PNL-11280
UC-000

Approved for public release; distribution is unlimited

Evaluation of Dredged Material Proposed for Ocean Disposal from Federal Projects in New York and New Jersey and the Military Ocean Terminal (MOTBY)

RECEIVED
OCT 3 0 1996
OSTI

E.S. Barrows
L. D. Antrim
M. R. Pinza
W. W. Gardiner
N.P. Kohn
B. D. Gruendell
H.L. Mayhew
J. Q. Word
L.B. Rosman

Battelle Marine Sciences Laboratory
Sequim, Washington

August 1996

Prepared for the
U.S. Army Corps of Engineers - New York District
under a Related Services Agreement
with the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830

Pacific Northwest National Laboratory
Operated for the U.S. Department of Energy
by Battelle Memorial Institute

Battelle

MASTER

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor Battelle Memorial Institute, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof, or Battelle Memorial Institute. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

PACIFIC NORTHWEST LABORATORY
operated by
BATTELLE MEMORIAL INSTITUTE
for the
UNITED STATES DEPARTMENT OF ENERGY
under Contract DE-AC06-76RLO 1830

Printed in the United States of America

Available to DOE and DOE contractors from the Office of Scientific and Technical Information, P.O. Box 62, Oak Ridge, TN 37831; prices available from (615) 576-8401.

Available to the public from the National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Rd., Springfield, VA 22161


This document was printed on recyled paper.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

PNL-11280
UC-000

EVALUATION OF DREDGED MATERIAL PROPOSED FOR OCEAN DISPOSAL FROM FEDERAL PROJECTS IN NEW YORK AND NEW JERSEY AND THE MILITARY OCEAN TERMINAL (MOTBY)

E.S. Barrows
L. D. Antrim
M. R. Pinza
W. W. Gardiner
N.P. Kohn
B. D. Gruendell
H.L. Mayhew
J. Q. Word
L.B. Rosman[a]

Battelle Marine Sciences Laboratory
Sequim, Washington

August 1996

Prepared for the
U.S. Army Corps of Engineers - New York District
under a Related Services Agreement
with the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830

Pacific Northwest National Laboratory
Richland, Washington 98382

(a) U.S. Army Corps of Engineers
New York District
New York, New York

MASTER

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

Summary

The U.S. Army Corps of Engineers (USACE) is authorized by Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA), Public Law 92-532, and by the Clean Water Act of 1972 (CWA) and Amendments of 1977 to permit, evaluate, and regulate the disposal of dredged material in ocean waters to minimize adverse environmental effects. Compliance with the regulations of the MPRSA calls for physical and biological testing of sediment proposed for dredging prior to its disposal in ocean waters. The testing required by the MPRSA criteria is conducted under a testing manual developed by the USACE and the U.S. Environmental Protection Agency (EPA), *Evaluation of Dredged Material Proposed for Ocean Disposal (Testing Manual)*, commonly referred to as the "Green Book." Testing protocols in the Green Book include bulk sediment analysis, grain size analysis, elutriate testing, and biological testing. The biological testing includes bioassays for acute toxicity as well as analysis to determine bioaccumulation of certain contaminants by marine organisms.

Management and disposal of dredged material from the Port of New York and New Jersey is the shared responsibility of the USACE-New York District (NYD) and the EPA, Region 2. In March 1993, the USACE-NYD requested the Battelle/Marine Sciences Laboratory to conduct a series of sediment evaluation projects to determine the suitability of dredged material for ocean disposal from the Military Ocean Terminal (MOTBY) in Bayonne, New Jersey, and three federal navigation projects in the New York/New Jersey Harbor Complex–the Hackensack River, Port Elizabeth in Newark Bay, and Arthur Kill. Sediment samples were also collected from an additional project area at Claremont, New Jersey, for specific chemical and biological tests to provide some baseline data for possible future work in the Claremont area.

The objective of the USACE-NYD Federal Projects Program was to evaluate sediment proposed for dredging and unconfined ocean disposal at the Mud Dump Site. The results of analytical measurements and bioassays performed on the test sediments were compared with analyses of sediment from the Mud Dump Reference Site to determine whether the test sediments were acutely toxic to marine organisms or resulted in statistically significantly greater bioaccumulation of contaminants in marine organisms, relative to the reference sediment. Testing for the federal project areas was performed according to the requirements in the USACE-NYD and EPA Region II regional manual, *Guidance for Performing Tests on Dredged*

Material to be Disposed of in Ocean Waters, also known as the "Regional Guidance Manual," and the Green Book.

In a survey conducted from April 12 through April 22, 1993, aboard the USACE-NYD vessel, the *Gelberman*, sediment samples were collected from 95 stations in five project areas of New York/New Jersey Harbor: MOTBY, Arthur Kill, Port Elizabeth, Hackensack River, and Claremont. Sediment samples from project areas were collected using a vibratory-hammer coring device. Surficial sediment from the Mud Dump Reference Site was collected using a grab sampler. Surface water samples, one representing each reach of each project area, were also collected for chemical analyses and use in bioassays.

Samples were processed at the Battelle/Marine Sciences Laboratory in Sequim, Washington, for chemical analyses and toxicity and bioaccumulation testing. Sediment samples from individual cores were analyzed for selected physical and chemical parameters. Surface water and elutriate samples were analyzed for selected chemical contaminants. Sediment samples collected from a number of stations in a project area reach were composited to produce one sample representative of the entire reach. Composited sediment core samples were tested for water-column toxicity, benthic toxicity, and bioaccumulation.

Individual sediment core samples were analyzed for grain size, total organic carbon (TOC), moisture content, and 2,3,7,8-tetrachlorodibenzo-*p*-dioxin and dibenzofuran (TCDD/TCDF). Composited sediment core samples were analyzed for metals, chlorinated pesticides, polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons (PAHs), and the chlorinated herbicides 2,4,5-T and 2,4-D. The MOTBY and federal projects sediments were predominantly silt and clay, with the exception of four of the eight stations in the Hackensack River and one station in Arthur Kill that were primarily sand. Concentrations of 2,3,7,8-TCDD were detected in all individual core samples collected from each project area with levels ranging from 0.59 pg/g to 455 pg/g (wet weight). Concentrations of 2,3,7,8-TCDF were detected in most individual core samples collected from each project area with detected levels ranging from 1.01 pg/g to 136 pg/g (wet weight).

Dredging site water and elutriate water samples were analyzed for metals, pesticides, and PCBs to provide the USACE-NYD with data to determine whether a potential release of dissolved chemical constituents from the dredged material to the water-column would be in compliance with regulations for marine water quality criteria. Generally, concentrations of most metals and organic compounds were greater in the elutriate water than in the dredging site water (with some exceptions) for all of the project areas tested.

Six of the New York/New Jersey federal projects sediments were tested for water-column toxicity to the silverside *Menidia beryllina*, the mysid shrimp *Mysidopsis bahia*, and larvae of the bivalve *Mytilus edulis*: three reaches in Arthur Kill (AK-A, AK-B, and AK-C), two reaches in Port Elizabeth (PE-A and PE-B), and the Hackensack River (HR-A). The suspended-particulate phase of all six sediment composites was acutely toxic to all three species tested.

Eleven of the New York/New Jersey federal projects/MOTBY sediment composites were tested for benthic toxicity to the amphipods *Ampelisca abdita* and *Rhepoxynius abronius*: two reaches in MOTBY (MT-A and MT-B), three reaches in the Arthur Kill (AK-A, AK-B, and AK-C), two reaches in Port Elizabeth (PE-A and PE-B), one reach in the Hackensack River (HR-A), and three reaches in Claremont (CL-I, CL-II, and CL-III). All 11 composites were acutely toxic to both amphipods. Six of the New York/New Jersey federal projects sediment composites were tested for benthic toxicity to the mysid *M. bahia*: AK-A, AK-B, AK-C, PE-A, PE-B, and HR-A. All six composites were acutely toxic to the mysid.

During the conduct of the amphipod tests, concentrations of ammonia were monitored in the pore water and overlying water of the test chambers. Pore water ammonia concentrations were found to be high in most of the federal projects sediments, and it is likely that ammonia contributed to the observed toxicity. The New York/New Jersey federal projects/MOTBY benthic toxicity tests were completed prior to December 1993, when EPA first recommended procedures for reducing ammonia in such toxicity tests. These procedures call for purging ammonia from interstitial water in test chambers to reach acceptable levels prior to introduction of test organisms. Because these procedures were not followed for the New York/New Jersey federal projects, the toxicity tests reported here probably reflect greater mortality due to the unpurged ammonia.

Sediments from the MOTBY (*Nereis virens* only), Arthur Kill, Port Elizabeth, and Hackensack River project areas were tested for bioaccumulation of metals, pesticides, PCBs, and PAHs in the tissues of the polychaete *N. virens* and the clam *Macoma nasuta*. Tissues of *N. virens* exposed to these sediments were also analyzed for polychlorinated dibenzodioxins/ dibenzofurans (PCDDs/PCDFs). In tissues of *N. virens* exposed to MOTBY, Arthur Kill, Port Elizabeth, and Hackensack River sediments, statistically significant levels of bioaccumulation of metals (all areas except MOTBY), pesticides, PCBs, 2,3,7,8-TCDD/TCDF, and PAH compounds were observed when compared with *N. virens* tissues exposed to Mud Dump Reference Site sediment. Statistically significant levels of bioaccumulation (when compared with tissues exposed to reference site sediment) of metals were observed in *M. nasuta* tissues exposed to

Arthur Kill and Port Elizabeth sediments. Statistically significant levels of bioaccumulation of pesticides, PCBs, and PAHs were observed in *M. nasuta* tissues exposed to Arthur Kill, Port Elizabeth, and Hackensack River sediments. In both species, metals bioaccumulated the least, and pesticides, PCBs, and PAHs bioaccumulated the most. Mean concentrations of selected contaminants in test sediment-exposed tissues were compared to U.S. Food and Drug Administration (FDA) levels for poisonous and deleterious substances in fish and shellfish for human food, FDA levels of concern for chronic shellfish consumption, and USACE-NYD/EPA Region II guidance values for bioaccumulation. For all contaminants, tissues exposed to project sediments had levels that were lower than the FDA and USACE-NYD guidance levels except 2,3,7,8-TCDD. Concentrations of 2,3,7,8-TCDD exceeded 1 ng/kg wet weight in *N. virens* tissues exposed to all project sediments and exceeded 10 ng/kg in Hackensack River-exposed tissues.

Contents

Summary ii

1.0 Introduction 1.1

1.1 Program Background 1.1

1.2 Program Objectives 1.2

1.2.1 MOTBY 1.4

1.2.2 Arthur Kill 1.4

1.2.3 Port Elizabeth 1.6

1.2.4 Hackensack River 1.7

1.2.5 Claremont 1.8

1.3 Organization of Report 1.8

2.0 Materials and Methods 2.1

2.1 Sediment and Water Collection 2.1

2.1.1 Test Sediment and Water Sampling 2.1

2.1.2 Reference and Control Sediment Sampling 2.3

2.1.4 Test Organism Collection 2.3

2.2 Sediment Sample Preparation 2.5

2.2.1 Laboratory Preparation and Safety Considerations 2.5

2.2.1.1 Glassware and Equipment Preparation 2.5

2.2.1.2 Laboratory Safety 2.6

2.2.2 Preparation of Sediment for Benthic Testing and Bulk Sediment Analyses 2.6

2.2.3 Preparation of Suspended-Particulate Phase and Elutriate 2.7

2.3 Biological Testing Procedures 2.8

2.3.1 Water-Column Toxicity Tests 2.8

2.3.1.1 Water-Column Toxicity Test with *Menidia beryllina* 2.8

2.3.1.2 Water-Column Toxicity Test with *Mysidopsis bahia* 2.10

2.3.1.3 Water-Column Toxicity Test with *Mytilus edulis* Larvae 2.11

2.3.2 Benthic Toxicity Tests 2.13

2.3.2.1 Static and Flow-Through Tests with *Ampelisca abdita* and *Rhepoxynius abronius* 2.13

2.3.2.2 Static Test With *Mysidopsis bahia* 2.17

Contents (contd)

2.3.3 Bioaccumulation Tests with *Nereis virens* and *Macoma nasuta* 2.18
2.4 Physical and Chemical Analytical Procedures 2.19
2.4.1 Sediment Physical Parameters 2.19
2.4.2 Sediment, Water, and Tissue Chemical Parameters 2.23
2.4.2.1 TOC 2.23
2.4.2.2 Metals 2.23
2.4.2.3 Chlorinated Pesticides and PCBs 2.24
2.4.2.4 Dioxins and Furans 2.25
2.4.2.5 PAHs and 1,4-Dichlorobenzene 2.26
2.4.2.6 Lipids 2.26
2.5 Data Analysis and Interpretation Procedures 2.27
2.5.1 Randomization 2.27
2.5.2 Statistical Analysis of Water-Column Tests 2.27
2.5.3 Statistical Analysis of Benthic Toxicity Tests 2.28
2.5.4 Statistical Analysis of Bioaccumulation 2.28
2.6 Quality Assurance/Quality Control Procedures 2.28
3.0 Results..... ..... 3.1
3.1 Results Relevant to All Projects 3.1
3.1.1 Sample Collection and Processing 3.1
3.1.2 Reference and Control Sediment Analyses 3.2
3.1.3 Mud Dump Site Water Chemistry 3.2
3.1.3.1 Metals in Mud Dump Site Water 3.2
3.1.3.2 Pesticides in Mud Dump Site Water 3.10
3.1.3.3 PCBs in Mud Dump Site Water 3.11
3.1.4 Biological Reference Toxicant Test Results 3.11
3.1.5 Background Tissue Lipid Content 3.11
3.2 Results of Physical, Chemical, and Biological Analyses of MOTBY Sediment ... 3.11
3.2.1 MOTBY Sediment Physical and Chemical Analyses 3.12
3.2.1.1 Metals in MOTBY Sediment Composites 3.13
3.2.1.2 Pesticides in MOTBY Sediment Composites 3.13
3.2.1.3 PCBs in MOTBY Sediment Composites 3.13

Contents (contd)

3.2.1.4 2,3,7,8-TCDD/TCDF in Individual Core Samples from MOTBY ... 3.13

3.2.1.5 PAHs and 1,4-dichlorobenzene in MOTBY Sediment Composites ... 3.14

3.2.1.6 Herbicides in MOTBY Sediment Composites ... 3.14

3.2.2 MOTBY Benthic Toxicity Testing ... 3.14

3.2.2.1 *Ampelisca abdita* Static and Flow-through Benthic Toxicity Tests ... 3.14

3.2.2.2 *Rhepoxynius abronius* Static and Flow-through Benthic Toxicity Tests ... 3.15

3.2.2.3 Ammonia Measurements During MOTBY Benthic Toxicity Testing ... 3.16

3.2.3 MOTBY Bioaccumulation Tests ... 3.18

3.2.3.1 Bioaccumulation of Metals in *N. virens* Exposed to MOTBY Composites ... 3.18

3.2.3.2 Bioaccumulation of Pesticides in *N. virens* Exposed to MOTBY Composites ... 3.18

3.2.3.3 Bioaccumulation of PCBs in *N. virens* Exposed to MOTBY Composites ... 3.21

3.2.3.4 Bioaccumulation of 2,3,7,8-TCDD/TCDF in *N. virens* Exposed to MOTBY Composites ... 3.21

3.2.3.5 Bioaccumulation of PAHs and 1,4-dichlorobenzene in *N. virens* Exposed to MOTBY Composites ... 3.21

3.3 Results of Physical, Chemical, and Biological Analyses of Arthur Kill Sediment .. 3.22

3.3.1 Arthur Kill Sediment Physical and Chemical Analyses ... 3.22

3.3.1.1 Metals in Arthur Kill Sediment Composites ... 3.22

3.3.1.2 Pesticides in Arthur Kill Sediment Composites ... 3.23

3.3.1.3 PCBs in Arthur Kill Sediment Composites ... 3.23

3.3.1.4 2,3,7,8-TCDD/TCDF in Individual Core Samples from Arthur Kill . 3.23

3.3.1.5 PAHs and 1,4-dichlorobenzene in Arthur Kill Sediment Composites ... 3.24

3.3.1.6 Herbicides in Arthur Kill Sediment Composites ... 3.25

3.3.2 Arthur Kill Site Water and Elutriate Chemical Analyses ... 3.25

3.3.2.1 Metals in Arthur Kill Water and Elutriate ... 3.25

Contents (contd)

3.3.2.2 Pesticides in Arthur Kill Water and Elutriate 3.26

3.3.2.3 PCBs in Arthur Kill Water and Elutriate 3.26

3.3.3 Arthur Kill Water-Column and Benthic Toxicity Testing 3.27

3.3.3.1 *Menidia beryllina* Water-Column Toxicity Test 3.27

3.3.3.2 *Mysidopsis bahia* Water-Column Toxicity Test 3.27

3.3.3.3 *Mytilus edulis* Water-Column Toxicity Test 3.28

3.3.3.4 *Ampelisca abdita* Static and Flow-through Benthic Acute Toxicity Tests 3.29

3.3.3.5 *Rhepoxynius abronius* Static and Flow-through Benthic Toxicity Tests 3.30

3.3.3.6 *Mysidopsis bahia* Static Benthic Toxicity Test 3.30

3.3.3.7 Ammonia Measurements During Arthur Kill Benthic Toxicity Testing 3.31

3.3.4 Arthur Kill Bioaccumulation Tests 3.31

3.3.4.1 Bioaccumulation of Metals in *N. virens* Exposed to Arthur Kill Composites 3.33

3.3.4.2 Bioaccumulation of Pesticides in *N. virens* Exposed to Arthur Kill Composites 3.33

3.3.4.3 Bioaccumulation of PCBs in *N. virens* Exposed to Arthur Kill Composites 3.33

3.3.4.4 Bioaccumulation of PCDD/PCDF in *N. virens* Exposed to Arthur Kill Composites 3.36

3.3.4.5 Bioaccumulation of PAHs and 1,4-dichlorobenzene in *N. virens* Exposed to Arthur Kill Composites 3.36

3.3.4.6 Bioaccumulation of Metals in *M. nasuta* Exposed to Arthur Kill Composites 3.36

3.3.4.7 Bioaccumulation of Pesticides in *M. nasuta* Exposed to Arthur Kill Composites 3.36

3.3.4.8 Bioaccumulation of PCBs in *M. nasuta* Exposed to Arthur Kill Composites 3.39

3.3.4.9 Bioaccumulation of PAHs and 1,4-dichlorobenzene in *M. nasuta* Exposed to Arthur Kill Composites 3.39

3.4 Results of Physical, Chemical, and Biological Analyses of Port Elizabeth Sediment 3.39

3.4.1 Port Elizabeth Sediment Physical and Chemical Analyses 3.39

Contents (contd)

3.4.1.1 Metals in Port Elizabeth Sediment Composites 3.40

3.4.1.2 Pesticides in Port Elizabeth Sediment Composites 3.40

3.4.1.3 PCBs in Port Elizabeth Sediment Composites 3.40

3.4.1.4 2,3,7,8-TCDD/TCDF in Individual Core Samples from Port Elizabeth 3.41

3.4.1.5 PAHs and 1,4-dichlorobenzene in Port Elizabeth Sediment Composites 3.41

3.4.1.6 Herbicides in Port Elizabeth Sediment Composites 3.42

3.4.2 Port Elizabeth Site Water and Elutriate Chemical Analyses 3.42

3.4.2.1 Metals in Port Elizabeth Water and Elutriate 3.42

3.4.2.2 Pesticides in Port Elizabeth Water and Elutriate 3.42

3.4.2.3 PCBs in Port Elizabeth Water and Elutriate 3.43

3.4.3 Port Elizabeth Water-Column and Benthic Toxicity Testing 3.43

3.4.3.1 *Menidia beryllina* Water-Column Toxicity Test 3.44

3.4.3.2 *Mysidopsis bahia* Water-Column Toxicity Test 3.44

3.4.3.3 *Mytilus edulis* Water-Column Toxicity Test 3.44

3.4.3.4 *Ampelisca abdita* Static and Flow-through Benthic Acute Toxicity Tests 3.45

3.4.3.5 *Rhepoxynius abronius* Static and Flow-through Benthic Toxicity Tests 3.46

3.4.3.6 *Mysidopsis bahia* Static Benthic Toxicity Test 3.47

3.4.3.7 Ammonia Measurements During Port Elizabeth Benthic Toxicity Testing 3.47

3.4.4 Port Elizabeth Bioaccumulation Tests 3.49

3.4.4.1 Bioaccumulation of Metals in *N. virens* Exposed to Port Elizabeth Composites 3.49

3.4.4.2 Bioaccumulation of Pesticides in *N. virens* Exposed to Port Elizabeth Composites 3.49

3.4.4.3 Bioaccumulation of PCBs in *N. virens* Exposed to Port Elizabeth Composites 3.52

3.4.4.4 Bioaccumulation of PCDD/PCDF in *N. virens* Exposed to Port Elizabeth Composites 3.52

3.4.4.5 Bioaccumulation of PAHs and 1,4-dichlorobenzene in *N. virens* Exposed to Port Elizabeth Composites 3.52

Contents (contd)

3.4.4.6 Bioaccumulation of Metals in *M. nasuta* Exposed to Port Elizabeth Composites 3.52

3.4.4.7 Bioaccumulation of Pesticides in *M. nasuta* Exposed to Port Elizabeth Composites 3.55

3.4.4.8 Bioaccumulation of PCBs in *M. nasuta* Exposed to Port Elizabeth Composites 3.55

3.4.4.9 Bioaccumulation of PAHs and 1,4-dichlorobenzene in *M. nasuta* Exposed to Port Elizabeth Composites 3.55

3.5 Results of Physical, Chemical, and Biological Analyses of Hackensack River Sediment 3.55

3.5.1 Hackensack River Sediment Physical and Chemical Analyses 3.56

3.5.1.1 Metals in Hackensack River Sediment Composite 3.56

3.5.1.2 Pesticides in Hackensack River Sediment Composite 3.57

3.5.1.3 PCBs in Hackensack River Sediment Composite 3.57

3.5.1.4 2,3,7,8-TCDD/TCDF in Individual Core Samples from Hackensack River 3.57

3.5.1.5 PAHs and 1,4-dichlorobenzene in Hackensack River Sediment Composite 3.57

3.5.1.6 Herbicides in Hackensack River Sediment Composite 3.58

3.5.2 Hackensack River Site Water and Elutriate Chemical Analyses 3.58

3.5.2.1 Metals in Hackensack River Water and Elutriate 3.58

3.5.2.2 Pesticides in Hackensack River Water and Elutriate 3.58

3.5.2.3 PCBs in Hackensack River Water and Elutriate 3.59

3.5.3 Hackensack River Water-Column and Benthic Toxicity Testing 3.59

3.5.3.1 *Menidia beryllina* Water-Column Toxicity Test 3.59

3.5.3.2 *Mysidopsis bahia* Water-Column Toxicity Test 3.60

3.5.3.3 *Mytilus edulis* Water-Column Toxicity Test 3.60

3.5.3.4 *Ampelisca abdita* Static and Flow-through Benthic Acute Toxicity Tests 3.61

3.5.3.5 *Rhepoxynius abronius* Static and Flow-through Benthic Toxicity Tests 3.61

3.5.3.6 *Mysidopsis bahia* Static Benthic Toxicity Test 3.62

Contents (contd)

3.5.3.7 Ammonia Measurements During Hackensack River Benthic Toxicity Testing 3.63

3.5.4 Hackensack River Bioaccumulation Tests 3.63

3.5.4.1 Bioaccumulation of Metals in *N. virens* Exposed to the Hackensack River Composite 3.63

3.5.4.2 Bioaccumulation of Pesticides in *N. virens* Exposed to the Hackensack River Composite 3.65

3.5.4.3 Bioaccumulation of PCBs in *N. virens* Exposed to the Hackensack River Composite 3.65

3.5.4.4 Bioaccumulation of PCDD/PCDF in *N. virens* Exposed to the Hackensack River Composite 3.65

3.5.4.5 Bioaccumulation of PAHs and 1,4-dichlorobenzene in *N. virens* Exposed to the Hackensack River Composite 3.68

3.5.4.6 Bioaccumulation of Metals in *M. nasuta* Exposed to the Hackensack River Composite 3.68

3.5.4.7 Bioaccumulation of Pesticides in *M. nasuta* Exposed to the Hackensack River Composite 3.68

3.5.4.8 Bioaccumulation of PCBs in *M. nasuta* Exposed to the Hackensack River Composite 3.68

3.5.4.9 Bioaccumulation of PAHs and 1,4-dichlorobenzene in *M. nasuta* Exposed to the Hackensack River Composite 3.68

3.6 Results of Physical, Chemical, and Biological Analyses of Claremont Sediment . 3.71

3.6.1 Claremont Sediment Physical and Chemical Analyses 3.71

3.6.1.1 Metals in Claremont Sediment Composites 3.71

3.6.1.2 Pesticides in Claremont Sediment Composites 3.71

3.6.1.3 PCBs in Claremont Sediment Composites 3.72

3.6.1.4 2,3,7,8-TCDD/TCDF in Claremont Sediment Composites 3.72

3.6.1.5 PAHs and 1,4-dichlorobenzene in Claremont Sediment Composites 3.72

3.6.1.6 Herbicides in Claremont Sediment Composites 3.73

3.6.2 Claremont Benthic Toxicity Testing 3.73

3.6.2.1 *Ampelisca abdita* Static and Flow-through Benthic Toxicity Tests 3.73

Contents (contd)

3.6.2.2 *Rhepoxynius abronius* Static and Flow-through Benthic Toxicity Tests 3.74

3.6.2.3 Ammonia Measurements During Claremont Benthic Toxicity Testing 3.75

4.0 Discussion and Conclusions 4.1

4.1 MOTBY 4.2

4.1.1 Sediment Physical and Chemical Characterization 4.2

4.1.2 Toxicity 4.6

4.1.3 Bioaccumulation 4.6

4.2 Arthur Kill 4.8

4.2.1 Sediment Physical and Chemical Characterization 4.8

4.2.2 Toxicity 4.8

4.2.3 Bioaccumulation 4.9

4.3 Port Elizabeth 4.11

4.3.1 Sediment Physical and Chemical Characterization 4.11

4.3.2 Toxicity 4.11

4.3.3 Bioaccumulation 4.12

4.4 Hackensack River 4.14

4.4.1 Sediment Physical and Chemical Characterization 4.14

4.4.2 Toxicity 4.14

4.4.3 Bioaccumulation 4.15

4.5 Claremont 4.17

4.5.1 Sediment Physical and Chemical Characterization 4.17

4.5.2 Toxicity 4.17

4.6 Relationship of Sediment Pore Water Ammonia Concentrations to Toxicity 4.18

5.0 References 5.1

Appendix A. Sediment Physical and Chemical Analyses

Appendix B. Water Chemical Analyses

Appendix C. Water-column Toxicity Tests

Appendix D. Benthic Acute Toxicity Tests

Appendix E. Bioaccumulation Tests

Appendix F. *Nereis virens* Tissue Chemical Analyses

Appendix G. *Macoma nasuta* Tissue Chemical Analyses

Tables

1.1 USACE-NYD New York/New Jersey Federal Projects/MOTBY Tests and Analyses 1.5

2.1. Percentage Dredging Site Water in Test Treatments Following Salinity Adjustments with Brine 2.10

2.2. List of Analytes, Methods, and Target Detection Limits 2.20

3.1 Summary of Core Sampling Data for New York/New Jersey Federal Projects 3.7

3.2 Summary of Reference Sediment and Water Sampling Data for New York/New Jersey Federal Projects 3.10

3.3 Summary of Reference Toxicant Test Results, New York/New Jersey Federal Projects 3.12

3.4 Results of Benthic Toxicity Testing for MOTBY Sediment Composites 3.16

3.5 Concentrations of Ammonia in MOTBY Amphipod Benthic Toxicity Tests 3.17

3.6 Mean Wet Weight Concentrations of Contaminants of Concern in Tissues of *Nereis virens* Exposed to MOTBY Sediment Composites 3.19

3.7 Summary of Water-Column Toxicity Testing for Arthur Kill 3.28

3.8 Results of Benthic Toxicity Testing for Arthur Kill Sediment Composites 3.31

3.9 Concentrations of Ammonia in Arthur Kill Amphipod Toxicity Tests 3.32

3.10 Mean Wet Weight Concentrations of Contaminants of Concern in Tissues of *Nereis virens* Exposed to Arthur Kill Sediment Composites 3.34

3.11 Mean Wet Weight Concentrations of Contaminants of Concern in Tissues of *Macoma nasuta* Exposed to Arthur Kill Sediment Composites 3.37

3.12 Summary of Water-Column Toxicity Testing for Port Elizabeth 3.45

3.13 Results of Benthic Toxicity Testing for Port Elizabeth Sediment Composites 3.46

3.14 Concentrations of Ammonia in Port Elizabeth Amphipod Benthic Toxicity Tests 3.48

3.15 Mean Wet Weight Concentrations of Contaminants of Concern in Tissues of *Nereis virens* Exposed to Port Elizabeth Sediment Composites 3.50

3.16 Mean Wet Weight Concentrations of Contaminants of Concern in Tissues of *Macoma nasuta* Exposed to Port Elizabeth Sediment Composites 3.53

Tables (contd)

3.17 Summary of Water-Column Toxicity Testing for the Hackensack River Composite ... 3.60

3.18 Results of Benthic Toxicity Testing for the Hackensack River Composite 3.62

3.19 Concentrations of Ammonia in Hackensack River Amphipod Benthic Toxicity Tests .. 3.64

3.20 Mean Wet Weight Concentrations of Contaminants of Concern in Tissues of *Nereis virens* Exposed to the Hackensack River Sediment Composite 3.66

3.21 Mean Wet Weight Concentrations of Contaminants of Concern in Tissues of *Macoma nasuta* Exposed to the Hackensack River Sediment Composite 3.69

3.22 Results of Benthic Toxicity Testing for Claremont 3.74

3.23 Concentrations of Ammonia in Claremont Amphipod Benthic Toxicity Tests 3.76

4.1 Comparison of Contaminant Concentrations in *N. virens* Tissues Exposed to Proposed Dredged Material from MOTBY with FDA and USACE Guidance Levels for Bioaccumulation/Tissue Burden 4.7

4.2 Comparison of Contaminant Concentrations in *N. virens* and *M. nasuta* Tissues Exposed to Proposed Dredged Material from Arthur Kill with FDA and USACE Guidance Levels for Bioaccumulation/Tissue Burden 4.10

4.3 Comparison of Contaminant Concentrations in *N. virens* and *M. nasuta* Tissues Exposed to Proposed Dredged Material from Port Elizabeth with FDA and USACE Guidance Levels for Bioaccumulation/Tissue Burden 4.13

4.4 Comparison of Contaminant Concentrations in *N. virens* and *M. nasuta* Tissues Exposed to Proposed Dredged Material from Hackensack River with FDA and USACE Guidance Levels for Bioaccumulation/Tissue Burden 4.16

Figures

1.1 Locations of MOTBY, Arthur Kill, Port Elizabeth, Hackensack, and Claremont Project Areas 1.3

2.1 Flow-Through and Static Testing Containers for *A. abdita* and *R. abronius* Toxicity Tests 2.15

3.1 Location of Sampling Stations in the MOTBY and Claremont Project Areas 3.3

3.2 Location of Sampling Stations in the Arthur Kill Project Area 3.4

3.3 Location of Sampling Stations in the Port Elizabeth Project Area 3.5

3.4 Location of Sampling Stations in the Hackensack River Project Area 3.6

4.1 Matrix of Significant Acute Toxicity and Statistically Significant Bioaccumulation for Sediment Treatments Representing Proposed Dredged Material from MOTBY and Hackensack River Projects 4.3

4.2 Matrix of Significant Acute Toxicity and Statistically Significant Bioaccumulation for Sediment Treatments Representing Proposed Dredged Material from the Arthur Kill Federal Project 4.4

4.3 Matrix of Significant Acute Toxicity and Statistically Significant Bioaccumulation for Sediment Treatments Representing Proposed Dredged Material from the Port Elizabeth Federal Project 4.5

4.4 *Ampelisca abdita* Survival vs. Total Ammonia Concentrations in Pore Water on Day 0, Under Static and Flow-Through Conditions 4.19

4.5 *Rhepoxynius abronius* Survival vs. Total Ammonia Concentrations in Pore Water on Day 0, Under Static and Flow-Through Conditions 4.21

1.0 Introduction

1.1 Program Background

The U.S. Army Corps of Engineers (USACE) is authorized by Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA), Public Law 92-532, and by the Clean Water Act of 1972 (CWA) and Amendments of 1977 to permit, evaluate, and regulate the disposal of dredged material in ocean waters to minimize adverse environmental effects. Compliance with the regulations of the MPRSA calls for physical, chemical, and biological testing of sediment proposed for dredging prior to its disposal in ocean waters. The testing required by the MPRSA criteria is conducted under a testing manual developed by the USACE and the U.S. Environmental Protection Agency (EPA), *Evaluation of Dredged Material Proposed for Ocean Disposal (Testing Manual)* (EPA/USACE 1991), commonly referred to as the "Green Book." Testing protocols in the Green Book include bulk sediment analysis, grain size analysis, elutriate testing, and biological testing. The biological testing includes bioassays for acute toxicity as well as analyses to determine bioaccumulation of certain contaminants by marine organisms.

Management and disposal of dredged material from the Port of New York and New Jersey is the responsibility of the USACE-New York District (USACE-NYD). To implement the technical guidance of the Green Book, the USACE-NYD and EPA Region II developed a regional manual, *Guidance for Performing Tests on Dredged Material to be Disposed of in Ocean Waters* (USACE-NYD/EPA Region II 1992), hereinafter referred to as the "Regional Guidance Manual." The Regional Guidance Manual provides specifications for the use of local or appropriate test species in biological tests and identifies chemical contaminants of concern.

In March 1993, the USACE-NYD requested the Battelle/Marine Sciences Laboratory (MSL)[a] to conduct a series of sediment evaluation projects to determine the suitability of dredged material for ocean disposal from the Military Ocean Terminal (MOTBY) in Bayonne, New Jersey, and three federal navigation projects in the New York/New Jersey Harbor Complex – the Hackensack River, Port Elizabeth in Newark Bay, and Arthur Kill. Sediment samples were also collected from an additional project area at Claremont, New Jersey, for specific chemical and

---

a The Battelle Marine Sciences Laboratory is part of the Pacific Northwest National Laboratory, which is operated for the U.S. Department of Energy by the Battelle Memorial Institute.

biological tests to provide some baseline data for possible future work in the Claremont area. Figure 1.1 shows the New York/New Jersey Harbor Complex and the locations of each of the project areas. All testing for the project areas was performed according to the requirements in the Regional Guidance Manual and the Green Book.

This series of sediment evaluations for federal waterways represents the first time that testing of sediment proposed for dredging and disposal was conducted according to the new requirements in the Regional Guidance Manual. The MSL tested and validated procedures for many of the biological tests and chemistry analyses required by this manual during the conduct of this program for the USACE-NYD. Additionally, a number of technical issues related to amphipod testing procedures, such as ammonia toxicity and sensitivity of amphipod species to differences in grain size, were also investigated during the sediment evaluations. The lessons learned from these projects will be applied to further refinements of the Regional Guidance Manual.

The EPA has recently issued guidance for reducing ammonia concentrations prior to initiation benthic toxicity tests (EPA/USACE 1993). The EPA has prescribed the use of these revised ammonia protocols whenever ammonia is present at toxicologically relevant levels. This updated method alleviates toxicity due to elevated ammonia concentrations by purging ammonia from interstitial water to reach acceptable levels prior to introduction of test organisms into the sediment. Acceptable ammonia levels are then maintained throughout the test.

Because the work described in this report was conducted prior to the issuance of the revised ammonia protocols, amphipod and mysid benthic toxicity tests did not follow these recommended protocols. Therefore, the toxicity tests in this report could reflect greater mortality due to the unpurged ammonia, and thus, the USACE-NYD has decided that they cannot be used for regulatory purposes.

1.2 Program Objectives

The objectives of the USACE-NYD Federal Projects Program were to collect and evaluate the effects of potentially contaminated sediment proposed for dredging and unconfined ocean disposal at the Mud Dump Site. The Mud Dump Site is the present dredged material disposal site for the Port of New York and New Jersey. It lies in the apex of the New York Bight about 6 miles east of Sandy Hook, New Jersey, and 12 miles south of Rockaway Point, New York. The results of analytical measurements and bioassays performed on the test sediments were compared with those from analyses of sediment from the Mud Dump Reference Site,

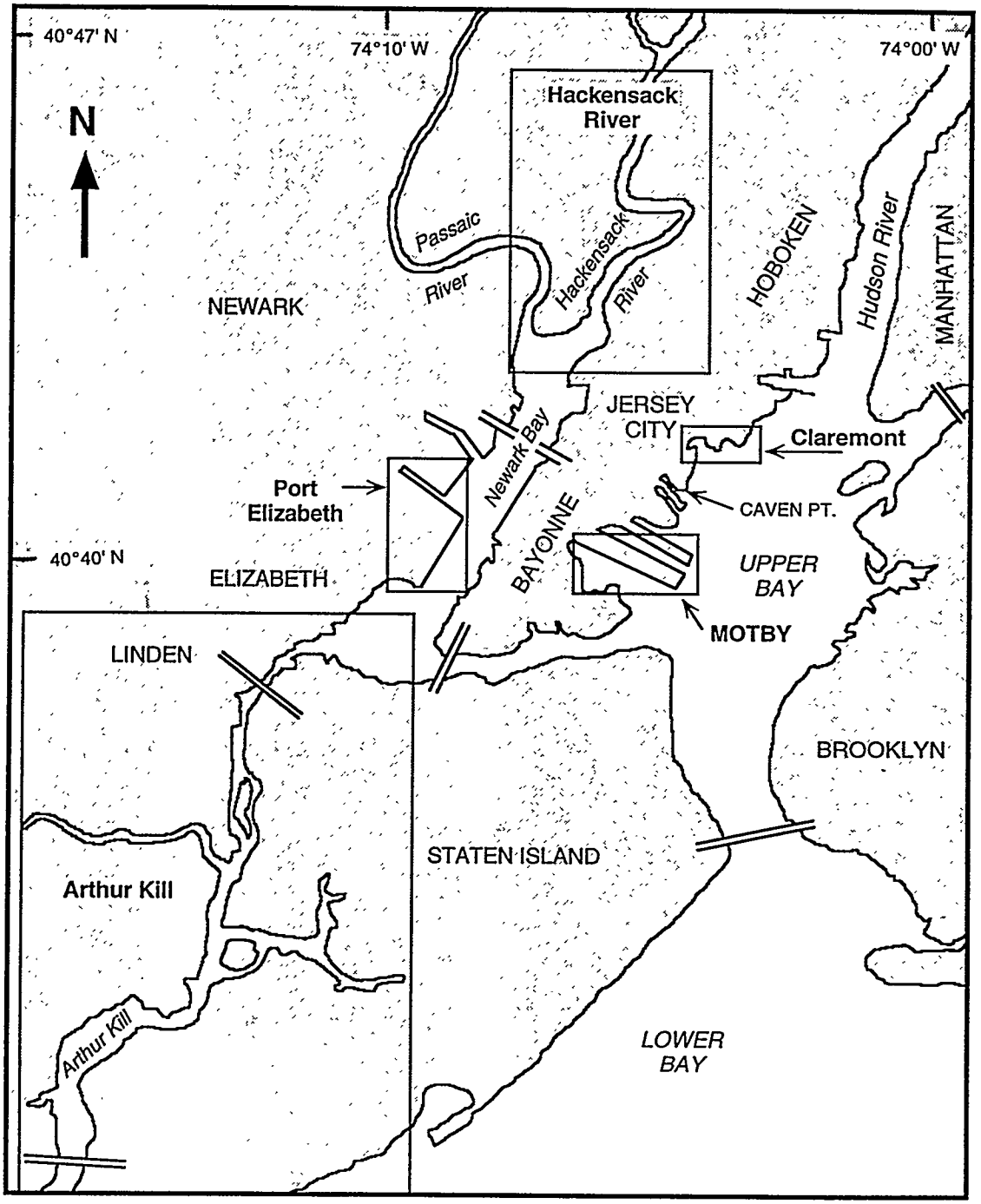


FIGURE 1.1. Locations of MOTBY, Arthur Kill, Port Elizabeth, Hackensack, and Claremont Project Areas.

located 2.6 nautical miles (nmi) southwest of the center of the Mud Dump Site, to determine whether the proposed dredged materials were acutely toxic to marine organisms, or resulted in statistically significantly greater bioaccumulation of contaminants than the reference sediment.

Table 1.1 lists each of the proposed dredging sites or federal navigation channels tested under this program, and the types of biological tests and chemistry analyses performed on each site.

1.2.1 MOTBY

The proposed MOTBY dredging project requires dredging and disposal of an estimated 208,500 cu yd of sediment. Dredging is proposed to take place along the northern berths (Berths N-1 through N-10) and the southern berths (Berths S-1 and S-2) of the terminal. Project depths at berths N-3 through N-10 are -35 ft mean low water (MLW) plus 2 ft of overdepth. Project depths at berths N-1, N-2, S-1, and S-2 are -36 ft MLW plus 2 ft of overdepth. For sampling and testing purposes, the dredging area is divided into two reaches: Reach A comprises six northern berth sampling stations, (berths N-5 through N-10) and Reach B comprises four northern berth and two southern berth stations (berths N-2, N-4, S-1, and S-2).

Individual sediment core samples collected at MOTBY Reach A and Reach B were analyzed for total organic carbon (TOC), moisture content, 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) and 2,3,7,8-tetrachlorodibenzofuran (TCDF). A composite sediment sample representing each reach was analyzed for metals, chlorinated pesticides, polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons (PAHs), 1,4-dichlorobenzene, and the herbicides, 2,4-D and 2,4,5-T. Toxicity of sediment composites from MOTBY Reach A and Reach B to marine organisms was evaluated by conducting 10-day benthic acute toxicity tests using the amphipods *Ampelisca abdita* and *Rhepoxynius abronius*. The ability of marine animals to bioaccumulate potential contaminants from the MOTBY sediments was determined using a 28-day bioaccumulation study with the polychaete *Nereis virens*. Tissue samples of *N. virens* were analyzed for metals, pesticides, PCBs, PAHs, 1,4-dichlorobenzene, and 2,3,7,8-TCDD/TCDF.

1.2.2 Arthur Kill

The proposed Arthur Kill dredging project requires dredging and disposal of an estimated 566,000 cu yd of sediment. Dredging in the Arthur Kill federal navigation channel is proposed to take place between Shooters's Island and Ploughshare Point. The project is divided into three reaches: Reach A, extending approximately 2 miles east of the mouth of the Elizabeth River north to Shooter's Island; Reach B, the northern portion of Arthur Kill extending approximately

TABLE 1.1. USACE-NYD New York/New Jersey Federal Projects/MOTBY Tests and Analyses

TEST/ANALYSIS TYPE	FEDERAL PROJECT					
	MOTBY	Arthur Kill	Port Elizabeth	Hackensack River	Claremont	Mud Dump Reference Site
BIOASSAYS						
Water Column Toxicity Tests						
M. beryllina (silverside) SPP	--[a]	C[b]	C	C	--	C
M. bahia (mysid) SPP	--	C	C	C	--	C
M. edulis (bivalve larvae) SPP	--	C	C	C	--	C
Benthic Acute Toxicity Tests						
A. abdita (amphipod) static	C	C	C	C	C	C
A. abdita (amphipod) flow-through	C	C	C	C	C	C
R. abronius (amphipod) static	C	C	C	C	C	C
R. abronius (amphipod) flow-through	C	C	C	C	C	C
M. bahia (mysid) static	--	C	C	C	--	--
Bioaccumulation Tests						
N. virens (worm) bioaccumulation	C	C	C	C	--	C
M. nasuta (clam) bioaccumulation	--	C	C	C	--	C
ANALYTICAL CHEMISTRY						
Water and Elutriate Analyses[c]						
Metals	--	S,E[d]	S,E	S,E	--	--
Pesticides/PCB congeners	--	S,E	S,E	S,E	--	--
Sediment Analyses						
Grain size	--	I[e]	I	I	C	C
Percent moisture	I	I	I	I	C	C
Bulk density	--	I	I	I	--	C
Specific gravity	--	I	I	I	--	C
TOC	I	I	I	I	C	C
Metals	C	C	C	C	C	C
Pesticides/PCB congeners	C	C	C	C	C	C
PAHs/1,4-dichlorobenzene	C	C	C	C	C	C
2,3,7,8-TCDD/TCDF	I	I	I	I	C	--
2,4-D/2,4,5-T	C	C	C	C	--	--
Tissue Analyses[f]						
Metals	N[g]	N,M[h]	N,M	N,M	--	N,M
Pesticides/PCB congeners	N	N,M	N,M	N,M	--	N,M
PAHs/1,4-dichlorobenzene	N	N,M	N,M	N,M	--	N,M
Dioxin/furan congeners	N[i]	N	N	N	--	N

(a) -- Test or analysis not conducted on samples from this site.
(b) C Test conducted on composited sediment sample.
(c) Metals, pesticides, and PCBs were also analyzed in water from the Mud Dump Site.
(d) S,E Analysis performed on both site water and elutriate samples.
(e) I Analysis performed on individual sediment core samples.
(f) All tissue parameters plus lipids also measured in pre-exposure tissues of *N. virens* and *M. nasuta*.
(g) N Analysis performed on *N. virens* tissue samples only.
(h) N,M Analysis performed on both *N. virens* and *M. nasuta* tissue samples.
(i) For MOTBY *N. virens* tissues, only 2,3,7,8-TCDD/TCDF were analyzed.

4 miles south of the Elizabeth River to just south of the mouth of the Rahway River; and Reach C, the southern portion of Arthur Kill extending approximately 6 miles north of the Island of Meadows to Ploughshare Point. Project depths for all three reaches are -35 ft MLW plus 2 ft of overdepth. A total of 33 stations was sampled, 12 in Reach A, 9 in Reach B, and 12 in Reach C.

Individual sediment core samples collected at Arthur Kill Reach A, B, and C were analyzed for grain size, TOC, moisture content, bulk density, specific gravity, and 2,3,7,8-TCDD/TCDF. A composite sediment sample representing each reach was analyzed for metals, chlorinated pesticides, PCBs, PAHs, 1,4-dichlorobenzene, 2,4-D, and 2,4,5-T. Samples of dredging site water, dump site water, and elutriates prepared with sediment from each reach were analyzed for metals, chlorinated pesticides, and PCBs. The effects of dissolved contaminants plus those associated with suspended particles of Arthur Kill Reach A, B, and C sediment composites in the water-column were evaluated by suspended-particulate-phase (SPP) testing using the mysid shrimp *Mysidopsis bahia*, the silverside minnow *Menidia beryllina*, and larvae of the bivalve *Mytilus edulis*. Toxicity of the Arthur Kill sediment composites to marine organisms was evaluated by conducting 10-day benthic acute toxicity tests using the amphipods *A. abdita* and *R. abronius* and the mysid *M. bahia*. Bioaccumulation of contaminants from the Arthur Kill sediment composites was determined using 28-day studies with the polychaete *N. virens* and the clam *Macoma nasuta*. Tissue samples of *N. virens* and *M. nasuta* were analyzed for metals, pesticides, PCBs, PAHs, and 1,4-dichlorobenzene; *N. virens* tissues were also analyzed for 17 polychlorinated dibenzo-*p*-dioxin (PCDD) and polychlorinated dibenzofuran (PCDF) congeners.

1.2.3 Port Elizabeth

The proposed Port Elizabeth project requires dredging and disposal of an estimated 220,000 cu yd of dredged material. Dredging is proposed to take place in two areas: Reach A, in the Elizabeth Channel, and Reach B, in the South Elizabeth Channel. Project depth for both reaches is -40 ft MLW plus 2 ft of overdepth. Six sampling stations were established in Reach A and nine in Reach B.

Individual sediment core samples collected at Port Elizabeth Reach A and Reach B were analyzed for grain size, TOC, moisture content, bulk density, specific gravity, and 2,3,7,8-TCDD/TCDF. A composite sediment sample representing each reach was analyzed for metals, chlorinated pesticides, PCBs, PAHs, 1,4-dichlorobenzene, 2,4-D, and 2,4,5-T. Samples of dredging site water, dump site water, and elutriates prepared with sediment composites from

each reach were analyzed for metals, chlorinated pesticides, and PCBs. The effects of dissolved contaminants plus those associated with suspended particles of Port Elizabeth Reach A and B sediment composites in the water-column were evaluated by SPP testing using the mysid *M. bahia*, the silverside *M. beryllina*, and larvae of *M. edulis*. Toxicity of the Port Elizabeth sediment composites to marine organisms was evaluated by conducting 10-day benthic acute toxicity tests using the amphipods *A. abdita* and *R. abronius* and the mysid *M. bahia*. Bioaccumulation of contaminants in the Port Elizabeth sediment composites was evaluated using 28-day studies with the polychaete *N. virens* and the clam *M. nasuta*. Tissue samples of *N. virens* and *M. nasuta* were analyzed for metals, pesticides, PCBs, PAHs, and 1,4-dichlorobenzene; *N. virens* tissues were also analyzed for 17 PCDD/PCDF congeners.

1.2.4 Hackensack River

The proposed Hackensack River project requires dredging and disposal of an estimated 300,000 cu yd of sediment, planned to take place between the 0-mile mark and the 4-mile mark in the federal navigation channel and in the turning basin. Eight sampling stations were established in the Hackensack River project area. Project depths for Sampling Stations 1 through 7 are -30 ft MLW plus 2 ft of overdepth, and -25 ft plus 2 ft of overdepth for Sampling Station 8.

Individual sediment core samples collected at the Hackensack River were analyzed for grain size, TOC, moisture content, bulk density, specific gravity, and 2,3,7,8-TCDD/TCDF. One composite sediment sample representing the entire area was analyzed for metals, chlorinated pesticides, PCBs, PAHs, 1,4-dichlorobenzene, 2,4-D, and 2,4,5-T. Samples of dredging site water, dump site water, and elutriates prepared with the sediment composite were analyzed for metals, chlorinated pesticides, and PCBs. The effects of dissolved contaminants plus those associated with suspended particles of Hackensack River sediment composite in the water-column were evaluated by SPP testing using the mysid *M. bahia*, the silverside *M. beryllina*, and larvae of *M. edulis*. Toxicity of the Hackensack River sediment composite to marine organisms was evaluated by conducting 10-day benthic acute toxicity tests using the amphipods *A. abdita* and *R. abronius* and the mysid *M. bahia*. The ability of marine animals to bioaccumulate contaminants from the Hackensack River sediment composite was determined using 28-day bioaccumulation studies with the polychaete *N. virens* and the clam *M. nasuta*. Tissue samples of *N. virens* and *M. nasuta* were analyzed for metals, pesticides, PCBs, PAHs, and 1,4-dichlorobenzene; *N. virens* tissues were also analyzed for 17 PCDD/PCDF congeners.

1.2.5 Claremont

The Claremont project area was sampled and tested to provide baseline information on the character of the sediments for the USACE-NYD's planning purposes. Data from the Claremont project area will be used to assess the feasibility of the proposed project and determine whether further dredged-material evaluations are appropriate. Twenty-seven Claremont core samples were collected in three reaches: Reach I consisted of Claremont Sampling Stations 1 through 9; Reach II consisted of Claremont Sampling Stations 10 through 20; and Reach III consisted of Claremont Sampling Stations 21 through 27.

A composite sediment sample from each of the three Claremont reaches was analyzed for grain size, TOC, moisture content, 2,3,7,8-TCDD/TCDF, metals, chlorinated pesticides, PCBs, PAHs, and 1,4-dichlorobenzene. Toxicity of the Claremont sediment composite to marine organisms was evaluated by conducting 10-day benthic acute toxicity tests using the amphipods *A. abdita* and *R. abronius*.

1.3 Organization of Report

Following the Section 1 introduction, Section 2 presents the methods and materials used for sample collection; physical and chemical analyses of sediment, water, and tissue samples; biological testing; data analysis; and quality assurance requirements. Results of all analyses and tests are provided in Section 3. Section 4 is a discussion of the results and conclusions, and Section 5 lists the literature cited. Appendixes A-G contain tabulated data sets for the following:

Appendix A	Sediment Physical and Chemical Analyses
Appendix B	Water Chemical Analyses
Appendix C	Water-Column Toxicity Tests
Appendix D	Benthic Acute Toxicity Tests
Appendix E	Bioaccumulation Tests
Appendix F	*Nereis virens* Tissue Chemical Analyses
Appendix G	*Macoma nasuta* Tissue Chemical Analyses.

2.0 Materials and Methods

2.1 Sediment and Water Collection

Sediment samples were collected from 95 stations in five project areas: 12 stations at MOTBY, 33 stations in Arthur Kill, 15 stations in Port Elizabeth, 8 stations in the Hackensack River, and 27 stations at Claremont. Sampling locations were selected by USACE-NYD based on recent bathymetric surveys. The locations, their coordinates, and water and core sampling depths are presented with the sampling results in Section 3.0. Water samples were collected at a representative location in the Mud Dump Site and from each reach within Arthur Kill, Port Elizabeth, and Hackensack River project areas. Reference sediment was collected from the Mud Dump Reference Site. All samples from the New York/New Jersey Harbor project areas were collected aboard the M/V *Gelberman*, a vessel owned and operated by USACE-NYD at Caven Point, New Jersey.

2.1.1 Test Sediment and Water Sampling

Test sediment core samples were collected using a vibratory-hammer coring device deployed from the *Gelberman*. The approximate sampling locations were first determined with the aid of reference to landmarks, such as shoreline features, buildings, piers, or buoys, as well as by water depth. Then, a hand-held Magellan Global Positioning System (GPS) was used to identify and record (within 30 m) each sampling station. The vessel's LORAN was available as a backup system. Water depth at the time of sampling was measured by a fathometer on the *Gelberman*. The actual water depth was corrected to MLW depth by correcting to the tide height at the time the depth was recorded. The difference between the MLW depth and the project depth, plus 2 ft overdepth, yields the length of core required. At some sites, more than one core replicate was required to collect a sufficient volume of sediment for conducting all tests.

Each core sample was collected using an adjustable-length, 4-in. outer diameter (OD), aluminum core barrel fitted with a 3.125-in. interior diameter (ID), steam-cleaned, Lexan polycarbonate tube, and attached to an electric vibratory hammer. The corer and vibratory hammer were suspended by the crane on the *Gelberman*. Once the coring apparatus was directly above the sampling station, the core was lowered through the water to the sediment surface. At this point, the station coordinates and water depth were recorded in the sample log. The vibratory hammer was switched on until the corer penetrated through the sediment to the desired project depth. Adequate penetration was determined relative to marks on the outside of

the core barrel and on the cable suspending the vibratory hammer from the crane. The coring apparatus was then pulled out of the sediment, detached from the vibratory hammer, and lowered onto the *Gelberman's* deck. A ball valve inserted in the top of each core liner prevented water from disturbing the sediment surface in the core and retained the sediment within the coring device as it was pulled through the water. A cutter-head and core-catcher assembly provide further protection and prevented loss of the sediment through the bottom of the core liner. After each core was brought on board, the liner was pulled from the barrel and the length of cored sediment was measured from the mudline to determine whether the appropriate depth has been reached. If not, the liner was replaced, and a second core sample was attempted. If the core achieved project depth plus 2 ft overdepth, it was capped, sealed with tape, labeled, and, if necessary, cut into shorter sections to fit in the freezer. If multiple attempts to core at a station were unsuccessful due to impenetrable material in the sediment, the longest core retrieved was kept and the station was abandoned with approval of USACE. While on board the sampling vessel, cores were kept cool (~4°C) in a freezer.

Surface-water samples for chemical analysis were collected at seven locations, one for each waterway or reach (three stations in the Arthur Kill project area, two stations in the Port Elizabeth project area, one station in the Hackensack project area) and one at the Mud Dump Site. Site water from the Mud Dump Site was also used as dilution water in water-column toxicity tests. Water samples were collected using a clean, epoxy-coated bucket that was inverted and forced below the surface of the water before it was filled. Water was then transferred to precleaned, 20-L polypropylene carboys. The carboys were rinsed with site water three times before filling. (Prior to the sampling survey, carboys were washed with hot water and detergent, acid-rinsed with dilute hydrochloric acid, then rinsed with distilled water, followed by acetone and methylene chloride.) Six carboys of water were collected at each location. Water samples were labeled and stored in a chest freezer to chill the samples while on board the ship.

At the end of each sampling day, when the *Gelberman* returned to Caven Point, all sediment cores and water samples were loaded into a refrigerated van at the staging area. The van was thermostatically controlled to maintain approximately 4°C. Detailed records of each sediment and water sample collected were maintained at each station and included information such as the station designation, coordinates, replicate number, date, sampling time, water depth, core length, and number of core sections per core. Sample identification numbers were logged in on chain-of-custody forms daily.

2.1.2 Reference and Control Sediment Sampling

Reference sediment for toxicity and bioaccumulation tests was collected from the Mud Dump Reference Site. Four 5-gal containers of surficial sediment were collected using a pipe-dredge sampler. The sampler was deployed from the *Gelberman* and towed astern of the ship for approximately 10 to 20 min. After recovery, water was drained from the sampler, and the sediments were transferred to epoxy-coated steel buckets. The buckets were covered, labeled, and stored at ambient temperature (in the shade) while aboard the ship, then were transferred to the refrigerated van at the end of the sampling day.

Records of reference sediment collected also included coordinates, replicate number, date, sampling time, and water depth. Reference sediment samples were loaded into the refrigerated van at the staging area upon return to port, and sample identification numbers were logged in on chain-of-custody forms.

Native control sediments were used in each toxicity and bioaccumulation test to validate test procedures. Control sediment used in *M. nasuta* and *M. bahia* tests was collected from Sequim Bay, Washington, using a Van Veen sampler deployed from an MSL research vessel. *R. abronius* control sediment was collected from West Beach, at Whidbey Island, Washington, using a small anchor-dredge sampler specially designed for collecting the amphipods and their sediment. Locations of these control sites were determined by reference to known shoreline features. While in transit from the sampling site, these control sediments were stored in coolers at ambient temperature for less than 2 hours. At the MSL they were stored in the walk-in cold room at 4°C±2°C. Native sediment for *N. virens* and *A. abdita* were shipped with the test organisms by their respective suppliers to the MSL, where they were stored in the walk-in cold room at 4°C±2°C.

2.1.3 Test Organism Collection

Seven species of test organisms were used to evaluate sediment samples from the New York/New Jersey federal project areas:

- *Ampelisca abdita*, a tube-dwelling, surface detrital-feeding amphipod (adult)
- *Rhepoxynius abronius*, a free-burrowing, subsurface detrital feeding amphipod (adult)
- *Mysidopsis bahia*, a mysid shrimp (juvenile)
- *Menidia beryllina*, a silverside fish (juvenile)
- *Mytilus edulis*, the blue mussel (larval zooplankton stage)

- *Macoma nasuta*, the bent-nose clam, a burrowing, surface-detrital feeder (adult)
- *Nereis virens*, a burrowing, deposit-feeding polychaete (adult).

All test organisms except mysids and silversides were wild-captured animals, collected either by a commercial supplier or by MSL personnel. The amphipod *A. abdita* was supplied by Brezina and Associates, Dillon Beach, California. *A. abdita* and its native sediment were collected from San Pablo Bay, California, by dragging a large dipnet along the sediment surface. Test organisms were carefully removed from their tubes for counting, and then placed in clean, native sediment for overnight transport to the MSL. The amphipod *R. abronius* was collected by MSL personnel from West Beach, at Whidbey Island, Washington, using the same anchor-dredge sampler that was used for collecting the amphipod's native sediment. The amphipods were transported to the MSL in clean coolers containing ~10 cm of sediment and 5 gal of clean seawater at a temperature approximating natural conditions. Mysid shrimp were purchased from Aquatic Biosystems, Fort Collins, Colorado. Mysids that were less than 24 h old were shipped via overnight delivery in plastic bags containing oxygen-supersaturated seawater maintained at ~15°C with "blue ice." Silversides were supplied by Aquatic Research Organisms in Hampton, New Hampshire, and were shipped via overnight delivery in plastic bags containing oxygen-supersaturated seawater maintained at ~22°C with blue ice. Mussels used for obtaining *M. edulis* larvae were purchased from Marinus, Inc., Long Beach, California. Mussels were wrapped in moist paper towels and transported in a Styrofoam cooler packed with blue ice to maintain an ambient temperature of ~15°C. Clams (*M. nasuta*) were collected from intertidal zones in Discovery Bay, Washington, by the commercial supplier Johnson and Gunstone using shovels, buckets, and sieves. The clams were kept in large containers filled with sediment and seawater obtained from the collection site and transported to the MSL. Worms were purchased through Envirosystems, Inc., and were collected from an intertidal region in Newcastle, Maine. The worms were packed in insulated boxes with mats of moist seaweed and shipped at ambient temperature to the MSL via overnight delivery.

All organisms were shipped or transported in native sediment or under conditions designed to ensure their viability. After arrival at the MSL, the test organisms were gradually acclimated to test conditions. Animals with abnormal behavior or appearance were not used in toxicological tests. All acclimation and animal care records become part of the raw data files for these projects.

2.2 Sediment Sample Preparation

Sediment sample preparation consists of all steps performed in the laboratory between receipt of the samples at the MSL and the preparation of samples for biological testing and physical/chemical analyses. Sediment samples for physical, chemical, and biological analysis were prepared from individual core samples, composites of a number of core samples, reference sediment, and control sediment. All sediment samples were assigned random, unique code numbers to ensure that samples are handled without bias by staff in the biology or chemistry laboratories.

Sediment for biological testing was used within the 6-week holding period specified in the Green Book. During this holding time, the sediment samples were received at the MSL; inventoried against chain-of-custody forms; processed and used for benthic and water-column toxicity tests, elutriate analysis, and bioaccumulation tests; and subsampled for sediment physical/chemical analyses. This section describes procedures followed for equipment preparation, compositing strategy, and preparation of sediments for biological testing and chemical analyses.

2.2.1 Laboratory Preparation and Safety Considerations

2.2.1.1 Glassware and Equipment Preparation

All glassware, stainless-steel or titanium utensils, Nalgene, Teflon, and other laboratory containers and equipment underwent stringent cleaning procedures to avoid contamination of samples. Glassware (e.g., test containers, aquaria, sediment transfer dishes) was washed with hot water and detergent, rinsed with deionized water, then soaked in a 5% solution of reagent grade nitric acid for a minimum of 4 h and rinsed again with deionized water before it was allowed to air dry. Glassware was then rinsed with methylene chloride and allowed to dry under a fume hood. Polyvinyl chloride (PVC), Nalgene, and Teflon tools were treated in the same manner as glassware. Stainless-steel bowls, spoons, spatulas, and other utensils were washed with hot, water and detergent, rinsed with deionized water, and allowed to air dry. They were then solvent-rinsed with methylene chloride and allowed to dry under a fume hood.

Neoprene stoppers and polyethylene sheets or other porous materials were washed with hot water and detergent and rinsed with deionized water. These items were then "seasoned" by continuous soaking in 0.45-μm filtered seawater for at least 2 days prior to use. Large pieces of laboratory equipment, such as the epoxy-coated sediment mixer, were washed with a dilute solution of detergent, and thoroughly rinsed with tap water followed by deionized water.

Equipment used for determining water quality, including the meters for pH, dissolved oxygen (DO), temperature, and salinity, were calibrated according to the manufacturers' specifications and internal MSL standard operating procedures (SOPs).

2.2.1.2 Laboratory Safety

Because the potential toxicity of the New York/New Jersey federal projects' sediments was unknown, sediment processing and testing were segregated from other laboratory activities. Specific areas at the MSL were established for sample storage and for core-cutting, sediment mixing, and sediment sieving. Work areas were covered with plastic sheeting to contain any waste sediment. Wastewater generated during all operations was retained in 55-gal barrels and periodically pumped through activated charcoal filters and into the MSL's wastewater treatment system. These procedures minimized any potential for cross-contamination of sediment samples.

Laboratory staff members were protected by personal safety equipment such as Tyvek suits, plastic aprons, and rubber gloves. Those who were likely to have the most exposure to the potential volatile compounds in the bulk sediment (i.e., those responsible for opening, homogenizing, and compositing core samples) were also provided with half-mask respirators. Under a requirement of Washington State law, an industrial hygienist was contracted to monitor the air for possible contaminants during periods of peak sample processing activities while laboratory staff members were wearing respirators. The air monitoring was conducted for benzene-soluble hydrocarbons, at the MSL's request.

2.2.2 Preparation of Sediment for Benthic Testing and Bulk Sediment Analyses

As each core sample was readied for processing, the presence of any strata in the cores was noted. Each Lexan core liner was opened either by removing the cap at both ends or by cutting the core longitudinally. The sediment between the mudline and project depth was transferred from the core liner to a clean, stainless-steel bowl. Depending on the water content of the core sediment, the contents of the core liner were removed by either tilting and shaking out the sediment, or by cutting the core longitudinally with a saw and scooping the sediment from the core liner with a spoon or spatula. The sediment was mixed by hand with stainless-steel utensils until the color and consistency appeared homogenous, creating a sample representative of the individual sampling station. When more than one replicate core was collected at a station, both replicates were composited into a single station sample for analysis (i.e., MT-A-4, MT-A-6, MT-B-7, MT-B-8, MT-B-9, and PE-A-2). Sieving was not necessary because organisms that

might interfere with test results were not observed in the sediment samples. Aliquots were then transferred to the appropriate jar(s) for the required physical and chemical analyses. The remainder of the homogenized sediment from the individual core station was added to a composite for biological testing. Each composite sample was homogenized in an epoxy-coated mixer, then stored in labeled epoxy-coated pails, tightly covered, at 4°C±2°C until use for SPP/elutriate preparation or benthic toxicity and bioaccumulation tests.

The Mud Dump Reference Site sediment, *M. nasuta* native control sediment, and *N. virens* native control sediment were also homogenized in the large epoxy-coated mixer, but prior to mixing, these sediments were pressed through a 1-mm mesh to remove live organisms that might affect the outcome of toxicity tests. Native control sediments for *A. abdita* and *R. abronius* were sieved through a 0.5-mm mesh to remove live organisms and mixed in stainless-steel bowls after sieving. After mixing, aliquots for physical and chemical analyses were removed. All reference and control sediments were stored at 4°C±2°C until use in benthic toxicity and bioaccumulation tests.

2.2.3 Preparation of Suspended-Particulate-Phase and Elutriate

Toxicological effects of dredged sediments dissolved and suspended in the water-column at an open-water disposal site were simulated in the laboratory by preparation of the SPP. To prepare SPP, a sediment-water slurry was created and centrifuged at low speed. The centrifugation procedure replaced the 1-h settling procedure described for elutriate preparation in the Green Book. Low speed centrifugation provided a more timely SPP preparation and maintained consistency between projects. The supernatant was decanted and reserved for testing with water-column organisms. The elutriate phase was prepared by centrifuging the SPP at a high speed and collecting the decanted supernatant. This liquid was analyzed for chemical constituents to identify potential water-soluble contaminants that may remain in the water-column after dredge and disposal operations.

SPP was prepared with composited sediment representing each federal navigation project reach or waterway for Port Elizabeth, Arthur Kill, and Hackensack River. Because the salinity of site waters from the New York/New Jersey waterways was less than 18‰ and therefore below the acceptable range for SPP toxicity tests (30‰±2‰), SPP was prepared using Sequim Bay seawater, which has a salinity of approximately 30‰. The Green Book allows either site water, clean seawater, or artificial seawater for preparing SPP and elutriate.

The SPP was prepared by creating a 4:1 (volume:volume) water-to-sediment slurry in 1–L glass jars with Teflon-lined lids. The jars were marked at 200 mL and 400 mL and filled to

the 200-mL mark with 0.45-μm-filtered Sequim Bay seawater. Homogenized sediment was added until the water was displaced to the 400-mL mark. Each jar was then filled to 1 L with filtered seawater, placed on a shaker table under ambient laboratory lighting, and agitated for 30 min at 120 to 150 cycles/min. The slurry was then transferred to 500-mL Teflon jars, tightly sealed, and centrifuged at approximately 1750 rpm for 10 min, at a relative centrifugal force of approximately 1000 g. Following centrifugation, the supernatant was poured into 4-L glass jars. The Teflon jars were rinsed after each use and the above process continued until an adequate amount of SPP was produced from each composite. Between SPP preparations, all glass and Teflon containers were cleaned according to procedures described in Section 2.2.1.1. When all SPP for a treatment was prepared, portions were taken for elutriate preparation. The remaining SPP was either used immediately for biological tests or stored at 4°C±2°C and used within 24 h for testing.

To prepare elutriate for chemistry analyses, a 1-L aliquot of the SPP was collected in an acid-washed Teflon bottle for trace metals analysis, and three 1-L aliquots were collected in EPA-certified amber glass bottles for analysis of organic compounds. The SPP for metals analysis was transferred to acid-washed polycarbonate centrifuge jars, and the SPP for analysis of organic compounds was transferred to Teflon centrifuge jars. Both were centrifuged at 2000 rpm for 30 min at a relative centrifugal force of approximately 1200 g. The decanted supernatant liquid was the elutriate phase. One liter of elutriate was submitted for triplicate trace metals analysis and three 1-L portions were submitted for analysis of organic compounds. Similar quantities of unmanipulated Mud Dump Site water and control water samples from Sequim Bay (control elutriate) were also collected for chemical analysis.

2.3 Biological Testing Procedures

2.3.1 Water-Column Toxicity Tests

Water-column effects of open-water dredged-material disposal were evaluated by exposing three species of water-column organisms to the SPP of selected New York/New Jersey Harbors sediment composites. The three test species were *M. beryllina* (silverside), *M. bahia* (mysid shrimp), and larval *M. edulis* (mussel).

2.3.1.1 Water-Column Toxicity Test with *Menidia beryllina*

Upon receipt, the *M. beryllina* were placed in 10-gal glass aquarium and gradually acclimated from 20.0‰ seawater to 30.0‰ Sequim Bay seawater over a period of 5 days. Prior to testing, *M. beryllina* were held at 20°C± 2°C under ambient laboratory light conditions and

were fed concentrated brine shrimp nauplii daily. During acclimation and holding, 2% to 3% mortality of the silversides was observed.

Test containers for the water-column toxicity test with silversides were 500-mL glass jars, labeled with sediment treatment code, concentration, position number, and replicate number. Appropriate volumes of 100% SPP and salinity-adjusted Mud Dump Site water were combined in a 4-L glass jar to make 0%, 10%, 50%, and 100% SPP test concentrations. Five replicates of each concentration were tested. Because the dredging site waters tested had salinities below acceptable levels for the test organisms (3‰ to 12‰), the salinities were adjusted to acceptable test level by the addition of high-salinity brine (approximately 80‰-90‰) prepared from Sequim Bay seawater. The actual percentages of dredging site water in each test treatment are summarized in Table 2.1.

A brine control was tested to monitor for possible effects from the brine adjustments. The brine control was prepared by first diluting Sequim Bay seawater (30‰) to Mud Dump Site water salinity (26‰), then returning the diluted control seawater back to the test salinity (30‰) with brine. A Sequim Bay seawater control was also included in the test setup.

The 300-mL test volume of SPP was placed in each of the five replicate test chambers. Each test chamber was then placed in a randomly assigned position on a water table at 20°C±2°C and allowed to equilibrate to test temperature for several hours. After the concentrations were prepared and placed on the water table, water quality parameters were measured and recorded for all replicates of each sediment treatment.

