Contaminants in Bed Sediments from 15 Reaches of the Fraser River Basin

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ABSTRACT

Bed sediments were collected from 15 reaches of the Fraser River basin for three consecutive years between 1994 and 1996. Chlorinated dioxins and furans, chlorophenolics, resin acids, polycyclic aromatic hydrocarbons and 4-nonylphenol were generally measured in higher concentrations downstream of pulp mills and urban centres relative to upstream locations. In areas impacted by urban runoff, organochlorine pesticides and polychlorinated biphenyls were elevated relative to reference locations. While most metals were found to be naturally high in sediments throughout the Fraser basin, elevated levels of some metals, such as arsenic, may originate from anthropogenic sources.

Urban areas such as the Fraser estuary and Thompson River were the most heavily impacted regions in the basin. The upper Fraser basin was the least impacted, although levels of contaminants associated with pulp mills and municipal wastewater treatment plants were elevated downstream of urban centres. Congener-specific source analysis for dioxins and furans suggests residual contamination from historical use of pentachlorophenol and combustion sources in most reaches, while the majority of chlorophenolics detected were pulp mill related. Polycyclic aromatic hydrocarbon distributions indicate both petroleum and combustion inputs throughout the basin. Atmospheric deposition, historical use and urban runoff are the likely sources of polychlorinated biphenyls and organochlorine pesticides.

Concentrations of dioxins, furans, chlorophenolics, polychlorinated biphenyls, organochlorine pesticides and lead were reduced relative to levels measured prior to 1991, due to regulations implemented in the 1980s and early 1990s. Dioxins, furans, polycyclic aromatic hydrocarbons, polychlorinated biphenyls, organochlorine pesticides and trace metals exceeded federal guidelines, provincial criteria and regional objectives for the protection of aquatic life in bed sediments at some locations in the Fraser River basin. With the exception of fatty acids and non-chlorinated resin acids, contaminant levels were similar to, or lower than, those measured in other large river systems throughout North America.

RÉSUMÉ

Pendant trois années consécutives de 1994 à 1996, on a recueilli des matériaux du lit dans 15 biefs du bassin du Fraser. De façon générale, on a mesuré des concentrations plus élevées de dioxines et de furanes chlorés, d'acides résiniques, d'hydrocarbures aromatiques polychlorés et de 4-nonylphénols à des sites en aval des usines de pâtes et des centres urbains, par rapport aux sites en amont. Les teneurs en pesticides organochlorés et en biphényles polychlorés étaient élevées par rapport à celles des sites de référence dans les régions touchées par le ruissellement urbain. D'après les analyses, alors que les concentrations naturelles de la plupart des métaux étaient élevées dans les sédiments de tout le bassin du Fraser, des concentrations élevées de certains métaux, par exemple l'arsenic, peuvent provenir de sources anthropiques.

Certaines régions urbaines comme l'estuaire du Fraser et la rivière Thompson étaient les régions les plus touchées du bassin. Le bassin supérieur du Fraser était relativement moins touché, même si on y a mesuré des concentrations élevées de contaminants associées à des usines de pâtes et à des stations d'épuration des eaux usées en aval de centres urbain. L'analyse des sources particulières de divers congénères de dioxines et de furanes suggère une contamination résiduelle due à l'utilisation antérieure de pentachlorophénol et à des sources de combustion dans la plupart des biefs, alors que la plus grande partie des chlorophénols détectés provenaient d'activités liées aux usines de pâtes. Les distributions des hydrocarbures aromatiques polycycliques indiquaient qu'il y a eu dans tout le bassin des apports de ces substances provenant d'utilisations du pétrole et de la combustion. Le dépôt atmosphérique, les utilisations antérieures et le ruissellement urbain sont les sources probables de biphényles polychlorés et de pesticides organochlorés.

On a également noté des réductions des concentrations de dioxines, de furanes, de composés chlorophénoliques, de biphényles polychlorés, de pesticides organochlorés et de plomb par rapport aux concentrations mesurées avant 1991, à cause des règlements entrés en vigueur au cours des années 1980 et 1990. On a mesuré des concentrations de dioxines, de furanes, d'hydrocarbures aromatiques polychlorés, de biphényles polychlorés, de pesticides organochlorés et de métaux à l'état de traces dépassant les lignes directrices fédérales, les critères provinciaux et les objectifs régionaux destinés à protéger la vie aquatique dans les matériaux du lit. Sauf pour les acides gras et les acides résiniques non chlorés, les teneurs en contaminants étaient semblables ou inférieures à celles mesurées dans d'autres grands réseaux aquatiques de l'Amérique du Nord.

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1. INTRODUCTION

With an area of 234,000 km^2, spanning from its headwaters in the Rocky Mountains to the city of Vancouver, the Fraser River basin covers a highly diverse geographical landscape. Many of its ecosystems are unique and include regions such as rugged alpine terrain, semi-desert, plateaus of mixed coniferous and deciduous forest and a large delta. As a result of increasing urbanization and industrialization, many of the basin's ecosystems have been exposed to a variety of contaminants that may deleteriously affect the ecosystems' delicate balance. Contaminant sources in the basin are diverse and include both point sources, such as pulp mills and wastewater treatment plants, and non-point sources, such as urban and agricultural runoff and long range atmospheric transport.

In the aquatic environment, most anthropogenic chemicals, including organic and inorganic chemicals, eventually accumulate in sediment (Ingersoll, 1995). There is substantial evidence of environmental degradation in areas where water quality criteria are not exceeded, yet organisms in or near sediments are adversely affected (Chapman, 1989; USEPA, 1994). Contaminated sediments may be directly toxic to aquatic life (Swartz *et al*., 1985) or, through bioaccumulation and biomagnification, can cause long term chronic effects. As the Fraser River carries a relatively high sediment load (8-26 million tons/year) (Stewart and Tassone, 1989), sediments make an ideal medium for the geographical characterization of contaminants in the basin.

Previously, studies of contaminants associated with sediments in the Fraser basin have been relatively few and of limited geographical coverage. In 1988, Mah *et al.* (1989) identified dioxins and furans in bed sediments downstream of pulp mills in the upper Fraser and Thompson rivers. From 1989 to 1991, Dwernychuk (1990) and Dwernychuk *et al.* (1991) measured trace organics associated with pulp mill effluents in bed sediments from the upper Fraser and Thompson rivers. Following the implementation of pulp mill abatement measures consisting of the substitution of molecular chlorine with chlorine dioxide, Hatfield (1996; 1997) reassessed levels of pulp mill related contaminants in 1994 and 1995. In the Fraser estuary, trace organics and metals were measured in bed sediments between 1985 and 1992 (FREMP, 1996).

The present study was conducted under the Environmental Quality Program of the Fraser River Action Plan (FRAP). As part of FRAP, the Environmental Quality Program was responsible for developing indicators of ecosystem health, providing a baseline of environmental conditions in the aquatic environment and measuring the effects of major pollution sources on the aquatic environment. The goals of the present study were 1) to establish a basin-wide baseline of contaminant data which would allow geographical characterization of both the types and levels of contaminants within the basin, 2) to measure changes in contaminant concentrations over time and 3) to identify areas within the basin that may be at risk due to contaminants exceeding federal and provincial sediment quality guidelines and criteria. The information is meant to provide a baseline against which future studies can be compared and to be used as a management tool for environmental planners.

2. METHODS

2.1 Study Design

For the purpose of this study, the Fraser River basin was divided into three geographical regions, the upper Fraser River, the Thompson River sub-basin and the lower Fraser River. Based on geographical characteristics and potential anthropogenic impacts, the three regions were further divided into 15 reaches (Table 1). Each reach was categorized as either "reference" or "non-reference". A reference reach was considered to have little or no potential anthropogenic impact, whereas a non-reference reach was considered to have some degree of anthropogenic impact. Individual sampling sites within a reach ranged from one to four, and their physical suitability was determined based on information provided by Northwest Hydraulic (1993) and McLaren and Ren (1995).

Bed sediments were collected over three consecutive years from 1994 to 1996. All reaches, except the Fraser River North Arm and Fraser River Main Arm, were sampled in 1994. All 15 reaches were sampled in 1995, while in 1996, only three reaches were sampled: Fraser River from Lytton to Chilliwack, Fraser River North Arm and Fraser River Main Arm. Refer to Table 1 for reach information, years sampled and number of sites sampled within each reach.

Table 1. Bed Sediment Reaches, Reach Type, Reach Identification (ID), Years Sampled and Number of Sites per Reach

Geographical Region	Reach	Reach Type	Reach ID	Year Sampled	# of Sites per Reach
Upper Fraser	Nechako River	reference	NEC	1994, 1995	4
Upper Fraser	Fraser River from McBride to Prince George	reference	MBD	1994, 1995	4
Upper Fraser	Fraser River from Prince George to Quesnel	non-reference	QPG	1994, 1995	4
Upper Fraser	Fraser River from Quesnel to Lytton	non-reference	LQN	1994, 1995	4
Upper Fraser	Stuart River	reference	SRT	1994, 1995	1
Upper Fraser	Chilcotin River	reference	CHN	1994, 1995	1
Upper Fraser	Quesnel River	reference	QNL	1994, 1995	1
Thompson sub-basin	North Thompson River	reference	NTH	1994, 1995	4
Thompson sub-basin	Thompson River	non-reference	THM	1994, 1995	4
Thompson sub-basin	South Thompson River	reference	STH	1994, 1995	3
Thompson sub-basin	South Thompson River at Kamloops	non-reference	STK	1994, 1995	1
Lower Fraser	Fraser River from Lytton To Chilliwack	reference	LCH	1994, 1995, 1996	4
Lower Fraser	Harrison River	reference	HAR	1994, 1995	1
Lower Fraser	Fraser River North Arm	non-reference	NAR	1995, 1996	4
Lower Fraser	Fraser River Main Arm	non-reference	MAN	1995, 1996	4

Refer to Table 2 for sample site identification and geographical coordinates and to Figures 1 and 2 for the locations of sampling sites. Samples were collected as close as possible to the same location in all three years in order to allow for comparisons between years. However, changes in water levels from one year to another necessitated the collection of some samples at locations slightly different from those of previous years.

Table 2. Sampling Site Identifications, Locations and Geographical Coordinates

Geographical Region	Sample ID	Location	Geographical Coordinates	
			North	West
Upper Fraser	NEC1	Nechako River downstream of Miworth	53°58.12’	122°54.96’
Upper Fraser	NEC2	Nechako River near Finmoore	53°59.31’	123°36.62’
Upper Fraser	NEC4	Nechako River near Fraser Lake	54°04.33’	124°36.23’
Upper Fraser	NEC6	Nechako River downstream Targe Creek	53°44.70’	124°42.36’
Upper Fraser	MBD1	Fraser River downstream of Salmon River	54°02.26’	122°35.99’
Upper Fraser	MBD2	Fraser River upstream of Snowshoe Creek	53° 36.84’	120° 42.58’
Upper Fraser	MBD3	Fraser River upstream of Dore River	53° 19.98’	120° 11.56’
Upper Fraser	MBD4	Fraser River downstream of Hansard Bridge	54° 05.53’	121° 51.50’
Upper Fraser	QPG1	Fraser River downstream of Cottonwood Canyon	53°05.44’	122°33.59’
Upper Fraser	QPG2	Fraser River at Woodpecker Island	53°28.95’	122°40.70’
Upper Fraser	QPG3	Fraser River downstream of Canfor Pulp Mill	53°55.08’	122°41.95’
Upper Fraser	QPG4	Fraser River upstream of Canfor Pulp Mill	53°56.08’	122°42.11’
Upper Fraser	LQN1	Fraser River upstream of Marguerite	52°31.02’	122°26.92’
Upper Fraser	LQN2	Fraser River upstream of Diamond Island	52°42.87’	122°28.84’
Upper Fraser	LQN3	Fraser River upstream of Kersley Creek	52°50.60’	122°27.59’
Upper Fraser	LQN4	Fraser River downstream of Quesnel	52°54.50’	122°29.16’
Upper Fraser	SRT3	Stuart River 60 km downstream of Fort St. James	54°10.66’	123°41.05’
Upper Fraser	CHN2	Chilcoltin River upstream of Big Creek	51°50.82’	122°43.12’
Upper Fraser	QNL2	Quesnel River downstream of Jackpine Creek	52°39.00’	121°51.77’
Thompson sub-basin	NTH1	North Thompson River downstream of Heffley Creek	50°52.02’	120°17.64’
Thompson sub-basin	NTH2	North Thompson River downstream of McLure Ferry	51°01.71’	120°14.94’
Thompson sub-basin	NTH3	North Thompson River downstream of Little Fort	51°25.19’	120°12.93’
Thompson sub-basin	NTH5	North Thompson River downstream of Mosquito Flats	51°34.66’	120°07.84’
Thompson sub-basin	STH3	South Thompson River at Monte Creek	50°39.54’	119°57.54’
Thompson sub-basin	STH5	South Thompson River downstream of Niskonlith	50°44.90’	119°45.27’
Thompson sub-basin	STH6	South Thompson River downstream of Chase	50°49.73’	119°42.75’
Thompson sub-basin	STK1A	South Thompson River at Riverside Park in Kamloops	50°40.87’	120°19.31’
Thompson sub-basin	THM1	Thompson River downstream of Kamloops Lake	50°45.49’	120°56.88’
Thompson sub-basin	THM2	Thompson River at Tranquille in Kamloops	50°43.36’	120°31.93’
Thompson sub-basin	THM3	Thompson River at Mission Flats in Kamloops	50°41.74’	120°27.29’
Thompson sub-basin	THM4	Thompson River at McArthur Island Park in Kamloops	50°41.73’	120°22.64’
Lower Fraser	LCH1	Fraser River downstream of Chilliwack	49°12.98’	121°55.90’
Lower Fraser	LCH4	Fraser River upstream of Hope	49°24.73’	121°25.35’
Lower Fraser	LCH5	Fraser River upstream of Alexandra Bridge	49°43.19’	121°25.68’
Lower Fraser	LCH6	Fraser River upstream of Nahatlatch River	50°01.09’	121°31.94’
Lower Fraser	HAR1	Harrison River downstream of Harrison Lake	49°15.39’	121°55.45’
Lower Fraser	MAN1	Fraser River Main Arm in Ewen Slough	49°06.37’	123°10.47’
Lower Fraser	MAN2	Fraser River Main Arm near Gunn Island	49°06.20’	123°06.86’
Lower Fraser	MAN3	Fraser River Main Arm near western tip of Annacis Island	49°09.82’	122°59.49’
Lower Fraser	MAN4	Fraser River Main Arm in Annacis Channel	49°11.20’	122°56.39’
Lower Fraser	NAR1	Fraser River North Arm in McDonald Slough	49°13.02’	123°12.18’
Lower Fraser	NAR2	Fraser River North Arm in Eburne Slough	49°12.22’	123°08.95’
Lower Fraser	NAR3	Fraser River North Arm in Sea Island Channel	49°10.77’	123°10.28’
Lower Fraser	NAR4	Fraser River North Arm in Tree Island Slough	49°11.28’	122°58.14’

2.2 Sample Collection

All field sampling equipment was made of stainless steel, and sample collection containers were made of Teflon. All jars and equipment coming in contact with the sediment were cleaned as follows: (1) washed with tap water and laboratory detergent, (2) rinsed with tap water, then deionized water (19 meg-ohm), (3) rinsed with pesticide grade acetone followed by hexane and (4) air dried. Prior to use, all equipment was rinsed with water from the sample collection site.

Sediment samples were collected using an Eckman dredge (15cmx15cmx15cm) at a distance between 0.5 and 5 m from shore. The majority of samples were collected by wading into the river at a depth of 0.5 to 1.0 m. Two reaches were sampled entirely by boat, Fraser River North Arm (NAR) and Fraser River Main Arm (MAN). The MBD1 site was also sampled by boat due to difficulty of access from shore.

A minimum of five bed sediment grabs were collected from each site. The sediment that came in contact with the sides of the Eckman dredge was discarded, and only the top layer (2-3 cm) of fine sediment from each grab was collected with a stainless steel spoon. Sediment from each of the grabs was composited in a stainless steel tray and hand homogenized. The homogenized sample was dispensed into Teflon sample containers and kept chilled until frozen. All samples were frozen within five hours of collection.

2.3 Laboratory Methods

All trace organics were analyzed by AXYS Analytical Laboratories, located in Sidney, British Columbia. Dioxins and furans were analyzed by high resolution gas chromatography and high resolution mass spectrometric detection (HRGC/HRMS). Chlorophenolics, 4-nonylphenol, polycyclic aromatic hydrocarbons (PAHs) and resin and fatty acids were analyzed by high resolution gas chromatography with low resolution (quadrupole) mass spectrometric detection (HRGC/LRMS). Polychlorinated biphenyls (PCBs) and non polar/moderately polar pesticides were analyzed by either HRGC/LRMS or HRGC/HRMS. Polar pesticides were analyzed by high resolution gas chromatography/electron capture detection (HRGC/ECD). Total organic carbon (TOC) was determined by Cantest Ltd. in Vancouver, British Columbia, using a Leco Carbon analyzer and by the National Laboratory for Environmental Testing (NLET) in Burlington, Ontario, using a PE2400 CHN analyzer. Particle size was determined by Geo-Sea Consultants in Cambridge, U.K., with a Malvern 2600L laser particle size analyzer. Samples collected for total trace metals in 1994 and 1995 were analyzed by the Elemental Research Lab in North Vancouver, British Columbia, and those collected in 1996 were analyzed at NLET. Elemental Research employed inductively coupled plasma mass spectrometry (ICP-MS) and atomic absorption methods, whereas NLET used open digestion and atomic absorption spectroscopy. For more information on analytical methods refer to Appendix B.

2.4 Data Analysis

The data for each individual sample site was summarized by averaging lab duplicates and field splits. Non detectable values were treated as zeroes, except for the coefficient of variation calculation where one half the detection limit was used. Reach means were calculated by averaging values for all sites within a reach. Organic chemical data were normalized to 1%

organic carbon for the purposes of comparisons to guidelines, criteria and objectives. Toxicity equivalents (TEQs) for 2,3,7,8-tetrachlorodibenzo-para-dioxin (TCDD) (NATO, 1988) and PCBs (Ahlborg *et al.,* 1994) were calculated with detection limits set to zero. Refer to Appendix C for summary tables which provide mean values for each reach and to Appendix D for raw data tables.

Analysis of variance (ANOVA) was performed on the data to determine if significant differences exist between reaches. The data were tested for equality of variance and normality using the Klomogorov-Smirnov test (with Lilliefors' correction). Organic chemical data were log transformed and analyzed by ANOVA followed by multiple comparison tests. If the assumptions for parametric tests were not satisfied, the data were analyzed by Kruskal-Wallis analysis of variance on ranks. Metals data did not require transformation, as they were generally normally distributed. Trace metals data were analyzed by analysis of covariance (ANCOVA), with the silt/clay fraction as the covariate. Pearson's test was used to test for correlations between variables. Statistical analysis was performed using Sigma Stat version 2.0, STATISTICA version 4.1 and SYSTAT version 7.0.

3. QUALITY ASSURANCE/QUALITY CONTROL

3.1 Field Quality Assurance/ Quality Control

3.1.1 Field Splits

Field split samples were collected in order to determine the precision on the analytical procedures. Field splits were collected by dividing a homogenized sediment sample from a single site into “splits” which were submitted “blind” to the lab for separate analytical analyses. Table 3 lists the samples which were split for this purpose.

Table 3. List of Samples with Field Splits

Sample	Number of Field Splits	Field Splits
94MBD1	5	94 FRM1, 94FRM2, 94FRM3, 94FRM4, 94FRM5
94QPG2	5	94FRQ1, 94FRQ2, 94FRQ3, 94FRQ4, 94FRQ5
94THM1	5	94FRT1, 94FRT2, 94FRT3, 94FRT4, 94FRT5
95NAR1	2	95FRN1, 95FRN2

The coefficient of variation (CV) was calculated for each measured variable as an indicator of the variability within each group of field splits. Table 4 presents the average CV for all variables within each variable group.

Table 4. Average Coefficient of Variation for Variables Measured in Samples with Field Splits

Variable Group	Number of samples with field splits	Number of Variables Measured in the Group	Average CV (%)
Dioxins and Furans	3	25	28.7
Chlorophenolics	4	43	39.5
Resin and Fatty Acids	4	21	48.5
PAHs	4	17	28.3
PCB Congeners	4	84	74.9
PCB Aroclors	4	3	61.8
PCB Coplanars	3	3	48.3
Pesticides	4	23	68.3
4-Nonylphenol	1	1	26.8
Total Trace Metals	4	13	12.1
Particle Size	3	3	5.0
Total Organic Carbon	3	1	15.0

Calculations based on non detectable values set to one half the detection limit.

The average CV ranged between 26.8-74.9 % for organic variables. The relatively high CV for PCBs and pesticides was due to detection limit variability, as a large number of these variables were not detectable. The average CV for metals was considerably lower (12.1%). Similarly, particle size and total organic carbon measures had low CVs (5.0% and 15.0%, respectively). The inorganic and physical variables were better indicators of analytical variability, as most of these variables were above the analytical detection limit.

3.1.2 Intra-Site Variability

To determine the variability among different sediment grabs taken from one site, five separate grab samples from McDonald Slough in the North Arm of the Fraser River (96NAR1A through 96NAR1E) and the homogenate from these grab samples (96 NAR1) were submitted to the lab separately for PAH analysis. The CV for the five individual grab samples ranged from 7-36% with a median CV of 14.6% (Figure 3). The mean concentration of individual PAHs in the five grab samples also showed good agreement with the PAH concentrations measured in the composited sample (96NAR1) (median CV = 10.7%). The low CV values between the individual grabs samples (96NAR1A through E) and between the mean of the five grab samples and the composite sample (96NAR1) demonstrate good analytical precision and indicates that a composite of five grab samples provided a representative measure of sediment concentrations at a given sampling site.

3.2 Laboratory Quality Assurance/Quality Control

3.3 Organic Contaminants

One laboratory duplicate was analyzed with each batch sample. Results for duplicates are reported along with the analysis results in Appendix D. Between 10 and 18% of all sediment samples were analyzed in duplicate for the various required analyses. Agreement within each set of duplicates generally satisfied the AXYS criterion of ±(20% + method detection limit).

One procedural sediment blank was analyzed with each batch sample. Overall, the procedural blanks demonstrated non-detectable or low background levels of the target compounds.

Surrogate standards (usually chemically labelled analogues of the target compounds) were added to samples prior to analysis and were expressed as percent recoveries. The recovery of each surrogate standard was monitored by comparing its response to that of the recovery standard added just prior to instrumental analysis. Quality assurance protocols require that surrogate standard recoveries must be within an acceptable range for data to be reported. These acceptable ranges vary with contaminant type. In cases where this criterion was not achieved, samples were repeated. All reported concentrations were corrected for recovery of the surrogate standards. Surrogate standard recoveries for each sample analyzed in this study are presented along with the sample data in Appendix D.

Reference samples were used as a method performance test. Each batch of samples analyzed included a spiked matrix sample or a certified reference sample. Spiked sediment samples were analyzed with field sediment samples for dioxins, furans, chlorophenolics, PCBs, pesticides, fatty acids and resin acids. All spiked sediment samples were prepared at AXYS by spiking a solution of authentic target compounds (either Aroclors and pesticides, PAHs, dioxins and furans, chlorinated phenolics, nonylphenol, resin acids or fatty acids) into a weighed amount of in-house reference sediment (well homogenized and analyzed unspiked in-house). A marine sediment certified reference material, HS-6 (National Research Council of Canada), was used to provide an indication of the accuracy of the PAH sediment data.

All analyses for dioxins, furans, PCBs and pesticides fell within the acceptable recovery range of 70-130%. PAH recoveries for certified reference samples were generally within 20% of the certified value range. The data for chlorinated phenolics and 4-nonylphenol were generally within the acceptable recovery range which, depending on the compound, ranged between 40-130% and 70-130%. Due to their reactive nature, some chloroguaiacols, chlorocatechols, chlorosyringols, chlorosyringaldehydes and chlorovanillins did not meet this criterion. All resin/fatty acid batches contained a spiked sediment sample. Recoveries of palustric, abietic, neoabietic and lignoceric acids were low in some instances, but within normal control ranges.

3.3.1 Trace Metals

The quality assurance/quality control (QA/QC) component of trace metal analysis at both NLET and the Elemental Research Lab consisted of requisite blanks, spiked samples and duplicates. All blanks, spikes and duplicates were within acceptable limits.

3.3.2 Total Organic Carbon

One blank and one certified reference material sample were analyzed at Cantest Lab with each batch of samples. Blanks and reference samples were within acceptable limits.

3.4 Interlaboratory Quality Assurance/Quality Control

An interlaboratory QA/QC check was performed on 1995 samples analyzed for total trace metals. Eight sediment samples were analyzed at both NLET and the Elemental Research Lab. The CV was calculated for each pair of results and the average CV (n=8) was calculated for each variable. Refer to Table 5 for these results. All CVs were below 14% with the exception of mercury. Higher mercury values were measured by NLET compared to the Elemental Research Lab, accounting for a coefficient of variation of 31.5%.

Table 5. Average Coefficient of Variation for Total Trace Metals Analyzed at both NLET and the Elemental Research Lab

Variable	Average CV (%)
Arsenic	9.2
Cobalt	9.7
Chromium	5.5
Copper	4.4
Iron	12.8
Manganese	13.4
Nickel	5.7
Lead	4.5
Zinc	4.0
Mercury	31.5

Calculations based on non detectable values set to one half the detection limit.
Cadmium was below detection limits at both labs and is therefore not shown.

3.5 Sample Aging Study

In order to determine the effects of sample storage, a select number of samples were re-analyzed for trace organic contaminants in approximately nine months to a year following the original analysis. Samples were stored at -20°C between analyses. Coefficients of variation were calculated for each pair of "before and after" results. Refer to Table 6 for the average CVs for each variable group.

Table 6. Summary of Variability in Contaminant Concentrations of Bed Sediment Samples Analyzed in Sample Aging Study

Variable Group	Number of Samples Analyzed	Number of Variables Measured	Range of CV (%)	Average CV (%)
Dioxins and Furans	4	25	17-81	46
Chlorophenolics	3	43	13-88	49
PAHs	3	17	3-92	38
PCB Congeners	3	84	0-90	41
PCB Aroclors	3	3	18-61	37
Pesticides	3	23	23-76	47
4-Nonylphenol	1	1	n/a	12

Calculations based on non detectable values set to one half the detection limit.
n/a denotes not applicable.

With the exception of 4-nonylphenol, the average CV ranged between 37-49%. The lower CV for 4-nonylphenol was probably due to sample size limitation. It is likely that a larger sample size would have generated a variability similar to the other contaminants. It should be noted that due to the large number of non detectable values for some of the analyses, such as chlorophenolics, PCBs, and pesticides, a portion of the variability measured is attributable to differences in analytical detection limits.

In a review of the stability of chemicals stored over extended periods of time, McFarland *et al.* (1995) state that PCBs in sediments frozen at -20°C are generally stable for up to 6 years. PAHs are reported to be stable in sediments (confirmatory studies pending), however chlorinated pesticide losses have been documented to occur within the first year. No conclusive data were available on dioxins and furans, chlorophenolics, resin acids and fatty acids in sediment samples. The mean CV determined for the variables measured in this study was similar to the mean CV determined for field splits. It was therefore concluded that the storage of samples for a period nine months to a year at -20°C had no significant effect on concentrations measured.

4. DIOXINS AND FURANS

Dioxins and furans are highly persistent compounds with a strong affinity for sediments and a high potential for accumulating in biological tissues. Due to their hydrophobic nature, (K_{ow} = 6-7), dioxins and furans have a high affinity for both particulate and dissolved organic carbon (Webster *et al*., 1986; Servos *et al*., 1989). Sediments that have a high organic carbon content and surface area (frequently silts and clays) have been shown to be a sink for dioxins and furans (Czuczwa and Hites, 1984).

In recent years, there has been growing concern over human exposure to dioxins and furans (especially 2,3,7,8-TCDD and 2,3,7,8-TCDF), as evidence of both acute and long-term toxicity has been rapidly accumulating. Although 2,3,7,8-TCDD is not a direct DNA mutagen, it has been shown to cause toxicity to mammals, affect reproduction, cause fetal abnormalities and promote carcinogenesis (CEPA, 1990). Non 2,3,7,8-dioxin and furan congeners appear to be rapidly metabolized and depurated by vertebrates, whereas very limited metabolic transformation of the 2,3,7,8-congeners is observed in most species (Owens *et al.,* 1994). As a consequence of its high toxicity, persistence and bioaccumulative potential, both federal and provincial governments are in the process of developing guidelines and criteria for 2,3,7,8-TCDD.

Major sources of dioxins and furans to the environment include pulp and paper mills that use chlorine bleaching, processing of pentachlorophenol-contaminated wood chips, commercial chemicals and combustion (CEPA, 1990). Pulp and/or paper mills utilizing the chlorine bleach kraft process have been an industrial source of the lower chlorinated dioxin and furan congeners (eg. tetra and penta) (Amendola, 1987), while pentachlorophenol (PCP) and combustion sources have been associated with production of the higher chlorinated congeners (Czuczwa and Hites, 1986).

Prior to 1991, contaminated PCP was the largest chemical source of dioxins and furans to the environment (CEPA, 1990). In 1990, PCP was deregulated as an anti-sapstain wood preservative, and its use has since been restricted to heavy-duty wood preservation. Evidence of dioxin and furan leaching from treated wood utility poles and railway ties has been found by Wan and Van Oostdam (1995). The second largest chemical source of dioxins is the pesticide 2,4-D, which is used in British Columbia as a herbicide (Environment Canada, 19997). Lastly, PCBs represent the most significant potential source of furans to the Canadian environment (CEPA, 1990). Although the use and storage of PCBs is now strictly controlled, the potential for releases through accidental spills or fires in equipment containing PCBs still remains.

Previous studies in the Fraser River Basin have shown that chlorinated dioxins and furans are detectable in bed sediment material (Hatfield, 1997) and suspended sediments (Sekela *et al.,* 1994; Sekela *et al.,* 1995; Sylvestre *et al.,*1998a; Sylvestre *et al.,*1998b) collected downstream of pulp mills and municipal wastewater treatment plants in the basin. Chlorinated dioxins and furans were also detected in wastewater treatment plant (WWTP) effluents and combined sewer overflow (CSO) discharges from the Fraser River basin (Derksen, draft, 1997).

A list of chlorinated dioxins and furans measured in the present study is presented in Table 7. Refer to Appendix C for mean dioxin and furan concentrations measured in each reach and to Appendix D for concentrations measured at individual sites.

Table 7. Dioxins and Furans Analyzed in Bed Sediments from the Fraser River Basin

Dioxins	Furans
T4CDD (TOTAL)	T4CDF (TOTAL)
2,3,7,8-TCDD	2,3,7,8-T4CDF
P5CDD (TOTAL)	P5CDF (TOTAL)
1,2,3,7,8-PCDD	1,2,3,7,8-P5CDF
H6CDD (TOTAL)	2,3,4,7,8-P5CDF
1,2,3,4,7,8-H6CDD	H6CDF (TOTAL)
1,2,3,6,7,8-H6CDD	1,2,3,4,7,8-H6CDF
1,2,3,7,8,9-H6CDD	1,2,3,6,7,8-H6CDF
H7CDD (TOTAL)	2,3,4,6,7,8-H6CDF
1,2,3,4,6,7,8-H7CDD	1,2,3,7,8,9-H6CDF
O8CDD (TOTAL)	H7CDF (TOTAL)
	1,2,3,4,6,7,8-H7CDF
	1,2,3,4,7,8,9-H7CDF
	O8CDF (TOTAL)

4.1 Upper Fraser Reaches

Dioxins and furans were analyzed in bed sediments collected from seven upper Fraser reaches in 1994 and 1995: Nechako River (NEC), McBride (MBD), Quesnel to Prince George (QPG), Lytton to Quesnel (LQN), Stuart River (SRT), Chilcotin River (CHN) and Quesnel River (QNL). Refer to Figure 1 for the location of these reaches.

Mean total T4CDD, P5CDD and H6CDD concentrations were significantly higher (1-way ANOVA, $p<0.05$) in the LQN reach relative to the MBD reach (Figure 4). Total H7CDD levels were similar among reaches with the exception of the SRT and QNL reaches which had lower levels. Total O8CDD concentrations were highest in the CHN reach. Of the furans measured, only total T4CDF was significantly higher in concentration (1-way ANOVA, $p<0.05$) in the LQN reach relative to the MBD reach, as no significant differences ($p>0.05$) were measured for the remainder of the furan congeners (Figure 5). The CHN and QNL reference reaches had no detectable levels of any furans. The NEC reach generally had levels of both dioxins and furans similar to the mainstem Fraser reaches, QPG and LQN.

Mean 2,3,7,8-TCDD TEQ concentrations (Figure 6) were not significantly different among the NEC, MBD, QPG and LQN reaches (1-way ANOVA, $p=0.184$), however the power of the test was low (0.187). Relatively high levels of hepta and octa-chlorinated dioxins contributed to the higher TEQs measured at the CHN reference reach. 2,3,7,8-TCDD TEQ concentrations exceeded the interim federal sediment quality guideline of 0.25 pg/g (CCME, draft, 1995) at four reference sites and seven non-reference sites in the upper Fraser basin (Table 8). Wainwright *et al.* (1995) reported 2,3,7,8-TCDD TEQ concentrations at least two orders of magnitude higher than the interim federal guideline in sediments sampled downstream of pulp mills at Prince George and Quesnel between 1980-1994.

Table 8. 2,3,7,8-TCDD TEQ Concentrations in Bed Sediments from Upper Fraser Sampling Sites Exceeding the Interim Federal Sediment Quality Guideline for the Protection of Aquatic Life

Year	Interim Federal Guideline$^{\otimes}$	NEC1	NEC2	MBD4	QPG1	QPG2	QPG4	LQN1	LQN2	LQN3	LQN4	CHN2
1994	0.25					0.54			0.53			0.34
1995	0.25	0.42	0.31	0.58	0.60		0.34	0.36	0.88	0.42	0.93	0.92

All values in pg/g dry weight and normalized to 1% TOC.

$^{\otimes}$ Threshold effects level

Although 2,3,7,8-TCDD TEQ guidelines were exceeded in this study at 11 sites in the upper Fraser basin, concentrations of total T4CDF measured downstream of pulp mills in Prince George and Quesnel were over 200 times lower relative to levels measured in 1988 by Mah *et al*. (1989). This substantial reduction followed the switch from the use of molecular chlorine to chlorine dioxide in the bleaching process which was initiated by the mills in 1991 and completed by 1994. A similar decrease in levels of 2,3,7,8-TCDD and 2,3,7,8-TCDF was observed in suspended sediments (Sekela *et al.,* 1995) and in resident fish from the Fraser River basin (Raymond *et al.,* 1998) in comparison to levels measured prior to 1991.

Results of Pearson correlations indicated that only the hepta and octa-chlorinated dioxins were significantly correlated with the sediment TOC and the silt/clay fraction. Accordingly, total H7CDD was weakly correlated with TOC ($r=0.293$, $p<0.05$, $n=52$), while total H7CDD ($r=0.377$, $p<0.05$, $n=52$) and total O8CDD ($r=0.386$, $p<0.05$, $n=52$) were weakly correlated with the silt/clay fraction.

Dioxin and furan congener profiles (Figure 7) indicate a predominance of the hepta and octa-chlorinated dioxins with small amounts hexa-chlorinated dioxins and hepta and octa-chlorinated furans in the majority of reaches sampled. The same pattern was found in air particulates from urban areas (Czuczwa and Hites, 1986), in surface sediments from the Saginaw River (Czuczwa and Hites, 1984) and the Great Lakes (Czuczwa and Hites, 1986). This source signature is consistent with the composition of dioxin and furans in formulations of PCP based wood preservative (Macdonald *et al.,* 1998a), used extensively in B.C. prior to the mid 1980s. However, several types of combustion sources also exhibit a highly similar composition. These include diesel emissions, chimney soot from oil central heating, black liquor recovery furnace flue gas and scrap wire and car incineration (Bright *et al*., submitted).

Principal Component Analysis (PCA) of percent normalized dioxin and furan data generated a factor scores plot showing three main clusters (Figure 8). Cluster #1 was driven by prominence of total tetra, penta and hexa-chlorinated furans, cluster #2 by a high proportion of O8CDD (over 90% of total dioxin and furan homologues) and cluster #3 by total H7CDD, H7CDF and O8CDF. The 94CHN2, 95CHN2 and 95SRT3 reference sites in the upper Fraser basin fell into cluster #2, driven by O8CDD, suggesting that combustion (Czuczwa and Hites, 1986) may be the principal source of dioxins in these reaches. The 94SRT3 sample, which was taken at a slightly different location from the 95SRT3 sample, had a higher proportion of total H7CDD and consequently separated out with the remainder of the upper Fraser reaches in cluster #3 which is likely influenced by historical use of PCP and combustion sources.

4.2 Thompson Sub-basin Reaches

Dioxins and furans were analyzed in bed sediments collected in 1994 and 1995 from four Thompson sub-basin reaches: North Thompson River (NTH), South Thompson River (STH), South Thompson River in Kamloops (STK1A) and Thompson River (THM) (Figure 1).

Mean concentrations of dioxins (Figure 9), furans (Figure10) and 2,3,7,8-TCDD TEQs (Figure 11) were generally higher in the THM reach relative to the NTH and STH reference reaches, although these differences were not statistically significant (1-way ANOVA, $p>0.05$), based on the 1995 data. STK1A, an urban site on the South Thompson River in Kamloops, generally had higher levels of all dioxin and furan congeners than the reference reach (STH) and similar levels to those found in the urbanized THM reach. Total P5CDF and H6CDF concentrations were notably higher at the STK1A site relative to the rest of the reaches. The higher levels of dioxins and furans and 2,3,7,8-TCDD TEQs measured in the THM reach in 1994 compared to 1995 are a result of only one site (THM1) having been sampled for dioxins and furans in this reach in the previous year. This site had similar concentrations in both 1994 and 1995, however in 1995 the reach mean was calculated based on the average of four sites (THM1,2,3 and 4). THM1 is located downstream of Kamloops City in a backwater area near a railroad and is conducive to more extensive sediment deposition than the other sites in the THM reach.

Both 2,3,7,8-TCDD and 2,3,7,8-TCDD TEQ concentrations exceeded interim federal sediment quality guidelines for the protection of aquatic life (CCME, draft, 1995) (Table 9). Although both reference and non-reference sites exceeded the TEQ guideline, the highest exceedences occurred at the THM1 and THM2 sites, both located downstream of the pulp mill in Kamloops. In spite of these exceedences, total T4CDF levels were over 250 times lower than those measured in bed sediments below the pulp mill at Kamloops in 1988, prior to the initiation of chlorine dioxide substitution (Mah *et al.,* 1989).

Table 9. 2,3,7,8-TCDD and 2,3,7,8-TCDD TEQ Concentrations in Bed Sediments from Thompson River Sampling Sites Exceeding Interim Federal Sediment Quality Guidelines for the Protection of Aquatic Life

Year	Variable	Interim Federal Guideline⊗	NTH1	STH6	STK1A	THM1	THM2
1994	2,3,7,8-TCDD	0.25				0.96	
	2,3,7,8-TCDD TEQ	0.25	0.95		2.2	5.32	
1995	2,3,7,8-TCDD	0.25				0.33	
	2,3,7,8-TCDD TEQ	0.25		0.41	0.90	1.63	8.75

All values in pg/g dry weight and normalized to 1% TOC.
⊗ Threshold effects level

Dioxin and furan congener profiles (Figure 12) were dominated by the hepta and octa-chlorinated dioxins in all Thompson sub-basin reaches. In the PCA factor scores plot (Figure 8), the majority of the Thompson sub-basin sites fell in cluster #3, indicating mixed dioxin and furan sources, including pulp mill effluents, combustion and historical use of PCP. However, the STK1A site had a higher proportion of furans, with consequent high loadings on Factor 1 on the PCA plot, separating this site from the others in cluster #1. The STK1A site was found to contain relatively high PCB levels (see section 8.2), and since high furan concentrations have been correlated to PCB contaminated soils (Grundy *et al.,* 1997), it is possible that furans associated with PCB formulations may be influencing the dioxin and furan profile at this site. The congener profile for the THM reach was similar to that measured by Macdonald *et al.* (1998a) in surface layers of Kamloops Lake sediment cores, indicating mixed PCP, pulp mill and combustion sources.

4.3 Lower Fraser Reaches

The lower Fraser River reach Lytton to Chilliwack (LCH) was sampled in 1994, 1995 and 1996, the Harrison River tributary (HAR) was sampled in 1994 and 1995 and the Main (MAN) and North Arm (NAR) of the Fraser River were sampled in 1995 and 1996. (Figures 1 and 2).

Dioxin and furan concentrations were significantly higher (2-way ANOVA, $p<0.05$) in the NAR reach compared to both the MAN and LCH reaches (Figures 13 and 14). Similarly, the MAN reach had significantly higher concentrations of all dioxins and furans (2-way ANOVA, $p<0.05$) than the LCH reference reach, with the exception of total P5CDF. Dioxin and furan concentrations in the HAR reach were generally similar to those measured in the LCH reach.

Mean 2,3,7,8-TCDD TEQ concentrations (Figure 15) were significantly higher (2-way ANOVA, $p<0.05$) in the NAR reach relative to both the MAN and LCH reaches. Mean 2,3,7 8-TCDD TEQ concentrations measured in the NAR reach were the highest in the basin, indicating that dioxins and furans from numerous sources including historical PCP use, stormwater runoff and combustion may be significantly raising the TEQ levels in sediments from this reach. Urban sources, such as stormwater runoff (Sekela *et al.,* 1998), and CSO and WWTP effluents, have been shown to provide significant loadings of 2,3,7,8-TCDD TEQs, often exceeding those of pulp mill effluents (Derksen, draft, 1997). All sites sampled in the lower Fraser basin exceeded the interim federal sediment quality guideline for the protection of aquatic life for 2,3,7,8-TCDD TEQs (CCME, draft, 1995) at least once over the sampling period (Table 10). The draft regional objective for 2,3,7,8-TCDD TEQ for the Main and North Arms of the Fraser River (Swain *et al*., draft, 1995) was exceeded at all sites in the Fraser estuary in both years sampled. The 2,3,7,8-TCDD guideline was exceeded only in the North Arm of the Fraser River at Eburne Slough (NAR2) and Tree Island Slough (NAR4).

Dioxin and furan concentrations measured in this study were similar to those measured in 1989 by Swain and Walton (1990) at McDonald Slough (NAR1) but generally lower than those measured in the Annacis Channel (MAN 4). Total T4CDF concentrations at the NAR4 site (Tree Island Slough) were over 60% lower than those measured in 1989 by Tuominen and Sekela (1992) 2 km upstream of this site.

Dioxin and furan congener profiles (Figure 16) indicate a predominance of hepta and octa-chlorinated dioxins in all lower Fraser basin reaches. The PCA plot (Figure 8) shows most of

Table 10. 2,3,7,8-TCDD and 2,3,7,8-TCDD TEQ Concentrations in Bed Sediments from Lower Fraser Sampling Sites Exceeding Interim Federal Sediment Quality Guidelines and Draft Regional Objectives for the Protection of Aquatic Life

Year	Variable	Interim Federal Guideline$^{\otimes}$	Draft Regional Objective*	LCH 1	LCH 4	LCH 5	LCH 6	HAR1	MAN1	MAN 2	MAN 3	MAN 4	NAR 1	NAR 2	NAR 3	NAR 4
1994	2,3,7,8-TCDD TEQs	0.25	0.25					0.44								
1995	2,3,7,8-TCDD TEQs	0.25	0.25	0.34	1.36	0.63	4.73	0.84	0.95	0.85	0.93	0.73	1.93	3.0	2.45	1.98
1996	2,3,7,8-TCDD	0.25												0.27		0.48
												2,3,7,8-TCDD TEQs		0.25	0.25	0.53

All values in pg/g dry weight and normalized to 1% TOC.

$^{\otimes}$ Threshold effects level

*For Fraser River Main and North Arms

the lower Fraser reaches falling in cluster #3, suggesting mixed sources, likely dominated by historical use of PCP and combustion.

4.4 Summary

Dioxin and furan concentrations were generally elevated in reaches downstream of urban areas relative to reference reaches. Dioxin and furan congener profiles suggest that historical use of PCP and combustion are major sources of dioxins and furans in the majority of reaches in the basin. Concentrations of 2,3,7,8-TCDD TEQs exceeded the interim federal sediment quality guideline for the protection of aquatic life at 11 reference and 18 non-reference sites sampled in the basin, with the greatest exceedences occurring in the Thompson River and in the North Arm of the Fraser River. The highest TEQ exceedences occurred in the highly urbanized and industrialized North Arm of the Fraser River in the Fraser estuary. Bed sediment concentrations of pulp mill associated 2,3,7,8-TCDF were, however, less than 1% of those measured in the upper Fraser and Thompson basins before 1991. This substantial decrease was not observed in the Fraser estuary where historical use of PCP and combustion sources likely account for the majority of the dioxin and furan inputs. With the exception of the North Arm, 2,3,7,8-TCDD TEQ concentrations in bed sediments were similar to those in the Columbia River (Bortleson *et al.,* 1994) and the northern rivers of Alberta (Crosley, 1996a; 1996b; Pastershank and Muir, 1995). Further reductions in dioxin and furan levels may occur with the complete removal of chlorinated compounds from the pulp bleaching process; however, the higher chlorinated dioxins and furans are likely to continue to contribute to the exceedence of the interim federal sediment quality guideline for 2,3,7,8-TCDD TEQs, given their association with a wide range of combustion sources and the widespread use of PCP preserved wood in the Fraser basin.

5. CHLOROPHENOLICS

There are four main classes of chlorinated phenolic compounds: phenols, guaiacols, catechols and vanillins. The environmental behaviour of these individual compounds is related to their physical and chemical properties. Volatility and water solubility decrease with increasing molecular weight, and sorption appears to play a significant role in the removal of some chlorinated phenols from the water column (CCREM, 1987). Chlorophenolic log K_{ow} values vary between 0.88 to 5.0, and highly chlorinated chlorophenolics such as PCP (log K_{ow} = 5.0) are more hydrophobic (Solomon *et al.*, 1993).

The concern over the presence of chlorophenolics in the aquatic environment stems from their immunotoxic, fetotoxic and embryotoxic properties. The acute toxicity of pulp mill specific chlorophenolics (chloroguaiacols, chlorocatechols and chlorovanillins) is reported to be in the low parts per million range in water and appears to increase with the level of chlorination (Szenasy *et al.,* 1998). Toxicity is greatest for chlorocatechols followed by chloroguaiacols and 6-chlorovanillin (Szenasy *et al.,* 1998). In mammals, chlorophenolics are not bioaccumulated to a high degree in fat due to their rapid excretion as glucuronide conjugates (BCMELP, 1993a).

Chlorophenolics are found world-wide in water, soil, sediment and biota (Konasewich *et al.,* 1978). Their widespread presence has been attributed to their historically extensive use in treated wood products as well as to waste dump leachate and accidental spills (BCMELP, 1993a). Until its restriction on December 31, 1990, about one half of the 750 tonnes of PCP, which entered British Columbia annually (WHO, 1989), was used as anti-sapstain treatment on cut lumber. However, present legislation has banned PCP use as a general anti-sapstain agent and has restricted its use to heavy duty wood preservation. In British Columbia, chlorophenols in mixtures of creosote are presently used on railway ties, trestles and utility and telecommunication poles (Wan and Van Oostdam, 1995). Other sources of chlorophenolics to the Fraser River basin include WWTP effluents, CSO discharges and kraft pulp mill effluents (Derksen, draft, 1997).

Pulp mills provide the greatest point source loadings of chlorophenolics to the aquatic environment of the Fraser River basin (Derksen, draft, 1997). Chlorophenols, chloroguaiacols and chlorocatechols are all produced in paper making during the chlorine bleaching process (Carey and Hart, 1988) and have been observed in bleach plant wastewater (Derksen, draft, 1997) and in water, sediment and biota in the Fraser basin downstream of pulp mill discharges (Dwernychuk, 1990; Dwernychuk *et al.*, 1991; Sekela *et al.,* 1994; Sekela *et al.,* 1995; FREMP, 1996; Sylvestre *et al*., 1998a; Raymond *et al.,* 1998).

A list of chlorophenolics analyzed in bed sediments is provided in Table 11. Refer to Appendix C for mean concentrations measured in each reach and to Appendix D for concentrations measured at individual sites.

Table 11. Chlorophenolics Analyzed in Bed Sediments from the Fraser River Basin

Chlorophenols	Chloroguaiacols	Chlorocatechols	Chlorovanillins	Chlorosyringols and Chlorosyringaldehydes
4-chlorophenol	6-chloroguaiacol	3-chlorocatechol	5-chlorovanillin	3-chlorosyringol
2,6-dichlorophenol	4-chloroguaiacol	4-chlorocatechol	6-chlorovanillin	3,5-dichlorosyringol
2,4/2,5-dichlorophenol	5-chloroguaiacol	3,6-dichlorocatechol	5,6-dichlorovanillin	2-chlorosyringaldehyde
3,5-dichlorophenol	4,6-dichloroguaiacol	3,5-dichlorocatechol		3,4,5-trichlorosyringol
2,3-dichlorophenol	3,4-dichloroguaiacol	3,4-dichlorocatechol		2,6-dichlorosyringaldehyde
3,4-dichlorophenol	4,5-dichloroguaiacol	4,5-dichlorocatechol		
2,4,6-trichlorophenol	3,4,6-trichloroguaiacol	3,4,6-trichlorocatechol		
2,3,6-trichlorophenol	3,4,5-trichloroguaiacol	3,4,5-trichlorocatechol		
2,3,5-trichlorophenol	4,5,6-trichloroguaiacol	3,4,5,6-tetrachlorocatechol		
2,4,5-trichlorophenol	3,4,5,6-tetrachloroguaiacol			
2,3,4-trichlorophenol				
3,4,5-trichlorophenol				
2,3,5,6-tetrachlorophenol				
2,3,4,6-tetrachlorophenol				
2,3,4,5-tetrachlorophenol				
pentachlorophenol				

5.1 Upper Fraser Reaches

Chlorophenolics were analyzed in bed sediments collected from seven upper Fraser reaches in 1994 and 1995: Nechako River (NEC), McBride (MBD), Quesnel to Prince George (QPG), Lytton to Quesnel (LQN), Stuart River (SRT), Chilcotin River (CHN) and Quesnel River (QNL) (Figure 1).

Four classes of chlorophenolics were detected in sediments from the upper Fraser basin: chlorophenols, chloroguaiacols, chlorocatechols and chlorovanillins (Figure 17). Two way ANOVAs did not show significant differences among the NEC, MBD, QPG and LQN reaches for total chlorophenols ($p=0.236$) and total chloroguaiacols ($p=0.688$); however both variables were several times higher in the SRT reach in 1994 compared to all other upper Fraser reaches. No chlorophenolics were detected in the SRT reach in 1995, likely due to a change in the location of the sampling site, from that of the previous year, necessitated by a change in flow conditions. Nevertheless, the detection of relatively high levels in 1994 suggests that this reach may be impacted by contaminants related to wood processing industries, perhaps from the upstream community of Fort St. James. Total chlorocatechol concentrations were significantly higher (2-way ANOVA, $p<0.05$) in the QPG and LQN reaches compared to the NEC and MBD reference reaches. Total chlorovanillin concentrations were significantly higher (2-way ANOVA, $p<0.05$) in the LQN reach relative to the NEC and MBD reaches. As both chlorocatechols and chlorovanillins are pulp mill related compounds (Carey and Hart, 1988), the elevated levels measured downstream of Prince George and Quesnel are likely reflective of pulp mill effluent inputs from these cities. Concentrations of total chlorophenolics (which include all chlorophenolic classes) were significantly higher in the LQN reach (2-way ANOVA, $p<0.05$) than in the NEC reach. Moreover, total chlorocatechol, total chlorovanillin and total chlorophenolic levels were significantly higher in 1994 than in 1995 (2-way ANOVA, $p<0.05$). It is unclear whether this difference is indicative of a declining trend in chlorophenolic concentrations or year to year variability.

Concentrations of tri and tetrachlorocatechols and chloroguaiacols measured in the QPG reach, downstream of Prince George, were <1.0 ng/g, which represents a decrease of more than an order of magnitude from those measured in 1990 by Dwernychuk *et al.* (1991). This is most likely the result of the implementation of pulp mill abatement measures consisting of the substitution of molecular chlorine with chlorine dioxide for the bleaching process. Total chlorophenolic concentrations were weakly correlated with the fine (silt and clay) sediment fraction (Pearson, $r=0.241$, $p=0.036$, $n=76$). No significant correlations were found between this variable and the sediment TOC ($p=0.502$). Guidelines and criteria do not presently exist for chlorophenolics in sediments.

5.2 Thompson Sub-basin Reaches

Chlorophenolics were analyzed in bed sediments collected in 1994 and 1995 from four Thompson sub-basin reaches: North Thompson River (NTH), South Thompson River (STH), South Thompson River in Kamloops (STK1A) and Thompson River (THM) (Figure 1).

All classes of chlorophenolics, with the exception of chlorovanillins, were detected in the Thompson basin reaches. Concentrations of all chlorophenolics detected were low (<10 ng/g), and no significant differences (2-way ANOVA, $p<0.05$) were detected between reference and non-reference reaches, with the exception of total chlorosyringaldehydes which were detected only in 1994 in the NTH reach and the STK1A site (Figure 18). Possible chlorophenolic sources in the NTH reach include past use of PCP as an anti-sapstain and leaching from treated wood products, while the STK1A site is affected by stormwater inputs. Concentrations of tetrachlorophenols, tri and tetrachloroguaiacols and tri and tetrachlorocatechols were generally one order of magnitude or more lower than those measured in the THM reach downstream of the pulp mill at Kamloops in 1990 (Dwernychuk *et al.,* 1991), prior to the initiation of chlorine dioxide substitution.

5.3 Lower Fraser Reaches

The lower Fraser River reach Lytton to Chilliwack (LCH) was sampled in 1994, 1995 and 1996, the Harrison River tributary (HAR) was sampled in 1994 and 1995 and the Main (MAN) and North Arms (NAR) of the Fraser River were sampled in 1995 and 1996 (Figures 1 and 2).

Total chlorophenol concentrations were significantly higher (2-way ANOVA, $p<0.05$) in the NAR reach compared to the MAN and LCH reaches (Figure 19). Total chlorophenols did not exceed the regional objective of 10 ng/g for the Main and North Arms of the Fraser River (Swain *et al.,* draft, 1995). Total chloroguaiacol and chlorocatechol concentrations were significantly higher (2-way ANOVA, $p<0.05$) in the NAR reach compared to the LCH reference reach but similar to concentrations found in the MAN reach. No significant differences were found for total chlorovanillin concentrations among the LCH, MAN and NAR reaches (p=0.069). In the HAR reach, chlorophenolics were detected in trace levels (<1.0 ng/g). The large number of stormwater inputs into the NAR reach likely accounts for this reach having the highest levels of total chlorophenolics in the Fraser basin. Levels of PCP in the NAR reach have decreased by an order of magnitude compared to those detected in bed sediments collected in 1987 by Swain and Walton (1988), prior to the initiation of the phase out of this compound by saw mills and the majority of wood preservation plants. Parallel declines have been reported in resident fish from the Fraser estuary (Drinnan and Humphrey, 1997; FREMP, 1996).

5.4 Summary

Total chlorocatechol and chlorovanillin concentrations were higher in reaches downstream of pulp mills relative to reference reaches in the upper Fraser River. Generally, all classes of chlorophenolics were elevated in the Fraser River estuary relative to the upper Fraser and Thompson regions. The same geographical trend was reported by Wainwright *et al.* (1995) based on data collected between 1984 and 1994. Total chlorophenolics measured in the Stuart River in 1994 were similar to levels measured in the heavily industrialized and urbanized North Arm of the Fraser River, indicating that chlorophenolic sources, present or historical, may exist in the Stuart River. Concentrations of chlorophenolics measured in bed sediments from the Fraser River basin were generally lower than those reported in the Columbia River (Bortleson *et. al.,* 1994), in the northern rivers of Alberta (Crosley, 1996a) and in the Apalachicola-Chattahoochee-Flint River system in Florida (USGS NAWQA, 1997). PCP and pulp mill related chlorophenolics have decreased from levels measured prior to 1990, reflecting changes from pulp mill abatement measures and phase out of anti-sapstains containing PCP. Chlorophenolics are likely to continue to be detected in the Fraser basin aquatic environment, given their historically extensive use in treated wood products and continued use of chlorinated compounds in the bleaching of pulp.

6. RESIN AND FATTY ACIDS

Resin acids are unsaturated, tricyclic monocarboxylic acids. They are normally insoluble in water but are soluble in various organic solvents and in dilute sodium hydroxide through the formation of sodium salts (Windholtz *et al*., 1983). Resin acids are present in oleoresin, a composition of hydrophobic material from conifers (Swan, 1973), and in tall oil, a resin containing by-product of the kraft pulping process (Rogers and Harris, 1970). While resin acids represent only a small percentage of the weight of the wood (Enos *et al*., 1970), the quantities which can be released into the environment through pulp mill effluents may reach toxic levels (Davis and Hoos, 1975). Even when diluted by receiving waters, concentrations of these compounds may still be sufficient enough to exert chronic effects on the aquatic community (Brownlee *et al*., 1977). Resin acids are all bioaccumulated (log BCF 1.1-2.9, Healey *et al*., 1994), and their toxicity increases with decreasing pH (Dwernychuk, 1994).

Numerous resin acids have been identified in mechanical pulping effluents, unbleached whitewater, woodroom wastes, bleached kraft whole mill effluents, sulphite effluents and paper mill effluents (Hemmingway and Greaves, 1973; Leach and Thakore, 1976). Resin acid concentrations entering a receiving water will depend upon the wood furnish in the mill, the age of chips used, the mill process and the extent of biological treatment prior to effluent discharge (Swanson, 1992). Although biological treatment of pulp mill effluent has been shown to reduce resin acid levels by up to 96% (Beak, 1987), resin acids have been detected in the final effluent of pulp and/or paper mills located on the Fraser River (IRC, 1994). Pimaric and isopimaric acids have been reported to be resistant to microbial degradation (CCREM, 1987), and dehydroabietic acid and its derivatives may have half-lives of 21 years (Taylor *et al.,* 1988).

Fatty acids are composed of both hydrophilic and hydrophobic groups. They are poorly soluble in aqueous solutions and are known to associate with suspended solids in water (TECW, 1987). Because of their dual hydrophilic and hydrophobic nature, fatty acids tend to concentrate at the interfaces of aqueous mixtures (CCREM, 1987).

Natural sources of fatty acids have been identified as breakdown products of vegetation and wood fibre in lakes and rivers (Fox, 1977). Fatty acids of anthropogenic origin have been reported in untreated whole mill effluent (McLeay and Associates, 1987). However, there is evidence that well-operated secondary wastewater treatment plants readily degrade fatty acids. Degradation of over 99% of fatty acids present in raw kraft mill effluent has been reported by Beak (1987) at an Ontario mill with an aerated lagoon. Although not as toxic as resin acids, sodium salts of unsaturated fatty acids have been shown to contribute up to 20% of the toxicity of the whitewater from kraft pulping (Leach and Thakore, 1973).

A list of resin and fatty acids analyzed in bed sediments collected in this study is presented in Table 12. Refer to Appendix C for mean concentrations measured in each reach and to Appendix D for concentrations measured at individual sites.

Table 12. Resin and Fatty Acids Analyzed in Bed Sediments from the Fraser River Basin

Resin Acids	Fatty Acids
Pimaric	Capric
Sandaracopimaric	Lauric
Isopimaric	Myristic
Palustric	Palmitic
Dihydroisopimaric	Linolenic
Dehydroabietic	Linoleic
Abietic	Oleic
Neoabietic	Stearic
12/14 Chlorodehydroabietic	Arachidic
12,14-Dichlorodehydroabietic	Behenic
	Lignoceric

6.1 Upper Fraser Reaches

Resin and fatty acids were analyzed in bed sediments collected from seven upper Fraser reaches in 1994 and 1995: Nechako River (NEC), McBride (MBD), Quesnel to Prince George (QPG), Lytton to Quesnel (LQN), Stuart River (SRT), Chilcotin River (CHN) and Quesnel River (QNL) (Figure 1).

Concentrations of total resin acids and total chlorinated resin acids (the sum of 12/14 chlorodehydroabietic acid and 12,14-dichlorodehydroabietic acids) were significantly higher (2-way ANOVA, $p<0.05$) in the QPG and LQN reaches, located downstream of pulp mills, compared to both NEC and MBD reference reaches (Figure 20). Similar findings were reported by Hatfield (1997). Although a variety of resin acids were detected in the NEC, MBD, SRT, CHN and QNL reference reaches, chlorinated resin acids were only detected in the QPG and LQN reaches, reflecting their association with pulp mill effluents. Abietic acid was the dominant resin acid in all reaches, with the exception of the NEC and QNL reaches where dehydroabietic acid was most abundant (Figure 21). Both abietic and its transformation product, dehydroabietic acid, have been identified as major constituents of pulp mill effluents (Fox, 1977). A highly significant correlation was found between abietic and dehydroabietic acids measured at all sites in the basin (Pearson, $r=0.941$, $p<0.001$, $n=55$). Pimaric acid was found in higher proportions in the QPG and LQN reaches than in the reference reaches, which is in agreement with findings by Sekela *et al.,* (1995) who reported a similar pattern in suspended sediments. Pimaric acid was found to be a major component of pulp mill effluent from a mill in Prince George, comprising 25% of the total resin acid concentration (IRC, 1994).

Total fatty acids were significantly higher (2 way-ANOVA, $p<0.05$) in the LQN and NEC reaches compared to the MBD reach (Figure 22). The CHN reach had levels of total fatty acids similar to the NEC reach but was not included in the statistical analysis due to insufficient replication. The fatty acid composition of bed sediments was generally similar between reaches, with palmitic acid being most abundant (Figure 23). It is unclear whether the elevated levels of fatty acids measured in 1995 in the LQN reach are related to wood processing industries or are simply a function of localized decomposition of organic matter. However, Sekela *et al.* (1995) have reported total fatty acids to be nearly four times higher than background levels in time integrated suspended sediment samples collected from Marguerite, located in the LQN reach, downstream of five pulp mills on the upper Fraser River. Similarly, Hatfield (1997) detected higher fatty acid concentrations in depositional sediments downstream of pulp mills at Prince George and Quesnel than in sediment from reference areas upstream of the mills.

Pearson correlations indicate that total fatty acids were weakly correlated with sediment TOC (r=0.316, p=0.005, n=76) and the silt and clay fraction (r=0.266, p=0.020, n=76). No significant correlations were found between total resin acids and the sediment TOC (p=0.892) or the fine sediment fraction (p=0.158).

6.2 Thompson Sub-basin Reaches

Resin and fatty acids were analyzed in bed sediments collected in 1994 and 1995 from four Thompson sub-basin reaches: North Thompson River (NTH), South Thompson River (STH), South Thompson River in Kamloops (STK1A) and Thompson River (THM) (Figure 1).

Total resin acid concentrations were not significantly different among the four reaches (2-way ANOVA p=0.105) (Figure 24). Chlorinated resin acids were only detected in the THM reach, at sites THM1 and THM2, both located downstream of the pulp mill at Kamloops. Total resin acid and total chlorinated resin acid concentrations in the Thompson sub-basin were approximately an order of magnitude lower than those measured downstream of pulp mills in the upper Fraser basin. The same pattern was observed with resin acids measured in whole water collected from the upper Fraser and Thompson sub-basin (Sekela *et al.,* 1995) and may be related to differences in natural resin acid sources. Abietic and dehydroabietic acids comprised over 50% of the total resin acid concentration at all sites (Figure 25). The NTH reach had the greatest proportion of abietic acid (approximately 60%), while the STH reach had the highest proportion of sandaracopimaric and neoabietic acids with a comparatively low proportion of abietic acid (<20%).

Total fatty acid concentrations were significantly higher (2-way ANOVA, p<0.05) in the STH reach compared to the NTH reach (Figure 26). The STK1A urban site in Kamloops had similar fatty acid levels to those measured in the NTH reach. The fatty acid composition was dominated by palmitic acid and was generally similar between all reaches in the Thompson sub-basin (Figure 27).

Resin and fatty acid concentrations measured in the THM reach were comparable to those measured by Hatfield (1996) in depositional sediments upstream and downstream of the pulp mill in Kamloops.

6.3 Lower Fraser Reaches

Resin and fatty acids were sampled in the Lytton to Chilliwack reach (LCH) in 1994, 1995 and 1996. The Harrison reach (HAR) was sampled in 1994 and 1995 and the Main Arm (MAN) and North Arm (NAR) of the Fraser River were sampled in 1995 and 1996 (Figures 1 and 2).

Total resin acid concentrations were significantly higher (2-way ANOVA, $p<0.05$) in the NAR reach relative to the MAN and LCH reaches, while the lowest levels were measured in the HAR reach (Figure 28). Total chlorinated resin acids were significantly higher (2-way ANOVA, $p<0.05$) in the NAR reach compared to the LCH reference reach. Chlorinated resin acids were not detected in the HAR reach. Total and chlorinated resin acids in the LCH, MAN and NAR reaches were generally similar to levels measured downstream of the pulp mills in the upper Fraser River, although total chlorinated resin acids measured in the NAR reach in 1995 were approximately three times higher than in the upper Fraser reaches. The resin acid composition was dominated by abietic and dehydroabietic acids, comprising between 50-75% of total resin acids (Figure 29). The lower Fraser River reaches (LCH, MAN, NAR) had a resin acid composition similar to that of the upper Fraser mainstem reaches (QPG and LQN) but had higher proportions of sandaracopimaric acid. Sandaracopimaric acid was identified as a minor component on pulp mill effluent discharged into the upper Fraser River (IRC, 1994). Resin acid concentrations were comparable to those measured in 1992 by Swain and Walton (1993) in the Fraser River estuary. The elevated levels of resin acids measured in the NAR and MAN reaches are likely attributable to a multitude of sources including wood processing industries, hog fuel leachate and log boom storage, all of which collectively contribute to the total resin acid loading.

Total fatty acid concentrations were significantly higher (2-way ANOVA, $p<0.05$) in the NAR reach compared to the LCH reach (Figure 30). The highest levels, however, were measured in the HAR reach (120,000-160,000 ng/g), which may be related to localized decomposition of numerous spawning salmon in the vicinity of this sampling site. As in sediments from the upper Fraser and Thompson sub-basin, the fatty acid composition was dominated by palmitic acid (Figure 31). The overall fatty acid pattern was slightly different in the MAN and NAR estuary reaches with higher proportions of stearic acid and lower proportions of behenic acid than in the reference reaches, LCH and HAR. Total fatty acid levels in the lower Fraser River were generally similar to those measured in the rest of the Fraser basin.

6.4 Summary

Resin and fatty acids were detected in all reaches throughout the Fraser River basin. Elevated levels of resin acids were detected in reaches downstream of pulp mills in the upper Fraser basin and in the lower Fraser estuary, relative to reference reaches. Chlorinated resin acids were not detected in any reaches upstream of pulp mills. Resin acid concentrations were similar in the upper Fraser and lower Fraser basins, while the Thompson sub-basin had relatively low levels. Abietic and dehydroabietic acids comprised the greatest proportion of resin acids measured in the majority of sediment samples.

Differences in total fatty acid concentrations among most reaches in the Fraser basin are likely a reflection of local decomposition of organic matter, since fatty acids were not consistently elevated downstream of pulp mills. Palmitic acid comprised the largest proportion of fatty acids measured in all reaches. In comparison to bed sediment concentrations measured in other large north American rivers, fatty acid and non-chlorinated resin acid concentrations were generally higher, while chlorinated resin acid levels were similar to those in the Columbia, Athabasca and Wapiti/Smoky rivers (Bortleson *et al*., 1994; Crosley, 1996b; Swanson, 1992). The risk to aquatic life potentially posed by resin and fatty acids in bed sediments is difficult to establish in the absence of sediment quality guidelines and criteria for these compounds. Given that resin acids have the potential to bioaccumulate, further studies are required to determine if the present concentrations measured in sediments are posing a risk to aquatic life in the Fraser River basin ecosystem.

7. POLYCYCLIC AROMATIC HYDROCARBONS

Polycyclic aromatic hydrocarbons are found extensively in the Canadian environment. Natural sources of PAHs to the Fraser River Basin include forest fires, biosynthesis by plants and bacteria and diagenesis (alteration of organic material over a long span of time at low temperatures) (BCMELP, 1993b). Anthropogenic sources include creosote treated products, spills of petroleum products (CEPA, 1994), urban runoff (Boom and Marsalek, 1988), industrial combustion sources, wood burning and automobile exhaust (BCMELP, 1993b).

Unsubstituted (or parent) PAHs are hydrophobic in nature (log K_{ow} = 3.37-7.66) and their aqueous solubilities are low (0.3-3,420 µg/L) with the exception of naphthalene (12,500-34,000 µg/L) (Neff, 1979). Their sorption coefficients (log K_{oc}) range between 2.38 to 7.53. Consequently, most PAHs adsorb strongly to the organic carbon fraction of sediments (CCREM, 1987) which can act as a final environmental sink for these contaminants (Payne *et al*., 1988).

Low molecular weight PAHs are acutely toxic to aquatic organisms, while several high molecular weight PAHs have been associated with carcinogenesis (BCMELP, 1993b). Of special concern are benzo[*a*]pyrene, benzo[*b*]fluoranthene, benzo[*j*]fluoranthene, benzo[*k*]fluoranthene and indeno[*1,2,3-cd*]pyrene which have all been classified as ‘probably carcinogenic to humans’ by Health Canada (CEPA, 1994).

Alkylated PAHs, like their parent PAH counterparts, are commonly found in hydrocarbon-contaminated soils and sediments (Royal Roads, 1996), but can also be present at low levels in natural sediments (Wakeham *et al.,* 1980). PAH contamination from a petroleum source is generally characterized by higher concentrations of alkylated PAHs relative to their unsubstituted forms. Studies have shown that the toxicity of alkylated PAHs depends on the positions and numbers of alkyl groups around the ring structure. While alkylated naphthalenes have been found to be more toxic than the unsubstituted form, the reverse is true for alkylated phenanthrenes (Knutzen, 1995). Retene, an alkylated phenanthrene, believed to be derived from abietic acid in anaerobic sediments (Bouloubassi and Saliot, 1991) and by combustion of wood at low temperatures and reduced oxygen conditions (Ramdahl, 1983), is a potent mixed function oxidase (MFO) inducer in fish (Fragoso *et al.,* 1997; Parrott, 1996). Moreover, it is reported to be toxic to aquatic organisms in lethal and sublethal tests in the high parts per billion range in water (Szenasy *et al.,* 1998).

Dibenzothiophenes and their methylated derivatives are sulphur containing PAHs whose principal source in the environment is petroleum, although coal combustion and pyrolytic processes are also documented sources. Elevated levels of dibenzothiophenes usually indicate enhanced anthropogenic input (Tolosa *et al*., 1996). They are known to be among the most persistent and probably the most toxic PAHs in the marine environment (Berthou and Vignier, 1986).

In the present study, analysis was restricted to the parent PAH suite for the 1994 samples, whereas the 1995 and 1996 samples were analyzed for parent, alkylated and dibenzothiophene PAHs (Table 13). Refer to Appendix C for mean concentrations measured in each reach and to Appendix D for concentrations measured at individual sites.

Table 13. PAHs Analyzed in Bed Sediments from the Fraser River Basin

Parent PAHs (# of rings)	Alkylated PAHs (# of rings)	Heterocyclic PAHs (# of rings)
Naphthalene (2)	C1 naphthalenes (2)	Dibenzothiophene (3)
Anthracene (3)	C2 naphthalenes (2)	C1 dibenzothiophenes (3)
Phenanthrene (3)	C3 naphthalenes (2)	C2 dibenzothiophenes (3)
Acenaphthylene (3)	C4 naphthalenes (2)	
Acenaphthene (3)	C1 phenanthrene/anthracenes (3)	
Fluorene (3)	C2 phenanthrene/anthracenes (3)	
Fluoranthene (4)	C3 phenanthrene/anthracenes (3)	
Benz(a)anthracene (4)	C4 phenanthrene/anthracenes (3)	
Pyrene (4)	Retene (3)	
Chrysene (4)		
Benzofluoranthenes (5)		
Benzo(a)pyrene (5)		
Dibenz(ah)anthracene (5)		
Benzo(e)pyrene (5)		
Perylene (5)		
Benzo(ghi)perylene (6)		
Indeno(1,2,3-cd)pyrene (6)		

7.1 Upper Fraser Reaches

PAHs were analyzed in bed sediments collected from seven upper Fraser reaches in 1994 and 1995: Nechako River (NEC), McBride (MBD), Quesnel to Prince George (QPG), Lytton to Quesnel (LQN), Stuart River (SRT), Chilcotin River (CHN) and Quesnel River (QNL) (Figure 1).

Total parent PAH concentrations were significantly higher (2-way ANOVA, $p<0.05$) in the QPG and LQN reaches relative to the MBD reach (Figure 32). Total parent PAH levels in the tributary reaches of the SRT, CHN, QNL and NEC were generally similar to those measured downstream of Prince George. Total parent PAHs measured in the Fraser basin were weakly correlated with the sediment TOC (Pearson, $r=0.269$, $p=0.019$, $n=76$). No significant correlations were found between this variable and the fine sediment fraction ($p=0.136$).

No significant differences (1-way ANOVA, $p=0.804$) were found for total alkylated PAH concentrations among the NEC, MBD, QPG and LQN reaches (Figure 33). Retene accounted for over 50% of the total alkylated PAH concentration in the NEC, QPG and LQN reaches, while in the MBD reach it accounted for over 96% of the total. Retene concentrations, however, were quite variable within these reaches. Three sites, measured in 1995, had relatively high retene levels: LQN1, NEC1 (both 150 ng/g) and MBD4 (450 ng/g). These high retene levels are likely associated with wood waste from present or abandoned sawmills (R. Fairservice, BCMELP, pers. comm.). Retene concentrations were notably lower in the QNL reach, where it accounted for <50% the total alkylated PAH concentration. Retene concentrations were not significantly correlated with known precursors, abietic acid (p=0.567) or dehydroabietic acid (p=0.514), measured throughout the Fraser basin (Pearson, n=55). Total alkylated PAHs in the SRT, CHN and QNL tributaries were dominated by the petroleum-related alkylated naphthalenes and phenanthrenes/anthracenes. The source of petroleum in these reaches could not be determined in the absence of petroleum biomarker data (eg. hopane and sterane), however, given their rural locations, the source is likely natural.

The relative concentrations of alkylated versus parent PAHs, the presence of dibenzothiophenes and the relative proportion of 4-5 ringed PAHs relative to 2-3 ringed PAHs have been used for PAH source identification (Yunker and Macdonald, 1995; Royal Roads, 1996; Requejo *et al*., 1997). Generally, a predominance of the alkylated naphthalenes and phenanthrenes/anthracenes, relative to their corresponding parent PAHs, coupled with low concentrations of the 4-5 ringed parent PAHs, is indicative of petroleum (or petrogenic) sources. Low alkylation and a predominance of parent PAHs is indicative of combustion (or pyrogenic) sources. In addition, weathered petroleum sources are indicated by loss of the lower alkylated PAHs and 2-3 ringed parent PAHs. Note that retene was subtracted from the total C4 phenanthrenes/anthracene concentration for the purpose of this analysis, because it represents a plant-derived source. The reference reaches, NEC, SRT, CHN and QNL, had higher alkylated naphthalenes and phenanthrenes/anthracenes relative to the unalkylated forms (Figure 34). This, coupled with the relatively low 4-5 ringed parent PAH concentrations, suggests a petroleum dominated PAH signature. PAH signatures in sediment cores from Stuart Lake (Macdonald *et al.*, 1998b) point to naturally derived petroleum as a source of PAHs in this lake. Dibenzothiophenes were absent in samples taken in the MBD and CHN reaches and were <1.0 ng/g in the remainder of the reaches. The higher proportion of unsubstituted naphthalenes and phenanthrenes/anthracenes (relative to their alkylated forms) and the greater proportions of the 4-5 ringed parent PAHs in the MBD and QPG reaches are indicative of contributions from pyrogenic sources (Figure 34). Although the MBD reference reach is upstream of any major urban centres, the highway running along the entire length of the Fraser River from Moose Lake to Prince George is a possible source of pyrogenic PAHs to this reach. However, the consistent PAH pattern seen in vertical segments of sediment cores from Moose Lake (Macdonald *et al*., 1998b) indicate that the PAH source to the lake has been relatively constant over the last century, suggesting consistent inputs from natural combustion sources such as forest fires. The PAH fingerprint for the LQN reach is generally similar to that of the tributaries with the exception of the relatively high concentration of parent naphthalene. This was due to a relatively high naphthalene peak of 22 ng/g detected at LQN1, suggesting contamination from a localized combustion source. Natural coal deposits along the Fraser River downstream of Quesnel (K. Andrews, BCMELP, pers. comm.) may account for the largely petroleum signature seen in sediments from this reach.

PAH alkyl homologue signatures similar to those found in the tributary reaches in the present study were reported by Yunker and Macdonald (1995) in Mackenzie delta suspended particulates and shelf sediments and by Steinhauer and Boehm (1992) in sediments from the Alaskan Beaufort Sea.

PAH concentrations, normalized to 1% organic carbon, were compared to BCMELP sediment quality criteria (BCMELP, 1995) and federal interim sediment quality guidelines (CCME, draft, 1994). Naphthalene was the only PAH which exceeded the provincial criterion in 1994 and 1995 (Table 14). A possible source of naphthalene at the LQN1 site may be diesel fuel, although bitumen, coal and mature organic matter can also be important natural sources of naphthalene (M. Yunker, pers. comm.).

Table 14. PAH Concentrations in Bed Sediments from Upper Fraser Sampling Sites Exceeding Provincial Sediment Quality Criteria for the Protection of Aquatic Life

Year	PAH	BCMELP Criterion*	NEC1	NEC4	LQN1	QNL2
1994	Naphthalene	10	10.1	12.0		30.0
1995	Naphthalene	10			33.9	14.6

All values in ng/g dry weight and normalized to 1% TOC.
* Lowest effects level

7.2 Thompson Sub-basin Reaches

PAHs were analyzed in bed sediments collected in 1994 and 1995 from four Thompson sub-basin reaches: North Thompson River (NTH), South Thompson River (STH), South Thompson River in Kamloops (STK1A) and Thompson River (THM) (Figure 1).

Total parent PAH concentrations were significantly higher (2-way ANOVA, $p<0.05$) in the THM reach than in the NTH reach (Figure 35). Numerous sources have been cited as likely contributing to PAH contamination in the Kamloops area, including beehive burners, hogfuel burning, vehicle emissions and historical inputs from an oil refinery. Strong evidence of recent PAH contamination was found in upper layers of sediment cores from Kamloops Lake (Macdonald *et al.*,1998b). However, the highest concentrations were measured at the urban site on the South Thompson River in Kamloops (STK1A). The proximity of STK1A downstream of a stormwater outfall likely accounts for this sample having the highest PAH levels in the Thompson basin.

Total alkylated PAH concentrations at STK1A were up to 15 times higher than in the rural NTH reach (Figure 36), suggesting that street runoff containing petroleum products is an important source of these compounds. Retene accounted for over 50% of the total alkylated PAH concentration in the NTH and STH reference reaches but for <50% of the total in the urbanized reaches, THM and STK1A (Figure 36). This is likely due to a greater proportion of alkylated PAHs, in the more urbanized reaches. The highest levels of retene were found at two sites: STH6, a backwater area in the town of Chase (133.5 ng/g), and THM4, a side channel of the Thompson River in Kamloops (130 ng/g). These elevated levels are likely a result of localized decomposition of wood debris. No significant differences were found among the NTH, STH and THM reaches for either retene ($p=0.574$) or total alkylated PAHs ($p=0.056$), however the power of the tests was low, (0.05 and 0.447, respectively).

The STH and THM reaches were characterized by alkyl versus parent PAH distribution patterns indicative of petroleum dominated sources (Figure 37). An alkylated PAH distribution suggesting a greater input of combustion and/or creosote related PAHs was seen in the NTH reach and the STK1A site, as indicated by the greater prominence of parent PAHs. The highway and rail line running adjacent to the North Thompson River are likely the major sources of pyrogenic PAHs found in the NTH reference reach, although forest fires and long range atmospheric transport are also likely sources. Mean total dibenzothiophenes were generally an order of magnitude higher at the STK1A site in Kamloops in comparison to all other reaches, indicating that petroleum linked to anthropogenic use is an important source of PAH contamination at this site.

Seven PAHs exceeded sediment provincial sediment quality criteria (BCMELP, 1995) and/or interim federal sediment quality guidelines (CCME, draft, 1994) for the protection of aquatic life (Table 15). Naphthalene levels exceeded the provincial criterion in the NTH reference reach, reflecting its pervasiveness in relatively unurbanized areas of the basin. The two urban sites, STK1A on the South Thompson River and THM2 on the Thompson River, both in Kamloops, are likely impacted by urban runoff containing PAHs from fossil fuel, wood combustion and petroleum-rich street oil. Note, however, that the 95THM2 sample had a very low TOC (0.07%), which resulted in normalized concentrations being much higher than actual measured values.

Table 15. PAH Concentrations in Bed Sediments from Thompson Sub-basin Sampling Sites Exceeding Provincial Sediment Quality Criteria and/or Interim Federal Guidelines for the Protection of Aquatic Life

Year	PAH	BCMELP Criterion*	Interim Federal Guideline$^{\otimes}$	NTH1	NTH3	NTH5	THM1	THM2	THM4	STK1A
1994	Naphthalene	10	-	12.4	15.0	12.9	13.0		13.2	14.0
	Phenanthrene	40	41.9							88.4
	Fluoranthene	2000	111.3							169.8
	Pyrene	490	53.0							158.1
	Benz(a)anthracene	200	31.7							79.1
	Chrysene	340	57.1							137.2
	Benzo(a)pyrene	60	31.9							74.4
1995	Naphthalene	10	-					28.6		
	Phenanthrene	40	41.9					77.1		
	Pyrene	490	53.0					82.9		59.2
	Chrysene	340	57.1					60.0		
	Benzo(a)pyrene	60	31.9					34.3		

All values in ng/g dry weight and normalized to 1% TOC.
* Lowest effects level
$^{\otimes}$ Threshold effects level

7.3 Lower Fraser Reaches

The lower Fraser River reach Lytton to Chilliwack (LCH) was sampled in 1994, 1995 and 1996, the Harrison River tributary (HAR) was sampled in 1994 and 1995 and the Main (MAN) and North (NAR) Arms of the Fraser River were sampled in 1995 and 1996 (Figures 1 and 2).

Mean total parent PAH concentrations followed an incremental increase in concentration from the LCH to the HAR, MAN and NAR reaches (Figure 38). Total parent PAHs were significantly higher (2-way ANOVA, $p<0.05$) in the NAR reach relative to both the MAN and LCH reaches, and significantly higher in the MAN reach relative to the LCH reach. Eburne Slough (NAR2) had the highest levels of total parent PAHs (846 and 967 ng/g in 1995 and 1996, respectively).

Total alkylated PAH concentrations measured in 1995 and 1996 were significantly higher (2-way ANOVA, $p<0.05$) in the MAN reach relative to the LCH reach and in the NAR reach compared to both the LCH and MAN reaches (Figure 39). The non-retene component of total alkylated PAHs was three to four times higher in the NAR reach compared to the MAN reach, a factor likely related to the large number of storm sewers entering the former reach. As with parent PAHs, Eburne Slough (NAR2) had the highest alkylated PAH concentrations in the basin, (797 and 1258 ng/g in 1995 and 1996, respectively).

Retene concentrations were similar in the NAR and MAN reaches but elevated in comparison to the LCH and HAR reaches (Figure 39). The MAN3 site, located 2 km downstream of the Annacis Island wastewater treatment plant outfall, had relatively high levels of retene (110 and 280 ng/g in 1995 and 1996, respectively) compared to the other three sites within the MAN reach (11-76 ng/g). The relatively high retene levels measured in the North Arm of the Fraser River are likely due to a concentration of wood processing industries and log boom storage in that reach of the river.

PAH source signatures indicated a largely petrogenic PAH source in the LCH reach (Figure 40). The remainder of the reaches (HAR, MAN and NAR) had a source signature consistent with inputs from combustion sources. In addition to the pyrogenic inputs, petroleum appears to be an important source of PAHs to the NAR and MAN reaches, as evidenced by the higher alkylated PAH and dibenzothiophene concentrations in these reaches. McDonald Slough (NAR1) and Eburne Slough (NAR2) had the highest levels of dibenzothiophenes measured in both 1995 and 1996 (25.2-59.8 ng/g), indicating antropogenic inputs of petroleum. These two sloughs, located downstream of heavily industrialized areas, are subject to enhanced accumulation of contaminants, due to relatively high rates of deposition of fine sediments in comparison to sites located in the main river channel. The relatively high levels of 3-4 ringed parent PAHs relative to alkylated PAHs measured in the HAR reach indicates that combustion, likely from atmospheric inputs from the lower Fraser valley, is an important PAH source to this reach. This is consistent with findings by Macdonald *et al.* (1998b) who reported PAH contamination in surface layers of sediment cores from Harrison Lake.

PAH concentrations were compared to provincial criteria (BCMELP, 1995), interim federal guidelines (CCME, draft, 1994) and draft regional objectives (Swain *et al.,* draft, 1995) for the protection of aquatic life. Refer to Table 16 for PAHs exceeding these criteria. The three sites at which the majority of exceedences over guidelines and criteria occurred are MAN4 (Annacis Channel), NAR2 (Eburne Slough) and NAR 3 (Sea Island

Table 16. PAH Concentrations in Bed Sediments from Lower Fraser Sampling Sites Exceeding Provincial Sediment Quality Criteria and/or Interim Federal Guidelines and/or Draft Regional Objectives for the Protection of Aquatic Life

Year	PAH	BCMELP Criterion*	Interim Federal Guideline⊗	Draft Regional Objective for Fraser River Main and North Arms	LCH1	LCH4	LCH5	LCH6	MAN3	MAN4	NAR2	NAR3	NAR4
1994	Naphthalene	10	-		16.8	11.9	26.1	10.2					
1995	Naphthalene	10	-	10				45.0				18.0	
	Phenanthrene	40	41.9	86.7				68.3			48.7	57.2	
	Pyrene	490	53.0	-							68.1	87.8	
	Benz(a)anthracene	200	31.7	200								35.1	
	Benzo(a)pyrene	60	31.9	60								46.0	
1996	Naphthalene	10	-	10					12.8		17.0	25.9	13.2
	Phenanthrene	40	41.9	86.7						96.4	80.4	61.1	
	Fluoranthene	2000	111.3	2000						178.6	151.8		
	Pyrene	490	53.0	-						141.1	125.0	77.8	54.0
	Benz(a)anthracene	200	31.7	200					11.0	51.8	48.2	33.3	
	Dibenz(ah)anthracene	60	-	5						8.8	5.7		
	Chrysene	340	57.1	200						91.0	77.7		
	Benzo(a)pyrene	60	31.9	60						67.9	45.5		

All values in ng/g dry weight and normalized to 1% TOC

* Lowest effects level

⊗ Threshold effects level

Channel). All of these sites are urban sites subject to PAH contamination from storm and combined sewers, creosote preserved wood, boat traffic and atmospheric deposition. Previous studies conducted between 1990 and 1992 by Swain and Walton (1991;1993) in the Fraser River estuary have similarly found relatively high PAH concentrations in the North Arm compared to the Main Arm of the Fraser River. Many of the same PAHs measured by Swain and Walton (1991;1993) were found to exceed the interim CCME threshold effect levels (CCME, draft, 1994) for the protection of aquatic life at some of the same sites as those sampled in the present study. These included McDonald Slough (NAR1), Sea Island Channel (NAR3) and Tree Island Slough (NAR4). The large number of stormwater outfalls emptying into the North Arm of the Fraser River, coupled with lower flows (15% of the total flow), are likely responsible for the elevated PAH levels measured in the North Arm. Moreover, the known seepage of PAH-rich creosote from a wood preservation site in the lower Fraser River mainstem (P. Krahn, Environment Canada, pers. comm.) may also contribute to the elevated PAH levels detected in both the NAR and MAN reaches.

7.4 Summary

The widespread presence of PAHs in the Fraser basin is reflective of the extensive use of fossil fuels within the region, as PAH contamination was clearly proportional to the degree of urbanization of each reach. Accordingly, the upper Fraser reaches of the basin were comparatively less impacted by PAH contamination relative to the Thompson sub-basin and lower Fraser reaches. Elevated parent and alkylated PAH concentrations, relative to reference reaches, were clearly observed in the more populated reaches of the Thompson sub-basin and lower Fraser River. The Fraser River estuary reaches, MAN and NAR, had the highest levels of parent, alkylated and dibenzothiophene PAHs measured in the Fraser basin, reflecting the multitude of non-point sources impacting these reaches. Retene was elevated in the MBD, MAN and NAR reaches, where it is likely related to wood debris decomposition and log boom storage.

PAH source signatures indicate both petroleum and combustion inputs throughout the Fraser basin. Generally, reference reaches were dominated by petrogenic PAH sources, while non-reference reaches were characterized by PAH signatures consistent with pyrogenic inputs in addition to petroleum sources. Exceptions were seen for the reference reaches used as transport corridors (MBD, NTH) and for the HAR reach whose geographical location subjects it to significant atmospheric deposition. PAH source signatures indicate a greater contribution from petroleum PAHs (likely from natural sources) in the upper Fraser basin, while the Thompson sub-basin and lower Fraser basin are influenced more strongly by combustion inputs and petroleum inputs of anthropogenic origin.

Given their association with fossil fuel combustion and petroleum spills of non-point source origin, PAHs are expected to remain one of the principal contaminants in urban areas. As automobile use in the metropolitan Vancouver area continues to grow, both parent and alkylated PAHs are likely to continue accumulating in fine sediments throughout the Fraser estuary. Trends in PAH concentrations in Fraser River sediments are at present difficult to predict, as the annual freshet flush may effectively prevent PAH concentrations from increasing in the sediments to levels beyond those measured in the present study. Even if PAH levels remain stable in the Fraser River, questions still remain about the effect of continual deposition of contaminated sediments into the Strait of Georgia, their final resting place. The exceedence of guidelines, criteria and objectives for some parent PAHs measured in the Fraser estuary reaches and in the Thompson and South Thompson urban sites suggests that aquatic life may be negatively impacted by these contaminants in the more urbanized parts of the basin. The biological risk of elevated alkylated and dibenzothiophene PAHs is difficult to ascertain in the absence of guidelines or criteria for the protection of aquatic life. An increase in the use of fossil fuels, associated with the escalating urban population in some parts of the Fraser basin, may result in PAHs reaching levels that could adversely affect fish and other biota inhabiting the Fraser River ecosystem.

8. POLYCHLORINATED BIPHENYLS

PCBs have been widely used in industrial applications because they are thermally stable, resistant to both acid and base hydrolysis, generally inert, soluble in organic solvents, possessive of excellent dielectric properties, resistant to oxidation and reduction and non-flammable. In 1980, the use of PCBs was prohibited as a constituent of any product, machinery or equipment manufactured in Canada (Environment Canada, 1980). In spite of their ban from general use, PCBs continue to be released from transformers, pre-1980 lamp ballasts, capacitors and stored askarel (commercial PCB preparations) (Environment Canada, 1991).

PCB congeners can be divided into two main classes: ortho-substituted coplanars and non ortho-substituted coplanars. As studies have determined that non-ortho-substituted PCB coplanars are more immunotoxic than the ortho-substituted forms (Silkworth and Grabstein, 1982), these congeners have become the focus of criteria development. Owing to their resistance to oxidation and hydrolysis (Hutzinger *et al.,*1974), low vapour pressure and reduced levels of biodegradation, PCBs are environmentally persistent compounds which bioaccumulate and bioconcentrate in biological systems (Hansen, 1976). The reproductive effects of PCBs remain controversial, and there is insufficient data on individual PCB congeners to evaluate the structure-activity relationships for the effects of PCBs on reproduction. However, Soto (1995) has demonstrated that some PCB congeners are estrogen-mimics and induce proliferation in human breast cancer cells. PCBs have also been reported to be teratogenic in mice (Battershill, 1994).

In western Canada, PCBs exceeding the interim federal sediment quality guideline (CCME, draft, 1994) were detected in bed sediments from the Peace River in Alberta (Crosley, 1996a). In the Fraser River basin, PCBs have been measured in final effluents of kraft pulp and paper mills and wastewater treatment plant effluent (Derksen, draft, 1997). In the receiving environment, PCBs were measured in suspended sediments from the Fraser River basin (Sekela *et al.*, 1994; 1995; Sylvestre *et al.*, 1998a; 1998b), in bed sediments from the Fraser River estuary (FREMP, 1996) and in the Brunette River watershed in the greater Vancouver area (Hall *et al.,* 1976; Sekela *et al.*, 1998).

PCBs analyzed in bed sediments from the Fraser basin in 1994, 1995 and 1996 are presented in Table 17. Note that PCB coplanars were not analyzed in 1995. Refer to Appendix C for mean concentrations measured in each reach and to Appendix D for concentrations measured at individual sites.

Table 17. PCBs Analyzed in Bed Sediments from the Fraser River Basin

PCB Congeners (ortho-substituted coplanars)				PCB Coplanars (non-ortho-substituted coplanars)	PCB Aroclors
8/5	74	149	174	PCB #77 (3,3’,4,4’ TCB)	Aroclor 1242
15	70/76	134	177	PCB #126 (3,3’,4,4’,5 PCB)	Aroclor 1254
19	66	131	171	PCB #169 (3,3’,4,4’,5,5’ HCB)	Aroclor 1260
18	56/60	146	172		
17	95	153	180		
24/27	91	141	193		
16/32	84/89	130	191		
26	101/90	137	170		
25	99	138	189		
31/28	83	158	201		
33	97	129	197		
22	87	128	198		
45	85	156	199		
46	110	157	196/203		
52	107	179	195		
49	118	176	194		
47/48	114	178	205		
44	105	175	208		
42	136	187/182	207		
41/71/64	151	183	206		
40	144/135	185	209		

8.1 Upper Fraser Reaches

PCB congeners, coplanars and Aroclors were analyzed in bed sediments collected from seven upper Fraser reaches in 1994 and 1995: Nechako River (NEC), McBride (MBD), Quesnel to Prince George (QPG), Lytton to Quesnel (LQN), Stuart River (SRT), Chilcotin River (CHN) and Quesnel River (QNL) (Figure 1).

Total PCB congener concentrations measured in 1994 and 1995 were generally <1.0 ng/g and did not differ between 1994 and 1995. Total PCB congener concentrations measured in 1995 were not significantly different among the NEC, MBD, QPG and LQN reaches (1-way ANOVA, p=0.233), although a higher mean concentration was measured in the LQN reach (Figure 41). This was due to a total PCB congener concentration of 16.9 ng/g detected at LQN3, located downstream of Quesnel. When normalized to 1% TOC, the total PCB concentration at this site (26.4 ng/g) exceeded the BCMELP sediment quality criterion for the protection of aquatic life (20 ng/g, BCMELP, 1995). Total PCB congener concentrations measured in the basin were not significantly correlated (Pearson, n=56) with either the sediment TOC (p=0.707) or fine particle size fraction (p=0.758).

Aroclor 1242 was detected in concentrations similar to total PCB congeners, indicating that this formulation is the primary source of PCB contamination in this area. PCB coplanars were measured in 1994, however differences in detection limits did not permit comparisons between samples.

8.2 Thompson Sub-basin Reaches

PCBs were analyzed in bed sediments collected in 1994 and 1995 from four Thompson sub-basin reaches: North Thompson River (NTH), South Thompson River (STH), South Thompson River in Kamloops (STK1A) and Thompson River (THM) (Figure 1).

Total PCBs were detected in trace levels (<0.20 ng/g) in all Thompson sub-basin reaches with the exception of the STK1A site in Kamloops where a concentration of 587.8 ng/g was measured in 1994 (Figure 42). This value exceeded the BCMELP sediment quality criterion (BCMELP, 1995) by over 60 times, when normalized to 1% TOC (Table 18). In 1995, the total PCB concentration at this site dropped to 19.9 ng/g and did not exceed the provincial criterion. Aroclor 1254 comprised between 80 to 90% of the total PCB concentration at this site over the two years sampled. In 1994, Aroclor 1254 exceeded the BCMELP sediment quality severe effect level criterion by more than three times, and Aroclor 1260 exceeded the lowest effect level criterion by approximately 30 times. PCB coplanars #77, #126 and #169 were detected in levels ranging from 0.9 to 270 pg/g at the STK1A site, while measured in trace levels (0.20 pg/g) in the other reaches (Figure 43). A TEQ value of 6.2 pg/g was calculated for the STK1A site. Subsequent sampling by Environment Canada in the vicinity of the STK1A site did not detect PCB concentrations exceeding the provincial criteria, and the source of the relatively high levels measured at the site could not be established (P. Krahn, Environment Canada, pers. comm). However, as this site is located downstream of a storm water outfall, urban runoff is the most likely source, given that relatively high levels of PCBs measured in urban creeks have been associated with stormwater inputs (Hall *et al*., 1976; Sekela *et al.,* 1998). Nevertheless, further investigation into the PCB source may be warranted, as this site is located approximately 500 m downstream of the municipal water pumping station supplying the city of Kamloops with drinking water.

Table 18. PCB Concentrations in Bed Sediments from Thompson Sub-Basin Sampling Sites Exceeding Provincial Sediment Quality Criteria and/or Interim Federal Guidelines for the Protection of Aquatic Life

Year	Variable	BCMELP Criterion	Interim Federal Guideline⊗	STK1A
1994	Total PCB Congeners	20*	34	1,367.0
	Aroclor 1254	340**	-	1,162.8
	Aroclor 1260	5*	-	148.8

All values in ng/g dry weight and normalized to 1% TOC.
* Lowest effects level
** Severe effects level
⊗ Threshold effects level

8.3 Lower Fraser Reaches

PCBs were sampled in the Lytton to Chilliwack reach (LCH) in 1994, 1995 and 1996. The Harrison reach (HAR) was sampled in 1994 and 1995 and the Main Arm (MAN) and North Arm (NAR) of the Fraser River were sampled in 1995 and 1996 (Figures 1 and 2).

Total PCB congener concentrations (Figure 44) were significantly higher in the NAR reach in comparison to the LCH reach (2-way ANOVA, $p<0.05$). Total PCBs were detected in the HAR reach in low levels (<2.0 ng/g) and only in 1994. Mean concentrations of Aroclors 1242, 1254 and 1260 were detected in concentrations <5 ng/g (Figure 45). PCB coplanars were only measured in 1996. Concentrations of coplanars #77 and #126 and PCB TEQs (Figure 46) were higher in the Fraser estuary reaches (NAR and MAN) than in the LCH reach, although only PCB #77 showed a statistically significant difference (1-way ANOVA, $p<0.05$).

As with most other organic contaminants, the NAR reach had higher concentrations of PCBs than the rest of the lower Fraser reaches, likely owing to the large number of stormwater inputs into this arm of the Fraser River. Aroclor 1260, measured at a 1% organic carbon normalized concentration of 8.3 ng/g in Eburne Slough (NAR2) in 1996, exceeded the provincial sediment quality criterion of 5.0 ng/g (BCMELP, 1995). FREMP (1996) similarly reported PCBs exceeding the interim federal guideline of 34 ng/g (CCME, draft, 1994) in sloughs in the Main Arm of the Fraser River. Nevertheless, PCB concentrations in the Fraser estuary have declined considerably since 1985, when levels as high as 155 µg/g were recorded by Swain (1986). This apparent declining trend, which is linked to the 1980 ban of PCBs from general use, is supported by dramatic declines in PCB levels measured in the Brunette River watershed in 1995 in comparison to levels measured 20 years prior (FREMP, 1996). This pattern was also reflected in peamouth chub livers measured in the Fraser basin in 1995 and 1996, relative to levels measured in the 1970s and 1980s (Raymond *et al.,* 1998).

8.4 Summary

Total PCBs measured in bed sediments were generally detected in trace levels in the upper Fraser and Thompson sub-basin reaches, although relatively high PCB levels were measured at an urban site in Kamloops located downstream of a storm water outfall. With the exception of this site, total PCB congener concentrations measured in the North Arm of the Fraser River were higher than in all other reaches in the basin, reflecting urban runoff contributions from the greater Vancouver area. PCB concentrations in bed sediments were four orders of magnitude lower than the in the Great Lakes Areas of Concern (Bolattino, 1993) but generally similar to those measured in the northern rivers of Alberta (Crosley, 1996a). PCB concentrations in the Fraser estuary have declined from the mid 1980s, reflecting their banning from general use since 1980. Further declines are likely to occur in the future if the present trend continues, although, given their high persistence, PCB residues will likely continue to be detected in the environment at trace levels for many decades to come.

9. PESTICIDES

Pesticides vary widely in their physical and chemical properties according to the chemical family to which they belong. Organochlorine pesticides are, environmentally, the most important group of synthetic organic pesticides because of their great stability, hydrophobicity and toxicity (McNeely *et al.,* 1979).

Technical hexachlorocyclohexane (HCH) containing a mixture of α, β, γ and δ isomers was widely used in Canada for controlling ticks and flies on livestock, seed treatment for wireworm control, controlling infestations of stored logs by the logging industry and for controlling bedbugs (Gummer, 1979) until its banning in 1971 (Barrie *et al.,*1992). However the γ isomer (lindane), is presently registered for use in Canada for seed treatment, although its use is in the Fraser basin is not extensive (A. Oliver, BCMELP, pers. comm). HCH has also been shown to be transported with global air movements from lower latitudes and deposited as wet and dry deposition in the Canadian arctic (Lockhart *et al.,* 1992). Most atmospheric measurements have shown a large prevalence of the α over the γ isomer (Sanchez *et al.,* 1993). The γ isomer is toxic to fish and aquatic organisms and has been classified as a possible human carcinogen by the International Agency for Cancer Research (CEPA, 1992).

Chlordane was widely used as an insecticide between 1945 and 1988. Because it is a suspected carcinogen, chlordane has been banned for use as an agricultural pesticide in Canada since 1985. However, it still has restricted use in a number of countries in the world (Barrie *et al.*, 1992).

DDT was used worldwide as an insecticide between 1945 and the mid 1970s. DDT has been banned or restricted for nearly two decades in Canada, the U.S.A and Europe, however it continues to be manufactured and used in many areas of the world including southern Asia, Africa, Central America and South America (Voldner and Ellenton, 1987). The parent compounds, p,p'-DDT and o,p'-DDT are highly stable to photolysis and hydrolysis, and the former is transformed to DDE and DDD through biological activity. Both DDT and DDE are of sufficiently low volatility to be transported in the atmosphere in both particle and gas phases (Barrie *et al.*, 1992). Consequently, despite the ban on its use, the Canadian environment is still accumulating DDT through global air currents (Sharpe, 1995). DDT and DDD are known carcinogens, and DDE is a suspected carcinogen (Lewis, 1992). Owing to their estrogenic and anti-androgenic properties (vonSaal *et al*., 1995; Kelce *et al.,* 1995), DDT and DDE have been linked to reproductive effects in animals and are suspected of causing developmental abnormalities in humans (Sharpe, 1995).

Endosulphan, used as a contact insecticide, is one of the few remaining organochlorine pesticides still registered in Canada for control of a wide range of insect pests (Wan *et al*., 1995). Endosulphan is consistently one of the most toxic pesticides tested with fish species (CCREM, 1987) and has been linked to endocrine disruption in birds (USEPA, 1997). Endosulphan is known to persist in soils for up to two years or more (NRCC, 1975). Endosulphan I, II and its transformation product, endosulphan sulphate, were detected in 1991 in crop soils, ditch sediments and water from agricultural areas in the lower Fraser River basin (Wan *et al*., 1995).

Pesticides analyzed in bed sediments from the Fraser basin in 1994, 1995 and 1996 are presented in Table 19. Refer to Appendix C for mean concentrations measured in each reach and to Appendix D for concentrations measured at individual sites.

Table 19. Pesticides Analyzed in Bed Sediments from the Fraser River Basin

Hexachlorobenzene	trans-Chlordane	Heptachlor Epoxide
alpha HCH	cis-Chlordane	alpha-Endosulphan (I)
beta HCH	p,p'-DDE	Dieldrin
gamma HCH	trans-Nonachlor	Endrin
delta HCH	p,p'-DDD	beta-Endosulphan (II)
Heptachlor	o,p'-DDT	Endosulphan Sulphate
Aldrin	p,p'-DDT	Methoxychlor
Oxychlordane	Mirex	

9.1 Upper Fraser Reaches

Organochlorine pesticides were analyzed in bed sediments collected from seven upper Fraser reaches in 1994 and 1995: Nechako River (NEC), McBride (MBD), Quesnel to Prince George (QPG), Lytton to Quesnel (LQN), Stuart River (SRT), Chilcotin River (CHN) and Quesnel River (QNL) (Figure 1).

The pesticides most often detected were hexachlorocyclohexanes, chlordanes and DDT and its breakdown products, DDE and DDD. Total organochlorine pesticide concentrations measured in 1995 were significantly higher (1-way ANOVA, $p<0.05$) in the MBD reach than in the NEC and QPG reaches and significantly higher in the LQN reach than in the NEC reach (Figure 47). However, this pattern was not observed in the 1994 data which, although based on a lower number of samples, shows similar total pesticide concentrations in the NEC, QPG and LQN reaches. The SRT reach sample from 1995 had the highest total pesticide concentration measured in the basin (8.36 ng/g). Total pesticide concentrations were not significantly correlated (Pearson, $n=56$) to the sediment TOC ($p=0.367$) or the silt and clay fraction ($p=0.625$).

Total HCH concentrations, measured in 1995, were significantly higher in concentration (1-way ANOVA, $p<0.05$) in the LQN reach relative to the NEC, MBD and QPG reaches (Figure 48). The same pattern was seen in 1994, although the data could not be included in the statistical analysis due to insufficient replication. The γ isomer (lindane) comprised the majority of total HCH, followed by the β and α isomers. As all reference reaches had total HCH concentrations of <1.0 ng/g, past and present use may account for the concentrations measured on the Fraser River mainstem downstream of Prince George and Quesnel, although atmospheric sources are also likely.

In 1994, mean total chlordane (Figure 49), comprised of oxychlordane, trans-chlordane and cis-chlordane, was detected up to a maximum of 3.35 ng/g in the NEC reach, while not detectable at any sites in 1995, with the exception of the SRT reach (0.52 ng/g). The levels of chlordane detected in these samples likely reflect historical use and atmospheric sources.

Total DDT and its metabolites (Figure 50) were detected up to a maximum of 7.84 ng/g in the SRT reach in 1995, with over 99% of the total being comprised of p,p'DDT. In 1995, mean total DDT and metabolite concentrations were significantly higher (1-way ANOVA, $p<0.05$) in the MBD reach in comparison to the NEC, QPG and LQN reaches, although in 1994 no notable differences were measured between these reaches. The NEC reach appears to have been least impacted by DDT, since DDT was not detected in any samples, with the exception of 94NEC4, which was found to contain a trace level of DDE (0.03 ng/g).

The ratio of DDE + DDD/total DDT can be used as an indicator of the relative age of the DDT source (Sanchez *et al.,* 1993). Accordingly, a ratio >0.8 is indicative of the predominance of DDT metabolites, suggesting an older DDT source, whereas a ratio <0.8 is indicative of a more recent DDT source. Ratios were generally below 0.8 in the upper Fraser region (Figure 51), indicating a more recent DDT source, perhaps originating from atmospheric deposition. This is in agreement with low DDE/total DDT ratios measured in surface layers of sediment cores and burbot from Moose Lake near the headwaters of the Fraser River (Macdonald *et al.,* 1998b), suggesting a recent input of "unweathered" DDT. A predominance of the metabolic products, DDD and DDE, was reported in deeper sections of the sediment core, which is consistent with aerial spraying of DDT in the upper Fraser region in the 1950s and 1960s (Prebble, 1975).

Pesticide concentrations, normalized to 1% sediment organic carbon, were compared to provincial sediment quality criteria (BCMELP, 1995) and interim federal sediment quality guidelines (CCME, draft, 1994). Five variables exceeded these criteria and/or guidelines: γ-HCH, total HCH, total chlordane, total DDT and total DDT + metabolites (Table 20).

Exceedences over guidelines and criteria occurred in five of the seven reaches sampled. Gamma HCH was the pesticide that most often exceeded federal guidelines or provincial criteria, however the concentrations were just above these levels. DDT measured in the SRT reach exceeded the provincial criterion and federal guideline in 1995 but not in 1994. This may be due to a change in the sampling location (the 1995 sample was collected from the opposite bank of the river), necessitated by changes in flow conditions between the two years. The exceedence of bed sediment guidelines and criteria for lindane in the McBride reach, where pesticide use has historically not been heavily employed (Shreier *et al.*, 1991), is suggestive of atmospheric deposition.

Table 20. Pesticide Concentrations in Bed Sediments from Upper Fraser Sampling Sites Exceeding Provincial Sediment Quality Criteria and/or Interim Federal Guidelines for the Protection of Aquatic Life

Year	Variable	BCMELP Criterion*	Interim Federal Guideline ⊗	MBD2	MBD3	MBD4	QPG1	LQN1	LQN2	LQN3	LQN4	NEC4	SRT3
1994	γ - HCH	3	0.94	1.35	2.66	1.89	1.57		5.95			1.66	
	Total HCH	3	-				5.04		10.54				
	Total Chlordane	7	-				8.37					13.40	
1995	γ - HCH	3	0.94					1.26	1.10	1.06	4.57		
	Total HCH	7	-								9.14		
	Total DDT	8	7										18.14
	Total DDT + metabolites	7	-										18.23

All values in ng/g dry weight and normalized to 1% TOC.
* Lowest effects level
⊗ Threshold effects level

9.2 Thompson Sub-basin Reaches

Pesticides were analyzed in bed sediments collected in 1994 and 1995 from four Thompson sub-basin reaches: North Thompson River (NTH), South Thompson River (STH), South Thompson River in Kamloops (STK1A) and Thompson River (THM) (Figure 1).

Trace levels of pesticides (<1.0 ng/g) were detected in the NTH and STH reaches, with the majority of detections recorded for HCH, DDE and DDT. Total pesticide concentrations were not significantly different in the NTH, STH and THM reaches (1-way ANOVA, p=0.117), however concentrations measured at the urban South Thompson site in Kamloops (STK1A) were several times greater than in the other reaches (Figure 52). This site also had the highest DDT and metabolite levels in the Thompson sub-basin (Figure 53). Ratios of DDE + DDD/total DDT were generally between 1 and 1.5 (Figure 51) and were generally higher than in the upper Fraser reaches, suggesting that historical use of DDT may be the primary source in this region. However, additional data would be required in order to confirm this apparent pattern.

Endosulphan I, endosulphan II, endosulphan sulfate, dieldrin and chlordane were also detected at the STK1A site, while not detectable at any of the other Thompson sub-basin reaches. With the exception of endosulphan and lindane, all other detected pesticides are no longer in use in Canada. The location of the STK1A site, downstream of a stormwater outfall, likely accounts for the elevated pesticide levels.

Pesticides exceeded provincial sediment quality criteria (BCMELP, 1995) or interim federal guidelines (CCME, draft, 1994) only at one site, THM2, located in the city of Kamloops (Table 21). Although the THM2 site had lower pesticide concentrations than the STK1A site, the very low TOC (0.07%) of sediments from the former site resulted in normalized values exceeding criteria and guidelines. This site was sampled only in 1995, therefore no comparisons could be made between years.

