	*Unknown Hydrocarbon 01*	344	NJ
57885	*Cholesterol*	1060	NJ
*3008007	*Unknown 07*	440	NJ
83476	*Gamma-Sitosterol*	786	NJ

Authorized By: D. Hunter Release Date: 6/23/97 Page: 3

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments **LIMS Project ID:** 1161-97

Sample: 97148258 **Date Received:** 04/07/97 **Method:** SW8270
Field ID: 26 **Date Prepared:** 04/09/97 **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** 05/17/97 **Units:** ug/Kg Dry Wt.

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	16	UJ	**Acenaphthene**	**15**	**J**
Pyridine	16	UJ	2,4-Dinitrophenol	319	UJ
Aniline	32	UJ	4-Nitrophenol	80	UJ
Phenol	16	UJ	**Dibenzofuran**	**23**	**J**
Bis(2-Chloroethyl)Ether	16	UJ	2,4-Dinitrotoluene	32	UJ
2-Chlorophenol	16	UJ	Diethylphthalate	16	UJ
1,3-Dichlorobenzene	16	UJ	**Fluorene**	**21**	**J**
1,4-Dichlorobenzene	16	UJ	4-Chlorophenyl-Phenylether	16	UJ
1,2-Dichlorobenzene	16	UJ	4-Nitroaniline	159	UJ
Benzyl Alcohol	16	UJ	4,6-Dinitro-2-Methylphenol	159	UJ
2-Methylphenol	16	UJ	N-Nitrosodiphenylamine	16	UJ
2,2'-Oxybis[1-chloropropane]	16	UJ	1,2-Diphenylhydrazine	16	UJ
N-Nitroso-Di-N-Propylamine	32	UJ	4-Bromophenyl-Phenylether	16	UJ
4-Methylphenol	16	UJ	Hexachlorobenzene	16	UJ
Hexachloroethane	16	UJ	Pentachlorophenol	159	UJ
Nitrobenzene	16	UJ	**Phenanthrene**	**140**	**J**
Isophorone	16	UJ	**Anthracene**	**38**	**J**
2-Nitrophenol	80	UJ	Caffeine	16	UJ
2,4-Dimethylphenol	16	UJ	Carbazole	159	UJ
Bis(2-Chloroethoxy)Methane	16	UJ	Di-N-Butylphthalate	32	UJ
Benzoic Acid	319	UJ	**Fluoranthene**	**191**	**J**
2,4-Dichlorophenol	16	UJ	Benzidine	319	UJ
1,2,4-Trichlorobenzene	16	UJ	**Pyrene**	**153**	**J**
Naphthalene	**271**	**J**	**Retene**	**29**	**J**
4-Chloroaniline	16	UJ	Butylbenzylphthalate	16	UJ
Hexachlorobutadiene	16	UJ	**Benzo(a)anthracene**	**39**	**J**
4-Chloro-3-Methylphenol	16	UJ	3,3'-Dichlorobenzidine	319	UJ
2-Methylnaphthalene	**33**	**J**	**Chrysene**	**62**	**J**
1-Methylnaphthalene	**28**	**J**	Bis(2-Ethylhexyl) Phthalate	80	UJ
Hexachlorocyclopentadiene	80	UJ	Di-N-Octyl Phthalate	159	UJ
2,4,6-Trichlorophenol	16	UJ	**Benzo(b)fluoranthene**	**62**	**J**
2,4,5-Trichlorophenol	80	UJ	**Benzo(k)fluoranthene**	**22**	**J**
2-Chloronaphthalene	16	UJ	**Benzo(a)pyrene**	**40**	**J**
2-Nitroaniline	32	UJ	3B-Coprostanol	319	UJ
Dimethylphthalate	32	UJ	**Indeno(1,2,3-cd)pyrene**	**28**	**J**
2,6-Dinitrotoluene	80	UJ	Dibenzo(a,h)anthracene	16	UJ
Acenaphthylene	**48**	**J**	**Benzo(ghi)perylene**	**24**	**J**
3-Nitroaniline	16	UJ			

Authorized By: D. Hinton Release Date: 7/1/97 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148258
Field ID: 26
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Surrogate Recoveries

2-Fluorophenol	169	%
D5-Phenol	139	%
D4-2-Chlorophenol	162	%
1,2-Dichlorobenzene-D4	76	%
D5-Nitrobenzene	126	%
2-Fluorobiphenyl	182	%
D10-Pyrene	184	%
D14-Terphenyl	180	%

Authorized By: D. Hemphill Release Date: 6/23/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148258
Field ID: 26
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 05/17/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
1534083	*Ethanethioic acid, S-methyl*	366	NJ
286204	*7-Oxabicyclo[4.1.0]Heptane*	217	NJ
*3008001	*Unknown 01*	679	NJ
*3008002	*Unknown 02*	493	NJ
544638	*Decanoic Acid, Tetra-*	594	NJ
*3008003	*Unknown 03*	688	NJ
1120258	*9-Hexadecenoic Acid, Methyl Ester, (Z)-*	449	NJ
115866	*Triphenyl Phosphate*	921	NJ
*3008004	*Unknown 04*	673	NJ
*3005001	*Unknown Hydrocarbon 01*	980	NJ
*3008005	*Unknown 05*	880	NJ
57885	*Cholesterol*	1530	NJ
83476	*Gamma-Sitosterol*	1360	NJ

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: BLN71188
Blank ID: OBS7099A1
Project Officer: Art Johnson

Date Prepared: 04/09/97
Date Analyzed: 05/16/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	20	U	Acenaphthene	20	U
Pyridine	20	U	2,4-Dinitrophenol	400	U
Aniline	40	U	4-Nitrophenol	100	U
Phenol	20	U	**Dibenzofuran**	**2.2**	**J**
Bis(2-Chloroethyl)Ether	20	U	2,4-Dinitrotoluene	40	U
2-Chlorophenol	20	U	**Diethylphthalate**	**3.7**	**J**
1,3-Dichlorobenzene	20	U	Fluorene	20	U
1,4-Dichlorobenzene	20	U	4-Chlorophenyl-Phenylether	20	U
1,2-Dichlorobenzene	20	U	4-Nitroaniline	200	U
Benzyl Alcohol	20	U	4,6-Dinitro-2-Methylphenol	200	U
2-Methylphenol	20	U	N-Nitrosodiphenylamine	20	U
2,2'-Oxybis[1-chloropropane]	20	U	1,2-Diphenylhydrazine	20	U
N-Nitroso-Di-N-Propylamine	40	U	4-Bromophenyl-Phenylether	20	U
4-Methylphenol	20	U	Hexachlorobenzene	20	U
Hexachloroethane	20	U	Pentachlorophenol	200	U
Nitrobenzene	20	U	**Phenanthrene**	**4.9**	**J**
Isophorone	20	U	**Anthracene**	**4.4**	**J**
2-Nitrophenol	100	U	Caffeine	20	U
2,4-Dimethylphenol	20	U	Carbazole	200	U
Bis(2-Chloroethoxy)Methane	20	U	**Di-N-Butylphthalate**	**28**	**J**
Benzoic Acid	**120**	**J**	**Fluoranthene**	**8.4**	**J**
2,4-Dichlorophenol	20	U	Benzidine	400	U
1,2,4-Trichlorobenzene	20	U	**Pyrene**	**8.9**	**J**
Naphthalene	20	U	Retene	20	U
4-Chloroaniline	20	U	**Butylbenzylphthalate**	**4.6**	**J**
Hexachlorobutadiene	20	U	Benzo(a)anthracene	20	U
4-Chloro-3-Methylphenol	20	U	3,3'-Dichlorobenzidine	400	U
2-Methylnaphthalene	20	U	**Chrysene**	**2.2**	**J**
1-Methylnaphthalene	20	U	**Bis(2-Ethylhexyl) Phthalate**	**4.2**	**J**
Hexachlorocyclopentadiene	100	U	Di-N-Octyl Phthalate	200	U
2,4,6-Trichlorophenol	20	U	Benzo(b)fluoranthene	20	U
2,4,5-Trichlorophenol	100	U	Benzo(k)fluoranthene	20	U
2-Chloronaphthalene	20	U	Benzo(a)pyrene	20	U
2-Nitroaniline	40	U	**3B-Coprostanol**	**50**	**J**
Dimethylphthalate	40	U	Indeno(1,2,3-cd)pyrene	20	U
2,6-Dinitrotoluene	100	U	Dibenzo(a,h)anthracene	20	U
Acenaphthylene	**4.5**	**J**	Benzo(ghi)perylene	20	U
3-Nitroaniline	20	U			

Authorized By: _____ Release Date: 7/2/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: BLN71188
Blank ID: OBS7099A1
Project Officer: Art Johnson

Date Prepared: 04/09/97
Date Analyzed: 05/16/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Surrogate Recoveries

2-Fluorophenol	72	%
D5-Phenol	76	%
D4-2-Chlorophenol	76	%
1,2-Dichlorobenzene-D4	72	%
D5-Nitrobenzene	77	%
2-Fluorobiphenyl	77	%
D10-Pyrene	81	%
D14-Terphenyl	79	%

Authorized By: _____ Release Date: 7/2/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: BLN71189
Blank ID: OBS7099A2
Project Officer: Art Johnson

Date Prepared: 04/09/97
Date Analyzed: 05/16/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	20	U	Acenaphthene	20	U
Pyridine	20	U	**2,4-Dinitrophenol**	**428**	
Aniline	40	U	4-Nitrophenol	100	U
Phenol	**17**	**J**	Dibenzofuran	20	U
Bis(2-Chloroethyl)Ether	20	U	2,4-Dinitrotoluene	40	U
2-Chlorophenol	20	U	**Diethylphthalate**	**5.3**	**J**
1,3-Dichlorobenzene	20	U	Fluorene	20	U
1,4-Dichlorobenzene	20	U	4-Chlorophenyl-Phenylether	20	U
1,2-Dichlorobenzene	20	U	4-Nitroaniline	200	U
Benzyl Alcohol	20	U	**4,6-Dinitro-2-Methylphenol**	**352**	
2-Methylphenol	20	U	N-Nitrosodiphenylamine	20	U
2,2'-Oxybis[1-chloropropane]	20	U	1,2-Diphenylhydrazine	20	U
N-Nitroso-Di-N-Propylamine	40	U	4-Bromophenyl-Phenylether	20	U
4-Methylphenol	20	U	Hexachlorobenzene	20	U
Hexachloroethane	20	U	**Pentachlorophenol**	**81**	**J**
Nitrobenzene	20	U	**Phenanthrene**	**3.6**	**J**
Isophorone	20	U	**Anthracene**	**2.1**	**J**
2-Nitrophenol	100	U	Caffeine	20	U
2,4-Dimethylphenol	20	U	Carbazole	200	U
Bis(2-Chloroethoxy)Methane	20	U	**Di-N-Butylphthalate**	**25**	**J**
Benzoic Acid	**123**	**J**	**Fluoranthene**	**4.3**	**J**
2,4-Dichlorophenol	20	U	Benzidine	400	U
1,2,4-Trichlorobenzene	20	U	Pyrene	20	U
Naphthalene	20	U	Retene	20	U
4-Chloroaniline	20	U	**Butylbenzylphthalate**	**4.6**	**J**
Hexachlorobutadiene	20	U	Benzo(a)anthracene	20	U
4-Chloro-3-Methylphenol	20	U	3,3'-Dichlorobenzidine	400	U
2-Methylnaphthalene	20	U	Chrysene	20	U
1-Methylnaphthalene	20	U	**Bis(2-Ethylhexyl) Phthalate**	**7.5**	**J**
Hexachlorocyclopentadiene	100	U	Di-N-Octyl Phthalate	200	U
2,4,6-Trichlorophenol	20	U	Benzo(b)fluoranthene	20	U
2,4,5-Trichlorophenol	100	U	Benzo(k)fluoranthene	20	U
2-Chloronaphthalene	20	U	Benzo(a)pyrene	20	U
2-Nitroaniline	40	U	**3B-Coprostanol**	**62**	**J**
Dimethylphthalate	40	U	Indeno(1,2,3-cd)pyrene	20	U
2,6-Dinitrotoluene	100	U	Dibenzo(a,h)anthracene	20	U
Acenaphthylene	**2**	**J**	Benzo(ghi)perylene	20	U
3-Nitroaniline	20	U			

Authorized By: _____ Release Date: 6/17/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: BLN71189

Blank ID: OBS7099A2

Project Officer: Art Johnson

Date Prepared: 04/09/97

Date Analyzed: 05/16/97

Method: SW8270

Matrix: Sediment/Soil

Units: ug/Kg Dry Wt.

Surrogate Recoveries

2-Fluorophenol	78	%
D5-Phenol	81	%
D4-2-Chlorophenol	80	%
1,2-Dichlorobenzene-D4	78	%
D5-Nitrobenzene	83	%
2-Fluorobiphenyl	77	%
D10-Pyrene	85	%
D14-Terphenyl	86	%

Authorized By: D. Heaton Release Date: 6/23/97

MANCHESTER ENVIRONMENTAL LABORATORY

7411 Beach Drive E , Port Orchard Washington 98366

CASE NARRATIVE

September 19, 1997

Subject: Fidalgo Bay Re-analyses

Samples: 97-148232, -148235, -148239, -148241, -148243, -148245, -148252 and -148258

Case No. 1161-97

Officer: Art Johnson

By: Dickey D. Huntamer
Organics Analysis Unit

SEMIVOLATILE ORGANICS

ANALYTICAL METHODS:

These samples are reanalysis of previous samples. The samples were reanalyzed due to possible carryover /contamination problems with the Gel Permeation Chromatography (GPC) cleanup proceedure.