To initiate the test, *M. beryllina* were transferred from the holding tank to test chambers with a wide-bore pipet via small transfer cups. Ten individuals were introduced to each test chamber, creating a test population of 50 silversides per concentration for each treatment. Ten animals per test chamber were used, rather than the 20 animals per chamber as described in the Regional Guidance Manual, because it is not possible to make accurate daily observations of *M. beryllina* behavior when using 20 animals. Test initiation time and date were recorded. Following test initiation, water quality parameters were recorded in one replicate each day. Because several treatments had DO levels lower than 40% saturation prior to test initiation, all test chambers were aerated to maintain consistency in handling DO concentration among test containers. Acceptable parameters for this test were as follows:

Temperature	20°C±2°C
DO	>40% saturation (>3.04 mg/L @ 20°C, 30‰)
pH	7.8±0.5
Salinity	30.0‰±2.0‰.

TABLE 2.1. Percentage of Dredging Site Water in Test Treatments Following Salinity Adjustments with Brine

Dredging Site	Salinity of Dredging Site Water (‰)	Percentage of Dredging Site Water
Arthur Kill Reach A	12.5	82
Arthur Kill Reach B	12.5	82
Arthur Kill Reach C	12.0	81
Port Elizabeth Reach A	8.0	77
Port Elizabeth Reach B	8.5	77
Hackensack River Reach A	3.5	72

The test was run under a 16-h light/8-h dark photoperiod. Silversides were not fed during the test. Observations of the animals were performed at 2 h, 24 h, 48 h, and 72 h, and the number of live, dead, and missing organisms was recorded. At the end of the 96-h test period, water quality parameters were measured for all test chambers, and the number of live, dead, and missing silversides was recorded on termination forms. As a quality control check, a second observer confirmed surviving test organisms on at least 10% of the termination counts.

A 96-h, water-only, reference toxicant test was performed concurrently with the toxicity test with each population of *M. beryllina* to establish the health and expected response of the test organisms. The reference toxicant test was conducted in the same manner as the water-column toxicity test. *M. beryllina* were exposed to a seawater control plus four concentrations of copper sulfate: 16, 64, 160, and 400 µg/L, using three replicates of each concentration.

2.3.1.2 Water-Column Toxicity Test with *Mysidopsis bahia*

Upon receipt, the *M. bahia* were placed in 10-gal aquaria and gradually acclimated from 24.0‰ seawater to 30‰ Sequim Bay seawater over a period of 3 days. Prior to testing, mysids were held at 20°C±2°C under ambient laboratory light conditions and were fed concentrated brine shrimp nauplii twice daily. Mortality of the *M. bahia* during holding was less than 1%.

The water-column toxicity test with the mysid was performed in 200 mL of test solution in 400-mL jars, labeled with sediment treatment code, concentration, position number, and replicate number. SPP was mixed with Mud Dump Site water (salinity-adjusted with brine) in a glass 2000-mL graduated cylinder to yield 1500 mL of each of four dilutions: 0%, 10%, 50%, and 100% SPP. Five replicates of each concentration were tested. Each of the test chambers received 300 mL of test solution, then was placed randomly in a recirculating water bath and allowed to equilibrate to test temperature for several hours. Prior to test initiation, water quality

parameters were measured in each replicate of each sediment treatment concentration. A Sequim Bay seawater control and brine control was tested concurrently with the test treatments. Acceptable water quality parameters for this test were as follows:

Temperature	20°C±2°C
DO	>40% saturation (>3.04 mg/L @ 20°C, 30‰)
pH	7.8±0.5
Salinity	30.0‰±2.0‰.

To initiate the test, *M. bahia* were transferred from the holding tank to test chambers with a wide-bore pipet via small transfer cups. Ten individuals were introduced to each test chamber, creating a test population of 50 mysids per concentration (200 mysids per treatment). Ten animals per test chamber were used, rather than the 20 animals per chamber as described in the Regional Guidance Manual, because it is not possible to make accurate daily observations of *M. bahia* behavior when using 20 animals. Test initiation time and date were documented on data forms. The test was run under a 16-h light/8-h dark photoperiod. Observations of test organisms were performed at 4 h, 24 h, 48 h, and 72 h, using a fluorescent light table to enhance visibility of the *M. bahia*. After test initiation, water quality parameters were measured daily in one replicate concentration of each sediment treatment. During the 96-h exposure, *M. bahia* were fed <24-h-old brine shrimp daily. Excess food was removed with a small pipet, taking care not to disturb test animals. Molted exoskeletons and any particulates from the SPP solutions were also removed.

Prior to test termination, water quality parameters were measured in all replicates. At 96 h, the number of live versus dead animals was recorded for each test container. An animal was considered dead if it did not respond to gentle probing. As a quality control check, a second observer confirmed surviving test organisms on at least 10% of the termination counts.

A 96-h, water-only, reference toxicant test was performed concurrently with the toxicity test with each batch of *M. bahia* to establish the health and expected response of the test organisms. The reference toxicant test was conducted in the same manner as the water-column toxicity test. *M. bahia* were exposed to a seawater control plus four concentrations of copper sulfate: 32, 80, 200, and 500 µg/L, using three replicates of each concentration.

2.3.1.3 Water-Column Toxicity Test with *Mytilus edulis* Larvae

Upon receipt at the MSL and prior to testing, adult *M. edulis* were held in flowing, unfiltered Sequim Bay seawater at ambient temperatures for approximately 5 days. Chambers for the bivalve larvae test were 500-mL glass jars labeled with sediment treatment code, concentration, position number, and replicate number. Dilutions of SPP (0%, 10%, 50%, and

100%) were prepared with Mud Dump Site water (salinity-adjusted with brine) in a 2000-mL graduated cylinder, then 300 mL of test solution was poured directly into each test chamber. Sequim Bay seawater controls, brine controls, unadjusted dredging site water controls, and salinity-adjusted dredging site water controls were tested concurrently with the test treatments. Test chambers were placed in random positions on a water table and allowed to equilibrate to test temperature for several hours. Initial water quality parameters were measured in all replicates once test chambers reached testing temperatures (16°C±2°C).

Spawning was induced by placing *M. edulis* into 15°C, filtered Sequim Bay seawater and rapidly raising the holding water temperature to 20°C. Spawning generally occurs within 1 h of temperature elevation; however, on the first day of spawning, gametes were shed after 3 h to 4 h. For this group of mussels, the water bath was changed when DO levels fell below 3.0 mg/L. When spawning began, males and females were identified and isolated in individual jars containing filtered Sequim Bay seawater and allowed to shed gametes for approximately 45 min. Eggs from each female were filtered through a 75-µm Nytex screen into separate jars to remove feces, detritus, and byssal fibers. Sperm from at least three males were pooled and 10 mL of sperm solution was then added to each of the egg stocks. Egg-sperm solutions were mixed every 10 min with a perforated plunger. Fertilization proceeded for 1 h, then fertilization rate (percentage of fertilized) was determined by removing a subsample and observing the number of multi-cell stage embryos. Fertilization was considered successful if greater than 90% of the embryos were in the multi-cell stage. Egg stocks with greater than 90% fertilization were combined and rinsed on a 20-µm Nytex screen to remove excess sperm. Stock embryo solution density was estimated by removing a 0.1-mL subsample and counting all multi-cell embryos, then multiplying by 10 to yield embryo density (embryos/mL). Stock solution was diluted or concentrated to yield 7500 to 9000 embryos/mL. The test was initiated by introducing 1 mL of stock solution into each test chamber, to produce embryo densities of 25 to 30 embryos/mL. Test initiation date and time were recorded on data sheets. Following initiation, 10-mL stocking-density subsamples were removed from each container and preserved in 5% formaldehyde to determine actual stocking density.

Water quality parameters were measured in one replicate concentration per treatment daily throughout the test. Acceptable ranges for water quality parameters were as follows:

Temperature	16°C±2°C
DO	>60% saturation (>4.93 mg/L @ 16°C, 30‰)
pH	7.8±0.5
Salinity	30.0‰±2.0‰.

Because several treatments had DO levels below the acceptable level of 60% saturation, each chamber was provided with gentle aeration to maintain consistency in handling DO concentration among test containers. The test was conducted under a 16-h light/8-h dark photoperiod, and the embryos were not fed during the test. The bivalve test was terminated after 72 h when greater than 80% of the larvae in the controls had reached the D-cell stage. Final water quality parameters were recorded for all replicates. The contents of each chamber were then homogenized with a perforated plunger, and a 10-mL sub-sample removed and placed into a 20-mL scintillation vial. The subsample was then fixed with 1 mL of 50% solution of formaldehyde in seawater. Samples were scored for the appearance of normal and abnormal D-shaped larvae, blastula larvae, and total number of larvae. At least 10% of the counts were confirmed by a second observer.

A 72-h reference toxicant test was conducted with each batch of test larvae to establish the health and expected response of the test organisms. The reference toxicant test was set up and conducted in the same manner as the liquid-phase tests. *M. edulis* larvae were exposed to a filtered Sequim Bay seawater control plus copper sulfate concentrations of 2.9, 9, 30, and 100 µg/L, with three replicates per concentration. Because not all treatments were tested concurrently, a separate reference toxicant test was performed with each set of tests to compare gamete sensitivity to the known toxicant.

2.3.2 Benthic Toxicity Tests

Deposited sediment effects of open-water dredged material disposal were evaluated by benthic acute toxicity tests with two marine amphipod species, *A. abdita* and *R. abronius*, and the mysid *M. bahia*.

2.3.2.1 Static and Flow-Through Tests with *Ampelisca abdita* and *Rhepoxynius abronius*

Upon receipt, the *A. abdita* were placed in a tub of clean sand from their collection area and gradually acclimated with flowing seawater from 25‰ to 32.0‰ Sequim Bay seawater over a period of 4 days. *A. abdita* were received at 15.9°C and acclimated to 20°C±2°C over 3 days. They were held at 20°C±2°C under ambient laboratory light, and were not fed prior to testing.

The *R. abronius* were also placed in a tub of clean sand from their collection area and held under flowing seawater upon arrival at the laboratory. They were received and held at a salinity of 30‰±2‰ and a temperature of 15°C±2°C until testing. *R. abronius* were held under ambient laboratory light and were not fed during the holding period.

Both *A. abdita* and *R. abronius* static and flow-through tests were performed in 1-L glass jars. The flow-through chambers were fitted with funneled lids and screened outflow and overflow ports (Figure 2.1). The water manifold was set to deliver 40 mL/min, or approximately 75 exchanges of overlying water per day, to the flow-through chambers. In static and flow-through tests with both species, five replicates of each test, reference, and control treatment were used. Each test chamber contained 20 organisms for a test population of 100 amphipods per sediment treatment.

Because the test sediments were collected in riverine and estuarine locations, the salinity of the interstitial water was very low. Low interstitial water salinity could cause adverse biological effects; therefore, a slightly different procedure was used to introduce sediment to the test chambers. Usually, 250 mL of sediment are placed in the chamber, and the chamber filled to 750 mL with filtered seawater. For these tests, filtered seawater and sediment (250 mL each) were added to the container and stirred. Seawater was added to reach the final test volume of 750 mL, and the sediment and water were stirred again. The chambers were then placed on the water tables and allowed to settle overnight. The following day, prior to test initiation, overlying water salinity was measured in all chambers to determine whether any values fell below the acceptable range of 28‰ to 32‰. If salinities were acceptable, other water quality parameters were measured and the test initiated as usual. For any chamber with a low salinity, part of the overlying water was replaced with filtered seawater to achieve an acceptable water salinity measurement. However, sediments were not restirred.

Salinity, temperature, DO, and pH were measured in all replicates prior to test initiation. These parameters were measured in at least one replicate per treatment daily, and in all replicates at test termination. In the flow-through test, flow rates of all chambers were measured daily. The following were the acceptable ranges for water quality parameters during the amphipod tests:

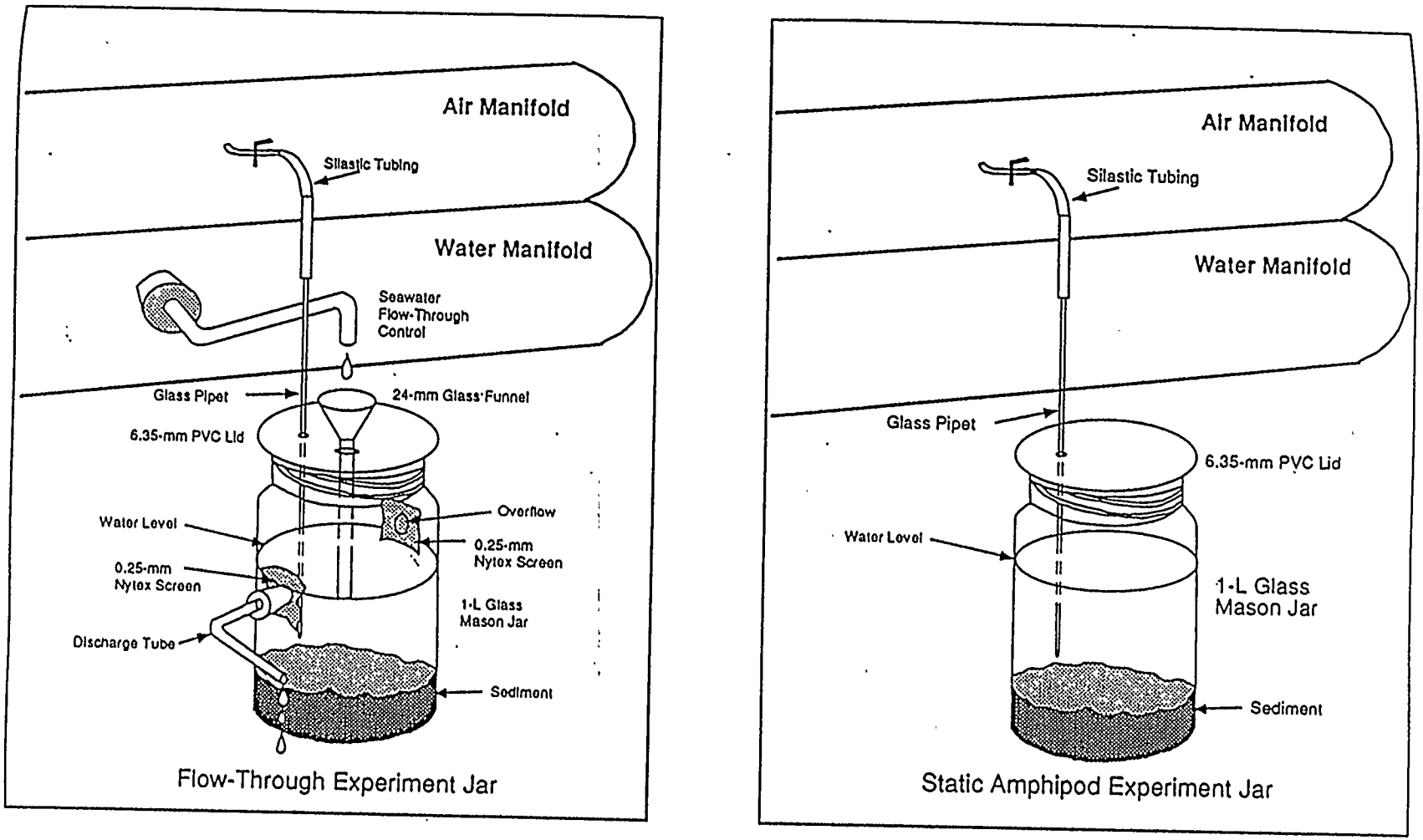


FIGURE 2.1. Flow-Through and Static Testing Containers for *A. abdita* and *R. abronius* Toxicity Tests

	A. abronius	*R. abronius*
Temperature	20°C±2°C	14°C±2°C
DO	>90% saturation (>6.84 mg/L)	>90% saturation (>7.68 mg/L)
pH	7.8±0.5	7.8±0.5
Salinity	30‰±2‰	30‰±2‰
Flow Rate (static)	none	none
Flow Rate (flow-through)	40±5 mL/min	40±5 mL/min.

Gentle aeration was provided throughout both the flow-through and static tests. Amphipod tests were conducted under continuous light to discourage organisms from emerging from the sediment; the organisms were not fed during the test.

At the end of the 10-day period, the contents of each chamber were gently sieved through 0.5-mm mesh, and the number of live, dead, and missing amphipods was recorded on termination forms. An animal was considered dead if it did not respond to gentle probing. As a quality control check, a second observer confirmed surviving test organisms on at least 10% of the termination counts.

In addition to the routine water quality monitoring, estimates of total ammonia levels in the overlying water and pore water were made for each test treatment under both static and flow-through conditions. These measurements were made using an ion-specific probe on three "dummy" containers per treatment that were set up in the same manner as the actual test containers (250 mL of sediment was mixed with 250 mL seawater, then brought up to a volume of 750 mL with seawater and allowed to settle overnight on water table) but did not have animals added to them. The first and second sets were held on the 20°C static table and the third set was held on the 15°C flow-through table. After overnight settling, initial ammonia, pH, and salinity were measured in overlying water and pore water in the first of the three sets of dummy containers. After 10 days, ammonia, pH, and salinity were measured in the overlying water and pore water of the second and third sets of containers. The pore water was obtained by decanting the overlying water in the dummy jar and centrifuging the sediment in a Teflon jar for at least 20 min at approximately 3000 rpm.

These tests were conducted before issuance of ammonia protocols by EPA and the USACE (EPA/USACE 1993) that provide guidance for reducing pore water ammonia concentrations to <30 mg/L (total ammonia) before initiation of toxicity tests. Although ammonia levels were monitored in overlying water and pore water, no procedures were implemented to reduce pore water ammonia levels before test initiation.

Reference toxicant tests with cadmium chloride were performed concurrently with the *A. abdita* and *R. abronius* tests. The reference toxicant tests were 96-h, water-only exposures that were otherwise conducted following the same procedures as for the static tests with sediment. *A. abdita* were exposed to nominal concentrations of 0, 0.25, 0.5, 1, and 2 mg/L cadmium chloride. *R. abronius* were exposed to nominal concentrations of 0, 0.5, 1, 2, and 4 mg/L cadmium chloride.

2.3.2.2 Static Test With *Mysidopsis bahia*

Upon receipt, the *M. bahia* were placed in 10-gal aquaria and gradually acclimated from 24‰ seawater to 30‰ Sequim Bay seawater over a period of 3 days. Prior to testing, mysids were held at 20°C±2°C under ambient laboratory light conditions and were fed concentrated brine shrimp nauplii twice daily. Mortality of the *M. bahia* during holding was less than 1%.

The procedures for conducting the 10-day benthic acute toxicity test with *M. bahia* were similar to those for the static amphipod test. The test was performed in 1-L glass jars. To prepare each test container, 250 mL of sediment was mixed with 750 mL seawater (to prevent the low interstitial water salinity from decreasing the overlying water salinity to unacceptable levels) and allowed to settle overnight on the water table. Five replicates of selected test treatments, reference sediment, and control sediment were tested. Each test chamber contained 20 organisms for a test population of 100 mysids per treatment.

Water quality parameters were measured in all replicates prior to test initiation, in at least one replicate per treatment daily, and in all replicates at test termination. The following were the acceptable ranges for water quality parameters during the *M. bahia* benthic test:

Temperature	20°C±2°C
DO	>40% saturation (>3.04 mg/L)
pH	7.8±0.5
Salinity	30‰ ± 2‰
Flow Rate (static)	none.

Gentle aeration was provided to all test chambers during the test to maintain consistency in handling DO concentration among test containers. The mysid test was conducted under a 16-h light/8-h dark photoperiod. During the test, mysids were fed brine shrimp nauplii approximately 0.5 mL per test container per day. At the end of the 10-day period, the contents of each chamber were gently sieved through 0.5-mm mesh, and the number of live and dead or missing mysids was recorded on termination forms. An animal was considered dead if it did not respond to gentle prodding. As a quality control check, a second observer confirmed surviving test organisms on at least 10% of the termination counts.

Because the same mysid population was used for the benthic test and the water-column test, one 96-h, water-only reference toxicant test with copper sulfate (0, 32, 80, 200, and 500 μg/L) was performed concurrently with these tests. (Refer to Section 2.3.1.2.)

2.3.3 Bioaccumulation Tests with *Nereis virens* and *Macoma nasuta*

The polychaete *N. virens* and the bivalve *M. nasuta* were used to evaluate the potential bioaccumulation of contaminants from dredged material. Upon receipt at the MSL, and prior to testing, *N. virens* were held in their native sediment in shallow trays covered with seaweed and supplied with well-aerated, continuously flowing, 20°C seawater. *M. nasuta* were held in their native sediment in a water table covered with continuously flowing 15°C seawater. Both species were held under ambient laboratory lighting, and were not fed during the holding period.

The bioaccumulation tests were 28-day flow-through exposures to sediment followed by a 24-h depuration period in seawater only (flow-through, about six volume exchanges per day) that allowed the organisms to void their digestive tracts of sediment. *N. virens* and *M. nasuta* were tested in separate 10-gal flow-through aquaria. Animals were exposed to five replicates of each test and reference sediment treatment and three replicates of the native control sediment; each chamber contained 25 *M. nasuta* or 30 *N. virens.* Water quality parameters (temperature, DO, pH, and salinity) were measured in all replicates at test initiation, in at least one replicate per treatment daily, and in all replicates at test termination. Flow rates were measured daily in all chambers. The Regional Guidance Manual provides an acceptable temperature range of 13°C±1°C for *M. nasuta*, however, laboratory logistics required that *M. nasuta* share a 15°C flow-through water supply with *R. abronius.* This alteration of test temperature was not expected to affect the outcome of the test; bioaccumulation tests with *M. nasuta* can be conducted at 15°C±2°C successfully. After discussion with the USACE-NYD project manager, the following ranges for water quality parameters were established as acceptable for the *M. nasuta* and *N. virens* tests:

	M. nasuta	*N. virens*
Temperature	14°C±2°C	20°C±2°C
DO	> 60% saturation (>5.03 mg/L)	> 60% saturation (>4.56 mg/L)
pH	7.8±0.5	7.8±0.5
Salinity	30‰±2‰	30‰±2‰
Flow Rate	125±10 mL/min	125±10 mL/min.

Aeration was provided to all test chambers to maintain consistency in handling DO concentrations among test chambers. The test was conducted under a 16-h light/8-h dark photoperiod. *M. nasuta* and *N. virens* were not fed during the test. Water quality, organism

behavior (e.g., burrowing activity, feeding) and organism mortality were recorded daily. Dead organisms were removed daily. At the end of the 28-day testing period, *M. nasuta* and *N. virens* were placed in clean, flowing seawater for 24 h, after which the tissues were transferred into the appropriate chemistry jars for metals, pesticide/PCB, PAH, and dioxin/furan analyses. All tissue samples were frozen immediately and stored at <20°C until analysis. Tissue samples were collected at test initiation for measurement of lipid content.

Water-only reference toxicant tests (96-h) were also performed using copper sulfate in five geometrically increasing concentrations. The exposures were conducted using a test volume of 5 L in static 9.5-L (2.5-gal) aquaria. Three replicates of each concentration were tested, each containing 10 organisms. Water quality parameters were monitored at the same frequency and maintained within the same limits as the 28-day test, except there were no flow rates. Based on information received from the USACE-NYD, concentrations for the initial reference toxicant test with *M. nasuta* were 0 (control), 0.63, 1.25, 2.5, 5, and 10 mg/L copper sulfate, and 0, 0.31, 0.63, 1.25, 2.5, and 5 mg/L copper sulfate for the initial reference toxicant test with *N. virens*. High mortality of both species was observed in all but the lowest concentrations, and the reference toxicant tests were repeated with copper sulfate concentrations reduced by a factor of 10: *M. nasuta* were exposed to 0, 0.125, 0.25, 0.50, and 1.0 mg/L copper sulfate; *N. virens* were exposed to 0, 0.063, 0.125, 0.25, and 0.50 mg/L copper sulfate.

2.4 Physical and Chemical Analytical Procedures

Individual sediment core, composited bulk sediment, water, elutriate, and tissue samples were analyzed for selected physical and chemical parameters. Table 2.2 lists the parameters measured in each sample type, the method used for each analysis, and the target analytical detection limits. The following sections briefly describe the procedures used for physical and chemical analyses. Procedures followed those required by the Regional Guidance Manual unless otherwise noted.

2.4.1 Sediment Physical Parameters

Physical parameters measured in sediment samples were grain size, moisture content, bulk density, and specific gravity. Grain size was measured according to American Society of Testing and Materials (ASTM) methods D-2217/D-422. Grain size was reported as percentages within three general size classes:

TABLE 2.2. List of Analytes, Methods, and Target Detection Limits

Analyte	Methods	Sediment Detection Limit [a]	Tissue Detection Limit [b]	Water Detection Limit
PHYSICAL PARAMETERS				
Grain Size	Plumb (1981)	--[c]	--	--
Specific Gravity	ASTM D-854	--	--	--
Bulk Density	EM 1110-2-1906	--	--	--
Percent Moisture	Sediment: Plumb (1981)	1.0 %	--	--
	Tissue: Freeze-dry	--	1.0 %	--
METALS				
Arsenic	EPA 200.2, -.3, -.8, -.9 [d]	0.1 mg/kg	1.0 mg/kg	--
Cadmium	EPA 200.2, -.3, -.8, -.9 [d]	0.01 mg/kg	0.1 mg/kg	0.025 µg/L
Chromium	EPA 200.2, -.3, -.8, -.9 [d]	0.02 mg/kg	0.2 mg/kg	1.0 µg/L
Copper	EPA 200.2, -.3, -.8, -.9 [d]	0.1 mg/kg	1.0 mg/kg	0.35 µg/L
Lead	EPA 200.2, -.3, -.8, -.9 [d]	0.1 mg/kg	0.1 mg/kg	0.35 µg/L
Mercury	EPA 245.5 (sed.); 245.6 (tiss.) [d]	0.02 mg/kg	0.02 mg/kg	
	Bloom and Crecelius (1983) (water)			0.002 µg/L
Nickel	EPA 200.2, -.3, -.8, -.9 [d]	0.1 mg/kg	0.1 mg/kg	0.3 µg/L
Silver	EPA 200.2, -.3, -.8, -.9 [d]	0.1 mg/kg	0.1 mg/kg	0.25 µg/L
Zinc	EPA 200.2, -.3, -.8, -.9 [d]	0.1 mg/kg	1.0 mg/kg	0.15 µg/L
ORGANIC COMPOUNDS				
TOC	EPA (1986)	0.01 %	--	--
Pesticides				
Aldrin	EPA 8080 (sediment, tissue)	1.0 µg/kg	0.4 µg/kg	
	EPA 608 (water) [d]			0.004 µg/L
α-Chlordane	EPA 8080 (sediment, tissue)	1.0 µg/kg	0.4 µg/kg	
	EPA 608 (water) [d]			0.014 µg/L
trans-Nonachlor	EPA 8080 (sediment, tissue)	1.0 µg/kg	0.4 µg/kg	
	EPA 608 (water) [d]			0.014 µg/L
Dieldrin	EPA 8080 (sediment, tissue)	1.0 µg/kg	0.4 µg/kg	
	EPA 608 (water) [d]			0.002 µg/L
4,4'-DDT	EPA 8080 (sediment, tissue)	1.0 µg/kg	0.4 µg/kg	
	EPA 608 (water) [d]			0.012 µg/L
2,4'-DDT	EPA 8080 (sediment, tissue)	1.0 µg/kg	0.4 µg/kg	
	EPA 608 (water) [d]			0.020 µg/L
4,4'-DDD	EPA 8080 (sediment, tissue)	1.0 µg/kg	0.4 µg/kg	
	EPA 608 (water) [d]			0.011 µg/L
2,4'-DDD	EPA 8080 (sediment, tissue)	1.0 µg/kg	0.4 µg/kg	
	EPA 608 (water) [d]			0.020 µg/L
4,4'-DDE	EPA 8080 (sediment, tissue)	1.0 µg/kg	0.4 µg/kg	
	EPA 608 (water) [d]			0.004 µg/L
2,4'-DDE	EPA 8080 (sediment, tissue)	1.0 µg/kg	0.4 µg/kg	
	EPA 608 (water) [d]			0.020 µg/L
Endosulfan I	EPA 8080 (sediment, tissue)	1.0 µg/kg	0.4 µg/kg	
	EPA 608 (water) [d]			0.014 µg/L
Endosulfan II	EPA 8080 (sediment, tissue)	1.0 µg/kg	0.4 µg/kg	
	EPA 608 (water) [d]			0.004 µg/L
Endosulfan sulfate	EPA 8080 (sediment, tissue)	1.0 µg/kg	0.4 µg/kg	
	EPA 608 (water) [d]			0.010 µg/L

TABLE 2.2. (contd)

Analyte	Method(s)	Sediment Detection Limit	Tissue Detection Limit	Water Detection Limit
Heptachlor	EPA 8080 (sediment, tissue)	1.0 µg/kg	0.4 µg/kg	
	EPA 608 (water) [d]			0.003 µg/L
Heptachlor epoxide	EPA 8080 (sediment, tissue)	1.0 µg/kg	0.4 µg/kg	
	EPA 608 (water) [d]			0.100 µg/L
PCBs				
8 (2,4')	NYSDEC (1992) [d]	1.0 µg/kg	0.4 µg/kg	0.0005µg/L
18 (2,2',5)	NYSDEC (1992) [d]	1.0 µg/kg	0.4 µg/kg	0.0005µg/L
28 (2,4,4')	NYSDEC (1992) [d]	1.0 µg/kg	0.4 µg/kg	0.0005µg/L
44 (2,2',3,5')	NYSDEC (1992) [d]	1.0 µg/kg	0.4 µg/kg	0.0005µg/L
49 (2,2',4,5')	NYSDEC (1992) [d]	1.0 µg/kg	0.4 µg/kg	0.0005µg/L
52 (2,2',5,5')	NYSDEC (1992) [d]	1.0 µg/kg	0.4 µg/kg	0.0005µg/L
66 (2,3',4,4')	NYSDEC (1992) [d]	1.0 µg/kg	0.4 µg/kg	0.0005µg/L
87 (2,2',3,4,5')	NYSDEC (1992) [d]	1.0 µg/kg	0.4 µg/kg	0.0005µg/L
101 (2,2',3,5,5')	NYSDEC (1992) [d]	1.0 µg/kg	0.4 µg/kg	0.0005µg/L
105 (2,3,3',4,4')	NYSDEC (1992) [d]	1.0 µg/kg	0.4 µg/kg	0.0005µg/L
118 (2,3',4,4',5)	NYSDEC (1992) [d]	1.0 µg/kg	0.4 µg/kg	0.0005µg/L
128 (2,2',3,3',4,4')	NYSDEC (1992) [d]	1.0 µg/kg	0.4 µg/kg	0.0005µg/L
138 (2,2',4,4',5,5')	NYSDEC (1992) [d]	1.0 µg/kg	0.4 µg/kg	0.0005µg/L
153 (2,2',4,4',5,5')	NYSDEC (1992) [d]	1.0 µg/kg	0.4 µg/kg	0.0005µg/L
170 (2,2',3,3',4,4',5)	NYSDEC (1992) [d]	1.0 µg/kg	0.4 µg/kg	0.0005µg/L
180 (2,2',3,4',5,5',6)	NYSDEC (1992) [d]	1.0 µg/kg	0.4 µg/kg	0.0005µg/L
183 (2,2',3,4,4',5',6)	NYSDEC (1992) [d]	1.0 µg/kg	0.4 µg/kg	0.0005µg/L
184 (2,2',3,4,4',6,6')	NYSDEC (1992) [d]	1.0 µg/kg	0.4 µg/kg	0.0005µg/L
187 (2,2',3,4',5,5',6)	NYSDEC (1992) [d]	1.0 µg/kg	0.4 µg/kg	0.0005µg/L
195 (2,2',3,3',4,4',5,6)	NYSDEC (1992) [d]	1.0 µg/kg	0.4 µg/kg	0.0005µg/L
206 (2,2',3,3',4,4',5,5',6)	NYSDEC (1992) [d]	1.0 µg/kg	0.4 µg/kg	0.0005µg/L
209 (2,2',3,3',4,4',5,5',6,6')	NYSDEC (1992) [d]	1.0 µg/kg	0.4 µg/kg	0.0005µg/L
Dioxins/Furans				
2,3,7,8-TCDD	EPA 8290	1 pg/g	1 pg/g	--
1,2,3,7,8-PCDD	EPA 8290	--	1 pg/g	--
1,2,3,4,7,8-HxCDD	EPA 8290	--	2.5 pg/g	--
1,2,3,6,7,8-HxCDD	EPA 8290	--	2.5 pg/g	--
1,2,3,7,8,9-HxCDD	EPA 8290	--	2.5 pg/g	--
1,2,3,4,6,7,8-HpCDD	EPA 8290	--	2.5 pg/g	--
OCDD	EPA 8290	--	5 pg/g	--
2,3,7,8-TCDF	EPA 8290	1 pg/g	1 pg/g	--
2,3,4,7,8-PCDF	EPA 8290	--	1 pg/g	--
1,2,3,7,8-PCDF	EPA 8290	--	1 pg/g	--
1,2,3,4,7,8-HxCDF	EPA 8290	--	2.5 pg/g	--
1,2,3,6,7,8-HxCDF	EPA 8290	--	2.5 pg/g	--
1,2,3,4,7,8-HxCDF	EPA 8290	--	2.5 pg/g	--
2,3,4,6,7,8-HxCDF	EPA 8290	--	2.5 pg/g	--
1, 2,3,4,6,7,8-HpCDF	EPA 8290	--	2.5 pg/g	--
1, 2,3,4,7,8,9-HpCDF	EPA 8290	--	2.5 pg/g	--
OCDF	EPA 8290	--	5 pg/g	--

TABLE 2.2. (contd)

Analyte	Method(s)	Sediment Detection Limit	Tissue Detection Limit	Water Detection Limit
PAHs				
Acenapthene	EPA 8270 [d]	10 µg/kg	4 µg/kg	--
Acenaphthylene	EPA 8270 [d]	10 µg/kg	4 µg/kg	--
Anthracene	EPA 8270 [d]	10 µg/kg	4 µg/kg	--
Fluorene	EPA 8270 [d]	10 µg/kg	4 µg/kg	--
Naphthalene	EPA 8270 [d]	10 µg/kg	4 µg/kg	--
Phenanthrene	EPA 8270 [d]	10 µg/kg	4 µg/kg	--
Benzo(a)anthracene	EPA 8270 [d]	10 µg/kg	4 µg/kg	--
Benzo(a)pyrene	EPA 8270 [d]	10 µg/kg	4 µg/kg	--
Benzo(b)fluoranthene	EPA 8270 [d]	10 µg/kg	4 µg/kg	--
Benzo(g,h,i)perylene	EPA 8270 [d]	10 µg/kg	4 µg/kg	--
Benzo(k)fluoranthene	EPA 8270 [d]	10 µg/kg	4 µg/kg	--
Chrysene	EPA 8270 [d]	10 µg/kg	4 µg/kg	--
Dibenzo(a,h)anthracene	EPA 8270 [d]	10 µg/kg	4 µg/kg	--
Fluoranthene	EPA 8270 [d]	10 µg/kg	4 µg/kg	--
Indeno(1,2,3-cd)pyrene	EPA 8270 [d]	10 µg/kg	4 µg/kg	--
Pyrene	EPA 8270 [d]	10 µg/kg	4 µg/kg	--
Industrial Chemicals/Herbicides				
1,4-Dichlorobenzene	EPA 8270 [d]	1.0 µg/kg	0.4 µg/kg	--
2,4-D	EPA 8150	100 µg/kg	--	--
2,4,5-T	EPA 8150	20 µg/kg	--	--
OTHER MEASUREMENTS				
Total Lipids	Bligh and Dyer (1959)/ Randall (1988)	--	0.1 %	--

(a) Detection limits are in dry weight for all sediment parameters except Hg and 2,3,7,8-TCDD/TCDF.
(b) Detection limits are in wet weight for all organic and inorganic tissue parameters.
(c) -- Analysis not required for this parameter.
(d) Equivalent Battelle standard operating procedures were substituted for the methods cited. Sample extraction and clean-up for pesticides, PCBs, and PAHs are described in NOAA 1993. Water extraction using chelation/extraction for Cd, Cu, Pb, Ag, and Ni are described in "Metals-14" S9.2 (EPA 1979).

Sand ≥0.0625-mm diameter

Silt <0.0625-mm diameter and ≥0.0039-mm diameter

Clay ≤0.0039-mm diameter.

Moisture content was determined according to the Plumb (1981) method. Specific gravity was measured according to ASTM D-854, and bulk density (or unit weight) was determined according to EM 111-2-1906 (USACE 1970).

2.4.2 Sediment, Water, and Tissue Chemical Parameters

Sediment, water, and tissue samples from the New York/New Jersey federal projects were analyzed for a series of inorganic and organic compounds (Table 2.2). Individual sediment core samples were analyzed for TOC and 2,3,7,8-TCDD/TCDF, and composited samples representing the reaches within the federal projects were analyzed for metals, pesticides, PCBs, PAHs, 1,4-dichlorobenzene, 2,4,5-T, and 2,4,-D. Dredging-site, Mud Dump Site, elutriate, and control water samples were analyzed for metals, pesticides, and PCBs. Selected tissue samples from the bioaccumulation tests were analyzed for metals, pesticides, PCBs, dioxin and furan congeners (with the exception of MOTBY samples, which were analyzed for the 2,3,7,8-TCDD/TCDF congeners only), PAHs, and 1,4-dichlorobenzene. Background tissue samples were collected from the test populations of *N. virens* and *M. nasuta*, allowed to depurate for 24 h, and chemically analyzed to determine whether test organisms had been exposed to any of the contaminants of concern prior to testing. Tissues of test organisms exposed to the control treatments were frozen and archived in case further analysis may be required.

2.4.2.1 TOC

Samples were analyzed for TOC according to the EPA Edison, New Jersey, Laboratory Procedure (EPA 1986). Inorganic carbon is removed from the sediment sample by acidification. The sample is combusted and the evolved carbon dioxide is quantitated using a carbon-hydrogen-nitrogen (CHN) analyzer. TOC was reported as a percentage of the dry weight of the unacidified sample.

2.4.2.2 Metals

Preparation and analysis of water samples for Cd, Cr, Cu, Pb, Ni, Ag, and Zn were conducted according to MSL SOPs equivalent to EPA Methods 200.2, 200.8, and 200.9 (EPA 1991). Samples were chelated with 2% ammonium pyrrolidinedithiocarbamate (APDC), precipitated out of solution, and filtered. The filter was digested in concentrated nitric acid and the digestate is analyzed by inductively coupled plasma/mass spectrometry (ICP/MS, EPA 200.8) for Cd, Cu, Pb, Ni, and Ag. This chelation/extraction technique, EPA 218.3, followed

methods described in "Metals-14," S 9.2 (EPA 1979). Water samples were analyzed directly by graphite furnace atomic absorption (GFAA) spectroscopy (EPA 200.9) for Cr and Zn. Water samples were analyzed for Hg directly by cold vapor atomic fluorescence (CVAF) according to the method of Bloom and Crecelius (1983). This CVAF technique is based on emission of 254-nm radiation by excited elemental Hg atoms in an inert gas stream. Mercuric ions in an oxidized sample were reduced to elemental Hg with tin chloride ($SnCl_2$), then purged onto gold-coated sand traps to preconcentrate the Hg and remove interferences. Mercury vapor was thermally desorbed to a second "analytical" gold trap, and from that into the fluorescence cell. Fluorescence (indicated by peak area) is proportional to the quantity of Hg collected, and was quantified using a standard curve as a function of the quantity of the sample purged.

Sediment samples for analysis of As, Cd, Cr, Cu, Pb, Ni, and Zn were prepared according to an MSL SOP equivalent to EPA Method 200.2 (EPA 1991). Solid samples were 0..first freeze-dried and blended in a Spex mixer mill. A 0.2- to 0.5-g aliquot of dried homogeneous sample was then digested in a microwave using nitric and hydrochloric acids. Sediment samples were analyzed for As, Cd, Cr, Cu, Pb, Ni, and Zn using ICP/MS, following an MSL SOP based on EPA Method 200.8 (EPA 1991). Sediment samples were analyzed for Ag by GFAA according to an MSL SOP based on EPA Method 200.9 (EPA 1991). Sediments were analyzed for Hg by cold vapor atomic absorption (CVAA) (spectroscopy) according to an MSL procedure for total Hg determination equivalent to EPA Method 245.5 (EPA 1991).

Tissue samples were prepared for analysis of metals according to an MSL SOP based on EPA Method 200.3. Solid samples were first freeze-dried and blended, and a 0.2- to 0.5-g aliquot of dried homogeneous sample was then digested in a microwave using nitric acid, hydrogen peroxide, and hydrochloric acid. Tissue samples were analyzed for As, Cd, Cr, Cu, Pb, Ni, Ag, and Zn using the ICP/MS method (EPA Method 200.8 [EPA 1991]). Tissue samples were analyzed for Hg by CVAA following an MSL procedure equivalent to EPA Method 245.6 (EPA 1991). All methods have been used previously at the MSL and have consistently provided data that are of acceptable accuracy, precision, and with low method detection limits (MDLs). The MSL has participated in the National Oceanic and Atmospheric Administration (NOAA) Status and Trends round robin studies and has always been rated "excellent" for the methods described in this section.

2.4.2.3 Chlorinated Pesticides and PCBs

Water samples were prepared and analyzed for pesticides and PCBs according to an MSL procedure equivalent to EPA Method 608 (40 CFR Section 135), and incorporating

techniques developed by the NOAA National Status and Trends "Mussel Watch" Program (NOAA 1993). Samples were extracted with methylene chloride. Extract volumes were reduced and solvent-exchanged to hexane. The sample extracts underwent cleanup by alumina and silica column chromatography; further interferences were removed by an additional cleanup treatment using high-performance liquid chromatography (HPLC). Sample extracts were concentrated and analyzed using gas chromatography with electron capture detection (GC-ECD) by the internal standard technique.

Sediment and tissue samples for pesticide and PCB analysis were extracted and analyzed according to an MSL procedure similar to EPA Method 8080 for pesticides and the New York State Department of Environmental Conservation (NYSDEC) Congener-Specific Method 91-11 (NYSDEC 1992). The method also uses techniques from the NOAA Mussel Watch procedure. A 20- to 50-g sample of homogenized sediment or macerated tissue was first combined with sodium sulfate in a sample jar to remove water. Samples were extracted by adding successive portions of methylene chloride and agitating sample jars at ambient temperature using a roller technique. Extracts volumes were reduced and solvent exchanged to hexane, followed by Florisil column chromatography cleanup. Interferences were removed using HPLC chromatography; tissue sample extracts underwent an additional cleanup by gel permeation chromatography (GPC). Sample extracts were concentrated and analyzed using GC-ECD by the internal standard technique. Pesticide and PCB detections were quantitatively confirmed on a secondary column.

The concentration of total PCBs in water, sediment, or tissues was estimated by calculating the sum of the 22 congeners and multiplying by 2 (personal communication, L.B. Rosman, USACE, 1996). For nondetect values, one-half of the detection limit was used to calculate the mean of replicate analyses and the sum of PCBs.

2.4.2.4 Dioxins and Furans

All sediment and tissue samples were analyzed for 2,3,7,8-TCDD/TCDF; tissue samples from the Arthur Kill, Port Elizabeth, and Hackensack River projects were also analyzed for 15 other PCDD/PCDF congeners (see Table 2.2). All dioxin analyses followed EPA Method 8290 (EPA 1990) with modifications taken from EPA Method 1613. Because samples had a high water content, they were first centrifuged to remove excess water from the sediment. A 5- to 10-g aliquot of sediment or tissue was spiked with nine isotopically labeled PCDD/PCDF compounds. Sediment samples underwent a toluene Soxhlet extraction; tissue samples underwent a hexane/methylene chloride Soxhlet extraction. The sample extracts were

subjected to an acid/base washing and dried with sodium sulfate before cleanup by silica/alumna and carbon column chromatography. After a concentration step, the extracts were spiked with internal standards: $^{13}C_{12}$-1,2,3,4-TCDD for quantitation of tetra- and pentachlorinated dioxin and furan congeners, and $^{13}C_{12}$-1,2,3,4,8,9-HxCDD for quantitation of hexa-, hepta-, and octachlorinated dioxin and furan congeners. Sample extracts were analyzed by high-resolution gas chromatography/high-resolution mass spectroscopy (HRGC/HRMS) in the selective ion monitoring (SIM) mode.

Some modifications were made to Method 8290. For all sediment samples and tissue samples from the MOTBY project, a DB-Dioxin column was used in place of the DB-5 column prescribed by Method 8290. The DB-Dioxin column provides separation of 2,3,7,8-TCDD/TCDF from all other tetrachloro-substituted isomers, eliminating the need for a confirmatory analysis with a second column. Additionally, $^{37}Cl_4$-2,3,7,8-TCDD was used as a cleanup recovery standard, added to sample extracts prior to cleanup to evaluate analyte recovery through cleanup procedures, as an extra measure of quality control. Procedures similar to EPA Method 1613 were followed for this cleanup recovery standard.

2.4.2.5 PAHs and 1,4-Dichlorobenzene

Sediment and tissue samples were prepared for the analysis of 16 PAHs and 1.4-dichlorobenzene (see Table 2.2) according to an MSL method based on the NOAA Mussel Watch procedure (NOAA 1993). A 20- to 50-g sample of homogenized sediment or macerated tissue was first combined with sodium sulfate in a sample jar to remove water. Samples were extracted by adding successive portions of methylene chloride and agitating sample jars at ambient temperature using a roller technique. Extracts volumes were reduced and solvent exchanged to hexane, followed by column chromatography cleanup. Interferences were removed using HPLC chromatography; tissue sample extracts underwent an additional cleanup by GPC. Sample extracts were concentrated and analyzed using gas chromatography with mass spectrometry (GC/MS) in the SIM mode. In calculation of total PAHs, one-half the detection limit was used when a compound was undetected in a sample.

2.4.2.6 Lipids

The lipid content of *M. nasuta* and *N. virens* was determined by the analysis of unexposed background tissue samples of each species. The lipid analysis procedure is a modification of Bligh and Dyer (1959) method, which involves a chloroform extraction followed by gravimetric measurement of lipids. Randall (1988) modified the original Bligh and Dyer method

to accommodate a smaller tissue sample size. Lipid analysis was performed in triplicate, once for each species. Lipid concentration was reported as a percentage on a dry weight basis.

2.5 Data Analysis and Interpretation Procedures

Statistical analyses were conducted to determine the magnitude and significance of toxicity and bioaccumulation in test treatments relative to the reference treatment. Each statistical test was based on a completely random design that allowed unbiased comparison between treatments.

2.5.1 Randomization

All water-column and benthic toxicity tests were designed as completely random tests. Organisms were randomly allocated to treatments, and treatments were randomly positioned on water tables. To determine randomization, a random-number table was generated for each test using the discrete random-number generator in Microsoft *Excel* spreadsheet software.

2.5.2 Statistical Analysis of Water-Column Tests

Two statistical analyses are presented in the 1991 Green Book for the interpretation of SPP (water-column) tests. The first is a one-sided t-test between survival in control test replicates and survival in the 100% SPP test replicates. A significant difference indicates acute toxicity in the 100% SPP treatment(s). This test is to be performed only when survival in the 100% SPP is less than the control (0% SPP) survival, and when control survival is >90% for non-larval tests and >70% for larval tests. Prior to conducting the t-test, angular transformation (arcsine of the square root) of the proportion surviving in test replicates was performed to reduce possible heterogeneity of variance between mean survival of test organisms in the control and in the 100% SPP. The second analysis required by the 1991 Green Book is estimation of a median lethal concentration (LC_{50}) or median effective concentration (EC_{50}). The LC_{50} or EC_{50} values for these tests were estimated using the trimmed Spearman-Karber method (Finney 1971) and are expressed as % SPP. The Spearman-Karber estimator is appropriate only if there was increasing mortality (or effect) with increasing concentration, and if at least 50% mortality (or effect) was observed in at least one test concentration when normalized to control survival. If 50% mortality (or effect) did not occur in the 100% SPP concentrations for a treatment, then the LC_{50} or EC_{50} value was reported as >100% SPP.

2.5.3 Statistical Analysis of Benthic Toxicity Tests

Benthic toxicity of all sediment treatments was compared to a single reference treatment by Dunnett's test (Dunnett 1964). The arcsine square-root of the proportion of organisms surviving the test was used to stabilize the within-class variances. As recommended by the Green Book, an experiment-wise error of α=0.05 was used. A statistically significant difference indicates significant acute toxicity in a test sediment relative to the reference sediment, if the additional mortality is greater than 10% for mysids or 20% for amphipods.

2.5.4 Statistical Analysis of Bioaccumulation

Results of the chemical analyses of test organism tissues exposed to the sediment treatments were statistically compared with those tissues similarly exposed to the Mud Dump Reference Site treatment using Dunnett's test with an experiment-wise error of α=0.05. The Dunnett's test determined whether or not contaminant body burdens in organisms exposed to the test sediments statistically exceeded those of organisms exposed to the reference sediment.

Statistical analyses were performed using tissue contaminant concentrations on a dry weight basis for comparability (to eliminate variability of tissue water content). When a compound (metals, pesticides, PCBs, and PAHs) was undetected (indicated by a "U" flag in data tables), one-half of the detection limit was used in numerical calculations for statistical analyses. If a compound was detected at a concentration below the detection limit ("J" flag), that concentration was used in the statistical analysis. If the compound was undetected in all five replicate samples or the mean concentration of that compound was greater in tissue samples from the reference treatment than in tissue samples from the test treatments, no further analysis was necessary. If a compound was undetected in all five replicates of the reference treatment, a one-sided, one-sample t-test (α=0.05) was used to determine if the tissue concentrations from organisms exposed to dredged sediment treatments were statistically greater than the mean detection limit for that compound from the reference tissue. Results of background and control tissues were not statistically compared with the reference.

2.6 Quality Assurance/Quality Control Procedures

The quality assurance/quality control (QA/QC) procedures for the New York/New Jersey federal projects were consistent with the Regional Guidance Manual and the Green Book, and were documented in the Work/Quality Assurance Project Plan, *Evaluation of Dredged Material Proposed for Ocean Disposal from Federal Projects in New York and New Jersey and the*

Military Ocean Terminal (MOTBY) (MSL 1993). This document describes all QA/QC procedures that were followed for sample collection, sample tracking and storage, biological testing, and chemical analyses. A member of Pacific Northwest National Laboratory's Quality Engineering Staff was present throughout all phases of this program to observe procedures, review and audit data, and ensure that accepted protocols were followed. Laboratory notebooks or data accumulation notebooks were assigned to each portion of these studies and served as records of day-to-day project activities.

3.0 Results

This section presents results of all activities conducted for the New York/New Jersey Federal Projects/MOTBY. Section 3.1 contains elements of the evaluations that are common to all five federal projects: sample collection, sample processing, reference and control sediment analyses, Mud Dump Site water chemistry, and quality control for biological tests. The results of physical, chemical, and biological analyses for each individual project are presented in Sections 3.2 through 3.6. The results of all dioxin/furan analyses are presented in appendix tables with raw data. However, this section discusses only the results of 2,3,7,8-TCDD/TCDF in sediments and tissues from bioaccumulation tests. Throughout this section the term "significant difference" (or a similar concept [e.g., significantly lower or higher]) is used to express *statistically* significant differences only (α=0.05). Tests for statistical significance between test treatments and control or reference treatments were performed following methods outlined in Section 2.5.

3.1 Results Relevant to All Projects

3.1.1 Sample Collection and Processing

Sample collection for the federal project areas in the New York/New Jersey Harbor Complex took place from April 12 through April 22, 1993. Sediment samples were collected from 95 stations in the five project areas of New York/New Jersey Harbor: MOTBY, Claremont, Arthur Kill, Port Elizabeth, and Hackensack River. The locations of these waterways and sample collection stations are shown in Figures 3.1 through 3.4.

During core sample collection, data were recorded in a field log book. These data are presented in Table 3.1 and consist of project area, station, number of replicates, sampling coordinates, collection date, mudline elevation, length of core required for testing (project depth plus 2 foot overdredge), and length of core actually collected. Table 3.1 also indicates which core samples were combined to create composite samples representing each reach of the federal project areas. When more than one replicate core was collected at a station, both replicates were composited into a single station sample for analysis (i.e., MT-A-4, MT-A-6, MT-B-7, MT-B-8, MT-B-9, and PE-A-2). These station composites were included in the reach composite samples generated for different project areas. Data associated with sediment

samples collected using the pipe dredge and surface water samples collected at each dredging site the Mud Dump Site were also recorded in the field log book; these data are listed in Table 3.2.

Upon delivery to the MSL on April 28, 1993, samples were processed for chemical analysis, and toxicity and bioaccumulation testing according to the procedures described in Section 2. Selected individual core samples and composited bulk sediment samples were subjected to physical analyses (grain size, percentage of moisture, bulk density, specific gravity) and chemical analyses (TOC, metals, chlorinated pesticides, PCBs, 2,3,7,8-TCDD/TCDF, PAHs, 1,4-dichlorobenzene, and the herbicides 2,4-D and 2,4,5-T). Dredging site water and elutriate prepared from sediment composite samples and dredging site water were analyzed for metals, chlorinated pesticides, and PCBs. Biological analyses included water-column effects of elutriate, benthic toxicity of sediment composites, and bioaccumulation of contaminants from sediment composites.

3.1.2 Reference and Control Sediment Analyses

Sediment from the Mud Dump Reference Site was 99% sand and 1% clay, with a TOC concentration of 0.06% (dry weight). The moisture content was 14%, bulk density was 98 lb/cu ft wet and 84 lb/cu ft dry, and specific gravity was 2.70. Native control sediment used for *A. abdita* testing (C-AM) was 11% sand, 44% silt, and 45% clay, with TOC of 1.26% and moisture content of 58%. Native control sediment used for *R. abronius* testing (C-WB) was 98% sand, 1% silt, and 1% clay, with TOC of 0.12% and moisture content of 24%. The Sequim Bay sediment used as a grain size control in amphipod benthic testing (C-SB) was 20% sand, 50% silt, and 30% clay. C-SB had 2.02% TOC and moisture content of 74%. The native control sediment used for *N. virens* testing (C-NR) was 14% sand, 50% silt, and 36% clay, with a moisture content of 48%.

3.1.3 Mud Dump Site Water Chemistry

Concentrations of metals, chlorinated pesticides, and PCB were determined in disposal-site water collected from the Mud Dump Site. Mud Dump Site water samples were analyzed in triplicate. Complete water chemistry results and quality control data are contained in Appendix B.

3.1.3.1 Metals in Mud Dump Site Water

Concentrations of metals found in Mud Dump Site water samples are presented in Table B.1. Results of QC samples corresponding to these analyses are found in Table B.2. For all metals except Zn, achieved detection limits were lower than target detection limits. Three

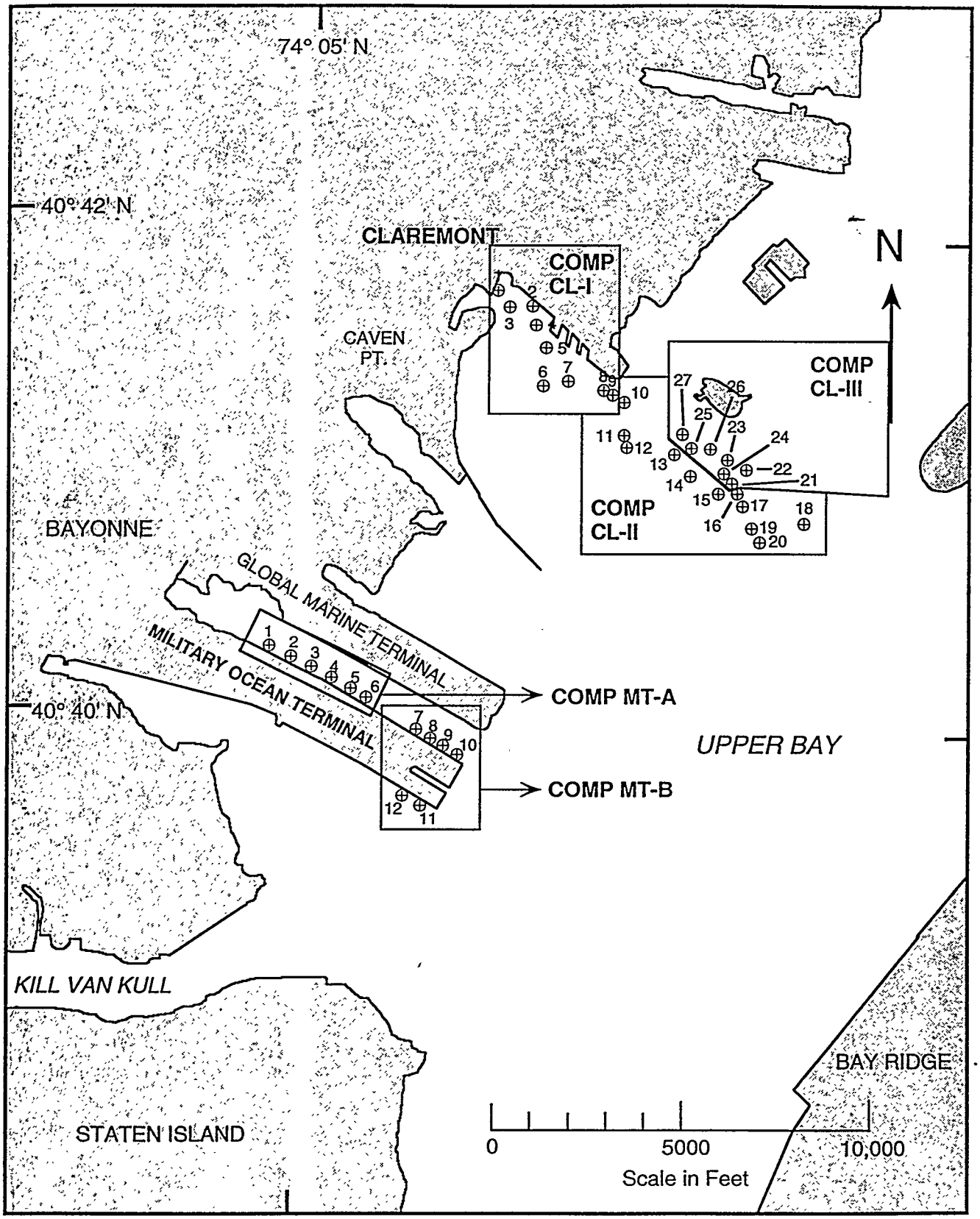


FIGURE 3.1. Location of Sampling Stations in the MOTBY and Claremont Project Areas

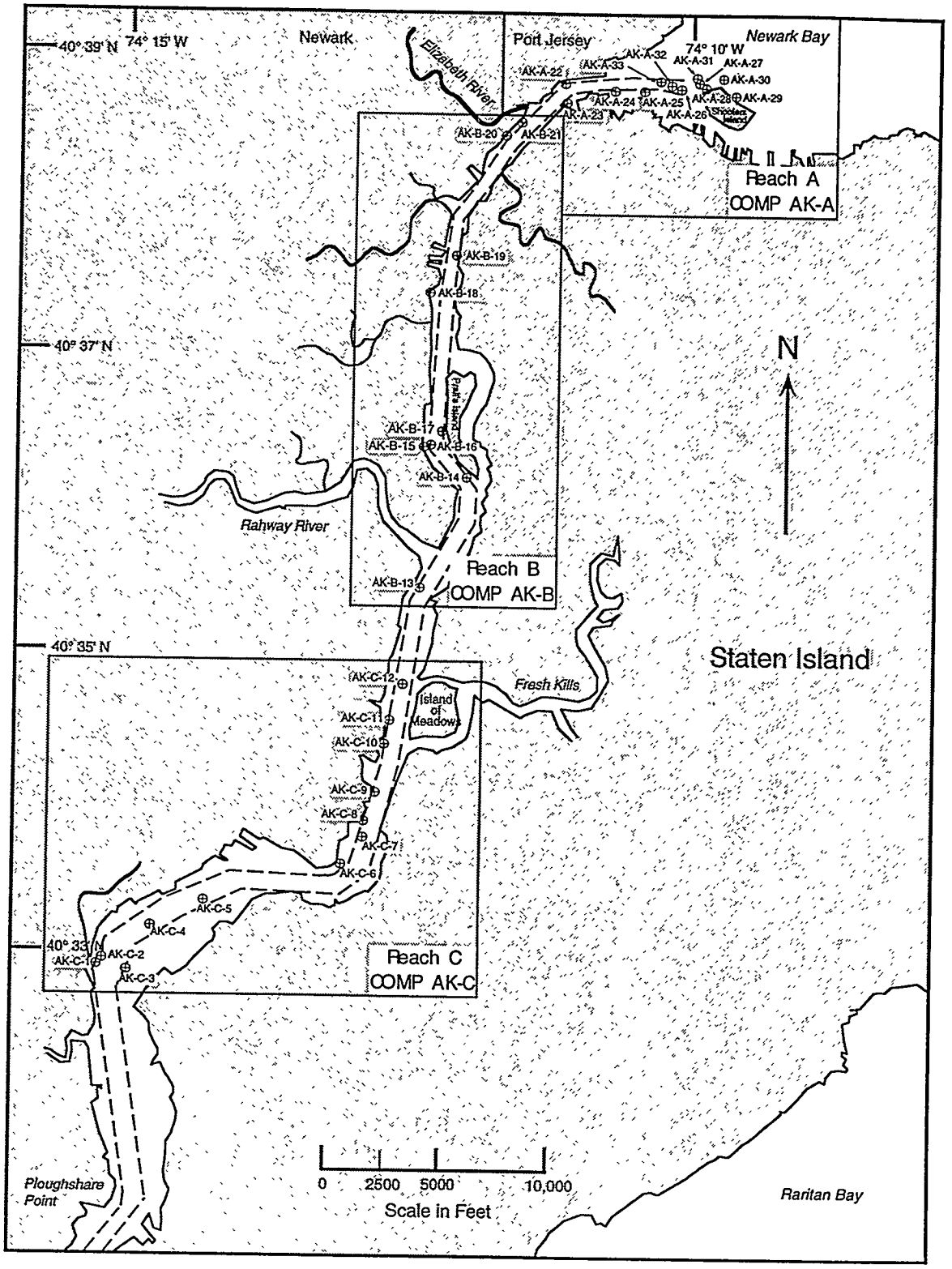


FIGURE 3.2. Location of Sampling Stations in the Arthur Kill Project Area

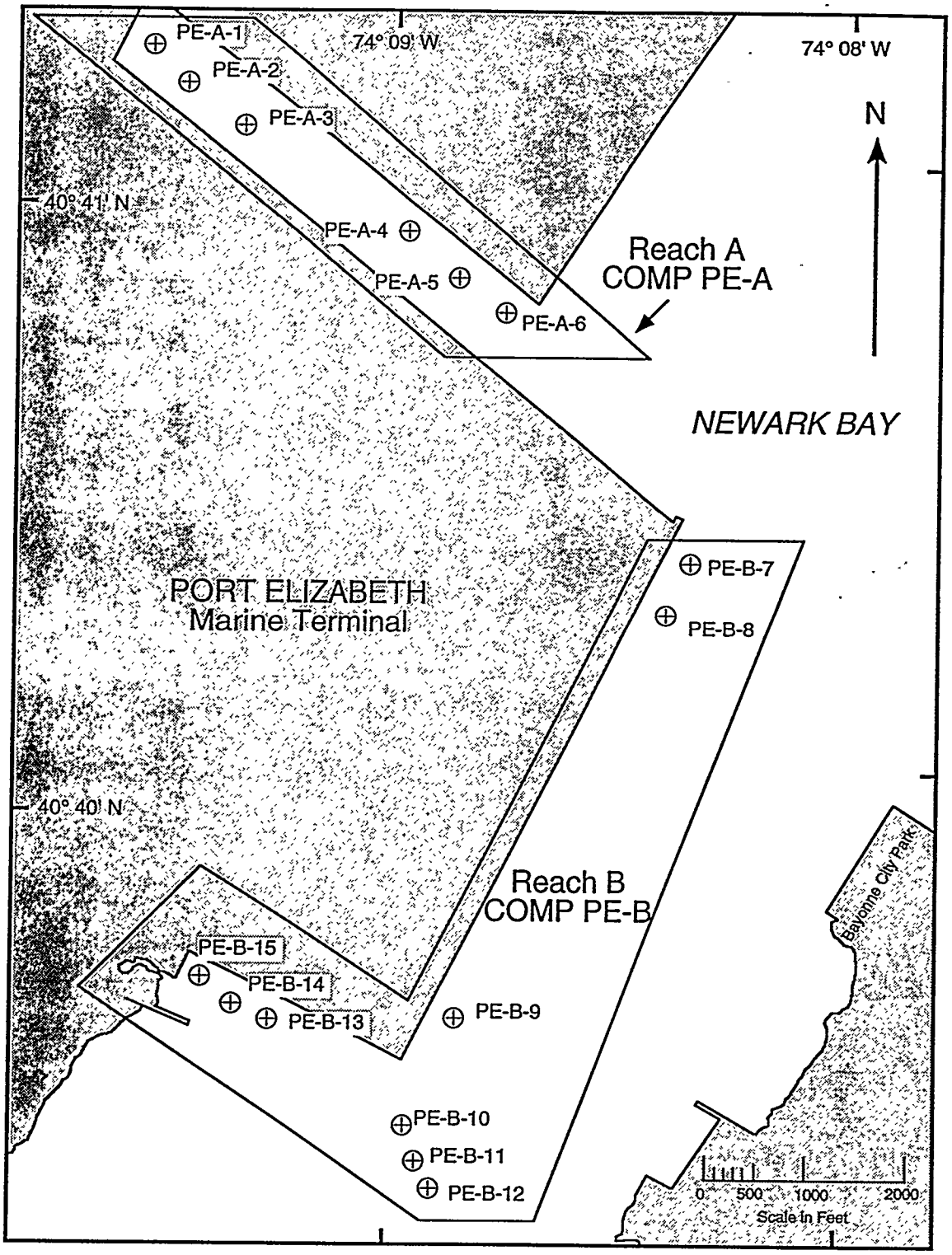


FIGURE 3.3. Location of Sampling Stations in the Port Elizabeth Project Area

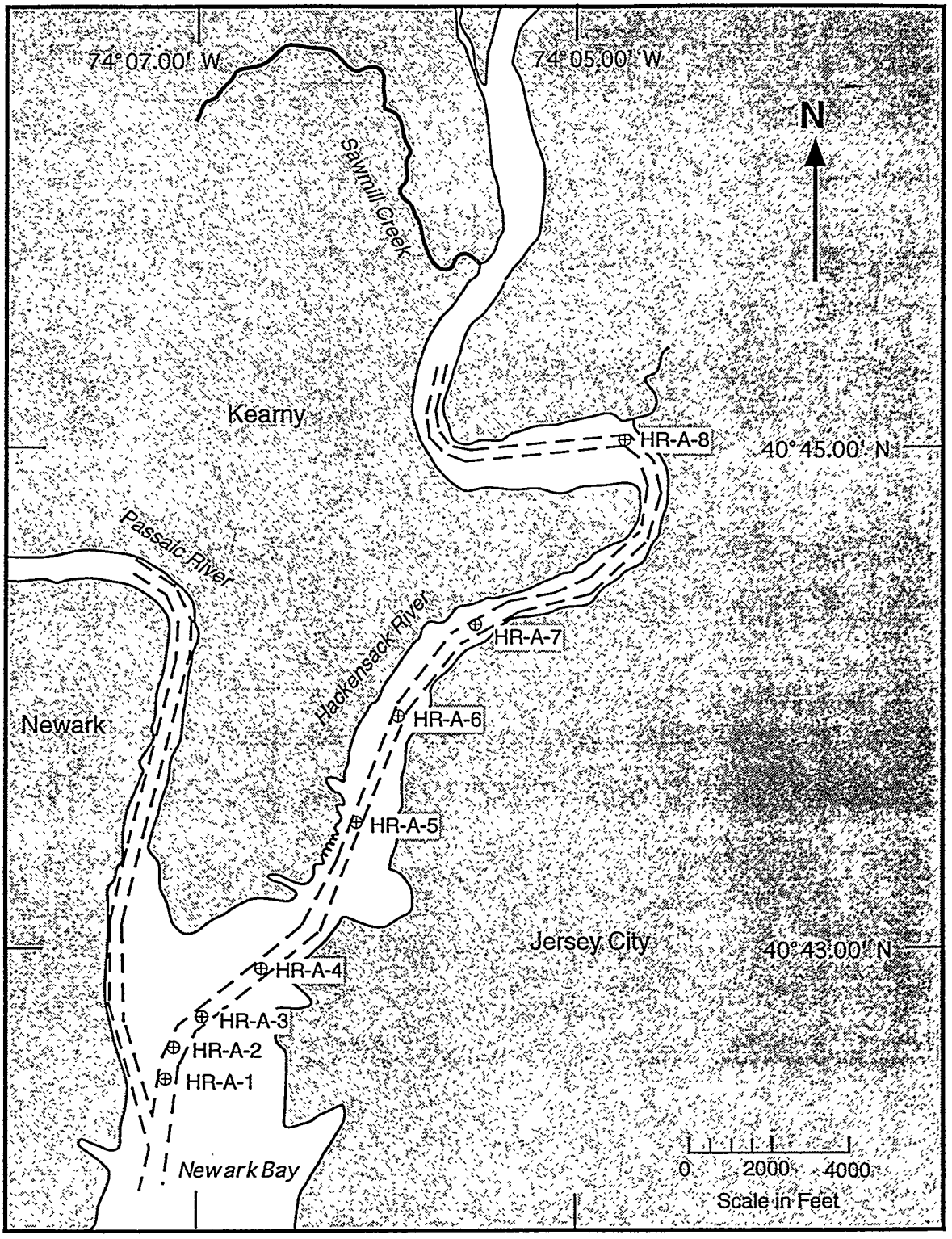


FIGURE 3.4. Location of Sampling Stations in the Hackensack River Project Area

TABLE 3.1. Summary of Core Sampling Data for New York/New Jersey Federal Projects