Table 21. Pesticide Concentrations in Bed Sediments from Thompson Sub-basin Sampling Sites Exceeding Provincial Sediment Quality Criteria and/or Interim Federal Guidelines for the Protection of Aquatic Life

Year	Variables	BCMELP Criterion*	Interim Federal Guideline⊗	THM2
1995	β-HCH	5	-	10.29
	p,p’-DDE	5	1.42	6.14
	Total DDT + metabolites	7	-	18.0

All values in ng/g dry weight and normalized to 1% TOC

* Lowest effects level

⊗ Threshold effects level

9.3 Lower Fraser Reaches

Pesticides were sampled in the Lytton to Chilliwack reach (LCH) in 1994, 1995 and 1996. The Harrison reach (HAR) was sampled in 1994 and 1995 and the Main Arm (MAN) and North Arm (NAR) of the Fraser River were sampled in 1995 and 1996 (Figures 1 and 2).

Concentrations of total pesticides (Figure 54) and total DDT metabolites (Figure 55) were significantly higher (2-way ANOVA, $p<0.05$) in the NAR and MAN reaches relative to the LCH reach and significantly higher ($p<0.001$) in 1996 than in 1995. This difference may be related to a greater amount of precipitation falling in the Fraser estuary in the two months prior to sampling in 1996, relative to 1995, resulting in additional DDT being introduced into the river through urban runoff. DDE+DDD/total DDT ratios in the Fraser estuary were generally higher in 1995 than in 1996 (Figure 51). This suggests that fresh, as opposed to weathered, DDT may be introduced into the Fraser estuary reaches during periods of high precipitation. The highest level of DDT and metabolites was measured in 1996 at the MAN3 site (5.85 ng/g). Total DDT and metabolite levels were higher in the HAR reach (up to 3.85 ng/g) than in the LCH reach in both 1994 and 1995. Accordingly, Macdonald *et al*. (1998b), have reported DDT levels in sediment cores from Harrison Lake to be several times higher than in lakes from the upper Fraser basin. A DDE+DDD/total DDT ratio >2 was measured in the HAR reach, over both years sampled, which may be linked to historical DDT use in this area as evidenced by the DDT signal in sediment cores from Harrison Lake (Macdonald *et al.,* 1998b). Mean total HCH and total chlordane levels were <1 ng/g in all reaches sampled.

The higher concentrations of pesticides measured in the NAR and MAN reaches are likely a combination of agricultural runoff from the Fraser River valley, urban runoff and WWTP inputs from the Greater Vancouver area. Derksen (draft, 1997) reported loadings of total organochlorine pesticides in WWTP effluents and CSO discharges to be in excess of 3 g/day in the Greater Vancouver area.

DDD and DDE concentrations measured in bed sediments from the MAN and NAR reaches were approximately an order of magnitude lower than those detected in 1989 by Swain and Walton (1990), indicating that environmental concentrations are decreasing in response to the banning of this pesticide in the mid 1970s. Similar declines in DDT and metabolite concentrations measured in Brunette River sediments were reported by FREMP (1996). Atmospheric deposition in the HAR reach may account for some of the pesticides measured in sediment samples, as many of the pesticides measured in this study were detected in dry air and rain samples at the nearby town of Agassiz (Belzer *et al*., 1997).

Three variables, measured in samples collected in 1994 and 1996, exceeded provincial criteria (BCMELP, 1995) and/or interim federal guidelines (CCME, draft, 1994) for the protection of aquatic life (Table 22). No pesticides exceeded these guidelines or criteria in the 1995 samples.

Table 22. Pesticide Concentrations in Bed Sediments from Lower Fraser Sampling Sites Exceeding Provincial Sediment Quality Criteria and/or Interim Federal Sediment Quality Guidelines for the Protection of Aquatic Life

Year	Variables	BCMELP Criterion*	Interim Federal Guideline⊗	LCH1	MAN1	MAN3	MAN4	NAR3
1994	γ-HCH	3	0.94	2.38				
1996	γ-HCH	3	0.94	6.14	1.17			1.03
	Total DDT	8	7			8.74	12.5	
	Total DDT and metabolites	7	-			9.59	13.39	8.85

All values in ng/g dry weight and normalized to 1% TOC.
* Lowest effects level
⊗ Threshold effects level

9.4 Summary

Individual organochlorine pesticide concentrations were generally low (<10 ng/g) throughout the Fraser basin. These levels were similar to those detected in rivers in the Great Lakes Areas of Concern (Bolattino, 1993) and in river basins studied in the U.S.A. (Ott, 1997; Stephens and Deacon, 1997; Tate and Heiny, 1997; Tornes *et al.,* 1996; USGS NAWQA, 1997). Samples occasionally exceeded guidelines or criteria for the protection of aquatic life; however these exceedences did not occur across all years sampled and were often marginal. Higher pesticide concentrations were detected at sites located in urban locations in both Kamloops and Vancouver, pointing to urban runoff as an important source of organochlorine pesticides. No differences were observed between reference and non-reference reaches in the upper Fraser basin where atmospheric deposition of globally transported pesticides and historical use are likely major sources. Although levels of DDT and metabolites have declined since the 1970s and 1980s, trace levels of organochlorine pesticides are likely to continue to be detected in the Fraser basin, given their high persistence and continued inputs through atmospheric sources originating from their use in other areas of the world.

10. NONYLPHENOL

Alkylphenol polyethoxylates (AP_nEOs) comprise the second largest group of nonionic surfactants in production since the 1940s (White *et al.*, 1994). The largest sources of AP_nEOs in the Canadian environment are pulp and paper mills and textile processing and manufacturing (WWF Canada, 1997). Other sources include plastics manufacturing, cleaners, oil production, pesticides, paints, metal processing and leather processing (WWF Canada, 1997). More than 300,000 tons of nonylphenol polyethoxylates (NP_nEOs) are produced annually worldwide. Approximately 60% of these compounds enter the aquatic environment through wastewater treatment facilities (Naylor *et al.,* 1992) where they are degraded to 4-nonylphenol (4-NP), nonylphenol mono and di-ethoxylates and octylphenol polyethoxylates, which are relatively stable metabolites (Ahel *et al.,* 1994a). Four-NP is moderately hydrophobic with a log K_{ow} of 4.48 (Ahel and Giger, 1993a) and a water solubility of 5.43 mg/L (Ahel and Giger, 1993b). Consequently, 4-NP tends to accumulate in sediment and sludge, while short chain NP_nEOs are more soluble (3.02-3.38 ng/L, Ahel and Giger, 1993a) and have been detected in drinking water in New Jersey, posing a risk to humans (Clark *et al.,* 1992).

NP and its ethoxylates are on the Canadian Environmental Protection Act's (CEPA) second Priority Substance List (PSL2) and will be assessed for toxicity based on effects on human health and the environment on which human health depends. Studies have shown that 4-NP is acutely toxic in the parts per billion range in salmon (McLeese *et al.,* 1981), fathead minnow (Holcombe *et al.,* 1984), cod (WWF Canada, 1997), shrimp (McLeese *et al.*, 1981) and mussels (Granmo *et al.*, 1989). The presence of 4-NP in the receiving environment is of increasing concern, since this contaminant has been shown to have estrogenic properties. Four-NP, 4-octylphenol (4-OP), 4-nonylphenol-di-ethoxylates (4-NP2EOs), and 4-nonylphenol-mono-carboxylates (4-NP1ECs) have been shown to induce vitellogenin gene expression in cultured rat hepatocytes, stimulate the growth of human breast cancer cells, increase the transcriptional activity of the estrogen receptor and mimic the binding of estradiol to the estrogen receptor (White *et al.*, 1994). In vivo studies with rainbow trout have demonstrated that 4-NP at concentrations as low as 10 ppb in the aquatic environment result in an increased transcription of vitellogenin in the liver (Lech *et al.*, 1996).

Total 4-NP, representing the total of all 4-NP isomers, has been measured in WWTP effluent Ahel *et al.*, (1994a) and in the Glatt River in Switzerland (Ahel *et al.,* 1994b). In Canada, Bennie *et al.* (1996) have measured 4-NP and its precursors in water and bottom sediments from the Great Lakes and the St. Lawrence River. In the Fraser River basin, 4-NP was measured in final WWTP effluent (GVRD, draft, 1996) and in suspended sediments and water (Sylvestre *et al.,* 1998a; 1998b).

Refer to Appendix C for mean concentrations measured in each reach and to Appendix D for concentrations measured at individual sites.

10.1 Upper Fraser Reaches

Total 4-NP was analyzed in bed sediments collected from the McBride (MBD), Quesnel to Prince George (QPG) and Lytton to Quesnel (LQN) reaches in 1994. In 1995 it was analyzed in bed sediments from four additional reaches: Nechako River (NEC), Stuart River (SRT), Chilcotin River (CHN) and Quesnel River (QNL) (Figure 1).

Mean total 4-NP concentrations measured in 1995 were not significantly different among the NEC, MBD, QPG and LQN reaches (1-way ANOVA, $p=0.063$), however the concentration measured in the SRT reach (570 ng/g) was over 60 times higher than those measured in the QPG and LQN reaches (Figure 56). Only a single sample was analyzed from the SRT reach, therefore this value could not be verified. Nevertheless, the discharge of treated municipal wastewater from the city of Fort St. James is a likely source. Total 4-NP was not detected in the NEC and QNL reference reaches. Although not statistically significant, the 1995 data suggests that 4-NP levels may be elevated downstream of Prince George and Quesnel. However, additional sampling would be required to establish this apparent pattern. Total 4-NP concentrations measured in 1994 in suspended sediments downstream of Quesnel were seven times higher relative to a reference location, upstream of Prince George (M. Sekela, Environment Canada, unpublished data). Total 4-NP was not significantly correlated (Pearson, $n=44$) with either the sediment TOC ($p=0.641$) or the fine particle size fraction ($p=0.602$). Guidelines and criteria do not presently exist for 4-NP.

10.2 Thompson Sub-basin Reaches

Total 4-NP was analyzed in bed sediments collected in 1995 from four Thompson sub-basin reaches: North Thompson River (NTH), South Thompson River (STH), South Thompson River in Kamloops (STK1A) and Thompson River (THM) (Figure 1).

Mean total 4-NP concentrations were between four to nine times higher at the urban site (STK1A) and the THM reach than those measured in the NTH and STH reference reaches (Figure 57). No significant differences (1-way ANOVA, $p=0.084$) were found between the NTH, STH and THM reaches, due to a large within reach variability in the THM reach resulting from a relatively high concentration of 4-NP measured at THM2. This site is located downstream of both the pulp mill and WWTP outfalls and may be influenced by potential 4-NP inputs from these sources. The STK1A site is influenced by urban runoff which is also a likely source of 4-NP.

10.3 Lower Fraser Reaches

Total 4-NP was measured only in the Lytton to Chilliwack (LCH) reach in 1994. In 1995 it was measured in the all lower Fraser reaches: LCH, the Harrison River (HAR) and the Main (MAN) and North (NAR) Arms of the Fraser River. In 1996 it was measured in the same reaches with the exception of the HAR reach (Figures 1 and 2).

Total 4-NP concentrations measured in 1995 and 1996 was significantly higher (2-way ANOVA, $p<0.05$) in the NAR reach compared to both the MAN and LCH reaches (Figure 58). Concentrations in the heavily industrialized NAR reach, which receives considerable volumes of stormwater runoff, were approximately three times higher than in the LCH reference reach and approximately two times higher than in the MAN reach. As urban creeks receiving large volumes of stormwater runoff have been shown to have high concentrations of 4-NP (Sekela *et al.,*1998), much of the 4-NP loading into the NAR reach probably originates from this source and direct stormwater discharges. The MAN reach, which receives effluents from two municipal WWTPs, had significantly higher concentrations of 4-NP (2-way ANOVA, $p<0.05$) than the LCH reach. Sylvestre *et al.,* (1998b) have shown that the Annacis Island WWTP is an important source of 4-NP to the Main Arm of the Fraser River, and that levels of 4-NP in suspended sediments are elevated, relative to background levels, as far as 6 km downstream of the WWTP outfall. Significantly higher concentrations of 4-NP were measured in 1995 compared to 1996 ($p<0.001$). Total 4-NP was not detected in the HAR reach.

4-NP concentrations in sediment cores and sediment grabs from the Strait of Georgia (Shang *et al.,* 1997) are reported to be between 5-8 times higher than those measured in the NAR reach. The higher levels may be attributed to samples in the Strait of Georgia being subject to inputs from two WWTPs, in addition to those in the Fraser River. A second possible reason is the fact that core samples contain a greater proportion of anaerobic sediments than surface sediment samples, which favor the degradation of polyethoxylate precursors to 4-NP (Ahel *et al*., 1994a). In comparison to levels measured in other river systems, concentrations measured in the Fraser basin were relatively low: 4-NP in the NAR reach were from 4-2,000 times lower than those measured in bottom sediments from heavily industrialized sites in the St. Lawrence River in Ontario (Bennie *et al*., 1996) and 71 times lower than those measured in the Glatt River in Switzerland (Ahel *et al*., 1994b).

10.4 Summary

With the exception of the Stuart River sample, total 4-NP concentrations in bed sediments were clearly related to the degree of urbanization in the various reaches sampled. Sites located downstream of municipal wastewater treatment plants or subject to urban runoff generally had higher 4-NP levels than rural sites. Accordingly, the North Arm of the Fraser River, which receives large volumes of storm water, had the highest levels of 4-NP. Concentrations of 4-NP in Fraser River bed sediments are considerably lower than those measured in Switzerland’s Glatt River and Canada’s St. Lawrence River. The biological impact of the levels of 4-NP measured in the Fraser basin cannot presently be determined in the absence of toxicological data and guidelines or criteria relating to 4-NP in sediments.

11. TOTAL TRACE METALS

Trace metal concentrations in river sediments are an important indicator of environmental quality due to their potential toxicity to aquatic life. The metals of greatest concern in aquatic systems are: copper, zinc, cadmium, mercury, arsenic and lead. These elements are toxic to organisms above specific threshold concentrations but many of them, such as copper and zinc, are essential for metabolism at lower concentrations. Lead and cadmium have no known biological function (Rand, 1995).

Metal toxicity has been shown to be affected by a number of variables, including temperature, oxygen levels, pH (Foulkes, 1990), water hardness and the presence or absence of other metal ions (Enserink *et al.,* 1991). Heavy metals such as lead, mercury and cadmium have been shown to readily accumulate in the food chain with resultant harmful effects in the uppermost trophic levels (Watras and Bloom, 1992).

Most metals found in surface waters are derived from natural weathering of metal-bearing soils and rocks. Anthropogenic sources include industrial processes (smelting, finishing and plating of metals, paint and dye manufacture), pipes and tanks in domestic systems and automobile use (Rand, 1995). In urban areas, atmospheric inputs can account for as much as 50% of metal inputs to aquatic sediments (Nriagu *et al.,* 1979).

Mining may also contribute trace metals to receiving waters in the Fraser River basin. As of 1991, there were six active metal mines in the basin extracting copper, molybdenum, silver and gold (Schreier *et al.,* 1991). Although most mines have self-contained water treatment systems, acid mine drainage from tailings and waste rock from abandoned mines still remains a concern. The Giant Mascot Nickel mine near Hope, although closed for over 20 years, was still releasing acid mine drainage, likely rich in nickel and copper, as recently as 1991 (Schreier *et al.,* 1991). There is also concern over mercury contamination from the abandoned Pinchi Lake mine in the Stuart River sub-basin, where mercury-rich tailings were deposited in Pinchi Lake during the 1930s and 1940s. The disturbance and release of mercury-contaminated sediments in historic placer mining could potentially have an impact in some selected locations where old claims are reworked. There are currently several large placer mining sites and over 200 smaller ones in operation in the Cariboo and upper Bridge River areas of the Fraser basin (Schreier *et al.,* 1991).

A list of trace metals analyzed in this study is presented in Table 23. Refer to Appendix C for mean concentrations measured in each reach and to Appendix D for concentrations measured at individual sites.

Table 23. Trace Metals Analyzed in Bed Sediments from the Fraser River Basin

Arsenic	Iron	Molybdenum
Cadmium	Lead	Nickel
Chromium	Manganese	Selenium
Cobalt	Mercury	Zinc
Copper		

11.1 Upper Fraser Reaches

Total metals were analyzed in bed sediments from seven upper Fraser basin reaches sampled in 1994: Nechako River (NEC), McBride (MBD), Quesnel to Prince George (QPG), Lytton to Quesnel (LQN), Stuart River (SRT), Chilcotin River (CHN) and Quesnel River (QNL) (Figure 1).

Trace metals were analyzed by 1-way analysis of covariance (ANCOVA) with the silt/clay fraction as the covariate. The silt/clay fraction was a significant confounding variable for the following metals: iron, cobalt, copper, zinc and selenium ($p<0.05$). Refer to Figure 59 for metals which were found to differ significantly ($p<0.05$) between reaches. Manganese was significantly higher in the NEC, QPG and LQN reaches relative to the MBD reach. Selenium was significantly higher in the QPG and LQN reaches relative to both the NEC and MBD reference reaches, however this metal was several fold higher at the reference site in the QNL reach. Lead was significantly higher in both the MBD and QPG reaches relative to LQN and NEC reaches, indicating that these concentrations may represent natural background levels for the basin. Copper was significantly higher in the MBD, QPG and LQN reaches relative to the NEC reach. However, the highest copper levels were measured in the CHN and QNL reference reaches which have a number of natural copper deposits (K. Andrews, BCMELP, pers. comm.). Arsenic was significantly higher in the QPG reach relative to the MBD reach, although levels measured in the SRT and QNL reference reaches were approximately double and triple, respectively, those measured in the QPG reach. Mercury was significantly higher in the LQN reach, downstream of Quesnel, relative to both the MBD and QPG reaches. Placer mining on the main stem of the Fraser and Quesnel River banks (K. Andrews, BCMELP, pers. comm.) may have contributed to the higher mercury levels in this reach.

The highest overall metal concentrations were measured at reference sites in the QNL and CHN reaches. Neither of the two active mines in the Quesnel River drainage have any specific point source discharges (K. Andrews, BCMELP, pers. comm.), however a number of abandoned mines may be contributing to elevated metal levels in these reference reaches.

Metal concentrations in bed sediments were compared to BCMELP's sediment quality criteria for the protection of aquatic life (BCMELP, 1995). Chromium, manganese, iron, nickel and copper exceeded lowest effect level criteria at all sites, including reference sites (Figure 60). Chromium and iron also exceeded the severe effect level criterion at multiple sites in the upper Fraser region, while manganese and nickel exceeded this criterion only at the CHN2 site. Arsenic exceeded the lowest effect level criterion of 6.0 µg/g at seven sites in the NEC, QPG, SRT and QNL reaches. The origin of elevated sources of arsenic in these reaches may be linked to geochemical factors.

Metal concentrations exceeding provincial sediment quality criteria have been routinely measured at water quality stations throughout the upper Fraser basin with some of the largest criteria exceedences occurring in the Quesnel River basin (Wainwright*et al.,* 1995). Metal concentrations, measured by Hatfield (1997), in depositional sediments upstream and downstream of the pulp mills at Prince George and Quesnel were up to 50% lower than those measured in our study. This difference, however, is likely attributed to the comparatively smaller silt and clay fraction of their samples (mean = 32%, SD=29%) relative to that measured in the MBD, QPG and LQN reaches in the present study (mean=65%, SD=9%).

11.2 Thompson Sub-basin Reaches

Total trace metals were analyzed in bed sediments collected in 1994 from four Thompson sub-basin reaches: North Thompson River (NTH), South Thompson River (STH), South Thompson River in Kamloops (STK1A) and Thompson River (THM) (Figure 1).

Iron concentrations were significantly higher ($p<0.05$) in the THM and NTH reaches compared to the STH reach (Figure 61). Cobalt and nickel concentrations were significantly higher in the THM reach relative to the STH reach but similar to levels measured in the NTH reach (Figure 61). The silt/clay fraction was found to be a significant confounding factor ($p<0.05$) for the same metals as in the upper Fraser reaches (iron, cobalt, copper, zinc, selenium) as well as mercury.

Although not statistically significant, the remainder of the metals were all higher in concentration in the NTH reach relative to the STH reach, suggesting that background trace metal levels may be higher in the NTH reach. Wainwright *et al.* (1995) reported a greater number of metals exceeding provincial sediment quality criteria in North Thompson River bed sediments compared to South Thompson and Thompson River bed sediments. The observed trace metal concentration pattern may be related to differences in the geochemical character of these reaches.

The urban sampling site on the South Thompson River at Kamloops (STK1A) had elevated levels of all metals measured with the exception of molybdenum and selenium, in comparison to concentrations measured upstream in the South Thompson (STH) reach. This site also had the highest lead concentration measured in this study (21 μg/g). Metal concentrations were generally similar between the three urban sites in the Thompson reach (THM2, THM3, THM4) and the rural site downstream of Kamloops Lake (THM1). Metal concentrations measured in sediments from the THM reach were similar to those reported by Hatfield (1997), although Hatfield did not detect differences in metal concentrations between reference sites (Little Shuswap Lake and Thompson River) upstream of the pulp mill and treatment sites downstream of the mill.

Metal concentrations of bed sediments were compared to provincial sediment quality criteria for the protection of aquatic life (BCMELP, 1995). Chromium, manganese, iron, nickel and copper exceeded BCMELP lowest effect level (LEL) criteria at the majority of sites, including reference sites, and severe effect level criteria were exceeded for chromium, manganese and iron at some of the sites (Figure 62). The exceedence of criteria in both reference and non-reference reaches indicates the presence of naturally high background levels of these five metals, all of which are normal constituents of sediments. Wainwright *et al.* (1995) similarly reported exceedences of provincial sediment quality criteria for the same trace metals as in the present study.

11.3 Lower Fraser Reaches

Trace metals were analyzed in bed sediments collected from the Lytton to Chilliwack (LCH) and Harrison River (HAR) reaches in 1994 and from the LCH, Main Arm (MAN) and North Arm (NAR) reaches in 1995 and 1996 (Figures 1 and 2).

Two way ANCOVAs (with the silt/clay fraction as covariate) were used to determine differences between reaches sampled in 1995 and 1996. The silt/clay fraction was found to be a significant confounding variable for cobalt, nickel, copper, zinc, lead and mercury. Refer to Figure 63 for metals which showed significant differences between reaches ($p<0.05$). All metal concentrations were significantly higher in the NAR reach compared to the LCH reach, with the exception of arsenic, which was significantly higher in the MAN reach relative to the LCH reach. Cobalt, copper, zinc and lead concentrations were significantly higher in the NAR versus the MAN reach, reflecting the industrial character and large number of storm water inputs in the former reach. Cobalt and mercury concentrations were significantly higher in 1996 than in 1995 ($p<0.05$). A significant interaction ($p<0.05$) between year and reach was found for mercury, due to interlaboratory analytical variability, as different labs were used for samples collected in these two years.

The HAR reach had higher levels of copper, zinc, lead and mercury relative to the LCH reach but similar metal concentrations to those measured in the urbanized NAR and MAN reaches (Figure 63). Macdonald *et al.* (1998b) have reported high fluxes of lead in sediment cores from Harrison Lake and linked them to the use of leaded gasoline prior to 1990. Moreover, atmospheric deposition of metals from the Greater Vancouver metropolitan area is also likely contributing to the total metal load in this reach (W. Belzer, Environment Canada, pers comm.).

Refer to Figure 64 for trace metals exceeding provincial sediment quality criteria for the protection of aquatic life (BCMELP, 1995). Chromium, manganese, iron, nickel and copper exceeded lowest effect level criteria at all sample sites, with a number of sites exceeding severe effect level criteria. Chromium also exceeded the draft sediment quality objective of 26 μg/g for the Main Arm (Swain *et al.,* draft, 1995). Arsenic (Figure 65) exceeded the lowest effect level criterion of 6 μg/g in all reaches with the exception of the HAR reach. Relatively high arsenic concentrations were measured at the MAN2 site located downstream of four wood preservation facilities. Zinc (Figure 65) exceeded the lowest effect level criterion of 120 μg/g only in the heavily industrialized NAR reach which receives a relatively large influx of stormwater in comparison to the MAN reach. All other metals for which provincial criteria or interim federal guidelines exist were below specified limits.

Sources of metal contamination to the Fraser estuary reaches include wastewater treatment plant discharges, storm water sewers and industrial discharges. Residential and industrial wastewater is reported to be a significant source of copper, mercury, cobalt, nickel, selenium, lead and zinc (GVRD, draft, 1996). Use of copper arsenate (a wood preservative) at a number of wood treatment facilities located in the Fraser River estuary (Envirochem, 1992) may be responsible for the relatively high arsenic levels observed in the NAR and MAN reaches.

Previous studies conducted in the Fraser River estuary have similarly reported metal concentrations exceeding interim federal sediment quality guidelines and provincial criteria for many of the same metals measured in the present study, including nickel, chromium, arsenic, copper and manganese (Swain and Walton, 1990; 1991; 1993). Lead concentrations were similar to those measured by Swain and Walton in 1990 and 1992, suggesting that levels of this metal may be leveling off after an initial sharp decrease associated with the banning of leaded gasoline in 1990. In spite of the consistent exceedences of criteria and guidelines, bed sediments from slough and backwater areas in the Fraser estuary were generally non-toxic to test organisms (Swain and Walton, 1993), although some toxicity was found using the solid phase Microtox® assay, amphipod survival and sand dollar fertilization tests (FREMP, 1996). No correlations were found between sediment toxicity conducted on Fraser River sediment and trace metal exceedence or metal bioavailability (FREMP, 1996).

11.4 Summary

Metal concentrations measured over the three year sampling period were higher in the Fraser estuary reaches (NAR and MAN) than those measured in the upper and middle Fraser main stem reaches (MBD, QPG, LQN and LCH) for copper, zinc, lead and arsenic. This is likely the result of extensive urbanization of the Fraser estuary reaches and inputs from industrial sources. The NAR reach generally had higher metal concentrations relative to the MAN reach, owing to its more industrialized nature, large number of stormwater inputs and lower capacity for dilution in comparison to the latter reach.

Although metal levels were generally elevated in the NAR and MAN reaches in comparison to main stem reaches of the upper Fraser basin, concentrations measured in the reference reaches of CHN and QNL often exceeded those measured in the Fraser estuary. Past mining activity may be enriching the sediments of the QNL and CHN reference reaches, while elevated levels of some metals measured in the HAR reach may be related to atmospheric deposition of trace metals from the greater Vancouver area.

Chromium, manganese, iron, nickel and copper exceeded provincial criteria at nearly all sites in the Fraser basin, indicating that these metals are naturally high in the sediments. Arsenic exceedences in the Fraser estuary may be linked to the use of arsenic-based wood preservatives; however, the origin of elevated concentrations of arsenic in some reference reaches remains unknown. In spite of these exceedences, most metals measured in the Fraser basin were lower in concentration than those found in the Columbia and Mississippi rivers (Bortleson *et al.,* 1994; Garbarino, *et al*., 1995), the Great Lakes Areas of Concern

(Bolattino, 1993) and many rivers in the U.S.A. (Tornes *et al*., 1996; Ott, 1997; USGS NAWQA, 1997).

12. CONCLUSIONS

Dioxins, furans, chlorophenolics, resin acids, PAHs, and 4-nonylphenol were generally measured in higher concentrations downstream of pulp mills and urban centres relative to reference locations throughout the Fraser River basin. In areas impacted by urban runoff, organochlorine pesticides and PCBs were elevated relative to reference locations. While most metals were found to be naturally high in sediments throughout the Fraser basin, elevated concentrations of some metals were observed in or downstream of urban centres in the upper Fraser, Thompson and lower Fraser rivers.

Congener-specific source analysis indicates that historical use of pentachlorophenol and combustion are major dioxin and furan sources in the Fraser basin. Chlorophenolics were dominated by the pulp mill specific chlorocatechols and chloroguaiacols, while chlorophenols associated with wood preservation were measured in trace levels. Wood processing industries are likely elevating the levels of resin acids in reaches downstream of urban centres in the upper and lower Fraser basin, while natural sources are probably responsible for the occasional elevated levels of fatty acids. Analysis of parent and alkylated PAH distributions indicates both petroleum (both natural and anthropogenic) and combustion inputs throughout the basin. Urban runoff is likely the greatest source of PCBs and chlorinated pesticides measured, although atmospheric inputs are also probable sources. Elevated levels of 4-nonylphenol measured in or downstream of urban centres may originate from municipal and pulp mill effluents and urban runoff. Although the source of the majority of metals in bed sediments appears to be natural, the observed enrichment of copper, zinc, lead and arsenic in sediments from the Fraser estuary is likely linked to urban runoff and industrial sources.

Concentrations of dioxins, furans, chlorophenolics, PCBs, pesticides and lead were reduced from levels measured prior to 1991, due to abatement measures implemented in the 1980s and early 1990s. Exceedences of federal guidelines, provincial criteria and regional objectives for the protection of aquatic life in bed sediments were measured for dioxins and furans, PAHs, PCBs, pesticides and trace metals.

Geographically, urbanized reaches, such as the Fraser estuary and Thompson River, were the most heavily impacted areas in the basin. The upper Fraser basin was the least impacted, although elevated levels of contaminants associated with pulp mills and municipal WWTPs were measured downstream of urban centres. The highly urbanized and industrialized Fraser estuary generally had the highest levels of contaminants measured in bed sediments.

On a larger scale, with the exception of fatty acids and non-chlorinated resin acids, contaminants were similar or lower than those measured in other large river systems throughout North America. Although, the environmental quality of bed sediments from the Fraser River basin is considered to be generally acceptable, the Thompson River and Fraser estuary should continue to be monitored to ensure that the environmental quality does not further degrade as a result of increasing stress from population growth.

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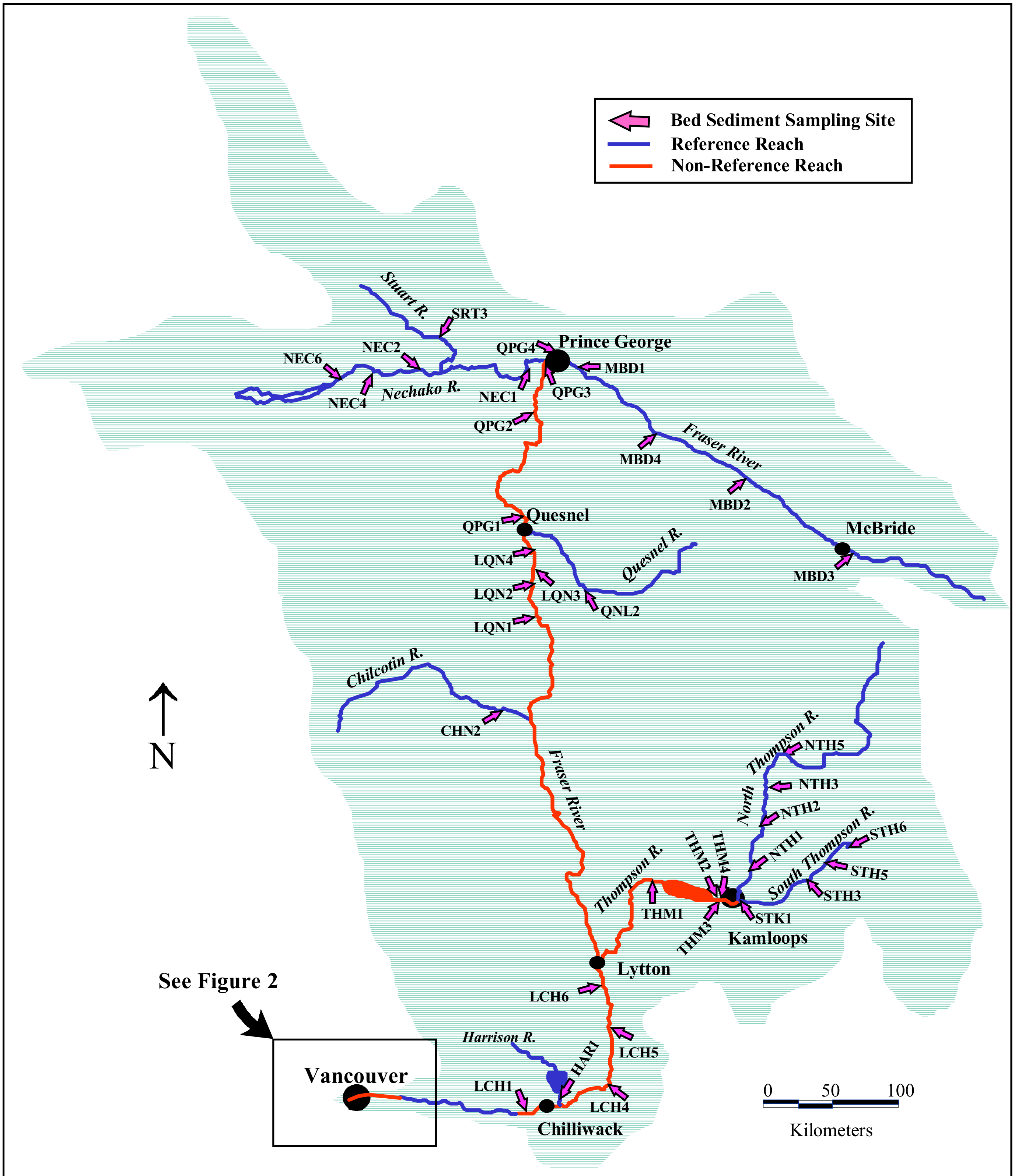

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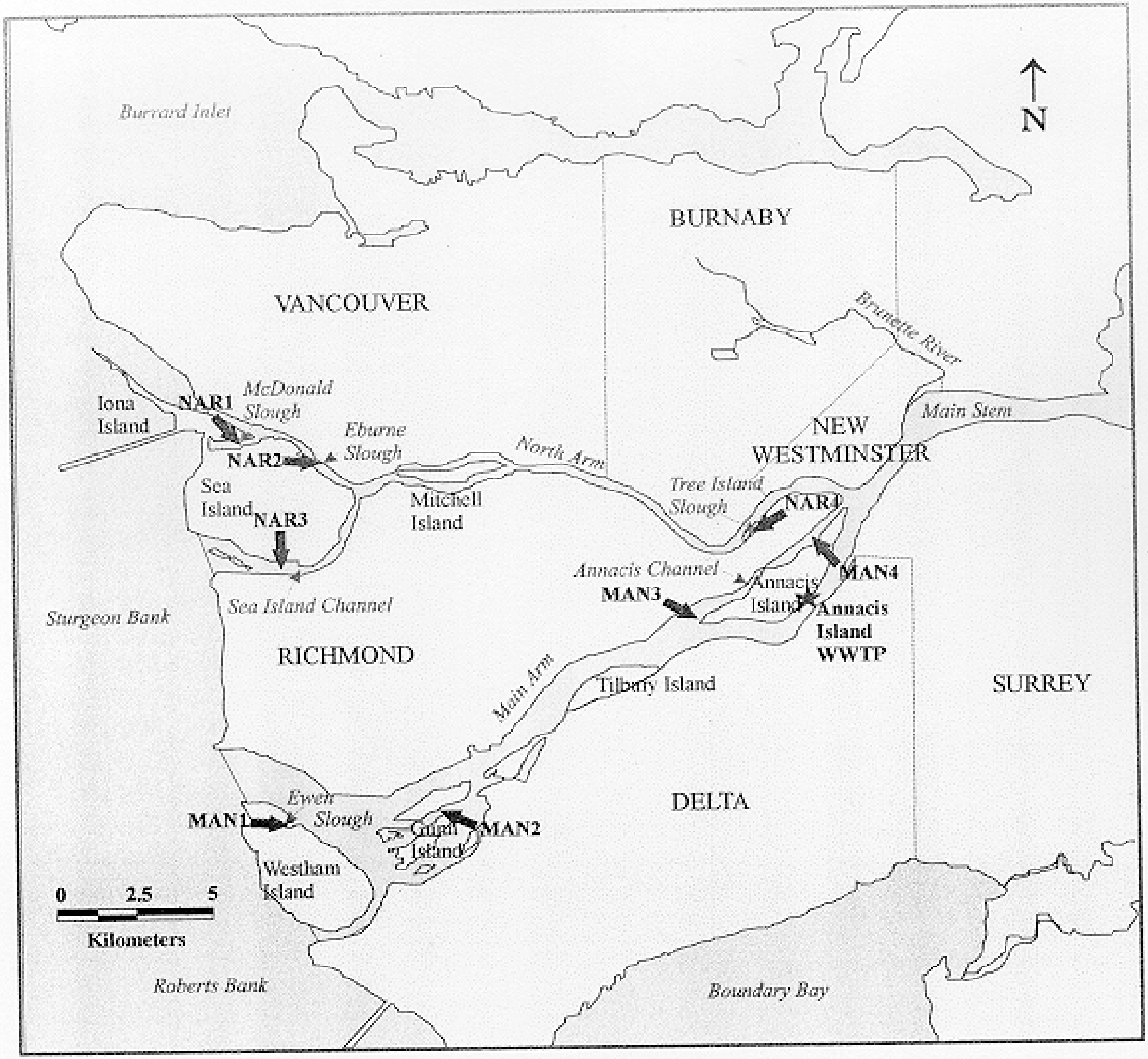

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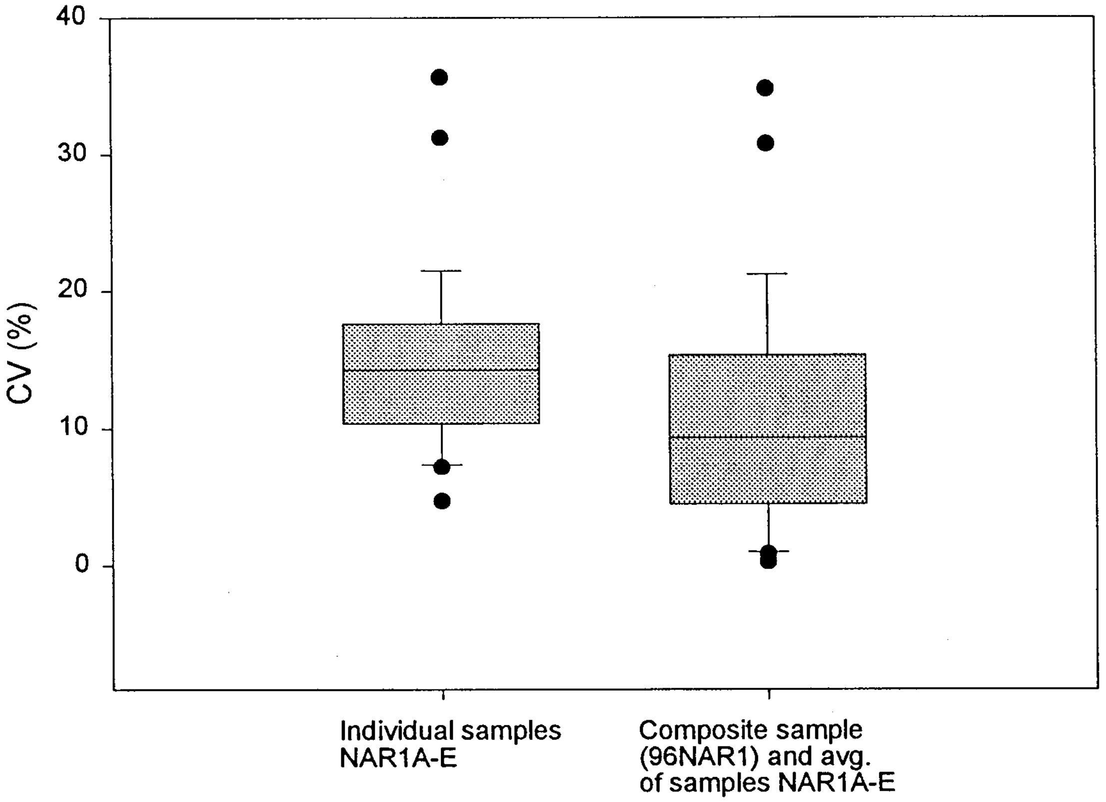

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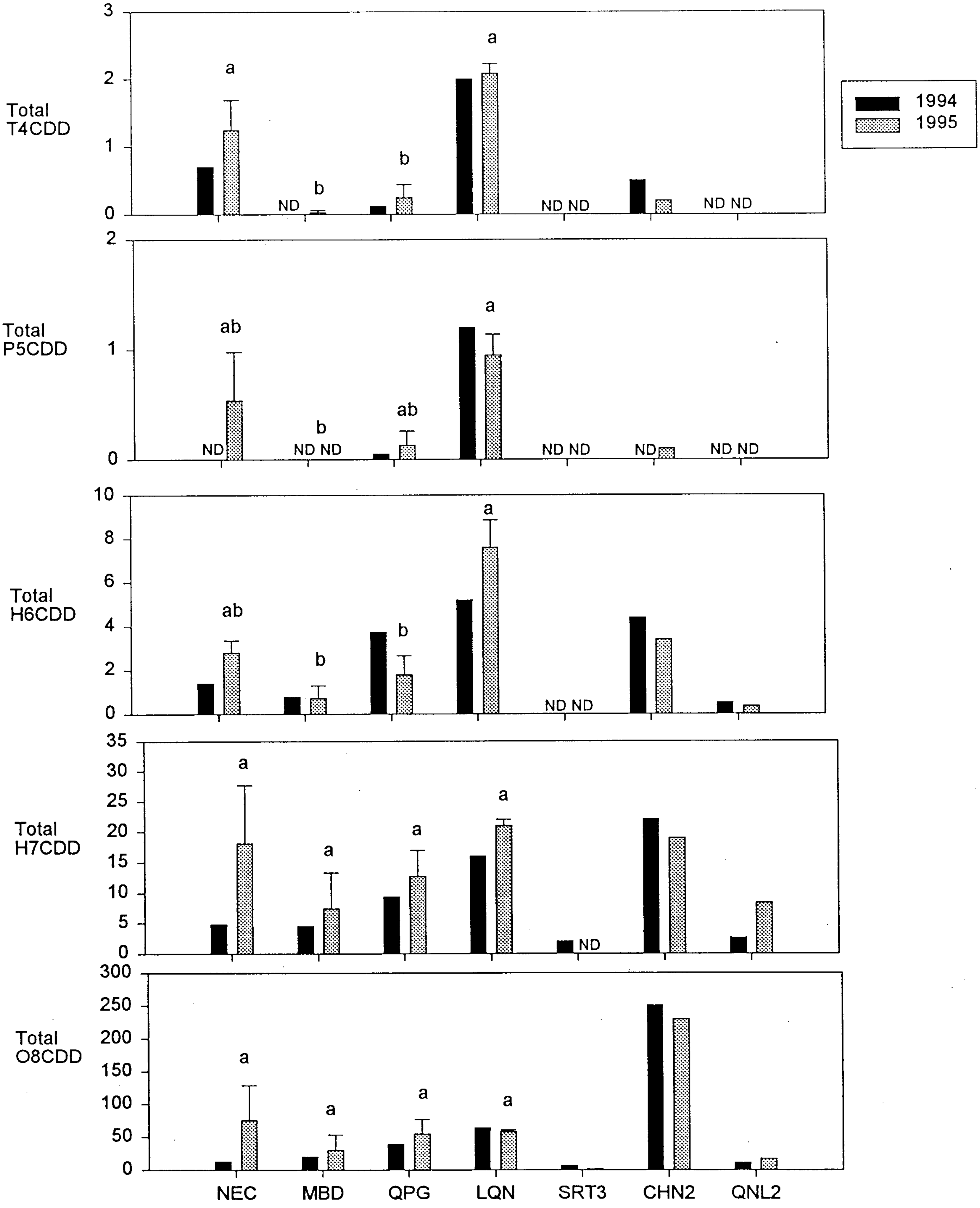

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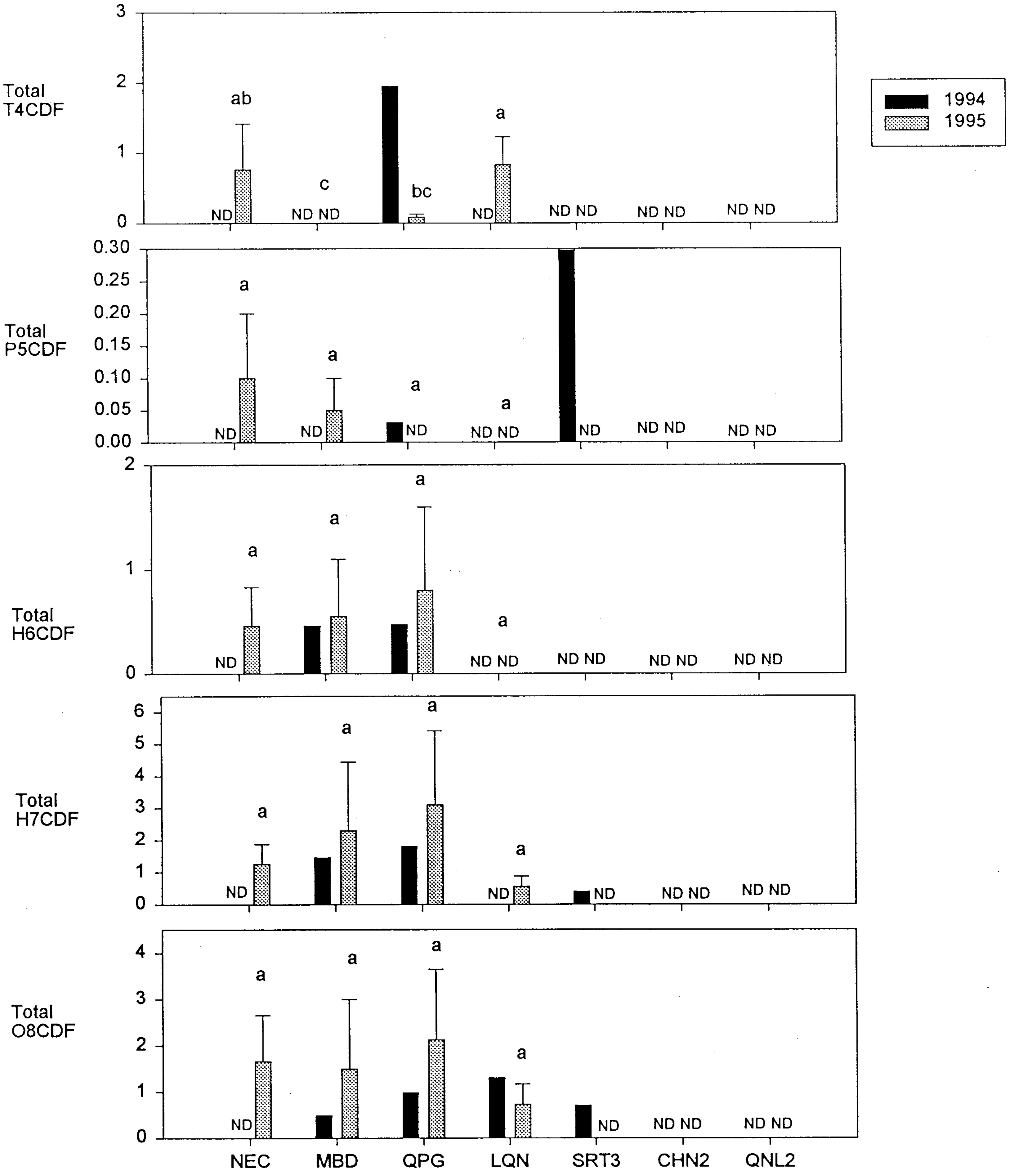

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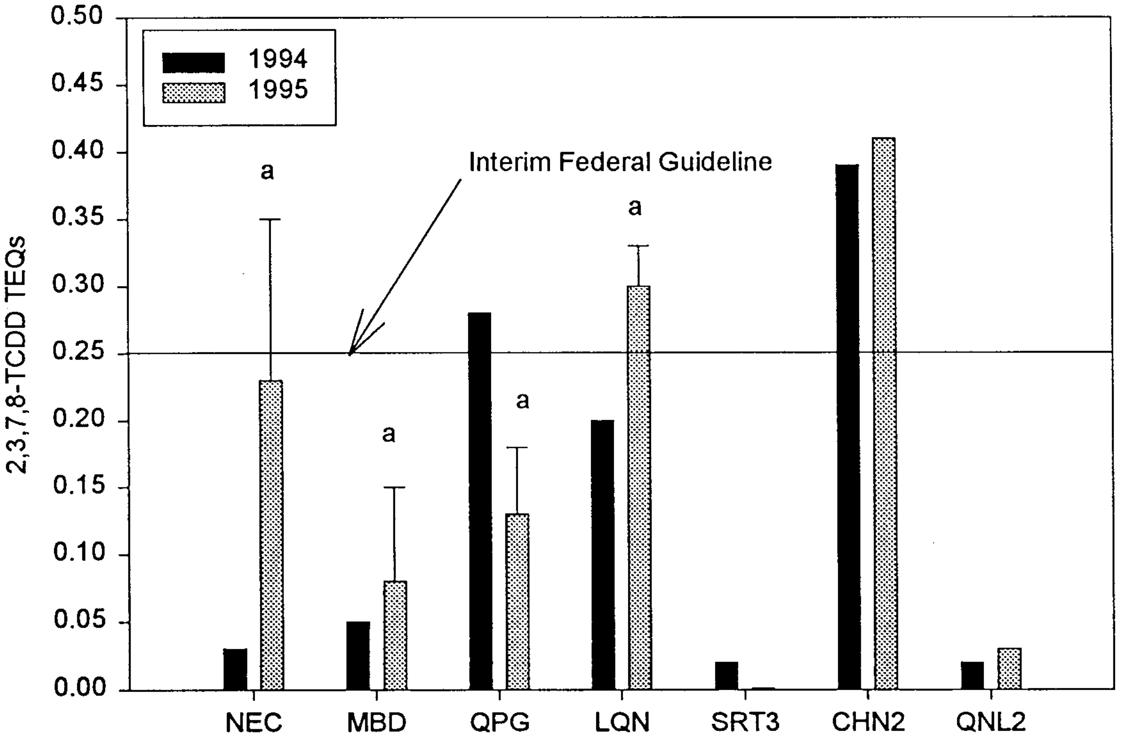

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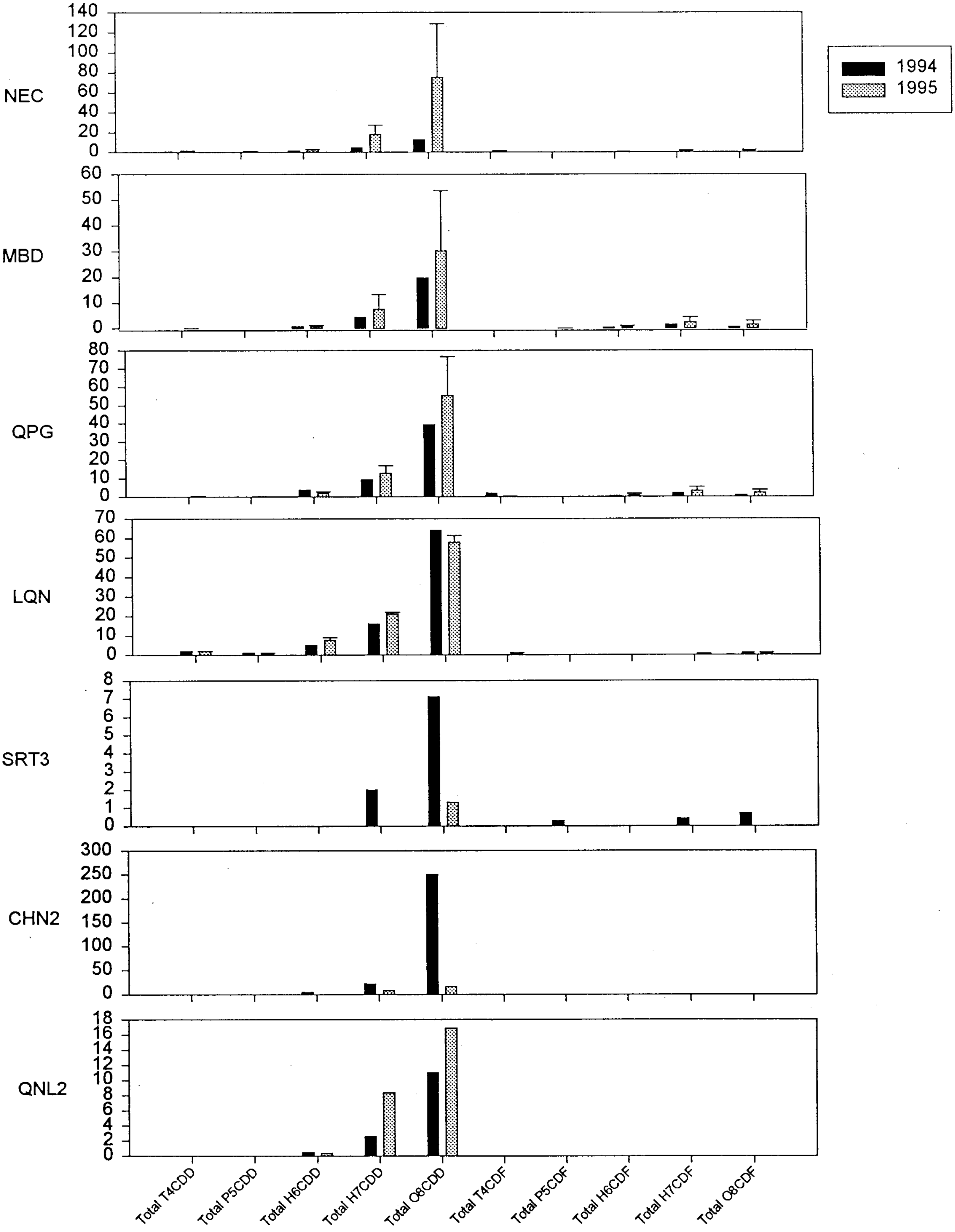

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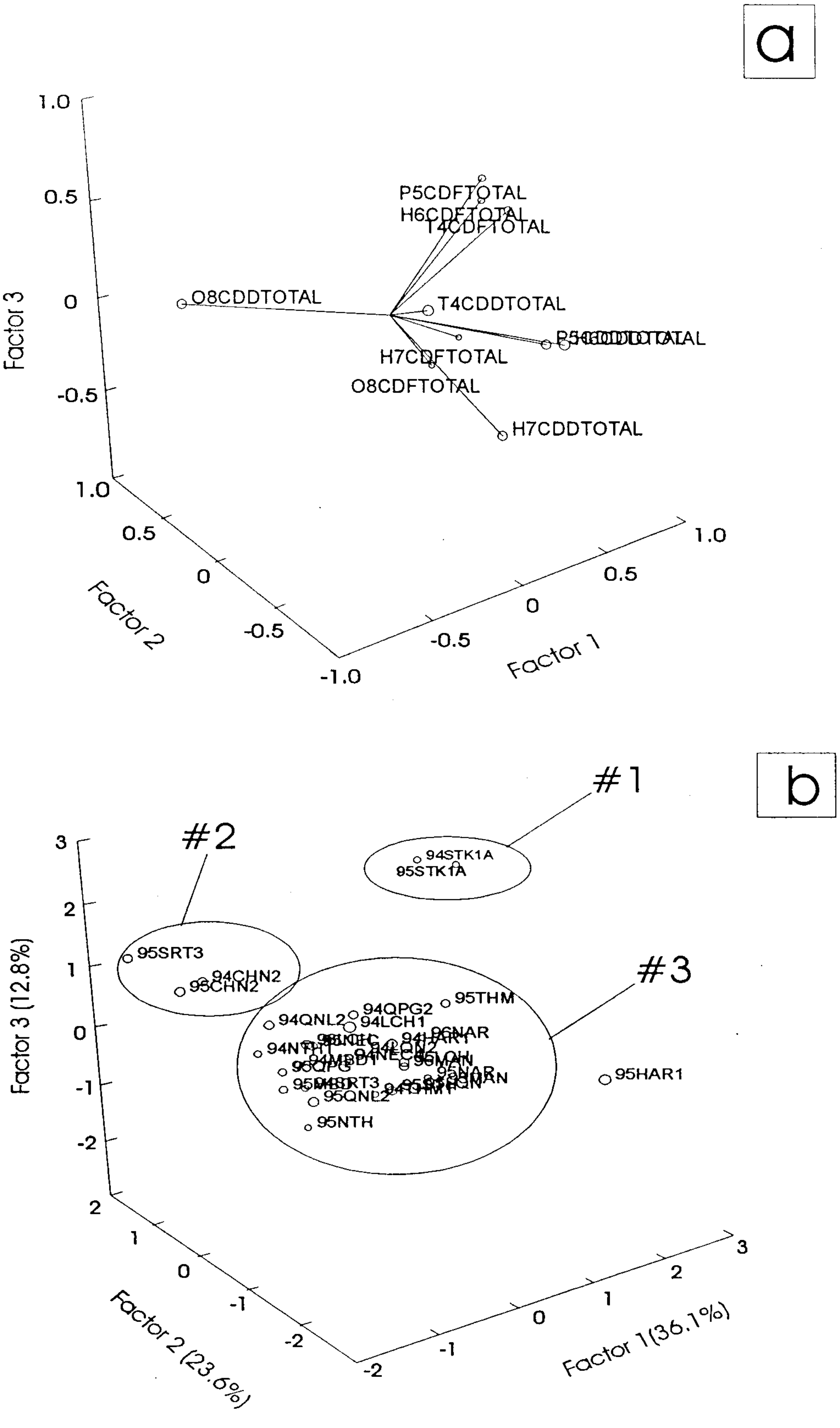

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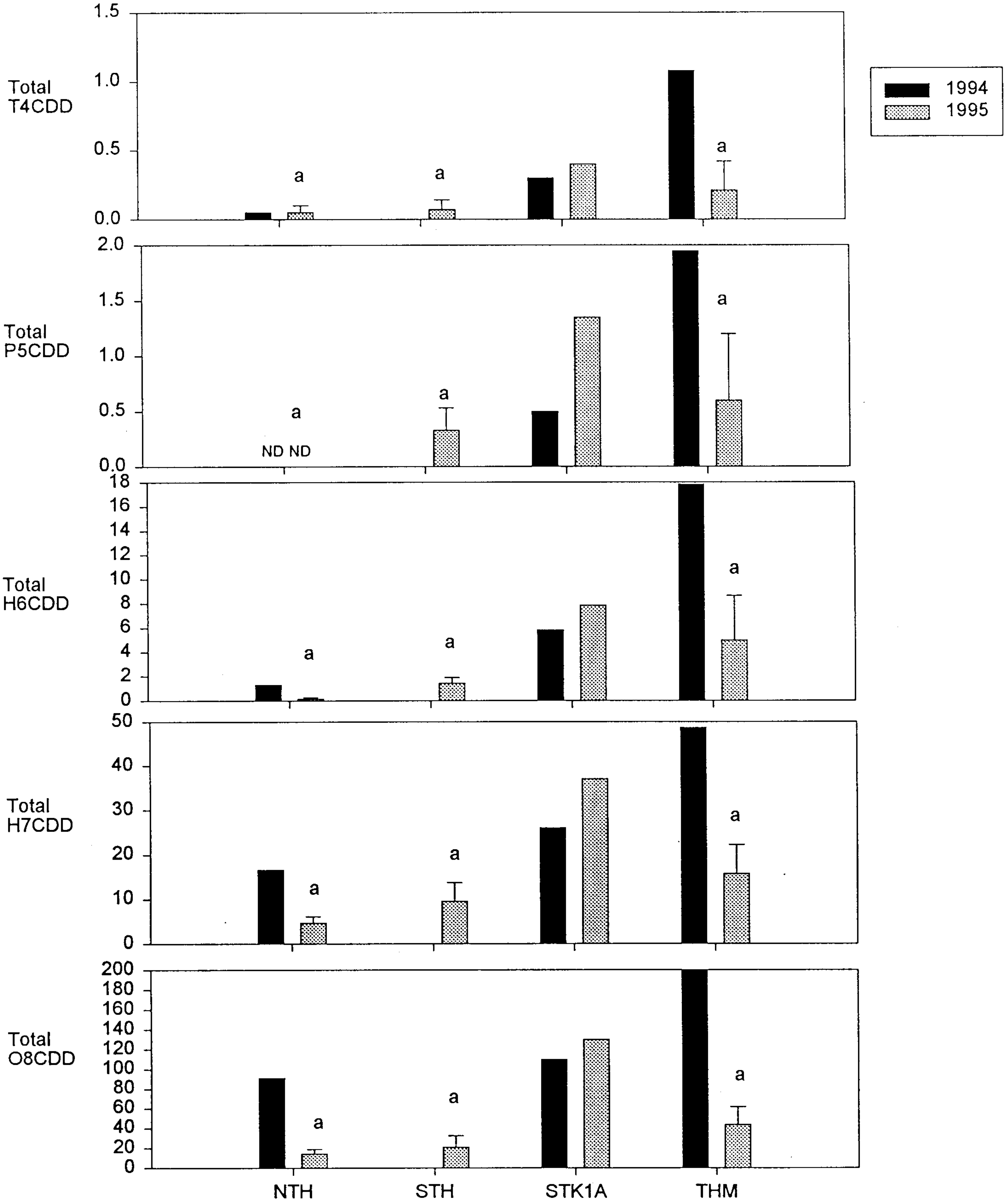

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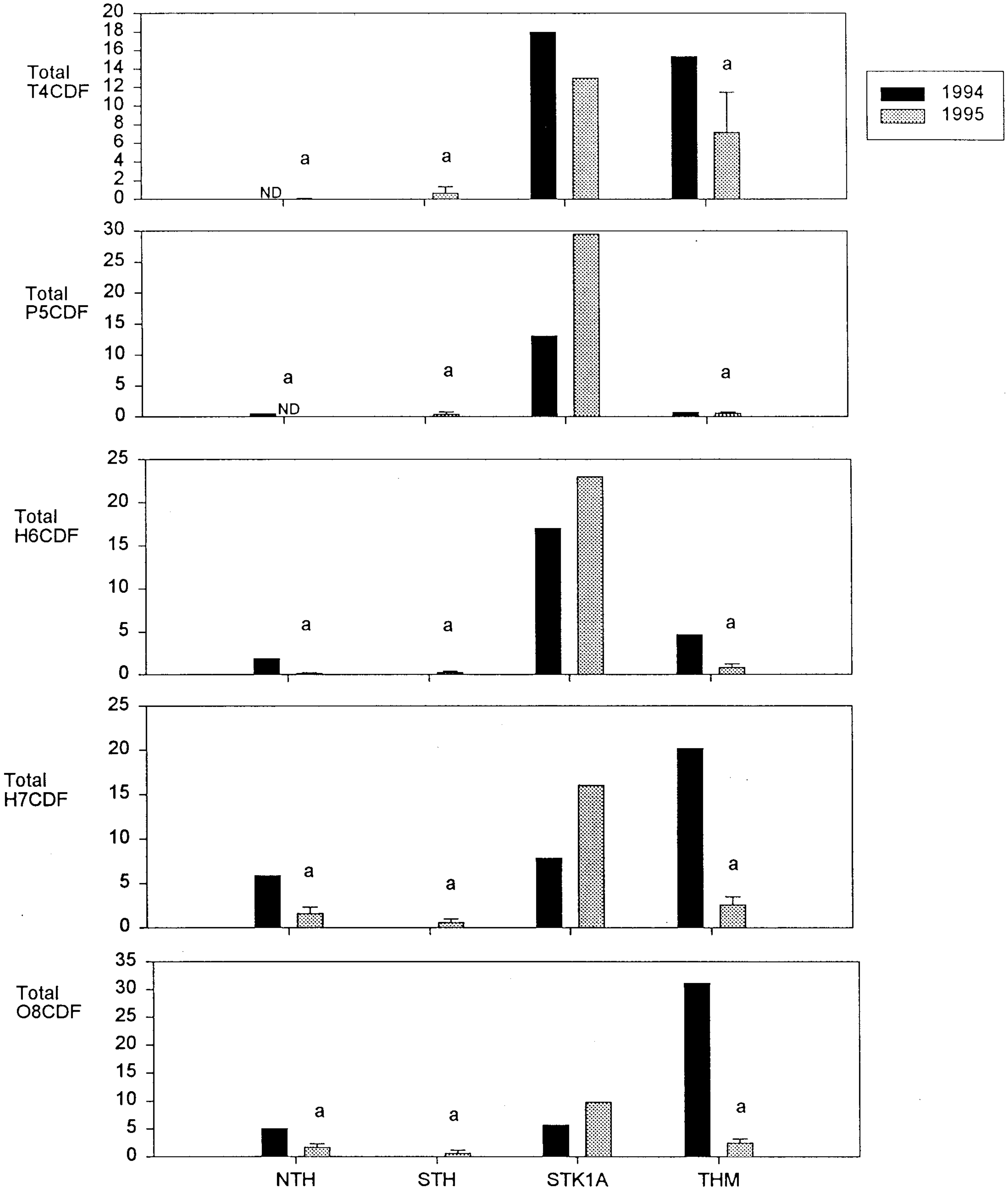

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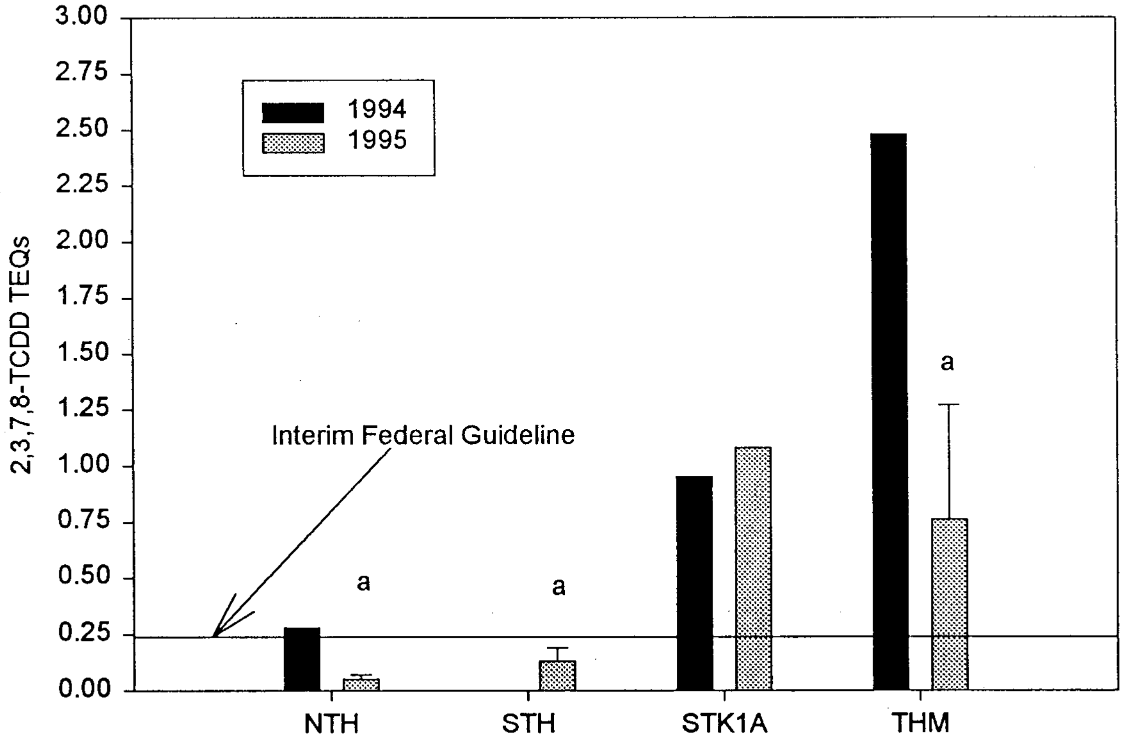

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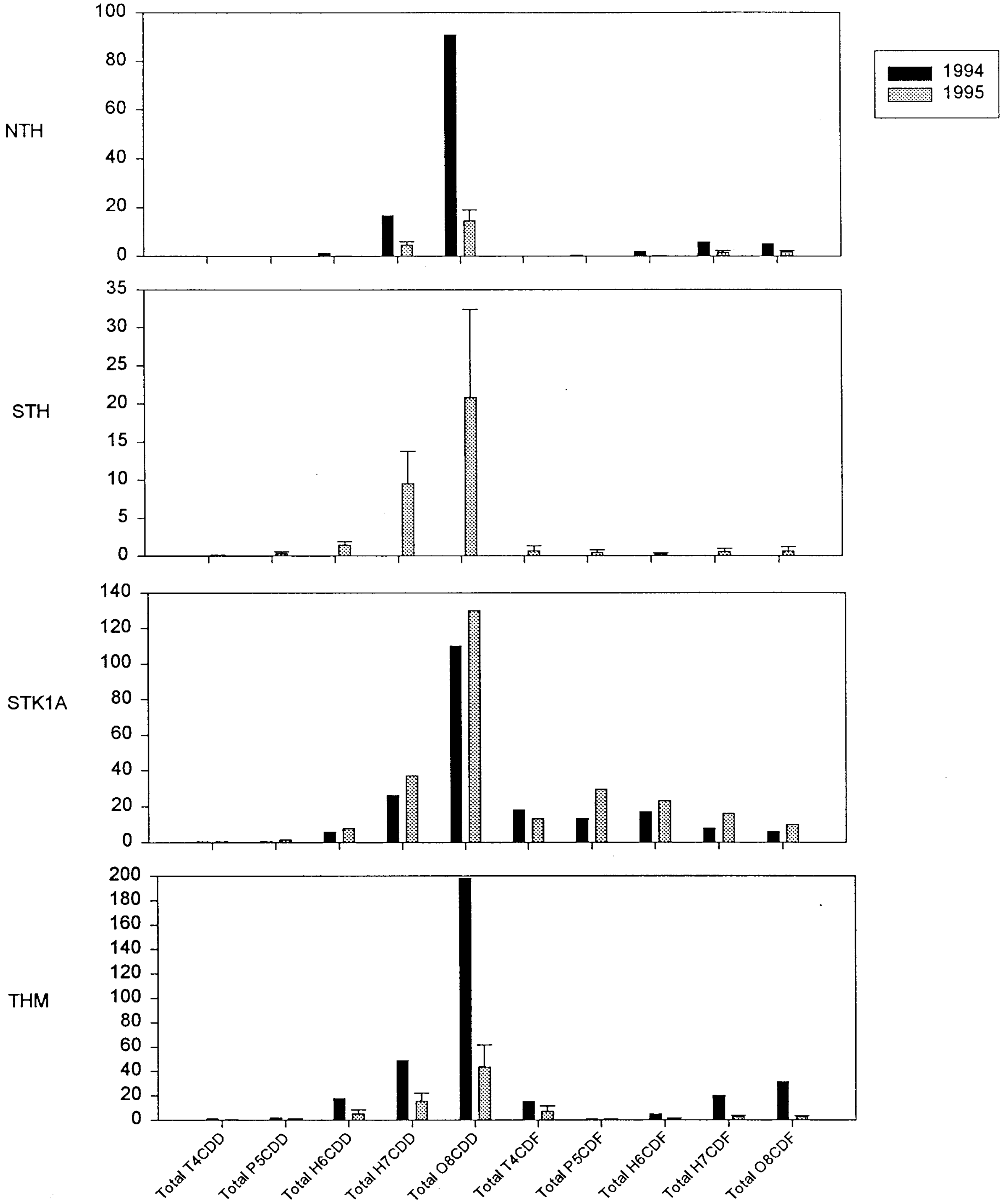

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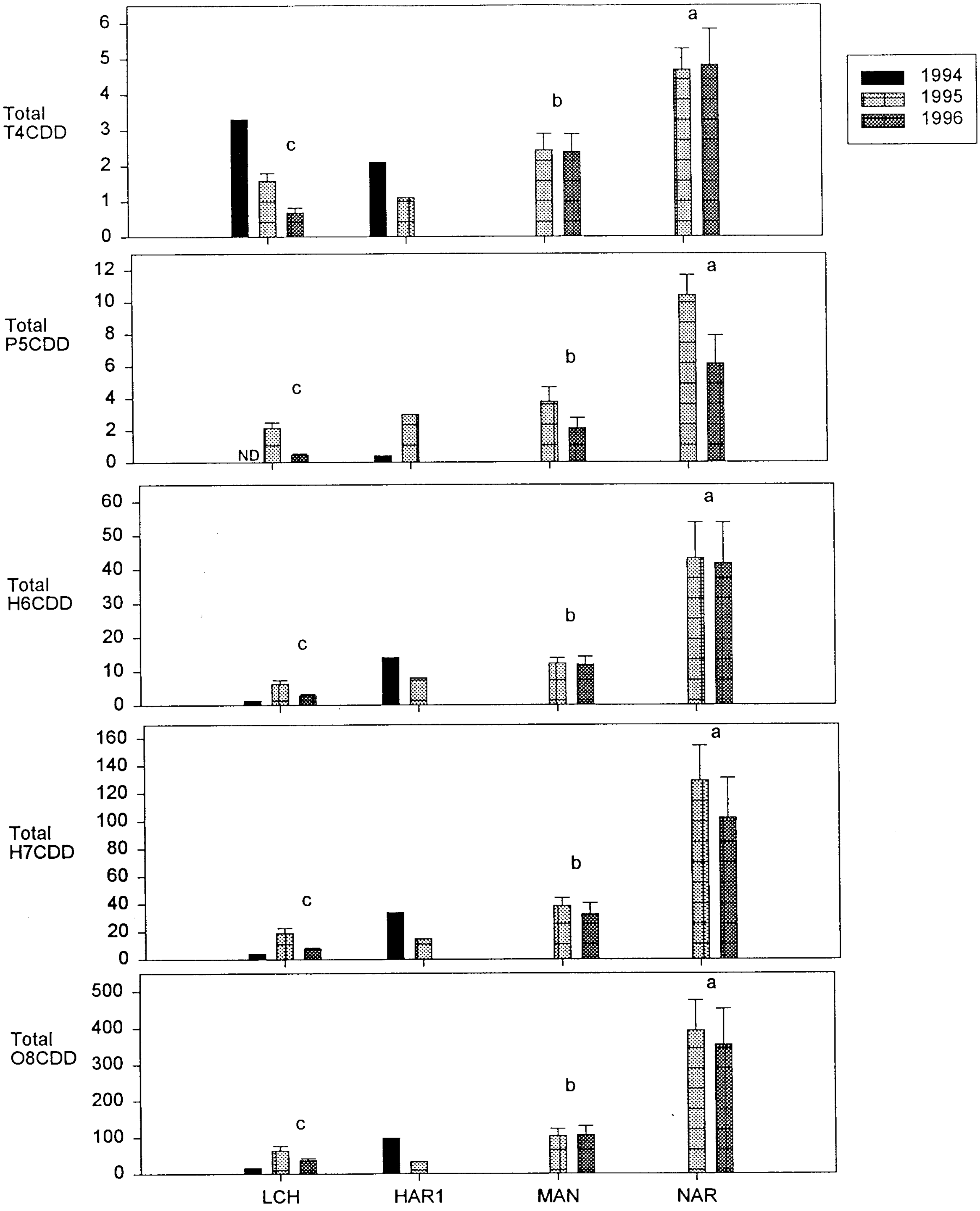

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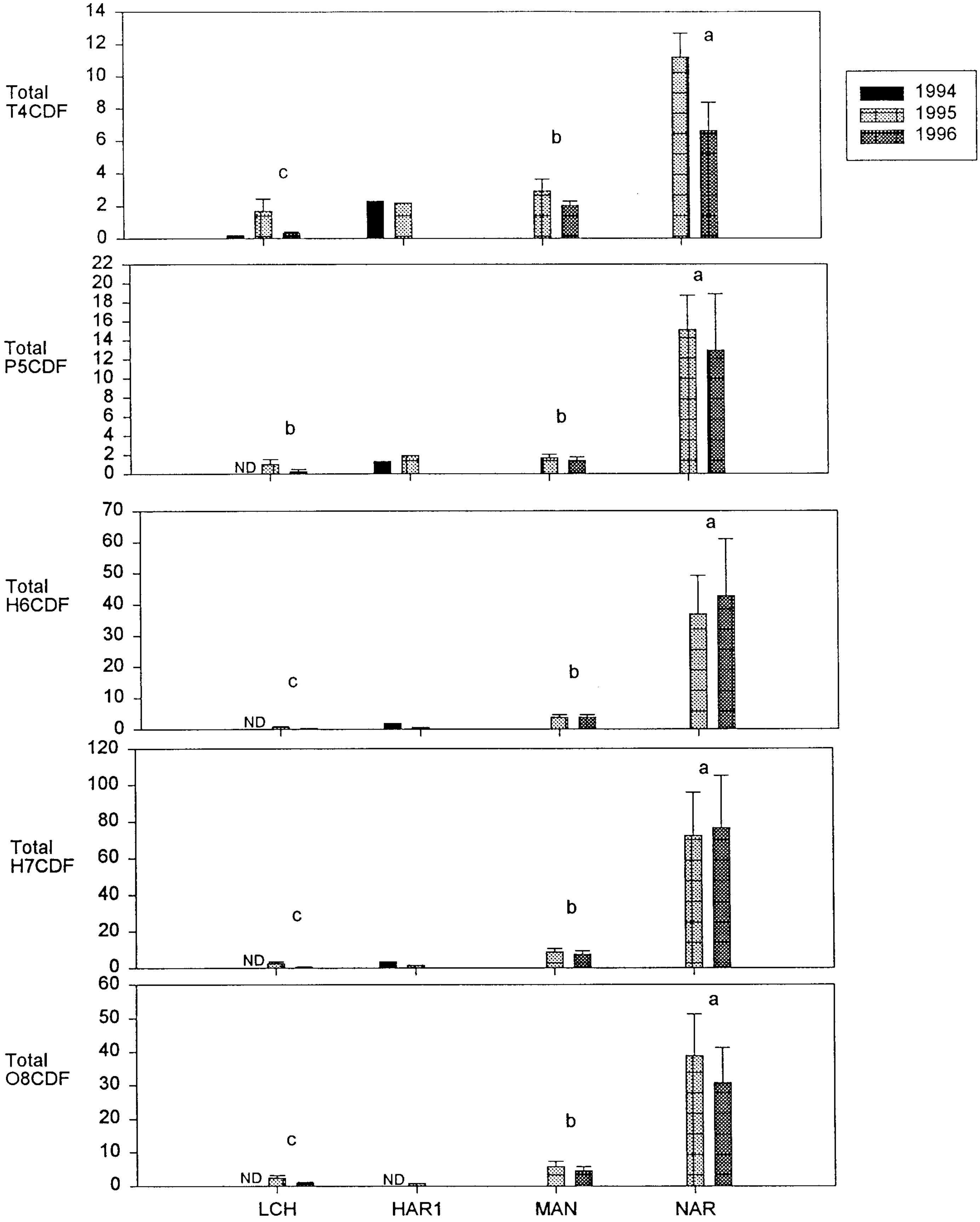


Figure 14. Total furan congener concentrations (means +/- SE, pg/g dw) in bed sediments from the lower Fraser reaches in 1994,1995 and 1996 (in 1994 n=1; in 1995 n=4 except HAR1 n=1; in 1996 n=4). Reaches with the same letter are not significantly different at p<0.05 according to 2-way ANOVA on the 1995 and 1996 data, followed by Tukey's test. Reaches not labeled with a letter were not included in the statistical analysis. ND indicates not detected.

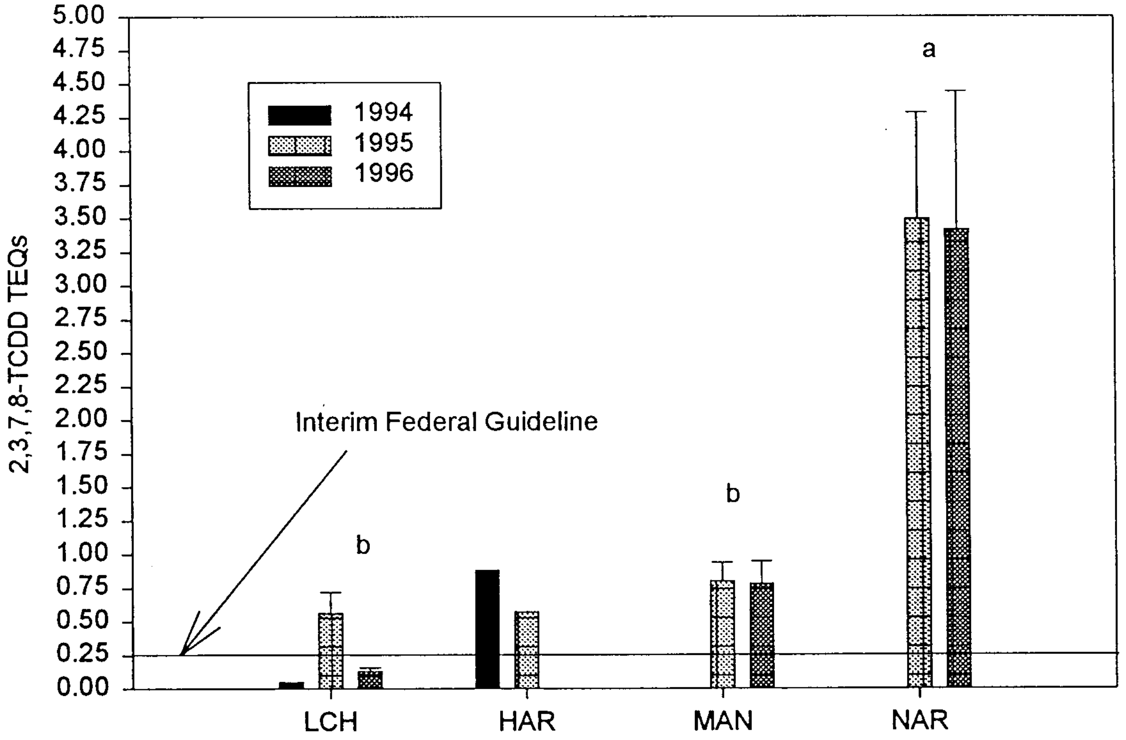


Figure 15. 2,3,7,8-TCDD TEQ concentrations (means +/- SE, pg/g dw) in bed sediments from the lower Fraser reaches in 1994,1995 and 1996 (in 1994 n=1; in 1995 n=4 except HAR1 n=1; in 1996 n=4). Reaches with the same letter are not significantly different at $p<0.05$ according to 2-way ANOVA on the 1995 and 1996 data, followed by Tukey's test. Reaches not labeled with a letter were not included in the statistical analysis.

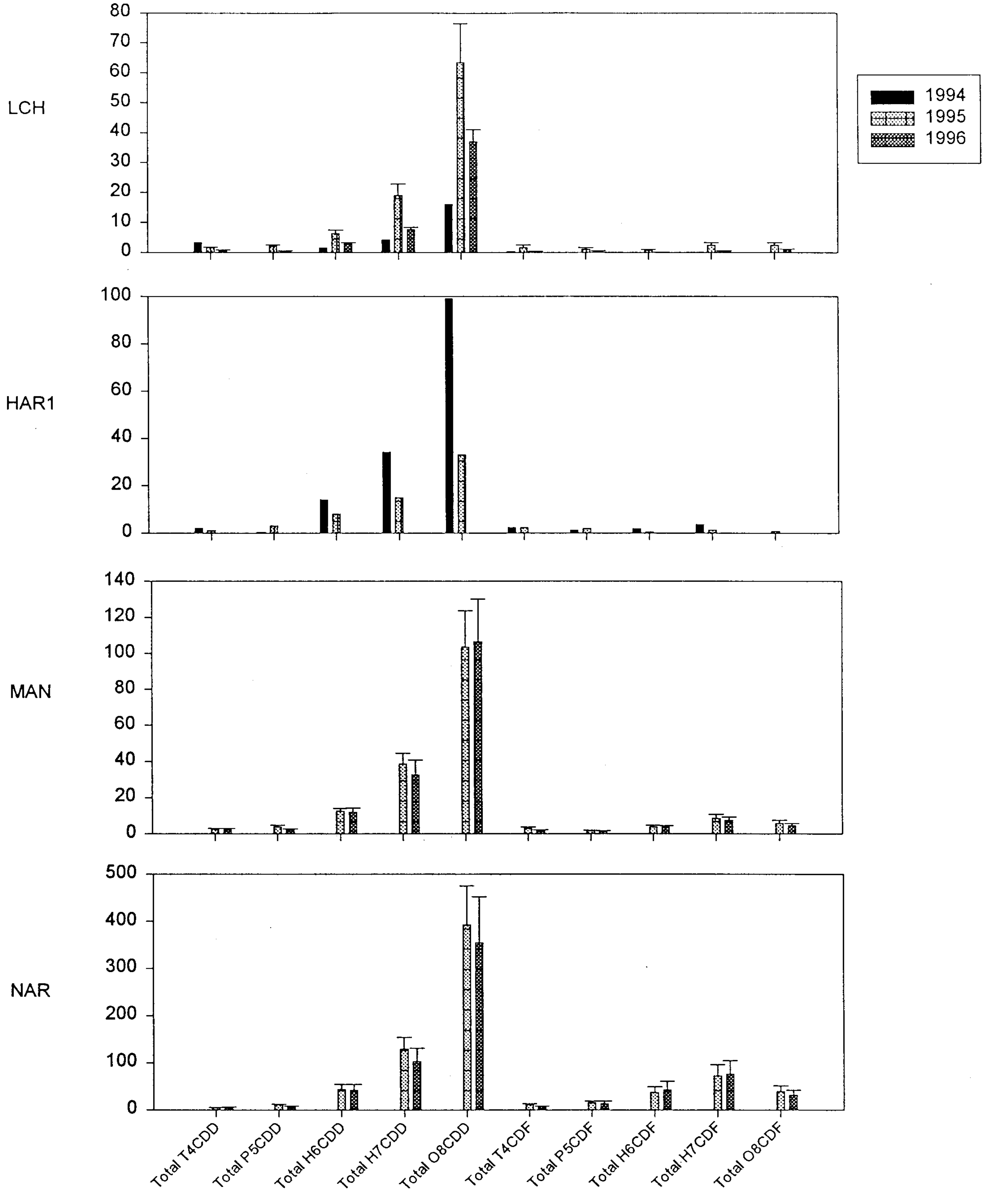


Figure 16. Dioxin and furan congener profiles (means +/- SE, pg/g dw) in bed sediments from the lower Fraser reaches in 1994,1995 and 1996 (in 1994 n=1; in 1995 n=4 except HAR1 n=1; in 1996 n=4).

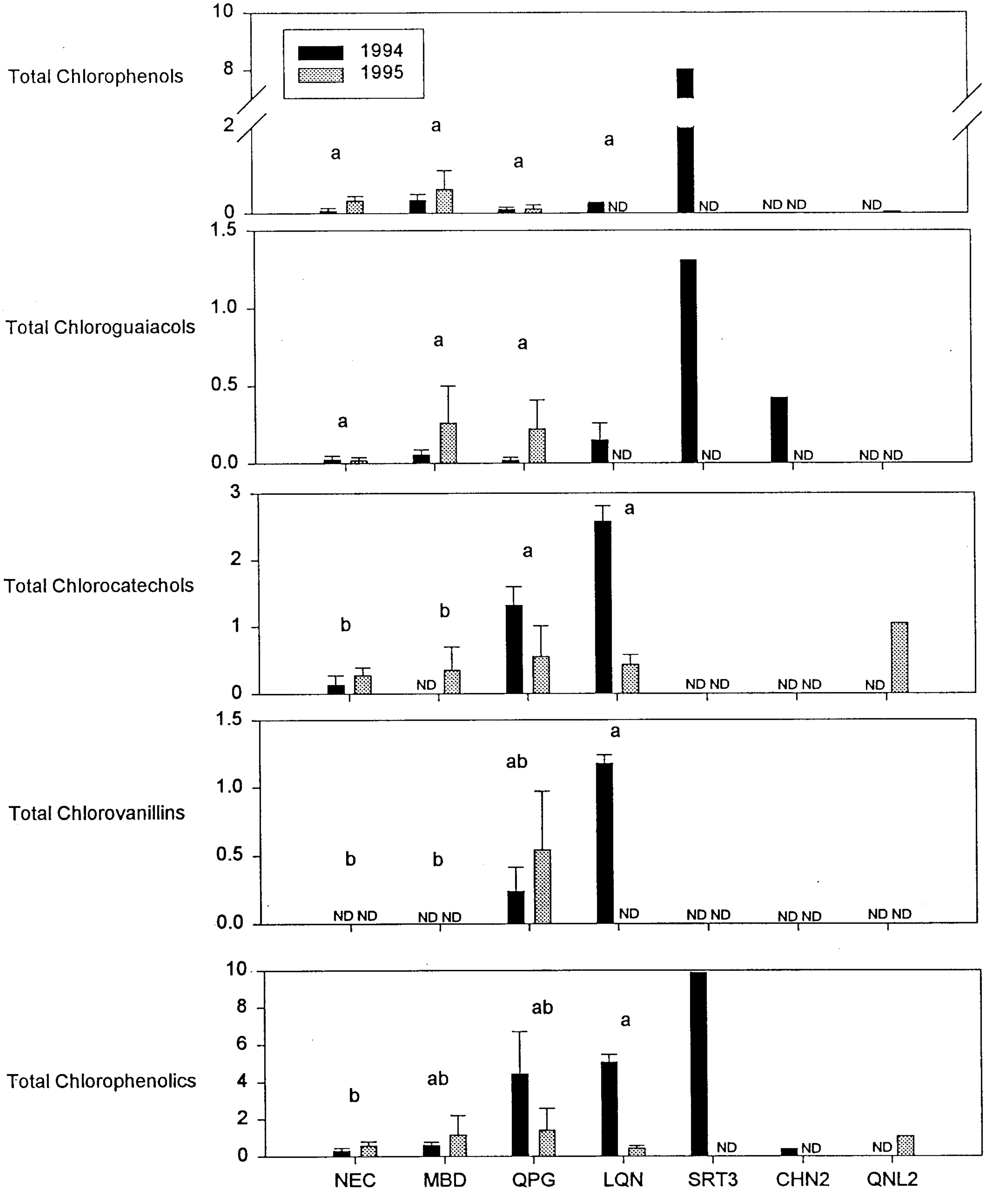


Figure 17. Chlorophenolic concentrations (means +/- SE, ng/g dw) in bed sediments from the upper Fraser reaches in 1994 and 1995 (n=4 except SRT3, CHN2, QNL2 n=1). Reaches with the same letter are not significantly different at $p<0.05$ according to 2-way ANOVA, followed by Tukey's test. Reaches not labeled with a letter were not included in the statistical analysis. ND indicates not detected.

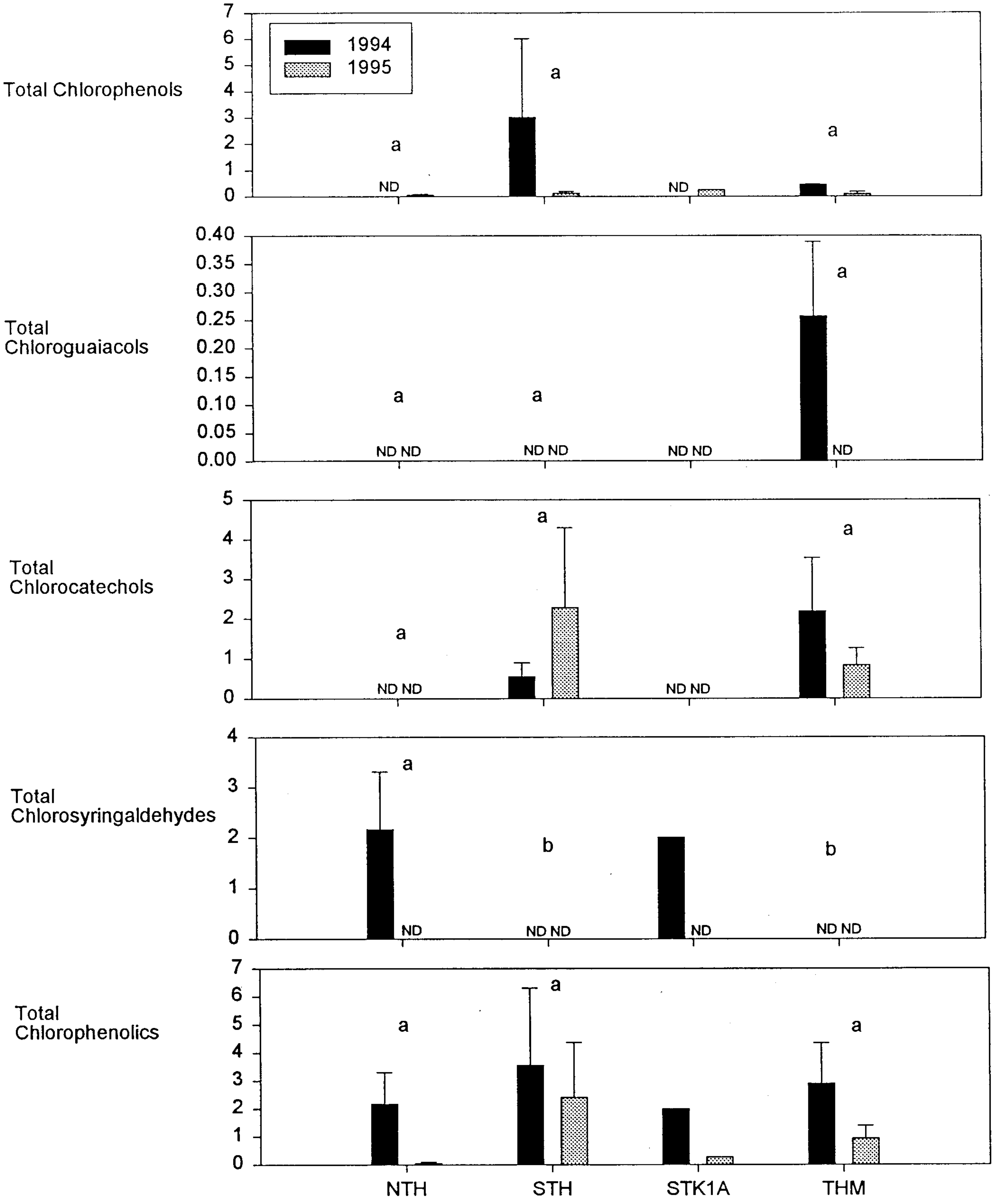


Figure 18. Chlorophenolic concentrations (means +/- SE, ng/g dw) in bed sediments from the Thompson sub-basin reaches in 1994 and 1995 (n=4 for NTH and THM, n=3 for STH, n=1 for STK1A). Reaches with the same letter are not significantly different at $p<0.05$ according to 2-way ANOVA, followed by Tukey's test. Reaches not labeled with a letter were not included in the statistical analysis. ND indicates not detected.

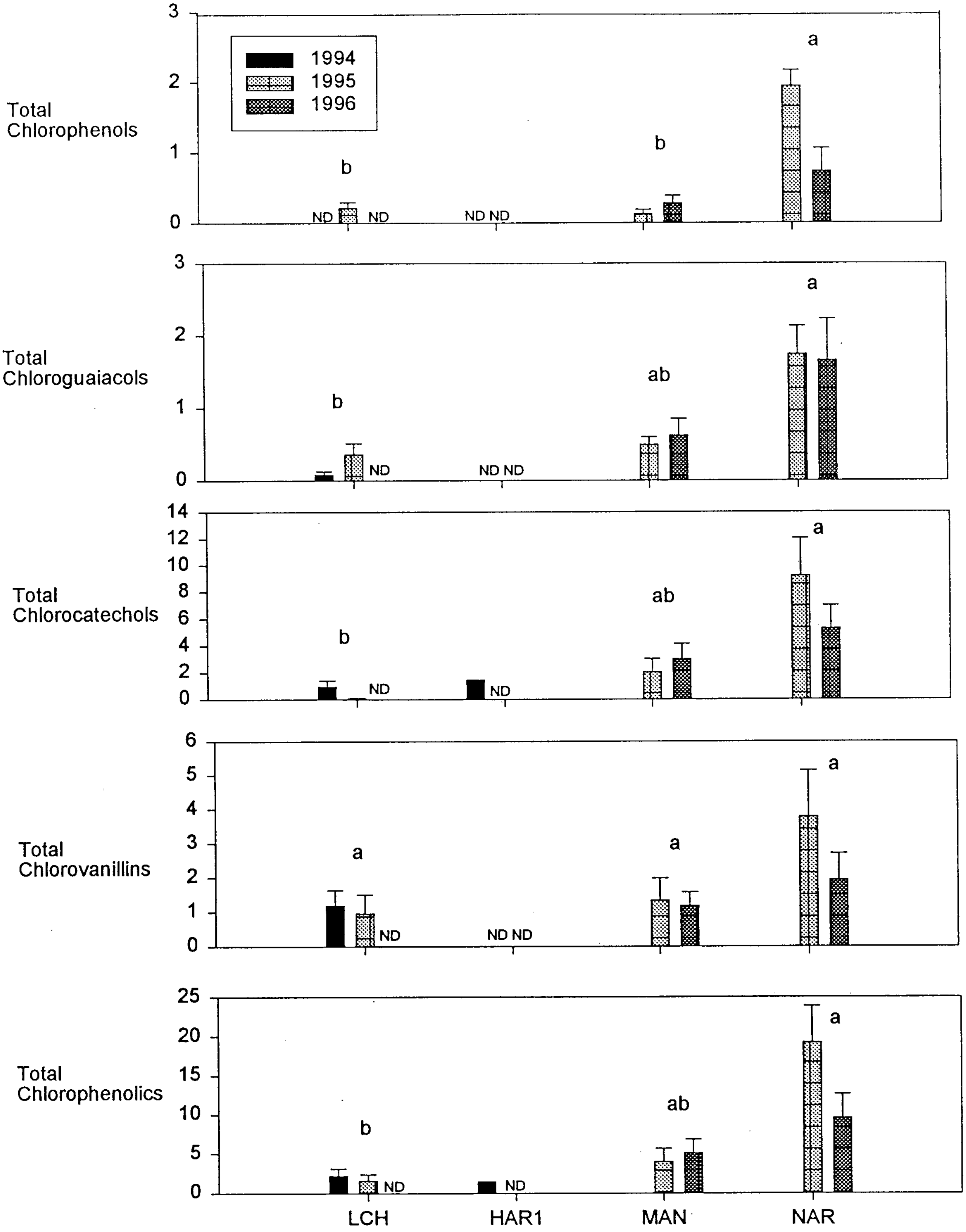


Figure 19. Chlorophenolic concentrations (means +/- SE, ng/g dw) in bed sediments from the lower Fraser reaches in 1994,1995 and 1996 (n=4 except HAR1 n=1). Reaches with the same letter are not significantly different at p<0.05 according to 2-way ANOVA on 1995 and 1996 data, followed by Tukey's test. Reaches not labeled with a letter were not included in the statistical analysis. ND indicates not detected.

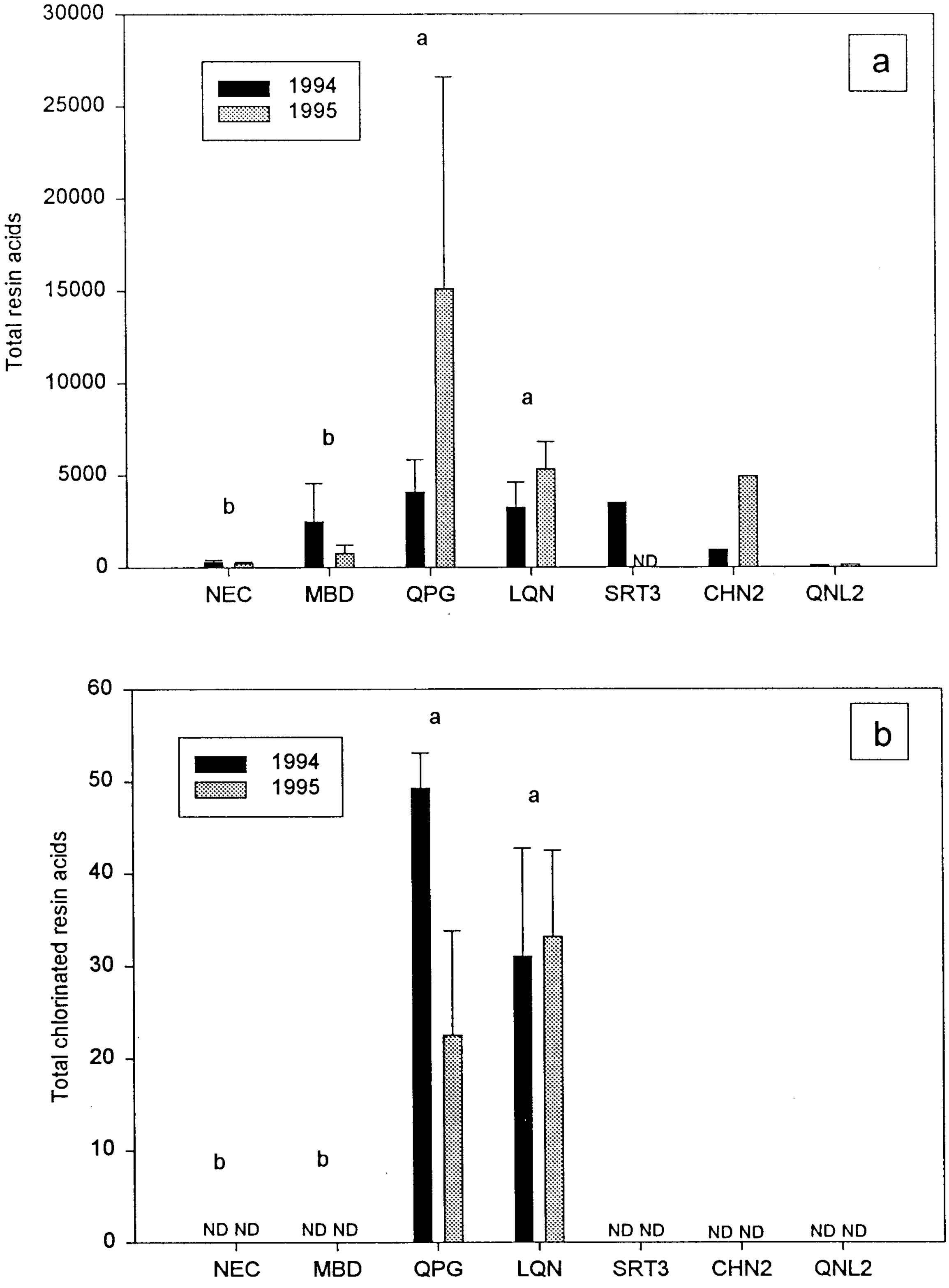


Figure 20. a) Total resin acid and b) total chlorinated resin acid concentrations (means +/- SE, ng/g dw) in bed sediments from the upper Fraser reaches in 1994 and 1995 (n=4 except SRT3, CHN2, QNL2 n=1). Reaches with the same letter are not significantly different at $p<0.05$ according to 2-way ANOVA followed by Tukey's test. Reaches not labeled with a letter were not included in the statistical analysis. ND indicates not detected.

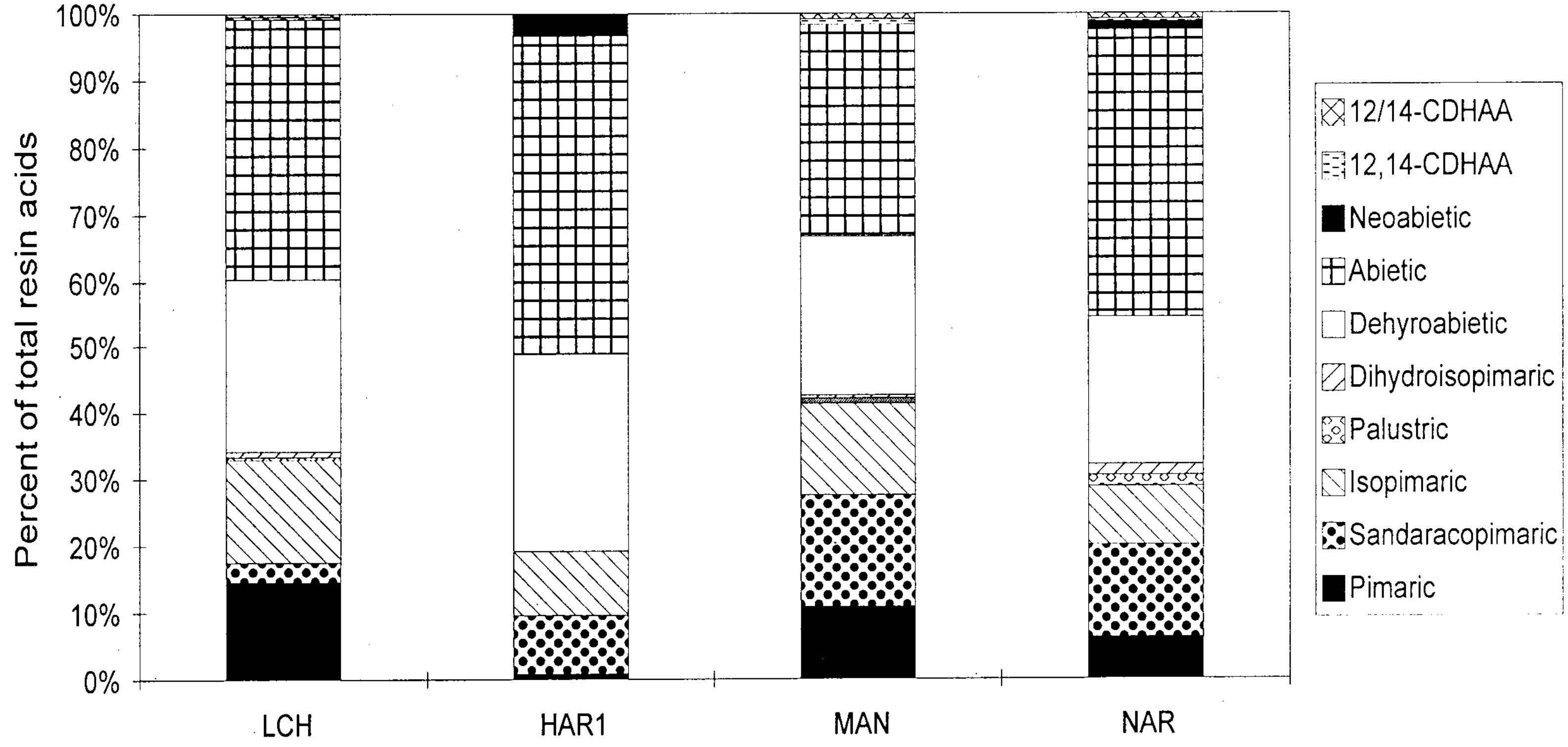


Figure 29. Resin acid composition (mean, % of total) of bed sediments from the lower Fraser basin reaches in 1994, 1995 and 1996 (n=4 except HAR1 n=1). 12/14-CDHAA refers to the isomers 12 or 14 chlorodehydroabietic acid; 12,14-CDHAA refers to 12,14-dichlorodehydroabietic acid.

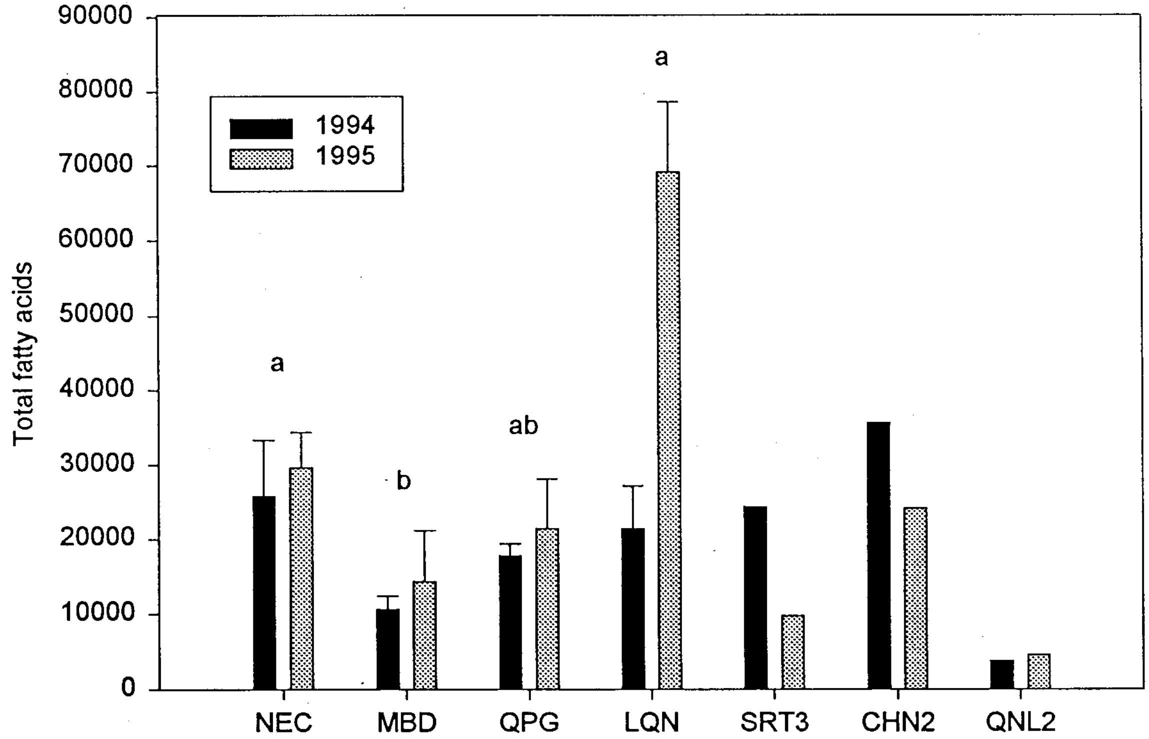


Figure 22. Total fatty acid concentrations (means +/- SE, ng/g dw) in bed sediments from the upper Fraser reaches in 1994 and 1995 (n=4 except SRT3, CHN2, QNL 2 n=1). Reaches with the same letter are not significantly different at $p<0.05$ according to 2-way ANOVA followed by Tukey's test. Reaches not labeled with a letter were not included in the statistical analysis.