The semivolatile soil samples were extracted with acetone following the Manchester modification of the EPA CLP and SW 846 8270 procedure with capillary GC/MS analysis of the sample extracts. Normal QA/QC procedures were performed with the analyses.

HOLDING TIMES:

The samples were reanalyzed using the frozen "archived" samples except for sample -148239 which had no archived sample and the original unfrozen sample was used for reanalysis. All extract holding times were within the recommended limits.

BLANKS:

Low levels of some target compounds were detected in the laboratory blanks. The EPA five times rule was applied to all target compounds which were found in the blank. Compounds that were found in the sample and in the blank were considered real and not the result of contamination if the levels in the sample are greater than or equal to five times the amount of compounds in the associated method blank.

SURROGATES:

The normal Manchester Laboratory surrogates were added to the sample prior to extraction. All surrogates were acceptable and no qualifiers were added to the data.

MATRIX SPIKE AND MATRIX SPIKE DUPLICATE:

Matrix spike recoveries were low for hexchloroethane, 2-nitrophenol, and 4-nitroaniline. Hexachlorocylcopentadiene, 2 and 3-nitroanilines, 4-chloroaniline and aniline were not recovered and are flagged as rejected, REJ" in the matrix spike source sample -148252.

ANALYTICAL COMMENTS:

No special analytical problems were encountered in the semivolatile analyses. Results for the reanalysis were generally comparable to the results obtained in the first analysis including -148239 which was not frozen but just refrigerated for three months. The data is acceptable for use as qualified.

Quantitation limits were reported not detection limits. Detection limits are generally three or four times lower than the quantitation limits.

DATA QUALIFIER CODES:

U	-	The analyte was not detected at or above the reported value.
J	-	The analyte was positively identified. The associated numerical value is an estimate.
UJ	-	The analyte was not detected at or above the reported estimated result.
REJ	-	The data are unusable for all purposes.
EXP	-	The result is equal to the number before EXP times 10 to the power of the number after EXP. As an example 3EXP6 equals 3×10^6.
NAF	-	Not analyzed for.
N	-	For organic analytes there is evidence the analyte is present in this sample.
NJ	-	There is evidence that the analyte is present. The associated numerical result is an estimate.
E	-	This qualifier is used when the concentration of the associated value exceeds the known calibration range.
bold	-	The analyte was present in the sample. (Visual Aid to locate detected compound on report sheet.)

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments **LIMS Project ID:** 1161-97

Sample: 97148232 (Replicate - REP1) **Date Received:** 04/07/97 **Method:** SW8270
Field ID: 3 **Date Prepared:** ~~04/09/97~~ **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** ~~05/16/97~~ **Units:** ug/Kg Dry Wt.
07/16/97 - 08/21/97 G.J.

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	76	U	**Acenaphthene**	**101**	
Pyridine	76	U	2,4-Dinitrophenol	305	UJ
Aniline	76	U	4-Nitrophenol	76	UJ
Phenol	49	UJ	**Dibenzofuran**	**50**	
Bis(2-Chloroethyl)Ether	76	U	2,4-Dinitrotoluene	31	U
2-Chlorophenol	76	U	Diethylphthalate	45	UJ
1,3-Dichlorobenzene	76	U	**Fluorene**	**115**	
1,4-Dichlorobenzene	76	U	4-Chlorophenyl-Phenylether	15	U
1,2-Dichlorobenzene	76	U	4-Nitroaniline	31	U
Benzyl Alcohol	**12**	J	4,6-Dinitro-2-Methylphenol	76	U
2-Methylphenol	**6.5**	J	N-Nitrosodiphenylamine	15	U
2,2'-Oxybis[1-chloropropane]	76	U	1,2-Diphenylhydrazine	15	U
N-Nitroso-Di-N-Propylamine	15	U	4-Bromophenyl-Phenylether	15	U
4-Methylphenol	**48**		Hexachlorobenzene	15	U
Hexachloroethane	76	U	Pentachlorophenol	76	U
Nitrobenzene	31	U	**Phenanthrene**	**625**	
Isophorone	15	U	**Anthracene**	**442**	
2-Nitrophenol	31	U	Caffeine	15	U
2,4-Dimethylphenol	15	U	**Carbazole**	**310**	
Bis(2-Chloroethoxy)Methane	15	U	Di-N-Butylphthalate	124	UJ
Benzoic Acid	**150**		**Fluoranthene**	**8570**	E
2,4-Dichlorophenol	31	U	Benzidine	153	U
1,2,4-Trichlorobenzene	31	U	**Pyrene**	**5970**	E
Naphthalene	**45**		**Retene**	**100**	
4-Chloroaniline	15	U	Butylbenzylphthalate	15	U
Hexachlorobutadiene	76	U	**Benzo(a)anthracene**	**951**	
4-Chloro-3-Methylphenol	15	U	3,3'-Dichlorobenzidine	61	U
2-Methylnaphthalene	**37**		**Chrysene**	**2460**	E
1-Methylnaphthalene	**23**		Bis(2-Ethylhexyl) Phthalate	36	UJ
Hexachlorocyclopentadiene	76	U	Di-N-Octyl Phthalate	15	U
2,4,6-Trichlorophenol	31	U	**Benzo(b)fluoranthene**	**1600**	E
2,4,5-Trichlorophenol	15	U	**Benzo(k)fluoranthene**	**547**	
2-Chloronaphthalene	15	U	**Benzo(a)pyrene**	**517**	
2-Nitroaniline	76	U	3B-Coprostanol	61	U
Dimethylphthalate	15	U	**Indeno(1,2,3-cd)pyrene**	**268**	
2,6-Dinitrotoluene	76	U	**Dibenzo(a,h)anthracene**	**80**	
Acenaphthylene	**376**		**Benzo(ghi)perylene**	**186**	
3-Nitroaniline	31	U			

Authorized By: _____ Release Date: 9/19/97 Page: 4

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148232 (Replicate - REP1)
Field ID: 3
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: ~~04/09/97~~
Date Analyzed: ~~05/16/97~~ 07/16/97 – 08/21/97 9.9.

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Surrogate Recoveries

2-Fluorophenol	75	%
D5-Phenol	76	%
D4-2-Chlorophenol	76	%
1,2-Dichlorobenzene-D4	43	%
D5-Nitrobenzene	73	%
2-Fluorobiphenyl	82	%
D10-Pyrene	78	%
D14-Terphenyl	87	%

Authorized By: D. Kenth Release Date: 9/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments **LIMS Project ID:** 1161-97

Sample: 97148232 (Replicate - REP1)
Field ID: 3
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: ~~04/09/97~~
Date Analyzed: ~~05/16/97~~ 07/16/97 - 08/21/97 G.G.

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
1534083	*Ethanethioic acid, S-methyl*	64	NJ
108383	*m-Xylene*	26	NJ
*3008001	*Unknown 01*	141	NJ
*3008002	*Unknown 02*	32	NJ
*3008003	*Unknown 03*	225	NJ
579102	*Acetamide, N-methyl-N-phenyl-*	201	NJ
*3008004	*Unknown 04*	463	NJ
*3008005	*Unknown 05*	237	NJ
26137531	*Naphthalene, 1,2,3-Trimethyl-4-Propenyl-, (E)-*	263	NJ
*3008006	*Unknown 06*	619	NJ
*3008007	*Unknown 07*	312	NJ
544638	*Decanoic Acid, Tetra-*	3700	NJ
*3008008	*Unknown 08*	3090	NJ
56875673	*7-Hexadecenoic acid, methyl*	337	NJ
57103	*Hexadecanoic Acid*	18600	NJ
243425	*Benzo[b]naphtho[2,3-d]furan*	1990	NJ
3442782	*Pyrene, 2-Methyl-*	1540	NJ

Authorized By: D Hanks Release Date: 9/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148232 (Dilution - DIL1)
Field ID: 3
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: ~~04/09/97~~
Date Analyzed: ~~05/16/97~~ 07/16/97 - 08/21/97 G.J.

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	764	U	**Acenaphthene**	**81**	**J**
Pyridine	764	U	2,4-Dinitrophenol	3050	U
Aniline	764	U	4-Nitrophenol	764	U
Phenol	153	UJ	**Dibenzofuran**	**42**	**J**
Bis(2-Chloroethyl)Ether	764	U	2,4-Dinitrotoluene	305	U
2-Chlorophenol	764	U	Diethylphthalate	153	UJ
1,3-Dichlorobenzene	764	U	**Fluorene**	**102**	**J**
1,4-Dichlorobenzene	764	U	4-Chlorophenyl-Phenylether	153	U
1,2-Dichlorobenzene	764	U	4-Nitroaniline	305	U
Benzyl Alcohol	305	U	4,6-Dinitro-2-Methylphenol	764	U
2-Methylphenol	305	U	N-Nitrosodiphenylamine	153	U
2,2'-Oxybis[1-chloropropane]	764	U	1,2-Diphenylhydrazine	153	U
N-Nitroso-Di-N-Propylamine	153	U	4-Bromophenyl-Phenylether	153	U
4-Methylphenol	153	U	Hexachlorobenzene	153	U
Hexachloroethane	764	U	Pentachlorophenol	764	U
Nitrobenzene	305	U	**Phenanthrene**	**576**	
Isophorone	153	U	**Anthracene**	**352**	
2-Nitrophenol	305	U	Caffeine	153	U
2,4-Dimethylphenol	153	U	**Carbazole**	**272**	
Bis(2-Chloroethoxy)Methane	153	U	Di-N-Butylphthalate	153	UJ
Benzoic Acid	764	U	**Fluoranthene**	**10600**	
2,4-Dichlorophenol	305	U	Benzidine	1530	U
1,2,4-Trichlorobenzene	305	U	**Pyrene**	**7340**	
Naphthalene	**40**	**J**	**Retene**	**107**	**J**
4-Chloroaniline	153	U	Butylbenzylphthalate	153	U
Hexachlorobutadiene	764	U	**Benzo(a)anthracene**	**907**	
4-Chloro-3-Methylphenol	153	U	3,3'-Dichlorobenzidine	611	U
2-Methylnaphthalene	**33**	**J**	**Chrysene**	**2520**	
1-Methylnaphthalene	**20**	**J**	Bis(2-Ethylhexyl) Phthalate	153	UJ
Hexachlorocyclopentadiene	764	U	Di-N-Octyl Phthalate	153	U
2,4,6-Trichlorophenol	305	U	**Benzo(b)fluoranthene**	**1450**	
2,4,5-Trichlorophenol	153	U	**Benzo(k)fluoranthene**	**640**	
2-Chloronaphthalene	153	U	**Benzo(a)pyrene**	**506**	
2-Nitroaniline	305	U	3B-Coprostanol	611	U
Dimethylphthalate	153	U	**Indeno(1,2,3-cd)pyrene**	**349**	
2,6-Dinitrotoluene	764	U	**Dibenzo(a,h)anthracene**	**239**	**J**
Acenaphthylene	**365**		**Benzo(ghi)perylene**	**186**	
3-Nitroaniline	305	U			

Authorized By: D. Kendrick (signature)　　Release Date: 9/19/97　　Page: 7

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148232 (Dilution - DIL1)
Field ID: 3
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: ~~04/09/97~~
Date Analyzed: ~~05/16/97~~ 07/16/97 - 08/21/97 a.g.

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Surrogate Recoveries

2-Fluorophenol	64	%
D5-Phenol	58	%
D4-2-Chlorophenol	68	%
1,2-Dichlorobenzene-D4	41	%
D5-Nitrobenzene	66	%
2-Fluorobiphenyl	70	%
D10-Pyrene	80	%
D14-Terphenyl	89	%

Authorized By: _____ Release Date: 9/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments **LIMS Project ID:** 1161-97

Sample: 97148235 (Replicate - REP1)
Field ID: 5
Project Officer: Art Johnson

Date Received: 04/07/97 **Method:** SW8270
Date Prepared: ~~04/09/97~~ **Matrix:** Sediment/Soil
Date Analyzed: ~~05/16/97~~ **Units:** ug/Kg
07/16/97 - 08/21/97 a.f.