Station Designation	Replicates	Sampling Coordinates Latitude N	Longitude W	Date Sampled	Mudline Elevation (-ft MLW)	Required Depth (-ft MLW)	Required Core Length (ft)	Collected Core Length (ft)
MOTBY Reach A								
MT-A- 1	1	40° 40.296'	74° 05.200'	4/14/93	35.4	37.0	1.6	2.5
MT-A- 2	1	40° 40.300'	74° 05.209'	4/14/93	33.5	37.0	3.5	4.0
MT-A- 3	1	40° 40.217'	74° 05.022'	4/14/93	33.7	37.0	3.3	3.5
MT-A- 4	1	40° 40.193'	74° 04.920'	4/14/93	35.0	37.0	2.0	2.0
MT-A- 4	2	40° 40.198'	74° 04.920'	4/14/93	33.0	37.0	4.0	4.0
MT-A- 5	1	40° 40.144'	74° 04.840'	4/14/93	34.3	37.0	2.7	3.5
MT-A- 6	1	40° 40.070'	74° 04.692'	4/14/93	35.0	37.0	2.0	2.0
MT-A- 6	2	40° 40.076'	74° 04.697'	4/14/93	35.0	37.0	2.0	2.0
MOTBY Reach B								
MT-B- 7	1	40° 39.964'	74° 04.362'	4/14/93	33.9	37.0	3.1	3.0
MT-B- 7	2	40° 39.947'	74° 04.396'	4/14/93	33.9	37.0	3.1	3.0
MT-B- 8	1	40° 39.915'	74° 04.167'	4/14/93	35.3	38.0	2.7	3.0
MT-B- 8	2	40° 39.915'	74° 04.167'	4/14/93	35.3	38.0	2.7	3.0
MT-B- 9	1	40° 39.899'	74° 04.238'	4/14/93	35.0	38.0	3.0	3.0
MT-B- 9	2	40° 39.895'	74° 04.248'	4/14/93	35.0	38.0	3.0	2.5
MT-B- 10	1	40° 39.767'	74° 04.068'	4/14/93	35.2	38.0	2.8	3.5
MT-B- 11	1	40° 39.588'	74° 04.329'	4/15/93	34.9	38.0	3.1	3.5
MT-B- 12	1	40° 39.719'	74° 04.478'	4/15/93	34.2	38.0	3.8	4.5
Arthur Kill Reach A								
AK-A- 22	1	40° 38.792'	74° 11.127'	4/17/93	29.9	37.0	7.1	8.0
AK-A- 23	1	40° 38.657'	74° 11.112'	4/17/93	28.9	37.0	8.1	9.5
AK-A- 24	1	40° 38.735'	74° 10.677'	4/17/93	31.9	37.0	5.1	5.5
AK-A- 25	1	40° 38.738'	74° 10.417'	4/17/93	32.0	37.0	5.0	5.2
AK-A- 26	1	40° 38.754'	74° 10.102'	4/17/93	34.2	37.0	2.8	4.0
AK-A- 27	1	40° 38.792'	74° 09.961'	4/17/93	30.3	37.0	6.7	7.0
AK-A- 28	1	40° 38.739'	74° 09.870'	4/17/93	30.4	37.0	6.6	7.0
AK-A- 29	1	40° 38.718'	74° 09.610'	4/17/93	29.5	37.0	7.5	9.0
AK-A- 30	1	40° 38.829'	74° 09.733'	4/17/93	29.5	37.0	7.5	9.0
AK-A- 31	1	40° 38.834'	74° 09.976'	4/17/93	34.3	37.0	2.7	3.5
AK-A- 32	1	40° 38.781'	74° 10.192'	4/17/93	34.3	37.0	2.7	3.0
AK-A- 33	1	40° 38.812'	74° 10.299'	4/17/93	34.0	37.0	3.0	3.0
Arthur Kill Reach B								
AK-B- 13	1	40° 35.410'	74° 12.414'	4/16/93	34.0	37.0	3.0	3.5
AK-B- 14	1	40° 36.153'	74° 11.976'	4/16/93	32.8	37.0	4.2	4.0
AK-B- 15	1	40° 36.332'	74° 12.443'	4/16/93	29.1	37.0	7.9	6.0
AK-B- 16	1	40° 36.366'	74° 12.318'	4/16/93	29.6	37.0	7.4	6.0
AK-B- 17	1	40° 36.445'	74° 12.207'	4/16/93	31.0	37.0	6.0	6.0
AK-B- 18	1	40° 37.389'	74° 12.337'	4/16/93	30.7	37.0	6.3	6.3
AK-B- 19	1	40° 37.632'	74° 12.105'	4/16/93	34.5	37.0	2.5	3.0
AK-B- 20	1	40° 38.440'	74° 11.656'	4/16/93	29.4	37.0	7.6	8.0
AK-B- 21	1	40° 38.527'	74° 11.510'	4/16/93	33.1	37.0	3.9	4.2

TABLE 3.1. (contd)

Station Designation	Replicates	Sampling Coordinates Latitude N	Longitude W	Date Sampled	Mudline Elevation (-ft MLW)	Required Depth (-ft MLW)	Required Core Length (ft)	Collected Core Length (ft)
Arthur Kill Reach C								
AK-C- 1	1	40° 32.912'	74° 15.230'	4/16/93	30.4	37.0	6.6	7.0
AK-C- 2	1	40° 32.935'	74° 15.187'	4/16/93	33.5	37.0	3.5	5.0
AK-C- 3	1	40° 32.862'	74° 14.969'	4/16/93	33.5	37.0	3.5	4.0
AK-C- 4	1	40° 33.166'	74° 14.749'	4/16/93	33.0	37.0	4.0	4.0
AK-C- 5	1	40° 33.342'	74° 14.275'	4/16/93	34.2	37.0	2.8	3.0
AK-C- 6	1	40° 33.587'	74° 13.063'	4/16/93	31.4	37.0	5.6	6.0
AK-C- 7	1	40° 33.773'	74° 12.869'	4/16/93	31.9	37.0	5.1	6.0
AK-C- 8	1	40° 33.878'	74° 12.871'	4/16/93	31.2	37.0	5.8	7.0
AK-C- 9	1	40° 34.047'	74° 12.784'	4/16/93	34.7	37.0	2.3	2.3
AK-C- 10	1	40° 34.375'	74° 12.703'	4/16/93	32.9	37.0	4.1	8.0
AK-C- 11	1	40° 34.537'	74° 12.658'	4/16/93	33.6	37.0	3.4	4.0
AK-C- 12	1	40° 34.775'	74° 12.536'	4/16/93	33.4	37.0	3.6	4.0
Port Elizabeth Reach A								
PE-A- 1	1	40° 41.388'	74° 09.595'	4/19/93	38.8	42.0	3.2	3.5
PE-A- 2	1	40° 41.148'	74° 09.446'	4/19/93	37.8	42.0	4.2	2.0
PE-A- 2	2	40° 41.148'	74° 09.446'	4/19/93	37.8	42.0	4.2	4.0
PE-A- 3	1	40° 40.964'	74° 09.190'	4/15/93	38.4	42.0	3.6	4.0
PE-A- 4	1	40° 40.996'	74° 08.972'	4/15/93	38.5	42.0	3.5	4.0
PE-A- 5	1	40° 40.962'	74° 08.894'	4/15/93	38.2	42.0	3.8	4.0
PE-A- 6	1	40° 40.817'	74° 08.713'	4/15/93	40.2	42.0	1.8	2.2
Port Elizabeth Reach B								
PE-B- 7	1	40° 40.358'	74° 08.323'	4/15/93	39.4	42.0	2.6	3.0
PE-B- 8	1	40° 40.285'	74° 08.431'	4/15/93	38.7	42.0	3.3	3.5
PE-B- 9	1	40° 39.626'	74° 08.870'	4/15/93	38.7	42.0	3.3	3.5
PE-B- 10	1	40° 39.503'	74° 08.960'	4/15/93	36.4	42.0	5.6	5.0
PE-B- 11	1	40° 39.561'	74° 09.001'	4/15/93	35.7	42.0	6.3	6.5
PE-B- 12	1	40° 39.398'	74° 08.879'	4/15/93	36.8	42.0	5.2	5.1
PE-B- 13	1	40° 39.735'	74° 09.218'	4/15/93	37.7	42.0	4.3	5.0
PE-B- 14	1	40° 39.720'	74° 09.335'	4/15/93	38.7	42.0	3.3	3.5
PE-B- 15	1	40° 39.744'	74° 09.374'	4/15/93	38.2	42.0	3.8	3.8
Hackensack River								
HR-A- 1	1	40° 42.537'	74° 07.050'	4/19/93	30.5	32.0	1.5	1.5
HR-A- 2	1	40° 42.614'	74° 06.855'	4/19/93	24.7	32.0	7.3	7.5
HR-A- 3	1	40° 42.630'	74° 06.890'	4/19/93	25.3	32.0	6.7	7.0
HR-A- 4	1	40° 42.792'	74° 06.647'	4/19/93	27.3	32.0	4.7	5.0
HR-A- 5	1	40° 43.214'	74° 06.183'	4/19/93	27.3	32.0	4.7	6.0
HR-A- 6	1	40° 43.876'	74° 05.776'	4/19/93	29.5	32.0	2.5	3.0
HR-A- 7	1	40° 44.260'	74° 05.428'	4/19/93	29.7	32.0	2.3	2.0
HR-A- 8	1	40° 44.960'	74° 04.728'	4/19/93	24.2	27.0	2.8	4.5

TABLE 3.1. (contd)

Station Designation	Repli-cates	Sampling Coordinates Latitude N	Longitude W	Date Sampled	Mudline Elevation (-ft MLW)	Required Depth (-ft MLW)	Required Core Length (ft)	Collected Core Length (ft)
Claremont Reach I								
CL-I- 1	1	40° 41.189'	74° 04.568'	4/19/93	19.7	36.0	16.3	9.0
CL-I- 2	1	40° 41.120'	74° 04.386'	4/19/93	16.5	36.0	19.5	7.0
CL-I- 3	1	40° 41.122'	74° 04.506'	4/19/93	24.5	36.0	11.5	5.0
CL-I- 4	1	40° 41.043'	74° 04.368'	4/19/93	19.5	36.0	16.5	5.0
CL-I- 5	1	40° 40.956'	74° 04.318'	4/20/93	27.7	36.0	8.3	6.5
CL-I- 6	1	40° 40.794'	74° 04.323'	4/20/93	25.4	36.0	10.6	10.0
CL-I- 7	1	40° 40.815'	74° 04.189'	4/20/93	18.7	36.0	17.3	6.5
CL-I- 8	1	40° 40.770'	74° 04.005'	4/20/93	26.2	36.0	9.8	9.0
CL-I- 9	1	40° 40.761'	74° 03.959'	4/20/93	19.7	36.0	16.3	5.9
Claremont Reach II								
CL-II- 10	1	40° 40.732'	74° 03.880'	4/20/93	20.0	36.0	16.0	4.0
CL-II- 11	1	40° 40.600'	74° 03.887'	4/20/93	25.2	36.0	10.8	5.0
CL-II- 12	1	40° 40.550'	74° 03.801'	4/20/93	21.4	36.0	14.6	5.5
CL-II- 13	1	40° 40.525'	74° 03.623'	4/19/93	28.0	36.0	8.0	5.5
CL-II- 14	1	40° 40.430'	74° 03.535'	4/20/93	24.0	36.0	12.0	6.4
CL-II- 15	1	40° 40.365'	74° 03.383'	4/20/93	24.8	36.0	11.2	8.5
CL-II- 16	1	40° 40.365'	74° 03.285'	4/20/93	20.7	36.0	15.3	5.5
CL-II- 17	1	40° 40.312'	74° 03.253'	4/20/93	25.0	36.0	11.0	8.8
CL-II- 18	1	40° 40.246'	74° 02.925'	4/19/93	29.7	36.0	6.3	5.0
CL-II- 19	1	40° 40.222'	74° 03.205'	4/20/93	25.6	36.0	10.4	6.2
CL-II- 20	1	40° 40.167'	74° 03.165'	4/20/93	33.8	36.0	2.2	5.0
Claremont Reach III								
CL-III- 21	1	40° 40.406'	74° 03.318'	4/20/93	12.8	25.0	12.2	6.0
CL-III- 22	1	40° 40.460'	74° 03.244'	4/20/93	14.7	25.0	10.3	6.0
CL-III- 23	1	40° 40.499'	74° 03.340'	4/20/93	16.7	25.0	8.3	9.0
CL-III- 24	1	40° 40.449'	74° 03.356'	4/20/93	15.4	25.0	9.6	5.0
CL-III- 25	1	40° 40.549'	74° 03.538'	4/20/93	17.2	25.0	7.8	5.0
CL-III- 26	1	40° 40.545'	74° 03.435'	4/20/93	15.2	25.0	9.8	5.0
CL-III- 27	1	40° 40.609'	74° 03.586'	4/20/93	14.8	25.0	10.2	8.0

TABLE 3.2. Summary of Reference Sediment and Water Sampling Data for New York/ New Jersey Federal Projects

Project Area	Sample Type	Station	Replicate	Depth (ft)	Date	Time (h)	Coordinates Latitude N	Longitude W
Mud Dump Reference	Sediment	MDRS	1	68	4/18/93	Start 1150	40°20.201′	74°52.189′
						End 1200	40°20.000′	74°52.108′
			2	65	4/18/93	Start 1254	40°20.210′	74°52.200′
						End 1315	40°19.750′	74°52.140′
			3	70	4/18/93	Start 1340	40°20.212′	74°52.208′
						End 1400	40°19.842′	74°52.138′
Mud Dump	Water	MDS	1	60	4/18/93	1115	40°22.699′	74°50.789′
Arthur Kill	Water	AK-C-7	1	31.9	4/16/93	NA[a]	40°33.773′	74°12.869′
		AK-B-17	1	31	4/16/93	NA	40°36.445′	74°12.207′
		AK-A-27	1	30.3	4/17/93	NA	40°38.792′	74°09.961′
Port Elizabeth	Water	PE-A-4	1	38.5	4/15/93	NA	40°40.996′	74°08.972′
		PE-B-13		37.7	4/15/93	NA	40°39.735′	74°09.218′
Hackensack	Water	HR-A-1	1	30.5	4/19/93	NA	40°42.537′	74°07.050′

(a) NA Not applicable.

metals (Ag, Cr, Hg) were undetected or detected below the target detection limits; four metals (Cd, Cu, Ni, Pb) were detected at two to three times their target detection limits. Sample results for Zn were 50 to 60 times higher than the target detection limit. Sequim Bay seawater was analyzed as a control and a method blank. Using these analyses as a basis for comparison, concentrations of Ag, Cr, Cd, Hg, and Ni at the Mud Dump Site were comparable to Sequim Bay seawater. Concentrations of Cu and Pb were 3 to 30 times higher in the Mud Dump Site water than in Sequim Bay seawater; concentrations of Zn were 8 to 10 times higher in the Mud Dump Site water than in Sequim Bay seawater.

3.1.3.2 Pesticides in Mud Dump Site Water

Concentrations of chlorinated pesticides found in Mud Dump Site water samples are presented in Tables B.3 and B.4. Results of QC samples corresponding to these analyses are

found in Tables B.5 and B.6. Achieved detection limits were lower than the target detection limits (for most pesticides, by at least an order of magnitude). All pesticides were essentially undetected in both the Mud Dump Site water and the Sequim Bay seawater (control). (In one replicate Mud Dump Site sample, 4,4'-DDD, -DDE, and -DDT were found at concentrations less than target detection limits.)

3.1.3.3 PCBs in Mud Dump Site Water

Concentrations of PCBs found in Mud Dump Site water samples are presented in Tables B.7 through B.9. Results of QC samples corresponding to these analyses are found in Tables B.10 and B.13. Target detection limits of 0.5 ng/L were achieved for 16 of the 22 PCB congeners. The remaining six congeners had detection limits of approximately 1 ng/L. All PCBs were undetected in both the Mud Dump Site water and the Sequim Bay seawater controls.

3.1.4 Biological Reference Toxicant Test Results

Because all of the federal projects study areas were tested concurrently using the same populations of test organisms, the reference toxicant tests used to evaluate organism sensitivity were common to all of the projects. Table 3.3 presents the results of reference toxicant tests for each species. Complete toxicity test data are contained in Appendixes C through E.

3.1.5 Background Tissue Lipid Content

The mean lipid content of background (unexposed) tissues was 5.7 percent dry weight for *M. nasuta* and 8.3 percent dry weight for *N. virens.*

3.2 Results of Physical, Chemical, and Biological Analyses of MOTBY Sediment

Samples from each of the 12 MOTBY stations were analyzed for TOC, moisture content, and 2,3,7,8-TCDD/TCDF. Metals, chlorinated pesticides, PCBs, PAHs, 1,4-dichlorobenzene, and the chlorinated herbicides, 2,4-D and 2,4,5-T, were determined in two sediment composites from MOTBY: COMP MT-A, which represents the combined samples from six stations in MOTBY Reach A, and COMP MT-B, which represents the combined samples from six stations in MOTBY Reach B. The amphipods *Ampelisca abdita* and *Rhepoxynius abronius* were used to evaluate the potential benthic toxicity of the two MOTBY sediment composites (for this program, water-column toxicity tests were not required for the MOTBY sediments). A bioaccumulation test with the polychaete *Nereis virens* was also conducted using the two sediment composites from MOTBY.

TABLE 3.3. Summary of Reference Toxicant Test Results, New York/New Jersey Federal Projects

Species	Toxicant	Control Survival (%)	LC50	LC50 Control Range, (mean ± 2 sd)	Relative Sensitivity
Water-column Test Organisms					
Menidia beryllina	Copper	94	223 µg/L	71-136 µg/L	less sensitive[a]
Mysidopsis bahia	Copper	97	277 µg/L	116-229 µg/L	less sensitive
Mytilus edulis larvae Test 1	Copper	72	15.2 µg/L	5.8-35 µg/L	normal
Mytilus edulis larvae Test 2	Copper	97	15.9 µg/L	5.8-35 µg/L	normal
Mytilus edulis larvae Test 1	Copper	59[b]	7.7 µg/L[c]	5.7-21 µg/L	normal
Mytilus edulis larvae Test 2	Copper	95[b]	15.4 µg/L[c]	5.7-21 µg/L	normal
Benthic Toxicity Test Organisms					
Ampelisca abdita Test 1	Cadmium	50	0.68 mg/L	0.5-1.4 mg/L	normal/more sensitive[d]
Ampelisca abdita Test 2	Cadmium	60	0.71 mg/L	0.5-1.4 mg/L	normal/more sensitive
Mysidopsis bahia	Copper	97	277 µg/L	116-229 µg/L	less sensitive
Rhepoxynius abronius	Cadmium	98	<0.5 mg/L	0.48-1.70 mg/L	more sensitive
Bioaccumulation Test Organisms					
Nereis virens	Copper	100	154.8 µg/L	None available	NA[e]
Macoma nasuta	Copper	100	>1 mg/L	None available	NA

(a) Less sensitive test population indicates possible underestimate of sediment toxicity.
(b) Percentage of normally developed larvae.
(c) Median effective concentration (EC_{50}) based on normal development.
(d) More sensitive test population indicates possible overestimate of sediment toxicity.
(e) NA Not applicable.

3.2.1 MOTBY Sediment Physical and Chemical Analyses

Complete results of sediment physical and chemical analyses and associated quality control data for the MOTBY project area is tabulated in Appendix A. MOTBY sediments were soft, black mud. The sheen and odor of oil or petroleum products were both present, especially at station MT-B-8. The 12 sediment core samples collected at MOTBY were analyzed for TOC and moisture content only (Table A.2). TOC in MOTBY Reach A core samples ranged from 0.92% to 4.68% dry weight and in MOTBY Reach B samples from 3.08% to 3.87% dry weight. Core samples from MOTBY Reach A were 27% to 67% moisture, and in MOTBY Reach B samples from 57% to 67% moisture.

3.2.1.1 Metals in MOTBY Sediment Composites

Concentrations of metals detected in COMP-MT-A and COMP MT-B sediments, and QC data corresponding to metals analyses, are found in Tables A.5 and A.6. All of the metals analyzed for were detected in both COMP MT-A and COMP MT-B. Concentrations of metals were comparable between the two reaches, but were all slightly higher in COMP MT-B than in COMP MT-A.

3.2.1.2 Pesticides in MOTBY Sediment Composites

Concentrations of chlorinated pesticides analyzed in COMP MT-A and COMP MT-B sediments are presented in Tables A.7 and A.8. Results of QC samples corresponding to these analyses are found in Tables A.9 and A.10. Of the 15 pesticides analyzed, 8 were detected. Pesticide concentrations between the two reaches were comparable. Concentrations of α-chlordane ranged from 3.11 μg/kg to 3.69 μg/kg dry weight; dieldrin ranged from 3.74 μg/kg to 6.18 μg/kg; 2,4'-DDD ranged from 6.16 μg/kg to 12.2 μg/kg; 4,4'-DDD ranged from 21.5 μg/kg to 38.7 μg/kg; 4,4'-DDE ranged from 16.5 μg/kg to 22.6 μg/kg; 4,4'-DDT ranged from 1.72 μg/kg to 3.46 μg/kg; endosulfan I ranged from an estimated 0.58 μg/kg to 4.68 μg/kg; and *trans*-nonachlor ranged from 1.13 μg/kg to 1.42 μg/kg. The pesticides heptachlor, heptachlor epoxide, endosulfan II, endosulfan sulfate, aldrin, and 2,4'-DDT were not detected in MOTBY composites.

3.2.1.3 PCBs in MOTBY Sediment Composites

Concentrations of PCB congeners analyzed in COMP MT-A and COMP MT-B sediments are presented in Tables A.11 through A.13. Results of QC samples corresponding to these analyses are found in Tables A.14 through A.16. All 22 congeners analyzed were detected in both COMP MT-A and COMP MT-B. Total PCB concentrations were 1109 μg/kg (dry weight) and 987 μg/kg for COMPs MT-A and MT-B, respectively.

3.2.1.4 2,3,7,8-TCDD/TCDF in Individual Core Samples from MOTBY

Concentrations of 2,3,7,8-TCDD and 2,3,7,8-TCDF analyzed in individual MOTBY Reach A and Reach B core samples are presented in Table A.17. Results of QC samples corresponding to these analyses are found in Table A.18. Station MT-A-2, Rep 3 had the highest 2,3,7,8-TCDD concentration at 249 pg/g wet weight; station MT-A-5 had the lowest at 4.65 pg/g. Concentrations of 2,3,7,8-TCDD in the remaining core samples from both Reach A and Reach B ranged from 6.36 pg/g to 50.7 pg/g. Concentrations of 2,3,7,8-TCDF in both reaches ranged from 8.46 pg/g to 43.2 pg/g.

3.2.1.5 PAHs and 1,4-dichlorobenzene in MOTBY Sediment Composites

Concentrations of PAHs analyzed in COMP MT-A and COMP MT-B sediments are presented in Tables A.19 through A.21. Results of QC samples corresponding to these analyses are found in Tables A.22 through A.24. All 16 PAH compounds analyzed were detected in both COMP MT-A and COMP MT-B. The concentration of total PAH in COMP MT-A was 7616 μg/kg dry weight; total low-molecular-weight PAHs (LPAH) was 1620 μg/kg; and total high-molecular-weight PAHs (HPAH) was 5996 μg/kg. Concentrations of individual LPAHs in COMP MT-A ranged from 123 μg/kg (acenaphthylene) to 556 μg/kg (phenanthrene). Concentrations of individual HPAHs in COMP MT-A ranged from 76.0 μg/kg (dibenzo[a,h] anthracene) to 1280 μg/kg (fluoranthene). The concentration of total PAH in COMP MT-B was 9186 μg/kg; total LPAH was 2757 μg/kg; and total HPAH was 6429 μg/kg. Concentrations of individual LPAHs in COMP MT-B ranged from 188 μg/kg (acenaphthylene) to 1030 μg/kg (naphthalene). Concentrations of individual HPAHs in COMP MT-B ranged from 78.3 μg/kg (dibenzo[a,h]anthracene) to 1270 μg/kg (fluoranthene).

Results of analysis of 1,4-dichlorobenzene (which was performed with the pesticide/PCB analyses) are presented in Table A.13, with corresponding QC data shown in Table A.16. The concentrations of 1,4-dichlorobenzene in COMPs MT-A and MT-B were 18.1 μg/kg and 28.2 μg/kg, respectively.

3.2.1.6 Herbicides in MOTBY Sediment Composites

The herbicides 2,4,5-T and 2,4-D were analyzed but were not detected in COMP MT-A and COMP MT-B (Table A.25).

3.2.2 MOTBY Benthic Toxicity Testing

The two MOTBY composites were tested in benthic toxicity tests with the amphipods *Ampelisca abdita* and *Rhepoxynius abronius* under both static and flow-through conditions. Elutriate and water-column testing were not required. This section summarizes the results of the amphipod tests and includes a section on ammonia measurements taken during the tests. Complete results of MOTBY benthic acute toxicity testing, including water quality measurements and results of reference toxicant tests, are tabulated in Appendix D.

3.2.2.1 *Ampelisca abdita* Static and Flow-through Benthic Toxicity Tests

Throughout the static *A. abdita* test, temperature and salinity measurements were within acceptable ranges. The dissolved oxygen measurements were low on Day 0 of testing (4.5 mg/L and 4.3 mg/L), but thereafter were above the acceptable level of 6.8 mg/L. The pH measurements exceeded acceptable ranges for COMP MT-A and COMP MT-B (by 0.09 and

0.23, respectively) on at least one day of testing. *A. abdita* survival was 61% in the native control, 70% in the grain size control, and 71% in the Mud Dump Reference (Table 3.4). *A. abdita* survival under static conditions was 5% in COMP MT-A and 0% in COMP MT-B, a difference of more than 20% from Mud Dump Reference survival. However, this static test is invalid for disposal evaluation according to the Green Book, which requires ≥90% survival of amphipods in the native control.

In the flow-through test with *A. abdita*, all of the water quality parameters (temperature, pH, DO, salinity, and flow rates) were within acceptable ranges throughout the test period. Mean survival of *A. abdita* in the native control (C-AM) was 89% (survival in one replicate was 80%; survival in the remaining four replicates ranged from 90% to 95%) and 87% in the grain size control (C-SB) (Table 3.4). Survival of *A. abdita* tested under flow-through conditions was 58% in COMP MT-A and 65% in COMP MT-B. Survival for *A. abdita* in the Mud Dump Reference Site sediment was 87%. Statistical analyses were performed for this test even though the native control survival of 89% was just below the 90% required for validation. *A. abdita* survival in flow-through tests with sediment from each MOTBY reach was significantly lower than in reference sediment, with the difference greater than 20% (Table 3.4).

3.2.2.2 *Rhepoxynius abronius* Static and Flow-through Benthic Toxicity Tests

Throughout the static test with *R. abronius*, temperature and salinity measurements were within acceptable ranges. The DO measurements were low on Day 0 of testing (6.9 mg/L and 6.7 mg/L), but thereafter were above the acceptable level of 7.7 mg/L. The pH measurements were above the acceptable ranges for COMP MT-A and COMP MT-B (by 0.11 and 0.17, respectively) on at least one day of testing, but it is unlikely that this pH level had any effect on the test. Survival of *R. abronius* in the native control (C-WB) was 97%, validating the test (Table 3.4). In the grain size control, survival of *R. abronius* was 81%, suggesting that *R. abronius* may prefer sediment with a coarser grain size. Survival of *R. abronius* in COMP MT-A and COMP MT-B sediments under static conditions was 9% and 1%, respectively. *R. abronius* survival in the Mud Dump Reference Site sediment was 90%. The statistical comparison of the test composites with the reference showed that survival in both COMP MT-A and COMP MT-B was significantly lower and had greater than 20% difference from the reference treatment.

TABLE 3.4. Results of Benthic Toxicity Testing for MOTBY Sediment Composites[a]

Sediment Treatment	Percent Survival (Mean of Five Replicates)			
	A. abdita Static	*A. abdita* Flow-through	*R. abronius* Static	*R. abronius* Flow-through
MOTBY Reach A (MT-A)	5	58	9	6
MOTBY Reach B (MT-B)	0	65	1	0
Mud Dump Reference Site	71	87	90	92
A. abdita Control (C-AM)	61	89	NA[b]	NA
R. abronius Control (C-WB)	NA	NA	97	95
Grain Size Control (C-SB)	70	87	81	90

(a) EPA recommended ammonia protocols were not in effect at time of testing (EPA/USACE 1993).
(b) NA Not applicable.

In the flow-through test with *R. abronius*, all of the water quality parameters (temperature, pH, DO, salinity, and flow rates) were within acceptable ranges throughout the test period. Survival of *R. abronius* in the native control (C-WB) was 95%, and in the grain size control (C-SB) was 90%, indicating a valid flow-through test. Survival of *R. abronius* in COMP MT-A and COMP MT-B sediments, conducted under flow-through conditions, was 6% and 0%, respectively. *R. abronius* survival in the Mud Dump Reference Site sediment was 92%. The results of the statistical evaluation showed that COMP MT-A and COMP MT-B were significantly different from the reference site and had greater than 20% difference in mortality from the Mud Dump Reference Site.

3.2.2.3 Ammonia Measurements During MOTBY Benthic Toxicity Testing

Concentrations of total ammonia were measured in the pore water and overlying water of COMP MT-A and COMP MT-B, as well as in reference and control sediments, during the benthic toxicity tests with *A. abdita* and *R. abronius*. Table 3.5 shows the results of ammonia measurements on Day 0 and Day 10 of MOTBY static and flow-through benthic toxicity tests. Ammonia levels were fairly high at test initiation in both pore water and overlying water. For both COMP MT-A and MT-B sediments, overlying water ammonia concentrations were about two-thirds of the pore water concentrations. There was less difference between ammonia concentrations in pore water and overlying water in the control and reference sediments. Generally, pore water concentrations decreased after 10 days of testing, most noticeably in the flow-through test. Overlying water concentrations in the static test on Day 10 were erratic (some

TABLE 3.5 Concentrations of Ammonia in MOTBY Amphipod Benthic Toxicity Tests

Sediment Treatment	Total Ammonia Concentration (mg/L) Day 0 Pore Water, Both Tests	Day 0 Overlying Water, Both Tests	Day 10 Pore Water, Static Test	Day 10 Overlying Water, Static Test	Day 10 Pore Water, Flow-through	Day 10 Overlying Water, Flow-through
MOTBY Reach A (MT-A)	54.9	30.5	36.6	43.92	0.61	3.1
MOTBY Reach B (MT-B)	73.2	48.8	61	85.4	2.44	4.9
Mud Dump Reference Site	30.5	10.98	6.1	11.59	0.61	6.1
A. abdita Control (C-AM)	9.76	7.32	ND(a)	ND	0.61	6.1
R. abronius Control (C-WB)	10.98	14.64	14.64	12.2	0.61	6.1
Grain Size Control (C-SB)	1.22	8.54	12.2	10.98	0.61	4.9

(a) ND No data available.

readings were higher than on Day 0, some were lower). Overlying water concentrations in the flow-through test decreased over the 10-day test.

3.2.3 MOTBY Bioaccumulation Tests

A bioaccumulation test with *N. virens* was conducted using the two sediment composites from MOTBY, COMP MT-A and COMP MT-B (for this dredging site bioaccumulation testing with *M. nasuta* was not necessary). Complete bioaccumulation test results, including water quality measurements and results of reference toxicant tests, are tabulated in Appendix E. Complete results of chemical analyses of *N. virens* tissue samples, including both wet and dry weight concentrations and quality control sample summaries for each analysis, are provided in Appendix F. Mean percent survival of worms for the 28-day test was 76% in the Mud Dump Reference Site and 89% in the control sediment (Table E.3). Mean percent survival in MOTBY sediments was 82% for Reach A and 75% for Reach B (Table E.3). All water quality parameters were within acceptable limits.

Table 3.6 summarizes the statistical evaluations of the mean concentrations of metals, pesticides, PCBs, 2,3,7,8-TCDD/TCDF, and PAHs in tissues of *N. virens* exposed to COMP MT-A and COMP MT-B, relative to the mean concentrations of these contaminants in tissues of *N. virens* exposed to the Mud Dump Reference Site sediment. Statistical analyses were performed on dry weight tissue concentrations. The following discussion includes only statistically significant bioaccumulation of contaminants.

3.2.3.1 Bioaccumulation of Metals in *N. virens* Exposed to MOTBY Composites

None of the nine metals analyzed in *N. virens* tissues exposed to COMP MT-A or COMP MT-B sediments was significantly higher when compared with metals in *N. virens* tissues exposed to the Mud Dump Reference Site sediment.

3.2.3.2 Bioaccumulation of Pesticides in *N. virens* Exposed to MOTBY Composites

Approximately half of the 15 pesticides analyzed were significantly higher in *N. virens* tissues exposed to COMP MT-A and COMP MT-B sediments than in *N. virens* tissues exposed to the Mud Dump Reference Site sediment. Six of the pesticides in COMP MT-A exposed *N. virens* tissues and four pesticides in COMP MT-B exposed *N. virens* tissues were at least 10 times higher than in *N. virens* tissues exposed to the reference sediment.

TABLE 3.6. Mean Wet Weight Concentrations of Contaminants of Concern in Tissues of *Nereis virens* Exposed to MOTBY Sediment Composites. (An asterisk indicates value is statistically significantly greater than in tissues exposed to the Mud Dump Reference Site when compared by Dunnett's test; underlined type indicates ≥5<10 times mean concentration in reference treatment on a dry weight basis; bold type indicates ≥10 times mean concentration in reference treatment.)

	Concentrations in Tissues of *Nereis virens* (wet weight)[a]					
Analyte	Mud Dump Reference Site		COMP MT-A		COMP MT-B	
Metals (mg/kg)						
Arsenic	2.29		2.28		1.93	
Cadmium	0.142		0.160		0.149	
Chromium	0.192		0.231		0.193	
Copper	1.88		2.19		1.97	
Lead	0.192		0.236		0.225	
Mercury	0.0105		0.0090		0.0080	
Nickel	0.203		0.332		0.298	
Silver	0.0385		0.0160		0.0200	
Zinc	21.4		12.3		12.6	
Pesticides (µg/kg)						
Aldrin	0.08	U[b]	**1.03**	*	**1.45**	*
α-Chlordane	0.13		1.64	*	1.43	*
trans-Nonachlor	0.09		**1.19**	*	0.81	*
Dieldrin	0.15	U	**1.56**	*	1.15	*
4,4'-DDT	0.16	U	**6.34**	*	**2.95**	*
2,4'-DDT	0.20	U	0.20	U	0.20	U
4,4'-DDD	0.22	U	**4.82**	*	**2.24**	*
2,4'-DDD	0.18	U	0.18	U	0.18	U
4,4'-DDE	0.07	U	**1.35**	*	**1.27**	*
2,4'-DDE	0.16		0.06	U	0.06	U
Endosulfan I	0.23	U	0.22	U	0.23	U
Endosulfan II	0.23	U	0.22	U	0.23	U
Endosulfan Sulfate	0.23	U	0.22	U	0.23	U
Heptachlor	0.07	U	0.49	*	0.07	U
Heptachlor Epoxide	0.22	U	0.45		0.30	
PCBs (µg/kg)						
PCB 8	0.38	U	0.36	U	0.38	U
PCB 18	0.39	U	**4.07**	*	2.58	*
PCB 28	0.18	U	**5.01**	*	**3.59**	*
PCB 44	0.15	U	**2.97**	*	**2.27**	*
PCB 49	0.03	U	**5.80**	*	**2.72**	*
PCB 52	0.33	U	**12.9**	*	**5.61**	*
PCB 66	0.20		**6.31**	*	**4.00**	*
PCB 87	0.15	U	0.51	*	0.30	
PCB 101	0.14	U	**4.58**	*	**3.48**	*
PCB 105	0.10	U	**1.10**	*	**0.98**	*
PCB 118	0.27	U	2.26	*	1.90	*

TABLE 3.6. (contd)

Analyte	Concentrations in Tissues of *Nereis virens* (wet weight)[a] Mud Dump Reference Site		COMP MT-A		COMP MT-B	
PCB 128	0.14	U	0.52	*	0.56	*
PCB 138	0.27	U	**4.40**	*	**2.85**	*
PCB 153	0.33		**8.13**	*	**3.91**	*
PCB 170	0.15	U	1.36	*	0.76	*
PCB 180	0.11		**2.83**	*	1.59	*
PCB 183	0.03	U	0.05	U	0.12	U
PCB 184	0.03	U	**0.74**	*	**0.44**	*
PCB 187	0.12	U	**2.77**	*	0.98	*
PCB 195	0.09	U	0.09	U	0.09	U
PCB 206	0.10	U	0.27	*	0.21	*
PCB 209	0.09	U	0.09	U	0.09	U
1,4-Dichlorobenzene	1.00	U	1.00	U	1.00	U
PCDD/PCDF (ng/kg)						
2,3,7,8-TCDD	1.04		1.95	*	1.44	
2,3,4,8-TCDF	0.85		**6.24**	*	2.39	*
PAHs (µg/kg)						
Acenaphthene	2.14		6.74	*	6.79	*
Acenaphthylene	1.24		1.70		1.47	
Anthracene	1.37		3.18	*	3.25	*
Fluorene	1.92		2.60		2.42	
Naphthalene	1.84		1.89		1.85	
Phenanthrene	1.75		3.51		3.19	
Benzo(a)anthracene	2.93		4.16	*	3.67	
Benzo(a)pyrene	2.95		2.68		2.17	
Benzo(g,h,i)perylene	1.99		2.94		3.17	
Benzo(b)fluoranthene	3.10		4.68		4.78	
Benzo(k)fluoranthene	1.28		4.05	*	3.89	*
Chrysene	0.60	U	**10.8**	*	**8.12**	*
Dibenzo(a,h)anthracene	2.69	U	2.04		2.57	U
Fluoranthene	3.00		28.7	*	21.3	*
Indeno(1,2,3-cd)pyrene	2.47		2.96		1.48	
Pyrene	1.54		**28.1**	*	16.2	*

(a) Results shown are a mean of five replicate tissue analyses. If any constituents were undetected, one-half the detection limit was used in calculation of the mean concentration.

(b) U Undetected at or above the detection limit shown.

3.2.3.3 Bioaccumulation of PCBs in *N. virens* Exposed to MOTBY Composites

Out of the 22 PCB congeners analyzed, at least 17 PCBs were significantly higher in *N. virens* tissues exposed to COMP MT-A and COMP MT-B sediments than in *N. virens* tissues exposed to the Mud Dump Reference Site sediment. Thirteen PCBs from COMP MT-A exposed tissues and 10 PCBs from COMP MT-B exposed tissues were at least 10 times higher than PCB concentrations in *N. virens* tissues exposed to the reference sediment. Total PCBs were estimated at 149 μg/kg and 78 μ/kg, wet weight, for MT-A and MT-B, respectively.

3.2.3.4 Bioaccumulation of 2,3,7,8-TCDD/TCDF in *N. virens* Exposed to MOTBY Composites

N. virens tissues exposed to MOTBY composites were analyzed for 2,3,7,8-TCDD/TCDF but no additional dioxin/furan isomers. The concentration of 2,3,7,8-TCDD in tissues of *N. virens* to exposed COMP MT-A sediment was significantly higher than but less than two times the concentration in tissues exposed to the Mud Dump Reference Site sediment. The concentration of 2,3,7,8-TCDF (dry weight) was over ten times greater in *N. virens* tissues exposed to COMP MT-A sediment and less than three times as high in *N. virens* tissues exposed to COMP MT-B than in *N. virens* tissues exposed to the reference sediment.

3.2.3.5 Bioaccumulation of PAHs and 1,4-dichlorobenzene in *N. virens* Exposed to MOTBY Composites

Nine of the 16 PAH compounds analyzed (acenaphthylene, fluorene, naphthalene, phenanthrene, benzo[a]pyrene, benzo[g,h,i]perylene, benzo[b]fluoranthene, dibenzo[a,h]anthracene, and indeno[1,2,3-c,d]pyrene) were not significantly higher in *N. virens* tissues exposed to either COMP MT-A or COMP MT-B sediments than in tissues of *N. virens* exposed to the reference site sediment. Benzo(a)anthracene was significantly higher in COMP MT-A-exposed tissues but not in COMP MT-B-exposed tissues. Concentrations of the remaining PAHs were significantly elevated in *N. virens* tissues exposed to COMP MT-A and COMP MT-B when compared with the reference site treatment. Three of these compounds, chrysene, fluoranthene, and pyrene, were 7 to 18 times higher in *N. virens* tissues exposed to COMP MT-A and COMP MT-B sediments than in the *N. virens* tissues from the Mud Dump Reference Site. The compound 1,4-dichlorobenzene was undetected in all replicates of both COMP MT-A and COMP MT-B test sediments.

3.3 Results of Physical, Chemical, and Biological Analyses of Arthur Kill Sediment

The 33 individual sediment core samples collected at Arthur Kill were analyzed for grain size, TOC, moisture content, bulk density, specific gravity, and 2,3,7,8-TCDD/TCDF. Metals, chlorinated pesticides, PCBs, PAHs, 1,4-dichlorobenzene, and the chlorinated herbicides 2,4-D and 2,4,5-T, were determined in three sediment composites from Arthur Kill: COMP AK-A, which represents the 12 core samples collected in Arthur Kill Reach A, COMP AK-B, which represents the 9 core samples collected in Arthur Kill Reach B, and COMP AK-C, which represents the 12 core samples collected in Arthur Kill Reach C. Elutriate prepared from Arthur Kill composites and dredging site water was analyzed chemically and also used to evaluate water-column toxicity to three species of marine organisms. The three Arthur Kill composites were also used for benthic toxicity (three species) and bioaccumulation tests (two species).

3.3.1 Arthur Kill Sediment Physical and Chemical Analyses

Complete results of sediment physical and chemical analyses and associated quality control data for the Arthur Kill project area is tabulated in Appendix A. Arthur Kill sediments were mostly dense, black material with a strong odor of petroleum products. Some cores also had a visible sheen of oil, especially stations AK-A-22 and AK-B-17. Each Arthur Kill core was analyzed for grain size, TOC, moisture content, bulk density, and specific gravity (Tables A.1 through A.4). Sediments from Arthur Kill Reach A and Reach C were generally silt and clay (approximately 10% sand, 50% silt, and 40% clay). Sediments from Arthur Kill Reach B were also mostly silt and clay, with a slightly higher sand content (approximately 20% sand, 40% silt, and 30% clay). One core from Reach B (AK-B-21) was distinctly different from the others, with 69% sand, 19% silt, and 12% clay.

TOC in Arthur Kill core sediments ranged from 2.70% to 5.65% (dry weight) in Reach A; 1.85% to 5.09% in Reach B; and 3.41% to 5.36% in Reach C. Moisture content in Arthur Kill samples ranged from 55% to 63% in Reach A; 52% to 65% in Reach B; and 59% to 72% in Reach C. Bulk density in Arthur Kill sediments from all three reaches ranged from 76 to 88 lb/cu ft wet and from 22 to 40 lb/cu ft dry. Specific gravity ranged from 2.43 to 2.67.

3.3.1.1 Metals in Arthur Kill Sediment Composites

Concentrations of metals found in Arthur Kill composites, and QC data corresponding to metals analyses, are found in Tables A.5 and A.6. Metals concentrations were generally comparable among the three Arthur Kill reaches, but for each analyte, COMP AK-A had the lowest concentrations, followed by COMP AK-B with the next highest concentrations, and COMP

AK-C with the highest concentrations. Concentrations of As, Cd, Cu, and Hg were at least twice as high in COMP AK-C as in COMP AK-A.

3.3.1.2 Pesticides in Arthur Kill Sediment Composites

Concentrations of chlorinated pesticides analyzed in COMP AK-A, COMP AK-B, and COMP AK-C sediments are presented in Tables A.7 and A.8. Results of QC samples corresponding to these analyses are found in Tables A.9 and A.10. Of the 15 pesticides analyzed, 8 were detected in COMP AK-A and 9 were detected in COMPs AK-B and AK-C. The highest pesticide concentrations found among the three reaches were in COMP AK-B, where concentrations of the DDD/DDE/DDT group of compounds ranged from 209 μg/kg (2,4'-DDD) to 2070 μg/kg dry weight (4,4'-DDD). COMP AK-A generally had the lowest concentrations of pesticides. In results from all three reaches, concentrations of α-chlordane ranged from 7.14 μg/kg to 10.5 μg/kg; dieldrin ranged from 3.99 μg/kg to 18.9 μg/kg; 2,4'-DDD ranged from 60.2 μg/kg to 209 μg/kg; 2,4'-DDT ranged from undetected in COMP AK-A to 240 μg/kg in COMP AK-B; 4,4'-DDD ranged from 200 μg/kg to 2070 μg/kg; 4,4'-DDE ranged from 127 μg/kg to 250 μg/kg; 4,4'-DDT ranged from 110 μg/kg to 1480 μg/kg; endosulfan I ranged from 21.7 μg/kg to 134 μg/kg; and *trans*-nonachlor ranged from 2.48 μg/kg to 14.4 μg/kg. Aldrin, endosulfan II, endosulfan sulfate, heptachlor, and heptachlor epoxide were not detected in sediment from any of the three reaches.

3.3.1.3 PCBs in Arthur Kill Sediment Composites

Concentrations of PCB congeners analyzed in COMP AK-A, COMP AK-B, and COMP AK-C sediments are presented in Tables A.11 through A.13. Results of QC samples corresponding to these analyses are found in Tables A.14 through A.16. All 22 congeners analyzed were detected in COMP AK-C; COMP AK-A had 1 undetected congener (PCB 170), and COMP AK-B had 4 undetected congeners (PCB 184, 195, 206, and 209). Total PCB concentrations followed a gradient, increasing from Arthur Kill Reach A to Reach C. Total PCB concentrations were 693 μg/kg dry weight, 2505 μg/kg, and 3316 μg/kg, for COMPs AK-A, AK-B, and AK-C, respectively.

3.3.1.4 2,3,7,8-TCDD/TCDF in Individual Core Samples from Arthur Kill

Concentrations of 2,3,7,8-TCDD and 2,3,7,8-TCDF analyzed in individual Arthur Kill Reach A, Reach B, and Reach C core samples are presented in Table A.17. Results of QC samples corresponding to these analyses are found in Table A.18. Concentrations of 2,3,7,8 TCDD and TCDF were comparable among the three Arthur Kill reaches, with few exceptions.

In Reach A of Arthur Kill, the 2,3,7,8-TCDD congener was detected in all core samples, and 2,3,7,8-TCDF was detected in all but two samples: AK-A-26, Replicate 3 only, and AK-A-31. However, in both of these samples, it was chromatographic interferences that prevented detection of the TCDF. Station AK-A-30, which was located near the bend in the channel just north of Shooters Island, had the highest 2,3,7,8-TCDD concentration of any of the samples analyzed at 455 pg/g wet weight. Concentrations of 2,3,7,8-TCDD in the remaining core samples from Reach A ranged from 22.8 pg/g (wet weight) at Station AK-A-26 (taken from a mean of triplicate analyses of that sample) to 42.1 pg/g at AK-A-23. Detected concentrations of 2,3,7,8-TCDF in Arthur Kill Reach A ranged from 9.54 pg/g to 18.4 pg/g (wet weight).

In Arthur Kill Reach B, 2,3,7,8-TCDD was detected in all stations, ranging from 0.59 pg/g wet weight at AK-B-14 to 41.0 pg/g at AK-B-18. In the sample from AK-G-20, a coeluting ether prevented determination of 2,3,7,8-TCDF. Detected concentrations of 2,3,7,8-TCDF in Reach B samples ranged from 1.01 pg/g at AK-B-14 to 136 pg/g at AK-B-18. No data for either the TCDD or TCDF congeners were obtainable for the third replicate of AK-B-15. Acceptable data were obtained for the other two replicates, but poor chromatography due to interferences, even after dilution and reinjection of the sample, prevented determination of either compound.

In Arthur Kill Reach C, 2,3,7,8-TCDD was detected in all stations, ranging from 5.79 pg/g (wet weight) at AK-C-5 to 84.0 pg/g at AK-C-10. The 2,3,7,8-TCDF congener was undetected in three samples–AK-C-1, AK-C-2, and in the third replicate of AK-C-3. No TCDF data were obtainable from sample AK-C-7 due to chromatographic interferences. Detectable concentrations of 2,3,7,8-TCDF ranged from 7.06 pg/g (AK-C-5) to 63.1 pg/g (AK-C-12).

3.3.1.5 PAHs and 1,4-dichlorobenzene in Arthur Kill Sediment Composites

Concentrations of PAHs analyzed in COMP AK-A, COMP AK-B, and COMP AK-C sediments are presented in Tables A.19 through A.21. Results of QC samples corresponding to these analyses are found in Tables A.22 through A.24. All 16 PAH compounds analyzed were detected in all three Arthur Kill reaches. In COMP AK-A, the concentration of total PAH was 8356 μg/kg dry weight; total low-molecular-weight PAH (LPAH) was 1925 μg/kg, and total high-molecular-weight PAH (HPAH) was 6431 μg/kg. Concentrations of individual LPAHs in COMP AK-A ranged from 151 μg/kg (acenaphthene) to 676 μg/kg (phenanthrene). Concentrations of individual HPAHs in COMP AK-A ranged from 114 μg/kg (dibenzo[a,h]anthracene) to 1060 μg/kg (fluoranthene). In COMP AK-B, the concentration of total PAH was 10,704 μg/kg; total LPAH was 3023 μg/kg, and total HPAH was 7681 μg/kg. Concentrations of individual LPAHs in COMP AK-B ranged from 212 μg/kg (acenaphthylene) to 1080 μg/kg (phenanthrene).

Concentrations of individual HPAHs in COMP AK-B ranged from 116 μg/kg (dibenzo[a,h]anthracene) to 1330 μg/kg (both fluoranthene and pyrene). In COMP AK-C, the concentration of total PAH was 12,696 μg/kg; total LPAH was 3887 μg/kg, and total HPAH was 8809 μg/kg. Concentrations of individual LPAHs in COMP AK-C ranged from 184 μg/kg (acenaphthylene) to 1340 μg/kg (phenanthrene). Concentrations of individual HPAHs in COMP AK-C ranged from 155 μg/kg (dibenzo[a,h]anthracene) to 1380 μg/kg (fluoranthene).

Results of analysis of 1,4-dichlorobenzene are presented in Table A.13, with corresponding QC data shown in Table A.16. The concentration of 1,4-dichlorobenzene in COMPs AK-A , AK-B, and AK-C was 39.6 μg/kg, 82.6 μg/kg, and 53.5 μg/kg, respectively.

3.3.1.6 Herbicides in Arthur Kill Sediment Composites

The herbicides 2,4,5-T and 2,4-D were analyzed but not detected in COMP AK-A, COMP AK-B, and COMP AK-C (Table A.25).

3.3.2 Arthur Kill Site Water and Elutriate Chemical Analyses

Metals, chlorinated pesticides, and PCB were determined in dredging site water collected from Arthur Kill Reach A (AK-A), Arthur Kill Reach B (AK-B), and Arthur Kill Reach C (AK-C), and in elutriate samples prepared from clean seawater and each of the Arthur Kill sediment composites. All site waters and elutriate samples were analyzed in triplicate. Complete results of all dredging site water and elutriate sample analyses and associated QC data are tabulated in Appendix B, Tables B.1 through B.13.

3.3.2.1 Metals in Arthur Kill Water and Elutriate

Concentrations of metals found in Arthur Kill water and elutriate samples are presented in Table B.1. Results of QC samples corresponding to these analyses are found in Table B.2. For all metals except Zn, achieved detection limits were lower than target detection limits. All sample results for Zn were at least one to two orders of magnitude higher than the achieved detection limit. In the site water samples, concentrations of the metals analyzed were highest in Arthur Kill Reach B, and generally comparable between Reaches A and C. Concentrations of Ag and Cd in site water and elutriate from all three reaches ranged from below to only slightly above target detection limits; thus, any trends between site water and elutriate were not obvious. Concentrations of Cr, Cu, Hg, Ni, Pb, and Zn were higher in the elutriate than in the site water, with elevations ranging from slightly greater to at least an order of magnitude, with two exceptions: the Zn concentration in the AK-A elutriate and the Cu concentration in the AK-B elutriate were about one-half the corresponding concentrations in the site water.

3.3.2.2 Pesticides in Arthur Kill Water and Elutriate

Concentrations of chlorinated pesticides found in Arthur Kill water and elutriate samples are presented in Tables B.3 and B.4. Results of QC samples corresponding to these analyses are found in Tables B.5 and B.6. All achieved detection limits were lower that the target detection limits, and, for most pesticides, by at least an order of magnitude. In the Arthur Kill site water samples, most of the pesticides analyzed were either undetected or detected at concentrations lower than the target detection limits. Detectable levels of dieldrin (Reach B only), 2,4'-DDD (Reach B only), 4,4'-DDE (all reaches), and 4,4'-DDT (Reach C) were found at concentrations less than 6 ng/L in one or two replicates from each reach. In Reach B site water, 4,4'-DDD was found at approximately 8 ng/L and 4,4'-DDT was 37.9 ng/L in one replicate. In elutriate samples from all three reaches, concentrations of aldrin, 2,4'-DDT, 4,4'-DDT, endosulfan I and II, endosulfan sulfate, heptachlor epoxide, and *trans*-nonachlor were near or below achieved detection limits. Concentrations of α-chlordane, dieldrin, 2,4'-DDD, 2,4'-DDE, 4,4'-DDD, 4,4'-DDE, and heptachlor increased from undetected in the site water to elutriate concentrations ranging from near detection limits to over 2000 times greater than the achieved detection limit. Of the three Arthur Kill elutriates, Reach C elutriate generally had the highest pesticide levels.

3.3.2.3 PCBs in Arthur Kill Water and Elutriate

Concentrations of PCBs found in Arthur Kill water and elutriate samples are presented in Tables B.7 through B.9. Results of QC samples corresponding to these analyses are found in Tables B.10 and B.13. Target detection limits of 0.5 ng/L were achieved for 16 of the 22 PCB congeners. The remaining six congeners had detection limits of approximately 1 ng/L. In the Arthur Kill site water samples, almost all of the PCBs analyzed were undetected; a few congeners were detected at concentrations near the detection limits. In the elutriate samples, there was essentially no difference in concentrations of three PCB congeners between the site water and elutriate for all three reaches. Concentrations of these PCBs remained near or below achieved detection limits. Concentrations of the other 19 congeners increased from undetected in the site water to near detection limits to over 1000 times greater than the achieved detection limits in elutriates. The greatest differences in PCBs between the site and elutriate waters were in the AK-C samples.

Total PCB concentrations followed a gradient, increasing from Arthur Kill Reach A to Reach C, as did the sediment PCB concentrations. Total PCB concentrations in elutriate samples were 300 ng/L, 695 ng/L, and 10,586 ng/L for Arthur Kill Reaches A, B, and C,

respectively. Total PCB concentrations in site water 11 ng/L, 12 ng/L, and 14 ng/L for Arthur Kill Reaches A, B, and C, respectively.

3.3.3 Arthur Kill Water-Column and Benthic Toxicity Testing

Water-column and benthic acute toxicity tests were conducted with the three test composites from Arthur Kill: COMPs AK-A, AK-B, and AK-C. Suspended-particulate-phase tests were conducted with the silverside *M. beryllina,* the mysid *M. bahia*, and larvae of the mussel *M. edulis.* Ten-day benthic toxicity tests were conducted under static and flow-through conditions using the amphipods *A. abdita* and *R. abronius,* and a 10-day static toxicity test was conducted using the mysid *M. bahia.* Complete water-column test results, including water quality measurements and results of reference toxicant tests, are tabulated in Appendix C; complete benthic toxicity test results are tabulated in Appendix D.

3.3.3.1 *Menidia beryllina* Water-Column Toxicity Test

Results of the *M. beryllina* water-column toxicity tests for the Arthur Kill composites are presented in Table 3.7. Dredging site water controls were not tested with *M. beryllina*, because an insufficient number of test organisms were available. Survival of *M. beryllina* in the 100% SPP treatment for all three Arthur Kill test composites was 0%, which was significantly lower than that in the Mud Dump Site control water. Survival of *M. beryllina* in the control treatments was 84%, 98%, and 92% for COMPs AK-A, AK-B, and AK-C, respectively. COMP AK-A control survival was below the acceptable level of 90%, but it is unlikely that this slightly lower survival affected the dose-response or calculated LC_{50} for COMP AK-A. The calculated LC_{50} for *M. beryllina* exposed to the SPP of COMP AK-A sediment was 23.6% SPP. For COMP AK-B, the LC_{50} was 22.4% SPP, and for COMP AK-C, it was 24.6% SPP.

For COMP AK-A, COMP AK-B, and COMP AK-C, the temperature, salinity, and DO measurements were within acceptable ranges throughout the test. The pH measurements exceeded acceptable ranges in the 50% and 100% SPP treatments for all three composites on at least one day of testing.

3.3.3.2 *Mysidopsis bahia* Water-Column Toxicity Test

Results of the *M. bahia* water-column toxicity tests for the Arthur Kill composites are presented in Table 3.7. Survival of *M. bahia* in the control treatments (100% Mud Dump Site water) was 96% for all three test treatments, indicating all valid tests. Survival of *M. bahia* in dredging site waters, unadjusted for salinity, was 97% for Arthur Kill Reach A, 90% for Arthur Kill Reach B, and 93% for Arthur Kill Reach C. For all three test composites, 0% of the *M. bahia* survived in the 100% SPP test treatment, which was significantly lower than the 0% SPP

TABLE 3.7. Summary of Water-Column Toxicity Testing for Arthur Kill

Test Organism and Sediment Treatment	Survival in 0% SPP	Survival in 100% SPP	0% & 100% Significantly Different	LC_{50} (% SPP)
Menidia beryllina				
Arthur Kill Reach A (COMP AK-A)	84%	0%	Yes	23.6
Arthur Kill Reach B (COMP AK-B)	98%	0%	Yes	22.4
Arthur Kill Reach C (COMP AK-C)	92%	0%	Yes	24.6
Mysidopsis bahia				
Arthur Kill Reach A (COMP AK-A)	96%	0%	Yes	45.1
Arthur Kill Reach B (COMP AK-B)	96%	0%	Yes	21.8
Arthur Kill Reach C (COMP AK-C)	96%	0%	Yes	17.1
Mytilus edulis larvae (survival)				
Arthur Kill Reach A (COMP AK-A)	96%	11%	Yes	54.5
Arthur Kill Reach B (COMP AK-B)	87%	4%	Yes	21.8
Arthur Kill Reach C (COMP AK-C)	57%	1%	Yes	17.1
Mytilus edulis larvae (survival to normal D-cell)				
Arthur Kill Reach A (COMP AK-A)	93%	0%	Yes	22.2[a]
Arthur Kill Reach B (COMP AK-B)	85%	0%	Yes	23.6[a]
Arthur Kill Reach C (COMP AK-C)	53%	0%	Yes	<10.0[a]

(a) Median effective concentration (EC_{50}) based on normal development to D-cell.

controls. The calculated LC_{50} for *M. bahia* exposed to the SPP of COMP AK-A was 45.1% SPP; for COMP AK-B, the LC_{50} was 21.8% SPP; and for COMP AK-C it was 17.1% SPP.

For COMP AK-A, COMP AK-B, and COMP AK-C, temperature, salinity, and DO measurements in each SPP treatment (except the dredging site water controls, which were tested at ambient salinities) were within acceptable ranges throughout the test. On at least one day the pH measurements were above the acceptable limit of 8.30 in the 50% SPP of each composite and in the 100% SPP treatment for COMP AK-A.

3.3.3.3 *Mytilus edulis* Water-Column Toxicity Test

Results of the *M. edulis* water-column toxicity test for the Arthur Kill composites are presented in Table 3.7. The percentage of surviving and normally developed *M. edulis* larvae were above the acceptability criteria of >70% in controls for COMP AK-A and COMP AK-B controls (0% SPP); however, survival and normal development of *M. edulis* larvae in the COMP

AK-C control was below 70%. Because a definite dose-response relationship was found with increasing SPP concentration and the reference toxicant test indicated normal larval sensitivity in the batch of test organisms, an LC_{50} was estimated for this composite. However, this test is invalid for disposal evaluation according to the Green Book, which requires >70% normal development in the control. Larval survival ranged from 1% to 11% in the 100% SPP treatments, but nearly all surviving larvae were abnormal (0% to 0.1% normally developed). For all three reaches, both survival and normal development were significantly lower in the 100% SPP treatments than in the control water (O% SPP). The calculated LC_{50} for *M. edulis* exposed to SPP of COMP AK-A was 54.5% SPP; for COMP AK-B, the LC_{50} was 39.9% SPP; and for COMP AK-C, it was <10.0% SPP. The calculated EC_{50} for the three Arthur Kill composites were 22.2% SPP for COMP AK-A; 23.6% SPP for COMP AK-B; and 18.1% SPP for COMP AK-C.

Temperature and salinity measurements were within acceptable ranges throughout the test. DO was slightly below the acceptable level of 4.9 at initiation in the highest concentration of each of the composites but was within range for the remainder of testing. The pH measurements were slightly above the acceptable range of 8.30 on at least one day in the highest concentrations of SPP for all three composites.

No larvae survived in any of the dredging site water controls, which had salinities of 10‰ to 15‰. In dredging site water treatments that were adjusted to a salinity of 30‰ with brine, survival was 86% with 81% normally developed larvae for site water from Arthur Kill Reach A; 93% with 85% normally developed larvae for site water from Arthur Kill Reach B; and 88% with 77% normally developed larvae for site water from Arthur Kill Reach C.

3.3.3.4 *Ampelisca abdita* Static and Flow-through Benthic Acute Toxicity Tests

Results of the *A. abdita* static and flow-through benthic acute toxicity test for the Arthur Kill composites are presented in Table 3.8. In the static test, *A. abdita* survival in the native control (C-AM) was 61%; survival in the grain size control (C-SB) was 70%. Survival of *A. abdita* in COMP AK-A, COMP AK-B and COMP AK-C was 0%, a difference of more than 20% from Mud Dump Reference survival. However, this static test is invalid for disposal evaluation according to the Green Book, which requires ≥90% survival of amphipods in the native control. Temperature and salinity measurements were within acceptable ranges throughout the test. The DO measurements were below acceptable ranges on the first day of testing, but were within range for the remainder of the test. The minimum DO measurement was 4.7 mg/L (approximately 60% saturated) in COMP AK-B. The pH measurements slightly exceeded acceptable ranges for all three test composites on at least one day of testing.

In the flow-through test, temperature, pH, and salinity measurements were within acceptable ranges throughout the test. The DO and flow-rate measurements were slightly below the acceptable limits in at least one test composite on one day of testing, but were within range for the remainder of the test. Survival in the native control (C-AM) was 89% and survival in the grain size control (C-SB) was 87% (Table 3.8). Survival of *A. abdita* was 30% in COMP AK-A and 3% in COMP AK-B and COMP AK-C. Although the native control survival of 89% is lower than the 90% required for validation, statistical analyses were performed. The results of the statistical analyses showed that all three test composites (COMPs AK-A, AK-B, and AK-C) were significantly different than the Mud Dump Reference Site (87%) and had greater than 20% mortality from the reference treatment.

3.3.3.5 *Rhepoxynius abronius* Static and Flow-Through Benthic Toxicity Tests

Results of the *R. abronius* static and flow-through benthic acute toxicity tests for the Arthur Kill composites are presented in Table 3.8. In the static test, DO measurements were below the acceptable limit of 7.6 on the first day of testing, but were within range for the remainder of the test. The pH measurements slightly exceeded acceptable ranges for all three test composites on at least one day of testing. Survival of *R. abronius* in the native control (C-WB) was 97%, validating the static test. *R. abronius* survival in the Mud Dump Reference Site sediment was 90%. No *R. abronius* survived in COMP AK-A, COMP AK-B, and COMP AK-C. The statistical comparison of the test composites to the reference showed that all three test composites were significantly different and had greater than 20% difference in mortality in comparison to the Mud Dump Reference Site.

In the flow-through test, all of the water quality parameters (temperature, pH, DO, salinity, and flow rates) were within acceptable ranges throughout the test period. *R. abronius* survival was 95% in the native control (C-WB), validating the test (Table 3.8). Survival in the grain size control (C-SB) was 90%. *R. abronius* survival in the reference treatment was 92%. In the test treatments, *R. abronius* survival was better in the flow-through test than the static: 37% in COMP AK-A, 4% in COMP AK-B, and 17% in COMP AK-C. The results of the statistical evaluation showed that all three test composites were significantly different and had greater than 20% difference in mortality relative to the Mud Dump Reference Site.

3.3.3.6 *Mysidopsis bahia* Static Benthic Toxicity Test

Results of the *M. bahia* static toxicity test are shown in Table 3.8. Survival of *M. bahia* in the native control (C-SB) was 96%, validating the test. Survival of *M. bahia* in Arthur Kill sediment treatments was low: 0% in COMP AK-A, 2% in COMP AK-B, and 0% in COMP AK-C.

TABLE 3.8. Results of Benthic Toxicity Testing for Arthur Kill Sediment Composites[a]

Sediment Treatment	Percentage of Survival (Mean of Five Replicates)				
	A. abdita Static	*A. abdita* Flow-through	*R. abronius* Static	*R. abronius* Flow-through	*M. bahia* Static
Arthur Kill Reach A (AK-A)	0	30	0	37	0
Arthur Kill Reach A (AK-B)	0	3	0	4	2
Arthur Kill Reach C (AK-C)	0	3	0	17	14
Mud Dump Reference Site	71	87	90	92	96
A. abdita Control (C-AM)	61	89	NA[b]	NA	NA
R. abronius Control (C-WB)	NA	NA	97	95	NA
Grain Size Control (C-SB)	70	87	81	90	96

(a) EPA recommended ammonia protocols were not in effect at time of testing (EPA/USACE 1993).
(b) NA Not applicable.

All three composites, COMP AK-A, COMP AK-B, and COMP AK-C, were significantly different from the Mud Dump Reference Site and had greater than 20% mortality relative to the reference treatment. The water quality parameters, pH, DO, and salinity, had values that were slightly outside of acceptable levels for at least one test composite and one day of testing.

3.3.3.7 Ammonia Measurements During Arthur Kill Benthic Toxicity Testing

Concentrations of total ammonia were measured in the pore water and overlying water of COMPs AK-A, AK-B, and AK-C, as well as in reference and control sediments, during the benthic toxicity tests with *A. abdita* and *R. abronius*. Measurements were made on Day 0 and Day 10 of the static and flow-through tests. Table 3.9 shows the results of ammonia measurements during Arthur Kill static and flow-through benthic toxicity tests. Ammonia levels were high at test initiation in both pore water and overlying water for COMP AK-A, AK-B, and AK-C sediments. Pore water concentrations increased after 10 days in the static test, but decreased noticeably in the flow-through test. Overlying water concentrations in the static test on Day 10 were erratic (some readings were higher than on Day 0, some were lower). Overlying water concentrations in the flow-through test decreased over the 10-day test.

3.3.4 Arthur Kill Bioaccumulation Tests

Bioaccumulation tests with *N. virens* and *M. nasuta* were conducted using the sediment composites from Arthur Kill Reach A (COMP AK-A), Reach B (COMP AK-B), and Reach C, (COMP AK-C). *N. virens* and *M. nasuta* were exposed to the sediment composites for 28 days under flow-through conditions. The tissues of the test organisms were then analyzed for metals and selected organic contaminants (chlorinated pesticides, PCBs, PCDD/PCDF [*N. virens* only], and PAHs). Complete bioaccumulation test results, including water quality measurements and

TABLE 3.9 , Concentrations of Ammonia in Arthur Kill Amphipod Toxicity Tests

Sediment Treatment	Total Ammonia Concentration (mg/L) Day 0 Pore Water, Both Tests	Day 0 Overlying Water, Both Tests	Day 10 Pore Water, Static Test	Day 10 Overlying Water, Static Test	Day 10 Pore Water, Flow-through	Day 10 Overlying Water, Flow-through
Arthur Kill Reach A (AK-A)	128.1	85.4	128.1	146.4	3.66	3.1
Arthur Kill Reach B (AK-B)	122	109.8	134.2	122	4.88	4.9
Arthur Kill Reach C (AK-C)	109.8	61	146.4	134.2	3.05	4.9
Mud Dump Reference Site	30.5	10.98	6.1	11.59	0.61	6.1
A. abdita Control (C-AM)	9.76	7.32	ND(a)	ND	0.61	6.1
R. abronius Control (C-WB)	10.98	14.64	14.64	12.2	0.61	6.1
Grain Size Control (C-SB)	1.22	8.54	12.2	10.98	0.61	4.9

(a) ND No data available.

results of reference toxicant tests, are tabulated in Appendix E. Mean percentage of survival of worms for the 28-day test was 76% in the Mud Dump Reference Site and 89% in the control sediment (Table E.3). Mean percentage of survival in Arthur Kill sediments was 79% for Reach A, 69% for Reach B, and 65% for Reach C (Table E.3). All water quality parameters were within acceptable limits except for minor deviations in temperature, pH, and flow rate (Table E.4). Mean percentage of survival of clams in reference, control, and Arthur Kill sediments were similar for all treatments, ranging from 80% (Reach C) to 95% (Reach B) (Table E.7). All water quality parameters were within acceptable limits except for minor deviations in temperature and pH (Table E.8).

Complete results of chemical analyses of tissue samples, including quality control sample summaries for each analysis, are provided in Appendix F for *N. virens* samples, and in Appendix G for *M. nasuta* samples. The following sections discuss only those contaminants of concern found at detectable concentrations in at least one of the five of the test treatment replicates.

3.3.4.1 Bioaccumulation of Metals in *N. virens* Exposed to Arthur Kill Composites

All metals were detected in *N. virens* exposed to COMPs AK-A, AK-B, and AK-C, but only nickel in COMP AK-B exposed tissues was significantly elevated relative to reference (Table 3.10).

3.3.4.2 Bioaccumulation of Pesticides in *N. virens* Exposed to Arthur Kill Composites

Out of the 15 pesticides analyzed, 9 were significantly higher in *N. virens* tissues exposed to all three Arthur Kill test composites when compared with *N. virens* tissues exposed to Mud Dump Reference Site sediment (Table 3.10). Seven of those pesticides (aldrin, α-chlordane, *trans*-nonachlor, 4,4'-DDT, 4,4'-DDD, 2,4'-DDD, and 4,4'-DDE) were over 10 times higher in the *N. virens* tissues exposed to COMP AK-A, COMP AK-B, and COMP AK-C than in *N. virens* tissues exposed to the reference site sediment. Dieldrin was over 10 times higher in the *N. virens* tissues exposed to COMP AK-B and COMP AK-C and over 5 times higher in COMP AK-A exposed tissues than in *N. virens* tissues exposed to the reference site sediment

3.3.4.3 Bioaccumulation of PCBs in *N. virens* Exposed to Arthur Kill Composites

Out of the 22 PCB congeners analyzed, 17 were significantly elevated in *N. virens* tissues exposed to all three composites from Arthur Kill relative to tissues exposed to the Mud Dump Reference Site (Table 3.10). Between 12 and 16 PCBs were ≥10 times higher in *N. virens* tissues exposed to COMPs AK-A, AK-B, and AK-C than in *N. virens* tissues exposed to reference site sediment. Total PCB concentrations were 105 µg/kg, 146 µg/kg, and 180 µg/kg

TABLE 3.10. Mean Wet Weight Concentrations of Contaminants of Concern in Tissues of *Nereis virens* Exposed to Arthur Kill Sediment Composites. (An asterisk indicates value is statistically significantly greater than in tissues exposed to the Mud Dump Reference Site when compared by Dunnett's test; underlined type indicates ≥5<10 times mean concentration in reference treatment on a dry weight basis; bold type indicates ≥10 times mean concentration in reference treatment.)