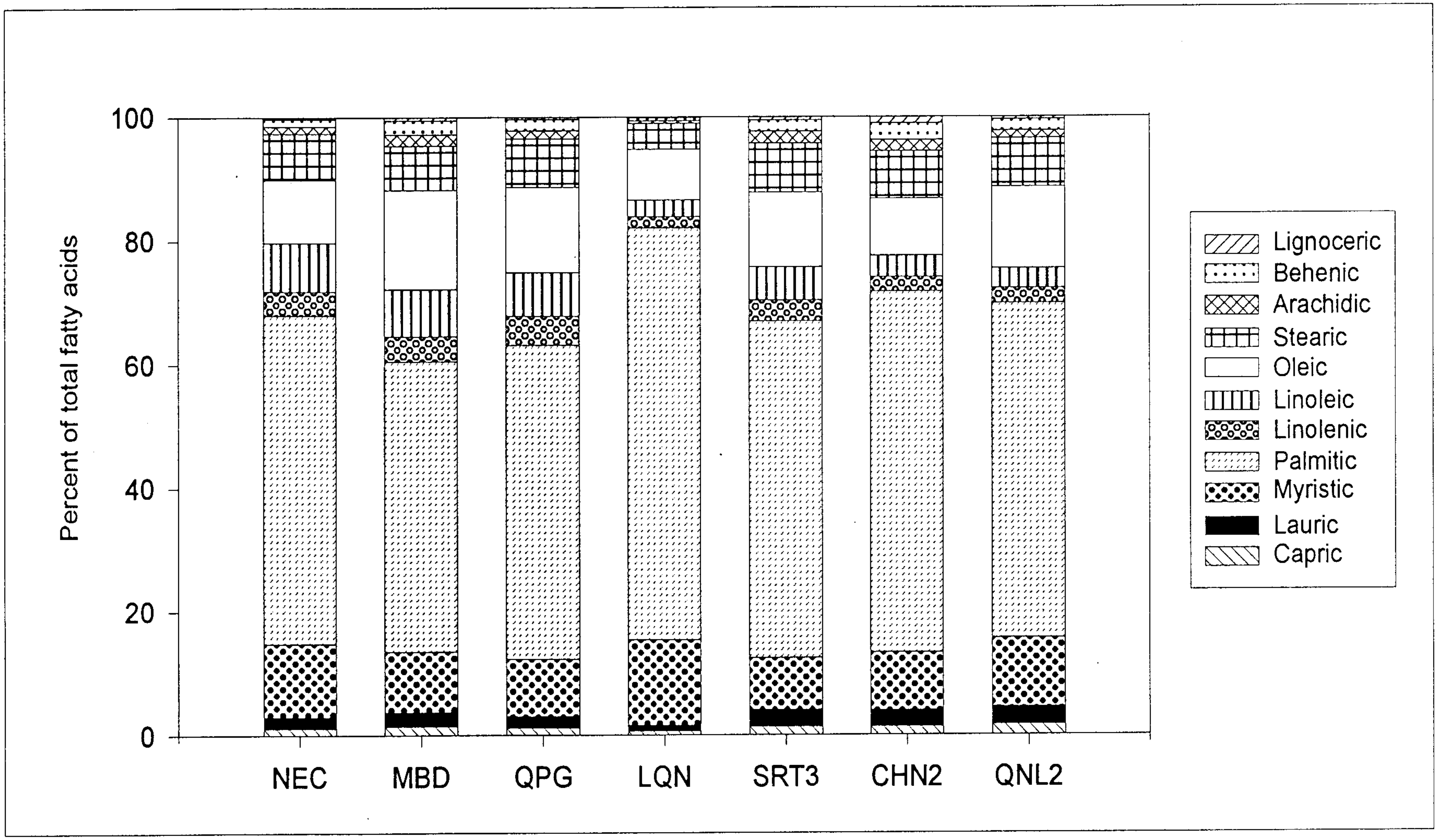


Figure 23. Fatty acid composition (mean, % of total) of bed sediments from the upper Fraser basin reaches in 1994 and 1995 (n=4 except SRT3, CHN2, QNL2 n=1).

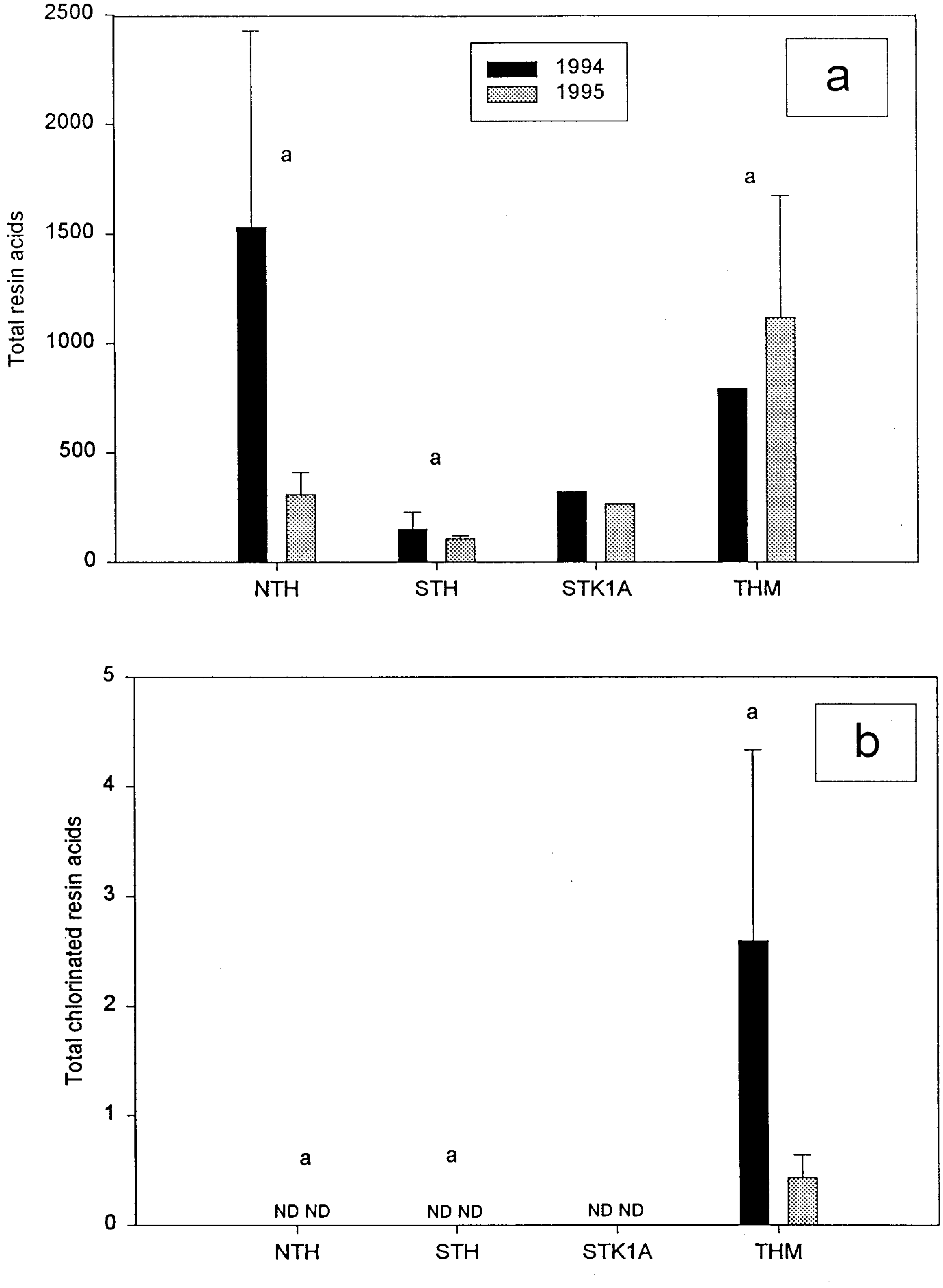


Figure 24. a) Total resin acid and b) total chlorinated resin acid concentrations (means +/- SE, ng/g dw) in bed sediments from the Thompson sub-basin reaches in 1994 and 1995 (n=4 for NTH and THM, n=3 for STH, n=1 for STK1A). Reaches with the same letter are not significantly different at $p<0.05$ according to 2-way ANOVA followed by Tukey's test. Reaches not labeled with a letter were not included in the statistical analysis. ND indicates not detected.

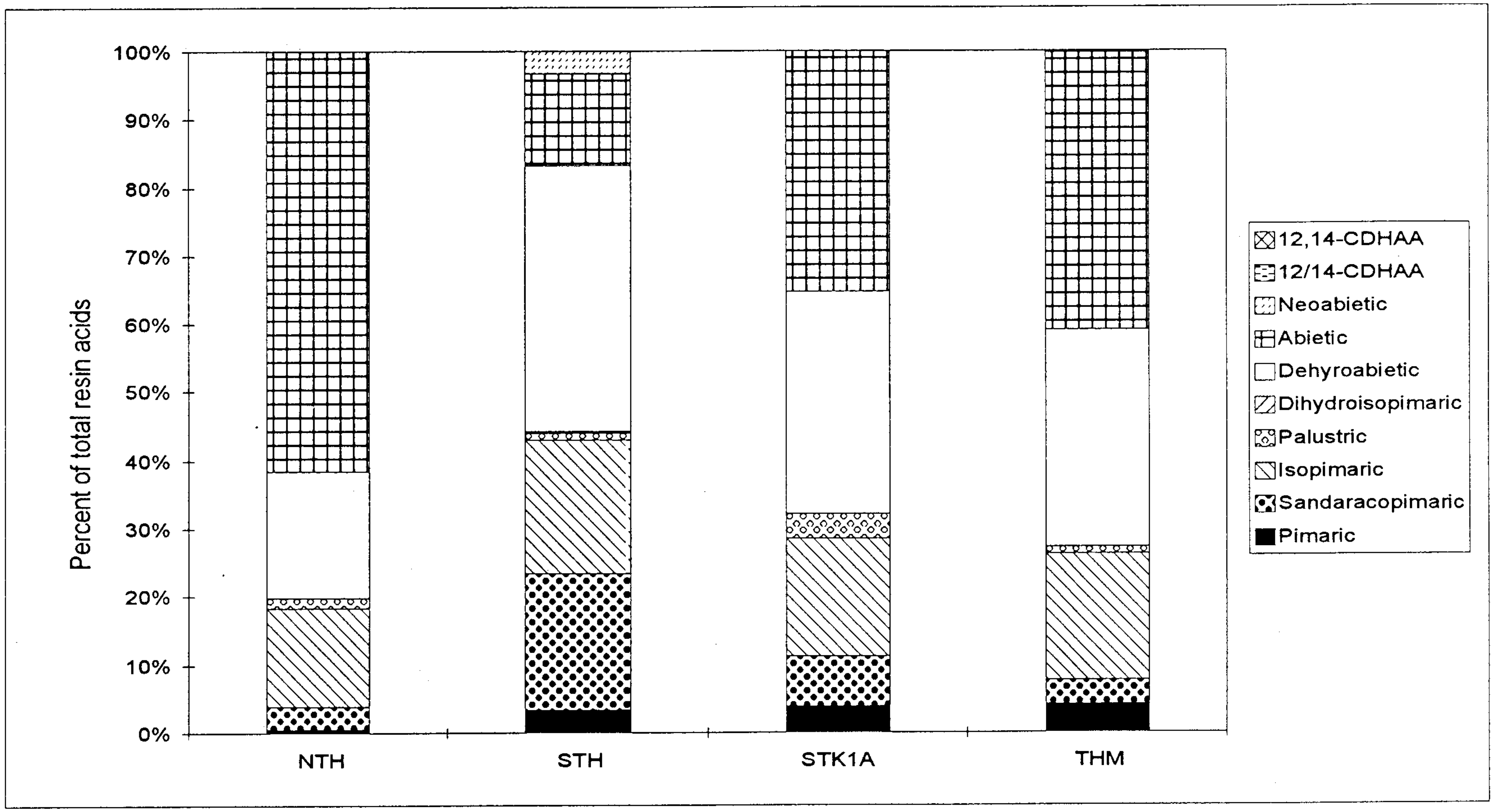


Figure 25. Resin acid composition (mean, % of total) of bed sediments from the Thompson sub-basin reaches in 1994 and 1995 (n=4 except STH n=3, STK1A n=1). 12/14-CDHAA refers to the isomers 12 or 14 chlorodehydroabietic acid; 12,14-CDHAA refers to 12,14-dichlorodehydroabietic acid.

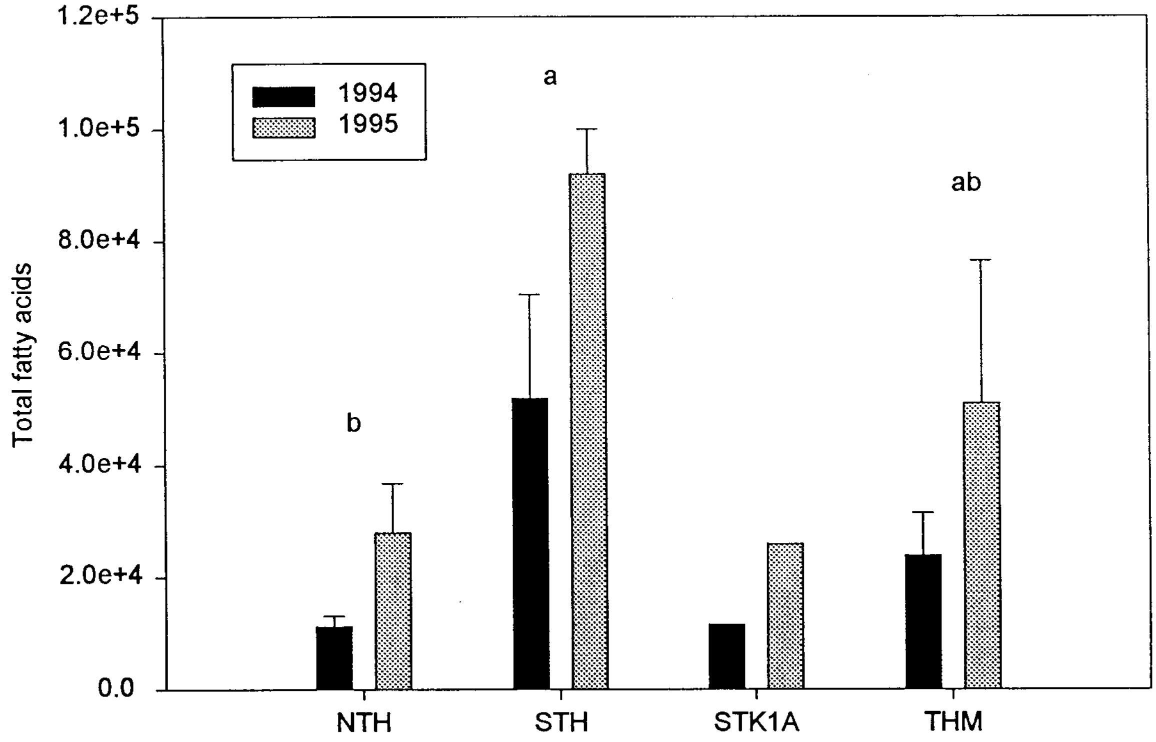


Figure 26. Total fatty acid concentrations (means +/- SE, ng/g dw) in bed sediments from the Thompson sub-basin reaches in 1994 and 1995 (n=4 for NTH and THM, n=3 for STH, n=1 for STK1A). Reaches with the same letter are not significantly different at $p<0.05$ according to 2-way ANOVA, followed by Tukey's test. Reaches not labeled with a letter were not included in the statistical analysis.

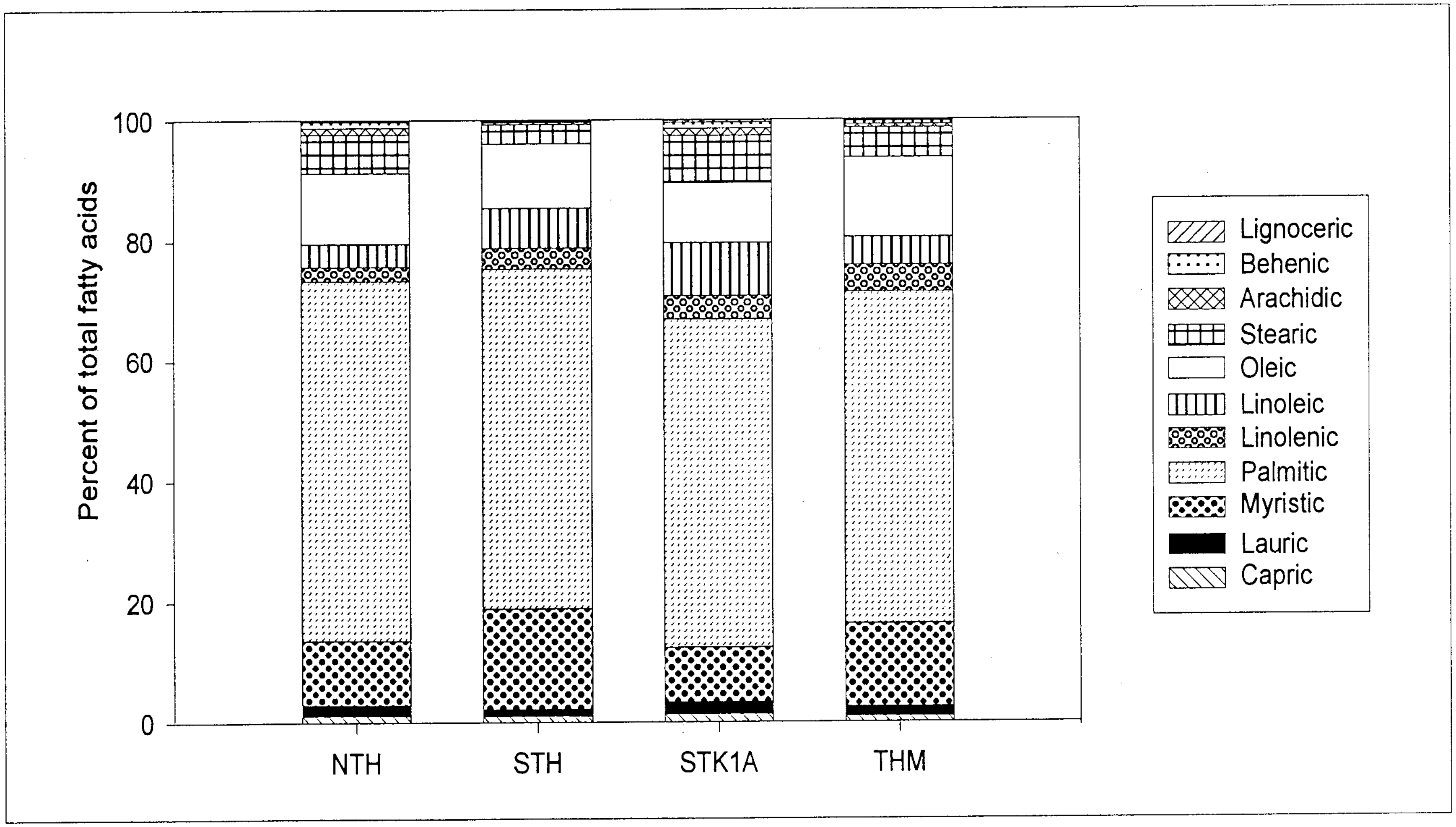


Figure 27. Fatty acid composition (mean, % of total) of bed sediments from the Thompson sub-basin reaches in 1994 and 1995 (n=4 except STH n=3, STK1A n=1).

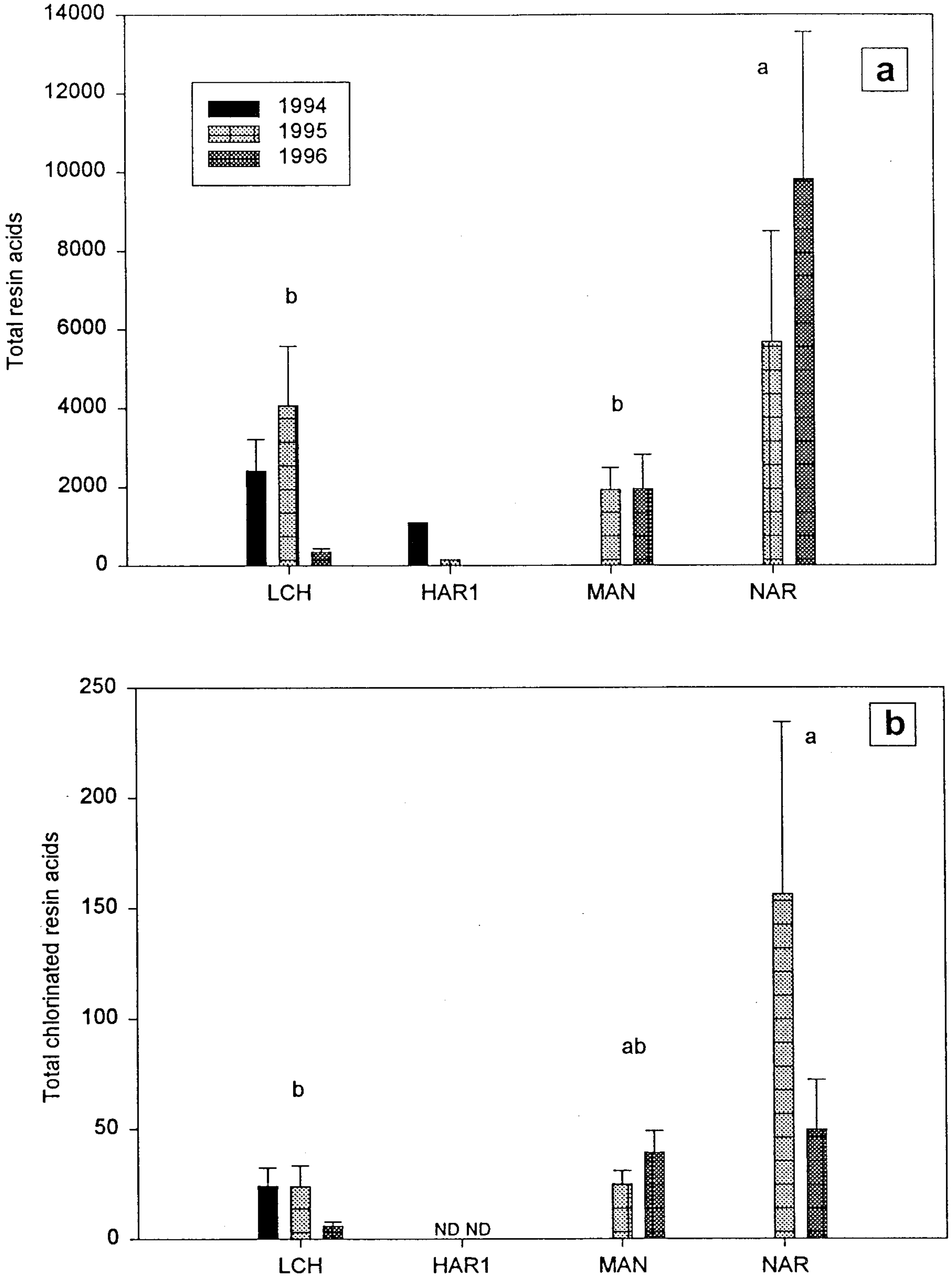


Figure 28. a) Total resin acid and b) total chlorinated resin acid concentrations (means +/- SE, ng/g dw) in bed sediments from the lower Fraser basin reaches in 1994,1995 and 1996 (n=4 except HAR1 n=1 and NAR in 1996 n=3). Reaches with the same letter are not significantly different at p<0.05 according to 2-way ANOVA on the 1995 and 1996 data, followed by Tukey'stest. Reaches not labeled with a letter were not included in the statistical analysis. ND indicates not detected.

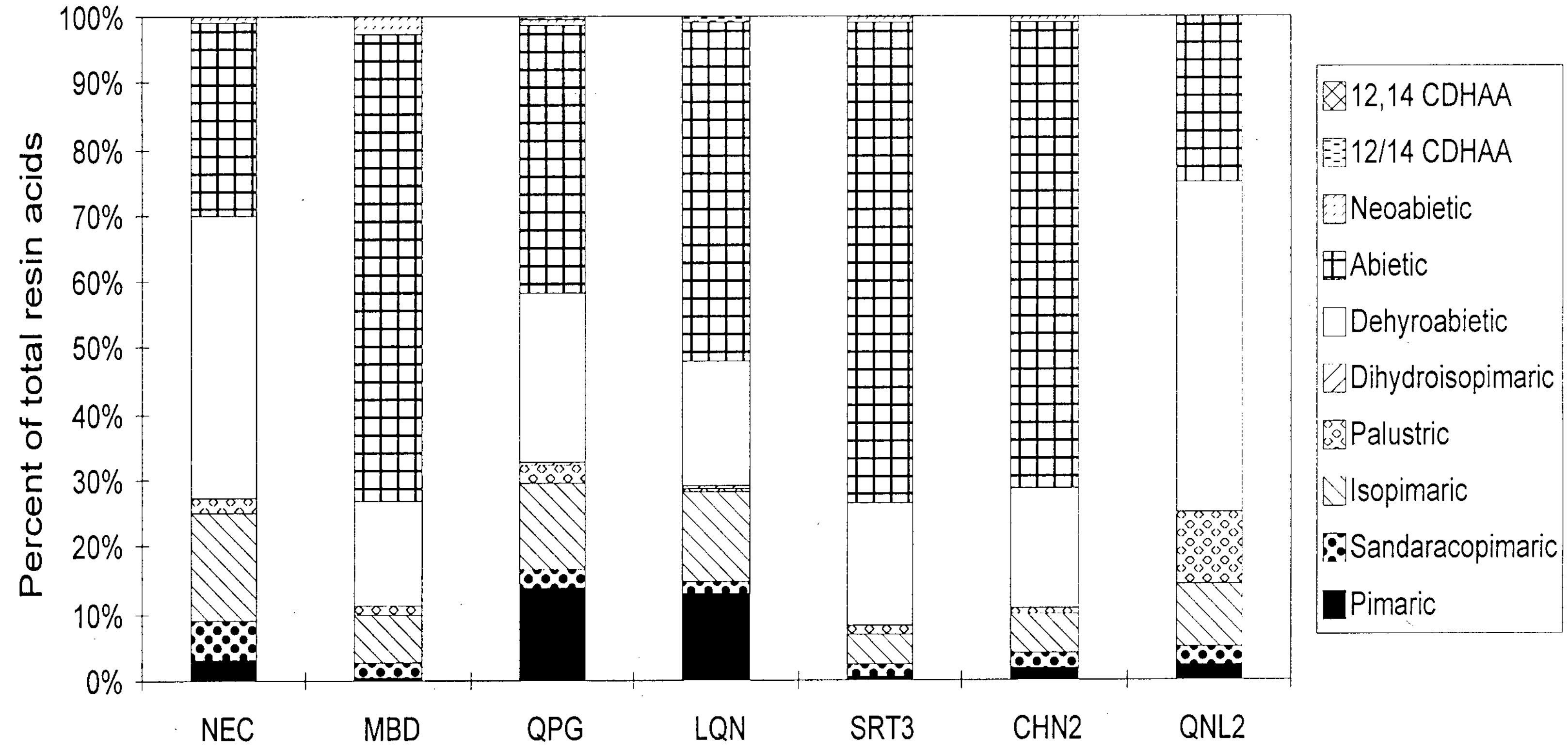


Figure 21. Resin acid composition (means, % of total) of bed sediments from the upper Fraser basin reaches in 1994 and 1995. 12/14-CDHAA refers to the isomers 12 or 14 chlorodehydroabietic acid; 12,14-CDHAA refers to 12,14-dichlorodehydroabietic acid.

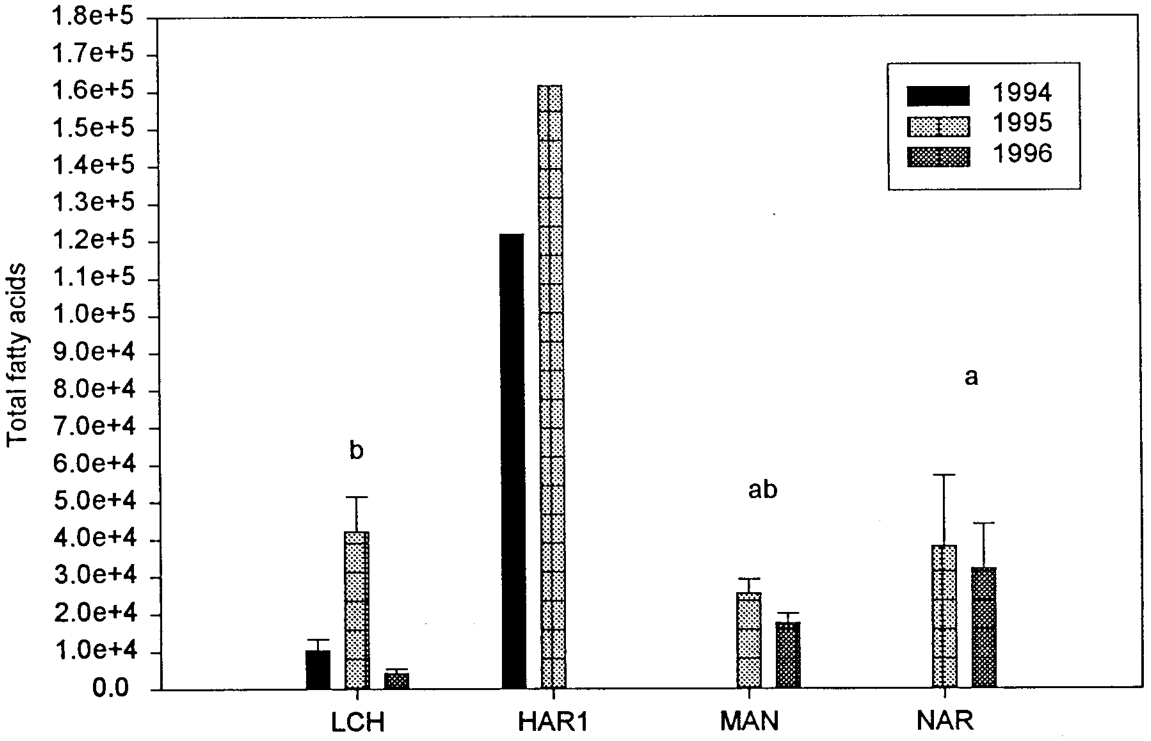


Figure 30. Total fatty acid concentrations (means +/- SE, ng/g dw) in bed sediments from the lower Fraser basin reaches in 1994,1995 and 1996 (n=4 except HAR1 n=1 and NAR in 1996 n=3). Reaches with the same letter are not significantly different at $p<0.05$ according to 2-way ANOVA on the 1995 and 1996 data, followed by Tukey's test. Reaches not labeled with a letter were not included in the statistical analysis.

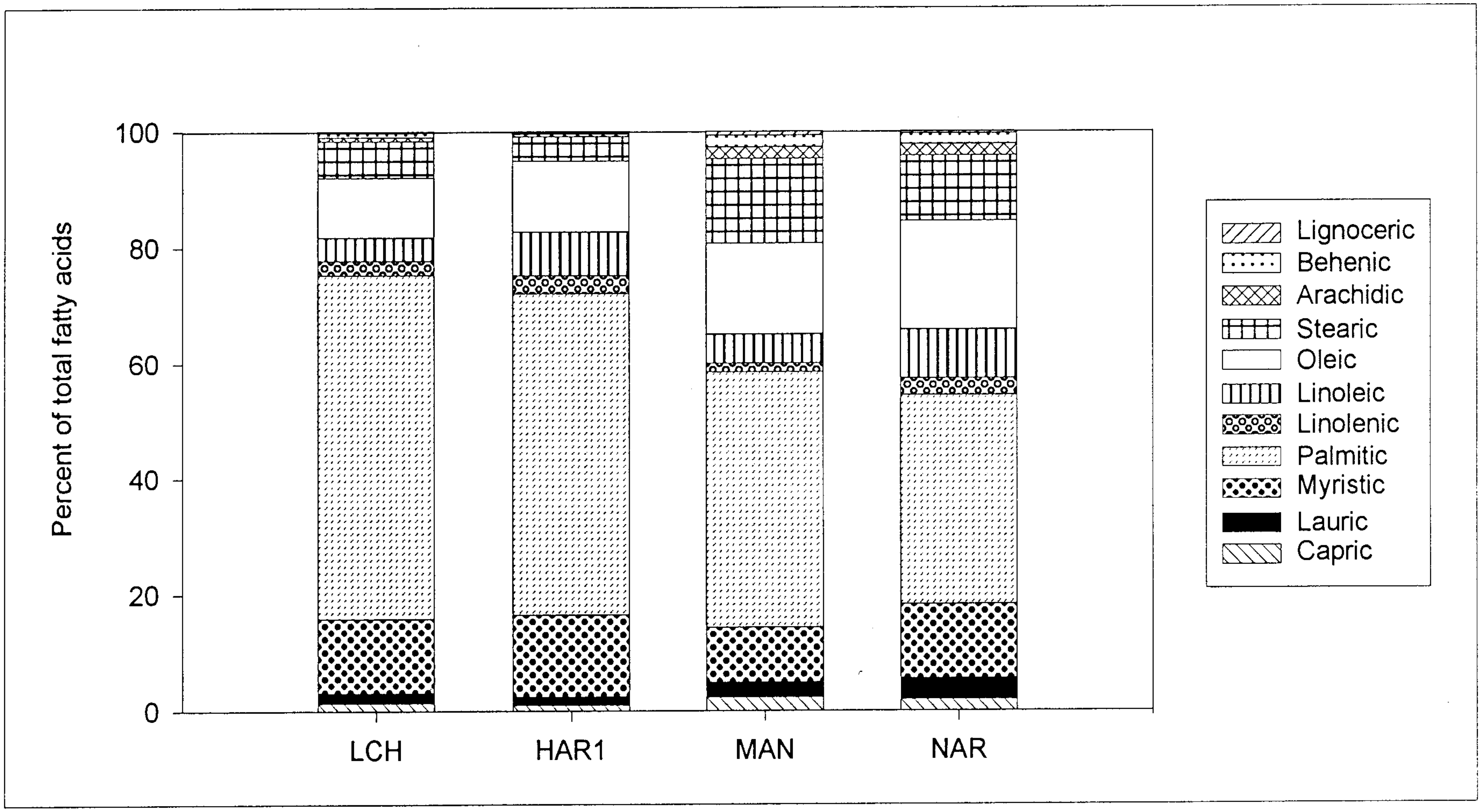


Figure 31. Fatty acid composition (mean, % of total) in bed sediments from the lower Fraser basin reaches in 1994,1995 and 1996 (n=4 except HAR1 n=1).

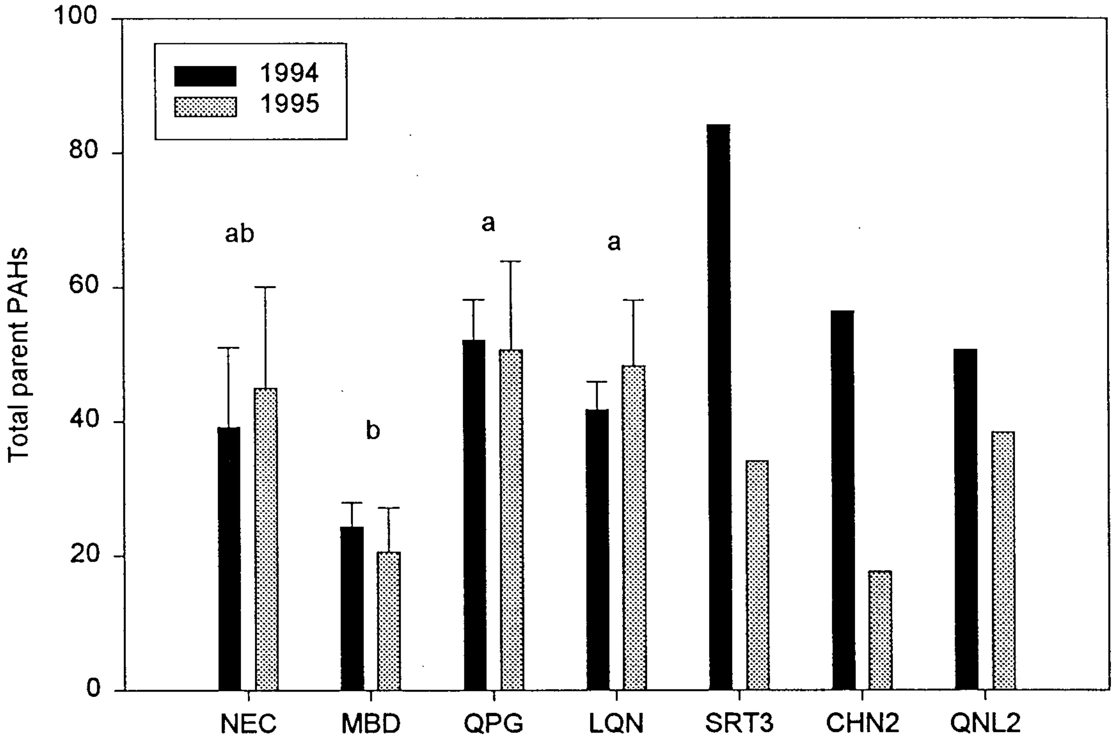


Figure 32. Total parent PAHs (means +/-SE, ng/g dw) in bed sediments from the upper Fraser reaches in 1994 and 1995 (n=4 except SRT3, CHN2, QNL2 n=1). Reaches with the same letter are not significanly different at $p<0.05$ according to 2- way ANOVA, followed by Tukey's test. Reaches not labeled with a letter were not included in the statistical analysis.

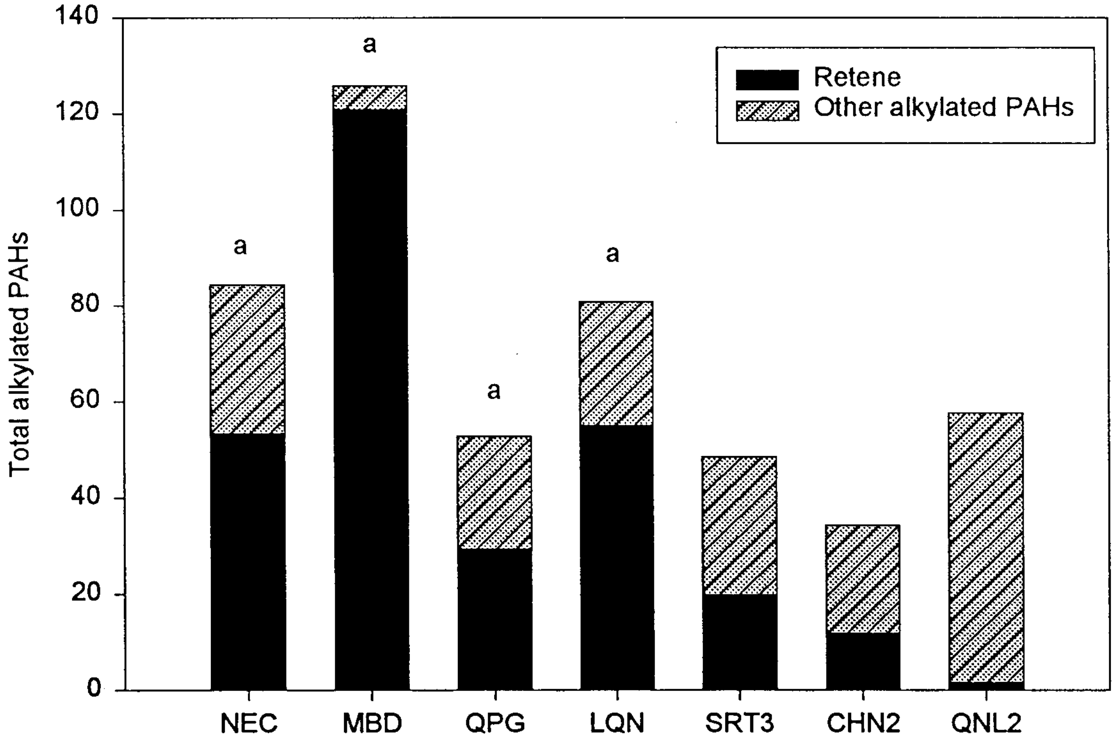


Figure 33. Mean total alkylated PAHs showing the proportion of retene (ng/g dw) in bed sediments from the upper Fraser reaches in 1995 (n=4 except SRT3, CHN2, QNL2 n=1). Reaches with the same letter are not significanly different at $p<0.05$ according to 1-way ANOVA, followed by Tukey's test. Reaches not labeled with a letter were not included in the statistical analysis.

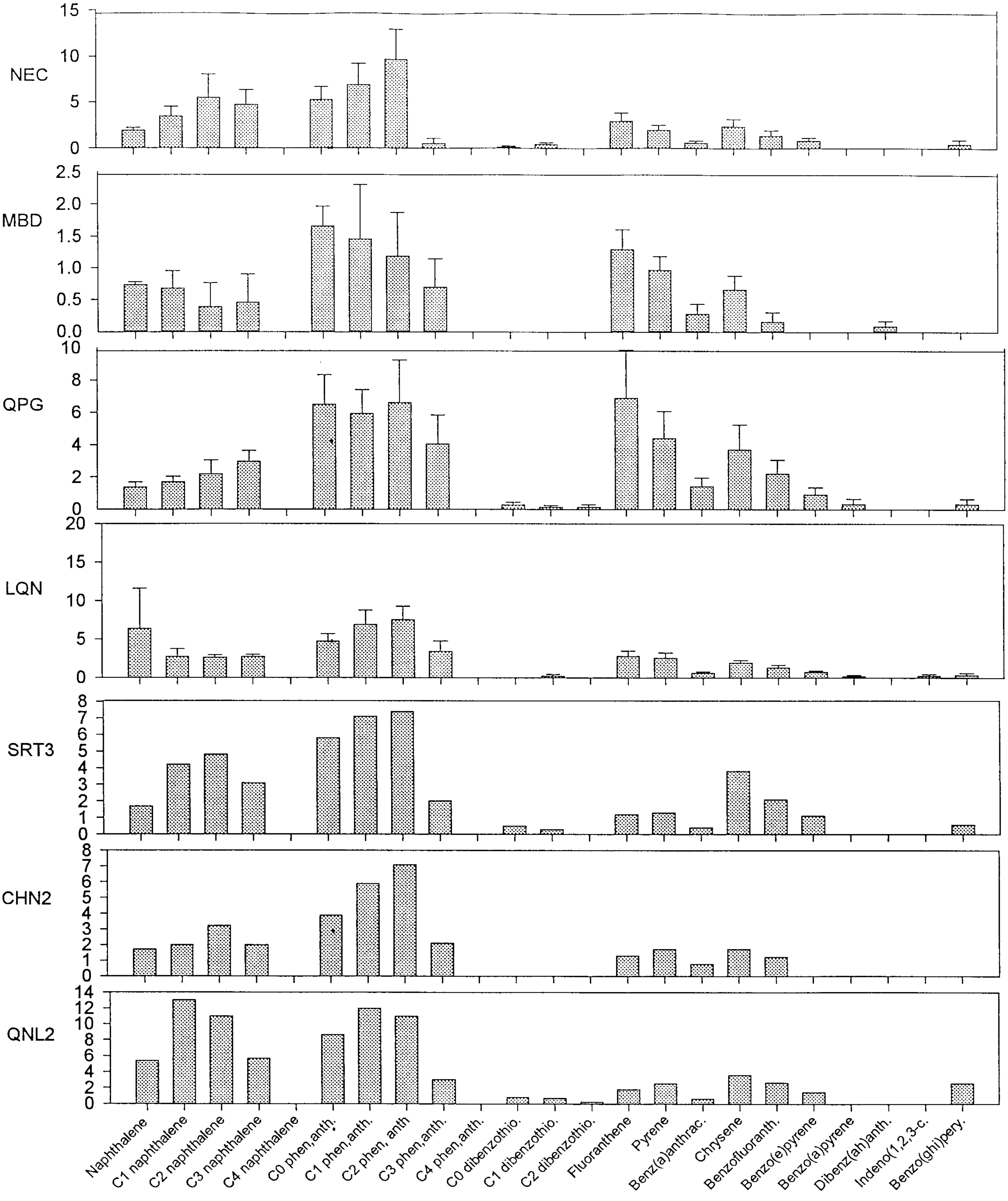


Figure 34. PAH source signatures (means +/- SE, ng/g dry weight) for bed sediments in the upper Fraser reaches in 1995 (n=4 except SRT3, CHN2, QNL2 n=1).

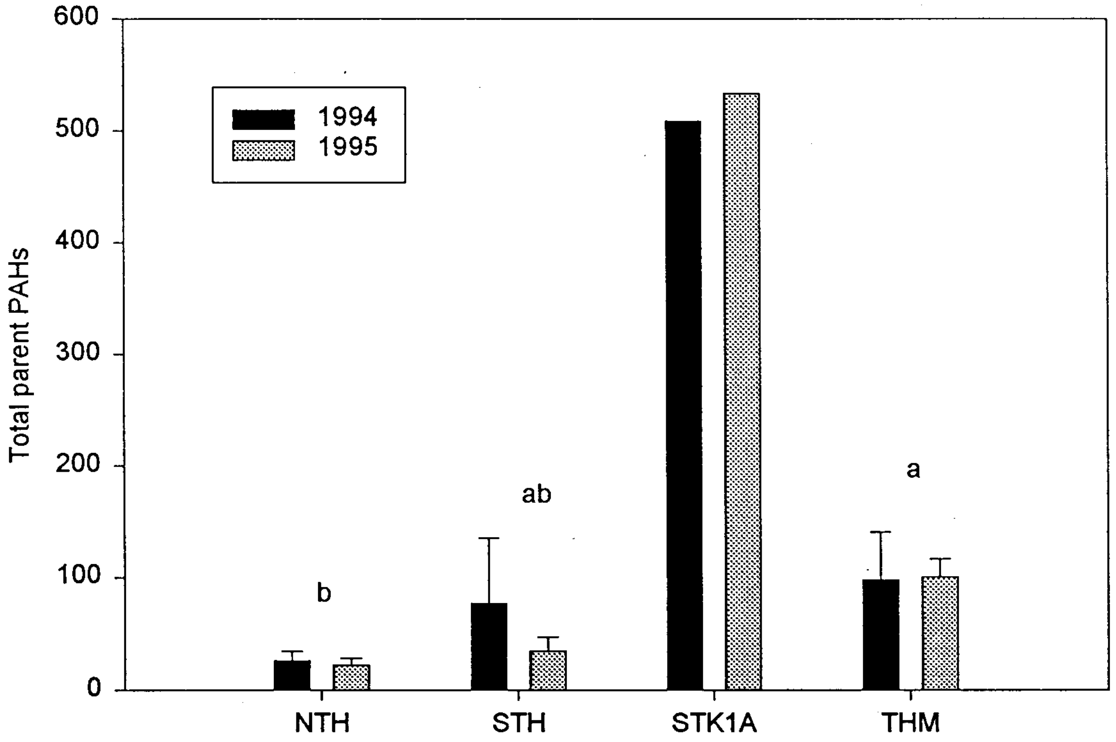


Figure 35. Total parent PAHs (means +/- SE, ng/g dry weight) for bed sediments in the Thompson sub-basin reaches in 1994 and 1995 (NTH and THM n=4, STH n=3, STK1A n=1). Reaches with the same letter are not significantly different at $p<0.05$ according to 2-way ANOVA, followed by Tukey's test. Reaches not labeled with a letter were not included in the statistical analysis.

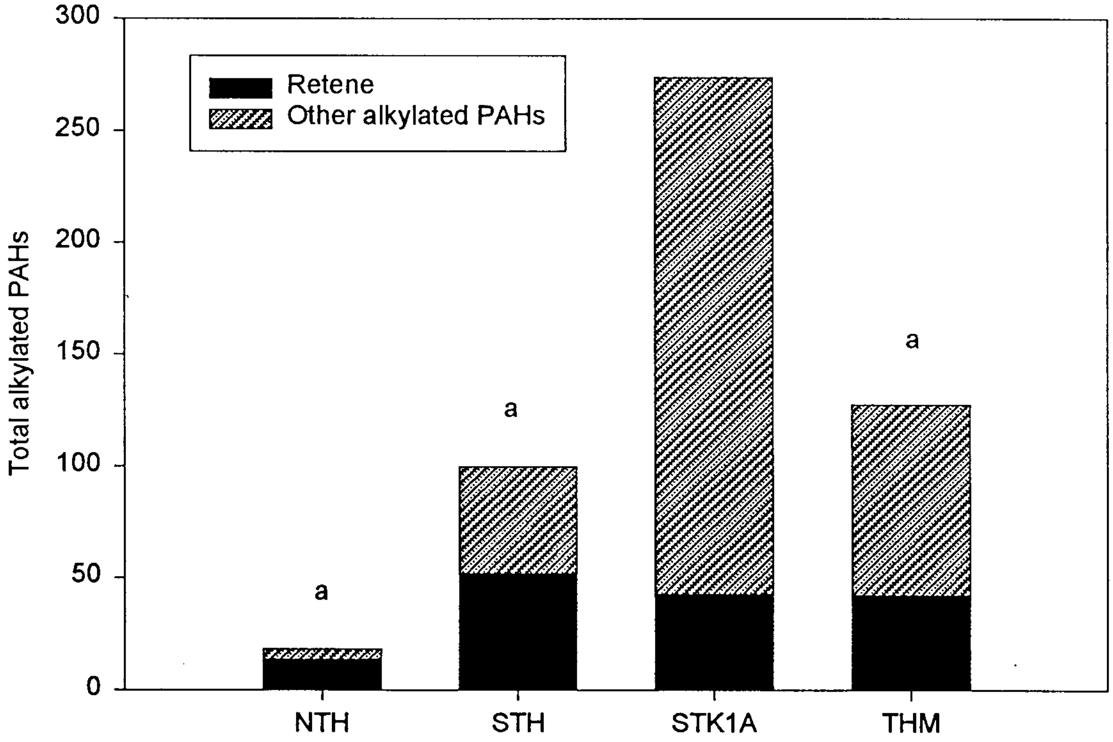


Figure 36. Mean total alkylated PAHs showing the proportion of retene (ng/g dw) in bed sediments from the Thompson sub-basin reaches in 1995 (n=4 except STH n=3 and STK1A n=1). Reaches with the same letter are not significantly different at $p<0.05$ according to 1-way ANOVA, followed by Tukey's test. Reaches not labeled with a letter were not included in the statistical analysis.

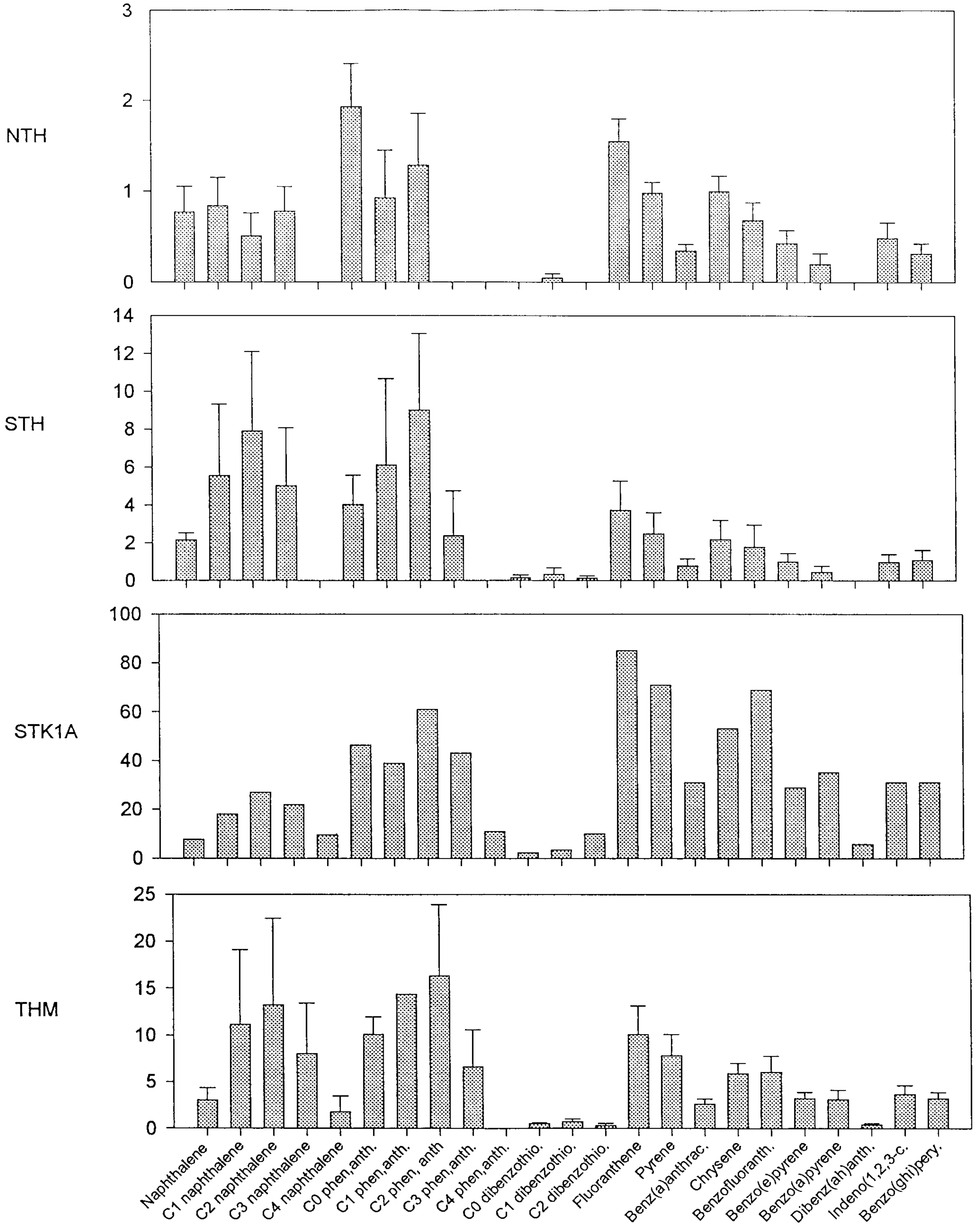


Figure 37. PAH source signatures (means +/- SE, ng/g dry weight) for bed sediments in the Thompson sub-basin reaches in 1995 (NTH and THM n=4, STH n=3, STK1A n=1).

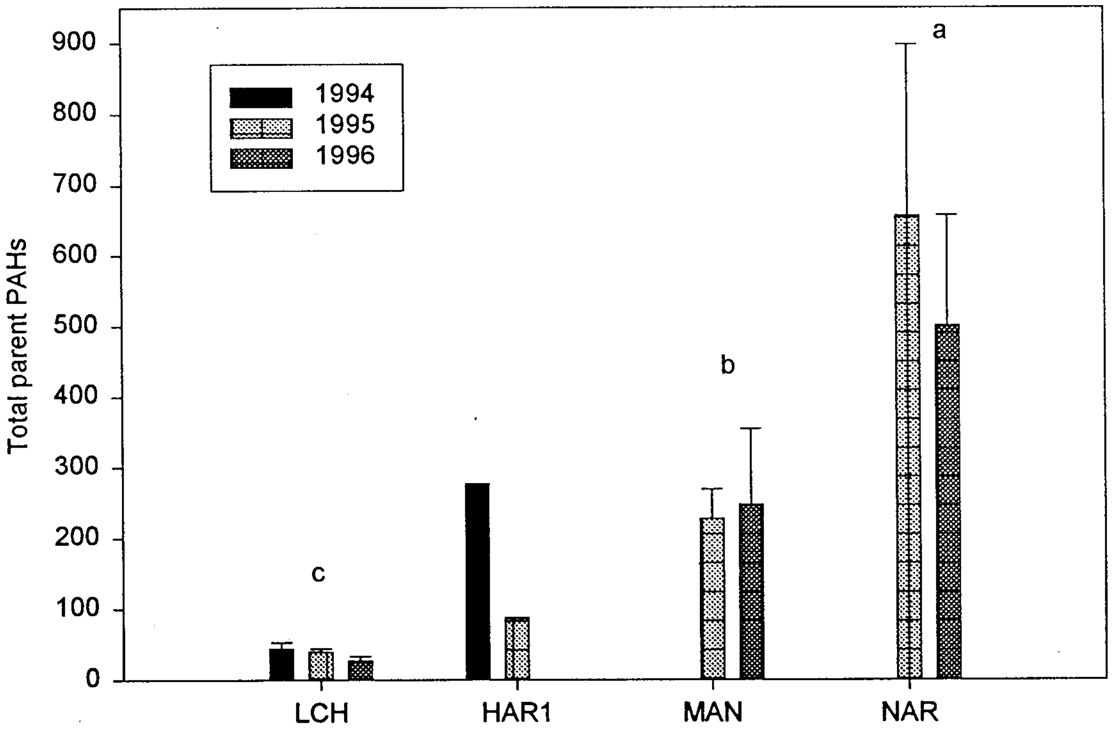


Figure 38. Total parent PAHs (means +/-SE, ng/g dw) in bed sediments from the lower Fraser basin reaches in 1994, 1995 and 1996 (n=4 except HAR1 n=1). Reaches with the same letter are not significantly different at $p<0.05$ according to 2-way ANOVA on the 1995 and 1996 data, followed by Tukey's test. Reaches not labeled with a letter were not included in the statistical analysis.

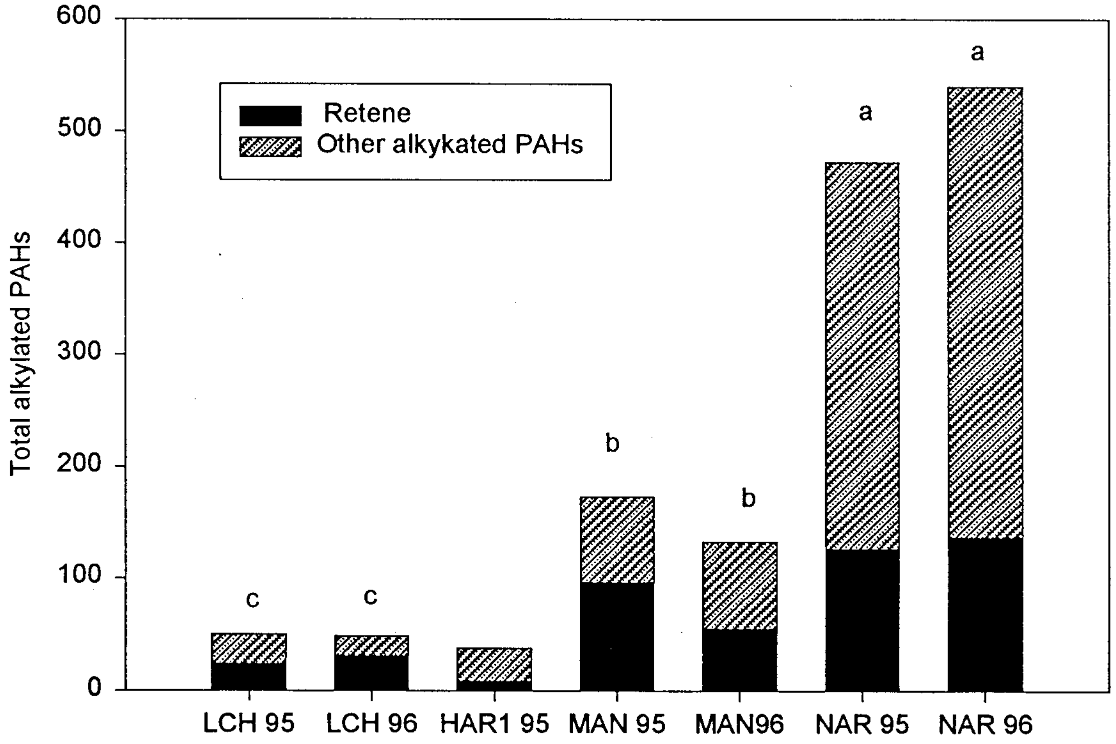


Figure 39. Mean total alkylated PAHs showing the proportion of retene (ng/g dw) in bed sediments from the lower Fraser basin reaches in 1995 and 1996 (n=4 except HAR1 n=1). Reaches with the same letter are not significanly different at p<0.05 according to 2-way ANOVA, followed by Tukey's test. Reaches not labeled with a letter were not included in the statistical analysis.

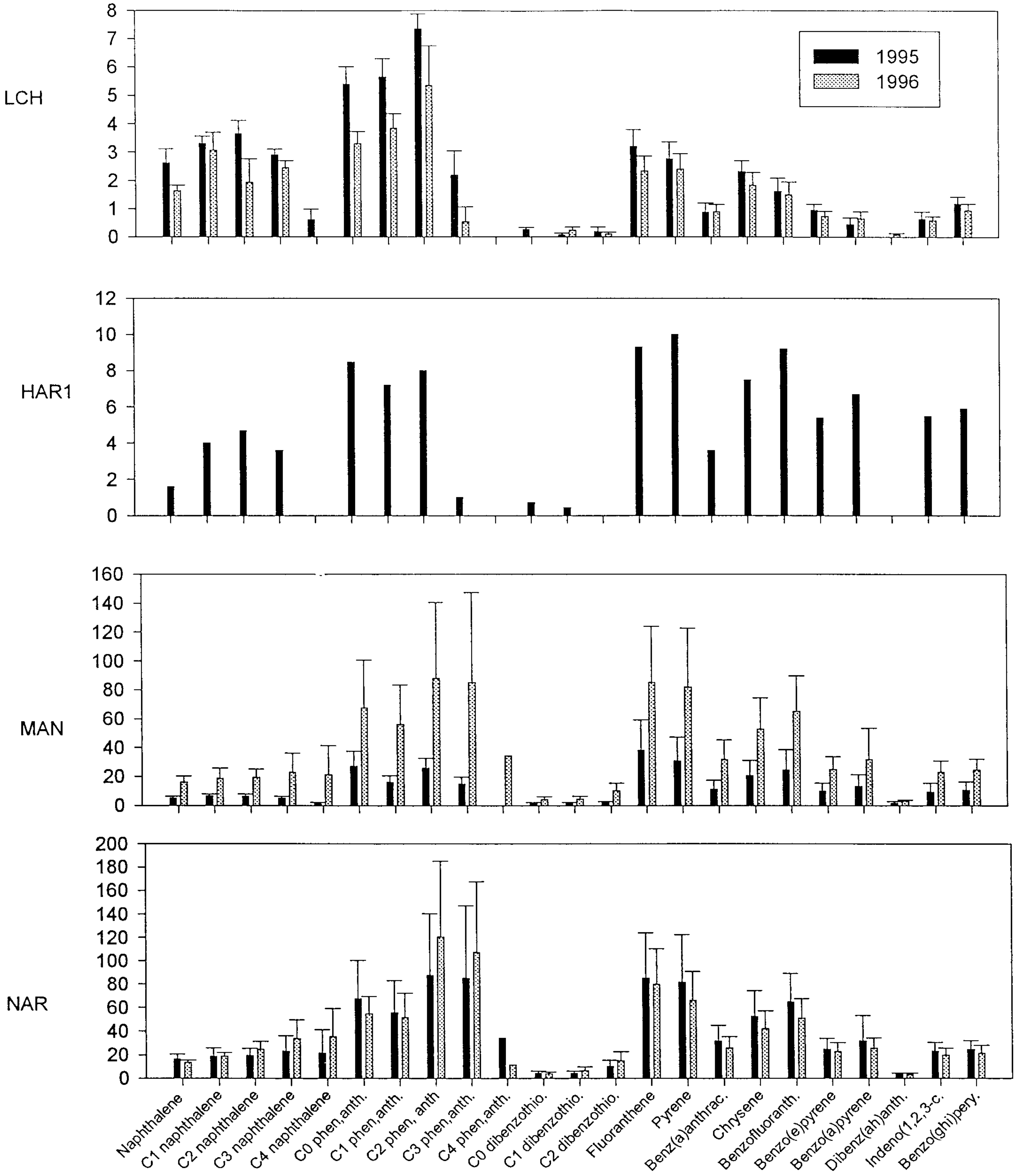


Figure 40. PAH source signatures (means +/- SE, ng/g dry weight) for bed sediments from the lower Fraser reaches in 1995 and 1996 (all reaches n=4 except HAR1 n=1).

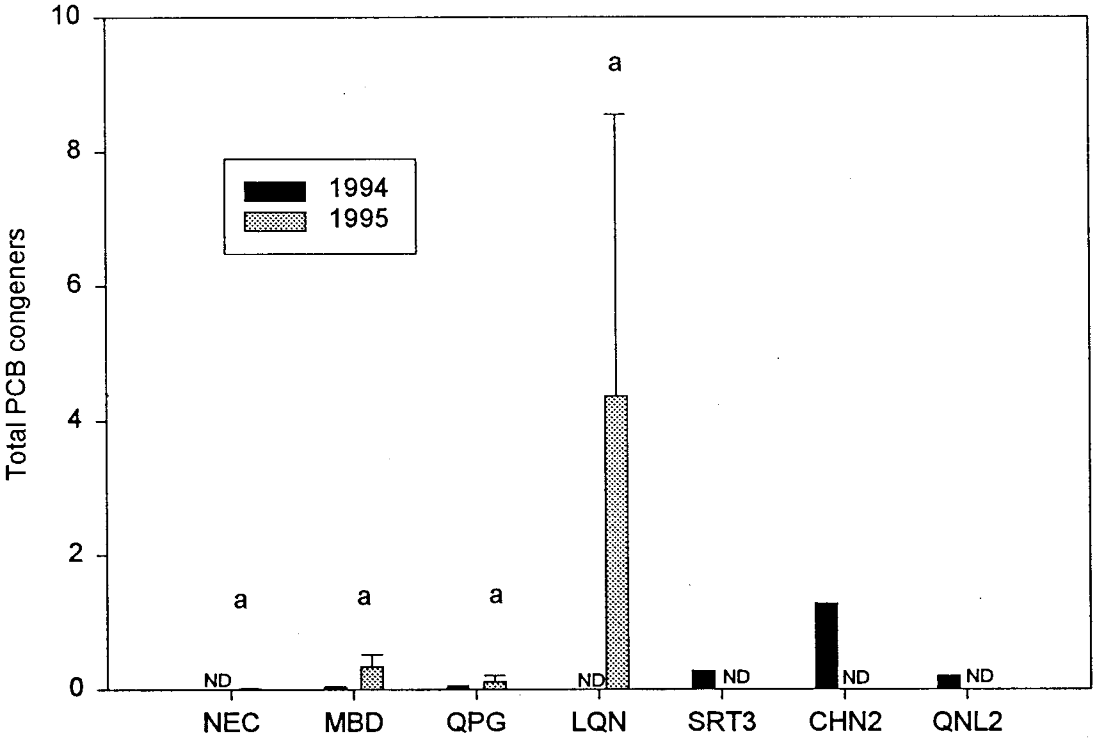


Figure 41. Total PCB congener concentrations (means +/- SE, ng/g dw) in bed sediments from the upper Fraser reaches in 1994 and 1995 (in 1994 n=4 for MBD, n=2 for QPG, all others n=1; in 1995 n=4 except SRT3, CHN2, QNL2 n=1). Reaches with the same letter are not significantly different at $p<0.05$ according to 1-way ANOVA on the 1995 data, followed by Tukey's test. Reaches not labeled with a letter were not included in the statistical analysis. ND indicates not detected.

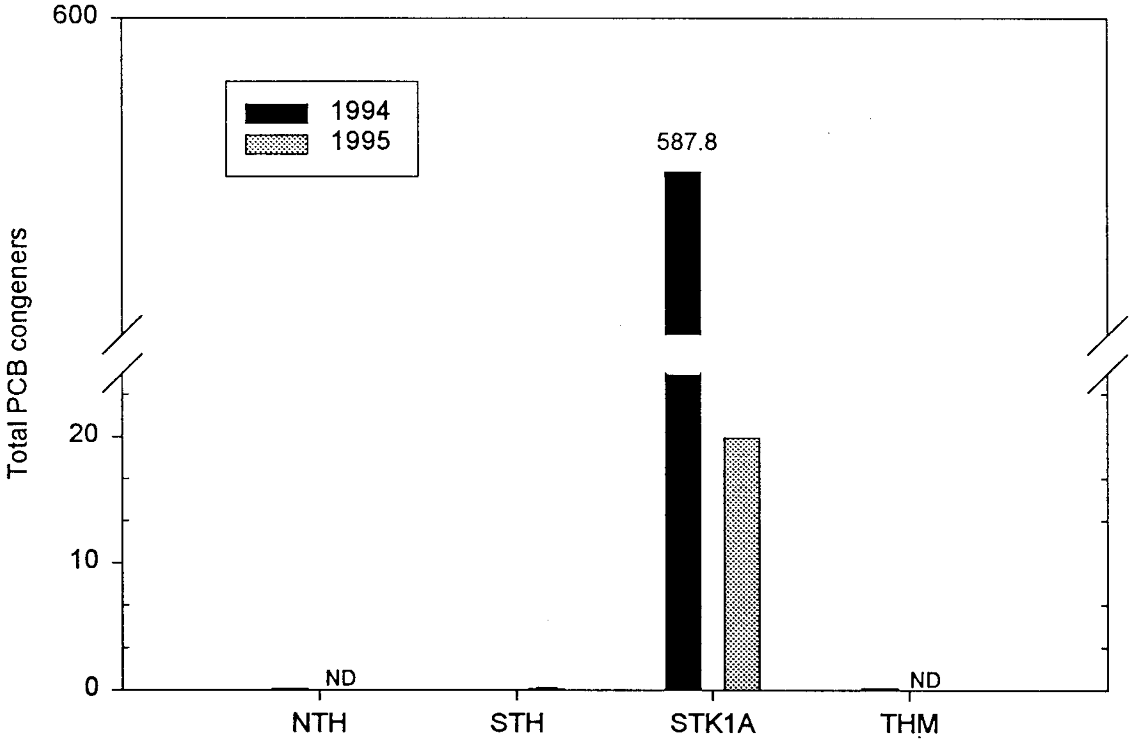


Figure 42. Total PCB congener concentrations (means +/- SE, ng/g dw) in bed sediments from the Thompson sub-basin reaches in 1994 and 1995 (in 1994 n=1; in 1995 NTH and THM n=4, STH n=3, STK1A n=1). ND indicates not detected.

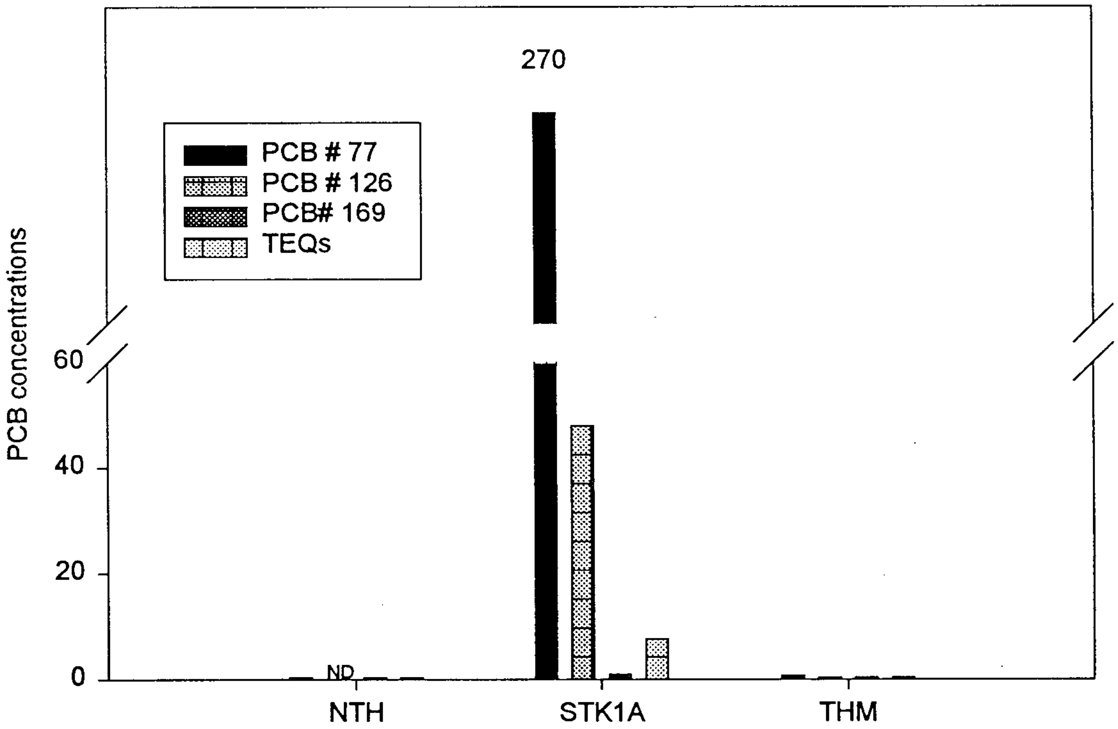


Figure 43. PCB coplanar and PCB TEQ concentrations (pg/g dw) in bed sediments from the Thompson sub-basin reaches in 1994 (n=1). ND indicates not detected.

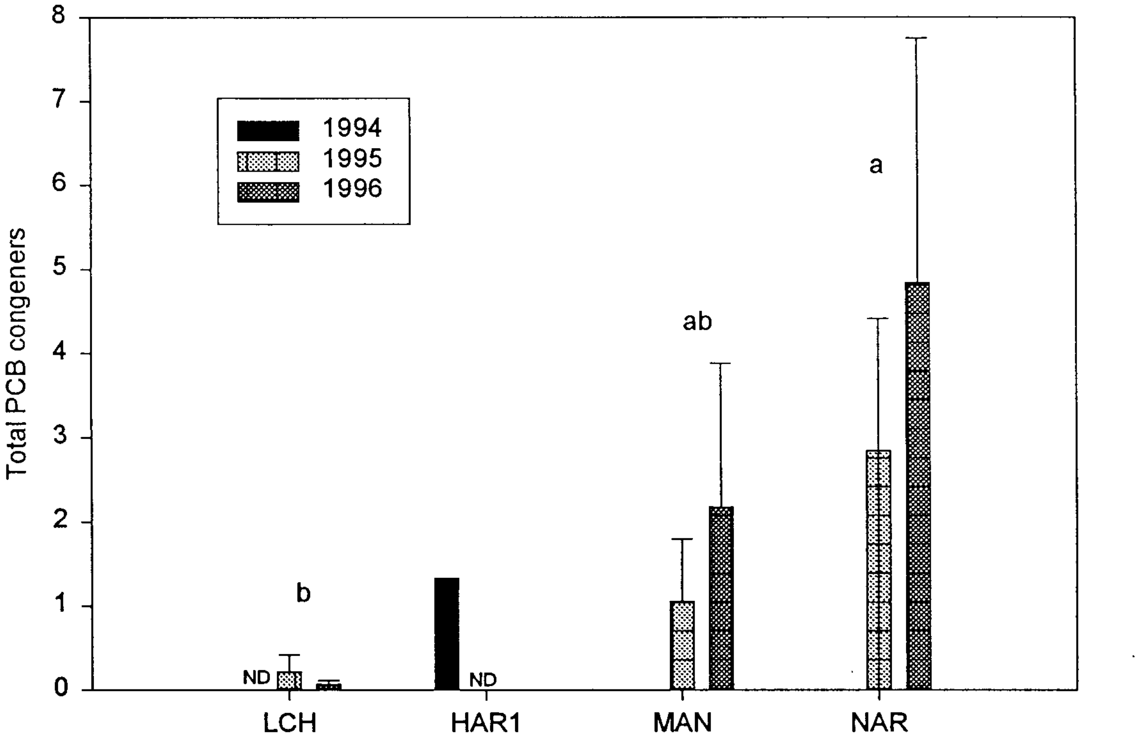


Figure 44. Total PCB congener concentrations (means +/- SE, ng/g dw) in bed sediments from the lower Fraser reaches in 1994,1995 and 1996 (in 1994 n=1; in 1995 n=4 except HAR1 n=1; in 1996 n=1). Reaches with the same letter are not significantly different at p<0.05 according to 2-way ANOVA on the 1995 and 1996 data, followed by Tukey's test. Reaches not labeled with a letter were not included in the statistical analysis.
ND indicates not detected.

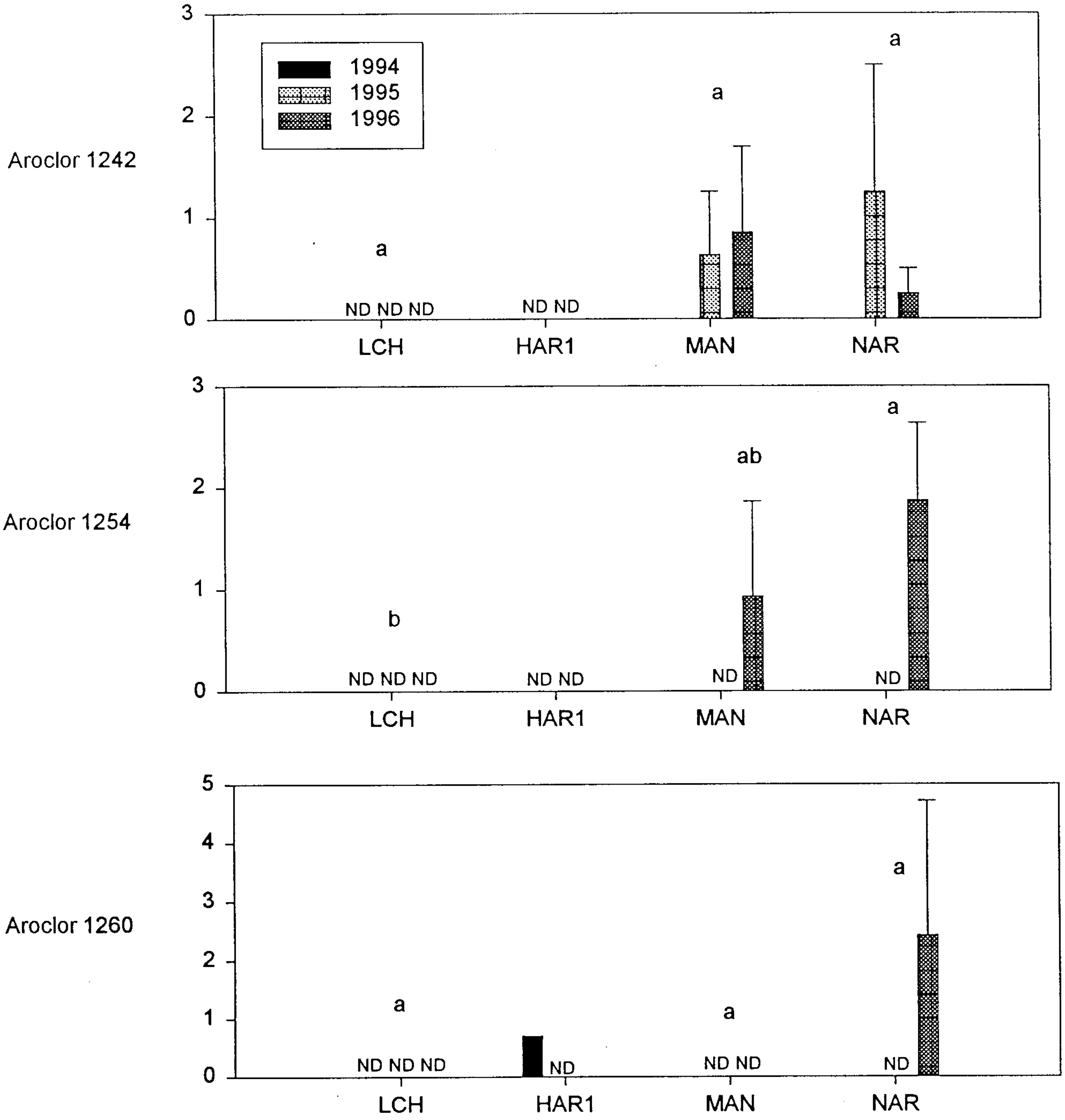


Figure 45. PCB Aroclor concentrations (means +/- SE, ng/g dw) in bed sediments from the lower Fraser reaches in 1994,1995 and 1996 (in 1994 n=1; in 1995 n=4 except HAR1 n=1; in 1996 n=4). Reaches with the same letter are not significantly different at $p<0.05$ according 2-way ANOVA on the 1995 and 1996 data, followed by Tukey's test. Reaches not labeled with a letter were not included in the statistical analysis. ND indicates not detected.

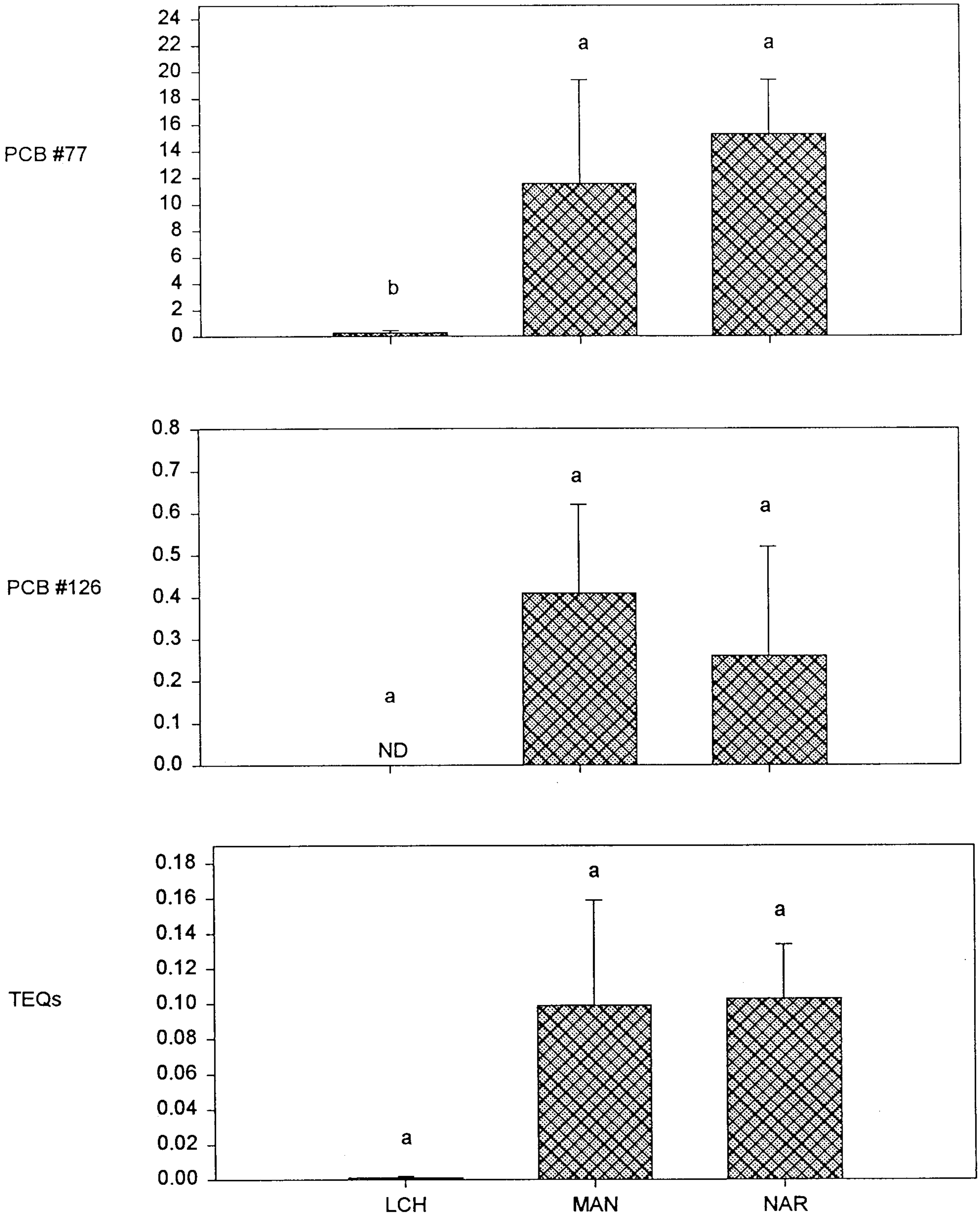


Figure 46. PCB coplanars #77 and #126 and PCB TEQs (means +/- SE, pg/g dw) in bed sediments from the lower Fraser River reaches in 1996 (n=4 for LCH and MAN, n=3 for NAR). Reaches with the same letter are not significantly different at $p<0.05$ according to 1-way ANOVA, followed by Tukey's test. ND indicates not detected.

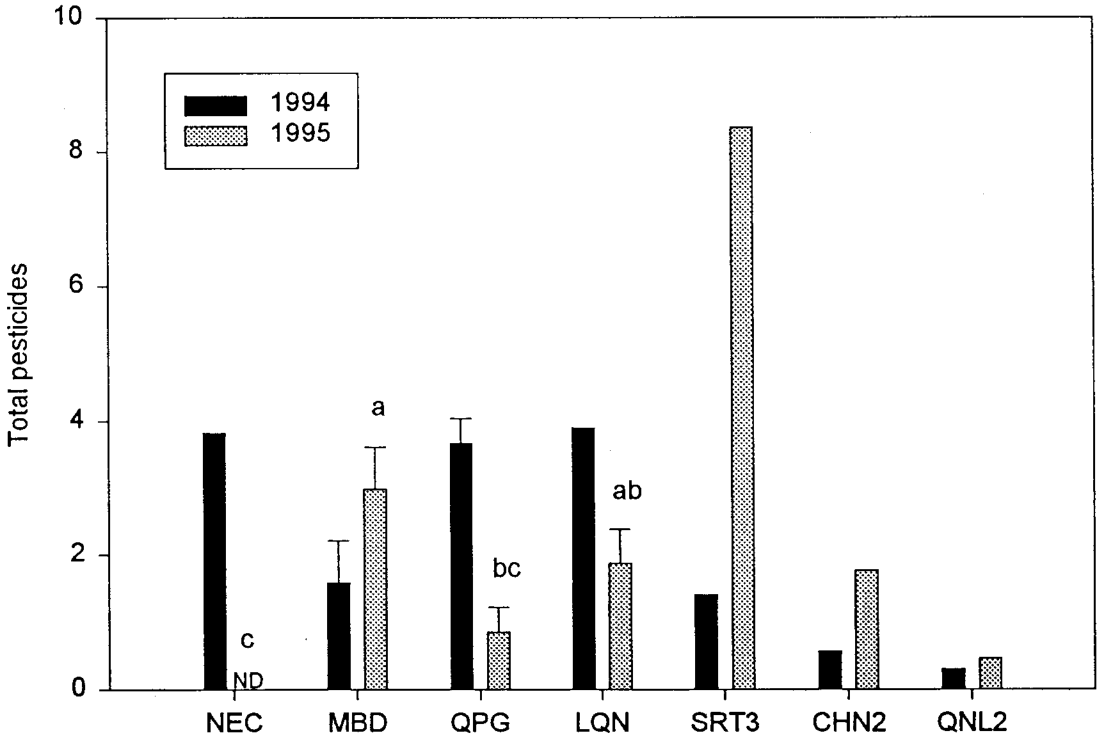


Figure 47. Total pesticides (means +/- SE, ng/g dw) in bed sediments from the upper Fraser reaches in 1994 and 1995 (in 1994 n=4 for MBD, n=2 for QPG, all others n=1; in 1995 n=4 except SRT3, CHN2, QNL2 n=1). Reaches with the same letter are not significantly different at $p<0.05$ according to 1-way ANOVA on the 1995 data, followed by Tukey's test. Reaches not labeled with a letter were not included in the statistical analysis. ND indicates not detected.

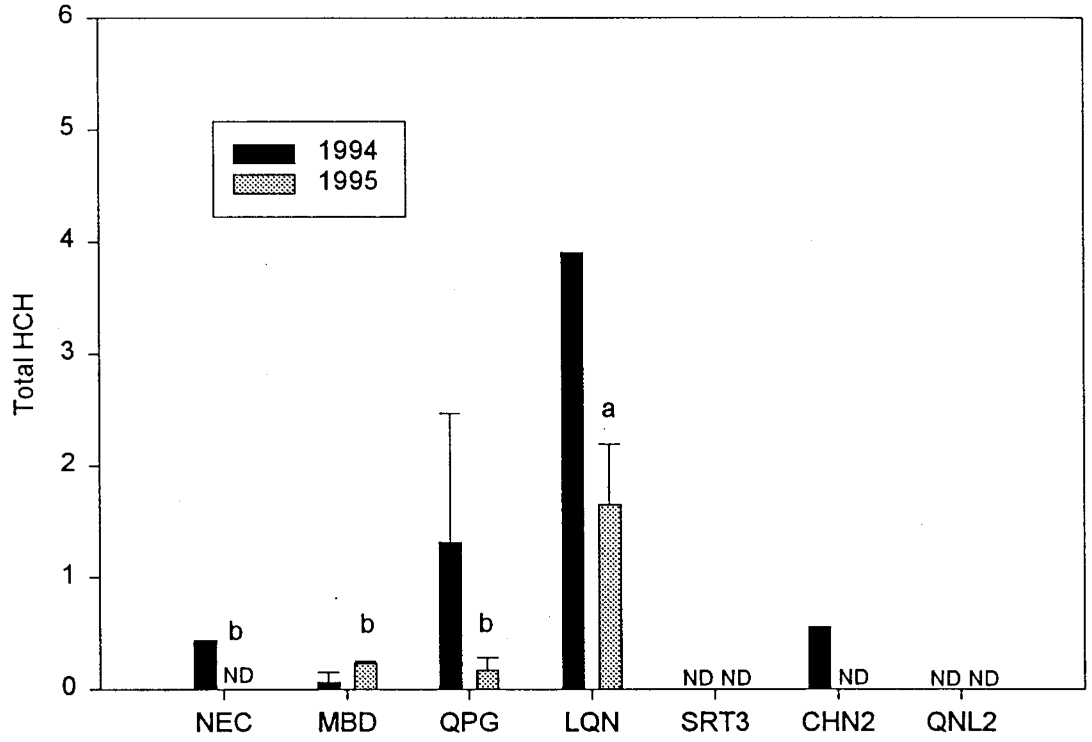


Figure 48. Total HCH (means +/- SE, ng/g dw) in bed sediments from the upper Fraser reaches in 1994 and 1995 (in 1994 n=4 for MBD, n=2 for QPG,all others n=1; in 1995 n=4 except SRT3, CHN2, QNL2 n=1). Reaches with the same letter are not significantly different at p<0.05 accoding to 1-way ANOVA on the 1995 data, followed by Tukey's test. Reaches not labeled with a letter were not included in the statistical analysis. ND indicates not detected.

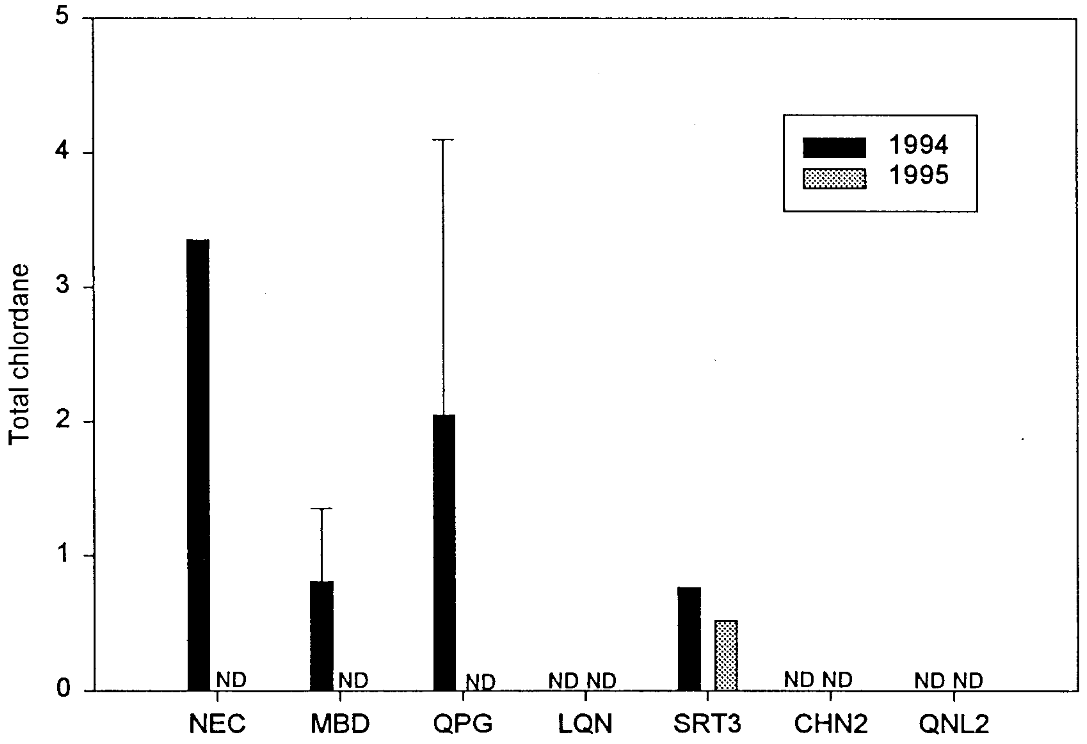


Figure 49. Total chlordane (means +/- SE, ng/g dw) in bed sediments from the upper Fraser reaches in 1994 and 1995 (in 1994 n=4 for MBD, n=2 for QPG, all others n=1; in 1995 n=4 except SRT3, CHN2, QNL2 n=1). ND indicates not detected.

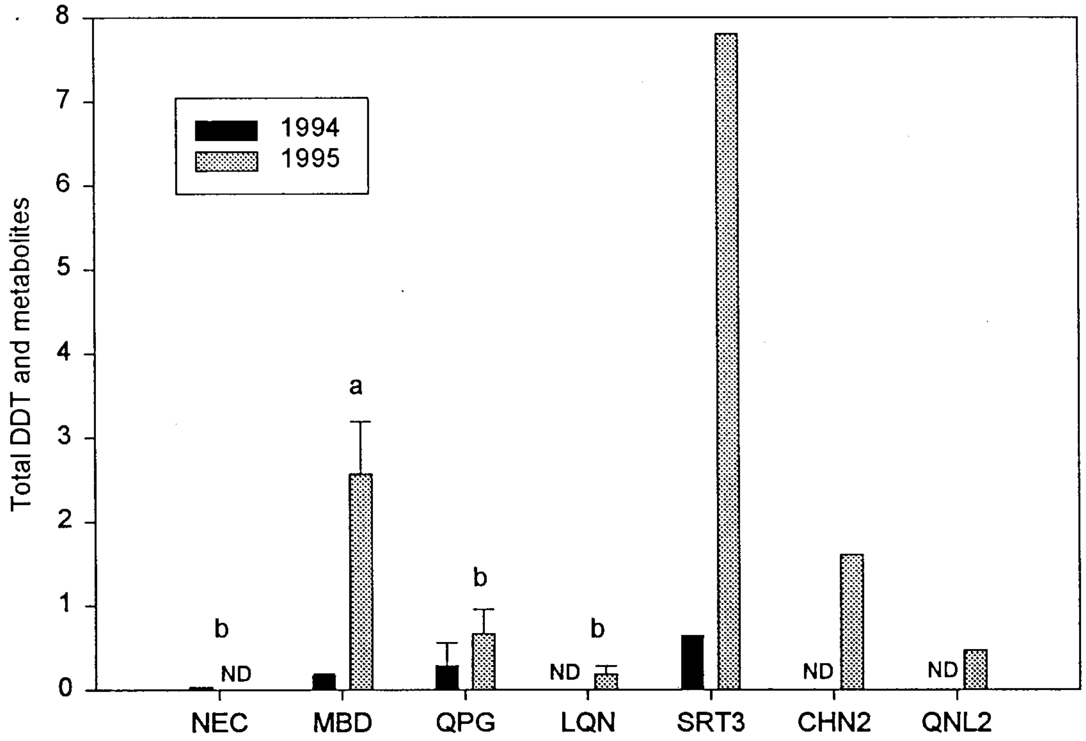


Figure 50. Total DDT and metabolites (means +/- SE, ng/g dw) in bed sediments from the upper Fraser reaches in 1994 and 1995 (in 1994 n=4 for MBD, n=2 for QPG, all others n=1; in 1995 n=4 except SRT3, CHN2, QNL2 n=1). Reaches with the same letter are not significantly different at p<0.05 according to 1-way ANOVA on the 1995 data, followed by Tukey's test. Reaches not labeled with a letter were not included in the statistical analysis. ND indicates not detected.

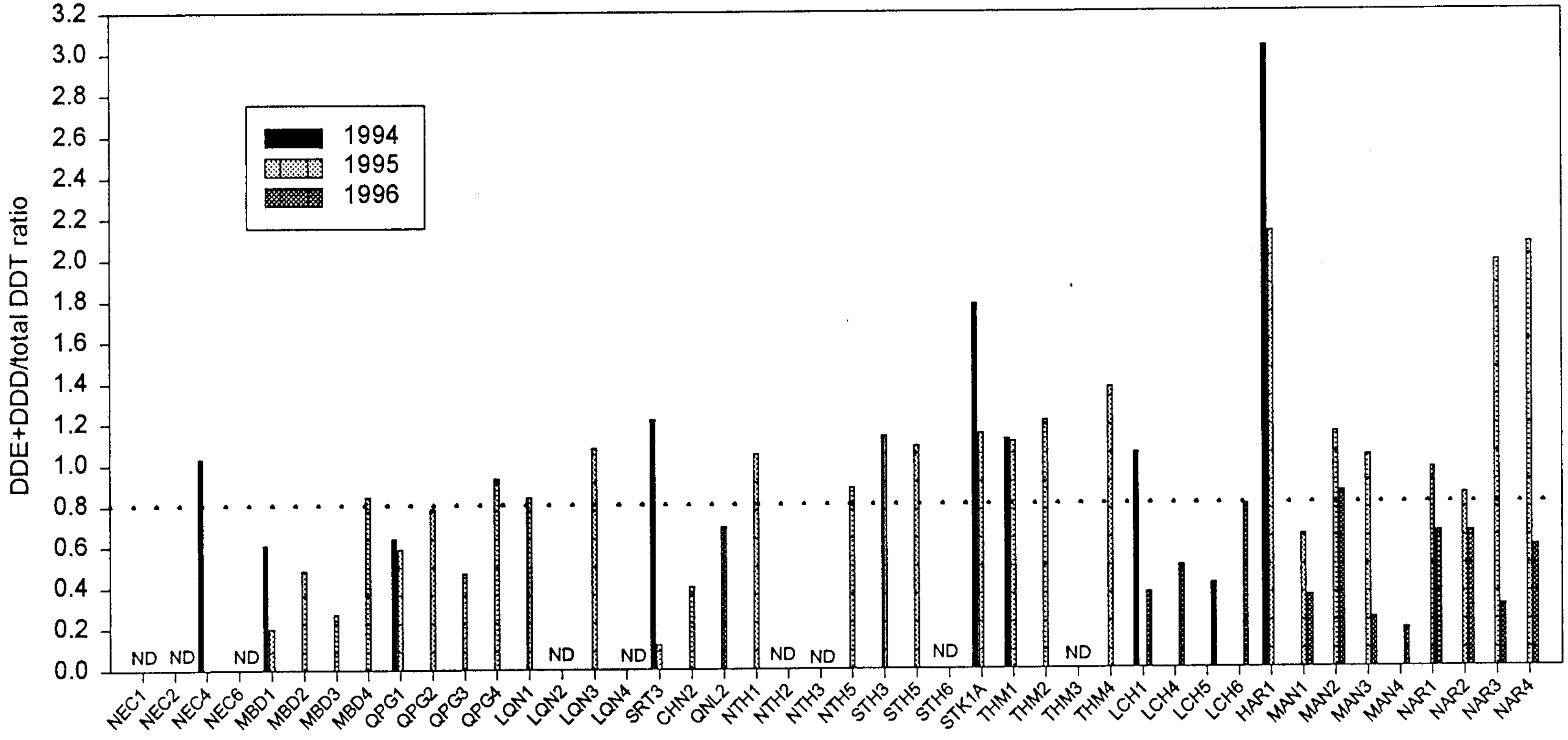


Figure 51. DDE+DDD/total DDT ratios in bed sediments from Fraser River basin sampling sites in 1994, 1995 and 1996.

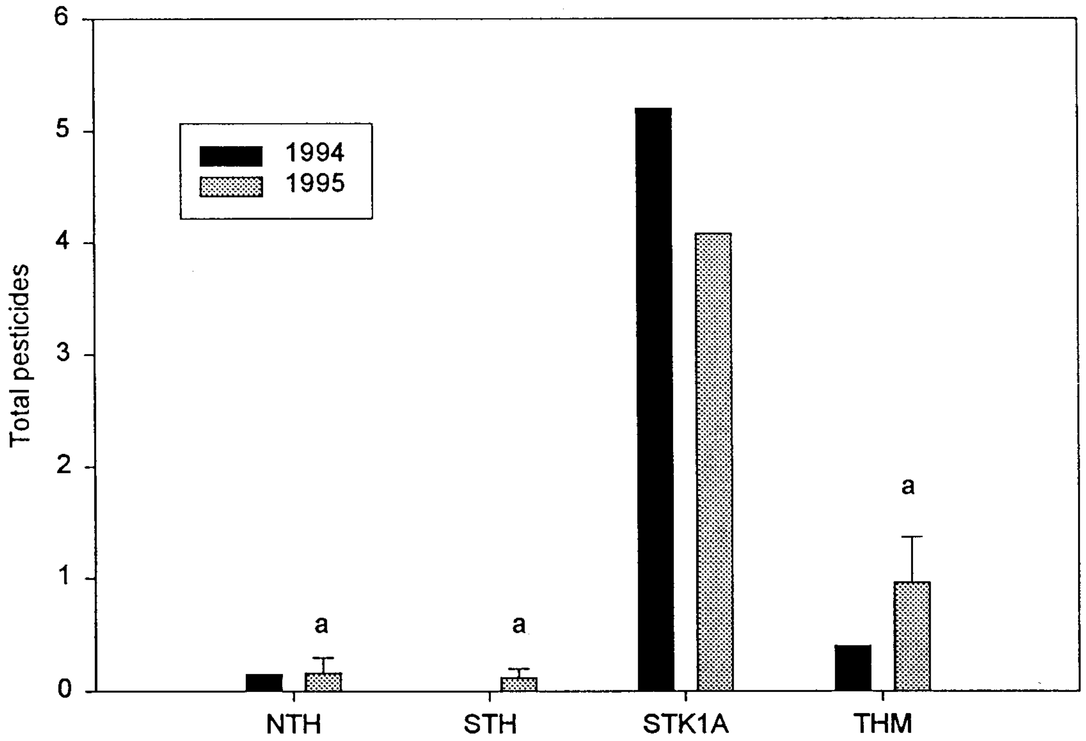


Figure 52. Total pesticides (means +/- SE, ng/g dw) in bed sediments from the Thompson sub-basin reaches in 1994 and 1995 (in 1994 n=1; in 1995 NTH and THM n=4, STH n=3, STK1A n=1). Reaches with the same letter are not significantly different at $p<0.05$ according to 1-way ANOVA on the 1995 data, followed by Tukey's test. Reaches not labeled with a letter were not included in the statistical analysis.

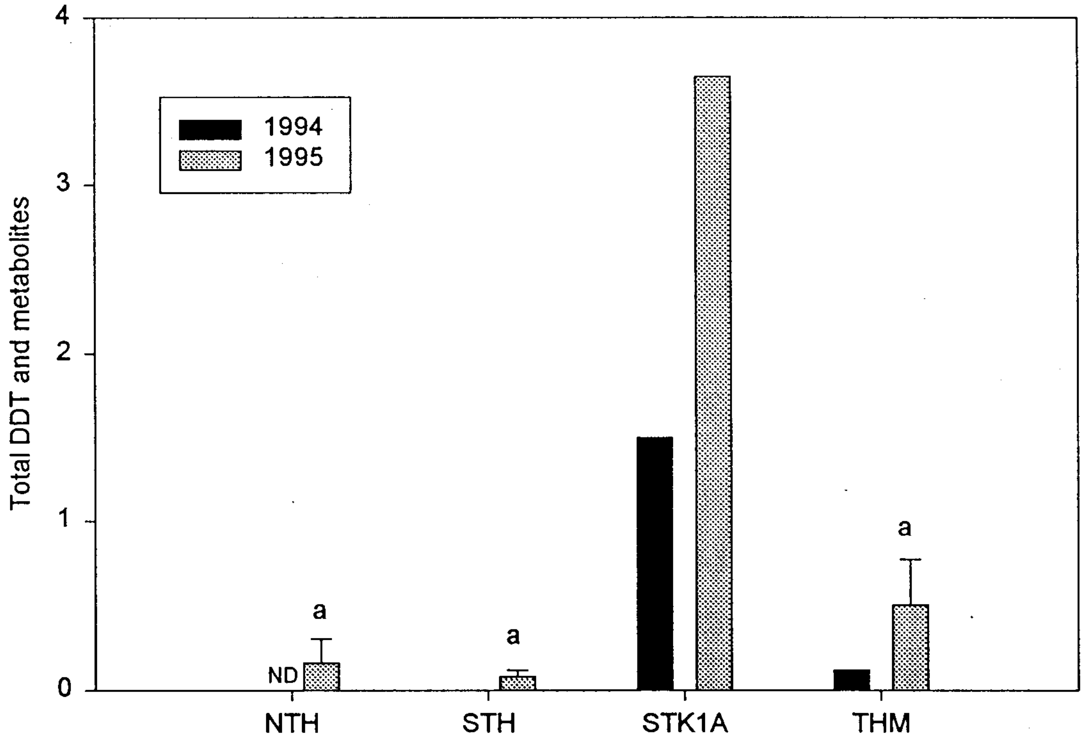


Figure 53. Total DDT and metabolites (means +/- SE, ng/g dw) in bed sediments from the Thompson sub-basin reaches in 1994 and 1995 (in 1994 n=1; in 1995 NTH and THM n=4, STH n=3, STK1A n=1). Reaches with the same letter are not significantly different at $p<0.05$ according to 1-way ANOVA on the 1995 data, followed by Tukey's test. Reaches not labeled with a letter were not included in the statistical analysis. ND indicates not detected.

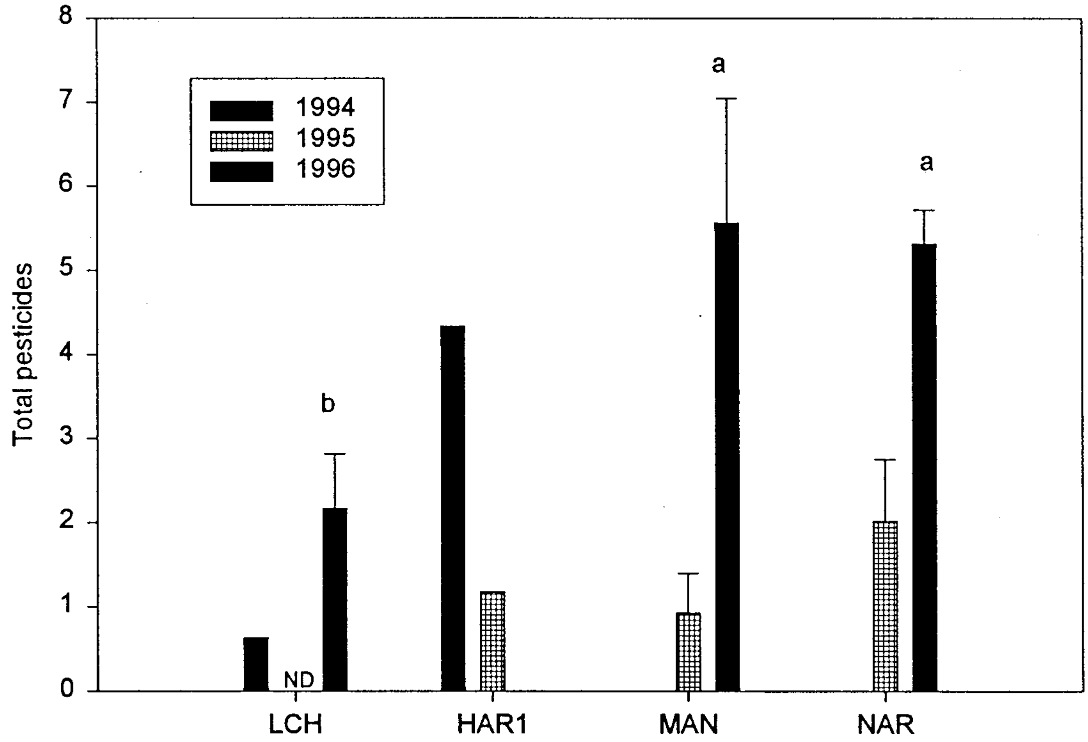


Figure 54. Total pesticides (means +/- SE, ng/g dw) in bed sediments from the lower Fraser reaches in 1994,1995 and 1996 (in 1994 n=1; in 1995 n=4 except HAR1 n=1; in 1996 n=4). Reaches with the same letter are not significantly different at p<0.05 according to 2-way ANOVA on 1995 and 1996 data, followed by Tukey's test. Reaches not labeled with a letter were not included in the statistical analysis. ND indicates not detected.

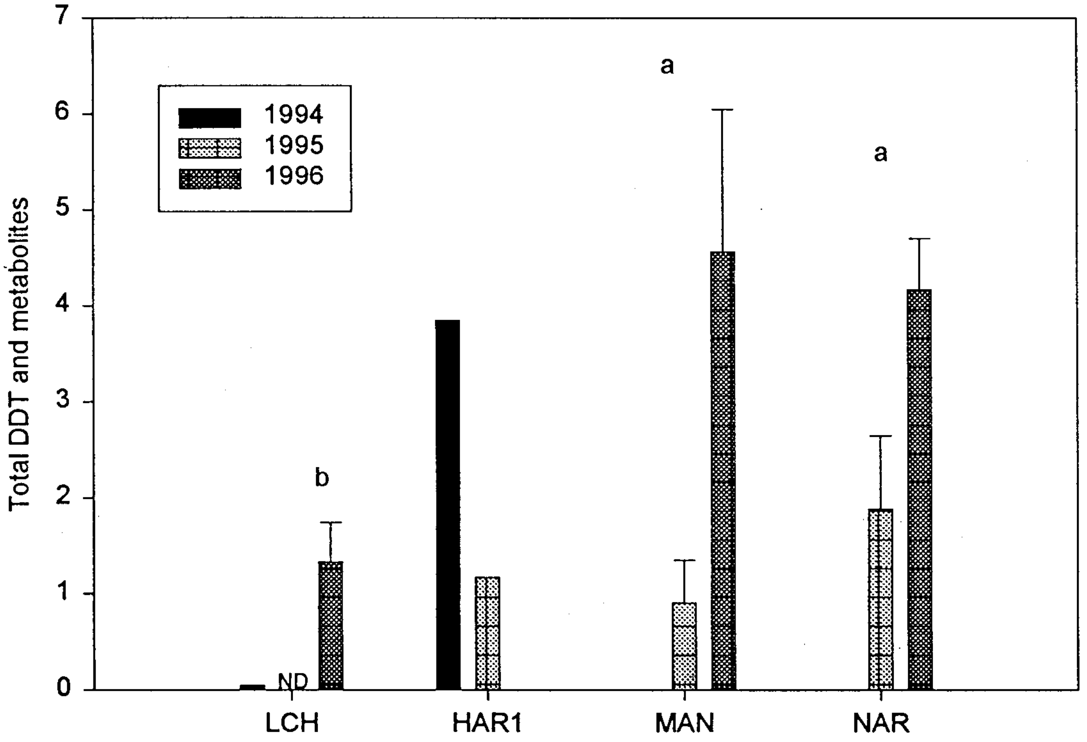


Figure 55. Total DDT and metabolites (means +/- SE, ng/g dw) in bed sediments from the lower Fraser reaches in 1994,1995 and 1996 (in 1994 n=1; in 1995 n=4 except HAR1 n=1; in 1996 n=4). Reaches with the same letter are not significantly different at $p<0.05$ according to 2-way ANOVA on 1995 and 1996 data, followed by Tukey's test. Reaches not labeled with a letter were not included in the statistical analysis. ND indicates not detected.

