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RESULTS OF CHEMICAL, TOXICOLOGICAL, AND BIOACCUMULATION EVALUATIONS OF DIOXINS, FURANS, AND GUAICOL/ORGANIC ACIDS IN SEDIMENTS FROM THE GRAYS HARBOR/CHEHALIS RIVER AREA

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SUMMARY

The Battelle/Marine Sciences Laboratory (MSL) was requested by the U.S. Army Corps of Engineers (USACE), Seattle District, to assist in planning and conducting sampling, toxicological tests, and chemistry evaluations on sediment samples collected from the Chehalis River in Grays Harbor, Washington.

The objectives of the study were to investigate the toxicity and biological effects of sediments that might potentially contain dioxins, furans, and organic acids, as a result of industrial practices in the Grays Harbor area, on sensitive marine species. In addition to the toxicological tests conducted using standard bioassays, sediment chemistry tests were performed to determine levels of selected chemicals, and elutriates of sediments were tested chemically and biologically to determine contaminant mobility in water. Also, bioaccumulation measurements were made to determine chemical mobility in animal tissue. A joint task group, including representatives from the USACE, Washington Department of Ecology (WDOE), Washington Department of Natural Resources (WDNR), Washington Department of Fisheries (WDOF), and Region 9 of the U.S. Environmental Protection Agency (USEPA) participated in designing the testing program and reviewing data produced by MSL. The results of this analysis will be included in a supplemental Environmental Assessment (EA) prepared by the USACE for the Grays Harbor Dredging Program, beginning in early 1990.

Toxicological test results indicate that sediment samples collected from the Grays Harbor area demonstrated no appreciable toxicity to test organisms, and although dioxin/furan and guaiacol/organic acid compounds were detected in most sediment samples, the concentrations were relatively low. Sediment elutriate preparations resulted in little-to-no-toxicity and were considered insignificant according to guidelines presented in the Implementation Manual (USEPA/COE 1977). Elutriate chemistry results showed that the guaiacol/organic acid compounds were not extracted by water, while 30- and 60-day bioaccumulation studies showed that no potential existed for bioaccumulation of dioxin compounds by the filter-feeding clam *Macoma nasuta*. Indigenous crabs from the in-bay disposal sites of the Grays Harbor area showed no

dioxin/furan contamination in crab muscle tissue, but detected levels of dioxin/furans were found in the hepatopancreas of crabs collected at North Bay, South Bay, and Half Moon Bay.

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1.0 INTRODUCTION

The Water Resources Development Act of 1986 (Public Law 99-662) authorized the Seattle District of the U.S. Army Corps of Engineers (USACE) to dredge Grays Harbor as part of the Grays Harbor Widening and Deepening Project. Subsequent to this authorization, concerns about potential dioxin/furan and guaiacol/organic acid contamination within the Chehalis River area arose. These concerns resulted in a requirement to evaluate the potential sediment concentrations, toxicity, and bioaccumulation of sediment-bound guaiacols/organic acids, dioxins, and furans before dredging and disposal could begin.

The Battelle/Marine Sciences Laboratory (MSL) was requested by the USACE, Seattle District, to assist in planning the sediment toxicity evaluation and performing toxicity and bioaccumulation tests on sediment and sediment elutriates. Solid phase toxicity tests were conducted using the amphipod Rhepoxynius abronius and the clam Macoma nasuta. Sediment elutriate toxicity was evaluated in a 96-h D-cell test using larvae of the oyster Crassostrea gigas and a Microtox illumination test. Dioxin/furan bioaccumulation potential was evaluated by exposing the clam M. nasuta to sediments for 30 and 60 days. In addition, MSL coordinated the analysis of dioxin/furan levels in the tissues of the Dungeness crab Cancer magister. The MSL was also requested to perform or arrange for analysis of tissue samples for any bioaccumulated dioxin/furan contaminants, sediment concentrations of dioxin/ furans, and chemical analyses of sediments, and sediment elutriates for the concentrations of guaiacols/organic acids. In addition, the USACE requested that an optional leachate experiment be performed on selected sediments to determine which resin acids, guaiacols, and fatty acids were available for dissolution from selected sediment treatments.

This report discusses the results of biological and chemical testing conducted by MSL on sediment samples collected from the Grays Harbor area. Section 2.0 describes the materials and methods used in the tests. Section 3.0 presents toxicological testing results, and analytical chemistry results are presented in Section 4.0. A discussion of the results is provided in Section 5.0.

2.0 MATERIALS AND METHODS

2.1 STUDY AREA DESCRIPTION

The dredging project area includes areas in Grays Harbor and the Chehalis River, located in Grays Harbor County, Washington. The study area for this project extends from the outer portion of Crossover Reach to the city of Cosmopolis on the Chehalis River (Figure 2.1), and sampling locations included within 17 transect lines, approximately 1 nautical mile apart along the river. The 17 sampling locations were determined by the USACE. Transects extending across the Chehalis River were numbered from 1 to 16. Transect 1 was located in Crossover Channel, and transect 16 was located upstream of Cosmopolis. Station 17 was located near the WEYCO Outfall in the Hoquiam Reach (Figure 2.1). Most transects consisted of a sampling station on the south side of the river near the bank (A), a center channel sampling location (B), and a station on the northside of the river near the bank (C). Uncontaminated sediments were also collected from Sequim Bay and West Beach, Whidbey Island, Washington (Figure 2.2).

2.2 STUDY OBJECTIVES AND EXPERIMENTAL DESIGN

The experimental design for the analysis of sediments for this project is presented in Table 2.1. The objectives of this study were to evaluate the potential toxicity and biological effects of selected sediments from the Grays Harbor area before dredging and disposal could be considered. This was accomplished by performing toxicological tests using the phoxocephalid amphipod _R. abronius_, the larvae of the Pacific oyster _C. gigas_, and the clam _M. nasuta_, and the bacterium _Photobacterium phosphoreum_ in a saline-extraction Microtox® test. Bioaccumulation potential was evaluated by exposing clams to sediment for 30- and 60-day periods and measuring tissues for dioxin/furan levels.

Analytical chemistry measurements were made on samples from individual sediment stations or sediment station composites, and on elutriate water and tissues. Dioxin/furans were measured in individual or sediment composites and in the tissues of clams exposed to sediments. Guaiacols/organic acids were

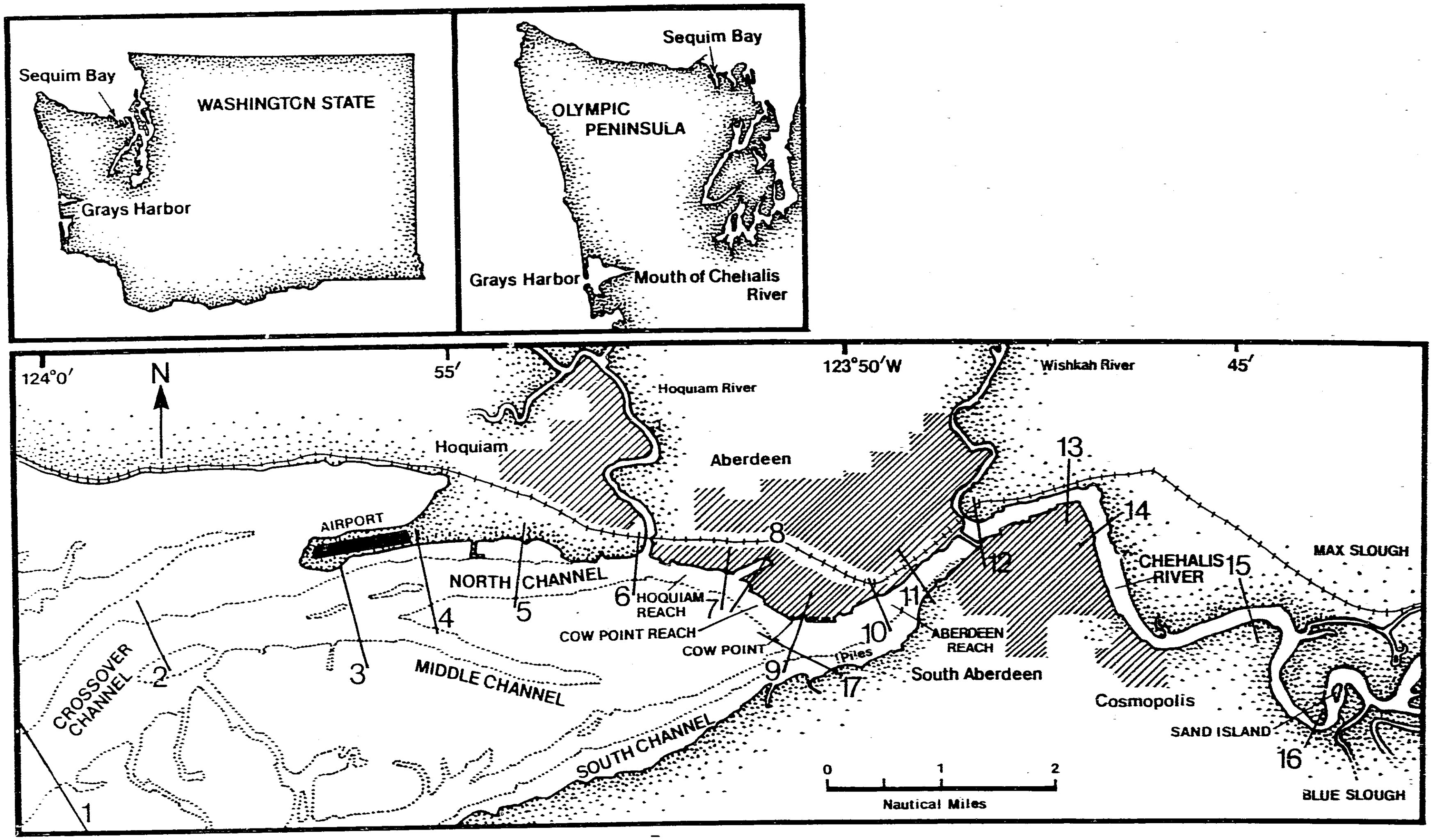

FIGURE 2.1. Grays Harbor Study Area

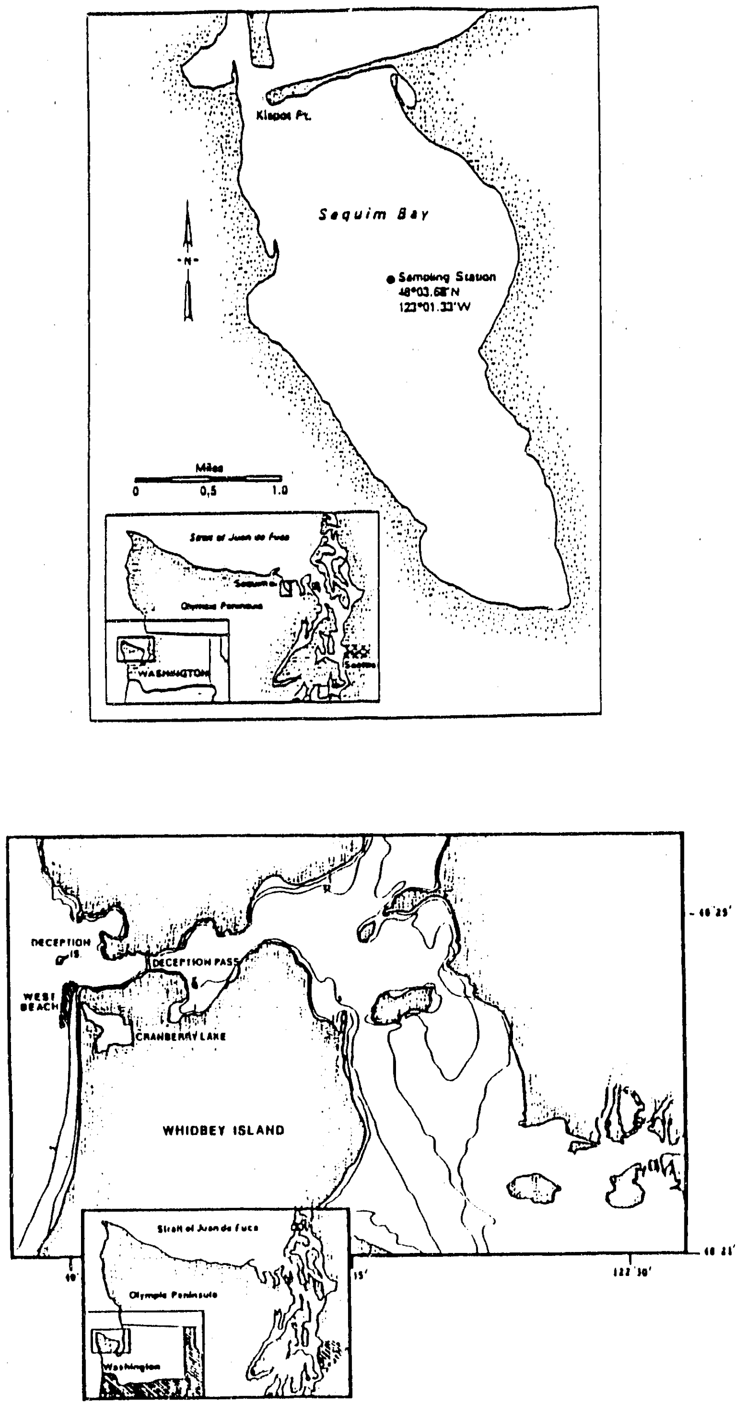

FIGURE 2.2. Sampling Locations at Sequim Bay and West Beach

TABLE 2.1. Experimental Design for Toxicological and Analytical Chemistry Evaluations

Sediment Sample[a]	Microtox	Amphipod	Oyster Larvae	30-Day Clam	60-Day Clam	Sediment Dioxins/Furans	Tissue Dioxins/Furans	Tissue Lipids	Sediment Guaiacols/Organic Acids	Elutriate Guaiacols/Organic Acids	Total Organic Carbon
1-A						C[b]					
1-B						CV[c] Archived					
1-C						C					
1-A-C	V[d]	V	V	C	C	C	C	C	V	V	V
2-A	V	V	V	C	C	C	C	C	V	V	V
2-B						CV Archived					
3-A						C					
3-B						C					
3-C						C					
3-A-C	V	V	V	C	C	C	C	C	V	V	V
4-A						C					
4-B						C					
4-C						C					
4-A-C	V	V	V	C	C	C	C	C	V	V	V
5-A						C					
5-B						C					
5-C						C					
5-A-C	V	V	V	C	C	C	C	C	V	V	V
6-A						C					
6-B						C					
6-C						C					
6-A-C	V	V	V	C	C	C	C	C	V	V	V
7-A						CV Archived					
7-C	V	V	V	C	C	C	C	C	V	V	V
8-A						C[b]					
8-B						C					
8-C						C					
8-D						CV Archived					
8-A-C	V[c]	V	V	C	C	C	C	C	V	V	V
9-A						C					
9-B						C					
9-C						C					
9-D						CV Archived					
9-A-C	V	V	V	C	C	C	C	C	V	V	V
10-A						C					
10-B						C					
10-C						C					
10-A-C	V	V	V	C	C	C	C	C	V	V	V
11-A						C					
11-B						CV Archived					

TABLE 2.1. (contd)

Sediment Sample[a]	Microtox	Amphipod	Oyster Larvae	30-Day Clam	60-Day Clam	Sediment Dioxins/Furans	Tissue Dioxins/Furans	Tissue Lipids	Sediment Guaiacols/Organic Acids	Elutriate Guaiacols/Organic Acids	Total Organic Carbon
11-C						C					
11-A-C	V	V	V	C	C	C	C	C	V	V	V
12-A						C					
12-B						CV Archived					
12-C						C					
12-A-C	V	V	V	C	C	C	C	C	V	V	V
13-A						X					
13-B						CV Archived					
13-C						C					
13-A-C	V	V	V	C	C	C	C	C	V	V	X
14-A						C[b]					
14-B						CV Archived					
14-C						C					
14-D						CV Archived					
14-A-C	V[c]	V	V			C			V	V	V
15-A	V	V	V						V	V	V
15-B						CV Archived					
16-B						CV Archived					
16-C	V	V	V						V	V	V
17-A	V	V	V	C	C	C	C	C		V	V
17-B						C					
17-C						C					
West Beach	D[e]	D	D	D	D	D	D	D	D	D	D
Sequim Bay	P[f]	P	P	P	P	P	P	P	P	P	P
South Bay							Crab[g]	Crab			
North Bay							Crab	Crab			
Buoy #3							Crab	Crab			
Ocean off Grayland							Crab	Crab			
Half Moon Bay							Crab	Crab			

(a) A = sampling location on southern edge of the Chehalis River, B = center channel, C = northern edge of river, D = near pier; A-C = composite sample of A and C.
(b) C indicates sediment used in evaluation was collected with a vibra or dart core.
(c) CV indicates sediment used in evaluation was collected with a vibra or dart core and/or a van Veen grab.
(d) V indicates sediment used in evaluation was collected with a van Veen grab.
(e) D indicates sediment used in evaluation was collected with an amphipod dredge.
(f) P indicates sediment used in evaluation was collected with a Ponar petite grab.
(g) Crab were collected in crab pots.

measured in sediment composites and elutriate preparations from those sediment composites. Lipids were measured in clam tissues exposed to sediments, and organic carbon was measured in sediment. An additional study was conducted to evaluate the baseline dioxin/furan levels in the Dungeness crab living in and around the Grays Harbor study area.

2.3 FIELD COLLECTIONS

2.3.1 Sediment

Sediment samples were collected from 17 transects in the Grays Harbor area from July 31 to August 5, 1989, using either a 0.1-m^2 van Veen grab sampler, a 2.5-in. diameter vibracore device, or a 3.5-in. dart core. A total of 59 grab and 77 core samples were collected from 50 stations during this time, including 11 dart cores and 66 vibracores.

Once a sampling station was located, its position was marked with a buoy deployed from a survey vessel operated by the USACE. Water depth was determined with a calibrated fathometer, and this information was radioed to the barge where it was entered into the field log. Tidal corrections were applied aboard the barge to verify that the buoy was positioned correctly, and the barge then moved into position near the buoy to begin sampling. The crane positioned the sampler within 5 ft of the marker buoy. Grab samples were collected at all stations, and core samples were collected at all stations except Stations 15 and 16 and some center channel locations where water depth exceeded the vibracore barrel length, and dart core sampling failed. These included Stations 1B, 2B, 11B, and 13B. At these locations, a grab sample was collected.

Grab samples were collected with a 0.1-m^2 van Veen grab that was cleaned between uses with river water. Grab samples were obtained, and the sampler opened to view the sediment. If the sediment surface was disturbed, the sampler was leaking sediment, or a minimum of 4 cm of sediment was not collected, the sample was rejected, and another one was collected. Sediment from acceptable grab samples was characterized for texture, color, odor, and collection depth, then removed with a clean stainless steel spoon and placed in a labeled, solvent-rinsed 4-L glass jar equipped with a Teflon-lined cap. Each jar was filled completely to minimize head space, sealed, and placed in a cooler containing ice. A storage temperature of 4°C was maintained in the field and laboratory until the sample was processed. Preparation of grab samples for testing and evaluation is discussed in Section 2.6.

Core samples were collected with either a 3.5-in.-diameter x 8-ft dart core or a 2.5-in.-diameter vibracore composed of 5-ft-long threaded pipe sections, which were coupled to produce a 50-ft pipe. Steam-cleaned cellulose acetate butyrate (CAB) liners were used in both devices. During the first 2 days of the field collections, dart cores were attempted first, because the dart core can collect a larger volume of sediment in less time than the vibracore and has been used successfully in other sampling studies. However, the nature of the Chehalis River bottom prevented obtaining many acceptable samples using the dart core. Modifications to the device were made, but did not improve the device's sampling efficiency. At stations where it was not possible to collect dart cores, the vibracore was used. Eventually, the dart core was completely abandoned, and only the van Veen grab and vibracore were used for sediment collections.

After core samples were brought aboard, the liner containing the sediment sample was removed from the core barrel, and one end was capped. The core was placed in a vertical position, the sediment length was measured, and excess liner was cut off the uncapped end just above the sediment level. This end was then capped, and a label was affixed to the side of the core that specified the station, collection date, and vertical orientation of the sample. Cores longer than 5 ft were cut into two sections, labeled, and described. All cores were stored in a chest freezer that maintained a storage temperature of 4°C. At the end of the cruise, the freezer was loaded onto a truck, and the cores were transported directly to MSL. Preparation of core samples for testing and evaluation is discussed in Section 2.7.

Sediments collected with the van Veen grab were analyzed for guaiacols/organic acids and total organic carbon, and provided test sediment for the Microtox, amphipod, and oyster larvae tests. Sediments collected with the dart and vibracores were analyzed for dioxin/furans and provided test sediment for the clam toxicity and bioaccumulation tests. At most transects, the "A" and "C" samples, representing the edges of the river basin were composited into a single sample for biological testing. Sediment dioxin/ furan analysis was conducted on "A," "B," and "C" stations, while guaiacols/ organic acids analysis was conducted on only the composites. On transects 2, 7, 16, and 17, chemical and biological samples were analyzed at only one location at each station (2A, 7C, 16C, and 17A). Core collection information is presented in Appendix A, Table A.1; grab sample collection information is summarized in Appendix A, Table A.2.

Sampling operations were conducted aboard a barge and tug supplied and crewed by personnel of Quigg Brothers, Inc., Aberdeen, Washington. This barge was equipped with a 60-ft crane, which was used to raise and lower sampling equipment. The scientific crew was composed of personnel from MSL; USACE, Seattle District; Beak Consultants; and one person from the USACE, Portland District, who operated the vibracore. Navigational support was provided by a laser positioning system operated by personnel from the USACE, Seattle District. During the sampling program, detailed field collection notes and chain-of-custody information was compiled by the MSL chief scientist. This information included the date and time for each collected sample; uncorrected water depths; grab sample descriptive characteristics (penetration depth, sediment type, odor, and color); core sample length; and other pertinent information.

2.3.2 Crab

Adult Dungeness crab, *C. magister*, were collected from five locations near the Grays Harbor sampling area, including three sites in the Chehalis River and two ocean sites. The crabs were collected at each site in crab pots set by either the USACE or the WDOF. Each crab was wrapped in aluminum foil, placed in a large ziplock bag, then placed on ice and delivered to MSL by USACE personnel within 24 h of collection. Even after the 24-h period, all crab arrived at the MSL alive, and the tissue was in good condition. Crab tissue sample processing is discussed in Section 2.7.3.

2.4 CONTROL AND REFERENCE SEDIMENT COLLECTION AND HANDLING

West Beach control sediment was collected from West Beach, Whidbey Island, by MSL staff on August 12, 1989. To collect the sediment, an MSL-designed amphipod dredge was towed parallel to the shore in approximately 3 m of water, near the western edge of the island. The sediment was placed in clean coolers and immediately transported to MSL.

Reference sediment was collected in Sequim Bay on August 13, 1989, using a ponar petite grab. Collected sediment was placed in a clean 5-gal bucket, transported to MSL, and stored at 4°C until use.

2.5 LABWARE PREPARATION

2.5.1 Glass, Plastic, Nytex, PVC, and Teflon

All labware, including toxicity testing containers, was handwashed in warm, soapy (Liquinox) water. Washing was followed by five rinses with deionized water and dried in open air. Dry labware was then soaked in 5% nitric acid (HNO_3, Baker Instra-analyzed grade) for at least 4 h. This labware was then rinsed five times with deionized water, air dried, and stored in clean containers until use.

2.5.2 Stainless Steel and Titanium

Stainless steel and titanium implements were washed with warm, soapy (Liquinox) water, rinsed five times with deionized water, air dried, rinsed twice with methylene chloride, and dried under a vented laboratory hood.

2.6 LABORATORY EQUIPMENT AND INSTRUMENTATION

Temperature control was established using MSL's seawater boiler coupled to a YSI temperature controller. This controller moderated mixing of the warmed (28°C) seawater with colder (12°C) incoming seawater. Temperatures during the biological tests were recorded with Fisher Model 15-077-8 or Fluke Model 52 digital thermometers, which were calibrated monthly against an ErTco L-68397 laboratory standard thermometer at 20°C. Salinity was measured with Reichert Model 10419 refractometers, which were calibrated monthly to International Association of Physical Oceanographers (IAPO) standard seawater with a certified salinity of 35.000 o/oo and chlorinity of 19.377 o/oo. The pH was measured with Orion Model SA-250 pH meters and calibrated daily to standard pH buffers of 7 and 10. Dissolved oxygen was measured with YSI Model 57 dissolved oxygen meters, which were calibrated daily to 100% air saturation.

Test containers used during this study included 1-L glass jars for the oyster larvae and amphipod tests and 39-L glass aquaria for the bioaccumulation tests. Aeration to the test containers was supplied by 1-mL borosilicate glass pipettes. Microtox supplies included 250-mL Pyrex beakers, Microtox cuvettes, and various Eppendorf digital pipettors.

2.7 SEDIMENT, ELUTRIATE, AND TISSUE SAMPLE PREPARATION

2.7.1. Sediment Preparation

At most transects, grab and core samples collected from stations near the river bank (A and C) were composited into one sample for toxicological and analytical chemistry testing. These composites were produced by placing equal volumes of sediment from each station into a large stainless steel bowl, and stirring it with stainless steel utensils until texture and color was consistent (approximately 5 to 10 min). For grab samples, this was accomplished by removing the sediment from the glass storage jars; for core samples, this was done by carefully scoring the core liner on opposite sides longitudinally with a circular saw, then cutting completely through the core liner and sediment with a stainless steel knife, which produced two equal half-cores. Sediment was then removed from the center of each half-core, avoiding the edges of the liner. After compositing, aliquots were removed for analytical chemistry samples, the rest of the sediment was transferred to solvent-rinsed 4-L glass jars with Teflon-lined lids, and the samples were stored at 4°C. Where compositing was not required, the material was removed from the storage container as described and placed in a clean stainless bowl, where the sediment was mixed as described above to create a homogenous mixture. Sediment chemistry samples were removed, and these samples were also stored as described above. Sediment chemistry samples were stored in clean solvent-rinsed 1-L Qorpac jars with Teflon-lined lids and either frozen or stored at 4°C, depending on the chemical analysis required. Dioxin/furan analysis was also conducted on each individual "A," "B," and "C" station, in addition to the A-C composites.

2.7.2 Elutriate Preparation

Elutriate samples were prepared for selected sediments or composites by adding one part sediment to 4 parts 0.45-µm-filtered Sequim Bay seawater volumetrically in a clean container, suspending all sediment by stirring vigorously, then placing the jar on a shaker table at 120-150 cycles per min for 30 min. After shaking, the mixture was allowed to settle for approximately 10 min; then, the supernatant was poured into 500-mL Teflon containers, placed in a centrifuge, and centrifuged for 10 min at 1750 RPM (740 g). The liquid portion was poured into a clean container, and the process was repeated until enough elutriate was collected for both the oyster larvae toxicological tests and resin acid chemistry tests. This procedure is consistent with protocols described in the Implementation Manual (USEPA/COE 1977).

2.7.3 Tissue Preparation

Three types of tissue samples were analyzed for dioxin/furan concentrations: tissue of the bioaccumulated clam and the hepatopancreas and muscle tissue of collected Dungeness crab. Clams were removed from an aquarium, immediately washed under clean seawater to remove external mud, and the tissue excised with clean titanium scalpels. The adductor muscles were cut, and tissue was scraped out of the shell into a prepared and labeled Qorpac jar. The jars were labeled by station. The jars were frozen and remained frozen until analysis was performed. Crab hepatopancreas tissue was obtained after pulling the legs off each crab and removing the carapace. The hepatopancreas was gently cut away from each crab and placed in a clean, labeled Qorpac jar. Stainless steel scalpels and scissors were used during this dissection. Muscle tissue was obtained by slitting the legs open with a scalpel or scissors, gently removing the tissue, and placing it in a clean Qorpac jar. Crab tissue was frozen immediately and remained frozen until analysis was performed. All tissue compositing was performed in the analytical testing laboratory (Twin City Testing, St. Paul, Minnesota) using approved procedures.

2.8 TOXICOLOGICAL TESTING PROCEDURES

2.8.1 Microtox

The Microtox bioassay was conducted following the saline extraction technique developed by Williams et al. (1986) and set forth in the Puget Sound Estuary Program Recommended Protocols (PSEP 1986). This technique calls for the preparation of a saline extract from 30 g of sample, followed by analysis of five concentrations of the extract (100%, 50%, 25%, 12.5%, and 0%). A Beckman Microtox Toxicity Analyzer Model 2055 was used to measure the change in bacterial luminescence over time, following the procedures in the Microtox System Operating Manual (Beckman Instruments 1982) developed by Bulich et al. (ASTM 1980). The viability of each batch of luminescent bacteria was assessed once or twice per day by exposing them to sodium arsenate, an established reference toxicant for Microtox (Williams et al. 1986).

The PSEP protocol was followed with the exception of three modifications. First, in preparing the saline extract, a 100-mL beaker was used for shaking the 30-g sediment sample with 10 mL of Microtox dilutent, instead of the 30-mL container called for by PSEP. Using the 100-mL beaker results in more thorough extraction of the water-soluble contaminants, as the large surface area of the beaker allows greater contact and agitation of the sediment and diluent than is possible in the 30-mL container. Second, during the Microtox analysis step, PSEP protocol calls for a measurement of initial luminescence (light output) before organisms are exposed to the extract and another measurement 15 min after organisms are exposed to the extract. The initial measurement was made before exposure, but light output was recorded at 5, 15, and 30 min after exposure. These additional measurements provide more temporal data on bacterial response to the extract over time than does the single 15-min reading. The third variation from PSEP was that a salinity calibration curve was not constructed for this test because Williams et al. (1986) reported that salinity-induced changes in luminescence were relatively small. The salinity of each extract was measured before analysis, and all measurements were within the 20 to 40 $^{o}/_{oo}$ optimum salinity range for light output of P. phosphoreum reported in the Microtox System Operating Manual (Beckman Instruments 1982). Data from the test were reported as the change in luminescence during each observation period. The EC50 calculations were made for the 15-min observation period to be consistent with Puget Sound Dredged Disposal Analysis (PSDDA) reporting requirements (PSDDA 1989).

2.8.2 Amphipod

2.8.2.1 Test Organism Collection and Care.

Amphipods were collected by MSL personnel from West Beach, Whidbey Island, using an infaunal dredge, on August 12, 1989. The West Beach sediments were sieved through a 1.0-mm screen to remove predators, and within 4 h of collection, the amphipods were transported to MSL in large tubs containing sieved native sediment and seawater. At MSL, the amphipods and sediment were transferred to holding tanks integrated into MSL's flow-through seawater system. The seawater temperature was increased gradually, over 24 h, from the West Beach ambient temperature of 9°C to a test temperature of 15°C. Daily water quality measurements of the holding tanks were taken. Animals were not fed before or during testing.

2.8.2.2 Testing Procedures

The amphipod static test was conducted in 1-L glass jars following protocols described in Swartz et al. (1985) and Puget Sound protocols (PSEP 1986). Nineteen stations were tested: 17 from the Grays Harbor area, a reference sediment from Sequim Bay, and a control sediment from West Beach. Each container was layered with 2 cm (100 mL) of sediment, and five replicate containers per station were tested. After adding the sediments, test containers were slowly filled to the 900-mL mark with filtered (0.45 μm) Sequim Bay seawater. These 95 test containers were then arranged randomly on a water table containing a 15°C water bath. At test initiation, amphipods were sieved from the holding sediment, and 20 organisms were randomly placed in each test container.

Daily observations of the test containers included the number of amphipods on the sediment and water surfaces and the temperature, dissolved oxygen, pH, and salinity of the water in each container. Acceptable environmental conditions included a temperature of 15.0 ± 1.0°C, dissolved oxygen of $\geq$ 4.0 mg/L, pH of ambient ± 0.4, and salinity of ambient ± 1.0 ‰ during daily observations. Any amphipods on the water surface were gently pushed into the water column using clean glass pipettes. No organisms were removed during testing. Amphipods were not supplied food other than that available from the test environment.

At the end of the 10-day exposure, test organisms were gently sieved from the test sediments through 0.5-mm Nytex screens and transferred to small finger bowls for determination of mortality. Death was defined as the absence of pleopod movement after stimulation with a glass probe.

2.8.3 Oyster Larvae

2.8.3.1 Test Organism Collection and Care

Oysters were obtained from Coast Oyster Company, Quilcene, Washington, on August 22, 1989. The organisms had been conditioned for a period of 4 to 6 weeks in 20°C seawater with a salinity of 26 °/oo and fed a mixture of algae to provide nutrition and hasten sexual maturity. Oysters were transported on moist paper towels in a cooler to MSL within 45 min of collection. At MSL, the organisms were placed in 26 °/oo seawater at 20°C in preparation for spawning.

2.8.3.2 Testing Procedures

The oyster larvae suspended particulate phase bioassay was conducted in 1-L glass jars generally following the procedures detailed in ASTM Method E724-80 (ASTM 1980). Sediment from the 17 Grays Harbor area stations, a West Beach reference, and a Sequim Bay control sediment were used to prepare the elutriate test media. In addition, a cadmium chloride ($CdCL_2$) reference toxicant was prepared.

Three replicates of four concentrations (0%, 10%, 50%, and 100%) of each station's elutriate were tested. Three replicates of each of the six cadmium chloride reference toxicant concentrations were tested. Test containers were placed randomly on two water tables maintaining 20°C water baths.

Oyster larvae used for the biological testing were obtained by laboratory-induced spawning. Twenty oysters were removed from the dry transport containers and placed in clean polypropylene tubs holding 26 °/oo, 30°C filtered offshore seawater. Water temperature was constantly monitored and maintained at ±2°C by periodically adding warm seawater to the tubs. Water was changed hourly by siphoning off the old seawater and gently pouring in new warm, salinity-adjusted seawater. This procedure prevented disturbing the oysters and minimized the disruption of the spawning process.

Spawning individuals were isolated in clean baking dishes containing warm seawater and allowed to continue to spawn in those dishes. Two males and two females spawned in this manner. When the organisms had finished spawning, gametes were examined under a compound microscope to determine quality. The eggs of both females were normal and pear shaped, so they were combined in a clean 1-L glass jar and diluted with seawater. One of the two males had viable sperm. To fertilize the eggs, 15 mL of sperm suspension was added to 1-L of the egg suspension to yield 10^5 to 10^7 sperm/mL in the final mixture. This solution was then stirred with a perforated plunger every 15 min to assist mixing and thus increase fertilization success.

One hour after fertilization, the concentration of embryos in the embryo suspension was determined after mixing the solution gently with a perforated plunger, withdrawing a 0.5-mL sample, and creating a 1:100 dilution with seawater by counting on a Sedgwick-Rafter cell the number of embryos that had developed to the two-cell stage or beyond. An estimate of fertilization success was then recorded. This procedure was repeated, and a mean was determined. Based on this mean, the volume of embryo suspension to provide 15 to 30 embryos per milliliter in the test solutions was calculated at 740 μL, and the appropriate volume of stock added to each container with an automatic pipette. The pipette had been calibrated before the test by weighing at least eight individual water delivery volumes to determine the coefficient of variation. If the coefficient of variation at the desired volume was less than 5%, the calibrated pipettor was used.

The test was initiated when test containers were stocked with the embryo suspension. After the embryos were added, the suspension in a randomly selected seawater control container was mixed, and a 10-mL sample was taken to estimate stocking density. This process was repeated for nine other containers, and a mean stocking density was estimated based on the 10 samples.

These samples were preserved with 5% buffered formalin in labeled polypropylene vials equipped with screw cap lids for later referral.

The temperature, dissolved oxygen, pH, and salinity were measured at initiation, and daily thereafter, including before termination. Acceptable environmental conditions included a test temperature of 20.0 ± 2.0°C, dissolved oxygen of ≥6.0 mg/L, pH of ambient ± 0.5, and salinity of 27.0 ± 1.0 ‰.

Ninety-six hours after the beginning of the test, the solution in each test chamber was carefully mixed, and a 10-mL sample was immediately removed and preserved in 5% formalin. To concentrate the larvae for counting, the samples were centrifuged for 10 min at 1700 rpm (740 x g). The embryos and larvae in the samples were transferred by pipette to a Sedgwick-Rafter cell for counting. Because the volume of the cell is 1 mL, it was necessary to prepare and count several slides to enumerate all embryos and larvae in each sample. All embryos exhibiting cell division were counted. All larvae with completely developed shells containing soft tissues were counted as normal. Larvae with incomplete shells were scored abnormal. To eliminate potential investigator bias, all counting/scoring was done blind, i.e., without the investigator knowing which sample was being evaluated. As an additional quality assurance measure, 10% of all samples were rescored by a second investigator, and any differences of 10% or greater were reconciled.

2.8.4 Clam

2.8.4.1 Test Organism Collection and Care

Clams were obtained from Discovery Bay, Washington, on three different dates: 420 clams were received on August 1, 1989; 2150 on August 15, 1989; and 300 on August 16, 1989. Organisms were transported to MSL in clean coolers containing native seawater. At MSL, the organisms were placed in a clean holding tank integrated into MSL's flow-through seawater system at 15°C. Daily water quality measurements of the holding tanks were taken. Animals were not fed before or during the testing periods.

2.8.4.2 Testing Procedures

The clam bioaccumulation test was conducted in 38-L glass aquaria randomly positioned on four water tables that are integrated to the laboratory's flow-through seawater system. Aquaria were cured with the flow-through seawater for a minimum of 24 h before test initiation. Cured aquaria were drained so that approximately 3 cm of seawater remained standing in each aquaria. Test sediments were removed from 4°C storage, and approximately 2 L of each test sediment was spooned into each of five replicate aquaria and smoothed out over the bottom of the aquaria. Stand-pipes then were replaced to allow the aquaria to refill slowly. Sediment from 15 Grays Harbor-area stations, Sequim Bay, and West Beach were tested.

Salinity, dissolved oxygen, temperature, and pH were measured. Thirty clams were then added to each aquarium. Initial observations were taken on those aquaria in which the sediment had settled sufficiently; most aquaria were too turbid to observe initially. Water quality measurements and biological observations were conducted daily on one replicate of each treatment for the duration of the test. Observations recorded the number of siphons exposed and the number of organisms situated fully above the sediment. Dead individuals were defined as those whose shells were open and did not respond to gentle probing with a clean pipette. These individuals were removed from the aquaria.

After 30 days, replicates 1, 2, and 3 of each test sediment were terminated. After 60 days, replicates 4 and 5 were terminated. Termination involved removing organisms from the test sediment, washing them under flowing seawater to remove sediment from the shell, recording the number alive and dead, and excising the tissue of all live clams in an aquarium from the shells. Tissue dissection and related sample preparation is discussed in Section 2.7.3.

2.9 ANALYTICAL CHEMISTRY PROCEDURES

2.9.1 Sediment and Tissue Dioxin/Furans

Sediment and tissue dioxin/furan samples were analyzed by Twin City Testing Corporation, St. Paul, Minnesota, under the direction of Dr. Fred DeRoos and Ms. Barb Larka. Sediment samples were run using a modification of EPA Method 8290 (Tondeur 1987). The analysis steps and equipment used are summarized as provided to MSL by Twin City Testing.

2.9.1.2 Extraction Techniques

Each sediment and tissue sample was homogenized, and a portion of each sample was removed and spiked with $^{13}C_{12}$-labeled PCDD/PCDF internal standards at a concentration of 2 ng/Kg. Sample weights were approximately 5 g for sediment and 10 to 15 g wet weight for tissues. The samples were extracted with benzene for 18 h in a Soxhlet/Dean Stark extraction apparatus; then, the extracts were transferred to Kuderna Danish concentrators, concentrated, and the solvent exchanged to hexane. The hexane extracts were then spiked with the 2,3,7,8 -TCDD-$^{37}Cl_4$ extraction efficiency standard, and processed through the analyte enrichment procedures described in the following subsection.

Relative efficiencies of the extraction step, the analyte enrichment step, and the gas chromatography/mass spectrometry (GC/MS) sensitivity are evaluated by comparing the three standards added at various points during the analysis. Quantitation, however, is based solely on the recoveries of the ^{13}C-labeled internal standards added before extraction.

2.9.1.3 Analyte Enrichment for PCDD/PCDF Analysis

The extraction procedure often removes a variety of compounds in addition to PCDDs and PCDFs. Some of these compounds can directly interfere with the analysis while others can overload the capillary column, causing a degradation in chromatographic resolution or sensitivity. The analyte enrichment steps described were used to reduce interference from the extracts.

The hexane extracts were concentrated to 1 mL and transferred to liquid chromatography columns containing alternate layers of silica gel, 44% concentrated sulfuric acid on silica gel, and 33% 1 m sodium hydroxide on silica gel. The columns were eluted with 60 mL of hexane, and each eluate was collected and concentrated under a gentle stream of dry nitrogen to a volume of 1 mL. The extracts were then fractionated on liquid chromatography columns containing 4 g of activated alumina. Then the columns were eluted with 10 mL of hexane followed by 7 mL of 2.0% methylene chloride/hexane and 25 mL of 60% methylene chloride in hexane. The 60% methylene chloride/hexane fractions were concentrated to 1 mL under a stream of dry nitrogen and applied to the tops of chromatography columns containing 1 g of 5% AX-21-activated carbon on silica gel. Each column was eluted with cyclohexane/methylene chloride (50:50 V/V) and cyclohexane/methanol/benzene (75:20:5 V/V) in the forward direction and then with benzene in the reverse direction. Each benzene fraction was collected, spiked with recovery standards (1,2,3,4-TCDD-$^{13}C_{12}$ and 1,2,3,7,8,9-HxCDD-$^{13}C_{12}$), and concentrated to a final volume of 20 μL.

2.9.1.4 PCDD/PCDF Analysis

The extracts were analyzed for the presence of PCDDs and PCDFs using combined capillary column gas chromatography/high resolution mass spectrometry (HRGC/HRMS). (Throughout further discussion of dioxin/furans, the terms "PCDD" and "PCDF" denote "poly" substituted congeners. Specific references to penta-substitutions will be denoted by "Pe.") The instruments used included a Hewlett Packard Model 5890 gas chromatograph and a VG model 70SE high-resolution mass spectrometer. The capillary column was interfaced directly into the ion source of the mass spectrometer, providing the highest possible sensitivity, while minimizing degradation of the chromatographic resolution. The mass spectrometer was operated in the electron impact ionization mode as a mass resolution of 10,000-11,000 (M/ M, 10% valley definition). This resolution is sufficient to resolve most interferences, such as PCBs, thus providing the highest level of confidence that the detected levels of PCDD/PCDF are not false positives resulting from interferences.

The data were acquired by selected-ion recording (SIR) monitoring of the groups of ion masses described in EPA Method 8290. The five groups corresponded to the tetra- through octa-chlorinated congener classes. Each group contained three ion masses for the PCDDs (with the exception of TCDD, which contained two ion masses), two ion masses for the PCDFs, the corresponding ion masses from the two isotopically labeled internal standards, and the ion masses characteristic of the false responses in the dibenzofuran channels. The third PCDD ion mass monitored in the pentachloro- through octachlorodibenzo-p-dioxin groups prevented the possibility of misinterpretation of a PCB isomer as PCDD. Thus, when a third ion mass existed for a congener, it was used for confirmation only. The two ion masses monitored for TCDD also fulfilled this purpose.

Each group of ion masses also contained a lock mass that was monitored during the analysis to detect suppressive interferences. It is important to detect this type of interference, because it can cause the quantification of congener class levels to be artificially high if it occurs during the elution of an internal standard, or low if it occurs during the elution of the native analytes.

2.9.1.5 Quantification and Calculation

The PCDD/PCDF isomers were quantified by comparison of their responses to the responses of the labeled internal standards as described in EPA Method 8290 (Tondeur 1987). Relative response factors were calculated from analyses of standard mixtures containing representatives of each of the PCDD congener classes at five concentration levels and each of the internal standards at one concentration level. The PCDD/PCDF response factors were calculated by comparing the sum of the responses from the two ion masses monitored for each chlorine congener class and the sum of the responses from the two ion masses of the corresponding isotopically labeled internal standard. The third ion mass was used for confirmation only. Detection limits were based on producing a signal that is 2.5 times the noise level, and was calculated for each undetected 2,3,7,8 -substituted isomer of any tetra- through octa- chlorinated congener class. The noise heights used to calculate the detection limits were measured at the retention time of the specific isomer.

Concentrations for sediment samples were reported in dry weight, which was determined by subtracting the weight of water removed by the Soxhlet/Dean Stark extractor from the wet weight of the sample. Method blank values for sediment were based on 5-g sample weights, and matrix spike results were calculated on a per sample basis, with the values reported as total nanograms spiked and measured in each spike sample. Clean sand was used as the matrix for the spikes and blanks.

Concentrations for tissue samples were reported in wet weight. Method blank values for tissues were calculated based on sample weights of 10-15 g, approximating the quantities of actual samples extracted in each batch. The matrix spike results were calculated on a per sample basis, and the values were reported as total nanograms spiked and measured in each spike sample.

2.9.2 Sediment and Elutriate Guaiacols/Organic Acids

Sediment and elutriate water samples were analyzed for guaiacols/organic acids, fatty acids, guaiacols, and catechols by Analytical Resources Incorporated (ARI), Seattle, Washington. The MSL provided sediment samples and the prepared elutriate samples to ARI. Sample preparation methods are discussed in Section 2.7. Samples were analyzed using a procedure similar to the National Council of the Paper Industry for Air and Stream Improvement, Inc. (NCASI) Method (NCASI 1986). A summary of that method follows.

2.9.2.1 Extraction Techniques

Sediment samples were extracted with methylene chloride using a sonicator method without altering the sample pH. Dry weight sediment samples ranged from approximately 15-30 g. Water samples were extracted by allowing the elutriate water sample to equilibrate to room temperature; then, the sample was shaken to thoroughly resuspend any solids that may have settled during storage. A 250-mL aliquot was removed, and the sample was spiked with methanolic solution of the surrogate standard O-methyl podocarpic acid at a concentration of 50 μg/L. The sample was transferred to a 500-mL separatory funnel and extracted with methylene chloride at a pH of 5 and again at a pH of less than 3. Extraction was accomplished by adding the sample and methylene to separatory funnel, vigorously shaking the sample for 1 min, then allowing the sample to settle for 15 to 20 min. The emulsions that formed were broken by centrifugation in screw-capped centrifuge tubes to minimize evaporation of the diethyl ether. The sediment and combined water extracts were concentrated to about 3 mL, exchanged into acetone, concentrated to about 1 mL and derivatized as described below. Sediment matrix spikes were produced by adding 3200 µg/Kg of seven different guaiacols/organic acids to a sample; water matrix blanks were produced by adding 71 µg/L of the same guaiacols/organic acids to water.

2.9.2.2 Derivatization

Derivatization was accomplished by adding 100 µL of methanol, 5 mg KCO_3, and 50 µL of d5 ethyl iodine to each extract, then heating the extracts at 80°C for 45 min. The derivatized acids were then analyzed by GC/MS as described below.

2.9.2.3 GC/MS Analysis

The GC/MS analysis was performed on an Incos 50 GC/MS/DS manufactured by the Finnigan Corporation. The component separation was accomplished with a 30-m x 0.25-mm i.d.-fused silica DB-5 column with a 0.25 µm film thickness and helium as the carrier gas. The injection port temperature was 280°C, and the oven was programmed from 140°C after a 1-min hold at 4°C/min to a final temperature of 280°C. A splitless injection technique with a 30-sec purge activization delay was used for all injections. The MS operated in the repetitive scan mode, scanning from m/z 50 to 400 at a rate of 162.5 AMU/sec and using 70 eV electron impact ionization. The GC/MS was calibrated daily by first tuning the MS on perfluorotri-n-butylamine and then running a calibration standard using the conditions described above.

2.9.3 Tissue Lipids

The percent lipids in each sample was determined by the procedure described in EPA Method 8290 (Tondeur 1987). A portion (approximately 3 g) of each sample was accurately weighed, blended with sodium sulfate, and placed in a glass column. The column was rinsed with methylene chloride, and the extract was dried on a steam bath until a constant weight was obtained. The lipid content was calculated as:

$$\frac{\text{the weight of the extraction residue}}{\text{the weight of the extracted tissue}} \times 100$$

2.9.4 Total Organic Carbon

Sediment total organic carbon was analyzed by Global Geochemistry Corporation, Canoga Park, California. Samples were analyzed using a nondispersive infrared measurement of carbon dioxide released from the organic carbon during combustion of the sediment. Inorganic carbonates were released from the sediment sample before combustion using hydrochloric acid. A Dohrmann DC-180 carbon analyzer was used to measure the released carbon dioxide. The method used is consistent with PSEP (PSEP 1986) and Standard Method 505 (Standard Methods 1975).

2.10 QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

2.10.1 General Procedures

Quality assurance/quality control (QA/QC) procedures common to each toxicological test include:

- using Battelle Laboratory Record Books (LRBs) to record all information, calculations, daily monitoring, and results related to each test
- using standard forms to record observations and water quality measurements during a test
- using MSL Standard Operating Procedures MSL-1 through MSL-4 when calibrating water quality instruments
- verifying data entry quality by having a person not involved in the data entry check the accuracy of data against original data.

2.10.2 Toxicological Tests

2.10.2.1 Microtox

Quality assurance procedures related to Microtox include monitoring the response of blank and reference toxicant samples during the conduct of each test to ensure that the response is appropriate. Appropriate blank response is defined as an initial (time 0) luminescence of 80 to 100% (corrected), with less than 2% difference between duplicates during a run. Appropriate reference toxicant response includes a rapid decline of light output over time and with increasing concentration and a decrease in light output of at least 50% relative to blank. During Microtox testing, the operator monitors these conditions relative to quality assurance and reruns any sample that fails to meet the above criteria. Microtox bacteria have a testing life of about 6 h and exhibit the described behavior near the end of their viable testing period. When the bacteria fail to respond acceptably, a new batch is reconstituted.

2.10.2.2 Amphipod

Quality assurance/quality control of the amphipod test includes inspection of the following data:

- survival in native West Beach control sediment of at least 90%
- test water temperature of 15° ± 1°C
- test water dissolved oxygen of ≥ 4.0 mg/L
- test water pH of ambient ± 0.4
- test water salinity of ambient ± 1.0 ‰.

Water quality data were examined and qualified for the test, and any parameters out of range for a jar or station were identified. Data were then compared to determine whether the water quality parameter might have influenced the amphipod survival in that sediment.

2.10.2.3 Oyster Larvae

A definitive test started with embryos of bivalve molluscs is usually considered unacceptable if one or more of the following occurred (ASTM 1980):

- All test chambers were not identical.
- Treatments were not randomly assigned to individual test chamber locations.
- A required dilution water or solvent control was not included in the test.
- All animals in the brood stock were not obtained from the same location.
- The test was begun with embryos more than 4 h after they were fertilized.

- Less than 70% of oyster embryos introduced into a required control treatment resulted in live larvae with completely developed shells at the end of the test.

- Dissolved oxygen and temperature were not measured as specified.

- Any measured dissolved oxygen concentration was not between 60 and 100% of saturation.

- The difference between the time-weighted average measured temperatures for any two test chambers from the beginning to the end of the test was greater than 1°C.

- Any single measured temperature in any test chamber was more than 3°C different from the mean of the time-weighted average measured temperatures for the individual test chambers.

- At any one time, the difference between the measured temperatures in any two test chambers was more than 2°C.

These criteria were examined at the end of the test, and data were qualified. If any of the above criteria were not met, data were compared to determine if survival was influenced by the factor.

2.10.2.4 Clam

Quality assurance related to the 30-day clam test involved inspection of the following data:

- survival in native Sequim Bay control sediment of at least 90%

- test water temperature of ambient ± 2°C

- test water dissolved oxygen of ≥ 4.0 mg/L

- test water pH of ambient ± 0.5

- test water salinity of ambient ± 1.0 ‰

- test water flow rate of 125 ± 10 mL/min.

