Exponent®

NASSCO and Southwest Marine Detailed Sediment Investigation

Volume III
Appendices F–P

Prepared for

NASSCO and Southwest Marine
San Diego, California

Exponent®

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Prepared for

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October 2003

Doc. no. 8601718.002 1201 0903 DN05

Volume III

Appendix F

Quality Assurance Report for Chemistry Data

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Acronyms and Abbreviations

AVS/SEM	acid-volatile sulfide/simultaneously extracted metals
CAS	Columbia Analytical Services
CRM	certified reference material
DQO	data quality objective
EML	estimated minimum level
EPA	U.S. Environmental Protection Agency
GC/MS	gas chromatography/mass spectrometry
GERG	Geochemical and Environmental Research Group
HRGC/HRMS	high resolution gas chromatography and high resolution mass spectrometry
ICP-MS	inductively coupled plasma-mass spectrometry
LCS	laboratory control sample
LPAH	low-molecular-weight polycyclic aromatic hydrocarbon
MDL	method detection limit
MQO	measurement quality objective
MRL	method reporting limit
MS/MSD	matrix spike/matrix spike duplicate
NIST	National Institute for Standards and Technology
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCT	polychlorinated terphenyl
QA/QC	quality assurance and quality control
QAPP	quality assurance project plan
RPD	relative percent difference
SDG	sample delivery group
TOC	total organic carbon

Introduction

Samples of sediment, pore water, biological tissue, and fish bile were collected in 2001 and 2002 during Phase 1 and Phase 2 of the detailed sediment investigation at NASSCO and Southwest Marine shipyards. Four laboratories participated in the analysis of the samples for organic and inorganic constituents and engineering properties. Exponent completed a data quality review, including data validation and data quality assessment. Results of the data quality review are provided in this report.

The data quality review was conducted to verify that quality assurance and quality control (QA/QC) procedures were completed and documented as required during sample collection and analysis and that the quality of the data is sufficiently high to support its intended uses. Data that did not meet control limits for quality control measurements were qualified as estimated (a *J* qualifier was applied to the result) during the review. All data that are qualified as estimated have an acceptable degree of uncertainty and represent data of good quality (U.S. EPA 1989, 1996). These results are acceptable for use to determine the nature and extent of contamination at the shipyards; to determine biological effects and assess ecological and human health risks; and to establish remediation measures for the shipyards sites. No data were rejected as unusable for this investigation.

The work plan for the detailed sediment investigation (Exponent 2001) provides a description of the study and the rationale for the sampling and analysis program. Sampling procedures are provided in the sampling and analysis plan (Appendix A of the work plan, Exponent 2001) and in the field sampling plan addendum (Exponent 2002) and are summarized in Section 2, *Study Design*, of the main report. The field sampling plan addendum also provides additional detail regarding the rationale for the Phase 2 sampling and analysis program. Descriptions of the procedures used for chemical analyses, data validation, and data management are provided in the quality assurance project plan (QAPP) (Appendix B of the work plan, Exponent 2001) and are summarized below. The remainder of this data quality report includes a summary of samples collected and analyses completed for Phase 1 and Phase 2 of the detailed sediment investigation, descriptions of data validation procedures, and descriptions of QA/QC procedures and data quality for the sediment, pore water, biological tissue, and fish bile samples. Data quality reviews of the sediment toxicity tests and serial dilution toxicity tests, bioaccumulation tests, and benthic macroinvertebrate community evaluation are provided in Appendices H, J, and L, respectively.

Samples and Analyses

Samples collected for the shipyards sediment investigation included the following:

- 116 surface sediment samples for chemical analysis
- 96 sediment core samples for chemical analysis
- 20 sediment core samples for determination of engineering properties
- 37 pore water samples from 18 stations
- 62 samples of fish tissue
- 36 samples of invertebrate tissue from the reference and study areas (lobster and benthic mussels)
- 3 samples of eelgrass
- 69 samples of the soft tissue of clams for the bioaccumulation study
- 50 fish bile samples.

Details are provided in Table F-1. Station locations and station numbers are provided in Table 2-2 of the main report. Field split samples were collected at seven coring stations for sediment chemistry, two coring stations for engineering characteristics, seven stations for surface sediment chemistry, and three stations for pore water analysis (Table F-2). To prepare field splits for sediment and pore water, samples were homogenized in the field and subsamples were sent to the laboratory with different sample numbers. Field blanks were collected with the sediment and pore water samples to evaluate sample collection procedures. One field blank was collected for every type of sampling equipment and for each sampling event (Table F-3). Certified reference materials (CRMs) were provided to the laboratories as additional control samples for analytical accuracy with the samples collected during Phase 1. CRMs of sediment were provided for analysis of polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyl (PCB) congeners. A CRM of mussel tissue was provided for PCB congeners. Field quality control samples were collected at the frequency indicated in the QAPP (Exponent 2001). However, the field blank collected for sediment samples during Phase 1 was not analyzed for PCB congeners and homologs as the result of an oversight.

Bioaccumulation studies were conducted during Phase 1 on sediment samples from four stations within the NASSCO leasehold, five stations within the Southwest Marine leasehold, and five reference stations. An exposure control sample was also prepared. The bioaccumulation tests involved exposing clams (*Macoma nasuta*) to test and control sediments for 28 days as described in ASTM (2000). Five replicate exposure tests were conducted for each sediment sample and 35 clams were used for each replicate exposure test. At the end of the 28-day exposure period, the surviving clams were removed from the sediment and the soft tissue was collected. Dead clams were discarded (survival ranged from 80 to 100 percent). The tissue from all of the clams in each exposure chamber was combined to create a single sample for each exposure. Clam tissue from replicate exposures was not combined, with one exception. Two of the five replicate exposures at Station NA20 were combined because the mass of clam tissue in each was less than the minimum needed to complete the analyses. Clams from the remaining three exposures were not combined. The clam tissue for each exposure was homogenized and analyzed as indicated in Table F-4. A total of 74 clam samples were generated for chemical analysis, 69 from test exposures and 5 from control sediment.

Samples collected during Phase 1 and Phase 2 of this study were analyzed for conventional analytes, physical characteristics, metals, and organic compounds as indicated in Table F-4. Analyses for PCB congeners and homologs were completed by Alta Analytical in El Dorado Hills, California. Analyses for engineering properties (Appendix B4) were completed by Soil Technology, Inc. on Bainbridge Island, Washington. Fish bile was analyzed for PAH breakdown products by Geochemical and Environmental Research Group (GERG) at Texas A&M in College Station, Texas. All other analyses were completed by Columbia Analytical Services (CAS) in Kelso, Washington. Chemical analyses were completed according to methods indicated in Table B-4 of the QAPP (Exponent 2001, Appendix B) with the following modifications:

- U.S. Environmental Protection Agency (EPA) Method 7740 (graphite furnace atomic absorption spectrometry) was used instead of EPA Method 6020 (inductively coupled plasma-mass spectrometry [ICP-MS]) for the analysis of selenium in all of the tissue samples and in sediment samples collected during Phase 1. Tissue samples were not analyzed by ICP-MS because carbon creates an isobaric interference on the mass spectrometer. EPA Method 7742 (borohydride reduction and atomic absorption spectrometry) was used to analyze for selenium in pore water samples and the related equipment blank, EB0003, because chloride interferes with the ICP-MS analysis. Sediment samples and equipment blanks for Phase 2 were analyzed by EPA Method 6020.

- EPA Method 200.8 (ICP-MS) was used for the analysis of arsenic, cadmium, copper, lead, nickel, and silver in clam tissue for the bioaccumulation study (Phase 1) rather than EPA Method 6020. Both methods are for analysis of metals by ICP-MS and are substantively the same, but the requirements for quality control procedures are slightly different. Data generated using the two methods are expected to be comparable.

- Analyses for chromium, copper, and zinc in tissue and sediment samples were completed by inductively coupled plasma-atomic emission spectrometry (EPA Method 6010B) rather than by ICP-MS (EPA Method 6020) when the concentrations in the samples were sufficiently high. Data generated using the two methods are expected to be comparable.

- Tissue samples were analyzed for mercury by EPA Method 7471A (cold vapor atomic absorption spectrometry) rather than by EPA Method 1631B (cold vapor atomic fluorescence spectrometry). EPA Method 7471A was sufficient to detect and reliably quantify mercury at the levels present in all tissue samples except the eelgrass sample from reference area 2240 (Sample BI0095).

- PCB congeners in all sample types were analyzed by high resolution gas chromatography and high resolution mass spectrometry (HRGC/HRMS) using EPA Method 1668A, rather than by gas chromatography and electron capture detection using EPA Method 8082. EPA Method 1668A provides lower detection limits and more definitive identification of the PCB congeners than EPA Method 8082.

- EPA Method 1668A was also used to analyze pore water samples for PCB homologs. This method was used to provide a lower detection limit and allow collection of smaller volumes of pore water for analysis than would have been needed for analysis by EPA Method 8082.

In addition to these method changes, pH determinations in sediment were added to the analyte list for Phase 1 and were completed using EPA Method 9045C, and tetrabutyltin was added to the analyte list for butyltin compounds. Many Phase 2 sediment samples that were analyzed for hexavalent chromium were also analyzed for pH and oxidation–reduction potential to determine the redox status of the sediment.

Additional analyses completed for Phase 2 included the analysis of four surface sediment samples for organochlorine pesticides and organophosphorous pesticides and the analysis of fish bile for PAH breakdown products.

Data Validation Procedures

Data validation was completed according to EPA Level 3 requirements (U.S. EPA 1995b) as specified in the QAPP (Exponent 2001). The Level 3 validation procedures were expanded to include review of instrument calibration and tuning. The laboratory was responsible for review and verification of analyte identifications, calculations, and transcriptions. The following items were evaluated during data validation:

- The case narrative discussing analytical problems (if any) and procedures
- Chain-of-custody documentation to verify completeness of data set
- Sample preparation logs or laboratory summary result forms to verify analytical holding times
- Results for mass spectrometer tuning, instrument calibration, and continuing calibration to assess instrument performance
- Results for method blanks and calibration blanks, to check for laboratory contamination
- Results for surrogate compounds, laboratory control samples (LCSs), and matrix spike/matrix spike duplicate (MS/MSD) samples, to assess analytical accuracy
- Results for internal standards to ensure that instrument sensitivity and response were stable throughout each analysis sequence
- Results for recovery standards and cleanup standards for PCB congener analyses to assess efficiency of the sample extraction and cleanup
- Results for serial dilutions to check for matrix interferences that may affect the analyte signal for metals analyzed by ICP methods
- Results for laboratory duplicate samples, MS/MSD analyses, and duplicate LCS analyses to assess analytical precision

- Results for CRMs as an overall check on accuracy for each sample type
- Results for field quality control samples (field blanks and split samples) to monitor sample collection activities.

In addition, method reporting limits (MRLs) provided by the laboratory were compared to the project data quality objectives (DQOs) for MRLs (Exponent 2001, Appendix B, Table B-4). Finally, all electronic data imported or hand-entered into the Exponent database were verified against the laboratory data packages or field logs, and all discrepancies were resolved.

The laboratory data were validated in accordance with procedures described in *EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review* (U.S. EPA 1999b) and *EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (U.S. EPA 1994, 2002), as applicable. Data validation procedures for PCB congeners were additionally based on *USEPA Contract Laboratory Program National Functional Guidelines for Dioxin/Furan Data Validation* (U.S. EPA 1993). Modifications to validation protocols were made to accommodate quality control requirements for methods that are not specifically addressed by the functional guidelines (i.e., analysis for PCB congeners by HRGC/HRMS, metals by ICP-MS, and all conventional analyses) and to incorporate method-specific control limits. Data qualifiers were assigned during the quality assurance review when control limits were not met, in accordance with U.S. EPA (1993, 1994, 1999b, 2002). All data qualified as estimated have an acceptable degree of uncertainty and represent good quality data (U.S. EPA 1989, 1996). No data were rejected.

Data Quality and Usability

The quality of the data for Phase 1 and 2 of the detailed sediment investigation was generally very good. Data qualifiers were applied to individual results when control limits were exceeded for one or more quality control samples or procedures. No data were rejected. All of the data, qualified and unqualified, are of sufficiently high quality for use in the remedial investigation and in risk assessment. Quality control results are described below for sediment, pore water, tissue, and fish bile samples.

Achievement of Data Quality Objectives

The method detection limits (MDLs) and MRLs provided by the laboratories for sediment and tissue samples met project DQOs (Exponent 2001) in most cases. However, elevated MDLs or MRLs were reported when chromatographic interferences were present or when dilutions were necessary to conduct an analysis. Dilutions were necessary when the samples contained high concentrations of target analytes, matrix interferences, or both, which prevented reliable identification and quantification of the target analytes in undiluted samples. In addition, the laboratory reduced the sample mass that was used for some of the analyses for tissue samples when the total amount of available sample was limited. This procedure also resulted in increased reporting and detection limits for a portion of the samples and analyses.

The MRLs provided by CAS for pore water were above the DQO in the following cases:

- The laboratory obtained an MRL for cadmium of 0.1 μg/L. The target level for the MRL was 0.05 μg/L. The reported MRL is below EPA's water quality criterion of 9.3 μg/L.
- The laboratory obtained an MRL for hexavalent chromium of 50 mg/L. The target level for the MRL was 5 μg/L. The reported MRL is at EPA's water quality criterion of 50 mg/L.

- The laboratory obtained an MRL for selenium of 5 μg/L. The target level for the MRL was 1 μg/L. The reported MRL is below EPA's water quality criterion of 71 μg/L.

MRLs for PCB homologs, PAHs, and butyltins met the DQOs provided in the QAPP.

Sediment

The chemical data for the sediment samples were evaluated in terms of completeness, holding times, instrument performance, laboratory and field blanks, accuracy, precision, and analyte identification and quantification. The results for the quality control procedures used during sample analyses are discussed below. A list of samples in each sample delivery group (SDG) is provided in Attachment 1.

Completeness

Completeness for the sediment data was nearly 100 percent. The laboratory provided results for all requested analyses with the exception of two results for zinc from the acid-volatile sulfide/ simultaneously extracted metals (AVS/SEM) analysis in Phase 1. No data were rejected during the quality assurance review. A total of 25,016 results were reported for sediment samples, excluding field blanks and laboratory quality control results. Of these results, 778 (3.1 percent) were qualified as estimated during the data quality review.

In Phase 1, SEM analyses for zinc were originally not reported because of a scheduling oversight by the laboratory. However, data for zinc had been collected during the analysis of SEM metals and the data were processed by CAS after the omission was discovered. Instrument calibration was found to be within control limits; however, the concentration of zinc in Samples SD0001 and SD0007 (Stations SW01 and SW09) was found to exceed the calibration range of the instrument. Zinc results from the SEM extract could not be reported for these samples.

Samples collected outside the leaseholds during Phase 1 were originally scheduled only for analysis of metals, AVS, SEM, and grain size. A portion of these samples was placed into frozen archive at the laboratory when they were originally received from the field. These archived samples were subsequently analyzed for butyltins, diesel-range organics, PAHs, PCB and polychlorinated terphenyl (PCT) Aroclors®, PCB congeners and homologs, and total organic carbon (TOC). However, the archived samples could not be analyzed for gasoline-range organics because the holding time and temperature were not appropriate for this analysis. This omission is inconsequential because gasoline-range organics were not detected in any surface sediment sample collected for this study.

Holding Times and Sample Preservation

The analytical holding time constraints and sample preservation requirements specified in Table B-5 of the QAPP (Exponent 2001, Appendix B) were met in most cases. The following exceptions were noted in Phases 1 and 2.

Phase 1 Samples

The temperature was above 6°C in two coolers (two SDGs) when they were opened at the laboratory. The coolers were packed with ice prior to shipment according to standard procedures, but the ice melted during shipment and the samples began to warm up. The temperature in both coolers had reached 10°C upon arrival at CAS. The coolers were used to ship Samples SD0013 through SD0018 and SD0049 through SD0056. It is unlikely that any of the analytes were affected because the temperature exceedance was small and of short duration. However, the data for AVS, the most volatile analyte, were qualified as estimated because of the storage temperature.

The holding time for equipment blank EQBL01 was exceeded by 7 days for diesel- and residual-range organic compounds. Diesel-range organic compounds were detected in the equipment blank at 41 μg/L, and residual-range organic compounds were undetected with a reporting limit of 53 μg/L. These results were qualified as estimated because the holding time was exceeded, and they may be biased low. However, the concentration of the diesel-range organic compounds in the field blank was very low with respect to the samples (discussed below under *Field Blanks*). Even if the concentration of diesel-range organic compounds in the field blank were corrected for a relatively large negative bias, the concentration would not be sufficient to indicate contamination in the sediment samples. The holding time exceedance for the equipment blank has negligible effect on the quality of the sediment data.

The holding time limit of 14 days was not met for AVS in Samples SD0043 to SD0060 (SDGs K2105900 and K2105935). These samples were initially analyzed within the allowed holding time, but reanalysis was required because an unacceptable LCS result was obtained in the initial analysis. The reanalyses were completed 4 to 5 days after the holding time had expired, or 18 to 19 days after collection. AVS data for the affected samples were qualified as estimated. Any bias resulting from the holding time exceedance would be expected to be negative because AVS may be lost as a result of extended storage. However, metals (i.e., SEM) would not be lost. This would result in an overestimate of the molar ratio of metals to AVS and in a conservative estimate of metals availability to benthic infauna.

Surface sediment samples were collected outside the shipyards' leaseholds from August 11 to 14, 2001, during Phase 1 sampling. Archived aliquots of these samples were analyzed for butyltins, diesel-range organics, PAHs, PCB and PCT Aroclors®, PCB congeners, and TOC in July 2002. Extractions for the analyses were completed from July 10 to 24, 2002. The holding time for frozen samples is 1 year from the time of collection until extraction for organic compounds and butyltins (PSWQAT 1997, Table 2). This holding time was met for all of the archived samples.

Phase 2 Samples

The holding time for equipment blank EB0001 was exceeded by 10 days for diesel-range and residual-range organics because of a laboratory sample tracking error. The results for these analytes were qualified as estimated in equipment blank EB0001.

The holding time for equipment blank EB0006 was exceeded by 4 days for PCB and PCT Aroclors® as a result of a delay in initiating sample analysis. No PCB or PCT Aroclors® were detected in this equipment blank. The reporting limits were qualified as estimated.

Instrument Performance

The performance of the analytical instruments was acceptable. No changes in instrument performance that would have resulted in the degradation of data quality were indicated during any analysis sequence.

Mass Spectrometer Tuning

Mass spectrometer tuning checks were completed as required and results met control limits. Mass spectrometer tuning checks were required for analysis of PAHs, PCB congeners, and metals by ICP-MS.

Initial and Continuing Calibration

Initial calibration, initial calibration verification, and continuing calibration were completed as required for all analyses. Initial calibrations were acceptable in all cases. Continuing calibration met control limits in all cases with one exception. For PCT Aroclors® in Phase 2 samples, the result for one continuing calibration in SDG K2206081 was slightly above the control limit. The difference between the continuing calibration standard and the initial calibration was 17 percent and the control limit is 15 percent. Thus, the results for Samples SD0056–SD0060 were qualified as estimated and may be biased slightly high.

Laboratory and Field Blanks

Laboratory blanks are analyzed to check for contamination during sample preparation and analysis. Laboratory blanks for this project included method blanks for all analyses and additional calibration blanks for metals analyses. Field blanks included equipment rinse blanks and trip blanks. Equipment rinse blanks were collected to determine the effectiveness of equipment decontamination procedures in the field. Trip blanks were collected to monitor for cross-contamination of samples during shipment. Trip blanks were analyzed for gasoline-range organics, the only volatile organic compounds on the analyte list for this study.

Calibration Blanks

Initial and continuing calibration blanks are required for metals, AVS, SEM, and TOC analyses. Initial and continuing calibration blanks were analyzed at the required frequency. No analyte was detected in any calibration blank.

Method Blanks

A method blank was prepared and analyzed with each sample batch and for every analysis, as required. Low levels of one or more metals were detected in the method blanks for sediment in several SDGs. However, the metals concentrations in all samples that were analyzed with these blanks was greater than 5 times the concentration in the blank, and no data required qualification.

Field Blanks

Seven equipment rinsate blanks were collected with the sediment samples to assess whether contaminants may have been introduced during sample collection. Equipment blanks and analyses are summarized in Table F-3. Results are provided in Table F-5.

Low levels of metals (chromium, copper, lead, nickel, selenium, and zinc), diesel-range organic compounds, and various PAHs were detected in one or more of the equipment blanks for sediment samples. The concentrations of these analytes in the equipment blanks were much lower than the reporting limits for the sediment samples. The equipment blank results indicated that decontamination procedures were sufficient to prevent measurable cross contamination in the field.

In addition to the equipment blanks, three trip blanks were collected for gasoline-range organics to monitor for potential cross contamination of these volatile compounds during sample shipment and storage. Gasoline-range organics were not detected in any of the trip blanks.

Accuracy

The accuracy (i.e., bias) of the analytical results is reflected by recoveries of internal standards, LCSs, matrix spikes, surrogate compounds, and for metals analyses, by serial dilution of samples. Results for these quality control procedures are described below.

Internal Standards

Internal standards are added to all samples for analysis of metals by gas chromatography/mass spectrometry (GC/MS), PAHs, and PCB congeners. Criteria for retention time and area count were met for all internal standards.

Laboratory Control Samples

LCSs provide a control for the entire analytical system, including sample preparation as well as instrumental analysis. An LCS must be included with every sample batch for all analyses except grain size distribution, pH, and total solids. LCSs were analyzed as required in all cases. All LCS recoveries met control limits, with the exception of LCS recoveries in two SDGs for PAH analyses completed during Phase 1.

These recoveries were for four early-eluting, low-molecular-weight PAHs (LPAHs) (i.e., naphthalene, 1-methylnaphthalene, 2-methylnaphthalene, and 2,6-dimethylnaphthalene). They were consistently low in the LCS and in the MS/MSD for SDGs K2105900 and K2105935. Low recovery of the LPAHs is commonly the result of evaporating the sample extracts too quickly during the concentration step of the extraction procedure. These consistently low recoveries indicate that the results for naphthalene and the alkylated naphthalenes are likely to be biased low for the samples in these SDGs. Affected samples include SD0043 through SD0048. The results for these samples and analytes were qualified as estimated.

Matrix Spike Samples

Matrix spikes are added to field samples to determine the analytical accuracy for samples from the study site. Matrix spike samples are required at a frequency of one per batch (20 or fewer samples) for all analyses except grain size distribution and total solids.

Matrix spike analyses were completed at the required frequency. Control limits for spike recoveries were exceeded in several cases for PAHs, butyltins, and metals (i.e., chromium, copper, and zinc) as discussed below. Matrix spike results are not meaningful when the native concentration of an analyte in the sample is greater than approximately 2 to 4 times the concentration of the added spike because the variability (i.e., precision) of the analysis may bias the matrix spike recovery. In these cases, the accuracy of the analysis was established on the basis of results for other quality control procedures for accuracy, such as surrogate compounds and LCSs.

PCB and PCT Aroclors® in Phase 1 and Phase 2 Samples—Results for several MS/MSD analyses for PCB and PCT Aroclors® in both Phase 1 and Phase 2 samples were above control limits. CAS indicated in its case narratives that high levels of Aroclors® 1254 and 1260 interfered with the quantification of the spiked PCBs (Aroclors® 1016, 1260, and 5442) in these cases. In addition, in several cases the concentration added by the spike was less than the concentration initially present in the sample. These high recoveries for the MS/MSD do not reflect a bias of the data. Quantification of multiple Aroclors® in the samples is discussed below under *Identification and Quantification of Analytes*.

PAHs in Phase 1 Samples—Results for several MS/MSDs did not meet control limits for spike recovery because of matrix interferences or because the concentration of the affected PAHs in the unspiked sample was greater than the spiking concentration. No consistent bias of the data was evident, and no data were qualified as estimated for these matrix spike results.

Recoveries of the LPAHs 1-methylnaphthalene and 2,6-dimethylnaphthalene were below the lower control limit in the MSD for SDG K2105935 (Samples SD0049 and SD0052 through SD0061). The recoveries of these LPAHs were lower in the MSD than in the MS. Recoveries for naphthalene and 1-methylnaphthalene were close to the lower control limits in the MSD. The laboratory attributed these results to excessively rapid final concentration of the extract for the MSD. The results for the LCS and the MS met control limits. The laboratory reanalyzed all of the samples in SDG K2105935 to verify that the extracts had been concentrated correctly. Results for the reanalysis agreed with the original results for all samples, with the exception of a number of PAHs in Samples SD0053 (Station NA18) and SD0059 (Station SW20). Neither station was used for bioassays; both were designated for chemical analysis only. Results for PAHs in these samples were higher in the reanalyses than the original analyses, with the widest discrepancies found among the high-molecular-weight PAHs rather than the LPAHs. These samples were analyzed a third time and results for the third analysis confirmed the original results. No explanation was found for the higher results in the second analysis. The original results were reported for all of the samples without qualification. Results for the reanalyses were not reported because holding times were not met.

Results for naphthalene and alkylated naphthalenes were below the control limit for the MS, MSD, and LCS for SDG K2105900. Results for these compounds were qualified as described above under *Laboratory Control Samples*.

Butyltins in Phase 1 Samples—Results for several MS/MSDs were above the upper control limit because of interferences or because the concentration of the affected butyltins in the unspiked sample was greater than the spiking concentration used. No systematic bias was evident, and no samples were qualified as estimated for matrix spike recoveries.

Metals in Phase 2 Samples—Four matrix spike samples were analyzed with the sediment samples for hexavalent chromium, with spike recoveries of 0 to 63 percent. The laboratory control limits are 70 to 130 percent recovery. The laboratory measured the oxidation–reduction potential and pH of the sediment samples (Table B2-1, Appendix B2) and determined that all of the samples that were spiked were reducing in nature. As a result, a portion or all of the hexavalent chromium that was spiked into the samples was reduced to trivalent chromium in the sample and was therefore not recovered from the sample during analysis. Results for hexavalent chromium were not qualified because the low matrix spike recoveries did not reflect the analytical accuracy of the system. Results for LCSs for the hexavalent chromium determinations indicated that the accuracy of the analytical system was acceptable.

The matrix spike recovery for chromium in SDG K2206396 was 67 percent, slightly below the control limits of 70 to 130 percent recovery. The chromium results for all of the samples in this SDG were qualified as estimated and may be biased slightly low. Chromium results were qualified for Samples SD0094, SD0095, SD0097, SD0099 to SD0108, and SD0110.

The laboratory experienced difficulties with the matrix of Sample SD0180, as indicated by high recovery of an internal standard, high matrix spike recoveries, and high results for the serial dilution analysis. During the initial analysis of Sample SD0180, recovery was above control limits for the internal standard scandium-45, which was used to quantify chromium, copper, and zinc. The laboratory reanalyzed the sample and the associated quality control samples at a 10-fold dilution, with acceptable recovery of the internal standard. However, the matrix spike recoveries were above the control limits for chromium, copper, and zinc, with recoveries of 161, 260, and 220 percent, respectively. These results would indicate that the data are biased high. Conversely, the results for the serial dilution (i.e., of the initial 10-fold dilution) were also above the control limits and indicated that the results for copper and zinc were biased low. The concentration of chromium in the diluted extract was not high enough to yield a reliable serial dilution result. Sample SD0180 was the only sample in SDG K2208082 that was analyzed for metals, and the results for chromium, copper, and zinc were qualified as estimated. No bias could be assigned to the data because of the conflicting quality control results.

Butyltin Compounds in Phase 2 Samples—Recoveries for the MS and MSD and for SDG K2206262 were at the low end of the laboratory control limits for all four butyltin analytes. The surrogate recoveries for the MS and MSD were low as well (30 and 29 percent, respectively). Sample SD0087 (Station NA04, 6–8.3 ft) was used for the spikes. The surrogate recovery for Sample SD0087 (i.e., the unspiked sample) was also 30 percent. Surrogate recoveries met control limits for all remaining samples in SDG K2206262. This indicates that the matrix of

Sample SD0087 presented analytical difficulties that led to a negative bias and poor recovery of the MS and MSD. The results for all four butyltins in Sample SD0087 were qualified as estimated and are biased low. Results for the remaining samples in SDG K2206262 were not qualified.

Surrogate Compounds

Surrogate compounds are used to monitor the efficiency of sample extraction and analysis procedures on a sample-specific basis. They are added to all field and quality control samples prior to extraction. Surrogate recoveries met control limits, with the following exceptions.

Petroleum Hydrocarbons in Phase 1 Samples—For gasoline-range organics, recovery of 4-bromofluorobenzene was below the lower control limit of 50 percent for Samples SD0022 (47 percent) and SD0031 (49 percent). No gasoline-range organics were detected in either sample. The reporting limits for these samples were qualified as estimated and may be biased low.

PAHs in Phase 1 Samples—For Sample SD0011, recoveries of the surrogate compounds fluorene-d10 and fluoranthene-d10 were 39 and 46 percent, respectively, below the control limits of 43 and 52 percent. All PAH results for Sample SD0011 were qualified as estimated. These values may be biased low.

Butyltins in Phase 1 Samples—Results for all four butyltin compounds in Sample SD0021 were qualified as estimated because the recovery of the surrogate compound, tri-*n*-propyltin (17 percent recovery), was below the control limits (31 percent recovery). These qualified results may be biased low.

The recovery of tri-*n*-propyltin was below the lower control limit for three method blanks. The laboratory reanalyzed samples with detected analyte levels and with new method blanks and obtained similar recoveries for the surrogate in the method blanks. Butyltin concentrations in the samples were also comparable to the original results. Because surrogate recovery data are used to assess extraction efficiency on a sample-specific basis and the surrogate recovery was within control limits for all sediment samples except one (described previously), no data were qualified. Only the data for the original analysis were reported because the reanalyses were completed after the holding time had expired.

PCB Aroclors® in Phase 1 Samples—Surrogate recovery could not be determined for five sediment samples (SD0001, SD0005, SD0006, SD0007, and SD0012) because dilutions were necessary for analysis or because the surrogate decachlorobiphenyl coeluted with decachlorobiphenyl that was native to the samples. Decachlorobiphenyl is a component of Aroclors® 1254 and 1260. No qualifiers were applied for the absence of surrogate results.

Butyltins in Phase 2 Samples—Recovery of the surrogate tri-*n*-propyltin in equipment blank EB0007 was 37 percent, below the control limit of 41 percent. No butyltins were detected in this equipment blank. All four reporting limits for butyltins were qualified as estimated and may be biased low.

Petroleum Hydrocarbons in Phase 2 Samples—The recovery of *n*-triacontane from Sample SD0011 was 60 percent, slightly below the lower control limit of 63 percent. The result for residual-range organics in this sample was qualified as estimated. However, the concentration of residual-range organics in this sample was quite high relative to the concentration of the added surrogate and the low surrogate recovery is likely to be an artifact of the high concentration of residual-range organics rather than an indication of low analyte recovery.

PAHs in Phase 2 Samples—Results for all 24 PAHs were qualified as estimated in Samples SD0108 and SD0125 because the recovery of the surrogate compounds fluorene-d10 and fluoranthene-d10 were below the control limits. The control limits for recovery are 42–130 percent for fluorene-d10 and 55–130 percent for fluoranthene-d10. Surrogate recoveries were 30 and 41 percent for fluorene-d10 and fluoranthene-d10 in Sample SD0108, and 40 and 48 percent in Sample SD0125. The results for PAHs in these samples may be biased low.

PCB and PCT Aroclors® in Phase 2 Samples—Recoveries of the surrogate decachlorobiphenyl were above control limits for PCBs in 21 samples and for PCTs in 12 samples. The following explanation was provided in the case narrative for each data package when control limits were not met for surrogate recovery: "The control criteria were exceeded for the Decachlorobiphenyl in samples [list of samples] due to suspected matrix interferences. An alternate surrogate: Tetrachloro-m-xylene, though not reported, is acceptable suggesting that the sample matrix is contributing to the high Decachlorobiphenyl recoveries. No further corrective action was taken."

Based on a review of the chromatograms for these samples, results for PCBs or PCTs, or both, were qualified as estimated when surrogate recoveries exceeded the control limits. Qualifiers were applied only to results for detected PCBs and PCTs. Results for the following samples were qualified.

Samples with Detected PCBs Qualified	Samples with Detected PCTs Qualified	Samples with Detected PCBs and PCTs Qualified
SD0006	SD0039	SD0043
SD0010	SD0110	SD0076
SD0018		SD0078
SD0022		SD0079
SD0054		SD0080
SD0086		SD0081
SD0087		SD0095
SD0088		SD0142
SD0141		SD0146
SD0143		
SD0158		
SD0159		

Serial Dilution for Metals by ICP

Serial dilution of sample solutions serves to check for matrix interferences that may affect the analyte signal for metals analyzed by ICP methods. The control limit is 10 percent difference between the undiluted sample and the diluted sample, after adjustment for the dilution.

Phase 1 Samples—Copper and zinc results were above the control limit for several serial dilution samples. Results ranged from 13 to 19 percent difference between the undiluted and the diluted samples. A total of 30 results for copper and 43 results for zinc were qualified as estimated because of the serial dilution results. The diluted sample yielded a higher concentration than the undiluted sample in all cases. This indicates that the qualified results for chromium and zinc may be biased slightly low. Copper results were qualified for Samples SD0001 through SD0018 and SD0049 through SD0060, and zinc results were qualified for Samples SD0001 through SD0025 and SD0043 through SD0060.

Phase 2 Samples—Results for serial dilution of test samples were above the control limit in several instances. The diluted sample yielded a higher concentration than the undiluted sample in all cases, which indicates a potential negative bias of data. Exceedances were small in all cases, however, and do not indicate a serious or systematic problem. Control limits were exceeded in the following cases:

- For arsenic in SDG K2206403, 18 percent difference was found between the serial dilution result and the undiluted sample. The arsenic results for Samples SD0111 to SD0122 were qualified as estimated.

- For chromium in SDG K2206258, 17 percent difference was found between the serial dilution result and the undiluted sample. The chromium results for Samples SD0065 to SD0084 were qualified as estimated.

- For copper in SDG K2206263, 11 percent difference was found between the serial dilution result and the undiluted sample. The copper results for Samples SD0085 to SD0092 were qualified as estimated.

- For silver in SDG K2206077, 16 percent difference was found between the serial dilution result and the undiluted sample. The silver results for Samples SD0017 to SD0034 and SD0037 were qualified as estimated.

- For silver in SDG K2207139, 11 percent difference was found between the serial dilution result and the undiluted sample. The silver results for Samples SD0300 and SD0301 were qualified as estimated.

- For zinc in SDG K2206396, 16 percent difference was found between the serial dilution result and the undiluted sample. The zinc results for Samples SD0094 to SD0110 were qualified as estimated.

Serial dilution results also exceeded control limits for copper, nickel, and zinc in sample SD0180. The results for copper and zinc were qualified as discussed above under *Matrix Spike Samples*. For nickel, 27 percent difference was found between the serial dilution result and the undiluted sample. The nickel result for Sample SD0180 was qualified as estimated and may be biased low.

Certified Reference Materials

Two reference materials were supplied to the laboratories for analysis with the sediment samples. Sequim-1, a frozen spiked sediment prepared by the National Oceanic and Atmospheric Administration, was sent to CAS for analysis of PAHs, and Standard Reference Material 1941a, a dried marine sediment from the National Institute for Standards and Technology (NIST), was sent to Alta for analysis of PCB congeners. Recoveries of PAHs from Sequim-1 ranged from 32 to 103 percent, with an average of 66 percent recovery. The concentrations of 18 PCB congeners in SRM 1941a were certified. Recoveries of these congeners ranged from 54 to 170 percent, with an average of 104 percent recovery.

Precision

Split samples were collected in the field and duplicate analyses were performed at the laboratory to evaluate the precision of the data. Field splits were created by filling two sample jars with portions of the same homogenized field sample and submitting them to the laboratory as separate samples. Matrix spike duplicates were prepared at the laboratory to monitor the precision of organic analyses. Laboratory duplicates (i.e., unspiked duplicates) were used for metals and conventional analyses. Matrix spike and laboratory duplicate samples were analyzed with every sample batch (20 or fewer samples), as required, for all analytes. Control limit exceedances are described below. Data that were qualified for exceeded duplicate results may be less precise than unqualified data for the same analysis. No bias can be assigned on the basis of duplicate results.

Laboratory Duplicates and Matrix Spike Duplicates

Control limits for relative percent difference (RPD) between laboratory duplicates were met, with the following exceptions.

Metals in Phase 1 Samples—The result for lead in the laboratory duplicates of sample SD0041 (SDG K2105847) was 37 RPD, slightly higher than the control limit of 35 RPD. The lead results for Samples SD0027 through SD0039, SD0041, and SD0042 were qualified as estimated because of this control limit exceedance.

Nickel results in the SEM extracts for two laboratory duplicates were above the control limit of 35 RPD. Results were 122 RPD and 83 RPD for duplicate analyses of Samples SD0025 and SD0006, respectively. The nickel results for all samples that were analyzed in the same batches as these duplicate samples were qualified as estimated and may be less precise than the unqualified data. A total of 25 nickel results for SEM were qualified as estimated.

PAHs in Phase 1 Samples—The RPD between the MS/MSD for SDG K2105935 exceeded the control limit for six LPAHs because the MSD was prepared incorrectly, as described above under *Matrix Spike Samples*. This situation did not reflect the precision of the analyses and no data were qualified.

Metals in Phase 2 Samples—The RPD between laboratory duplicates did not meet the control limit in three cases. The results for mercury in the laboratory duplicates for Samples SD0094 (SDG K2206396) and SD0135 (SDG K2206552) were 44 and 42 RPD, respectively. The control limit is 35 RPD. The mercury results for Samples SD0094, SD0097, SD0099 to SD0108, SD0110, and SD0134 to SD0138 were qualified as estimated because of these control limit exceedances. The result for nickel in the laboratory duplicate for Sample SD0164 (SDG K2206826) was 36 RPD, just above the control limit. The nickel results for Samples SD0164 to SD0166 were qualified as estimated.

Butyltins in Phase 2 Samples—The RPD between the MS/MSD exceeded the control limit in one instance each for monobutyltin and for dibutyltin. The difference between the MS/MSD in both cases was 53 RPD. Results for monobutyltin in Samples SD0123 to SD0128, SD0130, SD0131, SD0133, and SD0134 to SD0138 were qualified as estimated. Results for dibutyltin in Samples SD0042 and SD0046 were also qualified as estimated.

Control limits for precision of the MS and MSD were also exceeded for three of four butyltins in SDG K2206826. However, these exceedances were the result of poor sample preparation efficiency for the MS. Recoveries were low for the surrogate as well as the spiked butyltins in the MS. The imprecision of the MS and MSD did not reflect the analytical precision for the samples in this SDG and no data were qualified.

PCB Aroclors® in Phase 2 Samples—The control limit for precision was exceeded slightly for the MS/MSD analyzed with equipment blank EB0002. No PCBs were detected in this equipment blank. The MRLs for all PCB Aroclors® were qualified as estimated.

Field Split Samples

Split samples were collected at a frequency of approximately 5 percent of field samples for surface sediment and sediment cores. Sample information for split samples is provided in Table F-2. Results are provided in Tables F-6 through F-11. The RPD between the split sample results generally met the project DQO for precision (Exponent 2001, Table B-4). No systematic imprecision was identified and no data were qualified for split sample results.

Phase 1 Samples—The results for AVS in split samples SD0005 and SD0006 (Station SW02) were above the project DQO for precision. To avoid excessive volatilization or oxidation of sulfide, samples for AVS cannot be homogenized in the field or the laboratory prior to analysis. The level of homogeneity inherent to the sample directly affects the precision of the analysis.

Large differences in concentrations of PAHs were reported for field duplicate samples SD0017 and SD0018 (Station NA07). This situation may be the result of sample inhomogeneities or an undocumented error in the analysis of one of the samples.

Field duplicate results exceeded the DQO for precision in several additional instances. No pattern was evident that would have suggested a systematic problem.

Phase 2 Samples—For field split samples SD0142 and SD0146 (Station NA01, 2–4 ft), results were above 50 RPD for several LPAHs, phenanthrene, and 1-methylphenanthrene. Several grain size results exceeded the measurement quality objective (MQO) of 35 RPD for field split samples SD0079E and SD0083E (engineering core from Station NA09, 0–72 in.) and for Samples SD0076 and SD0078 (Station NA16, 2–4 ft). The split samples from Station NA16 (2–4 ft) additionally showed differences above the MQO for petroleum hydrocarbons, PCB and PCT Aroclors®, and PCB congeners. The concentrations of PCB congeners were generally higher in Sample SD0076, whereas the concentrations of petroleum hydrocarbons, PCB Aroclors®, and Aroclor® 5460 were higher in Sample SD0078. These inconsistencies may be the result of sample inhomogeneity.

The results for PCB congeners in split samples SD0163 and SD0164 (Station NA29, 2–4.4 ft) were above 50 RPD when detected. However, the results were fairly close to the MRL, and the background fluctuations of the instrument ("background noise") may have been responsible for the differences.

Field duplicate results exceeded the DQO for precision in several additional instances. No pattern was evident that would have suggested a systematic problem.

Identification and Quantification of Analytes

Identification requirements for organic and inorganic analytes are provided in each method description and involve such factors as retention times and chromatographic pattern matches for gas chromatography methods, mass spectra for mass spectrometry methods, and wavelengths of atomic emissions for ICP/AES analyses. Quantification of analyte concentrations involves calculation of concentrations with respect to standards; correction for starting weights or volumes, dilutions, and moisture content in the samples; and determination and correct calculation of reporting limits and detection limits for each analyte in each sample type and dilution level. In addition, the use of two dissimilar columns for gas chromatographic determinations provides confirmation of analyte identity as well as concentration. Verification of analyte quantification and identification were the responsibility of the laboratory. During data validation, results were qualified on the basis of information provided in the case narratives and data summaries and verified in the instrument printouts as follows.

Phase 1 and Phase 2 Samples

Petroleum Hydrocarbons—Petroleum hydrocarbons were analyzed by gas chromatography with flame ionization detection as described by the California Environmental Protection Agency (SWRCB 1989). Gasoline-range organics include aromatic and aliphatic compounds that elute in the range of linear alkanes with 6 to 12 carbon atoms. The compounds eluting in this range were quantified against a gasoline standard. Diesel-range organics include compounds that elute in the range of linear alkanes with 12 to 25 carbons. The compounds eluting in this range were quantified against a diesel standard. Residual-range organics include compounds that elute in the range of linear alkanes with 25 to 36 carbons. The compounds eluting in this range were quantified against a standard of motor oil.

CAS chemists compared the chromatograms of the samples to the standards to determine whether gasoline, diesel, or motor oil was present in samples with detected petroleum hydrocarbons. The chromatograms were judged by the analytical chemist to match the motor oil standard for 10 samples in the Phase 1 analyses and the diesel range organics for 1 sample. In all other cases, the results for gasoline-range organics, diesel-range organics, and residual-range organics (i.e., oil) did not match the standard. All of these results were qualified as estimated because the petroleum compounds in the samples were not the same as the standards, which resulted in imprecision in the quantification. In addition, the results were qualified "*N*" to indicate that the detected organic constituents were not identified as gasoline, diesel, or the motor oil used as the standard.

PCB Aroclors®—CAS indicated in its case narratives that the presence of multiple PCB Aroclors® in the sediment samples hindered the identification and quantification of the

Aroclors®. A statement similar to the following was included in the case narrative for all except two data packages for sediment samples:

> When mixtures of PCB Aroclors are present in a sample, correct identification and quantitative analysis of the individual Aroclors can be subjective. In particular, when mixtures are present, differentiating Aroclor 1242 from Aroclor 1248 can be difficult.
>
> A review of the sample chromatograms indicated the presence of PCB patterns that spanned the entire elution range from Aroclor 1242 through the end of Aroclor 1260. Based on individual PCB peaks in the early portion of the chromatogram, Aroclor 1248 was identified and quantitated. Aroclor 1260 was identified based on the presence of PCB peaks eluting late in the chromatogram. The remainder of the PCB pattern was identified as Aroclor 1254 because PCB peak height in the middle of the chromatogram was larger than could be attributed to either Aroclor 1248, or Aroclor 1260.
>
> When Aroclor mixtures are present in a sample, care is taken to minimize the possibility of double-counting PCBs. Analytical peaks are selected based on the best resolution possible for that particular sample. However, when a mixture of Aroclors 1248, 1254, and 1260 is present in a sample, the potential exists for a high bias from contribution of one Aroclor to another due to common peaks or peaks that cannot be completely resolved.

The concentrations of total PCB Aroclors® and total PCB homologs in sediment were compared to evaluate the possibility that PCB Aroclors® were overestimated. Regression of results for total PCB homologs against total PCB Aroclors® for all sediment samples yielded a slope of 0.53 (Figure 1), which was significantly ($p<0.05$) less than one. Concentrations of total PCB Aroclors® were higher than concentrations of total PCB homologs. These results are consistent with the laboratory's judgment that the PCB Aroclor® concentrations were overestimated. Total PCB homolog concentrations in sediment are likely to yield a more accurate result than total PCB Aroclor® concentrations. (A comparison of total PCB Aroclors® to total PCB homologs in fish and invertebrate tissue did not indicate a systematic laboratory bias, as discussed under *Plant and Animal Tissue*.)

Phase 1 Samples

Butyltins—Two different columns are used for butyltin analyses to confirm the identification and concentration of the target analytes. Results for butyltin compounds were qualified as estimated when the difference between the columns was greater than 40 percent. Results were qualified for monobutyltin in Samples SD0001 and SD0052, dibutyltin in Sample SD0008, and tetrabutyltin in Samples SD0008, SD0023, SD0046, SD0048, SD0052, and SD0060. The variability for these results ranged from 43 to 92 percent difference. The higher value was reported by the laboratory unless the chromatograms showed evidence of matrix interference.

PCB and PCT Aroclors®—Based on a review of the chromatograms, results for Aroclor® 1248 were qualified as estimated in Samples SD0016 and SD0018 because the Aroclor® may have been misidentified.

Three results for PCB Aroclors® were qualified as estimated because the difference between the concentrations reported from the two chromatographic columns did not meet control limits (40 percent difference). Results were qualified for Aroclor® 1260 in Sample SD0020 (47 percent difference) and for Aroclor® 1248 in Samples SD0016 and SD0018 (47 and 44 percent difference, respectively). These qualified results incorporate a slightly wider variability than unqualified data. Results were reported from the primary quantification column (RTX-5).

The result for PCT Aroclor® 5460 for Sample SD0012 was qualified as estimated because the concentration of this Aroclor® was above the upper calibration range of the instrument.

Phase 2 Samples

PAHs—The concentrations of C1-benz[a]anthracenes/chrysenes, C2-benz[a]anthracenes/chrysenes, and C1-fluoranthenes/pyrene were above the calibration range in Sample SD0173. These results were qualified as estimated and may be biased low.

Butyltins—Butyltin results were qualified as estimated when the difference between the concentrations reported from the two chromatographic columns did not meet control limits

(40 percent difference). The following results for Phase 2 samples were qualified as estimated on this basis:

- Monobutyltin results for Samples SD0092, SD0122, SD0127, SD0128, SD0137, and SD0159
- Dibutyltin results for Samples SD0124, SD0126, SD0127, SD0128, SD0134, SD0137, and SD0138
- Tributyltin results for Samples SD0004, SD0009, SD0010, SD0011, SD0091, SD0101, SD0103, SD0105, SD0112, SD0114, SD0118, SD0121, SD0122, SD0124, SD0126, SD0127, SD0130, SD0131, SD0133, SD0134, SD0136, SD0138, SD0141, SD0153, and SD0156
- Tetrabutyltin results for Samples SD0055, SD0135, and SD0136.

The laboratory reported the higher value unless the chromatograms showed evidence of matrix interference.

Chromatographic interference was encountered at the retention time for tributyltin in samples SD0086 and SD0092. Tributyltin was not detected in these samples, but the interference prevented resolution of the target compound at the reporting limit. The reporting limits were elevated by the laboratory and qualified as estimated during data validation.

PCT Aroclors®—The results for Aroclor® 5460 in Samples SD0001 and SD0032 were qualified as estimated because the difference between results for the two analytical columns was greater than 40 percent.

Pore Water

A total of 37 pore water samples and 2 equipment blanks were collected for the NASSCO and Southwest Marine shipyards sediment investigation. The results for the quality control procedures used during sample analyses are discussed below. A list of samples in each SDG is provided in Attachment F1.

Samples for pore water analysis were collected twice. Samples collected from September 8 to 14, 2002, were analyzed for metals, butyltins, and PCB homologs. The same stations were reoccupied from November 6 to 8, 2002, and samples were analyzed for alkylated PAHs and TOC. Pore water samples were extracted in the field for all analyses except chromium and hexavalent chromium, which were extracted at CAS. Whole sediment was sent to CAS for this purpose in September 2002, along with the extracted pore water for the remaining analyses.

Completeness

The laboratory provided results for all requested analyses for all samples. No data were rejected during the quality assurance review. Data completeness was 100 percent with respect to requested analyses. A total of 1,162 results were reported for pore water samples, excluding field blanks and laboratory QC results. Of these results, 50 (4.3 percent) were qualified as estimated during the data quality review. Station SW12 could not be occupied during the November 2002 sampling event because a battleship blocked access. No sample was collected from this station for PAH analysis.

Holding Times and Sample Preservation

The analytical holding time constraints and sample preservation requirements specified in Table B-5 of the QAPP (Exponent 2001, Appendix B) were met for all samples and analyses.

Instrument Performance

The performance of the analytical instruments was acceptable. No changes in instrument performance that would have resulted in the degradation of data quality were indicated during any analysis sequence.

Mass Spectrometer Tuning

Mass spectrometer tuning checks were completed as required and results met control limits. Mass spectrometer tuning checks were required for analyses for PAHs, PCB homologs, and metals by ICP-MS.

Initial and Continuing Calibration

Initial calibration, initial calibration verification, and continuing calibration were completed as required for all analyses. Initial and continuing calibrations were acceptable in all cases.

Laboratory and Field Blanks

Laboratory blanks for the pore water analyses included method blanks for all analyses and additional calibration blanks for metals analyses. Field blanks (i.e., equipment rinse blanks) were collected for pore water extraction for all analytes. Pore water for chromium and hexavalent chromium was extracted at the laboratory to accommodate the short holding time for hexavalent chromium.

Calibration Blanks

Initial and continuing calibration blanks are required only for metals analyses and were analyzed at the required frequency. No site analyte was detected in any calibration blank.

Method Blanks

A method blank was prepared and analyzed with each sample batch and for every analysis, as required. No site analyte was detected in any method blank.

Field Blanks

Two equipment blanks were collected to assess whether contaminants may have been introduced during pore water extraction in the field. Equipment blank EB0003 was collected during the initial pore water sampling event and was analyzed for metals, butyltins, and PCB homologs. Equipment blank EB0008 was collected during the second pore water sampling event and was analyzed for PAHs and TOC. Results for these equipment blanks are provided in Table F-12.

Lead and zinc were detected in equipment blank EB0003. The result for zinc in sample PW0011W was restated as undetected as specified in U.S. EPA (1994) because the zinc concentration in the sample (13 μg/L) was less than five times the concentration in the blank (3.1 μg/L).

Chromium was also detected in equipment blank EB0003. However, pore water extractions for total chromium and hexavalent chromium were completed at the laboratory using separate aliquots of whole sediment. Equipment blank EB0003 was collected in the field and does not apply to the pore water extractions completed at the laboratory or to the chromium data.

Accuracy

The accuracy (i.e., bias) of the analytical results is reflected by recoveries of internal standards, LCSs, matrix spikes, and surrogate compounds and, for metals analyses, by serial dilution of samples. Results met control limits in all cases for internal standards, LCSs, and serial dilution. Results for matrix spike samples and surrogate compounds are described below.

Matrix Spike Samples

Matrix spike analyses were completed at the required frequency. The control limits were met for all analytes except arsenic.

The 19 pore water samples and equipment blank EB0003 were analyzed for metals in a single sample batch. One matrix spike sample was also analyzed. The matrix spike recovery for arsenic was 44 percent, below the control limit of 75−125 percent recovery. The arsenic results for all 19 pore water samples and equipment blank EB0003 were qualified as estimated because the matrix spike results did not meet control limits. These results may be biased low.

Surrogate Compounds

Surrogate compound recoveries met the criteria for acceptable performance, with the exception of one sample for butyltins.

The recovery of the surrogate tri-*n*-propyltin was 38 percent for Sample PW0012W. This recovery was below the laboratory control limit of 41−128 percent recovery. All four results for butyltins in Sample PW0012W were qualified as estimated and may be biased low.

Precision

Split samples were collected in the field and duplicate analyses were performed at the laboratory to evaluate the precision of the data. Field split samples were created by extracting and mixing twice the normal volume of pore water and filling two sample jars with aliquots of the pore water. The split samples were submitted to the laboratory as separate samples and were not identified as split samples. Matrix spike duplicates and laboratory duplicates were prepared at the laboratory as described for sediment samples.

Laboratory Duplicates and Matrix Spike Duplicates

Laboratory duplicate or MS/MSD analyses were completed at the required frequency when sufficient sample volume was available. Control limits were exceeded for silver and butyltins, as described below.

Metals—The laboratory duplicate results for silver did not meet the control limit for precision. Sample PW0001W was analyzed in duplicate and yielded results with a difference of 66 RPD. The silver results for all of the pore water samples were qualified as estimated. These qualifiers reflect a possible decrease in the precision of the silver concentrations.

Butyltins—Butyltin analyses were completed in three batches. MS/MSD samples were prepared for butyltin analyses only for one sample because insufficient sample volume was available for the remaining samples. Duplicate LCSs were prepared and analyzed for the two sample batches with no MS/MSD samples.

The results of the LCS and LCS duplicate for mono-, di-, and tributyltin did not meet the laboratory control limit for precision for SDG K2206551. The laboratory control limit was 30 RPD and the difference between results was 31 RPD for monobutyltin, 40 percent for dibutyltin, and 73 percent for tributyltin. Samples PW0016W, PW0017W, PW0018W, and PW0019W were prepared in this batch. Results for monobutyltin were not qualified because the exceedance was minimal and the result met the project MQO for precision (35 RPD; Exponent 2001, Appendix B, Table B-4). However, the results for dibutyltin, tributyltin, and tetrabutyltin were qualified as estimated for all samples in this batch. These qualifiers reflect a possible decrease in the precision of the reported concentrations.

Field Split Samples

A field split sample was collected for each pore water sampling event and for the sediment samples that were extracted at the laboratory. However, the pore water field split collected in November 2002 for PAH analysis was broken during shipment. No data are available for this sample. Sample information for the remaining split samples is provided in Table F-2. Results are provided in Table F-13. The RPD between the split sample results generally met the project DQO for precision (Exponent 2001, Table B-4). DQOs were exceeded for silver and TOC. No systematic imprecision was identified, and no data were qualified for split sample results.

Identification and Quantification of Analytes

No problems were encountered by the laboratory with respect to analyte identification and quantification.

Plant and Animal Tissue

A total of 172 animal tissue samples and 3 eelgrass samples were collected for the NASSCO and Southwest Marine shipyards sediment investigation (Table F-4). The results for the quality control procedures used during sample analyses are discussed below. A list of samples in each SDG is provided in Attachment F1.

Completeness

The laboratory provided results for all requested analyses for all samples. No data were rejected during the quality assurance review. Data completeness was 100 percent with respect to requested analyses. A total of 18,491 results were reported for biological tissue samples, excluding laboratory quality control results. Of these results, 269 (1.5 percent) were qualified as estimated during the data quality review.

In Phase 1, the clam tissue from two replicate exposures at Station NA20 were combined because the mass of clam tissue in each was less than the minimum needed to complete the analyses. A total of 69 samples were generated, one less than intended. The bioaccumulation rates for Station NA20 were calculated based on four results rather than five.

Holding Times and Sample Preservation

The analytical holding time constraints and sample preservation requirements specified in Table B-5 of the QAPP (Exponent 2001, Appendix B) were met for all samples and analyses. All of the tissue samples were stored frozen at –20°C at the laboratory.

Instrument Performance

The performance of the analytical instruments was acceptable. No changes in instrument performance that would have resulted in the degradation of data quality were indicated during any analysis sequence.

Mass Spectrometer Tuning

Mass spectrometer tuning checks were completed as required and results met control limits. Mass spectrometer tuning checks were required for analyses for PAHs, PCB congeners, and metals by ICP-MS.

Initial and Continuing Calibration

Initial calibration, initial calibration verification, and continuing calibration were completed as required for all analyses. Initial and continuing calibrations were acceptable in all cases.

Laboratory Blanks

Laboratory blanks included method blanks for all analyses and, for metals analyses, calibration blanks.

Calibration Blanks

Initial and continuing calibration blanks are required only for metals analyses and were analyzed at the required frequency. No analyte was detected in any calibration blank.

Method Blanks

A method blank was prepared and analyzed with each sample batch and for every analysis, as required. The only target analytes detected in the method blanks were low levels of tributyltin and PCB congeners, as described below.

Butyltins in Phase 1 Samples—One tributyltin result (Sample MA0049C) was qualified as estimated because the analyte was detected in the associated method blank. This qualified result may exhibit a positive bias or may be reported as a false positive.

PCB Congeners in Phase 1 Samples—PCB congeners were detected at very low levels in five of the six method blanks analyzed with the clam samples. EPA Method 1668A (U.S. EPA 1999a) requires that levels of PCB congeners in the method blank be below the estimated minimum level (EML) for each congener, as provided in U.S. EPA (1999a, Table 2). This level varies by congener from 0.001 to 0.1 μg/kg (i.e., as calculated assuming the typical tissue sample weight used for the analysis). The EML is 0.05 μg/kg for most of the congeners that were detected in the method blanks. The concentrations of PCB congeners in the method blanks were below the EML in all cases. Analyte concentrations in the method blanks are provided in Table F-14.

The presence of low levels of PCB congeners in the method blanks was attributed by the laboratory to the silica gel that was used during cleanup of the sample extracts. According to Bob Mitzel of Alta, "the trace levels of PCB congeners present in the method blanks … are the background levels present in the [column] packing material used in cleaning up these samples. ALTA has used several techniques to clean this material prior to use. However, due to the inconsistency of batches of material the cleaning procedure is only good down to certain levels. Because we are looking at very low levels, the possibility of background levels is greater" (Mitzel 2001, pers. comm.).

The same lot of silica gel was used for the method blank and for all of the samples that were prepared and analyzed in a given sample batch. However, different lots of silica gel were used for different sample batches. Method blanks 2339 and 2340 (Table F-14) were prepared from the same lot of silica gel, and the results for these blanks are very similar. Therefore, the contaminant levels in the samples are expected to be consistent with the method blank for each batch, and the method blank provides a reliable indication of the levels of contaminants in the samples.

Procedures for qualifying data for laboratory contamination are provided in EPA Region 10's validation guidelines for EPA Method 1668 (U.S. EPA 1995a) and the functional guidelines for validating organics data (U.S. EPA 1999b). No validation procedures for Method 1668A are available from EPA Region 9. According to U.S. EPA (1995a), "Any measurement of PCB congeners in a sample that is also measured in any associated blank, is qualified with a "U" flag if the sample concentration is less than 5 times the blank concentration." In other words, analyte concentrations that are less than 5 times the method blank are restated as undetected at the reported concentration. When contaminant levels are constant, this qualification procedure limits the contribution by a contaminant to 25 percent of the native concentration of a given analyte (20 percent of the total concentration) when it is reported as detected in the sample. A similar procedure is provided in the national functional guidelines (U.S. EPA 1999b).

Because the source of contamination was established and the contaminant levels in the samples could be quantified, modifications were made to EPA's validation procedures to allow greater usability of the data while maintaining conservative analyte concentrations (i.e., erring on the side of overestimated, rather than underestimated, analyte concentrations). In samples with analyte concentrations below 2 times the concentration in the method blank, the result was restated as undetected (qualified with a "*U*") as described above. This procedure limits the contribution by the contaminants to no more than 50 percent of the reported analyte concentration. In addition, analyte concentrations that were 2 to 5 times the concentration in the blank were qualified as estimated (a "*J*" qualifier was applied). Although low levels of the congeners in question were introduced by the silica gel, these congeners were clearly also present in the clams, and therefore results that were 2 to 5 times the associated blank were qualified as estimated rather than restated as undetected. These qualified results are biased high by approximately 20 to 50 percent because of the contaminants introduced by the silica gel. The results were not blank-corrected to avoid any possibility of a negative bias in the analyte concentrations.

A total of 89 results for PCB congeners were qualified as estimated and 91 results were restated as undetected at the reported concentration because the analytes were detected in associated method blanks.

PCB Congeners in Phase 2 Samples—Dichlorinated PCB homologs were detected in two method blanks. Results for samples analyzed with these method blanks were restated as undetected at the reported concentration when the concentration in the sample was less than 2 times the concentration in the blank, as described above for Phase 1 clam samples. Results for dichlorinated PCB homologs were restated as undetected in the spotted sand bass fillets (Samples BI0013–BI0018, BI0024–BI0027, BI0033–BI0037, BI0043–BI0047, BI0054, and BI0057). Dichlorinated PCB homologs were not detected in the remaining three spotted sand bass fillets.

Accuracy

The accuracy (i.e., bias) of the analytical results is reflected by recoveries of internal standards, LCSs, matrix spikes, and surrogate compounds and, for metals analyses, by serial dilution of samples. Results for these quality control procedures are described below.

Internal Standards

Internal standards are added to all samples for analysis of metals by GC/MS, PAHs, and PCB congeners. Results for internal standards met the criteria for retention time and recovery in all cases except two for Phase 1 samples. The results for monochlorinated and dichlorinated PCB homologs in Sample MA0019E and the result for monochlorinated PCB homologs in Sample MA0027A were qualified as estimated because the recovery for the associated internal standard was below the lower control limit of 25 percent. As stipulated in EPA's method description (U.S. EPA 1999a), calculations for analyte concentrations include correcting the concentrations for recovery of the appropriate internal standard to compensate for analytical bias on a sample-specific basis. The data reported by the laboratory for these three results were corrected for internal standard recovery; therefore, no bias can be determined. The internal standards with low recoveries applied only to PCB congeners that were not target analytes for this study; therefore, no congener results required qualification.

Laboratory Control Samples

LCSs were analyzed as required in all cases. LCS recoveries met control limits in all cases.

Matrix Spike Samples

Matrix spike analyses were completed at the required frequency when sufficient sample mass was available. Control limits for spike recoveries were exceeded in several cases for copper and PCB-153, as discussed below. Matrix spike results are not meaningful when the native concentration of an analyte in the sample is greater than approximately 1 to 4 times the concentration of the added spike because the variability (i.e., precision) of the analysis may bias the matrix spike recovery. In these cases, the accuracy of the analysis was established using other quality control results (e.g., surrogate spike and LCS recoveries.)

Metals in Phase 1 Samples—Matrix spike results for copper exceeded control limits in two SDGs. The matrix spike results for these samples were 147 and 157 percent recovery, and the control limits are 75 to 125 percent recovery. A total of 40 results for copper in clam samples (i.e., 37 test samples and 3 control samples) were qualified as estimated because the matrix spike results did not meet control limits. Qualified results for copper may be biased high.

Sixty-four of the clam samples were prepared for mercury analysis on the same day. Four matrix spike samples were prepared with the samples. The spike recovery for all of the spiked samples was low, with a range of 37 to 52 percent recovery. Results for LCSs and post-digestion matrix spikes met control limits. The case narrative indicated that similar low recoveries were found for other sample types for other projects that were prepared on the same day and using the same spiking solution, and that the spiking solution was probably prepared incorrectly. The laboratory was not able to analyze the spiking solution directly. Seven clam tissue samples were reanalyzed with a fresh matrix spike solution to verify the original analysis. Results for all of the samples were comparable to the original analyses (i.e., the control limit for precision, 35 RPD between laboratory duplicates, was met for all seven samples). The reanalyses confirmed the validity of the original analyses and the mercury results were accepted without qualification. Both sets of data were included in the database. The inclusion of the mercury data from the reanalysis of seven clam samples constitutes a revision of the data presented in Technical Memorandum 4 (Exponent 2002b).

PAHs in Phase 1 Samples—Matrix spike samples were not prepared for PAH analyses because insufficient sample mass was available. The accuracy of the PAH analyses was evaluated using surrogate recoveries and LCS results.

PCB Congeners in Phase 1 Samples—Matrix spikes are not required for PCB congener analyses, but were completed when sufficient sample mass was available. One MS and MSD were analyzed for the clam tissue samples. Results met control limits (50 to 150 percent recovery) with one exception. The recovery was 153 percent for PCB-153 in one matrix spike sample. No data were qualified for this exceedance.

Metals in Phase 2 Samples—Matrix spike results did not meet control limits in four cases for metals analyses. For the matrix spike sample prepared with SDG K2207139, recoveries for selenium and silver were 71 percent and 67 percent, below the control limits of 75 to 125 percent. Results for selenium and silver were qualified as estimated for Samples BI0082, BI0084, and BI0095. These results may be biased low.

For SDG K2207123, the matrix spike recovery for mercury was 60 percent and the recovery for zinc was 152 percent. Results for mercury and zinc were qualified as estimated in Samples BI0059–BI0064, BI0075–BI0079, and BI0090–BI0094. The results for mercury may be biased slightly low and the results for zinc may be biased high.

Surrogate Compounds

Surrogate compound recoveries met the criteria for acceptable performance, with the following exceptions for PAHs in Phase 1 samples. All 24 results for PAHs in Sample MA0034B (second analysis only, described in LCS discussion above) were qualified as estimated because the surrogate recoveries did not meet control limits. Surrogate recoveries indicate that the PAH results for this sample and analysis may be biased low; however, the results agree well with the first analysis and any bias therefore appears to be minimal.

Serial Dilution for Metals by ICP

Results for all serial dilutions met control limits.

Standard Reference Material

SRM 1974a, frozen mussel tissue prepared by NIST, was analyzed for PCB congeners by Alta Analytical Laboratory. The concentrations of 18 PCB congeners were certified. Recoveries for these congeners ranged from 30 to 100 percent, with an average recovery of 83 percent.

Precision

Laboratory duplicate or matrix spike duplicate analyses were completed at the required frequency when sufficient sample mass was available. Duplicate LCSs were analyzed when sample limitations precluded the analysis of laboratory duplicates. Control limits were met in most cases with the exception of two metals (lead and copper) and one PAH (fluoranthene) described below. Replicate or composite samples were collected for each tissue type listed in Table F-1. Variability among replicates from each station is discussed in the ecological risk assessment (Section 10 of the main report).

Phase 1 Samples

Metals—The laboratory duplicate results for lead did not meet the control limit for precision (35 RPD) for one sample batch. Sample MA0041E was used for the laboratory duplicate and yielded results with 87 RPD. The lead results for the 20 clam samples (i.e., 18 field samples and 2 bioaccumulation control samples) that were analyzed in this sample batch were qualified as estimated. These qualifiers reflect a possible decrease in the precision of the lead concentrations. Lead results for the remaining 4 laboratory duplicate samples met control limits.

PAHs—Four of the samples from Station REF1 (i.e., Samples MA0034A through MA0034E) were analyzed twice for PAHs because the results for fluoranthene in the duplicate LCSs did not meet the control limits for precision. Insufficient sample volume remained of the fifth sample (Sample MA0034C) to complete the reanalysis. Sample MA0034A was analyzed a third time because the results from the first two analyses were discrepant. Results for the third analysis were similar to results for the second (Table F-15). Data from all analyses were reported and validated. Holding times were not exceeded; therefore, all replicate results were retained in the database and the average was used to determine bioaccumulation rates. The fluoranthene results for the first analysis were qualified as estimated.

Phase 2 Samples

In Phase 2, the laboratory duplicate results for copper and lead each did not meet the control limit for precision (35 RPD) for one sample processing batch of SDG K2207131. Sample BI0019 was used for the laboratory duplicate for copper and yielded results with 53 RPD. The copper results for the 20 tissue samples that were analyzed in this sample batch (i.e., Samples BI0019–BI0023, BI0028–BI0032, BI0038–BI0042, and BI0048–BI0052) were qualified as estimated. Sample BI0083 was used for the laboratory duplicate for lead and yielded results with 38 RPD. The lead results for the 16 tissue samples that were analyzed in this sample batch (i.e., Samples BI0065–BI0069, BI0070-1, BI0070-2, BI0070-3, BI0070-4, BI0071-1, BI0071-2, BI0071-3, BI0080, BI0081, BI0083-1, BI0083-2, BI0083-3) were qualified as estimated. These qualifiers reflect a possible decrease in the precision of the copper and lead concentrations. Copper and lead results for the remaining laboratory duplicate samples met control limits.

Identification and Quantification of Analytes

No problems were encountered by the laboratory with respect to analyte identification. Several results for butyltin compounds and PCB Aroclors® were qualified as estimated. These results are described below.

The concentrations of total PCB Aroclors® and total PCB homologs in tissue samples were compared to evaluate any systematic difference between these results. Regression of results for total PCB homologs against total PCB Aroclors® for all tissue samples yielded a slope of 1.07

(Figure 2) with an r-squared value of 0.70. The slope of this regression was not significantly different from one (*p*>0.05) and the intercept was not significantly different from zero. The results for total PCB homologs and total PCB Aroclors® in tissue are therefore statistically equivalent.

Phase 1 Samples

Butyltins—The results for di-*n*-butyltin in Samples MA0013A and MA0027E and the results for tri-*n*-butyltin in Samples Control D and MA0034A were qualified as estimated because the difference in concentration between the two chromatographic columns was above the control limit of 40 percent.

PCB Aroclors®—Six results for PCB Aroclors® were qualified as estimated because the difference in concentration between the two chromatographic columns was above the control limit of 40 percent. The results for Aroclor® 1260 were qualified in Samples MA0019E, MA0020E, MA0016C, and the results for Aroclor® 1254 were qualified in Samples MA0049B, MA0049D, MA0041D.

Phase 2 Samples

Results for Aroclor® 1260 in Samples BI0091, BI0092, and BI0094 were qualified as estimated because the difference in concentration between the two chromatographic columns was above the control limit of 40 percent.

Fish Bile

A total of 50 composite samples of bile from spotted sand bass were analyzed for naphthalene, phenanthrene, and benzo[a]pyrene metabolites and for protein content. The samples were collected by excising the gall bladder and piercing it over a sample vial. Composite samples were created by combining the bile of 218 spotted sand bass as described in Table F-16. Analysis was completed as described in the GERG SOP (Attachment F2 of this appendix).

The following quality control procedures and control limits were employed for the fish bile analyses:

- Initial calibration consisted of three analyses of a calibration standard. The control limit was 20 relative standard deviation in instrument response.
- Calibration verification was completed after every 10 samples. The control limit was 20 RPD in response between the calibration verification and the average of the initial calibration standards.
- A reference bile sample was analyzed with every sample batch. Control intervals were established by an interlaboratory study.
- Duplicate samples were analyzed at a frequency of 10 percent of samples. The control limit was 25 RPD between duplicates.
- A method blank was analyzed with each sample batch.

The MDLs were 0.6 μg/g for naphthalene metabolites, 0.1 μg/g for phenanthrene metabolites, and 0.05 μg/g for benzo[a]pyrene metabolites.

The samples were analyzed for PAH metabolites in three batches as indicated below.

SDG	Samples
B1147	BC-1 to BC-20
B1148	BC-21 to BC-40
B1149	BC-41 to BC-50

Control limits were met in all cases for protein analyses and in most cases for PAH metabolites. The recovery of PAH metabolites from the reference bile did not meet control limits in several cases. Recovery for phenanthrene metabolites was 147 μg/g, slightly above the control interval of 75–145 μg/g. The reference concentration was 110 μg/g. Results for phenanthrene metabolites in Samples BC-41 to BC-50 were qualified as estimated and may be biased high.

Recovery for benzo[a]pyrene metabolites was above the control interval for Batches B1147 and B1148. Batch B1148 was analyzed in two parts with two corresponding analyses of the reference material. The control interval for benzo[a]pyrene metabolites was 0.9 to 2.1 μg/g and the reference concentration was 1.5 μg/g. Recoveries for the reference material were 2.5 μg/g for Batch B1147 and 2.9 and 3.1 μg/g for Batch B1148. Data for benzo[a]pyrene metabolites in Samples BC-1 to BC-40 were qualified as estimated and may be biased high.

Naphthalene metabolites were detected in two method blanks at very low concentrations. Any contamination at levels found in the blanks was not high enough to affect results for the samples.

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Figures

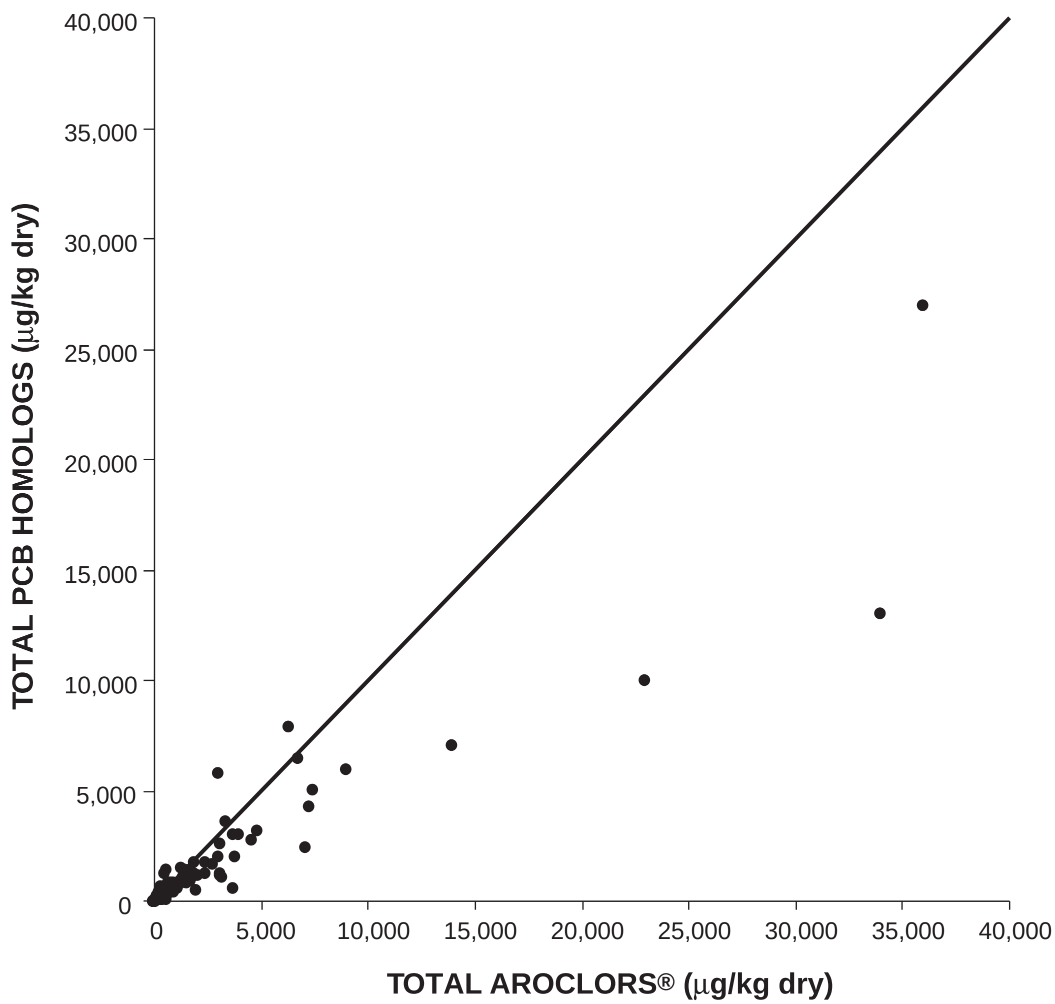

Figure F-1. Comparison of total PCB homolog and total Aroclor® concentrations in sediment samples collected during Phase 1 and Phase 2

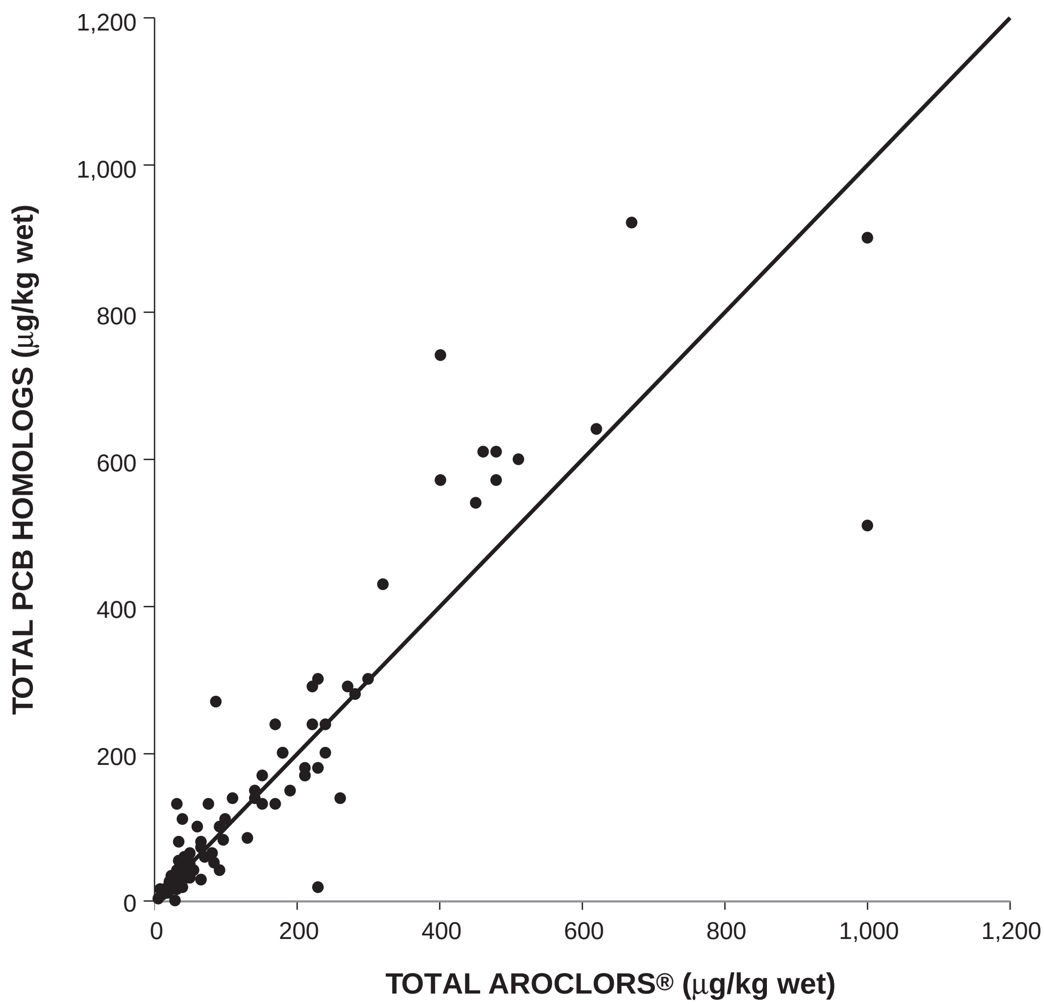

Figure F-2. Comparison of total PCB homolog and total Aroclor® concentrations in tissue samples collected during Phase 1 and Phase 2

Tables

Table F-1. Summary of Phase 1 and Phase 2 sampling program

Sample Type	Number of Stations: NASSCO	Number of Stations: Southwest Marine	Number of Stations: Reference	Samples per Station	Number of Samples[a]: NASSCO	Number of Samples[a]: Southwest Marine	Number of Samples[a]: Reference	Number of Samples[a]: Total
Phase 1								
Sediment profile imaging	54	44	5	1–6	161	129	26	316
Surface sediment (triad stations: chemistry, toxicity testing, benthic community evaluation)	15	15	5	1	15	15	5	35
Amphipod toxicity test dilution series	1	1	0	1	1	1	0	2
Bivalve tissue bioaccumulation[b]	4	5	5	1[c]	19	25	25	69
Surface sediment (chemistry only)	7	13	0	1	7	13	0	20
Phase 2								
Surface sediment (chemistry)	17 [d]	15	12	1–2[e]	22	22	17	61
Pore water and surface sediment for pore water extraction (chemistry)[f]	5	8	5	3[f]	15	23	15	53
Sediment cores (chemistry)	18	20	0	2–5	43	53	0	96
Sediment cores (engineering properties)	5	5	0	2	10	10	0	20
Sediment core samples (electron microprobe analysis)	1	3	0	1	1	3	0	4
Fish tissue for human health risk assessment—spotted sand bass fillets[g]	2	2	1	5	10	10	5	25
Fish tissue for human health and ecological risk assessment—whole spotted sand bass	2	2	1	5	10	10	5	25
Fish tissue for ecological risk assessment—whole forage fish composites	2	2	1	1–4	5	4	3	12
Benthic mussel tissue (soft tissue)	2	2	1	1	2	2	1	5
Lobster (whole body)	1	1	1	5–7	7	5	5	17
Lobster (edible tissue)	1	1	1	4–5	4	5	5	14
Eelgrass	1	1	1	1	1	1	1	3
Fish bile (PAH metabolites)	2	2	1	10	20	20	10	50
Spotted sand bass (histopathology, age determination, bile collection)	2	2	1	50–52	100	101	52	253

Note: PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl
TOC - total organic carbon

Table F-1. (cont.)

[a] Totals do not include field split samples or other quality control samples.

[b] In addition to the exposure tests for site and reference sediment, one control sample was included in this study (i.e., five replicate control exposures; see footnote c).

[c] Five replicate exposure tests were prepared from each sample. The tissue was combined for two replicate exposures at Station NA20.

[d] Samples collected during Phase 2 at Stations NA04, NA11, and NA22 were analyzed only for organophosphorous pesticides and organochlorine pesticides.

[e] Two surface sediment samples were collected at each station for the pore water study: 1) surface sediment samples were initially collected for analysis of metals, butyltins, PCB homologs, and TOC; 2) in November 2002, a second surface sediment sample was collected for analysis of PAHs at every porewater station except SW12.

[f] Three samples were collected at each station for pore water analysis: 1) pore water was extracted in the field for analysis of metals, butyltins, and PCB homologs; 2) whole sediment was sent to the laboratory for extraction of pore water for analysis of total and hexavalent chromium and TOC; 3) in November 2002, a second sample of pore water was collected in the field for analysis of PAHs. No sample was collected at Station SW12 in November 2002 because access was blocked.

[g] Fish fillets for chemical analyses were collected from fish used for histopathological analyses and age determinations.

Table F-2. Summary of field split samples

Survey	Sample Type	Station	Date	Depth Interval	Field Split 1	Field Split 2
Surface Sediment						
Phase 1	Sediment	NA01	08/11/01	0–2 cm	SD0030	SD0031
Phase 1	Sediment	NA07	08/08/01	0–2 cm	SD0017	SD0018
Phase 1	Sediment	SW02	08/06/01	0–2 cm	SD0005	SD0006
Phase 2	Sediment	2244	09/12/02	0–2 cm	SD0126	SD0127
Phase 2	Sediment	NA16	09/08/02	0–2 cm	SD0099	SD0100
Phase 2	Sediment	NA22	09/12/02	0–2 cm	SD0129	SD0132
Phase 2	Sediment	SW01	11/06/02	0–2 cm	SD0169	SD0171
Sediment Cores						
Phase 2	Sediment	NA01	09/18/02	2–4 ft	SD0142	SD0146
Phase 2	Sediment	NA09	09/04/02	0–6 ft	SD0079E	SD0083E
Phase 2	Sediment	NA16	09/04/02	2–4 ft	SD0076	SD0078
Phase 2	Sediment	NA20	09/04/02	4–6 ft	SD0072	SD0074
Phase 2	Sediment	NA29	09/21/02	24–53 in.	SD0163	SD0164
Phase 2	Sediment	SW27	08/14/02	0–2 ft	SD0014	SD0016
Phase 2	Sediment	SW34	08/29/02	0–2 ft	SD0052	SD0054
Phase 2	Sediment	SW08	08/28/02	0–2 ft	SD0033	SD0040
Phase 2	Sediment	SW17	08/26/02	0–3 ft	SD0017E	SD0020
Pore Water						
Phase 2	Pore water	NA16	09/08/02	0–2 cm	PW0002W	PW0003W
Phase 2	Pore water	SW04	11/06/02	0–2 cm	PW0024W	PW0026W
Phase 2	Sediment[a]	NA16	09/08/02	0–2 cm	PW0002S	PW0003S

[a] Split samples of sediment were sent to the laboratory. Pore water was extracted from these samples at the laboratory for analysis of total and hexavalent chromium and total organic carbon.

Table F-3. Equipment blanks and associated samples

Sample Number	Date	Analyses	Sampling Equipment	Associated Stations	Associated Samples
EB0001	08/15/02	Metals, organotins, PAHs, PCB and PCT Aroclors®, PCB congeners and homologs, petroleum hydrocarbons	Vibracorer	NA04, NA06, NA09, NA16, NA17R, NA19, NA20, NA23R All Southwest Marine coring stations	SD0001–SD0034; SD0037–SD0048; SD0051–SD0060; SD0065–SD0093
EB0002	09/13/02	Metals, organotins, PAHs, PCB and PCT Aroclors®, PCB congeners and homologs, petroleum hydrocarbons	Van Veen grab sampler	All reference stations NA01, NA04, NA06, NA11, NA13, NA16, NA17, NA22, NA23R, NA24, NA25, NA26, NA29, NA30, NA31 SW01, SW02, SW04, SW08, SW12, SW24, SW25, SW28, SW29, SW30, SW31, SW32, SW33, SW34	SD0094–SD0138
EB0003	09/13/02	Metals, organotins, PCB homologs	Centrifugation for pore water extraction	2231, 2243, 2433, 2440, 2441 NA01, NA06, NA13, NA16, NA17 SW01, SW02, SW04, SW08, SW12, SW24, SW25, SW28	PW0001–PW0019
EB0004	09/24/02	Metals, organotins, PAHs, PCB and PCT Aroclors®, PCB congeners and homologs, petroleum hydrocarbons	Slide hammer corer	NA02, NA21, NA24, NA25, NA26, NA29, NA30, NA31	SD0139–SD0140; SD0144–SD0145; SD0147–SD0166
EB0005	09/24/02	Metals, organotins, PAHs, PCB and PCT Aroclors®, PCB congeners and homologs, petroleum hydrocarbons	Piston corer	NA01	SD0141–SD0143; SD0146
EB0006	10/03/02	Metals, organotins, PAHs, PCB and PCT Aroclors®, PCB congeners and homologs, petroleum hydrocarbons	Hand collection by scuba diver	NA27, NA28	SD0300, SD0301
EB0007	11/08/02	Metals, organotins, PCB and PCT Aroclors®, PAHs, petroleum hydrocarbons, PCB congeners and homologs	Van Veen grab sampler	2231, 2243, 2433, 2440, 2441 NA01, NA06, NA13, NA16, NA17 SW01, SW02, SW04, SW08, SW12, SW24, SW25, SW28, SW36	SD0166A–SD0184

Table F-3. (cont.)

Sample Number	Date	Analyses	Sampling Equipment	Associated Stations	Associated Samples
EB0008	11/08/02	PAHs, TOC	Centrifugation	2441, 2433, 2231, 2440, 2243 NA01, NA06, NA16, NA13, NA17 SW01, SW02, SW04, SW08, SW24, SW25, SW28	PW0020–PW0037
EQBL01	08/15/01	Metals, organotins, PCB and PCT Aroclors®, PAHs, petroleum hydrocarbons	Van Veen grab sampler	2441, 2433, 2231, 2440, 2243 NA01–NA22 SW01–SW28	SD0001–SD0060

Note: PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl
PCT - polychlorinated terphenyl
TOC - total organic carbon

Table F-4. Chemical analyses for sediment, pore water, and tissue samples

Chemical Analyses	Surface Sediment and Sediment Cores[a,b]	Surface Sediment Associated with Pore Water Samples	Pore Water	Fish, Invertebrate Tissue, and Eelgrass
Conventional Wet Chemistry				
Total organic carbon	X	X	X	
Grain size distribution	X	X		
Solids	X	X		X
Lipids				X
Metals				
Arsenic	X	X	X	X
Cadmium	X	X	X	X
Chromium	X	X	X	X
Hexavalent chromium		X	X	
Copper	X	X	X	X
Lead	X	X	X	X
Mercury	X	X	X	X
Nickel	X	X	X	X
Selenium	X	X	X	X
Silver	X	X	X	X
Zinc	X	X	X	X
Organotins				
Butyltin	X	X	X	X
Dibutyltin	X	X	X	X
Tributyltin	X	X	X	X
Tetrabutyltin	X	X	X	X
Polycyclic Aromatic Hydrocarbons[a]				
LPAH				
Naphthalene	X	X	X	X
1-Methylnaphthalene	X	X	X	X
2-Methylnaphthalene	X	X	X	X
2,6-Dimethylnaphthalene	X			X
2,3,5-Trimethynaphthalene	X			X
C2-Naphthalenes		X	X	
C3-Naphthalenes		X	X	
C4-Naphthalenes		X	X	
Acenaphthylene	X	X	X	X
Acenaphthene	X	X	X	X
Fluorene	X	X	X	X
C1-Fluorenes		X	X	
C2-Fluorenes		X	X	
C3-Fluorenes		X	X	
Phenanthrene	X	X	X	X
1-Methyl phenanthrene	X			X
Anthracene	X	X	X	X
C1-Phenanthrenes/Anthracenes		X	X	
C2-Phenanthrenes/Anthracenes		X	X	
C3-Phenanthrenes/Anthracenes		X	X	
C4-Phenanthrenes/Anthracenes		X	X	
HPAH				
Fluoranthene	X	X	X	X
Pyrene	X	X	X	X
C1-Fluoranthenes/Pyrenes		X	X	
Benz[a]anthracene	X	X	X	X
Chrysene	X	X	X	X
C1-Benz[a]anthracenes/Chrysenes		X	X	

Table F-4. (cont.)

Chemical Analyses	Surface Sediment and Sediment Cores[a,b]	Surface Sediment Associated with Pore Water Samples	Pore Water	Fish, Invertebrate Tissue, and Eelgrass
C2-Benz[a]anthracenes/Chrysenes		X	X	
C3-Benz[a]anthracenes/Chrysenes		X	X	
C4-Benz[a]anthracenes/Chrysenes		X	X	
Benzo[b]fluoranthene	X	X	X	X
Benzo[k]fluoranthene	X	X	X	X
Perylene		X	X	X[c]
Benzo[a]pyrene	X	X	X	X
Benzo[e]pyrene	X	X	X	X
Indeno-[1,2,3-cd]pyrene	X	X	X	X
Dibenz[a,h]anthracene	X	X	X	X
Benzo[ghi]perylene	X	X	X	X
Additional Aromatic Hydrocarbons				
Dibenzothiophene		X	X	
C1-Dibenzothiophenes		X	X	
C2-Dibenzothiophenes		X	X	
C3-Dibenzothiophenes		X	X	
Biphenyl	X	X	X	X
Dibenzofuran	X	X	X	X
Petroleum Hydrocarbons				
Gasoline-range organics	X			
Diesel-range organics	X			
Residual-range organics	X			
Polychlorinated Biphenyls				
Polychlorinated biphenyl congeners and homolog totals[d]	X			X
Aroclor® 1016	X	X	X	X
Aroclor® 1221	X	X	X	X
Aroclor® 1232	X	X	X	X
Aroclor® 1242	X	X	X	X
Aroclor® 1248	X	X	X	X
Aroclor® 1254	X	X	X	X
Aroclor® 1260	X	X	X	X
Aroclor® 1268	X	X	X	X
Polychlorinated Terphenyls				
Aroclor® 5032	X			
Aroclor® 5442	X			
Aroclor® 5460	X			

Note: HPAH - high-molecular-weight polycyclic aromatic hydrocarbon
LPAH - low-molecular-weight polycyclic aromatic hydrocarbon
PAH - polycyclic aromatic hydrocarbon

[a] In addition to the indicated PAHs, the 0–2 ft interval of the cores collected from Stations NA19, SW08, and SW24 were analyzed for alkylated PAHs as listed for the pore water study.

[b] The surface sediment samples collected from Stations NA04, NA11, NA22, and SW04 were also analyzed for organochlorine pesticides and organophosphorus pesticides.

[c] Only the *Macoma* tissue from the bioaccumulation study was analyzed for perylene.

[d] IUPAC congeners 18, 28, 37, 44, 49, 52, 66, 70, 74, 77, 81, 87, 99, 101, 105, 110, 114, 118, 119, 123, 126, 128, 138, 149, 151, 153, 156, 157, 158, 167, 168, 169, 170, 177, 180, 183, 187, 189, 194, 201, and 206, and total homologs for each chlorination level.

Table F-5. Chemical concentrations found in equipment blanks for sediment samples

Chemical	Method	Units	Survey:	Phase 1	Phase 2	Phase 2	Phase 2	Phase 2	Phase 2	Phase 2
			Date:	08/15/01	08/15/02	09/13/02	09/24/02	09/24/02	10/03/02	11/08/02
			Sample No:	EQBL01	EB0001	EB0002	EB0004	EB0005	EB0006	EB0007
Petroleum Hydrocarbons										
Diesel-range organics	CALUFT	µg/L		41 *J*	110 *JN*	210 *JN*	130 *JN*	120 *JN*	130 *J*	50 *U*
Residual-range organics	CALUFT	µg/L		53 *UJ*	96 *UJ*	98 *U*	100 *U*	100 *U*	85 *U*	100 *U*
Gasoline-range organics	CATPHG	µg/L			50 *U*	50 *U*	50 *U*	50 *U*	50 *U*	50 *U*
Metals										
Arsenic	6020	µg/L		0.5 *U*	0.50 *U*	0.50 *U*	0.50 *U*	0.50 *U*	0.50 *U*	0.50 *U*
Cadmium	6020	µg/L		0.05 *U*	0.050 *U*	0.050 *U*	0.050 *U*	0.050 *U*	0.050 *U*	0.050 *U*
Chromium	6020	µg/L		0.4	0.65	0.50	0.20	0.20 *U*	0.20 *U*	0.25
Copper	6020	µg/L		3.2	0.50	0.30	1.2	0.20	0.10 *U*	0.30
Lead	6020	µg/L		0.65	0.23	0.14	0.20	0.020 *U*	0.020 *U*	0.19
Mercury	7470A	µg/L		0.2 *U*	0.20 *U*	0.20 *U*	0.20 *U*	0.20 *U*	0.20 *U*	0.20 *U*
Nickel	6020	µg/L		0.35	0.30	0.20 *U*	0.50	0.20 *U*	0.20	0.20 *U*
Selenium	6020	µg/L		1 *U*	1.0 *U*	2.2	1.0 *U*	1.0 *U*	1.0 *U*	1.0 *U*
Silver	6020	µg/L		0.02 *U*	0.020 *U*	0.020 *U*	0.020 *U*	0.020 *U*	0.020 *U*	0.020 *U*
Zinc	6020	µg/L		4.9	2.7	2.1	4.0	1.2	0.50 *U*	1.3
PCB Congeners										
PCB Congener 18	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 28	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 37	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 44	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 49	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 52	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 66	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 70	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 74	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 77	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 81	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 87	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 90 and 101	1668	ng/L			0.50 *U*	0.50 *U*	0.70 *U*	0.61 *U*	1.2 *U*	0.26 *U*
PCB Congener 99	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 105	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 110	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 114	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 118	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 119	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 123	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 126	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 128	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 138	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*

Table F-5. (cont.)

Chemical	Method	Units	Survey: Date: Sample No:	Phase 1 08/15/01 EQBL01	Phase 2 08/15/02 EB0001	Phase 2 09/13/02 EB0002	Phase 2 09/24/02 EB0004	Phase 2 09/24/02 EB0005	Phase 2 10/03/02 EB0006	Phase 2 11/08/02 EB0007
PCB Congener 149	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 151	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 153	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 156	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 157	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 158	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 167	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 168	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 169	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 170	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 177	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 180	1668	ng/L			0.62 *U*	0.63 *U*	0.88 *U*	0.76 *U*	1.5 *U*	0.65 *U*
PCB Congener 183	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 187	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 189	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 194	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 201	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Congener 206	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
PCB Homologs										
Monochloro PCB homologs	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
Dichloro PCB homologs	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
Trichloro PCB homologs	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
Tetrachloro PCB homologs	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
Pentachloro PCB homologs	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
Hexachloro PCB homologs	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
Heptachloro PCB homologs	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
Octachloro PCB homologs	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
Nonachloro PCB homologs	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
Decachloro biphenyl	1668	ng/L			0.25 *U*	0.25 *U*	0.35 *U*	0.30 *U*	0.60 *U*	0.26 *U*
Polychlorinated Biphenyls										
Aroclor® 1016	8082	µg/L		0.19 *U*	0.20 *U*	0.20 *UJ*	0.22 *U*	0.20 *U*	0.20 *UJ*	0.22 *U*
Aroclor® 1221	8082	µg/L		0.38 *U*	0.40 *U*	0.40 *UJ*	0.43 *U*	0.39 *U*	0.40 *UJ*	0.43 *U*
Aroclor® 1232	8082	µg/L		0.19 *U*	0.20 *U*	0.20 *UJ*	0.22 *U*	0.20 *U*	0.20 *UJ*	0.22 *U*
Aroclor® 1242	8082	µg/L		0.19 *U*	0.20 *U*	0.20 *UJ*	0.22 *U*	0.20 *U*	0.20 *UJ*	0.22 *U*
Aroclor® 1248	8082	µg/L		0.19 *U*	0.20 *U*	0.20 *UJ*	0.22 *U*	0.20 *U*	0.20 *UJ*	0.22 *U*
Aroclor® 1254	8082	µg/L		0.19 *U*	0.20 *U*	0.20 *UJ*	0.22 *U*	0.20 *U*	0.20 *UJ*	0.22 *U*
Aroclor® 1260	8082	µg/L		0.19 *U*	0.20 *U*	0.20 *UJ*	0.22 *U*	0.20 *U*	0.20 *UJ*	0.22 *U*

Table F-5. (cont.)

Chemical	Method	Units								
			Survey:	Phase 1	Phase 2	Phase 2	Phase 2	Phase 2	Phase 2	Phase 2
			Date:	08/15/01	08/15/02	09/13/02	09/24/02	09/24/02	10/03/02	11/08/02
			Sample No:	EQBL01	EB0001	EB0002	EB0004	EB0005	EB0006	EB0007
Polychlorinated Terphenyls										
Aroclor® 5432	GC-ECD	μg/L		0.19 *U*	0.20 *UJ*	0.20 *U*	0.22 *U*	0.20 *U*	0.20 *UJ*	0.22 *U*
Aroclor® 5442	GC-ECD	μg/L		0.19 *U*	0.20 *UJ*	0.20 *U*	0.22 *U*	0.20 *U*	0.20 *UJ*	0.22 *U*
Aroclor® 5460	GC-ECD	μg/L		0.95 *U*	1.0 *UJ*	1.0 *U*	1.1 *U*	0.97 *U*	0.99 *UJ*	1.1 *U*
Polycyclic Aromatic Hydrocarbons and Alkylated Polycyclic Aromatic Hydrocarbons										
Naphthalene	8270C	μg/L		0.045	0.02 *U*	0.024	0.54	0.54	0.35 *J*	0.020 *U*
1-Methylnaphthalene	8270C	μg/L		0.02 *U*	0.02 *U*	0.021 *U*	1.3	1.3	0.79 *J*	0.020 *U*
2-Methylnaphthalene	8270C	μg/L		0.027	0.02 *U*	0.021 *U*	1.6	1.7	0.99 *J*	0.020 *U*
2,6-Dimethylnaphthalene	8270C	μg/L		0.02 *U*	0.020 *U*	0.021 *U*	1.2	1.2	0.68 *J*	
2,3,5-Trimethylnaphthalene	8270C	μg/L		0.02 *U*	0.020 *U*	0.021 *U*	0.21	0.21	0.15 *J*	
C2-Naphthalenes	8270C	μg/L			0.020	0.021 *U*	0.21	0.21	0.15 *J*	0.020 *U*
C3-Naphthalenes	8270C	μg/L			0.020 *U*	0.021 *U*	0.21	0.21	0.15 *J*	0.020 *U*
C4-Naphthalenes	8270C	μg/L			0.020 *U*	0.021 *U*	0.21	0.21	0.15 *J*	0.020 *U*
Acenaphthylene	8270C	μg/L		0.02 *U*	0.02 *U*	0.021 *U*	0.021 *U*	0.023 *U*	0.02 *UJ*	0.020 *U*
Acenaphthene	8270C	μg/L		0.02 *U*	0.02 *U*	0.021 *U*	0.12	0.12	0.081 *J*	0.020 *U*
Fluorene	8270C	μg/L		0.02 *U*	0.02 *U*	0.047 *U*	0.087	0.088	0.081 *J*	0.020 *U*
C1-Fluorenes	8270C	μg/L			0.020 *U*					0.020 *U*
C2-Fluorenes	8270C	μg/L			0.020 *U*					0.020 *U*
C3-Fluorenes	8270C	μg/L			0.020 *U*					0.020 *U*
Phenanthrene	8270C	μg/L		0.02 *U*	0.02 *U*	0.021 *U*	0.041	0.042	0.061 *J*	0.020 *U*
1-Methyl phenanthrene	8270C	μg/L		0.02 *U*	0.020 *U*	0.021 *U*	0.021 *U*	0.023 *U*	0.020 *UJ*	
Anthracene	8270C	μg/L		0.02 *U*	0.02 *U*	0.021 *U*	0.021 *U*	0.023 *U*	0.02 *UJ*	0.020 *U*
C1-Phenanthrenes/Anthracenes	8270C	μg/L			0.020 *U*					0.020 *U*
C2-Phenanthrenes/Anthracenes	8270C	μg/L			0.020 *U*					0.020 *U*
C3-Phenanthrenes/Anthracenes	8270C	μg/L			0.020 *U*					0.020 *U*
C4-Phenanthrenes/Anthracenes	8270C	μg/L			0.020 *U*					0.020 *U*
Fluoranthene	8270C	μg/L		0.02 *U*	0.02 *U*	0.021 *U*	0.021 *U*	0.023 *U*	0.02 *UJ*	0.020 *U*
Pyrene	8270C	μg/L		0.02 *U*	0.02 *U*	0.021 *U*	0.021 *U*	0.023 *U*	0.02 *UJ*	0.020 *U*
C1-Fluoranthenes/Pyrenes	8270C	μg/L			0.020 *U*					0.020 *U*
Benz[a]anthracene	8270C	μg/L		0.02 *U*	0.02 *U*	0.021 *U*	0.021 *U*	0.023 *U*	0.02 *UJ*	0.020 *U*
Chrysene	8270C	μg/L		0.02 *U*	0.02 *U*	0.021 *U*	0.021 *U*	0.023 *U*	0.02 *UJ*	0.020 *U*
C1-Benz[a]anthracenes/Chrysenes	8270C	μg/L			0.020 *U*					0.020 *U*
C2-Benz[a]anthracenes/Chrysenes	8270C	μg/L			0.020 *U*					0.020 *U*
C3-Benz[a]anthracenes/Chrysenes	8270C	μg/L			0.020 *U*					0.020 *U*
C4-Benz[a]anthracenes/Chrysenes	8270C	μg/L			0.020 *U*					0.020 *U*
Benzo[b]fluoranthene	8270C	μg/L		0.02 *U*	0.02 *U*	0.021 *U*	0.021 *U*	0.023 *U*	0.02 *UJ*	0.020 *U*
Benzo[k]fluoranthene	8270C	μg/L		0.02 *U*	0.02 *U*	0.021 *U*	0.021 *U*	0.023 *U*	0.02 *UJ*	0.020 *U*
Perylene	8270C	μg/L								0.020 *U*

Table F-5. (cont.)

Chemical	Method	Units	Survey: / Date: / Sample No:	Phase 1 08/15/01 EQBL01	Phase 2 08/15/02 EB0001	Phase 2 09/13/02 EB0002	Phase 2 09/24/02 EB0004	Phase 2 09/24/02 EB0005	Phase 2 10/03/02 EB0006	Phase 2 11/08/02 EB0007
Benzo[a]pyrene	8270C	µg/L		0.02 *U*	0.02 *U*	0.021 *U*	0.021 *U*	0.023 *U*	0.02 *UJ*	0.020 *U*
Benzo[e]pyrene	8270C	µg/L		0.02 *U*	0.02 *U*	0.021 *U*	0.021 *U*	0.023 *U*	0.02 *UJ*	0.020 *U*
Indeno[1,2,3-cd]pyrene	8270C	µg/L		0.02 *U*	0.02 *U*	0.021 *U*	0.021 *U*	0.023 *U*	0.02 *UJ*	0.020 *U*
Dibenz[a,h]anthracene	8270C	µg/L		0.02 *U*	0.02 *U*	0.021 *U*	0.021 *U*	0.023 *U*	0.02 *UJ*	0.020 *U*
Benzo[ghi]perylene	8270C	µg/L		0.02 *U*	0.02 *U*	0.021 *U*	0.021 *U*	0.023 *U*	0.02 *UJ*	0.020 *U*
Dibenzothiophene	8270C	µg/L			0.02 *U*					0.020 *U*
C1-Dibenzothiophenes	8270C	µg/L			0.020 *U*					0.0200 *U*
C2-Dibenzothiophenes	8270C	µg/L			0.020 *U*					0.0200 *U*
C3-Dibenzothiophenes	8270C	µg/L			0.020 *U*					0.0200 *U*
Biphenyl	8270C	µg/L		0.02 *U*	0.02 *U*	0.021 *U*	0.23	0.23	0.11 *J*	0.020 *U*
Dibenzofuran	8270C	µg/L		0.02 *U*	0.02 *U*	0.021 *U*	0.035	0.034	0.023 *J*	0.020 *U*
Organotins										
Dibutyltin	Krone	µg/L		0.050 *U*	0.050 *U*	0.025 *U*	0.025 *U*	0.025 *U*	0.050 *U*	0.050 *UJ*
Monobutyltin	Krone	µg/L		0.050 *U*	0.050 *U*	0.025 *U*	0.025 *U*	0.025 *U*	0.050 *U*	0.050 *UJ*
Tetrabutyltin	Krone	µg/L		0.050 *U*	0.050 *U*	0.025 *U*	0.025 *U*	0.025 *U*	0.050 *U*	0.050 *UJ*
Tributyltin	Krone	µg/L		0.020 *U*	0.020 *U*	0.010 *U*	0.010 *U*	0.010 *U*	0.020 *U*	0.020 *UJ*

Note: *J* - estimated
N - tentatively identified
PCB - polychlorinated biphenyl
PCT - polychlorinated terphenyl
U - undetected at detection limit shown

Table F-6. Results for field splits for Phase 1 surface sediment samples

		Station:	NA01			NA07			SW02		
		Date:	08/11/01			08/08/01			08/06/01		
		Depth:	0–2 cm			0–2 cm			0–2 cm		
		Field Split:	1	2		1	2		1	2	
Chemical	Units	Sample No:	SD0030	SD0031	RPD	SD0017	SD0018	RPD	SD0005	SD0006	RPD
Conventional Analytes											
Acid-volatile sulfide	mg/kg		93	89	4	110 *J*	83 *J*	28	320	140	78
Total organic carbon	%		2.10	2.15	2	1.98	2.05	3	4.27	3.89	9
pH	pH		7.10	7.49	5	7.53	7.71	2	7.43	7.38	1
Total solids	%		35.6	34.6	3	37.0	36.0	3	38.2	34.6	10
Grain-Size Determination											
Gravel (Phi Class –6 to –1)	%		0.21	0.37	55	1.0	0.34	99	5.9	4.4	29
Very coarse sand (Phi Class –1 to 0)	%		0.47	0.28	51	0.70	0.89	24	3.50	3.7	6
Coarse sand (Phi Class 0 to 1)	%		0.40	0.27	39	1.5	1.8	18	3.6	3.4	6
Medium sand (Phi Class 1 to 2)	%		0.58	0.68	16	3.5	4.7	29	6.8	7.8	14
Fine sand (Phi Class 2 to 3)	%		3.9	3.8	3	6.5	7.5	14	16.0	14	13
Very fine sand (Phi Class 3 to 4)	%		12	12	0	6.3	7.0	11	5.7	5.0	13
Silt (Phi Class 4 to 8)	%		44	41	7	45	47	4	38	38	0
Clay (Phi Class Greater Than 8)	%		37	34	8	34	32	6	22	22	0
Metals											
Arsenic	mg/kg		11	11	0	15	12	22	16	13	21
Cadmium	mg/kg		0.26	0.27	4	0.27	0.27	0	2.50	2.6	4
Chromium	mg/kg		68	69	1	61	60	2	86	89	3
Copper	mg/kg		210	220	5	210 *J*	240 *J*	13	570 *J*	530 *J*	7
Lead	mg/kg		88 *J*	90 *J*	2	90	110	20	170	210	21
Mercury (total)	mg/kg		0.95	1.1	15	1.5	1.4	7	3.9	3.1	23
Nickel	mg/kg		17	16	6	16	16	0	68	76	11
Selenium	mg/kg		1	1.1	10	0.8 *U*	1 *U*	22	0.9 *U*	0.78 *U*	11
Silver	mg/kg		1.3	1.4	7	1.1	1.2	9	2.7	2.9	7
Zinc	mg/kg		260	270	4	240 *J*	270 *J*	12	550 *J*	550 *J*	0
Simultaneously Extracted Metals											
Cadmium	mg/kg		0.1	0.1	0	0.5	0.5	0	3.1	2.5	21
Copper	mg/kg		220	210	5	260	250	4	340	380	11
Lead	mg/kg		81	77	5	91	93	2	140	140	0
Mercury (total)	mg/kg		0.17	0.18	6	0.23	0.24	4	0.02	0.04	67
Nickel	mg/kg		8.3	8.3	0	9.1 *J*	8.9 *J*	2	35.0 *J*	61 *J*	54
Zinc	mg/kg		270	270	0	300	320	6	500	540	8
Petroleum Hydrocarbons											
Diesel-range organics	mg/kg		180	200	11	220	230	4	1,100	1,200	9
Residual-range organics	mg/kg		530	580	9	680	700	3	1,800	1,800	0
Gasoline-range organics	mg/kg		15 *U*	15 *U*	0	14 *U*	14 *U*	0	13 *U*	13 *U*	0
PCBs											
Aroclor® 1016	μg/kg		28 *U*	29 *U*	4	270 *U*	270 *U*	0	480 *U*	530 *U*	10

Table F-6. (cont.)

		Station:	NA01			NA07			SW02		
		Date:	08/11/01			08/08/01			08/06/01		
		Depths:	0–2 cm			0–2 cm			0–2 cm		
		Field Split:	1	2		1	2		1	2	
Chemical	Units	Sample No:	SD0030	SD0031	RPD	SD0017	SD0018	RPD	SD0005	SD0006	RPD
Aroclor® 1221	μg/kg		56 *U*	57 *U*	2	540 *U*	530 *U*	2	960 *U*	1,100 *U*	14
Aroclor® 1232	μg/kg		28 *U*	29 *U*	4	270 *U*	270 *U*	0	480 *U*	530 *U*	10
Aroclor® 1242	μg/kg		28 *U*	29 *U*	4	270 *U*	270 *U*	0	480 *U*	530 *U*	10
Aroclor® 1248	μg/kg		28 *U*	29 *U*	4	270 *U*	570 *J*	71	480 *U*	530 *U*	10
Aroclor® 1254	μg/kg		370	360	3	490	590	19	5,500	4,700	16
Aroclor® 1260	μg/kg		260	220	17	270 *U*	270 *U*	0	1,300	1,100	17
PCTs											
Aroclor® 5432	μg/kg		56 *U*	57 *U*	2	54 *U*	53 *U*	2	960 *U*	1,100 *U*	14
Aroclor® 5442	μg/kg		56 *U*	57 *U*	2	54 *U*	53 *U*	2	960 *U*	1,100 *U*	14
Aroclor® 5460	μg/kg		640	570	12	750	500	40	13,000	7,700	51
PCB Congeners											
PCB Congener 18	ng/g		0.83	0.60	32	2.3	2.5	8	54.0	51	6
PCB Congener 28	ng/g		1.7	1.3	27	3.6	4.0	11	77.0	72	7
PCB Congener 37	ng/g		0.58	0.56	4	0.85	0.86	1	16.00	16	0
PCB Congener 44	ng/g		4.8	4.5	6	9.2	8.0	14	200.0	200	0
PCB Congener 49	ng/g		4.3	4.2	2	12	11	9	170	180	6
PCB Congener 52	ng/g		10	9.7	3	19	17	11	340	330	3
PCB Congener 66	ng/g		5.9	6.0	2	11	13	17	190	200	5
PCB Congener 70	ng/g		7.0	6.3	11	12	12	0	270	280	4
PCB Congener 74	ng/g		2.4	2.3	4	4.8	5.2	8	100.0	110	10
PCB Congener 77	ng/g		0.82	0.83	1	1.0	1.3	26	17.0	18	6
PCB Congener 81	ng/g		0.29	0.29	0	0.26	0.25	4	7.90	7.3	8
PCB Congener 87	ng/g		14	13	7	16	16	0	320	280	13
PCB Congener 90 and 101	ng/g		30	29	3	39	45	14	580	510	13
PCB Congener 99	ng/g		14	13	7	21	28	29	230	210	9
PCB Congener 105	ng/g		11	9.7	13	12	12	0	200	190	5
PCB Congener 110	ng/g		21	20	5	25	30	18	430	380	12
PCB Congener 114	ng/g		0.43	0.24	57	0.36	0.52	36	11.00	8.7	23
PCB Congener 118	ng/g		26	24	8	30	49	48	460	430	7
PCB Congener 119	ng/g		0.67	0.64	5	1.6	2.0	22	8.1	7.7	5
PCB Congener 123	ng/g		0.32	0.28	13	0.39	0.49	23	6.20	5.8	7
PCB Congener 126	ng/g		0.15	0.15	0	0.15	0.17	13	2.30	2.1	9
PCB Congener 128	ng/g		8.3	7.9	5	8.3	8.5	2	100.0	88	13
PCB Congener 138	ng/g		51	50	2	52	55	6	560	550	2
PCB Congener 149	ng/g		30	29	3	33	38	14	280	250	11
PCB Congener 151	ng/g		9.9	10.0	1	13	14	7	88	76	15
PCB Congener 153	ng/g		41	39	5	46	57	21	350	280	22

Table F-6. (cont.)

Chemical	Units	Station:	NA01			NA07			SW02		
		Date:	08/11/01			08/08/01			08/06/01		
		Depths:	0–2 cm			0–2 cm			0–2 cm		
		Field Split:	1	2		1	2		1	2	
		Sample No:	SD0030	SD0031	RPD	SD0017	SD0018	RPD	SD0005	SD0006	RPD
PCB Congener 156	ng/g		3.9	3.8	3	3.9	4.3	10	55.0	49	12
PCB Congener 157	ng/g		0.76	0.81	6	0.80	1.0	22	12.00	11	9
PCB Congener 158	ng/g		2.4	2.3	4	2.5	2.5	0	33.0	28	16
PCB Congener 167	ng/g		1.6	1.6	0	1.8	2.0	11	18.0	16	12
PCB Congener 168	ng/g		0.31	0.42	30	0.49	0.18	93	0.03 *U*	0.025 *U*	0
PCB Congener 169	ng/g		0.025 *U*	0.025 *U*	0	0.025 *U*	0.026 *U*	4	0.025 *U*	0.025 *U*	0
PCB Congener 170	ng/g		9.5	9.4	1	9.3	10	7	66.0	60	10
PCB Congener 177	ng/g		6.6	7.0	6	6.6	7.3	10	40.0	36	11
PCB Congener 180	ng/g		23	23	0	23	26	12	140	130	7
PCB Congener 183	ng/g		5.8	5.7	2	6.1	6.7	9	37.0	35	6
PCB Congener 187	ng/g		16	16	0	18	22	20	78	75	4
PCB Congener 189	ng/g		0.39	0.39	0	0.41	0.49	18	2.70	2.5	8
PCB Congener 194	ng/g		5.7	6.2	8	5.8	7.0	19	44.0	29	41
PCB Congener 201	ng/g		5.9	6.8	14	5.8	7.2	22	30.0	43	36
PCB Congener 206	ng/g		5.2	5.1	2	3.4	4.2	21	26.0	37	35
PCB Homologs											
Monochloro biphenyls	ng/g		0.20	0.25	22	0.21	0.30	35	4.30	2.6	49
Dichloro biphenyls	ng/g		1.4	1.3	7	1.6	1.6	0	22.0	17	26
Trichloro biphenyls	ng/g		7.4	5.9	23	18	19	5	370	360	3
Tetrachloro biphenyls	ng/g		49	47	4	100	100	0	1,800	1,900	5
Pentachloro biphenyls	ng/g		170	160	6	210	260	21	3,300	2,900	13
Hexachloro biphenyls	ng/g		190	180	5	210	240	13	2,000	1,800	11
Heptachloro biphenyls	ng/g		89	89	0	92	110	18	550	510	8
Octachloro biphenyls	ng/g		23	25	8	23	29	23	150	150	0
Nonachloro biphenyls	ng/g		7.1	6.8	4	4.7	5.7	19	32.0	46	36
Decachloro biphenyl	ng/g		4.7	3.5	29	2.7	3.4	23	5.0	8.0	46
PAHs											
Naphthalene	μg/kg		14 *U*	15 *U*	7	14 *U*	14 *U*	0	13	14 *U*	7
2-Methylnaphthalene	μg/kg		14 *U*	15 *U*	7	14 *U*	14 *U*	0	13	15	14
1-Methylnaphthalene	μg/kg		14 *U*	15 *U*	7	14 *U*	14 *U*	0	12 *U*	14 *U*	15
2,6-Dimethylnapthalene	μg/kg		14 *U*	15 *U*	7	14 *U*	14 *U*	0	16	18	12
Acenaphthylene	μg/kg		93	100	7	40	150	116	91	120	27
Acenaphthene	μg/kg		14 *U*	15 *U*	7	14	17	19	38	29	27
Dibenzofuran	μg/kg		14 *U*	15 *U*	7	14 *U*	14 *U*	0	23	26	12
2,3,5-Trimethylnapthalene	μg/kg		14 *U*	15 *U*	7	14 *U*	14 *U*	0	12 *U*	14 *U*	15
Fluorene	μg/kg		24	25	4	16	27	51	67	62	8
Phenanthrene	μg/kg		190	150	24	140	320	78	440	280	44
Anthracene	μg/kg		270	270	0	130	390	100	370	570	43

Table F-6. (cont.)

		Station:	NA01			NA07			SW02		
		Date:	08/11/01			08/08/01			08/06/01		
		Depths:	0–2 cm			0–2 cm			0–2 cm		
		Field Split:	1	2		1	2		1	2	
Chemical	Units	Sample No:	SD0030	SD0031	RPD	SD0017	SD0018	RPD	SD0005	SD0006	RPD
1-Methyl phenanthrene	µg/kg		27	22	20	17	61	113	47	43	9
Fluoranthene	µg/kg		570	470	19	490	4,300	159	2,100	1,200	55
Pyrene	µg/kg		550	490	12	500	4,200	157	3,300	2,500	28
Benz[a]anthracene	µg/kg		630	490	25	370	2,100	140	970	1,000	3
Chrysene	µg/kg		1,200	960	22	550	2,400	125	1,600	1,900	17
Benzo[b]fluoranthene	µg/kg		1,200	1,000	18	630	3,700	142	2,000	1,500	29
Benzo[k]fluoranthene	µg/kg		980	740	28	500	2,300	129	1,500	1,300	14
Benzo[e]pyrene	µg/kg		790	660	18	420	2,200	136	1,200	970	21
Benzo[a]pyrene	µg/kg		1,300	1,000	26	670	3,500	136	1,900	1,500	24
Indeno[1,2,3-cd]pyrene	µg/kg		960	830	15	490	2,200	127	1,100	790	33
Dibenz[a,h]anthracene	µg/kg		190	160	17	110	510	129	260	210	21
Benzo[ghi]perylene	µg/kg		700	630	11	370	1,600	125	800	580	32
Biphenyl	µg/kg		14 *U*	15 *U*	7	14 *U*	14 *U*	0	12 *U*	14 *U*	15
Organotins											
Tetrabutyltin	µg/kg		7.2	6.3	13	2.7 *U*	2.7 *U*	0	5.1	5.6	9
Tributyltin	µg/kg		210	220	5	130	91	35	220	310	34
Dibutyltin	µg/kg		210	200	5	84	77	9	170	180	6
Monobutyltin	µg/kg		29	21	32	16	20	22	16	32	67

Note: Total solids represent dry weight as a percentage of whole weight. pH is measured in the whole sample. All other results are provided on a dry weight basis.

PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl
PCT - polychlorinated terphenyl
RPD - relative percent difference
U - undetected at the detection limit shown

Table F-7. Results for field splits for general sediment samples

		Station:	2244			NA01			NA16		
		Date:	09/12/02			09/18/02			09/04/02		
		Depth:	0–2 cm			2–4 ft			2–4 ft		
		Field Split:	1	2		1	2		1	2	
Chemical	Units	Sample No:	SD0126	SD0127	RPD	SD0142	SD0146	RPD	SD0076	SD0078	RPD
Conventional Analytes											
Total solids	%		64.3	64.5	0	43.0	43.7	2	48.5	47.7	2
Total organic carbon	%		0.55	0.51	8	3.41	3.66	7	2.76	2.97	7
Grain-Size Determination											
Gravel (Phi Class –6 to –1)	%		0.22	0.13	51	0	0.07	200	15	0.10	197
Very coarse sand (Phi Class –1 to 0)	%		0.40	0.29	32	0.14	0.13	7	5.8	0.51	168
Coarse sand (Phi Class 0 to 1)	%		0.73	0.25	98	0.15	0.15	0	5.8	0.63	161
Medium sand (Phi Class 1 to 2)	%		4.5	2.8	47	0.63	0.52	19	7.1	0.84	158
Fine sand (Phi Class 2 to 3)	%		28	23	20	2.1	2.0	5	8.6	1.8	131
Very fine sand (Phi Class 3 to 4)	%		34	41	19	4.5	4.9	9	12	5.5	74
Silt (Phi Class 4 to 8)	%		27	18	40	43	43	0	38	41	8
Clay (Phi Class Greater Than 8)	%		4.3	14	106	47	47	0	6.7	52	154
Petroleum Hydrocarbons											
Gasoline-range organics	mg/kg		6.9 *U*	7.6 *U*	10	12 *U*	12 *U*	0	10 *U*	11 *U*	10
Diesel-range organics	mg/kg		77 *U*	74 *U*	4	3,300 *JN*	3,600 *JN*	9	4,800 *JN*	11,000 *JN*	78
Residual-range organics	mg/kg		310 *U*	300 *U*	3	4,600 *JN*	4,900 *JN*	6	5,300 *JN*	10,000 *JN*	61
Metals											
Arsenic	mg/kg		3.8	4.1	8	8.2	8.9	8	9.3	10	7
Cadmium	mg/kg		0.12	0.12	0	4.5	4.8	6	3.5	4.0	13
Chromium	mg/kg		23	23	0	130	130	0	84 *J*	90 *J*	7
Chromium, hexavalent	mg/kg										
Copper	mg/kg		58	59	2	210	220	5	140	160	13
Lead	mg/kg		18	19	5	100	99	1	91	110	19
Mercury	mg/kg		0.20	0.24	18	2.4	2.7	12	3.7	4.2	13
Nickel	mg/kg		4.9	5.6	13	22	25	13	20	20	0
Selenium	mg/kg		0.60 *U*	1.1 *U*	59	1.1 *U*	1.1 *U*	0	1.5 *U*	1.5 *U*	0
Silver	mg/kg		0.50	0.53	6	5.7	5.9	3	2.8	3.3	16
Zinc	mg/kg		110	110	0	410	450	9	350	420	18
Organotins											
Monobutyltin	µg/kg		1.6 *UJ*	3.4 *J*	72	4.7	4.7	0	2.0 *U*	2.1 *U*	5
Dibutyltin	µg/kg		5.0 *J*	8.6 *J*	53	2.4 *U*	4.0	50	2.0 *U*	2.1 *U*	5
Tributyltin	µg/kg		2.6 *J*	3.5 *J*	30	2.4 *U*	2.4 *U*	0	2.0 *U*	2.1 *U*	5
Tetrabutyltin	µg/kg		1.6 *U*	1.6 *U*	0	2.4 *U*	2.4 *U*	0	2.0 *U*	2.1 *U*	5
PCB Congeners											
PCB Congener 18	ng/g		0.092	0.035	90	11	11	0	19	8.9	72
PCB Congener 28	ng/g		0.19	0.16	17	23	23	0	33	16	69
PCB Congener 37	ng/g		0.096	0.089	8	6.1	6.3	3	7.6	3.5	74
PCB Congener 44	ng/g		0.23	0.14	49	35	34	3	21	23	9
PCB Congener 49	ng/g		0.33	0.27	20	32	32	0	18	8.7	70
PCB Congener 52	ng/g		0.52	0.31	51	50	51	2	84	38	75
PCB Congener 66	ng/g		0.58	0.52	11	51	51	0	74	32	79
PCB Congener 70	ng/g		0.39	0.25	44	65	64	2	94	40	81
PCB Congener 74	ng/g		0.18	0.13	32	29	29	0	42	18	80
PCB Congener 77	ng/g		0.063	0.052	19	4.9	4.8	2	4.7	2.1	76

Table F-7. (cont.)

Chemical	Units	Station:	2244			NA01			NA16		
		Date:	09/12/02			09/18/02			09/04/02		
		Depth:	0–2 cm			2–4 ft			2–4 ft		
		Field Split:	1	2		1	2		1	2	
		Sample No:	SD0126	SD0127	RPD	SD0142	SD0146	RPD	SD0076	SD0078	RPD
PCB Congener 81	ng/g		0.024 *U*	0.025 *U*	4	0.94	1.1	16	1.9	0.57	108
PCB Congener 87	ng/g		0.53	0.33	47	39	38	3	64	26	84
PCB Congener 90 and 101	ng/g		1.9	1.5	24	92	90	2	140	58	83
PCB Congener 99	ng/g		1.3	1.2	8	37	36	3	58	26	76
PCB Congener 105	ng/g		0.53	0.40	28	32	31	3	52	22	81
PCB Congener 110	ng/g		1.1	0.80	32	59	58	2	100	42	82
PCB Congener 114	ng/g		0.024 *U*	0.025 *U*	4	1.6	1.5	6	1.6	0.64	86
PCB Congener 118	ng/g		1.7	1.4	19	74	69	7	110	46	82
PCB Congener 119	ng/g		0.070	0.063	11	1.2	1.1	9	2.1	1.0	71
PCB Congener 123	ng/g		0.074	0.066	11	1.2	2.8	80	1.5	0.60	86
PCB Congener 126	ng/g		0.024 *U*	0.025 *U*	4	0.25 *U*	0.25 *U*	0	0.58	0.25 *U*	80
PCB Congener 128	ng/g		0.58	0.50	15	15	15	0	25	9.2	92
PCB Congener 138	ng/g		3.6	3.6	0	110	100	10	150	57	90
PCB Congener 149	ng/g		1.8	1.9	5	72	69	4	83	33	86
PCB Congener 151	ng/g		0.50	0.54	8	21	20	5	22	8.2	91
PCB Congener 153	ng/g		3.4	3.4	0	85	81	5	110	43	88
PCB Congener 156	ng/g		0.18	0.15	18	7.4	7.8	5	13	4.7	94
PCB Congener 157	ng/g		0.053	0.043	21	1.5	1.6	6	2.8	0.98	96
PCB Congener 158	ng/g		0.21	0.19	10	10	10	0	15	5.9	87
PCB Congener 167	ng/g		0.12	0.11	9	2.8	2.7	4	4.6	1.7	92
PCB Congener 168	ng/g		0.024 *U*	0.025 *U*	4	0.63	0.58	8	0.50	0.26	63
PCB Congener 169	ng/g		0.024 *U*	0.025 *U*	4	0.25 *U*	0.25 *U*	0	0.25 *U*	0.25 *U*	0
PCB Congener 170	ng/g		0.52	0.61	16	26	24	8	26	9.7	91
PCB Congener 177	ng/g		0.64	0.71	10	19	18	5	18	6.5	94
PCB Congener 180	ng/g		1.1	1.3	17	64	58	10	57	23	85
PCB Congener 183	ng/g		0.34	0.40	16	18	16	12	16	6.8	81
PCB Congener 187	ng/g		1.4	1.6	13	42	38	10	37	16	79
PCB Congener 189	ng/g		0.029	0.030	3	0.99	0.88	12	1.1	0.38	97
PCB Congener 194	ng/g		0.40	0.46	14	16	14	13	14	6.0	80
PCB Congener 201	ng/g		0.081	0.093	14	2.2	2.0	10	2.0	1.2	50
PCB Congener 206	ng/g		0.32	0.36	12	7.8	7.7	1	6.8	21	102
PCB Homologs											
Monochloro PCB homologs	ng/g		0.027	0.025 *U*	8	0.25 *U*	0.25 *U*	0	0.25 *U*	0.25 *U*	0
Dichloro PCB homologs	ng/g		0.18	0.15	18	1.7	2.1	21	5.9	1.0	142
Trichloro PCB homologs	ng/g		0.79	0.53	39	97	95	2	140	64	75
Tetrachloro PCB homologs	ng/g		3.1	2.3	30	390	390	0	580	250	80
Pentachloro PCB homologs	ng/g		9.7	7.7	23	470	450	4	750	310	83
Hexachloro PCB homologs	ng/g		13	13	0	420	400	5	560	210	91
Heptachloro PCB homologs	ng/g		5.7	6.7	16	250	230	8	230	92	86
Octachloro PCB homologs	ng/g		1.5	1.7	13	54	48	12	47	24	65
Nonachloro PCB homologs	ng/g		0.56	0.64	13	13	12	8	12	35	98
Decachloro biphenyl	ng/g		0.47	0.47	0	11	9.2	18	7.1	33	129
PCB Aroclors											
Aroclor® 1016	µg/kg		8.1 *U*	16 *U*	66	240 *U*	240 *U*	0	210 *U*	210 *U*	0

Table F-7. (cont.)

Chemical	Units	Station:	2244			NA01			NA16		
		Date:	09/12/02			09/18/02			09/04/02		
		Depth:	0–2 cm			2–4 ft			2–4 ft		
		Field Split:	1	2		1	2		1	2	
		Sample No:	SD0126	SD0127	RPD	SD0142	SD0146	RPD	SD0076	SD0078	RPD
Aroclor® 1221	µg/kg		17 *U*	32 *U*	61	470 *U*	470 *U*	0	410 *U*	420 *U*	2
Aroclor® 1232	µg/kg		8.1 *U*	16 *U*	66	240 *U*	240 *U*	0	210 *U*	210 *U*	0
Aroclor® 1242	µg/kg		8.1 *U*	16 *U*	66	240 *U*	240 *U*	0	210 *U*	210 *U*	0
Aroclor® 1248	µg/kg		8.1 *U*	16 *U*	66	240 *U*	240 *U*	0	660 *J*	1,300 *J*	65
Aroclor® 1254	µg/kg		23	21	9	1,600 *J*	1,800 *J*	12	1,400 *J*	2,300 *J*	49
Aroclor® 1260	µg/kg		30	29	3	1,200 *J*	1,300 *J*	8	700 *J*	1,200 *J*	53
PCT Aroclors											
Aroclor® 5432	µg/kg		17 *U*	16 *U*	6	240 *U*	240 *U*	0	210 *U*	210 *U*	0
Aroclor® 5442	µg/kg		17 *U*	16 *U*	6	240 *U*	240 *U*	0	210 *U*	210 *U*	0
Aroclor® 5460	µg/kg		81 *U*	78 *U*	4	1,700 *J*	1,500 *J*	13	1,500 *J*	6,300 *J*	123
Polycyclic Aromatic Hydrocarbons											
Naphthalene	µg/kg		8.1 *U*	7.8 *U*	4	20	25	22	13	17	27
1-Methylnaphthalene	µg/kg		8.1 *U*	7.8 *U*	4	12 *U*	12 *U*	0	11 *U*	11 *U*	0
2-Methylnaphthalene	µg/kg		8.1 *U*	7.8 *U*	4	12 *U*	15	22	11 *U*	11 *U*	0
2,6-Dimethylnaphthalene	µg/kg		8.1 *U*	7.8 *U*	4	31	49	45	11 *U*	14	24
2,3,5-Trimethylnaphthalene	µg/kg		8.1 *U*	7.8 *U*	4	17	32	61	37	58	44
Acenaphthylene	µg/kg		8.1 *U*	7.8 *U*	4	56	68	19	25	29	15
Acenaphthene	µg/kg		8.1 *U*	7.8 *U*	4	37	73	65	19	26	31
Fluorene	µg/kg		8.1 *U*	7.8 *U*	4	44	140	104	11 *U*	12	9
Phenanthrene	µg/kg		8.1 *U*	7.8 *U*	4	290	930	105	92	110	18
1-Methyl phenanthrene	µg/kg		8.1 *U*	7.8 *U*	4	34	66	64	57	93	48
Anthracene	µg/kg		8.1 *U*	7.8 *U*	4	200	500	86	120	170	34
Fluoranthene	µg/kg		21	11	63	710	1,300	59	770	1,100	35
Pyrene	µg/kg		23	14	49	1,900	2,300	19	1,200	1,600	29
Benz[a]anthracene	µg/kg		10	7.8 *U*	25	530	700	28	410	570	33
Chrysene	µg/kg		16	11	37	510	680	29	410	580	34
Benzo[b]fluoranthene	µg/kg		26	16	48	700	810	15	460	590	25
Benzo[k]fluoranthene	µg/kg		21	13	47	550	670	20	330	420	24
Benzo[a]pyrene	µg/kg		22	15	38	1,000	1,200	18	640	810	23
Benzo[e]pyrene	µg/kg		21	14	40	660	770	15	390	500	25
Indeno[1,2,3-cd]pyrene	µg/kg		22	15	38	620	710	14	400	470	16
Dibenz[a,h]anthracene	µg/kg		8.1 *U*	7.8 *U*	4	89	110	21	55	74	29
Benzo[ghi]perylene	µg/kg		22	14	44	600	650	8	380	450	17
Biphenyl	µg/kg		8.1 *U*	7.8 *U*	4	12 *U*	12 *U*	0	11 *U*	11 *U*	0
Dibenzofuran	µg/kg		8.1 *U*	7.8 *U*	4	12 *U*	22	59	11 *U*	11 *U*	0

Table F-7. (cont.)

Chemical	Units	Station:	NA20			NA29			SW08		
		Date:	09/04/02			09/21/02			08/28/02		
		Depth:	4–6 ft			24–53 in			0–2 ft		
		Field Split:	1	2		1	2		1	2	
Chemical	Units	**Sample No:**	SD0072	SD0074	RPD	SD0163	SD0164	RPD	SD0033	SD0040	RPD
Conventional Analytes											
Total solids	%		61.6	60.1	2	82.8	82.6	0	56.0	55.5	1
Total organic carbon	%		1.26	1.28	2	0.14	0.070	67	1.66	1.32	23
Grain-Size Determination											
Gravel (Phi Class –6 to –1)	%		0.22	0.37	51	1.7	2.2	26	0.29	0.45	43
Very coarse sand (Phi Class –1 to 0)	%		0.45	0.80	56	1.4	1.2	15	0.81	1.0	21
Coarse sand (Phi Class 0 to 1)	%		1.1	1.4	24	2.6	2.5	4	2.3	3.0	26
Medium sand (Phi Class 1 to 2)	%		3.8	4.0	5	26	25	4	9.6	10	4
Fine sand (Phi Class 2 to 3)	%		15	15	0	51	45	13	20	19	5
Very fine sand (Phi Class 3 to 4)	%		15	14	7	7.5	10	29	16	14	13
Silt (Phi Class 4 to 8)	%		35	35	0	4.7	8.0	52	33	37	11
Clay (Phi Class Greater Than 8)	%		28	29	4	4.5	5.9	27	20	18	11
Petroleum Hydrocarbons											
Gasoline-range organics	mg/kg		7.9 *U*	8.2 *U*	4	6.0 *U*	6.0 *U*	0	9.6 *U*	9.4 *U*	2
Diesel-range organics	mg/kg		390 *JN*	400 *JN*	3	31 *U*	31 *U*	0	970 *JN*	910 *JN*	6
Residual-range organics	mg/kg		1,100 *JN*	1,200 *JN*	9	130 *U*	130 *U*	0	1,500 *JN*	1,500 *JN*	0
Metals											
Arsenic	mg/kg		7.3	7.8	7	1.8	1.9	5	27	22	20
Cadmium	mg/kg		1.0	1.1	10	0.06 *U*	0.06 *U*	0	1.1	1.0	10
Chromium	mg/kg		31 *J*	32 *J*	3	6.8	8.7	25	110	86	24
Chromium, hexavalent	mg/kg										
Copper	mg/kg		92	88	4	2.4	3.2	29	1,500	1,400	7
Lead	mg/kg		93	100	7	1.2	1.5	22	340	370	8
Mercury (total)	mg/kg		0.44	0.49	11	0.02 *U*	0.02 *U*	0	5.0	4.6	8
Nickel	mg/kg		11	11	0	3.1	3.9 *J*	23	17	13	27
Selenium	mg/kg		1.4 *U*	1.4 *U*	0	1.2 *U*	1.2 *U*	0	1.6 *U*	1.1	37
Silver	mg/kg		0.94	0.95	1	0.02 *U*	0.02 *U*	0	1.0	0.96	4
Zinc	mg/kg		220	220	0	10	12	18	1,400	1,100	24
Organotins											
Monobutyltin	μg/kg		3.3	8.4	87	1.3 *U*	1.2 *U*	8	190 *U*	250	27
Dibutyltin	μg/kg		43	68	45	1.3 *U*	1.2 *U*	8	2,300	2,300	0
Tributyltin	μg/kg		41	77	61	1.3 *U*	1.2 *U*	8	6,900	7,000	1
Tetrabutyltin	μg/kg		1.7 *U*	1.7 *U*	0	1.3 *U*	1.2 *U*	8	190 *U*	190 *U*	0
PCB Congeners											
PCB Congener 18	ng/g		1.8	1.9	5	0.025 *U*	0.025 *U*	0	210	190	10
PCB Congener 28	ng/g		3.6	3.3	9	0.025 *U*	0.029	15	300	320	6
PCB Congener 37	ng/g		1.1	1.2	9	0.025 *U*	0.025 *U*	0	36	37	3
PCB Congener 44	ng/g		5.5	2.0	93	0.025 *U*	0.066	90	190	220	15
PCB Congener 49	ng/g		1.9	1.8	5	0.025 *U*	0.065	89	320	370	14
PCB Congener 52	ng/g		8.9	8.0	11	0.030	0.12	120	360	410	13
PCB Congener 66	ng/g		6.8	6.6	3	0.039	0.11	95	410	450	9
PCB Congener 70	ng/g		7.7	7.4	4	0.025	0.10	120	430	470	9
PCB Congener 74	ng/g		3.5	3.4	3	0.025 *U*	0.047	61	170	180	6
PCB Congener 77	ng/g		0.68	0.69	1	0.025 *U*	0.025 *U*	0	27	29	7

Table F-7. (cont.)

Chemical	Units	Station:	NA20			NA29			SW08		
		Date:	09/04/02			09/21/02			08/28/02		
		Depth:	4–6 ft			24–53 in			0–2 ft		
		Field Split:	1	2		1	2		1	2	
		Sample No:	SD0072	SD0074	RPD	SD0163	SD0164	RPD	SD0033	SD0040	RPD
PCB Congener 81	ng/g		0.23	0.26	12	0.025 *U*	0.025 *U*	0	3.3	2.8	16
PCB Congener 87	ng/g		10.0	11	10	0.050	0.23	129	210	230	9
PCB Congener 90 and 101	ng/g		25	27	8	0.12	0.49	121	610	670	9
PCB Congener 99	ng/g		9.2	9.7	5	0.059	0.20	109	350	380	8
PCB Congener 105	ng/g		7.2	7.9	9	0.043	0.19	126	130	130	0
PCB Congener 110	ng/g		16	17	6	0.080	0.36	127	270	290	7
PCB Congener 114	ng/g		0.36	0.22	48	0.025 *U*	0.025 *U*	0	8.0	9.3	15
PCB Congener 118	ng/g		18	20	11	0.093	0.43	129	490	540	10
PCB Congener 119	ng/g		0.35	0.40	13	0.025 *U*	0.025 *U*	0	26	29	11
PCB Congener 123	ng/g		0.35	0.41	16	0.025 *U*	0.025 *U*	0	7.1	8.6	19
PCB Congener 126	ng/g		0.14	0.15	7	0.025 *U*	0.025 *U*	0	1.1	1.0	10
PCB Congener 128	ng/g		4.8	5.3	10	0.025 *U*	0.13	135	73	85	15
PCB Congener 138	ng/g		40	41	2	0.18	0.70	118	390	490	23
PCB Congener 149	ng/g		24	26	8	0.11	0.38	110	1.6	260	198
PCB Congener 151	ng/g		7.7	8.6	11	0.032	0.099	102	70	79	12
PCB Congener 153	ng/g		30	32	6	0.15	0.49	106	270	330	20
PCB Congener 156	ng/g		2.6	2.9	11	0.025 *U*	0.069	94	40	47	16
PCB Congener 157	ng/g		0.46	0.55	18	0.025 *U*	0.025 *U*	0	8.8	11	22
PCB Congener 158	ng/g		3.6	3.6	0	0.025 *U*	0.074	99	44	52	17
PCB Congener 167	ng/g		1.0	1.2	18	0.025 *U*	0.025 *U*	0	15	18	18
PCB Congener 168	ng/g		0.14	0.12	15	0.025 *U*	0.025 *U*	0	1.1	0.81	30
PCB Congener 169	ng/g		0.025 *U*	0.025 *U*	0	0.025 *U*	0.025 *U*	0	0.025 *U*	0.024 *U*	4
PCB Congener 170	ng/g		9.2	10	8	0.037	0.13	111	55	63	14
PCB Congener 177	ng/g		7.3	8.0	9	0.025 *U*	0.080	105	32	37	14
PCB Congener 180	ng/g		22	24	9	0.088	0.27	102	110	120	9
PCB Congener 183	ng/g		6.2	6.9	11	0.025 *U*	0.070	95	27	32	17
PCB Congener 187	ng/g		15	16	6	0.057	0.17	100	61	72	17
PCB Congener 189	ng/g		0.35	0.37	6	0.025 *U*	0.025 *U*	0	2.3	2.6	12
PCB Congener 194	ng/g		5.0	5.5	10	0.025 *U*	0.073	98	24	25	4
PCB Congener 201	ng/g		0.77	0.85	10	0.025 *U*	0.025 *U*	0	3.7	4.1	10
PCB Congener 206	ng/g		2.9	5.5	62	0.025 *U*	0.056	77	16	20	22
PCB Homologs											
Monochloro PCB homologs	ng/g		0.15	0.22	38	0.025 *U*	0.025 *U*	0	21	24	13
Dichloro PCB homologs	ng/g		1.9	2.5	27	0.025 *U*	0.025 *U*	0	110	110	0
Trichloro PCB homologs	ng/g		14	15	7	0.025 *U*	0.029	15	1,500	1,500	0
Tetrachloro PCB homologs	ng/g		55	52	6	0.094	0.63	148	2,900	3,300	13
Pentachloro PCB homologs	ng/g		120	130	8	0.56	2.5	127	2,900	3,200	10
Hexachloro PCB homologs	ng/g		150	160	6	0.50	2.4	131	1,500	1,800	18
Heptachloro PCB homologs	ng/g		92	100	8	0.21	0.95	128	420	490	15
Octachloro PCB homologs	ng/g		17	19	11	0.025 *U*	0.22	159	91	100	9
Nonachloro PCB homologs	ng/g		4.6	9.5	70	0.025 *U*	0.056	77	25	32	25
Decachloro biphenyl	ng/g		2.5	9.1	114	0.025 *U*	0.036	36	3.3	4.4	29
PCB Aroclors											
Aroclor® 1016	µg/kg		17 *U*	17 *U*	0	13 *U*	13 *U*	0	1,900 *U*	950 *U*	67

Table F-7. (cont.)

Chemical	Units	Station:	NA20			NA29			SW08		
		Date:	09/04/02			09/21/02			08/28/02		
		Depth:	4–6 ft			24–53 in			0–2 ft		
		Field Split:	1	2		1	2		1	2	
		Sample No:	SD0072	SD0074	RPD	SD0163	SD0164	RPD	SD0033	SD0040	RPD
Aroclor® 1221	μg/kg		33 *U*	34 *U*	3	25 *U*	25 *U*	0	3,800 *U*	1,900 *U*	67
Aroclor® 1232	μg/kg		17 *U*	17 *U*	0	13 *U*	13 *U*	0	1,900 *U*	950 *U*	67
Aroclor® 1242	μg/kg		17 *U*	17 *U*	0	13 *U*	13 *U*	0	1,900 *U*	950 *U*	67
Aroclor® 1248	μg/kg		190	160	17	13 *U*	13 *U*	0	9,300	12,000	25
Aroclor® 1254	μg/kg		260	290	11	13 *U*	13 *U*	0	7,000	8,700	22
Aroclor® 1260	μg/kg		330	350	6	13 *U*	13 *U*	0	4,100	4,400	7
PCT Aroclors											
Aroclor® 5432	μg/kg		17 *U*	17 *U*	0	13 *U*	13 *U*	0	1,900 *U*	1,900 *U*	0
Aroclor® 5442	μg/kg		17 *U*	17 *U*	0	13 *U*	13 *U*	0	1,900 *U*	1,900 *U*	0
Aroclor® 5460	μg/kg		260	200	26	61 *U*	61 *U*	0	19,000	35,000	59
Polycyclic Aromatic Hydrocarbons											
Naphthalene	μg/kg		8.8	8.3 *U*	6	6.1 *U*	6.1 *U*	0	19	30	45
1-Methylnaphthalene	μg/kg		8.2 *U*	8.3 *U*	1	6.1 *U*	6.1 *U*	0	15	20	29
2-Methylnaphthalene	μg/kg		8.2 *U*	8.3 *U*	1	6.1 *U*	6.1 *U*	0	18	24	29
2,6-Dimethylnaphthalene	μg/kg		8.2 *U*	8.3 *U*	1	6.1 *U*	6.1 *U*	0	16	19	17
2,3,5-Trimethylnaphthalene	μg/kg		8.2 *U*	8.3 *U*	1	6.1 *U*	6.1 *U*	0	11	15	31
Acenaphthylene	μg/kg		13	14	7	6.1 *U*	6.1 *U*	0	100	110	10
Acenaphthene	μg/kg		8.4	8.3 *U*	1	6.1 *U*	6.1 *U*	0	54	71	27
Fluorene	μg/kg		15	8.3 *U*	58	6.1 *U*	6.1 *U*	0	77	91	17
Phenanthrene	μg/kg		100	53	61	6.1 *U*	6.1 *U*	0	490	550	12
1-Methyl phenanthrene	μg/kg		11	8.3 *U*	28	6.1 *U*	6.1 *U*	0	59	77	26
Anthracene	μg/kg		36	40	11	6.1 *U*	6.1 *U*	0	360	350	3
Fluoranthene	μg/kg		240	160	40	6.1 *U*	6.1 *U*	0	1,000	1,100	10
Pyrene	μg/kg		440	360	20	6.1 *U*	6.1 *U*	0	6,000	6,200	3
Benz[a]anthracene	μg/kg		130	170	27	6.1 *U*	6.1 *U*	0	770	730	5
Chrysene	μg/kg		160	250	44	6.1 *U*	6.1 *U*	0	1,200	1,200	0
Benzo[b]fluoranthene	μg/kg		370	1,300	111	6.1 *U*	6.1 *U*	0	2,900	2,700	7
Benzo[k]fluoranthene	μg/kg		270	570	71	6.1 *U*	6.1 *U*	0	2,600	2,600	0
Benzo[a]pyrene	μg/kg		390	830	72	6.1 *U*	6.1 *U*	0	2,600	2,600	0
Benzo[e]pyrene	μg/kg		250	670	91	6.1 *U*	6.1 *U*	0	2,000	1,800	11
Indeno[1,2,3-cd]pyrene	μg/kg		230	340	39	6.1 *U*	6.1 *U*	0	1,400	1,300	7
Dibenz[a,h]anthracene	μg/kg		44	95	73	6.1 *U*	6.1 *U*	0	310	290	7
Benzo[ghi]perylene	μg/kg		200	270	30	6.1 *U*	6.1 *U*	0	970	940	3
Biphenyl	μg/kg		8.2 *U*	8.3 *U*	1	6.1 *U*	6.1 *U*	0	9.5 *U*	11	15
Dibenzofuran	μg/kg		8.2 *U*	8.3 *U*	1	6.1 *U*	6.1 *U*	0	38	46	19

Table F-7. (cont.)

Chemical	Units	Station:	SW27			SW34		
		Date:	08/14/02			08/29/02		
		Depth:	0–2 ft			0–2 ft		
		Field Split:	1	2		1	2	
		Sample No:	SD0014	SD0016	RPD	SD0052	SD0054	RPD
Conventional Analytes								
Total solids	%		55.5	51.5	7	66.8	60.9	9
Total organic carbon	%		1.3	1.31	1	0.73	0.73	0
Grain-Size Determination								
Gravel (Phi Class –6 to –1)	%		4.8	4.5	6	30	28	7
Very coarse sand (Phi Class –1 to 0)	%		4.1	5.4	27	11	12	9
Coarse sand (Phi Class 0 to 1)	%		7.6	9.2	19	9.8	9.2	6
Medium sand (Phi Class 1 to 2)	%		11	12	9	9.1	9.1	0
Fine sand (Phi Class 2 to 3)	%		15	15	0	12	12	0
Very fine sand (Phi Class 3 to 4)	%		11	11	0	7.5	7.9	5
Silt (Phi Class 4 to 8)	%		23	21	9	15	18	18
Clay (Phi Class Greater Than 8)	%		24	23	4	8.7	5.7	42
Petroleum Hydrocarbons								
Gasoline-range organics	mg/kg		8.8 *U*	8.8 *U*	0	7.6 *U*	7.8 *U*	3
Diesel-range organics	mg/kg		630 *JN*	520 *JN*	19	81 *JN*	83 *JN*	2
Residual-range organics	mg/kg		1,400 *JN*	1,100 *JN*	24	300 *U*	290 *U*	3
Metals								
Arsenic	mg/kg		11	9.2	18	5.7	5.2	9
Cadmium	mg/kg		0.93	0.69	30	0.25	0.18	33
Chromium	mg/kg		46	46	0	20	21	5
Chromium, hexavalent	mg/kg							
Copper	mg/kg		250	240	4	59	70	17
Lead	mg/kg		68	62	9	28	31	10
Mercury (total)	mg/kg		0.79	1.4	56	0.47	0.33	35
Nickel	mg/kg		14	12	15	5.7	6.1	7
Selenium	mg/kg		1.5 *U*	1.5 *U*	0	1.0	0.90 *U*	11
Silver	mg/kg		1.4	1.1	24	0.57	0.54	5
Zinc	mg/kg		450	220	69	94	110	16
Organotins								
Monobutyltin	µg/kg		47	120	87	11	10	10
Dibutyltin	µg/kg		380	420	10	30	30	0
Tributyltin	µg/kg		1,400	2,100	40	30	26	14
Tetrabutyltin	µg/kg		1.8 *U*	50	186	1.6 *U*	1.6 *U*	0
PCB Congeners								
PCB Congener 18	ng/g		1.5	1.9	24	0.29	0.23	23
PCB Congener 28	ng/g		2.4	3.4	34	0.62	0.53	16
PCB Congener 37	ng/g		0.41	0.49	18	0.19	0.19	0
PCB Congener 44	ng/g		4.1	5.1	22	0.99	1.1	11
PCB Congener 49	ng/g		4.8	5.9	21	1.2	1.2	0
PCB Congener 52	ng/g		8.2	10	20	1.7	2.3	30
PCB Congener 66	ng/g		5.9	7.3	21	2.0	2.0	0
PCB Congener 70	ng/g		6.4	8.2	25	1.5	1.8	18
PCB Congener 74	ng/g		2.6	3.3	24	0.75	0.77	3
PCB Congener 77	ng/g		0.60	0.75	22	0.17	0.18	6

Table F-7. (cont.)

Chemical	Units	Station:	SW27			SW34		
		Date:	08/14/02			08/29/02		
		Depth:	0–2 ft			0–2 ft		
		Field Split:	1	2		1	2	
		Sample No:	SD0014	SD0016	RPD	SD0052	SD0054	RPD
PCB Congener 81	ng/g		0.22	0.27	20	0.060	0.061	2
PCB Congener 87	ng/g		9.0	12	29	2.7	2.7	0
PCB Congener 90 and 101	ng/g		25	33	28	7.1	7.5	5
PCB Congener 99	ng/g		11	15	31	3.8	3.9	3
PCB Congener 105	ng/g		7.2	8.8	20	2.5	2.3	8
PCB Congener 110	ng/g		17	20	16	5.0	4.8	4
PCB Congener 114	ng/g		0.29	0.33	13	0.075	0.052	36
PCB Congener 118	ng/g		18	23	24	6.6	6.2	6
PCB Congener 119	ng/g		0.71	0.97	31	0.20	0.22	10
PCB Congener 123	ng/g		0.29	0.36	22	0.12	0.12	0
PCB Congener 126	ng/g		0.096	0.12	22	0.027	0.042	43
PCB Congener 128	ng/g		4.9	6.1	22	2.2	2.0	10
PCB Congener 138	ng/g		37	47	24	14	12	15
PCB Congener 149	ng/g		23	24	4	8.1	7.2	12
PCB Congener 151	ng/g		7.2	7.5	4	2.4	2.1	13
PCB Congener 153	ng/g		31	39	23	12	10	18
PCB Congener 156	ng/g		2.4	3.1	25	0.96	0.80	18
PCB Congener 157	ng/g		0.49	0.63	25	0.20	0.18	11
PCB Congener 158	ng/g		3.0	3.7	21	1.1	0.91	19
PCB Congener 167	ng/g		1.1	1.4	24	0.43	0.39	10
PCB Congener 168	ng/g		0.050	0.054	8	0.065	0.037	55
PCB Congener 169	ng/g		0.025 *U*	0.026 *U*	4	0.025 *U*	0.025 *U*	0
PCB Congener 170	ng/g		2.1	9.9	130	2.8	2.3	20
PCB Congener 177	ng/g		5.9	7.4	23	2.2	1.8	20
PCB Congener 180	ng/g		19	24	23	6.9	5.1	30
PCB Congener 183	ng/g		4.9	6.2	23	1.8	1.3	32
PCB Congener 187	ng/g		14	17	19	5.7	4.1	33
PCB Congener 189	ng/g		0.32	0.34	6	0.099	0.093	6
PCB Congener 194	ng/g		4.6	5.3	14	2.0	1.3	42
PCB Congener 201	ng/g		4.7	5.3	12	0.35	0.21	50
PCB Congener 206	ng/g		3.1	3.4	9	1.4	1.0	33
PCB Homologs								
Monochloro PCB homologs	ng/g		0.14	0.22	44	0.026	0.12	129
Dichloro PCB homologs	ng/g		1.6	1.9	17	0.46	0.60	26
Trichloro PCB homologs	ng/g		13	15	14	2.6	2.3	12
Tetrachloro PCB homologs	ng/g		50	61	20	12	13	8
Pentachloro PCB homologs	ng/g		130	160	21	39	39	0
Hexachloro PCB homologs	ng/g		140	170	19	52	45	14
Heptachloro PCB homologs	ng/g		76	95	22	29	21	32
Octachloro PCB homologs	ng/g		21	24	13	8.0	5.1	44
Nonachloro PCB homologs	ng/g		5.3	6.0	12	2.3	1.7	30
Decachloro biphenyl	ng/g		3.1	3.5	12	1.1	1.2	9
PCB Aroclors								
Aroclor® 1016	µg/kg		18 *U*	18 *U*	0	16 *U*	16 *U*	0

Table F-7. (cont.)

Chemical	Units	Station:	SW27			SW34		
		Date:	08/14/02			08/29/02		
		Depth:	0–2 ft			0–2 ft		
		Field Split:	1	2		1	2	
		Sample No:	SD0014	SD0016	RPD	SD0052	SD0054	RPD
Aroclor® 1221	µg/kg		36 *U*	36 *U*	0	31 *U*	32 *U*	3
Aroclor® 1232	µg/kg		18 *U*	18 *U*	0	16 *U*	16 *U*	0
Aroclor® 1242	µg/kg		18 *U*	18 *U*	0	16 *U*	16 *U*	0
Aroclor® 1248	µg/kg		110	90	20	16 *U*	16 *U*	0
Aroclor® 1254	µg/kg		290	240	19	82	110 *J*	29
Aroclor® 1260	µg/kg		270	210 *J*	25	120	130 *J*	8
PCT Aroclors								
Aroclor® 5432	µg/kg		36 *U*	36 *U*	0	32 *U*	32 *U*	0
Aroclor® 5442	µg/kg		36 *U*	36 *U*	0	32 *U*	32 *U*	0
Aroclor® 5460	µg/kg		520	500	4	160 *J*	140 *J*	13
Polycyclic Aromatic Hydrocarbons								
Naphthalene	µg/kg		8.8 *U*	8.8 *U*	0	7.8 *U*	8.0 *U*	3
1-Methylnaphthalene	µg/kg		8.8 *U*	8.8 *U*	0	7.8 *U*	8.0 *U*	3
2-Methylnaphthalene	µg/kg		8.8 *U*	8.8 *U*	0	7.8 *U*	8.0 *U*	3
2,6-Dimethylnaphthalene	µg/kg		8.8 *U*	8.8 *U*	0	7.8 *U*	8.0 *U*	3
2,3,5-Trimethylnaphthalene	µg/kg		8.8 *U*	8.8 *U*	0	7.8 *U*	8.0 *U*	3
Acenaphthylene	µg/kg		57	56	2	7.9	8.8	11
Acenaphthene	µg/kg		8.8 *U*	8.8 *U*	0	7.8 *U*	8.0 *U*	3
Fluorene	µg/kg		8.8 *U*	8.8 *U*	0	7.8 *U*	8.0 *U*	3
Phenanthrene	µg/kg		65	78	18	14	16	13
1-Methyl phenanthrene	µg/kg		11	12	9	7.8 *U*	8.0 *U*	3
Anthracene	µg/kg		140	120	15	15	16	6
Fluoranthene	µg/kg		160	220	32	46	58	23
Pyrene	µg/kg		350	380	8	63	84	29
Benz[a]anthracene	µg/kg		190	180	5	37	43	15
Chrysene	µg/kg		350	320	9	65	82	23
Benzo[b]fluoranthene	µg/kg		660	670	2	100	110	10
Benzo[k]fluoranthene	µg/kg		530	550	4	98	100	2
Benzo[a]pyrene	µg/kg		740	750	1	110	110	0
Benzo[e]pyrene	µg/kg		450	450	0	75	83	10
Indeno[1,2,3-cd]pyrene	µg/kg		420	430	2	84	98	15
Dibenz[a,h]anthracene	µg/kg		97	97	0	15	16	6
Benzo[ghi]perylene	µg/kg		320	330	3	75	80	6
Biphenyl	µg/kg		8.8 *U*	8.8 *U*	0	7.8 *U*	8.0 *U*	3
Dibenzofuran	µg/kg		8.8 *U*	8.8 *U*	0	7.8 *U*	8.0 *U*	3

Note: Total solids results represent dry weight as the percentage of whole weight. All other results are provided on a dry-weight basis.

J - estimated
N - tentatively identified
RPD - relative percent difference
PCB - polychlorinated biphenyl
PCT - polychlorinated terphenyl
U - undetected at detection limit shown

Table F-8. Results for field splits for sediment samples for the pore water study

			Station:	NA16		
			Date:	09/08/02		
			Depth:	0–2 cm		
		Measurement	Field Rep:	1	2	
Chemical	Units	Basis	Sample No:	SD0099	SD0100	RPD
Conventional Analytes						
Oxidation Reduction Potential	mV	wet		–160	–160	0
pH	pH	wet		7.80	7.79	0
Total solids	%	wet		17.4	18.1	4
Total organic carbon	%	dry		2.04	1.96	4
Grain-Size Determination						
Gravel (Phi Class –6 to –1)	%	dry		0.47	0.20	81
Very coarse sand (Phi Class –1 to 0)	%	dry		2.4	2.5	4
Coarse sand (Phi Class 0 to 1)	%	dry		2.7	1.9	35
Medium sand (Phi Class 1 to 2)	%	dry		3.7	2.8	28
Fine sand (Phi Class 2 to 3)	%	dry		6.3	5.6	12
Very fine sand (Phi Class 3 to 4)	%	dry		5.5	5.5	0
Silt (Phi Class 4 to 8)	%	dry		54	51	6
Clay (Phi Class Greater Than 8)	%	dry		28	36	25
Metals						
Arsenic	mg/kg	dry		10	10.0	0
Cadmium	mg/kg	dry		0.41	0.34	19
Chromium	mg/kg	dry		69 *J*	64 *J*	8
Chromium, hexavalent	mg/kg	dry		3.5	1.5 *U*	80
Copper	mg/kg	dry		250	240	4
Lead	mg/kg	dry		91	82	10
Mercury	mg/kg	dry		0.97 *J*	1.2 *J*	21
Nickel	mg/kg	dry		14	13	7
Selenium	mg/kg	dry		1.1 *U*	1.0 *U*	10
Silver	mg/kg	dry		1.4	1.2	15
Zinc	mg/kg	dry		330 *J*	300 *J*	10
Organotins						
Monobutyltin	µg/kg	dry		19	15	24
Dibutyltin	µg/kg	dry		160	150	6
Tributyltin	µg/kg	dry		170	150	13
Tetrabutyltin	µg/kg	dry		4.4	3.6	20
PCB Homologs						
Monochloro PCB homologs	ng/g	dry		0.16	0.19	17
Dichloro PCB homologs	ng/g	dry		1.1	0.97	13
Trichloro PCB homologs	ng/g	dry		8.3	6.1	31
Tetrachloro PCB homologs	ng/g	dry		53	40	28
Pentachloro PCB homologs	ng/g	dry		190	160	17
Hexachloro PCB homologs	ng/g	dry		200	180	11
Heptachloro PCB homologs	ng/g	dry		87	73	18
Octachloro PCB homologs	ng/g	dry		17	16	6
Nonachloro PCB homologs	ng/g	dry		5.3	5.4	2
Decachloro biphenyl	ng/g	dry		3.3	3.2	3

Note: Total solids results represent dry weight as a percentage of whole weight. pH and oxidation-reduction potential are measured in the whole sample. All other results are provided on a dry-weight basis.

J - estimated
PCB - polychlorinated biphenyl
RPD - relative percent difference
U - undetected at the detection limit shown

Table F-9. Results for field splits for alkylated PAHs in sediment samples

		Station:	SW01		
		Date:	11/06/02		
		Depth:	0–2 cm		
		Field Rep:	1	2	
Chemical	Units	Sample No:	SD0169	SD0171	RPD
Conventional Analytes					
Total solids	%		50.9	50.6	1
Total organic carbon	%		2.18	2.14	2
PAHs and Alkylated PAHs					
Naphthalene	μg/kg		13	17	27
1-Methylnaphthalene	μg/kg		9.9	10	1
2-Methylnaphthalene	μg/kg		12	15	22
C2-Naphthalenes	μg/kg		25	26	4
C3-Naphthalenes	μg/kg		28	28	0
C4-Naphthalenes	μg/kg		66	69	4
Acenaphthylene	μg/kg		19	16	17
Acenaphthene	μg/kg		23	21	9
Fluorene	μg/kg		31	28	10
C1-Fluorenes	μg/kg		41	9.9	122
C2-Fluorenes	μg/kg		9.9	9.9	0
C3-Fluorenes	μg/kg		9.9	9.9	0
Phenanthrene	μg/kg		210	190	10
Anthracene	μg/kg		110	83	28
C1-Phenanthrenes/Anthracenes	μg/kg		120	120	0
C2-Phenanthrenes/Anthracenes	μg/kg		130	150	14
C3-Phenanthrenes/Anthracenes	μg/kg		190	180	5
C4-Phenanthrenes/Anthracenes	μg/kg		350	310	12
Fluoranthene	μg/kg		470	480	2
Pyrene	μg/kg		830	800	4
C1-Fluoranthenes/Pyrenes	μg/kg		640	660	3
Benz[a]anthracene	μg/kg		340	360	6
Chrysene	μg/kg		600	490	20
C1-Benz[a]anthracenes/Chrysenes	μg/kg		590	570	3
C2-Benz[a]anthracenes/Chrysenes	μg/kg		400	370	8
C3-Benz[a]anthracenes/Chrysenes	μg/kg		200	140	35
C4-Benz[a]anthracenes/Chrysenes	μg/kg		160	120	29
Benzo[b]fluoranthene	μg/kg		920	780	16
Benzo[k]fluoranthene	μg/kg		470	500	6
Perylene	μg/kg		150	140	7
Benzo[a]pyrene	μg/kg		680	750	10
Benzo[e]pyrene	μg/kg		520	520	0
Indeno[1,2,3-cd]pyrene	μg/kg		410	440	7
Dibenz[a,h]anthracene	μg/kg		84	81	4
Benzo[ghi]perylene	μg/kg		300	330	10
Dibenzothiophene	μg/kg		12	12	0
C1-Dibenzothiophenes	μg/kg		9.9	9.9	0
C2-Dibenzothiophenes	μg/kg		9.9	9.9	0
C3-Dibenzothiophenes	μg/kg		85	89	5
Biphenyl	μg/kg		9.9	9.9	0
Dibenzofuran	μg/kg		18	16	12

Note: PAH - polycyclic aromatic hydrocarbon
RPD - relative percent difference

Total solids results represent dry weight as a percentage of whole weight. All other results are provided on a dry-weight basis.

Table F-10. Results for field splits for organophosphorous pesticides in sediment samples

		Station:	NA22		
		Date:	09/12/02		
		Depth:	0–2 cm		
		Field Rep:	1	2	
Chemical	Units	Sample No:	SD0129	SD0132	RPD
Conventional Analytes					
Total solids	%		50.2	48.1	4
Organophosphorous Pesticides					
Bolstar	mg/kg		2.1 *U*	2.1 *U*	0
Chlorpyrifos	mg/kg		2.1 *U*	2.1 *U*	0
Coumaphos	mg/kg		4.1 *U*	4.2 *U*	2
Demeton	mg/kg		4.2 *U*	4.2 *U*	0
Diazinon	mg/kg		2.1 *U*	2.1 *U*	0
Dichlorvos	mg/kg		2.1 *U*	2.1 *U*	0
Dimethoate	mg/kg		2.1 *U*	2.1 *U*	0
Disulfoton	mg/kg		2.1 *U*	2.1 *U*	0
EPN	mg/kg		2.1 *U*	2.1 *U*	0
Ethoprop	mg/kg		2.1 *U*	2.1 *U*	0
Fensulfothion	mg/kg		2.1 *U*	2.1 *U*	0
Fenthion	mg/kg		2.1 *U*	2.1 *U*	0
Guthion	mg/kg		2.1 *U*	2.1 *U*	0
Malathion	mg/kg		2.1 *U*	2.1 *U*	0
Merphos	mg/kg		2.1 *U*	2.1 *U*	0
Methyl parathion	mg/kg		2.1 *U*	2.1 *U*	0
Meviphos	mg/kg		2.1 *U*	2.1 *U*	0
Parathion	mg/kg		2.1 *U*	2.1 *U*	0
Phorate	mg/kg		2.1 *U*	2.1 *U*	0
Ronnel	mg/kg		2.1 *U*	2.1 *U*	0
Stirophos	mg/kg		2.1 *U*	2.1 *U*	0
Sulfotep	mg/kg		2.1 *U*	2.1 *U*	0
Tokuthion	mg/kg		2.1 *U*	2.1 *U*	0
Trichloronate	mg/kg		2.1 *U*	2.1 *U*	0

Note: Total solids results represent dry weight as a percentage of whole weight. All other results are provided on a dry-weight basis.

RPD - relative percent difference
U - undetected at detection limit shown

Table F-11. Results for field splits for engineering properties

Chemical	Units	Station:	NA09			SW17		
		Date:	09/04/02			08/26/02		
		Depth:	0–6 ft			0–3 ft		
		Field Split:	1	2		1	2	
		Sample No:	SD0079E	SD0083E	RPD	SD0017E	SD0020	RPD
Conventional Analytes								
Percent moisture (as percent of dry weight)	%		120	106	12	165	150	10
Total solids (dry weight as percent of wet weight)	%		47	49	4	38	40	5
Specific gravity	SI units		2.58	2.69	4	2.75	2.77	1
Atterberg Limits								
Liquid limit	%		87	87	0	103	90	13
Plastic limit	%		33	32	3	33	32	3
Plasticity index	%		55	55	0	70	58	19
Grain-Size Determination								
Particles > 4.75 mm	%		2	5	86	0	0	0
Particles >2.00 mm and <4.75 mm	%		2	0	200	0	0	0
Very coarse sand (Phi Class –1 to 0)	%		1	1	0	0	0	0
Coarse sand (Phi Class 0 to 1)	%		2	1	67	1	0	200
Medium sand (Phi Class 1 to 2)	%		3	3	0	1	1	0
Fine sand (Phi Class 2 to 3)	%		6	5	18	2	3	40
Very fine sand (Phi Class 3 to 4)	%		8	7	13	4	5	22
Coarse silt (Phi Class 4 to 5)	%		8	7	13	7	6	15
Medium silt (Phi Class 5 to 6)	%		12	13	8	14	15	7
Fine silt (Phi Class 6 to 7)	%		12	12	0	13	13	0
Very fine silt (Phi Class 7 to 8)	%		12	22	59	12	11	9
Coarse clay (Phi Class 8 to 9)	%		8	21	90	10	10	0
Medium clay (Phi Class 9 to 10)	%		20	2	164	9	10	11
Fine clay and smaller (Phi Class >10)	%		7	1	150	30	26	14

Note: Grain size results are presented on a dry weight basis.

RPD - relative percent difference

Table F-12. Chemical concentrations found in equipment blanks for pore water samples

		Survey:	Phase 2	Phase 2
		Date:	09/13/02	11/08/02
Chemical	Units	Sample No:	EB0003	EB0008
Conventional Analytes				
Total organic carbon	mg/L			2.30
Metals				
Arsenic	µg/L		2.5 *UJ*	
Cadmium	µg/L		0.10 *U*	
Copper	µg/L		1.0 *U*	
Lead	µg/L		0.20	
Mercury	µg/L		5.0 *U*	
Nickel	µg/L		1.0 *U*	
Selenium	µg/L		5.0 *U*	
Silver	µg/L		0.10 *UJ*	
Zinc	µg/L		3.1	
PCB Homologs				
Decachloro biphenyl	ng/L		0.76 *U*	
Dichloro PCB homologs	ng/L		0.76 *U*	
Heptachloro PCB homologs	ng/L		0.76 *U*	
Hexachloro PCB homologs	ng/L		0.76 *U*	
Monochloro PCB homologs	ng/L		0.76 *U*	
Nonachloro PCB homologs	ng/L		0.76 *U*	
Octachloro PCB homologs	ng/L		0.76 *U*	
Pentachloro PCB homologs	ng/L		0.76 *U*	
Tetrachloro PCB homologs	ng/L		0.76 *U*	
Trichloro PCB homologs	ng/L		0.76 *U*	
PAHs and Alkylated PAHs				
Naphthalene	µg/L			0.020 *U*
1-Methylnaphthalene	µg/L			0.020 *U*
2-Methylnaphthalene	µg/L			0.020 *U*
C2-Naphthalenes	µg/L			0.020 *U*
C3-Naphthalenes	µg/L			0.020 *U*
C4-Naphthalenes	µg/L			0.020 *U*
Acenaphthylene	µg/L			0.020 *U*
Acenaphthene	µg/L			0.020 *U*
Fluorene	µg/L			0.020 *U*
C1-Fluorenes	µg/L			0.020 *U*
C2-Fluorenes	µg/L			0.020 *U*
C3-Fluorenes	µg/L			0.020 *U*
Phenanthrene	µg/L			0.020 *U*
Anthracene	µg/L			0.020 *U*
C1-Phenanthrenes/Anthracenes	µg/L			0.020 *U*
C2-Phenanthrenes/Anthracenes	µg/L			0.020 *U*
C3-Phenanthrenes/Anthracenes	µg/L			0.020 *U*
C4-Phenanthrenes/Anthracenes	µg/L			0.020 *U*
Fluoranthene	µg/L			0.020 *U*
Pyrene	µg/L			0.020 *U*
C1-Fluoranthenes/Pyrenes	µg/L			0.020 *U*

Table F-12. (cont.)

		Survey:	Phase 2	Phase 2
		Station:	EBLANK	EBLANK
		Date:	09/13/02	11/08/02
Chemical	Units	Sample No:	EB0003	EB0008
Benz[a]anthracene	μg/L			0.020 *U*
Chrysene	μg/L			0.020 *U*
C1-Benz[a]anthracenes/Chrysenes	μg/L			0.020 *U*
C2-Benz[a]anthracenes/Chrysenes	μg/L			0.020 *U*
C3-Benz[a]anthracenes/Chrysenes	μg/L			0.020 *U*
C4-Benz[a]anthracenes/Chrysenes	μg/L			0.020 *U*
Benzo[b]fluoranthene	μg/L			0.020 *U*
Benzo[k]fluoranthene	μg/L			0.020 *U*
Perylene	μg/L			0.020 *U*
Benzo[a]pyrene	μg/L			0.020 *U*
Benzo[e]pyrene	μg/L			0.020 *U*
Indeno[1,2,3-cd]pyrene	μg/L			0.020 *U*
Dibenz[a,h]anthracene	μg/L			0.020 *U*
Benzo[ghi]perylene	μg/L			0.020 *U*
Dibenzothiophene	μg/L			0.020 *U*
C1-Dibenzothiophenes	μg/L			0.020 *U*
C2-Dibenzothiophenes	μg/L			0.020 *U*
C3-Dibenzothiophenes	μg/L			0.020 *U*
Biphenyl	μg/L			0.020 *U*
Dibenzofuran	μg/L			0.020 *U*
Organotins				
Dibutyltin	μg/L		0.025 *U*	
Monobutyltin	μg/L		0.025 *U*	
Tetrabutyltin	μg/L		0.025 *U*	
Tributyltin	μg/L		0.010 *U*	

Note: *U* - undetected at detection limit shown
J - estimated
PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl

Table F-13. Results for field splits for pore water samples

Chemical[a]	Units						
		Station:	NA16				
		Date:	09/08/02				
		Depth:	0–2 cm				
		Field Rep:	1		2		
		Sample No:	PW0002W; PW0002S		PW0003W; PW0003S		RPD
Conventional Analytes							
TOC[b]	mg/L		10.0		7.00		35
Metals							
Arsenic	μg/L		17	*J*	17	*J*	0
Cadmium	μg/L		0.10	*U*	0.10	*U*	0
Chromium[b]	μg/L		6.2		6.3		2
Chromium, hexavalent[b]	mg/L		0.050	*U*	0.050	*U*	0
Copper	μg/L		22		22		0
Lead	μg/L		9.1		8.9		2
Mercury	ng/L		89		75		17
Nickel	μg/L		2.7		2.7		0
Selenium	μg/L		5.0	*U*	5.0	*U*	0
Silver	μg/L		0.20	*J*	0.30	*J*	40
Zinc	μg/L		32		33		3
Organotins							
Monobutyltin	μg/L		0.025	*U*	0.025	*U*	0
Dibutyltin	μg/L		0.042		0.038		10
Tributyltin	μg/L		0.060		0.049		20
Tetrabutyltin	μg/L		0.025	*U*	0.025	*U*	0
PCB Homologs							
Monochloro PCB homologs	ng/L		0.61	*U*	0.53	*U*	14
Dichloro PCB homologs	ng/L		0.61	*U*	0.53	*U*	14
Trichloro PCB homologs	ng/L		0.61	*U*	0.53	*U*	14
Tetrachloro PCB homologs	ng/L		9.2		8.5		8
Pentachloro PCB homologs	ng/L		31		29		7
Hexachloro PCB homologs	ng/L		35		34		3
Heptachloro PCB homologs	ng/L		16		14		13
Octachloro PCB homologs	ng/L		3.7		3.0		21
Nonachloro PCB homologs	ng/L		0.89		0.79		12
Decachloro biphenyl	ng/L		0.65		0.82		23

Note: PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl
RPD - relative percent difference
TOC - total organic carbon

[a] The field split for PAH analysis was broken during shipment. No split data are available for PAH analyses.

[b] Pore water for analysis of total and hexavalent chromium and TOC was extracted at the laboratory.

Table F-14. Method blank results for PCB congeners

Analyte	Method Blank					
	2318	2326	2330	2339[a]	2340[a]	2383
PCB Congener 18	0.01 *U*	0.017	0.023	0.014	0.016	0.01 *U*
PCB Congener 28	0.01 *U*	0.027	0.027	0.018	0.018	0.012
PCB Congener 37	0.01 *U*	0.023	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
PCB Congener 44	0.01 *U*	0.020	0.022	0.015	0.017	0.01 *U*
PCB Congener 49	0.01 *U*	0.025	0.022	0.015	0.017	0.01 *U*
PCB Congener 52	0.01 *U*	0.029	0.032	0.022	0.026	0.011
PCB Congener 66	0.01 *U*	0.037	0.013	0.011	0.012	0.01 *U*
PCB Congener 70	0.01 *U*	0.031	0.017	0.013	0.014	0.01 *U*
PCB Congener 74	0.01 *U*	0.015	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
PCB Congener 77	0.01 *U*	0.030	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
PCB Congener 81	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
PCB Congener 87	0.01 *U*	0.016	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
PCB Congener 90 and 101	0.02 *U*	0.030	0.02 *U*	0.02 *U*	0.02 *U*	0.02 *U*
PCB Congener 99	0.01 *U*	0.014	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
PCB Congener 110	0.01 *U*	0.013	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
PCB Congener 119	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
PCB Congener 118	0.01 *U*	0.052	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
PCB Congener 123	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
PCB Congener 105	0.01 *U*	0.029	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
PCB Congener 114	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.028 *U*	0.01 *U*
PCB Congener 126	0.01 *U*	0.025	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
PCB Congener 151	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
PCB Congener 128	0.01 *U*	0.014	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
PCB Congener 138	0.01 *U*	0.024	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
PCB Congener 149	0.01 *U*	0.017	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
PCB Congener 153	0.01 *U*	0.011	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
PCB Congener 158	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
PCB Congener 167	0.01 *U*	0.012	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
PCB Congener 168	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
PCB Congener 156	0.01 *U*	0.015	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
PCB Congener 157	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
PCB Congener 169	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
PCB Congener 170	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
PCB Congener 177	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
PCB Congener 180	0.025 *U*	0.025 *U*	0.025 *U*	0.025 *U*	0.025 *U*	0.025 *U*
PCB Congener 183	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
PCB Congener 187	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
PCB Congener 189	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
PCB Congener 201	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
PCB Congener 194	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
PCB Congener 206	0.01 *U*	0.022	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
Monochloro biphenyls	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
Dichloro biphenyls	0.01 *U*	0.027	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
Trichloro biphenyls	0.01 *U*	0.17	0.11	0.050	0.065	0.025
Tetrachloro biphenyls	0.01 *U*	0.35	0.12	0.089	0.10	0.011
Pentachloro biphenyls	0.02 *U*	0.32	0.012	0.02 *U*	0.028 *U*	0.02 *U*
Hexachloro biphenyls	0.01 *U*	0.093	0.02 *U*	0.01 *U*	0.01 *U*	0.01 *U*
Heptachloro biphenyls	0.025 *U*	0.025 *U*	0.01 *U*	0.025 *U*	0.025 *U*	0.025 *U*
Octachloro biphenyls	0.01 *U*	0.015	0.025 *U*	0.01 *U*	0.01 *U*	0.01 *U*
Nonachloro biphenyls	0.01 *U*	0.022	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*
Decachloro biphenyl	0.01 *U*	0.016	0.01 *U*	0.01 *U*	0.01 *U*	0.01 *U*

Note: All concentrations in μg/kg.

The analyte concentrations in the method blanks are calculated based on the typical weight of tissue used for the analysis to provide results that are directly comparable to the concentrations in the samples.

PCB - polychlorinated biphenyl

[a] The same lot of silica gel was used for method blanks 2339 and 2340.

Table F-15. Replicate results for PAHs in *Macoma* Sample MA0034

Sample Number	Survey Station	Sampling Date	Sample ID	Lab Rep.	Naphthalene	Acenaphthene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz[a]-anthracene
MA0034A	2441	10/06/01	8	1	14	20	52	38	300 *J*	500	39
MA0034A	2441	10/06/01	8	RE	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	16	16	5.3
MA0034A	2441	10/06/01	8	RE1	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	23	23	7.2
MA0034B	2441	10/06/01	57	1	5.0 *UJ*	5.0 *UJ*	5.0 *UJ*	5.0 *UJ*	5.0 *UJ*	5.0 *UJ*	5.0 *UJ*
MA0034B	2441	10/06/01	57	RE	5.0 *UJ*	5.0 *UJ*	5.0 *UJ*	5.0 *U*	8.9 *J*	8.9 *J*	5.0 *J*
MA0034C	2441	10/06/01	32	1	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	22 *J*	140	5.9
MA0034D	2441	10/06/01	1	1	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	21 *J*	21	5.2
MA0034D	2441	10/06/01	1	RE	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	19	19	6.4
MA0034E	2441	10/06/01	54	1	5.0 *U*	5.0 *U*	6.9	5.7	40 *J*	34	11
MA0034E	2441	10/06/01	54	RE	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	15	13	5.5

Table F-15. (cont.)

Sample Number	Survey Station	Sampling Date	Sample ID	Lab Rep.	Chrysene	Benzo[b]-fluoranthene	Benzo[k]-fluoranthene	Perylene	Benzo[a]-pyrene	Benzo[e]-pyrene	Indeno[1,2,3-cd]-pyrene	Benzo[ghi]-perylene
MA0034A	2441	10/06/01	8	1	89	33	44	5.0 *U*	24	16	10	5.0 *U*
MA0034A	2441	10/06/01	8	RE	6.3	7.3	9.9	5.0 *U*	6.0	5.7	5.0 *U*	5.0 *U*
MA0034A	2441	10/06/01	8	RE1	8.6	9.8	12	5.0 *U*	6.7	7.1	5.0 *U*	5.0 *U*
MA0034B	2441	10/06/01	57	1	5.0 *UJ*	5.0 *UJ*	5.0 *UJ*	5.0 *UJ*	5.0 *UJ*	5.0 *UJ*	5.0 *UJ*	5.0 *UJ*
MA0034B	2441	10/06/01	57	RE	5.0 *J*	5.0 *J*	5.6 *J*	5.0 *UJ*	5.0 *J*	5.0 *J*	5.0 *UJ*	5.0 *J*
MA0034C	2441	10/06/01	32	1	8.4	7.9	8.3	39	44	70	7.6	26
MA0034D	2441	10/06/01	1	1	7.7	7.7	9.0	5.0 *U*	5.2	5.6	5.0 *U*	5.0 *U*
MA0034D	2441	10/06/01	1	RE	7.3	9.6	12	5.0 *U*	8.0	7.0	5.0 *U*	5.0 *U*
MA0034E	2441	10/06/01	54	1	12	11	14	5.0 *U*	7.2	8.2	5.0 *U*	14
MA0034E	2441	10/06/01	54	RE	7.6	6.8	9.1	5.0 *U*	6.4	5.2	5.0 *U*	5.0 *U*

Note: *J* - estimated
PAH - polycyclic aromatic hydrocarbon
U - undetected at the detection limit shown

All results were derived using Method 8270C SIM and are reported in μg/kg wet weight.

Results are provided only for analytes that were detected in at least one of the samples.

PAHs that were not detected in any analysis of Sample MA0034 are not listed on the table.

The reporting limit was 5 μg/kg in all cases.

Table F-16. Composite samples of spotted sand bass bile

Station	Composite	Sample Number
SWFI01	BC-1	02SDH-2
(Inside Southwest Marine)		02SDH-3
		02SDH-4
		02SDH-5
		02SDH-6
	BC-2	02SDH-7
		02SDH-9
		02SDH-10
		02SDH-11
	BC-3	02SDH-12
		02SDH-13
		02SDH-15
		02SDH-16
		02SDH-17
	BC-4	02SDH-18
		02SDH-19
		02SDH-20
		02SDH-21
	BC-5	02SDH-22
		02SDH-25
		02SDH-26
		02SDH-27
		02SDH-28
	BC-6	02SDH-29
		02SDH-30
		02SDH-31
		02SDH-32
	BC-7	02SDH-33
		02SDH-35
		02SDH-36
		02SDH-37
	BC-8	02SDH-38
		02SDH-39
		02SDH-40
		02SDH-41
	BC-9	02SDH-42
		02SDH-43
		02SDH-44
		02SDH-46
	BC-10	02SDH-47
		02SDH-48
		02SDH-49
		02SDH-51
NAFI01	BC-11	02SDH-52
(Inside NASSCO)		02SDH-53
		02SDH-55
		02SDH-56
	BC-12	02SDH-57
		02SDH-58
		02SDH-59

Table F-16. (cont.)

Station	Composite	Sample Number
	BC-13	02SDH-60
		02SDH-61
		02SDH-63
		02SDH-64
	BC-14	02SDH-66
		02SDH-67
		02SDH-70
	BC-15	02SDH-73
		02SDH-76
		02SDH-77
	BC-16	02SDH-78
		02SDH-79
		02SDH-82
		02SDH-84
	BC-17	02SDH-85
		02SDH-86
		02SDH-87
	BC-18	02SDH-89
		02SDH-91
		02SDH-92
	BC-19	02SDH-93
		02SDH-96
		02SDH-98
	BC-20	02SDH-99
		02SDH-100
		02SDH-101
2240FI	BC-21	02SDH-102
(Reference)		02SDH-103
		02SDH-104
		02SDH-105
		02SDH-106
	BC-22	02SDH-107
		02SDH-108
		02SDH-109
		02SDH-110
		02SDH-111
	BC-23	02SDH-112
		02SDH-113
		02SDH-115
		02SDH-116
		02SDH-118
	BC-24	02SDH-119
		02SDH-120
		02SDH-121
		02SDH-122
		02SDH-123
	BC-25	02SDH-124
		02SDH-125
		02SDH-126
		02SDH-127

Table F-16. (cont.)

Station	Composite	Sample Number
		02SDH-128
	BC-26	02SDH-129
		02SDH-130
		02SDH-131
		02SDH-132
		02SDH-133
	BC-27	02SDH-134
		02SDH-135
		02SDH-136
		02SDH-137
		02SDH-138
	BC-28	02SDH-139
		02SDH-140
		02SDH-141
		02SDH-142
		02SDH-143
	BC-29	02SDH-144
		02SDH-145
		02SDH-146
		02SDH-147
	BC-30	02SDH-148
		02SDH-149
		02SDH-150
		02SDH-151
		02SDH-152
		02SDH-153
SWFI02	BC-31	02SDH-154
(Outside Southwest Marine)		02SDH-155
		02SDH-156
		02SDH-157
		02SDH-158
	BC-32	02SDH-160
		02SDH-161
		02SDH-162
		02SDH-164
		02SDH-165
	BC-33	02SDH-166
		02SDH-167
		02SDH-168
		02SDH-169
	BC-34	02SDH-171
		02SDH-173
		02SDH-175
		02SDH-176
	BC-35	02SDH-177
		02SDH-178
		02SDH-179
		02SDH-180
	BC-36	02SDH-181
		02SDH-182

Table F-16. (cont.)

Station	Composite	Sample Number
		02SDH-183
		02SDH-184
	BC-37	02SDH-185
		02SDH-187
		02SDH-188
		02SDH-189
		02SDH-190
	BC-38	02SDH-191
		02SDH-192
		02SDH-193
		02SDH-194
	BC-39	02SDH-195
		02SDH-196
		02SDH-197
		02SDH-198
		02SDH-199
	BC-40	02SDH-200
		02SDH-201
		02SDH-202
		02SDH-203
NAFI02	BC-41	02SDH-204
(Outside NASSCO)		02SDH-205
		02SDH-206
		02SDH-207
		02SDH-208
	BC-42	02SDH-209
		02SDH-211
		02SDH-212
		02SDH-213
		02SDH-214
	BC-43	02SDH-215
		02SDH-216
		02SDH-217
		02SDH-218
		02SDH-219
	BC-44	02SDH-220
		02SDH-221
		02SDH-222
		02SDH-223
		02SDH-224
	BC-45	02SDH-225
		02SDH-226
		02SDH-227
		02SDH-228
		02SDH-229
	BC-46	02SDH-230
		02SDH-231
		02SDH-232
		02SDH-233
		02SDH-234

Table F-16. (cont.)

Station	Composite	Sample Number
	BC-47	02SDH-235
		02SDH-236
		02SDH-237
		02SDH-238
		02SDH-239
	BC-48	02SDH-240
		02SDH-241
		02SDH-242
		02SDH-243
		02SDH-244
	BC-49	02SDH-245
		02SDH-246
		02SDH-247
		02SDH-248
	BC-50	02SDH-249
		02SDH-250
		02SDH-251
		02SDH-253

Attachment F1

Samples in Each Sample Delivery Group by Laboratory

Samples in Each Data Package - Alta Analytical Laboratory

Data Package ALTA 20841

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE1	SW01	08/06/2001	SD0001	0	0	Sediment	SD0001
PHASE1	SW06	08/06/2001	SD0002	0	0	Sediment	SD0002
PHASE1	SW05	08/06/2001	SD0003	0	0	Sediment	SD0003
PHASE1	SW07	08/06/2001	SD0004	0	0	Sediment	SD0004
PHASE1	SW02	08/06/2001	SD0005	1	0	Sediment	SD0005
PHASE1	SW02	08/06/2001	SD0005	2	0	Sediment	SD0006
PHASE1	SW09	08/06/2001	SD0007	0	0	Sediment	SD0007
PHASE1	SW10	08/06/2001	SD0008	0	0	Sediment	SD0008
PHASE1	SW03	08/07/2001	SD0009	0	0	Sediment	SD0009
PHASE1	SW04	08/07/2001	SD0012	0	0	Sediment	SD0012
PHASE1	REF4	08/08/2001	SD0013	0	0	Sediment	SD0013
PHASE1	SW24	08/08/2001	SD0015	0	0	Sediment	SD0015
PHASE1	SW08	08/08/2001	SD0016	0	0	Sediment	SD0016
PHASE1	NA07	08/08/2001	SD0017	1	0	Sediment	SD0017
PHASE1	NA07	08/08/2001	SD0017	2	0	Sediment	SD0018
PHASE1	SW21	08/09/2001	SD0019	0	0	Sediment	SD0019
PHASE1	NA06	08/09/2001	SD0020	0	0	Sediment	SD0020
PHASE1	NA11	08/09/2001	SD0021	0	0	Sediment	SD0021
PHASE1	SW13	08/09/2001	SD0022	0	0	Sediment	SD0022
PHASE1	SW15	08/10/2001	SD0023	0	0	Sediment	SD0023
PHASE1	SW14	08/10/2001	SD0024	0	0	Sediment	SD0024
PHASE1	SW16	08/10/2001	SD0025	0	0	Sediment	SD0025

Data Package ALTA 20842

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE1	NA12	08/10/2001	SD0027	0	0	Sediment	SD0027
PHASE1	NA20	08/10/2001	SD0028	0	0	Sediment	SD0028
PHASE1	SW28	08/11/2001	SD0029	0	0	Sediment	SD0029
PHASE1	NA01	08/11/2001	SD0030	1	0	Sediment	SD0030
PHASE1	NA01	08/11/2001	SD0030	2	0	Sediment	SD0031
PHASE1	NA03	08/11/2001	SD0032	0	0	Sediment	SD0032
PHASE1	REF1	08/11/2001	SD0034	0	0	Sediment	SD0034
PHASE1	NA04	08/11/2001	SD0035	0	0	Sediment	SD0035
PHASE1	NA15	08/12/2001	SD0037	0	0	Sediment	SD0037
PHASE1	NA16	08/12/2001	SD0038	0	0	Sediment	SD0038
PHASE1	NA17	08/12/2001	SD0039	0	0	Sediment	SD0039
PHASE1	REF2	08/12/2001	SD0041	0	0	Sediment	SD0041

Samples in Each Data Package - Alta Analytical

Data Package ALTA 20842

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE1	NA19	08/12/2001	SD0042	0	0	Sediment	SD0042
PHASE1	REF3	08/13/2001	SD0043	0	0	Sediment	SD0043
PHASE1	NA05	08/13/2001	SD0044	0	0	Sediment	SD0044
PHASE1	SW27	08/13/2001	SD0045	0	0	Sediment	SD0045
PHASE1	SW18	08/13/2001	SD0046	0	0	Sediment	SD0046
PHASE1	SW17	08/13/2001	SD0047	0	0	Sediment	SD0047
PHASE1	SW11	08/13/2001	SD0048	0	0	Sediment	SD0048
PHASE1	REF5	08/14/2001	SD0049	0	0	Sediment	SD0049
PHASE1	NA22	08/14/2001	SD0052	0	0	Sediment	SD0052
PHASE1	NA18	08/14/2001	SD0053	0	0	Sediment	SD0053
PHASE1	NA09	08/14/2001	SD0054	0	0	Sediment	SD0054
PHASE1	NA08	08/14/2001	SD0055	0	0	Sediment	SD0055
PHASE1	NA10	08/14/2001	SD0056	0	0	Sediment	SD0056
PHASE1	SW25	08/15/2001	SD0057	0	0	Sediment	SD0057
PHASE1	SW23	08/15/2001	SD0058	0	0	Sediment	SD0058
PHASE1	SW20	08/15/2001	SD0059	0	0	Sediment	SD0059
PHASE1	SW22	08/15/2001	SD0060	0	0	Sediment	SD0060

Data Package ALTA 20856

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE1	SRM	08/16/2001	SRM1941a_CT	0	0	Standard Reference	SD0062

Data Package ALTA 21129

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE1	CONTROL	09/19/2001	40	0	0	Tissue--invertebrates	ControlA
PHASE1	CONTROL	09/19/2001	15	0	0	Tissue--invertebrates	ControlB
PHASE1	CONTROL	09/19/2001	20	0	0	Tissue--invertebrates	ControlC
PHASE1	CONTROL	09/19/2001	61	0	0	Tissue--invertebrates	ControlD
PHASE1	CONTROL	09/19/2001	33	0	0	Tissue--invertebrates	ControlE
PHASE1	SW04	09/19/2001	21	0	0	Tissue--invertebrates	MA0012A
PHASE1	SW04	09/19/2001	3	0	0	Tissue--invertebrates	MA0012B
PHASE1	SW04	09/19/2001	58	0	0	Tissue--invertebrates	MA0012C
PHASE1	SW04	09/19/2001	45	0	0	Tissue--invertebrates	MA0012D
PHASE1	SW04	09/19/2001	30	0	0	Tissue--invertebrates	MA0012E
PHASE1	REF4	09/19/2001	25	0	0	Tissue--invertebrates	MA0013A

Samples in Each Data Package - Alta Analytical

Data Package ALTA 21129

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE1	REF4	09/19/2001	66	0	0	Tissue--invertebrates	MA0013B
PHASE1	REF4	09/19/2001	43	0	0	Tissue--invertebrates	MA0013C
PHASE1	REF4	09/19/2001	38	0	0	Tissue--invertebrates	MA0013D
PHASE1	REF4	09/19/2001	42	0	0	Tissue--invertebrates	MA0013E
PHASE1	SW08	09/19/2001	73	0	0	Tissue--invertebrates	MA0016A
PHASE1	SW08	09/19/2001	5	0	0	Tissue--invertebrates	MA0016B
PHASE1	SW08	09/19/2001	44	0	0	Tissue--invertebrates	MA0016C
PHASE1	SW08	09/19/2001	63	0	0	Tissue--invertebrates	MA0016D
PHASE1	SW08	09/19/2001	70	0	0	Tissue--invertebrates	MA0016E
PHASE1	SW21	09/19/2001	48	0	0	Tissue--invertebrates	MA0019A
PHASE1	SW21	09/19/2001	28	0	0	Tissue--invertebrates	MA0019B
PHASE1	SW21	09/19/2001	31	0	0	Tissue--invertebrates	MA0019C
PHASE1	SW21	09/19/2001	23	0	0	Tissue--invertebrates	MA0019D
PHASE1	SW21	09/19/2001	6	0	0	Tissue--invertebrates	MA0019E
PHASE1	NA06	09/19/2001	18	0	0	Tissue--invertebrates	MA0020A
PHASE1	NA06	09/19/2001	55	0	0	Tissue--invertebrates	MA0020B
PHASE1	NA06	09/19/2001	12	0	0	Tissue--invertebrates	MA0020C
PHASE1	NA06	09/19/2001	26	0	0	Tissue--invertebrates	MA0020D
PHASE1	NA06	09/19/2001	37	0	0	Tissue--invertebrates	MA0020E
PHASE1	NA11	09/19/2001	46	0	0	Tissue--invertebrates	MA0021A
PHASE1	NA11	09/19/2001	51	0	0	Tissue--invertebrates	MA0021B
PHASE1	NA11	09/19/2001	19	0	0	Tissue--invertebrates	MA0021C
PHASE1	NA11	09/19/2001	16	0	0	Tissue--invertebrates	MA0021D
PHASE1	NA11	09/19/2001	24	0	0	Tissue--invertebrates	MA0021E
PHASE1	SW13	09/19/2001	4	0	0	Tissue--invertebrates	MA0022A
PHASE1	SW13	09/19/2001	14	0	0	Tissue--invertebrates	MA0022B
PHASE1	SW13	09/19/2001	29	0	0	Tissue--invertebrates	MA0022C
PHASE1	SW13	09/19/2001	59	0	0	Tissue--invertebrates	MA0022D
PHASE1	SW13	09/19/2001	60	0	0	Tissue--invertebrates	MA0022E
PHASE1	NA12	09/19/2001	11	0	0	Tissue--invertebrates	MA0027A
PHASE1	NA12	09/19/2001	9	0	0	Tissue--invertebrates	MA0027B
PHASE1	NA12	09/19/2001	56	0	0	Tissue--invertebrates	MA0027C
PHASE1	NA12	09/19/2001	22	0	0	Tissue--invertebrates	MA0027D
PHASE1	NA12	09/19/2001	36	0	0	Tissue--invertebrates	MA0027E
PHASE1	NA20	09/19/2001	68	0	0	Tissue--invertebrates	MA0028A
PHASE1	NA20	09/19/2001	72	0	0	Tissue--invertebrates	MA0028B
PHASE1	NA20	09/19/2001	34/35	0	0	Tissue--invertebrates	MA0028CE
PHASE1	NA20	09/19/2001	53	0	0	Tissue--invertebrates	MA0028D
PHASE1	SW28	09/19/2001	64	0	0	Tissue--invertebrates	MA0029A
PHASE1	SW28	09/19/2001	75	0	0	Tissue--invertebrates	MA0029B
PHASE1	SW28	09/19/2001	10	0	0	Tissue--invertebrates	MA0029C
PHASE1	SW28	09/19/2001	41	0	0	Tissue--invertebrates	MA0029D
PHASE1	SW28	09/19/2001	69	0	0	Tissue--invertebrates	MA0029E

Samples in Each Data Package - Alta Analytical

Data Package ALTA 21129

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE1	REF2	09/19/2001	67	0	0	Tissue--invertebrates	MA0041A
PHASE1	REF2	09/19/2001	65	0	0	Tissue--invertebrates	MA0041B
PHASE1	REF2	09/19/2001	47	0	0	Tissue--invertebrates	MA0041C
PHASE1	REF2	09/19/2001	71	0	0	Tissue--invertebrates	MA0041D
PHASE1	REF2	09/19/2001	2	0	0	Tissue--invertebrates	MA0041E
PHASE1	REF3	09/19/2001	13	0	0	Tissue--invertebrates	MA0043A
PHASE1	REF3	09/19/2001	49	0	0	Tissue--invertebrates	MA0043B
PHASE1	REF3	09/19/2001	17	0	0	Tissue--invertebrates	MA0043C
PHASE1	REF3	09/19/2001	50	0	0	Tissue--invertebrates	MA0043D
PHASE1	REF3	09/19/2001	74	0	0	Tissue--invertebrates	MA0043E
PHASE1	REF5	09/19/2001	39	0	0	Tissue--invertebrates	MA0049A
PHASE1	REF5	09/19/2001	52	0	0	Tissue--invertebrates	MA0049B
PHASE1	REF5	09/19/2001	7	0	0	Tissue--invertebrates	MA0049C
PHASE1	REF5	09/19/2001	62	0	0	Tissue--invertebrates	MA0049D
PHASE1	REF5	09/19/2001	27	0	0	Tissue--invertebrates	MA0049E

Data Package ALTA 21210

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE1	SRM	10/27/2001	SRM1974a	0	0	Standard Reference	SRM1974a

Data Package ALTA 21256

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE1	REF1	10/06/2001	8	0	0	Tissue--invertebrates	MA0034A
PHASE1	REF1	10/06/2001	57	0	0	Tissue--invertebrates	MA0034B
PHASE1	REF1	10/06/2001	32	0	0	Tissue--invertebrates	MA0034C
PHASE1	REF1	10/06/2001	1	0	0	Tissue--invertebrates	MA0034D
PHASE1	REF1	10/06/2001	54	0	0	Tissue--invertebrates	MA0034E

Data Package ALTA 22476

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE1	SW12	08/07/2001	SD0010	0	0	Sediment	SD0010

Samples in Each Data Package - Alta Analytical

Data Package ALTA 22476

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE1	SW19	08/07/2001	SD0011	0	0	Sediment	SD0011
PHASE1	SW26	08/08/2001	SD0014	0	0	Sediment	SD0014
PHASE1	NA02	08/11/2001	SD0033	0	0	Sediment	SD0033
PHASE1	NA13	08/11/2001	SD0036	0	0	Sediment	SD0036
PHASE1	NA21	08/14/2001	SD0050	0	0	Sediment	SD0050
PHASE1	NA14	08/14/2001	SD0051	0	0	Sediment	SD0051

Data Package ALTA 22670

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	EBLANK	08/15/2002	EB0001	0	0	Equipment blank - soil	EB0001
PHASE2	SW01	08/13/2002	SW01	0	1	Sediment	SD0001
PHASE2	SW01	08/13/2002	SW01	0	2	Sediment	SD0002
PHASE2	SW01	08/13/2002	SW01	0	3	Sediment	SD0003
PHASE2	SW20	08/13/2002	SW20	0	1	Sediment	SD0004
PHASE2	SW20	08/13/2002	SW20	0	2	Sediment	SD0005
PHASE2	SW24	08/13/2002	SW24	0	1	Sediment	SD0006
PHASE2	SW24	08/13/2002	SW24	0	2	Sediment	SD0007
PHASE2	SW25	08/13/2002	SW25	0	1	Sediment	SD0008
PHASE2	SW25	08/13/2002	SW25	0	2	Sediment	SD0009
PHASE2	SW28	08/14/2002	SW28	0	1	Sediment	SD0010
PHASE2	SW28	08/14/2002	SW28	0	2	Sediment	SD0011
PHASE2	SW28	08/14/2002	SW28	0	3	Sediment	SD0012
PHASE2	SW27	08/14/2002	SW27	0	3	Sediment	SD0013
PHASE2	SW27	08/14/2002	SW27	1	1	Sediment	SD0014
PHASE2	SW27	08/14/2002	SW27	0	2	Sediment	SD0015
PHASE2	SW27	08/14/2002	SW27	2	1	Sediment	SD0016

Data Package ALTA 22743

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	SW17	08/26/2002	SW17	0	1	Sediment	SD0017
PHASE2	SW17	08/26/2002	SW17	0	2	Sediment	SD0018
PHASE2	SW17	08/26/2002	SW17	0	3	Sediment	SD0019
PHASE2	SW12	08/27/2002	SW12	0	1	Sediment	SD0020A
PHASE2	SW12	08/27/2002	SW12	0	2	Sediment	SD0021
PHASE2	SW36	08/27/2002	SW36	0	1	Sediment	SD0022

Samples in Each Data Package - Alta Analytical

Data Package **ALTA 22743**

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	SW36	08/27/2002	SW36	0	2	Sediment	SD0023
PHASE2	SW31	08/27/2002	SW31	0	1	Sediment	SD0024
PHASE2	SW04	08/27/2002	SW04	0	1	Sediment	SD0025
PHASE2	SW04	08/27/2002	SW04	0	2	Sediment	SD0026
PHASE2	SW02	08/27/2002	SW02	0	1	Sediment	SD0027
PHASE2	SW02	08/27/2002	SW02	0	2	Sediment	SD0028
PHASE2	SW19	08/28/2002	SW19	0	1	Sediment	SD0029
PHASE2	SW19	08/28/2002	SW19	0	2	Sediment	SD0030
PHASE2	SW19	08/28/2002	SW19	0	3	Sediment	SD0031
PHASE2	SW33	08/28/2002	SW33	0	1	Sediment	SD0032
PHASE2	SW08	08/28/2002	SW08	1	1	Sediment	SD0033
PHASE2	SW31	08/27/2002	SW31	0	2	Sediment	SD0034
PHASE2	SW02	08/27/2002	SW02	0	3	Sediment	SD0037
PHASE2	SW08	08/28/2002	SW08	0	2	Sediment	SD0038

Data Package **ALTA 22744**

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	SW08	08/28/2002	SW08	0	3	Sediment	SD0039
PHASE2	SW08	08/28/2002	SW08	2	1	Sediment	SD0040
PHASE2	SW10	08/28/2002	SW10	0	1	Sediment	SD0041
PHASE2	SW10	08/28/2002	SW10	0	2	Sediment	SD0042
PHASE2	SW29	08/28/2002	SW29	0	1	Sediment	SD0043
PHASE2	SW29	08/28/2002	SW29	0	2	Sediment	SD0044
PHASE2	SW29	08/28/2002	SW29	0	3	Sediment	SD0045
PHASE2	SW29	08/28/2002	SW29	0	4	Sediment	SD0046
PHASE2	SW33	08/28/2002	SW33	0	2	Sediment	SD0047
PHASE2	SW08	08/28/2002	SW08	0	4	Sediment	SD0048
PHASE2	SW32	08/29/2002	SW32	0	1	Sediment	SD0051
PHASE2	SW34	08/29/2002	SW34	1	1	Sediment	SD0052
PHASE2	SW34	08/29/2002	SW34	0	2	Sediment	SD0053
PHASE2	SW34	08/29/2002	SW34	2	1	Sediment	SD0054
PHASE2	SW30	08/29/2002	SW30	0	1	Sediment	SD0055
PHASE2	SW30	08/29/2002	SW30	0	2	Sediment	SD0056
PHASE2	SW30	08/29/2002	SW30	0	3	Sediment	SD0057
PHASE2	SW30	08/29/2002	SW30	0	4	Sediment	SD0058
PHASE2	SW32	08/29/2002	SW32	0	2	Sediment	SD0059
PHASE2	SW30	08/29/2002	SW30	0	5	Sediment	SD0060

Samples in Each Data Package - Alta Analytical

Data Package ALTA 22775

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	NA19	09/03/2002	NA19	0	1	Sediment	SD0065
PHASE2	NA19	09/03/2002	NA19	0	2	Sediment	SD0066
PHASE2	NA19	09/03/2002	NA19	0	3	Sediment	SD0067
PHASE2	NA06	09/03/2002	NA06	0	1	Sediment	SD0068
PHASE2	NA06	09/03/2002	NA06	0	2	Sediment	SD0069
PHASE2	NA20	09/04/2002	NA20	0	1	Sediment	SD0070
PHASE2	NA20	09/04/2002	NA20	0	2	Sediment	SD0071
PHASE2	NA20	09/04/2002	NA20	1	3	Sediment	SD0072
PHASE2	NA20	09/04/2002	NA20	0	4	Sediment	SD0073
PHASE2	NA20	09/04/2002	NA20	2	3	Sediment	SD0074
PHASE2	NA16	09/04/2002	NA16	0	1	Sediment	SD0075
PHASE2	NA16	09/04/2002	NA16	1	2	Sediment	SD0076
PHASE2	NA16	09/04/2002	NA16	0	3	Sediment	SD0077
PHASE2	NA16	09/04/2002	NA16	2	2	Sediment	SD0078
PHASE2	NA09	09/04/2002	NA09	0	1	Sediment	SD0079
PHASE2	NA09	09/04/2002	NA09	0	2	Sediment	SD0080
PHASE2	NA09	09/04/2002	NA09	0	3	Sediment	SD0081
PHASE2	NA09	09/04/2002	NA09	0	4	Sediment	SD0082
PHASE2	NA09	09/04/2002	NA09	0	5	Sediment	SD0083
PHASE2	NA04	09/04/2002	NA04	0	1	Sediment	SD0084

Data Package ALTA 22776

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	NA04	09/04/2002	NA04	0	2	Sediment	SD0085
PHASE2	NA04	09/04/2002	NA04	0	3	Sediment	SD0086
PHASE2	NA04	09/04/2002	NA04	0	4	Sediment	SD0087
PHASE2	NA17R	09/04/2002	NA17R	0	1	Sediment	SD0088
PHASE2	NA17R	09/04/2002	NA17R	0	2	Sediment	SD0089
PHASE2	NA17R	09/04/2002	NA17R	0	3	Sediment	SD0090
PHASE2	NA23R	09/04/2002	NA23R	0	1	Sediment	SD0091
PHASE2	NA23R	09/04/2002	NA23R	0	2	Sediment	SD0092
PHASE2	NA23R	09/04/2002	NA23R	0	3	Sediment	SD0093

Data Package ALTA 22813

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample

Samples in Each Data Package - Alta Analytical

Data Package ALTA 22813

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	NA17	09/08/2002	NA17-SS	0	PW	Sediment pore water	PW0001W
PHASE2	NA16	09/08/2002	NA16-SS	1	PW	Sediment pore water	PW0002W
PHASE2	NA16	09/08/2002	NA16-SS	2	PW	Sediment pore water	PW0003W
PHASE2	NA06	09/08/2002	NA06-SS	0	PW	Sediment pore water	PW0004W
PHASE2	SW12	09/10/2002	SW12-SS	0	PW	Sediment pore water	PW0005W
PHASE2	NA24	09/08/2002	NA24	0	SED	Sediment	SD0094
PHASE2	NA17	09/08/2002	NA17	0	SED	Sediment	SD0097
PHASE2	NA16	09/08/2002	NA16	1	SED	Sediment	SD0099
PHASE2	NA16	09/08/2002	NA16	2	SED	Sediment	SD0100
PHASE2	NA06	09/08/2002	NA06	0	SED	Sediment	SD0101
PHASE2	2435	09/09/2002	2435	0	SED	Sediment	SD0102
PHASE2	2229	09/09/2002	2229	0	SED	Sediment	SD0103
PHASE2	2230	09/09/2002	2230	0	SED	Sediment	SD0104
PHASE2	NA31	09/09/2002	NA31	0	SED	Sediment	SD0105
PHASE2	NA25	09/09/2002	NA25	0	SED	Sediment	SD0106
PHASE2	2265	09/09/2002	2265	0	SED	Sediment	SD0107
PHASE2	SW32	09/09/2002	SW32	0	SED	Sediment	SD0108
PHASE2	SW29	09/09/2002	SW29	0	SED	Sediment	SD0110
PHASE2	SW12	09/10/2002	SW12	0	SED	Sediment	SD0111

Data Package ALTA 22814

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	SW12	09/10/2002	SW12-SS	0	PW	Sediment pore water	PW0005W
PHASE2	SW04	09/10/2002	SW04-SS	0	PW	Sediment pore water	PW0006W
PHASE2	SW24	09/10/2002	SW24-SS	0	PW	Sediment pore water	PW0007W
PHASE2	SW25	09/10/2002	SW25-SS	0	PW	Sediment pore water	PW0008W
PHASE2	NA13	09/11/2002	NA13-SS	0	PW	Sediment pore water	PW0009W
PHASE2	SW28	09/11/2002	SW28-SS	0	PW	Sediment pore water	PW0010W
PHASE2	SW04	09/10/2002	SW04	0	SED	Sediment	SD0112
PHASE2	SW24	09/10/2002	SW24	0	SED	Sediment	SD0113
PHASE2	SW25	09/10/2002	SW25	0	SED	Sediment	SD0114
PHASE2	NA30	09/11/2002	NA30	0	SED	Sediment	SD0115
PHASE2	NA26	09/11/2002	NA26	0	SED	Sediment	SD0116
PHASE2	SW34	09/11/2002	SW34	0	SED	Sediment	SD0117
PHASE2	SW33	09/11/2002	SW33	0	SED	Sediment	SD0118
PHASE2	NA29	09/11/2002	NA29	0	SED	Sediment	SD0119
PHASE2	NA13	09/11/2002	NA13	0	SED	Sediment	SD0120
PHASE2	SW28	09/11/2002	SW28	0	SED	Sediment	SD0121
PHASE2	SW31	09/11/2002	SW31	0	SED	Sediment	SD0122

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Data Package ALTA 22814

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample

Data Package ALTA 22833

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	EBLANK	09/13/2002	EB0002	0	0	Equipment blank - soil	EB0002
PHASE2	EBLANK	09/13/2002	EB0003	0	0	Equipment blank - water	EB0003
PHASE2	2441	09/12/2002	2441-SS	0	PW	Sediment pore water	PW0011W
PHASE2	2243	09/12/2002	2243-SS	0	PW	Sediment pore water	PW0012W
PHASE2	2433	09/13/2002	2433-SS	0	PW	Sediment pore water	PW0013W
PHASE2	2440	09/13/2002	2440-SS	0	PW	Sediment pore water	PW0014W
PHASE2	SW08	09/13/2002	SW08-SS	0	PW	Sediment pore water	PW0015W
PHASE2	2441	09/12/2002	2441	0	SED	Sediment	SD0123
PHASE2	2243	09/12/2002	2243	0	SED	Sediment	SD0124
PHASE2	2240	09/12/2002	2240	0	SED	Sediment	SD0125
PHASE2	2244	09/12/2002	2244	1	SED	Sediment	SD0126
PHASE2	2244	09/12/2002	2244	2	SED	Sediment	SD0127
PHASE2	2241	09/12/2002	2241	0	SED	Sediment	SD0128
PHASE2	2433	09/13/2002	2433	0	SED	Sediment	SD0130
PHASE2	2440	09/13/2002	2440	0	SED	Sediment	SD0131
PHASE2	SW08	09/13/2002	SW08	0	SED	Sediment	SD0133

Data Package ALTA 22840

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	2231	09/14/2002	2231-SS	0	PW	Sediment pore water	PW0016W
PHASE2	NA01	09/14/2002	NA01-SS	0	PW	Sediment pore water	PW0017W
PHASE2	SW01	09/14/2002	SW01-SS	0	PW	Sediment pore water	PW0018W
PHASE2	SW02	09/14/2002	SW02-SS	0	PW	Sediment pore water	PW0019W
PHASE2	2231	09/14/2002	2231	0	SED	Sediment	SD0134
PHASE2	SW30	09/14/2002	SW30	0	SED	Sediment	SD0135
PHASE2	NA01	09/14/2002	NA01	0	SED	Sediment	SD0136
PHASE2	SW01	09/14/2002	SW01	0	SED	Sediment	SD0137
PHASE2	SW02	09/14/2002	SW02	0	SED	Sediment	SD0138

Samples in Each Data Package - Alta Analytical

Data Package ALTA 22858

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	NA02	09/18/2002	NA02	0	1	Sediment	SD0139
PHASE2	NA02	09/18/2002	NA02	0	2	Sediment	SD0140
PHASE2	NA01	09/18/2002	NA01	0	1	Sediment	SD0141
PHASE2	NA01	09/18/2002	NA01	1	2	Sediment	SD0142
PHASE2	NA01	09/18/2002	NA01	0	3	Sediment	SD0143
PHASE2	NA31	09/19/2002	NA31	0	1	Sediment	SD0144
PHASE2	NA31	09/19/2002	NA31	0	2	Sediment	SD0145
PHASE2	NA01	09/18/2002	NA01	2	2	Sediment	SD0146
PHASE2	NA26	09/19/2002	NA26	0	1	Sediment	SD0147
PHASE2	NA26	09/19/2002	NA26	0	2	Sediment	SD0148
PHASE2	NA26	09/19/2002	NA26	0	3	Sediment	SD0149
PHASE2	NA26	09/19/2002	NA26	0	4	Sediment	SD0150
PHASE2	NA30	09/20/2002	NA30	0	1	Sediment	SD0151
PHASE2	NA30	09/20/2002	NA30	0	2	Sediment	SD0152
PHASE2	NA25	09/20/2002	NA25	0	1	Sediment	SD0153
PHASE2	NA25	09/20/2002	NA25	0	2	Sediment	SD0154
PHASE2	NA25	09/20/2002	NA25	0	3	Sediment	SD0155
PHASE2	NA13	09/20/2002	NA13	0	1	Sediment	SD0156
PHASE2	NA13	09/20/2002	NA13	0	2	Sediment	SD0157

Data Package ALTA 22872

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	EBLANK	09/24/2002	EB0004	0	0	Equipment blank - soil	EB0004
PHASE2	EBLANK	09/24/2002	EB0005	0	0	Equipment blank - soil	EB0005
PHASE2	NA21	09/21/2002	NA21	0	1	Sediment	SD0158
PHASE2	NA21	09/21/2002	NA21	0	2	Sediment	SD0159
PHASE2	NA21	09/21/2002	NA21	0	3	Sediment	SD0160
PHASE2	NA21	09/21/2002	NA21	0	4	Sediment	SD0161
PHASE2	NA29	09/21/2002	NA29	0	1	Sediment	SD0162
PHASE2	NA29	09/21/2002	NA29	1	2	Sediment	SD0163
PHASE2	NA29	09/21/2002	NA29	2	2	Sediment	SD0164
PHASE2	NA24	09/21/2002	NA24	0	1	Sediment	SD0165
PHASE2	NA24	09/21/2002	NA24	0	2	Sediment	SD0166

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Data Package ALTA 22909

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	EBLANK	10/03/2002	EB0006	0	0	Equipment blank - soil	EB0006
PHASE2	NA28	10/02/2002	NA28	0	SED	Sediment	SD0300
PHASE2	NA27	10/02/2002	NA27	0	SED	Sediment	SD0301

Data Package ALTA 22971

Survey	Station	Date	Main sample ID	Field replicate ID	Sub-sample ID	Sample	Sample
PHASE2	SWM-Lob	08/27/2002	BI0001	1	0	Lobster edible tissue	BI0001
PHASE2	SWM-Lob	08/27/2002	BI0002	2	0	Lobster edible tissue	BI0002
PHASE2	SWM-Lob	08/27/2002	BI0003	3	0	Lobster edible tissue	BI0003
PHASE2	NSCO-Lob	09/08/2002	BI0004	1	0	Lobster edible tissue	BI0004
PHASE2	NSCO-Lob	09/08/2002	BI0005	2	0	Lobster edible tissue	BI0005
PHASE2	NA19	09/16/2002	Mussel	0	0	Mussel tissu	BI0006
PHASE2	SW18	09/16/2002	Mussel	0	0	Mussel tissu	BI0007
PHASE2	2240	09/16/2002	Mussel	0	0	Mussel tissu	BI0008
PHASE2	NSCO-Lob	09/20/2002	BI0009	3	0	Lobster edible tissue	BI0009
PHASE2	NSCO-Lob	09/20/2002	BI0010	4	0	Lobster edible tissue	BI0010
PHASE2	SW27	09/23/2002	Mussel	0	0	Mussel tissu	BI0011
PHASE2	NA24	09/23/2002	Mussel	0	0	Mussel tissu	BI0012
PHASE2	SWM-Lob	09/29/2002	BI0073	4	0	Lobster edible tissue	BI0073
PHASE2	SWM-Lob	09/29/2002	BI0074	5	0	Lobster edible tissue	BI0074
PHASE2	2230	10/02/2002	BI0085	1	0	Lobster edible tissue	BI0085
PHASE2	2230	10/02/2002	BI0086	2	0	Lobster edible tissue	BI0086
PHASE2	2230	10/02/2002	BI0087	3	0	Lobster edible tissue	BI0087
PHASE2	2230	10/02/2002	BI0088	4	0	Lobster edible tissue	BI0088
PHASE2	2230	10/02/2002	BI0089	5	0	Lobster edible tissue	BI0089

Data Package ALTA 23028

Survey	Station	Date	Main sample ID	Field replicate ID	Sub-sample ID	Sample	Sample
PHASE2	SWFI01	09/25/2002	SSB-WB	1	0	Spotted sand bass whole	BI0019
PHASE2	SWFI01	09/25/2002	SSB-WB	2	0	Spotted sand bass whole	BI0020
PHASE2	SWFI01	09/25/2002	SSB-WB	3	0	Spotted sand bass whole	BI0021
PHASE2	SWFI01	09/25/2002	SSB-WB	4	0	Spotted sand bass whole	BI0022
PHASE2	SWFI01	09/25/2002	SSB-WB	5	0	Spotted sand bass whole	BI0023
PHASE2	NAFI01	09/26/2002	SSB-WB	1	0	Spotted sand bass whole	BI0028
PHASE2	NAFI01	09/26/2002	SSB-WB	2	0	Spotted sand bass whole	BI0029

Samples in Each Data Package - Alta Analytical

Data Package ALTA 23028

Survey	Station	Date	Main sample ID	Field replicate ID	Sub-sample ID	Sample	Sample
PHASE2	NAFI01	09/26/2002	SSB-WB	3	0	Spotted sand bass whole	BI0030
PHASE2	NAFI01	09/26/2002	SSB-WB	4	0	Spotted sand bass whole	BI0031
PHASE2	NAFI01	09/26/2002	SSB-WB	5	0	Spotted sand bass whole	BI0032
PHASE2	SWFI02	09/27/2002	SSB-WB	1	0	Spotted sand bass whole	BI0038
PHASE2	SWFI02	09/27/2002	SSB-WB	2	0	Spotted sand bass whole	BI0039
PHASE2	SWFI02	09/27/2002	SSB-WB	3	0	Spotted sand bass whole	BI0040
PHASE2	SWFI02	09/27/2002	SSB-WB	4	0	Spotted sand bass whole	BI0041
PHASE2	SWFI02	09/27/2002	SSB-WB	5	0	Spotted sand bass whole	BI0042
PHASE2	2240	09/27/2002	SSB-WB	1	0	Spotted sand bass whole	BI0048
PHASE2	2240	09/27/2002	SSB-WB	2	0	Spotted sand bass whole	BI0049
PHASE2	2240	09/27/2002	SSB-WB	3	0	Spotted sand bass whole	BI0050
PHASE2	2240	09/27/2002	SSB-WB	4	0	Spotted sand bass whole	BI0051
PHASE2	2240	09/27/2002	SSB-WB	5	0	Spotted sand bass whole	BI0052
PHASE2	NAFI02	09/28/2002	SSB-WB	1	0	Spotted sand bass whole	BI0065
PHASE2	NAFI02	09/28/2002	SSB-WB	2	0	Spotted sand bass whole	BI0066
PHASE2	NAFI02	09/28/2002	SSB-WB	3	0	Spotted sand bass whole	BI0067
PHASE2	NAFI02	09/28/2002	SSB-WB	4	0	Spotted sand bass whole	BI0068
PHASE2	SWFI02	09/28/2002	FF-WB	0	0	Forage fish whole body	BI0069
PHASE2	NAFI02	09/28/2002	FF-WB	1	0	Forage fish whole body	BI0070-1
PHASE2	NAFI02	09/28/2002	FF-WB	2	0	Forage fish whole body	BI0070-2
PHASE2	NAFI02	09/29/2002	FF-WB	3	0	Forage fish whole body	BI0070-3
PHASE2	NAFI02	09/29/2002	FF-WB	4	0	Forage fish whole body	BI0070-4
PHASE2	2240	09/28/2002	FF-WB	1	0	Forage fish whole body	BI0071-1
PHASE2	2240	09/28/2002	FF-WB	2	0	Forage fish whole body	BI0071-2
PHASE2	2240	09/28/2002	FF-WB	3	0	Forage fish whole body	BI0071-3
PHASE2	NAFI02	09/29/2002	SSB-WB	5	0	Spotted sand bass whole	BI0080
PHASE2	NAFI01	09/29/2002	FF-WB	0	0	Forage fish whole body	BI0081
PHASE2	SWFI01	10/01/2002	FF-WB	1	0	Forage fish whole body	BI0083-1
PHASE2	SWFI01	10/01/2002	FF-WB	2	0	Forage fish whole body	BI0083-2
PHASE2	SWFI01	10/01/2002	FF-WB	3	0	Forage fish whole body	BI0083-3

Data Package ALTA 23033

Survey	Station	Date	Main sample ID	Field replicate ID	Sub-sample ID	Sample	Sample
PHASE2	NAFI01	09/26/2002	SSB-F	1	0	Spotted sand bass fillet	BI0013
PHASE2	SWFI01	09/25/2002	SSB-F	1	0	Spotted sand bass fillet	BI0014
PHASE2	SWFI01	09/25/2002	SSB-F	2	0	Spotted sand bass fillet	BI0015
PHASE2	SWFI01	09/25/2002	SSB-F	3	0	Spotted sand bass fillet	BI0016
PHASE2	SWFI01	09/25/2002	SSB-F	4	0	Spotted sand bass fillet	BI0017
PHASE2	SWFI01	09/25/2002	SSB-F	5	0	Spotted sand bass fillet	BI0018

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Data Package ALTA 23033

Survey	Station	Date	Main sample ID	Field replicate ID	Sub-sample ID	Sample	Sample
PHASE2	NAFI01	09/26/2002	SSB-F	2	0	Spotted sand bass fillet	BI0024
PHASE2	NAFI01	09/26/2002	SSB-F	3	0	Spotted sand bass fillet	BI0025
PHASE2	NAFI01	09/26/2002	SSB-F	4	0	Spotted sand bass fillet	BI0026
PHASE2	NAFI01	09/26/2002	SSB-F	5	0	Spotted sand bass fillet	BI0027
PHASE2	SWFI02	09/27/2002	SSB-F	1	0	Spotted sand bass fillet	BI0033
PHASE2	SWFI02	09/27/2002	SSB-F	2	0	Spotted sand bass fillet	BI0034
PHASE2	SWFI02	09/27/2002	SSB-F	3	0	Spotted sand bass fillet	BI0035
PHASE2	SWFI02	09/27/2002	SSB-F	4	0	Spotted sand bass fillet	BI0036
PHASE2	SWFI02	09/27/2002	SSB-F	5	0	Spotted sand bass fillet	BI0037
PHASE2	2240	09/27/2002	SSB-F	1	0	Spotted sand bass fillet	BI0043
PHASE2	2240	09/27/2002	SSB-F	2	0	Spotted sand bass fillet	BI0044
PHASE2	2240	09/27/2002	SSB-F	3	0	Spotted sand bass fillet	BI0045
PHASE2	2240	09/27/2002	SSB-F	4	0	Spotted sand bass fillet	BI0046
PHASE2	2240	09/27/2002	SSB-F	5	0	Spotted sand bass fillet	BI0047
PHASE2	NAFI02	09/27/2002	SSB-F	1	0	Spotted sand bass fillet	BI0053
PHASE2	NAFI02	09/27/2002	SSB-F	2	0	Spotted sand bass fillet	BI0054
PHASE2	NAFI02	09/27/2002	SSB-F	3	0	Spotted sand bass fillet	BI0055
PHASE2	NAFI02	09/27/2002	SSB-F	4	0	Spotted sand bass fillet	BI0056
PHASE2	NAFI02	09/28/2002	SSB-F	5	0	Spotted sand bass fillet	BI0057

Data Package ALTA 23061

Survey	Station	Date	Main sample ID	Field replicate ID	Sub-sample ID	Sample	Sample
PHASE2	NSCO-Lob	09/26/2002	BI0058	1	0	Lobster whole body	BI0058
PHASE2	NSCO-Lob	09/27/2002	BI0059	2	0	Lobster whole body	BI0059
PHASE2	NSCO-Lob	09/27/2002	BI0060	3	0	Lobster whole body	BI0060
PHASE2	NSCO-Lob	09/27/2002	BI0061	4	0	Lobster whole body	BI0061
PHASE2	NSCO-Lob	09/27/2002	BI0062	5	0	Lobster whole body	BI0062
PHASE2	NSCO-Lob	09/28/2002	BI0063	6	0	Lobster whole body	BI0063
PHASE2	NSCO-Lob	09/28/2002	BI0064	7	0	Lobster whole body	BI0064
PHASE2	SWM-Lob	09/29/2002	BI0075	1	0	Lobster whole body	BI0075
PHASE2	SWM-Lob	09/29/2002	BI0076	2	0	Lobster whole body	BI0076
PHASE2	SWM-Lob	09/29/2002	BI0077	3	0	Lobster whole body	BI0077
PHASE2	SWM-Lob	09/29/2002	BI0078	4	0	Lobster whole body	BI0078
PHASE2	SWM-Lob	09/29/2002	BI0079	5	0	Lobster whole body	BI0079
PHASE2	SW-EG-1	10/01/2002	EELGRASS	0	0	Eel grass	BI0082
PHASE2	NA-EG-1	10/02/2002	EELGRASS	0	0	Eel grass	BI0084
PHASE2	2230	10/02/2002	BI0090	1	0	Lobster whole body	BI0090
PHASE2	2230	10/02/2002	BI0091	2	0	Lobster whole body	BI0091
PHASE2	2230	10/02/2002	BI0092	3	0	Lobster whole body	BI0092

Samples in Each Data Package - Alta Analytical

Data Package ALTA 23061

Survey	Station	Date	Main sample ID	Field replicate ID	Sub-sample ID	Sample	Sample
PHASE2	2230	10/02/2002	BI0093	4	0	Lobster whole body	BI0093
PHASE2	2230	10/02/2002	BI0094	5	0	Lobster whole body	BI0094
PHASE2	2240-EG	10/02/2002	EELGRASS	0	0	Eel grass	BI0095

Data Package ALTA 23087

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	EBLANK	11/08/2002	EB0007	0	0	Equipment blank - soil	EB0007
PHASE2	SW36	11/07/2002	SW36	0	SED	Sediment	SD0180

Samples in Each Data Package - CAS

Data Package CAS K2105657

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE1	SW01	08/06/2001	SD0001	0	0	Sediment	SD0001
PHASE1	SW06	08/06/2001	SD0002	0	0	Sediment	SD0002
PHASE1	SW05	08/06/2001	SD0003	0	0	Sediment	SD0003
PHASE1	SW07	08/06/2001	SD0004	0	0	Sediment	SD0004
PHASE1	SW02	08/06/2001	SD0005	1	0	Sediment	SD0005
PHASE1	SW02	08/06/2001	SD0005	2	0	Sediment	SD0006
PHASE1	SW09	08/06/2001	SD0007	0	0	Sediment	SD0007
PHASE1	SW10	08/06/2001	SD0008	0	0	Sediment	SD0008

Data Package CAS K2105719

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE1	SW03	08/07/2001	SD0009	0	0	Sediment	SD0009
PHASE1	SW12	08/07/2001	SD0010	0	0	Sediment	SD0010
PHASE1	SW19	08/07/2001	SD0011	0	0	Sediment	SD0011
PHASE1	SW04	08/07/2001	SD0012	0	0	Sediment	SD0012

Data Package CAS K2105764

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE1	REF4	08/08/2001	SD0013	0	0	Sediment	SD0013
PHASE1	SW26	08/08/2001	SD0014	0	0	Sediment	SD0014
PHASE1	SW24	08/08/2001	SD0015	0	0	Sediment	SD0015
PHASE1	SW08	08/08/2001	SD0016	0	0	Sediment	SD0016
PHASE1	NA07	08/08/2001	SD0017	1	0	Sediment	SD0017
PHASE1	NA07	08/08/2001	SD0017	2	0	Sediment	SD0018

Data Package CAS K2105797

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE1	SW21	08/09/2001	SD0019	0	0	Sediment	SD0019
PHASE1	NA06	08/09/2001	SD0020	0	0	Sediment	SD0020
PHASE1	NA11	08/09/2001	SD0021	0	0	Sediment	SD0021

Samples in Each Data Package - CAS

Data Package CAS K2105797

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE1	SW13	08/09/2001	SD0022	0	0	Sediment	SD0022
PHASE1	SW15	08/10/2001	SD0023	0	0	Sediment	SD0023
PHASE1	SW14	08/10/2001	SD0024	0	0	Sediment	SD0024
PHASE1	SW16	08/10/2001	SD0025	0	0	Sediment	SD0025

Data Package CAS K2105847

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE1	NA12	08/10/2001	SD0027	0	0	Sediment	SD0027
PHASE1	NA20	08/10/2001	SD0028	0	0	Sediment	SD0028
PHASE1	SW28	08/11/2001	SD0029	0	0	Sediment	SD0029
PHASE1	NA01	08/11/2001	SD0030	1	0	Sediment	SD0030
PHASE1	NA01	08/11/2001	SD0030	2	0	Sediment	SD0031
PHASE1	NA03	08/11/2001	SD0032	0	0	Sediment	SD0032
PHASE1	NA02	08/11/2001	SD0033	0	0	Sediment	SD0033
PHASE1	REF1	08/11/2001	SD0034	0	0	Sediment	SD0034
PHASE1	NA04	08/11/2001	SD0035	0	0	Sediment	SD0035
PHASE1	NA13	08/11/2001	SD0036	0	0	Sediment	SD0036
PHASE1	NA15	08/12/2001	SD0037	0	0	Sediment	SD0037
PHASE1	NA16	08/12/2001	SD0038	0	0	Sediment	SD0038
PHASE1	NA17	08/12/2001	SD0039	0	0	Sediment	SD0039
PHASE1	REF2	08/12/2001	SD0041	0	0	Sediment	SD0041
PHASE1	NA19	08/12/2001	SD0042	0	0	Sediment	SD0042

Data Package CAS K2105900

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE1	REF3	08/13/2001	SD0043	0	0	Sediment	SD0043
PHASE1	NA05	08/13/2001	SD0044	0	0	Sediment	SD0044
PHASE1	SW27	08/13/2001	SD0045	0	0	Sediment	SD0045
PHASE1	SW18	08/13/2001	SD0046	0	0	Sediment	SD0046
PHASE1	SW17	08/13/2001	SD0047	0	0	Sediment	SD0047
PHASE1	SW11	08/13/2001	SD0048	0	0	Sediment	SD0048

Samples in Each Data Package - CAS

Data Package CAS K2105935

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE1	EBLANK	08/15/2001	EQBL01	0	0	Equipment blank - soil	EQBL01
PHASE1	REF5	08/14/2001	SD0049	0	0	Sediment	SD0049
PHASE1	NA21	08/14/2001	SD0050	0	0	Sediment	SD0050
PHASE1	NA14	08/14/2001	SD0051	0	0	Sediment	SD0051
PHASE1	NA22	08/14/2001	SD0052	0	0	Sediment	SD0052
PHASE1	NA18	08/14/2001	SD0053	0	0	Sediment	SD0053
PHASE1	NA09	08/14/2001	SD0054	0	0	Sediment	SD0054
PHASE1	NA08	08/14/2001	SD0055	0	0	Sediment	SD0055
PHASE1	NA10	08/14/2001	SD0056	0	0	Sediment	SD0056
PHASE1	SW25	08/15/2001	SD0057	0	0	Sediment	SD0057
PHASE1	SW23	08/15/2001	SD0058	0	0	Sediment	SD0058
PHASE1	SW20	08/15/2001	SD0059	0	0	Sediment	SD0059
PHASE1	SW22	08/15/2001	SD0060	0	0	Sediment	SD0060

Data Package CAS K2106948

Survey	Station	Date	Main sample ID	Field replicate ID	Sub-sample ID	Sample	Sample
PHASE1	CONTROL	09/19/2001	40	0	0	Tissue--invertebrates	ControlA
PHASE1	CONTROL	09/19/2001	15	0	0	Tissue--invertebrates	ControlB
PHASE1	CONTROL	09/19/2001	20	0	0	Tissue--invertebrates	ControlC
PHASE1	CONTROL	09/19/2001	61	0	0	Tissue--invertebrates	ControlD
PHASE1	CONTROL	09/19/2001	33	0	0	Tissue--invertebrates	ControlE
PHASE1	SW04	09/19/2001	21	0	0	Tissue--invertebrates	MA0012A
PHASE1	SW04	09/19/2001	3	0	0	Tissue--invertebrates	MA0012B
PHASE1	SW04	09/19/2001	58	0	0	Tissue--invertebrates	MA0012C
PHASE1	SW04	09/19/2001	45	0	0	Tissue--invertebrates	MA0012D
PHASE1	SW04	09/19/2001	30	0	0	Tissue--invertebrates	MA0012E
PHASE1	REF4	09/19/2001	25	0	0	Tissue--invertebrates	MA0013A
PHASE1	REF4	09/19/2001	66	0	0	Tissue--invertebrates	MA0013B
PHASE1	REF4	09/19/2001	43	0	0	Tissue--invertebrates	MA0013C
PHASE1	REF4	09/19/2001	38	0	0	Tissue--invertebrates	MA0013D
PHASE1	REF4	09/19/2001	42	0	0	Tissue--invertebrates	MA0013E
PHASE1	SW08	09/19/2001	73	0	0	Tissue--invertebrates	MA0016A
PHASE1	SW08	09/19/2001	5	0	0	Tissue--invertebrates	MA0016B
PHASE1	SW08	09/19/2001	44	0	0	Tissue--invertebrates	MA0016C
PHASE1	SW08	09/19/2001	63	0	0	Tissue--invertebrates	MA0016D
PHASE1	SW08	09/19/2001	70	0	0	Tissue--invertebrates	MA0016E
PHASE1	SW21	09/19/2001	48	0	0	Tissue--invertebrates	MA0019A
PHASE1	SW21	09/19/2001	28	0	0	Tissue--invertebrates	MA0019B
PHASE1	SW21	09/19/2001	31	0	0	Tissue--invertebrates	MA0019C

Samples in Each Data Package - CAS

Data Package CAS K2106948

Survey	Station	Date	Main sample ID	Field replicate ID	Sub-sample ID	Sample	Sample
PHASE1	SW21	09/19/2001	23	0	0	Tissue--invertebrates	MA0019D
PHASE1	SW21	09/19/2001	6	0	0	Tissue--invertebrates	MA0019E
PHASE1	NA06	09/19/2001	18	0	0	Tissue--invertebrates	MA0020A
PHASE1	NA06	09/19/2001	55	0	0	Tissue--invertebrates	MA0020B
PHASE1	NA06	09/19/2001	12	0	0	Tissue--invertebrates	MA0020C
PHASE1	NA06	09/19/2001	26	0	0	Tissue--invertebrates	MA0020D
PHASE1	NA06	09/19/2001	37	0	0	Tissue--invertebrates	MA0020E
PHASE1	NA11	09/19/2001	46	0	0	Tissue--invertebrates	MA0021A
PHASE1	NA11	09/19/2001	51	0	0	Tissue--invertebrates	MA0021B
PHASE1	NA11	09/19/2001	19	0	0	Tissue--invertebrates	MA0021C
PHASE1	NA11	09/19/2001	16	0	0	Tissue--invertebrates	MA0021D
PHASE1	NA11	09/19/2001	24	0	0	Tissue--invertebrates	MA0021E
PHASE1	SW13	09/19/2001	4	0	0	Tissue--invertebrates	MA0022A
PHASE1	SW13	09/19/2001	14	0	0	Tissue--invertebrates	MA0022B
PHASE1	SW13	09/19/2001	29	0	0	Tissue--invertebrates	MA0022C
PHASE1	SW13	09/19/2001	59	0	0	Tissue--invertebrates	MA0022D
PHASE1	SW13	09/19/2001	60	0	0	Tissue--invertebrates	MA0022E
PHASE1	NA12	09/19/2001	11	0	0	Tissue--invertebrates	MA0027A
PHASE1	NA12	09/19/2001	9	0	0	Tissue--invertebrates	MA0027B
PHASE1	NA12	09/19/2001	56	0	0	Tissue--invertebrates	MA0027C
PHASE1	NA12	09/19/2001	22	0	0	Tissue--invertebrates	MA0027D
PHASE1	NA12	09/19/2001	36	0	0	Tissue--invertebrates	MA0027E
PHASE1	NA20	09/19/2001	68	0	0	Tissue--invertebrates	MA0028A
PHASE1	NA20	09/19/2001	72	0	0	Tissue--invertebrates	MA0028B
PHASE1	NA20	09/19/2001	34/35	0	0	Tissue--invertebrates	MA0028CE
PHASE1	NA20	09/19/2001	53	0	0	Tissue--invertebrates	MA0028D
PHASE1	SW28	09/19/2001	64	0	0	Tissue--invertebrates	MA0029A
PHASE1	SW28	09/19/2001	75	0	0	Tissue--invertebrates	MA0029B
PHASE1	SW28	09/19/2001	10	0	0	Tissue--invertebrates	MA0029C
PHASE1	SW28	09/19/2001	41	0	0	Tissue--invertebrates	MA0029D
PHASE1	SW28	09/19/2001	69	0	0	Tissue--invertebrates	MA0029E
PHASE1	REF2	09/19/2001	67	0	0	Tissue--invertebrates	MA0041A
PHASE1	REF2	09/19/2001	65	0	0	Tissue--invertebrates	MA0041B
PHASE1	REF2	09/19/2001	47	0	0	Tissue--invertebrates	MA0041C
PHASE1	REF2	09/19/2001	71	0	0	Tissue--invertebrates	MA0041D
PHASE1	REF2	09/19/2001	2	0	0	Tissue--invertebrates	MA0041E
PHASE1	REF3	09/19/2001	13	0	0	Tissue--invertebrates	MA0043A
PHASE1	REF3	09/19/2001	49	0	0	Tissue--invertebrates	MA0043B
PHASE1	REF3	09/19/2001	17	0	0	Tissue--invertebrates	MA0043C
PHASE1	REF3	09/19/2001	50	0	0	Tissue--invertebrates	MA0043D
PHASE1	REF3	09/19/2001	74	0	0	Tissue--invertebrates	MA0043E
PHASE1	REF5	09/19/2001	39	0	0	Tissue--invertebrates	MA0049A
PHASE1	REF5	09/19/2001	52	0	0	Tissue--invertebrates	MA0049B