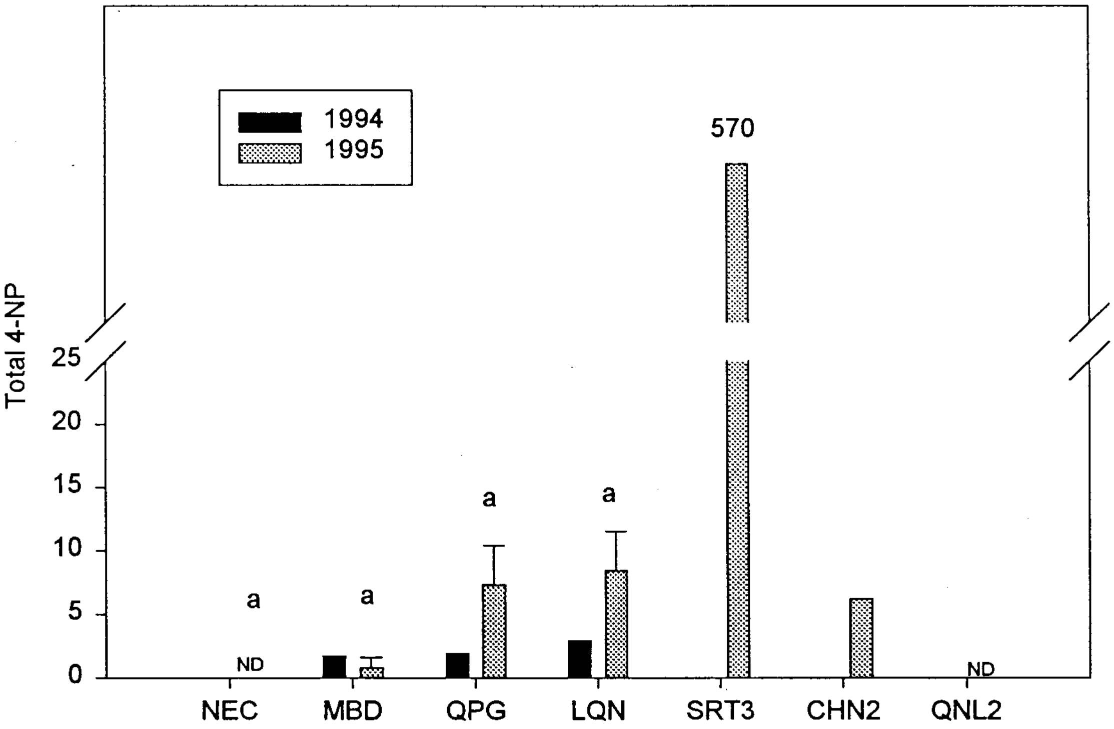


Figure 56. Total 4-nonylphenol concentrations (means +/-SE, ng/g dw) in bed sediments from the upper Fraser Reaches in 1994 and 1995 (in 1994 n=1; in 1995 n=4 for all reaches except SRT3, CHN2, QNL2 where n=1). Reaches with the same letter are not significantly different at $p<0.05$ accoding to 1-way ANOVA on the 1995 data, followed by Tukey's test. Reaches not labeled with a letter were not included in the statistical analysis due to lack of replication. ND indicates not detected.

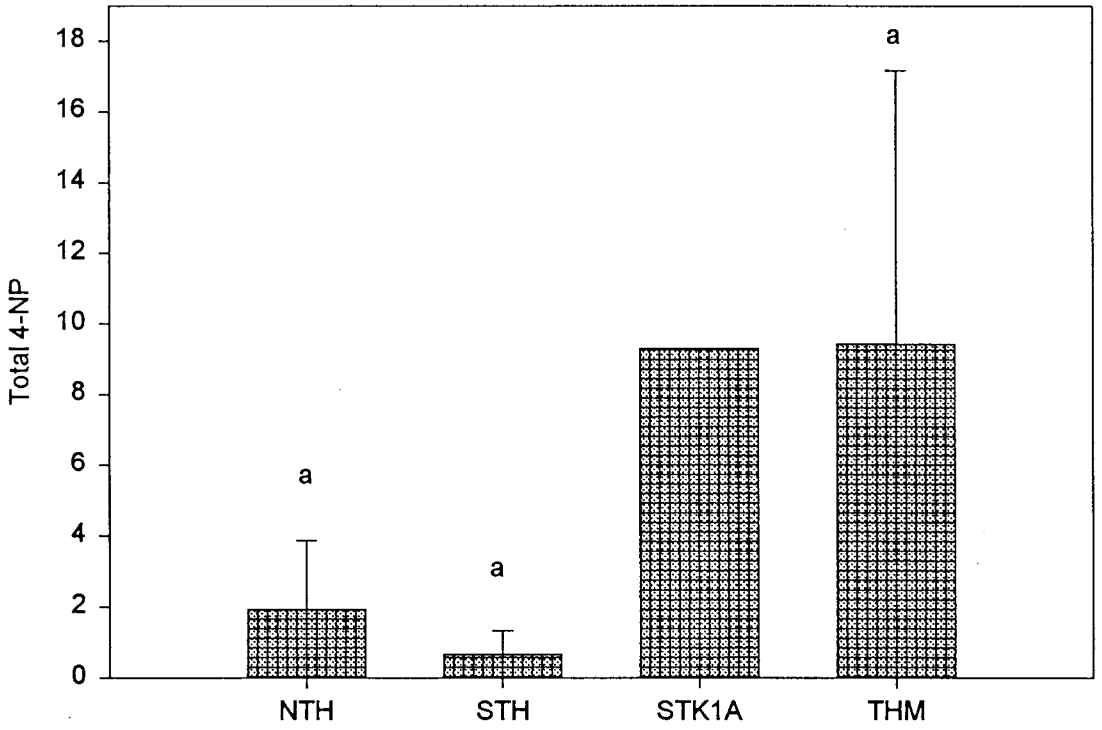


Figure 57. Total 4-nonylphenol concentrations (means +/-SE, ng/g dw) in bed sediments from the Thompson sub-basin reaches in 1995 (n=4 for NTH and THM; n=3 for STH n=1 for STK1A). Reaches with the same letter are not significantly different at $p<0.05$ according to 1-way ANOVA, followed by Tukey's test. Reaches not labeled with a letter were not included in the statistical analysis due to lack of replication.

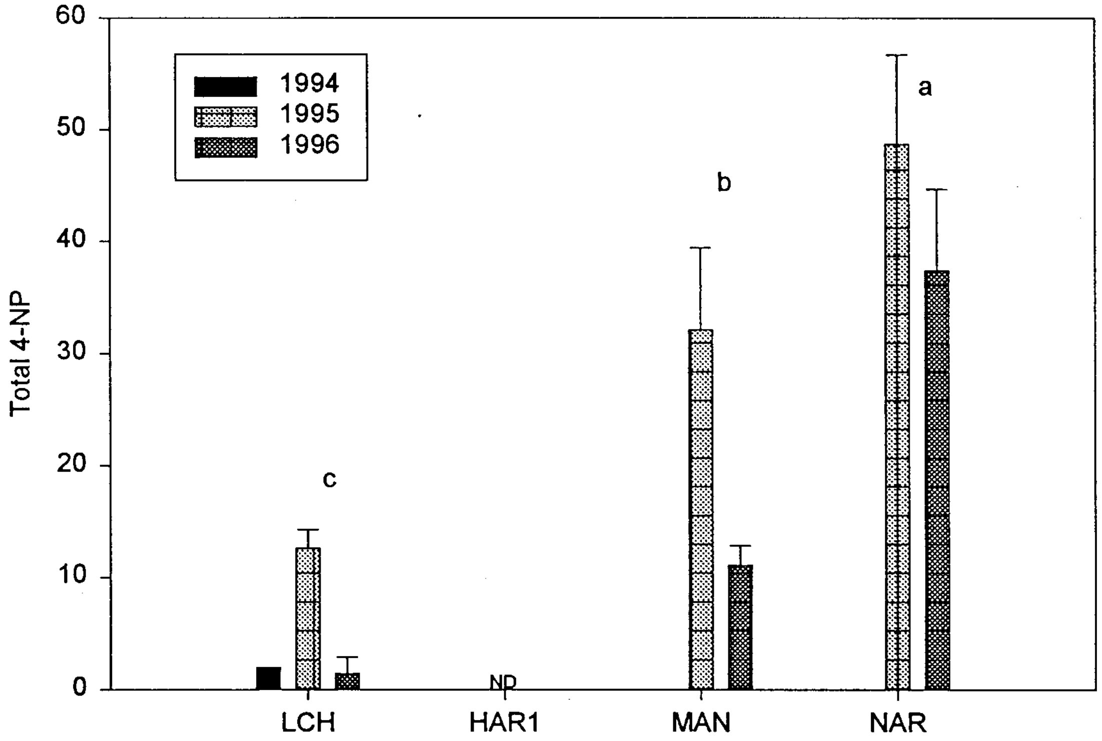


Figure 58. Total 4-nonylphenol concentrations (means +/-SE, ng/g dw) in bed sediments from the lower Fraser reaches in 1994,1995 and 1996 (1994 n=1;1995 and 1996 n=4 except HAR1 n=1). Reaches with the same letter are not significantly different at $p<0.05$ according to 2-way ANOVA on the 1995 and 1996 data, followed by Tukey's test. Reaches not labeled with a letter were not included in the statistical analysis due to lack of replication. ND indicates not detected.

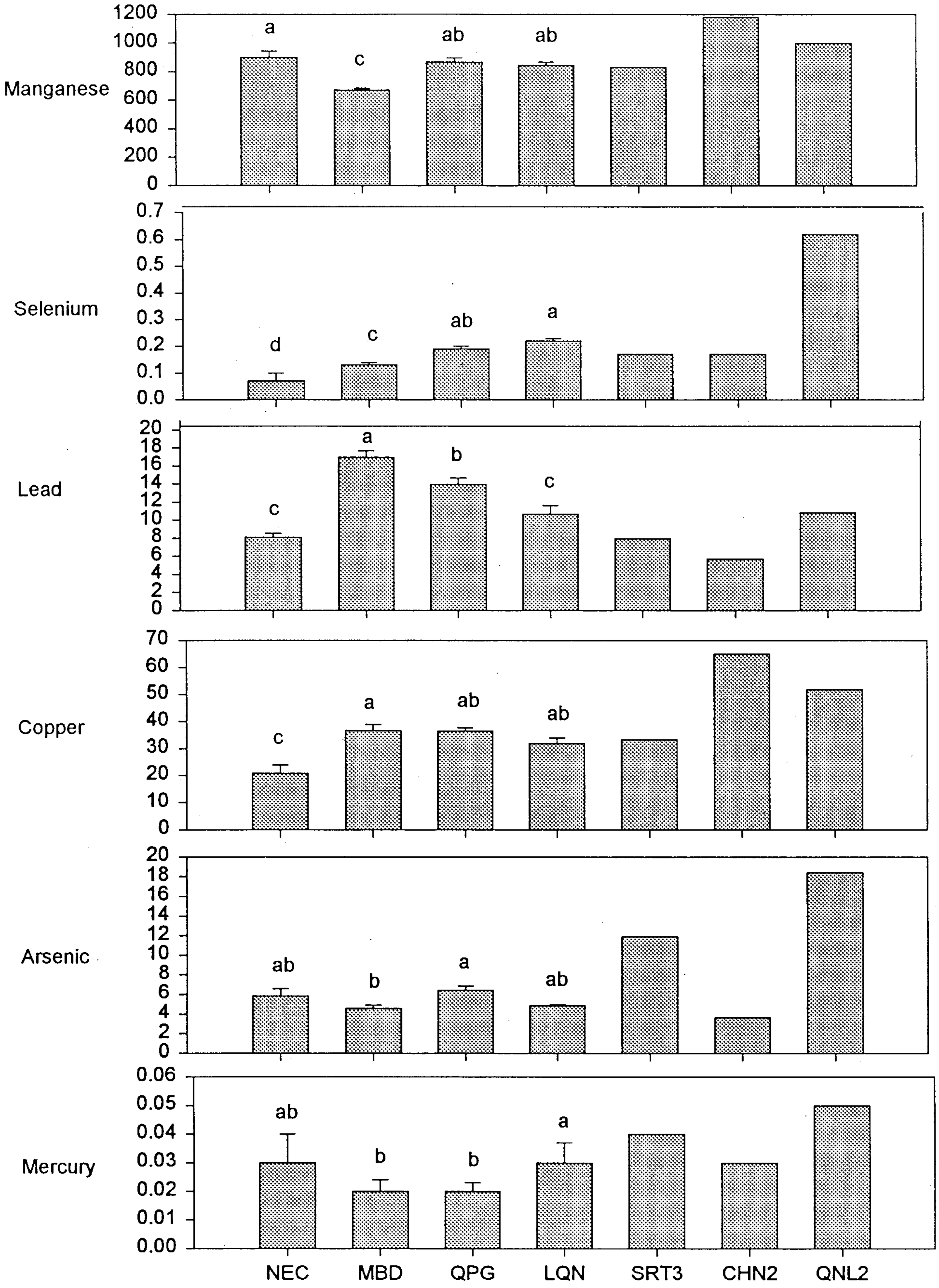


Figure 59. Trace metal concentrations (means +/- SE, ug/g dw) in bed sediments from the upper Fraser basin reaches in 1994 (n=4 except SRT3, CHN2, QNL2 n=1). Reaches with the same letter are not significantly different at p<0.05 according to 1-way ANOVA, followed by Tukey's test. Reaches not labeled with a letter were not included in the statistical analysis.

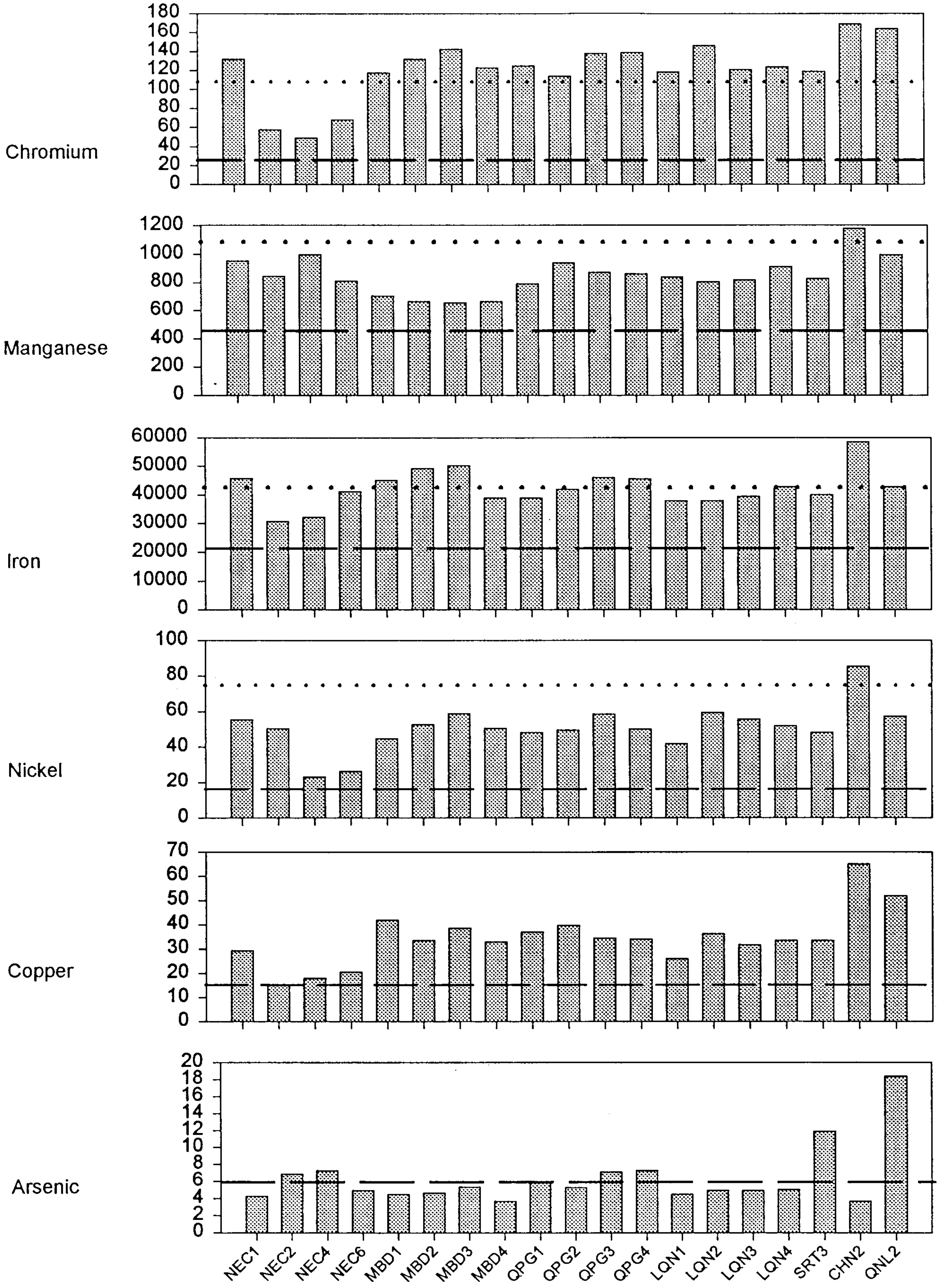


Figure 60. Trace metal concentrations (ug/g dw) in bed sediments from the upper Fraser basin sampling sites in 1994 relative to BCMELP sediment quality criteria. Dashed line indicates lowest effect level criteria. Dotted line indicates severe effect level criteria.

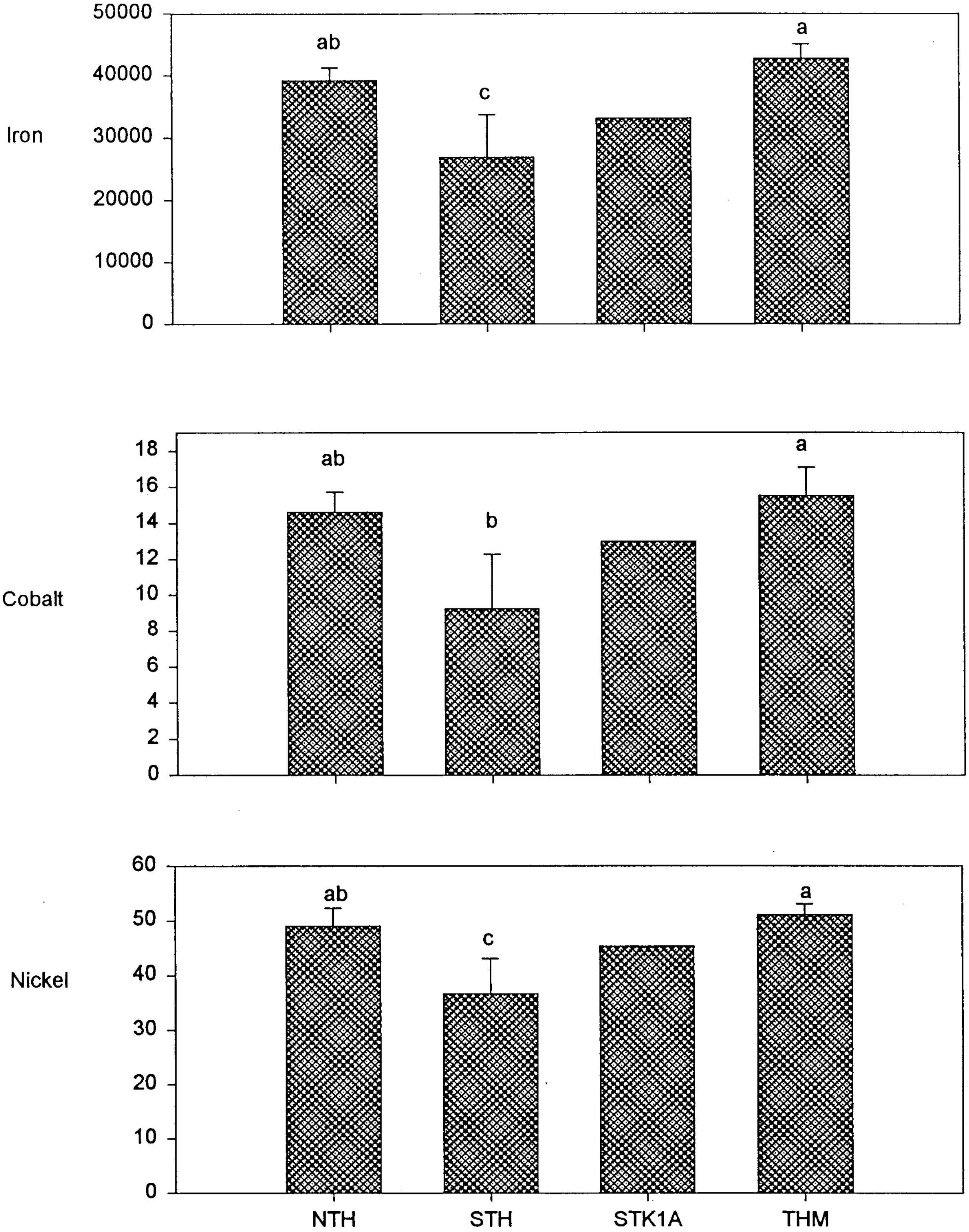


Figure 61. Trace metal concentrations (means +/- SE, ug/g dw) in bed sediments from the Thompson sub-basin reaches in 1994 (n=4 except STH n=3 and STK1A n=1). Reaches with the same letter are not significantly different at $p<0.05$ according to 1-way ANOVA, followed by Tukey's test. Reaches not labeled with a letter were not included in the statistical analysis.

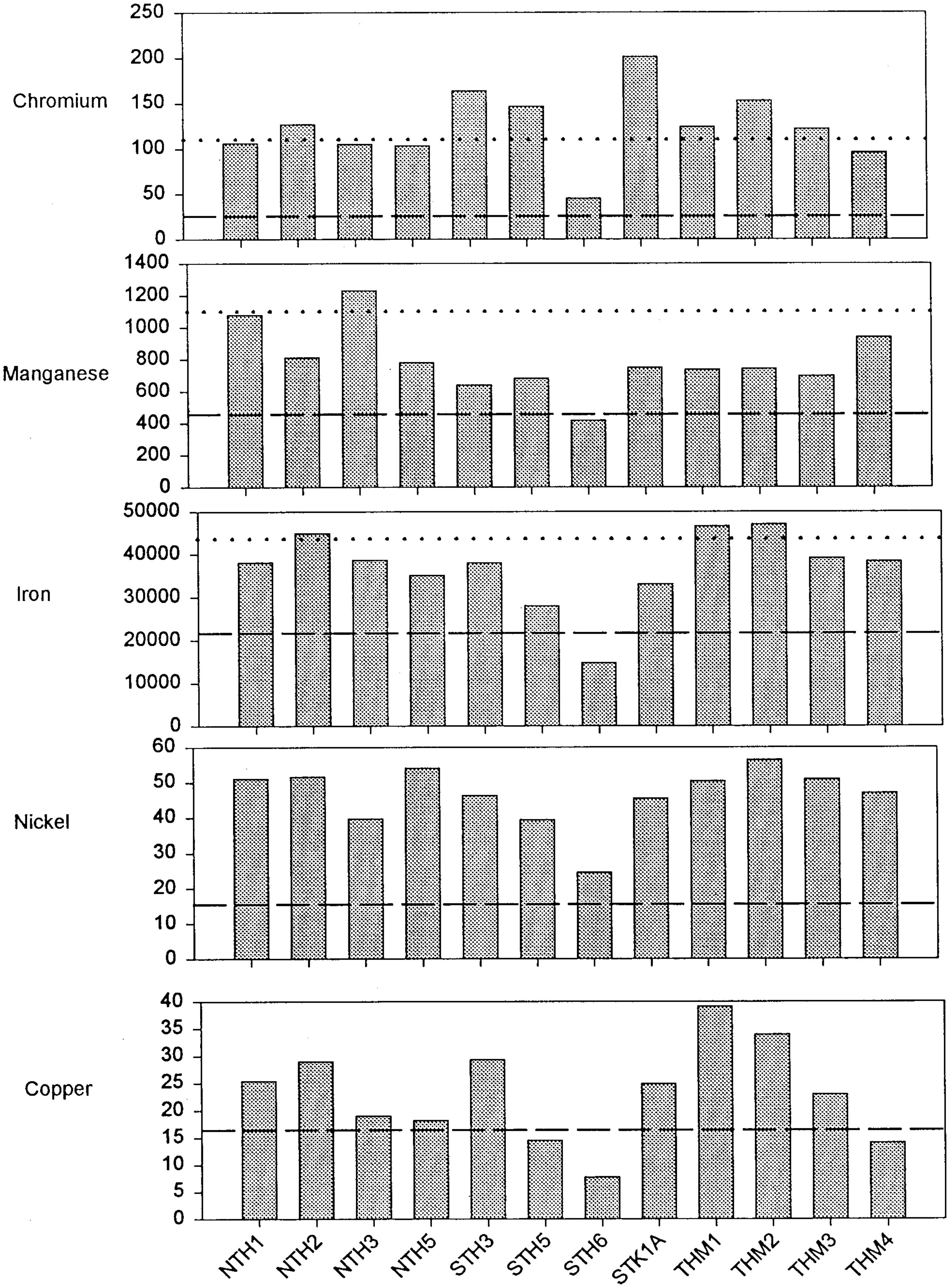


Figure 62. Trace metal concentrations (ug/g dw) in bed sediments from the Thompson sub-basin sampling sites in 1994 relative to BCMELP sediment quality criteria. Dashed line indicates lowest effect level criteria. Dotted line indicates severe effect level criteria.

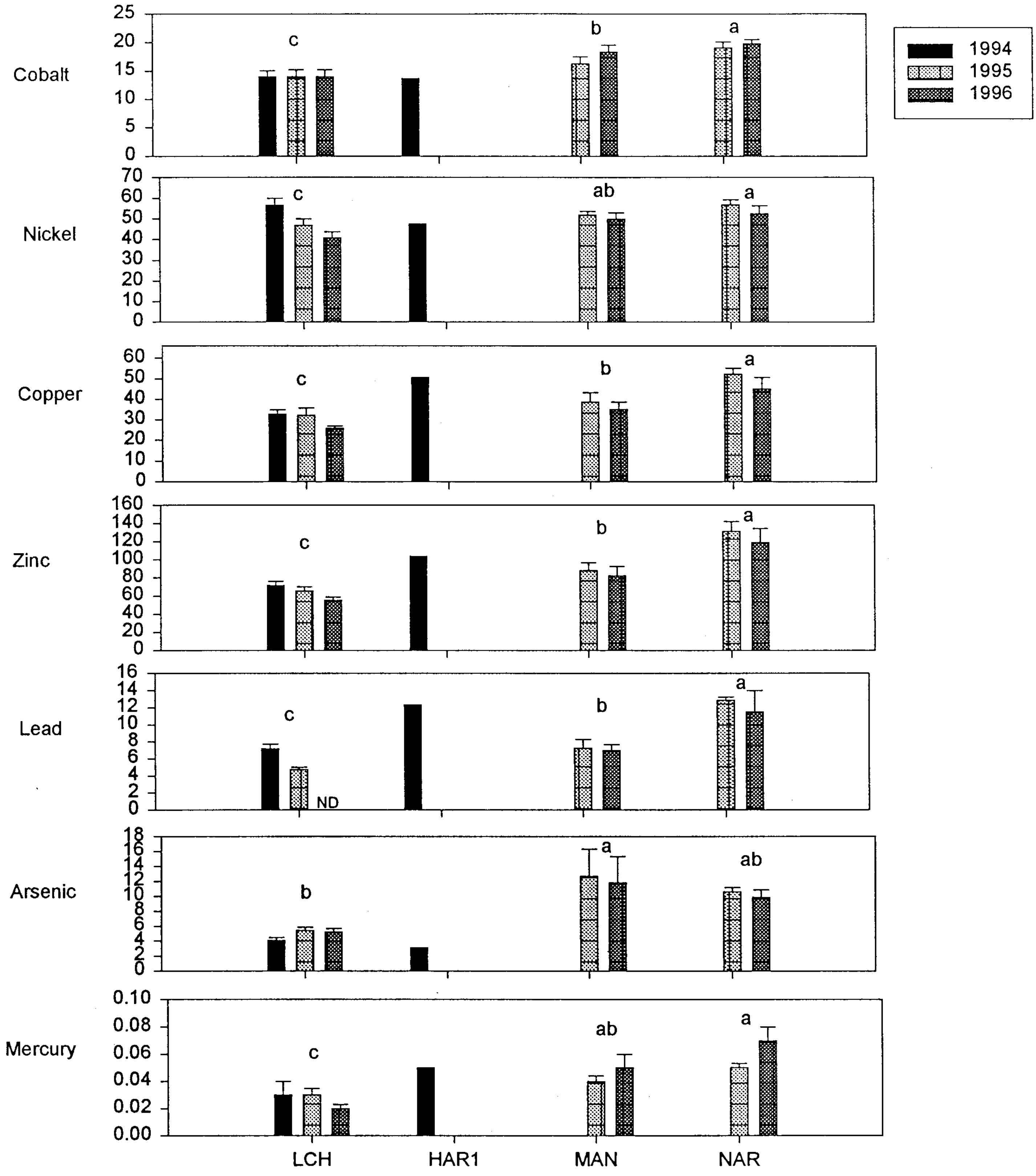
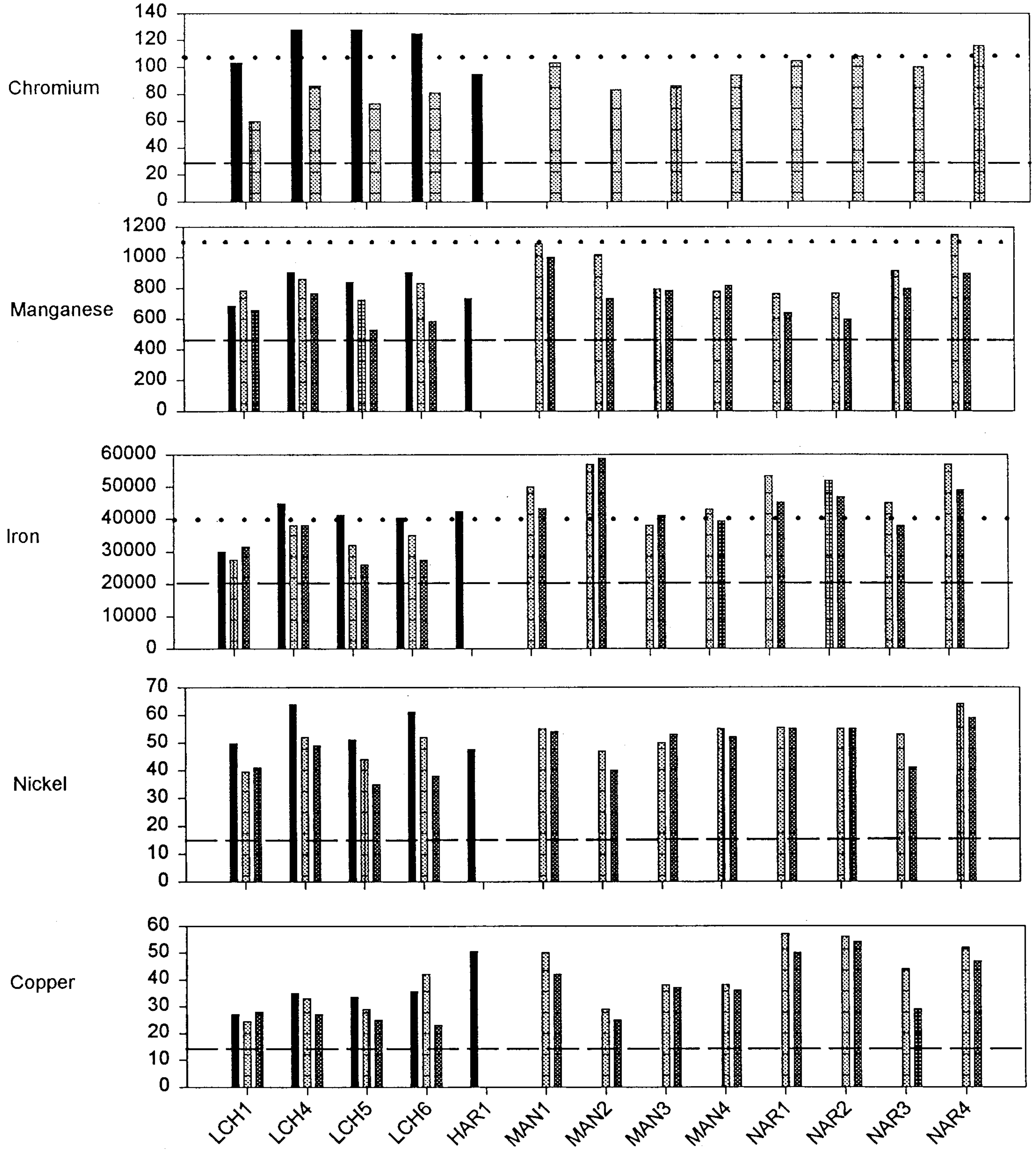
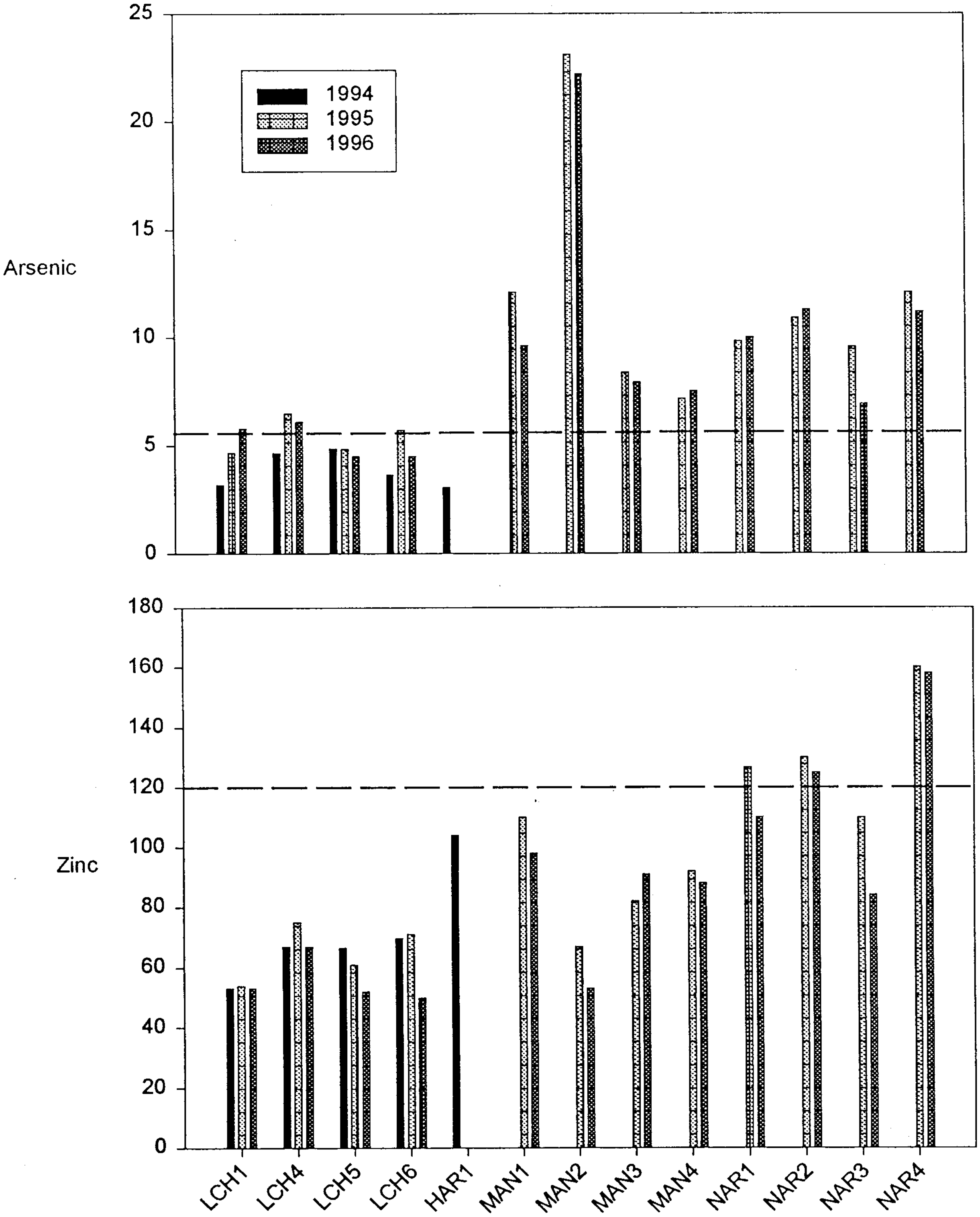


Figure 63. Trace metal concentrations (means +/- SE, ug/g dw) in bed sediments from the lower Fraser basin reaches in 1994, 1995 and 1996 (n=4 except HAR1 n=1). Reaches with the same letters are not significantly different at p<0.05 according to 2-way ANOVA on the 1995 and 1996 data, followed by Tukey's test. Reaches not labeled with a letter were not included in the statistical analysis. ND indicates not detected.



■	1994
▨	1995
▩	1996

Figure 64. Trace metal concentrations (ug/g dw) in bed sediments from the lower Fraser basin sampling sites in 1994, 1995 and 1996 relative to BCMELP sediment quality criteria. Dashed line indicates lowest effect level criteria. Dotted line indicates severe effect level criteria.



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Organic Contaminant Analysis - (AXYS Analytical Laboratory)

Sediment samples are homogenized by thoroughly stirring with a solvent-rinsed spatula after any large rocks (>0.5 cm) are removed. Samples are stored at -20 C until analyzed. Immediately prior to analysis, homogenized sediment samples are thawed, stirred thoroughly and sub-sampled for analysis. Sediment samples are analyzed wet and a separate sub-sample is taken for moisture determination.

Polychlorinated Dibenzodioxins/Dibenzofurans

Each sample is spiked with an aliquot of surrogate standard solution containing nine ^{13}C-labeled dioxin and furan congeners (tetra-octa). Sediment samples are soxhlet-extracted and the extracts sequentially washed with acid and base. All extracts are further cleaned up using a series of four chromatographic cleanup columns (silica, alumina, carbon, alumina). An aliquot of recovery standard containing two ^{13}C-labeled dioxin and furan congeners are added to each extract prior to analysis by high resolution gas chromatography with high resolution mass spectrometric detection (HRGC/HRMS). Dioxins/furans are analyzed on a VG Ultima AutoSpec high resolution mass spectrometer equipped with a Hewlett Packard 5890 GC, a CTC autosampler and a VAX work station.

Chlorinated Phenolics

Each sample is spiked with an aliquot of surrogate standard solution containing twelve ^{13}C-labeled chlorinated phenolic compounds (phenols, guaiacols, catechols and vanillins). Sediment samples are extracted with potassium hydroxide, the solution filtered and the filtrate acidified. The sample extracts are converted to acetate derivatives of chlorophenolics by reaction with acetic anhydride. The derivatized extracts are cleaned up on silica gel prior to analysis by GC/MS. Extracts are analyzed by high resolution gas chromatography with low resolution mass spectrometric detection (HRGC/LRMS) using a Finnigan INCOS 50 mass spectrometer equipped with a Varian 3400 GC, a CTC autosampler and a DG10 data system.

Resin and Fatty Acids

Each sample is spiked with an aliquot of surrogate standard solution containing o-methylpodocarpic acid and per-deuterated lauric, myristic, palmitic, stearic and arachidic acids. Samples are extracted by shaking with methanol:potassium hydroxide. The methanol:potassium hydroxide mixture is extracted with diethylether:hexane. The extract is derivatized with diazomethane to methyl esters of the resin and fatty acids. The derivatized extract is cleaned up on silica gel prior to analysis by HRGC/LRMS.

Polycyclic Aromatic Hydrocarbons (PAHs)

Each sample is spiked with an aliquot of surrogate standard solution containing nine perdeuterated PAHs. Samples are ground with anhydrous sodium sulphate, packed in a glass column and eluted with solvent. The extract is backwashed with dilute base followed by extracted water. Extracts are fractionated by column chromatography on silica into two fractions: a non-polar fraction and a polar fraction. Prior to instrumental analysis, an aliquot of recovery standard containing three perdeuterated PAHs is added to each fraction. Extracts are analyzed by high resolution gas chromatography with low resolution mass spectrometric detection (HRGC/LRMS) using a Finnigan INCOS 50 mass spectrometer equipped with a Varian 3400 GC, a CTC autosampler and a DG10 data system.

Polychlorinated Biphenyls (PCBs)/Pesticides

Each sample is spiked with a solution containing several labeled surrogate standards including ^{13}C-labeled hexachlorobenzene, gamma-HCH, p,p'-DDE, p,p'-DDT, Mirex, PCB 101, PCB 180 and PCB 209 (for analysis of Aroclors, non-polar and moderately polar pesticides, and PCB congeners) and deuterium-labeled endosulphan (for analysis of highly polar pesticides). Each sediment sample is solvent-extracted on a shaker table, and the extracts are washed in a separator funnel with solvent-extracted distilled water. Extracts are dried over anhydrous sodium sulphate and concentrated. Extracts are separated by column chromatography on Florisil into two fractions, a combined F1+F2 fraction and an F3 fraction. The PCBs, non-polar and moderately polar pesticides are collected in F1+F2, while the polar pesticides are collected in F3. Each fraction is prepared for instrumental analysis by transferring to an autosampler vial and adding an aliquot of recovery standard (^{13}C-labeled PCB 153). The Florisil F1+F2 fraction is analyzed for PCBs and non-polar / moderately polar pesticides by HRGC/LRMS or HRGC/HRMS. Low resolution MS analyses are carried out on a Finnigan INCOS 50 mass spectrometer equipped with a Varian 3400 GC, a CTC autosampler and a DG10 data system. High resolution MS analyses are carried out on a VG 70SE mass spectrometer. The most polar pesticides, collected in the third Florisil fraction (F3), are analyzed using a high resolution Hewlett Packard 5890 gas chromatograph with a ^{63}Ni electron capture detector (HRGC/ECD).

Nonylphenol

Each sample is spiked with a surrogate standard, ^{13}C-labeled pentachlorophenol. Samples are extracted by shaking with potassium hydroxide. The extract is centrifuged and the clear portion decanted and acidified. The sample extracts are converted to acetate derivatives of nonylphenol by reaction with acetic anhydride. The derivatized extracts are cleaned up on silica gel prior to analysis by HRGC/LRMS. Analyses are carried out on a Finnigan INCOS 50 mass spectrometer equipped with a Varian 3400 GC, a CTC autosampler and a DG10 data system.

Total Organic Carbon - (Cantest Ltd.)

Total Organic Carbon (TOC) is determined using a LECO carbon analyzer. Sediments are dried and digested with concentrated hydrochloric acid prior to analysis.

Total Trace Metals - (National Laboratory for Environmental Testing)

Aluminum, Cadmium, Cobalt, Chromium, Copper, Iron, Manganese, Nickel, Lead, Zinc

Prior to analysis, sediment samples are dried, ground and homogenized. Sample are then digested with a combination of acids on a hot plate at 200^{o}C. The decomposition of the sample is achieved by treating it with a mixture of hydrofluoric (HF), hydrochloric (HCl), nitric (HNO_3) and perchloric ($HClO_4$) acids. The resulting solutions are analysed by atomic absorption spectroscopy after the addition, in certain cases, of appropriate matrix modifiers. Additional interferences are removed or compensated for by background correction.

Arsenic/Selenium

Sediment samples are dried, ground and homogenized. The samples are weighed in a zirconium crucible, digested with nitric acid and then placed in a muffle furnace to allow for the extraction of arsenic and selenium by fusion with sodium hydroxide. The solidified melt is dissolved and further digested using sodium borohydride in hydrochloric acid, forming arsenic and selenium hydrides. The samples are analyzed by atomic emission spectroscopy using inductively coupled argon plasma as an excitation source.

Mercury

Inorganic forms of mercury are extracted, and organic forms of mercury are oxidized by digestion with sulphuric acid, nitric acid, hydrochloric acid, potassium permanganate and potassium persulphate. The use of this procedure ensures the total recovery of mercury from sediments with a very high organic content.

After oxidation, Hg++ is reduced to elemental mercury in an automated system by stannous chloride. The mercury is sparged from the solution with a stream of air and passed through an absorption cell, situated in the pathway of a mercury lamp. The absorption is measured at 253.7 nm.

Total Trace Metals - (Elemental Research Laboratory)

Chromium, Manganese, Iron, Cobalt, Zinc, Molybdenum, Cadmium, Lead

The sample is thoroughly mixed to achieve homogeneity and a subsample of 1.0 g is weighed accurately. Nitric and hydrochloric acid are added, the sample is heated to 95°C and gently refluxed for 30 minutes. The sample is then diluted with water and centrifuged or allowed to stand overnight to separate the insoluble material. The sample is spiked with internal standards, prior to analysis by inductively coupled plasma mass spectrometry (ICP-MS).

Arsenic/Selenium

This method uses an ancillary item of equipment referred to as a Hydride Generation system in conjunction with ICP-MS to improve detection limits on selected hydride forming elements. Reagent is mixed with the acidified sample in the tubing leading to the torch. This causes the metals Ge, As, Se, Sb, Te, Sn, Bi to form gaseous hydrides and elemental Hg to form a vapour. This means that transport efficiency of the gaseous hydrides is close to 100% with a 10-20 fold increase in sensitivity compared to conventional methods, resulting in detection limits in the ppt range.

Mercury

Analyzed by Cold Vapor Absorption Spectrometry (EPA method 7471) as described above for the National Laboratory for Environmental Testing.

Particle Size - (Geo-Sea Consulting)

Samples are analyzed using a standardized technique developed by GeoSea Consulting on a Malvern 2600L laser particle size analyzer.

This instrument measures the diffraction pattern caused by sediment particles, suspended in water, being continually passed though a laser beam. It uses lenses of different focal lengths to measure the concentration of particles within a maximum range of 1800 μm to 1μm. These samples are analyzed using 800 mm and 100 mm lenses.

A sample is introduced into the water bath of the Malvern by wet sieving though a 1.5 mm sieve. This is done to eliminate blockage of the instrument's sample pump by large or irregular shaped particles. If any material remains on the sieve, then the weight percentages for the coarse material (-2 ϕ to 0 ϕ) are normally derived from dry sieving. In the Malvern, disaggregation of the sample is achieved by both mechanical stirring and ultrasonic dispersion in the water bath. Three distributions are measured on each sample and the results averaged.

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Table 1. Mean Dioxin and Furan Concentrations in Bed Sediments from Individual Reaches of the Fraser River Basin (1994)

	Detection Limits	94MBD1	94QPG2	94LQN2	94LCH1	94NEC4	94 NTH1	94THM1	94STK1A	94SRT3	94CHN2	94QNL2	94HAR1
		n=1	n=1	n=1	n=1	n=1	n=1	n=1	n=1	n=1	n=1	n=1	n=1
T4CDD (TOTAL)	0.33 (0.10-3.0)	ND	0.12	2.00	3.30	0.70	0.05	1.08	0.30	ND	0.50	ND	2.10
2,3,7,8 TCDD	0.33 (0.10-3.0)	ND	ND	ND	ND	ND	ND	0.45	ND	ND	ND	ND	ND
P5CDD (TOTAL)	0.34 (0.10-3.0)	ND	0.05	1.20	ND	ND	ND	1.95	0.50	ND	ND	ND	0.40
1,2,3,7,8 PCDD	0.34 (0.10-3.0)	ND	ND	ND	ND	ND	ND	0.42	0.10	ND	ND	ND	0.40
H6CDD (TOTAL)	0.62 (0.20-6.0)	0.78	3.75	5.20	1.40	1.40	1.30	17.83	5.80	ND	4.40	0.50	14.00
1,2,3,4,7,8 H6CDD	0.62 (0.20-6.0)	ND	ND	ND	ND	ND	ND	0.42	0.20	ND	ND	ND	ND
1,2,3,6,7,8 H6CDD	0.62 (0.20-6.0)	ND	0.43	ND	ND	ND	0.35	1.95	0.80	ND	ND	ND	1.40
1,2,3,7,8,9 H6CDD	0.62 (0.20-6.0)	ND	0.20	0.60	ND	ND	ND	1.82	0.50	ND	0.50	ND	1.60
H7CDD (TOTAL)	1.04 (0.30-10.0)	4.50	9.35	16.00	4.20	4.80	16.50	48.67	26.00	2.00	22.00	2.60	34.00
1,2,3,4,6,7,8 H7CDD	1.04 (0.30-10.0)	2.23	4.18	6.30	1.50	1.70	10.65	22.50	13.00	1.00	8.50	0.80	14.00
O8CDD (TOTAL)	1.60 (0.50-15.0)	19.75	39.33	64.00	16.00	13.00	91.00	198.33	110.00	7.10	250.00	11.00	99.00
T4CDF (TOTAL)	0.33 (0.10-3.0)	ND	1.95	ND	0.20	ND	ND	15.33	18.00	ND	ND	ND	2.30
2,3,7,8 T4CDF	0.33 (0.10-3.0)	ND	1.27	ND	0.20	ND	ND	8.65	0.90	ND	ND	ND	0.60
P5CDF (TOTAL)	0.34 (0.10-3.0)	ND	0.03	ND	ND	ND	0.45	0.72	13.00	0.30	ND	ND	1.30
1,2,3,7,8 P5CDF	0.34 (0.10-3.0)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3,4,7,8 P5CDF	0.34 (0.10-3.0)	ND	ND	ND	ND	ND	ND	ND	0.40	ND	ND	ND	ND
H6CDF (TOTAL)	0.76 (0.20-6.0)	0.46	0.47	ND	ND	ND	1.90	4.67	17.00	ND	ND	ND	1.90
1,2,3,4,7,8 H6CDF	0.60 (0.20-6.0)	ND	ND	ND	ND	ND	ND	ND	0.40	ND	ND	ND	ND
1,2,3,6,7,8 H6CDF	0.60 (0.20-6.0)	ND	ND	ND	ND	ND	ND	ND	0.60	ND	ND	ND	ND
2,3,4,6,7,8 H6CDF	0.60 (0.20-6.0)	ND	ND	ND	ND	ND	0.15	0.15	0.80	ND	ND	ND	0.60
1,2,3,7,8,9 H6CDF	0.61 (0.20-6.0)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
H7CDF (TOTAL)	0.97 (0.30-10.0)	1.45	1.80	ND	ND	ND	5.85	20.17	7.80	0.40	ND	ND	3.50
1,2,3,4,6,7,8 H7CDF	0.97 (0.30-10.0)	0.68	0.70	0.80	ND	ND	2.40	7.05	3.20	ND	ND	ND	2.10
1,2,3,4,7,8,9 H7CDF	0.97 (0.30-10.0)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
O8CDF (TOTAL)	1.53 (0.40-16.0)	0.48	0.98	1.30	ND	ND	5.05	31.17	5.70	0.70	ND	ND	ND
2,3,7,8-TCDD TEQ	n/a	0.05	0.28	0.20	0.05	0.03	0.28	2.48	0.95	0.02	0.39	0.02	0.88

Values expressed in pg/g dry weight
Detection limits shown as means with lower and upper limits in brackets
ND denotes not detected
n/a denotes not applicable
TEQs calculated with detection limits set to zero

Table 2. Mean Dioxin and Furan Concentrations in Bed Sediments from Individual Reaches of the Fraser River Basin (1995)

	Detection Limits	95MBD n=4	95QPG n=4	95LQN n=4	95LCH n=4	95NEC n=4	95NTH n=4	95STH n=3	95THM n=4	95MAN n=4	95NAR n=4	95STK1A n=1	95SRT3 n=1	95CHN2 n=1	95QNL2 n=1	95HAR1 n=1
T4CDD (TOTAL)	0.22 (0.10-0.60)	0.03 (0.03)	0.25 (0.19)	2.08 (0.15)	1.58 (0.21)	1.24 (0.45)	0.05 (0.05)	0.07 (0.07)	0.21 (0.21)	2.43 (0.46)	4.68 (0.59)	0.40	ND	0.20	ND	1.10
2,3,7,8 TCDD	0.22 (0.10-0.60)	ND	ND	ND	ND	ND	ND	ND	0.11 (0.11)	ND	ND	ND	ND	ND	ND	ND
P5CDD (TOTAL)	0.22 (0.10-0.60)	ND	0.13 (0.13)	0.95 (0.19)	2.15 (0.35)	0.54 (0.44)	ND	0.33 (0.20)	0.60 (0.60)	3.79 (0.89)	10.40 (1.25)	1.35	ND	0.10	ND	3.00
1,2,3,7,8 PCDD	0.22 (0.10-0.60)	ND	ND	0.03 (0.03)	0.23 (0.03)	ND	ND	ND	0.10 (0.10)	0.24 (0.10)	0.80 (0.11)	0.15	ND	ND	ND	0.30
H6CDD (TOTAL)	0.46 (0.10-1.20)	0.70 (0.60)	1.78 (0.88)	7.58 (1.27)	6.25 (1.15)	2.80 (0.55)	0.13 (0.13)	1.45 (0.46)	4.99 (3.67)	12.35 (1.59)	43.25 (10.51)	7.85	ND	3.40	0.35	8.00
1,2,3,4,7,8 H6CDD	0.46 (0.20-1.20)	ND	ND	ND	ND	ND	ND	ND	0.13 (0.13)	ND	0.55 (0.33)	ND	ND	ND	ND	ND
1,2,3,6,7,8 H6CDD	0.46 (0.20-1.20)	0.13 (0.13)	ND	0.43 (0.08)	0.48 (0.18)	0.24 (0.15)	ND	ND	0.39 (0.39)	1.31 (0.17)	6.50 (1.66)	1.15	ND	0.30	ND	0.70
1,2,3,7,8,9 H6CDD	0.46 (0.20-1.20)	ND	ND	0.68 (0.10)	0.73 (0.13)	0.29 (0.18)	ND	0.08 (0.08)	0.41 (0.41)	1.24 (0.22)	3.38 (0.61)	0.85	ND	0.70	ND	1.00
H7CDD (TOTAL)	0.75 (0.40-2.00)	7.45 (5.89)	12.70 (4.28)	21.00 (1.08)	19.00 (3.87)	18.10 (9.59)	4.70 (1.38)	9.52 (4.25)	15.71 (6.51)	38.38 (6.06)	129.00 (25.38)	37.00	ND	19.00	8.35	15.00
1,2,3,4,6,7,8 H7CDD	0.75 (0.40-2.00)	3.25 (2.60)	5.35 (1.85)	6.65 (0.45)	7.63 (1.84)	6.40 (3.40)	2.35 (0.83)	3.97 (1.72)	6.76 (2.63)	14.39 (2.58)	62.00 (13.66)	19.00	ND	7.50	1.35	6.40
O8CDD (TOTAL)	1.19 (0.60-3.20)	30.23 (23.33)	55.25 (21.52)	58.00 (3.39)	63.50 (13.04)	75.50 (53.24)	14.50 (4.48)	20.85 (11.58)	43.50 (18.29)	103.50 (20.30)	392.50 (83.00)	130.00	1.30	230.00	16.90	33.00
T4CDF (TOTAL)	0.25 (0.10-0.70)	ND	0.08 (0.05)	0.83 (0.40)	1.68 (0.75)	0.76 (0.65)	0.05 (0.05)	0.67 (0.67)	7.14 (4.33)	2.93 (0.72)	11.18 (1.48)	13.00	ND	ND	ND	2.20
2,3,7,8 T4CDF	0.25 (0.10-0.70)	ND	0.08 (0.05)	0.50 (0.18)	0.85 (0.25)	0.30 (0.27)	0.05 (0.05)	0.38 (0.38)	3.81 (2.26)	1.43 (0.18)	3.08 (0.39)	0.50	ND	ND	ND	0.40
P5CDF (TOTAL)	0.25 (0.10-0.70)	0.05 (0.05)	ND	ND	1.00 (0.54)	0.10 (0.10)	ND	0.40 (0.40)	0.54 (0.25)	1.69 (0.38)	15.10 (3.63)	29.50	ND	ND	ND	1.90
1,2,3,7,8 P5CDF	0.25 (0.10-0.70)	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.13 (0.13)	ND	ND	ND	ND	0.10
2,3,4,7,8 P5CDF	0.25 (0.10-0.70)	ND	ND	ND	0.18 (0.12)	ND	ND	0.05 (0.05)	ND	ND	0.65 (0.09)	0.35	ND	ND	ND	0.20
H6CDF (TOTAL)	0.45 (0.20-1.20)	0.55 (0.55)	0.80 (0.80)	ND	0.70 (0.31)	0.46 (0.37)	0.10 (0.10)	0.25 (0.14)	0.79 (0.47)	3.80 (0.85)	36.75 (12.42)	23.00	ND	ND	ND	0.60
1,2,3,4,7,8 H6CDF	0.45 (0.20-1.20)	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.33 (0.33)	0.50	ND	ND	ND	ND
1,2,3,6,7,8 H6CDF	0.45 (0.20-1.20)	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.38 (0.38)	0.80	ND	ND	ND	ND
2,3,4,6,7,8 H6CDF	0.45 (0.20-1.20)	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.38 (0.38)	0.60	ND	ND	ND	ND
1,2,3,7,8,9 H6CDF	0.45 (0.20-1.20)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
H7CDF (TOTAL)	0.92 (0.40-9.20)	2.30 (2.14)	3.10 (2.32)	0.55 (0.32)	2.38 (0.84)	1.25 (0.63)	1.58 (0.70)	0.55 (0.39)	2.56 (0.96)	8.59 (2.06)	72.25 (23.58)	16.00	ND	ND	ND	1.40
1,2,3,4,6,7,8 H7CDF	0.92 (0.40-9.20)	0.75 (0.75)	0.90 (0.69)	ND	0.88 (0.42)	0.41 (0.24)	0.45 (0.26)	0.12 (0.12)	0.74 (0.47)	2.96 (0.61)	24.50 (8.15)	6.20	ND	ND	ND	0.80
1,2,3,4,7,8,9 H7CDF	0.92 (0.40-9.20)	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.58 (0.58)	ND	ND	ND	ND	ND
O8CDF (TOTAL)	1.15 (0.10-3.20)	1.50 (1.50)	2.13 (1.51)	0.73 (0.44)	2.35 (0.89)	1.66 (0.99)	1.68 (0.62)	0.60 (0.60)	2.53 (0.66)	5.79 (1.56)	38.75 (12.43)	9.80	ND	ND	ND	0.80
2,3,7,8-TCDD TEQ	n/a	0.08 (0.07)	0.13 (0.05)	0.30 (0.03)	0.56 (0.16)	0.23 (0.12)	0.05 (0.02)	0.13 (0.06)	0.76 (0.51)	0.80 (0.14)	3.49 (0.79)	1.08	0.001	0.41	0.03	0.57

Values expressed in pg/g dry weight with standard errors shown in brackets
Detection limits shown as means with lower and upper limits in brackets
ND denotes not detected
n/a denotes not applicable
Means and TEQs calculated with detection limits set to zero

Table 3. Mean Dioxin and Furan Concentrations in Bed Sediments from Individual Reaches of the Fraser River Basin (1996)

	Detection Limits	96LCH n=4	96MAN n=4	96NAR n=4
T4CDD (TOTAL)	0.10 (0.10-0.10)	0.68 (0.14)	2.38 (0.50)	4.81 (1.02)
2,3,7,8 TCDD	0.10 (0.10-0.10)	ND	0.10 (0.00)	0.23 (0.05)
P5CDD (TOTAL)	0.20 (0.20-0.20)	0.45 (0.10)	2.13 (0.65)	6.11 (1.78)
1,2,3,7,8 PCDD	0.20 (0.20-0.20)	ND	0.18 (0.06)	0.60 (0.18)
H6CDD (TOTAL)	0.32 (0.20-0.40)	2.83 (0.43)	11.88 (2.44)	41.75 (12.03)
1,2,3,4,7,8 H6CDD	0.32 (0.20-0.40)	ND	0.20 (0.12)	0.83 (0.24)
1,2,3,6,7,8 H6CDD	0.32 (0.20-0.40)	0.10 (0.06)	1.23 (0.25)	6.70 (2.16)
1,2,3,7,8,9 H6CDD	0.32 (0.20-0.40)	0.33 (0.05)	1.08 (0.23)	3.03 (0.76)
H7CDD (TOTAL)	0.52 (0.40-0.60)	7.65 (0.62)	32.50 (8.22)	102.25 (28.55)
1,2,3,4,6,7,8 H7CDD	0.52 (0.40-0.60)	3.03 (0.31)	13.20 (3.34)	50.38 (16.46)
O8CDD (TOTAL)	1.06 (0.80-1.30)	37.00 (4.06)	106.50 (23.71)	353.75 (98.73)
T4CDF (TOTAL)	0.10 (0.10-0.10)	0.33 (0.10)	2.03 (0.27)	6.63 (1.75)
2,3,7,8 T4CDF	0.10 (0.10-0.10)	0.20 (0.04)	0.75 (0.05)	1.84 (0.40)
P5CDF (TOTAL)	0.20 (0.20-0.20)	0.25 (0.25)	1.40 (0.37)	12.93 (5.93)
1,2,3,7,8 P5CDF	0.20 (0.20-0.20)	0.05 (0.05)	ND	0.21 (0.09)
2,3,4,7,8 P5CDF	0.20 (0.20-0.20)	0.05 (0.03)	ND	0.35 (0.14)
H6CDF (TOTAL)	0.32 (0.20-0.40)	0.08 (0.08)	3.80 (0.82)	42.63 (18.26)
1,2,3,4,7,8 H6CDF	0.32 (0.20-0.40)	ND	ND	0.98 (0.35)
1,2,3,6,7,8 H6CDF	0.32 (0.20-0.40)	ND	ND	0.89 (0.39)
2,3,4,6,7,8 H6CDF	0.32 (0.20-0.40)	ND	ND	0.91 (0.38)
1,2,3,7,8,9 H6CDF	0.32 (0.20-0.40)	ND	ND	ND
H7CDF (TOTAL)	0.52 (0.40-0.60)	0.45 (0.15)	7.43 (1.88)	76.00 (28.64)
1,2,3,4,6,7,8 H7CDF	0.52 (0.40-0.60)	ND	2.68 (0.65)	26.50 (11.00)
1,2,3,4,7,8,9 H7CDF	0.52 (0.40-0.60)	ND	ND	1.41 (0.50)
O8CDF (TOTAL)	1.06 (0.80-1.30)	0.85 (0.30)	4.53 (1.26)	30.63 (10.56)
2,3,7,8-TCDD TEQ	n/a	0.13 (0.03)	0.78 (0.17)	3.41 (1.03)

Values expressed in pg/g dry weight with standard errors shown in brackets
Detection limits shown as means with lower and upper limits in brackets
ND denotes not detected
n/a denotes not applicable
Means and TEQs calculated with detection limits set to zero

Table 4. Mean Chlorophenolic Concentrations in Bed Sediments from Individual Reaches of the Fraser River Basin (1994)

	Detection Limits	94MBD	94QPG	94LQN	94LCH	94NEC	94 NTH	94STH	94THM	94STK1A	94SRT3	94CHN2	94QNL2	94HAR1
		n=4	n=4	n=4	n=4	n=4	n=4	n=3	n=4	n=1	n=1	n=1	n=1	n=1
4-CHLOROPHENOL	0.22 (0.03-0.95)	0.038 (0.038)	ND	ND	ND	ND	ND	2.867 (2.867)	ND	ND	0.900	ND	ND	ND
2,6-DICHLOROPHENOL	0.16 (0.04-1.10)	0.005 (0.005)	ND	ND	ND	ND	ND	ND	ND	ND	0.480	ND	ND	ND
2,4/2,5-DICHLOROPHENOL	0.18 (0.03-0.94)	0.070 (0.041)	0.089 (0.052)	0.225 (0.026)	ND	ND	ND	0.143 (0.143)	0.458 (0.012)	ND	1.200	ND	ND	ND
3,5-DICHLOROPHENOL	0.25 (0.06-1.70)	0.008 (0.008)	ND	ND	ND	ND	ND	ND	ND	ND	0.820	ND	ND	ND
2,3-DICHLOROPHENOL	0.22 (0.06-1.50)	0.010 (0.010)	ND	ND	ND	ND	ND	ND	ND	ND	0.820	ND	ND	ND
3,4-DICHLOROPHENOL	0.16 (0.04-1.00)	0.007 (0.007)	ND	ND	ND	ND	ND	ND	ND	ND	0.520	ND	ND	ND
6-CHLOROGUAIACOL	0.08 (0.02-0.30)	0.008 (0.008)	ND	ND	ND	ND	ND	ND	ND	ND	0.200	ND	ND	ND
4-CHLOROGUAIACOL	0.07 (0.02-0.26)	0.008 (0.008)	0.003 (0.003)	ND	ND	ND	ND	ND	ND	ND	0.390	ND	ND	ND
5-CHLOROGUAIACOL	0.10 (0.03-0.38)	0.040 (0.031)	0.009 (0.009)	0.088 (0.088)	ND	ND	ND	ND	0.257 (0.132)	ND	0.510	0.420	ND	ND
2,4,6-TRICHLOROPHENOL	0.10 (0.04-0.72)	0.011 (0.011)	ND	ND	ND	ND	ND	ND	ND	ND	0.170	ND	ND	ND
2,3,6-TRICHLOROPHENOL	0.14 (0.05-0.95)	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.290	ND	ND	ND
2,3,5-TRICHLOROPHENOL	0.14 (0.05-0.97)	0.035 (0.029)	ND	ND	ND	ND	ND	ND	ND	ND	0.430	ND	ND	ND
2,4,5-TRICHLOROPHENOL	0.09 (0.03-0.65)	0.039 (0.031)	ND	ND	ND	ND	ND	ND	ND	ND	0.480	ND	ND	ND
2,3,4-TRICHLOROPHENOL	0.12 (0.04-0.86)	0.005 (0.005)	ND	ND	ND	ND	ND	ND	ND	ND	0.270	ND	ND	ND
3,4,5-TRICHLOROPHENOL	0.11 (0.03-0.80)	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.200	ND	ND	ND
3-CHLOROCATECHOL	0.34 (0.09-2.40)	ND	0.224 (0.095)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-CHLOROCATECHOL	0.21 (0.06-1.40)	ND	0.150 (0.087)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.145
4,6-DICHLOROGUAIACOL	0.08 (0.02-0.57)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,4-DICHLOROGUAIACOL	0.11 (0.03-0.82)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,5-DICHLOROGUAIACOL	0.08 (0.02-0.52)	ND	0.004 (0.004)	0.060 (0.035)	0.078 (0.047)	ND	ND	ND	ND	ND	ND	ND	ND	ND
3-CHLOROSYRINGOL	0.08 (0.02-0.86)	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.080	ND	ND	ND
3,6-DICHLOROCATECHOL	0.37 (0.08-2.60)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,5-DICHLOROCATECHOL	0.56 (0.13-4.00)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,4-DICHLOROCATECHOL	0.33 (0.08-2.40)	ND	0.153 (0.136)	0.090 (0.090)	ND	0.135 (0.135)	ND	0.543 (0.351)	1.218 (0.696)	ND	ND	ND	ND	1.300
4,5-DICHLOROCATECHOL	0.32 (0.07-2.40)	ND	0.114 (0.065)	0.638 (0.057)	0.270 (0.172)	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3,5,6-TETRACHLOROPHENOL	0.19 (0.05-1.40)	0.061 (0.048)	ND	ND	ND	ND	ND	ND	ND	ND	0.660	ND	ND	ND
2,3,4,6-TETRACHLOROPHENOL	0.11 (0.02-0.80)	0.023 (0.023)	ND	ND	ND	ND	ND	ND	ND	ND	0.310	ND	ND	ND
2,3,4,5-TETRACHLOROPHENOL	0.13 (0.04-0.52)	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.180	ND	ND	ND
5-CHLOROVANILLIN	0.65 (0.11-7.10)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6-CHLOROVANILLIN	0.73 (0.13-8.30)	ND	0.234 (0.180)	1.175 (0.063)	1.175 (0.463)	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,5-DICHLOROSYRINGOL	0.28 (0.09-1.50)	ND	ND	ND	ND	0.086 (0.086)	ND	ND	ND	ND	0.460	ND	ND	ND
3,4,6-TRICHLOROGUAIACOL	0.12 (0.03-0.66)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,4,5-TRICHLOROGUAIACOL	0.14 (0.04-0.86)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,5,6-TRICHLOROGUAIACOL	0.08 (0.02-0.25)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,4,6-TRICHLOROCATECHOL	0.37 (0.06-4.40)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,4,5-TRICHLOROCATECHOL	0.37 (0.05-4.20)	ND	0.485 (0.189)	1.725 (0.221)	0.678 (0.288)	ND	ND	ND	0.845 (0.666)	ND	ND	ND	ND	ND
5,6-DICHLOROVANILLIN	0.14 (0.04-0.87)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENTACHLOROPHENOL	0.12 (0.04-0.72)	ND	ND	ND	ND	0.030 (0.030)	ND	ND	ND	ND	0.290	ND	ND	ND
2-CHLOROSYRINGALDEHYDE	0.08 (0.02-0.46)	ND	ND	0.930 (0.115)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,4,5,6-TETRACHLOROGUAIACOL	0.34 (0.06-1.38)	ND	0.004 (0.004)	ND	ND	ND	ND	ND	ND	ND	0.210	ND	ND	ND
3,4,5-TRICHLOROSYRINGOL	0.11 (0.02-0.88)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,4,5,6-TETRACHLOROCATECHOL	0.24 (0.03-1.30)	ND	0.188 (0.109)	0.120 (0.120)	ND	ND	ND	ND	0.125 (0.125)	ND	ND	ND	ND	ND
2,6-DICHLOROSYRINGALDEHYDE	0.27 (0.04-3.20)	0.225 (0.159)	2.775 (2.422)	ND	ND	ND	2.158 (1.152)	ND	ND	2.000	ND	ND	ND	ND
TOTAL CHLOROPHENOLS	n/a	0.311 (0.140)	0.089 (0.052)	0.225 (0.026)	ND	0.060 (0.060)	ND	3.010 (3.010)	0.458 (0.012)	ND	8.020	ND	ND	ND
TOTAL CHLOROGUAIACOLS	n/a	0.056 (0.033)	0.020 (0.020)	0.148 (0.111)	0.078 (0.047)	0.025 (0.025)	ND	ND	0.257 (0.132)	ND	1.310	0.420	ND	ND
TOTAL CHLOROCATECHOLS	n/a	ND	1.313 (0.282)	2.573 (0.237)	0.948 (0.451)	0.135 (0.135)	ND	0.543 (0.351)	2.188 (1.349)	ND	ND	ND	ND	1.445
TOTAL CHLOROVANILLINS	n/a	ND	0.234 (0.180)	1.175 (0.063)	1.175 (0.463)	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOTAL CHLOROSYRINGOLS	n/a	ND	ND	ND	ND	0.086 (0.086)	ND	ND	ND	ND	0.540	ND	ND	ND
TOTAL CHLOROSYRINGALDEHYDES	n/a	0.225 (0.159)	2.775 (2.422)	0.930 (0.115)	ND	ND	2.158 (1.152)	ND	ND	2.000	ND	ND	ND	ND
TOTAL CHLOROPHENOLICS	n/a	0.593 (0.202)	4.430 (2.272)	5.050 (0.425)	2.200 (0.922)	0.306 (0.150)	2.158 (1.152)	3.553 (2.747)	2.903 (1.446)	2.000	9.870	0.420	ND	1.445

Values expressed in ng/g dry weight with standard errors shown in brackets
Detection limits shown as means with lower and upper limits in brackets
ND denotes not detected
n/a denotes not applicable
Means and sums calculated with detection limits set to zero

Table 5. Mean Chlorophenolic Concentrations in Bed Sediments from Individual Reaches of the Fraser River Basin (1995)

	Detection Limits	95MBD n=4	95QPG n=4	95LQN n=4	95LCH n=4	95NEC n=4	95NTH n=4	95STH n=3	95THM n=4	95MAN n=4	95NAR n=4	95STK1A n=1	95SRT3 n=1	95CHN2 n=1	95QNL2 n=1	95HAR1 n=1
4-CHLOROPHENOL	0.12 (0.04-0.28)	ND	ND	ND	ND	0.13 (0.04)	ND	0.03 (0.03)	ND	0.03 (0.03)	0.09 (0.09)	ND	ND	ND	ND	ND
2,6-DICHLOROPHENOL	0.09 (0.04-0.17)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4/2,5-DICHLOROPHENOL	0.08 (0.03-0.15)	0.06 (0.06)	0.10 (0.10)	ND	0.09 (0.03)	0.12 (0.06)	0.05 (0.05)	0.10 (0.06)	0.10 (0.08)	0.06 (0.04)	1.01 (0.09)	0.26	ND	ND	ND	ND
3,5-DICHLOROPHENOL	0.11 (0.04-0.19)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3-DICHLOROPHENOL	0.11 (0.04-0.18)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,4-DICHLOROPHENOL	0.08 (0.02-0.13)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6-CHLOROGUAIACOL	0.08 (0.02-0.34)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-CHLOROGUAIACOL	0.08 (0.02-0.35)	ND	0.09 (0.07)	ND	0.07 (0.04)	ND	ND	ND	ND	0.06 (0.04)	0.24 (0.10)	ND	ND	ND	ND	ND
5-CHLOROGUAIACOL	0.11 (0.05-0.52)	0.02 (0.02)	0.13 (0.13)	ND	0.18 (0.07)	0.02 (0.02)	ND	ND	ND	0.25 (0.04)	0.22 (0.05)	ND	ND	ND	ND	ND
2,4,6-TRICHLOROPHENOL	0.08 (0.03-0.25)	0.04 (0.04)	ND	ND	0.04 (0.04)	ND	ND	ND	ND	0.04 (0.03)	0.05 (0.03)	ND	ND	ND	ND	ND
2,3,6-TRICHLOROPHENOL	0.11 (0.05-0.22)	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.04 (0.04)	ND	ND	ND	ND	ND
2,3,5-TRICHLOROPHENOL	0.11 (0.02-0.20)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-TRICHLOROPHENOL	0.09 (0.05-0.23)	0.03 (0.03)	ND	ND	ND	ND	ND	ND	ND	ND	0.03 (0.03)	ND	ND	ND	ND	ND
2,3,4-TRICHLOROPHENOL	0.10 (0.05-0.23)	ND	ND	ND	ND	0.02 (0.02)	ND	ND	ND	ND	ND	ND	ND	ND	0.04	ND
3,4,5-TRICHLOROPHENOL	0.09 (0.02-0.16)	0.05 (0.05)	ND	ND	ND	ND	ND	ND	ND	ND	0.02 (0.02)	ND	ND	ND	ND	ND
3-CHLOROCATECHOL	0.19 (0.04-0.29)	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.27 (0.10)	ND	ND	ND	ND	ND
4-CHLOROCATECHOL	0.13 (0.04-0.21)	ND	0.30 (0.22)	ND	0.06 (0.06)	ND	ND	ND	ND	0.05 (0.03)	0.52 (0.31)	ND	ND	ND	ND	ND
4,6-DICHLOROGUAIACOL	0.08 (0.03-0.14)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,4-DICHLOROGUAIACOL	0.11 (0.04-0.18)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,5-DICHLOROGUAIACOL	0.09 (0.05-0.14)	0.03 (0.03)	ND	ND	0.12 (0.07)	ND	ND	ND	ND	0.18 (0.08)	0.71 (0.15)	ND	ND	ND	ND	ND
3-CHLOROSYRINGOL	0.07 (0.02-0.11)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,6-DICHLOROCATECHOL	0.41 (0.06-0.84)	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.08 (0.08)	ND	ND	ND	ND	ND
3,5-DICHLOROCATECHOL	0.60 (0.09-1.30)	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.61 (0.20)	ND	ND	ND	ND	ND
3,4-DICHLOROCATECHOL	0.41 (0.06-0.85)	0.15 (0.15)	0.11 (0.11)	ND	ND	0.27 (0.12)	ND	2.22 (2.04)	0.41 (0.34)	0.31 (0.18)	1.06 (0.22)	ND	ND	ND	1.05	ND
4,5-DICHLOROCATECHOL	0.39 (0.10-0.76)	ND	0.13 (0.13)	ND	ND	ND	ND	ND	ND	0.48 (0.28)	3.43 (0.98)	ND	ND	ND	ND	ND
2,3,5,6-TETRACHLOROPHENOL	0.24 (0.07-0.61)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3,4,6-TETRACHLOROPHENOL	0.14 (0.06-0.26)	0.05 (0.05)	ND	ND	ND	ND	ND	ND	ND	ND	0.09 (0.06)	ND	ND	ND	ND	ND
2,3,4,5-TETRACHLOROPHENOL	0.17 (0.05-0.30)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5-CHLOROVANILLIN	0.48 (0.13-0.82)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6-CHLOROVANILLIN	0.55 (0.15-0.95)	ND	0.54 (0.43)	ND	0.95 (0.55)	ND	ND	ND	ND	1.34 (0.64)	3.50 (1.13)	ND	ND	ND	ND	ND
3,5-DICHLOROSYRINGOL	0.35 (0.08-0.63)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,4,6-TRICHLOROGUAIACOL	0.15 (0.03-0.26)	0.03 (0.03)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,4,5-TRICHLOROGUAIACOL	0.17 (0.04-0.30)	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.36 (0.08)	ND	ND	ND	ND	ND
4,5,6-TRICHLOROGUAIACOL	0.11 (0.02-0.19)	0.03 (0.03)	ND	ND	ND	ND	ND	ND	ND	ND	0.02 (0.02)	ND	ND	ND	ND	ND
3,4,6-TRICHLOROCATECHOL	0.44 (0.09-0.84)	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.49 (0.24)	ND	ND	ND	ND	ND
3,4,5-TRICHLOROCATECHOL	0.45 (0.09-0.88)	ND	ND	ND	ND	ND	ND	ND	0.12 (0.12)	0.55 (0.32)	1.83 (0.41)	ND	ND	ND	ND	ND
5,6-DICHLOROVANILLIN	0.18 (0.05-0.34)	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.03 (0.03)	ND	ND	ND	ND	ND
PENTACHLOROPHENOL	0.17 (0.07-0.58)	0.33 (0.24)	ND	ND	0.08 (0.08)	0.03 (0.03)	ND	ND	ND	ND	0.77 (0.15)	ND	ND	ND	ND	ND
2-CHLOROSYRINGALDEHYDE	0.11 (0.02-0.19)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,4,5,6-TETRACHLOROGUAIACOL	0.22 (0.05-1.50)	0.16 (0.16)	ND	ND	ND	ND	ND	ND	ND	ND	0.22 (0.03)	ND	ND	ND	ND	ND
3,4,5-TRICHLOROSYRINGOL	0.24 (0.05-1.70)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,4,5,6-TETRACHLOROCATECHOL	0.74 (0.07-1.79)	0.20 (0.20)	ND	0.43 (0.15)	ND	ND	ND	0.06 (0.06)	0.31 (0.31)	0.63 (0.37)	3.51 (1.17)	ND	ND	ND	ND	ND
2,6-DICHLOROSYRINGALDEHYDE	0.16 (0.04-0.28)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOTAL CHLOROPHENOLS	n/a	0.55 (0.45)	0.10 (0.10)	ND	0.21 (0.09)	0.30 (0.11)	0.05 (0.05)	0.13 (0.07)	0.10 (0.08)	0.13 (0.06)	2.10 (0.23)	0.26	ND	ND	0.04	ND
TOTAL CHLOROGUAIACOLS	n/a	0.26 (0.24)	0.22 (0.19)	ND	0.36 (0.15)	0.02 (0.02)	ND	ND	ND	0.49 (0.11)	1.77 (0.32)	ND	ND	ND	ND	ND
TOTAL CHLOROCATECHOLS	n/a	0.35 (0.35)	0.55 (0.46)	0.43 (0.15)	0.06 (0.06)	0.27 (0.12)	ND	2.28 (2.02)	0.84 (0.43)	2.02 (1.01)	11.8 (3.49)	ND	ND	ND	1.05	ND
TOTAL CHLOROVANILLINS	n/a	ND	0.54 (0.43)	ND	0.95 (0.55)	ND	ND	ND	ND	1.34 (0.64)	3.53 (1.15)	ND	ND	ND	ND	ND
TOTAL CHLOROSYRINGOLS	n/a	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOTAL CHLOROSYRINGALDEHYDES	n/a	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOTAL CHLOROPHENOLICS	n/a	1.16 (1.04)	1.41 (1.18)	0.43 (0.15)	1.58 (0.78)	0.59 (0.22)	0.05 (0.05)	2.41 (1.95)	0.93 (0.46)	3.98 (1.69)	19.20 (4.67)	0.26	ND	ND	1.09	ND

Values expressed in ng/g dry weight with standard errors shown in brackets
Detection limits shown as means with lower and upper limits in brackets
ND denotes not detected
n/a denotes not applicable
Means and sums calculated with detection limits set to zero

Table 6. Mean Chlorophenolic Concentrations in Bed Sediments from Individual Reaches of the Fraser River Basin (1996)

	Detection Limits	96LCH n=4	96MAN n=4	96NAR n=4
4-CHLOROPHENOL	0.24 (0.11-0.38)	ND	ND	ND
2,6-DICHLOROPHENOL	0.20 (0.13-0.34)	ND	ND	ND
2,4/2,5-DICHLOROPHENOL	0.29 (0.11-0.55)	ND	0.28 (0.11)	0.14 (0.14)
3,5-DICHLOROPHENOL	0.23 (0.13-0.37)	ND	ND	ND
2,3-DICHLOROPHENOL	0.23 (0.13-0.37)	ND	ND	ND
3,4-DICHLOROPHENOL	0.19 (0.10-0.30)	ND	ND	ND
6-CHLOROGUAIACOL	0.11 (0.06-0.24)	ND	ND	ND
4-CHLOROGUAIACOL	0.12 (0.07-0.27)	ND	0.16 (0.06)	0.27 (0.10)
5-CHLOROGUAIACOL	0.14 (0.08-0.29)	ND	0.12 (0.07)	0.40 (0.17)
2,4,6-TRICHLOROPHENOL	0.20 (0.11-0.45)	ND	ND	0.11 (0.11)
2,3,6-TRICHLOROPHENOL	0.25 (0.14-0.51)	ND	ND	0.12 (0.12)
2,3,5-TRICHLOROPHENOL	0.27 (0.16-0.53)	ND	ND	ND
2,4,5-TRICHLOROPHENOL	0.20 (0.10-0.42)	ND	ND	ND
2,3,4-TRICHLOROPHENOL	0.22 (0.12-0.45)	ND	ND	ND
3,4,5-TRICHLOROPHENOL	0.23 (0.12-0.46)	ND	ND	ND
3-CHLOROCATECHOL	0.29 (0.15-0.51)	ND	ND	ND
4-CHLOROCATECHOL	0.30 (0.16-0.49)	ND	0.19 (0.12)	0.37 (0.28)
4,6-DICHLOROGUAIACOL	0.24 (0.12-0.39)	ND	ND	ND
3,4-DICHLOROGUAIACOL	0.31 (0.15-0.53)	ND	ND	ND
4,5-DICHLOROGUAIACOL	0.28 (0.14-0.43)	ND	0.33 (0.12)	0.78 (0.38)
3-CHLOROSYRINGOL	0.15 (0.08-0.32)	ND	ND	ND
3,6-DICHLOROCATECHOL	0.41 (0.17-0.94)	ND	ND	ND
3,5-DICHLOROCATECHOL	0.39 (0.16-0.88)	ND	ND	0.11 (0.11)
3,4-DICHLOROCATECHOL	0.42 (0.22-0.75)	ND	0.30 (0.17)	0.81 (0.31)
4,5-DICHLOROCATECHOL	0.42 (0.21-0.81)	ND	0.70 (0.33)	1.58 (0.55)
2,3,5,6-TETRACHLOROPHENOL	0.43 (0.26-0.85)	ND	ND	ND
2,3,4,6-TETRACHLOROPHENOL	0.32 (0.19-0.64)	ND	ND	ND
2,3,4,5-TETRACHLOROPHENOL	0.31 (0.18-0.56)	ND	ND	ND
5-CHLOROVANILLIN	0.88 (0.44-1.60)	ND	ND	ND
6-CHLOROVANILLIN	0.93 (0.56-1.74)	ND	1.18 (0.40)	1.93 (0.77)
3,5-DICHLOROSYRINGOL	0.32 (0.19-0.49)	ND	ND	ND
3,4,6-TRICHLOROGUAIACOL	0.29 (0.19-0.79)	ND	ND	ND
3,4,5-TRICHLOROGUAIACOL	0.33 (0.20-0.74)	ND	ND	ND
4,5,6-TRICHLOROGUAIACOL	0.20 (0.13-0.51)	ND	ND	0.19 (0.19)
3,4,6-TRICHLOROCATECHOL	0.54 (0.26-1.20)	ND	ND	ND
3,4,5-TRICHLOROCATECHOL	0.57 (0.30-1.10)	ND	0.81 (0.28)	1.33 (0.50)
5,6-DICHLOROVANILLIN	0.40 (0.19-0.58)	ND	ND	ND
PENTACHLOROPHENOL	0.36 (0.23-0.79)	ND	ND	0.37 (0.24)
2-CHLOROSYRINGALDEHYDE	0.26 (0.11-0.42)	ND	ND	ND
3,4,5,6-TETRACHLOROGUAIACOL	0.33 (0.17-0.79)	ND	ND	ND
3,4,5-TRICHLOROSYRINGOL	0.37 (0.23-0.72)	ND	ND	ND
3,4,5,6-TETRACHLOROCATECHOL	1.15 (0.41-4.10)	ND	1.00 (0.43)	1.08 (0.63)
2,6-DICHLOROSYRINGALDEHYDE	0.22 (0.16-0.38)	ND	ND	ND
TOTAL CHLOROPHENOLS	n/a	ND	0.28 (0.11)	0.73 (0.33)
TOTAL CHLOROGUAIACOLS	n/a	ND	0.62 (0.23)	1.65 (0.58)
TOTAL CHLOROCATECHOLS	n/a	ND	3.00 (1.17)	5.26 (1.76)
TOTAL CHLOROVANILLINS	n/a	ND	1.18 (0.40)	1.93 (0.77)
TOTAL CHLOROSYRINGOLS	n/a	ND	ND	ND
TOTAL CHLOROSYRINGALDEHYDES	n/a	ND	ND	ND
TOTAL CHLOROPHENOLICS	n/a	ND	5.08 (1.77)	9.57 (3.09)

Values expressed in ng/g dry weight with standard errors shown in brackets
Detection limits shown as means with lower and upper limits in brackets
ND denotes not detected
n/a denotes not applicable
Means and sums calculated with detection limits set to zero

Table 7. Mean Resin Acid Concentrations in Bed Sediments from Individual Reaches of the Fraser River Basin (1994)

	Detection Limits	94MBD	94QPG	94LQN	94LCH	94NEC	94 NTH	94STH	94THM	94STK1A	94SRT3	94CHN2	94QNL2	94HAR1
		n=4	n=4	n=4	n=4	n=4	n=4	n=3	n=4	n=1	n=1	n=1	n=1	n=1
Pimaric	4.41 (0.21-10.0)	5.45 (3.20)	719.17 (337.00)	369.25 (183.37)	296.50 (94.30)	9.17 (5.29)	2.50 (2.50)	8.32 (4.17)	30.75 (14.08)	19.00	17.00	33.00	2.40	9.55
Sandaracopimaric	0.42 (0.13-2.3)	50.21 (30.11)	120.29 (45.75)	74.50 (29.64)	76.35 (24.30)	8.90 (2.96)	42.23 (23.02)	10.35 (4.50)	34.78 (18.33)	14.00	51.00	29.00	2.50	97.00
Isopimaric	9.02 (0.46-20.0)	129.00 (67.96)	697.50 (282.26)	422.75 (207.85)	365.50 (120.46)	40.92 (18.29)	222.50 (134.19)	30.50 (18.21)	182.75 (90.63)	38.00	160.00	130.00	8.60	87.00
Palustric	2.82 (0.38-10.0)	42.70 (36.10)	63.47 (40.11)	7.25 (2.48)	23.75 (16.13)	6.20 (1.87)	21.70 (4.25)	2.50 (2.50)	1.58 (1.58)	12.00	37.00	43.00	7.40	ND
Dihydroisopimaric	1.03 (0.34-8.8)	ND	30.69 (15.53)	14.43 (6.17)	17.25 (6.14)	0.16 (0.16)	ND	0.73 (0.73)	0.32 (0.24)	ND	1.20	ND	ND	2.65
Dehydroabieitic	28.35 (0.15-45.0)	277.92 (88.00)	1,265.00 (541.07)	747.50 (339.27)	770.75 (283.30)	113.92 (39.86)	215.38 (111.68)	54.33 (27.42)	213.38 (96.45)	99.00	430.00	450.00	66.00	265.00
Abietic	10.68 (2.35-61.7)	1,896.58 (1,767.96)	1,142.08 (512.51)	1,602.50 (673.92)	826.50 (273.77)	101.71 (63.28)	1,025.00 (648.56)	34.97 (19.32)	327.42 (214.93)	140.00	2,800.00	270.00	31.00	590.00
Neoabietic	0.82 (0.13-8.5)	90.84 (89.72)	2.80 (0.88)	5.50 (5.50)	5.08 (2.21)	3.84 (1.60)	ND	8.70 (5.22)	ND	ND	40.00	ND	ND	41.00
12/14 CDHAA	0.58 (0.24-3.9)	ND	34.46 (4.11)	23.90 (9.72)	18.00 (6.16)	ND	ND	ND	0.64 (0.39)	ND	ND	ND	ND	ND
12,14 CDHAA	0.94 (0.38-5.9)	ND	14.83 (3.51)	7.13 (2.09)	6.05 (2.09)	ND	ND	ND	1.95 (1.36)	ND	ND	ND	ND	ND
Total Resin Acids	n/a	2,492.70 (2,076.76)	4,090.29 (1,769.30)	3,274.70 (1,371.61)	2,405.73 (806.73)	284.81 (128.36)	1,529.30 (895.47)	150.40 (77.06)	793.56 (390.02)	322.00	3,536.20	955.00	117.90	1,092.20
Total Chlorinated Resin Acids	n/a	ND	49.28 (3.84)	31.03 (11.70)	24.05 (8.25)	ND	ND	ND	2.59 (1.74)	ND	ND	ND	ND	ND

Values expressed in ng/g dry weight with standard errors shown in brackets
Detection limits shown as means with lower and upper limits in brackets
ND denotes not detected
n/a denotes not applicable
Means and sums calculated with detection limits set to zero

Table 8. Mean Fatty Acid Concentrations in Bed Sediments from Individual Reaches of the Fraser River Basin (1994)

	Detection Limits	94MBD	94QPG	94LQN	94LCH	94NEC	94 NTH	94STH	94THM	94STK1A	94SRT3	94CHN2	94QNL2	94HAR1
		n=4	n=4	n=4	n=4	n=4	n=4	n=3	n=4	n=1	n=1	n=1	n=1	n=1
Capric	20.37 (0.19-32.0)	169.58 (32.79)	248.33 (20.31)	262.50 (42.89)	135.00 (31.75)	285.83 (71.92)	170.00 (24.83)	558.33 (179.17)	258.33 (86.06)	140	330	520	82	1,700
Lauric	23.66 (0.11-36.0)	320.83 (49.67)	465.42 (44.36)	431.25 (81.04)	232.00 (48.17)	551.67 (130.67)	318.75 (57.60)	736.67 (202.51)	474.17 (54.22)	280	700	1,000	140	2,400
Myristic	57.24 (0.08-90.0)	929.58 (136.63)	1,362.50 (185.26)	2,842.50 (868.22)	1,012.50 (310.25)	2,316.67 (850.98)	1,182.50 (201.92)	6,966.67 (2,566.67)	3,154.17 (1,305.60)	890	2,000	3,000	480	17,000
Palmitic	321.18 (0.16-500.0)	5,262.50 (923.17)	8,945.83 (1,444.39)	11,525.00 (3,072.83)	5,625.00 (1,723.07)	13,550.00 (3,652.97)	6,075.00 (1,049.90)	30,666.67 (11,050.39)	12,641.67 (3,754.04)	4,700	13,000	20,000	1,900	57,500
Linolenic	12.95 (0.57-178.7)	275.42 (56.29)	592.50 (51.54)	531.00 (201.07)	211.75 (66.10)	1,132.50 (435.97)	247.50 (74.76)	1,833.33 (611.92)	707.92 (274.14)	500	940	920	110	3,500
Linoleic	9.38 (0.59-40.7)	523.75 (41.90)	1,006.25 (110.78)	992.50 (277.23)	511.75 (153.24)	2,348.33 (1,119.40)	440.00 (135.15)	3,816.67 (1,702.04)	1,412.50 (568.09)	1,800	1,100	1,200	110	13,500
Oleic	27.44 (1.24-211.7)	1,450.83 (277.14)	2,425.00 (126.66)	2,840.00 (948.30)	1,322.50 (392.65)	2,620.83 (688.91)	1,242.50 (290.36)	4,633.33 (1,596.18)	2,895.83 (1,255.99)	1,400	3,000	3,500	510	16,500
Stearic	322.98 (0.22-540.0)	1,060.83 (143.22)	1,816.67 (72.65)	1,467.50 (416.40)	905.00 (232.61)	2,112.50 (565.82)	1,181.25 (211.23)	2,316.67 (842.78)	1,722.50 (445.17)	1,500	2,000	2,700	270	7,950
Arachidic	3.98 (0.18-8.0)	265.83 (55.13)	322.08 (30.71)	231.25 (43.42)	128.00 (35.65)	366.25 (83.45)	189.38 (64.10)	195.00 (62.92)	233.75 (49.97)	160	540	870	52	880
Behenic	1.30 (0.21-3.5)	327.08 (83.32)	446.67 (36.89)	256.25 (43.56)	175.75 (46.45)	418.75 (66.28)	166.63 (44.67)	145.00 (20.21)	210.42 (40.62)	130	570	1,400	98	580
Lignoceric	1.71 (0.39-5.2)	70.17 (16.99)	89.58 (10.76)	46.63 (6.39)	42.00 (8.13)	127.21 (16.61)	31.63 (6.94)	43.50 (5.35)	45.33 (5.27)	37	140	530	23	119
Total Fatty Acids	n/a	10,656.42 (1,732.86)	17,720.83 (1,613.04)	21,426.38 (5,702.91)	10,301.25 (3,026.04)	25,830.54 (7,481.96)	11,245.13 (1,839.42)	51,911.83 (18,524.96)	23,756.58 (7,669.27)	11,537	24,320	35,640	3,775	121,629

Values expressed in ng/g dry weight with standard errors shown in brackets
Detection limits shown as means with lower and upper limits in brackets
ND denotes not detected
n/a denotes not applicable
Means and sums calculated with detection limits set to zero

Table 9. Mean Resin and Fatty Acid Concentrations in Bed Sediments from Individual Reaches of the Fraser River Basin (1995)

	Detection Limits	95MBD	95QPG	95LQN	95LCH	95NEC	95NTH
		n=4	n=4	n=4	n=4	n=4	n=4
Pimaric	0.63 (0.10-2.65)	7.98 (2.69)	1,960.13 (1,268.20)	766.25 (238.88)	654.00 (238.88)	7.83 (2.99)	7.63 (1.37)
Sandaracopimaric	0.60 (0.10-2.49)	25.80 (12.56)	374.75 (292.87)	76.63 (37.95)	100.25 (37.95)	21.06 (11.55)	17.48 (5.45)
Isopimaric	1.56 (0.27-6.43)	101.00 (56.15)	1,846.25 (1,248.94)	708.75 (230.77)	647.50 (230.77)	42.88 (11.18)	46.90 (13.37)
Palustric	1.78 (0.26-6.00)	4.68 (1.74)	436.43 (421.22)	42.30 (3.08)	4.68 (3.08)	6.58 (3.12)	5.83 (2.31)
Dihydroisopimaric	1.51 (0.29-4.94)	ND	16.10 (5.18)	25.80 (17.35)	39.38 (17.35)	ND	ND
Dehydroabieitic	0.30 (0.06-1.02)	235.00 (108.05)	3,638.75 (2,798.80)	876.25 (332.10)	907.50 (332.10)	106.75 (29.84)	124.75 (36.87)
Abietic	14.32 (3.82-48.95)	410.75 (274.66)	6,660.00 (5,296.26)	2,802.50 (659.03)	1,687.50 (659.03)	51.75 (37.75)	107.75 (45.83)
Neoabietic	0.77 (0.18-2.23)	1.48 (0.86)	176.29 (172.91)	13.69 (1.09)	1.88 (1.09)	ND	ND
12/14 CDHAA	0.79 (0.19-2.08)	ND	16.19 (7.48)	22.45 (6.13)	16.30 (6.13)	ND	ND
12,14 CDHAA	1.15 (0.34-3.54)	ND	6.36 (3.77)	10.70 (3.24)	7.70 (3.24)	ND	ND
Capric	6.46 (0.20-16.00)	182.00 (68.80)	193.00 (46.62)	263.75 (44.98)	552.50 (44.98)	308.75 (66.84)	251.25 (71.43)
Lauric	6.86 (0.12-18.00)	257.50 (67.99)	272.50 (50.23)	438.75 (57.79)	652.50 (57.79)	497.50 (73.30)	394.00 (107.58)
Myristic	16.76 (0.14-45.00)	1,502.50 (877.31)	2,276.25 (1,156.01)	9,712.50 (1,766.82)	5,800.00 (1,766.82)	4,237.50 (1,509.60)	3,002.50 (953.24)
Palmitic	91.32 (0.10-250.00)	6,475.00 (3,295.55)	10,950.00 (3,700.56)	48,875.00 (7,393.69)	26,000.00 (7,393.69)	15,975.00 (2,370.08)	17,300.00 (5,554.88)
Linolenic	10.73 (3.27-30.35)	742.50 (409.80)	1,263.75 (828.98)	1,161.25 (241.76)	1,080.00 (241.76)	1,028.75 (130.80)	675.50 (237.96)
Linoleic	7.31 (2.11-22.37)	1,385.00 (765.13)	1,738.75 (573.95)	1,388.75 (155.46)	1,450.00 (155.46)	2,062.50 (321.05)	1,046.75 (408.26)
Oleic	28.34 (8.60-84.82)	2,537.50 (1,154.23)	2,937.50 (699.52)	4,637.50 (450.00)	3,750.00 (450.00)	2,987.50 (450.17)	3,382.50 (1,206.36)
Stearic	98.53 (0.14-270.00)	722.50 (204.22)	1,252.50 (291.58)	2,287.50 (347.31)	2,275.00 (347.31)	2,032.50 (575.37)	1,312.50 (321.70)
Arachidic	1.92 (0.13-4.00)	201.00 (44.58)	193.75 (24.86)	171.25 (26.77)	190.00 (26.77)	252.50 (64.08)	237.25 (70.88)
Behenic	1.17 (0.23-4.23)	227.50 (51.86)	256.25 (35.90)	200.00 (17.97)	182.50 (17.97)	245.00 (45.92)	209.50 (57.51)
Lignoceric	2.20 (0.58-7.58)	60.75 (12.98)	55.00 (5.58)	41.13 (3.23)	46.50 (3.23)	46.38 (7.28)	47.25 (10.55)
Total resin acids	n/a	786.68 (455.44)	15,131.24 (11,478.47)	5,345.31 (1,506.87)	4,066.68 (1,506.87)	236.84 (82.27)	310.33 (98.13)
Total chlorinated resin acids	n/a	ND	22.54 (11.21)	33.15 (9.37)	24.00 (9.37)	ND	ND
Total fatty acids	n/a	14,293.75 (6,846.31)	21,389.25 (6,740.74)	69,177.38 (9,440.54)	41,979.00 (9,440.54)	29,673.88 (4,656.31)	27,859.00 (8,903.51)

Values expressed in ng/g dry weight with standard errors shown in brackets
Detection limits shown as means with lower and upper limits in brackets
ND denotes not detected
n/a denotes not applicable
Means and sums calculated with detection limits set to zero

Table 9 (continued)

	95STH	95THM	95MAN	95NAR	95STK1A	95SRT3	95CHN2	95QNL2	95HAR1
	n=3	n=4	n=4	n=4	n=1	n=1	n=1	n=1	n=1
Pimaric	ND	47.29 (23.64)	223.50 (66.03)	593.75 (296.88)	3.30	4.35	68.00	3.40	3.30
Sandaracopimaric	41.67 (12.91)	30.68 (15.34)	195.50 (67.46)	717.50 (358.75)	29.67	10.6	110.00	4.80	10.00
Isopimaric	20.33 (6.44)	175.00 (87.50)	319.25 (98.02)	600.00 (300.00)	63.33	14.5	210.00	18.00	29.00
Palustric	ND	18.79 (9.39)	19.89 (15.48)	3.65 (1.83)	9.00	17	13.00	22.00	ND
Dihydroisopimaric	ND	ND	9.00 (3.08)	226.10 (113.05)	ND	0	ND	ND	ND
Dehydroabieitic	45.67 (15.30)	389.38 (194.69)	492.50 (123.79)	1,855.00 (927.50)	93.33	280	600.00	70.00	99.00
Abietic	ND	452.38 (226.19)	623.50 (232.38)	1,505.41 (752.71)	67.33	17.5	3900.00	37.00	ND
Neoabietic	ND	1.48 (0.74)	4.06 (2.83)	8.58 (4.29)	ND	0	48.00	ND	1.70
12/14 CDHAA	ND	ND	11.73 (4.02)	23.50 (11.75)	ND	0	ND	ND	ND
12,14 CDHAA	ND	0.43 (0.21)	13.13 (2.15)	132.75 (66.38)	ND	0	ND	ND	ND
Capric	850.00 (41.63)	435.00 (217.50)	607.50 (237.82)	732.50 (366.25)	366.67	185.00	280.00	60.00	1100.00
Lauric	1,076.67 (113.48)	775.00 (387.50)	551.25 (100.88)	1,702.50 (851.25)	483.33	220.00	560.00	95.00	1700.00
Myristic	17,000.00 (3,214.55)	7,100.00 (3,550.00)	2,125.00 (295.45)	5,900.00 (2,950.00)	2500.00	820.00	2600.00	440.00	23000.00
Palmitic	50,666.67 (5,364.49)	28,550.00 (14,275.00)	12,050.00 (1,434.40)	13,700.00 (6,850.00)	15666.67	5950.00	15000.00	2600.00	100000.00
Linolenic	3,100.00 (305.51)	2,662.50 (1,331.25)	322.50 (84.99)	1,395.00 (697.50)	993.33	225.00	500.00	89.00	5200.00
Linoleic	5,866.67 (290.59)	2,065.00 (1,032.50)	1,100.00 (162.02)	3,537.50 (1,768.75)	1500.00	475.00	820.00	160.00	7800.00
Oleic	10,666.67 (1,201.85)	6,975.00 (3,487.50)	3,625.00 (738.66)	5,800.00 (2,900.00)	2300.00	960.00	2000.00	580.00	18000.00
Stearic	2,366.67 (166.67)	1,950.00 (975.00)	3,687.50 (830.76)	3,752.50 (1,876.25)	1466.67	810.00	1900.00	380.00	3800.00
Arachidic	216.67 (18.56)	217.50 (108.75)	537.50 (149.19)	685.00 (342.50)	276.67	130.00	230.00	49.00	420.00
Behenic	173.33 (14.53)	182.50 (91.25)	633.75 (158.03)	622.50 (311.25)	250.00	140.00	230.00	51.00	400.00
Lignoceric	49.67 (11.85)	43.63 (21.81)	201.13 (58.43)	107.90 (53.95)	78.67	35.50	68.00	15.00	150.00
Total resin acids	107.67 (12.77)	1,115.40 (557.70)	1,912.05 (563.13)	5,666.24 (2,833.12)	265.97	343.95	4949.00	155.20	143.00
Total chlorinated resin acids	ND	0.43 (0.21)	24.85 (6.14)	156.25 (78.13)	ND	0	ND	ND	ND
Total fatty acids	92,033.00 (8,013.75)	50,956.13 (25,478.06)	25,441.13 (3,616.39)	37,935.40 (18,967.70)	25882.00	9950.50	24188.00	4519.00	161570.00

Values expressed in ng/g dry weight with standard errors shown in brackets
Detection limits shown as means with lower and upper limits in brackets
ND denotes not detected
n/a denotes not applicable
Means and sums calculated with detection limits set to zero

Table 10. Mean Resin and Fatty Acid Concentrations in Bed Sediments from Individual Reaches of the Fraser River Basin (1996)

	Detection Limits	96LCH n=4	96MAN n=4	96NAR n=3
Pimaric	5.13 (5.00-5.50)	49.75 (15.54)	202.25 (76.89)	352.00 (165.70)
Sandaracopimaric	0.97 (0.85-1.11)	9.58 (2.13)	447.75 (384.83)	1,466.67 (218.58)
Isopimaric	8.25 (8.00-9.00)	55.88 (19.23)	202.50 (63.33)	720.00 (249.47)
Palustric	3.33 (2.90-3.70)	ND	14.04 (4.56)	288.33 (176.55)
Dihydroisopimaric	4.43 (3.90-4.90)	ND	6.35 (2.30)	11.67 (6.17)
Dehydroabieitic	23.00 (23.00-23.00)	100.75 (26.48)	430.25 (198.47)	1,560.00 (680.39)
Abietic	33.72 (30.68-38.15)	121.25 (32.57)	603.75 (154.80)	5,160.00 (2,344.70)
Neoabietic	1.33 (1.20-1.50)	ND	ND	201.00 (174.63)
12/14 CDHAA	1.44 (1.29-1.77)	3.23 (0.78)	19.03 (5.35)	24.90 (11.67)
12,14 CDHAA	1.50 (1.39-1.60)	2.79 (1.23)	20.10 (4.73)	24.53 (11.16)
Capric	16.00 (16.00-16.00)	71.00 (12.59)	365.00 (63.97)	590.00 (175.21)
Lauric	18.00 (18.00-18.00)	128.50 (20.06)	581.25 (73.95)	893.33 (288.75)
Myristic	45.00 (45.00-45.00)	336.25 (90.59)	1,950.00 (375.28)	3,023.33 (1,170.56)
Palmitic	250.00 (250.00-250.00)	1,922.50 (601.25)	6,900.00 (1,122.50)	11,500.00 (4,092.68)
Linolenic	53.70 (38.49-86.43)	88.38 (39.27)	348.75 (53.79)	683.33 (288.23)
Linoleic	16.62 (11.69-26.34)	284.50 (113.22)	1,027.50 (117.71)	2,376.67 (1,007.91)
Oleic	137.01 (95.54-219.55)	733.75 (283.37)	3,137.50 (458.88)	7,266.67 (2,836.86)
Stearic	270.00 (270.00-270.00)	370.00 (66.83)	2,562.50 (442.24)	4,100.00 (2,059.94)
Arachidic	4.00 (4.00-4.00)	52.50 (13.67)	275.00 (23.27)	670.00 (270.74)
Behenic	2.34 (1.41-3.97)	67.00 (13.90)	268.75 (22.40)	670.00 (215.02)
Lignoceric	2.99 (1.77-5.01)	20.75 (2.25)	67.38 (14.31)	161.67 (43.43)
Total resin acids	n/a	343.21 (95.14)	1,946.01 (861.72)	9,809.10 (3,753.74)
Total chlorinated resin acids	n/a	6.01 (1.95)	39.13 (10.07)	49.43 (22.83)
Total fatty acids	n/a	4,075.13 (1,230.99)	17,483.63 (2,519.06)	31,935.00 (11,950.50)

Values expressed in ng/g dry weight with standard errors shown in brackets
Detection limits shown as means with lower and upper limits in brackets
ND denotes not detected
n/a denotes not applicable
Means and sums calculated with detection limits set to zero

Table 11. Mean PAH Concentrations in Bed Sediments from Individual Reaches of the Fraser River Basin (1994)

	Detection Limits	94MBD n=4	94QPG n=4	94LQN n=4	94LCH n=4	94NEC n=4	94 NTH n=4	94STH n=3	94THM n=4	94STK1A n=1	94SRT3 n=1	94CHN2 n=1	94QNL2 n=1	94HAR1 n=1
Naphthalene	0.92 (0.12-5.91)	2.72 (0.17)	2.94 (0.30)	2.84 (0.16)	6.85 (3.72)	3.93 (1.01)	2.48 (0.39)	3.08 (0.77)	2.91 (1.07)	6.00	5.45	10.00	8.70	7.55
Acenaphthylene	0.22 (0.06-1.10)	0.004 (0.00)	0.073 (0.04)	ND	ND	ND	ND	ND	0.40 (0.31)	2.00	ND	ND	ND	0.81
Acenaphthene	0.45 (0.03-1.80)	ND	0.43 (0.43)	ND	0.21 (0.12)	ND	0.65 (0.38)	ND	0.31 (0.18)	2.10	ND	ND	ND	1.95
Fluorene	0.27 (0.07-1.00)	0.59 (0.05)	1.18 (0.21)	1.70 (0.15)	1.26 (0.18)	0.78 (0.28)	0.50 (0.30)	1.10 (0.64)	1.83 (0.53)	5.30	3.05	1.40	3.30	5.25
Phenanthrene	0.18 (0.05-1.50)	3.16 (0.19)	5.68 (0.55)	5.31 (0.35)	7.43 (2.25)	5.18 (1.69)	3.23 (1.01)	5.10 (2.51)	7.41 (1.78)	38.00	13.50	11.00	11.00	20.50
Anthracene	0.22 (0.06-1.61)	0.15 (0.09)	0.50 (0.21)	0.29 (0.04)	0.41 (0.15)	0.27 (0.11)	0.35 (0.24)	0.53 (0.53)	0.90 (0.22)	6.30	0.60	0.78	ND	2.45
Fluoranthene	0.13 (0.03-0.46)	1.76 (0.17)	3.52 (0.54)	2.46 (0.40)	3.10 (0.64)	2.23 (0.86)	2.98 (0.92)	14.83 (12.59)	10.15 (4.10)	73.00	3.90	6.00	1.70	25.00
Pyrene	0.13 (0.03-0.42)	2.08 (0.12)	2.53 (0.23)	2.30 (0.30)	3.08 (0.69)	1.86 (0.67)	2.25 (0.59)	10.36 (8.82)	9.76 (4.30)	68.00	4.05	5.10	3.00	26.50
Benz(a)anthracene	0.24 (0.05-1.01)	0.28 (0.09)	0.83 (0.13)	ND	1.23 (0.24)	0.79 (0.27)	0.88 (0.33)	5.26 (4.87)	7.40 (4.56)	34.00	2.10	1.00	0.59	9.75
Chrysene	0.20 (0.06-1.08)	0.97 (0.09)	2.38 (0.07)	2.29 (0.32)	2.48 (0.49)	2.23 (0.58)	2.02 (1.05)	7.66 (6.67)	13.38 (9.25)	59.00	6.60	3.30	3.60	18.50
Benzofluoranthenes	0.22 (0.05-0.95)	0.65 (0.13)	1.90 (0.11)	0.80 (0.12)	1.67 (0.37)	1.87 (0.64)	1.04 (0.44)	7.16 (5.92)	9.82 (5.53)	70.00	5.25	3.60	3.40	28.50
Benzo(e)pyrene	0.23 (0.05-1.03)	0.25 (0.09)	0.90 (0.05)	0.38 (0.15)	0.84 (0.31)	1.13 (0.37)	0.42 (0.15)	2.10 (2.10)	2.92 (1.41)	32.00	3.60	1.70	2.60	13.50
Benzo(a)pyrene	0.64 (0.16-2.80)	ND	0.07 (0.07)	ND	0.19 (0.19)	ND	0.35 (0.14)	2.10 (2.10)	3.47 (1.97)	32.00	1.19	ND	0.78	16.50
Perylene	0.31 (0.06-1.18)	10.78 (3.12)	27.88 (5.27)	21.88 (3.70)	13.75 (1.75)	17.73 (5.40)	8.05 (3.76)	14.82 (9.11)	21.09 (11.33)	25.00	30.50	10.00	7.20	70.50
Dibenz(ah)anthracene	0.47 (0.13-2.20)	ND	ND	ND	ND	ND	0.13 (0.13)	ND	0.38 (0.22)	4.80	0.59	ND	0.60	1.70
Ideno(1,2,3,cd)pyrene	0.40 (0.08-1.72)	0.07 (0.07)	0.46 (0.04)	0.59 (0.06)	0.40 (0.23)	0.33 (0.12)	0.24 (0.24)	1.57 (0.90)	2.77 (1.01)	24.00	1.30	ND	0.77	13.00
Benzo(ghi)perylene	0.33 (0.07-1.53)	0.87 (0.03)	0.88 (0.04)	0.86 (0.09)	1.18 (0.40)	0.84 (0.39)	0.43 (0.25)	1.63 (0.88)	2.80 (0.67)	27.00	2.40	2.50	3.40	15.00
Total PAHs	n/a	24.33 (3.55)	52.14 (6.08)	41.69 (4.19)	44.06 (9.61)	39.12 (11.92)	25.97 (9.04)	77.31 (57.87)	97.71 (43.01)	508.50	84.07	56.38	50.64	276.96