For the 60-day exposure, the same water quality parameters pertained, although no control survival limits were set. These criteria were examined at the end of the test, and data were qualified. If any of the above criteria were not met, data were compared to determine if survival was influenced by the factor.

2.10.3 Analytical Chemistry

General quality assurance requirements for analytical chemistry data included the inspection and review of the following results:

- method blank analysis
- surrogate standard recovery
- matrix spike recoveries
- duplicate sample analysis
- relative percent difference in machine calibration variation (where appropriate)
- standard reference material (SRM) analysis (if available).

A summary follows of acceptable ranges for each of the above data for sediment and tissue dioxin/furans, sediment and elutriate guaiacols/organic acids, tissue lipids, and total organic carbon.

2.10.3.1 Sediment and Tissue Dioxin/Furans

The quality assurance requirements for this program were established for the sediment and tissue dioxin/furan data based on requirements of EPA Method 8290 (Tondeur 1987). Some of the quality assurance requirements include:

- daily GC performance checks - RPD of calibration runs should not exceed 25%.
- analysis of one method blank per batch of samples - Method blank must contain the sample amount of $^{13}C_{12}$-labeled internal standards that is added to samples before extraction.
- method blank results that exhibit no positive response - Method blanks that contain any of the 2,3,7,8-substituted congeners except OCDD and OCDF that exceed 110% of the desired detection limit must be reported and may invalidate results and require automatic sample reruns.
- mass resolution check to demonstrate a static resolving power of 10,000 minimum - 10% valley definition
- method calibration limits definition
- a field blank (uncontaminated sample) contained in each batch of samples

- calculation of the concentration of 2,3,7,8-substituted PCDDs/PCDFs and the percent recovery of the internal standards - Percent recovery of 2,3,7,8-substituted PCDD/PCDF congeners should be 40 to 120%.

- duplicate analysis of one sample per each batch, with relative difference between duplicate results ≤25% - Note: for this study, replicate samples or matrix spike duplicates were substituted because duplicate analysis, for they are a better indicator of precision and accuracy than duplicates.

- analysis of a matrix spike and matrix spike duplicates for each batch of samples - Matrix spike and matrix spike duplicate results must agree within 20% relative difference.

- for each sample, calculation of the percent recovery of internal standards - Percent recovery should be between 40 and 120%, although high or low recovery does not necessarily invalidate the results.

2.10.3.2 Sediment and Elutriate Guaiacols/Organic Acids

Quality assurance requirements for analysis of sediment and elutriate guaiacols/organic acids are not directly discussed in the NCASI Method (NCASI 1986), although method validation studies are discussed. For the purposes of quality assurance, MSL's requirements for sediment and water resin acid analysis included:

- daily GC performance checks - RPD of calibration runs should not exceed 25%.

- analysis of one method blank per batch of samples - Method blank must contain the surrogate O-Methyl Podocapic acid (d5-Ethyl-ester), added before extraction.

- method blank results that exhibit no positive response - Detected compounds in method blanks may invalidate results and require automatic sample reruns.

- a field blank (uncontaminated sample) contained in each batch of samples

- duplicate analysis of one sample per each batch, with relative difference between duplicate results ≤25% - Note: for this study, replicate samples or matrix spike duplicates were substituted for duplicate analysis.

- analysis of a matrix spike and matrix spike duplicates for each batch of samples - Matrix spike and matrix spike duplicate results must agree within 20% relative difference.

- for each sample, calculation of the percent recovery of internal standards - Percent recovery should be between 40 and 120%, although high or low recovery does not necessarily invalidate the results.

2.10.3.3 Tissue Lipids

Tissue lipid concentrations were determined during the analysis of tissues for dioxin/furans. General quality assurance guidelines pertaining to the sediment and tissue dioxin/furan analysis apply to the tissue lipids. For this analysis, duplicate sample analysis was performed on 10% of the samples and was expected to agree within 20% relative difference.

2.10.3.4 Total Organic Carbon

Total organic carbon quality assurance procedures were adapted from Standard Method 505 (Standard Methods 1975) and include:

- construction of a standard curve of inorganic and organic carbon based on known concentrations and serial dilutions

- use of low carbon content reagent water and reagents

- duplicate analysis of 10% of the samples.

2.11 STATISTICAL DESIGN, DATA ANALYSIS, AND INTERPRETATION

2.11.1 Randomization

All toxicological tests were conducted using completely random designs and blind coding. Organisms were randomly allocated to exposure containers, and exposure containers were randomly assigned positions on water tables. Separate random number tables were generated for each of the biological tests, using the discrete uniform random number generator available in Lotus 123.®

2.11.2 Methods

The purpose of the statistical analyses was to determine whether the results of each toxicological test produced stations that were statistically different from each other. If differences existed, statistical groupings were constructed to determine which stations were similar and which were different from each other. For elutriate-type tests, it was necessary to determine what percent of the elutriate produced a 50% change in the measured parameter (i.e., an effective concentration or EC50). A discussion follows of the statistical methods used for the solid phase tests (amphipod, clams) and elutriate tests (Microtox, oyster larvae).

2.11.2.1 Amphipod and Clam Tests

Amphipod and clam toxicological tests were analyzed statistically for the proportion of test organisms surviving the exposure for each station. The data were first transformed by arcsine square root to stabilize the within-class variances to meet the assumptions of analysis of variance (ANOVA). If ANOVA produced significant differences between stations ($p = 0.05$), a multiple comparison analysis was run using Tukey's Honestly Significantly Different (HSD) test for all possible comparisons (Steel and Torrie 1980). Tukey's HSD is a conservative multiple comparisons test that uses an experiment-wide error rate. Tukey's HSD thus provides more information about how each sediment treatment compares with every other one, as opposed to the more limited comparisons to a single control in Dunnet's t-test (Chew 1977). The analysis results in a grouping of stations (alphabetic) that are not significantly different from each other. Inspection of these groupings provides insight into which stations group with (or away from) control or reference stations.

2.11.2.2 Microtox and Oyster Larvae Tests

Microtox and oyster larvae tests are based on dilutions of elutriate that is produced from test sediment. Microtox results were analyzed on the Microtox data analysis program to determine if an effective concentration existed that reduced light output by 50% (EC50) at the 15-min observation period, as required by PSDDA. If enhanced illumination occurred in more than three of the four elutriate concentrations, EC50 calculation was calculated, as recommended in PSDDA.

In the oyster larvae test, the data were first transformed via arcsine square root to reduce within-class variance, then ANOVA was run on the proportion of the larvae that survived to normal D-stage in each station and at each elutriate concentration to determine if stations were statistically different from each other. If a statistical difference existed, Tukey's HSD was used to determine station rankings and ultimately determine which stations belonged to a group that included control or reference stations. In addition, the EC50 concentration that produced a 50% decrease in normal D-stage larvae relative to seawater control was calculated for each applicable station.

3.0 TOXICOLOGICAL TESTING RESULTS

3.1 MICROTOX

Microtox toxicity testing was conducted on sediment from 17 stations or station composites from the Grays Harbor area and on uncontaminated sediment collected at West Beach and Sequim Bay. The summary results of this test are presented in Table 3.1, and data on individual Microtox samples are presented in Appendix B, Table B.1.

All quality assurance parameters associated with this test described in Section 2.10.2 were met. The results of reference toxicant performance presented in Appendix B, Table B.6, show that the bacterium's response to sodium arsenate at the 15-min observation period produced EC50s ranging from 7.7 to 18.9 mg/L (as arsenic). This is similar to past Microtox tests conducted at the MSL, although it is below the EC50 of 26 mg/L reported in the Beckman Manual (Beckman Instruments 1982). This suggests that this batch of bacteria is more sensitive than the batch referred to in the Beckman Manual.

The results of the Microtox analysis show enhancement, rather than decrease, in illumination after exposure to sediment elutriates in nearly all the test stations during the 15-min observation period (Appendix B, Table B.1). A definite trend toward decreasing illumination was observed in only one sample (2A) during the 15-min observation. However, none of the decreases were significant enough to calculate an EC50, as noted in Table 3.1. Results indicate that none of the stations from the Grays Harbor area, Sequim Bay, or West Beach resulted in a 50% decrease in light output at the 15-min observation period.

3.2 AMPHIPOD

Toxicological tests were conducted with the amphipod on sediment from 17 stations or station composites from the Grays Harbor area and on uncontaminated sediment collected from Sequim Bay and West Beach. The results of these tests are presented in Table 3.1 and Figure 3.1. Data on individual replicates may be found in Appendix B, Table B.2.

TABLE 3.1. Biological Survival Data Summary

Sediment Sample	Microtox (15 min)	Amphipod (% Survival)	Clam % Survival (30 d)	Clam % Survival (60 d)	Oyster Larvae % Normal[a]	Oyster Larvae EC50
1-A-C	--[b]	86	85	67	92	--
2-A	--	89	88	79	53 [c]	28%[d]
3-A-C	--	85	98	85	62	57%[d]
4-A-C	--	95	98	88	86	--
5-A-C	--	86	97	95	90	--
6-A-C	--	78	97	90	85	--
7-C	--	89	99	89	87	--
8-A-C	--	93	93	93	90	--
9-A-C	--	92	96	88	81	--
10-A-C	--	88	98	91	85	--
11-A-C	--	84	94	98	82	--
12-A-C	--	91	96	87	63	63%[d]
13-A-C	--	88	97	82	75	--
14-A-C	--	85	94	88	80	--
15-A-C	--	88	(e)	(e)	49[c]	19%[d]
16-C	--	87	(e)	(e)	92	--
17-A	--	79	100	82	99	--
West Beach	--	96	98	78	92	--
Sequim Bay	--	87	98	70	88	--
Conclusions[e]	NS[f]	NS	NS	NS	2,15 S	2,3,12,15 S

(a) Mean survival to normal-D over all dilutions.
(b) EC50 for decreased light illumination not appropriate - light did not increase in all cases.
(c) Statistically different from West Beach control, but not from Sequim Bay reference.
(d) Suspended particulate phase concentration calculated to provide 50% decrease in survival to normal.
(e) Toxicity/bioaccumulation was not performed on sediment from Stations 15 and 16.
(f) NS is not significant; S is significant at p = 0.05.

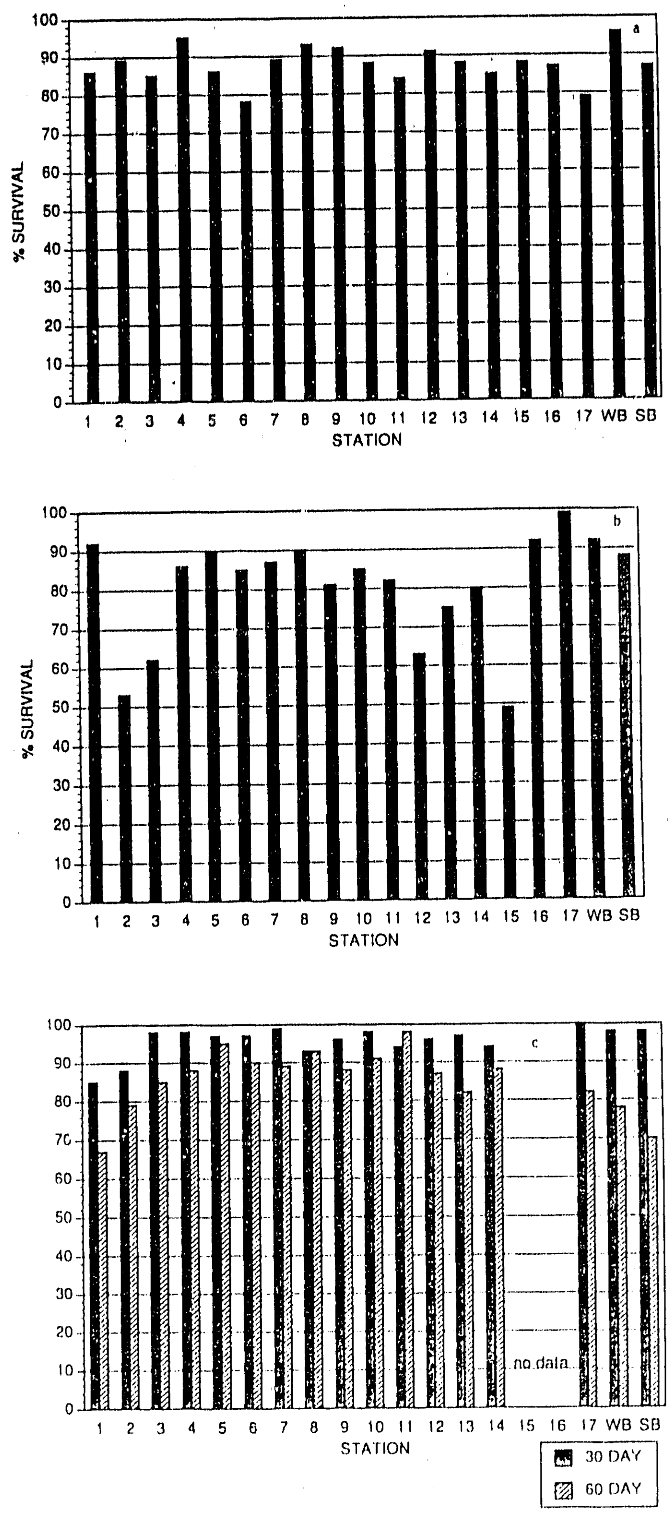

FIGURE 3.1. Results of (a) Amphipod, (b) Oyster Larvae, and (c) Clam Toxicity Tests (WB = West Beach; SB = Sequim Bay)

Quality assurance parameters described in Section 2.10.2 were met during this test for control survival (96% in West Beach) and dissolved oxygen. Quality assurance parameters were exceeded for temperature, pH, and salinity. Temperature exceeded the upper limit of 16°C by approximately 2°C in some test containers. However, this was a short-term occurrence and did not appear to affect survival in either control or test containers. Further, Swartz et al. (1985) have reported high survivals at temperatures of 19°C and indicate that 15°C is not close to the upper thermal limit for this species. The variation in pH was probably a result of individual sediment characteristics, and the range reported in Appendix B, Table B.6, is the experiment-wide range. The range within replicate test containers was very consistent. Salinity ranges reported in Appendix B, Table B.6, are also experiment wide, encompassing the effect of less saline river sediments compared with estuarine sediments such as those from Sequim Bay and West Beach. Again, variation between replicate test containers was within acceptable limits during the test. Acceptable survival in salinities of 25 ‰ are reported by Swartz et al. (1985). The results of these quality assurance checks indicate our test was not compromised by water quality and is therefore valid.

The results of the amphipod test presented in Table 3.1 show that survival ranged from 78 to 96% in the West Beach control sediment. The ANOVA of the arcsine square root of the proportion surviving indicated no significant differences between stations ($p = 0.05$). These data indicate that no significant differences existed among sediments from the Grays Harbor area, Sequim Bay, and West Beach stations, or station composites, relative to amphipod survival, and thus, no significant toxicological effects were apparent.

3.3. OYSTER LARVAE

A 96-h oyster larvae test was conducted on sediment from 17 stations, or station composites, from the Grays Harbor area and on uncontaminated sediment collected from Sequim Bay and West Beach. The results of the test are summarized for all dilutions in Table 3.1 and Figure 3.1. Data on individual replicates of each dilution are presented in Appendix B, Table B.3.

The quality assurance parameters summarized in Section 2.10.2 were met during the oyster test for percent survival in control, temperature, dissolved oxygen, and pH, but the salinity in some containers reached 25.0 ‰, which is below the minimum acceptable level of 26.0 ‰. This was likely a result of low interstitial water salinity in some of the river sediments collected in the Grays Harbor area (Appendix B, Table B.6). The salinity range was consistent within replicate containers, however, and larval survival was not affected by these conditions. Reported EC50 to the reference toxicant cadmium chloride was 1.9 mg/L. This compared well with past oyster larvae studies conducted at MSL. These data are therefore considered valid.

Summary results presented in Table 3.1 and Figure 3.1 show that the mean percent of larvae surviving to normal D-shape in all dilutions of each sediment treatment ranged from 49% in the sediment elutriate from Station composite 15A-C to 99% in Station 17A. West Beach and Sequim Bay elutriates produced 92 and 88% survival, respectively. Data in Appendix B, Table B.3, show that normal D-shape survival in seawater-only controls (run for each station) ranged between 84 and 100%, with the exception of the seawater control for Station 17A, where only 50% survival to normal was recorded. The results of this seawater control were considered to be anomalous and were not used in data analysis.

Analysis of variance (ANOVA) on the proportion of normal larvae indicated that Stations 2A and 15AC were statistically different from the West Beach control, but not significantly different from Sequim Bay. An EC50 was calculated at Stations 2A, 3AC, 12AC, and 15AC for the percent elutriate needed to produce a 50% decrease in survival to normal-D. These data are reported in Table 3.1 and show that the EC50 ranged from 19% at Station 15AC to 68% at Station 12AC. These data indicate that elutriates of four Grays Harbor station composites were capable of producing a 50% decrease in oyster larvae survival to the normal-D stage of development, but the concentration of elutriate necessary to produce this effect would not likely occur during dredged material disposal situations, based on USACE calculations of mixing and dilution (Wakeman 1989).

3.4. 30-DAY CLAM

A 30-day toxicity/bioaccumulation test was conducted using clams. Sediment from 15 stations, or station composites, from the Grays Harbor area were evaluated, along with uncontaminated sediment from West Beach and Sequim Bay. The original experimental design included 5 replicate containers per station for the 30-day test. However, pursuant to instructions from the USACE, three replicates were analyzed at 30 days, while the remaining two replicates were analyzed at 60 days as described in Section 3.5. Concern was expressed that maximum contaminant uptake would not be manifest over the 30-day test period. Thus, the data presented in Table 3.1 and Appendix B, Table B.4, reflect three replicate exposures per station rather than 5.

Quality assurance parameters outlined in Section 2.10.2 were met for control survival (98% in Sequim Bay), water temperature, and dissolved oxygen. Water quality limits were exceeded for pH and salinity. The pH and salinity deviations occurred over a relatively long period of time and are probably the result of the long-term nature of the exposure. High survival for all stations, however, suggests that these deviations had little effect on the test results, and that these data are therefore considered valid.

The summary results for the 30-day clam exposures are presented in Table 3.1 and Figure 3.1. They show that survival at all stations was ≥85% and usually above 90%. The ANOVA of the transformed survival data indicated no significant differences existed between stations ($p = 0.05$).

3.5. 60-DAY CLAM

The 60-day clam experiment was an extension of the 30-day exposure described above. Two of the five replicates for each station were used in this test. Summary results are presented in Table 3.1 and Figure 3.1, and individual data for each replicate is presented in Appendix B, Table B.5.

The quality assurance parameters discussed in Section 2.10.2 were met for water temperature, dissolved oxygen, and salinity, but were not met for pH (Appendix B, Table B.6). The reported range for pH was experiment wide, and the variation between replicate containers was within acceptable ranges. No quality assurance parameters are available for survival in the 60-day test. However, given the relatively high survival of clams in sediment from most stations relative to the control, the results of this test are considered valid.

The 60-day summary data for clams presented in Table 3.1 and Figure 3.1 show a range of survival from 67% (Station 1AC) to 98% in Station 11AC. Five of the 17 stations exhibited survival of ≥90%, and 13 of the 17 stations exhibited survival of ≥80%. The ANOVA of the transformed data indicated no significant differences between stations ($p = 0.05$). In 15 of the 17 stations, mortality increased from 2 to 28% compared with the 30-day results. At one station (8A-C), no change in mortality occurred from 30 to 60 days, and at another station (11A-C), a 4% improvement in survival occurred for the two containers over the 60-day period compared with the three containers over the 30-day period. These data indicate that after 60 days of exposure to sediment from stations, or station composites, from the Grays Harbor area, a decrease in survival is apparent compared with 30-day data. No significant difference between the Grays Harbor sediments and the uncontaminated sediment collected from Sequim Bay and West Beach during the 60-day exposure is apparent.

4.0 ANALYTICAL CHEMISTRY RESULTS

4.1 SEDIMENT DIOXIN/FURANS AND TOTAL ORGANIC CARBON

The concentration of dioxin/furans was measured in 48 sediment samples from the Grays Harbor area and in uncontaminated reference sediment samples from West Beach and Sequim Bay. Total organic carbon was measured in sediment from 17 samples, including 15 Grays Harbor samples and samples from West Beach and Sequim Bay. Summary information for the sediment samples from the station or station composites that were tested are presented in Table 4.1. Data from all analyses are presented in Appendix C, Tables C.1 and C.4.

Quality assurance summary information has been compiled for these analyses and is presented in Appendix C, Table C.5 (dioxins/furans) and Table C.8 (total organic carbon). Quality assurance requirements summarized in Section 2.9.3 were generally met for these analyses. Our target detection limit for 2,3,7,8 TCDD was 1.0 ng/Kg. Actual detection limits for 2,3,7,8 TCDD were generally between 1 and 3 ng/Kg, although in some sediment samples, it reached 6 ng/Kg. The higher detection limits were probably a result of suppression or interference of the ion beam by some compound present in the sediment. This occurrence was noted in a few individual samples, but should not raise concern about the extraction methodology or machine performance. The acceptable limit for instrument calibration variation is 25%. The measured calibration ranged between 1 to 10%, with an average of about 5%, and is within acceptable limits. Acceptable method blanks exhibit 2,3,7,8 substituted congeners of ≤110% of the desirable detection limit. The method blank data presented in Appendix C, Table C.5 shows that only one of the nine blanks indicated the presence of 2,3,7,8 TCDD (at 0.39 ng/kg dry). This is essentially the detection limit. The PCDF or PCDD congeners were present in two blanks at levels of less than 1.0 ng/kg; non-total HCDF or HCDD congeners were present in 5 of 9 blanks at levels of less than 1.0 ng/kg; and non-total HCDF or HCDD congeners were present in most blanks at concentrations ranging from 0.45 to 3.9 ng/kg. The presence of OCDF or OCDD was detected in all method blanks at concentrations no greater than 31 ng/kg. These detected isomers do not represent 110% of the desirable detection limit, but their presence in method blanks should be noted when evaluating the data, as the sediment concentrations have not been blank corrected. The presence of OCDF and OCDD in method blanks is not considered a problem according to EPA 8290 Method (USEPA 1988) because of their ubiquitous nature. Acceptable matrix spikes must show a percent recovery of 40-120%. Evaluation of four matrix spikes presented in Appendix C, Table C.5 shows that percent recovery was generally about 90% for all isomers, with only one isomer in one spike less than 80%, and only four isomers in one spike greater than 120%. Surrogate recoveries were calculated for all sediment samples and ranged from 41 to 134%, which is slightly above the acceptable range of 40 to 120%. On the basis of the quality assurance data presented, these data were viewed as acceptable for use and interpretation when interpreting suspected dioxin/furan contamination in Grays Harbor area sediments. Quality assurance summary information for sediment total organic carbon data indicates acceptable analytical precision based on comparison of duplicate analysis results on two samples.

Table 4.1 summarizes the dioxin/furan concentrations for 2,3,7,8 TCDD, total TCDD, 12378 PeCDD, and 2,3,4,7,8 PeCDF observed in samples that were also used for toxicological tests. These isomers were chosen for closer examination because of their relatively high toxicity, based on EPA's toxicity equivalence factors (TEFs) (USEPA 1988). The dioxin/furan concentrations for all isomers from the remaining samples are presented in Appendix C, Table C.1. In the 17 samples tested for toxicological response, 2,3,7,8 TCDD concentrations were nondetectable in 12 of the 15 samples and ranged from 0.7 to 2.9 ng/kg in the remaining four samples. Total TCDD was nondetectable in 9 of 15 samples and ranged from 1.9 to 9.5 in the remaining 6 samples. 1,2,3,7,8 PeCDD was present in 13 of 15 samples at concentrations of 0.43 to 4.0 ng/kg, and 2,3,4,7,8 PeCDF was present in only 4 of 15 samples at concentrations of 0.48 to 3.1 ng/kg. The highest concentrations of these isomers were found in sediment samples from Stations 11A-C and 13A-C, which are located in the Aberdeen Reach-Elliott Slough region of Grays Harbor. Figure 4.1 presents the values of TCDD and PeCDD compared with observed total organic carbon concentrations. This figure shows that the highest concentration of the isomers is in sediment with organic carbon levels exceeding

TABLE 4.1. Sediment Chemistry Data Summary

Sediment Sample	TOC (% dry wt)	Dioxins/Furans (ng/kg dry wt) 2,3,7,8 TCDD[a]	TCDD	1,2,3,7,8 PeCDD	2,3,4,7,8 PeCDF	Guaiacols/Organic Acids Sediment (g/kg) of Detected (b)	Elutriate (g/L) of Detected (c)
1 A-C	0.41	nd (0.87)	2.4	0.43	nd (.32)	0	nd
2 A	1.30	0.7	4.0	1.2	0.48	490	nd
3 A-C	0.87	nd (2.1)	nd (2.1)	0.55	nd (0.17)	353	nd
4 A-C	1.13	nd (6.1)	nd (6.1)	nd (2.0)	nd (1.3)	432	nd
5 A-C	1.02	nd (3.2)	nd (3.2)	0.96	nd (.57)	650	nd
6 A-C	1.22	nd (1.8)	nd (1.8)	1.2	nd (.5)	1002	nd
7 C	1.96	nd (3.6)	nd (3.6)	2.0	nd (1.1)	252	nd
8 A-C	2.13	1.5	5.1	2.1	nd (0.83)	1136	nd
9 A-C	1.30	nd (9.2)	nd (9.2)	nd (3.5)	nd (0.7)	1023	nd
10 A-C	1.63	nd (4.1)	nd (4.1)	nd (2.6)	nd (1.3)	530	nd
11 A-C	2.21	2.9	9.5	4.0	3.1	1342	nd
12 A-C	1.56	nd (1.8)	2.0 (1.8)	0.74	0.27	963	nd
13 A-C	1.88	2.1	4.5	2.5	nd (0.74)	870	nd
14 A-C	1.71	nd (5.2)	nd (5.2)	1.3	nd (0.75)	1890	nd
15 A-C	N/A(d)	N/A	N/A	N/A	N/A	700	nd
16 C	N/A	N/A	N/A	N/A	N/A	157	nd
17 A	2.28	1.7	7.4	1.6	nd (0.73)	N/A	nd
West Beach	0.06	nd (2.3)	nd (—)	nd (0.64)	nd (0.69)	868	nd
Sequim Bay	2.03	nd (2.6)	1.9	0.95	0.72	6900	nd

(a) Nondetectable; detection limit is included in parenthesis.
(b) Detection limit = 30-400 g/kg.
(c) Detection limit = 1-5 g/L.
(d) Analyses not performed.

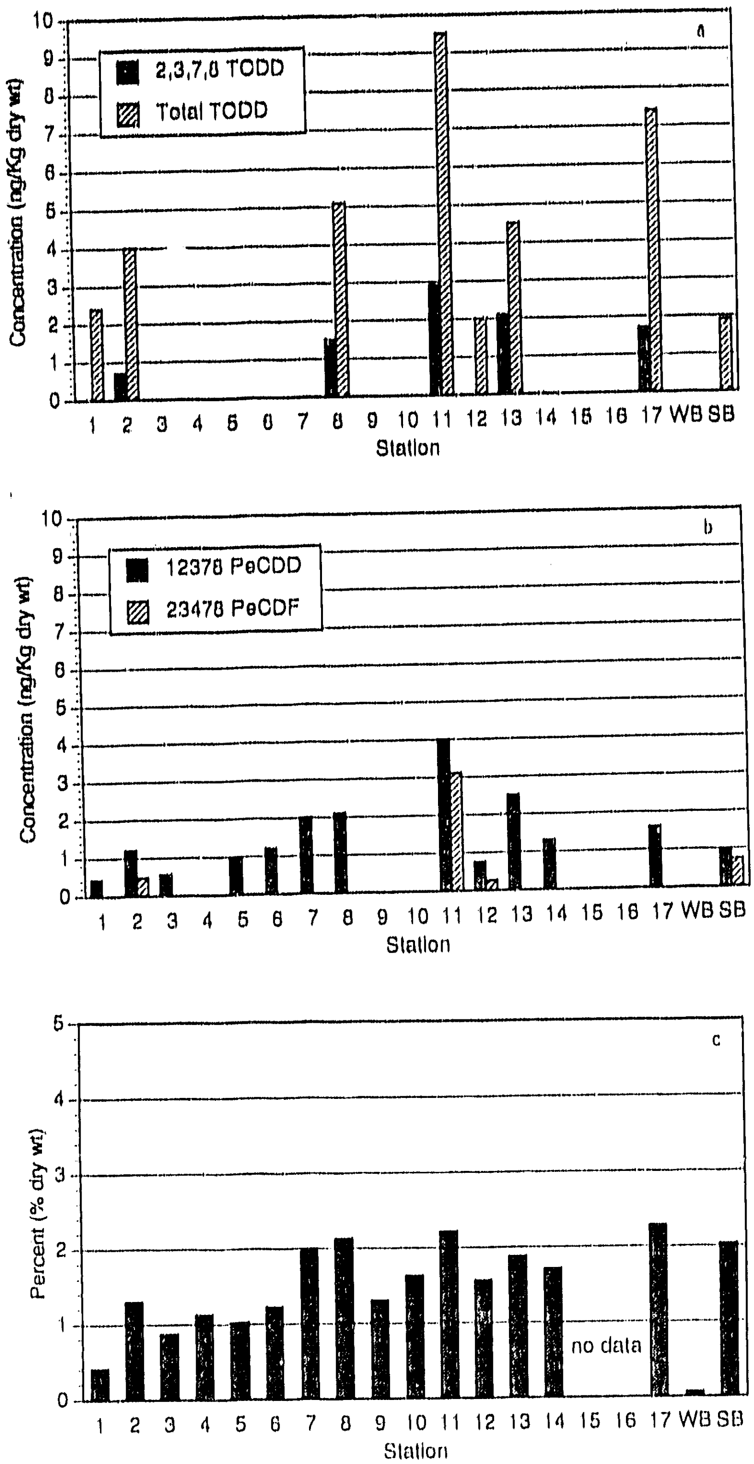

FIGURE 4.1. (a) TCDD, (b) PeCDD and (c) PeCDF, and Total Organic Carbon Concentrations in Sediment Samples Tested for Toxicological Response

1.5%. The results of the other sediment samples tested for dioxin/furan, but not evaluated toxicologically, are presented in Appendix C, Table C.1. These data show levels of 2,3,7,8 TCDD below 2.0 ng/kg at Stations 2A, 8C, 11A, and 17A, and at levels of between 2 and 3 ng/kg at Stations 8A, 8B, 11C, and 13C. 2,3,7,8 TCDD was nondetectable at the remaining stations. PeCDF and PeCDD followed a similar pattern with detectable concentrations above 1.0 ng/kg occurring at Stations 2A, 5C, 8, 9C, 10, 11, 13, 14, and 17.

4.2 SEDIMENT AND ELUTRIATE GUAIACOLS/ORGANIC ACIDS

Sediment and elutriate guaiacols/organic acids were measured in 19 samples, including 17 Grays Harbor samples and samples from West Beach and Sequim Bay. Table 4.1 summarizes data for the total detected guaiacols/organic acids found in each sediment and elutriate sample. The concentrations for each measured compound in sediment and elutriate samples are presented in Appendix C, Tables C.2 and C.3, respectively.

Quality assurance parameters for sediment guaiacol/organic acids are summarized in Appendix C, Table C.6. Acceptable instrument calibration is ≤25%, and the actual calibration produced a relative standard difference of ≤25%. Our target detection limit of 50 μg/kg was generally met, although in some samples, the detection limit was 400 μg/kg. No compounds were detected in the method blanks with the exception of almitoleic, linolenic, oleic, and stearic acid in the West Beach method blanks for matrix and matrix spike duplicates. Acceptable matrix spike and duplicate matrix spike recoveries of 40-120% were met, as recoveries were above 80% for most spiked compounds. Recoveries were low for neoabietic acid at 1.6% for the matrix spike, and 22.7% for the matrix spike duplicate. This is not surprising, because a rapid loss of neoabietic acid in preserved samples (pH 2) has been documented, along with a concurrent increase in abietic acid (NCASI 1986). This is caused by acid-catalyzed isomerization and is present in samples preserved for as few as 7 days. Abietic acid was not measured in the spikes for this project, but method validation data provided to MSL by ARI, Inc. showed a 44% recovery for neoabeitic acid and an accompanying 179% recovery for abietic acid spiked into water, confirming the documented loss and gain of these acids. The relative percent difference in matrix spike duplicates was 13% or less in all matrix spike compounds, except for the neoabietic acid spike. Appendix C, Table C.2 shows that in all samples, the recovery of the surrogate O-methyl podocaprate acid was within the 40 to 120% stipulated in the quality assurance guidelines in Section 2.9.3. These results allow us to qualify the sediment guaiacol/organic acid data as acceptable for use in analysis.

Quality assurance data related to the elutriate guaiacols/organic acid data is presented in Appendix C, Table C.7. Instrument calibration produced an acceptable relative standard difference of ≤25%, and no compounds were detected in the method blanks with the exception of almitoleic, linolenic, oleic, and stearic acid in the West Beach method blanks for matrix and matrix spike duplicates. These compounds were detected at levels of less than 10 μg/L. Our target detection limit of 10 μg/L was met, with actual detection limits of 1 to 5 μg/L. Matrix spike and matrix spike duplicate recoveries ranged from 38 to 106%, excluding neoabietic acid. Neoabietic acid recoveries were zero in both the matrix spike and matrix spike duplicate because of the reasons discussed above. The relative percent difference between the matrix spike and matrix spike duplicate was less than 20%, except for 4-chloroguaiacol, where a 30% RPD was noted. Acceptable RPD is 20% or less. Appendix C, Table C.3, shows that the recovery of the surrogate O-methyl podocaprate acid in all samples was within the acceptable range of 40 to 120% indicated in the quality assurance guidelines discussed in Section 2.9.3. These results allow qualification of the sediment guaiacols/organic acids data as acceptable for use in analysis.

The summary results of total detected guaiacols/organic acids found in each sediment and elutriate sample are presented in Table 4.1. They show a range of concentrations from nondetectable to 6900 μg/kg in sediment and nondetectable concentrations in all of the elutriate water preparations. The Grays Harbor-area sediment samples generally contained less than 1000 μg/kg, except in samples from Stations 8A-C, 11A-C, and 14A-C. The highest concentration of guaiacols/organic acids was found in Sequim Bay sediment. These data indicate that guaiacols/organic acids concentrations in Grays Harbor sediment samples are similar to the uncontaminated West Beach sample and are much lower than the Sequim Bay sample. Little transport of acids to water is possible, given the nondetectable results in the elutriate samples. It was also observed that the color of the elutriate water was not extractable with the present technique.

4.3 30-DAY AND 60-DAY TISSUE DIOXINS/FURANS AND LIPIDS

The 30- and 60-day bioaccumulation studies were conducted by exposing the clams to 15 sediment samples from the Grays Harbor area and uncontaminated reference sediment from Sequim Bay and West Beach. After exposures, the tissue of all living clams in a test aquaria were dissected and composited into a single sample for dioxin/furan analysis. Background dioxin/furan levels in clam tissue were determined by randomly removing 30 clams from the shipment, dissecting the tissue, and analyzing a composite of that tissue. The results of that analysis are presented in Appendix D, Table D.1 and show that the only dioxin/furans present in the background tissue sample were very low levels of TCDF, HpCDF, HpCDD, OCDF, and OCDD. All tissue data (or calculation based on tissue concentrations) presented reflect a background correction of 0.0744 ng/kg TEC (for detected values). This represents approximately 19% of the mean TEC for all tissues of clams that were exposed for 30 days to sediment from those stations (mean of detected values), and approximately 8% of the highest TEC recorded in the 30-day tissues as the mean of the detected values. The background sample contained only 2,3,7,8 TCDF (0.35 ng/kg); 1,2,3,4,6,7,8 HpCDF (0.53 ng/kg); 1,2,3,4,6,7,8 HpCDD (1.6 ng/kg); OCDF (1.10 ng/kg); and OCDD (17.00 ng/kg), all as wet weights.

The quality assurance summary for the 30-day tissue data is presented in Appendix D, Table D.2. Associated tissue lipid data are presented in Appendix D, Table D.3. Instrument calibration variation was within the accepted limit of 25% and ranged between 1 and 10%, with a mean of about 5%. Our target detection limit of 1.0 ng/kg was met, because the detection limit for each isomer was below 1.0 ng/kg (wet wt). The five method blanks for the 30-day tissue analysis indicated the presence of PeCDF in one blank, HXCDF in most blanks, HxCDD in one blank, HpCDF in one blank, and OCDF and OCDD in all blanks. The levels of these congeners were generally below 0.5 ng/kg, except for the OCDF and OCDD congeners, where levels of 1 to 2 ng/kg were noted. These levels are extremely low and are not indicative of method blank contamination (EPA Method 8290). Acceptable matrix spike recovery levels of 40-120% were generally met, as the 5 matrix spikes run for the 30-day tissue data produced recoveries ranging from 80-125%. Surrogate recovery data presented in Appendix D, Table D.3 show that most surrogate recoveries were within the acceptable range of 40-120%, except for a 20% recovery of 1,2,3,7,8 PeCDD-C13 in tissue from clams exposed to Station 4 sediment, and recoveries of some isomers in excess of 120% in one replicate of sediment from Stations 8, 12, 14, and West Beach. These data are considered valid based on the low frequency of isomers where recovery ranges were not met. Quality assurance associated with tissue lipid data was evaluated through the RPD between duplicate samples in six samples. The RPD level for lipids ranged from 3.1 to 66.7% in the six samples duplicated (Appendix D, Table D.2). These data, therefore, are conditionally qualified as acceptable for use, but an attempt will be made to determine the reason for the high RPDs in some of the samples.

The quality assurance summary for 60-day tissue dioxins/furans and lipid data are approximately 80% complete. These data will be presented, and a complete quality assurance review will be conducted when all data are available.

The results of the 30- and 60-day bioaccumulation tests are presented in Table 4.2 for 2,3,7,8 TCDD; 2,3,4,7,8 PeCDF; and 1,2,3,7,8 PeCDD congeners. These congeners were chosen for further consideration because they are considered the most toxic forms of dioxin, based on toxicity equivalance factors (USEPA 1988). Dioxin/furan concentrations for all congeners are presented in Appendix D, Table D.1. These summary results show that the three most toxic isomers were nondetectable in the majority of tissue samples. 2,3,7,8 TCDD was detected in only one replicate 30-day tissue sample (Rep. 1 of 5A-C). The levels of 2,3,7,8 TCDD were less than 0.50 ng/kg and are essentially at detection limit. 2,3,4,7,8 PeCDF occurred in a number of 30-day tissue samples, but all except one (11A-C) were below 0.50 ng/kg. 1,2,3,7,8 PeCDD was detected in only three tissue samples, and all except replicate 1 at Station

TABLE 4.2. Concentrations of 2,3,7,8 TCDD; 2,3,4,7,8 PeCDF; and 1,2,3,7,8 PeCDD in Clam Tissues After 30-and 60-Day Exposures (background corrected)

Sediment Sample	2,3,7,8 TCDD 30-Day Exposure			2,3,7,8 TCDD 60-Day Exposure		2,3,4,7,8 PeCDF 30-Day Exposure			2,3,4,7,8 PeCDF 60-Day Exposure		1,2,3,7,8 PeCDD 30-Day Exposure			1,2,3,7,8 PeCDD 60-Day Exposure	
	Rep.1	Rep.2	Rep.3	Rep.4[a]	Rep.5	Rep.1	Rep.2	Rep.3	Rep.4	Rep.5	Rep.1	Rep.2	Rep.3	Rep.4	Rep.5
1A-C	nd[b]	nd	nd	nd	nd	nd	0.49	nd	nd	nd	nd	0.48	nd	nd	nd
2A	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.50	nd	nd	nd	nd	nd
3A-C	nd	nd	nd	nd	nd	0.15	nd	0.29	nd	nd	nd	nd	nd	nd	nd
4A-C	nd	nd	nd	nd	nd	0.34	0.28	nd	nd	nd	nd	nd	nd	nd	nd
5A-C	nd	0.44	nd	nd	nd	nd	nd	0.18	nd	nd	nd	nd	nd	nd	nd
6A-C	nd	nd	nd	nd	nd	nd	nd	0.03	nd	0.33	nd	nd	nd	nd	nd
7C	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
8A-C	nd	nd	nd	nd	nd	nd	nd	0.41	nd	nd	nd	nd	0.41	nd	nd
9A-C	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
10A-C	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
11A-C	nd	nd	nd	nd	nd	0.60	nd	nd	nd	nd	nd	nd	nd	nd	nd
12A-C	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
13A-C	nd	nd	nd	nd	nd	nd	0.40	nd	nd	nd	nd	nd	nd	nd	nd
14A-C	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
17A	nd	nd	nd	nd	nd	nd	0.19	nd	nd	nd	nd	nd	nd	nd	nd
West Beach	nd	nd	nd	nd	nd	0.23	nd	nd	nd	nd	0.15	nd	nd	nd	nd
Sequim Bay	nd	nd	nd	nd	nd	0.33	nd	nd	nd	nd	0.22	nd	nd	nd	nd

(a) Five replicate containers were originally set up; replicates 1, 2, and 3 are 30-day exposures; replicates 4 and 5 are 60-day exposures.
(b) Nondetectable.

11A-C were at levels below 0.5 ng/kg. The 60-day tissue data show no detectable 2,3,7,8 TCDD or PeCDD and only two occurrences of PeCDF, both at less than 0.5 ng/kg.

In summary, Table 4.2 shows that in only 19 of 255 determinations was dioxin present. In the 19 positive determinations, 4 were associated with reference or control sites. The most noteworthy observation was that the most toxic congener of dioxin, 2,3,7,8 TCDD was accumulated only in tissues from one sediment station. This congener was near the detection limit and was not reported again in the 60-day exposure to the same sediment.

These data indicate that dioxin/furan bioaccumulation at levels exceeding 0.5 ng/kg (wet wt) for 2,3,7,8 TCDD; 2,3,4,7,8 PeCDF; and 1,2,3,7,8 PeCDD did not occur in the clams exposed to Grays Harbor-area sediments over periods of 30 and 60 days. When these isomers were detected, the levels were just above detection limits.

Toxicity equivalance concentrations were calculated for the 30- and 60-day tissue data by multiplying the mean of the detected value of each isomer by a toxicity equivalance factor (TEF). These factors are available in USEPA (1988). Summation of the isomer TEC values generates a TEC number that reflects the total toxic load of each tissue sample. Table 4.3 summarizes the TECs for the 30- and 60-day tissue sample results as the mean of detected values and mean of detected plus one-half of the detection limit.

This table shows that steady-state was probably reached at 30 days, because in the majority of the tissue samples, the 60-day TEC decreased compared with 30-day values, based on the mean of detected values. Figure 4.2 illustrates the changes in TEC between 30- and 60-day tests and relates the TEC values to the reported mean lipid concentrations for each station. This figure shows that TEC values were highest in samples from Stations 1, 5, 8, and 11, but did not exceed 1.0 in any sample.

The 30-day tissue lipid data summarized in Appendix D, Table D.2 and Figure 4.2 show that concentrations did not vary greatly between samples. Mean percent tissue lipids ranged from 0.13 to 0.28%, with a mean value of 0.19 (sd = 0.04; cv = 21.05; n = 17). The ANOVA of all replicate data show no

TABLE 4.3. Toxicity Equivalence Concentrations for 30- and 60-Day Clam Tissue Tests (background corrected)

Sediment Sample	Mean of Detected 30-day	60-day	Change 60-30	Mean of Detected + 1/2 D.L. 30-day	60-day	Change 60-30
1-AC	0.9767	0.0225	-0.9542	1.1221	1.5471	0.4250
2A	0.3588	0.5277	0.1689	1.0360	1.4054	0.3694
3A-C	0.2096	0.0163	-0.1933	0.9407	1.1020	0.1793
4A-C	0.3882	0.2271	-0.1611	0.8566	1.6289	0.7723
5A-C	0.7006	0.0369	-0.6637	0.8251	2.2002	1.3751
6A-C	0.2961	0.4714	0.1753	0.9346	1.2072	0.2726
7C	0.1109	0.1515	0.0406	0.6438	1.1817	0.5379
8A-C	0.7288	0.1320	-0.5968	1.1710	1.3278	0.1568
9A-C	0.2204	0.1210	-0.0994	0.7256	1.8474	1.1218
10A-C	0.2101	0.1167(a)	-0.0934	0.6968	1.6454(a)	0.9486
11A-C	0.5888	0.1175	-0.4713	1.1412	1.1588	0.0176
12A-C	0.1995	0.1812	-0.0183	1.0711	1.1719	0.1008
13A-C	0.4361	0.1136	-0.3225	0.9925	0.8035	-0.1890
14A-C	0.0929	0.0486	-0.0443	0.9424	0.6323	-0.3101
17A	0.1907	0.0484	-0.1423	0.9661	0.8075	-0.1586
West Beach	0.2572	0.0050	-0.2522	0.9406	1.6070	0.6664
Sequim Bay	0.4405	0.0114	-0.4291	1.1694	1.0803	-0.0891
Mean(b)	0.3806	0.1555		0.9377	1.3111	

(a) One replicate was used for the TEC calculation.
(b) Mean does not include Sequim Bay or West Beach.

significant differences between stations based on transformed lipid concentrations ($p < 0.05$), and Figure 4.2 shows no correlation between calculated TEC values and lipid concentrations for the 30-day values. The 60-day tissue lipid data are summarized in Appendix E, Table E.2. These data ranged from 0.15 to 0.89%, were slightly higher overall in comparison to the 30-day values, and were not significanly different from each other ($p \leq 0.05$).

4.4 CRAB TISSUE DIOXINS/FURANS

Dungeness crab were collected at five locations in the Grays Harbor study area, including in the Pacific Ocean off Grayland, at Buoy #3, and in Half Moon Bay, North Bay, and South Bay. At each site, a hepatopancreas and a muscle tissue sample were produced by compositing the tissue of five crab. The results of this analysis are summarized in Appendix F, Tables F.1 and F.2.

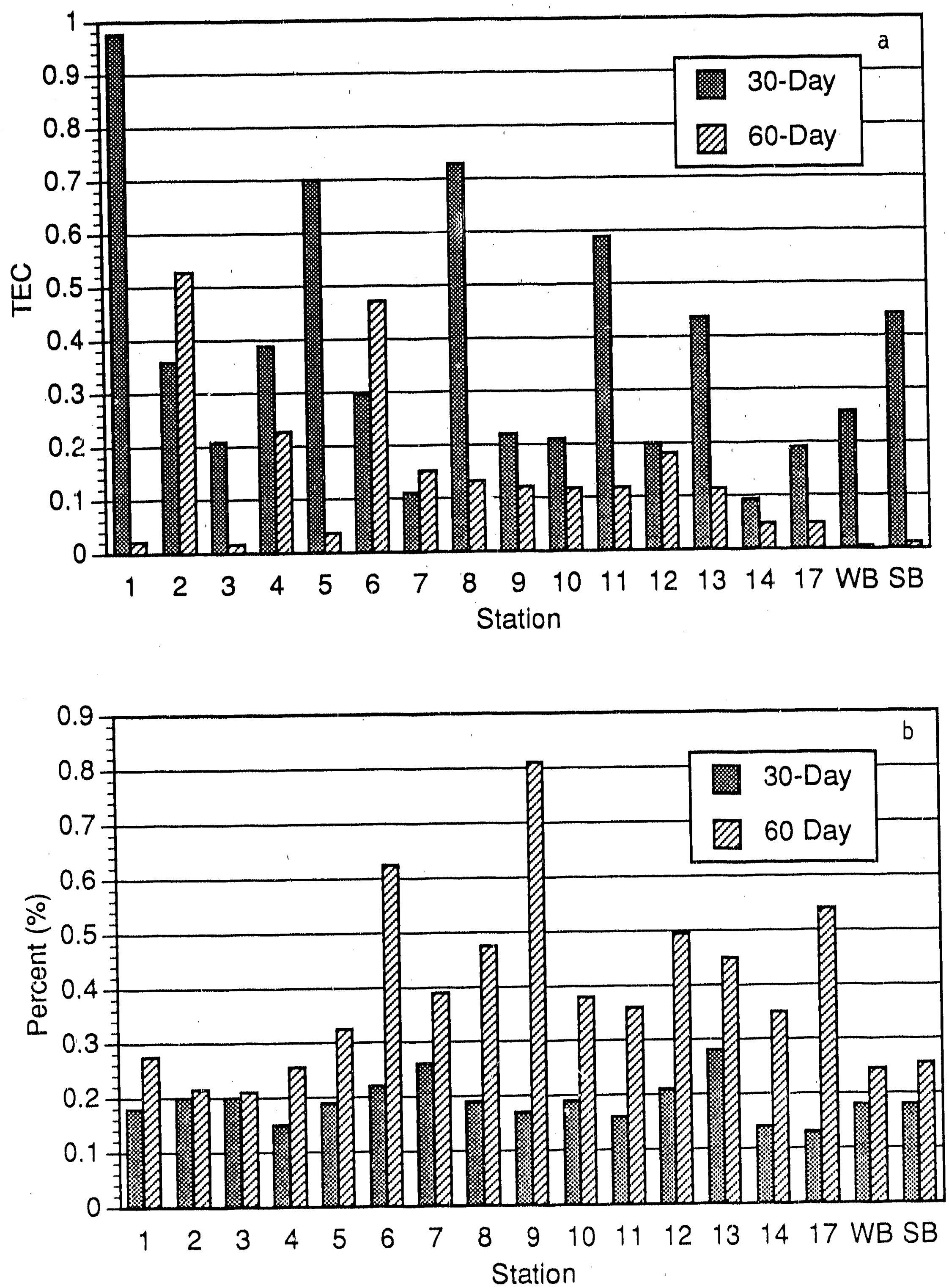

FIGURE 4.2. (a) Mean of detected values for 30- and 60-day clam tests, and (b) Summary of 30-day Tissue Lipid Tests. Note: 60-Day lipid data are not yet available. (WB = West Beach; SB = Sequim Bay)

Quality assurance information is presented in Appendix F, Table F.3. Quality assurance data for the crab tissue analysis is incomplete and currently in review. Preliminary results show that our target detection limit of 1.0 ng/kg for 2,3,7,8 TCDD was generally met for muscle tissue, but detection limits for the hepatopancreas tissue ranged from 2.10 to 3.40 ng/kg. This may be because of the smaller hepatopancreas mass relative to the muscle tissue samples. Method blank data are presented in Appendix F, Table F.3, and show that the method blank was clean except for the presence of OCDD. Acceptable spike and matrix spike recoveries are 40-120%, and this was generally met, with the exception of recoveries greater than 125% for TCDF, TCDD, and some hexa-chloronated isomers. Surrogate recoveries generally met quality assurance requirements of 40-120% recovery, except recoveries of greater than 125% were noted for some isomers associated with the South Bay hepatopancreas sample, and the recovery of 123789-HxCDD-13, which was low in nearly all samples. Surrogate recoveries associated with the matrix spike sample were less than 40%. These data are conditionally accepted until the reasons for the elevated detection limits and low or high recoveries can be explained.

The results of the crab tissue analysis are summarized in Table 4.4 for 2,3,7,8 TCDD; 2,3,4,7,8 PeCDF; and 1,2,3,7,8 PeCDD. Toxicity equivalence concentrations are also calculated for both the detected isomer value and one-half of the detection limit when an isomer was undetected. The table shows that the three dioxin/furan isomers were undetected in all muscle tissue, and detection limits were generally at or less than 1.0 ng/kg (wet wt). The dioxin/furan isomer 2,3,4,7,8 PeCDF was detected in three of five hepato-pancreas samples, and the isomer 1,2,3,7,8 PeCDD was detected in two of five samples.