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Data Package CAS K2106948

Survey	Station	Date	Main sample ID	Field replicate ID	Sub-sample ID	Sample	Sample
PHASE1	REF5	09/19/2001	7	0	0	Tissue--invertebrates	MA0049C
PHASE1	REF5	09/19/2001	62	0	0	Tissue--invertebrates	MA0049D
PHASE1	REF5	09/19/2001	27	0	0	Tissue--invertebrates	MA0049E

Data Package CAS K2107946

Survey	Station	Date	Main sample ID	Field replicate ID	Sub-sample ID	Sample	Sample
PHASE1	REF1	10/06/2001	8	0	0	Tissue--invertebrates	MA0034A
PHASE1	REF1	10/06/2001	57	0	0	Tissue--invertebrates	MA0034B
PHASE1	REF1	10/06/2001	32	0	0	Tissue--invertebrates	MA0034C
PHASE1	REF1	10/06/2001	1	0	0	Tissue--invertebrates	MA0034D
PHASE1	REF1	10/06/2001	54	0	0	Tissue--invertebrates	MA0034E

Data Package CAS K2201095

Survey	Station	Date	Main sample ID	Field replicate ID	Sub-sample ID	Sample	Sample
PHASE1	CONTROL	09/19/2001	40	0	0	Tissue--invertebrates	ControlA
PHASE1	SW04	09/19/2001	58	0	0	Tissue--invertebrates	MA0012C
PHASE1	NA11	09/19/2001	46	0	0	Tissue--invertebrates	MA0021A
PHASE1	NA11	09/19/2001	51	0	0	Tissue--invertebrates	MA0021B
PHASE1	NA20	09/19/2001	34/35	0	0	Tissue--invertebrates	MA0028CE
PHASE1	REF2	09/19/2001	65	0	0	Tissue--invertebrates	MA0041B
PHASE1	REF5	09/19/2001	27	0	0	Tissue--invertebrates	MA0049E

Data Package CAS K2205620

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	EBLANK	08/15/2002	EB0001	0	0	Equipment blank - soil	EB0001
PHASE2	SW01	08/13/2002	SW01	0	1	Sediment	SD0001
PHASE2	SW01	08/13/2002	SW01	0	2	Sediment	SD0002
PHASE2	SW01	08/13/2002	SW01	0	3	Sediment	SD0003
PHASE2	SW20	08/13/2002	SW20	0	1	Sediment	SD0004
PHASE2	SW20	08/13/2002	SW20	0	2	Sediment	SD0005
PHASE2	SW24	08/13/2002	SW24	0	1	Sediment	SD0006

Samples in Each Data Package - CAS

Data Package CAS K2205620

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	SW24	08/13/2002	SW24	0	2	Sediment	SD0007
PHASE2	SW25	08/13/2002	SW25	0	1	Sediment	SD0008
PHASE2	SW25	08/13/2002	SW25	0	2	Sediment	SD0009
PHASE2	SW28	08/14/2002	SW28	0	1	Sediment	SD0010
PHASE2	SW28	08/14/2002	SW28	0	2	Sediment	SD0011
PHASE2	SW28	08/14/2002	SW28	0	3	Sediment	SD0012
PHASE2	SW27	08/14/2002	SW27	0	3	Sediment	SD0013
PHASE2	SW27	08/14/2002	SW27	1	1	Sediment	SD0014
PHASE2	SW27	08/14/2002	SW27	0	2	Sediment	SD0015
PHASE2	SW27	08/14/2002	SW27	2	1	Sediment	SD0016

Data Package CAS K2206020

Survey	Station	Date	Main sample ID	Field replicate ID	Sub-sample ID	Sample	Sample
PHASE2	SWM-Lob	08/27/2002	BI0001	1	0	Lobster edible tissue	BI0001
PHASE2	SWM-Lob	08/27/2002	BI0002	2	0	Lobster edible tissue	BI0002
PHASE2	SWM-Lob	08/27/2002	BI0003	3	0	Lobster edible tissue	BI0003
PHASE2	NSCO-Lob	09/08/2002	BI0004	1	0	Lobster edible tissue	BI0004
PHASE2	NSCO-Lob	09/08/2002	BI0005	2	0	Lobster edible tissue	BI0005
PHASE2	NSCO-Lob	09/20/2002	BI0009	3	0	Lobster edible tissue	BI0009
PHASE2	NSCO-Lob	09/20/2002	BI0010	4	0	Lobster edible tissue	BI0010
PHASE2	SWM-Lob	09/29/2002	BI0073	4	0	Lobster edible tissue	BI0073
PHASE2	SWM-Lob	09/29/2002	BI0074	5	0	Lobster edible tissue	BI0074
PHASE2	2230	10/02/2002	BI0085	1	0	Lobster edible tissue	BI0085
PHASE2	2230	10/02/2002	BI0086	2	0	Lobster edible tissue	BI0086
PHASE2	2230	10/02/2002	BI0087	3	0	Lobster edible tissue	BI0087
PHASE2	2230	10/02/2002	BI0088	4	0	Lobster edible tissue	BI0088
PHASE2	2230	10/02/2002	BI0089	5	0	Lobster edible tissue	BI0089

Data Package CAS K2206077

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	SW17	08/26/2002	SW17	0	1	Sediment	SD0017
PHASE2	SW17	08/26/2002	SW17	0	2	Sediment	SD0018
PHASE2	SW17	08/26/2002	SW17	0	3	Sediment	SD0019
PHASE2	SW12	08/27/2002	SW12	0	1	Sediment	SD0020A
PHASE2	SW12	08/27/2002	SW12	0	2	Sediment	SD0021

Samples in Each Data Package - CAS

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Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	SW36	08/27/2002	SW36	0	1	Sediment	SD0022
PHASE2	SW36	08/27/2002	SW36	0	2	Sediment	SD0023
PHASE2	SW31	08/27/2002	SW31	0	1	Sediment	SD0024
PHASE2	SW04	08/27/2002	SW04	0	1	Sediment	SD0025
PHASE2	SW04	08/27/2002	SW04	0	2	Sediment	SD0026
PHASE2	SW02	08/27/2002	SW02	0	1	Sediment	SD0027
PHASE2	SW02	08/27/2002	SW02	0	2	Sediment	SD0028
PHASE2	SW19	08/28/2002	SW19	0	1	Sediment	SD0029
PHASE2	SW19	08/28/2002	SW19	0	2	Sediment	SD0030
PHASE2	SW19	08/28/2002	SW19	0	3	Sediment	SD0031
PHASE2	SW33	08/28/2002	SW33	0	1	Sediment	SD0032
PHASE2	SW08	08/28/2002	SW08	1	1	Sediment	SD0033
PHASE2	SW31	08/27/2002	SW31	0	2	Sediment	SD0034
PHASE2	SW02	08/27/2002	SW02	0	3	Sediment	SD0037
PHASE2	SW08	08/28/2002	SW08	0	2	Sediment	SD0038
PHASE2	SW08	08/28/2002	SW08	0	3	Sediment	SD0039

Data Package CAS K2206081

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	SW08	08/28/2002	SW08	2	1	Sediment	SD0040
PHASE2	SW10	08/28/2002	SW10	0	1	Sediment	SD0041
PHASE2	SW10	08/28/2002	SW10	0	2	Sediment	SD0042
PHASE2	SW29	08/28/2002	SW29	0	1	Sediment	SD0043
PHASE2	SW29	08/28/2002	SW29	0	2	Sediment	SD0044
PHASE2	SW29	08/28/2002	SW29	0	3	Sediment	SD0045
PHASE2	SW29	08/28/2002	SW29	0	4	Sediment	SD0046
PHASE2	SW33	08/28/2002	SW33	0	2	Sediment	SD0047
PHASE2	SW08	08/28/2002	SW08	0	4	Sediment	SD0048
PHASE2	SW32	08/29/2002	SW32	0	1	Sediment	SD0051
PHASE2	SW34	08/29/2002	SW34	1	1	Sediment	SD0052
PHASE2	SW34	08/29/2002	SW34	2	1	Sediment	SD0054
PHASE2	SW30	08/29/2002	SW30	0	1	Sediment	SD0055
PHASE2	SW30	08/29/2002	SW30	0	2	Sediment	SD0056
PHASE2	SW30	08/29/2002	SW30	0	3	Sediment	SD0057
PHASE2	SW30	08/29/2002	SW30	0	4	Sediment	SD0058
PHASE2	SW32	08/29/2002	SW32	0	2	Sediment	SD0059
PHASE2	SW30	08/29/2002	SW30	0	5	Sediment	SD0060

Samples in Each Data Package - CAS

Data Package CAS K2206258

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	NA19	09/03/2002	NA19	0	1	Sediment	SD0065
PHASE2	NA19	09/03/2002	NA19	0	2	Sediment	SD0066
PHASE2	NA19	09/03/2002	NA19	0	3	Sediment	SD0067
PHASE2	NA06	09/03/2002	NA06	0	1	Sediment	SD0068
PHASE2	NA06	09/03/2002	NA06	0	2	Sediment	SD0069
PHASE2	NA20	09/04/2002	NA20	0	1	Sediment	SD0070
PHASE2	NA20	09/04/2002	NA20	0	2	Sediment	SD0071
PHASE2	NA20	09/04/2002	NA20	1	3	Sediment	SD0072
PHASE2	NA20	09/04/2002	NA20	0	4	Sediment	SD0073
PHASE2	NA20	09/04/2002	NA20	2	3	Sediment	SD0074
PHASE2	NA16	09/04/2002	NA16	0	1	Sediment	SD0075
PHASE2	NA16	09/04/2002	NA16	1	2	Sediment	SD0076
PHASE2	NA16	09/04/2002	NA16	0	3	Sediment	SD0077
PHASE2	NA16	09/04/2002	NA16	2	2	Sediment	SD0078
PHASE2	NA09	09/04/2002	NA09	0	1	Sediment	SD0079
PHASE2	NA09	09/04/2002	NA09	0	2	Sediment	SD0080
PHASE2	NA09	09/04/2002	NA09	0	3	Sediment	SD0081
PHASE2	NA09	09/04/2002	NA09	0	4	Sediment	SD0082
PHASE2	NA04	09/04/2002	NA04	0	1	Sediment	SD0084

Data Package CAS K2206262

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	NA04	09/04/2002	NA04	0	2	Sediment	SD0085
PHASE2	NA04	09/04/2002	NA04	0	3	Sediment	SD0086
PHASE2	NA04	09/04/2002	NA04	0	4	Sediment	SD0087
PHASE2	NA17R	09/04/2002	NA17R	0	1	Sediment	SD0088
PHASE2	NA17R	09/04/2002	NA17R	0	2	Sediment	SD0089
PHASE2	NA17R	09/04/2002	NA17R	0	3	Sediment	SD0090
PHASE2	NA23R	09/04/2002	NA23R	0	1	Sediment	SD0091
PHASE2	NA23R	09/04/2002	NA23R	0	2	Sediment	SD0092

Data Package CAS K2206384

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	NA17	09/08/2002	NA17-SS	0	CR	Sediment	PW0001S
PHASE2	NA17	09/08/2002	NA17-SS	0	PW	Sediment pore water	PW0001W

Samples in Each Data Package - CAS

Data Package CAS K2206384

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	NA16	09/08/2002	NA16-SS	1	CR	Sediment	PW0002S
PHASE2	NA16	09/08/2002	NA16-SS	1	PW	Sediment pore water	PW0002W
PHASE2	NA16	09/08/2002	NA16-SS	2	CR	Sediment	PW0003S
PHASE2	NA16	09/08/2002	NA16-SS	2	PW	Sediment pore water	PW0003W
PHASE2	NA06	09/08/2002	NA06-SS	0	CR	Sediment	PW0004S
PHASE2	NA06	09/08/2002	NA06-SS	0	PW	Sediment pore water	PW0004W
PHASE2	SW12	09/10/2002	SW12-SS	0	CR	Sediment	PW0005S
PHASE2	SW12	09/10/2002	SW12-SS	0	PW	Sediment pore water	PW0005W
PHASE2	SW04	09/10/2002	SW04-SS	0	CR	Sediment	PW0006S
PHASE2	SW04	09/10/2002	SW04-SS	0	PW	Sediment pore water	PW0006W
PHASE2	SW24	09/10/2002	SW24-SS	0	CR	Sediment	PW0007S
PHASE2	SW24	09/10/2002	SW24-SS	0	PW	Sediment pore water	PW0007W
PHASE2	SW25	09/10/2002	SW25-SS	0	CR	Sediment	PW0008S
PHASE2	SW25	09/10/2002	SW25-SS	0	PW	Sediment pore water	PW0008W
PHASE2	NA13	09/11/2002	NA13-SS	0	CR	Sediment	PW0009S
PHASE2	NA13	09/11/2002	NA13-SS	0	PW	Sediment pore water	PW0009W
PHASE2	SW28	09/11/2002	SW28-SS	0	CR	Sediment	PW0010S
PHASE2	SW28	09/11/2002	SW28-SS	0	PW	Sediment pore water	PW0010W

Data Package CAS K2206396

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	NA24	09/08/2002	NA24	0	SED	Sediment	SD0094
PHASE2	NA23R	09/08/2002	NA23R	0	SED	Sediment	SD0095
PHASE2	NA17	09/08/2002	NA17	0	SED	Sediment	SD0097
PHASE2	NA16	09/08/2002	NA16	1	SED	Sediment	SD0099
PHASE2	NA16	09/08/2002	NA16	2	SED	Sediment	SD0100
PHASE2	NA06	09/08/2002	NA06	0	SED	Sediment	SD0101
PHASE2	2435	09/09/2002	2435	0	SED	Sediment	SD0102
PHASE2	2229	09/09/2002	2229	0	SED	Sediment	SD0103
PHASE2	2230	09/09/2002	2230	0	SED	Sediment	SD0104
PHASE2	NA31	09/09/2002	NA31	0	SED	Sediment	SD0105
PHASE2	NA25	09/09/2002	NA25	0	SED	Sediment	SD0106
PHASE2	2265	09/09/2002	2265	0	SED	Sediment	SD0107
PHASE2	SW32	09/09/2002	SW32	0	SED	Sediment	SD0108
PHASE2	SW29	09/09/2002	SW29	0	SED	Sediment	SD0110

Samples in Each Data Package - CAS

Data Package CAS K2206396 (Organophosphorus Pesticides)

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	NA04	09/08/2002	NA04	0	SED	Sediment	SD0096
PHASE2	NA11	09/08/2002	NA11	0	SED	Sediment	SD0098

Data Package CAS K2206403

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	SW12	09/10/2002	SW12	0	SED	Sediment	SD0111
PHASE2	SW04	09/10/2002	SW04	0	SED	Sediment	SD0112
PHASE2	SW24	09/10/2002	SW24	0	SED	Sediment	SD0113
PHASE2	SW25	09/10/2002	SW25	0	SED	Sediment	SD0114
PHASE2	NA30	09/11/2002	NA30	0	SED	Sediment	SD0115
PHASE2	NA26	09/11/2002	NA26	0	SED	Sediment	SD0116
PHASE2	SW34	09/11/2002	SW34	0	SED	Sediment	SD0117
PHASE2	SW33	09/11/2002	SW33	0	SED	Sediment	SD0118
PHASE2	NA29	09/11/2002	NA29	0	SED	Sediment	SD0119
PHASE2	NA13	09/11/2002	NA13	0	SED	Sediment	SD0120
PHASE2	SW28	09/11/2002	SW28	0	SED	Sediment	SD0121
PHASE2	SW31	09/11/2002	SW31	0	SED	Sediment	SD0122

Data Package CAS K2206403 (Organophosphorus Pesticides)

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	SW04	09/10/2002	SW04	0	SED	Sediment	SD0112

Data Package CAS K2206465

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	EBLANK	09/13/2002	EB0002	0	0	Equipment blank - soil	EB0002
PHASE2	EBLANK	09/13/2002	EB0003	0	0	Equipment blank - water	EB0003
PHASE2	2441	09/12/2002	2441-SS	0	CR	Sediment	PW0011S
PHASE2	2441	09/12/2002	2441-SS	0	PW	Sediment pore water	PW0011W
PHASE2	2243	09/12/2002	2243-SS	0	CR	Sediment	PW0012S
PHASE2	2243	09/12/2002	2243-SS	0	PW	Sediment pore water	PW0012W
PHASE2	2433	09/13/2002	2233-SS	0	CR	Sediment	PW0013S

Samples in Each Data Package - CAS

Data Package CAS K2206465

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	2433	09/13/2002	2433-SS	0	PW	Sediment pore water	PW0013W
PHASE2	2440	09/13/2002	2440-SS	0	CR	Sediment	PW0014S
PHASE2	2440	09/13/2002	2440-SS	0	PW	Sediment pore water	PW0014W
PHASE2	SW08	09/13/2002	SW08-SS	0	CR	Sediment	PW0015S
PHASE2	SW08	09/13/2002	SW08-SS	0	PW	Sediment pore water	PW0015W

Data Package CAS K2206472

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	2441	09/12/2002	2441	0	SED	Sediment	SD0123
PHASE2	2243	09/12/2002	2243	0	SED	Sediment	SD0124
PHASE2	2240	09/12/2002	2240	0	SED	Sediment	SD0125
PHASE2	2244	09/12/2002	2244	1	SED	Sediment	SD0126
PHASE2	2244	09/12/2002	2244	2	SED	Sediment	SD0127
PHASE2	2241	09/12/2002	2241	0	SED	Sediment	SD0128
PHASE2	2433	09/13/2002	2433	0	SED	Sediment	SD0130
PHASE2	2440	09/13/2002	2440	0	SED	Sediment	SD0131
PHASE2	SW08	09/13/2002	SW08	0	SED	Sediment	SD0133

Data Package CAS K2206472 (Organophosphorus Pesticides)

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	NA22	09/12/2002	NA22	1	SED	Sediment	SD0129
PHASE2	NA22	09/12/2002	NA22	2	SED	Sediment	SD0132

Data Package CAS K2206508

Survey	Station	Date	Main sample ID	Field replicate ID	Sub-sample ID	Sample	Sample
PHASE2	NA19	09/16/2002	Mussel	0	0	Mussel tissu	BI0006
PHASE2	SW18	09/16/2002	Mussel	0	0	Mussel tissu	BI0007
PHASE2	2240	09/16/2002	Mussel	0	0	Mussel tissu	BI0008
PHASE2	SW27	09/23/2002	Mussel	0	0	Mussel tissu	BI0011
PHASE2	NA24	09/23/2002	Mussel	0	0	Mussel tissu	BI0012

Samples in Each Data Package - CAS

Data Package CAS K2206551

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	2231	09/14/2002	2231-SS	0	CR	Sediment	PW0016S
PHASE2	2231	09/14/2002	2231-SS	0	PW	Sediment pore water	PW0016W
PHASE2	NA01	09/14/2002	NA01-SS	0	CR	Sediment	PW0017S
PHASE2	NA01	09/14/2002	NA01-SS	0	PW	Sediment pore water	PW0017W
PHASE2	SW01	09/14/2002	SW01-SS	0	CR	Sediment	PW0018S
PHASE2	SW01	09/14/2002	SW01-SS	0	PW	Sediment pore water	PW0018W
PHASE2	SW02	09/14/2002	SW02-SS	0	CR	Sediment	PW0019S
PHASE2	SW02	09/14/2002	SW02-SS	0	PW	Sediment pore water	PW0019W

Data Package CAS K2206552

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	2231	09/14/2002	2231	0	SED	Sediment	SD0134
PHASE2	SW30	09/14/2002	SW30	0	SED	Sediment	SD0135
PHASE2	NA01	09/14/2002	NA01	0	SED	Sediment	SD0136
PHASE2	SW01	09/14/2002	SW01	0	SED	Sediment	SD0137
PHASE2	SW02	09/14/2002	SW02	0	SED	Sediment	SD0138

Data Package CAS K2206703

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	NA02	09/18/2002	NA02	0	1	Sediment	SD0139
PHASE2	NA02	09/18/2002	NA02	0	2	Sediment	SD0140
PHASE2	NA01	09/18/2002	NA01	0	1	Sediment	SD0141
PHASE2	NA01	09/18/2002	NA01	1	2	Sediment	SD0142
PHASE2	NA01	09/18/2002	NA01	0	3	Sediment	SD0143
PHASE2	NA01	09/18/2002	NA01	2	2	Sediment	SD0146

Data Package CAS K2206826

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	EBLANK	09/24/2002	EB0004	0	0	Equipment blank - soil	EB0004
PHASE2	EBLANK	09/24/2002	EB0005	0	0	Equipment blank - soil	EB0005
PHASE2	NA31	09/19/2002	NA31	0	1	Sediment	SD0144

Samples in Each Data Package - CAS

Data Package CAS K2206826

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	NA31	09/19/2002	NA31	0	2	Sediment	SD0145
PHASE2	NA26	09/19/2002	NA26	0	1	Sediment	SD0147
PHASE2	NA26	09/19/2002	NA26	0	2	Sediment	SD0148
PHASE2	NA26	09/19/2002	NA26	0	3	Sediment	SD0149
PHASE2	NA26	09/19/2002	NA26	0	4	Sediment	SD0150
PHASE2	NA30	09/20/2002	NA30	0	1	Sediment	SD0151
PHASE2	NA30	09/20/2002	NA30	0	2	Sediment	SD0152
PHASE2	NA25	09/20/2002	NA25	0	1	Sediment	SD0153
PHASE2	NA25	09/20/2002	NA25	0	2	Sediment	SD0154
PHASE2	NA25	09/20/2002	NA25	0	3	Sediment	SD0155
PHASE2	NA13	09/20/2002	NA13	0	1	Sediment	SD0156
PHASE2	NA13	09/20/2002	NA13	0	2	Sediment	SD0157
PHASE2	NA21	09/21/2002	NA21	0	1	Sediment	SD0158
PHASE2	NA21	09/21/2002	NA21	0	2	Sediment	SD0159
PHASE2	NA21	09/21/2002	NA21	0	3	Sediment	SD0160
PHASE2	NA21	09/21/2002	NA21	0	4	Sediment	SD0161
PHASE2	NA29	09/21/2002	NA29	0	1	Sediment	SD0162
PHASE2	NA29	09/21/2002	NA29	1	2	Sediment	SD0163
PHASE2	NA29	09/21/2002	NA29	2	2	Sediment	SD0164
PHASE2	NA24	09/21/2002	NA24	0	1	Sediment	SD0165
PHASE2	NA24	09/21/2002	NA24	0	2	Sediment	SD0166

Data Package CAS K2207123

Survey	Station	Date	Main sample ID	Field replicate ID	Sub-sample ID	Sample	Sample
PHASE2	NSCO-Lob	09/27/2002	BI0059	2	0	Lobster whole body	BI0059
PHASE2	NSCO-Lob	09/27/2002	BI0060	3	0	Lobster whole body	BI0060
PHASE2	NSCO-Lob	09/27/2002	BI0061	4	0	Lobster whole body	BI0061
PHASE2	NSCO-Lob	09/27/2002	BI0062	5	0	Lobster whole body	BI0062
PHASE2	NSCO-Lob	09/28/2002	BI0063	6	0	Lobster whole body	BI0063
PHASE2	NSCO-Lob	09/28/2002	BI0064	7	0	Lobster whole body	BI0064
PHASE2	SWM-Lob	09/29/2002	BI0075	1	0	Lobster whole body	BI0075
PHASE2	SWM-Lob	09/29/2002	BI0076	2	0	Lobster whole body	BI0076
PHASE2	SWM-Lob	09/29/2002	BI0077	3	0	Lobster whole body	BI0077
PHASE2	SWM-Lob	09/29/2002	BI0078	4	0	Lobster whole body	BI0078
PHASE2	SWM-Lob	09/29/2002	BI0079	5	0	Lobster whole body	BI0079
PHASE2	2230	10/02/2002	BI0090	1	0	Lobster whole body	BI0090
PHASE2	2230	10/02/2002	BI0091	2	0	Lobster whole body	BI0091
PHASE2	2230	10/02/2002	BI0092	3	0	Lobster whole body	BI0092
PHASE2	2230	10/02/2002	BI0093	4	0	Lobster whole body	BI0093

Samples in Each Data Package - CAS

Data Package CAS K2207123

Survey	Station	Date	Main sample ID	Field replicate ID	Sub-sample ID	Sample	Sample
PHASE2	2230	10/02/2002	BI0094	5	0	Lobster whole body	BI0094

Data Package CAS K2207129

Survey	Station	Date	Main sample ID	Field replicate ID	Sub-sample ID	Sample	Sample
PHASE2	NAFI01	09/26/2002	SSB-F	1	0	Spotted sand bass fillet	BI0013
PHASE2	SWFI01	09/25/2002	SSB-F	1	0	Spotted sand bass fillet	BI0014
PHASE2	SWFI01	09/25/2002	SSB-F	2	0	Spotted sand bass fillet	BI0015
PHASE2	SWFI01	09/25/2002	SSB-F	3	0	Spotted sand bass fillet	BI0016
PHASE2	SWFI01	09/25/2002	SSB-F	4	0	Spotted sand bass fillet	BI0017
PHASE2	SWFI01	09/25/2002	SSB-F	5	0	Spotted sand bass fillet	BI0018
PHASE2	NAFI01	09/26/2002	SSB-F	2	0	Spotted sand bass fillet	BI0024
PHASE2	NAFI01	09/26/2002	SSB-F	3	0	Spotted sand bass fillet	BI0025
PHASE2	NAFI01	09/26/2002	SSB-F	4	0	Spotted sand bass fillet	BI0026
PHASE2	NAFI01	09/26/2002	SSB-F	5	0	Spotted sand bass fillet	BI0027
PHASE2	SWFI02	09/27/2002	SSB-F	1	0	Spotted sand bass fillet	BI0033
PHASE2	SWFI02	09/27/2002	SSB-F	2	0	Spotted sand bass fillet	BI0034
PHASE2	SWFI02	09/27/2002	SSB-F	3	0	Spotted sand bass fillet	BI0035
PHASE2	SWFI02	09/27/2002	SSB-F	4	0	Spotted sand bass fillet	BI0036
PHASE2	SWFI02	09/27/2002	SSB-F	5	0	Spotted sand bass fillet	BI0037
PHASE2	2240	09/27/2002	SSB-F	1	0	Spotted sand bass fillet	BI0043
PHASE2	2240	09/27/2002	SSB-F	2	0	Spotted sand bass fillet	BI0044
PHASE2	2240	09/27/2002	SSB-F	3	0	Spotted sand bass fillet	BI0045
PHASE2	2240	09/27/2002	SSB-F	4	0	Spotted sand bass fillet	BI0046
PHASE2	2240	09/27/2002	SSB-F	5	0	Spotted sand bass fillet	BI0047
PHASE2	NAFI02	09/27/2002	SSB-F	1	0	Spotted sand bass fillet	BI0053
PHASE2	NAFI02	09/27/2002	SSB-F	2	0	Spotted sand bass fillet	BI0054
PHASE2	NAFI02	09/27/2002	SSB-F	3	0	Spotted sand bass fillet	BI0055
PHASE2	NAFI02	09/27/2002	SSB-F	4	0	Spotted sand bass fillet	BI0056
PHASE2	NAFI02	09/28/2002	SSB-F	5	0	Spotted sand bass fillet	BI0057

Data Package CAS K2207131

Survey	Station	Date	Main sample ID	Field replicate ID	Sub-sample ID	Sample	Sample
PHASE2	SWFI01	09/25/2002	SSB-WB	1	0	Spotted sand bass whole	BI0019
PHASE2	SWFI01	09/25/2002	SSB-WB	2	0	Spotted sand bass whole	BI0020
PHASE2	SWFI01	09/25/2002	SSB-WB	3	0	Spotted sand bass whole	BI0021

Samples in Each Data Package - CAS

Data Package CAS K2207131

Survey	Station	Date	Main sample ID	Field replicate ID	Sub-sample ID	Sample	Sample
PHASE2	SWFI01	09/25/2002	SSB-WB	4	0	Spotted sand bass whole	BI0022
PHASE2	SWFI01	09/25/2002	SSB-WB	5	0	Spotted sand bass whole	BI0023
PHASE2	NAFI01	09/26/2002	SSB-WB	1	0	Spotted sand bass whole	BI0028
PHASE2	NAFI01	09/26/2002	SSB-WB	2	0	Spotted sand bass whole	BI0029
PHASE2	NAFI01	09/26/2002	SSB-WB	3	0	Spotted sand bass whole	BI0030
PHASE2	NAFI01	09/26/2002	SSB-WB	4	0	Spotted sand bass whole	BI0031
PHASE2	NAFI01	09/26/2002	SSB-WB	5	0	Spotted sand bass whole	BI0032
PHASE2	SWFI02	09/27/2002	SSB-WB	1	0	Spotted sand bass whole	BI0038
PHASE2	SWFI02	09/27/2002	SSB-WB	2	0	Spotted sand bass whole	BI0039
PHASE2	SWFI02	09/27/2002	SSB-WB	3	0	Spotted sand bass whole	BI0040
PHASE2	SWFI02	09/27/2002	SSB-WB	4	0	Spotted sand bass whole	BI0041
PHASE2	SWFI02	09/27/2002	SSB-WB	5	0	Spotted sand bass whole	BI0042
PHASE2	2240	09/27/2002	SSB-WB	1	0	Spotted sand bass whole	BI0048
PHASE2	2240	09/27/2002	SSB-WB	2	0	Spotted sand bass whole	BI0049
PHASE2	2240	09/27/2002	SSB-WB	3	0	Spotted sand bass whole	BI0050
PHASE2	2240	09/27/2002	SSB-WB	4	0	Spotted sand bass whole	BI0051
PHASE2	2240	09/27/2002	SSB-WB	5	0	Spotted sand bass whole	BI0052
PHASE2	NAFI02	09/28/2002	SSB-WB	1	0	Spotted sand bass whole	BI0065
PHASE2	NAFI02	09/28/2002	SSB-WB	2	0	Spotted sand bass whole	BI0066
PHASE2	NAFI02	09/28/2002	SSB-WB	3	0	Spotted sand bass whole	BI0067
PHASE2	NAFI02	09/28/2002	SSB-WB	4	0	Spotted sand bass whole	BI0068
PHASE2	SWFI02	09/28/2002	FF-WB	0	0	Forage fish whole body	BI0069
PHASE2	NAFI02	09/28/2002	FF-WB	1	0	Forage fish whole body	BI0070-1
PHASE2	NAFI02	09/28/2002	FF-WB	2	0	Forage fish whole body	BI0070-2
PHASE2	NAFI02	09/29/2002	FF-WB	3	0	Forage fish whole body	BI0070-3
PHASE2	NAFI02	09/29/2002	FF-WB	4	0	Forage fish whole body	BI0070-4
PHASE2	2240	09/28/2002	FF-WB	1	0	Forage fish whole body	BI0071-1
PHASE2	2240	09/28/2002	FF-WB	2	0	Forage fish whole body	BI0071-2
PHASE2	2240	09/28/2002	FF-WB	3	0	Forage fish whole body	BI0071-3
PHASE2	NAFI02	09/29/2002	SSB-WB	5	0	Spotted sand bass whole	BI0080
PHASE2	NAFI01	09/29/2002	FF-WB	0	0	Forage fish whole body	BI0081
PHASE2	SWFI01	10/01/2002	FF-WB	1	0	Forage fish whole body	BI0083-1
PHASE2	SWFI01	10/01/2002	FF-WB	2	0	Forage fish whole body	BI0083-2
PHASE2	SWFI01	10/01/2002	FF-WB	3	0	Forage fish whole body	BI0083-3

Data Package CAS K2207139

Survey	Station	Date	Main sample ID	Field replicate ID	Sub-sample ID	Sample	Sample
PHASE2	SW-EG-1	10/01/2002	EELGRASS	0	0	Eel grass	BI0082
PHASE2	NA-EG-1	10/02/2002	EELGRASS	0	0	Eel grass	BI0084

Samples in Each Data Package - CAS

Data Package CAS K2207139

Survey	Station	Date	Main sample ID	Field split/ replicate ID	Sub-sample ID	Sample	Sample
PHASE2	2240-EG	10/02/2002	EELGRASS	0	0	Eel grass	BI0095
PHASE2	EBLANK	10/03/2002	EB0006	0	0	Equipment blank - soil	EB0006
PHASE2	NA28	10/02/2002	NA28	0	SED	Sediment	SD0300
PHASE2	NA27	10/02/2002	NA27	0	SED	Sediment	SD0301

Data Package CAS K2208081

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	EBLANK	11/08/2002	EB0007	0	0	Equipment blank - soil	EB0007

Data Package CAS K2208082

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	SW36	11/07/2002	SW36	0	SED	Sediment	SD0180

Data Package CAS K2301116 (Organochlorine pesticides)

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	NA04	09/08/2002	NA04	0	SED	Sediment	SD0096
PHASE2	NA11	09/08/2002	NA11	0	SED	Sediment	SD0098
PHASE2	SW04	09/10/2002	SW04	0	SED	Sediment	SD0112
PHASE2	NA22	09/12/2002	NA22	1	SED	Sediment	SD0129

Samples in Each Data Package - GERG

Data Package GERG B1147A S

Survey	Station	Date	Main sample ID	Field replicate ID	Sub-sample ID	Sample	Sample
PHASE2	SWFI01	10/04/2002	SWFI01	1	0	Fish bile	BC-1
PHASE2	SWFI01	10/04/2002	SWFI01	10	0	Fish bile	BC-10
PHASE2	NAFI01	10/04/2002	NAFI01	1	0	Fish bile	BC-11
PHASE2	NAFI01	10/04/2002	NAFI01	2	0	Fish bile	BC-12
PHASE2	NAFI01	10/04/2002	NAFI01	3	0	Fish bile	BC-13
PHASE2	NAFI01	10/04/2002	NAFI01	4	0	Fish bile	BC-14
PHASE2	NAFI01	10/04/2002	NAFI01	5	0	Fish bile	BC-15
PHASE2	NAFI01	10/04/2002	NAFI01	6	0	Fish bile	BC-16
PHASE2	NAFI01	10/04/2002	NAFI01	7	0	Fish bile	BC-17
PHASE2	NAFI01	10/04/2002	NAFI01	8	0	Fish bile	BC-18
PHASE2	NAFI01	10/04/2002	NAFI01	9	0	Fish bile	BC-19
PHASE2	SWFI01	10/04/2002	SWFI01	2	0	Fish bile	BC-2
PHASE2	NAFI01	10/04/2002	NAFI01	10	0	Fish bile	BC-20
PHASE2	SWFI01	10/04/2002	SWFI01	3	0	Fish bile	BC-3
PHASE2	SWFI01	10/04/2002	SWFI01	4	0	Fish bile	BC-4
PHASE2	SWFI01	10/04/2002	SWFI01	5	0	Fish bile	BC-5
PHASE2	SWFI01	10/04/2002	SWFI01	6	0	Fish bile	BC-6
PHASE2	SWFI01	10/04/2002	SWFI01	7	0	Fish bile	BC-7
PHASE2	SWFI01	10/04/2002	SWFI01	8	0	Fish bile	BC-8
PHASE2	SWFI01	10/04/2002	SWFI01	9	0	Fish bile	BC-9

Data Package GERG B1148A S

Survey	Station	Date	Main sample ID	Field replicate ID	Sub-sample ID	Sample	Sample
PHASE2	2240FI	10/04/2002	2240FI	1	0	Fish bile	BC-21
PHASE2	2240FI	10/04/2002	2240FI	2	0	Fish bile	BC-22
PHASE2	2240FI	10/04/2002	2240FI	3	0	Fish bile	BC-23
PHASE2	2240FI	10/04/2002	2240FI	4	0	Fish bile	BC-24
PHASE2	2240FI	10/04/2002	2240FI	5	0	Fish bile	BC-25
PHASE2	2240FI	10/04/2002	2240FI	6	0	Fish bile	BC-26
PHASE2	2240FI	10/04/2002	2240FI	7	0	Fish bile	BC-27
PHASE2	2240FI	10/04/2002	2240FI	8	0	Fish bile	BC-28
PHASE2	2240FI	10/04/2002	2240FI	9	0	Fish bile	BC-29
PHASE2	2240FI	10/04/2002	2240FI	10	0	Fish bile	BC-30
PHASE2	SWFI02	10/04/2002	SWFI02	1	0	Fish bile	BC-31
PHASE2	SWFI02	10/04/2002	SWFI02	2	0	Fish bile	BC-32
PHASE2	SWFI02	10/04/2002	SWFI02	3	0	Fish bile	BC-33
PHASE2	SWFI02	10/04/2002	SWFI02	4	0	Fish bile	BC-34

Samples in Each Data Package - GERG

Data Package GERG B1148A S

Survey	Station	Date	Main sample ID	Field replicate ID	Sub-sample ID	Sample	Sample
PHASE2	SWFI02	10/04/2002	SWFI02	5	0	Fish bile	BC-35
PHASE2	SWFI02	10/04/2002	SWFI02	6	0	Fish bile	BC-36
PHASE2	SWFI02	10/04/2002	SWFI02	7	0	Fish bile	BC-37
PHASE2	SWFI02	10/04/2002	SWFI02	8	0	Fish bile	BC-38
PHASE2	SWFI02	10/04/2002	SWFI02	9	0	Fish bile	BC-39
PHASE2	SWFI02	10/04/2002	SWFI02	10	0	Fish bile	BC-40

Data Package GERG B1149A S

Survey	Station	Date	Main sample ID	Field replicate ID	Sub-sample ID	Sample	Sample
PHASE2	NAFI02	10/04/2002	NAFI02	1	0	Fish bile	BC-41
PHASE2	NAFI02	10/04/2002	NAFI02	2	0	Fish bile	BC-42
PHASE2	NAFI02	10/04/2002	NAFI02	3	0	Fish bile	BC-43
PHASE2	NAFI02	10/04/2002	NAFI02	4	0	Fish bile	BC-44
PHASE2	NAFI02	10/04/2002	NAFI02	5	0	Fish bile	BC-45
PHASE2	NAFI02	10/04/2002	NAFI02	6	0	Fish bile	BC-46
PHASE2	NAFI02	10/04/2002	NAFI02	7	0	Fish bile	BC-47
PHASE2	NAFI02	10/04/2002	NAFI02	8	0	Fish bile	BC-48
PHASE2	NAFI02	10/04/2002	NAFI02	9	0	Fish bile	BC-49
PHASE2	NAFI02	10/04/2002	NAFI02	10	0	Fish bile	BC-50

Samples in Each Data Package - Soil Technology

Data Package STI STI09252002

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	SW01	08/13/2002	SW01	0	1	Sediment	SD0001
PHASE2	SW01	08/13/2002	SW01	0	2	Sediment	SD0002
PHASE2	SW01	08/13/2002	SW01	0	3	Sediment	SD0003
PHASE2	SW24	08/13/2002	SW24-ENG	0	1	Sediment	SD0006E
PHASE2	SW24	08/13/2002	SW24-ENG	0	2	Sediment	SD0007E
PHASE2	SW17	08/26/2002	SW17-ENG	1	1	Sediment	SD0017E
PHASE2	SW17	08/26/2002	SW17-ENG	0	2	Sediment	SD0018E
PHASE2	SW17	08/26/2002	SW17-ENG	2	1	Sediment	SD0020
PHASE2	SW31	08/27/2002	SW31-ENG	0	1	Sediment	SD0035
PHASE2	SW31	08/27/2002	SW31-ENG	0	2	Sediment	SD0036
PHASE2	SW10	08/28/2002	SW10-ENG	0	1	Sediment	SD0049
PHASE2	SW10	08/28/2002	SW10-ENG	0	2	Sediment	SD0050
PHASE2	SW30	08/29/2002	SW30-ENG	0	1	Sediment	SD0061
PHASE2	SW30	08/29/2002	SW30-ENG	0	2	Sediment	SD0062
PHASE2	SW30	08/29/2002	SW30-ENG	0	3	Sediment	SD0063

Data Package STI STI10152002

Survey	Station	Date	Main sample ID	Field split ID	Sub-sample ID	Sample	Sample
PHASE2	NA06	09/03/2002	NA06-ENG	0	1	Sediment	SD0068E
PHASE2	NA06	09/03/2002	NA06-ENG	0	2	Sediment	SD0069E
PHASE2	NA09	09/04/2002	NA09-ENG	1	1	Sediment	SD0079E
PHASE2	NA09	09/04/2002	NA09	0	4	Sediment	SD0082
PHASE2	NA09	09/04/2002	NA09-ENG	2	1	Sediment	SD0083E
PHASE2	NA17R	09/04/2002	NA17R	0	1	Sediment	SD0088
PHASE2	NA17R	09/04/2002	NA17R-ENG	0	4	Sediment	SD0089E
PHASE2	NA17R	09/04/2002	NA17R-ENG	0	5	Sediment	SD0090E
PHASE2	NA13	09/20/2002	NA13-ENG	0	1	Sediment	SD0156E
PHASE2	NA13	09/20/2002	NA13-ENG	0	2	Sediment	SD0157E
PHASE2	NA24	09/21/2002	NA24-ENG	0	1	Sediment	SD0165E
PHASE2	NA24	09/21/2002	NA24-ENG	0	2	Sediment	SD0166E

Attachment F2

Analysis of Aromatic Hydrocarbon Metabolites in Bile

Geochemical and Environmental Research Group
STANDARD OPERATING PROCEDURES SOP-0302

ANALYSIS OF AROMATIC HYDROCARBON METABOLITES IN BILE

This document presents the procedures, materials, and quality control used in the performance of the above instrumental activities.

Quality Assurance Manager Date

Author/Revision By: Yaorong Qian

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ANALYSIS OF AROMATIC HYDROCARBON METABOLITES IN BILE

1.0 PURPOSE

This document provides the procedures used by the staff of the Geochemical and Environmental Research Group (GERG) of the College of Geosciences at Texas A&M University to analyze aromatic hydrocarbon metabolites in bile or other types of samples using high performance liquid chromatography (HPLC) with fluorescence detection (FL).

1.1 Summary

Organisms exposed to petroleum often accumulate polynuclear aromatic hydrocarbons (PAH). Assimilated PAHs can have functional groups added or modified by mixed-function oxidases (MFO) within an organism. This can result in the formation of toxic and/or carcinogenic polar metabolites. Bile samples are collected in the field, immediately frozen, and shipped to the laboratory. The aqueous samples are analyzed using high performance liquid chromatography (HPLC) with a fluorescence detector (FL) set at excitation/emission (EX/EM) wavelengths of 380/430 nm, 257/380 nm and 292/335 nm for benzo[a]pyrene, phenanthrene and naphthalene, respectively.

1.2 Applicability

The analytical procedures described in this document are applicable to the quantitative analysis of bile, water, sample extracts, and other sample matrices after appropriate preparation and purification.

1.3 Detection and Reporting Limits

Instrument detection limits using calibration standards have been performed to verify chromatographic elution order for target analytes.

The reporting limits for aromatic hydrocarbon metabolite analyses using HPLC/FL for bile samples are 0.6, 0.1, and 0.05 µg/mL.

1.4 Interferences

Method interferences may be caused by contaminants in solvents, reagents, and glassware. All materials utilized in this procedure are routinely demonstrated to have minimal interferences introduced during sample extraction and analytical activities by the preparation and analysis of a method blank with each QC sample batch.

Matrix interferences may be caused by naturally occurring biogenic materials. The extent of matrix interferences varies considerably depending upon the nature of the sample analyzed. Matrix interferences may be minimized by sample dilution and/or using different HPLC columns.

2.0 SAFETY

The hazards or toxicity of each compound or reagent used in GERG standard operating procedures have not been precisely determined. However, each chemical compound should be treated as a potential health hazard. Exposure to these compounds should be reduced to the lowest possible level. The laboratory maintains Material Safety Data Sheets (MSDS) that contain information regarding the safe handling of chemicals used at GERG facilities. A reference file of MSDS is available to all personnel involved with these materials. All laboratory personnel should direct any questions regarding safety issues to their supervisor or the Safety Officer.

3.0 QUALITY CONTROL

3.1 Standards

The approximate standard concentrations used for this analysis are: naphthalene, 4 ng/µL; phenanthrene, 2 ng/µL; and benzo[a]pyrene, 0.3 ng/µL. Standards are prepared in methanol and stored at -20°C in amber vials.

3.2 Calibration

Three calibration standards are analyzed at the beginning of each sample batch and the relative stand deviation (RSD) of the replicate standards should be within ± 20% before proceeding. A calibration verification standard is analyzed for every ten samples in the analytical sequence and at the end of the sequence. The relative percent difference (RPD) between the calibration verification standard and the initial calibration standards must be within 20% of the mean calibration value.

3.3 Reference Bile

A reference bile is analyzed and reported for each QC batch and must have an RSD of no more than ± 25% of the consensus value established between GERG and other laboratories.

3.4 Duplicates and Blanks

A duplicate sample is analyzed (if there is adequate sample) for every ten samples or less. The RPD between duplicate samples should be within 25%. Reagent blanks are analyzed three times daily at the beginning, middle, and end of the analytical sequence to ensure that contaminants from reagents and previous analyses are not interfering with analyses.

3.5 Analytical Notes

1. Detector sensitivity can vary significantly with small changes in the wavelength settings. The EX/EM wavelengths reported in this SOP are specific for GERG detectors.
2. Two detectors may be placed in series to facilitate analyzing two PAH metabolites at different EX/EM.
3. Smaller injection volumes may be required for bile samples having high metabolite concentrations.

4.0 APPARATUS AND MATERIALS

4.1 Equipment/Instrumentation

HPLC Pump	Spectra-Physics, Model 8800-010, ternary gradient pump, or equivalent.
Column Heater	Spectra-Physics, Model 8792-010
Autosampler	Hewlett Packard 1050 autosampler
Detector	Perkin-Elmer, Model LC-240 Luminescence Detector
Freezer	Cools to - 20°C

4.2 Labware and Apparatus

1 L Graduated Cylinder	Glass
Wash Bottle	Teflon
4 mL Vials	Amber, Glass
0.5 mL Vials	Tapered, Amber, Glass
Caps	Teflon-Lined
Microliter Syringes	10, 25, 100 and 1000 µL
Balance	Accurate to 0.0001 mg
Volumetric flasks	Glass, 10, 25, 50 and 100 mL
Autosampler Vials	0.5 mL tapered amber glass; Chromacol; Cat# 05CTV(A), or equivalent
Analytical Column	Waters Spherisorb ODS (2); 25 x 0.46 cm (ID); 5 µm C_{18} Reverse-Phase, or equivalent
Guard Column	Waters, 2.3 x 0.39 cm, or equivalent
Helium	Purified, ≥ 99.995%

4.3 Solvents, Reagents, and Standards

Water	Mallinckrodt, HPLC Grade
Methanol	Burdick and Jackson, GC grade
Acetic Acid	Baker, Ultrex
Naphthalene	Supelco or equivalent
Phenanthrene	Supelco or equivalent
Benzo[a]pyrene	Supelco or equivalent

5.0 PROCEDURES

5.1 Field Sample Collection

Dissection instruments are thoroughly rinsed with methanol before sampling and between samples. All glass storage vials are cleaned by combustion in a muffle furnace at 400°C for at least four hours.

Bile samples are collected by sacrificing live animals, excising the gall bladder and piercing it over a four milliliter amber sample vial or by using vacutainers. All samples are immediately frozen at or below -20°C.

5.2 Sample Preservation and Storage

Upon arrival at the laboratory sample vials are inspected, logged in, and unique laboratory identification numbers are assigned. Samples are maintained at -20°C ± 4°C until the start of analytical activities.

5.3 Preparation of Samples for analysis

After thawing, a 50 µl subsample of bile samples is placed in an autosampler vial. If sample amount is limited, smaller amount of samples (e.g., 5, 10, or 20 µL) is transferred to an autosampler vial and appropriate amount of 0.85% NaCl aqueous solution is added to the autosampler vial to bring the volume in the vial to 50 µL. A dilution factor (final volume (e.g., 50 µL) divided by sample amount transferred) is calculated and used in the final concentration calculations.

5.4 HPLC and Fluorescence Detector Operating Conditions

Column Oven Temperature	50 ± 1°C
HPLC Pump Run Time	35 minutes
Gradient Elution	Linear

Time	*Water (%)	Methanol (%)	Flow (mL/min)
0	100	0	1.0
15	0	100	1.0
22	0	100	1.0
25	100	0	1.0
35	100	0	1.0

*5 µL of acetic acid is added to each 1-liter of water.

LC-240 Fluorescence Detector 257 nm (excitation) 380 nm (emission) for phenanthrene;
292 nm (excitation) 335 nm (emission) for naphthalene;
380 nm (excitation) 430 nm (emission) for benzo[a]pyrene
Slit Width at 10 nm for both excitation and emission

5.5 Sample Analysis

Once optimal HPLC operating parameters have been established and the instrument is functioning according to specifications (see above), 5µl of each sample/standard are injected directly onto the HPLC system using the autosampler. The response of the fluorescence detector is acquired with Xchrom chromatographic software for 30 minutes at naphthalene, phenanthrene and benzo[a]pyrene excitation/emission wavelength pairs. Peak areas are integrated for those peaks eluting between 2 and 20 minutes for naphthalene, phenanthrene and benzo[a]pyrene metabolites. These times are approximate and are based on times reported in the NOAA Technical Memorandum, NMFS F/NWC-102 and are verified for each system.

5.6 Calculations

5.6.1 Phenanthrene, naphthalene, and benzo[a]pyrene peaks are identified from the calibration standards. The approximate retention times for naphthalene, phenanthrene, and benzo[a]pyrene are approximately 12, 14, and 18 minutes, respectively under the given analytical conditions. The retention times are recorded and the areas of the reference standards are integrated. The mean response factor (ng/integration unit) is used to calculate sample analyte concentrations.

5.6.2 The integrated areas of individual peaks for PAH metabolites are summed for each bile sample.

5.6.3 The metabolite concentrations at each wavelength pair are calculated using the following equations:

Eq. 1: concentration of naphthalene (NAPH) metabolites (ng/g wet weight) is equal to:

$$\left[\frac{\text{mean response factor (NAPH)}}{\mu\text{L sample (inj)}}\right] \text{x} \left[\frac{\text{area sum (~ 2 - 20 min)}}{\text{density of bile}}\right] \text{x dilution}$$

Eq. 2: concentration of phenanthrene (PHEN) metabolites (ng/g wet weight) is equal to:

$$\left[\frac{\text{mean response factor (PHEN)}}{\mu\text{L sample (inj)}}\right] \text{x} \left[\frac{\text{area sum (~ 2 - 20 min)}}{\text{density of bile}}\right] \text{x dilution}$$

Eq. 3: concentration of benzo[a]pyrene (BAP) metabolites (ng/g wet weight) is equal to:

$$\left[\frac{\text{mean response factor (BAP)}}{\mu\text{L sample (inj)}}\right] \text{x} \left[\frac{\text{area sum (~ 2 - 20 min)}}{\text{density of bile}}\right] \text{x dilution}$$

All data are reported to two significant figures.

5.6.4 The density conversion used for bile is 1 µl of bile is equal to 1 µg.

6.0 INSTRUMENT MAINTENANCE

6.1 Solvent levels need to be inspected to make sure the solvent amount is sufficient.

6.2 Pressure of helium and nitrogen tanks need to be maintained above 200 psi. Helium is used for solvent degassing. Nitrogen is used for autosampler operation.

6.3 Waste solvent collection bottle needs to be emptied.

6.4 Detector lamps need to be replaced when malfunctioning.

6.5 Column back pressure need to be checked before sample analysis. The normal operating pressure is in the range of 900 to 2000 PSI, depending on flow rate and mobile phase.

6.6 Guard column needs to be replaced once the pressure is above 2000 PSI.

7.0 DOCUMENTATION REQUIRED

Copies of the following documents (as appropriate for the sample types) must be kept for each sample set in a labeled folder in the trace metals laboratory office.

7.1 Chain of custody documents

7.2 Sample information sheet

7.3 Organic Analysis Request Form (Figure 7.1)

7.4 All analytical runs are recorded in the "HPLC Instrument Run Log," with the analysis date, client identification, analyst initials, and any relevant comments.

7.5 All initial calibration data together with Continuing Calibration Verification data, chromatograms, integrated peaks from the raw data and calculated results are maintained in computer records. This information can be printed upon client request.

Appendix G

Toxicity Test Data

Contents

Table G-1. Amphipod survival results

Station	Batch	Amphipod Survival (percent)				
		Replicate 1	Replicate 2	Replicate 3	Replicate 4	Replicate 5
Reference						
2441	640-2	95	100	95	85	100
2433	640-3	95	90	95	90	95
2440	640-3	95	100	95	100	95
2231	640-2	85	80	90	90	75
2243	640-3	90	90	95	95	75
NASSCO						
NA01	640-2	70	85	95	80	70
NA03	640-2	95	100	70	90	65
NA04	640-2	55	85	90	85	85
NA05	640-3	85	80	80	95	90
NA06	640-2	80	85	60	95	70
NA07	640-1	75	85	55	70	80
NA09	640-3	80	90	90	80	85
NA11	640-2	60	75	75	70	70
NA12	640-2	75	75	95	80	85
NA15	640-3	95	90	100	100	85
NA16	640-3	90	90	85	90	80
NA17	640-3	85	95	95	90	95
NA19	640-3	70	95	100	85	80
NA20	640-2	100	90	90	90	80
NA22	640-3	95	75	95	100	95
Southwest Marine						
SW02	640-2	95	90	90	75	90
SW03	640-2	95	85	95	85	100
SW04	640-1	75	95	100	100	95
SW08	640-2	95	95	85	90	90
SW09	640-2	85	95	85	100	75
SW11	640-3	70	85	75	70	75
SW13	640-2	85	90	95	95	95
SW15	640-2	100	90	90	80	100
SW17	640-3	85	90	95	95	95
SW18	640-3	75	95	40	80	70
SW21	640-2	85	90	90	95	95
SW22	640-3	85	90	90	85	85
SW23	640-3	80	100	90	85	85
SW25	640-3	90	80	85	70	90
SW27	640-3	60	65	95	65	70

Table G-2. Echinoderm fertilization results

Station	Batch	Echinoderm Fertilization (percent) Replicate 1	Replicate 2	Replicate 3	Replicate 4	Replicate 5
Reference						
2441	Batch 2	80	80	82	90	83
2433	Batch 2	83	69	73	68	71
2440	Batch 3	79	82	81	83	78
2231	Batch 1	96	92	92	99	87
2243	Batch 3	67	69	69	65	76
NASSCO						
NA01	Batch 2	78	77	84	75	80
NA03	Batch 2	78	84	74	80	70
NA04	Batch 2	80	77	85	79	82
NA05	Batch 3	75	74	63	78	67
NA06	Batch 1	99	94	97	99	93
NA07	Batch 1	99	93	91	95	97
NA09	Batch 3	69	70	76	73	83
NA11	Batch 1	93	95	97	93	91
NA12	Batch 2	86	86	85	72	82
NA15	Batch 2	81	86	78	81	78
NA16	Batch 2	76	85	70	80	73
NA17	Batch 2	77	83	82	81	80
NA19	Batch 2	63	74	57	65	70
NA20	Batch 2	66	81	72	70	72
NA22	Batch 3	83	84	80	85	83
Southwest Marine						
SW02	Batch 1	95	96	97	97	94
SW03	Batch 1	96	95	94	96	98
SW04	Batch 3	85	79	79	82	82
SW08	Batch 1	94	94	95	97	98
SW09	Batch 1	94	92	92	95	92
SW11	Batch 3	76	62	66	69	63
SW13	Batch 1	91	93	93	92	93
SW15	Batch 1	94	100	96	97	92
SW17	Batch 3	70	72	72	73	72
SW18	Batch 3	67	60	55	66	62
SW21	Batch 1	96	95	95	96	94
SW22	Batch 3	74	85	77	76	79
SW23	Batch 3	82	80	76	83	82
SW25	Batch 3	74	78	82	71	80
SW27	Batch 3	72	66	67	71	63

Table G-3. Bivalve normality results

Station	Batch	Bivalve Combined Survival and Normality (percent)				
		Replicate 1	Replicate 2	Replicate 3	Replicate 4	Replicate 5
Reference						
2441	Batch 2	69	77	60	64	59
2433	Batch 2	24	58	66	39	47
2440	Batch 2	61	71	66	64	88
2231	Batch 1	88	86	80	77	80
2243	Batch 2	62	24	75	8	79
NASSCO						
NA01	Batch 2	44	6	10	80	77
NA03	Batch 2	85	90	67	84	90
NA04	Batch 2	60	77	83	80	71
NA05	Batch 2	92	79	82	80	84
NA06	Batch 1	62	38	65	91	86
NA07	Batch 1	81	82	93	57	91
NA09	Batch 2	5	0	1	0	0
NA11	Batch 1	90	84	84	35	79
NA12	Batch 2	65	0	0	0	2
NA15	Batch 2	75	89	74	88	84
NA16	Batch 2	1	12	0	0	3
NA17	Batch 2	66	80	77	47	79
NA19	Batch 2	0	0	0	0	8
NA20	Batch 1	71	65	65	81	89
NA22	Batch 2	0	2	0	7	0
Southwest Marine						
SW02	Batch 1	90	67	90	65	77
SW03	Batch 1	82	74	88	90	70
SW04	Batch 1	65	33	84	46	63
SW08	Batch 1	87	84	88	83	86
SW09	Batch 1	78	82	72	76	81
SW11	Batch 2	84	47	74	77	84
SW13	Batch 1	19	0	41	70	0
SW15	Batch 1	0	0	16	16	9
SW17	Batch 2	0	0	0	0	69
SW18	Batch 2	16	54	74	60	76
SW21	Batch 1	2	71	78	80	78
SW22	Batch 2	1	0	0	4	1
SW23	Batch 2	52	3	14	1	2
SW25	Batch 2	39	4	1	0	0
SW27	Batch 2	72	1	4	11	9

Table G-4. Amphipod control data

Batch	Amphipod Survival (percent)				
	Replicate 1	Replicate 2	Replicate 3	Replicate 4	Replicate 5
640-1	100	95	100	100	100
640-2	100	100	100	100	100
640-3	100	95	90	100	100

Table G-5. Echinoderm control data

Batch	Echinoderm Fertilization (percent) Replicate 1	Replicate 2	Replicate 3	Replicate 4	Replicate 5
Batch 1	96	91	90	98	94
Batch 1	94	95	97	93	92
Batch 2	93	91	92	93	92
Batch 2	93	89	93	94	91
Batch 3	83	81	82	82	77
Batch 3	69	75	71	63	70

Table G-6. Bivalve control data

Batch	Control type	Toxicant[a]	Concen-tration (μg/L)	Bivalve Combined Survival and Normality (percent)				
				Replicate 1	Replicate 2	Replicate 3	Replicate 4	Replicate 5
Batch 1	Water	Copper	0	94	93	91	93	90
Batch 1	Water	Copper	2	97	96	93	95	98
Batch 1	Water	Copper	5	99	92	94	98	91
Batch 1	Water	Copper	10	73	76	76	74	79
Batch 1	Water	Copper	20	0	0	0	0	0
Batch 1	Water	Copper	40	0	0	0	0	0
Batch 2	Water	Copper	0	83	90	84	92	90
Batch 2	Water	Copper	2	76	83	84	86	78
Batch 2	Water	Copper	5	91	90	88	92	87
Batch 2	Water	Copper	10	90	84	94	91	86
Batch 2	Water	Copper	20	3	5	6	3	2
Batch 2	Water	Copper	40	0	0	0	0	0
Batch 1	Water			94	93	91	93	90
Batch 2	Water			83	90	84	92	90
Batch 1	Sediment			85	86	81	88	87
Batch 2	Sediment			70	75	65	15	83
Batch 1	Sediment			77	79	71	75	81
Batch 2	Sediment			82	80	74	76	89

[a] A toxicant is used for positive controls only.

Table G-7. Amphipod serial dilution results

			Amphipod Survival (percent)				
Station	Batch	Dilution[a]	Replicate 1	Replicate 2	Replicate 3	Replicate 4	Replicate 5
NASSCO							
NA07	640-1	10	95	100	95	100	100
NA07	640-1	20	100	100	90	100	100
NA07	640-1	30	100	90	95	100	85
NA07	640-1	40	90	95	90	100	100
NA07	640-1	50	80	95	75	100	75
NA07	640-1	60	95	70	45	95	90
NA07	640-1	70	95	70	95	90	90
NA07	640-1	80	85	65	85	85	90
NA07	640-1	90	95	65	65	85	80
NA07	640-1	100	75	85	55	70	80
Southwest Marine							
SW04	640-1	10	100	100	90	100	100
SW04	640-1	20	100	100	100	100	100
SW04	640-1	30	100	95	100	100	100
SW04	640-1	40	100	90	90	100	100
SW04	640-1	50	100	90	95	95	95
SW04	640-1	60	100	100	95	90	95
SW04	640-1	70	100	95	95	90	100
SW04	640-1	80	100	100	85	90	100
SW04	640-1	90	95	95	90	100	95
SW04	640-1	100	75	95	100	100	95

[a] Percent of original sample.

Table G-8. Navy amphipod and echinoderm toxicity results from the final reference pool stations

			Amphipod Survival (percent)								Echinoderm fertilization (percent)			
Station	Batch	Dilution	Replicate 1	Replicate 2	Replicate 3	Replicate 4	Replicate 5	Station	Batch	Dilution	Replicate 1	Replicate 2	Replicate 3	Replicate 4
2433	EE29		90	90	85	60	90	2433	S541	50	98	97	97	99
2238	EE33		90	75	80	95	85	2433	S541	100	95	90	91	95
								2238	S555	25	93	97	97	96
								2238	S555	50	91	94	89	95
								2238	S555	100	31	22	23	41

Table G-9. Bight '98 amphipod toxicity results from the final reference pool stations

		Amphipod Survival (percent)				
Station	Batch	Replicate 1	Replicate 2	Replicate 3	Replicate 4	Replicate 5
2231	EE10	90	75	95	90	100
2233	EE12	85	100	100	100	100
2238	EE12	85	85	85	80	90
2240	EE12	100	80	80	90	85
2241	EE10	95	95	95	90	95
2242	EE12	100	90	95	75	90
2243	EE12	95	90	95	95	95
2244	EE12	100	100	100	90	100
2247	EE12	80	85	85	90	100
2252	EE10	100	100	100	100	100
2256	EE10	100	95	90	100	95
2257	EE12	90	100	85	95	75
2265	80798	85	90	60	80	80
2433	EE8	95	100	90	90	90
2435	EE8	100	95	100	100	95
2436	EE10	95	90	100	100	95
2440	EE10	95	100	100	100	100

Appendix H

Toxicity Test Quality Assurance Reports

Contents

Appendix H1

Quality Assurance Report for Amphipod Toxicity Test Data

Quality Assurance Report for Amphipod Toxicity Test Data

Introduction

This report documents the results of the quality assurance and quality control (QA/QC) review of the data generated for the 10-day amphipod toxicity test that was performed on composite sediment samples collected from 30 stations at NASSCO and Southwest Marine shipyards in San Diego Bay, California, and from 5 stations at reference areas in San Diego Bay. These tests were conducted by Northwestern Aquatic Sciences in Newport, Oregon. Exponent conducted the quality assurance review to ensure that the toxicity testing was consistent with the specifications of the statement of work and that the data are acceptable for their intended use in future stages of the study.

The quality assurance review consisted of an evaluation of the following major elements for the toxicity test:

- **Field Methods—**Were the major specifications of the field sampling procedures followed, as described in the work plan (Exponent 2001)?
- **Laboratory System and Testing Methods—**Were the major specifications of the laboratory testing procedures followed, as described in the laboratory's statement of work? Were the specified methods (i.e., ASTM 1999) followed and were any modifications adequately justified and documented?
- **Sediment Holding Time—**Was each sediment sample analyzed within the specified holding time after collection?
- **Water Quality Conditions—**Were water quality conditions monitored adequately during testing and were the measured conditions within the specified ranges for each test chamber?

- **Negative Control Responses—**Were the responses in the negative controls (i.e., clean sediment) within specified limits?
- **Positive Control Responses—**Did the positive controls (i.e., reference toxicant) indicate that the test organisms were suitably responsive for testing?

Throughout this report, the term “sample” refers to the whole sediment sample collected from each station in the field for toxicity testing. The term “replicate” refers to one of the five subsamples of each sediment sample collected in the field that was subjected to toxicity testing in the laboratory.

The following section of this report presents the results of the QA/QC evaluation for the toxicity tests. QA/QC considerations are then summarized, and conclusions are presented in the final section.

Quality Assurance and Quality Control Evaluation

Field Methods

On August 6–15, 2001, sediment samples were collected from 30 stations along the shoreline of NASSCO and Southwest Marine shipyards and from 5 reference area stations. All of the sampling stations were located in San Diego Bay, California. At each station, surface sediment (0–2 cm) was collected using a dual 0.1-m^2 stainless steel van Veen grab sampler, homogenized, and transferred to appropriate containers for shipment to the toxicity testing laboratory and the analytical chemistry laboratory. The same homogenized sediments were used for both the chemical analyses and the sediment toxicity test to ensure that these analyses were related as closely as possible.

Sediment sampling was conducted according to the procedures and plans described in the work plan (Exponent 2001). The only exception was the slight relocation of two of the proposed sampling stations due to a physical obstruction (i.e., a dock) and an off-limit security area designated by the U.S. Navy.

Laboratory System

Water from Yaquina Bay, Oregon, was pumped directly into the laboratory. Prior to being used for the toxicity test, the seawater was filtered to ≤0.40 μm, its salinity was adjusted with Milli-Q® deionized water, and it was then aerated. The water was characterized as having a pH of 7.8 and a salinity of 28.0 ppt.

Sediments were stored at 4°C in the dark in capped containers until used. After the test was set up, unused sample material was returned to the sample jars and again stored at 4°C in the dark. Sediments were homogenized by mixing with stainless steel implements.

Because of the large number of samples that were tested under this program, it was agreed that the laboratory could run the toxicity tests in multiple batches provided that at least one reference area sample was included in each batch. The laboratory performed the toxicity tests in two batches and reference sediments were present in both batches. All testing was conducted according to the good laboratory practices as defined in the EPA/TSCA Good Laboratory Practice regulations revised August 17, 1989 (40 CFR 792).

10-Day Amphipod Toxicity Test Using *Eohaustorius estuarius*

The amphipod toxicity test using *Eohaustorius estuarius* determines percent survival in adult amphipods exposed for 10 days to test sediment.

Test Organism Culturing, Holding, and Acclimation

The *E. estuarius* used in these toxicity tests were obtained from Yaquina Bay, Oregon. Amphipods were collected on August 15 and 19, 2001, respectively for the two test batches, and transferred to a shallow holding container with a small amount of control sediment (i.e., sediment from the collection area) on the bottom, and acclimated for 2 days.

Average conditions during the acclimation period of the first batch of test organisms were temperature of 15.3 ± 0.7°C, dissolved oxygen content of 7.3 ± 0.8 mg/L, pH of 8.0 ± 0.1, and salinity of 28.5 ± 1.3 ppt. Average conditions during the acclimation period of the second batch of test organisms were temperature of 15.6 ± 1.2°C, dissolved oxygen content of 7.4 ± 1.1 mg/L, pH of 8.1 ± 0.1, and salinity of 29.5 ± 1.3 ppt. During the acclimation of both batches of test organisms, the photoperiod was constant illumination. Water used to acclimate the amphipods was similar to the overlying water used during the 10-day test.

Test Methods

Overall, the recommended protocols were followed closely during testing. All biological testing was in compliance with ASTM (1999). Samples were collected and stored properly. The first batch of the 10-day amphipod toxicity test was initiated on August 17, 2001, and the second batch of the 10-day amphipod toxicity test was initiated on August 21, 2001. Both of these test initiation dates are within the specified 14-day holding time.

Adult organisms were used for the test. All organisms used in the test were from the same source (see above discussion). The day before test initiation, thoroughly homogenized test sediment, reference sediment, and laboratory control sediment (i.e., negative control) were added to the replicate test vessels and the overlying water was added.

For each toxicity test replicate, 20 amphipods were exposed to 175 mL of bedded test sediment in a 1-L chamber filled with 950 mL of acceptable overlying water. However, due to breakage of two sample jars during sample transit, amphipods for these two series of test replicates (Sample SD0005 collected at Station SW02 and Sample SD0042 collected at Station NA19) were exposed to 120 mL of bedded test sediment in a 1 L chamber filled with 950 mL of acceptable overlying water.

Five replicate analyses were conducted for each sediment sample. In addition, one water quality replicate and two additional sacrificial replicates were set up for water quality measurements on Day 0 and Day 5 interstitial water quality measurements, respectively. The test chambers were aerated throughout the exposure period.

Test chambers were checked daily for dead amphipods, for emergence of the test organisms from the sediment, and for test organisms trapped on the water surface. All observations were noted in the laboratory's data sheets. Dead amphipods were not removed from the test chambers.

On Day 10, the surviving amphipods in the test chambers were sieved from the sediment and counted. Percent survival was determined relative to the total of 20 individuals added to each chamber at the beginning of the test.

Water Quality Measurements

Water quality monitoring was conducted during the amphipod toxicity test. Measurements of the overlying water were taken just prior to the introduction of the test organisms to the test chambers, and then at the same time each day until the conclusion of the test. This monitoring consisted of the following measurements:

- Temperature was measured in the overlying water of one replicate beaker daily. The daily mean test temperature should be 15 ± 3°C. Temperatures measured during the testing period ranged from 14.6°C to 15.8°C. The individual temperature readings did not vary by more than 3°C from the selected test temperature (i.e., 15°C), and the time-weighted average of measured temperature at the end of the test was within 1°C of the selected test temperature (i.e., 15°C).

- Dissolved oxygen was measured in the overlying water of one replicate beaker daily. Dissolved oxygen was also measured in the overlying water of all replicates on Days 0, 5, and 10. Dissolved oxygen concentrations were greater than or equal to 5.0 mg/L throughout the study in all control and test sediment replicates. The lowest dissolved oxygen concentration was 6.0 mg/L. The dissolved oxygen levels ranged from 6.0 to 8.6 mg/L.

- Salinity was measured in the overlying water of one replicate beaker daily. The daily mean test salinity should be 28 ± 2 ppt. Salinity values ranged from 27.0 to 30.5 ppt, which is slightly outside the recommended range of 26.0–30.0 ppt.

- The pH of the overlying water in one replicate beaker was measured daily. Values for pH ranged from 7.7 to 8.5, which is within the recommended range of 7.0–9.0.

- The Eh of the overlying water in one replicate beaker was measured daily. Values for Eh ranged from 168 to 321 mV.

- Ammonia nitrogen (ammonia-N) and sulfide were measured in the overlying water of one replicate beaker on Days 0 and 10. Interstitial ammonia-N and sulfide were measured in the bulk sediments in sacrificial beakers on Days 0 and 5. The concentrations of ammonia-N in the overlying water during the testing period ranged from less than 0.5 mg/L (detection limit) to 30 mg/L. The concentrations of ammonia-N in the interstitial water ranged from less than 2.5 mg/L (detection limit) to 40 mg/L. The concentrations of soluble sulfide were less than 0.2 mg/L (detection limit) in the overlying water, and less than 0.5 mg/L (detection limit) in the interstitial water.

Reference Areas and Negative Control Sediments

Five reference sediments (collected in the field from within the same water body as the test sediments, but without any history of industrial contamination) were used to evaluate the survival and reburial of the test organisms. Five replicate tests were performed on each reference sediment. In addition, a laboratory control sediment (i.e., negative control sediment collected from the same location where the test organisms were collected by the laboratory [i.e., Yaquina Bay, Oregon] on August 15 and 19, 2001, respectively, for the two batches), was used to evaluate the survival of the test organisms. Five replicate tests were performed on each negative control sediment. All reference sediment and negative control testing was conducted in compliance with ASTM (1999) methods. Performance standards developed for the negative controls of this test are ≥90 percent mean control survival (ASTM 1999) and ≥80 percent in all individual replicates.

Mean amphipod survival in the laboratory control sediment (i.e., negative control) was 100 percent for the first batch and 97 percent for the second batch. Amphipod survival in each replicate of the laboratory control sediment was 100 percent for the first batch and 90–100 percent for the second batch. Percent reburial in the laboratory control sediment was 100 percent for both batches. These results meet the performance standards set for the test and suggest that the test organisms were sufficiently healthy for testing.

A positive control was tested using cadmium chloride as the reference toxicant. The 96-hour LC50 values for the positive control were 1.82 and 1.56 mg Cd/L, respectively for the two batches. The LC50 values are within the laboratory's control chart warning limits for this test (i.e., 1.30–3.45 mg/L). The observed LC50 values suggest that the test organisms were suitably sensitive for testing.

Summary of Quality Assurance and Quality Control Considerations

Mean survival in the amphipod test for the laboratory control sediment (i.e., negative control) was 100 and 97 percent, respectively, for the two batches. Amphipod survival in each replicate of the laboratory control sediment was 100 percent for the first batch and 90–100 percent for the second batch. These results are above the performance standards set for the 10-day amphipod test. The reference toxicant test (i.e., positive control) results were with in an acceptable range.

While in transit, two of the sample containers were broken and the sediment was discarded. Amphipods for these two series of test replicates (Sample SD0005 collected at Station SW02 and Sample SD0042 collected at Station NA19) were exposed to 120 mL of test sediment instead of 175 mL of test sediment as stipulated in ASTM (1999). It is not anticipated that this deviation affected the results.

During the testing period, there were four inconsistencies with the specifications provided in the statement of work:

- The salinity of the overlying water in one replicate was slightly more than the recommended range of 26.0–30.0 ppt. One salinity measurement was 30.5 ppt, which is 0.5 ppt outside the recommended range. This salinity measurement was noted on Day 9, and the salinity in this replicate was adjusted to 28.5 ppt. It is not anticipated that this minor deviation affected the results.

- The Eh of the overlying water was not measured from Day 1 through Day 4. Measurements on other test days did not indicate any extreme variations on a daily basis. It is not anticipated that failure to collect this water quality measurement affected the results.

- The maximum ammonia concentrations in the overlying and interstitial water were 30 and 40 mg/L, respectively. Ammonia concentrations of <60 mg/L (with a normal pH) are not toxic to *E. estuarius* (U.S. EPA 1994).

- Twenty-two amphipods, instead of 20, were found in one replicate of the control treatment. The laboratory assumed that this number was erroneously added to this test container at the beginning of the test and consequently computed the percent mortality for this container based on 22 test organisms. Mean survival in this control was 97 percent. It is not anticipated that this laboratory error affected the results.

The data are determined to be acceptable for use in the NASSCO and Southwest Marine sediment investigations.

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Appendix H2

Quality Assurance Report for Echinoderm Toxicity Test Data

Quality Assurance Report for Echinoderm Toxicity Test Data

Introduction

This report documents the results of the quality assurance and quality control (QA/QC) review of the data generated for the echinoderm toxicity test that was performed on interstitial water extracted from composite sediment samples collected from 30 stations at NASSCO and Southwest Marine shipyards in San Diego Bay, California, and from 5 stations at reference areas in San Diego Bay. These tests were conducted by AMEC Earth and Environment in San Diego, California. Exponent conducted the quality assurance review to ensure that the toxicity testing was consistent with the specifications of the statement of work (SOW) and that the data are acceptable for their intended use in future stages of the study.

The quality assurance review consisted of an evaluation of the following major elements for the toxicity test:

- **Field Methods—**Were the major specifications of the field sampling procedures followed, as described in the work plan (Exponent 2001)?
- **Laboratory System and Testing Methods—**Were the major specifications of the laboratory testing procedures followed, as described in the laboratory's SOW? Were the specified methods (i.e., U.S. EPA [1995] guidelines with consideration of conditions suggested in Carr and Chapman [1992, 1995]) followed and were any modifications adequately justified and documented?
- **Sediment Holding Time—**Was each sediment sample analyzed within the specified holding time after collection?
- **Water Quality Conditions—**Were water quality conditions monitored adequately during testing and were the measured conditions within the specified ranges for each test replicate?

- **Negative Control Responses—**Were the responses in the negative controls (i.e., interstitial water from "clean" sediment) within specified limits?
- **Positive Control Responses—**Did the positive controls (i.e., reference toxicant) indicate that the test organisms were suitably responsive for testing?

Throughout this report, the term "sample" refers to the whole sediment sample collected from each station in the field for toxicity testing. The term "replicate" refers to one of the five subsamples of each sediment sample collected in the field that was subjected to toxicity testing in the laboratory.

The following section of this report presents the results of the QA/QC evaluation for toxicity testing. QA/QC considerations are then summarized, and conclusions are presented in the final section.

Quality Assurance and Quality Control Evaluation

Field Methods

On August 6–15, 2001, sediment samples were collected from 30 stations along the shoreline of NASSCO and Southwest Marine shipyards and from 5 reference area stations. All of the sampling stations were located in San Diego Bay, California. At each station, surface sediment (0–2 cm) was collected using a dual 0.1-m^2 stainless steel van Veen grab sampler, homogenized, and transferred to appropriate containers for shipment to the toxicity testing laboratory and the analytical chemistry laboratory. The same homogenized sediments were used for both the chemical analyses and the sediment toxicity tests to ensure that these analyses were related as closely as possible.

Sediment sampling was conducted according to the procedures and plans described in the work plan (Exponent 2001). The only exception was the slight relocation of two of the proposed sampling stations due to a physical obstruction (i.e., a dock) and an off-limit security area designated by the U.S. Navy.

Laboratory System

Seawater from Scripps Institute of Oceanography was used for the toxicity testing program. The seawater is filtered by Scripps and then trucked to the testing laboratory and held onsite in a recirculating temperature-controlled system. Prior to being used for the toxicity test, the seawater was filtered through a 0.20-μm in-line filter.

Sediments were stored at 4°C in the dark until used. To minimize sample disturbance, sediments were not screened prior to porewater extraction or elutriate testing. After the test was set up, unused sample material was returned to the respective sample container and returned to storage at 4°C in the dark. Sediments were homogenized prior to testing by mixing with stainless steel implements.

Because of the large number of samples that were tested under this program, it was agreed that the laboratory could run the toxicity tests in multiple batches provided that at least one reference area sample was included in each batch. The laboratory performed the toxicity tests in three batches, and reference sediments were present in all three batches.

All testing was conducted according to the good laboratory practices as defined in the EPA/TSCA Good Laboratory Practice regulations revised August 17, 1989 (40 CFR 792).

Echinoderm Toxicity Test Using *Strongylocentrotus purpuratus*

The echinoderm toxicity test using the purple sea urchin (*Strongylocentrotus purpuratus*) determines percent fertilization of echinoderm gametes exposed to test sediment pore water.

Test Organism Culturing and Holding

S. purpuratus used in these toxicity tests were obtained from Mission Bay, California. Echinoderms were collected on August 6 and 16, 2001. The first two test batches were performed with echinoderms collected on August 6, and the third test batch was performed with echinoderms collected on August 16. Echinoderms were transferred to glass aquaria and maintained under flow-through conditions (2–3 exchanges of natural seawater per day) until test initiation.

There was no pretest mortality of test organisms (i.e., adult echinoderms), and only healthy organisms of similar size and life history stage were used to produce gametes for the toxicity test.

Water quality conditions during the holding period for the echinoderms collected on August 6 were temperature of 15–17°C, dissolved oxygen content of 6–7 mg/L, and salinity of 34 ± 1 ppt. Water quality conditions during the holding period for the echinoderms collected on August 16 were temperature of 15–17°C, dissolved oxygen content of 5–6 mg/L, and salinity of 34 ± 1 ppt. During the acclimation of all batches of test organisms, the photoperiod was a 9:15 light:dark cycle.

Test Methods

Overall, the recommended protocols were followed closely during testing. This toxicity test measured echinoderm (*S. purpuratus*) egg fertilization by sperm exposed to interstitial water collected from test sediment consistent with the guidelines provided in Carr and Chapman (1992, 1995) and the test procedures and acceptability criteria as described in U.S. EPA (1995).

Samples were collected and stored properly. Interstitial water from each test sediment and reference sediment was extracted by centrifugation within 72 hours of receipt of each sample. However, interstitial water was not extracted from “clean” sediment (i.e., negative control) as stipulated in the laboratory’s SOW. The laboratory did attempt to extract porewater from Mission Bay sediments (i.e., location where adult echinoderms were collected). However, sediment at this location is very sandy and held no interstitial water. Several attempts at centrifuging a large volume of this sediment failed to extract sufficient porewater for testing (Stransky et al. 2002, pers. comm.). Without consultation with Exponent, the laboratory decided to use clean filtered seawater as the negative control for all tests performed.

Echinoderm toxicity tests were initiated within 48 hours of extraction procedures. The three batches of echinoderm toxicity tests were initiated on August 10, August 14, and August 17, 2001, respectively. All of these test initiation dates are within the specified 14-day holding-time limit.

Adult organisms were spawned to produce gametes that were used for the test. All adult organisms used in the test were from the same source (see above discussion). The test exposed sperm suspensions (appropriate sperm density is determined in a trial fertilization test) from up to four pooled males to interstitial water obtained from the test sediment for 20 minutes. Pooled eggs from up to four females were then added to the sperm suspensions and 20 minutes after the eggs were added, the test was terminated by the addition of a preservative. The percent fertilization was determined by microscopic examination of a maximum of 100 eggs in an aliquot of eggs from each treatment. The test endpoint was successful egg fertilization.

Five replicate analyses were conducted for each sediment sample. Three concentrations of interstitial water were created and tested for each sediment sample: 100, 50, and 25 percent. Seawater from the Scripps Institute of Oceanography (see above) was used as the dilution water for the test solutions.

Water Quality Measurements

Water quality monitoring was conducted during the echinoderm toxicity test. Measurements of the overlying water were taken at test initiation, just prior to the introduction of the test organisms to the test chambers. This monitoring consisted of the following measurements:

- Temperature was measured in the overlying water of one replicate beaker at test initiation only. The desired test temperature is 15 ± 1°C. Temperatures measured at test initiation ranged from 14.6°C to 15.9°C (Stransky et al. 2002, pers. comm.).

- Dissolved oxygen was measured in the overlying water of one replicate at test initiation only. Dissolved oxygen concentrations should be at least 5.0 mg/L throughout the study in all water quality replicates. The dissolved oxygen concentrations ranged from 2.5 to 8.4 mg/L. The lowest dissolved oxygen concentration was 2.5 mg/L. Dissolved oxygen concentrations less than 5.0 mg/L were observed in 22 of the 35 water quality measurements in the 100 percent concentration at test initiation. Twenty-one of these replicates were aerated and the dissolved oxygen concentration in these samples increased to greater than 5.0 mg/L. One replicate (Sample SD0042; Station NA19), which had a dissolved oxygen concentration of 4.2 mg/L, was not aerated prior to test initiation.

- Salinity was measured in the overlying water of one replicate at test initiation only. The daily mean test salinity should be 34 ± 2 ppt. Salinity values ranged from 33 to 35 ppt, which is within the recommended range of 32–36 ppt.

- Interstitial salinity was measured prior to test initiation in each test sediment. The range of interstitial salinity concentrations was 33–35 ppt.

- The pH of the overlying water was measured in one replicate at test initiation only. Values for pH ranged from 7.1 to 8.0 , which is within the recommended range of 7.0–9.0.

- Ammonia and total sulfide were measured in the interstitial water of one replicate beaker at test initiation only. The concentrations of ammonia in the interstitial water during the testing period ranged from less than 0.1 mg/L (detection limit) to 16.7 mg/L. The concentrations of total sulfide in the interstitial water were all below the detection limit.

Reference Area Sediments and Negative Controls

Five reference sediments (collected from the field from within the same water body as the test sediments, but without any history of industrial contamination), conducted with five replicates, were used to evaluate the fertilization rate of the test organisms in a non-contaminated sediment. All reference sediment testing was in compliance with U.S. EPA (1995) guidelines, with consideration of conditions suggested in Carr and Chapman (1992, 1995).

In addition, a laboratory seawater-only control (i.e., negative control), was used to evaluate the survival of the test organisms. The negative control was also conducted with five replicates. All negative control testing was in compliance with U.S. EPA (1995) guidelines.

Performance standards for the echinoderm fertilization test are acceptable only if all of the following requirements are met:

- Egg fertilization at the no-observed-effects concentration (NOEC) must be greater than 80 percent of that in the negative control.
  - All NOECs were greater than 80 percent different relative to respective controls, which is acceptable.
- The minimum significant difference (MSD) in percent fertilization is less than 25 percent relative to the negative control.
  - The minimum MSD was 13.5 percent, which is acceptable.
- The sperm count for the final sperm stock must not exceed 33,600,000/mL.
  - The highest sperm:egg ratio used was 1,600:1. This is equal to a density of 3,200,000 sperm/mL, which is acceptable.
- If the sperm count for the final sperm stock is between 5,600,000 and 33,600,000/mL, it must not exceed two times the target density from the trial, or the high-sperm-density controls (0.2 mL sperm stock) must have at least

5 percent higher fertilization than the low-sperm-density controls (0.05 mL sperm stock).

- Not applicable; see previous bullet.

- Egg blanks for both dilution water and a minimum of one site should be exposed concurrently with each batch and should contain essentially no eggs with fertilization membranes.

  - A 1 percent fertilization rate was observed in one of the egg blanks and 0 percent fertilization was observed in the other two egg blanks. This meets the requirement that the egg blanks should contain "essentially no eggs with fertilization membranes."

Based on the results described above, all of the specified performance standards were achieved during the tests.

Two laboratory seawater-only controls (i.e., negative controls) were run for each test batch. Mean echinoderm fertilization in the seawater-only controls were 94 and 94 percent for the first batch, 92 and 92 percent for the second batch, and 81 and 70 percent for the third batch. U.S. EPA (1995) stipulates that there must be at least 70 percent fertilization in the controls for the test to be acceptable. These results are above the performance standards set for the test and suggest that the test organisms were sufficiently healthy for testing.

Values of percent fertilization in the negative controls for Batch 3 (i.e., 81 and 70 percent) were lower than the values observed for Batch 1 (i.e., 94 and 94 percent) and Batch 2 (i.e., 92 and 92 percent). These differences may be due, in part, to the fact that the adult urchins used for spawning for Batch 3 were collected at a later date than the adults used for Batch 1 and Batch 2. This potential difference among batches should be considered during data analysis and interpretation.

A positive control was tested using copper chloride as the reference toxicant. The EC50 values for the positive control were 23.36 and 10.52 mg Cu/L, respectively, for the first two test batches. Due to an error in the preparation of the dilution series for the reference toxicant for Batch 3, an EC50 value could not be calculated for the third test batch.

The EC50 values are within the laboratory's control chart warning limits for this test (i.e., 7.85–43.67 mg/L) (Stransky et al. 2002, pers. comm.). The observed EC50 values suggest that the test organisms were suitably sensitive for testing.

Summary of Quality Assurance and Quality Control Considerations

Mean echinoderm fertilization in the seawater-only controls were 94 and 94 percent for the first batch, 92 and 92 percent for the second batch, and 81 and 70 percent for the third batch. These results meet the performance standard set for the echinoderm fertilization test.

During the testing period, there were two inconsistencies with the specifications provided in the SOW:

- The laboratory used a seawater-only control instead of a control of interstitial water that was suppose to be prepared from negative control sediment.
- Due to an error in the preparation of the dilution series for the reference toxicant for Batch 3, the results of the positive control for Batch 3 were rejected. However, because the test organisms were responsive to many of the test samples in Batch 3, it appears that the organisms were suitably sensitive to toxicants. Therefore, the lack of positive controls for Batch 3 did not affect the quality of the data.

Potential differences between Batch 3 and the other two batches related to use of different spawning organisms did not affect the quality of the data. However, these potential differences should be considered during data analysis and interpretation.

The data are determined to be acceptable for use in the NASSCO and Southwest Marine sediment investigations.

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Appendix H3

Quality Assurance Report for Sediment–Water Interface Toxicity Test Data

Quality Assurance Report for Sediment–Water Interface Toxicity Test Data

Introduction

This report documents the results of the quality assurance and quality control (QA/QC) review of the data generated for the toxicity test that was performed on intact sediment cores collected from 30 stations at NASSCO and Southwest Marine shipyards in San Diego Bay, California, and from 5 stations at reference areas in San Diego Bay. These tests were conducted by MEC Analytical in Tiburon, California. Exponent conducted the quality assurance review to ensure that the toxicity testing was consistent with the specifications of the statement of work (SOW) and that the data are acceptable for their intended use in future stages of the study.

The quality assurance review consisted of an evaluation of the following major elements for the bioaccumulation test:

- **Field Methods**—Were the major specifications of the field sampling procedures followed, as described in the work plan (Exponent 2001)?
- **Laboratory System and Testing Methods**—Were the major specifications of the laboratory testing procedures followed, as described in the laboratory's SOW? Were the specified methods (i.e., U.S. EPA 1995; U.S. EPA/Corps 1998; ASTM 1998; with consideration of conditions provided in Anderson et al. 1996, 2001) followed and were any modifications adequately justified and documented?
- **Sediment Holding Time**—Was each sediment sample analyzed within the specified holding time after collection?
- **Water Quality Conditions**—Were water quality conditions monitored adequately during testing and were the measured conditions within the specified ranges for each test chamber?

- **Negative Control Responses—**Were the responses in the negative controls (i.e., clean seawater) within specified limits?

- **Positive Control Responses—**Did the positive controls (i.e., reference toxicant) indicate that the test organisms were suitably responsive for testing?

Throughout this report, the term "replicate" refers to one of the six intact sediment cores collected in the field at each station. Five of the replicates were subjected to toxicity testing in the laboratory and the sixth replicate was used for water quality measurements.

The following section of this report presents the results of the QA/QC evaluation for the sediment–water interface toxicity test. QA/QC considerations are then summarized, and conclusions are presented in the final section.

Quality Assurance and Quality Control Evaluation

Field Methods

On August 6–15, 2001, sediment samples were collected from 30 stations along the shoreline of NASSCO and Southwest Marine shipyards and from 5 reference area stations. All of the sampling stations were located in San Diego Bay, California. At each station, surface sediment was collected using a dual 0.1-m^2 stainless steel van Veen grab sampler. Intact, unhomogenized surface sediment was collected for the bivalve development test at the sediment–water interface. Decontaminated, polycarbonate core tubes (3-in. diameter by 8-in. high) were inserted approximately 4–6 in. into the sediment while the sediment was still in the grab sampler and prior to removal of any overlying water. The core tube was pressed into the sediment and a decontaminated polyethelene cap was inserted under the bottom of the core to prevent leakage of sample and interstitial water as the core tube was removed. A second cap was used to seal the top of the core tube. Sample integrity was verified in the field by the presence of overlying water and adequate penetration depth of the core tube into the grab sampler. Homogenized sediments collected from separate grabs from the same station locations were used for the chemical analyses to ensure that the sediment–water interface test and the chemical analyses were related as closely as possible.

Sediment sampling was conducted according to the procedures and plans described in the work plan (Exponent 2001). The only exceptions were as follows: 1) one of the proposed reference stations was relocated slightly due to an off-limit security area designated by the U.S. Navy; 2) the penetration depth of the core tube was increased from 2 in. (as stipulated in the work plan; Exponent 2001) to approximately 4–6 in.; 3) a decontaminated polyethelene cap was used under the bottom of each core tube instead of precleaned acrylic plates; and 4) sediment core samples were erroneously collected at Station SD28 (no toxicity testing was performed on these cores).

Laboratory System

Seawater from San Francisco Bay was used for the toxicity testing program. Prior to being used for the toxicity test, the seawater was ultraviolet-treated and filtered through a 0.20-μm filter.

Because of the large number of samples that were tested under this program, it was agreed that the laboratory could run the toxicity tests in multiple batches provided that at least one reference area sample was included in each batch. The laboratory performed the toxicity tests in two batches and reference sediments were present in both batches.

Sediments were stored at 4°C in the dark until used. All testing was conducted in close adherence to the good laboratory practice requirements as defined in the EPA/TSCA Good Laboratory Practice regulations revised August 17, 1989 (40 CFR 792).

Bivalve Development Test at the Sediment–Water Interface

This toxicity test measured bivalve larval development and survival using the mussel *Mytilus galloprovincialis*. The laboratory used the test organism *Mytilus galloprovincialis* rather than *Mytilus edulis* as stipulated in the laboratory's SOW. This is not a test species substitution, but reflects a current change in the scientific taxonomic literature (Bodensteiner 2001b, pers.

comm.). Recent taxonomic guidance has split the *Mytilus edulis* species into two new species names based on range. Within the southern range (Baja to Monterey, California), *M. gallo-provincialis* is the correct species nomenclature and within the northern range (i.e., north of Monterey, California), *M. trossulus* is the correct species nomenclature. The bivalves used in this test were from the southern range.

Test Organism Collection, Holding, and Spawning

The *M. galloprovincialis* used in these toxicity tests were obtained from Marine Educational and Research Products (also known as Carlsbad Aquafarms) in Escondido, California. The bivalves were collected on August 15 and 21, 2001, for the two test batches. The bivalves that were used in the first test batch were received on August 16 and kept undisturbed overnight at 4°C and spawned for test initiation on August 17. The bivalves used for the second test batch were received and spawned on August 22. The bivalve embryos were 2.0 hours old at test initiation for the first batch and 2.1 hours old at test initiation for the second batch. Pretest survival of test organisms (i.e., adult bivalves used for spawning) was 100 percent for both batches, and only healthy adult organisms of similar size and life history stage were spawned to provide gametes for the toxicity test.

M. galloprovincialis used for both test batches were spawned using the heat-shock induction method where the bivalves are placed in laboratory water at 12°C and slowly raised to 20°C with aquarium heaters. Gametes were collected and checked for viability under a microscope prior to fertilization. Successful fertilization (>95 percent fertilized) was confirmed by the laboratory prior to test initiation. The mean embryo concentration at 0 hours was determined by collecting three replicate 1-mL samples from the stock solution.

Test Methods

Overall, the recommended protocols were followed closely during testing. All biological testing was in compliance with U.S. EPA (1995), U.S. EPA/Corps (1998), and ASTM (1998) with consideration of the modifications in Anderson et al. (1996, 2001). Samples were collected and stored properly. The two batches of the bivalve development test were initiated on August 17 and August 22, 2001, respectively. Both of these test initiation dates are within the specified 14-day holding time. All organisms used in the test were from the same source (see above discussion).

Five toxicity analyses on replicate core samples were conducted for each station. In addition, one additional sediment core from each station was set up for water quality measurements. Approximately 24 hours prior to test initiation, overlying water in the collected cores was siphoned off leaving about 0.5-cm of water remaining in the core tube. Fresh overlying water was added to the cores. Screen tubes were then added to the cores. The screens were placed 1-cm above the sediment surface, and the system was allowed to equilibrate for 24 hours at the appropriate test temperature.

After fertilization, approximately 300 *M. galloprovincialis* embryos were added to each screen tube using an automatic pipette. The containers were then incubated for 48 hours. The test chambers were not aerated during the exposure period.

The test was terminated after 48 hours by removing the screen tube from the chamber and gently rinsing its contents into 20-mL scintillation vials. Larvae in these vials were then fixed with 5 percent buffered formalin and the vials were capped and stored.

Water Quality Measurements

Water quality monitoring was conducted during the bivalve development test. Measurements of the overlying water in the sixth water quality replicate for each station were taken just prior to the introduction of the test organisms into the other test replicate chambers and then at the same time each day until the conclusion of the test. This monitoring consisted of the following measurements:

- Temperature was measured in the overlying water of each water quality replicate daily. The desired daily mean test temperature is 15 ± 1°C.

Temperatures measured during the testing period ranged from 14.4°C to 15.6°C, which is within the recommended range of 14–16°C.

- Dissolved oxygen was measured in the overlying water of each water quality replicate daily. Dissolved oxygen concentrations should be at least 5.0 mg/L throughout the study in all control and test water quality replicates. The lowest dissolved oxygen concentration was 2.6 mg/L. The dissolved oxygen concentrations ranged from 2.6 to 8.7 mg/L. Dissolved oxygen concentrations less than 5.0 mg/L were observed in 6 of the 35 water quality replicates on Day 2 of the test. Because these declines in dissolved oxygen concentrations occurred on the last day of the test (just prior to test termination) the test chambers were not aerated.

- The pH of the overlying water was measured in each water quality replicate daily. Values for pH ranged from 7.3 to 8.1, which is within the recommended range of 7–9 pH units.

- Salinity was measured in the overlying water in each water quality replicate daily. The daily salinity concentrations should be 32 ± 2 ppt throughout the study in all control and test sediment replicates. The lowest salinity concentration was 30 ppt. The salinity concentrations ranged from 30 to 32 ppt, which is within the recommended range of 30–34 ppt.

- According to the laboratory's SOW, the interstitial salinity was supposed to be measured in each sample upon receipt. These measurements were not collected.

- Total ammonia concentrations were measured in the overlying water of one replicate beaker daily. Interstitial ammonia was measured in the sediments in one replicate at test termination. The concentrations of ammonia in the overlying water during the testing period ranged from <0.1 mg/L (detection limit) to 1.19 mg/L. The concentration of ammonia in the interstitial water ranged from 0.24 to 30.2 mg/L.

- According to the laboratory's SOW, both interstitial sulfide and sulfide in the overlying water were supposed to be measured in each sample. However, neither of these measurements were collected.

Reference Area Sediments and Controls

Five reference area sediments (collected from the field from within the same water body as the test sediments, but without any history of industrial contamination) were used to evaluate the development and survival of the test organisms in non-contaminated sediments. Five replicate tests were performed on each reference sediment. A seawater-only laboratory control (i.e., negative control) was also used to evaluate the development and survival of the test organisms. To account for potential grain-size effects, both a coarse-grained and a fine-grained sediment were tested as negative controls. The coarse-grained negative control was obtained from Yaquina Bay in Newport, Oregon, and the fine-grained negative control was obtained from Paradise Cove near Pt. Chauncey in San Francisco Bay. Five replicate tests were performed on each negative control sediment. A seawater-only negative control was also tested to evaluate the development and survival of the test organisms. All reference sediment, negative control, and seawater-only control testing was in compliance with test protocols and methods discussed above.

Performance standards developed for this test are at least 50 percent mean seawater-only control survival with at least 90 percent normal shell development in surviving larvae, and must achieve a percent mean standard deviation (MSD) of less than 25 percent (U.S. EPA 1995).

Mean survival of the test organisms in the negative control sediments and seawater-only negative control was as follows:

Batch	Negative Control	Mean Percent Normal
First Batch	Coarse-grained sediment	77 ± 4
	Fine-grained sediment	85 ± 3
	Seawater-only	92 ± 2
Second Batch	Coarse-grained sediment	80 ± 6
	Fine-grained sediment	62 ± 27
	Seawater-only	88 ± 4

These results meet the performance standards set for the test and suggest that the test organisms were sufficiently healthy for testing. However, test organism responses in the second test batch may have been more sensitive to the fine-grained sediment than the test organisms in the first batch.

A positive control was tested using copper sulfate as the reference toxicant. The 48-hour EC50 values for the positive control were 12.33 and 14.41 μg $CuSO_4$/L, respectively, for the two batches. These EC50 values are within the laboratory acceptable range for this test (i.e., 16.7 ± 7.7 μg/L). The observed EC50 values suggest that the test organisms were suitably sensitive for testing.

Other Considerations

Examination of the abnormality results for each sample showed that results for several samples exhibited unusually high variability due primarily to a single outlier value. Those samples included the following:

- Sample SD0021 (Replicate 4); Station NA11
- Sample SD0027 (Replicate 1); Station NA12
- Sample SD0038 (Replicate 2); Station NA16
- Sample SD0022 (Replicate 4); Station SW13
- Sample SD0047 (Replicate 5); Station SW17
- Sample SD0046 (Replicate 1); Station SW18

- Sample SD0019 (Replicate 1); Station SW21
- Sample SD0058 (Replicate 1); Station SW23
- Sample SD0057 (Replicate 1); Station SW25
- Sample SD0045 (Replicate 1); Station SW27
- PC Control (Replicate 4); control sediment collected at Paradise Cove near Pt. Chauncey in San Francisco Bay.

Summary of Quality Assurance and Quality Control Considerations

Mean survival in the seawater-only negative control with normal shell development in the surviving larvae was 90 and 88 percent for the first and second test batches, respectively, and the percent MSD was 2 and 4 percent for the first and second test batches, respectively. These results meet the performance standards set for the bivalve development test (U.S. EPA 1995).

During the testing period, there were three inconsistencies with the specifications provided in the SOW:

- On the last day of the testing period, the dissolved oxygen in the overlying water of six of the test replicates was lower than the recommended minimum value of 5 mg/L. Because these deviations occurred just prior to test termination, it is not anticipated that they affected the results.
- During the testing period, the interstitial salinity was supposed to be measured in each sample upon receipt. This measurement was not collected. It is not anticipated that failure to collect these water quality measurements affected the results, but it may affect the interpretation of the results.
- During the testing period, both interstitial sulfide and sulfide in the overlying water were supposed to be measured in each sample. These measurements

were not collected. It is not anticipated that failure to collect these water quality measurements affected the quality of the results, but it may affect the interpretation of the results.

In addition, unusually high variability was observed in the abnormality results for several samples. This variability is not clearly attributable to any aspect of laboratory performance or to specific conditions within the unusual replicates (Bodensteiner 2001a, pers. comm.). The variability in the test results may reflect varying sensitivity within the group of test organisms. In addition, modification of the standard bivalve test method (U.S. EPA/Corps 1998) to isolate the larvae from the sediment (Anderson et al. 1996, 2001) may have introduced physical variations within the test chamber that affect larval development. The lack of consistency among some bivalve test replicates may indicate problems with the bivalve test method or test conditions, and should be considered during data interpretation. Although the high variability does not appear to be a QA/QC issue, it could affect interpretation of the results, and should be considered during data analysis.

The data are determined to be acceptable for use in the NASSCO and Southwest Marine sediment investigation.

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Appendix H4

Quality Assurance Report for Dilution Series Toxicity Test Data

Quality Assurance Report for Dilution Series Toxicity Test Data

Introduction

This report documents the results of the quality assurance and quality control (QA/QC) review of the data generated for the 10-day amphipod toxicity test that was performed on sediment from two composite samples collected from NASSCO and Southwest Marine shipyards in San Diego Bay, California. These tests were conducted by Northwestern Aquatic Sciences in Newport, Oregon. Exponent conducted the quality assurance review to ensure that the toxicity testing was consistent with the specifications of the statement of work (SOW) and that the data are acceptable for their intended use in future stages of the study.

The quality assurance review consisted of an evaluation of the following major elements for the toxicity test:

- **Field Methods—**Were the major specifications of the field sampling procedures followed, as described in the work plan (Exponent 2001)?
- **Laboratory System and Testing Methods—**Were the major specifications of the laboratory testing procedures followed, as described in the laboratory's SOW? Were the specified methods (i.e., ASTM 1999) followed and were any modifications adequately justified and documented?
- **Sediment Holding Time—**Was each sediment sample analyzed within the specified holding time after collection?
- **Water Quality Conditions—**Were water quality conditions monitored adequately during testing and were the measured conditions within the specified ranges for each test chamber?
- **Negative Control Responses—**Were the responses in the negative controls (i.e., clean sediment) within specified limits?

- **Positive Control Responses—**Did the positive controls (i.e., reference toxicant) indicate that the test organisms were suitably responsive for testing?

Throughout this report, the term "sample" refers to the whole sediment sample collected from each station in the field for toxicity testing. The term "replicate" refers to one of the five subsamples of each sediment sample collected in the field that was subjected to toxicity testing in the laboratory.

The following section of this report presents the results of the QA/QC evaluation for the toxicity tests. QA/QC considerations are then summarized, and conclusions are presented in the final section.

Quality Assurance and Quality Control Evaluation

Field Methods

On August 7–8, 2001, sediment samples were collected from two stations along the shoreline of NASSCO and Southwest Marine shipyards in San Diego Bay, California. At each station, surface sediment (0–2 cm) was collected using a dual 0.1-m^2 stainless steel van Veen grab sampler, homogenized, and transferred to appropriate containers for shipment to the toxicity testing laboratory and the analytical chemistry laboratory. The same homogenized sediments were used for both the chemical analyses and the dilution series toxicity test to ensure that these analyses were related as closely as possible.

Sediment sampling was conducted according to the procedures and plans described in the work plan (Exponent 2001).

Laboratory System

Water from Yaquina Bay, Oregon, was pumped directly into the laboratory. Prior to being used for the toxicity test, the seawater was filtered to ≤0.40 μm, its salinity was adjusted with

Milli-Q® deionized water, and it was then aerated. The water was characterized as having a pH of 7.8 and a salinity of 28.0 ppt.

Sediments were stored at 4°C in the dark in capped containers until used. After the test was set up, unused sample material was returned to the sample jars and returned to storage at 4°C in the dark. Sediments were homogenized by mixing with stainless steel implements. Each of the two test sediments were diluted with negative control sediment to create test sediment concentrations of 10, 20, 30, 40, 50, 60, 70, 80, 90, and 100 percent by weight.

All testing was conducted according to the good laboratory practices as defined in the EPA/ TSCA Good Laboratory Practice regulations revised August 17, 1989 (40 CFR 792).

Dilution Series Test Using 10-Day Amphipod Toxicity Test

The amphipod toxicity test using *Eohaustorius estuarius* determines percent survival in adult amphipods exposed for 10 days to test sediment.

Test Organism Culturing, Holding, and Acclimation

The *E. estuarius* used in these toxicity tests were obtained from Yaquina Bay, Oregon. Amphipods were collected on August 9, 2001, and transferred to a shallow holding container with a small amount of control sediment (i.e., sediment from the collection area) on the bottom, and acclimated for 5 days.

Average conditions during the acclimation period of the test organisms were temperature of 16.0 ± 2.8°C, dissolved oxygen content of 7.6 ± 1.4 mg/L, pH of 8.0 ± 0.1, and salinity of 28.3 ± 0.6 ppt. The photoperiod was constant illumination. Water used to acclimate the amphipods was similar to the overlying water used during the 10-day dilution series test.

Test Methods

Overall, the recommended protocols were followed closely during testing. All biological testing was in compliance with ASTM (1999). Samples were collected and stored properly. The dilution series test was initiated on August 14, 2001. This test initiation date is within the specified 14-day holding time.

Adult organisms were used for the test. All organisms used in the test were from the same source (see above discussion). The day before test initiation, thoroughly homogenized test sediment was combined with laboratory control sediment (i.e., negative control) to create the dilution series (i.e., 10, 20, 30, 40, 50, 60, 70, 80, 90, and 100 percent by weight). The dilution series sediment was added to the replicate test vessels and the overlying water was added.

For each toxicity test replicate, 20 amphipods were exposed to 175 mL of bedded test sediment in a 1-L chamber filled with 950 mL of acceptable overlying water. Five replicate analyses were conducted for each sediment sample within each concentration series. In addition, one water quality replicate and two additional sacrificial replicates were set up for water quality measurements on Day 0 and Day 5 interstitial water quality measurements, respectively. The test chambers were aerated throughout the exposure period.

Test chambers were checked daily for dead amphipods, for emergence of the test organisms from the sediment, and for test organisms trapped on the water surface. All observations were noted in the laboratory's data sheets. Dead amphipods were not removed from the test chambers.

On Day 10, the surviving amphipods in the test chambers were sieved from the sediment and counted. Percent survival was determined relative to the total of 20 individuals added to each chamber at the beginning of the test.

Water Quality Measurements

Water quality monitoring was conducted during the dilution series test. Measurements of the overlying water were taken just prior to the introduction of the test organisms to the test chambers, then at the same time each day until the conclusion of the test. This monitoring consisted of the following measurements:

- Temperature was measured in the overlying water of one replicate beaker daily. The daily mean test temperature should be 15 ± 3°C. Temperatures measured during the testing period ranged from 14.6°C to 15.8°C. The individual temperature readings did not vary by more than 3°C from the selected test temperature (i.e., 15°C), and the time-weighted average of measured temperature at the end of the test was within 1°C of the selected test temperature (i.e., 15°C).

- Dissolved oxygen was measured in the overlying water of one replicate beaker daily. Dissolved oxygen was also measured in the overlying water of all replicates on Days 0, 5, and 10. Dissolved oxygen concentrations were greater than or equal to 5.0 mg/L throughout the study in all control and test sediment replicates. The lowest dissolved oxygen concentration was 7.0 mg/L. The dissolved oxygen levels ranged from 7.0 to 8.4 mg/L.

- The salinity of the overlying water in one replicate beaker was measured daily. The daily mean test salinity should be 28 ± 2 ppt. Salinity values ranged from 27.0 to 29.0 ppt, which is within the recommended range of 26.0–30.0 ppt.

- The pH of the overlying water in one replicate beaker was measured daily. Values for pH ranged from 7.8 to 8.3, which is within the recommended range of 7.0–9.0.

- The Eh of the overlying water in one replicate beaker was measured daily. Values for Eh ranged from 208 to 316 mV.

- Ammonia nitrogen (ammonia-N) and sulfide were measured in the overlying water of one replicate beaker on Days 0 and 10. Interstitial ammonia-N and sulfide were measured in the bulk sediments in sacrificial beakers on Days 0 and 5. The concentrations of ammonia-N ranged from less than 0.5 mg/L (detection limit) to 30 mg/L in the overlying water and from less than 2.5 mg/L (detection limit) to 37.5 mg/L in the interstitial water. The concentrations of soluble sulfide were less than 0.2 mg/L (detection limit) in the overlying water and less than 0.5 mg/L (detection limit) in the interstitial water.

Controls

A laboratory control sediment (i.e., negative control sediment collected from the same location where the test organisms were collected by the laboratory [i.e., Yaquina Bay, Oregon] on August 9, 2001), was used to evaluate the survival of the test organisms. Five replicate tests were performed on each negative control sediment. All negative control testing was in compliance with ASTM (1999) methods. Performance standards developed for the negative controls of this test are ≥90 percent mean control survival (ASTM 1999) and ≥80 percent in all individual replicates.

Mean amphipod survival in the dilution series for the laboratory control sediment (i.e., negative control) was 99 percent and the percent reburial was 100 percent. Amphipod survival in the individual replicates of the dilution series for the laboratory control sediment (i.e., negative control) was 99–100 percent. These results are above the performance standards set for the test and suggest that the test organisms were sufficiently healthy for testing.

A positive control was tested using cadmium chloride as the reference toxicant. The 96-hour LC50 value for the positive control was 2.41 mg Cd/L. This LC50 value is within the laboratory's control chart warning limits for this test (i.e., 1.28–3.46 mg/L). The observed LC50 value suggests that the test organisms were suitably sensitive for testing.

Summary of Quality Assurance and Quality Control Considerations

Mean survival in the amphipod survival for the laboratory control sediment (i.e., negative control) was 99 percent and survival in the individual replicates of the negative control was 99–100 percent. These results meet the performance standards set for the 10-day amphipod test. The reference toxicant test (i.e., positive control) results were within an acceptable range.

During the testing period, there were two inconsistencies with the specifications provided in the SOW:

- The Eh in the overlying water was not measured from Day 1 through Day 7. Measurements on other test days did not indicate any extreme variations on a daily basis. It is not anticipated the failure to collect this water quality measurement will affect the results.
- The maximum ammonia concentration in the overlying and interstitial water was 37.5 mg/L. Ammonia concentrations of <60 mg/L (with a normal pH) are not toxic to *E. estuarius* (U.S. EPA 1994).

The data are determined to be acceptable for use in the NASSCO and Southwest Marine sediment investigations.

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Appendix I

Bioaccumulation Test Data

Contents

Table I-1. Phase 1 results for metals and butyltins in *Macoma* tissue

		Metals									
Station	Sample ID	Arsenic (mg/kg wet)	Cadmium (mg/kg wet)	Chromium (mg/kg wet)	Copper (mg/kg wet)	Lead (mg/kg wet)	Mercury (mg/kg wet)	Nickel (mg/kg wet)	Selenium (mg/kg wet)	Silver (mg/kg wet)	Zinc (mg/kg wet)
NASSCO											
NA06	18	3.0	0.032	0.33	2.3 *J*	0.64 *J*	0.016 *J*	0.38	0.4	0.038	17
NA06	55	2.6	0.033	0.34	2.1 *J*	0.82	0.014 *J*	0.37	0.2	0.052	18
NA06	12	2.7	0.056	0.29	2.3 *J*	0.50 *J*	0.016 *J*	0.34	0.3	0.053	21
NA06	26	3.0	0.037	0.38	2.4	0.53	0.026 *J*	0.47	0.3	0.030	18
NA06	37	3.3	0.051	0.25	2.3	0.58	0.018 *J*	0.37	0.3	0.026	24
NA11	46	3.2	0.036	0.26	1.6 *J*	0.37	0.012 *J*	0.39	0.3	0.051	15
NA11	51	2.6	0.028	0.23	1.8 *J*	0.28	0.014 *J*	0.27	0.2	0.041	16
NA11	19	2.8	0.025	0.18	1.6 *J*	0.30 *J*	0.017 *J*	0.28	0.3	0.042	14
NA11	16	3.7	0.052	0.34	2.6 *J*	0.53 *J*	0.018 *J*	0.39	0.4	0.072	20
NA11	24	2.6	0.054	0.36	1.9	0.48	0.016 *J*	0.36	0.2	0.037	18
NA12	11	2.8	0.020	0.20	1.7 *J*	0.30 *J*	0.020 *J*	0.32	0.4	0.020	12
NA12	9	2.6	0.036	0.26	2.0 *J*	0.31 *J*	0.015 *J*	0.36	0.3	0.031	17
NA12	56	2.6	0.031	0.26	1.5 *J*	0.30	0.013 *J*	0.30	0.2	0.027	17
NA12	22	2.9	0.035	0.32	1.7 *J*	0.37 *J*	0.014 *J*	0.37	0.4	0.031	17
NA12	36	2.6	0.028	0.19	2.4	0.38	0.014 *J*	0.29	0.2	0.050	18
NA20	68	3.0	0.029	0.25	1.7	0.41	0.017 *J*	0.42	0.3	0.022	19
NA20	72	2.2	0.023	0.27	1.6	0.38	0.017 *J*	0.34	0.2	0.019	15
NA20	34/35	3.2	0.035	0.37	2.0	0.55	0.023 *J*	0.50	0.2	0.022	18
NA20	53	2.5	0.029	0.30	1.4 *J*	0.37	0.017 *J*	0.38	0.2	0.022	16
Southwest Marine											
SW04	21	3.8	0.043	0.76	8.1 *J*	1.9 *J*	0.023 *J*	0.48	0.3	0.058	46
SW04	3	3.8	0.055	0.49	5.0 *J*	1.7 *J*	0.021 *J*	0.63	0.2	0.029	31
SW04	58	3.1	0.037	0.53	4.0 *J*	1.3	0.022 *J*	0.35	0.2	0.034	27
SW04	45	3.6	0.031	0.18	2.5 *J*	0.70	0.016 *J*	0.37	0.2	0.028	19
SW04	30	3.6	0.027	0.42	4.6	1.1	0.019 *J*	0.38	0.3	0.024	21
SW08	73	2.6	0.022	0.33	3.2	0.80	0.026 *J*	0.29	0.2	0.016	15
SW08	5	2.8	0.029	0.35	3.2 *J*	1.4 *J*	0.015 *J*	0.29	0.2 *U*	0.034	14
SW08	44	2.8	0.035	0.53	2.6 *J*	0.60	0.018 *J*	0.43	0.3	0.019	17
SW08	63	3.0	0.037	0.30	3.2 *J*	0.66	0.017 *J*	0.37	0.2	0.041	19
SW08	70	2.6	0.030	0.31	4.3	0.75	0.017 *J*	0.30	0.2	0.067	14
SW13	4	2.5	0.032	0.26	2.5 *J*	0.35 *J*	0.013 *J*	0.35	0.2	0.043	17
SW13	14	3.6	0.045	0.31	5.6 *J*	0.40 *J*	0.014 *J*	0.44	0.5	0.077	24
SW13	29	3.1	0.031	0.30	3.1	0.43	0.018 *J*	0.41	0.3	0.028	25
SW13	59	2.1	0.025	0.41	4.2 *J*	0.35	0.013 *J*	0.34	0.2	0.027	16
SW13	60	2.9	0.027	0.29	2.9 *J*	0.33	0.016 *J*	0.34	0.2	0.038	14
SW21	48	3.1	0.033	0.32	2.4 *J*	0.46	0.016 *J*	0.36	0.2	0.053	18
SW21	28	3.1	0.037	0.32	2.0	0.53	0.017 *J*	0.31	0.2	0.039	18
SW21	31	3.7	0.053	0.35	2.4	0.69	0.017 *J*	0.41	0.3	0.061	24

Table I-1. (cont.)

		Metals									
Station	Sample ID	Arsenic (mg/kg wet)	Cadmium (mg/kg wet)	Chromium (mg/kg wet)	Copper (mg/kg wet)	Lead (mg/kg wet)	Mercury (mg/kg wet)	Nickel (mg/kg wet)	Selenium (mg/kg wet)	Silver (mg/kg wet)	Zinc (mg/kg wet)
SW21	23	2.9	0.042	0.34	2.2	0.58	0.017 *J*	0.36	0.3	0.050	18
SW21	6	2.6	0.038	0.60	3.1 *J*	0.90 *J*	0.012 *J*	0.37	0.4	0.054	19
SW28	64	2.8	0.036	0.20	1.8 *J*	0.35	0.019 *J*	0.40	0.2	0.028	18
SW28	75	2.7	0.028	0.18	1.6	0.39	0.017 *J*	0.32	0.3 *U*	0.020	15
SW28	10	3.3	0.036	0.25	2.2 *J*	0.45 *J*	0.020 *J*	0.38	0.4	0.038	22
SW28	41	3.5	0.053	0.30	2.7	0.51	0.015 *J*	0.48	0.3	0.052	25
SW28	69	3.1	0.034	0.27	2.2	0.45	0.016 *J*	0.35	0.2	0.039	17
Reference											
2441	8	2.7	0.049	0.41	2.3	0.30	0.009	0.48	0.2	0.060	15
2441	57	2.6	0.047	0.44	2.4	0.28	0.010	0.58	0.1 *U*	0.058	14
2441	32	2.6	0.060	0.35	2.7	0.28	0.010	0.44	0.1	0.067	17
2441	1	2.7	0.057	0.40	2.7	0.32	0.012	0.50	0.2	0.072	15
2441	54	2.7	0.053	0.40	2.7	0.36	0.012	0.47	0.1	0.065	20
2433	67	2.8	0.039	0.38	1.5	0.28	0.014 *J*	0.44	0.2	0.042	16
2433	65	2.8	0.038	0.30	1.5 *J*	0.25	0.014 *J*	0.44	0.2	0.037	15
2433	47	2.9	0.040	0.36	1.4 *J*	0.23	0.011 *J*	0.42	0.2	0.041	17
2433	71	2.8	0.032	0.35	1.8	0.26	0.009 *J*	0.37	0.2	0.051	13
2433	2	2.7	0.034	0.37	1.5 *J*	0.37 *J*	0.011 *J*	0.45	0.3	0.042	14
2440	13	2.6	0.027	0.48	1.6 *J*	0.49 *J*	0.019 *J*	0.45	0.4	0.037	14
2440	49	2.5	0.023	0.26	1.1 *J*	1.0	0.018 *J*	0.33	0.2	0.020	13
2440	17	2.2	0.025	0.19	1.2 *J*	0.38 *J*	0.015 *J*	0.30	0.3	0.025	13
2440	50	2.5	0.028	0.24	1.3 *J*	0.52	0.019 *J*	0.38	0.2	0.017	17
2440	74	2.4	0.029	0.27	1.7	0.52	0.014 *J*	0.38	0.2	0.066	17
2231	25	3.1	0.032	0.32	1.4	0.24	0.022 *J*	0.31	0.3	0.022	15
2231	66	2.7	0.033	0.17	1.6	0.25	0.023 *J*	0.29	0.2	0.022	18
2231	43	2.8	0.022	0.21	1.2	0.25	0.020 *J*	0.37	0.2	0.021	14
2231	38	2.7	0.047	0.08	1.1	0.26	0.019 *J*	0.28	0.2	0.016	20
2231	42	3.4	0.031	0.31	1.6	0.30	0.027 *J*	0.33	0.3	0.034	17
2243	39	2.3	0.025	0.31	1.3	0.33	0.018 *J*	0.32	0.2	0.038	15
2243	52	3.2	0.028	0.26	1.9 *J*	0.23	0.017 *J*	0.33	0.2	0.035	17
2243	7	3.1	0.028	0.30	1.9 *J*	0.29 *J*	0.018 *J*	0.43	0.4	0.033	15
2243	62	3.0	0.029	0.29	1.3 *J*	0.26	0.018 *J*	0.32	0.2	0.023	18
2243	27	3.8	0.040	0.39	2.3	0.40	0.015 *J*	0.44	0.2	0.065	18

Table I-1. (cont.)