Values expressed in ng/g dry weight with standard errors shown in brackets
Detection limits shown as means with lower and upper limits in brackets
ND denotes not detected
n/a denotes not applicable
Means and sums calculated with detection limits set to zero

Table 12. Mean PAH Concentrations in Bed Sediments from Individual Reaches of the Fraser River Basin (1995)

	Detection Limits	95MBD n=4	95QPG n=4	95LQN n=4	95LCH n=4	95NEC n=4	95NTH n=4	95STH n=3	95THM n=4	95MAN n=4	95NAR n=4	95STK1A n=1	95SRT3 n=1	95CHN2 n=1	95QNL2 n=1	95HAR1 n=1
Naphthalene	0.20 (0.07-0.58)	0.73 (0.05)	1.37 (0.31)	6.37 (5.21)	2.61 (0.49)	1.93 (0.28)	0.77 (0.28)	2.15 (0.38)	3.03 (1.33)	5.53 (1.07)	16.08 (4.32)	7.7	1.7	1.7	5.4	1.6
Acenaphthylene	0.18 (0.09-0.48)	ND	ND	0.06 (0.06)	0.14 (0.11)	ND	0.06 (0.06)	ND	0.31 (0.12)	1.63 (0.47)	4.53 (1.70)	1.4	ND	ND	ND	0.86
Acenaphthene	0.21 (0.06-0.56)	ND	0.26 (0.15)	0.70 (0.18)	0.38 (0.02)	0.43 (0.11)	0.07 (0.04)	0.37 (0.09)	0.64 (0.17)	2.94 (0.73)	9.38 (6.29)	1.7	ND	ND	0.2	0.62
Fluorene	0.14 (0.04-0.35)	0.24 (0.08)	0.79 (0.19)	0.72 (0.11)	1.01 (0.20)	1.09 (0.41)	0.22 (0.07)	0.96 (0.42)	1.85 (0.73)	6.23 (1.08)	17.80 (10.64)	5.6	1.1	0.49	2.5	1.5
Phenanthrene	0.08 (0.03-0.20)	1.65 (0.31)	5.95 (1.86)	4.16 (0.93)	4.94 (0.43)	5.05 (1.33)	1.94 (0.48)	3.88 (1.46)	9.40 (1.66)	20.88 (4.93)	57.29 (28.09)	38	5.8	3.6	8.5	8
Anthracene	0.09 (0.03-0.28)	ND	0.52 (0.14)	0.58 (0.24)	0.46 (0.19)	0.20 (0.11)	ND	0.15 (0.08)	0.65 (0.23)	2.56 (0.58)	10.24 (5.06)	8.2	ND	0.28	0.17	0.48
Fluoranthene	0.06 (0.04-0.17)	1.29 (0.31)	6.88 (2.98)	2.78 (0.69)	3.18 (0.60)	2.95 (0.91)	1.55 (0.25)	3.73 (1.54)	10.10 (3.00)	32.48 (9.99)	85.21 (38.78)	85	1.2	1.3	1.8	9.3
Pyrene	0.06 (0.04-0.17)	0.97 (0.21)	4.38 (1.70)	2.55 (0.66)	2.75 (0.60)	1.99 (0.53)	0.98 (0.12)	2.47 (1.13)	7.78 (2.28)	27.63 (7.96)	81.88 (40.76)	71	1.3	1.7	2.6	10
Benz(a)anthracene	0.11 (0.05-0.28)	0.27 (0.16)	1.41 (0.55)	0.61 (0.15)	0.86 (0.34)	0.60 (0.25)	0.35 (0.07)	0.78 (0.36)	2.63 (0.55)	8.08 (2.05)	31.83 (13.33)	31	0.4	0.78	0.63	3.6
Chrysene	0.11 (0.05-0.28)	0.66 (0.22)	3.68 (1.55)	1.90 (0.37)	2.31 (0.37)	2.38 (0.84)	1.00 (0.17)	2.18 (1.01)	5.90 (1.09)	13.35 (3.02)	52.67 (21.93)	53	3.8	1.7	3.6	7.5
Benzofluoranthenes	0.28 (0.08-0.81)	0.15 (0.15)	2.19 (0.87)	1.29 (0.34)	1.61 (0.46)	1.39 (0.58)	0.68 (0.20)	1.77 (1.17)	6.05 (1.69)	15.83 (4.06)	64.96 (24.58)	69	2.1	1.2	2.7	9.2
Benzo(e)pyrene	0.29 (0.09-0.87)	ND	0.94 (0.42)	0.72 (0.19)	0.95 (0.21)	0.84 (0.33)	0.43 (0.14)	0.99 (0.46)	3.23 (0.66)	6.60 (1.63)	24.71 (9.09)	29	1.1	ND	1.5	5.4
Benzo(a)pyrene	0.43 (0.10-1.30)	ND	0.33 (0.33)	0.15 (0.15)	0.44 (0.23)	ND	0.20 (0.12)	0.45 (0.33)	3.15 (0.99)	7.75 (2.49)	31.83 (21.57)	35	ND	ND	ND	6.7
Perylene	0.35 (0.10-1.03)	12.85 (5.28)	15.15 (2.63)	20.38 (2.69)	10.78 (0.73)	20.43 (9.54)	11.11 (4.46)	8.62 (3.64)	28.60 (12.50)	39.50 (3.23)	48.58 (5.80)	30	15	4.9	6.2	12
Dibenz(ah)anthracene	0.51 (0.13-2.34)	0.08 (0.08)	ND	ND	ND	ND	ND	ND	0.40 (0.14)	0.60 (0.21)	3.23 (0.75)	5.7	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	0.38 (0.12-1.20)	ND	ND	0.23 (0.23)	0.62 (0.28)	ND	0.49 (0.17)	0.98 (0.41)	3.70 (0.91)	5.88 (1.47)	23.08 (7.63)	31	ND	ND	ND	5.5
Benzo(ghi)perylene	0.31 (0.09-1.00)	ND	0.33 (0.33)	0.30 (0.30)	1.17 (0.25)	0.45 (0.45)	0.32 (0.11)	1.06 (0.57)	3.23 (0.64)	6.23 (1.51)	24.67 (7.44)	31	0.58	ND	2.6	5.9
C1 naphthalenes	0.22 (0.07-0.57)	0.68 (0.27)	1.68 (0.37)	2.69 (1.04)	3.28 (0.28)	3.45 (1.04)	0.84 (0.31)	5.54 (3.79)	11.15 (7.95)	7.28 (1.21)	18.75 (7.14)	18	4.2	2	13	4
C2 naphthalenes	0.21 (0.05-0.39)	0.38 (0.38)	2.18 (0.86)	2.59 (0.36)	3.64 (0.46)	5.50 (2.51)	0.51 (0.25)	7.90 (4.19)	13.20 (9.27)	6.73 (0.96)	19.42 (5.85)	27	4.8	3.2	11	4.7
C3 naphthalenes	0.16 (0.05-0.41)	0.45 (0.45)	2.95 (0.68)	2.68 (0.31)	2.88 (0.21)	4.73 (1.60)	0.78 (0.27)	5.02 (3.05)	8.03 (5.35)	7.35 (1.20)	22.93 (13.27)	22	3.1	2	5.7	3.6
C4 naphthalenes	0.21 (0.08-0.41)	ND	ND	ND	0.59 (0.38)	ND	ND	ND	1.75 (1.75)	1.70 (1.03)	21.24 (20.03)	9.6	ND	ND	ND	ND
C1 phen,anth	0.17 (0.05-0.61)	1.45 (0.85)	5.90 (1.50)	6.91 (1.85)	5.65 (0.64)	6.88 (2.28)	0.93 (0.53)	6.13 (4.54)	14.38 (7.88)	20.03 (4.77)	55.96 (27.57)	39	7.1	5.9	12	7.2
C2 phen,anth	0.21 (0.10-0.47)	1.18 (0.68)	6.58 (2.67)	7.48 (1.78	7.34 (0.54)	9.68 (3.25)	1.29 (0.57)	9.02 (4.02)	16.30 (7.60)	19.20 (4.31)	87.88 (52.70)	61	7.4	7.1	11	8
C3 phen,anth	0.28 (0.10-1.26)	0.69 (0.45)	4.05 (1.78)	3.40 (1.35)	2.19 (0.85)	0.55 (0.55)	ND	2.37 (2.37)	6.63 (3.93)	12.73 (3.47)	85.33 (61.98)	43	2	2.1	3.1	1
C4 phen,anth	0.29 (0.10-0.62)	121.05 (109.69)	29.50 (1.32)	55.13 (31.67)	24.38 (1.52)	53.63 (33.29)	13.88 (4.99)	52.30 (40.72)	42.65 (29.29)	98.25 (61.38)	161.00 (76.36)	54	20	12	1.8	9.1
Retene	0.29 (0.10-0.63)	121.05 (109.69)	29.50 (1.32)	55.13 (31.67)	24.38 (1.52)	53.63 (33.29)	13.88 (4.99)	52.30 (40.72)	42.65 (29.29)	97.25 (61.61)	126.83 (55.86)	43	20	12	1.8	9.1
Dibenzothiophene	0.10 (0.05-0.20)	ND	0.28 (0.17)	ND	0.26 (0.05)	0.13 (0.13)	ND	0.15 (0.15)	0.49 (0.10)	1.25 (0.25)	4.05 (2.00)	2.2	0.52	ND	0.82	0.72
C1 dibenzothiophene	0.10 (0.04-0.26)	ND	0.13 (0.13)	0.23 (0.23)	0.06 (0.06)	0.44 (0.18)	0.05 (0.05)	0.33 (0.33)	0.71 (0.31)	1.21 (0.25)	4.30 (1.97)	3.3	0.29	ND	0.7	0.43
C2 dibenzothiophene	0.09 (0.03-0.40)	ND	0.15 (0.15)	ND	0.17 (0.17)	ND	ND	0.13 (0.13)	0.33 (0.21)	1.70 (0.58)	10.13 (5.34)	10	ND	ND	0.26	ND
Total parent PAHs	n/a	20.54 (6.57)	50.64 (13.24)	48.24 (9.88)	39.59 (4.95)	44.96 (15.14)	22.13 (6.26)	34.55 (12.68)	100.67 (15.58)	227.09 (41.86)	655.50 (242.04)	533.3	34.08	17.65	38.4	88.16
Total alkylated PAHs	n/a	125.87 (111.88)	52.83 (7.37)	80.86 (35.74)	49.92 (3.02)	84.40 (43.12)	18.21 (6.33)	88.27 (33.17)	114.08 (41.63)	173.25 (72.67)	472.50 (258.22)	273.6	48.6	34.3	57.6	37.6
Total dibenzothiophenes	n/a	ND	0.55 (0.43)	0.23 (0.23)	0.49 (0.28)	0.57 (0.30)	0.05 (0.05)	0.61 (0.61)	1.53 (0.62)	4.16 (1.04)	18.49 (9.07)	15.5	0.81	ND	1.78	1.15

Values expressed in ng/g dry weight with standard errors shown in brackets
Detection limits shown as means with lower and upper limits in brackets
ND denotes not detected
n/a denotes not applicable
Means and sums calculated with detection limits set to zero

Table 13. Mean PAH Concentrations in Bed Sediments from Individual Reaches of the Fraser River Basin (1996)

	Detection Limits	96LCH	96MAN	96NAR
		n=4	n=4	n=4
Naphthalene	0.26 (0.15-0.38)	1.63 (0.19)	5.06 (1.19)	13.33 (2.23)
Acenaphthylene	0.26 (0.12-0.59)	ND	0.95 (0.30)	2.06 (0.68)
Acenaphthene	0.59 (0.38-0.79)	ND	1.89 (0.75)	8.38 (3.23)
Fluorene	0.19 (0.12-0.26)	0.69 (0.11)	4.53 (1.18)	13.23 (4.03)
Phenanthrene	0.29 (0.17-0.41)	3.08 (0.43)	24.45 (10.34)	46.50 (14.75)
Anthracene	0.30 (0.17-0.43)	0.21 (0.05)	2.81 (0.95)	8.56 (3.24)
Fluoranthene	0.11 (0.06-0.14)	2.32 (0.53)	38.20 (20.99)	80.13 (30.32)
Pyrene	0.10 (0.06-0.14)	2.40 (0.53)	30.90 (16.38)	66.25 (24.77)
Benz(a)anthracene	0.24 (0.12-0.32)	0.87 (0.28)	11.29 (6.06)	26.00 (9.43)
Chrysene	0.24 (0.12-0.33)	1.83 (0.45)	20.53 (10.46)	42.25 (15.03)
Benzofluoranthenes	0.41 (0.19-0.57)	1.49 (0.46)	24.48 (14.09)	51.13 (16.47)
Benzo(e)pyrene	0.45 (0.22-0.64)	0.73 (0.18)	10.06 (5.45)	22.63 (7.50)
Benzo(a)pyrene	0.64 (0.30-0.91)	0.65 (0.24)	13.08 (8.40)	25.25 (8.70)
Perylene	0.52 (0.24-0.72)	9.58 (3.39)	36.50 (5.27)	51.13 (11.99)
Dibenz(ah)anthracene	2.52 (1.14-3.50)	0.08 (0.05)	1.66 (1.10)	2.81 (1.33)
Indeno(1,2,3-cd)pyrene	0.80 (0.38-1.03)	0.57 (0.16)	9.46 (5.90)	19.75 (5.85)
Benzo(ghi)perylene	0.68 (0.33-0.89)	0.95 (0.23)	10.69 (5.86)	21.38 (6.88)
C1 naphthalenes	0.41 (0.25-0.56)	3.05 (0.64)	6.78 (1.26)	18.38 (3.53)
C2 naphthalenes	1.07 (0.69-1.44)	1.93 (0.82)	6.33 (1.71)	24.46 (6.78)
C3 naphthalenes	0.47 (0.26-0.79)	2.45 (0.23)	5.03 (1.46)	33.70 (15.95)
C4 naphthalenes	1.28 (0.83-1.73)	ND	1.15 (1.15)	35.50 (23.67)
C1 phen,anth	0.09 (0.05-0.14)	3.83 (0.53)	16.25 (4.40)	51.88 (20.82)
C2 phen,anth	1.56 (0.88-2.09)	5.35 (1.39)	26.05 (6.63)	120.63 (64.82)
C3 phen,anth	0.72 (0.17-2.81)	0.53 (0.53)	14.75 (4.80)	107.50 (60.16)
C4 phen,anth	2.36 (1.37-3.20)	31.30 (13.28)	55.88 (22.65)	148.25 (56.96)
Retene	2.36 (1.37-3.20)	31.30 (13.28)	55.88 (22.65)	137.00 (58.59)
Dibenzothiophene	0.61 (0.35-0.87)	ND	1.56 (0.53)	3.90 (1.35)
C1 dibenzothiophene	0.38 (0.14-0.71)	0.22 (0.12)	1.72 (0.46)	6.66 (3.21)
C2 dibenzothiophene	0.19 (0.09-0.38)	0.09 (0.07)	2.27 (0.59)	14.75 (7.68)
Total parent PAHs	n/a	27.06 (6.79)	246.51 (108.50)	500.73 (156.17)
Total alkylated PAHs	n/a	48.43 (16.24)	132.20 (39.74)	540.29 (251.12)
Total dibenzothiophenes	n/a	0.30 (0.17)	5.55 (1.49)	25.31 (12.18)

Mean values (ng/g dry weight) expressed with standard errors in brackets, where applicable.
Detection limits expressed as means with lower and upper limits in brackets.
n/a denotes not applicable
ND denotes not detected.
Means and sums calculated with detection limits set to zero

Table 14. Mean PCB Aroclor, Coplanar, Total PCB Congener and PCB TEQ Concentrations in Bed Sediments from Individual Reaches of the Fraser River Basin (1994)

	Detection Limits	94MBD n=4	94QPG n=2	94LQN2 n=1	94LCH1 n=1	94NEC4 n=1	94 NTH1 n=1	94THM1 n=1	94STK1A n=1	94SRT3 n=1	94CHN2 n=1	94QNL2 n=1	94HAR1 n=1
Aroclor 1242 (ng/g)	1.06 (0.09-4.80)	0.02 (0.02)	ND	ND	ND	ND	ND	ND	5.000	ND	ND	ND	ND
Aroclor 1254 (ng/g)	2.15 (0.39-9.20)	ND	ND	ND	ND	ND	ND	ND	500.000	ND	ND	ND	ND
Aroclor 1260 (ng/g)	1.99 (0.08-7.80)	ND	ND	ND	ND	ND	ND	0.128	64.000	ND	ND	ND	0.695
PCB #77 (3,3',4,4' TCB) (pg/g)	0.44 (0.01-1.5)	0.046 (0.046)	0.034 (0.034)	ND	ND	ND	0.180	0.712	270.000	0.420	0.400	0.230	4.400
PCB #126 (3,3',4,4',5 PCB) (pg/g)	0.28 (0.01-1.4)	0.004 (0.004)	0.005 (0.005)	ND	ND	ND	ND	0.110	48.000	0.090	0.130	0.060	0.740
PCB #169 (3,3',4,4',5,5' HCB) (pg/g)	0.29 (0.01-0.9)	ND	0.009 (0.009)	ND	ND	ND	0.045	0.090	0.930	0.180	0.240	0.160	0.680
Total PCB Congeners (ng/g)	0.013 (0.001-0.320)	0.028 (0.018)	0.027 (0.027)	ND	ND	ND	0.040	0.140	587.820	0.280	1.280	0.200	1.325
PCB TEQs (pg/g)	n/a	0.001 (0.001)	0.001 (0.001)	0.000	0.000	0.000	0.001	0.015	6.160	0.013	0.017	0.009	0.103

Mean values (dry weight) expressed with standard errors in brackets
Detection limits shown as means with lower and upper limits in brackets
ND denotes not detected
n/a denotes not applicable
TEQs calculated with detection limits set to zero
Means, sums and TEQs calculated with detection limits set to zero

Table 15. Mean PCB Aroclor and Total PCB Congener Concentrations in Bed Sediments from Individual Reaches of the Fraser River Basin (1995)

	Detection Limits	95MBD	95QPG	95LQN	95LCH	95NEC	95NTH	95STH	95THM	95MAN	95NAR	95STK1A	95SRT3	95CHN2	95QNL2	95HAR1
		n=4	n=4	n=4	n=4	n=4	n=4	n=3	n=4	n=4	n=4	n=1	n=1	n=1	n=1	n=1
Aroclor 1242	1.56 (0.15-10.00)	0.28 (0.19)	0.11 (0.11)	4.75 (4.75)	ND	ND	ND	ND	ND	0.63 (0.63)	1.25 (1.25)	0.73	ND	ND	ND	ND
Aroclor 1254	2.55 (0.32-12.00)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20	ND	ND	ND	ND
Aroclor 1260	2.19 (0.28-12.00)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.2	ND	ND	ND	ND
Total PCB Congeners	0.11 (0.01-1.90)	0.34 (0.18)	0.11 (0.10)	4.36 (4.19)	0.21 (0.21)	0.01 (0.01)	ND	0.10 (0.10)	ND	1.05 (0.74)	2.84 (1.57)	19.9	ND	ND	ND	ND

Mean values (ng/g dry weight) expressed with standard errors in brackets
Detection limits shown as means with lower and upper limits in brackets
ND denotes not detected
n/a denotes not applicable
Means and sums calculated with detection limits set to zero

Table 16. Mean PCB Aroclor, Coplanar, Total PCB Congener and PCB TEQ Concentrations in Bed Sediments from Individual Reaches of the Fraser River Basin (1996)

	Detection Limits	96LCH n=4	96MAN n=4	96NAR n=4*
Aroclor 1242 (ng/g)	0.40 (0.11-0.87)	ND	0.85 (0.85)	0.25 (0.25)
Aroclor 1254 (ng/g)	0.57 (0.18-1.44)	ND	0.93 (0.93)	1.87 (0.77)
Aroclor 1260 (ng/g)	0.56 (0.17-1.60)	ND	ND	2.43 (2.29)
PCB #77 (3,3',4,4' TCB) (pg/g)	0.63 (0.60-0.90)	0.28 (0.19)	11.55 (7.84)	15.3 (4.12)
PCB #126 (3,3',4,4',5 PCB) (pg/g)	0.32 (0.30-0.50)	ND	0.41 (0.21)	0.26 (0.26)
PCB #169 (3,3',4,4',5,5' HCB) (pg/g)	0.44 (0.40-0.70)	ND	ND	ND
Total PCB Congeners (ng/g)	0.04 (0.01-0.31)	0.07 (0.04)	2.17 (1.71)	4.84 (2.91)
PCB TEQs (pg/g)	n/a	0.001 (0.001)	0.099 (0.060)	0.103 (0.031)

Mean values (dry weight) expressed with standard errors in brackets
Detection limits shown as means with lower and upper limits in brackets
ND denotes not detected
n/a denotes not applicable
*except for PCB #77, #126, #169 and TEQs where n=3
Means, sums and TEQs calculated with detection limits set to zero

Table 17. Mean Pesticide Concentrations in Bed Sediments from Individual Reaches of the Fraser River Basin (1994)

	Detection Limits	94MBD	94QPG	94LQN2	94LCH1	94NEC4	94 NTH1	94THM1	94STK1A	94SRT3	94CHN2	94QNL2	94HAR1
		n=4	n=2	n=1	n=1	n=1	n=1	n=1	n=1	n=1	n=1	n=1	n=1
Hexachlorobenzene (284)	0.08 (0.01-0.42)	0.01 (0.01)	0.02 (0.02)	ND	0.03	ND	0.14	0.12	0.17	ND	ND	ND	0.26
alpha HCH (219)	0.21 (0.01-1.20)	ND	0.01 (0.01)	ND	ND	0.03	ND	0.02	ND	ND	ND	ND	0.03
beta HCH (219)	0.41 (0.01-2.30)	ND	0.85 (0.85)	1.70	0.17	ND	ND	0.04	ND	ND	ND	ND	ND
gamma HCH (219)	0.24 (0.01-1.30)	0.60 (0.09)	0.46 (0.32)	2.20	0.38	0.42	ND	0.07	ND	ND	0.56	ND	ND
delta HCH (219)	0.23 (0.01-1.30)	ND	ND	ND	ND	ND	ND	0.02	ND	ND	ND	ND	ND
Heptachlor (337)	0.40 (0.01-1.20)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aldrin (263)	0.15 (0.004-0.74)	0.01 (0.01)	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.30	ND
Oxychlordane (373)	0.70 (0.02-3.00)	0.81 (0.54)	2.05 (2.05)	ND	ND	3.35	ND	ND	ND	0.76	ND	ND	ND
trans-Chlordane (373)	0.12 (0.00-0.50)	ND	ND	ND	ND	ND	ND	ND	0.11	ND	ND	ND	0.04
cis-Chlordane (373)	0.13 (0.01-0.54)	ND	ND	ND	ND	ND	ND	ND	0.08	ND	ND	ND	0.04
p,p'-DDE (246)	0.09 (0.02-0.51)	0.003 (0.003)	ND	ND	0.05	0.03	ND	0.10	0.58	ND	ND	ND	2.00
trans-Nonachlor (409)	0.10 (0.01-0.31)	ND	ND	ND	ND	ND	ND	0.003	0.04	ND	ND	ND	0.10
p,p'-DDD (235)	0.11 (0.02-0.50)	ND	ND	ND	ND	ND	ND	0.02	0.66	0.45	ND	ND	1.40
o,p'-DDT (235)	0.23 (0.04-0.89)	ND	ND	ND	ND	ND	ND	ND	ND	0.19	ND	ND	ND
p,p'-DDT (235)	0.31 (0.02-1.30)	0.17 (0.17)	0.28 (0.28)	ND	ND	ND	ND	ND	0.26	ND	ND	ND	0.45
Mirex (272)	0.39 (0.00-0.73)	ND	0.002 (0.002)	ND	ND	ND	0.01	0.02	0.04	ND	ND	ND	0.03
Heptachlor Epoxide	0.10 (0.01-0.44)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
alpha-Endosulphan (I)	0.09 (0.01-0.36)	ND	ND	ND	ND	ND	ND	ND	0.91	ND	ND	ND	ND
Dieldrin	0.08 (0.01-0.41)	ND	ND	ND	ND	ND	ND	ND	0.30	ND	ND	ND	ND
Endrin	0.27 (0.02-1.40)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
beta-Endosulphan (II)	0.11 (0.01-0.60)	ND	ND	ND	ND	ND	ND	ND	1.70	ND	ND	ND	ND
Endosulphan Sulphate	0.15 (0.01-0.99)	ND	ND	ND	ND	ND	ND	ND	0.35	ND	ND	ND	ND
Methoxychlor	0.71 (0.02-5.00)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total HCH	n/a	0.06 (0.09)	1.31 (1.16)	3.90	0.55	0.44	ND	0.14	ND	ND	0.56	ND	0.03
Total Chlordane	n/a	0.81 (0.54)	2.05 (2.05)	ND	ND	3.35	ND	ND	0.19	0.76	ND	ND	0.07
Total DDT	n/a	0.17 (0.17)	0.28 (0.28)	ND	ND	ND	ND	ND	0.26	0.19	ND	ND	0.45
Total DDT and metabolites	n/a	0.17 (0.17)	0.28 (0.28)	ND	0.05	0.03	ND	0.12	1.50	0.64	ND	ND	3.85
Total Pesticides	n/a	1.58 (0.54)	3.63 (3.46)	3.90	0.63	3.82	0.15	0.40	5.20	1.40	0.56	0.30	4.34

Values expressed in ng/g dry weight with standard errors shown in brackets
Detection limits shown as means with lower and upper limits in brackets
ND denotes not detected
n/a denotes not applicable
Means and sums calculated with detection limits set to zero

Table 18. Mean Pesticide Concentrations in Bed Sediments from Individual Reaches of the Fraser River Basin (1995)

	Detection Limits	95MBD	95QPG	95LQN	95LCH	95NEC	95NTH	95STH	95THM	95MAN	95NAR	95STK1A	95SRT3	95CHN2	95QNL2	95HAR1
		n=4	n=4	n=4	n=4	n=4	n=4	n=3	n=4	n=4	n=4	n=1	n=1	n=1	n=1	n=1
Hexachlorobenzene (284)	0.07 (0.01-0.28)	0.03 (0.01)	0.02 (0.01)	ND	ND	ND	ND	0.04 (0.04)	ND	ND	ND	0.06	ND	0.06	ND	ND
alpha HCH (219)	0.20 (0.02-0.95)	ND	0.02 (0.02)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
beta HCH (219)	0.34 (0.04-1.70)	ND	0.03 (0.03)	0.76 (0.30)	ND	ND	ND	ND	0.38 (0.22)	ND	ND	ND	ND	ND	ND	ND
gamma HCH (219)	0.31 (0.03-1.60)	0.23 (0.02)	0.11 (0.08)	0.89 (0.25)	ND	ND	ND	ND	0.08 (0.08)	ND	ND	ND	ND	ND	ND	ND
delta HCH (219)	0.30 (0.04-1.60)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor (337)	0.72 (0.03-3.70)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aldrin (263)	0.22 (0.03-1.10)	0.06 (0.04)	ND	0.05 (0.05)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Oxychlordane (373)	1.15 (0.09-5.80)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.52	ND	ND	ND
trans-Chlordane (373)	0.15 (0.02-0.73)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-Chlordane (373)	0.16 (0.03-0.78)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
p,p'-DDE (246)	0.11 (0.02-0.41)	0.09 (0.09)	0.03 (0.02)	0.05 (0.03)	ND	ND	0.07 (0.05)	0.08 (0.04)	0.20 (0.09)	0.20 (0.09)	0.88 (0.16)	1.20	0.04	0.04	ND	0.91
trans-Nonachlor (409)	0.15 (0.02-0.78)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
p,p'-DDD (235)	0.10 (0.01-0.42)	0.15 (0.15)	0.01 (0.01)	ND	ND	ND	ND	ND	0.13 (0.09)	0.17 (0.06)	0.09 (0.09)	0.82	ND	ND	ND	0.26
o,p'-DDT (235)	0.19 (0.01-0.90)	0.02 (0.02)	ND	0.06 (0.06)	ND	ND	ND	ND	0.06 (0.06)	ND	0.35 (0.35)	0.43	ND	ND	ND	ND
p,p'-DDT (235)	0.19 (0.01-0.80)	2.31 (0.70)	0.63 (0.27)	0.08 (0.08)	ND	ND	0.09 (0.09)	ND	0.12 (0.12)	0.53 (0.33)	0.56 (0.38)	1.20	7.80	1.60	0.46	ND
Mirex (272)	0.50 (0.25-0.95)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor Epoxide	0.03 (0.01-0.06)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
alpha-Endosulphan (I)	0.04 (0.01-0.13)	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.05 (0.05)	ND	ND	ND	ND	ND
Dieldrin	0.03 (0.01-0.07)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin	0.05 (0.01-0.13)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
beta-Endosulphan (II)	0.05 (0.01-0.16)	0.06 (0.03)	ND	ND	ND	ND	ND	ND	ND	ND	0.04 (0.04)	0.23	ND	0.06	ND	ND
Endosulphan Sulphate	0.06 (0.02-0.14)	0.02 (0.02)	ND	ND	ND	ND	ND	ND	ND	0.02 (0.02)	0.04 (0.02)	0.14	ND	ND	ND	ND
Methoxychlor	0.07 (0.02-0.17)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total HCH	n/a	0.23 (0.02)	0.17 (0.11)	1.65 (0.54)	ND	ND	ND	ND	0.45 (0.18)	ND	ND	ND	ND	ND	ND	ND
Total Chlordane	n/a	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.52	ND	ND	ND
Total DDT	n/a	2.34 (0.69)	0.63 (0.27)	0.13 (0.08)	ND	ND	0.09 (0.09)	ND	0.18 (0.11)	0.53 (0.33)	0.91 (0.71)	1.63	7.80	1.60	0.46	ND
Total DDT and metabolites	n/a	2.57 (0.62)	0.66 (0.29)	0.18 (0.10)	ND	ND	0.16 (0.14)	0.08 (0.04)	0.50 (0.27)	0.90 (0.45)	1.88 (0.77)	3.65	7.84	1.64	0.46	1.17
Total Pesticides	n/a	2.98 (0.63)	0.85 (0.37)	1.87 (0.51)	ND	ND	0.16 (0.14)	0.12 (0.08)	0.95 (0.41)	0.92 (0.47)	2.01 (0.74)	4.08	8.36	1.76	0.46	1.17

Values expressed in ng/g dry weight with standard errors shown in brackets
Detection limits shown as means with lower and upper limits in brackets
ND denotes not detected
n/a denotes not applicable
Means and sums calculated with detection limits set to zero

Table 19. Mean Pesticide Concentrations in Bed Sediments from Individual Reaches of the Fraser River Basin (1996)

	Detection Limits	96LCH n=4	96MAN n=4	96NAR n=4
Hexachlorobenzene (284)	0.04 (0.01-0.08)	0.03 (0.01)	0.06 (0.02)	0.12 (0.03)
alpha HCH (219)	0.21 (0.03-1.00)	ND	0.06 (0.06)	ND
beta HCH (219)	0.41 (0.07-2.00)	0.30 (0.13)	0.39 (0.24)	0.54 (0.25)
gamma HCH (219)	0.35 (0.06-1.70)	0.22 (0.08)	0.21 (0.21)	0.18 (0.13)
delta HCH (219)	0.32 (0.05-1.70)	0.03 (0.03)	ND	ND
Heptachlor (337)	0.26 (0.06-0.77)	ND	ND	ND
Aldrin (263)	0.05 (0.02-0.14)	ND	ND	ND
Oxychlordane (373)	0.32 (0.10-0.90)	0.19 (0.11)	0.24 (0.24)	ND
trans-Chlordane (373)	0.03 (0.01-0.08)	ND	ND	0.07 (0.06)
cis-Chlordane (373)	0.04 (0.01-0.11)	ND	ND	0.06 (0.05)
p,p'-DDE (246)	0.06 (0.01-0.14)	0.02 (0.01)	0.17 (0.06)	0.50 (0.17)
trans-Nonachlor (409)	0.03 (0.01-0.08)	ND	ND	0.05 (0.05)
p,p'-DDD (235)	0.05 (0.02-0.12)	0.05 (0.03)	0.29 (0.05)	0.64 (0.13)
o,p'-DDT (235)	0.06 (0.02-0.20)	ND	0.16 (0.16)	0.11 (0.06)
p,p'-DDT (235)	0.07 (0.02-0.25)	1.26 (0.38)	3.94 (1.38)	2.93 (0.45)
Mirex (272)	0.10 (0.03-0.24)	0.07 (0.04)	0.05 (0.05)	ND
Heptachlor Epoxide	0.06 (0.03-0.13)	ND	ND	ND
alpha-Endosulphan (I)	0.04 (0.02-0.10)	ND	ND	ND
Dieldrin	0.06 (0.03-0.14)	ND	ND	0.13 (0.13)
Endrin	0.15 (0.07-0.32)	ND	ND	ND
beta-Endosulphan (II)	0.05 (0.02-0.11)	ND	ND	ND
Endosulphan Sulphate	0.05 (0.02-0.12)	ND	ND	ND
Methoxychlor	0.38 (0.15-1.20)	ND	ND	ND
Total HCH	n/a	0.54 (0.21)	0.66 (0.49)	0.72 (0.26)
Total Chlordane	n/a	0.19 (0.11)	0.24 (0.24)	0.13 (0.11)
Total DDT	n/a	1.26 (0.38)	4.10 (1.42)	3.03 (0.49)
Total DDT and metabolites	n/a	1.33 (0.41)	4.56 (1.49)	4.17 (0.53)
Total Pesticides	n/a	2.16 (0.66)	5.56 (1.49)	5.31 0.41)

Values expressed in ng/g dry weight with standard errors shown in brackets
Detection limits shown as means with lower and upper limits in brackets
ND denotes not detected
n/a denotes not applicable
Means and sums calculated with detection limits set to zero

Table 20. Total 4-Nonylphenol Concentrations in Bed Sediments from Individual Reaches of the Fraser River Basin (1994)

	Detection Limits	94MBD1 n=1	94QPG2 n=1	94LQN1 n=1	94LCH1 n=1
TOTAL 4-NONYLPHENOLS	0.14 (0.01-0.23)	1.70	1.90	2.90	2.00

Values expressed in ng/g dry weight
Detection limits shown as means with lower and upper limits in brackets

Table 21. Total 4-Nonylphenol Concentrations in Bed Sediments from Individual Reaches of the Fraser River Basin (1995)

	Detection Limits	95MBD	95QPG	95LQN	95LCH	95NEC	95NTH	95STH	95THM	95MAN	95NAR	95STK1A	95SRT3	95CHN2	95QNL2	95HAR1
		n=4	n=4	n=4	n=4	n=4	n=4	n=3	n=4	n=4	n=4	n=1	n=1	n=1	n=1	n=1
TOTAL 4-NONYLPHENOLS	5.17 (1.0-20.0)	0.80 (0.80)	7.30 (3.10)	8.43 (3.10)	12.63 (1.63)	ND	1.93 (1.93)	0.67 (0.67)	9.44 (7.74)	32.13 (7.33)	48.67 (8.02)	9.30	570.00	6.20	ND	ND

Values expressed in ng/g dry weight with standard errors shown in brackets
Detection limits shown as means with lower and upper limits in brackets
ND denotes not detected
n/a denotes not applicable
Means calculated with detection limits set to zero

Table 22. Total 4-Nonylphenol Concentrations in Bed Sediments from Individual Reaches of the Fraser River Basin (1996)

	Detection Limit	96LCH n=4	96MAN n=4	96NAR n=4
TOTAL 4-NONYLPHENOLS	5.0	1.45 (1.45)	11.08 (1.76)	37.38 (7.34)

Values expressed in ng/g dry weight with standard errors shown in brackets
Detection limits shown as means with lower and upper limits in brackets
ND denotes not detected
n/a denotes not applicable
Means calculated with detection limits set to zero

Table 23. Total Trace Metal Concentrations in Bed Sediments from Individual Reaches of the Fraser River Basin (1994)*

	Detection Limits (range)	94MBD n=4	94QPG n=4	94LQN n=4	94LCH n=4	94NEC n=4	94 NTH n=4	94STH n=3	94THM n=4	94STK1A n=1	94SRT3 n=1	94CHN2 n=1	94QNL2 n=1	94HAR1 n=1
Chromium	2.36-2.50	128.67 (5.34)	129.00 (5.93)	127.38 (6.31)	121.00 (6.04)	76.67 (18.85)	110.38 (5.57)	118.83 (36.99)	123.88 (11.61)	201.00	119.00	169.00	164.00	94.80
Manganese	2.22-2.43	672.92 (11.49)	866.83 (30.26)	844.13 (23.45)	833.25 (51.92)	901.25 (43.54)	975.25 (108.41)	580.50 (82.21)	779.25 (54.24)	750.00	830.00	1,180.00	998.00	734.00
Iron	11.2-11.5	45,833.33 (2,567.64)	43,137.50 (1,677.22)	39,537.50 (1,138.23)	39,100.00 (3,210.14)	37,500.00 (3,600.46)	39,225.00 (2,052.39)	26,933.33 (6,718.47)	42,758.33 (2,320.58)	33,100.00	40,200.00	58,400.00	42,800.00	42,400.00
Cobalt	1.05-1.15	15.74 (0.97)	15.65 (0.75)	14.15 (0.90)	14.00 (1.03)	11.56 (1.61)	14.62 (1.10)	9.24 (3.06)	15.52 (1.57)	13.00	14.50	26.60	18.30	13.70
Nickel	6.07-6.83	51.83 (2.90)	51.59 (2.34)	52.24 (3.79)	56.47 (3.50)	38.82 (8.22)	49.07 (3.23)	36.70 (6.41)	51.12 (1.97)	45.40	48.30	85.60	57.40	47.60
Copper	2.31-2.81	36.77 (2.15)	36.61 (1.19)	31.86 (2.14)	32.77 (1.94)	20.84 (3.08)	22.90 (2.59)	17.22 (6.35)	27.57 (5.62)	24.90	33.40	65.00	51.90	50.60
Zinc	1.86-1.87	80.53 (4.85)	82.49 (3.99)	71.80 (4.27)	64.02 (3.74)	70.72 (5.66)	61.74 (4.75)	54.23 (9.32)	68.17 (7.02)	66.70	83.20	103.00	83.20	104.00
Molybdenum	2.11-2.17	0.91 (0.38)	0.64 (0.08)	0.78 (0.05)	1.03 (0.06)	1.06 (0.07)	0.93 (0.37)	0.87 (0.13)	0.72 (0.05)	0.58	0.88	1.28	1.46	1.45
Cadmium	0.99-1.03	0.13 (0.06)	0.18 (0.08)	0.09 (0.05)	0.14 (0.06)	0.21 (0.10)	0.01 (0.01)	0.08 (0.04)	0.14 (0.06)	0.15	0.18	ND	0.34	0.41
Lead	2.09-2.27	16.93 (0.77)	13.97 (0.68)	10.64 (0.94)	7.19 (0.53)	8.10 (0.43)	14.67 (0.59)	14.33 (0.62)	15.25 (1.60)	21.00	7.94	5.67	10.80	12.30
Arsenic	0.089-0.10	4.55 (0.34)	6.43 (0.47)	4.87 (0.12)	4.09 (0.40)	5.86 (0.74)	2.02 (0.69)	2.46 (0.97)	2.60 (0.59)	2.71	11.90	3.66	18.40	3.08
Selenium	0.089-0.10	0.13 (0.01)	0.19 (0.01)	0.22 (0.01)	0.22 (0.03)	0.07 (0.03)	0.12 (0.02)	0.16 (0.04)	0.14 (0.03)	0.11	0.17	0.17	0.62	0.32
Mercury	0.019-0.02	0.02 (0.00)	0.02 (0.00)	0.03 (0.00)	0.03 (0.01)	0.03 (0.01)	ND	0.05 (0.03)	0.02 (0.01)	0.12	0.04	0.03	0.05	0.05

Values expressed in ug/g dry weight with standard errors shown in brackets
ND denotes not detected
Means calculated with detection limits set to zero
*Samples analyzed at the Elemental Research Lab

Table 24. Total Trace Metal Concentrations in Bed Sediments from Individual Reaches of the Fraser River Basin (1995)*

	Detection Limits (range)	95LCH n=4	95MAN n=4	95NAR n=4
Chromium	2.36-2.50	74.88 (5.78)	91.50 (4.48)	107.17 (3.37)
Manganese	2.22-2.43	801.00 (29.59)	920.50 (79.01)	898.67 (90.67)
Iron	11.2-11.5	33,125.00 (2,239.56)	47,000.00 (4,143.27)	51,833.33 (2,511.09)
Cobalt	1.05-1.15	14.00 (1.22)	16.25 (1.25)	19.08 (1.06)
Nickel	6.07-6.83	46.88 (3.10)	51.75 (1.97)	56.83 (2.44)
Copper	2.31-2.81	32.13 (3.72)	38.75 (4.31)	52.25 (2.95)
Zinc	1.86-1.87	65.25 (4.77)	87.75 (9.02)	131.67 (10.41)
Molybdenum	2.11-2.17	ND	0.50 (0.29)	1.50 (0.29)
Cadmium	0.99-1.03	ND	ND	ND
Lead	2.09-2.27	4.75 (0.25)	7.25 (1.03)	12.83 (0.44)
Arsenic	0.089-0.10	5.43 (0.42)	12.68 (3.63)	10.60 (0.58)
Selenium**	0.05	ND	ND	ND
Mercury	0.019-0.02	0.03 (0.005)	0.04 (0.004)	0.05 (0.003)

Values expressed in ug/g dry weight with standard errors shown in brackets
ND denotes not detected
Means calculated with detection limits set to zero
* Samples analyzed at the Elemental Research Lab
** Selenium not detected due to analytical difficulties

Table 25. Total Trace Metal Concentrations in Bed Sediments from Individual Reaches of the Fraser River Basin (1996)*

	Detection Limit	96LCH n=4	96MAN n=4	96NAR n=4
Arsenic	0.20	5.23 (0.42)	11.80 (3.50)	9.85 (1.03)
Selenium	0.20	0.30 (0.00)	0.40 (0.04)	0.50 (0.07)
Cadmium	1.0	ND	ND	ND
Cobalt	2.0	14.03 (1.20)	18.30 (1.27)	19.78 (0.71)
Copper	1.0	25.75 (1.11)	35.00 (3.58)	45.00 (5.52)
Iron	5.0	30,700.00 (2,718.76)	45,625.00 (4,493.03)	44,725.00 (2,410.52)
Manganese	1.0	634.25 (51.25)	833.50 (57.85)	733.25 (70.19)
Nickel	2.0	40.75 (3.01)	49.75 (3.28)	52.50 (3.95)
Lead	5.0	ND	7.00 (0.71)	11.50 (2.53)
Zinc	1.0	55.50 (3.88)	82.50 (10.05)	119.25 (15.45)
Mercury	0.002	0.02 (0.003)	0.05 (0.007)	0.07 (0.013)

Values expressed in ug/g dry weight with standard errors shown in brackets
ND denotes not detected
Means calculated with detection limits set to zero
*Samples analyzed at the NLET Lab

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Table 1. Particle Size of Bed Sediments from Individual Sampling Sites in 1994

Parameter	94MBD1	94FRM1	94FRM2	94FRM3	94FRM4	94FRM5	94MBD2	94MBD3	94MBD4	94QPG1	94QPG2	94FRQ1	94FRQ2	94FRQ3	94FRQ4	94FRQ5	94QPG3	94QPG4
% Sand	22.81	23.47	24.30	24.66	23.00	22.45	34.66	38.87	45.31	28.69	26.29	26.49	26.78	26.68	26.46	27.45	31.60	21.80
% Silt	73.16	73.11	71.98	71.68	73.07	73.41	62.47	58.59	51.85	66.84	69.02	68.29	68.02	68.85	69.09	67.66	63.77	73.82
% Clay	4.03	3.42	3.71	3.66	3.93	4.14	2.86	2.54	2.84	4.47	4.69	5.22	5.20	4.47	4.45	4.89	4.63	4.39

*particle size categories are defined as follows:
gravel = 2-64 mm
sand = 0.062-2 mm
silt = 0.004-0.062 mm
clay = < 0.004 mm

94FRM1-5 are field splits of 94MBD1
94FRQ1-5 are field splits of 94QPG2
94FRT1-5 are field splits of 94THM1

Table 1 (continued)

Parameter	94LQN1	94LQN2	94LQN3	94LQN4	94LCH1	94LCH4	94LCH5	94LCH6	94NEC1	94NEC2	94NEC4	94NEC6	94 NTH1	94NTH2	94 NTH3	94 NTH5	94STH3	94STH5
% Sand	42.94	51.90	42.34	30.77	91.50	43.87	41.55	46.31	27.69	72.99	69.47	63.40	73.66	58.43	82.92	82.96	34.31	79.49
% Silt	52.43	44.12	52.84	64.26	7.88	51.55	54.25	49.54	68.21	24.90	29.10	34.74	25.03	40.13	16.09	16.33	64.01	19.38
% Clay	5.04	3.98	4.82	4.97	0.62	4.58	4.19	4.15	4.10	2.11	1.43	1.86	1.31	1.44	1.00	0.70	1.68	1.12

*particle size categories are defined as follows:
gravel = 2-64 mm
sand = 0.062-2 mm
silt = 0.004-0.062 mm
clay = < 0.004 mm

94FRM1-5 are field splits of 94MBD1
94FRQ1-5 are field splits of 94QPG2
94FRT1-5 are field splits of 94THM1

Table 1 (continued)

Parameter	94STH6	94THM1	94FRT1	94FRT2	94FRT3	94FRT4	94FRT5	94THM2	94THM3	94THM4	94STK1A	94SRT3	94CHN2	94QNL2	94HAR1
% Sand	71.14	54.51	50.00	48.91	48.63	50.62	57.59	51.56	59.12	75.84	59.58	41.06	27.70	41.34	54.97
% Silt	27.93	42.12	47.20	47.78	47.89	46.46	39.45	47.10	39.35	22.91	39.11	55.49	65.63	52.61	45.03
% Clay	0.94	3.37	2.79	3.31	3.48	2.93	2.96	1.34	1.53	1.26	1.31	3.45	6.67	6.04	0.00

*particle size categories are defined as follows:
gravel = 2-64 mm
sand = 0.062-2 mm
silt = 0.004-0.062 mm
clay = < 0.004 mm

94FRM1-5 are field splits of 94MBD1
94FRQ1-5 are field splits of 94QPG2
94FRT1-5 are field splits of 94THM1

Table 2. Particle Size of Bed Sediments from Individual Sampling Sites in 1995

Parameter	95MBD1	95MBD2	95MBD3	95MBD4	95QPG1	95QPG2	95QPG3	95QPG4	95LQN1	95LQN2	95LQN3	95LQN4	95LCH1	95LCH4	95LCH5	95LCH6	95NEC1	95NEC2	95NEC4	95NEC6	95NTH1	95NTH2	95NTH3
% Sand	52.33	64.34	79.15	60.79	31.44	62.13	57.16	57.28	23.62	59.87	52.18	32.82	66.20	43.51	60.46	47.45	25.78	48.77	61.29	72.54	63.50	56.22	98.65
% Silt	46.14	35.66	20.85	39.21	63.96	36.61	41.51	41.68	72.91	38.77	46.11	63.02	33.80	53.19	38.22	49.63	72.42	49.80	38.71	27.46	36.50	43.78	1.35
% Clay	1.53	0.00	0.00	0.00	4.60	1.26	1.33	1.04	3.48	1.36	1.71	4.16	0.00	3.30	1.31	2.92	1.79	1.43	0.00	0.00	0.00	0.00	0.00

*particle size categories are defined as follows:
gravel = 2-64 mm
sand = 0.062-2 mm
silt = 0.004-0.062 mm
clay = < 0.004 mm

95FRN1and 95FRN2 are field splits of 95NAR1

Table 2 (continued)

Parameter	95NTH5	95STH3	95STH5	95STH6	95THM1	95THM2	95THM3	95THM4	95MAN1	95MAN2	95MAN3	95MAN4	95NAR1	95FRN1	95FRN2	95NAR2	95NAR3	95NAR4	95STK1A	95SRT3	95CHN2	95QNL2	95HAR1
% Sand	75.96	29.42	55.50	64.95	57.35	24.64	66.52	44.79	0.00	38.15	27.41	14.02	0.00	0.00	1.33	5.21	14.81	0.00	49.43	68.32	43.29	47.81	54.97
% Silt	24.04	69.54	44.50	35.05	41.41	73.97	33.48	55.21	85.65	56.81	69.08	76.86	89.71	90.23	89.23	86.43	77.26	91.39	49.45	30.32	53.93	49.23	45.03
% Clay	0.00	1.04	0.00	0.00	1.24	1.38	0.00	0.00	14.35	5.04	3.51	9.12	10.29	9.77	9.43	8.35	7.93	8.61	1.12	1.36	2.79	2.96	0.00

*particle size categories are defined as follows:
gravel = 2-64 mm
sand = 0.062-2 mm
silt = 0.004-0.062 mm
clay = < 0.004 mm

95FRN1and 95FRN2 are field splits of 95NAR1

Table 3. Particle Size of Bed Sediments from Individual Sampling Sites in 1996

Parameter	96LCH1	96LCH4	96LCH5	96LCH6	96MAN1	96MAN2	96MAN3	96MAN4	96NAR1	96NAR2	96NAR3	96NAR4
% Sand	57.07	60.04	85.47	88.69	0.00	35.83	11.51	25.31	0.00	0.00	22.47	0.00
% Silt	41.67	38.76	14.47	11.31	91.54	56.66	82.47	68.63	89.78	91.15	72.20	85.55
% Clay	1.25	1.20	0.00	0.00	8.46	7.51	6.03	6.05	10.22	8.85	5.34	14.45
% Silt and Clay	42.92	39.96	14.47	11.31	100.00	64.17	88.50	74.68	100.00	100.00	77.54	100.00

*particle size categories are defined as follows:
gravel = 2-64 mm
sand = 0.062-2 mm
silt = 0.004-0.062 mm
clay = < 0.004 mm

Table 4. Total Organic Carbon (TOC) in Bed Sediments from Individual Sampling Sites in 1994

Parameter	94MBD1	94FRM1	94FRM2	94FRM3	94FRM4	94FRM5	94FRM5d	94MBD2	94MBD3	94MBD4	94MBD4d	94QPG1	94QPG2	94FRQ1	94FRQ2	94FRQ3	94FRQ4	94FRQ5	94QPG3
TOC (%)	0.58	0.44	0.48	0.48	0.47	0.49	0.42	0.43	0.32	0.29	0.28	0.49	0.53	0.53	0.49	0.49	0.57	0.48	0.47

Lab duplicates denoted by a "d" following the sample ID.
94FRM1-5 are field splits of 94MBD1
94FRQ1-5 are field splits of 94QPG2
94FRT1-5 are field splits of 94THM1

Table 4 (continued)

Parameter	94QPG4	94LQN1	94LQN2	94LQN3	94LQN4	94LCH1	94LCH4	94LCH5	94LCH6	94LCH6d	94NEC1	94NEC1d	94NEC2	94NEC4	94NEC6	94 NTH1	94NTH2	94 NTH3	94 NTH5	94STH3	94STH5
TOC (%)	0.49	0.45	0.37	0.46	0.66	0.16	0.31	0.69	0.29	0.30	0.74	0.61	0.51	0.25	0.92	0.29	0.69	0.14	0.14	0.74	0.36

Lab duplicates denoted by a "d" following the sample ID.
94FRM1-5 are field splits of 94MBD1
94FRQ1-5 are field splits of 94QPG2
94FRT1-5 are field splits of 94THM1

Table 4 (continued)

Parameter	94STH5d	94STH6	94THM1	94FRT1	94FRT2	94FRT2d	94FRT3	94FRT4	94FRT5	94THM2	94THM3	94THM4	94STK1A	94SRT3	94CHN2	94CHN2d	94QNL2	94HAR1
TOC (%)	0.31	0.25	0.46	0.43	0.49	0.95	0.41	0.46	0.32	0.73	0.48	0.17	0.43	0.84	1.16	1.08	0.29	1.99

Lab duplicates denoted by a "d" following the sample ID.
94FRM1-5 are field splits of 94MBD1
94FRQ1-5 are field splits of 94QPG2
94FRT1-5 are field splits of 94THM1

Table 5. Total Organic Carbon (TOC) in Bed Sediments from Individual Sampling Sites in 1995

Parameter	95MBD1	95MBD2	95MBD3	95MBD4	95QPG1	95QPG2	95QPG3	95QPG4	95LQN1	95LQN2	95LQN3	95LQN4	95LCH1	95LCH4	95LCH5	95LCH6	95NEC1	95NEC2	95NEC2d	95NEC4	95NEC6	95NTH1	95NTH2
TOC (%)	2.31	0.55	0.50	0.51	0.35	0.40	0.57	0.61	0.65	0.42	0.64	0.35	0.78	0.74	0.83	0.09	1.32	0.83	0.83	0.61	0.70	0.88	0.87

*Samples analyzed at Cantest laboratory except 95MAN1,95MAN2, 95MAN3, 95 MAN4, 95NAR1, 95NAR2, 95NAR3 and 95NAR4 which were analyzed at the NLET laboratory and 95LQN3 , 95THM3 and 95STK1A which were analyzed at ASL laboratory
Lab duplicates denoted by a "d" following the sample ID.

Table 5 (continued)

Parameter	95NTH3	95NTH5	95STH3	95STH5	95STH6	95THM1	95THM2	95THM3	95THM4	95MAN1	95MAN2	95MAN3	95MAN4	95NAR1	95NAR2	95NAR3	95NAR4	95STK1A	95SRT3	95CHN2	95QNL2	95HAR1
TOC (%)	0.36	0.59	0.71	0.98	0.61	1.37	0.07	0.58	0.48	1.15	0.65	1.07	0.77	1.77	1.91	1.11	1.06	1.20	0.43	0.44	0.37	0.68

*Samples analyzed at Cantest laboratory except 95MAN1,95MAN2, 95MAN3, 95 MAN4, 95NAR1, 95NAR2, 95NAR3 and 95NAR4 which were analyzed at the NLET laboratory and 95LQN3 , 95THM3 and 95STK1A which were analyzed at ASL laboratory
Lab duplicates denoted by a "d" following the sample ID.

Table 6. Total Organic Carbon (TOC) in Bed Sediments from Individual Sampling Sites in 1996

Parameter	96LCH1	96LCH4	96LCH5	96LCH6	96MAN1	96MAN1d	96MAN2	96MAN3	96MAN4	96NAR1	96NAR1A	96NAR1Ad	96NAR1B	96NAR1C	96NAR1D	96NAR1E	96NAR2	96NAR2d	96NAR3	96NAR4	96NAR4d
TOC (%)	0.38	0.42	0.46	0.34	0.67	0.77	0.4	0.61	0.56	1.26	1.11	1.15	1.11	0.98	1.05	1.03	1.05	1.19	0.54	0.61	0.64

Lab duplicates denoted by a "d" following the sample ID.
96NAR1A-E are QA/QC grabs taken at the 96NAR1 site.

Table 7. Dioxin and Furan Concentrations in Bed Sediments from Individual Sampling Sites in 1994

Parameter	94MBD1	94FRM1	94FRM1d	94FRM2	94FRM3	94FRM4	94FRM5	94QPG2	94FRQ1	94FRQ2	94FRQ3	94FRQ4	94FRQ5	94LQN2	94LCH1	94NEC4
T4CDD (TOTAL)	<0.4	<0.2	<0.2	<0.2	<0.2	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	0.40	0.30	2.00	3.30	0.70
2,3,7,8 TCDD	<0.4	<0.2	<0.2	<0.2	<0.2	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
P5CDD (TOTAL)	<0.4	<0.2	<0.2	<0.2	<0.2	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	0.30	<0.2	1.20	<0.2	<0.2
1,2,3,7,8 PCDD	<0.4	<0.2	<0.2	<0.2	<0.2	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
H6CDD (TOTAL)	<0.6	0.90	0.90	1.00	1.10	0.60	1.10	3.40	2.80	3.30	4.10	4.70	4.20	5.20	1.40	1.40
1,2,3,4,7,8 H6CDD	<0.6	<0.3	<0.3	<0.4	<0.3	<0.6	<0.3	<0.4	<0.4	<0.4	<0.3	<0.3	<0.3	<0.4	<0.4	<0.3
1,2,3,6,7,8 H6CDD	<0.6	<0.3	<0.3	<0.4	<0.3	<0.6	<0.3	0.50	0.50	<0.4	0.40	0.60	0.60	<0.4	<0.4	<0.3
1,2,3,7,8,9 H6CDD	<0.6	<0.3	<0.3	<0.4	<0.3	<0.6	<0.3	<0.4	<0.4	<0.4	0.40	0.40	0.40	0.60	<0.4	<0.3
H7CDD (TOTAL)	2.80	3.60	4.40	4.20	4.50	6.40	5.10	7.40	8.70	9.50	12.00	9.80	8.70	16.00	4.20	4.80
1,2,3,4,6,7,8 H7CDD	2.60	1.70	1.90	1.90	2.00	2.90	2.20	3.40	4.20	4.30	4.70	4.50	4.00	6.30	1.50	1.70
O8CDD (TOTAL)	20.00	15.00	22.00	18.00	18.00	24.00	20.00	33.00	42.00	48.00	31.00	46.00	36.00	64.00	16.00	13.00
T4CDF (TOTAL)	<0.4	<0.2	<0.2	<0.2	<0.2	<0.4	<0.2	1.80	1.90	2.00	1.40	2.30	2.30	<0.2	0.20	<0.2
2,3,7,8 T4CDF	<0.4	<0.2	<0.2	<0.2	<0.2	<0.4	<0.2	1.20	1.30	1.30	1.00	1.50	1.30	<0.2	0.20	<0.2
P5CDF (TOTAL)	<0.4	<0.2	<0.2	<0.3	<0.2	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	0.20	<0.2	<0.2	<0.2	<0.2
1,2,3,7,8 P5CDF	<0.4	<0.2	<0.2	<0.3	<0.2	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
2,3,4,7,8 P5CDF	<0.4	<0.2	<0.2	<0.3	<0.2	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
H6CDF (TOTAL)	<0.6	0.50	0.40	<0.3	0.60	0.70	1.00	<0.4	<0.4	<0.4	0.80	1.00	1.00	<0.4	<0.4	<0.3
1,2,3,4,7,8 H6CDF	<0.6	<0.2	<0.2	<0.3	<0.2	<0.6	<0.2	<0.4	<0.4	<0.4	<0.3	<0.3	<0.2	<0.4	<0.4	<0.3
1,2,3,6,7,8 H6CDF	<0.6	<0.2	<0.2	<0.3	<0.2	<0.6	<0.2	<0.4	<0.4	<0.4	<0.3	<0.3	<0.2	<0.4	<0.4	<0.3
2,3,4,6,7,8 H6CDF	<0.6	<0.2	<0.2	<0.3	<0.2	<0.6	<0.2	<0.4	<0.4	<0.4	<0.3	<0.3	<0.2	<0.4	<0.4	<0.3
1,2,3,7,8,9 H6CDF	<0.6	<0.2	<0.2	<0.3	<0.2	<0.6	<0.2	<0.4	<0.4	<0.4	<0.3	<0.3	<0.2	<0.4	<0.6	<0.3
H7CDF (TOTAL)	<1	1.20	1.00	1.20	1.40	3.00	2.00	0.80	1.80	1.90	1.60	2.50	2.20	<0.6	<0.6	<0.3
1,2,3,4,6,7,8 H7CDF	<1	0.60	0.50	0.50	0.60	1.50	0.90	<0.6	0.70	0.80	0.80	1.10	0.80	0.80	<0.6	<0.3
1,2,3,4,7,8,9 H7CDF	<1	<0.3	<0.3	<0.4	<0.4	<1	<0.3	<0.6	<0.6	<0.4	<0.4	<0.4	<0.3	<0.6	<0.6	<0.3
O8CDF (TOTAL)	<2	0.60	0.80	<0.5	1.00	<1.5	1.20	<0.8	<2	1.30	1.30	1.60	1.70	1.30	<0.8	<0.4
2,3,7,8-TCDD TEQs	0.05	0.04	0.05	0.04	0.05	0.07	0.05	0.24	0.27	0.23	0.27	0.35	0.32	0.20	0.05	0.03
% Surrogate Recovery																
13C-2,3,7,8 T4CDF	84	79	81	76	85	76	85	97	95	83	81	75	84	83	87	72
13C-2,3,7,8 T4CDD	75	72	71	59	83	75	69	84	84	84	83	62	79	69	77	49
13C-1,2,3,7,8 P5CDF	78	83	83	75	78	78	84	89	90	87	79	86	89	78	82	73
13C-1,2,3,7,8 P5CDD	74	89	90	74	81	97	87	85	89	99	79	86	94	73	78	70
13C-1,2,3,4,7,8 H6CDF	70	77	76	77	82	67	85	81	76	77	73	80	78	68	79	73
13C-1,2,3,4,7,8 H6CDD	78	80	81	73	82	82	87	91	84	90	76	83	85	75	81	71
13C-1,2,3,4,6,7,8 H6CDF	58	84	88	71	73	77	92	72	65	80	75	88	91	61	71	71
13C-1,2,3,4,6,7,8 H6CDD	55	89	86	77	75	74	87	70	61	81	71	84	92	54	61	58
13C-O8CDD	29	89	84	72	60	60	79	45	33	78	58	73	94	34	47	43

Values expressed as pg/g dry weight.
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected
94FRM1-5 are field splits of 94MBD1
94FRQ1-5 are field splits of 94QPG2
94FRT1-5 are field splits of 94THM1

Table 7 (continued)

Parameter	94 NTH1	95 NTH1d	94THM1	94FRT1	94FRT2	94FRT3	94FRT4	94FRT5	94STK1A	94SRT3	94CHN2	94QNL2	94HAR1
T4CDD (TOTAL)	<0.1	0.10	1.30	1.00	1.30	0.90	1.10	0.90	0.30	<0.1	0.50	<0.1	2.10
2,3,7,8 TCDD	<0.1	<0.1	0.50	0.50	0.50	0.40	0.40	0.40	<0.1	<0.1	<0.2	<0.1	<0.3
P5CDD (TOTAL)	<0.1	<0.1	0.80	2.60	2.00	2.10	2.30	1.90	0.50	<0.1	<0.2	<0.1	0.40
1,2,3,7,8 PCDD	<0.1	<0.1	0.50	0.40	0.40	0.40	0.40	0.40	0.10	<0.1	<0.2	<0.1	0.40
H6CDD (TOTAL)	1.30	1.30	21.00	19.00	17.00	16.00	16.00	18.00	5.80	<0.2	4.40	0.50	14.00
1,2,3,4,7,8 H6CDD	<0.2	<0.2	<0.6	0.60	0.50	0.40	0.50	0.50	0.20	<0.2	<0.4	<0.3	<0.5
1,2,3,6,7,8 H6CDD	0.30	0.40	2.30	1.90	2.00	1.80	1.80	1.90	0.80	<0.2	<0.4	<0.3	1.40
1,2,3,7,8,9 H6CDD	<0.2	<0.2	2.00	2.20	1.70	1.50	1.80	1.70	0.50	<0.2	0.50	<0.3	1.60
H7CDD (TOTAL)	18.00	15.00	54.00	46.00	48.00	52.00	45.00	47.00	26.00	2.00	22.00	2.60	34.00
1,2,3,4,6,7,8 H7CDD	12.00	9.30	26.00	22.00	24.00	21.00	21.00	21.00	13.00	1.00	8.50	0.80	14.00
O8CDD (TOTAL)	82.00	100.00	240.00	200.00	210.00	180.00	180.00	180.00	110.00	7.10	250.00	11.00	99.00
T4CDF (TOTAL)	<0.1	<0.1	14.00	16.00	15.00	15.00	16.00	16.00	18.00	<0.1	<0.2	<0.1	2.30
2,3,7,8 T4CDF	<0.1	<0.1	8.70	8.80	8.70	8.20	8.60	8.90	0.90	<0.1	<0.2	<0.1	0.60
P5CDF (TOTAL)	0.40	0.50	0.50	0.80	0.80	0.80	0.70	0.70	13.00	0.30	<0.2	<0.1	1.30
1,2,3,7,8 P5CDF	<0.1	<0.1	<0.3	<0.2	<0.2	<0.2	<0.2	<0.2	<0.1	<0.1	<0.2	<0.1	<0.3
2,3,4,7,8 P5CDF	<0.1	<0.1	<0.3	<0.2	<0.2	<0.2	<0.2	<0.2	0.40	<0.1	<0.2	<0.1	<0.3
H6CDF (TOTAL)	1.20	2.60	4.00	5.80	5.40	4.60	4.10	4.10	17.00	<0.2	<0.4	<0.2	1.90
1,2,3,4,7,8 H6CDF	<0.2	<0.2	<0.6	<0.4	<0.4	<0.4	<0.4	<0.4	0.40	<0.2	<0.4	<0.2	<0.5
1,2,3,6,7,8 H6CDF	<0.2	<0.2	<0.6	<0.4	<0.4	<0.4	<0.4	<0.4	0.60	<0.2	<0.4	<0.2	<0.5
2,3,4,6,7,8 H6CDF	<0.2	0.30	0.90	<0.4	<0.4	<0.4	<0.4	<0.4	0.80	<0.2	<0.4	<0.2	0.60
1,2,3,7,8,9 H6CDF	<0.2	<0.2	<0.6	<0.4	<0.4	<0.4	<0.4	<0.4	<0.2	<0.2	<0.4	<0.2	<0.5
H7CDF (TOTAL)	3.30	8.40	19.00	24.00	27.00	19.00	16.00	16.00	7.80	0.40	<0.6	<0.3	3.50
1,2,3,4,6,7,8 H7CDF	1.50	3.30	8.10	8.30	8.70	6.30	5.50	5.40	3.20	<0.4	<0.6	<0.3	2.10
1,2,3,4,7,8,9 H7CDF	<0.4	<0.3	<1	<0.5	<0.5	<0.6	<0.6	<0.6	<0.4	<0.4	<0.6	<0.3	<1
O8CDF (TOTAL)	2.40	7.70	25.00	33.00	47.00	31.00	25.00	26.00	5.70	0.70	<1	<0.4	<2
2,3,7,8-TCDD TEQs	0.25	0.30	2.75	2.59	2.57	2.27	2.34	2.37	0.95	0.02	0.39	0.02	0.88
% Surrogate Recovery													
13C-2,3,7,8 T4CDF	90	92	98	89	88	80	84	92	83	80	93	85	79
13C-2,3,7,8 T4CDD	90	86	82	89	81	73	81	91	84	77	94	83	71
13C-1,2,3,7,8 P5CDF	92	86	89	84	90	80	90	100	84	83	92	76	84
13C-1,2,3,7,8 P5CDD	97	86	86	82	93	83	89	98	97	84	96	76	93
13C-1,2,3,4,7,8 H6CDF	78	80	85	94	75	67	73	80	76	69	92	87	80
13C-1,2,3,4,7,8 H6CDD	91	86	84	88	82	74	85	89	84	74	88	72	90
13C-1,2,3,4,6,7,8 H6CDF	81	69	71	83	70	61	73	76	84	62	107	75	85
13C-1,2,3,4,6,7,8 H6CDD	73	54	65	79	58	49	64	63	85	49	121	70	85
13C-O8CDD	56	31	39	67	34	29	44	40	72	24	92	45	89

Values expressed as pg/g dry weight.
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected
94FRM1-5 are field splits of 94MBD1
94FRQ1-5 are field splits of 94QPG2
94FRT1-5 are field splits of 94THM1

Table 8. Dioxin and Furan Concentrations in Bed Sediments from Individual Sampling Sites in 1995

Parameter	95MBD1	95MBD2	95MBD3	95MBD4	95QPG1	95QPG2	95QPG3	95QPG4	95LQN1	95LQN2	95LQN3	95LQN4	95LCH1	95LCH4	95LCH5	95LCH6	95NEC1	95NEC1d	95NEC2	95NEC4	95NEC6	95NTH1	95NTH2	95NTH3	95NTH5	95STH3
T4CDD (TOTAL)	0.10	<0.1	<0.1	<0.2	0.80	<0.1	<0.2	0.20	1.80	2.10	1.90	2.50	1.40	2.10	1.70	1.10	3.00	2.10	0.60	0.80	1.00	<0.2	<0.2	<0.2	0.20	<0.3
2,3,7,8 TCDD	<0.1	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2	<0.2	<0.2	<0.2	<0.1	<0.2	<0.1	<0.2	<0.1	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2	<0.3
P5CDD (TOTAL)	<0.1	<0.1	<0.1	<0.2	0.50	<0.1	<0.2	<0.2	0.90	0.60	1.50	0.80	1.40	3.10	2.10	2.00	2.00	1.70	<0.2	<0.1	0.30	<0.2	<0.2	<0.2	<0.2	0.30
1,2,3,7,8 PCDD	<0.1	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2	<0.2	<0.2	<0.2	0.10	<0.2	0.20	0.30	0.20	0.20	<0.2	<0.2	<0.2	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2	<0.3
H6CDD (TOTAL)	0.30	<0.3	<0.1	2.50	4.30	0.30	1.00	1.50	5.50	11.00	5.80	8.00	3.70	9.30	5.90	6.10	4.60	4.20	2.60	2.10	2.10	<0.4	0.50	<0.4	<0.5	2.20
1,2,3,4,7,8 H6CDD	<0.3	<0.3	<0.3	<0.4	<0.5	<0.3	<0.4	<0.4	<0.3	<0.3	<0.3	<0.4	<0.4	<0.4	<0.2	<0.3	<0.4	<0.4	<0.3	<0.3	<0.3	<0.4	<0.4	<0.4	<0.5	<0.5
1,2,3,6,7,8 H6CDD	<0.3	<0.3	<0.3	0.50	<0.5	<0.3	<0.4	<0.4	0.30	0.60	0.30	0.50	<0.4	0.90	0.50	0.50	0.70	0.60	0.30	<0.3	<0.3	<0.4	<0.4	<0.4	<0.5	<0.5
1,2,3,7,8,9 H6CDD	<0.3	<0.3	<0.3	<0.4	<0.5	<0.3	<0.4	<0.4	0.50	0.90	0.50	0.80	0.50	1.10	0.60	0.70	0.80	0.70	0.40	<0.3	<0.3	<0.4	<0.4	<0.4	<0.5	<0.5
H7CDD (TOTAL)	3.50	<0.5	1.30	25.00	21.00	3.90	6.90	19.00	21.00	22.00	18.00	23.00	12.00	30.00	16.00	18.00	50.00	43.00	13.00	6.00	6.90	6.10	4.80	0.80	7.10	18.00
1,2,3,4,6,7,8 H7CDD	1.40	<0.5	0.60	11.00	8.10	1.50	2.90	8.90	6.80	6.60	5.50	7.70	4.70	13.00	6.30	6.50	18.00	15.00	4.30	2.30	2.50	3.20	2.40	<0.7	3.80	7.40
O8CDD (TOTAL)	12.00	4.20	4.70	100.00	100.00	15.00	22.00	84.00	61.00	54.00	51.00	66.00	40.00	100.00	51.00	63.00	240.00	230.00	30.00	17.00	20.00	18.00	15.00	2.00	23.00	44.00
T4CDF (TOTAL)	<0.1	<0.1	<0.1	<0.2	0.20	0.10	<0.2	<0.2	0.20	2.00	0.40	0.70	0.30	3.80	1.50	1.10	0.30	0.20	2.70	<0.1	0.10	<0.2	0.20	<0.2	<0.2	<0.3
2,3,7,8 T4CDF	<0.1	<0.1	<0.1	<0.2	0.20	0.10	<0.2	<0.2	0.20	1.00	0.30	0.50	0.30	1.50	0.90	0.70	<0.2	<0.2	1.10	<0.1	0.10	<0.2	0.20	<0.2	<0.2	<0.3
P5CDF (TOTAL)	<0.1	<0.1	<0.1	0.20	<0.2	<0.1	<0.2	<0.2	<0.2	<0.2	<0.1	<0.2	<0.3	2.40	1.30	0.30	0.40	0.40	<0.2	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2	<0.3
1,2,3,7,8 P5CDF	<0.1	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2	<0.2	<0.2	<0.2	<0.1	<0.2	<0.3	<0.3	<0.2	<0.3	<0.2	<0.2	<0.2	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2	<0.3
2,3,4,7,8 P5CDF	<0.1	<0.1	<0.1	<0.2	<0.2	<0.1	<0.2	<0.2	<0.2	<0.2	<0.1	<0.2	<0.3	0.50	0.20	<0.3	<0.2	<0.2	<0.2	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2	<0.3
H6CDF (TOTAL)	<0.3	<0.3	<0.3	2.20	<0.4	<0.3	<0.4	3.20	<0.3	<0.3	<0.3	<0.4	<0.3	1.40	1.00	0.40	1.90	1.20	0.30	<0.3	<0.3	0.40	<0.4	<0.4	<0.5	0.50
1,2,3,4,7,8 H6CDF	<0.3	<0.3	<0.3	<0.4	<0.4	<0.3	<0.4	<0.4	<0.3	<0.3	<0.3	<0.4	<0.3	<0.4	<0.2	<0.3	<0.4	<0.4	<0.3	<0.3	<0.3	<0.4	<0.4	<0.4	<0.5	<0.5
1,2,3,6,7,8 H6CDF	<0.3	<0.3	<0.3	<0.4	<0.4	<0.3	<0.4	<0.4	<0.3	<0.3	<0.3	<0.4	<0.3	<0.4	<0.2	<0.3	<0.4	<0.4	<0.3	<0.3	<0.3	<0.4	<0.4	<0.4	<0.5	<0.5
2,3,4,6,7,8 H6CDF	<0.3	<0.3	<0.3	<0.4	<0.4	<0.3	<0.4	<0.4	<0.3	<0.3	<0.3	<0.4	<0.3	<0.4	<0.2	<0.3	<0.4	<0.4	<0.3	<0.3	<0.3	<0.4	<0.4	<0.4	<0.5	<0.5
1,2,3,7,8,9 H6CDF	<0.3	<0.3	<0.3	<0.4	<0.4	<0.3	<0.4	<0.4	<0.3	<0.3	<0.3	<0.4	<0.3	<0.4	<0.2	<0.3	<0.4	<0.4	<0.3	<0.3	<0.3	<0.4	<0.4	<0.4	<0.5	<0.5
H7CDF (TOTAL)	0.50	<0.5	<0.5	8.70	1.50	<0.5	0.90	10.00	1.10	<0.5	<0.5	1.10	1.00	4.80	2.10	1.60	5.80	<9.2	1.50	<0.4	0.60	2.60	0.80	<0.7	2.90	1.30
1,2,3,4,6,7,8 H7CDF	<0.5	<0.5	<0.5	3.00	0.70	<0.5	<0.6	2.90	<0.6	<0.5	<0.5	<0.7	<0.5	2.00	0.90	0.60	1.90	<9.2	0.70	<0.4	<0.5	0.80	<0.8	<0.7	1.00	<0.9
1,2,3,4,7,8,9 H7CDF	<0.5	<0.5	<0.5	<0.6	<0.6	<0.5	<0.6	<0.6	<0.6	<0.5	<0.5	<0.7	<0.5	<0.6	<0.4	<0.5	<0.7	<9.2	<0.6	<0.4	<0.5	<0.8	<0.8	<0.7	<0.8	<0.9
O8CDF (TOTAL)	<0.8	<0.8	<0.8	6.00	2.10	<0.8	<0.8	6.40	1.80	<0.8	<0.8	1.10	1.50	5.00	1.60	1.30	5.40	3.70	1.10	<0.7	1.00	2.50	1.50	<1.1	2.70	1.80
2,3,7,8-TCDD TEQs	0.03	0.00	0.01	0.30	0.21	0.04	0.05	0.21	0.23	0.37	0.27	0.32	0.27	1.01	0.52	0.43	0.59	0.51	0.26	0.04	0.06	0.06	0.06	0.00	0.07	0.12
% Surrogate Recovery																										
13C-2,3,7,8 T4CDF	63	67	58	60	56	67	72	66	64	68	68	68	73	61	70	75	52	54	71	69	74	70	88	76	86	84
13C-2,3,7,8 T4CDD	37	69	61	63	61	76	79	71	63	74	70	67	66	52	74	84	38	50	67	64	76	75	96	77	93	94
13C-1,2,3,7,8 P5CDF	71	73	66	76	63	82	88	74	69	80	78	88	85	67	75	78	74	54	88	92	86	86	98	77	92	100
13C-1,2,3,7,8 P5CDD	60	62	53	67	54	71	87	74	58	76	68	97	71	60	65	68	62	47	100	93	90	69	89	70	81	88
13C-1,2,3,4,7,8 H6CDF	66	65	59	60	54	72	73	69	69	71	73	65	82	86	86	85	77	50	60	80	80	77	95	78	95	92
13C-1,2,3,4,7,8 H6CDD	93	69	59	75	74	99	84	78	74	68	78	68	84	86	88	88	81	48	76	75	80	83	100	80	110	100
13C-1,2,3,4,6,7,8 H7CDF	61	61	55	54	46	73	68	62	60	75	66	78	73	73	75	77	68	38	110	89	85	88	98	69	100	100
13C-1,2,3,4,6,7,8 H7CDD	55	54	46	48	39	68	63	59	50	72	57	96	73	69	74	77	51	26	74	93	74	79	92	51	91	84
13C-O8CDD	55	50	40	46	32	76	65	50	40	72	58	110	67	57	64	75	36	16	62	110	75	80	84	39	110	100

Values expressed as pg/g dry weight.
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected

Table 8. (continued)

Parameter	95STH5	95STH6	95STH6d	95THM1	95THM1d	95THM2	95THM2d	95THM3	95THM4	95MAN1	95MAN2	95MAN2d	95MAN3	95MAN4	95NAR1	95NAR2	95NAR3	95NAR4	95STK1A	95STK1Ad	95SRT3	95CHN2	95QNL2	95QNL2d	95HAR1
T4CDD (TOTAL)	<0.2	0.40	<0.4	0.90	0.80	<0.3	<0.3	<0.2	<0.3	3.60	2.30	0.90	1.80	2.70	4.00	5.90	3.40	5.40	0.40	0.40	<0.1	0.20	<0.1	<0.1	1.10
2,3,7,8 TCDD	<0.2	<0.2	<0.4	0.50	0.40	<0.3	<0.3	<0.2	<0.3	<0.2	<0.2	<0.4	<0.4	<0.3	<0.6	<0.4	<0.4	<0.4	<0.2	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1
P5CDD (TOTAL)	<0.2	0.90	0.50	2.50	2.30	<0.3	<0.3	<0.2	<0.3	4.90	2.30	1.20	5.60	2.90	9.90	14.00	8.30	9.40	1.30	1.40	<0.1	0.10	<0.1	<0.1	3.00
1,2,3,7,8 PCDD	<0.2	<0.2	<0.4	0.40	0.40	<0.3	<0.3	<0.2	<0.3	0.40	0.30	<0.4	0.40	<0.3	0.80	1.10	0.70	0.60	0.30	<0.2	<0.1	<0.1	<0.1	<0.1	0.30
H6CDD (TOTAL)	0.60	2.10	1.00	16.00	16.00	0.90	0.80	1.50	1.60	16.00	9.00	9.80	14.00	10.00	45.00	72.00	32.00	24.00	8.00	7.70	<0.2	3.40	0.40	0.30	8.00
1,2,3,4,7,8 H6CDD	<0.5	<0.4	<0.9	0.50	0.50	<0.6	<0.6	<0.4	<0.5	<0.5	<0.3	<0.7	<0.8	<0.6	<1.2	1.30	0.90	<0.8	<0.4	<0.4	<0.2	<0.2	<0.2	<0.2	<0.3
1,2,3,6,7,8 H6CDD	<0.5	<0.4	<0.9	1.60	1.50	<0.6	<0.6	<0.4	<0.5	1.70	0.90	1.00	1.50	1.10	6.90	11.00	4.70	3.40	1.20	1.10	<0.2	0.30	<0.2	<0.2	0.70
1,2,3,7,8,9 H6CDD	<0.5	0.50	<0.9	1.70	1.60	<0.6	<0.6	<0.4	<0.5	1.50	0.90	1.00	1.70	0.80	3.00	5.10	3.20	2.20	0.90	0.80	<0.2	0.70	<0.2	<0.2	1.00
H7CDD (TOTAL)	4.80	5.30	6.20	34.00	36.00	9.50	7.60	7.30	12.00	52.00	21.00	24.00	40.00	39.00	130.00	200.00	100.00	86.00	38.00	36.00	<0.3	19.00	14.00	2.70	15.00
1,2,3,4,6,7,8 H7CDD	2.10	2.20	2.60	14.00	15.00	4.40	3.50	3.10	5.50	21.00	8.10	9.00	15.00	13.00	62.00	100.00	49.00	37.00	20.00	18.00	<0.3	7.50	1.90	0.80	6.40
O8CDD (TOTAL)	9.70	7.90	9.80	96.00	100.00	23.00	19.00	24.00	31.00	160.00	63.00	65.00	90.00	100.00	380.00	630.00	300.00	260.00	130.00	130.00	1.30	230.00	24.00	9.80	33.00
T4CDF (TOTAL)	<0.2	2.00	2.00	18.00	18.00	11.00	9.50	0.30	<0.3	2.30	3.20	2.20	5.00	1.70	12.00	15.00	8.70	9.00	13.00	13.00	<0.1	<0.1	<0.1	<0.1	2.20
2,3,7,8 T4CDF	<0.2	1.20	1.10	9.70	9.20	5.80	5.20	0.30	<0.3	1.50	1.20	1.20	1.90	1.10	3.70	3.80	2.50	2.30	0.50	0.50	<0.1	<0.1	<0.1	<0.1	0.40
P5CDF (TOTAL)	<0.2	1.80	0.60	0.40	0.50	<0.3	<0.3	0.50	1.20	1.50	1.50	1.00	2.80	1.20	18.00	24.00	9.70	8.70	29.00	30.00	<0.1	<0.1	<0.1	<0.1	1.90
1,2,3,7,8 P5CDF	<0.2	<0.2	<0.4	<0.2	<0.2	<0.3	<0.3	<0.2	<0.3	<0.4	<0.3	<0.7	<0.4	<0.3	<0.6	0.50	<0.4	<0.4	<0.2	<0.2	<0.1	<0.1	<0.1	<0.1	0.10
2,3,4,7,8 P5CDF	<0.2	0.30	<0.4	<0.2	<0.2	<0.3	<0.3	<0.2	<0.3	<0.4	<0.3	<0.7	<0.4	<0.3	0.80	0.80	0.50	0.50	0.30	0.40	<0.1	<0.1	<0.1	<0.1	0.20
H6CDF (TOTAL)	<0.5	0.50	<0.9	1.40	2.30	<0.6	<0.6	<0.4	1.30	6.20	2.40	2.20	3.70	3.00	32.00	73.00	24.00	18.00	24.00	22.00	<0.2	<0.2	<0.2	<0.2	0.60
1,2,3,4,7,8 H6CDF	<0.5	<0.4	<0.9	<0.3	<0.3	<0.6	<0.6	<0.4	<0.5	<0.4	<0.3	<0.7	<0.8	<0.6	<1.2	1.30	<0.7	<0.8	0.60	0.40	<0.2	<0.2	<0.2	<0.2	<0.3
1,2,3,6,7,8 H6CDF	<0.5	<0.4	<0.9	<0.3	<0.3	<0.6	<0.6	<0.4	<0.5	<0.4	<0.3	<0.7	<0.8	<0.6	<1.2	1.50	<0.7	<0.8	0.80	0.80	<0.2	<0.2	<0.2	<0.2	<0.3
2,3,4,6,7,8 H6CDF	<0.5	<0.4	<0.9	<0.3	<0.3	<0.6	<0.6	<0.4	<0.5	<0.4	<0.3	<0.7	<0.8	<0.6	<1.2	1.50	<0.7	<0.8	0.60	0.60	<0.2	<0.2	<0.2	<0.2	<0.3
1,2,3,7,8,9 H6CDF	<0.5	<0.4	<0.9	<0.3	<0.3	<0.6	<0.6	<0.4	<0.5	<0.4	<0.3	<0.7	<0.8	<0.6	<1.2	<0.8	<0.7	<0.8	<0.4	<0.4	<0.2	<0.2	<0.2	<0.2	<0.3
H7CDF (TOTAL)	<0.8	0.70	<1.5	3.90	6.20	1.40	1.00	0.90	3.10	14.00	4.00	4.70	9.20	6.80	65.00	140.00	52.00	32.00	20.00	12.00	<0.3	<0.3	<0.3	<0.3	1.40
1,2,3,4,6,7,8 H7CDF	<0.8	0.70	<1.5	1.40	2.50	<0.9	<0.9	<0.7	1.00	4.40	1.40	1.90	3.50	2.30	22.00	48.00	17.00	11.00	7.40	5.00	<0.3	<0.3	<0.3	<0.3	0.80
1,2,3,4,7,8,9 H7CDF	<0.8	<0.6	<1.5	<0.5	<0.5	<0.9	<0.9	<0.7	<0.9	<0.7	<0.6	<1.2	<1.4	<0.9	<2	2.30	<1.2	<1.3	<0.6	<0.6	<0.3	<0.3	<0.3	<0.3	<0.4
O8CDF (TOTAL)	<1.3	<0.9	<2.3	3.50	4.80	1.90	1.60	1.20	3.00	9.90	2.30	2.40	5.20	5.70	33.00	75.00	28.00	19.00	12.00	7.60	<0.5	<0.5	<0.5	<0.5	0.80
2,3,7,8-TCDD TEQs	0.03	0.36	0.15	2.30	2.16	0.65	0.58	0.09	0.10	1.09	0.61	0.50	0.99	0.56	3.41	5.73	2.72	2.10	1.18	0.99	0.00	0.41	0.04	0.02	0.57
% Surrogate Recovery																									
13C-2,3,7,8 T4CDF	87	64	86	59	59	84	84	80	85	76	57	66	83	52	88	83	85	71	76	87	82	61	57	66	57
13C-2,3,7,8 T4CDD	94	58	79	55	57	91	90	88	93	75	55	78	84	47	92	95	94	69	83	94	89	100	96	89	77
13C-1,2,3,7,8 P5CDF	100	72	96	76	71	92	110	100	100	79	63	66	89	44	86	89	92	79	85	95	76	46	52	55	47
13C-1,2,3,7,8 P5CDD	88	63	76	77	65	70	76	99	87	69	62	71	72	32	73	75	74	66	76	82	85	52	55	65	50
13C-1,2,3,4,7,8 H6CDF	95	75	96	66	66	95	97	96	97	83	75	80	100	61	110	88	89	86	74	85	59	59	64	72	66
13C-1,2,3,4,7,8 H6CDD	100	75	86	65	65	110	110	100	100	86	73	84	90	50	97	80	84	90	79	93	63	69	93	76	74
13C-1,2,3,4,6,7,8 H7CDF	100	66	78	80	71	91	100	98	100	76	66	72	85	36	95	79	75	76	66	81	55	56	60	68	65
13C-1,2,3,4,6,7,8 H7CDD	88	68	74	85	73	87	96	100	100	75	60	71	83	29	92	77	78	72	63	80	56	65	59	60	63
13C-O8CDD	100	62	74	98	74	100	120	120	120	71	49	57	95	17	100	83	98	73	58	86	57	53	53	43	67

Values expressed as pg/g dry weight.
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected

Table 9. Dioxin and Furan Concentrations in Bed Sediments from Individual Sampling Sites in 1996

Parameter	96LCH1	96LCH4	96LCH5	96LCH6	96MAN1	96MAN2	96MAN3	96MAN4	96NAR1	96NAR2	96NAR2d	96NAR3	96NAR4
T4CDD (TOTAL)	1.00	0.50	0.80	0.40	2.70	0.90	2.90	3.00	4.40	6.20	6.50	2.10	6.40
2,3,7,8 TCDD	<0.1	<0.1	<0.1	<0.1	0.10	0.10	0.10	0.10	0.20	0.30	0.30	0.10	0.30
P5CDD (TOTAL)	0.50	0.70	0.40	0.20	2.30	0.30	2.50	3.40	3.50	11.00	9.90	2.90	7.60
1,2,3,7,8 PCDD	<0.1	<0.1	<0.1	<0.1	0.20	<0.2	0.20	0.30	0.40	1.10	1.10	0.30	0.60
H6CDD (TOTAL)	3.80	3.20	2.50	1.80	10.00	6.50	13.00	18.00	38.00	78.00	74.00	20.00	33.00
1,2,3,4,7,8 H6CDD	<0.2	<0.2	<0.2	<0.2	<0.3	<0.3	0.30	0.50	0.60	1.50	1.50	0.40	0.80
1,2,3,6,7,8 H6CDD	0.20	0.20	<0.2	<0.2	1.10	0.70	1.20	1.90	5.40	13.00	13.00	3.20	5.20
1,2,3,7,8,9 H6CDD	0.40	0.30	0.40	0.20	0.90	0.60	1.10	1.70	2.60	5.30	5.10	1.70	2.60
H7CDD (TOTAL)	8.30	9.00	7.10	6.20	30.00	14.00	32.00	54.00	76.00	190.00	180.00	56.00	92.00
1,2,3,4,6,7,8 H7CDD	3.70	3.40	2.60	2.40	12.00	5.80	13.00	22.00	35.00	100.00	97.00	25.00	43.00
O8CDD (TOTAL)	44.00	44.00	31.00	29.00	100.00	46.00	120.00	160.00	240.00	660.00	590.00	180.00	370.00
T4CDF (TOTAL)	0.60	0.30	0.30	0.10	2.60	1.30	2.00	2.20	4.80	11.00	11.00	3.00	7.70
2,3,7,8 T4CDF	0.30	0.20	0.20	0.10	0.90	0.70	0.70	0.70	1.50	2.20	2.30	0.90	2.70
P5CDF (TOTAL)	1.00	<0.1	<0.1	<0.1	1.30	0.50	1.50	2.30	6.40	31.00	30.00	5.20	9.60
1,2,3,7,8 P5CDF	0.20	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2	0.20	0.50	0.40	<0.2	0.20
2,3,4,7,8 P5CDF	0.10	0.10	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2	0.30	0.70	0.70	<0.2	0.40
H6CDF (TOTAL)	0.30	<0.2	<0.2	<0.2	4.50	1.50	3.90	5.30	20.00	99.00	94.00	20.00	34.00
1,2,3,4,7,8 H6CDF	<0.2	<0.2	<0.2	<0.2	<0.3	<0.3	<0.3	<0.3	0.50	2.00	2.00	0.50	0.90
1,2,3,6,7,8 H6CDF	<0.2	<0.2	<0.2	<0.2	<0.3	<0.3	<0.3	<0.3	0.50	2.10	2.00	0.40	0.60
2,3,4,6,7,8 H6CDF	<0.2	<0.2	<0.2	<0.2	<0.3	<0.3	<0.3	<0.3	0.50	2.10	2.00	0.50	0.60
1,2,3,7,8,9 H6CDF	<0.2	<0.2	<0.2	<0.2	<0.3	<0.3	<0.3	<0.3	<0.4	<0.4	<0.4	<0.2	<0.3
H7CDF (TOTAL)	0.60	0.60	<0.4	0.60	7.60	2.80	7.30	12.00	38.00	160.00	160.00	41.00	65.00
1,2,3,4,6,7,8 H7CDF	<0.4	<0.4	<0.4	<0.4	2.60	1.10	2.70	4.30	13.00	59.00	59.00	13.00	21.00
1,2,3,4,7,8,9 H7CDF	<0.4	<0.4	<0.4	<0.4	<0.6	<0.4	<0.4	<0.6	0.70	2.60	3.10	0.80	1.30
O8CDF (TOTAL)	0.90	1.20	<0.6	1.30	6.20	1.30	3.80	6.80	17.00	57.00	66.00	17.00	27.00
2,3,7,8-TCDD TEQs	0.20	0.10	0.10	0.10	0.70	0.40	0.80	1.20	2.50	6.40	6.30	1.60	3.20
% Surrogate Recovery													
13C-2,3,7,8 T4CDF	85	51	70	68	81	92	86	110	100	100	94	91	73
13C-2,3,7,8 T4CDD	98	65	94	74	89	100	79	110	88	90	88	85	80
13C-1,2,3,7,8 P5CDF	89	46	67	62	78	87	63	86	76	80	80	68	55
13C-1,2,3,7,8 P5CDD	100	42	67	64	78	86	64	90	99	84	86	71	60
13C-1,2,3,4,7,8 H6CDF	80	46	68	60	67	110	82	97	88	81	75	68	71
13C-1,2,3,4,7,8 H6CDD	96	50	84	67	83	98	79	100	85	83	78	77	85
13C-1,2,3,4,6,7,8 H7CDF	100	43	77	62	73	78	65	74	74	71	65	58	66
13C-1,2,3,4,6,7,8 H7CDD	120	33	70	55	68	80	66	77	73	72	67	63	69
13C-O8CDD	95	25	69	53	63	69	60	67	76	87	82	79	85

Values expressed as pg/g dry weight.
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected

Table 10. Chlorophenolic Concentrations in Bed Sediments from Individual Sampling Sites in 1994

Parameter	94MBD1	94FRM1	94FRM2	94FRM3	94FRM4	94FRM5	94MBD2	94MBD3	94MBD3d	94MBD4	94QPG1	94QPG2	94FRQ1	94FRQ2	94FRQ3	94FRQ4	94FRQ5	94QPG3	94QPG4	94QPG4d
4-CHLOROPHENOL	<0.15	<0.15	<0.2	0.48	0.44	<0.85	<0.22	<0.19	<0.53	<0.37	<0.39	<0.14	<0.14	<0.28	<0.14	<0.26	<0.14	<0.2	<0.13	<0.13
2,6-DICHLOROPHENOL	<0.14	0.12	<0.12	<0.12	<0.12	<0.32	<0.1	<0.1	<0.12	<0.12	<0.1	<0.1	<0.1	<0.19	<0.07	<0.13	<0.1	<0.14	<0.09	<0.1
2,4/2,5-DICHLOROPHENOL	<0.11	0.31	0.16	0.14	0.18	<0.27	<0.09	0.15	0.15	<0.18	0.20	0.17	<0.4	0.76	<0.17	<0.4	<0.4	<0.5	<0.5	<0.5
3,5-DICHLOROPHENOL	<0.21	0.18	<0.19	<0.19	<0.2	<0.51	<0.15	<0.16	<0.19	<0.21	<0.16	<0.16	<0.17	<0.33	<0.12	<0.23	<0.18	<0.25	<0.17	<0.18
2,3-DICHLOROPHENOL	<0.19	0.23	<0.18	<0.18	<0.18	<0.47	<0.14	<0.15	<0.18	<0.18	<0.15	<0.15	<0.15	<0.28	<0.1	<0.2	<0.16	<0.21	<0.14	<0.15
3,4-DICHLOROPHENOL	<0.12	0.16	<0.14	<0.14	<0.14	<0.37	<0.09	<0.12	<0.14	<0.13	<0.12	<0.12	<0.11	<0.21	<0.07	<0.15	<0.12	<0.16	<0.1	<0.11
6-CHLOROGUAIACOL	<0.07	0.19	<0.09	<0.06	<0.07	<0.15	<0.07	<0.05	<0.07	<0.03	<0.09	<0.06	<0.04	<0.09	<0.02	<0.1	<0.06	<0.05	<0.05	<0.03
4-CHLOROGUAIACOL	<0.06	0.18	<0.08	<0.06	<0.06	<0.13	<0.06	<0.04	<0.06	<0.07	<0.08	<0.05	<0.03	<0.07	0.07	<0.09	<0.05	<0.04	<0.05	<0.03
5-CHLOROGUAIACOL	<0.08	0.19	<0.12	<0.08	<0.09	<0.19	<0.08	<0.06	<0.09	0.13	<0.11	<0.08	<0.07	0.11	0.11	<0.13	<0.08	<0.15	<0.06	<0.04
2,4,6-TRICHLOROPHENOL	<0.08	0.08	<0.08	<0.07	<0.07	0.18	<0.07	<0.06	<0.09	<0.04	<0.1	<0.07	<0.04	<0.14	<0.04	<0.05	<0.05	<0.06	<0.05	<0.06
2,3,6-TRICHLOROPHENOL	<0.1	<0.09	<0.08	<0.11	<0.08	<0.21	<0.09	<0.09	<0.1	<0.09	<0.15	<0.08	<0.06	<0.18	<0.05	<0.07	<0.06	<0.09	<0.07	<0.08
2,3,5-TRICHLOROPHENOL	<0.12	0.13	<0.09	<0.12	<0.08	<0.23	<0.1	<0.1	<0.12	0.12	<0.16	<0.08	<0.06	<0.18	<0.05	<0.07	<0.06	<0.09	<0.07	<0.08
2,4,5-TRICHLOROPHENOL	<0.07	0.16	<0.06	<0.08	<0.05	<0.14	<0.06	<0.06	<0.07	0.13	<0.11	<0.06	<0.04	<0.12	<0.03	<0.04	<0.05	<0.06	<0.05	<0.06
2,3,4-TRICHLOROPHENOL	<0.09	0.12	<0.07	<0.1	<0.07	<0.18	<0.08	<0.08	<0.09	<0.06	<0.14	<0.08	<0.06	<0.18	<0.04	<0.06	<0.06	<0.08	<0.07	<0.08
3,4,5-TRICHLOROPHENOL	<0.08	<0.09	<0.07	<0.1	<0.07	<0.17	<0.07	<0.08	<0.09	<0.03	<0.13	<0.07	<0.05	<0.16	<0.04	<0.06	<0.06	<0.08	<0.06	<0.08
3-CHLOROCATECHOL	<0.11	<0.23	<0.3	<0.31	<0.3	<0.5	<0.09	<0.26	<0.32	<0.17	<0.42	<0.28	<0.16	0.37	<0.1	0.27	0.26	0.44	0.37	0.24
4-CHLOROCATECHOL	<0.07	<0.16	<0.21	<0.22	<0.21	<0.35	<0.06	<0.18	<0.23	<0.07	<0.3	<0.2	<0.08	<0.18	<0.06	<0.11	<0.1	0.33	0.40	0.14
4,6-DICHLOROGUAIACOL	<0.07	<0.06	<0.06	<0.06	<0.14	<0.14	<0.07	<0.05	<0.07	<0.02	<0.1	<0.06	<0.03	<0.09	<0.02	<0.04	<0.04	<0.08	<0.04	<0.04
3,4-DICHLOROGUAIACOL	<0.09	<0.1	<0.09	<0.09	<0.19	<0.18	<0.08	<0.06	<0.1	<0.03	<0.14	<0.08	<0.04	<0.13	<0.04	<0.06	<0.06	<0.12	<0.06	<0.06
4,5-DICHLOROGUAIACOL	<0.06	<0.06	<0.06	<0.06	<0.14	<0.13	<0.06	<0.04	<0.07	<0.02	<0.1	<0.05	<0.06	<0.09	0.09	<0.04	<0.04	<0.08	<0.04	<0.04
3-CHLOROSYRINGOL	<0.04	<0.07	<0.09	<0.09	<0.07	<0.13	<0.04	<0.07	<0.08	<0.04	<0.12	<0.06	<0.03	<0.07	<0.03	<0.04	<0.04	<0.05	<0.04	<0.03
3,6-DICHLOROCATECHOL	<0.58	<0.25	<0.3	<0.27	<0.25	<0.46	<0.38	<0.22	<0.22	<0.1	<0.35	<0.21	<0.17	<0.5	<0.17	<0.25	<0.48	<0.28	<0.16	<0.2
3,5-DICHLOROCATECHOL	<0.85	<0.38	<0.45	<0.41	<0.39	<0.71	<0.56	<0.28	<0.34	<0.15	<0.54	<0.32	<0.26	<0.77	<0.27	<0.39	<0.74	<0.43	<0.24	<0.31
3,4-DICHLOROCATECHOL	<0.51	<0.21	<0.27	<0.25	<0.24	<0.43	<0.34	<0.17	<0.21	<0.11	<0.33	<0.19	<0.16	<0.46	<0.16	0.30	<0.45	0.56	<0.14	<0.19
4,5-DICHLOROCATECHOL	<0.48	<0.21	<0.27	<0.24	<0.23	<0.42	<0.32	<0.17	<0.2	<0.09	<0.32	<0.19	<0.15	<0.44	0.21	0.22	<0.42	0.30	0.17	<0.18
2,3,5,6-TETRACHLOROPHENOL	<0.17	0.26	<0.13	<0.17	<0.14	<0.34	<0.05	<0.16	<0.17	0.20	<0.22	<0.14	<0.06	<0.24	<0.06	<0.1	<0.1	<0.14	<0.1	<0.08
2,3,4,6-TETRACHLOROPHENOL	<0.1	<0.09	<0.07	<0.09	<0.08	<0.18	<0.02	<0.09	<0.09	0.09	<0.12	<0.07	<0.04	<0.14	<0.04	<0.06	<0.06	<0.08	<0.06	<0.04
2,3,4,5-TETRACHLOROPHENOL	<0.07	<0.12	<0.1	<0.13	<0.1	<0.25	<0.08	<0.12	<0.12	<0.04	<0.16	<0.1	<0.07	<0.23	<0.06	<0.09	<0.11	<0.12	<0.07	<0.08
5-CHLOROVANILLIN	<0.56	<0.42	<0.42	<0.38	<0.54	<0.97	<0.71	<0.32	<0.42	<0.11	<0.76	<0.5	<0.23	<0.4	<0.11	<0.24	<0.29	<0.34	<0.22	<0.2
6-CHLOROVANILLIN	<0.66	<0.47	<0.47	<0.42	<0.6	<1.1	<0.84	<0.36	<0.46	<0.13	<0.85	<0.55	0.48	<0.46	0.57	<0.28	<0.33	<0.39	0.86	0.66
3,5-DICHLOROSYRINGOL	<0.17	<0.21	<0.28	<0.23	<0.33	<0.46	<0.28	<0.26	<0.25	<0.14	<0.37	<0.29	<0.14	<0.25	<0.14	<0.12	<0.15	<0.26	<0.11	<0.12
3,4,6-TRICHLOROGUAIACOL	<0.08	<0.08	<0.08	<0.08	<0.08	<0.18	<0.08	<0.07	<0.09	<0.04	<0.12	<0.08	<0.05	<0.1	<0.04	<0.09	<0.09	<0.06	<0.04	<0.04
3,4,5-TRICHLOROGUAIACOL	<0.09	<0.1	<0.1	<0.1	<0.11	<0.22	<0.1	<0.09	<0.12	<0.05	<0.15	<0.1	<0.06	<0.13	<0.13	<0.11	<0.11	<0.08	<0.05	<0.06
4,5,6-TRICHLOROGUAIACOL	<0.06	<0.06	<0.06	<0.07	<0.07	<0.14	<0.06	<0.06	<0.07	<0.03	<0.09	<0.06	<0.04	<0.08	<0.03	<0.07	<0.07	<0.05	<0.03	<0.04
3,4,6-TRICHLOROCATECHOL	<0.7	<0.18	<0.26	<0.34	<0.29	<0.4	<0.6	<0.14	<0.17	<0.06	<0.25	<0.18	<0.13	<0.3	<0.12	<0.25	<0.3	<0.28	<0.2	<0.13
3,4,5-TRICHLOROCATECHOL	<0.74	<0.19	<0.27	<0.36	<0.3	<0.42	<0.64	<0.14	<0.18	<0.05	0.81	0.68	0.37	0.88	0.73	0.80	1.10	0.37	<0.18	<0.11
5,6-DICHLOROVANILLIN	<0.1	<0.12	<0.13	<0.15	<0.18	<0.36	<0.12	<0.11	<0.13	<0.04	<0.21	<0.14	<0.08	<0.09	<0.06	<0.05	<0.05	<0.09	<0.06	<0.06
PENTACHLOROPHENOL	<0.13	<0.11	<0.1	<0.07	<0.1	<0.18	<0.13	<0.09	<0.08	<0.09	<0.12	<0.1	<0.06	<0.11	<0.05	<0.08	<0.07	<0.09	<0.05	<0.05
2-CHLOROSYRINGALDEHYDE	<0.04	<0.06	<0.06	<0.07	<0.06	<0.15	<0.04	<0.05	<0.06	<0.02	<0.1	<0.06	<0.03	<0.08	<0.02	<0.03	<0.04	<0.05	<0.04	<0.03
3,4,5,6-TETRACHLOROGUAIACOL	<0.05	<0.11	<0.09	<0.1	<0.1	<0.18	<0.07	<0.08	<0.09	<0.07	<0.14	<0.1	<0.05	<0.1	0.09	<0.04	<0.06	<0.05	<0.05	<0.04
3,4,5-TRICHLOROSYRINGOL	<0.09	<0.08	<0.09	<0.1	<0.14	<0.21	<0.1	<0.09	<0.11	<0.05	<0.12	<0.07	<0.04	<0.08	<0.08	<0.05	<0.03	<0.17	<0.06	<0.04
3,4,5,6-TETRACHLOROCATECHOL	<0.18	<0.19	<0.37	<0.13	<0.43	<0.6	<0.26	<0.12	<0.14	<0.05	0.17	0.35	0.30	0.66	0.46	0.56	0.65	<0.15	0.10	0.07
2,6-DICHLOROSYRINGALDEHYDE	<0.2	<0.36	0.77	0.59	<0.43	<0.9	<0.23	0.66	0.69	<0.04	10.00	6.60	<0.08	<0.11	<0.07	<0.09	<0.12	<0.2	<0.16	<0.1
% Surrogate Recovery																				
4-CHLOROPHENOL-13C	45	101	95	118	120	60	30	87	34	7	69	131	60	64	41	28	56	52	60	66
2,4-DICHLOROPHENOL-13C	45	71	64	77	87	48	42	66	46	23	63	82	74	78	60	41	67	64	71	75
4-CHLOROGUAIACOL-13C	50	70	70	76	89	65	53	75	61	50	69	81	74	78	75	46	67	63	65	73
2,4,6-TRICHLOROPHENOL-13C	47	66	63	68	84	62	50	65	53	32	66	75	74	75	64	46	67	65	71	73
2,4,5-TRICHLOROPHENOL-13C	58	75	72	75	96	76	63	73	65	56	74	79	80	82	78	54	70	72	77	77
5-CHLOROVANILLIN-13C	28	43	53	60	63	54	17	62	54	64	47	55	50	50	59	45	45	55	44	58
2,3,4,5-TETRACHLOROPHENOL-13C	74	75	83	91	103	94	72	86	81	88	77	81	86	85	87	69	73	78	84	91
4,5-DICHLOROCATECHOL-13C	14	35	36	41	49	45	15	44	39	43	40	43	43	44	40	29	24	35	47	54
4,5,6-TRICHLOROGUAIACOL-13C	66	66	70	76	80	75	61	76	70	80	68	71	75	74	74	65	66	69	75	81
PENTACHLOROPHENOL-13C	67	68	73	79	85	79	61	76	73	80	71	76	80	81	78	64	65	69	75	82
3,4,5,6-TETRACHLOROGUAIACOL-13C	65	66	70	73	77	74	62	73	70	77	71	72	75	74	73	67	68	70	73	80
3,4,5,6-TETRACHLOROCATECHOL-13C	18	13	10	25	9	13	13	25	23	24	29	21	29	26	25	18	17	23	25	38

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected
94FRM1-5 are field splits of 94MBD1
94FRQ1-5 are field splits of 94QPG2
94FRT1-5 are field splits of 94THM1

Table 10 (continued)