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	91	U	**Acenaphthene**	**4.6**	**J**
Pyridine	91	U	2,4-Dinitrophenol	364	UJ
Aniline	91	U	4-Nitrophenol	91	UJ
Phenol	91	UJ	**Dibenzofuran**	**7.8**	**J**
Bis(2-Chloroethyl)Ether	91	U	2,4-Dinitrotoluene	36	U
2-Chlorophenol	91	U	Diethylphthalate	18	U
1,3-Dichlorobenzene	91	U	**Fluorene**	**8.6**	**J**
1,4-Dichlorobenzene	91	U	4-Chlorophenyl-Phenylether	18	U
1,2-Dichlorobenzene	91	U	4-Nitroaniline	36	U
Benzyl Alcohol	36	U	4,6-Dinitro-2-Methylphenol	91	U
2-Methylphenol	36	U	N-Nitrosodiphenylamine	18	U
2,2'-Oxybis[1-chloropropane]	91	U	1,2-Diphenylhydrazine	18	U
N-Nitroso-Di-N-Propylamine	18	U	4-Bromophenyl-Phenylether	18	U
4-Methylphenol	**9.3**	**J**	Hexachlorobenzene	18	U
Hexachloroethane	91	U	Pentachlorophenol	91	U
Nitrobenzene	36	U	**Phenanthrene**	**38**	
Isophorone	18	U	**Anthracene**	**11**	**J**
2-Nitrophenol	36	U	Caffeine	18	U
2,4-Dimethylphenol	18	U	Carbazole	18	U
Bis(2-Chloroethoxy)Methane	18	U	Di-N-Butylphthalate	46	UJ
Benzoic Acid	95	UJ	**Fluoranthene**	**69**	
2,4-Dichlorophenol	36	U	Benzidine	182	U
1,2,4-Trichlorobenzene	36	U	**Pyrene**	**60**	
Naphthalene	**27**	**J**	**Retene**	**16**	**J**
4-Chloroaniline	18	U	Butylbenzylphthalate	18	U
Hexachlorobutadiene	91	U	**Benzo(a)anthracene**	**19**	
4-Chloro-3-Methylphenol	18	U	3,3'-Dichlorobenzidine	73	U
2-Methylnaphthalene	**15**	**J**	**Chrysene**	**28**	
1-Methylnaphthalene	**9.9**	**J**	Bis(2-Ethylhexyl) Phthalate	36	UJ
Hexachlorocyclopentadiene	91	U	Di-N-Octyl Phthalate	18	U
2,4,6-Trichlorophenol	36	U	**Benzo(b)fluoranthene**	**30**	
2,4,5-Trichlorophenol	18	U	**Benzo(k)fluoranthene**	**11**	**J**
2-Chloronaphthalene	18	U	**Benzo(a)pyrene**	**15**	**J**
2-Nitroaniline	36	U	3B-Coprostanol	73	U
Dimethylphthalate	18	U	**Indeno(1,2,3-cd)pyrene**	**27**	**J**
2,6-Dinitrotoluene	91	U	Dibenzo(a,h)anthracene	36	U
Acenaphthylene	**11**	**J**	**Benzo(ghi)perylene**	**16**	**J**
3-Nitroaniline	36	U			

Authorized By: _____ Release Date: 9/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments **LIMS Project ID:** 1161-97

Sample: 97148235 (Replicate - REP1)
Field ID: 5
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: ~~04/09/97~~
Date Analyzed: ~~05/16/97~~ 07/16/97 – 08/21/97 g.g.

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg

Surrogate Recoveries

2-Fluorophenol	49	%
D5-Phenol	55	%
D4-2-Chlorophenol	53	%
1,2-Dichlorobenzene-D4	32	%
D5-Nitrobenzene	47	%
2-Fluorobiphenyl	63	%
D10-Pyrene	74	%
D14-Terphenyl	81	%

Authorized By: D. Hewitt Release Date: 9/19/97 Page: 5

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments **LIMS Project ID:** 1161-97

Sample: 97148235 (Replicate - REP1)
Field ID: 5
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: ~~04/09/97~~
Date Analyzed: ~~05/16/97~~ 07/16/97 - 08/21/97 a.j.

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
1534083	*Ethanethioic acid, S-methyl*	409	NJ
54833237	*Eicosane, 10methyl-(9ci)*	647	NJ
544638	*Decanoic Acid, Tetra-*	1430	NJ
5746587	*Tetradecanoic Acid, 12-Methyl-, (S)-*	1820	NJ
*3008001	*Unknown 01*	382	NJ
17351347	*14-Pentadecenoic acid*	458	NJ
2091294	*9-Hexadecenoic Acid*	9350	NJ
57103	*Hexadecanoic Acid*	6700	NJ
*3008002	*Unknown 02*	410	NJ
*3008003	*Unknown 03*	1000	NJ
506127	*Heptadecanoic Acid*	372	NJ
150867	*Phytol*	470	NJ
57114	*Octadecanoic Acid*	412	NJ
112856	*Docosanoic Acid*	236	NJ
*3008004	*Unknown 04*	281	NJ
57885	*Cholesterol*	1540	NJ

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148239 (Replicate - REP1)
Field ID: 8
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: ~~04/09/97~~
Date Analyzed: ~~05/17/97~~ 07/16/97 - 08/21/97 9q.

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg

Analyte	Result	Qualifier
N-Nitrosodimethylamine	80	U
Pyridine	80	U
Aniline	80	U
Phenol	32	U
Bis(2-Chloroethyl)Ether	80	U
2-Chlorophenol	80	U
1,3-Dichlorobenzene	80	U
1,4-Dichlorobenzene	80	U
1,2-Dichlorobenzene	80	U
Benzyl Alcohol	32	U
2-Methylphenol	32	U
2,2'-Oxybis[1-chloropropane]	80	U
N-Nitroso-Di-N-Propylamine	16	U
4-Methylphenol	**30**	
Hexachloroethane	80	U
Nitrobenzene	32	U
Isophorone	**7.9**	**J**
2-Nitrophenol	32	U
2,4-Dimethylphenol	16	U
Bis(2-Chloroethoxy)Methane	16	U
Benzoic Acid	95	UJ
2,4-Dichlorophenol	32	U
1,2,4-Trichlorobenzene	32	U
Naphthalene	**53**	
4-Chloroaniline	16	U
Hexachlorobutadiene	80	U
4-Chloro-3-Methylphenol	16	U
2-Methylnaphthalene	**15**	**J**
1-Methylnaphthalene	**9.7**	**J**
Hexachlorocyclopentadiene	80	U
2,4,6-Trichlorophenol	32	U
2,4,5-Trichlorophenol	16	U
2-Chloronaphthalene	16	U
2-Nitroaniline	32	U
Dimethylphthalate	16	U
2,6-Dinitrotoluene	80	U
Acenaphthylene	**16**	**J**
3-Nitroaniline	32	U
Acenaphthene	**8.2**	**J**
2,4-Dinitrophenol	318	UJ
4-Nitrophenol	80	UJ
Dibenzofuran	**15**	**J**
2,4-Dinitrotoluene	32	U
Diethylphthalate	16	U
Fluorene	**13**	**J**
4-Chlorophenyl-Phenylether	16	U
4-Nitroaniline	32	U
4,6-Dinitro-2-Methylphenol	80	U
N-Nitrosodiphenylamine	16	U
1,2-Diphenylhydrazine	16	U
4-Bromophenyl-Phenylether	16	U
Hexachlorobenzene	16	U
Pentachlorophenol	80	U
Phenanthrene	**63**	
Anthracene	**27**	
Caffeine	16	U
Carbazole	16	U
Di-N-Butylphthalate	168	UJ
Fluoranthene	**146**	
Benzidine	159	U
Pyrene	**128**	
Retene	**22**	
Butylbenzylphthalate	16	U
Benzo(a)anthracene	**35**	
3,3'-Dichlorobenzidine	64	U
Chrysene	**56**	
Bis(2-Ethylhexyl) Phthalate	64	UJ
Di-N-Octyl Phthalate	16	U
Benzo(b)fluoranthene	**53**	
Benzo(k)fluoranthene	**20**	
Benzo(a)pyrene	**28**	
3B-Coprostanol	64	U
Indeno(1,2,3-cd)pyrene	**32**	
Dibenzo(a,h)anthracene	32	U
Benzo(ghi)perylene	**22**	

Authorized By: D. Hewitt Release Date: 9/17/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148239 (Replicate - REP1)
Field ID: 8
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: ~~04/09/97~~
Date Analyzed: ~~05/17/97~~ 07/16/97 - 08/21/97 GJ.

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg

Surrogate Recoveries

2-Fluorophenol	60	%
D5-Phenol	66	%
D4-2-Chlorophenol	66	%
1,2-Dichlorobenzene-D4	33	%
D5-Nitrobenzene	52	%
2-Fluorobiphenyl	68	%
D10-Pyrene	79	%
D14-Terphenyl	88	%

Authorized By: D. Hopkins Release Date: 9/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148239 (Replicate - REP1)
Field ID: 8
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: ~~04/09/97~~
Date Analyzed: ~~05/17/97~~ 07/16/97 - 08/21/97 G.J.

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
1534083	*Ethanethioic acid, S-methyl*	148	NJ
544638	*Decanoic Acid, Tetra-*	718	NJ
*3008001	*Unknown 01*	350	NJ
2091294	*9-Hexadecenoic Acid*	3300	NJ
57103	*Hexadecanoic Acid*	2420	NJ
10544500	*Sulfur, Mol. (S8)*	9680	NJ
57114	*Octadecanoic Acid*	183	NJ
112856	*Docosanoic Acid*	286	NJ
*3008002	*Unknown 02*	415	NJ
*3008003	*Unknown 03*	623	NJ
*3008004	*Unknown 04*	254	NJ
59029	*Vitamin E*	326	NJ
57885	*Cholesterol*	1360	NJ
83476	*Gamma-Sitosterol*	1580	NJ
1058613	*Stigmast-4-en-3-one*	472	NJ

Authorized By: _____ Release Date: 9/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148241 (Replicate - REP1)
Field ID: 10
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: ~~04/09/97~~ 07/16/97 - 08/21/97 9.J.
Date Analyzed: ~~05/17/97~~

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	77	U	**Acenaphthene**	**4.3**	**J**
Pyridine	77	U	2,4-Dinitrophenol	308	UJ
Aniline	77	U	4-Nitrophenol	77	UJ
Phenol	15	UJ	**Dibenzofuran**	**4.5**	**J**
Bis(2-Chloroethyl)Ether	77	U	2,4-Dinitrotoluene	31	U
2-Chlorophenol	77	U	Diethylphthalate	15	U
1,3-Dichlorobenzene	77	U	**Fluorene**	**6**	**J**
1,4-Dichlorobenzene	77	U	4-Chlorophenyl-Phenylether	15	U
1,2-Dichlorobenzene	77	U	4-Nitroaniline	31	U
Benzyl Alcohol	31	U	4,6-Dinitro-2-Methylphenol	77	U
2-Methylphenol	31	U	N-Nitrosodiphenylamine	15	U
2,2'-Oxybis[1-chloropropane]	77	U	1,2-Diphenylhydrazine	15	U
N-Nitroso-Di-N-Propylamine	15	U	4-Bromophenyl-Phenylether	15	U
4-Methylphenol	**22**		Hexachlorobenzene	15	U
Hexachloroethane	77	U	Pentachlorophenol	77	U
Nitrobenzene	31	U	**Phenanthrene**	**33**	
Isophorone	15	U	**Anthracene**	**12**	**J**
2-Nitrophenol	31	U	Caffeine	15	U
2,4-Dimethylphenol	15	U	Carbazole	15	U
Bis(2-Chloroethoxy)Methane	15	U	Di-N-Butylphthalate	56	UJ
Benzoic Acid	106	UJ	**Fluoranthene**	**72**	
2,4-Dichlorophenol	31	U	Benzidine	154	U
1,2,4-Trichlorobenzene	31	U	**Pyrene**	**68**	
Naphthalene	**12**	**J**	**Retene**	**13**	**J**
4-Chloroaniline	15	U	Butylbenzylphthalate	15	U
Hexachlorobutadiene	77	U	**Benzo(a)anthracene**	**18**	
4-Chloro-3-Methylphenol	15	U	3,3'-Dichlorobenzidine	62	U
2-Methylnaphthalene	**8.9**	**J**	**Chrysene**	**29**	
1-Methylnaphthalene	**5.6**	**J**	Bis(2-Ethylhexyl) Phthalate	31	UJ
Hexachlorocyclopentadiene	77	U	Di-N-Octyl Phthalate	15	U
2,4,6-Trichlorophenol	31	U	**Benzo(b)fluoranthene**	**28**	
2,4,5-Trichlorophenol	15	U	**Benzo(k)fluoranthene**	**11**	**J**
2-Chloronaphthalene	15	U	**Benzo(a)pyrene**	**14**	**J**
2-Nitroaniline	31	U	3B-Coprostanol	62	U
Dimethylphthalate	15	U	**Indeno(1,2,3-cd)pyrene**	**20**	**J**
2,6-Dinitrotoluene	77	U	Dibenzo(a,h)anthracene	31	U
Acenaphthylene	**7.6**	**J**	**Benzo(ghi)perylene**	**11**	**J**
3-Nitroaniline	31	U			

Authorized By: D. Kenaston Release Date: 9/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148241 (Replicate - REP1)
Field ID: 10
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: ~~04/09/97~~
Date Analyzed: ~~05/17/97~~ 07/16/97 - 08/21/97 G.G.

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg

Surrogate Recoveries

2-Fluorophenol	60	%
D5-Phenol	63	%
D4-2-Chlorophenol	59	%
1,2-Dichlorobenzene-D4	34	%
D5-Nitrobenzene	56	%
2-Fluorobiphenyl	67	%
D10-Pyrene	74	%
D14-Terphenyl	85	%

Authorized By: D. Houston Release Date: 9/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148241 (Replicate - REP1)
Field ID: 10
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: ~~04/09/97~~
Date Analyzed: ~~05/17/97~~ 07/16/97 - 08/21/97 G.J.

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
		142	NJ
1534083	*Ethanethioic acid, S-methyl*	431	NJ
544638	*Decanoic Acid, Tetra-*	464	NJ
*3008001	*Unknown 01*	1430	NJ
*3008002	*Unknown 02*	8820	NJ
2091294	*9-Hexadecenoic Acid*	5880	NJ
57103	*Hexadecanoic Acid*	634	NJ
*3008003	*Unknown 03*	409	NJ
506127	*Heptadecanoic Acid*	1470	NJ
150867	*Phytol*	1640	NJ
112801	*Oleic Acid*	449	NJ
57114	*Octadecanoic Acid*	255	NJ
*3008004	*Unknown 04*	480	NJ
*3008005	*Unknown 05*	501	NJ
59029	*Vitamin E*	806	NJ
57885	*Cholesterol*	1300	NJ
83476	*Gamma-Sitosterol*	457	NJ
1058613	*Stigmast-4-en-3-one*		

Authorized By: D. Knutzen Release Date: 9/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148243 (Replicate - REP1)
Field ID: 11
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: ~~04/09/97~~
Date Analyzed: ~~05/17/97~~ 07/16/97 - 08/21/97 G.J.