Station	Sample ID	Butyltins Tetrabutyltin (μg/kg wet)	Tributyltin (μg/kg wet)	Dibutyltin (μg/kg wet)	Monobutyltin (μg/kg wet)
NASSCO					
NA06	18	1.0 *U*	16	5.5	1.0 *U*
NA06	55	1.0 *U*	32	7.0	1.0 *U*
NA06	12	1.0 *U*	31	6.9	1.0 *U*
NA06	26	1.0 *U*	38	8.2	1.0 *U*
NA06	37	1.0 *U*	41	7.5	1.0 *U*
NA11	46	1.0 *U*	15	5.7	1.0 *U*
NA11	51	1.0 *U*	11	4.4	1.0 *U*
NA11	19	1.0 *U*	12	3.9	1.0 *U*
NA11	16	1.0 *U*	19	6.3	1.0 *U*
NA11	24	0.99 *U*	12	3.6	0.99 *U*
NA12	11	0.99 *U*	18	5.2	0.99 *U*
NA12	9	0.99 *U*	15	4.9	0.99 *U*
NA12	56	0.99 *U*	13	4.5	0.99 *U*
NA12	22	0.99 *U*	19	5.7	0.99 *U*
NA12	36	1.0 *U*	8.8	2.1 *J*	1.0 *U*
NA20	68	0.99 *U*	22	5.8	0.99 *U*
NA20	72	1.0 *U*	26	6.3	1.0 *U*
NA20	34/35	1.0 *U*	27	7.0	1.0 *U*
NA20	53	1.0 *U*	16	4.3	1.0 *U*
Southwest Marine					
SW04	21	10 *U*	330	63	10 *U*
SW04	3	10 *U*	740	120	10 *U*
SW04	58	10 *U*	420	74	10 *U*
SW04	45	10 *U*	150	32	10 *U*
SW04	30	1.0 *U*	15	3.7	1.0 *U*
SW08	73	10 *U*	120	24	10 *U*
SW08	5	5.0 *U*	210	35	5.0 *U*
SW08	44	10 *U*	110	23	10 *U*
SW08	63	9.9 *U*	180	30	9.9 *U*
SW08	70	9.9 *U*	120	23	9.9 *U*
SW13	4	5.0 *U*	120	15	5.0 *U*
SW13	14	2.0 *U*	140	20	2.0 *U*
SW13	29	2.0 *U*	150	22	2.0 *U*
SW13	59	9.9 *U*	93	15	9.9 *U*
SW13	60	9.9 *U*	120	17	9.9 *U*
SW21	48	1.0 *U*	13	4.0	1.0 *U*
SW21	28	1.0 *U*	14	4.2	1.0 *U*
SW21	31	0.99 *U*	16	3.7	0.99 *U*

Table I-1. (cont.)

		Butyltins			
Station	Sample ID	Tetrabutyltin (μg/kg wet)	Tributyltin (μg/kg wet)	Dibutyltin (μg/kg wet)	Monobutyltin (μg/kg wet)
SW21	23	1.0 *U*	15	3.7	1.0 *U*
SW21	6	1.0 *U*	24	6.5	1.0 *U*
SW28	64	1.0 *U*	15	5.2	1.0 *U*
SW28	75	1.0 *U*	10	4.2	1.0 *U*
SW28	10	1.0 *U*	16	5.9	1.0 *U*
SW28	41	1.0 *U*	11	3.8	1.0 *U*
SW28	69	1.0 *U*	13	5.2	1.0 *U*
Reference					
2441	8	1.0 *U*	2.2 *J*	1.3	1.0 *U*
2441	57	1.0 *U*	1.5	1.6	1.0 *U*
2441	32	3.3 *U*	3.3 *U*	3.3 *U*	3.3 *U*
2441	1	1.1 *U*	1.5	1.1 *U*	1.1 *U*
2441	54	1.0 *U*	2.5	1.2	1.0 *U*
2433	67	0.99 *U*	2.4	2.4	0.99 *U*
2433	65	0.99 *U*	3.7	2.8	0.99 *U*
2433	47	1.0 *U*	3.7	2.5	1.0 *U*
2433	71	1.0 *U*	3.6	2.7	1.0 *U*
2433	2	3.7 *U*	4.8	3.7 *U*	3.7 *U*
2440	13	1.0 *U*	14	4.6	1.0 *U*
2440	49	1.0 *U*	10	2.5	1.0 *U*
2440	17	1.0 *U*	14	3.6	1.0 *U*
2440	50	0.98 *U*	9.6	2.5	0.98 *U*
2440	74	1.0 *U*	12	2.7	1.0 *U*
2231	25	0.99 *U*	3.5	1.6 *J*	0.99 *U*
2231	66	1.0 *U*	4.4	2.8	1.0 *U*
2231	43	0.99 *U*	2.6	1.8	0.99 *U*
2231	38	1.0 *U*	3.1	2.2	1.0 *U*
2231	42	1.0 *U*	4.5	2.5	1.0 *U*
2243	39	1.0 *U*	2.9	2.1	1.0 *U*
2243	52	0.99 *U*	1.8	2.2	0.99 *U*
2243	7	1.0 *U*	4.6 *J*	2.9	1.0 *U*
2243	62	1.0 *U*	3.6	2.8	1.0 *U*
2243	27	0.99 *U*	1.3	0.99 *U*	0.99 *U*

Note: *J* - estimated
U - undetected at quantitation limit

Table I-2. Phase 1 results for PAHs in *Macoma* tissue

Station	Sample ID	Naphthalene (µg/kg wet)	2-Methyl-naphthalene (µg/kg wet)	1-Methyl-naphthalene (µg/kg wet)	2,6-Dimethyl-naphthalene (µg/kg wet)	Acenaph-thylene (µg/kg wet)	Acenaph-thene (µg/kg wet)	2,3,5-Trimethyl-naphthalene (µg/kg wet)	Fluorene (µg/kg wet)	Phenan-threne (µg/kg wet)	Anthracene (µg/kg wet)
NASSCO											
NA06	18	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	6.0
NA06	55	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*
NA06	12	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*
NA06	26	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*
NA06	37	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*
NA11	46	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*
NA11	51	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*
NA11	19	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*
NA11	16	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.4
NA11	24	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*
NA12	11	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	6.5
NA12	9	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.6
NA12	56	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*
NA12	22	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	7.1
NA12	36	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*
NA20	68	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*
NA20	72	12 *U*	12 *U*	12 *U*	12 *U*	12 *U*	12 *U*	12 *U*	12 *U*	12 *U*	12 *U*
NA20	53	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*
NA20	34/35	9.9 *U*	9.9 *U*	9.9 *U*	9.9 *U*	9.9 *U*	9.9 *U*	9.9 *U*	9.9 *U*	9.9 *U*	10
Southwest Marine											
SW04	21	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	6.2	5.0 *U*	5.0 *U*	5.0 *U*	5.2	35
SW04	3	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	6.2	5.0 *U*	5.0 *U*	5.0 *U*	6.6	32
SW04	58	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	30
SW04	45	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	30
SW04	30	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	20	44
SW08	73	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	16
SW08	5	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	6.8	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	21
SW08	44	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	23
SW08	63	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	18
SW08	70	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	16
SW13	4	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0	5.0 *U*	5.0 *U*	5.0 *U*	13	17
SW13	14	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.6	5.0 *U*	5.0 *U*	5.0 *U*	11	21

Table I-2. (cont.)

Station	Sample ID	Naphthalene (μg/kg wet)	2-Methyl-naphthalene (μg/kg wet)	1-Methyl-naphthalene (μg/kg wet)	2,6-Dimethyl-naphthalene (μg/kg wet)	Acenaph-thylene (μg/kg wet)	Acenaph-thene (μg/kg wet)	2,3,5-Trimethyl-naphthalene (μg/kg wet)	Fluorene (μg/kg wet)	Phenan-threne (μg/kg wet)	Anthracene (μg/kg wet)
SW13	29	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	18
SW13	59	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	12	14
SW13	60	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	13	15
SW21	48	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	17
SW21	28	10 *U*	10 *U*	10 *U*	10 *U*	10	10 *U*	10 *U*	10 *U*	10 *U*	25
SW21	31	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	13	20
SW21	23	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	19
SW21	6	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	12
SW28	64	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	13
SW28	75	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	13
SW28	10	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.4	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	16
SW28	41	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	21
SW28	69	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	11
Reference											
2441	8	8.0	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	10	5.0 *U*	5.0 *U*	21	16
2441	57	5.0 *UJ*	5.0 *UJ*	5.0 *UJ*	5.0 *UJ*	5.0 *UJ*	5.0 *UJ*	5.0 *UJ*	5.0 *UJ*	5.0 *UJ*	5.0 *UJ*
2441	32	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*
2441	1	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*
2441	54	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	6.0	5.3
2433	67	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*
2433	65	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*
2433	47	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*
2433	71	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*
2433	2	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*
2440	13	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	7.8	17
2440	49	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	13
2440	17	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	6.7	11
2440	50	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	12	18
2440	74	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10	16
2231	25	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*
2231	66	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*
2231	43	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*

Table I-2. (cont.)

Station	Sample ID	Naphthalene (μg/kg wet)	2-Methyl-naphthalene (μg/kg wet)	1-Methyl-naphthalene (μg/kg wet)	2,6-Dimethyl-naphthalene (μg/kg wet)	Acenaph-thylene (μg/kg wet)	Acenaph-thene (μg/kg wet)	2,3,5-Trimethyl-naphthalene (μg/kg wet)	Fluorene (μg/kg wet)	Phenan-threne (μg/kg wet)	Anthracene (μg/kg wet)
2231	38	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*
2231	42	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*
2243	39	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*
2243	52	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*
2243	7	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*
2243	62	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*
2243	27	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*

Table I-2. (cont.)

Station	Sample ID	1-Methyl phenanthrene (µg/kg wet)	Fluoran-thene (µg/kg wet)	Pyrene (µg/kg wet)	Benz[a]-anthracene (µg/kg wet)	Chrysene (µg/kg wet)	Benzo[b]-fluoranthene (µg/kg wet)	Benzo[k]-fluoranthene (µg/kg wet)	Benzo[e]-pyrene (µg/kg wet)	Benzo[a]-pyrene (µg/kg wet)	Indeno[1,2,3-cd]pyrene (µg/kg wet)
NASSCO											
NA06	18	5.0 *U*	26	32	10	21	48	48	38	27	10
NA06	55	10 *U*	26	37	11	23	44	51	35	26	10 *U*
NA06	12	5.0 *U*	16	20	6.1	16	37	39	31	20	7.2
NA06	26	10 *U*	29	40	11	27	57	65	50	30	11
NA06	37	10 *U*	29	37	13	28	60	68	51	32	12
NA11	46	10 *U*	16	16	10 *U*	16	37	40	30	23	10 *U*
NA11	51	10 *U*	19	19	10 *U*	18	42	46	35	26	10 *U*
NA11	19	5.0 *U*	16	15	6.8	14	33	32	25	19	7.4
NA11	16	5.0 *U*	20	20	9.7	19	43	45	33	27	11
NA11	24	10 *U*	20	20	10 *U*	19	31	46	29	20	10 *U*
NA12	11	5.0 *U*	35	32	13	27	34	36	28	19	8.0
NA12	9	5.0 *U*	32	28	12	24	34	31	26	19	7.5
NA12	56	10 *U*	28	27	13	25	34	40	30	21	10 *U*
NA12	22	5.0 *U*	33	33	14	28	39	42	31	23	8.3
NA12	36	10 *U*	34	31	15	27	31	46	27	18	10 *U*
NA20	68	10 *U*	59	150	23	38	93	32	43	46	10 *U*
NA20	72	12 *U*	27	73	12 *U*	20	46	16	22	23	12 *U*
NA20	53	10 *U*	43	120	19	31	52	60	40	35	10 *U*
NA20	34/35	9.9 *U*	50	130	20	35	67	45	45	43	9.9 *U*
Southwest Marine											
SW04	21	5.0 *U*	240	380	92	170	280	190	190	170	39
SW04	3	5.0 *U*	210	340	95	170	270	170	180	170	41
SW04	58	10 *U*	230	400	84	160	230	200	170	150	31
SW04	45	10 *U*	210	360	81	160	230	210	180	180	27
SW04	30	10 *U*	300	470	120	220	330	270	240	200	44
SW08	73	10 *U*	190	200	73	150	350	110	180	170	38
SW08	5	5.0 *U*	170	190	66	140	230	150	160	140	35
SW08	44	10 *U*	210	230	78	170	240	240	190	180	30
SW08	63	10 *U*	230	280	87	180	300	260	220	190	43
SW08	70	10 *U*	180	190	67	140	300	93	160	150	34
SW13	4	5.0 *U*	140	170	39	64	120	82	73	79	18
SW13	14	5.0 *U*	200	260	61	94	180	140	110	120	24

Table I-2. (cont.)

Station	Sample ID	1-Methyl phenanthrene (µg/kg wet)	Fluoranthene (µg/kg wet)	Pyrene (µg/kg wet)	Benz[a]anthracene (µg/kg wet)	Chrysene (µg/kg wet)	Benzo[b]fluoranthene (µg/kg wet)	Benzo[k]fluoranthene (µg/kg wet)	Benzo[e]pyrene (µg/kg wet)	Benzo[a]pyrene (µg/kg wet)	Indeno[1,2,3-cd]pyrene (µg/kg wet)
SW13	29	10 *U*	180	220	52	93	150	160	110	100	21
SW13	59	10 *U*	150	190	48	83	140	130	98	100	19
SW13	60	10 *U*	180	240	58	100	180	180	120	130	24
SW21	48	10 *U*	69	240	44	89	230	220	170	180	35
SW21	28	10 *U*	61	230	44	84	220	190	160	150	34
SW21	31	10 *U*	71	250	38	71	180	160	140	120	30
SW21	23	10 *U*	63	230	40	75	190	180	150	130	26
SW21	6	5.0 *U*	45	160	29	56	150	100	100	110	25
SW28	64	10 *U*	93	250	35	72	180	190	130	140	27
SW28	75	10 *U*	98	220	36	71	230	91	110	130	27
SW28	10	5.0 *U*	100	260	41	76	180	140	120	130	26
SW28	41	10 *U*	140	380	49	96	220	210	160	140	26
SW28	69	10 *U*	90	230	36	70	250	87	120	140	28
Reference											
2441	8	5.0 *U*	110 *J*	180	17	35	17	22	10	12	7.0
2441	57	5.0 *UJ*	7.0 *J*	7.0 *J*	5.0 *J*	5.0 *J*	5.0 *J*	5.3 *J*	5.0 *J*	5.0 *J*	5.0 *UJ*
2441	32	5.0 *U*	22 *J*	140	5.9	8.4	7.9	8.3	70	44	7.6
2441	1	5.0 *U*	20 *J*	20	5.8	7.5	8.7	11	6.3	6.6	5.0 *U*
2441	54	5.0 *U*	28 *J*	24	8	10	9	12	6.7	6.8	5.0 *U*
2433	67	10 *U*	11	11	10 *U*	10 *U*	11	19	10 *U*	10 *U*	10 *U*
2433	65	10 *U*	12	13	10 *U*	10 *U*	12	18	10 *U*	10 *U*	10 *U*
2433	47	10 *U*	11	11	10 *U*	10 *U*	12	16	10 *U*	10 *U*	10 *U*
2433	71	10 *U*	11	10 *U*	10 *U*	10 *U*	22	10 *U*	10 *U*	10 *U*	10 *U*
2433	2	5.0 *U*	9.5	8.8	5.0 *U*	6.2	12	12	7.0	6.0	5.0 *U*
2440	13	5.0 *U*	170	210	51	60	43	46	29	27	7.9
2440	49	10 *U*	160	200	49	59	44	50	29	27	10 *U*
2440	17	5.0 *U*	130	160	43	47	33	34	23	21	5.8
2440	50	10 *U*	180	210	58	66	47	61	33	34	10 *U*
2440	74	10 *U*	180	190	53	61	70	28	29	34	10 *U*
2231	25	10 *U*	11	10 *U*	10 *U*	10	11	16	10	10 *U*	10 *U*
2231	66	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	17	10 *U*	10 *U*	10 *U*
2231	43	10 *U*	12	11	10 *U*	11	10	14	10 *U*	10 *U*	10 *U*

Table I-2. (cont.)

Station	Sample ID	1-Methyl phenanthrene (µg/kg wet)	Fluoran- thene (µg/kg wet)	Pyrene (µg/kg wet)	Benz[a]- anthracene (µg/kg wet)	Chrysene (µg/kg wet)	Benzo[b]- fluoranthene (µg/kg wet)	Benzo[k]- fluoranthene (µg/kg wet)	Benzo[e]- pyrene (µg/kg wet)	Benzo[a]- pyrene (µg/kg wet)	Indeno[1,2,3- cd]pyrene (µg/kg wet)
2231	38	10 *U*	10 *U*	10 *U*	10 *U*	10	10 *U*	15	10 *U*	10 *U*	10 *U*
2231	42	10 *U*	10	10 *U*	10 *U*	10 *U*	10 *U*	17	10	10 *U*	10 *U*
2243	39	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10	10 *U*	10 *U*	10 *U*
2243	52	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*
2243	7	5.0 *U*	9.2	5.9	5.0 *U*	5.0 *U*	9.5	8.3	6.8	5.0 *U*	5.0 *U*
2243	62	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*
2243	27	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*

Table I-2. (cont.)

Station	Sample ID	Dibenz[a,h]-anthracene (μg/kg wet)	Benzo[ghi]-perylene (μg/kg wet)	Perylene (μg/kg wet)	Biphenyl (μg/kg wet)	HPAH[a] (μg/kg wet)	LPAH[b] (μg/kg wet)	Total PAH[c] (μg/kg wet)
NASSCO								
NA06	18	5.0 *U*	7.8	5.3	5.0 *U*	230	21	250
NA06	55	10 *U*	10 *U*	10 *U*	10 *U*	230	35 *U*	270
NA06	12	5.0 *U*	6.3	5.0 *U*	5.0 *U*	170	18 *U*	190
NA06	26	10 *U*	11	10 *U*	10 *U*	290	35 *U*	320
NA06	37	10 *U*	10 *U*	10 *U*	10 *U*	290	35 *U*	320
NA11	46	10 *U*	10 *U*	10 *U*	10 *U*	170	35 *U*	200
NA11	51	10 *U*	10 *U*	10 *U*	10 *U*	190	35 *U*	230
NA11	19	5.0 *U*	6.2	5.0 *U*	5.0 *U*	150	18 *U*	170
NA11	16	5.0 *U*	8.9	5.0 *U*	5.0 *U*	210	20	230
NA11	24	10 *U*	10 *U*	10 *U*	10 *U*	180	35 *U*	210
NA12	11	5.0 *U*	7.5	5.0	5.0 *U*	210	22	240
NA12	9	5.0 *U*	6.8	5.0 *U*	5.0 *U*	200	21	220
NA12	56	10 *U*	10 *U*	10 *U*	10 *U*	200	35 *U*	240
NA12	22	5.0 *U*	7.0	5.0 *U*	5.0 *U*	230	22	250
NA12	36	10 *U*	10 *U*	10 *U*	10 *U*	220	35 *U*	250
NA20	68	10 *U*	11	10 *U*	10 *U*	460	35 *U*	500
NA20	72	12 *U*	12 *U*	12 *U*	12 *U*	230	42 *U*	270
NA20	53	10 *U*	10 *U*	10 *U*	10 *U*	380	35 *U*	410
NA20	34/35	9.9 *U*	11	10	9.9 *U*	410	40	450
Southwest Marine								
SW04	21	5.0 *U*	28	35	5.0 *U*	1,600	56	1,600
SW04	3	5.6	29	34	5.0 *U*	1,500	55	1,600
SW04	58	10 *U*	26	32	10 *U*	1,500	60	1,600
SW04	45	10 *U*	22	42	10 *U*	1,500	60	1,500
SW04	30	10 *U*	35	42	10 *U*	2,000	89	2,100
SW08	73	10 *U*	39	33	10 *U*	1,300	46	1,400
SW08	5	5.0 *U*	25	26	5.0 *U*	1,100	40	1,200
SW08	44	10 *U*	26	38	10 *U*	1,400	53	1,500
SW08	63	10 *U*	36	35	10 *U*	1,600	48	1,700
SW08	70	10 *U*	33	29	10 *U*	1,200	46	1,200
SW13	4	5.0 *U*	14	16	5.0 *U*	730	45	770
SW13	14	5.0 *U*	17	25	5.0 *U*	1,100	48	1,100

Table I-2. (cont.)

Station	Sample ID	Dibenz[a,h]-anthracene (μg/kg wet)	Benzo[ghi]-perylene (μg/kg wet)	Perylene (μg/kg wet)	Biphenyl (μg/kg wet)	HPAH[a] (μg/kg wet)	LPAH[b] (μg/kg wet)	Total PAH[c] (μg/kg wet)
SW13	29	10 *U*	17	23	10 *U*	1,000	48	1,000
SW13	59	10 *U*	15	21	10 *U*	880	51	930
SW13	60	10 *U*	20	26	10 *U*	1,100	53	1,200
SW21	48	10 *U*	29	35	10 *U*	1,100	47	1,200
SW21	28	10 *U*	26	33	10 *U*	1,000	60	1,100
SW21	31	10 *U*	21	28	10 *U*	950	58	1,000
SW21	23	10 *U*	20	30	10 *U*	960	49	1,000
SW21	6	5.0 *U*	18	23	5.0 *U*	700	27	720
SW28	64	10 *U*	22	24	10 *U*	1,000	43	1,100
SW28	75	10 *U*	26	24	10 *U*	930	43	980
SW28	10	5.0 *U*	18	23	5.0 *U*	970	34	1,000
SW28	41	10 *U*	26	29	10 *U*	1,300	51	1,300
SW28	69	10 *U*	26	26	10 *U*	960	41	1,000
Reference								
2441	8	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	410 *J*	62	470 *J*
2441	57	5.0 *UJ*	5.0 *UJ*	5.0 *UJ*	5.0 *UJ*	47 *J*	18 *UJ*	64 *J*
2441	32	5.0 *U*	26	39	5.0 *U*	270 *J*	18 *U*	290 *J*
2441	1	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	87 *J*	18 *U*	100 *J*
2441	54	5.0 *U*	10	5.0 *U*	5.0 *U*	110 *J*	24	130 *J*
2433	67	10 *U*	10 *U*	10 *U*	10 *U*	82	35 *U*	120
2433	65	10 *U*	10 *U*	10 *U*	10 *U*	85	35 *U*	120
2433	47	10 *U*	10 *U*	10 *U*	10 *U*	80	35 *U*	120
2433	71	10 *U*	10 *U*	10 *U*	10 *U*	73	35 *U*	110
2433	2	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	65	18 *U*	82
2440	13	5.0 *U*	6.7	6.8	5.0 *U*	620	37	660
2440	49	10 *U*	10 *U*	10 *U*	10 *U*	600	43	650
2440	17	5.0 *U*	5.4	5.6	5.0 *U*	480	30	510
2440	50	10 *U*	14	10 *U*	10 *U*	680	55	740
2440	74	10 *U*	10 *U*	10 *U*	10 *U*	630	51	680
2231	25	10 *U*	10 *U*	10 *U*	10 *U*	78	35 *U*	110
2231	66	10 *U*	10 *U*	10 *U*	10 *U*	62	35 *U*	97
2231	43	10 *U*	10 *U*	10 *U*	10 *U*	83	35 *U*	120

Table I-2. (cont.)

Station	Sample ID	Dibenz[a,h]-anthracene (μg/kg wet)	Benzo[ghi]-perylene (μg/kg wet)	Perylene (μg/kg wet)	Biphenyl (μg/kg wet)	HPAH[a] (μg/kg wet)	LPAH[b] (μg/kg wet)	Total PAH[c] (μg/kg wet)
2231	38	10 *U*	10 *U*	10 *U*	10 *U*	65	35 *U*	100
2231	42	10 *U*	10 *U*	10 *U*	10 *U*	67	35 *U*	100
2243	39	10 *U*	10 *U*	10 *U*	10 *U*	55	35 *U*	90
2243	52	10 *U*	10 *U*	10 *U*	10 *U*	50 *U*	35 *U*	85 *U*
2243	7	5.0 *U*	5.0 *U*	5.0 *U*	5.0 *U*	48	18 *U*	65
2243	62	10 *U*	10 *U*	10 *U*	10 *U*	50 *U*	35 *U*	85 *U*
2243	27	10 *U*	10 *U*	10 *U*	10 *U*	50 *U*	35 *U*	85 *U*

Note: HPAH - high-molecular-weight polycyclic aromatic hydrocarbon
J - estimated
LPAH - low-molecular-weight polycyclic aromatic hydrocarbon
PAH - polycyclic aromatic hydrocarbon
U - undetected at quantitation limit

[a] Sum includes benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[ghi]perylene, benzo[k]fluoranthene, chrysene, dibenz[a,h]anthracene, fluoranthene, indeno[1,2,3-cd]pyrene, and pyrene using one-half quantitation limit.

[b] Sum includes 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene using one-half quantitation limit.

[c] Sum of HPAH and LPAH low molecular weight polycyclic aromatic hydrocarbon analytes using one-half quantitation limit.

Table I-3. Phase 1 results for PCBs and PCTs in *Macoma* tissue

		Polychlorinated Biphenyls								Polychlorinated Terphenyls			PCB Congeners	
Station	Sample ID	Aroclor® 1016 (µg/kg wet)	Aroclor® 1221 (µg/kg wet)	Aroclor® 1232 (µg/kg wet)	Aroclor® 1242 (µg/kg wet)	Aroclor® 1248 (µg/kg wet)	Aroclor® 1254 (µg/kg wet)	Aroclor® 1260 (µg/kg wet)	Total PCBs[a] (µg/kg wet)	Aroclor® 5432 (µg/kg wet)	Aroclor® 5442 (µg/kg wet)	Aroclor® 5460 (µg/kg wet)	PCB Congener 18 (ng/g wet)	PCB Congener 28 (ng/g wet)
NASSCO														
NA06	18	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	55	11	66	20 *U*	20 *U*	100 *U*	0.19	1.5
NA06	55	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	69	10 *U*	69	20 *U*	20 *U*	100 *U*	0.17	1.3
NA06	12	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	53	13	66	20 *U*	20 *U*	100 *U*	0.11	0.46
NA06	26	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	78	14	92	20 *U*	20 *U*	100 *U*	0.22	1.8
NA06	37	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	75	21 *J*	96 *J*	20 *U*	20 *U*	100 *U*	0.20	1.5
NA11	46	9.9 *U*	20 *U*	9.9 *U*	9.9 *U*	9.9 *U*	47	9.9 *U*	47	20 *U*	20 *U*	99 *U*	0.068 *J*	0.46
NA11	51	9.9 *U*	20 *U*	9.9 *U*	9.9 *U*	9.9 *U*	49	9.9 *U*	49	20 *U*	20 *U*	99 *U*	0.071	0.38
NA11	19	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	37	10 *U*	37	20 *U*	20 *U*	100 *U*	0.045 *J*	0.39
NA11	16	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	43	12	55	20 *U*	20 *U*	100 *U*	0.056	0.45
NA11	24	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	46	10 *U*	46	20 *U*	20 *U*	100 *U*	0.070 *J*	0.49
NA12	11	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	22	10 *U*	22	20 *U*	20 *U*	100 *U*	0.020	0.14
NA12	9	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	22	10 *U*	22	20 *U*	20 *U*	100 *U*	0.021	0.15
NA12	56	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	35	10 *U*	35	20 *U*	20 *U*	100 *U*	0.032 *J*	0.17
NA12	22	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	38	11	49	20 *U*	20 *U*	100 *U*	0.035 *J*	0.22
NA12	36	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	31	10 *U*	31	20 *U*	20 *U*	100 *U*	0.038 *U*	0.18
NA20	68	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	34	10 *U*	34	20 *U*	20 *U*	100 *U*	0.14	0.69
NA20	72	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	29	10 *U*	29	20 *U*	20 *U*	100 *U*	0.14	0.55
NA20	34/35	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	40	10 *U*	40	20 *U*	20 *U*	100 *U*	0.093	0.37
NA20	53	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	25	10 *U*	25	20 *U*	20 *U*	100 *U*	0.11	0.46
Southwest Marine														
SW04	21	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	190	32	220	20 *U*	20 *U*	100 *U*	1.4	7.6
SW04	3	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	190	28	220	20 *U*	20 *U*	100 *U*	0.90	5.7
SW04	58	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	230	10 *U*	230	20 *U*	20 *U*	100 *U*	0.028 *J*	0.20
SW04	45	9.9 *U*	20 *U*	9.9 *U*	9.9 *U*	9.9 *U*	180	9.9 *U*	180	20 *U*	20 *U*	99 *U*	1.2	4.9
SW04	30	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	210	24	230	20 *U*	20 *U*	100 *U*	1.5	7.3
SW08	73	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	190	10 *U*	190	20 *U*	20 *U*	100 *U*	0.69	2.9
SW08	5	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	92	15	110	20 *U*	20 *U*	100 *U*	0.83	2.5
SW08	44	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	150	23 *J*	170 *J*	20 *U*	20 *U*	100 *U*	0.54	2.7
SW08	63	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	180	10 *U*	180	20 *U*	20 *U*	100 *U*	1.1	3.9
SW08	70	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	150	10 *U*	150	20 *U*	20 *U*	100 *U*	0.77	2.7
SW13	4	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	24	10 *U*	24	20 *U*	20 *U*	100 *U*	0.059	0.33
SW13	14	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	68	22	90	20 *U*	20 *U*	100 *U*	0.098	0.80
SW13	29	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	59	21	80	20 *U*	20 *U*	100 *U*	0.096	0.61
SW13	59	15 *U*	29 *U*	15 *U*	15 *U*	15 *U*	68	17	85	29 *U*	29 *U*	150 *U*	1.6	7.3
SW13	60	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	68	14	82	20 *U*	20 *U*	100 *U*	0.061 *J*	0.47
SW21	48	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	170	70	240	20 *U*	20 *U*	100 *U*	0.31	1.2
SW21	28	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	200	100	300	20 *U*	20 *U*	100 *U*	0.36	1.3
SW21	31	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	190	76	270	20 *U*	20 *U*	100 *U*	0.41	1.5

Table I-3. (cont.)

		Polychlorinated Biphenyls								Polychlorinated Terphenyls			PCB Congeners	
Station	Sample ID	Aroclor® 1016 (µg/kg wet)	Aroclor® 1221 (µg/kg wet)	Aroclor® 1232 (µg/kg wet)	Aroclor® 1242 (µg/kg wet)	Aroclor® 1248 (µg/kg wet)	Aroclor® 1254 (µg/kg wet)	Aroclor® 1260 (µg/kg wet)	Total PCBs[a] (µg/kg wet)	Aroclor® 5432 (µg/kg wet)	Aroclor® 5442 (µg/kg wet)	Aroclor® 5460 (µg/kg wet)	PCB Congener 18 (ng/g wet)	PCB Congener 28 (ng/g wet)
SW21	23	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	200	84	280	20 *U*	20 *U*	100 *U*	0.29	1.3
SW21	6	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	140	85 *J*	230 *J*	20 *U*	20 *U*	100 *U*	0.24	1.1
SW28	64	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	120	89	210	20 *U*	20 *U*	100 *U*	0.063 *J*	0.36
SW28	75	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	130	82	210	20 *U*	20 *U*	100 *U*	0.10	0.42
SW28	10	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	150	88	240	20 *U*	20 *U*	100 *U*	0.84	1.0
SW28	41	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	170	92	260	20 *U*	20 *U*	100 *U*	0.086 *J*	0.34
SW28	69	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	130	82	210	20 *U*	20 *U*	100 *U*	0.076 *J*	0.42
Reference														
2441	8	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	10	10 *U*	10	20 *U*	20 *U*	100 *U*	0.023	0.16
2441	57	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	20 *U*	20 *U*	20 *U*	100 *U*	0.021	0.14
2441	32	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	20 *U*	20 *U*	20 *U*	100 *U*	0.020	0.14
2441	1	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	20 *U*	20 *U*	20 *U*	100 *U*	0.032	0.15
2441	54	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*	20 *U*	20 *U*	20 *U*	100 *U*	0.025	0.13
2433	67	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	31	10 *U*	31	20 *U*	20 *U*	100 *U*	0.036 *J*	0.20
2433	65	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	28	10 *U*	28	20 *U*	20 *U*	100 *U*	0.049 *J*	0.26
2433	47	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	18	10 *U*	18	20 *U*	20 *U*	100 *U*	0.043 *U*	0.19
2433	71	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	21 *J*	10 *U*	21 *J*	20 *U*	20 *U*	100 *U*	0.057 *J*	0.27
2433	2	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	19	10 *U*	19	20 *U*	20 *U*	100 *U*	0.039	0.21
2440	13	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	49	10 *U*	49	20 *U*	20 *U*	100 *U*	0.065	0.45
2440	49	9.9 *U*	20 *U*	9.9 *U*	9.9 *U*	9.9 *U*	38	9.9 *U*	38	20 *U*	20 *U*	99 *U*	0.10 *J*	0.49
2440	17	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	32	10 *U*	32	20 *U*	20 *U*	100 *U*	0.065	0.33
2440	50	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	43	10 *U*	43	20 *U*	20 *U*	100 *U*	0.13	0.54
2440	74	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	37	10 *U*	37	20 *U*	20 *U*	100 *U*	0.10	0.52
2231	25	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	21	10 *U*	21	20 *U*	20 *U*	100 *U*	0.028 *U*	0.13 *J*
2231	66	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	32	10 *U*	32	20 *U*	20 *U*	100 *U*	0.025 *U*	0.15
2231	43	9.9 *U*	20 *U*	9.9 *U*	9.9 *U*	9.9 *U*	23	9.9 *U*	23	20 *U*	20 *U*	99 *U*	0.037 *U*	0.12 *J*
2231	38	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	23	10 *U*	23	20 *U*	20 *U*	100 *U*	0.034 *U*	0.11 *J*
2231	42	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	19	10 *U*	19	20 *U*	20 *U*	100 *U*	0.035 *U*	0.11 *J*
2243	39	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	23	10 *U*	23	20 *U*	20 *U*	100 *U*	0.041 *U*	0.18
2243	52	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	30 *J*	10 *U*	30 *J*	20 *U*	20 *U*	100 *U*	0.027	0.20
2243	7	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	18	10 *U*	18	20 *U*	20 *U*	100 *U*	0.017	0.16
2243	62	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	28 *J*	10 *U*	28 *J*	20 *U*	20 *U*	100 *U*	0.021 *U*	0.040 *J*
2243	27	10 *U*	20 *U*	10 *U*	10 *U*	10 *U*	21	10 *U*	21	20 *U*	20 *U*	100 *U*	0.029 *U*	0.20

Table I-3. (cont.)

Station	Sample ID	PCB Congener 37 (ng/g wet)	PCB Congener 44 (ng/g wet)	PCB Congener 49 (ng/g wet)	PCB Congener 52 (ng/g wet)	PCB Congener 66 (ng/g wet)	PCB Congener 70 (ng/g wet)	PCB Congener 74 (ng/g wet)	PCB Congener 77 (ng/g wet)	PCB Congener 81 (ng/g wet)	PCB Congener 87 (ng/g wet)	PCB Congener 90 and 101 (ng/g wet)
		PCB Congeners										
NASSCO												
NA06	18	0.13	0.33	2.6	2.7	3.4	2.8	1.7	0.19	0.054	2.1	6.0
NA06	55	0.095	0.32	1.9	2.1	2.4	2.0	1.2	0.13	0.034	1.5	4.4
NA06	12	0.067	0.15	0.79	0.93	0.90	0.82	0.39	0.086	0.020	0.91	2.2
NA06	26	0.14	0.37	3.4	3.5	4.0	3.4	2.0	0.22	0.053	2.7	7.8
NA06	37	0.13	0.35	2.8	2.9	3.3	3.0	1.8	0.18	0.049	2.2	6.4
NA11	46	0.038	0.11	0.79	0.90	1.1	0.76	0.50	0.090	0.025	1.0	2.9
NA11	51	0.036	0.085	0.70	0.78	0.95	0.69	0.47	0.085	0.020	0.91	2.5
NA11	19	0.047 *J*	0.091 *J*	0.67	0.69	0.95	0.68	0.45	0.099 *J*	0.027	0.81	2.3
NA11	16	0.046	0.11	0.83	0.87	1.3	0.84	0.55	0.093	0.022	1.0	2.9
NA11	24	0.057 *J*	0.14	0.76	0.85	1.1	0.76	0.52	0.11 *J*	0.030	0.96	2.7
NA12	11	0.024	0.037	0.32	0.34	0.51	0.30	0.19	0.054	0.013	0.50	1.6
NA12	9	0.020	0.031	0.33	0.35	0.50	0.29	0.19	0.050	0.011 *U*	0.47	1.5
NA12	56	0.021	0.053 *J*	0.35	0.40	0.48	0.31	0.21	0.052	0.014	0.58	1.7
NA12	22	0.047 *J*	0.070 *J*	0.53	0.53	0.71	0.47	0.32	0.10 *J*	0.026	0.71	2.3
NA12	36	0.023	0.053 *J*	0.39	0.42	0.51	0.33	0.23	0.054	0.012	0.56	1.7
NA20	68	0.094	0.18	0.99	1.3	0.94	0.93	0.52	0.095	0.026	1.0	2.7
NA20	72	0.083	0.17	0.71	0.85	0.68	0.69	0.39	0.068	0.019	0.68	1.8
NA20	34/35	0.048	0.11	0.51	0.65	0.49	0.48	0.28	0.046	0.013	0.52	1.4
NA20	53	0.060	0.14	0.75	0.96	0.72	0.71	0.38	0.072	0.021	0.92	2.4
Southwest Marine												
SW04	21	0.82	2.9	14	16	15	14	7.5	0.98	0.22	8.6	21
SW04	3	0.57	2.2	10	11	12	12	6.0	0.69	0.18	7.7	18
SW04	58	0.017	0.027 *U*	0.35	0.30	0.47	0.21	0.16	0.033	0.011 *U*	0.28	1.4
SW04	45	0.58	1.9	9.6	11	9.9	10	5.3	0.66	0.14	6.1	15
SW04	30	0.82	2.8	13	15	14	14	7.5	0.91	0.18	9.7	21
SW08	73	0.36	0.93	7.0	6.4	7.7	6.3	3.5	0.54	0.10	4.2	11
SW08	5	0.27	1.2	6.2	6.1	7.6	6.1	3.2	0.47	0.10	4.0	11
SW08	44	0.30	0.51	5.8	5.2	6.6	5.4	3.1	0.46	0.064	3.5	9.3
SW08	63	0.45	1.2	8.8	8.9	9.6	8.1	4.5	0.67	0.11	5.3	15
SW08	70	0.32	0.77	6.0	5.7	6.7	5.5	3.1	0.47	0.080	3.6	9.9
SW13	4	0.042	0.091	0.99	0.80	0.90	0.61	0.35	0.090	0.019	0.69	2.4
SW13	14	0.067	0.15	1.3	1.4	1.8	1.4	0.80	0.093	0.022	1.1	3.1
SW13	29	0.064 *J*	0.16	1.9	1.7	1.6	1.1	0.67	0.13 *J*	0.029	1.4	4.8
SW13	59	0.81	2.4	13	13	13	13	6.9	0.86	0.20	8.1	19
SW13	60	0.050	0.12	1.5	1.3	1.3	0.90	0.53	0.100	0.027	1.1	3.9
SW21	48	0.15	0.38	6.8	4.0	2.9	2.1	1.1	0.22	0.052	2.7	16
SW21	28	0.18	0.55	7.9	4.4	3.4	2.4	1.3	0.25	0.061	3.4	19
SW21	31	0.20	0.53	7.9	4.5	3.5	2.5	1.3	0.25	0.051	3.4	19

Table I-3. (cont.)

		PCB Congeners										
Station	Sample ID	PCB Congener 37 (ng/g wet)	PCB Congener 44 (ng/g wet)	PCB Congener 49 (ng/g wet)	PCB Congener 52 (ng/g wet)	PCB Congener 66 (ng/g wet)	PCB Congener 70 (ng/g wet)	PCB Congener 74 (ng/g wet)	PCB Congener 77 (ng/g wet)	PCB Congener 81 (ng/g wet)	PCB Congener 87 (ng/g wet)	PCB Congener 90 and 101 (ng/g wet)
SW21	23	0.20	0.50	7.6	4.3	3.4	2.4	1.3	0.26	0.061	3.0	18
SW21	6	0.11	0.26	4.6	2.6	2.3	1.5	0.80	0.14	0.036	2.1	12
SW28	64	0.051	0.096	1.8	1.4	1.2	0.80	0.43	0.13	0.044	2.2	13
SW28	75	0.054	0.14	1.9	1.6	1.3	0.86	0.47	0.14	0.055	2.1	13
SW28	10	0.17	0.82	2.2	2.7	1.8	1.7	0.71	0.18	0.077	3.3	15
SW28	41	0.045	0.10 *J*	1.6	1.4	1.1	0.73	0.39	0.12	0.036	1.9	11
SW28	69	0.056	0.13	1.9	1.6	1.3	0.87	0.48	0.14	0.058	2.2	13
Reference												
2441	8	0.013	0.018	0.16	0.15	0.23	0.14	0.097	0.016	0.011 *U*	0.11	0.45
2441	57	0.013	0.019	0.16	0.15	0.21	0.13	0.086	0.014	0.011 *U*	0.12	0.46
2441	32	0.012	0.019	0.15	0.14	0.20	0.12	0.082	0.013	0.012 *U*	0.11	0.42
2441	1	0.012	0.018	0.17	0.16	0.22	0.15	0.094	0.014	0.011 *U*	0.15	0.54
2441	54	0.013 *U*	0.023	0.13	0.14	0.18	0.11	0.073	0.013 *U*	0.013 *U*	0.10	0.39
2433	67	0.017	0.047 *J*	0.38	0.32	0.49	0.24	0.18	0.028	0.011 *U*	0.28	1.1
2433	65	0.020	0.058 *J*	0.47	0.39	0.60	0.29	0.21	0.034	0.014 *U*	0.34	1.3
2433	47	0.015	0.045 *J*	0.37	0.31	0.46	0.23	0.17	0.026	0.011 *U*	0.25	0.94
2433	71	0.021	0.068 *J*	0.48	0.42	0.60	0.29	0.21	0.037	0.011 *U*	0.34	1.3
2433	2	0.011 *U*	0.050	0.37	0.30	0.54	0.25	0.17	0.032	0.011 *U*	0.31	1.1
2440	13	0.049	0.11	1.4	1.2	1.3	0.84	0.49	0.097	0.020	0.98	3.5
2440	49	0.072	0.14	1.00	1.3	0.94	0.95	0.46	0.098	0.022	0.96	2.5
2440	17	0.056	0.091	0.65	0.77	0.76	0.68	0.33	0.061	0.016	0.70	1.7
2440	50	0.076	0.18	0.90	1.1	0.91	0.88	0.46	0.10	0.020	0.91	2.3
2440	74	0.067	0.13	0.89	1.1	0.88	0.87	0.45	0.086	0.024	0.87	2.2
2231	25	0.036 *U*	0.041 *J*	0.27	0.25	0.40	0.22	0.16	0.075 *J*	0.018	0.40	1.2
2231	66	0.019	0.049 *J*	0.27	0.25	0.40	0.21	0.16	0.047	0.013 *U*	0.42	1.4
2231	43	0.012	0.040 *U*	0.21	0.21	0.31	0.17	0.12	0.037	0.011 *U*	0.31	0.97
2231	38	0.013	0.033 *U*	0.20	0.21	0.31	0.17	0.12	0.035	0.011 *U*	0.32	0.97
2231	42	0.011	0.039 *U*	0.19	0.19	0.29	0.15	0.11	0.034	0.011 *U*	0.27	0.86
2243	39	0.016	0.049 *J*	0.32	0.29	0.41	0.19	0.14	0.030	0.011 *U*	0.26	1.3
2243	52	0.017	0.028 *U*	0.36	0.30	0.50	0.21	0.16	0.035	0.011 *U*	0.29	1.5
2243	7	0.013	0.019	0.32	0.27	0.49	0.19	0.14	0.031	0.010 *U*	0.27	1.4
2243	62	0.011 *U*	0.017 *U*	0.025 *U*	0.036 *U*	0.022 *J*	0.023 *U*	0.014	0.011 *U*	0.011 *U*	0.011 *U*	0.029
2243	27	0.018 *U*	0.029 *U*	0.35	0.32	0.52	0.22	0.17	0.034 *U*	0.011 *U*	0.29	1.4

Table I-3. (cont.)

Station	Sample ID	PCB Congener 99 (ng/g wet)	PCB Congener 105 (ng/g wet)	PCB Congener 110 (ng/g wet)	PCB Congener 114 (ng/g wet)	PCB Congener 118 (ng/g wet)	PCB Congener 119 (ng/g wet)	PCB Congener 123 (ng/g wet)	PCB Congener 126 (ng/g wet)	PCB Congener 128 (ng/g wet)	PCB Congener 138 (ng/g wet)	PCB Congener 149 (ng/g wet)
		PCB Congeners										
NASSCO												
NA06	18	3.7	1.6	4.0	0.062	4.8	0.21	0.048	0.029 *U*	0.70	4.3	2.9
NA06	55	2.7	1.1	2.9	0.042	3.5	0.15	0.039	0.011 *U*	0.48	3.1	2.3
NA06	12	1.2	0.73	1.5	0.034	1.9	0.061	0.038	0.020	0.29	1.9	1.2
NA06	26	4.6	2.0	5.0	0.067	6.0	0.26	0.052	0.019 *U*	0.87	5.6	4.0
NA06	37	3.9	1.6	4.1	0.067	4.9	0.21	0.049	0.011 *U*	0.70	4.8	3.1
NA11	46	1.6	0.83	2.0	0.011 *U*	2.3	0.096	0.011 *U*	0.011 *U*	0.44	2.8	2.1
NA11	51	1.4	0.68	1.7	0.024	1.9	0.086	0.020	0.0092 *U*	0.36	2.4	1.9
NA11	19	1.3	0.62	1.6	0.023	1.7	0.076	0.026	0.023 *U*	0.32	2.2	1.7
NA11	16	1.7	0.83	2.0	0.032	2.3	0.088	0.018	0.010 *U*	0.43	3.1	2.1
NA11	24	1.5	0.78	1.8	0.025	2.2	0.093	0.030	0.030 *U*	0.41	2.8	2.1
NA12	11	1.1	0.42	1.1	0.016	1.4	0.061	0.026	0.010 *U*	0.28	1.9	1.4
NA12	9	0.98	0.41	1.0	0.011 *U*	1.2	0.060	0.011	0.011 *U*	0.28	1.9	1.3
NA12	56	1.1	0.50	1.2	0.018	1.5	0.068	0.015	0.011 *U*	0.33	2.1	1.5
NA12	22	1.5	0.61	1.5	0.022	2.0	0.088	0.029	0.032 *U*	0.44	2.9	1.9
NA12	36	1.1	0.45	1.2	0.011 *U*	1.3	0.068	0.013	0.011 *U*	0.30	2.1	1.4
NA20	68	1.3	0.60	1.7	0.026	1.8	0.075	0.021	0.014 *U*	0.31	2.2	1.7
NA20	72	0.85	0.41	1.1	0.020	1.3	0.047	0.014	0.013 *U*	0.20	1.4	1.3
NA20	34/35	0.66	0.33	0.85	0.014	0.98	0.039	0.011 *U*	0.011 *U*	0.17	1.2	1.0
NA20	53	1.2	0.58	1.5	0.026	1.7	0.064	0.016	0.013 *U*	0.29	2.1	1.7
Southwest Marine												
SW04	21	11	5.5	14	0.24	15	0.62	0.19	0.059 *J*	1.7	10	8.0
SW04	3	9.1	4.8	11	0.21	13	0.49	0.088	0.010 *U*	1.6	9.5	6.4
SW04	58	1.3	0.30	0.66	0.011 *U*	1.3	0.057	0.012	0.011 *U*	0.27	1.9	1.3
SW04	45	7.4	3.7	9.4	0.19	10	0.41	0.11	0.021	1.2	7.2	5.5
SW04	30	11	5.3	15	0.24	15	0.61	0.15	0.030 *U*	1.8	11	7.8
SW08	73	6.5	2.9	6.8	0.11	8.9	0.40	0.10	0.021	1.0	6.3	5.1
SW08	5	6.3	3.0	6.5	0.12	8.6	0.35	0.064	0.033	1.0	6.4	4.2
SW08	44	5.5	2.4	5.7	0.12	7.3	0.33	0.010 *U*	0.021	0.86	5.5	3.9
SW08	63	8.6	3.7	8.9	0.15	12	0.52	0.14	0.026	1.3	8.0	6.4
SW08	70	5.7	2.5	6.1	0.098	7.8	0.35	0.083	0.018	0.90	5.5	4.1
SW13	4	1.5	0.48	1.3	0.016	1.6	0.13	0.014	0.021	0.29	2.4	1.8
SW13	14	1.8	0.85	2.1	0.035	2.3	0.10	0.016	0.011	0.36	2.3	1.5
SW13	29	3.1	0.91	2.6	0.027	2.8	0.27	0.028	0.014 *U*	0.53	4.2	3.4
SW13	59	9.9	5.0	13	0.25	15	0.59	0.16	0.030	1.6	9.5	7.7
SW13	60	2.4	0.77	2.0	0.031	2.5	0.22	0.025	0.011 *U*	0.44	3.3	3.0
SW21	48	12	1.2	5.0	0.011 *U*	4.8	1.8	0.011 *U*	0.016	0.87	12	18
SW21	28	15	1.6	6.4	0.011 *U*	5.5	2.2	0.011 *U*	0.023 *U*	1.1	15	20
SW21	31	15	1.6	6.3	0.011 *U*	5.5	2.1	0.011 *U*	0.017 *U*	1.1	14	20

Table I-3. (cont.)

		PCB Congeners										
Station	Sample ID	PCB Congener 99 (ng/g wet)	PCB Congener 105 (ng/g wet)	PCB Congener 110 (ng/g wet)	PCB Congener 114 (ng/g wet)	PCB Congener 118 (ng/g wet)	PCB Congener 119 (ng/g wet)	PCB Congener 123 (ng/g wet)	PCB Congener 126 (ng/g wet)	PCB Congener 128 (ng/g wet)	PCB Congener 138 (ng/g wet)	PCB Congener 149 (ng/g wet)
SW21	23	14	1.5	5.8	0.032	5.4	2.0	0.048	0.039 *U*	1.1	15	20
SW21	6	9.6	0.94	4.0	0.044	3.7	1.3	0.025	0.0092 *U*	0.69	9.2	12
SW28	64	4.4	1.1	4.9	0.040	4.7	0.42	0.052	0.026	1.4	17	18
SW28	75	4.2	1.1	4.8	0.036	4.6	0.39	0.032	0.028 *U*	1.3	16	17
SW28	10	4.9	1.8	6.4	0.080	5.8	0.37	0.028	0.063	1.7	19	17
SW28	41	3.6	0.94	4.2	0.030	3.9	0.33	0.029	0.024	1.2	15	15
SW28	69	4.1	1.1	4.9	0.037	4.5	0.39	0.039	0.011 *U*	1.3	17	17
Reference												
2441	8	0.31	0.14	0.22	0.011 *U*	0.47	0.017	0.011 *U*	0.011 *U*	0.082	0.47	0.35
2441	57	0.33	0.14	0.23	0.011 *U*	0.47	0.018	0.011 *U*	0.011 *U*	0.082	0.49	0.36
2441	32	0.30	0.13	0.22	0.012 *U*	0.45	0.017	0.012 *U*	0.012 *U*	0.080	0.48	0.35
2441	1	0.40	0.15	0.28	0.011 *U*	0.50	0.018	0.011 *U*	0.011 *U*	0.095	0.63	0.39
2441	54	0.27	0.12	0.19	0.013 *U*	0.40	0.015	0.013 *U*	0.013 *U*	0.071	0.42	0.32
2433	67	0.81	0.29	0.58	0.011 *U*	0.92	0.041	0.011 *U*	0.011 *U*	0.19	1.2	0.89
2433	65	0.97	0.37	0.70	0.014 *U*	1.2	0.054	0.017	0.014 *U*	0.26	1.6	1.1
2433	47	0.72	0.23	0.53	0.011 *U*	0.78	0.036	0.011 *U*	0.011 *U*	0.17	1.1	0.75
2433	71	0.95	0.32	0.69	0.011 *U*	1.0	0.051	0.013	0.011 *U*	0.22	1.5	1.1
2433	2	0.87	0.37	0.65	0.011 *U*	1.0	0.047	0.011 *U*	0.011 *U*	0.22	1.4	0.87
2440	13	2.3	0.69	1.9	0.032	2.3	0.21	0.048	0.019	0.40	3.1	2.5
2440	49	1.3	0.70	1.6	0.023	1.9	0.074	0.011 *U*	0.011 *U*	0.31	1.8	1.4
2440	17	0.93	0.55	1.2	0.020	1.4	0.039	0.011 *U*	0.011 *U*	0.21	1.4	0.90
2440	50	1.2	0.65	1.5	0.025	1.8	0.060	0.011 *U*	0.010	0.29	1.9	1.4
2440	74	1.2	0.66	1.4	0.026	1.9	0.063	0.017	0.011 *U*	0.29	1.8	1.3
2231	25	0.95	0.39	0.89	0.012	1.3	0.070	0.027	0.030 *U*	0.32	2.1	1.3
2231	66	1.0	0.43	0.92	0.013 *U*	1.5	0.073	0.017	0.013 *U*	0.33	2.1	1.6
2231	43	0.77	0.31	0.72	0.011 *U*	0.95	0.053	0.011 *U*	0.011 *U*	0.25	1.7	1.1
2231	38	0.80	0.28	0.73	0.031 *U*	0.96	0.053	0.013	0.011 *U*	0.23	1.6	1.1
2231	42	0.68	0.26	0.64	0.032 *U*	0.82	0.049	0.012	0.011 *U*	0.22	1.5	0.97
2243	39	1.1	0.26	0.59	0.011 *U*	1.1	0.048	0.013	0.011 *U*	0.25	1.9	1.1
2243	52	1.4	0.32	0.69	0.011 *U*	1.4	0.059	0.012	0.011 *U*	0.30	2.2	1.4
2243	7	1.3	0.26	0.64	0.010 *U*	1.2	0.058	0.010 *U*	0.010 *U*	0.27	2.1	1.3
2243	62	0.014	0.011 *U*	0.013	0.011 *U*	0.016	0.011 *U*	0.011 *U*	0.011 *U*	0.011 *U*	0.018	0.016
2243	27	1.3	0.28	0.71	0.011 *U*	1.1	0.058	0.011 *U*	0.011 *U*	0.28	2.0	1.2

Table I-3. (cont.)

Station	Sample ID	PCB Congener 151 (ng/g wet)	PCB Congener 153 (ng/g wet)	PCB Congener 156 (ng/g wet)	PCB Congener 157 (ng/g wet)	PCB Congener 158 (ng/g wet)	PCB Congener 167 (ng/g wet)	PCB Congener 168 (ng/g wet)	PCB Congener 169 (ng/g wet)	PCB Congener 170 (ng/g wet)	PCB Congener 177 (ng/g wet)
		PCB Congeners									
NASSCO											
NA06	18	0.88	4.3	0.29	0.053	0.19	0.12	0.012 *U*	0.012 *U*	0.36	0.35
NA06	55	0.62	3.2	0.19	0.033	0.13	0.079	0.025	0.011 *U*	0.23	0.23
NA06	12	0.33	1.6	0.14	0.023	0.094	0.048	0.010 *U*	0.010 *U*	0.16	0.14
NA06	26	1.1	5.4	0.35	0.054	0.24	0.15	0.011 *U*	0.011 *U*	0.45	0.44
NA06	37	1.0	4.6	0.30	0.045	0.20	0.12	0.031	0.011 *U*	0.42	0.37
NA11	46	0.53	2.9	0.19	0.034	0.13	0.075	0.011 *U*	0.011 *U*	0.25	0.24
NA11	51	0.53	2.6	0.14	0.022	0.097	0.061	0.016	0.0092 *U*	0.22	0.23
NA11	19	0.52	2.1	0.13	0.026	0.092	0.060	0.0089 *U*	0.0089 *U*	0.20	0.20
NA11	16	0.64	3.0	0.17	0.037	0.13	0.062	0.010 *U*	0.010 *U*	0.27	0.29
NA11	24	0.58	2.8	0.17	0.035	0.11	0.076	0.011 *U*	0.011 *U*	0.26	0.27
NA12	11	0.41	2.1	0.11	0.029	0.079	0.060	0.010 *U*	0.010 *U*	0.17	0.19
NA12	9	0.41	2.0	0.083	0.014	0.077	0.042	0.011 *U*	0.011 *U*	0.16	0.19
NA12	56	0.44	2.2	0.11	0.021	0.080	0.056	0.014	0.011 *U*	0.18	0.20
NA12	22	0.58	3.0	0.16	0.036	0.11	0.075	0.013 *U*	0.013 *U*	0.25	0.27
NA12	36	0.49	2.2	0.096	0.018	0.075	0.052	0.015	0.011 *U*	0.18	0.20
NA20	68	0.46	2.3	0.15	0.019	0.11	0.056	0.017	0.014 *U*	0.25	0.22
NA20	72	0.30	1.5	0.10	0.013 *U*	0.069	0.036	0.013	0.013 *U*	0.15	0.15
NA20	34/35	0.26	1.2	0.082	0.011 *U*	0.054	0.030	0.011 *U*	0.011 *U*	0.14	0.13
NA20	53	0.47	2.1	0.14	0.017	0.098	0.050	0.013	0.013 *U*	0.23	0.20
Southwest Marine											
SW04	21	2.1	9.8	0.77	0.12	0.52	0.28	0.011 *U*	0.011 *U*	0.78	0.69
SW04	3	1.8	8.6	0.71	0.12	0.53	0.24	0.010 *U*	0.010 *U*	0.69	0.62
SW04	58	0.33	2.5	0.064	0.016	0.040	0.048	0.016	0.011 *U*	0.12	0.20
SW04	45	1.3	7.3	0.55	0.084	0.34	0.19	0.011 *U*	0.011 *U*	0.50	0.45
SW04	30	2.3	9.8	0.83	0.12	0.53	0.29	0.063	0.011 *U*	0.85	0.76
SW08	73	1.0	6.8	0.41	0.066	0.29	0.18	0.057	0.013 *U*	0.48	0.46
SW08	5	1.1	6.1	0.43	0.077	0.33	0.17	0.072	0.011 *U*	0.011 *U*	0.44
SW08	44	1.0	5.6	0.35	0.058	0.25	0.15	0.010 *U*	0.010 *U*	0.40	0.39
SW08	63	1.6	8.8	0.55	0.087	0.37	0.23	0.050	0.011 *U*	0.65	0.60
SW08	70	0.92	5.9	0.39	0.064	0.25	0.16	0.040	0.011 *U*	0.42	0.40
SW13	4	0.65	2.7	0.13	0.021	0.11	0.048	0.010 *U*	0.010 *U*	0.25	0.26
SW13	14	0.43	2.2	0.15	0.028	0.11	0.056	0.010 *U*	0.010 *U*	0.17	0.17
SW13	29	1.3	5.0	0.22	0.030	0.17	0.098	0.013 *U*	0.013 *U*	0.47	0.48
SW13	59	1.8	9.4	0.69	0.11	0.47	0.26	0.064	0.011 *U*	0.71	0.65
SW13	60	0.93	4.3	0.18	0.027	0.14	0.081	0.035	0.011 *U*	0.39	0.37
SW21	48	6.0	23	0.52	0.060	0.49	0.23	0.011 *U*	0.011 *U*	1.8	1.8
SW21	28	9.3	28	0.58	0.011 *U*	0.60	0.29	0.15	0.011 *U*	2.4	2.4
SW21	31	8.7	27	0.56	0.011 *U*	0.56	0.28	0.14	0.011 *U*	2.2	2.3

Table I-3. (cont.)

		PCB Congeners									
Station	Sample ID	PCB Congener 151 (ng/g wet)	PCB Congener 153 (ng/g wet)	PCB Congener 156 (ng/g wet)	PCB Congener 157 (ng/g wet)	PCB Congener 158 (ng/g wet)	PCB Congener 167 (ng/g wet)	PCB Congener 168 (ng/g wet)	PCB Congener 169 (ng/g wet)	PCB Congener 170 (ng/g wet)	PCB Congener 177 (ng/g wet)
SW21	23	7.8	27	0.63	0.073	0.61	0.30	0.18	0.011 *U*	2.3	2.3
SW21	6	4.8	17	0.35	0.031	0.40	0.15	0.30	0.0092 *U*	1.3	1.4
SW28	64	5.7	22	0.99	0.048	0.81	0.38	0.14	0.014 *U*	3.4	2.4
SW28	75	4.9	21	0.93	0.073	0.75	0.35	0.16	0.028 *U*	2.8	2.1
SW28	10	5.6	21	1.1	0.055	1.0	0.36	0.011 *U*	0.011 *U*	2.8	2.3
SW28	41	5.3	18	0.77	0.061	0.68	0.30	0.12	0.011 *U*	2.3	1.8
SW28	69	4.9	21	0.90	0.052	0.78	0.36	0.14	0.011 *U*	2.7	2.1
Reference											
2441	8	0.086	0.66	0.032	0.011 *U*	0.014	0.017	0.011 *U*	0.011 *U*	0.053	0.057
2441	57	0.084	0.66	0.031	0.011 *U*	0.015	0.017	0.011 *U*	0.011 *U*	0.052	0.055
2441	32	0.085	0.64	0.028	0.012 *U*	0.014	0.016	0.012 *U*	0.012 *U*	0.050	0.054
2441	1	0.10	0.70	0.035	0.011 *U*	0.020	0.017	0.011 *U*	0.011 *U*	0.057	0.061
2441	54	0.074	0.57	0.026	0.013 *U*	0.013 *U*	0.015	0.013 *U*	0.013 *U*	0.045	0.048
2433	67	0.24	1.5	0.073	0.015	0.041	0.037	0.011 *U*	0.011 *U*	0.14	0.13
2433	65	0.30	1.8	0.12	0.023	0.060	0.047	0.014 *U*	0.014 *U*	0.17	0.16
2433	47	0.19	1.3	0.061	0.011	0.040	0.030	0.011 *U*	0.011 *U*	0.11	0.11
2433	71	0.25	1.7	0.080	0.016	0.052	0.041	0.021	0.011 *U*	0.15	0.15
2433	2	0.26	1.4	0.085	0.016	0.061	0.037	0.011 *U*	0.011 *U*	0.13	0.13
2440	13	0.83	3.9	0.17	0.035	0.13	0.068	0.011 *U*	0.011 *U*	0.32	0.33
2440	49	0.34	1.9	0.14	0.026	0.089	0.054	0.011 *U*	0.011 *U*	0.17	0.16
2440	17	0.26	1.3	0.100	0.018	0.076	0.032	0.011 *U*	0.011 *U*	0.12	0.12
2440	50	0.33	1.9	0.14	0.024	0.084	0.052	0.011 *U*	0.011 *U*	0.19	0.17
2440	74	0.28	1.8	0.14	0.023	0.083	0.051	0.013	0.011 *U*	0.17	0.15
2231	25	0.38	2.2	0.11	0.027	0.074	0.064	0.011 *U*	0.011 *U*	0.19	0.21
2231	66	0.42	2.5	0.11	0.023	0.071	0.063	0.013 *U*	0.013 *U*	0.21	0.22
2231	43	0.34	1.8	0.073	0.015	0.056	0.046	0.011 *U*	0.011 *U*	0.15	0.16
2231	38	0.35	1.7	0.070	0.016	0.055	0.044	0.014	0.011 *U*	0.15	0.17
2231	42	0.30	1.5	0.064	0.012	0.050	0.039	0.016	0.011 *U*	0.13	0.15
2243	39	0.32	2.3	0.062	0.013	0.038	0.047	0.017	0.011 *U*	0.12	0.19
2243	52	0.34	2.8	0.074	0.016	0.047	0.052	0.020	0.011 *U*	0.14	0.23
2243	7	0.34	2.4	0.071	0.018	0.052	0.046	0.010 *U*	0.010 *U*	0.13	0.22
2243	62	0.011 *U*	0.026	0.011 *U*	0.011 *U*	0.011 *U*	0.011 *U*	0.011 *U*	0.011 *U*	0.011 *U*	0.011 *U*
2243	27	0.40	2.5	0.064 *J*	0.013	0.043	0.050 *J*	0.011 *U*	0.011 *U*	0.12	0.23

Table I-3. (cont.)

		PCB Congeners								PCB Homologs		
Station	Sample ID	PCB Congener 180 (ng/g wet)	PCB Congener 183 (ng/g wet)	PCB Congener 187 (ng/g wet)	PCB Congener 189 (ng/g wet)	PCB Congener 194 (ng/g wet)	PCB Congener 201 (ng/g wet)	PCB Congener 206 (ng/g wet)	Total PCB Congeners[b] (ng/g wet)	Monochloro biphenyls (ng/g wet)	Dichloro biphenyls (ng/g wet)	Trichloro biphenyls (ng/g wet)
NASSCO												
NA06	18	0.80	0.29	0.90	0.018	0.13	0.20	0.095 *J*	55.0 *J*	0.0116 *U*	0.251	4.55
NA06	55	0.55	0.20	0.64	0.011 *U*	0.066	0.14	0.043	40.1	0.0109 *U*	0.168	3.66
NA06	12	0.33	0.13	0.35	0.010 *U*	0.048	0.082	0.036	20.1	0.0104 *U*	0.193	1.65
NA06	26	1.0	0.37	1.2	0.016	0.13	0.26	0.073 *J*	69.2 *J*	0.0111 *U*	0.284	5.58
NA06	37	0.94	0.31	0.96	0.015	0.12	0.20	0.071	57.9	0.0109 *U*	0.226	4.66
NA11	46	0.58	0.21	0.65	0.011 *U*	0.072	0.14	0.037	26.9 *J*	0.0110 *U*	0.0893	1.40
NA11	51	0.53	0.19	0.61	0.0092 *U*	0.063	0.12	0.033	23.8	0.00919 *U*	0.0941	1.25
NA11	19	0.46	0.18	0.54	0.012	0.062	0.11	0.047 *J*	21.6 *J*	0.00893 *U*	0.104 *J*	1.19
NA11	16	0.66	0.25	0.76	0.010 *U*	0.086	0.14	0.044	28.1	0.0104 *U*	0.112	1.33
NA11	24	0.61	0.23	0.71	0.015	0.082	0.15	0.059 *J*	26.5 *J*	0.0107 *U*	0.147	1.50
NA12	11	0.39	0.16	0.53	0.010 *U*	0.059	0.096	0.036	16.1	0.0103 *UJ*	0.0767	0.437
NA12	9	0.37	0.15	0.50	0.011 *U*	0.056	0.086	0.028	15.2	0.0107 *U*	0.0832	0.415
NA12	56	0.43	0.16	0.54	0.011 *U*	0.056	0.11	0.032	17.3 *J*	0.0111 *U*	0.0490	0.521
NA12	22	0.58	0.22	0.75	0.015	0.081	0.14	0.061 *J*	23.4 *J*	0.0135 *U*	0.0650 *J*	0.747 *J*
NA12	36	0.44	0.16	0.55	0.011 *U*	0.062	0.10	0.036	17.1 *J*	0.0109 *U*	0.0628	0.547
NA20	68	0.60	0.20	0.54	0.014 *U*	0.074	0.13	0.034	24.5	0.0139 *U*	0.176	2.50
NA20	72	0.39	0.14	0.37	0.013 *U*	0.048	0.091	0.023	16.9	0.0132 *U*	0.115	2.00
NA20	34/35	0.34	0.12	0.33	0.011 *U*	0.043	0.073	0.021	13.2	0.0106 *U*	0.0985	1.33
NA20	53	0.54	0.18	0.49	0.013 *U*	0.066	0.12	0.035	21.6	0.0132 *U*	0.138	1.63
Southwest Marine												
SW04	21	1.9	0.67	1.8	0.033	0.23	0.40	0.13	195 *J*	0.0105 *U*	0.763	25.7
SW04	3	1.6	0.61	1.5	0.026	0.20	0.31	0.14	161	0.0102 *U*	0.702	18.3
SW04	58	0.25	0.12	0.59	0.011 *U*	0.047	0.091	0.031	15.0 *J*	0.0106 *U*	0.0808	0.569
SW04	45	1.3	0.44	1.2	0.016	0.14	0.29	0.068	136	0.0111 *U*	0.610	17.7
SW04	30	2.0	0.71	1.9	0.028	0.24	0.37	0.12	196	0.0110 *U*	0.798	24.8
SW08	73	1.1	0.45	1.3	0.016	0.15	0.27	0.067	103	0.0192	0.507	11.2
SW08	5	1.0	0.42	1.2	0.021	0.15	0.22	0.091	98.2	0.0185	0.532	9.61
SW08	44	0.98	0.37	1.1	0.013	0.13	0.21	0.052	86.2	0.0130	0.416	9.30
SW08	63	1.6	0.58	1.7	0.021	0.20	0.36	0.083	135	0.0201	0.649	15.0
SW08	70	0.98	0.38	1.1	0.015	0.13	0.25	0.061	90.1	0.0189	0.507	10.0
SW13	4	0.63	0.24	0.72	0.012	0.074	0.12	0.047	22.9	0.0103 *U*	0.0819	1.22
SW13	14	0.41	0.15	0.45	0.010 *U*	0.059	0.095	0.035	27.9	0.0103 *U*	0.143	2.31
SW13	29	1.2	0.42	1.3	0.015	0.14	0.22	0.062 *J*	43.2 *J*	0.0130 *U*	0.111 *J*	2.11
SW13	59	1.8	0.64	1.7	0.024	0.19	0.37	0.097	181	0.0108 *U*	0.818	26.0
SW13	60	0.94	0.35	1.1	0.013	0.12	0.22	0.052	35.3 *J*	0.0106 *U*	0.0749	1.68
SW21	48	5.0	1.8	6.4	0.049	0.63	1.1	0.15	143	0.0113 *U*	0.247	6.38
SW21	28	6.3	2.3	8.1	0.066	0.81	1.2	0.21	175	0.0112 *U*	0.272	6.92
SW21	31	5.9	2.2	7.8	0.054	0.72	1.1	0.17	170	0.0110 *U*	0.326	7.82

Table I-3. (cont.)

Station	Sample ID	PCB Congeners: PCB Congener 180 (ng/g wet)	PCB Congener 183 (ng/g wet)	PCB Congener 187 (ng/g wet)	PCB Congener 189 (ng/g wet)	PCB Congener 194 (ng/g wet)	PCB Congener 201 (ng/g wet)	PCB Congener 206 (ng/g wet)	Total PCB Congeners[b] (ng/g wet)	PCB Homologs: Monochloro biphenyls (ng/g wet)	Dichloro biphenyls (ng/g wet)	Trichloro biphenyls (ng/g wet)
SW21	23	6.4	2.3	8.0	0.067	0.85	1.4	0.23	167	0.0113 *U*	0.316	6.70
SW21	6	3.6	1.4	4.6	0.036	0.45	0.71	0.13	106	0.00918 *UJ*	0.383 *J*	5.19
SW28	64	7.4	2.6	5.4	0.11	0.85	1.1	0.15	127 *J*	0.0136 *U*	0.0831	1.53
SW28	75	6.3	2.3	4.9	0.086	0.59	0.86	0.10	120	0.0282 *U*	0.115	1.84
SW28	10	6.2	2.3	4.8	0.091	0.58	0.74	0.11	136	1.66	3.03	5.45
SW28	41	5.2	1.9	4.0	0.067	0.48	0.61	0.079	104 *J*	0.0108 *U*	0.0863	1.51
SW28	69	6.3	2.2	4.9	0.084	0.55	0.88	0.10	121 *J*	0.0110 *U*	0.102	1.81
Reference												
2441	8	0.096	0.052	0.21	0.011 *U*	0.022	0.041	0.015	5.04	0.011 *U*	0.0557	0.381
2441	57	0.096	0.048	0.20	0.011 *U*	0.022	0.041	0.015	5.02	0.0112 *U*	0.0765	0.354
2441	32	0.093	0.048	0.20	0.012 *U*	0.020	0.039	0.013	4.82	0.0116 *U*	0.0576	0.349
2441	1	0.11	0.049	0.20	0.011 *U*	0.023	0.043	0.017	5.63	0.0112 *U*	0.0556	0.363
2441	54	0.087	0.043	0.17	0.013 *U*	0.018	0.035	0.013 *U*	4.33	0.0131 *U*	0.0594	0.302
2433	67	0.31	0.12	0.39	0.011 *U*	0.054	0.100	0.032	11.4 *J*	0.0109 *U*	0.0663	0.664
2433	65	0.36	0.14	0.48	0.014 *U*	0.061	0.11	0.035	14.2 *J*	0.0140 *U*	0.0869	0.816
2433	47	0.24	0.090	0.32	0.011 *U*	0.039	0.080	0.025	10.0 *J*	0.0110 *U*	0.0567	0.642
2433	71	0.34	0.13	0.44	0.011 *U*	0.058	0.11	0.037	13.4 *J*	0.0110 *U*	0.0920	0.900
2433	2	0.28	0.11	0.36	0.011 *U*	0.047	0.080	0.036	11.9	0.0111 *U*	0.0752	0.626
2440	13	0.79	0.31	0.94	0.012	0.10	0.16	0.043	32.0	0.0109 *U*	0.131	1.54
2440	49	0.38	0.14	0.43	0.011 *U*	0.055	0.11	0.037	22.3 *J*	0.0111 *U*	0.148	1.84
2440	17	0.27	0.10	0.30	0.011 *U*	0.040	0.066	0.022	15.7	0.0106 *U*	0.163	1.16
2440	50	0.45	0.16	0.47	0.011 *U*	0.064	0.13	0.048	21.5	0.0109 *U*	0.154	2.01
2440	74	0.38	0.13	0.40	0.011 *U*	0.056	0.11	0.038	20.7	0.0110 *U*	0.136	1.85
2231	25	0.44	0.17	0.61	0.014	0.072	0.14	0.064 *J*	15.3 *J*	0.0112 *U*	0.108 *J*	0.479 *J*
2231	66	0.47	0.18	0.68	0.013 *U*	0.075	0.15	0.045	16.5 *J*	0.0133 *U*	0.0563	0.410
2231	43	0.34	0.13	0.46	0.011 *U*	0.054	0.096	0.032	12.1 *J*	0.0110 *U*	0.0557	0.370 *J*
2231	38	0.34	0.13	0.49	0.011 *U*	0.057	0.093	0.035	12.1 *J*	0.0110 *U*	0.0557	0.348 *J*
2231	42	0.29	0.12	0.44	0.011 *U*	0.054	0.094	0.033	10.8 *J*	0.0114 *U*	0.0508	0.347 *J*
2243	39	0.26	0.11	0.53	0.011 *U*	0.050	0.078	0.028	13.7 *J*	0.0109 *U*	0.0691	0.553
2243	52	0.29	0.13	0.62	0.011 *U*	0.051	0.099	0.035	16.3	0.0114 *U*	0.0836	0.570
2243	7	0.27	0.13	0.60	0.010 *U*	0.054	0.077	0.032	14.8	0.0102 *U*	0.0883	0.440
2243	62	0.028 *U*	0.011 *U*	0.011 *U*	0.011 *U*	0.011 *U*	0.011 *U*	0.011 *U*	0.419 *J*	0.0110 *U*	0.0469	0.125 *J*
2243	27	0.27	0.13	0.62	0.011 *U*	0.054	0.090	0.034 *U*	15.2 *J*	0.0113 *U*	0.0984 *J*	0.576 *J*

Table I-3. (cont.)

		PCB Homologs							
Station	Sample ID	Tetrachloro biphenyls (ng/g wet)	Pentachloro biphenyls (ng/g wet)	Hexachloro biphenyls (ng/g wet)	Heptachloro biphenyls (ng/g wet)	Octachloro biphenyls (ng/g wet)	Nonachloro biphenyls (ng/g wet)	Decachloro biphenyl (ng/g wet)	Total PCB Homologs[b] (ng/g wet)
NASSCO									
NA06	18	22.0	31.1	17.2	3.97	0.673	0.137	0.0521 *J*	79.9 *J*
NA06	55	15.9	22.5	12.4	2.66	0.428	0.0589	0.0277	57.8
NA06	12	6.12	11.5	6.91	1.64	0.263	0.0502	0.0407	28.4
NA06	26	27.2	38.9	21.7	4.97	0.812	0.103 *J*	0.0471 *J*	99.6 *J*
NA06	37	22.9	31.8	18.5	4.33	0.665	0.0979	0.0463	83.2
NA11	46	7.02	14.7	11.2	2.78	0.436	0.0518	0.0284	37.7
NA11	51	6.24	12.9	9.93	2.57	0.391	0.0464	0.0265	33.5
NA11	19	6.15	11.7	8.88	2.36	0.363	0.0626 *J*	0.0355 *J*	30.8 *J*
NA11	16	7.65	15.1	11.9	3.29	0.488	0.0634	0.0419	40.0
NA11	24	7.12	14.0	11.1	3.07	0.507	0.0789 *J*	0.0480 *J*	37.6 *J*
NA12	11	2.92	8.33	7.67	2.09	0.326	0.0507	0.0338	21.9 *J*
NA12	9	2.92	7.81	7.29	1.99	0.281	0.0408	0.0282	20.9
NA12	56	3.07	9.02	8.27	2.15	0.345	0.0453	0.0286	23.5
NA12	22	4.70	11.9	11.1	3.02	0.494	0.0836 *J*	0.0535 *J*	32.2 *J*
NA12	36	3.29	8.79	8.05	2.21	0.340	0.0512	0.0312	23.4
NA20	68	7.99	12.6	9.00	2.64	0.429	0.0344	0.0262	35.4
NA20	72	5.83	8.46	6.03	1.73	0.280	0.0231	0.0188	24.5
NA20	34/35	4.17	6.55	4.99	1.51	0.229	0.0215	0.0151	18.9
NA20	53	5.93	11.5	8.50	2.38	0.391	0.0355	0.0249	30.5
Southwest Marine									
SW04	21	111	104	43.0	8.70	1.35	0.183	0.0610 *J*	295 *J*
SW04	3	84.9	88.2	37.5	7.45	1.13	0.202	0.0562	238
SW04	58	2.39	6.82	7.39	1.74	0.278	0.0435	0.0325	19.3
SW04	45	76.9	72.2	29.5	5.65	0.918	0.0916	0.0334	204
SW04	30	106	109	43.8	9.35	1.36	0.168	0.0483 *J*	295 *J*
SW08	73	51.8	55.9	26.1	5.58	0.895	0.0900	0.0283	152
SW08	5	48.3	54.4	25.1	4.70	0.802	0.130	0.0404	144
SW08	44	43.2	46.5	21.8	4.64	0.716	0.0701	0.0231	127
SW08	63	66.1	73.6	34.0	7.29	1.20	0.112	0.0364	198
SW08	70	45.5	49.1	22.5	4.82	0.806	0.0801	0.0257	133
SW13	4	7.43	11.6	10.3	3.14	0.417	0.0614	0.0316	34.3
SW13	14	10.9	15.7	8.76	1.96	0.321	0.0482	0.0234	40.2
SW13	29	14.1	22.6	18.8	5.79	0.790	0.0851 *J*	0.0414 *J*	64.4 *J*
SW13	59	101	97.9	39.8	8.05	1.23	0.130	0.0457	275
SW13	60	11.3	18.2	15.3	4.50	0.716	0.0703	0.0346	51.9
SW21	48	55.0	69.6	79.7	25.4	3.90	0.209	0.0333	240
SW21	28	62.9	87.3	100	33.3	4.44	0.284	0.0484 *J*	295 *J*
SW21	31	63.8	85.5	96.1	31.5	4.03	0.229	0.0400 *J*	289 *J*

Table I-3. (cont.)

		PCB Homologs							
Station	Sample ID	Tetrachloro biphenyls (ng/g wet)	Pentachloro biphenyls (ng/g wet)	Hexachloro biphenyls (ng/g wet)	Heptachloro biphenyls (ng/g wet)	Octachloro biphenyls (ng/g wet)	Nonachloro biphenyls (ng/g wet)	Decachloro biphenyl (ng/g wet)	Total PCB Homologs[b] (ng/g wet)
SW21	23	60.5	79.2	95.7	32.8	4.82	0.316	0.0567 *J*	280 *J*
SW21	6	36.4	54.2	58.8	19.1	2.55	0.175	0.0278	177 *J*
SW28	64	13.0	43.9	81.7	31.5	4.43	0.204	0.0927	176
SW28	75	14.2	42.7	77.3	27.3	3.22	0.133	0.0348	167
SW28	10	18.2	53.2	82.8	28.2	2.95	0.155	0.0489	196
SW28	41	11.9	36.7	69.0	23.1	2.41	0.104	0.0280	145
SW28	69	14.4	42.9	77.8	27.3	3.20	0.140	0.0344	168
Reference									
2441	8	1.25	2.22	1.95	0.616	0.117	0.0151	0.0157	6.6
2441	57	1.19	2.25	1.98	0.576	0.106	0.0153	0.0151	6.57
2441	32	1.13	2.13	1.95	0.558	0.0983	0.0126	0.0153	6.31
2441	1	1.21	2.60	2.27	0.626	0.109	0.0166	0.0173	7.27
2441	54	0.989	1.89	1.72	0.496	0.0778	0.0131 *U*	0.0171	5.56
2433	67	2.65	5.34	4.87	1.48	0.296	0.0462	0.0298	15.4
2433	65	3.28	6.62	6.30	1.81	0.341	0.0511	0.0343	19.3
2433	47	2.56	4.70	4.30	1.17	0.233	0.0245	0.0230	13.7
2433	71	3.34	6.27	5.81	1.70	0.327	0.0531	0.0333	18.5
2433	2	2.69	5.75	5.29	1.45	0.245	0.0505	0.0294	16.2
2440	13	10.7	16.8	13.8	4.00	0.563	0.0592	0.0324	47.6
2440	49	7.51	12.4	7.44	1.82	0.346	0.0528	0.0351	31.6
2440	17	5.15	8.66	5.32	1.33	0.209	0.0335	0.0290	22.1
2440	50	7.12	11.4	7.27	2.00	0.386	0.0649	0.0424	30.5
2440	74	6.84	11.3	6.88	1.74	0.335	0.0537	0.0355	29.2
2231	25	2.53	7.27	7.91	2.35	0.452	0.100 *J*	0.0610 *J*	21.3 *J*
2231	66	2.25	7.62	8.45	2.44	0.461	0.0660	0.0455	21.8
2231	43	1.78	5.58	6.36	1.75	0.296	0.0471	0.0315	16.3 *J*
2231	38	1.74	5.64	6.23	1.82	0.292	0.0496	0.0332	16.2 *J*
2231	42	1.65	4.97	5.65	1.58	0.283	0.0475	0.0318	14.6 *J*
2243	39	2.15	6.11	6.95	1.65	0.259	0.0401	0.0345	17.8
2243	52	2.49	7.25	8.28	1.92	0.306	0.0482	0.0367	21.0
2243	7	2.28	6.56	7.56	1.87	0.267	0.0459	0.0363	19.2
2243	62	0.190 *J*	0.0864	0.0600	0.0225 *U*	0.0110 *U*	0.0110 *U*	0.0110 *U*	0.542 *J*
2243	27	2.53	6.87	7.71	1.93	0.288	0.0490 *J*	0.0374 *J*	20.1 *J*

Note: *J* - estimated; PCB - polychlorinated biphenyl; PCT - polychlorinated terphenyl; *U* - undetected at quantitation limit shown

[a] Total PCB for each sample is computed as the sum of Aroclors® according to the following rules: 1) if any Aroclor® is detected, all detected Aroclors® are summed; 2) if no Aroclor® is detected, the highest quantitation limit for any Aroclor® is used.

[b] One-half quantitation limit used in sum.

Table I-4. Phase 1 results for conventional analytes in *Macoma* tissue

Station	Sample ID	Total solids (% wet)	Lipid (% wet)
NASSCO			
NA06	18	14.7	0.52
NA06	55	15.1	0.43
NA06	12	12.8	0.29
NA06	26	15.9	0.71
NA06	37	16.7	0.62
NA11	46	15.5	0.61
NA11	51	14.8	0.53
NA11	19	13.1	0.28
NA11	16	15.5	0.48
NA11	24	14.7	0.61
NA12	11	14.0	0.51
NA12	9	13.2	0.42
NA12	56	15.2	0.45
NA12	22	14.7	0.51
NA12	36	14.2	0.58
NA20	68	16.2	0.53
NA20	72	13.6	0.49
NA20	34/35	15.8	0.46
NA20	53	14.7	0.42
Southwest Marine			
SW04	21	14.6	0.56
SW04	3	14.2	0.59
SW04	58	15.2	0.67
SW04	45	15.3	0.61
SW04	30	14.9	0.66
SW08	73	14.8	0.42
SW08	5	12.0	0.45
SW08	44	14.8	0.47
SW08	63	15.7	0.47
SW08	70	13.8	0.49
SW13	4	12.0	0.41
SW13	14	15.8	0.50
SW13	29	16.3	0.62
SW13	59	14.0	0.38
SW13	60	15.1	0.53
SW21	48	15.7	0.36
SW21	28	14.6	0.52
SW21	31	16.4	0.62
SW21	23	14.8	0.53
SW21	6	12.8	0.47
SW28	64	15.7	0.50
SW28	75	14.3	0.42
SW28	10	15.5	0.63
SW28	41	16.3	0.52
SW28	69	15.5	0.54
Reference			
2441	8	12.5	0.44
2441	57	12.5	0.37
2441	32	12.4	0.39

Table I-4. (cont.)

Station	Sample ID	Total solids (% wet)	Lipid (% wet)
2441	1	12.5	0.42
2441	54	13.2	0.42
2433	67	15.3	0.47
2433	65	15.8	0.62
2433	47	14.5	0.37
2433	71	14.8	0.59
2433	2	13.1	0.43
2440	13	13.3	0.37
2440	49	15.0	0.56
2440	17	11.2	0.40
2440	50	14.5	0.62
2440	74	13.6	0.45
2231	25	15.2	0.62
2231	66	15.8	0.60
2231	43	15.3	0.40
2231	38	14.5	0.62
2231	42	16.5	0.49
2243	39	13.8	0.26
2243	52	15.1	0.44
2243	7	14.3	0.50
2243	62	16.7	0.43
2243	27	15.8	0.54

Table I-5. Phase 1 results for *Macoma* tissue control group

Chemical	Units[a]	Sample No. Control A	Control B	Control C	Control D	Control E
Conventional analytes						
Total solids	%	16.1	14.6	14.0	15.4	15.1
Lipid	%	0.50	0.44	0.39	0.57	0.55
Metals						
Arsenic	mg/kg	3.0	3.1	2.7	2.8	3.2
Cadmium	mg/kg	0.031	0.045	0.040	0.034	0.037
Chromium	mg/kg	0.78	0.25	0.77	0.35	0.19
Copper	mg/kg	1.5	1.2 *J*	0.99 *J*	1.2 *J*	0.97
Lead	mg/kg	0.10	0.12 *J*	0.11 *J*	0.090	0.11
Mercury (total)	mg/kg	0.018 *J*	0.015 *J*	0.016 *J*	0.012 *J*	0.013 *J*
Nickel	mg/kg	0.40	0.43	0.75	0.38	0.35
Selenium	mg/kg	0.2	0.4	0.3	0.3 *U*	0.2
Silver	mg/kg	0.027	0.033	0.036	0.027	0.041
Zinc	mg/kg	16	18	15	14	17
Polychlorinated biphenyls						
Aroclor® 1016	µg/kg	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*
Aroclor® 1221	µg/kg	20 *U*	20 *U*	20 *U*	20 *U*	20 *U*
Aroclor® 1232	µg/kg	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*
Aroclor® 1242	µg/kg	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*
Aroclor® 1248	µg/kg	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*
Aroclor® 1254	µg/kg	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*
Aroclor® 1260	µg/kg	10 *U*	10 *U*	10 *U*	10 *U*	10 *U*
Polychlorinated biphenyls[b]	µg/kg	20 *U*	20 *U*	20 *U*	20 *U*	20 *U*
Polychlorinated terphenyls						
Aroclor® 5432	µg/kg	20 *U*	20 *U*	20 *U*	20 *U*	20 *U*
Aroclor® 5442	µg/kg	20 *U*	20 *U*	20 *U*	20 *U*	20 *U*
Aroclor® 5460	µg/kg	100 *U*	100 *U*	100 *U*	100 *U*	100 *U*
Polychlorinated biphenyl congeners						
PCB Congener 18	ng/g	0.034 *U*	0.011	0.020 *U*	0.10	0.014 *U*
PCB Congener 28	ng/g	0.056 *J*	0.030	0.048 *U*	0.59	0.038 *U*
PCB Congener 37	ng/g	0.011 *U*	0.011 *U*	0.025 *U*	0.068	0.011 *U*
PCB Congener 44	ng/g	0.026 *U*	0.011 *U*	0.023 *U*	0.15	0.012 *U*
PCB Congener 49	ng/g	0.034 *U*	0.022	0.035 *U*	1.9	0.025 *U*
PCB Congener 52	ng/g	0.048 *U*	0.026	0.042 *U*	1.6	0.029 *U*
PCB Congener 66	ng/g	0.025 *U*	0.023	0.046 *U*	1.6	0.022 *U*

Table I-5. (cont.)

Chemical	Units	Sample No. Control A	Control B	Control C	Control D	Control E
PCB Congener 70	ng/g	0.029 *U*	0.022	0.042 *U*	1.2	0.024 *U*
PCB Congener 74	ng/g	0.017	0.013	0.022 *U*	0.71	0.014 *U*
PCB Congener 77	ng/g	0.011 *U*	0.011 *U*	0.032 *U*	0.13	0.011 *U*
PCB Congener 81	ng/g	0.011 *U*	0.011 *U*	0.010	0.034	0.011 *U*
PCB Congener 87	ng/g	0.011 *U*	0.011 *U*	0.020 *U*	1.5	0.011 *U*
PCB Congener 90 and 101	ng/g	0.034	0.027	0.045 *U*	5.0	0.030 *U*
PCB Congener 99	ng/g	0.015	0.016	0.025 *U*	3.2	0.017 *U*
PCB Congener 105	ng/g	0.011 *U*	0.012	0.036 *J*	1.0	0.011 *U*
PCB Congener 110	ng/g	0.015	0.015	0.022 *U*	2.7	0.017 *U*
PCB Congener 114	ng/g	0.011 *U*	0.011 *U*	0.013	0.038	0.011 *U*
PCB Congener 118	ng/g	0.016	0.022	0.064 *U*	3.5	0.018 *U*
PCB Congener 119	ng/g	0.011 *U*	0.011 *U*	0.011 *U*	0.28	0.011 *U*
PCB Congener 123	ng/g	0.011 *U*	0.011 *U*	0.019	0.032	0.011 *U*
PCB Congener 126	ng/g	0.011 *U*	0.011 *U*	0.025 *U*	0.013	0.011 *U*
PCB Congener 128	ng/g	0.011 *U*	0.011 *U*	0.017 *U*	0.57	0.011 *U*
PCB Congener 138	ng/g	0.022	0.021	0.040 *U*	4.5	0.023 *U*
PCB Congener 149	ng/g	0.017	0.013	0.026 *U*	4.0	0.016 *U*
PCB Congener 151	ng/g	0.011 *U*	0.011 *U*	0.011 *U*	1.3	0.011 *U*
PCB Congener 153	ng/g	0.028	0.021	0.032 *J*	5.6	0.028 *J*
PCB Congener 156	ng/g	0.011 *U*	0.011 *U*	0.016 *U*	0.24	0.011 *U*
PCB Congener 157	ng/g	0.011 *U*	0.011 *U*	0.011 *U*	0.035	0.011 *U*
PCB Congener 158	ng/g	0.011 *U*	0.011 *U*	0.011 *U*	0.18	0.011 *U*
PCB Congener 167	ng/g	0.011 *U*	0.011 *U*	0.011 *U*	0.10	0.011 *U*
PCB Congener 168	ng/g	0.011 *U*	0.011 *U*	0.011 *U*	0.041	0.011 *U*
PCB Congener 169	ng/g	0.011 *U*	0.011 *U*	0.011 *U*	0.013 *U*	0.011 *U*
PCB Congener 170	ng/g	0.011 *U*	0.011 *U*	0.011 *U*	0.47	0.011 *U*
PCB Congener 177	ng/g	0.011 *U*	0.011 *U*	0.011 *U*	0.47	0.011 *U*
PCB Congener 180	ng/g	0.028 *U*	0.026 *U*	0.028 *U*	1.1	0.027 *U*
PCB Congener 183	ng/g	0.011 *U*	0.011 *U*	0.011 *U*	0.42	0.011 *U*
PCB Congener 187	ng/g	0.011 *U*	0.011 *U*	0.013	1.4	0.011 *U*
PCB Congener 189	ng/g	0.011 *U*	0.011 *U*	0.011 *U*	0.015	0.011 *U*
PCB Congener 194	ng/g	0.011 *U*	0.011 *U*	0.011 *U*	0.14	0.011 *U*
PCB Congener 201	ng/g	0.011 *U*	0.011 *U*	0.011 *U*	0.26	0.011 *U*
PCB Congener 206	ng/g	0.011 *U*	0.011 *U*	0.023 *U*	0.059	0.011 *U*
Total PCB Congeners[c]	ng/g	0.47 *J*	0.44	0.54 *J*	46	0.33 *J*

Table I-5. (cont.)

Chemical	Units	Sample No.				
		Control A	Control B	Control C	Control D	Control E
Polychlorinated biphenyl homologs						
Monochlorobiphenyls	ng/g	0.011 *U*	0.011 *U*	0.011 *U*	0.013 *U*	0.011 *U*
Dichlorobiphenyls	ng/g	0.044	0.043	0.063 *J*	0.10	0.045 *U*
Trichlorobiphenyls	ng/g	0.20 *U*	0.083	0.24 *U*	2.1	0.11 *U*
Tetrachlorobiphenyls	ng/g	0.24 *U*	0.16	0.45 *U*	14	0.18 *U*
Pentachlorobiphenyls	ng/g	0.10	0.10	0.38 *U*	24	0.098 *U*
Hexachlorobiphenyls	ng/g	0.068	0.056	0.14 *U*	20	0.067 *U*
Heptachlorobiphenyls	ng/g	0.028 *U*	0.026 *U*	0.013	5.6	0.027 *U*
Octachlorobiphenyls	ng/g	0.011 *U*	0.011 *U*	0.015 *U*	0.84	0.011 *U*
Nonachlorobiphenyls	ng/g	0.011 *U*	0.011 *U*	0.023 *U*	0.081	0.011 *U*
Decachlorobiphenyl	ng/g	0.011 *U*	0.011 *U*	0.017 *U*	0.041	0.011 *U*
Total PCB Homologs[c]	ng/g	0.47	0.48	0.72 *J*	68	0.28 *U*
Polycyclic aromatic hydrocarbons						
Naphthalene	μg/kg	10 *U*	5.0 *U*	5.0 *U*	10 *U*	10 *U*
2-Methylnaphthalene	μg/kg	10 *U*	5.0 *U*	5.0 *U*	10 *U*	10 *U*
1-Methylnaphthalene	μg/kg	10 *U*	5.0 *U*	5.0 *U*	10 *U*	10 *U*
2,6-Dimethylnaphthalene	μg/kg	10 *U*	5.0 *U*	5.0 *U*	10 *U*	10 *U*
Acenaphthylene	μg/kg	10 *U*	5.0 *U*	5.0 *U*	10 *U*	10 *U*
Acenaphthene	μg/kg	10 *U*	5.0 *U*	5.0 *U*	10 *U*	10 *U*
2,3,5-Trimethylnaphthalene	μg/kg	10 *U*	5.0 *U*	5.0 *U*	10 *U*	10 *U*
Fluorene	μg/kg	10 *U*	5.0 *U*	5.0 *U*	10 *U*	10 *U*
Phenanthrene	μg/kg	10 *U*	5.0 *U*	5.0 *U*	10 *U*	10 *U*
Anthracene	μg/kg	10 *U*	5.0 *U*	5.0 *U*	10 *U*	10 *U*
1-Methyl phenanthrene	μg/kg	10 *U*	5.0 *U*	5.0 *U*	10 *U*	10 *U*
Fluoranthene	μg/kg	10 *U*	5.0 *U*	5.0 *U*	10 *U*	10 *U*
Pyrene	μg/kg	10 *U*	5.0 *U*	5.0 *U*	10 *U*	10 *U*
Benz[a]anthracene	μg/kg	10 *U*	5.0 *U*	5.0 *U*	10 *U*	10 *U*
Chrysene	μg/kg	10 *U*	5.0 *U*	5.0 *U*	10 *U*	10 *U*
Benzo[b]fluoranthene	μg/kg	10 *U*	5.0 *U*	5.0 *U*	10 *U*	10 *U*
Benzo[k]fluoranthene	μg/kg	10 *U*	5.0 *U*	5.0 *U*	10 *U*	10 *U*
Benzo[e]pyrene	μg/kg	10 *U*	5.0 *U*	5.0 *U*	10 *U*	10 *U*
Benzo[a]pyrene	μg/kg	10 *U*	5.0 *U*	5.0 *U*	10 *U*	10 *U*
Indeno[1,2,3-cd]pyrene	μg/kg	10 *U*	5.0 *U*	5.0 *U*	10 *U*	10 *U*
Dibenz[a,h]anthracene	μg/kg	10 *U*	5.0 *U*	5.0 *U*	10 *U*	10 *U*
Benzo[ghi]perylene	μg/kg	10 *U*	5.0 *U*	5.0 *U*	10 *U*	10 *U*
Perylene	μg/kg	10 *U*	5.0 *U*	5.0 *U*	10 *U*	10 *U*

Table I-5. (cont.)

Chemical	Units	Sample No.				
		Control A	Control B	Control C	Control D	Control E
Biphenyl	μg/kg	10 *U*	5.0 *U*	5.0 *U*	10 *U*	10 *U*
High molecular weight polycyclic aromatic hydrocarbon[d]	μg/kg	50 *U*	25 *U*	25 *U*	50 *U*	50 *U*
Low molecular weight polycyclic aromatic hydrocarbon[e]	μg/kg	35 *U*	18 *U*	18 *U*	35 *U*	35 *U*
Total polycyclic aromatic hydrocarbons[f]	μg/kg	85 *U*	43 *U*	43 *U*	85 *U*	85 *U*
Butyltins	μg/kg					
Tetrabutyltin	μg/kg	0.99 *U*	1.0 *U*	1.0 *U*	1.0 *U*	0.99 *U*
Tributyltin	μg/kg	0.99 *U*	1.0 *U*	1.0 *U*	1.4 *J*	0.99 *U*
Dibutyltin	μg/kg	2.3	1.6	1.8	2.9	0.99 *U*
Monobutyltin	μg/kg	0.99 *U*	1.0 *U*	1.0 *U*	1.0 *U*	0.99 *U*

Note: *J* - estimated
U - undetected at quantitation limit

[a] All measurements based on wet weight.

[b] Total PCB for each sample is computed as the sum of Aroclors® according to the following rules: 1) if any Aroclor® is detected, all detected Aroclors® are summed; 2) if no Aroclor® is detected, the highest quantitation limit for any Aroclor® is used.

[c] One-half quantitation limit used in sum.

[d] Sum includes benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[ghi]perylene, benzo[k]fluoranthene, chrysene, dibenz[a,h]anthracene, fluoranthene, indeno[1,2,3-cd]pyrene, and pyrene using one-half quantitation limit.

[e] Sum includes 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene using one-half quantitation limit.

[f] Sum of high molecular weight polycyclic aromatic hydrocarbon and low molecular weight polycyclic aromatic hydrocarbon analytes using one-half quantitation limit.

Appendix J

Quality Assurance Report for *Macoma* Bioaccumulation Test Data

Quality Assurance Report for *Macoma* Bioaccumulation Test Data

Introduction

This report documents the results of the quality assurance and quality control (QA/QC) review of the data generated for the 28-day *Macoma* bioaccumulation test that was performed on composite sediment samples collected from nine stations at NASSCO and Southwest Marine shipyards in San Diego Bay, California, and from five stations at reference areas in San Diego Bay. These tests were conducted by AMEC Earth and Environment in San Diego, California. Exponent conducted the quality assurance review to ensure that the bioaccumulation testing was consistent with the specifications of the statement of work (SOW) and that the data are acceptable for their intended use in future stages of the study.

The quality assurance review consisted of an evaluation of the following major elements for the bioaccumulation test:

- **Field Methods—**Were the major specifications of the field sampling procedures followed, as described in the work plan (Exponent 2001)?
- **Laboratory System and Testing Methods—**Were the major specifications of the laboratory testing procedures followed, as described in the laboratory's SOW? Were the specified methods (i.e., ASTM 2000) followed and were any modifications adequately justified and documented?
- **Sediment Holding Time—**Was each sediment sample analyzed within the specified holding time after collection?
- **Water Quality Conditions—**Were water quality conditions monitored adequately during testing and were the measured conditions within the specified ranges for each test chamber?

- **Negative Control Responses—**Were the responses in the negative controls (i.e., clean sediment) within specified limits?

Throughout this report, the term "sample" refers to the whole sediment sample collected from each station in the field for bioaccumulation testing. The term "replicate" refers to one of the five subsamples of each sediment sample collected in the field that was subjected to bioaccumulation testing in the laboratory.

The following section of this report presents the results of the QA/QC evaluation for the bioaccumulation tests. QA/QC considerations are then summarized, and conclusions are presented in the final section.

Quality Assurance and Quality Control Evaluation

Field Methods

On August 6–15, 2001, sediment samples were collected from nine stations along the shoreline of NASSCO and Southwest Marine shipyards and from five reference area stations. All of the sampling stations were located in San Diego Bay, California. At each station, surface sediment (0–2 cm) was collected using a dual 0.1-m^2 stainless steel van Veen grab sampler, homogenized, and transferred to appropriate containers (i.e., Teflon® bags) for shipment to the bioaccumulation testing laboratory and the analytical chemistry laboratory. The same homogenized sediments were used for both the chemical analyses and the sediment bioaccumulation tests to ensure that these analyses were related as closely as possible.

Sediment sampling was conducted according to the procedures and plans described in the work plan (Exponent 2001). The only exceptions were 1) the slight relocation of one of the proposed reference stations due to an off-limit security area designated by the U.S. Navy; 2) the addition of two bioaccumulation stations to the seven stations near the shipyards that were specified in the study design; and 3) the reassignment of bioaccumulation stations within the shipyards by the California Regional Water Quality Control Board.

Laboratory System

Seawater from Scripps Institute of Oceanography was used for the bioaccumulation testing program. The seawater is filtered by Scripps and then trucked to the testing laboratory and held onsite in a recirculating temperature-controlled system. Prior to being used for the bioaccumulation test, the seawater was filtered through a 0.20-μm in-line filter.

Sediments were stored at 4°C in the dark until used. Prior to test initiation, sediment samples were screened through 1,000-μm and 500-μm mesh screens to remove debris and/or benthic organisms, respectively. After the test was set up, unused sample material was returned to the respective sample bucket/bag and again stored at 4°C in the dark. Sediments were homogenized prior to testing in a Nalgene tub by mixing with stainless steel implements.

Bioaccumulation tests were initiated on August 21 and September 7, 2001, respectively for the two test batches. Due to an error in the field chain-of-custody (COC) record and failure of the testing laboratory to inform Exponent of the COC discrepancy, test initiation of one of the samples (SD0034; Station 2441) was delayed. The laboratory initiated testing of this sample on September 7, 2001, which is outside the 14-day holding time requirement stipulated in the laboratory's SOW. This sample was initiated 27 days after sample collection. However, because the mean survival for this sample was 96.6 percent, the delay in test initiation probably did not affect the quality of the results for Sample SD0034.

All testing was conducted according to the good laboratory practices as defined in the EPA/ TSCA Good Laboratory Practice regulations revised August 17, 1989 (40 CFR 792).

Macoma Bioaccumulation Test

This bioaccumulation test measures the concentrations of specific chemicals in the edible tissue of adult clams (*Macoma nasuta*) exposed for 28 days to test sediment. Test procedures and acceptability criteria are described in ASTM (2000).

Bioaccumulation tests were conducted under flow-through conditions in 5-gallon glass aquaria. Control, test, or reference sediments were added to each aquarium to achieve a final sediment thickness of 4 cm. Five replicates were tested for each test site, reference area, and control sediment. To provide adequate biomass for tissue chemical analyses to evaluate bioaccumulation, 35 clams were placed in each aquarium. At test initiation, test organisms were observed for mortality and failure to rebury. No mortality or failure to rebury was observed and therefore, it was not necessary to replace any of the samples.

On Day 28, the sediment in each aquarium was sieved to recover the clams. Counts of surviving test organisms were recorded. Percent survival was determined relative to the total of 35 individuals added to each chamber at the beginning of the test.

The clams were depurated for 24 hours in a water-only exposure. Following depuration, the clams from each replicate were placed in a polypropylene bag, cable-tied, labeled with a random number, frozen overnight, and shipped to the chemical testing laboratory (Columbia Analytical Services, Kelso, Washington) for chemical analysis of the tissue.

Test Organism Collection, Holding, and Acclimation

The *M. nasuta* used in these bioaccumulation tests were obtained from Tomales Bay, California. The clams were collected on approximately August 14–16 and August 6–8, 2001, respectively, for test batches 1 and 2. The clams were approximately 3–5 cm in shell length. After collection, the test organisms were transferred to environmentally controlled holding areas at the laboratory in flow-through tanks with a small amount of control sediment (i.e., sediment from the area where the clams were collected) on the bottom, and acclimated for at least 2 days to test conditions.

Average conditions during the acclimation period were temperature of 15–18°C, dissolved oxygen content of 6.5–8.0 mg/L, and salinity of 35 ± 1 ppt. The photoperiod during acclimation was an approximate 9:15 light:dark cycle. Water used to acclimate the clams was similar to the overlying water used during the 10-day test.

Water Quality Measurements

Water quality monitoring was conducted during the *M. nasuta* bioaccumulation test. Measurements of the overlying water were taken just prior to the introduction of the test organisms to the test chambers and then at the same time each day until the conclusion of the test. This monitoring consisted of the following measurements:

- Temperature was measured at mid-depth in the overlying water of each replicate aquarium daily. The desired daily mean test temperature is 15 ± 2°C. Temperatures measured during the testing period ranged from 12.6°C to 19.4°C. The individual temperature readings did not vary by more than 2.6°C from the selected test temperature (i.e., 15 ± 2°C). Eleven percent of the daily mean test temperatures were outside the selected test temperature (i.e., 15 ± 2°C). Flow rates were adjusted by the laboratory accordingly to compensate and maintain the selected test temperature range.

- Dissolved oxygen was measured at mid-depth in the overlying water in each replicate aquarium daily. Dissolved oxygen concentrations should be at least 5.0 mg/L throughout the study in all control and test sediment replicates. The lowest dissolved oxygen concentration was 1.6 mg/L. The dissolved oxygen concentrations ranged from 1.6 to 8.7 mg/L. Seven percent of the daily dissolved oxygen concentrations were outside the selected test dissolved oxygen concentrations (i.e., >5 mg/L). Flow rates were adjusted by the laboratory accordingly to compensate and maintain the selected test dissolved oxygen concentration.

- The pH was measured at mid-depth in the overlying water in each replicate aquarium daily. Values for pH ranged from 7.3 to 8.3, which is within the recommended range of 6.5–8.5.

- Salinity was measured at mid-depth in the overlying water in each replicate aquarium daily. The daily salinity concentrations should be 34 ± 2 ppt throughout the study in all control and test sediment replicates. The range of salinity concentrations was 34–35 ppt.

- Interstitial salinity was measured prior to test initiation in each test sediment. The range of interstitial salinity concentrations was 33–35 ppt.

- Ammonia and sulfide were measured in a composite of equal volumes of the overlying water of each replicate on Days 0, 5, 10, 15, 20, 25, and 28. During the testing period, the ammonia concentrations in the overlying water ranged from <0.1 mg/L (detection limit) to 1.3 mg/L and all sulfide concentrations in the overlying water were below the detection level.

Reference Areas and Negative Control Sediments

Five reference area sediments (collected from the field from within the same water body as the test sediments, but without any history of industrial contamination), conducted with five replicates, were used to evaluate the survival of the test organisms in non-contaminated sediments. In addition, a laboratory control sediment (i.e., negative control; sediment collected from the same location where the test organisms were collected by the laboratory [i.e., Tomales Bay, California]; collected on August 13, 2001, respectively for the two batches), was used to evaluate survival of the test organisms. The negative control was also conducted with five replicates. All reference sediment and negative control testing was in compliance with ASTM (2000) methods. Performance standards developed for this test are ≥80 percent survival in the negative control and an adequate mass of organisms at test termination for detection of target analytes (i.e., 125–130 g of tissue).

Mean survival of the test organisms in the laboratory control sediment (i.e., negative control) was 88.6 percent. These results meet the performance standards set for the test and suggest that the test organisms were sufficiently healthy for testing. Adequate tissue mass was generated in the bioaccumulation test for chemical analysis.

Summary of Quality Assurance and Quality Control Considerations

Mean survival for the laboratory control sediment (i.e., negative control) was 88.6 percent. This result meets the performance standard set for the 28-day *M. nasuta* bioaccumulation test.

Due to an error in the field COC record and failure of the testing laboratory to inform Exponent of the COC discrepancy, test initiation of one of the samples (SD0034; Station 2441) was delayed. The laboratory initiated testing of this sample on September 7, 2001, which is outside the 14-day holding time requirement stipulated in the laboratory's SOW. This sample was initiated 27 days after sample collection. However, because the mean survival for this sample was 96.6 percent, it is not anticipated that this deviation affected the results.

During the testing period, there were four inconsistencies with the specifications provided in the SOW:

- The temperature in the overlying water of several of the test replicates was higher than the recommended range of 13–17°C. However, because of the high mean percent survival in all test replicates (i.e., >80 percent), it is not anticipated that these minor deviations affected the results.
- The dissolved oxygen in the overlying water of several of the test replicates was lower than the recommended concentration of 5 mg/L. However, because of the high mean percent survival in all test replicates (i.e., >80 percent), it is not anticipated that this minor deviation affected the results.
- Water quality measurements were not measured for one of the replicate test chambers for Sample SD0012 and for two of the replicate test chambers for Sample SD0013 on Day 23. It is not anticipated that the failure to collect water quality measurements in these replicates affected the results.

- The interstitial salinity was supposed to be measured in each sample upon receipt, and this measurement was not collected. It is not anticipated the failure to collect water quality measurements in these replicates affected the results.

The data are determined to be acceptable for use in the NASSCO and Southwest Marine sediment investigations.

References

ASTM. 2000. Standard guide for determination of the bioaccumulation of sediment-associated contaminants by benthic invertebrates. Method E1688-00a. American Society for Testing and Materials, West Conshohocken, PA.

Exponent. 2001. Work plan for the NASSCO and Southwest Marine detailed sediment investigation. Prepared for NASSCO and Southwest Marine, San Diego, CA. Exponent, Bellevue, WA.

Appendix K

Benthic Macroinvertebrate Data

Contents

Table K-1. Species abundance data for Station NA01

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates				
						1	2	3	4	5
Annelida										
Oligochaeta						24	18	24	16	30
Polychaeta										
Palpata										
	Phyllodocida		Nereididae	*Neanthes*	*acuminata*			2		2
	Phyllodocida		Polynoidae			2				
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*	2		2	2	2
	Phyllodocida		Syllidae	*Exogone*	*lourei*	54	26	46	8	34
	Phyllodocida		Syllidae	*Syllis (Typosyllis)*	*nipponica*	2		2	2	
	Sabellida		Sabellidae	*Euchone*	*limnicola*		2	4		
	Sabellida	Eunicida	Dorvilleidae	*Dorvillea (Schistomeringos)*	*longicornis*		2			2
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	132	86	54	102	84
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*erecta*			10		2
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*tetraura*	6	2			2
	Sabellida	Eunicida	Oenonidae	*Drilonereis*	sp		2			
	Spionida		Poecilochaetidae	*Poecilochaetus*	sp A (Martin 1977)[a]		2			
	Spionida		Spionidae	*Prionospio*	*heterobranchia*	36	6	16	34	24
	Spionida		Spionidae	*Pseudopolydora*	*paucibranchiata*	8	10	10	28	14
	Terebellida		Terebellidae	*Eupolymnia*	*heterobranchia*			2		6
	Terebellida		Terebellidae	*Pista*	*percyi*	10	6	18	2	12
Scolecida	Capitellida		Capitellidae	*Mediomastus*	sp	4	2	6	4	4
	Cossurida		Cossuridae	*Cossura*	sp	2	2	2	6	6
	Opheliida		Opheliidae	*Armandia*	*brevis*	4		4	2	
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	10	10	8	10	4
Arthropoda										
Malacostraca										
Eumalacostraca	Amphipoda		Aoridae	*Acuminodeutopus*	*stenopropodus*	2		4	2	6
	Amphipoda		Dexaminidae	*Paradexamine*	sp A			2		
	Amphipoda	Caprellidea	Caprellidae	*Caprella*	*natalenis*			12	12	6
	Amphipoda	Caprellidea	Protellidae	*Mayerella*	*banksia*	2				
	Amphipoda	Gammaridea	Ampithoidae	*Ampithoe*	*plumulosa*			6	2	4
	Amphipoda	Gammaridea	Aoridae	*Bemlos*	*macromanus*			2		
	Amphipoda	Gammaridea	Aoridae	*Grandidierella*	*japonica*	2		14	2	6
	Amphipoda	Gammaridea	Isaeidae	*Amphideutopus*	*oculatus*	22	26	14	4	2
	Amphipoda	Gammaridea	Ischyroceridae	*Ericthonius*	*brasiliensis*			2	6	12
	Amphipoda	Gammaridea	Phoxocephalidae	*Heterophoxus*	*cf ellisi*	42	44	114	16	54
	Amphipoda	Gammaridea	Podoceridae	*Podocerus*	*fulanus*	22		32	8	30
	Decapoda	Pleocyemata	Alpheidae	*Alpheus*	*californiensis*			2		
	Decapoda	Pleocyemata	Axiidae	*Calocarides*	sp	2		4		
	Decapoda	Pleocyemata	Hippolytidae	*Hippolyte*	*californiensis*			2	6	4
	Decapoda	Pleocyemata	Majidae	*Pyromaia*	*tuberculata*				2	8
	Isopoda	Anthuridea	Paranthuridae	*Paranthura*	*elegans*	4		2		2
	Isopoda	Flabellifera	Serolidae	*Heteroserolis*	*carinata*	10	8	10	6	8

Table K-1 (cont.)

Phylum/Class/						Field replicates				
Subclass	Order	Suborder	Family	Genus	Species	1	2	3	4	5
	Isopoda	Flabellifera	Sphaeromatidae	*Paracerceis*	*cordata*			2	18	26
	Mysidacea		Mysidae	*Heteromysis*	*odontops*		2	8		4
	Stomatopod	Gammaridea	Squillidae	*Schmittius*	*politus*			2		
	Tanaidacea	Apseudomorpha	Tanaidae	*Kalliapseudes*	*crassus*			4		4
	Tanaidacea	Tanaidomorpha	Leptocheliidae	*Leptochelia*	*dubia*	2				
Ostracoda										
Myodocopa	Myodocopina		Philomedidae	*Euphilomedes*	*carcharodonta*	8	4	6	8	4
Chordata										
Actinopterygii										
Neopterygii	Perciformes	Gobioidei	Gobiidae				6	4	4	
Ascidiacea									2	
	Aplousobranchia		Polycitoridae	*Distaplia*	sp					1
Mollusca										
Bivalvia										
	Pholadomyoida		Lyonsiidae	*Lyonsia*	*californica*		2			
Heterodonta	Veneroida		Cardiidae	*Laevicardium*	*substriatum*		2		2	
	Veneroida		Semelidae	*Theora*	*lubrica*	18	10	34	36	12
Pteriomorphia	Mytiloida		Mytilidae	*Musculista*	*senhousei*	70	36	34	14	36
Gastropoda										
Opisthobranchia	Cephalaspidea		Bullidae	*Bulla*	*gouldiana*		2			2
	Cephalaspidea		Cylichnidae	*Acteocina*	*inculta*				2	
	Cephalaspidea		Haminoeidae	*Haminoea*	*vesicula*				6	
Prosobranchia	Neogastropoda		Nassariidae	*Nassarius*	*tegula*	4		8	2	4
Nematoda						4	16	6		14
Nemertea										
Anopla	Paleonemertea		Tubulanidae	*Tubulanus*	*polymorphus/pellucidus*		2			
Enopla	Hoplonemertea	Monostilifera	Emplectonematidae	*Paranemertes*	*californica*	2				4
Platyhelminthes										
Turbellaria										
Archoophora	Polycladida		Leptoplanidae	*Notoplana*	sp			2		

[a] Provisional species. Identified in parentheses is the taxonomist or organization who believes this species may be a new one because it does not fit known species descriptions for the area.