Parameter	94LQN1	94LQN2	94LQN3	94LQN4	94LCH1	94LCH4	94LCH5	94LCH6	94NEC1	94NEC2	94NEC2d	94NEC4	94NEC6	94 NTH1	94 NTH2	94 NTH3	94NTH3d	94 NTH5
4-CHLOROPHENOL	<0.1	<0.1	<0.11	<0.12	<0.13	<0.24	<0.15	<0.13	<0.18	<0.33	<0.2	<0.1	<0.62	<0.06	<0.1	<0.03	<0.04	<0.05
2,6-DICHLOROPHENOL	<0.08	<0.07	<0.09	<0.09	<0.1	<0.17	<0.12	<0.07	<0.14	<0.18	<0.14	<0.08	<0.27	<0.06	<0.15	<0.04	<0.04	<0.05
2,4/2,5-DICHLOROPHENOL	0.15	0.24	0.27	0.24	<0.08	<0.13	<0.09	<0.08	<0.5	<0.16	<0.12	<0.35	<0.24	<0.05	<0.12	<0.03	<0.04	<0.04
3,5-DICHLOROPHENOL	<0.12	<0.11	<0.14	<0.14	<0.15	<0.26	<0.18	<0.1	<0.24	<0.32	<0.24	<0.13	<0.49	<0.1	<0.23	<0.06	<0.07	<0.08
2,3-DICHLOROPHENOL	<0.11	<0.1	<0.12	<0.13	<0.14	<0.23	<0.16	<0.1	<0.21	<0.27	<0.21	<0.11	<0.42	<0.09	<0.22	<0.06	<0.06	<0.07
3,4-DICHLOROPHENOL	<0.08	<0.08	<0.09	<0.1	<0.08	<0.15	<0.1	<0.06	<0.16	<0.17	<0.13	<0.08	<0.26	<0.07	<0.16	<0.04	<0.05	<0.06
6-CHLOROGUAIACOL	<0.07	<0.06	<0.07	<0.08	<0.06	<0.09	<0.08	<0.06	<0.06	<0.16	<0.08	<0.03	<0.14	<0.05	<0.09	<0.03	<0.03	<0.04
4-CHLOROGUAIACOL	<0.06	<0.05	<0.06	<0.06	<0.05	<0.07	<0.06	<0.05	<0.05	<0.13	<0.07	<0.02	<0.12	<0.04	<0.07	<0.02	<0.03	<0.03
5-CHLOROGUAIACOL	0.35	<0.08	<0.08	<0.1	<0.08	<0.11	<0.09	<0.07	<0.15	<0.2	<0.1	0.10	<0.17	<0.06	<0.11	<0.04	<0.04	<0.05
2,4,6-TRICHLOROPHENOL	<0.07	<0.07	<0.07	<0.06	<0.06	<0.06	<0.06	<0.07	<0.06	<0.08	<0.08	<0.04	<0.16	<0.06	<0.11	<0.04	<0.05	<0.06
2,3,6-TRICHLOROPHENOL	<0.1	<0.1	<0.11	<0.09	<0.07	<0.08	<0.08	<0.08	<0.08	<0.1	<0.1	<0.05	<0.2	<0.09	<0.16	<0.06	<0.07	<0.08
2,3,5-TRICHLOROPHENOL	<0.1	<0.1	<0.11	<0.09	<0.08	<0.09	<0.09	<0.09	<0.09	<0.12	<0.12	<0.05	<0.24	<0.09	<0.16	<0.06	<0.07	<0.08
2,4,5-TRICHLOROPHENOL	<0.06	<0.06	<0.06	<0.05	<0.05	<0.06	<0.06	<0.06	<0.07	<0.08	<0.08	<0.03	<0.15	<0.06	<0.11	<0.04	<0.04	<0.05
2,3,4-TRICHLOROPHENOL	<0.09	<0.08	<0.1	<0.08	<0.06	<0.08	<0.08	<0.08	<0.09	<0.14	<0.1	<0.04	<0.18	<0.07	<0.14	<0.04	<0.05	<0.06
3,4,5-TRICHLOROPHENOL	<0.07	<0.07	<0.08	<0.06	<0.06	<0.07	<0.07	<0.07	<0.08	<0.1	<0.1	<0.04	<0.19	<0.07	<0.13	<0.04	<0.05	<0.06
3-CHLOROCATECHOL	<0.15	<0.12	<0.15	<0.16	<0.17	<0.21	<0.24	<0.24	<0.23	<0.4	<0.39	<0.2	<0.35	<0.15	<0.29	<0.09	<0.11	<0.12
4-CHLOROCATECHOL	<0.09	<0.08	<0.09	<0.1	<0.11	<0.14	<0.16	<0.15	<0.14	<0.25	<0.25	<0.06	<0.22	<0.1	<0.2	<0.06	<0.08	<0.08
4,6-DICHLOROGUAIACOL	<0.07	<0.06	<0.07	<0.07	<0.05	<0.07	<0.09	<0.06	<0.11	<0.07	<0.08	<0.03	<0.12	<0.04	<0.09	<0.03	<0.04	<0.04
3,4-DICHLOROGUAIACOL	<0.09	<0.08	<0.09	<0.09	<0.06	<0.08	<0.12	<0.08	<0.17	<0.2	<0.11	<0.04	<0.16	<0.06	<0.12	<0.04	<0.06	<0.05
4,5-DICHLOROGUAIACOL	0.12	<0.09	<0.11	0.12	<0.05	0.19	<0.12	0.12	<0.11	<0.07	<0.07	<0.03	<0.1	<0.04	<0.09	<0.03	<0.04	<0.04
3-CHLOROSYRINGOL	<0.05	<0.05	<0.06	<0.06	<0.04	<0.04	<0.05	<0.04	<0.05	<0.05	<0.05	<0.03	<0.08	<0.06	<0.12	<0.04	<0.05	<0.05
3,6-DICHLOROCATECHOL	<0.32	<0.4	<0.44	<0.41	<0.27	<0.39	<0.46	<0.35	<0.23	<0.34	<0.3	<0.08	<0.5	<0.2	<0.48	<0.1	<0.12	<0.15
3,5-DICHLOROCATECHOL	<0.46	<0.57	<0.63	<0.58	<0.4	<0.57	<0.68	<0.52	<0.36	<0.55	<0.47	<0.13	<0.8	<0.31	<0.73	<0.15	<0.18	<0.22
3,4-DICHLOROCATECHOL	<0.28	0.36	<0.39	<0.36	<0.24	<0.34	<0.41	<0.31	0.54	<0.33	<0.28	<0.08	<0.48	<0.18	<0.43	<0.09	<0.11	<0.13
4,5-DICHLOROCATECHOL	0.52	0.56	0.73	0.74	<0.22	0.72	<0.38	0.36	<0.21	<0.33	<0.28	<0.07	<0.48	<0.17	<0.41	<0.08	<0.1	<0.13
2,3,5,6-TETRACHLOROPHENOL	<0.19	<0.14	<0.17	<0.19	<0.16	<0.13	<0.18	<0.12	<0.24	0.24	<0.11	<0.06	<0.29	<0.15	<0.29	<0.08	<0.1	<0.11
2,3,4,6-TETRACHLOROPHENOL	<0.11	<0.08	<0.09	<0.1	<0.09	<0.07	<0.1	<0.06	<0.14	<0.11	<0.06	<0.04	<0.16	<0.08	<0.16	<0.05	<0.06	<0.06
2,3,4,5-TETRACHLOROPHENOL	<0.13	<0.1	<0.11	<0.13	<0.07	<0.1	<0.12	<0.07	<0.18	<0.12	<0.09	<0.07	<0.16	<0.09	<0.16	<0.05	<0.06	<0.06
5-CHLOROVANILLIN	<0.79	<0.81	<0.99	<0.58	<0.42	<0.72	<1	<0.49	<0.22	<0.58	<0.5	<0.14	<0.8	<0.35	<0.57	<0.18	<0.24	<0.17
6-CHLOROVANILLIN	1.20	1.00	1.30	1.20	<0.49	2.20	1.50	1.00	<0.25	<0.65	<0.57	<0.16	<0.9	<0.4	<0.66	<0.21	<0.28	<0.2
3,5-DICHLOROSYRINGOL	<0.26	<0.24	<0.23	<0.22	<0.15	<0.21	<0.2	<0.17	<0.29	0.69	<0.22	<0.13	<0.45	<0.17	<0.33	<0.09	<0.11	<0.18
3,4,6-TRICHLOROGUAIACOL	<0.08	<0.09	<0.09	<0.08	<0.06	<0.06	<0.1	<0.07	<0.07	<0.15	<0.08	<0.03	<0.19	<0.08	<0.16	<0.05	<0.05	<0.06
3,4,5-TRICHLOROGUAIACOL	<0.1	<0.11	<0.11	<0.09	<0.07	<0.09	<0.11	<0.08	<0.09	<0.2	<0.11	<0.04	<0.25	<0.1	<0.2	<0.06	<0.06	<0.08
4,5,6-TRICHLOROGUAIACOL	<0.06	<0.07	<0.07	<0.06	<0.04	<0.05	<0.07	<0.05	<0.06	<0.12	<0.07	<0.02	<0.16	<0.06	<0.12	<0.04	<0.04	<0.05
3,4,6-TRICHLOROCATECHOL	<0.22	<0.27	<0.3	<0.27	<0.37	<0.57	<0.53	<0.63	<0.31	<0.26	<0.18	<0.08	<0.38	<0.19	<0.37	<0.09	<0.12	<0.14
3,4,5-TRICHLOROCATECHOL	2.00	1.40	1.30	2.20	<0.39	1.40	0.57	0.74	<0.27	<0.26	<0.17	<0.07	<0.37	<0.2	<0.39	<0.09	<0.12	<0.14
5,6-DICHLOROVANILLIN	<0.1	<0.12	<0.1	<0.11	<0.09	<0.09	<0.09	<0.1	<0.1	<0.26	<0.11	<0.06	<0.2	<0.14	<0.2	<0.06	<0.09	<0.09
PENTACHLOROPHENOL	<0.1	<0.13	<0.12	<0.18	<0.11	<0.11	<0.09	<0.17	<0.07	0.24	<0.07	<0.06	<0.14	<0.25	<0.13	<0.04	<0.05	<0.05
2-CHLOROSYRINGALDEHYDE	1.20	0.87	0.65	1.00	<0.02	<0.05	<0.04	<0.04	<0.04	<0.06	<0.05	<0.02	<0.09	<0.06	<0.12	<0.04	<0.05	<0.05
3,4,5,6-TETRACHLOROGUAIACOL	<0.1	<0.11	<0.11	<0.11	<0.04	<0.05	<0.07	<0.06	<0.07	<0.12	<0.07	<0.04	<0.08	<0.04	<0.1	<0.03	<0.04	<0.05
3,4,5-TRICHLOROSYRINGOL	<0.12	<0.1	<0.1	<0.1	<0.05	<0.09	<0.07	<0.07	<0.08	<0.16	<0.06	<0.02	<0.1	<0.09	<0.17	<0.05	<0.06	<0.07
3,4,5,6-TETRACHLOROCATECHOL	0.48	<0.45	<0.44	<0.34	<0.15	<0.23	<0.2	<0.16	<0.27	<0.15	<0.15	<0.12	<0.26	<0.14	<0.3	<0.11	<0.12	<0.14
2,6-DICHLOROSYRINGALDEHYDE	<0.11	<0.18	<0.34	<0.28	<0.13	<0.26	<0.19	<0.23	<0.27	<0.07	<0.18	<0.06	<0.23	2.20	5.40	0.48	0.76	0.41
% Surrogate Recovery																		
4-CHLOROPHENOL-13C	87	105	75	76	47	28	57	56	55	37	47	50	24	71	61	75	84	67
2,4-DICHLOROPHENOL-13C	73	96	64	69	49	40	57	56	63	47	54	59	39	50	40	51	58	50
4-CHLOROGUAIACOL-13C	68	90	63	64	56	43	56	52	71	44	49	65	39	53	41	57	62	55
2,4,6-TRICHLOROPHENOL-13C	67	91	63	65	51	46	56	55	62	47	55	60	46	52	40	52	54	48
2,4,5-TRICHLOROPHENOL-13C	76	109	74	77	62	53	65	62	60	50	59	67	53	55	41	58	61	55
5-CHLOROVANILLIN-13C	16	19	15	25	24	18	24	27	61	33	38	60	33	38	27	40	47	45
2,3,4,5-TETRACHLOROPHENOL-13C	63	92	67	66	68	57	71	73	46	55	60	79	62	55	41	65	68	62
4,5-DICHLOROCATECHOL-13C	16	16	11	14	23	17	23	23	42	26	34	59	30	27	19	35	36	30
4,5,6-TRICHLOROGUAIACOL-13C	50	58	45	53	64	55	64	67	61	53	59	77	55	49	38	57	61	54
PENTACHLOROPHENOL-13C	55	60	47	54	66	59	67	71	58	52	60	80	53	54	40	61	62	54
3,4,5,6-TETRACHLOROGUAIACOL-13C	56	64	45	54	66	58	68	69	55	54	61	75	54	53	42	61	61	54
3,4,5,6-TETRACHLOROCATECHOL-13C	17	9	7	13	15	16	18	22	16	14	14	13	11	12	8	15	15	9

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected
94FRM1-5 are field splits of 94MBD1
94FRQ1-5 are field splits of 94QPG2
94FRT1-5 are field splits of 94THM1

Table 10 (continued)

Parameter	94STH3	94STH5	94STH6	94THM1	94FRT1	94FRT2	94FRT3	94FRT4	94FRT5	94THM2	94THM3	94THM3d	94THM4	94STK1A	94SRT3	94CHN2	94QNL2	94HAR1	94HAR1d
4-CHLOROPHENOL	<0.09	8.60	<0.13	<0.16	<0.25	<0.15	<0.19	<0.15	<0.14	<0.2	<0.1	<0.14	<0.14	<0.05	0.90	<0.63	<0.21	<0.22	<0.19
2,6-DICHLOROPHENOL	<0.1	<0.15	<0.14	<0.16	<0.28	<0.17	<0.19	<0.17	<0.14	<0.19	<0.1	<0.11	<0.15	<0.06	0.48	<0.33	<0.18	<0.14	<0.12
2,4/2,5-DICHLOROPHENOL	<0.08	0.43	<0.1	0.42	0.46	0.30	0.39	0.97	0.39	0.46	0.46	0.45	0.43	<0.05	1.20	<0.29	<0.16	<0.11	<0.09
3,5-DICHLOROPHENOL	<0.15	<0.17	<0.2	<0.22	<0.39	<0.23	<0.27	<0.24	<0.2	<0.27	<0.13	<0.15	<0.21	<0.09	0.82	<0.59	<0.32	<0.21	<0.18
2,3-DICHLOROPHENOL	<0.14	<0.15	<0.18	<0.2	<0.35	<0.21	<0.24	<0.22	<0.18	<0.25	<0.12	<0.14	<0.19	<0.08	0.82	<0.5	<0.27	<0.19	<0.16
3,4-DICHLOROPHENOL	<0.1	<0.11	<0.11	<0.14	<0.24	<0.15	<0.17	<0.15	<0.12	<0.17	<0.08	<0.09	<0.13	<0.06	0.52	<0.31	<0.17	<0.12	<0.1
6-CHLOROGUAIACOL	<0.07	<0.05	<0.07	<0.1	<0.12	<0.08	<0.09	<0.08	<0.06	<0.14	<0.08	<0.07	<0.07	<0.04	0.20	<0.18	<0.12	<0.09	<0.07
4-CHLOROGUAIACOL	<0.06	<0.05	<0.06	<0.08	<0.1	<0.06	<0.07	<0.06	<0.05	<0.12	<0.06	<0.05	<0.05	<0.04	0.39	<0.16	<0.1	<0.08	<0.06
5-CHLOROGUAIACOL	<0.09	<0.15	<0.09	0.43	<0.14	<0.1	<0.1	<0.09	<0.08	0.55	0.29	0.52	<0.08	<0.06	0.51	0.42	<0.15	<0.11	<0.09
2,4,6-TRICHLOROPHENOL	<0.1	<0.04	<0.07	<0.1	<0.14	<0.12	<0.14	<0.11	<0.06	<0.14	<0.1	<0.09	<0.1	<0.06	0.17	<0.14	<0.11	<0.12	<0.17
2,3,6-TRICHLOROPHENOL	<0.15	<0.05	<0.08	<0.14	<0.2	<0.18	<0.19	<0.16	<0.09	<0.19	<0.14	<0.13	<0.15	<0.08	0.29	<0.18	<0.14	<0.16	<0.12
2,3,5-TRICHLOROPHENOL	<0.15	<0.05	<0.1	<0.13	<0.19	<0.16	<0.18	<0.14	<0.08	<0.18	<0.13	<0.12	<0.14	<0.08	0.43	<0.21	<0.16	<0.18	<0.14
2,4,5-TRICHLOROPHENOL	<0.09	<0.03	<0.06	<0.09	<0.13	<0.1	<0.11	<0.11	<0.06	<0.11	<0.08	<0.08	<0.08	<0.06	0.48	<0.14	<0.1	<0.12	<0.09
2,3,4-TRICHLOROPHENOL	<0.11	<0.05	<0.08	<0.12	<0.18	<0.14	<0.15	<0.14	<0.08	<0.15	<0.11	<0.1	<0.11	<0.07	0.27	<0.17	<0.12	<0.15	<0.12
3,4,5-TRICHLOROPHENOL	<0.11	<0.04	<0.07	<0.11	<0.16	<0.12	<0.13	<0.13	<0.07	<0.14	<0.1	<0.09	<0.1	<0.06	0.20	<0.17	<0.12	<0.14	<0.11
3-CHLOROCATECHOL	<0.24	<0.12	<0.1	<0.54	<0.9	<0.61	<0.66	<0.63	<0.5	<0.6	<0.32	<0.35	<0.5	<0.22	<0.56	<0.63	<0.39	<0.18	<0.14
4-CHLOROCATECHOL	<0.16	<0.07	<0.06	<0.32	<0.53	<0.36	<0.39	<0.37	<0.29	<0.36	<0.19	<0.21	<0.29	<0.15	<0.36	<0.4	<0.24	0.29	<0.19
4,6-DICHLOROGUAIACOL	<0.07	<0.04	<0.08	<0.1	<0.12	<0.08	<0.09	<0.1	<0.07	<0.09	<0.06	<0.07	<0.04	<0.04	<0.07	<0.13	<0.09	<0.12	<0.1
3,4-DICHLOROGUAIACOL	<0.1	<0.05	<0.1	<0.12	<0.16	<0.1	<0.12	<0.13	<0.09	<0.12	<0.08	<0.09	<0.06	<0.06	<0.16	<0.18	<0.12	<0.15	<0.13
4,5-DICHLOROGUAIACOL	<0.07	<0.04	<0.07	<0.09	<0.11	<0.07	<0.09	<0.09	<0.06	<0.09	<0.06	<0.06	<0.04	<0.04	<0.06	<0.12	<0.08	<0.11	<0.09
3-CHLOROSYRINGOL	<0.09	<0.02	<0.04	<0.08	<0.14	<0.09	<0.08	<0.12	<0.06	<0.08	<0.05	<0.06	<0.05	<0.06	0.08	<0.1	<0.07	<0.07	<0.07
3,6-DICHLOROCATECHOL	<0.36	<0.09	<0.22	<0.45	<0.54	<0.44	<0.52	<0.48	<0.38	<0.5	<0.36	<0.34	<0.22	<0.21	<0.47	<1.2	<0.36	<0.37	<0.35
3,5-DICHLOROCATECHOL	<0.54	<0.13	<0.33	<0.66	<0.78	<0.64	<0.74	<0.69	<0.55	<0.72	<0.63	<0.37	<0.31	<0.32	<0.7	<1.9	<0.58	<0.54	<0.52
3,4-DICHLOROCATECHOL	1.20	<0.25	0.43	1.40	0.65	1.10	1.40	1.20	0.69	3.20	0.59	0.61	<0.21	<0.19	<0.42	<1.1	<0.34	1.20	1.40
4,5-DICHLOROCATECHOL	<0.31	<0.08	<0.19	<0.37	<0.42	<0.34	<0.4	<0.37	<0.3	<0.4	<0.23	<0.33	<0.16	<0.18	<0.42	<1.1	<0.34	<0.31	<0.29
2,3,5,6-TETRACHLOROPHENOL	<0.22	<0.06	<0.14	<0.27	<0.29	<0.23	<0.21	<0.26	<0.2	<0.2	<0.14	<0.15	<0.14	<0.13	0.66	<0.32	<0.14	<0.37	<0.23
2,3,4,6-TETRACHLOROPHENOL	<0.12	<0.04	<0.08	<0.15	<0.16	<0.13	<0.12	<0.14	<0.11	<0.11	<0.08	<0.08	<0.08	<0.07	0.31	<0.18	<0.08	<0.2	<0.13
2,3,4,5-TETRACHLOROPHENOL	<0.13	<0.1	<0.1	<0.19	<0.26	<0.18	<0.16	<0.18	<0.13	<0.14	<0.1	<0.1	<0.11	<0.07	0.18	<0.22	<0.13	<0.16	<0.15
5-CHLOROVANILLIN	<0.42	<0.14	<0.42	<0.71	<1	<0.8	<0.99	<0.49	<0.71	<0.7	<0.65	<0.54	<0.53	<0.28	<0.4	<0.88	<0.77	<0.87	<1.3
6-CHLOROVANILLIN	<0.48	<0.16	<0.5	<0.77	<1.1	<0.84	<1	<0.52	<0.75	<0.76	<0.71	<0.59	<0.56	<0.32	<0.45	<1	<0.87	<1	<1.5
3,5-DICHLOROSYRINGOL	<0.25	<0.11	<0.21	<0.41	<0.44	<0.39	<0.28	<0.3	<0.31	<0.4	<0.28	<0.2	<0.18	<0.15	0.46	<0.44	<0.27	<0.5	<0.32
3,4,6-TRICHLOROGUAIACOL	<0.08	<0.03	<0.09	<0.18	<0.22	<0.18	<0.18	<0.17	<0.14	<0.21	<0.11	<0.13	<0.15	<0.07	<0.12	<0.17	<0.09	<0.09	<0.08
3,4,5-TRICHLOROGUAIACOL	<0.1	<0.04	<0.11	<0.2	<0.24	<0.19	<0.2	<0.19	<0.16	<0.22	<0.12	<0.14	<0.16	<0.09	<0.13	<0.22	<0.12	<0.11	<0.1
4,5,6-TRICHLOROGUAIACOL	<0.06	<0.03	<0.07	<0.13	<0.16	<0.12	<0.13	<0.12	<0.1	<0.15	<0.08	<0.09	<0.11	<0.06	<0.08	<0.13	<0.08	<0.07	<0.06
3,4,6-TRICHLOROCATECHOL	<0.33	<0.11	<0.3	<0.32	<0.37	<0.3	<0.35	<0.33	<0.26	<0.36	<0.14	<0.14	<0.15	<0.2	<0.22	<0.67	<0.32	<0.58	<0.56
3,4,5-TRICHLOROCATECHOL	<0.35	<0.09	<0.32	<0.31	<0.35	0.86	0.98	0.88	0.75	2.80	<0.13	<0.26	<0.14	<0.21	<0.22	<0.66	<0.31	<0.62	<0.59
5,6-DICHLOROVANILLIN	<0.24	<0.06	<0.1	<0.08	<0.14	<0.14	<0.13	<0.07	<0.09	<0.16	<0.09	<0.06	<0.08	<0.1	<0.31	<0.87	<0.12	<0.26	<0.25
PENTACHLOROPHENOL	<0.11	<0.06	<0.14	<0.11	<0.12	<0.1	<0.11	<0.19	<0.12	<0.12	<0.1	<0.07	<0.08	<0.1	0.29	<0.16	<0.11	<0.21	<0.24
2-CHLOROSYRINGALDEHYDE	<0.1	<0.03	<0.05	<0.18	<0.21	<0.15	<0.15	<0.14	<0.11	<0.31	<0.09	<0.08	<0.1	<0.06	<0.08	<0.06	<0.08	<0.09	<0.09
3,4,5,6-TETRACHLOROGUAIACOL	<0.11	<0.04	<0.06	<0.1	<0.14	<0.09	<0.1	<0.12	<0.11	<0.08	<0.06	<0.08	<0.06	<0.04	0.21	<0.11	<0.1	<0.13	<0.12
3,4,5-TRICHLOROSYRINGOL	<0.14	<0.05	<0.09	<0.15	<0.08	<0.09	<0.12	<0.1	<0.12	<0.13	<0.09	<0.07	<0.06	<0.08	<0.1	<0.15	<0.12	<0.07	<0.15
3,4,5,6-TETRACHLOROCATECHOL	<0.35	<0.06	<0.18	0.60	<0.44	0.69	0.50	0.68	0.53	<1.3	<0.44	<0.33	<0.23	<0.14	<0.11	<0.23	<0.09	<0.54	<0.9
2,6-DICHLOROSYRINGALDEHYDE	<3.2	<0.13	<0.11	<0.22	<0.17	<0.12	<0.12	<0.11	<0.09	<0.22	<0.16	<0.06	<0.17	2.00	<0.21	<0.23	<0.09	<1.1	<0.38
% Surrogate Recovery																			
4-CHLOROPHENOL-13C	101	53	29	49	140	118	120	117	123	120	116	120	77	108	18	42	20	55	51
2,4-DICHLOROPHENOL-13C	63	38	51	54	109	84	89	93	85	92	92	98	79	79	33	58	31	56	55
4-CHLOROGUAIACOL-13C	66	39	45	54	101	86	89	96	89	96	91	98	81	82	36	52	44	57	55
2,4,6-TRICHLOROPHENOL-13C	62	35	56	53	97	84	83	91	80	87	85	95	79	78	40	59	43	57	55
2,4,5-TRICHLOROPHENOL-13C	68	41	66	61	106	105	97	107	94	104	97	110	92	95	49	64	50	64	63
5-CHLOROVANILLIN-13C	52	33	54	23	52	34	40	44	44	48	46	41	36	38	38	45	36	27	20
2,3,4,5-TETRACHLOROPHENOL-13C	75	44	76	66	122	109	97	109	99	106	113	127	104	110	60	73	65	75	72
4,5-DICHLOROCATECHOL-13C	30	18	65	31	33	38	30	30	27	30	30	42	36	48	26	23	22	30	26
4,5,6-TRICHLOROGUAIACOL-13C	64	43	76	52	99	90	76	83	80	86	98	107	88	90	57	65	61	64	60
PENTACHLOROPHENOL-13C	67	40	59	58	101	86	78	91	84	89	96	103	88	88	51	65	63	65	58
3,4,5,6-TETRACHLOROGUAIACOL-13C	66	41	65	56	95	83	75	86	80	85	94	97	89	86	54	64	61	63	56
3,4,5,6-TETRACHLOROCATECHOL-13C	13	6	34	19	15	12	10	13	12	13	5	10	10	15	16	19	25	14	5

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected
94FRM1-5 are field splits of 94MBD1
94FRQ1-5 are field splits of 94QPG2
94FRT1-5 are field splits of 94THM1

Table 11. Chlorophenolic Concentrations in Bed Sediments from Individual Sampling Sites in 1995

Parameter	95MBD1	95MBD2	95MBD3	95MBD4	95MBD4d	95QPG1	95QPG2	95QPG2r	95QPG3	95QPG4	95LQN1	95LQN2	95LQN3	95LQN4	95LCH1	95LCH4	95LCH5	95LCH6	95NEC1	95NEC1r	95NEC2	95NEC2r	95NEC4
4-CHLOROPHENOL	<0.13	<0.1	<0.1	<0.13	<0.18	<0.38	<0.16	<0.09	<0.09	<0.33	<0.18	<0.12	<0.12	<0.13	<0.09	<0.1	<0.15	<0.07	<0.2	0.28	<0.16	0.23	<0.13
2,6-DICHLOROPHENOL	<0.08	<0.18	<0.14	<0.23	<0.22	<0.3	<0.11	<0.14	<0.14	<0.56	<0.2	<0.16	<0.13	<0.25	<0.11	<0.08	<0.09	<0.06	<0.14	<0.32	<0.11	<0.21	<0.09
2,4/2,5-DICHLOROPHENOL	0.23	<0.15	<0.12	<0.2	<0.18	0.41	<0.09	<0.12	<0.12	<0.48	<0.25	<0.14	<0.12	<0.16	0.16	0.10	0.11	<0.1	<0.16	0.50	<0.1	<0.18	<0.13
3,5-DICHLOROPHENOL	<0.1	<0.2	<0.17	<0.27	<0.25	<0.33	<0.01	<0.16	<0.17	<0.66	<0.23	<0.19	<0.15	<0.21	<0.15	<0.11	<0.13	<0.09	<0.17	<0.38	<0.13	<0.24	<0.11
2,3-DICHLOROPHENOL	<0.1	<0.19	<0.17	<0.27	<0.25	<0.33	<0.01	<0.16	<0.16	<0.65	<0.23	<0.19	<0.15	<0.21	<0.14	<0.1	<0.13	<0.08	<0.17	<0.38	<0.13	<0.24	<0.1
3,4-DICHLOROPHENOL	<0.08	<0.18	<0.14	<0.23	<0.21	<0.27	<0.01	<0.13	<0.14	<0.56	<0.2	<0.16	<0.13	<0.18	<0.1	<0.07	<0.09	<0.06	<0.15	<0.32	<0.11	<0.2	<0.09
6-CHLOROGUAIACOL	<0.04	<0.05	<0.05	<0.05	<0.06	<0.11	<0.05	<0.05	<0.07	<0.2	<0.09	<0.07	<0.06	<0.1	<0.07	<0.09	<0.09	<0.07	<0.07	<0.12	<0.05	<0.12	<0.05
4-CHLOROGUAIACOL	<0.05	<0.06	<0.06	<0.06	<0.08	0.28	0.07	0.11	<0.08	<0.24	<0.11	<0.08	<0.08	<0.12	<0.06	0.13	<0.07	0.13	<0.08	<0.14	<0.06	<0.14	<0.06
5-CHLOROGUAIACOL	<0.06	<0.08	<0.06	<0.05	0.15	0.50	<0.06	<0.06	<0.09	<0.25	<0.11	<0.1	<0.08	<0.12	<0.09	0.32	0.21	0.18	<0.09	<0.15	<0.06	<0.15	<0.06
2,4,6-TRICHLOROPHENOL	0.14	<0.11	<0.11	<0.17	<0.16	<0.29	<0.08	<0.1	<0.11	<0.41	<0.14	<0.12	<0.13	<0.13	<0.09	<0.09	<0.07	0.16	<0.1	<0.25	<0.07	<0.16	<0.07
2,3,6-TRICHLOROPHENOL	<0.07	<0.14	<0.13	<0.2	<0.19	<0.34	<0.1	<0.13	<0.13	<0.5	<0.16	<0.15	<0.16	<0.16	<0.13	<0.12	<0.1	<0.09	<0.13	<0.3	<0.09	<0.2	<0.09
2,3,5-TRICHLOROPHENOL	<0.08	<0.15	<0.14	<0.23	<0.21	<0.35	<0.11	<0.14	<0.14	<0.55	<0.18	<0.16	<0.17	<0.18	<0.13	<0.13	<0.1	<0.1	<0.14	<0.33	<0.1	<0.22	<0.1
2,4,5-TRICHLOROPHENOL	0.10	<0.12	<0.11	<0.17	<0.16	<0.24	<0.08	<0.11	<0.11	<0.4	<0.12	<0.11	<0.12	<0.13	<0.09	<0.09	<0.07	<0.07	<0.11	<0.25	<0.08	<0.17	<0.07
2,3,4-TRICHLOROPHENOL	<0.11	<0.12	<0.12	<0.19	<0.18	<0.25	<0.09	<0.12	<0.12	<0.44	<0.13	<0.12	<0.12	<0.14	<0.12	<0.11	<0.1	<0.09	0.16	<0.27	<0.1	<0.19	<0.08
3,4,5-TRICHLOROPHENOL	0.21	<0.13	<0.13	<0.19	<0.18	<0.26	<0.09	<0.12	<0.12	<0.45	<0.13	<0.12	<0.13	<0.14	<0.12	<0.11	<0.1	<0.09	<0.13	<0.28	<0.09	<0.19	<0.08
3-CHLOROCATECHOL	<0.15	<0.18	<0.15	<0.22	<0.21	<0.38	<0.19	<0.11	<0.14	<0.52	<0.21	<0.2	<0.14	<0.23	<0.19	<0.23	<0.23	<0.22	<0.27	<0.32	<0.2	<0.22	<0.15
4-CHLOROCATECHOL	<0.15	<0.19	<0.16	<0.23	<0.22	0.94	0.24	0.31	<0.15	<0.54	<0.22	<0.2	<0.15	<0.23	<0.12	0.24	<0.16	<0.15	<0.28	<0.34	<0.2	<0.24	<0.17
4,6-DICHLOROGUAIACOL	<0.06	<0.16	<0.13	<0.19	<0.2	<0.22	<0.08	<0.12	<0.13	<0.42	<0.2	<0.17	<0.12	<0.18	<0.13	<0.08	<0.09	<0.08	<0.11	<0.26	<0.09	<0.29	<0.07
3,4-DICHLOROGUAIACOL	<0.07	<0.21	<0.19	<0.26	<0.28	<0.3	<0.1	<0.18	<0.18	<0.6	<0.28	<0.24	<0.17	<0.26	<0.17	<0.11	<0.12	<0.11	<0.14	<0.37	<0.11	<0.42	<0.08
4,5-DICHLOROGUAIACOL	0.13	<0.19	<0.16	<0.22	<0.24	<0.25	<0.09	<0.15	<0.16	<0.51	<0.24	<0.2	<0.2	<0.22	<0.14	0.23	<0.09	0.23	<0.13	<0.31	<0.1	<0.35	<0.08
3-CHLOROSYRINGOL	<0.06	<0.08	<0.06	<0.09	<0.09	<0.14	<0.07	<0.06	<0.05	<0.22	<0.1	<0.09	<0.07	<0.1	<0.09	<0.07	<0.08	<0.08	<0.1	<0.14	<0.07	<0.09	<0.06
3,6-DICHLOROCATECHOL	<0.34	<0.28	<0.24	<0.39	<0.38	<0.41	<0.35	<0.25	<0.34	<0.83	<0.56	<0.48	<0.31	<0.6	<0.52	<0.56	<0.5	<0.84	<0.48	<0.68	<0.24	<0.33	<0.21
3,5-DICHLOROCATECHOL	<0.33	<0.28	<0.24	<0.38	<0.37	<0.38	<0.34	<0.24	<0.33	<0.82	<0.54	<0.46	<0.3	<0.58	<0.8	<0.85	<0.76	<1.3	<0.31	<0.67	<0.23	<0.33	<0.2
3,4-DICHLOROCATECHOL	0.61	<0.28	<0.24	<0.39	<0.38	0.44	<0.35	<0.25	<0.34	<0.83	<0.55	<0.47	<1.2	<1.2	<0.51	<0.53	<0.47	<0.79	1.20	<0.68	0.29	<0.33	0.49
4,5-DICHLOROCATECHOL	<0.35	<0.28	<0.24	<0.39	<0.38	0.53	<0.36	<0.25	<0.34	<0.83	<0.56	<0.48	<0.31	<0.6	<0.49	<0.53	<0.45	<0.76	<0.48	<0.68	<0.25	<0.33	<0.22
2,3,5,6-TETRACHLOROPHENOL	<0.11	<0.3	<0.29	<0.4	<0.42	<0.62	<0.15	<0.26	<0.28	<0.9	<0.32	<0.28	<0.2	<0.3	<0.42	<0.22	<0.28	<0.22	<0.22	<0.56	<0.18	<0.63	<0.14
2,3,4,6-TETRACHLOROPHENOL	0.20	<0.22	<0.21	<0.3	<0.31	<0.47	<0.11	<0.2	<0.21	<0.67	<0.24	<0.21	<0.15	<0.23	<0.23	<0.12	<0.15	<0.12	<0.16	<0.42	<0.4	<0.47	<0.1
2,3,4,5-TETRACHLOROPHENOL	<0.08	<0.21	<0.2	<0.28	<0.3	<0.41	<0.11	<0.19	<0.2	<0.64	<0.23	<0.2	<0.14	<0.22	<0.3	<0.16	<0.21	<0.17	<0.17	<0.4	<0.13	<0.44	<0.1
5-CHLOROVANILLIN	<0.43	<0.54	<0.5	<0.72	<0.69	<0.95	<0.52	<0.46	<0.6	<1.8	<0.66	<0.48	<0.54	<0.69	<0.64	<0.49	<0.67	<0.5	<0.61	<1	<0.61	<1.1	<0.54
6-CHLOROVANILLIN	<0.48	<0.57	<0.51	<0.74	<0.71	1.80	<0.58	0.73	<0.625	<1.8	<0.68	<0.48	<0.54	<0.69	<0.7	2.10	<0.78	1.70	<0.68	<1	<0.68	<1.2	<0.8
3,5-DICHLOROSYRINGOL	<0.1	<0.26	<0.21	<0.29	<0.31	<0.45	<0.13	<0.19	<0.2	<0.66	<0.27	<0.24	<0.17	<0.25	<0.37	<0.37	<0.22	<0.39	<0.2	<0.41	<0.16	<0.46	<0.12
3,4,6-TRICHLOROGUAIACOL	0.12	<0.2	<0.22	<0.3	<0.3	<0.4	<0.08	<0.2	<0.23	<0.72	<0.22	<0.19	<0.15	<0.21	<0.26	<0.16	<0.18	<0.17	<0.17	<0.41	<0.12	<0.37	<0.1
3,4,5-TRICHLOROGUAIACOL	<0.11	<0.2	<0.22	<0.31	<0.3	<0.37	<0.09	<0.21	<0.24	<0.74	<0.22	<0.2	<0.18	<0.21	<0.3	<0.18	<0.2	<0.19	<0.18	<0.42	<0.13	<0.38	<0.1
4,5,6-TRICHLOROGUAIACOL	0.11	<0.13	<0.14	<0.2	<0.2	<0.26	<0.06	<0.13	<0.16	<0.48	<0.15	<0.13	<0.1	<0.14	<0.19	<0.12	<0.14	<0.12	<0.12	<0.27	<0.09	<0.24	<0.07
3,4,6-TRICHLOROCATECHOL	<0.4	<0.33	<0.34	<0.55	<0.53	<0.58	<0.48	<0.36	<0.46	<1.2	<0.69	<0.73	<0.39	<0.64	<0.48	<0.58	<0.62	<0.7	<0.54	<0.95	<0.29	<0.46	<0.25
3,4,5-TRICHLOROCATECHOL	<0.43	<0.34	<0.36	<0.57	<0.55	<0.52	<0.51	<0.38	<0.48	<1.2	<0.7	<0.74	<0.39	<0.65	<0.5	<0.61	<0.65	<0.73	<0.61	<0.99	<0.31	<0.48	<0.26
5,6-DICHLOROVANILLIN	<0.14	<0.22	<0.22	<0.35	<0.34	<0.26	<0.16	<0.21	<0.3	<0.81	<0.2	<0.17	<0.14	<0.2	<0.19	<0.23	<0.22	<0.23	<0.26	<0.52	<0.18	<0.57	<0.14
PENTACHLOROPHENOL	1.00	<0.31	<0.2	0.33	0.29	<0.65	<0.08	<0.19	<0.27	<0.76	<0.26	<0.22	<0.18	<0.25	<0.2	<0.21	<0.17	0.30	<0.22	<0.47	<0.18	<0.52	0.20
2-CHLOROSYRINGALDEHYDE	<0.11	<0.17	<0.13	<0.21	<0.2	<0.21	<0.13	<0.13	<0.18	<0.48	<0.31	<0.26	<0.22	<0.3	<0.17	<0.19	<0.12	<0.09	<0.21	<0.31	<0.14	<0.34	<0.11
3,4,5,6-TETRACHLOROGUAIACOL	0.62	<0.21	<0.19	<0.29	<0.31	<0.48	<0.1	<0.18	<0.22	<0.7	<0.26	<0.2	<0.16	<0.22	<0.17	<0.16	<0.23	<0.16	<0.14	<0.41	<0.12	<0.42	<0.11
3,4,5-TRICHLOROSYRINGOL	<0.16	<0.32	<0.34	<0.52	<0.58	<0.53	<0.12	<0.32	<0.4	<1.3	<0.27	<0.24	<0.19	<0.26	<0.24	<0.19	<0.21	<0.17	<0.17	<0.74	<0.14	<0.76	<0.11
3,4,5,6-TETRACHLOROCATECHOL	0.80	<0.96	<0.49	<1.9	<1.4	<1.1	<0.41	<0.56	<0.41	<1.6	0.48	0.68	<0.36	0.57	<0.22	<0.55	<0.36	<0.47	<1.4	<0.98	<0.53	<0.73	<0.37
2,6-DICHLOROSYRINGALDEHYDE	<0.1	<0.13	<0.14	<0.23	<0.22	<0.26	<0.14	<0.14	<0.19	<0.52	<0.2	<0.17	<0.14	<0.19	<0.24	<0.28	<0.16	<0.19	<0.23	<0.34	<0.14	<0.37	<0.11
% Surrogate Recovery																							
4-CHLOROPHENOL-13C	64	71	77	65	75	30	52	83	68	68	43	47	42	49	45	62	40	78	58	81	61	65	86
2,4-DICHLOROPHENOL-13C	69	77	80	67	76	39	59	87	75	72	59	52	55	53	38	53	43	63	59	83	67	72	91
4-CHLOROGUAIACOL-13C	65	82	80	69	76	46	58	79	53	73	74	55	68	57	41	52	52	61	67	86	70	50	91
2,4,6-TRICHLOROPHENOL-13C	74	83	83	71	80	48	64	87	78	77	67	54	63	56	44	57	62	64	64	83	72	71	92
2,4,5-TRICHLOROPHENOL-13C	78	82	80	73	80	55	68	86	77	81	80	60	72	60	45	65	63	67	64	86	72	69	95
5-CHLOROVANILLIN-13C	58	57	53	50	54	43	33	47	41	53	50	44	47	44	38	56	53	52	59	61	51	30	62
2,3,4,5-TETRACHLOROPHENOL-13C	85	57	50	53	57	52	55	53	54	66	53	45	54	53	51	90	87	79	48	58	57	32	67
4,5-DICHLOROCATECHOL-13C	25	55	43	40	47	46	23	40	33	53	26	22	29	26	21	25	28	20	25	35	48	45	48
4,5,6-TRICHLOROGUAIACOL-13C	80	62	54	58	66	51	56	58	52	67	62	51	57	82	39	67	58	65	50	64	68	45	75
PENTACHLOROPHENOL-13C	73	63	62	56	66	58	67	61	48	70	64	56	59	64	48	51	79	75	54	59	72	33	82
3,4,5,6-TETRACHLOROGUAIACOL-13C	67	62	59	58	60	58	61	62	52	66	63	52	58	61	37	64	51	62	57	82	68	37	79
3,4,5,6-TETRACHLOROCATECHOL-13C	29	15	18	7	11	11	18	21	22	24	25	23	28	25	11	12	17	14	9	20	15	17	16

Values expressed as ng/g dry weight.
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Lab reruns denoted by an "r" following the sample ID
Values are recovery corrected
95FRN1 is a field split of 95NAR1

Table 11 (continued)

Parameter	95NEC4r	95NEC6	95NEC6d	95NEC6r	95NTH1	95NTH2	95NTH2r	95NTH3	95NTH3d	95NTH3r	95NTH5	95NTH5r	95NTH5rd	95STH3	95STH5	95STH5r	95STH6	95THM1	95THM1d	95THM2	95THM2r	95THM3
4-CHLOROPHENOL	0.44	0.17	<0.12	<0.15	<0.05	<0.14	<0.59	<0.16	<0.09	<0.25	<0.15	<0.38	<0.41	<0.11	0.17	<0.36	<0.31	<0.06	<0.08	<0.16	<0.26	<0.14
2,6-DICHLOROPHENOL	<0.22	<0.09	<0.08	<0.2	<0.07	<0.08	<0.54	<0.08	<0.08	<0.2	<0.09	<0.39	<0.35	<0.12	<0.09	<0.34	<0.14	<0.06	<0.09	<0.12	<0.3	<0.1
2,4/2,5-DICHLOROPHENOL	0.37	0.20	<0.09	<0.17	0.18	<0.26	<0.48	<0.1	<0.15	<0.41	<0.11	<0.55	<0.53	0.19	0.23	<0.55	<0.18	0.46	0.19	<0.1	<0.26	<0.13
3,5-DICHLOROPHENOL	<0.25	<0.11	<0.1	<0.23	<0.09	<0.09	<0.67	<0.09	<0.09	<0.25	<0.1	<0.48	<0.43	<0.17	<0.12	<0.42	<0.16	<0.09	<0.12	<0.13	<0.35	<0.11
2,3-DICHLOROPHENOL	<0.25	<0.1	<0.1	<0.23	<0.09	<0.09	<0.66	<0.09	<0.09	<0.24	<0.1	<0.48	<0.43	<0.16	<0.11	<0.42	<0.16	<0.17	<0.12	<0.13	<0.35	<0.11
3,4-DICHLOROPHENOL	<0.21	<0.09	<0.08	<0.19	<0.06	<0.07	<0.67	<0.07	<0.07	<0.25	<0.08	<0.46	<0.41	<0.11	<0.1	<0.39	<0.13	<0.13	<0.08	<0.1	<0.29	<0.09
6-CHLOROGUAIACOL	<0.08	<0.04	<0.05	<0.06	<0.04	<0.03	<0.23	<0.03	<0.04	<0.1	<0.04	<0.21	<0.14	<0.09	<0.05	<0.17	<0.04	<0.34	<0.06	<0.04	<0.13	<0.04
4-CHLOROGUAIACOL	<0.1	<0.05	<0.06	<0.07	<0.04	<0.04	<0.28	<0.04	<0.04	<0.12	<0.05	<0.26	<0.17	<0.07	<0.06	<0.2	<0.05	<0.35	<0.05	<0.05	<0.15	<0.04
5-CHLOROGUAIACOL	0.18	<0.05	<0.07	<0.13	<0.05	<0.18	<0.3	<0.1	<0.04	<0.13	<0.05	<0.27	<0.18	<0.11	<0.06	<0.22	<0.05	<0.52	<0.07	<0.05	<0.16	<0.15
2,4,6-TRICHLOROPHENOL	<0.18	<0.06	<0.06	<0.15	<0.06	<0.07	<0.49	<0.07	<0.07	<0.19	<0.08	<0.35	<0.36	<0.11	<0.07	<0.36	<0.09	<0.06	<0.08	<0.1	<0.21	<0.08
2,3,6-TRICHLOROPHENOL	<0.19	<0.07	<0.08	<0.18	<0.09	<0.08	<0.66	<0.08	<0.08	<0.25	<0.09	<0.48	<0.48	<0.17	<0.09	<0.48	<0.1	<0.09	<0.11	<0.12	<0.25	<0.1
2,3,5-TRICHLOROPHENOL	<0.21	<0.08	<0.09	<0.2	<0.09	<0.08	<0.76	<0.08	<0.09	<0.29	<0.08	<0.53	<0.54	<0.17	<0.1	<0.54	<0.1	<0.19	<0.11	<0.12	<0.27	<0.1
2,4,5-TRICHLOROPHENOL	<0.15	<0.05	<0.06	<0.14	<0.07	<0.07	<0.53	<0.07	<0.07	<0.2	<0.07	<0.41	<0.34	<0.12	<0.07	<0.35	<0.08	<0.23	<0.08	<0.1	<0.18	<0.08
2,3,4-TRICHLOROPHENOL	<0.17	<0.09	<0.07	<0.15	<0.09	<0.07	<0.81	<0.12	<0.08	<0.23	<0.08	<0.48	<0.39	<0.15	<0.1	<0.41	<0.08	<0.23	<0.1	<0.1	<0.19	<0.08
3,4,5-TRICHLOROPHENOL	<0.17	<0.06	<0.08	<0.15	<0.08	<0.07	<0.66	<0.07	<0.09	<0.25	<0.08	<0.51	<0.42	<0.15	<0.08	<0.44	<0.08	<0.12	<0.1	<0.1	<0.2	<0.08
3-CHLOROCATECHOL	<0.2	<0.15	<0.16	<0.19	<0.18	<0.1	<0.53	<0.1	<0.11	<0.22	<0.11	<0.37	<0.27	<0.28	<0.17	<0.3	<0.13	<0.29	<0.18	<0.14	<0.32	<0.12
4-CHLOROCATECHOL	<0.21	<0.16	<0.17	<0.19	<0.12	<0.1	<0.59	<0.1	<0.1	<0.24	<0.1	<0.41	<0.28	<0.18	<0.17	<0.33	<0.13	<0.2	<0.12	<0.14	<0.32	<0.12
4,6-DICHLOROGUAIACOL	<0.18	<0.06	<0.07	<0.13	<0.08	<0.08	<0.42	<0.06	<0.08	<0.23	<0.08	<0.38	<0.26	<0.09	<0.08	<0.21	<0.08	<0.11	<0.06	<0.12	<0.21	<0.09
3,4-DICHLOROGUAIACOL	<0.23	<0.07	<0.08	<0.17	<0.11	<0.12	<0.6	<0.1	<0.12	<0.32	<0.12	<0.5	<0.34	<0.12	<0.08	<0.28	<0.12	<0.13	<0.08	<0.18	<0.3	<0.13
4,5-DICHLOROGUAIACOL	<0.19	<0.07	<0.07	<0.15	<0.09	<0.09	<0.58	<0.07	<0.1	<0.31	<0.09	<0.49	<0.33	<0.09	<0.07	<0.26	<0.09	<0.13	<0.07	<0.14	<0.26	<0.1
3-CHLOROSYRINGOL	<0.08	<0.06	<0.06	<0.07	<0.06	<0.04	<0.42	<0.04	<0.04	<0.19	<0.04	<0.32	<0.25	<0.09	<0.06	<0.27	<0.05	<0.11	<0.06	<0.06	<0.15	<0.05
3,6-DICHLOROCATECHOL	<0.34	<0.2	<0.24	<0.26	<0.44	<0.15	<0.86	<0.09	<0.14	<0.47	<0.14	<0.64	<0.58	<0.65	<0.19	<0.62	<0.2	<0.49	<0.51	<0.24	<0.58	<0.21
3,5-DICHLOROCATECHOL	<0.33	<0.2	<0.23	<0.25	<0.67	<0.14	<0.87	<0.08	<0.12	<0.48	<0.13	<0.63	<0.58	<1	<0.19	<0.61	<0.18	<0.75	<0.78	<0.22	<0.57	<0.19
3,4-DICHLOROCATECHOL	<0.34	<0.21	0.33	<0.85	<0.43	<0.25	<0.92	<0.22	<0.16	<0.5	<0.88	<0.65	<0.6	<0.85	0.74	<0.63	6.30	1.40	1.40	<0.29	<0.9	<0.26
4,5-DICHLOROCATECHOL	<0.34	<0.21	<0.25	<0.26	<0.41	<0.14	<0.96	<0.08	<0.12	<0.52	<0.24	<0.68	<0.63	<0.62	<0.2	<0.66	<0.28	<0.46	<0.48	<0.48	<0.58	<0.23
2,3,5,6-TETRACHLOROPHENOL	<0.34	<0.12	<0.13	<0.28	<0.25	<0.2	<1.5	<0.13	<0.15	<0.56	<0.17	<0.96	<0.69	<0.4	<0.13	<0.6	<0.17	<0.61	<0.22	<0.25	<0.35	<0.2
2,3,4,6-TETRACHLOROPHENOL	<0.25	<0.09	<0.1	<0.2	<0.14	<0.15	<1.1	<0.1	<0.11	<0.41	<0.12	<0.72	<0.52	<0.22	<0.09	<0.46	<0.13	<0.26	<0.12	<0.18	<0.26	<0.15
2,3,4,5-TETRACHLOROPHENOL	<0.24	<0.09	<0.1	<0.19	<0.15	<0.13	<1.1	<0.08	<0.1	<0.43	<0.11	<0.71	<0.51	<0.24	<0.09	<0.45	<0.11	<0.27	<0.14	<0.18	<0.25	<0.13
5-CHLOROVANILLIN	<0.64	<0.47	<0.54	<0.42	<0.37	<0.27	<2.1	<0.2	<0.22	<1.8	<0.29	<2	<1.6	<0.82	<0.51	<1.2	<0.38	<0.5	<0.51	<0.62	<0.66	<0.26
6-CHLOROVANILLIN	<0.68	<0.52	<0.61	<0.44	<0.41	<0.27	<2.2	<0.2	<0.22	<1.7	<0.29	<2	<1.6	<0.9	<0.57	<1.3	<0.38	<0.56	<0.56	<0.62	<0.86	<0.28
3,5-DICHLOROSYRINGOL	<0.25	<0.11	<0.12	<0.2	<0.37	<0.14	<1	<0.09	<0.12	<0.51	<0.12	<0.8	<0.73	<0.58	<0.11	<0.44	<0.13	<0.47	<0.35	<0.2	<0.3	<0.17
3,4,6-TRICHLOROGUAIACOL	<0.28	<0.1	<0.09	<0.16	<0.14	<0.13	<0.51	<0.1	<0.13	<0.31	<0.13	<0.54	<0.4	<0.23	<0.1	<0.34	<0.13	<0.19	<0.17	<0.19	<0.23	<0.15
3,4,5-TRICHLOROGUAIACOL	<0.28	<0.1	<0.1	<0.16	<0.16	<0.11	<0.57	<0.09	<0.12	<0.35	<0.12	<0.59	<0.44	<0.26	<0.1	<0.37	<0.12	<0.3	<0.19	<0.17	<0.24	<0.14
4,5,6-TRICHLOROGUAIACOL	<0.18	<0.07	<0.07	<0.1	<0.1	<0.08	<0.4	<0.06	<0.08	<0.25	<0.09	<0.42	<0.31	<0.18	<0.07	<0.26	<0.09	<0.11	<0.13	<0.12	<0.16	<0.1
3,4,6-TRICHLOROCATECHOL	<0.47	<0.24	<0.28	<0.37	<0.31	<0.16	<1.1	<0.18	<0.19	<0.58	<0.2	<1.2	<1	<0.84	<0.22	<0.88	<0.28	<0.5	<0.52	<0.44	<0.5	<0.27
3,4,5-TRICHLOROCATECHOL	<0.49	<0.26	<0.3	<0.38	<0.32	<0.13	<1.2	<0.08	<0.16	<0.61	<0.14	<1.2	<1	<0.88	<0.25	<0.9	<0.23	<0.52	<0.54	<1.2	0.95	<0.3
5,6-DICHLOROVANILLIN	<0.31	<0.14	<0.13	<0.17	<0.15	<0.09	<0.68	<0.08	<0.09	<0.54	<0.12	<0.52	<0.76	<0.34	<0.14	<0.52	<0.14	<0.2	<0.16	<0.17	<0.21	<0.12
PENTACHLOROPHENOL	<0.28	<0.12	<0.12	<0.22	<0.14	<0.13	<0.99	<0.09	<0.14	<0.4	<0.11	<0.66	<0.7	<0.29	<0.11	<0.51	<0.16	<0.58	<0.14	<0.17	<0.27	<0.1
2-CHLOROSYRINGALDEHYDE	<0.18	<0.11	<0.1	<0.18	<0.12	<0.05	<0.8	<0.05	<0.06	<0.3	<0.07	<0.54	<0.45	<0.15	<0.11	<0.44	<0.06	<0.1	<0.12	<0.08	<0.33	<0.06
3,4,5,6-TETRACHLOROGUAIACOL	<0.26	<0.09	<0.08	<0.19	<1.5	<0.1	<1	<0.08	<0.08	<0.52	<0.12	<0.66	<0.69	<0.23	<0.08	<0.49	<0.13	<0.29	<0.15	<0.16	<0.23	<0.13
3,4,5-TRICHLOROSYRINGOL	<0.47	<0.1	<0.09	<0.24	<1.7	<0.11	<0.83	<0.1	<0.11	<0.54	<0.1	<0.73	<0.6	<0.28	<0.1	<0.51	<0.14	<0.18	<0.2	<0.19	<0.28	<0.14
3,4,5,6-TETRACHLOROCATECHOL	<0.47	<0.7	<0.55	<1.1	<0.25	<0.41	<5.4	<0.24	<0.35	<1.4	<0.34	<3.6	<3.2	<0.53	0.34	<2.6	<0.57	<0.55	<1.1	<3	2.50	<0.67
2,6-DICHLOROSYRINGALDEHYDE	<0.2	<0.11	<0.1	<0.18	<0.12	<0.08	<0.82	<0.05	<0.04	<0.47	<0.06	<0.59	<0.53	<0.26	<0.12	<0.48	<0.17	<0.12	<0.15	<0.08	<0.21	<0.07
% Surrogate Recovery																						
4-CHLOROPHENOL-13C	70	61	79	52	82	73	64	75	68	84	76	71	56	65	67	64	27	82	64	78	28	72
2,4-DICHLOROPHENOL-13C	73	67	80	54	63	72	54	78	70	80	78	84	60	60	69	63	52	73	60	81	36	73
4-CHLOROGUAIACOL-13C	74	69	73	68	61	82	82	84	73	84	82	74	73	57	69	66	89	67	61	83	48	79
2,4,6-TRICHLOROPHENOL-13C	77	71	79	57	63	75	49	75	68	74	80	68	64	67	74	61	63	75	65	81	41	76
2,4,5-TRICHLOROPHENOL-13C	82	75	80	63	64	71	52	75	67	79	80	65	75	71	78	69	69	79	70	51	49	75
5-CHLOROVANILLIN-13C	56	53	52	55	53	55	60	58	42	42	48	52	64	50	55	75	38	53	60	39	40	48
2,3,4,5-TETRACHLOROPHENOL-13C	63	66	61	59	76	66	44	75	53	40	79	42	62	79	61	69	70	92	92	60	48	76
4,5-DICHLOROCATECHOL-13C	47	43	37	49	28	55	54	74	40	40	59	42	49	24	44	43	45	28	29	39	35	59
4,5,6-TRICHLOROGUAIACOL-13C	64	67	69	66	64	74	71	89	51	53	84	57	68	54	62	79	74	67	68	55	59	80
PENTACHLOROPHENOL-13C	67	74	77	63	75	75	61	88	51	52	82	60	80	66	74	87	72	79	83	51	61	80
3,4,5,6-TETRACHLOROGUAIACOL-13C	65	69	77	52	6	74	60	81	58	53	76	62	82	54	73	67	70	64	61	85	61	78
3,4,5,6-TETRACHLOROCATECHOL-13C	28	11	13	13	10	11	11	26	14	16	18	13	11	9	24	13	9	4	3	5	8	9

Values expressed as ng/g dry weight.
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Lab reruns denoted by an "r" following the sample ID
Values are recovery corrected
95FRN1 is a field split of 95NAR1

Table 11 (continued)

Parameter	95THM3r	95THM4	95THM4r1	95THM4r2	95MAN1	95MAN2	95MAN3	95MAN3d	95MAN4	95NAR1	95FRN1	95NAR2	95NAR3	95NAR4	95NAR4d	95STK1A	95SRT3	95CHN2	95CHN2r	95CHN2rd	95QNL2	95QNL2r	95HAR1
4-CHLOROPHENOL	<0.19	<0.4	<0.48	<0.34	0.12	<0.12	<0.1	<0.05	<0.17	0.31	0.44	<0.17	<0.27	<0.15	<0.13	<0.07	<0.27	<0.15	<0.12	<0.11	<0.13	<0.11	<0.17
2,6-DICHLOROPHENOL	<0.21	<0.18	<0.32	<0.33	<0.07	<0.07	<0.08	<0.04	<0.12	<0.1	<0.17	<0.15	<0.11	<0.1	<0.08	<0.09	<0.27	<0.14	<0.16	<0.15	<0.08	<0.15	<0.15
2,4/2,5-DICHLOROPHENOL	<0.18	0.18	<0.65	<0.79	0.16	<0.09	<0.09	0.14	<0.1	1.40	1.10	0.99	0.87	1.20	0.62	0.26	<0.21	<0.18	<0.14	<0.13	<0.07	<0.13	<0.35
3,5-DICHLOROPHENOL	<0.24	<0.22	<0.39	<0.41	<0.1	<0.1	<0.11	<0.06	<0.18	<0.12	<0.19	<0.1	<0.12	<0.1	<0.09	<0.12	<0.3	<0.15	<0.18	<0.17	<0.1	<0.17	<0.16
2,3-DICHLOROPHENOL	<0.24	<0.21	<0.39	<0.41	<0.1	<0.1	<0.11	<0.06	<0.17	<0.11	<0.18	<0.1	<0.12	<0.09	<0.08	<0.12	<0.3	<0.15	<0.18	<0.17	<0.1	<0.17	<0.16
3,4-DICHLOROPHENOL	<0.2	<0.19	<0.39	<0.39	<0.07	<0.07	<0.08	<0.04	<0.12	<0.08	<0.13	<0.07	<0.08	<0.07	<0.06	<0.08	<0.24	<0.12	<0.15	<0.15	<0.09	<0.14	<0.13
6-CHLOROGUAIACOL	<0.08	<0.08	<0.13	<0.17	<0.06	<0.06	<0.08	<0.05	<0.12	<0.08	<0.12	<0.06	<0.06	<0.06	<0.05	<0.06	<0.13	<0.06	<0.08	<0.07	<0.04	<0.07	<0.07
4-CHLOROGUAIACOL	<0.09	<0.09	<0.15	<0.21	0.16	0.08	<0.07	<0.04	<0.1	0.60	0.41	0.25	<0.1	0.20	0.19	<0.05	<0.15	<0.08	<0.1	<0.08	<0.05	<0.09	<0.08
5-CHLOROGUAIACOL	<0.1	<0.09	<0.16	<0.22	0.24	0.17	0.28	0.16	0.35	0.20	0.17	0.12	0.24	0.41	0.27	<0.07	<0.16	<0.07	<0.1	<0.08	<0.05	<0.09	<0.4
2,4,6-TRICHLOROPHENOL	<0.14	<0.12	<0.31	<0.33	<0.07	0.11	0.13	<0.05	<0.13	<0.08	<0.25	0.10	<0.08	0.08	0.10	<0.07	<0.27	<0.12	<0.18	<0.11	<0.05	<0.12	<0.13
2,3,6-TRICHLOROPHENOL	<0.17	<0.14	<0.42	<0.45	<0.1	<0.11	<0.11	<0.08	<0.18	0.35	<0.22	<0.12	<0.13	<0.12	<0.1	<0.11	<0.32	<0.14	<0.22	<0.14	<0.06	<0.14	<0.15
2,3,5-TRICHLOROPHENOL	<0.19	<0.16	<0.48	<0.5	<0.11	<0.11	<0.11	<0.08	<0.2	<0.1	<0.15	<0.15	<0.06	<0.1	<0.1	<0.11	<0.34	<0.14	<0.24	<0.15	<0.07	<0.15	<0.16
2,4,5-TRICHLOROPHENOL	<0.12	<0.1	<0.32	<0.38	<0.08	<0.07	<0.07	<0.06	<0.12	0.23	<0.11	<0.15	<0.06	<0.06	<0.07	<0.08	<0.22	<0.11	<0.18	<0.11	<0.05	<0.11	<0.12
2,3,4-TRICHLOROPHENOL	<0.13	<0.11	<0.36	<0.44	<0.1	<0.09	<0.1	<0.08	<0.16	<0.1	<0.1	<0.1	<0.05	<0.05	<0.05	<0.11	<0.24	<0.12	<0.19	<0.12	0.08	<0.12	<0.13
3,4,5-TRICHLOROPHENOL	<0.14	<0.12	<0.4	<0.47	<0.1	<0.09	<0.1	<0.07	<0.16	<0.15	<0.1	0.09	<0.05	<0.06	<0.05	<0.11	<0.25	<0.12	<0.2	<0.12	<0.06	<0.12	<0.13
3-CHLOROCATECHOL	<0.22	<0.24	<0.28	<0.32	<0.25	<0.16	<0.19	<0.16	<0.27	0.26	0.41	0.45	<0.25	0.26	0.31	<0.21	<0.23	<0.17	<0.21	<0.19	<0.15	<0.2	<0.18
4-CHLOROCATECHOL	<0.23	<0.25	<0.31	<0.38	<0.17	0.13	<0.13	0.13	<0.18	0.34	0.68	1.40	<0.11	0.20	0.14	<0.14	<0.22	<0.18	<0.22	<0.2	<0.16	<0.2	<0.18
4,6-DICHLOROGUAIACOL	<0.18	<0.09	<0.23	<0.35	<0.1	<0.06	<0.09	<0.07	<0.14	<0.07	<0.14	<0.05	<0.06	<0.08	<0.08	<0.1	<0.24	<0.13	<0.21	<0.17	<0.08	<0.15	<0.12
3,4-DICHLOROGUAIACOL	<0.28	<0.11	<0.32	<0.48	<0.14	<0.07	<0.12	<0.09	<0.18	<0.08	<0.16	<0.06	<0.07	<0.09	<0.16	<0.14	<0.34	<0.2	<0.29	<0.23	<0.08	<0.22	<0.1
4,5-DICHLOROGUAIACOL	<0.22	<0.1	<0.31	<0.46	0.40	0.20	0.12	0.13	<0.14	1.10	1.00	0.73	0.33	0.79	0.69	<0.11	<0.27	<0.15	<0.25	<0.2	<0.07	<0.18	<0.14
3-CHLOROSYRINGOL	<0.1	<0.09	<0.24	<0.3	<0.08	<0.06	<0.1	<0.06	<0.1	<0.03	<0.05	<0.05	<0.02	<0.03	<0.02	<0.1	<0.14	<0.1	<0.1	<0.09	<0.05	<0.08	<0.08
3,6-DICHLOROCATECHOL	<0.45	<0.32	<0.64	<0.98	<0.46	<0.28	<0.62	<0.3	<0.67	<0.23	<0.26	0.33	<0.1	<0.19	<0.15	<0.76	<0.49	<0.51	<0.58	<0.5	<1.1	<0.78	<0.29
3,5-DICHLOROCATECHOL	<0.44	<0.31	<0.64	<0.97	<0.7	<0.42	<0.93	<0.46	<1	1.00	0.81	1.00	0.25	0.25	0.31	<1.2	<0.46	<0.46	<0.56	<0.49	<1.1	<0.78	<0.26
3,4-DICHLOROCATECHOL	<0.6	0.66	<0.68	<1	<0.57	0.68	0.65	0.50	<0.63	1.30	1.00	1.60	0.57	1.10	0.77	<0.74	<0.43	<0.7	<0.57	<0.8	2.10	<0.77	<0.7
4,5-DICHLOROCATECHOL	<0.45	<0.32	<0.71	<1	0.92	1.00	<0.56	<0.3	<0.61	4.90	5.70	4.60	0.88	3.80	2.10	<0.71	<0.45	<0.45	<0.58	<0.5	<1.1	<0.78	<0.2
2,3,5,6-TETRACHLOROPHENOL	<0.3	<0.18	<0.67	<0.94	<0.31	<0.22	<0.32	<0.22	<0.36	<0.17	<0.17	<0.07	<0.08	<0.1	<0.1	<0.24	<0.6	<0.41	<0.34	<0.27	<0.13	<0.25	<0.23
2,3,4,6-TETRACHLOROPHENOL	<0.23	<0.13	<0.49	<0.71	<0.16	<0.12	<0.17	<0.11	<0.19	<0.14	<0.14	0.27	<0.06	0.19	<0.19	<0.13	<0.44	<0.3	<0.25	<0.2	<0.09	<0.19	<0.17
2,3,4,5-TETRACHLOROPHENOL	<0.21	<0.13	<0.52	<0.7	<0.23	<0.17	<0.24	<0.16	<0.27	<0.12	<0.13	<0.05	<0.06	<0.07	<0.08	<0.22	<0.4	<0.26	<0.24	<0.19	<0.09	<0.18	<0.15
5-CHLOROVANILLIN	<0.5	<0.73	<1.5	<1.8	<0.63	<0.44	<0.71	<0.46	<0.81	<0.32	<0.56	<0.17	<0.19	<0.26	<0.28	<0.64	<0.69	<0.44	<0.55	<0.47	<0.47	<0.35	<0.5
6-CHLOROVANILLIN	<0.5	<0.81	<1.6	<1.8	3.00	1.60	0.85	0.68	<0.95	8.90	4.50	2.80	1.40	3.50	2.70	<0.71	<0.74	<0.44	<0.55	<0.47	<0.52	<0.35	<0.5
3,5-DICHLOROSYRINGOL	<0.25	<0.16	<0.62	<0.79	<0.63	<0.43	<0.48	<0.26	<0.45	<0.22	<0.41	<0.16	<0.19	<0.24	<0.24	<0.47	<0.38	<0.24	<0.28	<0.23	<0.11	<0.21	<0.19
3,4,6-TRICHLOROGUAIACOL	<0.18	<0.11	<0.38	<0.44	<0.2	<0.12	<0.2	<0.12	<0.22	<0.1	<0.15	<0.06	<0.06	<0.08	<0.07	<0.21	<0.31	<0.15	<0.24	<0.2	<0.1	<0.17	<0.19
3,4,5-TRICHLOROGUAIACOL	<0.19	<0.12	<0.42	<0.48	<0.23	<0.13	<0.22	<0.14	<0.25	0.65	0.45	0.43	0.20	0.29	0.26	<0.24	<0.29	<0.13	<0.25	<0.2	<0.1	<0.17	<0.17
4,5,6-TRICHLOROGUAIACOL	<0.12	<0.08	<0.3	<0.34	<0.15	<0.09	<0.15	<0.09	<0.17	<0.08	<0.12	0.06	<0.04	<0.06	<0.06	<0.16	<0.2	<0.1	<0.16	<0.13	<0.07	<0.11	<0.13
3,4,6-TRICHLOROCATECHOL	<0.41	<0.37	<0.96	<1.2	<0.48	<0.29	<0.64	<0.31	<0.84	0.75	0.54	1.10	0.22	<0.26	<0.2	<0.77	<0.69	<0.57	<0.71	<0.62	<1.5	<0.96	<0.4
3,4,5-TRICHLOROCATECHOL	<0.42	<0.41	<1	<1.2	1.20	1.00	<0.67	<0.33	<0.88	2.10	2.00	2.70	0.75	2.10	1.50	<0.81	<0.63	<0.46	<0.72	<0.63	<1.7	<0.98	<0.33
5,6-DICHLOROVANILLIN	<0.17	<0.2	<0.45	<0.66	<0.23	<0.15	<0.22	<0.22	<0.25	0.20	<0.18	<0.15	<0.1	<0.16	<0.1	<0.23	<0.25	<0.16	<0.22	<0.19	<0.14	<0.16	<0.22
PENTACHLOROPHENOL	<0.22	<0.09	<0.57	<0.6	<0.19	<0.15	<0.22	<0.15	<0.27	0.56	0.48	1.10	0.94	0.58	0.44	<0.16	<0.35	<0.19	<0.28	<0.24	<0.12	<0.21	<0.21
2-CHLOROSYRINGALDEHYDE	<0.27	<0.16	<0.51	<0.55	<0.13	<0.14	<0.14	<0.11	<0.17	<0.13	<0.11	<0.04	<0.04	<0.05	<0.05	<0.15	<0.16	<0.08	<0.34	<0.29	<0.11	<0.25	<0.13
3,4,5,6-TETRACHLOROGUAIACOL	<0.19	<0.13	<0.58	<0.66	<0.26	<0.13	<0.2	<0.17	<0.26	0.30	0.22	0.27	0.21	0.16	0.13	<0.21	<0.34	<0.19	<0.25	<0.22	<0.08	<0.19	<0.21
3,4,5-TRICHLOROSYRINGOL	<0.22	<0.14	<0.71	<0.87	<0.19	<0.16	<0.2	<0.14	<0.21	<0.14	<0.23	<0.09	<0.09	<0.11	<0.12	<0.28	<0.47	<0.18	<0.3	<0.26	<0.1	<0.22	<0.19
3,4,5,6-TETRACHLOROCATECHOL	<0.59	<1.2	<11	<3	1.10	1.40	<0.86	<0.9	<1.1	5.10	3.70	6.40	1.30	2.60	1.30	<0.67	<1	<0.32	<0.32	<0.39	<0.41	<0.3	<1.2
2,6-DICHLOROSYRINGALDEHYDE	<0.17	<0.17	<0.84	<0.55	<0.23	<0.17	<0.19	<0.17	<0.22	<0.19	<0.23	<0.09	<0.09	<0.1	<0.12	<0.13	<0.1	<0.07	<0.22	<0.19	<0.12	<0.15	<0.17
% Surrogate Recovery																							
4-CHLOROPHENOL-13C	32	28	51	74	70	63	57	93	39	99	120	73	51	100	120	78	30	75	71	54	51	48	65
2,4-DICHLOROPHENOL-13C	44	45	53	65	58	67	49	74	37	86	100	64	60	81	94	59	33	77	78	61	59	53	57
4-CHLOROGUAIACOL-13C	57	53	80	70	57	57	46	72	44	76	99	72	75	77	96	60	35	77	83	78	58	59	59
2,4,6-TRICHLOROPHENOL-13C	50	58	58	67	68	67	53	72	47	91	100	69	71	83	95	70	35	76	79	63	63	53	64
2,4,5-TRICHLOROPHENOL-13C	58	67	65	64	69	74	59	73	54	100	111	80	82	84	98	67	41	76	83	67	66	58	67
5-CHLOROVANILLIN-13C	45	48	56	48	48	66	48	60	43	69	76	89	86	69	65	43	28	46	55	48	48	55	44
2,3,4,5-TETRACHLOROPHENOL-13C	48	60	57	40	72	45	74	90	66	130	130	120	120	99	100	70	34	58	62	56	48	52	68
4,5-DICHLOROCATECHOL-13C	37	37	43	29	32	24	17	38	23	32	55	34	53	32	42	20	13	25	31	25	5	14	48
4,5,6-TRICHLOROGUAIACOL-13C	63	57	64	50	54	45	56	76	53	79	100	96	110	86	91	54	36	66	69	62	50	63	78
PENTACHLOROPHENOL-13C	64	72	56	51	71	49	64	75	73	99	110	97	110	99	91	71	42	67	73	61	59	62	69
3,4,5,6-TETRACHLOROGUAIACOL-13C	65	67	54	53	53	49	52	65	53	77	92	84	93	82	79	51	38	88	71	59	58	59	72
3,4,5,6-TETRACHLOROCATECHOL-13C	11	10	4	10	11	3	5	5	6	5	15	4	14	7	10	6	5	17	30	27	15	20	7

Values expressed as ng/g dry weight.
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Lab reruns denoted by an "r" following the sample ID
Values are recovery corrected
95FRN1 is a field split of 95NAR1

Table 12. Chlorophenolic Concentrations in Bed Sediments from Individual Sampling Sites in 1996

Parameter	96LCH1	96LCH4	96LCH4d	96LCH5	96LCH6	96MAN1	96MAN2	96MAN3	96MAN4	96NAR1	96NAR2	96NAR3	96NAR3d	96NAR4
4-CHLOROPHENOL	<0.33	<0.31	<0.3	<0.36	<0.26	<0.38	<0.13	<0.13	<0.13	<0.11	<0.34	<0.14	<0.14	<0.29
2,6-DICHLOROPHENOL	<0.21	<0.2	<0.2	<0.24	<0.19	<0.25	<0.14	<0.19	<0.19	<0.13	<0.34	<0.16	<0.13	<0.27
2,4/2,5-DICHLOROPHENOL	<0.5	<0.5	<0.55	<0.5	<0.25	<0.3	0.27	0.52	0.34	<0.15	0.56	<0.13	<0.23	<0.28
3,5-DICHLOROPHENOL	<0.24	<0.22	<0.23	<0.26	<0.21	<0.28	<0.16	<0.21	<0.22	<0.13	<0.37	<0.18	<0.14	<0.3
2,3-DICHLOROPHENOL	<0.24	<0.23	<0.23	<0.27	<0.22	<0.29	<0.16	<0.21	<0.22	<0.13	<0.37	<0.18	<0.14	<0.3
3,4-DICHLOROPHENOL	<0.21	<0.2	<0.2	<0.23	<0.19	<0.25	<0.13	<0.18	<0.18	<0.1	<0.3	<0.15	<0.12	<0.26
6-CHLOROGUAIACOL	<0.12	<0.1	<0.1	<0.1	<0.08	<0.12	<0.09	<0.1	<0.08	<0.08	<0.24	<0.09	<0.06	<0.14
4-CHLOROGUAIACOL	<0.14	<0.12	<0.12	<0.12	<0.09	<0.14	0.25	0.22	0.18	0.25	0.34	<0.11	<0.07	0.50
5-CHLOROGUAIACOL	<0.14	<0.12	<0.13	<0.12	<0.1	<0.15	<0.11	0.31	0.17	0.38	0.82	<0.19	<0.08	0.41
2,4,6-TRICHLOROPHENOL	<0.21	<0.2	<0.21	<0.24	<0.17	<0.23	<0.13	<0.16	<0.2	0.42	<0.45	<0.15	<0.11	<0.23
2,3,6-TRICHLOROPHENOL	<0.26	<0.25	<0.26	<0.3	<0.21	<0.29	<0.16	<0.21	<0.26	0.48	<0.51	<0.19	<0.14	<0.29
2,3,5-TRICHLOROPHENOL	<0.29	<0.27	<0.28	<0.32	<0.23	<0.32	<0.18	<0.24	<0.29	<0.18	<0.53	<0.22	<0.16	<0.33
2,4,5-TRICHLOROPHENOL	<0.21	<0.2	<0.21	<0.24	<0.18	<0.23	<0.12	<0.16	<0.19	<0.14	<0.42	<0.14	<0.1	<0.22
2,3,4-TRICHLOROPHENOL	<0.24	<0.22	<0.24	<0.27	<0.21	<0.26	<0.14	<0.19	<0.23	<0.15	<0.45	<0.17	<0.12	<0.25
3,4,5-TRICHLOROPHENOL	<0.25	<0.23	<0.24	<0.28	<0.21	<0.27	<0.14	<0.19	<0.23	<0.16	<0.46	<0.17	<0.12	<0.26
3-CHLOROCATECHOL	<0.32	<0.29	<0.32	<0.36	<0.27	<0.34	<0.22	<0.23	<0.28	<0.23	<0.51	<0.2	<0.15	<0.38
4-CHLOROCATECHOL	<0.34	<0.31	<0.34	<0.38	<0.29	<0.36	<0.24	0.25	0.52	0.28	1.20	<0.22	<0.17	<0.35
4,6-DICHLOROGUAIACOL	<0.3	<0.25	<0.27	<0.31	<0.27	<0.32	<0.14	<0.19	<0.19	<0.13	<0.39	<0.16	<0.12	<0.25
3,4-DICHLOROGUAIACOL	<0.39	<0.33	<0.36	<0.4	<0.35	<0.42	<0.18	<0.24	<0.25	<0.18	<0.53	<0.2	<0.15	<0.32
4,5-DICHLOROGUAIACOL	<0.35	<0.29	<0.32	<0.36	<0.31	<0.37	0.30	0.46	0.57	0.57	0.76	<0.19	<0.19	1.80
3-CHLOROSYRINGOL	<0.15	<0.14	<0.14	<0.17	<0.13	<0.16	<0.11	<0.2	<0.12	<0.14	<0.32	<0.12	<0.08	<0.18
3,6-DICHLOROCATECHOL	<0.54	<0.33	<0.36	<0.35	<0.31	<0.63	<0.28	<0.49	<0.31	<0.31	<0.94	<0.21	<0.17	<0.5
3,5-DICHLOROCATECHOL	<0.52	<0.32	<0.34	<0.33	<0.3	<0.6	<0.28	<0.48	<0.31	0.42	<0.88	<0.21	<0.16	<0.49
3,4-DICHLOROCATECHOL	<0.54	<0.4	<0.36	<0.35	<0.31	<0.75	0.63	<0.51	0.56	0.81	1.50	<0.22	<0.22	0.94
4,5-DICHLOROCATECHOL	<0.56	<0.34	<0.37	<0.36	<0.32	<0.65	1.60	0.58	0.62	2.10	2.50	<0.22	<0.21	1.70
2,3,5,6-TETRACHLOROPHENOL	<0.44	<0.37	<0.4	<0.46	<0.4	<0.47	<0.29	<0.45	<0.47	<0.27	<0.85	<0.36	<0.26	<0.49
2,3,4,6-TETRACHLOROPHENOL	<0.33	<0.28	<0.3	<0.34	<0.3	<0.35	<0.21	<0.33	<0.34	<0.2	<0.64	<0.27	<0.19	<0.36
2,3,4,5-TETRACHLOROPHENOL	<0.33	<0.28	<0.3	<0.34	<0.3	<0.35	<0.22	<0.34	<0.35	<0.18	<0.56	<0.27	<0.2	<0.37
5-CHLOROVANILLIN	<1.2	<0.81	<0.86	<0.98	<1.1	<1	<0.52	<0.95	<0.69	<0.7	<1.6	<0.6	<0.44	<0.86
6-CHLOROVANILLIN	<1.2	<0.81	<0.86	<0.98	<1.1	<1	1.60	1.30	1.80	1.50	2.60	<0.64	<0.74	3.60
3,5-DICHLOROSYRINGOL	<0.28	<0.24	<0.26	<0.29	<0.25	<0.3	<0.25	<0.36	<0.35	<0.39	<0.49	<0.32	<0.19	<0.46
3,4,6-TRICHLOROGUAIACOL	<0.27	<0.2	<0.2	<0.22	<0.19	<0.26	<0.2	<0.3	<0.34	<0.31	<0.79	<0.29	<0.19	<0.31
3,4,5-TRICHLOROGUAIACOL	<0.29	<0.21	<0.21	<0.23	<0.2	<0.27	<0.22	<0.33	<0.37	<0.29	<0.74	<0.32	<0.21	<0.67
4,5,6-TRICHLOROGUAIACOL	<0.18	<0.14	<0.14	<0.15	<0.13	<0.17	<0.15	<0.22	<0.25	0.77	<0.51	<0.22	<0.14	<0.23
3,4,6-TRICHLOROCATECHOL	<0.62	<0.41	<0.43	<0.45	<0.41	<0.84	<0.45	<0.49	<0.59	<0.41	<1.2	<0.39	<0.26	<0.6
3,4,5-TRICHLOROCATECHOL	<0.69	<0.46	<0.48	<0.5	<0.45	<0.93	1.20	0.94	1.10	1.10	2.00	<0.5	<0.3	2.20
5,6-DICHLOROVANILLIN	<0.43	<0.38	<0.38	<0.42	<0.35	<0.48	<0.23	<0.5	<0.58	<0.19	<0.47	<0.43	<0.23	<0.52
PENTACHLOROPHENOL	<0.36	<0.31	<0.31	<0.35	<0.29	<0.4	<0.23	<0.35	<0.36	<0.34	1.00	0.49	0.45	<0.45
2-CHLOROSYRINGALDEHYDE	<0.27	<0.24	<0.24	<0.26	<0.22	<0.3	<0.22	<0.27	<0.35	<0.11	<0.32	<0.26	<0.18	<0.42
3,4,5,6-TETRACHLOROGUAIACOL	<0.28	<0.25	<0.25	<0.27	<0.23	<0.3	<0.28	<0.38	<0.4	<0.2	<0.79	<0.26	<0.17	<0.57
3,4,5-TRICHLOROSYRINGOL	<0.33	<0.29	<0.29	<0.32	<0.27	<0.35	<0.26	<0.4	<0.49	<0.24	<0.72	<0.35	<0.23	<0.65
3,4,5,6-TETRACHLOROCATECHOL	<0.65	<0.93	<1	<0.53	<0.56	<2.2	2.10	0.81	1.10	1.90	<4.1	<0.75	<0.88	2.40
2,6-DICHLOROSYRINGALDEHYDE	<0.2	<0.18	<0.18	<0.2	<0.16	<0.22	<0.18	<0.26	<0.38	<0.19	<0.25	<0.18	<0.19	<0.34
% Surrogate Recovery														
4-CHLOROPHENOL-13C	78	79	81	74	96	69	63	68	65	92	77	72	54	72
2,4-DICHLOROPHENOL-13C	91	88	88	82	106	77	67	72	70	88	79	78	65	79
4-CHLOROGUAIACOL-13C	69	89	84	82	101	76	57	63	64	69	65	72	60	71
2,4,6-TRICHLOROPHENOL-13C	82	80	77	73	97	74	67	71	70	90	79	76	66	77
2,4,5-TRICHLOROPHENOL-13C	85	86	81	76	96	79	74	78	79	90	79	85	76	85
5-CHLOROVANILLIN-13C	52	75	70	67	57	52	66	67	75	45	51	76	66	86
2,3,4,5-TETRACHLOROPHENOL-13C	57	68	62	57	62	56	45	63	65	65	56	62	54	71
4,5-DICHLOROCATECHOL-13C	42	62	60	58	62	35	24	34	52	43	37	61	53	73
4,5,6-TRICHLOROGUAIACOL-13C	56	75	75	70	76	61	45	61	60	58	52	59	54	73
PENTACHLOROPHENOL-13C	64	71	72	66	76	59	49	66	61	66	61	61	54	76
3,4,5,6-TETRACHLOROGUAIACOL-13C	62	69	68	65	73	61	49	67	63	67	62	60	51	72
3,4,5,6-TETRACHLOROCATECHOL-13C	16	18	17	32	29	8	3	14	40	14	8	16	10	32

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected

Table 13. Resin Acid Concentrations in Bed Sediments from Individual Sampling Sites in 1994

Parameter	94MBD1	94FRM1	94FRM2	94FRM3	94FRM4	94FRM5	94MBD2	94MBD3	94MBD4	94QPG1	94QPG2	94FRQ1	94FRQ2	94FRQ3	94FRQ4	94FRQ5	94QPG3	94QPG3d	94QPG4	94LQN1
Pimaric	14.00	12.00	10.00	14.00	8.80	15.00	9.50	<8	<8	580.00	260.00	220.00	180.00	100.00	110.00	220.00	380.00	450.00	1700.00	440.00
Sandaracopimaric	54.00	18.00	14.00	24.00	15.00	18.00	140.00	26.00	11.00	140.00	40.00	35.00	29.00	26.00	20.00	43.00	56.00	82.00	240.00	72.00
Isopimaric	91.00	97.00	61.00	150.00	44.00	67.00	330.00	70.00	31.00	660.00	310.00	260.00	230.00	130.00	130.00	260.00	340.00	480.00	1500.00	450.00
Palustric	59.00	28.00	<6.8	5.80	20.00	12.00	150.00	<5.5	<4	6.80	19.00	15.00	22.00	14.00	11.00	6.50	31.00	74.00	180.00	8.30
Dihydroisopimaric	<0.87	<0.93	<1.2	<1.3	<1.6	<1	<0.92	<0.7	<0.66	18.00	6.90	7.40	5.50	3.30	4.70	6.80	21.00	25.00	76.00	14.00
Dehydroabieitic	420.00	150.00	150.00	190.00	260.00	220.00	530.00	230.00	120.00	1200.00	440.00	350.00	320.00	310.00	240.00	380.00	650.00	790.00	2800.00	890.00
Abietic	450.00	180.00	100.00	140.00	60.00	110.00	7200.00	150.00	63.00	1100.00	470.00	410.00	350.00	210.00	130.00	400.00	460.00	620.00	2600.00	1100.00
Neoabietic	6.20	2.70	<0.55	1.90	<0.69	2.10	360.00	1.20	<0.31	3.50	2.20	1.90	2.20	2.00	3.40	1.50	<0.38	1.40	4.80	<0.31
12/14 CDHAA	<0.8	<0.68	<0.74	<0.48	<0.57	<0.39	<0.48	<0.29	<0.39	43.00	35.00	30.00	27.00	18.00	20.00	34.00	27.00	28.00	40.00	32.00
12,14 CDHAA	<0.83	<0.96	<1.2	<1.1	<0.87	<0.58	<1.3	<0.6	<0.83	10.00	28.00	27.00	25.00	19.00	22.00	29.00	9.60	11.00	14.00	10.00
% Surrogate Recovery																				
O-Methylpodocarpic	72	75	69	80	74	71	78	76	71	65	70	70	72	83	78	73	68	66	73	83
D23-Lauric	77	79	68	69	64	60	70	77	71	67	57	56	62	89	86	88	51	63	65	91
D27-Myristic	83	84	78	85	86	76	76	84	80	84	81	80	88	95	90	91	75	65	89	103
D31-Palmitic	85	88	82	94	77	71	88	90	82	69	89	66	73	105	99	99	81	88	77	109
D35-Stearic	74	77	71	83	76	73	80	77	73	67	71	72	76	87	81	77	73	72	75	94
D39-Arachidic	85	96	85	96	90	85	85	93	88	87	86	75	76	89	85	79	76	85	80	86

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected
94FRM1-5 are field splits of 94MBD1
94FRQ1-5 are field splits of 94QPG2
94FRT1-5 are field splits of 94THM1

Table 13 (continued)

Parameter	94LQN2	94LQN3	94LQN4	94LQN4d	94LCH1	94LCH4	94LCH5	94LCH6	94NEC1	94NEC2	94NEC2d	94NEC4	94NEC6	94NEC6d1	94NEC6d2	94 NTH1	94NTH2	94 NTH3	94NTH3d	94 NTH5	94STH3	94STH5
Pimaric	88.00	89.00	870.00	850.00	16.00	420.00	390.00	360.00	18.00	<10	<10	<10	18.00	24.00	14.00	<8	10.00	<8	<8	<8	12.00	<8
Sandaracopimaric	13.00	58.00	150.00	160.00	4.40	91.00	110.00	100.00	14.00	8.00	4.50	1.80	16.00	7.70	17.00	68.00	94.00	<0.84	2.60	5.60	19.00	3.90
Isopimaric	91.00	150.00	1000.00	1000.00	22.00	460.00	580.00	400.00	61.00	25.00	19.00	<18	48.00	64.00	130.00	540.00	350.00	<15	<15	<15	63.00	<17
Palustric	<5.5	11.00	10.00	9.40	7.00	17.00	71.00	<3	3.90	5.80	4.70	3.90	6.20	10.00	19.00	24.00	32.00	20.00	3.60	19.00	7.50	<3.5
Dihydroisopimaric	5.60	6.10	36.00	28.00	<0.77	29.00	21.00	19.00	<0.62	<0.43	<0.39	<0.34	0.95	1.00	<1.1	<2	<2.3	<1.6	<0.64	<0.93	2.20	<0.82
Dehydroabieitic	210.00	240.00	1700.00	1600.00	53.00	970.00	1400.00	660.00	110.00	120.00	94.00	22.00	240.00	160.00	250.00	320.00	480.00	17.00	12.00	47.00	88.00	<45
Abietic	110.00	1900.00	3300.00	3300.00	36.00	990.00	1300.00	980.00	92.00	33.00	18.00	6.00	100.00	250.00	500.00	1400.00	2700.00	<25	<7.6	<19	72.00	6.90
Neoabietic	<1.4	22.00	<0.27	<0.41	<0.48	7.20	10.00	3.10	2.70	1.80	1.50	2.40	7.80	3.00	15.00	<1.6	<2	<1.3	<8.5	<0.77	19.00	5.00
12/14 CDHAA	10.00	6.10	44.00	51.00	<0.5	28.00	22.00	22.00	<0.75	<0.32	<0.36	<0.32	<0.52	<0.57	<0.45	<0.82	<1.2	<0.81	<0.45	<0.53	<0.7	<0.44
12,14 CDHAA	5.50	2.00	10.00	12.00	<0.87	9.50	7.90	6.80	<1.2	<0.56	<0.79	<0.56	<0.74	<1.1	<1.1	<1.4	<1.6	<1.2	<0.74	<0.74	<1.1	<0.73
% Surrogate Recovery																						
O-Methylpodocarpic	89	87	91	85	83	84	59	73	80	73	82	75	60	71	75	62	71	63	75	114	77	77
D23-Lauric	91	81	97	85	80	87	72	79	101	83	93	89	61	64	65	70	80	72	70	132	86	80
D27-Myristic	104	88	103	92	91	92	79	83	104	86	100	92	66	68	72	72	81	75	77	135	92	87
D31-Palmitic	116	152	142	121	97	91	80	88	116	103	105	96	70	79	82	68	75	71	85	121	105	86
D35-Stearic	93	92	105	8	82	84	76	78	82	73	81	76	60	73	76	61	68	63	73	113	67	73
D39-Arachidic	87	77	110	101	84	91	74	102	84	79	91	95	63	81	78	62	84	87	90	156	89	95

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected
94FRM1-5 are field splits of 94MBD1
94FRQ1-5 are field splits of 94QPG2
94FRT1-5 are field splits of 94THM1

Table 13 (continued)

Parameter	94STH6	94STH6d	94THM1	94FRT1	94FRT2	94FRT3	94FRT4	94FRT5	94THM2	94THM2d	94THM3	94THM4	94STK1A	94SRT3	94CHN2	94QNL2	94HAR1	94HAR1d
Pimaric	8.90	17.00	40.00	160.00	51.00	61.00	24.00	42.00	68.00	20.00	16.00	<5.7	19.00	17.00	33.00	2.40	9.40	9.70
Sandaracopimaric	9.70	6.60	8.00	100.00	7.20	16.00	6.40	28.00	55.00	120.00	21.00	3.00	14.00	51.00	29.00	2.50	130.00	64.00
Isopimaric	22.00	35.00	72.00	1800.00	96.00	160.00	56.00	210.00	230.00	300.00	49.00	18.00	38.00	160.00	130.00	8.60	110.00	64.00
Palustric	<3	<3.7	<5.5	17.00	<5	<6	<5.1	21.00	<7.7	<10	<4.5	<4.5	12.00	37.00	43.00	7.40	<5.5	<4.8
Dihydroisopimaric	<0.84	<0.72	<0.52	1.50	<0.52	<0.55	<0.55	<1.9	0.86	1.20	<0.6	<0.53	<1.8	1.20	<8.8	<1	5.30	<1.2
Dehydroabieitic	50.00	100.00	120.00	900.00	130.00	200.00	73.00	140.00	480.00	450.00	91.00	37.00	99.00	430.00	450.00	66.00	350.00	180.00
Abietic	24.00	28.00	50.00	630.00	95.00	150.00	37.00	56.00	330.00	1600.00	150.00	25.00	140.00	2800.00	270.00	31.00	870.00	310.00
Neoabietic	1.70	2.50	<0.35	<0.45	<0.43	<0.45	<0.45	<1.6	<3.5	<2.6	<0.49	<0.43	<2.5	40.00	<3	<1.2	45.00	37.00
12/14 CDHAA	<0.39	<0.4	1.20	0.99	0.90	0.89	0.73	1.10	1.60	1.60	<0.54	<0.41	<1	<0.48	<3.9	<0.47	<0.93	<0.79
12,14 CDHAA	<0.51	<0.42	2.10	1.80	2.00	2.10	1.60	2.60	5.30	6.20	<0.79	<0.72	<1.4	<0.87	<5.9	<0.86	<1.5	<1.2
% Surrogate Recovery																		
O-Methylpodocarpic	85	78	85	81	82	75	86	70	81	86	92	93	75	78	82	73	66	70
D23-Lauric	100	89	85	80	82	81	92	83	87	106	108	102	74	70	62	49	81	87
D27-Myristic	109	95	93	87	90	87	100	81	97	117	124	118	76	78	76	54	85	88
D31-Palmitic	155	121	131	131	131	122	137	93	114	138	136	152	72	92	77	68	101	107
D35-Stearic	86	77	85	90	89	87	97	56	78	94	106	109	61	81	77	65	54	55
D39-Arachidic	88	78	79	103	99	100	92	85	75	92	99	103	66	75	75	61	72	60

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected
94FRM1-5 are field splits of 94MBD1
94FRQ1-5 are field splits of 94QPG2
94FRT1-5 are field splits of 94THM1

Table 14. Fatty Acid Concentrations in Bed Sediments from Individual Sampling Sites in 1994

Parameter	94MBD1	94FRM1	94FRM2	94FRM3	94FRM4	94FRM5	94MBD2	94MBD3	94MBD4	94QPG1	94QPG2	94FRQ1	94FRQ2	94FRQ3	94FRQ4	94FRQ5	94QPG3	94QPG3d	94QPG4	94LQN1
Capric	210.00	250.00	250.00	290.00	270.00	280.00	180.00	120.00	120.00	200.00	320.00	300.00	250.00	290.00	320.00	310.00	280.00	230.00	240.00	260.00
Lauric	400.00	420.00	440.00	370.00	430.00	420.00	400.00	240.00	230.00	360.00	520.00	510.00	620.00	590.00	620.00	600.00	520.00	390.00	470.00	500.00
Myristic	1000.00	1300.00	1200.00	1100.00	950.00	1100.00	1200.00	800.00	610.00	1300.00	2300.00	1600.00	2000.00	1500.00	1800.00	1900.00	1300.00	1400.00	950.00	2400.00
Palmitic	5000.00	5800.00	6100.00	6600.00	7500.00	7700.00	7200.00	4000.00	3400.00	10000.00	11000.00	14000.00	14000.00	7200.00	12000.00	17000.00	6500.00	6000.00	7000.00	11000.00
Linolenic	170.00	260.00	240.00	270.00	250.00	320.00	430.00	260.00	160.00	700.00	840.00	910.00	910.00	320.00	370.00	610.00	480.00	500.00	520.00	450.00
Linoleic	600.00	740.00	580.00	380.00	500.00	470.00	570.00	580.00	400.00	870.00	780.00	870.00	1100.00	530.00	620.00	930.00	1100.00	1000.00	1300.00	1300.00
Oleic	1200.00	1800.00	1600.00	1300.00	1300.00	1400.00	2200.00	1300.00	870.00	2300.00	3000.00	2700.00	2300.00	1500.00	2000.00	2600.00	2200.00	2300.00	2800.00	2900.00
Stearic	1100.00	1400.00	1500.00	1400.00	1400.00	1500.00	1200.00	920.00	740.00	1900.00	2000.00	1800.00	2100.00	1700.00	1800.00	1800.00	1700.00	1500.00	1900.00	1900.00
Arachidic	280.00	350.00	310.00	260.00	280.00	280.00	410.00	190.00	170.00	230.00	210.00	280.00	410.00	420.00	430.00	370.00	410.00	300.00	350.00	270.00
Behenic	300.00	400.00	380.00	360.00	440.00	390.00	540.00	210.00	180.00	400.00	210.00	380.00	590.00	750.00	730.00	500.00	370.00	370.00	490.00	330.00
Lignoceric	64.00	99.00	100.00	73.00	120.00	64.00	110.00	45.00	39.00	87.00	45.00	67.00	130.00	190.00	180.00	110.00	63.00	79.00	80.00	55.00
% Surrogate Recovery																				
O-Methylpodocarpic	72	75	69	80	74	71	78	76	71	65	70	70	72	83	78	73	68	66	73	83
D23-Lauric	77	79	68	69	64	60	70	77	71	67	57	56	62	89	86	88	51	63	65	91
D27-Myristic	83	84	78	85	86	76	76	84	80	84	81	80	88	95	90	91	75	65	89	103
D31-Palmitic	85	88	82	94	77	71	88	90	82	69	89	66	73	105	99	99	81	88	77	109
D35-Stearic	74	77	71	83	76	73	80	77	73	67	71	72	76	87	81	77	73	72	75	94
D39-Arachidic	85	96	85	96	90	85	85	93	88	87	86	75	76	89	85	79	76	85	80	86

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected
94FRM1-5 are field splits of 94MBD1
94FRQ1-5 are field splits of 94QPG2
94FRT1-5 are field splits of 94THM1

Table 14 (continued)

Parameter	94LQN2	94LQN3	94LQN4	94LQN4d	94LCH1	94LCH4	94LCH5	94LCH6	94NEC1	94NEC2	94NEC2d	94NEC4	94NEC6	94NEC6d1	94NEC6d2	94 NTH1	94NTH2	94 NTH3	94NTH3d	94 NTH5	94STH3	94STH5
Capric	160.00	260.00	370.00	370.00	40.00	170.00	170.00	160.00	490.00	190.00	170.00	190.00	280.00	290.00	280.00	120.00	230.00	130.00	150.00	190.00	860.00	240.00
Lauric	240.00	370.00	620.00	610.00	88.00	280.00	270.00	290.00	920.00	400.00	420.00	330.00	510.00	560.00	570.00	220.00	480.00	260.00	250.00	320.00	1100.00	400.00
Myristic	570.00	4200.00	4300.00	4100.00	160.00	1600.00	990.00	1300.00	4800.00	1500.00	1500.00	1000.00	2200.00	1800.00	1900.00	810.00	1700.00	1100.00	740.00	1300.00	11000.00	2200.00
Palmitic	3100.00	15000.00	16000.00	18000.00	800.00	7900.00	5500.00	8300.00	24000.00	9800.00	9200.00	7700.00	14000.00	12000.00	13000.00	3800.00	7200.00	4600.00	5200.00	8400.00	52000.00	15000.00
Linolenic	74.00	550.00	1000.00	1100.00	17.00	310.00	250.00	270.00	2100.00	2300.00	960.00	290.00	540.00	490.00	500.00	200.00	460.00	120.00	100.00	220.00	2800.00	700.00
Linoleic	240.00	930.00	1400.00	1600.00	57.00	660.00	610.00	720.00	5600.00	2100.00	2000.00	790.00	1200.00	830.00	830.00	380.00	820.00	160.00	200.00	380.00	7200.00	1800.00
Oleic	560.00	2700.00	5300.00	5100.00	190.00	1900.00	1400.00	1800.00	4600.00	2200.00	2300.00	1400.00	2600.00	2100.00	2000.00	870.00	2100.00	960.00	840.00	1100.00	7800.00	2700.00
Stearic	570.00	1000.00	2400.00	2400.00	270.00	1200.00	850.00	1300.00	3800.00	1600.00	1500.00	1400.00	1600.00	1700.00	1800.00	1100.00	1800.00	990.00	780.00	940.00	4000.00	1400.00
Arachidic	150.00	170.00	330.00	340.00	22.00	170.00	150.00	170.00	580.00	280.00	270.00	200.00	310.00	490.00	430.00	190.00	370.00	80.00	95.00	110.00	320.00	120.00
Behenic	220.00	150.00	320.00	330.00	43.00	240.00	180.00	240.00	570.00	310.00	300.00	310.00	330.00	610.00	530.00	130.00	300.00	93.00	160.00	110.00	180.00	110.00
Lignoceric	55.00	28.00	49.00	48.00	20.00	51.00	40.00	57.00	170.00	89.00	90.00	120.00	78.00	160.00	150.00	18.00	51.00	19.00	38.00	29.00	43.00	53.00
% Surrogate Recovery																						
O-Methylpodocarpic	89	87	91	85	83	84	59	73	80	73	82	75	60	71	75	62	71	63	75	114	75	77
D23-Lauric	91	81	97	85	80	87	72	79	101	83	93	89	61	64	65	70	80	72	70	132	74	86
D27-Myristic	104	88	103	92	91	92	79	83	104	86	100	92	66	68	72	72	81	75	77	135	76	92
D31-Palmitic	116	152	142	121	97	91	80	88	116	103	105	96	70	79	82	68	75	71	85	121	72	105
D35-Stearic	93	92	105	8	82	84	76	78	82	73	81	76	60	73	76	61	68	63	73	113	61	67
D39-Arachidic	87	77	110	101	84	91	74	102	84	79	91	95	63	81	78	62	84	87	90	156	66	89

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected
94FRM1-5 are field splits of 94MBD1
94FRQ1-5 are field splits of 94QPG2
94FRT1-5 are field splits of 94THM1

Table 14 (continued)

Parameter	94STH6	94STH6d	94THM1	94FRT1	94FRT2	94FRT3	94FRT4	94FRT5	94THM2	94THM2d	94THM3	94THM4	94STK1A	94SRT3	94CHN2	94QNL2	94HAR1	94HAR1d
Capric	590.00	560.00	500.00	500.00	490.00	540.00	430.00	590.00	220.00	230.00	180.00	120.00	140.00	330.00	520.00	82.00	1800.00	1600.00
Lauric	730.00	690.00	600.00	580.00	630.00	640.00	520.00	610.00	520.00	540.00	360.00	410.00	280.00	700.00	1000.00	140.00	2600.00	2200.00
Myristic	7900.00	7500.00	7000.00	6900.00	8100.00	8600.00	6700.00	5100.00	1900.00	1800.00	2000.00	1700.00	890.00	2000.00	3000.00	480.00	17000.00	17000.00
Palmitic	25000.00	25000.00	29000.00	17000.00	20000.00	21000.00	16000.00	39000.00	8300.00	8900.00	11000.00	7300.00	4700.00	13000.00	20000.00	1900.00	64000.00	51000.00
Linolenic	2000.00	2000.00	1200.00	1800.00	1700.00	1600.00	1300.00	1500.00	510.00	460.00	300.00	530.00	500.00	940.00	920.00	110.00	3700.00	3300.00
Linoleic	2500.00	2400.00	2600.00	3400.00	3400.00	3400.00	2800.00	3000.00	1000.00	840.00	1000.00	630.00	1800.00	1100.00	1200.00	110.00	16000.00	11000.00
Oleic	3400.00	3400.00	5400.00	7300.00	7300.00	6900.00	6100.00	6800.00	2000.00	1700.00	1900.00	1200.00	1400.00	3000.00	3500.00	510.00	18000.00	15000.00
Stearic	1600.00	1500.00	2900.00	3000.00	3200.00	3200.00	2600.00	3100.00	1600.00	1500.00	1400.00	940.00	1500.00	2000.00	2700.00	270.00	8500.00	7400.00
Arachidic	150.00	140.00	250.00	200.00	230.00	240.00	220.00	210.00	370.00	370.00	210.00	130.00	160.00	540.00	870.00	52.00	970.00	790.00
Behenic	150.00	140.00	180.00	140.00	160.00	160.00	150.00	120.00	310.00	350.00	190.00	170.00	130.00	570.00	1400.00	98.00	780.00	380.00
Lignoceric	36.00	33.00	60.00	46.00	58.00	48.00	45.00	39.00	44.00	64.00	48.00	30.00	37.00	140.00	530.00	23.00	170.00	67.00
% Surrogate Recovery																		
O-Methylpodocarpic	77	85	78	85	81	82	75	86	70	81	86	92	93	78	82	73	66	70
D23-Lauric	80	100	89	85	80	82	81	92	83	87	106	108	102	70	62	49	81	87
D27-Myristic	87	109	95	93	87	90	87	100	81	97	117	124	118	78	76	54	85	88
D31-Palmitic	86	155	121	131	131	131	122	137	93	114	138	136	152	92	77	68	101	107
D35-Stearic	73	86	77	85	90	89	87	97	56	78	94	106	109	81	77	65	54	55
D39-Arachidic	95	88	78	79	103	99	100	92	85	75	92	99	103	75	75	61	72	60

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected
94FRM1-5 are field splits of 94MBD1
94FRQ1-5 are field splits of 94QPG2
94FRT1-5 are field splits of 94THM1

Table 15. Resin and Fatty Acid Concentrations in Bed Sediments from Individual Sampling Sites in 1995

Parameter	95MBD1	95MBD2	95MBD3	95MBD4	95QPG1	95QPG1d	95QPG2	95QPG2r	95QPG3	95QPG3r	95QPG4	95QPG4r	95LQN1	95LQN2	95LQN2d	95LQN3	95LQN4	95LCH1	95LCH4	95LCH5	95LCH6	95NEC1	95NEC2	95NEC4
Pimaric	14.00	3.70	3.20	11.00	1300.00	1100.00	890.00	820.00	92.00	79.00	6200.00	5200.00	370.00	320.00	350.00	260.00	2100.00	96.00	1100.00	420.00	1000.00	14.00	<3.7	21.00
Sandaracopimaric	62.00	12.00	6.20	23.00	150.00	130.00	87.00	99.00	15.00	17.00	1200.00	1300.00	47.00	32.00	33.00	27.00	200.00	16.00	190.00	65.00	130.00	14.00	54.00	8.50
Isopimaric	260.00	28.00	16.00	100.00	1100.00	900.00	770.00	700.00	100.00	100.00	6400.00	4700.00	380.00	300.00	310.00	250.00	1900.00	100.00	1100.00	440.00	950.00	69.00	54.00	34.00
Palustric	8.90	3.00	0.92	5.90	4.50	<2.1	28.00	24.00	29.00	5.90	2600.00	800.00	19.00	16.00	10.00	7.20	130.00	<3.2	13.00	5.70	<4.9	2.80	10.00	27.00
Dihydroisopimaric	<1.3	<0.45	<0.29	<1.1	31.00	27.00	16.00	12.00	3.60	4.20	19.00	16.00	12.00	15.00	16.00	9.70	66.00	2.50	51.00	22.00	82.00	<2.3	<7.8	<12
Dehydroabieitic	530.00	100.00	50.00	260.00	1500.00	1400.00	880.00	930.00	210.00	190.00	14000.00	10000.00	560.00	390.00	400.00	350.00	2200.00	140.00	1300.00	590.00	1600.00	140.00	170.00	74.00
Abietic	1200.00	53.00	20.00	370.00	2000.00	1100.00	2900.00	1700.00	340.00	240.00	29000.00	16000.00	1300.00	1200.00	1100.00	860.00	7900.00	150.00	3100.00	1100.00	2400.00	47.00	160.00	<140
Neoabietic	3.20	<0.27	<0.18	2.70	<20	<1.5	11.00	4.60	3.80	0.94	980.00	410.00	11.00	4.70	<0.75	2.40	39.00	<0.84	3.40	<0.48	4.10	<32	<3.6	<5.8
12/14 CDHAA	<0.9	<0.32	<0.19	<0.63	36.00	34.00	23.00	19.00	1.10	2.00	6.40	8.00	11.00	14.00	14.00	8.80	56.00	2.20	28.00	10.00	25.00	<1.6	<3.3	<5.4
12,14 CDHAA	<1.1	<0.37	<0.34	<0.92	17.00	14.00	11.00	8.20	<1.4	0.65	<2.1	<2.2	5.30	11.00	11.00	4.50	22.00	<1.6	14.00	4.80	12.00	<1.7	<4.5	<7.2
Capric	380.00	98.00	80.00	170.00	320.00	330.00	160.00	200.00	84.00	130.00	150.00	170.00	420.00	100.00	90.00	230.00	310.00	520.00	620.00	440.00	630.00	480.00	350.00	200.00
Lauric	430.00	170.00	130.00	300.00	420.00	400.00	260.00	300.00	160.00	200.00	210.00	230.00	670.00	180.00	170.00	380.00	530.00	580.00	730.00	530.00	770.00	660.00	580.00	390.00
Myristic	4100.00	600.00	310.00	1000.00	5900.00	5500.00	1700.00	1400.00	600.00	710.00	1200.00	1200.00	21000.00	1600.00	1500.00	9600.00	6700.00	11000.00	4500.00	3100.00	4600.00	3900.00	8600.00	3100.00
Palmitic	16000.00	2700.00	1500.00	5700.00	21000.00	21000.00	14000.00	9000.00	4400.00	3200.00	7800.00	7200.00	75000.00	13000.00	12000.00	73000.00	35000.00	48000.00	20000.00	16000.00	20000.00	19000.00	18000.00	16000.00
Linolenic	1900.00	230.00	100.00	740.00	4000.00	3500.00	440.00	530.00	390.00	390.00	440.00	420.00	1700.00	350.00	340.00	1500.00	1100.00	1700.00	830.00	590.00	1200.00	1300.00	1200.00	820.00
Linoleic	3600.00	480.00	260.00	1200.00	2900.00	2900.00	520.00	940.00	550.00	1000.00	2200.00	2900.00	1800.00	570.00	540.00	1000.00	2200.00	1600.00	1500.00	1000.00	1700.00	2900.00	2100.00	1200.00
Oleic	5900.00	1400.00	750.00	2100.00	3800.00	3400.00	2100.00	2200.00	1300.00	1600.00	4600.00	4500.00	5700.00	1700.00	1600.00	5100.00	6100.00	3700.00	4500.00	2500.00	4300.00	3800.00	3700.00	2400.00
Stearic	1200.00	480.00	300.00	910.00	2000.00	2000.00	1500.00	1300.00	650.00	680.00	930.00	960.00	2400.00	1300.00	1200.00	2400.00	3100.00	1900.00	2700.00	1500.00	3000.00	3500.00	2400.00	1300.00
Arachidic	260.00	180.00	84.00	280.00	240.00	230.00	150.00	190.00	110.00	160.00	230.00	240.00	190.00	110.00	100.00	110.00	280.00	140.00	250.00	150.00	220.00	430.00	250.00	170.00
Behenic	200.00	240.00	110.00	360.00	340.00	300.00	250.00	330.00	100.00	210.00	230.00	290.00	180.00	170.00	150.00	120.00	340.00	160.00	230.00	150.00	190.00	270.00	340.00	220.00
Lignoceric	43.00	62.00	41.00	97.00	71.00	57.00	48.00	78.00	24.00	56.00	44.00	62.00	36.00	49.00	40.00	29.00	55.00	48.00	55.00	42.00	41.00	66.00	46.00	47.00
% Surrogate Recovery																								
O-Methylpodocarpic	76	71	68	85	66	77	46	85	54	69	50	87	58	46	50	69	48	92	96	92	88	89	73	35
D23-Lauric	60	60	58	68	58	78	61	68	46	63	50	75	46	45	60	52	56	110	130	98	110	97	55	41
D27-Myristic	60	71	65	76	67	86	68	72	47	63	52	80	53	50	69	54	60	94	110	86	100	100	58	40
D31-Palmitic	70	97	78	110	99	120	73	93	48	78	61	100	96	60	69	84	67	130	110	130	130	120	64	62
D35-Stearic	55	86	66	100	82	92	54	99	39	59	64	110	60	49	54	51	55	94	99	84	80	100	64	60
D39-Arachidic	45	78	57	86	79	81	66	93	33	55	55	110	80	63	69	71	60	100	91	79	85	70	48	53

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Lab reruns denoted by an"r" following the sample ID
Values are recovery corrected
n/a indicates not available
95FRN1 is a field split of 95NAR1

Table 15 (continued)