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	78	U	**Acenaphthene**	**1.9**	**J**
Pyridine	78	U	2,4-Dinitrophenol	311	UJ
Aniline	78	U	4-Nitrophenol	78	U
Phenol	31	UJ	**Dibenzofuran**	**4.3**	**J**
Bis(2-Chloroethyl)Ether	78	U	2,4-Dinitrotoluene	31	U
2-Chlorophenol	78	U	Diethylphthalate	16	U
1,3-Dichlorobenzene	78	U	**Fluorene**	**5.4**	**J**
1,4-Dichlorobenzene	78	U	4-Chlorophenyl-Phenylether	16	U
1,2-Dichlorobenzene	78	U	4-Nitroaniline	31	U
Benzyl Alcohol	31	U	4,6-Dinitro-2-Methylphenol	78	U
2-Methylphenol	31	U	N-Nitrosodiphenylamine	16	U
2,2'-Oxybis[1-chloropropane]	78	U	1,2-Diphenylhydrazine	16	U
N-Nitroso-Di-N-Propylamine	16	U	4-Bromophenyl-Phenylether	16	U
4-Methylphenol	**11**	**J**	Hexachlorobenzene	16	U
Hexachloroethane	78	U	Pentachlorophenol	78	U
Nitrobenzene	31	U	**Phenanthrene**	**26**	
Isophorone	16	U	**Anthracene**	**5.1**	**J**
2-Nitrophenol	31	U	Caffeine	16	U
2,4-Dimethylphenol	16	U	Carbazole	16	U
Bis(2-Chloroethoxy)Methane	16	U	Di-N-Butylphthalate	16	U
Benzoic Acid	114	UJ	**Fluoranthene**	**38**	
2,4-Dichlorophenol	31	U	Benzidine	156	U
1,2,4-Trichlorobenzene	31	U	**Pyrene**	**27**	
Naphthalene	**12**	**J**	**Retene**	**13**	**J**
4-Chloroaniline	16	U	Butylbenzylphthalate	16	U
Hexachlorobutadiene	78	U	**Benzo(a)anthracene**	**11**	**J**
4-Chloro-3-Methylphenol	16	U	3,3'-Dichlorobenzidine	62	U
2-Methylnaphthalene	**8.2**	**J**	**Chrysene**	**14**	**J**
1-Methylnaphthalene	**5.5**	**J**	Bis(2-Ethylhexyl) Phthalate	31	UJ
Hexachlorocyclopentadiene	78	U	Di-N-Octyl Phthalate	16	U
2,4,6-Trichlorophenol	31	U	**Benzo(b)fluoranthene**	**15**	**J**
2,4,5-Trichlorophenol	16	U	**Benzo(k)fluoranthene**	**4.8**	**J**
2-Chloronaphthalene	16	U	**Benzo(a)pyrene**	**6.1**	**J**
2-Nitroaniline	31	U	3B-Coprostanol	62	U
Dimethylphthalate	16	U	**Indeno(1,2,3-cd)pyrene**	**16**	**J**
2,6-Dinitrotoluene	78	U	Dibenzo(a,h)anthracene	31	U
Acenaphthylene	**3.5**	**J**	**Benzo(ghi)perylene**	**7.4**	**J**
3-Nitroaniline	31	U			

Authorized By: D Hinton Release Date: 9/19/97 Page: 4

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148243 (Replicate - REP1)
Field ID: 11
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: ~~04/09/97~~
Date Analyzed: ~~05/17/97~~ 07/16/97 - 08/21/97 a.g.

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg

Surrogate Recoveries

2-Fluorophenol	56	%
D5-Phenol	64	%
D4-2-Chlorophenol	60	%
1,2-Dichlorobenzene-D4	35	%
D5-Nitrobenzene	51	%
2-Fluorobiphenyl	68	%
D10-Pyrene	72	%
D14-Terphenyl	88	%

Authorized By: D. Knutson Release Date: 9/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148243 (Replicate - REP1)
Field ID: 11
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: ~~04/09/97~~
Date Analyzed: ~~05/17/97~~ 07/16/97 - 08/21/97 GJ

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
1534083	*Ethanethioic acid, S-methyl*	152	NJ
544638	*Decanoic Acid, Tetra-*	419	NJ
5746587	*Tetradecanoic Acid, 12-Methyl-, (S)-*	2130	NJ
2091294	*9-Hexadecenoic Acid*	9650	NJ
57103	*Hexadecanoic Acid*	6840	NJ
*3008001	*Unknown 01*	830	NJ
*3008002	*Unknown 02*	498	NJ
506127	*Heptadecanoic Acid*	577	NJ
150867	*Phytol*	1140	NJ
57114	*Octadecanoic Acid*	688	NJ
112856	*Docosanoic Acid*	242	NJ
57885	*Cholesterol*	1310	NJ
516950	*Epicholestanol*	515	NJ
83476	*Gamma-Sitosterol*	1050	NJ

Authorized By: D. Hall Release Date: 9/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148245 (Replicate - REP1)
Field ID: 13
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: ~~04/09/97~~
Date Analyzed: ~~05/17/97~~ 07/16/97 - 08/21/97a.g.

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	74	U	Acenaphthene	15	U
Pyridine	74	U	2,4-Dinitrophenol	296	UJ
Aniline	74	U	4-Nitrophenol	74	UJ
Phenol	30	UJ	Dibenzofuran	15	U
Bis(2-Chloroethyl)Ether	74	U	2,4-Dinitrotoluene	30	U
2-Chlorophenol	74	U	Diethylphthalate	23	UJ
1,3-Dichlorobenzene	74	U	Fluorene	15	U
1,4-Dichlorobenzene	74	U	4-Chlorophenyl-Phenylether	15	U
1,2-Dichlorobenzene	74	U	4-Nitroaniline	30	U
Benzyl Alcohol	30	U	4,6-Dinitro-2-Methylphenol	74	U
2-Methylphenol	30	U	N-Nitrosodiphenylamine	15	U
2,2'-Oxybis[1-chloropropane]	74	U	1,2-Diphenylhydrazine	15	U
N-Nitroso-Di-N-Propylamine	15	U	4-Bromophenyl-Phenylether	15	U
4-Methylphenol	**23**		Hexachlorobenzene	15	U
Hexachloroethane	74	U	Pentachlorophenol	74	U
Nitrobenzene	30	U	**Phenanthrene**	**9.8**	**J**
Isophorone	15	U	Anthracene	15	U
2-Nitrophenol	30	U	Caffeine	15	U
2,4-Dimethylphenol	15	U	Carbazole	15	U
Bis(2-Chloroethoxy)Methane	15	U	Di-N-Butylphthalate	55	UJ
Benzoic Acid	100	UJ	**Fluoranthene**	**18**	
2,4-Dichlorophenol	30	U	Benzidine	148	U
1,2,4-Trichlorobenzene	30	U	**Pyrene**	**13**	**J**
Naphthalene	30	U	**Retene**	**9.7**	**J**
4-Chloroaniline	15	U	Butylbenzylphthalate	15	U
Hexachlorobutadiene	74	U	Benzo(a)anthracene	15	U
4-Chloro-3-Methylphenol	15	U	3,3'-Dichlorobenzidine	59	U
2-Methylnaphthalene	**5.4**	**J**	**Chrysene**	**6.3**	**J**
1-Methylnaphthalene	**3.3**	**J**	Bis(2-Ethylhexyl) Phthalate	14.8	UJ
Hexachlorocyclopentadiene	74	U	Di-N-Octyl Phthalate	15	U
2,4,6-Trichlorophenol	30	U	**Benzo(b)fluoranthene**	**8**	**J**
2,4,5-Trichlorophenol	15	U	**Benzo(k)fluoranthene**	**4.1**	**J**
2-Chloronaphthalene	15	U	**Benzo(a)pyrene**	**4.1**	**J**
2-Nitroaniline	30	U	3B-Coprostanol	59	U
Dimethylphthalate	15	U	Indeno(1,2,3-cd)pyrene	30	U
2,6-Dinitrotoluene	74	U	Dibenzo(a,h)anthracene	30	U
Acenaphthylene	15	U	Benzo(ghi)perylene	15	U
3-Nitroaniline	30	U			

Authorized By: D. Norton Release Date: 9/19/97 Page: 4

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148245 (Replicate - REP1)
Field ID: 13
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: ~~04/09/97~~
Date Analyzed: ~~05/17/97~~ 07/16/97 - 08/21/97 G.J.

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg

Surrogate Recoveries

2-Fluorophenol	63	%
D5-Phenol	66	%
D4-2-Chlorophenol	67	%
1,2-Dichlorobenzene-D4	39	%
D5-Nitrobenzene	54	%
2-Fluorobiphenyl	67	%
D10-Pyrene	71	%
D14-Terphenyl	79	%

Authorized By: D. Norton Release Date: 9/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148245 (Replicate - REP1)
Field ID: 13
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: ~~04/09/97~~
Date Analyzed: ~~05/17/97~~ 07/16/97 - 08/21/97 9.9.

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
		120	NJ
1534083	*Ethanethioic acid, S-methyl*	341	NJ
544638	*Decanoic Acid, Tetra-*	354	NJ
*3008001	*Unknown 01*	1100	NJ
1002842	*Decanoic Acid, Penta-*	2000	NJ
*3008002	*Unknown 02*	6890	NJ
2091294	*9-Hexadecenoic Acid*	5400	NJ
57103	*Hexadecanoic Acid*	609	NJ
*3008003	*Unknown 03*	375	NJ
57114	*Octadecanoic Acid*	266	NJ
112856	*Docosanoic Acid*	237	NJ
*3005001	*Unknown Hydrocarbon 01*	380	NJ
59029	*Vitamin E*	807	NJ
57885	*Cholesterol*	1830	NJ
83476	*Gamma-Sitosterol*	555	NJ
1058613	*Stigmast-4-en-3-one*		

Authorized By: _____ Release Date: 9/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments **LIMS Project ID:** 1161-97

Sample: 97148252 (Matrix Spike - LMX3) **Date Received:** 04/07/97 **Method:** SW8270
Field ID: 20 **Date Prepared:** ~~04/09/97~~ **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** ~~05/17/97~~ **Units:** % Recovery
07/16/97 - 08/21/97 a.g.

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	44		Acenaphthene	63	
Pyridine		NAF	2,4-Dinitrophenol	69	
Aniline		REJ	4-Nitrophenol	71	
Phenol	60		Dibenzofuran	64	
Bis(2-Chloroethyl)Ether	59		2,4-Dinitrotoluene	65	
2-Chlorophenol	66		Diethylphthalate	78	
1,3-Dichlorobenzene	40		Fluorene	69	
1,4-Dichlorobenzene	42		4-Chlorophenyl-Phenylether	76	
1,2-Dichlorobenzene	50		4-Nitroaniline	25	
Benzyl Alcohol	68		4,6-Dinitro-2-Methylphenol	69	
2-Methylphenol	70		N-Nitrosodiphenylamine	81	
2,2'-Oxybis[1-chloropropane]	64		1,2-Diphenylhydrazine	64	
N-Nitroso-Di-N-Propylamine	68		4-Bromophenyl-Phenylether	84	
4-Methylphenol	71		Hexachlorobenzene	81	
Hexachloroethane	8		Pentachlorophenol	80	
Nitrobenzene	59		Phenanthrene	75	
Isophorone	65		Anthracene	77	
2-Nitrophenol	47		Caffeine		NAF
2,4-Dimethylphenol	66		Carbazole		NAF
Bis(2-Chloroethoxy)Methane	66		Di-N-Butylphthalate	78	
Benzoic Acid	57		Fluoranthene	74	
2,4-Dichlorophenol	72		Benzidine		NAF
1,2,4-Trichlorobenzene	54		Pyrene	68	
Naphthalene	54		Retene		NAF
4-Chloroaniline		REJ	Butylbenzylphthalate	88	
Hexachlorobutadiene	51		Benzo(a)anthracene	72	
4-Chloro-3-Methylphenol	68		3,3'-Dichlorobenzidine		NAF
2-Methylnaphthalene	61		Chrysene	70	
1-Methylnaphthalene		NAF	Bis(2-Ethylhexyl) Phthalate	83	
Hexachlorocyclopentadiene		REJ	Di-N-Octyl Phthalate	92	
2,4,6-Trichlorophenol	83		Benzo(b)fluoranthene	80	
2,4,5-Trichlorophenol	80		Benzo(k)fluoranthene	75	
2-Chloronaphthalene	66		Benzo(a)pyrene	74	
2-Nitroaniline		REJ	3B-Coprostanol		NAF
Dimethylphthalate	80		Indeno(1,2,3-cd)pyrene	75	
2,6-Dinitrotoluene	64		Dibenzo(a,h)anthracene	81	
Acenaphthylene	66		Benzo(ghi)perylene	70	
3-Nitroaniline		REJ			

Authorized By: D. Knutzen Release Date: 9/19/97 Page: 8

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments **LIMS Project ID:** 1161-97

Sample: 97148252 (Matrix Spike - LMX3) **Date Received:** 04/07/97 **Method:** SW8270
Field ID: 20 **Date Prepared:** ~~04/09/97~~ **Matrix:** Sediment/Soil
Project Officer: Art Johnson **Date Analyzed:** ~~05/17/97~~ **Units:** % Recovery
07/16/97 - 08/21/97 a.j.

Surrogate Recoveries

2-Fluorophenol	64	%
D5-Phenol	65	%
D4-2-Chlorophenol	65	%
1,2-Dichlorobenzene-D4	49	%
D5-Nitrobenzene	57	%
2-Fluorobiphenyl	70	%
D10-Pyrene	73	%
D14-Terphenyl	84	%

Authorized By: D. Christie Release Date: 9/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148252 (Matrix Spike - LMX4)
Field ID: 20
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: ~~04/09/97~~
Date Analyzed: ~~05/17/97~~ 07/16/97 - 08/21/97 a.g.