Analyte	Concentrations in Tissues of *Nereis virens* (wet wt) [a]							
	Mud Dump Reference Site		COMP AK-A		COMP AK-B		COMP AK-C	
Metals (mg/kg)								
Arsenic	2.29		2.00		2.01		2.06	
Cadmium	0.142		0.145		0.166		0.124	
Chromium	0.192		0.287		0.237		0.176	
Copper	1.88		2.19		2.77		2.05	
Lead	0.192		0.317		0.302		0.202	
Mercury	0.0105		0.0107		0.0117		0.0078	
Nickel	0.203		0.363		0.402	*	0.280	
Silver	0.0385		0.0150		0.0119		0.0153	
Zinc	21.4		11.4		23.3		18.6	
Pesticides (µg/kg)								
Aldrin	0.08	U[b]	**1.37**	*	**1.29**	*	**1.09**	*
α-Chlordane	0.21		**2.62**	*	**2.98**	*	**3.12**	*
trans-Nonachlor	0.11		**1.44**	*	**1.59**	*	**1.39**	*
Dieldrin	0.15	U	1.40	*	**2.43**	*	**4.17**	*
4,4'-DDT	0.16	U	**4.52**	*	**10.1**	*	**5.48**	*
2,4'-DDT	0.20	U	0.20	U	0.20	U	0.18	U
4,4'-DDD	0.22	U	**17.5**	*	**103**	*	**18.3**	*
2,4'-DDD	0.18	U	**9.97**	*	**32.2**	*	**10.5**	*
4,4'-DDE	0.07	U	**4.57**	*	**16.5**	*	**9.74**	*
2,4'-DDE	0.18		0.06	U	0.91		0.05	U
Endosulfan I	0.23	U	0.23	U	0.23	U	0.20	U
Endosulfan II	0.23	U	0.23	U	0.23	U	0.20	U
Endosulfan Sulfate	0.23	U	0.23	U	0.23	U	0.20	U
Heptachlor	0.07	U	0.40		0.35		0.12	
Heptachlor Epoxide	0.22	U	0.71	*	0.88	*	1.15	*
PCBs (µg/kg)								
PCB 8	0.38	U	0.38	U	0.38	U	0.33	U
PCB 18	0.39	U	2.95	*	**6.51**	*	**7.44**	*
PCB 28	0.18	U	**4.02**	*	**6.28**	*	**8.17**	*
PCB 44	0.15	U	**2.68**	*	**3.68**	*	**3.81**	*
PCB 49	0.03	U	**4.09**	*	**5.09**	*	**5.24**	*
PCB 52	0.33	U	**7.24**	*	**10.5**	*	**10.4**	*
PCB 66	0.23		**5.31**	*	**7.13**	*	**10.7**	*
PCB 87	0.15	U	0.33		0.36		0.49	*
PCB 101	0.14	U	**4.50**	*	**5.30**	*	**8.02**	*
PCB 105	0.10	U	**1.84**	*	**2.54**	*	**3.93**	*
PCB 118	0.27	U	2.64	*	**2.74**	*	**4.75**	*

TABLE 3.10. (contd)

Analyte	Concentrations in Tissues of *Nereis virens* (wet wt) [a]							
	Mud Dump Reference Site		COMP AK-A		COMP AK-B		COMP AK-C	
PCB 128	0.14	U	0.63	*	0.89	*	**1.40**	*
PCB 138	0.27	U	**4.54**	*	**8.55**	*	**8.10**	*
PCB 153	0.35		**5.13**	*	**5.84**	*	**7.90**	*
PCB 170	0.15	U	1.23	*	1.52	*	**1.79**	*
PCB 180	0.17		**2.36**	*	**2.80**	*	**3.68**	*
PCB 183	0.03	U	0.03	U	0.03	U	0.02	U
PCB 184	0.03	U	**0.73**	*	**0.81**	*	**1.15**	*
PCB 187	0.12	U	**1.44**	*	**1.77**	*	**2.21**	*
PCB 195	0.09	U	0.09	U	0.09	U	0.08	U
PCB 206	0.10	U	0.32	*	0.32	*	0.32	*
PCB 209	0.09	U	0.09	U	0.09	U	0.08	U
1,4-Dichlorobenzene	1.00	U	1.00	U	1.00	U	1.00	U
PCDD/PCDF (ng/kg)								
2,3,7,8-TCDD	1.04		3.82	*	3.17	*	3.14	*
2,3,7,8-TCDF	0.85		2.25	*	2.40	*	3.66	*
PAHs (µg/kg)								
Acenaphthene	2.14		3.49	*	4.99	*	4.57	*
Acenaphthylene	1.32		1.83	*	2.54	*	1.87	*
Anthracene	2.21		4.20	*	6.52	*	6.11	*
Fluorene	2.06		2.55		3.77	*	3.53	*
Naphthalene	1.84		1.96		2.53		1.88	
Phenanthrene	1.75		3.54		7.16	*	6.19	*
Benzo(a)anthracene	2.93		5.19	*	6.60	*	6.06	*
Benzo(a)pyrene	2.95		3.93		4.16		2.73	
Benzo(g,h,i)perylene	2.62		3.83		4.52		3.00	
Benzo(b)fluoranthene	3.13		5.82	*	6.62	*	5.87	*
Benzo(k)fluoranthene	1.57		4.97	*	7.27	*	4.15	*
Chrysene	0.60	U	**14.5**	*	**17.4**	*	**16.5**	*
Dibenzo(a,h)anthracene	2.69	U	2.21		3.58		2.01	
Fluoranthene	3.00		16.8	*	21.0	*	22.3	*
Indeno(1,2,3-cd)pyrene	2.47		3.86		5.37		2.92	
Pyrene	1.84		17.6	*	**20.6**	*	**21.3**	*

(a) Results shown are a mean of five replicate tissue analyses. If any constituents were undetected, one-half the detection limit was used in calculation of the mean concentration.

(b) U Undetected at or above the detection limit shown.

wet weight in *N. virens* tissues exposed to COMP AK-A, COMP AK-B, and COMP AK-C, respectively.

3.3.4.4 Bioaccumulation of PCDD/PCDF in *N. virens* Exposed to Arthur Kill Composites

The concentrations of 2,3,7,8-TCDD in tissues of *N. virens* exposed to COMP AK-A, COMP AK-B, and COMP AK-C sediments were significantly elevated (about two or three times as high on a dry weight basis) when compared with concentrations of 2,3,7,8-TCDD in *N. virens* tissues exposed to the reference site sediment (Table 3.10). The concentrations of 2,3,7,8-TCDF in tissues of *N. virens* exposed to all three Arthur Kill sediment composites were significantly elevated (at least twice as high on a dry weight basis) when compared with concentrations of 2,3,7,8-TCDF in *N. virens* tissues exposed to the reference site sediment.

3.3.4.5 Bioaccumulation of PAHs and 1,4-dichlorobenzene in *N. virens* Exposed to Arthur Kill Composites

Out of the 16 PAH compounds analyzed, concentrations of 9 were significantly elevated in *N. virens* tissues exposed to all three Arthur Kill composites when compared with the concentrations of PAHs in *N. virens* tissues exposed to the reference site sediment (Table 3.10). Three PAHs (fluoranthene, pyrene, and chrysene) concentrations were significantly elevated in *N. virens* tissues exposed to all three Arthur Kill composites at levels at least five times higher than in *N. virens* tissues that had been exposed to the Mud Dump Reference Site sediment.

3.3.4.6 Bioaccumulation of Metals in *M. nasuta* Exposed to Arthur Kill Composites

Out of the nine metals analyzed in *M. nasuta* tissues exposed to COMPs AK-A, AK-B, and AK-C, concentrations of Cd, Cu, Hg and Ni were significantly elevated in one or more composite when compared with the concentrations of metals in *M. nasuta* tissues exposed to the reference site sediment (Table 3.11). No metals concentrations in tissues from Arthur Kill-exposed composites were greater than two times higher when compared with those of *M. nasuta* tissues that had been exposed to the Mud Dump Reference Site sediment.

3.3.4.7 Bioaccumulation of Pesticides in *M. nasuta* Exposed to Arthur Kill Composites

Out of the 15 pesticides analyzed in *M. nasuta* tissues exposed to Arthur Kill sediments, three (4,4'-DDD, 4,4'-DDE, and 2,4'-DDE) were significantly different and elevated in all three composites at least five times above those exposed to the Mud Dump Reference Site sediment (Table 3.11). No other pesticide concentrations were significantly different and elevated in all three reaches compared to levels found in tissues exposed to the reference sediment.

TABLE 3.11. Mean Wet Weight Concentrations of Contaminants of Concern in Tissues of *Macoma nasuta* Exposed to Arthur Kill Sediment Composites. (An asterisk indicates value is statistically significantly greater than in tissues exposed to the Mud Dump Reference Site when compared by Dunnett's test; underlined type indicates ≥5<10 times mean concentration in reference treatment on a dry weight basis; bold type indicates ≥10 times mean concentration in reference treatment.)

	Concentrations in Tissues of *Macoma nasuta* (wet wt) [a]							
Analyte	Mud Dump Reference Site		COMP AK-A		COMP AK-B		COMP AK-C	
Metals (mg/kg)								
Arsenic	2.94		2.92		3.68		3.23	
Cadmium	0.0255		0.0403	*	0.0390	*	0.0437	*
Chromium	0.751		0.538		0.335		0.767	
Copper	1.92		2.48	*	1.85		2.65	
Lead	0.666		0.845		0.494		1.41	
Mercury	0.0187		0.0266	*	0.0237		0.0252	
Nickel	0.396		0.523	*	0.425		0.509	
Silver	0.0344		0.0300		0.0187		0.0352	
Zinc	12.3		12.0		14.6		14.1	
Pesticides (µg/kg)								
Aldrin	0.61		0.93		1.17		0.99	
α-Chlordane	0.29		2.30	*	0.38		0.40	
trans-Nonachlor	0.06	U[b]	0.53	*	0.06	U	0.06	U
Dieldrin	0.25		1.74	*	0.16	U	2.18	
4,4'-DDT	1.91		3.53	*	4.12	*	2.52	
2,4'-DDT	0.22	U	0.22	U	0.22	U	0.22	U
4,4'-DDD	1.54		**20.6**	*	**77.5**	*	**33.0**	*
2,4'-DDD	0.20	U	**8.42**	*	**22.6**	*	10.6	
4,4'-DDE	2.35		15.5	*	**32.2**	*	22.4	*
2,4'-DDE	0.18		**6.79**	*	**21.7**	*	**12.7**	*
Endosulfan I	0.25	U	0.25	U	0.25	U	0.25	U
Endosulfan II	0.25	U	0.25	U	0.25	U	0.16	
Endosulfan Sulfate	0.25	U	0.25	U	0.25	U	0.25	U
Heptachlor	0.30		0.08	U	0.08	U	0.36	
Heptachlor Epoxide	0.24	U	0.24	U	0.14		0.24	U
PCBs (µg/kg)								
PCB 8	0.65		0.32		2.23		3.11	*
PCB 18	0.86		5.72	*	**9.62**	*	**10.9**	*
PCB 28	3.53		11.7	*	14.1	*	16.8	*
PCB 44	0.23		**5.30**	*	**6.56**	*	**6.88**	*
PCB 49	2.36		11.4	*	10.5	*	12.3	*
PCB 52	2.43		9.77	*	11.3	*	13.3	*
PCB 66	3.87		8.57	*	9.42	*	12.5	*
PCB 87	0.93		2.13	*	2.02		2.73	*
PCB 101	2.99		6.12	*	5.49	*	6.80	*
PCB 105	0.49		1.45	*	0.32		1.82	*

TABLE 3.11. (contd)

Analyte	Concentrations in Tissues of *Macoma nasuta* (wet wt) [a]							
	Mud Dump Reference Site		COMP AK-A		COMP AK-B		COMP AK-C	
PCB 118	2.13		3.85	*	3.31	*	4.31	*
PCB 128	0.30		0.38		0.22		0.40	
PCB 138	1.40		2.55	*	2.75	*	2.63	*
PCB 153	1.93		2.63	*	1.96		2.26	
PCB 170	0.17	U	0.17	U	0.17	U	0.17	U
PCB 180	0.47		0.77	*	0.35		0.54	
PCB 183	0.20	U	0.20	U	0.20	U	0.20	U
PCB 184	0.16		0.25		0.20	U	0.17	
PCB 187	0.29		0.29	U	0.18		0.51	
PCB 195	0.10	U	0.10	U	0.10	U	0.09	
PCB 206	0.11	U	0.11	U	0.11	U	0.11	U
PCB 209	0.09	U	0.09	U	0.09	U	0.09	U
1,4-Dichlorobenzene	1.00	U	1.00	U	0.64		1.00	U
PCDD/PCDF (ng/kg)								
2,3,7,8-TCDD	NA[c]		NA		NA		NA	
2,3,7,8-TCDF	NA		NA		NA		NA	
PAHs (µg/kg)								
Acenaphthene	0.83		6.35	*	6.38	*	6.10	*
Acenaphthylene	1.98		2.73	*	2.17		2.17	
Anthracene	5.28		40.7	*	**67.1**	*	**57.9**	*
Fluorene	2.89		10.7	*	12.2	*	12.8	*
Naphthalene	3.02		3.55		3.01		2.93	
Phenanthrene	5.02		**50.3**	*	**79.2**	*	**80.3**	*
Benzo(a)anthracene	9.48		68.1	*	67.7	*	66.3	*
Benzo(a)pyrene	15.0		37.5	*	28.8	*	26.3	*
Benzo(g,h,i)perylene	7.07		14.5		11.3		11.6	
Benzo(b)fluoranthene	21.5		58.1	*	44.4	*	43.4	*
Benzo(k)fluoranthene	8.61		15.4	*	10.3		10.4	
Chrysene	12.1		100	*	96.0	*	96.5	*
Dibenzo(a,h)anthracene	2.92	U	3.58	*	1.75		2.92	U
Fluoranthene	14.1		**141**	*	**152**	*	**159**	*
Indeno(1,2,3-cd)pyrene	7.96		12.3		8.16		7.89	
Pyrene	34.7		174	*	178	*	183	*

(a) Results shown are a mean of five replicate tissue analyses. If any constituents were undetected, one-half the detection limit was used in calculation of the mean concentration.
(b) U Undetected at or above the detection limit shown.
(c) NA Not analyzed.

However, five additional pesticides (α-chlordane, *trans*-nonachlor, dieldrin, 4,4'-DDT, and 2,4'-DDD) were significantly elevated in tissues exposed to at least one of the Arthur Kill composites.

3.3.4.8 Bioaccumulation of PCBs in *M. nasuta* Exposed to Arthur Kill Composites

Concentrations of 9 of the 18 PCBs detected in *M. nasuta* tissues were significantly different in all three Arthur Kill composite-exposed tissues when compared with those in tissues exposed to Mud Dump Reference sediment (Table 3.11). Concentrations of the analytes PCB 18 and PCB 44 were significantly different and elevated at least five times over those found in tissues exposed to the reference sediment for all three Arthur Kill composites. Total PCB concentrations were 147 µg/kg, 162 µg/kg, and 197 µg/kg wet weight in *M. nasuta* tissues exposed to COMP AK-A, COMP AK-B, and COMP AK-C, respectively.

3.3.4.9 Bioaccumulation of PAHs and 1,4-dichlorobenzene in *M. nasuta* Exposed to Arthur Kill Composites

Concentrations of ten PAHs were significantly different and elevated in all three Arthur Kill composite-exposed tissues when compared with those of Mud Dump Reference Site-exposed tissues (Table 3.11). Concentrations of 7 of the 16 PAHs were different and at least five times higher for COMP AK-A, COMP AK-B, and COMP AK-C than those found in tissues exposed to the reference sediment.

3.4 Results of Physical, Chemical, and Biological Analyses of Port Elizabeth Sediment

The 15 sediment core samples collected at Port Elizabeth were analyzed for grain size, TOC, moisture content, bulk density, specific gravity, and 2,3,7,8-TCDD/TCDF. Metals, chlorinated pesticides, PCBs, PAHs, 1,4-dichlorobenzene, and the chlorinated herbicides 2,4-D and 2,4,5-T, were determined in two sediment composites from Port Elizabeth: COMP PE-A, which represents the six core samples collected in Port Elizabeth Reach A, and COMP PE-B, which represents the nine core samples collected in Port Elizabeth Reach B. Elutriate prepared from Port Elizabeth composites and dredging site water was analyzed chemically and was used to evaluate water-column toxicity to three species of marine organisms. The two Port Elizabeth composites were also used for benthic toxicity (three species) and bioaccumulation tests (two species).

3.4.1 Port Elizabeth Sediment Physical and Chemical Analyses

Complete results of sediment physical and chemical analyses and associated quality control data for the Port Elizabeth project area is tabulated in Appendix A. Port Elizabeth

sediments were generally black mud with some odor of petroleum products. Sample PE-A-2 had about 1.5 ft of hard-packed red clay at the bottom of the core, and sample PE-B-11 had several bits of red clay interspersed through the core. The 15 individual sediment core samples collected at Port Elizabeth were analyzed for grain size, TOC, moisture content, bulk density, and specific gravity (Appendix A, Tables A.1 through A.4). Sediments from Port Elizabeth Reach A were generally silt and clay (approximately 10% sand, 50% silt, and 40% clay). Sediments from Port Elizabeth Reach B were also mostly silt and clay, with a slightly higher sand content (approximately 15% sand, 50% silt, and 35% clay).

TOC in Port Elizabeth core sediments ranged from 1.51% to 2.96% (dry weight) in Reach A; and from 1.87% to 3.37% in Reach B. Moisture content in Port Elizabeth samples ranged from 48% to 63% in Reach A and from 43% to 60% in Reach B. Bulk density in Port Elizabeth sediments from both reaches ranged from 82 to 99 lb/cu ft wet and from 31 to 57 lb/cu ft dry. Specific gravity ranged from 2.57 to 2.66.

3.4.1.1 Metals in Port Elizabeth Sediment Composites

Concentrations of metals found in Port Elizabeth composites, and QC data corresponding to metals analyses, are found in Tables A.5 and A.6. Concentrations of each of the metals analyzed were comparable between the two Port Elizabeth reaches.

3.4.1.2 Pesticides in Port Elizabeth Sediment Composites

Concentrations of chlorinated pesticides in COMP PE-A and COMP PE-B sediments are presented in Tables A.7 and A.8. Results of QC samples corresponding to these analyses are found in Tables A.9 and A.10. Of the 15 pesticides analyzed, 7 were detected in COMP PE-A and 8 were detected in COMP PE-B. Concentrations of each of the pesticides were comparable between the Port Elizabeth Reach A and Reach B sediments, except for 4,4'-DDT, which was undetected in COMP PE-A and 10.2 μg/kg dry weight in COMP PE-B. Concentrations of α-chlordane ranged from 4.81 μg/kg to 6.95 μg/kg; dieldrin ranged from 3.16 μg/kg to 5.32 μg/kg; 2,4'-DDD ranged from 17.4 μg/kg to 18.0 μg/kg; 4,4'-DDD ranged from 45.4 μg/kg to 72.6 μg/kg; 4,4'-DDE ranged from 49.0 μg/kg to 75.6 μg/kg; endosulfan I ranged from 7.75 μg/kg to 7.85 μg/kg; and *trans*-nonachlor ranged from 2.01 μg/kg to 3.36 μg/kg.

3.4.1.3 PCBs in Port Elizabeth Sediment Composites

Concentrations of PCB congeners analyzed in COMP PE-A and COMP PE-B sediments are presented in Tables A.11 through A.13. Results of QC samples corresponding to these analyses are found in Tables A.14 through A.16. All 22 congeners analyzed were detected in both COMP PE-A and COMP PE-B. Concentrations of PCBs were comparable between

COMPs PE-A and PE-B. Total PCB concentrations were 1494 μg/kg (dry weight) and 1414 μg/kg (dry weight) for COMP PE-A and COMP PE-B, respectively.

3.4.1.4 2,3,7,8-TCDD/TCDF in Individual Core Samples from Port Elizabeth

Concentrations of 2,3,7,8-TCDD and 2,3,7,8-TCDF analyzed in individual Port Elizabeth Reach A and Reach B core samples are presented in Table A.17. Results of QC samples corresponding to these analyses are found in Table A.18. Concentrations of 2,3,7,8-TCDD and -TCDF were comparable between the two reaches. The 2,3,7,8-TCDD congener was detected in all core samples in both Port Elizabeth Reach A and Reach B. Concentrations of 2,3,7,8-TCDD ranged from 15.8 pg/g wet weight at PE-A-2 to 81.5 pg/g at PE-A-3. The 2,3,7,8-TCDF congener was detected in all but two stations from Port Elizabeth Reach B (samples PE-B-8 and PE-B-12) in which coeluting interference prohibited determination of this compound. Detectable concentrations of 2,3,7,8-TCDF ranged from 5.98 pg/g at PE-A-2 to 13.3 pg/g at PE-A-3.

3.4.1.5 PAHs and 1,4-dichlorobenzene in Port Elizabeth Sediment Composites

Concentrations of PAHs analyzed in COMP PE-A and COMP PE-B sediments are presented in Tables A.19 through A.21. Results of QC samples corresponding to these analyses are found in Tables A.22 through A.24. All 16 PAH compounds analyzed were detected in both COMP PE-A and COMP PE-B. The concentrations and distribution of PAH compounds were comparable between the two Port Elizabeth reaches. The concentration of total PAH in COMP PE-A was 20,820 μg/kg dry weight; total LPAH was 5619 μg/kg, and total HPAH was 15,201 μg/kg. Concentrations of individual LPAHs in COMP PE-A ranged from 310 μg/kg (acenaphthylene) to 1950 μg/kg (phenanthrene). Concentrations of individual HPAHs in COMP PE-A ranged from 160 μg/kg (dibenzo[a,h]anthracene) to 3520 μg/kg (fluoranthene).

The concentration of total PAH in COMP PE-B was 17,170 μg/kg; total LPAH was 6224 μg/kg, and total HPAH was 10,946 μg/kg. Concentrations of individual LPAHs in COMP PE-B ranged from 213 μg/kg (acenaphthylene) to 2330 μg/kg (phenanthrene). Concentrations of individual HPAHs in COMP PE-B ranged from 113 μg/kg (dibenzo[a,h]anthracene) to 2,890 μg/kg (fluoranthene).

Results of analysis of 1,4-dichlorobenzene (which was performed with the pesticide/PCB analyses) are presented in Table A.13, with corresponding QC data shown in Table A.16. The concentration of 1,4-dichlorobenzene in COMPs PE-A and PE-B was 39.4 μg/kg and 37.5 μg/kg, respectively.

3.4.1.6 Herbicides in Port Elizabeth Sediment Composites

The herbicides 2,4,5-T and 2,4-D were analyzed but not detected in COMP PE-A and COMP PE-B (Table A.25).

3.4.2 Port Elizabeth Site Water and Elutriate Chemical Analyses

Metals, chlorinated pesticides, and PCB were determined in dredging site water collected from Port Elizabeth Reach A (PE-A) and Port Elizabeth Reach B (PE-B), and in elutriate samples prepared from clean seawater and each of the Port Elizabeth sediment composites. All site waters and elutriate samples were analyzed in triplicate. Complete results of all dredging site water and elutriate sample analyses and associated QC data are tabulated in Appendix B, Tables B.1 through B.13.

3.4.2.1 Metals in Port Elizabeth Water and Elutriate

Concentrations of metals found in Port Elizabeth water and elutriate samples are presented in Table B.1. Results of QC samples corresponding to these analyses are found in Table B.2. For all metals except Zn, achieved detection limits were lower than target detection limits; however, all site water and elutriate sample results for Zn were at least one to two orders of magnitude higher than the detection limit. In the site water samples, concentrations of the metals analyzed were comparable between PE-A and PE-B. Concentrations of Cd in site water and elutriate from both reaches ranged from below to slightly above the target detection limit; thus, any trends between site water and elutriate for Cd were not obvious. Likewise, there was essentially no difference in concentrations of Cu between the site water and elutriate. Concentration of Zn was actually slightly lower in the elutriate than in the site water. Concentrations of Ag, Cr, Hg, Ni, and Pb were 2 to 20 times higher in the elutriate than in the site water for both reaches (except Pb in Reach B). The highest elevations in elutriate were found with Hg and Ag.

3.4.2.2 Pesticides in Port Elizabeth Water and Elutriate

Concentrations of chlorinated pesticides found in Port Elizabeth water and elutriate samples are presented in Tables B.3 and B.4. Results of QC samples corresponding to these analyses are found in Tables B.5 and B.6. All achieved detection limits were lower than the target detection limits, and, for most pesticides, by at least an order of magnitude. In the Port Elizabeth site water samples, almost all of the pesticides analyzed were either undetected or detected at concentrations lower than the target detection limits. Dieldrin, 4,4'-DDE, 4,4'-DDT, and heptachlor were detected in one replicate from Reach A and/or Reach B site water, all at concentrations less than 5.4 ng/L. In the elutriate samples, there was no difference in

concentrations of aldrin, 2,4'-DDD (Reach A only), 2,4'-DDE (Reach A only), 2,4'-DDT (Reach B only), 4,4'-DDT (Reach B only), endosulfan I, endosulfan II, endosulfan sulfate, heptachlor epoxide, and *trans*-nonachlor (Reach B only); concentrations of these pesticides remained near or below achieved detection limits. Concentrations of α-chlordane, dieldrin, 2,4'-DDE (Reach B), 4,4'-DDD, 4,4'-DDE, 4,4'-DDT (Reach A), and heptachlor (Reach B) were higher in the elutriates than in the site water. The highest concentrations of pesticides in Port Elizabeth elutriates were found with α-chlordane (Reach A), and 4,4'-DDD and 4,4'-DDE (both reaches) with levels between 9 and 31 ng/L.

3.4.2.3 PCBs in Port Elizabeth Water and Elutriate

Concentrations of PCBs found in Port Elizabeth water and elutriate samples are presented in Tables B.7 through B.9. Results of QC samples corresponding to these analyses are found in Tables B.10 and B.13. Target detection limits of 0.5 ng/L were achieved for 16 of the 22 PCB congeners. The remaining six congeners had detection limits of approximately 1 ng/L. In the Port Elizabeth site water samples, almost all of the PCBs analyzed were undetected; a few congeners were detected at concentrations near the detection limits. In the elutriate samples, there was essentially no difference in concentrations of only five PCB congeners (PCBs 8, 87, 183, 195, and 209). Concentrations of these PCBs remained near or below achieved detection limits. Concentrations of the remaining congeners increased from undetected concentrations in the site water to concentrations ranging from near detection limits to about 60 times greater than the achieved detection limit.

Total PCB concentrations were 737 ng/L for Port Elizabeth Reach A elutriate and 395 ng/L for Port Elizabeth Reach B elutriate. Total PCB concentrations in Port Elizabeth site waters were 12 ng/L for Reach A and 14 ng/L for Reach B.

3.4.3 Port Elizabeth Water-Column and Benthic Toxicity Testing

Water-column and benthic acute toxicity tests were conducted with the two test composites from Port Elizabeth: COMP PE-A and COMP PE-B. Suspended-particulate-phase tests were conducted with the silverside *M. beryllina,* the mysid shrimp *M. bahia*, and larvae of the mussel *M. edulis.* Ten-day toxicity tests were conducted under static and flow-through conditions using the amphipods *A. abdita* and *R. abronius*, and a 10-day static toxicity test was conducted using the mysid *M. bahia.* Complete water-column test results, including water quality measurements and results of reference toxicant tests, are tabulated in Appendix C; complete benthic toxicity test results are tabulated in Appendix D.

3.4.3.1 *Menidia beryllina* Water-Column Toxicity Test

Results of the *M. beryllina* water-column toxicity tests for the Port Elizabeth composites are presented in Table 3.12. Survival of *M. beryllina* in the control SPP treatment was 96% for both COMP PE-A and COMP PE-B, validating the toxicity tests. Survival of *M. beryllina* in the 100% SPP treatment of both test composites was 0%, which was significantly different from the 0% SPP control. The calculated LC_{50} for the *M. beryllina* exposed to the SPP of COMP PE-A was 51.3% SPP; the LC_{50} for COMP PE-B was 61.2% SPP. The temperature, salinity, and DO measurements were within acceptable ranges throughout the test. The pH measurements exceeded acceptable ranges in the 50% SPP for COMP PE-A and 100% SPP for both composites on at least one day of testing.

3.4.3.2 *Mysidopsis bahia* Water-Column Toxicity Test

Results of the *M. bahia* water-column toxicity test for the Port Elizabeth composites are presented in Table 3.12. Survival of *M. bahia* in the control treatment (100% Mud Dump Site Water) was 98% for COMP PE-A and 96% for COMP PE-B, validating the test. Survival of *M. bahia* in dredging site waters, unadjusted for salinity, was 53% for COMP PE-A and 27% for COMP PE-B. Survival of *M. bahia* in the 100% SPP treatments for both COMP PE-A and COMP PE-B was above 50%, but was significantly different from the control water. The LC_{50}s were >100% for *M. bahia* exposed to the SPP of COMPs PE-A and PE-B. Temperature, salinity, and DO measurements were within acceptable ranges throughout the test. On at least one day the pH measurement was above the acceptable limit of 8.30 in the 100% SPP preparation of COMP PE-A. Salinity in the dredging site waters ranged from 8‰ to 12‰ for both COMP PE-A and COMP PE-B.

3.4.3.3 *Mytilus edulis* Water-Column Toxicity Test

Results of the *M. edulis* water-column toxicity test for the Port Elizabeth composites are presented in Table 3.12. Survival of *M. edulis* larvae in the control was 62% with 58% normally developed larvae for COMP PE-A, and 58% with 57% normally developed larvae for COMP PE-B. The percentages of surviving and normally developed larvae were below the acceptability criteria of 70%. Because there were strong dose-response relationships and reference toxicant sensitivity was within acceptable ranges, statistical analyses were completed for these composites. However, because control survival did not meet acceptability criteria, these test results are invalid for disposal evaluation. The proportion of normally developed larvae in the 100% SPP treatment for both composites was 0%, and was significantly different from the controls. The calculated LC_{50} for *M. edulis* exposed to SPP of COMP PE-A was 51.2% SPP;

TABLE 3.12. Summary of Water-Column Toxicity Testing for Port Elizabeth

Test Organism and Sediment Treatment	Survival in 0% SPP	Survival in 100% SPP	0% & 100% Significantly Different	LC_{50} (% SPP)
Menidia beryllina				
Port Elizabeth Reach A (COMP PE-A)	96%	0%	Yes	51.3
Port Elizabeth Reach B (COMP PE-B)	96%	0%	Yes	61.2
Mysidopsis bahia				
Port Elizabeth Reach A (COMP PE-A)	98%	70%	Yes	>100%
Port Elizabeth Reach B (COMP PE-B)	96%	60%	Yes	>100%
Mytilus edulis larvae (survival)				
Port Elizabeth Reach A (COMP PE-A)	62%	2%	Yes	51.2
Port Elizabeth Reach B (COMP PE-B)	58%	1%	Yes	49.3
Mytilus edulis larvae (survival to normal D-cell)				
Port Elizabeth Reach A (COMP PE-A)	58%	0%	Yes	22.4[(a)]
Port Elizabeth Reach B (COMP PE-B)	57%	0%	Yes	22.4[(a)]

(a) Median effective concentration (EC_{50}) based on normal development to D-cell.

for COMP PE-B, the LC_{50} was 49.3% SPP. The calculated EC_{50} for both of the Port Elizabeth composites was 22.4% SPP.

Temperature, DO, and salinity measurements were within acceptable ranges throughout the test. Some pH measurements were slightly above the acceptable limit of 8.30 on at least one day in the two highest concentrations of SPP for both composites.

No larvae survived in any of the dredging site water controls, which had salinities of 9‰ to 11‰. In dredging-site treatments that were adjusted to a salinity of 30‰ with brine, survival was 84% with 75% normally developed larvae for COMP PE-A, and 92% with 89% normally developed larvae for COMP PE-B.

3.4.3.4 *Ampelisca abdita* Static and Flow-through Benthic Acute Toxicity Tests

Results of the *A. abdita* static and flow-through benthic acute toxicity tests for the Port Elizabeth composites are presented in Table 3.13. In the static test, *A. abdita* survival in the native control (C-AM) was 61%; survival in the grain size control (C-SB) was 70%. Survival of *A. abdita* in both COMPs PE-A and PE-B was 0%, difference of more than 20% from Mud Dump Reference survival. The low survival in the native control invalidates this test for any statistical interpretation. The water quality parameters of temperature and salinity were within acceptable ranges throughout testing. The DO measurements were below the acceptable limit

TABLE 3.13. Results of Benthic Toxicity Testing for Port Elizabeth Sediment Composites[a]

Sediment Treatment	Percent Survival (Mean of Five Replicates)				
	A. abdita Static	*A. abdita* Flow-through	*R. abronius* Static	*R. abronius* Flow-through	*M. bahia* Static
Port Elizabeth Reach A (PE-A)	0	48	10	27	14
Port Elizabeth Reach B (PE-B)	0	46	3	28	14
Mud Dump Reference Site	71	87	90	92	96
A. abdita Control (C-AM)	61	89	NA[b]	NA	NA
R. abronius Control (C-WB)	NA	NA	97	95	NA
Grain Size Control (C-SB)	70	87	81	90	96

(a) EPA recommended ammonia protocols were not in effect at time of toxicity testing (EPA/USACE 1993).
(b) NA Not applicable.

on Day 0 of testing but were within range on all subsequent days of testing. The pH measurements for both composites were slightly outside of acceptable levels on at least one day of testing.

In the flow-through test, survival in the native control (C-AM) was 89%. Survival in the grain size control (C-SB) was 87%. Survival of *A. abdita* was 48% in COMP PE-A and 46% in COMP PE-B (Table 3.13). Although the native control survival of 89% is lower than the 90% required for validation, statistical analyses were performed. The results of the statistical analyses showed that both test composites COMP PE-A and COMP PE-B were significantly different from the Mud Dump Reference Site (87% survival) and had greater than 20% difference in mortality from the reference treatment.

3.4.3.5 *Rhepoxynius abronius* Static and Flow-through Toxicity Tests

Results of the *R. abronius* static and flow-through benthic acute toxicity tests for the Port Elizabeth composites are presented in Table 3.13. In the static test, survival of *R. abronius* in the native control (C-WB) was 97%, validating the test. Survival in the grain size control (C-SB) was 81%. Survival of *R. abronius* was 10% in COMP PE-A, and 3% in COMP PE-B. *R. abronius* survival in the Mud Dump Reference Site sediment was 90%. Both test composites were significantly different and had greater than 20% difference in mortality from the Mud Dump Reference Site. In the static test, temperature and salinity measurements were within acceptable ranges throughout the static test. The DO measurements were below acceptable limit on Day 0 of testing, but were acceptable for the remainder of the test. The pH

measurements slightly exceeded acceptable ranges for both test composites on at least one day of testing.

In the flow-through test, survival of *R. abronius* in the native control (C-WB) was 95%, validating the test, and survival in the grain size control (C-SB) was 90%. Survival of *R. abronius* in COMP PE-A was 27%, and 28% in COMP PE-B. *R. abronius* survival in the Mud Dump Reference Site sediment was 92%. The results of the statistical evaluation showed that both test composites were significantly different and had greater than 20% difference in mortality relative to the Mud Dump Reference Site. All of the water quality parameters in the flow-through test (temperature, pH, DO, salinity, and flow rates) were within acceptable ranges throughout the test period.

3.4.3.6 *Mysidopsis bahia* Static Benthic Toxicity Test

Results of the *M. bahia* static benthic acute toxicity test for the Port Elizabeth composites are presented in Table 3.13. This test was validated by an acceptable native control (C-SB) survival of 96%. Survival of *M. bahia* was 14% in both COMP PE-A and COMP PE-B. The statistical comparison of the test composites with the reference showed that COMP PE-A and COMP PE-B were significantly different from the Mud Dump Reference Site. These composites also had greater than 20% difference in mortality relative to the reference treatment. Temperature was within acceptable ranges throughout the *M. bahia* 10-day test. Other water quality parameters, including pH, DO, and salinity, slightly exceeded acceptable levels for at least one test composite on one day of testing.

3.4.3.7 Ammonia Measurements During Port Elizabeth Benthic Toxicity Testing

Concentrations of total ammonia were measured in the pore water and overlying water of COMP PE-A and COMP PE-B, as well as in reference and control sediments, during the benthic toxicity tests with *A. abdita* and *R. abronius*. Measurements were made on Day 0 and Day 10 of the static and flow-through tests. Table 3.14 shows the results of ammonia measurements during Port Elizabeth static and flow-through benthic toxicity tests. In COMP PE-A, ammonia levels were moderate at test initiation in both pore water and overlying water. In COMP PE-B, ammonia levels were high in both pore water and overlying water. Pore water concentrations decreased after 10 days in the static test, and decreased considerably in the flow-through test. Overlying water concentrations in the static test on Day 10 were erratic (some readings were higher than on Day 0, some were lower). Overlying water concentrations in the flow-through test decreased over the 10-day test.

TABLE 3.14. Concentrations of Ammonia in Port Elizabeth Amphipod Benthic Toxicity Tests

Sediment Treatment	Total Ammonia Concentration (mg/L)					
	Day 0		Day 10			
	Pore Water, Both Tests	Overlying Water, Both Tests	Pore Water, Static Test	Overlying Water, Static Test	Pore Water, Flow-through	Overlying Water, Flow-through
Port Elizabeth Reach A (PE-A)	48.8	24.4	36.6	30.5	0.61	6.1
Port Elizabeth Reach B (MT-B)	97.6	61	61	48.8	0.61	6.1
Mud Dump Reference Site	30.5	10.98	6.1	11.59	0.61	6.1
A. abdita Control (C-AM)	9.76	7.32	ND(a)	ND	0.61	6.1
R. abronius Control (C-WB)	10.98	14.64	14.64	12.2	0.61	6.1
Grain Size Control (C-SB)	1.22	8.54	12.2	10.98	0.61	4.9

(a) ND No data available.

3.4.4 Port Elizabeth Bioaccumulation Tests

Bioaccumulation tests with *N. virens* and *M. nasuta* were conducted using the sediment composites from Port Elizabeth Reach A (COMP PE-A) and Reach B (COMP PE-B). *N. virens* and *M. nasuta* were exposed to the sediment composites for 28 days under flow-through conditions. The tissues of the test organisms were then analyzed for metals and selected organic contaminants (chlorinated pesticides, PCBs, PCDD/PCDF [*N. virens* only], and PAHs). Complete bioaccumulation test results, including water quality measurements and results of reference toxicant tests, are tabulated in Appendix E. Mean percentage survival of worms for the 28-day test was 76% in the Mud Dump Reference Site and 89% in the control sediment (Table E.3). Mean percentage survival in Port Elizabeth sediments was 63% for Reach A, and 75% for Reach B (Table E.3). All water quality parameters were within acceptable limits except for minor deviations in dissolved oxygen and flow rate (Table E.4). Mean percentage survival of clams in reference, control, and Port Elizabeth sediments were similar for all treatments, ranging from 90% (Mud Dump Reference Site) to 94% (Reach A) (Table E.7). All water quality parameters were within acceptable limits except for minor deviations in temperature and flow rate (Table E.8). Complete results of chemical analyses of tissue samples, including quality control sample summaries for each analysis, are provided in Appendix F for *N. virens* samples, and in Appendix G for *M. nasuta* samples. The following sections discuss only those contaminants of concern found at detectable concentrations in at least one of the five of the test treatment replicates.

3.4.4.1 Bioaccumulation of Metals in *N. virens* Exposed to Port Elizabeth Composites

Out of the nine metals analyzed in *N. virens* tissues exposed to COMP PE-A and COMP PE-B sediments, only the concentration of Ni in COMP PE-B was significantly higher (but less than twice) than *N. virens* tissues exposed to the Mud Dump Reference Site sediment (Table 3.15).

3.4.4.2 Bioaccumulation of Pesticides in *N. virens* Exposed to Port Elizabeth Composites

Significant elevated pesticide concentrations were found in both Port Elizabeth composite-exposed tissues for *trans*-nonachlor and dieldrin (greater than 5 times) and aldrin, α-chlordane, 4,4'-DDT, 4,4'-DDD, and 4,4'-DDE (greater than 10 times) (Table 3.15).

TABLE 3.15. Mean Wet Weight Concentrations of Contaminants of Concern in Tissues of *Nereis virens* Exposed to Port Elizabeth Sediment Composites. (An asterisk indicates value is statistically significantly greater than in tissues exposed to the Mud Dump Reference Site when compared by Dunnett's test; underlined type indicates ≥5<10 times mean concentration in reference treatment on a dry weight basis; bold type indicates ≥10 times mean concentration in reference treatment.)

Analyte	Concentrations in Tissues of *Nereis virens* (wet wt) [a]					
	Mud Dump Reference Site		COMP PE-A		COMP PE-B	
Metals (mg/kg)						
Arsenic	2.29		2.19		2.08	
Cadmium	0.142		0.145		0.156	
Chromium	0.192		0.194		0.222	
Copper	1.88		2.09		2.36	
Lead	0.192		0.252		0.262	
Mercury	0.0105		0.0092		0.0090	
Nickel	0.203		0.264		0.382	*
Silver	0.0385		0.0096		0.0172	
Zinc	21.4		13.7		21.9	
Pesticides (µg/kg)						
Aldrin	0.08	U	**1.29**	*	**1.90**	*
α-Chlordane	0.13		2.19	*	**2.20**	*
trans-Nonachlor	0.09		0.98	*	1.02	*
Dieldrin	0.15	U	1.49	*	1.39	*
4,4'-DDT	0.16	U	**4.69**	*	**3.65**	*
2,4'-DDT	0.20	U	0.20	U	0.21	U
4,4'-DDD	0.22	U	**3.28**	*	**5.37**	*
2,4'-DDD	0.18	U	0.18	U	1.10	
4,4'-DDE	0.07	U	**1.35**	*	**2.90**	*
2,4'-DDE	0.16		0.06	U	0.06	U
Endosulfan I	0.23	U	0.23	U	0.24	U
Endosulfan II	0.23	U	0.23	U	0.24	U
Endosulfan Sulfate	0.23	U	0.23	U	0.24	U
Heptachlor	0.07	U	0.07	U	0.57	*
Heptachlor Epoxide	0.22	U	0.33		0.59	*
PCBs (µg/kg)						
PCB 8	0.38	U	0.38	U	0.39	U
PCB 18	0.39	U	1.62	*	**4.24**	*
PCB 28	0.18	U	**2.22**	*	**5.58**	*
PCB 44	0.15	U	1.30	*	**3.23**	*
PCB 49	0.03	U	**1.80**	*	**4.28**	*
PCB 52	0.33	U	**5.37**	*	**8.48**	*
PCB 66	0.20		**4.36**	*	**5.97**	*
PCB 87	0.15	U	0.15	U	0.49	
PCB 101	0.14	U	**3.85**	*	**4.74**	*
PCB 105	0.10	U	**1.77**	*	**1.93**	*

TABLE 3.15. (contd)

Analyte	Concentrations in Tissues of *Nereis virens* (wet wt) [a]					
	Mud Dump Reference Site		COMP PE-A		COMP PE-B	
PCB 118	0.27	U	2.04	*	**2.93**	*
PCB 128	0.14	U	0.81	*	0.63	*
PCB 138	0.27	U	**5.28**	*	**4.25**	*
PCB 153	0.33		**6.03**	*	**4.88**	*
PCB 170	0.15	U	1.49	*	1.06	*
PCB 180	0.11		**3.20**	*	**2.15**	*
PCB 183	0.03	U	0.03	U	0.06	U
PCB 184	0.03	U	**0.96**	*	**0.62**	*
PCB 187	0.12	U	**1.93**	*	**1.44**	*
PCB 195	0.09	U	0.09	U	0.10	U
PCB 206	0.10	U	0.28		0.34	*
PCB 209	0.09	U	0.09	U	0.10	U
1,4-Dichlorobenzene	1.00	U	1.00	U	1.00	U
PCDD/PCDF (ng/kg)						
2,3,7,8-TCDD	1.04		5.85	*	4.81	*
2,3,7,8-TCDF	0.85		1.80	*	1.89	*
PAHs (µg/kg)						
Acenaphthene	2.14		11.0	*	**25.5**	*
Acenaphthylene	1.24		2.21	*	2.67	*
Anthracene	1.37		3.81	*	7.41	*
Fluorene	1.92		3.39	*	6.50	*
Naphthalene	1.84		2.17		2.72	
Phenanthrene	1.75		5.30	*	**19.3**	*
Benzo(a)anthracene	2.93		4.93	*	7.98	*
Benzo(a)pyrene	2.95		3.45		5.73	
Benzo(g,h,i)perylene	1.99		3.48		3.53	
Benzo(b)fluoranthene	3.10		5.16		7.67	*
Benzo(k)fluoranthene	1.28		4.90	*	5.91	*
Chrysene	0.60	U	**11.7**	*	**21.1**	*
Dibenzo(a,h)anthracene	2.69	U	2.78		2.85	
Fluoranthene	3.00		25.8	*	**75.1**	*
Indeno(1,2,3-cd)pyrene	2.47		3.56		3.81	
Pyrene	1.54		**18.7**	*	**56.4**	*

(a) Results shown are a mean of five replicate tissue analyses. If any constituents were undetected, one-half the detection limit was used in calculation of the mean concentration.
(b) U Undetected at or above the detection limit shown.

3.4.4.3 Bioaccumulation of PCBs in *N. virens* Exposed to Port Elizabeth Composites

Four PCB congeners (PCB 8, 183, 195, and 209) were not detected in *N. virens* tissues exposed to either Port Elizabeth composite (Table 3.15). The concentrations of 11 PCB congeners were significantly elevated in *N. virens* tissues exposed to both Port Elizabeth composites at levels greater than 10 times those exposed to the Mud Dump Reference Site. Total PCB concentrations were 89 µg/kg and 115 µg/kg wet weight in *N. virens* tissues exposed to COMP PE-A and COMP PE-B, respectively.

3.4.4.4 Bioaccumulation of PCDD/PCDF in *N. virens* Exposed to Port Elizabeth Composites

The concentrations of 2,3,7,8-TCDD in tissues of *N. virens* exposed to COMP PE-A and COMP PE-B sediments were significantly elevated (about four times as high) when compared with concentrations of 2,3,7,8-TCDD in *N. virens* tissues exposed to the reference site sediment (Table 3.15). The concentrations of 2,3,7,8-TCDF in tissues of *N. virens* exposed to both Port Elizabeth sediment composites were significantly elevated (about twice as high) when compared with concentrations of 2,3,7,8-TCDF in *N. virens* tissues exposed to the reference site sediment.

3.4.4.5 Bioaccumulation of PAHs and 1,4-dichlorobenzene in *N. virens* Exposed to Port Elizabeth Composites

The compound 1,4-dichlorobenzene was not detected in either Port Elizabeth composite exposed *N. virens* tissue (Table 3.15). All 16 PAHs were detected in worm tissue exposed to Port Elizabeth composites. The concentrations of five PAHs, naphthalene, benzo[a]pyrene, benzo(g,h,i)perylene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene, were not significantly elevated in *N. virens* tissues exposed to COMP PE-A or COMP PE-A relative to tissues exposed to the Mud Dump Reference Site. Four PAH compounds, acenaphthene, chrysene, fluoranthene, and pyrene, were significantly elevated in *N. virens* tissues exposed to both Port Elizabeth composites at levels at least 5 and up to 35 times higher than those found in tissues exposed to the reference sediment.

3.4.4.6 Bioaccumulation of Metals in *M. nasuta* Exposed to Port Elizabeth Composites

Of the nine metals analyzed in *M. nasuta* tissues exposed to COMP PE-A and COMP PE-B sediments, Cd and Pb were significantly elevated (but less than twice the concentration) in *M. nasuta* tissues exposed to COMP PE-A and COMP PE-B compared with the concentrations of metals in *M. nasuta* tissues exposed to the reference site sediment (Table 3.16). Mercury was significantly different and elevated (but less than twice the concentration) in *M. nasuta*

TABLE 3.16. Mean Wet Weight Concentrations of Contaminants of Concern in Tissues of *Macoma nasuta* Exposed to Port Elizabeth Sediment Composites. (An asterisk indicates value is statistically significantly greater than in tissues exposed to the Mud Dump Reference Site when compared by Dunnett's test; underlined type indicates ≥5<10 times mean concentration in reference treatment on a dry weight basis; bold type indicates ≥10 times mean concentration in reference treatment.)

	Concentrations in Tissues of *Macoma nasuta* (wet wt) [a]					
Analyte	Mud Dump Reference Site		COMP PE-A		COMP PE-B	
Metals (mg/kg)						
Arsenic	2.94		3.23		3.41	
Cadmium	0.0255		0.0437	*	0.0432	*
Chromium	0.751		0.767		0.736	
Copper	1.92		2.65		2.60	
Lead	0.666		1.41	*	1.08	*
Mercury	0.0187		0.0252		0.0297	*
Nickel	0.396		0.509		0.569	
Silver	0.0344		0.0352		0.0330	
Zinc	12.3		14.1		14.2	
Pesticides (µg/kg)						
Aldrin	0.61		1.10		0.93	
α-Chlordane	0.29		1.92	*	1.92	*
trans-Nonachlor	0.06	U[b]	0.26		0.39	*
Dieldrin	0.25		0.97		0.88	
4,4'-DDT	1.91		3.15		3.26	
2,4'-DDT	0.22	U	0.22	U	0.22	U
4,4'-DDD	1.54		3.88		5.07	*
2,4'-DDD	0.20	U	0.20	U	**4.00**	*
4,4'-DDE	2.35		6.82	*	9.28	*
2,4'-DDE	0.18		1.47	*	**2.60**	*
Endosulfan I	0.25	U	0.25	U	0.25	U
Endosulfan II	0.25	U	0.25	U	0.25	U
Endosulfan Sulfate	0.25	U	0.25	U	0.25	U
Heptachlor	0.30		0.28		0.17	
Heptachlor Epoxide	0.24	U	0.24	U	0.24	U
PCBs (µg/kg)						
PCB 8	0.65		0.41	U	0.41	U
PCB 18	0.86		5.85	*	6.45	*
PCB 28	3.53		10.1	*	13.0	*
PCB 44	0.23		**4.35**	*	**4.98**	*
PCB 49	2.36		6.27	*	7.99	*
PCB 52	2.43		9.29	*	10.4	*
PCB 66	3.87		8.05	*	9.41	*
PCB 87	0.93		2.44		2.35	
PCB 101	2.99		5.92	*	6.35	*
PCB 105	0.49		1.75	*	1.69	*

TABLE 3.16. (contd)

Analyte	Concentrations in Tissues of *Macoma nasuta* (wet wt) [a]					
	Mud Dump Reference Site		COMP PE-A		COMP PE-B	
PCB 118	2.13		4.09	*	4.21	*
PCB 128	0.30		0.62		0.57	
PCB 138	1.40		3.61	*	2.91	*
PCB 153	1.93		3.49	*	2.88	*
PCB 170	0.17	U	0.17	U	0.17	U
PCB 180	0.47		1.30	*	0.87	*
PCB 183	0.20	U	0.20	U	0.20	U
PCB 184	0.16		0.37		0.41	*
PCB 187	0.29		0.90	*	0.77	*
PCB 195	0.10	U	0.10	U	0.10	U
PCB 206	0.11	U	0.10		0.11	U
PCB 209	0.09	U	0.09	U	0.09	U
1,4-Dichlorobenzene	1.00	U	0.78		0.76	
PCDD/PCDF (ng/kg)						
2,3,7,8-TCDD	NA[C]		NA		NA	
2,3,7,8-TCDF	NA		NA		NA	
PAHs (µg/kg)						
Acenaphthene	0.83		**28.2**	*	**36.7**	*
Acenaphthylene	1.98		3.30	*	3.57	*
Anthracene	5.28		**55.3**	*	**83.9**	*
Fluorene	2.89		**29.0**	*	**38.1**	*
Naphthalene	3.02		5.12	*	5.77	*
Phenanthrene	5.02		**178**	*	**247**	*
Benzo(a)anthracene	9.48		**106**	*	**126**	*
Benzo(a)pyrene	15.0		52.7	*	60.0	*
Benzo(g,h,i)perylene	7.07		18.2		18.9	
Benzo(b)fluoranthene	21.5		88.3	*	94.0	*
Benzo(k)fluoranthene	8.61		25.4	*	24.3	*
Chrysene	12.1		**134**	*	**150**	*
Dibenzo(a,h)anthracene	2.92	U	4.23	*	4.64	*
Fluoranthene	14.1		**462**	*	**473**	*
Indeno(1,2,3-cd)pyrene	7.96		16.6		16.1	
Pyrene	34.7		**382**	*	**394**	*

(a) Results shown are a mean of five replicate tissue analyses. If any constituents were undetected, one-half the detection limit was used in calculation of the mean concentration.
(b) U Undetected at or above the detection limit shown.
(c) NA Not analyzed.

tissues exposed to COMP PE-B when compared with *M. nasuta* tissues exposed to the Mud Dump Reference Site sediment.

3.4.4.7 Bioaccumulation of Pesticides in *M. nasuta* Exposed to Port Elizabeth Composites

Concentrations of six pesticides in *M. nasuta* tissues exposed to COMP PE-A or PE-B were significantly different from those exposed to the Mud Dump Reference Site sediment (Table 3.16). Three pesticides, *trans*-nonachlor, 2,4'-DDD, and 2,4'-DDE, were significantly different and elevated in tissues exposed to either COMP PE-A or COMP PE-B at least five times above those in *M. nasuta* tissues exposed to the Mud Dump Reference Site sediment. Endosulfans (I, II, and sulfate), heptachlor epoxide, and 2,4'-DDT were not detected in *Macoma* exposed to Port Elizabeth sediment.

3.4.4.8 Bioaccumulation of PCBs in *M. nasuta* Exposed to Port Elizabeth Composites

Of 22 PCB congeners analyzed, 17 congeners were detected in *M. nasuta* tissues exposed to Port Elizabeth composites (Table 3.16). Fourteen of the 17 PCBs were significantly elevated in tissues exposed to either COMP PE-A or COMP PE-B above those in *M. nasuta* tissues exposed to the Mud Dump Reference Site sediment. Two PCBs, PCB 18 and PCB 44, were different and elevated in tissues exposed to COMP PE-A and COMP PE-B at least five times above those exposed to the Mud Dump Reference Site sediment. Total PCB concentrations were 137 µg/kg and 152 µg/kg wet weight in *M. nasuta* tissues exposed to COMP PE-A and COMP PE-B, respectively.

3.4.4.9 Bioaccumulation of PAHs and 1,4-dichlorobenzene in *M. nasuta* Exposed to Port Elizabeth Composites

All 16 PAHs were detected in clam tissue exposed to Port Elizabeth sediment. Concentrations of 3 of the 16 PAHs were significantly different but less than twice the concentrations found in *M. nasuta* tissues exposed to the Mud Dump Reference Site sediment. Eight of the 16 PAHs were different and elevated in tissues exposed to COMP PE-A and COMP PE-B at least 5 and up to 50 times above *M. nasuta* tissues exposed to the Mud Dump Reference Site sediment.

3.5 Results of Physical, Chemical, and Biological Analyses of Hackensack River Sediment

The eight individual sediment core samples collected in Hackensack River Reach A were analyzed for grain size, TOC, moisture content, bulk density, specific gravity, and 2,3,7,8-

TCDD/TCDF. Metals, chlorinated pesticides, PCBs, PAHs, 1,4-dichlorobenzene, and the chlorinated herbicides 2,4-D and 2,4,5-T were determined in COMP HR-A, the sediment composite representing the eight cores from Hackensack River Reach A. Elutriate prepared from COMP HR-A and dredging site water was analyzed chemically and also used to evaluate water-column toxicity to three species of marine organisms. COMP HR-A was also tested for benthic toxicity (three species) and bioaccumulation (two species).

3.5.1 Hackensack River Sediment Physical and Chemical Analyses

Complete results of sediment physical and chemical analyses and associated quality control data for the Hackensack River project area are tabulated in Appendix A. Hackensack River sediments ranged from coarse sandy material to dense, soft, gray, clayey material, to hard brown clay. A few chunks of red clay were noted in some cores, and the odor and sheen of petroleum products were present in others (particularly HR-A-7 and -8). Sediments from the Hackensack River Reach A core samples had variable grain sizes. The eight individual sediment core samples collected at the Hackensack River were analyzed for grain size, TOC, moisture content, bulk density, and specific gravity (Appendix A, Tables A.1 through A.4). Among all eight core samples, sand content ranged from 14% to 89% (the sandiest stations were cores HR-A-1 and HR-A- 6, -7, and -8, at either end of the reach), silt content ranged from 7% to 54%, and clay content ranged from 2% to 33%.

TOC in Hackensack River Reach A core sediments was also variable, ranging from 0.35% to 13.40% (dry weight), with the highest TOC content found in cores HR-A-6, -7, and -8, in which sand content was high. High TOC values are usually correlated with fine-grained sediment. Initial analyses for HR-A-6, -7, and -8 had extremely high TOC results (as high as 37%), whereas these samples were predominantly sand. Although QC data for the initial sample analyses did not indicate problems, these samples were reanalyzed. TOC values from the reanalyses were still relatively high, but these results were reported because they are more representative of TOC values from other sediment analyses. Moisture content in Hackensack River samples ranged from 18% to 48%. Bulk density in Hackensack River sediments ranged from 92 to 130 lb/cu ft wet and from 38 to 108 lb/cu ft dry. Specific gravity ranged from 2.39 to 2.68.

3.5.1.1 Metals in Hackensack River Sediment Composite

Concentrations of metals found in COMP HR-A sediments and corresponding QC data are found in Tables A.5 and A.6. All nine of the metals analyzed were detected in COMP HR-A.

3.5.1.2 Pesticides in Hackensack River Sediment Composite

Concentrations of chlorinated pesticides analyzed in COMP HR-A sediment are presented in Tables A.7 and A.8. Results of QC samples corresponding to these analyses are found in Tables A.9 and A.10. Of the 15 pesticides analyzed, 6 were detected in COMP HR-A. The concentration of α-chlordane was 8.12 μg/kg dry weight; dieldrin was 3.43 μg/kg; 4,4'-DDD was 32.1 μg/kg; 4,4'-DDE was 20.2 μg/kg; 4,4'-DDT was 22.9 μg/kg, and endosulfan I was 4.47 μg/kg.

3.5.1.3 PCBs in Hackensack River Sediment Composite

Concentrations of PCB congeners measured in COMP HR-A sediments are presented in Tables A.11 through A.13. Results of QC samples corresponding to these analyses are found in Tables A.14 through A.16. Only PCB 209 was undetected in COMP HR-A; 21 of the 22 congeners were detected in COMP HR-A. Total PCB concentration for COMP HR-A sediment was 1161 μg/kg dry weight.

3.5.1.4 2,3,7,8-TCDD/TCDF in Individual Core Samples from Hackensack River

Concentrations of 2,3,7,8-TCDD and 2,3,7,8-TCDF analyzed in individual Hackensack River Reach A core samples are presented in Table A.17. Results of QC samples corresponding to these analyses are found in Table A.18. Both the 2,3,7,8-TCDD and -TCDF congeners were detected in all core samples in Hackensack River Reach A. Concentrations of 2,3,7,8-TCDD ranged from 19.7 pg/g wet weight at HR-A-1 to 252 pg/g at HR-A-4. Concentrations of 2,3,7,8-TCDF ranged from 4.52 pg/g at HR-A-1 to 34.2 pg/g at HR-A-3.

3.5.1.5 PAHs and 1,4-dichlorobenzene in Hackensack River Sediment Composite

Concentrations of PAHs analyzed in COMP HR-A sediment are presented in Tables A.19 through A.21. Results of QC samples corresponding to these analyses are found in Tables A.22 through A.24. All 16 PAH compounds analyzed were detected in COMP HR-A. The concentration of total PAH in COMP HR-A was 306,170 μg/kg dry weight; total LPAH was 88,260 μg/kg, and total HPAH was 217,910 μg/kg. Concentrations of individual LPAHs in COMP HR-A ranged from 4970 μg/kg (acenaphthylene) to 31,700 μg/kg (phenanthrene). Concentrations of individual HPAHs in COMP HR-A ranged from 2050 μg/kg (dibenzo[a,h]anthracene) to 57,500 μg/kg (fluoranthene).

Results of analysis of 1,4-dichlorobenzene (which was performed with the pesticide/PCB analyses) are presented in Table A.13, with corresponding QC data shown in Table A.16. The concentration of 1,4-dichlorobenzene in COMP HR-A was 67.5 μg/kg.

3.5.1.6 Herbicides in Hackensack River Sediment Composite

The herbicides 2,4,5-T and 2,4-D were analyzed but not detected in COMP HR-A (Table A.25).

3.5.2 Hackensack River Site Water and Elutriate Chemical Analyses

Metals, chlorinated pesticides, and PCBs were determined in dredging site water collected from the Hackensack River Reach A (HR-A), and in elutriate samples prepared from clean seawater and the Hackensack River sediment composite. All site waters and elutriate samples were analyzed in triplicate. Complete results of all dredging site water and elutriate sample analyses and associated QC data are tabulated in Appendix B, Tables B.1 through B.13.

3.5.2.1 Metals in Hackensack River Water and Elutriate

Concentrations of metals found in Hackensack water and elutriate samples are presented in Table B.1. Results of QC samples corresponding to these analyses are found in Table B.2. For all metals except Zn, achieved detection limits were lower than target detection limits; however, all sample results for Zn were at least an order of magnitude higher than the detection limit. In site water, concentrations of metals ranged from at or near achieved detection limits (Ag) to greater than 70 times achieved detection limits (Hg and Pb). In elutriate water, concentrations of Cd, Cu, and Pb were lower than site water metals concentrations. All other metals were measured at two to six times higher concentrations in elutriate water.

3.5.2.2 Pesticides in Hackensack River Water and Elutriate

Concentrations of chlorinated pesticides found in Hackensack water and elutriate samples are presented in Tables B.3 and B.4. Results of QC samples corresponding to these analyses are found in Tables B.5 and B.6. All achieved detection limits were lower that the target detection limits, and, for most pesticides, by at least an order of magnitude. In the Hackensack site water samples, all of the pesticides analyzed were undetected or detected at concentrations near the target detection limits. In the elutriate samples, there was no difference in concentrations of aldrin (in two sample replicates), 2,4'-DDD (in two sample replicates), 2,4'-DDE, 2,4'-DDT, 4,4'-DDT, endosulfan II, endosulfan sulfate, heptachlor epoxide, and *trans*-nonachlor between the site water and elutriate; concentrations of these pesticides remained near or below achieved detection limits. Concentrations of α-chlordane, dieldrin (in two replicates), 4,4'-DDD (in two replicates), endosulfan I, and heptachlor were higher in the elutriate than in the site water, but were still either near or below 5 ng/L. The concentration of 4,4'-DDE was approximately 12 ng/L in the Hackensack River elutriate.

3.5.2.3 PCBs in Hackensack River Water and Elutriate

Concentrations of PCBs found in Hackensack water and elutriate samples are presented in Tables B.7 through B.9. Results of QC samples corresponding to these analyses are found in Tables B.10 and B.13. Target detection limits of 0.5 ng/L were achieved for 16 of the 22 PCB congeners. The remaining six congeners had detection limits of approximately 1 ng/L. In the Hackensack site water samples, almost all of the PCBs analyzed were undetected; a few congeners were detected at concentrations near the detection limits in one or two of the replicate samples, but not in all three. There was essentially no difference in concentrations of 10 PCB congeners between the site water and the elutriate. Concentrations of these PCBs remained near or below achieved detection limits. Concentrations of the remaining congeners increased in elutriate from undetected concentrations in the site water to concentrations ranging from near detection limits to about 50 times greater than the achieved detection limit. The total PCB concentration in the Hackensack Reach A site water was 13 ng/L and elutriate was 214 ng/L.

3.5.3 Hackensack River Water-Column and Benthic Toxicity Testing

Water-column and benthic acute toxicity tests were conducted with the one composite from the Hackensack River, COMP HR-A. Suspended-particulate-phase tests were conducted with the silverside *M. beryllina,* the mysid shrimp *M. bahia*, and larvae of the mussel *M. edulis.* Ten-day acute benthic toxicity tests were conducted under static and flow-through conditions using the amphipods *A. abdita* and *R. abronius* , and a 10-day static benthic toxicity test was conducted using the mysid *M. bahia.* Complete water-column test results, including water quality measurements and results of reference toxicant tests, are tabulated in Appendix C; complete benthic toxicity test results are tabulated in Appendix D.

3.5.3.1 *Menidia beryllina* Water-Column Toxicity Test

Results of the *M. beryllina* water-column toxicity test for the Hackensack River test composite is presented in Table 3.17. Survival of *M. beryllina* in the control SPP treatment was 100%, validating the test. Survival was dramatically reduced (0%) in all three replicates of 100% SPP. However, there was no variance in either the control or the 100% SPP treatments, and no test for statistical significance could be performed. The calculated LC_{50} for *M. beryllina* exposed to the SPP of COMP HR-A was 39.7% SPP. The temperature, salinity, and DO measurements were within acceptable ranges throughout the test. The pH measurements slightly exceeded acceptable ranges in the 50% SPP and 100% SPP on at least one day of testing.

TABLE 3.17. Summary of Water-Column Toxicity Testing for the Hackensack River Composite

Test Organism	Survival in 0% SPP	Survival in 100% SPP	0% & 100% Significantly Different	LC_{50} (% SPP)
Menidia beryllina	100%	0%	Yes	39.7
Mysidopsis bahia	94%	0%	Yes	68.3
Mytilus edulis larvae (survival)	90%	24%	Yes	81.5
Mytilus edulis larvae (survival to normal D-cell)	88%	0%	Yes	24.1[a]

(a) Median effective concentration (EC_{50}) based on normal development to D-cell.

3.5.3.2 *Mysidopsis bahia* Water-Column Toxicity Test

Results of the *M. bahia* water-column toxicity test for the Hackensack River test composite is presented in Table 3.17. Survival of *M. bahia* in the 0% SPP treatment (100% Mud Dump Site Water) was 94%, validating the test. Survival of *M. bahia* in the 100% SPP treatment for COMP HR-A was 0%. Survival in the 100% SPP treatment was significantly different from the control. The calculated LC_{50} for *M. bahia* exposed to the SPP of COMP HR-A was 68.3% SPP. Temperature, salinity, and DO measurements were within acceptable ranges throughout the test. On at least one day the pH measurement was above the acceptable limit of 8.30 in the 100% SPP preparation of COMP HR-A. Survival of *M. bahia* in the dredging site water, unadjusted for salinity, was 0%. In the dredging site water, temperature, DO, and pH were within acceptable ranges; however, salinity was 4 ‰ throughout the test.

3.5.3.3 *Mytilus edulis* Water-Column Toxicity Test

Results of the *M. edulis* water-column toxicity test for the Hackensack River composite are presented in Table 3.17. Survival of *M. edulis* larvae in the control was 90%, with 88% normally developed larvae, validating the test. In the 100% SPP treatment, survival of *M. edulis* larvae was 24%, with 0% normally developed larvae. The statistical comparison of the test composite with the control showed that COMP HR-A was significantly different from the control. The calculated LC_{50} for *M. edulis* larvae exposed to SPP of COMP HR-A was 81.5% SPP; the calculated EC_{50} was 24.1% SPP.

No larvae survived in the dredging site water, unadjusted for salinity, which had a salinity of 4‰ to 5‰. In the dredging site treatment that was adjusted to a salinity of 30‰ with brine, survival of *M. edulis* larvae was 75%, with 48% normally developed larvae.

Temperature and salinity measurements were within acceptable ranges throughout the test. On initiation, one 100% SPP replicate had a DO measurement below the acceptable limit; however, all other DO measurements were within the acceptable range. The pH measurements were above the acceptable limit of 8.30 on at least one day in the two highest concentrations of SPP for COMP HR-A.

3.5.3.4 *Ampelisca abdita* Static and Flow-Through Benthic Acute Toxicity Tests

Results of the *A. abdita* static and flow-through benthic acute toxicity tests for the Hackensack River test composite are presented in Table 3.18. In the static test, *A. abdita* survival was 61% in the native control (C-AM) and 70% in the grain size control. Survival of *A. abdita* in COMP HR-A was 0%, a difference of more than 20% from Mud Dump Reference survival (71% survival). However, this static test is invalid for disposal evaluation according to the Green Book, which requires ≥90% survival of amphipods in the native control. Temperature and salinity were within acceptable ranges throughout testing. The DO measurement was below the acceptable limit on the first day of testing but remained within range on all subsequent days of testing. The pH measurement for COMP HR-A was slightly above the acceptable level on at least one day of testing.

In the flow-through tests, survival of *A. abdita* in the native control (C-AM) was 89%. *A. abdita* survival in the grain size control was 87%. Survival of *A. abdita* was 39% in COMP HR-A. Although the native control survival of 89% is lower than the 90% required for validation, statistical analyses were performed. The results of the statistical analyses showed that COMP HR-A composite was significantly different from the Mud Dump Reference Site sediment (87% survival), and had greater than 20% difference in mortality from the reference treatment. The temperature, pH, DO, salinity, and flow-rate measurements were within acceptable ranges throughout the flow-through *A. abdita* test.

3.5.3.5 *Rhepoxynius abronius* Static and Flow-through Benthic Toxicity Tests

Results of the *R. abronius* static and flow-through toxicity tests for the Hackensack River test composite are shown in Table 3.18. In the static test, survival of *R. abronius* in the native control (C-WB) was 97%, validating the test. Survival in the Mud Dump Reference Site sediment was 90%, and 81% in the grain size control (C-SB). No *R. abronius* survived in COMP HR-A. The statistical comparison of the test composite with the reference showed that COMP HR-A was significantly different and had greater than 20% difference in mortality from the reference site.

TABLE 3.18. Results of Benthic Acute Toxicity Testing for the Hackensack River Composite[a]

Sediment Treatment	Percent Survival (Mean of Five Replicates)				
	A. abdita Static	*A. abdita* Flow-through	*R. abronius* Static	*R. abronius* Flow-through	*M. bahia* Static
Hackensack Reach A (HR-A)	0	39	0	32	3
Mud Dump Reference Site	71	87	90	92	96
A. abdita Control (C-AM)	61	89	NA[b]	NA	NA
R. abronius Control (C-WB)	NA	NA	97	95	NA
Grain Size Control (C-SB)	70	87	81	90	96

(a) EPA recommended ammonia protocols were not in effect at the time of toxicity testing (EPA/USACE 1993).
(b) NA Not applicable.

The temperature and salinity measurements were within acceptable ranges throughout the test. The DO measurement was below the acceptable limit on Day 0 of testing, but was within range for the remainder of the test. The pH measurement exceeded the acceptable limit on at least one day of testing.

In the flow-through test, survival of *R. abronius* in COMP HR-A was 32%. Survival of *R. abronius* in the native control (C-WB) was 95%, validating the test. *R. abronius* survival in the Mud Dump Reference Site sediment was 92% and 90% in the grain size control (C-SB). The statistical comparison of the test composite with the reference showed that COMP HR-A was significantly different and had greater than 20% difference in mortality relative to the Mud Dump Reference Site. All of the water quality parameters (temperature, pH, DO, salinity, and flow-rates) were within acceptable ranges throughout the flow-through *R. abronius* test.

3.5.3.6 *Mysidopsis bahia* Static Benthic Toxicity Test

Results of the *M. bahia* static benthic acute toxicity test are shown in Table 3.18. Survival of *M. bahia* in the native control (C-SB) was 96%, validating the test, and survival in the Mud Dump Reference Site sediment was 96%. Survival of *M. bahia* was 3% in COMP HR-A. The statistical comparison of the test composite with the reference showed that COMP HR-A was significantly different from the Mud Dump Reference Site. This composite also had greater than 20% difference in mortality relative to the reference treatment. Temperature was within acceptable ranges throughout the 10-day test period. The pH, DO, and salinity values were slightly outside of acceptable levels for at least one day of testing.

3.5.3.7 Ammonia Measurements During Hackensack River Benthic Toxicity Testing

Concentrations of total ammonia were measured in the pore water and overlying water of COMP HR-A, as well as in reference and control sediments, during the benthic toxicity tests with *A. abdita* and *R. abronius*. Measurements were made on Day 0 and Day 10 of the static and flow-through tests. Table 3.19 shows the results of ammonia measurements during Hackensack River static and flow-through benthic toxicity tests. The ammonia concentration was high at test initiation in both pore water and overlying water for COMP HR-A sediment. The pore water concentration increased after 10 days in the static test, and decreased considerably in the flow-through test. The overlying water concentration increased after 10 days in the static test and decreased in the flow-through test.

3.5.4 Hackensack River Bioaccumulation Tests

Bioaccumulation tests with *N. virens* and *M. nasuta* were conducted using COMP HR-A from Hackensack River Reach A. *N. virens* and *M. nasuta* were exposed to the sediment composites for 28 days under flow-through conditions. The tissues of the test organisms were then analyzed for metals and selected organic contaminants (chlorinated pesticides, PCBs, PCDD/PCDF [*N. virens* only], and PAHs. Complete bioaccumulation test results, including water quality measurements and results of reference toxicant tests, are tabulated in Appendix E. Mean percentage of survival of worms for the 28-day test was 76% in the Mud Dump Reference Site and 89% in the control sediment (Table E.3). Mean percentage of survival in Hackensack River sediment was 76% for Reach A (Table E.3). All water quality parameters were within acceptable limits (Table E.4). Mean percentage of survival of clams in reference, control, and Hackensack River sediments were similar for all treatments, ranging from 90% (Mud Dump Reference Site) to 93% (Hackensack River Reach A and control) (Table E.7). All water quality parameters were within acceptable limits (Table E.8).

Complete results of chemical analyses of tissue samples, including quality control sample summaries for each analysis, are provided in Appendix F for *N. virens* samples, and in Appendix G for *M. nasuta* samples. The following sections discuss only those contaminants of concern found at detectable concentrations in at least one of the five of the test treatment replicates.