Parameter	95NEC4r	95NEC6	95NTH1	95NTH2	95NTH3	95NTH5	95STH3	95STH5	95STH6	95THM1	95THM2	95THM2d	95THM3	95THM4	95MAN1	95MAN2	95MAN3	95MAN4	95MAN4d	95NAR1	95FRN1	95NAR2	95NAR3
Pimaric	<3.6	6.80	5.40	10.00	5.10	10.00	<7.3	<3.7	<1.7	52.00	8.30	18.00	87.00	37.00	370.00	49.00	240.00	240.00	230.00	1700.00	470.00	600.00	240.00
Sandaracopimaric	24.00	<1.2	18.00	25.00	1.90	25.00	37.00	66.00	22.00	21.00	4.20	7.20	23.00	73.00	170.00	22.00	340.00	300.00	200.00	780.00	1800.00	950.00	400.00
Isopimaric	15.00	24.00	59.00	54.00	7.60	67.00	16.00	12.00	33.00	190.00	30.00	50.00	160.00	310.00	370.00	67.00	540.00	310.00	290.00	<2.1	1100.00	1000.00	380.00
Palustric	<5.2	<4.1	4.90	11.00	<2.6	7.40	<11	<5.4	<5.3	2.30	8.50	15.00	6.10	55.00	<7.6	9.10	66.00	2.30	6.60	22.00	<6	<1.9	<1.6
Dihydroisopimaric	<7.5	<5.4	<2.5	<2.8	<3	<2.6	<15	<7.7	<7.1	<2.2	<2.1	<2.3	<2.5	<1.9	14.00	<3.3	11.00	11.00	11.00	1700.00	24.00	16.00	5.40
Dehydroabieitic	<23	80.00	190.00	140.00	19.00	150.00	34.00	27.00	76.00	240.00	65.00	110.00	430.00	800.00	710.00	140.00	600.00	570.00	470.00	4000.00	1900.00	2800.00	790.00
Abietic	<80	<48	150.00	71.00	<36	210.00	<160	<83	<45	210.00	61.00	78.00	330.00	1200.00	650.00	64.00	1200.00	550.00	610.00	3.30	4100.00	2100.00	770.00
Neoabietic	<3.5	<1.6	<4.6	<4.6	<1.4	<4.8	<7.1	<3.6	<2.1	<5.2	<0.87	<0.92	<1.7	5.90	<5.4	<1.7	12.00	4.90	3.60	26.00	19.00	5.20	3.20
12/14 CDHAA	<3.2	<1.7	<1.2	<1.3	<1.1	<1.2	<6.5	<3.3	<2.2	<1.1	<1.5	<1.4	<1.3	<1.3	22.00	3.90	7.00	15.00	13.00	22.00	30.00	30.00	12.00
12,14 CDHAA	<4.3	<2	<1.4	<2.1	<1.9	<1.8	<8.7	<4.4	<2.2	1.70	<2.1	<1.8	<2	<2.1	18.00	9.40	9.60	16.00	15.00	930.00	24.00	27.00	10.00
Capric	210.00	200.00	250.00	310.00	55.00	390.00	770.00	910.00	870.00	580.00	610.00	650.00	180.00	350.00	1300.00	370.00	520.00	250.00	230.00	1600.00	1200.00	780.00	380.00
Lauric	410.00	350.00	440.00	430.00	96.00	610.00	930.00	1000.00	1300.00	770.00	1200.00	1100.00	320.00	860.00	810.00	450.00	600.00	350.00	340.00	7000.00	1400.00	1300.00	570.00
Myristic	1800.00	2000.00	3400.00	4000.00	210.00	4400.00	11000.00	22000.00	18000.00	5900.00	11000.00	13000.00	1700.00	8800.00	2600.00	1300.00	2100.00	2500.00	2500.00	20000.00	5400.00	5400.00	2600.00
Palmitic	20000.00	8900.00	19000.00	23000.00	1200.00	26000.00	43000.00	48000.00	61000.00	37000.00	58000.00	63000.00	9900.00	6800.00	15000.00	9300.00	14000.00	9800.00	10000.00	1600.00	18000.00	20000.00	13000.00
Linolenic	890.00	760.00	610.00	960.00	32.00	1100.00	2500.00	3500.00	3300.00	1400.00	5800.00	4100.00	300.00	4000.00	210.00	160.00	390.00	530.00	530.00	5200.00	1000.00	1000.00	960.00
Linoleic	1500.00	1900.00	720.00	1500.00	67.00	1900.00	5400.00	6400.00	5800.00	2500.00	3900.00	2600.00	510.00	2000.00	950.00	750.00	1200.00	1500.00	1500.00	7900.00	4000.00	4100.00	2900.00
Oleic	2500.00	2000.00	2600.00	5000.00	330.00	5600.00	10000.00	13000.00	9000.00	7000.00	17000.00	12000.00	1600.00	4800.00	5000.00	1900.00	4700.00	2900.00	2900.00	4400.00	10000.00	7400.00	5400.00
Stearic	960.00	1100.00	1600.00	1600.00	350.00	1700.00	2200.00	2200.00	2700.00	1800.00	2200.00	2600.00	1200.00	2400.00	4400.00	2400.00	5700.00	2300.00	2200.00	920.00	4900.00	6100.00	3500.00
Arachidic	230.00	130.00	270.00	310.00	29.00	340.00	240.00	180.00	230.00	230.00	260.00	260.00	160.00	220.00	770.00	360.00	810.00	210.00	210.00	740.00	1200.00	1000.00	420.00
Behenic	280.00	120.00	250.00	280.00	38.00	270.00	170.00	150.00	200.00	220.00	160.00	180.00	170.00	170.00	980.00	640.00	700.00	230.00	200.00	120.00	1500.00	920.00	420.00
Lignoceric	38.00	31.00	40.00	60.00	21.00	68.00	67.00	27.00	55.00	72.00	32.00	37.00	46.00	22.00	300.00	280.00	180.00	48.00	41.00	79.19	280.00	130.00	68.00
% Surrogate Recovery																							
O-Methylpodocarpic	77	58	72	62	44	68	61	66	59	77	95	82	64	50	91	86	n/a	72	75	72	75	76	74
D23-Lauric	62	60	87	69	73	72	46	41	85	74	64	75	76	50	110	87	n/a	66	65	88	74	69	62
D27-Myristic	85	68	89	73	84	80	48	55	98	80	65	72	84	52	91	76	n/a	75	75	110	79	83	73
D31-Palmitic	82	75	95	110	99	120	37	100	115	120	96	110	91	98	91	78	n/a	110	100	95	93	100	93
D35-Stearic	90	64	81	69	76	95	73	84	82	120	79	100	80	65	90	76	n/a	86	90	67	83	92	93
D39-Arachidic	62	57	100	65	82	87	45	63	52	85	80	110	90	98	73	77	n/a	83	85	67	78	67	79

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Lab reruns denoted by an"r" following the sample ID
Values are recovery corrected
n/a indicates not available
95FRN1 is a field split of 95NAR1

Table 15 (continued)

Parameter	95NAR4	95STK1A	95STK1Ad	95STK1Ar	95SRT3	95SRT3d	95CHN2	95QNL2	95HAR1
Pimaric	450.00	<16	<15	9.90	4.80	3.90	68.00	3.40	3.30
Sandaracopimaric	230.00	24.00	17.00	48.00	15.00	6.20	110.00	4.80	10.00
Isopimaric	470.00	46.00	34.00	110.00	16.00	13.00	210.00	18.00	29.00
Palustric	3.60	<3.8	<4.4	27.00	16.00	18.00	13.00	22.00	<3
Dihydroisopimaric	21.00	<1.3	<1.6	<7.2	<3.1	<1.2	<2.6	<2.1	<3.4
Dehydroabieitic	880.00	96.00	90.00	94.00	350.00	210.00	600.00	70.00	99.00
Abietic	1100.00	29.00	23.00	150.00	<40	35.00	3900.00	37.00	<45
Neoabietic	3.40	<0.68	<0.83	<3.3	<5.7	<2.2	48.00	<1.2	1.70
12/14 CDHAA	26.00	<0.47	<0.99	<3.1	<1.3	<0.52	<1.2	<1	<1.6
12,14 CDHAA	17.00	<1.1	<2	<4.1	<2.1	<0.83	<1.7	<1.5	<2.6
Capric	370.00	430.00	430.00	240.00	180.00	190.00	280.00	60.00	1100.00
Lauric	740.00	540.00	550.00	360.00	220.00	220.00	560.00	95.00	1700.00
Myristic	2900.00	3100.00	3200.00	1200.00	820.00	820.00	2600.00	440.00	23000.00
Palmitic	12000.00	18000.00	19000.00	10000.00	6100.00	5800.00	15000.00	2600.00	100000.00
Linolenic	520.00	510.00	570.00	1900.00	230.00	220.00	500.00	89.00	5200.00
Linoleic	1200.00	1500.00	1700.00	1300.00	370.00	580.00	820.00	160.00	7800.00
Oleic	3200.00	2600.00	2700.00	1600.00	940.00	980.00	2000.00	580.00	18000.00
Stearic	2500.00	1500.00	1700.00	1200.00	770.00	850.00	1900.00	380.00	3800.00
Arachidic	350.00	310.00	350.00	170.00	130.00	130.00	230.00	49.00	420.00
Behenic	340.00	240.00	310.00	200.00	140.00	140.00	230.00	51.00	400.00
Lignoceric	54.00	69.00	110.00	57.00	37.00	34.00	68.00	15.00	150.00
% Surrogate Recovery									
O-Methylpodocarpic	76	91	93	71	74	74	69	52	66
D23-Lauric	60	100	93	40	60	72	66	45	53
D27-Myristic	69	93	82	54	60	71	76	51	56
D31-Palmitic	91	96	91	57	60	70	80	62	94
D35-Stearic	85	91	90	61	98	92	75	60	110
D39-Arachidic	74	71	75	42	59	76	81	51	96

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Lab reruns denoted by an"r" following the sample ID
Values are recovery corrected
n/a indicates not available
95FRN1 is a field split of 95NAR1

Table 16. Resin and Fatty Acid Concentrations in Bed Sediments from Individual Sampling Sites in 1996

Parameter	96LCH1	96LCH4	96LCH5	96LCH5d	96LCH6	96MAN1	96MAN2	96MAN3	96MAN3d	96MAN4	96NAR1	96NAR2	96NAR3
Pimaric	47	94	36	34	23	150	44	210	200	410	350	640	66
Sandaracopimaric	14	9.2	9.4	13	3.9	43	18	100	160	1600	1300	1900	1200
Isopimaric	52	110	40	43	20	170	55	230	220	360	1100	810	250
Palustric	<3.7	<3.6	<2.9	<3.1	<3.1	14	3.9	18	6.5	26	640	140	85
Dihydroisopimaric	<4.9	<4.8	<3.9	<4.1	<2.7	7.2	<2	6.3	8.1	11	14	21	<3.1
Dehydroabieitic	97	170	80	110	41	290	81	350	350	1000	2600	1800	280
Abietic	130	210	66	86	69	630	190	760	550	940	8600	6200	680
Neoabietic	<1.5	<1.4	<1.2	<1.2	<1.4	<1.8	<1.1	<1.5	<1.2	<2.2	550	38	15
12/14 CDHAA	3.3	5.4	2	2	2.2	17	6.1	21	21	32	23	46	5.7
12,14 CDHAA	2.6	6	2.2	2.9	<2.4	18	8.4	23	23	31	22	45	6.6
Capric	100	79	76	54	40	530	230	380	400	310	780	750	240
Lauric	170	140	120	140	74	750	410	670	620	520	1400	880	400
Myristic	550	370	290	340	110	2500	1000	2900	2300	1700	4700	3600	770
Palmitic	3300	2200	1700	1900	390	7500	4100	9400	9600	6500	14000	17000	3500
Linolenic	190	70	98	89	<24	300	220	470	400	440	820	1100	130
Linoleic	590	260	250	240	43	1100	680	1300	960	1200	2600	4000	530
Oleic	1500	740	570	520	150	4100	1900	3300	3000	3400	9100	11000	1700
Stearic	490	450	300	400	190	2600	1400	3600	3500	2700	3300	8000	1000
Arachidic	62	83	38	56	18	320	210	250	310	290	740	1100	170
Behenic	67	100	53	85	32	330	270	200	250	250	800	960	250
Lignoceric	17	26	17	29	17	110	58	44	57	51	200	210	75
% Surrogate Recovery													
O-Methylpodocarpic	70	68	73	68	57	56	51	56	57	50	60	60	56
D23-Lauric	52	57	61	67	68	67	69	71	71	61	64	69	62
D27-Myristic	54	68	68	76	79	76	74	76	75	65	70	71	69
D31-Palmitic	46	69	77	90	85	86	82	81	81	82	79	78	85
D35-Stearic	45	71	75	81	75	76	76	71	70	66	70	69	74
D39-Arachidic	31	54	53	71	64	61	65	74	57	55	54	53	63

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected

Table 17. PAH Concentrations in Bed Sediments from Individual Sampling Sites in 1994

Parameter	94MBD1	94FRM1	94FRM2	94FRM3	94FRM4	94FRM5	94MBD2	94MBD3	94MBD4	94QPG1	94QPG2	94FRQ1	94FRQ2	94FRQ3	94FRQ4	94FRQ4d	94FRQ4r	94FRQ5	94FRQ5r	94QPG3
Naphthalene	2.50	4.00	3.10	1.80	1.80	1.70	3.20	2.70	2.50	2.50	1.90	3.20	7.00	4.00	<3.6	<3.6	6.10	3.80	5.00	3.00
Acenaphthylene	<0.11	<0.22	<0.14	<0.09	0.09	<0.08	<0.14	<0.16	<0.15	0.13	0.13	<0.34	<1.1	<0.46	<0.56	<0.39	<0.4	<0.59	<0.29	0.14
Acenaphthene	<0.06	<0.17	<0.11	<0.06	<0.04	<0.03	<0.14	<0.1	<0.08	<0.06	<0.04	2.00	4.40	2.00	1.60	1.30	<0.67	1.70	<0.5	<0.04
Fluorene	0.65	0.65	0.58	0.59	0.66	0.59	0.71	0.54	0.48	0.69	0.81	1.70	3.80	1.80	1.60	1.60	0.70	1.70	<0.66	1.10
Phenanthrene	3.90	4.80	3.70	3.10	2.90	2.90	3.40	2.70	3.00	4.10	4.10	7.50	9.10	6.80	5.80	6.10	6.00	5.80	5.50	5.80
Anthracene	0.40	0.46	0.29	<0.19	0.30	<0.17	0.34	<0.2	<0.19	<0.24	0.29	0.45	0.53	0.36	0.39	0.38	0.58	0.26	<0.5	0.71
Fluoranthene	2.00	2.40	1.70	1.90	1.70	1.40	1.60	1.40	2.20	2.40	2.40	3.20	3.40	3.40	3.10	3.00	4.40	3.00	4.50	5.00
Pyrene	2.40	3.30	2.30	1.30	1.10	1.10	2.10	1.90	2.40	2.10	1.80	2.50	2.30	2.60	2.40	2.20	3.10	2.40	3.20	3.20
Benz(a)anthracene	0.38	0.46	<0.18	0.88	0.33	0.24	0.34	<0.27	0.38	0.58	0.50	0.87	0.75	0.70	0.95	0.78	1.30	0.71	1.50	1.20
Chrysene	1.20	1.20	0.99	1.50	1.20	1.20	1.00	0.85	0.81	2.30	2.10	2.60	2.20	2.00	2.70	1.90	3.20	2.10	2.50	2.30
Benzofluoranthenes	0.81	0.95	0.85	1.20	1.00	0.48	0.41	0.42	0.88	1.70	1.70	1.80	1.60	1.60	1.70	1.60	1.90	1.70	1.90	2.10
Benzo(e)pyrene	0.46	0.40	0.33	0.45	0.43	0.31	<0.2	0.29	0.31	0.93	0.76	1.00	0.88	0.96	0.94	0.83	1.20	0.91	1.30	0.76
Benzo(a)pyrene	<0.22	<0.36	<0.23	<0.15	<0.14	<0.14	<0.3	<0.29	<0.23	<0.15	<0.14	0.60	<0.31	0.49	0.50	0.36	<1	0.40	<0.93	<0.11
Perylene	19.00	18.00	19.00	20.00	21.00	22.00	6.50	6.80	10.00	19.00	25.00	26.00	27.00	26.00	28.00	26.00	27.00	28.00	28.00	23.00
Dibenz(ah)anthracene	<0.4	<2.2	<0.55	<0.33	<0.36	<0.23	<0.53	<0.56	<0.24	<0.24	<0.18	<0.34	<0.71	<0.4	<0.4	<0.31	<0.98	<0.21	<0.68	<0.18
Ideno(1,2,3,cd)pyrene	0.48	<0.66	<0.36	0.48	0.39	0.41	<0.39	<0.39	<0.36	0.57	0.52	<0.77	1.20	<0.77	<0.73	<0.65	1.40	0.60	<0.5	0.42
Benzo(ghi)perylene	1.00	1.20	0.84	0.61	0.56	0.56	0.86	0.95	0.86	0.96	0.78	0.98	0.92	<0.81	0.80	0.77	1.30	0.81	1.20	0.91
% Surrogate Recovery																				
d8-Naphthalene	43	33	31	23	38	33	27	44	42	21	29	21	15	17	9	9	48	10	45	19
d10-Acenaphthene	59	44	41	43	51	54	47	59	53	36	42	47	37	46	32	39	61	29	66	35
d10-Phenanthrene	76	71	67	68	69	73	72	76	73	57	64	67	66	68	64	69	88	60	85	60
d10-Pyrene	87	86	83	79	81	81	88	86	87	76	79	81	86	80	85	89	96	81	93	80
d12-Chrysene	85	84	76	71	71	72	84	86	80	74	77	78	89	77	84	89	86	80	80	80
d12-Benzo(a)pyrene	91	93	92	85	91	88	93	92	94	78	84	83	99	84	89	96	105	86	98	89
d12-Perylene	90	96	93	88	92	87	93	94	96	80	86	82	96	84	88	95	109	84	99	91
d14-Dibenzo(ah)anthracene	63	75	69	71	75	69	66	65	67	68	75	70	91	71	75	87	76	69	63	77
d12-Benzo(ghi)perylene	92	100	94	92	99	93	95	91	92	88	99	83	100	82	87	98	98	82	90	102

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Lab reruns denoted by an"r" following the sample ID
Values are recovery corrected
94FRM1-5 are field splits of 94MBD1
94FRQ1-5 are field splits of 94QPG2
94FRT1-5 are field splits of 94THM1

Table 17 (continued)

Parameter	94QPG4	94LQN1	94LQN2	94LQN2d	94LQN3	94LQN4	94LCH1	94LCH4	94LCH5	94LCH6	94NEC1	94NEC2	94NEC4	94NEC6	94 NTH1	94 NTH2	94 NTH3	94 NTH5	94STH3	94STH5
Naphthalene	2.50	2.80	2.60	3.50	3.10	2.40	2.70	3.70	18.00	3.00	6.80	3.70	3.00	2.20	3.60	2.40	2.10	1.80	4.30	3.30
Acenaphthylene	<0.18	<0.31	<0.26	<0.26	<0.21	<0.31	<0.25	<0.12	<0.16	<0.18	<0.36	<0.11	<0.18	<0.12	<0.19	<0.23	<0.22	<0.15	<0.22	<0.11
Acenaphthene	<0.11	<0.62	<0.48	<0.71	<0.77	<0.38	<1	<0.35	0.41	0.43	<0.54	<0.16	<0.16	<0.17	<0.61	1.30	1.30	<0.4	<0.56	<0.53
Fluorene	1.20	1.60	1.50	1.90	2.10	1.40	0.82	1.20	1.70	1.30	1.60	0.69	0.34	0.48	<0.61	1.20	0.80	<0.32	2.20	1.10
Phenanthrene	6.30	5.10	4.60	4.30	5.60	6.10	3.80	5.90	14.00	6.00	10.00	5.00	2.70	3.00	2.60	6.00	3.10	1.20	10.00	3.60
Anthracene	0.94	0.39	0.24	0.23	0.30	0.24	<0.28	0.50	0.68	0.47	0.50	0.36	0.20	<0.2	<0.21	1.00	0.38	<0.21	1.60	<0.5
Fluoranthene	3.40	2.40	1.80	1.70	2.10	3.60	1.40	3.10	3.40	4.50	4.60	2.40	1.10	0.80	2.00	4.90	4.10	0.92	40.00	2.90
Pyrene	2.40	2.10	2.00	1.80	2.00	3.20	1.40	2.60	3.70	4.60	3.70	2.00	0.93	0.80	2.20	3.30	2.90	0.61	28.00	1.90
Benz(a)anthracene	0.72	<0.31	<0.41	<0.71	<0.61	<0.81	0.53	1.40	1.50	1.50	1.50	0.91	0.37	0.38	1.00	1.60	0.92	<0.13	15.00	0.52
Chrysene	2.60	2.10	1.90	1.60	2.10	3.20	1.10	3.00	3.30	2.50	3.90	2.10	1.40	1.50	1.00	5.10	1.50	0.48	21.00	1.10
Benzofluoranthenes	2.10	0.46	0.74	0.89	0.92	1.00	0.78	2.50	1.40	2.00	3.70	1.50	0.76	1.50	0.84	2.10	1.20	<0.44	19.00	1.40
Benzo(e)pyrene	0.98	<0.2	0.32	0.35	0.53	0.67	<0.39	1.30	0.74	1.30	2.20	0.92	0.55	0.85	0.47	0.73	0.46	<0.46	6.30	<0.44
Benzo(a)pyrene	<0.1	<0.28	<0.2	<0.2	<0.28	<0.37	<0.47	<0.75	<0.22	0.77	<0.85	<0.18	<0.2	<0.23	0.34	0.71	0.36	<0.54	6.30	<0.52
Perylene	43.00	11.00	28.00	27.00	25.00	24.00	12.00	12.00	19.00	12.00	31.00	22.00	9.90	8.00	6.80	19.00	2.50	3.90	33.00	6.80
Dibenz(ah)anthracene	<0.15	<0.24	<0.13	<0.13	<0.21	<0.29	<0.36	<0.29	<0.73	<0.22	<0.65	<0.3	<0.36	<0.45	<0.57	0.52	<0.24	<1.5	<1.2	<0.35
Ideno(1,2,3,cd)pyrene	0.45	0.56	0.52	0.50	0.51	0.76	<0.35	<0.63	0.86	0.75	<0.47	0.46	0.30	0.54	<0.47	0.94	<0.47	<0.33	3.10	1.60
Benzo(ghi)perylene	0.86	0.78	0.67	0.73	0.85	1.10	<0.53	1.30	1.70	1.70	2.00	0.54	0.40	0.40	0.96	0.75	<0.37	<0.3	3.00	1.90
% Surrogate Recovery																				
d8-Naphthalene	13	25	25	10	12	16	10	32	31	31	36	34	48	21	26	32	22	38	26	43
d10-Acenaphthene	32	34	39	26	28	41	22	43	48	50	62	57	56	51	48	70	52	48	51	59
d10-Phenanthrene	63	55	64	58	52	60	51	59	67	75	81	76	76	74	75	86	67	55	71	66
d10-Pyrene	78	80	90	88	79	79	74	73	88	89	84	94	92	92	90	92	73	67	72	65
d12-Chrysene	77	70	90	91	77	70	69	61	90	90	74	91	84	90	92	89	66	58	66	56
d12-Benzo(a)pyrene	86	78	114	114	90	88	84	76	93	100	95	101	94	95	99	99	71	68	74	67
d12-Perylene	87	74	115	116	90	89	62	56	94	100	95	98	93	93	97	98	70	50	56	49
d14-Dibenzo(ah)anthracene	77	46	88	84	60	55	53	50	71	97	78	98	90	80	65	92	61	38	77	51
d12-Benzo(ghi)perylene	98	61	101	97	75	71	69	68	90	120	104	105	98	85	99	104	74	57	101	73

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Lab reruns denoted by an"r" following the sample ID
Values are recovery corrected
94FRM1-5 are field splits of 94MBD1
94FRQ1-5 are field splits of 94QPG2
94FRT1-5 are field splits of 94THM1

Table 17 (continued)

Parameter	94STH6	94STH6d	94THM1	94FRT1	94FRT2	94FRT3	94FRT4	94FRT5	94THM2	94THM3	94THM4	94THM4d	94STK1A	94SRT3	94SRT3d	94CHN2	94QNL2	94HAR1	94HAR1d
Naphthalene	1.70	1.60	3.90	5.70	6.40	7.00	7.00	6.50	1.40	1.90	2.50	2.00	6.00	5.10	5.80	10.00	8.70	6.40	8.70
Acenaphthylene	<0.09	<0.12	<0.22	<0.1	<0.13	<0.14	<0.11	<0.08	1.30	0.31	<0.15	<0.16	2.00	<0.12	<0.14	<0.45	<0.12	0.77	0.84
Acenaphthene	<0.36	<0.39	<0.72	0.71	0.92	0.66	0.66	<0.63	<0.36	<0.65	0.87	0.60	2.10	<0.18	<0.36	<1.6	<0.41	<1.5	3.90
Fluorene	<0.2	<0.31	4.00	3.20	3.20	3.40	2.90	3.20	1.40	1.80	1.00	0.64	5.30	3.10	3.00	1.40	3.30	5.20	5.30
Phenanthrene	1.60	1.80	12.00	11.00	12.00	12.00	12.00	12.00	5.70	8.50	4.30	2.90	38.00	14.00	13.00	11.00	11.00	20.00	21.00
Anthracene	<0.23	<0.29	0.46	0.52	0.51	0.59	0.58	0.57	1.50	1.00	0.78	0.37	6.30	0.61	0.59	0.78	<0.46	2.30	2.60
Fluoranthene	1.30	1.90	3.60	3.90	4.10	4.40	3.70	4.00	21.00	12.00	3.90	3.40	73.00	3.50	4.30	6.00	1.70	24.00	26.00
Pyrene	0.94	1.40	2.70	4.00	4.20	4.20	3.80	3.90	22.00	9.50	3.90	3.60	68.00	3.60	4.50	5.10	3.00	23.00	30.00
Benz(a)anthracene	<0.28	0.53	1.40	2.40	2.60	2.30	1.90	2.20	21.00	4.30	2.30	2.00	34.00	2.00	2.20	1.00	0.59	9.50	10.00
Chrysene	0.58	1.20	4.10	3.90	4.20	3.60	4.00	4.10	41.00	6.50	2.30	1.80	59.00	6.40	6.80	3.30	3.60	17.00	20.00
Benzofluoranthenes	0.68	1.50	2.60	3.10	3.70	2.80	3.60	3.00	26.00	7.80	2.50	2.20	70.00	4.90	5.60	3.60	3.40	28.00	29.00
Benzo(e)pyrene	<0.36	<0.49	1.70	1.60	1.90	1.40	1.80	1.70	7.10	2.00	1.00	0.80	32.00	3.50	3.70	1.70	2.60	13.00	14.00
Benzo(a)pyrene	<0.43	<0.53	0.58	0.76	1.20	0.76	1.30	1.00	9.30	2.50	1.30	1.00	32.00	0.77	1.60	<1.4	0.78	16.00	17.00
Perylene	4.60	4.70	2.20	2.20	2.60	2.80	3.10	3.40	52.00	24.00	6.10	5.20	25.00	30.00	31.00	10.00	7.20	70.00	71.00
Dibenz(ah)anthracene	<0.27	<0.88	0.36	<0.42	<0.38	<0.15	1.00	<0.72	1.00	0.31	<0.37	<0.14	4.80	0.59	0.58	<1.2	0.60	1.60	1.80
Ideno(1,2,3,cd)pyrene	<0.46	<0.62	1.60	1.20	1.70	1.30	1.60	1.70	5.60	2.80	1.30	1.00	24.00	1.20	1.40	<0.68	0.77	13.00	13.00
Benzo(ghi)perylene	<0.53	<0.54	1.80	1.90	2.30	1.80	2.60	2.70	4.50	3.10	1.50	1.30	27.00	2.30	2.50	2.50	3.40	14.00	16.00
% Surrogate Recovery																			
d8-Naphthalene	13	28	19	10	44	49	41	76	10	35	27	59	46	26	25	33	19	40	32
d10-Acenaphthene	47	49	44	38	55	71	64	91	38	50	35	61	49	51	50	57	33	71	68
d10-Phenanthrene	75	70	65	72	75	88	85	89	72	66	57	84	74	76	76	81	60	92	90
d10-Pyrene	82	82	84	95	80	91	87	81	95	85	75	93	91	94	92	94	90	96	94
d12-Chrysene	73	67	74	93	69	77	78	57	93	83	69	85	86	90	92	84	79	84	76
d12-Benzo(a)pyrene	91	93	90	111	79	92	89	75	111	102	87	96	97	98	96	105	88	99	99
d12-Perylene	67	67	65	111	78	90	89	73	111	105	87	96	96	95	92	107	89	99	100
d14-Dibenzo(ah)anthracene	69	74	57	86	56	69	76	46	86	78	61	68	70	95	91	84	64	81	83
d12-Benzo(ghi)perylene	93	95	82	101	67	81	86	56	101	96	73	81	80	99	97	106	78	95	99

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Lab reruns denoted by an"r" following the sample ID
Values are recovery corrected
94FRM1-5 are field splits of 94MBD1
94FRQ1-5 are field splits of 94QPG2
94FRT1-5 are field splits of 94THM1

Table 18. PAH Concentrations in Bed Sediments from Individual Sampling Sites in 1995

Parameter	95MBD1	95MBD1d	95MBD2	95MBD3	95MBD4	95QPG1	95QPG2	95QPG3	95QPG4	95LQN1	95LQN2	95LQN2d	95LQN3	95LQN4	95LCH1	95LCH4	95LCH5	95LCH6
Naphthalene	0.91	0.80	0.65	0.75	0.68	1.50	0.83	0.95	2.20	22.00	0.99	1.00	1.20	1.30	1.80	2.30	2.30	3.10
Acenaphthylene	<0.26	<0.32	<0.21	<0.21	<0.14	<0.48	<0.26	<0.16	<0.18	<0.24	<0.17	<0.1	<0.15	0.25	<0.13	0.12	<0.14	0.46
Acenaphthene	<0.42	<0.39	<0.3	<0.38	<0.31	<0.58	<0.4	0.47	0.57	1.00	0.29	0.26	0.99	0.52	0.38	0.43	0.36	0.68
Fluorene	0.36	0.32	0.32	<0.18	0.31	0.77	0.30	0.90	1.20	1.00	0.51	0.60	0.55	0.79	0.42	1.20	1.10	1.60
Phenanthrene	2.90	2.00	1.70	0.94	1.50	4.50	2.20	6.10	11.00	6.40	2.10	3.00	2.70	5.00	4.10	4.80	4.70	7.00
Anthracene	<0.28	<0.14	<0.11	<0.14	<0.12	0.48	0.26	0.42	0.93	0.37	0.29	0.34	0.33	1.30	<0.05	0.58	0.34	1.20
Fluoranthene	2.60	1.40	0.86	0.70	1.60	3.10	1.80	7.60	15.00	3.10	1.70	1.70	1.70	4.60	2.40	3.10	2.30	6.70
Pyrene	1.90	1.00	0.58	0.64	1.20	2.20	1.50	4.80	9.00	2.80	1.50	1.90	1.40	4.30	2.10	2.50	1.90	6.10
Benz(a)anthracene	0.82	0.44	<0.11	<0.13	0.44	1.00	0.45	1.20	3.00	0.68	0.39	0.30	0.42	1.00	0.48	0.69	0.41	2.40
Chrysene	1.40	0.95	0.24	0.36	0.88	2.50	1.20	2.80	8.20	2.20	1.20	1.20	1.40	2.80	1.90	2.30	1.70	4.10
Benzofluoranthenes	1.20	<0.55	<0.38	<0.44	<0.5	1.80	0.67	1.60	4.70	1.40	0.80	0.77	0.77	2.20	1.30	1.30	0.88	3.60
Benzo(e)pyrene	<0.68	<0.6	<0.41	<0.49	<0.55	1.10	<0.55	0.66	2.00	0.85	0.57	0.37	0.37	1.20	0.68	0.94	0.62	1.80
Benzo(a)pyrene	<1	<0.88	<0.61	<0.72	<0.81	<1.3	<0.81	<0.82	1.30	<0.22	<0.17	<0.2	<0.25	0.60	0.34	0.35	<0.2	1.20
Perylene	22.00	22.00	3.60	3.80	22.00	18.00	9.60	12.00	21.00	25.00	16.00	17.00	15.00	25.00	12.00	10.00	9.10	12.00
Dibenz(ah)anthracene	0.63	<0.94	<0.38	<0.51	<1	<1.1	<0.7	<1	<0.37	<0.36	<0.26	<0.82	<0.41	<0.76	<0.25	<0.27	<0.34	<0.3
Indeno(1,2,3-cd)pyrene	<0.69	<1.1	<0.46	<1	<0.48	<0.97	<0.37	<0.83	<1.3	<0.6	<0.37	<0.43	<0.85	0.93	0.46	0.69	<0.31	1.80
Benzo(ghi)perylene	<0.59	<0.98	<0.39	<0.91	<0.41	<0.83	<0.37	<0.72	1.30	<1	<0.62	<0.54	<0.7	1.20	0.86	1.20	0.76	2.10
C1 naphthalenes	0.98	1.10	0.49	<0.22	1.20	1.60	0.92	1.50	2.70	5.80	1.60	1.70	1.40	1.90	3.10	3.00	2.90	4.30
C2 naphthalenes	<0.29	<0.27	<0.2	<0.2	1.50	3.50	1.60	<0.28	3.60	3.40	1.90	2.00	2.00	3.00	3.50	3.30	2.80	3.60
C3 naphthalenes	<0.27	<0.3	<0.18	<0.22	1.80	3.80	1.90	1.70	4.40	3.30	2.10	2.30	2.10	3.10	2.80	2.60	2.60	3.90
C4 naphthalenes	<0.3	<0.29	<0.22	<0.27	<0.23	<0.41	<0.29	<0.29	<0.24	<0.15	<0.12	<0.14	<0.18	<0.15	1.60	0.74	<0.12	<0.1
C1 phen,anth	3.50	3.10	<0.27	<0.25	2.50	7.10	3.40	3.50	9.60	12.00	4.00	4.30	4.20	7.30	5.00	5.50	4.60	7.40
C2 phen,anth	2.90	1.90	<0.24	<0.28	2.30	8.90	2.60	1.80	13.00	9.80	3.10	3.50	5.80	11.00	6.80	6.80	6.80	9.10
C3 phen,anth	0.91	0.82	<0.35	<0.3	1.90	2.80	3.20	0.98	9.20	2.40	2.40	2.40	1.40	7.40	<0.18	3.00	1.80	3.50
C4 phen,anth	17.00	23.00	8.20	6.00	450.00	28.00	27.00	33.00	30.00	150.00	19.00	22.00	22.00	28.00	27.00	20.00	25.00	27.00
Retene	17.00	23.00	8.20	6.00	450.00	28.00	27.00	33.00	30.00	150.00	19.00	22.00	22.00	28.00	27.00	20.00	25.00	27.00
Dibenzothiophene	<0.16	<0.14	<0.11	<0.13	<0.12	<0.2	<0.13	0.40	0.71	<0.07	<0.06	<0.08	<0.08	<0.07	0.21	0.20	0.22	0.45
C1 dibenzothiophene	<0.24	<0.12	<0.12	<0.15	<0.1	<0.23	<0.2	<0.13	0.52	0.92	<0.1	<0.12	<0.17	<0.26	<0.1	<0.08	<0.06	<0.09
C2 dibenzothiophene	<0.19	<0.1	<0.08	<0.15	<0.09	<0.35	<0.2	<0.11	0.58	<0.13	<0.09	<0.1	<0.11	<0.3	<0.08	<0.18	<0.07	0.27
% Surrogate Recovery																		
Naphthalene d-8	71	70	76	67	85	71	63	77	34	54	56	56	34	56	50	59	47	10
Acenaphthene d-10	70	70	76	69	85	74	67	79	37	60	57	59	43	61	61	72	58	46
Phenanthrene d-10	71	76	81	74	88	79	79	83	50	73	62	69	54	74	65	72	64	68
Pyrene d-10	74	75	83	78	85	78	81	86	58	73	66	70	59	74	74	97	76	84
Chrysene d-12	62	64	77	74	73	59	70	80	60	58	61	62	47	59	63	97	64	83
Benzo(a)pyrene d-12	84	89	97	93	94	87	95	91	61	78	74	76	57	81	76	100	66	98
Perylene-d12	75	80	89	85	84	79	86	87	55	71	66	69	51	74	71	94	59	83
Dibenz(ah)anthracene d-14	68	76	74	68	74	74	83	75	64	65	61	65	43	68	54	75	39	84
Benzo(ghi)perylene d-12	71	77	75	72	78	78	83	77	62	66	61	67	43	67	62	78	43	78
2-Methylnaphthalene d-10	61	61	67	61	74	62	56	68	31	50	51	52	34	51	52	61	48	21

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected
95FRN1and 95FRN2 are field splits of 95NAR1

Table 18 (continued)

Parameter	95LCH6d	95NEC1	95NEC2	95NEC4	95NEC6	95NTH1	95NTH2	95NTH3	95NTH3d	95NTH5	95STH3	95STH5	95STH6	95STH6d	95THM1	95THM2	95THM3	95THM4
Naphthalene	5.00	2.40	1.30	1.60	2.40	1.30	1.00	<0.54	<0.44	0.78	2.90	1.80	1.70	1.80	7.00	2.00	1.40	1.70
Acenaphthylene	0.44	<0.29	<0.21	<0.15	<0.13	0.23	<0.15	<0.09	<0.1	<0.12	<0.2	<0.15	<0.18	<0.16	<0.13	0.57	0.27	0.39
Acenaphthene	<0.27	0.62	0.40	0.13	0.56	0.16	0.13	<0.1	<0.08	<0.08	0.54	0.23	0.40	0.25	0.44	0.34	1.10	0.68
Fluorene	1.00	2.30	0.94	0.47	0.65	0.36	0.31	0.12	<0.07	0.16	1.80	0.66	0.55	0.31	4.00	0.89	1.40	1.10
Phenanthrene	5.30	8.50	4.30	5.30	2.10	2.00	3.20	0.90	0.85	1.70	6.80	2.60	2.20	2.30	13.00	5.40	11.00	8.20
Anthracene	0.64	0.50	0.21	0.09	<0.19	<0.06	<0.08	<0.08	<0.06	<0.06	0.27	<0.04	0.19	0.15	0.25	0.44	1.30	0.61
Fluoranthene	3.10	5.40	2.30	3.00	1.10	2.10	1.80	0.77	1.20	1.30	6.80	2.00	2.60	2.20	3.00	7.40	14.00	16.00
Pyrene	2.90	3.20	1.60	2.40	0.75	1.10	1.20	0.55	0.72	1.00	4.70	1.10	1.60	1.60	2.30	5.80	11.00	12.00
Benz(a)anthracene	1.30	1.30	0.60	0.31	0.18	0.48	0.41	0.13	0.21	0.34	1.50	0.44	0.34	0.46	1.40	2.00	3.60	3.50
Chrysene	2.60	4.80	2.10	1.70	0.93	1.20	1.20	0.32	0.68	1.10	4.20	1.20	1.20	1.10	3.90	4.20	7.20	8.30
Benzofluoranthenes	2.30	3.00	1.20	1.10	0.24	0.78	0.73	<0.19	0.24	1.10	4.10	0.66	0.81	0.26	2.00	5.00	7.20	10.00
Benzo(e)pyrene	1.30	1.80	0.75	0.47	0.35	0.54	0.63	<0.18	<0.15	0.55	1.90	0.55	0.56	0.48	1.90	2.30	4.10	4.60
Benzo(a)pyrene	0.97	<0.36	<0.22	<0.23	<0.31	<0.17	0.43	<0.25	<0.2	0.38	1.10	<0.1	0.48	<0.18	0.70	2.40	4.90	4.60
Perylene	12.00	48.00	18.00	10.00	5.70	16.00	21.00	1.70	1.80	5.70	15.00	2.40	8.10	8.80	1.40	61.00	20.00	32.00
Dibenz(ah)anthracene	<0.22	<1.6	<0.35	<0.34	<0.72	<0.22	<0.23	<0.22	<0.17	<0.17	<0.22	<0.13	<0.29	<0.27	0.64	<0.39	0.42	0.54
Indeno(1,2,3-cd)pyrene	0.87	<1.4	<0.56	<0.6	<0.29	0.61	0.69	<0.2	<0.15	0.67	1.80	0.58	0.59	0.50	1.40	3.10	4.90	5.40
Benzo(ghi)perylene	1.60	1.80	<0.77	<0.43	<0.25	0.40	0.41	<0.15	<0.1	0.46	2.20	0.54	0.51	0.36	1.60	2.80	4.10	4.40
C1 naphthalenes	3.90	6.50	3.10	2.20	2.00	1.40	1.20	<0.57	<0.3	0.75	13.00	3.00	0.64	0.60	35.00	3.60	3.20	2.80
C2 naphthalenes	6.30	12.00	6.20	3.80	<0.72	1.10	0.73	<0.13	<0.11	0.20	16.00	5.70	1.80	2.20	41.00	3.50	4.20	4.10
C3 naphthalenes	3.10	9.00	5.30	2.80	1.80	1.60	0.49	0.55	0.40	0.54	11.00	3.00	0.79	1.30	24.00	3.90	3.00	1.20
C4 naphthalenes	<0.26	<0.23	<0.13	<0.12	<0.86	<0.16	<0.16	<0.14	<0.12	<0.12	<0.24	<0.11	<0.15	<0.16	7.00	<0.24	<0.14	<0.18
C1 phen,anth	7.60	13.00	6.10	6.40	2.00	1.90	<0.1	<0.09	<0.12	1.80	15.00	3.40	<0.61	<0.58	38.00	6.70	6.60	6.20
C2 phen,anth	8.80	18.00	10.00	8.50	2.20	2.40	0.65	<0.12	<0.11	2.10	17.00	5.80	5.10	3.40	39.00	9.60	6.60	10.00
C3 phen,anth	4.40	<0.21	<0.12	2.20	<0.44	<0.1	<0.14	<0.19	<0.12	<0.11	7.10	<0.42	<0.18	<0.28	18.00	<0.48	3.50	5.00
C4 phen,anth	24.00	150.00	46.00	6.50	12.00	22.00	21.00	0.44	0.58	12.00	17.00	6.40	210.00	57.00	6.60	22.00	12.00	130.00
Retene	24.00	150.00	46.00	6.50	12.00	22.00	21.00	0.44	0.58	12.00	17.00	6.40	210.00	57.00	6.60	22.00	12.00	130.00
Dibenzothiophene	0.35	0.52	<0.06	<0.06	<0.39	<0.07	<0.09	<0.08	<0.07	<0.07	0.46	<0.05	<0.08	<0.1	0.78	0.30	0.50	0.39
C1 dibenzothiophene	0.51	0.89	0.44	0.42	<0.2	<0.08	<0.07	<0.06	<0.04	0.20	0.99	<0.05	<0.08	<0.08	1.60	0.22	0.45	0.56
C2 dibenzothiophene	1.10	<0.2	<0.05	<0.12	<0.16	<0.03	<0.04	<0.03	<0.03	<0.03	0.39	<0.06	<0.1	<0.11	0.96	<0.04	0.21	0.16
% Surrogate Recovery																		
Naphthalene d-8	10	35	39	52	48	31	33	41	43	48	34	31	25	35	34	23	46	34
Acenaphthene d-10	27	45	57	59	55	35	47	49	53	54	44	55	44	56	46	33	51	38
Phenanthrene d-10	43	60	70	66	70	57	58	59	64	68	63	78	62	61	63	56	63	59
Pyrene d-10	51	57	69	68	70	74	74	74	76	79	80	87	76	64	79	73	79	75
Chrysene d-12	53	42	52	49	58	74	68	69	74	75	73	87	70	59	77	63	81	72
Benzo(a)pyrene d-12	59	71	85	72	80	81	83	82	91	88	92	105	86	75	93	77	91	88
Perylene-d12	55	62	73	63	70	73	75	75	83	81	86	96	78	69	85	71	83	79
Dibenz(ah)anthracene d-14	59	62	69	56	70	64	57	54	63	79	86	79	68	65	84	60	84	75
Benzo(ghi)perylene d-12	56	85	74	56	73	60	59	56	66	79	85	79	71	68	80	65	80	74
2-Methylnaphthalene d-10	12	35	41	49	45	28	35	38	40	44	33	36	29	41	34	23	44	31

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected
95FRN1and 95FRN2 are field splits of 95NAR1

Table 18 (continued)

Parameter	95MAN1	95MAN2	95MAN3	95MAN4	95NAR1	95FRN1	95FRN2	95NAR2	95NAR3	95NAR3d	95NAR4	95STK1A	95SRT3	95CHN2	95QNL2	95HAR1
Naphthalene	7.80	2.70	6.20	5.40	14.00	17.00	18.00	18.00	23.00	17.00	10.00	7.70	1.70	1.70	5.40	1.60
Acenaphthylene	2.80	0.53	1.80	1.40	3.60	3.90	4.10	6.60	5.30	4.80	2.60	1.40	<0.22	<0.32	<0.22	0.86
Acenaphthene	3.50	0.85	4.20	3.20	8.50	5.30	5.50	16.00	14.00	12.00	2.10	1.70	<0.36	<0.47	0.20	0.62
Fluorene	7.50	3.00	7.00	7.40	18.00	12.00	12.00	30.00	22.00	22.00	5.20	5.60	1.10	0.49	2.50	1.50
Phenanthrene	24.00	6.50	24.00	29.00	45.00	45.00	47.00	93.00	61.00	66.00	27.00	38.00	5.80	3.60	8.50	8.00
Anthracene	3.60	0.94	3.10	2.60	7.00	9.90	10.00	16.00	12.00	12.00	4.00	8.20	<0.14	0.28	0.17	0.48
Fluoranthene	30.00	6.90	55.00	38.00	75.00	69.00	73.00	130.00	99.00	100.00	39.00	85.00	1.20	1.30	1.80	9.30
Pyrene	28.00	6.50	45.00	31.00	66.00	62.00	64.00	130.00	95.00	100.00	36.00	71.00	1.30	1.70	2.60	10.00
Benz(a)anthracene	11.00	2.00	10.00	9.30	22.00	28.00	29.00	46.00	37.00	41.00	16.00	31.00	0.40	0.78	0.63	3.60
Chrysene	17.00	4.40	15.00	17.00	41.00	42.00	39.00	74.00	64.00	72.00	28.00	53.00	3.80	1.70	3.60	7.50
Benzofluoranthenes	21.00	4.30	16.00	22.00	58.00	52.00	50.00	88.00	78.00	87.00	36.00	69.00	2.10	1.20	2.70	9.20
Benzo(e)pyrene	8.90	1.90	6.90	8.70	22.00	20.00	19.00	32.00	31.00	34.00	14.00	29.00	1.10	<0.86	1.50	5.40
Benzo(a)pyrene	9.90	0.61	8.50	12.00	2.90	19.00	18.00	50.00	48.00	54.00	13.00	35.00	<0.85	<1.3	<0.3	6.70
Perylene	41.00	34.00	35.00	48.00	46.00	50.00	49.00	55.00	49.00	51.00	41.00	30.00	15.00	4.90	6.20	12.00
Dibenz(ah)anthracene	0.88	<0.39	0.64	0.86	2.60	3.70	3.00	3.40	4.20	4.00	2.30	5.70	<0.84	<0.88	<0.22	<0.37
Indeno(1,2,3-cd)pyrene	7.10	1.70	6.20	8.50	16.00	19.00	20.00	28.00	29.00	33.00	15.00	31.00	<0.48	<1.2	<0.58	5.50
Benzo(ghi)perylene	8.30	2.00	6.10	8.50	19.00	20.00	20.00	30.00	31.00	33.00	17.00	31.00	0.58	<1	2.60	5.90
C1 naphthalenes	10.00	4.10	7.60	7.40	19.00	19.00	19.00	26.00	22.00	20.00	9.00	18.00	4.20	2.00	13.00	4.00
C2 naphthalenes	9.00	4.30	6.70	6.90	19.00	25.00	24.00	26.00	16.00	14.00	14.00	27.00	4.80	3.20	11.00	4.70
C3 naphthalenes	10.00	4.20	7.80	7.40	32.00	28.00	33.00	37.00	15.00	15.00	8.70	22.00	3.10	2.00	5.70	3.60
C4 naphthalenes	2.60	<0.09	4.20	<0.15	31.00	34.00	51.00	38.00	7.90	8.70	<0.32	9.60	<0.26	<0.34	<0.11	<0.1
C1 phen,anth	25.00	7.10	29.00	19.00	53.00	66.00	71.00	90.00	45.00	46.00	25.00	39.00	7.10	5.90	12.00	7.20
C2 phen,anth	23.00	7.80	28.00	18.00	110.00	110.00	110.00	150.00	62.00	59.00	31.00	61.00	7.40	7.10	11.00	8.00
C3 phen,anth	20.00	3.90	16.00	11.00	89.00	90.00	92.00	170.00	57.00	49.00	28.00	43.00	2.00	2.10	3.10	1.00
C4 phen,anth	58.00	11.00	280.00	44.00	160.00	150.00	170.00	260.00	160.00	140.00	74.00	54.00	20.00	12.00	1.80	9.10
Retene	54.00	11.00	280.00	44.00	120.00	120.00	130.00	200.00	130.00	110.00	64.00	43.00	20.00	12.00	1.80	9.10
Dibenzothiophene	1.50	0.50	1.40	1.60	3.40	4.00	4.20	6.60	4.00	4.10	1.70	2.20	0.52	<0.18	0.82	0.72
C1 dibenzothiophene	1.60	0.53	1.60	1.10	3.70	5.10	5.80	6.80	3.20	3.30	2.30	3.30	0.29	<0.26	0.70	0.43
C2 dibenzothiophene	2.80	0.30	2.50	1.20	8.70	14.00	17.00	16.00	6.80	6.20	4.80	10.00	<0.09	<0.4	0.26	<0.06
% Surrogate Recovery																
Naphthalene d-8	25	45	46	29	40	19	18	52	42	12	16	10	55	76	72	45
Acenaphthene d-10	49	60	64	47	71	34	29	67	50	55	29	23	54	77	73	65
Phenanthrene d-10	68	77	78	68	88	51	45	80	72	78	47	44	57	77	74	83
Pyrene d-10	96	93	90	89	91	56	53	94	93	93	53	52	59	72	77	97
Chrysene d-12	98	90	99	92	79	47	51	90	94	89	51	56	50	60	74	89
Benzo(a)pyrene d-12	99	91	97	93	77	59	55	94	96	95	59	59	88	89	82	92
Perylene-d12	92	82	90	88	78	56	52	87	88	88	57	55	82	80	75	82
Dibenz(ah)anthracene d-14	94	70	95	89	59	63	51	87	96	97	64	65	75	77	66	70
Benzo(ghi)perylene d-12	88	75	88	85	54	62	49	84	91	94	62	60	74	79	65	76
2-Methylnaphthalene d-10	32	45	47	32	46	21	19	54	41	25	18	11	47	68	64	48

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected
95FRN1and 95FRN2 are field splits of 95NAR1

Table 19. PAH Concentrations in Bed Sediments from Individual Sampling Sites in 1996

Parameter	96LCH1	96LCH4	96LCH5	96LCH6	96MAN1	96MAN1d	96MAN2	96MAN3	96MAN4	96NAR1	96NAR1A	96NAR1B	96NAR1C	96NAR1D	96NAR1E	96NAR2	96NAR3	96NAR3d	96NAR4
Naphthalene	1.90	1.40	2.00	1.20	5.00	5.30	2.00	7.80	5.30	12.00	14.00	17.00	14.00	15.00	15.00	19.00	17.00	11.00	8.30
Acenaphthylene	<0.09	<0.19	<0.14	<0.18	1.00	1.60	0.34	1.60	0.56	1.90	1.20	1.90	1.00	2.00	1.20	4.00	1.70	1.30	0.83
Acenaphthene	<0.35	<0.38	<0.36	<0.39	1.60	1.70	<0.42	2.30	3.60	4.20	6.80	8.20	5.60	7.20	4.90	17.00	13.00	6.20	2.70
Fluorene	1.00	0.65	0.49	0.62	4.00	4.20	1.60	5.10	7.30	10.00	12.00	13.00	11.00	13.00	13.00	25.00	13.00	9.20	6.80
Phenanthrene	4.20	2.70	3.20	2.20	16.00	20.00	5.80	20.00	54.00	38.00	42.00	44.00	33.00	45.00	44.00	90.00	40.00	26.00	25.00
Anthracene	0.28	0.27	0.20	0.08	2.80	2.80	0.72	2.40	5.30	7.00	6.70	7.10	5.20	8.80	7.70	18.00	6.70	5.20	3.30
Fluoranthene	3.00	2.50	3.00	0.78	20.00	25.00	6.30	24.00	100.00	62.00	64.00	69.00	55.00	82.00	79.00	170.00	50.00	49.00	39.00
Pyrene	3.00	2.40	3.30	0.91	16.00	20.00	5.60	21.00	79.00	49.00	54.00	60.00	48.00	62.00	57.00	140.00	42.00	42.00	34.00
Benz(a)anthracene	1.10	0.71	1.50	0.18	7.10	8.60	1.60	6.70	29.00	19.00	23.00	25.00	20.00	28.00	26.00	54.00	18.00	18.00	13.00
Chrysene	2.40	1.50	2.70	0.70	18.00	13.00	3.60	12.00	51.00	32.00	34.00	38.00	27.00	45.00	40.00	87.00	30.00	24.00	23.00
Benzofluoranthenes	2.60	1.40	1.60	0.36	15.00	16.00	3.40	13.00	66.00	38.00	42.00	47.00	34.00	50.00	46.00	100.00	45.00	32.00	28.00
Benzo(e)pyrene	1.10	0.73	0.84	0.26	6.40	7.30	1.40	6.00	26.00	16.00	20.00	20.00	15.00	23.00	20.00	45.00	18.00	15.00	13.00
Benzo(a)pyrene	1.10	0.62	0.88	<0.16	6.10	7.70	1.40	6.00	38.00	20.00	20.00	20.00	16.00	26.00	21.00	51.00	17.00	17.00	13.00
Perylene	18.00	5.10	12.00	3.20	33.00	33.00	26.00	51.00	36.00	38.00	40.00	46.00	37.00	44.00	43.00	62.00	26.00	25.00	79.00
Dibenz(ah)anthracene	0.20	0.12	<0.16	<0.1	0.77	1.10	<0.22	0.80	4.90	2.50	2.50	<3	<3.5	3.50	3.30	6.40	2.60	2.10	<2.2
Indeno(1,2,3-cd)pyrene	0.91	0.71	0.50	0.16	4.60	5.70	1.40	4.30	27.00	17.00	15.00	16.00	12.00	18.00	16.00	37.00	14.00	12.00	12.00
Benzo(ghi)perylene	1.50	0.98	0.91	0.39	6.30	7.00	2.00	6.10	28.00	15.00	17.00	19.00	14.00	21.00	19.00	42.00	15.00	14.00	14.00
C1 naphthalenes	4.10	1.70	4.20	2.20	8.20	8.20	3.00	8.20	7.70	17.00	18.00	21.00	18.00	18.00	18.00	28.00	24.00	11.00	11.00
C2 naphthalenes	3.60	<0.66	2.90	1.20	7.40	9.00	1.20	7.90	8.00	30.00	24.00	24.00	22.00	24.00	22.00	41.00	20.00	9.70	12.00
C3 naphthalenes	2.90	2.80	2.10	2.00	6.80	4.40	2.30	8.90	3.30	33.00	31.00	30.00	30.00	34.00	38.00	79.00	10.00	9.60	13.00
C4 naphthalenes	<0.73	<0.79	<0.77	<0.81	<1	<1	<0.86	4.60	<0.8	42.00	24.00	27.00	21.00	24.00	31.00	100.00	<0.84	<0.83	<1
C1 phen,anth	5.10	3.80	3.90	2.50	15.00	16.00	5.50	17.00	27.00	54.00	66.00	74.00	60.00	56.00	63.00	110.00	23.00	18.00	23.00
C2 phen,anth	7.90	3.20	7.60	2.70	24.00	24.00	9.20	30.00	41.00	99.00	100.00	100.00	89.00	130.00	120.00	310.00	37.00	30.00	40.00
C3 phen,anth	<0.11	2.10	<0.12	<0.34	12.00	10.00	3.00	21.00	24.00	100.00	99.00	91.00	74.00	130.00	99.00	280.00	24.00	22.00	27.00
C4 phen,anth	65.00	12.00	40.00	8.20	26.00	23.00	13.00	110.00	76.00	140.00	90.00	100.00	97.00	97.00	120.00	310.00	32.00	68.00	93.00
Retene	65.00	12.00	40.00	8.20	26.00	23.00	13.00	110.00	76.00	95.00	90.00	100.00	97.00	97.00	120.00	310.00	32.00	68.00	93.00
Dibenzothiophene	<0.36	<0.38	<0.38	<0.38	1.20	1.30	0.48	1.50	3.00	3.40	4.00	3.90	3.40	3.90	4.20	7.80	3.40	2.20	1.60
C1 dibenzothiophene	0.42	<0.11	0.44	<0.1	1.60	1.60	0.48	2.60	2.20	5.80	6.00	6.20	4.60	6.70	7.20	16.00	2.50	2.20	2.50
C2 dibenzothiophene	0.29	0.06	<0.05	<0.06	2.20	2.50	0.72	2.40	3.60	16.00	15.00	18.00	10.00	18.00	14.00	36.00	2.20	3.20	4.30
% Surrogate Recovery																			
Naphthalene d-8	73	64	69	65	63	75	71	73	70	24	39	34	43	41	35	48	62	55	53
Acenaphthene d-10	81	73	77	74	76	81	80	76	80	39	52	45	58	66	54	58	78	68	69
Phenanthrene d-10	89	82	82	86	84	85	89	83	88	64	68	52	74	81	71	67	90	92	83
Pyrene d-10	92	87	85	91	89	89	92	85	91	70	70	52	66	72	66	58	88	87	75
Chrysene d-12	85	85	73	94	74	74	81	67	76	73	48	37	45	49	44	40	65	73	52
Benzo(a)pyrene d-12	110	99	82	110	97	100	100	91	100	79	62	50	63	79	70	66	91	97	75
Perylene-d12	96	89	72	99	88	92	94	82	94	77	60	48	60	72	66	61	83	89	68
Dibenz(ah)anthracene d-14	79	74	55	86	71	75	83	65	78	72	45	42	52	65	57	61	80	78	56
Benzo(ghi)perylene d-12	79	72	57	82	72	77	81	70	82	59	47	42	54	70	61	62	81	79	57
2-Methylnaphthalene d-10	66	60	63	59	62	69	66	66	66	26	39	36	44	46	37	48	63	52	54

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected
96NAR1A-E are QA/QC grab samples taken at the 96NAR1 site

Table 20. PCB Congener Concentrations in Bed Sediments from Individual Sampling Sites in 1994

Parameter	94MBD1	94FRM1	94FRM2	94FRM3	94FRM4	94FRM5	94MBD2	94MBD2d	94MBD3	94MBD4	94QPG1	94QPG2	94FRQ1	94FRQ2	94FRQ3	94FRQ4	94FRQ5	94LQN2	94LCH1
8/5	<0.02	<0.14	<0.1	<0.04	<0.11	<0.13	<0.11	<0.12	<0.22	<0.08	<0.22	<0.04	<0.05	<0.06	<0.24	<0.25	<0.18	<0.11	<0.03
15	<0.02	<0.14	<0.1	<0.04	<0.11	<0.13	<0.11	<0.12	<0.22	<0.08	<0.22	<0.04	<0.05	<0.06	<0.24	<0.25	<0.18	<0.11	<0.03
19	<0.02	<0.19	<0.03	<0.03	<0.08	<0.1	<0.09	<0.09	<0.21	<0.13	<0.28	<0.02	<0.02	<0.01	<0.42	<0.43	<0.25	<0.2	<0.02
18	<0.02	<0.19	<0.03	<0.03	<0.08	<0.1	<0.09	<0.09	<0.21	<0.13	<0.28	<0.02	<0.02	<0.01	<0.42	<0.43	<0.25	<0.2	<0.02
17	<0.02	<0.19	<0.03	<0.03	<0.08	<0.1	<0.09	<0.09	<0.21	<0.13	<0.28	<0.02	<0.02	<0.01	<0.42	<0.43	<0.25	<0.2	<0.02
24/27	<0.02	<0.19	<0.03	<0.03	<0.08	<0.1	<0.09	<0.09	<0.21	<0.13	<0.28	<0.02	<0.02	<0.01	<0.42	<0.43	<0.25	<0.2	<0.02
16/32	<0.02	<0.19	<0.03	<0.03	<0.08	<0.1	<0.09	<0.09	<0.21	<0.13	<0.28	<0.02	<0.02	<0.01	<0.42	<0.43	<0.25	<0.2	<0.02
26	<0.02	<0.13	<0.02	<0.02	<0.06	<0.07	<0.06	<0.06	<0.15	<0.09	<0.19	<0.01	<0.02	<0.007	<0.26	<0.27	<0.16	<0.13	<0.02
25	<0.02	<0.13	<0.02	<0.02	<0.06	<0.07	<0.06	<0.06	<0.15	<0.09	<0.19	<0.01	<0.02	<0.007	<0.26	<0.27	<0.16	<0.13	<0.02
31/28	<0.02	<0.13	0.120	<0.02	<0.06	<0.07	0.150	<0.06	<0.15	<0.09	<0.19	<0.01	<0.02	<0.01	<0.26	<0.27	<0.16	<0.13	<0.02
33	<0.02	<0.13	<0.02	<0.02	<0.06	<0.07	<0.06	<0.06	<0.15	<0.09	<0.19	<0.01	<0.02	<0.009	<0.26	<0.27	<0.16	<0.13	<0.02
22	<0.02	<0.13	<0.02	<0.02	<0.06	<0.07	<0.06	<0.06	<0.15	<0.09	<0.19	<0.01	<0.02	<0.007	<0.26	<0.27	<0.16	<0.13	<0.01
45	<0.02	<0.17	<0.03	<0.03	<0.08	<0.1	<0.1	<0.09	<0.17	<0.09	<0.36	<0.005	<0.004	<0.005	<0.22	<0.22	<0.18	<0.1	<0.03
46	<0.02	<0.17	<0.03	<0.03	<0.08	<0.1	<0.1	<0.09	<0.17	<0.09	<0.36	<0.005	<0.004	<0.005	<0.22	<0.22	<0.18	<0.1	<0.03
52	<0.02	<0.17	<0.03	<0.03	<0.08	<0.1	<0.1	<0.09	<0.17	<0.09	<0.36	0.008	0.010	<0.009	<0.22	<0.22	<0.18	<0.1	<0.03
49	<0.02	<0.17	<0.03	<0.03	<0.08	<0.1	<0.1	<0.09	<0.17	<0.1	<0.36	<0.005	0.008	<0.008	<0.23	<0.23	<0.18	<0.1	<0.04
47/48	<0.02	<0.17	<0.03	<0.03	<0.08	<0.1	<0.1	<0.09	<0.17	<0.1	<0.36	0.005	<0.004	<0.006	<0.23	<0.23	<0.18	<0.1	<0.04
44	<0.02	<0.21	<0.03	<0.04	<0.1	<0.12	<0.12	<0.12	<0.21	<0.11	<0.46	0.006	0.007	<0.02	<0.26	<0.27	<0.21	<0.11	<0.04
42	<0.02	<0.21	<0.03	<0.04	<0.1	<0.12	<0.12	<0.12	<0.21	<0.11	<0.46	<0.006	<0.005	<0.007	<0.26	<0.27	<0.21	<0.11	<0.04
41/71/64	<0.02	<0.21	<0.03	<0.04	<0.1	<0.12	<0.12	<0.12	<0.21	<0.11	<0.46	0.006	0.008	<0.007	<0.26	<0.27	<0.21	<0.11	<0.04
40	<0.03	<0.37	<0.04	<0.06	<0.18	<0.22	<0.21	<0.2	<0.37	<0.13	<0.84	<0.006	<0.005	<0.007	<0.29	<0.3	<0.24	<0.13	<0.06
74	<0.03	<0.37	<0.04	<0.06	<0.18	<0.22	<0.21	<0.2	<0.37	<0.13	<0.84	0.008	0.007	<0.02	<0.29	<0.3	<0.24	<0.13	<0.06
70/76	<0.03	<0.37	<0.04	<0.06	<0.18	<0.22	<0.21	<0.2	<0.37	<0.13	<0.84	0.010	0.010	<0.02	<0.29	<0.3	<0.24	<0.13	<0.06
66	<0.02	<0.14	<0.02	<0.02	<0.07	<0.08	<0.08	<0.08	<0.14	<0.06	<0.3	0.008	0.005	<0.007	<0.15	<0.15	<0.12	<0.06	<0.03
56/60	<0.02	<0.14	<0.02	<0.02	<0.08	0.100	<0.08	<0.08	<0.14	<0.06	<0.3	0.009	<0.003	<0.004	<0.15	<0.15	<0.12	<0.06	<0.03
95	<0.02	<0.11	<0.02	<0.03	<0.08	<0.1	<0.1	<0.08	<0.18	<0.08	<0.25	<0.02	<0.02	<0.02	<0.36	<0.32	<0.24	<0.14	<0.02
91	<0.02	<0.11	<0.02	<0.03	<0.08	<0.1	<0.1	<0.08	<0.18	<0.08	<0.25	<0.02	<0.02	<0.02	<0.36	<0.32	<0.24	<0.14	<0.02
84/89	<0.02	<0.11	<0.02	<0.03	<0.08	<0.1	<0.1	<0.08	<0.18	<0.08	<0.25	<0.02	<0.02	<0.02	<0.36	<0.32	<0.24	<0.14	<0.02
101/90	<0.02	<0.11	<0.02	<0.03	<0.08	<0.1	<0.1	<0.08	<0.18	<0.08	<0.25	<0.02	<0.02	<0.02	<0.36	<0.32	<0.24	<0.14	<0.02
99	<0.02	<0.11	<0.02	<0.03	<0.08	<0.1	<0.1	<0.08	<0.18	<0.08	<0.25	<0.02	<0.02	<0.02	<0.36	<0.32	<0.24	<0.14	<0.02
83	<0.03	<0.16	<0.02	<0.05	<0.11	<0.14	<0.14	<0.11	<0.25	<0.1	<0.34	<0.03	<0.03	<0.02	<0.42	<0.37	<0.28	<0.17	<0.04
97	<0.03	<0.16	<0.02	<0.05	<0.11	<0.14	<0.14	<0.11	<0.25	<0.1	<0.34	<0.03	<0.03	<0.02	<0.42	<0.37	<0.28	<0.17	<0.04
87	<0.03	<0.16	<0.02	<0.05	<0.11	<0.14	<0.14	<0.11	<0.25	<0.1	<0.34	<0.03	<0.03	<0.02	<0.42	<0.37	<0.28	<0.17	<0.04
85	<0.04	<0.16	<0.02	<0.05	<0.11	<0.14	<0.14	<0.11	<0.25	<0.1	<0.34	<0.03	<0.03	<0.02	<0.43	<0.37	<0.28	<0.17	<0.04
110	<0.03	<0.16	<0.02	<0.05	<0.11	<0.14	<0.14	<0.11	<0.25	<0.1	<0.34	<0.03	<0.03	<0.02	<0.42	<0.37	<0.28	<0.17	<0.04
107	<0.02	<0.11	<0.02	<0.03	<0.08	<0.1	<0.1	<0.08	<0.18	<0.08	<0.24	<0.02	<0.02	<0.02	<0.36	<0.32	<0.24	<0.14	<0.02
118	<0.02	<0.1	<0.01	<0.03	<0.07	<0.11	<0.1	<0.07	<0.16	<0.06	<0.23	<0.03	<0.02	<0.02	<0.29	<0.28	<0.22	<0.12	<0.02
114	<0.02	<0.11	<0.02	<0.03	<0.08	<0.1	<0.1	<0.08	<0.18	<0.08	<0.24	<0.02	<0.02	<0.02	<0.36	<0.32	<0.24	<0.14	<0.02
105	<0.02	<0.1	<0.02	<0.03	<0.07	<0.1	<0.1	<0.07	<0.15	<0.07	<0.24	<0.03	<0.03	<0.02	<0.32	<0.29	<0.24	<0.14	<0.02
136	<0.03	<0.16	<0.02	<0.05	<0.12	<0.17	<0.14	<0.13	<0.26	<0.1	<0.44	<0.004	<0.009	<0.01	<0.29	<0.29	<0.23	<0.14	<0.03
151	<0.03	<0.16	<0.02	<0.05	<0.12	<0.17	<0.14	<0.13	<0.26	<0.1	<0.44	0.005	<0.009	<0.01	<0.29	<0.29	<0.23	<0.14	<0.03
144/135	<0.03	<0.16	<0.02	<0.05	<0.12	<0.17	<0.14	<0.13	<0.26	<0.1	<0.44	0.004	<0.009	<0.01	<0.29	<0.29	<0.23	<0.14	<0.03
149	<0.03	<0.16	<0.02	<0.05	<0.12	<0.17	<0.14	<0.13	<0.26	<0.1	<0.44	0.020	0.020	0.010	<0.29	<0.29	<0.23	<0.14	<0.03
134	<0.03	<0.16	<0.02	<0.05	<0.12	<0.17	<0.14	<0.13	<0.26	<0.1	<0.44	<0.004	<0.009	<0.01	<0.29	<0.29	<0.23	<0.14	<0.03
131	<0.03	<0.16	<0.02	<0.05	<0.12	<0.17	<0.14	<0.13	<0.26	<0.1	<0.44	<0.004	<0.009	<0.01	<0.29	<0.29	<0.23	<0.14	<0.03
146	<0.01	<0.05	<0.01	<0.02	<0.04	<0.05	<0.04	<0.04	<0.08	<0.04	<0.14	<0.003	<0.007	<0.005	<0.09	<0.09	<0.07	<0.04	<0.01
153	<0.04	<0.12	<0.02	<0.04	<0.09	<0.17	<0.13	<0.1	<0.21	<0.09	<0.34	0.020	0.020	0.020	<0.2	<0.2	<0.21	<0.1	<0.02
141	<0.05	<0.18	<0.03	<0.06	<0.13	<0.24	<0.19	<0.14	<0.3	<0.12	<0.5	<0.004	<0.008	<0.009	<0.29	<0.28	<0.3	<0.15	<0.03
130	<0.05	<0.18	<0.03	<0.06	<0.13	<0.24	<0.19	<0.14	<0.3	<0.12	<0.5	<0.005	<0.01	<0.01	<0.3	<0.3	<0.31	<0.16	<0.03
137	<0.05	<0.18	<0.03	<0.06	<0.13	<0.24	<0.19	<0.14	<0.3	<0.12	<0.5	0.005	<0.01	<0.01	<0.3	<0.3	<0.31	<0.16	<0.03
138	<0.05	<0.18	<0.03	<0.06	<0.13	<0.24	<0.19	<0.14	<0.3	<0.12	<0.5	0.020	<0.02	<0.01	<0.3	<0.3	<0.31	<0.16	<0.03
158	<0.05	<0.18	<0.03	<0.06	<0.13	<0.24	<0.19	<0.14	<0.3	<0.12	<0.5	<0.005	<0.01	<0.01	<0.3	<0.3	<0.31	<0.16	<0.03
129	<0.05	<0.18	<0.03	<0.06	<0.13	<0.24	<0.19	<0.14	<0.3	<0.12	<0.5	<0.005	<0.01	<0.01	<0.3	<0.3	<0.31	<0.16	<0.03
128	<0.1	<0.32	<0.05	<0.1	<0.23	<0.44	<0.34	<0.25	<0.54	<0.22	<0.89	<0.006	<0.01	<0.01	<0.5	<0.48	<0.51	<0.26	<0.07
156	<0.08	<0.27	<0.03	<0.08	<0.2	<0.37	<0.29	<0.21	<0.46	<0.15	<0.76	<0.009	<0.02	<0.01	<0.34	<0.33	<0.35	<0.18	<0.05
157	<0.08	<0.27	<0.03	<0.08	<0.2	<0.37	<0.29	<0.21	<0.46	<0.15	<0.76	<0.009	<0.02	<0.01	<0.34	<0.33	<0.35	<0.18	<0.05
179	<0.06	<0.2	<0.02	<0.05	<0.16	<0.24	<0.18	<0.15	<0.3	<0.14	<0.37	<0.02	<0.02	<0.02	<0.38	<0.42	<0.41	<0.2	<0.04
176	<0.06	<0.2	<0.02	<0.05	<0.16	<0.24	<0.18	<0.15	<0.3	<0.14	<0.37	<0.02	<0.02	<0.02	<0.38	<0.42	<0.41	<0.2	<0.04
178	<0.06	<0.2	<0.02	<0.05	<0.16	<0.24	<0.18	<0.15	<0.3	<0.14	<0.37	<0.02	<0.02	<0.02	<0.38	<0.42	<0.41	<0.2	<0.04
175	<0.06	<0.2	<0.02	<0.05	<0.16	<0.24	<0.18	<0.15	<0.3	<0.14	<0.37	<0.02	<0.02	<0.02	<0.38	<0.42	<0.41	<0.2	<0.04
187/182	<0.06	<0.2	<0.02	<0.05	<0.16	<0.24	<0.18	<0.15	<0.3	<0.14	<0.37	<0.02	<0.02	<0.02	<0.38	<0.42	<0.41	<0.2	<0.04
183	<0.07	<0.22	<0.03	<0.06	<0.17	<0.26	<0.2	<0.17	<0.34	<0.17	<0.42	<0.02	<0.02	<0.02	<0.42	<0.46	<0.45	<0.22	<0.05
185	<0.07	<0.22	<0.03	<0.06	<0.17	<0.26	<0.2	<0.17	<0.34	<0.17	<0.42	<0.02	<0.02	<0.02	<0.42	<0.46	<0.45	<0.22	<0.05
174	<0.07	<0.22	<0.03	<0.06	<0.17	<0.26	<0.2	<0.17	<0.34	<0.17	<0.42	<0.02	<0.02	<0.02	<0.42	<0.46	<0.45	<0.22	<0.05
177	<0.07	<0.22	<0.03	<0.06	<0.17	<0.26	<0.2	<0.17	<0.34	<0.17	<0.42	<0.02	<0.02	<0.02	<0.42	<0.46	<0.45	<0.22	<0.05
171	<0.07	<0.24	<0.03	<0.06	<0.19	<0.29	<0.22	<0.18	<0.37	<0.17	<0.46	<0.008	<0.009	<0.02	<0.44	<0.48	<0.47	<0.23	<0.05
172	<0.07	<0.23	<0.03	<0.06	<0.18	<0.27	<0.21	<0.18	<0.35	<0.16	<0.43	<0.008	<0.009	<0.02	<0.45	<0.49	<0.48	<0.23	<0.05
180	<0.07	<0.23	<0.03	<0.06	<0.18	<0.27	<0.21	<0.18	<0.35	<0.16	<0.43	0.030	0.030	<0.03	<0.45	<0.49	<0.48	<0.23	<0.05
193	<0.07	<0.23	<0.03	<0.06	<0.18	<0.27	<0.21	<0.18	<0.35	<0.16	<0.43	<0.008	<0.009	<0.02	<0.45	<0.49	<0.48	<0.23	<0.05
191	<0.07	<0.23	<0.03	<0.06	<0.18	<0.27	<0.21	<0.18	<0.35	<0.16	<0.43	<0.008	<0.009	<0.02	<0.45	<0.49	<0.48	<0.23	<0.05
170	<0.1	<0.3	<0.03	<0.08	<0.23	<0.36	<0.27	<0.23	<0.45	<0.22	<0.56	<0.01	<0.01	<0.02	<0.56	<0.61	<0.6	<0.29	<0.06
189	<0.1	<0.3	<0.03	<0.08	<0.23	<0.36	<0.27	<0.23	<0.45	<0.22	<0.56	<0.01	<0.01	<0.02	<0.56	<0.61	<0.6	<0.29	<0.06
201	<0.06	<0.27	<0.03	<0.08	<0.22	<0.3	<0.25	<0.22	<0.43	<0.2	<0.5	<0.005	<0.006	<0.003	<0.46	<0.51	<0.44	<0.25	<0.04
197	<0.09	<0.38	<0.04	<0.11	<0.31	<0.41	<0.35	<0.31	<0.6	<0.28	<0.69	<0.008	<0.008	0.010	<0.62	<0.7	<0.6	<0.34	<0.06
198	<0.09	<0.38	<0.04	<0.11	<0.31	<0.41	<0.35	<0.31	<0.6	<0.28	<0.69	<0.008	<0.008	<0.003	<0.62	<0.7	<0.6	<0.34	<0.06
199	<0.09	<0.38	<0.04	<0.11	<0.31	<0.41	<0.35	<0.31	<0.6	<0.28	<0.69	<0.008	<0.008	<0.006	<0.62	<0.7	<0.6	<0.34	<0.06
196/203	<0.08	<0.34	<0.04	<0.1	<0.28	<0.37	<0.32	<0.28	<0.54	<0.26	<0.62	<0.008	<0.008	<0.008	<0.6	<0.67	<0.58	<0.33	<0.06
195	<0.08	<0.34	<0.04	<0.1	<0.28	<0.37	<0.32	<0.28	<0.54	<0.26	<0.62	<0.008	<0.007	<0.003	<0.6	<0.67	<0.58	<0.33	<0.06
194	<0.12	<0.48	<0.04	<0.14	<0.39	<0.53	<0.45	<0.4	<0.77	<0.36	<0.88	<0.01	<0.009	<0.003	<0.73	<0.82	<0.7	<0.4	<0.08
205	<0.12	<0.48	<0.04	<0.14	<0.39	<0.53	<0.45	<0.4	<0.77	<0.36	<0.88	<0.01	<0.009	<0.005	<0.73	<0.82	<0.7	<0.4	<0.08
208	<0.06	<0.31	<0.02	<0.08	<0.1	<0.45	<0.24	<0.21	<0.37	<0.21	<0.48	<0.006	<0.004	<0.005	<0.71	<0.68	<0.62	<0.39	<0.06
207	<0.06	<0.31	<0.02	<0.08	<0.1	<0.45	<0.24	<0.21	<0.37	<0.21	<0.48	<0.004	<0.004	<0.002	<0.71	<0.68	<0.62	<0.39	<0.06
206	<0.06	<0.31	<0.02	<0.08	<0.1	<0.45	<0.24	<0.21	<0.37	<0.21	<0.48	<0.004	<0.004	<0.002	<0.71	<0.68	<0.62	<0.39	<0.06
209	<0.04	<0.16	<0.01	<0.05	<0.06	<0.26	<0.11	<0.13	<0.2	<0.14	<0.28	<0.004	<0.003	<0.009	<0.3	<0.33	<0.31	<0.19	<0.05
% Surrogate Recovery																			
13 C-Hexachlorobenzene	52	38	89	56	31	41	61	46	39	48	0	71	66	46	66	97	106	83	62
13C-101	74	44	93	75	43	54	66	50	38	48	44	83	73	68	75	82	86	89	79
13C-118	74	43	94	75	41	46	59	49	40	47	42	94	87	78	76	77	79	85	80
13C-105	78	47	88	79	44	50	60	52	44	47	43	91	81	76	72	75	71	79	77
13C-180	39	40	76	71	38	37	50	47	33	41	40	84	74	72	73	82	64	80	75
13C-209	74	41	81	58	75	30	50	49	40	41	38	89	79	60	75	91	75	87	85
13C-153	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected
94FRM1-5 are field splits of 94MBD1
94FRQ1-5 are field splits of 94QPG2
94FRT1-5 are field splits of 94THM1

Table 20 (continued)

Parameter	94NEC4	94NEC4d	94 NTH1	94THM1	94FRT1	94FRT2	94FRT3	94FRT4	94FRT5	94STK1A	94SRT3	94CHN2	94QNL2	94HAR1	94HAR1d
8/5	<0.02	<0.03	<0.06	<0.03	<0.09	<0.09	<0.07	<0.07	<0.09	0.340	<0.1	<0.15	<0.12	<0.22	<0.16
15	<0.03	<0.03	<0.06	<0.04	<0.09	<0.09	<0.07	<0.07	<0.09	0.090	<0.1	<0.15	<0.12	<0.22	<0.16
19	<0.02	<0.04	<0.008	<0.04	<0.01	<0.02	<0.02	<0.01	<0.02	0.040	<0.18	<0.11	<0.07	<0.03	<0.03
18	<0.02	<0.04	<0.008	<0.04	<0.01	<0.02	<0.02	<0.01	<0.02	0.390	<0.18	<0.11	<0.07	<0.03	<0.03
17	<0.02	<0.04	<0.008	<0.04	<0.01	<0.02	<0.02	<0.01	<0.02	0.130	<0.18	<0.11	<0.07	<0.03	<0.03
24/27	<0.02	<0.04	<0.008	<0.04	<0.01	<0.02	<0.02	<0.01	<0.02	0.030	<0.18	<0.11	<0.07	<0.03	<0.03
16/32	<0.02	<0.04	<0.008	<0.04	<0.01	<0.02	<0.02	<0.01	<0.02	0.210	<0.18	<0.11	<0.07	<0.03	<0.03
26	<0.02	<0.03	<0.005	<0.03	<0.008	<0.009	<0.009	<0.008	<0.01	0.050	0.150	<0.07	<0.05	<0.01	<0.02
25	<0.02	<0.03	<0.005	<0.03	<0.008	<0.009	<0.009	<0.008	<0.01	0.020	<0.12	0.280	0.140	<0.01	<0.02
31/28	<0.02	<0.03	<0.005	<0.03	0.020	0.010	0.010	<0.008	<0.01	0.870	<0.12	0.180	0.060	0.060	<0.04
33	<0.02	<0.03	<0.005	<0.03	<0.008	<0.009	<0.009	<0.008	<0.01	0.240	<0.12	0.420	<0.05	<0.01	<0.02
22	<0.02	<0.03	<0.005	<0.03	<0.008	<0.009	<0.009	<0.008	<0.01	0.120	<0.12	<0.07	<0.05	<0.01	<0.02
45	<0.03	<0.03	<0.002	<0.1	<0.005	<0.005	<0.004	<0.006	<0.003	0.120	<0.05	<0.08	<0.05	<0.01	<0.01
46	<0.03	<0.03	<0.002	<0.1	<0.005	<0.005	<0.004	<0.004	<0.003	<0.01	<0.05	<0.08	<0.05	<0.01	<0.01
52	<0.03	<0.03	<0.006	<0.1	0.010	<0.009	<0.004	0.020	0.020	25.000	<0.05	<0.08	<0.05	0.040	0.040
49	<0.03	<0.03	<0.004	<0.1	0.020	<0.005	<0.005	<0.004	<0.008	5.300	<0.05	<0.08	<0.05	0.020	<0.01
47/48	<0.03	<0.03	<0.004	<0.1	<0.007	<0.005	<0.005	<0.006	<0.005	1.200	<0.05	<0.08	<0.05	0.020	0.020
44	<0.04	<0.04	<0.002	<0.12	<0.006	<0.006	<0.006	<0.008	0.010	11.000	<0.06	<0.1	<0.06	0.020	0.020
42	<0.04	<0.04	<0.006	<0.12	<0.006	<0.006	<0.006	<0.01	<0.004	0.810	<0.06	<0.1	<0.06	<0.02	<0.01
41/71/64	<0.04	<0.04	<0.002	<0.13	<0.009	<0.006	<0.008	<0.02	<0.008	5.300	<0.06	<0.1	<0.06	0.030	<0.01
40	<0.05	<0.05	<0.005	<0.16	<0.006	<0.007	<0.006	<0.005	<0.004	0.530	<0.08	<0.13	<0.08	<0.01	<0.01
74	<0.05	<0.05	<0.005	<0.16	<0.006	<0.009	<0.02	<0.005	0.010	7.400	<0.08	<0.13	<0.08	0.060	0.070
70/76	<0.05	<0.05	<0.003	<0.16	0.010	0.020	<0.007	<0.02	0.020	28.000	0.130	<0.13	<0.08	0.100	0.070
66	<0.02	<0.02	<0.004	<0.08	<0.005	<0.007	<0.003	<0.009	<0.007	5.300	<0.05	<0.06	<0.04	0.030	0.040
56/60	<0.02	<0.02	<0.003	<0.08	<0.004	<0.004	<0.007	<0.007	<0.004	2.500	<0.03	<0.06	<0.04	0.010	0.020
95	<0.02	<0.02	<0.01	<0.03	<0.03	<0.02	<0.03	<0.02	<0.02	32.000	<0.04	<0.05	<0.04	<0.04	0.040
91	<0.02	<0.02	<0.01	<0.03	<0.03	<0.02	<0.03	<0.02	<0.02	4.600	<0.04	<0.05	<0.04	<0.04	<0.03
84/89	<0.02	<0.02	<0.01	<0.03	<0.03	<0.02	<0.03	<0.02	<0.02	6.800	<0.04	<0.05	<0.04	<0.04	<0.03
101/90	<0.02	<0.02	<0.01	<0.03	<0.03	<0.02	<0.03	<0.02	0.030	53.000	<0.04	<0.05	<0.04	0.100	0.080
99	<0.02	<0.02	<0.01	<0.03	<0.03	<0.02	<0.03	<0.02	<0.02	15.000	<0.04	<0.05	<0.04	<0.04	0.040
83	<0.03	<0.03	<0.02	<0.05	<0.04	<0.03	<0.05	<0.03	<0.03	2.600	<0.06	<0.06	<0.05	<0.06	<0.05
97	<0.03	<0.03	<0.02	<0.05	<0.04	<0.03	<0.05	<0.03	<0.03	16.000	<0.06	<0.06	<0.05	<0.06	<0.05
87	<0.03	<0.03	<0.02	<0.05	<0.04	<0.03	<0.05	<0.03	<0.03	29.000	<0.06	<0.06	<0.05	<0.06	<0.05
85	<0.03	<0.03	<0.02	<0.05	<0.04	<0.03	<0.05	<0.03	<0.03	5.800	<0.06	<0.06	<0.05	<0.06	<0.05
110	<0.03	<0.03	<0.02	<0.05	<0.04	<0.03	<0.05	<0.03	0.050	59.000	<0.06	<0.06	<0.05	0.080	0.120
107	<0.02	<0.02	<0.01	<0.03	<0.04	<0.02	<0.04	<0.02	<0.03	2.500	<0.04	<0.05	<0.04	<0.05	<0.04
118	<0.02	<0.02	<0.02	<0.03	<0.04	<0.02	<0.04	<0.03	<0.03	36.000	<0.03	<0.04	<0.03	0.110	0.070
114	<0.02	<0.02	<0.01	<0.03	<0.04	<0.02	<0.04	<0.02	<0.03	0.810	<0.04	<0.05	<0.04	<0.05	<0.04
105	<0.02	<0.02	<0.02	<0.03	<0.04	<0.02	<0.04	<0.03	<0.03	16.000	<0.04	<0.05	<0.04	<0.06	<0.05
136	<0.04	<0.04	<0.003	<0.06	<0.008	<0.004	<0.01	<0.01	<0.006	12.000	<0.04	<0.06	<0.05	<0.03	<0.02
151	<0.04	<0.04	<0.007	<0.06	0.010	<0.004	<0.01	<0.01	<0.006	6.500	<0.04	<0.06	<0.05	<0.03	<0.02
144/135	<0.04	<0.04	<0.004	<0.06	<0.008	<0.004	<0.01	<0.01	<0.008	7.500	<0.04	<0.06	<0.05	<0.03	<0.02
149	<0.04	<0.04	0.010	<0.06	0.040	<0.004	0.010	0.020	0.020	33.000	<0.04	<0.06	<0.05	0.090	0.090
134	<0.04	<0.04	<0.003	<0.06	<0.008	<0.004	<0.01	<0.01	<0.006	3.800	<0.04	<0.06	<0.05	<0.03	<0.02
131	<0.04	<0.04	<0.003	<0.06	<0.008	<0.004	<0.01	<0.01	<0.006	<0.01	<0.04	<0.06	<0.05	<0.03	<0.02
146	<0.01	<0.01	<0.002	<0.01	<0.004	<0.002	<0.007	<0.005	<0.003	3.900	<0.02	<0.03	<0.03	0.020	0.020
153	<0.02	<0.02	0.010	<0.03	0.020	<0.01	0.010	0.020	0.030	26.000	<0.05	<0.06	<0.05	0.180	0.140
141	<0.04	<0.03	<0.002	<0.05	<0.007	<0.003	<0.01	<0.009	0.010	6.800	<0.06	<0.08	<0.06	<0.03	<0.02
130	<0.03	<0.03	<0.003	<0.05	<0.008	<0.004	<0.01	<0.01	<0.005	<0.01	<0.06	<0.08	<0.06	<0.03	<0.02
137	<0.03	<0.03	<0.003	<0.05	<0.008	<0.004	<0.01	<0.01	<0.01	3.400	<0.06	<0.08	<0.06	<0.03	<0.02
138	<0.03	<0.03	<0.006	<0.05	0.040	0.020	<0.02	0.030	0.030	51.000	<0.06	<0.08	<0.06	0.140	0.140
158	<0.03	<0.03	<0.005	<0.05	<0.008	<0.007	<0.01	<0.01	<0.005	5.700	<0.06	<0.08	<0.06	<0.03	<0.02
129	<0.03	<0.03	<0.003	<0.05	<0.008	<0.004	<0.01	<0.01	<0.005	3.100	<0.06	<0.08	<0.06	<0.03	<0.02
128	<0.07	<0.07	<0.003	<0.1	<0.008	<0.006	<0.01	<0.01	<0.009	14.000	<0.1	<0.13	<0.1	0.060	0.030
156	<0.05	<0.05	<0.005	<0.07	<0.01	<0.005	<0.02	<0.01	<0.02	6.700	<0.08	<0.1	<0.08	<0.04	0.050
157	<0.05	<0.05	<0.004	<0.07	<0.01	<0.005	<0.02	<0.01	<0.007	1.500	<0.08	<0.1	<0.08	<0.04	<0.03
179	<0.04	<0.04	<0.003	<0.04	<0.01	<0.009	<0.01	<0.01	<0.008	1.200	<0.06	<0.21	<0.06	<0.05	<0.03
176	<0.04	<0.04	<0.003	<0.04	<0.01	<0.009	<0.01	<0.01	<0.008	0.590	<0.06	0.330	<0.06	<0.03	<0.03
178	<0.04	<0.04	<0.003	<0.04	<0.01	<0.009	<0.01	<0.01	<0.008	0.640	<0.06	<0.21	<0.06	<0.03	<0.03
175	<0.04	<0.04	<0.003	<0.04	<0.01	<0.009	<0.01	<0.01	<0.008	0.210	<0.06	<0.21	<0.06	<0.03	<0.03
187/182	<0.04	<0.04	<0.003	<0.04	<0.01	<0.009	<0.01	0.010	0.010	2.900	<0.06	<0.21	<0.06	0.050	<0.04
183	<0.04	<0.04	<0.003	<0.05	<0.01	<0.01	<0.01	<0.01	<0.009	2.100	<0.06	<0.24	<0.06	<0.03	<0.03
185	<0.04	<0.04	<0.003	<0.05	<0.01	<0.01	<0.01	<0.01	<0.009	0.260	<0.06	<0.24	<0.06	<0.03	<0.03
174	<0.04	<0.04	<0.005	<0.05	<0.01	<0.01	<0.01	<0.01	0.020	3.600	<0.06	<0.24	<0.06	<0.05	<0.03
177	<0.04	<0.04	<0.005	<0.05	<0.01	<0.01	<0.01	<0.02	<0.009	2.200	<0.06	<0.24	<0.06	<0.03	<0.03
171	<0.04	<0.04	<0.004	<0.05	<0.008	<0.007	0.010	<0.007	<0.006	1.100	<0.06	<0.24	<0.06	<0.02	<0.02
172	<0.04	<0.04	<0.002	<0.05	<0.009	<0.007	<0.01	<0.008	<0.007	0.440	<0.06	<0.22	<0.06	<0.02	<0.02
180	<0.04	<0.04	0.020	<0.05	0.020	<0.03	<0.02	0.040	0.040	5.800	<0.06	<0.22	<0.06	0.080	0.080
193	<0.04	<0.04	<0.008	<0.05	0.010	<0.007	0.010	<0.008	<0.008	0.220	<0.06	<0.22	<0.06	<0.04	<0.05
191	<0.04	<0.04	<0.002	<0.05	<0.009	<0.007	<0.01	<0.008	<0.007	0.100	<0.06	<0.22	<0.06	<0.02	<0.02
170	<0.06	<0.06	<0.007	<0.07	0.010	<0.007	0.020	0.010	<0.007	4.800	<0.08	<0.29	<0.08	0.040	0.030
189	<0.06	<0.06	<0.002	<0.07	<0.009	<0.007	<0.01	<0.008	<0.007	0.180	<0.08	<0.29	<0.08	<0.02	<0.02
201	<0.06	<0.05	<0.004	<0.04	<0.009	<0.002	<0.003	<0.003	<0.002	0.130	<0.07	<0.09	<0.07	<0.01	<0.004
197	<0.08	<0.07	<0.001	<0.05	<0.003	<0.002	<0.004	<0.005	<0.002	0.090	<0.09	<0.12	<0.09	<0.01	<0.01
198	<0.08	<0.07	<0.003	<0.05	<0.003	<0.002	<0.004	<0.003	<0.002	0.060	<0.09	<0.12	<0.09	0.010	<0.01
199	<0.08	<0.07	<0.005	<0.05	<0.003	<0.005	<0.004	0.010	<0.005	0.630	<0.09	<0.12	<0.09	<0.04	<0.03
196/203	<0.07	<0.06	<0.003	<0.05	<0.009	<0.002	<0.005	<0.008	0.020	0.640	<0.09	<0.12	<0.09	<0.02	<0.03
195	<0.07	<0.06	<0.003	<0.05	<0.005	<0.003	<0.003	<0.003	<0.004	0.200	<0.09	<0.12	<0.09	<0.02	<0.02
194	<0.1	<0.09	<0.003	<0.07	<0.008	<0.003	<0.004	<0.003	<0.004	0.460	<0.12	<0.16	<0.12	0.020	<0.02
205	<0.1	<0.09	<0.003	<0.07	<0.005	<0.003	<0.005	<0.003	<0.004	0.040	<0.12	<0.16	<0.12	<0.01	<0.01
208	<0.05	<0.06	<0.004	<0.06	0.010	<0.006	<0.005	<0.001	<0.004	0.040	<0.03	<0.1	<0.05	0.010	0.010
207	<0.05	<0.06	<0.001	<0.06	<0.003	<0.002	<0.002	<0.001	<0.001	0.020	<0.03	<0.1	<0.05	<0.01	<0.003
206	<0.05	<0.06	<0.001	<0.06	<0.003	<0.003	<0.002	<0.006	<0.003	0.130	<0.03	<0.1	<0.05	<0.01	0.010
209	<0.05	<0.03	<0.007	<0.05	<0.009	0.010	<0.01	0.010	<0.008	0.040	<0.04	0.070	<0.04	0.020	0.020
% Surrogate Recovery															
13 C-Hexachlorobenzene	53	42	65	64	47	56	49	54	60	41	77	83	68	60	65
13C-101	66	57	81	71	63	71	64	72	78	63	75	88	84	74	78
13C-118	67	64	94	78	72	86	73	83	93	77	83	96	90	82	85
13C-105	66	62	89	78	72	86	73	82	89	74	78	91	86	80	82
13C-180	69	61	91	90	69	83	68	78	88	73	55	70	72	84	88
13C-209	83	61	89	97	60	75	63	71	80	60	68	75	74	74	78
13C-153	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected
94FRM1-5 are field splits of 94MBD1
94FRQ1-5 are field splits of 94QPG2
94FRT1-5 are field splits of 94THM1

Table 21. PCB Congener Concentrations in Bed Sediments from Individual Sampling Sites in 1995

Parameter	95MBD1	95MBD2	95MBD3	95MBD3d	95MBD4	95QPG1	95QPG2	95QPG3	95QPG4	95QPG4d	95LQN1	95LQN2	95LQN3	95LQN4	95LCH1	95LCH4	95LCH5	95LCH6	95NEC1	95NEC2	95NEC4	95NEC6
8/5	<0.06	<0.05	<0.05	<0.05	<0.03	<0.04	<0.02	0.080	<0.05	<0.02	<0.02	<0.02	1.800	<0.04	<0.02	<0.06	<0.05	<0.06	<0.03	<0.04	<0.05	<0.04
15	0.020	0.020	<0.01	<0.02	<0.02	<0.04	<0.02	0.010	<0.05	<0.02	<0.06	0.090	1.600	<0.05	<0.02	<0.06	<0.05	<0.06	0.050	<0.04	<0.05	<0.04
19	0.020	<0.06	<0.03	<0.04	<0.02	<0.02	<0.02	0.009	<0.04	<0.05	<0.04	<0.04	0.100	<0.02	<0.05	<0.16	<0.1	<0.16	<0.12	<0.11	<0.1	<0.04
18	0.150	<0.06	<0.03	<0.04	0.040	<0.02	0.030	0.060	<0.04	<0.05	<0.04	<0.04	1.400	<0.02	<0.05	<0.16	<0.1	<0.16	<0.12	<0.11	<0.1	<0.04
17	0.050	<0.06	<0.03	<0.04	<0.02	<0.02	<0.02	0.030	<0.04	<0.05	<0.04	<0.04	0.630	<0.02	<0.05	<0.16	<0.1	<0.16	<0.12	<0.11	<0.1	<0.04
24/27	<0.01	<0.06	<0.03	<0.04	<0.02	<0.02	<0.02	<0.01	<0.04	<0.05	<0.04	<0.04	0.150	<0.02	<0.05	<0.16	<0.1	<0.16	<0.12	<0.11	<0.1	<0.04
16/32	<0.01	<0.06	<0.03	<0.04	<0.02	<0.02	<0.02	<0.01	<0.04	<0.05	<0.04	<0.04	1.100	0.050	<0.05	<0.16	<0.1	<0.16	<0.12	<0.11	<0.1	<0.04
26	<0.01	<0.04	<0.02	<0.03	<0.01	<0.02	<0.01	<0.01	<0.03	<0.04	<0.03	<0.03	0.250	<0.02	<0.04	<0.12	<0.08	<0.12	<0.08	<0.08	<0.07	<0.03
25	<0.03	<0.04	<0.02	<0.03	0.020	<0.02	<0.01	0.040	<0.03	<0.04	<0.03	<0.03	0.120	<0.02	<0.04	<0.12	<0.08	<0.12	<0.08	<0.08	<0.07	<0.03
31/28	0.060	0.040	<0.04	<0.03	0.030	<0.02	<0.01	0.040	<0.03	<0.04	<0.03	0.040	2.600	0.120	<0.04	<0.12	<0.08	<0.12	<0.08	<0.08	<0.07	<0.03
33	0.050	<0.04	<0.02	<0.03	<0.01	<0.02	<0.01	0.040	<0.05	<0.04	<0.03	<0.03	1.000	0.090	<0.04	<0.12	<0.08	<0.12	<0.08	<0.08	<0.07	<0.03
22	<0.01	<0.004	<0.02	<0.01	0.020	<0.02	<0.01	<0.01	<0.06	<0.04	<0.03	<0.03	0.450	0.080	<0.04	<0.12	<0.08	<0.12	<0.08	<0.08	<0.07	<0.03
45	0.040	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	<0.03	<0.02	<0.03	<0.02	<0.02	0.130	<0.03	<0.12	<0.15	<0.12	<0.17	<0.03	<0.03	<0.02	<0.02
46	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	<0.03	<0.02	<0.03	<0.02	<0.02	0.040	<0.01	<0.12	<0.15	<0.12	<0.17	<0.03	<0.03	<0.02	<0.02
52	<0.01	<0.01	<0.01	<0.01	0.030	<0.02	<0.02	<0.03	<0.02	<0.03	<0.02	<0.02	0.590	<0.02	<0.12	<0.15	<0.12	<0.17	<0.03	<0.03	<0.02	<0.02
49	<0.01	<0.01	<0.01	<0.01	0.030	<0.02	<0.02	<0.03	<0.02	<0.03	<0.02	<0.02	0.480	<0.01	<0.13	<0.16	<0.13	<0.18	<0.03	<0.03	<0.02	<0.02
47/48	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	<0.03	<0.02	<0.03	<0.02	<0.02	0.390	<0.01	<0.13	<0.16	<0.13	<0.18	<0.03	<0.03	<0.02	<0.02
44	0.090	<0.01	<0.01	<0.01	0.020	<0.03	<0.02	<0.04	<0.03	<0.04	<0.02	<0.02	0.560	<0.02	<0.15	<0.19	<0.15	<0.22	<0.04	<0.04	<0.02	<0.03
42	<0.01	<0.01	<0.01	<0.01	<0.02	<0.03	<0.02	<0.04	<0.03	<0.04	<0.02	<0.02	0.280	<0.02	<0.15	<0.19	<0.15	<0.22	<0.04	<0.04	<0.02	<0.03
41/71/64	<0.01	<0.01	<0.01	<0.01	0.030	<0.03	<0.02	<0.04	<0.03	<0.04	<0.02	<0.02	0.800	<0.04	<0.15	<0.19	<0.15	<0.22	<0.04	<0.04	<0.02	<0.03
40	<0.01	<0.01	<0.01	<0.01	<0.02	<0.03	<0.02	<0.04	<0.04	<0.05	<0.04	<0.04	0.120	<0.02	<0.16	<0.25	<0.19	<0.28	<0.06	<0.05	<0.03	<0.04
74	<0.01	<0.01	<0.01	<0.01	0.020	<0.03	<0.02	0.040	<0.04	<0.05	<0.04	<0.04	0.460	<0.02	<0.16	<0.25	<0.19	<0.28	<0.06	<0.05	<0.03	<0.04
70/76	0.150	<0.01	<0.01	<0.01	0.060	<0.03	<0.02	<0.04	<0.04	<0.05	<0.04	<0.04	0.820	<0.06	<0.16	<0.25	<0.19	<0.28	<0.06	<0.05	<0.03	<0.04
66	<0.01	<0.01	<0.01	<0.01	0.030	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	0.320	<0.04	<0.09	<0.13	<0.1	<0.15	<0.03	<0.02	<0.01	<0.02
56/60	<0.01	<0.01	<0.01	<0.01	0.020	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	0.260	0.050	<0.09	<0.13	<0.1	<0.15	<0.03	<0.02	<0.01	<0.02
95	<0.01	<0.01	<0.01	<0.02	0.030	<0.02	<0.02	<0.01	<0.04	<0.05	<0.03	<0.02	0.120	<0.02	<0.03	<0.13	<0.12	<0.15	<0.06	<0.04	<0.04	<0.04
91	<0.01	<0.01	<0.01	<0.02	<0.01	<0.02	<0.02	<0.01	<0.04	<0.05	<0.03	<0.02	0.030	<0.02	<0.03	<0.13	<0.12	<0.15	<0.06	<0.04	<0.04	<0.04
84/89	<0.01	<0.01	<0.01	<0.02	<0.01	<0.02	<0.02	<0.01	<0.04	<0.05	<0.03	<0.02	0.040	<0.02	<0.03	<0.13	<0.12	<0.15	<0.06	<0.04	<0.04	<0.04
101/90	<0.01	<0.01	<0.01	<0.02	0.040	<0.02	<0.02	<0.01	<0.04	<0.05	<0.03	<0.02	0.090	<0.04	<0.03	<0.13	<0.12	<0.15	<0.06	<0.04	<0.04	<0.04
99	<0.01	<0.01	<0.01	<0.02	0.010	<0.02	<0.02	<0.01	<0.04	<0.05	<0.03	<0.02	<0.05	<0.02	<0.03	<0.13	<0.12	<0.15	<0.06	<0.04	<0.04	<0.04
83	<0.01	<0.01	<0.01	<0.02	<0.02	<0.03	<0.02	<0.01	<0.06	<0.07	<0.04	<0.03	<0.02	<0.02	<0.05	<0.19	<0.17	<0.22	<0.09	<0.06	<0.05	<0.06
97	<0.01	<0.01	<0.01	<0.02	<0.02	<0.03	<0.02	<0.01	<0.06	<0.07	<0.04	<0.03	<0.02	<0.02	<0.05	<0.19	<0.17	<0.22	<0.09	<0.06	<0.05	<0.06
87	<0.01	<0.01	<0.01	<0.02	<0.02	<0.03	<0.02	<0.01	<0.06	<0.07	<0.06	<0.03	0.050	<0.02	<0.05	<0.19	<0.17	<0.22	<0.09	<0.06	<0.05	<0.06
85	<0.01	<0.01	<0.01	<0.02	<0.02	<0.03	<0.02	<0.01	<0.06	<0.07	<0.04	<0.03	<0.02	<0.02	<0.05	<0.19	<0.17	<0.22	<0.09	<0.06	<0.05	<0.06
110	0.020	<0.01	<0.01	<0.02	0.080	<0.03	<0.02	0.030	<0.06	<0.07	<0.04	<0.03	0.090	<0.07	<0.05	<0.19	<0.17	<0.22	<0.09	<0.06	<0.05	<0.06
107	<0.01	<0.01	<0.01	<0.02	<0.01	<0.02	<0.02	<0.01	<0.05	<0.05	<0.03	<0.03	<0.02	<0.02	<0.04	<0.14	<0.12	<0.16	<0.07	<0.04	<0.04	<0.04
118	0.010	<0.01	<0.01	<0.01	0.030	<0.02	<0.01	0.020	<0.04	<0.04	<0.02	<0.02	0.030	<0.04	<0.03	<0.13	<0.11	<0.14	<0.05	<0.04	<0.03	<0.03
114	<0.01	<0.01	<0.01	<0.02	<0.01	<0.02	<0.02	<0.01	<0.05	<0.05	<0.03	<0.03	<0.02	<0.02	<0.04	<0.14	<0.12	<0.16	<0.07	<0.04	<0.04	<0.04
105	<0.01	<0.01	<0.01	<0.01	0.010	<0.02	<0.01	<0.01	<0.03	<0.04	<0.02	<0.02	0.020	<0.02	<0.03	<0.13	<0.11	<0.14	<0.05	<0.03	<0.03	<0.03
136	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.03	<0.03	<0.1	<0.08	<0.04	<0.04	<0.03	<0.02	<0.07	<0.11	<0.05	<0.12	<0.07	<0.05	<0.05	<0.05
151	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.03	<0.03	<0.1	<0.08	<0.04	<0.04	<0.03	<0.02	<0.07	<0.11	<0.05	<0.12	<0.07	<0.05	<0.05	<0.05
144/135	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.03	<0.03	<0.1	<0.08	<0.04	<0.04	<0.03	<0.02	<0.07	<0.11	<0.05	<0.12	<0.07	<0.05	<0.05	<0.05
149	<0.02	<0.02	<0.02	<0.02	0.030	<0.04	<0.03	<0.03	<0.1	<0.08	<0.04	<0.04	<0.03	<0.03	<0.07	<0.11	<0.05	<0.12	<0.07	<0.05	<0.05	<0.05
134	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.03	<0.03	<0.1	<0.08	<0.04	<0.04	<0.03	<0.02	<0.07	<0.11	<0.05	<0.12	<0.07	<0.05	<0.05	<0.05
131	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.03	<0.03	<0.1	<0.08	<0.04	<0.04	<0.03	<0.02	<0.07	<0.11	<0.05	<0.12	<0.07	<0.05	<0.05	<0.05
146	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04	<0.03	<0.01	<0.01	<0.01	<0.01	<0.04	<0.06	<0.02	<0.06	<0.03	<0.02	<0.02	<0.02
153	<0.01	<0.01	<0.01	<0.01	0.020	<0.04	<0.02	<0.02	<0.08	<0.06	<0.03	<0.02	<0.03	<0.04	<0.06	<0.11	<0.04	<0.1	<0.06	<0.03	<0.04	<0.03
141	<0.02	<0.02	<0.02	<0.02	<0.02	<0.03	<0.02	<0.03	<0.11	<0.09	<0.05	<0.03	<0.03	<0.02	<0.09	<0.15	<0.06	<0.15	<0.06	<0.04	<0.05	<0.04
130	<0.02	<0.02	<0.01	<0.02	<0.02	<0.03	<0.02	<0.03	<0.11	<0.09	<0.05	<0.03	<0.03	<0.02	<0.08	<0.15	<0.05	<0.13	<0.06	<0.04	<0.05	<0.04
137	<0.02	<0.02	<0.01	<0.02	<0.02	<0.03	<0.02	<0.03	<0.11	<0.09	<0.05	<0.03	<0.03	<0.02	<0.08	<0.15	<0.05	<0.13	<0.06	<0.04	<0.05	<0.04
138	<0.02	<0.02	<0.01	<0.02	0.040	<0.03	<0.02	<0.03	<0.11	<0.09	<0.05	<0.03	<0.03	<0.05	<0.08	<0.15	<0.05	<0.13	<0.06	<0.04	<0.05	<0.04
158	<0.02	<0.02	<0.01	<0.02	<0.02	<0.03	<0.02	<0.03	<0.11	<0.09	<0.05	<0.03	<0.03	<0.02	<0.08	<0.15	<0.05	<0.13	<0.06	<0.04	<0.05	<0.04
129	<0.02	<0.02	<0.01	<0.02	<0.02	<0.03	<0.02	<0.03	<0.11	<0.09	<0.05	<0.03	<0.03	<0.02	<0.08	<0.28	<0.05	<0.13	<0.06	<0.04	<0.05	<0.04
128	<0.03	<0.03	<0.02	<0.03	<0.04	<0.06	<0.04	<0.04	<0.19	<0.15	<0.09	<0.05	<0.06	<0.04	<0.16	<0.2	<0.1	<0.26	<0.11	<0.08	<0.09	<0.08
156	<0.02	<0.02	<0.02	<0.02	<0.03	<0.04	<0.03	<0.03	<0.15	<0.12	<0.06	<0.04	<0.04	<0.03	<0.11	<0.2	<0.07	<0.18	<0.09	<0.06	<0.07	<0.06
157	<0.02	<0.02	<0.02	<0.02	<0.03	<0.04	<0.03	<0.03	<0.15	<0.12	<0.06	<0.04	<0.04	<0.03	<0.11	<0.08	<0.07	<0.18	<0.09	<0.06	<0.07	<0.06
179	<0.02	<0.02	<0.01	<0.02	<0.02	<0.04	<0.02	<0.02	<0.08	<0.06	<0.05	<0.03	<0.04	<0.03	<0.05	<0.08	<0.04	<0.08	<0.06	<0.05	<0.05	<0.05
176	<0.02	<0.02	<0.01	<0.02	<0.02	<0.04	<0.02	<0.02	<0.08	<0.06	<0.05	<0.03	<0.04	<0.03	<0.05	<0.08	<0.04	<0.08	<0.06	<0.05	<0.05	<0.05
178	<0.02	<0.02	<0.01	<0.02	<0.02	<0.04	<0.02	<0.02	<0.08	<0.06	<0.05	<0.03	<0.04	<0.03	<0.05	<0.08	<0.04	<0.08	<0.06	<0.05	<0.05	<0.05
175	<0.02	<0.02	<0.01	<0.02	<0.02	<0.04	<0.02	<0.02	<0.08	<0.06	<0.05	<0.03	<0.04	<0.03	<0.05	<0.08	<0.04	<0.08	<0.06	<0.05	<0.05	<0.05
187/182	<0.02	<0.02	<0.01	<0.02	<0.02	<0.04	<0.02	<0.02	<0.08	<0.06	<0.05	<0.03	<0.04	<0.03	<0.05	<0.08	<0.04	<0.08	<0.06	<0.05	<0.05	<0.05
183	<0.02	<0.02	<0.02	<0.02	<0.03	<0.04	<0.03	<0.03	<0.09	<0.07	<0.06	<0.04	<0.04	<0.03	<0.06	<0.09	<0.04	<0.09	<0.07	<0.06	<0.06	<0.05
185	<0.02	<0.02	<0.02	<0.02	<0.03	<0.04	<0.03	<0.03	<0.09	<0.07	<0.06	<0.04	<0.04	<0.03	<0.06	<0.09	<0.04	<0.09	<0.07	<0.06	<0.06	<0.05
174	<0.02	<0.02	<0.02	<0.02	<0.03	<0.04	<0.03	<0.03	<0.09	<0.07	<0.06	<0.04	<0.04	<0.03	<0.06	<0.09	<0.04	<0.09	<0.07	<0.06	<0.06	<0.05
177	<0.02	<0.02	<0.02	<0.02	<0.03	<0.04	<0.03	<0.03	<0.09	<0.07	<0.06	<0.04	<0.04	<0.03	<0.06	<0.09	<0.04	<0.09	<0.07	<0.06	<0.06	<0.05
171	<0.02	<0.02	<0.02	<0.02	<0.03	<0.04	<0.03	<0.03	<0.1	<0.07	<0.06	<0.04	<0.04	<0.03	<0.06	<0.09	<0.04	<0.09	<0.07	<0.06	<0.06	<0.05
172	<0.02	<0.02	<0.02	<0.02	<0.03	<0.04	<0.03	<0.03	<0.09	<0.07	<0.06	<0.04	<0.04	<0.03	<0.05	<0.08	<0.04	<0.08	<0.07	<0.06	<0.06	<0.05
180	<0.02	<0.02	<0.02	<0.02	<0.03	<0.04	<0.03	<0.03	<0.09	<0.07	<0.06	<0.04	<0.04	<0.03	0.820	<0.08	<0.04	<0.08	<0.07	<0.06	<0.06	<0.05
193	<0.02	<0.02	<0.02	<0.02	<0.03	<0.04	<0.03	<0.03	<0.09	<0.07	<0.06	<0.04	<0.04	<0.03	<0.05	<0.08	<0.04	<0.08	<0.07	<0.06	<0.06	<0.05
191	<0.02	<0.02	<0.02	<0.02	<0.03	<0.04	<0.03	<0.03	<0.09	<0.07	<0.06	<0.04	<0.04	<0.03	<0.05	<0.08	<0.04	<0.08	<0.07	<0.06	<0.06	<0.05
170	<0.03	<0.02	<0.02	<0.03	<0.04	<0.05	<0.04	<0.03	<0.12	<0.09	<0.08	<0.05	<0.05	<0.04	<0.06	<0.1	<0.05	<0.11	<0.09	<0.07	<0.07	<0.07
189	<0.03	<0.02	<0.02	<0.03	<0.04	<0.05	<0.04	<0.03	<0.12	<0.09	<0.08	<0.05	<0.05	<0.04	<0.06	<0.1	<0.05	<0.11	<0.09	<0.07	<0.07	<0.07
201	<0.02	<0.01	<0.01	<0.02	<0.02	<0.03	<0.02	<0.02	<0.08	<0.06	<0.03	<0.03	<0.04	<0.03	<0.07	<0.05	<0.03	<0.06	<0.07	<0.06	<0.06	<0.06
197	<0.02	<0.01	<0.02	<0.03	<0.03	<0.05	<0.03	<0.03	<0.09	<0.07	<0.05	<0.05	<0.05	<0.04	<0.08	<0.06	<0.03	<0.07	<0.09	<0.07	<0.08	<0.08
198	<0.02	<0.01	<0.02	<0.03	<0.03	<0.05	<0.03	<0.03	<0.09	<0.07	<0.05	<0.05	<0.05	<0.04	<0.08	<0.06	<0.03	<0.07	<0.09	<0.07	<0.08	<0.08
199	<0.02	<0.01	<0.02	<0.03	<0.03	<0.05	<0.03	<0.03	<0.09	<0.07	<0.05	<0.05	<0.05	<0.04	<0.08	<0.06	<0.03	<0.07	<0.09	<0.07	<0.08	<0.08
196/203	<0.02	<0.01	<0.02	<0.02	<0.03	<0.04	<0.03	<0.03	<0.08	<0.06	<0.04	<0.04	<0.04	<0.04	<0.07	<0.05	<0.03	<0.06	<0.08	<0.06	<0.06	<0.06
195	<0.02	<0.01	<0.02	<0.02	<0.03	<0.04	<0.03	<0.03	<0.17	<0.06	<0.04	<0.04	<0.04	<0.04	<0.07	<0.05	<0.03	<0.06	<0.08	<0.06	<0.06	<0.06
194	<0.04	<0.02	<0.03	<0.05	<0.05	<0.07	<0.05	<0.05	<0.13	<0.11	<0.07	<0.08	<0.09	<0.07	<0.1	<0.07	<0.04	<0.09	<0.13	<0.1	<0.11	<0.11
205	<0.04	<0.02	<0.03	<0.05	<0.05	<0.07	<0.05	<0.05	<0.13	<0.11	<0.07	<0.08	<0.09	<0.07	<0.1	<0.07	<0.04	<0.09	<0.13	<0.1	<0.11	<0.11
208	<0.04	<0.04	<0.04	<0.05	<0.05	<0.07	<0.04	<0.07	<0.13	<0.11	<0.06	<0.07	<0.08	<0.06	<0.06	<0.09	<0.05	<0.08	<0.12	<0.08	<0.08	<0.07
207	<0.04	<0.04	<0.04	<0.05	<0.05	<0.07	<0.04	<0.07	<0.13	<0.11	<0.06	<0.07	<0.08	<0.06	<0.06	<0.09	<0.05	<0.08	<0.12	<0.08	<0.08	<0.07
206	<0.04	<0.04	<0.04	<0.05	<0.05	<0.07	<0.04	<0.07	<0.13	<0.11	<0.06	<0.07	<0.08	<0.06	<0.06	<0.09	<0.05	<0.08	<0.12	<0.08	<0.08	<0.07
209	<0.02	<0.03	<0.03	<0.03	<0.04	<0.05	<0.05	<0.08	<0.06	<0.05	<0.03	<0.06	<0.06	<0.05	<0.04	<0.06	<0.05	<0.08	<0.1	<0.05	<0.07	<0.06
% Surrogate Recovery																						
13 C-Hexachlorobenzene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	78	94	79	62	82	66	58	88	91	81	87	91	89	85
13C-101	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	90	91	88	84	93	89	70	96	94	87	81	89	89	88
13C-118	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	94	91	90	95	97	96	72	92	92	89	84	93	92	94
13C-105	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	100	98	95	97	97	91	77	103	102	98	94	103	100	101
13C-180	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	79	76	82	93	83	75	57	89	94	86	88	100	88	100
13C-209	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	57	53	74	85	85	73	35	85	81	66	65	77	60	77
13C-153	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected
n/a indicates not analyzed
95FRN1and 95FRN2 are field splits of 95NAR1