Method: SW8270
Matrix: Sediment/Soil
Units: % Recovery

Analyte	Result	Qualifier
N-Nitrosodimethylamine	46	
Pyridine		NAF
Aniline		REJ
Phenol	74	
Bis(2-Chloroethyl)Ether	61	
2-Chlorophenol	70	
1,3-Dichlorobenzene	45	
1,4-Dichlorobenzene	46	
1,2-Dichlorobenzene	54	
Benzyl Alcohol	77	
2-Methylphenol	75	
2,2'-Oxybis[1-chloropropane]	69	
N-Nitroso-Di-N-Propylamine	69	
4-Methylphenol	82	
Hexachloroethane	7	
Nitrobenzene	61	
Isophorone	70	
2-Nitrophenol	56	
2,4-Dimethylphenol	74	
Bis(2-Chloroethoxy)Methane	67	
Benzoic Acid	61	
2,4-Dichlorophenol	79	
1,2,4-Trichlorobenzene	62	
Naphthalene	62	
4-Chloroaniline		REJ
Hexachlorobutadiene	58	
4-Chloro-3-Methylphenol	72	
2-Methylnaphthalene	66	
1-Methylnaphthalene		NAF
Hexachlorocyclopentadiene		REJ
2,4,6-Trichlorophenol	74	
2,4,5-Trichlorophenol	78	
2-Chloronaphthalene	67	
2-Nitroaniline		REJ
Dimethylphthalate	74	
2,6-Dinitrotoluene	68	
Acenaphthylene	64	
3-Nitroaniline		REJ
Acenaphthene	67	
2,4-Dinitrophenol	71	
4-Nitrophenol	69	
Dibenzofuran	65	
2,4-Dinitrotoluene	65	
Diethylphthalate	78	
Fluorene	71	
4-Chlorophenyl-Phenylether	74	
4-Nitroaniline	18	
4,6-Dinitro-2-Methylphenol	72	
N-Nitrosodiphenylamine	77	
1,2-Diphenylhydrazine	59	
4-Bromophenyl-Phenylether	78	
Hexachlorobenzene	76	
Pentachlorophenol	79	
Phenanthrene	66	
Anthracene	72	
Caffeine		NAF
Carbazole		NAF
Di-N-Butylphthalate	71	
Fluoranthene	73	
Benzidine		NAF
Pyrene	67	
Retene		NAF
Butylbenzylphthalate	94	
Benzo(a)anthracene	73	
3,3'-Dichlorobenzidine		NAF
Chrysene	74	
Bis(2-Ethylhexyl) Phthalate	85	
Di-N-Octyl Phthalate	96	
Benzo(b)fluoranthene	82	
Benzo(k)fluoranthene	74	
Benzo(a)pyrene	78	
3B-Coprostanol		NAF
Indeno(1,2,3-cd)pyrene	78	
Dibenzo(a,h)anthracene	80	
Benzo(ghi)perylene	70	

Authorized By: _____ Release Date: 9/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148252 (Matrix Spike - LMX4)
Field ID: 20
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: ~~04/09/97~~
Date Analyzed: ~~05/17/97~~ 07/16/97 – 08/21/97 a.y.

Method: SW8270
Matrix: Sediment/Soil
Units: % Recovery

Surrogate Recoveries

2-Fluorophenol	66	%
D5-Phenol	73	%
D4-2-Chlorophenol	68	%
1,2-Dichlorobenzene-D4	48	%
D5-Nitrobenzene	60	%
2-Fluorobiphenyl	67	%
D10-Pyrene	74	%
D14-Terphenyl	88	%

Authorized By: _____ Release Date: 9/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148252 (Replicate - REP1)
Field ID: 20
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: ~~04/09/97~~ 07/16/97 - 08/21/97 a.g.
Date Analyzed: ~~05/17/97~~

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	100	U	**Acenaphthene**	**7.1**	**J**
Pyridine	100	U	2,4-Dinitrophenol	400	UJ
Aniline		**REJ**	4-Nitrophenol	100	UJ
Phenol	48	UJ	**Dibenzofuran**	**14**	**J**
Bis(2-Chloroethyl)Ether	100	U	2,4-Dinitrotoluene	40	U
2-Chlorophenol	100	U	Diethylphthalate	20	U
1,3-Dichlorobenzene	100	U	**Fluorene**	**14**	**J**
1,4-Dichlorobenzene	100	U	4-Chlorophenyl-Phenylether	20	U
1,2-Dichlorobenzene	100	U	4-Nitroaniline	40	UJ
Benzyl Alcohol	40	U	4,6-Dinitro-2-Methylphenol	100	U
2-Methylphenol	40	U	N-Nitrosodiphenylamine	20	U
2,2'-Oxybis[1-chloropropane]	100	U	1,2-Diphenylhydrazine	20	U
N-Nitroso-Di-N-Propylamine	20	U	4-Bromophenyl-Phenylether	20	U
4-Methylphenol	**38**		Hexachlorobenzene	20	U
Hexachloroethane	100	UJ	Pentachlorophenol	100	U
Nitrobenzene	40	U	**Phenanthrene**	**68**	
Isophorone	20	U	**Anthracene**	**23**	
2-Nitrophenol	40	UJ	Caffeine	20	U
2,4-Dimethylphenol	20	U	Carbazole	20	U
Bis(2-Chloroethoxy)Methane	20	U	Di-N-Butylphthalate	123	UJ
Benzoic Acid	133	UJ	**Fluoranthene**	**129**	
2,4-Dichlorophenol	40	U	Benzidine	200	U
1,2,4-Trichlorobenzene	40	U	**Pyrene**	**100**	
Naphthalene	**50**		**Retene**	**28**	
4-Chloroaniline		**REJ**	Butylbenzylphthalate	20	U
Hexachlorobutadiene	100	U	**Benzo(a)anthracene**	**31**	
4-Chloro-3-Methylphenol	20	U	3,3'-Dichlorobenzidine	80	U
2-Methylnaphthalene	**16**	**J**	**Chrysene**	**47**	
1-Methylnaphthalene	**12**	**J**	Bis(2-Ethylhexyl) Phthalate	40	UJ
Hexachlorocyclopentadiene		**REJ**	Di-N-Octyl Phthalate	20	U
2,4,6-Trichlorophenol	40	U	**Benzo(b)fluoranthene**	**51**	
2,4,5-Trichlorophenol	20	U	**Benzo(k)fluoranthene**	**20**	**J**
2-Chloronaphthalene	20	U	**Benzo(a)pyrene**	**26**	
2-Nitroaniline		**REJ**	**3B-Coprostanol**	**234**	
Dimethylphthalate	20	U	**Indeno(1,2,3-cd)pyrene**	**36**	**J**
2,6-Dinitrotoluene	100	U	Dibenzo(a,h)anthracene	40	U
Acenaphthylene	**14**	**J**	**Benzo(ghi)perylene**	**23**	
3-Nitroaniline		**REJ**			

Authorized By: D. Hopkins Release Date: 9/19/97 Page: 12

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148252 (Replicate - REP1)
Field ID: 20
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: ~~04/09/97~~
Date Analyzed: ~~05/17/97~~ 07/16/97 - 08/21/97 G.J.

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg

Surrogate Recoveries

2-Fluorophenol	57	%
D5-Phenol	63	%
D4-2-Chlorophenol	59	%
1,2-Dichlorobenzene-D4	29	%
D5-Nitrobenzene	52	%
2-Fluorobiphenyl	64	%
D10-Pyrene	73	%
D14-Terphenyl	84	%

Authorized By: D. R. Newton Release Date: 9/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148252 (Replicate - REP1)
Field ID: 20
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: ~~04/09/97~~
Date Analyzed: ~~05/17/97~~ 07/16/97 - 08/21/97 a.g.

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
1534083	*Ethanethioic acid, S-methyl*	203	NJ
*3008001	*Unknown 01*	1010	NJ
544638	*Decanoic Acid, Tetra-*	2070	NJ
*3008002	*Unknown 02*	1260	NJ
*3008003	*Unknown 03*	2070	NJ
57103	*Hexadecanoic Acid*	7100	NJ
*3008004	*Unknown 04*	777	NJ
506127	*Heptadecanoic Acid*	664	NJ
10544500	*Sulfur, Mol. (S8)*	1020	NJ
57114	*Octadecanoic Acid*	582	NJ
112856	*Docosanoic Acid*	459	NJ
*3008005	*Unknown 05*	443	NJ
*3008006	*Unknown 06*	757	NJ
59029	*Vitamin E*	791	NJ
57885	*Cholesterol*	2840	NJ
*3008007	*Unknown 07*	1140	NJ
83476	*Gamma-Sitosterol*	1540	NJ

Authorized By: D. Hunter Release Date: 9/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148258 (Replicate - REP1)
Field ID: 26
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: ~~04/09/97~~ 07/16/97 - 08/21/97 a.g.
Date Analyzed: ~~05/17/97~~

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	73	U	**Acenaphthene**	**9.1**	**J**
Pyridine	73	U	2,4-Dinitrophenol	294	UJ
Aniline	73	U	4-Nitrophenol	73	UJ
Phenol	29	U	**Dibenzofuran**	**12**	**J**
Bis(2-Chloroethyl)Ether	73	U	2,4-Dinitrotoluene	29	U
2-Chlorophenol	73	U	Diethylphthalate	15	U
1,3-Dichlorobenzene	73	U	**Fluorene**	**11**	**J**
1,4-Dichlorobenzene	73	U	4-Chlorophenyl-Phenylether	15	U
1,2-Dichlorobenzene	73	U	4-Nitroaniline	29	U
Benzyl Alcohol	29	U	4,6-Dinitro-2-Methylphenol	73	U
2-Methylphenol	29	U	N-Nitrosodiphenylamine	15	U
2,2'-Oxybis[1-chloropropane]	73	U	1,2-Diphenylhydrazine	15	U
N-Nitroso-Di-N-Propylamine	15	U	4-Bromophenyl-Phenylether	15	U
4-Methylphenol	**35**		Hexachlorobenzene	15	U
Hexachloroethane	73	U	Pentachlorophenol	73	U
Nitrobenzene	29	U	**Phenanthrene**	**64**	
Isophorone	15	U	**Anthracene**	**15**	
2-Nitrophenol	29	U	Caffeine	15	U
2,4-Dimethylphenol	15	U	Carbazole	15	U
Bis(2-Chloroethoxy)Methane	15	U	Di-N-Butylphthalate	15	UJ
Benzoic Acid	78	UJ	**Fluoranthene**	**88**	
2,4-Dichlorophenol	29	U	Benzidine	147	U
1,2,4-Trichlorobenzene	29	U	**Pyrene**	**72**	
Naphthalene	**115**		**Retene**	**20**	
4-Chloroaniline	15	U	Butylbenzylphthalate	15	U
Hexachlorobutadiene	73	U	**Benzo(a)anthracene**	**16**	
4-Chloro-3-Methylphenol	15	U	3,3'-Dichlorobenzidine	59	U
2-Methylnaphthalene	**14**	**J**	**Chrysene**	**21**	
1-Methylnaphthalene	**8.8**	**J**	Bis(2-Ethylhexyl) Phthalate	15	UJ
Hexachlorocyclopentadiene	73	U	Di-N-Octyl Phthalate	15	U
2,4,6-Trichlorophenol	29	U	**Benzo(b)fluoranthene**	**22**	
2,4,5-Trichlorophenol	15	U	**Benzo(k)fluoranthene**	**10**	**J**
2-Chloronaphthalene	15	U	**Benzo(a)pyrene**	**12**	**J**
2-Nitroaniline	29	U	3B-Coprostanol	59	U
Dimethylphthalate	15	U	**Indeno(1,2,3-cd)pyrene**	**21**	**J**
2,6-Dinitrotoluene	73	U	Dibenzo(a,h)anthracene	29	U
Acenaphthylene	**22**		**Benzo(ghi)perylene**	**13**	**J**
3-Nitroaniline	29	U			

Authorized By: _____ Release Date: 9/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148258 (Replicate - REP1)
Field ID: 26
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: ~~04/09/97~~
Date Analyzed: ~~05/17/97~~ 07/16/97 - 05/21/97 A.J.

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg

Surrogate Recoveries

2-Fluorophenol	61	%
D5-Phenol	64	%
D4-2-Chlorophenol	65	%
1,2-Dichlorobenzene-D4	34	%
D5-Nitrobenzene	55	%
2-Fluorobiphenyl	69	%
D10-Pyrene	71	%
D14-Terphenyl	74	%

Authorized By: D. Hamilton Release Date: 9/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148258 (Replicate - REP1)
Field ID: 26
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: ~~04/09/97~~
Date Analyzed: ~~05/17/97~~
07/16/97 - 08/21/97 a.j.