Table K-2. Species abundance data for Station NA03

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Annelida										
Oligochaeta								2		4
Polychaeta										
Palpata	Flabelligerida	Terebellida	Flabelligeridae	*Diplocirrus*	sp SD1			2		
	Flabelligerida	Terebellida	Flabelligeridae	*Pherusa*	*capulata*	2		4		
	Phyllodocida		Glyceridae	*Glycera*	*americana*			2		
	Phyllodocida		Nereididae	*Neanthes*	*acuminata*	4			4	6
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*		12	12	8	12
	Phyllodocida		Polynoidae	*Harmothoe*	sp 1					2
	Phyllodocida		Syllidae	*Exogone*	*lourei*	48	56	38	44	82
	Phyllodocida		Syllidae	*Odontosyllis*	*phosphorea*				2	
	Phyllodocida		Syllidae	*Syllis (Typosyllis)*	*nipponica*	2	4	8		2
	Sabellida		Sabellidae	*Euchone*	*limnicola*		4	2	4	
	Sabellida	Eunicida	Dorvilleidae	*Dorvillea (Schistomeringos)*	*longicornis*			6		
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	28	70	106	46	70
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*erecta*	4	6		6	6
	Sabellida	Eunicida	Oenonidae	*Drilonereis*	sp				2	
	Spionida		Spionidae	*Prionospio*	*heterobranchia*	6	12	16	16	16
	Spionida		Spionidae	*Pseudopolydora*	*paucibranchiata*	46	34	100	40	20
	Terebellida		Terebellidae	*Eupolymnia*	*heterobranchia*		2	6	2	4
	Terebellida		Terebellidae	*Pista*	*percyi*	14	22	32	24	14
Scolecida	Capitellida		Capitellidae	*Capitella*	*capitata complex*					2
	Capitellida		Capitellidae	*Mediomastus*	sp		4	10	4	6
	Cossurida		Cossuridae	*Cossura*	sp				4	
	Opheliida		Opheliidae	*Armandia*	*brevis*		10	14		6
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	14	22	28	18	20
Arthropoda										
Malacostraca										
Eumalacostraca	Amphipoda		Aoridae	*Acuminodeutopus*	*stenopropodus*	2	2	2	2	2
	Amphipoda		Dexaminidae	*Paradexamine*	sp A		2	4	2	
	Amphipoda	Caprellidea	Caprellidae	*Caprella*	*natalenis*			4	8	
	Amphipoda	Gammaridea	Ampithoidae	*Ampithoe*	*plumulosa*				2	
	Amphipoda	Gammaridea	Aoridae	*Bemlos*	*macromanus*		4	4	6	2
	Amphipoda	Gammaridea	Aoridae	*Grandidierella*	*japonica*	2	8	10	12	
	Amphipoda	Gammaridea	Isaeidae	*Amphideutopus*	*oculatus*	2	12	18	12	
	Amphipoda	Gammaridea	Ischyroceridae	*Ericthonius*	*brasiliensis*			2	2	
	Amphipoda	Gammaridea	Phoxocephalidae	*Heterophoxus*	*cf ellisi*	22	8	30	14	26
	Amphipoda	Gammaridea	Podoceridae	*Podocerus*	*fulanus*	10	4	46	42	12
	Decapoda	Pleocyemata	Alpheidae	*Alpheus*	*californiensis*		2		2	2
	Decapoda	Pleocyemata	Axiidae	*Calocarides*	sp		4	4		
	Decapoda	Pleocyemata	Hippolytidae	*Hippolyte*	*californiensis*	2	4	2	6	
	Decapoda	Pleocyemata	Majidae					2		2
	Decapoda	Pleocyemata	Majidae	*Pyromaia*	*tuberculata*	10	8	10	6	4

Table K-2. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Decapoda	Pleocyemata	Processidae	*Ambidexter*	*panamensis*	2	2			
	Isopoda	Anthuridea	Paranthuridae	*Paranthura*	*elegans*		2		2	2
	Isopoda	Flabellifera	Serolidae	*Heteroserolis*	*carinata*	4	6	8	6	2
	Isopoda	Flabellifera	Sphaeromatidae	*Paracerceis*	*cordata*	14	20	28	18	22
	Mysidacea		Mysidae	*Heteromysis*	*odontops*			2	2	2
	Tanaidacea	Tanaidomorpha	Leptocheliidae	*Leptochelia*	*dubia*		2	2		2
	Tanaidacea	Tanaidomorpha	Tanaidae	*Synaptotanais*	*notabilis*	2			2	2
Ostracoda										
Myodocopa	Myodocopina		Philomedidae	*Euphilomedes*	*carcharodonta*		4	8	6	4
Pycnogonida	Pegmata		Phoxichilidiidae	*Anoplodactylus*	*pacificus*				4	
Chordata										
Actinopterygii										
Neopterygii	Perciformes	Gobioidei	Gobiidae			2	6	2		
Ascidiacea	Aplousobranchia						1			
Cnidaria										
Anthozoa										
Hexacorallia	Actiniaria		Edwardsiidae	*Scolanthus*	sp B	6	4	6	2	4
Echinodermata										
Ophiuroidea										
	Ophiurida	Gnathophiurina	Amphiuridae	*Amphipholis*	sp		2	2		2
Ectoprocta										
Gymnolaemata										
	Ctenostomata	Carnosa	Arachidiidae	*Nolella*	sp	1				
Mollusca										
Bivalvia										
	Pholadomyoida		Lyonsiidae	*Lyonsia*	*californica*		2	6	4	2
Heterodonta	Veneroida		Cardiidae	*Laevicardium*	*substriatum*		4		2	
Heterodonta	Veneroida		Semelidae	*Theora*	*lubrica*	24	10	40	18	24
Heterodonta	Veneroida		Solecurtidae	*Tagelus*	*subteres*		2		2	
Pteriomorphia	Mytiloida		Mytilidae	*Musculista*	*senhousei*	66	66	62	46	68
Gastropoda										
	Neotaenioglossa		Calyptraeidae	*Crepidula*	sp					2
	Neotaenioglossa		Littorinidae	*Lacuna*	*unifasciata*	2				
Opisthobranchia	Cephalaspidea		Bullidae	*Bulla*	*gouldiana*		2			
	Cephalaspidea		Cylichnidae	*Acteocina*	*inculta*					2
	Cephalaspidea		Haminoeidae	*Haminoea*	*vesicula*	4	4	4		4
Prosobranchia	Neogastropoda		Nassariidae	*Nassarius*	*tegula*	8	8	2	6	
Nematoda						4	6	2	6	
Nemertea										
Enopla	Hoplonemertea	Monostilifera	Emplectonematidae	*Paranemertes*	*californica*		2	2	4	
Platyhelminthes										
Turbellaria										
Archoophora	Polycladida		Gnesiocerotidae	*Spinicirrus*	sp					2

Table K-3. Species abundance data for Station NA04

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Annelida										
Oligochaeta									2	
Polychaeta	Spionida		Cirratulidae	*Protocirrineris*	sp A	14	8		22	4
Palpata	Flabelligerida	Terebellida	Flabelligeridae	*Diplocirrus*	sp SD1	2	2	2	4	
	Flabelligerida	Terebellida	Flabelligeridae	*Pherusa*	*capulata*					2
	Phyllodocida		Glyceridae	*Glycera*	*americana*					2
	Phyllodocida		Polynoidae				2			
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*	4	2			
	Phyllodocida		Syllidae	*Exogone*	*lourei*	32	18	26	40	30
	Sabellida		Sabellidae	*Euchone*	*limnicola*	4		4	14	
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	70	98	60	114	58
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*erecta*	10	8	2	6	2
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*tetraura*				4	
	Sabellida	Eunicida	Oenonidae	*Drilonereis*	*falcata*	2		2	4	
	Spionida		Spionidae	*Paraprionospio*	*pinnata*				2	
	Spionida		Spionidae	*Prionospio*	*heterobranchia*	6	2		8	2
	Spionida		Spionidae	*Pseudopolydora*	*paucibranchiata*		2		4	10
	Spionida		Spionidae	*Spiophanes*	*duplex*				2	
	Spionida	Terebellida	Cirratulidae							6
	Terebellida		Pectinariidae	*Pectinaria*	*californiensis*				2	
	Terebellida		Terebellidae	*Pista*	*percyi*	22	16	16	30	30
Scolecida	Capitellida		Capitellidae	*Mediomastus*	sp	10		8		4
	Capitellida		Capitellidae	*Notomastus*	sp	2				2
	Cossurida		Cossuridae	*Cossura*	sp	4		2	4	
	Opheliida		Opheliidae	*Armandia*	*brevis*				2	
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	24	24	20	20	4
Arthropoda										
Malacostraca										
Eumalacostraca	Amphipoda		Aoridae	*Acuminodeutopus*	*stenopropodus*	2		6	8	4
	Amphipoda	Gammaridea	Aoridae	*Bemlos*	*macromanus*	4		4		
	Amphipoda	Gammaridea	Aoridae	*Grandidierella*	*japonica*				2	
	Amphipoda	Gammaridea	Corophiidae					2		
	Amphipoda	Gammaridea	Isaeidae	*Amphideutopus*	*oculatus*	6	6	2	2	4
	Amphipoda	Gammaridea	Liljeborgiidae	*Liljeborgia*	*geminata*		2			
	Amphipoda	Gammaridea	Oedicerotidae	*Hartmanodes*	*hartmanae*	2				
	Amphipoda	Gammaridea	Phoxocephalidae	*Heterophoxus*	*cf ellisi*	6	4		2	2
	Amphipoda	Gammaridea	Podoceridae	*Podocerus*	*fulanus*			2		
	Decapoda	Pleocyemata	Alpheidae	*Alpheus*	*californiensis*		2	2		
	Decapoda	Pleocyemata	Axiidae	*Calocarides*	sp		6			
	Decapoda	Pleocyemata	Majidae	*Pyromaia*	*tuberculata*	4		2	2	2
	Decapoda	Pleocyemata	Processidae	*Ambidexter*	*panamensis*	2	2	2		
	Isopoda	Flabellifera	Serolidae	*Heteroserolis*	*carinata*	6	6		6	
	Mysidacea		Mysidae	*Heteromysis*	*odontops*	2	4			

Table K-3. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Ostracoda										
Myodocopa	Myodocopina		Philomedidae	*Euphilomedes*	*carcharodonta*	4	6	2	4	
Chordata										
Actinopterygii										
Neopterygii	Batrachoidiformes		Batrachoididae	*Porichthys*	*myriaster*			2		
	Perciformes	Gobioidei	Gobiidae				2		2	
Cnidaria										
Anthozoa										
Hexacorallia	Actiniaria		Edwardsiidae	*Scolanthus*	sp B	10	4	6	14	18
Mollusca										
Bivalvia										
Heterodonta	Veneroida		Cardiidae	*Laevicardium*	*substriatum*	2				
	Veneroida		Semelidae	*Theora*	*lubrica*	32	8	2	10	16
Pteriomorphia	Mytiloida		Mytilidae	*Musculista*	*senhousei*	32	40	32	56	26
Gastropoda	Neotaenioglossa		Calyptraeidae	*Crepidula*	sp				2	
Prosobranchia	Neogastropoda		Nassariidae	*Nassarius*	*tegula*			2		
Nemertea										
Anopla	Heteronemertea		Lineidae			2				
	Paleonemertea		Tubulanidae	*Tubulanus*	*frenatus*					2

Table K-4. Species abundance data for Station NA05

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates				
						1	2	3	4	5
Annelida										
Oligochaeta									2	
Polychaeta										
	Spionida		Cirratulidae	*Protocirrineris*	sp A				8	
Palpata	Flabelligerida	Terebellida	Flabelligeridae	*Diplocirrus*	sp SD1	2	6	4	2	6
	Flabelligerida	Terebellida	Flabelligeridae	*Pherusa*	*capulata*					2
	Phyllodocida		Glyceridae	*Glycera*	*americana*					2
	Phyllodocida		Nereididae	*Neanthes*	*acuminata*	2				
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*	2	6	12	4	2
	Phyllodocida		Syllidae	*Exogone*	*lourei*	78	256	204	156	194
	Phyllodocida		Syllidae	*Odontosyllis*	*phosphorea*				4	2
	Phyllodocida		Syllidae	*Syllis (Syllis)*	*gracilis*		2			
	Phyllodocida		Syllidae	*Syllis (Typosyllis)*	*nipponica*		2			
	Sabellida		Sabellidae	*Euchone*	*limnicola*	4	2	2	2	
	Sabellida	Eunicida	Dorvilleidae	*Dorvillea (Schistomeringos)*	*longicornis*	4	2	2	2	2
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	44	90	140	52	68
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*erecta*		2		2	
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*limicola*					2
	Spionida		Spionidae	*Prionospio*	*heterobranchia*	6	16	8	4	12
	Spionida		Spionidae	*Pseudopolydora*	*paucibranchiata*	74	60	108	82	62
	Spionida	Terebellida	Cirratulidae	*Aphelochaeta*	*phillipsi*	2				
	Terebellida		Terebellidae	*Pista*	*percyi*	10	28	24	18	12
Scolecida	Capitellida		Capitellidae	*Mediomastus*	sp	4	26	22	8	14
	Capitellida		Capitellidae	*Scyphoproctus*	*oculatus*	12	8	10	6	2
	Cossurida		Cossuridae	*Cossura*	sp	2	2			
	Opheliida		Opheliidae	*Armandia*	*brevis*	2				
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	14	24	18	14	20
Arthropoda										
Malacostraca										
	Decapoda	Natantia					4	2		
Eumalacostraca	Amphipoda		Aoridae	*Acuminodeutopus*	*stenopropodus*	2		2	4	
	Amphipoda	Caprellidea	Caprellidae	*Caprella*	*natalenis*		8	2		20
	Amphipoda	Gammaridea	Ampithoidae	*Ampithoe*	*plumulosa*				2	
	Amphipoda	Gammaridea	Aoridae	*Aoroides*	sp		2		2	
	Amphipoda	Gammaridea	Aoridae	*Bemlos*	*macromanus*	2		8		4
	Amphipoda	Gammaridea	Aoridae	*Grandidierella*	*japonica*	2	2	6		2
	Amphipoda	Gammaridea	Isaeidae	*Amphideutopus*	*oculatus*	4	10	12		
	Amphipoda	Gammaridea	Ischyroceridae	*Cerapus*	*tubularis*					2
	Amphipoda	Gammaridea	Ischyroceridae	*Ericthonius*	*brasiliensis*			2	2	
	Amphipoda	Gammaridea	Liljeborgiidae	*Liljeborgia*	*geminata*					2
	Amphipoda	Gammaridea	Oedicerotidae	*Hartmanodes*	*hartmanae*		2			
	Amphipoda	Gammaridea	Phoxocephalidae	*Heterophoxus*	*cf ellisi*		8	4	16	4
	Amphipoda	Gammaridea	Podoceridae	*Podocerus*	*fulanus*		6	24	10	2

Table K-4. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Decapoda	Pleocyemata	Alpheidae	*Alpheus*	*californiensis*		2	2	2	
	Decapoda	Pleocyemata	Axiidae	*Calocarides*	sp					2
	Decapoda	Pleocyemata	Hippolytidae	*Hippolyte*	*californiensis*			2		
	Decapoda	Pleocyemata	Majidae	*Pyromaia*	*tuberculata*	2	4	6	4	2
	Isopoda	Flabellifera	Serolidae	*Heteroserolis*	*carinata*		6		6	4
	Isopoda	Flabellifera	Sphaeromatidae	*Paracerceis*	*cordata*		2	2		
	Mysidacea		Mysidae	*Heteromysis*	*odontops*			2		
	Tanaidacea	Apseudomorpha	Tanaidae	*Kalliapseudes*	*crassus*		2	2		
	Tanaidacea	Tanaidomorpha	Leptocheliidae	*Leptochelia*	*dubia*			2		
	Tanaidacea	Tanaidomorpha	Tanaidae	*Synaptotanais*	*notabilis*		10			2
Ostracoda										
Myodocopa	Myodocopina		Philomedidae	*Euphilomedes*	*carcharodonta*			2	2	2
Chordata										
Actinopterygii										
Neopterygii	Perciformes	Gobioidei	Gobiidae				2	2		2
Ascidiacea	Stolidobranchiata		Styelidae	*Styela*	sp	2				
Cnidaria										
Anthozoa										
Hexacorallia	Actiniaria		Edwardsiidae	*Scolanthus*	sp B		8	10	6	
Zoantharia	Actiniaria	Athenaria	Edwardsiidae	*Edwardsia*	sp G (MEC)[a]					2
Echinodermata										
Holothuroidea										
Apodacea	Apodida		Synaptidae	*Leptosynapta*	sp		2			
Mollusca										
Bivalvia						2				
	Pholadomyoida		Lyonsiidae	*Lyonsia*	*californica*	2	2	2		
	Pholadomyoida		Thraciidae	*Thracia*	*curta*			2		
Heterodonta	Veneroida		Cardiidae	*Laevicardium*	*substriatum*	2	2			
	Veneroida		Semelidae	*Theora*	*lubrica*	12	24	14	8	8
	Veneroida		Tellinidae	*Macoma*	sp		4	4		
Pteriomorphia	Mytiloida		Mytilidae	*Musculista*	*senhousei*	38	80	102	52	38
Gastropoda	Neotaenioglossa		Calyptraeidae	*Crepidula*	sp	2	2	6		4
Opisthobranchia	Cephalaspidea		Haminoeidae	*Haminoea*	*vesicula*			2		
Prosobranchia	Neogastropoda		Nassariidae	*Nassarius*	*tegula*		2			2
Nemertea										
Anopla	Paleonemertea		Tubulanidae	*Tubulanus*	*frenatus*		2	2		2
	Paleonemertea		Tubulanidae	*Tubulanus*	*polymorphus/pellucidus*		2			
Enopla	Hoplonemertea	Monostilifera	Emplectonematidae	*Paranemertes*	*californica*		2	4		6
	Hoplonemertea	Monostilifera	Tetrastemmidae	*Tetrastemma*	sp	2	2		2	

[a] Provisional species. Identified in parentheses is the taxonomist or organization who believes this species may be a new one because it does not fit known species descriptions for the area.

Table K-5. Species abundance data for Station NA06

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Annelida										
Oligochaeta						4	28	16	16	10
Polychaeta	Spionida		Cirratulidae	*Protocirrineris*	sp A	10	12	2	2	4
Palpata	Flabelligerida	Terebellida	Flabelligeridae	*Diplocirrus*	sp SD1		2			
	Flabelligerida	Terebellida	Flabelligeridae	*Pherusa*	*capulata*		2			
	Phyllodocida		Nereididae	*Neanthes*	*acuminata*	20	24	20	20	36
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*	30	8	16	2	16
	Phyllodocida		Syllidae	*Exogone*	*lourei*	114	236	140	132	214
	Phyllodocida		Syllidae	*Odontosyllis*	*phosphorea*		2			
	Phyllodocida		Syllidae	*Syllis(Typosyllis)*	*nipponica*		4	2	2	
	Phyllodocida		Syllidae	*Trypanosyllis*	sp 1 (Harris)[a]	2				
	Sabellida	Eunicida	Dorvilleidae	*Dorvillea (Schistomeringos)*	*longicornis*	4	6		4	
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	76	82	84	34	54
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*erecta*	4	8	6	6	2
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*limicola*	8	6	10	2	10
	Spionida		Spionidae						2	
	Spionida		Spionidae	*Prionospio*	*heterobranchia*	26	36	22	22	10
	Spionida		Spionidae	*Pseudopolydora*	*paucibranchiata*	32	62	28	30	26
	Terebellida		Terebellidae	*Eupolymnia*	*heterobranchia*	8	4	2		4
	Terebellida		Terebellidae	*Pista*	*percyi*	40	42	28	2	16
Scolecida	Capitellida		Capitellidae						2	
	Capitellida		Capitellidae	*Capitella*	*capitata complex*		4			2
	Capitellida		Capitellidae	*Mediomastus*	sp	18	16	40	24	18
	Capitellida		Capitellidae	*Scyphoproctus*	*oculatus*	6	2	2	2	
	Opheliida		Opheliidae	*Armandia*	*brevis*	4			6	2
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	24	16	44	24	20
Arthropoda										
Copepoda	Harpacticoida						2		2	
Malacostraca										
Eumalacostraca	Amphipoda		Aoridae	*Acuminodeutopus*	*stenopropodus*	2		2		
	Amphipoda		Dexaminidae	*Paradexamine*	sp A	6	4			
	Amphipoda	Caprellidea	Caprellidae	*Caprella*	*natalenis*		2			
	Amphipoda	Gammaridea	Ampithoidae	*Ampithoe*	*plumulosa*	6	6		2	
	Amphipoda	Gammaridea	Aoridae	*Bemlos*	*macromanus*	6	8	6	2	4
	Amphipoda	Gammaridea	Aoridae	*Grandidierella*	*japonica*		2	6		2
	Amphipoda	Gammaridea	Liljeborgiidae	*Liljeborgia*	*geminata*				2	
	Amphipoda	Gammaridea	Oedicerotidae	*Synchelidium*	*rectipalmum*	2				
	Amphipoda	Gammaridea	Podoceridae	*Podocerus*	*fulanus*	6	4		2	4
	Decapoda	Pleocyemata	Alpheidae	*Alpheus*	*californiensis*	2		6	4	2
	Decapoda	Pleocyemata	Axiidae	*Calocarides*	sp			2		2
	Decapoda	Pleocyemata	Grapsidae	*Hemigrapsus*	*oregonensis*				2	2
	Decapoda	Pleocyemata	Hippolytidae	*Hippolyte*	*californiensis*	20	8			4
	Decapoda	Pleocyemata	Majidae							2

Table K-5. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Decapoda	Pleocyemata	Majidae	*Pyromaia*	*tuberculata*	10	2	2	8	
	Decapoda	Pleocyemata	Xanthidae	*Lophopanopeus*	sp	2	2		4	2
	Isopoda	Anthuridea	Paranthuridae	*Paranthura*	*elegans*	2	2	2		
	Isopoda	Flabellifera	Sphaeromatidae	*Paracerceis*	*cordata*	100	50	18	4	54
	Mysidacea		Mysidae	*Heteromysis*	*odontops*	2	2			
	Tanaidacea	Tanaidomorpha	Tanaidae	*Synaptotanais*	*notabilis*		2		2	
Chordata										
Actinopterygii										
Neopterygii	Perciformes	Gobioidei	Gobiidae			10	4	2	4	
Cnidaria										
Anthozoa										
Hexacorallia	Actiniaria		Edwardsiidae	*Scolanthus*	sp B		2	12	8	8
Echinodermata										
Ophiuroidea	Ophiurida	Gnathophiurina	Amphiuridae	*Amphipholis*	sp					2
Mollusca										
Bivalvia	Pholadomyoida		Lyonsiidae	*Lyonsia*	sp	2				
Heterodonta	Veneroida		Semelidae	*Theora*	*lubrica*	4	4	4	4	
Pteriomorphia	Mytiloida		Mytilidae	*Musculista*	*senhousei*	54	52	36	26	38
Gastropoda	Neotaenioglossa		Calyptraeidae	*Crepidula*	sp	8	2	2		
Opisthobranchia	Cephalaspidea		Bullidae	*Bulla*	*gouldiana*				2	
Opisthobranchia	Cephalaspidea		Cylichnidae	*Acteocina*	*inculta*	2	8			2
Opisthobranchia	Cephalaspidea		Haminoeidae	*Haminoea*	*vesicula*				2	
Prosobranchia	Neogastropoda		Nassariidae	*Nassarius*	*tegula*				4	2
Nematoda							30	16		4
Nemertea										
Anopla	Heteronemertea		Lineidae							2
	Paleonemertea		Tubulanidae							2
	Paleonemertea		Tubulanidae	*Tubulanus*	*frenatus*			2		
	Paleonemertea		Tubulanidae	*Tubulanus*	*polymorphus/pellucidus*			2		
Enopla	Hoplonemertea		Emplectonematidae	*Cryptonemertes*	*actinophila*	4				
	Hoplonemertea	Monostilifera	Amphiporidae	*Amphiporus*	sp	2				
	Hoplonemertea	Monostilifera	Emplectonematidae	*Paranemertes*	*californica*			2	4	4

[a] Provisional species. Identified in parentheses is the taxonomist or organization who believes this species may be a new one because it does not fit known species descriptions for the area.

Table K-6. Species abundance data for Station NA07

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Annelida										
Oligochaeta									4	
Polychaeta	Spionida		Cirratulidae	*Protocirrineris*	sp A	12	4	2	2	12
Palpata	Flabelligerida	Terebellida	Flabelligeridae	*Diplocirrus*	sp SD1				2	
	Flabelligerida	Terebellida	Flabelligeridae	*Pherusa*	*capulata*		2			
	Phyllodocida		Aphroditidae	*Aphrodita*	sp		2	2		
	Phyllodocida		Nereididae	*Neanthes*	*acuminata*	2	2			6
	Phyllodocida		Phyllodocidae	*Eumida*	*longicornuta*		2			
	Phyllodocida		Polynoidae						2	
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*	26	22	8	2	24
	Phyllodocida		Syllidae	*Exogone*	*lourei*	58	68	62	68	262
	Phyllodocida		Syllidae	*Odontosyllis*	*phosphorea*				2	
	Phyllodocida		Syllidae	*Syllis (Syllis)*	*gracilis*		2			
	Phyllodocida		Syllidae	*Syllis (Typosyllis)*	*nipponica*	8	2			
	Phyllodocida		Syllidae	*Syllis (Typosyllis)*	sp				2	
	Phyllodocida		Syllidae	*Trypanosyllis*	sp 1 (Harris)[a]			2		
	Sabellida		Sabellidae	*Euchone*	*incolor*		2		2	
	Sabellida		Serpulidae						4	
	Sabellida	Eunicida	Dorvilleidae	*Dorvillea (Schistomeringos)*	*longicornis*	2		2		4
	Sabellida	Eunicida	Lumbrineridae				2		2	
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	50	84	62	22	74
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*erecta*	16	12	2	4	6
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*limicola*		8	4		2
	Sabellida	Eunicida	Oenonidae	*Drilonereis*	sp		2			
	Spionida		Spionidae	*Prionospio*	*heterobranchia*	12	8	4	4	16
	Spionida		Spionidae	*Pseudopolydora*	*paucibranchiata*	4		12	14	42
	Terebellida		Terebellidae			2				2
	Terebellida		Terebellidae	*Eupolymnia*	*heterobranchia*	2	2	4	4	
	Terebellida		Terebellidae	*Nicolea*	sp A	2	2			
	Terebellida		Terebellidae	*Pista*	*percyi*	24	50	38	16	56
Scolecida	Capitellida		Capitellidae						2	
	Capitellida		Capitellidae	*Mediomastus*	sp	12	8	8	8	30
	Capitellida		Capitellidae	*Scyphoproctus*	*oculatus*	10	4	6	8	12
	Cossurida		Cossuridae	*Cossura*	sp				2	
	Opheliida		Opheliidae	*Armandia*	*brevis*			2		
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	16	26	8	6	18
Arthropoda										
Malacostraca										
Eumalacostraca	Amphipoda		Aoridae	*Acuminodeutopus*	*stenopropodus*	4		2		6
	Amphipoda		Dexaminidae	*Paradexamine*	sp A	2	2			2
	Amphipoda	Gammaridea	Ampithoidae	*Ampithoe*	*plumulosa*	6		2		4
	Amphipoda	Gammaridea	Aoridae	*Aoroides*	sp					2
	Amphipoda	Gammaridea	Aoridae	*Bemlos*	*macromanus*	2	10	2		8

Table K-6. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Amphipoda	Gammaridea	Aoridae	*Grandidierella*	*japonica*	6		2	6	12
	Amphipoda	Gammaridea	Hyalidae	*Hyale*	sp		2			
	Amphipoda	Gammaridea	Isaeidae	*Amphideutopus*	*oculatus*	6	16		2	10
	Amphipoda	Gammaridea	Liljeborgiidae	*Liljeborgia*	*geminata*					2
	Amphipoda	Gammaridea	Melitidae	*Elasmopus*	sp		2			
	Amphipoda	Gammaridea	Phoxocephalidae	*Heterophoxus*	*cf ellisi*	4	6		2	
	Amphipoda	Gammaridea	Podoceridae	*Podocerus*	*fulanus*	20	6	10	4	2
	Decapoda	Pleocyemata	Alpheidae	*Alpheus*	*californiensis*	2	2			
	Decapoda	Pleocyemata	Axiidae	*Calocarides*	sp		2			
	Decapoda	Pleocyemata	Hippolytidae	*Hippolyte*	*californiensis*	2	6			6
	Decapoda	Pleocyemata	Majidae	*Pyromaia*	*tuberculata*	6	14	6	6	18
	Decapoda	Pleocyemata	Majidae	*Scyra*	*acutifrons*			2		
	Decapoda	Pleocyemata	Xanthidae	*Lophopanopeus*	sp		4	4	2	2
	Isopoda	Anthuridea	Paranthuridae	*Paranthura*	*elegans*	2	2		4	2
	Isopoda	Flabellifera	Serolidae	*Heteroserolis*	*carinata*	2				
	Isopoda	Flabellifera	Sphaeromatidae	*Paracerceis*	*cordata*	4	10	4	2	2
	Mysidacea		Mysidae	*Heteromysis*	*odontops*	2				2
	Tanaidacea	Tanaidomorpha	Leptocheliidae	*Leptochelia*	*dubia*	4				2
	Tanaidacea	Tanaidomorpha	Tanaidae	*Synaptotanais*	*notabilis*	4	4	6	8	6
Ostracoda										
Myodocopa	Myodocopina		Philomedidae	*Euphilomedes*	*carcharodonta*	2	4		2	
Chordata										
Actinopterygii										
Neopterygii	Perciformes	Gobioidei	Gobiidae			2		2		2
Ascidiacea							2			
	Aplousobranchia					1		1	1	
	Phlebobranchia		Ascidiidae	*Ascidian*	sp A				2	4
Cnidaria										
Anthozoa										
Hexacorallia	Actiniaria		Edwardsiidae	*Scolanthus*	sp B	8	6	8		10
Zoantharia	Actiniaria	Athenaria	Edwardsiidae	*Edwardsia*	*californica*					2
	Actiniaria	Thenaria	Diadumenidae				4			2
Echinodermata										
Ophiuroidea						2				
Ectoprocta										
Gymnolaemata	Ctenostomata	Carnosa	Vesiculariidae	*Zoobotryon*	*pellucida*					1
Mollusca										
Bivalvia	Pholadomyoida		Lyonsiidae	*Lyonsia*	*californica*		4			
Heterodonta	Veneroida		Semelidae	*Theora*	*lubrica*	18	18	10	2	2
Heterodonta	Veneroida		Veneridae	*Chione*	*californiensis*				2	
Pteriomorphia	Mytiloida		Mytilidae	*Musculista*	*senhousei*	36	64	60	28	72
Pteriomorphia	Mytiloida		Mytilidae	*Mytilus*	*galloprovincialis*			4		
Pteriomorphia	Ostreoida		Ostreidae	*Ostrea*	*conchaphila*	4		4		8

Table K-6. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Gastropoda	Neotaenioglossa		Calyptraeidae	*Crepidula*	sp	2	2	2	2	4
Opisthobranchia	Cephalaspidea		Cylichnidae	*Acteocina*	*inculta*	14	14	2		
Opisthobranchia	Cephalaspidea		Haminoeidae	*Haminoea*	*vesicula*	2		2		
Prosobranchia	Neogastropoda		Nassariidae	*Nassarius*	*tegula*					4
Nematoda						8		10	12	10
Nemertea										
Anopla	Paleonemertea		Tubulanidae	*Tubulanus*	*frenatus*	2	2			
Enopla	Hoplonemertea	Monostilifera	Emplectonematidae	*Paranemertes*	*californica*			2		2

[a] Provisional species. Identified in parentheses is the taxonomist or organization who believes this species may be a new one because it does not fit known species descriptions for the area.

Table K-7. Species abundance data for Station NA09

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Annelida										
Oligochaeta						2			4	6
Polychaeta	Spionida		Cirratulidae	*Monticellina*	*siblina*			2		
	Spionida		Cirratulidae	*Protocirrineris*	sp A	46	40	52	152	86
Palpata	Flabelligerida	Terebellida	Flabelligeridae	*Diplocirrus*	sp SD1					2
	Flabelligerida	Terebellida	Flabelligeridae	*Pherusa*	*capulata*	4			2	4
	Phyllodocida		Nereididae	*Neanthes*	*acuminata*	4	6	6	6	6
	Phyllodocida		Phyllodocidae	*Eteone*	sp 11 (Harris)[a]			4		
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*	8	8	8	24	28
	Phyllodocida		Syllidae	*Exogone*	*lourei*	108	104	298	320	362
	Phyllodocida		Syllidae	*Syllis (Typosyllis)*	*nipponica*	2				4
	Sabellida	Eunicida	Dorvilleidae	*Dorvillea (Schistomeringos)*	*longicornis*	4	10	6	4	16
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	272	92	152	226	248
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*erecta*	8		12	20	22
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*limicola*		2	2		
	Sabellida	Eunicida	Oenonidae	*Drilonereis*	sp	2				4
	Spionida		Spionidae	*Prionospio*	*heterobranchia*	2	12	12	18	20
	Spionida		Spionidae	*Pseudopolydora*	*paucibranchiata*	34	12	26	60	34
	Spionida	Terebellida	Cirratulidae			2	6	4	18	12
	Spionida	Terebellida	Cirratulidae	*Cirriformia*	sp SD 2				4	
	Terebellida		Ampharetidae	*Melinna*	*oculata*				2	
	Terebellida		Terebellidae	*Eupolymnia*	*heterobranchia*	4			4	12
	Terebellida		Terebellidae	*Nicolea*	sp A				2	
	Terebellida		Terebellidae	*Pista*	*percyi*	18	6	12	4	24
Scolecida	Capitellida		Capitellidae	*Capitella*	*capitata complex*			2		
	Capitellida		Capitellidae	*Mediomastus*	sp	12	10	14	14	4
	Capitellida		Capitellidae	*Notomastus*	*hemipodus*	2				
	Capitellida		Capitellidae	*Scyphoproctus*	*oculatus*	2	8	8		2
	Opheliida		Opheliidae	*Armandia*	*brevis*	4	4	12	24	10
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	32	24	18	14	20
	Orbiniidae		Paraonidae	*Acmira*	*catherinae*		8			
Arthropoda										
Copepoda	Harpacticoida								2	2
Malacostraca										
Eumalacostraca	Amphipoda		Aoridae	*Acuminodeutopus*	*stenopropodus*		4	4		8
	Amphipoda		Dexaminidae	*Paradexamine*	sp A	4		2		
	Amphipoda	Caprellidea	Caprellidae	*Caprella*	*natalenis*					4
	Amphipoda	Caprellidea	Protellidae	*Mayerella*	*banksia*		6	4	6	
	Amphipoda	Gammaridea	Ampithoidae	*Ampithoe*	*plumulosa*		2			
	Amphipoda	Gammaridea	Aoridae	*Bemlos*	*macromanus*	4			6	14
	Amphipoda	Gammaridea	Aoridae	*Grandidierella*	*japonica*				10	12
	Amphipoda	Gammaridea	Isaeidae	*Amphideutopus*	*oculatus*		2	6	2	2
	Amphipoda	Gammaridea	Phoxocephalidae	*Heterophoxus*	*cf ellisi*	4				

Table K-7. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Amphipoda	Gammaridea	Podoceridae	*Podocerus*	*fulanus*	10	6	10	6	40
	Decapoda	Pleocyemata	Hippolytidae	*Hippolyte*	*californiensis*	10	2	6	10	12
	Decapoda	Pleocyemata	Majidae					6		2
	Decapoda	Pleocyemata	Majidae	*Pyromaia*	*tuberculata*			2	2	
	Decapoda	Pleocyemata	Processidae	*Ambidexter*	*panamensis*	2	6		2	2
	Decapoda	Pleocyemata	Xanthidae	*Lophopanopeus*	sp	6		4	4	2
	Isopoda	Flabellifera	Sphaeromatidae	*Paracerceis*	*cordata*	10		16	32	20
	Mysidacea		Mysidae			2				
	Mysidacea		Mysidae	*Heteromysis*	*odontops*			2		2
	Tanaidacea	Tanaidomorpha	Leptocheliidae	*Leptochelia*	*dubia*		2			
	Tanaidacea	Tanaidomorpha	Tanaidae	*Synaptotanais*	*notabilis*		2	4	6	
Ostracoda										
Myodocopa	Myodocopina		Philomedidae	*Euphilomedes*	*carcharodonta*				2	
Chordata										
Actinopterygii										
Neopterygii	Perciformes	Gobioidei	Gobiidae			2		2	2	
Ascidiacea	Phlebobranchia		Ascidiidae	*Ascidian*	sp A					2
	Stolidobranchiata		Styelidae	*Styela*	sp	2			2	2
Cnidaria										
Anthozoa										
Ceriantipatharia	Ceriantharia					2				
Hexacorallia	Actiniaria		Edwardsiidae	*Scolanthus*	sp B	12	6	4		8
Zoantharia	Actiniaria	Athenaria	Edwardsiidae	*Edwardsia*	*californica*	10				2
Echinodermata										
Ophiuroidea	Ophiurida	Gnathophiurina	Amphiuridae	*Amphipholis*	sp				2	
	Ophiurida	Gnathophiurina	Amphiuridae	*Amphipholis*	*squamata*	2				
Ectoprocta										
Gymnolaemata	Cheilostomata	Ascophora	Celleporidae	*Celleporina*	sp	1	1			
	Cheilostomata	Ascophora	Schizoporellidae	*Watersipora*	*cucullata*			1		
Mollusca										
Bivalvia	Pholadomyoida		Lyonsiidae	*Lyonsia*	*californica*	2	2			
Heterodonta	Veneroida		Cardiidae	*Laevicardium*	*substriatum*	2	2			2
	Veneroida		Semelidae	*Theora*	*lubrica*	16				4
	Veneroida		Tellinidae	*Macoma*	sp	20	6	2	2	2
Pteriomorphia	Mytiloida		Mytilidae	*Musculista*	*senhousei*	38	28	10	54	32
	Ostreoida		Ostreidae	*Ostrea*	*conchaphila*					2
Gastropoda	Neotaenioglossa		Calyptraeidae	*Crepidula*	sp	2				2
Opisthobranchia	Cephalaspidea		Bullidae	*Bulla*	*gouldiana*	4		6	6	2
	Cephalaspidea		Cylichnidae	*Acteocina*	*inculta*		8	14	4	12
	Cephalaspidea		Haminoeidae	*Haminoea*	*vesicula*		10	2	4	8
Prosobranchia	Neogastropoda		Columbellidae	*Alia*	*carinata*					2
	Neogastropoda		Nassariidae	*Nassarius*	*tegula*		8		18	2
Nematoda						12	8	22	32	30

Table K-7. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Nemertea										
Anopla	Heteronemertea		Lineidae							2
	Paleonemertea		Tubulanidae	*Tubulanus*	*frenatus*		2			
	Paleonemertea		Tubulanidae	*Tubulanus*	*polymorphus/pellucidus*	2		2		2
Enopla	Hoplonemertea	Monostilifera	Amphiporidae	*Amphiporus*	sp		2			
	Hoplonemertea	Monostilifera	Emplectonematidae	*Paranemertes*	*californica*	6	2	2		
Phorona	Phoronida						2			
Sipuncula								2		

[a] Provisional species. Identified in parentheses is the taxonomist or organization who believes this species may be a new one because it does not fit known species descriptions for the area.

Table K-8. Species abundance data for Station NA11

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Annelida										
Oligochaeta							8	2	24	10
Polychaeta	Spionida		Cirratulidae	*Protocirrineris*	sp A				2	
Palpata	Flabelligerida	Terebellida	Flabelligeridae	*Diplocirrus*	sp SD1	4		6		
	Flabelligerida	Terebellida	Flabelligeridae	*Pherusa*	*capulata*				2	
	Phyllodocida		Aphroditidae	*Aphrodita*	sp					2
	Phyllodocida		Glyceridae	*Glycera*	*americana*		2			
	Phyllodocida		Nephtyidae	*Nephtys*	*caecoides*	2				2
	Phyllodocida		Nereididae	*Neanthes*	*acuminata*				2	6
	Phyllodocida		Pholoidae	*Pholoe*	sp				2	
	Phyllodocida		Polynoidae				2		2	
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*	2	4	2	14	4
	Phyllodocida		Syllidae	*Exogone*	*lourei*	120	168	24	160	154
	Phyllodocida		Syllidae	*Syllis (Typosyllis)*	*nipponica*			2	2	
	Sabellida		Sabellidae	*Euchone*	*limnicola*	4	4	2	8	4
	Sabellida	Eunicida	Dorvilleidae	*Dorvillea (Schistomeringos)*	*longicornis*	4	2		4	10
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	94	90	36	126	184
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*erecta*					4
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*tetraura*	2		2		6
	Sabellida	Eunicida	Oenonidae	*Drilonereis*	sp					2
	Spionida		Spionidae	*Microspio*	*pigmentata*		2			
	Spionida		Spionidae	*Prionospio*	*heterobranchia*	6	4		4	2
	Spionida		Spionidae	*Pseudopolydora*	*paucibranchiata*	58	26	24	14	42
	Spionida	Terebellida	Cirratulidae				12	2	12	16
	Terebellida		Terebellidae						2	
	Terebellida		Terebellidae	*Pista*	*percyi*	8	18	16	12	10
	Terebellida		Terebellidae	*Pista*	sp C	4				
Scolecida	Capitellida		Capitellidae	*Mediomastus*	sp	34	22	6	20	14
	Capitellida		Capitellidae	*Scyphoproctus*	*oculatus*	22	18	6	38	52
	Opheliida		Opheliidae	*Armandia*	*brevis*		2			2
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	12	4	14	8	4
Arthropoda										
Malacostraca	Tanaidae		Anarthruridae	*Chauliopleona*	*dentata*				2	
Eumalacostraca	Amphipoda		Aoridae	*Acuminodeutopus*	*stenopropodus*		2	2	2	2
	Amphipoda	Gammaridea	Ampeliscidae	*Ampelisca*	*pugetica*				2	
	Amphipoda	Gammaridea	Aoridae	*Bemlos*	*macromanus*				2	2
	Amphipoda	Gammaridea	Aoridae	*Grandidierella*	*japonica*		2		14	10
	Amphipoda	Gammaridea	Isaeidae	*Amphideutopus*	*oculatus*	4	6	4	8	12
	Amphipoda	Gammaridea	Liljeborgiidae	*Liljeborgia*	*geminata*				4	
	Amphipoda	Gammaridea	Lysianassidae	*Aruga*	*holmesi*	4				
	Amphipoda	Gammaridea	Oedicerotidae	*Hartmanodes*	*hartmanae*				2	
	Amphipoda	Gammaridea	Oedicerotidae	*Synchelidium*	*rectipalmum*				2	2
	Amphipoda	Gammaridea	Phoxocephalidae	*Heterophoxus*	*cf ellisi*	2		6	6	2

Table K-8. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Amphipoda	Gammaridea	Podoceridae	*Podocerus*	*fulanus*		4		6	4
	Decapoda	Pleocyemata	Alpheidae	*Alpheus*	*californiensis*			2		
	Decapoda	Pleocyemata	Axiidae	*Calocarides*	sp			2	2	
	Decapoda	Pleocyemata	Majidae				2	2		2
	Decapoda	Pleocyemata	Majidae	*Pyromaia*	*tuberculata*		4	2		2
	Decapoda	Pleocyemata	Xanthidae	*Lophopanopeus*	*frontalis*		2		2	
	Isopoda	Flabellifera	Serolidae	*Heteroserolis*	*carinata*			2		
	Mysidacea		Mysidae	*Heteromysis*	*odontops*			2	2	
	Tanaidacea	Tanaidomorpha	Leptocheliidae	*Leptochelia*	*dubia*		2			
	Tanaidacea	Tanaidomorpha	Tanaidae	*Synaptotanais*	*notabilis*	4	6		6	10
Phyllocarida	Leptostraca		Nebaliidae	*Nebalia*	*pugettensis*				2	
Ostracoda										
Myodocopa	Myodocopina		Cylindroleberididae	*Postasterope*	*barnesi*					2
	Myodocopina		Philomedidae	*Euphilomedes*	*carcharodonta*	4	2	4	2	2
Cnidaria										
Anthozoa										
Hexacorallia	Actiniaria		Edwardsiidae	*Scolanthus*	sp B	6	8	6	6	18
Ectoprocta										1
Mollusca										
Bivalvia	Pholadomyoida		Lyonsiidae	*Lyonsia*	*californica*	2				
Heterodonta	Veneroida		Cardiidae	*Laevicardium*	*substriatum*					2
	Veneroida		Semelidae	*Theora*	*lubrica*	8		6		
	Veneroida		Tellinidae	*Macoma*	sp				2	
Pteriomorphia	Mytiloida		Mytilidae	*Musculista*	*senhousei*	74	206	12	240	304
Gastropoda	Neotaenioglossa		Calyptraeidae	*Crepidula*	sp	2			8	
Opisthobranchia	Cephalaspidea		Cylichnidae	*Acteocina*	*inculta*				2	
	Cephalaspidea		Haminoeidae	*Haminoea*	*vesicula*			2	2	
Nemertea										
Anopla	Heteronemertea		Lineidae						2	
	Paleonemertea		Tubulanidae	*Tubulanus*	*frenatus*	2				
Enopla	Hoplonemertea	Monostilifera	Emplectonematidae	*Paranemertes*	*californica*		2		2	
	Hoplonemertea	Monostilifera	Tetrastemmidae	*Tetrastemma*	sp				2	
Phorona	Phoronida					2				

Table K-9. Species abundance data for Station NA12

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Annelida										
Polychaeta										
Palpata	Flabelligerida	Terebellida	Flabelligeridae	*Diplocirrus*	sp SD1	8	8	10	28	10
	Flabelligerida	Terebellida	Flabelligeridae	*Pherusa*	*capulata*					2
	Flabelligerida	Terebellida	Flabelligeridae	*Pherusa*	sp				2	
	Phyllodocida		Glyceridae	*Glycera*	*americana*	6		4	4	
	Phyllodocida		Nephtyidae	*Nephtys*	*ferruginea*			2		
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*	4	4	4		2
	Phyllodocida		Syllidae	*Exogone*	*lourei*	32	88	72	34	24
	Phyllodocida		Syllidae	*Odontosyllis*	*phosphorea*		2			
	Phyllodocida		Syllidae	*Syllis (Typosyllis)*	sp			2		
	Phyllodocida	Eunicida	Onuphidae	*Diopatra*	sp	2				
	Sabellida		Sabellidae	*Euchone*	*limnicola*	26	22	6	12	10
	Sabellida	Eunicida	Dorvilleidae	*Dorvillea (Schistomeringos)*	*longicornis*		2		2	
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	66	120	114	62	92
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*erecta*			2	2	
	Sabellida	Eunicida	Oenonidae	*Drilonereis*	*falcata*			8		2
	Spionida		Spionidae	*Prionospio*	*heterobranchia*	16	6	6		8
	Spionida		Spionidae	*Pseudopolydora*	*paucibranchiata*	20	12	20	8	42
	Spionida		Spionidae	*Spiophanes*	*duplex*	2			2	
	Spionida	Terebellida	Cirratulidae			2	2		10	
	Terebellida		Ampharetidae	*Melinna*	*oculata*	2				
	Terebellida		Terebellidae	*Pista*	*percyi*	60	98	156	76	196
Scolecida	Capitellida		Capitellidae	*Mediomastus*	sp	26	20	16	14	
	Capitellida		Capitellidae	*Scyphoproctus*	*oculatus*	4	24	20	4	16
	Cossurida		Cossuridae	*Cossura*	sp	2				2
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	12	12	26	20	24
Arthropoda										
Malacostraca										
Eumalacostraca	Amphipoda		Aoridae	*Acuminodeutopus*	*stenopropodus*			6	4	2
	Amphipoda	Gammaridea	Aoridae	*Bemlos*	*macromanus*	2		2	2	
	Amphipoda	Gammaridea	Aoridae	*Grandidierella*	*japonica*	2	2	4		
	Amphipoda	Gammaridea	Isaeidae	*Amphideutopus*	*oculatus*	10	18	10	12	22
	Amphipoda	Gammaridea	Leucothoidae	*Leucothoe*	*alata*					2
	Amphipoda	Gammaridea	Lysianassidae	*Aruga*	*holmesi*		2			2
	Amphipoda	Gammaridea	Oedicerotidae	*Hartmanodes*	*hartmanae*		4			
	Amphipoda	Gammaridea	Oedicerotidae	*Synchelidium*	*rectipalmum*		2			
	Amphipoda	Gammaridea	Phoxocephalidae	*Heterophoxus*	*cf ellisi*	2	14	6		2
	Decapoda	Pleocyemata	Alpheidae	*Alpheus*	*californiensis*		2	2		2
	Decapoda	Pleocyemata	Axiidae	*Calocarides*	sp			2		
	Decapoda	Pleocyemata	Hippolytidae	*Hippolyte*	*californiensis*					2
	Decapoda	Pleocyemata	Majidae					4		4
	Decapoda	Pleocyemata	Majidae	*Pyromaia*	*tuberculata*	8	8	12	8	10

Table K-9. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Decapoda	Pleocyemata	Pinnotheridae					2		
	Isopoda	Flabellifera	Serolidae	*Heteroserolis*	*carinata*	10	8	6	2	8
	Isopoda	Flabellifera	Sphaeromatidae	*Paracerceis*	*cordata*			2	2	
	Mysidacea		Mysidae	*Heteromysis*	*odontops*		6	6		
	Stomatopod	Gammaridea	Squillidae	*Schmittius*	*politus*	2				
	Tanaidacea	Apseudomorpha	Tanaidae	*Kalliapseudes*	*crassus*	6	4	2		2
Ostracoda										
Myodocopa	Myodocopina		Cylindroleberididae	*Asteropella*	*slatteryi*		2			
	Myodocopina		Philomedidae	*Euphilomedes*	*carcharodonta*	4	4	4	6	8
Chordata										
Actinopterygii										
Neopterygii	Batrachoidiformes		Batrachoididae	*Porichthys*	*myriaster*			2		
	Perciformes	Gobioidei	Gobiidae						2	
Ascidiacea	Aplousobranchia		Agnesiidae	*Agnesia*	*septentrionalis*	2				
	Aplousobranchia		Cionidae	*Ciona*	*intestinalis*				2	
	Stolidobranchiata		Styelidae	*Styela*	*coriacea*			2		
Cnidaria										
Anthozoa										
Hexacorallia	Actiniaria		Edwardsiidae	*Scolanthus*	sp B	2	10	8	4	14
Zoantharia	Actiniaria	Athenaria	Edwardsiidae	*Edwardsia*	*californica*			2		
Ectoprocta							1	1		1
Gymnolaemata	Cheilostomata	Ascophora	Celleporidae	*Celleporina*	sp	1		1	1	
	Cheilostomata	Ascophora	Schizoporellidae	*Watersipora*	*cucullata*	1				1
Stenolaemata	Cyclostomata	Articulata	Crisiidae	*Crisia*	sp	1			1	
Mollusca										
Bivalvia	Pholadomyoida		Lyonsiidae	*Lyonsia*	*californica*	8	2	2		
	Pholadomyoida		Thraciidae	*Thracia*	*curta*		2		2	2
Heterodonta	Veneroida		Semelidae	*Theora*	*lubrica*	16	48	42	58	46
	Veneroida		Solecurtidae	*Tagelus*	sp		2	2		
	Veneroida		Tellinidae	*Macoma*	sp	4		2	8	2
	Veneroida		Veneridae	*Protothaca*	sp	2				
Pteriomorphia	Mytiloida		Mytilidae	*Musculista*	*senhousei*	22	36	36	18	48
	Ostreoida		Ostreidae	*Ostrea*	*conchaphila*	2		2		
Gastropoda	Neotaenioglossa		Calyptraeidae	*Crepidula*	sp	2	14	6		
	Neotaenioglossa		Calyptraeidae	*Crucibulum*	*spinosum*		2			
Opisthobranchia	Cephalaspidea		Bullidae	*Bulla*	*gouldiana*				2	
Nemertea										
Enopla	Hoplonemertea	Monostilifera	Emplectonematidae	*Paranemertes*	*californica*	2	2		2	2
Phorona	Phoronida									2

Table K-10. Species abundance data for Station NA15

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Annelida										
Polychaeta	Spionida		Cirratulidae	*Protocirrineris*	sp A					2
Palpata	Flabelligerida	Terebellida	Flabelligeridae	*Diplocirrus*	sp SD1		2	6		4
	Flabelligerida	Terebellida	Flabelligeridae	*Pherusa*	*capulata*	2		2	2	
	Phyllodocida		Aphroditidae	*Aphrodita*	sp				2	
	Phyllodocida		Glyceridae	*Glycera*	*americana*			2		
	Phyllodocida		Nephtyidae	*Nephtys*	*caecoides*					2
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*		2	16	4	2
	Phyllodocida		Syllidae	*Exogone*	*lourei*	2	36	32	30	82
	Phyllodocida		Syllidae	*Syllis (Typosyllis)*	*nipponica*		4			6
	Sabellida		Sabellidae	*Euchone*	*limnicola*				2	
	Sabellida	Eunicida	Dorvilleidae	*Dorvillea (Schistomeringos)*	*longicornis*				2	
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	38	82	164	126	68
	Spionida		Poecilochaetidae	*Poecilochaetus*	sp		2			
	Spionida		Spionidae	*Prionospio*	*heterobranchia*			4	8	
	Spionida		Spionidae	*Pseudopolydora*	*paucibranchiata*	4	14	18	12	46
	Spionida	Terebellida	Cirratulidae	*Cirriformia*	sp					2
	Terebellida		Terebellidae	*Eupolymnia*	*heterobranchia*			6		
	Terebellida		Terebellidae	*Pista*	*percyi*	4	10	18	4	10
Scolecida	Capitellida		Capitellidae	*Mediomastus*	sp		2	12	8	4
	Capitellida		Capitellidae	*Scyphoproctus*	*oculatus*		14	12		8
	Cossurida		Cossuridae	*Cossura*	sp	2				
	Opheliida		Opheliidae	*Armandia*	*brevis*				2	2
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	56	50	38	44	36
Arthropoda										
Malacostraca										
Eumalacostraca	Amphipoda		Aoridae	*Acuminodeutopus*	*stenopropodus*			2	4	2
	Amphipoda	Caprellidea	Protellidae	*Mayerella*	*banksia*			2		
	Amphipoda	Gammaridea	Aoridae	*Bemlos*	*macromanus*			12		2
	Amphipoda	Gammaridea	Aoridae	*Grandidierella*	*japonica*		2		2	2
	Amphipoda	Gammaridea	Isaeidae	*Amphideutopus*	*oculatus*				14	4
	Amphipoda	Gammaridea	Phoxocephalidae	*Heterophoxus*	*cf ellisi*		2	2	2	
	Amphipoda	Gammaridea	Podoceridae	*Podocerus*	*fulanus*	4	2	8		
	Decapoda	Pleocyemata	Alpheidae	*Alpheus*	*californiensis*		4	2		
	Decapoda	Pleocyemata	Axiidae	*Calocarides*	sp			4		
	Decapoda	Pleocyemata	Hippolytidae	*Hippolyte*	*californiensis*			12		
	Decapoda	Pleocyemata	Majidae					2		
	Decapoda	Pleocyemata	Majidae	*Pyromaia*	*tuberculata*	2		4	2	2
	Decapoda	Pleocyemata	Processidae	*Ambidexter*	*panamensis*				4	
	Isopoda	Flabellifera	Serolidae	*Heteroserolis*	*carinata*				2	
	Isopoda	Flabellifera	Sphaeromatidae	*Paracerceis*	*cordata*	2		22	2	2
	Mysidacea		Mysidae	*Heteromysis*	*odontops*				2	
	Stomatopod	Gammaridea	Squillidae	*Schmittius*	*politus*					2

Table K-10. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Tanaidacea	Tanaidomorpha	Tanaidae	*Synaptotanais*	*notabilis*		2	10	4	2
Ostracoda										
Myodocopa	Myodocopina		Philomedidae	*Euphilomedes*	*carcharodonta*					2
Chordata										
Actinopterygii										
Neopterygii	Perciformes	Gobioidei	Gobiidae					4	2	6
Cnidaria										
Anthozoa										
Hexacorallia	Actiniaria		Edwardsiidae	*Scolanthus*	sp B	4	6	18	4	6
Zoantharia	Actinaria							2		
	Actiniaria	Athenaria	Edwardsiidae	*Edwardsia*	*californica*		4			
Echinodermata										
Holothuroidea										
Apodacea	Apodida		Synaptidae	*Leptosynapta*	sp					2
Mollusca										
Bivalvia										
Heterodonta	Veneroida		Semelidae	*Theora*	*lubrica*	4	2	4		4
Pteriomorphia	Mytiloida		Mytilidae	*Musculista*	*senhousei*	2	18	18	10	8
	Mytiloida		Mytilidae	*Mytilus*	*galloprovincialis*			2		
Gastropoda										
Opisthobranchia	Cephalaspidea		Cylichnidae	*Acteocina*	*inculta*	6	12	10	6	4
	Cephalaspidea		Haminoeidae	*Haminoea*	*vesicula*		8	6		4
Prosobranchia	Neogastropoda		Nassariidae	*Nassarius*	*tegula*	2	6			4
	Neogastropoda		Pseudomelatomidae	*Pseudomelatoma*	*pencillata*			2		
Nemertea										
Enopla	Hoplonemertea	Monostilifera	Emplectonematidae	*Paranemertes*	*californica*		2		4	

Table K-11. Species abundance data for Station NA16

Phylum/Class/						Field replicates				
Subclass	Order	Suborder	Family	Genus	Species	1	2	3	4	5
Annelida										
Polychaeta										
Palpata	Flabelligerida	Terebellida	Flabelligeridae	*Diplocirrus*	sp SD1	6	2		4	4
	Flabelligerida	Terebellida	Flabelligeridae	*Pherusa*	*capulata*	4				2
	Phyllodocida		Glyceridae	*Glycera*	*americana*		2			
	Phyllodocida		Polynoidae			2			2	2
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*	16	2	2	4	4
	Phyllodocida		Syllidae	*Exogone*	*lourei*	244	30	58	60	160
	Phyllodocida		Syllidae	*Odontosyllis*	*phosphorea*			2		
	Phyllodocida		Syllidae	*Syllis (Typosyllis)*	*nipponica*	2				
	Sabellida		Sabellidae	*Euchone*	*limnicola*	2	2			2
	Sabellida	Eunicida	Dorvilleidae	*Dorvillea (Schistomeringos)*	*longicornis*	4				2
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	228	84	72	94	188
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*erecta*	4			4	
	Spionida		Spionidae	*Prionospio*	*heterobranchia*	28	4	2	4	8
	Spionida		Spionidae	*Pseudopolydora*	*paucibranchiata*	64	24	88	34	20
	Spionida	Terebellida	Cirratulidae				2			
	Terebellida		Terebellidae	*Amaeana*	*occidentalis*	2				
	Terebellida		Terebellidae	*Eupolymnia*	*heterobranchia*	4				
	Terebellida		Terebellidae	*Pista*	*percyi*	4	16	18	8	8
Scolecida	Capitellida		Capitellidae	*Mediomastus*	sp	26		2	12	8
	Capitellida		Capitellidae	*Scyphoproctus*	*oculatus*	52	8	14	2	18
	Opheliida		Opheliidae	*Armandia*	*brevis*	2	2	2	4	
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	50	24	18	22	56
Arthropoda										
Malacostraca										
Eumalacostraca	Amphipoda		Aoridae	*Acuminodeutopus*	*stenopropodus*	10	2	8		2
	Amphipoda		Dexaminidae	*Paradexamine*	sp A	4				
	Amphipoda	Caprellidea	Caprellidae	*Caprella*	*natalenis*	2		2	2	
	Amphipoda	Caprellidea	Protellidae	*Mayerella*	*banksia*					6
	Amphipoda	Gammaridea	Aoridae	*Bemlos*	*macromanus*	2				
	Amphipoda	Gammaridea	Aoridae	*Grandidierella*	*japonica*	8	4	2	4	4
	Amphipoda	Gammaridea	Isaeidae	*Amphideutopus*	*oculatus*	6	4	12	4	6
	Amphipoda	Gammaridea	Lysianassidae	*Aruga*	*holmesi*			2		
	Amphipoda	Gammaridea	Phoxocephalidae	*Heterophoxus*	*cf ellisi*	4	4		10	16
	Amphipoda	Gammaridea	Podoceridae	*Podocerus*	*fulanus*	14	8	2	4	6
	Decapoda	Pleocyemata	Alpheidae	*Alpheus*	*californiensis*				2	
	Decapoda	Pleocyemata	Hippolytidae	*Hippolyte*	*californiensis*	14				
	Decapoda	Pleocyemata	Majidae	*Pyromaia*	*tuberculata*	2	6	4	2	
	Decapoda	Pleocyemata	Xanthidae	*Lophopanopeus*	sp	4				
	Isopoda	Flabellifera	Serolidae	*Heteroserolis*	*carinata*		2	2		4
	Isopoda	Flabellifera	Sphaeromatidae	*Paracerceis*	*cordata*	10				
	Mysidacea		Mysidae	*Heteromysis*	*odontops*		2			

Table K-11. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Mysidacea		Mysidae	*Siriella*	*pacifica*	2				
	Tanaidacea	Tanaidomorpha	Tanaidae	*Synaptotanais*	*notabilis*	22		12	14	10
Ostracoda										
Myodocopa	Myodocopina		Philomedidae	*Euphilomedes*	*carcharodonta*			2	2	
Chordata										
Actinopterygii										
Neopterygii	Perciformes	Gobioidei	Gobiidae			2	4	2	2	
Ascidiacea	Aplousobranchia		Agnesiidae	*Agnesia*	*septentrionalis*	2				
Cnidaria										
Anthozoa										
Hexacorallia	Actiniaria		Edwardsiidae	*Scolanthus*	sp B	4	16	10	8	12
Zoantharia	Actinaria					2				
	Actiniaria	Athenaria	Edwardsiidae	*Edwardsia*	*californica*		2	2		2
Echinodermata										
Holothuroidea										
Apodacea	Apodida		Synaptidae	*Leptosynapta*	sp		2	2		
Mollusca										
Bivalvia							2			
Heterodonta	Veneroida		Cardiidae	*Laevicardium*	*substriatum*			2		
	Veneroida		Semelidae	*Theora*	*lubrica*	2	2	10	4	4
	Veneroida		Tellinidae	*Macoma*	sp				2	
Pteriomorphia	Mytiloida		Mytilidae	*Musculista*	*senhousei*	52	26	22	26	28
	Mytiloida		Mytilidae	*Mytilus*	*galloprovincialis*				2	
Gastropoda	Neotaenioglossa		Calyptraeidae	*Crepidula*	sp			4		4
Opisthobranchia	Cephalaspidea		Bullidae	*Bulla*	*gouldiana*		2	2		
	Cephalaspidea		Cylichnidae	*Acteocina*	*inculta*	2	6	8	4	4
	Cephalaspidea		Haminoeidae	*Haminoea*	*vesicula*		4	20	2	6
Prosobranchia	Neogastropoda		Nassariidae	*Nassarius*	*tegula*	18	4	6		2
Nematoda						2				
Nemertea										
Anopla	Paleonemertea		Tubulanidae	*Tubulanus*	*polymorphus/pellucidus*					2
Enopla	Hoplonemertea	Monostilifera	Tetrastemmidae	*Tetrastemma*	sp			2		

Table K-12. Species abundance data for Station NA17

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Annelida										
Polychaeta										
Palpata	Flabelligerida	Terebellida	Flabelligeridae	*Diplocirrus*	sp SD1			2		
	Flabelligerida	Terebellida	Flabelligeridae	*Pherusa*	*capulata*					2
	Phyllodocida		Glyceridae	*Glycera*	*americana*		4			
	Phyllodocida		Nephtyidae	*Nephtys*	*cornuta*		2			
	Phyllodocida		Nereididae	*Neanthes*	*acuminata*	18	2		4	8
	Phyllodocida		Phyllodocidae	*Eumida*	*longicornuta*			2		
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*	30	18	14	20	14
	Phyllodocida		Syllidae	*Exogone*	*lourei*	88	72	82	94	60
	Phyllodocida		Syllidae	*Syllis (Typosyllis)*	*nipponica*				2	
	Sabellida	Eunicida	Dorvilleidae	*Dorvillea (Schistomeringos)*	*longicornis*	8	4	6	16	16
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	68	38	42	68	60
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*erecta*	16	6	2	8	14
	Spionida		Poecilochaetidae	*Poecilochaetus*	*johnsoni*					2
	Spionida		Spionidae	*Paraprionospio*	*pinnata*					2
	Spionida		Spionidae	*Prionospio*	*heterobranchia*	10	4		6	10
	Spionida		Spionidae	*Pseudopolydora*	*paucibranchiata*	4	2	14	6	
	Spionida	Terebellida	Cirratulidae			2	2			
	Spionida	Terebellida	Cirratulidae	*Aphelochaeta*	*phillipsi*	2				
	Terebellida		Terebellidae	*Eupolymnia*	*heterobranchia*	2			2	
	Terebellida		Terebellidae	*Pista*	*percyi*	30	8	14	46	34
Scolecida	Capitellida		Capitellidae	*Mediomastus*	sp	18	10	18	16	14
	Capitellida		Capitellidae	*Notomastus*	*magnus*	4			6	
	Capitellida		Capitellidae	*Notomastus*	sp			2		
	Opheliida		Opheliidae	*Armandia*	*brevis*	2			2	
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	66	46	58	80	30
Arthropoda										
Malacostraca	Decapoda	Natantia							2	
Eumalacostraca	Amphipoda		Aoridae	*Acuminodeutopus*	*stenopropodus*	6	2	6		8
	Amphipoda		Dexaminidae	*Paradexamine*	sp A	8	2	4		2
	Amphipoda	Caprellidea	Caprellidae	*Caprella*	*natalenis*			2		
	Amphipoda	Caprellidea	Protellidae	*Mayerella*	*banksia*	8	2	6		10
	Amphipoda	Gammaridea	Aoridae	*Bemlos*	*macromanus*	10	10	4	12	6
	Amphipoda	Gammaridea	Aoridae	*Grandidierella*	*japonica*	4		2	2	
	Amphipoda	Gammaridea	Isaeidae	*Amphideutopus*	*oculatus*	2				
	Amphipoda	Gammaridea	Lysianassidae	*Aruga*	*holmesi*				2	
	Amphipoda	Gammaridea	Oedicerotidae	*Synchelidium*	*rectipalmum*					4
	Amphipoda	Gammaridea	Podoceridae	*Podocerus*	*fulanus*	6	2	2	4	
	Decapoda	Pleocyemata	Alpheidae	*Alpheus*	*californiensis*	2	2	4		2
	Decapoda	Pleocyemata	Axiidae	*Calocarides*	sp				2	
	Decapoda	Pleocyemata	Diogenidae	*Isocheles*	*pilosus*					2
	Decapoda	Pleocyemata	Hippolytidae	*Hippolyte*	*californiensis*		6	12	2	4

Table K-12. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Decapoda	Pleocyemata	Majidae				2		6	
	Decapoda	Pleocyemata	Majidae	*Pyromaia*	*tuberculata*	6		2	2	2
	Decapoda	Pleocyemata	Processidae	*Ambidexter*	*panamensis*				4	2
	Decapoda	Pleocyemata	Xanthidae	*Lophopanopeus*	sp		2	2		
	Isopoda	Anthuridea	Paranthuridae	*Paranthura*	*elegans*		2		2	
	Isopoda	Flabellifera	Sphaeromatidae	*Paracerceis*	*cordata*			6		
	Mysidacea		Mysidae	*Heteromysis*	*odontops*					2
	Mysidacea		Mysidae	*Siriella*	*pacifica*		2			
	Tanaidacea	Tanaidomorpha	Tanaidae	*Synaptotanais*	*notabilis*	2				
Chordata										
Actinopterygii										
Neopterygii	Batrachoidiformes		Batrachoididae	*Porichthys*	*myriaster*		2			
	Perciformes	Gobioidei	Gobiidae				4	4		2
Ascidiacea	Phlebobranchia		Ascidiidae	*Ascidian*	sp A				2	
	Stolidobranchiata		Styelidae	*Styela*	sp					2
Cnidaria										
Anthozoa										
Hexacorallia	Actiniaria		Edwardsiidae	*Scolanthus*	sp B	8		8	10	10
Zoantharia	Actiniaria	Athenaria	Edwardsiidae	*Edwardsia*	*californica*	4	2		2	4
Echinodermata										
Holothuroidea										
Apodacea	Apodida		Synaptidae	*Leptosynapta*	sp		2			
Ectoprocta										
Gymnolaemata	Cheilostomata	Ascophora	Celleporidae	*Celleporina*	sp		1	1		1
Stenolaemata	Cyclostomata	Articulata	Crisiidae	*Crisia*	sp					1
Mollusca										
Bivalvia	Pholadomyoida		Lyonsiidae	*Lyonsia*	*californica*			4		
Heterodonta	Veneroida		Cardiidae	*Laevicardium*	*substriatum*					2
	Veneroida		Semelidae	*Theora*	*lubrica*	4				2
Pteriomorphia	Mytiloida		Mytilidae	*Musculista*	*senhousei*	44	62	30	76	28
	Ostreoida		Ostreidae	*Ostrea*	sp	2				
Gastropoda							2			
	Neotaenioglossa		Calyptraeidae	*Crepidula*	sp	2	2			
Opisthobranchia	Cephalaspidea		Bullidae	*Bulla*	*gouldiana*	2				
	Cephalaspidea		Cylichnidae	*Acteocina*	*inculta*			10		6
	Cephalaspidea		Haminoeidae	*Haminoea*	*vesicula*				2	
Prosobranchia	Neogastropoda		Muricidae	*Pteropurpura*	*festiva*	2				
Nematoda							6		14	
Nemertea										
Anopla	Heteronemertea		Lineidae			2				
Enopla	Hoplonemertea	Monostilifera	Emplectonematidae	*Paranemertes*	*californica*	8	2	4		6

Table K-13. Species abundance data for Station NA19

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Annelida										
Polychaeta	Spionida		Cirratulidae	*Protocirrineris*	sp A	26	2		4	10
Palpata	Flabelligerida	Terebellida	Flabelligeridae	*Diplocirrus*	sp SD1	8	2	4		2
	Flabelligerida	Terebellida	Flabelligeridae	*Pherusa*	*capulata*	8	4	8	4	4
	Phyllodocida		Aphroditidae	*Aphrodita*	*brevitentaculata*		2			
	Phyllodocida		Nereididae	*Neanthes*	*acuminata*	8	2	4	2	148
	Phyllodocida		Phyllodocidae	*Eteone*	sp 11 (Harris)[a]			2		
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*	30	16	12	10	10
	Phyllodocida		Syllidae	*Exogone*	*lourei*	128	138	158	14	196
	Phyllodocida		Syllidae	*Odontosyllis*	*phosphorea*					2
	Phyllodocida		Syllidae	*Syllis (Syllis)*	*gracilis*	2				
	Phyllodocida		Syllidae	*Syllis (Typosyllis)*	*nipponica*	4		4		2
	Sabellida		Sabellidae	*Euchone*	*limnicola*	8		2		2
	Sabellida		Serpulidae	*Hydroides*	*pacificus*			2		
	Sabellida		Spirorbidae						2	
	Sabellida	Eunicida	Dorvilleidae	*Dorvillea (Schistomeringos)*	*longicornis*	2	4	8	2	18
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	186	94	96	22	136
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*erecta*	4			2	2
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*limicola*	4	8			6
	Spionida		Spionidae	*Polydora*	sp		2			
	Spionida		Spionidae	*Prionospio*	*heterobranchia*	10	8	6		8
	Spionida		Spionidae	*Pseudopolydora*	*paucibranchiata*	102	124	156	22	150
	Spionida		Spionidae	*Spiophanes*	*duplex*		2			
	Spionida	Terebellida	Cirratulidae			2	2			
	Terebellida		Terebellidae	*Eupolymnia*	*heterobranchia*	4	6	2	2	2
	Terebellida		Terebellidae	*Nicolea*	sp A				2	2
	Terebellida		Terebellidae	*Pista*	*percyi*	16	18	16	2	18
Scolecida	Capitellida		Capitellidae	*Capitella*	*capitata complex*			2		6
	Capitellida		Capitellidae	*Mediomastus*	sp	34	26	26		26
	Capitellida		Capitellidae	*Scyphoproctus*	*oculatus*	146	142	168	30	124
	Cossurida		Cossuridae	*Cossura*	sp	4		2		
	Opheliida		Opheliidae	*Armandia*	*brevis*	4	2	2	4	2
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	2	4			2
Arthropoda										
Malacostraca										
Eumalacostraca	Amphipoda		Aoridae	*Acuminodeutopus*	*stenopropodus*	2	2	2		10
	Amphipoda		Dexaminidae	*Paradexamine*	sp A	2		2	2	2
	Amphipoda	Caprellidea	Caprellidae	*Caprella*	*natalenis*			2		4
	Amphipoda	Caprellidea	Protellidae	*Mayerella*	*banksia*			4		2
	Amphipoda	Gammaridea	Ampithoidae	*Ampithoe*	*plumulosa*	4			2	
	Amphipoda	Gammaridea	Aoridae	*Bemlos*	*macromanus*	2	6	2	4	10
	Amphipoda	Gammaridea	Aoridae	*Grandidierella*	*japonica*		2	2	2	2
	Amphipoda	Gammaridea	Ischyroceridae	*Ericthonius*	*brasiliensis*	8	2	2	2	

Table K-13. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Amphipoda	Gammaridea	Phoxocephalidae	*Heterophoxus*	*cf ellisi*	10	2	4	2	10
	Amphipoda	Gammaridea	Podoceridae	*Podocerus*	*fulanus*	16	4	24	8	2
	Decapoda	Pleocyemata	Alpheidae	*Alpheus*	*californiensis*		4	2	2	4
	Decapoda	Pleocyemata	Majidae			2	2	2		
	Decapoda	Pleocyemata	Majidae	*Pyromaia*	*tuberculata*	18	2	6		8
	Decapoda	Pleocyemata	Xanthidae	*Lophopanopeus*	sp	2				
	Isopoda	Flabellifera	Sphaeromatidae	*Paracerceis*	*cordata*	4	2	6	6	4
	Mysidacea		Mysidae	*Heteromysis*	*odontops*		2			
	Tanaidacea	Tanaidomorpha	Leptocheliidae	*Leptochelia*	*dubia*					2
	Tanaidacea	Tanaidomorpha	Tanaidae	*Synaptotanais*	*notabilis*		6			
Ostracoda										
Myodocopa	Myodocopina		Philomedidae	*Euphilomedes*	*carcharodonta*		2			6
Chordata										
Actinopterygii										
Neopterygii	Batrachoidiformes		Batrachoididae	*Porichthys*	*myriaster*					2
	Perciformes	Gobioidei	Gobiidae			4	2			
Ascidiacea							2			
	Phlebobranchia		Ascidiidae	*Ascidian*	sp A					10
	Stolidobranchiata		Styelidae	*Botryllus*	sp	1				
Cnidaria										
Anthozoa										
Hexacorallia	Actiniaria		Edwardsiidae	*Scolanthus*	sp B	4	6	6	2	18
Zoantharia	Actinaria								2	
	Actiniaria	Thenaria	Diadumenidae			2				
Echinodermata										
Ophiuroidea							4			
	Ophiurida	Gnathophiurina	Amphiuridae	*Amphipholis*	sp	2	2			
	Ophiurida	Gnathophiurina	Amphiuridae	*Amphipholis*	*squamata*	6				
Ectoprocta										
Gymnolaemata	Cheilostomata	Ascophora	Celleporidae	*Celleporina*	sp		1	1		
	Cheilostomata	Ascophora	Schizoporellidae	*Watersipora*	*cucullata*		1			
Mollusca										
Bivalvia										4
Heterodonta	Veneroida		Cardiidae	*Laevicardium*	*substriatum*		4			2
	Veneroida		Semelidae	*Theora*	*lubrica*	24	16	16		36
Pteriomorphia	Mytiloida		Mytilidae	*Musculista*	*senhousei*	176	74	68	20	124
	Ostreoida		Ostreidae	*Ostrea*	*conchaphila*					6
Gastropoda	Neotaenioglossa		Calyptraeidae	*Crepidula*	*dorsata*		2			
	Neotaenioglossa		Calyptraeidae	*Crepidula*	sp	2	2	4		6
	Neotaenioglossa		Calyptraeidae	*Crucibulum*	*spinosum*		2			
Opisthobranchia	Cephalaspidea		Bullidae	*Bulla*	*gouldiana*					2
Prosobranchia	Neogastropoda		Muricidae	*Pteropurpura*	*festiva*					2
	Neogastropoda		Nassariidae	*Nassarius*	*tegula*			2	6	

Table K-13. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Nematoda							6	24		82
Nemertea										
Anopla	Paleonemertea		Tubulanidae	*Tubulanus*	*polymorphus/pellucidus*	2		2		2
Enopla	Hoplonemertea		Emplectonematidae	*Cryptonemertes*	*actinophila*		12			

[a] Provisional species. Identified in parentheses is the taxonomist or organization who believes this species may be a new one because it does not fit known species descriptions for the area.

Table K-14. Species abundance data for Station NA20

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Annelida										
Polychaeta										
Palpata	Flabelligerida	Terebellida	Flabelligeridae	*Diplocirrus*	sp SD1	2	2	2	4	2
	Phyllodocida		Glyceridae	*Glycera*	*americana*	2				
	Phyllodocida		Nereididae	*Neanthes*	*acuminata*		2			
	Phyllodocida		Phyllodocidae	*Eteone*	sp 11 (Harris)[a]				2	
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*					2
	Phyllodocida		Polynoidae	*Tenonia*	*priops*				2	
	Phyllodocida		Syllidae	*Exogone*	*lourei*	12	8	2	20	28
	Sabellida		Sabellidae	*Euchone*	*limnicola*	2		2		
	Sabellida	Eunicida	Dorvilleidae	*Dorvillea (Schistomeringos)*	*longicornis*	2			6	
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	96	62	50	90	114
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*tetraura*	4	2	12	8	4
	Sabellida	Eunicida	Oenonidae	*Drilonereis*	sp	2				
	Spionida		Spionidae	*Prionospio*	*heterobranchia*	6	4	4	6	2
	Spionida		Spionidae	*Pseudopolydora*	*paucibranchiata*	10	6	2	12	26
	Spionida		Spionidae	*Scolelepis*	sp		2			
	Spionida	Terebellida	Cirratulidae							2
	Terebellida		Terebellidae	*Pista*	*percyi*	94	26	38	82	78
Scolecida	Capitellida		Capitellidae	*Mediomastus*	sp	4	2		10	10
	Cossurida		Cossuridae	*Cossura*	sp	14		2	4	10
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	60	20	30	28	44
Arthropoda										
Malacostraca	Decapoda	Natantia								2
Eumalacostraca	Amphipoda	Gammaridea	Isaeidae	*Amphideutopus*	*oculatus*	2		4	2	
	Amphipoda	Gammaridea	Phoxocephalidae	*Heterophoxus*	*cf ellisi*		2		2	
	Decapoda	Pleocyemata	Callianassidae	*Neotrypaea*	sp					2
	Decapoda	Pleocyemata	Majidae	*Pyromaia*	*tuberculata*	2			6	4
	Decapoda	Pleocyemata	Processidae	*Ambidexter*	*panamensis*				2	
Arthropoda										
Ostracoda										
Myodocopa	Myodocopina		Philomedidae	*Euphilomedes*	*carcharodonta*	14		4	2	6
Chordata										
Actinopterygii										
Neopterygii	Perciformes	Gobioidei	Gobiidae			2			2	
Cnidaria										
Anthozoa										
Hexacorallia	Actiniaria		Edwardsiidae	*Scolanthus*	sp B	28	22	18	22	26
Ectoprocta										
Gymnolaemata	Ctenostomata	Carnosa	Vesiculariidae	*Amathia*	sp				1	
Mollusca										
Bivalvia										
Heterodonta	Myoida		Myidae	*Cryptomya*	*californica*	2	2			

Table K-14. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Veneroida		Semelidae	*Theora*	*lubrica*	52	12	26	36	22
Pteriomorphia	Mytiloida		Mytilidae	*Musculista*	*senhousei*	66	72	74	88	138
Gastropoda	Heterostropha		Pyramidellidae	*Odostomia*	sp					2
	Neotaenioglossa		Calyptraeidae	*Crepidula*	sp					2
Opisthobranchia	Cephalaspidea		Cylichnidae	*Acteocina*	*inculta*	2				4
	Cephalaspidea		Haminoeidae	*Haminoea*	*vesicula*			2		
Prosobranchia	Neogastropoda		Nassariidae	*Nassarius*	*tegula*	2				
Nematoda						8	26	4	16	28
Nemertea										
Anopla	Paleonemertea		Tubulanidae	*Tubulanus*	*polymorphus/pellucidus*	4				
Enopla	Hoplonemertea	Monostilifera	Emplectonematidae	*Paranemertes*	*californica*			2		

[a] Provisional species. Identified in parentheses is the taxonomist or organization who believes this species may be a new one because it does not fit known species descriptions for the area.

Table K-15. Species abundance data for Station NA22

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Annelida										
Polychaeta										
Palpata	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*	2				
	Phyllodocida		Syllidae	*Exogone*	*lourei*			6		
	Phyllodocida		Syllidae	*Odontosyllis*	*phosphorea*		2			
	Sabellida		Sabellidae	*Euchone*	*limnicola*	4	4	6		2
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	40	28	48	10	22
	Spionida		Spionidae	*Prionospio*	*heterobranchia*	2				
	Spionida		Spionidae	*Pseudopolydora*	*paucibranchiata*	20	8	2	4	
	Terebellida		Terebellidae	*Pista*	*percyi*	4				
Scolecida	Capitellida		Capitellidae	*Mediomastus*	sp	4	4	2		
	Cossurida		Cossuridae	*Cossura*	sp		2	6		
	Cossurida		Cossuridae	*Cossura*	sp A	16	44	28	8	4
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	20	16	4	8	12
Arthropoda										
Malacostraca										
Eumalacostraca	Amphipoda		Aoridae	*Acuminodeutopus*	*stenopropodus*				2	
	Amphipoda	Caprellidea	Protellidae	*Mayerella*	*banksia*				2	
	Amphipoda	Gammaridea	Aoridae	*Bemlos*	*macromanus*	2			2	
	Amphipoda	Gammaridea	Lysianassidae	*Aruga*	*holmesi*		2			
	Amphipoda	Gammaridea	Melitidae	*Elasmopus*	sp				2	
	Amphipoda	Gammaridea	Oedicerotidae	*Hartmanodes*	*hartmanae*				2	
	Amphipoda	Gammaridea	Phoxocephalidae	*Heterophoxus*	*cf ellisi*	2				
	Amphipoda	Gammaridea	Podoceridae	*Podocerus*	*fulanus*	2				
	Decapoda	Pleocyemata	Alpheidae	*Alpheus*	*californiensis*	2				
	Decapoda	Pleocyemata	Callianassidae	*Neotrypaea*	sp				2	2
	Decapoda	Pleocyemata	Majidae	*Pyromaia*	*tuberculata*			4		2
	Decapoda	Pleocyemata	Processidae	*Ambidexter*	*panamensis*			6	6	4
	Isopoda	Flabellifera	Sphaeromatidae	*Paracerceis*	*cordata*				2	
	Stomatopod	Gammaridea	Squillidae	*Schmittius*	*politus*	2				
Ostracoda										
Myodocopa	Myodocopina		Philomedidae	*Euphilomedes*	*carcharodonta*				2	
Chordata										
Actinopterygii										
Neopterygii	Perciformes	Gobioidei	Gobiidae			2				
Cnidaria										
Anthozoa										
Hexacorallia	Actiniaria		Edwardsiidae	*Scolanthus*	sp B		2			
Zoantharia	Actiniaria	Athenaria	Edwardsiidae	*Edwardsia*	*californica*					2
Ectoprocta						1	1			
Gymnolaemata	Cheilostomata	Anasca	Candidae	*Scrupocellaria*	sp			1		
Stenolaemata	Cyclostomata	Articulata	Crisiidae	*Crisia*	sp			1		

Table K-15. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Mollusca										
Bivalvia										
Heterodonta	Veneroida		Cardiidae	*Laevicardium*	*substriatum*	2		2		
	Veneroida		Semelidae	*Theora*	*lubrica*	6	4	2	6	4
Pteriomorphia	Ostreoida		Ostreidae	*Ostrea*	*conchaphila*			2		
Gastropoda										
Opisthobranchia	Cephalaspidea		Haminoeidae	*Haminoea*	*vesicula*	6	20	6	10	8
Porifera										
Calcerea										
Calcaronea	Leucosoleniida		Leucoleniidae	*Leucosolenia*	sp			1		

Table K-16. Species abundance data for Station 2441

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Annelida										
Polychaeta	Capitellida		Maldanidae	*Metasychis*	*disparidentatus*			2	8	
	Spionida		Cirratulidae	*Monticellina*	*siblina*			2	6	2
Palpata	Flabelligerida	Terebellida	Flabelligeridae	*Diplocirrus*	sp SD1	4	6		8	12
	Flabelligerida	Terebellida	Flabelligeridae	*Pherusa*	*capulata*					2
	Oweniida	Sabellida	Oweniidae	*Owenia*	*collaris*					2
	Phyllodocida		Glyceridae	*Glycera*	*americana*	6			4	2
	Phyllodocida		Goniadidae	*Glycinde*	sp				2	
	Phyllodocida		Nephtyidae	*Nephtys*	*caecoides*	2	2			2
	Phyllodocida		Nereididae			2			4	
	Phyllodocida		Nereididae	*Nereis*	*procera*		4	8	2	
	Phyllodocida		Pholoidae	*Pholoe*	*glabra*			2		
	Phyllodocida		Phyllodocidae	*Eumida*	*longicornuta*				2	
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*					2
	Phyllodocida		Polynoidae	*Malmgreniella*	sp			6		
	Phyllodocida		Sigalionidae	*Sthenelanella*	*uniformis*	2	8		4	
	Phyllodocida		Syllidae	*Exogone*	*lourei*	4	2			
	Phyllodocida	Eunicida	Onuphidae	*Diopatra*	*ornata*	2		2	2	6
	Sabellida		Sabellidae	*Chone*	sp D		4			
	Sabellida		Sabellidae	*Euchone*	*limnicola*	4	4		2	
	Sabellida		Sabellidae	*Megalomma*	*pigmentum*				2	
	Sabellida	Eunicida	Dorvilleidae	*Dorvillea (Schistomeringos)*	*longicornis*					2
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	114	150	182	178	180
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*limicola*				2	
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*luti*	2			4	2
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*tetraura*			2		
	Spionida		Spionidae	*Microspio*	*pigmentata*		4	8	10	4
	Spionida		Spionidae	*Paraprionospio*	*pinnata*	8	2	4	4	8
	Spionida		Spionidae	*Prionospio*	*heterobranchia*	10	4	2	4	10
	Spionida		Spionidae	*Prionospio*	*lighti*					2
	Spionida		Spionidae	*Prionospio*	sp		6			
	Spionida		Spionidae	*Scolelepis*	sp					2
	Spionida		Spionidae	*Spiophanes*	*duplex*	4	4		2	8
	Spionida	Terebellida	Cirratulidae	*Aphelochaeta*	*petersenae*		4			6
	Spionida	Terebellida	Cirratulidae	*Aphelochaeta*	sp	2				
	Spionida	Terebellida	Cirratulidae	*Chaetozone*	*corona*	16	34	24	34	38
	Terebellida		Ampharetidae	*Ampharete*	*labrops*		2	2		2
	Terebellida		Ampharetidae	*Amphicteis*	*scaphobranchiata*	12	14	6	18	10
	Terebellida		Ampharetidae	*Melinna*	*oculata*		2	4	2	
	Terebellida		Pectinariidae	*Pectinaria*	*californiensis*	2				
	Terebellida		Terebellidae	*Amaeana*	*occidentalis*		2	4	4	4
	Terebellida		Terebellidae	*Pista*	*percyi*	4	2	4	6	10
	Terebellida		Terebellidae	*Pista*	sp C	2	16	10	12	28

Table K-16. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates				
						1	2	3	4	5
Scolecida	Capitellida		Capitellidae	*Mediomastus*	sp		14		12	
	Capitellida		Capitellidae	*Notomastus*	*hemipodus*	2	6	6		10
	Capitellida		Maldanidae	*Euclymeninae*	sp A (SCAMIT)[a]	6	10	4	6	14
	Capitellida		Maldanidae	*Praxillella*	*pacifica*			2	2	6
	Cossurida		Cossuridae	*Cossura*	sp				12	8
	Opheliida		Scalibregmatidae	*Scalibregma*	*californicum*	2				
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	36	52	36	64	86
	Orbiniidae		Paraonidae	*Aricidea*	*(Acmira) horikoshii*	2				
Arthropoda										
Malacostraca										
Eumalacostraca	Amphipoda		Aoridae	*Acuminodeutopus*	*stenopropodus*			4		
	Amphipoda	Gammaridea	Ampeliscidae	*Ampelisca*	*brachycladus*	2		14		
	Amphipoda	Gammaridea	Ampeliscidae	*Ampelisca*	*cristata*	2		6		2
	Amphipoda	Gammaridea	Ampeliscidae	*Ampelisca*	*cristata microdentata*			2	2	
	Amphipoda	Gammaridea	Ampeliscidae	*Ampelisca*	*romigi*					2
	Amphipoda	Gammaridea	Isaeidae	*Amphideutopus*	*oculatus*	6	16	8	2	
	Amphipoda	Gammaridea	Isaeidae	*Photis*	*brevipes*				6	
	Amphipoda	Gammaridea	Liljeborgiidae	*Listriella*	*diffusa*			2		
	Amphipoda	Gammaridea	Liljeborgiidae	*Listriella*	*melanica*	4	4		4	
	Decapoda	Pleocyemata	Majidae			2			2	
	Decapoda	Pleocyemata	Majidae	*Pyromaia*	*tuberculata*		2			2
	Decapoda	Pleocyemata	Pinnotheridae	*Scleroplax*	*granulata*			2		
	Decapoda	Pleocyemata	Xanthidae	*Lophopanopeus*	sp					2
	Isopoda	Flabellifera	Serolidae	*Heteroserolis*	*carinata*			2		
	Isopoda	Valvifera	Arcturidae	*Neastacilla*	*californica*			2		
Ostracoda										
Myodocopa	Myodocopina		Cylindroleberididae	*Asteropella*	*slatteryi*				2	
	Myodocopina		Cypridinidae	*Vargula*	*tsujii*	2				
	Myodocopina		Philomedidae	*Euphilomedes*	*carcharodonta*		2			4
Chordata										
Actinopterygii										
Neopterygii	Perciformes	Gobioidei	Gobiidae							2
Cnidaria										
Anthozoa										
Alcyonaria	Pennatulacea	Subselliflorae	Virgulariidae	*Virgularia*	*californica*		2	2		
Ceriantipatharia	Ceriantharia						2			
Hexacorallia	Actiniaria		Edwardsiidae	*Scolanthus*	sp B				2	
Zoantharia	Actiniaria	Athenaria	Edwardsiidae	*Edwardsia*	*californica*	26	102	58	34	20
Echinodermata										
Holothuroidea										
Apodacea	Apodida		Synaptidae	*Leptosynapta*	sp	8	4	10	10	4
Ophiuroidea	Ophiurida	Gnathophiurina	Amphiuridae	*Amphiodia*	*digitata*	2				
	Ophiurida	Gnathophiurina	Amphiuridae	*Amphiodia*	sp	6		4		6

Table K-16. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Ophiurida	Gnathophiurina	Amphiuridae	*Amphiodia*	*urtica*	14	12	34	12	32
	Ophiurida	Gnathophiurina	Amphiuridae	*Amphipholis*	*squamata*					4
Ectoprocta										
Gymnolaemata	Cheilostomata	Anasca	Candidae	*Scrupocellaria*	sp		1			1
Mollusca										
Bivalvia	Pholadomyoida		Lyonsiidae	*Lyonsia*	*californica*			2		
	Pholadomyoida		Periplomatidae	*Periploma*	*discus*			2		
Heterodonta	Veneroida		Cardiidae	*Laevicardium*	*substriatum*		2		2	2
	Veneroida		Lasaeidae	*Rochefortia*	*coani*		2			2
	Veneroida		Lasaeidae	*Rochefortia*	*tumida*	2				
	Veneroida		Lucinidae	*Parvilucina*	*tenuisculpta*			2		
	Veneroida		Mactridae	*Mactromeris*	*polynyma*		2			
	Veneroida		Mactridae	*Mactrotoma*	*californica*				2	
	Veneroida		Petricolidae	*Cooperella*	*subdiaphana*		2			
	Veneroida		Semelidae	*Theora*	*lubrica*	2	4			2
	Veneroida		Solecurtidae	*Tagelus*	*subteres*	8	6	2	4	8
	Veneroida		Solenidae	*Solen*	*sicarius*			2		
	Veneroida		Tellinidae	*Macoma*	*nasuta*		2			
	Veneroida		Tellinidae	*Macoma*	*yoldiformis*	4	6	4	6	12
	Veneroida		Tellinidae	*Tellina*	*tenella*	2				
	Veneroida		Veneridae	*Chione*	*californiensis*		2		2	
Protobranchia	Nuculoida		Nuculanidae	*Nuculana*	*taphria*	2				
Pteriomorphia	Ostreoida		Pectinidae	*Leptopecten*	*latiauratus*					10
Mollusca										
Gastropoda	Heterostropha		Acteonidae	*Rictaxis*	*punctocaelatus*		2		2	6
Opisthobranchia	Cephalaspidea		Haminoeidae	*Haminoea*	*vesicula*	2				
	Cephalaspidea		Philinidae	*Philine*	*auriformis*	4			2	
	Nudibranchia		Arminidae	*Armina*	*californica*	2	2			
Prosobranchia	Neogastropoda		Olividae	*Olivella*	*baetica*			2		
Scaphopoda	Gadilida		Gadilidae	*Gadila*	*aberrans*			2		
Nemertea						2				
Anopla	Heteronemertea		Lineidae						2	
	Paleonemertea		Tubulanidae	*Tubulanus*	*cingulatus*		2	2	2	
	Paleonemertea		Tubulanidae	*Tubulanus*	*polymorphus/pellucidus*	2	6	6	4	8
Platyhelminthes										
Turbellaria	Polycladida	Acotylea	Stylochidae	*Imogine*	*exiguus*				2	

[a] Provisional species. Identified in parentheses is the taxonomist or organization who believes this species may be a new one because it does not fit known species descriptions for the area.

Table K-17. Species abundance data for Station 2433

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Annelida										
Polychaeta	Capitellida		Maldanidae	*Metasychis*	*disparidentatus*	2		4		
	Spionida		Cirratulidae	*Monticellina*	*siblina*	2				2
Palpata	Flabelligerida	Terebellida	Flabelligeridae	*Diplocirrus*	sp SD1	94	126	52	112	136
	Phyllodocida		Glyceridae	*Glycera*	*americana*	2				6
	Phyllodocida		Goniadidae	*Goniada*	*littorea*	2	2	2		
	Phyllodocida		Hesionidae	*Podarkeopsis*	*glabra*				2	
	Phyllodocida		Nephtyidae	*Nephtys*	*caecoides*			2	2	
	Phyllodocida		Nephtyidae	*Nephtys*	*cornuta*	2		4		
	Phyllodocida		Nereididae	*Nereis*	*procera*		2			
	Phyllodocida		Syllidae	*Syllis (Typosyllis)*	*nipponica*	12	6		2	2
	Sabellida		Sabellidae	*Euchone*	*limnicola*					4
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	128	94	138	102	68
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*luti*	12	12			
	Spionida		Spionidae	*Microspio*	*pigmentata*					2
	Spionida		Spionidae	*Paraprionospio*	*pinnata*					2
	Spionida		Spionidae	*Spiophanes*	*berkeleyorum*		8			
	Spionida		Spionidae	*Spiophanes*	*duplex*	12	10	6	20	6
	Spionida	Terebellida	Cirratulidae	*Aphelochaeta*	*phillipsi*				8	
	Spionida	Terebellida	Cirratulidae	*Chaetozone*	*corona*	12	22	26	10	6
	Terebellida		Ampharetidae	*Ampharete*	*labrops*				2	
	Terebellida		Ampharetidae	*Melinna*	*oculata*	2			2	
	Terebellida		Pectinariidae	*Pectinaria*	*californiensis*			4		
	Terebellida		Terebellidae	*Amaeana*	*occidentalis*	4	2	10		4
	Terebellida		Terebellidae	*Pista*	*percyi*	6	8	8	8	
	Terebellida		Terebellidae	*Pista*	sp C	4	8		4	4
Scolecida	Capitellida		Capitellidae	*Mediomastus*	sp		2		14	4
	Capitellida		Capitellidae	*Mediomastus*	sp C					2
	Capitellida		Capitellidae	*Notomastus*	*hemipodus*		2	4		
	Capitellida		Capitellidae	*Notomastus*	*magnus*	2	2	2		2
	Capitellida		Maldanidae	*Euclymeninae*	sp A (SCAMIT)[a]	8	10	18	10	10
	Capitellida		Maldanidae	*Praxillella*	*pacifica*	6				
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	58	48	28	26	32
	Orbiniidae		Paraonidae	*Acmira*	*catherinae*			4		
Arthropoda										
Malacostraca	Amphipoda		Alpheidae	*Betaeus*	*ensenadensis*		2			
Eumalacostraca	Amphipoda		Aoridae	*Acuminodeutopus*	*stenopropodus*	10			2	
	Amphipoda	Caprellidea	Caprellidae	*Caprella*	*natalenis*			6		
	Amphipoda	Gammaridea	Ampeliscidae	*Ampelisca*	*cristata*			2		
	Amphipoda	Gammaridea	Isaeidae	*Amphideutopus*	*oculatus*	8		2	12	14
	Cumacea		Diastylidae	*Oxyurostylis*	*pacifica*	2			2	
	Decapoda	Pleocyemata	Callianassidae	*Neotrypaea*	sp		2			
	Decapoda	Pleocyemata	Goneplacidae	*Malacoplax*	*californiensis*				2	

Table K-17. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Decapoda	Pleocyemata	Pinnotheridae	*Scleroplax*	*granulata*		6			6
	Isopoda	Flabellifera	Serolidae	*Heteroserolis*	*carinata*				2	
	Isopoda	Valvifera	Arcturidae	*Neastacilla*	*californica*	6	4	18	24	24
Ostracoda										
Myodocopa	Myodocopina		Cylindroleberidida	*Leuroleberis*	*sharpei*			2		
	Myodocopina		Cylindroleberididae	*Asteropella*	*slatteryi*	4			6	4
	Myodocopina		Philomedidae	*Euphilomedes*	*carcharodonta*				2	
Chordata										
Actinopterygii										
Neopterygii	Perciformes	Gobioidei	Gobiidae				2			6
Ascidiacea	Stolidobranchiata		Molgulidae	*Molgula*	sp	2			4	
Cnidaria										
Anthozoa	Pennatulacea	Subselliflorae	Virgulariidae	*Acanthoptilum*	sp	40	4	6	16	6
Alcyonaria	Pennatulacea	Subselliflorae	Virgulariidae	*Stylatula*	sp A (MEC)[a]	2				
	Pennatulacea	Subselliflorae	Virgulariidae	*Virgularia*	*californica*	2			4	2
Ceriantipatharia	Ceriantharia								2	
Hexacorallia	Actiniaria		Edwardsiidae	*Scolanthus*	sp B	4	2		2	
Zoantharia	Actiniaria	Athenaria	Edwardsiidae	*Edwardsia*	*californica*	2				
	Scleractinia	Thenaria	Isophelliidae	*Flosmaris*	*grandis*		2			
Echinodermata										
Holothuroidea										
Apodacea	Apodida		Synaptidae	*Leptosynapta*	sp	2				
Ophiuroidea	Ophiurida	Gnathophiurina	Amphiuridae	*Amphiodia*	*urtica*			2	8	
Mollusca										
Bivalvia	Pholadomyoida		Lyonsiidae	*Lyonsia*	*californica*		8	4	2	10
	Pholadomyoida		Thraciidae	*Thracia*	*curta*	2	10		2	8
Heterodonta	Myoida		Myidae	*Cryptomya*	*californica*		4			
	Veneroida		Cardiidae	*Laevicardium*	*substriatum*	2	4		4	6
	Veneroida		Lasaeidae	*Rochefortia*	*coani*					2
	Veneroida		Lasaeidae	*Rochefortia*	sp			2		
	Veneroida		Petricolidae	*Cooperella*	*subdiaphana*				2	
	Veneroida		Semelidae	*Theora*	*lubrica*	16	28	12	14	28
	Veneroida		Solecurtidae	*Tagelus*	*subteres*	4	4	4	12	16
	Veneroida		Tellinidae	*Macoma*	*yoldiformis*	2	2		2	2
	Veneroida		Tellinidae	*Tellina*	*cadieni*		2			
	Veneroida		Tellinidae	*Tellina*	*tenella*		4	2	2	2
Gastropoda	Cephalaspidea		Uncertain	*Bullomorpha*	sp A (MEC)[a]					2
Opisthobranchia	Cephalaspidea		Cylichnidae	*Acteocina*	*inculta*			2		
	Cephalaspidea		Philinidae	*Philine*	*auriformis*				2	
	Cephalaspidea		Retusidae	*Retusa*	*xystrum*					2
Nemertea										
Anopla	Heteronemertea		Lineidae						2	2
	Paleonemertea		Tubulanidae	*Tubulanus*	*polymorphus/pellucidus*			2		2

Table K-17. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Platyhelminthes										
Turbellaria	Polycladida	Acotylea	Stylochidae	*Imogine*	*exiguus*					2

[a] Provisional species. Identified in parentheses is the taxonomist or organization who believes this species may be a new one because it does not fit known species descriptions for the area.

Table K-18. Species abundance data for Station 2440

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Annelida										
Polychaeta	Spionida		Cirratulidae	*Monticellina*	*cryptica*	2				
	Spionida		Cirratulidae	*Monticellina*	*siblina*					2
Palpata	Flabelligerida	Terebellida	Flabelligeridae	*Diplocirrus*	sp SD1	38	44	38	46	56
	Flabelligerida	Terebellida	Flabelligeridae	*Pherusa*	*capulata*		2			
	Phyllodocida		Glyceridae	*Glycera*	*americana*					6
	Phyllodocida		Goniadidae	*Glycinde*	*armigera*		2			
	Phyllodocida		Goniadidae	*Goniada*	*littorea*	2				2
	Phyllodocida		Nereididae	*Nereis*	*procera*		2			
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*		2		2	
	Phyllodocida		Sigalionidae	*Sthenelanella*	*uniformis*				2	
	Phyllodocida		Syllidae	*Exogone*	*lourei*	28	14	14	18	28
	Phyllodocida		Syllidae	*Odontosyllis*	*phosphorea*	2				
	Phyllodocida		Syllidae	*Syllis(Typosyllis)*	*nipponica*	6	2			2
	Phyllodocida	Eunicida	Onuphidae	*Diopatra*	*ornata*					2
	Sabellida		Sabellidae	*Euchone*	*limnicola*		2	2	4	2
	Sabellida	Eunicida	Dorvilleidae	*Dorvillea (Schistomeringos)*	*longicornis*	18	8	8	10	12
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	90	88	60	78	100
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*erecta*		2		4	
	Spionida		Spionidae	*Paraprionospio*	*pinnata*	2				
	Spionida		Spionidae	*Polydora*	sp					2
	Spionida		Spionidae	*Prionospio*	*heterobranchia*	8	6	8	8	2
	Spionida		Spionidae	*Prionospio*	*pygmaea*	2	2			
	Spionida		Spionidae	*Pseudopolydora*	*paucibranchiata*	2		2	6	
	Spionida		Spionidae	*Scolelepis*	*occidentalis*				2	
	Spionida		Spionidae	*Spiophanes*	*duplex*	10	4	2		4
	Spionida	Terebellida	Cirratulidae	*Aphelochaeta*	*petersenae*			2		
	Spionida	Terebellida	Cirratulidae	*Chaetozone*	*corona*		6	2	2	
	Terebellida		Terebellidae	*Pista*	*disjuncta*		2			
	Terebellida		Terebellidae	*Pista*	*percyi*	124	126	122	118	68
	Terebellida	Sabellida	Sabellidae	*Fabricinuda*	*limnicola*		2		12	4
Scolecida	Capitellida		Capitellidae	*Mediomastus*	sp	38	44	38	54	56
	Capitellida		Capitellidae	*Notomastus*	*magnus*			2		
	Opheliida		Opheliidae	*Armandia*	*brevis*			2	6	
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	100	76	42	96	126
Arthropoda										
Malacostraca										
Eumalacostraca	Amphipoda		Aoridae	*Acuminodeutopus*	*stenopropodus*					6
	Amphipoda		Dexaminidae	*Paradexamine*	sp A					10
	Amphipoda	Caprellidea	Protellidae	*Tritella*	sp					2
	Amphipoda	Gammaridea	Ampeliscidae	*Ampelisca*	*cristata microdentata*					2
	Amphipoda	Gammaridea	Ampithoidae	*Ampithoe*	*plumulosa*					2
	Amphipoda	Gammaridea	Aoridae	*Aoroides*	sp					12

Table K-18. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Amphipoda	Gammaridea	Aoridae	*Grandidierella*	*japonica*					8
	Amphipoda	Gammaridea	Hyalidae	*Hyale*	sp					2
	Amphipoda	Gammaridea	Isaeidae	*Amphideutopus*	*oculatus*	10	24	20	8	22
	Amphipoda	Gammaridea	Oedicerotidae	*Hartmanodes*	*hartmanae*		2			
	Amphipoda	Gammaridea	Oedicerotidae	*Synchelidium*	*rectipalmum*				2	
	Amphipoda	Gammaridea	Phoxocephalidae	*Heterophoxus*	*cf ellisi*	4	4	4	2	4
	Amphipoda	Gammaridea	Podoceridae	*Podocerus*	*fulanus*				2	38
	Decapoda	Pleocyemata	Hippolytidae	*Hippolyte*	*californiensis*					2
	Decapoda	Pleocyemata	Majidae					2		2
	Decapoda	Pleocyemata	Majidae	*Pyromaia*	*tuberculata*		4	6	2	
	Decapoda	Pleocyemata	Xanthidae	*Lophopanopeus*	sp					4
	Isopoda	Anthuridea	Paranthuridae	*Paranthura*	*elegans*					4
	Isopoda	Flabellifera	Serolidae	*Heteroserolis*	*carinata*	2		22	4	2
	Isopoda	Flabellifera	Sphaeromatidae	*Paracerceis*	*cordata*					8
	Stomatopod	Gammaridea	Squillidae	*Schmittius*	*politus*		2			
	Tanaidacea	Tanaidomorpha	Leptocheliidae	*Leptochelia*	*dubia*		2			
	Tanaidacea	Tanaidomorpha	Tanaidae	*Synaptotanais*	*notabilis*					194
Ostracoda										
Myodocopa	Myodocopina		Cylindroleberididae	*Asteropella*	*slatteryi*		16	6		
	Myodocopina		Philomedidae	*Euphilomedes*	*carcharodonta*	30	20	36	30	12
Pycnogonida	Pegmata		Phoxichilidiidae	*Anoplodactylus*	*erectus*				2	
Chordata										
Actinopterygii										
Neopterygii	Batrachoidiformes		Batrachoididae	*Porichthys*	*myriaster*					2
	Perciformes	Gobioidei	Gobiidae			4		2		
Cnidaria										
Anthozoa										
Hexacorallia	Actiniaria		Edwardsiidae	*Scolanthus*	sp B		4	2	4	4
Zoantharia	Actiniaria	Athenaria	Edwardsiidae					2		
Echinodermata										
Holothuroidea										
Apodacea	Apodida		Synaptidae	*Leptosynapta*	sp	2				
Ophiuroidea	Ophiurida	Gnathophiurina	Amphiuridae	*Amphiodia*	*urtica*				2	
Ectoprocta										
Gymnolaemata	Cheilostomata	Anasca	Bugulidae	*Bugula*	*neritina*					1
	Cheilostomata	Ascophora	Celleporidae	*Celleporina*	sp	1				
	Ctenostomata	Carnosa	Vesiculariidae	*Zoobotryon*	*pellucida*					1
Stenolaemata	Cyclostomata	Articulata	Crisiidae	*Crisia*	sp	1	1			
Mollusca										
Bivalvia									6	
	Pholadomyoida		Lyonsiidae	*Lyonsia*	*californica*	4	16	12	36	4
	Pholadomyoida		Thraciidae	*Thracia*	*curta*	2	4			
Heterodonta	Veneroida		Cardiidae	*Laevicardium*	*substriatum*	10	6	4	2	4

Table K-18. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Veneroida		Lasaeidae	*Rochefortia*	*grippi*				2	
	Veneroida		Mactridae	*Simomactra*	*falcata*	4				4
	Veneroida		Petricolidae	*Cooperella*	*subdiaphana*		2			
	Veneroida		Semelidae	*Theora*	*lubrica*	6	10	46	10	26
	Veneroida		Solecurtidae	*Tagelus*	*subteres*	18	4	6	8	6
	Veneroida		Solenidae	*Solen*	*rostriformis*	2	2			4
	Veneroida		Solenidae	*Solen*	*sicarius*				2	
	Veneroida		Tellinidae	*Macoma*	*yoldiformis*			4	2	
	Veneroida		Veneridae	*Chione*	*californiensis*	2				2
Pteriomorphia	Mytiloida		Mytilidae	*Musculista*	*senhousei*	8	8	10	8	30
	Ostreoida		Pectinidae	*Leptopecten*	*latiauratus*				2	
Gastropoda	Neotaenioglossa		Epitoniidae	*Nitidiscala*	*tincta*				2	
Opisthobranchia	Cephalaspidea		Haminoeidae	*Haminoea*	*vesicula*		2			4
Opisthobranchia	Cephalaspidea		Philinidae	*Philine*	sp A (SCAMIT)[a]			2		2
Prosobranchia	Neogastropoda		Nassariidae	*Nassarius*	sp	2				
Nemertea										
Enopla	Hoplonemertea	Monostilifera	Emplectonematidae	*Paranemertes*	*californica*	2		2	2	
Platyhelminthes										
Turbellaria	Polycladida	Acotylea	Stylochidae	*Imogine*	*exiguus*				2	

[a] Provisional species. Identified in parentheses is the taxonomist or organization who believes this species may be a new one because it does not fit known species descriptions for the area.

Table K-19. Species abundance data for Station 2231

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Annelida										
Polychaeta	Phyllodocida		Phyllodocidae	*Eulalia*	*californiensis*		2			
Palpata	Flabelligerida	Terebellida	Flabelligeridae	*Pherusa*	*capulata*	10	2			4
	Phyllodocida		Aphroditidae	*Aphrodita*	*brevitentaculata*	2	2			
	Phyllodocida		Glyceridae	*Glycera*	*americana*	2				2
	Phyllodocida		Goniadidae	*Goniada*	*littorea*		2	10	10	2
	Phyllodocida		Phyllodocidae	*Anaitides*	*longipes*	2				
	Phyllodocida		Phyllodocidae	*Eteone*	sp 11 (Harris)[a]	2	2		2	
	Phyllodocida		Phyllodocidae	*Eumida*	*longicornuta*		6			2
	Phyllodocida		Polynoidae			2				
	Phyllodocida		Polynoidae	*Halosydna*	*brevisetosa*			2		
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*	8	20	28	30	24
	Phyllodocida		Syllidae			2				
	Phyllodocida		Syllidae	*Amblyosyllis*	sp D (Harris)[a]	2	2			
	Phyllodocida		Syllidae	*Brania*	*californiensis*	2				
	Phyllodocida		Syllidae	*Exogone*	*lourei*	144	100	38	228	232
	Phyllodocida		Syllidae	*Odontosyllis*	*phosphorea*	4	4	2	6	8
	Phyllodocida		Syllidae	*Syllis (Syllis)*	*gracilis*	2	2	4		8
	Phyllodocida		Syllidae	*Syllis (Typosyllis)*	*nipponica*	8	8	4	8	8
	Phyllodocida		Syllidae	*Syllis (Typosyllis)*	sp		4	2		
	Phyllodocida	Eunicida	Onuphidae	*Diopatra*	*ornata*		2			4
	Sabellida		Sabellidae	*Chone*	*minuta*				6	6
	Sabellida		Sabellidae	*Euchone*	*incolor*		2	2		
	Sabellida	Eunicida	Dorvilleidae	*Dorvillea (Schistomeringos)*	*longicornis*	6	10	4		
	Sabellida	Eunicida	Eunicidae			4	10	6	12	18
	Sabellida	Eunicida	Eunicidae	*Marphysa*	sp 1				2	14
	Sabellida	Eunicida	Lumbrineridae			6	14		4	12
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	24	34	50	60	86
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*erecta*	10	6	6	10	4
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*limicola*	18	8	6	16	18
	Sabellida	Eunicida	Oenonidae	*Drilonereis*	sp	2				
	Spionida		Chaetopteridae	*Spiochaetopterus*	*costarum*				4	
	Spionida		Spionidae	*Boccardia*	sp	2				
	Spionida		Spionidae	*Prionospio*	*heterobranchia*	6	30	16	8	6
	Spionida		Spionidae	*Pseudopolydora*	*paucibranchiata*				4	16
	Spionida		Spionidae	*Spiophanes*	*duplex*		2	2		
	Terebellida		Terebellidae			4	6	2	2	14
	Terebellida		Terebellidae	*Amaeana*	*occidentalis*	2		2		
	Terebellida		Terebellidae	*Eupolymnia*	*heterobranchia*	18	14	28	40	40
	Terebellida		Terebellidae	*Nicolea*	sp A	6	10	8	34	24
	Terebellida		Terebellidae	*Pista*	*percyi*	28	50	56	90	50
	Terebellida		Terebellidae	*Polycirrus*	sp			2		
	Terebellida	Sabellida	Sabellariidae	*Sabellaria*	*gracilis*			2	2	
Scolecida	Capitellida		Capitellidae	*Mediomastus*	sp	12	16	18	16	22

Table K-19. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Capitellida		Capitellidae	*Scyphoproctus*	*oculatus*	14	104	24	14	130
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	2		2	2	2
	Orbiniidae		Orbiniidae	*Scoloplos*	*acmeceps*	2				
Arthropoda										
Malacostraca										
Eumalacostraca	Amphipoda	Caprellidea	Protellidae	*Tritella*	sp					2
	Amphipoda	Gammaridea	Ampeliscidae	*Ampelisca*	*lobata*	4			6	2
	Amphipoda	Gammaridea	Aoridae	*Bemlos*	*macromanus*	2	6	6	18	4
	Amphipoda	Gammaridea	Aoridae	*Grandidierella*	*japonica*				2	2
	Amphipoda	Gammaridea	Corophiidae					4		4
	Amphipoda	Gammaridea	Isaeidae	*Amphideutopus*	*oculatus*				2	
	Amphipoda	Gammaridea	Isaeidae	*Gammaropsis*	*thompsoni*	4	4	2		20
	Amphipoda	Gammaridea	Ischyroceridae	*Ericthonius*	*brasiliensis*	6	6	8	2	10
	Amphipoda	Gammaridea	Leucothoidae	*Leucothoe*	*alata*	2	10	8	2	10
	Amphipoda	Gammaridea	Liljeborgiidae	*Liljeborgia*	*geminata*				2	
	Amphipoda	Gammaridea	Liljeborgiidae	*Listriella*	*melanica*	2				2
	Amphipoda	Gammaridea	Lysianassidae	*Aruga*	*holmesi*				4	4
	Amphipoda	Gammaridea	Phoxocephalidae	*Heterophoxus*	*cf ellisi*	6	18	20	24	10
	Amphipoda	Gammaridea	Pleustidae			2	2			
	Amphipoda	Gammaridea	Podoceridae	*Podocerus*	*fulanus*	10	6	10	18	40
	Decapoda	Pleocyemata	Alpheidae	*Alpheus*	*californiensis*			4	2	
	Decapoda	Pleocyemata	Hippolytidae	*Hippolyte*	*californiensis*				2	
	Decapoda	Pleocyemata	Majidae			2	2		6	4
	Decapoda	Pleocyemata	Majidae	*Pyromaia*	*tuberculata*	14	20	34	30	52
	Decapoda	Pleocyemata	Pinnotheridae	*Scleroplax*	*granulata*		2			
	Decapoda	Pleocyemata	Xanthidae	*Lophopanopeus*	sp	10	12	18	16	30
	Isopoda	Anthuridea	Paranthuridae	*Paranthura*	*elegans*	2		6	6	2
	Isopoda	Asellota	Janiridae	*Janiralata*	sp		2			
	Isopoda	Asellota	Joeropsidae	*Joeropsis*	sp			2	6	2
	Isopoda	Asellota	Munnidae	*Uromunna*	*ubiquita*	2				
	Isopoda	Flabellifera	Sphaeromatidae	*Paracerceis*	*cordata*				2	8
	Isopoda	Valvifera	Arcturidae	*Neastacilla*	*californica*					2
	Mysidacea		Mysidae	*Heteromysis*	*odontops*			4		
	Tanaidacea	Apseudomorpha	Tanaidae	*Kalliapseudes*	*crassus*	3480	4052	5644	6512	7598
	Tanaidacea	Tanaidomorpha	Leptocheliidae	*Leptochelia*	*dubia*	78	42	20	68	48
	Tanaidacea	Tanaidomorpha	Tanaidae	*Synaptotanais*	*notabilis*	4	4	2	4	2
Pycnogonida	Pegmata		Phoxichilidiidae	*Anoplodactylus*	*viridintestinalis*				2	4
Chordata										
Ascidiacea						2				
	Phlebobranchia		Ascidiidae	*Ascidian*	sp A	4		4	4	10
	Stolidobranchiata		Styelidae	*Botryllus*	sp			1	1	
Cnidaria										
Anthozoa										
Ceriantipatharia	Ceriantharia									2

Table K-19. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Hexacorallia	Actiniaria		Edwardsiidae	*Scolanthus*	sp B		2			
Zoantharia	Actinaria							4		6
Hydrozoa						1	1		1	
Echinodermata										
Ophiuroidea	Ophiurida	Gnathophiurina	Amphiuridae			2		2	8	
	Ophiurida	Gnathophiurina	Amphiuridae	*Amphipholis*	sp	12		6	18	10
	Ophiurida	Gnathophiurina	Amphiuridae	*Amphipholis*	*squamata*	8	8	20	12	34
Ectoprocta										
Gymnolaemata	Cheilostomata	Ascophora	Celleporidae	*Celleporina*	sp			1		
	Ctenostomata	Carnosa	Vesiculariidae	*Amathia*	sp	1	1		1	1
Mollusca										
Bivalvia								2		
	Pholadomyoida		Lyonsiidae	*Lyonsia*	*californica*	2	4	2	2	14
Heterodonta	Myoida		Hiatellidae	*Hiatella*	*arctica*				2	4
	Veneroida		Cardiidae	*Trachycardium*	*quadragenarium*		2			
	Veneroida		Semelidae	*Theora*	*lubrica*		2		2	2
	Veneroida		Solecurtidae	*Tagelus*	*subteres*	2			2	10
	Veneroida		Veneridae	*Chione*	*californiensis*			2		
	Veneroida		Veneridae	*Irusella*	*lamellifera*				2	
	Veneroida		Veneridae	*Protothaca*	sp		2			4
Pteriomorphia	Limoida		Limidae	*Limaria*	*hemphilli*	4			4	
	Mytiloida		Mytilidae	*Musculista*	*senhousei*	2	8	4	8	2
	Ostreoida		Ostreidae	*Ostrea*	*conchaphila*	4		2		6
	Ostreoida		Pectinidae	*Leptopecten*	*latiauratus*	2	6	6	2	6
Cephalopoda										
Coleoidea	Octopoda	Incirrina	Octopodidae	*Octopus*	sp				2	
Gastropoda	Heterostropha		Pyramidellidae	*Turbonilla*	sp	2			12	
	Neotaenioglossa		Caecidae	*Caecum*	*crebricinctum*				2	
	Neotaenioglossa		Calyptraeidae	*Crepidula*	*dorsata*			2		
	Neotaenioglossa		Calyptraeidae	*Crepidula*	sp	10				
	Neotaenioglossa		Calyptraeidae	*Crucibulum*	*spinosum*		2			2
Opisthobranchia	Nudibranchia		Notodorididae	*Aegires*	*albopunctatus*		4		6	
Nemertea						4				8
Anopla	Heteronemertea		Lineidae						2	
	Paleonemertea		Tubulanidae	*Tubulanus*	*frenatus*			2		
	Paleonemertea		Tubulanidae	*Tubulanus*	*polymorphus/pellucidus*					2
Enopla	Hoplonemertea	Monostilifera	Emplectonematidae	*Paranemertes*	*californica*	2	10	8	16	4
	Hoplonemertea	Monostilifera	Tetrastemmidae	*Tetrastemma*	sp		4			
Phorona	Phoronida						2			2
Porifera							2	1		

[a] Provisional species. Identified in parentheses is the taxonomist or organization who believes this species may be a new one because it does not fit known species descriptions for the area.

Table K-20. Species abundance data for Station 2243

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Annelida										
Oligochaeta							4	4		
Polychaeta										
Palpata	Flabelligerida	Terebellida	Flabelligeridae	*Pherusa*	*capulata*		2			2
	Phyllodocida		Glyceridae	*Glycera*	*americana*		2			
	Phyllodocida		Nereididae	*Neanthes*	*acuminata*		10	14	2	18
	Phyllodocida		Phyllodocidae	*Eteone*	sp 11 (Harris)[a]					2
	Phyllodocida		Polynoidae	*Halosydna*	*johnsoni*			2		
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*			2	2	2
	Phyllodocida		Syllidae	*Branchiosyllis*	sp		2	2		
	Phyllodocida		Syllidae	*Exogone*	*lourei*	176	434	144	116	248
	Phyllodocida		Syllidae	*Odontosyllis*	*phosphorea*		2			6
	Sabellida	Eunicida	Dorvilleidae	*Dorvillea (Schistomeringos)*	*longicornis*	8	2	4		
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	126	250	246	70	390
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*erecta*			6		4
	Spionida		Spionidae	*Prionospio*	*heterobranchia*	4	8			8
	Spionida		Spionidae	*Pseudopolydora*	*paucibranchiata*	28	36	16	8	20
	Spionida		Spionidae	*Spiophanes*	*berkeleyorum*		2			2
	Terebellida		Terebellidae	*Pista*	*percyi*		6	2		2
	Terebellida	Sabellida	Sabellidae	*Fabricinuda*	*limnicola*	20	26	10	4	
Scolecida	Capitellida		Capitellidae	*Mediomastus*	sp	46	88	76	42	112
	Capitellida		Capitellidae	*Scyphoproctus*	*oculatus*	6	204	26	8	54
	Opheliida		Opheliidae	*Armandia*	*brevis*		2			
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*		2	6		8
Arthropoda										
Malacostraca										
Eumalacostraca	Amphipoda		Aoridae	*Acuminodeutopus*	*stenopropodus*	12	2	4		2
	Amphipoda		Dexaminidae	*Paradexamine*	sp A			2	2	
	Amphipoda	Caprellidea	Caprellidae	*Caprella*	*natalenis*	4	22	28	4	22
	Amphipoda	Caprellidea	Protellidae	*Mayerella*	*banksia*	4	2		2	2
	Amphipoda	Gammaridea	Aoridae	*Bemlos*	*macromanus*		12	6		10
	Amphipoda	Gammaridea	Aoridae	*Grandidierella*	*japonica*	14				2
	Amphipoda	Gammaridea	Isaeidae	*Amphideutopus*	*oculatus*	12	2	4		2
	Amphipoda	Gammaridea	Leucothoidae	*Leucothoe*	*alata*		2			2
	Amphipoda	Gammaridea	Oedicerotidae	*Hartmanodes*	*hartmanae*	2				
	Amphipoda	Gammaridea	Oedicerotidae	*Synchelidium*	*rectipalmum*	2				
	Amphipoda	Gammaridea	Podoceridae	*Podocerus*	*fulanus*	12	28	76	6	30
	Cumacea		Diastylidae	*Oxyurostylis*	*pacifica*			2		
	Decapoda	Pleocyemata	Alpheidae	*Alpheus*	*californiensis*					2
	Decapoda	Pleocyemata	Hippolytidae	*Hippolyte*	*californiensis*					4
	Decapoda	Pleocyemata	Majidae	*Pyromaia*	*tuberculata*		2			4
	Isopoda	Asellota	Munnidae	*Uromunna*	*ubiquita*			2		
	Isopoda	Flabellifera	Serolidae	*Heteroserolis*	*carinata*			2		4

Table K-20. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Isopoda	Flabellifera	Sphaeromatidae	*Paracerceis*	*cordata*	6	40	124	4	122
	Stomatopod	Gammaridea	Squillidae	*Schmittius*	*politus*	2				
	Tanaidacea	Apseudomorpha	Tanaidae	*Kalliapseudes*	*crassus*	2				
	Tanaidacea	Tanaidomorpha	Leptocheliidae	*Leptochelia*	*dubia*				4	2
	Tanaidacea	Tanaidomorpha	Tanaidae	*Synaptotanais*	*notabilis*	14				
Ostracoda										
Myodocopa	Myodocopina		Philomedidae	*Euphilomedes*	*carcharodonta*	6		4		
Pycnogonida	Pegmata		Phoxichilidiidae	*Anoplodactylus*	sp	2				
Chordata										
Actinopterygii										
Neopterygii	Perciformes	Gobioidei	Gobiidae			6				2
Ascidiacea							1			2
Cnidaria										
Anthozoa										
Ceriantipatharia	Ceriantharia					2				
Hexacorallia	Actiniaria		Edwardsiidae	*Scolanthus*	sp B		4	4		6
Zoantharia	Actiniaria	Athenaria	Edwardsiidae	*Edwardsia*	*californica*	50	18	8	14	14
	Actiniaria	Thenaria	Diadumenidae				4			
Echinodermata										
Holothuroidea										
Apodacea	Apodida		Synaptidae	*Leptosynapta*	sp	2	4			2
Ophiuroidea	Ophiurida	Gnathophiurina	Amphiuridae	*Amphipholis*	sp		6			
Ophiuroidea	Ophiurida	Gnathophiurina	Amphiuridae	*Amphipholis*	*squamata*				4	2
Ectoprocta						1				
Gymnolaemata	Cheilostomata	Anasca	Thalamoporellidae	*Thalamoporella*	*californica*		1			
Gymnolaemata	Cheilostomata	Ascophora	Celleporidae	*Celleporina*	sp		1		1	
Gymnolaemata	Ctenostomata	Carnosa	Vesiculariidae	*Zoobotryon*	*pellucida*	1				1
Mollusca										
Bivalvia									2	
	Pholadomyoida		Lyonsiidae	*Lyonsia*	*californica*	18	36	30		16
Heterodonta	Veneroida		Cardiidae	*Laevicardium*	*substriatum*	2	6	4		
	Veneroida		Semelidae	*Theora*	*lubrica*	2				4
	Veneroida		Solecurtidae	*Tagelus*	*subteres*	2		2		
	Veneroida		Solenidae	*Solen*	*sicarius*	2	2			
	Veneroida		Tellinidae	*Macoma*	sp	2	4	10		6
Pteriomorphia	Mytiloida		Mytilidae	*Musculista*	*senhousei*	14	54	40	8	76
Gastropoda	Neotaenioglossa		Calyptraeidae	*Crucibulum*	*spinosum*	2				
Opisthobranchia	Cephalaspidea		Bullidae	*Bulla*	*gouldiana*	2	4		2	
	Cephalaspidea		Cylichnidae	*Acteocina*	*inculta*	58	18	2	2	
	Cephalaspidea		Haminoeidae	*Haminoea*	*vesicula*	4				
Prosobranchia	Neogastropoda		Columbellidae	*Alia*	*carinata*					4
	Neogastropoda		Nassariidae	*Nassarius*	*tegula*	4	4	10	6	6
Nematoda						48	54	134	36	106

Table K-20. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Nemertea										
Anopla	Paleonemertea		Tubulanidae	*Tubulanus*	*frenatus*		2			
Enopla	Hoplonemertea	Monostilifera	Emplectonematidae	*Paranemertes*	*californica*		4	8		
Phorona	Phoronida					10	6	18	2	6
Porifera							1	1		

[a] Provisional species. Identified in parentheses is the taxonomist or organization who believes this species may be a new one because it does not fit known species descriptions for the area.