3.5.4.1 Bioaccumulation of Metals in N. virens Exposed to the Hackensack River Composite

Out of the nine metals analyzed in *N. virens* tissues exposed to COMP HR-A sediments, Cr, Pb, and Ni had significantly higher concentrations (approximately two to three times higher)

TABLE 3.19. Concentrations of Ammonia in Hackensack River Amphipod Benthic Toxicity Tests

	Total Ammonia Concentration (mg/L)					
	Day 0		Day 10			
Sediment Treatment	Pore Water, Both Tests	Overlying Water, Both Tests	Pore Water, Static Test	Overlying Water, Static Test	Pore Water, Flow-through	Overlying Water, Flow-through
Hackensack Reach A (HR-A)	85.4	48.8	109.8	103.7	2.44	6.1
Mud Dump Reference Site	30.5	10.98	6.1	11.59	0.61	6.1
A. abdita Control (C-AM)	9.76	7.32	ND(a)	ND	0.61	6.1
R. abronius Control (C-WB)	10.98	14.64	14.64	12.2	0.61	6.1
Grain Size Control (C-SB)	1.22	8.54	12.2	10.98	0.61	4.9

(a) ND No data available.

in the COMP HR-A treatment than those in with *N. virens* tissues exposed to the Mud Dump Reference Site sediment (Table 3.20).

3.5.4.2 Bioaccumulation of Pesticides in *N. virens* Exposed to the Hackensack River Composite

Nine pesticides out of 15 analyzed were detected in worm tissues exposed to the Hackensack River composite, and their concentrations were significantly elevated compared with those in tissues exposed to the reference sediment (Table 3.20). Aldrin, α-chlordane, *trans*-nonachlor, dieldrin, 4,4'-DDT, 4.4'-DDD, 4,4'-DDE, and heptachlor were elevated at levels at least five times higher in Hackensack River composite-exposed tissues than in reference-exposed tissues.

3.5.4.3 Bioaccumulation of PCBs in *N. virens* Exposed to the Hackensack River Composite

Eighteen of the 22 PCBs analyzed were detected in worm tissues exposed to the Hackensack River composite. Concentrations of these 18 PCB congeners (except PCB 206) were significantly elevated in *N. virens* tissues exposed to COMP HR-A relative to tissues exposed to the Mud Dump Reference Site (Table 3.20); 13 of those PCB congeners were greater than 10 times higher. Fifteen of the pesticides were significantly elevated at least five times higher in *N. virens* tissues exposed to COMP HR-A when compared with tissues from the Mud Dump Reference Site. The total PCB concentration in *N. virens* tissue exposed to the Hackensack River composite was 114 µg/kg wet weight.

3.5.4.4 Bioaccumulation of PCDD/PCDF in *N. virens* Exposed to the Hackensack River Composite

The concentrations of 2,3,7,8-TCDD in tissues of *N. virens* exposed to COMP HR-A sediments were significantly elevated (about 10 times as high) when compared with concentrations of 2,3,7,8-TCDD in *N. virens* tissues exposed to the reference site sediment (Table 3.20). The concentrations of 2,3,7,8-TCDF in tissues of *N. virens* exposed to the Hackensack River sediment composite was significantly elevated (over twice as high) when compared with concentrations of 2,3,7,8-TCDF in *N. virens* tissues exposed to the reference site sediment.

TABLE 3.20. Mean Wet Weight Concentrations of Contaminants of Concern in Tissues of *Nereis virens* Exposed to the Hackensack River Sediment Composite. (An asterisk indicates value is statistically significantly greater than in tissues exposed to the Mud Dump Reference Site when compared by Dunnett's test; underlined type indicates ≥5<10 times mean concentration in reference treatment on a dry weight basis; bold type indicates ≥10 times mean concentration in reference treatment.)

	Concentrations in Tissues of *Nereis virens* (wet wt) [a]			
Analyte	Mud Dump Reference Site		COMP HR-A	
Metals (mg/kg)				
Arsenic	2.29		2.30	
Cadmium	0.142		0.174	
Chromium	0.192		0.604	*
Copper	1.88		2.47	
Lead	0.192		0.443	*
Mercury	0.0105		0.0145	
Nickel	0.203		0.458	*
Silver	0.0385		0.0194	
Zinc	21.4		16.6	
Pesticides (µg/kg)				
Aldrin	0.08	U[b]	**1.81**	*
α-Chlordane	0.13		1.99	*
trans-Nonachlor	0.09		0.74	*
Dieldrin	0.15	U	1.47	*
4,4'-DDT	0.16	U	**4.27**	*
2,4'-DDT	0.20	U	0.21	U
4,4'-DDD	0.22	U	**2.79**	*
2,4'-DDD	0.18	U	0.19	U
4,4'-DDE	0.07	U	**2.34**	*
2,4'-DDE	0.16		0.06	U
Endosulfan I	0.23	U	0.24	U
Endosulfan II	0.23	U	0.24	U
Endosulfan Sulfate	0.23	U	0.24	U
Heptachlor	0.07	U	0.47	*
Heptachlor Epoxide	0.22	U	0.72	*
PCBs (µg/kg)				
PCB 8	0.38	U	0.39	U
PCB 18	0.39	U	3.52	*
PCB 28	0.18	U	**4.84**	*
PCB 44	0.15	U	**2.98**	*
PCB 49	0.03	U	**4.11**	*
PCB 52	0.33	U	**8.88**	*
PCB 66	0.20		**5.51**	*
PCB 87	0.15	U	0.57	*

TABLE 3.20. (contd)

Concentrations in Tissues of *Nereis virens* (wet wt) [a]

Analyte	Mud Dump Reference Site		COMP HR-A	
PCB 101	0.14	U	**5.05**	*
PCB 105	0.10	U	**1.87**	*
PCB 118	0.27	U	**2.87**	*
PCB 128	0.14	U	0.67	*
PCB 138	0.27	U	**4.26**	*
PCB 153	0.33		**6.03**	*
PCB 170	0.15	U	1.05	*
PCB 180	0.11		**2.16**	*
PCB 183	0.03	U	0.03	U
PCB 184	0.03	U	**0.51**	*
PCB 187	0.12	U	**1.74**	*
PCB 195	0.09	U	0.10	U
PCB 206	0.10	U	0.21	
PCB 209	0.09	U	0.10	U
1,4-Dichlorobenzene	1.00	U	1.00	U
PCDD/PCDF (ng/kg)				
2,3,7,8-TCDD	1.04		13.2	*
2,3,7,8-TCDF	0.85		2.53	*
PAHs (µg/kg)				
Acenaphthene	2.14		**242**	*
Acenaphthylene	1.24		9.86	*
Anthracene	2.21		**80.9**	*
Fluorene	1.92		**56.3**	*
Naphthalene	1.84		8.41	*
Phenanthrene	1.75		**258**	*
Benzo(a)anthracene	2.93		**51.3**	*
Benzo(a)pyrene	2.95		24.9	*
Benzo(g,h,i)perylene	1.99		8.92	*
Benzo(b)fluoranthene	3.10		22.9	*
Benzo(k)fluoranthene	1.28		14.6	*
Chrysene	0.60	U	**90.4**	*
Dibenzo(a,h)anthracene	2.69	U	4.65	*
Fluoranthene	3.00		**554**	*
Indeno(1,2,3-cd)pyrene	2.47		8.21	*
Pyrene	1.54		**227**	*

(a) Results shown are a mean of five replicate tissue analyses. If any constituents were undetected, one-half the detection limit was used in calculation of the mean concentration.
(b) U Undetected at or above the detection limit shown.

3.5.4.5 Bioaccumulation of PAHs and 1,4-dichlorobenzene in *N. virens* Exposed to the Hackensack River Composite

All 16 PAHs analyzed were detected in worm tissues exposed to the Hackensack River composite. Twelve PAHs were significantly elevated in *N. virens* tissues exposed to COMP HR-A at levels at least 5 and up to 180 times higher than tissues exposed to the Mud Dump Reference Site; eight of these showed at least a tenfold magnification. The compound 1,4-dichlorobenzene was not detected in *N. virens* tissues exposed to COMP HR-A.

3.5.4.6 Bioaccumulation of Metals in *M. nasuta* Exposed to the Hackensack River Composite

None of the metals analyzed in *M. nasuta* tissues exposed to COMP HR-A sediments was significantly different when compared with those detected in tissues exposed to the Mud Dump Reference Site sediment (Table 3.21).

3.5.4.7 Bioaccumulation of Pesticides in *M. nasuta* Exposed to the Hackensack River Composite

Two of the seven detected pesticides were significantly different in *M. nasuta* tissues exposed to COMP HR-A sediment when compared with those found in tissues exposed to the Mud Dump Reference Site sediment (Table 3.21). Concentrations of α-chlordane and 4,4'-DDE in tissues exposed to COMP HR-A were between two and five times the concentrations of those compounds found in tissues exposed to the Mud Dump Reference Site sediment.

3.5.4.8 Bioaccumulation of PCBs in *M. nasuta* Exposed to the Hackensack River Composite

Ten of the detected PCBs congeners were significantly greater in *M. nasuta* tissues exposed to COMP HR-A sediment when compared with those found in tissues exposed to the Mud Dump Reference Site sediment (Table 3.21). All of these 10 PCB congeners were significantly greater and at least five times as high as concentrations in *M. nasuta* tissues exposed to the reference site. The total PCB concentration in *M. nasuta* tissue exposed to the Hackensack River composite was 123 µg/kg wet weight.

3.5.4.9 Bioaccumulation of PAHs and 1,4-dichlorobenzene in *M. nasuta* Exposed to the Hackensack River Composite

All 16 PAHs were detected in clam tissues exposed to the Hackensack composite. Fourteen PAH compounds were significantly different and between 5 and nearly 500 times as high in *M. nasuta* tissues exposed to COMP HR-A sediment when compared with those found in tissues exposed to the Mud Dump Reference Site sediment (Table 3.21). Only one of the five tissue replicates exposed to the Hackensack composite had measurable levels of 1,4-dichlorobenzene.

TABLE 3.21. Mean Wet Weight Concentrations of Contaminants of Concern in Tissues of *Macoma nasuta* Exposed to Hackensack River Sediment Composites. (An asterisk indicates value is statistically significantly greater than in tissues exposed to the Mud Dump Reference Site when compared by Dunnett's test; underlined type indicates ≥5<10 times mean concentration in reference treatment on a dry weight basis; bold type indicates ≥10 times mean concentration in reference treatment.)

	Concentrations in Tissues of *Macoma nasuta* (wet weight) [a]			
Analyte	Mud Dump Reference Site		COMP HR-A	
Metals (mg/kg)				
Arsenic	2.94		3.37	
Cadmium	0.0255		0.0330	
Chromium	0.751		0.645	
Copper	1.92		1.87	
Lead	0.666		0.659	
Mercury	0.0187		0.0213	
Nickel	0.396		0.383	
Silver	0.0344		0.0239	
Zinc	12.3		14.4	
Pesticides (µg/kg)				
Aldrin	0.61		0.91	
α-Chlordane	0.29		1.17	*
trans-Nonachlor	0.06	U	0.09	
Dieldrin	0.25		1.00	
4,4'-DDT	1.91		2.26	
2,4'-DDT	0.22	U	0.22	U
4,4'-DDD	1.54		2.02	
2,4'-DDD	0.20	U	0.20	U
4,4'-DDE	2.35		6.10	*
2,4'-DDE	0.21		0.07	U
Endosulfan I	0.25	U	0.25	U
Endosulfan II	0.25	U	0.25	U
Endosulfan Sulfate	0.25	U	0.25	U
Heptachlor	0.30		0.08	U
Heptachlor Epoxide	0.24	U	0.24	U
PCBs (µg/kg)				
PCB 8	0.65		0.41	U
PCB 18	0.86		5.34	*
PCB 28	3.53		10.1	*
PCB 44	0.23		**3.26**	*
PCB 49	2.36		7.00	*
PCB 52	2.43		9.34	*
PCB 66	3.87		7.52	*
PCB 87	0.93		1.34	
PCB 101	2.99		5.51	*
PCB 105	0.49		1.48	*

TABLE 3.21. (contd)

Analyte	Concentrations in Tissues of *Macoma nasuta* (wet weight) [a]				
	Mud Dump Reference Site			COMP HR-A	
PCB 118	2.13			3.69	*
PCB 128	0.30			0.43	
PCB 138	1.40			2.31	*
PCB 153	1.93			2.52	
PCB 170	0.15	U		0.17	U
PCB 180	0.47			0.67	
PCB 183	0.03	U		0.20	U
PCB 184	0.16			0.19	
PCB 187	0.29			0.34	
PCB 195	0.09	U		0.10	U
PCB 206	0.10	U		0.11	U
PCB 209	0.09	U		0.09	U
1,4-Dichlorobenzene	1.00	U		0.81	
PCDD/PCDF (ng/kg)					
2,3,7,8-TCDD	NA[C]			NA	
2,3,7,8-TCDF	NA			NA	
PAHs (µg/kg)					
Acenaphthene	0.83			**362**	*
Acenaphthylene	1.98			12.0	*
Anthracene	5.28			**710**	*
Fluorene	2.89			**329**	*
Naphthalene	3.02			19.6	*
Phenanthrene	5.02			**2340**	*
Benzo(a)anthracene	9.48			**601**	*
Benzo(a)pyrene	15.0			**192**	*
Benzo(g,h,i)perylene	7.07			35.5	
Benzo(b)fluoranthene	21.5			**284**	*
Benzo(k)fluoranthene	8.61			84.4	*
Chrysene	12.1			**536**	*
Dibenzo(a,h)anthracene	2.92	U		8.31	*
Fluoranthene	14.1			**3380**	*
Indeno(1,2,3-cd)pyrene	7.96			40.8	
Pyrene	34.7			**2430**	*

(a) Results shown are a mean of five replicate tissue analyses. If any constituents were undetected, one-half the detection limit was used in calculation of the mean concentration.
(b) U Undetected at or above the detection limit shown.
(c) NA Not analyzed.

3.6 Results of Physical, Chemical, and Biological Analyses of Claremont Sediment

Grain size, moisture content, and TOC metals, chlorinated pesticides, PCBs, 2,3,7,8-TCDD/TCDF, PAHs, 1,4-dichlorobenzene, and the herbicides 2,4-D and 2,4,5-T were determined in three sediment composites from the Claremont project area: COMP CL-I, which represents the 9 core samples collected in Claremont Reach I, COMP CL-II, which represents the 11 core samples collected in Claremont Reach II, and COMP CL-III, which represents the 7 core samples collected in Claremont Reach III. The amphipods *Ampelisca abdita* and *Rhepoxynius abronius* were used to evaluate the potential benthic toxicity of the three Claremont sediment composites. Water-column toxicity tests and bioaccumulation tests were not required for the Claremont project.

3.6.1 Claremont Sediment Physical and Chemical Analyses

Complete results of sediment physical and chemical analyses and associated quality control data for the Claremont project area is tabulated in Appendix A. Sediment from all three Claremont reaches had similar physical characteristics: grain size was approximately 15% sand, 47% silt, and 38% clay; TOC ranged from 2.88% to 3.63%; and moisture content was approximately 55%.

3.6.1.1 Metals in Claremont Sediment Composites

Concentrations of metals found in Claremont composites, and QC data corresponding to these analyses, are found in Tables A.5 and A.6. Concentrations of the metals analyzed were similar among the three Claremont reaches, but generally, COMP CL-I had the lowest metals concentrations, followed by COMP CL-II with the next highest concentrations, and COMP CL-III with the highest concentrations.

3.6.1.2 Pesticides in Claremont Sediment Composites

Concentrations of chlorinated pesticides analyzed in COMP-CL-I, COMP CL-II, and COMP CL-III sediments are presented in Tables A.7 and A.8. Results of QC samples corresponding to these analyses are found in Tables A.9 and A.10. The pesticides α-chlordane, dieldrin, 2,4'-DDD, 2,4'-DDE, 4,4-DDD, 4,4'-DDE, endosulfan I, and *trans*-nonachlor were detected in all three composites. Aldrin, 2,4'-DDT, endosulfan II, endosulfan sulfate, heptachlor, heptachlor epoxide, and lindane were not detected in any of the Claremont composites. Generally, the concentrations of detected pesticides were highest in COMP CL-II. The highest pesticide concentrations found were those of the DDD/DDE/DDT group of pesticides, where concentrations of individual compounds in Claremont composites ranged from the detection

limit, which was approximately 1 μg/kg, to 64 μg/kg dry weight. The remaining pesticide concentrations were ≤5 times the target detection limit of 2 μg/kg. Concentrations of α-chlordane ranged from 1.48 μg/kg to 8.06 μg/kg; dieldrin ranged from 2.49 μg/kg to 10.8 μg/kg; 2,4'-DDD ranged from 4.11 μg/kg to 12.3 μg/kg; 4,4'-DDD ranged from 12.1 μg/kg to 64.1 μg/kg; 4,4'-DDE ranged from 14.9 μg/kg to 54.9 μg/kg. In COMPs CL-I and CL-III, and in one replicate of COMP CL-II, 4,4'-DDT was undetected; in the other two replicates of COMP CL-II, 4,4'-DDT concentrations were 1.89 μg/kg and 4.74 μg/kg. Endosulfan I concentrations ranged from 3.52 μg/kg to 14.0 μg/kg; and *trans*-nonachlor ranged from an estimated 0.40 μg/kg to 3.07 μg/kg.

3.6.1.3 PCBs in Claremont Sediment Composites

Concentrations of PCB congeners analyzed in COMP-CL-I, COMP CL-II, and COMP CL-III sediments are presented in Tables A.11 through A.13. Results of QC samples corresponding to these analyses are found in Tables A.14 through A.16. All 22 congeners analyzed were detected in all three reaches in the Claremont project area. Generally, PCB congener concentrations were two to three times higher in COMP CL-II than in COMPs CL-I and CL-III. Total PCB concentrations were 614 μg/kg dry weight for COMP CL-I sediment; 2348 μg/kg for COMP CL-II sediment (determined from a mean of triplicate analyses for each congener); and 979 μg/kg for COMP CL-III sediment.

3.6.1.4 2,3,7,8-TCDD/TCDF in Claremont Sediment Composites

Concentrations of 2,3,7,8-TCDD and 2,3,7,8-TCDF analyzed in COMP-CL-I, COMP CL-II, and COMP CL-III sediments are presented in Table A.17. Results of QC samples corresponding to these analyses are found in Table A.18. Both 2,3,7,8-TCDD and 2,3,7,8-TCDF were detected in all three Claremont reaches. Concentrations of 2,3,7,8-TCDD were 25.7 pg/g wet weight in COMP CL-I, 31.5 pg/g in COMP CL-II, and 7.79 pg/g in COMP CL-III. Concentrations of 2,3,7,8-TCDF were 11.4 pg/g wet weight in COMP CL-I, 19.8 pg/g in COMP CL-II, and 11.3 pg/g in COMP CL-III.

3.6.1.5 PAHs and 1,4-dichlorobenzene in Claremont Sediment Composites

Concentrations of PAHs analyzed in COMP CL-I, COMP CL-II, and COMP CL-III sediments are presented in Tables A.19 through A.21. Results of QC samples corresponding to these analyses are found in Tables A.22 through A.24. All 16 PAH compounds analyzed were detected in all three Claremont reaches. Concentrations were generally lowest in COMP CL-I, higher in COMP CL-III, and the highest in COMP CL-II. In COMP CL-I, the concentration of total PAH was 5415 μg/kg dry weight; total LPAH was 1205 μg/kg, and total HPAH was 4210 μg/kg.

Concentrations of individual LPAHs in COMP CL-I ranged from 91.1 μg/kg (acenaphthene) to 384 μg/kg (phenanthrene). Concentrations of individual HPAHs in COMP CL-I ranged from 70.5 μg/kg (dibenzo[a,h]anthracene) to 719 μg/kg (pyrene). In COMP CL-II, the concentration of total PAH (determined by a mean of three analyses) was 11,088 μg/kg; total LPAH was 2591 μg/kg, and total HPAH was 8497 μg/kg. Concentrations of individual LPAHs in COMP CL-II ranged from 172 μg/kg (acenaphthene) to 744 μg/kg (phenanthrene). Concentrations of individual HPAHs in COMP CL-II ranged from 147 μg/kg (dibenzo[a,h]anthracene) to 1267 μg/kg (pyrene). In COMP CL-III, the concentration of total PAH was 8244 μg/kg; total LPAH was 1623 μg/kg, and total HPAH was 6621 μg/kg. Concentrations of individual LPAHs in COMP CL-III ranged from 81.7 μg/kg (acenaphthene) to 547 μg/kg (phenanthrene). Concentrations of individual HPAHs in COMP CL-III ranged from 99.1 μg/kg (dibenzo[a,h]anthracene) to 1030 μg/kg (fluoranthene).

Results of analysis of 1,4-dichlorobenzene are presented in Table A.13, with corresponding QC data shown in Table A.16. The concentration of 1,4-dichlorobenzene in COMPs CL-I, CL-II, and CL-III was 24.1 μg/kg, 65.8 μg/kg, and 31.5 μg/kg, respectively.

3.6.1.6 Herbicides in Claremont Sediment Composites

The herbicides 2,4,5-T and 2,4-D were analyzed for but not detected in COMPs CL-I, CL-II, and CL-III (Table A.25).

3.6.2 Claremont Benthic Toxicity Testing

The amphipods *A. abdita* and *R. abronius* were used to evaluate the potential benthic toxicity of the Claremont test sediments. (For this dredging site, water-column toxicity tests were not required for the Claremont sediments.) The 10-day amphipod tests were conducted under both static and flow-through conditions. Complete benthic toxicity test results, including water quality measurements and results of reference toxicant tests, are tabulated in Appendix D.

3.6.2.1 *Ampelisca abdita* Static and Flow-through Benthic Toxicity Tests

Results of the *A. abdita* static and flow-through benthic acute toxicity tests for the Claremont test composites are shown in Table 3.22. In the static test, survival of *A. abdita* in the native control (C-AM) was 61%, and 70% in the grain size control (C-SB). Survival of *A. abdita* was 0% in all three composites, COMPs CL-I, CL-II, and CL-III, a difference of more than 20% from Mud Dump Reference survival. However, this static test is invalid for disposal evaluation according to the Green Book, which requires ≥90% survival of amphipods in the native control. The temperature and salinity measurements were within acceptable ranges throughout the *A. abdita* static test. The DO measurements were below the acceptable limit on Day 0 of testing,

TABLE 3.22. Results of Benthic Toxicity Testing for Claremont[a]

Sediment Treatment	Percent Survival (Mean of Five Replicates)			
	A. abdita Static	*A. abdita* Flow-through	*R. abronius* Static	*R. abronius* Flow-through
Claremont Reach I (CL-I)	0	43	0	24
Claremont Reach II (CL-II)	0	56	1	16
Claremont Reach III (CL-III)	0	57	2	11
Mud Dump Reference Site	71	87	90	92
A. abdita Control (C-AM)	61	89	NA[b]	NA
R. abronius Control (C-WB)	NA	NA	97	95
Grain Size Control (C-SB)	70	87	81	90

(a) EPA recommended ammonia protocols were not in effect at time of toxicity testing (EPA/USACE 1993).
(b) NA Not applicable.

but were within range for the remainder of the test. The pH measurements slightly exceeded the acceptable limit on at least one day of testing.

In the flow-through test, survival of *A. abdita* in the native control (C-AM) was 89%, and survival in the grain size control (C-SB) was 87%. Survival of *A. abdita* in the Mud Dump Reference Site sediment was 87%. Survival was 43% in COMP CL-I, 56% in COMP CL-II, and 57% in COMP CL-III. Although the native control survival of 89% is lower than the 90% required for validation, statistical analyses were performed. The statistical comparison of the test composites with the reference sediment showed that all three Claremont test composites were significantly different from the Mud Dump Reference Site sediment and had greater than 20% difference in mortality relative to the reference site. All of the water quality parameters, (temperature, pH, DO, salinity, and flow rates) were acceptable throughout the flow-through test.

3.6.2.2 *Rhepoxynius abronius* Static and Flow-through Benthic Toxicity Tests

Results of the *R. abronius* static and flow-through benthic acute toxicity tests for the Claremont test composites are shown in Table 3.22. In the static test, *R. abronius* survival in the native control (C-WB) was 97%; survival in the grain size control survival was lower at 81%. *R. abronius* survival in the Mud Dump Reference Site sediment was 90%. Survival of *R. abronius* was 0%, 1%, and 2% in COMPs CL-I, CL-II, and CL-III, respectively. The statistical comparison of the test composites with the reference sediment showed that all three test composites were significantly different and had greater than 20% difference in mortality from the reference treatment. The temperature and salinity measurements were within acceptable ranges throughout the static *R. abronius* test. The DO measurements were below the

acceptable limit of 7.6 on the first day of testing, but were within range for the remainder of the test. The pH measurements slightly exceeded acceptable ranges for all three test composites on at least one day of testing.

In the flow-through test, survival of *R. abronius* in the native control (C-WB) was 95%, validating the test, and survival in the Mud Dump Reference Site sediment was 92%. Survival of *R. abronius* in the grain size control survival was 90%. *R. abronius* survival was 24%, 16%, and 11% in COMPs CL-I, CL-II, and CL-III, respectively. The statistical comparison of the test composites with the reference sediment showed that all three test composites were significantly different from the reference site sediment and had greater than 20% difference in mortality from the reference treatment. Temperature, DO, salinity, and flow rates were within acceptable ranges throughout the *R. abronius* flow-through test. The pH measurement for COMP CL-III was outside of acceptable ranges on at least one day of testing.

3.6.2.3 Ammonia Measurements During Claremont Benthic Toxicity Testing

Concentrations of total ammonia were measured in the pore water and overlying water of COMP CL-I, COMP CL-II, and COMP CL-III, as well as in reference and control sediments, during the benthic toxicity tests with *A. abdita* and *R. abronius*. Measurements were made on Day 0 and Day 10 of the static and flow-through tests. Table 3.23 shows the results of ammonia measurements during Claremont static and flow-through benthic toxicity tests. Ammonia levels were high at test initiation in both pore water and overlying water in COMPs CL-I, CL-II, and CL-III sediments. Pore water concentrations decreased after 10 days in COMPs CL-I and CL-II, and increased in COMP CL-III in the static test. Pore water concentrations decreased after 10 days in all Claremont treatments the flow-through test. Overlying water concentrations in the static test on Day 10 were erratic (some readings were higher than on Day 0, some were lower). Overlying water concentrations in the flow-through test decreased over the 10-day test.

TABLE 3.23. Concentrations of Ammonia in Claremont Amphipod Benthic Toxicity Tests

	Total Ammonia Concentration (mg/L)					
	Day 0		Day 10			
Sediment Treatment	Pore Water, Both Tests	Overlying Water, Both Tests	Pore Water, Static Test	Overlying Water, Static Test	Pore Water, Flow-through	Overlying Water, Flow-through
Claremont Reach I (CL-I)	122	97.6	97.6	ND[a]	4.27	4.9
Claremont Reach II (CL-II)	134.2	97.6	122	14.03	1.22	7.3
Clarmont Reach III (CL-III)	84.5	97.6	134.2	103.7	2.44	6.1
Mud Dump Reference Site	30.5	10.98	6.1	11.59	0.61	6.1
A. abdita Control (C-AM)	9.76	7.32	ND(a)	ND	0.61	6.1
R. abronius Control (C-WB)	10.98	14.64	14.64	12.2	0.61	6.1
Grain Size Control (C-SB)	1.22	8.54	12.2	10.98	0.61	4.9

(a) ND No data available.

4.0 Discussion and Conclusions

In this section, physical and chemical analyses, and bioassays performed on sediments from each of the New York/New Jersey federal project sites are evaluated relative to the Mud Dump Reference Site sediment by the Tier III guidelines of Green Book. Tier III evaluations include water-column toxicity tests, benthic toxicity tests, and whole sediment bioaccumulation studies. Tier III evaluations assess the impact of contaminants in the dredged material on marine organisms to determine whether there is potential for the material to have an unacceptable environmental effect during ocean disposal. The Green Book provides the following guidance for determining whether the proposed dredged material is unacceptable for ocean disposal based on the Tier III tests:

- Water-Column Toxicity. The limiting permissible concentration (LPC) of dissolved plus suspended contaminants cannot exceed 0.01 of the acutely toxic concentration at the boundaries of the disposal site within the first 4 h after disposal, or at any point in the marine environment after the first 4 h. The acutely toxic concentration in this case is taken to be the median lethal concentration (LC_{50}); therefore, acute toxicity in SPP tests would require at least 50% mortality in an SPP treatment to be evaluated according to the Green Book. A numerical mixing model is used to predict whether concentrations greater than 0.01 of the acutely toxic SPP concentrations are likely to occur beyond the boundaries of the disposal site within the first 4 h after disposal.

- Benthic Acute Toxicity. The proposed dredged material does not meet the LPC for benthic toxicity when organism survival in the test sediment and the reference site sediment is statistically significantly different, and the decrease in survival exceeds 20% for *A. abdita* and *R. abronius*, or 10% for *M. bahia.*

- Bioaccumulation. Results of *N. virens* and *M. nasuta* tissue analyses from test sediment bioaccumulation studies were compared with guidance levels for poisonous or deleterious substances in fish and shellfish for human consumption published by the U.S. Food and Drug Administration (FDA) and with USACE-NYD bioaccumulation matrix levels. The proposed dredged material does not meet the LPC for bioaccumulation if tissue concentrations of one or more contaminants of concern are greater than the applicable FDA levels. Concentrations of As, Cd, Cr, Ni, and Pb were also compared with the FDA level of concern for chronic shellfish consumption (FDA 1993a, 1993b, 1993c, 1993d, 1993e) for each of these metals. The bioaccumulation matrix values provided by USACE (1981) are NYD regional guidance levels for interpretation of bioaccumulation. Results of tissue analyses from test sediment bioaccumulation studies also were compared with contaminant concentrations in tissues of organisms similarly exposed to Mud Dump Reference Site sediment. When the bioaccumulation of contaminants in the dredged material statistically exceeds that in the reference material exposures, further Tier IV case-specific evaluation criteria listed in the Green Book should be consulted to determine LPC and benthic effects compliance.

Sections 4.1 through 4.5 discuss the MOTBY, Arthur Kill, Port Elizabeth, Hackensack River, and Claremont project sites in terms of sediment characterization and Tier III evaluations. The matrixes in Figures 4.1 (MOTBY and Hackensack River), 4.2 (Arthur Kill), and 4.3 (Port Elizabeth) summarize sediment contaminant levels, contribution to water-column or benthic acute toxicity, and potential for bioaccumulation for the different project sites. These matrixes show bioaccumulation potential as the number of contaminants that were significantly elevated in the tissues of *M. nasuta* and *N. virens* at a range of magnitudes (i.e., two-, five-, or tenfold) above tissues of each species exposed to the reference sediment. Magnitude of elevation was calculated on a dry weight basis. This format clearly shows where similar classes of contaminants were accumulated by both *M. nasuta* and *N. virens*. In Section 4.6, the results of benthic acute toxicity tests on all of the test sediments are discussed in relation to sediment pore water concentrations of the nonpersistent contaminant ammonia.

4.1 MOTBY

4.1.1 Sediment Physical and Chemical Characterization

MOTBY Reach A and Reach B sediment core samples were soft, black mud with an oily appearance and odor at some stations. Sediment moisture contents varied from 27% to 67% in individual cores. The TOC content ranged from 0.92% to 4.68% in individual cores. Concentrations of metals were slightly higher in COMP MT-B than in COMP MT-A. The dominant pesticides found were those in the DDD/DDE/DDT group of compounds. All PCB congeners analyzed were detected. Total PCB concentrations were 1217 μg/Kg and 1083 μg/kg, dry weight, for MT-A and MT-B, respectively. Concentrations of 2,3,7,8-TCDD were detected in all cores from MT-A and MT-B (4.65 to 50.7 ng/kg, wet weight); 2,3,7,8-TCDF was detected in all cores from MT-A and MT-B (8.46 to 43.2 ng/kg, wet weight). Sediment concentrations of dioxins greater than 1 ng/kg (wet weight) trigger dioxin bioaccumulation analysis. All PAH compounds analyzed were detected. Total PAH in MT-A was 7616 μg/kg, dry weight; 21% of total was LPAH; 79% of total was HPAH. Total PAH in MT-B was 9186 μg/kg, dry weight; 30% of total was LPAH; 70% of total was HPAH. The concentration of 1,4-dichlorobenzene was 18.1 μg/kg dry weight in MT-A and 28.2 μg/kg dry weight in MT-B. The herbicides 2,4-D and 2,4,5-T were not detected.

	Sediment Treatment	Hackensack River Reach A	MOTBY Reach A	MOTBY Reach B
Acute Toxicity	*A. abdita* Benthic Flow-Through Test	AT[a]	AT	AT
	A. abdita Benthic Static Test	-[b]	-	-
	R. abronius Benthic Flow-Through Test	AT	AT	AT
	R. abronius Benthic Static Test	AT	AT	AT
	M. bahia Benthic Static Test	AT	NT[c]	NT
	M. beryllina SPP Test	S[d]	NT	NT
	M. bahia SPP Test	S	NT	NT
	M. edulis SPP Test	S	NT	NT

	Test Species	*N. virens*[e]	*M. nasuta*[e]	*N. virens*[e]	*N. virens*[e]
Any Significant Bioaccumulation (f)	# of Metals (9 total)	3	-	-	-
	# of Pesticide compounds (15 total)	9	2	8	7
	# of PCB congeners (22 total)	17	10	18	17
	# of PAH compounds (16 total)	16	14	7	6
	# of TCDD/TCDF congeners (2 total)[g]	2	NA[h]	2	1
	1,4-dichlorobenzene	-	-	-	-
Bioaccumulaton <2 times Reference	# of Metals (9 total)	-	-	-	-
	# of Pesticide compounds (15 total)	-	-	-	-
	# of PCB congeners (22 total)	-	4	-	-
	# of PAH compounds (16 total)	1	-	2	1
	# of TCDD/TCDF congeners (2 total)	-	NA	1	-
	1,4-dichlorobenzene	-	-	-	-
Bioaccumulaton ≥2<5 times Reference	# of Metals (9 total)	3	-	-	-
	# of Pesticide compounds (15 total)	1	2	-	-
	# of PCB congeners (22 total)	2	4	3	2
	# of PAH compounds (16 total)	3	1	2	2
	# of TCDD/TCDF congeners (2 total)	1	NA	-	1
	1,4-dichlorobenzene	-	-	-	-
Bioaccumulation ≥5<10 times Reference	# of Metals (9 total)	-	-	-	-
	# of Pesticide compounds (15 total)	4	-	2	3
	# of PCB congeners (22 total)	2	1	2	5
	# of PAH compounds (16 total)	4	3	1	2
	# of TCDD/TCDF congeners (2 total)	1	NA	-	-
	1,4-dichlorobenzene	-	-	-	-
Bioaccumulaton ≥10 times Reference	# of Metals (9 total)	-	-	-	-
	# of Pesticide compounds (15 total)	4	-	6	4
	# of PCB congeners (22 total)	13	1	13	10
	# of PAH compounds (16 total)	8	10	2	1
	# of TCDD/TCDF congeners (2 total)	-	NA	1	-
	1,4-dichlorobenzene	-	-	-	-

(a) AT Acutely Toxic: Significantly Different from Reference and Mortality at least 20% Greater (at least 10% for Mysids) Greater Than Reference.
(b) No significant difference/no significant bioaccumulation at this level.
(c) NT Not tested.
(d) S Significantly different mortality between 0% and 100% SPP.
(e) Number of compounds bioaccumulating in tissues.
(f) Represents total number of anaytes significantly greater than reference regardless of magnitude above reference tissue.
(g) Only 2,3,7,8-TCDD/TCDF were used in statistical analysis.
(h) NA Not analyzed.

FIGURE 4.1. Matrix of Significant Acute Toxicity and Statistically Significant Bioaccumulation for Sediment Treatments Representing Proposed Dredged Material from MOTBY and Hackensack River Projects

	Sediment Treatment	Arthur Kill Reach A	Arthur Kill Reach B	Arthur Kill Reach C
Acute Toxicity	*A. abdita* Benthic Flow-Through Test	AT[a]	AT	AT
	A. abdita Benthic Static Test	-[b]	-	-
	R. abronius Benthic Flow-Through Test	AT	AT	AT
	R. abronius Benthic Static Test	AT	AT	AT
	M. bahia Benthic Static Test	AT	AT	AT
	M. beryllina SPP Test	S[c]	S	S
	M. bahia SPP Test	S	S	S
	M. edulis SPP Test	S	S	S

	Test Species	*N. virens*[d]	*M. nasuta*[d]	*N. virens*[d]	*M. nasuta*[d]	*N. virens*[d]	*M. nasuta*[d]
Any Significant Bioaccumulation (e)	# of Metals (9 total)	-	4	1	1	-	1
	# of Pesticide compounds (15 total)	9	8	9	5	9	3
	# of PCB congeners (22 total)	17	13	17	9	18	12
	# of PAH compounds (16 total)	9	13	11	10	11	10
	# of TCDD/TCDF congeners (2 total)[f]	2	NA[g]	2	NA	2	NA
	1,4-dichlorobenzene	-	-	-	-	-	-
Bioaccumulaton < 2 times Reference	# of Metals (9 total)	-	4	1	1	-	1
	# of Pesticide compounds (15 total)	-	1	-	-	-	-
	# of PCB congeners (22 total)	-	4	-	3	-	2
	# of PAH compounds (16 total)	5	3	2	2	3	2
	# of TCDD/TCDF congeners (2 total)	-	NA	-	NA	-	NA
	1,4-dichlorobenzene	-	-	-	-	-	-
Bioaccumulaton ≥2<5 times Reference	# of Metals (9 total)	-	-	-	-	-	-
	# of Pesticide compounds (15 total)	1	-	1	1	-	-
	# of PCB congeners (22 total)	2	6	1	4	2	6
	# of PAH compounds (16 total)	1	3	6	1	5	1
	# of TCDD/TCDF congeners (2 total)	2	NA	2	NA	2	NA
	1,4-dichlorobenzene	-	-	-	-	-	-
Bioaccumulaton ≥5<10 times Reference	# of Metals (9 total)	-	-	-	-	-	-
	# of Pesticide compounds (15 total)	1	4	-	-	1	1
	# of PCB congeners (22 total)	3	2	2	-	-	2
	# of PAH compounds (16 total)	2	5	1	4	1	4
	# of TCDD/TCDF congeners (2 total)	-	NA	-	NA	-	NA
	1,4-dichlorobenzene	-	-	-	-	-	-
Bioaccumulaton ≥ 10 times Reference	# of Metals (9 total)	-	-	-	-	-	-
	# of Pesticide compounds (15 total)	7	3	8	4	8	2
	# of PCB congeners (22 total)	12	1	14	2	16	2
	# of PAH compounds (16 total)	1	2	2	3	2	3
	# of TCDD/TCDF congeners (2 total)	-	NA	-	NA	-	NA
	1,4-dichlorobenzene	-	-	-	-	-	-

(a) AT Acutely Toxic: Significantly Different from Reference and Mortality at least 20% Greater (at least 10% for Mysids) Greater Than Reference.
(b) No significant difference/no significant bioaccumulation at this level.
(c) S Significantly different mortality between 0% and 100% SPP.
(d) Number of compounds bioaccumulating in tissues.
(e) Represents total number of anaytes significantly greater than reference regardless of magnitude above reference tissue.
(f) Only 2,3,7,8-TCDD/TCDF were used in statistical analysis.
(g) NA Not analyzed.

FIGURE 4.2. Matrix of Significant Acute Toxicity and Statistically Significant Bioaccumulation for Sediment Treatments Representing Proposed Dredged Material from the Arthur Kill Federal Project

	Sediment Treatment	Port Elizabeth Reach A	Port Elizabeth Reach B
Acute Toxicity	*A. abdita* Benthic Flow-Through Test	AT[a]	AT
	A. abdita Benthic Static Test	-[b]	-
	R. abronius Benthic Flow-Through Test	AT	AT
	R. abronius Benthic Static Test	AT	AT
	M. bahia Benthic Static Test	AT	AT
	M. beryllina SPP Test	S[c]	S
	M. bahia SPP Test	S	S
	M. edulis SPP Test	S	S

	Test Species	*N. virens*[d]	*M. nasuta*[d]	*N. virens*[d]	*M. nasuta*[d]
Any Significant Bioaccumulation (e)	# of Metals (9 total)	-	2	1	3
	# of Pesticide compounds (15 total)	7	3	9	6
	# of PCB congeners (22 total)	16	13	17	14
	# of PAH compounds (16 total)	10	14	11	14
	# of TCDD/TCDF congeners (2 total)[f]	2	NA[g]	2	NA
	1,4-dichlorobenzene	-	-	-	-
Bioaccumulation < 2 times Reference	# of Metals (9 total)	-	2	1	3
	# of Pesticide compounds (15 total)	-	-	-	-
	# of PCB congeners (22 total)	-	4	-	7
	# of PAH compounds (16 total)	4	3	-	3
	# of TCDD/TCDF congeners (2 total)	1	NA	1	NA
	1,4-dichlorobenzene	-	-	-	-
Bioaccumulation ≥2<5 times Reference	# of Metals (9 total)	-	-	-	-
	# of Pesticide compounds (15 total)	-	2	1	3
	# of PCB congeners (22 total)	1	7	2	5
	# of PAH compounds (16 total)	2	3	6	3
	# of TCDD/TCDF congeners (2 total)	1	NA	1	NA
	1,4-dichlorobenzene	-	-	-	-
Bioaccumulation ≥5<10 times Reference	# of Metals (9 total)	-	-	-	-
	# of Pesticide compounds (15 total)	3	1	3	1
	# of PCB congeners (22 total)	4	1	1	1
	# of PAH compounds (16 total)	2	-	-	-
	# of TCDD/TCDF congeners (2 total)	-	NA	-	NA
	1,4-dichlorobenzene	-	-	-	-
Bioaccumulation ≥ 10 times Reference	# of Metals (9 total)	-	-	-	-
	# of Pesticide compounds (15 total)	4	-	5	2
	# of PCB congeners (22 total)	11	1	14	1
	# of PAH compounds (16 total)	2	8	5	8
	# of TCDD/TCDF congeners (2 total)	-	NA	-	NA
	1,4-dichlorobenzene	-	-	-	-

(a) AT Acutely Toxic: Significantly Different from Reference and Mortality at least 20% Greater (at least 10% for Mysids) Greater Than Reference.
(b) No significant difference/no significant bioaccumulation at this level.
(c) S Significantly different mortality between 0% and 100% SPP.
(d) Number of compounds bioaccumulating in tissues.
(e) Represents total number of anaytes significantly greater than reference regardless of magnitude above reference tissue.
(f) Only 2,3,7,8-TCDD/TCDF were used in statistical analysis.
(g) NA Not analyzed.

FIGURE 4.3. Matrix of Significant Acute Toxicity and Statistically Significant Bioaccumulation for Sediment Treatments Representing Proposed Dredged Material from the Port Elizabeth Federal Project

4.1.2 Toxicity

Sediments from both MT-A and MT-B were acutely toxic to *A. abdita* and *R. abronius* under both flow-through and static conditions and had greater than 20% increase in mortality over the reference sediment. Therefore, MT-A and MT-B do not meet the LPC for benthic toxicity to these test organisms, if the observed effects are due to persistent contaminants.

4.1.3 Bioaccumulation

When used in bioaccumulation tests, sediments from MT-A and MT-B resulted in elevated concentrations of some contaminants in tissues of *N. virens*. Table 4.1 compares the mean concentrations of contaminants found in tissues of *N. virens* exposed to MT-A and MT-B sediments with FDA action levels for poisonous or deleterious substances in fish and shellfish for human consumption for selected pesticides, FDA levels of concern for chronic shellfish consumption for selected metals, and USACE-NYD bioaccumulation guidance levels for the New York Bight (USACE 1981). For all contaminants listed except 2,3,7,8-TCDD, the *N. virens* tissues exposed to MOTBY sediments had tissue body burdens that were lower than the guidance levels for these selected contaminants.

Concentrations of 2,3,7,8-TCDD ranged from 1.57 to 2.60 ng/kg wet weight in *N. virens* tissues exposed to MT-A, and from 1.11 to 1.71 ng/kg wet weight in *N. virens* tissues exposed to MT-B. According to USACE-NYD/EPA Region II criteria for ocean disposal of dredged material, sediments that result in bioaccumulation concentrations in *N. virens* tissues from 1 to 10 ng/kg (wet weight) would be unsuitable for unrestricted ocean disposal, but suitable for disposal at the Mud Dump Site with capping, assuming LPC compliance for all other Tier III criteria (water-column and benthic).

N. virens tissues exposed to MT-A and MT-B sediment for 28 days had significantly higher concentrations of pesticides, PCBs, TCDD/TCDF, and PAHs than Mud Dump Reference Site sediment-exposed worms. Therefore, MT-A and MT-B sediments require further evaluation to determine LPC and benthic effects compliance.

Figure 4.1 indicates the number of compounds in each contaminant group that was statistically significantly elevated, and whether the bioaccumulation was a two- to fivefold increase over the reference; five- to tenfold increase over the reference; or tenfold or greater increase over the reference site treatments. Organic analytes (PCBs, PAHs, pesticides, PCDD/PCDF) bioaccumulated significantly in *N. virens* tissues from MOTBY sediments, whereas few metals demonstrated comparable significant bioavailability.

TABLE 4.1. Comparison of Contaminant Concentrations in *N. virens* Tissues Exposed to Proposed Dredged Material from MOTBY with FDA and USACE Guidance Levels for Bioaccumulation/Tissue Burden

Substance	Guidance Level (mg/kg wet wt)	Mean Concentration[a] in *N. virens* Tissues (mg/kg wet wt) MT-A	MT-B
Chlordane	0.3[b]	0.00164[c]	0.00143[c]
Total DDT[d]	5.0[b]	0.0127	0.00668
Dieldrin + Aldrin	0.3[b]	0.00259	0.00260
Heptachlor + Heptachlor epoxide	0.3[b]	0.00094	0.00034
Total PCBs[e]	2.0[b]	0.133	0.078
Arsenic	86[f]	2.28	1.93
Cadmium	3.7[f]	0.160	0.149
Chromium	13[f]	0.231	0.193
Lead	1.7[f]	0.236	0.225
Nickel	80[f]	0.332	0.298
Methyl mercury	1.0[f]	0.0090[g]	0.0080[g]
Total DDT[d]	0.04[h]	0.0127	0.00668
Total PCBs[e]	0.40[h]	0.133	0.078
Mercury (total)	0.20[h]	0.0090	0.0080
Cadmium	0.30[h]	0.160	0.149
Dioxin (2,3,7,8-TCDD only, concentrations in ng/kg or pptr wet weight)	1/10[i]	1.95	1.44

(a) Concentration shown is mean of five replicate tissue analyses. If any constituents were undetected, one-half of the detection limit was used in calculation of the mean concentration.
(b) FDA action levels for poisonous and deleterious substances in fish and shellfish for human food.
(c) Sum of α-chlordane and *trans* nonachlor only, whereas FDA action level is a sum of nine chlordane analytes.
(d) Sum of mean values for 2,4'-DDT, 4,4'-DDT, 2,4'-DDE, 4,4'-DDE, 2,4'-DDD, and 4,4'-DDD. One-half of the detection limit was used in the summation when mean values were undetected in a replicate. Due to a chromatographic interference, values determined for DDT may be a false positive or biased high.
(e) Total PCBs estimated as (2 X sum of 22 congeners). One-half of the detection limit was used in the summation when mean values were undetected in a replicate.
(f) FDA level of concern for chronic shellfish consumption.
(g) Value is for total mercury.
(h) NYD bioaccumulation matrix value designated in 1981 (USACE 1981).
(i) USACE-NYD/EPA Region II guidance values (1992). Exceedance of 1 ng/kg triggers capping; dioxin levels of 10 or greater results in noncompliance of LPC.

4.2 Arthur Kill

4.2.1 Sediment Physical and Chemical Characterization

Arthur Kill Reach A, Reach B, and Reach C sediment core samples were mostly dense, black material with a strong odor of petroleum products. Some cores also had a visible sheen of oil on the associated water. Individual core sample moisture contents ranged from 52% to 72%. Sediments from AK-A, AK-B, and AK-C were mostly silt and clay; however, AK-B had slightly more sand than the other reaches. The TOC content ranged from 1.85% to 5.65% in individual cores. Concentrations of metals were similar among the three reaches, but generally lowest in COMP AK-A and highest in COMP AK-C. The dominant pesticides found were those in the DDD/DDE/DDT group of compounds. All PCB congeners analyzed were detected from one or more reaches. Total PCB concentrations increased from AK-A (761 μg/kg) to AK-C (3633 μg/kg, dry weight). Concentrations of 2,3,7,8-TCDD were detected in all cores from AK-A, AK-B, and AK-C (0.59 to 455 ng/kg, wet weight). Concentrations of 2,3,7,8-TCDF were detected in most Arthur Kill cores (1.01 to 136 ng/kg, wet weight), except two core samples that had a chromatographic interference preventing detection and quantitation of the TCDF congener. Sediment concentrations of dioxins greater than 1 ng/kg (wet weight) trigger dioxin bioaccumulation analysis. All PAH compounds analyzed were detected. Total PAH in AK-A was 8356 μg/kg, dry weight; 23% of the total was LPAH; 77% of the total was HPAH. Total PAH in AK-B was 10,704 μg/kg, dry weight; 28% of the total was LPAH; 72% of the total was HPAH. Total PAH in AK-C was 12,696 μg/kg, dry weight; 31% of the total was LPAH; 69% of the total was HPAH. The concentration of 1,4-dichlorobenzene ranged from 39.6 μg/kg (AK-A) to 82.6 μg/kg (AK-B), dry weight. The herbicides 2,4-D and 2,4,5-T were not detected.

4.2.2 Toxicity

In water-column toxicity tests, the 100% SPP treatments for all three Arthur Kill sediment composites were acutely toxic to *M. beryllina, M. bahia*, and *M. edulis*. LC_{50}s for *M. beryllina, M. bahia*, and *M. edulis* ranged from 23.6% to 54.5% SPP for AK-A; from 21.8% to 22.4% SPP for AK-B; and 17.1% to 24.6% SPP for AK-C. Therefore, the LPC for water-column effects outside of the disposal site boundaries after 4 h is 0.24% SPP for AK-A, 0.22% SPP for AK-B, and 0.17% SPP for AK-C. Projections of SPP concentrations exceeding these values for each of these sediments after 4 h at the Mud Dump Site boundary would be unacceptable.

Sediments from AK-A, AK-B, and AK-C were acutely toxic to *A. abdita, R. abronius,* and *M. bahia* under both flow-through and static conditions and had greater than 20% increase in mortality over the reference sediment. Therefore, sediments from Arthur Kill Reach A, Reach B,

and Reach C do not meet the LPC for benthic toxicity to these test organisms, if the observed effects are due to persistent contaminants.

4.2.3 Bioaccumulation

When used in bioaccumulation tests, sediments from AK-A, AK-B, and AK-C resulted in elevated concentrations of some contaminants in tissues of *N. virens* and *M. nasuta*. Concentrations of metals, pesticides, and PCBs were generally the same or higher in *N. virens* than in *M. nasuta*. Concentrations of PAHs were higher in *M. nasuta*, sometimes by an order of magnitude, than in *N. virens*. These inter-species comparisons are uncorrected for differences in lipid content.

Table 4.2 compares mean concentrations of contaminants found in tissues of *N. virens* and *M. nasuta* exposed to AK-A, AK-B, and AK-C sediments with FDA action levels for poisonous or deleterious substances in fish and shellfish for human consumption for selected pesticides, FDA levels of concern for chronic shellfish consumption for selected metals, and USACE-NYD bioaccumulation guidance levels for the New York Bight (USACE 1981). The *N. virens* and *M. nasuta* exposed to Arthur Kill sediments had tissue body burdens that were lower than the FDA and USACE-NYD guidance levels for each of these selected contaminants except 2,3,7,8-TCDD.

Concentrations of 2,3,7,8-TCDD ranged from 3.10 to 4.37 ng/kg wet weight in *N. virens* tissues exposed to AK-A; from undetected at 0.6 ng/kg to 4.92 ng/kg wet weight in tissues exposed to AK-B; and from 2.84 to 3.41 ng/kg wet weight in tissues exposed to AK-C. According to USACE-NYD/EPA Region II criteria for ocean disposal of dredged material, sediments that result in bioaccumulation concentrations in *N. virens* tissues from 1 to 10 ng/kg (wet weight) would be unsuitable for unrestricted ocean disposal, but suitable for disposal at the Mud Dump Site with capping, assuming LPC compliance for all other Tier III criteria (water column and benthic).

N. virens and *M. nasuta* tissues exposed to Arthur Kill sediments for 28 days had significantly higher concentrations of pesticides, PCBs, TCDD/TCDF (analyzed in *N. virens* tissues only), and PAHs than Mud Dump Reference Site sediment-exposed worms. Therefore, AK-A, AK-B, and AK-C sediments require further evaluation to determine LPC and benthic effects compliance. Figure 4.2 indicates the number of compounds in each contaminant group that was significantly elevated, and whether the bioaccumulation was a greater than two- but

TABLE 4.2. Comparison of Contaminant Concentrations in *N. virens* and *M. nasuta* Tissues Exposed to Proposed Dredged Material from Arthur Kill with FDA and USACE Guidance Levels for Bioaccumulation/Tissue Burden

Substance	Guidance Level (mg/kg wet wt)	Mean Concentration[a] in *N. virens* Tissues (mg/kg wet wt) AK-A	AK-B	AK-C	Mean Concentration[a] in *M. nasuta* Tissues (mg/kg wet wt) AK-A	AK-B	AK-C
Chlordane	0.3[b]	0.00262[c]	0.00298[c]	0.00312[c]	0.00230[c]	0.00038[c]	0.00040[c]
Total DDT[d]	5.0[b]	0.0367	0.162	0.0441	0.0550	0.158	0.0813
Dieldrin + Aldrin	0.3[b]	0.00177	0.00372	0.00526	0.00267	0.00125	0.00317
Heptachlor + Heptachlor epoxide	0.3[b]	0.00111	0.00123	0.00127	ND[e]	0.00018	0.00048
Total PCBs[f]	2.0[b]	0.105	0.146	0.180	0.147	0.162	0.197
Arsenic	86[g]	2.00	2.01	2.06	2.92	3.68	3.23
Cadmium	3.7[g]	0.145	0.166	0.124	0.0403	0.0390	0.0437
Chromium	13[g]	0.287	0.237	0.176	0.538	0.335	0.767
Lead	1.7[g]	0.317	0.302	0.202	0.845	0.494	1.41
Nickel	80[g]	0.363	0.402	0.280	0.523	0.425	0.509
Methyl mercury	1.0[g]	0.0107[h]	0.0117[h]	0.0078[h]	0.0266[h]	0.0237[h]	0.0252[h]
Total DDT	0.04[i]	0.0367	0.162	0.0441	0.0550	0.158	0.0813
Total PCBs	0.40[i]	0.105	0.146	0.180	0.147	0.162	0.197
Mercury (total)	0.20[i]	0.0107	0.0117	0.0078	0.0266	0.0237	0.0252
Cadmium	0.30[i]	0.145	0.166	0.124	0.0403	0.0390	0.0437
Dioxin (2,3,7,8-TCDD only, concentrations in ng/kg or pptr wet weight)	25[j]	3.82	3.17	3.14	NA[k]	NA	NA

(a) Concentration shown is mean of five replicate tissue analyses. If any constituents were undetected, one-half of the detection limit was used in calculation of the mean concentration.
(b) FDA action levels for poisonous and deleterious substances in fish and shellfish for human food.
(c) Sum of α-chlordane and *trans* nonachlor only, whereas FDA action level is a sum of nine chlordane analytes.
(d) Sum of mean values for 2,4'-DDT, 4,4'-DDT, 2,4'-DDE, 4,4'-DDE, 2,4'-DDD, and 4,4'-DDD. One-half of the detection limit was used in the summation when mean values were undetected in a replicate. Due to a chromatographic interference, values determined for DDT may be a false positive or biased high.
(e) ND Not detected.
(f) Total PCBs estimated as (2 X sum of 22 congeners). One-half of the detection limit was used in the summation when mean values were undetected in a replicate.
(g) FDA level of concern for chronic shellfish consumption.
(h) Value is for total mercury.
(i) NYD bioaccumulation matrix value designated in 1981 (USACE 1981).
(j) USACE-NYD/EPA Region II guidance values (1992). Exceedance of 1 ng/kg triggers capping; dioxin levels of 10 or greater results in noncompliance of LPC.
(k) NA Not analyzed.

less than fivefold increase over the reference; greater than five- but less than tenfold increase over the reference; or a greater than tenfold increase over the reference site treatments. Organic analytes (PCBs, PAHs, pesticides, PCDD/PCDF) bioaccumulated significantly in *N. virens* tissues from Arthur Kill sediments, whereas few metals demonstrated comparable significant bioavailability. The trend for *M. nasuta* was similar but more variable.

4.3 Port Elizabeth

4.3.1 Sediment Physical and Chemical Characterization

Port Elizabeth Reach A and Reach B sediment core samples were black mud with some odor of petroleum products. Some cores also had a visible sheen of oil. Individual core sample moisture contents ranged from 43% to 63%. Sediments from PE-A and PE-B were mostly silt and clay; however, PE-B had a slightly higher sand content than PE-A. The TOC content ranged from 1.51% to 3.37% in individual cores. Concentrations of metals were comparable between the two Port Elizabeth reaches. The dominant pesticides found were DDD and DDE. All PCB congeners analyzed were detected. Total PCB concentrations were 1638 μg/kg in PE-A and 1551 μg/kg (dry weight) in PE-B sediment. Concentrations of 2,3,7,8-TCDD were detected in all cores from PE-A and PE-B (15.8 to 81.5 ng/kg, wet weight). Concentrations of 2,3,7,8-TCDF were detected in all but two Port Elizabeth cores (5.98 to 13.3 ng/kg, wet weight). Sediment concentrations of dioxins greater than 1 ng/kg (wet weight) trigger dioxin bioaccumulation analysis. All PAH compounds analyzed were detected. Total PAH in PE-A was 20,820 μg/kg, dry weight; 27% of the total was LPAH; 73% of the total was HPAH. Total PAH in PE-B was 17,170 μg/kg, dry weight; 36% of the total was LPAH; 64% of the total was HPAH. In both PE-A and PE-B, 1,4-dichlorobenzene was detected, but the herbicides 2,4-D and 2,4,5-T were undetected.

4.3.2 Toxicity

In water-column toxicity tests, the 100% SPP treatments for PE-A and PE-B were acutely toxic to *M. beryllina, M. bahia*, and *M. edulis*. LC_{50}s for *M. beryllina, M. bahia*, and *M. edulis* ranged from 51.2% to >100% SPP for PE-A, and from 49.3% to >100% SPP for PE-B. Therefore, the LPC for water-column effects outside of the disposal site boundaries after 4 h is 0.51% SPP for PE-A and 0.49% SPP for PE-B. Projections of SPP concentrations exceeding these values for each of these sites after 4 h at the Mud Dump Site boundary would be unacceptable.

Sediments from PE-A and PE-B were acutely toxic to *A. abdita*, *R. abronius*, and *M. bahia* under both flow-through and static conditions and had greater than 20% increase in mortality over the reference sediment. Therefore, sediments from Port Elizabeth Reach A and Reach B do not meet the LPC for benthic toxicity to these test organisms, if the observed effects are due to persistent contaminants.

4.3.3 Bioaccumulation

When used in bioaccumulation tests, sediments from PE-A and PE-B resulted in elevated concentrations of some contaminants in tissues of *N. virens* and *M. nasuta*. Concentrations of metals were similar between *N. virens* and *M. nasuta*. In general, pesticide and PCB concentrations were higher in *N. virens* than in *M. nasuta*, whereas PAH concentrations were higher in *M. nasuta*, sometimes by an order of magnitude, than in *N. virens*. These inter-species comparisons are uncorrected for differences in lipid content.

Table 4.3 compares mean concentrations of contaminants found in tissues of *N. virens* and *M. nasuta* exposed to PE-A and PE-B sediments with FDA action levels for poisonous or deleterious substances in fish and shellfish for human consumption for selected pesticides, FDA levels of concern for chronic shellfish consumption for selected metals, and USACE-NYD bioaccumulation guidance levels for the New York Bight (USACE 1981). The concentrations found in the tissues of both species were lower than the FDA and USACE-NYD guidance levels for all contaminants except 2,3,7,8-TCDD.

Concentrations of 2,3,7,8-TCDD ranged from 4.10 to 6.71 ng/kg wet weight in *N. virens* tissues exposed to PE-A. In *N. virens* exposed to PE-B, 2,3,7,8-TCDD ranged from 3.81 to 6.29 ng/kg wet weight. According to USACE-NYD/EPA Region II criteria for ocean disposal of dredged material, sediments that result in bioaccumulation concentrations in *N. virens* tissues from 1 to 10 ng/kg (wet weight) would be unsuitable for unrestricted ocean disposal, but suitable for disposal at the Mud Dump Site with capping, assuming LPC compliance for all other Tier III criteria (water column and benthic).

N. virens and *M. nasuta* tissues exposed to Port Elizabeth sediment for 28 days had significantly higher concentrations of metals (in *M. nasuta* tissues only exposed to PE-A), pesticides, PCBs, TCDD/TCDF (analyzed in *N. virens* tissues only), and PAHs than Mud Dump Reference Site sediment-exposed worms. Therefore, PE-A and PE-B sediments require further evaluation to determine LPC and benthic effects compliance.

TABLE 4.3. Comparison of Contaminant Concentrations in *N. virens* and *M. nasuta* Tissues Exposed to Proposed Dredged Material from Port Elizabeth with FDA and USACE Guidance Levels for Bioaccumulation/Tissue Burden

Substance	Guidance Level (mg/kg wet wt)	Mean Concentration[a] in *N. virens* Tissues (mg/kg wet wt) PE-A	PE-B	Mean Concentration[a] in *M. nasuta* Tissues (mg/kg wet wt) PE-A	PE-B
Chlordane	0.3[b]	0.00219[c]	0.00220[c]	0.00192[c]	0.00192[c]
Total DDT[d]	5.0[b]	0.00954	0.0132	0.0155	0.0243
Dieldrin + Aldrin	0.3[b]	0.00278	0.00329	0.00207	0.00181
Heptachlor + Heptachlor epoxide	0.3[b]	0.00034	0.00116	0.00040	0.00029
Total PCBs[e]	2.0[b]	0.089	0.115	0.137	0.152
Arsenic	86[f]	2.19	2.08	3.23	3.41
Cadmium	3.7[f]	0.145	0.156	0.0437	0.0432
Chromium	13[f]	0.194	0.222	0.767	0.736
Lead	1.7[f]	0.252	0.262	1.41	1.08
Nickel	80[f]	0.264	0.382	0.509	0.569
Methyl mercury	1.0[f]	0.0092[g]	0.0090[g]	0.0252[g]	0.0297[g]
Total DDT[d]	0.04[h]	0.00954	0.0132	0.0155	0.0243
Total PCBs[e]	0.40[h]	0.089	0.115	0.137	0.152
Mercury (total)	0.20[h]	0.0092[f]	0.0090[f]	0.0252[f]	0.0297[f]
Cadmium	0.30[h]	0.145	0.156	0.0437	0.0432
Dioxin (2,3,7,8-TCDD only, concentrations in ng/kg or pptr wet weight)					
	25[i]	5.85	4.81	NA[j]	NA

(a) Concentration shown is mean of five replicate tissue analyses. If any constituents were undetected, one-half of the detection limit was used in calculation of the mean concentration.
(b) FDA action levels for poisonous and deleterious substances in fish and shellfish for human food.
(c) Sum of α-chlordane and *trans* nonachlor only, whereas FDA action level is a sum of nine chlordane analytes.
(d) Sum of mean values for 2,4'-DDT, 4,4'-DDT, 2,4'-DDE, 4,4'-DDE, 2,4'-DDD, and 4,4'-DDD. One-half of the detection limit was used in the summation when means values were undetected in a replicate. Due to a chromatographic interference, values determined for DDT may be a false positive or biased high.
(e) Total PCBs estimated as (2 X sum of 22 congeners). One-half of the detection limit was used in the summation when mean values were undetected in a replicate.
(f) FDA level of concern for chronic shellfish consumption.
(g) Value is for total mercury.
(h) NYD bioaccumulation matrix value designated in 1981 (USACE 1981).
(i) USACE-NYD/EPA Region II guidance values (1992). Exceedance of 1 ng/kg triggers capping; dioxin levels of 10 or greater results in noncompliance of LPC.
(j) NA Not analyzed.

Figure 4.3 indicates the number of compounds in each contaminant group that was significantly elevated, and whether the bioaccumulation was a greater than two- but less than fivefold increase over the reference; greater than five- but less than tenfold increase over the reference; or a greater than tenfold increase over the reference site treatments. Organic analytes (PCBs, PAHs, pesticides, PCDD/PCDF) bioaccumulated significantly in *N. virens* tissues from Port Elizabeth sediments, but few metals demonstrated comparable significant bioavailability. The trend for *M. nasuta* was similar for organics, whereas metals appeared more bioavailable than in worms.

4.4 Hackensack River

4.4.1 Sediment Physical and Chemical Characterization

Portions of the Hackensack River sediment core samples were coarse, sandy material, others were dense, gray, clayey material, and still others were hard, brown clay. The odor of petroleum products and an oily sheen were present in some of the cores. Individual core sample moisture contents ranged from 18% to 48%. Grain sizes of Hackensack sediments cores were variable, but were generally silt and clay with some sandy stations. The TOC content was also variable, ranging from 0.35% to 13.40% in individual cores. Concentrations of all metals were elevated over typical New York Bight sediments. The dominant pesticides found were the DDD/DDE/DDT group of pesticides. Almost all of PCB congeners analyzed were detected, with a total PCB concentration of 1273 μg/kg (dry weight) in HR-A sediment. Concentrations of 2,3,7,8-TCDD were detected at high concentrations in all cores from HR-A, ranging from 19.7 to 252 ng/kg, wet weight. Concentrations of 2,3,7,8-TCDF were also detected in all HR-A cores (4.52 to 34.2 ng/kg, wet weight). Sediment concentrations of dioxins greater than 1 ng/kg (wet weight) trigger dioxin bioaccumulation analysis. All PAH compounds analyzed were detected. The total PAH in HR-A was high at 306,170 μg/kg, dry weight; 29% of the total was LPAH; 71% of the total was HPAH. An additional hydrocarbon fingerprinting analysis performed on sample HR-A indicated that a likely source of the hydrocarbon contamination in HR-A sediment was a coal-tar product. The compound 1,4-dichlorobenzene was detected in HR-A, but the herbicides 2,4-D and 2,4,5-T were undetected.

4.4.2 Toxicity

In water-column toxicity tests, the 100% SPP treatment for HR-A was acutely toxic to *M. beryllina, M. bahia*, and *M. edulis*. The LC_{50}s for *M. beryllina, M. bahia*, and *M. edulis* ranged from 39.7% to 81.5% SPP for HR-A. Therefore, the LPC for water-column effects outside of the

disposal site boundaries after 4 h is 0.40% SPP for HR-A. Projections of SPP concentrations exceeding this value after 4 h at the Mud Dump Site boundary would be unacceptable.

Sediment from HR-A was acutely toxic to *A. abdita*, *R. abronius*, and *M. bahia* under both flow-through and static conditions and had greater than 20% increase in mortality over the reference sediment. Therefore, sediments from Hackensack River Reach A and Reach B do not meet the LPC for benthic toxicity to these test organisms, if the observed effects are due to persistent contaminants.

4.4.3 Bioaccumulation

When used in bioaccumulation tests, sediment from HR-A resulted in elevated concentrations of some contaminants in tissues of *N. virens* and *M. nasuta*. Concentrations of metals, pesticides, and PCBs were in general higher in *N. virens* than in *M. nasuta* tissues. Concentrations of PAHs were higher in *M. nasuta*, often by an order of magnitude, than in *N. virens*. These inter-species comparisons are uncorrected for differences in lipid content.

Table 4.4 compares mean concentrations of contaminants found in tissues of *N. virens* and *M. nasuta* exposed to HR-A sediment with FDA action levels for poisonous or deleterious substances in fish and shellfish for human consumption for selected pesticides, FDA levels of concern for chronic shellfish consumption for selected metals, and USACE-NYD bioaccumulation guidance levels for the New York Bight (USACE 1981). The *N. virens* and *M. nasuta* exposed to HR-A sediment had tissue body burdens that were lower than the FDA and USACE-NYD guidance levels for all contaminants except 2,3,7,8-TCDD.

Concentrations of 2,3,7,8-TCDD ranged from 11.1 to 14.6 ng/kg wet weight in *N. virens* tissues exposed to HR-A. According to USACE-NYD/EPA Region II criteria for ocean disposal of dredged material, sediments that result in bioaccumulation concentrations in *N. virens* tissues greater than 10 ng/kg (wet weight) would be unsuitable for disposal at the Mud Dump Site, even with capping.

N. virens and *M. nasuta* tissues exposed to Hackensack River sediment for 28 days had significantly higher concentrations of metals (in *N. virens* only), pesticides, PCBs, TCDD/TCDF (analyzed in *N. virens* tissues only), and PAHs than Mud Dump Reference Site sediment-exposed worms. Therefore, HR-A sediment require further evaluation to determine LPC and benthic effects compliance.

TABLE 4.4. Comparison of Contaminant Concentrations in *N. virens* and *M. nasuta* Tissues Exposed to Proposed Dredged Material from Hackensack River with FDA and USACE Guidance Levels for Bioaccumulation/Tissue Burden

Substance	Guidance Level (mg/kg wet wt)	Mean Concentration[a] in *N. virens* Tissues (mg/kg wet wt) HR-A	Mean Concentration[a] in *M. nasuta* Tissues (mg/kg wet wt) HR-A
Chlordane	0.3[b]	0.00199[c]	0.00117[c]
Total DDT[d]	5.0[b]	0.00679	0.00851
Dieldrin + Aldrin	0.3[b]	0.00328	0.00191
Heptachlor + Heptachlor epoxide	0.3[b]	0.00119	0.00016
Total PCBs[e]	2.0[b]	0.114	0.123
Arsenic	86[f]	2.30	3.37
Cadmium	3.7[f]	0.174	0.0330
Chromium	13[f]	0.604	0.645
Lead	1.7[f]	0.443	0.659
Nickel	80[f]	0.458	0.383
Methyl mercury	1.0[f]	0.0145[g]	0.0213[g]
Total DDT[d]	0.04[h]	0.00963	0.0106
Total PCBs	0.40[h]	0.114	0.123
Mercury (total)	0.20[h]	0.0145	0.0213
Cadmium	0.30[h]	0.174	0.0330
Dioxin (2,3,7,8-TCDD only, concentrations in ng/kg or pptr wet weight)	25[i]	13.2	NA[j]

(a) Concentration shown is mean of five replicate tissue analyses. If any constituents were undetected, one-half of the detection limit was used in calculation of the mean concentration.
(b) FDA action levels for poisonous and deleterious substances in fish and shellfish for human food.
(c) Sum of α-chlordane and *trans* nonachlor only, whereas FDA action level is a sum of nine chlordane analytes.
(d) Sum of mean values for 2,4'-DDT, 4,4'-DDT, 2,4'-DDE, 4,4'-DDE, 2,4'-DDD, and 4,4'-DDD. One-half of the detection limit was used in the summation when means values were undetected in a replicate. Due to a chromatographic interference, values determined for DDT may be a false positive or biased high.
(e) Total PCBs estimated as (2 X sum of 22 congeners). One-half of the detection limit was used in the summation when mean values were undetected in a replicate.
(f) FDA level of concern for chronic shellfish consumption.
(g) Value is for total mercury.
(h) NYD bioaccumulation matrix value designated in 1981 (USACE 1981).
(i) USACE-NYD/EPA Region II guidance values (1992). Exceedance of 1 ng/kg triggers capping; dioxin levels of 10 or greater results in noncompliance of LPC.
(j) NA Not analyzed.