In crab collected from South Bay, all three dioxin/furan isomers were detected in the hepatopancreas tissue at levels ≥2.10 ng/kg (wet wt), although 2,3,7,8 TCDD was detected at a level below the detection limit of the other four hepatopancreas samples. This suggests that a level of 2,3,7,8 TCDD of approximately 2.00 ng/kg (wet wt) is possible in the other four hepato-pancreas samples, and the detection limit is influencing the result.

TABLE 4.4. Results of Crab Tissue Analysis

Tissue Sample	2,3,7,8 TCDD (ng/kg wet wt.)	2,3,4,7,8 PeCDF (ng/kg wet wt.)	1,2,3,7,8 PeCDD (ng/kg wet wt.)	Toxicity Equivalence Concentrations: Detected Only	Toxicity Equivalence Concentrations: Detected or 1/2 D.L.
Ocean Off Grayland					
Hepatopancreas	nd (3.40)[a]	nd (2.60)	nd (2.30)	1.0180	4.9320
Muscle	nd (0.86)	nd (0.24)	nd (0.62)	0.1600	1.0191
Buoy #3					
Hepatopancreas	nd (2.40)	nd (1.00)	nd (1.80)	0.9890	4.0093
Muscle	nd (0.88)	nd (0.26)	nd (0.41)	0.1418	0.9471
Half Moon Bay					
Hepatopancreas	nd (2.60)	2.50	nd (5.40)	6.4389	11.1459
Muscle	nd (0.82)	nd (0.44)	nd (0.46)	0.2780	1.1023
North Bay					
Hepatopancreas	nd (2.30)	1.80	3.80	8.0890	9.8486
Muscle	nd (1.20)	nd (0.32)	nd (0.71)	0.2340	1.4815
South Bay					
Hepatopancreas	2.10	2.10	3.70	9.7480	10.3481
Muscle	nd (1.30)	nd (0.30)	nd (0.94)	0.1930	1.6211

(a) nd is nondetectable.
Detection limit in parenthesis.

Toxicity equivalence concentrations for crab muscle tissue (based on detected concentrations) ranged from 0.1418 at Buoy #3 to 0.2780 at Half Moon Bay. The TEC estimates for crab hepatopancreas based on the detected isomers were 6 to 50 times higher than the corresponding muscle TEC. The TEC estimates based on the detected or one-half of the detection for undetected isomers showed that the hepatopancreas calculation was 6 to 10 times that recorded in the corresponding muscle tissue. These data show that dioxin/furan isomers are bioaccumulating in the lipid-rich hepatopancreas tissues of crab collected from South Bay, North Bay, and Half Moon Bay, but there is no indication of bioaccumulation in the muscle tissue from crab collected at any of the five stations, based on a detection limit of approximately 1.0 ng/kg (wet wt).

5.0 DISCUSSION AND CONCLUSIONS

The potential toxicity and biological effects of sediment samples collected from the Grays Harbor area were evaluated in a number of ways: toxicological evaluations were performed using standard biological tests employing sensitive invertebrates; sediment chemistry analysis was performed to determine the levels of selected chemicals; elutriates of sediments were tested both chemically and biologically to determine contaminant mobility in water; and bioaccumulation tests were conducted to determine chemical mobility into animal tissues. Additionally, tissue chemistry analysis was conducted on hepatopancreas and muscle tissue of Dungeness crab that were collected within and outside of the study area to determine levels of dioxin/furans in native organisms. The results of these studies are presented in Table 5.1 and are discussed below.

Toxicological evaluations showed that sediment samples collected from the Grays Harbor area did not produce significant mortality in any of the test organisms except oyster larvae. In the oyster larvae test, the percent normal larvae from oysters exposed to sediment from Stations 2A and 15A-C was significantly different from larvae exposed to West Beach control sediment. An effective concentration that produced a 50% decrease in larval survival to normal-D was calculable in four samples, including those from Stations 2A, 3A-C, 12A-C, and 15A-C. When these EC50 elutriate percentages were evaluated with the initial mixing model provided in the Implementation Manual (USEPA/COE 1977), it was determined that levels of elutriate necessary to reduce larvae survival would not be reached during disposal according to John Wakeman (USACE, Memorandum of Record 1989). The results of the toxicological data, therefore, suggest that the sediment samples from the Grays Harbor area are not toxic.

The sediment chemistry evaluations presented in Table 5.1 show that the most toxic dioxin (2,3,7,8 TCDD) was present in detectable quantities in 5 of the 15 sediment samples evaluated. The levels of 2,3,7,8 TCDD ranged from 0.7 ng/kg in sediment collected from Station 2A to 2.9 ng/kg from

TABLE 5.1. Summary of Toxicological and Chemical Evaluations of Grays Harbor Sediment Samples

Measured Parameter	Sediment Samples (a)																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	WB	SB
Toxicological Tests																			
Microtox	--(b)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Amphipod	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Oyster	--	S(c)	S	--	--	--	--	--	--	--	--	S	--	--	S	--	--	--	--
Clam	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sediment Chemistry (dry wt)																			
TOC (%)	0.41	1.30	0.87	1.13	1.02	1.22	1.96	2.13	1.30	1.63	2.21	1.56	1.88	1.71	NA(d)	NA	2.28	0.06	2.03
2,3,7,8 TCDD (ng/kg dry wt)	nd(e)	0.7	nd	nd	nd	nd	nd	1.5	nd	nd	2.9	nd	2.1	nd	NA	NA	1.7	nd	nd
Guaiacols/organics Acids (g/kg)(f)	0	490	353	432	650	1002	252	1136	1023	530	1342	963	870	1890	700	157	NA	868	6900
Elutriate Chemistry																			
Guaiacols/organics Acids (g/L)(f)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
30-day Tissue Chemistry																			
2,3,7,8 TCDD (ng/kg dry wt)(g)	nd	nd	nd	nd	0.44	0.04	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
TEC (Mean of detected)	0.98	0.36	0.21	0.39	0.71	0.35	0.11	0.73	0.22	0.21	0.59	0.20	0.44	0.09	NA	NA	0.19	0.26	0.44
TEC (Mean of Det + 1/2 D.L)	1.12	1.04	0.94	0.85	0.83	0.77	0.64	1.17	0.73	0.70	1.14	1.07	0.99	0.94	NA	NA	0.97	0.94	1.17
60-day Tissue Chemistry																			
2,3,7,8 TCDD (ng/kg dry)	nd	nd	nd	nd	nd	nd	nd	N/D(g)	N/D	N/D	N/D	N/D	nd	nd	nd	nd	nd	N/D	N/D
TEC (Mean of detected)	0.02	0.53	0.02	0.01	0.04	0.47	0.15	0.19	0.11	0.07	0.08	0.12	0.11	0.05	NA	NA	0.05	0.00	0.00
TEC (Mean of Det + 1/2 D.L)	1.55	1.41	1.10	1.82	2.20	1.21	1.18	1.38	0.94	1.10	1.02	0.37	0.80	0.63	NA	NA	0.81	2.20	1.82

(a) Sediment samples are composited of "A" and "C" stations except for samples 2, 7, and 17.
(b) Not significant based on the evaluation criteria for that toxicological test.
(c) Significantly different from West Beach or EC50 calculation possible for oyster larvae.
(d) Not analyzed.
(e) Compound not detected.
(f) Sum of all detected compounds.
(g) Background corrected; detected values were found in only one replicate.
(h) Data not yet available.

Station 11A-C. Where 2,3,7,8 TCDD was detected, organic carbon levels were above 1.5%, leading to the conclusion that dioxin/furans concentrations are related to the available organic carbon. Sediment guaiacol/organic acid analysis showed that these compounds were detectable in all Grays Harbor samples and in samples from West Beach and Sequim Bay. The concentrations of guaiacol/organic acid in most Grays Harbor samples were similar to those found in the West Beach sample. The guaiacol/organic acids in Sequim Bay were the highest observed. The only consistent pattern between guaiacol/organic acid concentrations in sediment composites was that elevated concentrations of 2,3,7,8 TCDD and total guaiacol/organic acids occurred in the same two Grays Harbor sediment composites: 8A-C and 11A-C. This potential suggests a common source for both types of materials. Elutriate chemistry evaluation of guaiacols/organic acids shows that although these compounds were observed in all sediment samples, no detectable concentrations were present in the elutriates. This indicates that the guaiacol/organic acid compounds were not soluble in water, and thus, are not mobile. This is supported by the fact that the extraction method did not remove the color of the elutriate water.

The 30- and 60-day tissue evaluations of clams were conducted to determine whether dioxin/furan compounds observed in the sediment samples could be bioaccumulated by a filter-feeding marine organism. The results of the 30-day study showed 2,3,7,8 TCDD in only two of 50 samples (one from Station 5A-C, one from Station 6A-C). The levels of 2,3,7,8 TCDD were less than 0.5 ng/kg (wet wt), which is very close to the operational detection limit of 0.30 ng/kg. The preliminary results of the 60-day tissue analyses confirms this assumption because no detectable 2,3,7,8 TCDD was observed in any of the samples.

The summary results of the crab tissue dioxin/furan analysis are presented in Table 5.2. These data show no evidence of bioaccumulation of dioxins/furans in the muscle tissue of Dungeness crab collected within and outside the Grays Harbor study area. The levels of dioxins and furans in hepatopancreas tissue suggest bioaccumulation may occur, but when the presence

TABLE 5.2. Summary Results for Crab Tissue Dioxin/Furan Concentrations

Measurement	Tissue Concentrations (Maximum Observed in ng/kg wet wt) 30-day Clam	60-Day Clam	Crab Muscle	Crab Hepatopancreas
2,3,7,8, TCDD	0.44	nd(a)	nd	2.1
2,3,4,7,8 PeCDF	0.60	0.50	nd	2.5
1,2,3,7,8 PeCDD	0.48	nd	nd	3.8
TEC (Mean of Det.)	0.97	0.53	0.28	9.75
TEC (Mean of Det + 1/2 D.L.)	1.17	2.20	1.62	10.3

(a) Nd is nondetectable.

CONCLUSIONS

Maximums:

- Crab tissue ≤30-day clam = 60-day clam
- Crab hepatopancreas is 5- to 10-fold higher than crab muscle, 30-day clam, and 60-day clam tissue
- The locations of hits in the crab hepatopancreas are:

Location	TCDD	PeCDF	PeCDD	TEC X of Det.	TEC X Det. + 1/2 D.L.	
South Bay	2.1	2.1	3.7	9.8	10.4	A
North Bay	nd (2.3)	1.8	3.8	8.1	9.9	A
Half Moon Bay	nd (2.6)	2.5	nd (5.4)	6.4	11.2	A
Buoy #3	nd (2.4)	nd (1.0)	nd (1.8)	1.0	4.0	B
Ocean	nd (3.4)	nd (2.6)	nd (2.3)	1.0	4.9	B

A Group: No real differences within
B Group: No real differences within
A has a factor of 2 to 10 higher than B
Real differences is probably 2-fold

of 2,3,7,8 TCDD, PeCDF, and PeCDD is compared among stations, the levels of these chemicals are indistinguishable, given the detection limits where those materials were undetected are compared to their concentrations when they were detected in the Chehalis River collection sites. Table 5.2 separates the five crab collection sites into one group that contains South Bay, North Bay, and Half Moon Bay, and another group that contains samples from ocean sites at Buoy #3 and off Grayland. The groupings suggest that bioaccumulation may occur within the confines of Chehalis River, and toxicity equivalence calculations seem to substantiate these conclusions. The relative similarity of TEC values of detected concentrations when compared with the TEC values of detected or one-half of the detection limits within the Chehalis River area suggests the higher TEC values found in this area may be a product of chance rather than a result of actual differences between river and ocean samples. Also, the TEC of dioxin/furans observed within the hepatopancreas of adult male crabs in the Chehalis River area did not bioaccumulate in the muscle tissue. Lipid data for muscle tissue and hepatopancreas are presented in Appendix F, Table F.2. This table shows that lipids in muscle tissue ranged from 0.05 to 0.13%. Hepatopancreas lipid values ranged from 2.50 to 5.41%. The relatively high lipid concentrations in the hepatopancreas may explain the presence of the lipophyllic dioxin compounds found.

In summary, the toxicological and chemical evaluations of sediment samples from the Grays Harbor area indicate that sediment dioxin/furan and guaiacols/organic acids concentrations were generally low and were non-toxic to all species tested. Elutriate/bioaccumulation studies verify that the detected compounds exhibit little or no mobility from sediment. Tissue studies of Dungeness crab indigenous to the Chehalis River and nearby ocean sites demonstrated no bioaccumulation potential to muscle tissue, but the potential for some bioaccumulation to the hepatopancreas of crab exists in samples collected from South Bay, North Bay, and Half Moon Bay, which are located within the Chehalis River. A true evaluation of the significance of this potential bioaccumulation into hepatopancreas of crabs may require additional studies. Test data indicate, however, that no reason exists to suspect that sediments from those sites would be toxic to marine organisms, or would produce measurable bioaccumulation in the clam *M. nasuta* or the crab *C. magister*.

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APPENDIX A

SUMMARY INFORMATION FOR FIELD COLLECTIONS

TABLE A.1. Summary of Core Collections

Station	Type[(a)]	Sampling Date	Sampling Time	Sample Location - WA State Plan Coordinates Northing	Easting	Water Depth (ft. MLLW)	Core Length* (feet)
1-A	VC	8-4-89	1136	605365.36	1125760.26	29.7	5.0
1-A	VC	8-4-89	1140	605365.36	1125760.26	29.7	4.0
1-C	VC	8-4-89	1213	605895.01	1124743.78	29.7	4.5
1-C	VC	8-4-89	1220	605895.01	1124743.78	29.7	5.0
2-A	VC	8-4-89	1000	612576.08	1132960.30	30.2	5.0
2-A	VC	8-4-89	1007	612576.08	1132960.30	30.2	5.0
2-A	VC	8-4-89	1015	612576.08	1132960.30	30.2	5.0
3-A	VC	8-3-89	1045	614000.50	1142600.16	19.0	3.5
3-A	VC	8-3-89	1100	614000.50	1142600.16	19.0	4.0
3-A	VC(L)	8-3-89	1120	614000.50	1142600.16	19.0	6.7
3-B	VC	8-3-89	1145	614519.92	1142532.21	34.2	4.3
3-C	VC	8-3-89	1200	614963.93	1142446.88	19.0	3.3
3-C	VC	8-3-89	1215	614963.93	1142446.88	19.0	4.1
4-A	VC	8-2-89	1700	614928.53	1146005.72	23.3	3.6
4-A	VC	8-2-89	1710	614928.53	1146005.72	23.3	5.0
4-B	VC	8-3-89	1005	615255.67	1145980.62	33.8	5.0
4-C	VC	8-2-89	1734	615268.91	1146306.73	23.3	4.2
4-C	VC	8-2-89	1740	615268.91	1146306.73	23.3	5.0
5-A	VC	8-2-89	1505	N/A	N/A	21.4	5.0
5-A	VC	8-2-89	1511	N/A	N/A	21.4	5.0
5-B	VC	8-2-89	1630	N/A	N/A	35.4	4.8
5-C	VC	8-2-89	1529	N/A	N/A	21.4	5.0
5-C	VC	8-2-89	1539	N/A	N/A	21.4	5.0
6-A	VC(L)	8-1-89	1730	613996.39	1157054.23	20.2	8.7
6-A	VC	8-1-89	1754	613996.39	1157054.23	20.2	7.3
6-A	VC	8-1-89	1811	613996.39	1157054.23	20.2	5.0
6-B	VC	8-3-89	0922	614294.57	1157026.99	35.8	4.0
6-C	DC	8-2-89	1335	614721.57	1157145.50	22.2	2.3
6-C	DC	8-2-89	1335	614721.57	1157145.50	22.2	2.3
7-A	VC	8-2-89	1219	613347.85	1160511.99	19.0	2.0
7-C	VC	8-1-89	1540	N/A	N/A	7.6	5.5
7-C	VC	8-1-89	1555	N/A	N/A	7.6	4.2
7-C	VC	8-1-89	1615	N/A	N/A	7.6	7.0
8-A	DC	8-1-89	1321	612840.23	1161628.14	21.1	2.0
8-A	DC	8-1-89	1326	612840.23	1161628.14	21.1	1.7
8-B	VC	8-2-89	0957	612928.36	1161897.58	35.4	4.3
8-C	DC	8-1-89	1410	613426.27	1162039.00	22.1	1.3
8-C	DC	8-1-89	1415	613426.27	1162039.00	22.1	2.8
8-D	DC	8-1-89	1140	612743.23	1163065.82	29.1	2.6

(a) VC is vibra-core; DC is dart-core. L is long vibra-core.

TABLE A.1. Summary of Core Collections (Cont'd)

Station	Type[(a)]	Sampling Date	Sampling Time	Sample Location - WA State Plan Coordinates Northing	Easting	Water Depth (ft MLLW)	Core Length (feet)
9-A	VC	8-1-89	0940	610741.70	1164030.01	14.8	7.0
9-A	VC	8-2-89	1042	611359.50	1164381.65	13.0	4.2
9-A	VC	8-2-89	1054	611359.50	1164381.65	13.0	3.4
9-B	VC	8-2-89	1117	611359.50	1164381.65	32.5	5.0
9-C	DC	8-1-89	1020	611531.30	1164502.83	18.9	2.0
9-C	DC	8-1-89	1036	611531.30	1164502.83	18.9	2.5
9-D	VC	8-2-89	1145	N/A	N/A	41.5	5.0
10-A	VC	7-31-89	1522	610670.28	1168371.52	14.4	3.5
10-A	VC	7-31-89	1545	610670.28	1168371.52	14.4	5.0
10-B	DC	7-31-89	1740	611154.96	1168255.87	28.9	1.3
10-B	DC	7-31-89	1746	611154.96	1168255.87	28.9	2.25
10-C	VC	7-31-89	1619	611324.20	1168200.00	16.6	4.5
10-C	VC	7-31-89	1633	611324.20	1168200.00	16.6	4.5
11-A	VC	8-3-89	1647	612732.71	1171993.95	24.2	3.0
11-A	VC	8-3-89	1652	612732.71	1171993.95	24.2	3.8
11-C	VC	8-3-89	1622	613261.77	1171534.18	23.2	3.0
11-C	VC	8-3-89	1630	613261.77	1171534.18	23.2	2.8
12-A	VC	8-4-89	1345	615670.39	1176892.40	34.0	3.8
12-A	VC	8-4-89	1350	615670.39	1176892.40	34.0	5.0
12-B	VC	8-4-89	1420	616008.27	1176856.33	32.5	5.0
12-C	VC	8-3-89	1810	615757.17	1176808.91	26.7	5.0
12-C	VC	8-3-89	1820	615757.17	1176808.91	26.7	5.0
13-A	VC	8-4-89	1443	615873.99	1181086.48	10.8	3.5
13-A	VC	8-4-89	1450	615873.99	1181086.48	10.0	4.0
13-C	VC	8-4-89	1517	615984.66	1181831.48	18.4	4.0
13-C	VC	8-4-89	1532	615984.66	1181831.48	18.4	3.1
13-C	VC(L)	8-4-89	1550	615984.66	1181831.48	18.4	3.2
14-A	VC	8-4-89	1718	613794.59	1181527.91	24.5	3.5
14-A	VC	8-4-89	1727	613794.59	1181527.91	24.5	5.0
14-C	VC	8-5-89	1025	613972.47	1182173.21	8.5	2.5
14-C	VC	8-5-89	1030	613972.47	1182173.21	8.5	4.8
14-D	VC	8-5-89	1050	N/A	N/A	33.1	5.0
17-A	VC	8-3-89	1420	609003.37	1164053.43	4.0	3.0
17-A	VC	8-3-89	1425	609003.37	1164053.43	4.0	5.0
17-A	VC	8-3-89	1432	609003.37	1164053.43	4.0	3.0
17-A	VC	8-3-89	1441	609003.37	1164053.43	4.0	5.0
17-B	VC	8-3-89	1515	609572.00	1164024.12	7.6	4.5
17-C	VC	8-3-89	1540	610470.50	1164126.50	7.6	5.0

(a) VC is vibra-core; DC is dart-core. L is long vibra-core

TABLE A.2. Summary of Grab Sample Collections

Station	Sampling Date	Sampling Time	Water Depth (ft MLLW)	Sample Location - WA State Plan Coordinates Northing	Easting	Grab Penetration (cm)	Sediment Type	Sediment Color	Comments
1-A	8-4-89	1135	27.7	605365.36	1125760.26	12	FSA	DO	
1-B	8-4-89	1112	40.8	605678.70	1124997.31	14	MFSA	DO	2 jars - Reps 1 and 2
1-C	8-4-89	1212	27.7	605895.01	1124743.78	12	FSA	DO	
2-A	8-4-89	1000	30.2	612576.08	1132960.30	9	FMSA	DO	
2-B	8-4-89	0920	40.3	612848.10	1133071.44	6	CL/SI/SA/WC	DO	Rep #1
2-B	8-4-89	0920	40.3	612848.10	1133071.44	7	CL/SI/SA/WC	DO	Rep #2
3-A	8-3-89	1035	19.0	614000.50	1142600.16	6	MCSA/SI	DO	Rep #1
3-A	8-3-89	1039	19.0	614000.50	1142600.16	6	MCSA/SI	DO	Rep #2
3-B	8-3-89	1147	34.2	614519.92	1142532.21	12	CSA/G/WC/SI	DO	Shell fragments present
3-C	8-3-89	1158	19.0	614963.93	1142446.88	12	MSA/SI	DO	
4-A	8-2-89	1715	20.0	614928.53	1146005.72	Full	MSA/SI	DO/BL	
4-B	8-3-89	1020	33.7	615255.67	1145980.62	5	SI/FSA	DO/LBS/BL	
4-C	8-2-89	1727	20.0	615268.91	1146306.73	7	SI/MSA	DO	
5-A	8-2-89	1440	21.4	N/A	N/A	6	RO/CO/G/CSA	DO	Rep #1- cobble w/barnacles
5-A	8-2-89	1451	21.4	N/A	N/A	6	RO/CO/G/CSA	DO	Rep #2- cobble w/barnacles
5-B	8-2-89	1613	35.4	N/A	N/A	14	CMSA/SI	DO/BL/LBS	
5-C	8-2-89	1550	21.4	N/A	N/A	5	MSA/SI		Rep #2
5-C	8-2-89	1545	21.4	N/A	N/A	5	MSA/SI		Rep #1
6-A	8-1-89	1655	20.2	613996.39	1157054.23	5	SI/FSA/WC	DO/BL	Rep #1 - 1/2 gallon
6-A	8-1-89	1702	20.2	613996.39	1157054.23	5	SI/FSA/WC	DO/BL	Rep #2
6-B	8-2-89	1309	40.7	614294.57	1157026.99	12	SI	DO	
6-C	8-2-89	1330	22.2	614721.57	1157145.50	5	SI	DO/BL	

(a) SI is silt; SA, sand (F is fine, M is medium, C is coarse); G, gravel; CO, cobble; CL, clay; RO, rocks; WC, wood chips. "/" indicates dominant first.

(b) DO is drab olive; BL, black; LBS, light brown surface; G, gray.

TABLE A.2. Summary of Grab Sample Collections (Cont'd)

Station	Sampling Date	Sampling Time	Water Depth (ft. MLLW)	Sample Location - WA State Plan Coordinates Northing	Sample Location - WA State Plan Coordinates Easting	Grab Penetration (cm)	Sediment Type	Sediment Color	Comments
7-A	8-1-89	1441	24.8	613347.85	1160511.99	4	SI/FMSA	DO/BL	1L for archive; no biology
7-C	8-1-89	1525	7.6	N/A	N/A	5	SI/CL/WC	DO/LB	Rep #1
7-C	8-1-89	1534	7.6	N/A	N/A	6	SI/CL/WC	DO/LB	Rep #2
8-A	8-1-89	1314	21.1	612840.23	1161628.14	10	FSA/SI/WC	DO/BL	
8-B	8-2-89	1000	35.4	612928.36	1161897.58	Full	SI/MSA	DO	
8-C	8-1-89	1400	22.1	613426.27	1162039.00	Full	SI/FSA	DO/BL/LPS	Worms present
8-D	8-1-89	1132	29.1	612743.23	1163065.82	12	SI	DO	Extra sediment collected
9-A	8-1-89	0910	14.8	610741.70	1164030.01	Full	SI/CL/CMFSA	G/LBS	
9-B	8-1-89	1050	35.3	611359.50	1164381.65	12	SI/CSA/WC	DO/LBS/BL	Slight petroleum odor, sheen
9-C	8-1-89	1003	18.9	611531.30	1164502.83	Full			
9-D	7-31-89	1840	41.9	N/A	N/A	14	SI/CL	DO/BL	Area recently dredged
10-A	7-31-89	1412	14.4	610670.28	1168371.52	5	SI/CL	DO	Rep #1 < 1/2 gallon
10-A	7-31-89	1510	14.4	610670.28	1168371.52	5	SI/CL	DO	Rep #2 < 1/2 gallon
10-B	7-31-89	1300	28.9	611154.96	1168255.87	12	SI/WC	DO/BL/LBS	Woody material
10-C	7-31-89	1227	16.6	611324.20	1168200.00	10	SI	DO	
11-A	8-3-89	1658	24.1	612732.71	1171993.95	5			
11-B	8-3-89	1720	38.1	613109.00	1171777.25	4	WC/CSA	DO	
11-C	8-3-89	1620	23.1	613261.77	1171534.18	12	SI/MSA/WC/G	DO/BL	

(a) SI is silt; SA, sand (F is fine, M is medium, C is coarse); G, gravel; CO, cobble; CL, clay; RO, rocks; WC, wood chips. "/" indicates dominant first.

(b) DO is drab olive; BL, black; LBS, light brown surface; G, gray.

TABLE A.2. Summary of Grab Sample Collections (Cont'd)

Station	Sampling Date	Sampling Time	Water Depth (ft. MLLW)	Sample Location - WA State Plan Coordinates Northing	Easting	Grab Penetration (cm)	Sediment Type	Sediment Color	Comments
12-A	8-4-89	1355	34.0	615670.39	1176892.40	Full	SI/WC	BL/G	Slight petroleum odor, sheen
12-B	8-4-89	1400	33.5	616008.27	1176856.33	5	G/CSA	DO	3 Reps to get enough
12-C	8-3-89	1805	26.7	615757.17	1176808.91	5	CSA/G	DO	
13-A	8-4-89	1454	10.8	615873.99	1181086.48	10	SI/WC	DO/BL/LBS	
13-B	8-4-89	1557	33.8	615903.44	1181451.87	5			
13-C	8-4-89	1510	18.4	615984.66	1181831.48	Full	SI/FSA/WC	BL/LBS	
14-A	8-4-89	1645	24.5	613794.59	1181527.91	12	SI/WC	BL	
14-B	8-4-89	1730	35.5	613808.84	1181790.25	5	SI/FSA	DO/LBS/BL	Rep #1
14-B	8-4-89	1735	35.5	613808.84	1181790.25	5	SI/FSA	DO/LBS/BL	Rep #2
14-C	8-5-89	1005	8.5	613972.47	1182173.21	4	G/SI/CL/WC	BL	4 Reps to get enough
14-D	8-5-89	1052	33.1	N/A	N/A	Full	SI	DO/BL	
15-A	8-5-89	0853	19.3	610197.63	1188532.94	10	SI/MSA/WC/G	DO/G/BL	
15-B	8-5-89	0906	39.6	610536.04	1188599.00	12	CSA	DO	
16-C	8-5-89	0922	19.7	607449.00	1190460.80	12	CSA	DO	
16-B	8-5-89	0925	59.8	607314.55	1190170.48	12	CSA	DO	
17-A	8-3-89	1450	4.0	609003.37	1164053.43	Full	SI/CL	DO	
17-B	8-3-89	1510	7.6	609572.00	1164024.12	12	CSA/CO/G/SI	DO/LBS/BL	
17-C	8-3-89	1545	7.5	610470.50	1164126.50	6	CSA/SI	DO/LBS	Rep #1
17-C	8-3-89	1551	7.5	610470.50	1164126.50	6	CSA/SI	DO/LBS	Rep #2

(a) SI is silt; SA, sand (F is fine, M is medium, C is coarse); G, gravel; CO, cobble; CL, clay; RO, rocks; WC, wood chips. "/" indicates dominant first.

(b) DO is drab olive; BL, black; LBS, light brown surface; G, gray.

APPENDIX B

BIOLOGICAL DATA

TABLE B.1. Microtox Results

Sediment Sample	Extract Conc. (%)	Percent Change in Illumination Over Time[a] 5 Min	15 Min	30 Min
1A-C	7.27	8.19	9.47	6.03
1A-C	14.53	11.72	11.96	4.01
1A-C	29.07	11.66	7.69	-4.34
1A-C	58.14	13.54	5.17	-8.73
2A	7.27	32.32	34.18	29.49
2A	14.53	12.80	14.39	10.85
2A	29.07	1.57	3.34	5.30
2A	58.14	-23.50	-18.44	-12.30
3A-C	7.27	11.60	7.58	0.42
3A-C	14.53	5.90	3.98	-0.88
3A-C	29.07	34.98	30.05	13.25
3A-C	58.14	34.33	30.43	14.61
4A-C	7.27	7.73	10.42	0.95
4A-C	14.53	16.10	15.51	5.11
4A-C	29.07	17.33	16.04	3.50
4A-C	58.14	19.81	19.78	9.37
5A-C	7.27	8.93	7.14	-5.45
5A-C	14.53	14.06	13.24	-5.40
5A-C	29.07	18.19	15.10	-5.11
5A-C	58.14	14.70	12.57	-5.76
6A-C	7.27	11.70	8.34	3.71
6A-C	14.53	14.63	7.58	0.06
6A-C	29.07	20.19	15.03	5.15
6A-C	58.14	26.74	20.83	12.82
7C	7.27	23.11	22.07	7.89
7C	14.53	28.09	25.47	6.40
7C	29.07	34.22	31.89	9.83
7C	58.14	38.27	32.86	11.84
8A-C	7.27	14.12	17.77	6.17
8A-C	14.53	19.27	23.08	7.17
8A-C	29.07	23.72	26.97	10.14
8A-C	58.14	16.67	19.74	9.03

(a) Positive numbers indicate an increase in illumination, negative numbers indicate a decrease in illumination

TABLE B.1. Microtox Results (Cont'd)

Sediment Sample	Extract Conc. (%)	Percent Change in Illumination Over Time[a] 5 Min	15 Min	30 Min
9A-C	7.27	8.76	8.85	-1.45
9A-C	14.53	13.47	10.65	-2.61
9A-C	29.07	16.19	12.51	-5.87
9A-C	58.14	13.57	10.63	-5.74
10A-C	7.27	31.94	39.17	22.90
10A-C	14.53	42.70	51.39	33.96
10A-C	29.07	50.50	58.74	33.01
10A-C	58.14	43.98	48.77	19.94
11A-C	7.27	5.17	7.66	-0.42
11A-C	14.53	9.31	11.90	-0.97
11A-C	29.07	10.28	8.88	-7.39
11A-C	58.14	13.91	9.47	-11.39
12A-C	7.27	7.08	7.68	0.28
12A-C	14.53	10.52	9.90	-1.88
12A-C	29.07	14.72	12.93	0.95
12A-C	58.14	11.29	10.83	-2.66
13A-C	6.97	7.93	15.72	14.06
13A-C	13.95	11.99	23.23	20.54
13A-C	27.90	18.99	32.66	25.81
13A-C	55.81	20.97	35.53	30.55
14A-C	7.27	-0.71	1.09	-8.48
14A-C	14.53	11.28	10.31	-5.05
14A-C	29.07	16.94	11.73	-10.98
14A-C	58.14	15.78	14.11	-8.47
15A	6.84	6.38	8.50	4.48
15A	13.67	8.19	11.12	1.56
15A	27.33	15.09	20.70	9.14
15A	54.65	17.31	20.64	10.65
16C	6.91	8.51	8.36	5.07
16C	13.81	12.05	14.35	9.37
16C	27.62	14.00	16.30	10.30
16C	55.23	22.95	23.30	13.95

(a) Positive numbers indicate an increase in illumination, negative numbers indicate a decrease in illumination

TABLE B.1. Microtox Results (Cont'd)

Sediment Sample	Extract Conc. (%)	Percent Change in Illumination Over Time[a] 5 Min	15 Min	30 Min
17A	7.27	11.53	15.55	11.28
17A	14.53	17.07	22.53	10.51
17A	29.07	19.86	25.52	12.34
17A	58.14	20.55	25.57	13.43
West Beach	7.27	2.99	4.33	-0.81
West Beach	14.53	12.84	12.23	1.39
West Beach	29.07	16.89	14.59	-0.01
West Beach	58.14	9.83	4.05	-8.68
Sequim Bay	7.27	15.64	15.47	5.54
Sequim Bay	14.53	20.45	19.22	7.13
Sequim Bay	29.07	23.70	21.75	7.43
Sequim Bay	58.14	28.07	24.34	8.69

(a) Positive numbers indicate an increase in illumination, negative numbers indicate a decrease in illumination

TABLE B.2. Amphipod Results

Station	Composite	Rep	Alive	Dead	Total	Percent Survival	Mean Percent Survival
Sta. 1	A-C	1	18	2	20	90	
Sta. 1	A-C	2	17	3	20	85	
Sta. 1	A-C	3	18	2	20	90	
Sta. 1	A-C	4	16	4	20	80	
Sta. 1	A-C	5	17	3	20	85	86
Sta. 2	A	1	19	1	20	95	
Sta. 2	A	2	18	2	20	90	
Sta. 2	A	3	19	1	20	95	
Sta. 2	A	4	15	5	20	75	
Sta. 2	A	5	18	2	20	90	89
Sta. 3	A-C	1	17	3	20	85	
Sta. 3	A-C	2	20	0	20	100	
Sta. 3	A-C	3	16	4	20	80	
Sta. 3	A-C	4	17	3	20	85	
Sta. 3	A-C	5	15	5	20	75	85
Sta. 4	A-C	1	19	1	20	95	
Sta. 4	A-C	2	20	0	20	100	
Sta. 4	A-C	3	18	2	20	90	
Sta. 4	A-C	4	19	1	20	95	
Sta. 4	A-C	5	19	1	20	95	95
Sta. 5	A-C	1	18	2	20	90	
Sta. 5	A-C	2	15	5	20	75	
Sta. 5	A-C	3	16	4	20	80	
Sta. 5	A-C	4	20	0	20	100	
Sta. 5	A-C	5	17	3	20	85	86
Sta. 6	A-C	1	17	3	20	85	
Sta. 6	A-C	2	13	7	20	65	
Sta. 6	A-C	3	17	3	20	85	
Sta. 6	A-C	4	15	5	20	75	
Sta. 6	A-C	5	16	4	20	80	78
Sta. 7	C	1	18	2	20	90	
Sta. 7	C	2	17	3	20	85	
Sta. 7	C	3	18	2	20	90	
Sta. 7	C	4	18	2	20	90	
Sta. 7	C	5	18	2	20	90	89

TABLE B.2. Amphipod Results (Cont'd)

Station	Composite	Rep	Alive	Dead	Total	Percent Survival	Mean Percent Survival
Sta. 8	A-C	1	19	1	20	95	
Sta. 8	A-C	2	20	0	20	100	
Sta. 8	A-C	3	17	3	20	85	
Sta. 8	A-C	4	18	2	20	90	
Sta. 8	A-C	5	19	1	20	95	93
Sta. 9	A-C	1	19	1	20	95	
Sta. 9	A-C	2	16	4	20	80	
Sta. 9	A-C	3	20	0	20	100	
Sta. 9	A-C	4	19	1	20	95	
Sta. 9	A-C	5	18	2	20	90	92
Sta. 10	A-C	1	15	5	20	75	
Sta. 10	A-C	2	19	1	20	95	
Sta. 10	A-C	3	19	1	20	95	
Sta. 10	A-C	4	18	2	20	90	
Sta. 10	A-C	5	17	3	20	85	88
Sta. 11	A-C	1	13	7	20	65	
Sta. 11	A-C	2	20	0	20	100	
Sta. 11	A-C	3	15	5	20	75	
Sta. 11	A-C	4	19	1	20	95	
Sta. 11	A-C	5	17	3	20	85	84
Sta. 12	A-C	1	19	1	20	95	
Sta. 12	A-C	2	18	2	20	90	
Sta. 12	A-C	3	20	0	20	100	
Sta. 12	A-C	4	18	2	20	90	
Sta. 12	A-C	5	16	4	20	80	91
Sta. 13	A-C	1	17	3	20	85	
Sta. 13	A-C	2	19	1	20	95	
Sta. 13	A-C	3	17	3	20	85	
Sta. 13	A-C	4	19	1	20	95	
Sta. 13	A-C	5	16	4	20	80	88
Sta. 14	A-C	1	17	3	20	85	
Sta. 14	A-C	2	20	0	20	100	
Sta. 14	A-C	3	14	6	20	70	
Sta. 14	A-C	4	18	2	20	90	
Sta. 14	A-C	5	16	4	20	80	85

TABLE B.2. Amphipod Results (Cont'd)

Station	Composite	Rep	Alive	Dead	Total	Percent Survival	Mean Percent Survival
Sta. 15	A	1	15	5	20	75	
Sta. 15	A	2	18	2	20	90	
Sta. 15	A	3	18	2	20	90	
Sta. 15	A	4	20	0	20	100	
Sta. 15	A	5	17	3	20	85	88
Sta. 16	C	1	18	2	20	90	
Sta. 16	C	2	17	3	20	85	
Sta. 16	C	3	17	3	20	85	
Sta. 16	C	4	19	1	20	95	
Sta. 16	C	5	16	4	20	80	87
Sta. 17	A	1	11	9	20	55	
Sta. 17	A	2	17	3	20	85	
Sta. 17	A	3	18	2	20	90	
Sta. 17	A	4	16	4	20	80	
Sta. 17	A	5	17	3	20	85	79
Sequim Bay	-	1	17	3	20	85	
Sequim Bay	-	2	19	1	20	95	
Sequim Bay	-	3	17	3	20	85	
Sequim Bay	-	4	14	6	20	70	
Sequim Bay	-	5	20	0	20	100	87
West Beach	-	1	20	0	20	100	
West Beach	-	2	19	1	20	95	
West Beach	-	3	20	0	20	100	
West Beach	-	4	17	3	20	85	
West Beach	-	5	20	0	20	100	96

TABLE B.3. Oyster Results

Sediment Sample	Conc	Rep	Total D-Cell[a]	Mean	Prop Surviving 202 per 10-ml Stocking Density	Mean Prop Surviving	ANOVA[b]	EC_{50}[c]
1 A-C	--	--	---		----		NS	N/A
1 A-C	0	1	223		1.10			
1 A-C	0	2	189		0.94			
1 A-C	0	3	196	202.7	0.97	1.00		
1 A-C	10	1	229		1.13			
1 A-C	10	2	167		0.83			
1 A-C	10	3	214	203.3	1.06	1.01		
1 A-C	50	1	220		1.09			
1 A-C	50	2	150		0.74			
1 A-C	50	3	201	190.3	1.00	0.94		
1 A-C	100	1	187		0.93			
1 A-C	100	2	187		0.93			
1 A-C	100	3	157	177.0	0.78	0.88		
2 A	--	--	---		----		S	28%
2 A	0	1	178		0.88			
2 A	0	2	214		1.06			
2 A	0	3	216	202.7	1.07	1.00		
2 A	10	1	189		0.94			
2 A	10	2	191		0.95			
2 A	10	3	240	206.7	1.19	1.02		
2 A	50	1	0		0.00			
2 A	50	2	115		0.57			
2 A	50	3	10	41.7	0.05	0.21		
2 A	100	1	0		0.00			
2 A	100	2	0		0.00			
2 A	100	3	1	0.3	0.00	0.00		

(a) Abnormal larvae were counted, but no significant difference was observed.
(b) S = Significant at $\alpha = 0.05$; NS = Not significant relative to West Beach.
(c) As percent elutriate; N/A indicates EC_{50} cannot be calculated.

TABLE B.3. Oyster Results (Cont'd)

Sediment Sample	Conc	Rep	Total D-Cell[a]	Mean	Prop Surviving 202 per 10-ml Stocking Density	Mean Prop Surviving	ANOVA[b]	EC_{50}[c]
3 A-C	--	--	---		----		S	57%
3 A-C	0	1	227		1.12			
3 A-C	0	2	273		1.35			
3 A-C	0	3	266	255.3	1.32	1.26		
3 A-C	10	1	218		1.08			
3 A-C	10	2	207		1.02			
3 A-C	10	3	243	222.7	1.20	1.10		
3 A-C	50	1	138		0.68			
3 A-C	50	2	143		0.71			
3 A-C	50	3	199	160.0	0.99	0.79		
3 A-C	100	1	0		0.00			
3 A-C	100	2	0		0.00			
3 A-C	100	3	0	0.0	0.00	0.00		
4 A-C	--	--	---		----		NS	N/A
4 A-C	0[d]	1	176		0.87			
4 A-C	0	2	241	208.5	1.19	1.03		
4 A-C	10	1	227		1.12			
4 A-C	10[d]	3	223	225.0	1.10	1.11		
4 A-C	50	1	167		0.83			
4 A-C	50	2	233		1.15			
4 A-C	50	3	179	193.0	0.89	0.96		
4 A-C	100	1	127		0.63			
4 A-C	100	2	168		0.83			
4 A-C	100	3	159	151.3	0.79	0.75		
5 A-C	--	--	---		----		NS	N/A
5 A-C	0	1	191		0.95			
5 A-C	0	2	187		0.93			
5 A-C	0	3	209	195.7	1.03	0.97		
5 A-C	10	1	196		0.97			
5 A-C	10	2	139		0.69			
5 A-C	10	3	230	188.3	1.14	0.93		
5 A-C	50	2	122		0.60			
5 A-C	50[d]	3	172	147.0	0.85	0.73		
5 A-C	100	1	195		0.97			
5 A-C	100	2	168		0.83			
5 A-C	100	3	195	186.0	0.97	0.92		

(a) Abnormal larvae were counted, but no significant difference was observed.
(b) S = Significant at $\alpha = 0.05$; NS = Not significant relative to West Beach
(c) As percent elutriate; N/A indicates EC_{50} cannot be calculated.

TABLE B.3. Oyster Results (Cont'd)

Sediment Sample	Conc	Rep	Total D-Cell[a]	Mean	Prop Surviving 202 per 10-ml Stocking Density	Mean Prop Surviving	ANOVA[b]	EC_{50}[c]
6 A-C	--	--	---		----		NS	N/A
6 A-C	0	1	238		1.18			
6 A-C	0	2	210		1.04			
6 A-C	0	3	157	201.7	0.78	1.00		
6 A-C	10	1	123		0.61			
6 A-C	10	2	171		0.85			
6 A-C	10	3	189	161.0	0.94	0.80		
6 A-C	50	1	144		0.71			
6 A-C	50[d]	2	152	148.0	0.75	0.73		
6 A-C	100	1	201		1.00			
6 A-C	100[d]	3	189	195.0	0.94	0.97		
7 C	--	--	---		----		NS	N/A
7 C	0	1	181		0.90			
7 C	0[d]	3	213	197.0	1.05	0.98		
7 C	50	1	219		1.08			
7 C	50	2	134		0.66			
7 C	50	3	233	195.3	1.15	0.97		
7 C	100	1	179		0.89			
7 C	100	2	128		0.63			
7 C	100	3	156	154.3	0.77	0.76		
8 A-C	--	--	---		----		NS	N/A
8 A-C	0	3	180		0.89			
8 A-C	0	1	257		1.27			
8 A-C	0	2	151	196.0	0.75	0.97		
8 A-C	10	1	204		1.01			
8 A-C	10	2	254		1.26			
8 A-C	10	3	138	198.7	0.68	0.98		
8 A-C	50	1	164		0.81			
8 A-C	50[d]	3	158	161.0	0.78	0.80		
8 A-C	100	1	212		1.05			
8 A-C	100	2	236		1.17			
8 A-C	100	3	174	207.3	0.86	1.03		

(a) Abnormal larvae were counted, but no significant difference was observed.
(b) S = Significant at $\alpha = 0.05$; NS = Not significant relative to West Beach
(c) As percent elutriate; N/A indicates EC_{50} cannot be calculated.
(d) Outlier replicate removed from data analyses in calculation of EC_{50}. Outlier replicate removed from data analyses for ANOVA. Inclusion of outlier did not affect conclusion of significance from ANOVA results. Approximately 4% (11 outliers of 245 treatment containers) of data were outliers.

TABLE B.3. Oyster Results (Cont'd)

Sediment Sample	Conc	Rep	Total D-Cell[(a)]	Mean	Prop Surviving 202 per 10-ml Stocking Density	Mean Prop Surviving	ANOVA[(b)]	EC_{50}[(c)]
9 A-C	--	--	---		----		NS	N/A
9 A-C	0	1	183		0.91			
9 A-C	0	2	170		0.84			
9 A-C	0	3	210	187.7	1.04	0.93		
9 A-C	10	1	138		0.68			
9 A-C	10	2	162		0.80			
9 A-C	10	3	109	136.3	0.54	0.67		
9 A-C	50[(d)]	1	130		0.64			
9 A-C	50	2	155	142.5	0.77	0.71		
9 A-C	100	1	116		0.57			
9 A-C	100	2	190		0.94			
9 A-C	100	3	153	153.0	0.76	0.76		
10 A-C	--	--	---		----		NS	N/A
10 A-C	0	1	176		0.87			
10 A-C	0	2	217		1.07			
10 A-C	0	3	178	190.3	0.88	0.94		
10 A-C	10	1	192		0.95			
10 A-C	10	2	248		1.23			
10 A-C	10	3	197	212.3	0.98	1.05		
10 A-C	50	1	113		0.56			
10 A-C	50	2	173		0.86			
10 A-C	50	3	97	127.7	0.48	0.63		
10 A-C	100	1	157		0.78			
10 A-C	100[(d)]	3	118	137.5	0.58	0.68		

(a) Abnormal larvae were counted, but no significant difference was observed.
(b) S = Significant at $\alpha = 0.05$; NS = Not significant relative to West Beach.
(c) As percent elutriate; N/A indicates EC_{50} cannot be calculated.
(d) Outlier replicate removed from data analyses in calculation of EC_{50}. Outlier replicate removed from data analyses for ANOVA. Inclusion of outlier did not affect conclusion of significance from ANOVA results. Approximately 4% (11 of 245 treatment containers) of data were outliers.

TABLE B.3. Oyster Results (Cont'd)

Sediment Sample	Conc	Rep	Total D-Cell[a]	Mean	Prop Surviving 202 per 10-ml Stocking Density	Mean Prop Surviving	ANOVA[b]	EC_{50}[c]
11 A-C	--	--	---		----		NS	N/A
11 A-C	0	1	229		1.13			
11 A-C	0	2	200		0.99			
11 A-C	0	3	206	211.7	1.02	1.05		
11 A-C	10	1	132		0.65			
11 A-C	10	2	233		1.15			
11 A-C	10	3	208	191.0	1.03	0.95		
11 A-C	50	1	167		0.83			
11 A-C	50	2	220		1.09			
11 A-C	50	3	109	165.3	0.54	0.82		
11 A-C	100	1	167		0.83			
11 A-C	100	2	144		0.71			
11 A-C	100	3	132	147.7	0.65	0.73		
12 A-C	--	--	---		----		S	68%
12 A-C	0	1	153		0.76			
12 A-C	0[d]	2	188	170.5	0.93	0.85		
12 A-C	10	1	175		0.87			
12 A-C	10	2	180		0.89			
12 A-C	10	3	76	143.7	0.38	0.71		
12 A-C	50	1	93		0.46			
12 A-C	50	2	188		0.93			
12 A-C	50	3	188	156.3	0.93	0.77		
12 A-C	100	1	4		0.02			
12 A-C	100	2	0		0.00			
12 A-C	100	3	0	1.3	0.00	0.01		

(a) Abnormal larvae were counted, but no significant difference was observed.
(b) S = Significant at $\alpha = 0.05$; NS = Not significant relative to West Beach.
(c) As percent elutriate; N/A indicates EC_{50} cannot be calculated.
(d) Outlier replicate removed from data analyses in calculation of EC_{50}. Outlier replicate removed from data analyses for ANOVA. Inclusion of outlier did not affect conclusion of significance from ANOVA results.

TABLE B.3. Oyster Results (Cont'd)

Sediment Sample	Conc	Rep	Total D-Cell[a]	Mean	Prop Surviving 202 per 10-ml Stocking Density	Mean Prop Surviving	ANOVA[b]	EC_{50}[c]
13 A-C	--	--	---		----		NS	N/A
13 A-C	0	1	234		1.16			
13 A-C	0[d]	2	221	227.5	1.09	1.1		
13 A-C	10	1	215		1.06			
13 A-C	10	2	139		0.69			
13 A-C	10	3	183	179.0	0.91	0.89		
13 A-C	50	1	132		0.65			
13 A-C	50	2	161		0.80			
13 A-C	50	3	189	160.7	0.94	0.80		
13 A-C	100	1	93		0.46			
13 A-C	100	2	138		0.68			
13 A-C	100	3	201	144.0	1.00	0.71		
14 A-C	--	--	---		----		NS	N/A
14 A-C	0	1	218		1.08			
14 A-C	0	2	213		1.05			
14 A-C	0	3	128	186.3	0.63	0.92		
14 A-C	10	1	178		0.88	0.97		
14 A-C	10	2	185		0.92			
14 A-C	10	3	226	196.3	1.12			
14 A-C	50	1	134		0.66			
14 A-C	50	2	150		0.74			
14 A-C	50	3	57	113.7	0.28	0.56		
14 A-C	100	1	195		0.97			
14 A-C	100	2	119		0.59			
14 A-C	100	3	92	135.3	0.46	0.67		

(a) Abnormal larvae were counted, but no significant difference was observed.
(b) S = Significant at $\alpha = 0.05$; NS = Not significant relative to West Beach.
(c) As percent elutriate; N/A indicates EC_{50} cannot be calculated.
(d) Outlier replicate removed from data analyses in calculation of EC_{50}. Outlier replicate removed from data analyses for ANOVA. Inclusion of outlier did not affect conclusion of significance from ANOVA results.

TABLE B.3. Oyster Results (Cont'd)

Sediment Sample	Conc	Rep	Total D-Cell[(a)]	Mean	Prop Surviving 202 per 10-ml Stocking Density	Mean Prop Surviving	ANOVA[(b)]	EC_{50}[(c)]
15 A	--	--	---		----		S	19%
15 A	0	1	199		0.99			
15 A	0	2	157		0.78			
15 A	0	3	176	177.3	0.87	0.88		
15 A	10	1	136		0.67			
15 A	10	2	139		0.69			
15 A	10	3	174	149.7	0.86	0.74		
15 A	50	1	1		0.00			
15 A	50	2	1		0.00			
15 A	50	3	3	1.7	0.01	0.01		
15 A	100[(d)]	2	0		0.00			
15 A	100	3	4	2.0	0.02	0.01		
16 C	--	--	---		----		NS	N/A
16 C	0	1	195		0.97			
16 C	0	2	194		0.96			
16 C	0	3	242	210.3	1.20	1.04		
16 C	10	1	172		0.85			
16 C	10	2	201		1.00			
16 C	10	3	170	181.0	0.84	0.90		
16 C	50	1	215		1.06			
16 C	50	2	224		1.11			
16 C	50	3	206	215.0	1.02	1.06		
16 C	100	1	161		0.80			
16 C	100	2	231		1.14			
16 C	100	3	178	190.0	0.88	0.94		

(a) Abnormal larvae were counted, but no significant difference was observed.
(b) S = Significant at α = 0.05; NS = Not significant relative to West Beach.
(c) As percent elutriate; N/A indicates EC_{50} cannot be calculated.
(d) Outlier replicate removed from data analyses in calculation of EC_{50}. Outlier replicate removed from data analyses for ANOVA. Inclusion of outlier did not affect conclusion of significance from ANOVA results.