Table K-21. Species abundance data for Station SW02

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Annelida										
Oligochaeta							4			
Polychaeta	Spionida		Cirratulidae	*Protocirrineris*	sp A	4	2	2	8	12
Palpata	Flabelligerida	Terebellida	Flabelligeridae	*Pherusa*	*capulata*					2
	Phyllodocida		Nereididae	*Neanthes*	*acuminata*	10	2	14	42	16
	Phyllodocida		Phyllodocidae	*Eteone*	sp 11 (Harris)[a]				2	2
	Phyllodocida		Polynoidae							2
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*	2		2	12	8
	Phyllodocida		Syllidae	*Exogone*	*lourei*	88	100	126	202	540
	Phyllodocida		Syllidae	*Odontosyllis*	*phosphorea*		8	18	24	54
	Phyllodocida		Syllidae	*Syllis (Typosyllis)*	*nipponica*				6	
	Phyllodocida	Eunicida	Onuphidae	*Diopatra*	*ornata*			2		
	Phyllodocida	Eunicida	Onuphidae	*Diopatra*	sp		2			
	Sabellida		Sabellidae	*Euchone*	*limnicola*	8	4	4	16	10
	Sabellida		Serpulidae	*Hydroides*	*pacificus*			2		
	Sabellida	Eunicida	Dorvilleidae	*Dorvillea (Schistomeringos)*	*longicornis*	32	16	34	60	116
	Sabellida	Eunicida	Eunicidae				2			
	Sabellida	Eunicida	Eunicidae	*Marphysa*	sp 1				2	
	Sabellida	Eunicida	Lumbrineridae					6	2	4
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	24	18	8	34	24
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*erecta*	2	2	8	6	6
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*limicola*		2	2		
	Sabellida	Eunicida	Oenonidae	*Drilonereis*	sp		2			
	Spionida		Spionidae	*Polydora*	sp	2				
	Spionida		Spionidae	*Prionospio*	*heterobranchia*	18	6	10	30	30
	Spionida		Spionidae	*Pseudopolydora*	*paucibranchiata*	196	134	368	386	238
	Spionida		Spionidae	*Scolelepis*	*occidentalis*				2	
	Spionida		Spionidae	*Scolelepis*	*squamatus*			2	4	2
	Terebellida		Terebellidae	*Pista*	*percyi*	10	6	6	2	26
Scolecida	Capitellida		Capitellidae	*Capitella*	*capitata complex*	2	2		2	2
	Capitellida		Capitellidae	*Mediomastus*	sp	10	8	4	14	8
	Capitellida		Capitellidae	*Scyphoproctus*	*oculatus*				4	
	Opheliida		Opheliidae	*Armandia*	*brevis*					6
	Opheliida		Opheliidae	*Polyophthalmus*	*pictus*				2	
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	6	14	10	18	8
Arthropoda										
Malacostraca	Decapoda	Natantia							2	
Eumalacostraca	Amphipoda		Aoridae	*Acuminodeutopus*	*stenopropodus*	6	10	10	64	30
	Amphipoda		Dexaminidae	*Paradexamine*	sp A				4	
	Amphipoda	Caprellidea	Protellidae	*Mayerella*	*banksia*	6	6	2	58	12
	Amphipoda	Gammaridea	Aoridae	*Grandidierella*	*japonica*	10		4	2	14
	Amphipoda	Gammaridea	Isaeidae	*Amphideutopus*	*oculatus*	8			6	4
	Amphipoda	Gammaridea	Isaeidae	*Photis*	sp	2		2		

Table K-21. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Amphipoda	Gammaridea	Melitidae	*Maera*	*simile*	2				
	Amphipoda	Gammaridea	Phoxocephalidae	*Heterophoxus*	*cf ellisi*					2
	Amphipoda	Gammaridea	Podoceridae	*Podocerus*	*fulanus*			2	14	2
	Decapoda	Pleocyemata	Axiidae	*Calocarides*	sp			4		
	Decapoda	Pleocyemata	Grapsidae	*Hemigrapsus*	*oregonensis*				2	
	Decapoda	Pleocyemata	Majidae	*Pyromaia*	*tuberculata*		2	2	6	
	Decapoda	Pleocyemata	Pinnotheridae	*Scleroplax*	*granulata*			2	4	2
	Isopoda	Anthuridea	Paranthuridae	*Paranthura*	*elegans*	6		4	18	6
	Isopoda	Flabellifera	Sphaeromatidae	*Paracerceis*	*cordata*		2			
	Mysidacea		Mysidae	*Heteromysis*	*odontops*	4		6	4	6
	Tanaidacea	Apseudomorpha	Tanaidae	*Kalliapseudes*	*crassus*	8	2	2	2	8
	Tanaidacea	Tanaidomorpha	Tanaidae	*Synaptotanais*	*notabilis*	40	12	18	24	20
Ostracoda										
Myodocopa	Myodocopina		Cylindroleberididae	*Postasterope*	*barnesi*	2			4	2
	Myodocopina		Philomedidae	*Euphilomedes*	*carcharodonta*	2	4		4	6
Chordata										
Actinopterygii										
Neopterygii	Perciformes	Gobioidei	Gobiidae					4	2	
Ascidiacea								2	2	
Cnidaria										
Anthozoa										
Hexacorallia	Actiniaria		Edwardsiidae	*Scolanthus*	sp B	4	2	2	6	
Echinodermata										
Holothuroidea										
Apodacea	Apodida		Synaptidae	*Leptosynapta*	sp			2		
Ectoprocta								1		
Gymnolaemata	Cheilostomata	Ascophora	Celleporidae	*Celleporina*	sp		1			
Mollusca										
Bivalvia	Pholadomyoida		Lyonsiidae	*Lyonsia*	*californica*	6	4	2	8	2
Heterodonta	Veneroida		Cardiidae	*Laevicardium*	*substriatum*			4		2
	Veneroida		Semelidae	*Theora*	*lubrica*	2	4	6		6
Pteriomorphia	Mytiloida		Mytilidae	*Musculista*	*senhousei*	94	156	108	184	300
	Mytiloida		Mytilidae	*Mytilus*	*galloprovincialis*					2
Gastropoda	Neotaenioglossa		Calyptraeidae	*Crepidula*	sp				2	
Opisthobranchia	Cephalaspidea		Bullidae	*Bulla*	*gouldiana*			4		2
Prosobranchia	Neogastropoda		Nassariidae	*Nassarius*	*tegula*	2	2			
Nematoda							4	16	12	18
Nemertea										
Enopla	Hoplonemertea	Monostilifera	Emplectonematidae	*Paranemertes*	*californica*	6			2	2
	Hoplonemertea	Monostilifera	Tetrastemmidae	*Tetrastemma*	sp				2	
Platyhelminthes										
Turbellaria	Polycladida	Acotylea	Stylochidae	*Imogine*	*exiguus*	2				

[a] Provisional species. Identified in parentheses is the taxonomist or organization who believes this species may be a new one because it does not fit known species descriptions for the area.

Table K-22. Species abundance data for Station SW03

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Annelida										
Oligochaeta						2			2	
Polychaeta	Spionida		Cirratulidae	*Protocirrineris*	sp A				4	
Palpata	Flabelligerida	Terebellida	Flabelligeridae	*Diplocirrus*	sp SD1		2	2		
	Flabelligerida	Terebellida	Flabelligeridae	*Pherusa*	*capulata*			2	2	6
	Phyllodocida		Polynoidae				2			
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*				4	8
	Phyllodocida		Syllidae	*Exogone*	*lourei*	2	30	16	136	20
	Phyllodocida		Syllidae	*Odontosyllis*	*phosphorea*		2			
	Phyllodocida		Syllidae	*Syllis (Typosyllis)*	*nipponica*			6	6	2
	Sabellida		Sabellidae	*Euchone*	*limnicola*			6	4	12
	Sabellida	Eunicida	Dorvilleidae	*Dorvillea (Schistomeringos)*	*longicornis*		4		6	
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	42	28	36	42	14
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*erecta*	4	2	4	12	6
	Sabellida	Eunicida	Oenonidae	*Drilonereis*	sp				2	
	Spionida		Poecilochaetidae	*Poecilochaetus*	*johnsoni*				4	
	Spionida		Spionidae	*Prionospio*	*heterobranchia*	16	16	8	16	20
	Spionida		Spionidae	*Pseudopolydora*	*paucibranchiata*	6	36	20	12	4
	Terebellida		Terebellidae	*Pista*	*percyi*	16	22	26	46	12
Scolecida	Capitellida		Capitellidae	*Capitella*	*capitata complex*				2	
	Capitellida		Capitellidae	*Mediomastus*	sp		2	4	26	6
	Cossurida		Cossuridae	*Cossura*	sp				2	
	Opheliida		Opheliidae	*Armandia*	*brevis*	2			2	2
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	12	34	36	28	26
Arthropoda										
Malacostraca										
Eumalacostraca	Amphipoda		Aoridae	*Acuminodeutopus*	*stenopropodus*	4	6	4	10	12
	Amphipoda	Caprellidea	Protellidae	*Mayerella*	*banksia*		2		12	4
	Amphipoda	Caprellidea	Protellidae	*Tritella*	sp					2
	Amphipoda	Gammaridea						2		
	Amphipoda	Gammaridea	Corophiidae							2
	Amphipoda	Gammaridea	Isaeidae	*Amphideutopus*	*oculatus*	10	72	24	52	60
	Amphipoda	Gammaridea	Liljeborgiidae	*Liljeborgia*	*geminata*	2				
	Amphipoda	Gammaridea	Oedicerotidae	*Synchelidium*	*rectipalmum*			2		2
	Amphipoda	Gammaridea	Phoxocephalidae	*Heterophoxus*	*cf ellisi*	8	12	4	12	8
	Amphipoda	Gammaridea	Podoceridae	*Podocerus*	*fulanus*					2
	Cumacea		Diastylidae	*Oxyurostylis*	*pacifica*		2			
	Decapoda	Pleocyemata	Alpheidae	*Alpheus*	*californiensis*		4	4		
	Decapoda	Pleocyemata	Alpheidae	*Betaeus*	*ensenadensis*	2				
	Decapoda	Pleocyemata	Axiidae	*Calocarides*	sp			2	4	
	Decapoda	Pleocyemata	Majidae			2				
	Decapoda	Pleocyemata	Majidae	*Pyromaia*	*tuberculata*	6				2
	Decapoda	Pleocyemata	Pinnotheridae	*Scleroplax*	*granulata*					2

Table K-22. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Isopoda	Flabellifera	Serolidae	*Heteroserolis*	*carinata*		8	6	8	14
	Mysidacea		Mysidae	*Heteromysis*	*odontops*	2	4	4	6	4
	Tanaidacea	Apseudomorpha	Tanaidae	*Kalliapseudes*	*crassus*					2
	Tanaidacea	Tanaidomorpha	Leptocheliidae	*Leptochelia*	*dubia*	2				
Ostracoda										
Myodocopa	Myodocopina		Philomedidae	*Euphilomedes*	*carcharodonta*		2	4	4	
Chordata										
Actinopterygii										
Neopterygii	Perciformes	Gobioidei	Gobiidae				2			
Cnidaria										
Anthozoa										
Hexacorallia	Actiniaria		Edwardsiidae	*Scolanthus*	sp B	2	4		2	
Zoantharia	Actiniaria	Athenaria	Edwardsiidae	*Edwardsia*	*californica*					2
Hydrozoa							1		1	
Ectoprocta										
Gymnolaemata	Cheilostomata	Ascophora	Celleporidae	*Celleporina*	sp				1	
Mollusca										
Bivalvia	Pholadomyoida		Lyonsiidae	*Lyonsia*	*californica*	2	2	16	2	
Heterodonta	Veneroida		Cardiidae	*Laevicardium*	*substriatum*	6	2	2	8	
	Veneroida		Semelidae	*Theora*	*lubrica*	52	66	18	36	38
Pteriomorphia	Mytiloida		Mytilidae	*Musculista*	*senhousei*	18	28	30	34	18
Gastropoda	Neotaenioglossa		Calyptraeidae	*Crepidula*	sp	2		2		
Opisthobranchia	Cephalaspidea		Cylichnidae	*Acteocina*	*inculta*			2		
	Cephalaspidea		Philinidae	*Philine*	sp				2	
Prosobranchia	Neogastropoda		Nassariidae	*Nassarius*	*tegula*	2				
Nemertea										
Anopla	Paleonemertea		Tubulanidae	*Tubulanus*	*frenatus*			2		
Enopla	Hoplonemertea	Monostilifera	Emplectonematidae	*Paranemertes*	*californica*	2	2	4		4
Platyhelminthes										
Turbellaria	Polycladida	Acotylea	Stylochidae	*Imogine*	*exiguus*	2			10	
Sipuncula										
Phascolosomatidea	Phascolosomatiformes		Phascolosomatidae	*Apionsoma*	*misakiana*	2				

Table K-23. Species abundance data for Station SW04

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Annelida										
Oligochaeta						6	16	16	6	20
Polychaeta	Spionida		Cirratulidae	*Protocirrineris*	sp A		4	8	2	6
Palpata	Phyllodocida		Glyceridae	*Glycera*	*americana*		2			
	Phyllodocida		Nereididae	*Neanthes*	*acuminata*	64	24	56	44	30
	Phyllodocida		Nereididae	*Platynereis*	*bicanaliculata*					2
	Phyllodocida		Polynoidae	*Halosydna*	*brevisetosa*				2	
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*	10	10	20	12	24
	Phyllodocida		Syllidae	*Exogone*	*lourei*	690	628	1398	678	756
	Phyllodocida		Syllidae	*Odontosyllis*	*phosphorea*		4	6	4	
	Phyllodocida		Syllidae	*Syllis(Typosyllis)*	*nipponica*			2		4
	Sabellida		Sabellidae	*Euchone*	*incolor*		2			2
	Sabellida	Eunicida	Dorvilleidae	*Dorvillea (Schistomeringos)*	*longicornis*	2		14	2	18
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	80	54	58	40	46
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*erecta*			2		
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*limicola*	4		2	2	6
	Spionida		Spionidae	*Microspio*	*pigmentata*			2		
	Spionida		Spionidae	*Polydora*	sp		8	8		4
	Spionida		Spionidae	*Prionospio*	*heterobranchia*	18	18	42	42	22
	Spionida		Spionidae	*Pseudopolydora*	*paucibranchiata*	1674	1250	2128	1556	1466
	Spionida		Spionidae	*Scolelepis*	sp 1 (PtLoma)	2		4	4	
	Spionida	Terebellida	Cirratulidae			2	8	4	2	8
Scolecida	Capitellida		Capitellidae	*Capitella*	*capitata complex*				4	2
	Capitellida		Capitellidae	*Mediomastus*	sp	6	16	34	16	10
	Capitellida		Capitellidae	*Notomastus*	*hemipodus*					2
	Capitellida		Capitellidae	*Scyphoproctus*	*oculatus*			144	6	2
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*			4	2	
Arthropoda										
Malacostraca										
Eumalacostraca	Amphipoda		Dexaminidae	*Paradexamine*	sp A	12	4	44	28	46
	Amphipoda	Caprellidea	Protellidae	*Mayerella*	*banksia*			4		2
	Amphipoda	Gammaridea	Ampithoidae	*Ampithoe*	*plumulosa*				2	10
	Amphipoda	Gammaridea	Aoridae	*Aoroides*	sp		8	16	16	40
	Amphipoda	Gammaridea	Aoridae	*Grandidierella*	*japonica*	48	62	58	36	20
	Amphipoda	Gammaridea	Hyalidae	*Hyale*	sp			2	14	24
	Amphipoda	Gammaridea	Ischyroceridae	*Ericthonius*	*brasiliensis*				8	10
	Amphipoda	Gammaridea	Melitidae	*Elasmopus*	sp			2		
	Amphipoda	Gammaridea	Podoceridae	*Podocerus*	*fulanus*	2	2	24	20	98
	Decapoda	Pleocyemata	Axiidae	*Calocarides*	sp			2		
	Decapoda	Pleocyemata	Grapsidae	*Hemigrapsus*	*oregonensis*			2	2	2
	Decapoda	Pleocyemata	Hippolytidae	*Hippolyte*	*californiensis*	2	2		10	14
	Isopoda	Anthuridea	Paranthuridae	*Paranthura*	*elegans*	32	32	46	26	38
	Isopoda	Asellota	Janiridae	*Janiralata*	sp					4

Table K-23. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Isopoda	Flabellifera	Serolidae	*Heteroserolis*	*carinata*	2				
	Isopoda	Flabellifera	Sphaeromatidae	*Paracerceis*	*cordata*	2	2	12	4	14
	Tanaidacea	Tanaidomorpha	Tanaidae	*Synaptotanais*	*notabilis*	92	72	634	144	268
Ostracoda										
Myodocopa	Myodocopina		Cylindroleberididae	*Postasterope*	*barnesi*				2	
	Myodocopina		Philomedidae	*Euphilomedes*	*carcharodonta*		2			
Chordata										
Actinopterygii										
Neopterygii	Perciformes	Gobioidei	Gobiidae						4	
Ascidiacea						2				
Cnidaria										
Anthozoa										
Hexacorallia	Actiniaria		Edwardsiidae	*Scolanthus*	sp B	6	6	4	14	
Zoantharia	Actinaria					2			4	
	Actiniaria	Athenaria	Edwardsiidae	*Edwardsia*	*californica*		4	8	8	2
Echinodermata										
Holothuroidea										
Apodacea	Apodida		Synaptidae	*Leptosynapta*	sp	2				
Ectoprocta										
Gymnolaemata	Cheilostomata	Ascophora	Celleporidae	*Celleporina*	sp					1
	Cheilostomata	Ascophora	Schizoporellidae	*Watersipora*	*cucullata*					1
	Ctenostomata	Carnosa	Vesiculariidae	*Zoobotryon*	*pellucida*	1				
Mollusca										
Bivalvia							2			
Heterodonta	Veneroida		Cardiidae	*Laevicardium*	*substriatum*	2				
	Veneroida		Veneridae	*Protothaca*	sp				2	
Pteriomorphia	Mytiloida		Mytilidae	*Musculista*	*senhousei*	46	52	82	22	24
Gastropoda	Neotaenioglossa		Calyptraeidae	*Crepidula*	sp			2		
Opisthobranchia	Cephalaspidea		Aglajidae	*Navanax*	*inermis*				2	
	Cephalaspidea		Bullidae	*Bulla*	*gouldiana*			2		
Prosobranchia	Neogastropoda		Nassariidae	*Nassarius*	*tegula*				2	
Nemertea							2		4	
Anopla	Heteronemertea		Lineidae							2
	Paleonemertea		Tubulanidae	*Tubulanus*	*polymorphus/pellucidus*				2	
Enopla	Hoplonemertea	Monostilifera	Emplectonematidae	*Paranemertes*	*californica*	6	4	2	2	8
Platyhelminthes										
Turbellaria										
Archoophora	Polycladida		Gnesiocerotidae	*Spinicirrus*	sp	2				
	Polycladida		Leptoplanidae	*Notoplana*	sp		2	2		

Table K-24. Species abundance data for Station SW08

Phylum/Class/						Field replicates				
Subclass	Order	Suborder	Family	Genus	Species	1	2	3	4	5
Annelida										
Oligochaeta						122	126	170	352	72
Polychaeta	Spionida		Cirratulidae	*Protocirrineris*	sp A			2		16
Palpata	Phyllodocida		Nephtyidae	*Nephtys*	*caecoides*			2		
	Phyllodocida		Nereididae	*Neanthes*	*acuminata*	54	16	16	30	62
	Phyllodocida		Phyllodocidae	*Eteone*	sp 11 (Harris)[a]	2				6
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*	48	18	48	16	62
	Phyllodocida		Syllidae	*Exogone*	*lourei*	532	350	324	686	968
	Phyllodocida		Syllidae	*Odontosyllis*	*phosphorea*					2
	Phyllodocida		Syllidae	*Syllis (Typosyllis)*	sp				2	2
	Sabellida	Eunicida	Dorvilleidae	*Dorvillea (Schistomeringos)*	*longicornis*	4			2	2
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	12	6	4	14	32
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*erecta*					2
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*limicola*	4	2		6	12
	Spionida		Spionidae							2
	Spionida		Spionidae	*Polydora*	*websteri*	164	48	26	18	16
	Spionida		Spionidae	*Prionospio*	*heterobranchia*	26	14	28	30	18
	Spionida		Spionidae	*Pseudopolydora*	*paucibranchiata*	634	332	340	378	252
	Spionida		Spionidae	*Scolelepis*	sp 1 (PtLoma)			2		2
	Spionida	Terebellida	Cirratulidae	*Cirriformia*	sp SD 2	2				
	Terebellida		Terebellidae	*Eupolymnia*	*heterobranchia*					2
	Terebellida		Terebellidae	*Nicolea*	sp A					2
	Terebellida		Terebellidae	*Pista*	*percyi*			2		
Scolecida	Capitellida		Capitellidae				4	10		
	Capitellida		Capitellidae	*Capitella*	*capitata complex*	2	2		4	4
	Capitellida		Capitellidae	*Mediomastus*	sp	10	20	8	2	48
	Capitellida		Capitellidae	*Notomastus*	*hemipodus*	2	26	24	6	
	Capitellida		Capitellidae	*Scyphoproctus*	*oculatus*	380	254	350	248	254
	Opheliida		Opheliidae	*Armandia*	*brevis*		4	2		
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	4	2	14	20	4
Arthropoda										
Copepoda	Harpacticoida								2	
Malacostraca										
Eumalacostraca	Amphipoda		Dexaminidae	*Paradexamine*	sp A	30	10	8	26	24
	Amphipoda	Caprellidea	Protellidae	*Mayerella*	*banksia*				2	
	Amphipoda	Gammaridea	Ampithoidae	*Ampithoe*	*plumulosa*	36	18	48	8	62
	Amphipoda	Gammaridea	Aoridae	*Aoroides*	sp	12	6	22	22	34
	Amphipoda	Gammaridea	Aoridae	*Grandidierella*	*japonica*	144	36	28	120	8
	Amphipoda	Gammaridea	Corophiidae						4	
	Amphipoda	Gammaridea	Hyalidae	*Hyale*	sp	6		2		24
	Amphipoda	Gammaridea	Ischyroceridae	*Ericthonius*	*brasiliensis*		4			12
	Amphipoda	Gammaridea	Podoceridae	*Podocerus*	*fulanus*	12	2	6	16	24
	Decapoda	Pleocyemata	Grapsidae	*Hemigrapsus*	*oregonensis*	2				

Table K-24. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Decapoda	Pleocyemata	Hippolytidae	*Hippolyte*	*californiensis*		2		6	12
	Decapoda	Pleocyemata	Processidae	*Ambidexter*	*panamensis*				2	
	Isopoda	Anthuridea	Paranthuridae	*Paranthura*	*elegans*	34	14	30	34	44
	Isopoda	Asellota	Janiridae	*Janiralata*	sp		2	4		
	Isopoda	Flabellifera	Sphaeromatidae	*Paracerceis*	*cordata*	6	2	2	2	36
	Tanaidacea	Apseudomorpha	Tanaidae	*Kalliapseudes*	*crassus*	2	4	8		
	Tanaidacea	Tanaidomorpha	Tanaidae	*Synaptotanais*	*notabilis*	684	212	260	350	532
Pycnogonida	Pegmata		Phoxichilidiidae	*Anoplodactylus*	*pacificus*					2
Chordata										
Actinopterygii										
Neopterygii	Perciformes	Gobioidei	Gobiidae			2				2
Ascidiacea										2
Cnidaria										
Anthozoa										
Hexacorallia	Actiniaria		Edwardsiidae	*Scolanthus*	sp B	6	4			4
Zoantharia	Actinaria								2	
	Actiniaria	Athenaria	Edwardsiidae	*Edwardsia*	*californica*	2		4	8	16
	Actiniaria	Athenaria	Edwardsiidae	*Edwardsia*	sp G (MEC)[a]			4	8	2
	Actiniaria	Thenaria	Diadumenidae			2		2	4	4
Echinodermata										
Holothuroidea										
Apodacea	Apodida		Synaptidae	*Leptosynapta*	sp	4	4	8	6	4
Mollusca										
Bivalvia	Pholadomyoida		Lyonsiidae	*Lyonsia*	*californica*					2
Heterodonta	Veneroida		Cardiidae	*Laevicardium*	*substriatum*		2			2
Pteriomorphia	Mytiloida		Mytilidae	*Musculista*	*senhousei*	146	68	44	90	106
Gastropoda	Neotaenioglossa		Rissoidae					2		2
	Patellogastropoda		Lotiidae	*Notoacmea*	*dipicta*	12	6	20		36
Opisthobranchia	Cephalaspidea		Aglajidae	*Navanax*	*inermis*	2				
	Cephalaspidea		Haminoeidae	*Haminoea*	*vesicula*	14		8	2	
Prosobranchia	Neogastropoda		Columbellidae	*Alia*	*carinata*					6
	Neogastropoda		Cystiscidae	*Granulina*	*margaritula*	10	2	8		6
	Neogastropoda		Nassariidae	*Nassarius*	*tegula*					2
Nematoda						8	58	56	36	58
Nemertea										
Anopla	Heteronemertea		Lineidae				2	4	2	
	Paleonemertea		Tubulanidae	*Tubulanus*	*polymorphus/pellucidus*			2		
Enopla	Hoplonemertea	Monostilifera	Emplectonematidae	*Paranemertes*	*californica*				2	
Porifera										1

[a] Provisional species. Identified in parentheses is the taxonomist or organization who believes this species may be a new one because it does not fit known species descriptions for the area.

Table K-25. Species abundance data for Station SW09

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Annelida										
Oligochaeta						2		6		
Polychaeta	Spionida		Cirratulidae	*Protocirrineris*	sp A			2		2
Palpata	Flabelligerida	Terebellida	Flabelligeridae	*Pherusa*	*capulata*		2	4	6	4
	Phyllodocida		Nereididae	*Neanthes*	*acuminata*	2	8	36	4	6
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*	14	24	22	6	14
	Phyllodocida		Syllidae	*Exogone*	*lourei*	162	408	188	64	42
	Phyllodocida		Syllidae	*Odontosyllis*	*phosphorea*	2		4		
	Phyllodocida		Syllidae	*Syllis(Typosyllis)*	*nipponica*	2	4	2	2	
	Sabellida		Sabellidae	*Euchone*	*limnicola*	2		4		
	Sabellida	Eunicida	Dorvilleidae	*Dorvillea (Schistomeringos)*	*longicornis*	2	20	52	10	6
	Sabellida	Eunicida	Lumbrineridae				2			
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	68	34	60	30	44
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*erecta*	12	16	16	6	2
	Spionida		Spionidae	*Prionospio*	*heterobranchia*	8	12	22		6
	Spionida		Spionidae	*Pseudopolydora*	*paucibranchiata*	24	58	64	16	
	Spionida	Terebellida	Cirratulidae			2	2	10		4
	Spionida	Terebellida	Cirratulidae	*Aphelochaeta*	*monilaris*		2			
	Spionida	Terebellida	Cirratulidae	*Aphelochaeta*	*phillipsi*	6	2	16	8	
	Spionida	Terebellida	Cirratulidae	*Aphelochaeta*	sp		2			
	Spionida	Terebellida	Cirratulidae	*Cirriformia*	sp		2	2	4	
	Terebellida		Terebellidae				2			
	Terebellida		Terebellidae	*Eupolymnia*	*heterobranchia*			8		
	Terebellida		Terebellidae	*Pista*	*percyi*	40	50	16	12	12
Scolecida	Capitellida		Capitellidae				2	2		
	Capitellida		Capitellidae	*Capitella*	*capitata complex*		2	6	6	
	Capitellida		Capitellidae	*Mediomastus*	sp	12	8	20	10	8
	Capitellida		Capitellidae	*Notomastus*	*magnus*			2		
	Capitellida		Capitellidae	*Notomastus*	sp					2
	Capitellida		Capitellidae	*Notomastus*	sp A	2				
	Opheliida		Opheliidae	*Polyophthalmus*	*pictus*				2	
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	16	42	32	16	14
Arthropoda										
Malacostraca										
Eumalacostraca	Amphipoda		Aoridae	*Acuminodeutopus*	*stenopropodus*	10	8	32	44	10
	Amphipoda		Dexaminidae	*Paradexamine*	sp A	4	12		2	
	Amphipoda	Caprellidea	Caprellidae	*Caprella*	*natalenis*			4		
	Amphipoda	Caprellidea	Protellidae	*Mayerella*	*banksia*	4	6	8	24	4
	Amphipoda	Gammaridea	Ampithoidae	*Ampithoe*	*plumulosa*			6	2	2
	Amphipoda	Gammaridea	Aoridae	*Bemlos*	*macromanus*	4	2			
	Amphipoda	Gammaridea	Aoridae	*Grandidierella*	*japonica*	8	14	16	6	
	Amphipoda	Gammaridea	Isaeidae	*Amphideutopus*	*oculatus*	14	2	4	4	
	Amphipoda	Gammaridea	Ischyroceridae	*Ericthonius*	*brasiliensis*			4		

Table K-25. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Amphipoda	Gammaridea	Podoceridae	*Podocerus*	*fulanus*	6	4	26	6	2
	Decapoda							2		
	Decapoda	Pleocyemata	Alpheidae	*Alpheus*	*californiensis*	2				
	Decapoda	Pleocyemata	Grapsidae	*Hemigrapsus*	*oregonensis*			2		
	Decapoda	Pleocyemata	Majidae	*Pyromaia*	*tuberculata*	4	6	6	2	2
	Decapoda	Pleocyemata	Pinnotheridae	*Pinnixa*	sp	2				
	Isopoda	Anthuridea	Paranthuridae	*Paranthura*	*elegans*	12	10	6		2
	Isopoda	Flabellifera	Sphaeromatidae	*Paracerceis*	*cordata*	10	4	16	12	2
	Mysidacea		Mysidae	*Heteromysis*	*odontops*	2		2	2	
	Tanaidacea	Tanaidomorpha	Leptocheliidae	*Leptochelia*	*dubia*	2				
	Tanaidacea	Tanaidomorpha	Tanaidae	*Synaptotanais*	*notabilis*		10	8	8	2
Ostracoda										
Myodocopa	Myodocopina		Cylindroleberididae	*Postasterope*	*barnesi*			2		
	Myodocopina		Philomedidae	*Euphilomedes*	*carcharodonta*		4	2	2	
Chordata										
Actinopterygii										
Neopterygii	Perciformes	Gobioidei	Gobiidae			6		2		
Ascidiacea	Aplousobranchia		Agnesiidae	*Agnesia*	*septentrionalis*			2		
Anthozoa										
Hexacorallia	Actiniaria		Edwardsiidae	*Scolanthus*	sp B	6	8		2	
Zoantharia	Actiniaria	Athenaria	Edwardsiidae	*Edwardsia*	*californica*		2	2		2
Echinodermata										
Ophiuroidea	Ophiurida	Gnathophiurina	Amphiuridae	*Amphipholis*	sp		2			
Mollusca										
Bivalvia	Pholadomyoida		Lyonsiidae	*Lyonsia*	*californica*		4	2		
Heterodonta	Veneroida		Cardiidae	*Laevicardium*	*substriatum*		4			2
	Veneroida		Semelidae	*Theora*	*lubrica*	6	6	2		
	Veneroida		Solecurtidae	*Tagelus*	sp	2				
Pteriomorphia	Mytiloida		Mytilidae	*Musculista*	*senhousei*	36	54	66	52	48
Gastropoda	Neotaenioglossa		Calyptraeidae	*Crepidula*	sp		2	4	2	
Opisthobranchia	Cephalaspidea		Bullidae	*Bulla*	*gouldiana*				2	
	Cephalaspidea		Cylichnidae	*Acteocina*	*inculta*				2	2
	Cephalaspidea		Haminoeidae	*Haminoea*	*vesicula*		6			
Prosobranchia	Neogastropoda		Muricidae	*Pteropurpura*	*festiva*		2	2		
	Neogastropoda		Nassariidae	*Nassarius*	*tegula*				2	
Nematoda							2			
Nemertea										
Anopla	Heteronemertea		Lineidae					2		
	Paleonemertea		Tubulanidae	*Tubulanus*	*polymorphus/pellucidus*	2				
Enopla	Hoplonemertea		Emplectonematidae	*Cryptonemertes*	*actinophila*		8			
	Hoplonemertea	Monostilifera	Emplectonematidae	*Paranemertes*	*californica*			2	2	4
	Hoplonemertea	Monostilifera	Tetrastemmidae	*Tetrastemma*	sp		2	2		

Table K-26. Species abundance data for Station SW11

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Annelida										
Oligochaeta						6	6	18	12	8
Polychaeta										
Palpata	Flabelligerida	Terebellida	Flabelligeridae	*Diplocirrus*	sp SD1			2	4	
	Flabelligerida	Terebellida	Flabelligeridae	*Pherusa*	*capulata*			4	6	4
	Phyllodocida		Aphroditidae	*Aphrodita*	*brevitentaculata*	2				
	Phyllodocida		Nereididae	*Neanthes*	*acuminata*	2		8	2	
	Phyllodocida		Phyllodocidae	*Eteone*	sp 11 (Harris)[a]			2	2	
	Phyllodocida		Polynoidae			2	2			2
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*	12	8	2	10	2
	Phyllodocida		Syllidae	*Exogone*	*lourei*	48	30	48	58	100
	Phyllodocida		Syllidae	*Odontosyllis*	*phosphorea*			2	4	
	Phyllodocida		Syllidae	*Syllis(Syllis)*	*gracilis*	2				2
	Phyllodocida		Syllidae	*Syllis(Typosyllis)*	*nipponica*	2			4	
	Phyllodocida		Syllidae	*Syllis(Typosyllis)*	sp					2
	Sabellida		Sabellidae	*Euchone*	*limnicola*	8	4		4	20
	Sabellida	Eunicida	Dorvilleidae	*Dorvillea (Schistomeringos)*	*longicornis*	8	10	32		14
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	98	82	154	134	162
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*erecta*	10	8	2	20	16
	Sabellida	Eunicida	Oenonidae	*Drilonereis*	sp		2			
	Spionida		Spionidae	*Prionospio*	*heterobranchia*	40	40	26	20	24
	Spionida		Spionidae	*Pseudopolydora*	*paucibranchiata*	16	20	28	12	12
	Spionida	Terebellida	Cirratulidae				4		6	
	Terebellida		Terebellidae	*Eupolymnia*	*heterobranchia*		6	4	6	2
	Terebellida		Terebellidae	*Pista*	*percyi*	22	56	38	58	40
Scolecida	Capitellida		Capitellidae	*Capitella*	*capitata complex*				2	
	Capitellida		Capitellidae	*Mediomastus*	sp	6	34	24	12	36
	Cossurida		Cossuridae	*Cossura*	sp		6	14	14	18
	Opheliida		Opheliidae	*Armandia*	*brevis*		2			
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	14	16	36	38	24
Arthropoda										
Malacostraca										
Eumalacostraca	Amphipoda		Aoridae	*Acuminodeutopus*	*stenopropodus*	4	2			6
	Amphipoda		Dexaminidae	*Paradexamine*	sp A			6		
	Amphipoda	Caprellidea	Caprellidae	*Caprella*	*natalenis*	2		6	8	
	Amphipoda	Gammaridea	Amphilochidae	*Gitanopsis*	*vilordes*	4				
	Amphipoda	Gammaridea	Ampithoidae	*Ampithoe*	*plumulosa*			4	4	
	Amphipoda	Gammaridea	Aoridae	*Grandidierella*	*japonica*	4	2	12	4	6
	Amphipoda	Gammaridea	Corophiidae				2			
	Amphipoda	Gammaridea	Isaeidae	*Amphideutopus*	*oculatus*	10	10		2	24
	Amphipoda	Gammaridea	Isaeidae	*Gammaropsis*	*thompsoni*	2		2	2	
	Amphipoda	Gammaridea	Ischyroceridae	*Ericthonius*	*brasiliensis*		2	6		
	Amphipoda	Gammaridea	Leucothoidae	*Leucothoe*	*alata*			2	2	

Table K-26. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Amphipoda	Gammaridea	Liljeborgiidae	*Liljeborgia*	*geminata*	2				
	Amphipoda	Gammaridea	Lysianassidae	*Aruga*	*holmesi*					2
	Amphipoda	Gammaridea	Melitidae	*Elasmopus*	sp			2		
	Amphipoda	Gammaridea	Melitidae	*Maera*	*simile*	2				
	Amphipoda	Gammaridea	Phoxocephalidae	*Heterophoxus*	*cf ellisi*	26	20	34	10	18
	Amphipoda	Gammaridea	Podoceridae	*Podocerus*	*fulanus*	88		88	42	14
	Decapoda	Pleocyemata	Alpheidae	*Alpheus*	*californiensis*	2	2			4
	Decapoda	Pleocyemata	Axiidae	*Calocarides*	sp				4	
	Decapoda	Pleocyemata	Hippolytidae	*Hippolyte*	*californiensis*	16		14		
	Decapoda	Pleocyemata	Majidae							2
	Decapoda	Pleocyemata	Majidae	*Pyromaia*	*tuberculata*	52	2	14	8	8
	Decapoda	Pleocyemata	Palaemonidae	*Periclimenes*	*infraspinus*				6	
	Decapoda	Pleocyemata	Pinnotheridae	*Scleroplax*	*granulata*					2
	Decapoda	Pleocyemata	Xanthidae	*Lophopanopeus*	sp	2	2			2
	Isopoda	Flabellifera	Serolidae	*Heteroserolis*	*carinata*		6	2		
	Isopoda	Flabellifera	Sphaeromatidae	*Paracerceis*	*cordata*	72		38	20	
	Mysidacea		Mysidae	*Heteromysis*	*odontops*	6	2	2	2	
	Tanaidacea	Apseudomorpha	Tanaidae	*Kalliapseudes*	*crassus*					2
	Tanaidacea	Tanaidomorpha	Leptocheliidae	*Leptochelia*	*dubia*	4			2	
	Tanaidacea	Tanaidomorpha	Tanaidae	*Synaptotanais*	*notabilis*	2		2	2	4
Arthropoda										
Ostracoda										
Myodocopa	Myodocopina		Cylindroleberididae	*Postasterope*	*barnesi*			2		
Myodocopa	Myodocopina		Philomedidae	*Euphilomedes*	*carcharodonta*		2	4		
Pycnogonida	Pegmata		Ammotheidae	*Achelia*	sp	2		2		
Chordata										
Actinopterygii										
Neopterygii	Perciformes	Gobioidei	Gobiidae				2			
Ascidiacea	Phlebobranchia		Ascidiidae	*Ascidian*	sp A			12		
Ascidiacea	Stolidobranchiata		Styelidae	*Styela*	sp			4		
Cnidaria										
Anthozoa										
Hexacorallia	Actiniaria		Edwardsiidae	*Scolanthus*	sp B		2			
Echinodermata										
Ophiuroidea	Ophiurida	Gnathophiurina	Amphiuridae	*Amphipholis*	sp		2			
Ophiuroidea	Ophiurida	Gnathophiurina	Amphiuridae	*Amphipholis*	*squamata*					2
Ectoprocta										1
Gymnolaemata	Cheilostomata	Ascophora	Celleporidae	*Celleporina*	sp	1	1	1	1	
	Cheilostomata	Ascophora	Schizoporellidae	*Watersipora*	*cucullata*	1			1	
	Ctenostomata	Carnosa	Vesiculariidae	*Zoobotryon*	*pellucida*	1		1		
Stenolaemata	Cyclostomata	Articulata	Crisiidae	*Crisia*	sp				1	
Mollusca										
Bivalvia	Pholadomyoida		Lyonsiidae	*Lyonsia*	*californica*		18			2

Table K-26. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Heterodonta	Veneroida		Cardiidae	*Laevicardium*	*substriatum*		6	2		
	Veneroida		Semelidae	*Theora*	*lubrica*	30	90	124	130	24
	Veneroida		Tellinidae	*Macoma*	sp				4	
	Veneroida		Veneridae	*Protothaca*	sp					2
Pteriomorphia	Mytiloida		Mytilidae	*Musculista*	*senhousei*	50	58	136	102	154
	Ostreoida		Pectinidae	*Leptopecten*	*latiauratus*	2				
Gastropoda	Heterostropha		Amathinidae	*Iselica*	*ovoidea*	2				
	Neotaenioglossa		Calyptraeidae	*Crepidula*	sp	2	2	6		
	Neotaenioglossa		Calyptraeidae	*Crucibulum*	*spinosum*	6	8	24	2	18
Opisthobranchia	Nudibranchia		Goniodorididae	*Ancula*	sp			18		
Nematoda							2	6		4
Nemertea										
Anopla	Heteronemertea		Lineidae					2		2
	Paleonemertea		Tubulanidae	*Tubulanus*	*polymorphus/pellucidus*					4
Enopla	Hoplonemertea	Monostilifera	Emplectonematidae	*Paranemertes*	*californica*		2	2		4

[a] Provisional species. Identified in parentheses is the taxonomist or organization who believes this species may be a new one because it does not fit known species descriptions for the area.

Table K-27. Species abundance data for Station SW13

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Annelida										
Oligochaeta						2			2	
Polychaeta	Spionida		Cirratulidae	*Protocirrineris*	sp A			54	22	4
Palpata	Flabelligerida	Terebellida	Flabelligeridae	*Diplocirrus*	sp SD1		2	4	4	
	Flabelligerida	Terebellida	Flabelligeridae	*Pherusa*	*capulata*	8		10	38	
	Phyllodocida		Chrysopetalidae	*Paleanotus*	*bellis*			2		
	Phyllodocida		Glyceridae	*Glycera*	*americana*			2		2
	Phyllodocida		Hesionidae	*Gyptis*	sp				2	
	Phyllodocida		Nereididae	*Neanthes*	*acuminata*	20	2	36	32	16
	Phyllodocida		Phyllodocidae	*Eumida*	*longicornuta*		2			
	Phyllodocida		Polynoidae						2	
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*	16	8	30	40	10
	Phyllodocida		Syllidae	*Amblyosyllis*	sp D (Harris)[a]			2		
	Phyllodocida		Syllidae	*Branchiosyllis*	sp			2		
	Phyllodocida		Syllidae	*Brania*	sp 8 (Harris)[a]			12		
	Phyllodocida		Syllidae	*Exogone*	*dwisula*			2	2	4
	Phyllodocida		Syllidae	*Exogone*	*lourei*	20	4	34	64	14
	Phyllodocida		Syllidae	*Odontosyllis*	*phosphorea*	4	2	2	14	
	Phyllodocida		Syllidae	*Syllis(Typosyllis)*	*nipponica*			4	18	4
	Phyllodocida		Syllidae	*Syllis(Typosyllis)*	sp	4		2	10	2
	Phyllodocida		Syllidae	*Trypanosyllis*	sp 1 (Harris)[a]			4		
	Sabellida		Sabellidae	*Euchone*	*limnicola*	4		4	2	
	Sabellida		Serpulidae	*Hydroides*	*gracilis*			8		
	Sabellida		Spirorbidae					84		
	Sabellida	Eunicida	Dorvilleidae	*Dorvillea (Schistomeringos)*	*longicornis*	12	8	58	214	8
	Sabellida	Eunicida	Eunicidae						2	
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	58	26	60	66	58
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*erecta*	6		6	8	10
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*limicola*			6	16	
	Sabellida	Eunicida	Oenonidae	*Drilonereis*	sp	2				
	Spionida		Spionidae	*Prionospio*	*heterobranchia*	8	4	10	14	6
	Spionida		Spionidae	*Pseudopolydora*	*paucibranchiata*	16	36	10	6	10
	Spionida	Terebellida	Cirratulidae			30	2	46	82	62
	Spionida	Terebellida	Cirratulidae	*Chaetozone*	*corona*			2		
	Spionida	Terebellida	Cirratulidae	*Cirriformia*	*spirabrancha*			2		
	Spionida	Terebellida	Cirratulidae	*Timarete*	*luxuriosa*	4		12	18	10
	Terebellida		Terebellidae	*Eupolymnia*	*heterobranchia*	4		24	30	2
	Terebellida		Terebellidae	*Nicolea*	sp A			24	16	
	Terebellida		Terebellidae	*Pista*	*percyi*	62	38	42	62	68
	Terebellida		Terebellidae	*Polycirrus*	sp			6	4	
Scolecida	Capitellida		Capitellidae	*Capitella*	*capitata complex*	2				
	Capitellida		Capitellidae	*Mediomastus*	sp	12	6	24	20	16
	Capitellida		Capitellidae	*Scyphoproctus*	*oculatus*	2				2

Table K-27. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Cossurida		Cossuridae	*Cossura*	sp			4	2	2
	Opheliida		Opheliidae	*Armandia*	*brevis*		2			2
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	28	14	34	64	56
Arthropoda										
Malacostraca										
Eumalacostraca	Amphipoda		Aoridae	*Acuminodeutopus*	*stenopropodus*	6	2	12	30	8
	Amphipoda		Dexaminidae	*Paradexamine*	sp A				2	
	Amphipoda	Caprellidea	Caprellidae	*Caprella*	sp				2	
	Amphipoda	Gammaridea	Ampithoidae	*Ampithoe*	*plumulosa*	2			6	
	Amphipoda	Gammaridea	Aoridae	*Bemlos*	*macromanus*				2	2
	Amphipoda	Gammaridea	Aoridae	*Grandidierella*	*japonica*	2	4	26	18	14
	Amphipoda	Gammaridea	Isaeidae	*Amphideutopus*	*oculatus*	6	12	12	6	6
	Amphipoda	Gammaridea	Liljeborgiidae	*Liljeborgia*	*geminata*			2	2	
	Amphipoda	Gammaridea	Lysianassidae	*Aruga*	*holmesi*			6		
	Amphipoda	Gammaridea	Lysianassidae	*Orchomene*	sp			2	2	
	Amphipoda	Gammaridea	Melitidae	*Elasmopus*	sp			2		
	Amphipoda	Gammaridea	Oedicerotidae	*Hartmanodes*	*hartmanae*		2			
	Amphipoda	Gammaridea	Oedicerotidae	*Synchelidium*	*rectipalmum*			2		
	Amphipoda	Gammaridea	Phoxocephalidae	*Heterophoxus*	*cf ellisi*	4		2	8	
	Amphipoda	Gammaridea	Podoceridae	*Podocerus*	*fulanus*	2		26	56	
	Decapoda	Pleocyemata	Alpheidae	*Alpheus*	*californiensis*		2	6		
	Decapoda	Pleocyemata	Axiidae	*Calocarides*	sp			2		
	Decapoda	Pleocyemata	Crangonidae	*Metacrangon*	*spinosissima*					2
	Decapoda	Pleocyemata	Hippolytidae	*Hippolyte*	*californiensis*	4		2		
	Decapoda	Pleocyemata	Majidae			2	4	6		2
	Decapoda	Pleocyemata	Majidae	*Loxorhynchus*	sp		2			
	Decapoda	Pleocyemata	Majidae	*Pyromaia*	*tuberculata*	10	14	16	16	8
	Decapoda	Pleocyemata	Majidae	*Scyra*	*acutifrons*			2		
	Decapoda	Pleocyemata	Xanthidae	*Lophopanopeus*	sp	4	2	16	2	2
	Isopoda	Flabellifera	Sphaeromatidae	*Paracerceis*	*cordata*	4		8	10	
	Mysidacea		Mysidae	*Heteromysis*	*odontops*			6		
	Stomatopod	Gammaridea	Squillidae	*Schmittius*	*politus*			2		
	Tanaidacea	Apseudomorpha	Tanaidae	*Kalliapseudes*	*crassus*			2	6	2
	Tanaidacea	Tanaidomorpha	Leptocheliidae	*Leptochelia*	*dubia*			2	4	
	Tanaidacea	Tanaidomorpha	Tanaidae	*Synaptotanais*	*notabilis*	2	2	4	16	12
Phyllocarida	Leptostraca		Nebaliidae	*Nebalia*	*pugettensis*			2		
Ostracoda										
Myodocopa	Myodocopina		Cylindroleberididae	*Postasterope*	*barnesi*				6	
	Myodocopina		Philomedidae	*Euphilomedes*	*carcharodonta*	4	4			6
Chordata										
Actinopterygii										
Neopterygii	Perciformes	Gobioidei	Gobiidae					2		2
Ascidiacea								4	4	2

Table K-27. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Aplousobranchia									1
	Phlebobranchia		Ascidiidae	*Ascidian*	sp A	2		42	18	
	Stolidobranchiata		Styelidae	*Botryllus*	sp					1
	Stolidobranchiata		Styelidae	*Styela*	sp	2		2	2	
Cnidaria										
Anthozoa										
Zoantharia	Actiniaria	Athenaria	Edwardsiidae	*Edwardsia*	*californica*	2				
Echinodermata										
Ophiuroidea	Ophiurida	Gnathophiurina	Amphiuridae						8	
	Ophiurida	Gnathophiurina	Amphiuridae	*Amphipholis*	*squamata*				2	
Ectoprocta										
Gymnolaemata	Cheilostomata	Ascophora	Celleporidae	*Celleporina*	sp	1				
Stenolaemata	Cyclostomata	Articulata	Crisiidae	*Filicrisia*	sp		1	1		
Mollusca										
Bivalvia										
Heterodonta	Myoida		Hiatellidae	*Hiatella*	*arctica*	2				
	Veneroida		Cardiidae	*Laevicardium*	*substriatum*		4			
	Veneroida		Semelidae	*Theora*	*lubrica*	168	40	30	68	26
	Veneroida		Tellinidae	*Macoma*	sp				4	
Pteriomorphia	Mytiloida		Mytilidae	*Musculista*	*senhousei*	10	6	20	22	46
	Mytiloida		Mytilidae	*Mytilus*	*galloprovincialis*			14	22	
	Ostreoida		Ostreidae	*Ostrea*	*conchaphila*		2	58	90	2
Gastropoda	Heterostropha		Pyramidellidae	*Turbonilla*	sp	2			2	
	Neotaenioglossa		Calyptraeidae	*Crepidula*	sp	2				
Opisthobranchia	Cephalaspidea		Bullidae	*Bulla*	*gouldiana*				2	
	Cephalaspidea		Haminoeidae	*Haminoea*	*vesicula*				2	
	Cephalaspidea		Haminoeidae	*Haminoea*	*virescens*			2		
	Nudibranchia		Notodorididae	*Aegires*	*albopunctatus*			2	2	
Prosobranchia	Neogastropoda		Columbellidae	*Alia*	*carinata*	2				
	Neogastropoda		Muricidae	*Ocenebra*	sp	2		2		
	Neogastropoda		Muricidae	*Pteropurpura*	*festiva*	2				
	Neogastropoda		Nassariidae	*Nassarius*	*tegula*	4	10			
Nematoda						2				4
Nemertea							2			
Anopla	Heteronemertea		Lineidae			2				
	Paleonemertea		Tubulanidae	*Tubulanus*	*polymorphus/pellucidus*			2		
Enopla	Hoplonemertea	Monostilifera	Emplectonematidae	*Paranemertes*	*californica*					2
Platyhelminthes									2	
Turbellaria	Polycladida	Acotylea	Stylochidae	*Imogine*	*exiguus*					2
Archoophora	Polycladida		Leptoplanidae	*Notoplana*	sp					2
Porifera								1	1	

[a] Provisional species. Identified in parentheses is the taxonomist or organization who believes this species may be a new one because it does not fit known species descriptions for the area.

Table K-28. Species abundance data for Station SW15

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Annelida										
Oligochaeta							4		2	
Polychaeta	Spionida		Cirratulidae	*Protocirrineris*	sp A		16	8	16	6
Palpata	Flabelligerida	Terebellida	Flabelligeridae	*Diplocirrus*	sp SD1	20	12	4	14	14
	Flabelligerida	Terebellida	Flabelligeridae	*Pherusa*	*capulata*	16	16	20	10	32
	Flabelligerida	Terebellida	Flabelligeridae	*Piromis*	sp		2			
	Phyllodocida		Aphroditidae	*Aphrodita*	sp				2	2
	Phyllodocida		Glyceridae	*Glycera*	*americana*					2
	Phyllodocida		Nereididae	*Neanthes*	*acuminata*	4	6	12	6	12
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*	14	20	4	14	16
	Phyllodocida		Syllidae				14			4
	Phyllodocida		Syllidae	*Amblyosyllis*	sp D (Harris)[a]		6			
	Phyllodocida		Syllidae	*Brania*	*californiensis*		10		2	
	Phyllodocida		Syllidae	*Exogone*	*lourei*	2	10	18	16	26
	Phyllodocida		Syllidae	*Odontosyllis*	*phosphorea*		2			2
	Phyllodocida		Syllidae	*Syllis(Syllis)*	*gracilis*		82	14	12	4
	Phyllodocida		Syllidae	*Syllis(Typosyllis)*	*aciculata*	4	44	4	2	
	Phyllodocida		Syllidae	*Trypanosyllis*	sp 1 (Harris)[a]		2		2	
	Sabellida		Sabellidae	*Euchone*	*limnicola*	20	68	80	20	70
	Sabellida		Sabellidae	*Myxicola*	*infundibulum*		2			
	Sabellida		Serpulidae	*Hydroides*	*pacificus*		2	2		2
	Sabellida		Spirorbidae				2			
	Sabellida	Eunicida	Dorvilleidae	*Dorvillea (Schistomeringos)*	*longicornis*	14	46	22	28	28
	Sabellida	Eunicida	Eunicidae					2		
	Sabellida	Eunicida	Eunicidae	*Nematonereis*	sp		2			
	Sabellida	Eunicida	Lumbrineridae				6	4	2	2
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	62	44	52	44	72
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*limicola*	14	44	20	34	62
	Sabellida	Eunicida	Oenonidae	*Drilonereis*	sp		2			
	Spionida		Spionidae	*Polydora*	sp		2			
	Spionida		Spionidae	*Prionospio*	*heterobranchia*	26	18	20	10	20
	Spionida		Spionidae	*Pseudopolydora*	*paucibranchiata*	16	44	30	10	70
	Spionida		Spionidae	*Scolelepis*	sp 1 (PtLoma)		2			
	Spionida		Spionidae	*Spiophanes*	*duplex*		2	2		
	Spionida	Terebellida	Cirratulidae			2	6	12	8	6
	Spionida	Terebellida	Cirratulidae	*Aphelochaeta*	*phillipsi*	10	4	6		10
	Spionida	Terebellida	Cirratulidae	*Aphelochaeta*	sp	2				
	Spionida	Terebellida	Cirratulidae	*Cirriformia*	sp		2			
	Terebellida		Terebellidae			2	2	2		
	Terebellida		Terebellidae	*Eupolymnia*	*heterobranchia*	8	10	8		2
	Terebellida		Terebellidae	*Nicolea*	sp A	4	2		2	2
	Terebellida		Terebellidae	*Pista*	*percyi*	2	12	14	2	18
	Terebellida		Terebellidae	*Polycirrus*	*californicus*		2			

Table K-28. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Terebellida		Terebellidae	*Polycirrus*	sp	2	4			2
	Terebellida	Sabellida	Sabellariidae	*Sabellaria*	*gracilis*				2	
Scolecida	Capitellida		Capitellidae					2		
	Capitellida		Capitellidae	*Mediomastus*	sp	20	28	24	14	48
	Capitellida		Capitellidae	*Notomastus*	sp		2			
	Capitellida		Capitellidae	*Scyphoproctus*	*oculatus*		12			
	Cossurida		Cossuridae	*Cossura*	sp		4	4		6
	Opheliida		Opheliidae	*Armandia*	*brevis*		2	2		
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	22	14	26	4	16
Arthropoda										
Malacostraca										
Eumalacostraca	Amphipoda		Aoridae	*Acuminodeutopus*	*stenopropodus*					8
	Amphipoda	Gammaridea	Ampeliscidae	*Ampelisca*	*lobata*	2	2			
	Amphipoda	Gammaridea	Aoridae	*Grandidierella*	*japonica*	24	2	4	6	22
	Amphipoda	Gammaridea	Corophiidae				2			
	Amphipoda	Gammaridea	Isaeidae	*Amphideutopus*	*oculatus*	2		2		2
	Amphipoda	Gammaridea	Isaeidae	*Gammaropsis*	*thompsoni*			2		
	Amphipoda	Gammaridea	Leucothoidae	*Leucothoe*	*alata*	10	18			
	Amphipoda	Gammaridea	Liljeborgiidae	*Liljeborgia*	*geminata*	4			6	
	Amphipoda	Gammaridea	Lysianassidae	*Orchomene*	sp		4			
	Amphipoda	Gammaridea	Melitidae	*Elasmopus*	*rapax*	2	6			
	Amphipoda	Gammaridea	Melitidae	*Maera*	*simile*		20	2		
	Amphipoda	Gammaridea	Phoxocephalidae	*Heterophoxus*	*cf ellisi*	4	6	10	10	6
	Decapoda	Pleocyemata	Grapsidae			2				
	Decapoda	Pleocyemata	Majidae			2	2		4	4
	Decapoda	Pleocyemata	Majidae	*Pyromaia*	*tuberculata*	10	14	10	8	8
	Decapoda	Pleocyemata	Xanthidae	*Lophopanopeus*	sp				2	6
	Isopoda	Flabellifera	Serolidae	*Heteroserolis*	*carinata*		2			
	Isopoda	Flabellifera	Sphaeromatidae	*Paracerceis*	*cordata*	2	6	4		
	Mysidacea		Mysidae	*Heteromysis*	*odontops*	10	4	8	4	6
	Tanaidacea	Tanaidomorpha	Leptocheliidae	*Leptochelia*	*dubia*		2		2	4
	Tanaidacea	Tanaidomorpha	Tanaidae	*Synaptotanais*	*notabilis*				2	
Ostracoda										
Myodocopa	Myodocopina		Cylindroleberididae	*Postasterope*	*barnesi*	2	4	2	2	
	Myodocopina		Philomedidae	*Euphilomedes*	*carcharodonta*		2	2		
Chordata										
Ascidiacea							2			
	Aplousobranchia					1	1			
	Aplousobranchia		Cionidae	*Ciona*	*intestinalis*		16	2	2	
	Phlebobranchia		Ascidiidae	*Ascidian*	sp A	14	24	2	6	18
Cnidaria										
Anthozoa										
Hexacorallia	Actiniaria		Edwardsiidae	*Scolanthus*	sp B		2			2

Table K-28. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Zoantharia	Actinaria									4
	Actiniaria	Thenaria	Diadumenidae			2	2	4	2	2
Hydrozoa							1			
Hydrozoa	Athecatae	Anthomedusae	Corymorphidae	*Syncoryne*	sp	1	1			
Echinodermata										
Ophiuroidea							2			
	Ophiurida	Gnathophiurina	Amphiuridae	*Amphipholis*	sp					2
Ectoprocta										1
Gymnolaemata	Ctenostomata	Carnosa	Vesiculariidae	*Zoobotryon*	*pellucida*		1			1
Stenolaemata	Cyclostomata	Articulata	Crisiidae	*Crisia*	sp				1	
Mollusca										
Bivalvia										
Heterodonta	Myoida		Myidae	*Mya*	*arenaria*	2	22	4	4	8
	Veneroida		Cardiidae	*Nemocardium*	*centifilosum*	2				
	Veneroida		Semelidae	*Theora*	*lubrica*	210	148	222	124	210
	Veneroida		Solecurtidae	*Tagelus*	*subteres*		2	2		
	Veneroida		Veneridae	*Chione*	*californiensis*			6		
	Veneroida		Veneridae	*Protothaca*	*laciniata*			2		
Pteriomorphia	Mytiloida		Mytilidae	*Musculista*	*senhousei*					4
	Mytiloida		Mytilidae	*Mytilus*	*galloprovincialis*	4	18	4	2	2
	Ostreoida		Ostreidae	*Ostrea*	*conchaphila*	20	52	44	48	86
	Ostreoida		Pectinidae	*Leptopecten*	*latiauratus*		2			
Gastropoda	Heterostropha		Pyramidellidae	*Odostomia*	sp	8	2	6	4	
	Neotaenioglossa		Calyptraeidae	*Crepidula*	sp		6			
	Neotaenioglossa		Calyptraeidae	*Crucibulum*	*spinosum*	2	10	24	18	8
Opisthobranchia	Cephalaspidea		Philinidae	*Philine*	sp			4		
	Nudibranchia					2	2			
	Nudibranchia		Notodorididae	*Aegires*	*albopunctatus*			2		
	Nudibranchia		Onchidorididae	*Acanthodoris*	*hudsoni*					2
	Nudibranchia		Tritoniidae	*Tritonia*	sp		2			
Prosobranchia	Neogastropoda		Muricidae	*Pteropurpura*	*festiva*		2			
Nematoda						2	16	2	2	6
Nemertea										2
Anopla	Heteronemertea		Lineidae				2			
Enopla	Hoplonemertea	Monostilifera	Emplectonematidae	*Paranemertes*	*californica*	4	2			
Platyhelminthes										
Turbellaria										
Archoophora	Polycladida		Gnesiocerotidae	*Spinicirrus*	sp					2
Porifera						1	1	1	1	
Calcerea										
Calcaronea	Leucosoleniida		Leucoleniidae	*Leucosolenia*	sp			1		1

[a] Provisional species. Identified in parentheses is the taxonomist or organization who believes this species may be a new one because it does not fit known species descriptions for the area.

Table K-29. Species abundance data for Station SW17

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Annelida										
Polychaeta	Spionida		Cirratulidae	*Protocirrineris*	sp A	28	42	56	32	32
	Flabelligerida	Terebellida	Flabelligeridae	*Diplocirrus*	sp SD1	10	18	16	2	
	Phyllodocida		Nephtyidae	*Nephtys*	*cornuta*	2		2		
	Phyllodocida		Nereididae	*Neanthes*	*acuminata*			6		
	Phyllodocida		Phyllodocidae	*Eteone*	sp 11 (Harris)[a]	2				
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*	2		4		2
	Phyllodocida		Sigalionidae	*Sthenelanella*	*uniformis*		2			
	Phyllodocida		Syllidae	*Exogone*	*lourei*	22	26	6	10	4
	Phyllodocida		Syllidae	*Odontosyllis*	*phosphorea*	2	2			
	Phyllodocida		Syllidae	*Syllis (Syllis)*	*gracilis*		2			
	Phyllodocida		Syllidae	*Syllis (Typosyllis)*	*nipponica*	4	8	2	2	2
	Sabellida		Sabellidae	*Euchone*	*limnicola*	2		6		
	Sabellida	Eunicida	Dorvilleidae	*Dorvillea (Schistomeringos)*	*longicornis*	24	8	32	6	32
	Sabellida	Eunicida	Lumbrineridae							4
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	146	102	128	96	112
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*erecta*	6	8	14	2	12
	Spionida		Chaetopteridae	*Spiochaetopterus*	*costarum*					2
	Spionida		Poecilochaetidae	*Poecilochaetus*	sp A (Martin 1977)[a]			2		
	Spionida		Spionidae	*Prionospio*	*heterobranchia*	6	16	10	4	8
	Terebellida		Ampharetidae	*Amphicteis*	*scaphobranchiata*		2			
	Terebellida		Terebellidae	*Amaeana*	*occidentalis*	2				
	Terebellida		Terebellidae	*Pista*	*percyi*	96	134	78	134	188
Scolecida	Capitellida		Capitellidae	*Mediomastus*	sp	14	14	34	8	10
	Capitellida		Capitellidae	*Notomastus*	sp A	2				
	Cossurida		Cossuridae	*Cossura*	sp	4		2	4	8
	Opheliida		Opheliidae	*Armandia*	*brevis*	2				
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	40	50	34	6	48
Arthropoda										
Malacostraca										
Eumalacostraca	Amphipoda		Aoridae	*Acuminodeutopus*	*stenopropodus*	4	6	6	2	2
	Amphipoda	Gammaridea	Aoridae	*Grandidierella*	*japonica*		2	4	2	
	Amphipoda	Gammaridea	Isaeidae	*Amphideutopus*	*oculatus*	10	12	16	8	4
	Amphipoda	Gammaridea	Lysianassidae	*Aruga*	*holmesi*		2			
	Amphipoda	Gammaridea	Phoxocephalidae	*Heterophoxus*	*cf ellisi*			14	12	10
	Amphipoda	Gammaridea	Podoceridae	*Podocerus*	*fulanus*			2		
	Decapoda	Pleocyemata	Alpheidae	*Alpheus*	*californiensis*					4
	Decapoda	Pleocyemata	Axiidae	*Calocarides*	sp			20		
	Decapoda	Pleocyemata	Majidae				4			
	Decapoda	Pleocyemata	Majidae	*Pyromaia*	*tuberculata*	2	2	4		
	Decapoda	Pleocyemata	Pinnotheridae	*Scleroplax*	*granulata*				2	2
	Decapoda	Pleocyemata	Processidae	*Ambidexter*	*panamensis*			2		4
	Isopoda	Flabellifera	Serolidae	*Heteroserolis*	*carinata*	2		10		

Table K-29. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Mysidacea		Mysidae	*Heteromysis*	*odontops*					2
	Stomatopod	Gammaridea	Squillidae	*Schmittius*	*politus*	2				
	Tanaidacea	Apseudomorpha	Tanaidae	*Kalliapseudes*	*crassus*		10	6		
	Tanaidacea	Tanaidomorpha	Tanaidae	*Synaptotanais*	*notabilis*					2
Ostracoda										
Myodocopa	Myodocopina		Philomedidae	*Euphilomedes*	*carcharodonta*	2				
Pycnogonida	Pegmata		Phoxichilidiidae	*Anoplodactylus*	*erectus*			2		
Chordata										
Actinopterygii										
Neopterygii	Batrachoidiformes		Batrachoididae	*Porichthys*	*myriaster*		2			
	Perciformes	Gobioidei	Gobiidae					2		
Cnidaria										
Anthozoa										
Hexacorallia	Actiniaria		Edwardsiidae	*Scolanthus*	sp B	2				2
Ectoprocta										
Gymnolaemata	Ctenostomata	Carnosa	Vesiculariidae	*Zoobotryon*	*pellucida*	1				
Mollusca										
Bivalvia										
Heterodonta	Veneroida		Cardiidae	*Laevicardium*	*substriatum*		2			
	Veneroida		Semelidae	*Theora*	*lubrica*	280	136	106	58	94
	Veneroida		Tellinidae	*Macoma*	sp			6		
Pteriomorphia	Mytiloida		Mytilidae	*Musculista*	*senhousei*	10	20	8	28	28
	Mytiloida		Mytilidae	*Mytilus*	*galloprovincialis*				2	
Gastropoda	Heterostropha		Acteonidae	*Rictaxis*	*punctocaelatus*		2	2		
	Neotaenioglossa		Caecidae	*Caecum*	*crebricinctum*		2			
Opisthobranchia	Cephalaspidea		Cylichnidae	*Acteocina*	*inculta*	2				
	Cephalaspidea		Philinidae	*Philine*	sp A (SCAMIT)[a]		2			
	Nudibranchia					2				
Nemertea							2			
Anopla	Heteronemertea		Lineidae			8	4	18	6	4
	Paleonemertea		Tubulanidae	*Tubulanus*	*frenatus*	2				
	Paleonemertea		Tubulanidae	*Tubulanus*	*polymorphus/pellucidus*	2	2	2		2
Enopla	Hoplonemertea	Monostilifera	Emplectonematidae	*Paranemertes*	*californica*			2		

[a] Provisional species. Identified in parentheses is the taxonomist or organization who believes this species may be a new one because it does not fit known species descriptions for the area.

Table K-30. Species abundance data for Station SW18

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	 2	 3	 4	 5
Annelida										
Oligochaeta						2		4	6	
Polychaeta	Spionida		Cirratulidae	*Protocirrineris*	sp A	6	4	10	24	40
Palpata	Flabelligerida	Terebellida	Flabelligeridae	*Diplocirrus*	sp SD1	4			2	
	Flabelligerida	Terebellida	Flabelligeridae	*Pherusa*	*capulata*	8		6	4	14
	Phyllodocida		Aphroditidae	*Aphrodita*	*brevitentaculata*	2		2	2	
	Phyllodocida		Nereididae	*Neanthes*	*acuminata*	2	2	2		
	Phyllodocida		Phyllodocidae	*Eumida*	*longicornuta*					4
	Phyllodocida		Polynoidae			2				
	Phyllodocida		Polynoidae	*Halosydna*	*johnsoni*	2				
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*	22	2	6	4	12
	Phyllodocida		Sigalionidae	*Sthenelanella*	*uniformis*	2			2	
	Phyllodocida		Syllidae	*Exogone*	*lourei*	74	32	70	62	56
	Phyllodocida		Syllidae	*Odontosyllis*	*phosphorea*					4
	Phyllodocida		Syllidae	*Syllis(Typosyllis)*	*nipponica*	8	6			12
	Sabellida		Sabellidae	*Euchone*	*limnicola*	10		2	2	2
	Sabellida		Serpulidae	*Hydroides*	*pacificus*					4
	Sabellida	Eunicida	Dorvilleidae	*Dorvillea (Schistomeringos)*	*longicornis*	20	8	14	2	20
	Sabellida	Eunicida	Eunicidae	*Marphysa*	sp 1		2		2	
	Sabellida	Eunicida	Lumbrineridae			4			4	
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	112	52	112	148	128
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*erecta*	10	8	14	8	8
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*limicola*					2
	Sabellida	Eunicida	Oenonidae	*Drilonereis*	sp		2			
	Spionida		Spionidae	*Polydora*	sp		2			
	Spionida		Spionidae	*Prionospio*	*heterobranchia*	32	16	12	14	30
	Spionida		Spionidae	*Pseudopolydora*	*paucibranchiata*	6	4	18	10	22
	Spionida	Terebellida	Cirratulidae						2	
	Terebellida		Terebellidae	*Eupolymnia*	*heterobranchia*	8				4
	Terebellida		Terebellidae	*Nicolea*	sp A	4				
	Terebellida		Terebellidae	*Pista*	*percyi*	66	122	120	52	74
Scolecida	Capitellida		Capitellidae	*Mediomastus*	sp	14	6	14	12	20
	Cossurida		Cossuridae	*Cossura*	sp	16	4	4	8	2
	Opheliida		Opheliidae	*Armandia*	*brevis*				4	
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	10		4	8	16
Arthropoda										
Malacostraca										
Eumalacostraca	Amphipoda		Aoridae	*Acuminodeutopus*	*stenopropodus*			2		4
	Amphipoda	Gammaridea	Aoridae	*Grandidierella*	*japonica*	18	12	52	14	20
	Amphipoda	Gammaridea	Isaeidae	*Amphideutopus*	*oculatus*	4	12	16	16	24
	Amphipoda	Gammaridea	Ischyroceridae	*Ericthonius*	*brasiliensis*	2				
	Amphipoda	Gammaridea	Liljeborgiidae	*Liljeborgia*	*geminata*				2	
	Amphipoda	Gammaridea	Phoxocephalidae	*Heterophoxus*	*cf ellisi*	64	30	58	34	40

Table K-30. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Amphipoda	Gammaridea	Podoceridae	*Podocerus*	*fulanus*				4	
	Decapoda	Pleocyemata	Alpheidae	*Alpheus*	*californiensis*		2			2
	Decapoda	Pleocyemata	Majidae				2	2	8	
	Decapoda	Pleocyemata	Majidae	*Pyromaia*	*tuberculata*	4	2	10	6	6
	Decapoda	Pleocyemata	Pinnotheridae	*Pinnixa*	sp					2
	Decapoda	Pleocyemata	Pinnotheridae	*Scleroplax*	*granulata*	2				
	Decapoda	Pleocyemata	Xanthidae	*Lophopanopeus*	sp	2	2			
	Isopoda	Flabellifera	Serolidae	*Heteroserolis*	*carinata*		4	4	8	16
	Mysidacea		Mysidae	*Heteromysis*	*odontops*	4		4	8	4
	Tanaidacea	Apseudomorpha	Tanaidae	*Kalliapseudes*	*crassus*	12	10	10		8
	Tanaidacea	Tanaidomorpha	Leptocheliidae	*Leptochelia*	*dubia*	2	6	4	2	6
	Tanaidacea	Tanaidomorpha	Tanaidae	*Synaptotanais*	*notabilis*				2	
Ostracoda										
Myodocopa	Myodocopina		Philomedidae	*Euphilomedes*	*carcharodonta*		8	2	4	6
Pycnogonida	Pegmata		Ammotheidae	*Achelia*	sp	2				
Chordata										
Actinopterygii										
Neopterygii	Perciformes	Gobioidei	Gobiidae			2		2	2	
Ascidiacea	Stolidobranchiata		Styelidae	*Styela*	sp			2		
Echinodermata										
Ophiuroidea	Ophiurida	Gnathophiurina	Amphiuridae	*Amphipholis*	*squamata*				2	
Ectoprocta										
Gymnolaemata	Ctenostomata	Carnosa	Arachidiidae	*Nolella*	sp			1		
Gymnolaemata	Ctenostomata	Carnosa	Vesiculariidae	*Amathia*	sp				1	
Mollusca										
Bivalvia							2	2		2
	Pholadomyoida		Lyonsiidae	*Lyonsia*	*californica*		2	6	4	
Heterodonta	Veneroida		Cardiidae	*Laevicardium*	*substriatum*					4
	Veneroida		Semelidae	*Theora*	*lubrica*	58	24	32	30	138
	Veneroida		Tellinidae	*Macoma*	sp					2
Pteriomorphia	Mytiloida		Mytilidae	*Musculista*	*senhousei*	124	224	314	180	114
	Mytiloida		Mytilidae	*Mytilus*	*galloprovincialis*	4	4		4	
	Ostreoida		Ostreidae	*Ostrea*	*conchaphila*	12	4	8	8	2
	Ostreoida		Pectinidae	*Argopecten*	*circularis*	2				
Gastropoda	Heterostropha		Pyramidellidae	*Odostomia*	sp		2			
	Neotaenioglossa		Calyptraeidae	*Crepidula*	sp	32	10	30	20	12
	Neotaenioglossa		Calyptraeidae	*Crucibulum*	*spinosum*	4	6	14	14	4
Prosobranchia	Neogastropoda		Columbellidae	*Alia*	*carinata*				2	
Nematoda						24	2	16	10	4
Nemertea										
Enopla	Hoplonemertea	Monostilifera	Emplectonematidae	*Paranemertes*	*californica*	2	4	6	4	
Platyhelminthes										
Turbellaria	Polycladida	Acotylea	Stylochidae	*Imogine*	*exiguus*				2	

Table K-31. Species abundance data for Station SW21

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Annelida										
Polychaeta										
Palpata	Flabelligerida	Terebellida	Flabelligeridae	*Diplocirrus*	sp SD1	2	4	6	2	
	Phyllodocida		Glyceridae	*Glycera*	*americana*		2			
	Phyllodocida		Nereididae	*Neanthes*	*acuminata*	2	18			4
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*	8	8	6	8	4
	Phyllodocida		Syllidae	*Exogone*	*lourei*	114	22	40	82	10
	Phyllodocida		Syllidae	*Odontosyllis*	*phosphorea*		2			
	Phyllodocida		Syllidae	*Syllis(Typosyllis)*	*nipponica*	2			2	
	Sabellida		Sabellidae	*Euchone*	*limnicola*				2	
	Sabellida	Eunicida	Dorvilleidae	*Dorvillea (Schistomeringos)*	*longicornis*	2	10	4	8	
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	38	106	34	46	26
	Spionida		Spionidae	*Prionospio*	*heterobranchia*	10	4	8		
	Spionida		Spionidae	*Pseudopolydora*	*paucibranchiata*	18	10	6	30	
	Terebellida		Terebellidae	*Eupolymnia*	*heterobranchia*			2		
	Terebellida		Terebellidae	*Pista*	*percyi*	12	16	30	30	10
Scolecida	Capitellida		Capitellidae	*Mediomastus*	sp	24	28	6	8	2
	Capitellida		Capitellidae	*Notomastus*	*magnus*		2	2		
	Capitellida		Capitellidae	*Scyphoproctus*	*oculatus*	4	2		8	2
	Cossurida		Cossuridae	*Cossura*	*candida*					2
	Opheliida		Opheliidae	*Armandia*	*brevis*			2		
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	48	98	108	56	44
Arthropoda										
Malacostraca										
Eumalacostraca	Amphipoda		Aoridae	*Acuminodeutopus*	*stenopropodus*	2	2		8	10
	Amphipoda	Caprellidea	Protellidae	*Mayerella*	*banksia*	2			2	
	Amphipoda	Gammaridea	Aoridae	*Bemlos*	*macromanus*	2				
	Amphipoda	Gammaridea	Aoridae	*Grandidierella*	*japonica*		6		2	
	Amphipoda	Gammaridea	Isaeidae	*Amphideutopus*	*oculatus*	6		2	2	2
	Amphipoda	Gammaridea	Oedicerotidae	*Hartmanodes*	*hartmanae*					2
	Amphipoda	Gammaridea	Phoxocephalidae	*Heterophoxus*	*cf ellisi*		4			2
	Amphipoda	Gammaridea	Podoceridae	*Podocerus*	*fulanus*	2	2		4	
	Decapoda	Pleocyemata	Alpheidae	*Alpheus*	*californiensis*				2	
	Decapoda	Pleocyemata	Axiidae	*Calocarides*	*sp*			2		
	Decapoda	Pleocyemata	Majidae	*Pyromaia*	*tuberculata*			2	4	
	Decapoda	Pleocyemata	Processidae	*Ambidexter*	*panamensis*	2	6		2	
	Isopoda	Anthuridea	Paranthuridae	*Paranthura*	*elegans*	2				
	Isopoda	Flabellifera	Sphaeromatidae	*Paracerceis*	*cordata*			2		
	Tanaidacea	Apseudomorpha	Tanaidae	*Kalliapseudes*	*crassus*	2				
	Tanaidacea	Tanaidomorpha	Tanaidae	*Synaptotanais*	*notabilis*	2			2	
Chordata										
Actinopterygii										
Neopterygii	Perciformes	Gobioidei	Gobiidae					2	2	

Table K-31. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Cnidaria										
Anthozoa										
Hexacorallia	Actiniaria		Edwardsiidae	*Scolanthus*	sp B		6		8	6
Mollusca										
Bivalvia										
Heterodonta	Veneroida		Cardiidae	*Laevicardium*	*substriatum*	2		2	2	
	Veneroida		Semelidae	*Theora*	*lubrica*	4	12	6	10	22
Pteriomorphia	Mytiloida		Mytilidae	*Musculista*	*senhousei*	26	20	28	28	6
Gastropoda										
Opisthobranchia	Cephalaspidea		Bullidae	*Bulla*	*gouldiana*				2	
	Cephalaspidea		Cylichnidae	*Acteocina*	*inculta*		4			
	Cephalaspidea		Haminoeidae	*Haminoea*	*vesicula*			4	2	2
Prosobranchia	Neogastropoda		Nassariidae	*Nassarius*	*tegula*				6	
Nemertea										
Anopla	Heteronemertea		Lineidae				2			
Enopla	Hoplonemertea	Monostilifera	Emplectonematidae	*Paranemertes*	*californica*	8	2	2	2	

Table K-32. Species abundance data for Station SW22

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Annelida										
Polychaeta										
Palpata	Flabelligerida	Terebellida	Flabelligeridae	*Diplocirrus*	sp SD1	4	2	10	4	
	Flabelligerida	Terebellida	Flabelligeridae	*Pherusa*	*capulata*		2			
	Phyllodocida		Aphroditidae	*Aphrodita*	sp	2				
	Phyllodocida		Nereididae	*Neanthes*	*acuminata*	2	6	6		
	Phyllodocida		Nereididae	*Platynereis*	*bicanaliculata*			2		
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*	4	2	2	10	4
	Phyllodocida		Syllidae	*Exogone*	*lourei*	20	2	8	32	10
	Phyllodocida		Syllidae	*Odontosyllis*	*phosphorea*	2				
	Sabellida		Sabellidae	*Euchone*	*limnicola*					2
	Sabellida	Eunicida	Dorvilleidae	*Dorvillea (Schistomeringos)*	*longicornis*	6		10	2	4
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	36	42	98	76	38
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*tetraura*	6			8	
	Spionida		Spionidae	*Prionospio*	*heterobranchia*	4	2	18	2	4
	Spionida		Spionidae	*Pseudopolydora*	*paucibranchiata*	6		4	4	
	Spionida	Terebellida	Cirratulidae	*Aphelochaeta*	*petersenae*		2			
	Terebellida		Terebellidae						2	
	Terebellida		Terebellidae	*Nicolea*	sp A			2		
	Terebellida		Terebellidae	*Pista*	*percyi*	24	12	40	30	54
	Terebellida		Terebellidae	*Pista*	sp C	2				
Scolecida	Capitellida		Capitellidae	*Mediomastus*	sp	4	2	10	2	6
	Capitellida		Capitellidae	*Scyphoproctus*	*oculatus*			2		
	Cossurida		Cossuridae	*Cossura*	sp	2				
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	104	48	112	72	92
Arthropoda										
Malacostraca										
Eumalacostraca	Amphipoda		Aoridae	*Acuminodeutopus*	*stenopropodus*	10	2	6	2	2
	Amphipoda		Dexaminidae	*Paradexamine*	sp A			26		
	Amphipoda	Caprellidea	Caprellidae	*Caprella*	*natalenis*			2		
	Amphipoda	Caprellidea	Protellidae	*Mayerella*	*banksia*					2
	Amphipoda	Gammaridea	Ampithoidae	*Ampithoe*	*plumulosa*			14		
	Amphipoda	Gammaridea	Aoridae	*Bemlos*	*macromanus*			6	2	
	Amphipoda	Gammaridea	Aoridae	*Grandidierella*	*japonica*			6		
	Amphipoda	Gammaridea	Hyalidae	*Hyale*	sp			2		
	Amphipoda	Gammaridea	Isaeidae	*Amphideutopus*	*oculatus*	6			8	10
	Amphipoda	Gammaridea	Liljeborgiidae	*Liljeborgia*	*geminata*	2				
	Amphipoda	Gammaridea	Phoxocephalidae	*Heterophoxus*	*cf ellisi*		2	2	2	
	Amphipoda	Gammaridea	Podoceridae	*Podocerus*	*fulanus*			30		
	Decapoda	Pleocyemata	Alpheidae	*Alpheus*	*californiensis*			8	4	
	Decapoda	Pleocyemata	Axiidae	*Calocarides*	sp	2				
	Decapoda	Pleocyemata	Callianassidae	*Neotrypaea*	sp				2	
	Decapoda	Pleocyemata	Hippolytidae	*Hippolyte*	*californiensis*			4		

Table K-32. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Decapoda	Pleocyemata	Majidae	*Pyromaia*	*tuberculata*			6	6	
	Decapoda	Pleocyemata	Processidae	*Ambidexter*	*panamensis*		4	4		
	Isopoda	Asellota	Janiridae	*Janiralata*	sp	2				
	Isopoda	Flabellifera	Serolidae	*Heteroserolis*	*carinata*					8
	Mysidacea		Mysidae	*Heteromysis*	*odontops*	4				
	Mysidacea		Mysidae	*Neomysis*	sp		2			
	Mysidacea		Mysidae	*Siriella*	*pacifica*			6		
Ostracoda										
Myodocopa	Myodocopina		Philomedidae	*Euphilomedes*	*carcharodonta*		2			
Chordata										
Actinopterygii										
Neopterygii	Perciformes	Gobioidei	Gobiidae				2		2	
Ascidiacea									6	
Cnidaria										
Anthozoa										
Hexacorallia	Actiniaria		Edwardsiidae	*Scolanthus*	sp B	14	4	6	6	14
Zoantharia	Actiniaria	Athenaria	Edwardsiidae	*Edwardsia*	*californica*			4		
Mollusca										
Bivalvia	Pholadomyoida		Lyonsiidae	*Lyonsia*	*californica*	2		2	2	4
Heterodonta	Veneroida		Cardiidae	*Laevicardium*	*substriatum*					2
	Veneroida		Chamidae	*Chama*	*arcana*	2				
	Veneroida		Semelidae	*Theora*	*lubrica*	70	56	70	32	36
Pteriomorphia	Mytiloida		Mytilidae	*Musculista*	*senhousei*	14	2	22	48	34
Cephalopoda										
Coleoidea	Octopoda	Incirrina	Octopodidae	*Octopus*	sp	2				
Gastropoda	Neotaenioglossa		Calyptraeidae	*Crepidula*	*dorsata*					2
	Neotaenioglossa		Calyptraeidae	*Crepidula*	sp			2	2	2
Opisthobranchia	Cephalaspidea		Haminoeidae	*Haminoea*	*vesicula*			2		
Prosobranchia	Neogastropoda		Nassariidae	*Nassarius*	*tegula*			6	2	
Nemertea										
Anopla	Paleonemertea		Tubulanidae	*Tubulanus*	*polymorphus/pellucidus*			2		
Enopla	Hoplonemertea	Monostilifera	Emplectonematidae	*Paranemertes*	*californica*	2		2		

Table K-33. Species abundance data for Station SW23

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Annelida										
Polychaeta	Spionida		Cirratulidae	*Protocirrineris*	sp A	2				2
Palpata	Flabelligerida	Terebellida	Flabelligeridae	*Diplocirrus*	sp SD1	4	6	2		
	Flabelligerida	Terebellida	Flabelligeridae	*Pherusa*	*capulata*			4		
	Phyllodocida		Nereididae	*Neanthes*	*acuminata*		6	2		
	Phyllodocida		Nereididae	*Platynereis*	*bicanaliculata*		2			
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*	8	12	2		2
	Phyllodocida		Syllidae	*Exogone*	*lourei*	34	12	10	8	12
	Phyllodocida		Syllidae	*Odontosyllis*	*phosphorea*				2	
	Phyllodocida		Syllidae	*Syllis (Typosyllis)*	*nipponica*		2			
	Sabellida		Sabellidae	*Euchone*	*limnicola*	2				
	Sabellida	Eunicida	Dorvilleidae	*Dorvillea (Schistomeringos)*	*longicornis*	6	12			2
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	34	40	26	48	20
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*erecta*		4	2		4
	Spionida		Poecilochaetidae	*Poecilochaetus*	sp A (Martin 1977)[a]			2		
	Spionida		Spionidae	*Prionospio*	*heterobranchia*		8	8	2	6
	Spionida		Spionidae	*Pseudopolydora*	*paucibranchiata*	56	2	6	6	2
	Spionida		Spionidae	*Spiophanes*	*duplex*		2			2
	Spionida	Terebellida	Cirratulidae	*Cirriformia*	sp					2
	Terebellida		Terebellidae	*Pista*	*percyi*	40	36	32	36	32
Scolecida	Capitellida		Capitellidae	*Mediomastus*	sp	10	6	8		4
	Capitellida		Capitellidae	*Scyphoproctus*	*oculatus*	4			2	
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	78	62	56	32	20
Arthropoda										
Malacostraca	Decapoda	Natantia								2
Eumalacostraca	Amphipoda		Aoridae	*Acuminodeutopus*	*stenopropodus*	4	4		6	
	Amphipoda	Gammaridea	Isaeidae	*Amphideutopus*	*oculatus*	6		16	4	10
	Amphipoda	Gammaridea	Oedicerotidae	*Hartmanodes*	*hartmanae*	2				
	Amphipoda	Gammaridea	Oedicerotidae	*Synchelidium*	*rectipalmum*				2	
	Amphipoda	Gammaridea	Phoxocephalidae	*Heterophoxus*	*cf ellisi*		4	6	2	6
	Amphipoda	Gammaridea	Podoceridae	*Podocerus*	*fulanus*		4	2		
	Decapoda	Pleocyemata	Alpheidae	*Alpheus*	*californiensis*	6	4	2		
	Decapoda	Pleocyemata	Hippolytidae	*Hippolyte*	*californiensis*		6			
	Decapoda	Pleocyemata	Majidae				2			
	Decapoda	Pleocyemata	Majidae	*Pyromaia*	*tuberculata*		8	2	4	8
	Decapoda	Pleocyemata	Processidae	*Ambidexter*	*panamensis*	2	4		2	
	Isopoda	Flabellifera	Serolidae	*Heteroserolis*	*carinata*	4	6	2	2	
	Isopoda	Flabellifera	Sphaeromatidae	*Paracerceis*	*cordata*		6			
	Mysidacea		Mysidae	*Heteromysis*	*odontops*				2	
	Stomatopod	Gammaridea	Squillidae	*Schmittius*	*politus*		2			
	Tanaidacea	Tanaidomorpha	Tanaidae	*Synaptotanais*	*notabilis*	2				
Ostracoda										
Myodocopa	Myodocopina		Philomedidae	*Euphilomedes*	*carcharodonta*	2	2	4	2	

Table K-33. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Chordata										
Actinopterygii										
Neopterygii	Perciformes	Gobioidei	Gobiidae			2				2
Ascidiacea	Phlebobranchia		Ascidiidae	*Ascidian*	sp A	8				
Cnidaria										
Anthozoa										
Hexacorallia	Actiniaria		Edwardsiidae	*Scolanthus*	sp B	20	24	8	16	16
Mollusca										
Bivalvia	Pholadomyoida		Lyonsiidae	*Lyonsia*	*californica*	2		2	2	
Heterodonta	Veneroida		Cardiidae	*Laevicardium*	*substriatum*	2		2		
	Veneroida		Semelidae	*Theora*	*lubrica*	32	128	86	56	28
	Veneroida		Tellinidae	*Macoma*	sp		2			
	Veneroida		Veneridae	*Chione*	*californiensis*			2		2
Pteriomorphia	Mytiloida		Mytilidae	*Musculista*	*senhousei*	22	8	8	6	10
	Mytiloida		Mytilidae	*Mytilus*	*galloprovincialis*				2	
Gastropoda										
Opisthobranchia	Cephalaspidea		Cylichnidae	*Acteocina*	*inculta*			2		
Prosobranchia	Neogastropoda		Nassariidae	*Nassarius*	*tegula*	2	6	2	4	4
Nemertea										
Anopla	Paleonemertea		Tubulanidae	*Tubulanus*	*polymorphus/pellucidus*	2				
Enopla	Hoplonemertea	Monostilifera	Emplectonematidae	*Paranemertes*	*californica*			4		

[a] Provisional species. Identified in parentheses is the taxonomist or organization who believes this species may be a new one because it does not fit known species descriptions for the area.

Table K-34. Species abundance data for Station SW25

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Annelida										
Oligochaeta							12			2
Polychaeta	Spionida		Cirratulidae	*Protocirrineris*	sp A		2			
Palpata	Flabelligerida	Terebellida	Flabelligeridae	*Diplocirrus*	sp SD1	4	4	6	2	2
	Flabelligerida	Terebellida	Flabelligeridae	*Pherusa*	*capulata*	12	6	10	8	6
	Phyllodocida		Nereididae	*Neanthes*	*acuminata*			2		
	Phyllodocida		Phyllodocidae	*Eumida*	*longicornuta*				2	
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*		4			2
	Phyllodocida		Syllidae	*Exogone*	*lourei*	80	86	80	4	44
	Phyllodocida		Syllidae	*Odontosyllis*	*phosphorea*					2
	Phyllodocida		Syllidae	*Syllis (Syllis)*	*gracilis*		2			
	Phyllodocida		Syllidae	*Syllis (Typosyllis)*	*nipponica*	4				
	Phyllodocida		Syllidae	*Syllis (Typosyllis)*	sp	2	2			
	Sabellida		Sabellidae	*Euchone*	*limnicola*	2	10	4	2	2
	Sabellida	Eunicida	Dorvilleidae	*Dorvillea (Schistomeringos)*	*longicornis*	12	8	6	4	6
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	20	64	34	10	22
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*erecta*	8	12	2		
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*limicola*		4			2
	Spionida		Poecilochaetidae	*Poecilochaetus*	*johnsoni*		2			2
	Spionida		Spionidae	*Prionospio*	*heterobranchia*	18	14	14	6	16
	Spionida		Spionidae	*Pseudopolydora*	*paucibranchiata*	88	58	236	78	126
	Spionida		Spionidae	*Spiophanes*	*berkeleyorum*			2		
	Spionida	Terebellida	Cirratulidae	*Timarete*	*luxuriosa*		2			
	Terebellida		Ampharetidae	*Melinna*	*oculata*	2		2		
	Terebellida		Terebellidae	*Pista*	*percyi*	64	68	64	40	48
Scolecida	Capitellida		Capitellidae	*Mediomastus*	sp	20	18	16	16	16
	Capitellida		Capitellidae	*Scyphoproctus*	*oculatus*		2			
	Cossurida		Cossuridae	*Cossura*	sp	8	6	4		2
	Opheliida		Opheliidae	*Armandia*	*brevis*	2		2	2	
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	36	6	18	22	8
Arthropoda										
Malacostraca										
Eumalacostraca	Amphipoda		Aoridae	*Acuminodeutopus*	*stenopropodus*			6	10	2
	Amphipoda	Caprellidea	Caprellidae	*Caprella*	*natalenis*		2			2
	Amphipoda	Caprellidea	Protellidae	*Mayerella*	*banksia*				2	
	Amphipoda	Gammaridea	Aoridae	*Grandidierella*	*japonica*	4	2		8	2
	Amphipoda	Gammaridea	Isaeidae	*Amphideutopus*	*oculatus*	28	16	34	20	44
	Amphipoda	Gammaridea	Ischyroceridae	*Ericthonius*	*brasiliensis*		2			
	Amphipoda	Gammaridea	Lysianassidae	*Aruga*	*holmesi*	2			2	
	Amphipoda	Gammaridea	Oedicerotidae	*Synchelidium*	*rectipalmum*					2
	Amphipoda	Gammaridea	Phoxocephalidae	*Heterophoxus*	*cf ellisi*	10	18		10	10
	Amphipoda	Gammaridea	Podoceridae	*Podocerus*	*fulanus*	2	14			2
	Cumacea		Diastylidae	*Oxyurostylis*	*pacifica*			2		

Table K-34. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Decapoda					2				
	Decapoda	Pleocyemata	Alpheidae	*Alpheus*	*californiensis*					2
	Decapoda	Pleocyemata	Majidae				6	2	6	2
	Decapoda	Pleocyemata	Majidae	*Pyromaia*	*tuberculata*	6	4		8	
	Decapoda	Pleocyemata	Pinnotheridae	*Pinnixa*	sp					2
	Decapoda	Pleocyemata	Pinnotheridae	*Scleroplax*	*granulata*		2		2	
	Decapoda	Pleocyemata	Processidae	*Ambidexter*	*panamensis*				2	
	Decapoda	Pleocyemata	Xanthidae	*Lophopanopeus*	sp	2	2			
	Isopoda	Flabellifera	Serolidae	*Heteroserolis*	*carinata*		6	4	4	8
	Stomatopod	Gammaridea	Squillidae	*Schmittius*	*politus*				2	
	Tanaidacea	Apseudomorpha	Tanaidae	*Kalliapseudes*	*crassus*	2	6		2	2
	Tanaidacea	Tanaidomorpha	Leptocheliidae	*Leptochelia*	*dubia*		2			
	Tanaidacea	Tanaidomorpha	Tanaidae	*Synaptotanais*	*notabilis*	4	6	4		
Ostracoda										
Myodocopa	Myodocopina		Cylindroleberididae	*Asteropella*	*slatteryi*				4	
	Myodocopina		Philomedidae	*Euphilomedes*	*carcharodonta*	14	12	18	30	4
Chordata										
Actinopterygii										
Neopterygii	Perciformes	Gobioidei	Gobiidae			2			4	
Ascidiacea	Aplousobranchia		Cionidae	*Ciona*	*intestinalis*		4			
	Phlebobranchia		Ascidiidae	*Ascidian*	sp A			2	4	
	Stolidobranchiata		Styelidae	*Styela*	sp	2				
Cnidaria										
Anthozoa										
Hexacorallia	Actiniaria		Edwardsiidae	*Scolanthus*	sp B	2				
Echinodermata										
Ophiuroidea	Ophiurida	Gnathophiurina	Amphiuridae	*Amphipholis*	sp			2		
	Ophiurida	Gnathophiurina	Amphiuridae	*Amphipholis*	*squamata*		2	2		
Ectoprocta										
Gymnolaemata	Ctenostomata	Carnosa	Arachidiidae	*Nolella*	sp	1				
	Ctenostomata	Carnosa	Vesiculariidae	*Amathia*	sp			1		
Stenolaemata	Cyclostomata	Articulata	Crisiidae	*Filicrisia*	sp	1				
Mollusca										
Bivalvia	Pholadomyoida		Lyonsiidae	*Lyonsia*	*californica*	4	2	2	10	8
Heterodonta	Veneroida		Cardiidae	*Laevicardium*	*substriatum*		4			8
	Veneroida		Semelidae	*Theora*	*lubrica*	46	24	98	60	46
	Veneroida		Tellinidae	*Tellina*	sp B (SCAMIT)[a]		2			
	Veneroida		Veneridae	*Protothaca*	sp			2		
Pteriomorphia	Mytiloida		Mytilidae	*Musculista*	*senhousei*	86	178	14	6	30
	Ostreoida		Ostreidae	*Ostrea*	*conchaphila*	2		2	2	
Gastropoda	Neotaenioglossa		Calyptraeidae	*Crepidula*	sp		12			
	Neotaenioglossa		Rissoidae						2	
Opisthobranchia	Cephalaspidea		Cylichnidae	*Acteocina*	*inculta*	2				

Table K-34. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Cephalaspidea		Haminoeidae	*Haminoea*	*vesicula*			2		
Prosobranchia	Neogastropoda		Muricidae	*Ocenebra*	sp				2	
Nematoda						58	44	10		14
Nemertea										
Anopla	Paleonemertea		Tubulanidae	*Tubulanus*	*frenatus*			2		
	Paleonemertea		Tubulanidae	*Tubulanus*	*polymorphus/pellucidus*			2		2
Enopla	Hoplonemertea	Monostilifera	Emplectonematidae	*Paranemertes*	*californica*				2	4
Phorona	Phoronida								6	
Platyhelminthes										
Turbellaria	Polycladida	Acotylea	Stylochidae	*Imogine*	*exiguus*					2
Archoophora	Polycladida		Leptoplanidae	*Notoplana*	sp	2				
Porifera							1		1	
Calcerea										
Calcaronea	Leucosoleniida		Leucoleniidae	*Leucosolenia*	sp	2	2			2

[a] Provisional species. Identified in parentheses is the taxonomist or organization who believes this species may be a new one because it does not fit known species descriptions for the area.

Table K-35. Species abundance data for Station SW27

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Annelida										
Oligochaeta						14		16		2
Palpata	Flabelligerida	Terebellida	Flabelligeridae	*Diplocirrus*	sp SD1	2	2	4	8	4
	Flabelligerida	Terebellida	Flabelligeridae	*Pherusa*	*capulata*	14	4	20	22	16
	Phyllodocida		Nephtyidae	*Nephtys*	*cornuta*	2				
	Phyllodocida		Nereididae	*Neanthes*	*acuminata*	4	6	10	8	10
	Phyllodocida		Polynoidae							2
	Phyllodocida		Polynoidae	*Harmothoe*	*imbricata*	6	16	4	20	22
	Phyllodocida		Syllidae	*Branchiosyllis*	sp			2		
	Phyllodocida		Syllidae	*Brania*	*brevipharyngea*			2		
	Phyllodocida		Syllidae	*Exogone*	*lourei*	240	104	260	140	70
	Phyllodocida		Syllidae	*Odontosyllis*	*phosphorea*		2	4		
	Phyllodocida		Syllidae	*Sphaerosyllis*	sp 7 (Harris)[a]					2
	Phyllodocida		Syllidae	*Syllis (Syllis)*	*gracilis*	2		4		
	Phyllodocida		Syllidae	*Syllis (Typosyllis)*	*nipponica*	2	10		16	18
	Phyllodocida		Syllidae	*Syllis (Typosyllis)*	sp					2
	Sabellida		Sabellidae	*Euchone*	*limnicola*	8	8	8	4	8
	Sabellida	Eunicida	Dorvilleidae	*Dorvillea (Schistomeringos)*	*longicornis*	12	8	12	14	18
	Sabellida	Eunicida	Eunicidae	*Marphysa*	*disjuncta*					2
	Sabellida	Eunicida	Lumbrineridae	*Lumbrinereis*	sp	76	48	72	44	44
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*erecta*	4	14	6	2	
	Sabellida	Eunicida	Lumbrineridae	*Lumbrineris*	*limicola*					14
	Spionida		Poecilochaetidae	*Poecilochaetus*	*johnsoni*	2			2	2
	Spionida		Spionidae	*Boccardiella*	*ligerica*			6		
	Spionida		Spionidae	*Prionospio*	*heterobranchia*	26	32	26	18	28
	Spionida		Spionidae	*Pseudopolydora*	*paucibranchiata*	84	42	126	100	98
	Spionida	Terebellida	Cirratulidae			2		4		
	Terebellida		Terebellidae	*Eupolymnia*	*heterobranchia*	6		2	8	6
	Terebellida		Terebellidae	*Nicolea*	sp A				2	
	Terebellida		Terebellidae	*Pista*	*percyi*	44	48	54	28	40
	Terebellida		Terebellidae	*Polycirrus*	sp				2	
Scolecida	Capitellida		Capitellidae	*Capitella*	*capitata complex*	2		6	2	2
	Capitellida		Capitellidae	*Mediomastus*	sp	10	14	16	4	12
	Capitellida		Capitellidae	*Scyphoproctus*	*oculatus*	12	4	6		2
	Cossurida		Cossuridae	*Cossura*	sp	26	4	78	26	10
	Opheliida		Opheliidae	*Armandia*	*brevis*	2	2			4
	Orbiniidae		Orbiniidae	*Leitoscoloplos*	*pugettensis*	2	4		2	12
Arthropoda										
Copepoda	Harpacticoida					2				
Malacostraca										
Eumalacostraca	Amphipoda		Aoridae	*Acuminodeutopus*	*stenopropodus*		2		14	4
	Amphipoda	Gammaridea	Ampeliscidae	*Ampelisca*	*lobata*				2	4
	Amphipoda	Gammaridea	Aoridae	*Bemlos*	*macromanus*	2	2			

Table K-35. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
	Amphipoda	Gammaridea	Aoridae	*Grandidierella*	*japonica*	18	14	10	22	8
	Amphipoda	Gammaridea	Isaeidae	*Amphideutopus*	*oculatus*	10	14	12	14	12
	Amphipoda	Gammaridea	Ischyroceridae	*Ericthonius*	*brasiliensis*	2				
	Amphipoda	Gammaridea	Liljeborgiidae	*Liljeborgia*	*geminata*	4	2			
	Amphipoda	Gammaridea	Liljeborgiidae	*Listriella*	*melanica*					2
	Amphipoda	Gammaridea	Oedicerotidae	*Hartmanodes*	*hartmanae*		2			
	Amphipoda	Gammaridea	Phoxocephalidae	*Heterophoxus*	*cf ellisi*	30	24	30	52	20
	Amphipoda	Gammaridea	Podoceridae	*Podocerus*	*fulanus*	8		2		
	Decapoda	Pleocyemata	Axiidae	*Calocarides*	sp					2
	Decapoda	Pleocyemata	Majidae			2			4	
	Decapoda	Pleocyemata	Majidae	*Pyromaia*	*tuberculata*	10	12	6	2	10
	Decapoda	Pleocyemata	Pinnotheridae	*Pinnixa*	sp				2	
	Decapoda	Pleocyemata	Xanthidae	*Lophopanopeus*	sp	2				
	Isopoda	Anthuridea	Paranthuridae	*Paranthura*	*elegans*		2	4		
	Isopoda	Flabellifera	Serolidae	*Heteroserolis*	*carinata*	20	2	10	14	2
	Isopoda	Flabellifera	Sphaeromatidae	*Paracerceis*	*cordata*				2	2
	Mysidacea		Mysidae	*Heteromysis*	*odontops*	2		2	2	
	Tanaidacea	Apseudomorpha	Tanaidae	*Kalliapseudes*	*crassus*		2			2
	Tanaidacea	Tanaidomorpha	Leptocheliidae	*Leptochelia*	*dubia*	2	2	2	4	
	Tanaidacea	Tanaidomorpha	Tanaidae	*Synaptotanais*	*notabilis*	12		18	4	2
Ostracoda										
Myodocopa	Myodocopina		Cylindroleberididae	*Postasterope*	*barnesi*				4	
	Myodocopina		Philomedidae	*Euphilomedes*	*carcharodonta*	16	8	14	12	22
Pycnogonida	Pegmata		Ammotheidae	*Achelia*	sp			2	2	
Chordata										
Actinopterygii										
Neopterygii	Perciformes	Gobioidei	Gobiidae						2	
Ascidiacea									2	2
	Aplousobranchia								2	
	Aplousobranchia		Cionidae	*Ciona*	*intestinalis*				2	
	Phlebobranchia		Ascidiidae	*Ascidian*	sp A		2			2
	Stolidobranchiata		Styelidae	*Styela*	sp				2	
Cnidaria										
Anthozoa										
Hexacorallia	Actiniaria		Edwardsiidae	*Scolanthus*	sp A (SCAMIT)[a]		12	2	4	
Zoantharia	Actiniaria	Athenaria	Edwardsiidae	*Edwardsia*	*californica*	2				
	Actiniaria	Thenaria	Diadumenidae						2	
Echinodermata										
Ophiuroidea						8	2	12		2
	Ophiurida	Gnathophiurina	Amphiuridae	*Amphipholis*	sp				2	
	Ophiurida	Gnathophiurina	Amphiuridae	*Amphipholis*	*squamata*	4				
Mollusca										
Bivalvia	Pholadomyoida		Lyonsiidae	*Lyonsia*	*californica*		16			2

Table K-35. (cont.)

Phylum/Class/ Subclass	Order	Suborder	Family	Genus	Species	Field replicates 1	2	3	4	5
Heterodonta	Veneroida		Cardiidae	*Laevicardium*	*substriatum*		2			
	Veneroida		Semelidae	*Theora*	*lubrica*	74	20	52	100	60
	Veneroida		Solecurtidae	*Tagelus*	*subteres*				2	
	Veneroida		Tellinidae	*Macoma*	sp	2			4	2
Pteriomorphia	Mytiloida		Mytilidae	*Musculista*	*senhousei*	166	150	222	90	204
	Mytiloida		Mytilidae	*Mytilus*	*galloprovincialis*		2	2		
	Ostreoida		Ostreidae	*Ostrea*	*conchaphila*	4				8
	Ostreoida		Pectinidae	*Leptopecten*	*latiauratus*			2		
Gastropoda	Heterostropha		Amathinidae	*Iselica*	*ovoidea*		6			
	Neotaenioglossa		Calyptraeidae	*Crepidula*	sp	12		6	2	
	Neotaenioglossa		Calyptraeidae	*Crucibulum*	*spinosum*	4		2		
Opisthobranchia	Cephalaspidea		Haminoeidae	*Haminoea*	*vesicula*	6				
Nematoda						**78**		**12**	**2**	
Nemertea						**2**				
Anopla	Heteronemertea		Lineidae						2	
Enopla	Hoplonemertea	Monostilifera	Amphiporidae	*Amphiporus*	sp		4			
Platyhelminthes										
Turbellaria	Polycladida	Acotylea	Stylochidae	*Imogine*	*exiguus*		10			

[a] Provisional species. Identified in parentheses is the taxonomist or organization who believes this species may be a new one because it does not fit known species descriptions for the area.

Appendix L

Quality Assurance Report for Benthic Macroinvertebrate Data

Quality Assurance Report for Benthic Macroinvertebrate Data

Introduction

This report documents the results of the quality assurance and quality control (QA/QC) review of the data generated on benthic macroinvertebrate assemblages that were collected from 30 stations at the NASSCO and Southwest Marine shipyards in San Diego Bay, California, and from 5 stations at reference areas in San Diego Bay. These evaluations were conducted by MEC Analytical in Carlsbad, California. Exponent conducted the quality assurance review to ensure that the evaluation of the benthic macroinvertebrate assemblages was consistent with the specifications of the statement of work (SOW) and that the data are acceptable for use in future stages of the study.

The quality assurance review consisted of an evaluation of the following major elements of the benthic macroinvertebrate evaluations:

- **Field Methods—**Were the major specifications of the field sampling procedures followed, as described in the work plan (Exponent 2001)?
- **Laboratory Methods—**Were the major specifications of the laboratory testing procedures followed, as described in the laboratory's SOW? Were the specified methods (i.e., U.S. EPA 1987) followed and were any modifications adequately justified and documented?
- **Sorting Efficiency—**Was each sample sorted with an efficiency of 95 percent?
- **Taxonomic Accuracy—**Were taxonomic identifications conducted by experienced taxonomists using the appropriate literature and a reference collection?

Throughout this report, the term "replicate" refers to one of the five separate grab samples collected in the field at each station.

The following section of this report presents the results of the QA/QC evaluation of the data for the benthic macroinvertebrate assemblages. QA/QC considerations are then summarized, and conclusions are presented in the final section.

Quality Assurance and Quality Control Evaluation

Field Methods

On August 6–15, sediment samples were collected from 30 stations along the shoreline of NASSCO and Southwest Marine shipyards and from 5 reference area stations. All of the sampling stations were located in San Diego Bay, California. At each station, surface sediment was collected using a dual 0.1-m^2 stainless steel van Veen grab sampler. Sampling was conducted according to the procedures and plans described in the work plan (Exponent 2001). The sediment in the grab sampler was evaluated for acceptability according to the requirements described in Exponent (2001). Five replicate grab samples were collected at each station. All of the sediment (to a maximum depth of 30 cm) and overlying water collected in each grab sample were sieved (1.0-mm) to isolate benthic organisms. Retained material from each grab sample was transferred to an appropriate sample container and preserved in the field with 10 percent formalin.

Homogenized sediments collected from separate grab samples from the same station locations were used for the chemical analyses to ensure that the chemical analyses, toxicity tests, and benthic macroinvertebrate assemblages data were related as closely as possible.

Sampling was conducted according to the procedures and plans described in the work plan (Exponent 2001). The only exceptions were as follows: 1) one of the proposed reference stations was relocated slightly due to an off-limit security area designated by the U.S. Navy, and 2) rose bengal was not added to the sieved samples.

During field sampling, it was noted that two of the reference stations (2231 and 2243) had unusual biological characteristics. At Station 2231, a crustacean tube mat or hydroid colony was observed in each sediment grab sample. Large quantities of this substance were found throughout the sample. At Station 2243, sponges were observed in each sediment grab sample. It was also noted in the field that the reference areas had dissimilar grain-size characteristics from the site stations (i.e., coarser-grained sediment at the reference areas than at the site). These anomalies and grain-size differences may have the potential to affect benthic community structure and should be considered during data interpretation.

Laboratory Methods

The analytical methods for the benthic macroinvertebrate samples were based on the specifications presented in the work plan (Exponent 2001) and the laboratory SOW. The laboratory methods are discussed in the following sections.

Sample Handling

Samples received by the laboratory remained in the 10 percent formalin solution for a minimum of 24 hours, to allow proper fixation. The maximum fixation period was 10 days, to reduce the risk of decalcifying molluscs. After fixation, the samples were washed (i.e., rescreened) with a sieve that has mesh opening of 0.5 mm, and preserved in a 70 percent solution of ethanol.

Washed samples were stored in an upright position at a cool temperature and away from direct sunlight. Samples were stored in a secure place, where containers were not susceptible to breakage, and samples were checked periodically to ensure that adequate levels of preservative were maintained.

Sample Splitting

Approximately 50 percent of the benthic samples collected during the sampling event contained volumes of mussel byssal threads and small shell fragments in excess of typical benthic samples. This has been found by other in parts of San Diego Bay (Bay 2001, pers. comm.; Villas 2001, pers. comm.; Word 2001, pers. comm.). As agreed between Exponent and the laboratory prior to sample sorting, the laboratory used the following approach to subsample the benthic samples:

1. Each replicate was split by laboratory technicians into 50 percent fractions using a rotary splitter (e.g., type similar to a plankton splitter) and a 0.5-mm screen.
2. These two subsamples of split and screened materials were retained:
   - Fifty percent of the material was returned to the original sample container and stored in a 70 percent solution of ethanol. This subsample was used by the laboratory for identification, enumeration, and biomass determination.
   - The other 50 percent of the material was stored in a 70 percent solution of ethanol using new containers. This subsample was marked as "unsorted" and archived by the laboratory.

Sorting

Each sample was sorted by carefully pouring the material over a 0.5-mm sieve and gently rinsing with tap water using a spray nozzle. The sample was placed in a finger bowl using a spoon and a squirt bottle. Tap water was added to the finger bowl so that the sample was completely covered. Sample identification information was completed on the sample sort sheet.

Each replicate was sorted by only one person. For the sorting process, a small amount of the sample was placed into a sorting tray. The material was then sorted systematically using a dissecting microscope. Animals were removed with a pair of forceps and placed by major taxonomic group into vials or jars containing 70 percent ethanol. Each tray was examined 3 or 4 times to ensure that all organisms were removed.

Appropriate labels were completed for each vial or jar. Each vial or jar containing a major taxonomic group had an internal label listing the survey name, the date sampled, the station, replicate, the initials of the sorter, the major taxonomic group, and the number of vials or jars for the major group (if more than one container was required). The sort sheet was completed, including listing the vials and jars generated for each major group. Residue was returned to a sample container with 70 percent ethanol for storage. The residue was marked as "sorted" with the sorting completion date and returned to the sample shelf. Vials and jars were placed in boxes organized by station and replicate.

Taxonomic Identifications and Counts

After sorting was completed, organisms were identified to the lowest taxonomic level possible, the target being species level. Vials and jars were distributed to the taxonomists designated by the laboratory for each group of organisms. The sample custodian prepared chain-of-custody forms for samples that were shipped to taxonomists working outside the MEC Carlsbad laboratory. All taxonomic identifications were made by qualified taxonomists (see Attachment L1). All specimens were enumerated. For incomplete specimens, only the anterior or posterior end was enumerated, depending upon the taxon. All identifications were made using dissecting or compound microscopes. At least two pieces of literature were used for each species identification (see Attachment L2). Each species identification was conferred on between taxonomic experts and possibly checked against a reference specimen from a verified reference collection. Counts data were entered into a Microsoft® Excel spreadsheet. The counts data were multiplied by 2 to account for the initial 50 percent sample split.

After completing taxonomic identifications, all organisms were placed in vials or jars containing 70 percent ethanol, 25 percent water, and 5 percent glycerine. The vials were placed in a larger jar filled with 70 percent ethanol, and then the larger jar was sealed with electrical tape. The jars were individually sealed and placed in boxes for each station. Each vial or jar was labeled with the following information: survey name, sample number, major taxonomic group, initials of sorter, and date of collection. Each taxonomist recorded initial identifications and counts on sample data sheets. Any pertinent notes and comments on the organisms in each sample were added to the sample data sheets.

Biomass Determinations

Following taxonomic identifications and counts, the biomass of each major taxonomic group was determined to the nearest 0.1 g (wet weight). The wet-weight biomass of the specimens was determined by the laboratory by pouring sample vials into a funnel lined with a 0.3-mm screen. The funnel was attached to a vacuum system, and the pump was turned on for 15 seconds to remove excess ethanol. The specimens were transferred to a tared plastic weighing tray and weighed. Biomass data were entered into a Microsoft® Excel spreadsheet. The biomass data were multiplied by 2 to account for the initial 50 percent sample split.

QA/QC Procedures

The residue of one replicate for every station was selected at random and reexamined by a senior laboratory technician. Twenty-five percent of the selected replicates were re-sorted for QA/QC purposes. Any benthic macroinvertebrates found during the re-sorting process were noted and added to the replicate-specific vials or jars for the taxonomy. Re-sorting is the examination of a sample or subsample that has been sorted once and is considered free of organisms. The re-sorted sediment aliquot was a representative subsample of the originally split sediment sample. Re-sorting was conducted by a senior laboratory technician trained in the QA/QC procedures using the same procedures discussed above in the *Sorting* section of this report. Re-sorting was conducted by an individual other than the one who sorted the original sample. A partial re-sorting of selected sample ensures that any gross sorting errors are detected. Each 25 percent sample aliquot was checked for removal of at least 95 percent of the total organisms. Thus, each sample elicits a decision concerning a possible re-sort.

Sorting Efficiency

A sample-sorting efficiency of 95 percent (of the total number of individuals in each sample) was required for this study. That is, no more than 5 percent of the organisms in a given sample can be missed by the original sorter. The percent error in the laboratory's sample-sorting efficiency for this study ranged from 72 to 100 percent with replicates from 12 samples having sample-sorting efficiencies less than 95 percent (Tables L-1, L-2, and L-3). As a corrective measure, all replicates from each of the 12 samples were completely re-sorted.

Taxonomic Accuracy

As stated previously, taxonomic identifications were made by qualified taxonomists. As a check on the identifications, comparisons were made with the taxonomic listings for soft-bottom substrates in the Southern California Bight (SCAMIT 2001). All but 27 of the total of 389 identifications made in the current study were found in SCAMIT (2001). The 27 taxa are presented in Table L-4. The benthic laboratory was contacted regarding the 27 taxa, and the identifications were verified. The 27 taxa are not listed in SCAMIT (2001) for various reasons. Some of the identifications are too new (e.g., *Scolanthus* sp. B, *Marphysa* sp. HYP1 have just recently been identified). Some of the taxa are new to the area (e.g., *Nematonereis* sp.). Many of the taxa are intertidal or shallow-water taxa (e.g., *Flosmaris grandis*, *Ostrea conchaphila*, and *Mactromeris polynyma*), that generally are not addressed by SCAMIT (2001). Some of the taxa are hard-bottom taxa (e.g., *Branchiosyllis* sp.) that also are not addressed by SCAMIT (2001). Based on the review of taxonomic accuracy, it was concluded that the taxonomic identifications were made with acceptable accuracy.