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
		608	NJ
1534083	*Ethanethioic acid, S-methyl*	358	NJ
*3008001	*Unknown 01*	893	NJ
544638	*Decanoic Acid, Tetra-*	292	NJ
*3008002	*Unknown 02*	1780	NJ
5746587	*Tetradecanoic Acid, 12-Methyl-, (S)-*	680	NJ
1002842	*Decanoic Acid, Penta-*	3810	NJ
2091294	*9-Hexadecenoic Acid*	3640	NJ
57103	*Hexadecanoic Acid*	366	NJ
*3008003	*Unknown 03*	333	NJ
506127	*Heptadecanoic Acid*	760	NJ
150867	*Phytol*	308	NJ
57114	*Octadecanoic Acid*	245	NJ
*3008004	*Unknown 04*	1080	NJ
57885	*Cholesterol*	577	NJ
516950	*Epicholestanol*		

Authorized By: D. Vantwo Release Date: 9/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: BLN72276
Blank ID: OBS7197A1
Project Officer: Art Johnson

Date Prepared: 07/16/97
Date Analyzed: 08/21/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	100	U	Acenaphthene	20	U
Pyridine	100	U	2,4-Dinitrophenol	400	UJ
Aniline	100	U	4-Nitrophenol	100	UJ
Phenol	**29**	**J**	Dibenzofuran	20	U
Bis(2-Chloroethyl)Ether	100	U	2,4-Dinitrotoluene	40	U
2-Chlorophenol	100	U	**Diethylphthalate**	**4.3**	**J**
1,3-Dichlorobenzene	100	U	**Fluorene**	**.83**	**J**
1,4-Dichlorobenzene	100	U	4-Chlorophenyl-Phenylether	20	U
1,2-Dichlorobenzene	100	U	4-Nitroaniline	40	U
Benzyl Alcohol	40	U	4,6-Dinitro-2-Methylphenol	100	U
2-Methylphenol	40	U	N-Nitrosodiphenylamine	20	U
2,2'-Oxybis[1-chloropropane]	100	U	**1,2-Diphenylhydrazine**	**1.9**	**J**
N-Nitroso-Di-N-Propylamine	20	U	4-Bromophenyl-Phenylether	20	U
4-Methylphenol	**24**		Hexachlorobenzene	20	U
Hexachloroethane	100	U	Pentachlorophenol	100	U
Nitrobenzene	40	U	Phenanthrene	20	U
Isophorone	20	U	Anthracene	20	U
2-Nitrophenol	40	U	Caffeine	20	U
2,4-Dimethylphenol	20	U	Carbazole	20	U
Bis(2-Chloroethoxy)Methane	20	U	**Di-N-Butylphthalate**	**166**	
Benzoic Acid	**80**	**J**	**Fluoranthene**	**3**	**J**
2,4-Dichlorophenol	40	U	Benzidine	200	U
1,2,4-Trichlorobenzene	40	U	**Pyrene**	**3.2**	**J**
Naphthalene	40	U	Retene	20	U
4-Chloroaniline	20	U	**Butylbenzylphthalate**	**3.3**	**J**
Hexachlorobutadiene	100	U	**Benzo(a)anthracene**	**4**	**J**
4-Chloro-3-Methylphenol	20	U	3,3'-Dichlorobenzidine	80	U
2-Methylnaphthalene	20	U	**Chrysene**	**1.6**	**J**
1-Methylnaphthalene	20	U	**Bis(2-Ethylhexyl) Phthalate**	**53**	
Hexachlorocyclopentadiene	100	U	**Di-N-Octyl Phthalate**	**4.2**	**J**
2,4,6-Trichlorophenol	40	U	**Benzo(b)fluoranthene**	**1.7**	**J**
2,4,5-Trichlorophenol	20	U	**Benzo(k)fluoranthene**	**1.2**	**J**
2-Chloronaphthalene	20	U	**Benzo(a)pyrene**	**4.6**	**J**
2-Nitroaniline	40	U	3B-Coprostanol	80	U
Dimethylphthalate	20	U	Indeno(1,2,3-cd)pyrene	40	U
2,6-Dinitrotoluene	100	U	Dibenzo(a,h)anthracene	40	U
Acenaphthylene	**.98**	**J**	Benzo(ghi)perylene	20	U
3-Nitroaniline	40	U			

Authorized By: D-[signature] Release Date: 9/19/97 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: BLN72276
Blank ID: OBS7197A1
Project Officer: Art Johnson

Date Prepared: 07/16/97
Date Analyzed: 08/21/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Surrogate Recoveries

2-Fluorophenol	64	%
D5-Phenol	65	%
D4-2-Chlorophenol	67	%
1,2-Dichlorobenzene-D4	61	%
D5-Nitrobenzene	64	%
2-Fluorobiphenyl	65	%
D10-Pyrene	70	%
D14-Terphenyl	78	%

Authorized By: D-Hart Release Date: 9/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: BLN72276
Blank ID: OBS7197A1
Project Officer: Art Johnson

Date Prepared: 07/16/97
Date Analyzed: 08/21/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
		180	NJ
10574375	*2-Pentene, 2,3-dimethyl*	122	NJ
*3008001	*Unknown 01*	157	NJ
2216300	*Heptane, 2,5-dimethyl*	9130	NJ
123422	*4-Hydroxy-4-Methylpentan-2-one*	118	NJ
*3008002	*Unknown 02*	123	NJ
*3008003	*Unknown 03*	91	NJ
1072055	*Heptane, 2,6-Dimethyl-*	247	NJ
2216333	*Octane, 3-Methyl-*	209	NJ
*3008004	*Unknown 04*	162	NJ
*3008005	*Unknown 05*	344	NJ
*3008006	*Unknown 06*	215	NJ
*3008007	*Unknown 07*	163	NJ
*3008008	*Unknown 08*	67	NJ
544638	*Decanoic Acid, Tetra-*	138	NJ
57114	*Octadecanoic Acid*	172	NJ
*3008009	*Unknown 09*	242	NJ
*3008010	*Unknown 10*	482	NJ
19047859	*Phosphonic Acid, Dioctadecyl*	73	NJ
*3008011	*Unknown 11*	100	NJ
*3008012	*Unknown 12*		

Authorized By: D. Hunter Release Date: 9/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: BLN72277
Blank ID: OBS7197A2
Project Officer: Art Johnson

Date Prepared: 07/16/97
Date Analyzed: 08/21/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	100	U	Acenaphthene	20	U
Pyridine	100	U	2,4-Dinitrophenol	400	UJ
Aniline	100	U	4-Nitrophenol	100	UJ
Phenol	**26**	**J**	Dibenzofuran	20	U
Bis(2-Chloroethyl)Ether	100	U	2,4-Dinitrotoluene	40	U
2-Chlorophenol	100	U	**Diethylphthalate**	**31**	
1,3-Dichlorobenzene	100	U	**Fluorene**	**.72**	**J**
1,4-Dichlorobenzene	100	U	4-Chlorophenyl-Phenylether	20	U
1,2-Dichlorobenzene	100	U	4-Nitroaniline	40	U
Benzyl Alcohol	40	U	4,6-Dinitro-2-Methylphenol	100	U
2-Methylphenol	40	U	N-Nitrosodiphenylamine	20	U
2,2'-Oxybis[1-chloropropane]	100	U	**1,2-Diphenylhydrazine**	**3.4**	**J**
N-Nitroso-Di-N-Propylamine	20	U	4-Bromophenyl-Phenylether	20	U
4-Methylphenol	**10**	**J**	Hexachlorobenzene	20	U
Hexachloroethane	100	U	Pentachlorophenol	100	U
Nitrobenzene	40	U	**Phenanthrene**	**1.3**	**J**
Isophorone	20	U	**Anthracene**	**.91**	**J**
2-Nitrophenol	40	U	Caffeine	20	U
2,4-Dimethylphenol	20	U	Carbazole	20	U
Bis(2-Chloroethoxy)Methane	20	U	**Di-N-Butylphthalate**	**102**	
Benzoic Acid	**67**	**J**	**Fluoranthene**	**1.6**	**J**
2,4-Dichlorophenol	40	U	Benzidine	200	U
1,2,4-Trichlorobenzene	40	U	Pyrene	20	U
Naphthalene	40	U	Retene	20	U
4-Chloroaniline	20	U	**Butylbenzylphthalate**	**1.8**	**J**
Hexachlorobutadiene	100	U	**Benzo(a)anthracene**	**2.8**	**J**
4-Chloro-3-Methylphenol	20	U	3,3'-Dichlorobenzidine	80	U
2-Methylnaphthalene	20	U	**Chrysene**	**.8**	**J**
1-Methylnaphthalene	20	U	**Bis(2-Ethylhexyl) Phthalate**	**16**	**J**
Hexachlorocyclopentadiene	100	U	Di-N-Octyl Phthalate	20	U
2,4,6-Trichlorophenol	40	U	Benzo(b)fluoranthene	20	U
2,4,5-Trichlorophenol	20	U	Benzo(k)fluoranthene	20	U
2-Chloronaphthalene	20	U	Benzo(a)pyrene	20	U
2-Nitroaniline	40	U	3B-Coprostanol	80	U
Dimethylphthalate	20	U	Indeno(1,2,3-cd)pyrene	40	U
2,6-Dinitrotoluene	100	U	Dibenzo(a,h)anthracene	40	U
Acenaphthylene	**1.1**	**J**	Benzo(ghi)perylene	20	U
3-Nitroaniline	40	U			

Authorized By: _____ Release Date: 9/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: **Fidalgo Bay Sediments**

LIMS Project ID: 1161-97

Sample: BLN72277
Blank ID: OBS7197A2
Project Officer: Art Johnson

Date Prepared: 07/16/97
Date Analyzed: 08/21/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Surrogate Recoveries

2-Fluorophenol	57	%
D5-Phenol	58	%
D4-2-Chlorophenol	58	%
1,2-Dichlorobenzene-D4	60	%
D5-Nitrobenzene	64	%
2-Fluorobiphenyl	62	%
D10-Pyrene	69	%
D14-Terphenyl	80	%

Authorized By: [signature]　　Release Date: 9/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: BLN72277
Blank ID: OBS7197A2
Project Officer: Art Johnson

Date Prepared: 07/16/97
Date Analyzed: 08/21/97

Method: SW8270
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Tentatively Identified Compounds

CAS Number	Analyte Description	Result	Qualifier
109499	*5-Hexen-2-one*	63	NJ
141797	*3-Penten-2-One, 4-Methyl-*	126	NJ
3031752	*Hydroperoxide, 1-methylethy*	122	NJ
123422	*4-Hydroxy-4-Methylpentan-2-one*	8820	NJ
286204	*7-Oxabicyclo[4.1.0]Heptane*	78	NJ
619998	*Hexane, 3-Ethyl-*	130	NJ
3221612	*Octane, 2-Methyl-*	89	NJ
2216333	*Octane, 3-Methyl-*	270	NJ
110134	*2,5-Hexanedione*	194	NJ
*3008001	*Unknown 01*	108	NJ
23293507	*3-Hexyn-2-ol, 5-methyl-*	457	NJ
*3008002	*Unknown 02*	292	NJ
*3008003	*Unknown 03*	132	NJ
79298	*Butane, 2,3-Dimethyl-*	57	NJ
57114	*Octadecanoic Acid*	154	NJ
*3008004	*Unknown 04*	54	NJ
112856	*Docosanoic Acid*	58	NJ
*3008005	*Unknown 05*	135	NJ
*3008006	*Unknown 06*	49	NJ
*3008007	*Unknown 07*	258	NJ

Authorized By: D. Hamilton Release Date: 9/19/97

Manchester Environmental Laboratory

7411 Beach Dr E, Port Orchard Washington 98366

CASE NARRATIVE

June 5, 1997

Subject:	Fidalgo Bay sediments
Samples:	97148230 - 258
Case No.	116197
Officer:	Art Johnson
By:	Greg Perez Organics Analysis Unit

POLYCHLORINATED BIPHENYLS

SUMMARY:

No difficulties were encountered in the analysis of this sample. The data is usable as qualified.

ANALYTICAL METHODS:

The samples were analyzed using EPA Method 8080 using dual column capillary GC analysis with Electron Capture detectors. Normal QA/QC procedures were performed on the sample.

BLANKS:

No target compounds were found in the laboratory blanks.

SURROGATES:

Surrogate recoveries were within acceptable limits for the sediment samples.

HOLDING TIMES:

The sediment samples were analyzed within the recommended holding times.

MATRIX SPIKE AND MATRIX SPIKE DUPLICATE:

The samples were spiked with Arochlors 1242 and 1260. Recoveries were within acceptable limits.

DATA QUALIFIER CODES:

U	-	The analyte was not detected at or above the reported value.
J	-	The analyte was positively identified. The associated numerical value is an estimate.
UJ	-	The analyte was not detected at or above the reported estimated result.
REJ	-	The data are unusable for all purposes.
NAF	-	Not analyzed for.
N	-	For organic analytes there is evidence the analyte is present in this sample.
NJ	-	There is evidence that the analyte is present. The associated numerical result is an estimate.
E	-	This qualifier is used when the concentration of the associated value exceeds the known calibration range.
bold	-	The analyte was present in the sample. (Visual Aid to locate detected compound on report sheet.)