TABLE B.3. Oyster Results (Cont'd)

Sediment Sample	Conc	Rep	Total D-Cell[(a)]	Mean	Prop Surviving 202 per 10-ml Stocking Density	Mean Prop Surviving	ANOVA[(b)]	EC_{50}[(c)]
17 A	--	--	---		----		NS	N/A
17 A	0	2	116		0.57			
17 A	0[(d)]	3	100	108.0	0.50	0.54		
17 A	10	1	219		1.08			
17 A	10	2	168		0.83			
17 A	10	3	212	199.7	1.05	0.99		
17 A	50	1	230		1.14			
17 A	50	2	154		0.76			
17 A	50	3	153	179.0	0.76	0.89		
17 A	100	1	180		0.89			
17 A	100	2	136		0.67			
17 A	100	3	108	141.3	0.53	0.70		
Sequim Bay	--	--	---		----		NS	N/A
Sequim Bay	0	1	233		1.15			
Sequim Bay	0	2	154		0.76			
Sequim Bay	0	3	165	184.0	0.82	0.91		
Sequim Bay	10	1	209		1.03			
Sequim Bay	10	2	149		0.74			
Sequim Bay	10	3	150	169.3	0.74	0.84		
Sequim Bay	50	1	213		1.05			
Sequim Bay	50	2	145		0.72			
Sequim Bay	50	3	150	169.3	0.74	0.84		
Sequim Bay	100	1	172		0.85			
Sequim Bay	100	3	159	165.5	0.79	0.82		

(a) Abnormal larvae were counted, but no significant difference was observed.
(b) S = Significant at $\alpha = 0.05$; NS = Not significant relative to West Beach.
(c) As percent elutriate; N/A indicates EC_{50} cannot be calculated.
(d) Outlier replicate removed from data analyses in calculation of EC_{50}. Outlier replicate removed from data analyses for ANOVA. Inclusion of outlier did not affect conclusion of significance from ANOVA results.

TABLE B.3. Oyster Results (Cont'd)

Sediment Sample	Conc	Rep	Total D-Cell[a]	Mean	Prop Surviving 202 per 10-ml Stocking Density	Mean Prop Surviving	ANOVA[b]	EC_{50}[c]
West Beach	--	--	---		----		NS	N/A
West Beach	0	1	230		1.14			
West Beach	0	2	218		1.08			
West Beach	0	3	151	199.7	0.75	0.99		
West Beach	10	1	229		1.13			
West Beach	10	2	228		1.13			
West Beach	10	3	219	225.3	1.08	1.12		
West Beach	50	1	176		0.87			
West Beach	50	2	247		1.22			
West Beach	50	3	234	219.0	1.16	1.08		
West Beach	100	1	156		0.77			
West Beach	100	2	146		0.72			
West Beach	100	3	185	162.3	0.92	0.80		

(a) Abnormal larvae were counted, but no significant difference was observed.
(b) S = Significant at $\alpha = 0.05$; NS = Not significant relative to West Beach.
(c) As percent elutriate; N/A indicates EC_{50} cannot be calculated.
(d) Outlier replicate removed from data analyses in calculation of EC_{50}. Outlier replicate removed from data analyses for ANOVA. Inclusion of outlier did not affect conclusion of significance from ANOVA results.

TABLE B.4. 30-Day Macoma Results

Sediment Sample	Rep	Number Removed	Termination Number Alive	Termination Number Dead	Termination Number Empty	Total	Proportion Surviving
Sta. 1A-C	1	3	26	0	0	29	0.90
Sta. 1A-C	2	1	26	3	0	30	0.87
Sta. 1A-C	3	4	23	2	0	29	0.79
Sta. 2A	1	2	21	5	0	28	0.75
Sta. 2A	2	2	27	0	0	29	0.93
Sta. 2A	3	0	28	0	1	29	0.97
Sta. 3A-C	1	0	31	0	0	31	1.00
Sta. 3A-C	2	1	29	0	0	30	0.97
Sta. 3A-C	3	1	30	0	0	31	0.97
Sta. 4A-C	1	0	28	1	0	29	0.97
Sta. 4A-C	2	1	28	0	0	29	0.97
Sta. 4A-C	3	0	30	0	0	30	1.00
Sta. 5A-C	1	1	28	0	1	30	0.93
Sta. 5A-C	2	0	30	0	0	30	1.00
Sta. 5A-C	3	1	29	0	0	30	0.97
Sta. 6A-C	1	0	30	0	0	30	1.00
Sta. 6A-C	2	2	29	0	0	31	0.94
Sta. 6A-C	3	1	29	0	0	30	0.97
Sta. 7C	1	0	30	0	0	30	1.00
Sta. 7C	2	0	30	0	0	30	1.00
Sta. 7C	3	1	29	0	0	30	0.97
Sta. 8A-C	1	0	27	1	1	29	0.93
Sta. 8A-C	2	0	26	0	3	29	0.90
Sta. 8A-C	3	1	27	0	0	28	0.96
Sta. 9A-C	1	0	30	0	0	30	1.00
Sta. 9A-C	2	1	30	0	0	31	0.97
Sta. 9A-C	3	2	27	0	1	30	0.90
Sta. 10A-C	1	0	31	0	1	32	0.97
Sta. 10A-C	2	0	30	0	0	30	1.00
Sta. 10A-C	3	1	28	0	0	29	0.97
Sta. 11A-C	1	2	27	0	0	29	0.93
Sta. 11A-C	2	2	27	1	0	30	0.90
Sta. 11A-C	3	0	29	0	0	29	1.00

TABLE B.4. 30-Day Macoma Results (Cont'd)

Sediment Sample	Rep	Number Removed	Termination Number Alive	Termination Number Dead	Termination Number Empty	Total	Proportion Surviving
Sta. 12A-C	1	1	25	0	0	26	0.96
Sta. 12A-C	2	1	26	0	0	27	0.96
Sta. 12A-C	3	1	29	0	0	30	0.97
Sta. 13A-C	1	0	27	1	0	28	0.96
Sta. 13A-C	2	0	30	0	0	30	1.00
Sta. 13A-C	3	2	29	0	0	31	0.94
Sta. 14A-C	1	1	29	1	0	31	0.94
Sta. 14A-C	2	0	27	1	0	28	0.96
Sta. 14A-C	3	2	26	0	0	28	0.93
Sta. 17A	1	0	32	0	0	32	1.00
Sta. 17A	2	0	30	0	0	30	1.00
Sta. 17A	3	0	32	0	0	32	1.00
Sequim Bay	1	0	30	1	0	31	0.97
Sequim Bay	2	0	28	0	1	29	0.97
Sequim Bay	3	0	30	0	0	30	1.00
West Beach	1	0	30	0	0	30	1.00
West Beach	2	0	29	0	0	29	1.00
West Beach	3	2	28	0	0	30	0.93

TABLE B.5. 60-Day Macoma Results

Sediment Sample	Rep	Number Removed	Termination Number Alive	Termination Number Dead	Termination Number Empty	Total	Proportion Surviving
Sta. 1 A-C	4	7	21	0	1	29	0.72
Sta. 1 A-C	5	11	18	0	0	29	0.62
Sta. 2 A	4	6	23	0	0	29	0.97
Sta. 2 A	5	5	23	0	1	29	0.79
Sta. 3 A-C	4	1	27	0	0	28	0.96
Sta. 3 A-C	5	8	22	0	0	30	0.73
Sta. 4 A-C	4	5	24	0	1	30	0.80
Sta. 4 A-C	5	1	29	0	0	30	0.97
Sta. 5 A-C	4	2	28	0	0	30	0.93
Sta. 5 A-C	5	1	31	0	0	32	0.97
Sta. 6 A-C	4	4	25	0	0	29	0.86
Sta. 6 A-C	5	2	27	0	0	29	0.93
Sta. 7 C	4	3	22	2	0	27	0.81
Sta. 7 C	5	1	30	0	0	31	0.97
Sta. 8 A-C	4	2	25	0	0	27	0.93
Sta. 8 A-C	5	2	29	0	0	31	0.94
Sta. 9 A-C	4	2	28	0	0	30	0.93
Sta. 9 A-C	5	5	25	0	0	30	0.83
Sta. 10 A-C	4	3	25	0	0	28	0.89
Sta. 10 A-C	5	2	28	0	0	30	0.93
Sta. 11 A-C	4	1	28	0	0	29	0.97
Sta. 11 A-C	5	0	30	0	0	30	1.00
Sta. 12 A-C	4	3	28	0	0	31	0.90
Sta. 12 A-C	5	4	25	1	0	30	0.83
Sta. 13 A-C	4	5	24	1	0	30	0.80
Sta. 13 A-C	5	5	27	0	0	32	0.84
Sta. 14 A-C	4	2	27	0	1	30	0.90
Sta. 14 A-C	5	2	24	1	1	28	0.86

TABLE B.6. Quality Assurance Summary for Toxicological Tests

Parameter	Microtox		Amphipod		30-Day Macoma		60-Day Macoma[a]		Oyster Larvae	
	Required	Observed	Required	Observed	Required	Observed	Required	Observed	Required	Observed
Control Survival (%)	N/A [b]	N/A	90	96	90	98	N/A	70-73	70	99
Reference Toxicant (mg/L) Response (EC- or LC_{50})	26 [c]	7.68-18.99	N/A	N/A	N/A	N/A	N/A	N/A	0.61 [d]	1.9
Water Quality										
Temp. Range (°C)	N/A	N/A	15 ± 1	13.9-18.1[e]	ambient	11.1-15.7	ambient	10.6-13.5	20 ± 2	18.7-21.0
D.O. Range (mg/L)	N/A	N/A	≥4.0	6.2-8.2	≥4.0	5.7-8.6	≥ 6.0	6.1-8.6	≥6.0	6.7-8.5
pH Range	N/A	N/A	ambient ± 0.4	7.56-8.62	ambient ± 0.5	7.34-8.07	ambient ± 0.5	6.70-8.03	ambient ± 0.5	7.92-8.58
Salinity Range (°/..)	N/A	N/A	ambient ± 1.0	28.0-33.0	ambient ± 1.0	30.0-33.0	ambient ± 1.0	30.0-32.5	27.0 ± 1.0	25.0-28.0[e]
Flow Rate (ml/min)	N/A	N/A	N/A	N/A	125 ± 10	114-139[e]	125 ± 10	108-132[e]	N/A	N/A

(a) Summary for Day 31 through Day 60, only
(b) N/A - not applicable
(c) Reported in Beckman Operating Manual (Beckman 1982)
(d) Reported in (TetraTech 1985) for 48-hour test
(e) Out of acceptable range

TABLE B.6. Quality Assurance Summary for Toxicological Tests

Parameter	Microtox Required	Microtox Observed	Amphipod Required	Amphipod Observed	30-Day Macoma Required	30-Day Macoma Observed	60-Day Macoma[a] Required	60-Day Macoma[a] Observed	Oyster Larvae Required	Oyster Larvae Observed
Control Survival (%)	N/A [b]	N/A	90	96	90	98	N/A	70-78	70	99
Reference Toxicant (mg/L) Response (EC- or LC_{50})	26 [c]	7.68-18.99	N/A	N/A	N/A	N/A	N/A	N/A	0.61 [d]	1.9
Water Quality										
Temp. Range (°C)	N/A	N/A	15 ± 1	13.9-18.1[e]	ambient	11.1-15.7	ambient	10.6-13.5	20 ± 2	18.7-21.0
D.O. Range (mg/L)	N/A	N/A	≥4.0	6.2-8.2	≥4.0	5.7-8.6	≥ 6.0	6.1-8.6	≥6.0	6.7-8.5
pH Range	N/A	N/A	ambient ± 0.4	7.56-8.62	ambient ± 0.5	7.34-8.07	ambient ± 0.5	6.70-8.03	ambient ± 0.5	7.92-8.58
Salinity Range (°/..)	N/A	N/A	ambient ± 1.0	28.0-33.0	ambient ± 1.0	30.0-33.0	ambient ± 1.0	30.0-32.5	27.0 ± 1.0	25.0-28.0[e]
Flow Rate (ml/min)	N/A	N/A	N/A	N/A	125 ± 10	114-139[e]	125 ± 10	108-132[e]	N/A	N/A

(a) Summary for Day 31 through Day 60, only
(b) N/A - not applicable
(c) Reported in Beckman Operating Manual (Beckman 1982)
(d) Reported in (TetraTech 1985) for 48-hour test
(e) Out of acceptable range

APPENDIX C

SEDIMENT AND ELUTRIATE CHEMISTRY DATA

TABLE C.1. Sediment Dioxin Results Concentrations in ng/Kg dry

Native Isomer	Sta. 1A Conc.	Sta. 1A D.L.	Sta. 1C Conc.	Sta. 1C D.L.	Sta. 1A-C Conc.	Sta. 1A-C D.L.	Sta. 2A Conc.	Sta. 2A D.L.	Sta. 3A Conc.	Sta. 3A D.L.	Sta. 3B Conc.	Sta. 3B D.L.	Sta. 3C Conc.	Sta. 3C D.L.	Sta. 3A-C Conc.	Sta. 3A-C D.L.
2378-TCDF	2.10	--	nd	1.10	1.80	--	3.70	--	nd	1.30	nd	1.10	nd	1.00	nd	1.30
Total TCDF	2.10	--	nd	--	2.30	--	5.40	--	nd	--	nd	--	nd	--	nd	--
2378-TCDD	nd	3.50	nd	1.60	nd	0.81	0.67	--	nd	1.40	nd	2.20	nd	1.10	nd	2.10
Total TCDD	1.50	--	1.80	--	2.40	--	4.00	--	nd	--	1.70	--	nd	--	nd	--
12378-PeCDF	nd	0.62	nd	0.35	nd	0.21	0.31	--	nd	0.38	nd	0.34	nd	0.45	nd	0.27
23478-PeCDF	0.49	--	nd	0.47	nd	0.32	0.48	--	nd	0.24	nd	0.31	nd	0.44	nd	0.17
Total PeCDF	1.50	--	nd	--	1.50	--	5.00	--	nd	--	nd	--	nd	--	nd	--
12378-PeCDD	nd	0.44	nd	0.52	0.43	--	1.20	--	0.52	--	0.82	--	nd	0.85	0.55	--
Total PeCDD	nd	--	nd	--	0.88	--	3.20	--	1.10	--	0.82	--	nd	--	1.10	--
123478-HxCDF	nd	1.00	nd	0.46	nd	0.32	0.84	--	nd	0.30	nd	0.68	nd	0.91	nd	0.55
123678-HxCDF	nd	0.34	nd	0.53	nd	0.18	0.65	--	nd	0.19	nd	0.55	nd	0.82	nd	0.59
123789-HxCDF	0.82	--	0.63	--	nd	0.67	1.20	--	nd	0.19	nd	0.78	rd	0.67	nd	0.66
234678-HxCDF	nd	0.68	nd	0.53	nd	0.43	nd	1.10	0.74	--	nd	0.32	nd	0.59	nd	0.50
Total-HxCDF	4.30	--	0.63	--	nd	--	13.00	--	0.74	--	nd	--	nd	--	nd	--
123478-HxCDD	nd	0.85	nd	0.56	nd	0.66	0.39	--	nd	0.48	nd	0.62	nd	0.70	nd	0.53
123678-HxCDD	0.68	--	nd	1.00	0.86	--	2.50	--	nd	0.82	nd	0.91	nd	0.58	nd	0.44
123789-HxCDD	1.10	--	nd	0.59	1.50	--	3.30	--	1.50	--	2.40	--	2.20	--	1.60	--
Total-HxCDD	7.80	--	2.50	--	9.40	--	26.00	--	9.30	--	17.00	--	15.00	--	11.00	--
1234678-HpCDF	2.80	--	nd	0.59	3.00	--	6.50	--	0.42	--	nd	0.60	nd	0.96	nd	1.40
1234789-HpCDF	nd	0.98	nd	0.84	nd	0.61	nd	1.20	nd	0.54	nd	0.60	nd	1.80	nd	0.64
Total HpCDF	7.50	--	nd	--	7.60	--	17.00	--	1.30	--	nd	--	nd	--	3.10	--
1234678-HpCDD	11.00	--	3.50	--	9.70	--	32.00	--	4.90	--	8.80	--	5.60	--	6.40	--
Total HpCDD	21.00	--	6.60	--	20.00	--	64.00	--	9.50	--	18.00	--	12.00	--	12.00	--
OCDF	6.60	--	1.60	--	5.20	--	14.00	--	2.00	--	1.20	--	nd	1.50	7.80	--
OCDD	89.00	--	37.00	--	68.00	--	200.00	--	45.00	--	42.00	--	37.00	--	48.00	--

TABLE C.1. Sediment Dioxin Results (Cont'd) - Concentrations in ng/Kg dry

Native	Sta. 4A		Sta. 4B		Sta. 4C		Sta. 4A-C		Sta. 5A		Sta. 5B		Sta. 5C	
Isomer	Conc.	D.L.	Conc.	D.L.	Conc.	D.L.	Conc.	D.L.	Conc.	D.L.	Conc.	D.L.	Conc.	D.L.
2378-TCDF	5.00	--	1.30	--	nd	2.70	2.90	--	nd	1.50	2.30	--	1.40	--
Total TCDF	5.00	--	1.30	--	nd	--	4.50	--	nd	--	2.30	--	1.40	--
2378-TCDD	nd	1.80	nd	2.60	nd	3.10	nd	6.10	nd	3.00	nd	--	nd	2.00
Total TCDD	3.00	--	2.40	--	nd	--	nd	--	nd	--	nd	7.80	1.80	--
12378-PeCDF	nd	0.73	nd	0.42	nd	0.90	nd	0.86	nd	1.10	nd	1.40	0.47	--
23478-PeCDF	0.89	--	nd	0.49	nd	0.63	nd	1.30	nd	0.51	nd	1.90	0.39	--
Total PeCDF	8.20	--	1.50	--	nd	--	nd	--	nd	--	6.40	--	8.30	--
12378-PeCDD	nd	1.50	1.00	--	nd	0.92	nd	2.00	nd	1.10	nd	3.20	1.20	--
Total PeCDD	4.10	--	1.80	--	nd	--	nd	--	3.80	--	nd	--	1.20	--
123478-HxCDF	1.80	--	0.80	--	nd	1.30	nd	1.90	nd	0.80	2.00	--	1.70	--
123678-HxCDF	1.40	--	0.47	--	nd	0.75	nd	1.90	nd	0.50	nd	1.80	1.40	--
123789-HxCDF	1.20	--	0.80	--	nd	0.99	nd	2.10	nd	0.94	nd	1.70	0.64	--
234678-HxCDF	nd	0.69	nd	0.64	nd	0.92	nd	6.00	nd	1.00	nd	1.50	nd	0.74
Total-HxCDF	30.00	--	9.90	--	nd	--	nd	--	nd	--	32.00	--	25.00	--
123478-HxCDD	0.90	--	0.56	--	nd	0.66	nd	3.80	nd	0.78	nd	3.40	nd	1.10
123678-HxCDD	3.00	--	1.90	--	nd	1.40	2.40	--	1.30	--	3.10	--	1.70	--
123789-HxCDD	3.40	--	2.90	--	3.20	--	nd	1.80	3.60	--	3.70	--	2.70	--
Total-HxCDD	32.00	--	20.00	--	20.00	--	34.00	--	21.00	--	56.00	--	23.00	--
1234678-HpCDF	16.00	--	5.60	--	nd	0.84	13.00	--	0.95	--	20.00	--	23.00	--
1234789-HpCDF	nd	0.63	nd	1.00	nd	1.10	nd	1.40	nd	0.97	nd	4.86	nd	0.93
Total HpCDF	53.00	--	15.00	--	nd	--	35.00	--	0.95	--	77.00	--	46.00	--
1234678-HpCDD	66.00	--	23.00	--	9.00	--	40.00	--	9.80	--	89.00	--	23.00	--
Total HpCDD	140.00	--	50.00	--	20.00	--	68.00	--	19.00	--	220.00	--	48.00	--
OCDF	43.00	--	8.40	--	nd	2.80	27.00	--	5.10	--	38.00	--	44.00	--
OCDD	660.00	--	150.00	--	41.00	--	370.00	--	55.00	--	750.00	--	330.00	--

TABLE C.1. Sediment Dioxin Results (Cont'd) - Concentrations in ng/Kg dry

Native	Sta. 5A-C		Sta. 6A		Sta. 6B		Sta. 6C		Sta 6A-C		Sta. 7C		Sta. 8A	
Isomer	Conc.	D.L.	Conc.	D.L.	Conc.	D.L.	Conc.	D.L.	Conc.	D.L.	Conc.	D.L.	Conc.	D.L.
2378-TCDF	nd	1.60	nd	0.94	3.30	--	2.30	--	nd	1.20	nd	2.00	7.00	--
Total TCDF	nd	--	nd	--	3.30	--	20.00	--	nd	--	nd	--	14.00	--
2378-TCDD	nd	3.20	nd	1.70	nd	4.80	nd	3.10	nd	1.80	nd	3.60	2.50	--
Total TCDD	nd	--	nd	--	nd	--	nd	--	nd	--	nd	--	2.50	--
12378-PeCDF	nd	0.60	nd	0.75	nd	0.86	nd	0.95	nd	0.50	nd	1.00	nd	1.10
23478-PeCDF	nd	0.57	nd	0.72	nd	0.64	nd	1.40	nd	0.50	nd	1.10	5.80	--
Total PeCDF	nd	--	nd	--	3.30	--	28.00	--	8.90	--	nd	--	8.10	--
12378-PeCDD	0.96	--	nd	1.20	nd	1.20	nd	1.90	1.20	--	2.00	--	2.30	--
Total PeCDD	0.96	--	nd	--	nd	--	nd	--	3.40	--	2.00	--	6.80	--
123478-HxCDF	nd	0.84	nd	1.20	nd	1.10	3.50	--	nd	1.10	nd	1.90	2.10	--
123678-HxCDF	nd	0.54	nd	0.68	nd	4.40	4.00	--	1.00	--	nd	0.93	nd	1.60
123789-HxCDF	0.93	--	nd	1.50	nd	1.30	nd	1.70	0.89	--	nd	1.40	1.70	--
234678-HxCDF	nd	0.78	nd	1.20	nd	1.50	nd	2.00	nd	0.75	nd	2.60	nd	1.70
Total-HxCDF	2.60	--	nd	--	16.00	--	120.00	--	27.00	--	nd	--	32.00	--
123478-HxCDD	nd	0.60	nd	0.78	nd	1.50	nd	2.00	0.70	--	nd	2.30	nd	2.10
123678-HxCDD	1.20	--	nd	2.00	nd	2.80	5.70	--	2.30	--	nd	1.50	6.00	--
123789-HxCDD	3.10	--	nd	2.00	4.10	--	6.00	--	2.70	--	3.70	--	6.10	--
Total-HxCDD	18.00	--	10.00	--	29.00	--	79.00	--	26.00	--	23.00	--	52.00	--
1234678-HpCDF	4.20	--	nd	2.40	16.00	--	91.00	--	22.00	--	nd	1.90	22.00	--
1234789-HpCDF	nd	0.86	nd	1.70	nd	1.90	nd	4.50	nd	0.70	nd	2.40	nd	2.80
Total HpCDF	11.00	--	nd	--	74.00	--	250.00	--	63.00	--	nd	--	66.00	--
1234678-HpCDD	11.00	--	14.00	--	120.00	--	150.00	--	41.00	--	11.00	--	83.00	--
Total HpCDD	26.00	--	29.00	--	260.00	--	300.00	--	89.00	--	20.00	--	140.00	--
OCDF	7.60	--	7.40	--	86.00	--	220.00	--	54.00	--	3.00	--	91.00	--
OCDD	73.00	--	93.00	--	1400.00	--	1100.00	--	300.00	--	65.00	--	510.00	--

TABLE C.1. Sediment Dioxin Results (Cont'd) - Concentrations in ng/Kg dry

Native Isomer	Sta. 8B Conc.	Sta. 8B D.L.	Sta. 8C Conc.	Sta. 8C D.L.	Sta. 8A-C Conc.	Sta. 8A-C D.L.	Sta. 9A Conc.	Sta. 9A D.L.	Sta. 9B Conc.	Sta. 9B D.L.	Sta. 9C Conc.	Sta. 9C D.L.	Sta. 9A-C Conc.	Sta. 9A-C D.L.
2378-TCDF	6.8	--	6.30	--	7.00	--	nd	0.97	nd	2.00	6.70	--	nd	9.20
Total TCDF	12.0	--	16.00	--	8.90	--	nd	--	nd	--	9.30	--	nd	--
2378-TCDD	2.8	--	1.80	--	1.50	--	nd	1.70	nd	2.90	nd	4.50	nd	8.20
Total TCDD	11.0	--	4.70	--	5.10	--	2.50	--	nd	--	nd	--	nd	--
12378-PeCDF	4.1	--	nd	0.45	1.30	--	nd	0.39	nd	0.63	nd	1.10	nd	1.70
23478-PeCDF	nd	3.8	0.87	--	nd	0.83	nd	0.41	nd	0.55	nd	1.80	nd	0.70
Total PeCDF	14.0	--	8.00	--	11.00	--	nd	--	nd	--	4.60	--	nd	--
12378-PeCDD	3.3	--	2.20	--	2.10	--	nd	0.68	nd	0.91	3.50	--	nd	3.50
Total PeCDD	11.0	--	8.00	--	6.10	--	nd	--	nd	--	3.50	--	nd	--
123478-HxCDF	3.0	--	1.30	--	nd	1.80	nd	0.37	nd	0.76	nd	2.20	nd	1.90
123678-HxCDF	2.5	--	1.20	--	0.98	--	nd	0.56	nd	0.58	nd	1.30	nd	1.60
123789-HxCDF	1.7	--	1.40	--	nd	1.30	0.91	--	nd	0.77	nd	1.70	nd	1.20
234678-HxCDF	nd	2.1	0.53	--	nd	0.84	4.70	--	nd	1.20	nd	2.00	nd	1.40
Total-HxCDF	35.0	--	25.00	--	27.00	--	8.70	--	nd	--	18.00	--	nd	--
123478-HxCDD	2.1	--	1.00	--	nd	2.10	nd	0.60	nd	1.40	nd	1.60	nd	2.50
123678-HxCDD	6.4	--	6.20	--	5.80	--	nd	0.41	1.20	--	4.20	--	nd	3.50
123789-HxCDD	11.0	--	5.50	--	5.40	--	1.60	--	nd	1.80	8.60	--	4.70	--
Total-HxCDD	82.0	--	50.00	--	58.00	--	10.00	--	12.00	--	51.00	--	29.00	--
1234678-HpCDF	19.0	--	15.00	--	16.00	--	nd	0.64	nd	1.60	13.00	--	6.30	--
1234789-HpCDF	nd	2.3	0.75	--	nd	1.80	nd	0.68	nd	1.50	nd	1.60	nd	4.50
Total HpCDF	48.0	--	39.00	--	46.00	--	1.50	--	2.60	--	34.00	--	15.00	--
1234678-HpCDD	98.0	--	74.00	--	87.00	--	4.20	--	10.00	--	55.00	--	28.00	--
Total HpCDD	170.0	--	150.00	--	160.00	--	8.70	--	20.00	--	110.00	--	57.00	--
OCDF	78.0	--	29.00	--	85.00	--	nd	0.97	3.30	--	24.00	--	nd	13.00
OCDD	1100.0	--	460.00	--	1100.00	--	24.00	--	67.00	--	370.00	--	240.00	--

TABLE C.1. Sediment Dioxin Results (Cont'd) - Concentrations in ng/Kg dry

Native Isomer	Sta. 10A Conc.	Sta. 10A D.L.	Sta. 10B Conc.	Sta. 10B D.L.	Sta. 10C Conc.	Sta. 10C D.L.	Sta. 10A-C Conc.	Sta. 10A-C D.L.	Sta. 11A Conc.	Sta. 11A D.L.	Sta. 11C Conc.	Sta. 11C D.L.	Sta. 11A-C Conc.	Sta. 11A-C D.L.
2378-TCDF	nd	1.30	7.6	--	4.30	--	nd	2.5	2.30	--	3.30	--	3.10	--
Total TCDF	nd	--	12.00	--	21.00	--	4.0	--	22.00	--	29.00	--	22.00	--
2378-TCDD	nd	2.60	nd	3.50	nd	2.10	nd	4.1	1.70	--	2.40	--	2.90	--
Total TCDD	nd	--	nd	--	6.60	--	nd	--	1.70	--	7.50	--	9.50	--
12378-PeCDF	nd	0.45	nd	1.00	nd	0.70	nd	1.5	1.00	--	1.00	--	3.50	--
23478-PeCDF	nd	0.58	nd	1.40	nd	0.75	nd	1.3	1.30	--	1.60	--	3.10	--
Total PeCDF	nd	--	4.60	--	23.00	--	12.0	--	41.00	--	31.00	--	37.00	--
12378-PeCDD	nd	0.84	1.80	--	2.90	--	nd	2.6	2.10	--	2.10	--	4.00	--
Total PeCDD	nd	--	1.80	--	12.00	--	nd	--	3.80	--	9.00	--	7.10	--
123478-HxCDF	nd	1.60	nd	2.00	4.90	--	4.5	--	7.60	--	3.90	--	5.90	--
123678-HxCDF	nd	0.55	nd	0.93	3.40	--	2.1	--	4.00	--	3.60	--	4.50	--
123789-HxCDF	nd	1.20	nd	1.90	nd	2.00	nd	2.2	1.60	--	2.20	--	3.60	--
234678-HxCDF	nd	1.20	nd	2.00	nd	1.30	nd	1.1	0.90	--	0.40	--	1.80	--
Total-HxCDF	nd	--	20.00	--	80.00	--	59.0	--	150.00	--	100.00	--	130.00	--
123478-HxCDD	nd	0.73	nd	1.50	nd	1.40	nd	2.3	1.30	--	2.30	--	2.70	--
123678-HxCDD	nd	0.60	4.10	--	9.30	--	6.0	--	5.60	--	9.30	--	8.40	--
123789-HxCDD	2.20	--	6.00	--	9.30	--	8.3	--	5.80	--	9.10	--	7.60	--
Total-HxCDD	9.70	--	47.00	--	98.00	--	68.0	--	59.00	--	87.00	--	71.00	--
1234678-HpCDF	nd	1.50	15.00	--	67.00	--	40.0	--	210.00	--	99.99	--	160.00	--
1234789-HpCDF	nd	1.00	nd	1.90	nd	2.00	nd	3.4	4.10	--	2.10	--	3.40	--
Total HpCDF	nd	--	39.00	--	220.00	--	160.0	--	400.00	--	240.00	--	300.00	--
1234678-HpCDD	9.40	--	66.00	--	220.00	--	170.0	--	86.00	--	200.00	--	130.00	--
Total HpCDD	15.00	--	120.00	--	420.00	--	380.0	--	180.00	--	400.00	--	270.00	--
OCDF	nr	5.10	31.00	--	210.00	--	160.0	--	130.00	--	150.00	--	140.00	--
OCDD	81.00	--	420.00	--	1700.00	--	1700.0	--	560.00	--	1500.00	--	1000.00	--

TABLE C.1. Sediment Dioxin Results (Cont'd) - Concentrations in ng/Kg dry

Native Isomer	Sta. 12A Conc.	Sta. 12A D.L.	Sta. 12C Conc.	Sta. 12C D.L.	Sta. 12A-C Conc.	Sta. 12A-C D.L.	Sta. 13A Conc.	Sta. 13A D.L.	Sta. 13C Conc.	Sta. 13C D.L.	Sta. 13A-C Conc.	Sta. 13A-C D.L.	Sta. 14A Conc.	Sta. 14A D.L.	Sta. 14C Conc.	Sta. 14C D.L.
2378-TCDF	0.770	--	nd	1.20	1.90	--	nd	4.70	3.20	--	2.40	--	nd	1.20	nd	1.90
Total TCDF	1.300	--	nd	--	2.60	--	1.60	--	3.20	--	4.40	--	nd	--	nd	--
2378-TCDD	0.180	--	nd	0.89	nd	1.80	nd	5.30	2.10	--	2.10	--	nd	1.80	nd	1.70
Total TCDD	0.700	--	nd	--	2.00	--	5.50	--	5.20	--	4.50	--	nd	--	nd	--
12378-PeCDF	0.061	--	nd	0.44	nd	0.54	nd	1.50	nd	0.72	nd	0.83	nd	0.66	nd	1.00
23478-PeCDF	0.045	--	nd	0.31	0.27	--	0.81	--	0.63	--	nd	0.74	nd	0.61	nd	1.00
Total PeCDF	0.970	--	1.40	--	3.50	--	13.00	--	3.30	--	8.90	--	nd	--	7.00	--
12378-PeCDD	0.260	--	nd	0.74	0.74	--	1.80	--	2.80	--	2.50	--	nd	0.53	1.90	--
Total PeCDD	1.100	--	nd	--	0.74	--	4.00	--	4.70	--	9.90	--	nd	--	4.40	--
123478-HxCDF	0.180	--	nd	0.36	nd	0.64	2.60	--	nd	1.10	2.30	--	nd	0.65	0.95	--
123678-HxCDF	0.130	--	0.39	--	0.42	--	2.40	--	nd	0.77	1.30	--	nd	0.42	nd	1.00
123789-HxCDF	0.130	--	nd	0.55	0.75	--	1.60	--	1.40	--	1.50	--	nd	0.54	nd	0.95
234678-HxCDF	nd	0.090	nd	0.47	0.20	--	nd	0.67	0.58	--	nd	0.93	nd	0.70	nd	1.20
Total-HxCDF	2.900	--	8.10	--	10.00	--	45.00	--	16.00	--	38.00	--	nd	--	30.00	--
123478-HxCDD	0.074	--	nd	0.97	0.60	--	1.10	--	0.93	--	0.80	--	nd	0.60	nd	0.78
123678-HxCDD	0.620	--	0.91	--	1.80	--	3.80	--	3.90	--	3.90	--	nd	1.10	2.90	--
123789-HxCDD	0.800	--	nd	1.90	2.80	--	6.50	--	7.80	--	7.40	--	nd	2.10	5.30	--
Total-HxCDD	5.800	--	13.00	--	21.00	--	52.00	--	50.00	--	51.00	--	9.70	--	36.00	--
1234678-HpCDF	1.600	--	7.60	--	6.80	--	41.00	--	nd	0.60	34.00	--	nd	1.20	40.00	--
1234789-HpCDF	nd	0.091	nd	1.30	nd	0.58	nd	3.50	3.20	--	nd	1.10	nd	1.10	nd	1.30
Total HpCDF	4.400	--	26.00	--	19.00	--	97.00	--	20.00	--	84.00	--	1.40	--	75.00	--
1234678-HpCDD	8.500	--	29.00	--	29.00	--	63.00	--	32.00	--	62.00	--	6.40	--	24.00	--
Total HpCDD	19.000	--	64.00	--	69.00	--	130.00	--	66.00	--	120.00	--	13.00	--	45.00	--
OCDF	3.700	--	24.00	--	16.00	--	74.00	--	17.00	--	59.00	--	2.20	--	28.00	--
OCDD	60.000	--	350.00	--	220.00	--	440.00	--	200.00	--	420.00	--	40.00	--	130.00	--

TABLE C.1. Sediment Dioxin Results (Cont'd) Concentrations in ng/Kg dry

Native Isomer	Sta. 14A-C Conc.	Sta. 14A-C D.L.	Sta. 17A Conc.	Sta. 17A D.L.	Sta. 17B Conc.	Sta. 17B D.L.	Sta. 17C Conc.	Sta. 17C D.L.	Sequim Bay Conc.	Sequim Bay D.L.	West Beach Conc.	West Beach D.L.
2378-TCDF	nd	2.40	1.60	--	nd	2.30	nd	1.50	1.90	--	nd	2.60
Total TCDF	nd	--	13.00	--	nd	--	nd	--	6.70	--	nd	--
2378-TCDD	nd	5.20	1.70	--	nd	5.70	nd	2.20	[illegible]	2.60	nd	2.30
Total TCDD	nd	--	7.40	--	nd	--	1.30	--	1.90	--	nd	--
12378-PeCDF	nd	0.66	nd	0.85	nd	0.97	0.54	--	nd	1.10	nd	0.68
23478-PeCDF	nd	0.76	nd	0.73	nd	0.95	nd	0.32	0.72	--	nd	0.69
Total PeCDF	3.70	--	12.00	--	nd	--	0.54	--	2.40	--	nd	--
12378-PeCDD	1.30	--	1.60	--	nd	--	1.30	--	0.95	--	nd	0.64
Total PeCDD	2.80	--	4.30	--	0.95	--	1.30	--	2.30	--	nd	--
123478-HxCDF	0.64	--	3.20	--	nd	1.40	nd	0.37	0.97	--	nd	0.70
123678-HxCDF	0.72	--	1.90	--	nd	0.73	nd	0.30	nd	0.86	nd	0.51
123789-HxCDF	nd	1.10	1.50	--	nd	1.10	0.95	--	0.97	--	nd	0.73
234678-HxCDF	0.73	--	nd	0.57	nd	0.92	0.40	--	nd	0.88	nd	0.75
Total-HxCDF	15.00	--	52.00	--	nd	--	1.40	--	8.40	--	nd	--
123478-HxCDD	nd	1.10	1.00	--	nd	0.61	nd	0.72	1.00	--	nd	0.52
123678-HxCDD	1.40	--	3.50	--	nd	1.00	nd	0.73	3.10	--	nd	0.83
123789-HxCDD	3.70	--	4.90	--	3.20	--	0.86	--	2.10	--	nd	1.30
Total-HxCDD	27.00	--	45.00	--	22.00	--	16.00	--	33.00	--	nd	--
1234678-HpCDF	28.00	--	45.00	--	1.80	--	nd	0.87	5.20	--	nd	2.00
1234789-HpCDF	nd	0.92	nd	2.10	nd	1.40	nd	0.92	nd	1.40	nd	0.95
Total HpCDF	47.00	--	110.00	--	13.00	--	nd	--	14.00	--	nd	--
1234678-HpCDD	16.00	--	61.00	--	16.00	--	6.30	--	36.00	--	2.40	--
Total HpCDD	32.00	--	140.00	--	29.00	--	14.00	--	78.00	--	2.40	--
OCDF	13.00	--	75.00	--	18.00	--	2.30	--	13.00	--	nd	4.50
OCDD	100.00	--	430.00	--	88.00	--	45.00	--	230.00	--	19.00	--

TABLE C.2. Sediment Guaiacols/Organic Acids Results Concentration in $\mu g/Kg$ dry

Laboratory ID Compound	Method Blank	1A-C	2A	3A-C	4A-C	5A-C	6A-C
Guaiacol	67 U	70 U	82 U	81 U	75 U	110 U	110 U
4-Chloroguaiacol	67 U	70 U	82 U	81 U	75 U	110 U	110 U
Isoeugenol	67 U	70 U	82 U	81 U	75 U	110 U	110 U
Eugenol	67 U	70 U	82 U	81 U	75 U	110 U	110 U
4,5-Dichloroguaiacol	67 U	70 U	82 U	81 U	75 U	110 U	110 U
4,5,6-Trichloroguaiacol	67 U	70 U	82 U	81 U	75 U	110 U	110 U
3,4,5-Trichloroguaiacol	67 U	70 U	82 U	81 U	75 U	110 U	110 U
Tetrachloroguaiacol	67 U	70 U	82 U	81 U	75 U	110 U	110 U
Catechol	67 U	70 U	82 U	81 U	75 U	110 U	110 U
4-Chlorocatechol	67 U	70 U	82 U	81 U	75 U	110 U	110 U
4,5-Dichlorocatechol	67 U	70 U	82 U	81 U	75 U	110 U	110 U
6-Chlorovanillin	67 U	70 U	82 U	81 U	75 U	110 U	110 U
3,4,5-Trichlorocatechol	67 U	70 U	82 U	81 U	75 U	110 U	110 U
Trichlorosyringol	67 U	70 U	82 U	81 U	75 U	110 U	110 U
5,6-Dichlorovanillin	67 U	70 U	82 U	81 U	75 U	110 U	110 U
Tetrachlorocatechol	67 U	70 U	82 U	81 U	75 U	110 U	110 U
Heptanoic Acid	67 U	70 U	82 U	81 U	75 U	110 U	110 U
Palmitoleic Acid	130 U	140 U	260	180	240	380	360
Linoleic Acid	67 U	70 U	82 U	81 U	75 U	110 U	110 U
Linolenic Acid	67 U	70 U	82 U	81 U	75 U	110 U	110 U
Oleic Acid	330 U	350 U	410 U	400 U	380 U	530 U	530 U
Stearic Acid	67 U	70 U	110	88	92	130	220
Hexadecanedioic Acid	130 U	140 U	160 U	160 U	150 U	210 U	210 U
Pimaric Acid	67 U	70 U	82 U	81 U	75 U	110 U	110 U
Sandaracopimaric Acid	67 U	70 U	82 U	81 U	75 U	110 U	110 U
Isopimaric Acid	67 U	70 U	82 U	81 U	75 U	110 U	110 U
Palustrate Acid	67 U	70 U	82 U	81 U	75 U	110 U	110 U
Dehydroabietic Acid	67 U	70 U	120	85	100	140	360
Abietic Acid	67 U	70 U	82 U	81 U	75 U	110 U	62 J
Neoabietic Acid	67 U	70 U	82 U	81 U	75 U	110 U	110 U
1,4-Chloroabietic Acid	67 U	70 U	82 U	81 U	75 U	110 U	110 U
1,2-Chloroabietic Acid	67 U	70 U	82 U	81 U	75 U	110 U	110 U
Dichloroabietic Acid	67 U	70 U	82 U	81 U	75 U	110 U	110 U
Surrogate Recovery (%):							
Dihydroxy-d4-Benzene	50.5	46.2	29.6	40.9	40.8	65.5	70.8
0-Methyl Podocaprate Acid	94.7	106	115	113	116	116	114

U - undetected; J - estimated because result less than detection limit;

TABLE C.2. Sediment Guaiacols/Organic Acids Results (Cont'd)
Concentration in µg/Kg dry

Laboratory ID Compound	7A-C	8A-C	9A-C	10A-C	11A-C	12A-C
Guaiacol	86 U	86 U	97 U	88 U	96 U	94 U
4-Chloroguaiacol	86 U	86 U	97 U	88 U	96 U	94 U
Isoeugenol	86 U	86 U	97 U	88 U	96 U	94 U
Eugenol	86 U	86 U	97 U	88 U	96 U	94 U
4,5-Dichloroguaiacol	86 U	86 U	97 U	88 U	96 U	94 U
4,5,6-Trichloroguaiacol	86 U	86 U	97 U	88 U	96 U	94 U
3,4,5-Trichloroguaiacol	86 U	86 U	97 U	88 U	96 U	94 U
Tetrachloroguaiacol	86 U	86 U	97 U	88 U	96 U	94 U
Catechol	86 U	86 U	97 U	88 U	96 U	94 U
4-Chlorocatechol	86 U	86 U	97 U	88 U	96 U	94 U
4,5-Dichlorocatechol	86 U	86 U	97 U	88 U	96 U	94 U
6-Chlorovanillin	86 U	86 U	97 U	88 U	96 U	94 U
3,4,5-Trichlorocatechol	86 U	86 U	97 U	88 U	96 U	94 U
Trichlorosyringol	86 U	86 U	97 U	88 U	96 U	94 U
5,6-Dichlorovanillin	86 U	86 U	97 U	88 U	96 U	94 U
Tetrachlorocatechol	86 U	86 U	97 U	88 U	96 U	94 U
Heptanoic Acid	86 U	86 U	97 U	88 U	96 U	94 U
Palmitoleic Acid	170 U	590	540	270	360 M	290
Linoleic Acid	86 U	86 U	97 U	88 U	96 U	94 U
Linolenic Acid	86 U	86 U	97 U	88 U	96 U	94 U
Oleic Acid	430 U	110 M	480 U	440 U	480 U	470 U
Stearic Acid	61 M	180	220	140	190 M	220
Hexadecanedioic Acid	170 U	170 U	190 U	180 U	190 U	190 U
Pimaric Acid	86 U	86 U	97 U	88 U	96 U	94 U
Sandaracopimaric Acid	86 U	86 U	97 U	88 U	96 U	94 U
Isopimaric Acid	86 U	86 U	97 U	88 U	96 U	94 U
Palustrate Acid	86 U	86 U	97 U	88 U	96 U	94 U
Dehydroabietic Acid	160	190	190	120	520	300
Abietic Acid	31 J	32 J	40 J	88 U	140	49 J
Neoabietic Acid	86 U	86 U	97 U	88 U	96 U	94 U
1,4-Chloroabietic Acid	86 U	86 U	97 U	88 U	96 U	94 U
1,2-Chloroabietic Acid	86 U	48 M	33 M	88 U	87	68 M
Dichloroabietic Acid	86 U	34 M	97 U	88 U	45 M	36 M
Surrogate Recovery:						
Dihydroxy-d4-Benzene	64.7	43.4	48.6	75.2	42.3	59.6
0-Methyl Podocaprate Acid	116.0	121.0	115.0	114.0	113	98.4

U - undetected; J - estimated because result less than detection limit;

TABLE C.2. Sediment Guaiacols/Organic Acids Results (Cont'd)
Concentration in μg/Kg dry

Laboratory ID Compound	13A-C	14A-C	15A	16C	SB	WB
Guaiacol	100 U	94 U	110 U	66 U	130 U	63 U
4-Chloroguaiacol	100 U	94 U	110 U	66 U	130 U	63 U
Isoeugenol	100 U	94 U	110 U	66 U	130 U	63 U
Eugenol	106 U	94 U	110 U	66 U	130 U	63 U
4,5-Dichloroguaiacol	100 U	94 U	110 U	66 U	130 U	63 U
4,5,6-Trichloroguaiacol	100 U	94 U	110 U	66 U	130 U	63 U
3,4,5-Trichloroguaiacol	100 U	94 U	110 U	66 U	130 U	63 U
Tetrachloroguaiacol	100 U	94 U	110 U	66 U	130 U	63 U
Catechol	100 U	94 U	110 U	66 U	130 U	63 U
4-Chlorocatechol	100 U	94 U	110 U	66 U	130 U	63 U
4,5-Dichlorocatechol	100 U	94 U	110 U	66 U	130 U	63 U
6-Chlorovanillin	100 U	94 U	110 U	66 U	130 U	63 U
3,4,5-Trichlorocatechol	100 U	94 U	110 U	66 U	130 U	63 U
Trichlorosyringol	100 U	94 U	110 U	66 U	130 U	63 U
5,6-Dichlorovanillin	100 U	94 U	110 U	66 U	130 U	63 U
Tetrachlorocatechol	100 U	94 U	110 U	66 U	130 U	63 U
Heptanoic Acid	100 U	94 U	110 U	66 U	130 U	63 U
Palmitoleic Acid	210 U	500 M	500	130	4800	790
Linoleic Acid	100 U	94 U	110 U	66 J	130 U	63 U
Linolenic Acid	100 U	94 U	110 U	66 U	130 U	63 U
Oleic Acid	520 U	470 U	550 U	330 U	1600	260 J
Stearic Acid	180	220	200	27 M	500	78
Hexadecanedioic Acid	210 U	190 U	220 U	130 U	260 U	130 U
Pimaric Acid	100 U	94 U	110 U	66 U	130 U	63 U
Sandaracopimaric Acid	220	470	110 U	66 U	130 U	63 U
Isopimaric Acid	100 U	94 U	110 U	66 U	130 U	63 U
Palustrate Acid	100 U	94 U	110 U	66 U	130 U	63 U
Dehydroabietic Acid	340	510	110 U	70 U	130 U	60 U
Abietic Acid	130	190	110 U	66 U	130 U	63 U
Neoabietic Acid	100 U	94 U	110 U	66 U	130 U	63 U
1,4-Chloroabietic Acid	100 U	94 U	110 U	66 U	130 U	63 U
1,2-Chloroabietic Acid	100 U	94 U	110 U	66 U	130 U	63 U
Dichloroabietic Acid	100 U	94 U	110 U	66 U	130 U	63 U
Surrogate Recovery (%):						
Dihydroxy-d4-Benzene	48.6	44.4	52.2	43.8	50.5	93.1
0-Methyl Podocaprate Acid	109	118	116	111	111	111

U - undetected; J - estimated because result less than detection limit;

TABLE C.3. Elutriate Guaiacols/Organic Acids Results Concentration in μg/L

Laboratory ID Compound	Method Blank	1A-C	2A	3A-C	4A-C	5A-C
Guaiacol	1 U	1 U	1 U	1 U	1 U	1 U
4-Chloroguaiacol	1 U	1 U	1 U	1 U	1 U	1 U
Isoeugenol	1 U	1 U	1 U	1 U	1 U	1 U
Eugenol	1 U	1 U	1 U	1 U	1 U	1 U
4,5-Dichloroguaiacol	1 U	1 U	1 U	1 U	1 U	1 U
4,5,6-Trichloroguaiacol	1 U	1 U	1 U	1 U	1 U	1 U
3,4,5-Trichloroguaiacol	1 U	1 U	1 U	1 U	1 U	1 U
Tetrachloroguaiacol	1 U	1 U	1 U	1 U	1 U	1 U
Catechol	1 U	1 U	1 U	1 U	1 U	1 U
4-Chlorocatechol	1 U	1 U	1 U	1 U	1 U	1 U
4,5-Dichlorocatechol	1 U	1 U	1 U	1 U	1 U	1 U
6-Chlorovanillin	1 U	1 U	1 U	1 U	1 U	1 U
3,4,5-Trichlorocatechol	1 U	1 U	1 U	1 U	1 U	1 U
Trichlorosyringol	1 U	1 U	1 U	1 U	1 U	1 U
5,6-Dichlorovanillin	1 U	1 U	1 U	1 U	1 U	1 U
Tetrachlorocatechol	1 U	1 U	1 U	1 U	1 U	1 U
Heptanoic Acid	1 U	1 U	1 U	1 U	1 U	1 U
Palmitoleic Acid	2 U	2 U	2 U	2 U	2 U	2 U
Linoleic Acid	1 U	1 U	1 U	1 U	1 U	1 U
Linolenic Acid	1 U	1 U	1 U	1 U	1 U	1 U
Oleic Acid	5 U	5 U	5 U	5 U	5 U	5 U
Stearic Acid	1 U	1 U	1 U	1 U	1 U	1 U
Hexadecanedioic Acid	2 U	2 U	2 U	2 U	2 U	2 U
Pimaric Acid	1 U	1 U	1 U	1 U	1 U	1 U
Sandaracopimaric Acid	1 U	1 U	1 U	1 U	1 U	1 U
Isopimaric Acid	1 U	1 U	1 U	1 U	1 U	1 U
Palustrate Acid	1 U	1 U	1 U	1 U	1 U	1 U
Dehydroabietic Acid	1 U	1 U	1 U	1 U	1 U	1 U
Abietic Acid	1 U	1 U	1 U	1 U	1 U	1 U
Neoabietic Acid	1 U	1 U	1 U	1 U	1 U	1 U
1,4-Chloroabietic Acid	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Chloroabietic Acid	1 U	1 U	1 U	1 U	1 U	1 U
Dichloroabietic Acid	1 U	1 U	1 U	1 U	1 U	1 U
Surrogate Recovery (%):						
Ø-Methyl Podocaprate Acid	62.1	101	96.3	97.4	91.8	91.7

U - undetected; J - estimated because result less than detection limit;

TABLE C.3. Elutriate Guaiacols/Organic Acids Results (Cont'd) Concentration in μg/L