Summary of Quality Assurance and Quality Control Considerations

During field sampling, it was noted that two of the reference stations (2231 and 2243) had unusual biological characteristics. At Station 2231, a crustacean tube mat or hydroid colony was observed in each sediment grab sample. Large quantities of this substance were found throughout the sample. At Station 2243, sponges were observed in each sediment grab sample. It was also noted in the field that the reference areas had dissimilar grain-size characteristics from the site stations (i.e., coarser-grained sediment at the reference areas than at the site). These anomalies and grain-size differences may have the potential to affect benthic community structure and should be considered during data interpretation.

Based on sorting efficiency and taxonomic accuracy, all of the results of the benthic macroinvertebrate evaluations are determined to be acceptable for use.

References

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Tables

TABLE L-1
SAN DIEGO SHIPYARD
SORTING EFFICIENCY

STATION	REP FOR QA	SORTING EFFICIENCY (%)
BI0001	2	100
BI0002	1	83
BI0003	3	94
BI0004	2	91
BI0005	4	95
BI0006	4	98
BI0007	5	93
BI0008	4	95
BI0009	4	85
BI0010	1	99
BI0011	4	95
BI0012	2	98
BI0013	2	95
BI0014	4	98
BI0015	5	89
BI0016	2	95
BI0017	1	100
BI0018	5	87
BI0019	3	95
BI0020	4	87
BI0021	5	96
BI0022	1	96
BI0023	2	96
BI0024	3	95
BI0025	5	72
BI0026	1	96
BI0027	5	94
BI0028	1	100
BI0029	4	87
BI0030	4	100
BI0031	1	84
BI0032	1	95
BI0033	1	99
BI0034	4	96
BI0035	2	100

TABLE L-2
SAN DIEGO SHIPYARD
RESULTS OF 25 % RESORT

STATION	NO. ANIMALS FOUND IN SORTING	NO. ANIMALS IN SORT QA	PASS / FAIL	NO. ANIMALS FOUND IN RESORT
BI0001	297	0	P	
BI0002	251	13	F	5
BI0003	356	6	F	13
BI0004	1292	33	F	59
BI0005	3797	51	P	
BI0006	1349	7	P	
BI0007	455	9	F	36
BI0008	238	3	P	
BI0009	246	11	F	36
BI0010	322	1	P	
BI0011	764	10	P	
BI0012	663	4	P	
BI0013	315	4	P	
BI0014	253	1	P	
BI0015	252	8	F	9
BI0016	337	4	P	
BI0017	165	0	P	
BI0018	111	4	F	3
BI0019	251	3	P	
BI0020	157	6	F	18
BI0021	205	2	P	
BI0022	192	2	P	
BI0023	383	4	P	
BI0024	406	5	P	
BI0025	250	24	F	3
BI0026	653	6	P	
BI0027	584	10	F	36
BI0028	364	0	P	
BI0029	346	13	F	20
BI0030	217	0	P	
BI0031	61	3	F	4
BI0032	387	5	P	
BI0033	457	1	P	
BI0034	103	1	P	
BI0035	90	0	P	

TABLE L-3

SAN DIEGO SHIPYARD
STATIONS THAT DID NOT PASS 25% SORT QA/QC

STATION	REPLICATE	NO. ANIMALS FOUND IN SORTING	NO.ANIMALS IN SORT QA	NO. ANIMALS FOUND IN RESORT
BI0002	1	251	13	5
	2	465	2	NA
	3	433	5	NA
	4	181	1	NA
	5	119	3	9
BI0003	1	204	2	NA
	2	325	5	16
	3	356	6	13
	4	358	24	69
	5	459	1	NA
BI0004	1	1479	18	NA
	2	1292	33	59
	3	2742	27	NA
	4	1424	64	229
	5	1950	16	NA
BI0007	1	239	7	6
	2	330	4	NA
	3	246	5	19
	4	124	2	8
	5	455	9	36
BI0009	1	370	26	54
	2	416	14	151
	3	304	8	55
	4	246	11	36
	5	317	12	28
BI0015	1	200	14	52
	2	183	2	NA
	3	307	1	NA
	4	223	1	NA
	5	252	8	9
BI0018	1	159	6	18
	2	147	2	NA
	3	97	2	4
	4	199	6	10
	5	111	4	3
BI0020	1	332	22	82
	2	137	3	15
	3	197	5	10
	4	157	6	18
	5	300	4	NA
BI0025	1	183	8	5
	2	300	25	41
	3	358	27	15
	4	238	9	14
	5	250	24	3

BI0027	1	482	8	38
	2	411	5	NA
	3	597	6	NA
	4	485	7	NA
	5	584	10	36
BI0029	1	312	9	32
	2	253	7	29
	3	462	11	16
	4	346	13	20
	5	349	13	35
BI0031	1	61	3	4
	2	73	1	NA
	3	57	2	5
	4	32	0	NA
	5	34	0	NA

Table L-4. Benthic macroinvertebrate taxa not found in SCAMIT

Phylum	Family	Genus and Species
Cnidaria	Edwardsiidae	*Scolanthus* sp. B
	Scleractinia	*Flosmaris grandis*
Mollusca	Ostreidae	*Ostrea conchaphila*
	Mactridae	*Mactromeris polynyma*
Annelida	Eunicidae	*Marphysa* sp. HYP1
		Nematonereis sp.
	Lumbrineridae	*Scoletoma erecta*
		Scoletoma luti
	Phyllodocidae	*Eteone* sp. 11
	Sabellidae	*Chone* sp. D
	Serpulidae	*Hydroides gracilis*
	Spionidae	*Boccardiella ligerica*
		Polydora websteri
	Syllidae	*Amblyosyllis* sp. D
		Branchiosyllis sp.
		Brania sp. 8
		Sphaerosyllis sp. 7
		Syllis aciculata
	Terebellidae	*Nicolea* sp. A
		Pista sp. C
		Pista percyi
Arthropoda	Ammotheidae	*Achelia* sp.
	Palaemonidae	*Periclimenes infraspinus*
	Kallianopsidae	*Kalliapseudes crassus*
Ectoprocta	Crisiidae	*Filicrisia* sp.
	Schizoporellidae	*Watersipora cucullata*
Chordata	Styelidae	*Botryllus* sp.

Attachment L1

Credentials for Taxonomists

CREDENTIALS FOR TAXONOMISTS

Nancy A. Carder
Echinoderms

Education
B.A. Anthropology/Sociology, Emphasis in Biology. Rollins College - 1987

Qualifications
Ms. Carder has 10 years experience in the field of marine biology. She has participated in several marine sampling projects in Southern California; including the collection, transfer, processing, sorting, and biomassing of samples. Other areas of expertise include taxonomic identification of echinoderms, carbon analysis of sediments, and the operation of field equipment. Ms. Carder is also SCUBA certified.

Ms. Carder has participated in tropical marine studies conducted in Belize, British Honduras. These included studies of various reef ecosystems as well as the collection and identification of marine invertebrates. She has been conducting taxonomic identification of echinoderms for the OCSD Benthic Monitoring Program for 7 years, and has performed taxonomic identification of echinoderms from several other programs, including SCBPP 1994, SCCWRP 1998, Long Beach Baseline (3 years), Encina Wastewater Authority, and many wetlands studies.

Douglas Diener, Ph.D.
Arthropods

Education
Ph.D. Marine Biology, Scripps Institution of Oceanography - 1975
B.A. Biochemistry, University of California, Berkeley - 1969
Postdoctoral fellowship, Smithsonian Tropical Research Institute, 1975-1976

Qualifications
Dr. Diener has over 24 years of professional and academic training in marine biology, taxonomy, chemistry, and ecology, encompassing a wide range of environmental studies in all major habitats along the Pacific coast. His expertise includes almost 25 years of fish taxonomy and over 20 years of crustacean and echinoderm taxonomy. Dr. Diener is a charter member of both the Southern California Association of Invertebrate Taxonomists (SCAMIT) and Northern Association of Invertebrate Taxonomists (NAMIT). He has provided taxonomic identifications for samples collected throughout the Pacific and has conducted numerous studies involving identification of organisms from photographs and video tapes. Dr. Diener's taxonomic services have provided information used to establish baseline conditions and/or biological impacts for many types of projects. Analyses has been done for projects related to industrial development, including: offshore oil and gas development and production, onshore processing and refining facilities, oil and gas transport options, ocean wastewater and thermal outfalls; water quality objectives; artificial reefs; dredge and fill projects; harbor development and expansion; wetlands restoration and mitigation; and nuclear power plant operations.

Leslie Harris

Annelids

Qualifications

Ms. Harris has over 25 years experience in marine ecology and invertebrate and algal taxonomy. As the Collections Manager for the Allan Hancock Polychaete Collection of the Los Angeles County Museum of Natural History, she maintains North America's 2nd largest collection of polychaetes and related literature. Her expertise is in the collection and identification of polychaetes of the west coast of North America, from Baja California, Mexico, California, Oregon, Washington, and Alaska, intertidal to abyssal habitats. Ms. Harris also has experience with bibliographic research and summarizing and reporting research results.

John Ljubenkov

Molluscs, Miscellaneous Taxa

Education

B.S. Zoology, California State University, Long Beach - 1969

Qualifications

Mr. Ljubenkov has over 30 years of experience in marine ecology and marine invertebrate taxonomy. He has provided taxonomic expertise on invertebrate fauna, especially molluscs and miscellaneous taxa, along the west coast of the U.S. for many large and small programs. He is a recognized specialist in cnidarian and miscellaneous taxonomy and has identified these fauna from virtually every sample collected in federal and state lease tracts off the California coast. Additionally, Mr. Ljubenkov has conducted numerous ROV (remote-operated vehicle) and manned submersible surveys on the shelf and slope areas of California. Over the years, he has interpreted hundreds of bottom photographs and ROV-collected video tapes using photogrammetric and cartographic techniques.

Mr. Ljubenkov frequently participates in sampling expeditions off the coast of California. He is familiar with a wide range of marine field sampling techniques. He is also familiar with bibliographic techniques and databases, and has the ability to translate scientific German and French. Mr. Ljubenkov has used many laboratory techniques from dissections of whales in the field to fine microscopic work in the identification of invertebrates.

Charles A. Phillips

Annelids

Education

B.S. Marine Biology, California State University, Long Beach, 1976.

Qualifications

Mr. Phillips has over 25 years of experience in the identification of benthic infauna. He has been responsible for identification of infauna, trawl fish, and invertebrates collected during NPDES required monitoring studies of Santa Monica Bay and outer Los Angeles Harbor, data analysis of completed infauna samples; supervision of field work (benthos, water column, microlayer). Additional projects include the taxonomic study of the Order Cumacea in the Southern California Bight and clarification of the taxonomy of Aphelochaeta and Monticellina (Polychaeta: Cirratulidae) in the Southern California Bight. He is experienced in the identification of polychaetes, molluscs, crustaceans, and miscellaneous phyla from areas such as San Diego, Orange County, Los Angeles, Gaviota, Morro Bay, Santa Barbara, Puget Sound, and Prince William Sound.

Attachment L2

Invertebrate Taxonomic References

INVERTEBRATE TAXONOMIC REFERENCES

Annelida

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Appendix M

Evaluation of the Benthic Response Index

Evaluation of the Benthic Response Index

The benthic response index (BRI) approach is an attempt to compress the wealth of information available on benthic macroinvertebrate communities into a single number. Although Smith et al. (2003) acknowledge that reducing biological data to a single variable has disadvantages, they state that the resulting indices remove much of the subjectivity associated with interpreting benthic data. However, evaluation of the BRI approach indicates that several of its features are either highly subjective or negatively affected by uncertainty.

Although the p_i values on which the BRI approach is based are developed using relatively objective multivariate methods, their interpretation is highly subjective. Although the BRI values represent a continuum of benthic community conditions, variation along this continuum is assumed to be attributable solely to pollution effects, and the manner in which the benthic response thresholds break that continuum into discrete categories is highly artificial and subjective. Smith et al. (2003) acknowledge that the threshold for Response Level 1 was chosen "somewhat arbitrarily," and provide no evidence that the other thresholds were not chosen in a similar manner. As shown previously, the use of these artificial thresholds can overestimate the significance of any benthic community alterations, particularly with respect to major community characteristics such as taxa richness, total abundance, and species diversity.

Smith et al. (2003) conducted several checks of the consistency of the BRI values. One of these consisted of correlations between BRI scores for northern and southern bays, when applied to the region of overlap (Newport Bay and Dana Point Harbor). Because data from Newport Bay and Dana Point Harbor were included in the development of the BRI method for both northern and southern bays, consistency is to be expected, and this check does not constitute an independent validation of either BRI calculation.

A second consistency check carried out by Smith et al. (2003) was to examine correlations between BRI scores and both amphipod toxicity and effects range-median (ER-M) quotients. Because the pollution tolerance scores were originally assigned on the basis of amphipod toxicity and ER-M values, this check is circular and also does not constitute an independent validation of the BRI.

A third consistency check carried out by Smith et al. (2003) was to evaluate BRI scores for stations that were designated *a priori* as either disturbed or undisturbed. Because the *a priori* determinations of presence or absence of disturbance were also made using amphipod toxicity and ER-M quotients, this check is similar to the previous one, is also circular, and does not constitute an independent validation.

A fourth check carried out by Smith et al. (2003) was to determine whether there was any association between BRI values and physical variables such as sediment grain size and total organic carbon (TOC) content. The BRI varied consistently only with TOC, but weak or absent relationships between the BRI and most physical variables do not provide any assurance that the BRI has a strong relationship with pollution effects. This check therefore also does not constitute an independent validation of the method. Smith et al. (2003) also attempted to conduct a truly independent validation of the BRI method by splitting the data set into two subsets, developing the BRI using one subset, and validating it using the other subset. This attempt was unsuccessful, most likely as a result of the relatively limited quantity of data and the relatively wide range of conditions and benthic communities in bays. As a consequence, there has not yet been a completely independent validation of the newly developed BRI for southern (or northern) California bays.

The taxon-specific p_i values are abundance-weighted averages of the multiple (up to 170) observations of each taxon along the presumed pollution gradient defined by ordination analysis. There is therefore a quantifiable uncertainty (e.g., standard deviation) associated with each p_i value. Smith et al. (2003) do not present estimates of the uncertainties associated with the p_i values, but the differences between p_i values for northern and southern bays suggest that these uncertainties may be quite large. If the uncertainty associated with each p_i value had been reported by Smith et al. (2003), the uncertainties could be propagated throughout the BRI calculation to produce an estimate of the overall uncertainty associated with each BRI value. Prior to any use of the BRI for cleanup decision making, this uncertainty analysis needs to be performed, and the results evaluated, to determine how large a difference in BRI values would have to be found to actually represent a meaningful difference in biological conditions. Such an analysis might reveal why the different response levels selected by Smith et al. (2003) do not actually represent distinct categories of biological effects at the shipyards.

The BRI approach is also limited by the fact that it ignores study-specific reference conditions and the fact that species replacements can occur in benthic communities without resulting in measurable losses of community function. Use of the reference conditions measured in the shipyard study showed that many communities identified as altered on the basis of their BRI values actually fell within the reference envelopes for major community metrics or did not differ statistically from the mean reference values determined for those metrics. Although some reference species were absent from the communities at the shipyard stations, the major community metrics did not substantially differ from reference conditions at many of those stations because alternate species were present at equivalent abundances. Because the alternate species in the shipyard communities may serve roles similar to those of the reference species, the functioning of those communities may be unaffected. Of the total of 418 taxa present in the 1.0-mm California bays database, Smith et al. (2003) were able to develop p_i values for only about half of the taxa (i.e., 216 taxa, or 51 percent). This indicates that the pollution tolerance of almost half of the taxa in the database is unknown. It therefore is possible that many of the species replacements that occurred at the shipyard stations included species with pollution tolerances similar to those of the reference species, and that the replacements occurred as the result of habitat changes unrelated to toxic chemicals (e.g., sediment grain size, sediment organic content, water currents).

Another potential problem with the lack of p_i values for certain species was found for Station 2231 in the present study. Station 2231 was not included in the set of original five reference stations that was used to evaluate benthic communities because of the unusually high density of the tanaidacean *Kalliapsuedes crassus* that was found there. The benthic community found at this station was highly altered due to the presence of *K. crassus*. For example, mean total abundance of benthic organisms (i.e., 6,232 individuals per sample) was nearly an order of magnitude higher than the values found at the other four stations (i.e., 440–987 individuals per sample; Table M-1), primarily because of the high abundance of *K. crassus*, which accounted for more than 85 percent of the total abundance. In addition, mean species diversity at Station 2231 (i.e., 0.79) was very low compared to the values found at the other four reference stations (i.e., 2.49–2.80) and the values found at the shipyard stations (i.e., 1.58–3.17). Despite the presence of a highly altered benthic community at Station 2231, the BRI value for that station (31.0) identified it as representative of reference conditions (Table M-1). However, because p_i values were not available for *K. crassus*, that species did not enter into the calculation of the BRI value. This example demonstrates that the results of the BRI approach can be misleading when an important benthic species is present at a site, but lacks a p_i value.

In addition to the external uncertainties related to interpretation of the BRI values, the internal consistency of the BRI values is highly uncertain. For example, Smith et al. (2001, 2003) developed a total of five different sets of p_i values for specific aquatic habitats in southern California: three sets for the coastal shelf (i.e., shallow, mid-depth, and deep) and two sets for the bays (i.e., northern and southern). The p_i values for many individual taxa are very different across the five sets of p_i values, including across the two sets of bay p_i values. For northern and southern bays, there are 56 species with p_i values that differ by more than 30 points, and 47 of these species are consequently assigned to different response levels. Table M-2 presents the p_i values for 8 of the 10 taxa that were largely responsible for the elevated BRI values at the six shipyard stations that were grouped in Response Level 3. (Only eight of these have p_i values for both northern and southern bays.) In many cases, the p_i values presented in Table M-2 differ considerably among habitats for the same benthic taxon. The largest differences are found for the cnidarian family Edwardsiidae and the amphipod species *Mayerella banksia*. For the amphipod, p_i values for four of the five habitats range from –37 to 19 and were indicative of reference conditions (i.e., p_i value <31). However, the p_i value for southern bays (i.e., 150) was one of the highest values found for any taxon in any of the five habitats, and was indicative of Response Level 4 (i.e., p_i value >73). The p_i values for Edwardsiidae exhibited a similar range in response levels: for four habitats, p_i values were indicative of reference conditions or Response Level 1, but for the southern bays, the p_i value was representative of Response Level 4. In fact, for five of the eight taxa presented in Table M-2, the p_i values for the southern bays were the highest ones found among the different aquatic habitats, and in all five cases, the high p_i values for the southern bays were the only ones representative of Response Level 4.

Overall, there are 21 taxa (17 species and 4 higher taxonomic groups) that are categorized as reference species for northern bays, but not for southern bays, with an average difference of 50 in the p_i values. The consequence of these discrepancies in p_i values may be overestimation of BRI scores in southern California bays.

The differences among p_i values cannot be explained by different scales of effects in northern and southern bays, because Smith et al. (2003) state that "the scales of the index values from the two habitats were standardized so that a particular index value indicates the same level of effect, regardless of the habitat." Smith et al. (2003) themselves identified inconsistencies between p_i values for the southern and northern bays when they found a low level of correlation ($r = 0.39$) between the two sets of p_i values for the taxa common to both data sets. However, the authors did not take any steps to reduce these inconsistencies.

The inconsistency of species-specific p_i values across aquatic habitats is difficult to justify, especially when the values range from reference conditions to Response Level 4 for the same species. There is no reasonable explanation for large differences in chemical sensitivity of individual species between northern and southern bays. In the case of higher taxonomic levels (e.g., the cnidarian family Edwardsiidae), Smith et al. (2003) speculated that the inconsistency may be partly the result of the higher levels containing multiple species with difference responses to stress. However, Smith et al. (2003) provided no convincing explanation for the wide ranges of p_i values among different habitats that were found for many individual species. Differences among the three studies used to develop the p_i values could be responsible for some of the observed discrepancies in pollution tolerance scores; Smith et al. (2003) do not provide any analysis of variations among these studies, however. Another likely explanation is that the gradients defined by ordination analysis for the northern and southern bays data sets actually represent different effects, whether different kinds of pollution or different combinations of pollution effects and physical effects. If this is the case, there is no assurance that whatever it is that the gradient represents is also pertinent to conditions at the shipyards.

The varying physical conditions in bays—water depths, sediment grain size, temperature, salinity, and water currents—create a very complex environment, with complex variations in the benthic macroinvertebrate community. Some species prefer muddy bottoms, and some prefer sandy bottoms; some prefer deep water, and others prefer shallow water. Species also vary in their tolerance for differing temperature and salinity. Some of these habitat conditions vary systematically throughout an enclosed bay such as San Diego Bay. For example, grain size, temperature, and salinity can all be expected to change systematically with distance from the open ocean. These systematically varying habitat characteristics also can be related to systematic changes in physical–chemical relationships, such as the tendency of some chemicals to naturally occur at higher concentrations on fine particles. Organisms that are naturally found in fine sediments are therefore more likely to have high pollution tolerance scores, and their presence will therefore result in elevated BRI values even in the absence of pollution. A gradient of increasing BRI scores with distance from the mouth of San Diego Bay can be seen not only among the shipyard reference stations but also among the 18 Bight '98 stations identified as representative of clean ambient conditions by the distance-from-shore approach (Bay and Brown 2003). Establishing a single scale of community conditions, such as the BRI, is therefore likely to be difficult, especially if it is to be developed and applied to bays with differing combinations of physical and chemical conditions.

A final concern with the BRI values based on the p_i values developed for the southern bays is their relatively low correlation with sediment toxicity results based on the amphipod *Eohaustorius estuarius*. Although Smith et al. (2003) found that BRI values developed for both the northern and southern bays correlated significantly ($P \leq 0.001$) with the amphipod results, the correlation coefficient for the southern bays (r = 0.50) was considerably lower than the value for the northern bays (r = 0.72). This suggests that the p_i values developed for the southern bays may be less accurate in representing the effects of chemical toxicity than are the p_i values developed for the northern bays, and is consistent with the low correlation among p_i values (i.e., r = 0.39) between the two data sets that was described previously.

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Table M-1. Summary of BRI values, benthic response levels, and major benthic community metrics for each reference and shipyard station

	BRI Value	Response Level[a]	Percent of Taxa without Pollution Tolerance Scores	Mean Total Abundance[b]	Mean Taxa Richness	Mean Species Diversity[c]
Reference Stations						
2441	19.9	Reference	44	505	47.8	2.8
2433	16.8	Reference	36	440	34.8	2.57
2440	32.2	1	35	639	39	2.72
2231	31	Reference	53	6,232	64	0.79
2243	45.1	2	42	987	39	2.49
Mean Value[d]				643	40.2	2.65
NASSCO						
NA01	42.2	2	42	447	33.4	2.79
NA03	45.5	2	37	492	39.8	2.99
NA04	49.6	2	35	285 *	25.2 *	2.5
NA05	44.4	2	41	569	34.6	2.42
NA06	54.4	3	54	611	36.6	2.7
NA07	44.6	2	49	475	42.8	2.96
NA09	51.1	2	49	862	44	2.61
NA11	46	2	46	604	33.4	2.39
NA12	42.6	2	48	538	37.2	2.74
NA15	51	2	31	306 *	25.8 *	2.33 *
NA16	48	2	41	522	33.4	2.56
NA17	55.3	3	48	418	33.2	2.73
NA19	46.7	2	47	828	42.8	2.71
NA20	54	3	40	412	21.6 *	2.31 *
NA22	51.6	2	31	107 *	15.0 *	2.18 *
Southwest Marine						
SW02	52.1	2	45	976	39.2	2.35 *
SW03	49.9	2	48	361	30.6	2.79
SW04	41.1	1	50	3,175	35.6	1.58 *
SW08	41.5	1	51	2,457	41	2.42
SW09	53.2	3	51	572	39.2	2.74
SW11	42.4	2	52	777	44.2	2.92
SW13	43.6	2	62	742	52.6	3.17
SW15	37.8	1	61	806	58.8	3.14
SW17	45.7	2	38	621	30.0 *	2.37
SW18	39.5	1	44	829	42	2.77
SW21	53.2	3	26	315 *	24.0 *	2.38
SW22	55.1	3	46	363	26.2 *	2.41
SW23	50	2	33	316 *	26.6 *	2.57
SW25	41.3	1	48	611	40.2	2.79
SW27	42.9	2	49	927	47.8	2.9

Note: * - value is significantly less ($P \leq 0.05$) than mean reference value
BRI - benthic response index

[a] Based on the ranges of BRI values identified by Smith et al. (2003). For assigning response levels, each BRI value was rounded up to the next highest value, unless it was a whole number (i.e., 42.0 = 42, whereas 42.1 = 43).

[b] Per sample.

[c] Shannon-Wiener Diversity Index (H′).

[d] Excludes data for Station 2231.

Table M-2. Summary of p_i values based on different southern California habitats for key benthic macroinvertebrate taxa from the six shipyard stations classified as Response Level 3[a]

	Continental Shelf p_i Values			Bays p_i Values	
Taxon	Shallow	Mid-Depth	Deep	North	South
Cnidaria					
Edwardsiidae	15	35	6	20	77
Mollusca					
Musculista senhousia	NA	NA	NA	138	70
Polychaeta					
Aphelochaeta/Monticellina complex	69	86	39	63	97
Capitella capitata complex	76	84	89	197	88
Leitoscoloplos pugettensis	42	48	8	50	94
Neanthes acuminata complex	NA	NA	NA	166	90
Pherusa capulata	NA	NA	NA	NA	122
Arthropoda					
Ambidexter panamensis	NA	NA	NA	NA	120
Mayerella banksia	5	–15	–37	19	150
Pyromaia tuberculata	32	40	NA	12	96

[a] p_i values taken from Smith et al. (2003).

Appendix N

Fish Histopathology Data

Contents

Table N-1. Characteristics of fish analyzed for histopathology

Station	Date	Sample ID	Sample Number	Fork Length (mm)	Mass (g)	Sex	Age (y)[a]
2240FI	27-Sep-02	02SDH-102	102	270	300	F	8
2240FI	27-Sep-02	02SDH-103	103	268	297	M	5
2240FI	27-Sep-02	02SDH-104	104	259	258	F	5
2240FI	27-Sep-02	02SDH-105	105	265	257	M	5
2240FI	27-Sep-02	02SDH-106	106	260	270	M	10
2240FI	27-Sep-02	02SDH-107	107	268	302	M	3
2240FI	27-Sep-02	02SDH-108	108	272	298	F	5
2240FI	27-Sep-02	02SDH-109	109	229	167	M	5
2240FI	27-Sep-02	02SDH-110	110	316	418	M	6
2240FI	27-Sep-02	02SDH-111	111	258	268	F	4
2240FI	27-Sep-02	02SDH-112	112	266	276	M	3
2240FI	27-Sep-02	02SDH-113	113	225	152	F	5
2240FI	27-Sep-02	02SDH-114	114	223	163	M	7
2240FI	27-Sep-02	02SDH-115	115	324	444	M	1
2240FI	27-Sep-02	02SDH-116	116	292	420	M	5
2240FI	27-Sep-02	02SDH-117	117	270	304	M	1
2240FI	27-Sep-02	02SDH-118	118	255	245	M	5
2240FI	27-Sep-02	02SDH-119	119	244	198	F	5
2240FI	27-Sep-02	02SDH-120	120	252	250	M	5
2240FI	27-Sep-02	02SDH-121	121	222	150	M	5
2240FI	27-Sep-02	02SDH-122	122	319	390	M	5
2240FI	27-Sep-02	02SDH-123	123	255	229	F	7
2240FI	27-Sep-02	02SDH-124	124	305	432	M	3
2240FI	27-Sep-02	02SDH-125	125	299	344	M	5
2240FI	27-Sep-02	02SDH-126	126	252	231	M	7
2240FI	27-Sep-02	02SDH-127	127	270	250	F	1
2240FI	27-Sep-02	02SDH-128	128	252	211	F	5
2240FI	27-Sep-02	02SDH-129	129	262	260	F	2
2240FI	27-Sep-02	02SDH-130	130	288	363	M	4
2240FI	27-Sep-02	02SDH-131	131	270	282	M	5
2240FI	27-Sep-02	02SDH-132	132	247	211	F	3
2240FI	27-Sep-02	02SDH-133	133	288	340	F	1
2240FI	27-Sep-02	02SDH-134	134	233	175	F	5
2240FI	27-Sep-02	02SDH-135	135	276	274	F	5
2240FI	27-Sep-02	02SDH-136	136	248	210	F	4
2240FI	27-Sep-02	02SDH-137	137	306	348	F	5
2240FI	27-Sep-02	02SDH-138	138	245	208	F	5
2240FI	27-Sep-02	02SDH-139	139	316	411	M	8
2240FI	27-Sep-02	02SDH-140	140	258	240	F	3
2240FI	27-Sep-02	02SDH-141	141	252	203	M	5
2240FI	27-Sep-02	02SDH-142	142	278	280	M	4
2240FI	27-Sep-02	02SDH-143	143	273	274	F	5
2240FI	27-Sep-02	02SDH-144	144	286	309	M	4
2240FI	27-Sep-02	02SDH-145	145	280	293	F	3
2240FI	27-Sep-02	02SDH-146	146	281	283	F	3
2240FI	27-Sep-02	02SDH-147	147	251	235	M	5
2240FI	27-Sep-02	02SDH-148	148	242	203	F	1
2240FI	27-Sep-02	02SDH-149	149	251	221	F	5
2240FI	27-Sep-02	02SDH-150	150	254	228	M	5

Table N-1. (cont.)

Station	Date	Sample ID	Sample Number	Fork Length (mm)	Mass (g)	Sex	Age (y)[a]
2240FI	27-Sep-02	02SDH-151	151	359	613	M	5
2240FI	27-Sep-02	02SDH-152	152	248	219	M	4
2240FI	27-Sep-02	02SDH-153	153	306	394	F	5
NAFI01	26-Sep-02	02SDH-100	100	250	235	M	5
NAFI01	26-Sep-02	02SDH-101	101	241	200	F	4
NAFI01	26-Sep-02	02SDH-52	52	243	190	F	7
NAFI01	26-Sep-02	02SDH-53	53	312	369	F	5
NAFI01	26-Sep-02	02SDH-54	54	260	242	M	10
NAFI01	26-Sep-02	02SDH-55	55	244	197	M	5
NAFI01	26-Sep-02	02SDH-56	56	230	152	M	3
NAFI01	26-Sep-02	02SDH-57	57	295	410	F	2
NAFI01	26-Sep-02	02SDH-58	58	280	371	F	5
NAFI01	26-Sep-02	02SDH-59	59	289	390	F	5
NAFI01	26-Sep-02	02SDH-60	60	302	415	F	5
NAFI01	26-Sep-02	02SDH-61	61	264	281	M	4
NAFI01	26-Sep-02	02SDH-62	62	225	166	M	6
NAFI01	26-Sep-02	02SDH-63	63	224	155	M	5
NAFI01	26-Sep-02	02SDH-64	64	335	508	M	5
NAFI01	26-Sep-02	02SDH-65	65	290	400	M	2
NAFI01	26-Sep-02	02SDH-66	66	326	530	F	5
NAFI01	26-Sep-02	02SDH-67	67	247	232	M	6
NAFI01	26-Sep-02	02SDH-68	68	275	295	M	3
NAFI01	26-Sep-02	02SDH-69	69	290	350	M	5
NAFI01	26-Sep-02	02SDH-70	70	325	470	M	1
NAFI01	26-Sep-02	02SDH-71	71	272	285	F	5
NAFI01	26-Sep-02	02SDH-72	72	310	415	M	5
NAFI01	26-Sep-02	02SDH-73	73	258	218	F	5
NAFI01	26-Sep-02	02SDH-74	74	266	235	F	1
NAFI01	26-Sep-02	02SDH-75	75	254	230	M	5
NAFI01	26-Sep-02	02SDH-76	76	254	220	F	1
NAFI01	26-Sep-02	02SDH-77	77	250	210	M	5
NAFI01	26-Sep-02	02SDH-78	78	310	445	M	8
NAFI01	26-Sep-02	02SDH-79	79	270	260	M	4
NAFI01	26-Sep-02	02SDH-80	80	226	170	M	5
NAFI01	26-Sep-02	02SDH-81	81	295	340	M	6
NAFI01	26-Sep-02	02SDH-82	82	220	155	M	5
NAFI01	26-Sep-02	02SDH-83	83	240	225	M	11
NAFI01	26-Sep-02	02SDH-84	84	248	230	M	5
NAFI01	26-Sep-02	02SDH-85	85	300	430	M	5
NAFI01	26-Sep-02	02SDH-86	86	288	340	M	5
NAFI01	26-Sep-02	02SDH-87	87	270	265	M	5
NAFI01	26-Sep-02	02SDH-88	88	316	480	F	5
NAFI01	26-Sep-02	02SDH-89	89	285	385	M	5
NAFI01	26-Sep-02	02SDH-90	90	340	602	M	11
NAFI01	26-Sep-02	02SDH-91	91	280	305	M	7
NAFI01	26-Sep-02	02SDH-92	92	242	197	M	5
NAFI01	26-Sep-02	02SDH-93	93	250	228	M	5
NAFI01	26-Sep-02	02SDH-94	94	270	323	F	7
NAFI01	26-Sep-02	02SDH-95	95	280	337	M	6

Table N-1. (cont.)

Station	Date	Sample ID	Sample Number	Fork Length (mm)	Mass (g)	Sex	Age (y)[a]
NAFI01	26-Sep-02	02SDH-96	96	300	415	M	8
NAFI01	26-Sep-02	02SDH-97	97	319	532	F	5
NAFI01	26-Sep-02	02SDH-98	98	310	440	F	5
NAFI01	26-Sep-02	02SDH-99	99	228	360	M	3
NAFI02	28-Sep-02	02SDH-204	204	275	300	M	1
NAFI02	28-Sep-02	02SDH-205	205	299	385	M	12
NAFI02	28-Sep-02	02SDH-206	206	308	355	M	5
NAFI02	28-Sep-02	02SDH-207	207	300	330	M	4
NAFI02	28-Sep-02	02SDH-208	208	259	245	M	4
NAFI02	28-Sep-02	02SDH-209	209	260	230	F	5
NAFI02	28-Sep-02	02SDH-210	210	280	290	M	3
NAFI02	28-Sep-02	02SDH-211	211	297	350	M	5
NAFI02	28-Sep-02	02SDH-212	212	263	275	M	1
NAFI02	28-Sep-02	02SDH-213	213	262	275	M	9
NAFI02	28-Sep-02	02SDH-214	214	295	350	M	4
NAFI02	28-Sep-02	02SDH-215	215	240	178	F	5
NAFI02	28-Sep-02	02SDH-216	216	305	400	M	13
NAFI02	29-Sep-02	02SDH-217	217	280	310	M	5
NAFI02	29-Sep-02	02SDH-218	218	260	215	F	4
NAFI02	29-Sep-02	02SDH-219	219	240	217	M	3
NAFI02	29-Sep-02	02SDH-220	220	300	364	M	5
NAFI02	29-Sep-02	02SDH-221	221	310	490	M	1
NAFI02	29-Sep-02	02SDH-222	222	275	296	M	5
NAFI02	29-Sep-02	02SDH-223	223	276	305	M	4
NAFI02	29-Sep-02	02SDH-224	224	318	518	M	2
NAFI02	29-Sep-02	02SDH-225	225	250	286	M	4
NAFI02	29-Sep-02	02SDH-226	226	260	334	M	7
NAFI02	29-Sep-02	02SDH-227	227	245	341	M	1
NAFI02	29-Sep-02	02SDH-228	228	240	265	M	6
NAFI02	29-Sep-02	02SDH-229	229	245	335	M	5
NAFI02	29-Sep-02	02SDH-230	230	230	325	M	5
NAFI02	29-Sep-02	02SDH-231	231	245	336	M	4
NAFI02	29-Sep-02	02SDH-232	232	235	186	F	4
NAFI02	29-Sep-02	02SDH-233	233	243	226	F	4
NAFI02	29-Sep-02	02SDH-234	234	253	242	F	4
NAFI02	29-Sep-02	02SDH-235	235	299	342	M	10
NAFI02	29-Sep-02	02SDH-236	236	284	323	M	5
NAFI02	29-Sep-02	02SDH-237	237	335	487	M	3
NAFI02	29-Sep-02	02SDH-238	238	295	329	M	5
NAFI02	29-Sep-02	02SDH-239	239	255	216	F	5
NAFI02	29-Sep-02	02SDH-240	240	275	297	M	5
NAFI02	29-Sep-02	02SDH-241	241	280	350	M	5
NAFI02	29-Sep-02	02SDH-242	242	310	390	M	6
NAFI02	29-Sep-02	02SDH-243	243	262	240	F	1
NAFI02	29-Sep-02	02SDH-244	244	264	246	F	1
NAFI02	29-Sep-02	02SDH-245	245	286	355	M	7
NAFI02	29-Sep-02	02SDH-246	246	279	318	M	2
NAFI02	29-Sep-02	02SDH-247	247	320	392	M	1
NAFI02	29-Sep-02	02SDH-248	248	260	257	M	5

Table N-1. (cont.)

Station	Date	Sample ID	Sample Number	Fork Length (mm)	Mass (g)	Sex	Age (y)[a]
NAFI02	29-Sep-02	02SDH-249	249	350	370	M	3
NAFI02	29-Sep-02	02SDH-250	250	295	385	M	7
NAFI02	29-Sep-02	02SDH-251	251	255	224	F	13
NAFI02	29-Sep-02	02SDH-252	252	253	225	F	5
NAFI02	29-Sep-02	02SDH-253	253	285	326	M	1
SWFI01	25-Sep-02	02SDH-1	1	299	384	F	6
SWFI01	25-Sep-02	02SDH-10	10	217	139	M	7
SWFI01	25-Sep-02	02SDH-11	11	268	249	M	5
SWFI01	25-Sep-02	02SDH-12	12	254	245	M	7
SWFI01	25-Sep-02	02SDH-13	13	240	180	M	5
SWFI01	25-Sep-02	02SDH-14	14	254	230	M	7
SWFI01	25-Sep-02	02SDH-15	15	253	198	F	5
SWFI01	25-Sep-02	02SDH-16	16	297	384	M	10
SWFI01	25-Sep-02	02SDH-17	17	279	290	F	4
SWFI01	25-Sep-02	02SDH-18	18	287	340	M	4
SWFI01	25-Sep-02	02SDH-19	19	253	223	F	5
SWFI01	25-Sep-02	02SDH-2	2	273	265	F	5
SWFI01	25-Sep-02	02SDH-20	20	258	225	F	3
SWFI01	25-Sep-02	02SDH-21	21	240	230	M	5
SWFI01	25-Sep-02	02SDH-22	22	320	447	F	5
SWFI01	25-Sep-02	02SDH-23	23	270	270	F	10
SWFI01	25-Sep-02	02SDH-24	24	263	249	F	6
SWFI01	25-Sep-02	02SDH-25	25	304	438	M	5
SWFI01	25-Sep-02	02SDH-26	26	325	468	F	8
SWFI01	25-Sep-02	02SDH-27	27	270	251	F	5
SWFI01	25-Sep-02	02SDH-28	28	260	254	M	5
SWFI01	25-Sep-02	02SDH-29	29	238	173	M	5
SWFI01	25-Sep-02	02SDH-3	3	266	279	M	5
SWFI01	25-Sep-02	02SDH-30	30	352	576	F	8
SWFI01	25-Sep-02	02SDH-31	31	251	226	M	5
SWFI01	25-Sep-02	02SDH-32	32	280	262	F	5
SWFI01	25-Sep-02	02SDH-33	33	240	207	F	9
SWFI01	25-Sep-02	02SDH-34	34	225	171	M	6
SWFI01	25-Sep-02	02SDH-35	35	285	327	F	7
SWFI01	25-Sep-02	02SDH-36	36	228	156	M	3
SWFI01	25-Sep-02	02SDH-37	37	243	203	M	5
SWFI01	25-Sep-02	02SDH-38	38	245	201	M	5
SWFI01	25-Sep-02	02SDH-39	39	270	260	F	5
SWFI01	25-Sep-02	02SDH-4	4	280	330	M	4
SWFI01	25-Sep-02	02SDH-40	40	270	256	M	5
SWFI01	25-Sep-02	02SDH-41	41	228	298	F	7
SWFI01	25-Sep-02	02SDH-42	42	286	356	F	4
SWFI01	25-Sep-02	02SDH-43	43	254	260	F	5
SWFI01	25-Sep-02	02SDH-44	44	264	243	F	3
SWFI01	25-Sep-02	02SDH-45	45	340	605	F	6
SWFI01	25-Sep-02	02SDH-46	46	292	365	F	3
SWFI01	25-Sep-02	02SDH-47	47	258	225	F	4
SWFI01	25-Sep-02	02SDH-48	48	275	321	F	5
SWFI01	25-Sep-02	02SDH-49	49	300	436	F	4

Table N-1. (cont.)

Station	Date	Sample ID	Sample Number	Fork Length (mm)	Mass (g)	Sex	Age (y)[a]
SWFI01	25-Sep-02	02SDH-5	5	270	280	M	10
SWFI01	25-Sep-02	02SDH-50	50	320	445	M	5
SWFI01	25-Sep-02	02SDH-51	51	259	225	F	5
SWFI01	25-Sep-02	02SDH-6	6	284	318	F	3
SWFI01	25-Sep-02	02SDH-7	7	265	245	F	11
SWFI01	25-Sep-02	02SDH-8	8	257	252	F	5
SWFI01	25-Sep-02	02SDH-9	9	352	630	M	4
SWFI02	27-Sep-02	02SDH-154	154	294	344	M	5
SWFI02	27-Sep-02	02SDH-155	155	306	272	M	5
SWFI02	27-Sep-02	02SDH-156	156	294	377	M	5
SWFI02	27-Sep-02	02SDH-157	157	290	347	M	5
SWFI02	27-Sep-02	02SDH-158	158	283	308	M	5
SWFI02	27-Sep-02	02SDH-159	159	285	323	M	5
SWFI02	27-Sep-02	02SDH-160	160	285	333	M	5
SWFI02	27-Sep-02	02SDH-161	161	260	225	F	5
SWFI02	27-Sep-02	02SDH-162	162	291	360	M	6
SWFI02	27-Sep-02	02SDH-163	163	248	210	F	6
SWFI02	27-Sep-02	02SDH-164	164	284	325	M	5
SWFI02	28-Sep-02	02SDH-165	165	269	304	M	7
SWFI02	28-Sep-02	02SDH-166	166	305	376	M	6
SWFI02	28-Sep-02	02SDH-167	167	235	198	F	10
SWFI02	28-Sep-02	02SDH-168	168	273	305	M	5
SWFI02	28-Sep-02	02SDH-169	169	271	260	F	8
SWFI02	28-Sep-02	02SDH-170	170	244	217	F	5
SWFI02	28-Sep-02	02SDH-171	171	324	430	M	5
SWFI02	28-Sep-02	02SDH-172	172	218	337	M	6
SWFI02	28-Sep-02	02SDH-173	173	247	208	F	5
SWFI02	28-Sep-02	02SDH-174	174	313	409	M	5
SWFI02	28-Sep-02	02SDH-175	175	326	463	M	3
SWFI02	28-Sep-02	02SDH-176	176	304	370	M	5
SWFI02	28-Sep-02	02SDH-177	177	306	428	M	5
SWFI02	28-Sep-02	02SDH-178	178	294	351	M	9
SWFI02	28-Sep-02	02SDH-179	179	298	330	M	5
SWFI02	28-Sep-02	02SDH-180	180	305	368	M	6
SWFI02	28-Sep-02	02SDH-181	181	283	303	M	11
SWFI02	28-Sep-02	02SDH-182	182	259	257	F	5
SWFI02	28-Sep-02	02SDH-183	183	267	274	F	5
SWFI02	28-Sep-02	02SDH-184	184	309	418	M	5
SWFI02	28-Sep-02	02SDH-185	185	304	378	M	5
SWFI02	28-Sep-02	02SDH-186	186	290	302	M	7
SWFI02	28-Sep-02	02SDH-187	187	254	243	F	5
SWFI02	28-Sep-02	02SDH-188	188	272	300	M	11
SWFI02	28-Sep-02	02SDH-189	189	265	310	M	3
SWFI02	28-Sep-02	02SDH-190	190	308	382	M	5
SWFI02	28-Sep-02	02SDH-191	191	262	258	M	5
SWFI02	28-Sep-02	02SDH-192	192	298	280	M	3
SWFI02	28-Sep-02	02SDH-193	193	245	210	F	2
SWFI02	28-Sep-02	02SDH-194	194	293	338	M	5
SWFI02	28-Sep-02	02SDH-195	195	308	390	M	5

Table N-1. (cont.)

Station	Date	Sample ID	Sample Number	Fork Length (mm)	Mass (g)	Sex	Age (y)[a]
SWFI02	28-Sep-02	02SDH-196	196	258	255	F	7
SWFI02	28-Sep-02	02SDH-197	197	259	275	M	8
SWFI02	28-Sep-02	02SDH-198	198	285	355	M	7
SWFI02	28-Sep-02	02SDH-199	199	248	225	F	8
SWFI02	28-Sep-02	02SDH-200	200	275	325	M	2
SWFI02	28-Sep-02	02SDH-201	201	305	375	M	5
SWFI02	28-Sep-02	02SDH-202	202	316	430	M	6
SWFI02	28-Sep-02	02SDH-203	203	255	222	F	5

[a] Age was determined from otolith measurements.

Table N-2. Fish histopathology results—gill

Station ID	Sample ID	CUE	EPC	GLF	GLH	GLT	LEL	RAK	THR	TMT
2240FI	02SDH-102	0	0	0	0	0	0	1	0	0
2240FI	02SDH-103	0	0	0	0	0	0	0	0	0
2240FI	02SDH-104	0	0	0	0	0	0	1	0	0
2240FI	02SDH-105	0	0	1	0	1	0	1	0	0
2240FI	02SDH-106	0	0	1	0	2	0	1	0	0
2240FI	02SDH-107	0	0	0	0	2	0	1	0	0
2240FI	02SDH-108	0	0	0	0	1	0	1	0	0
2240FI	02SDH-109	0	1	0	0	0	0	1	0	0
2240FI	02SDH-110	0	0	1	0	3	0	1	0	0
2240FI	02SDH-111	0	0	0	0	1	0	3	0	0
2240FI	02SDH-112	0	0	1	1	0	0	1	0	0
2240FI	02SDH-113	0	0	0	0	0	0	0	0	0
2240FI	02SDH-114	0	0	0	0	0	0	3	0	0
2240FI	02SDH-115	0	1	2	2	3	0	1	0	0
2240FI	02SDH-116	0	0	0	0	1	0	1	0	0
2240FI	02SDH-117	0	1	0	0	0	0	0	0	0
2240FI	02SDH-118	0	0	0	0	0	0	1	0	0
2240FI	02SDH-119	0	0	1	0	0	0	0	0	0
2240FI	02SDH-120	0	0	0	0	1	0	2	0	0
2240FI	02SDH-121	0	0	0	0	0	0	1	0	0
2240FI	02SDH-122	0	0	1	0	2	0	0	0	0
2240FI	02SDH-123	0	0	0	0	0	1	1	0	0
2240FI	02SDH-124	0	1	2	2	3	0	1	0	0
2240FI	02SDH-125	0	0	0	0	0	0	0	0	0
2240FI	02SDH-126	0	0	1	0	0	0	0	0	0
2240FI	02SDH-127	0	0	0	0	0	0	0	0	0
2240FI	02SDH-128	0	0	0	0	0	0	1	0	0
2240FI	02SDH-129	0	0	1	0	0	0	1	0	0
2240FI	02SDH-130	0	0	1	0	1	0	1	0	0
2240FI	02SDH-131	0	0	0	0	0	0	2	0	0
2240FI	02SDH-132	0	0	0	1	0	0	1	0	0
2240FI	02SDH-133	0	0	0	0	2	0	0	0	0
2240FI	02SDH-134	0	1	0	0	0	0	1	0	0
2240FI	02SDH-135	0	0	0	0	1	0	1	0	0
2240FI	02SDH-136	0	0	1	0	1	0	1	0	0
2240FI	02SDH-137	0	0	1	0	1	0	0	0	0
2240FI	02SDH-138	0	0	0	0	2	0	1	0	0
2240FI	02SDH-139	0	0	0	0	0	0	0	0	0
2240FI	02SDH-140	0	0	0	0	0	0	1	0	0
2240FI	02SDH-141	0	0	0	0	0	0	1	0	0
2240FI	02SDH-142	0	0	1	0	3	0	1	0	0
2240FI	02SDH-143	0	0	0	0	1	0	0	0	0
2240FI	02SDH-144	0	0	0	0	0	0	1	0	0
2240FI	02SDH-145	0	0	0	0	1	0	1	0	0
2240FI	02SDH-146	0	0	0	0	0	0	1	0	0
2240FI	02SDH-147	0	0	0	0	0	0	2	0	0
2240FI	02SDH-148	0	1	0	0	0	0	1	0	0
2240FI	02SDH-149	0	0	0	0	1	0	1	0	0
2240FI	02SDH-150	0	0	1	0	1	0	1	0	0
2240FI	02SDH-151	0	0	0	0	1	0	0	0	0

Table N-2. (cont.)

Station ID	Sample ID	CUE	EPC	GLF	GLH	GLT	LEL	RAK	THR	TMT
2240FI	02SDH-152	0	0	1	0	0	0	1	0	0
2240FI	02SDH-153	1	0	0	0	0	1	1	0	0
NAFI01	02SDH-100	0	0	0	0	0	0	1	0	0
NAFI01	02SDH-101	0	0	0	0	2	0	1	0	0
NAFI01	02SDH-52	0	0	0	0	0	0	1	0	0
NAFI01	02SDH-53	0	0	1	0	1	0	1	0	1
NAFI01	02SDH-54	0	0	1	2	2	0	1	0	0
NAFI01	02SDH-55	0	0	0	0	0	0	0	0	0
NAFI01	02SDH-56	0	0	0	0	0	0	1	0	0
NAFI01	02SDH-57	0	0	1	0	3	0	1	0	0
NAFI01	02SDH-58	0	0	0	0	0	0	0	0	0
NAFI01	02SDH-59	0	1	2	1	2	0	0	0	0
NAFI01	02SDH-60	0	0	1	0	2	0	1	0	0
NAFI01	02SDH-61	0	0	1	1	0	0	3	0	0
NAFI01	02SDH-62	0	0	0	0	0	0	1	0	0
NAFI01	02SDH-63	0	1	0	0	1	3	0	0	0
NAFI01	02SDH-64	0	0	1	0	3	0	1	0	0
NAFI01	02SDH-65	0	0	0	0	2	0	1	0	0
NAFI01	02SDH-66	0	0	2	0	2	0	1	0	0
NAFI01	02SDH-67	0	0	1	0	0	0	0	0	0
NAFI01	02SDH-68	0	0	1	0	2	0	1	0	0
NAFI01	02SDH-69	0	0	0	0	1	0	2	0	1
NAFI01	02SDH-70	0	0	0	2	0	0	1	1	0
NAFI01	02SDH-71	0	0	0	0	1	0	3	0	0
NAFI01	02SDH-72	0	0	2	0	3	0	0	0	0
NAFI01	02SDH-73	0	0	0	0	3	0	1	0	0
NAFI01	02SDH-74	0	0	0	0	1	0	1	0	0
NAFI01	02SDH-75	0	0	0	0	0	0	1	0	0
NAFI01	02SDH-76	0	0	1	0	1	0	0	0	0
NAFI01	02SDH-77	0	0	0	0	0	0	1	0	0
NAFI01	02SDH-78	0	0	0	0	2	0	1	0	0
NAFI01	02SDH-79	0	0	0	0	2	0	1	0	0
NAFI01	02SDH-80	0	0	0	0	0	0	1	0	0
NAFI01	02SDH-81	0	0	0	0	0	0	1	0	0
NAFI01	02SDH-82	0	1	0	0	0	0	1	0	0
NAFI01	02SDH-83	0	0	0	0	1	0	1	1	0
NAFI01	02SDH-84	0	0	0	0	0	0	2	0	0
NAFI01	02SDH-85	0	1	1	1	0	0	1	0	0
NAFI01	02SDH-86	0	0	0	0	1	0	2	0	0
NAFI01	02SDH-87	0	0	0	0	1	0	2	0	0
NAFI01	02SDH-88	0	1	0	0	1	0	1	0	0
NAFI01	02SDH-89	0	0	0	0	0	0	1	0	0
NAFI01	02SDH-90	0	0	2	1	2	0	2	0	1
NAFI01	02SDH-91	0	0	0	0	0	0	1	0	0
NAFI01	02SDH-92	0	0	1	0	1	0	1	0	0
NAFI01	02SDH-93	0	0	0	0	0	1	2	0	0
NAFI01	02SDH-94	0	0	0	0	1	0	1	0	0
NAFI01	02SDH-95	0	1	1	0	2	0	1	0	0
NAFI01	02SDH-96	0	0	1	0	3	0	2	0	0
NAFI01	02SDH-97	0	0	1	0	2	0	1	0	0

Table N-2. (cont.)

Station ID	Sample ID	CUE	EPC	GLF	GLH	GLT	LEL	RAK	THR	TMT
NAFI01	02SDH-98	0	1	1	0	1	0	0	0	0
NAFI01	02SDH-99	0	0	1	0	3	0	1	0	0
NAFI02	02SDH-204	0	0	1	1	1	0	2	0	0
NAFI02	02SDH-205	0	0	1	0	0	0	2	0	0
NAFI02	02SDH-206	0	0	1	0	2	0	0	0	0
NAFI02	02SDH-207	0	0	0	0	1	0	1	0	1
NAFI02	02SDH-208	0	0	0	0	2	0	1	0	0
NAFI02	02SDH-209	0	0	0	0	2	0	2	0	0
NAFI02	02SDH-210	0	0	0	0	0	0	0	0	0
NAFI02	02SDH-211	0	1	0	0	1	0	2	0	0
NAFI02	02SDH-212	0	0	0	0	1	0	0	0	0
NAFI02	02SDH-213	0	0	0	0	0	0	1	0	1
NAFI02	02SDH-214	0	0	0	0	1	0	2	0	0
NAFI02	02SDH-215	0	0	0	0	1	0	0	0	0
NAFI02	02SDH-216	0	0	0	0	2	0	0	0	0
NAFI02	02SDH-217	0	0	0	0	1	0	2	0	1
NAFI02	02SDH-218	0	0	0	0	1	0	1	0	0
NAFI02	02SDH-219	0	0	1	0	0	0	0	0	0
NAFI02	02SDH-220	0	0	1	0	0	0	2	0	0
NAFI02	02SDH-221	0	0	1	0	2	0	1	0	0
NAFI02	02SDH-222	0	0	0	0	1	0	1	0	0
NAFI02	02SDH-223	0	0	1	0	2	0	2	0	0
NAFI02	02SDH-224	0	0	1	0	2	0	2	0	1
NAFI02	02SDH-225	0	0	0	0	0	0	1	0	0
NAFI02	02SDH-226	0	0	0	0	1	0	2	0	0
NAFI02	02SDH-227	0	0	0	0	0	0	1	0	0
NAFI02	02SDH-228	0	1	0	1	1	0	1	0	0
NAFI02	02SDH-229	0	0	0	0	0	0	1	0	0
NAFI02	02SDH-230	0	0	1	0	1	0	1	0	0
NAFI02	02SDH-231	0	0	0	0	0	0	1	0	0
NAFI02	02SDH-232	0	0	0	0	0	0	1	0	0
NAFI02	02SDH-233	0	0	0	0	0	0	0	0	0
NAFI02	02SDH-234	0	0	0	0	0	0	0	1	0
NAFI02	02SDH-235	0	0	1	0	2	0	2	0	0
NAFI02	02SDH-236	0	0	0	0	0	0	2	0	0
NAFI02	02SDH-237	0	0	0	0	1	0	2	0	0
NAFI02	02SDH-238	0	0	2	0	3	0	1	0	0
NAFI02	02SDH-239	0	0	0	0	0	0	0	0	0
NAFI02	02SDH-240	0	0	0	0	0	0	1	0	0
NAFI02	02SDH-241	0	0	0	0	1	0	1	0	0
NAFI02	02SDH-242	1	0	1	1	0	0	1	0	0
NAFI02	02SDH-243	0	0	0	0	0	0	2	0	0
NAFI02	02SDH-244	0	0	0	0	1	0	1	0	0
NAFI02	02SDH-245	0	0	0	0	0	0	1	0	0
NAFI02	02SDH-246	0	0	0	0	0	0	1	0	0
NAFI02	02SDH-247	0	0	1	2	2	0	1	0	0
NAFI02	02SDH-248	0	0	0	0	0	0	1	0	0
NAFI02	02SDH-249	0	0	0	0	0	0	1	0	0
NAFI02	02SDH-250	0	0	2	0	3	0	2	1	0
NAFI02	02SDH-251	0	0	0	0	2	0	2	0	0

Table N-2. (cont.)

Station ID	Sample ID	CUE	EPC	GLF	GLH	GLT	LEL	RAK	THR	TMT
NAFI02	02SDH-252	0	1	0	0	1	0	1	0	0
NAFI02	02SDH-253	0	0	0	1	2	0	1	0	0
SWFI01	02SDH-1	0	0	1	0	3	0	2	0	0
SWFI01	02SDH-10	0	0	0	0	0	0	1	0	0
SWFI01	02SDH-11	0	0	0	0	1	0	1	0	0
SWFI01	02SDH-12	0	0	0	0	0	1	1	0	0
SWFI01	02SDH-13	0	1	1	2	0	0	2	0	0
SWFI01	02SDH-14	0	0	0	0	1	0	0	0	0
SWFI01	02SDH-15	0	0	2	2	0	0	1	0	0
SWFI01	02SDH-16	0	1	1	0	2	0	1	0	0
SWFI01	02SDH-17	0	0	0	0	1	0	0	0	0
SWFI01	02SDH-18	0	1	0	0	0	0	1	1	0
SWFI01	02SDH-19	0	0	1	0	2	0	3	0	0
SWFI01	02SDH-2	0	1	0	0	1	0	1	0	0
SWFI01	02SDH-20	0	1	0	0	0	0	1	0	0
SWFI01	02SDH-21	0	1	1	0	0	0	1	0	0
SWFI01	02SDH-22	0	0	0	0	1	0	2	0	0
SWFI01	02SDH-23	0	0	0	0	0	0	2	0	0
SWFI01	02SDH-24	0	0	0	0	0	0	1	0	0
SWFI01	02SDH-25	0	0	0	0	2	1	1	0	0
SWFI01	02SDH-26	0	1	1	0	0	0	1	0	0
SWFI01	02SDH-27	0	0	0	0	0	0	0	0	0
SWFI01	02SDH-28	0	0	0	0	1	0	1	0	0
SWFI01	02SDH-29	0	0	0	0	0	1	2	0	0
SWFI01	02SDH-3	0	0	0	0	0	0	1	0	0
SWFI01	02SDH-30	0	1	1	0	3	0	1	0	0
SWFI01	02SDH-31	0	0	0	0	1	0	1	0	0
SWFI01	02SDH-32	0	0	0	0	0	0	1	0	0
SWFI01	02SDH-33	0	0	0	0	0	2	1	0	0
SWFI01	02SDH-34	0	1	0	0	0	0	2	0	0
SWFI01	02SDH-35	0	0	0	0	0	0	1	0	0
SWFI01	02SDH-36	0	0	0	0	0	0	1	0	0
SWFI01	02SDH-37	0	0	0	0	1	0	2	0	0
SWFI01	02SDH-38	0	0	0	0	1	0	1	0	0
SWFI01	02SDH-39	0	1	1	0	2	0	1	0	0
SWFI01	02SDH-4	0	0	1	0	0	0	1	0	0
SWFI01	02SDH-40	0	0	1	0	1	0	2	0	0
SWFI01	02SDH-41	0	1	0	0	1	1	1	0	0
SWFI01	02SDH-42	0	1	1	0	1	1	1	0	0
SWFI01	02SDH-43	0	0	0	0	0	0	0	0	0
SWFI01	02SDH-44	0	0	1	2	0	0	1	0	0
SWFI01	02SDH-45	0	1	0	0	1	0	1	0	1
SWFI01	02SDH-46	0	0	0	0	0	0	1	0	0
SWFI01	02SDH-47	0	0	0	0	0	0	1	0	0
SWFI01	02SDH-48	0	1	0	0	1	0	1	0	0
SWFI01	02SDH-49	0	0	1	0	0	0	1	0	0
SWFI01	02SDH-5	0	0	0	0	0	0	1	0	0
SWFI01	02SDH-50	0	1	0	0	1	0	2	0	1
SWFI01	02SDH-51	0	1	1	0	2	0	1	0	0
SWFI01	02SDH-6	0	0	1	0	3	0	1	0	0

Table N-2. (cont.)

Station ID	Sample ID	CUE	EPC	GLF	GLH	GLT	LEL	RAK	THR	TMT
SWFI01	02SDH-7	0	0	0	0	1	0	1	0	0
SWFI01	02SDH-8	1	0	0	0	1	0	1	0	0
SWFI01	02SDH-9	0	0	1	0	3	0	1	0	0
SWFI02	02SDH-154	0	0	0	0	0	0	1	0	0
SWFI02	02SDH-155	0	0	0	0	1	0	1	0	0
SWFI02	02SDH-156	0	0	0	0	1	0	1	0	0
SWFI02	02SDH-157	0	0	2	0	3	0	1	0	0
SWFI02	02SDH-158	0	1	0	0	0	0	1	0	0
SWFI02	02SDH-159	0	0	1	0	1	0	1	0	0
SWFI02	02SDH-160	0	1	0	0	0	0	1	0	0
SWFI02	02SDH-161	0	0	1	0	3	0	1	0	0
SWFI02	02SDH-162	0	0	0	0	0	0	1	0	1
SWFI02	02SDH-163	0	0	0	0	2	0	1	0	0
SWFI02	02SDH-164	0	0	0	0	2	0	2	0	0
SWFI02	02SDH-165	0	0	0	0	0	0	1	0	0
SWFI02	02SDH-166	0	0	0	0	1	0	1	1	0
SWFI02	02SDH-167	0	0	0	0	0	0	0	0	0
SWFI02	02SDH-168	0	0	1	0	1	0	1	0	0
SWFI02	02SDH-169	0	0	0	0	0	0	1	0	0
SWFI02	02SDH-170	0	0	0	0	0	0	1	0	0
SWFI02	02SDH-171	0	1	0	0	0	0	1	0	0
SWFI02	02SDH-172	0	0	0	0	0	0	0	1	0
SWFI02	02SDH-173	0	0	0	0	1	0	1	0	0
SWFI02	02SDH-174	0	0	0	1	1	0	1	1	0
SWFI02	02SDH-175	0	0	0	0	0	0	0	0	0
SWFI02	02SDH-176	0	1	0	0	1	0	1	0	0
SWFI02	02SDH-177	0	0	0	0	0	1	1	0	0
SWFI02	02SDH-178	0	0	1	0	2	0	1	0	0
SWFI02	02SDH-179	0	0	0	0	2	0	1	0	0
SWFI02	02SDH-180	0	0	2	2	0	0	0	0	0
SWFI02	02SDH-181	0	0	0	0	0	0	0	0	0
SWFI02	02SDH-182	0	0	0	0	1	0	0	0	0
SWFI02	02SDH-183	0	0	1	0	1	0	1	0	0
SWFI02	02SDH-184	0	0	1	0	3	0	2	0	0
SWFI02	02SDH-185	0	1	1	0	3	0	2	0	0
SWFI02	02SDH-186	0	0	1	0	3	0	1	0	0
SWFI02	02SDH-187	0	0	0	0	1	0	1	0	0
SWFI02	02SDH-188	0	1	0	0	0	0	1	0	0
SWFI02	02SDH-189	0	0	0	0	1	0	1	0	0
SWFI02	02SDH-190	0	0	1	0	3	0	1	0	0
SWFI02	02SDH-191	0	0	0	1	0	0	0	0	0
SWFI02	02SDH-192	0	1	1	0	2	0	0	0	0
SWFI02	02SDH-193	0	1	0	0	0	0	1	0	0
SWFI02	02SDH-194	0	0	1	1	2	0	1	0	0
SWFI02	02SDH-195	0	1	2	0	2	0	2	0	0
SWFI02	02SDH-196	0	0	0	0	1	0	1	0	0
SWFI02	02SDH-197	0	0	1	0	0	1	1	0	0
SWFI02	02SDH-198	0	0	0	0	1	0	2	0	0
SWFI02	02SDH-199	0	0	0	0	2	0	1	0	0
SWFI02	02SDH-200	0	0	0	0	3	0	1	0	0

Table N-2. (cont.)

Station ID	Sample ID	CUE	EPC	GLF	GLH	GLT	LEL	RAK	THR	TMT
SWFI02	02SDH-201	0	0	0	0	0	0	0	1	0
SWFI02	02SDH-202	0	0	0	0	1	0	1	0	0
SWFI02	02SDH-203	0	0	1	0	0	0	1	0	1

Note:
CUE - cyst of unknown etiology
EPC - epitheliocystis
GLF - gill lamellar fusion
GLH - gill lamellar hyperplasia
GLT - gill lamellar telangiectasis
LEL - lamellar epithelial lifting
RAK - raker inflammation
THR - thrombosis
TMT - monogenetic trematode

Table N-3. Fish histopathology results—gonad (non-specific)

Station ID	Sample ID	BGP-ST	CUE	EGL	FBG	GGR	GMA	HVW	OAI	OAM	SPM
2240FI	02SDH-102	0	0	1	0	0	1	0	1	3	NP
2240FI	02SDH-103	0	0	2	0	0	1	1	1	1	NP
2240FI	02SDH-104	0	0	1	0	0	1	0	3	3	NP
2240FI	02SDH-105	0	0	1	2	0	1	1	0	3	NP
2240FI	02SDH-106	0	0	1	0	0	2	0	NP	NP	1
2240FI	02SDH-107	0	0	2	0	0	1	0	NP	NP	1
2240FI	02SDH-108	0	0	1	1	0	1	1	3	3	NP
2240FI	02SDH-109	0	0	1	0	0	1	0	0	NP	1
2240FI	02SDH-110	1	0	1	1	0	2	0	NP	NP	1
2240FI	02SDH-111	0	0	1	0	0	1	0	2	3	NP
2240FI	02SDH-112	0	0	1	0	1	1	0	NP	NP	1
2240FI	02SDH-113	0	0	0	0	0	0	0	1	NP	NP
2240FI	02SDH-114	0	0	1	0	0	1	0	2	NP	1
2240FI	02SDH-115	0	0	1	1	0	3	1	NP	NP	1
2240FI	02SDH-116	0	1	1	1	0	1	0	NP	NP	1
2240FI	02SDH-117	0	0	2	0	0	2	0	NP	NP	1
2240FI	02SDH-118	0	0	2	0	0	1	0	NP	NP	1
2240FI	02SDH-119	0	1	1	1	0	1	0	3	1	NP
2240FI	02SDH-120	0	0	1	0	1	1	0	NP	NP	2
2240FI	02SDH-121	0	0	1	0	0	0	0	0	NP	0
2240FI	02SDH-122	0	0	1	1	0	2	1	NP	NP	1
2240FI	02SDH-123	0	0	1	0	0	1	2	3	3	NP
2240FI	02SDH-124	1	0	1	1	0	3	0	NP	NP	1
2240FI	02SDH-125	0	0	1	0	0	1	0	NP	NP	1
2240FI	02SDH-126	0	0	1	0	0	1	0	NP	NP	1
2240FI	02SDH-127	0	0	1	0	0	1	1	1	3	NP
2240FI	02SDH-128	0	0	0	0	0	0	0	2	NP	0
2240FI	02SDH-129	0	0	1	1	0	1	0	3	3	NP
2240FI	02SDH-130	0	0	2	0	0	2	0	NP	NP	1
2240FI	02SDH-131	0	0	2	0	0	1	0	NP	NP	1
2240FI	02SDH-132	0	0	1	0	0	1	1	1	3	NP
2240FI	02SDH-133	0	0	1	0	0	2	1	2	3	NP
2240FI	02SDH-134	0	0	1	0	0	0	0	1	NP	1
2240FI	02SDH-135	0	0	1	0	0	2	1	1	3	NP
2240FI	02SDH-136	0	0	1	0	0	1	1	2	2	NP
2240FI	02SDH-137	0	0	1	0	0	2	1	3	2	NP
2240FI	02SDH-138	0	0	1	0	0	1	1	1	1	NP
2240FI	02SDH-139	0	0	1	1	1	3	1	NP	NP	1
2240FI	02SDH-140	0	0	1	0	0	1	1	2	2	NP
2240FI	02SDH-141	0	0	2	0	0	1	0	NP	NP	1
2240FI	02SDH-142	0	0	1	0	0	2	0	NP	NP	2
2240FI	02SDH-143	0	0	1	0	0	1	1	2	3	NP
2240FI	02SDH-144	0	0	2	0	0	3	0	NP	NP	1
2240FI	02SDH-145	0	0	1	0	0	1	1	2	NP	NP
2240FI	02SDH-146	0	0	1	0	0	1	0	1	2	NP
2240FI	02SDH-147	1	0	2	0	0	1	0	NP	NP	1
2240FI	02SDH-148	0	0	1	0	0	1	0	1	NP	0
2240FI	02SDH-149	0	0	1	1	0	1	1	1	3	NP
2240FI	02SDH-150	0	0	2	0	0	2	0	NP	NP	2
2240FI	02SDH-151	0	0	2	1	0	2	0	NP	NP	1
2240FI	02SDH-152	0	0	1	0	0	1	0	0	NP	1
2240FI	02SDH-153	0	0	1	0	0	1	1	2	3	NP
NAFI01	02SDH-100	0	0	1	1	0	1	0	NP	NP	1

Table N-3. (cont.)

Station ID	Sample ID	BGP-ST	CUE	EGL	FBG	GGR	GMA	HVW	OAI	OAM	SPM
NAFI01	02SDH-101	0	0	1	0	0	1	0	2	2	NP
NAFI01	02SDH-52	0	0	1	0	0	2	1	2	1	NP
NAFI01	02SDH-53	0	0	0	0	0	2	0	3	2	NP
NAFI01	02SDH-54	0	0	1	0	0	1	0	NP	NP	1
NAFI01	02SDH-55	0	0	1	0	0	1	0	NP	NP	2
NAFI01	02SDH-56	0	0	1	0	1	1	1	2	2	NP
NAFI01	02SDH-57	0	0	1	0	0	3	1	1	1	NP
NAFI01	02SDH-58	3	0	1	0	0	3	0	NP	NP	0
NAFI01	02SDH-59	0	0	0	0	0	3	1	1	NP	NP
NAFI01	02SDH-60	3	1	1	0	0	3	0	NP	NP	1
NAFI01	02SDH-61	0	0	1	1	0	1	0	1	NP	NP
NAFI01	02SDH-62	0	0	1	0	0	1	1	1	2	0
NAFI01	02SDH-63	0	0	1	0	0	1	0	1	NP	NP
NAFI01	02SDH-64	1	0	2	0	0	3	0	NP	NP	1
NAFI01	02SDH-65	0	0	1	0	0	1	0	NP	NP	2
NAFI01	02SDH-66	2	0	1	0	0	3	0	NP	NP	1
NAFI01	02SDH-67	0	0	1	0	0	2	0	NP	NP	1
NAFI01	02SDH-68	0	0	1	1	0	1	0	NP	NP	1
NAFI01	02SDH-69	0	0	1	0	0	1	0	NP	NP	1
NAFI01	02SDH-70	0	0	1	0	0	2	0	NP	NP	1
NAFI01	02SDH-71	0	0	1	0	0	2	0	3	3	NP
NAFI01	02SDH-72	0	0	1	0	0	3	1	NP	NP	1
NAFI01	02SDH-73	0	0	1	0	0	1	0	2	2	NP
NAFI01	02SDH-74	0	0	1	0	0	1	1	3	2	NP
NAFI01	02SDH-75	1	0	2	0	0	2	0	NP	NP	1
NAFI01	02SDH-76	NP	0	0	1	0	1	0	3	2	NP
NAFI01	02SDH-77	0	0	2	0	0	3	0	NP	NP	1
NAFI01	02SDH-78	0	0	1	0	0	1	0	NP	NP	1
NAFI01	02SDH-79	1	0	1	1	0	1	0	NP	NP	1
NAFI01	02SDH-80	0	0	2	0	1	2	0	NP	NP	1
NAFI01	02SDH-81	0	0	1	0	0	2	0	NP	NP	1
NAFI01	02SDH-82	0	0	2	0	0	1	0	NP	NP	1
NAFI01	02SDH-83	0	0	2	1	0	1	0	NP	NP	1
NAFI01	02SDH-84	1	0	1	1	2	2	0	NP	NP	1
NAFI01	02SDH-85	0	0	1	0	0	1	0	NP	NP	1
NAFI01	02SDH-86	0	0	1	0	0	1	0	NP	NP	1
NAFI01	02SDH-87	0	0	2	0	0	1	0	NP	NP	1
NAFI01	02SDH-88	0	0	0	0	1	1	1	3	3	0
NAFI01	02SDH-89	2	0	1	0	0	3	0	NP	NP	1
NAFI01	02SDH-90	2	0	1	0	0	3	1	NP	NP	1
NAFI01	02SDH-91	0	0	1	0	0	1	1	1	NP	NP
NAFI01	02SDH-92	0	0	1	0	0	2	1	2	NP	NP
NAFI01	02SDH-93	0	0	1	0	0	1	0	NP	NP	1
NAFI01	02SDH-94	0	0	1	0	0	3	1	2	NP	NP
NAFI01	02SDH-95	1	0	2	0	0	1	0	NP	NP	1
NAFI01	02SDH-96	0	0	1	0	0	1	0	NP	NP	1
NAFI01	02SDH-97	0	0	1	1	0	3	0	1	NP	1
NAFI01	02SDH-98	0	0	1	0	0	3	0	1	1	0
NAFI01	02SDH-99	0	0	2	3	1	2	0	NP	NP	1
NAFI02	02SDH-204	0	0	1	1	0	1	0	NP	NP	2
NAFI02	02SDH-205	0	0	1	0	0	3	0	NP	NP	1
NAFI02	02SDH-206	0	0	1	0	0	2	0	NP	NP	1
NAFI02	02SDH-207	0	0	2	1	0	3	0	NP	NP	1

Table N-3. (cont.)

Station ID	Sample ID	BGP-ST	CUE	EGL	FBG	GGR	GMA	HVW	OAI	OAM	SPM
NAFI02	02SDH-208	0	0	2	0	1	1	0	NP	NP	1
NAFI02	02SDH-209	0	0	1	0	0	1	0	3	3	0
NAFI02	02SDH-210	0	0	2	0	0	2	0	NP	NP	1
NAFI02	02SDH-211	0	0	1	1	0	2	0	NP	NP	1
NAFI02	02SDH-212	0	0	2	0	0	3	0	NP	NP	2
NAFI02	02SDH-213	0	0	1	0	0	2	0	NP	NP	1
NAFI02	02SDH-214	0	0	1	1	0	1	0	NP	NP	1
NAFI02	02SDH-215	0	0	1	0	0	1	0	2	2	NP
NAFI02	02SDH-216	0	0	1	2	0	3	0	NP	NP	1
NAFI02	02SDH-217	0	0	1	1	0	2	0	NP	NP	1
NAFI02	02SDH-218	0	0	1	0	0	1	1	3	1	NP
NAFI02	02SDH-219	0	0	2	1	0	2	0	NP	NP	1
NAFI02	02SDH-220	0	0	1	0	0	1	0	NP	NP	1
NAFI02	02SDH-221	2	0	1	0	0	3	0	NP	NP	1
NAFI02	02SDH-222	0	0	2	0	0	1	0	NP	NP	1
NAFI02	02SDH-223	0	0	1	0	0	2	0	NP	NP	1
NAFI02	02SDH-224	0	0	1	1	0	1	0	NP	NP	1
NAFI02	02SDH-225	0	0	1	0	0	2	0	NP	NP	1
NAFI02	02SDH-226	1	0	2	0	0	2	0	NP	NP	1
NAFI02	02SDH-227	0	0	1	0	0	1	0	NP	NP	1
NAFI02	02SDH-228	0	0	1	0	0	2	0	NP	NP	1
NAFI02	02SDH-229	0	0	1	0	0	1	0	NP	NP	1
NAFI02	02SDH-230	0	0	1	0	0	1	0	NP	NP	1
NAFI02	02SDH-231	0	0	2	0	0	1	0	NP	NP	1
NAFI02	02SDH-232	0	1	1	0	0	1	1	3	3	NP
NAFI02	02SDH-233	0	0	1	0	0	1	1	3	1	NP
NAFI02	02SDH-234	0	0	1	1	0	1	1	2	2	NP
NAFI02	02SDH-235	1	0	2	1	0	2	0	NP	NP	1
NAFI02	02SDH-236	0	0	1	0	0	1	0	NP	NP	1
NAFI02	02SDH-237	0	0	1	0	1	2	0	NP	NP	1
NAFI02	02SDH-238	0	0	1	0	1	2	0	NP	NP	1
NAFI02	02SDH-239	0	0	1	0	0	1	1	1	2	NP
NAFI02	02SDH-240	0	0	1	0	0	1	0	NP	NP	1
NAFI02	02SDH-241	0	0	1	1	0	1	0	NP	NP	1
NAFI02	02SDH-242	0	0	2	1	0	2	2	NP	NP	1
NAFI02	02SDH-243	0	0	1	0	0	1	1	1	1	NP
NAFI02	02SDH-244	0	0	1	0	0	2	1	1	3	0
NAFI02	02SDH-245	0	0	1	0	0	1	0	NP	NP	1
NAFI02	02SDH-246	0	0	2	0	0	1	0	NP	NP	1
NAFI02	02SDH-247	0	0	1	0	0	2	0	NP	NP	1
NAFI02	02SDH-248	0	0	1	0	0	1	0	NP	NP	2
NAFI02	02SDH-249	0	0	1	1	0	2	0	NP	NP	1
NAFI02	02SDH-250	0	0	1	0	0	2	0	NP	NP	1
NAFI02	02SDH-251	0	0	1	1	0	1	1	1	2	NP
NAFI02	02SDH-252	0	0	1	0	0	1	1	3	1	NP
NAFI02	02SDH-253	0	0	2	1	0	2	0	NP	NP	1
SWFI01	02SDH-1	0	0	0	0	0	2	1	3	3	NP
SWFI01	02SDH-10	0	0	1	0	0	1	0	1	NP	0
SWFI01	02SDH-11	0	0	2	1	0	1	0	NP	NP	2
SWFI01	02SDH-12	0	0	1	0	0	1	0	NP	NP	1
SWFI01	02SDH-13	0	0	1	0	0	0	0	0	NP	1
SWFI01	02SDH-14	0	0	1	0	0	1	0	NP	NP	1
SWFI01	02SDH-15	0	0	1	0	0	1	1	3	3	NP

Table N-3. (cont.)

Station ID	Sample ID	BGP-ST	CUE	EGL	FBG	GGR	GMA	HVW	OAI	OAM	SPM
SWFI01	02SDH-16	1	0	1	0	0	2	0	NP	NP	1
SWFI01	02SDH-17	0	0	1	0	0	2	1	1	NP	NP
SWFI01	02SDH-18	0	0	2	0	0	1	0	NP	NP	1
SWFI01	02SDH-19	0	0	1	0	0	1	1	3	1	NP
SWFI01	02SDH-2	0	0	1	0	0	1	0	2	1	NP
SWFI01	02SDH-20	0	0	1	0	0	1	0	3	1	NP
SWFI01	02SDH-21	0	0	2	0	0	1	0	NP	NP	2
SWFI01	02SDH-22	0	0	1	0	1	3	0	0	NP	0
SWFI01	02SDH-23	0	0	1	1	0	2	1	1	1	0
SWFI01	02SDH-24	0	0	1	1	0	2	1	2	1	NP
SWFI01	02SDH-25	1	0	2	0	0	2	0	NP	NP	1
SWFI01	02SDH-26	2	0	1	2	0	3	0	NP	NP	1
SWFI01	02SDH-27	0	0	1	0	0	2	1	1	2	NP
SWFI01	02SDH-28	0	0	1	0	0	1	0	NP	NP	2
SWFI01	02SDH-29	0	0	2	0	0	1	0	1	NP	1
SWFI01	02SDH-3	0	0	1	0	0	1	0	3	NP	NP
SWFI01	02SDH-30	1	0	1	1	0	3	1	NP	NP	1
SWFI01	02SDH-31	0	0	2	0	0	1	0	NP	NP	2
SWFI01	02SDH-32	0	0	1	0	0	1	1	3	2	NP
SWFI01	02SDH-33	0	0	2	0	1	1	1	3	1	1
SWFI01	02SDH-34	0	0	1	0	0	0	0	NP	NP	1
SWFI01	02SDH-35	3	0	1	1	0	3	0	NP	NP	1
SWFI01	02SDH-36	0	0	2	0	0	1	0	NP	NP	1
SWFI01	02SDH-37	0	0	2	1	0	1	0	NP	NP	1
SWFI01	02SDH-38	0	1	2	0	0	1	0	NP	NP	2
SWFI01	02SDH-39	0	0	1	0	0	2	1	2	1	NP
SWFI01	02SDH-4	0	0	1	1	0	1	1	1	1	NP
SWFI01	02SDH-40	0	0	1	0	2	1	0	NP	NP	1
SWFI01	02SDH-41	0	0	1	0	0	3	0	2	2	NP
SWFI01	02SDH-42	0	0	1	0	0	2	0	2	2	NP
SWFI01	02SDH-43	0	0	1	0	0	1	0	2	3	NP
SWFI01	02SDH-44	0	0	1	0	0	2	1	3	1	NP
SWFI01	02SDH-45	3	0	2	1	0	3	0	NP	NP	1
SWFI01	02SDH-46	0	0	1	0	0	3	1	1	2	NP
SWFI01	02SDH-47	0	0	2	0	0	1	0	2	2	NP
SWFI01	02SDH-48	0	0	1	0	0	3	0	0	1	NP
SWFI01	02SDH-49	0	1	1	1	0	2	1	0	NP	NP
SWFI01	02SDH-5	1	0	1	0	0	2	0	NP	NP	1
SWFI01	02SDH-50	2	0	1	0	0	3	0	NP	NP	1
SWFI01	02SDH-51	0	0	1	0	0	3	0	1	3	NP
SWFI01	02SDH-6	3	0	1	0	0	3	0	NP	NP	1
SWFI01	02SDH-7	0	0	1	0	0	2	1	1	NP	NP
SWFI01	02SDH-8	0	0	1	0	0	1	0	3	3	0
SWFI01	02SDH-9	0	0	1	1	0	1	0	NP	NP	1
SWFI02	02SDH-154	0	0	2	0	0	1	0	NP	NP	1
SWFI02	02SDH-155	0	0	1	0	0	1	0	NP	NP	1
SWFI02	02SDH-156	0	0	2	0	0	2	0	NP	NP	1
SWFI02	02SDH-157	0	0	1	0	0	3	0	NP	NP	1
SWFI02	02SDH-158	0	0	2	0	0	2	0	NP	NP	1
SWFI02	02SDH-159	0	0	1	0	0	1	0	NP	NP	2
SWFI02	02SDH-160	0	0	1	0	0	1	0	NP	NP	1
SWFI02	02SDH-161	0	0	1	0	0	1	1	2	2	NP
SWFI02	02SDH-162	0	0	2	0	0	2	0	NP	NP	1

Table N-3. (cont.)

Station ID	Sample ID	BGP-ST	CUE	EGL	FBG	GGR	GMA	HVW	OAI	OAM	SPM
SWFI02	02SDH-163	0	0	1	0	0	1	0	2	2	NP
SWFI02	02SDH-164	0	0	1	1	0	2	0	NP	NP	2
SWFI02	02SDH-165	0	0	1	1	0	2	0	NP	NP	1
SWFI02	02SDH-166	0	1	1	0	0	1	0	NP	NP	1
SWFI02	02SDH-167	0	0	1	0	0	2	0	1	1	NP
SWFI02	02SDH-168	0	0	2	0	0	1	0	NP	NP	2
SWFI02	02SDH-169	0	0	1	0	0	1	0	3	3	NP
SWFI02	02SDH-170	0	0	2	0	0	1	0	3	1	NP
SWFI02	02SDH-171	1	0	1	0	0	2	0	NP	NP	1
SWFI02	02SDH-172	0	1	2	1	0	1	0	NP	NP	2
SWFI02	02SDH-173	0	0	1	1	0	1	2	2	2	1
SWFI02	02SDH-174	0	0	1	1	0	1	0	NP	NP	2
SWFI02	02SDH-175	0	0	1	0	0	2	0	NP	NP	1
SWFI02	02SDH-176	1	0	1	0	0	2	0	NP	NP	1
SWFI02	02SDH-177	1	0	2	1	0	2	0	NP	NP	2
SWFI02	02SDH-178	0	0	2	0	0	2	0	NP	NP	1
SWFI02	02SDH-179	0	0	1	0	0	2	1	NP	NP	1
SWFI02	02SDH-180	0	0	1	1	0	1	0	NP	NP	1
SWFI02	02SDH-181	0	0	1	1	0	1	0	NP	NP	2
SWFI02	02SDH-182	0	0	2	1	0	2	1	1	2	NP
SWFI02	02SDH-183	0	0	2	2	0	2	1	2	3	NP
SWFI02	02SDH-184	0	0	1	0	0	1	0	NP	NP	1
SWFI02	02SDH-185	0	0	1	1	1	1	0	NP	NP	1
SWFI02	02SDH-186	1	0	1	1	0	2	0	NP	NP	1
SWFI02	02SDH-187	0	0	1	0	0	1	0	2	3	0
SWFI02	02SDH-188	0	0	2	1	0	2	0	NP	NP	1
SWFI02	02SDH-189	0	0	1	1	0	1	0	NP	NP	2
SWFI02	02SDH-190	1	0	1	0	0	2	0	NP	NP	1
SWFI02	02SDH-191	0	0	1	0	1	2	0	NP	NP	1
SWFI02	02SDH-192	0	0	2	0	0	1	1	NP	NP	1
SWFI02	02SDH-193	0	0	1	0	0	2	1	2	2	0
SWFI02	02SDH-194	1	0	1	2	0	2	0	NP	NP	1
SWFI02	02SDH-195	0	0	2	1	0	2	0	NP	NP	1
SWFI02	02SDH-196	0	0	1	0	0	1	1	1	2	NP
SWFI02	02SDH-197	0	0	1	0	0	1	0	NP	NP	2
SWFI02	02SDH-198	0	0	1	0	0	1	0	NP	NP	1
SWFI02	02SDH-199	0	0	1	0	0	2	2	1	3	NP
SWFI02	02SDH-200	0	0	1	0	0	2	0	NP	NP	1
SWFI02	02SDH-201	0	0	1	0	0	2	0	NP	NP	1
SWFI02	02SDH-202	0	0	1	0	0	1	0	NP	NP	1
SWFI02	02SDH-203	0	0	1	0	0	2	1	1	2	0

Note:
BGP-ST - blue-green pigment in cytoplasm of cells lining seminiferous tubules
CUE - cyst of unknown etiology
EGL - eosinophilic granular leukocytes
FBG - foreign body granuloma
GGR - gonadal granulomatous inflammation
GMA - gonadal macrophage aggregates
HVW - hyalinization of vessel walls
NP - not present
OAI - atresia of primary (unyolked) follicles
OAM - atresia of yolked (maturing or mature) follicles
SPM - spermatocytes

Table N-4. Fish histopathology results—liver

Station ID	Sample ID	ANI	BCF	BGP-HP	CBH	CCF	CUE	ECF	FBG	FPL	GD	GDV	LFC	LGR	LIP	LMA	NEO	PCL	PIG	PVL	SCN	SH
2240FI	02SDH-102	0	0	0	0	0	0	0	P	0	0	0	0	0	0	1	0	1	0	1	0	0
2240FI	02SDH-103	0	0	0	0	0	0	0	P	0	2	1	0	0	0	1	0	1	0	1	0	0
2240FI	02SDH-104	M	0	0	1	0	0	0	0	1	1	2	0	0	0	1	0	0	0	0	0	0
2240FI	02SDH-105	0	0	0	0	0	0	0	P	0	1	0	0	0	0	2	0	0	0	1	0	0
2240FI	02SDH-106	0	0	0	0	0	0	0	0	0	2	1	0	0	0	1	0	1	1	1	0	0
2240FI	02SDH-107	0	0	0	0	0	0	0	0	0	1	2	0	0	0	1	0	0	0	1	0	0
2240FI	02SDH-108	0	0	0	0	0	0	0	B	0	0	0	0	0	0	1	0	0	0	1	0	0
2240FI	02SDH-109	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	2	0	0
2240FI	02SDH-110	0	0	1	1	0	0	0	P	0	3	1	0	0	0	3	1	1	0	0	0	0
2240FI	02SDH-111	M	0	0	0	0	0	0	P	0	2	1	0	0	0	1	0	1	0	1	0	0
2240FI	02SDH-112	0	0	0	0	0	0	0	0	0	2	1	0	2	0	1	0	1	0	1	0	0
2240FI	02SDH-113	0	0	0	0	0	0	0	P	0	0	1	0	0	0	1	0	2	0	0	0	0
2240FI	02SDH-114	0	0	0	0	0	0	0	M	0	2	1	0	0	0	1	0	0	0	1	0	0
2240FI	02SDH-115	0	0	0	0	0	0	0	P	0	3	1	0	0	0	2	0	1	1	0	1	0
2240FI	02SDH-116	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0
2240FI	02SDH-117	0	0	0	0	0	0	0	P	0	2	1	0	0	0	1	0	0	0	0	0	0
2240FI	02SDH-118	0	0	0	0	0	0	0	B	0	3	1	0	0	0	2	0	1	0	1	0	0
2240FI	02SDH-119	0	0	0	0	0	0	0	P	0	0	0	0	0	0	1	0	0	0	1	0	0
2240FI	02SDH-120	0	0	0	0	0	0	0	M	0	1	1	0	0	0	2	0	0	0	0	0	0
2240FI	02SDH-121	0	0	0	0	0	0	0	0	0	2	1	0	0	0	1	0	0	0	1	0	0
2240FI	02SDH-122	0	0	0	0	0	0	0	B	0	2	1	0	0	0	2	0	1	0	1	0	0
2240FI	02SDH-123	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	1	0	0
2240FI	02SDH-124	0	0	1	0	0	0	0	P	0	3	1	0	0	0	3	0	1	0	1	0	0
2240FI	02SDH-125	0	0	0	0	0	0	0	0	0	3	0	0	0	0	2	0	1	0	1	0	0
2240FI	02SDH-126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	1	0	0
2240FI	02SDH-127	0	0	0	0	0	0	0	0	0	3	1	0	1	0	1	0	1	0	2	0	0
2240FI	02SDH-128	0	0	0	0	0	0	0	P	0	0	1	0	1	0	1	0	2	0	0	0	0
2240FI	02SDH-129	P	0	0	0	0	0	0	0	0	2	1	0	0	0	3	0	0	0	0	0	0
2240FI	02SDH-130	M	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	1	0	0	0	0
2240FI	02SDH-131	0	0	0	0	0	0	0	0	0	2	1	0	0	0	1	0	0	0	1	0	0
2240FI	02SDH-132	0	0	0	0	0	0	0	M	0	0	0	0	0	0	1	0	0	0	0	0	0
2240FI	02SDH-133	0	0	0	1	0	0	0	P	0	2	1	0	0	0	3	0	1	0	1	0	0
2240FI	02SDH-134	0	0	0	0	0	0	0	0	0	1	2	0	0	0	1	0	1	0	0	0	0
2240FI	02SDH-135	0	0	0	0	0	0	0	P	0	1	1	0	0	0	2	0	0	0	1	0	0
2240FI	02SDH-136	0	0	0	0	0	0	0	B	0	3	0	0	0	0	3	0	1	0	1	0	0
2240FI	02SDH-137	0	0	0	0	0	0	0	0	0	2	2	0	0	0	1	0	1	0	1	0	0
2240FI	02SDH-138	0	0	0	1	0	0	0	P	0	3	1	0	0	0	2	0	1	0	1	0	0
2240FI	02SDH-139	0	0	0	1	0	0	0	P	0	2	0	0	0	0	2	2	0	0	1	0	0
2240FI	02SDH-140	0	0	0	0	0	0	0	0	0	2	1	0	0	0	1	0	0	0	1	0	0
2240FI	02SDH-141	0	0	0	0	0	0	0	M	0	1	0	0	0	0	1	0	1	0	1	0	0
2240FI	02SDH-142	0	0	0	1	0	0	0	P	0	3	0	0	0	0	2	0	1	0	1	0	0
2240FI	02SDH-143	0	0	0	0	0	0	0	P	0	1	1	0	0	0	1	0	1	0	0	0	0

Table N-4. (cont.)

Station ID	Sample ID	ANI	BCF	BGP-HP	CBH	CCF	CUE	ECF	FBG	FPL	GD	GDV	LFC	LGR	LIP	LMA	NEO	PCL	PIG	PVL	SCN	SH
2240FI	02SDH-144	0	0	0	0	0	0	0	M	0	2	0	0	0	0	1	0	0	0	1	0	0
2240FI	02SDH-145	0	0	0	0	0	0	0	P	0	3	1	0	0	0	1	0	1	1	0	0	0
2240FI	02SDH-146	0	0	0	0	0	0	0	0	0	2	1	0	0	0	2	0	0	0	1	0	0
2240FI	02SDH-147	0	0	0	0	0	0	0	0	0	3	1	0	0	0	1	0	1	0	1	0	0
2240FI	02SDH-148	0	0	0	0	0	0	0	B	0	2	0	0	0	0	1	0	0	0	1	0	0
2240FI	02SDH-149	0	0	0	0	0	0	0	0	0	2	1	0	0	0	1	0	1	0	1	0	0
2240FI	02SDH-150	0	0	0	0	0	0	0	M	0	2	1	0	0	0	1	0	0	0	2	0	0
2240FI	02SDH-151	0	0	0	0	0	0	0	M	0	3	1	0	0	0	3	0	1	0	2	0	0
2240FI	02SDH-152	0	0	0	0	0	0	0	0	0	2	1	0	0	0	1	0	1	0	2	0	0
2240FI	02SDH-153	0	0	0	0	0	0	0	P	0	2	1	0	0	0	1	0	0	0	0	0	0
NAFI01	02SDH-100	0	0	0	1	0	0	0	M	0	1	1	0	0	0	1	0	1	0	1	0	0
NAFI01	02SDH-101	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2	0	1	0	1	0	0
NAFI01	02SDH-52	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	1	0	1	0	0
NAFI01	02SDH-53	0	0	0	0	0	0	0	P	0	2	0	0	0	0	3	0	0	1	0	0	0
NAFI01	02SDH-54	0	0	0	1	0	0	0	M	0	3	1	0	0	0	1	0	1	0	0	0	0
NAFI01	02SDH-55	0	0	0	0	0	0	0	0	0	2	1	0	0	0	1	0	1	0	1	0	0
NAFI01	02SDH-56	0	0	0	0	0	0	0	M	0	2	3	0	0	0	1	0	0	0	1	0	0
NAFI01	02SDH-57	0	0	3	1	0	0	0	0	0	3	0	0	0	0	3	0	0	0	0	0	0
NAFI01	02SDH-58	0	0	3	0	0	0	0	0	0	3	0	0	0	0	3	0	1	0	0	0	1
NAFI01	02SDH-59	0	0	3	0	0	0	0	P	0	3	0	0	0	0	3	0	1	0	1	0	0
NAFI01	02SDH-60	0	0	2	0	0	0	0	0	0	3	1	0	0	0	3	0	1	0	1	0	0
NAFI01	02SDH-61	0	0	0	1	0	0	0	P	0	3	0	0	0	0	1	0	1	0	1	1	0
NAFI01	02SDH-62	0	0	0	1	0	0	0	0	1	2	2	0	0	0	1	0	2	0	1	0	0
NAFI01	02SDH-63	0	0	0	0	0	0	0	0	0	3	1	0	0	0	1	0	1	0	1	0	0
NAFI01	02SDH-64	0	0	0	2	0	0	0	B	0	3	0	0	0	0	2	0	1	0	1	0	0
NAFI01	02SDH-65	0	0	0	1	0	0	0	0	0	2	1	0	0	0	1	0	2	0	0	0	0
NAFI01	02SDH-66	0	0	1	1	0	0	0	0	0	3	1	0	0	0	2	0	1	0	2	0	0
NAFI01	02SDH-67	0	0	0	0	0	0	0	M	0	1	1	0	0	0	1	0	1	0	1	0	0
NAFI01	02SDH-68	0	0	0	1	0	0	0	P	0	3	0	0	0	0	2	0	1	0	0	0	0
NAFI01	02SDH-69	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	1	0	0
NAFI01	02SDH-70	0	0	0	0	0	0	0	0	0	2	1	0	0	1	2	0	2	0	1	0	0
NAFI01	02SDH-71	0	0	0	1	0	0	0	0	0	3	1	0	0	0	2	0	1	0	1	0	0
NAFI01	02SDH-72	0	0	0	0	0	0	0	B	0	3	1	0	0	0	3	0	0	0	0	0	0
NAFI01	02SDH-73	0	0	0	0	0	0	0	P	0	1	1	0	0	0	3	0	0	0	1	0	0
NAFI01	02SDH-74	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2	0	1	0	0	0	0
NAFI01	02SDH-75	0	0	1	0	0	0	0	0	0	2	0	0	0	0	1	0	1	0	0	0	0
NAFI01	02SDH-76	0	0	0	0	0	0	0	B	0	2	1	0	0	0	1	0	0	0	1	0	0
NAFI01	02SDH-77	0	0	0	0	0	0	0	B	0	1	1	0	1	0	1	0	1	0	1	0	0
NAFI01	02SDH-78	0	0	0	0	0	0	0	0	1	2	0	0	0	0	1	0	1	0	1	0	0
NAFI01	02SDH-79	0	0	1	0	0	0	0	M	0	3	1	0	0	0	2	0	0	0	1	0	0
NAFI01	02SDH-80	0	0	0	1	0	0	0	0	0	2	1	0	0	0	2	0	2	0	1	0	0
NAFI01	02SDH-81	0	0	0	0	0	0	0	B	1	2	1	0	0	0	1	0	1	0	2	0	0

Table N-4. (cont.)

Station ID	Sample ID	ANI	BCF	BGP-HP	CBH	CCF	CUE	ECF	FBG	FPL	GD	GDV	LFC	LGR	LIP	LMA	NEO	PCL	PIG	PVL	SCN	SH
NAFI01	02SDH-82	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	1	0	0
NAFI01	02SDH-83	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	1	0	0
NAFI01	02SDH-84	0	0	0	2	0	0	0	M	0	2	2	0	0	0	1	0	1	0	1	0	0
NAFI01	02SDH-85	0	0	0	1	0	0	0	0	2	2	1	0	2	0	1	0	2	0	0	0	0
NAFI01	02SDH-86	0	0	0	0	0	0	0	B	0	0	0	0	0	0	2	0	1	0	1	0	0
NAFI01	02SDH-87	0	0	0	0	0	0	0	P	0	2	1	0	0	0	3	0	1	0	2	0	0
NAFI01	02SDH-88	0	0	0	0	0	0	0	M	0	3	0	0	0	0	1	0	1	0	1	0	0
NAFI01	02SDH-89	0	0	1	1	0	0	0	0	0	2	0	0	0	0	3	0	2	0	1	0	0
NAFI01	02SDH-90	0	0	1	2	0	0	0	P	0	3	1	0	0	0	2	0	0	0	1	0	1
NAFI01	02SDH-91	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	0	0	0	0
NAFI01	02SDH-92	0	0	0	0	0	0	0	M	0	1	1	0	0	0	2	0	1	0	1	0	0
NAFI01	02SDH-93	0	0	0	0	0	0	0	0	0	2	2	0	0	0	2	0	0	0	0	0	0
NAFI01	02SDH-94	0	0	3	1	0	0	0	0	0	3	0	0	0	0	3	0	1	0	1	0	0
NAFI01	02SDH-95	0	0	1	0	0	0	0	P	0	2	2	0	0	1	1	0	1	0	1	0	0
NAFI01	02SDH-96	0	0	0	0	0	0	0	P	0	3	0	0	0	1	3	1	1	0	1	0	0
NAFI01	02SDH-97	0	0	3	0	0	0	0	0	0	3	0	0	0	0	3	0	1	0	1	0	0
NAFI01	02SDH-98	0	0	3	1	0	0	0	0	0	3	0	0	0	0	3	0	1	0	1	0	0
NAFI01	02SDH-99	0	0	0	0	0	0	0	P	0	1	2	0	0	0	1	0	1	0	1	0	0
NAFI02	02SDH-204	0	0	0	0	0	0	0	P	0	2	2	0	0	0	1	0	0	0	1	0	0
NAFI02	02SDH-205	0	0	0	0	0	0	0	P	0	2	1	0	0	0	2	0	1	1	0	0	0
NAFI02	02SDH-206	0	0	0	0	0	0	0	B	0	2	2	0	0	1	3	0	0	0	0	0	0
NAFI02	02SDH-207	0	0	0	0	0	0	0	B	0	3	1	0	0	0	3	0	1	0	1	0	0
NAFI02	02SDH-208	0	0	0	0	0	0	0	M	0	2	1	0	0	0	1	0	1	0	1	0	0
NAFI02	02SDH-209	0	0	0	0	0	0	0	P	0	1	1	0	0	0	1	0	0	1	0	0	0
NAFI02	02SDH-210	0	0	0	1	0	0	0	B	0	2	1	0	0	0	1	0	0	0	1	0	0
NAFI02	02SDH-211	0	0	0	0	0	0	0	B	0	3	1	0	0	0	3	0	0	0	1	0	0
NAFI02	02SDH-212	0	0	0	1	0	0	0	P	0	1	1	0	0	0	2	0	1	1	1	0	0
NAFI02	02SDH-213	0	0	0	0	0	0	0	B	0	3	1	0	0	0	3	0	1	0	1	0	0
NAFI02	02SDH-214	0	0	0	0	0	0	0	0	0	2	3	0	0	0	1	0	0	0	1	0	0
NAFI02	02SDH-215	0	0	0	0	0	0	0	0	0	3	1	0	0	0	1	0	0	0	1	0	0
NAFI02	02SDH-216	0	0	0	0	0	0	0	P	0	3	0	0	0	0	1	0	2	1	1	1	0
NAFI02	02SDH-217	0	0	0	0	0	0	0	0	0	1	2	0	0	0	2	0	0	0	0	0	0
NAFI02	02SDH-218	0	0	0	0	0	0	0	M	0	2	1	0	0	0	1	0	0	0	1	0	0
NAFI02	02SDH-219	0	0	0	0	0	0	0	0	0	2	1	0	0	0	2	0	0	0	1	0	0
NAFI02	02SDH-220	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0	1	0	0
NAFI02	02SDH-221	0	0	2	0	0	0	0	P	0	3	1	0	0	0	3	0	1	0	1	0	0
NAFI02	02SDH-222	0	0	0	1	0	0	0	0	0	2	1	0	0	0	2	0	1	0	1	0	0
NAFI02	02SDH-223	0	0	0	0	0	0	0	0	0	3	1	0	0	0	1	0	1	0	1	0	0
NAFI02	02SDH-224	0	0	0	1	0	0	0	0	0	2	1	0	0	1	1	0	1	1	1	0	0
NAFI02	02SDH-225	0	0	0	0	0	0	0	M	0	3	1	0	0	0	2	0	1	0	2	1	0
NAFI02	02SDH-226	0	0	1	1	0	0	0	B	0	2	1	0	0	0	2	0	2	1	1	0	0
NAFI02	02SDH-227	0	0	0	1	0	0	0	P	0	1	1	0	1	0	2	0	1	0	1	0	0

Table N-4. (cont.)

Station ID	Sample ID	ANI	BCF	BGP-HP	CBH	CCF	CUE	ECF	FBG	FPL	GD	GDV	LFC	LGR	LIP	LMA	NEO	PCL	PIG	PVL	SCN	SH
NAFI02	02SDH-228	0	0	0	0	0	0	0	P	0	1	1	0	0	0	1	0	1	0	0	0	0
NAFI02	02SDH-229	0	0	0	0	0	0	0	P	0	2	1	0	0	0	3	0	0	0	1	0	0
NAFI02	02SDH-230	0	0	0	1	0	0	0	P	0	1	0	0	0	0	2	0	2	0	1	0	0
NAFI02	02SDH-231	0	0	0	0	0	0	0	P	0	3	1	0	0	0	2	0	0	1	1	0	0
NAFI02	02SDH-232	0	0	0	0	0	0	0	0	0	2	1	0	0	0	1	0	0	0	1	0	0
NAFI02	02SDH-233	0	0	0	0	0	0	0	0	0	2	1	0	0	0	2	0	1	0	1	0	0
NAFI02	02SDH-234	0	0	0	0	0	0	0	0	0	2	1	0	0	0	1	0	1	0	1	0	0
NAFI02	02SDH-235	0	0	1	1	0	0	0	P	0	2	2	0	0	0	3	0	1	0	1	0	0
NAFI02	02SDH-236	0	0	0	0	0	0	0	0	0	3	2	0	1	0	2	0	0	0	1	0	0
NAFI02	02SDH-237	0	0	0	0	0	0	0	0	0	2	1	0	0	0	2	0	0	0	1	0	0
NAFI02	02SDH-238	0	0	0	1	0	0	0	B	0	3	0	0	1	0	3	0	1	1	1	0	0
NAFI02	02SDH-239	0	0	0	0	0	0	0	P	0	2	1	0	0	0	1	0	0	0	1	0	0
NAFI02	02SDH-240	0	0	0	0	0	0	0	P	0	3	0	0	0	0	2	0	0	1	1	0	0
NAFI02	02SDH-241	0	0	0	1	0	0	0	P	0	2	3	0	0	0	2	0	2	0	1	0	0
NAFI02	02SDH-242	0	0	0	0	0	0	0	B	0	3	1	0	0	0	3	0	1	1	1	0	0
NAFI02	02SDH-243	0	0	0	0	0	0	0	B	0	1	2	0	0	0	1	0	1	0	0	0	0
NAFI02	02SDH-244	0	0	0	0	0	0	0	P	0	2	1	0	0	0	1	0	1	0	1	0	0
NAFI02	02SDH-245	0	0	0	0	0	0	0	P	0	2	1	0	0	0	1	0	1	0	1	0	0
NAFI02	02SDH-246	0	0	0	0	0	0	0	P	0	2	1	0	0	0	1	0	2	0	2	0	0
NAFI02	02SDH-247	0	0	0	0	0	0	0	P	1	2	1	0	0	0	2	0	1	0	1	0	0
NAFI02	02SDH-248	0	0	0	0	0	0	0	0	0	2	1	0	0	0	1	0	1	0	1	0	0
NAFI02	02SDH-249	0	0	0	0	0	0	0	0	0	3	1	0	0	0	2	0	0	1	1	0	0
NAFI02	02SDH-250	0	0	0	0	0	0	0	0	0	2	1	0	0	0	2	0	0	0	1	1	0
NAFI02	02SDH-251	0	0	1	0	0	0	0	0	0	2	1	0	0	0	1	0	1	0	1	0	0
NAFI02	02SDH-252	0	0	0	1	0	0	0	0	0	2	1	0	0	0	2	0	1	0	1	0	0
NAFI02	02SDH-253	0	0	0	1	0	0	0	0	0	3	1	0	0	0	3	0	0	0	1	0	0
SWFI01	02SDH-1	0	0	0	0	0	0	0	0	0	3	0	0	0	0	2	0	0	0	1	0	0
SWFI01	02SDH-10	0	0	0	0	0	0	0	0	0	3	1	0	0	0	1	0	1	0	1	0	0
SWFI01	02SDH-11	0	0	0	0	0	0	0	P	0	2	2	0	0	0	1	0	0	0	1	0	0
SWFI01	02SDH-12	0	0	0	0	0	0	0	0	0	2	1	0	0	0	1	0	0	0	1	0	0
SWFI01	02SDH-13	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	1	0	0
SWFI01	02SDH-14	0	0	0	1	0	0	0	0	0	2	1	0	0	0	2	0	2	0	1	0	0
SWFI01	02SDH-15	0	0	0	0	0	0	0	P	0	3	2	0	0	1	1	0	0	0	1	0	0
SWFI01	02SDH-16	0	0	1	1	0	0	0	0	0	2	1	0	0	0	1	0	1	0	1	0	0
SWFI01	02SDH-17	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	1	0	1	0	0
SWFI01	02SDH-18	0	0	0	0	0	0	0	M	0	2	0	0	0	0	1	0	1	0	1	0	0
SWFI01	02SDH-19	0	0	0	0	0	0	0	B	0	0	0	0	0	0	1	0	0	0	0	0	0
SWFI01	02SDH-2	0	0	0	0	0	0	0	0	0	2	2	0	0	0	2	0	1	0	1	0	0
SWFI01	02SDH-20	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2	0	0	0	1	0	0
SWFI01	02SDH-21	0	0	0	0	0	0	0	0	0	2	1	0	0	0	1	0	1	0	0	0	0
SWFI01	02SDH-22	0	0	3	0	0	0	0	0	0	3	0	0	0	0	2	0	0	0	1	0	0
SWFI01	02SDH-23	0	0	0	0	0	0	0	B	0	1	1	0	0	0	2	0	0	0	1	0	0

Table N-4. (cont.)

Station ID	Sample ID	ANI	BCF	BGP-HP	CBH	CCF	CUE	ECF	FBG	FPL	GD	GDV	LFC	LGR	LIP	LMA	NEO	PCL	PIG	PVL	SCN	SH
SWFI01	02SDH-24	0	0	0	0	0	0	0	P	0	0	0	0	0	0	1	0	1	0	1	0	0
SWFI01	02SDH-25	0	0	1	0	0	0	0	0	0	2	1	0	0	0	3	0	0	0	0	0	0
SWFI01	02SDH-26	0	0	2	0	0	0	0	M	0	3	1	0	0	0	3	0	0	0	1	0	0
SWFI01	02SDH-27	0	0	0	0	0	0	0	P	0	2	2	0	0	0	2	0	0	1	0	0	0
SWFI01	02SDH-28	0	0	0	0	0	0	0	B	0	1	1	0	0	1	2	0	0	0	0	0	0
SWFI01	02SDH-29	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	1	0	0
SWFI01	02SDH-3	0	0	0	0	0	0	0	M	0	3	0	0	0	1	2	0	0	0	1	0	0
SWFI01	02SDH-30	0	0	1	1	0	0	0	0	0	2	2	0	0	0	3	0	1	0	0	0	0
SWFI01	02SDH-31	0	0	0	0	0	0	0	0	1	3	0	0	0	1	1	0	1	0	1	0	0
SWFI01	02SDH-32	0	0	0	0	0	0	0	0	0	2	2	0	0	0	3	0	0	0	1	0	0
SWFI01	02SDH-33	0	0	0	0	0	0	0	P	0	2	3	0	0	0	1	0	1	0	1	0	0
SWFI01	02SDH-34	0	0	0	0	0	0	0	P	0	1	1	0	0	0	1	0	1	0	1	0	0
SWFI01	02SDH-35	0	0	2	1	0	0	0	P	0	3	0	0	0	0	3	0	0	0	0	0	0
SWFI01	02SDH-36	0	0	0	0	0	0	0	0	0	2	2	0	0	0	1	0	1	0	1	0	0
SWFI01	02SDH-37	0	0	0	0	0	0	0	M	0	0	1	0	0	0	1	0	1	0	0	0	0
SWFI01	02SDH-38	0	0	0	0	0	0	0	P	0	2	2	0	0	0	1	0	1	0	1	0	0
SWFI01	02SDH-39	0	0	0	1	0	0	0	0	0	2	1	0	0	0	1	0	1	0	1	0	0
SWFI01	02SDH-4	0	0	0	0	0	0	0	0	0	3	1	0	0	0	1	0	0	0	1	0	0
SWFI01	02SDH-40	0	0	0	0	0	0	0	P	0	3	0	0	0	0	1	0	1	0	1	0	0
SWFI01	02SDH-41	0	0	3	0	0	0	0	0	0	2	1	0	0	0	3	0	0	0	0	0	0
SWFI01	02SDH-42	0	0	0	2	0	0	0	0	0	2	3	0	0	0	2	0	1	0	0	0	0
SWFI01	02SDH-43	0	0	0	0	0	0	0	P	0	1	1	0	0	0	2	0	1	0	1	0	0
SWFI01	02SDH-44	0	0	0	2	0	0	0	P	0	3	1	0	0	0	2	0	1	0	0	0	0
SWFI01	02SDH-45	0	0	3	0	0	0	0	P	0	3	1	0	0	0	3	0	1	0	1	0	0
SWFI01	02SDH-46	0	0	3	0	0	0	0	0	0	3	1	0	0	0	3	0	1	0	1	0	0
SWFI01	02SDH-47	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	1	0	1	0	0
SWFI01	02SDH-48	0	0	3	0	0	0	0	P	0	3	1	0	0	0	3	0	0	0	1	0	0
SWFI01	02SDH-49	0	0	0	2	0	0	0	P	0	2	1	0	0	1	1	0	1	0	1	0	0
SWFI01	02SDH-5	0	0	0	0	0	0	0	0	0	3	2	0	0	0	2	0	1	0	1	0	0
SWFI01	02SDH-50	0	0	2	0	0	0	0	0	0	2	1	0	0	0	3	0	1	0	1	0	0
SWFI01	02SDH-51	0	0	2	0	0	0	0	0	0	1	1	0	0	0	3	0	2	0	1	0	0
SWFI01	02SDH-6	0	0	3	1	0	0	0	P	0	3	0	0	0	0	3	0	1	0	0	0	0
SWFI01	02SDH-7	0	0	0	0	0	0	0	M	0	3	2	0	0	0	1	0	1	0	1	0	0
SWFI01	02SDH-8	0	0	0	1	0	0	0	0	0	3	1	0	0	0	2	0	1	0	0	0	0
SWFI01	02SDH-9	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	1	0	0
SWFI02	02SDH-154	0	0	0	0	0	0	0	0	0	3	0	0	0	0	1	0	1	0	1	0	0
SWFI02	02SDH-155	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3	0	1	0	0	0	0
SWFI02	02SDH-156	0	0	0	0	0	0	0	P	1	1	1	0	0	0	3	0	0	0	1	0	0
SWFI02	02SDH-157	0	0	0	1	0	0	0	B	0	2	2	0	0	0	3	0	0	1	1	0	0
SWFI02	02SDH-158	0	0	0	0	0	0	0	0	0	3	1	0	1	0	1	0	1	0	1	0	0
SWFI02	02SDH-159	0	0	0	0	0	0	0	M	0	3	1	0	0	0	1	0	1	1	1	0	0
SWFI02	02SDH-160	0	0	0	0	0	0	0	B	0	2	1	0	0	0	1	0	0	0	1	0	0

Table N-4. (cont.)

Station ID	Sample ID	ANI	BCF	BGP-HP	CBH	CCF	CUE	ECF	FBG	FPL	GD	GDV	LFC	LGR	LIP	LMA	NEO	PCL	PIG	PVL	SCN	SH
SWFI02	02SDH-161	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0
SWFI02	02SDH-162	0	0	0	0	0	0	0	P	0	2	1	0	0	0	2	0	0	0	1	0	0
SWFI02	02SDH-163	0	0	0	0	0	0	0	P	0	0	0	0	0	0	2	0	0	0	1	0	0
SWFI02	02SDH-164	0	0	0	0	0	0	0	P	0	3	1	0	0	0	1	0	1	1	1	1	0
SWFI02	02SDH-165	0	0	0	0	0	0	0	M	0	1	1	0	0	0	0	0	1	0	1	0	0
SWFI02	02SDH-166	0	0	0	0	0	0	0	P	0	1	1	0	0	0	2	0	0	1	1	0	0
SWFI02	02SDH-167	0	0	0	0	0	0	0	P	0	3	3	0	0	0	1	0	1	0	1	0	0
SWFI02	02SDH-168	0	0	0	0	0	0	0	M	0	1	1	0	0	0	1	0	1	0	1	0	0
SWFI02	02SDH-169	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	1	0	0
SWFI02	02SDH-170	0	0	0	0	0	0	0	0	0	1	2	0	0	0	1	0	1	0	0	0	0
SWFI02	02SDH-171	0	0	1	0	0	0	0	0	0	1	1	0	0	0	2	0	0	0	0	0	0
SWFI02	02SDH-172	0	0	0	1	0	0	0	P	0	2	0	0	0	0	1	0	1	1	1	0	0
SWFI02	02SDH-173	0	0	0	0	0	0	0	P	0	1	1	0	0	0	2	0	1	0	0	0	0
SWFI02	02SDH-174	0	0	0	0	0	0	0	P	0	2	1	0	0	0	2	0	0	0	0	0	0
SWFI02	02SDH-175	0	0	0	0	0	0	0	P	1	2	1	0	0	0	2	0	1	1	1	0	0
SWFI02	02SDH-176	0	0	1	1	0	0	0	P	0	2	2	0	0	0	1	0	1	0	1	0	0
SWFI02	02SDH-177	0	0	1	0	0	0	0	P	1	3	1	0	0	0	3	0	1	1	2	0	0
SWFI02	02SDH-178	0	0	0	1	0	0	0	P	0	3	1	0	0	0	3	0	0	1	0	0	0
SWFI02	02SDH-179	0	0	0	0	0	0	0	B	0	2	2	0	0	0	2	0	0	0	1	0	0
SWFI02	02SDH-180	0	0	0	1	0	0	0	0	0	2	1	0	0	0	2	0	0	0	1	0	0
SWFI02	02SDH-181	0	0	0	0	0	0	0	P	0	2	1	0	0	0	1	0	0	0	0	0	0
SWFI02	02SDH-182	0	0	0	0	0	0	0	P	0	0	0	0	0	0	1	0	1	0	1	0	0
SWFI02	02SDH-183	0	0	0	0	0	0	0	0	0	2	1	0	0	0	1	0	1	0	1	0	0
SWFI02	02SDH-184	0	0	0	0	0	0	0	P	1	0	0	0	0	1	1	0	0	0	1	0	0
SWFI02	02SDH-185	0	0	0	0	0	0	0	B	0	2	2	0	0	0	2	0	0	0	0	0	0
SWFI02	02SDH-186	0	0	1	1	0	0	0	B	0	2	1	0	0	0	3	0	1	0	1	0	0
SWFI02	02SDH-187	0	0	0	0	0	0	0	P	1	1	1	0	0	0	1	0	0	0	1	0	0
SWFI02	02SDH-188	0	0	0	0	0	0	0	M	0	2	0	0	0	0	1	0	1	0	1	0	0
SWFI02	02SDH-189	0	0	0	0	0	0	0	B	0	2	1	0	0	1	1	0	0	0	0	0	0
SWFI02	02SDH-190	0	0	1	1	0	0	0	P	0	2	0	0	0	0	3	0	1	1	1	0	0
SWFI02	02SDH-191	0	0	0	1	0	0	0	P	1	2	1	0	0	0	1	0	0	0	1	0	0
SWFI02	02SDH-192	0	0	0	0	0	0	0	P	0	1	3	0	0	0	2	0	1	0	1	0	0
SWFI02	02SDH-193	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	1	0	1	0	0
SWFI02	02SDH-194	0	0	1	0	0	0	0	B	0	1	1	0	0	0	3	0	1	0	1	0	0
SWFI02	02SDH-195	0	0	0	0	0	0	0	P	0	2	3	0	0	0	2	0	0	0	1	0	0
SWFI02	02SDH-196	0	0	0	0	0	0	0	M	0	2	1	0	0	0	1	0	1	0	1	0	0
SWFI02	02SDH-197	0	0	0	0	0	0	0	0	0	3	1	0	0	0	1	0	1	0	1	0	0
SWFI02	02SDH-198	0	0	0	0	0	0	0	P	0	3	0	0	0	0	3	0	1	0	1	0	0
SWFI02	02SDH-199	0	0	0	1	0	0	0	P	0	2	2	0	0	0	1	0	1	1	1	0	0
SWFI02	02SDH-200	0	0	0	0	0	0	0	P	0	2	1	0	0	0	2	0	0	0	1	0	0

Table N-4. (cont.)