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148230
Field ID: 1
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 04/25/97

Method: SW8080
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
PCB - 1016	3.5	U
PCB - 1221	3.5	U
PCB - 1232	3.5	U
PCB - 1242	3.5	U
PCB - 1248	3.5	U
PCB - 1254	3.5	U
PCB - 1260	3.5	U

Surrogate Recoveries

4,4-Dibromooctafluorobiphenyl	**92**	**%**
Dibutylchlorendate		**NAF**
Decachlorobiphenyl	**84**	**%**
Tetrachloro-m-xylene	**86**	**%**

Authorized By: _____ Release Date: 5/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148230 (Matrix Spike - LMX1)
Field ID: 1
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 04/25/97

Method: SW8080
Matrix: Sediment/Soil
Units: % Recovery

Analyte	Result	Qualifier
PCB - 1016		NAF
PCB - 1221		NAF
PCB - 1232		NAF
PCB - 1242	**107**	
PCB - 1248		NAF
PCB - 1254		NAF
PCB - 1260	**105**	

Surrogate Recoveries

4,4-Dibromooctafluorobiphenyl	**100**	%
Dibutylchlorendate		NAF
Decachlorobiphenyl	**91**	%
Tetrachloro-m-xylene	**95**	%

Authorized By: _____ Release Date: 5/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148230 (Matrix Spike - LMX2)
Field ID: 1
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 04/25/97

Method: SW8080
Matrix: Sediment/Soil
Units: % Recovery

Analyte	Result	Qualifier
PCB - 1016		NAF
PCB - 1221		NAF
PCB - 1232		NAF
PCB - 1242	**98**	
PCB - 1248		NAF
PCB - 1254		NAF
PCB - 1260	**101**	

Surrogate Recoveries

4,4-Dibromooctafluorobiphenyl	**101**	%
Dibutylchlorendate		NAF
Decachlorobiphenyl	**92**	%
Tetrachloro-m-xylene	**96**	%

Authorized By: _____ Release Date: 5/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148232
Field ID: 3
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 04/25/97

Method: SW8080
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
PCB - 1016	2.9	U
PCB - 1221	2.9	U
PCB - 1232	2.9	U
PCB - 1242	2.9	U
PCB - 1248	2.9	U
PCB - 1254	**7.4**	
PCB - 1260	**3.0**	

Surrogate Recoveries

4,4-Dibromooctafluorobiphenyl	**88**	**%**
Dibutylchlorendate		**NAF**
Decachlorobiphenyl	**99**	**%**
Tetrachloro-m-xylene	**83**	**%**

Authorized By: _____ Release Date: 5/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148233
Field ID: 4
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 04/25/97

Method: SW8080
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
PCB - 1016	3.6	U
PCB - 1221	3.6	U
PCB - 1232	3.6	U
PCB - 1242	**6.1**	
PCB - 1248	3.6	U
PCB - 1254	**2.9**	**J**
PCB - 1260	3.6	U

Surrogate Recoveries

4,4-Dibromooctafluorobiphenyl	**95**	**%**
Dibutylchlorendate		**NAF**
Decachlorobiphenyl	**97**	**%**
Tetrachloro-m-xylene	**89**	**%**

Authorized By: _____ Release Date: 5/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148234
Field ID: 4A
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 04/25/97

Method: SW8080
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
PCB - 1016	3.8	U
PCB - 1221	3.8	U
PCB - 1232	3.8	U
PCB - 1242	3.8	U
PCB - 1248	3.8	U
PCB - 1254	3.8	U
PCB - 1260	3.8	U

Surrogate Recoveries

4,4-Dibromooctafluorobiphenyl	**89**	**%**
Dibutylchlorendate		**NAF**
Decachlorobiphenyl	**91**	**%**
Tetrachloro-m-xylene	**83**	**%**

Authorized By: _____ Release Date: 5/19/97 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148235
Field ID: 5
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 04/25/97

Method: SW8080
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
PCB - 1016	3.4	U
PCB - 1221	3.4	U
PCB - 1232	3.4	U
PCB - 1242	3.4	U
PCB - 1248	3.4	U
PCB - 1254	3.4	U
PCB - 1260	3.4	U

Surrogate Recoveries

4,4-Dibromooctafluorobiphenyl	88	%
Dibutylchlorendate		NAF
Decachlorobiphenyl	87	%
Tetrachloro-m-xylene	83	%

Authorized By: _____ Release Date: 5/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148239
Field ID: 8
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 04/25/97

Method: SW8080
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
PCB - 1016	3.3	U
PCB - 1221	3.3	U
PCB - 1232	3.3	U
PCB - 1242	3.3	U
PCB - 1248	3.3	U
PCB - 1254	3.3	U
PCB - 1260	3.3	U

Surrogate Recoveries

4,4-Dibromooctafluorobiphenyl	**82**	**%**
Dibutylchlorendate		**NAF**
Decachlorobiphenyl	**92**	**%**
Tetrachloro-m-xylene	**78**	**%**

Authorized By: _____ Release Date: 5/15/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148241
Field ID: 10
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 04/25/97

Method: SW8080
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
PCB - 1016	3.0	U
PCB - 1221	3.0	U
PCB - 1232	3.0	U
PCB - 1242	3.0	U
PCB - 1248	3.0	U
PCB - 1254	3.0	U
PCB - 1260	3.0	U

Surrogate Recoveries

4,4-Dibromooctafluorobiphenyl	**80**	**%**
Dibutylchlorendate		**NAF**
Decachlorobiphenyl	**83**	**%**
Tetrachloro-m-xylene	**75**	**%**

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148242
Field ID: 10A
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 04/25/97

Method: SW8080
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
PCB - 1016	3.1	U
PCB - 1221	3.1	U
PCB - 1232	3.1	U
PCB - 1242	3.1	U
PCB - 1248	3.1	U
PCB - 1254	3.1	U
PCB - 1260	3.1	U

Surrogate Recoveries

4,4-Dibromooctafluorobiphenyl	**85**	**%**
Dibutylchlorendate		**NAF**
Decachlorobiphenyl	**88**	**%**
Tetrachloro-m-xylene	**81**	**%**

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148243
Field ID: 11
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 04/25/97

Method: SW8080
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
PCB - 1016	3.0	U
PCB - 1221	3.0	U
PCB - 1232	3.0	U
PCB - 1242	3.0	U
PCB - 1248	3.0	U
PCB - 1254	3.0	U
PCB - 1260	3.0	U

Surrogate Recoveries

4,4-Dibromooctafluorobiphenyl	81	%
Dibutylchlorendate		NAF
Decachlorobiphenyl	93	%
Tetrachloro-m-xylene	73	%

Authorized By: _____ Release Date: 5/15/97 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148245
Field ID: 13
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 04/25/97

Method: SW8080
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
PCB - 1016	3.0	U
PCB - 1221	3.0	U
PCB - 1232	3.0	U
PCB - 1242	3.0	U
PCB - 1248	3.0	U
PCB - 1254	3.0	U
PCB - 1260	3.0	U

Surrogate Recoveries

4,4-Dibromooctafluorobiphenyl	**84**	**%**
Dibutylchlorendate		**NAF**
Decachlorobiphenyl	**86**	**%**
Tetrachloro-m-xylene	**80**	**%**

Authorized By: _____ Release Date: 5/12/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148247
Field ID: 15
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 04/25/97

Method: SW8080
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
PCB - 1016	3.9	U
PCB - 1221	3.9	U
PCB - 1232	3.9	U
PCB - 1242	3.9	U
PCB - 1248	3.9	U
PCB - 1254	3.9	U
PCB - 1260	3.9	U

Surrogate Recoveries

4,4-Dibromooctafluorobiphenyl	85	%
Dibutylchlorendate		NAF
Decachlorobiphenyl	94	%
Tetrachloro-m-xylene	82	%

Authorized By: _____ Release Date: 5/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148249
Field ID: 17
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 04/25/97

Method: SW8080
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
PCB - 1016	3.9	U
PCB - 1221	3.9	U
PCB - 1232	3.9	U
PCB - 1242	3.9	U
PCB - 1248	3.9	U
PCB - 1254	3.9	U
PCB - 1260	3.9	U

Surrogate Recoveries

4,4-Dibromooctafluorobiphenyl	**94**	**%**
Dibutylchlorendate		**NAF**
Decachlorobiphenyl	**98**	**%**
Tetrachloro-m-xylene	**92**	**%**

Authorized By: _____ Release Date: 5/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148252
Field ID: 20
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 04/25/97

Method: SW8080
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
PCB - 1016	4.0	U
PCB - 1221	4.0	U
PCB - 1232	4.0	U
PCB - 1242	4.0	U
PCB - 1248	4.0	U
PCB - 1254	4.0	U
PCB - 1260	4.0	U

Surrogate Recoveries

4,4-Dibromooctafluorobiphenyl	**54**	**%**
Dibutylchlorendate		**NAF**
Decachlorobiphenyl	**82**	**%**
Tetrachloro-m-xylene	**37**	**%**

Authorized By: _____ Release Date: 5/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148253
Field ID: 21
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 04/25/97

Method: SW8080
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
PCB - 1016	4.1	U
PCB - 1221	4.1	U
PCB - 1232	4.1	U
PCB - 1242	4.1	U
PCB - 1248	4.1	U
PCB - 1254	4.1	U
PCB - 1260	4.1	U

Surrogate Recoveries

4,4-Dibromooctafluorobiphenyl	**84**	**%**
Dibutylchlorendate		**NAF**
Decachlorobiphenyl	**94**	**%**
Tetrachloro-m-xylene	**82**	**%**

Authorized By: _____ Release Date: 5/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148257
Field ID: 25
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 04/25/97

Method: SW8080
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
PCB - 1016	3.1	U
PCB - 1221	3.1	U
PCB - 1232	3.1	U
PCB - 1242	3.1	U
PCB - 1248	3.1	U
PCB - 1254	3.1	U
PCB - 1260	3.1	U

Surrogate Recoveries

4,4-Dibromooctafluorobiphenyl	**91**	**%**
Dibutylchlorendate		**NAF**
Decachlorobiphenyl	**97**	**%**
Tetrachloro-m-xylene	**84**	**%**

Authorized By: _____ Release Date: 5/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148258
Field ID: 26
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/09/97
Date Analyzed: 04/25/97

Method: SW8080
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
PCB - 1016	3.2	U
PCB - 1221	3.2	U
PCB - 1232	3.2	U
PCB - 1242	3.2	U
PCB - 1248	3.2	U
PCB - 1254	3.2	U
PCB - 1260	3.2	U

Surrogate Recoveries

4,4-Dibromooctafluorobiphenyl	**71**	**%**
Dibutylchlorendate		**NAF**
Decachlorobiphenyl	**87**	**%**
Tetrachloro-m-xylene	**68**	**%**

Authorized By: _____ Release Date: 5/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: BLN71034
Blank ID: OBS7099A1
Project Officer: Art Johnson

Date Prepared: 04/09/97
Date Analyzed: 04/25/97

Method: SW8080
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
PCB - 1016	4.0	U
PCB - 1221	4.0	U
PCB - 1232	4.0	U
PCB - 1242	4.0	U
PCB - 1248	4.0	U
PCB - 1254	4.0	U
PCB - 1260	4.0	U

Surrogate Recoveries

4,4-Dibromooctafluorobiphenyl	**86**	**%**
Dibutylchlorendate		**NAF**
Decachlorobiphenyl	**92**	**%**
Tetrachloro-m-xylene	**85**	**%**

Authorized By: _____ Release Date: 5/19/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: BLN71035
Blank ID: OBS7099A2
Project Officer: Art Johnson

Date Prepared: 04/09/97
Date Analyzed: 04/25/97

Method: SW8080
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
PCB - 1016	4.0	U
PCB - 1221	4.0	U
PCB - 1232	4.0	U
PCB - 1242	4.0	U
PCB - 1248	4.0	U
PCB - 1254	4.0	U
PCB - 1260	4.0	U

Surrogate Recoveries

4,4-Dibromooctafluorobiphenyl	**80**	**%**
Dibutylchlorendate		**NAF**
Decachlorobiphenyl	**91**	**%**
Tetrachloro-m-xylene	**77**	**%**

Authorized By: _____ Release Date: 5/19/97 Page: 1

MANCHESTER ENVIRONMENTAL LABORATORY

7411 Beach Drive E , Port Orchard Washington 98366

CASE NARRATIVE

June 30, 1997

Subject: Fildalgo Bay Sediments

Samples: 97-148241, -148243, -148257, -148258, and -148259

Case No. 1161-97

Officer: Art Johnson

By: Dickey D. Huntamer
Organics Analysis Unit

TRIBUTYL TINS

ANALYTICAL METHODS:

The samples were extracted following the methods given in Puget Sound Estuary Program (PSEP) "Recommended Guidelines for Measuring Organic Compounds in Puget Sound Sediment and Tissue Samples" Recommended Methods for Organotin Compounds. The samples were extracted by tumbling with sodium sulfate and methylene chloride /tropolone, 0.1% by weight. After extraction the samples were solvent exchanged to hexane. The organotin compounds were hexylated using the Grignard reaction given in Krone et al (1989) including the silica gel/alumina cleanup. Analysis was done by capillary Gas Chromatography using Single Ion Monitoring (SIM) mode GC/MS. All samples are reported on a dry weight basis.

HOLDING TIMES:

The samples were extracted within fourteen days. After extraction all samples were analyzed within the recommended 40 day extract time.

BLANKS:

No target analytes were detected in the laboratory blanks. Some traces of monobutyltin were seen in the laboratory blanks but the mass spectral purity was poor. All of the samples showed monobutyltin at low levels. Previous experience with this batch of Grignard derivitizing reagent showed that it had some monobutyltin present. Consequently although monobutyltin was not detected in the blanks for this analysis it is possible that it may be an artifact from the Grignard reagent and should be viewed with caution.

SURROGATES:

Recovery of the surrogate spike, Tripropyltin, ranged from 50% to 89%. recoveries of the tripentyl tin ranged from 78% to 146%. No surrogate recovery QC limits have been established for this method.

MATRIX SPIKE AND MATRIX SPIKE DUPLICATE:

Matrix spike recoveries ranged from 75% to 156% for tetrabutyltin, tributyltin and dibutyltin compounds. The Relative Percent Differences (RPD) ranged from 0.96% to 17%. No spike recovery or RPD QC limits have been established for organotins at this time. Recoveries for monobutyltin were low, about 17% and all results for monobutyltin are "J" qualified.

ANALYTICAL COMMENTS:

Sample 97148257 was was run in duplicate, (LDP1). A third run (LDP2) was done using 10% methanol added to the methylene chloride/tropolone extraction solvent. Results for tributyltin were 1.3 J, 2.1 J, and 1.4 J respectively.