Laboratory ID Compound	6A-C	7C	8A-C	9A-C	10A-C	11A-C
Guaiacol	1 U	1 U	1 U	1 U	2 U	1 U
4-Chloroguaiacol	1 U	1 U	1 U	1 U	2 U	1 U
Isoeugenol	1 U	1 U	1 U	1 U	2 U	1 U
Eugenol	1 U	1 U	1 U	1 U	2 U	1 U
4,5-Dichloroguaiacol	1 U	1 U	1 U	1 U	2 U	1 U
4,5,6-Trichloroguaiacol	1 U	1 U	1 U	1 U	2 U	1 U
3,4,5-Trichloroguaiacol	1 U	1 U	1 U	1 U	2 U	1 U
Tetrachloroguaiacol	1 U	1 U	1 U	1 U	2 U	1 U
Catechol	1 U	1 U	1 U	1 U	2 U	1 U
4-Chlorocatechol	1 U	1 U	1 U	1 U	2 U	1 U
4,5-Dichlorocatechol	1 U	1 U	1 U	1 U	2 U	1 U
6-Chlorovanillin	1 U	1 U	1 U	1 U	2 U	1 U
3,4,5-Trichlorocatechol	1 U	1 U	1 U	1 U	2 U	1 U
Trichlorosyringol	1 U	1 U	1 U	1 U	2 U	1 U
5,6-Dichlorovanillin	1 U	1 U	1 U	1 U	2 U	1 U
Tetrachlorocatechol	1 U	1 U	1 U	1 U	2 U	1 U
Heptanoic Acid	1 U	1 U	1 U	1 U	2 U	1 U
Palmitoleic Acid	2 U	2 U	2 U	2 U	4 U	2 U
Linoleic Acid	1 U	1 U	1 U	1 U	2 U	1 U
Linolenic Acid	1 U	1 U	1 U	1 U	2 U	1 U
Oleic Acid	5 U	5 U	5 U	5 U	10 U	5 U
Stearic Acid	1 U	1 U	1 U	1 U	2 U	1 U
Hexadecanedioic Acid	2 U	2 U	2 U	2 U	4 U	2 U
Pimaric Acid	1 U	1 U	1 U	1 U	2 U	1 U
Sandaracopimaric Acid	1 U	1 U	1 U	1 U	2 U	1 U
Isopimaric Acid	1 U	1 U	1 U	1 U	2 U	1 U
Palustrate Acid	1 U	1 U	1 U	1 U	2 U	1 U
Dehydroabietic Acid	1 U	1 U	1 U	1 U	2 U	1 U
Abietic Acid	1 U	1 U	1 U	1 U	2 U	1 U
Neoabietic Acid	1 U	1 U	1 U	1 U	2 U	1 U
1,4-Chloroabietic Acid	1 U	1 U	1 U	1 U	2 U	1 U
1,2-Chloroabietic Acid	1 U	1 U	1 U	1 U	2 U	1 U
Dichloroabietic Acid	1 U	1 U	1 U	1 U	2 U	1 U
Surrogate Recovery:						
0-Methyl Podocaprate Acid	103.0	88.5	91.5	95.9	99.0	101

U - undetected; J - estimated because result less than detection limit;

TABLE C.3. Elutriate Guaiacols/Organic Acids Results (Cont'd)
Concentration in μg/L

Laboratory ID Compound	12A-C	13A-C	14A-C	15A	16C	SB	WB
Guaiacol	1 U	1 U	1 U	1 U	1 U	1 U	1 U
4-Chloroguaiacol	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Isoeugenol	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Eugenol	1 U	1 U	1 U	1 U	1 U	1 U	1 U
4,5-Dichloroguaiacol	1 U	1 U	1 U	1 U	1 U	1 U	1 U
4,5,6-Trichloroguaiacol	1 U	1 U	1 U	1 U	1 U	1 U	1 U
3,4,5-Trichloroguaiacol	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Tetrachloroguaiacol	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Catechol	1 U	1 U	1 U	1 U	1 U	1 U	1 U
4-Chlorocatechol	1 U	1 U	1 U	1 U	1 U	1 U	1 U
4,5-Dichlorocatechol	1 U	1 U	1 U	1 U	1 U	1 U	1 U
6-Chlorovanillin	1 U	1 U	1 U	1 U	1 U	1 U	1 U
3,4,5-Trichlorocatechol	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Trichlorosyringol	1 U	1 U	1 U	1 U	1 U	1 U	1 U
5,6-Dichlorovanillin	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Tetrachlorocatechol	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Heptanoic Acid	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Palmitoleic Acid	2 U	2 U	3 U	2 U	2 U	2 U	2 U
Linoleic Acid	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Linolenic Acid	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Oleic Acid	5 U	5 U	7 U	5 U	5 U	5 U	5 U
Stearic Acid	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Hexadecanedioic Acid	2 U	2 U	3 U	2 U	2 U	2 U	2 U
Pimaric Acid	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Sandaracopimaric Acid	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Isopimaric Acid	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Palustrate Acid	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dehydroabietic Acid	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Abietic Acid	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Neoabietic Acid	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,4-Chloroabietic Acid	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Chloroabietic Acid	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dichloroabietic Acid	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Surrogate Recovery (%):							
0-Methyl Podocaprate Acid	74.2	92.0	76.3	98.6	72.5	96.9	80.5

U - undetected; J - estimated because result less than detection limit;

TABLE C.4. Sediment Total Organic Carbon (TOC) Results

Station	TOC (% dry wt)
1 A-C	0.41
2 A	1.30
3 A-C	0.87
4 A-C	1.13
5 A-C	1.02
6 A-C	1.22
7 C	1.96
8 A-C	2.13
9 A-C	1.30
10 A-C	1.63
11 A-C	2.21
12 A-C	1.56
13 A-C	1.88
14 A-C	1.71
15 A	N/A[a]
16 C	N/A
17 A	2.28
West Beach	0.06
Sequim Bay	2.03

(a) N/A - analyses not performed

TABLE C.5. Quality Assurance for Sediment Dioxins (Cont'd)
Method Blank Data

	9-27-89 MB1 R1		9-29-89 MB1 R1-14		9-29-89 MB1 R13		10-5-89 MB1 R3		10-6-89 MB1	
Native Isomer	Conc.	D.L.	Conc.	D.L.	Conc.	D.L.	Conc.	D.L.	Conc.	D.L.
2378-TCDF	nd	1.70	nd	2.20	nd	0.34	nd	1.30	nd	1.00
Total TCDF	nd	--	nd	--	nd	--	nd	--	nd	--
2378-TCDD	nd	1.60	nd	2.60	nd	0.53	nd	1.10	nd	2.70
Total TCDD	nd	--	nd	--	0.39	--	nd	--	nd	--
12378-PeCDF	nd	0.49	nd	1.40	nd	0.13	0.34	--	nd	0.99
23478-PeCDF	nd	0.25	nd	1.20	nd	0.08	0.36	--	nd	0.80
Total PeCDF	nd	--	nd	--	nd	--	0.70	--	nd	--
12378-PeCDD	nd	0.38	nd	0.52	nd	0.20	nd	0.46	nd	0.95
Total PeCDD	nd	--	nd	--	nd	--	nd	--	nd	--
123478-HxCDF	nd	0.45	nd	0.98	nd	0.11	nd	0.66	nd	1.40
123678-HxCDF	nd	0.23	nd	0.45	nd	0.09	nd	0.32	nd	0.68
123789-HxCDF	0.57	--	nd	1.20	0.30	--	0.31	--	nd	1.20
234678-HxCDF	nd	0.56	nd	1.30	nd	0.13	nd	0.98	nd	2.00
Total-HxCDF	0.57	--	nd	--	0.30	--	0.31	--	nd	--
123478-HxCDD	nd	0.51	nd	0.57	nd	0.10	nd	0.41	nd	1.70
123678-HxCDD	nd	0.44	nd	1.10	0.27	1.10	nd	0.59	nd	1.90
123789-HxCDD	nd	0.71	nd	2.20	0.19	2.20	nd	0.29	nd	1.00
Total-HxCDD	nd	--	nd	--	1.70	--	0.88	--	nd	--
1234678-HpCDF	nd	0.84	nd	1.00	nd	0.36	nd	0.29	nd	1.30
1234789-HpCDF	nd	1.20	nd	1.40	nd	0.19	nd	0.76	nd	1.50
Total HpCDF	nd	--	nd	--	nd	--	nd	--	nd	--
1234678-HpCDD	1.80	--	nd	3.10	0.45	--	1.90	--	3.90	--
Total HpCDD	1.80	--	nd	--	0.96	--	4.00	--	8.90	--
OCDF	nd	1.40	nd	3.30	0.69	--	1.70	--	1.60	--
OCDD	18.00	--	27.00	--	10.00	--	31.00	--	30.00	--

TABLE C.5. Quality Assurance for Sediment Dioxins (Cont'd)
Method Blank Data (Cont'd)

Native Isomer	10-10-89 MB1 Conc.	10-10-89 MB1 D.L.	10-17-89 MB1 R8 Conc.	10-17-89 MB1 R8 D.L.	10-18-89 MB1 R13 Conc.	10-18-89 MB1 R13 D.L.	10-19-89 MB1 R20 Conc.	10-19-89 MB1 R20 D.L.
2378-TCDF	nd	1.30	nd	2.80	nd	2.40	nd	1.50
Total TCDF	nd	--	nd	--	nd	--	nd	--
2378-TCDD	nd	1.90	nd	1.70	nd	1.80	nd	0.89
Total TCDD	nd	--	nd	--	nd	--	nd	--
12378-PeCDF	nd	0.65	0.78	--	nd	0.34	nd	1.00
23478-PeCDF	nd	0.62	nd	0.98	nd	0.42	nd	0.63
Total PeCDF	nd	--	0.78	--	nd	--	nd	--
12378-PeCDD	nd	1.50	nd	1.00	nd	0.57	nd	1.00
Total PeCDD	nd	--	nd	--	nd	--	nd	--
123478-HxCDF	nd	0.48	nd	1.10	nd	0.49	nd	0.77
123678-HxCDF	nd	0.48	nd	--	nd	0.26	nd	0.75
123789-HxCDF	nd	0.86	nd	1.50	0.60	--	nd	1.00
234678-HxCDF	nd	0.62	nd	0.74	nd	0.62	nd	0.69
Total-HxCDF	nd	--	1.10	--	0.60	--	nd	--
123478-HxCDD	nd	0.46	nd	0.81	nd	0.35	nd	1.30
123678-HxCDD	nd	0.56	nd	1.00	nd	0.29	nd	0.62
123789-HxCDD	nd	0.78	1.10	--	nd	0.36	nd	1.20
Total-HxCDD	nd	--	1.10	--	0.87	--	nd	--
1234678-HpCDF	nd	0.68	nd	1.10	0.96	--	nd	1.10
1234789-HpCDF	nd	0.75	nd	1.10	nd	0.71	nd	1.10
Total HpCDF	nd	--	nd	--	0.96	--	nd	--
1234678-HpCDD	1.60	--	1.90	--	1.90	--	nd	1.50
Total HpCDD	1.60	--	1.90	--	1.90	--	nd	--
OCDF	nd	1.90	2.50	--	2.00	--	nd	1.60
OCDD	17.00	--	15.00	--	15.00	--	9.10	--

TABLE C.5. Quality Assurance for Sediment Dioxins (Cont'd) Matrix Spike Data

Native Isomer	9-28-89 Spike R-3-3			10-3-89 Spike R12			10-11-89 Spike R9			10-19-89 Spike R21		
	Qs	Qm	%Rec	Qs	Qm	%Rec	Qs	Qm	%Rec	Qs	Qm	%Rec
2378-TCDF	0.80	0.78	98	0.80	0.94	118	0.80	0.82	103	0.80	0.86	108
Total TCDF	0.80	0.78	98	0.80	0.94	118	0.80	0.82	103	0.80	0.86	108
2378-TCDD	0.80	0.82	103	0.80	1.00	125	0.80	0.89	111	0.80	0.86	108
Total TCDD	0.80	0.82	103	0.80	1.00	125	0.80	0.89	111	0.80	0.86	108
12378-PeCDF	4.00	3.60	90	4.00	4.20	105	4.00	3.70	93	4.00	4.10	103
23478-PeCDF	4.00	3.60	90	4.00	4.30	108	4.00	3.80	95	4.00	4.10	103
Total PeCDF	8.00	7.20	90	8.00	8.50	106	8.00	7.50	94	8.00	8.20	103
12378-PeCDD	4.00	3.50	88	4.00	4.20	105	4.00	3.80	95	4.00	3.80	95
Total PeCDD	4.00	3.50	88	4.00	4.20	105	4.00	3.80	95	4.00	3.80	95
123478-HxCDF	4.00	4.10	103	4.00	4.70	118	4.00	3.60	90	4.00	3.80	95
123678-HxCDF	4.00	3.30	83	4.00	3.90	98	4.00	3.80	95	4.00	3.90	98
123789-HxCDF	4.00	3.70	93	4.00	4.20	105	4.00	3.70	93	4.00	3.90	98
234678-HxCDF	4.00	3.70	93	4.00	4.30	108	4.00	3.80	95	4.00	3.90	98
Total-HxCDF	16.00	15.00	94	16.00	17.00	106	6.00	15.00	94	16.00	16.00	100
123478-HxCDD	4.00	3.40	85	4.00	7.90	123	4.00	4.40	110	4.00	4.40	110
123678-HxCDD	4.00	3.90	98	4.00	3.80	95	4.00	3.40	85	4.00	3.50	88
123789-HxCDD	4.00	3.40	85	4.00	3.90	98	4.00	3.30	83	4.00	3.10	78
Total-HxCDD	12.00	11.00	92	12.00	13.00	108	12.00	11.00	92	12.00	11.00	92
1234678-HpCDF	4.00	3.70	93	4.00	4.30	108	4.00	4.10	103	4.00	4.10	103
1234789-HpCDF	4.00	3.70	93	4.00	4.30	108	4.00	4.10	103	4.00	4.10	103
Total HpCDF	8.00	7.40	93	8.00	8.60	108	8.00	8.20	103	8.00	8.20	103
1234678-HpCDD	4.00	3.60	90	4.00	4.20	105	4.00	3.70	93	4.00	3.70	93
Total HpCDD	4.00	3.60	90	4.00	4.20	105	4.00	3.70	93	4.00	3.70	93
OCDF	8.00	7.40	93	8.00	10.00	125	8.00	8.90	111	8.00	8.30	104
OCDD	8.00	7.30	91	8.00	8.70	109	8.00	7.60	95	8.00	7.70	95

Qs = Quantity spiked
Qm = Quantity measured
%Rec = Percent recovered

TABLE C.5. Quality Assurance for Sediment Dioxins (Cont'd)
Surrogate Recovery (%)

Native Isomer	ng's Added	Percent Recovered 1A	1C	1A-C	2A	3A	3B	3C	3A-C	4A	4B	4C	4A-C
2378-TCDF-C13	2.00	53	49	51	67	46	72	81	75	67	82	64	75
2378-TCDD-C13	2.00	54	53	56	69	50	73	80	72	70	83	65	76
12378-PeCDF-C13	2.00	71	66	67	84	76	81	69	95	79	106	89	71
23478-PeCDF-C13	2.00	73	64	66	89	79	85	65	104	81	115	89	69
12378-PeCDD-C13	2.00	79	80	75	101	93	106	70	100	84	121	96	59
123478-HxCDF-C13	2.00	58	65	41	60	70	59	54	54	50	62	60	105
123678-HxCDF-C13	2.00	60	63	50	79	66	66	66	38	42	58	64	98
123789-HxCDF-C13	2.00	60	64	65	78	74	61	68	65	59	75	58	87
234678-HxCDF-C13	2.00	63	67	68	81	75	65	67	68	65	80	61	66
123478-HxCDD-C13	2.00	63	80	77	82	70	68	80	77	63	91	67	85
123678-HxCDD-C13	2.00	69	64	68	88	79	73	70	67	72	77	62	86
1234678-HpCDF-C13	2.00	55	64	63	74	72	62	57	57	56	70	58	104
1234789-HpCDF-C13	2.00	67	77	76	89	83	73	75	73	74	85	63	134
1234678-HpCDD-C13	2.00	64	71	69	78	75	65	72	68	69	86	64	127
OCDD-C13	4.00	49	65	61	75	67	81	70	71	67	87	54	148
1234-TCDD-C13	2.00	na	na	na	na	na	na	na	na	na	na	na	na
123789-HxCDD-C13	2.00	na	na	na	na	na	na	na	na	na	na	na	na
2378-TCDD-C137	0.80	57	55	56	72	51	(a)	73	68	63	78	71	70

(a) No data

TABLE C.5. Quality Assurance for Sediment Dioxins (Cont'd) Surrogate Recovery (%) (Cont'd)

Native Isomer	ng's Added	Percent Recovered 5A	5B	5C	5A-C	6A	6B	6C	6A-C	7C	8A	8B	8C
2378-TCDF-C13	2.00	52	56	78	65	69	58	66	68	66	63	79	71
2378-TCDD-C13	2.00	55	58	79	66	70	53	66	71	66	67	80	73
12378-PeCDF-C13	2.00	60	60	68	79	70	75	60	73	63	68	69	80
23478-PeCDF-C13	2.00	59	58	66	79	64	69	57	71	60	67	64	82
12378-PeCDD-C13	2.00	64	60	71	86	69	75	60	76	67	73	72	88
123478-HxCDF-C13	2.00	50	70	64	56	59	51	66	56	58	58	67	64
123678-HxCDF-C13	2.00	44	62	66	55	65	62	75	70	66	73	67	73
123789-HxCDF-C13	2.00	57	70	63	66	61	55	68	63	60	66	69	68
234678-HxCDF-C13	2.00	60	58	65	72	64	57	62	70	62	68	67	72
123478-HxCDD-C13	2.00	62	69	79	77	69	58	66	66	66	73	84	71
123678-HxCDD-C13	2.00	65	90	62	69	61	65	68	69	66	76	64	81
1234678-HpCDF-C13	2.00	53	55	55	58	58	56	73	61	60	68	67	71
1234789-HpCDF-C13	2.00	67	48	71	76	71	69	92	74	75	81	85	83
1234678-HpCDD-C13	2.00	59	65	66	73	58	66	77	67	65	80	81	78
OCDD-C13	4.00	59	43	32	76	69	71	100	69	71	85	47	81
1234-TCDD-C13	2.00	na	na	na	na	na	na	na	na	na	na	na	na
123789-HxCDD-C13	2.00	na	na	na	na	na	na	na	na	na	na	na	na
2378-TCDD-C137	0.80	51	58	74	68	71	59	68	72	68	64	73	(a)

(a) No data

TABLE C.5. Quality Assurance for Sediment Dioxins (Cont'd) Surrogate Recovery (%) (Cont'd)

Native Isomer	ng's Added	Percent Recovered 8A-C	9A	9B	9C	9A-C	10A	10B	10C	10A-C	11A	11C	11A-C
2378-TCDF-C13	2.00	83	61	57	65	60	80	81	57	63	83	81	77
2378-TCDD-C13	2.00	84	63	62	64	60	78	77	60	65	79	86	77
12378-PeCDF-C13	2.00	71	66	70	75	69	72	79	58	64	98	94	81
23478-PeCDF-C13	2.00	66	64	68	71	69	67	71	56	65	111	88	83
12378-PeCDD-C13	2.00	70	64	75	77	75	71	78	61	70	120	93	88
123478-HxCDF-C13	2.00	56	50	51	54	50	55	44	47	43	68	53	68
123678-HxCDF-C13	2.00	70	50	66	57	60	70	61	56	51	77	70	65
123789-HxCDF-C13	2.00	66	57	61	55	56	65	65	54	57	106	69	64
234678-HxCDF-C13	2.00	66	63	66	58	59	67	65	54	63	75	73	69
123478-HxCDD-C13	2.00	75	66	62	71	64	73	77	64	72	89	86	77
123678-HxCDD-C13	2.00	72	61	72	59	67	74	64	60	62	74	73	68
1234678-HpCDF-C13	2.00	55	62	58	56	54	65	59	51	56	67	66	68
1234789-HpCDF-C13	2.00	74	77	70	70	64	84	75	61	69	81	76	81
1234678-HpCDD-C13	2.00	72	75	64	62	63	79	67	62	66	74	74	77
OCDD-C13	4.00	35	82	55	75	53	42	61	71	73	79	76	83
1234-TCDD-C13	2.00	na	na	na	na	na	na	na	na	na	na	na	na
123789-HxCDD-C13	2.00	na	na	na	na	na	na	na	na	na	na	na	na
2378-TCDD-C137	0.80	77	60	57	65	65	72	82	61	69	80	85	(a)

(a) No data

TABLE C.5. Quality Assurance for Sediment Dioxins (Cont'd) Surrogate Recovery (%) (Cont'd)

Native Isomer	ng's Added	Percent Recovered 12A	12C	12A-C	13A	13C	13A-C	14A	14C	14A-C	17A	17B	17C	SB	WB
2378-TCDF-C13	2.00	65	59	78	78	73	65	73	66	68	76	85	49	71	54
2378-TCDD-C13	2.00	60	63	79	79	71	60	76	64	72	79	81	60	69	52
12378-PeCDF-C13	2.00	76	75	86	87	87	74	73	65	80	80	96	72	89	70
23478-PeCDF-C13	2.00	83	76	85	85	87	73	68	60	79	79	104	81	97	69
12378-PeCDD-C13	2.00	84	82	97	94	96	78	74	67	84	87	112	95	112	73
123478-HxCDF-C13	2.00	36	68	68	80	49	39	51	58	70	65	69	58	74	53
123678-HxCDF-C13	2.00	50	73	73	82	65	56	70	62	75	71	73	62	68	55
123789-HxCDF-C13	2.00	57	73	69	79	64	57	64	60	72	65	70	59	68	54
234678-HxCDF-C13	2.00	60	76	74	83	68	61	67	57	79	71	75	64	74	59
123478-HxCDD-C13	2.00	72	84	88	98	73	64	75	70	80	74	77	64	64	59
123678-HxCDD-C13	2.00	58	74	71	82	71	68	68	64	81	78	79	67	78	54
1234678-HpCDF-C13	2.00	51	68	68	85	62	53	58	62	48	71	75	61	70	54
1234789-HpCDF-C13	2.00	62	79	84	87	73	66	74	74	87	80	87	69	82	64
1234678-HpCDD-C13	2.00	60	73	70	88	74	66	65	72	85	75	80	66	75	62
OCDD-C13	4.00	63	64	77	85	68	68	57	83	87	79	89	69	74	59
1234-TCDD-C13	2.00	na	na	na	na	na	na	na	na	na	na	na	na	na	na
123789-HxCDD-C13	2.00	na	na	na	na	na	na	na	na	na	na	na	na	na	na
2378-TCDD-C137	0.80	64	63	(a)	79	68	63	80	64	71	(a)	83	61	72	57

(a) No data

TABLE C.5. Quality Assurance for Sediment Dioxins (Cont'd)
Surrogate Recovery (%)
Method Blanks and Matrix Spikes

Native Isomer	ng's Added	MBL R1	Percent Recovered MBL R1-14	MBL R8	MBL R20	Spike R12	Percent Recovered Spike R-3-3	Spike R9	Spike R21
2378-TCDF-C13	2.00	70	37	35	70	39	66	56	77
2378-TCDD-C13	2.00	70	41	39	71	37	72	59	71
12378-PeCDF-C13	2.00	95	56	54	60	53	75	81	78
23478-PeCDF-C13	2.00	104	58	56	59	55	79	84	88
12378-PeCDD-C13	2.00	111	48	62	57	58	85	90	92
123478-HxCDF-C13	2.00	67	60	55	63	45	64	74	71
123678-HxCDF-C13	2.00	66	64	56	64	52	64	70	70
123789-HxCDF-C13	2.00	65	61	55	65	49	65	71	64
234678-HxCDF-C13	2.00	66	60	59	66	51	64	74	63
123478-HxCDD-C13	2.00	80	69	63	76	49	74	71	67
123678-HxCDD-C13	2.00	70	63	57	63	52	72	83	80
1234678-HpCDF-C13	2.00	62	56	54	61	48	59	62	62
1234789-HpCDF-C13	2.00	74	63	67	77	56	70	80	72
1234678-HpCDD-C13	2.00	73	60	66	73	51	70	74	76
OCDD-C13	4.00	72	48	65	81	43	74	64	72
1234-TCDD-C13	2.00	na	na	na	na	XX	XX	XX	XX
123789-HxCDD-C13	2.00	na	na	na	na	XX	XX	XX	XX
2378-TCDD-C137	0.80	(a)	47	47	67	39	59	55	68

(a) No data

TABLE C.6. Quality Assurance for Sediment Guaiacols/Organic Acids Method Blank Data

Laboratory ID Compound	Method Blank	West Beach Matrix Spike	West Beach Spike Duplicate
Guaiacol	67 U[(a)]	61 U	68 U
4-Chloroguaiacol	67 U	--	--
Isoeugenol	67 U	61 U	68 U
Eugenol	67 U	61 U	68 U
4,5-Dichloroguaiacol	67 U	61 U	68 U
4,5,6-Trichloroguaiacol	67 U	61 U	68 U
3,4,5-Trichloroguaiacol	67 U	61 U	68 U
Tetrachloroguaiacol	67 U	--	--
Catechol	67 U	61 U	68 U
4-Chlorocatechol	67 U	61 U	68 U
4,5-Dichlorocatechol	67 U	61 U	68 U
6-Chlorovanillin	67 U	61 U	68 U
3,4,5-Trichlorocatechol	67 U	61 U	68 U
Trichlorosyringol	67 U	61 U	68 U
5,6-Dichlorovanillin	67 U	61 U	68 U
Tetrachlorocatechol	67 U	61 U	68 U
Heptanoic Acid	67 U	61 U	68 U
Palmitoleic Acid	130 U	930	1100
Linoleic Acid	67 U	61 U	68 U
Linolenic Acid	67 U	61 U	68 U
Oleic Acid	330 U	310 J[(b)]	330 J
Stearic Acid	67 U	59 J	58 J
Hexadecanedioic Acid	130 U	120 U	140 U
Pimaric Acid	67 U	61 U	68 U
Sandaracopimaric Acid	67 U	--	--
Isopimaric Acid	67 U	61 U	68 U
Palustrate Acid	67 U	61 U	68 U
Dehydroabietic Acid	67 U	--	--
Abietic Acid	67 U	61 U	68 U
Neoabietic Acid	67 U	--	--
1,4-Chloroabietic Acid	67 U	61 U	68 U
1,2-Chloroabietic Acid	67 U	61 U	68 U
Dichloroabietic Acid	67 U	--	--
Surrogate Recovery (%):			
Dihydroxy-d4-Benzene	50.5	74.6	77.2
O-Methyl Podocapric Acid	94.7	110	115

(a) U indicates compound undetected at given detection limit
(b) J indicates estimated value for result less than detection limit

TABLE C.6. Quality Assurance for Sediment Guaiacols/Organic Acids (Cont'd)

Matrix Spike Recovery

	Spike Added (µg/Kg)	Sample Conc (µg/Kg)	MS Conc (µg/Kg)	MS% Rec
4-Chloroguaiacol	3200	0	2771	86.6
Tetrachloroguaiacol	3200	0	3116	97.4
Sandaracopimaric Acid	3200	0	2789	87.1
Dehydroabietic Acid	3200	0	3224	101.0
Neoabietic Acid	3200	0	52	1.6
Dichloroabietic Acid	3200	0	2551	79.7

Matrix Spike Dulicate Recovery

	Spike Added (µg/Kg)	MSD Conc (µg/Kg)	MSD % Rec	% RPD
4-Chloroguaiacol	3200	2661	83.2	4
Tetrachloroguaiacol	3200	3549	111.0	-13
Sandaracopimaric Acid	3200	2982	93.2	-7
Dehydroabietic Acid	3200	2998	93.7	7
Neoabietic Acid	3200	725	22.7	-173
Dichloroabietic Acid	3200	2870	89.7	-12

TABLE C.7. Quality Assurance for Elutriate Guaiacols/Organic Acids (Concentrations in μg/L)

Laboratory ID Compound	Method Blank	Sta. 15 Matrix Spike	Sta. 15 Spike Duplicate
Guaiacol	1 U	1 U	1 U
4-Chloroguaiacol	1 U	--	--
Isoeugenol	1 U	1 U	1 U
Eugenol	1 U	1 U	1 U
4,5-Dichloroguaiacol	1 U	1 U	1 U
4,5,6-Trichloroguaiacol	1 U	1 U	1 U
3,4,5-Trichloroguaiacol	1 U	1 U	1 U
Tetrachloroguaiacol	1 U	--	--
Catechol	1 U	1 U	1 U
4-Chlorocatechol	1 U	1 U	1 U
4,5-Dichlorocatechol	1 U	1 U	1 U
6-Chlorovanillin	1 U	1 U	1 U
3,4,5-Trichlorocatechol	1 U	1 U	1 U
Trichlorosyringol	1 U	1 U	1 U
5,6-Dichlorovanillin	1 U	1 U	1 U
Tetrachlorocatechol	1 U	1 U	1 U
Heptanoic Acid	1 U	1 U	1 U
Palmitoleic Acid	2 U	3	3
Linoleic Acid	1 U	1 U	1 U
Linolenic Acid	1 U	1 U	1 U
Oleic Acid	5 U	7 J	7 J
Stearic Acid	1 U	1 J	1 J
Hexadecanedioic Acid	2 U	3 U	3 U
Pimaric Acid	1 U	1 U	1 U
Sandaracopimaric Acid	1 U	--	--
Isopimaric Acid	1 U	1 U	1 U
Palustrate Acid	1 U	1 U	1 U
Dehydroabietic Acid	1 U	--	--
Abietic Acid	1 U	1 U	1 U
Neoabietic Acid	1 U	--	--
1,4-Chloroabietic Acid	1 U	1 U	1 U
1,2-Chloroabietic Acid	1 U	1 U	1 U
Dichloroabietic Acid	1 U	--	--
Surrogate Recovery (%):			
O-Methyl Podocaprate Acid	62.1	95.8	102

TABLE C.7. Quality Assurance for Elutriate Guaiacols/Organic Acids (Cont'd)

Matrix Spike Recovery

	Spike Added (μg/L)	Sample Conc (μg/L)	MS Conc (μg/L)	MS % Rec
4-Chloroguaiacol	71.0	0.0	36.4	51.3
Tetrachloroguaiacol	71.0	0.0	72.0	101.0
Sandaracopimaric Acid	71.0	0.0	60.5	85.3
Dehydroabietic Acid	71.0	0.0	55.4	78.1
Neoabietic Acid	71.0	0.0	0.0	0.0
Dichloroabietic Acid	71.0	0.0	48.7	68.6

Matrix Spike Dulicate Recovery

	Spike Added (μg/Kg)	MSD Conc (μg/Kg)	MSD %Rec	% RPD
4-Chloroguaiacol	71.0	26.9	37.9	30
Tetrachloroguaiacol	71.0	75.4	106.0	-5
Sandaracopimaric Acid	71.0	65.3	92.0	-8
Dehydroabietic Acid	71.0	61.0	86.0	-10
Neoabietic Acid	71.0	0.0	0.0	N/A
Dichloroabietic Acid	71.0	56.0	78.9	-14

TABLE C.8. Quality Assurance for Sediment Organic Carbon

Duplicate Sample Results

Sample	Rep 1	Rep 2	% RPD
10 A-C	1.63	1.64	0.61
Sequim Bay	2.03	2.03	0.00

No spike or blank data required for this analysis.

APPENDIX D

30-DAY TISSUE CHEMISTRY DATA

TABLE D.1. 30-Day Tissue Dioxin Results, background corrected, ng/Kg wet

STATION 1A-C	Rep 1		Rep 2		Rep 3		Average Congener Concentrations				Average TEF Concentrations		
Native Isomer	Conc.	D.L.	Conc.	D.L.	Conc.	D.L.	Mean Det. Values	Mean Det. + 1/2 D.L.	Mean D.L.	TEF	Mean Det. Values	Mean Det. + 1/2 D.L.	Mean D.L.
2378-TCDF	nd	0.51	0.00	--	nd	1.40	0.00	0.32	0.96	0.10	0.0000	0.0318	0.0960
Total TCDF	nd	--	0.00	--	nd	--	0.00	0.00	--	0.000	0.0000	0.0000	--
2378-TCDD	nd	0.76	nd	0.52	nd	1.50	nd	0.46	0.93	1.00	nd	0.4600	0.9267
Total TCDD	nd	--	nd	--	nd	--	nd	N/A	--	0.00	nd	N/A	--
12378-PeCDF	nd	0.25	0.49	--	nd	0.41	0.49	0.27	0.33	0.05	0.0245	0.0137	0.0165
23478-PeCDF	nd	0.21	0.49	--	nd	0.39	0.49	0.26	0.30	0.50	0.2450	0.1317	0.1500
Total PeCDF	nd	--	0.98	--	nd	--	0.98	0.98	--	0.000	0.0000	0.0000	--
12378-PeCDD	nd	0.25	0.48	--	nd	0.46	0.48	0.28	0.36	0.50	0.2400	0.1392	0.1800
Total PeCDD	nd	--	0.48	--	nd	--	0.48	0.48	--	0.000	0.0000	0.0000	--
123478-HxCDF	nd	0.50	0.58	--	nd	0.40	0.58	0.34	0.45	0.10	0.0580	0.0343	0.0450
123678-HxCDF	nd	0.14	0.62	--	nd	0.25	0.62	0.27	0.20	0.10	0.0620	0.0272	0.0200
123789-HxCDF	0.42	--	0.60	--	nd	0.47	0.51	0.42	0.47	0.10	0.0510	0.0418	0.0470
234678-HxCDF	nd	0.42	0.54	--	nd	0.56	0.54	0.34	0.49	0.10	0.0540	0.0343	0.0490
Total-HxCDF	0.42	--	2.30	--	nd	--	1.36	1.36	--	0.0000	0.0000	0.0000	--
123478-HxCDD	nd	0.41	0.59	--	nd	0.83	0.59	0.40	0.62	0.10	0.0590	0.0403	0.0620
123678-HxCDD	nd	0.58	0.55	--	nd	0.78	0.55	0.41	0.68	0.10	0.0550	0.0410	0.0680
123789-HxCDD	nd	0.58	0.37	--	nd	0.59	0.37	0.32	0.59	0.10	0.0370	0.0318	0.0590
Total-HxCDD	1.90	--	1.50	--	1.90	--	1.77	1.77	--	0.0000	0.0000	0.0000	--
1234678-HpCDF	0.27	--	0.30	--	nd	0.99	0.29	0.36	0.99	0.01	0.0029	0.0036	0.0099
1234789-HpCDF	nd	0.39	nd	0.79	nd	0.65	nd	0.31	0.61	0.01	nd	0.0031	0.0061
Total HpCDF	1.97	--	0.30	--	1.07	--	1.11	1.11	--	0	0.0000	0.0000	--
1234678-HpCDD	1.90	--	0.30	--	2.20	--	1.47	1.47	--	0.01	0.0147	0.0147	--
Total HpCDD	2.50	--	0.00	--	3.40	--	1.97	1.97	--	0	0.0000	0.0000	--
OCDF	3.20	--	0.60	--	4.10	--	2.63	2.63	--	0.001	0.0026	0.0026	--
OCDD	75.00	--	5.00	--	133.00	--	71.00	71.00	--	0.001	0.0710	0.0710	--
Total TEF adjusted values											0.9767	1.1221	

TABLE D.1. 30-Day Tissue Dioxin Results (Cont'd)

STATION 2A	Rep 1		Rep 2		Rep 3		Average Congener Concentrations				Average TEF Concentrations		
Native Isomer	Conc.	D.L.	Conc.	D.L.	Conc.	D.L.	Mean Det. Values	Mean Det. + 1/2 D.L.	Mean D.L.	TEF	Mean Det. Values	Mean Det. + 1/2 D.L.	Mean D.L.
2378-TCDF	0.75	--	nd	0.54	0.27	--	0.51	0.43	0.54	0.10	0.0510	0.0430	0.0540
Total TCDF	0.75	--	nd	--	0.27	--	0.51	0.51	--	0.000	0.0000	0.0000	--
2378-TCDD	nd	1.60	nd	1.00	nd	0.50	nd	0.52	1.03	1.00	nd	0.5167	1.0333
Total TCDD	nd	--	nd	--	0.79	--	0.79	0.79	--	0.00	0.0000	0.0000	--
12378-PeCDF	nd	0.52	nd	0.25	0.18	--	0.18	0.19	--	0.05	0.0090	0.0094	--
23478-PeCDF	nd	0.55	nd	0.22	nd	0.19	nd	0.16	0.32	0.50	nd	0.0800	0.1600
Total PeCDF	nd	--	nd	--	0.18	--	0.18	0.18	--	0.000	0.0000	0.0000	--
12378-PeCDD	nd	0.70	nd	0.32	nd	0.20	nd	0.20	0.41	0.50	nd	0.1000	0.2033
Total PeCDD	nd	--	nd	--	0.34	--	0.34	0.34	--	0.000	0.0000	0.0000	--
123478-HxCDF	nd	0.62	nd	0.19	0.18	--	0.18	0.20	0.41	0.10	0.0180	0.0195	0.0405
123678-HxCDF	0.38	--	nd	0.25	nd	0.16	0.38	0.20	0.21	0.10	0.0380	0.0195	0.0210
123789-HxCDF	0.71	--	nd	0.41	nd	0.29	0.71	0.35	0.35	0.10	0.0710	0.0353	0.0350
234678-HxCDF	nd	0.95	nd	0.46	nd	0.45	nd	0.31	0.62	0.10	nd	0.0310	0.0620
Total-HxCDF	1.10	--	0.66	--	0.18	--	0.65	0.65	--	0.0000	0.0000	0.0000	--
123478-HxCDD	nd	0.98	nd	0.44	0.20	--	0.20	0.30	0.70	0.10	0.0200	0.0303	0.0700
123678-HxCDD	nd	0.75	nd	0.38	0.71	--	0.71	0.43	0.57	0.10	0.0710	0.0425	0.0570
123789-HxCDD	nd	0.84	nd	0.38	nd	0.36	nd	0.26	0.53	0.10	nd	0.0260	0.0527
Total-HxCDD	3.20	--	1.20	--	2.70	--	2.37	2.37	--	0.0000	0.0000	0.0000	--
1234678-HpCDF	0.57	--	0.22	--	0.19	--	0.33	0.33	--	0.01	0.0033	0.0033	--
1234789-HpCDF	nd	0.58	nd	0.34	nd	0.29	nd	0.20	0.40	0.01	nd	0.0020	0.0040
Total HpCDF	2.07	--	1.67	--	1.27	--	1.46	1.46	--	0	0.0036	0.0000	--
1234678-HpCDD	nd	--	1.70	--	0.80	--	1.25	1.25	--	0.01	0.0125	0.0125	--
Total HpCDD	6.10	--	2.70	--	0.80	--	3.20	3.20	--	0	0.0000	0.0000	--
OCDF	4.20	--	3.60	--	0.30	--	2.70	2.70	--	0.001	0.0027	0.0027	--
OCDD	133.00	--	51.00	--	3.00	--	62.33	62.33	--	0.001	0.0623	0.0623	--
Total TEF adjusted values											0.3588	1.0360	

TABLE D.1. 30-Day Tissue Dioxin Results (Cont'd)

STATION 3A-C	Rep 1		Rep 2		Rep 3		Average Congener Concentrations				Average TEF Concentrations		
Native Isomer	Conc.	D.L.	Conc.	D.L.	Conc.	D.L.	Mean Det. Values	Mean Det. + 1/2 D.L.	Mean D.L.	TEF	Mean Det. Values	Mean Det. + 1/2 D.L.	Mean D.L.
2378-TCDF	0.15	--	nd	0.75	0.24	--	0.20	0.26	0.75	0.10	0.0195	0.0260	0.0750
Total TCDF	0.15	--	nd	--	0.58	--	0.37	0.37	--	0.000	0.0000	0.0000	—
2378-TCDD	nd	0.61	nd	2.00	nd	0.53	nd	0.52	1.05	1.00	nd	0.5200	1.0467
Total TCDD	0.73	--	nd	--	0.39	--	0.56	0.56	--	0.00	0.0000	0.0000	—
12378-PeCDF	0.20	--	nd	0.43	nd	0.25	0.20	0.18	0.34	0.05	0.0100	0.0090	0.0170
23478-PeCDF	0.15	--	nd	0.22	0.29	--	0.22	0.18	0.22	0.50	0.1100	0.0917	0.1100
Total PeCDF	0.35	--	nd	--	0.29	--	0.32	0.32	--	0.000	0.0000	0.0000	—
12378-PeCDD	nd	0.21	nd	0.29	nd	0.22	nd	0.12	0.24	0.50	nd	0.0600	0.1200
Total PeCDD	nd	--	nd	--	nd	--	nd	N/A	--	0.000	nd	N/A	—
123478-HxCDF	nd	0.49	nd	0.41	nd	0.43	nd	0.22	0.44	0.10	nd	0.0220	0.0443
123678-HxCDF	nd	0.19	nd	0.35	nd	0.25	nd	0.13	0.26	0.10	nd	0.0132	0.0263
123789-HxCDF	0.35	--	nd	0.63	nd	0.40	0.35	0.29	0.52	0.10	0.0350	0.0288	0.0520
234678-HxCDF	nd	0.74	nd	0.71	nd	0.55	nd	0.33	0.67	0.10	nd	0.0333	0.0667
Total-HxCDF	0.35	--	nd	--	nd	--	0.35	0.35	--	0.0000	0.0000	0.0000	—
123478-HxCDD	nd	0.42	nd	0.34	nd	0.41	nd	0.20	0.39	0.10	nd	0.0195	0.0390
123678-HxCDD	nd	0.58	nd	0.55	nd	1.10	nd	0.37	0.74	0.10	nd	0.0372	0.0743
123789-HxCDD	nd	0.80	nd	0.34	nd	0.97	nd	0.35	0.70	0.10	nd	0.0352	0.0703
Total-HxCDD	nd	--	nd	--	nd	--	nd	N/A	—	0.0000	nd	0.0000	—
1234678-HpCDF	nd	0.43	nd	0.71	nd	3.00	nd	0.69	1.38	0.01	nd	0.0069	0.0138
1234789-HpCDF	nd	0.55	nd	0.94	nd	0.46	nd	0.33	0.65	0.01	nd	0.0033	0.0065
Total HpCDF	nd	--	nd	--	nd	--	nd	N/A	--	0	nd	N/A	—
1234678-HpCDD	0.70	--	0.80	--	0.00	--	0.50	0.50	--	0.01	0.0050	0.0050	—
Total HpCDD	0.30	--	0.40	--	0.00	--	0.23	0.23	--	0	0.0000	0.0000	—
OCDF	0.80	--	2.70	--	nd	1.40	1.75	1.40	1.40	0.001	0.0018	0.0014	0.0014
OCDD	17.00	--	63.00	--	5.00	--	28.33	28.33	--	0.001	0.0283	0.0283	—
Total TEF adjusted values											0.2096	0.9407	

TABLE D.1. 30-Day Tissue Dioxin Results (Cont'd)

STATION 4A-C							Average Congener Concentrations				Average TEF Concentrations		
	Rep 1		Rep 2		Rep 3		Mean Det.	Mean Det.	Mean		Mean Det.	Mean Det.	Mean
Native Isomer	Conc.	D.L.	Conc.	D.L.	Conc.	D.L.	Values	+ 1/2 D.L.	D.L.	TEF	Values	+ 1/2 D.L.	D.L.
2378-TCDF	nd	0.77	0.14	--	0.45	--	0.30	0.33	0.77	0.10	0.0295	0.0325	0.0770
Total TCDF	nd	--	0.14	--	0.45	--	0.30	0.30	--	0.000	0.0000	0.0000	—
2378-TCDD	nd	0.85	nd	0.52	nd	1.10	nd	0.32	0.64	1.00	nd	0.3200	0.6400
Total TCDD	nd	--	0.44	--	nd	--	0.44	0.44	--	0.00	0.0000	0.0000	—
12378-PeCDF	0.36	--	0.24	--	nd	0.23	0.30	0.24	0.23	0.05	0.0150	0.0119	0.0115
23478-PeCDF	0.34	--	0.28	--	nd	0.16	0.31	0.23	0.16	0.50	0.1550	0.1167	0.0800
Total PeCDF	0.70	--	1.10	--	nd	--	0.90	0.90	--	0.000	0.0000	0.0000	—
12378-PeCDD	nd	0.84	nd	0.32	nd	0.57	nd	0.29	0.58	0.50	nd	0.1442	0.2883
Total PeCDD	nd	--	0.20	--	nd	--	0.20	0.20	--	0.000	0.0000	0.0000	—
123478-HxCDF	0.63	--	0.34	--	nd	0.40	0.49	0.39	0.40	0.10	0.0485	0.0390	0.0400
123678-HxCDF	0.37	--	0.27	--	nd	0.27	0.32	0.26	0.27	0.10	0.0320	0.0258	0.0270
123789-HxCDF	nd	0.48	nd	0.81	0.39	--	0.39	0.35	0.65	0.10	0.0390	0.0345	0.0650
234678-HxCDF	nd	0.77	nd	0.44	nd	0.55	nd	0.29	0.59	0.10	nd	0.0293	0.0587
Total-HxCDF	1.00	--	0.61	--	0.39	--	0.67	0.67	--	0.0000	0.0000	0.0000	—
123478-HxCDD	nd	0.38	nd	0.43	nd	0.42	nd	0.21	0.41	0.10	nd	0.0205	0.0410
123678-HxCDD	nd	0.41	nd	0.56	nd	0.48	nd	0.24	0.48	0.10	nd	0.0242	0.0483
123789-HxCDD	nd	0.54	nd	0.70	nd	0.34	nd	0.26	0.53	0.10	nd	0.0263	0.0527
Total-HxCDD	0.91	--	0.75	--	nd	--	0.83	0.83	--	0.0000	0.0000	0.0000	—
1234678-HpCDF	1.47	--	0.26	--	0.57	--	0.77	0.77	--	0.01	0.0077	0.0077	—
1234789-HpCDF	1.50	--	0.21	--	nd	0.64	0.86	0.68	0.64	0.01	0.0086	0.0068	0.0064
Total HpCDF	4.97	--	1.87	--	2.27	--	3.04	3.04	--	0	0.0000	0.0000	—
1234678-HpCDD	1.50	--	0.30	--	2.70	--	1.50	1.50	--	0.01	0.0150	0.0000	—
Total HpCDD	3.10	--	0.00	--	4.10	--	2.40	2.40	--	0	0.0000	0.6150	—
OCDF	1.70	--	0.60	--	4.50	--	2.27	2.27	--	0.001	0.0023	0.0000	—
OCDD	6.00	--	8.05	--	93.00	--	35.67	35.67	--	0.001	0.0357	0.0023	—
Total TEF adjusted values											0.3882	0.8566	

TABLE D.1. 30-Day Tissue Dioxin Results (Cont'd)

STATION 5A-C	Rep 1		Rep 2		Rep 3		Average Congener Concentrations				Average TEF Concentrations		
Native Isomer	Conc.	D.L.	Conc.	D.L.	Conc.	D.L.	Mean Det. Values	Mean Det. + 1/2 D.L.	Mean D.L.	TEF	Mean Det. Values	Mean Det. + 1/2 D.L.	Mean D.L.
2378-TCDF	nd	1.30	0.02	--	0.08	--	0.05	0.25	1.30	0.10	0.0050	0.0250	—
Total TCDF	nd	--	0.02	--	0.08	--	0.05	0.05	—	0.000	0.0000	0.0000	—
2378-TCDD	nd	1.30	0.44	--	nd	0.65	0.44	0.47	0.98	1.00	0.4400	0.4717	0.9750
Total TCDD	nd	--	0.68	--	nd	--	0.68	0.68	—	0.00	0.0000	0.0000	—
12378-PeCDF	nd	0.36	nd	0.08	nd	0.19	nd	0.11	0.21	0.05	nd	0.0053	0.0105
23478-PeCDF	nd	0.19	nd	0.08	0.18	—	0.18	0.11	0.14	0.50	0.0900	0.0527	0.0675
Total PeCDF	nd	--	0.39	--	0.18	--	0.29	0.29	—	0.000	0.0000	0.0000	—
12378-PeCDD	nd	0.43	nd	0.07	nd	0.29	nd	0.13	0.26	0.50	nd	0.0662	0.1323
Total PeCDD	nd	--	0.27	--	nd	--	0.27	0.27	—	0.000	0.0000	0.0000	—
123478-HxCDF	nd	0.32	nd	0.15	0.31	--	0.31	0.18	0.24	0.10	0.0310	0.0180	0.0235
123678-HxCDF	nd	0.27	nd	0.10	0.28	--	0.28	0.16	0.19	0.10	0.0280	0.0155	0.0185
123789-HxCDF	0.50	--	0.16	—	0.47	—	0.38	0.38	—	0.10	0.0377	0.0377	—
234678-HxCDF	nd	0.63	nd	0.17	nd	0.46	nd	0.21	0.42	0.10	nd	0.0210	0.0420
Total-HxCDF	0.50	--	0.16	--	1.10	--	0.59	0.59	—	0.0000	0.0000	0.0000	—
123478-HxCDD	nd	1.10	nd	0.10	nd	0.39	nd	0.26	0.53	0.10	nd	0.0264	0.0529
123678-HxCDD	nd	0.51	0.21	--	nd	0.31	0.21	0.21	0.41	0.10	0.0210	0.0207	0.0410
123789-HxCDD	nd	0.44	nd	0.21	nd	0.27	nd	0.15	0.31	0.10	nd	0.0153	0.0307
Total-HxCDD	nd	--	2.00	--	nd	--	2.00	2.00	—	0.0000	0.0000	0.0000	—
1234678-HpCDF	nd	0.75	nd	0.52	0.29	--	0.29	0.29	0.64	0.01	0.0029	0.0029	—
1234789-HpCDF	nd	0.57	nd	0.17	nd	0.35	nd	0.18	0.36	0.01	nd	0.0018	0.0036
Total HpCDF	nd	--	0.05	--	1.47	--	0.76	0.76	--	0	0.0000	0.0000	—
1234678-HpCDD	2.00	--	0.00	--	1.00	--	1.00	1.00	—	0.01	0.0100	0.0100	—
Total HpCDD	2.70	--	0.00	--	0.70	--	1.13	1.13	—	0	0.0000	0.0000	—
OCDF	2.30	--	0.00	--	0.90	--	1.07	1.07	--	0.001	0.0011	0.0011	—
OCDD	54.00	--	3.00	--	45.00	—	34.00	34.00	—	0.001	0.0340	0.0340	—
Total TEF adjusted values											0.7006	0.8251	

TABLE D.1. 30-Day Tissue Dioxin Results (Cont'd)