Table 21 (continued)

Parameter	95NTH1	95NTH2	95NTH3	95NTH5	95STH3	95STH5	95STH6	95THM1	95THM2	95THM3	95THM3d	95THM4	95MAN1	95MAN2	95MAN3	95MAN4	95NAR1	95FRN1	95FRN2	95FRN2d	95NAR2	95NAR3
8/5	<0.02	<0.02	<0.01	<0.02	<0.03	<0.02	<0.02	<0.02	<0.03	<0.02	<0.02	<0.03	<0.27	<0.12	<0.13	<0.32	<0.61	<0.47	<0.57	<0.39	<0.39	<0.24
15	<0.02	<0.02	<0.01	<0.02	<0.03	<0.03	<0.02	<0.15	<0.02	<0.03	<0.05	<0.03	<0.27	<0.12	<0.13	<0.32	<0.61	<0.47	<0.57	<0.39	<0.39	<0.24
19	<0.02	<0.02	<0.01	<0.02	<0.03	<0.02	<0.02	<0.04	<0.03	<0.02	<0.04	<0.05	<0.16	<0.07	<0.17	<0.37	<0.37	<0.65	<0.34	<0.24	<0.71	<0.34
18	<0.02	<0.02	<0.01	<0.02	<0.03	<0.02	<0.02	<0.04	<0.03	<0.02	<0.04	<0.05	0.310	<0.07	0.250	0.650	<0.37	2.000	<0.34	<0.45	2.200	0.890
17	<0.02	<0.02	<0.01	<0.02	<0.03	<0.02	<0.02	<0.04	<0.03	<0.02	<0.04	<0.05	<0.16	<0.07	0.200	<0.37	<0.37	<0.65	<0.34	<0.24	1.100	<0.34
24/27	<0.02	<0.02	<0.01	<0.02	<0.03	<0.02	<0.02	<0.04	<0.03	<0.02	<0.04	<0.05	<0.16	<0.07	<0.17	<0.37	<0.37	<0.65	<0.34	<0.24	<0.71	<0.34
16/32	<0.02	<0.02	<0.01	<0.02	<0.03	<0.02	<0.02	<0.04	<0.03	<0.02	<0.04	<0.05	<0.16	<0.07	<0.17	<0.37	<0.37	<0.65	<0.34	<0.24	<0.71	<0.34
26	<0.01	<0.02	<0.01	<0.02	<0.02	<0.01	<0.02	<0.03	<0.02	<0.02	<0.02	<0.03	<0.11	<0.05	<0.12	<0.25	<0.25	<0.44	<0.24	<0.16	<0.48	<0.24
25	<0.01	<0.02	<0.01	<0.02	<0.02	<0.01	<0.02	<0.03	<0.02	<0.02	<0.02	<0.03	<0.11	<0.05	<0.12	<0.25	<0.25	<0.44	<0.24	<0.16	<0.48	<0.24
31/28	<0.05	<0.01	<0.01	<0.02	<0.1	<0.01	<0.1	<0.1	<0.02	<0.07	<0.06	<0.1	<0.11	<0.05	0.260	<0.25	<0.25	<0.44	<0.24	<0.26	0.660	0.360
33	<0.01	<0.01	<0.01	<0.02	<0.02	<0.01	<0.02	<0.03	<0.02	<0.02	<0.02	<0.03	<0.11	<0.05	<0.12	<0.25	<0.25	<0.44	<0.24	<0.16	<0.48	<0.24
22	<0.01	<0.01	<0.01	<0.02	<0.08	<0.01	<0.02	<0.03	<0.02	<0.02	<0.02	<0.03	<0.11	<0.05	<0.12	<0.25	<0.25	<0.44	<0.24	<0.16	<0.48	<0.24
45	<0.02	<0.02	<0.01	<0.02	<0.04	<0.02	<0.03	<0.05	<0.04	<0.02	<0.03	<0.06	<0.15	<0.06	<0.07	<0.18	<0.34	<0.26	<0.31	<0.22	<0.22	<0.13
46	<0.02	<0.02	<0.01	<0.02	<0.04	<0.02	<0.03	<0.05	<0.04	<0.02	<0.03	<0.06	<0.15	<0.06	<0.07	<0.18	<0.34	<0.26	<0.31	<0.22	<0.22	<0.13
52	<0.02	<0.02	<0.01	<0.02	<0.04	<0.02	<0.03	<0.05	<0.04	<0.18	<0.03	<0.06	<0.15	<0.06	0.230	<0.18	<0.34	<0.26	<0.31	<0.22	<0.22	0.160
49	<0.02	<0.02	<0.01	<0.02	<0.04	<0.02	<0.03	<0.05	<0.04	<0.03	<0.03	<0.06	<0.16	<0.07	0.180	<0.19	<0.36	<0.28	<0.33	<0.23	<0.23	<0.14
47/48	<0.02	<0.02	<0.01	<0.02	<0.04	<0.02	<0.03	<0.05	<0.04	<0.02	<0.03	<0.06	<0.16	<0.07	0.120	<0.19	<0.36	<0.28	<0.33	<0.23	<0.23	<0.14
44	<0.02	<0.02	<0.02	<0.03	<0.04	<0.03	<0.04	<0.06	<0.05	<0.08	<0.04	<0.08	<0.18	<0.08	0.170	<0.21	<0.4	<0.3	<0.37	<0.25	<0.26	<0.15
42	<0.02	<0.02	<0.02	<0.03	<0.04	<0.03	<0.04	<0.06	<0.05	<0.02	<0.04	<0.08	<0.18	<0.08	0.100	<0.21	<0.4	<0.3	<0.37	<0.25	<0.26	<0.15
41/71/64	<0.02	<0.02	<0.02	<0.03	<0.04	<0.03	<0.04	<0.06	<0.05	<0.04	<0.04	<0.08	<0.18	<0.08	0.260	<0.21	<0.4	<0.3	<0.37	<0.25	<0.26	<0.15
40	<0.02	<0.02	<0.02	<0.03	<0.05	<0.03	<0.04	<0.07	<0.06	<0.03	<0.04	<0.08	<0.2	<0.09	<0.1	<0.24	<0.46	<0.35	<0.43	<0.29	<0.3	<0.18
74	<0.02	<0.02	<0.02	<0.03	<0.05	<0.03	<0.04	<0.07	<0.06	<0.04	<0.04	<0.08	<0.2	<0.09	0.190	<0.24	<0.46	<0.35	<0.43	<0.29	<0.3	<0.18
70/76	<0.02	<0.02	<0.02	<0.03	0.300	<0.03	<0.04	<0.07	<0.25	<0.28	<0.1	<0.25	<0.2	<0.09	0.400	<0.24	<0.46	<0.35	<0.43	<0.29	0.410	0.250
66	<0.01	<0.01	<0.01	<0.02	<0.1	<0.02	<0.02	<0.04	<0.03	<0.06	<0.05	<0.06	<0.11	<0.05	0.190	<0.13	<0.25	<0.19	<0.23	<0.16	0.200	0.120
56/60	<0.01	<0.01	<0.01	<0.02	<0.05	<0.02	<0.02	<0.04	<0.05	<0.04	<0.03	<0.2	<0.11	<0.05	0.140	<0.13	<0.25	<0.19	<0.23	<0.16	<0.16	<0.1
95	<0.03	<0.04	<0.02	<0.03	<0.06	<0.01	<0.02	<0.06	<0.05	<0.28	<0.05	<0.07	<0.15	<0.06	0.090	<0.18	<0.33	<0.25	<0.31	<0.21	<0.21	0.140
91	<0.03	<0.04	<0.02	<0.03	<0.06	<0.01	<0.02	<0.06	<0.05	<0.04	<0.05	<0.07	<0.15	<0.06	<0.07	<0.18	<0.33	<0.25	<0.31	<0.21	<0.21	<0.13
84/89	<0.03	<0.04	<0.02	<0.03	<0.06	<0.01	<0.02	<0.06	<0.05	<0.12	<0.05	<0.07	<0.15	<0.06	<0.07	<0.18	<0.33	<0.25	<0.31	<0.21	<0.21	<0.13
101/90	<0.03	<0.04	<0.02	<0.03	<0.06	<0.01	<0.02	<0.06	<0.05	<0.32	<0.05	<0.09	<0.15	<0.06	0.130	<0.18	<0.33	<0.25	<0.31	<0.21	0.360	0.240
99	<0.03	<0.04	<0.02	<0.03	<0.06	<0.01	<0.02	<0.06	<0.05	<0.14	<0.05	<0.07	<0.15	<0.06	<0.07	<0.18	<0.33	<0.25	<0.31	<0.21	<0.21	<0.13
83	<0.04	<0.04	<0.02	<0.04	<0.06	<0.02	<0.02	<0.06	<0.06	<0.04	<0.06	<0.08	<0.2	<0.09	<0.1	<0.24	<0.45	<0.34	<0.42	<0.29	<0.29	<0.17
97	<0.04	<0.04	<0.02	<0.04	<0.06	<0.02	<0.02	<0.06	<0.06	<0.1	<0.06	<0.08	<0.2	<0.09	<0.1	<0.24	<0.45	<0.34	<0.42	<0.29	<0.29	<0.17
87	<0.04	<0.04	<0.02	<0.04	<0.06	<0.02	<0.02	<0.06	<0.06	<0.19	<0.06	<0.08	<0.2	<0.09	<0.1	<0.24	<0.45	<0.34	<0.42	<0.29	<0.29	<0.17
85	<0.04	<0.04	<0.02	<0.04	<0.06	<0.02	<0.02	<0.06	<0.06	<0.04	<0.06	<0.08	<0.2	<0.09	<0.1	<0.24	<0.45	<0.34	<0.42	<0.29	<0.29	<0.17
110	<0.04	<0.04	<0.02	<0.04	<0.06	<0.02	<0.02	<0.06	<0.06	<0.53	<0.06	<0.15	<0.2	<0.09	0.210	<0.24	<0.45	<0.34	0.320	0.330	0.570	0.490
107	<0.03	<0.04	<0.02	<0.03	<0.06	<0.01	<0.02	<0.06	<0.05	<0.04	<0.05	<0.07	<0.16	<0.07	<0.08	<0.19	<0.35	<0.27	<0.33	<0.23	<0.23	<0.14
118	<0.03	<0.03	<0.02	<0.03	<0.05	<0.01	<0.01	<0.05	<0.04	<0.28	<0.04	<0.1	<0.13	<0.05	0.110	<0.15	<0.3	<0.22	<0.27	<0.19	0.310	0.240
114	<0.03	<0.04	<0.02	<0.03	<0.06	<0.01	<0.02	<0.06	<0.05	<0.04	<0.05	<0.07	<0.16	<0.07	<0.08	<0.19	<0.35	<0.27	<0.33	<0.23	<0.23	<0.14
105	<0.03	<0.03	<0.02	<0.02	<0.05	<0.01	<0.01	<0.05	<0.04	<0.1	<0.04	<0.05	<0.13	<0.06	<0.06	<0.15	<0.3	<0.21	<0.28	<0.19	<0.18	<0.11
136	<0.03	<0.03	<0.02	<0.03	<0.06	<0.02	<0.03	<0.05	<0.04	<0.05	<0.04	<0.06	<0.21	<0.09	<0.1	<0.25	<0.46	<0.36	<0.43	<0.3	<0.3	<0.18
151	<0.03	<0.03	<0.02	<0.03	<0.06	<0.02	<0.03	<0.05	<0.04	<0.03	<0.04	<0.06	<0.21	<0.09	<0.1	<0.25	<0.46	<0.36	<0.43	<0.3	<0.3	<0.18
144/135	<0.03	<0.03	<0.02	<0.03	<0.06	<0.02	<0.03	<0.05	<0.04	<0.03	<0.04	<0.06	<0.21	<0.09	<0.1	<0.25	<0.46	<0.36	<0.43	<0.3	<0.3	<0.18
149	<0.03	<0.03	<0.02	<0.03	<0.06	<0.02	<0.03	<0.05	<0.04	<0.2	<0.04	<0.07	<0.21	<0.09	<0.1	<0.25	<0.46	<0.36	<0.43	<0.3	0.340	0.230
134	<0.03	<0.03	<0.02	<0.03	<0.06	<0.02	<0.03	<0.05	<0.04	<0.03	<0.04	<0.06	<0.21	<0.09	<0.1	<0.25	<0.46	<0.36	<0.43	<0.3	<0.3	<0.18
131	<0.03	<0.03	<0.02	<0.03	<0.06	<0.02	<0.03	<0.05	<0.04	<0.03	<0.04	<0.06	<0.21	<0.09	<0.1	<0.25	<0.46	<0.36	<0.43	<0.3	<0.3	<0.18
146	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.08	<0.04	<0.04	<0.1	<0.18	<0.14	<0.17	<0.12	<0.12	<0.07
153	<0.03	<0.03	<0.02	<0.02	<0.06	<0.02	<0.03	<0.05	<0.04	<0.2	<0.04	<0.08	<0.16	<0.08	<0.07	<0.18	<0.4	<0.26	<0.36	<0.23	0.300	0.260
141	<0.03	<0.04	<0.02	<0.03	<0.07	<0.03	<0.04	<0.06	<0.05	<0.06	<0.05	<0.06	<0.23	<0.11	<0.1	<0.26	<0.58	<0.38	<0.52	<0.33	<0.32	<0.2
130	<0.03	<0.04	<0.02	<0.03	<0.07	<0.02	<0.03	<0.06	<0.05	<0.04	<0.05	<0.07	<0.22	<0.1	<0.1	<0.25	<0.54	<0.35	<0.49	<0.31	<0.3	<0.19
137	<0.03	<0.04	<0.02	<0.03	<0.07	<0.02	<0.03	<0.06	<0.05	<0.04	<0.05	<0.07	<0.22	<0.1	<0.1	<0.25	<0.54	<0.35	<0.49	<0.31	<0.3	<0.19
138	<0.03	<0.04	<0.02	<0.03	<0.07	<0.02	<0.03	<0.06	<0.05	<0.37	<0.05	<0.15	<0.22	<0.1	<0.1	<0.25	<0.54	<0.35	<0.49	<0.31	0.430	0.340
158	<0.03	<0.04	<0.02	<0.03	<0.07	<0.02	<0.03	<0.06	<0.05	<0.04	<0.05	<0.07	<0.22	<0.1	<0.1	<0.25	<0.54	<0.35	<0.49	<0.31	<0.3	<0.19
129	<0.03	<0.04	<0.02	<0.03	<0.07	<0.02	<0.03	<0.06	<0.05	<0.04	<0.05	<0.07	<0.22	<0.1	<0.1	<0.25	<0.54	<0.35	<0.49	<0.31	<0.3	<0.19
128	<0.05	<0.06	<0.04	<0.05	<0.12	<0.05	<0.07	<0.1	<0.09	<0.1	<0.08	<0.11	<0.41	<0.19	<0.18	<0.46	<1	<0.66	<0.91	<0.59	<0.56	<0.35
156	<0.04	<0.05	<0.03	<0.04	<0.09	<0.04	<0.05	<0.08	<0.07	<0.1	<0.06	<0.08	<0.3	<0.14	<0.14	<0.34	<0.75	<0.49	<0.67	<0.44	<0.41	<0.26
157	<0.04	<0.05	<0.03	<0.04	<0.09	<0.04	<0.05	<0.08	<0.07	<0.05	<0.06	<0.08	<0.3	<0.14	<0.14	<0.34	<0.75	<0.49	<0.67	<0.44	<0.41	<0.26
179	<0.03	<0.04	<0.02	<0.03	<0.07	<0.02	<0.03	<0.06	<0.05	<0.04	<0.05	<0.07	<0.26	<0.12	<0.12	<0.3	<0.65	<0.42	<0.58	<0.38	<0.36	<0.22
176	<0.03	<0.04	<0.02	<0.03	<0.07	<0.02	<0.03	<0.06	<0.05	<0.04	<0.05	<0.07	<0.26	<0.12	<0.12	<0.3	<0.65	<0.42	<0.58	<0.38	<0.36	<0.22
178	<0.03	<0.04	<0.02	<0.03	<0.07	<0.02	<0.03	<0.06	<0.05	<0.04	<0.05	<0.07	<0.26	<0.12	<0.12	<0.3	<0.65	<0.42	<0.58	<0.38	<0.36	<0.22
175	<0.03	<0.04	<0.02	<0.03	<0.07	<0.02	<0.03	<0.06	<0.05	<0.04	<0.05	<0.07	<0.26	<0.12	<0.12	<0.3	<0.65	<0.42	<0.58	<0.38	<0.36	<0.22
187/182	<0.03	<0.04	<0.02	<0.03	<0.07	<0.02	<0.03	<0.06	<0.05	<0.04	<0.05	<0.07	<0.26	<0.12	<0.12	<0.3	<0.65	<0.42	<0.58	<0.38	<0.36	<0.22
183	<0.04	<0.05	<0.03	<0.04	<0.08	<0.03	<0.03	<0.07	<0.06	<0.04	<0.05	<0.08	<0.3	<0.14	<0.14	<0.34	<0.74	<0.48	<0.66	<0.43	<0.41	<0.26
185	<0.04	<0.05	<0.03	<0.04	<0.08	<0.03	<0.03	<0.07	<0.06	<0.04	<0.05	<0.08	<0.3	<0.14	<0.14	<0.34	<0.74	<0.48	<0.66	<0.43	<0.41	<0.26
174	<0.04	<0.05	<0.03	<0.04	<0.08	<0.03	<0.03	<0.07	<0.06	<0.04	<0.05	<0.08	<0.3	<0.14	<0.14	<0.34	<0.74	<0.48	<0.66	<0.43	<0.41	<0.26
177	<0.04	<0.05	<0.03	<0.04	<0.08	<0.03	<0.03	<0.07	<0.06	<0.04	<0.05	<0.08	<0.3	<0.14	<0.14	<0.34	<0.74	<0.48	<0.66	<0.43	<0.41	<0.26
171	<0.04	<0.05	<0.03	<0.04	<0.08	<0.03	<0.03	<0.07	<0.06	<0.04	<0.05	<0.08	<0.31	<0.15	<0.14	<0.35	<0.77	<0.5	<0.69	<0.45	<0.43	<0.26
172	<0.04	<0.05	<0.03	<0.04	<0.08	<0.02	<0.03	<0.07	<0.06	<0.05	<0.06	<0.09	<0.27	<0.13	<0.12	<0.31	<0.68	<0.44	<0.6	<0.39	<0.37	<0.23
180	<0.04	<0.05	<0.03	<0.04	<0.08	<0.02	<0.03	<0.07	<0.06	<0.05	<0.06	<0.09	<0.27	<0.13	<0.12	<0.31	<0.68	<0.44	<0.6	<0.39	<0.37	<0.23
193	<0.04	<0.05	<0.03	<0.04	<0.08	<0.02	<0.03	<0.07	<0.06	<0.05	<0.06	<0.09	<0.27	<0.13	<0.12	<0.31	<0.68	<0.44	<0.6	<0.39	<0.37	<0.23
191	<0.04	<0.05	<0.03	<0.04	<0.08	<0.02	<0.03	<0.07	<0.06	<0.05	<0.06	<0.09	<0.27	<0.13	<0.12	<0.31	<0.68	<0.44	<0.6	<0.39	<0.37	<0.23
170	<0.05	<0.06	<0.04	<0.05	<0.1	<0.03	<0.04	<0.09	<0.07	<0.06	<0.07	<0.11	<0.37	<0.18	<0.17	<0.41	<0.92	<0.59	<0.82	<0.53	<0.5	<0.31
189	<0.05	<0.06	<0.04	<0.05	<0.1	<0.03	<0.04	<0.09	<0.07	<0.06	<0.07	<0.11	<0.37	<0.18	<0.17	<0.41	<0.92	<0.59	<0.82	<0.53	<0.5	<0.31
201	<0.03	<0.04	<0.02	<0.03	<0.06	<0.02	<0.02	<0.05	<0.05	<0.04	<0.06	<0.07	<0.35	<0.16	<0.16	<0.39	<0.86	<0.56	<0.77	<0.5	<0.48	<0.3
197	<0.04	<0.06	<0.03	<0.05	<0.09	<0.02	<0.03	<0.08	<0.07	<0.05	<0.08	<0.1	<0.48	<0.23	<0.22	<0.54	<1.2	<0.78	<1.1	<0.69	<0.66	<0.41
198	<0.04	<0.06	<0.03	<0.05	<0.09	<0.02	<0.03	<0.08	<0.07	<0.05	<0.08	<0.1	<0.48	<0.23	<0.22	<0.54	<1.2	<0.78	<1.1	<0.69	<0.66	<0.41
199	<0.04	<0.06	<0.03	<0.05	<0.09	<0.02	<0.03	<0.08	<0.07	<0.05	<0.08	<0.1	<0.48	<0.23	<0.22	<0.54	<1.2	<0.78	<1.1	<0.69	<0.66	<0.41
196/203	<0.04	<0.05	<0.03	<0.04	<0.08	<0.02	<0.02	<0.06	<0.06	<0.04	<0.07	<0.08	<0.41	<0.2	<0.19	<0.46	<1	<0.66	<0.91	<0.59	<0.56	<0.35
195	<0.04	<0.05	<0.03	<0.04	<0.08	<0.02	<0.02	<0.06	<0.06	<0.04	<0.07	<0.08	<0.41	<0.2	<0.19	<0.46	<1	<0.66	<0.91	<0.59	<0.56	<0.35
194	<0.07	<0.1	<0.06	<0.08	<0.14	<0.03	<0.03	<0.12	<0.11	<0.08	<0.13	<0.16	<0.78	<0.37	<0.35	<0.88	<1.9	<1.2	<1.7	<1.1	<1.1	<0.66
205	<0.07	<0.1	<0.06	<0.08	<0.14	<0.03	<0.03	<0.12	<0.11	<0.08	<0.13	<0.16	<0.78	<0.37	<0.35	<0.88	<1.9	<1.2	<1.7	<1.1	<1.1	<0.66
208	<0.04	<0.06	<0.04	<0.06	<0.14	<0.02	<0.03	<0.09	<0.11	<0.06	<0.1	<0.13	<0.44	<0.27	<0.15	<0.53	<0.85	<0.69	<0.78	<0.52	<0.58	<0.3
207	<0.04	<0.06	<0.04	<0.06	<0.14	<0.02	<0.03	<0.09	<0.11	<0.06	<0.1	<0.13	<0.44	<0.27	<0.15	<0.53	<0.85	<0.69	<0.78	<0.52	<0.58	<0.3
206	<0.04	<0.06	<0.04	<0.06	<0.14	<0.02	<0.03	<0.09	<0.11	<0.06	<0.1	<0.13	<0.44	<0.27	<0.15	<0.53	<0.85	<0.69	<0.78	<0.52	<0.58	<0.3
209	<0.04	<0.05	<0.04	<0.05	<0.1	<0.02	<0.03	<0.08	<0.08	<0.06	<0.09	<0.1	<0.32	<0.2	<0.11	<0.39	<0.63	<0.51	<0.58	<0.38	<0.43	<0.22
% Surrogate Recovery																						
13 C-Hexachlorobenzene	79	113	90	76	102	69	76	102	97	90	95	106	69	67	70	65	55	67	79	83	71	69
13C-101	71	92	94	71	80	88	94	81	87	81	76	79	89	86	88	77	61	72	80	85	83	70
13C-118	75	97	100	74	80	82	88	82	89	83	79	81	86	89	89	79	59	74	79	83	83	71
13C-105	79	101	104	78	84	91	96	86	91	89	84	85	88	91	95	84	61	80	80	87	90	76
13C-180	68	83	86	63	64	71	76	67	69	70	66	67	82	73	88	75	51	71	70	78	81	66
13C-209	67	80	73	56	52	49	50	59	55	60	61	67	80	56	112	69	64	72	85	94	82	81
13C-153	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected
n/a indicates not detected
95FRN1and 95FRN2 are field splits of 95NAR1

Table 21 (continued)

Parameter	95NAR4	95STK1A	95SRT3	95CHN2	95QNL2	95HAR1
8/5	<0.55	<0.07	<0.01	<0.03	<0.02	<0.06
15	<0.55	<0.05	<0.02	<0.04	<0.03	<0.08
19	<0.34	<0.03	<0.02	<0.04	<0.02	<0.03
18	<0.34	0.040	<0.02	<0.04	<0.02	<0.03
17	<0.34	<0.03	<0.02	<0.04	<0.02	<0.03
24/27	<0.34	<0.03	<0.02	<0.04	<0.02	<0.03
16/32	<0.34	0.040	<0.02	<0.04	<0.02	<0.03
26	<0.23	<0.02	<0.01	<0.04	<0.02	<0.02
25	<0.23	<0.02	<0.01	<0.04	<0.02	<0.02
31/28	<0.23	0.110	<0.01	<0.04	<0.02	<0.02
33	<0.23	0.040	<0.01	<0.04	<0.02	<0.02
22	<0.23	0.030	<0.01	<0.04	<0.02	<0.02
45	<0.3	<0.03	<0.01	<0.02	<0.01	<0.03
46	<0.3	<0.03	<0.01	<0.02	<0.01	<0.03
52	<0.3	1.000	<0.01	<0.02	<0.01	<0.03
49	<0.32	0.230	<0.01	<0.01	<0.01	<0.03
47/48	<0.32	0.050	<0.01	<0.01	<0.01	<0.03
44	<0.36	0.450	<0.01	<0.02	<0.01	<0.04
42	<0.36	<0.03	<0.01	<0.02	<0.01	<0.04
41/71/64	<0.36	0.270	<0.01	<0.02	<0.01	<0.04
40	<0.42	<0.04	<0.01	<0.02	<0.01	<0.04
74	<0.42	0.190	<0.01	<0.02	<0.01	<0.04
70/76	<0.42	0.960	<0.01	<0.02	<0.01	<0.04
66	<0.22	0.290	<0.008	<0.01	<0.009	<0.02
56/60	<0.22	0.130	<0.008	<0.01	<0.009	<0.02
95	<0.3	1.300	<0.01	<0.01	<0.01	<0.03
91	<0.3	0.180	<0.01	<0.01	<0.01	<0.03
84/89	<0.3	0.640	<0.01	<0.01	<0.01	<0.03
101/90	<0.3	1.700	<0.01	<0.01	<0.01	<0.03
99	<0.3	0.540	<0.01	<0.01	<0.01	<0.03
83	<0.41	0.090	<0.01	<0.02	<0.01	<0.04
97	<0.41	0.570	<0.01	<0.02	<0.01	<0.04
87	<0.41	0.960	<0.01	<0.02	<0.01	<0.04
85	<0.41	0.290	<0.01	<0.02	<0.01	<0.04
110	<0.41	2.800	<0.01	<0.02	<0.01	<0.04
107	<0.32	0.060	<0.009	<0.01	<0.01	<0.03
118	<0.26	1.200	<0.007	<0.01	<0.01	<0.1
114	<0.32	<0.02	<0.009	<0.01	<0.01	<0.03
105	<0.24	0.480	<0.007	<0.01	<0.01	<0.2
136	<0.42	0.230	<0.01	<0.02	<0.02	<0.07
151	<0.42	0.160	<0.01	<0.02	<0.02	<0.07
144/135	<0.42	0.200	<0.01	<0.02	<0.02	<0.07
149	<0.42	0.840	<0.01	<0.02	<0.02	<0.07
134	<0.42	0.070	<0.01	<0.02	<0.02	<0.07
131	<0.42	<0.04	<0.01	<0.02	<0.02	<0.07
146	<0.17	0.040	<0.006	<0.007	<0.006	<0.04
153	<0.32	0.880	<0.009	<0.007	<0.01	<0.06
141	<0.45	0.190	<0.01	<0.02	<0.02	<0.08
130	<0.43	<0.05	<0.01	<0.02	<0.01	<0.08
137	<0.43	<0.05	<0.01	<0.02	<0.01	<0.08
138	<0.43	1.400	<0.01	<0.02	<0.01	<0.15
158	<0.43	0.150	<0.01	<0.02	<0.01	<0.08
129	<0.43	<0.05	<0.01	<0.02	<0.01	<0.08
128	<0.8	0.400	<0.01	<0.02	<0.01	<0.15
156	<0.59	0.130	<0.01	<0.02	<0.01	<0.1
157	<0.59	<0.07	<0.01	<0.02	<0.01	<0.1
179	<0.51	<0.06	<0.01	<0.02	<0.02	<0.09
176	<0.51	<0.06	<0.01	<0.02	<0.02	<0.09
178	<0.51	<0.06	<0.01	<0.02	<0.02	<0.09
175	<0.51	<0.06	<0.01	<0.02	<0.02	<0.09
187/182	<0.51	0.080	<0.01	<0.02	<0.02	<0.09
183	<0.58	0.080	<0.02	<0.03	<0.02	<0.1
185	<0.58	<0.08	<0.02	<0.03	<0.02	<0.1
174	<0.58	0.090	<0.02	<0.03	<0.02	<0.1
177	<0.58	<0.08	<0.02	<0.03	<0.02	<0.1
171	<0.61	<0.08	<0.02	<0.03	<0.02	<0.1
172	<0.53	<0.07	<0.02	<0.03	<0.02	<0.08
180	<0.53	0.200	<0.02	<0.03	<0.02	<0.08
193	<0.53	<0.07	<0.02	<0.03	<0.02	<0.08
191	<0.53	<0.07	<0.02	<0.03	<0.02	<0.08
170	<0.72	0.120	<0.02	<0.04	<0.02	<0.11
189	<0.72	<0.09	<0.02	<0.04	<0.02	<0.11
201	<0.68	<0.05	<0.02	<0.02	<0.02	<0.1
197	<0.94	<0.06	<0.04	<0.05	<0.03	<0.13
198	<0.94	<0.06	<0.04	<0.05	<0.03	<0.13
199	<0.94	<0.06	<0.04	<0.05	<0.03	<0.13
196/203	<0.8	<0.06	<0.04	<0.04	<0.03	<0.11
195	<0.8	<0.06	<0.04	<0.04	<0.03	<0.11
194	<1.5	<0.1	<0.04	<0.04	<0.03	<0.16
205	<1.5	<0.1	<0.04	<0.04	<0.03	<0.16
208	<0.69	<0.12	<0.03	<0.03	<0.02	<0.08
207	<0.69	<0.12	<0.03	<0.03	<0.02	<0.08
206	<0.69	<0.12	<0.03	<0.03	<0.02	<0.08
209	<0.51	<0.11	<0.04	<0.05	<0.02	<0.07
% Surrogate Recovery						
13 C-Hexachlorobenzene	82	n/a	n/a	n/a	n/a	83
13C-101	76	n/a	n/a	n/a	n/a	95
13C-118	78	n/a	n/a	n/a	n/a	94
13C-105	84	n/a	n/a	n/a	n/a	98
13C-180	73	n/a	n/a	n/a	n/a	85
13C-209	90	n/a	n/a	n/a	n/a	76
13C-153	100	n/a	n/a	n/a	n/a	100

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected
n/a indicates not detected
95FRN1and 95FRN2 are field splits of 95NAR1

Table 22. PCB Congener Concentrations in Bed Sediments from Individual Sampling Sites in 1996

Parameter	96LCH1	96LCH4	96LCH5	96LCH6	96LCH6d	96MAN1	96MAN2	96MAN3	96MAN4	96NAR1	96NAR2	96NAR3	96NAR4
8/5	<0.007	<0.005	<0.008	<0.005	<0.006	<0.01	0.060	0.070	<0.03	<0.06	0.160	0.020	0.040
15	<0.03	<0.11	<0.01	<0.006	<0.008	0.030	<0.03	0.100	0.080	0.120	0.130	0.050	<0.04
19	<0.01	<0.009	<0.02	<0.007	<0.007	<0.02	<0.03	<0.05	<0.03	<0.38	<0.14	<0.04	<0.31
18	<0.01	<0.009	<0.02	<0.007	<0.007	<0.02	<0.03	0.120	<0.03	<0.38	<0.24	<0.04	<0.31
17	<0.01	<0.009	<0.02	<0.007	<0.007	<0.02	0.090	0.070	<0.03	<0.38	<0.24	<0.04	<0.31
24/27	<0.01	<0.009	<0.02	<0.007	<0.007	<0.02	<0.03	<0.05	<0.03	<0.38	<0.24	<0.04	<0.31
16/32	<0.01	<0.009	<0.02	<0.007	<0.007	<0.02	<0.03	0.080	<0.03	<0.38	<0.24	<0.04	<0.31
26	<0.009	0.020	<0.01	<0.005	0.010	<0.01	<0.03	<0.07	<0.03	<0.3	<0.19	<0.03	<0.24
25	<0.009	<0.007	<0.01	<0.005	<0.006	<0.01	<0.03	<0.04	<0.03	<0.3	<0.19	<0.03	<0.24
31/28	0.030	0.010	<0.01	0.010	<0.007	0.070	0.080	0.610	0.080	<0.3	0.480	0.190	<0.24
33	0.030	0.020	<0.01	<0.005	<0.006	<0.03	<0.03	0.130	<0.05	<0.3	<0.19	0.050	<0.24
22	<0.009	<0.007	<0.01	<0.005	<0.006	<0.01	<0.03	<0.08	<0.03	<0.3	<0.19	<0.03	<0.24
45	<0.02	<0.02	<0.02	<0.009	<0.01	<0.06	<0.01	<0.08	<0.07	<0.03	0.020	<0.02	<0.02
46	<0.02	<0.02	<0.02	<0.009	<0.01	<0.06	<0.01	<0.08	<0.07	<0.03	<0.02	<0.02	<0.02
52	<0.02	<0.02	<0.02	<0.009	<0.01	<0.06	0.050	0.420	<0.07	0.160	0.240	0.090	0.060
49	<0.02	<0.02	<0.02	<0.008	<0.008	<0.05	0.020	0.280	<0.07	0.080	0.120	0.040	0.020
47/48	<0.02	<0.02	<0.02	<0.008	<0.008	<0.05	0.020	0.180	<0.06	0.040	0.090	<0.02	<0.01
44	<0.03	<0.02	<0.02	<0.01	<0.01	<0.06	0.030	0.370	<0.08	0.080	0.130	0.060	0.030
42	<0.03	<0.02	<0.02	<0.01	<0.01	<0.06	<0.01	<0.11	<0.08	<0.03	0.060	<0.02	<0.02
41/71/64	<0.04	<0.05	<0.04	<0.01	<0.01	<0.06	0.030	0.570	<0.08	0.110	0.160	0.120	0.030
40	<0.02	<0.02	<0.02	<0.01	<0.01	<0.06	<0.01	<0.08	<0.08	<0.03	<0.02	<0.02	<0.02
74	0.060	0.060	<0.05	<0.01	<0.01	<0.06	0.020	0.480	<0.08	0.060	0.100	0.110	0.030
70/76	<0.02	<0.05	<0.03	<0.01	<0.01	<0.06	0.040	0.670	<0.08	0.160	0.250	0.110	0.070
66	<0.02	<0.04	<0.03	<0.01	<0.009	<0.04	0.030	0.470	<0.05	0.090	0.160	0.110	0.040
56/60	0.040	<0.04	<0.01	<0.007	<0.007	<0.04	0.010	0.330	<0.05	0.050	0.110	0.040	0.020
95	<0.007	<0.009	<0.008	<0.006	<0.006	<0.03	0.030	0.200	<0.03	0.130	0.360	0.080	0.050
91	<0.007	<0.009	<0.008	<0.006	<0.006	<0.02	<0.01	0.050	<0.02	<0.04	0.040	<0.02	<0.01
84/89	<0.007	<0.009	<0.008	<0.006	<0.006	<0.02	<0.01	0.120	<0.02	<0.06	0.140	0.030	0.030
101/90	<0.007	<0.009	<0.008	<0.006	<0.006	0.030	0.040	0.290	0.030	0.180	0.540	0.090	0.070
99	<0.007	<0.009	<0.008	<0.006	<0.006	<0.02	<0.01	0.150	<0.02	0.070	0.150	0.040	0.030
83	<0.008	<0.01	<0.008	<0.006	<0.006	<0.02	<0.01	<0.05	<0.02	<0.04	<0.02	<0.02	<0.02
97	<0.008	<0.01	<0.008	<0.006	<0.006	<0.02	<0.01	0.110	<0.02	<0.04	0.100	0.030	0.020
87	<0.008	<0.01	<0.008	<0.006	<0.006	<0.02	<0.01	0.120	<0.02	<0.07	0.170	0.030	0.030
85	<0.008	<0.01	<0.008	<0.006	<0.006	<0.02	<0.01	0.070	<0.02	<0.04	0.060	<0.02	<0.02
110	<0.008	<0.01	<0.008	<0.006	<0.006	0.070	0.040	0.450	0.060	0.220	0.620	0.160	0.100
107	<0.006	<0.008	<0.007	<0.005	<0.005	<0.02	<0.01	<0.04	<0.02	<0.03	0.030	<0.02	<0.01
118	0.010	<0.007	<0.006	<0.005	<0.005	0.050	0.030	0.270	<0.05	0.130	0.310	0.090	0.050
114	<0.006	<0.008	<0.007	<0.005	<0.005	<0.02	<0.01	<0.04	<0.02	<0.03	<0.01	<0.02	<0.01
105	<0.006	<0.008	<0.007	<0.005	<0.005	<0.02	<0.01	0.100	<0.02	0.050	0.120	0.040	0.020
136	<0.02	<0.01	<0.01	<0.008	<0.01	<0.04	<0.01	<0.06	<0.04	<0.04	0.250	<0.03	<0.02
151	<0.02	<0.01	<0.01	<0.008	<0.01	<0.04	<0.01	<0.06	<0.04	<0.04	0.350	<0.03	0.020
144/135	<0.02	<0.01	<0.01	<0.008	<0.01	<0.04	<0.01	<0.06	<0.04	<0.04	0.210	<0.03	<0.02
149	<0.02	<0.01	<0.01	<0.008	<0.01	<0.04	0.020	0.110	<0.04	0.170	1.100	0.080	0.070
134	<0.02	<0.01	<0.01	<0.008	<0.01	<0.04	<0.01	<0.06	<0.04	<0.04	0.050	<0.03	<0.02
131	<0.02	<0.01	<0.01	<0.008	<0.01	<0.04	<0.01	<0.06	<0.04	<0.04	<0.02	<0.03	<0.02
146	<0.005	<0.003	<0.004	<0.002	<0.003	<0.01	<0.004	<0.02	<0.04	<0.01	0.060	<0.03	<0.007
153	<0.01	<0.009	<0.01	<0.006	<0.008	0.040	0.020	0.120	0.040	0.130	0.890	0.100	0.070
141	<0.02	<0.01	<0.02	<0.009	<0.01	<0.04	<0.02	<0.07	<0.04	<0.04	0.230	<0.04	0.020
130	<0.02	<0.01	<0.01	<0.008	<0.01	<0.04	<0.01	<0.07	<0.04	<0.04	<0.02	<0.03	<0.02
137	<0.02	<0.01	<0.01	<0.008	<0.01	<0.04	<0.01	<0.07	<0.04	<0.04	<0.02	<0.03	<0.02
138/163/164	<0.02	<0.01	<0.01	<0.008	<0.01	0.050	0.030	0.180	0.050	0.170	1.100	0.150	0.100
158	<0.02	<0.01	<0.01	<0.008	<0.01	<0.04	<0.01	<0.07	<0.04	<0.04	0.100	<0.03	<0.02
129	<0.02	<0.01	<0.01	<0.008	<0.01	<0.04	<0.01	<0.07	<0.04	<0.04	<0.02	<0.03	<0.02
128	<0.02	<0.01	<0.02	<0.009	<0.01	<0.04	<0.02	<0.07	<0.04	<0.04	0.090	<0.03	<0.02
156	<0.02	<0.01	<0.01	<0.008	<0.01	<0.04	<0.01	<0.07	<0.04	<0.03	0.080	<0.03	<0.02
157	<0.02	<0.01	<0.01	<0.008	<0.01	<0.04	<0.01	<0.07	<0.04	<0.03	<0.02	<0.03	<0.02
179	<0.01	<0.01	<0.01	<0.008	<0.09	<0.02	<0.02	<0.07	<0.02	<0.05	0.210	<0.03	<0.02
176	<0.01	<0.01	<0.01	<0.008	<0.09	<0.02	<0.02	<0.07	<0.02	<0.05	0.060	<0.03	<0.02
178	<0.01	<0.01	<0.01	<0.008	<0.09	<0.02	<0.02	<0.07	<0.02	<0.05	0.060	<0.03	<0.02
175	<0.01	<0.01	<0.01	<0.008	<0.09	<0.02	<0.02	<0.07	<0.02	<0.05	<0.04	<0.03	<0.02
187/182	<0.01	<0.01	<0.01	<0.008	<0.09	<0.02	<0.02	<0.07	<0.02	<0.05	0.440	<0.03	0.020
183	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.02	<0.09	<0.03	<0.06	0.260	<0.04	<0.02
185	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.02	<0.09	<0.03	<0.06	0.060	<0.04	<0.02
174	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.02	<0.09	<0.03	<0.06	0.430	<0.04	<0.02
177	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.02	<0.09	<0.03	<0.06	0.230	<0.04	<0.02
171	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.03	<0.09	<0.03	<0.06	0.100	<0.04	<0.02
172	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.02	<0.09	<0.03	<0.06	0.050	<0.04	<0.02
180	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.02	<0.09	<0.03	0.080	0.940	0.080	0.050
193	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.02	<0.09	<0.03	<0.06	0.050	<0.03	<0.02
191	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.02	<0.09	<0.03	<0.06	<0.04	<0.03	<0.02
170/190	<0.02	<0.02	<0.02	<0.01	<0.02	<0.04	<0.03	<0.12	<0.04	<0.08	0.530	<0.04	<0.02
189	<0.02	<0.02	<0.02	<0.01	<0.02	<0.04	<0.03	<0.12	<0.04	<0.08	<0.06	<0.03	<0.02
201	<0.01	<0.008	<0.01	<0.007	<0.01	<0.02	<0.02	<0.07	<0.02	<0.08	<0.02	<0.06	<0.02
197	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.16	<0.06	<0.19	<0.04	<0.06	<0.04
198	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.16	<0.06	<0.19	<0.04	<0.06	<0.04
199	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.16	<0.06	<0.19	0.240	0.080	<0.04
196/203	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.04	<0.14	<0.05	<0.17	0.240	<0.05	<0.04
195	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.04	<0.14	<0.05	<0.17	0.060	<0.06	<0.04
194	<0.03	<0.02	<0.03	<0.02	<0.03	<0.06	<0.06	<0.19	<0.07	<0.23	0.200	<0.06	<0.04
205	<0.03	<0.02	<0.03	<0.02	<0.03	<0.06	<0.06	<0.19	<0.07	<0.23	<0.04	<0.06	<0.04
208	<0.02	<0.02	<0.02	<0.02	<0.02	<0.03	<0.06	<0.12	<0.03	<0.13	<0.03	<0.08	<0.02
207	<0.02	<0.02	<0.02	<0.02	<0.02	<0.03	<0.06	<0.12	<0.03	<0.13	<0.03	0.140	<0.02
206	<0.02	<0.02	<0.02	<0.02	<0.02	<0.03	<0.06	<0.12	<0.03	<0.13	<0.03	<0.08	<0.02
209	<0.01	<0.01	<0.02	<0.01	<0.01	<0.02	<0.05	<0.09	<0.02	<0.17	<0.02	0.240	<0.02

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected

Table 23. PCB Aroclor Concentrations in Bed Sediments from Individual Sampling Sites in 1994

Parameter	94MBD1	94FRM1	94FRM2	94FRM3	94FRM4	94FRM5	94MBD2	94MBD2d	94MBD3	94MBD4	94QPG1	94QPG2	94FRQ1	94FRQ2	94FRQ3	94FRQ4	94FRQ5	94LQN2	94LCH1
Aroclor 1242	<0.26	<2.2	0.40	<0.36	<1	<1.2	<1	<1.1	<2.4	<1.5	<3.2	<0.24	<0.29	<0.14	<4.7	<4.8	<2.8	<2.3	<0.31
Aroclor 1254	<0.73	<3.4	<0.48	<1	<2.3	<3	<2.9	<2.3	<5.4	<2.2	<7.3	<0.63	<0.6	<0.54	<9.2	<8.1	<6.1	<3.7	<0.74
Aroclor 1260	<0.57	<3.7	<0.43	<1	<2.9	<4.4	<3.4	<2.8	<4.6	<2.7	<7	<0.24	<0.24	<0.28	<7.1	<7.8	<7.6	<3.7	<0.76

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
94FRM1-5 are field splits of 94MBD1
94FRQ1-5 are field splits of 94QPG2
94FRT1-5 are field splits of 94THM1

Table 23 (continued)

Parameter	94NEC4	94NEC4d	94 NTH1	94THM1	94FRT1	94FRT2	94FRT3	94FRT4	94FRT5	94STK1A	94SRT3	94CHN2	94QNL2	94HAR1	94HAR1d
Aroclor 1242	<0.28	<0.48	<0.09	<0.5	<0.15	<0.18	<0.17	<0.15	<0.2	5.00	<2.1	<1.2	<0.85	<0.28	<0.3
Aroclor 1254	<0.57	<0.73	<0.39	<1	<0.94	<0.61	<1	<0.68	<0.69	500.00	<1.2	<1.4	<1.2	<1.3	<1.1
Aroclor 1260	<0.67	<0.7	<0.15	<0.8	0.21	0.15	<0.18	0.28	0.21	64.00	<0.99	<1.2	<0.98	0.72	0.67

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
94FRM1-5 are field splits of 94MBD1
94FRQ1-5 are field splits of 94QPG2
94FRT1-5 are field splits of 94THM1

Table 24. PCB Aroclor Concentrations in Bed Sediments from Individual Sampling Sites in 1995

Parameter	95MBD1	95MBD2	95MBD3	95MBD3d	95MBD4	95QPG1	95QPG2	95QPG3	94QPG4	94QPG4d	95LQN1	95LQN2	95LQN3	95LQN4	95LCH1	95LCH4	95LCH5	95LCH6	95NEC1	95NEC2	95NEC4	95NEC6	95NTH1	95NTH2	95NTH3
Aroclor 1242	0.82	<0.85	<0.49	<0.59	0.30	<0.38	<0.29	0.43	<0.53	<0.72	<0.58	<0.59	19.00	<0.68	<0.75	<2.5	<1.6	<2.4	<1.6	<1.5	<1.3	<0.63	<0.29	<0.36	<0.21
Aroclor 1254	<0.32	<0.33	<0.37	<0.58	<0.45	<0.78	<0.66	<0.33	<0.91	<1.1	<0.84	<0.83	<1.1	<0.62	<1.2	<4.9	<4.3	<5.5	<1	<1.1	<0.61	<0.85	<0.98	<1.2	<0.64
Aroclor 1260	<0.38	<0.35	<0.28	<0.41	<0.49	<0.73	<0.5	<0.48	<1	<1.4	<0.8	<0.71	<0.75	<0.6	<0.9	<5.7	<1.5	<1.5	<1.1	<1	<0.71	<0.83	<0.65	<0.87	<0.51

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
95FRN1and 95FRN2 are field splits of 95NAR1

Table 24 (continued)

Parameter	95NTH5	95STH3	95STH5	95STH6	95THM1	95THM2	95THM3	95THM3d	95THM4	95MAN1	95MAN2	95MAN3	95MAN4	95NAR1	95FRN1	95FRN2	95FRN2d	95NAR2	95NAR3	95NAR4	95STK1A	95SRT3	95CHN2	95QNL2	95HAR1
Aroclor 1242	<0.31	<0.45	<0.45	<0.64	<0.48	<0.45	<0.29	<0.35	<0.55	<2.4	<1	2.50	<5.3	<5.3	<9.2	<4.9	<3.4	<10	5.00	<4.8	0.73	<0.28	<0.58	<0.4	<0.39
Aroclor 1254	<0.98	<1.7	<1.5	<1.2	<1.8	<1.7	<0.44	<0.55	<1.7	<5.1	<2.3	<2.5	<6.2	<12	<8.9	<11	<7.4	<7.5	<4.5	<10	20	<0.32	<0.45	<0.41	<0.98
Aroclor 1260	<0.7	<1.4	<0.48	<0.6	<0.44	<1.4	<0.43	<0.54	<1.2	<5	<2.4	<2.3	<5.6	<12	<8	<11	<7.2	<6.8	<4.2	<9.7	2.2	<0.28	<0.51	<0.32	<1.6

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
95FRN1and 95FRN2 are field splits of 95NAR1

Table 25. PCB Aroclor Concentrations in Bed Sediments from Individual Sampling Sites in 1996

Parameter	96LCH1	96LCH4	96LCH5	96LCH6	96LCH6d	96MAN1	96MAN2	96MAN3	96MAN4	96NAR1	96NAR2	96NAR3	96NAR4
Aroclor 1242	<0.18	<0.15	<0.3	<0.11	<0.12	<0.33	<0.56	3.40	<0.57	<0.62	<3.9	1.00	<5
Aroclor 1254	<0.22	<0.27	<0.24	<0.18	<0.18	<0.61	<0.38	3.70	<0.69	1.70	4.10	0.94	0.73
Aroclor 1260	<0.23	<0.21	<0.24	<0.17	<0.2	<0.55	<0.45	<1.6	<0.57	<1	9.30	<0.55	0.40

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID

Table 26. PCB Coplanar Concentrations in Bed Sediments from Individual Sampling Sites in 1994

Parameter	94MBD1	94FRM1	94FRM2	94FRM3	94FRM4	94FRM5	94MBD2	94MBD2d	94MBD3	94MBD4	94QPG1	94QPG2	94FRQ1	94FRQ2	94FRQ3	94FRQ4	94FRQ5
PCB #77 (3,3',4,4' TCB)	<1	<0.4	0.41	<0.4	<0.6	0.70	<0.5	<0.7	<0.4	<0.6	<0.7	<0.7	<0.7	0.41	<0.9	<1.2	<0.7
PCB #126 (3,3',4,4',5 PCB)	<0.4	<0.2	0.09	<0.1	<0.2	<0.1	<0.08	<0.1	<0.2	<0.2	<0.2	<0.3	<0.3	0.06	<1.4	<1.3	<1.1
PCB #169 (3,3',4,4',5,5' HCB)	<0.8	<0.2	<0.23	<0.3	<0.3	<0.3	<0.4	<0.3	<0.4	<0.3	<0.5	<0.5	<0.5	0.11	<0.5	<0.9	<0.44
% Surrogate Recovery																	
13C-PCB #77	74	28	67	70	32	21	47	42	28	28	23	75	74	95	81	88	86
13C-PCB #126	80	27	61	69	32	21	46	40	26	27	22	77	76	93	78	85	78
13C-PCB #169	80	26	43	64	30	20	46	39	26	26	20	76	79	104	84	89	87

Values expressed as pg/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected
94FRM1-5 are field splits of 94MBD1
94FRQ1-5 are field splits of 94QPG2
94FRT1-5 are field splits of 94THM1

Table 26 (continued)

Parameter	94LQN2	94LCH1	94NEC4	94NEC4d	94 NTH1	95 NTH1d	94THM1	94FRT1	94FRT2	94FRT3	94FRT4	94FRT5	94STK1A	94SRT3	94CHN2	94QNL2	94HAR1
PCB #77 (3,3',4,4' TCB)	<0.5	<0.5	<1.5	<0.7	0.18	0.18	1.20	0.74	0.56	0.58	0.61	0.58	270.00	0.42	0.40	0.23	4.40
PCB #126 (3,3',4,4',5 PCB)	<0.2	<0.2	<1.3	<0.8	<0.06	<0.06	<0.3	0.20	0.12	0.11	0.11	0.12	48.00	0.09	0.13	0.06	0.74
PCB #169 (3,3',4,4',5,5' HCB)	<0.4	<0.4	<0.16	<0.3	0.09	<0.09	<0.6	0.21	0.11	0.11	0.11	<0.09	0.93	0.18	0.24	0.16	0.68
% Surrogate Recovery																	
13C-PCB #77	89	86	52	100	106	102	94	131	125	116	105	97	104	102	72	87	100
13C-PCB #126	95	96	44	100	115	109	99	104	95	92	95	101	104	107	67	95	100
13C-PCB #169	95	97	42	110	117	111	100	116	105	100	100	103	112	111	69	95	120

Values expressed as pg/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected
94FRM1-5 are field splits of 94MBD1
94FRQ1-5 are field splits of 94QPG2
94FRT1-5 are field splits of 94THM1

Table 27. PCB Coplanar Concentrations in Bed Sediments from Individual Sampling Sites in 1996

Parameter	96LCH1	96LCH4	96LCH5	96LCH6	96LCH6d	96MAN1	96MAN2	96MAN3	96MAN4	96NAR1	96NAR2	96NAR3
PCB #77 (3,3',4,4' TCB)	0.8	<0.6	<0.6	0.65	<0.6	3.7	2.4	35	5.1	14	23	8.9
PCB #126 (3,3',4,4',5 PCB)	<0.3	<0.3	<0.3	<0.3	<0.3	0.32	<0.3	1	0.31	0.78	<2.1	<1.3
PCB #169 (3,3',4,4',5,5' HCB)	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.7	<1.3	<0.6
% Surrogate Recovery												
13C-PCB #77	67	70	79	75	66	69	64	69	66	70	82	84
13C-PCB #126	70	81	82	79	75	71	64	71	73	72	90	81
13C-PCB #169	65	83	79	77	71	66	63	70	68	69	85	77

Values expressed as pg/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected
96NAR4 could not be analyzed due to insufficient sample.

Table 28. Pesticide Concentrations in Bed Sediments from Individual Sampling Sites in 1994

Parameter	94MBD1	94FRM1	94FRM2	94FRM3	94FRM4	94FRM5	94MBD2	94MBD2d	94MBD3	94MBD4	94QPG1	94QPG2	94FRQ1	94FRQ2	94FRQ3	94FRQ4	94FRQ5
Hexachlorobenzene (284)	0.06	<0.11	0.05	<0.05	<0.12	<0.1	<0.09	<0.08	<0.15	<0.07	<0.14	0.06	0.05	0.17	<0.42	<0.34	<0.22
alpha HCH (219)	<0.06	<0.27	<0.14	<0.11	<0.25	<0.31	<0.3	<0.28	<0.43	<0.22	<0.3	0.03	0.04	0.03	<1.2	<0.85	<0.68
beta HCH (219)	<0.1	<0.57	<0.24	<0.24	<0.53	<0.66	<0.64	<0.6	<0.91	<0.36	1.70	<0.04	<0.03	<0.03	<2.3	<1.7	<1.3
gamma HCH (219)	0.36	0.58	0.19	<0.18	0.70	0.67	0.66	0.50	0.85	0.54	0.77	<0.03	<0.03	<0.02	<1.3	<0.95	0.84
delta HCH (219)	<0.07	<0.29	<0.17	<0.12	<0.27	<0.34	<0.33	<0.3	<0.46	<0.27	<0.32	<0.03	<0.03	<0.02	<1.3	<0.95	<0.76
Heptachlor (337)	<0.15	<0.92	<0.21	<0.2	<0.62	<0.8	<0.64	<0.78	<1	<0.62	<1.1	<0.05	<0.06	<0.01	<1.2	<1.1	<0.97
Aldrin (263)	<0.05	<0.23	0.18	<0.07	<0.19	<0.23	<0.2	<0.2	<0.38	<0.17	<0.38	<0.01	<0.02	<0.01	<0.5	<0.74	<0.5
Oxychlordane (373)	<0.31	1.60	<0.25	1.50	1.50	0.96	2.70	1.90	<1.8	<0.89	4.10	<0.04	<0.05	<0.04	<3	<2.7	<2.5
trans-Chlordane (373)	<0.04	<0.24	<0.03	<0.05	<0.16	<0.2	<0.16	<0.18	<0.32	<0.13	<0.32	<0.02	<0.03	<0.02	<0.48	<0.5	<0.33
cis-Chlordane (373)	<0.04	<0.26	<0.03	<0.05	<0.17	<0.2	<0.17	<0.18	<0.33	<0.14	<0.34	<0.03	<0.04	<0.02	<0.52	<0.54	<0.36
p,p'-DDE (246)	<0.03	<0.11	0.06	<0.07	<0.09	<0.1	<0.09	<0.09	<0.14	<0.08	<0.51	<0.03	<0.02	<0.03	<0.24	<0.27	<0.19
trans-Nonachlor (409)	<0.03	<0.2	<0.03	<0.05	<0.14	<0.17	<0.14	<0.17	<0.28	<0.12	<0.26	<0.03	<0.04	<0.02	<0.29	<0.31	<0.22
p,p'-DDD (235)	<0.04	<0.15	<0.03	<0.04	<0.12	<0.14	<0.12	<0.13	<0.24	<0.08	<0.25	<0.02	<0.02	<0.04	<0.48	<0.5	<0.36
o,p'-DDT (235)	<0.04	<0.24	<0.09	<0.07	<0.2	<0.27	<0.21	<0.21	<0.36	<0.29	<0.37	<0.21	<0.17	<0.11	<0.83	<0.89	<0.67
p,p'-DDT (235)	<0.06	<0.34	4.00	<0.1	<0.28	<0.39	<0.3	<0.3	<0.36	<0.36	0.56	<0.28	<0.24	<0.14	<1.2	<1.3	<0.96
Mirex (272)	<0.71	<0.66	<0.43	<0.69	<0.63	<0.59	<0.68	<0.73	<0.65	<0.6	<0.66	<0.04	<0.05	0.02	<0.7	<0.54	<0.55
Heptachlor Epoxide	<0.19	<0.04	<0.05	<0.04	<0.06	<0.05	<0.03	<0.04	<0.04	<0.04	<0.08	<0.04	<0.16	<0.13	<0.12	<0.21	<0.27
alpha-Endosulphan (I)	<0.09	<0.04	<0.06	<0.05	<0.07	<0.06	<0.04	<0.04	<0.05	<0.04	<0.09	<0.04	<0.06	<0.14	<0.03	<0.05	<0.31
Dieldrin	<0.06	<0.04	<0.05	<0.04	<0.06	<0.05	<0.03	<0.04	<0.04	<0.04	<0.08	<0.04	<0.05	<0.12	<0.04	<0.04	<0.07
Endrin	<0.22	<0.08	<0.2	<0.1	<0.14	<0.12	<0.07	<0.08	<0.09	<0.08	<0.17	<0.14	<0.2	<0.42	<0.15	<0.17	<0.27
beta-Endosulphan (II)	<0.08	<0.06	<0.08	<0.07	<0.09	<0.08	<0.05	<0.05	<0.06	<0.06	<0.12	<0.05	<0.08	<0.18	<0.06	<0.05	<0.1
Endosulphan Sulphate	<0.99	<0.06	<0.09	<0.07	<0.1	<0.09	<0.05	<0.06	<0.07	<0.06	<0.13	<0.08	<0.18	<0.19	<0.07	<0.15	<0.1
Methoxychlor	<0.43	<0.2	<0.2	<0.23	<0.33	<0.28	<0.17	<0.18	<0.22	<0.2	<0.41	<0.08	<0.4	<1.5	<0.29	<0.25	<0.62
% Surrogate Recovery																	
d4-alpha-Endosulphan	103	120	86	118	113	124	105	109	110	119	111	95	97	104	102	90	94
13C6-Hexachlorobenzene (292)	52	38	89	56	31	41	61	46	39	48	47	71	66	46	66	97	106
13C6-gamma HCH (225)	64	41	99	59	34	46	81	49	43	46	75	76	70	59	100	119	114
13C12-p,p'-DDE (330)	76	39	85	72	40	47	59	45	35	44	41	85	77	73	75	78	81
13C12-p,p'-DDT (247)	65	33	52	58	31	34	47	37	31	22	35	48	49	76	81	85	85
13C8-Mirex (277)	58	33	63	52	30	34	44	38	34	31	33	62	55	51	67	82	74
13C12-PCB 101 (338)	74	44	93	75	43	54	66	50	38	48	44	83	73	68	75	82	86
13C12-PCB 180 (406)	77	40	76	71	38	37	50	47	41	41	40	84	74	72	73	82	64
13C12-PCB 209 (512)	74	41	81	58	31	30	50	49	40	41	38	89	79	60	75	91	75

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected
94FRM1-5 are field splits of 94MBD1
94FRQ1-5 are field splits of 94QPG2
94FRT1-5 are field splits of 94THM1

Table 28 (continued)

Parameter	94LQN2	94LCH1	94NEC4	94NEC4d	94 NTH1	94THM1	94FRT1	94FRT2	94FRT3	94FRT4	94FRT5	94STK1A	94SRT3	94CHN2	94QNL2	94HAR1	94HAR1d
Hexachlorobenzene (284)	<0.15	0.03	<0.02	<0.03	0.14	0.06	0.18	0.16	0.17	<0.02	0.15	0.17	<0.05	<0.04	<0.05	0.25	0.27
alpha HCH (219)	<0.67	<0.06	0.05	<0.05	<0.01	0.10	<0.02	<0.03	<0.01	<0.01	<0.02	<0.01	<0.12	<0.26	<0.2	0.05	<0.04
beta HCH (219)	1.70	0.17	<0.08	<0.09	<0.02	0.22	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.23	<0.5	<0.39	<0.05	<0.04
gamma HCH (219)	2.20	0.38	0.40	0.43	<0.01	0.39	<0.02	<0.01	<0.02	<0.02	<0.03	<0.01	<0.18	0.56	<0.28	<0.04	<0.03
delta HCH (219)	<0.74	<0.07	<0.05	<0.06	<0.01	0.14	<0.02	<0.01	<0.02	<0.02	<0.01	<0.01	<0.15	<0.33	<0.25	<0.04	<0.03
Heptachlor (337)	<0.64	<0.19	<0.16	<0.18	<0.004	<0.25	<0.02	<0.01	<0.02	<0.01	<0.01	<0.02	<0.28	<0.46	<0.43	<0.06	<0.01
Aldrin (263)	<0.3	<0.05	<0.05	<0.07	<0.004	<0.06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.12	<0.17	0.30	<0.02	<0.02
Oxychlordane (373)	<1.2	<0.35	3.50	3.20	<0.02	<0.39	<0.06	<0.05	<0.05	<0.06	<0.02	<0.03	0.76	<0.59	<0.46	<0.11	<0.08
trans-Chlordane (373)	<0.24	<0.05	<0.04	<0.04	<0.02	<0.05	<0.02	<0.02	<0.01	<0.01	<0.04	0.11	<0.05	<0.08	<0.08	0.04	0.03
cis-Chlordane (373)	<0.26	<0.05	<0.04	<0.04	<0.004	<0.05	<0.02	<0.02	<0.02	<0.02	<0.01	0.08	<0.05	<0.09	<0.08	<0.04	0.07
p,p'-DDE (246)	<0.14	0.05	0.03	0.02	<0.04	0.22	0.08	0.08	0.06	0.08	0.08	0.58	<0.05	<0.07	<0.06	2.00	2.00
trans-Nonachlor (409)	<0.14	<0.04	<0.03	<0.04	<0.004	<0.04	<0.03	<0.02	<0.02	0.02	<0.01	0.04	<0.06	<0.1	<0.06	0.11	0.09
p,p'-DDD (235)	<0.23	<0.03	<0.03	<0.03	<0.04	0.12	<0.06	<0.07	<0.07	<0.05	<0.04	0.66	0.45	<0.08	<0.06	1.50	1.30
o,p'-DDT (235)	<0.41	<0.05	<0.05	<0.05	<0.14	<0.05	<0.17	<0.2	<0.22	<0.15	<0.14	<0.18	0.19	<0.16	<0.12	<0.35	<0.28
p,p'-DDT (235)	<0.59	<0.07	<0.06	<0.06	<0.19	<0.06	<0.22	<0.27	<0.29	<0.2	<0.18	0.26	<0.18	<0.21	<0.16	0.90	<0.37
Mirex (272)	<0.49	<0.63	<0.53	<0.55	0.01	<0.68	0.02	0.02	0.02	0.02	0.02	0.04	<0.39	<0.5	<0.43	0.03	0.03
Heptachlor Epoxide	<0.06	<0.05	<0.06	<0.04	<0.08	<0.11	<0.08	<0.07	<0.15	<0.06	<0.27	<0.12	<0.23	<0.08	<0.1	<0.14	<0.44
alpha-Endosulphan (I)	<0.01	<0.03	<0.06	<0.04	<0.08	<0.09	<0.08	<0.07	<0.15	<0.06	<0.36	0.91	<0.16	<0.1	<0.11	<0.15	<0.3
Dieldrin	<0.01	<0.03	<0.06	<0.04	<0.07	<0.07	<0.08	<0.06	<0.13	<0.06	<0.32	0.30	<0.14	<0.14	<0.1	<0.13	<0.41
Endrin	<0.06	<0.11	<0.17	<0.11	<0.26	<0.11	<0.25	<0.22	<0.47	<0.2	<0.75	<0.38	<0.97	<0.6	<0.69	<0.45	<1.4
beta-Endosulphan (II)	<0.03	<0.04	<0.09	<0.06	<0.11	<0.03	<0.11	<0.1	<0.2	<0.09	<0.48	1.70	<0.22	<0.14	<0.16	<0.2	<0.6
Endosulphan Sulphate	<0.03	<0.03	<0.1	<0.07	<0.12	<0.15	<0.12	<0.1	<0.21	<0.09	<0.5	0.35	<0.29	<0.18	<0.21	<0.2	<0.65
Methoxychlor	<0.12	<0.17	<0.21	<0.14	<0.94	<0.27	<0.9	<0.8	<1.7	<0.72	<3.2	<1.4	<1.2	<0.77	<0.88	<1.6	<5
% Surrogate Recovery																	
d4-alpha-Endosulphan	106	92	108	104	88	119	124	115	117	108	89	89	78	97	87	118	87
13C6-Hexachlorobenzene (292)	83	62	53	42	65	64	47	56	49	54	60	41	77	83	68	60	65
13C6-gamma HCH (225)	96	78	76	58	78	87	60	65	62	66	75	53	116	87	75	74	75
13C12-p,p'-DDE (330)	84	82	67	61	85	74	69	78	68	80	85	69	78	87	83	75	79
13C12-p,p'-DDT (247)	90	68	56	52	85	72	69	79	66	74	86	76	40	60	56	73	78
13C8-Mirex (277)	73	63	60	49	90	70	53	64	57	68	72	41	42	58	56	73	69
13C12-PCB 101 (338)	89	79	66	57	81	71	63	71	64	72	78	63	75	88	84	74	78
13C12-PCB 180 (406)	80	75	69	61	91	90	69	83	68	78	88	73	55	70	72	84	88
13C12-PCB 209 (512)	87	85	83	61	89	97	60	75	63	71	80	60	68	75	74	74	78

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected
94FRM1-5 are field splits of 94MBD1
94FRQ1-5 are field splits of 94QPG2
94FRT1-5 are field splits of 94THM1

Table 29. Pesticide Concentrations in Bed Sediments from Individual Sampling Sites in 1995

Parameter	95MBD1	95MBD2	95MBD3	95MBD3d	95MBD4	95QPG1	95QPG2	95QPG3	94QPG4	9QPG4d	95LQN1	95LQN2	95LQN3	95LQN4	95LCH1	95LCH4	95LCH5	95LCH6	95NEC1	95NEC2	95NEC4	95NEC6	95NTH1	95NTH2	95NTH3
Hexachlorobenzene (284)	0.05	0.04	<0.03	<0.03	0.03	0.05	<0.03	0.03	<0.06	<0.08	<0.05	<0.04	<0.03	<0.03	<0.02	<0.09	<0.07	<0.1	<0.08	<0.08	<0.04	<0.04	<0.03	<0.03	<0.02
alpha HCH (219)	<0.07	<0.06	<0.06	<0.09	<0.06	<0.1	<0.1	0.09	<0.04	<0.06	<0.03	<0.03	<0.03	<0.02	<0.09	<0.43	<0.27	<0.44	<0.12	<0.09	<0.07	<0.09	<0.04	<0.05	<0.04
beta HCH (219)	<0.12	<0.11	<0.1	<0.16	<0.11	<0.16	<0.17	<0.12	0.26	<0.1	0.76	0.28	0.40	1.60	<0.13	<0.8	<0.49	<0.8	<0.2	<0.16	<0.12	<0.16	<0.06	<0.09	<0.06
gamma HCH (219)	0.26	0.25	0.23	0.30	0.16	<0.15	<0.15	0.35	0.18	<0.14	0.82	0.46	0.68	1.60	<0.12	<0.6	<0.43	<0.7	<0.18	<0.14	<0.1	<0.14	<0.06	<0.08	<0.06
delta HCH (219)	<0.11	<0.1	<0.1	<0.15	<0.1	<0.15	<0.15	<0.08	<0.06	<0.08	<0.05	<0.04	<0.09	<0.16	<0.09	<0.52	<0.33	<0.54	<0.18	<0.14	<0.1	<0.14	<0.06	<0.08	<0.06
Heptachlor (337)	<0.13	<0.17	<0.12	<0.19	<0.18	<0.22	<0.19	<0.13	<0.33	<0.35	<0.24	<0.26	<0.21	<0.17	<0.3	<1.3	<1.1	<1.2	<0.37	<0.03	<0.21	<0.27	<0.17	<0.24	<0.13
Aldrin (263)	<0.05	0.13	0.12	0.12	<0.06	<0.09	<0.08	<0.04	<0.03	<0.1	<0.03	<0.08	0.19	<0.03	<0.06	<0.38	<0.23	<0.35	<0.05	<0.05	<0.04	<0.04	<0.06	<0.07	<0.04
Oxychlordane (373)	<0.34	<0.34	<0.29	<0.43	<0.28	<0.35	<0.37	<0.24	<0.19	<0.09	<0.69	<0.94	<0.16	<0.31	<0.35	<1.4	<0.97	<1.4	<0.28	<0.93	<0.57	<0.17	<0.41	<0.47	<0.28
trans-Chlordane (373)	<0.03	<0.03	<0.02	<0.03	<0.03	<0.06	<0.04	<0.03	<0.07	<0.09	<0.06	<0.07	<0.05	<0.05	<0.06	<0.38	<0.23	<0.31	<0.08	<0.08	<0.06	<0.09	<0.04	<0.05	<0.03
cis-Chlordane (373)	<0.03	<0.03	<0.03	<0.03	<0.04	<0.06	<0.04	<0.03	<0.08	<0.1	<0.07	<0.08	<0.06	<0.05	<0.06	<0.41	<0.25	<0.33	<0.09	<0.09	<0.06	<0.09	<0.05	<0.05	<0.03
p,p'-DDE (246)	<0.07	<0.07	<0.06	<0.06	0.36	0.07	<0.06	0.06	<0.06	<0.06	0.09	0.00	0.09	<0.07	<0.09	<0.16	<0.16	<0.19	<0.07	<0.04	<0.05	<0.05	0.06	<0.07	<0.08
trans-Nonachlor (409)	<0.02	<0.03	<0.02	<0.04	<0.03	<0.04	<0.03	<0.03	<0.06	<0.08	<0.06	<0.06	<0.05	<0.04	<0.05	<0.27	<0.18	<0.26	<0.09	<0.08	<0.05	<0.08	<0.04	<0.04	<0.02
p,p'-DDD (235)	<0.01	<0.01	<0.01	<0.01	0.59	<0.02	<0.02	0.02	<0.02	<0.02	<0.05	<0.04	<0.01	<0.01	<0.03	<0.34	<0.3	<0.29	<0.09	<0.02	<0.01	<0.01	<0.02	<0.02	<0.05
o,p'-DDT (235)	<0.02	<0.02	<0.01	<0.02	0.09	<0.04	<0.03	<0.01	<0.04	<0.06	<0.03	<0.03	0.22	<0.02	<0.06	<0.61	<0.5	<0.5	<0.06	<0.06	<0.04	<0.04	<0.04	<0.06	<0.03
p,p'-DDT (235)	4.10	1.10	2.10	3.40	1.30	0.83	0.29	1.30	<0.04	0.17	0.30	<0.03	<0.05	<0.02	<0.05	<0.56	<0.46	<0.46	<0.06	<0.05	<0.04	<0.04	<0.05	<0.05	<0.03
Mirex (272)	<0.43	<0.42	<0.39	<0.38	<0.38	<0.45	<0.39	<0.43	<0.58	<0.47	<0.42	<0.36	<0.41	<0.49	<0.35	<0.46	<0.25	<0.52	<0.51	<0.43	<0.45	<0.41	<0.5	<0.45	<0.35
Heptachlor Epoxide	<0.03	<0.02	<0.02	<0.01	<0.02	<0.03	<0.02	<0.02	<0.03	<0.04	<0.03	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.05	<0.03	<0.02	<0.02	<0.02	<0.02	<0.01
alpha-Endosulphan (I)	<0.03	<0.01	<0.02	<0.01	<0.02	<0.03	<0.02	<0.02	<0.04	<0.06	<0.04	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.06	<0.03	<0.04	<0.03	<0.02	<0.01	<0.01
Dieldrin	<0.03	<0.02	<0.02	<0.01	<0.02	<0.03	<0.02	<0.02	<0.03	<0.06	<0.04	<0.03	<0.03	<0.05	<0.02	<0.02	<0.02	<0.02	<0.06	<0.04	<0.03	<0.03	<0.02	<0.02	<0.01
Endrin	<0.08	<0.04	<0.04	<0.03	<0.04	<0.06	<0.04	<0.05	<0.04	<0.07	<0.05	<0.04	<0.04	<0.06	<0.04	<0.03	<0.03	<0.03	<0.08	<0.05	<0.03	<0.04	<0.03	<0.03	<0.02
beta-Endosulphan (II)	0.12	0.05	<0.02	<0.02	0.08	<0.03	<0.03	<0.04	<0.06	<0.08	<0.05	<0.03	<0.04	<0.06	<0.04	<0.03	<0.03	<0.03	<0.08	<0.05	<0.05	<0.04	<0.03	<0.02	<0.02
Endosulphan Sulphate	0.09	<0.03	<0.02	<0.02	<0.02	<0.04	<0.03	<0.02	<0.07	<0.08	<0.06	<0.04	<0.04	<0.06	<0.08	<0.05	<0.1	<0.03	<0.09	<0.05	<0.06	<0.04	<0.04	<0.03	<0.02
Methoxychlor	<0.11	<0.05	<0.06	<0.05	<0.06	<0.1	<0.07	<0.07	<0.06	<0.1	<0.06	<0.05	<0.05	<0.08	<0.11	<0.06	<0.09	<0.06	<0.12	<0.07	<0.05	<0.05	<0.06	<0.05	<0.03
% Surrogate Recovery																									
d4-alpha-Endosulphan	84	91	94	93	96	85	94	100	55	71	77	88	90	90	77	79	86	77	75	78	58	81	95	96	92
13C6-Hexachlorobenzene (	74	78	77	75	71	64	47	90	66	57	63	62	82	66	58	88	91	81	59	73	76	65	79	113	90
13C6-gamma HCH (225)	76	81	74	66	93	70	59	94	100	85	80	88	100	98	50	90	90	80	110	110	120	110	100	140	110
13C12-p,p'-DDE (330)	100	98	97	93	104	86	93	102	93	91	92	90	94	82	70	86	83	84	85	92	100	100	70	90	92
13C12-p,p'-DDT (247)	70	68	64	64	90	68	75	71	59	50	64	59	64	62	61	80	84	75	46	51	54	58	60	65	74
13C8-Mirex (277)	70	74	73	74	73	64	77	72	61	60	69	78	78	61	53	77	82	75	64	78	83	75	58	69	75
13C12-PCB 101 (338)	93	91	89	84	93	83	87	97	97	90	86	84	93	89	70	96	94	87	77	85	94	98	71	92	94
13C12-PCB 180 (406)	88	92	94	98	90	87	106	93	74	74	86	93	83	75	57	89	94	86	77	93	88	84	68	83	86
13C12-PCB 209 (512)	76	69	70	91	76	74	87	83	67	55	67	85	85	73	35	85	81	66	59	81	87	76	67	80	73

Values expressed as ng/g dry weight

Values below detection limits shown as less than the detection limit

Lab duplicates denoted by a "d" following the sample ID

Values are recovery corrected

95FRN1and 95FRN2 are field splits of 95NAR1

Table 29 (continued)

Parameter	95NTH5	95STH3	95STH5	95STH6	95THM1	95THM2	95THM3	95THM3d	95THM4	95MAN1	95MAN2	95MAN3	95MAN4	95NAR1	95FRN1	95FRN2	95FRN2d	95NAR2	95NAR3	95NAR4	95STK1A	95SRT3	95CHN2	95QNL2	95HAR1
Hexachlorobenzene (284)	<0.02	0.11	<0.02	<0.01	<0.05	<0.04	<0.03	<0.03	<0.04	<0.14	<0.06	<0.07	<0.16	<0.28	<0.2	<0.24	<0.16	<0.19	<0.1	<0.21	0.06	<0.05	0.06	<0.05	<0.05
alpha HCH (219)	<0.06	<0.08	<0.06	<0.1	<0.05	<0.05	<0.06	<0.08	<0.1	<0.44	<0.18	<0.22	<0.53	<0.9	<0.68	<0.95	<0.56	<0.6	<0.32	<0.8	<0.19	<0.04	<0.07	<0.05	<0.1
beta HCH (219)	<0.09	<0.12	<0.08	<0.13	0.78	0.72	<0.11	<0.14	<0.16	<0.74	<0.29	<0.35	<0.86	<1.7	<1.1	<1.5	<0.94	<1	<0.54	<1.3	<0.32	<0.08	<0.12	<0.08	<0.13
gamma HCH (219)	<0.09	<0.12	<0.08	<0.12	<0.12	<0.21	<0.1	<0.14	0.30	<0.69	<0.28	<0.32	<0.82	<1.6	<1	<1.3	<0.88	<0.9	<0.5	<1.2	<0.29	<0.05	<0.1	<0.07	<0.21
delta HCH (219)	<0.09	<0.12	<0.06	<0.09	<0.08	<0.08	<0.1	<0.14	<0.16	<0.69	<0.28	<0.32	<0.82	<1.6	<1	<1.3	<0.88	<0.9	<0.5	<1.2	<0.29	<0.06	<0.1	<0.07	<0.18
Heptachlor (337)	<0.17	<0.3	<0.16	<0.18	<0.22	<0.22	<0.2	<0.24	<0.41	<1.6	<0.73	<0.81	<2	<3.7	<2.8	<3.5	<2.4	<2.4	<1.4	<3.4	<0.29	<0.12	<0.18	<0.15	<0.39
Aldrin (263)	<0.05	<0.1	<0.04	<0.06	<0.09	<0.08	<0.06	<0.08	<0.28	<0.5	<0.22	<0.24	<0.6	<1.1	<0.86	<1	<0.72	<0.72	<0.44	<1	<0.14	<0.06	<0.08	<0.05	<0.09
Oxychlordane (373)	<0.38	<0.74	<0.26	<0.34	<0.63	<0.54	<0.42	<0.58	<0.84	<2.6	<1.1	<1.3	<3.1	<5.8	<4.5	<5.4	<3.7	<3.8	<2.2	<5.3	<0.66	0.52	<0.39	<0.3	<0.52
trans-Chlordane (373)	<0.04	<0.09	<0.02	<0.04	<0.07	<0.05	<0.05	<0.06	<0.09	<0.32	<0.14	<0.16	<0.38	<0.73	<0.56	<0.67	<0.46	<0.47	<0.28	<0.66	<0.06	<0.01	<0.02	<0.02	<0.09
cis-Chlordane (373)	<0.05	<0.1	<0.03	<0.04	<0.08	<0.06	<0.05	<0.07	<0.1	<0.34	<0.15	<0.17	<0.41	<0.78	<0.59	<0.72	<0.5	<0.5	<0.3	<0.7	<0.07	<0.02	<0.03	<0.02	<0.09
p,p'-DDE (246)	0.21	0.15	0.10	<0.07	0.12	0.43	<0.41	<0.18	0.25	0.43	0.14	0.24	<0.21	0.61	0.54	0.54	0.60	1.20	0.66	1.10	1.20	0.04	0.04	<0.03	0.91
trans-Nonachlor (409)	<0.04	<0.07	<0.02	<0.03	<0.05	<0.05	<0.03	<0.05	<0.08	<0.34	<0.15	<0.17	<0.41	<0.78	<0.59	<0.72	<0.5	<0.5	<0.3	<0.7	<0.06	<0.02	<0.03	<0.02	<0.07
p,p'-DDD (235)	<0.05	<0.04	<0.03	<0.03	<0.03	0.36	<0.09	<0.09	0.15	0.20	0.25	0.23	<0.22	<0.42	<0.32	<0.39	<0.27	<0.27	0.36	<0.38	0.82	<0.02	<0.06	<0.03	0.26
o,p'-DDT (235)	<0.04	<0.08	<0.06	<0.1	0.23	<0.06	<0.15	<0.11	<0.15	<0.38	<0.19	<0.21	<0.51	<0.9	<0.66	<0.87	<0.57	1.40	<0.33	<0.77	0.43	<0.03	<0.09	<0.05	<0.11
p,p'-DDT (235)	0.37	<0.07	<0.06	<0.09	<0.09	0.47	<0.45	<0.2	<0.08	1.50	0.20	0.41	<0.46	1.20	0.66	<0.8	<0.52	1.60	<0.76	<0.7	1.20	7.80	1.60	0.46	<0.1
Mirex (272)	<0.41	<0.6	<0.36	<0.33	<0.6	<0.6	<0.45	<0.45	<0.6	<0.53	<0.32	<0.37	<0.62	<0.95	<0.8	<0.86	<0.86	<0.78	<0.68	<0.66	<0.6	<0.04	<0.04	<0.06	<0.55
Heptachlor Epoxide	<0.02	<0.03	<0.01	<0.02	<0.05	<0.04	<0.01	<0.01	<0.04	<0.03	<0.02	<0.01	<0.03	<0.05	<0.06	<0.04	<0.04	<0.05	<0.03	<0.03	<0.03	<0.02	<0.03	<0.02	<0.02
alpha-Endosulphan (I)	<0.02	<0.03	<0.01	<0.03	<0.05	<0.04	<0.01	<0.02	<0.04	<0.05	<0.03	<0.02	<0.06	<0.13	<0.1	<0.07	<0.06	<0.1	<0.06	0.20	<0.04	<0.02	<0.02	<0.02	<0.02
Dieldrin	<0.02	<0.04	<0.01	<0.03	<0.06	<0.05	<0.02	<0.02	<0.05	<0.03	<0.02	<0.02	<0.03	<0.06	<0.07	<0.05	<0.05	<0.06	<0.04	<0.03	<0.04	<0.03	<0.03	<0.03	<0.02
Endrin	<0.03	<0.05	<0.01	<0.04	<0.09	<0.07	<0.02	<0.03	<0.07	<0.06	<0.04	<0.03	<0.06	<0.1	<0.13	<0.09	<0.09	<0.1	<0.07	<0.06	<0.08	<0.06	<0.07	<0.06	<0.04
beta-Endosulphan (II)	<0.02	<0.05	<0.01	<0.03	<0.08	<0.06	<0.02	<0.03	<0.06	<0.06	<0.03	<0.03	<0.08	<0.16	<0.13	<0.09	<0.08	<0.12	<0.08	0.16	0.23	<0.02	0.06	<0.02	<0.03
Endosulphan Sulphate	<0.03	<0.06	<0.02	<0.04	<0.12	<0.09	<0.03	<0.04	<0.09	0.09	<0.03	<0.04	<0.07	<0.14	<0.12	<0.08	<0.07	<0.11	0.08	0.07	0.14	<0.02	<0.02	<0.02	<0.07
Methoxychlor	<0.05	<0.08	<0.02	<0.08	<0.17	<0.13	<0.05	<0.05	<0.12	<0.06	<0.03	<0.03	<0.05	<0.1	<0.12	<0.08	<0.08	<0.1	<0.06	<0.06	<0.12	<0.1	<0.12	<0.1	<0.07
% Surrogate Recovery																									
d4-alpha-Endosulphan	88	89	82	79	85	86	86	82	89	49	54	57	39	34	50	55	55	42	46	45	82	99	98	87	83
13C6-Hexachlorobenzene (	76	102	69	76	102	97	90	95	106	69	67	70	65	55	67	79	83	71	69	82	65	120	96	76	83
13C6-gamma HCH (225)	89	130	70	80	130	130	100	110	130	80	90	85	70	52	80	80	90	85	78	86	56	89	90	88	95
13C12-p,p'-DDE (330)	70	76	88	92	76	84	77	72	75	80	89	85	76	60	71	76	81	84	69	72	70	63	54	59	99
13C12-p,p'-DDT (247)	56	62	52	45	64	65	65	61	62	73	63	65	57	49	59	61	68	65	59	64	56	66	54	57	55
13C8-Mirex (277)	54	55	60	57	58	56	59	60	57	70	64	75	59	47	67	71	78	73	60	69	60	80	84	85	78
13C12-PCB 101 (338)	71	80	88	94	81	87	81	76	79	89	86	88	77	61	72	80	85	83	70	76	74	95	81	88	95
13C12-PCB 180 (406)	63	64	71	76	67	69	70	66	67	82	73	88	75	51	71	70	78	81	66	73	65	71	45	58	85
13C12-PCB 209 (512)	56	52	49	50	59	55	60	61	67	80	56	112	69	64	72	85	94	82	81	90	52	100	100	92	76

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected
95FRN1and 95FRN2 are field splits of 95NAR1

Table 30. Pesticide Concentrations in Bed Sediments from Individual Sampling Sites in 1996

Parameter	96LCH1	96LCH4	96LCH5	96LCH6	96LCH6d	96MAN1	96MAN2	96MAN3	96MAN4	96NAR1	96NAR2	96NAR3	96NAR4
Hexachlorobenzene (284)	0.05	0.05	<0.05	<0.05	0.04	0.09	0.06	0.08	<0.08	0.15	0.18	0.06	0.09
alpha HCH (219)	<0.09	<0.03	<0.07	<0.03	<0.05	0.25	<0.07	<0.27	<1	<0.17	<0.13	<0.13	<0.09
beta HCH (219)	0.40	0.60	0.20	<0.1	<0.11	1.00	0.54	<0.49	<2	0.79	<0.23	0.26	1.10
gamma HCH (219)	0.27	0.39	0.20	<0.1	<0.07	0.84	<0.11	<0.41	<1.7	<0.26	<0.2	0.55	0.17
delta HCH (219)	<0.13	<0.07	0.10	<0.05	<0.07	<0.31	<0.11	<0.2	<1.7	<0.26	<0.2	<0.19	<0.14
Heptachlor (337)	<0.1	<0.06	<0.11	<0.06	<0.07	<0.23	<0.2	<0.63	<0.15	<0.77	<0.28	<0.13	<0.18
Aldrin (263)	<0.02	<0.02	<0.02	<0.04	<0.03	<0.04	<0.05	<0.11	<0.03	<0.14	<0.13	<0.19	<0.08
Oxychlordane (373)	0.37	<0.1	0.38	<0.1	<0.12	<0.25	<0.31	0.96	<0.19	<0.9	<1.1	<0.2	<0.55
trans-Chlordane (373)	<0.02	<0.009	<0.01	<0.01	<0.01	<0.02	<0.04	<0.08	<0.02	<0.08	0.24	0.03	<0.03
cis-Chlordane (373)	<0.02	<0.01	<0.02	<0.01	<0.02	<0.02	<0.04	<0.11	<0.02	<0.1	0.21	0.03	<0.04
p,p'-DDE (246)	0.06	<0.03	0.03	<0.03	<0.04	0.30	<0.02	0.23	0.15	0.42	0.97	0.18	0.42
trans-Nonachlor (409)	<0.01	<0.008	<0.01	<0.008	<0.009	<0.02	<0.03	<0.07	<0.02	<0.08	0.19	<0.02	<0.03
p,p'-DDD (235)	0.09	0.09	<0.02	<0.02	<0.03	0.36	0.16	0.29	0.35	0.43	0.83	0.40	0.89
o,p'-DDT (235)	<0.02	<0.02	<0.03	<0.02	<0.02	<0.03	<0.04	0.63	<0.04	<0.1	0.23	0.20	<0.07
p,p'-DDT (235)	2.10	1.20	1.50	0.26	0.25	3.70	0.35	4.70	7.00	1.80	3.00	4.00	2.90
Mirex (272)	<0.11	0.14	0.15	<0.1	<0.1	0.18	<0.06	<0.24	<0.13	<0.14	<0.1	<0.15	<0.07
Heptachlor Epoxide	<0.1	<0.08	<0.03	<0.04	<0.05	<0.12	<0.05	<0.04	<0.05	<0.13	<0.07	<0.03	<0.06
alpha-Endosulphan (I)	<0.05	<0.04	<0.02	<0.02	<0.03	<0.06	<0.03	<0.02	<0.03	<0.1	<0.05	<0.02	<0.04
Dieldrin	<0.1	<0.08	<0.03	<0.04	<0.05	<0.12	<0.05	<0.04	<0.06	0.50	<0.07	<0.03	<0.06
Endrin	<0.26	<0.19	<0.07	<0.09	<0.12	<0.28	<0.12	<0.09	<0.13	<0.32	<0.16	<0.07	<0.14
beta-Endosulphan (II)	<0.06	<0.05	<0.02	<0.03	<0.04	<0.07	<0.03	<0.02	<0.11	<0.09	<0.06	<0.03	<0.06
Endosulphan Sulphate	<0.07	<0.06	<0.02	<0.03	<0.05	<0.11	<0.04	<0.03	<0.06	<0.12	<0.08	<0.03	<0.07
Methoxychlor	<0.46	<0.42	<0.15	<0.21	<0.29	<0.62	<0.27	<0.2	<0.29	<1.2	<0.39	<0.17	<0.33
% Surrogate Recovery													
d4-alpha-Endosulphan	66	64	66	69	62	58	54	69	76	65	70	58	59
13C6-Hexachlorobenzene (	80	71	69	73	59	64	88	66	93	110	120	69	100
13C6-gamma HCH (225)	81	80	81	87	80	69	84	75	79	78	92	88	91
13C12-p,p'-DDE (330)	62	56	52	64	57	79	80	45	63	110	110	46	100
13C12-p,p'-DDT (247)	51	46	48	57	46	59	59	46	52	89	86	45	87
13C8-Mirex (277)	81	79	78	90	82	72	76	80	84	76	81	86	81
13C12-PCB 101 (338)	81	80	80	94	75	74	77	70	80	95	100	68	94
13C12-PCB 180 (406)	71	69	63	81	62	78	66	56	93	85	87	56	78
13C12-PCB 209 (512)	78	71	68	63	58	76	68	79	80	65	100	110	100

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected

Table 31. Total 4-Nonylphenol Concentrations in Bed Sediments from Individual Sampling Sites in 1994

Parameter	94MBD1	94QPG2	94LQN1	94LCH1
TOTAL 4-NONYLPHENOLS	1.70	1.90	2.90	2.00
% Surrogate Recovery				
Pentachlorophenol	56	57	55	58

Values expressed as ng/g dry weight
Values are recovery corrected

Table 32. Total 4-Nonylphenol Concentrations in Bed Sediments from Individual Sampling Sites in 1995

Parameter	95MBD1	95MBD2	95MBD2d	95MBD3	95MBD4	95QPG1	95QPG2	95QPG3	95QPG4	95LQN1	95LQN2	95LQN3	95LQN4	95LCH1	95LCH4	95LCH4d	95LCH5
TOTAL 4-NONYLPHENOLS	3.20	<2	<2	<2	<5	15.00	6.00	<2	8.20	12.00	7.70	<5	14.00	9.50	18.00	16.00	11.00
% Surrogate Recovery																	
d6-Bisphenol-A	68	90	85	79	50	82	72	76	69	53	64	55	61	76	81	73	85

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Lab reruns denoted by an"r" following the sample ID
Values are recovery corrected
95FRN1and 95FRN2 are field splits of 95NAR1

Table 32 (continued)

Parameter	95LCH6	95NEC1	95NEC2	95NEC4	95NEC6	95NTH1	95NTH2	95NTH3	95NTH3d	95NTH5	95STH3	95STH5	95STH6	95THM1	95THM1d	95THM2	95THM3	95THM4
TOTAL 4-NONYLPHENOLS	13.00	<5	<5	<5	<2	7.70	<1.5	<1.5	<2	<3	2.00	<5	<5	8.00	5.10	21.00	5.10	5.10
% Surrogate Recovery																		
d6-Bisphenol-A	72	71	56	75	75	57	51	73	63	55	52	61	56	77	82	51	56	59

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Lab reruns denoted by an"r" following the sample ID
Values are recovery corrected
95FRN1and 95FRN2 are field splits of 95NAR1

Table 32 (continued)

Parameter	95MAN1	95MAN2	95MAN3	95MAN4	95MAN4r	95NAR1	95FRN1	95FRN2	95NAR2	95NAR3	95NAR4	95STK1A	95SRT3	95CHN2	95QNL2	95QNL2d	95HAR1
TOTAL 4-NONYLPHENOLS	46.00	34.00	37.00	12.00	11.00	54.00	43.00	73.00	64.00	47.00	27.00	9.30	570.00	6.20	<5	<5	<5
% Surrogate Recovery																	
d6-Bisphenol-A	78	76	78	78	84	70	79	100	85	73	79	59	73	76	73	61	53

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Lab reruns denoted by an"r" following the sample ID
Values are recovery corrected
95FRN1and 95FRN2 are field splits of 95NAR1

Table 33. Total 4-Nonylphenol Concentrations in Bed Sediments from Individual Sampling Sites in 1996

Parameter	96LCH1	96LCH4	96LCH4d	96LCH5	96LCH6	96MAN1	96MAN2	96MAN3	96MAN4	96NAR1	96NAR2	96NAR3	96NAR3d	96NAR4
TOTAL 4-NONYLPHENOLS	5.80	<5	<5	<5	<5	8.90	7.40	15.00	13.00	30.00	47.00	19.00	22.00	52.00
% Surrogate Recovery														
d6-Bisphenol-A	78	86	87	78	83	71	75	74	78	89	73	83	70	74

Values expressed as ng/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
Values are recovery corrected

Table 34. Total Trace Metal Concentrations in Bed Sediments from Individual Sampling Sites in 1994 (Elemental Research Lab)

Parameter	Chromium	Manganese	Iron	Cobalt	Nickel	Copper	Zinc	Molybdenum	Cadmium	Lead	Arsenic	Selenium	Mercury
94MBD1	129	763	45900	15.2	45.8	35.6	82.4	1.15	0.290	15.9	3.93	0.0900	0.0240
94FRM1	119	676	43200	13.4	42.3	51.5	75.0	0.510	<0.1	14.3	4.74	0.160	0.0400
94FRM2	105	681	46000	13.0	46.7	38.9	66.8	0.690	<0.1	22.7	4.86	0.160	0.0230
94MBD2	132	665	49200	17.1	52.7	33.5	84.8	0.320	0.140	17.2	4.68	0.130	0.0160
94MBD3	142	655	50200	17.7	59.0	38.6	92.0	0.530	<0.1	18.2	5.34	0.140	0.0110
94MBD4	123	665	38900	14.3	50.7	33.0	70.6	2.00	0.270	14.7	3.42	0.110	0.0130
94MBD4d	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	3.91	0.100	0.0200
94QPG1	125	792	38900	14.9	48.2	37.0	78.7	0.540	0.360	12.2	6.36	0.180	0.0150
94QPG1d	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	5.7199	0.180	n/a
94QPG2	117	1010	40900	14.5	46.3	28.7	75.3	0.740	0.230	13.0	6.85	0.180	0.0400
94QPG2d	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.0200
94FRQ1	117	967	41600	14.2	52.1	47.0	75.0	0.690	0.170	12.8	4.32	0.165	0.0280
94FRQ1d	115	728	47000	15.0	52.9	32.4	80.0	0.640	0.120	18.6	n/a	n/a	n/a
94FRQ2	109	962	40800	13.3	49.6	51.0	67.0	0.240	0.320	12.7	4.73	0.180	0.0210
94FRQ2d	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.0250
94QPG3	138	873	46000	17.6	58.5	34.5	87.2	0.610	<0.1	15.4	7.11	0.190	0.0200
94QPG4	147	882	46000	16.6	51.9	39.9	93.6	0.860	0.120	13.9	7.29	0.200	0.0230
94QPG4d	131	843	45300	15.3	48.5	30.4	88.0	0.860	0.110	15.1	n/a	n/a	0.0170
94LQN1	123	925	38100	12.7	45.4	30.1	64.5	0.740	<0.1	9.56	4.52	0.200	0.0370
94LQN1d	114	756	37800	10.7	38.3	22.0	56.5	0.740	<0.1	8.47	n/a	n/a	n/a
94LQN2	146	805	38000	15.1	59.4	36.2	70.3	0.890	0.220	9.25	4.94	0.220	0.0250
94LQN3	121	820	39400	14.0	55.8	31.8	76.4	0.810	<0.1	11.3	4.94	0.210	0.0320
94LQN4	124	911	42800	15.8	51.9	33.4	80.0	0.660	0.130	13.0	5.07	0.230	0.0410
94LCH1	103	684	29900	11.0	49.9	27.1	53.0	0.920	<0.1	5.66	3.20	0.140	0.0310
94LCH4	128	904	44800	15.4	63.8	34.9	66.9	1.19	0.100	7.34	4.65	0.270	0.0220
94LCH5	128	841	41300	14.3	51.1	33.5	66.6	1.03	0.270	7.89	4.38	0.240	0.0550
94LCH5d	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	5.34	0.260	n/a
94LCH6	125	904	40400	15.3	61.1	35.6	69.6	0.980	0.190	7.87	3.66	0.220	0.0280
94LCH6d	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.0300
94NEC1	132	952	45800	16.2	55.5	29.5	86.4	1.17	0.180	8.85	4.28	0.130	0.0350
94NEC2	57.5	846	30800	9.44	50.3	15.3	60.3	1.12	<0.1	6.88	6.57	0.100	0.0390
94NEC2d	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	7.30	0.0900	n/a
94NEC4	51.0	1060	33100	9.52	24.4	18.7	70.6	1.14	0.180	7.85	7.29	<0.05	0.0120
94NEC4d	47.2	932	31300	9.12	22.0	17.4	59.8	0.980	0.150	8.63	n/a	n/a	n/a
94NEC6	68.1	811	41200	11.3	26.3	20.5	71.0	0.870	0.500	8.43	4.95	0.0700	0.0180
94 NTH1	106	1080	38200	12.7	51.0	25.4	54.4	0.460	<0.1	14.0	1.29	0.100	<0.01
94 NTH2	127	812	44900	17.5	51.6	29.0	75.2	2.04	<0.1	16.0	1.40	0.170	<0.01
94 NTH3	105	1230	38700	13.1	39.6	19.0	61.6	0.510	<0.1	13.4	4.08	0.130	<0.01
94 NTH5	104	820	35800	15.0	51.8	19.1	58.9	0.820	<0.1	14.2	1.31	0.0800	<0.01
95 NTH5d	103	738	34400	15.4	56.4	17.3	52.6	0.610	0.100	16.4	n/a	n/a	<0.01
94STH3	164	640	38000	14.4	46.2	29.3	71.3	1.10	<0.1	14.1	3.88	0.220	0.110
94STH5	142	685	28000	9.36	42.3	14.6	57.0	0.890	0.280	13.0	2.94	0.0900	0.0200
94STH5d	152	682	28000	9.68	36.5	14.6	47.4	0.870	<0.1	13.8	2.84	0.100	n/a
94STH6	45.5	418	14800	3.80	24.5	7.76	39.2	0.640	0.110	15.5	0.610	0.120	0.0120
94STH6d	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.580	0.180	n/a
94THM1	121	779	47700	16.2	47.8	35.4	76.8	0.720	0.190	11.5	4.23	0.150	0.0250
94FRT1	120	693	45700	16.1	44.0	40.4	72.1	0.740	<0.1	9.75	2.96	0.150	0.0930
94FRT2	132	742	46200	15.9	59.0	41.8	71.6	0.760	0.170	10.2	2.73	0.160	0.0230
94THM2	153	743	47000	19.6	56.4	34.0	84.8	0.840	<0.1	17.1	3.69	0.230	0.0180
94THM3	122	697	39100	14.2	50.9	23.0	62.0	0.620	0.280	17.2	2.35	0.0900	0.0180
94THM4	96.2	939	38400	12.2	46.9	14.1	52.4	0.680	0.170	16.2	1.05	0.0900	<0.01
94THM4d	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.0200
94STK1A	201	750	33100	13.0	45.4	24.9	66.7	0.580	0.150	21.0	2.71	0.110	0.120
94SRT3	119	830	40200	14.5	48.3	33.4	83.2	0.880	0.180	7.94	11.9	0.170	0.0370
94CHN2	169	1180	58400	26.6	85.6	65.0	103	1.28	<0.1	5.67	3.30	0.160	0.0320
94CHN2d	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	4.02	0.180	n/a
94QNL2	164	998	42800	18.3	57.4	51.9	83.2	1.46	0.340	10.8	18.4	0.620	0.0450
94HAR1	94.8	734	42400	13.7	47.6	50.6	104	1.45	0.410	12.3	3.08	0.320	0.0500

Values expressed as ug/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
94FRM1-5 are field splits of 94MBD1
94FRQ1-5 are field splits of 94QPG2
94FRT1-5 are field splits of 94THM1
n/a indicates not analyzed

Table 35. Total Trace Metal Concentrations in Bed Sediments from Individual Sampling Sites in 1995 (Elemental Research Lab)

Parameter	95LCH1	95LCH1d	95LCH4	95LCH5	95LCH6	95MAN1	95MAN2	95MAN3	95MAN4	95NAR1	95FRN1	95FRN2	95NAR2	95NAR3	95NAR4
Chromium	60.00	59.00	86.00	73.00	81.00	103.00	83.00	86.00	94.00	111.00	103.00	100.00	108.00	100.00	116.00
Manganese	779.00	793.00	860.00	725.00	833.00	1090.00	1020.00	793.00	779.00	779.00	766.00	752.00	766.00	913.00	1150.00
Iron	27000.00	28000.00	38000.00	32000.00	35000.00	50000.00	57000.00	38000.00	43000.00	54000.00	54000.00	52000.00	52000.00	45000.00	57000.00
Cobalt	11.00	11.00	16.00	13.00	16.00	19.00	13.00	16.00	17.00	19.00	18.00	18.00	19.00	17.00	22.00
Nickel	39.00	40.00	52.00	44.00	52.00	55.00	47.00	50.00	55.00	58.00	53.00	55.00	55.00	53.00	64.00
Copper	25.00	24.00	33.00	29.00	42.00	50.00	29.00	38.00	38.00	62.00	55.00	54.00	56.00	44.00	52.00
Zinc	53.00	55.00	75.00	61.00	71.00	110.00	67.00	82.00	92.00	130.00	120.00	130.00	130.00	110.00	160.00
Molybdenum	<1	<1	<1	<1	<1	1.00	1.00	<1	<1	2.00	2.00	2.00	2.00	1.00	1.00
Cadmium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Lead	4.00	4.00	5.00	5.00	5.00	10.00	5.00	7.00	7.00	12.00	12.00	13.00	13.00	12.00	14.00
Arsenic	4.62	4.73	6.49	4.84	5.72	12.10	23.10	8.36	7.15	9.57	10.10	9.79	10.90	9.57	12.10
Selenium*	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Mercury	0.04	0.04	0.03	0.02	0.04	0.05	0.03	0.04	0.04	0.05	0.05	0.05	0.05	0.04	0.04

Values expressed as ug/g dry weight
Values below detection limits shown as less than the detection limit
Lab duplicates denoted by a "d" following the sample ID
95FRN1and 95FRN2 are field splits of 95NAR1
* Selenium not detected due to analytical difficulties

Table 36. Total Trace Metal Concentrations in Bed Sediments from Individual Sampling Sites in 1995 (NLET Lab)

Parameter	95MAN1	95MAN2	95MAN3	95MAN4	95NAR1	95NAR2	95NAR3	95NAR4
Arsenic	13.1	28.4	8.9	8.6	11.3	12.3	10.9	13.6
Selenium	0.4	0.2	0.3	0.3	0.5	0.4	0.3	0.3
Aluminum	96400	72300	80400	90900	97900	99100	90500	102000
Cadmium	<1	<1	<1	<1	<1	<1	<1	<1
Cobalt	21.5	15.3	19.1	20	21	21.8	20	22.9
Chromium	94	76	88	97	95	100	95	99
Copper	51	35	39	43	58	57	46	49
Iron	44300	46500	38500	38600	40800	43600	41100	45800
Manganese	948	877	792	714	637	677	812	927
Nickel	53	40	49	52	51	52	49	55
Lead	10	5	8	9	13	14	12	14
Zinc	114	70	87	90	123	131	128	145
Mercury	0.071	0.046	0.05	0.05	0.082	0.081	0.104	0.067

Values expressed as ug/g dry weight
Values below detection limits shown as less than the detection limit

Table 37. Total Trace Metal Concentrations in Bed Sediments from Individual Sampling Sites in 1996 (NLET Lab)

Parameter	96LCH1	96LCH4	96LCH5	96LCH6	96MAN1	96MAN2	96MAN3	96MAN4	96NAR1	96NAR2	96NAR3	96NAR4
Arsenic	5.8	6.1	4.5	4.5	9.6	22.2	7.9	7.5	10	11.3	6.9	11.2
Selenium	0.3	0.3	0.3	0.3	0.4	0.3	0.5	0.4	0.6	0.6	0.3	0.5
Cadmium	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cobalt	15.4	16.7	11.9	12.1	20.2	14.6	19.6	18.8	20	20.6	17.7	20.8
Copper	28	27	25	23	42	25	37	36	50	54	29	47
Iron	31600	38000	25900	27300	43200	58900	41000	39400	45100	46900	37900	49000
Manganese	658	766	529	584	1000	735	785	814	639	597	798	899
Nickel	41	49	35	38	54	40	53	52	55	55	41	59
Lead	<5	<5	<5	<5	8	5	8	7	10	16	5	15
Zinc	53	67	52	50	98	53	91	88	110	125	84	158
Mercury	0.028	0.021	0.018	0.016	0.059	0.038	0.073	0.049	0.084	0.103	0.041	0.071

Values expressed as ug/g dry weight
Values below detection limits shown as less than the detection limit