Additional QC samples were analyzed with the sediment samples. These were Sequim Bay Reference Sediments which presumably was spiked with 100 ng/gm (100 ug/Kg) wet weight of tributyltin chloride. No value for tributyltin has been established for the Sequim Bay Reference Sediment so the accuracy of the analysis cannot be determined. These samples are identified as OCS7104A1, A2, A3 and A4 (SBR71182 to SBR71185).

SRM A1	77.4	ug/Kg (wet weight)
SRM A2	73.4	ug/Kg (wet weight)
SRM A3	71.8	ug/Kg (wet weight)
SRM A4*	104.5	ug/Kg (wet weight)

*(Extract 10% MeOH in $MeCl_2$/tropolone)

Note that the data sheets report these values as dry weight. The percent solids is 56.5% for these samples.

Additional reference samples analyzed were PACS-1, PACS-2 and HISS-1. These are identified as samples: OCS7104B1 and B2 for PACS-1, OCS7104B3 for PACS-2 and OCS7104B4 for HISS-1.

Reference material HISS-1 is off the coast of Newfoundland and would not be expected to have much if any organotins. At this time no values for PACS-2 have been reported.

OCS7104-	B1	B2	PACS-1 (ug/Kg as Tributyltin chloride)	PACS-2
TBTCl	690	810	3480	2260
$DBTCl_2$	1000	1210	2970	2370
$MBTCl_3$	1700	1730	665	1160

There is obviously a problem with the PACS-1 analysis. Relative Percent Differences are good but the concentrations are low for tributyltin and dibutyltin and high for monobutyltin, backwards of what is expected. Surrogate recoveries were 78% to 133% for the PACS-1 samples. Additional sets of PACS-1 are being analyzed and an adequate explanation of these odd results for PACS-1 may have to await their analysis.

No analytical problems were encountered in the analysis of the samples and Sequim Bay reference materials. Results for PACS-2 appear to be reasonable but will have to await data on the certified values. Results for PACS-1 are quite odd and if not the result of problems in the analysis may indicate possible breakdown of the organotin species. The final word on this will have to await results of further analysis. The sample data is acceptable for use as qualified.

DATA QUALIFIER CODES:

U	-	The analyte was not detected at or above the reported value.
J	-	The analyte was positively identified. The associated numerical value is an estimate.
UJ	-	The analyte was not detected at or above the reported estimated result.
REJ	-	The data are unusable for all purposes.
EXP	-	The result is equal to the number before EXP times 10 to the power of the number after EXP. As an example 3EXP6 equals 3×10^6.
NAF	-	Not analyzed for.
N	-	For organic analytes there is evidence the analyte is present in this sample.
NJ	-	There is evidence that the analyte is present. The associated numerical result is an estimate.
E	-	This qualifier is used when the concentration of the associated value exceeds the known calibration range.
bold	-	The analyte was present in the sample. (Visual Aid to locate detected compound on report sheet.)

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148241
Field ID: 10
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/14/97
Date Analyzed: 05/21/97

Method: NOAA_TBT
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
Tetrabutyltin Chloride	8.7	U
Tributyltin Chloride	8.6	U
Dibutyltin Chloride	8.9	U
Monobutyltin Chloride	**7.3**	**J**

Surrogate Recoveries

Tripropyltin Chloride	**74**	%
Tripentyltin Chloride	**117**	%

Authorized By: D. Hopkins Release Date: 6/13/97 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

LIMS Project ID: 1161-97

Project Name: Fidalgo Bay Sediments

Sample: 97148243
Field ID: 11
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/14/97
Date Analyzed: 05/21/97

Method: NOAA_TBT
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
Tetrabutyltin Chloride	8.6	U
Tributyltin Chloride	8.6	U
Dibutyltin Chloride	8.8	U
Monobutyltin Chloride	**1.1**	**J**

Surrogate Recoveries

Tripropyltin Chloride	**65**	%
Tripentyltin Chloride	**97**	%

Authorized By: D. Haw[signature] Release Date: 6/23/97 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148258
Field ID: 26
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/14/97
Date Analyzed: 05/21/97

Method: NOAA_TBT
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
Tetrabutyltin Chloride	9	U
Tributyltin Chloride	**.29**	**J**
Dibutyltin Chloride	9.2	U
Monobutyltin Chloride	**2.6**	**J**

Surrogate Recoveries

Tripropyltin Chloride	**58**	%
Tripentyltin Chloride	**78**	%

Authorized By: O. [signature] Release Date: 6/23/97 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148257
Field ID: 25
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/14/97
Date Analyzed: 05/21/97

Method: NOAA_TBT
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
Tetrabutyltin Chloride	7.1	U
Tributyltin Chloride	**1.3**	**J**
Dibutyltin Chloride	7.3	U
Monobutyltin Chloride	**6.9**	**J**

Surrogate Recoveries

Tripropyltin Chloride	**73**	%
Tripentyltin Chloride	**113**	%

Authorized By: D. Hodson Release Date: 6/24/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

LIMS Project ID: 1161-97

Project Name: Fidalgo Bay Sediments

Sample: 97148257 (Duplicate - LDP1)
Field ID: 25
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/14/97
Date Analyzed: 05/21/97

Method: NOAA_TBT
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
Tetrabutyltin Chloride	19.4	U
Tributyltin Chloride	**2.1**	
Dibutyltin Chloride	19.9	U
Monobutyltin Chloride	**3.2**	

Surrogate Recoveries

Tripropyltin Chloride	**64**	%
Tripentyltin Chloride	**89**	%

Authorized By: O-Olesten

Release Date: 6/24/97

Page: 2

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148257 (Duplicate - LDP2)
Field ID: 25
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/14/97
Date Analyzed: 05/21/97

Method: NOAA_TBT
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
Tetrabutyltin Chloride	15.7	U
Tributyltin Chloride	**1.4**	
Dibutyltin Chloride	16	U
Monobutyltin Chloride	**5.8**	

Surrogate Recoveries

Tripropyltin Chloride	**85**	%
Tripentyltin Chloride	**112**	%

Authorized By: _____ Release Date: 8/29/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148258
Field ID: 26
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/14/97
Date Analyzed: 05/21/97

Method: NOAA_TBT
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
Tetrabutyltin Chloride	9	U
Tributyltin Chloride	**.29**	**J**
Dibutyltin Chloride	9.2	U
Monobutyltin Chloride	**2.6**	**J**

Surrogate Recoveries

Tripropyltin Chloride	**58**	%
Tripentyltin Chloride	**78**	%

Authorized By: D. Norton Release Date: 6/24/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148259
Field ID: 27
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/14/97
Date Analyzed: 05/21/97

Method: NOAA_TBT
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
Tetrabutyltin Chloride	7.5	U
Tributyltin Chloride	**.067**	**J**
Dibutyltin Chloride	7.6	U
Monobutyltin Chloride	**1.8**	**J**

Surrogate Recoveries

Tripropyltin Chloride	**50**	**%**
Tripentyltin Chloride	**87**	**%**

Authorized By: D. Hinton Release Date: 6/23/97 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148259 (Matrix Spike - LMX1)
Field ID: 27
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/14/97
Date Analyzed: 05/21/97

Method: NOAA_TBT
Matrix: Sediment/Soil
Units: % Recovery

Analyte	Result	Qualifier
Tetrabutyltin Chloride	76	
Tributyltin Chloride	75	
Dibutyltin Chloride	137	
Monobutyltin Chloride	17	

Surrogate Recoveries

Tripropyltin Chloride	60	%
Tripentyltin Chloride	97	%

Authorized By: D Hamilton Release Date: 6/29/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: 97148259 (Matrix Spike - LMX2)
Field ID: 27
Project Officer: Art Johnson

Date Received: 04/07/97
Date Prepared: 04/14/97
Date Analyzed: 05/21/97

Method: NOAA_TBT
Matrix: Sediment/Soil
Units: % Recovery

Analyte	Result	Qualifier
Tetrabutyltin Chloride	90	
Tributyltin Chloride	84	
Dibutyltin Chloride	156	
Monobutyltin Chloride	17	

Surrogate Recoveries

Tripropyltin Chloride	93	%
Tripentyltin Chloride	111	%

Authorized By: D. Heath Release Date: 6/27/97 Page: 3

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: BLN71176
Blank ID: OBS7104A1
Project Officer: Art Johnson

Date Prepared: 04/14/97
Date Analyzed: 05/21/97

Method: NOAA_TBT
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
Tetrabutyltin Chloride	9.1	U
Tributyltin Chloride	9	U
Dibutyltin Chloride	9.3	U
Monobutyltin Chloride	10	U

Surrogate Recoveries

Tripropyltin Chloride	**89**	**%**
Tripentyltin Chloride	**102**	**%**

Authorized By: D. Hinton Release Date: 6/23/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: BLN71177
Blank ID: OBS7104A2
Project Officer: Art Johnson

Date Prepared: 04/14/97
Date Analyzed: 05/21/97

Method: NOAA_TBT
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
Tetrabutyltin Chloride	9.1	U
Tributyltin Chloride	9	U
Dibutyltin Chloride	9.3	U
Monobutyltin Chloride	10	U

Surrogate Recoveries

Tripropyltin Chloride	**88**	**%**
Tripentyltin Chloride	**104**	**%**

Authorized By: D. Kuntz Release Date: 8/13/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: PAC71178
Blank ID: OCS7104B1
Project Officer: Art Johnson

Date Prepared: 04/14/97
Date Analyzed: 05/21/97

Method: NOAA_TBT
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
Tetrabutyltin Chloride	103	U
Tributyltin Chloride	**690**	
Dibutyltin Chloride	**1000**	
Monobutyltin Chloride	**1700**	

Surrogate Recoveries

Tripropyltin Chloride	**78**	%
Tripentyltin Chloride	**102**	%

Authorized By: D Hunter Release Date: 6/24/97 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: PAC71179
Blank ID: OCS7104B2
Project Officer: Art Johnson

Date Prepared: 04/14/97
Date Analyzed: 05/21/97

Method: NOAA_TBT
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
Tetrabutyltin Chloride	114	U
Tributyltin Chloride	**810**	
Dibutyltin Chloride	**1210**	
Monobutyltin Chloride	**1730**	

Surrogate Recoveries

Tripropyltin Chloride	**81**	%
Tripentyltin Chloride	**133**	%

Authorized By: D. Norton Release Date: 6/24/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: PAC71180
Blank ID: OCS7104B3
Project Officer: Art Johnson

Date Prepared: 04/14/97
Date Analyzed: 05/21/97

Method: NOAA_TBT
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
Tetrabutyltin Chloride	350	U
Tributyltin Chloride	2260	
Dibutyltin Chloride	2370	
Monobutyltin Chloride	1160	

Surrogate Recoveries

Tripropyltin Chloride	70	%
Tripentyltin Chloride	146	%

Authorized By: D. Hoster Release Date: 6/24/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: PAC71181
Blank ID: OCS7104B4
Project Officer: Art Johnson

Date Prepared: 04/14/97
Date Analyzed: 05/21/97

Method: NOAA_TBT
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
Tetrabutyltin Chloride	6.9	U
Tributyltin Chloride	6.9	U
Dibutyltin Chloride	7.1	U
Monobutyltin Chloride	7.9	U

Surrogate Recoveries

Tripropyltin Chloride	**77**	**%**
Tripentyltin Chloride	**109**	**%**

Authorized By: D. Hunter Release Date: 6/24/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: SBR71182
Blank ID: OCS7104A1
Project Officer: Art Johnson

Date Prepared: 04/14/97
Date Analyzed: 05/21/97

Method: NOAA_TBT
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
Tetrabutyltin Chloride	12.8	U
Tributyltin Chloride	**137**	
Dibutyltin Chloride	13.1	U
Monobutyltin Chloride	**9.3**	

Surrogate Recoveries

Tripropyltin Chloride	**59**	%
Tripentyltin Chloride	**127**	%

Authorized By: O. Johnson Release Date: 6/18/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: SBR71183
Blank ID: OCS7104A2
Project Officer: Art Johnson

Date Prepared: 04/14/97
Date Analyzed: 05/21/97

Method: NOAA_TBT
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
Tetrabutyltin Chloride	9.1	U
Tributyltin Chloride	**130**	
Dibutyltin Chloride	9.3	U
Monobutyltin Chloride	**11.6**	

Surrogate Recoveries

Tripropyltin Chloride	**62**	%
Tripentyltin Chloride	**99**	%

Authorized By: Dr Newton Release Date: 6/29/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: SBR71184
Blank ID: OCS7104A3
Project Officer: Art Johnson

Date Prepared: 04/14/97
Date Analyzed: 05/21/97

Method: NOAA_TBT
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
Tetrabutyltin Chloride	12.4	U
Tributyltin Chloride	**127**	
Dibutyltin Chloride	12.7	U
Monobutyltin Chloride	**23**	

Surrogate Recoveries

Tripropyltin Chloride	**67**	%
Tripentyltin Chloride	**95**	%

Authorized By: D. Kratz Release Date: 6/24/97

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Tri-butyl Tin

Project Name: Fidalgo Bay Sediments

LIMS Project ID: 1161-97

Sample: SBR71185
Blank ID: OCS7104A4
Project Officer: Art Johnson

Date Prepared: 04/14/97
Date Analyzed: 05/21/97

Method: NOAA_TBT
Matrix: Sediment/Soil
Units: ug/Kg Dry Wt.

Analyte	Result	Qualifier
Tetrabutyltin Chloride	10.3	U
Tributyltin Chloride	**185**	
Dibutyltin Chloride	10.5	U
Monobutyltin Chloride	**8.6**	**J**

Surrogate Recoveries

Tripropyltin Chloride	**67**	%
Tripentyltin Chloride	**112**	%

Authorized By: D. Houston Release Date: 6/24/97