STATION 6A-C	Rep 1		Rep 2		Rep 3		Average Congener Concentrations				Average TEF Concentrations		
Native Isomer	Conc.	D.L.	Conc.	D.L.	Conc.	D.L.	Mean Det. Values	Mean Det. + 1/2 D.L.	Mean D.L.	TEF	Mean Det. Values	Mean Det. + 1/2 D.L.	Mean D.L.
2378-TCDF	nd	1.30	0.21	--	0.43	--	0.32	0.43	1.30	0.10	0.0320	0.0430	0.1300
Total TCDF	nd	--	0.21	--	0.43	--	0.32	0.32	—	0.000	0.0000	0.0000	—
2378-TCDD	nd	0.64	nd	1.10	nd	1.00	nd	0.46	0.91	1.00	nd	0.4567	0.9133
Total TCDD	0.77	--	nd	--	nd	--	0.77	0.77	—	0.00	0.0000	0.0000	—
12378-PeCDF	nd	0.31	nd	0.19	nd	0.15	nd	0.11	0.22	0.05	nd	0.0054	0.0108
23478-PeCDF	nd	0.19	nd	0.19	nd	0.22	nd	0.10	0.20	0.50	nd	0.0500	0.0100
Total PeCDF	nd	--	2.00	--	nd	--	2.00	2.00	—	0.000	0.0000	0.0000	—
12378-PeCDD	nd	0.24	nd	0.39	nd	0.52	nd	0.19	0.38	0.50	nd	0.0958	0.1917
Total PeCDD	0.44	--	0.45	--	nd	--	0.45	0.45	—	0.000	0.0000	0.0000	—
123478-HxCDF	nd	0.25	0.47	--	0.40	--	0.44	0.33	0.25	0.10	0.0435	0.0332	0.0250
123678-HxCDF	nd	0.47	nd	0.28	nd	0.34	nd	0.18	0.36	0.10	nd	0.0182	0.0365
123789-HxCDF	nd	0.71	nd	0.45	0.42	--	0.42	0.33	0.58	0.10	0.0420	0.0333	0.0582
234678-HxCDF	nd	0.30	nd	0.70	nd	0.51	nd	0.25	0.50	0.10	nd	0.0252	0.0503
Total-HxCDF	1.70	--	2.60	--	2.10	--	2.13	2.13	—	0.0000	0.0000	0.0000	—
123478-HxCDD	nd	0.34	nd	0.56	nd	0.34	nd	0.21	0.41	0.10	nd	0.0207	0.0413
123678-HxCDD	nd	0.65	0.67	--	nd	0.40	0.67	0.43	0.63	0.10	0.0670	0.0432	0.0625
123789-HxCDD	nd	0.58	0.31	--	nd	0.40	0.31	0.27	0.49	0.10	0.0310	0.0270	0.0490
Total-HxCDD	1.60	--	3.60	--	nd	--	2.60	2.60	—	0.0000	0.0000	0.0000	—
1234678-HpCDF	nd	2.40	1.27	--	1.27	--	1.27	1.25	2.40	0.01	0.0127	0.0125	0.0240
1234789-HpCDF	nd	0.86	nd	0.22	nd	0.37	nd	0.25	0.49	0.01	nd	0.0025	0.0049
Total HpCDF	3.77	--	5.57	--	4.67	--	4.67	4.67	--	0	0.0000	0.0000	—
1234678-HpCDD	1.90	--	1.90	--	2.60	--	2.13	2.13	—	0.01	0.0213	0.0213	—
Total HpCDD	0.20	--	3.40	--	7.70	--	3.77	3.77	—	0	0.0600	0.0000	—
OCDF	5.80	--	5.00	--	3.00	--	4.60	4.60	—	0.001	0.0046	0.0046	—
OCDD	38.00	--	42.00	--	46.00	--	42.00	42.00	—	0.001	0.0420	0.0420	—
Total TEF adjusted values											0.2961	0.9346	

TABLE D.1. 30-Day Tissue Dioxin Results (Cont'd)

STATION 7C							Average Congener Concentrations				Average TEF Concentrations		
	Rep 1		Rep 2		Rep 3		Mean Det.	Mean Det.	Mean		Mean Det.	Mean Det.	Mean
Native Isomer	Conc.	D.L.	Conc.	D.L.	Conc.	D.L.	Values	+ 1/2 D.L.	D.L.	TEF	Values	+ 1/2 D.L.	D.L.
2378-TCDF	0.00	--	0.33	--	nd	0.70	0.17	0.23	0.70	0.10	0.0165	0.0227	0.0700
Total TCDF	0.00	--	0.33	--	nd	--	0.17	0.17	—	0.000	0.0000	0.0000	—
2378-TCDD	nd	0.40	nd	0.72	nd	0.79	nd	0.32	0.64	1.00	nd	0.3183	0.6367
Total TCDD	0.89	--	nd	--	nd	--	0.89	0.89	—	0.00	0.0000	0.0000	—
12378-PeCDF	nd	0.13	nd	0.24	nd	0.17	nd	0.09	0.18	0.05	nd	0.0045	0.0090
23478-PeCDF	nd	0.07	nd	0.25	nd	0.18	nd	0.08	0.17	0.50	nd	0.0417	0.0833
Total PeCDF	nd	--	nd	--	nd	--	nd	N/A	—	0.000	nd	0.0000	—
12378-PeCDD	nd	0.17	nd	0.28	nd	0.26	nd	0.12	0.24	0.50	nd	0.0592	0.1183
Total PeCDD	nd	--	nd	--	nd	—	nd	N/A	—	0.030	nd	0.0000	—
123478-HxCDF	nd	0.18	nd	0.33	nd	0.40	nd	0.15	0.30	0.10	nd	0.0152	0.0303
123678-HxCDF	nd	0.12	nd	0.22	nd	0.16	nd	0.08	0.17	0.10	nd	0.0083	0.0167
123789-HxCDF	nd	0.21	0.50	--	nd	0.66	0.50	0.31	0.44	0.10	0.0500	0.0312	0.0435
234678-HxCDF	nd	0.36	nd	0.39	nd	1.20	nd	0.33	0.65	0.10	nd	0.0325	0.0650
Total-HxCDF	nd	--	0.50	--	nd	--	0.50	0.50	—	0.0000	0.0000	0.0000	—
123478-HxCDD	nd	0.21	nd	0.33	nd	0.69	nd	0.21	0.41	0.10	nd	0.0205	0.0410
123678-HxCDD	nd	0.19	nd	0.29	nd	0.50	nd	0.16	0.33	0.10	nd	0.0163	0.0327
123789-HxCDD	nd	0.30	nd	0.51	nd	0.65	nd	0.24	0.49	0.10	nd	0.0243	0.0487
Total-HxCDD	1.20	--	nd	--	nd	--	1.20	1.20	—	0.0000	0.0000	0.0000	—
1234678-HpCDF	nd	0.26	nd	2.00	nd	0.46	nd	0.45	0.91	0.01	nd	0.0045	0.0091
1234789-HpCDF	nd	0.57	nd	0.57	nd	0.46	nd	0.27	0.53	0.01	nd	0.0027	0.0053
Total HpCDF	nd	--	nd	--	nd	—	nd	N/A	—	0	nd	0.0000	—
1234678-HpCDD	nd	0.57	2.00	—	0.00	—	1.00	0.76	0.57	0.01	0.0100	0.0076	0.0057
Total HpCDD	nd	—	2.00	—	0.00	—	1.00	1.00	—	0	0.0000	0.0000	—
OCDF	nd	1.80	2.10	--	0.00	—	1.05	1.00	1.80	0.001	0.0011	0.0010	0.0018
OCDD	0.00	—	83.00	--	17.00	—	33.33	33.33	—	0.001	0.0333	0.0333	—
Total TEF adjusted values											0.1109	0.6438	

TABLE D.1. 30-Day Tissue Dioxin Results (Cont'd)

STATION 8A-C	Rep 1		Rep 2		Rep 3		Average Congener Concentrations				Average TEF Concentrations		
Native Isomer	Conc.	D.L.	Conc.	D.L.	Conc.	D.L.	Mean Det. Values	Mean Det. + 1/2 D.L.	Mean D.L.	TEF	Mean Det. Values	Mean Det. + 1/2 D.L.	Mean D.L.
2378-TCDF	nd	1.40	0.43	--	0.18	--	0.33	0.45	1.40	0.10	0.0330	0.0453	0.1400
Total TCDF	nd	--	0.48	--	0.18	--	0.33	0.33	--	0.000	0.0000	0.0000	--
2378-TCDD	nd	1.70	nd	0.81	nd	0.50	nd	0.50	1.00	1.00	nd	0.5017	1.0033
Total TCDD	nd	--	nd	--	nd	--	nd	N/A	--	0.00	nd	0.0000	--
12378-PeCDF	nd	0.52	nd	0.40	0.44	--	0.44	0.30	0.46	0.05	0.0220	0.0150	0.0230
23478-PeCDF	nd	0.40	nd	0.28	0.41	--	0.41	0.25	0.34	0.50	0.2050	0.1250	0.1700
Total PeCDF	nd	--	0.51	--	0.85	--	0.68	0.68	--	0.000	0.0000	0.0000	--
12378-PeCDD	nd	0.42	nd	0.21	0.41	--	0.41	0.24	0.32	0.50	0.2050	0.1208	0.1575
Total PeCDD	nd	--	nd	--	0.41	--	0.41	0.41	--	0.000	0.0000	0.0006	--
123478-HxCDF	nd	0.83	nd	0.27	0.82	--	0.82	0.46	0.55	0.10	0.0820	0.0457	0.0550
123678-HxCDF	nd	0.51	nd	0.18	0.52	--	0.52	0.29	0.35	0.10	0.0520	0.0288	0.0345
123789-HxCDF	nd	1.00	nd	0.41	0.84	--	0.84	0.52	0.71	0.10	0.0840	0.0515	0.0705
234678-HxCDF	nd	3.80	nd	0.42	nd	0.65	nd	0.81	1.62	0.10	nd	0.0812	0.1623
Total-HxCDF	nd	--	0.37	--	2.20	--	1.29	1.29	--	0.0000	0.0006	0.0009	--
123478-HxCDD	nd	1.30	nd	0.48	nd	0.63	nd	0.40	0.80	0.10	nd	0.0402	0.0803
123678-HxCDD	nd	0.97	nd	0.46	nd	0.61	nd	0.34	0.68	0.10	nd	0.0340	0.0680
123789-HxCDD	nd	0.81	nd	0.46	nd	0.54	nd	0.30	0.60	0.10	nd	0.0302	0.0603
Total-HxCDD	nd	--	1.00	--	nd	--	1.00	1.00	--	0.0000	0.0000	0.0000	--
1234678-HpCDF	nd	1.70	0.67	--	0.57	--	0.62	0.70	1.70	0.01	0.0062	0.0070	0.0170
1234789-HpCDF	nd	1.60	nd	0.43	nd	0.60	nd	0.44	0.88	0.01	nd	0.0044	0.0088
Total HpCDF	nd	--	3.17	--	3.57	--	3.37	3.37	--	0	0.0000	0.0000	--
1234678-HpCDD	1.80	--	1.50	--	1.90	--	1.73	1.73	--	0.01	0.0173	0.0173	--
Total HpCDD	0.10	--	2.40	--	3.00	--	1.83	1.83	--	0	0.0000	0.0000	--
OCDF	nd	7.40	1.30	--	1.90	--	1.60	2.30	7.40	0.001	0.0016	0.0023	0.0074
OCDD	26.00	--	9.00	--	27.00	--	20.67	20.67	--	0.001	0.0207	0.0207	--
Total TEF adjusted values											0.7288	1.1710	

TABLE D.1. 30-Day Tissue Dioxin Results (Cont'd)

STATION 9A-C	Rep 1		Rep 2		Rep 3		Average Congener Concentrations				Average TEF Concentrations		
Native Isomer	Conc.	D.L.	Conc.	D.L.	Conc.	D.L.	Mean Det. Values	Mean Det. + 1/2 D.L.	Mean D.L.	TEF	Mean Det. Values	Mean Det. + 1/2 D.L.	Mean D.L.
2378-TCDF	0.24	--	0.56	--	0.31	--	0.37	0.37	—	0.10	0.0370	0.0370	—
Total TCDF	0.41	--	0.56	--	0.31	--	0.43	0.43	—	0.000	0.0000	0.0000	—
2378-TCDD	nd	0.34	nd	0.82	nd	0.95	nd	0.35	0.70	1.00	nd	0.3517	0.7033
Total TCDD	0.83	--	0.52	--	0.47	--	0.61	0.61	—	0.00	0.0030	0.0000	—
12378-PeCDF	nd	0.14	nd	0.37	nd	0.24	nd	0.13	0.25	0.05	nd	0.0063	0.0125
23478-PeCDF	nd	0.08	nd	0.35	nd	0.34	nd	0.13	0.26	0.50	nd	0.0642	0.1283
Total PeCDF	0.13	--	nd	--	nd	--	0.13	0.13	--	0.000	0.0000	0.0000	—
12378-PeCDD	nd	0.13	nd	0.32	nd	0.30	nd	0.13	0.25	0.50	nd	0.0625	0.1250
Total PeCDD	0.30	--	0.42	--	nd	--	0.36	0.36	—	0.000	0.0000	0.0000	—
123478-HxCDF	nd	0.18	nd	0.60	nd	0.27	nd	0.18	0.35	0.10	nd	0.0175	0.0350
123678-HxCDF	nd	0.09	nd	0.40	nd	0.17	nd	0.11	0.22	0.10	nd	0.0110	0.0220
123789-HxCDF	nd	0.18	nd	0.67	0.40	--	0.40	0.28	0.43	0.10	0.0400	0.0275	0.0425
234678-HxCDF	nd	0.24	nd	0.71	nd	0.49	nd	0.24	0.48	0.10	nd	0.0240	0.0480
Total-HxCDF	0.54	--	nd	--	0.96	--	0.75	0.75	--	0.0000	0.0000	0.0000	—
123478-HxCDD	nd	0.15	nd	0.35	nd	0.25	nd	0.13	0.25	0.10	nd	0.0125	0.0250
123678-HxCDD	nd	0.29	0.57	--	nd	0.45	0.57	0.31	0.37	0.10	0.0570	0.0313	0.0370
123789-HxCDD	nd	0.27	nd	0.67	0.36	—	0.36	0.28	0.47	0.10	0.0360	0.0277	0.0470
Total-HxCDD	1.80	—	0.57	--	0.96	—	1.11	1.11	—	0.0000	0.0000	0.0000	—
1234678-HpCDF	nd	0.47	0.04	--	0.77	—	0.41	0.35	0.47	0.01	0.0041	0.0035	0.0047
1234789-HpCDF	nd	0.22	nd	0.86	nd	0.41	nd	0.25	0.50	0.01	nd	0.0025	0.0050
Total HpCDF	0.32	--	0.04	--	2.67	—	1.01	1.01	—	0	0.0000	0.0000	—
1234678-HpCDD	0.00	--	1.30	—	1.80	—	1.03	1.03	—	0.01	0.0103	0.0103	—
Total HpCDD	0.00	--	2.10	—	3.70	—	1.93	1.93	—	0	0.0000	0.0000	—
OCDF	0.20	--	nd	3.60	2.50	—	1.35	1.50	3.60	0.001	0.0014	0.0015	—
OCDD	7.00	--	29.00	—	68.00	—	34.67	34.67	—	0.001	0.0347	0.0347	—
Total TEF adjusted values											0.2204	0.7256	

TABLE D.1. 30-Day Tissue Dioxin Results (Cont'd)

STATION 10A-C	Rep 1		Rep 2		Rep 3		Average Congener Concentrations				Average TEF Concentrations		
Native Isomer	Conc.	D.L.	Conc.	D.L.	Conc.	D.L.	Mean Det. Values	Mean Det. + 1/2 D.L.	Mean D.L.	TEF	Mean Det. Values	Mean Det. + 1/2 D.L.	Mean D.L.
2378-TCDF	0.00	--	0.04	--	nd	0.54	0.02	0.10	0.54	0.10	0.0020	0.0103	0.0540
Total TCDF	0.00	--	0.04	--	nd	--	0.02	0.02	—	0.000	0.0000	0.0000	—
2378-TCDD	nd	0.35	nd	0.46	nd	1.10	nd	0.32	0.64	1.00	nd	0.3183	0.6367
Total TCDD	0.38	--	nd	--	0.74	--	0.56	0.56	—	0.00	0.0000	0.0000	—
12378-PeCDF	nd	0.06	nd	0.37	nd	0.14	nd	0.10	0.19	0.05	nd	0.0050	0.0095
23478-PeCDF	nd	0.11	nd	0.16	nd	0.27	nd	0.09	0.18	0.50	nd	0.0450	0.0900
Total PeCDF	nd	--	nd	--	0.42	--	0.42	0.42	—	0.000	0.0000	0.0000	—
12378-PeCDD	nd	0.15	nd	0.36	nd	0.39	nd	0.15	0.30	0.50	nd	0.0750	0.1500
Total PeCDD	0.26	--	nd	--	1.30	--	0.78	0.78	—	0.000	0.0000	0.0000	—
123478-HxCDF	nd	0.14	nd	0.31	nd	0.32	nd	0.13	0.26	0.10	nd	0.0128	0.0257
123678-HxCDF	0.10	--	nd	0.32	nd	0.30	0.10	0.14	—	0.10	0.0100	0.0137	—
123789-HxCDF	0.20	--	nd	0.42	0.26	--	0.23	0.22	—	0.10	0.0230	0.0223	—
234678-HxCDF	nd	0.19	nd	0.48	nd	0.57	nd	0.21	0.41	0.10	nd	0.0207	0.0413
Total-HxCDF	0.30	--	1.40	—	0.26	--	0.65	0.65	—	0.0000	0.0000	0.0000	—
123478-HxCDD	nd	0.23	nd	0.51	0.16	--	0.16	0.18	0.37	0.10	0.0160	0.0177	0.0370
123678-HxCDD	nd	0.26	nd	0.73	0.52	--	0.52	0.34	0.50	0.10	0.0520	0.0338	0.0495
123789-HxCDD	nd	0.12	nd	0.30	nd	0.36	nd	0.13	0.26	0.10	nd	0.0130	0.0260
Total-HxCDD	0.96	--	1.50	--	23.00	--	8.49	8.49	—	0.0000	0.0000	0.0000	—
1234678-HpCDF	0.00	--	1.47	—	nd	1.50	0.74	0.74	—	0.01	0.0074	0.0074	—
1234789-HpCDF	nd	0.23	nd	0.50	nd	0.48	nd	0.20	0.40	0.01	nd	0.0026	0.0040
Total HpCDF	1.37	--	9.47	--	3.77	—	4.87	4.87	—	0	0.0000	0.0000	—
1234678-HpCDD	0.10	--	5.60	--	4.70	--	3.47	3.47	--	0.01	0.0347	0.0347	—
Total HpCDD	0.00	--	9.70	--	48.70	--	19.47	19.47	—	0	0.0000	0.0000	—
OCDF	0.40	--	10.90	--	0.80	--	4.03	4.03	--	0.001	0.0040	0.0040	—
OCDD	8.00	--	82.00	--	93.00	--	61.00	61.00	—	0.001	0.0610	0.0610	—
Total TEF adjusted values											0.2101	0.6968	

TABLE D.1. 30-Day Tissue Dioxin Results (Cont'd)

STATION 11A-C	Rep 1		Rep 2		Rep 3		Average Congener Concentrations				Average TEF Concentrations		
Native Isomer	Conc.	D.L.	Conc.	D.L.	Conc.	D.L.	Mean Det. Values	Mean Det. + 1/2 D.L.	Mean D.L.	TEF	Mean Det. Values	Mean Det. + 1/2 D.L.	Mean D.L.
2378-TCDF	nd	1.10	0.31	--	nd	1.40	0.31	0.52	1.25	0.10	0.0310	0.0520	0.1250
Total TCDF	nd	--	0.31	--	nd	--	0.31	0.31	--	0.000	0.0000	0.0000	--
2378-TCDD	nd	1.20	nd	0.57	nd	0.93	nd	0.45	0.90	1.00	nd	0.4500	0.9000
Total TCDD	nd	--	nd	--	nd	--	nd	N/A	--	0.00	nd	N/A	--
12378-PeCDF	0.77	--	nd	0.17	nd	0.28	0.77	0.33	0.23	0.05	0.0385	0.0166	0.0113
23478-PeCDF	0.60	--	nd	0.33	nd	0.32	0.60	0.31	0.33	0.50	0.3000	0.1542	0.1625
Total PeCDF	1.40	--	1.30	--	nd	--	1.35	1.35	--	0.000	0.0000	0.0000	--
12378-PeCDD	nd	0.79	nd	0.30	nd	0.32	nd	0.24	0.47	0.50	nd	0.1175	0.2350
Total PeCDD	nd	--	nd	--	nd	--	nd	N/A	--	0.000	nd	0.0000	--
123478-HxCDF	nd	0.52	nd	0.39	nd	0.46	nd	0.23	0.46	0.10	nd	0.0228	0.0457
123678-HxCDF	0.53	--	nd	0.34	nd	0.41	0.53	0.30	0.38	0.10	0.0530	0.0302	0.0375
123789-HxCDF	nd	0.53	nd	0.56	nd	0.44	nd	0.26	0.51	0.10	nd	0.0255	0.0510
234678-HxCDF	nd	0.61	nd	0.62	nd	0.31	nd	0.26	0.51	0.10	nd	0.0257	0.0513
Total-HxCDF	0.53	--	2.70	--	1.20	--	1.48	1.48	--	0.0000	0.0000	0.0000	--
123478-HxCDD	nd	0.46	nd	0.57	nd	0.44	nd	0.25	0.49	0.10	nd	0.0245	0.0490
123678-HxCDD	nd	0.58	nd	0.25	nd	0.77	nd	0.27	0.53	0.10	nd	0.0267	0.0533
123789-HxCDD	nd	0.58	nd	0.44	nd	0.62	nd	0.27	0.55	0.10	nd	0.0273	0.0547
Total-HxCDD	nd	--	1.60	--	3.10	--	2.35	0.30	--	0.0000	0.0000	0.0000	--
1234678-HpCDF	2.97	--	3.07	--	3.27	--	3.10	3.10	--	0.01	0.0310	0.0310	--
1234789-HpCDF	nd	0.49	nd	0.25	nd	0.45	nd	0.20	0.40	0.01	nd	0.0020	0.0040
Total HpCDF	8.57	--	6.87	--	9.37	--	8.27	8.27	--	0	0.0000	0.0000	--
1234678-HpCDD	5.70	--	2.10	--	5.80	--	4.53	4.53	--	0.01	0.0453	0.0453	--
Total HpCDD	8.70	--	3.90	--	12.70	--	8.43	8.43	--	0	0.0000	0.0000	--
OCDF	6.10	--	1.30	--	5.40	--	4.27	4.27	--	0.001	0.0043	0.0043	--
OCDD	153.00	--	11.00	--	93.00	--	85.67	85.67	--	0.001	0.0857	0.0857	--
Total TEF adjusted values											0.5888	1.1412	

TABLE D.1. 30-Day Tissue Dioxin Results (Cont'd)

STATION 12A-C	Rep 1		Rep 2		Rep 3		Average Congener Concentrations				Average TEF Concentrations		
Native Isomer	Conc.	D.L.	Conc.	D.L.	Conc.	D.L.	Mean Det. Values	Mean Det. + 1/2 D.L.	Mean D.L.	TEF	Mean Det. Values	Mean Det. + 1/2 D.L.	Mean D.L.
2378-TCDF	1.15	--	0.39	--	0.60	--	0.71	0.71	--	0.10	0.0713	0.0713	--
Total TCDF	1.85	--	0.39	--	0.60	--	0.95	0.95	--	0.000	0.0000	0.0000	--
2378-TCDD	nd	0.64	nd	0.62	nd	2.10	nd	0.56	1.12	1.00	0.0000	0.5600	1.1200
Total TCDD	nd	--	nd	--	nd	--	nd	N/A	--	0.00	0.0000	0.0000	--
12378-PeCDF	nd	0.33	nd	0.35	nd	0.96	nd	0.27	0.55	0.05	0.0000	0.0137	0.0273
23478-PeCDF	nd	0.22	nd	0.26	nd	0.54	nd	0.17	0.34	0.50	0.0000	0.0850	0.1700
Total PeCDF	nd	--	nd	--	nd	--	nd	N/A	--	0.000	0.0000	0.0000	--
12378-PeCDD	nd	0.26	nd	0.40	nd	0.68	nd	0.22	0.45	0.50	0.0000	0.1117	0.2233
Total PeCDD	nd	--	nd	--	nd	--	nd	N/A	--	0.000	0.0000	0.0000	--
123478-HxCDF	nd	0.26	nd	0.61	nd	0.64	nd	0.25	0.50	0.10	0.0000	0.0252	0.0503
123678-HxCDF	nd	0.34	nd	0.30	nd	0.31	nd	0.16	0.32	0.10	0.0000	0.0158	0.0317
123789-HxCDF	nd	0.36	nd	0.47	nd	0.92	nd	0.29	0.58	0.10	0.0000	0.0292	0.0583
234678-HxCDF	nd	0.61	nd	0.90	nd	0.70	nd	0.37	0.74	0.10	0.0000	0.0368	0.0737
Total-HxCDF	nd	--	nd	--	nd	--	nd	N/A	--	0.0000	0.0000	0.0000	--
123478-HxCDD	nd	0.42	nd	0.57	nd	0.61	nd	0.20	0.59	0.10	0.0000	0.0197	0.0590
123678-HxCDD	0.38	--	nd	0.46	nd	0.57	0.38	0.30	0.52	0.10	0.0380	0.0298	0.0515
123789-HxCDD	0.54	--	nd	0.36	nd	1.00	0.54	0.41	0.68	0.10	0.0540	0.0407	0.0680
Total-HxCDD	2.40	--	2.10	--	nd	--	2.25	2.25	--	0.0000	0.0000	0.0000	--
1234678-HpCDF	0.25	--	0.87	--	nd	1.30	0.56	0.59	1.30	0.01	0.0056	0.0059	0.0130
1234789-HpCDF	nd	0.28	1.00	--	nd	1.20	1.00	0.58	1.20	0.01	0.0100	0.0058	0.0120
Total HpCDF	2.77	--	2.97	--	2.27	--	2.67	2.67	--	0	0.0000	0.0000	--
1234678-HpCDD	0.70	--	1.60	--	0.80	--	1.03	1.03	--	0.01	0.0103	0.0103	--
Total HpCDD	1.30	--	2.30	--	2.90	--	2.17	2.17	--	0	0.0000	0.0000	--
OCDF	0.40	--	0.90	--	2.30	--	1.20	1.20	--	0.001	0.0012	0.0012	--
OCDD	5.00	--	10.00	--	12.00	--	9.00	9.00	--	0.001	0.0090	0.0090	--
Total TEF adjusted values											0.1995	1.0711	

TABLE D.1. 30-Day Tissue Dioxin Results (Cont'd)

STATION 13A-C	Rep 1		Rep 2		Rep 3		Average Congener Concentrations				Average TEF Concentrations		
Native Isomer	Conc.	D.L.	Conc.	D.L.	Conc.	D.L.	Mean Det. Values	Mean Det. + 1/2 D.L.	Mean D.L.	TEF	Mean Det. Values	Mean Det. + 1/2 D.L.	Mean D.L.
2378-TCDF	0.22	--	0.24	--	nd	0.52	0.23	0.24	0.52	0.10	0.0230	0.0240	0.0520
Total TCDF	0.22	--	0.24	--	nd	--	0.23	0.23	--	0.000	0.0000	0.0000	--
2378-TCDD	nd	0.97	nd	1.40	nd	0.66	nd	0.51	1.01	1.00	nd	0.5050	1.0100
Total TCDD	nd	--	nd	--	nd	--	nd	N/A	--	0.00	nd	0.0000	--
12378-PeCDF	nd	0.19	0.37	--	nd	0.36	0.37	0.22	0.28	0.05	0.0185	0.0108	0.0138
23478-PeCDF	nd	0.20	0.40	--	nd	0.26	0.40	0.21	0.23	0.50	0.2000	0.1050	0.1150
Total PeCDF	nd	--	0.77	--	nd	--	0.77	0.77	--	0.000	0.0000	0.0000	--
12378-PeCDD	nd	0.33	nd	0.42	nd	0.38	nd	0.19	0.38	0.50	nd	0.0942	0.1883
Total PeCDD	nd	--	nd	--	nd	--	nd	N/A	--	0.000	nd	N/A	--
123478-HxCDF	nd	0.50	0.62	--	nd	0.39	0.62	0.36	0.45	0.10	0.0620	0.0355	0.0445
123678-HxCDF	nd	0.24	0.41	--	0.32	--	0.37	0.28	0.24	0.10	0.0365	0.0283	0.0240
123789-HxCDF	nd	0.37	0.65	--	nd	0.76	0.65	0.41	0.57	0.10	0.0650	0.0405	0.0565
234678-HxCDF	nd	1.20	nd	0.53	nd	0.46	nd	0.37	0.73	0.10	nd	0.0365	0.0730
Total-HxCDF	nd	--	2.30	--	0.64	--	1.47	1.47	--	0.0000	0.0000	0.0000	--
123478-HxCDD	nd	0.53	nd	0.43	nd	0.39	nd	0.23	0.45	0.10	nd	0.0225	0.0450
123678-HxCDD	nd	0.44	nd	0.51	nd	0.50	nd	0.24	0.48	0.10	nd	0.0242	0.0483
123789-HxCDD	nd	0.50	nd	0.70	nd	0.75	nd	0.33	0.65	0.10	nd	0.0325	0.0650
Total-HxCDD	nd	--	nd	--	nd	--	nd	N/A	--	0.0000	nd	N/A	--
1234678-HpCDF	0.77	--	0.97	--	2.67	--	1.47	1.47	--	0.01	0.0147	0.0147	--
1234789-HpCDF	nd	0.55	nd	0.55	nd	0.37	nd	0.25	0.49	0.01	nd	0.0025	0.0049
Total HpCDF	2.67	--	2.77	--	6.67	--	4.04	4.04	--	0	0.0[illegible]0	0.0000	--
1234678-HpCDD	0.70	--	0.80	--	1.00	--	0.83	0.83	--	0.01	0.0083	0.0083	--
Total HpCDD	1.30	--	1.20	--	0.00	--	0.83	0.83	--	0	0.0000	0.0000	--
OCDF	1.90	--	1.70	--	2.70	--	2.10	2.10	--	0.001	0.0021	0.0021	--
OCDD	8.00	--	2.00	--	8.00	--	6.00	6.00	--	0.001	0.0060	0.0060	--
Total TEF adjusted values											0.4361	0.9925	

TABLE D.1. 30-Day Tissue Dioxin Results (Cont'd)

STATION 14A-C	Rep 1		Rep 2		Rep 3		Average Congener Concentrations				Average TEF Concentrations		
Native Isomer	Conc.	D.L.	Conc.	D.L.	Conc.	D.L.	Mean Det. Values	Mean Det. + 1/2 D.L.	Mean D.L.	TEF	Mean Det. Values	Mean Det. + 1/2 D.L.	Mean D.L.
2378-TCDF	nd	0.94	nd	0.74	nd	1.00	nd	0.45	0.89	0.10	nd	0.0447	0.0893
Total TCDF	nd	--	nd	--	nd	--	nd	N/A	--	0.000	nd	N/A	--
2378-TCDD	nd	1.00	nd	1.20	nd	1.10	nd	0.55	1.10	1.00	nd	0.5500	1.1000
Total TCDD	nd	--	nd	--	nd	--	nd	N/A	--	0.00	nd	N/A	--
12378-PeCDF	nd	0.23	nd	0.48	nd	0.22	nd	0.16	0.31	0.05	nd	0.0078	0.0155
23478-PeCDF	nd	0.17	nd	0.22	nd	0.22	nd	0.10	0.20	0.50	nd	0.0568	0.1017
Total PeCDF	nd	--	nd	--	nd	--	nd	N/A	--	0.000	nd	N/A	--
12378-PeCDD	nd	0.24	nd	0.39	nd	0.54	nd	0.20	0.39	0.50	nd	0.0975	0.1950
Total PeCDD	nd	--	nd	--	nd	--	nd	N/A	--	0.000	nd	N/A	--
123478-HxCDF	nd	0.24	nd	0.53	nd	0.25	nd	0.17	0.34	0.10	nd	0.0170	0.0340
123678-HxCDF	nd	0.13	nd	0.17	nd	0.19	nd	0.08	0.16	0.10	nd	0.0082	0.0163
123789-HxCDF	nd	0.50	nd	0.48	nd	0.50	nd	0.25	0.49	0.10	nd	0.0247	0.0493
234678-HxCDF	nd	0.29	nd	1.10	nd	1.20	nd	0.43	0.86	0.10	nd	0.0432	0.0863
Total-HxCDF	nd	--	nd	--	nd	--	nd	N/A	--	0.0000	nd	N/A	--
123478-HxCDD	nd	0.48	nd	0.30	nd	0.40	nd	0.20	0.39	0.10	nd	0.0197	0.0393
123678-HxCDD	nd	0.29	nd	0.46	nd	0.47	nd	0.20	0.41	0.10	nd	0.0203	0.0407
123789-HxCDD	nd	0.29	0.63	--	nd	0.54	0.63	0.35	0.42	0.10	0.0630	0.0348	0.0415
Total-HxCDD	nd	--	0.63	--	nd	--	0.63	0.63	--	0.0000	0.0000	0.0090	--
1234678-HpCDF	0.47	--	0.97	--	0.57	--	0.67	0.67	--	0.01	0.0067	0.0067	--
1234789-HpCDF	nd	0.29	1.10	--	nd	0.59	1.10	0.51	0.44	0.01	0.0110	0.0051	0.0044
Total HpCDF	1.67	--	3.67	--	1.97	--	2.44	2.44	--	0	0.0000	0.0000	--
1234678-HpCDD	0.20	--	0.10	--	0.40	--	0.23	0.23	--	0.01	0.0023	0.0023	--
Total HpCDD	0.00	--	0.00	--	0.00	--	0.00	0.00	--	0	0.0000	0.0000	--
OCDF	2.10	--	1.00	--	nd	1.70	1.55	1.32	1.70	0.001	0.0016	0.0013	0.0017
OCDD	9.00	--	0.00	--	16.00	--	8.33	8.33	--	0.001	0.0083	0.0083	--
Total TEF adjusted values											0.0929	0.9424	

TABLE D.1. 30-Day Tissue Dioxin Results (Cont'd)

STATION 17A	Rep 1		Rep 2		Rep 3		Average Congener Concentrations				Average TEF Concentrations		
Native Isomer	Conc.	D.L.	Conc.	D.L.	Conc.	D.L.	Mean Det. Values	Mean Det. + 1/2 D.L.	Mean D.L.	TEF	Mean Det. Values	Mean Det. + 1/2 D.L.	Mean D.L.
2378-TCDF	nd	1.00	nd	1.30	0.04	--	0.04	0.40	1.15	0.10	0.0040	0.0397	0.1150
Total TCDF	nd	--	nd	--	0.04	--	0.04	0.04	--	0.000	0.0000	0.0000	--
2378-TCDD	nd	0.97	nd	0.98	nd	0.92	nd	0.48	0.96	1.00	nd	0.4783	0.9567
Total TCDD	nd	--	0.93	--	0.43	--	0.68	0.68	--	0.00	0.0000	0.0000	--
12378-PeCDF	nd	0.28	nd	0.38	nd	0.28	nd	0.16	0.31	0.05	nd	0.0078	0.0157
23478-PeCDF	nd	0.23	0.19	--	nd	0.13	0.19	0.12	0.18	0.50	0.0950	0.0617	0.0900
Total PeCDF	nd	--	0.19	--	nd	--	0.19	0.19	--	0.000	0.0000	0.0000	--
12378-PeCDD	nd	0.21	nd	0.51	nd	0.38	nd	0.18	0.37	0.50	nd	0.0917	0.1833
Total PeCDD	nd	--	nd	--	nd	--	nd	N/A	--	0.000	nd	N/A	--
123478-HxCDF	nd	0.30	nd	0.51	nd	0.73	nd	0.26	0.51	0.10	nd	0.0257	0.0513
123678-HxCDF	nd	0.30	nd	0.38	nd	0.57	nd	0.21	0.42	0.10	nd	0.0208	0.0417
123789-HxCDF	nd	0.48	nd	0.83	nd	0.63	nd	0.32	0.65	0.10	nd	0.0323	0.0647
234678-HxCDF	nd	0.60	nd	0.97	nd	0.25	nd	0.30	0.61	0.10	nd	0.0303	0.0607
Total-HxCDF	1.20	--	nd	--	1.40	--	1.30	1.30	--	0.0000	0.0000	0.0000	--
123478-HxCDD	nd	0.27	nd	0.60	nd	0.21	nd	0.18	0.36	0.10	nd	0.0180	0.0360
123678-HxCDD	nd	0.29	nd	0.91	nd	0.51	nd	0.29	0.57	0.10	nd	0.0285	0.0570
123789-HxCDD	nd	0.35	nd	1.10	nd	0.63	nd	0.35	0.69	0.10	nd	0.0347	0.0693
Total-HxCDD	0.70	--	nd	--	0.93	--	0.82	0.82	--	0.0000	0.0000	0.0000	--
1234678-HpCDF	1.27	--	1.17	--	nd	2.20	1.22	1.18	2.20	0.01	0.0122	0.0118	0.0220
1234789-HpCDF	nd	0.39	nd	1.60	nd	1.20	nd	0.53	1.06	0.01	nd	0.0053	0.0106
Total HpCDF	3.77	--	4.07	--	nd	--	3.92	3.92	--	0	0.0000	0.0000	--
1234678-HpCDD	0.40	--	3.90	--	1.80	--	2.03	2.03	--	0.01	0.0203	0.0203	--
Total HpCDD	2.50	--	6.70	--	3.10	--	4.10	4.10	--	0	0.0000	0.0000	--
OCDF	2.10	--	6.30	--	3.00	--	3.80	3.80	--	0.001	0.0038	0.0038	--
OCDD	11.00	--	113.00	--	42.00	--	55.33	55.33	--	0.001	0.0553	0.0553	--
Total TEF adjusted values											0.1907	0.9661	

TABLE D.1. 30-Day Tissue Dioxin Results (Cont'd)

SEQUIM BAY	Rep 1		Rep 2		Rep 3		Average Congener Concentrations				Average TEF Concentrations		
Native Isomer	Conc.	D.L.	Conc.	D.L.	Conc.	D.L.	Mean Det. Values	Mean Det. + 1/2 D.L.	Mean D.L.	TEF	Mean Det. Values	Mean Det. + 1/2 D.L.	Mean D.L.
2378-TCDF	0.26	--	nd	1.00	0.04	--	0.15	0.27	1.00	0.10	0.0150	0.0267	0.1000
Total TCDF	0.56	--	nd	--	0.04	--	0.30	0.30	--	0.000	0.0000	0.0000	--
2378-TCDD	nd	0.82	nd	2.90	nd	0.78	nd	0.75	1.50	1.00	nd	0.7500	1.5000
Total TCDD	nd	--	nd	--	nd	--	nd	N/A	--	0.00	nd	N/A	--
12378-PeCDF	0.27	--	nd	0.40	nd	0.23	0.27	0.20	0.32	0.05	0.0135	0.0098	0.0158
23478-PeCDF	0.33	--	nd	0.39	nd	0.10	0.33	0.19	0.25	0.50	0.1650	0.0958	0.1225
Total PeCDF	0.85	--	nd	--	nd	--	0.85	0.85	--	0.000	0.0000	0.0000	--
12378-PeCDD	0.22	--	nd	0.32	nd	0.21	0.22	0.16	0.27	0.50	0.1100	0.0808	0.1325
Total PeCDD	0.55	--	nd	--	0.34	--	0.45	0.45	--	0.000	0.0000	0.0000	--
123478-HxCDF	nd	0.22	nd	0.49	nd	0.20	nd	0.15	0.30	0.10	nd	0.0152	0.0303
123678-HxCDF	0.32	--	nd	0.34	nd	0.21	0.32	0.20	0.28	0.10	0.0320	0.0198	0.0275
123789-HxCDF	nd	0.39	nd	0.71	nd	0.30	nd	0.23	0.47	0.10	nd	0.0233	0.0467
234678-HxCDF	nd	0.72	nd	0.68	nd	0.32	nd	0.29	0.57	0.10	nd	0.0287	0.0573
Total-HxCDF	0.32	--	nd	--	nd	--	0.32	0.32	--	0.0000	0.0000	0.0000	--
123478-HxCDD	nd	0.39	nd	0.79	0.25	--	0.25	0.28	0.32	0.10	0.0250	0.0280	0.0320
123678-HxCDD	0.77	--	nd	0.34	0.40	--	0.59	0.45	0.34	0.10	0.0585	0.0447	0.0340
123789-HxCDD	nd	0.34	nd	0.51	nd	0.42	nd	0.21	0.42	0.10	nd	0.0212	0.0423
Total-HxCDD	4.10	--	nd	--	2.40	--	3.25	3.25	--	0.0000	0.0000	0.0000	--
1234678-HpCDF	0.12	--	0.77	--	nd	0.70	0.45	0.41	--	0.01	0.0045	0.0041	--
1234789-HpCDF	nd	0.70	nd	1.60	nd	0.31	nd	0.44	0.87	0.01	nd	0.0044	0.0087
Total HpCDF	0.12	--	0.77	--	1.57	--	0.82	0.82	--	0	0.0000	0.0000	--
1234678-HpCDD	0.80	--	1.10	--	0.80	--	0.90	0.90	--	0.01	0.0090	0.0090	--
Total HpCDD	1.50	--	1.70	--	1.40	--	1.53	1.53	--	0	0.0000	0.0000	--
OCDF	0.20	--	1.60	--	0.30	--	0.70	0.70	--	0.001	0.0007	0.0007	--
OCDD	4.00	--	1.00	--	17.00	--	7.33	7.33	--	0.001	0.0073	0.0073	--
Total TEF adjusted values											0.4405	1.1694	

TABLE D.1. 30-Day Tissue Dioxin Results (Cont'd)

	Average Congener Concentrations									Average TEF Concentrations			
Native Isomer	Rep 1 Conc.	Rep 1 D.L.	Rep 2 Conc.	Rep 2 D.L.	Rep 3 Conc.	Rep 3 D.L.	Mean Det. Values	Mean Det. + 1/2 D.L.	Mean D.L.	TEF	Mean Det. Values	Mean Det. + 1/2 D.L.	Mean D.L.
2378-TCDF	0.18	--	nd	0.73	nd	1.10	0.18	0.37	0.92	0.10	0.0180	0.0365	0.0915
Total TCDF	0.58	--	nd	--	nd	--	0.58	0.58	--	0.000	0.0000	0.0000	—
2378-TCDD	nd	0.57	nd	0.54	nd	1.70	nd	0.47	0.94	1.00	nd	0.4683	0.9367
Total TCDD	0.52	--	nd	--	nd	--	0.52	0.52	--	0.00	0.0000	0.0000	—
12378-PeCDF	0.24	--	nd	0.27	nd	0.48	0.24	0.21	0.38	0.65	0.0120	0.0103	0.0188
23478-PeCDF	0.23	--	nd	0.25	nd	0.37	0.23	0.18	0.31	0.50	0.1150	0.0900	0.1550
Total PeCDF	0.58	--	nd	--	nd	--	0.58	0.58	--	0.000	0.0000	0.0000	—
12378-PeCDD	0.15	--	nd	0.38	nd	0.44	0.15	0.19	0.41	0.50	0.0750	0.0933	0.2050
Total PeCDD	0.40	--	nd	--	nd	--	0.40	0.40	--	0.000	0.0000	0.0000	--
123478-HxCDF	nd	0.14	nd	0.33	nd	0.72	nd	0.20	0.40	0.10	nd	0.0198	0.0397
123678-HxCDF	nd	0.12	nd	0.22	nd	0.51	nd	0.14	0.28	0.10	nd	0.0142	0.0283
123789-HxCDF	0.23	--	nd	0.38	nd	1.50	0.23	0.39	0.94	0.10	0.0230	0.0390	0.0940
234678-HxCDF	nd	0.22	nd	1.10	nd	2.20	nd	0.59	1.17	0.10	nd	0.0587	0.1173
Total-HxCDF	0.23	--	nd	--	nd	--	0.23	0.23	--	0.0000	0.0000	0.0000	—
123478-HxCDD	nd	0.12	nd	0.34	nd	1.40	nd	0.31	0.62	0.10	nd	0.0310	0.0620
123678-HxCDD	nd	0.19	nd	0.33	nd	1.70	nd	0.37	0.74	0.10	nd	0.0370	0.0740
123789-HxCDD	nd	0.18	nd	0.27	nd	1.20	nd	0.28	0.55	0.10	nd	0.0275	0.0550
Total-HxCDD	1.20	--	nd	--	nd	--	1.20	1.20	--	0.0000	0.0000	0.0000	—
1234678-HpCDF	nd	0.41	nd	0.38	nd	1.20	nd	0.33	0.66	0.01	nd	0.0033	0.0066
1234789-HpCDF	nd	0.47	nd	0.45	0.95	--	0.95	0.47	0.46	0.01	0.0095	0.0047	0.0046
Total HpCDF	nd	--	nd	--	0.42	--	0.42	0.42	--	0	0.0000	0.0000	—
1234678-HpCDD	0.00	--	0.00	--	nd	1.40	0.00	0.23	1.40	0.01	nd	0.0023	0.0140
Total HpCDD	0.00	--	0.00	--	nd	--	0.00	0.00	--	0	0.0000	0.0000	—
OCDF	0.00	--	0.90	--	1.20	--	0.70	0.70	--	0.001	0.0007	0.0007	—
OCDD	5.00	--	7.00	--	0.00	--	4.00	4.00	--	0.001	0.0040	0.0040	—
Total TEF adjusted values											0.2572	0.9406	

TABLE D.1. 30-Day Tissue Dioxin Results (Cont'd)

BACKGROUND	Congener Concentrations				TEF Concentrations		
Native Isomer	Conc.	D.L.	1/2 D.L.	TEF	Conc.	D.L.	1/2 D.L.
2378-TCDF	0.35	--	--	0.10	0.0350	--	--
Total TCDF	0.35	--	--	0.000	0.0000	--	--
2378-TCDD	nd	0.49	0.25	1.00	nd	0.4900	0.2450
Total TCDD	nd	--	--	0.00	nd	--	--
12378-PeCDF	nd	0.13	0.07	0.05	nd	0.0065	0.0033
23478-PeCDF	nd	0.18	0.09	0.50	nd	0.0900	0.0450
Total PeCDF	nd	--	--	0.000	nd	--	--
12378-PeCDD	nd	0.24	0.12	0.50	nd	0.1200	0.0600
Total PeCDD	nd	--	--	0.000	nd	--	--
123478-HxCDF	nd	0.45	0.23	0.10	nd	0.0450	0.0225
123678-HxCDF	nd	0.25	0.13	0.10	nd	0.0250	0.0125
123789-HxCDF	nd	0.31	0.16	0.10	nd	0.0310	0.0155
234678-HxCDF	nd	0.56	0.28	0.10	nd	0.0560	0.0280
Total-HxCDF	nd	--	--	0.0000	nd	--	--
123478-HxCDD	nd	0.28	0.14	0.10	nd	0.0280	0.0140
123678-HxCDD	nd	0.26	0.13	0.10	nd	0.0260	0.0130
123789-HxCDD	nd	0.46	0.23	0.10	nd	0.0460	0.0230
Total-HxCDD	nd	--	--	0.0000	nd	--	--
1234678-HpCDF	0.53	--	--	0.01	0.0053	--	--
1234789-HpCDF	nd	0.42	0.21	0.01	nd	0.0042	0.0021
Total HpCDF	0.53	--	--	0	0.0000	--	--
1234678-HpCDD	1.60	--	--	0.01	0.0160	--	--
Total HpCDD	3.30	--	--	0	0.0000	--	--
OCDF	1.10	--	--	0.001	0.0011	--	--
OCDD	17.00	--	--	0.001	0.0170	--	--
Total TEF adjusted values					0.0744	0.9677	

TABLE D.2. Thirty-day tissue lipid results.

Station	Rep	% Lipid	Dup.	% RPD
Sta. 1	1	0.19		
Sta. 1	2	0.22	0.17	25.0
Sta. 1	3	0.15		
Sta. 2	1	0.21		
Sta. 2	2	0.21		
Sta. 2	3	0.18		
Sta. 3	1	0.21		
Sta. 3	2	0.28		
Sta. 3	3	0.11		
Sta. 4	1	0.29	0.17	52.2
Sta. 4	2	0.08		
Sta. 4	3	0.14		
Sta. 5	1	0.20		
Sta. 5	2	0.10		
Sta. 5	3	0.19		
Sta. 6	1	0.25		
Sta. 6	2	0.18		
Sta. 6	3	0.22		
Sta. 7	1	0.18		
Sta. 7	2	0.28		
Sta. 7	3	0.33	0.32	3.0
Sta. 8	1	0.17		
Sta. 8	2	0.12		
Sta. 8	3	0.27		
Sta. 9	1	0.17		
Sta. 9	2	0.13		
Sta. 9	?	0.21		
Sta. 10	1	0.17		
Sta. 10	2	0.14		
Sta. 10	3	0.28		
Sta. 11	1	0.09		
Sta. 11	2	0.20		
Sta. 11	3	0.18		

TABLE D.2. Thirty-day tissue lipid results (cont'd).