Figure 4.1 indicates the number of compounds in each contaminant group that was statistically significantly elevated, and whether the bioaccumulation was a greater than two- but less than fivefold increase over the reference; greater than five- but less than tenfold increase over the reference; or a greater than tenfold increase over the reference site treatments. Organic analytes (PCBs, PAHs, pesticides, PCDD/PCDF) bioaccumulated significantly in *N. virens* tissues from Hackensack River sediment, whereas metals demonstrated less significant bioavailability. The trend for *M. nasuta* was similar but more variable for organics; metals appeared much less bioavailable than in worms.

4.5 Claremont

4.5.1 Sediment Physical and Chemical Characterization

Claremont Reach I, Reach II, and Reach III sediment core samples were black silty clay. All physical and chemical measurements were made on the sediment composite samples for each reach. Sediment moisture content was approximately 55%. The TOC content ranged from 2.88% to 3.63%. Concentrations of all metals were similar among the three Claremont reaches, but generally lowest in COMP CL-I and highest in COMP CL-III. The dominant pesticides found were those in the DDD/DDE/DDT group of compounds. COMP CL-II generally had the highest concentrations of pesticides. All PCB congeners analyzed were detected. Total PCB concentrations (in dry weight) were 675 μg/kg in CL-I, 2573 μg/kg in CL-II, and 1074 μg/kg in CL-III. Concentrations of 2,3,7,8-TCDD were detected in all three Claremont reaches: 25.7 ng/kg in CL-I, 31.5 ng/kg in CL-II, and 7.79 ng/kg in CL-III (in wet weight). Concentrations of 2,3,7,8-TCDF were detected in all three Claremont reaches: 11.4 ng/kg in CL-I, 19.8 ng/kg in CL-II, and 11.3 ng/kg in CL-III (in wet weight). All PAH compounds analyzed were detected in all three reaches. Total PAH in CL-I was 5415 μg/kg, dry weight; 22% of total was LPAH; 78% of total was HPAH. Total PAH in CL-II was 11,088 μg/kg, dry weight; 23% of total was LPAH; 77% of total was HPAH. Total PAH in CL-III was 8244 μg/kg, dry weight; 20% of total was LPAH; 80% of total was HPAH. The compound 1,4-dichlorobenzene was detected in all three sediment composite samples. The herbicides 2,4-D and 2,4,5-T were not detected.

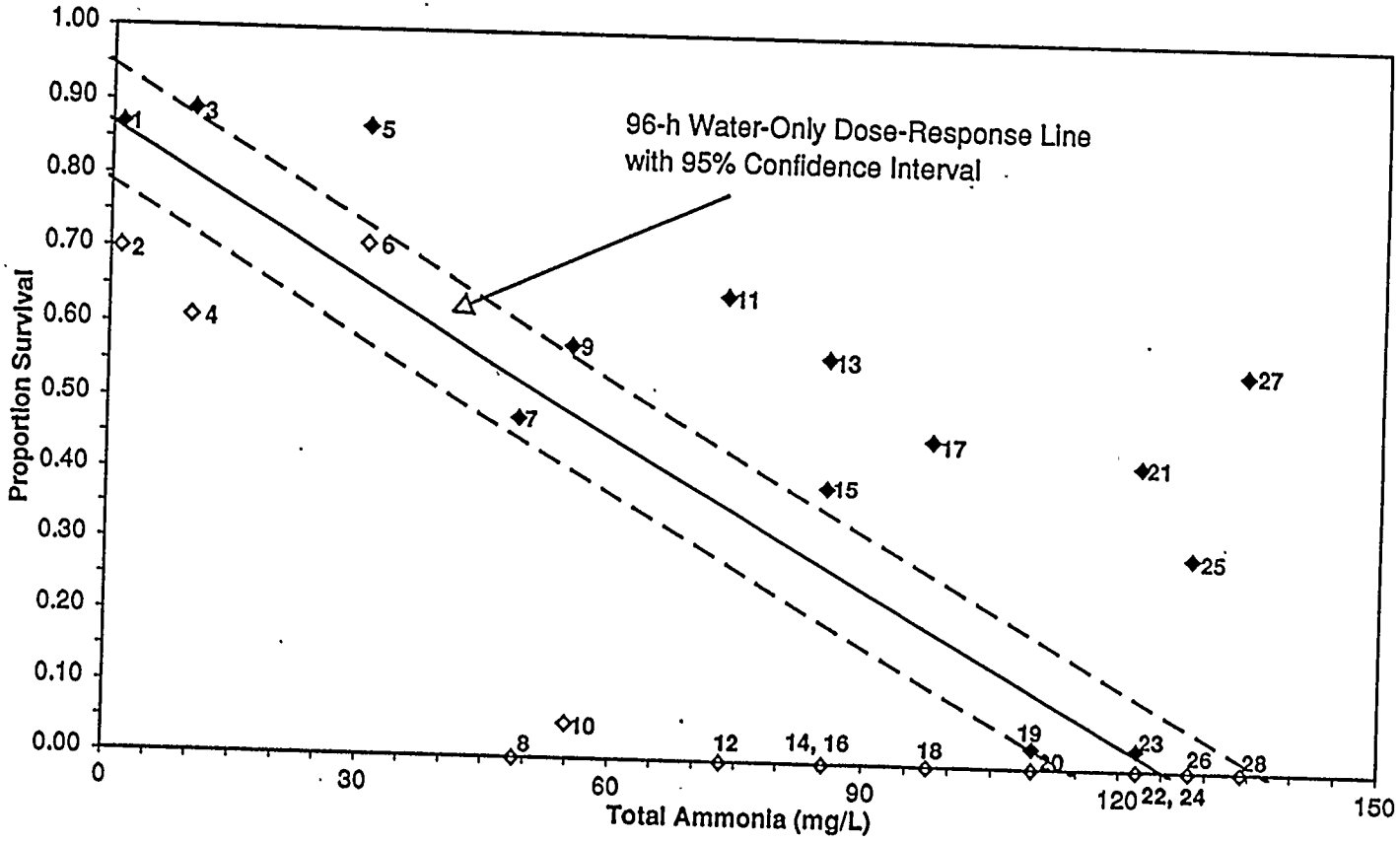
4.5.2 Toxicity

Sediments from CL-I, CL-II, and CL-III were acutely toxic to *A. abdita* and *R. abronius* under both flow-through and static conditions, and had greater than 20% increase in mortality over the reference sediment. Therefore, CL-I, CL-II, and CL-III do not meet the LPC for benthic toxicity to these test organisms if the observed effects are due to persistent contaminants.

4.6 Relationship of Sediment Pore Water Ammonia Concentrations to Toxicity

Ammonia has been suspected of contributing to observed amphipod toxicity. Sediment pore water is considered the primary pathway by which some of these test animals are exposed to ammonia, whereas overlying water is a secondary source. The LC_{50}s for *A. abdita* and *R. abronius* in ammonia, as determined by a 96-h exposure of these animals to aqueous ammonia solutions, are 49.8 mg/L and 78.7 mg/L total ammonia, respectively (Kohn et al. 1993). In all of the New York/New Jersey federal projects sediments, concentrations of total ammonia in the sediment pore water ranged from 48.8 mg/L at Port Elizabeth Reach A to 134.2 mg/L at Claremont Reach II. It is likely that ammonia is a contributing factor to the overall toxicity effects observed in these test sediments. Examining survival data for amphipods exposed to test sediments and concentrations of initial pore water in relation to the 96-h, water-only, dose response of each species to ammonia can provide information that aids in interpreting the observed toxicity of amphipods.

In Figure 4.4, survival of *A. abdita* exposed to each test sediment composite under static and flow-through conditions is plotted against the initial (Day 0) pore water total ammonia concentration for each test sediment. Superimposed over the plot is the 96-h, water-only, dose-response line with its 95% confidence interval for *A. abdita* exposed to ammonia. Each point on the plot represents a sediment treatment tested under a static or flow-through system. The points are numbered for identification. For all of these New York/New Jersey project sediments, *A. abdita* survival was higher in the flow-through tests than in the static tests. *A. abdita* is a tube-dwelling amphipod that lives on the sediment surface. Apparently, the flow of water benefits organisms that rely on adequate overlying water for survival by providing food, whereas the static test, in which overlying water quality is suboptimal, has a greater effect on these test animals. For the points or test sediments that fell along the ammonia dose-response line and confidence interval (points 1, 3, 6, 7, 9, 15, 19, 23, 26, and 28), the dose response for 96-h exposure predicts the toxicity observed in *A. abdita*. That is, when *A. abdita* is exposed to sediments having initial pore water total ammonia at those concentrations, survival can be expected to fall near the dose-response line. For the points or test sediments that lie above the dose-response line (points 5, 11, 13, 17, 21, 25, and 27), some factor keeps the test organism from the responding to the initial pore water total ammonia concentration. All of the tests above the dose-response line were run as flow-through tests, suggesting that the adequate overlying



◇ Static Tests ◆ Flow-Through Tests

KEY TO SEDIMENT TREATMENT NUMBERS

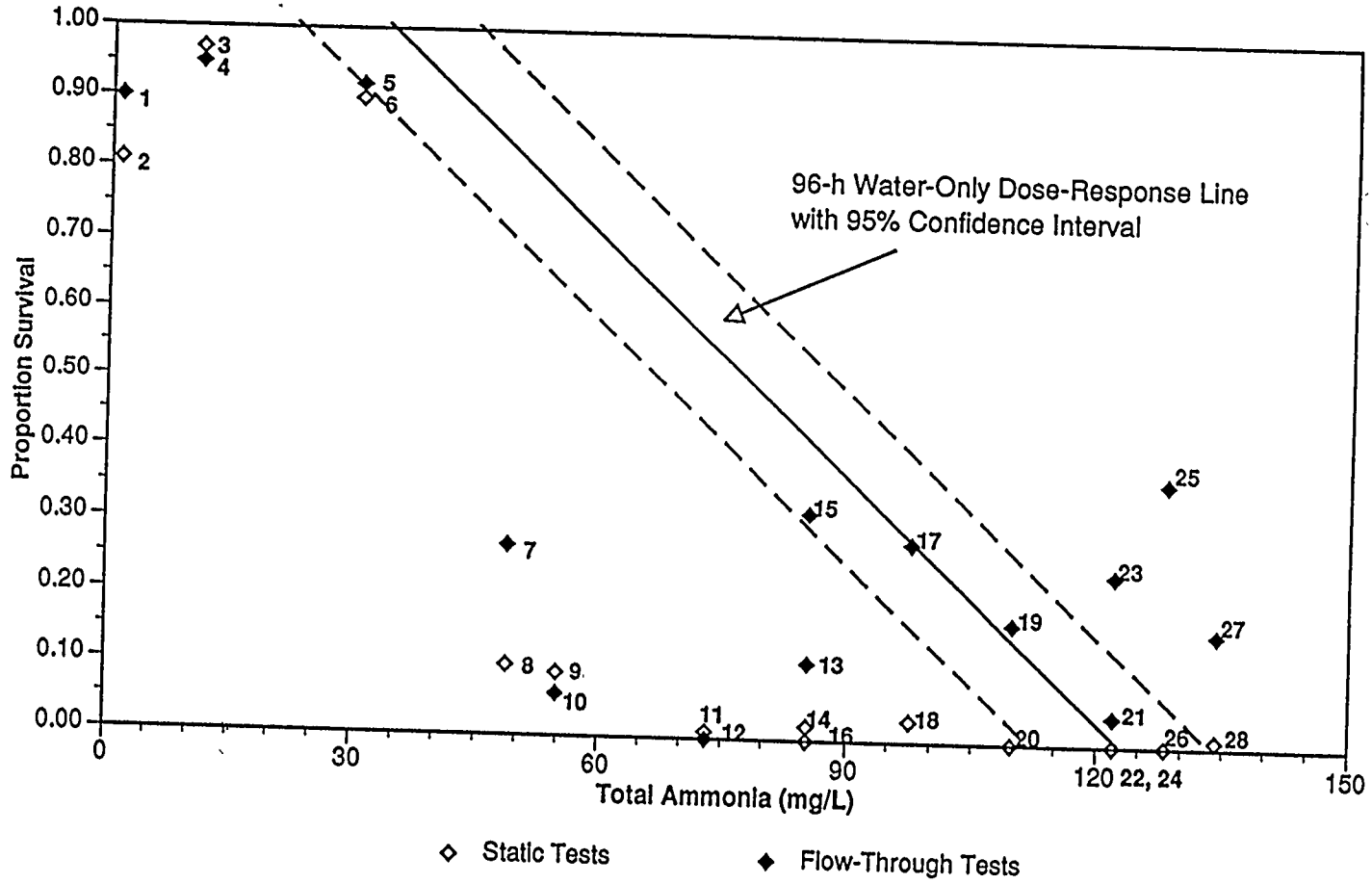
1. C-WB flow through
2. C-WB static
3. C-AM flow through
4. C-AM static
5. R-MUD flow through
6. R-MUD static
7. PE-A flow through
8. PE-A static
9. MT-A flow through
10. MT-A static
11. MT-B flow through
12. MT-B static
13. CL-III flow through
14. CL-III static
15. HR-A flow through
16. HR-A static
17. PE-B flow through
18. PE-B static
19. AK-C flow through
20. AK-C static
21. CL-I flow through
22. CL-I static
23. AK-B flow through
24. AK-B static
25. AK-A flow through
26. AK-A static
27. CL-II flow through
28. CL-III static

FIGURE 4.4. *Ampelisca abdita* Survival vs. Total Ammonia Concentrations in Pore Water on Day 0, Under Static and Flow-Through Conditions

water quality provided by water renewal protected the amphipod from the pore water ammonia concentrations. For the points that lie below the dose-response line (points 2, 4, 8, 10, 12, 14, 16, 18, and 20), other constituents in the sediment in addition to the initial pore water ammonia concentrations must have contributed to the observed toxicity. All of these tests were static, suggesting that the sediment toxicity was enhanced by the suboptimal water quality, resulting in lower survival.

Figure 4.5 is a similar plot for *R. abronius,* in which amphipod survival is plotted against initial pore water total ammonia concentrations. As in the previous figure, the 96-h, water-only, dose-response line for *R. abronius* exposed to ammonia is superimposed over the plot. For the points or test sediments that fall along the ammonia dose-response line and confidence interval (points 5, 6,15, 17, 19, 20, 21, 26, and 28), the 96-h dose response predicts the toxicity observed in *R. abronius.* In contrast to the *A. abdita* test results, organism survival in the *R. abronius* tests was apparently not affected by whether tests were run under static or flow-through conditions. *R. abronius* burrows into the sediment; thus, it appears to respond more to sediment conditions than to overlying water conditions. Only a few sediment treatments fell above the dose-response line (points 23, 25, and 27). Most sediments fell below the dose-response line. Because *R. abronius* survival was low in these sediments, and initial pore water ammonia concentrations were less than the concentration at which an effect would be expected, the observed toxicity must be attributed to constituents in addition to ammonia in the sediment.

Between the *A. abdita* and *R. abronius* benthic toxicity tests, the toxicity of some test sediments could be predicted based on the initial pore water concentrations of ammonia. Most of the sediments tested with *A. abdita* under static systems showed toxicity that exceeded the expected effects of ammonia, whereas the sediments tested under flow-through systems showed less toxicity than would be expected at the pore water ammonia levels that were present. Most of the sediments tested with *R. abronius*, whether conducted under static or flow-through systems, showed toxicity that exceeded the expected effects of ammonia. These results suggest that particularly with regard to ammonia, *A. abdita* is more responsive to toxicants in the overlying water, and *R. abronius* is more responsive to toxicants in the pore water or sediment.



KEY TO SEDIMENT TREATMENT NUMBERS

1. C-WB flow through
2. C-WB static
3. C-SB static
4. C-SB flow through
5. R-MUD flow through
6. R-MUD static
7. PE-A flow through
8. PE-A static
9. MT-A static
10. MT-A flow through
11. MT-B static
12. MT-B flow through
13. CL-III flow through
14. CL-III static
15. HR-A flow through
16. HR-A static
17. PE-B flow through
18. PE-B static
19. AK-C flow through
20. AK-C static
21. CL-I flow through
22. CL-I static
23. AK-B flow through
24. AK-B static
25. AK-A flow through
26. AK-A static
27. CL-II flow through
28. CL-III static

FIGURE 4.5. *Rhepoxynius abronius* Survival vs. Total Ammonia Concentrations in Pore Water on Day 0, Under Static and Flow-Through Conditions

APPENDIX A

Sediment Physical and Chemical Analyses

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects

PARAMETER: Grain Size and Percent Moisture

LABORATORY: Soil Technology, Bainbridge Island, Washington

MATRIX: Sediment

QA/QC DATA QUALITY OBJECTIVES

	Reference Method	Range of Recovery	SRM Accuracy	Relative Precision	Detection Limit (dry wt)
Grain Size	ASTM D-2217 and D-422	N/A	N/A	≤20%	1.0%
Percent Moisture	Plumb 1981	N/A	N/A	N/A	1.0%

METHOD Grain size was measured for three fractions using a combination of sieve and pipette techniques, following ASTM Method D-2217 and D-422 for wet sieving. Percentage of moisture was measured gravimetrically following Plumb (1981).

HOLDING TIMES Samples were analyzed within the 6-month holding time.

DETECTION LIMITS Target detection limit of 1.0% by weight for each fraction was met for all samples.

METHOD BLANKS Not applicable.

MATRIX SPIKES Not applicable.

REPLICATES Five samples were analyzed in triplicate. Precision was measured by calculating the relative standard deviation (RSD) between the replicate results. The RSDs for grain size ranged from 0% to 9%, indicating acceptable precision of the method.

SRMs Not applicable.

REFERENCES

ASTM (American Society for Testing and Materials). 1992. *Standard Method for Wet Preparation of Soil Samples for Particle-size Analysis and Determination of Soil Constants.* D-2217. ASTM Annual Book of ASTM Standards, Philadelphia, Pennsylvania.

ASTM (America Society for Testing and Materials). 1992. *Standard Method for Particle-Size Analysis of Soils.* D-422. ASTM Annual Book of ASTM Standards, Philadelphia, Pennsylvania.

Plumb, R.H., Jr. 1981. *Procedure for Handling and Chemical Analysis of Sediment and Water Samples.* Tech. Rep. EPA/CE-81-1. Prepared for Great Lakes Laboratory, State University College at Buffalo, Buffalo, New York, for the Environmental Protection Agency/U.S. Army Corps of Engineers Technical Committee on Criteria for Dredged and Fill Material. U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects

PARAMETER: Total Organic Carbon (TOC)

LABORATORY: Global Geochemistry, Canoga Park, California

MATRIX: Sediment

QA/QC DATA QUALITY OBJECTIVES

Reference Method	Range of Recovery	SRM Accuracy	Relative Precision	Detection Limit (dry wt)
EPA 1986	N/A	≤20%	≤10%	0.01%

METHOD TOC was analyzed in accordance with U.S. Environmental Protection Agency (EPA 1986). Analysis was performed by combustion and quantitation of evolved carbon dioxide using a LECO analyzer.

HOLDING TIMES Samples were analyzed within the 6-month holding time.

DETECTION LIMITS Target detection limit of 0.01% by weight for each fraction was met for all samples.

METHOD BLANKS Eleven method blanks were analyzed with the sediment samples. TOC levels detected in blanks ranged from 0.001% to 0.009%, which were lower than the established detection limit.

MATRIX SPIKES Not applicable.

REPLICATES Ten samples were analyzed in triplicate. Precision was measured by calculating the relative standard deviation (RSD) between the replicate results. All RSDs were between 0% and 3%, indicating acceptable precision of the method.

SRMs Standard reference material MESS-1, obtained from the National Research Council of Canada, was analyzed with the sediment samples. Although MESS-1 is not certified for TOC, values reported were all within 20% of the in-house consensus value.

COMMENTS Although no QC data indicated problems with analytical accuracy, three samples from Hackensack River Reach A (HR-A-6, -7, and -8) had unusually high TOC values (between 10% and 37%). These samples were reanalyzed, and TOC values ranged from 5% to 13.4%. The results of the reanalysis were reported in this appendix.

REFERENCES

EPA (U.S. Environmental Protection Agency). 1986. *Determination of Total Organic Carbon in Sediment.* U.S. Environmental Protection Agency, Region II, Environmental Services Division, Monitoring Management Branch, Edison, New Jersey.

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects

PARAMETER: Bulk Density and Specific Gravity

LABORATORY: Soil Technology, Bainbridge Island, Washington

MATRIX: Sediment

QA/QC DATA QUALITY OBJECTIVES

	Reference Method	Range of Recovery	SRM Accuracy	Relative Precision	Detection Limit (dry wt)
Bulk Density	EM 1110-2-1906	N/A	N/A	≤20%	N/A
Specific Gravity	ASTM D-854	N/A	N/A	≤20%	N/A

METHOD Specific gravity was measured according to ASTM D-854, and bulk density was determined according to EM 1110-2-1906.

HOLDING TIMES Samples were analyzed within the 6-month holding time.

DETECTION LIMITS Not applicable.

METHOD BLANKS Not applicable.

MATRIX SPIKES Not applicable.

REPLICATES Five samples were analyzed in triplicate. Precision was measured by calculating the relative standard deviation (RSD) between the replicate results. All RSDs for bulk density were between 0% and 1%. All RSDs for specific gravity were between 1% and 2%.

SRMs Not applicable.

REFERENCES

ASTM (American Society for Testing and Materials). 1992. *Standard Method for Specific Gravity.* D-854. American Society for Testing and Materials, Philadelphia, Pennsylvania.

USACE (U.S. Army Corps of Engineers). 1970. *Engineering and Design Laboratory Soils Testing.* EM 1110-2-1906. U.S. Army Corps of Engineers, Headquarters, Department of the Army, Office of Chief of Engineers, Washington, D.C.

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects

PARAMETER: Metals

LABORATORY: Battelle/Marine Sciences Laboratory, Sequim, Washington

MATRIX: Sediment

QA/QC DATA QUALITY OBJECTIVES

	Reference Method	Range of Recovery	SRM Accuracy	Relative Precision	Detection Limit (dry wt)
Arsenic	ICP/MS	75-125%	≤20%	≤20%	0.1
Cadmium	ICP/MS	75-125%	≤20%	≤20%	0.01
Chromium	ICP/MS	75-125%	≤20%	≤20%	0.02
Copper	ICP/MS	75-125%	≤20%	≤20%	0.1
Lead	ICP/MS	75-125%	≤20%	≤20%	0.1
Mercury	CVAA	75-125%	≤20%	≤20%	0.02
Nickel	ICP/MS	75-125%	≤20%	≤20%	0.1
Silver	GFAA	75-125%	≤20%	≤20%	0.1
Zinc	ICP/MS	75-125%	≤20%	≤20%	0.1

METHOD

Nine metals were analyzed: silver (Ag), arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), mercury (Hg), nickel (Ni), lead (Pb) and zinc (Zn). Hg was analyzed using cold-vapor atomic absorption spectroscopy (CVAA) following the EPA Method 245.5. One metal, Ag, was analyzed using Zeeman Graphite Furnace Atomic Absorption (GFAA) spectrometry following the EPA Method 200.9 (EPA 1991). The remaining metals were analyzed by inductively coupled plasma mass spectrometry (ICP/MS) following EPA Method 200.8 (EPA 1991)

To prepare sediment samples for analysis, samples were freeze-dried and blended in a Spex mixer-mill. Approximately 5 g of mixed sample was ground in a ceramic ball mill. For ICP/MS, GFAA and CVAA analyses, 0.2- to 0.5-g aliquots of dried homogenous sample were digested using a mixture of nitric and hydrochloric acids and hydrogen peroxide following EPA Method 200.2 (EPA 1991).

HOLDING TIMES

Samples were collected from 4/14/93 through 4/20/93, and, after compositing, were held frozen at -20° C until transfer to the analytical laboratory. Samples were frozen to -80°C and subsequently freeze-dried within approximately 7 days of sample receipt. Samples were all analyzed within 180 days of collection. The following list summarizes all analysis dates:

Task	Date Performed
Sample Digestion	11/08/93
ICP-MS	12/15/93
CVAA-Hg	11/17/93
GFAA-Ag	12/02/93

QA/QC SUMMARY/METALS (contd)

DETECTION LIMITS Target detection limits were exceeded for some metals. However, metals were detected above the method detection limits (MDLs) in all samples.

METHOD BLANKS One method blank was analyzed. Levels detected were greater than three times the target detection limits for As, Cr, Cd, Pb and Zn; however, the levels in the blanks were on the order of 10 to 1000 times lower than the levels in the samples. Therefore, no corrective action was taken and no data were flagged. All data were blank corrected.

MATRIX SPIKES One sample was spiked with all nine metals. Recoveries of As, Cd, Cu, Hg, and Ag were within the QC limits of 75%-125%. Recoveries of Cr, Ni, Pb, and Zn exceeded the acceptance limits, because native levels of these metals in the samples were 5 to 50 times higher than the level spiked, thus accurate spike recoveries were not achievable.

REPLICATES One sample was digested and analyzed in triplicate. Precision for triplicate analyses is reported by calculating the relative standard deviation (RSD) between the replicate results. RSD values ranged from 0% to 6%, all within the QC limits of ±20%, indicating acceptable precision.

SRM Standard reference material (SRM) 1646a (estuarine sediment from the National Institute of Standards and Technology, NIST), was analyzed for all metals. Only results for Cd and Cu were within ±20 % of the certified value (Ag is not certified). Values for the remaining metals (except Hg) were low, because the digestion method used is not as strong as the method used to certify the SRM (perchloric acid); thus the results for this analysis should not be expected to match the SRM certified values. Therefore, no corrective actions were taken. A second SRM, BEST-1, (sediment obtained from the National Research Council of Canada, NRCC) was analyzed for Hg only. Results were within the control limits.

REFERENCES

Bloom, N. S., and E.A. Crecelius. 1983. Determination of Mercury in Seawater at Sub-Nanogram per Liter Levels. Mar. Chem. 14:49-59.

EPA (U.S. Environmental Protection Agency). 1991. *Methods for the Determination of Metals in Environmental Samples.* EPA-600/4-91-010. U.S. Environmental Protection Agency, Office of Research and Development, Washington, D.C.

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects

PARAMETER: Chlorinated Pesticides

LABORATORY: Battelle Ocean Sciences, Duxbury, Massachusetts

MATRIX: Sediment

QA/QC DATA QUALITY OBJECTIVES

Reference Method	MS Recovery	Surrogate Recovery	SRM Accuracy	Relative Precision	Detection Limit (dry wt)
GC/ECD	50-120%	30-150%	≤30%	≤30%	1.0 ng/g

METHOD

Sediment samples were extracted with methylene chloride according to a modified version of EPA Method 8080 and the National Oceanic and Atmospheric Administration (NOAA) Status and Trends cleanup procedure (Krahn et al. 1988). Extracts were analyzed using gas chromatography with electron capture detection (GC/ECD) following a modified version of EPA Method 8270. Pesticide detections were qualitatively confirmed on a secondary column.

HOLDING TIMES

Samples were collected from 4/14/93 through 4/20/93, and, after compositing, were held frozen at -20° C until shipment to the analytical laboratory. Eleven sediment samples were received by Battelle Ocean Sciences, Duxbury, Massachusetts, on 9/18/93. Samples were held frozen at -20°C until extraction and analysis. Samples were extracted by 10/12/93 and analyzed from 11/10/93 to 11/20/93; dilutions were analyzed from 12/1/93 to 12/7/93.

DETECTION LIMITS

Target detection limits were exceeded for all samples. Actual detection limits were determined by the method detection limit (MDL) verification study and ranged from 0.10 ng/g to 0.67 ng/g. Four sediment samples with very low background concentrations of contaminants were spiked with target compounds. For each analyte, the standard deviation of the four spiked replicates was multiplied by 3.5.

METHOD BLANKS

One method blank was extracted with the samples. No pesticides were detected in the blank.

SURROGATES

Two compounds, DBOFB and PCB congener 112, were added to all samples prior to extraction to assess the efficiency of the analysis. The mean recoveries of DBOFB and PCB 112 were 68% and 66%, respectively. Recoveries of these compounds were within the QC guidelines of 40%-120% for all samples analyzed, with the following exceptions: recovery of DBOFB exceeded the mean ±15% in four samples, and recovery of PCB 112 exceeded the mean ±15% in five samples.

QA/QC SUMMARY/CHLORINATED PESTICIDES (contd)

MATRIX SPIKES

The recovery of target pesticide compounds in the matrix spike sample was elevated due to the highly contaminated nature of the sediment selected for the matrix spike sample. The best indicator of method performance is reflected in the MDL verification samples. Absolute recovery of all the target compounds in all four MDL verification samples, with the exception of 4,4'-DDT, was acceptable.

REPLICATES

One sample from each batch was extracted in triplicate. Precision was measured by calculating the relative standard deviation (RSD) between the replicate results. RSDs were evaluated only when pesticides were detected in all three replicates. For these cases, the RSDs were less than 30%, with the exception of 4,4'-DDD, which had an RSD of 32%. There were particular problems encountered with analysis of the DDT family of compounds for this set of sediment samples because of matrix-related effects. (See Comments section below.)

SRMs

One SRM, 1941a, a marine sediment sample obtained from the National Institute of Science and Technology (NIST) was analyzed with each batch. Certified values for pesticides are not available.

COMMENTS

In the analysis of this set of sediment samples, the analysts encountered problems maintaining GC calibration within acceptance criteria for DDT family of compounds. The first daily calibration standard analyzed at the beginning of the sample run would meet acceptance criteria. Sediment extracts were run next, followed by the second calibration check. By the time the second check standard was run, the percent difference (PD) for DDTs was near the limit of the acceptance criteria. By the time another group of sediment extracts had been analyzed, the third check standard would exceed acceptance criteria. The same sediment extracts were analyzed at least three times, and each time, response of the DDT calibration check during the sample run would deteriorate. Analysts performed instrument checks and determined that the problems were not due to mechanical or instrument failure. Because the chromatograms of these sediment samples showed high levels of contamination with organic compounds, the calibration problems must be attributed to matrix effects. Apparently, during the sample run, the GC column was becoming overloaded with too much material, interfering with the response of the DDT standards. To avoid this problem with future sediment analyses of this type, the initial amount of sediment extracted could be reduced from 30 g to 15-20 g. These sediment extracts should always be processed through an alumina cleanup column followed by high-performance liquid chromatography (HPLC) cleanup prior to GC analysis.

Endosulfan I and 2,4'-DDE coeluted and could not be independently quantified. Dual column confirmation provided qualitative information to distinguish the two compounds. Because this information was not quantitative, results are presented as endosulfan 1/2,4'-DDE.

QA/QC SUMMARY/CHLORINATED PESTICIDES (contd)

REFERENCES

Krahn, M. M., C. A. Wigren, R. W. Pearce, L. K. Moore, R. G. Bogar, W. D. MacLeod, Jr., S.-L. Chan, and D. W. Brown. 1988. *New HPLC Cleanup and Revised Extraction Procedures for Organic Contaminants.* NOAA Technical Memorandum NMFS F/NWC-153, Seattle, Washington.

EPA (U.S. Environmental Protection Agency). 1986. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods.* SW-846. U.S. Document No. 955-001-00000, U.S. Environmental Protection Agency, Washington D.C.

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects

PARAMETER: PCB Congeners

LABORATORY: Battelle Ocean Sciences, Duxbury, Massachusetts

MATRIX: Sediment

QA/QC DATA QUALITY OBJECTIVES

Reference Method	MS Recovery	Surrogate Recovery	SRM Accuracy	Relative Precision	Detection Limit (dry wt)
GC/ECD	50-120%	30-150%	≤30%	≤30%	1.0 ng/g

METHOD

Sediment samples were extracted with methylene chloride according to a modified version of EPA Method 8080 and the NOAA Status and Trends cleanup procedure (Krahn et al. 1988). Extracts were analyzed using gas chromatography with electron capture detection (GC/ECD) following a modified version of EPA Method 8270.

HOLDING TIMES

Samples were collected from 4/14/93 through 4/20/93, and after compositing, were held frozen at -20° C until shipment to the analytical laboratory. Eleven sediment samples were received by Battelle Ocean Sciences, Duxbury, Massachusetts, on 9/18/93. Samples were held frozen at -20° C until extraction and analysis. Samples were extracted by 10/12/93 and analyzed from 11/10/93 to 11/20/93; dilutions were analyzed from 12/1/93 to 12/7/93.

DETECTION LIMITS

Target detection limits were exceeded for all samples. Actual detection limits were determined by the method detection limit (MDL) verification study. Four sediment samples with very low background concentrations of contaminants were spiked with target compounds. For each analyte, the standard deviation of the four spiked replicates was multiplied by 3.5. Actual detection limits ranged from 0.09 ng/g to 0.42 ng/g.

METHOD BLANKS

One method blank was extracted with the samples. One PCB congener was detected in the blank from the first batch; however, it was detected at less than three times the MDL, and no further action was taken.

SURROGATES

Two compounds, DBOFB and PCB congener 112, were added to all samples prior to extraction to assess the efficiency of the analysis. The mean recoveries of DBOFB and PCB 112 were 68% and 66%, respectively. Recoveries of these compounds were within the QC guidelines of 40%-120% for all samples analyzed, with the following exceptions: recovery of DBOFB exceeded the mean ± 15% in four samples, and recovery of PCB 112 exceeded the mean ± 15% in five samples.

QA/QC SUMMARY/PCB CONGENERS (contd)

MATRIX SPIKES

One sample was spiked with 18 of the 22 congeners analyzed. The recovery of target PCB compounds in the matrix spike sample was elevated due to the highly contaminated nature of the sediment selected for the matrix spike sample. The best indicator of method performance is reflected in the MDL verification samples.

REPLICATES

One sample from each batch was extracted in triplicate. Precision was measured by calculating the relative standard deviation (RSD) between the replicate results. The RSDs between the triplicate analyses were less than 30% for all congeners.

SRMs

One standard reference material (SRM), 1941a, a marine sediment sample obtained from the National Institute of Science and Technology (NIST) was analyzed with the sample batch. Certified values for PCBs are not available.

COMMENTS

Elevated levels of PCB 170 are due to phthalate interference in selected samples. Phthalate contamination was associated with the detection of PCB 170, as determined by the significant abundance of this congener relative to other PCB congeners in all samples except COMP AK-A.

REFERENCES

Krahn, M. M., C. A. Wigren, R. W. Pearce, L. K. Moore, R. G. Bogar, W. D. MacLeod, Jr., S.-L. Chan, and D. W. Brown. 1988. *New HPLC Cleanup and Revised Extraction Procedures for Organic Contaminants.* NOAA Technical Memorandum NMFS F/NWC-153, Seattle, Washington.

EPA (U.S. Environmental Protection Agency). 1986. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods.* SW-846. U.S. Document No. 955-001-00000, U.S. Environmental Protection Agency, Washington D.C.

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects

PARAMETER: 2,3,7,8-TCDD/2,3,7,8-TCDF

LABORATORY: Battelle Columbus Laboratory, Columbus, Ohio

MATRIX: Sediment

QA/QC DATA QUALITY OBJECTIVES

Reference Method	MS Recovery	Surrogate Recovery	SRM Accuracy	Relative Precision	Detection Limit (dry wt)
EPA 8290	50 - 120%	40 - 135%	≤30%	≤25%	1 pg/g

METHOD

General procedures in EPA Method 8290 were followed for the analysis of 2,3,7,8-TCDD/TCDF. Samples were solvent-extracted and processed through acid/base silica, alumina, and carbon column cleanup procedures. Samples were analyzed by gas chromatography/high resolution mass spectrometry (GC/HRMS) on a DB-Dioxin column. The DB-dioxin column provided separation of 2,3,7,8-TCDD/TCDF from all other tetra isomers so that no second column confirmation analysis was necessary.

HOLDING TIMES

Samples were held frozen until extraction. The following are the extraction and analysis dates for the sediment samples.

Batch	Extracted	Analyzed
1	5/27/93	6/14/93 - 6/18/93
2	7/20/93	8/9/93 - 8/11/93
3	8/13/93	8/31/93 - 9/16/93
4	9/8/93	9/20/93 - 9/23/93

DETECTION LIMITS

The target detection limit of 1 pg/g was met for all but a few samples in batches 2 and 3 for 2,3,7,8 TCDF. Elevated detection limits in these samples was due to coeluting ether interference, which prohibited determination of 2,3,7,8 TCDF.

METHOD BLANKS

One method blank was analyzed with each batch of samples. 2,3,7,8-TCDD and 2,3,7,8-TCDF were detected in one of the blanks, but both were detected at or below the target detection limit.

SURROGATES

Three surrogates were added to all samples prior to extraction to assess the efficiency of the analysis. Recoveries of these surrogates were within the QC guidelines of 40%-135% for all samples analyzed, with the following exception: recovery of one of the three surrogates was 12%.

QA/QC SUMMARY/TCDD and TCDF (contd)

MATRIX SPIKES

Four samples were spiked with 2,3,7,8-TCDD and 2,3,7,8-TCDF. Recovery of 2,3,7,8-TCDD for two of the samples (128% and 26%) exceeded the acceptable recovery criterion of 50%-120%. All other recoveries fell within the acceptable range.

REPLICATES

Five samples were analyzed in replicates. Four of the eight calculable RSDs or RPDs were outside the acceptable precision criterion of ≤25%.

SRMs

One SRM was analyzed with each batch of samples. Recoveries ranged from 74% to 97%; all within the acceptable criterion of 70% to 130%.

REFERENCES

EPA (U.S. Environmental Protection Agency). 1986. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods.* SW-846. U.S. Document No. 955-001-00000, U.S. Environmental Protection Agency, Washington D.C.

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects

PARAMETER: PAHs

LABORATORY: Battelle Ocean Sciences, Duxbury, Massachusetts

MATRIX: Sediment

QA/QC DATA QUALITY OBJECTIVES

Reference Method	MS/MSD Recovery	Surrogate Recovery	SRM Accuracy	Relative Precision	Detection Limit (dry wt)
GC/MS/SIM	30-130%	50-150%	≤30%	≤30%	4 ng/g

METHOD

Sediment samples were extracted according to a modified version of EPA Method 8080 and the National Oceanic and Atmospheric Administration (NOAA) Status and Trends cleanup procedure (Krahn et al. 1988). Extracts were analyzed using gas chromatography/mass spectrometry (GC/MS) in the selected ion mode (SIM) following a modified version of EPA Method 8270.

HOLDING TIMES

Samples were collected from 4/14/93 through 4/20/93, and after compositing, were held frozen at -20° C until shipment to the analytical laboratory. Eleven sediment samples were received by Battelle Ocean Sciences, Duxbury, Massachusetts, on 9/18/93. Samples were held frozen at approximately -20°C until extraction and analysis. Samples were extracted by 10/12/93 and analyzed from 11/10/93 to 11/20/93.

DETECTION LIMITS

Target detection limits of 4 ng/g dry wt were met for all PAH compounds. Actual detection limits were determined by the method detection limit (MDL) verification study. Four sediment samples with very low background concentrations of contaminants were spiked with target compounds. For each analyte, the standard deviation of the four spiked replicates was multiplied by 3.5. Actual detection limits ranged from 0.49 to 1.65 μg/kg.

METHOD BLANKS

One method blank was extracted with the samples. No PAH compounds were detected above the MDL; however, 8 of the 16 compounds were detected below the MDL and are flagged with a "J" to indicate that the values are estimates.

SURROGATES

Three isotopically labeled compounds were added prior to extraction to assess the efficiency of the method. These were naphthalene-d_8, acenaphthene-d_{10}, and chrysene-d_{12}. Recoveries of surrogates were within the quality control limits of 30%-150% with one exception. Note that no surrogate recoveries were available for COMP-HR-A from the Hackensack River Reach A. Because of the high levels of PAHs in this sample, the extract was diluted and reanalyzed; thus the surrogate compounds were not detected. Mean recoveries of naphthalene-d_8, acenaphthene-d_{10}, and chrysene-d_{12} were 65%, 69%, and 55%, respectively. In three samples, recovery of naphthalene-d_8 exceeded

the mean by ±15%; in two samples, recovery of acenaphthene-d_{10} exceeded the mean by ±15%; and in seven samples, recovery of chrysene-d_{12} exceeded the mean by ±15%.

MATRIX SPIKES

One sample(COMP MT-A) was spiked with all PAH compounds. Matrix spike recoveries for all but four of the compounds were above the upper control limit of 150%. Because of the high levels of PAHs in this sample, the extract required significant dilution. When the diluted sample was reanalyzed, the target PAH compounds were not detected.

REPLICATES

One sample was extracted in triplicate. Precision was measured by calculating the relative standard deviation (RSD) between the replicate results. The RPDs ranged from 5 to 24%, within the target precision goal of ≤30%.

SRMs

One standard reference material (SRM)1941a, a marine sediment sample obtained from the National Institute of Standards and Technology, was analyzed with the samples. Ten of the 16 PAH compounds analyzed are certified at levels above the MDLs. Of these, all compounds all were detected within 30% of the certified mean, with the exception of pyrene and benzo(a)anthracene, which were recovered only slightly above the upper limit (33% and 32%, respectively).

REFERENCES

Krahn, M. M., C. A. Wigren, R. W. Pearce, L. K. Moore, R. G. Bogar, W. D. MacLeod, Jr., S.-L. Chan, and D. W. Brown. 1988. *New HPLC Cleanup and Revised Extraction Procedures for Organic Contaminants.* NOAA Technical Memorandum NMFS F/NWC-153, Seattle, Washington.

EPA (U.S. Environmental Protection Agency). 1986. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods.* SW-846. U.S. Document No. 955-001-00000, U.S. Environmental Protection Agency, Washington, D.C.

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects

PARAMETER: Herbicides

LABORATORY: Analytical Resources Inc., Seattle, Washington

MATRIX: Sediment

QA/QC DATA QUALITY OBJECTIVES

Reference Method	Range of Recovery	SRM Accuracy	Relative Precision	Detection Limit (dry wt)
EPA 8150	NE[(a)]	NE	NE	NE

METHOD General procedures in EPA Method 8150 were followed for the analysis of 2,4,5-T and 2,4-D.

HOLDING TIMES Samples were received at A.R.I. on 6/29/93; extracted on 7/12/93; and analyzed on 7/15/93.

DETECTION LIMITS The achieved detection limits were 20 μg/kg for 2,4,5-T and 100 μg/kg for 2,4-D.

METHOD BLANKS One method blank was extracted with the samples. No herbicides were detected in the blank.

SURROGATES Diphenylacetic acid was added to all samples to assess the efficiency of the analysis. Surrogate recoveries ranged from 69.2% to 89.2%.

MATRIX SPIKES One sample was spiked with 2,4-D and Silvex. Percentage recovery was 59.8% and 85.8% respectively.

REPLICATES Not applicable.

SRMs Not applicable.

REFERENCES

EPA (U.S. Environmental Protection Agency). 1986. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods.* SW-846. U.S. Document No. 955-001-00000, U.S. Environmental Protection Agency, Washington, D.C.

(a) NE Not established in project planning documents.

TABLE A.1. Sediment Grain Size Summary, Including Quality Control Data, Federal Projects in New York and New Jersey

Sediment Treatment	Analytical Batch	Total Percent Sand >62.4 μm	Silt 62.4-3.9 μm	Clay <3.9 μm
Target DL[a]		1.0	1.0	1.0
Achieved DL		1.0	1.0	1.0
Arthur Kill Reach A				
AK-A-22 Replicate 1	5	7	46	48
AK-A-22 Replicate 2	5	6	47	47
AK-A-22 Replicate 3	5	6	46	49
AK-A-23	5	21	54	25
AK-A-24	5	6	49	45
AK-A-25	5	7	47	46
AK-A-26	5	4	52	44
AK-A-27	4	3	49	48
AK-A-28	4	4	49	48
AK-A-29	4	8	47	45
AK-A-30 Replicate 1	4	10	48	43
AK-A-30 Replicate 2	4	9	48	42
AK-A-30 Replicate 3	4	9	48	43
AK-A-31	4	8	52	40
AK-A-32	4	8	53	38
AK-A-33	4	8	53	40
Arthur Kill Reach B				
AK-B-13	2	23	42	35
AK-B-14	2	15	41	44
AK-B-15	2	9	48	43
AK-B-16	2	13	43	44
AK-B-17	5	22	42	37
AK-B-18	5	38	36	26
AK-B-19	5	11	45	44
AK-B-20	5	14	44	43
AK-B-21	5	69	19	12
Arthur Kill Reach C				
AK-C-1	2	4	51	45
AK-C-2 Replicate 1	2	9	46	45
AK-C-2 Replicate 2	2	9	47	44
AK-C-2 Replicate 3	2	9	47	44
AK-C-3	2	11	49	40
AK-C-4	2	9	46	45
AK-C-5	2	20	42	38

TABLE A.1. (contd)

Sediment Treatment	Analytical Batch	Total Percent Sand >62.4 μm	Silt 62.4-3.9 μm	Clay <3.9 μm
AK-C-6	2	14	39	47
AK-C-7	2	3	45	52
AK-C-8	2	5	46	49
AK-C-9	2	21	44	35
AK-C-10	2	20	40	40
AK-C-11	2	26	36	38
AK-C-12	2	40	37	23
Port Elizabeth Reach A				
PE-A-1	1	6	57	37
PE-A-2	1	7	51	42
PE-A-3	1	17	48	35
PE-A-4 Replicate 1	1	8	50	42
PE-A-4 Replicate 2	1	8	47	45
PE-A-4 Replicate 3	1	7	50	43
PE-A-5	1	4	51	45
PE-A-6	1	3	55	42
Port Elizabeth Reach B				
PE-B-7	1	9	52	39
PE-B-8	1	12	52	36
PE-B-9	1	13	48	39
PE-B-10	1	27	43	30
PE-B-11	1	25	42	33
PE-B-12	1	29	47	24
PE-B-13	1	6	56	38
PE-B-14	1	9	50	41
PE-B-15	1	6	50	44
Hackensack River Reach A				
HR-A-1	3	87	8	5
HR-A-2	3	14	54	32
HR-A-3	3	17	50	33
HR-A-4 Replicate 1	3	26	46	28
HR-A-4 Replicate 2	3	26	45	29
HR-A-4 Replicate 3	3	26	46	28
HR-A-5 Replicate 1	3	40	36	24
HR-A-5 Replicate 2	3	IS[(b)]	IS	IS
HR-A-5 Replicate 3	3	IS	IS	IS

TABLE A.1. (contd)

Sediment Treatment	Analytical Batch	Total Percent Sand >62.4 μm	Silt 62.4-3.9 μm	Clay <3.9 μm
HR-A-6	3	89	7	4
HR-A-7	3	87	11	2
HR-A-8	3	75	15	10
Claremont Reach I, II, and III				
COMP CL-I	3	14	47	39
COMP CL-II	3	15	46	39
COMP CL-III	3	15	47	38
Reference				
Mud Dump Reference	3	99	0	1
Controls				
C-AM	3	11	44	45
C-NR	3	14	50	36
C-SB	3	20	50	30
C-WB	3	98	1	1
Quality Control Data				
Analytical Replicates				
AK-A-22 Replicate 1	5	7	46	48
AK-A-22 Replicate 2	5	6	47	47
AK-A-22 Replicate 3	5	6	46	49
RSD		9%	1%	2%
AK-A-30 Replicate 1	4	10	48	43
AK-A-30 Replicate 2	4	9	48	42
AK-A-30 Replicate 3	4	9	48	43
RSD		6%	0%	1%
AK-C-2 Replicate 1	2	9	46	45
AK-C-2 Replicate 2	2	9	47	44
AK-C-2 Replicate 3	2	9	47	44
RSD		0%	1%	1%

TABLE A.1. (contd)

Sediment Treatment	Analytical Batch	Total Percent Sand >62.4 μm	Silt 62.4-3.9 μm	Clay <3.9 μm
PE-A-4 Replicate 1	1	8	50	42
PE-A-4 Replicate 2	1	8	47	45
PE-A-4 Replicate 3	1	7	50	43
RSD		8%	4%	4%
HR-A-4 Replicate 1	3	26	46	28
HR-A-4 Replicate 2	3	26	45	29
HR-A-4 Replicate 3	3	26	46	28
RSD		0%	1%	2%
HR-A-5 Replicate 1	3	40	36	24
HR-A-5 Replicate 2	3	IS	IS	IS
HR-A-5 Replicate 3	3	IS	IS	IS
RSD		NA	NA	NA

(a) DL Detection limit.
(b) IS Insufficient sample to perform a triplicate analysis for all physical parameters.

TABLE A.2. Sediment Total Organic Carbon (TOC) and Percent Moisture, Federal Projects in New York and New Jersey

Sediment Treatment	Analytical TOC Batch	TOC (percent dry wt.)	Analytical Solids Batch	Percent Moisture
Target DL[a]		0.1		1.0
Achieved DL		0.1		1.0
MOTBY Reach A				
MT-A-1	1	1.71	3	45
MT-A-2	1	2.33	3	53
MT-A-3	1	4.68	3	39
MT-A-4 Replicate 1	1	2.61	3	59
MT-A-4 Replicate 2	1	2.74	NA[b]	NA
MT-A-4 Replicate 3	1	2.70	NA	NA
MT-A-5	1	0.92	3	27
MT-A-6	1	2.99	3	67
MOTBY Reach B				
MT-B-7 Replicate 1	1	3.18	3	61
MT-B-7 Replicate 2	1	3.34	NA	NA
MT-B-8	1	3.15	3	61
MT-B-9	1	3.08	3	57
MT-B-10	1	3.87	3	62
MT-B-11	1	3.22	3	67
MT-B-12	1	3.52	3	65
Arthur Kill Reach A				
AK-A-22 Replicate 1	3	3.96	5	61
AK-A-22 Replicate 2	NA	NA	5	61
AK-A-22 Replicate 3	NA	NA	5	61
AK-A-23	3	5.65	5	61
AK-A-24	3	3.84	5	61
AK-A-25	3	3.34	5	60
AK-A-26 Replicate 1	4	2.79	5	60
AK-A-26 Replicate 2	4	2.76	NA	NA
AK-A-26 Replicate 3	4	2.70	NA	NA
AK-A-27	4	3.12	4	58
AK-A-28	4	3.37	4	57
AK-A-29	4	3.09	4	55
AK-A-30 Replicate 1	4	3.04	4	55
AK-A-30 Replicate 2	NA	NA	4	55
AK-A-30 Replicate 3	NA	NA	4	55
AK-A-31	4	3.04	4	61
AK-A-32	4	3.11	4	63
AK-A-33	4	2.86	4	60

TABLE A.2. (contd)

Sediment Treatment	Analytical TOC Batch	TOC (percent dry wt.)	Analytical Solids Batch	Percent Moisture
Arthur Kill Reach B				
COMP AK-B	4	1.85	NA	NA
AK-B-13	3	3.40	2	59
AK-B-14	3	3.13	2	55
AK-B-15	3	4.05	2	57
AK-B-16	3	4.12	2	64
AK-B-17	3	5.09	5	64
AK-B-18	3	4.41	5	59
AK-B-19	3	4.11	5	65
AK-B-20	3	4.96	5	65
AK-B-21 Replicate 1	3	3.79	5	52
AK-B-21 Replicate 2	3	3.79	NA	NA
AK-B-21 Replicate 3	3	3.96	NA	NA
Arthur Kill Reach C				
AK-C-1	2	4.27	2	65
AK-C-2 Replicate 1	2	4.00	2	63
AK-C-2 Replicate 2	NA	NA	2	63
AK-C-2 Replicate 3	NA	NA	2	63
AK-C-3	2	3.61	2	68
AK-C-4	2	3.49	2	65
AK-C-5	2	3.41	2	64
AK-C-6 Replicate 1	3	3.79	2	62
AK-C-6 Replicate 2	3	3.92	NA	NA
AK-C-6 Replicate 3	3	3.83	NA	NA
AK-C-7	3	4.18	2	66
AK-C-8	3	4.57	2	64
AK-C-9	3	5.36	2	72
AK-C-10	3	4.34	2	60
AK-C-11	3	4.33	2	59
AK-C-12	3	3.63	2	62
Port Elizabeth Reach A				
PE-A-1 Replicate 1	2	2.86	1	59
PE-A-1 Replicate 2	2	2.96	NA	NA
PE-A-1 Replicate 3	2	2.92	NA	NA
PE-A-2	2	1.51	1	48
PE-A-3	2	2.91	1	55
PE-A-4 Replicate 1	2	2.55	1	54
PE-A-4 Replicate 2	NA	NA	1	54
PE-A-4 Replicate 3	NA	NA	1	54
PE-A-5	2	2.39	1	53
PE-A-6	2	2.64	1	63

TABLE A.2. (contd)

Sediment Treatment	Analytical TOC Batch	TOC (percent dry wt.)	Analytical Solids Batch	Percent Moisture
Port Elizabeth Reach B				
PE-B-7	2	2.41	1	59
PE-B-8	2	2.03	1	51
PE-B-9	2	2.72	1	59
PE-B-10	2	2.04	1	46
PE-B-11 Replicate 1	2	2.36	1	48
PE-B-11 Replicate 2	2	2.35	NA	NA
PE-B-11 Replicate 3	2	2.28	NA	NA
PE-B-12	2	1.87	1	43
PE-B-13	2	2.72	1	55
PE-B-14	2	2.87	1	59
PE-B-15	2	3.37	1	60
Hackensack River Reach A				
HR-A-1	4	0.35	3	18
HR-A-2	4	2.40	3	46
HR-A-3 Replicate 1	4	3.13	3	48
HR-A-3 Replicate 2	4	3.29	NA	NA
HR-A-3 Replicate 3	4	3.12	NA	NA
HR-A-4 Replicate 1	4	2.82	3	47
HR-A-4 Replicate 2	NA	NA	3	47
HR-A-4 Replicate 3	NA	NA	3	47
HR-A-5 Replicate 1	4	3.54	3	45
HR-A-5 Replicate 2	NA	NA	3	IS[c]
HR-A-5 Replicate 3	NA	NA	3	IS
HR-A-6	5	5.05	3	26
HR-A-7 Replicate 1	5	10.29	3	21
HR-A-7 Replicate 2	5	10.18	NA	NA
HR-A-7 Replicate 3	5	9.98	NA	NA
HR-A-8	5	13.40	3	34
Claremont Reach I, II, and III				
COMP CL-I	4	2.90	3	55
COMP CL-II	4	3.63	3	56
COMP CL-III	4	2.88	3	55
Reference				
Mud Dump Reference Rep 1	4	0.06	3	14
Mud Dump Reference Rep 2	4	0.06	NA	NA
Mud Dump Reference Rep 3	4	0.06	NA	NA

TABLE A.2. (contd)

Sediment Treatment	Analytical TOC Batch	TOC (percent dry wt.)	Analytical Solids Batch	Percent Moisture
Controls				
C-AM	4	1.26	3	58
C-NR	NA	NA	3	48
C-SB	4	2.02	3	74
C-WB	4	0.12	3	24

(a) DL Detection limit.
(b) NA Not applicable.
(c) IS Insufficient sample to perform a triplicate analysis for all physical parameters.

TABLE A.3. Quality Control Data for Sediment, Total Organic Carbon (TOC), Federal Projects in New York and New Jersey

Sediment Treatment	Analytical TOC Batch	TOC (percent dry weight)
Method Blanks		
Blank 1	1	0.001
Blank 2	1	0.002
Blank 3	2	0.003
Blank 4	2	0.003
Blank 5	3	0.004
Blank 6	3	0.007
Blank 7	4	0.007
Blank 8	4	0.003
Blank 9	4	0.005
Blank 10	4	0.009
Blank 11	4	0.009
Standard Reference Material		
Non-Certified Value		2.6[b]
MESS-1	1	2.50
MESS-1	2	2.47
MESS-1	3	2.47
MESS-1 Replicate 1	4	2.49
MESS-1 Replicate 2	4	2.44
MESS-1 Replicate 3	4	2.46
Analytical Duplicates		
MT-B-7 Replicate 1	1	3.18
MT-B-7 Replicate 2	1	3.34
RPD		5%
I-STAT		0.02
Analytical Triplicates		
MT-A-4 Replicate 1	1	2.61
MT-A-4 Replicate 2	1	2.74
MT-A-4 Replicate 3	1	2.70
RSD		2%
AK-A-26 Replicate 1	4	2.79
AK-A-26 Replicate 2	4	2.76
AK-A-26 Replicate 3	4	2.70
RSD		2%

TABLE A.3. (contd)

Sediment Treatment	Analytical TOC Batch	TOC (percent dry weight)
AK-B-21 Replicate 1	3	3.79
AK-B-21 Replicate 2	3	3.79
AK-B-21 Replicate 3	3	3.96
RSD		3%
AK-C-6 Replicate 1	3	3.79
AK-C-6 Replicate 2	3	3.92
AK-C-6 Replicate 3	3	3.83
RSD		2%
PE-A-1 Replicate 1	2	2.86
PE-A-1 Replicate 2	2	2.96
PE-A-1 Replicate 3	2	2.92
RSD		2%
PE-B-11 Replicate 1	2	2.36
PE-B-11 Replicate 2	2	2.35
PE-B-11 Replicate 3	2	2.28
RSD		2%
HR-A-3 Replicate 1	4	3.13
HR-A-3 Replicate 2	4	3.29
HR-A-3 Replicate 3	4	3.12
RSD		3%
HR-A-7 Replicate 1	5	10.29
HR-A-7 Replicate 2	5	10.18
HR-A-7 Replicate 3	5	9.98
RSD		1%
Mud Dump Reference Rep 1	4	0.06
Mud Dump Reference Rep 2	4	0.06
Mud Dump Reference Rep 3	4	0.06
RSD		0%

(a) NA Not applicable.
(b) MESS-1 is not certified for TOC, but frequent analyses at MSL indicate an estimated value of 2.6%.

TABLE A.4. Bulk Density and Specific Gravity in Individual Core Samples, Including Quality Control Data, Federal Projects in New York and New Jersey

Sediment Treatment	Analytical Batch	Bulk Density Wet lbs/ft^3	Bulk Density Dry lbs/ft^3	Specific Gravity
Arthur Kill Reach A				
AK-A-22 Replicate 1	5	83	33	2.55
AK-A-22 Replicate 2	5	83	33	2.61
AK-A-22 Replicate 3	5	83	33	2.59
AK-A-23	5	82	32	2.51
AK-A-24	5	82	32	2.54
AK-A-25	5	83	33	2.58
AK-A-26	5	83	33	2.67
AK-A-27	4	84	35	2.65
AK-A-28	4	86	36	2.61
AK-A-29	4	87	39	2.61
AK-A-30 Replicate 1	4	87	40	2.59
AK-A-30 Replicate 2	4	87	40	2.59
AK-A-30 Replicate 3	4	88	40	2.62
AK-A-31	4	83	32	2.64
AK-A-32	4	83	31	2.64
AK-A-33	4	85	33	2.65
Arthur Kill Reach B				
AK-B-13	2	84	34	2.64
AK-B-14	2	87	39	2.64
AK-B-15	2	80	28	2.57
AK-B-16	2	80	28	2.55
AK-B-17	5	80	28	2.56
AK-B-18	5	84	34	2.54
AK-B-19	5	80	27	2.53
AK-B-20	5	81	28	2.57
AK-B-21	5	85	37	2.57
Arthur Kill Reach C				
AK-C-1	2	80	28	2.59
AK-C-2 Replicate 1	2	81	31	2.46
AK-C-2 Replicate 2	2	82	31	2.43
AK-C-2 Replicate 3	2	82	31	2.54
AK-C-3	2	79	25	2.65
AK-C-4	2	80	28	2.65
AK-C-5	2	81	29	2.62
AK-C-6	2	82	32	2.50
AK-C-7	2	80	27	2.56
AK-C-8	2	80	29	2.62
AK-C-9	2	76	22	2.56

TABLE A.4. (contd)

Sediment Treatment	Analytical Batch	Bulk Density Wet lbs/ft^3	Bulk Density Dry lbs/ft^3	Specific Gravity
AK-C-10	2	83	33	2.58
AK-C-11	2	84	35	2.58
AK-C-12	2	84	31	2.58
Port Elizabeth Reach A				
PE-A-1	1	84	34	2.58
PE-A-2	1	93	49	2.66
PE-A-3	1	87	39	2.61
PE-A-4 Replicate 1	1	88	40	2.64
PE-A-4 Replicate 2	1	88	40	2.62
PE-A-4 Replicate 3	1	88	40	2.65
PE-A-5	1	89	42	2.59
PE-A-6	1	82	31	2.60
Port Elizabeth Reach B				
PE-B-7	1	85	35	2.59
PE-B-8	1	90	45	2.64
PE-B-9	1	84	34	2.63
PE-B-10	1	94	51	2.64
PE-B-11	1	93	49	2.64
PE-B-12	1	99	57	2.60
PE-B-13	1	86	39	2.61
PE-B-14	1	84	35	2.57
PE-B-15	1	83	33	2.63
Hackensack River Reach A				
HR-A-1	3	130	108	2.68
HR-A-2	3	95	52	2.66
HR-A-3	3	92	48	2.62
HR-A-4 Replicate 1	3	93	49	2.64
HR-A-4 Replicate 2	3	IS[a]	IS	IS
HR-A-4 Replicate 3	3	IS	IS	IS
HR-A-5 Replicate 1	3	96	53	2.62
HR-A-5 Replicate 2	3	96	53	2.65
HR-A-5 Replicate 3	3	95	53	2.62
HR-A-6	3	109	65	2.57
HR-A-7	3	112	90	2.39
HR-A-8	3	99	38	2.41
Reference				
Mud Dump Reference	3	98	84	2.70

TABLE A.4. (contd)

Sediment Treatment	Analytical Batch	Bulk Density Wet lbs/ft^3	Bulk Density Dry lbs/ft^3	Specific Gravity
Quality Control Data				
AK-A-22 Replicate 1	5	83	33	2.55
AK-A-22 Replicate 2	5	83	33	2.61
AK-A-22 Replicate 3	5	83	33	2.59
RSD		0%	0%	1%
AK-A-30 Replicate 1	4	87	40	2.59
AK-A-30 Replicate 2	4	87	40	2.59
AK-A-30 Replicate 3	4	88	40	2.62
RSD		1%	0%	1%
AK-C-2 Replicate 1	2	81	31	2.46
AK-C-2 Replicate 2	2	82	31	2.43
AK-C-2 Replicate 3	2	82	31	2.54
RSD		1%	0%	2%
PE-A-4 Replicate 1	1	88	40	2.64
PE-A-4 Replicate 2	1	88	40	2.62
PE-A-4 Replicate 3	1	88	40	2.65
RSD		0%	0%	1%
HR-A-4 Replicate 1	3	93	49	2.64
HR-A-4 Replicate 2	3	IS	IS	IS
HR-A-4 Replicate 3	3	IS	IS	IS
RSD		NA[b]	NA	NA
HR-A-5 Replicate 1	3	96	53	2.62
HR-A-5 Replicate 2	3	96	53	2.65
HR-A-5 Replicate 3	3	95	53	2.62
RSD		1%	0%	1%

(a) IS Insufficient sample to perform a triplicate analysis for all physical parameters.
(b) NA Not applicable.

TABLE A.5. Metals in Sediment, Federal Projects in New York and New Jersey

Sediment Treatment	Batch	(Metals µg/g dry weight) Ag	As	Cr	Cd	Cu	Hg	Ni	Pb	Zn
Target DL[a]		0.1	0.1	0.02	0.01	0.1	0.02	0.1	0.1	0.1
Achieved DL		0.119	0.572	0.401	0.020	0.525	0.015	0.849	0.136	2.55
MDL[b] verification		0.119	0.572	0.401	0.020	0.525	0.015	0.849	0.136	2.55
MOTBY Reach A										
Comp MT-A	1	4.24	11.7	110	2.60	124	1.62	30.7	130	245
MOTBY Reach B										
Comp MT-B	1	6.59	17.4	163	3.83	191	2.59	42.8	231	342
Arthur Kill Reach A										
Comp AK-A	1	6.44	24.3	201	5.49	313	5.88	53.7	255	422
Arthur Kill Reach B										
Comp AK-B	1	6.55	45.2	238	9.11	495	12.4	61.8	293	558
Arthur Kill Reach C										
Comp AK-C	1	8.34	83.8	245	10.7	688	13.6	61.8	352	626
Port Elizabeth Reach A										
Comp PE-A, Replicate 1	1	3.96	14.3	155	3.73	177	2.99	44.0	224	395
Comp PE-A, Replicate 2	1	4.10	14.0	153	3.60	174	2.96	44.4	212	356
Comp PE-A, Replicate 3	1	4.03	14.4	156	3.69	172	3.02	44.3	208	352
Port Elizabeth Reach B										
Comp PE-B	1	4.32	15.7	150	3.35	179	3.24	45.6	171	285
Hackensack River Reach A										
Comp HR-A	1	2.38	13.4	192	2.76	119	3.42	33.4	132	248

TABLE A.5. (contd)

Sediment Treatment	Batch	(Metals μg/g dry weight) Ag	As	Cr	Cd	Cu	Hg	Ni	Pb	Zn
Claremont Reach I, II, and III										
Comp CL-I	1	5.96	22.8	192	4.30	202	3.17	39.7	214	363
Comp CL-II	1	8.90	20.4	248	7.01	246	4.43	49.9	254	451
Comp CL-III	1	5.41	15.4	135	2.81	147	2.54	38.0	159	287

(a) DL Detection limit.
(b) MDL Method detection limit.

TABLE A.6. Quality Control Data for Metals in Sediment, Federal Projects in New York and New Jersey

Sediment Treatment	Batch	(Metals µg/g dry weight) Ag	As	Cr	Cd	Cu	Hg	Ni	Pb	Zn
Method Blank										
Blank	1	0.012	1.52	0.422	0.140	0.087	0.001 U[a]	0.211	0.325	0.650
Blank Spikes										
Blank	1	0.012	1.52	0.422	0.140	0.087	0.001 U	0.211	0.33	0.650
Blank Spike	1	5.04	6.87	5.39	5.15	5.31	1.91	5.22	5.20	5.67
Concentration Recovered		5.03	5.35	4.96	5.01	5.23	1.91	5.01	4.88	5.02
Amount Spiked		5.00	5.00	5.00	5.00	5.00	2.00	5.00	5.00	5.00
Percent Recovery		101%	107%	99%	100%	105%	96%	100%	98%	100%
Matrix Spikes										
Comp HR-A	1	2.38	13.4	192	2.76	119	3.42	33.6	132	248
Comp HR-A, MS	1	7.51	18.8	203	7.34	124	5.40	36.4	140	279
Concentration Recovered		5.13	5.42	11.3	4.59	4.69	1.98	2.78	8.49	31.1
Amount Spiked		5.00	5.00	5.00	5.00	5.00	2.00	5.00	5.00	5.00
Percent Recovery		103%	108%	226%[b]	92%	94%	99%	56%[b]	170%[b]	622%[b]
Standard Reference Material										
Certified Value 1646		NC[c] NC	11.6 ±1.30	76.0 ±3.00	0.360 ±0.070	18.0 ±3.00	0.063 ±0.012	32.0 ±3.00	28.2 ±1.80	138 ±6.00
SRM 1646		0.076	9.03[d]	35.9[d]	0.310	14.4	0.076[d]	21.9[d]	20.5[d]	103[d]
Certified Value BEST-1		NA[e] NA	NA NA	NA NA	NA NA	NA NA	0.092 ±0.009	NA NA	NA NA	NA NA
BEST-1		NA	NA	NA	NA	NA	0.086	NA	NA	NA

TABLE A.6. (contd)

Sediment Treatment	Batch	(Metals µg/g dry weight) Ag	As	Cr	Cd	Cu	Hg	Ni	Pb	Zn
Analytical Replicates										
Comp PE-A, Replicate 1	1	3.96	14.3	155	3.73	177	2.99	44.0	224	395
Comp PE-A, Replicate 2	1	4.10	14.0	153	3.60	174	2.96	44.4	212	356
Comp PE-A, Replicate 3	1	4.03	14.4	156	3.69	172	3.02	44.3	208	352
RSD		2%	1%	1%	2%	2%	1%	0%	4%	6%

(a) U Undetected at or above the detection limit shown.
(b) Outside quality control criteria (75-125%) for matrix spike recoveries.
(c) NC Not certified.
(d) Outside SRM range for certified value (±20%).
(e) NA Not applicable.

TABLE A.7. Sediment Chlorinated Pesticide Results (alphabetical Aldrin - 4,4'-DDT), Federal Projects in New York and New Jersey

Sediment Treatment	Batch	Pesticides (µg/kg dry weight)							
		Aldrin	alpha-Chlordane	Dieldrin	2,4'-DDD	2,4'-DDT	4,4'-DDD	4,4'-DDE	4,4'-DDT
Target DL[a]		1	1	1	1	1	1	1	1
Achieved DL		0.83-1.10	0.89-1.19	0.87-1.16	0.71-0.95	0.94-1.25	0.60-0.80	1.39-1.85	0.56-0.75
MDL[b] verification		0.30	0.14	0.67	0.10	0.53	0.49	0.21	0.30
MOTBY Reach A									
COMP MT-A	1	0.99 U[c]	3.11	6.18	12.2	0.87 U	38.7	16.5	1.72
MOTBY Reach B									
COMP MT-B	1	1.20 U	3.69	3.74	6.16	1.06 U	21.5	22.6	3.46
Arthur Kill Reach A									
COMP AK-A	1	1.21 U	7.14	3.99	60.2	1.06 U	312	127	110
Arthur Kill Reach B									
COMP AK-B	1	1.16 U	10.5	13.2	209	240	2070	250	1480
Arthur Kill Reach C									
COMP AK-C	1	1.20 U	10.3	18.9	65.9	30.9	200	166	165
Port Elizabeth Reach A									
COMP PE-A	1	1.08 U	6.95	5.32	18.0	0.95 U	45.4	49.0	1.59 U
Port Elizabeth Reach B									
COMP PE-B	1	0.91 U	4.81	3.16	17.4	0.80 U	72.6	75.6	10.2
Hackensack River Reach A									
COMP HR-A	1	0.92 U	8.12	3.43	1.08 U	0.81 U	32.1	20.2	22.9

TABLE A.7. (contd)

Sediment Treatment	Batch	Pesticides (μg/kg dry weight)							
		Aldrin	alpha-Chlordane	Dieldrin	2,4'-DDD	2,4'-DDT	4,4'-DDD	4,4'-DDE	4,4'-DDT
Claremont Reach I, II, and III									
COMP CL-I	1	1.05 U	1.48	2.49	6.01	0.92 U	17.6	26.4	1.54 U
COMP CL-II, Replicate 1	1	1.12 U	6.06	8.79	7.97	0.99 U	34.2	41.8	1.66 U
COMP CL-II, Replicate 2	1	1.18 U	8.06	10.8	12.3	1.04 U	64.1	54.9	4.74
COMP CL-II, Replicate 3	1	1.19 U	7.96	9.36	10.4	1.04 U	43.8	45.6	1.89
COMP CL-III	1	0.91 U	2.97	2.83	4.11	0.80 U	12.1	14.9	1.34 U

(a) DL Detection limit.
(b) MDL Method detection limit.
(c) Undetected at or above the detection limit shown.