Station ID	Sample ID	ANI	BCF	BGP-HP	CBH	CCF	CUE	ECF	FBG	FPL	GD	GDV	LFC	LGR	LIP	LMA	NEO	PCL	PIG	PVL	SCN	SH
SWFI02	02SDH-201	0	0	0	0	0	0	0	P	0	2	1	0	0	0	1	0	0	0	1	0	0
SWFI02	02SDH-202	0	0	0	1	0	0	0	0	0	2	1	0	0	0	2	0	1	0	2	0	0
SWFI02	02SDH-203	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2	0	1	0	0	0	0

Note:
ANI - Anisakis; none (0), parenchyma (P), or margin (M)
BCF - basophilic cellular focus
BGP-HP - blue-green pigment in cytoplasm of hepatocytes
CBH - cholangitis/biliary hyperplasia
CCF - clear cellular focus
CUE - cyst of unknown etiology
ECF - eosinophilic cellular focus
FBG - foreign body granuloma
FPL - focal/multifocal parenchymal leukocytes
GD - glycogen depletion
GDV - GD variability
LFC - number of 0.5–1.0 mm white foci in liver
LGR - liver granulomas
LIP - lipidosis
LMA - macrophage aggregates
NEO - neoplasia (number of neoplasms per fish)
PCL - pericholangial lymphocytes/leukocytes
PIG - abundant well-demarcated cytoplasmic green pigment
PVL - perivascular lymphocytes/leukocytes
SCN - single cell necrosis
SH - spongiosis hepatis

Table N-5. Fish histopathology results—kidney

Station ID	Sample ID	CON	CUE	FBG	HPC	HVW	KGR	KMA	MIN	NPH	RTN	RTR	TDI	TEP	TEV
2240FI	02SDH-102	0	0	0	0	1	0	1	0	1	0	0	0	0	0
2240FI	02SDH-103	0	0	0	0	0	0	1	0	1	0	1	0	0	1
2240FI	02SDH-104	0	0	0	0	1	1	1	0	1	0	2	0	0	1
2240FI	02SDH-105	0	0	0	0	0	0	1	0	0	0	0	0	0	0
2240FI	02SDH-106	0	0	0	0	1	0	1	0	0	0	2	0	0	1
2240FI	02SDH-107	0	0	0	0	1	0	1	0	0	1	1	0	0	0
2240FI	02SDH-108	0	0	0	0	1	0	1	0	0	0	1	0	0	0
2240FI	02SDH-109	0	0	1	0	1	0	1	0	1	0	0	0	0	1
2240FI	02SDH-110	0	1	2	0	1	0	3	1	1	0	1	0	0	0
2240FI	02SDH-111	0	0	0	0	1	0	1	1	1	0	3	0	0	1
2240FI	02SDH-112	0	0	1	1	0	1	1	0	1	0	1	0	1	0
2240FI	02SDH-113	0	0	0	0	1	0	0	0	1	0	0	0	0	0
2240FI	02SDH-114	0	0	0	0	1	0	0	0	0	0	1	0	0	0
2240FI	02SDH-115	0	0	2	0	1	0	2	1	0	0	1	0	0	0
2240FI	02SDH-116	0	1	0	0	1	0	1	1	0	0	2	0	0	1
2240FI	02SDH-117	0	0	0	0	1	0	1	0	1	0	0	0	0	0
2240FI	02SDH-118	0	0	0	0	1	0	1	0	1	0	0	0	0	1
2240FI	02SDH-119	0	0	0	0	0	0	1	0	0	0	1	0	0	0
2240FI	02SDH-120	0	0	0	0	0	0	1	0	0	0	1	0	0	1
2240FI	02SDH-121	0	0	0	0	1	0	0	0	1	0	0	0	0	1
2240FI	02SDH-122	0	0	1	0	1	0	1	0	0	0	2	0	0	1
2240FI	02SDH-123	0	0	1	0	1	0	1	0	0	0	0	0	0	1
2240FI	02SDH-124	0	0	0	0	1	0	2	0	0	0	1	1	0	1
2240FI	02SDH-125	0	0	0	0	0	0	1	0	0	0	1	1	0	1
2240FI	02SDH-126	0	0	0	0	1	0	1	0	0	0	2	0	0	0
2240FI	02SDH-127	0	0	0	0	0	0	1	0	1	0	0	0	0	1
2240FI	02SDH-128	0	0	0	0	1	0	1	0	0	0	0	0	0	0
2240FI	02SDH-129	0	0	0	0	0	0	1	0	0	0	1	0	0	0
2240FI	02SDH-130	0	0	0	0	1	0	1	1	0	0	2	0	0	1
2240FI	02SDH-131	0	0	0	0	1	0	1	0	0	0	0	0	0	0
2240FI	02SDH-132	0	0	0	0	1	0	1	0	0	0	1	0	0	1
2240FI	02SDH-133	0	0	0	0	0	0	1	0	0	0	0	0	0	0
2240FI	02SDH-134	0	0	0	0	1	0	0	0	0	0	0	0	0	1
2240FI	02SDH-135	0	0	1	0	0	0	0	1	0	0	0	0	0	0
2240FI	02SDH-136	0	0	1	0	1	0	1	0	0	0	1	0	0	1

Table N-5. (cont.)

Station ID	Sample ID	CON	CUE	FBG	HPC	HVW	KGR	KMA	MIN	NPH	RTN	RTR	TDI	TEP	TEV
2240FI	02SDH-137	0	0	0	0	1	0	1	1	0	0	0	0	0	1
2240FI	02SDH-138	0	0	0	0	1	0	0	0	0	0	1	0	0	0
2240FI	02SDH-139	0	0	0	0	1	0	1	0	0	0	0	0	0	1
2240FI	02SDH-140	0	0	0	0	0	0	0	0	0	0	0	0	0	2
2240FI	02SDH-141	0	0	0	0	1	0	1	0	0	0	1	0	1	0
2240FI	02SDH-142	0	0	0	0	0	0	1	0	0	0	0	1	0	1
2240FI	02SDH-143	0	0	1	0	1	0	1	0	0	0	1	0	0	1
2240FI	02SDH-144	0	0	0	0	0	0	3	1	0	0	2	0	0	1
2240FI	02SDH-145	0	0	1	0	1	0	1	0	0	0	1	0	0	1
2240FI	02SDH-146	0	0	0	0	1	0	1	0	0	0	0	1	0	1
2240FI	02SDH-147	0	0	0	0	0	0	1	0	0	0	1	0	0	1
2240FI	02SDH-148	0	0	0	0	0	0	1	0	0	0	1	0	0	1
2240FI	02SDH-149	0	0	0	0	0	0	0	0	0	0	1	0	0	0
2240FI	02SDH-150	0	0	0	0	1	0	1	0	0	0	1	0	0	1
2240FI	02SDH-151	0	0	2	0	1	0	1	2	1	0	0	1	0	0
2240FI	02SDH-152	0	0	0	0	1	0	1	0	0	0	0	1	0	1
2240FI	02SDH-153	0	0	1	0	1	0	1	0	0	0	0	1	0	0
NAFI01	02SDH-100	0	0	1	0	1	0	1	1	2	0	0	0	0	0
NAFI01	02SDH-101	0	0	0	0	0	0	1	0	1	0	0	0	0	0
NAFI01	02SDH-52	0	0	0	0	1	0	1	0	0	0	0	0	0	0
NAFI01	02SDH-53	0	0	1	0	0	0	2	0	1	0	0	0	0	0
NAFI01	02SDH-54	0	0	0	0	0	0	1	0	1	0	1	0	0	1
NAFI01	02SDH-55	0	0	0	0	1	0	1	0	1	0	1	0	0	0
NAFI01	02SDH-56	0	0	0	0	0	0	1	0	1	0	1	0	0	0
NAFI01	02SDH-57	0	0	0	0	0	0	3	0	1	0	0	0	0	1
NAFI01	02SDH-58	0	0	0	0	1	0	3	1	1	0	1	0	0	1
NAFI01	02SDH-59	0	0	0	0	1	0	3	1	1	0	0	0	0	0
NAFI01	02SDH-60	0	0	0	0	1	0	2	0	0	0	1	1	0	1
NAFI01	02SDH-61	0	0	0	0	0	0	1	0	1	0	1	0	0	0
NAFI01	02SDH-62	0	0	0	0	0	0	0	0	0	0	0	1	0	1
NAFI01	02SDH-63	0	0	0	0	1	0	0	0	0	0	0	0	0	1
NAFI01	02SDH-64	0	0	1	0	1	0	2	0	1	0	1	0	0	0
NAFI01	02SDH-65	0	0	1	0	1	0	1	0	0	0	1	0	0	1
NAFI01	02SDH-66	0	0	1	0	0	0	1	0	1	0	1	0	0	1
NAFI01	02SDH-67	0	0	0	0	1	0	1	0	1	0	1	0	0	1

Table N-5. (cont.)

Station ID	Sample ID	CON	CUE	FBG	HPC	HVW	KGR	KMA	MIN	NPH	RTN	RTR	TDI	TEP	TEV
NAFI01	02SDH-68	0	0	0	0	0	1	1	0	1	0	0	0	0	0
NAFI01	02SDH-69	0	0	1	0	0	0	1	0	0	0	1	0	0	0
NAFI01	02SDH-70	0	0	0	0	1	0	1	0	0	0	0	0	1	1
NAFI01	02SDH-71	0	0	0	0	0	0	1	0	1	0	1	0	0	1
NAFI01	02SDH-72	0	0	2	0	0	0	1	1	0	0	0	0	0	0
NAFI01	02SDH-73	0	0	0	0	0	0	1	0	0	0	0	0	0	0
NAFI01	02SDH-74	0	0	0	0	1	0	1	0	0	0	0	0	0	0
NAFI01	02SDH-75	0	0	1	0	0	0	1	1	0	0	0	0	1	1
NAFI01	02SDH-76	0	0	0	0	1	0	1	0	1	0	0	0	0	0
NAFI01	02SDH-77	0	0	0	0	1	0	1	0	0	0	0	0	0	0
NAFI01	02SDH-78	0	0	1	0	0	0	1	0	0	0	1	0	0	0
NAFI01	02SDH-79	0	0	1	0	1	0	1	1	1	0	0	0	0	1
NAFI01	02SDH-80	0	0	0	0	1	0	1	0	1	0	1	0	0	0
NAFI01	02SDH-81	0	0	0	0	1	0	2	1	0	0	1	0	0	0
NAFI01	02SDH-82	0	0	0	0	1	0	0	0	1	0	0	0	0	0
NAFI01	02SDH-83	0	0	0	0	0	0	1	0	1	0	1	0	0	1
NAFI01	02SDH-84	0	0	0	0	0	0	1	0	1	0	0	0	0	0
NAFI01	02SDH-85	0	0	0	0	1	0	1	0	1	0	1	0	0	1
NAFI01	02SDH-86	0	0	1	0	1	0	1	0	0	0	0	0	0	1
NAFI01	02SDH-87	0	0	1	0	1	0	1	1	0	0	1	0	0	1
NAFI01	02SDH-88	0	0	0	0	0	0	1	0	0	0	0	1	0	1
NAFI01	02SDH-89	0	0	1	0	1	0	1	0	2	0	0	0	0	1
NAFI01	02SDH-90	0	0	1	0	2	1	1	0	1	0	0	0	0	1
NAFI01	02SDH-91	0	0	0	0	1	0	1	0	0	0	1	0	0	1
NAFI01	02SDH-92	0	0	0	0	1	0	1	0	0	0	0	0	0	0
NAFI01	02SDH-93	1	0	0	0	1	0	1	0	0	0	0	0	0	0
NAFI01	02SDH-94	0	0	0	0	1	0	2	0	0	0	0	0	0	1
NAFI01	02SDH-95	1	0	0	0	1	0	1	0	0	0	1	0	0	0
NAFI01	02SDH-96	0	0	0	0	0	0	1	1	1	0	0	0	0	0
NAFI01	02SDH-97	0	0	1	0	0	0	2	0	0	0	1	0	0	1
NAFI01	02SDH-98	0	0	1	0	1	0	3	0	1	0	1	0	0	0
NAFI01	02SDH-99	0	0	1	0	1	0	1	0	0	0	0	0	0	1
NAFI02	02SDH-204	0	0	0	0	1	0	1	1	0	0	0	0	0	1
NAFI02	02SDH-205	0	0	0	0	1	0	2	0	0	0	0	0	0	1
NAFI02	02SDH-206	0	0	0	0	1	0	2	0	0	0	0	0	0	1

Table N-5. (cont.)

Station ID	Sample ID	CON	CUE	FBG	HPC	HVW	KGR	KMA	MIN	NPH	RTN	RTR	TDI	TEP	TEV
NAFI02	02SDH-207	0	0	0	0	1	0	3	1	0	0	0	0	0	0
NAFI02	02SDH-208	0	0	0	0	1	0	1	0	2	0	0	0	0	1
NAFI02	02SDH-209	0	0	0	0	0	0	1	0	1	0	0	0	0	0
NAFI02	02SDH-210	0	0	0	0	1	0	1	0	0	0	0	0	0	0
NAFI02	02SDH-211	0	0	0	0	0	0	1	1	0	0	1	0	0	1
NAFI02	02SDH-212	0	0	2	0	1	0	2	0	0	0	0	0	0	0
NAFI02	02SDH-213	0	0	1	0	1	0	1	0	0	0	1	1	0	1
NAFI02	02SDH-214	0	0	0	0	0	0	1	1	0	0	0	0	0	0
NAFI02	02SDH-215	0	0	0	0	1	0	1	0	1	0	0	0	0	0
NAFI02	02SDH-216	0	0	0	0	1	0	1	1	1	0	0	0	0	1
NAFI02	02SDH-217	0	0	0	0	1	0	1	0	0	0	0	0	0	0
NAFI02	02SDH-218	0	0	0	0	0	0	1	0	0	0	1	0	0	0
NAFI02	02SDH-219	0	0	1	0	1	0	1	0	1	0	0	0	0	0
NAFI02	02SDH-220	0	0	0	0	1	0	1	0	0	0	0	0	0	1
NAFI02	02SDH-221	0	1	0	0	1	0	1	0	1	1	0	0	0	0
NAFI02	02SDH-222	0	0	0	0	1	0	1	1	0	0	0	0	0	0
NAFI02	02SDH-223	0	0	0	0	1	0	1	1	0	0	1	0	0	0
NAFI02	02SDH-224	0	0	0	0	0	0	1	0	1	0	1	0	0	1
NAFI02	02SDH-225	0	0	0	0	1	0	1	0	0	0	0	0	0	0
NAFI02	02SDH-226	0	0	1	0	1	0	2	1	0	0	1	0	0	1
NAFI02	02SDH-227	0	0	0	0	1	0	1	1	0	0	1	0	0	0
NAFI02	02SDH-228	0	0	0	0	1	0	1	0	1	0	1	0	0	1
NAFI02	02SDH-229	0	0	0	0	1	0	1	0	0	0	0	0	0	2
NAFI02	02SDH-230	0	0	1	0	0	0	1	0	1	0	0	0	0	1
NAFI02	02SDH-231	0	0	0	1	1	0	1	0	1	0	0	0	0	0
NAFI02	02SDH-232	0	0	0	0	1	0	0	0	1	0	1	1	0	1
NAFI02	02SDH-233	0	0	0	0	1	0	0	0	0	0	0	1	0	1
NAFI02	02SDH-234	0	0	1	0	0	0	1	0	0	0	1	0	0	1
NAFI02	02SDH-235	0	0	0	0	1	0	1	1	0	0	1	0	0	0
NAFI02	02SDH-236	0	0	0	0	0	0	1	0	0	0	0	0	0	1
NAFI02	02SDH-237	0	0	0	0	1	0	1	1	0	0	0	0	0	1
NAFI02	02SDH-238	0	0	0	0	0	0	2	1	0	0	0	0	0	1
NAFI02	02SDH-239	0	0	0	0	0	0	3	0	1	0	0	0	0	0
NAFI02	02SDH-240	0	0	0	0	0	0	1	0	0	0	0	0	0	1
NAFI02	02SDH-241	0	0	0	0	1	0	1	1	0	0	0	0	0	1

Table N-5. (cont.)

Station ID	Sample ID	CON	CUE	FBG	HPC	HVW	KGR	KMA	MIN	NPH	RTN	RTR	TDI	TEP	TEV
NAFI02	02SDH-242	0	0	0	0	0	0	1	0	0	0	0	0	0	1
NAFI02	02SDH-243	0	0	0	0	1	0	1	0	1	0	0	0	0	0
NAFI02	02SDH-244	0	0	0	0	1	0	1	0	1	0	0	0	0	1
NAFI02	02SDH-245	0	0	0	0	1	0	1	0	1	0	0	1	0	1
NAFI02	02SDH-246	0	0	0	0	1	0	1	1	0	0	0	0	0	1
NAFI02	02SDH-247	0	0	1	0	1	0	1	0	0	0	1	0	0	1
NAFI02	02SDH-248	0	0	0	0	1	0	2	1	1	0	0	0	0	1
NAFI02	02SDH-249	0	0	0	0	1	0	1	1	0	0	0	0	0	1
NAFI02	02SDH-250	0	0	0	0	1	0	2	1	0	0	1	0	0	0
NAFI02	02SDH-251	0	0	0	0	1	0	1	0	1	0	1	0	0	0
NAFI02	02SDH-252	0	0	0	0	0	0	1	0	0	0	0	0	0	0
NAFI02	02SDH-253	0	0	0	0	1	0	2	0	0	0	0	0	0	0
SWFI01	02SDH-1	0	0	0	0	0	0	1	0	1	0	0	0	0	0
SWFI01	02SDH-10	0	0	0	0	1	0	0	0	0	0	1	0	0	0
SWFI01	02SDH-11	1	0	0	0	0	0	1	0	0	0	0	1	1	2
SWFI01	02SDH-12	0	0	0	0	1	0	1	0	0	0	0	0	0	0
SWFI01	02SDH-13	0	0	0	0	1	0	0	0	0	0	0	2	0	1
SWFI01	02SDH-14	0	0	0	0	1	0	1	0	0	0	0	1	0	1
SWFI01	02SDH-15	0	0	0	0	1	0	1	0	0	0	0	0	0	0
SWFI01	02SDH-16	0	0	0	0	0	0	1	0	0	0	1	0	0	1
SWFI01	02SDH-17	0	0	0	0	1	0	1	0	0	0	0	0	0	1
SWFI01	02SDH-18	0	0	0	0	0	0	1	0	0	0	1	1	0	1
SWFI01	02SDH-19	0	0	0	0	1	0	1	0	0	0	0	0	0	0
SWFI01	02SDH-2	0	0	0	0	1	0	1	0	0	0	0	0	0	0
SWFI01	02SDH-20	0	0	0	0	1	0	1	1	0	0	0	0	0	0
SWFI01	02SDH-21	0	0	0	0	1	0	1	0	0	0	1	1	0	1
SWFI01	02SDH-22	0	0	0	0	0	0	1	1	0	0	1	1	0	0
SWFI01	02SDH-23	0	0	0	0	0	0	1	0	1	0	0	0	0	1
SWFI01	02SDH-24	1	0	1	0	0	0	1	0	0	0	1	0	0	1
SWFI01	02SDH-25	0	0	0	0	0	0	1	0	0	0	0	0	0	1
SWFI01	02SDH-26	0	0	1	1	0	1	3	1	1	0	1	0	0	2
SWFI01	02SDH-27	0	0	0	0	1	0	1	0	1	0	0	0	0	0
SWFI01	02SDH-28	0	0	0	0	1	0	1	2	0	0	0	1	0	1
SWFI01	02SDH-29	0	0	0	0	1	0	0	0	0	0	2	0	0	0
SWFI01	02SDH-3	0	0	0	0	1	0	1	0	0	0	0	0	1	1

Table N-5. (cont.)

Station ID	Sample ID	CON	CUE	FBG	HPC	HVW	KGR	KMA	MIN	NPH	RTN	RTR	TDI	TEP	TEV
SWFI01	02SDH-30	0	0	0	0	0	0	1	1	0	0	0	2	0	1
SWFI01	02SDH-31	0	0	0	0	0	0	1	0	0	0	1	1	0	1
SWFI01	02SDH-32	0	0	0	0	0	0	1	0	0	0	0	1	0	0
SWFI01	02SDH-33	0	0	0	0	1	0	1	0	0	0	0	0	0	1
SWFI01	02SDH-34	0	0	0	0	0	0	1	1	0	0	1	1	0	0
SWFI01	02SDH-35	0	0	0	0	0	0	2	1	1	1	0	3	0	1
SWFI01	02SDH-36	0	0	0	0	0	0	1	0	1	0	1	1	0	1
SWFI01	02SDH-37	0	0	0	0	1	0	1	0	0	0	0	0	0	1
SWFI01	02SDH-38	0	0	0	0	0	0	1	1	0	0	0	1	0	1
SWFI01	02SDH-39	0	0	0	0	1	0	1	0	0	0	1	1	0	0
SWFI01	02SDH-4	0	0	0	0	1	0	1	0	0	0	1	0	0	0
SWFI01	02SDH-40	0	0	0	0	0	0	1	0	1	0	1	1	0	1
SWFI01	02SDH-41	0	0	0	0	0	0	1	0	0	0	1	0	0	0
SWFI01	02SDH-42	0	0	0	2	1	0	1	0	3	1	3	1	0	1
SWFI01	02SDH-43	0	0	1	0	0	0	1	0	0	0	0	0	0	1
SWFI01	02SDH-44	0	0	0	0	0	0	1	0	1	0	0	0	0	1
SWFI01	02SDH-45	0	0	1	0	1	0	2	1	1	0	0	0	0	1
SWFI01	02SDH-46	0	0	0	0	1	0	1	0	0	0	0	0	0	0
SWFI01	02SDH-47	0	0	0	0	0	0	1	0	0	0	0	0	0	0
SWFI01	02SDH-48	0	0	1	0	1	0	1	1	0	0	0	0	0	0
SWFI01	02SDH-49	0	0	0	0	1	0	1	0	0	0	1	0	0	0
SWFI01	02SDH-5	0	0	0	0	0	1	1	0	0	0	0	0	0	1
SWFI01	02SDH-50	0	0	0	0	1	0	3	1	1	0	0	0	0	1
SWFI01	02SDH-51	0	0	0	0	1	0	2	0	0	0	0	0	0	0
SWFI01	02SDH-6	0	0	1	0	1	0	3	0	0	0	1	0	0	1
SWFI01	02SDH-7	0	0	0	0	0	0	1	0	0	0	0	0	0	0
SWFI01	02SDH-8	0	0	0	0	0	0	1	0	0	0	0	0	0	1
SWFI01	02SDH-9	0	0	0	0	1	0	2	1	1	0	0	0	0	1
SWFI02	02SDH-154	0	0	0	0	0	0	1	0	1	0	0	0	0	1
SWFI02	02SDH-155	0	0	0	0	1	0	1	0	0	0	0	1	0	1
SWFI02	02SDH-156	0	0	0	0	0	0	1	1	0	0	0	0	0	1
SWFI02	02SDH-157	0	0	0	0	1	0	2	0	0	0	1	1	0	1
SWFI02	02SDH-158	0	0	0	0	1	0	1	0	1	0	0	0	0	1
SWFI02	02SDH-159	0	0	0	0	1	0	1	0	0	0	0	0	0	0
SWFI02	02SDH-160	0	0	2	0	1	0	1	0	0	0	0	0	0	0

Table N-5. (cont.)

Station ID	Sample ID	CON	CUE	FBG	HPC	HVW	KGR	KMA	MIN	NPH	RTN	RTR	TDI	TEP	TEV
SWFI02	02SDH-161	0	0	0	0	1	0	2	0	1	0	0	0	1	0
SWFI02	02SDH-162	0	0	0	0	1	0	1	0	0	0	0	1	0	0
SWFI02	02SDH-163	0	0	0	0	0	0	1	0	0	0	0	0	0	0
SWFI02	02SDH-164	0	0	1	0	1	0	1	1	0	0	0	0	0	0
SWFI02	02SDH-165	0	0	0	0	0	0	1	0	0	0	2	0	0	1
SWFI02	02SDH-166	0	0	0	0	1	0	1	0	1	0	0	0	0	0
SWFI02	02SDH-167	0	0	0	0	0	0	1	0	1	0	1	0	0	0
SWFI02	02SDH-168	0	0	1	0	1	0	1	1	0	0	1	0	0	1
SWFI02	02SDH-169	0	0	0	0	0	0	1	0	0	0	0	0	0	0
SWFI02	02SDH-170	0	0	0	0	1	0	1	0	1	0	0	0	0	1
SWFI02	02SDH-171	0	0	0	0	1	0	1	1	0	0	1	0	1	1
SWFI02	02SDH-172	0	0	0	0	1	0	1	0	1	0	1	0	0	0
SWFI02	02SDH-173	0	0	0	0	1	0	1	0	0	0	0	0	0	1
SWFI02	02SDH-174	0	0	1	0	0	0	1	0	0	0	0	0	1	1
SWFI02	02SDH-175	0	0	0	0	1	0	1	0	1	0	1	0	0	0
SWFI02	02SDH-176	0	0	0	0	1	0	2	0	0	0	0	0	0	1
SWFI02	02SDH-177	0	0	1	0	0	0	2	1	2	0	1	0	0	0
SWFI02	02SDH-178	0	0	1	0	1	0	2	1	0	0	0	0	0	0
SWFI02	02SDH-179	0	0	0	0	1	0	1	1	0	0	0	0	0	0
SWFI02	02SDH-180	0	0	0	0	0	0	1	0	1	0	1	0	0	0
SWFI02	02SDH-181	0	0	0	0	1	0	1	0	1	0	0	0	0	1
SWFI02	02SDH-182	0	0	1	0	0	0	3	0	0	0	0	0	0	1
SWFI02	02SDH-183	0	0	0	0	1	0	1	0	1	0	0	0	0	0
SWFI02	02SDH-184	0	0	0	0	1	0	1	1	0	0	0	0	0	0
SWFI02	02SDH-185	0	0	1	1	1	0	1	2	1	0	1	2	0	1
SWFI02	02SDH-186	0	0	1	0	1	0	1	0	1	0	1	0	0	0
SWFI02	02SDH-187	0	0	0	0	0	0	1	0	0	0	0	0	0	0
SWFI02	02SDH-188	0	0	0	0	1	0	1	0	0	0	1	0	0	0
SWFI02	02SDH-189	0	0	0	0	1	0	0	1	0	0	0	1	0	1
SWFI02	02SDH-190	0	0	0	0	1	0	1	1	0	0	1	0	0	0
SWFI02	02SDH-191	0	0	0	0	1	0	1	0	0	0	0	0	0	0
SWFI02	02SDH-192	0	0	0	0	1	0	1	0	0	0	2	1	0	0
SWFI02	02SDH-193	0	0	0	0	0	0	0	0	0	0	1	0	0	0
SWFI02	02SDH-194	0	0	0	0	1	0	1	0	1	0	2	0	0	0
SWFI02	02SDH-195	0	0	1	0	0	0	1	0	0	0	0	1	0	1

Table N-5. (cont.)

Station ID	Sample ID	CON	CUE	FBG	HPC	HVW	KGR	KMA	MIN	NPH	RTN	RTR	TDI	TEP	TEV
SWFI02	02SDH-196	0	0	0	0	0	0	1	0	0	0	0	1	0	1
SWFI02	02SDH-197	0	0	1	0	0	0	1	0	0	0	0	0	0	1
SWFI02	02SDH-198	0	0	0	0	0	0	1	1	0	0	0	1	0	1
SWFI02	02SDH-199	0	0	0	0	1	0	2	0	1	0	0	0	0	0
SWFI02	02SDH-200	0	0	1	0	0	0	1	1	0	0	1	1	0	1
SWFI02	02SDH-201	0	0	0	0	1	0	1	1	1	0	0	1	0	1
SWFI02	02SDH-202	0	0	0	0	1	0	1	1	0	0	0	0	0	2
SWFI02	02SDH-203	0	0	0	0	1	0	1	0	0	0	0	1	0	0

Note:
CON - congestion
CUE - cyst of unknown etiology
FBG - foreign body granuloma
HPC - hematopoietic cells (relative area)
HVW - hyalinization of vessel walls
KGR - granulomatous inflammation
KMA - pigmented macrophage aggregates
MIN - mineralization
NPH - nephritis
RTN - renal tubular necrosis
RTR - renal tubular regeneration
TDI - tubular dilation (of lumen)
TEP - renal tubular epithelial protein droplets
TEV - tubular epithelial vacuolation

Table N-6. Fish histopathology results—whole organism

Station ID	Sample ID	CC	CFF	CFR	DSR	FBR	FSR	ICH	OFF	SGF
2240FI	02SDH-102	0	0	0	0	0	0	0	1	1
2240FI	02SDH-103	0	1	0	0	0	0	0	0	1
2240FI	02SDH-104	0	1	0	0	0	0	1	1	1
2240FI	02SDH-105	0	1	0	0	0	0	1	1	1
2240FI	02SDH-106	0	1	1	0	0	1	1	1	1
2240FI	02SDH-107	0	1	1	0	0	0	0	0	1
2240FI	02SDH-108	0	1	0	0	0	0	1	0	1
2240FI	02SDH-109	0	1	0	0	0	0	1	0	NS
2240FI	02SDH-110	0	1	0	0	0	1	0	0	2
2240FI	02SDH-111	0	1	1	0	0	1	1	1	1
2240FI	02SDH-112	0	1	0	0	0	2	1	1	3
2240FI	02SDH-113	0	1	0	0	0	0	0	0	1
2240FI	02SDH-114	0	1	1	0	0	1	1	0	0
2240FI	02SDH-115	0	1	1	0	0	1	0	1	2
2240FI	02SDH-116	0	1	1	0	0	0	1	1	1
2240FI	02SDH-117	0	1	0	0	0	0	1	0	2
2240FI	02SDH-118	0	1	0	0	0	0	0	2	1
2240FI	02SDH-119	0	1	0	0	0	1	0	0	1
2240FI	02SDH-120	0	1	0	0	0	0	1	0	2
2240FI	02SDH-121	0	1	0	0	0	1	0	0	0
2240FI	02SDH-122	0	1	1	0	0	0	0	1	1
2240FI	02SDH-123	0	0	0	0	0	0	1	2	0
2240FI	02SDH-124	0	2	0	0	0	1	1	0	2
2240FI	02SDH-125	0	1	0	0	0	0	0	1	1
2240FI	02SDH-126	0	1	1	0	0	0	1	1	2
2240FI	02SDH-127	0	1	0	0	0	0	1	0	1
2240FI	02SDH-128	0	1	0	0	0	0	0	1	1
2240FI	02SDH-129	0	1	0	0	0	0	1	1	1
2240FI	02SDH-130	0	1	0	0	0	0	1	1	2
2240FI	02SDH-131	0	1	0	0	0	0	0	0	1
2240FI	02SDH-132	0	1	0	0	0	0	1	1	1
2240FI	02SDH-133	0	1	0	0	0	1	1	1	2
2240FI	02SDH-134	0	1	0	0	0	0	1	0	1
2240FI	02SDH-135	0	1	1	0	0	0	0	0	1
2240FI	02SDH-136	0	1	1	0	0	0	1	1	1
2240FI	02SDH-137	0	1	0	0	0	0	0	1	2
2240FI	02SDH-138	0	1	0	0	0	0	0	1	1
2240FI	02SDH-139	0	1	1	0	0	1	1	1	1
2240FI	02SDH-140	0	1	1	0	0	0	0	1	1
2240FI	02SDH-141	0	1	0	0	0	0	1	1	1
2240FI	02SDH-142	0	1	1	0	0	1	1	1	1
2240FI	02SDH-143	0	1	0	0	0	1	1	1	1
2240FI	02SDH-144	0	1	1	0	0	0	1	1	2
2240FI	02SDH-145	0	1	0	0	0	1	0	1	0
2240FI	02SDH-146	0	1	0	0	0	1	1	1	1
2240FI	02SDH-147	0	1	0	0	0	0	1	1	1
2240FI	02SDH-148	0	1	0	0	0	0	1	1	1
2240FI	02SDH-149	0	1	0	0	0	0	0	1	1
2240FI	02SDH-150	0	1	0	0	0	1	1	1	1
2240FI	02SDH-151	0	1	1	0	0	0	1	1	1

Table N-6. (cont.)

Station ID	Sample ID	CC	CFF	CFR	DSR	FBR	FSR	ICH	OFF	SGF
2240FI	02SDH-152	0	1	1	0	0	0	0	1	0
2240FI	02SDH-153	0	1	1	0	0	0	0	1	1
NAFI01	02SDH-100	0	1	0	0	0	1	0	0	2
NAFI01	02SDH-101	0	1	1	0	0	1	1	0	1
NAFI01	02SDH-52	0	1	0	0	0	0	0	1	NS
NAFI01	02SDH-53	0	1	0	0	0	1	0	1	NS
NAFI01	02SDH-54	0	1	0	0	0	0	1	1	2
NAFI01	02SDH-55	0	1	0	0	0	0	1	1	1
NAFI01	02SDH-56	0	1	0	0	0	0	0	0	NS
NAFI01	02SDH-57	0	1	0	0	0	0	0	0	NS
NAFI01	02SDH-58	0	1	0	0	0	0	0	1	NS
NAFI01	02SDH-59	0	0	0	0	0	0	0	0	NS
NAFI01	02SDH-60	0	1	0	0	0	1	0	1	NS
NAFI01	02SDH-61	0	1	0	0	0	1	0	0	2
NAFI01	02SDH-62	0	1	0	0	0	0	0	1	NS
NAFI01	02SDH-63	0	1	0	0	0	0	0	0	1
NAFI01	02SDH-64	0	1	1	0	0	1	0	0	2
NAFI01	02SDH-65	0	1	0	0	0	1	1	1	2
NAFI01	02SDH-66	1	1	0	0	0	0	0	0	1
NAFI01	02SDH-67	0	0	0	0	0	0	0	0	2
NAFI01	02SDH-68	0	1	0	0	0	0	0	1	2
NAFI01	02SDH-69	0	1	0	0	0	1	0	1	1
NAFI01	02SDH-70	0	1	0	0	0	1	0	0	1
NAFI01	02SDH-71	0	1	1	0	0	0	0	1	0
NAFI01	02SDH-72	0	1	0	0	0	1	0	1	3
NAFI01	02SDH-73	0	1	0	0	0	0	0	1	0
NAFI01	02SDH-74	0	0	0	0	0	1	0	2	1
NAFI01	02SDH-75	0	1	0	0	0	0	0	0	1
NAFI01	02SDH-76	0	1	0	0	0	1	0	1	1
NAFI01	02SDH-77	0	0	0	0	0	1	0	0	1
NAFI01	02SDH-78	0	1	0	0	0	0	0	0	1
NAFI01	02SDH-79	0	1	0	0	0	0	0	0	1
NAFI01	02SDH-80	0	1	0	0	0	0	NS	1	0
NAFI01	02SDH-81	0	1	0	0	0	0	0	0	1
NAFI01	02SDH-82	0	1	0	0	0	0	0	0	1
NAFI01	02SDH-83	0	1	0	0	0	1	0	1	1
NAFI01	02SDH-84	0	0	0	0	0	0	0	0	1
NAFI01	02SDH-85	0	1	0	0	0	1	1	1	1
NAFI01	02SDH-86	0	1	1	0	0	1	0	1	1
NAFI01	02SDH-87	0	1	0	0	0	1	0	0	2
NAFI01	02SDH-88	0	1	0	0	0	0	0	0	1
NAFI01	02SDH-89	0	1	0	0	0	1	0	1	1
NAFI01	02SDH-90	0	1	0	0	0	1	0	1	2
NAFI01	02SDH-91	1	1	0	0	0	0	0	0	1
NAFI01	02SDH-92	0	0	0	0	0	0	0	0	1
NAFI01	02SDH-93	0	1	0	0	0	0	0	1	1
NAFI01	02SDH-94	0	1	0	0	0	1	0	1	0
NAFI01	02SDH-95	0	1	0	0	0	1	0	0	2
NAFI01	02SDH-96	0	1	0	0	0	0	1	0	1
NAFI01	02SDH-97	0	1	0	0	0	1	1	1	0

Table N-6. (cont.)

Station ID	Sample ID	CC	CFF	CFR	DSR	FBR	FSR	ICH	OFF	SGF
NAFI01	02SDH-98	0	1	0	0	0	0	1	1	1
NAFI01	02SDH-99	0	1	0	0	0	0	0	1	1
NAFI02	02SDH-204	0	1	0	0	0	0	1	1	2
NAFI02	02SDH-205	0	1	0	0	0	0	1	1	NS
NAFI02	02SDH-206	0	1	0	0	0	0	0	0	1
NAFI02	02SDH-207	0	1	0	0	0	1	0	1	1
NAFI02	02SDH-208	0	1	0	0	0	1	1	1	2
NAFI02	02SDH-209	0	1	0	0	0	0	1	1	1
NAFI02	02SDH-210	0	1	0	0	0	0	1	0	1
NAFI02	02SDH-211	0	1	0	0	0	1	0	1	1
NAFI02	02SDH-212	0	1	0	0	0	1	1	1	1
NAFI02	02SDH-213	0	1	0	0	0	1	0	0	1
NAFI02	02SDH-214	0	1	0	0	0	1	1	1	1
NAFI02	02SDH-215	0	1	0	0	0	0	1	0	0
NAFI02	02SDH-216	1	1	0	0	0	1	1	1	1
NAFI02	02SDH-217	0	1	0	0	0	0	1	0	1
NAFI02	02SDH-218	0	1	0	0	0	1	1	1	1
NAFI02	02SDH-219	0	1	1	0	0	0	1	1	1
NAFI02	02SDH-220	0	1	0	0	0	0	1	0	1
NAFI02	02SDH-221	0	1	0	0	0	1	0	1	0
NAFI02	02SDH-222	0	1	0	0	0	0	0	0	2
NAFI02	02SDH-223	0	1	0	0	0	1	1	1	1
NAFI02	02SDH-224	0	1	0	0	0	0	0	1	1
NAFI02	02SDH-225	0	1	0	0	0	0	1	0	1
NAFI02	02SDH-226	0	1	0	0	0	1	0	1	2
NAFI02	02SDH-227	0	1	0	0	1	1	1	1	1
NAFI02	02SDH-228	0	1	0	0	0	0	1	0	1
NAFI02	02SDH-229	0	0	0	0	0	3	0	0	1
NAFI02	02SDH-230	0	1	0	0	0	1	0	0	1
NAFI02	02SDH-231	0	1	0	0	1	0	1	1	1
NAFI02	02SDH-232	0	1	0	0	0	0	0	0	1
NAFI02	02SDH-233	0	0	0	0	0	0	0	1	1
NAFI02	02SDH-234	0	1	1	0	0	0	1	1	0
NAFI02	02SDH-235	0	1	1	0	0	1	1	0	0
NAFI02	02SDH-236	0	1	0	0	0	0	0	1	1
NAFI02	02SDH-237	0	1	0	0	0	0	1	0	NS
NAFI02	02SDH-238	0	1	1	0	0	1	0	1	1
NAFI02	02SDH-239	0	1	0	0	0	0	1	1	1
NAFI02	02SDH-240	0	1	0	0	0	0	1	1	1
NAFI02	02SDH-241	0	1	0	0	0	1	1	0	1
NAFI02	02SDH-242	1	0	0	0	0	0	1	1	1
NAFI02	02SDH-243	0	1	0	0	0	0	1	1	0
NAFI02	02SDH-244	0	1	0	0	0	0	1	1	1
NAFI02	02SDH-245	0	1	0	0	0	1	1	0	1
NAFI02	02SDH-246	0	1	0	0	0	0	0	1	1
NAFI02	02SDH-247	0	1	0	0	0	1	1	1	1
NAFI02	02SDH-248	0	1	0	0	0	0	1	1	1
NAFI02	02SDH-249	0	1	0	0	0	1	1	0	1
NAFI02	02SDH-250	0	1	0	0	0	1	0	1	1
NAFI02	02SDH-251	1	1	0	0	0	0	1	0	1

Table N-6. (cont.)

Station ID	Sample ID	CC	CFF	CFR	DSR	FBR	FSR	ICH	OFF	SGF
NAFI02	02SDH-252	0	1	0	0	0	1	0	1	1
NAFI02	02SDH-253	0	1	0	0	0	0	1	0	1
SWFI01	02SDH-1	0	0	0	0	0	0	0	1	NS
SWFI01	02SDH-10	0	1	0	0	0	0	0	2	NS
SWFI01	02SDH-11	0	1	0	0	0	0	0	1	NS
SWFI01	02SDH-12	NS	0	0	0	0	0	0	2	NS
SWFI01	02SDH-13	0	1	1	0	0	0	0	1	NS
SWFI01	02SDH-14	0	2	0	0	1	0	0	2	NS
SWFI01	02SDH-15	0	1	0	0	0	0	0	1	NS
SWFI01	02SDH-16	0	1	1	0	0	1	0	1	NS
SWFI01	02SDH-17	0	1	1	0	0	0	0	1	NS
SWFI01	02SDH-18	0	1	0	0	0	0	0	1	NS
SWFI01	02SDH-19	0	1	0	0	0	0	0	1	NS
SWFI01	02SDH-2	0	1	0	0	0	0	0	1	NS
SWFI01	02SDH-20	0	1	0	0	0	0	0	1	NS
SWFI01	02SDH-21	0	1	0	0	0	1	0	3	NS
SWFI01	02SDH-22	0	1	1	0	0	1	0	2	NS
SWFI01	02SDH-23	0	1	0	0	0	0	0	0	NS
SWFI01	02SDH-24	0	1	0	0	0	0	0	1	NS
SWFI01	02SDH-25	0	1	0	0	0	0	0	1	NS
SWFI01	02SDH-26	0	1	0	0	0	0	0	1	NS
SWFI01	02SDH-27	0	1	0	0	0	0	0	1	NS
SWFI01	02SDH-28	0	1	0	0	0	0	0	0	NS
SWFI01	02SDH-29	0	1	0	0	0	0	0	0	NS
SWFI01	02SDH-3	0	0	0	0	0	0	0	3	NS
SWFI01	02SDH-30	0	1	1	0	0	0	0	1	NS
SWFI01	02SDH-31	0	1	1	0	0	0	0	1	NS
SWFI01	02SDH-32	0	1	1	0	0	0	0	0	NS
SWFI01	02SDH-33	0	1	0	0	0	0	0	1	2
SWFI01	02SDH-34	0	1	0	0	0	1	0	0	NS
SWFI01	02SDH-35	0	1	0	0	0	0	1	1	NS
SWFI01	02SDH-36	0	2	1	0	0	0	0	0	NS
SWFI01	02SDH-37	0	1	0	0	0	1	0	1	NS
SWFI01	02SDH-38	0	1	0	0	0	0	0	1	2
SWFI01	02SDH-39	0	1	0	0	0	0	0	1	NS
SWFI01	02SDH-4	0	1	0	0	0	0	0	1	NS
SWFI01	02SDH-40	0	1	0	0	0	0	0	1	NS
SWFI01	02SDH-41	0	1	0	0	0	0	0	1	NS
SWFI01	02SDH-42	0	1	0	0	0	0	0	1	NS
SWFI01	02SDH-43	0	1	0	0	0	0	1	1	NS
SWFI01	02SDH-44	0	1	0	0	0	1	0	1	2
SWFI01	02SDH-45	0	2	0	0	0	0	0	2	2
SWFI01	02SDH-46	0	1	0	0	0	0	0	0	NS
SWFI01	02SDH-47	0	1	0	0	0	0	0	1	NS
SWFI01	02SDH-48	0	1	0	0	0	0	0	1	NS
SWFI01	02SDH-49	0	1	0	0	0	0	1	1	2
SWFI01	02SDH-5	0	1	0	0	0	0	0	0	NS
SWFI01	02SDH-50	0	1	0	0	0	0	0	1	NS
SWFI01	02SDH-51	0	1	1	0	0	0	0	0	NS
SWFI01	02SDH-6	0	1	0	0	0	0	0	0	NS

Table N-6. (cont.)

Station ID	Sample ID	CC	CFF	CFR	DSR	FBR	FSR	ICH	OFF	SGF
SWFI01	02SDH-7	0	1	0	0	0	0	0	1	NS
SWFI01	02SDH-8	0	1	0	0	0	0	0	2	NS
SWFI01	02SDH-9	0	1	0	0	1	1	0	1	NS
SWFI02	02SDH-154	0	1	0	0	0	0	1	0	1
SWFI02	02SDH-155	0	1	0	0	1	1	0	1	2
SWFI02	02SDH-156	0	1	0	0	0	0	0	1	3
SWFI02	02SDH-157	0	1	0	0	0	0	1	0	2
SWFI02	02SDH-158	0	1	0	0	0	1	0	0	2
SWFI02	02SDH-159	0	0	0	0	0	0	1	0	1
SWFI02	02SDH-160	0	1	0	0	0	0	1	1	2
SWFI02	02SDH-161	0	1	0	0	1	1	0	1	1
SWFI02	02SDH-162	0	1	1	0	0	1	1	1	1
SWFI02	02SDH-163	0	1	0	0	0	0	0	0	1
SWFI02	02SDH-164	0	1	1	0	0	1	0	1	1
SWFI02	02SDH-165	0	1	0	0	0	1	0	1	1
SWFI02	02SDH-166	0	1	0	0	0	1	1	1	1
SWFI02	02SDH-167	0	1	1	0	0	1	1	1	1
SWFI02	02SDH-168	0	1	0	0	0	1	1	1	1
SWFI02	02SDH-169	0	0	0	0	0	0	1	0	2
SWFI02	02SDH-170	0	1	0	0	0	0	1	1	1
SWFI02	02SDH-171	0	0	0	0	0	1	1	0	1
SWFI02	02SDH-172	0	0	0	0	0	0	1	0	1
SWFI02	02SDH-173	0	0	0	0	0	0	1	0	2
SWFI02	02SDH-174	0	0	0	0	0	1	0	2	1
SWFI02	02SDH-175	0	1	0	0	0	1	0	0	1
SWFI02	02SDH-176	0	1	0	0	0	0	1	0	1
SWFI02	02SDH-177	0	0	0	0	0	1	1	0	1
SWFI02	02SDH-178	0	1	0	0	0	0	1	0	2
SWFI02	02SDH-179	0	1	0	0	0	0	1	1	2
SWFI02	02SDH-180	0	0	0	0	0	1	1	0	1
SWFI02	02SDH-181	0	0	0	0	0	1	1	0	1
SWFI02	02SDH-182	0	1	0	0	0	0	1	0	2
SWFI02	02SDH-183	0	0	0	0	0	0	1	1	1
SWFI02	02SDH-184	0	1	0	0	1	0	1	0	1
SWFI02	02SDH-185	0	1	0	0	0	1	1	0	1
SWFI02	02SDH-186	0	1	1	0	0	1	1	0	1
SWFI02	02SDH-187	0	0	0	0	0	0	1	0	1
SWFI02	02SDH-188	0	1	0	0	0	0	1	1	1
SWFI02	02SDH-189	0	1	0	0	0	1	0	0	1
SWFI02	02SDH-190	0	1	0	0	0	1	0	1	1
SWFI02	02SDH-191	0	1	0	0	0	1	1	1	1
SWFI02	02SDH-192	0	1	0	0	1	1	0	1	2
SWFI02	02SDH-193	0	0	0	0	0	0	1	1	1
SWFI02	02SDH-194	0	1	1	0	0	0	1	0	1
SWFI02	02SDH-195	0	1	1	0	0	1	0	1	2
SWFI02	02SDH-196	0	1	0	0	0	0	1	1	1
SWFI02	02SDH-197	0	1	0	0	0	0	1	1	1
SWFI02	02SDH-198	0	1	0	0	0	1	0	1	2
SWFI02	02SDH-199	0	1	0	0	0	0	0	1	1
SWFI02	02SDH-200	0	1	0	0	0	0	1	1	1

Table N-6. (cont.)

Station ID	Sample ID	CC	CFF	CFR	DSR	FBR	FSR	ICH	OFF	SGF
SWFI02	02SDH-201	0	1	0	0	0	0	1	1	2
SWFI02	02SDH-202	0	1	1	0	0	1	1	1	2
SWFI02	02SDH-203	0	1	0	0	0	0	1	1	1

Note:
CC - cutaneous copepod
CFF - caudal fin fraying
CFR - caudal fin reddening
DSR - diffuse skin reddening
FBR - fin base reddening
FSR - focal skin reddening
ICH - diffuse opaque epicardium consistent with a parasite reaction
NS - not scored
OFF - other fin fraying
SGF - shiny gill foci at the base of filaments

Table N-7. Fish histopathology results—whole organism Anisakis

Station ID	Sample ID	AN
2240FI	02SDH-102	0
2240FI	02SDH-103	0
2240FI	02SDH-104	0
2240FI	02SDH-105	3
2240FI	02SDH-106	0
2240FI	02SDH-107	0
2240FI	02SDH-108	0
2240FI	02SDH-109	0
2240FI	02SDH-110	0
2240FI	02SDH-111	0
2240FI	02SDH-112	0
2240FI	02SDH-113	0
2240FI	02SDH-114	0
2240FI	02SDH-115	1
2240FI	02SDH-116	0
2240FI	02SDH-117	4
2240FI	02SDH-118	0
2240FI	02SDH-119	0
2240FI	02SDH-120	1
2240FI	02SDH-121	0
2240FI	02SDH-122	1
2240FI	02SDH-123	2
2240FI	02SDH-124	2
2240FI	02SDH-125	2
2240FI	02SDH-126	0
2240FI	02SDH-127	9
2240FI	02SDH-128	0
2240FI	02SDH-129	3
2240FI	02SDH-130	2
2240FI	02SDH-131	0
2240FI	02SDH-132	0
2240FI	02SDH-133	2
2240FI	02SDH-134	0
2240FI	02SDH-135	2
2240FI	02SDH-136	0
2240FI	02SDH-137	5
2240FI	02SDH-138	0
2240FI	02SDH-139	0
2240FI	02SDH-140	0
2240FI	02SDH-141	0
2240FI	02SDH-142	3
2240FI	02SDH-143	6
2240FI	02SDH-144	1
2240FI	02SDH-145	1
2240FI	02SDH-146	1
2240FI	02SDH-147	0
2240FI	02SDH-148	0
2240FI	02SDH-149	3
2240FI	02SDH-150	1
2240FI	02SDH-151	2
2240FI	02SDH-152	1
2240FI	02SDH-153	0

Table N-7. (cont.)

Station ID	Sample ID	AN
NAFI01	02SDH-100	0
NAFI01	02SDH-101	0
NAFI01	02SDH-52	0
NAFI01	02SDH-53	0
NAFI01	02SDH-54	0
NAFI01	02SDH-55	0
NAFI01	02SDH-56	0
NAFI01	02SDH-57	0
NAFI01	02SDH-58	0
NAFI01	02SDH-59	0
NAFI01	02SDH-60	0
NAFI01	02SDH-61	0
NAFI01	02SDH-62	0
NAFI01	02SDH-63	0
NAFI01	02SDH-64	0
NAFI01	02SDH-65	0
NAFI01	02SDH-66	0
NAFI01	02SDH-67	0
NAFI01	02SDH-68	1
NAFI01	02SDH-69	0
NAFI01	02SDH-70	0
NAFI01	02SDH-71	0
NAFI01	02SDH-72	0
NAFI01	02SDH-73	0
NAFI01	02SDH-74	0
NAFI01	02SDH-75	0
NAFI01	02SDH-76	0
NAFI01	02SDH-77	0
NAFI01	02SDH-78	0
NAFI01	02SDH-79	0
NAFI01	02SDH-80	0
NAFI01	02SDH-81	0
NAFI01	02SDH-82	0
NAFI01	02SDH-83	0
NAFI01	02SDH-84	0
NAFI01	02SDH-85	0
NAFI01	02SDH-86	0
NAFI01	02SDH-87	4
NAFI01	02SDH-88	0
NAFI01	02SDH-89	0
NAFI01	02SDH-90	0
NAFI01	02SDH-91	0
NAFI01	02SDH-92	2
NAFI01	02SDH-93	0
NAFI01	02SDH-94	0
NAFI01	02SDH-95	0
NAFI01	02SDH-96	1
NAFI01	02SDH-97	0
NAFI01	02SDH-98	0
NAFI01	02SDH-99	0
NAFI02	02SDH-204	0
NAFI02	02SDH-205	1
NAFI02	02SDH-206	0

Table N-7. (cont.)

Station ID	Sample ID	AN
NAFI02	02SDH-207	0
NAFI02	02SDH-208	0
NAFI02	02SDH-209	0
NAFI02	02SDH-210	0
NAFI02	02SDH-211	1
NAFI02	02SDH-212	1
NAFI02	02SDH-213	3
NAFI02	02SDH-214	3
NAFI02	02SDH-215	1
NAFI02	02SDH-216	0
NAFI02	02SDH-217	0
NAFI02	02SDH-218	0
NAFI02	02SDH-219	1
NAFI02	02SDH-220	1
NAFI02	02SDH-221	0
NAFI02	02SDH-222	0
NAFI02	02SDH-223	2
NAFI02	02SDH-224	0
NAFI02	02SDH-225	0
NAFI02	02SDH-226	3
NAFI02	02SDH-227	1
NAFI02	02SDH-228	1
NAFI02	02SDH-229	0
NAFI02	02SDH-230	4
NAFI02	02SDH-231	1
NAFI02	02SDH-232	0
NAFI02	02SDH-233	0
NAFI02	02SDH-234	0
NAFI02	02SDH-235	1
NAFI02	02SDH-236	0
NAFI02	02SDH-237	0
NAFI02	02SDH-238	2
NAFI02	02SDH-239	2
NAFI02	02SDH-240	1
NAFI02	02SDH-241	1
NAFI02	02SDH-242	3
NAFI02	02SDH-243	0
NAFI02	02SDH-244	0
NAFI02	02SDH-245	0
NAFI02	02SDH-246	0
NAFI02	02SDH-247	3
NAFI02	02SDH-248	1
NAFI02	02SDH-249	2
NAFI02	02SDH-250	1
NAFI02	02SDH-251	3
NAFI02	02SDH-252	0
NAFI02	02SDH-253	2
SWFI01	02SDH-1	1
SWFI01	02SDH-10	0
SWFI01	02SDH-11	0
SWFI01	02SDH-12	0
SWFI01	02SDH-13	0
SWFI01	02SDH-14	0

Table N-7. (cont.)

Station ID	Sample ID	AN
SWFI01	02SDH-15	0
SWFI01	02SDH-16	0
SWFI01	02SDH-17	0
SWFI01	02SDH-18	0
SWFI01	02SDH-19	0
SWFI01	02SDH-2	0
SWFI01	02SDH-20	0
SWFI01	02SDH-21	0
SWFI01	02SDH-22	0
SWFI01	02SDH-23	0
SWFI01	02SDH-24	0
SWFI01	02SDH-25	0
SWFI01	02SDH-26	3
SWFI01	02SDH-27	0
SWFI01	02SDH-28	0
SWFI01	02SDH-29	0
SWFI01	02SDH-3	0
SWFI01	02SDH-30	0
SWFI01	02SDH-31	0
SWFI01	02SDH-32	0
SWFI01	02SDH-33	0
SWFI01	02SDH-34	0
SWFI01	02SDH-35	0
SWFI01	02SDH-36	0
SWFI01	02SDH-37	1
SWFI01	02SDH-38	0
SWFI01	02SDH-39	0
SWFI01	02SDH-4	0
SWFI01	02SDH-40	0
SWFI01	02SDH-41	0
SWFI01	02SDH-42	0
SWFI01	02SDH-43	0
SWFI01	02SDH-44	0
SWFI01	02SDH-45	0
SWFI01	02SDH-46	0
SWFI01	02SDH-47	0
SWFI01	02SDH-48	0
SWFI01	02SDH-49	0
SWFI01	02SDH-5	1
SWFI01	02SDH-50	0
SWFI01	02SDH-51	0
SWFI01	02SDH-6	0
SWFI01	02SDH-7	0
SWFI01	02SDH-8	0
SWFI01	02SDH-9	4
SWFI02	02SDH-154	0
SWFI02	02SDH-155	0
SWFI02	02SDH-156	3
SWFI02	02SDH-157	2
SWFI02	02SDH-158	0
SWFI02	02SDH-159	0
SWFI02	02SDH-160	2
SWFI02	02SDH-161	0

Table N-7. (cont.)

Station ID	Sample ID	AN
SWFI02	02SDH-162	0
SWFI02	02SDH-163	0
SWFI02	02SDH-164	1
SWFI02	02SDH-165	0
SWFI02	02SDH-166	1
SWFI02	02SDH-167	1
SWFI02	02SDH-168	0
SWFI02	02SDH-169	0
SWFI02	02SDH-170	0
SWFI02	02SDH-171	0
SWFI02	02SDH-172	3
SWFI02	02SDH-173	2
SWFI02	02SDH-174	0
SWFI02	02SDH-175	1
SWFI02	02SDH-176	0
SWFI02	02SDH-177	0
SWFI02	02SDH-178	1
SWFI02	02SDH-179	1
SWFI02	02SDH-180	0
SWFI02	02SDH-181	0
SWFI02	02SDH-182	0
SWFI02	02SDH-183	0
SWFI02	02SDH-184	0
SWFI02	02SDH-185	2
SWFI02	02SDH-186	1
SWFI02	02SDH-187	0
SWFI02	02SDH-188	0
SWFI02	02SDH-189	0
SWFI02	02SDH-190	3
SWFI02	02SDH-191	0
SWFI02	02SDH-192	0
SWFI02	02SDH-193	0
SWFI02	02SDH-194	2
SWFI02	02SDH-195	2
SWFI02	02SDH-196	0
SWFI02	02SDH-197	1
SWFI02	02SDH-198	0
SWFI02	02SDH-199	0
SWFI02	02SDH-200	2
SWFI02	02SDH-201	0
SWFI02	02SDH-202	0
SWFI02	02SDH-203	0

Note: AN - number of Anisakis parasites in body cavity

Glossary of Terms for Appendix N

Excerpted from Marty (2002)

Glossary of Terms for Appendix N
Excerpted from Marty (2002)[1]

Gill

CUE—cysts of unknown etiology. Granulomas or "cysts" were usually about 500 μm in diameter. The periphery had concentric bands of fibroblasts and mature collagen. The central region, when present, was composed of intensely basophilic material with brightly eosinophilic droplets that were 1 to 6 μm in diameter and arranged into spherules, each 20 to 50 μm in diameter. These granulomas were described grossly as "pinpoint white foci" or "1-mm-diameter pale foci." Occasionally, the gill had fibroblast-lined granulomas.

score = 0; no CUE in sections.
score = 1; 1, 2, or 3 CUE per slide/section and minimal active inflammation.
score = 2; 4–8 CUE per slide/section, but minimal inflammatory reaction.
score = 3; none were severe.

EPC—branchial *Epitheliocystis*. Foci of *Epitheliocystis* (cysts) ranged from 50 to 150 μm in diameter, surrounded by a 2-μm-thick hyaline capsule. Contents of cysts were granular and either deeply basophilic or pale basophilic.

score = 0; no *Epitheliocystis*.
score = 1; 10 *Epitheliocystis* foci per slide.
score = 2; >10 *Epitheliocystis* foci per slide, but minimal inflammatory reaction.
score = 3; >10 *Epitheliocystis* foci per slide, with moderate to severe inflammation.

GLF—gill lamellar fusion. Fusion of adjacent lamellae can be either partial or complete. Lamellar fusion decreases the available surface area for gas transfer.

score = 0; lamellae are not fused.
score = 1; <5% of lamellae are fused.
score = 2; 5–50% of lamellae on at least one filament are fused.
score = 3; >50% of lamellae on at least one filament are fused, or >20% of all lamellae are fused.

[1] Marty, G.D. 2002. Necropsy and histopathology of spotted sea bass from San Diego Harbor: September 2002. Prepared for Exponent, Bellevue, WA. Fish Pathology Services, Davis, CA.

GLH—gill lamellar hyperplasia/hypertrophy. Hypertrophy results from thickening of individual epithelial cells, including chloride cells, whereas hyperplasia is an increase in the number of cells lining the fill lamellae. Apoptotic chloride cells were scored separately as CCA (next lesion).

score = 0; lamellar epithelium was uniformly simple and squamous.
score = 1; lamellar epithelial are thickened and cuboidal rather than squamous (flat).
score = 2; epithelial thickening is greater than cuboidal, or cells are beginning to pile up; total affected area involves >2mm of filament.
score = 3; none were severe.

GLT—gill lamellar telangiectasis. Tips of gill lamella were dilated (i.e., had aneurysms), occasionally >30 μm in diameter. Old aneurysms often contained recanalized thrombi; these were NOT included in the THR score. Affected lamellae on the edge of the cut were not counted (scissors-induced artifact would be expected under normal handling conditions).

score = 0; <5 dilated lamellar capillaries per section.
score = 1; >5 dilated lamellar capillaries per section, but <6 filament involved.
score = 2; >15 dilated lamellar capillaries per filament, with <6 filaments involved.
score = 3; >15 dilated lamellar capillaries per section, with >5 filaments involved.

LEL—gill lamellar epithelial lifting. Can be a result of postmortem artifact or toxicant exposure. True change is more likely when protein-containing fluid is between the epithelium and the pillar cells.

score = 0; all lamellar epithelium is in close contact with pillar cells.
score = 1; <5% lamellar epithelium separated from pillar cells.
score = 2; 5–20% of lamellar epithelium separated from pillar cells.
score = 3; >20% of lamellar epithelium separated from pillar cells.

RAK—raker inflammation (includes connective tissue at base of rakers). Inflammation was usually a mixture of lymphocytes and plasma cells, with lesser numbers of EGLs, neutrophils and macrophages. The base of the filaments has a band of hematopoietic cells that is considered normal (e.g., 02FPS3-29B) and is NOT scored as part of RAK.

score = 0; rakers are free of foci of inflammation (a few scattered inflammatory cells are considered normal.
score = 1; foci of inflammation in rakers total <500 µm in diameter.
score = 2; foci of inflammation in rakers total 500 µm – 1 mm in diameter.
score = 3; foci of inflammation in rakers total >1 mm in diameter.

THR—thrombosis. Thrombi are clots within blood vessels. They can be predominantly fibrin or thrombocytes, or a combination of the two components. They tend to be most common in vessels at the tips of filaments.

score = 0; no thrombi in the section.
score = 1; <10 thrombi in the section, and total area of thrombi <500 µm in diameter.
score = 2; 10–30 thrombi in the section, or total area of thrombi >500 µm in diameter.
score = 3; none were severe.

TMT—trematode. Gill lamellae had two sizes of monogenetic trematodes: 1) smaller ones were up to 150×80 μm, with oral suckers, parenchymatous body cavity, poorly developed esophagus and no developed gonads (02FPS3-240B); and 2) larger ones were up to 700× 300 μm, with oral suckers, parenchymatous body cavity, well-developed esophagus, digestive glands, and ovary with eggs (02FPS3-58B). Digenetic trematodes, occasionally found encysted in the arch and filaments are NOT scored under TMT.

score = 0; no trematodes.
score = 1; ≤5 trematodes in the section.
score = 2; >5 trematodes in the section, but no associated inflammation.
score = 3; >5 trematodes in the section, with associated inflammation.

Gonad

BGP-ST—blue-green pigment in cytoplasm of cells lining seminiferous tubules. The pigment was the same color as GMAs. [Females = 0]

score = 0; no blue-green pigment in cytoplasm of cells lining seminiferous tubules.
score = 1; blue-green pigment present, but less than 20% of area pigmented.
score = 2; blue-green pigment in 20–50% of area.
score = 3; blue-green pigment in >50% of area.

CUE—cysts of unknown etiology. These "cysts" were the same as described in the liver (below).

EGL—eosinophilic granular leukocytes. EGLs were often scattered throughout the section, but only the 400× field in which EGLs were most abundant was used for scoring. With a similar appearance, follicular cells with eosinophilic granules were considered normal and were NOT scored as EGLs. EGLs were not directly associated with any foreign material/body.

score = 0; ≤2 (and usually zero) EGLs in every 400× field.
score = 1; >2 but ≤25 EGLs in the 400× field scored.
score = 2; >25 EGLs in the 400× field scored.
score = 3; >25 EGLs in several 400× fields.

FBG—foreign body granuloma (probably secondary to Anisakis or an unidentified parasite). A lesion of the gonadal stroma or capsule. Granulomas were composed of concentric layers of intensely eosinophilic material (fibrin?) and small (about 8 ×5 μm), oval, deeply basophilic nuclei. Many of the granulomas contained hyaline material that probably was degenerating parasite cuticle. Some granulomas contained clumped, amorphous, brown-green material or refractile yellow material. Other granulomas had features of "cysts of unknown etiology" described in the liver.

score = 0; no FBGs in sections examined.
score = 1; sections had 1–3 FBG.
score = 2; sections had 4–6 FBGs.
score = 3; sections had >7 FBGs.

GGR—gonadal granulomas (or focal granulomatous inflammation). Foci of granulomatous inflammation were distributed throughout the interstitium. GGRs occasionally contained eosinophilic granular leukocytes (EGLs).

score = 0; no granulomatous inflammation in sections examined.
score = 1; sections had <1 focus of granulomatous inflammation per 100× field.
score = 2; sections had 1 but <3 foci of granulomatous inflammation per 100× field.
score = 3; sections had 3 foci of granulomatous inflammation per 100× field.

GMA—gonadal macrophage aggregates. Macrophage aggregates were pigmented yellow-brown to green-brown, and occasionally contained lymphocytes.

score = 0; no macrophage aggregates.
score = 1; sections had 2 MAs >60 μm in diameter per 100× field.
score = 2; sections had >2 but 5 MAs >60 μm in diameter per 100× field.
score = 3; sections had >5 MAs >60 μm in diameter per 100× field.

HVW—hyalinized vessel walls. This change most commonly affected the lining of renal sinusoids (small thin-walled vessels). Vessel walls were thickened with pale, homogeneous, basophilic material.

score = 0; no hyalinization of vessel walls.
score = 1; at least one vessel wall was hyalinized and the wall was <20 μm thick.
score = 2; >20% of vessels hyalinized, or the wall of at least one vessel wall was hyalinized and >40 μm thick.
score = 3; none were severe.

OAI—atresia of primary (unyolked) follicles; a change/lesion in ovaries based on the estimated average number of atretic primary follicles per 100× field. Atretic primary follicles had irregularities and clumping of the deeply basophilic cytoplasm.

score = 0; no atretic primary follicles in the section.
score = 1; <1 atretic primary follicle per 100× field.
score = 2; 1–3 atretic primary follicles per 100× field.
score = 3; >3 atretic primary follicles per 100× field.

OAM—atresia of yolked (maturing or mature) follicles; a change/lesion in ovaries based on the estimated average number of atretic follicles per 100× field. Initial stages of "mature" atretic follicles had irregularities and breaks in the chorion and disruption of the nuclear membrane. Advanced stages had complete fragmentation of the chorion, degeneration of both lipid vacuoles and yolk protein droplets, increased cytoplasmic eosinophilia, and complete dissolution of the nucleus. Final stages of atresia had marked shrinkage, complete lysis of chorion and nucleus, with replacement of the cytoplasm by lipid and variable infiltration with macrophages.

score = 0; no atretic follicles in the section.
score = 1; <1 atretic follicle per 100× field.
score = 2; 1–3 atretic follicles per 100× field.
score = 3; >3 atretic follicles per 100× field.

SPM—spermatocytes. In distended seminiferous tubules, sperm foci thickness was greater than the thickness of seminiferous tubule walls (SPM is scored only in sexually mature males; immature males and all females = not present/NP).

score = 0; <5% seminiferous tubules were distended.
score = 1; 50% seminiferous tubules were distended.
score = 2; >50% and 95% of seminiferous tubules were distended.
score = 3; all seminiferous tubules were distended.

Liver

ANI—Anisakis nematode parasites. Location was designated at none (0), parenchyma (P), capsule/margin (M), or both parenchyma and margin (B). Severity was not scored.

BCF—basophilic cell focus of cellular alteration.

score = number of foci per section.

BGP-HP—blue-green to yellow-green pigment (lipofuscin) in cytoplasm of hepatocytes. This dull pigment was poorly demarcated within the cytoplasm. With special stains, the pigment is acid-fast positive, PAS positive, and negative for iron and copper (consistent with lipofuscin). When present in hepatocytes, the pigment was the same color as LMAs. In the most severe cases, the cytoplasm was packed and even distended by accumulations of the pigment. This pigment was different from the yellow-green to yellow-brown staining of hemosiderin, which is positive for iron and tended to be well demarcated (scored under "PIG" below). Hemosiderin pigments were common in hepatocytes, but they were NOT included in the BGP score. The pigments associated with BGP and PIG are very similar with the standard hematoxylin and eosin stain, especially when BGP accumulations are small; best differential results would require examination of iron and lipofuscin stains on every section.

score = 0; no blue-green pigment in cytoplasm of hepatocytes.
score = 1; blue-green pigment present in hepatocyte cytoplasm, but <25% of cytoplasm pigmented.
score = 2; blue-green pigment present in hepatocyte cytoplasm, with 25–75% of cytoplasm pigmented.
score = 3; blue-green pigment present in hepatocyte cytoplasm, with >75% of cytoplasm pigmented.

CBH—cholangitis/biliary hyperplasia. Cholangitis had lymphocytic exocytosis, with variable amounts of bile ductule hyperplasia and fibrosis. Hyperplastic foci of preductular biliary epithelial cells were deeply basophilic, and they often interdigitated between hepatocytes.

score = 0; no cholangitis or biliary hyperplasia.
score = 1; 2 foci of cholangitis or biliary hyperplasia, and foci were 400 μm in diameter.
score = 2; >2 foci of cholangitis or biliary hyperplasia, or foci were >400 μm in diameter.
score = 3; none were severe.

CCF—clear (=vacuolated) cell focus of cellular alteration.
score = number of foci per section.

CUE—cysts of unknown etiology. These "cysts" were usually 500–800 μm in diameter. The periphery had concentric bands of collagen or fibrocartilage. The central region (an Ichthyophonus-like organism?), when present in the section, was 80–400 μm in diameter. The organism had an outer hyaline capsule that was 10–20 μm thick. The central region of the organism had several homogenous basophilic spherules, each 20 to 50 μm in diameter. Each spherule often contained brightly eosinophilic droplets that were 1 to 6 μm in diameter. The spherules were within a finely granular matrix that most often was deeply basophilic but occasionally was eosinophilic (e.g., 02FPS3-204A). CUE were described grossly as "pinpoint white foci" or "1-mm-diameter pale foci."
score = number of CUE in the section.

ECF—eosinophilic cell focus of cellular alteration.
score = number of foci per section.

FBG—foreign body granuloma (probably secondary to Anisakis or an unidentified parasite). A lesion of the hepatic stroma or capsule. The granulomas were composed of concentric layers of intensely eosinophilic material (fibrin?) and small (about 8 ×5 μm), oval, deeply basophilic nuclei. Many of the granulomas contained hyaline material that probably was degenerating parasite cuticle. Some granulomas contained clumped, amorphous, brown-green material or refractile yellow material. Location was designated at none (0), parenchyma (P), capsule/margin (M), or both parenchyma and margin (B). CUE was not included in the FBG score.

FPL—focal/multifocal parenchymal leukocytes. Leukocyte aggregates were usually less than 500 μm in diameter and were composed mostly of lymphocytes.
score = 0; no focal parenchymal leukocytes.
score = 1; <1 focus of parenchymal leukocytes per 100×field.
score = 2; 1–2 foci of parenchymal leukocytes per 100×field.
score = 3; none were severe

GD—glycogen depletion. A lesion in hepatocytes; hepatocytes normally have abundant cytoplasmic glycogen stores characterized by a large volume of clear, irregular, poorly demarcated vacuoles (= glycogen vacuoles).
score = 0; hepatocytes had abundant glycogen vacuoles.
score = 1; glycogen vacuoles were smaller, but still larger than nuclei.
score = 2; glycogen vacuoles were smaller than or about equal to nuclear diameter.
score = 3; glycogen vacuoles were absent for most hepatocytes.

GDV—glycogen depletion variability. The volume of glycogen within hepatocytes was sometimes highly variable in different parts of the liver.

score = 0; hepatocellular glycogen vacuoles did not vary by more than 1 score.
score = 1; hepatocellular glycogen vacuoles varied by 2 scores in at least part of the liver (but <50%), or up to 3 scores in <20% of the liver.
score = 2; hepatocellular glycogen vacuoles varied by 2 scores in >50% of the liver, or by 3 scores in 20–50% of the liver.
score = 3; hepatocellular glycogen vacuoles varied by 3 scores in >50% of the liver.

LFC—white foci in liver. Observations of LFC were made after the liver was excised and preserved. The LFC score is the number of grossly visible CUE. Only white foci 0.5−1.0 mm in diameter were enumerated.

score = number of 0.5−1.0 mm white foci

LGR—liver/hepatic granulomas (or focal granulomatous inflammation). Focal hepatic granulomatous inflammation, composed of nonpigmented macrophages and variable numbers of EGLs, lymphocytes, and plasma cells, was distributed throughout the parenchyma. A rim of fibroblasts was also variable, and sometimes absent. LGR did NOT include inflammation scored as part of the CUE scores [see above], or pigmented macrophage aggregates scores as part of the LMA score [see below].

score = 0; no granulomatous inflammation.
score = 1; total area of granulomatous inflammation is <1 mm^2.
score = 2; total area of granulomatous inflammation is 1 mm^2 but <3 mm^2.
score = 3; foci of granulomatous inflammation total >3 mm^2.

LIP—lipidosis. A change/lesion in hepatocytes; excess lipid appears as clear, round, well demarcated, cytoplasmic vacuoles (= lipid vacuoles). Pathologic change is more likely when the vacuoles are significantly larger than nuclei. When nearly all hepatocytes are uniformly affected and vacuoles are about the size of nuclei, the change may be normal in association with egg production. Foci of lipidosis were most common near the capsule of the liver.

score = 0; hepatocytes had no lipid vacuoles.
score = 1; <33% of hepatocytes in the section had lipid vacuoles.
score = 2; 34−66% of hepatocytes in the section had lipid vacuoles, or up to 100% of hepatocytes had vacuoles that were rarely larger than nuclei.
score = 3; >66% of hepatocytes in the section had lipid vacuoles.

LMA—liver macrophage aggregates. Macrophage aggregates were pigmented dull green to blue, scattered in the hepatic parenchyma, and occasionally contained lymphocytes. In many livers, hepatocytes contained cytoplasmic pigment that was similar to the pigment of LMAs, but hepatocellular pigment was not scored (type specimen = 02FPS3-197A).

score = 0; no macrophage aggregates.
score = 1; sections had <7 MAs greater than 60 μm in diameter per 100×field.
score = 2; sections had 7 but <14 MAs greater than 60 μm in diameter per 100×field.
score = 3; sections had 14 MAs greater than 60 μm in diameter per 100×field.

NEO—neoplasia.

score = number of neoplasms per section. Neoplasms were also classified as follows:
Hepatocellular adenoma (type specimen = 02FPS3-141A)
Hepatocellular carcinoma (type specimen = none)
Biliary adenoma (type specimen = 02FPS3-93A)
Biliary carcinoma (type specimen = 02FPS3-3A)

PCL—pericholangial leukocytes (lymphocytes, plasma cells, and macrophages). A lesion of the connective tissue (adventitia) surrounding bile ducts. Leukocytes within the bile duct epithelium or lumen were NOT included in this category (they were included in the CBH category). This lesion was scored only in the absence of cholangitis (i.e., leukocytes with cholangitis were included in the CBH score and not also scored in PCL).

score = 0; <3 leukocytes around every bile duct in the section.
score = 1; 3 to many lymphocytes or plasma cells surround at least on bile duct in the section, but leukocytes do not extend into the surrounding parenchyma.
score = 2; pericholangial leukocytes extend into the surrounding parenchyma.
score = 3; none were severe.

PIG—yellow-green to yellow-brown pigment, probably hemosiderin (positive for iron and tend to be well demarcated). When present in hepatocytes, the pigment was the same color as is LMAs. This pigment was different from the blue-green to yellow-brown staining of lipofuscin, which is acid-fast and PAS positive and tended to be poorly demarcated (scored under "BGP" above). Lipofuscin pigments were NOT included in the PIG score. Lipofuscin and hemosiderin stain very similar with the standard hematoxylin and eosin stain, especially when BGP accumulations are small; best differential results would require examination of iron and lipofuscin stains on every section. Because of the difficulty in differentiating these stains, livers were simply scored as having abundant pigment consistent with hemosiderin (score = Y) or not having abundant such pigment (score = N)

PVL—perivascular leukocytes (eosinophilic granular leukocytes, lymphocytes, and plasma cells). A lesion of the connective tissue (adventitia) surrounding blood vessels. Lymphocytes within the tunica intima and tunica media were NOT included in this category.

score = 0; <3 lymphocytes or plasma cells in the adventitia of any vessel in the section.
score = 1; 3 to many lymphocytes or plasma cells in the adventitia of at least one vessel in the section, but leukocytes do not extend into the surrounding parenchyma or the muscular tunics of the vessel.
score = 2; perivascular leukocytes extend into the surrounding parenchyma, and more than one vessel is involved.
score = 3; none were severe.

SCN—single cell necrosis. A lesion of hepatocytes. Affected cells had pyknotic nuclei and condensed cytoplasm that often stained more deeply eosinophilic than normal cells. Because of cytoplasmic collapse, individual necrotic cells were sometimes surrounded by a clear ring or halo. SCN must be differentiated from artifact. Even slightly rough handling results in cells with dark-staining cytoplasm, but nuclei were not pyknotic and cytoplasm tends to stain basophilic.

score = 0; <3 necrotic cells in the section.
score = 1; <1 necrotic cell per 400×field.
score = 2; 1–2 necrotic cells per 400×field.
score = 3; >2 necrotic cells per 400×field.

SH—spongiosis hepatis. Foci varied from 50 to 500 μm in diameter. Affected foci were characterized by narrow net-like connective tissue surrounded spaces filled with proteinaceous fluid and small numbers of lymphocytes. Foci of SH were often associated with bile ducts.

score = 0; sections had no foci of spongiosis.
score = 1; 1–3 foci of spongiosis per section.
score = 2; 4–8 foci of spongiosis per section, or at least one focus greater than 1.5 mm in diameter.
score = 3; >8 foci of spongiosis per section.

Kidney

CON—renal blood vessel/interstitial congestion.

score = 0; vessels were not congested, and total vascular sectional area was <5% of kidney sectional area.
score = 1; total vascular sectional area was >5% but <10% of kidney sectional area.
score = 2; total vascular sectional area was >10% but <25% of kidney sectional area.
score = 3; total vascular sectional area was >25% of kidney sectional area.

CUE—cysts of unknown etiology. These "cysts" were as described in the liver (above).

FBG—foreign body granuloma (probably secondary to a parasite). A lesion of the renal stroma or capsule. Granulomas were composed of concentric layers of intensely eosinophilic material (fibrin?) and small (about 8 ×5 μm), oval, deeply basophilic nuclei. Many of the granulomas contained hyaline material that probably was degenerating parasite cuticle. Some granulomas contained clumped, amorphous, brown-green material or refractile yellow material. Other granulomas had features of "cysts of unknown etiology" described in the liver. FBGs that were on the peritoneal side of the ventral capsule (i.e., adjacent to the swim bladder) were NOT included in this FBG score.

score = 0; no FBGs in sections examined.
score = 1; sections had 1–3 FBGs.
score = 2; sections had >3 FBGs, or total sectional area of FBGs 1–2 mm^2.
score = 3; sections had >7 FBGs, or total sectional area of FBGs >2 mm^2.

HPC—hematopoietic cells (relative area/volume). Hematopoiesis is a normal function of the renal interstitium, but in some cases, the number of hematopoietic cells was decreased or increased.

score = 0; area of hematopoietic cells <1/2× area of tubules.
score = 1; area of hematopoietic cells >1/2× area of tubules but <1× area of tubules.
score = 2; area of hematopoietic cells >1× area of tubules but <1.5× area of tubules.
score = 3; increased amounts of hematopoiesis, with bands of hematopoietic cells sometimes greater than 100 μm thick.

HVW—hyalinized vessel walls. This change most commonly affected the lining of renal sinusoids (small thin-walled vessels) or arterioles leading to glomeruli. Vessel walls were thickened with pale, homogeneous, basophilic material. This change was often subtle, and it probably would be best scored using sections stained with PAS, but examination of hematoxylin- and eosin-stained sections provides at least a crude estimate of the significance of HVW in these fish.

score = 0; no hyalinization of vessel walls.
score = 1; at least one vessel wall was hyalinized and the wall was <20 μm thick.
score = 2; >20% of vessels hyalinized, or the wall of at least one vessel wall was hyalinized and >40 μm thick.
score = 3; none were severe.

KGR—kidney granulomas (or focal granulomatous inflammation). Foci of granulomatous inflammation were scattered throughout the tissues between the real tubules (i.e., the interstitium). Some foci have small eosinophilic bodies that resembled presporogonic stages of the PKX myxosporean.

score = 0; no granulomatous inflammation in sections examined.
score = 1; the sections had <1 focus of granulomatous inflammation per 100× field.
score = 2; the sections had ≥1 but <3 foci of granulomatous inflammation per 100× field.
score = 3; the sections had ≥3 MA foci of granulomatous inflammation per 100× field.

KMA—kidney macrophage aggregates. Macrophage aggregates, found in the renal interstitium, were usually pigmented yellow-brown to green-brown, and occasionally contained eosinophilic granular leukocytes (EGLs). Larger KMAs often contained irregularly round nuclei, 5–10 μm in diameter, that had marginated chromatin.

score = 0; no MAs in sections examined.
score = 1; the sections had <6 MA per 100× field that were >40 μm in diameter.
score = 2; the sections had ≥6 but <15 MA per 100× field that were >40 μm in diameter.
score = 3; the sections had ≥15 MA per 100× field that were >40 μm in diameter.

MIN—mineralization. Affected tubules or interstitial tissues contained granular to homogeneous basophilic deposits of mineral. Sometimes, mineral deposits distended lumen diameter. Tubule dilation associated with mineral was scored here and NOT under TDI.

score = 0; no mineral in sections.
score = 1; <10 foci of mineral.
score = 2; ≥5 but <10% of tubules contained mineral, or ≥10 foci of interstitial mineral; some affected tubules were dilated, with hyperplastic epithelium.
score = 3; none were severe.

NPH—nephritis. Affected tissues contained primarily lymphocytes and plasma cells, with variable but usually small numbers of EGLs. Chronic cases had fibrosis. Without fibrosis, this lesion is difficult to differentiate from hematopoiesis; NPH usually includes exocytosis of inflammatory cells into the surrounded tubular or glomerular epithelium. Hematopoietic cells do not infiltrate epithelium.

score = 0; no nephritis in the section.
score = 1; nephritis present, but total affected area <500 μm in diameter.
score = 2; nephritis >500 μm but <2 mm in diameter.
score = 3; nephritis >2 mm in diameter.

RTN—renal tubular necrosis.

score = 0; sections had no renal tubular necrosis.
score = 1; renal tubular necrosis present, but <4 tubules per cross section.
score = 2; ≥4 or <10 foci of renal tubular necrosis per cross section.
score = 3; ≥10 foci of renal tubular necrosis per cross section.

RTR—renal tubular regeneration. Regenerative renal tubules are small foci of basophilic cells. Each focus is about 50 μm in diameter, and these foci often do not contain a lumen. Foci have a high nucleus:cytoplasm ratio (<1:2), cytoplasm is basophilic, and nuclei have vesiculated chromatin with prominent nucleoli. In growing fish, a certain amount of regeneration could be classified as normal tubule generation (comparison with control values is needed to determine significance).

score = 0; no regenerative tubules in the cross section.
score = 1; ≤5 foci of regenerative epithelial cells per cross section.
score = 2; >5 but ≤10 foci of regenerative epithelial cells per cross section.
score = 3; >10 foci of regenerative epithelial cells per cross section.

TDI—tubular dilation (of lumen). A lesion of the renal tubules. A tubule was considered dilated when luminal diameter was more than 2× the thickness of the tubular epithelium. Any tubular dilation resulting from mineralization was scored in the MIN category (not under TDI).

score = 0; tubules were not dilated.
score = 1; <50% of the tubules were dilated.
score = 2; >50% of the tubules were dilated.
score = 3; at least one tubule dilated >500 μm in diameter.

TEP—renal tubular epithelial protein droplets. The cytoplasm of renal tubular epithelium contained protein droplets that were homogeneous, eosinophilic, and varied from 3 to 12 μm in diameter. Nuclei of affected cells were NOT undergoing degeneration.

score = 0; no renal tubules contained cytoplasmic protein droplets.
score = 1; <10% of renal tubular epithelial cells contained protein droplets.
score = 2; >10% of renal tubular epithelial cells contained protein droplets.
score = 3; none were severe.

TEV—proximal tubular epithelial vacuolation. A change in the proximal renal tubular epithelium. The epithelium was considered vacuolated if it contained clear vacuoles with a cross-sectional area greater than that of the nucleus. In some cases, vacuoles may be a result of normal glycogen storage.

score = 0; tubular epithelium was not vacuolated.
score = 1; <20% of proximal tubular epithelial cells were vacuolated.
score = 2; >20% of proximal tubular epithelial cells were vacuolated.
score = 3; none were severe.

Appendix O

Truth Tables for Causation Analysis

Truth Tables for Causation Analysis

This appendix presents some background information on truth tables and their use for causation analysis. A causation analysis is included in Section 12 of the main text of this report to evaluate potential causes of observed effects on aquatic life.

Truth tables are a tool of formal logic that allow one to interpret combinations of statements, each of which may be true or false. Examples of such statements relevant to this investigation are: "There are elevated concentrations of shipyard chemicals at this station," "There are large amounts of fine sediment at this station," and "Biological effects are likely at this station." There are several different ways in which such statements can be combined. Combinations of different statements can be true or false, depending on whether the statements themselves are true or false, and the way in which they are combined. Truth tables represent the logical results of all possible combinations of true/false statements.

Two common ways in which statements are combined are with the logical conjunction AND and with the logical disjunction OR. When two statements are combined with AND, the result is true only when both of the fundamental statements are true. When two statements are combined with OR, the result is true only when either of the fundamental statements is true. Truth tables, like those below, are a formal means of showing the results of logical operations such as AND and OR. Because there are two statements, and each can take either of two values (true or false), there are four rows in the truth tables.

Truth table for AND

Statement A	Statement B	A AND B
T	T	T
T	F	F
F	T	F
F	F	F

Truth table for OR

Statement A	Statement B	A OR B
T	T	T
T	F	T
F	T	T
F	F	F

A combination of two simple statements, such as "A AND B" is a compound statement. Complex compound statements can be built up from simple statements using nesting and precedence, exactly analogous to algebraic formulae.

Truth Tables for Causation

To apply truth tables to the analysis of causation, two different forms of causation must be distinguished. These forms are:

- Exclusive causation—Exclusive causation is the case when condition A is the only cause of condition B. That is, if condition A happens (or exists), then condition B happens, and if A does not happen, then B does not happen. The relationship of exclusive causation is represented by the symbol °→.
- Non-exclusive causation—Non-exclusive causation is the case when condition A is a cause of condition B, but not necessarily the only cause. That is, if condition A happens, condition B happens, but if A does not happen, B may or may not happen. The relationship of non-exclusive causation is represented by the symbol →.

The truth tables for exclusive and non-exclusive causation are shown below.

Truth table for exclusive causation

A	B	A ∘→ B
T	T	T
T	F	F
F	T	F
F	F	T

Truth table for non-exclusive causation

A	B	A → B
T	T	T
T	F	F
F	T	T
F	F	T

The statements (or conditions) shown in these tables may be either simple statements or compound statements. So, for example, if conditions X, Y, and Z are all non-exclusive causes of condition B, then all of the possible combinations of conditions X and B, Y and B, and Z and B should correspond to the rows where A→B is true in the truth table for non-exclusive causation. However, if statement A is formed from the disjunction "X OR Y OR Z," then all of the possible combinations of conditions A and B should correspond to the rows where A∘→B is true in the truth table for exclusive causation.

Although truth tables can be used to represent the logical relationships between cause and effect, they cannot be used to determine which of two conditions (A and B) is the cause and which is the effect. This is because the truth table for exclusive causation is symmetrical: the truth table for A∘→B is the same as the truth table for B∘→A. That is, an effect implies its exclusive cause just as much as an exclusive cause implies its effect. Truth tables do not incorporate all aspects of causality—in particular, they do not represent temporal relationships between two conditions.

Identification of one condition as a cause (actual or potential) and another condition as an effect (actual or potential) must be done separately.

The value of truth tables in causation analysis is that they allow formal logical tests of hypotheses about causal relations. For any causal hypothesis, such as A→B, information on the conditions of A and B can be collected and compared to the allowable conditions in the truth table. All combinations of A and B that correspond to the rows of the table where A→B is true are consistent with the hypothesized causal relationship. Any combination of A and B that corresponds to the rows of the table where A→B is false contradicts the hypothesis. Because truth tables do not represent all aspects of causality, logical consistency between data and hypothesis lends support to the hypothesis, but cannot be regarded as a complete proof of the hypothesis. Logical contradiction between data and hypothesis, however, effectively disproves a causal hypothesis.

Appendix P

Potential ARARs and TBC Criteria

Potential ARARs and TBC Criteria

Introduction

This appendix provides a review of the potential applicable or relevant and appropriate requirements (ARARs) and criteria to be considered (TBC) by NASSCO and Southwest Marine for remediation of contaminated sediments in San Diego Bay, California.

ARARs and TBC Criteria

An ARAR describes a federal or state regulatory requirement against which the remedial action alternatives are reviewed. ARARs are defined as follows:

- An *applicable requirement* is a promulgated federal or state standard that specifically addresses a hazardous constituent, remedial action, location, or other circumstance at a site. To be applicable, the remedial actions or the circumstances at the site must be within the intended scope and authority of the requirement.
- A *relevant and appropriate requirement* is a promulgated federal or state requirement that addresses problems or situations similar to those encountered at a site, even though the requirement is not legally applicable.

Criteria in nonpromulgated federal and state standards and policies and guidance documents are TBC when a site is undergoing remediation to protect human health and the environment. These nonpromulgated, nonbinding criteria, referred to as TBC criteria, are not formal ARARs.

Substantive and Administrative Requirements

U.S. Environmental Protection Agency (EPA) guidance (U.S. EPA 1988) defines substantive requirements as those requirements that pertain directly to actions or conditions in the environment. For example, quantitative health- or risk-based restrictions upon exposure to types of hazardous constituents (e.g., drinking water maximum contaminant levels [MCLs]), technology-based requirements for actions taken upon hazardous constituents, and restrictions upon activities in special locations are all substantive requirements (U.S. EPA 1988).

Administrative requirements are defined as those mechanisms that facilitate the implementation of the substantive requirements of a statute or regulation. For example, the approval of or consultation with administrative bodies, issuance of permits, documentation, reporting, record keeping, and enforcement are all administrative requirements.

Types of ARARs

There are three types of ARARs: chemical-specific, action-specific, and location-specific. Chemical-specific ARARs are human-health-risk- or ecological-risk-based concentration limits for specific constituents (e.g., federal and state drinking water standards). Action-specific ARARs are technology-based requirements that are prompted by the type of remedial action under consideration (e.g., National Pollutant Discharge Elimination System [NPDES] requirements for point source discharges to surface water). Location-specific ARARs restrict certain activities based on the location of the site (e.g., in a wetlands, floodplain, or historical site area).

TBC criteria include nonpromulgated policies, advisories, and guidance issued by the federal or state government (e.g., health effects assessments).

Identification Process for ARARs and TBC Criteria

Potential ARARs and TBC criteria were identified using the following steps:

- Identification of indicator chemicals and affected media
- Evaluation of the indicator chemicals and current or potential uses of affected media to identify chemical-specific ARARs and TBC criteria
- Review of potential remedial action methods in relation to site-specific chemicals to identify action-specific ARARs and TBC criteria
- Review of the site setting to identify location-specific ARARs and TBC criteria.

In the following sections, only those potential ARARs that appear to be the most likely to pertain to site remediation activities are summarized.

Chemical-Specific ARARs and TBC Criteria

Chemicals in sediments at the site that have been detected most frequently and at elevated concentrations have been identified as indicator chemicals. The primary indicator chemicals are metals (arsenic, copper, lead, mercury, and zinc), tributyltin, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and petroleum hydrocarbons. The chemical-specific ARARs and TBC criteria identified and discussed in this section apply to water, air, and sediment quality. No federal or California state sediment criteria have yet been established for the indicator chemicals, although the California State Water Resources Control Board is in the process of developing state sediment quality criteria.

Federal Ambient Water Quality Criteria

EPA is required under the Clean Water Act (CWA; 33 USC §1251 et seq.) to publish water quality criteria for the protection of human health and welfare and freshwater and marine aquatic life. These federal water quality criteria are nonenforceable guidelines that may be used by states to set water quality standards for surface water. The water quality criteria are based on protection of human health (risk levels based on ingestion of water and organisms and on ingestion of organisms only) and aquatic life (freshwater acute and chronic and marine acute and chronic) and are set forth in 63 FR 68354–68364. Of the indicator chemicals identified for the shipyard sediments, criteria have been published for all metals of concern, tributyltin, PAHs, and PCBs (Table P-1).

National Toxics Rule/California Toxics Rule

In 1992, EPA adopted numeric criteria for priority toxic pollutants (commonly referred to as the "National Toxics Rule [NTR]," 57 FR 60848–60923) on behalf of states that had not adopted water quality standards for these pollutants as required by Section 303 of the CWA. A subset of the published criteria was determined to apply to the State of California, which was already regulating other chemicals through its Inland Surface Water Plan and Enclosed Bays and Estuaries Plan. However, in 1994, a California State court ordered the state to rescind these water quality control plans, leaving California without statewide numerical water quality standards for many priority pollutants in non-ocean surface waters. On May 18, 2000, EPA promulgated the California Toxics Rule to replace the water quality criteria rescinded in 1994. The rule defined 23 ambient aquatic life criteria and 57 ambient human health criteria for inland surface waters, enclosed bays (e.g., San Diego Bay), and estuaries in the state of California (40 CFR §131.38). Applicable criteria are presented in Table P-1.

Federal Safe Drinking Water Act

The Safe Drinking Water Act (SDWA; 42 USC §1401 et seq.) regulates levels of constituents in drinking water supplies through the use of drinking water standards. EPA has developed two sets of drinking water standards, referred to as primary and secondary standards, to protect human health and ensure the aesthetic quality of drinking water, respectively. Primary standards consist of chemical-specific standards, known as MCLs. MCLs are set as close as feasible to maximum contaminant level goals (MCLGs), which are non-enforceable concentrations protective of adverse health effects. Secondary drinking water standards, referred to as secondary MCLs (SMCLs), consist primarily of limits to regulate the aesthetic quality of water supplies. EPA recommends them to states as reasonable goals, but federal law does not require water systems to comply with them. Additional federal regulations set drinking water standards for a limited number of chemicals that are referred to as action levels.

MCLs, SMCLs, and action levels apply to waters that are used as public drinking water supplies. MCLs are usually only legally applicable under the SDWA to the quality of drinking water at the tap. MCLs are generally considered relevant and appropriate to surface water or groundwater that is or may be used for drinking. Water from San Diego Bay is not used for drinking, and thus drinking water standards are not applicable to remediation activities conducted onsite. Drinking water standards would be applicable if disposal of dredged sediments could impact drinking water supplies.

Federal Clean Air Act

Under the federal Clean Air Act (CAA; 42 USC §7401 et seq.), EPA has established national ambient air quality standards (NAAQSs) for certain constituents (40 CFR 50). These standards are national limitations on ambient air concentrations intended to protect health and welfare. Pursuant to the 42 USC §7412, EPA is also to develop a list of hazardous air pollutants and then establish emissions standards for source types that emit the listed pollutants. These standards are known as national emissions standards for hazardous air pollutants. Specific air quality standards established under the CAA may be applicable to remediation of the shipyard sediments if contaminated materials are exposed to air (e.g., dredged materials) or if the operation of equipment such as dredges would affect air quality.

California Water Quality Standards

Pursuant to the Porter-Cologne Water Quality Control Act (Division 7 of the California Water Code), California has established water quality standards through its state and regional water quality control plans. These include the California Ocean Plan, which is applicable to point source discharges to the territorial marine waters of the state (excluding enclosed bays, estuaries, and coastal lagoons), and regional basin plans such as the Water Quality Control Plan for the San Diego Basin, which is applicable to all surface and groundwaters in the region (e.g., San Diego Bay). The plans designate beneficial uses for bodies of water, establish narrative and numerical water quality standards to protect those uses, and provide guidelines for meeting the numerical standards known as water quality objectives. The plans define standards for both surface waters and groundwater. The State and Regional Water Quality Control Boards implement the standards through the issuance of waste discharge requirements (WDR) for discharges to land or groundwater, NPDES permits for discharges to surface waters, and other enforcement actions. The plans are adopted by the State and Regional Boards through administrative rule making and therefore have the force of regulation. Applicable California and regional water quality standards are presented in Table P-1.

California Drinking Water Regulations

The California drinking water regulations are state equivalents of the federal SDWA regulations. Similar to the federal MCL and SMCLs, California's drinking water regulations set forth primary and secondary maximum contaminant concentrations for public water systems. Primary MCLs are found in Title 22 of the California Code of Regulations (CCR) §64431−§64444, and specific regulations for lead and copper appear in 22 CCR §64670 et seq. SMCLs, which protect drinking water taste, odor, and appearance, are found in 22 CCR §64449. Of the chemicals identified for the shipyard sediments, a primary MCL is identified for PCBs and all metals of concern except silver and zinc, for which SMCLs are identified. As discussed in the section on the SDWA above, drinking water standards would be applicable to remediation of shipyards sediments only if disposal of dredged sediments could impact drinking water supplies.

California Air Quality Control Regulations

In California, the Air Resources Board is responsible for promulgating state ambient air quality standards and air emissions standards, and for enforcing vehicular emissions standards. State ambient air quality standards are set forth in 17 CCR §70200 et seq. The Board delegates the regulation of air emissions from stationary sources to local and regional authorities, which may set stricter standards for these sources than the state standards. The Air Pollution Control District of San Diego County has jurisdiction over nonvehicular air emissions in the San Diego Bay area. District air quality control regulations are found in the Rules and Regulations of the Air Pollution Control District of San Diego County. Applicability of California air quality standards to sediment remediation activities at the shipyards would be the same as those discussed above under *Federal Clean Air Act*.

Regional Water Quality Control Board Sediment Cleanup Guidelines

In accordance with State Water Resources Control Board Resolution No. 92-49, *Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code Section 13304*, the Regional Water Quality Control Board for San Diego Region (RWQCB) issued *Guidelines for the Assessment and Remediation of Contaminated Sediments in San Diego Bay at NASSCO and Southwest Marine Shipyards* (RWQCB 2001). Under Resolution No. 92-49, the RWQCB is mandated to require a presumptive cleanup goal of background water quality. However, the RWQCB may decide that attaining background water quality is technologically or economically infeasible and may select an alternative cleanup level that is feasible and will not impair beneficial uses in San Diego Bay (RWQCB 2001). The RWQCB guidelines (RWQCB 2001) outline a procedure by which NASSCO and Southwest Marine must develop alternative sediment cleanup levels protective of aquatic life, aquatic-dependent wildlife, and human health. The RWQCB guidelines (RWQCB 2001) specifically instruct the shipyards to formulate aquatic life cleanup levels for each indicator chemical using the apparent effects threshold and equilibrium partitioning methodologies, and to formulate aquatic-dependent wildlife and human health cleanup levels using the tissue residue approach. Thus, the RWQCB guidelines (RWQCB 2001) are applicable to the development of sediment cleanup levels for indicator chemicals at the shipyards.

Action-Specific ARARs and TBC Criteria

The following sections summarize action-specific ARARs that may pertain to site remedial activities.

Federal Resource Conservation and Recovery Act

As of June 1, 1999, when the Hazardous Remediation Waste Management Requirements (HWIR-media) final rule, including the Dredged Material Exclusion (40 CFR §261.4(g)), took effect, dredged material disposed in accordance with a permit issued under Section 404 of the CWA or a permit issued under Section 103 of the Marine Protection, Research, and Sanctuaries Act is excluded from hazardous waste regulation under the Resource Conservation and Recovery Act Subtitle C program (RCRA; USC §6901 et seq.). However, upland-disposed dredged material with no return flow to waters of the United States may be regulated as hazardous waste under RCRA. EPA has delegated RCRA Subtitle C authority in California to the Department of Toxic Substance Control.

Uplands-disposed sediments dredged during shipyards site remediation may qualify as hazardous waste under RCRA Subtitle C. Toxic characteristic wastes (40 CFR 261.24) are determined by testing using the toxicity characteristic leaching procedure (TCLP). The sediment is processed using an extraction solution, and the resulting leachate is analyzed. If concentrations of selected constituents in the leachate exceed regulatory levels, then the waste is considered to be a characteristic waste. Shipyard chemicals that have TCLP regulatory levels are cadmium (1.0 mg/L), lead (5.0 mg/L), mercury (0.2 mg/L), and silver (5.0 mg/L).

The highest detected concentrations of cadmium, lead, mercury, and silver in shipyard surface sediments were 2.6, 480, 3.5, and 2.8 mg/kg dry weight, respectively. Assuming that the sediment is dry and contains these maximum metal concentrations, that all the metal would leach out of the sediment during the TCLP extraction procedure, and a liquid/solid (extraction fluid/sediment) ratio of 20:1 in accordance with the TCLP analytical procedure, the approximate concentrations of cadmium, mercury, and silver in the extract would be 0.13, 0.18, and 0.14 mg/L, respectively. These values, which were derived using conservative assumptions, are lower than the regulatory levels. However, the approximate concentration of lead in the extract would be 24 mg/kg, assuming the maximum detected lead concentration and dry sediment, or 5.2 mg/kg, assuming the mean detected lead concentration and dry sediment. Lead concentrations in dewatered sediment would likely be lower than these estimates for dry sediment. Nonetheless, shipyard sediments may qualify as hazardous waste if lead concentrations in the TCLP extract exceed regulatory levels.

RCRA Subtitle D addresses the management of solid wastes that are not hazardous wastes. EPA criteria for municipal solid waste landfills address location restrictions, operating criteria, design criteria, groundwater monitoring, and closure and post-closure care (40 CFR §258). Cover requirements for landfill closure include a low-permeability layer and an erosion protection layer capable of sustaining native plant growth or equivalent protection. RCRA solid waste requirements may be applicable to nonhazardous sediments dredged from the shipyard sites if those sediments are disposed of at an upland location on shipyards property or if the material is transported to a solid waste landfill.

Federal Toxic Substances Control Act

The Toxic Substances Control Act (TSCA; 15 USC §2601 et seq.) allows EPA to track industrial chemicals produced by or imported into the United States and to ban those that are hazardous to human health or the environment. The act specifically prohibits the manufacture of PCBs and provides a framework for the phase-out and disposal of PCBs in the United States. EPA regulates the treatment, storage, and disposal of PCB remediation waste under 40 CFR §761.61. Bulk PCB remediation wastes, including dredged material, with a PCB concentration >50 ppm must be disposed of in a hazardous waste landfill or PCB disposal facility. Because the maximum concentration of summed PCBs measured in shipyards surface sediment collected during the Phase 1 field investigation was 7.1 ppm, it is unlikely that dredged shipyards sediment will exceed the 50 ppm threshold. However, other provisions of TSCA may apply to the remediation of shipyards sediments with PCB concentrations <50 ppm.

Federal Clean Water Act

The objective of the CWA is to restore and maintain the chemical, physical, and biological integrity of the nation's water. The CWA regulates point source discharges of wastewater to surface water by establishing ambient water quality criteria (previously discussed) and effluent standards. Discharges to surface water are regulated under the NPDES program (Section 402 of the CWA; 23 CCR §3830–3869). Effluent standards are based on prescribed treatment technologies (e.g., best conventional technology or best demonstrated available technology). Actions taken to clean up shipyards sediments would be subject to the water quality criteria as discussed previously. If remediation activities include a point source discharge of wastewater back to San Diego Bay (e.g., if sediments are dewatered prior to transport to a disposal facility), or if source control of a facility-related discharge is included in the remedy, an NPDES permit could be required. Dredge and fill activities regulated under Section 404 of the CWA (see below) are exempt from the NPDES permit program (40 CFR §122.3).

Section 401 of the CWA confers upon states the authority to review projects that require a federal permit or license and may result in a discharge into waters of the United States, including dredge and fill activities permitted under Section 404 of the CWA. In California, Regional Water Quality Control Boards are responsible for evaluating proposed projects for their compliance with applicable federal and state water quality standards and for granting, denying, or waiving §401 certifications. Federal agencies such as the U.S. Army Corps of Engineers (Corps) must receive a water quality certification or waiver from the state before issuing a permit for a project that may affect water quality. Through the §401 certification, states may place conditions on federal permits, such as effluent limitations, monitoring requirements, or other constraints.

Federal Dredge and Fill Standards

Dredge and fill activities are managed under Section 10 of the Rivers and Harbors Act (33 USC §410 et seq.), Section 404 of the CWA (33 USC §1251 et seq.), and Section 103 of the Marine Protection, Research, and Sanctuaries Act (16 USC §1401 et seq.). One of the primary purposes of the regulations promulgated under these acts is to protect aquatic habitats and wetlands. The

Corps is responsible for issuing permits for dredge and fill operations. The decision whether to issue a permit for dredge or fill activities is based on an evaluation of the probable impacts, including cumulative impacts, of the proposed activity and its intended use on the public interest.

The Corps can issue three different types of permits that address dredge-and-fill activities: nationwide permits, regional permits, and individual permits. The level of documentation and required activities prior to permit issuance vary from one type of permit to the next. The individual permit authorizes a specific activity and requires the most effort prior to a permit decision; for example, an evaluation of whether an environmental impact statement (EIS) will be required and, if so, completion of the EIS.

The other two types of permits are referred to jointly as general permits and authorize a category or categories of activities nationwide or in specific geographical regions. A general permit is defined as:

> "…a Department of Army [Corps] authorization that is issued on a nationwide or regional basis for a category or categories of activities when: 1) Those activities are substantially similar in nature and cause only minimal individual and cumulative environmental impacts; or 2) The general permit would result in avoiding unnecessary duplication of the regulatory control exercised by another Federal, state, or local agency provided it has been determined that the environmental consequences of the action are individually and cumulatively minimal." (33 CFR §322.2(f))

These general permits (particularly the nationwide permit) are designed to regulate with little, if any, delay or paperwork certain activities that have minimal impacts (33 CFR §330.1(b)). If an activity is covered by one of the general permits, a Corps permit application may not have to be completed. However, notification of the district engineer may be required (33 CFR §330 Appendix A, Part C(13)), and submitting a completed application may be the most effective way to ensure that notification requirements are met. In addition, general permits may include other conditions that a proposed project must meet to satisfy requirements of law for a Corps permit. For example, the Corps may restrict dredging in San Diego Bay during the endangered least tern's nesting season (April 1 to September 15), and/or require the use of silt curtains to reduce turbidity for brown pelicans and least terns, which forage by sight (Kenny 2001, pers. comm.).

The applicability of a general permit to the shipyard sites may depend on such factors as the quantity of material to be dredged and the severity of potential ecological impacts associated with that dredging. Two nationwide permits that could be applicable to the shipyard sites include the following:

- Permit No. 19: *Minor Dredging*. This permit would apply if the quantity of material to be dredged does not exceed 25 yd^3 below the plane of the ordinary high water mark.
- Permit No. 38: *Cleanup of Hazardous and Toxic Wastes*. This permit authorizes specific activities required to effect the containment, stabilization, or removal of hazardous or toxic waste material that are performed, ordered, or sponsored by a government agency with established legal or regulatory authority. Notification of and approval by the Corps is required prior to conducting any activities under this permit.

National Environmental Policy Act

The National Environmental Policy Act of 1969 (NEPA; 42 USC §4321 et seq.), as amended, ensures that the environmental consequences of actions executed, funded, or permitted by a federal agency are considered in the decision-making process, and provides opportunities for the public to review and comment on proposed actions. If the remedial action at the shipyards requires one or more federal permits (e.g., dredge and fill), the action must undergo NEPA analysis. The Corps may take lead agency, or supervisory, responsibility for overseeing NEPA procedures if the shipyards remediation project involves a Corps permit. Title 33, Section 230 of the Code of Federal Regulations defines Corps procedures for implementing NEPA. According to these regulations, minor maintenance dredging and disposal at existing facilities is categorically exempt from NEPA evaluation (33 CFR 230.9 (c)).

Most Corps regulatory actions (permits) require completion of an environmental assessment but not a full EIS (33 CFR §230.7). The environmental assessment is a concise document that describes the need for action, presents alternatives that address the need for action, including the preferred alternative, and evaluates the potential environmental impacts of each alternative. The agency reviews the environmental assessment and either issues a finding of no significant impact, allowing the preferred action to move forward, or determines the need to prepare an EIS to evaluate the proposed project in greater detail. The EIS is generally a much longer, more in-depth analysis of potential environmental effects than the environmental assessment and involves the participation of cooperating agencies and the public as well as the lead agency.

Federal Endangered Species Act

The Endangered Species Act as amended (16 USC §1531 et seq.) requires federal agencies executing, funding, or permitting actions to consult with the Department of the Interior (U.S. Fish and Wildlife Service) and the Department of Commerce (National Marine Fisheries Service) to ensure that the actions will not result in a taking of a threatened or endangered species or adversely affect the critical habitat of these species. In this context, a taking constitutes effects to wildlife ranging from harassment to injury or death. Habitat modification or degradation that results in injury or death of threatened or endangered wildlife also represents a taking. Federally listed species found in San Diego Bay include the California least tern (*Sterna antillarum browni*), the California brown pelican (*Pelecanus occidentalis californicus*), and the green sea turtle (*Chelonia mydas*). Remedial actions at the shipyards would have to protect all listed species and critical habitats in accordance with the Endangered Species Act.

Federal Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (16 USC §661 et seq.) requires consideration of the effects that water-related projects, involving the control or structural modification of a natural stream or body of water, would have upon fish and wildlife, and actions to prevent loss or damage to those resources. Pursuant to Section 662 of this act, consultation with federal and state wildlife agencies is required if alteration of the water resource will occur as a result of remedial activities. The purpose of this consultation is to develop measures to prevent, mitigate, or compensate for project-related losses to fish and wildlife. The lead agency must first determine whether the action will result in the control or structural modification of a body of water. Several types of actions fall under the jurisdiction of this act, including discharges of industrial wastes or the placement of fill materials into a water body or wetland, and projects involving construction of structures in a waterway or that divert or relocate a waterway. Federal regulations associated with the NPDES program require compliance with the act (40 CFR 122.49). The act also requires coordination with the U.S. Fish and Wildlife Service and state environmental agencies when issuing a CWA Section 404 permit. Consultation with appropriate agencies in relation to active sediment remediation at the shipyards will occur as part of the Corps permitting process.

Federal Coastal Zone Management Act/California Coastal Act

Passed in 1972 and amended by the Coastal Zone Protection Act of 1996, the Coastal Zone Management Act (CZMA; USC 16 §1451 et seq.) declares a national policy for coastal zone management and authorizes federal grants to assist states in developing coastal zone management programs. The coastal zone refers to shorelands and coastal waters extending to the seaward limit of the territorial sea; in California, the coastal zone includes waters up to 3 miles from the coastline and lands up to 5 miles inland of the mean high tide line in undeveloped areas (Title 20, Section 30103 of the California Public Resources Code [PRC]). The California Coastal Commission (CCC) oversees the implementation of state's Coastal Zone Management Program, which was established through the California Coastal Act of 1976 (20 PRC §30000 et seq.) and approved by the Secretary of Commerce in 1977 (RWQCB 1994).

Section 307 of the CZMA dictates that any applicant for a federal license or permit to conduct an activity in the coastal zone must submit a certification of compliance with the state's approved coastal zone management program to the agency and the state (CCC), and that the state (CCC) must concur with the certification before the federal agency may issue the requested permit. Permitted dredging in San Diego Bay and disposal of dredged sediments in the coastal zone are activities that would require CCC approval. Section 30233 of the California Coastal

Act states that dredging and disposal of dredged material in the coastal zone is permitted where alternatives with lower environmental impacts are infeasible and environmental effects are minimized through mitigation, and also states that such activities "shall be planned and carried out to avoid significant disruption to marine and wildlife habitats and water circulation. Dredged spoils suitable for beach replenishment should be transported for such purposes to appropriate beaches or into suitable long shore current systems."

Federal Clean Air Act

The purpose of the CAA is to protect and enhance the quality of the nation's air resources to promote public health and welfare. The CAA regulates air quality, in part, by establishing NAAQSs for certain constituents and national emission standards for specific listed hazardous constituents. Ambient air quality standards and emission standards are implemented through state implementation plans. Applicability of the CAA to remediation at the shipyards will depend on the specific activities conducted, as discussed under *Chemical-Specific ARARs and TBC Criteria, Federal Clean Air Act* above.

California Environmental Quality Act

The California Environmental Quality Act (CEQA; PRC §21000 et seq.) was enacted in 1970 as the state counterpart to NEPA. Remediation of shipyard sediments would likely constitute a "project" as defined by CEQA (PRC §21065) and would therefore trigger the CEQA process. Through the CEQA review, the lead agency, with input from other responsible or trustee agencies, evaluates the potential environmental effects of proposed projects and may require project alterations or mitigation measures to avoid or reduce environmental impacts. The lead agency for nongovernmental projects is "the public agency with the greatest responsibility for supervising or approving the project as a whole" (14 CCR §15051) and is typically a government such as a city or county as opposed to an agency with a more limited regulatory role, such as an Air Pollution Control District. The San Diego Unified Port District's Environmental Review Department generally processes CEQA documents for Port District tenants, in accordance with the Port District CEQA guidelines. When projects require federal and state or local approval and are thus subject to both NEPA and CEQA, projects may be reviewed through a joint NEPA/CEQA process.

In an initial step, the Port staff prepares a preliminary environmental checklist form to evaluate whether the project is exempt from CEQA procedures. Sediment cleanup at the shipyards may be exempt under Categorical Exemption Class 4 (14 CCR §15304), Minor Alterations to Land, if the action qualifies as maintenance dredging, or under Class 30 (14 CCR §15330), Minor Actions to Prevent, Minimize, Stabilize, Mitigate or Eliminate the Release or Threat of Release of Hazardous Waste or Hazardous Substances, if the cleanup costs $1 million or less and meets other criteria outlined in Section 15330. If the project is not exempt, the tenant must submit an environmental assessment form with project details to assist the Port in evaluating the project for potential significant environmental effects. The Port then prepares an initial study form and determines whether to issue a negative declaration (no significant environmental effects) or a mitigated negative declaration (no significant effects with mitigation) or to require the preparation of a draft environmental impact report to examine the project further. Both pathways involve a public review period.

California Endangered Species Act

The California Endangered Species Act (CESA; Sections 2050–2116 of the California Fish and Game Code) is the state counterpart to the federal Endangered Species Act. CESA prohibits state agencies from approving projects that would jeopardize threatened or endangered species or habitats that are essential to sustain those species, if there are "reasonable and prudent alternatives" to the project that would protect these species (Section 2053 of the California Fish and Game Code). However, if reasonable alternatives to the project are unfeasible, state agencies may approve proposed projects, provided the projects incorporate suitable mitigation and enhancement measures. Species listed as threatened or endangered by the State of California that occur in San Diego Bay include the California least tern and the California brown pelican. Like the federal Endangered Species Act, CESA is applicable to remediation of shipyard sediments when activities may affect listed species or their habitats.

California Hazardous Waste Management Regulations

California hazardous waste regulations address the management of hazardous wastes, including identification of hazardous wastes, standards for generators and transporters of hazardous wastes, and requirements for treatment, storage, and disposal facilities. Title 22 of the California Code of Regulations (22 CCR §66261) defines criteria for identifying characteristics of hazardous waste, while Title 23 (23 CCR §2510 et seq.) regulates discharges of hazardous waste to land. California criteria for evaluating the toxicity of waste include federal TCLP regulatory levels, soluble threshold limit concentrations, and total threshold limit concentrations. As discussed under the federal RCRA section above, dredged shipyards sediment could exceed the TCLP regulatory level for lead. Therefore, California hazardous waste management regulations may be ARARs for sediment remediation at the shipyards.

California Solid Waste Management Regulations

The California solid waste management regulations, promulgated by the State Water Resources Control Board and the California Integrated Waste Management Board (27 CCR §20005 et seq.), address the management of solid waste disposal facilities. These regulations could be applicable to remediation of shipyards sediments if the sediments are determined to be solid waste and are disposed of either in an approved onsite disposal facility or in an approved offsite solid waste disposal facility (see the discussion of RCRA Subtitle D under *Action-Specific ARARs* above).

California Water Quality Standards

As discussed under *Chemical-Specific ARARs* above, the California water quality standards define designated uses and numerical or narrative criteria designed to protect and measure attainment of those uses. Remediation activities that may result in a discharge of waste to waters of the state (e.g., capping or dredging), as well as the disposal of dredged material at a confined aquatic, nearshore, or uplands facility, must comply with applicable California water quality standards. The RWQCB enforces these standards through NPDES permits or WDRs.

The RWQCB waives WDRs for the removal of 5,000 yd^3 or less dredged material, if the agency anticipates that no adverse impacts to the environment would result from the project. The RWQCB may also waive WDRs "if the waiver is not against the public interest" (Division 7 of the California Water Code, Section 13269). Disposal of dredged material at LA-5 Ocean Dredged Material Disposal Site, located 11 km southwest of Point Loma, is outside the jurisdiction of the RWQCB and is regulated by the Corps and EPA (RWQCB 1994).

California Bay Protection and Toxic Cleanup Act

The California Bay Protection and Toxic Cleanup Act (Division 7 of the California Water Code, Sections 13390–13396) requires the State Water Resources Control Board and Regional Boards to identify and characterize toxic hot spots in bays, estuaries, and ocean waters of the state and to plan for hot spot cleanup through the establishment and implementation of a Consolidated Toxic Hot Spot Cleanup Plan (SWRCB 1999) for the state. The consolidated plan incorporates regional plans, such as the Regional Toxic Hot Spot Cleanup Plan for the San Diego Region. Toxic hot spots are regions of enclosed bays, estuaries, and ocean waters of the state where contamination of water or sediments is affecting the interests of the state and 1) may threaten aquatic life, fisheries, wildlife, or human health, 2) may affect beneficial uses, or 3) causes water or sediments to exceed water quality or sediment quality objectives (Section 13391.5(e)). According to Section 13396 of the California Water Code, any dredging project or other activity that may disturb a toxic hot spot requires a CWA Section 401 certification or WDR from the RWQCB. In addition, disposal of dredge spoils must not impair beneficial uses of the receiving water or adversely impact aquatic life or wildlife (RWQCB 1994).

Toxic hot spots identified in San Diego Bay include a 2-acre, moderate priority site located at the foot of Sampson and Evans Streets in San Diego and a 3-acre, moderate priority site at the mouth of Chollas Creek. Both sites were listed because of elevated chemical concentrations and degraded benthic communities (SWRCB 1999; RWQCB 2000). The former site may encompass areas leased by Southwest Marine, and the latter site may encompass areas leased by NASSCO. Therefore, the California Bay Protection and Toxic Cleanup Act may be applicable to any cleanup activity at the shipyards that would potentially disturb a toxic hot spot.

California Air Quality Control Regulations

State air quality control regulations (17 CCR §70200 et seq.; Rules and Regulations of the Air Pollution Control District of San Diego County), which include ambient air quality standards and air emission standards, may be applicable to sediment remedial actions undertaken at the shipyard sites, if those activities would result in emissions of constituents into the air in excess of specified standards.

Regional Water Quality Control Board Sediment Cleanup Guidelines

The RWQCB guidelines (RWQCB 2001) outline procedures for NASSCO and Southwest Marine to evaluate the technical and economic feasibility of remedial alternatives designed to attain sediment cleanup levels, including cleanup to background (which is the presumptive goal), or cleanup to alternative levels that are protective of aquatic life, aquatic-dependent wildlife, and human health, and which are as close as possible to background and do not unreasonably affect present and anticipated future beneficial uses of San Diego Bay. Remedial alternatives that are specified by the RWQCB guidelines to be considered include dredging with disposal or reuse of dredged material, subaqueous capping, treatment, and no action. Specific criteria to be considered in evaluating the economic feasibility of each cleanup strategy are presented in Section X of the guidelines (RWQCB 2001). These guidelines include reference to Water Code Section 13000 and RWQCB Resolution 92-49, which require that evaluation of economic feasibility of cleanup alternatives include consideration of all demands being made and to be made on San Diego Bay waters and the total values involved, beneficial and detrimental, economic and social, tangible and intangible.

Location-Specific ARARs and TBC Criteria

Location-specific ARARs include those regulations that may pertain to San Diego Bay and streams and wetlands that are located within or in the vicinity of the shipyard sites. These ARARs may include the Fish and Wildlife Coordination Act, California Coastal Act, federal and California Endangered Species Acts, Section 404 of the CWA, and the RWQCB sediment cleanup guidelines (RWQCB 2001). Each of these potential ARARs was discussed in the section on action-specific ARARs.

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Table P-1. Marine water quality criteria for protection of aquatic life

Compound	Federal Water Quality Criteria[a,b] (μg/L)	California Toxics Rule[a,c] (μg/L)	California Ocean Plan Discharge Limits[d,e] (μg/L)
Arsenic	36	36	80
Cadmium	8.8	9.3	10
Chromium(VI)	50	50	20
Copper	3.1	3.1	30
Lead	8.1	8.1	20
Mercury	0.94		0.4
Nickel	8.2	8.2	
Selenium	71	71	
Zinc	81	81	200
Polychlorinated biphenyls	0.03	0.03	

[a] Criterion continuous concentration

[b] U.S. EPA. 2002. National recommended water quality criteria: 2002. U.S. Environmental Protection Agency

[c] 40 CFR Part 131; May 18, 2000. Water quality standards; Establishment of numeric criteria for priority toxic pollutants for the State of California.

[d] Instantaneous maximum.

[e] SWRCB. 2001. California ocean plan. California State Water Resources Control Board.