Station	Rep	% Lipid	Dup.	% RPD
Sta. 12	1	0.04	0.08	66.7
Sta. 12	2	0.23		
Sta. 12	3	0.34		
Sta. 13	1	0.26		
Sta. 13	2	0.28		
Sta. 13	3	0.30		
Sta. 14	1	0.12		
Sta. 14	2	0.14		
Sta. 14	3	0.15		
Sta. 17	1	0.15	0.18	18.2
Sta. 17	2	0.08	0.04	66.7
Sta. 17	3	0.16		
Sequim Bay	1	0.18		
Sequim Bay	2	0.14		
Sequim Bay	3	0.22		
West Beach	1	0.17		
West Beach	2	0.21		
West Beach	3	0.17		

TABLE D.3. Quality Assurance for Dioxins and Lipids Method Blank Data (ng/Kg dry)

Native Isomer	09-23-89 Conc.	09-23-89 D.L.	09-26-89 Conc.	09-26-89 D.L.	10-10-89 Conc.	10-10-89 D.L.	10-12-89 Conc.	10-12-89 D.L.	10-18-89 Conc.	10-18-89 D.L.
2378-TCDF	nd	0.34	nd	1.30	nd	0.84	nd	1.20	nd	1.20
Total TCDF	nd	--	nd	--	nd	--	nd	--	nd	--
2378-TCDD	nd	0.63	nd	1.10	nd	1.10	nd	0.66	nd	0.92
Total TCDD	0.39	--	nd	--	nd	--	nd	--	nd	--
12378-PeCDF	nd	0.13	0.34	--	nd	0.37	nd	0.40	nd	0.17
23478-PeCDF	nd	0.08	0.36	--	nd	0.15	nd	0.38	nd	0.21
Total PeCDF	nd	--	0.70	--	nd	--	nd	--	nd	--
12378-PeCDD	nd	0.20	nd	0.46	nd	0.24	nd	0.47	nd	0.29
Total PeCDD	nd	--	nd	--	nd	--	nd	--	nd	--
123478-HxCDF	nd	0.11	nd	0.66	nd	0.15	nd	0.53	nd	0.24
123678-HxCDF	nd	0.09	nd	0.32	nd	0.18	nd	0.42	nd	0.13
123789-HxCDF	0.30	--	0.31	--	0.34	--	nd	0.39	0.30	--
234678-HxCDF	nd	0.13	nd	0.98	nd	0.26	nd	0.58	nd	0.31
Total-HxCDF	0.30	--	0.31	--	0.34	--	nd	--	0.30	--
123478-HxCDD	nd	0.10	nd	0.41	nd	0.39	nd	0.44	nd	0.17
123678-HxCDD	0.27	--	nd	0.59	nd	0.35	nd	0.49	nd	0.14
123789-HxCDD	0.19	--	nd	0.29	nd	0.42	nd	0.35	nd	0.18
Total-HxCDD	1.70	--	0.88	--	nd	--	nd	--	0.43	--
1234678-HpCDF	nd	0.36	nd	0.29	nd	0.25	nd	0.42	0.48	--
1234789-HpCDF	nd	0.19	nd	0.76	nd	0.30	nd	0.57	nd	0.35
Total HpCDF	nd	--	nd	--	nd	--	nd	--	0.48	--
1234678-HpCDD	0.45	--	1.90	--	nd	0.61	1.20	--	0.96	--
Total HpCDD	0.96	--	4.00	--	nd	--	1.20	--	0.96	--
OCDF	0.69	--	1.70	--	nd	0.45	nd	1.50	0.99	--
OCDD	10.00	--	31.00	--	4.50	--	18.00	--	7.40	--

TABLE D.3. Quality Assurance for Dioxins and Lipids (Cont'd) Matrix Spike Data

Native Isomer	Spike 09-23-89 Qs	Qm	% Rec	Spike 09-26-89 Qs	Qm	% Rec	Spike 09-28-89 Qs	Qm	% Rec	Spike 10-03-89 Qs	Qm	% Rec	Spike 10-06-89 Qs	Qm	% Rec
2378-TCDF	0.80	1.00	125	0.80	1.00	125	0.80	0.78	98	0.80	0.92	115	0.80	0.96	120
Total TCDF	0.80	1.00	125	0.80	1.00	125	0.80	0.78	98	0.80	0.92	115	0.80	0.96	120
2378-TCDD	0.80	1.00	125	0.80	1.10	138	0.80	0.81	101	0.80	0.94	118	0.80	1.00	125
Total TCDD	0.80	1.00	125	0.80	1.10	138	0.80	0.81	101	0.80	0.94	118	0.80	1.00	125
12378-PeCDF	4.00	4.50	113	4.00	4.50	113	4.00	3.50	88	4.00	3.90	98	4.00	4.10	103
23478-PeCDF	4.00	4.50	113	4.00	4.50	113	4.00	3.50	88	4.00	3.90	98	4.00	4.10	103
Total PeCDF	8.00	9.00	113	8.00	9.00	113	8.00	7.00	88	8.00	7.80	98	8.00	8.20	103
12378-PeCDD	4.00	4.50	113	4.00	4.50	113	4.00	3.50	88	4.00	4.00	100	4.00	4.20	105
Total PeCDD	4.00	4.50	113	4.00	4.50	113	4.00	3.50	88	4.00	4.00	100	4.00	4.20	105
123478-HxCDF	4.00	4.90	123	4.00	5.10	128	4.00	4.00	100	4.00	3.60	90	4.00	4.70	118
123678-HxCDF	4.00	4.10	103	4.00	4.30	108	4.00	3.40	85	4.00	4.00	100	4.00	3.90	98
123789-HxCDF	4.00	4.40	110	4.00	4.00	125	4.00	3.80	95	4.00	4.00	100	4.00	4.20	105
234678-HxCDF	4.00	4.40	110	4.00	4.80	120	4.00	3.80	95	4.00	3.90	98	4.00	4.50	113
Total-HxCDF	16.00	18.00	113	16.00	19.00	119	16.00	15.00	94	16.00	16.00	100	16.00	17.00	106
123478-HxCDD	4.00	4.00	100	4.00	4.20	105	4.00	4.20	105	4.00	4.60	115	4.00	3.80	95
123678-HxCDD	4.00	4.80	120	4.00	4.90	123	4.00	3.30	83	4.00	3.50	88	4.00	4.60	115
123789-HxCDD	4.00	4.30	108	4.00	4.40	110	4.00	3.20	80	4.00	3.30	83	4.00	3.70	93
Total-HxCDD	12.00	13.00	108	12.00	14.00	117	12.00	11.00	92	12.00	11.00	92	12.00	12.00	100
1234678-HpCDF	4.00	4.60	115	4.00	4.80	120	4.00	3.80	95	4.00	4.30	108	4.00	4.50	113
1234789-HpCDF	4.00	4.40	110	4.00	4.90	123	4.00	3.80	95	4.00	4.00	100	4.00	4.30	108
Total HpCDF	8.00	9.00	113	8.00	9.70	121	8.00	7.60	95	8.00	8.30	104	8.00	8.80	110
1234678-HpCDD	4.00	4.20	105	4.00	4.60	115	4.00	3.80	95	4.00	3.70	93	4.00	4.20	105
Total HpCDD	4.00	4.20	105	4.00	4.60	115	4.00	3.80	95	4.00	3.70	93	4.00	4.20	105
OCDF	8.00	9.70	121	8.00	10.00	125	8.00	8.80	110	8.00	8.20	103	8.00	9.40	118
OCDD	8.00	8.80	110	8.00	10.00	125	8.00	8.30	104	8.00	8.00	100	8.00	8.20	103

TABLE D.3. Quality Assurance for Dioxins and Lipids (Cont'd) Surrogate Recovery Data(%)

Native	ng's	Station 1			Station 2			Station 3			Station 4			Station 5		
Isomer	Added	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3
2378-TCDF-C13	2.00	68	80	52	62	67	66	63	66	76	55	68	78	65	65	85
2378-TCDD-C13	2.00	70	73	57	66	70	65	62	72	72	54	69	75	68	68	75
12378-PeCDF-C13	2.00	75	94	59	71	83	83	82	80	68	66	77	90	84	83	131
23478-PeCDF-C13	2.00	73	92	58	68	83	78	80	78	77	64	72	87	82	80	139
12378-PeCDD-C13	2.00	79	103	61	73	89	82	88	86	85	20	74	92	84	88	148
123478-HxCDF-C13	2.00	76	81	63	68	75	77	74	66	57	64	83	76	67	64	71
123678-HxCDF-C13	2.00	72	96	63	70	75	74	78	75	73	80	82	75	77	75	90
123789-HxCDF-C13	2.00	67	76	55	64	69	63	63	63	64	68	70	70	69	67	82
234678-HxCDF-C13	2.00	51	54	43	57	58	76	49	60	60	52	48	61	62	59	66
123478-HxCDD-C13	2.00	76	85	64	72	77	71	78	69	79	65	81	80	66	72	79
123678-HxCDD-C13	2.00	66	81	54	69	72	53	52	77	37	84	57	71	77	65	92
1234678-HpCDF-C13	2.00	63	76	51	58	57	71	65	55	50	70	72	59	60	31	79
1234789-HpCDF-C13	2.00	77	92	59	72	70	[illegible]	85	67	107	77	86	74	74	83	96
1234678-HpCDD-C13	2.00	67	82	54	64	63	81	72	60	92	79	86	65	63	81	91
OCDD-C13	4.00	73	87	43	54	55	93	84	50	110	72	75	51	49	82	98
1234-TCDD-C13	2.00	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
123789-HxCDD-C13	2.00	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
2378-TCDD-C137	0.80	74	79	57	68	73	67	61	74	81	52	71	68	73	70	81

TABLE D.3. Quality Assurance for Dioxins and Lipids (Cont'd)
Surrogate Recovery Data (%)

Native Isomer	ng's Added	Station 6			Station 7			Station 8			Station 9			Station 10		
		Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3
2378-TCDF-C13	2.00	80	66	65	52	69	68	54	60	68	70	77	71	48	68	71
2378-TCDD-C13	2.00	83	68	69	49	77	64	46	61	69	74	74	73	48	73	69
12378-PeCDF-C13	2.00	92	74	74	57	67	86	63	70	77	78	78	86	61	80	86
23478-PeCDF-C13	2.00	89	72	74	52	63	84	59	66	72	77	75	83	60	78	87
12378-PeCDD-C13	2.00	91	79	75	55	72	86	56	73	74	84	79	91	67	93	89
123478-HxCDF-C13	2.00	86	68	59	97	69	62	102	67	83	78	62	71	65	70	60
123678-HxCDF-C13	2.00	81	71	74	113	81	78	151	68	82	73	66	79	69	74	80
123789-HxCDF-C13	2.00	76	68	63	78	72	66	98	68	70	70	58	72	63	69	66
234678-HxCDF-C13	2.00	69	57	64	48	74	43	52	48	48	57	44	61	59	59	63
123478-HxCDD-C13	2.00	84	79	78	112	75	63	132	77	81	79	62	74	70	79	58
123678-HxCDD-C13	2.00	80	70	66	87	86	80	123	74	57	63	66	80	67	75	93
1234678-HpCDF-C13	2.00	29	67	68	72	39	54	90	67	72	63	46	61	40	64	12
1234789-HpCDF-C13	2.00	68	86	83	60	87	75	84	88	86	74	61	71	67	75	45
1234678-HpCDD-C13	2.00	60	84	77	59	84	63	74	87	80	70	54	65	72	70	39
OCDD-C13	4.00	51	83	73	28	80	62	35	91	75	58	42	77	61	63	52
1234-TCDD-C13	2.00	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
123789-HxCDD-C13	2.00	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
2378-TCDD-C137	0.80	88	71	72	51	77	68	47	63	71	76	77	71	51	76	77

TABLE D.3. Quality Assurance for Dioxins and Lipids (Cont'd) Surrogate Recovery Data (%)

Native Isomer	ng's Added	Station 11			Station 12			Station 13			Station 14			Station 17		
		Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3
2378-TCDF-C13	2.00	73	64	71	73	62	53	75	64	60	64	70	59	67	79	70
2378-TCDD-C13	2.00	80	63	78	77	63	50	70	62	57	62	75	61	70	76	74
12378-PeCDF-C13	2.00	89	77	93	82	60	81	91	75	68	75	85	63	80	99	84
23478-PeCDF-C13	2.00	87	74	91	81	58	88	87	74	64	72	81	62	76	100	84
12378-PeCDD-C13	2.00	50	79	95	81	58	87	90	76	69	74	89	65	81	112	89
123478-HxCDF-C13	2.00	79	58	77	81	76	62	76	62	84	56	112	90	74	70	70
123678-HxCDF-C13	2.00	85	69	87	95	79	81	93	71	92	69	126	98	80	72	74
123789-HxCDF-C13	2.00	79	63	80	88	77	60	82	65	70	63	100	89	72	64	59
234678-HxCDF-C13	2.00	78	54	81	74	60	51	62	49	53	52	79	59	65	64	52
123478-HxCDD-C13	2.00	89	68	81	100	68	67	85	72	78	60	108	88	80	74	70
123678-HxCDD-C13	2.00	83	73	88	80	55	56	94	74	75	75	101	86	82	72	73
1234678-HpCDF-C13	2.00	79	64	82	91	93	66	80	63	72	67	101	99	56	57	35
1234789-HpCDF-C13	2.00	94	76	99	108	127	73	90	74	74	80	116	111	69	71	68
1234678-HpCDD-C13	2.00	90	75	89	103	119	69	91	76	75	76	108	107	69	62	58
OCDD-C13	4.00	78	76	95	98	139	57	84	70	56	40	94	109	58	51	56
1234-TCDD-C13	2.00	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
123789-HxCDD-C13	2.00	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
2378-TCDD-C137	0.80	83	64	79	76	67	51	74	62	57	65	72	64	68	80	76

TABLE D.3. Quality Assurance for Dioxins and Lipids (Cont'd) Surrogate Recovery Data (%)

Native Isomer	ng's Added	Sequim Bay			West Beach			Back-ground
		Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	
2378-TCDF-C13	2.00	71	56	70	68	61	69	74
2378-TCDD-C13	2.00	74	53	66	70	62	72	73
12378-PeCDF-C13	2.00	83	76	84	75	76	88	81
23478-PeCDF-C13	2.00	75	78	85	71	70	88	78
12378-PeCDD-C13	2.00	92	78	87	86	76	77	81
123478-HxCDF-C13	2.00	96	67	67	76	60	179	104
123678-HxCDF-C13	2.00	109	90	79	77	85	163	112
123789-HxCDF-C13	2.00	81	71	71	70	70	132	87
234678-HxCDF-C13	2.00	55	65	73	64	52	89	72
123478-HxCDD-C13	2.00	96	69	77	81	78	126	93
123678-HxCDD-C13	2.00	71	90	81	76	72	93	95
1234678-HpCDF-C13	2.00	67	62	44	36	71	186	58
1234789-HpCDF-C13	2.00	82	72	88	90	88	267	94
1234678-HpCDD-C13	2.00	70	66	86	84	85	245	81
OCDD-C13	4.00	87	47	102	82	41	342	80
1234-TCDD-C13	2.00	na	na	na	na	na	na	na
123789-HxCDD-C13	2.00	na	na	na	na	na	na	na
2378-TCDD-C137	0.80	75	54	69	72	64	72	78

TABLE D.3. Quality Assurance for Dioxins and Lipids (Cont'd)
Method Blank and Matrix Spike
Surrogate Recovery Data (%)

Native Isomer	Blank 09-23	Blank 09-26	Blank 09-28	Blank 10-03	Blank 10-06	Spike 09-23	Spike 09-26	Spike 09-28	Spike 10-03	Spike 10-06
2378-TCDF-C13	41	50	64	37	39	54	57	77	48	54
2378-TCDD-C13	42	32	72	43	43	54	56	84	47	51
12378-PeCDF-C13	61	61	70	75	60	79	70	89	58	70
23478-PeCDF-C13	65	61	67	74	66	80	71	86	57	71
12378-PeCDD-C13	69	65	75	79	69	85	77	95	55	71
123478-HxCDF-C13	62	82	67	68	67	58	48	74	51	65
123678-HxCDF-C13	73	93	69	78	80	69	62	81	64	87
123789-HxCDF-C13	67	78	65	75	72	59	55	72	54	69
234678-HxCDF-C13	66	66	68	75	69	55	46	64	39	43
123478-HxCDD-C13	66	100	73	76	79	72	66	80	55	80
123678-HxCDD-C13	76	87	69	81	84	60	56	82	65	68
1234678-HpCDF-C13	64	73	61	78	67	59	45	66	51	66
1234789-HpCDF-C13	68	69	74	90	76	76	57	82	67	79
1234678-HpCDD-C13	68	68	65	87	73	70	50	73	66	77
OCDD-C13	51	52	55	84	62	65	54	62	70	72
1234-TCDD-C13	na	na	na	na	na	XX	XX	XX	XX	XX
123789-HxCDD-C13	na	na	na	na	na	XX	XX	XX	XX	XX
2378-TCDD-C137	45	51	70	44	42	56	59	81	57	47

APPENDIX E

60-DAY TISSUE CHEMISTRY DATA

TABLE E.1. 60-Day Tissue Dioxin Results, background-corrected (ng/Kg wet)

STATION 1					Average Congener Concentrations				Average TEF Concentrations		
	Rep 4		Rep 5								
Native Isomer	Conc.	D.L.	Conc.	D.L.	Mean Det. Values	Mean Det. +1/2 D.L.	Mean D.L.	TEF	Mean Det. Values	Mean Det. +1/2 D.L.	Mean D.L.
2378-TCDF	nd	1.50	nd	1.60	nd	0.78	1.55	0.1	nd	0.0775	0.1550
Total TCDF	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
2378-TCDD	nd	0.93	nd	2.30	nd	0.81	1.62	1	nd	0.8075	1.6150
Total TCDD	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
12378-PeCDF	nd	0.48	nd	0.69	nd	0.29	0.59	0.05	nd	0.0146	0.0292
23478-PeCDF	nd	0.41	nd	0.80	nd	0.30	0.61	0.5	nd	0.1513	0.3025
Total PeCDF	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
12378-PeCDD	nd	0.33	nd	1.20	nd	0.38	0.77	0.5	nd	0.1913	0.3825
Total PeCDD	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
123478-HxCDF	nd	0.72	nd	0.87	nd	0.40	0.80	0.1	nd	0.0398	0.0795
123678-HxCDF	nd	0.63	nd	0.44	nd	0.27	0.54	0.1	nd	0.0268	0.0535
123789-HxCDF	nd	0.63	nd	0.87	nd	0.38	0.75	0.1	nd	0.0375	0.0750
234678-HxCDF	nd	1.60	nd	0.93	nd	0.63	1.27	0.1	nd	0.0633	0.1265
Total-HxCDF	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
123478-HxCDD	nd	0.75	nd	0.85	nd	0.40	0.80	0.1	nd	0.0400	0.0800
123678-HxCDD	nd	0.77	nd	0.49	nd	0.32	0.63	0.1	nd	0.0315	0.0630
123789-HxCDD	nd	1.00	nd	0.49	nd	0.37	0.75	0.1	nd	0.0373	0.0745
Total-HxCDD	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
1234678-HpCDF	nd	0.39	nd	0.65	nd	0.26	0.52	0.01	nd	0.0026	0.0052
1234789-HpCDF	nd	0.73	nd	1.60	nd	0.58	1.17	0.01	nd	0.0058	0.0117
Total HpCDF	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
1234678-HpCDD	nd	1.20	1.00	--	1.00	0.80	1.20	0.01	0.0100	0.0080	0.0120
Total HpCDD	nd	--	0.00	--	0.00	0.00	--	0	0.0000	0.0000	--
OCDF	nd	1.60	nd	1.90	nd	0.88	1.75	0.001	nd	0.0009	0.0018
OCDD	5.00	--	20.00	--	12.50	12.50	--	0.001	0.0125	0.0125	--
Total TEF									0.0225	1.5471	

TABLE E.1. 60-Day Tissue Dioxin Results, ng/Kg wet (Cont'd)

STATION 2 Native Isomer	Rep 4 Conc.	Rep 4 D.L.	Rep 5 Conc.	Rep 5 D.L.	Average Congener Concentrations: Mean Det. Values	Average Congener Concentrations: Mean Det. +1/2 D.L.	Average Congener Concentrations: Mean D.L.	TEF	Average TEF Concentrations: Mean Det. Values	Average TEF Concentrations: Mean Det. +1/2 D.L.	Average TEF Concentrations: Mean D.L.
2378-TCDF	0.09	--	1.45	--	0.77	0.77	--	0.1	0.0770	0.0770	--
Total TCDF	0.09	--	1.45	--	0.77	0.77	--	0	0.0000	0.0000	--
2378-TCDD	nd	0.88	nd	1.70	nd	0.65	1.29	1	nd	0.6450	1.2900
Total TCDD	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
12378-PeCDF	nd	0.41	0.63	--	0.63	0.42	0.41	0.05	0.0315	0.0209	0.0205
23478-PeCDF	nd	0.30	0.50	--	0.50	0.33	0.30	0.5	0.2500	0.1625	0.1500
Total PeCDF	nd	--	3.20	--	3.20	3.20	--	0	0.0000	0.0000	--
12378-PeCDD	nd	0.39	nd	0.52	nd	0.23	0.46	0.5	nd	0.1138	0.2275
Total PeCDD	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
123478-HxCDF	nd	0.67	1.40	--	1.40	0.87	0.67	0.1	0.1400	0.0868	0.0670
123678-HxCDF	nd	0.47	nd	0.59	nd	0.27	0.53	0.1	nd	0.0265	0.0530
123789-HxCDF	nd	0.84	nd	0.88	nd	0.43	0.86	0.1	nd	0.0430	0.0860
234678-HxCDF	nd	1.10	nd	0.98	nd	0.52	1.04	0.1	nd	0.0520	0.1040
Total-HxCDF	nd	--	1.40	--	1.40	1.40	--	0	0.0000	0.0000	--
123478-HxCDD	nd	0.65	nd	0.85	nd	0.38	0.75	0.1	nd	0.0375	0.0750
123678-HxCDD	nd	1.30	nd	0.97	nd	0.57	1.14	0.1	nd	0.0568	0.1135
123789-HxCDD	nd	1.00	nd	1.10	nd	0.53	1.05	0.1	nd	0.0525	0.1050
Total-HxCDD	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
1234678-HpCDF	nd	0.86	0.87	--	0.87	0.65	0.86	0.01	0.0087	0.0065	0.0086
1234789-HpCDF	nd	0.49	nd	1.00	nd	0.37	0.75	0.01	nd	0.0037	0.0075
Total HpCDF	nd	--	0.87	--	0.87	0.65	--	0	0.0000	0.0000	--
1234678-HpCDD	0.60	--	1.30	--	0.95	0.95	--	0.01	0.0095	0.0095	--
Total HpCDD	0.70	--	3.50	--	2.10	2.10	--	0	0.0000	0.0000	--
OCDF	nd	0.91	nd	1.30	nd	0.55	1.11	0.001	nd	0.0006	0.0011
OCDD	8.00	--	14.00	--	11.00	11.00	--	0.001	0.0110	0.0110	--
Total TEF									0.5277	1.4054	

TABLE E.1. 60-Day Tissue Dioxin Results, ng/Kg wet (Cont'd)

STATION 3					Average Congener Concentrations				Average TEF Concentrations		
	Rep 4		Rep 5		Mean Det.	Mean Det.	Mean		Mean Det.	Mean Det.	Mean
Native Isomer	Conc.	D.L.	Conc.	D.L.	Values	+1/2 D.L.	D.L.	TEF	Values	+1/2 D.L.	D.L.
2378-TCDF	nd	0.45	nd	0.88	nd	0.33	0.67	0.1	nd	0.0333	0.0665
Total TCDF	nd	--	nd	--	nd	N/A	--	0	nd	N/A	—
2378-TCDD	nd	0.94	nd	1.30	nd	0.56	1.12	1	nd	0.5600	1.1200
Total TCDD	nd	--	nd	--	nd	N/A	--	0	nd	N/A	—
12378-PeCDF	nd	0.21	nd	0.21	nd	0.11	0.21	0.05	nd	0.0053	0.0105
23478-PeCDF	nd	0.47	nd	0.29	nd	0.19	0.38	0.5	nd	0.0950	0.1900
Total PeCDF	nd	--	nd	--	nd	N/A	--	0	nd	N/A	—
12378-PeCDD	nd	1.10	nd	0.44	nd	0.39	0.77	0.5	nd	0.1925	0.3850
Total PeCDD	nd	--	nd	--	nd	N/A	--	0	nd	N/A	—
123478-HxCDF	nd	0.67	nd	0.37	nd	0.26	0.52	0.1	nd	0.0260	0.0520
123678-HxCDF	nd	0.60	nd	0.33	nd	0.23	0.47	0.1	nd	0.0233	0.0465
123789-HxCDF	nd	0.77	nd	0.43	nd	0.30	0.60	0.1	nd	0.0300	0.0600
234678-HxCDF	nd	0.60	nd	0.69	nd	0.32	0.65	0.1	nd	0.0323	0.0645
Total-HxCDF	nd	--	nd	--	nd	N/A	--	0	nd	N/A	—
123478-HxCDD	nd	0.62	nd	0.71	nd	0.33	0.67	0.1	nd	0.0333	0.0665
123678-HxCDD	nd	0.37	nd	0.38	nd	0.19	0.38	0.1	nd	0.0188	0.0375
123789-HxCDD	nd	0.65	nd	0.76	nd	0.35	0.71	0.1	nd	0.0353	0.0705
Total-HxCDD	1.00	--	nd	--	1.00	1.00	--	0	0.0000	0.0000	—
1234678-HpCDF	nd	0.58	0.39	--	0.39	0.34	0.58	0.01	0.0039	0.0034	0.0058
1234789-HpCDF	nd	0.62	nd	0.41	nd	0.26	0.52	0.01	nd	0.0026	0.0052
Total HpCDF	nd	--	0.39	--	0.39	0.39	--	0	0.0000	0.0000	—
1234678-HpCDD	0.00	--	0.20	--	0.10	0.10	--	0.01	0.0010	0.0010	—
Total HpCDD	0.00	--	0.00	--	0.00	0.00	--	0	0.0000	0.0000	—
OCDF	nd	1.10	2.90	--	2.90	1.73	--	0.001	0.0029	0.0017	—
OCDD	24.00	7.00	12.00	--	8.50	8.50	--	0.001	0.0085	0.0085	—
Total TEF									0.0163	1.1020	

TABLE E.1. 60-Day Tissue Dioxin Results, ng/Kg wet (Cont'd)

STATION 4	Rep 4		Rep 5		Average Congener Concentrations				Average TEF Concentrations		
Native Isomer	Conc.	D.L.	Conc.	D.L.	Mean Det. Values	Mean Det. +1/2 D.L.	Mean D.L.	TEF	Mean Det. Values	Mean Det. +1/2 D.L.	Mean D.L.
2378-TCDF	nd	0.97	0.49	--	0.49	0.49	0.97	0.1	0.0490	0.0490	0.0970
Total TCDF	nd	--	0.49	--	0.49	0.49	--	0	0.0000	0.0000	—
2378-TCDD	nd	2.50	nd	1.50	nd	1.00	2.00	1	nd	1.0000	2.0000
Total TCDD	nd	--	nd	--	nd	N/A	--	0	nd	N/A	—
12378-PeCDF	nd	0.49	nd	0.61	nd	0.28	0.55	0.05	nd	0.0138	0.0275
23478-PeCDF	nd	0.48	nd	0.48	nd	0.24	0.48	0.5	nd	0.1200	0.2400
Total PeCDF	nd	--	nd	--	nd	nd	--	0	nd	N/A	—
12378-PeCDD	nd	0.49	nd	0.43	nd	0.23	0.46	0.5	nd	0.1150	0.2300
Total PeCDD	nd	--	nd	--	nd	N/A	--	0	nd	N/A	—
123478-HxCDF	nd	0.48	nd	0.54	nd	0.26	0.51	0.1	nd	0.0255	0.0510
123678-HxCDF	nd	0.47	nd	0.38	nd	0.21	0.43	0.1	nd	0.0213	0.0425
123789-HxCDF	nd	0.70	0.89	--	0.89	0.62	0.70	0.1	0.0890	0.0620	0.0700
234678-HxCDF	nd	0.91	nd	0.84	nd	0.44	0.86	0.1	nd	0.0438	0.0875
Total-HxCDF	nd	--	0.89	--	0.89	0.89	--	0	0.0000	0.0000	—
123478-HxCDD	nd	0.48	nd	0.61	nd	0.27	0.55	0.1	nd	0.0273	0.0545
123678-HxCDD	nd	0.78	nd	0.57	nd	0.34	0.68	0.1	nd	0.0338	0.0675
123789-HxCDD	nd	0.78	nd	0.64	nd	0.36	0.71	0.1	nd	0.0355	0.0710
Total-HxCDD	nd	--	nd	--	nd	N/A	--	0	nd	N/A	—
1234678-HpCDF	nd	0.81	1.07	--	1.07	0.74	0.81	0.01	0.0107	0.0074	0.0081
1234789-HpCDF	nd	0.89	0.70	--	0.70	0.57	0.89	0.01	0.0070	0.0057	0.0089
Total HpCDF	nd	--	3.87	--	3.87	3.87	—	0	0.0000	0.0000	—
1234678-HpCDD	0.20	--	3.20	--	1.70	1.70	—	0.01	0.0170	0.0170	—
Total HpCDD	0.00	--	4.40	--	2.20	2.20	—	0	0.0000	0.0000	—
OCDF	nd	1.30	5.40	--	5.40	3.03	1.30	0.001	0.0054	0.0030	0.0013
OCDD	5.00	--	93.00	--	49.00	49.00	--	0.001	0.0490	0.0490	—
Total TEF									0.2271	1.6289	

TABLE E.1. 60-Day Tissue Dioxin Results, ng/Kg wet (Cont'd)

STATION 5	Rep 4		Rep 5		Average Congener Concentrations				Average TEF Concentrations		
Native Isomer	Conc.	D.L.	Conc.	D.L.	Mean Det. Values	Mean Det. +1/2 D.L.	Mean D.L.	TEF	Mean Det. Values	Mean Det. +1/2 D.L.	Mean D.L.
2378-TCDF	nd	2.20	nd	0.51	nd	0.68	1.36	0.1	nd	0.0678	0.1355
Total TCDF	nd	--	nd	--	nd	N/A	--	0	nd	N/A	—
2378-TCDD	nd	4.20	nd	0.60	nd	1.20	2.40	1	nd	1.2000	2.4000
Total TCDD	nd	--	nd	--	nd	N/A	--	0	nd	N/A	—
12378-PeCDF	nd	0.74	nd	0.22	nd	0.24	0.48	0.05	nd	0.0120	0.0240
23478-PeCDF	nd	0.72	nd	0.20	nd	0.23	0.46	0.5	nd	0.1150	0.2300
Total PeCDF	nd	--	nd	--	nd	N/A	--	0	nd	N/A	—
12378-PeCDD	nd	2.40	nd	0.18	nd	0.65	1.29	0.5	nd	0.3225	0.6450
Total PeCDD	nd	--	nd	--	nd	N/A	--	0	nd	N/A	—
123478-HxCDF	nd	0.86	nd	0.18	nd	0.26	0.52	0.1	nd	0.0260	0.0520
123678-HxCDF	nd	0.93	nd	0.17	nd	0.28	0.55	0.1	nd	0.0275	0.0550
123789-HxCDF	nd	2.00	0.35	--	0.35	0.68	--	0.1	0.0350	0.0675	—
234678-HxCDF	nd	5.10	nd	0.28	nd	1.35	2.69	0.1	nd	0.1345	0.2690
Total-HxCDF	*nd*	--	*0.35*	--	*0.35*	*0.35*	--	*0*	*0.0000*	*0.0000*	—
123478-HxCDD	nd	2.10	nd	0.19	nd	0.57	1.15	0.1	nd	0.0573	0.1145
123678-HxCDD	nd	3.30	nd	0.20	nd	0.88	1.75	0.1	nd	0.0875	0.1750
123789-HxCDD	nd	2.30	nd	0.29	nd	0.65	1.30	0.1	nd	0.0648	0.1295
Total-HxCDD	7.60	--	nd	--	7.60	7.60	--	0	0.0000	0.0000	—
1234678-HpCDF	nd	2.10	0.09	--	0.09	0.57	2.10	0.01	0.0009	0.0057	0.0210
1234789-HpCDF	nd	1.10	nd	0.34	nd	0.36	0.72	0.01	nd	0.0036	0.0072
Total HpCDF	nd	--	0.67	--	0.67	0.67	--	0	0.0000	0.0000	—
1234678-HpCDD	nd	2.90	0.00	--	0.00	0.73	2.90	0.01	0.0000	0.0072	0.0290
Total HpCDD	nd	--	0.00	--	0.00	0.00	--	0	0.0000	0.0000	—
OCDF	nd	1.50	0.00	--	0.00	0.38	1.50	0.001	0.0000	0.0004	0.0015
OCDD	2.00	--	0.00	--	1.00	1.00	--	0.001	0.0010	0.0010	—
Total TEF									0.0369	2.2002	

TABLE E.1. 60-Day Tissue Dioxin Results, ng/Kg wet (Cont'd)

STATION 6					Average Congener Concentrations				Average TEF Concentrations		
	Rep 4		Rep 5		Mean Det.	Mean Det.	Mean		Mean Det.	Mean Det.	Mean
Native Isomer	Conc.	D.L.	Conc.	D.L.	Values	+1/2 D.L.	D.L.	TEF	Values	+1/2 D.L.	D.L.
2378-TCDF	nd	1.60	nd	0.62	nd	0.56	1.11	0.1	nd	0.0555	0.1110
Total TCDF	nd	--	nd	--	nd	N/A	--	0	nd	N/A	—
2378-TCDD	nd	1.40	nd	0.61	nd	0.50	1.01	1	nd	0.5025	1.0050
Total TCDD	nd	--	nd	--	nd	N/A	--	0	nd	N/A	—
12378-PeCDF	nd	0.59	nd	0.35	nd	0.24	0.47	0.05	nd	0.0118	0.0235
23478-PeCDF	nd	0.44	0.33	--	0.33	0.28	0.44	0.5	0.1650	0.1375	0.2200
Total PeCDF	nd	--	0.33	--	0.33	0.33	--	0	0.0000	0.0000	—
12378-PeCDD	nd	0.62	nd	0.49	nd	0.28	0.56	0.5	nd	0.1386	0.2775
Total PeCDD	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
123478-HxCDF	nd	0.37	nd	0.52	nd	0.22	0.45	0.1	nd	0.0223	0.0445
123678-HxCDF	0.60	--	0.80	--	0.70	0.70	--	0.1	0.0700	0.0700	—
123789-HxCDF	nd	0.42	0.83	--	0.83	0.52	0.42	0.1	0.0830	0.0520	0.0420
234678-HxCDF	nd	0.65	nd	0.64	nd	0.32	0.65	0.1	nd	0.0323	0.0645
Total-HxCDF	1.80	--	4.10	--	2.95	2.95	—	0	0.0000	0.0000	—
123478-HxCDD	nd	0.68	nd	0.79	nd	0.37	0.74	0.1	nd	0.0368	0.0735
123678-HxCDD	nd	0.29	nd	0.55	nd	0.21	0.42	0.1	nd	0.0210	0.0420
123789-HxCDD	nd	0.40	0.80	--	0.80	0.50	0.40	0.1	0.0800	0.0500	—
Total-HxCDD	nd	--	2.70	--	2.70	2.70	--	0	0.0000	0.0000	—
1234678-HpCDF	3.77	--	2.17	--	2.97	2.97	—	0.01	0.0297	0.0297	—
1234789-HpCDF	nd	0.76	nd	0.67	nd	0.36	0.72	0.01	nd	0.0036	0.0072
Total HpCDF	8.27	--	7.47	--	7.87	7.87	—	0	0.0000	0.0000	—
1234678-HpCDD	1.80	--	2.40	--	2.10	2.10	—	0.01	0.0210	0.0210	—
Total HpCDD	3.10	--	4.10	--	3.60	3.60	--	0	0.0000	0.0000	—
OCDF	3.70	--	3.60	--	3.65	3.65	--	0.001	0.0037	0.0037	—
OCDD	12.00	--	26.00	--	19.00	19.00	—	0.001	0.0190	0.0190	—
Total TEF									0.4714	1.2072	

TABLE E.1. 60-Day Tissue Dioxin Results, ng/Kg wet (Cont'd)

STATION 7	Rep 4		Rep 5		Average Congener Concentrations				Average TEF Concentrations		
Native Isomer	Conc.	D.L.	Conc.	D.L.	Mean Det. Values	Mean Det. +1/2 D.L.	Mean D.L.	TEF	Mean Det. Values	Mean Det. +1/2 D.L.	Mean D.L.
2378-TCDF	nd	1.00	0.30	--	0.30	0.40	1.00	0.1	0.0650	0.0575	0.1000
Total TCDF	nd	--	0.30	--	0.30	0.30	—	0	0.0000	0.0000	0.0000
2378-TCDD	nd	1.40	nd	1.10	nd	0.63	1.25	1	nd	0.6250	1.2500
Total TCDD	nd	--	nd	--	nd	N/A	—	0	nd	N/A	—
12378-PeCDF	nd	0.37	nd	0.50	nd	0.22	0.44	0.05	nd	0.0109	0.0220
23478-PeCDF	nd	0.43	nd	0.54	nd	0.24	0.49	0.5	nd	0.1213	0.2450
Total PeCDF	nd	--	nd	--	nd	N/A	--	0	nd	N/A	—
12378-PeCDD	nd	0.70	nd	0.47	nd	0.29	0.59	0.5	nd	0.1463	0.2950
Total PeCDD	nd	--	nd	--	nd	N/A	—	0	nd	N/A	—
123478-HxCDF	nd	0.44	nd	0.44	nd	0.22	0.44	0.1	nd	0.0220	0.0440
123678-HxCDF	nd	0.58	nd	0.42	nd	0.25	0.50	0.1	nd	0.0250	0.0500
123789-HxCDF	0.72	--	nd	0.49	0.72	0.48	0.49	0.1	0.0720	0.0483	0.0490
234678-HxCDF	nd	0.61	nd	0.90	nd	0.38	0.76	0.1	nd	0.0378	0.0760
Total-HxCDF	0.72	--	nd	--	0.72	0.36	—	0	0.0000	0.0000	—
123478-HxCDD	nd	0.79	nd	0.38	nd	0.29	0.59	0.1	nd	0.0292	0.0590
123678-HxCDD	nd	0.41	nd	0.35	nd	0.19	0.38	0.1	nd	0.0190	0.0380
123789-HxCDD	nd	0.58	nd	0.71	nd	0.32	0.65	0.1	nd	0.0323	0.0650
Total-HxCDD	nd	--	nd	--	nd	N/A	—	0	nd	N/A	—
1234678-HpCDF	nd	0.42	nd	1.40	nd	0.46	0.91	0.01	nd	0.0046	0.0091
1234789-HpCDF	nd	0.40	nd	0.37	nd	0.19	0.39	0.01	nd	0.0019	0.0039
Total HpCDF	nd	—	nd	—	nd	N/A	—	0	nd	N/A	—
1234678-HpCDD	0.00	--	0.10	—	0.05	0.03	—	0.01	0.0005	0.0003	—
Total HpCDD	0.00	--	0.00	—	0.00	0.00	—	0	0.0000	0.0000	—
OCDF	nd	1.00	nd	1.40	nd	0.60	1.20	0.001	nd	0.0006	0.0012
OCDD	15.00	--	13.00	—	14.00	7.00	—	0.001	0.0140	N/A	—
Total TEF									0.1515	1.1817	

TABLE E.1. 60-Day Tissue Dioxin Results, ng/Kg wet (Cont'd)

STATION 8	Rep 4		Rep 5		Average Congener Concentrations				Average TEF Concentrations		
Native Isomer	Conc.	D.L.	Conc.	D.L.	Mean Det. Values	Mean Det. +1/2 D.L.	Mean D.L.	TEF	Mean Det. Values	Mean Det. +1/2 D.L.	Mean D.L.
2378-TCDF	0.34	--	1.45	--	0.90	0.90	—	0.1	0.0895	0.0895	—
Total TCDF	0.34	--	1.45	--	0.90	0.90	—	0	0.0000	0.0000	—
2378-TCDD	nd	1.40	nd	1.40	nd	0.70	1.40	1	nd	0.7000	1.4000
Total TCDD	1.00	--	nd	--	1.00	1.00	--	0	0.0000	N/A	—
12378-PeCDF	nd	0.36	nd	0.51	nd	0.22	0.44	0.05	nd	0.0109	0.0218
23478-PeCDF	nd	0.39	nd	0.56	nd	0.24	0.48	0.5	nd	0.1188	0.2375
Total PeCDF	nd	--	nd	--	nd	N/A	—	0	nd	N/A	—
12378-PeCDD	nd	0.27	nd	0.49	nd	0.19	0.38	0.5	nd	0.0950	0.1900
Total PeCDD	nd	--	nd	--	nd	N/A	—	0	nd	N/A	—
123478-HxCDF	nd	0.47	nd	0.88	nd	0.34	0.68	0.1	nd	0.0338	0.0675
123678-HxCDF	nd	0.69	nd	0.47	nd	0.29	0.58	0.1	nd	0.0290	0.0580
123789-HxCDF	nd	0.53	nd	0.61	nd	0.29	0.57	0.1	nd	0.0285	0.0570
234678-HxCDF	nd	1.20	nd	0.94	nd	0.54	1.07	0.1	nd	0.0535	0.1070
Total-HxCDF	nd	--	nd	--	nd	N/A	—	0	nd	N/A	—
123478-HxCDD	nd	0.36	nd	0.98	nd	0.34	0.67	0.1	nd	0.0335	0.0670
123678-HxCDD	nd	0.56	nd	1.40	nd	0.49	0.98	0.1	nd	0.0490	0.0980
123789-HxCDD	nd	0.66	nd	0.61	nd	0.32	0.64	0.1	nd	0.0318	0.0635
Total-HxCDD	nd	—	nd	—	nd	N/A	—	0	nd	N/A	—
1234678-HpCDF	nd	0.73	nd	2.80	nd	0.88	1.77	0.01	nd	0.0088	0.0177
1234789-HpCDF	nd	0.27	nd	0.60	nd	0.22	0.44	0.01	nd	0.0022	0.0044
Total HpCDF	nd	--	1.87	--	1.87	1.87	—	0	0.0000	0.0000	—
1234678-HpCDD	1.40	--	1.40	--	1.40	1.40	—	0.01	0.0140	0.0140	—
Total HpCDD	2.50	--	4.30	--	3.40	3.40	—	0	0.0000	0.0000	—
OCDF	nd	5.70	0.50	--	0.50	1.66	5.70	0.001	0.0005	0.0017	0.0057
OCDD	26.00	--	30.00	--	28.00	28.00	—	0.001	0.0280	0.0280	—
Total TEF									0.1320	1.3278	

TABLE E.1. 60-Day Tissue Dioxin Results, ng/Kg wet (Cont'd)

STATION 9	Rep 4		Rep 5		Average Congener Concentrations				Average TEF Concentrations		
Native Isomer	Conc.	D.L.	Conc.	D.L.	Mean Det. Values	Mean Det. +1/2 D.L.	Mean D.L.	TEF	Mean Det. Values	Mean Det. +1/2 D.L.	Mean D.L.
2378-TCDF	nd	3.50	0.85	--	0.85	1.30	3.50	0.1	0.0850	0.1300	0.3500
Total TCDF	nd	--	0.85	--	0.85	0.85	—	0	0.0000	0.0000	—
2378-TCDD	nd	0.66	nd	0.83	nd	0.38	0.75	1	nd	0.3800	0.7450
Total TCDD	nd	--	nd	--	nd	N/A	—	0	nd	N/A	—
12378-PeCDF	nd	0.79	nd	0.29	nd	0.27	0.54	0.05	nd	0.0135	0.0270
23478-PeCDF	nd	3.00	nd	0.29	nd	0.83	1.65	0.5	nd	0.4150	0.8225
Total PeCDF	1.10	--	nd	--	1.10	1.10	—	0	0.0000	0.0000	—
12378-PeCDD	nd	2.80	nd	0.60	nd	0.85	1.70	0.5	nd	0.4250	0.8500
Total PeCDD	nd	--	nd	--	nd	N/A	—	0	nd	N/A	—
123478-HxCDF	nd	0.96	nd	0.39	nd	0.34	0.68	0.1	nd	0.0340	0.0675
123678-HxCDF	nd	1.20	nd	0.30	nd	0.38	0.75	0.1	nd	0.0380	0.0750
123789-HxCDF	nd	1.90	nd	0.59	nd	0.63	1.24	0.1	nd	0.0630	0.1245
234678-HxCDF	nd	2.90	nd	0.43	nd	0.84	1.67	0.1	nd	0.0840	0.1665
Total-HxCDF	nd	--	nd	—	nd	N/A	—	0	nd	N/A	—
123478-HxCDD	nd	1.90	nd	0.36	nd	0.57	1.13	0.1	nd	0.0570	0.1130
123678-HxCDD	nd	3.00	nd	0.61	nd	0.91	1.81	0.1	nd	0.0910	0.1805
123789-HxCDD	nd	1.50	nd	0.76	nd	0.57	1.13	0.1	nd	0.0570	0.1130
Total-HxCDD	nd	--	1.00	--	1.00	1.00	—	0	0.0000	0.0000	—
1234678-HpCDF	nd	1.60	nd	0.73	nd	0.59	1.17	0.01	nd	0.0059	0.0117
1234789-HpCDF	nd	2.80	nd	0.64	nd	0.86	1.72	0.01	nd	0.0086	0.0172
Total HpCDF	nd	--	nd	—	nd	N/A	—	0	nd	N/A	—
1234678-HpCDD	nd	5.30	1.10	--	1.10	1.88	5.30	0.01	0.0110	0.0188	0.0530
Total HpCDD	nd	--	1.70	--	1.70	1.70	—	0	0.0000	0.0000	—
OCDF	nd	6.50	0.00	--	0.00	1.63	6.50	0.001	0.0000	0.0016	0.0065
OCDD	35.00	--	15.00	--	25.00	25.00	—	0.001	0.0250	0.0250	—
Total TEF									0.1210	1.8474	

TABLE E.1. 60-Day Tissue Dioxin Results, ng/Kg wet (Cont'd)

STATION 10					Average Congener Concentrations				Average TEF Concentrations		
	Rep 4		Rep 5		Mean Det.	Mean Det.	Mean		Mean Det.	Mean Det.	Mean
Native Isomer	Conc.	D.L.	Conc.	D.L.	Values	+1/2 D.L.	D.L.	TEF	Values	+1/2 D.L.	D.L.
2378-TCDF	nd	1.60	NO DATA		nd	0.80	1.60	0.1	0.0000	0.0800	0.1600
Total TCDF	nd	--			nd	N/A	--	0	0.0000	0.0000	—
2378-TCDD	nd	1.20			nd	0.60	1.20	1	nd	0.6000	1.2000
Total TCDD	nd	--			nd	N/A	—	0	nd	N/A	—
12378-PeCDF	nd	0.44			nd	0.22	0.44	0.05	0.0000	0.0110	0.0220
23478-PeCDF	nd	1.70			nd	0.85	1.70	0.5	0.0000	0.4250	0.8500
Total PeCDF	nd	--			nd	N/A	—	0	0.0000	0.0000	—
12378-PeCDD	nd	0.29			nd	0.15	0.29	0.5	0.0000	0.0750	0.1450
Total PeCDD	nd	—			nd	N/A	—	0	0.0000	0.0000	—
123478-HxCDF	nd	0.61			nd	0.30	0.61	0.1	0.0000	0.0300	0.0610
123678-HxCDF	nd	0.92			nd	0.46	0.92	0.1	0.0000	0.0460	0.0920
123789-HxCDF	nd	0.81			nd	0.40	0.81	0.1	0.0000	0.0400	—
234678-HxCDF	nd	1.30			nd	0.65	1.30	0.1	nd	0.0650	0.1300
Total-HxCDF	nd	--			nd	N/A	—	0	0.0000	0.0000	—
123478-HxCDD	nd	1.20			nd	0.60	1.20	0.1	nd	0.0600	0.1200
123678-HxCDD	nd	1.20			nd	0.60	1.20	0.1	nd	0.0600	0.1200
123789-HxCDD	nd	0.68			nd	0.32	0.68	0.1	0.0000	0.0320	0.0680
Total-HxCDD	nd	--			nd	N/A	—	0	0.0000	0.0000	—
1234678-HpCDF	0.35	--			0.35	0.35	--	0.01	0.0035	0.0035	—
1234789-HpCDF	nd	0.93			nd	0.47	0.93	0.01	0.0000	0.0047	0.0093
Total HpCDF	4.07	--			4.07	4.07	—	0	0.0000	0.0000	—
1234678-HpCDD	3.40	--			3.40	3.40	—	0.01	0.0340	0.0340	—
Total HpCDD	2.80	--			2.80	2.80	—	0	0.0000	0.0000	—
OCDF	3.20	--			3.20	3.20	--	0.001	0.0032	0.0032	—
OCDD	76.00	--			76.00	76.00	—	0.001	0.0760	0.0760	—
Total TEF									0.1167	1.6454	

TABLE E.1. 60-Day Tissue Dioxin Results, ng/Kg wet (Cont'd)

STATION 11	Rep 4		Rep 5		Average Congener Concentrations				Average TEF Concentrations		
Native Isomer	Conc.	D.L.	Conc.	D.L.	Mean Det. Values	Mean Det. +1/2 D.L.	Mean D.L.	TEF	Mean Det. Values	Mean Det. +1/2 D.L.	Mean D.L.
2378-TCDF	nd	1.20	nd	0.79	nd	0.50	1.00	0.1	nd	0.0498	0.0995
Total TCDF	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
2378-TCDD	nd	1.10	nd	1.30	nd	0.60	1.20	1	nd	0.6000	1.2000
Total TCDD	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
12378-PeCDF	nd	0.31	nd	0.42	nd	0.18	0.37	0.05	nd	0.0091	0.0183
23478-PeCDF	nd	0.32	nd	0.38	nd	0.18	0.35	0.5	nd	0.0900	0.1750
Total PeCDF	0.93	--	nd	--	0.93	0.93	--	0	0.0000	0.0000	--
12378-PeCDD	nd	0.26	nd	0.40	nd	0.17	0.33	0.5	nd	0.0850	0.1650
Total PeCDD	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
123478-HxCDF	nd	0.46	nd	0.48	nd	0.24	0.47	0.1	nd	6.0240	0.0470
123678-HxCDF	nd	0.53	nd	0.49	nd	0.25	0.51	0.1	nd	0.0250	0.0510
123789-HxCDF	nd	0.47	nd	0.82	nd	0.33	0.65	0.1	nd	0.0330	0.0645
234678-HxCDF	nd	0.42	nd	0.41	nd	0.21	0.42	0.1	nd	0.0210	0.0415
Total-HxCDF	3.50	--	nd	--	3.50	3.50	--	0	0.0060	0.0000	--
123478-HxCDD	nd	0.73	nd	0.52	nd	0.32	0.63	0.1	nd	0.0320	0.0625
123678-HxCDD	nd	0.56	nd	0.64	nd	0.30	0.60	0.1	nd	0.0300	0.0600
123789-HxCDD	nd	0.63	nd	0.64	nd	0.32	0.64	0.1	nd	0.0320	0.0635
Total-HxCDD	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
1234678-HpCDF	2.97	--	nd	9.10	2.97	3.76	9.10	0.01	0.0297	0.0376	0.0910
1234789-HpCDF	nd	0.48	nd	0.54	nd	0.26	0.51	0.01	nd	0.0026	0.0051
Total HpCDF	8.37	--	7.97	--	8.17	8.17	--	0	0.0000	0.0000	--
1234678-HpCDD	2.60	--	4.00	--	3.30	3.30	--	0.01	0.0330	0.0330	--
Total HpCDD	4.80	--	6.60	--	5.70	5.70	--	0	0.0000	0.0000	--
OCDF	4.50	--	4.00	--	4.25	4.25	--	0.001	0.0043	0.0043	--
OCDD	18.00	--	83.00	--	50.50	50.50	--	0.001	0.0505	0.0505	--
Total TEF									0.1175	1.1588	

TABLE E.1. 60-Day Tissue Dioxin Results, ng/Kg wet (Cont'd)

STATION 12	Rep 4		Rep 5		Average Congener Concentrations				Average TEF Concentrations		
Native Isomer	Conc.	D.L.	Conc.	D.L.	Mean Det. Values	Mean Det. +1/2 D.L.	Mean D.L.	TEF	Mean Det. Values	Mean Det. +1/2 D.L.	Mean D.L.
2378-TCDF	nd	0.97	0.50	--	0.50	0.49	0.97	0.1	0.0500	0.0493	0.0970
Total TCDF	nd	--	0.50	--	0.50	0.50	--	0	0.0000	0.0000	--
2378-TCDD	nd	1.80	nd	0.77	nd	0.64	1.29	1	nd	0.6425	1.2850
Total TCDD	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
12378-PeCDF	nd	0.73	nd	0.36	nd	0.27	0.55	0.05	nd	0.0136	0.0273
23478-PeCDF	nd	0.29	nd	0.23	nd	0.13	0.26	0.5	nd	0.0650	0.1300
Total PeCDF	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
12378-PeCDD	nd	0.85	nd	0.23	nd	0.27	0.54	0.5	nd	0.1350	0.2700
Total PeCDD	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
123478-HxCDF	nd	0.46	nd	0.20	nd	0.17	0.33	0.1	nd	0.0165	0.0330
123678-HxCDF	nd	0.48	nd	0.17	nd	0.16	0.33	0.1	nd	0.0163	0.0325
123789-HxCDF	nd	0.70	0.44	--	0.44	0.40	0.70	0.1	0.0440	0.0395	0.0700
234678-HxCDF	nd	0.93	nd	0.31	nd	0.31	0.62	0.1	nd	0.0310	0.0620
Total-HxCDF	nd	--	1.60	--	1.60	1.60	--	0	0.0000	0.0000	--
123478-HxCDD	nd	0.56	nd	0.33	nd	0.22	0.45	0.1	nd	0.0223	0.0445
123678-HxCDD	nd	0.74	nd	0.28	nd	0.26	0.51	0.1	nd	0.0255	0.0510
123789-HxCDD	nd	0.58	nd	0.43	nd	0.25	0.51	0.1	nd	0.0253	0.0505
Total-HxCDD	nd	--	0.95	--	0.95	0.95	--	0	0.0000	0.0000	--
1234678-HpCDF	nd	0.81	0.31	--	0.31	0.36	0.81	0.01	0.0031	0.0036	--
1234789-HpCDF	nd	0.71	nd	0.33	nd	0.26	0.52	0.01	nd	0.0026	0.0052
Total HpCDF	nd	--	1.67	--	1.67	1.67	--	0	0.0000	0.0000	--
1234678-HpCDD	4.10	--	1.20	--	2.65	2.65	--	0.01	0.0265	0.0265	--
Total HpCDD	7.70	--	2.90	--	5.30	5.30	--	0	0.0000	0.0000	--
OCDF	2.40	--	0.80	--	1.60	1.60	--	0.001	0.0016	0.0016	--
OCDD	103.00	--	9.00	--	56.00	56.00	--	0.001	0.0560	0.0560	--
Total TEF									0.1812	1.1719	