TABLE A.8. Sediment Chlorinated Pesticide Results (alphabetical Endosulfan I - Trans nonachlor), Federal Projects in New York and New Jersey

Sediment Treatment	Batch	Pesticides (µg/kg dry weight) Endosulfan I/ 2,4'-DDE	Endosulfan II	Endosulfan Sulfate	Heptachlor	Heptachlor epoxide	Lindane	Trans-nonachlor
Target DL[a]		1	1	1	1	1	1	1
Achieved DL		1.09-1.45	0.56-0.75	0.56-0.75	0.64-0.86	0.76-1.01	1.74-2.32	0.83-1.10
MDL[b] verification		0.13	NA	NA	0.11	0.67	0.12	0.14
MOTBY Reach A								
COMP MT-A	1	0.58 J[c]	1.46 U[d]	1.46 U	1.27 U	1.08 U	0.47 U	1.13
MOTBY Reach B								
COMP MT-B	1	4.68	1.77 U	1.77 U	1.55 U	1.32 U	0.57 U	1.42
Arthur Kill Reach A								
COMP AK-A	1	21.7	1.78 U	1.78 U	1.55 U	1.32 U	0.58 U	3.65
Arthur Kill Reach B								
COMP AK-B	1	124	1.72 U	1.72 U	1.50 U	1.28 U	0.55 U	14.4
Arthur Kill Reach C								
COMP AK-C	1	134	1.78 U	1.78 U	1.55 U	1.32 U	0.57 U	2.48
Port Elizabeth Reach A								
COMP PE-A	1	7.75	1.59 U	1.59 U	1.39 U	1.18 U	0.51 U	3.36
Port Elizabeth Reach B								
COMP PE-B	1	7.85	1.34 U	1.34 U	1.17 U	0.99 U	0.43 U	2.01
Hackensack River Reach A								
COMP HR-A	1	4.47	1.36 U	1.36 U	1.19 U	1.01 U	0.44 U	0.92 U

TABLE A.8. (contd)

Sediment Treatment	Batch	Pesticides (µg/kg dry weight) Endosulfan I/ 2,4'-DDE	Endosulfan II	Endosulfan Sulfate	Heptachlor	Heptachlor epoxide	Lindane	Transnonachlor
Claremont Reach I, II, and III								
COMP CL-I	1	3.52	1.54 U	1.17 J	1.34 U	1.15 U	0.50 U	0.40 J
COMP CL-II, Replicate 1	1	9.96	1.66 U	1.66 U	1.45 U	1.23 U	0.54 U	2.22
COMP CL-II, Replicate 2	1	14.0	1.75 U	1.75 U	1.52 U	1.29 U	0.56 U	3.07
COMP CL-II, Replicate 3	1	11.8	1.75 U	1.75 U	1.52 U	1.30 U	0.56 U	2.78
COMP CL-III	1	4.40	1.34 U	1.34 U	1.17 U	1.00 U	0.43 U	1.19

(a) DL Detection limit.
(b) MDL Method detection limit.
(c) J Analyte detected below the method detection limit (MDL); concentration reported may be an estimate.
(d) U Undetected at or above the detection limit shown.

TABLE A.9. Quality Control Results for Chlorinated Pesticides in Sediment (alphabetical Aldrin - 4,4'-DDT), Federal Projects in New York and New Jersey

Sediment Treatment	Batch	Pesticides (µg/kg dry weight)							
		Aldrin	alpha-Chlordane	Dieldrin	2,4'-DDD	2,4'-DDT	4,4'-DDD	4,4'-DDE	4,4'-DDT
Method Blank									
Blank	1	1.07 U[a]	1.00 U	1.02 U	1.25 U	0.95 U	1.48 U	0.64 U	1.59 U
Matrix Spikes									
COMP HR-A	1	ND[b]	8.12	3.43	ND	ND	32.14	20.19	22.90
COMP HR-A MS		67.1	16.4	10.4	116.7	10.0	46.13	57.72	5.03
Concentration recovered		67.1	8.25	6.93	116.7	10.0	13.99	37.53	0
Amount Spiked		5.72	5.67	5.67	5.69	5.65	5.73	5.69	5.66
Percent Recovery		1174[c]	145[c]	122[c]	2052[c]	177[c]	244[c]	660[c]	0[c]
Analytical Triplicates									
COMP CL-II, Replicate 1	1	1.12 U	6.06	8.79	7.97	0.99 U	34.16	41.83	1.66 U
COMP CL-II, Replicate 2	1	1.18 U	8.06	10.76	12.31	1.04 U	64.06	54.85	4.74
COMP CL-II, Replicate 3	1	1.19 U	7.96	9.36	10.36	1.04 U	43.77	45.60	1.89
RSD		NA	15	10	21	NA	32[d]	14	NA

(a) U Undetected at or above the detection limit shown.
(b) ND No data.
(c) Recovery outside QC limits of 50-120%.
(d) Value outside relative precision range of ±30%.

TABLE A.10. Quality Control Results for Chlorinated Pesticides in Sediment (alphabetical Endosulfan I - Trans nonachlor), Federal Projects in New York and New Jersey

Sediment Treatment	Batch	Pesticides (µg/kg dry weight) Endosulfan I/ 2,4'-DDE	Endosulfan II	Endosulfan Sulfate	Heptachlor	Heptachlor epoxide	Lindane	Trans-nonachlor
Method Blank								
Blank	1	0.82 U[a]	1.59 U	1.59 U	1.38 U	1.18 U	0.51 U	1.07 U
Matrix Spikes								
COMP HR-A	1	4.47	ND[b]	ND	ND	ND	ND	ND
COMP HR-A MS		11.80	ND	ND	13.87	18.47	10.13	6.68
Concentration Recovered		7.33	ND	ND	13.87	18.47	10.13	6.68
Amount Spiked		5.69	NA	NA	5.69	5.69	5.67	5.72
Percent Recovery		129[c]	NA	NA	244[c]	325[c]	179[c]	117
Analytical Triplicates								
COMP CL-II, Rep 1	1	9.96	1.66 U	1.66 U	1.45 U	1.23 U	0.54 U	2.22
COMP CL-II, Rep 2	1	13.98	1.75 U	1.75 U	1.52 U	1.29 U	0.56 U	3.07
COMP CL-II, Rep 3	1	11.78	1.75 U	1.75 U	1.52 U	1.30 U	0.56 U	2.78
RSD		17	NA	NA	NA	NA	NA	16

(a) U Undetected at or above the detection limit shown.
(b) ND No data.
(c) Recovery outside QC limits of 50-120%.

TABLE A.11. Sediment Polychlorinated Biphenyls (PCBs) 8 through 66, Dry Weight, Including Surrogate Percent Recoveries, Federal Projects in New York and New Jersey

Sediment Treatment	Batch	Surrogate Percent Recoveries DBOFB	Surrogate Percent Recoveries CL5 (112)	PCBs (µg/kg dry weight) CL2 (8)	CL3 (18)	CL3 (28)	CL4 (52)	CL4 (49)	CL4 (44)	CL4 (66)
Target DL[a]		1	1	1	1	1	1	1	1	1
Achieved DL		NA[b]	NA	0.40-0.53	0.72-0.96	1.51-2.01	1.34-1.78	0.77-1.02	0.52-0.69	0.81-1.08
MDL[c] verification		NA	NA	0.11	0.09	0.06	0.06	NA	0.22	0.22
MOTBY Reach A										
COMP MT-A	1	59	50	7.57	18.7	38.9	47.5	36.9	19.8	32.5
MOTBY Reach B										
COMP MT-B	1	88	76	8.90	18.8	46.9	23.7	19.0	19.5	39.8
Arthur Kill Reach A										
COMP AK-A	1	65	68	9.88	25.0	36.6	26.7	19.1	22.3	36.4
Arthur Kill Reach B										
COMP AK-B	1	52	58	20.8	80.0	105	63.8	57.4	61.1	80.8
Arthur Kill Reach C										
COMP AK-C	1	77	52	17.4	85.3	118	128	109	112	179
Port Elizabeth Reach A										
COMP PE-A	1	60	54	9.17	23.5	39.0	34.2	27.8	26.1	45.4
Port Elizabeth Reach B										
COMP PE-B	1	53	53	10.0	26.7	54.9	35.3	29.5	30.5	38.4
Hackensack River Reach A										
COMP HR-A	1	40	78	9.15	16.1	41.9	43.4	33.3	35.0	36.8

TABLE A.11. (contd)

Sediment Treatment	Batch	Surrogate Percent Recoveries DBOFB	Surrogate Percent Recoveries CL5 (112)	PCBs (µg/kg dry weight) CL2 (8)	CL3 (18)	CL3 (28)	CL4 (52)	CL4 (49)	CL4 (44)	CL4 (66)
Claremont Reach I, II, and III										
COMP CL-I	1	91	81	6.70	15.8	30.6	19.6	14.6	14.6	21.3
COMP CL-II, Replicate 1	1	71	57	22.0	57.3	125	63.3	56.1	55.5	92.0
COMP CL-II, Replicate 2	1	56	50	27.1	70.3	174	89.8	81.8	77.1	135
COMP CL-II, Replicate 3	1	68	64	23.3	64.7	166	78.0	70.3	71.4	121
COMP CL-III	1	73	67	9.12	18.7	62.9	26.4	26.7	21.0	43.3

(a) DL Detection limit.
(b) NA Not applicable.
(c) MDL Method detection limit.

TABLE A.12. Sediment Polychlorinated Biphenyls (PCBs) 101 through 187, Dry Weight, Federal Projects in New York and New Jersey

Sediment Treatment	Batch	PCBs (µg/kg dry weight) CL5 (101)	CL5 (87)	CL5 (118)	CL7 (184)	CL6 (153)	CL5 (105)	CL6 (138)	CL7 (187)
Target DL[a]		1	1	1	1	1	1	1	1
Achieved DL		0.71-0.95	0.68-0.90	0.77-1.03	0.60-0.80	0.42-0.56	0.58-0.77	0.77-1.03	0.60-0.80
MDL[b] verification		0.14	NA[c]	0.23	NA	0.42	0.13	0.38	0.19
MOTBY Reach A									
COMP MT-A	1	23.8	8.09	17.5	5.35	40.8	6.02	43.5	20.1
MOTBY Reach B									
COMP MT-B	1	19.5	8.86	20.9	2.49	25.5	6.70	45.1	8.15
Arthur Kill Reach A									
COMP AK-A	1	26.1	9.10	19.1	1.66 J[d]	25.1	4.63	34.4	7.70
Arthur Kill Reach B									
COMP AK-B	1	75.2	22.5	52.5	1.61 U	33.5	25.1	55.4	24.6
Arthur Kill Reach C									
COMP AK-C	1	87.7	41.3	88.5	11.0	82.1	29.9	105	25.2
Port Elizabeth Reach A									
COMP PE-A	1	29.7	12.7	27.4	3.10	35.4	9.40	56.2	12.6
Port Elizabeth Reach B									
COMP PE-B	1	28.4	12.0	26.4	2.53	28.9	8.00	38.0	8.81
Hackensack River Reach A									
COMP HR-A	1	30.9	3.85	9.73	2.09	13.2	3.20	17.7	5.50

TABLE A.12. (contd)

Sediment Treatment	Batch	PCBs (µg/kg dry weight) CL5 (101)	CL5 (87)	CL5 (118)	CL7 (184)	CL6 (153)	CL5 (105)	CL6 (138)	CL7 (187)
Claremont Reach I, II, and III									
COMP CL-I	1	13.6	7.36	13.6	1.41 J	16.1	3.83	14.1	5.43
COMP CL-II, Replicate 1	1	43.8	20.4	48.7	6.79	47.2	16.5	84.2	12.0
COMP CL-II, Replicate 2	1	55.8	27.9	60.6	6.84	59.1	19.7	103	17.3
COMP CL-II, Replicate 3	1	51.2	27.0	54.8	7.00	51.0	16.8	98.6	13.3
COMP CL-III	1	17.4	8.35	18.7	2.80	21.0	5.82	35.1	6.76

(a) DL Detection limit.
(b) MDL Method detection limit.
(c) NA Not applicable.
(d) J Analyte detected below the MDL; concentration reported may be an estimate.

TABLE A.13. Sediment Polychlorinated Biphenyls (PCBs) 183 through 209, plus 1,4-Dichlorobenzene, Dry Weight, Federal Projects in New York and New Jersey

Sediment Treatment	Batch	PCBs (µg/kg dry weight) CL7 (183)	CL6 (128)	CL7 (180)	CL7 (170)[a]	CL8 (195)	CL9 (206)	CL10 (209)	1,4-Dichloro-benzene
Target DL[b]	1	1	1	1	1	1	1	1	NA[c]
Achieved DL		0.60-0.80	1.02-1.36	0.71-0.95	0.52-0.69	0.57-0.76	0.36-0.48	0.55-0.73	NA
MDL[d] verification		NA	0.14	0.53	0.29	0.17	0.15	0.20	NA
MOTBY Reach A									
COMP MT-A	1	4.66	4.23	20.5	142	3.64	6.15	6.57	18.1
MOTBY Reach B									
COMP MT-B	1	2.94	6.52	14.4	136	3.32	8.56	8.06	28.2
Arthur Kill Reach A									
COMP AK-A	1	3.05	5.96	14.8	1.93 U[e]	4.46	6.37	8.05	39.6
Arthur Kill Reach B									
COMP AK-B	1	5.38	2.87	29.4	457	1.69 U	2.66 U	1.75 U	82.6
Arthur Kill Reach C									
COMP AK-C	1	8.69	13.4	48.6	315	17.0	12.8	23.0	53.5
Port Elizabeth Reach A									
COMP PE-A	1	4.74	8.55	26.6	290	3.39	9.39	12.6	39.4
Port Elizabeth Reach B									
COMP PE-B	1	3.13	7.04	16.6	282	2.97	9.18	7.93	37.5
Hackensack River Reach A									
COMP HR-A	1	3.09	74.4	10.7	169	3.13	18.3	1.39 U	67.5

TABLE A.13. (contd)

Sediment Treatment	Batch	PCBs (µg/kg dry weight) CL7 (183)	CL6 (128)	CL7 (180)	CL7 (170) (a)	CL8 (195)	CL9 (206)	CL10 (209)	1,4-Dichloro-benzene
Claremont Reach I, II, and III									
COMP CL-I	1	2.14	4.77	9.04	62.2	4.25	12.4	13.8	24.1
COMP CL-II, Replicate 1	1	4.89	10.9	26.9	173	5.64	22.2	15.7	60.1
COMP CL-II, Replicate 2	1	5.84	13.6	32.3	226	6.59	26.1	17.7	82.6
COMP CL-II, Replicate 3	1	5.13	12.1	29.2	179	5.42	21.0	12.5	54.7
COMP CL-III	1	2.44	7.83	11.7	129	2.27	6.58	5.59	31.5

(a) Interference found with detection of PCB 170
(b) DL Detection limit.
(c) NA Not applicable.
(d) MDL Method detection limit.
(e) U Undetected at or above detection limit shown.

TABLE A.14. Quality Control Summary for Sediment Polychlorinated Biphenyls (PCBs) 8 through 66, Dry Weight, Including Surrogate Percent Recoveries, Federal Projects in New York and New Jersey

Sediment Treatment	Batch	Surrogate Percent Recoveries DBOFB	Surrogate Percent Recoveries CL5 (112)	PCBs (µg/kg dry weight) CL2 (8)	CL3 (18)	CL3 (28)	CL4 (52)	CL4 (49)	CL4 (44)	CL4 (66)
Method Blank										
Blank	1	72	81	2.22 U[a]	1.23	0.59 U	0.66 U	1.16 U	1.71 U	1.10 U
Matrix Spikes										
COMP HR-A	1	40	78	9.15	16.1	41.9	43.4	33.3	35.0	36.8
COMP HR-A MS		62	50	16.9	62.4	64.5	56.7	NS[b]	48.6	45.8
Concentration recovered				7.75	46.4	22.6	13.3	33.3	13.6	8.95
Amount Spiked				5.76	5.76	5.76	5.76	NA[c]	5.76	5.76
Percent Recovery				135[d]	805[d]	392[d]	232[d]	NA	237[d]	155[d]
Analytical Triplicates										
COMP CL-II, Replicate 1	1	71	57	22.0	57.3	125	63.3	56.1	55.5	92.0
COMP CL-II, Replicate 2	1	56	50	27.1	70.3	174	89.8	81.8	77.1	135
COMP CL-II, Replicate 3	1	68	64	23.3	64.7	166	78.0	70.3	71.4	121
RSD				11	10	17	17	19	16	19

(a) U Undetected at or above the detection limit shown.
(b) NS Not spiked.
(c) NA Not applicable.
(d) Recovery outside QC limits of 50-120%.

TABLE A.15. Quality Control Summary for Sediment Polychlorinated Biphenyls (PCBs) 101 through 187, Dry Weight, Federal Projects in New York and New Jersey

Sediment Treatment	Batch	PCBs (µg/kg dry weight) CL5 (101)	CL5 (87)	CL5 (118)	CL7 (184)	CL6 (153)	CL5 (105)	CL6 (138)	CL7 (187)
Method Blank									
Blank	1	1.25 U[a]	1.31 U	1.15 U	1.48 U	2.10 U	1.53 U	1.15 U	1.48 U
Matrix Spikes									
COMP HR-A	1	30.9	3.85	9.73	2.09	13.2	3.20	17.7	5.50
COMP HR-A MS		50.0	NS[b]	26.5	NS	36.1	11.7	38.0	15.6
Concentration recovered		19.1	NA[c]	16.8	NA	22.8	8.51	20.3	10.1
Amount Spiked		5.76	NA	5.76	NA	5.76	5.76	5.76	5.76
Percent Recovery		331[d]	NA	292[d]	NA	397[d]	148[d]	352[d]	175[d]
Analytical Triplicates									
COMP CL-II, Replicate 1	1	43.8	20.4	48.7	6.79	47.2	16.5	84.2	12.0
COMP CL-II, Replicate 2	1	55.8	27.9	60.6	6.84	59.1	19.7	102.6	17.3
COMP CL-II, Replicate 3	1	51.2	27.0	54.8	7.00	51.0	16.8	98.6	13.3
RSD		12	16	11	2	12	10	10	19

(a) U Undetected at or above the detection limit shown.
(b) NS Not spiked.
(c) NA Not applicable.
(d) Recovery outside QC limits of 50-120%.

TABLE A.16. Quality Control Summary for Sediment Polychlorinated Biphenyls (PCBs) 183 through 209, plus 1,4-Dichlorobenzene, Dry Weight, Federal Projects in New York and New Jersey

Sediment Treatment	Batch	PCBs (µg/kg dry weight) CL7 (183)	CL6 (128)	CL7 (180)	CL7 (170)[a]	CL8 (195)	CL9 (206)	CL10 (209)	1,4-Dichloro-benzene
Method Blank									
Blank	1	1.48 U[b]	0.87 U	1.25 U	1.71 U	1.56 U	2.45 U	1.61 U	1.59 U
Matrix Spikes									
COMP HR-A	1	3.09	74.4	10.7	169	3.13	18.3	ND[c]	67.5
COMP HR-A MS		NS[d]	25.3	26.9	55.5	15.6	37.4	14.2	117
Concentration recovered		NA[e]	0	16.2	0	12.8	19.1	14.2	49.3
Amount Spiked		NA	5.76	5.76	5.76	5.76	5.76	5.76	10.9
Percent Recovery		NA	0[f]	282[f]	0[f]	222[f]	331[f]	247[f]	450[f]
Analytical Triplicates									
COMP CL-II, Replicate 1	1	4.89	10.9	27.0	173	5.64	22.2	15.7	60.2
COMP CL-II, Replicate 2	1	5.84	13.6	32.3	226	6.59	26.1	17.7	82.6
COMP CL-II, Replicate 3	1	5.13	12.1	29.2	179	5.42	21.0	12.5	54.7
RSD		9	11	9	15	11	12	17	22

(a) Interference found with detection of PCB 170.
(b) U Undetected at or above the detection limit shown.
(c) ND No data.
(d) NS Not spiked.
(e) NA Not applicable.
(f) Recovery outside QC limits of 50-120%.

TABLE A.17. 2,3,7,8-TCDD/TCDF in Individual Core Samples, Federal Projects in New York and New Jersey

Sediment Treatment	Batch	Surrogate Percent Recoveries 2378-TCDD-13C12	2378-TCDF-13C12	2378-TCDD-37C14	(pg/g dry weight) 2378-TCDD	2378-TCDF	Total Percent Solids	(pg/g wet weight) 2378-TCDD	2378-TCDF
Target DL[a]		NA[b]	NA	NA	NA	NA	NA	1	1
Achieved DL		NA	NA	NA	NA	NA	NA	0.41	0.19
MDL[c] Verification		NA	NA	NA	NA	NA	NA	13.6	14.4
MOTBY Reach A									
COMP MT-A-1	1	101	109	111	92.2	15.6	55	50.7	8.58
COMP MT-A-2 Replicate 1	1	95	106	107	20.0	22.5	47	9.40	10.6
COMP MT-A-2 Replicate 2	1	97	108	105	22.1	24.1	47	10.4	11.3
COMP MT-A-2 Replicate 3	1	99	116	105	529	22.6	47	249	11.5
COMP MT-A-3	1	95	108	109	21.9	16.0	61	13.4	9.74
COMP MT-A-4	1	95	108	103	24.9	27.1	41	10.2	11.1
COMP MT-A-5	1	99	115	107	6.37	59.2	73	4.65	43.2
COMP MT-A-6	1	95	105	102	21.2	33.0	33	6.99	10.9
MOTBY Reach B									
COMP MT-B-7	1	95	103	106	20.2	36.0	39	7.88	14.0
COMP MT-B-8	1	95	104	104	16.3	21.7	39	6.36	8.46
COMP MT-B-9	1	93	102	104	35.7	29.1	43	15.4	12.5
COMP MT-B-10	1	93	106	104	51.5	40.4	38	19.6	15.3
COMP MT-B-11	1	98	102	104	23.7	27.0	33	7.82	8.91
COMP MT-B-12	1	98	106	107	30.6	28.2	35	10.7	9.87
Arthur Kill Reach A									
AK-A-22	3	95	98	98	66.4	27.5	39	25.9	10.7
AK-A-23	3	100	91	107	108	47.2	39	42.1	18.4
AK-A-24	3	91	93	103	78.3	33.8	39	30.5	13.2
AK-A-25	3	96	89	104	70.7	30.9	40	28.3	12.4
AK-A-26 Replicate 1	4	51	50	57	71.5	26.3	40	28.6	10.5
AK-A-26 Replicate 2	4	81	76	80	51.4	26.2	40	20.6	10.5
AK-A-26 Replicate 3	4	81	ND[d]	83	48.3	ND	40	19.3	ND
AK-A-27 Replicate 1	4	69	67	80	75.9	30.1	42	31.9	12.6
AK-A-27 Replicate 2	4	71	63	72	98.0	22.7	42	41.2	9.53
AK-A-28	4	78	74	82	64.7	28.0	43	27.8	12.0
AK-A-29	4	69	65	69	73.3	21.2	45	33.0	9.54
AK-A-30	4	67	64	70	1010	26.4	45	455	11.9
AK-A-31	4	64	ND	75	59.8	ND	39	23.3	ND
AK-A-32	4	75	62	72	88.7	31.8	37	32.8	11.8
AK-A-33	4	67	67	70	69.0	31.4	40	27.6	12.6

TABLE A.17. (contd)

Sediment Treatment	Batch	Surrogate Percent Recoveries 2378-TCDD-13C12	2378-TCDF-13C12	2378-TCDD-37C14	(pg/g dry weight) 2378-TCDD	2378-TCDF	Total Percent Solids	(pg/g wet weight) 2378-TCDD	2378-TCDF
Arthur Kill Reach B									
AK-B-13	3	86	86	88	56.8	119	41	23.3	48.8
AK-B-14	3	94	90	100	1.30	2.24	45	0.59	1.01
AK-B-15 Replicate 1	3	83	90	92	46.1	41.1	43	19.8	17.7
AK-B-15 Replicate 2	3	94	81	96	43.5	39.3	43	18.7	16.9
AK-B-15 Replicate 3	3	ND	ND	ND	ND	ND	43	ND	ND
AK-B-16	3	98	90	94	60.2	46.5	36	21.7	16.7
AK-B-17	3	101	100	105	98.4	52.6	36	35.4	18.9
AK-B-18	3	94	100	99	100	332	41	41.0	136
AK-B-19	3	91	79	94	51.3	37.7	35	18.0	13.2
AK-B-20	3	97	114	99	80.9	676 U[e]	35	28.3	237 U
AK-B-21	3	94	93	94	68.6	19.2	48	32.9	9.22
Arthur Kill Reach C									
AK-C-1	2	134	110	133	77.5	366 U	35	27.1	128 U
AK-C-2	2	98	42	117	94.5	161 U	37	35.0	59.6 U
AK-C-3	2	84	70	84	19.4	32.5	32	6.21	10.4
AK-C-4 Replicate 1	2	86	90	92	15.9	60.6	35	5.57	21.2
AK-C-4 Replicate 2	2	96	87	90	67.7	31.2	35	23.7	10.9
AK-C-4 Replicate 3	2	102	71	115	41.8	94.2 U	35	14.6	33.0 U
AK-C-5	2	98	51	84	16.1	19.6	36	5.79	7.06
AK-C-6	2	96	90	93	17.0	30.7	38	6.46	11.7
AK-C-7	3	54	ND	82	46.8	ND	34	15.9	ND
AK-C-8	3	94	90	112	171	107	36	61.6	38.5
AK-C-9	3	84	97	97	61.1	80.1	28	17.1	22.4
AK-C-10	3	78	62	87	210	66.4	40	84.0	26.5
AK-C-11	3	81	82	98	105	75.1	41	43.1	30.8
AK-C-12	3	95	90	99	63.1	166	38	24.0	63.1
Port Elizabeth Reach A									
PE-A-1	1	99	114	108	77.7	22.8	41	31.9	9.35
PE-A-2	1	96	105	105	30.3	11.5	52	15.8	5.98
PE-A-3	1	96	112	103	181	29.6	45	81.5	13.3
PE-A-4	1	97	110	101	82.0	27.8	46	37.7	12.8
PE-A-5	1	82	87	95	96.6	26.9	47	45.4	12.6

TABLE A.17. (contd)

Sediment Treatment	Batch	Surrogate Percent Recoveries (pg/g dry weight) 2378-TCDD-13C12	2378-TCDF-13C12	2378-TCDD-37C14	(pg/g dry weight) 2378-TCDD	2378-TCDF	Total Percent Solids	(pg/g wet weight) 2378-TCDD	2378-TCDF
Port Elizabeth Reach B									
PE-B-7	2	79	63	77	62.4	15.0	41	25.6	6.14
PE-B-8	2	87	47	94	42.1	36.9 U	49	20.6	18.1 U
PE-B-9	2	82	77	82	48.0	18.5	41	19.7	7.59
PE-B-10	2	84	80	84	50.6	18.2	54	27.3	9.85
PE-B-11	2	82	50	88	45.8	25.4	52	23.8	13.2
PE-B-12	2	91	45	105	63.0	42.8 U	57	35.9	24.4 U
PE-B-13	1	92	102	108	117	26.9	45	52.7	12.1
PE-B-14	2	93	77	91	80.6	28.6	41	33.0	11.7
PE-B-15	2	53	52	57	115	22.7	40	46.0	9.07
Hackensack River Reach A									
HR-A-1	4	77	74	78	24.0	5.51	82	19.7	4.52
HR-A-2	4	80	86	81	127	22.5	54	68.6	12.1
HR-A-3	4	78	36	89	449	65.8	52	233	34.2
HR-A-4	4	76	73	79	475	32.1	53	252	17.0
HR-A-5	4	76	71	79	148	27.3	55	81.4	15.0
HR-A-6	4	60	68	65	63.2	22.5	74	46.8	16.6
HR-A-7	4	88	74	85	28.1	5.77	79	22.2	4.56
HR-A-8	4	93	73	96	158	17.0	66	104	11.2
Claremont Reach I, II and III									
COMP CL-I	4	77	74	78	57.2	25.4	45	25.7	11.4
COMP CL-II	4	86	83	85	71.6	44.9	44	31.5	19.8
COMP CL-III	4	88	84	88	17.3	25.2	45	7.79	11.3

(a) DL Detection limit.
(b) NA Not applicable.
(c) MDL Method detection limit
(d) ND Not detected due to interferences during analysis
(e) U Undetected at or above given concentration; elevated detection limits in some samples were due to coeluting ether interference.

TABLE A.18. Quality Control Summary for 2,3,7,8-TCDD/TCDF in Sediment, Federal Projects in New York and New Jersey

Sediment Treatment	Batch	Surrogate Percent Recoveries 2378-TCDD-13C12	2378-TCDF-13C12	2378-TCDD-37C14	(pg/g dry weight) 2378-TCDD	2378-TCDF
Method Blanks						
Method Blank 1	1	53	59	60	0.91 U[a]	0.42 U
Method Blank 2	2	49	49	66	2.57 U	1.02 U
Method Blank 3	3	92	95	100	1.0	0.7
Method Blank 4	4	88	89	90	1.21 U	0.61 U
Matrix Spikes						
AK-A-25	3	96	89	104	70.7	30.9
AK-A-25 MS	3	97	92	97	115	63.6
Concentration Recovered					44.7	32.8
Amount Spiked					35.0	35.0
Percent Recovery					128[b]	94
AK-C-6	2	96	90	93	17.0	30.7
AK-C-6 MS	2	98	63	89	60.7	87.3
Concentration Recovered					43.7	56.6
Amount Spiked					52.1	52.1
Percent Recovery					84	108
PE-B-13	1	92	102	108	117	26.9
PE-B-13 MS	1	94	115	111	128	77.2
Concentration Recovered					11.3	50.3
Amount Spiked					44.2	44.2
Percent Recovery					26[b]	114
COMP CL-III	4	88	84	88	17.3	25.2
COMP CL-III MS	4	89	87	87	79.7	86.1
Concentration Recovered					62.4	60.9
Amount Spiked					64.7	64.7
Percent Recovery					97	94
Standard Reference Material						
Certified value	1				500	500
Concentration Recovered		85	115	98	483	445
Percent Recovery					97	89
Certified value	2				500	500
Concentration Recovered		89	124	78	401	380
Percent Recovery					80	76
Certified value					500	500
Concentration Recovered	3	103	12[c]	109	390	370
Percent Recovery					78	74
Certified value	4				500	500
Concentration Recovered		87	82	91	433	414
Percent Recovery					87	83

TABLE A.18. (contd)

Sediment Treatment	Batch	Surrogate Percent Recoveries 2378-TCDD-13C12	2378-TCDF-13C12	2378-TCDD-37C14	(pg/g dry weight) 2378-TCDD	2378-TCDF
Analytical Duplicates						
AK-A-27 Replicate 1	4	69	67	80	75.9	30.1
AK-A-27 Replicate 2	4	71	63	72	98.0	22.7
RPD					25	28(d)
Analytical Triplicates						
COMP MT-A-2 Replicate 1	1	95	106	107	20.0	22.5
COMP MT-A-2 Replicate 2	1	97	108	105	22.1	24.1
COMP MT-A-2 Replicate 3	1	99	110	108	11.3	11.50
RSD					32(d)	35(d)
AK-A-26 Replicate 1	4	51	50	57	71.5	26.3
AK-A-26 Replicate 2	4	81	76	80	51.4	26.2
AK-A-26 Replicate 3	4	81	ND	83	48.3	ND(e)
RSD					22	NA(f)
AK-B-15 Replicate 1	3	83	90	92	46.1	41.1
AK-B-15 Replicate 2	3	94	81	96	43.5	39.3
AK-B-15 Replicate 3	3	ND	ND	ND	ND	ND
RPD(g)					6	5
AK-C-4 Replicate 1	2	86	90	92	15.9	60.6
AK-C-4 Replicate 2	2	96	87	90	67.7	31.2
AK-C-4 Replicate 3	2	102	71	115	41.8	94.2 U
RSD					62(d)	NA

(a) U Undetected at or above the detection limit shown.
(b) Percent recovery is outside the quality control limit of 50-120%.
(c) Percent recovery is outside the quality control limit of 40-135%.
(d) RSD or RPD greater than 25% quality control limit.
(e) ND Not detected due to interferences during analysis.
(f) NA Not applicable.
(g) RPD is reported instead of RSD because only two data points were available.

TABLE A.19. Total Polynuclear Aromatic Hydrocarbons (TPAHs), Dry Weight, in Sediment, Federal Projects in New York and New Jersey

Sediment Treatment	Batch	PAHs (µg/kg dry weight) Total Low Molecular Weight PAHs	Total High Molecular Weight PAHs	Total PAHs
MOTBY Reach A				
Comp MT-A	1	1620	5996	7616
MOTBY Reach B				
Comp MT-B	1	2757	6429	9186
Arthur Kill Reach A				
Comp AK-A	1	1925	6431	8356
Arthur Kill Reach B				
Comp AK-B	1	3023	7681	10704
Arthur Kill Reach C				
Comp AK-C	1	3887	8809	12696
Port Elizabeth Reach A				
Comp PE-A	1	5619	15201	20820
Port Elizabeth Reach B				
Comp PE-B	1	6224	10946	17170
Hackensack River Reach A				
Comp HR-A	1	88260	217910	306170
Claremont Reach I, II, and III				
Comp CL-I	1	1205	4210	5415
Comp CL-II Replicate 1	1	2132	7501	9633
Comp CL-II Replicate 2	1	2941	9193	12134
Comp CL-II Replicate 3	1	2700	8798	11498
Comp CL-III	1	1623	6621	8244

TABLE A.20. Low Molecular Weight Polynuclear Hydrocarbons (LPAHs), Dry Weight, in Sediment, Federal Projects in New York and New Jersey

Sediment Treatment	LPAHs (µg/kg dry weight) Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene
Target DL[a]	4	4	4	4	4	4
Achieved DL	0.72-0.96	0.26-0.34	0.33-0.44	0.42-0.56	0.25-0.33	0.26-0.35
MDL[b] verification	0.49	0.70	0.91	0.89	1.39	0.89
MOTBY Reach A						
Comp MT-A	208	123	231	177	556	325
MOTBY Reach B						
Comp MT-B	1030	188	277	236	621	405
Arthur Kill Reach A						
Comp AK-A	305	179	151	196	676	418
Arthur Kill Reach B						
Comp AK-B	426	212	286	336	1080	683
Arthur Kill Reach C						
Comp AK-C	585	184	313	530	1340	935
Port Elizabeth Reach A						
Comp PE-A	669	310	910	770	1950	1010
Port Elizabeth Reach B						
Comp PE-B	750	213	1130	895	2330	906
Hackensack River Reach A						
Comp HR-A	10100	4970	11000	8690	31700	21800
Claremont Reach I, II, and III						
Comp CL-I	224	137	91.1	130	384	239
Comp CL-II Replicate 1	424	231	155	195	614	513
Comp CL-II Replicate 2	593	356	182	254	859	697
Comp CL-II Replicate 3	472	257	178	228	759	806
Comp CL-III	246	183	81.7	152	547	413

(a) DL Detection limit.
(b) MDL Method Detection Limit.

TABLE A.21. High Molecular Weight Polynuclear Aromatic Hydrocarbons (HPAHs), Dry Weight, in Sediment, Federal Projects in New York and New Jersey

Sediment Treatment	Batch	HPAHs (µg/kg dry weight)									
		Fluoranthene	Pyrene	Benzo(a)-anthracene	Chrysene	Benzo(b)-fluoranthene	Benzo(k)-fluoranthene	Benzo(a) pyrene	Indeno-(1,2,3-cd) pyrene	Dibenzo-(a,h) anthracene	Benzo-(g,h,i) perylene
Target DL[a]		4	4	4	4	4	4	4	4	4	4
Achieved DL		0.13-0.17	0.14-0.19	0.23-0.31	0.19-0.25	0.25-0.33	0.21-0.28	0.35-0.47	0.15-0.20	0.25-0.33	0.14-0.18
MDL[b] verification		1.03	1.30	0.31	0.84	2.21	0.74	0.97	1.65	1.65	1.48
MOTBY Reach A											
Comp MT-A	1	1280	1200	566	725	691	258	539	354	76.0	307
MOTBY Reach B											
Comp MT-B	1	1270	1090	749	877	808	313	639	334	78.3	271
Arthur Kill Reach A											
Comp AK-A	1	1060	1030	655	867	846	324	699	432	114	404
Arthur Kill Reach B											
Comp AK-B	1	1330	1330	927	1030	1090	320	729	442	116	367
Arthur Kill Reach C											
Comp AK-C	1	1380	1310	1090	1310	1330	329	818	572	155	515
Port Elizabeth Reach A											
Comp PE-A	1	3520	2930	1970	1890	1880	578	1130	635	160	508
Port Elizabeth Reach B											
Comp PE-B	1	2890	2320	1080	1290	1150	401	869	450	113	383
Hackensack River Reach A											
Comp HR-A	1	57500	44800	23400	23500	22400	8420	19400	9270	2050	7170

TABLE A.21. (contd)

Sediment Treatment	Batch	HPAHs (µg/kg dry weight)									
		Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(1,2,3-cd)pyrene	Dibenzo(a,h)anthracene	Benzo(g,h,i)perylene
Claremont Reach I, II, and III											
Comp CL-I	1	684	719	438	527	530	192	459	318	70.5	273
Comp CL-II Replicate 1	1	1070	1120	890	903	1090	336	894	576	133	489
Comp CL-II Replicate 2	1	1380	1410	1160	1140	1300	393	1060	653	157	540
Comp CL-II Replicate 3	1	1270	1270	1120	1120	1280	413	1030	627	151	517
Comp CL-III	1	990	1030	862	804	957	290	784	437	99.1	368

(a) DL Detection limit.
(b) MDL Method detection limit (calculated using standard deviation times 3.5).

TABLE A.22. Quality Control Data for Low Molecular Weight Polynuclear Aromatic Hydrocarbons (LPAHs), Dry Weight, in Sediment, Federal Projects in New York and New Jersey

Sediment Treatment	Batch	LPAHs (µg/kg dry weight) Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene
Method Blanks							
Blank	1	0.74 J[a]	3.48 U[b]	2.68 U	2.12 U	3.61 U	3.38 U
QC Matrix Spikes							
MT61 MS	1	9.46	8.46	9.70	9.39	8.99	6.77
Amount Spiked		8.90	8.53	9.20	8.82	8.87	6.71
Percent Recovery		106	99	105	106	101	101
MT62 MS	1	9.75	8.28	9.47	9.25	9.03	6.60
Amount Spiked		8.97	8.59	9.27	8.88	8.93	6.76
Percent Recovery		109	96	102	104	101	98
MT63 MS	1	9.70	8.59	10.0	9.37	9.35	6.67
Amount Spiked		9.15	8.76	9.46	9.06	9.11	6.90
Percent Recovery		106	98	106	103	103	97
MT64 MS	1	9.75	8.75	9.99	9.83	9.85	7.17
Amount Spiked		9.37	8.97	9.68	9.28	9.33	7.06
Percent Recovery		104	98	103	106	106	101
Standard Reference Material							
Certified Value		NC[c]	NC	NC	NC	577	202
Percent Difference						21	3
SRM NIST 1941a		NA	NA	NA	NA	453.65	195.90
Analytical Triplicates							
COMP CL-II Replicate 1	1	424.34	230.54	155.04	195.04	614.41	513.12
COMP CL-II Replicate 2	1	593.25	355.86	182.30	254.24	859.00	696.76
COMP CL-II Replicate 3	1	472.46	256.85	177.66	228.23	759.06	805.72
RSD		18%	24%	8%	13%	17%	22%

(a) J Analyte detected below method detection limit (MDL).
(b) U Undetected at or above given concentration.
(c) NC Not certified.

TABLE A.23. Quality Control Data for High Molecular Weight Polynuclear Aromatic Hydrocarbons (HPAHs), Dry Weight, in Sediment, Federal Projects in New York and New Jersey

Sediment Treatment	Batch	HPAHs (µg/kg dry weight) Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(1,2,3-cd)pyrene	Dibenzo(a,h)anthracene	Benzo(g,h,i)perylene
Method Blanks											
Blank	1	0.49 J[a]	0.82 J	0.43 J	0.64 J	0.75 J	0.19 J	2.53 U[b]	6.03 U	3.55 U	1.13 J
QC Matrix Spikes											
MT61 MS	1	9.88	10.03	7.93	9.31	9.55	8.40	7.74	7.84	6.02	7.98
Amount Spiked		8.90	8.89	7.70	8.93	8.86	8.83	8.00	7.87	6.65	7.92
Percent Recovery		111	113	103	104	108	95	97	100	91	101
MT62 MS	1	9.42	9.39	7.73	8.89	8.55	8.83	7.89	7.16	5.05	7.11
Amount Spiked		8.97	8.95	7.76	9.00	8.92	8.89	8.06	7.92	6.70	7.98
Percent Recovery		105	105	100	99	96	99	98	90	75	89
MT63 MS	1	9.64	9.54	7.80	8.90	8.67	8.82	7.44	7.20	5.83	7.49
Amount Spiked		9.15	9.14	7.92	9.18	9.11	9.07	8.22	8.08	6.84	8.14
Percent Recovery		105	104	99	97	95	97	91	89	85	92
MT64 MS	1	10.1	10.2	7.75	8.76	8.03	8.55	7.28	6.69	5.21	7.07
Amount Spiked		9.36	9.35	8.10	9.40	9.32	9.29	8.42	8.28	7.00	8.33
Percent Recovery		108	109	96	93	86	92	86	81	74	85
Standard Reference Material											
Certified Value		1220	1080[d]	550[d]	NC[c]	780	444	670	569	NC	516
Percent Difference		29	33	32		19	18	23	4		12
SRM NIST 1941a		870.17	728.81	376.24	NA	925.18	364.79	519.04	548.94	NA	453.06

TABLE A.23. (contd)

Sediment Treatment	Batch	HPAHs (µg/kg dry weight) Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(1,2,3-cd)pyrene	Dibenzo(a,h)anthracene	Benzo(g,h,i)perylene
Analytical Triplicates											
Comp CL-II Replicate 1	1	1071.00	1119.88	889.92	902.88	1088.50	335.61	893.90	576.48	133.43	489.48
Comp CL-II Replicate 2	1	1379.67	1414.46	1164.79	1138.54	1298.61	393.36	1063.82	652.68	156.53	540.41
Comp CL-II Replicate 3	1	1266.98	1272.72	1120.13	1119.73	1277.47	412.86	1027.63	626.81	151.19	517.42
RSD		13%	12%	14%	12%	9%	11%	9%	6%	8%	5%

(a) J Analyte detected below MDL.
(b) U Undetected at or above the given concentration.
(c) NC Not certified.
(d) Outside SRM range of ±30%.

TABLE A.24. Surrogate Percent Recoveries for Polynuclear Aromatic Hydrocarbon Including Quality Control Data, Dry Weight, in Sediment, Federal Projects in New York and New Jersey

Sediment Treatment	Batch	Surrogate Percent Recoveries		
		Naph-thalene-d8	Acenaph-thene-d10	Chrysene d12
MOTBY Reach A				
Comp MT-A	1	39	46	40
MOTBY Reach B				
Comp MT-B	1	69	78	53
Arthur Kill Reach A				
Comp AK-A	1	66	71	52
Arthur Kill Reach B				
Comp AK-B	1	62	66	41
Arthur Kill Reach C				
Comp AK-C	1	96	87	43
Port Elizabeth Reach A				
Comp PE-A	1	52	56	35
Port Elizabeth Reach B				
Comp PE-B	1	52	57	41
Hackensack River Reach A				
Comp HR-A	1	D	D	D
Claremont Reach I, II, and III				
Comp CL-I	1	69	78	61
Comp CL-II Rep 1	1	65	70	42
Comp CL-II Rep 2	1	48	54	32
Comp CL-II Rep 3	1	59	69	40
Comp CL-III	1	63	73	47

TABLE A.24. (contd)

Sediment Treatment	Batch	Surrogate Percent Recoveries Naph-thalene-d8	Acenaph-thene-d10	Chrysene d12
Quality Control Data				
Method Blank				
Blank		79	77	81
QC Matrix Spikes				
MT61 MS	1	73	71	76
MT62 MS	1	72	69	73
MT63 MS	1	80	77	82
MT64 MS	1	76	74	80
Standard Reference Material				
SRM NIST 1941a		57	61	62
Analytical Replicates				
Comp CL-II Rep 1	1	65	70	42
Comp CL-II Rep 2	1	48	54	32
Comp CL-II Rep 3	1	59	69	40
MT61, Replicate 1	1	73	71	76
MT62, Replicate 2	1	72	69	73
MT63, Replicate 3	1	80	77	82
MT64, Replicate 4	1	76	74	80

TABLE A.25. Sediment Herbicide Results, Including Quality Control Data, Federal Projects in New York and New Jersey

Sediment Treatment	Surrogate Percent Recovery Diphenylacetic Acid	Concentration (µg/kg) 2,4,5-T	2,4-D	Silvex
COMP MT-A	72.1	20 U[a]	100 U	NA[b]
COMP MT-B	75.3	20 U	100 U	NA
COMP AK-A	77.5	20 U	100 U	NA
COMP AK-B	72.4	20 U	100 U	NA
COMP PE-A	83.6	20 U	100 U	NA
COMP PE-B	89.2	20 U	100 U	NA
COMP HR-A	70.9	20 U	100 U	NA
COMP CL-III	69.2	20 U	100 U	NA
Quality Control Data				
Method Blank				
Blank	70.6	20 U	100 U	NM[c]
Matrix Spike				
COMP HR-A	70.9	20 U	100 U	20 U
COMP HR-A MS	77.1	20 U	321	115
Concentration Recovered	NA	NA	321	115
Amount Spiked	NA	NS	537	134
Percent Recovery	NA	NA	59.8%	85.8%
Blank Spike				
Blank	70.6	20 U	100 U	20 U
Blank MS	75.2	NA	140	399
Concentration Recovered	NA	NA	140	399
Amount Spiked	NA	NS	179	714
Percent Recovery	NA	NA	78.2%	55.9%

(a) U Undetected above given concentration.
(b) NA Not applicable.
(c) NM Not measured.

APPENDIX B

Water Chemical Analyses

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects

PARAMETER: Metals

LABORATORY: Battelle Marine Sciences Laboratory, Sequim, Washington

MATRIX: Water

QA/QC DATA QUALITY OBJECTIVES

	Reference Method	Range of Recovery	SRM Accuracy	Relative Precision	Detection Limit (μg/L)
Cadmium	ICP/MS	75-125%	≤20%	≤20%	0.025
Chromium	GFAA	75-125%	≤20%	≤20%	1.0
Copper	ICP/MS	75-125%	≤20%	≤20%	0.35
Lead	ICP/MS	75-125%	≤20%	≤20%	0.35
Mercury	CVAA	75-125%	≤20%	≤20%	0.002
Nickel	ICP/MS	75-125%	≤20%	≤20%	0.3
Silver	ICP/MS	75-125%	≤20%	≤20%	0.25
Zinc	GFAA	75-125%	≤20%	≤20%	0.15

METHOD

Eight metals were analyzed in water and elutriate samples: silver (Ag), cadmium (Cd), chromium (Cr), copper (Cu), mercury (Hg), nickel (Ni), lead (Pb) and zinc (Zn). Hg was analyzed using cold-vapor atomic absorption spectroscopy (CVAA) according to the method of Bloom and Crecelius (1983). Cr and Zn were analyzed by graphite furnace atomic absorption (GFAA) spectrometry following the EPA Method 200.9 (EPA 1991). The remaining metals were analyzed by inductively coupled plasma mass spectrometry (ICP/MS) following a procedure based on EPA Method 200.8 (EPA 1991).

All water and elutriate samples were acidified to pH <2 upon receipt in the laboratory. Five metals, Cd, Cu, Pb, Ni and Ag, were extracted from the water according to a procedure based on EPA Method 218.3 (EPA 1979). This preconcentration involves addition of a chelating agent, which results in precipitation of the metals from solution, followed by filtration, and digestion of the filter in concentrated acid in order to achieve low detection limits. The digestates were then analyzed by ICP/MS as described above.

HOLDING TIMES

Fourteen water samples were received on 5/3/93 and 5/10/93 in good condition. Samples were logged into Battelle's log-in system, acidified to pH<2 and held at ambient temperature until analysis. Mercury in water has a holding time of 28 days from collection to analysis. All samples were analyzed within this holding time. Samples were all analyzed for the remaining metals within 180 days of collection. Samples were received, digested and analyzed in two batches. The following table summarizes all analysis dates:

QA/QC SUMMARY/METALS (contd)

Task	Date Performed Batch 1	Batch 2
APDC Extraction	5/13/93	5/17/93
ICP-MS	5/21/93	7/16/93
CVAA-Hg	5/10/93	6/2/93
GFAA-Cr	5/20/93	5/25/93
GFAA-Zn	5/19/93	5/21/93

DETECTION LIMITS

Four samples of a site seawater were spiked with the five APDC metals and were processed through the extraction procedure and analyzed as four separate replicates. The standard deviation of these results were multiplied by 3.5 to determine the method detection limit (MDL). Target detection limits were met for these five metals. Detection limits for the remaining three metals, Cr, Zn, and Hg, were determined by multiplying the standard deviation of the absorbance readings from three blanks times 3. Detection limits for Cr were below the target limits. Detection limits for the second batch of water samples analyzed exceeded the target limits by a factor of two; however, the second set of waters were those created by elutriate testing, and Hg sample values were higher than those of the corresponding site waters. Detection limits for Zn exceeded the target limits; however, all sample values were well above the detection limits achieved.

METHOD BLANKS

Procedural blanks were only generated during the APDC extraction step and only analyzed for the metals that were preconcentrated. These included Ag, Cd, Cu, Ni and Pb. One water procedural blank was generated with each batch extracted, for a total of two blanks. Ag and Pb were not detected in either blank. Cd, Cu and Ni were detected above the MDL in both blanks. All data are corrected for the blank concentrations in the associated blank.

MATRIX SPIKES

Two samples from each batch were spiked with Hg, and one sample from each batch was spiked with Ag and Cr. Note that these metals are analyzed by direct injection of the water, and no extraction of the water is performed. All recoveries were within the QC limits of 75% - 125%, with the exception of Hg in one spike from the second batch. Since Hg values for the other spike was acceptable, no further action was taken.

The remaining five metals that were analyzed in the APDC digestates were spiked in site seawater samples prior to the extraction and processed the same as the samples. Four samples were spiked with the second batch, and recoveries were all within the QC limits of 75% - 125%. These spiked sample recoveries were also used to perform the MDL verification.

QA/QC SUMMARY/METALS (contd)

REPLICATES

Each sample was analyzed in triplicate. This triplicate analysis included the APDC extraction step as well with the exception of the site water blank, which did not have enough water to analyze triplicates; instead, duplicate analyses were performed. Precision for triplicate analyses is reported by calculating the relative standard deviation (RSD) between the replicate results. RSD values were all within the QC limits of ±20%.

SRMs

Standard reference material (SRM), CASS-2, a certified salt water sample from the National Institute of Standards and Technology (NIST), was analyzed for all metals, with the exception of Ag and Hg, which are not certified in this SRM. Results for all metals were within ±20 % of mean certified value.

A second SRM, 1641b, a freshwater sample from NIST, was analyzed for Hg only twice with each batch. Results were within ±20 % of mean certified value. No salt water SRMS are available that are certified for Ag.

REFERENCES

Bloom, N. S., and E.A. Crecelius. 1983. "Determination of Mercury in Seawater at Sub-Nanogram per Liter Levels." Mar. Chem. 14:49-59.

EPA (U.S. Environmental Protection Agency). 1979. (Revised 1983). *Methods for the Chemical Analysis of Water and Wastes.* EPA-600/4-79-020. Environmental Monitoring Systems Laboratory, Cincinnati, Ohio.

EPA (U.S. Environmental Protection Agency). 1991. *Methods for the Determination of Metals in Environmental Samples.* EPA-600/4-91-010. Office of Research and Development, Environmental Services Division, Monitoring Management Branch, Washington, D.C.

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects

PARAMETER: Chlorinated Pesticides

LABORATORY: Battelle/Marine Sciences Laboratory, Sequim, Washington

MATRIX: Water

QA/QC DATA QUALITY OBJECTIVES

Reference Method	Surrogate Recovery	MS Recovery	Relative Precision	Detection Limit
GC/ECD	30-150%	50-120%	≤30%	0.4 ng/g

SAMPLE CUSTODY Fourteen water samples were received in two batches on 5/3/93 and 5/11/93 in good condition. Samples were logged into Battelle's log-in system and stored at approximately 4°C until extraction. Note that the set of waters received on 5/11/93 included additional site water to be used for matrix spiking.

METHOD Water samples were extracted with methylene chloride using a separatory funnel under ambient conditions following a procedure based on methods used by the National Oceanic and Atmospheric Administration for the Status and Trends Program (Krahn et al. 1988). Samples were then cleaned using silica/alumina (5% deactivated) chromatography followed by high performance liquid chromatography (HPLC) cleanup (Krahn et al. 1988). Extracts were analyzed for 15 chlorinated pesticides using gas chromatography/electron capture detection (GC/ECD) following a procedure based on EPA Method 8080 (EPA 1986). The column used was a J&W DB-17, and the confirmatory column was a DB-1701, both capillary columns (30-m x 0.25-mm I.D.).

HOLDING TIMES Samples were extracted in four batches: 5/4, 5/5, 5/11, and 5/12/93. Extracts from batches 1 and 2 were analyzed by GC/ECD from 5/26 through 5/28/93, and extracts from batches 3 and 4 were analyzed by GC/ECD from 5/29/93 through 5/31/93, within the established holding time of 40 days.

DETECTION LIMITS Target detection limits ranged from 3 to 100 ng/L. Actual method detection limits (MSLs) ranged from 0.28 to 2.14 ng/L, depending on the pesticide compound. MDLs were determined by multiplying the standard deviation of seven spiked replicates of Sequim Bay seawater by the Students t value.

METHOD BLANKS One method blank was extracted with each extraction batch for a total of four method blanks. No pesticides were detected above the MDL in any of the method blanks.

QA/QC SUMMARY/CHLORINATED PESTICIDES (contd)

SURROGATES

Two compounds, PCB congeners 103 and 198, were added to all samples prior to extraction to assess the efficiency of the analysis. Sample surrogate recoveries were all within the QC guidelines of 30%-150%, with the exception of the recoveries of PCB 103 for the three replicates of Arthur Kill Reach C. This sample contained high levels of chlorinated compounds, and matrix interference resulted in coelution of unknown peaks with surrogate compound PCB 103. For this reason, quantitation was performed using PCB 198 only. Following surrogate internal standard method, all results are corrected for surrogate recoveries.

MATRIX SPIKES

Due to limited sample volumes of actual test waters, site water was used for both matrix spikes. Ten out of the 15 pesticides analyzed were spiked. Matrix spike recoveries for the batch 2 spike ranged from 76% to 104%. Matrix spike recoveries for the sample spiked with batch 4 ranged from 83% to 110%. Both spike recoveries were within the control limit range of 50% to 120%.

BLANK SPIKES

The method blank from batches 1 and 3 was also spiked in duplicate with the same 10 pesticide compounds prior to extraction. Recoveries ranged from 75% to 120%.

REPLICATES

Each samples was extracted and analyzed in triplicate (with the exception of the control sample, which was analyzed in duplicate due to limited sample volume). Precision was measured by calculating the relative standard deviation between the replicate results. Few pesticide compounds were detected above the MDL in samples; however, relative standard deviations (RSDs) for all detectable values were below the target precision goal of ≤30%, except that of the sample from Arthur Kill Reach B. The third replicate of the sample from Arthur Kill Reach B appeared to contain values two times higher than those of the values of the other two replicates, resulting in calculable RSDs between 25% and 63%.

SRMs

Not applicable.

MISCELLANEOUS

Note that the first replicate analysis of the Mud Dump SIte water analyzed had extremely high levels of pesticides, especially the DDDs and DDTs. This was assumed to be a result of contamination of the sample outside of the analytical laboratory. No pesticide contamination was found in method blanks, and no other replicates of this sample had the high pesticide levels. This replicate, therefore, was not reported. An additional analysis of this sample was processed with batch 4 to provide three replicate analyses.

QA/QC SUMMARY/CHLORINATED PESTICIDES (contd)

REFERENCES

Krahn, M. M., C. A. Wigren, R. W. Pearce, L. K. Moore, R. G. Bogar, W. D. MacLeod, Jr., S.-L. Chan, and D. W. Brown. 1988. *New HPLC Cleanup and Revised Extraction Procedures for Organic Contaminants.* NOAA Technical Memorandum NMFS F/NWC-153, Seattle, Washington.

EPA (U.S. Environmental Protection Agency). 1986. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods.* SW-846. U.S. Document No. 955-001-00000, U.S. Environmental Protection Agency, Washington D.C.

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects

PARAMETER: PCB Congeners

LABORATORY: Battelle/Marine Sciences Laboratory, Sequim, Washington

MATRIX: Water

QA/QC DATA QUALITY OBJECTIVES

Reference Method	Surrogate Recovery	MS Recovery	Relative Precision	Detection Limit
GC/ECD	30-150%	50-120%	≤30%	0.4 ng/g

SAMPLE CUSTODY Fourteen water samples were received in two batches on 5/3/93 and 5/11/93 in good condition. Samples were logged into Battelle's log-in system and stored at approximately 4°C until extraction. Note that the set of waters received on 5/11/93 included additional site water to be used for matrix spiking.

METHOD Water samples were extracted with methylene chloride using a separatory funnel under ambient conditions following a procedure based on methods used by the National Oceanic and Atmospheric Administration for the Status and Trends Program (Krahn et al. 1988). Samples were then cleaned using silica/alumina (5% deactivated) chromatography followed by high performance liquid chromatography (HPLC) cleanup (Krahn et al. 1988). Extracts were analyzed for 15 chlorinated pesticides using gas chromatography/electron capture detection (GC/ECD) following a procedure based on EPA Method 8080 (EPA 1986). The column used was a J&W DB-17, and the confirmatory column was a DB-1701, both capillary columns (30-m x 0.25-mm I.D.).

HOLDING TIMES Samples were extracted in four batches: 5/4, 5/5, 5/11, and 5/12/93. Extracts from batches 1 and 2 were analyzed by GC/ECD from 5/26 through 5/28/93, and extracts from batches 3 and 4 were analyzed by GC/ECD from 5/29 through 5/31/93, within the established holding time of 40 days.

DETECTION LIMITS Target detection limits were 0.5 ng/L. Actual method detection limits (MDLs) ranged from 0.17 to 1.15 ng/L depending on the congener. MDLs were determined by multiplying the standard deviation of seven spiked replicates of Sequim Bay seawater by the Student's t value.

QA/QC SUMMARY/PCB CONGENERS (contd)

METHOD BLANKS

One method blank was extracted with each extraction batch for a total of four method blanks. No PCB congeners were detected in method blanks with the exception of PCB 105 in the blank from batch 3, which was detected at 2.04 ng/L.This value is greater than three times the MDL for that congener (0.17 ng/L), and corresponding detections (<5 times the blank) from that batch were flagged with a "B" to indicate possible blank contamination.

SURROGATES

Two compounds, PCB congeners 103 and 198, were added to all samples prior to extraction to assess the efficiency of the analysis. Sample surrogate recoveries were all within the QC guidelines of 30% - 150%, with the exception of the recoveries of PCB 103 for the three replicates of Arthur Kill Reach C. This sample contained high levels of chlorinated compounds, and matrix interference resulted in coelution of unknown peaks with surrogate compound PCB 103. For this reason, quantitation was performed using PCB 198 only. Following surrogate internal standard method, all results are corrected for surrogate recoveries.

MATRIX SPIKES

Due to limited sample volumes of actual test waters, site water was used for both matrix spikes. Five (5) out of the 19 congeners analyzed were spiked. Matrix spike recoveries for the sample spiked with batch 3 ranged from 90% to 108%, within the control limit range of 50%-120%.

BLANK SPIKES

The method blank from batches 1 and 3 was also spiked in duplicate with the same five congeners compounds prior to extraction. Recoveries ranged from 79% to 116%.

REPLICATES

Each sample was extracted and analyzed in triplicate (with the exception of the control sample, which was analyzed in duplicate due to limited sample volume). Precision was measured by calculating the relative standard deviation (RDS) between the replicate results. RSDs for all detectable values were below the target precision goal of ≤30%, except for that of the sample from Arthur Kill Reach B. The third replicate for the sample from Arthur Kill Reach B appeared to contain values two times higher than those of the values of the other two replicates, resulting in RSDs between 31%-60%.

SRMs

Not applicable.

REFERENCES

Krahn, M. M., C. A. Wigren, R. W. Pearce, L. K. Moore, R. G. Bogar, W. D. MacLeod, Jr., S.-L. Chan, and D. W. Brown. 1988. *New HPLC Cleanup and Revised Extraction Procedures for Organic Contaminants.* NOAA Technical Memorandum NMFS F/NWC-153, Seattle, Washington.

EPA (U.S. Environmental Protection Agency). 1986. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods.* SW-846. U.S. Document No. 955-001-00000, U.S. Environmental Protection Agency, Washington D.C.

TABLE B.1. Water Chemistry for Metals, Federal Projects in New York and New Jersey

Water Treatment	Batch	Replicate	Metals (µg/L wet weight) Ag ICP/MS	Cr GFAA	Cd ICP/MS	Cu ICP/MS	Hg CVAF	Ni ICP/MS	Pb ICP/MS	Zn GFAA
Target Detection Limit			0.25	1.0	0.025	0.35	0.002	0.3	0.35	0.15
Achieved DL	1		0.006	0.054	0.023	0.12	0.00024	0.220	0.03	0.365
Achieved DL	2		0.006	0.111	0.023	0.12	0.00493	0.220	0.03	0.619
Method Detection Limit			0.007	0.163	0.025	0.143	0.000223	0.253	0.035	0.582
Dredging Site Water Samples										
Arthur Kill Reach A	1	1	0.006 U[a]	0.741	0.044	2.00	0.00742	1.10	0.958	8.89
Arthur Kill Reach A	1	2	0.006 U	0.741	0.044	1.96	0.00729	1.15	0.952	9.95
Arthur Kill Reach A	1	3	0.006 U	0.710	0.045	2.04	0.00714	1.12	0.985	10.30
Arthur Kill Reach B	1	1	0.11	1.85	0.104	6.42	0.069	1.91	4.32	15.3
Arthur Kill Reach B	1	2	0.051	1.79	0.104	6.22	0.0683	1.84	4.28	14.1
Arthur Kill Reach B	1	3	0.052	1.85	0.104	6.36	0.0643	1.84	4.32	15.3
Arthur Kill Reach C	1	1	0.006 U	0.710	0.062	2.80	0.0108	1.06	1.11	11.5
Arthur Kill Reach C	1	2	0.006 U	0.679	0.062	2.87	0.0103	1.09	1.11	12.4
Arthur Kill Reach C	1	3	0.006 U	0.741	0.063	2.83	0.0102	1.08	1.08	12.8
Port Elizabeth Reach A	1	1	0.006 U	0.895	0.053	3.68	0.00557	1.61	1.82	11.3
Port Elizabeth Reach A	1	2	0.006 U	0.803	0.056	3.51	0.00550	1.60	1.85	13.0
Port Elizabeth Reach A	1	3	0.006 U	0.834	0.053	3.31	0.00586	1.56	1.84	14.1
Port Elizabeth Reach B	1	1	0.006 U	1.20	0.065	2.40	0.0124	1.53	1.91	9.64
Port Elizabeth Reach B	1	2	0.006 U	1.14	0.061	2.57	0.0128	1.69	2.11	10.40
Port Elizabeth Reach B	1	3	0.006 U	1.24	0.056	2.43	0.0135	1.58	1.99	9.21
Hackensack River Reach A	1	1	0.015	1.17	0.085	3.36	0.0173	1.91	2.61	16.2
Hackensack River Reach A	1	2	0.013	1.17	0.085	3.26	0.0160	1.83	2.68	11.8
Hackensack River Reach A	1	3	0.013	1.11	0.086	3.23	0.0162	1.80	2.75	14.8
Mud Dump Site	1	1	0.006 U	0.310	0.068	1.08	0.00451	0.579	0.627	8.68
Mud Dump Site	1	2	0.006 U	0.310	0.067	1.04	0.00508	0.563	0.618	7.940
Mud Dump Site	1	3	0.006 U	0.332	0.074	1.08	0.00477	0.591	0.679	8.26
Elutriate Water Samples										
Arthur Kill Reach A	2	1	0.041	4.15	0.023 U	2.47	0.0942	3.02	1.37	6.09
Arthur Kill Reach A	2	2	0.037	4.37	0.023 U	2.21	0.0847	2.70	1.22	5.21
Arthur Kill Reach A	2	3	0.031	4.13	0.023 U	2.11	0.0861	2.46	1.15	5.41

TABLE B.1. (contd)

Water Treatment	Batch	Replicate	Metals (μg/L wet weight) Ag ICP/MS	Cr GFAA	Cd ICP/MS	Cu ICP/MS	Hg CVAF	Ni ICP/MS	Pb ICP/MS	Zn GFAA
Arthur Kill Reach B	2	1	0.026	4.40	0.023 U	3.51	0.206	2.46	1.29	3.24
Arthur Kill Reach B	2	2	0.027	4.32	0.023 U	3.39	0.213	2.38	1.30	4.13
Arthur Kill Reach B	2	3	0.025	3.86	0.023 U	3.47	0.205	2.29	1.25	3.64
Arthur Kill Reach C	2	1	0.006 U	7.27	0.215	16.7	0.721	8.13	15.7	35.0
Arthur Kill Reach C	2	2	0.006 U	7.69	0.163	16.6	0.749	6.42	12.7	39.8
Arthur Kill Reach C	2	3	0.006 U	7.77	0.164	17.3	0.662	6.31	12.6	34.3
Port Elizabeth Reach A	2	1	0.054	4.23	0.042	3.19	0.103	3.94	6.75	8.85
Port Elizabeth Reach A	2	2	0.057	4.47	0.035	3.13	0.101	3.49	5.98	12.3
Port Elizabeth Reach A	2	3	0.054	4.57	0.038	3.35	0.101	3.63	6.16	10.0
Port Elizabeth Reach B	2	1	0.053	4.50	0.028	2.76	0.123	2.09	2.13	6.49
Port Elizabeth Reach B	2	2	0.054	4.45	0.046	2.77	0.125	2.01	2.20	6.49
Port Elizabeth Reach B	2	3	0.054	4.40	0.023 U	2.64	0.116	1.85	2.06	5.90
Hackensack River Reach A	2	1	0.042	6.41	0.023 U	2.50	0.110	3.04	1.76	5.90
Hackensack River Reach A	2	2	0.036	6.54	0.023 U	2.54	0.102	3.19	1.90	5.50
Hackensack River Reach A	2	3	0.036	7.10	0.023 U	2.36	0.102	2.93	1.71	6.68
Controls	2	1	0.006 U	NA(b)	0.051	0.28	NA	0.802	0.03 U	NA
Controls	2	2	0.006 U	NA	0.056	0.28	NA	0.763	0.03 U	NA

(a) U Undetected at or above given concentration.
(b) NA Not analyzed.