TABLE E.1. 60-Day Tissue Dioxin Results, ng/Kg wet (Cont'd)

STATION 13					Average Congener Concentrations				Average TEF Concentrations		
	Rep 4		Rep 5		Mean Det.	Mean Det.	Mean		Mean Det.	Mean Det.	Mean
Native Isomer	Conc.	D.L.	Conc.	D.L.	Values	+1/2 D.L.	D.L.	TEF	Values	+1/2 D.L.	D.L.
2378-TCDF	nd	0.71	nd	0.46	nd	0.29	0.59	0.1	nd	0.0292	0.0585
Total TCDF	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
2378-TCDD	nd	1.40	nd	0.64	nd	0.51	1.02	1	nd	0.5100	1.0200
Total TCDD	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
12378-PeCDF	nd	0.18	nd	0.25	nd	0.11	0.22	0.05	nd	0.0054	0.0108
23478-PeCDF	nd	0.14	nd	0.17	nd	0.08	0.16	0.5	nd	0.0388	0.0775
Total PeCDF	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
12378-PeCDD	nd	0.45	nd	0.16	nd	0.15	0.31	0.5	nd	0.0763	0.1525
Total PeCDD	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
123478-HxCDF	0.30	--	nd	0.21	0.3	0.20	0.21	0.1	0.0300	0.0203	0.0210
123678-HxCDF	0.39	--	nd	0.21	0.39	0.25	0.21	0.1	0.0390	0.0248	0.0210
123789-HxCDF	0.34	--	0.25	--	0.30	0.30	--	0.1	0.0295	0.0295	--
234678-HxCDF	nd	0.37	nd	0.37	nd	0.19	0.37	0.1	nd	0.0185	0.0370
Total-HxCDF	1.00	--	1.30	--	1.15	1.15	--	0	0.0000	0.0000	--
123478-HxCDD	nd	0.23	nd	0.28	nd	0.13	0.26	0.1	nd	0.0128	0.0255
123678-HxCDD	nd	0.22	nd	0.17	nd	0.10	0.20	0.1	nd	0.0098	0.0195
123789-HxCDD	nd	0.22	nd	0.25	nd	0.12	0.24	0.1	nd	0.0118	0.0235
Total-HxCDD	nd	--	1.50	--	1.50	1.50	--	0	0.0000	0.0000	--
1234678-HpCDF	0.47	--	0.36	--	0.42	0.42	--	0.01	0.0042	0.0042	--
1234789-HpCDF	nd	0.32	nd	0.29	nd	0.15	0.31	0.01	nd	0.0015	0.0031
Total HpCDF	2.17	--	1.57	--	1.87	1.87	--	0	0.0000	0.0000	--
1234678-HpCDD	0.60	--	0.50	--	0.55	0.55	--	0.01	0.0055	0.0055	--
Total HpCDD	1.50	--	0.00	--	0.75	0.75	--	0	0.0000	0.0006	--
OCDF	1.70	--	0.20	--	0.95	0.95	--	0.001	0.0010	0.0010	--
OCDD	8.00	--	1.00	--	4.50	4.50	--	0.001	0.0045	0.0045	--
Total TEF									0.1136	0.8035	

TABLE E.1. 60-Day Tissue Dioxin Results, ng/Kg wet (Cont'd)

STATION 14	Rep 4		Rep 5		Average Congener Concentrations				Average TEF Concentrations		
Native Isomer	Conc.	D.L.	Conc.	D.L.	Mean Det. Values	Mean Det. +1/2 D.L.	Mean D.L.	TEF	Mean Det. Values	Mean Det. +1/2 D.L.	Mean D.L.
2378-TCDF	nd	0.45	nd	0.62	nd	0.27	0.54	0.1	nd	0.0268	0.0535
Total TCDF	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
2378-TCDD	nd	0.95	nd	0.53	nd	0.37	0.74	1	nd	0.3700	0.7400
Total TCDD	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
12378-PeCDF	nd	0.24	nd	0.20	nd	0.11	0.22	0.05	nd	0.0055	0.0110
23478-PeCDF	nd	0.20	nd	0.17	nd	0.09	0.19	0.5	nd	0.0463	0.0925
Total PeCDF	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
12378-PeCDD	nd	0.22	nd	0.25	nd	0.12	0.24	0.5	nd	0.0588	0.1175
Total PeCDD	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
123478-HxCDF	nd	0.35	nd	0.25	nd	0.15	0.30	0.1	nd	0.0150	0.0300
123678-HxCDF	nd	0.26	nd	0.13	nd	0.10	0.20	0.1	nd	0.0098	0.0195
123789-HxCDF	0.52	--	0.38	--	0.45	0.45	--	0.1	0.0450	0.0450	--
234678-HxCDF	nd	0.25	nd	0.17	nd	0.11	0.21	0.1	nd	0.0105	0.0210
Total-HxCDF	0.52	--	0.38	--	0.45	0.45	--	0	0.0000	0.0000	--
123478-HxCDD	nd	0.27	nd	0.22	nd	0.12	0.25	0.1	nd	0.0123	0.0245
123678-HxCDD	nd	0.33	nd	0.30	nd	0.16	0.32	0.1	nd	0.0158	0.0315
123789-HxCDD	nd	0.33	nd	0.15	nd	0.12	0.24	0.1	nd	0.0120	0.0240
Total-HxCDD	nd	--	0.45	--	0.45	0.45	--	0	0.0000	0.0000	--
1234678-HpCDF	0.37	--	0.29	--	0.33	0.33	--	0.01	0.0033	0.0033	--
1234789-HpCDF	nd	0.25	nd	0.23	nd	0.12	0.24	0.01	nd	0.0012	0.0024
Total HpCDF	1.37	--	1.37	--	1.37	1.37	--	0	0.0000	0.0000	--
1234678-HpCDD	0.00	--	0.00	--	0.00	0.00	--	0.01	0.0000	0.0000	--
Total HpCDD	0.00	--	0.00	--	0.00	0.00	--	0	0.0000	0.0000	--
OCDF	0.30	--	0.20	--	0.25	0.25	--	0.001	0.0002	0.0003	--
OCDD	0.00	--	0.00	--	0.00	0.00	--	0.001	0.0000	0.0000	--
Total TEF									0.0486	0.6323	

TABLE E.1. 60-Day Tissue Dioxin Results, ng/Kg wet (Cont'd)

STATION 17					Average Congener Concentrations				Average TEF Concentrations		
	Rep 4		Rep 5		Mean Det.	Mean Det.	Mean		Mean Det.	Mean Det.	Mean
Native Isomer	Conc.	D.L.	Conc.	D.L.	Values	+1/2 D.L.	D.L.	TEF	Values	+1/2 D.L.	D.L.
2378-TCDF	0.26	--	nd	0.90	0.26	0.36	0.90	0.1	0.0260	0.0355	0.0900
Total TCDF	0.26	--	nd	--	0.26	0.26	--	0	0.0000	0.0000	--
2378-TCDD	nd	0.54	nd	1.10	nd	0.41	0.82	1	nd	0.4100	0.8200
Total TCDD	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
12378-PeCDF	nd	0.15	nd	0.45	nd	0.15	0.30	0.05	nd	0.0075	0.0150
23478-PeCDF	nd	0.13	nd	0.49	nd	0.16	0.31	0.5	nd	0.0775	0.1550
Total PeCDF	0.24	--	nd	--	0.24	0.24	--	0	0.0000	0.0000	--
12378-PeCDD	nd	0.18	nd	0.36	nd	0.14	0.27	0.5	nd	0.0675	0.1350
Total PeCDD	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
123478-HxCDF	nd	0.22	nd	0.71	nd	0.23	0.46	0.1	nd	0.0233	0.0465
123678-HxCDF	nd	0.16	nd	0.61	nd	0.19	0.39	0.1	nd	0.0193	0.0385
123789-HxCDF	nd	0.28	nd	0.77	nd	0.26	0.53	0.1	nd	0.0263	0.0525
234678-HxCDF	nd	0.24	nd	1.30	nd	0.39	0.77	0.1	nd	0.0385	0.0770
Total-HxCDF	1.20	--	nd	--	1.20	1.20	--	0	0.0000	0.0000	--
123478-HxCDD	nd	0.24	nd	0.52	nd	0.19	0.38	0.1	nd	0.0190	0.0380
123678-HxCDD	nd	0.30	nd	0.76	nd	0.27	0.53	0.1	nd	0.0265	0.0530
123789-HxCDD	nd	0.24	nd	0.76	nd	0.25	0.50	0.1	nd	0.0250	0.0500
Total-HxCDD	0.63	--	nd	--	0.63	0.63	--	0	0.0000	0.0000	--
1234678-HpCDF	0.57	--	nd	4.00	0.57	1.29	4.00	0.01	0.0057	0.0129	0.0400
1234789-HpCDF	nd	0.18	nd	0.69	nd	0.22	0.44	0.01	nd	0.0022	0.0044
Total HpCDF	2.37	--	nd	--	2.37	2.37	--	0	0.0000	0.0000	--
1234678-HpCDD	0.10	--	1.00	--	0.55	0.55	--	0.01	0.0055	0.0055	--
Total HpCDD	0.20	--	1.90	--	1.05	1.05	--	0	0.0000	0.0000	--
OCDF	0.50	--	0.90	--	0.70	0.70	--	0.001	0.0007	0.0007	--
OCDD	0.00	--	21.00	--	10.50	10.50	--	0.001	0.0105	0.0105	--
Total TEF									0.0484	0.8075	

TABLE E.1. 60-Day Tissue Dioxin Results, ng/Kg wet (Cont'd)

SQUIM BAY	Rep 4		Rep 5		Average Congener Concentrations				Average TEF Concentrations		
Native Isomer	Conc.	D.L.	Conc.	D.L.	Mean Det. Values	Mean Det. +1/2 D.L.	Mean D.L.	TEF	Mean Det. Values	Mean Det. +1/2 D.L.	Mean D.L.
2378-TCDF	nd	1.40	nd	0.82	nd	0.55	1.11	0.1	nd	0.0555	0.1110
Total TCDF	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
2378-TCDD	nd	0.83	nd	0.52	nd	0.34	0.68	1	nd	0.3375	0.6750
Total TCDD	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
12378-PeCDF	nd	0.40	nd	0.33	nd	0.18	0.37	0.05	nd	0.0091	0.0183
23478-PeCDF	nd	0.42	nd	0.27	nd	0.17	0.35	0.5	nd	0.0863	0.1725
Total PeCDF	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
12378-PeCDD	nd	0.74	nd	0.18	nd	0.23	0.46	0.5	nd	0.1150	0.2300
Total PeCDD	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
123478-HxCDF	nd	2.60	nd	0.32	nd	0.73	1.46	0.1	nd	0.0730	0.1460
123678-HxCDF	nd	2.50	nd	0.28	nd	0.70	1.39	0.1	nd	0.0695	0.1390
123789-HxCDF	nd	3.20	nd	0.28	nd	0.87	1.74	0.1	nd	0.0870	0.1740
234678-HxCDF	nd	1.60	nd	0.67	nd	0.57	1.14	0.1	nd	0.0568	0.1135
Total-HxCDF	nd	--	0.73	--	0.73	0.73	--	0	0.0000	0.0000	--
123478-HxCDD	nd	1.80	nd	0.42	nd	0.56	1.11	0.1	nd	0.0555	0.1110
123678-HxCDD	nd	2.10	nd	0.52	nd	0.66	1.31	0.1	nd	0.0655	0.1310
123789-HxCDD	nd	1.70	nd	0.52	nd	0.56	1.11	0.1	nd	0.0555	0.1110
Total-HxCDD	nd	--	nd	--	nd	N/A	--	0	nd	N/A	--
1234678-HpCDF	1.27	--	0.00	--	0.64	0.64	--	0.01	0.0064	0.0064	--
1234789-HpCDF	nd	0.71	nd	0.39	nd	0.28	0.55	0.01	nd	0.0028	0.0055
Total HpCDF	1.27	--	0.00	--	0.64	0.64	--	0	0.0000	0.0000	--
1234678-HpCDD	0.40	--	0.10	--	0.25	0.25	--	0.01	0.0025	0.0025	--
Total HpCDD	0.00	--	0.00	--	0.00	0.00	--	0	0.0000	0.0000	--
OCDF	nd	2.80	0.00	--	0.00	0.00	--	0.001	0.0000	0.0000	--
OCDD	5.00	--	0.00	--	2.50	2.50	--	0.001	0.0025	0.0025	--
Total TEF								0.0114	1.0803		

TABLE E.1. 60-Day Tissue Dioxin Results, ng/Kg wet (Cont'd)

WEST BEACH					Average Congener Concentrations				Average TEF Concentrations		
	Rep 4		Rep 5		Mean Det.	Mean Det.	Mean		Mean Det.	Mean Det.	Mean
Native Isomer	Conc.	D.L.	Conc.	D.L.	Values	+1/2 D.L.	D.L.	TEF	Values	+1/2 D.L.	D.L.
2378-TCDF	nd	1.30	nd	1.50	nd	0.70	1.40	0.1	nd	0.0700	0.1400
Total TCDF	nd	--	nd	--	nd	N/A	--	0	nd	N/A	—
2378-TCDD	nd	2.50	nd	0.47	nd	0.74	1.49	1	nd	0.7425	1.4850
Total TCDD	nd	--	nd	--	nd	N/A	--	0	nd	N/A	—
12378-PeCDF	nd	0.51	nd	0.41	nd	0.23	0.46	0.05	nd	0.0115	0.0230
23478-PeCDF	nd	0.82	nd	1.30	nd	0.53	1.06	0.5	nd	0.2650	0.5300
Total PeCDF	nd	--	nd	--	nd	N/A	--	0	nd	N/A	—
12378-PeCDD	nd	1.00	nd	0.26	nd	0.32	0.63	0.5	nd	0.1575	0.3150
Total PeCDD	nd	--	16.00	--	16.00	16.00	--	0	0.0000	0.0000	—
123478-HxCDF	nd	0.51	nd	0.61	nd	0.28	0.56	0.1	nd	0.0280	0.0560
123678-HxCDF	nd	0.54	nd	0.61	nd	0.29	0.58	0.1	nd	0.0288	0.0575
123789-HxCDF	nd	0.96	nd	1.70	nd	0.67	1.33	0.1	nd	0.0665	0.1330
234678-HxCDF	nd	2.40	nd	0.72	nd	0.78	1.56	0.1	nd	0.0780	0.1560
Total-HxCDF	nd	--	nd	--	nd	N/A	--	0	nd	N/A	—
123478-HxCDD	nd	0.97	nd	0.57	nd	0.39	0.77	0.1	nd	0.0385	0.0770
123678-HxCDD	nd	1.40	nd	0.53	nd	0.48	0.97	0.1	nd	0.0483	0.0965
123789-HxCDD	nd	1.10	nd	0.86	nd	0.49	0.98	0.1	nd	0.0490	0.0980
Total-HxCDD	nd	--	nd	--	nd	N/A	--	0	nd	N/A	—
1234678-HpCDF	nd	1.10	nd	0.87	nd	0.49	0.99	0.01	nd	0.0049	0.0099
1234789-HpCDF	nd	1.40	nd	0.58	nd	0.50	0.99	0.01	nd	0.0050	0.0099
Total HpCDF	nd	--	nd	—	nd	N/A	—	0	nd	N/A	—
1234678-HpCDD	nd	1.50	0.00	--	0.00	0.75	1.50	0.01	0.0000	0.0075	0.0150
Total HpCDD	nd	--	0.00	--	0.00	0.00	—	0	0.0000	0.0000	—
OCDF	nd	3.70	nd	0.92	nd	1.16	2.31	0.001	nd	0.0012	0.0023
OCDD	0.00	--	10.00	--	5.00	5.00	--	0.001	0.0050	0.0050	—
Total TEF									0.0050	1.6070	

TABLE E.2. 60-Day Tissue Lipid Results

Station	Rep	% Lipid	Dup.	% RPD
Sta. 1	4	0.35		
Sta. 1	5	0.20		
Sta. 2	4	0.20		
Sta. 2	5	0.23		
Sta. 3	4	0.21		
Sta. 3	5	0.21		
Sta. 4	4	0.21		
Sta. 4	5	0.30		
Sta. 5	4	0.28		
Sta. 5	5	0.37		
Sta. 6	4	0.50	0.50	0.00
Sta. 6	5	0.75		
Sta. 7	4	0.42		
Sta. 7	5	0.36		
Sta. 8	4	0.15	0.15	0.00
Sta. 8	5	0.80		
Sta. 9	4	0.89		
Sta. 9	5	0.73		
Sta. 10	4	0.20		
Sta. 10	5	0.56		
Sta. 11	4	0.27	0.27	0.00
Sta. 11	5	0.45		
Sta. 12	4	0.43		
Sta. 12	5	0.56		
Sta. 13	4	0.27		
Sta. 13	5	0.63		
Sta. 14	4	0.55		
Sta. 14	5	0.15		
Sta. 17	4	0.29		
Sta. 17	5	0.79		
Sequim Bay	4	0.26		
Sequim Bay	5	0.23		
West Beach	4	0.35		
West Beach	5	0.16		

TABLE E.3. Quality Assurance for Dioxins and Lipids Method Blank and Matrix Spike Data

Native	MBL 11-1		MBL L28		MBL 11-17		Spike 11-9			Spike 11-20		
Isomer	Conc.	D.L.	Conc.	D.L.	Conc.	D.L.	Qs	Qm	% Rec	Qs	Qm	% Rec
2378-TCDF	nd	23.00	nd	0.60	nd	1.50	0.80	0.97	121	0.80	0.95	119
Total TCDF	nd	--	nd	--	nd	--	0.80	0.97	121	0.80	0.95	119
2378-TCDD	nd	26.00	nd	1.70	nd	2.40	0.80	0.93	116	0.80	0.87	109
Total TCDD	nd	--	nd	--	nd	--	0.80	0.93	116	0.80	0.87	109
12378-PeCDF	nd	1.30	nd	0.33	nd	0.58	4.00	4.10	103	4.00	4.10	103
23478-PeCDF	nd	0.48	nd	0.35	nd	0.68	4.00	4.10	103	4.00	4.20	105
Total PeCDF	nd	--	nd	--	nd	--	8.00	8.20	103	8.00	8.30	104
12378-PeCDD	nd	0.60	nd	0.61	nd	0.65	4.00	5.20	130	4.00	4.10	103
Total PeCDD	nd	--	nd	--	nd	--	4.00	5.20	130	4.00	4.10	103
123478-HxCDF	nd	0.44	nd	0.46	nd	0.36	4.00	5.10	128	4.00	4.40	110
123678-HxCDF	nd	0.39	nd	0.33	nd	0.43	4.00	4.10	103	4.00	4.56	113
123789-HxCDF	nd	0.48	0.52	--	0.52	0.70	4.00	4.40	110	4.00	4.30	108
234678-HxCDF	nd	0.36	nd	0.52	nd	0.71	4.00	4.30	108	4.00	4.40	110
Total-HxCDF	nd	--	0.52	--	nd	--	16.00	18.00	113	16.00	18.00	113
123478-HxCDD	nd	0.35	nd	0.24	nd	1.10	4.00	5.20	130	4.00	4.00	100
123678-HxCDD	nd	0.31	nd	0.19	nd	0.34	4.00	3.80	95	4.00	4.60	115
123789-HxCDD	nd	0.31	nd	0.19	nd	0.52	4.00	2.50	63	4.00	4.10	103
Total-HxCDD	nd	--	nd	--	nd	--	12.00	12.00	100	12.00	13.00	108
1234678-HpCDF	nd	0.47	nd	0.41	nd	0.68	4.00	5.00	125	4.00	4.70	118
1234789-HpCDF	nd	0.42	nd	0.54	nd	0.77	4.00	4.70	118	4.00	4.50	113
Total HpCDF	nd	--	nd	--	1.40	--	8.00	9.70	121	8.00	9.20	115
1234678-HpCDD	nd	0.96	1.40	--	1.40	--	4.00	4.20	105	4.00	4.30	108
Total HpCDD	nd	--	1.40	--	1.40	--	4.00	4.20	105	4.00	4.30	108
OCDF	nd	0.69	nd	0.87	4.80	--	8.00	9.80	123	8.00	10.00	125
OCDD	7.70	--	24.30	--	15.00	--	8.00	9.10	114	8.00	9.20	115

TABLE E.3. Quality Assurance for Dioxins and Lipids (Cont'd)
Surrogate Recovery Data (%)

Native Isomer	ng's Added	#35 S1 R4	#31 S1 R5	#68 S2 R4	#76 S2 R5	#43 S3 R4	#69 S3 R5	#3 S4 R4	#51 S4 R5	#57 S5 R4	#73 S5 R5	#71 S6 R4	#54 S6 R5	#4 S7 R4	#19 S7 R5	#12 S8 R4	#22 S8 R5
2378-TCDF-C13	2.00	68	55	85	54	75	69	68	76	44	41	36	96	75	79	77	106
2378-TCDD-C13	2.00	69	55	81	57	79	71	66	71	43	46	41	86	73	79	73	100
12378-PeCDF-C13	2.00	84	64	110	74	81	87	86	69	50	63	54	91	93	102	81	117
23478-PeCDF-C13	2.00	81	58	102	67	73	88	80	23	53	59	50	85	91	95	78	114
12378-PeCDD-C13	2.00	85	41	108	69	45	92	83	10	17	61	53	28	97	103	85	113
123478-HxCDF-C13	2.00	59	67	74	50	55	61	64	56	95	57	57	79	64	71	63	51
123678-HxCDF-C13	2.00	71	71	99	62	71	77	78	76	81	67	60	103	84	88	72	58
123789-HxCDF-C13	2.00	60	61	79	56	60	70	68	67	68	57	56	67	74	81	72	48
234678-HxCDF-C13	2.00	44	47	58	38	50	52	50	55	34	47	49	59	68	69	68	48
123478-HxCDD-C13	2.00	60	67	83	60	76	73	68	73	76	58	49	84	72	85	77	60
123678-HxCDD-C13	2.00	68	78	75	61	72	81	78	79	56	67	64	129	89	96	76	61
1234678-HpCDF-C13	2.00	64	65	75	59	68	75	72	52	71	54	52	45	57	45	24	32
1234789-HpCDF-C13	2.00	73	60	85	61	72	36	72	73	89	60	60	83	82	94	76	70
1234678-HpCDD-C13	2.00	82	75	92	74	87	92	83	75	94	64	66	92	86	99	77	71
OCDD-C13	4.00	80	58	106	65	85	87	84	78	89	65	69	96	81	92	76	67
1234-TCDD-C13	2.00	na	na	na	na	na	na	na	na	na	na	na	XX	na	na	na	na
123789-HxCDD-C13	2.00	na	na	na	na	na	na	na	na	na	na	na	XX	na	na	na	na
2378-TCDD-C137	0.80	74	53	87	57	78	71	69	75	41	47	38	97	76	78	79	102

TABLE E.3. Quality Assurance for Dioxins and Lipids (Cont'd)
Surrogate Recovery Data (%)

Native Isomer	ng's Added	#62 S9 R4	#17 S9 R5	#70 S10 R4	#28 S10 R5	#72 S11 R4	#53 S11 R5	#49 S12 R4	#84 S12 R5	#29 S13 R4	#5 S13 R5	#67 S14 R4	#7 S14 R5
2378-TCDF-C13	2.00	36	88	35	73	37	55	52	52	42	44	57	41
2378-TCDD-C13	2.00	33	88	34	75	42	64	58	56	42	48	62	44
12378-PeCDF-C13	2.00	52	101	52	86	52	72	64	64	66	65	66	61
23478-PeCDF-C13	2.00	56	94	55	81	53	71	65	66	66	62	64	58
12378-PeCDD-C13	2.00	55	97	51	81	56	78	66	74	66	68	66	63
123478-HxCDF-C13	2.00	48	86	45	77	57	76	65	69	65	60	66	56
123678-HxCDF-C13	2.00	59	98	46	97	55	82	65	76	65	67	77	62
123789-HxCDF-C13	2.00	55	98	44	89	53	78	62	71	61	58	71	54
234678-HxCDF-C13	2.00	52	74	44	65	56	84	59	55	56	51	61	48
123478-HxCDD-C13	2.00	51	106	40	90	63	85	72	71	71	64	69	57
123678-HxCDD-C13	2.00	62	109	52	108	53	80	65	80	62	68	80	65
1234678-HpCDF-C13	2.00	50	64	38	36	50	87	61	74	59	50	66	55
1234789-HpCDF-C13	2.00	59	108	47	100	66	104	75	85	70	70	81	64
1234678-HpCDD-C13	2.00	59	112	46	114	61	96	75	87	77	77	76	68
OCDD-C13	4.00	47	102	35	117	49	84	71	77	75	75	63	64
1234-TCDD-C13	2.00	na	na	na	na	na	na	na	na	na	na	na	na
123789-HxCDD-C13	2.00	na	na	na	na	na	na	na	na	na	na	na	na
2378-TCDD-C137	0.80	34	91	37	73	44	59	56	55	46	49	62	44

TABLE E.3. Quality Assurance for Dioxins and Lipids (Cont'd)
Surrogate Recovery Data (%)

Native Isomer	ng's Added	#80 S17 R4	#8 S17 R5	#32 SB R4	#21 SB R5	#77 WB R4	#37 WB R5
2378-TCDF-C13	2.00	42	89	55	86	38	52
2378-TCDD-C13	2.00	44	87	62	95	38	58
12378-PeCDF-C13	2.00	62	85	62	91	47	60
23478-PeCDF-C13	2.00	59	91	64	88	47	62
12378-PeCDD-C13	2.00	61	95	67	87	45	67
123478-HxCDF-C13	2.00	64	85	58	114	126	67
123678-HxCDF-C13	2.00	50	83	68	127	137	80
123789-HxCDF-C13	2.00	60	76	63	108	104	75
234678-HxCDF-C13	2.00	59	64	65	76	49	64
123478-HxCDD-C13	2.00	71	84	59	104	117	67
123678-HxCDD-C13	2.00	58	80	71	86	114	78
1234678-HpCDF-C13	2.00	44	42	56	116	105	74
1234789-HpCDF-C13	2.00	71	98	73	139	78	81
1234678-HpCDD-C13	2.00	71	101	61	126	74	77
OCDD-C13	4.00	64	105	48	118	31	79
1234-TCDD-C13	2.00	na	na	na	na	na	na
123789-HxCDD-C13	2.00	na	na	na	na	na	na
2378-TCDD-C137	0.60	46	90	6	97	42	60

TABLE E.3. Quality Assurance for Dioxins and Lipids (Cont'd)
Surrogate Recovery Data (%)
Method Blank and Matrix Spike

Native Isomer	ng's Added	MB11-1	MBL28	MBL 11-17	M.S. 54S6R5	M.S. 155198
2378-TCDF-C13	2.00	1	62	24	86	60
2378-TCDD-C13	2.00	3	65	32	86	69
12378-PeCDF-C13	2.00	18	74	45	91	72
23478-PeCDF-C13	2.00	26	75	51	85	72
12378-PeCDD-C13	2.00	20	79	60	28	83
123478-HxCDF-C13	2.00	43	71	57	79	74
123678-HxCDF-C13	2.00	45	81	66	103	75
123789-HxCDF-C13	2.00	48	89	63	67	73
234678-HxCDF-C13	2.00	45	71	65	59	72
123478-HxCDD-C13	2.00	41	88	70	84	85
123678-HxCDD-C13	2.00	53	88	69	129	75
1234678-HpCDF-C13	2.00	52	80	59	45	74
1234789-HpCDF-C13	2.00	49	81	68	83	85
1234678-HpCDD-C13	2.00	52	89	64	92	83
OCDD-C13	4.00	44	69	43	96	67
1234-TCDD-C13	2.00	na	na	na	XX	XX
123789-HxCDD-C13	2.00	na	na	na	XX	XX
2378-TCDD-C137	0.80	3	63	29	97	70

APPENDIX F

CRAB TISSUE CHEMISTRY DATA

TABLE F.1. Tissue Dioxin Results (ng/Kg wet)

Ocean off Grayland	Concentration									TEF Concentration			
	Hepato		Muscle		Detected Value		Detected or 1/2 D.L.			Detected Value		Detected or 1/2 D.L.	
Native Isomer	Conc.	D.L.	Conc.	D.L.	Hepato	Muscle	Hepato	Muscle	TEF	Hepato	Muscle	Hepato	Muscle
2378-TCDF	9.60	--	1.30	--	9.60	1.30	9.60	1.30	0.1	0.9600	0.1300	0.9600	0.1300
Total TCDF	9.60	--	1.30	--	9.60	1.30	9.60	1.30	0	0.0000	0.0000	0.0000	0.0000
2378-TCDD	nd	3.40	nd	0.86	nd	nd	1.70	0.43	1	nd	nd	1.7000	0.4300
Total TCDD	nd	--	nd	--	nd	nd	--	--	0	nd	nd	--	--
12378-PeCDF	nd	0.79	nd	0.31	nd	nd	0.40	0.16	0.05	nd	nd	0.0198	0.0078
23478-PeCDF	nd	2.60	nd	0.24	nd	nd	1.30	0.12	0.5	nd	nd	0.6500	0.0600
Total PeCDF	nd	--	nd	--	nd	nd	--	--	0	nd	nd	--	--
12378-PeCDD	nd	2.30	nd	0.62	nd	nd	1.15	0.31	0.5	nd	nd	0.5750	0.1550
Total PeCDD	nd	--	nd	--	nd	nd	--	--	0	nd	nd	--	--
123478-HxCDF	nd	1.70	nd	0.27	nd	nd	0.85	0.14	0.1	nd	nd	0.0850	0.0135
123678-HxCDF	nd	5.50	nd	0.47	nd	nd	2.75	0.24	0 1	nd	nd	0.2750	0.0235
123789-HxCDF	nd	1.60	nd	0.42	nd	nd	0.80	0.21	0.1	nd	nd	0.0800	0.0210
234678-HxCDF	nd	1.90	nd	1.00	nd	nd	0.95	0.50	0.1	nd	nd	0.0950	0.0500
Total-HxCDF	nd	--	nd	--	nd	nd	--	--	0	nd	nd	--	--
123478-HxCDD	nd	2.00	nd	0.47	nd	nd	1.00	0.24	0.1	nd	nd	0.1000	0.0235
123678-HxCDD	nd	3.30	nd	0.53	nd	nd	1.65	0.27	0.1	nd	nd	0.1650	0.0265
123789-HxCDD	nd	2.70	nd	0.71	nd	nd	1.35	0.36	0.1	nd	nd	0.1350	0.0355
Total-HxCDD	nd	--	nd	--	nd	nd	--	--	0	nd	nd	--	--
1234678-HpCDF	nd	5.00	nd	1.70	nd	nd	2.50	0.85	0.01	nd	nd	0.0250	0.0085
1234789-HpCDF	nd	1.40	nd	0.77	nd	nd	0.70	0.39	0.01	nd	nd	0.0070	0.0039
Total HpCDF	nd	--	nd	--	nd	nd	--	--	0	nd	nd	--	--
1234678-HpCDD	4.10	--	1.70	--	4.10	1.70	4.10	1.70	0.01	0.0410	0.0170	0.0410	0.0170
Total HpCDD	7.00	--	1.70	--	7.00	1.70	7.00	1.70	0	0.0000	0.0000	0.0000	0.0000
OCDF	nd	4.50	nd	0.98	nd	nd	2.25	0.49	0.001	nd	nd	0.0023	0.0005
OCDD	17.00	--	13.00	--	17.00	13.00	17.00	13.00	0.001	0.0170	0.0130	0.0170	0.0130
Total TEF										1.0180	0.1600	4.9320	1.0191

TABLE F.1. Tissue Dioxin Results (ng/Kg wet) (Cont'd)

Bouy #3	Concentration									TEF Concentration			
	Hepato		Muscle		Detected Value		Detected or 1/2 D.L.			Detected Value		Detected or 1/2 D.L.	
Native Isomer	Conc.	D.L.	Conc.	D.L.	Hepato	Muscle	Hepato	Muscle	TEF	Hepato	Muscle	Hepato	Muscle
2378-TCDF	9.00	--	1.20	--	9.00	1.20	9.00	1.20	0.1	0.9000	0.1200	0.9000	0.1200
Total TCDF	9.00	--	1.20	--	9.00	1.20	9.00	1.20	0	0.0000	0.0000	0.0000	0.0000
2378-TCDD	nd	2.40	nd	0.88	nd	nd	1.20	0.44	1	nd	nd	1.2000	0.4400
Total TCDD	nd	--	nd	--	nd	nd	--	--	0	nd	nd	--	--
12378-PeCDF	nd	0.76	nd	0.36	nd	nd	0.38	0.18	0.05	nd	nd	0.0190	0.0090
23478-PeCDF	nd	1.00	nd	0.26	nd	nd	0.50	0.13	0.5	nd	nd	0.2500	0.0650
Total PeCDF	nd	--	nd	--	nd	nd	--	--	0	nd	nd	--	--
12378-PeCDD	nd	1.80	nd	0.41	nd	nd	0.90	0.21	0.5	nd	nd	0.4500	0.1025
Total PeCDD	nd	--	nd	--	nd	nd	--	--	0	nd	nd	--	--
123478-HxCDF	nd	1.20	nd	0.37	nd	nd	0.60	0.19	0.1	nd	nd	0.0600	0.0185
123678-HxCDF	nd	6.80	nd	0.28	nd	nd	3.40	0.14	0.1	nd	nd	0.3400	0.0140
123789-HxCDF	nd	2.70	nd	0.33	nd	nd	1.35	0.17	0.1	nd	nd	0.1350	0.0165
234678-HxCDF	nd	2.50	nd	1.10	nd	nd	1.25	0.55	0.1	nd	nd	0.1250	0.0550
Total-HxCDF	nd	--	nd	--	nd	nd	--	--	0	nd	nd	--	--
123478-HxCDD	nd	2.40	nd	0.50	nd	nd	1.20	0.25	0.1	nd	nd	0.1200	0.0250
123678-HxCDD	nd	2.80	nd	0.32	nd	nd	1.40	0.16	0.1	nd	nd	0.1400	0.0160
123789-HxCDD	nd	3.10	nd	0.40	nd	nd	1.55	0.20	0.1	nd	nd	0.1550	0.0200
Total-HxCDD	nd	--	nd	--	nd	nd	--	--	0	nd	nd	--	--
1234678-HpCDF	nd	3.40	nd	4.20	nd	nd	1.70	2.10	0.01	nd	nd	0.0170	0.0210
1234789-HpCDF	nd	1.70	nd	0.43	nd	nd	0.85	0.22	0.01	nd	nd	0.0085	0.0022
Total HpCDF	nd	--	nd	--	nd	nd	--	--	0	nd	nd	--	--
1234678-HpCDD	6.00	--	0.88	--	6.00	0.88	6.00	0.88	0.01	0.0600	0.0088	0.0600	0.0088
Total HpCDD	12.00	--	0.88	--	12.00	0.88	12.00	0.88	0	0.0000	0.0000	0.6000	0.0000
OCDF	nd	1.60	nd	1.20	nd	nd	0.80	0.60	0.001	nd	nd	0.0008	0.0006
OCDD	29.00	--	13.00	--	29.00	13.00	29.00	13.00	0.001	0.0290	0.0130	0.0290	0.0130
Total TEF										0.9890	0.1418	4.0093	0.9471

TABLE F.1. Tissue Dioxin Results (ng/Kg wet) (Cont'd)

Half Moon Bay	Concentration									TEF Concentration			
	Hepato		Muscle		Detected Value		Detected or 1/2 D.L.			Detected Value		Detected or 1/2 D.L.	
Native Isomer	Conc.	D.L.	Conc.	D.L.	Hepato	Muscle	Hepato	Muscle	TEF	Hepato	Muscle	Hepato	Muscle
2378-TCDF	38.00	--	2.50	--	38.00	2.50	38.00	2.50	0.1	3.8000	0.2500	3.8000	0.2500
Total TCDF	53.00	--	2.50	--	53.00	2.50	53.00	2.50	0	0.0000	0.0000	0.0000	0.0000
2378-TCDD	nd	2.60	nd	0.82	nd	nd	1.30	0.41	1	nd	nd	1.3000	0.4100
Total TCDD	nd	--	nd	--	nd	nd	--	--	0	nd	nd	--	--
12378-PeCDF	nd	1.40	nd	0.37	nd	nd	0.70	0.19	0.05	nd	nd	0.0350	0.0093
23478-PeCDF	2.50	--	nd	0.44	2.50	nd	2.50	0.22	0.5	1.2500	nd	1.2500	0.1100
Total PeCDF	21.00	--	nd	--	21.00	nd	21.00	--	0	0.0000	nd	0.0000	--
12378-PeCDD	nd	5.40	nd	0.46	nd	nd	5.40	0.23	0.5	nd	nd	2.7000	0.1150
Total PeCDD	nd	--	nd	--	nd	nd	--	--	0	nd	nd	--	--
123478-HxCDF	nd	1.40	nd	0.35	nd	nd	0.70	0.18	0.1	nd	nd	0.0700	0.0175
123678-HxCDF	nd	7.40	nd	0.51	nd	nd	3.70	0.26	0.1	nd	nd	0.3700	0.0255
123789-HxCDF	nd	1.20	nd	0.47	nd	nd	0.60	0.24	0.1	nd	nd	0.0600	0.0235
234678-HxCDF	nd	1.10	nd	0.38	nd	nd	0.55	0.19	0.1	nd	nd	0.0550	0.0190
Total-HxCDF	13.00	--	nd	--	13.00	nd	13.00	--	0	0.0000	nd	0.0000	--
123478-HxCDD	nd	2.10	nd	0.47	nd	nd	1.05	0.24	0.1	nd	nd	0.1050	0.0235
123678-HxCDD	9.40	--	nd	0.66	9.40	nd	9.40	0.33	0.1	0.9400	nd	0.9400	0.0330
123789-HxCDD	3.70	--	nd	0.59	3.70	nd	3.70	0.30	0.1	0.3700	nd	0.3700	0.0295
Total-HxCDD	36.00	--	nd	--	36.00	nd	36.00	--	0	0.0000	nd	0.0000	--
1234678-HpCDF	nd	1.50	nd	1.10	nd	nd	0.75	0.55	0.01	nd	nd	0.0075	0.0055
1234789-HpCDF	nd	0.65	nd	0.55	nd	nd	0.33	0.28	0.01	nd	nd	0.0033	0.0028
Total HpCDF	nd	--	nd	--	nd	nd	--	--	0	nd	nd	--	--
1234678-HpCDD	6.90	--	1.00	--	6.90	1.00	6.90	1.00	0.01	0.0690	0.0100	0.0690	0.0100
Total HpCDD	6.90	--	1.00	--	6.90	1.00	6.90	1.00	0	0.0000	0.0000	0.0000	0.0000
OCDF	nd	2.40	nd	0.59	nd	nd	1.20	0.30	0.001	nd	nd	0.0012	0.0003
OCDD	9.90	--	18.00	--	9.90	18.00	9.90	18.00	0.001	0.0099	0.0180	0.0099	0.0180
Total TEF										6.4389	0.2780	11.1459	1.1023

TABLE F.1. Tissue Dioxin Results (ng/Kg wet) (Cont'd)

North Bay	Concentration				Detected Value		Detected or 1/2 D.L.			TEF Concentration			
	Hepato		Muscle							Detected Value		Detected or 1/2 D.L.	
Native Isomer	Conc.	D.L.	Conc.	D.L.	Hepato	Muscle	Hepato	Muscle	TEF	Hepato	Muscle	Hepato	Muscle
2378-TCDF	28.00	--	1.90	--	28.00	1.90	28.00	1.90	0.1	2.8000	0.1900	2.8000	0.1900
Total TCDF	55.00	--	1.90	--	55.00	1.90	55.00	1.90	0	0.0000	0.0000	0.0000	0.0000
2378-TCDD	nd	2.30	nd	1.40	nd	nd	1.15	0.70	1	nd	nd	1.1500	0.7000
Total TCDD	nd	--	nd	--	nd	nd	--	--	0	nd	nd	--	--
12378-PeCDF	nd	0.65	nd	0.32	nd	nd	0.33	0.16	0.05	nd	nd	0.0163	0.0080
23478-PeCDF	1.80	--	nd	0.32	1.80	nd	1.80	0.16	0.5	0.9000	nd	0.9050	0.0800
Total PeCDF	20.00	--	nd	--	20.00	nd	20.00	--	0	0.0000	nd	0.0000	--
12378-PeCDD	3.80	--	nd	0.71	3.80	nd	3.80	0.36	0.5	1.9000	nd	1.9000	0.1775
Total PeCDD	11.00	--	nd	--	11.00	nd	11.00	--	0	0.0000	nd	0.0000	--
123478-HxCDF	1.70	--	nd	0.63	1.70	nd	1.70	0.32	0.1	0.1700	nd	0.1700	0.0315
123678-HxCDF	nd	4.70	nd	0.65	nd	nd	2.35	0.33	0.1	nd	nd	0.2350	0.0325
123789-HxCDF	nd	1.40	nd	0.50	nd	nd	0.70	0.25	0.1	nd	nd	0.0700	0.0250
234678-HxCDF	nd	3.30	nd	0.94	nd	nd	1.65	0.47	0.1	nd	nd	0.1650	0.0470
Total-HxCDF	17.00	--	nd	--	17.00	nd	17.00	--	0	0.0000	nd	0.0000	--
123478-HxCDD	11.00	--	nd	0.69	11.00	nd	11.00	0.35	0.1	1.1000	nd	1.1000	0.0345
123678-HxCDD	nd	1.90	nd	1.00	nd	nd	0.95	0.50	0.1	nd	nd	0.0950	0.0500
123789-HxCDD	11.00	--	nd	0.83	11.00	nd	11.00	0.42	0.1	1.1000	nd	1.1000	0.0415
Total-HxCDD	55.00	--	nd	--	55.00	nd	55.00	--	0	0.0000	nd	0.0000	--
1234678-HpCDF	nd	2.70	nd	3.30	nd	nd	1.35	1.65	0.01	nd	nd	0.0135	0.0165
1234789-HpCDF	nd	2.80	nd	0.62	nd	nd	1.40	0.31	0.01	nd	nd	0.0140	0.0031
Total HpCDF	nd	--	nd	--	nd	nd	--	--	0	nd	nd	--	--
1234678-HpCDD	9.90	--	2.20	--	9.90	2.20	9.90	2.20	0.01	0.0990	0.0220	0.0990	0.0220
Total HpCDD	20.00	--	3.50	--	20.00	3.50	20.00	3.50	0	0.0000	0.0000	0.0000	0.0000
OCDF	nd	1.70	nd	0.99	nd	nd	0.85	0.45	0.001	nd	nd	0.0009	0.0004
OCDD	20.00	--	22.00	--	20.00	22.00	20.00	22.00	0.001	0.0200	0.0220	0.0200	0.0220
Total TEF										8.0890	0.2340	9.8486	1.4815

TABLE F.1. Tissue Dioxin Results (ng/Kg wet) (Cont'd)

South Bay	Concentration									TEF Concentration			
	Hepato		Muscle		Detected Value		Detected or 1/2 D.L.			Detected Value		Detected or 1/2 D.L.	
Native Isomer	Conc.	D.L.	Conc.	D.L.	Hepato	Muscle	Hepato	Muscle	TEF	Hepato	Muscle	Hepato	Muscle
2378-TCDF	38.00	--	1.50	--	38.00	1.50	38.00	1.50	0.1	3.8000	0.1500	3.8000	0.1500
Total TCDF	59.00	--	1.50	--	59.00	1.50	59.00	1.50	0	0.0000	0.0000	0.0000	0.0000
2378-TCDD	2.10	--	nd	1.30	2.10	nd	2.10	0.65	1	2.1000	nd	2.1000	0.6500
Total TCDD	2.10	--	nd	--	2.10	nd	2.10	--	0	0.0000	nd	0.0000	--
12378-PeCDF	0.58	--	nd	0.84	0.58	nd	0.58	0.42	0.05	0.0290	nd	0.0290	0.0210
23478-PeCDF	2.10	--	nd	0.30	2.10	nd	2.10	0.15	0.5	1.0500	nd	1.0500	0.0750
Total PeCDF	17.00	--	nd	--	17.00	nd	17.00	--	0	0.0000	nd	0.0000	--
12378-PeCDD	3.70	--	nd	0.94	3.70	nd	3.70	0.47	0.5	1.8500	nd	1.8500	0.2350
Total PeCDD	8.50	--	nd	--	8.50	nd	8.50	--	0	0.0000	nd	0.0000	--
123478-HxCDF	1.10	--	nd	0.78	1.10	nd	1.10	0.39	0.1	0.1100	nd	0.1100	0.0390
123678-HxCDF	nd	4.90	nd	1.30	nd	nd	2.45	0.65	0.1	nd	nd	0.2450	0.0650
123789-HxCDF	nd	1.50	nd	0.80	nd	nd	0.75	0.40	0.1	nd	nd	0.0750	0.0400
234678-HxCDF	nd	2.10	nd	1.50	nd	nd	1.05	0.75	0.1	nd	nd	0.1050	0.0750
Total-HxCDF	18.00	--	nd	--	18.00	nd	18.00	--	0	0.0000	nd	0.0000	--
123478-HxCDD	nd	1.70	nd	1.90	nd	nd	0.85	0.95	0.1	nd	nd	0.0850	0.0950
123678-HxCDD	7.30	--	nd	0.99	7.30	nd	7.30	0.45	0.1	0.7300	nd	0.7300	0.0445
123789-HxCDD	nd	1.30	nd	0.66	nd	nd	0.65	0.33	0.1	nd	nd	0.0650	0.0330
Total-HxCDD	43.00	--	nd	--	43.00	nd	43.00	--	0	0.0000	nd	0.0000	--
1234678-HpCDF	nd	3.60	nd	8.90	nd	nd	1.80	4.95	0.01	nd	nd	0.0180	0.0495
1234789-HpCDF	nd	1.30	nd	1.00	nd	nd	0.65	0.50	0.01	nd	nd	0.0065	0.0050
Total HpCDF	nd	--	nd	--	nd	nd	--	--	0	nd	nd	--	--
1234678-HpCDD	6.40	--	1.90	--	6.40	1.90	6.40	1.90	0.01	0.0640	0.0190	0.0640	0.0190
Total HpCDD	12.00	--	3.70	--	12.00	3.70	12.00	3.70	0	0.0000	0.0000	0.0000	0.0000
OCDF	nd	1.10	nd	2.10	nd	nd	0.55	1.05	0.001	nd	nd	0.0006	0.0011
OCDD	15.00	--	24.00	--	15.00	24.00	15.00	24.00	0.001	0.0150	0.0240	0.0150	0.0240
Total TEF										9.7480	0.1930	10.3481	1.6211

TABLE F.2. Tissue Lipid Results

Station	Muscle	Hepatopancreas
Grays Harbor Buoy #3	0.12	3.03
Ocean Off Grayland	0.07	2.50
Half Moon Bay	0.09, 0.07[a]	3.30
South Bay	0.05	5.07
North Bay	0.13	5.41

(a) Duplicate analysis.

TABLE F.3. Quality Assurance for Dioxins and Lipids Method Blank and Matrix Spike Data

Native Isomer	MBL 11-27-89 Conc.	D.L.	Spike 159205 Qs	Qm	% Rec	M.S. Spike Qs	Qm	% Rec
2378-TCDF	nd	1.60	0.80	1.00	125	0.80	1.00	125
Total TCDF	nd	--	0.80	1.00	125	0.80	1.00	125
2378-TCDD	nd	2.40	0.80	1.10	138	0.80	0.92	115
Total TCDD	nd	--	0.80	1.10	138	0.80	0.92	115
12378-PeCDF	nd	0.95	4.00	5.00	125	4.00	4.00	100
23478-PeCDF	nd	0.93	4.00	5.00	125	4.00	4.20	105
Total PeCDF	nd	--	8.00	10.00	125	8.00	8.20	103
12378-PeCDD	nd	1.10	4.00	4.70	118	4.00	4.30	108
Total PeCDD	nd	--	4.00	4.70	118	4.00	4.30	108
123478-HxCDF	nd	0.73	4.00	5.10	128	4.00	4.90	123
123678-HxCDF	nd	0.85	4.00	4.80	120	4.00	4.00	100
123789-HxCDF	nd	0.76	4.00	5.10	128	4.00	4.40	110
234678-HxCDF	nd	1.10	4.00	5.00	125	4.00	4.30	108
Total-HxCDF	nd	--	16.00	20.00	125	16.00	18.00	113
123478-HxCDD	nd	0.78	4.00	5.80	145	4.00	5.30	133
123678-HxCDD	nd	1.00	4.00	4.30	108	4.00	3.70	93
123789-HxCDD	nd	1.00	4.00	4.10	103	4.00	2.60	65
Total-HxCDD	nd	--	12.00	14.00	117	12.00	12.00	100
1234678-HpCDF	nd	1.30	4.00	4.40	110	4.00	4.70	118
1234789-HpCDF	nd	1.00	4.00	4.70	118	4.00	4.50	113
Total HpCDF	nd	--	8.00	9.90	124	8.00	9.20	115
1234678-HpCDD	nd	1.30	4.00	4.70	118	4.00	3.80	95
Total HpCDD	nd	--	4.00	4.70	118	4.00	3.80	95
OCDF	nd	2.80	8.00	11.00	138	8.00	11.00	138
OCDD	12.00	--	8.00	10.00	125	8.00	9.40	118

TABLE F.3. Quality Assurance for Dioxins and Lipids Surrogate Recovery (%) Data

Internal Standard	ng's Added	Ocean off Grayland Hep	Ocean off Grayland Mus	Bouy #3 Hep	Bouy #3 Mus	Half Moon Bay Hep	Half Moon Bay Mus	North Bay Hep	North Bay Mus	South Bay Hep	South Bay Mus	Method Blank	Spike 159205	MS Spike
2378-TCDF-C13	2.00	58	62	77	69	62	70	60	73	72	59	54	67	23
2378-TCDD-C13	2.00	59	61	80	79	62	69	56	74	68	54	59	65	20
12378-PeCDF-C13	2.00	65	63	76	65	63	68	63	76	70	62	62	69	29
23478-PeCDF-C13	2.00	62	61	80	65	62	67	63	74	70	64	62	69	30
12378-PeCDD-C13	2.00	64	65	79	65	67	70	71	82	74	73	60	74	29
123478-HxCDF-C13	2.00	81	78	138	79	90	58	84	92	143	77	59	78	29
123678-HxCDF-C13	2.00	89	74	118	61	71	64	89	94	120	74	70	64	32
123789-HxCDF-C13	2.00	71	67	87	60	73	63	65	80	85	60	59	66	27
234678-HxCDF-C13	2.00	66	60	61	60	65	64	51	71	70	55	59	65	20
123478-HxCDD-C13	2.00	67	73	97	89	83	71	68	83	94	72	58	63	28
123678-HxCDD-C13	2.00	75	67	80	60	54	56	61	80	80	64	68	71	37
123789-HxCDD-C13	2.00	24	15	36	6	44	13	25	11	28	5	54	5	20
1234678-HpCDF-C13	2.00	95	82	123	85	84	82	54	108	81	97	61	93	24
1234789-HpCDF-C13	2.00	91	84	110	81	80	80	54	103	82	92	55	85	26
1234678-HpCDD-C13	4.00	85	77	171	70	86	69	82	103	140	74	36	84	15
1234-TCDD-C13	2.00	na	na	na	na	na	na	na	na	na	na	na	XX	XX
123789-HxCDD-C13	2.00	na	na	na	na	na	na	na	na	na	na	na	XX	XX
2378-TCDD-C137	0.80	58	67	72	80	62	71	43	77	67	55	55	75	22

END

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