TABLE B.2. Quality Control Summary for Water Chemistry for Metals, Federal Projects in New York and New Jersey

Water Treatment	Replicate	Batch	Metals (µg/L wet weight) Ag ICP/MS	Cr GFAA	Cd ICP/MS	Cu ICP/MS	Hg CVAF	Ni ICP/MS	Pb ICP/MS	Zn GFAA
Method Blank										
Blank	1	1	0.0445	0.093	0.004	0.045	0.00109	0.020	0.034	1.16
Blank	2	1	0.0131	0.111 U[a]	0.002	0.025	0.00365	0.020	0.021	0.983
Blank	3	1	0.0122	NA[b]	0.002	0.041	NA	0.031	0.020	NA
Mean Blank			0.023	NA	0.003	0.037	0.00237	0.024	0.025	1.070
Blank	1	2	0.006 U	0.215	0.051	0.319	0.00493 U	0.774	0.052	0.983
Blank	2	2	0.006 U	0.255	0.049	0.308	0.00493 U	0.763	0.045	0.786
Blank	3	2	NA	0.196	NA	NA	0.00493 U	NA	NA	0.885
Matrix Spikes										
Dredging Site Water Samples										
Arthur Kill Reach A[c]		1	NS[d]	NS	NS	NS	0.007283	NS	NS	NS
Arthur Kill Reach A MS		1	NS	NS	NS	NS	0.0436	NS	NS	NS
Amount Recovered			NS	NS	NS	NS	0.0363	NS	NS	NS
Amount Spiked			NS	NS	NS	NS	0.0351	NS	NS	NS
Percent Recovery			NS	NS	NS	NS	103%	NS	NS	NS
Port Elizabeth Reach A[c]		1	NS	NS	NS	NS	0.005648	NS	NS	NS
Port Elizabeth Reach A MS		1	NS	NS	NS	NS	0.0430	NS	NS	NS
Amount Recovered			NS	NS	NS	NS	0.0374	NS	NS	NS
Amount Spiked			NS	NS	NS	NS	0.0363	NS	NS	NS
Percent Recovery			NS	NS	NS	NS	103%	NS	NS	NS
Mud Dump Site[c]		1	NS	0.317	NS	NS	NS	NS	NS	8.29
Mud Dump Site MS		1	NS	4.89	NS	NS	NS	NS	NS	17.4
Amount Recovered			NS	4.57	NS	NS	NS	NS	NS	9.11
Amount Spiked			NS	4.67	NS	NS	NS	NS	NS	8.91
Percent Recovery			NS	98%	NS	NS	NS	NS	NS	102%
Elutriate Water Samples										
Arthur Kill Reach A[c]		2	NS	NS	NS	NS	0.083	NS	NS	NS
Arthur Kill Reach A MS		2	NS	NS	NS	NS	0.161	NS	NS	NS
Amount Recovered			NS	NS	NS	NS	0.0727	NS	NS	NS
Amount Spiked			NS	NS	NS	NS	0.0596	NS	NS	NS
Percent Recovery			NS	NS	NS	NS	122%	NS	NS	NS

TABLE B.2. (contd)

Water Treatment	Replicate	Batch	Metals (µg/L wet weight) Ag ICP/MS	Cr GFAA	Cd ICP/MS	Cu ICP/MS	Hg CVAF	Ni ICP/MS	Pb ICP/MS	Zn GFAA
Controls[c]		2	0.006 U	NS	0.054	0.282	NS	0.783	0.030 U	NS
Controls MS		2	0.082	NS	0.240	1.273	NS	1.35	0.528	NS
Amount Recovered			0.082	NS	0.186	0.991	NS	0.563	0.528	NS
Amount Spiked			0.10	NS	0.20	1.0	NS	0.50	0.50	NS
Percent Recovery			82%	NS	93%	99%	NS	113%	106%	NS
Controls[c]		2	0.006 U	NS	0.054	0.282	NS	0.783	0.030 U	NS
Controls MSD		2	0.080	NS	0.236	1.20	NS	1.30	0.536	NS
Amount Recovered			0.080	NS	0.182	0.921	NS	0.513	0.536	NS
Amount Spiked			0.10	NS	0.20	1.0	NS	0.50	0.50	NS
Percent Recovery			80%	NS	91%	92%	NS	103%	107%	NS
RPD			2%	NS	2%	7%	NS	9%	2%	NS
I-Stat			0.01	NS	0.01	0.04	NS	0.05	0.01	NS
Controls[c]		2	0.006 U	NS	0.054	0.282	NS	0.783	0.030 U	NS
Controls MS		2	0.080	NS	0.231	1.18	NS	1.21	0.528	NS
Amount Recovered			0.080	NS	0.177	0.901	NS	0.423	0.528	NS
Amount Spiked			0.10	NS	0.20	1.0	NS	0.50	0.50	NS
Percent Recovery			80%	NS	89%	90%	NS	85%	106%	NS
Controls[c]		2	0.006 U	NS	0.054	0.282	NS	0.783	0.030 U	NS
Controls MSD		2	0.077	NS	0.248	1.19	NS	1.20	0.549	NS
Amount Recovered			0.077	NS	0.194	0.911	NS	0.413	0.549	NS
Amount Spiked			0.10	NS	0.20	1.0	NS	0.50	0.50	NS
Percent Recovery			77%	NS	97%	91%	NS	83%	110%	NS
RPD			4%	NS	9%	1%	NS	2%	4%	NS
I-Stat			0.02	NS	0.05	0.01	NS	0.01	0.02	NS
Standard Reference Material										
Certified Value			NC[f]	0.118	0.019	0.675	NC	0.298	0.019	1.970
Range			NC	±0.021	±0.004	±0.039	NC	±0.036	±0.006	±0.12
CASS-2		1	0.006 U	0.111	0.023	0.696	NA	0.298	0.006[g]	2.18
CASS-2		2	0.006 U	0.118	0.020	0.690	NA	0.290	0.009[g]	2.32
Certified Value			NC	NC	NC	NC	1520	NC	NC	NC
Range			NC	NC	NC	NC	±40	NC	NC	NC

TABLE B.2. (contd)

Water Treatment	Replicate	Batch	Metals (µg/L wet weight) Ag ICP/MS	Cr GFAA	Cd ICP/MS	Cu ICP/MS	Hg CVAF	Ni ICP/MS	Pb ICP/MS	Zn GFAA
Certified Value			NC	NC	NC	NC	1520	NC	NC	NC
Range			NC	NC	NC	NC	±40	NC	NC	NC
1641b		1	NA	NA	NA	NA	1700	NA	NA	NA
1641b		1	NA	NA	NA	NA	1690	NA	NA	NA
1641b		2	NA	NA	NA	NA	1640	NA	NA	NA
1641b		2	NA	NA	NA	NA	1540	NA	NA	NA
Replicate Analysis										
Dredging Site Water Samples										
Arthur Kill Reach A	1	1	0.006 U	0.741	0.044	2.00	0.00742	1.10	0.958	8.89
Arthur Kill Reach A	2	1	0.006 U	0.741	0.044	1.96	0.00729	1.15	0.952	9.95
Arthur Kill Reach A	3	1	0.006 U	0.710	0.045	2.04	0.00714	1.12	0.985	10.3
RSD			NA	2%	1%	2%	2%	2%	2%	8%
Arthur Reach Kill B	1	1	0.112	1.85	0.104	6.42	0.0690	1.91	4.32	15.3
Arthur Reach Kill B	2	1	0.051	1.79	0.104	6.22	0.0683	1.84	4.28	14.1
Arthur Reach Kill B	3	1	0.052	1.85,	0.104	6.36	0.0643	1.84	4.32	15.3
RSD			49%(h)	2%	0%	2%	4%	2%	1%	5%
Arthur Kill Reach C	1	1	0.006 U	0.710	0.062	2.80	0.0108	1.06	1.11	11.5
Arthur Kill Reach C	2	1	0.006 U	0.679	0.062	2.87	0.0103	1.09	1.11	12.4
Arthur Kill Reach C	3	1	0.006 U	0.741	0.063	2.83	0.0102	1.08	1.08	12.8
RSD			NA	4%	1%	1%	3%	1%	2%	5%
Port Elizabeth Reach A	1	1	0.006 U	0.895	0.053	3.68	0.00557	1.61	1.82	11.3
Port Elizabeth Reach A	2	1	0.006 U	0.803	0.056	3.51	0.00550	1.60	1.85	13.0
Port Elizabeth Reach A	3	1	0.006 U	0.834	0.053	3.31	0.0059	1.56	1.84	14.1
RSD			NA	6%	3%	5%	3%	2%	1%	11%
Port Elizabeth Reach B	1	1	0.006 U	1.20	0.065	2.40	0.0124	1.53	1.91	9.64
Port Elizabeth Reach B	2	1	0.006 U	1.14	0.061	2.57	0.0128	1.69	2.11	10.4
Port Elizabeth Reach B	3	1	0.006 U	1.24	0.056	2.43	0.0135	1.58	1.99	9.21
RSD			NA	4%	7%	4%	4%	5%	5%	6%
Hackensack River Reach A	1	1	0.015	1.17	0.085	3.36	0.0173	1.91	2.61	16.2
Hackensack River Reach A	2	1	0.013	1.17	0.085	3.26	0.0160	1.83	2.68	11.8
Hackensack River Reach A	3	1	0.013	1.11	0.086	3.23	0.0162	1.80	2.75	14.8
RSD			8%	3%	1%	2%	4%	3%	3%	16%

TABLE B.2. (contd)

Water Treatment	Replicate	Batch	Metals (µg/L wet weight) Ag ICP/MS	Cr GFAA	Cd ICP/MS	Cu ICP/MS	Hg CVAF	Ni ICP/MS	Pb ICP/MS	Zn GFAA
Mud Dump Site 1		1	0.006 U	0.310	0.068	1.08	0.00451	0.579	0.627	8.68
Mud Dump Site 2		1	0.006 U	0.310	0.067	1.04	0.00508	0.563	0.618	7.94
Mud Dump Site 3		1	0.006 U	0.332	0.074	1.08	0.00477	0.591	0.679	8.26
RSD			NA	4%	5%	2%	6%	2%	5%	4%
Elutriate Water Samples										
Arthur Kill Reach A	1	2	0.041	4.15	0.023 U	2.47	0.0942	3.02	1.37	6.09
Arthur Kill Reach A	2	2	0.037	4.37	0.023 U	2.21	0.0847	2.70	1.22	5.21
Arthur Kill Reach A	3	2	0.031	4.13	0.023 U	2.11	0.0861	2.46	1.15	5.41
RSD			14%	3%	NA	8%	6%	10%	9%	8%
Arthur Reach Kill B	1	2	0.026	4.40	0.023 U	3.51	0.206	2.46	1.29	3.24
Arthur Reach Kill B	2	2	0.027	4.32	0.023 U	3.39	0.213	2.38	1.30	4.13
Arthur Reach Kill B	3	2	0.025	3.86	0.023 U	3.47	0.205	2.29	1.25	3.64
RSD			4%	7%	NA	2%	2%	4%	2%	12%
Arthur Kill Reach C	1	2	0.006 U	7.27	0.215	16.7	0.721	8.13	15.7	35.0
Arthur Kill Reach C	2	2	0.006 U	7.69	0.163	16.6	0.749	6.42	12.7	39.8
Arthur Kill Reach C	3	2	0.006 U	7.77	0.164	17.3	0.662	6.31	12.6	34.3
RSD			NA	4%	16%	2%	6%	15%	13%	8%
Port Elizabeth Reach A	1	2	0.054	4.23	0.042	3.19	0.103	3.94	6.75	8.85
Port Elizabeth Reach A	2	2	0.057	4.47	0.035	3.13	0.101	3.49	5.98	12.3
Port Elizabeth Reach A	3	2	0.054	4.57	0.038	3.35	0.101	3.63	6.16	10.0
RSD			3%	4%	9%	122%	1%	6%	6%	17%
Port Elizabeth Reach B	1	2	0.053	4.50	0.028	2.76	0.123	2.07	2.13	6.49
Port Elizabeth Reach B	2	2	0.054	4.45	0.046	2.77	0.125	2.01	2.20	6.49
Port Elizabeth Reach B	3	2	0.054	4.40	0.023 U	2.64	0.116	1.85	2.06	5.90
RSD			1%	1%	NA	3%	4%	6%	3%	5%
Hackensack River Reach	1	2	0.042	6.41	0.023 U	2.50	0.110	3.04	1.76	5.90
Hackensack River Reach	2	2	0.036	6.54	0.023 U	2.54	0.102	3.19	1.90	5.50
Hackensack River Reach	3	2	0.036	7.10	0.023 U	2.36	0.102	2.93	1.71	6.68
RSD			9%	5%	NA	4%	4%	4%	6%	10%
Blank	1	2	0.006 U	0.215	0.051	0.319	0.00493 U	0.774	0.052	0.983
Blank	2	2	0.006 U	0.255	0.049	0.308	0.00493 U	0.763	0.045	0.786
Blank	3	2	NA	0.196	NA	NA	0.00493 U	NA	NA	0.885
RSD			NA	14%	NA	NA	NA	NA	NA	11%

TABLE B.2. (contd)

Water Treatment	Replicate	Batch	Metals (µg/L wet weight) Ag ICP/MS	Cr GFAA	Cd ICP/MS	Cu ICP/MS	Hg CVAF	Ni ICP/MS	Pb ICP/MS	Zn GFAA
Blank	1	2	0.006 U	0.215	0.051	0.319	0.00493 U	0.774	0.052	0.983
Blank	2	2	0.006 U	0.255	0.049	0.308	0.00493 U	0.763	0.045	0.786
Blank	3	2	NA	0.196	NA	NA	0.00493 U	NA	NA	0.885
RSD			NA	14%	NA	NA	NA	NA	NA	11%

(a) U Undetected at or above given concentration.
(b) NA Not applicable.
(c) Mean of replicated sample.
(d) NS Not spiked.
(e) Recovery outside quality control range of 75%-125%.
(f) NC Not certified.
(g) Value outside SRM Range of ≤20% for certified value.
(h) Value exceeds relative standard deviation range ≤30%.

TABLE B.3. Water Chemistry for Pesticides (alphabetical, Aldrin - 2,4'DDT), Federal Projects in New York and New Jersey

Water Treatment	Replicate	Batch	Sample Vol. (L)	Pesticides (ng/L wet weight) Aldrin	a-Chlordane	Dieldrin	2,4'-DDD	2,4'-DDE	2,4'-DDT
Target DL				4	14	2	11	4	20
Achieved DL				0.76	1.93	0.36	0.98	0.74	0.88
Dredging Site Water Samples									
Hackensack River Reach A	1	1	0.90	0.76 U[(a)]	1.93 U	3.03	0.98 U	0.74 U	0.88 U
Hackensack River Reach A	2	1	0.90	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
Hackensack River Reach A	3	1	0.90	0.76 U	1.93 U	3.39	0.98 U	0.74 U	0.88 U
Arthur Kill Reach A	1	2	0.90	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
Arthur Kill Reach A	2	2	0.90	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
Arthur Kill Reach A	3	2	0.90	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
Port Elizabeth Reach B	1	2	0.90	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
Port Elizabeth Reach B	2	2	0.90	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
Port Elizabeth Reach B	3	2	0.90	0.76 U	1.93 U	3.16	0.98 U	0.74 U	0.88 U
Arthur Kill Reach C	1	2	0.90	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
Arthur Kill Reach C	2	2	0.90	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
Arthur Kill Reach C	3	2	0.90	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
Arthur Kill Reach B	1	1	0.90	0.76 U	1.93 U	0.36 U	3.98	0.74 U	0.88 U
Arthur Kill Reach B	2	1	0.90	0.76 U	1.93 U	3.03	3.93	0.74 U	0.88 U
Arthur Kill Reach B	3	1	0.90	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
Port Elizabeth Reach A	1	1	0.90	0.76 U	1.93 U	3.12	0.98 U	0.74 U	0.88 U
Port Elizabeth Reach A	2	1	0.90	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
Port Elizabeth Reach A	3	1	0.90	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
Mud Dump Site	2	2	0.90	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
Mud Dump Site	3	2	0.90	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
Mud Dump Site	4	4	0.95	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
Elutriate Water Samples									
Arthur Kill Reach C	1	3	0.74	0.76 U	105	59.6	220	533	0.88 U
Arthur Kill Reach C	2	3	0.83	0.76 U	110	62.5	236	578	0.88 U
Arthur Kill Reach C	3	3	0.90	0.76 U	101	58.3	215	519	0.88 U

TABLE B.3. (contd)

Water Treatment	Replicate	Batch	Sample Vol. (L)	Pesticides (ng/L wet weight) Aldrin	a-Chlordane	Dieldrin	2,4'-DDD	2,4'-DDE	2,4'-DDT
Arthur Kill Reach B	1	4	0.92	0.76 U	1.93 U	6.67	95.1	84.3	0.88 U
Arthur Kill Reach B	2	4	0.96	0.76 U	1.93 U	6.42	97.3	99.8	0.88 U
Arthur Kill Reach B	3	4	0.94	0.76 U	1.93 U	10.1	207	250	0.88 U
Arthur Kill Reach A	1	3	0.91	0.76 U	3.49	0.36 U	13.1	10.4	0.88 U
Arthur Kill Reach A	2	3	0.92	0.76 U	4.00	3.86	12.3	11.1	0.88 U
Arthur Kill Reach A	3	3	0.90	0.76 U	3.67	3.93	11.9	9.78	0.88 U
Hackensack River Reach A	1	4	0.92	0.76 U	3.78	4.62	0.98 U	0.74 U	0.88 U
Hackensack River Reach A	2	4	0.95	0.76 U	4.26	0.36 U	0.98 U	0.74 U	0.88 U
Hackensack River Reach A	3	4	0.96	5.01	3.17	4.25	3.86	0.74 U	0.88 U
Port Elizabeth Reach B	1	3	0.89	0.76 U	4.89	4.77	14.4	6.95	0.88 U
Port Elizabeth Reach B	2	3	0.82	0.76 U	4.91	4.85	0.98 U	6.73	0.88 U
Port Elizabeth Reach B	3	3	0.89	0.76 U	6.34	5.29	0.98 U	9.07	0.88 U
Port Elizabeth Reach A	1	3	0.81	0.76 U	9.11	6.82	0.98 U	0.74 U	0.88
Port Elizabeth Reach A	2	3	0.80	0.76 U	9.81	6.99	0.98 U	0.74 U	0.88 U
Port Elizabeth Reach A	3	3	0.79	0.76 U	8.89	6.71	0.98 U	0.74 U	5.63
Control	1	4	0.98	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
Control	2	4	0.96	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U

(a) U Undetected at or above given concentration.

TABLE B.4. Water Chemistry for Pesticides (alphabetical, 4,4'-DDD - Trans Nonachlor), Federal Projects in New York and New Jersey

Water Treatment	Replicate	Batch	Sample Vol.(L)	Pesticides (ng/L wet weight) 4,4'-DDD	4,4'-DDE	4,4'-DDT	Endosulfan I	Endosulfan II	Endosulfan sulfate	Heptachlor	Heptachlor epoxide	Trans Nonachlor
Target DL				20	20	20	14	4	10	3	100	14
Achieved DL				0.28	0.84	0.50	1.00	1.00	1.00	1.02	2.14	0.57
Dredging Site Water Samples												
Hackensack River Reach A	1	1	0.90	0.28 U[a]	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	2.11	2.14 U	0.57 U
Hackensack River Reach A	2	1	0.90	0.28 U	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	2.14	2.14 U	0.57 U
Hackensack River Reach A	3	1	0.90	0.28 U	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Arthur Kill Reach A	1	2	0.90	0.28 U	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Arthur Kill Reach A	2	2	0.90	0.28 U	3.33	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Arthur Kill Reach A	3	2	0.90	0.28 U	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Port Elizabeth Reach B	1	2	0.90	0.28 U	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Port Elizabeth Reach B	2	2	0.90	0.28 U	0.84 U	4.50	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Port Elizabeth Reach B	3	2	0.90	0.28 U	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	5.34	2.14 U	0.57 U
Arthur Kill Reach C	1	2	0.90	0.28 U	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	1.91	2.14 U	0.57 U
Arthur Kill Reach C	2	2	0.90	0.28 U	3.15	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Arthur Kill Reach C	3	2	0.90	0.28 U	0.84 U	5.81	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Arthur Kill Reach B	1	1	0.90	7.90	3.56	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Arthur Kill Reach B	2	1	0.90	8.08	4.03	4.36	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Arthur Kill Reach B	3	1	0.90	8.51	0.84 U	37.9	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Port Elizabeth Reach A	1	1	0.90	0.28 U	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Port Elizabeth Reach A	2	1	0.90	0.28 U	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Port Elizabeth Reach A	3	1	0.90	0.28 U	3.70	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Mud Dump Site	2	2	0.90	0.28 U	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Mud Dump Site	3	2	0.90	6.62	3.17	6.74	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Mud Dump Site	4	4	0.95	0.28 U	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U

TABLE B.4. (contd)

Water Treatment	Replicate	Batch	Sample Vol.(L)	Pesticides (ng/L wet weight) 4,4'-DDD	4,4'-DDE	4,4'-DDT	Endosulfan I	Endosulfan II	Endosulfan sulfate	Heptachlor	Heptachlor epoxide	Trans Nonachlor
Elutriate Water Samples												
Arthur Kill Reach C	1	3	0.74	316	1110 D[b]	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Arthur Kill Reach C	2	3	0.83	354	1250 D	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Arthur Kill Reach C	3	3	0.90	322	1060 D	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Arthur Kill Reach B	1	4	0.92	312	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	6.80	2.14 U	0.57 U
Arthur Kill Reach B	2	4	0.96	320	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	8.37	2.14 U	0.57 U
Arthur Kill Reach B	3	4	0.94	619	459	0.50 U	1.00 U	1.00 U	1.00 U	11.1	2.14 U	0.57 U
Arthur Kill Reach A	1	3	0.91	23.2	22.2	0.50 U	1.00 U	1.00 U	1.00 U	3.73	2.14 U	0.57 U
Arthur Kill Reach A	2	3	0.92	23.3	21.7	0.50 U	1.96	1.00 U	1.00 U	3.67	2.14 U	0.57 U
Arthur Kill Reach A	3	3	0.90	21.5	19.8	0.50 U	1.00 U	1.00 U	1.00 U	3.48	2.14 U	0.57 U
Hackensack River Reach A	1	4	0.92	0.28 U	12.1	0.50 U	3.79	1.00 U	1.00 U	3.99	2.14 U	0.57 U
Hackensack River Reach A	2	4	0.95	6.66	14.4	0.50 U	4.17	1.00 U	1.00 U	4.98	2.14 U	0.57 U
Hackensack River Reach A	3	4	0.96	5.92	10.4	0.50 U	3.21	1.00 U	1.00 U	3.91	2.14 U	0.57 U
Port Elizabeth Reach B	1	3	0.89	11.9	18.6	0.50 U	1.00 U	1.00 U	1.00 U	5.27	2.14 U	0.57 U
Port Elizabeth Reach B	2	3	0.82	10.7	18.5	0.50 U	1.00 U	1.00 U	1.00 U	4.89	2.14 U	0.57 U
Port Elizabeth Reach B	3	3	0.89	12.7	24.5	0.50 U	1.00 U	1.00 U	1.00 U	5.29	2.14 U	0.57 U
Port Elizabeth Reach A	1	3	0.81	12.6	28.9	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	2.99
Port Elizabeth Reach A	2	3	0.80	13.3	31.0	0.50 U	1.00 U	1.00 U	1.00 U	6.70	2.14 U	0.57 U
Port Elizabeth Reach A	3	3	0.79	14.7	28.7	22.8	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	2.84
Control	1	4	0.98	0.28 U	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Control	2	4	0.96	0.28 U	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U

U Undetected at or above given concentration.
D Diluted (1:10).

TABLE B.5. Quality Control Summary for Pesticides in Water (alphabetical, Aldrin - 2,4'-DDT), Federal Projects in New York and New Jersey

Water Treatment	Replicate	Batch	Sample Vol. (L)	Pesticides (ng/L wet weight) Aldrin	a-Chlordane	Dieldrin	2,4'-DDD	2,4'-DDE	2,4'-DDT
Method Blank									
Blank		1	1.0	0.76 U[a]	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
Blank		2	1.0	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
Blank		3	1.0	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
Blank		4	1.0	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
Matrix Spikes									
Mud Dump Site[b]		2	0.90	0.76 U	NS[c]	0.36 U	NS	NS	NS
Mud Dump Site MS		2	0.90	26.3	NS	23.6	NS	NS	NS
Amount Recovered				25.5	NS	21.3	NS	NS	NS
Amount Spiked				27.8	NS	27.8	NS	NS	NS
Percent Recovery				92%	NS	76%	NS	NS	NS
Mud Dump Site[b]		4	0.90	0.76 U	NS	0.36 U	NS	NS	NS
Mud Dump Site MS		4	0.90	20.1	NS	21.8	NS	NS	NS
Amount Recovered				20.1	NS	21.8	NS	NS	NS
Amount Spiked				24.3	NS	24.3	NS	NS	NS
Percent Recovery				83%	NS	90%	NS	NS	NS
Replicate Analysis									
Dredging Site Water Samples									
Arthur Kill Reach A	1	2	0.90	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
Arthur Kill Reach A	2	2	0.90	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
Arthur Kill Reach A	3	2	0.90	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
RSD				NA[d]	NA	NA	NA	NA	NA
Arthur Kill Reach B	1	1	0.90	0.76 U	1.93 U	0.36 U	3.98	0.74 U	0.88 U
Arthur Kill Reach B	2	1	0.90	0.76 U	1.93 U	3.03	3.93	0.74 U	0.88 U
Arthur Kill Reach B	3	1	0.90	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
RSD				NA	NA	NA	NA	NA	NA
Arthur Kill Reach C	1	2	0.90	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
Arthur Kill Reach C	2	2	0.90	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
Arthur Kill Reach C	3	2	0.90	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
RSD				NA	NA	NA	NA	NA	NA

TABLE B.5. (contd)

Water Treatment	Replicate	Batch	Sample Vol. (L)	Pesticides (ng/L wet weight)					
				Aldrin	a-Chlordane	Dieldrin	2,4'-DDD	2,4'-DDE	2,4'-DDT
Port Elizabeth Reach A	1	1	0.90	0.76 U	1.93 U	3.12	0.98 U	0.74 U	0.88 U
Port Elizabeth Reach A	2	1	0.90	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
Port Elizabeth Reach A	3	1	0.90	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
RSD				NA	NA	NA	NA	NA	NA
Port Elizabeth Reach B	1	2	0.90	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
Port Elizabeth Reach B	2	2	0.90	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
Port Elizabeth Reach B	3	2	0.90	0.76 U	1.93 U	3.16	0.98 U	0.74 U	0.88 U
RSD				NA	NA	NA	NA	NA	NA
Hackensack River Reach A	1	1	0.90	0.76 U	1.93 U	3.03	0.98 U	0.74 U	0.88 U
Hackensack River Reach A	2	1	0.90	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
Hackensack River Reach A	3	1	0.90	0.76 U	1.93 U	3.39	0.98 U	0.74 U	0.88 U
RSD				NA	NA	NA	NA	NA	NA
Mud Dump Site	2	2	0.90	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
Mud Dump Site	3	2	0.90	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
Mud Dump Site	4	4	0.95	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
RSD				NA	NA	NA	NA	NA	NA
Elutriate Water Samples									
Arthur Kill Reach A	1	3	0.91	0.76 U	3.49	0.36 U	13.1	10.4	0.88 U
Arthur Kill Reach A	2	3	0.92	0.76 U	4.00	3.86	12.3	11.1	0.88 U
Arthur Kill Reach A	3	3	0.90	0.76 U	3.67	3.93	11.9	9.78	0.88 U
RSD				NA	7%	NA	5%	6%	NA
Arthur Kill Reach B	1	4	0.92	0.76 U	1.93 U	6.67	95.1	84.3	0.88 U
Arthur Kill Reach B	2	4	0.96	0.76 U	1.93 U	6.42	97.3	99.8	0.88 U
Arthur Kill Reach B	3	4	0.94	0.76 U	1.93 U	10.1	207	250	0.88 U
RSD				NA	NA	27%	48%(e)	63%(e)	NA
Arthur Reach Kill C	1	3	0.74	0.76 U	105	59.6	220	533	0.88 U
Arthur Reach Kill C	2	3	0.83	0.76 U	110	62.5	236	578	0.88 U
Arthur Reach Kill C	3	3	0.90	0.76 U	101	58.3	215	519	0.88 U
RSD				NA	4%	4%	5%	6%	NA
Port Elizabeth Reach A	1	3	0.81	0.76 U	9.11	6.82	0.98 U	0.74 U	0.88 U
Port Elizabeth Reach A	2	3	0.80	0.76 U	9.81	6.99	0.98 U	0.74 U	0.88 U
Port Elizabeth Reach A	3	3	0.79	0.76 U	8.89	6.71	0.98 U	0.74 U	5.63
RSD				NA	5%	2%	NA	NA	NA

TABLE B.5. (contd)

Water Treatment	Replicate	Batch	Sample Vol. (L)	Pesticides (ng/L wet weight) Aldrin	a-Chlordane	Dieldrin	2,4'-DDD	2,4'-DDE	2,4'-DDT
Port Elizabeth Reach B	1	3	0.89	0.76 U	4.89	4.77	14.4	6.95	0.88 U
Port Elizabeth Reach B	2	3	0.82	0.76 U	4.91	4.85	0.98 U	6.73	0.88 U
Port Elizabeth Reach B	3	3	0.89	0.76 U	6.34	5.29	0.98 U	9.07	0.88 U
RSD				NA	15%	6%	NA	17%	NA
Hackensack River Reach A	1	4	0.92	0.76 U	3.78	4.62	0.98 U	0.74 U	0.88 U
Hackensack River Reach A	2	4	0.95	0.76 U	4.26	0.36 U	0.98 U	0.74 U	0.88 U
Hackensack River Reach A	3	4	0.96	5.01	3.17	4.25	3.86	0.74 U	0.88 U
RSD				NA	15%	NA	NA	NA	NA
Control	1	4	0.98	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
Control	2	4	0.96	0.76 U	1.93 U	0.36 U	0.98 U	0.74 U	0.88 U
RPD				NA	NA	NA	NA	NA	NA
I-Stat				NA	NA	NA	NA	NA	NA

(a) U Undetected at or above the detection limit shown.
(b) Mean of replicated sample.
(c) NS Not spiked
(d) NA Not applicable.
(e) Value exceeds relative standard deviation range (≤30%).

TABLE B.6. Quality Control Summary for Pesticides in Water (alphabetical, 4,4'-DDD - Trans-Nonachlor), Federal Projects in New York and New Jersey

Water Treatment	Replicate	Batch	Sample Vol. (L)	Pesticides (ng/L wet weight) 4,4'-DDD	4,4'-DDE	4,4'-DDT	Endo-Sulfan I	Endo-Sulfan II	Endo-Sulfan Sulfate	Hepta-chlor	Hepta-chlor epoxide	Trans Nonachlor
Method Blanks												
Blank		1	1.0	0.28 U[a]	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Blank		2	1.0	0.28 U	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Blank		3	1.0	0.28 U	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Blank		4	1.0	0.28 U	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Matrix Spikes												
Mud Dump Site[b]		2	0.90	0.28 U	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	NS[c]
Mud Dump Site MS		2	0.90	25.9	22.5	24.4	23.2	24.8	25.8	28.8	30.2	NS
Amount Recovered				25.9	22.5	24.4	23.2	24.8	25.8	28.8	30.2	NS
Amount Spiked				27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	NS
Percent Recovery				93%	81%	88%	83%	89%	93%	104%	109%	NS
Mud Dump Site[b]		4	0.90	0.28 U	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	NS
Mud Dump Site MS		4	0.90	23.0	21.3	21.9	22.8	23.3	26.8	22.1	24.6	NS
Amount Recovered				23.0	21.3	21.9	22.8	23.3	26.8	22.1	24.6	NS
Amount Spiked				24.3	24.3	24.3	24.3	24.3	24.3	24.3	24.3	NS
Percent Recovery				95%	88%	90%	94%	96%	110%	91%	101%	NS
Replicate Analysis												
Dredging Site Water Samples												
Arthur Kill Reach A	1	2	0.90	0.28 U	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Arthur Kill Reach A	2	2	0.90	0.28 U	3.33	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Arthur Kill Reach A	3	2	0.90	0.28 U	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
RSD				NA[d]	NA	NA	NA	NA	NA	NA	NA	NA
Arthur Kill Reach B	1	1	0.90	7.90	3.56	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Arthur Kill Reach B	2	1	0.90	8.08	4.03	4.36	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Arthur Kill Reach B	3	1	0.90	8.51	0.84 U	37.91	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
RSD				4%	NA	NA	NA	NA	NA	NA	NA	NA
Arthur Kill Reach C	1	2	0.90	0.28 U	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	1.91	2.14 U	0.57 U
Arthur Kill Reach C	2	2	0.90	0.28 U	3.15	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Arthur Kill Reach C	3	2	0.90	0.28 U	0.84 U	5.81	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
RSD				NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE B.6. (contd)

Water Treatment	Replicate	Batch	Sample Vol. (L)	Pesticides (ng/L wet weight) 4,4'-DDD	4,4'-DDE	4,4'-DDT	Endo-Sulfan I	Endo-Sulfan II	Endo-Sulfan Sulfate	Heptachlor	Heptachlor epoxide	Trans Nonachlor
Port Elizabeth Reach A	1	1	0.90	0.28 U	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Port Elizabeth Reach A	2	1	0.90	0.28 U	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Port Elizabeth Reach A	3	1	0.90	0.28 U	3.70	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
RSD				NA	NA	NA	NA	NA	NA	NA	NA	NA
Port Elizabeth Reach B	1	2	0.90	0.28 U	0.84 U	0.50 U	1.00 U	1.00 U	8.00 U	1.02 U	2.14 U	0.57 U
Port Elizabeth Reach B	2	2	0.90	0.28 U	0.84 U	4.50	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Port Elizabeth Reach B	3	2	0.90	0.28 U	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	5.34	2.14 U	0.57 U
RSD				NA	NA	NA	NA	NA	NA	NA	NA	NA
Hackensack River Reach A	1	1	0.90	0.28 U	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	2.11	2.14 U	0.57 U
Hackensack River Reach A	2	1	0.90	0.28 U	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	2.14	2.14 U	0.57 U
Hackensack River Reach A	3	1	0.90	0.28 U	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
RSD				NA	NA	NA	NA	NA	NA	NA	NA	NA
Mud Dump Site	1	2	0.90	0.28 U	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Mud Dump Site	2	2	0.90	6.62	3.17	6.72	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Mud Dump Site	3	4	0.95	0.28 U	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
RSD				NA	NA	NA	NA	NA	NA	NA	NA	NA
Elutriate Water Samples												
Arthur Kill Reach A	1	3	0.91	23.2	22.2	0.50 U	1.00 U	1.00 U	1.00 U	3.73	2.14 U	0.57 U
Arthur Kill Reach A	2	3	0.92	23.3	21.7	0.50 U	1.96	1.00 U	1.00 U	3.67	2.14 U	0.57 U
Arthur Kill Reach A	3	3	0.90	21.5	19.8	0.50 U	1.00 U	1.00 U	1.00 U	3.48	2.14 U	0.57 U
RSD				5%	6%	NA	NA	NA	NA	4%	NA	NA
Arthur Kill Reach B	1	4	0.92	312	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	6.80	2.14 U	0.57 U
Arthur Kill Reach B	2	4	0.96	320	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	8.37	2.14 U	0.57 U
Arthur Kill Reach B	3	4	0.94	619	459	0.50 U	1.00 U	1.00 U	1.00 U	11.08	2.14 U	0.57 U
RSD				42%(f)	NA	NA	NA	NA	NA	25%	NA	NA
Arthur Reach Kill C	1	3	0.74	316	1110 D(e)	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Arthur Reach Kill C	2	3	0.83	354	1250 D	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Arthur Reach Kill C	3	3	0.90	322	1060 D	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
RSD				6%	9%	NA	NA	NA	NA	NA	NA	NA
Port Elizabeth Reach A	1	3	0.81	12.6	28.9	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	2.99
Port Elizabeth Reach A	2	3	0.80	13.3	31.0	0.50 U	1.00 U	1.00 U	1.00 U	6.70	2.14 U	0.57 U
Port Elizabeth Reach A	3	3	0.79	14.7	28.7	22.8	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	2.84
RSD				8%	4%	NA	NA	NA	NA	NA	NA	NA

TABLE B.6. (contd)

Water Treatment	Replicate	Batch	Sample Vol.(L)	Pesticides (ng/L wet weight) 4,4'-DDD	4,4'-DDE	4,4'-DDT	Endo-Sulfan I	Endo-Sulfan II	Endo-Sulfan Sulfate	Heptachlor	Heptachlor epoxide	Trans Nonachlor
Port Elizabeth Reach B	1	3	0.89	11.9	18.6	0.50 U	1.00 U	1.00 U	1.00 U	5.27	2.14 U	0.57 U
Port Elizabeth Reach B	2	3	0.82	10.7	18.5	0.50 U	1.00 U	1.00 U	1.00 U	4.89	2.14 U	0.57 U
Port Elizabeth Reach B	3	3	0.89	12.7	24.5	0.50 U	1.00 U	1.00 U	1.00 U	5.29	2.14 U	0.57 U
RSD				8%	17%	NA	NA	NA	NA	4%	NA	NA
Hackensack River Reach A	1	4	0.92	0.28 U	12.1	0.50 U	3.79	1.00 U	1.00 U	3.99	2.14 U	0.57 U
Hackensack River Reach A	2	4	0.95	6.66	14.4	0.50 U	4.17	1.00 U	1.00 U	4.98	2.14 U	0.57 U
Hackensack River Reach A	3	4	0.96	5.92	10.4	0.50 U	3.21	1.00 U	1.00 U	3.91	2.14 U	0.57 U
RSD				NA	16%	NA	13%	NA	NA	14%	NA	NA
Control	1	4	0.98	0.28 U	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
Control	2	4	0.96	0.28 U	0.84 U	0.50 U	1.00 U	1.00 U	1.00 U	1.02 U	2.14 U	0.57 U
RPD				NA	NA	NA	NA	NA	NA	NA	NA	NA
I-Stat				NA	NA	NA	NA	NA	NA	NA	NA	NA

(a) U Not detected at or above the detection limit shown.
(b) Mean of replicated sample.
(c) NS Not spiked.
(d) NA Not applicable.
(e) D Diluted (1:10).
(f) Value exceeds relative standard deviation range (≤30%).

TABLE B.7. Polychlorinated Biphenyls in Water Congeners 8 through 49, Federal Projects in New York and New Jersey

Water Treatment	Replicate	Batch	Sample Vol.(L)	PCBs (ng/L Wet Weight) PCB 8	PCB 18	PCB 28	PCB 52	PCB 44	PCB 49
Target Detection Limit				0.5	0.5	0.5	0.5	0.5	0.5
Achieved DL				1.15	0.75	0.32	0.40	0.55	1.00
Dredging Site Water Samples									
Arthur Kill Reach A	1	2	0.90	1.15 U[a]	0.75 U	0.32 U	0.40 U	0.55 U	1.11 U
Arthur Kill Reach A	2	2	0.90	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.11 U
Arthur Kill Reach A	3	2	0.90	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.11 U
Arthur Kill Reach B	1	1	0.90	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.11 U
Arthur Kill Reach B	2	1	0.90	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.24
Arthur Kill Reach B	3	1	0.90	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.11 U
Arthur Kill Reach C	1	2	0.90	3.31	0.75 U	0.32 U	0.40 U	0.55 U	1.11 U
Arthur Kill Reach C	2	2	0.90	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.11 U
Arthur Kill Reach C	3	2	0.90	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.11 U
Port Elizabeth Reach A	1	1	0.90	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.11 U
Port Elizabeth Reach A	2	1	0.90	1.15 U	0.75 U	1.67	0.40 U	0.55 U	1.11 U
Port Elizabeth Reach A	3	1	0.90	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.11 U
Port Elizabeth Reach B	1	2	0.90	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.11 U
Port Elizabeth Reach B	2	2	0.90	1.15 U	0.75 U	1.84	0.40 U	0.55 U	1.11 U
Port Elizabeth Reach B	3	2	0.90	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.11 U
Hackensack River Reach A	1	1	0.90	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.11 U
Hackensack River Reach A	2	1	0.90	1.15 U	0.75 U	1.96	0.40 U	0.55 U	1.11 U
Hackensack River Reach A	3	1	0.90	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.11 U
Mud Dump Site	1	2	0.90	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.11 U
Mud Dump Site	2	2	0.90	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.11 U
Mud Dump Site	3	4	0.95	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.05 U
Elutriate Water Samples									
Arthur Kill Reach A	1	3	0.91	1.15 U	11.5	10.8	12.7	8.77	10.8
Arthur Kill Reach A	2	3	0.92	1.15 U	9.55	9.77	12.4	8.31	10.8
Arthur Kill Reach A	3	3	0.90	1.15 U	8.79	9.01	11.4	7.58	9.91

TABLE B.7. (contd)

Water Treatment	Replicate	Batch	Sample Vol.(L)	PCBs (ng/L Wet Weight) PCB 8	PCB 18	PCB 28	PCB 52	PCB 44	PCB 49
Arthur Kill Reach B	1	4	0.92	6.69	31.5	28.7	28.6	22.5	24.8
Arthur Kill Reach B	2	4	0.96	10.7	34.5	29.6	31.0	23.7	27.8
Arthur Kill Reach B	3	4	0.94	12.7	54.2	58.3	60.1	48.9	55.2
Arthur Kill Reach C	1	3	0.74	99.5	449	489	597	495	504
Arthur Kill Reach C	2	3	0.83	91.1	457	502	595	504	572
Arthur Kill Reach C	3	3	0.90	92.5	424	460	550	463	534
Port Elizabeth Reach A	1	3	0.81	1.15 U	20.2	24.3	32.6	22.4	22.7
Port Elizabeth Reach A	2	3	0.80	1.15 U	21.1	25.5	34.8	24.8	24.4
Port Elizabeth Reach A	3	3	0.79	1.15 U	19.7	23.2	31.4	21.4	21.6
Port Elizabeth Reach B	1	3	0.89	1.15 U	16.7	18.4	19.6	13.8	14.4
Port Elizabeth Reach B	2	3	0.82	1.15 U	16.4	17.2	19.5	14.0	14.6
Port Elizabeth Reach B	3	3	0.89	3.33	20.7	22.8	25.0	17.9	19.3
Hackensack River Reach A	1	4	0.92	1.15 U	12.5	12.6	14.9	13.3	1.09 U
Hackensack River Reach A	2	4	0.95	1.15 U	0.75 U	15.5	18.5	14.7	1.05 U
Hackensack River Reach A	3	4	0.96	1.15 U	11.6	11.2	13.7	11.5	1.04 U
Control	1	4	0.98	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.02 U
Control	2	4	0.96	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.04 U

(a) U Undetected at or above given concentration.

TABLE B.8. Polychlorinated Biphenyls Congeners 66 through 183, Federal Projects in New York and New Jersey

Water Treatment	Replicate	Batch	Sample Vol.(L)	PCBs (ng/L wet weight) PCB 66	PCB 101	PCB 87	PCB 118	PCB 153	PCB 105	PCB 138	PCB 183
Target Detection Limit				0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Achieved DL				0.42	0.19	0.35	0.23	0.17	0.17	0.18	1.00
Dredging Site Water Samples											
Arthur Kill Reach A	1	2	0.90	0.42 U[a]	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.11 U
Arthur Kill Reach A	2	2	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.11 U
Arthur Kill Reach A	3	2	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.11 U
Arthur Kill Reach B	1	1	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.11 U
Arthur Kill Reach B	2	1	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.71	1.11 U
Arthur Kill Reach B	3	1	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.11 U
Arthur Kill Reach C	1	2	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.11 U
Arthur Kill Reach C	2	2	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.11 U
Arthur Kill Reach C	3	2	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	1.27	1.11 U
Port Elizabeth Reach A	1	1	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	1.26	0.18 U	1.11 U
Port Elizabeth Reach A	2	1	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	1.28	0.18 U	1.11 U
Port Elizabeth Reach A	3	1	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.11 U
Port Elizabeth Reach B	1	2	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	1.12	0.18 U	1.11 U
Port Elizabeth Reach B	2	2	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.99	0.18 U	1.11 U
Port Elizabeth Reach B	3	2	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.11 U
Hackensack River Reach A	1	1	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	1.6	0.18 U	1.11 U
Hackensack River Reach A	2	1	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.11 U
Hackensack River Reach A	3	1	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	1.88	0.18 U	1.11 U
Mud Dump Reference Site	2	2	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.11 U
Mud Dump Reference Site	3	2	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.11 U
Mud Dump Reference Site	4	4	0.95	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.05 U
Elutriate Water Samples											
Arthur Kill Reach A	1	3	0.91	7.43	6.75	0.35 U	6.82	7.70	56.0	6.54	1.10 U
Arthur Kill Reach A	2	3	0.92	8.86	7.99	0.35 U	6.21	7.96	54.6	7.14	1.09 U
Arthur Kill Reach A	3	3	0.90	7.12	6.36	0.35 U	5.76	6.45	59.0	5.85	1.11 U

TABLE B.8. (contd)

Water Treatment	Replicate	Batch	Sample Vol.(L)	PCBs (ng/L wet weight) PCB 66	PCB 101	PCB 87	PCB 118	PCB 153	PCB 105	PCB 138	PCB 183
Arthur Kill Reach B	1	4	0.92	24.8	16.2	0.35 U	13.5	12.3	0.17 U	11.2	1.09 U
Arthur Kill Reach B	2	4	0.96	26.7	17.8	0.35 U	15.3	14.1	0.17 U	12.4	1.04 U
Arthur Kill Reach B	3	4	0.94	59	40.3	0.35 U	36.4	34.1	0.17 U	29.7	1.06 U
Arthur Kill Reach C	1	3	0.74	637 D[b]	452	0.35 U	379	304	150	289	10.1
Arthur Kill Reach C	2	3	0.83	663 D	453	0.35 U	386	310	159	300	1.21 U
Arthur Kill Reach C	3	3	0.90	574 D	414	0.35 U	351	283	145	274	1.11 U
Port Elizabeth Reach A	1	3	0.81	31.3	33.7	0.35 U	27.8	38.0	12.3	32.7	1.24 U
Port Elizabeth Reach A	2	3	0.80	33.7	36.1	0.35 U	30.1	40.8	13.3	35.7	1.25 U
Port Elizabeth Reach A	3	3	0.79	30.1	31.5	0.35 U	26.4	35.3	11.4	30.2	1.27 U
Port Elizabeth Reach B	1	3	0.89	15	13.2	0.35 U	12.5	13.4	6.88 B[b]	11.6	1.12 U
Port Elizabeth Reach B	2	3	0.82	15.6	13.7	0.35 U	12.2	12.7	6.90 B	11.4	1.22 U
Port Elizabeth Reach B	3	3	0.89	22.1	19.1	0.35 U	17.2	18.0	8.16 B	15.8	1.12 U
Hackensack River Reach A	1	4	0.92	11.3	9.50	0.35 U	8.19	9.72	0.17 U	5.90	1.09 U
Hackensack River Reach A	2	4	0.95	15.2	12.0	0.35 U	9.77	12.7	0.17 U	8.49	1.05 U
Hackensack River Reach A	3	4	0.96	9.79	7.85	0.35 U	6.94	8.76	0.17 U	5.40	1.04 U
Control	1	4	0.98	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.02 U
Control	2	4	0.96	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.04 U

(a) Undetected at or above the given concentration.
(b) D Diluted (1:10).
(c) B Result less than five times the concentration in analyte.

TABLE B.9. Polychlorinated Biphenyls Congeners 184 through 209, Federal Projects in New York and New Jersey

Water Treatment	Replicate	Batch	Sample Vol.(L)	PCBs (ng/L wet weight) PCB 184	PCB 187	PCB 128	PCB 180	PCB 170	PCB 195	PCB 206	PCB 209
Target Detection LImit				0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Achieved DL				1.00	0.35	0.29	0.32	0.35	1.12	0.23	0.24
Dredging Site Water Samples											
Arthur Kill Reach A	1	2	0.90	1.11 U[a]	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Arthur Kill Reach A	2	2	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Arthur Kill Reach A	3	2	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Arthur Kill Reach B	1	1	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Arthur Kill Reach B	2	1	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Arthur Kill Reach B	3	1	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Arthur Kill Reach C	1	2	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Arthur Kill Reach C	2	2	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Arthur Kill Reach C	3	2	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Port Elizabeth Reach A	1	1	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Port Elizabeth Reach A	2	1	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Port Elizabeth Reach A	3	1	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Port Elizabeth Reach B	1	2	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Port Elizabeth Reach B	2	2	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Port Elizabeth Reach B	3	2	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Hackensack River Reach A	1	1	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Hackensack River Reach A	2	1	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Hackensack River Reach A	3	1	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Mud Dump Site	2	2	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Mud Dump Site	3	2	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Mud Dump Site	4	4	0.95	1.05 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Elutriate Water Samples											
Arthur Kill Reach A	1	3	0.91	1.10 U	2.60	0.29 U	4.67	0.35 U	1.12 U	0.23 U	0.24 U
Arthur Kill Reach A	2	3	0.92	1.29	2.75	1.17	5.14	0.35 U	1.12 U	0.23 U	0.24 U
Arthur Kill Reach A	3	3	0.90	1.11 U	2.28	0.29 U	3.99	0.35 U	1.12 U	0.23 U	0.24 U

TABLE B.9. (contd)

Water Treatment	Replicate	Batch	Sample Vol.(L)	PCBs (ng/L wet weight) PCB 184	PCB 187	PCB 128	PCB 180	PCB 170	PCB 195	PCB 206	PCB 209
Arthur Kill Reach B	1	4	0.92	1.69	4.38	2.01	7.98	0.35 U	1.12 U	1.76	0.24 U
Arthur Kill Reach B	2	4	0.96	1.72	4.80	1.98	8.40	0.35 U	1.12 U	1.98	0.24 U
Arthur Kill Reach B	3	4	0.94	3.85	11.3	3.48	19.0	9.09	1.71	3.93	0.24 U
Arthur Kill Reach C	1	3	0.74	45.2	106	49.2	164	76.8	13.6	28.6	0.24 U
Arthur Kill Reach C	2	3	0.83	48.6	112	51.6	177	81.6	14.2	30.1	0.24 U
Arthur Kill Reach C	3	3	0.90	44.5	101	46.7	159	75.1	12.6	26.9	0.24 U
Port Elizabeth Reach A	1	3	0.81	6.61	14.4	4.87	23.7	10.5	2.77	5.58	0.24 U
Port Elizabeth Reach A	2	3	0.80	7.10	15.5	5.32	25.9	11.3	2.47	6.18	0.24 U
Port Elizabeth Reach A	3	3	0.79	5.75	13.0	4.66	21.6	9.96	2.64	5.22	0.24 U
Port Elizabeth Reach B	1	3	0.89	2.22	4.68	1.97	7.13	3.48	1.12 U	2.10	0.24 U
Port Elizabeth Reach B	2	3	0.82	1.88	4.42	1.94	8.29	3.62	1.12 U	2.21	0.24 U
Port Elizabeth Reach B	3	3	0.89	2.89	6.29	2.61	9.76	4.83	1.12 U	3.11	0.24 U
Hackensack River Reach A	1	4	0.92	1.99	0.36 U	0.29 U	4.97	0.35 U	1.12 U	0.23 U	0.24 U
Hackensack River Reach A	2	4	0.95	1.05 U	4.32	1.91	6.22	0.35 U	1.12 U	1.76	0.24 U
Hackensack River Reach A	3	4	0.96	1.04 U	3.13	1.13	4.74	0.35 U	1.12 U	0.23 U	0.24 U
Control	1	4	0.98	1.02 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Control	2	4	0.96	1.04 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U

(a) U Undetected at or above given concentration.

TABLE B.10. Quality Control Summary for Polychlorinated Biphenyls Congeners 8 through 49, Federal Projects in New York and New Jersey

Water Treatment	Replicate	Batch	Sample Vol.(L)	PCBs (ng/L wet weight) PCB 8	PCB 18	PCB 28	PCB 52	PCB 44	PCB 49
Method Blank									
Blank		1	1.0	1.15 U[a]	0.75 U	0.32 U	0.40 U	0.55 U	1.00 U
Blank		2	1.0	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.00 U
Blank		3	1.0	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.00 U
Blank		4	1.0	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.00 U
Matrix Spikes									
Mud Dump Site[b]		2	0.90	NS[c]	NS	0.32 U	0.40 U	NS	NS
Mud Dump Site MS		2	0.90	NS	NS	38.4	66.4	NS	NS
Amount Recovered				NS	NS	38.4	66.4	NS	NS
Amount Spiked				NS	NS	35.4	73.9	NS	NS
Percent Recovery				NS	NS	108%	90%	NS	NS
Mud Dump Site[b]		4	0.90	NS	NS	0.32 U	0.40 U	NS	NS
Mud Dump Site MS		4	0.90	NS	NS	30.8	61.1	NS	NS
Amount Recovered				NS	NS	30.8	61.1	NS	NS
Amount Spiked				NS	NS	31.0	31.0	NS	NS
Percent Recovery				NS	NS	99%	197%[d]	NS	NS
Replicate Analysis									
Dredging Site Water Samples									
Arthur Kill Reach A		2	0.90	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.11 U
Arthur Kill Reach A		2	0.90	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.11 U
Arthur Kill Reach A		2	0.90	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.11 U
RSD				NA[e]	NA	NA	NA	NA	NA
Arthur Kill Reach B		1	0.90	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.11 U
Arthur Kill Reach B		1	0.90	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.24
Arthur Kill Reach B		1	0.90	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.11 U
RSD				NA	NA	NA	NA	NA	NA
Arthur Kill Reach C		2	0.90	3.31	0.75 U	0.32 U	0.40 U	0.55 U	1.11 U
Arthur Kill Reach C		2	0.90	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.11 U
Arthur Kill Reach C		2	0.90	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.11 U
RSD				NA	NA	NA	NA	NA	NA

TABLE B.10. (contd)

Water Treatment	Replicate	Batch	Sample Vol.(L)	PCBs (ng/L wet weight) PCB 8	PCB 18	PCB 28	PCB 52	PCB 44	PCB 49
Port Elizabeth Reach A		1	0.90	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.11 U
Port Elizabeth Reach A		1	0.90	1.15 U	0.75 U	1.67	0.40 U	0.55 U	1.11 U
Port Elizabeth Reach A		1	0.90	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.11 U
RSD				NA	NA	NA	NA	NA	NA
Port Elizabeth Reach B		2	0.90	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.11 U
Port Elizabeth Reach B		2	0.90	1.15 U	0.75 U	1.84	0.40 U	0.55 U	1.11 U
Port Elizabeth Reach B		2	0.90	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.11 U
RSD				NA	NA	NA	NA	NA	NA
Hackensack River Reach A		1	0.90	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.11 U
Hackensack River Reach A		1	0.90	1.15 U	0.75 U	1.96	0.40 U	0.55 U	1.11 U
Hackensack River Reach A		1	0.90	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.11 U
RSD				NA	NA	NA	NA	NA	NA
Mud Dump Site		2	0.90	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.11 U
Mud Dump Site		2	0.90	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.11 U
Mud Dump Site		4	0.95	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.05 U
RSD				NA	NA	NA	NA	NA	NA
Elutriate Water Samples									
Arthur Kill Reach A		3	0.91	1.15 U	11.5	10.8	12.7	8.77	10.8
Arthur Kill Reach A		3	0.92	1.15 U	9.55	9.77	12.4	8.31	10.8
Arthur Kill Reach A		3	0.90	1.15 U	8.79	9.01	11.4	7.58	9.91
RSD				NA	14%	9%	6%	7%	5%
Arthur Kill Reach B		4	0.92	6.69	31.5	28.7	28.6	22.5	24.8
Arthur Kill Reach B		4	0.96	10.7	34.5	29.6	31.0	23.7	27.8
Arthur Kill Reach B		4	0.94	12.7	54.2	58.3	60.1	48.9	55.2
RSD				31%(f)	31%(f)	43%(f)	44%(f)	47%(f)	47%(f)
Arthur Reach Kill C		3	0.74	99.5	449	489	597	495	504
Arthur Reach Kill C		3	0.83	91.1	457	502	595	504	572
Arthur Reach Kill C		3	0.90	92.5	424	460	550	463	534
RSD				5%	4%	4%	5%	4%	6%
Port Elizabeth Reach A		3	0.81	1.15 U	20.2	24.3	32.6	22.4	22.7
Port Elizabeth Reach A		3	0.80	1.15 U	21.1	25.5	34.8	24.8	24.4
Port Elizabeth Reach A		3	0.79	1.15 U	19.7	23.2	31.4	21.4	21.6
RSD				NA	3%	5%	5%	8%	6%

TABLE B.10. (contd)

Water Treatment	Replicate	Batch	Sample Vol.(L)	PCBs (ng/L wet weight) PCB 8	PCB 18	PCB 28	PCB 52	PCB 44	PCB 49
Port Elizabeth Reach B		3	0.89	1.15 U	16.7	18.4	19.6	13.8	14.4
Port Elizabeth Reach B		3	0.82	1.15 U	16.4	17.2	19.5	14.0	14.6
Port Elizabeth Reach B		3	0.89	3.33	20.7	22.8	25.0	17.9	19.3
RSD				NA	13%	15%	15%	15%	17%
Hackensack River Reach A		4	0.92	1.15 U	12.5	12.6	14.9	13.3	1.09 U
Hackensack River Reach A		4	0.95	1.15 U	0.75 U	15.5	18.5	14.7	1.05 U
Hackensack River Reach A		4	0.96	1.15 U	11.6	11.2	13.7	11.5	1.04 U
RSD				NA	NA	17%	16%	12%	NA
Control		4	0.98	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.02 U
Control		4	0.96	1.15 U	0.75 U	0.32 U	0.40 U	0.55 U	1.04 U
RPD				NA	NA	NA	NA	NA	NA
I-Stat				NA	NA	NA	NA	NA	NA

(a) U Undetected at or above given concentration.
(b) Mean of replicated sample.
(c) NS Not spiked.
(d) Recovery outside quality control range (30-150%).
(e) NA Not applicable.
(f) Outside relative standard deviation range (≤30%).

TABLE B.11. Quality Control Summary for Polychlorinated Biphenyls Congeners 66 through 183, Federal Projects in New York and New Jersey

Water Treatment	Replicate	Batch	Sample Vol.(L)	PCBs (ng/L wet weight) PCB 66	PCB 101	PCB 87	PCB 118	PCB 153	PCB 105	PCB 138	PCB 183
Method Blank											
Blank		1	1.00	0.42 U[a]	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.00 U
Blank		2	1.00	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.00 U
Blank		3	1.00	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	2.04	0.18 U	1.00 U
Blank		4	1.00	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.00 U
Matrix Spikes											
Mud Dump Site[b]		2	0.90	NS[c]	0.19 U	NS	NS	0.17 U	NS	0.18 U	NS
Mud Dump Site MS		2	0.90	NS	50.3	NS	NS	29.7	NS	23.0	NS
Amount Recovered				NS	50.3	NS	NS	29.7	NS	23.0	NS
Amount Spiked				NS	50	NS	NS	29.3	NS	22.7	NS
Percent Recovery				NS	101%	NS	NS	101%	NS	101%	NS
Mud Dump Site[b]		4	0.90	NS	0.19 U	NS	NS	0.17 U	NS	0.18 U	NS
Mud Dump Site MS		4	0.90	NS	44.8	NS	NS	28.9	NS	21.8	NS
Amount Recovered				NS	44.8	NS	NS	28.9	NS	21.8	NS
Amount Spiked				NS	43.8	NS	NS	25.6	NS	19.8	NS
Percent Recovery				NS	102%	NS	NS	113%	NS	110%	NS
Replicate Analysis											
Dredging Site Water Samples											
Arthur Kill Reach A	1	2	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.11 U
Arthur Kill Reach A	2	2	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.11 U
Arthur Kill Reach A	3	2	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.11 U
RSD				NA[d]	NA	NA	NA	NA	NA	NA	NA
Arthur Kill Reach B	1	1	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.11 U
Arthur Kill Reach B	2	1	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.71	1.11 U
Arthur Kill Reach B	3	1	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.11 U
RSD				NA	NA	NA	NA	NA	NA	NA	NA
Arthur Kill Reach C	1	2	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.11 U
Arthur Kill Reach C	2	2	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.11 U
Arthur Kill Reach C	3	2	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	1.27	1.11 U
RSD				NA	NA	NA	NA	NA	NA	NA	NA

TABLE B.11. (contd)

Water Treatment	Replicate	Batch	Sample Vol.(L)	PCBs (ng/L wet weight) PCB 66	PCB 101	PCB 87	PCB 118	PCB 153	PCB 105	PCB 138	PCB 183
Port Elizabeth Reach A	1	1	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	1.26	0.18 U	1.11 U
Port Elizabeth Reach A	2	1	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	1.28	0.18 U	1.11 U
Port Elizabeth Reach A	3	1	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.11 U
RSD				NA	NA	NA	NA	NA	NA	NA	NA
Port Elizabeth Reach B	1	2	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	1.12	0.18 U	1.11 U
Port Elizabeth Reach B	2	2	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.99	0.18 U	1.11 U
Port Elizabeth Reach B	3	2	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.11 U
RSD				NA	NA	NA	NA	NA	NA	NA	NA
Hackensack River Reach A	1	1	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	1.6	0.18 U	1.11 U
Hackensack River Reach A	2	1	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.11 U
Hackensack River Reach A	3	1	0.90	0:42 U	0.19 U	0.35 U	0.23 U	0.17 U	1.88	0.18 U	1.11 U
RSD				NA	NA	NA	NA	NA	NA	NA	NA
Mud Dump Site	1	2	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.11 U
Mud Dump Site	2	2	0.90	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.11 U
Mud Dump Site	3	4	0.95	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.05 U
RSD				NA	NA	NA	NA	NA	NA	NA	NA
Elutriate Water Samples											
Arthur Kill Reach A	1	3	0.91	7.43	6.75	0.35 U	6.82	7.70	56.0	6.54	1.10 U
Arthur Kill Reach A	2	3	0.92	8.86	7.99	0.35 U	6.21	7.96	54.6	7.14	1.09 U
Arthur Kill Reach A	3	3	0.90	7.12	6.36	0.35 U	5.76	6.45	59.0	5.85	1.11 U
RSD				12%	12%	NA	8%	11%	4%	10%	NA
Arthur Kill Reach B	1	4	0.92	24.8	16.2	0.35 U	13.5	12.3	0.17 U	11.2	1.09 U
Arthur Kill Reach B	2	4	0.96	26.7	17.8	0.35 U	15.3	14.1	0.17 U	12.4	1.04 U
Arthur Kill Reach B	3	4	0.94	59.0	40.3	0.35 U	36.4	34.1	0.17 U	29.7	1.06 U
RSD				52%(e)	54%(e)	NA	59%(e)	60%(e)	NA	58%(e)	NA
Arthur Reach Kill C	1	3	0.74	637 D(f)	452	0.35 U	379	304	150	289	10.1
Arthur Reach Kill C	2	3	0.83	663 D	453	0.35 U	386	310	159	300	1.21 U
Arthur Reach Kill C	3	3	0.90	574 D	414	0.35 U	351	283	145	274	1.11 U
RSD				7%	5%	NA	5%	5%	5%	5%	NA
Port Elizabeth Reach A	1	3	0.81	31.3	33.7	0.35 U	27.8	38.0	12.3	32.7	1.24 U
Port Elizabeth Reach A	2	3	0.80	33.7	36.1	0.35 U	30.1	40.8	13.3	35.7	1.25 U
Port Elizabeth Reach A	3	3	0.79	30.1	31.5	0.35 U	26.4	35.3	11.4	30.2	1.27 U
RSD				6%	7%	NA	7%	7%	8%	8%	NA

TABLE B.11. (contd)

Water Treatment	Replicate	Batch	Sample Vol.(L)	PCBs (ng/L wet weight) PCB 66	PCB 101	PCB 87	PCB 118	PCB 153	PCB 105	PCB 138	PCB 183
Port Elizabeth Reach B	1	3	0.89	15.0	13.2	0.35 U	12.5	13.4	6.88 B[g]	11.6	1.12 U
Port Elizabeth Reach B	2	3	0.82	15.6	13.7	0.35 U	12.2	12.7	6.90 B	11.4	1.22 U
Port Elizabeth Reach B	3	3	0.89	22.1	19.1	0.35 U	17.2	18.0	8.16 B	15.8	1.12 U
RSD				22%	21%	NA	20%	20%	10%	19%	NA
Hackensack River Reach A	1	4	0.92	11.3	9.5	0.35 U	8.19	9.72	0.17 U	5.9	1.09 U
Hackensack River Reach A	2	4	0.95	15.2	12.0	0.35 U	9.77	12.7	0.17 U	8.49	1.05 U
Hackensack River Reach A	3	4	0.96	9.79	7.85	0.35 U	6.94	8.76	0.17 U	5.4	1.04 U
RSD				23%	21%	NA	17%	20%	NA	25%	NA
Control	1	4	0.98	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.02 U
Control	2	4	0.96	0.42 U	0.19 U	0.35 U	0.23 U	0.17 U	0.17 U	0.18 U	1.04 U
RPD				NA	NA	NA	NA	NA	NA	NA	NA
I-Stat				NA	NA	NA	NA	NA	NA	NA	NA

(a) U Undetected at or above given concentration.
(b) Mean of replicated sample.
(c) NS Not spiked.
(d) NA Not applicable.
(e) Value exceeds relative standard deviation range of ≤30%.
(f) D Diluted (1:10).
(g) B Result is less than five times the concentration in analyte.

TABLE B.12. Quality Control Summary for Polychlorinated Biphenyls Congeners 184 through 209, Federal Projects in New York and New Jersey

Water Treatment	Replicate	Batch	Sample Vol.(L)	PCBs (ng/L wet weight) PCB 184	PCB 187	PCB 128	PCB 180	PCB 170	PCB 195	PCB 206	PCB 209
Method Blank											
Blank		1	1.0	1.00 U[a]	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Blank		2	1.0	1.00 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Blank		3	1.0	1.00 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Blank		4	1.0	1.00 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Matrix Spikes											
Mud Dump Site[b]		2	0.90	NS[c]	NS	NS	NS	NS	NS	NS	NS
Mud Dump Site MS		2	0.90	NS	NS	NS	NS	NS	NS	NS	NS
Amount Recovered				NS	NS	NS	NS	NS	NS	NS	NS
Amount Spiked				NS	NS	NS	NS	NS	NS	NS	NS
Percent Recovery				NS	NS	NS	NS	NS	NS	NS	NS
Mud Dump Site[b]		4	0.90	NS	NS	NS	NS	NS	NS	NS	NS
Mud Dump Site MS		4	0.90	NS	NS	NS	NS	NS	NS	NS	NS
Amount Recovered				NS	NS	NS	NS	NS	NS	NS	NS
Amount Spiked				NS	NS	NS	NS	NS	NS	NS	NS
Percent Recovery				NS	NS	NS	NS	NS	NS	NS	NS
Replicate Analysis											
Dredging Site Water Samples											
Arthur Kill Reach A	1	2	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Arthur Kill Reach A	2	2	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Arthur Kill Reach A	3	2	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
RSD				NA[d]	NA	NA	NA	NA	NA	NA	NA
Arthur Kill Reach B	1	1	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Arthur Kill Reach B	2	1	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Arthur Kill Reach B	3	1	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
RSD				NA	NA	NA	NA	NA	NA	NA	NA
Arthur Kill Reach C	1	2	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Arthur Kill Reach C	2	2	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Arthur Kill Reach C	3	2	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
RSD				NA	NA	NA	NA	NA	NA	NA	NA

TABLE B.12. (contd)

Water Treatment	Replicate	Batch	Sample Vol.(L)	PCBs (ng/L wet weight) PCB 184	PCB 187	PCB 128	PCB 180	PCB 170	PCB 195	PCB 206	PCB 209
Port Elizabeth Reach A	1	1	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Port Elizabeth Reach A	2	1	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Port Elizabeth Reach A	3	1	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
RSD				NA	NA	NA	NA	NA	NA	NA	NA
Port Elizabeth Reach B	1	2	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Port Elizabeth Reach B	2	2	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Port Elizabeth Reach B	3	2	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
RSD				NA	NA	NA	NA	NA	NA	NA	NA
Hackensack River Reach A	1	1	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Hackensack River Reach A	2	1	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Hackensack River Reach A	3	1	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
RSD				NA	NA	NA	NA	NA	NA	NA	NA
Mud Dump Site	1	2	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Mud Dump Site	2	2	0.90	1.11 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Mud Dump Site	3	4	0.95	1.05 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
RSD				NA	NA	NA	NA	NA	NA	NA	NA
Elutriate Water Samples											
Arthur Kill Reach A	1	3	0.91	1.10 U	2.60	0.29 U	4.67	0.35 U	1.12 U	0.23 U	0.24 U
Arthur Kill Reach A	2	3	0.92	1.29	2.75	1.17	5.14	0.35 U	1.12 U	0.23 U	0.24 U
Arthur Kill Reach A	3	3	0.90	1.11 U	2.28	0.29 U	3.99	0.35 U	1.12 U	0.23 U	0.24 U
RSD				NA	9%	NA	13%	NA	NA	NA	NA
Arthur Kill Reach B	1	4	0.92	1.69	4.38	2.01	7.98	0.35 U	1.12 U	1.76	0.24 U
Arthur Kill Reach B	2	4	0.96	1.72	4.80	1.98	8.40	0.35 U	1.12 U	1.98	0.24 U
Arthur Kill Reach B	3	4	0.94	3.85	11.3	3.48	19.0	9.09	1.71	3.93	0.24 U
RSD				51%(e)	57%(e)	34%(e)	53%(e)	NA	NA	47%(e)	NA
Arthur Reach Kill C	1	3	0.74	45.2	106	49.2	164	76.8	13.6	28.6	0.24 U
Arthur Reach Kill C	2	3	0.83	48.6	112	51.6	177	81.6	14.2	30.1	0.24 U
Arthur Reach Kill C	3		0.90	44.5	101	46.7	159	75.1	12.6	26.9	0.24 U
RSD				5%	5%	5%	6%	4%	6%	6%	NA
Port Elizabeth Reach A	1	3	0.81	6.61	14.4	4.87	23.7	10.5	2.77	5.58	0.24 U
Port Elizabeth Reach A	2	3	0.80	7.10	15.5	5.32	25.9	11.3	2.47	6.18	0.24 U
Port Elizabeth Reach A	3	3	0.79	5.75	13.0	4.66	21.6	9.96	2.64	5.22	0.24 U
RSD				11%	9%	7%	9%	6%	6%	9%	NA

TABLE B.12. (contd)

Water Treatment	Replicate	Batch	Sample Vol.(L)	PCBs (ng/L wet weight) PCB 184	PCB 187	PCB 128	PCB 180	PCB 170	PCB 195	PCB 206	PCB 209
Port Elizabeth Reach B	1	3	0.89	2.22	4.68	1.97	7.13	3.48	1.12 U	2.10	0.24 U
Port Elizabeth Reach B	2	3	0.82	1.88	4.42	1.94	8.29	3.62	1.12 U	2.21	0.24 U
Port Elizabeth Reach B	3	3	0.89	2.89	6.29	2.61	9.76	4.83	1.12 U	3.11	0.24 U
RSD				22%	20%	17%	16%	19%	NA	22%	NA
Hackensack River Reach A	1	4	0.92	1.99	0.36 U	0.29 U	4.97	0.35 U	1.12 U	0.23 U	0.24 U
Hackensack River Reach A	2	4	0.95	1.05 U	4.32	1.91	6.22	0.35 U	1.12 U	1.76	0.24 U
Hackensack River Reach A	3	4	0.96	1.04 U	3.13	1.13	4.74	0.35 U	1.12 U	0.23 U	0.24 U
RSD				NA	NA	NA	15%	NA	NA	NA	NA
Control	1	4	0.98	1.02 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
Control	2	4	0.96	1.04 U	0.36 U	0.29 U	0.32 U	0.35 U	1.12 U	0.23 U	0.24 U
RPD				NA	NA	NA	NA	NA	NA	NA	NA
I-Stat				NA	NA	NA	NA	NA	NA	NA	NA

(a) U Undetected at or above given concentration.
(b) Mean of replicated sample.
(c) NS Not spiked.
(d) NA Not applicable.
(e) Value exceeds relative standard deviation range of ≤30%.

TABLE B.13. Surrogate Recoveries for Chlorinated Pesticides and Polychlorinated Biphenyls in Water, Federal Projects in New York and New Jersey

Water Treatment	Replicate	Batch	Sample Vol.(L)	Surrogate Recoveries PCB 103	PCB 198
Dredging Site Water Samples					
Arthur Kill Reach A	1	2	0.90	66%	67%
Arthur Kill Reach A	2	2	0.90	80%	86%
Arthur Kill Reach A	3	2	0.90	47%	47%
Arthur Kill Reach B	1	1	0.90	45%	46%
Arthur Kill Reach B	2	1	0.90	71%	78%
Arthur Kill Reach B	3	1	0.90	48%	52%
Arthur Kill Reach C	1	2	0.90	68%	75%
Arthur Kill Reach C	2	2	0.90	75%	81%
Arthur Kill Reach C	3	2	0.90	66%	80%
Port Elizabeth Reach A	1	1	0.90	71%	79%
Port Elizabeth Reach A	2	1	0.90	77%	86%
Port Elizabeth Reach A	3	1	0.90	57%	58%
Port Elizabeth Reach B	1	2	0.90	79%	83%
Port Elizabeth Reach B	2	2	0.90	79%	85%
Port Elizabeth Reach B	3	2	0.90	73%	82%
Hackensack River Reach A	1	1	0.90	75%	82%
Hackensack River Reach A	2	1	0.90	71%	74%
Hackensack River Reach A	3	1	0.90	67%	70%
Mud Dump Site	2	2	0.90	62%	65%
Mud Dump Site	3	2	0.90	53%	57%
Mud Dump Site	4	4	0.95	67%	73%
Elutriate Water Samples					
Arthur Kill Reach A	1	3	0.91	51%	50%
Arthur Kill Reach A	2	3	0.92	64%	63%
Arthur Kill Reach A	3	3	0.90	62%	61%
Arthur Kill Reach B	1	4	0.92	67%	65%
Arthur Kill Reach B	2	4	0.96	67%	63%
Arthur Kill Reach B	3	4	0.94	68%	63%
Arthur Kill Reach C	1	3	0.74	185%[a]	59%
Arthur Kill Reach C	2	3	0.83	253%[a]	74%
Arthur Kill Reach C	3	3	0.90	220%[a]	64%

TABLE B.13. (contd)

Water Treatment	Replicate	Batch	Sample Vol.(L)	Surrogate Recoveries PCB 103	PCB 198
Port Elizabeth Reach A	1	3	0.81	61%	59%
Port Elizabeth Reach A	2	3	0.80	53%	52%
Port Elizabeth Reach A	3	3	0.79	62%	62%
Port Elizabeth Reach B	1	3	0.89	53%	51%
Port Elizabeth Reach B	2	3	0.82	56%	56%
Port Elizabeth Reach B	3	3	0.89	59%	57%
Hackensack River Reach A	1	4	0.92	54%	52%
Hackensack River Reach A	2	4	0.95	70%	70%
Hackensack River Reach A	3	4	0.96	71%	69%
Control	1	4	0.98	68%	70%
Control	2	4	0.96	66%	75%
Quality Control Summary					
Method Blank					
Blank		1	1.0	77%	79%
Blank		2	1.0	57%	61%
Blank		3	1.0	72%	75%
Blank		4	1.0	68%	70%
Matrix Spikes					
Mud Dump Site[(b)]		2	0.90		
Mud Dump Site MS		2	0.90	63%	73%
Amount Recovered					
Amount Spiked					
Percent Recovery					
Mud Dump Site[(b)]		4	0.90		
Mud Dump Site MS		4	0.90	63%	73%
Amount Recovered					
Amount Spiked					
Percent Recovery					
Replicate Analysis					
Dredging Site Water Samples					
Arthur Kill Reach A		2	0.90	66%	67%
Arthur Kill Reach A		2	0.90	80%	86%
Arthur Kill Reach A		2	0.90	47%	47%

TABLE B.13. (contd)

Water Treatment	Replicate	Batch	Sample Vol.(L)	Surrogate Recoveries PCB 103	PCB 198
Arthur Kill Reach B		1	0.90	45%	46%
Arthur Kill Reach B		1	0.90	71%	78%
Arthur Kill Reach B		1	0.90	48%	52%
Arthur Kill Reach C		2	0.90	68%	75%
Arthur Kill Reach C		2	0.90	75%	81%
Arthur Kill Reach C		2	0.90	66%	80%
Port Elizabeth Reach A		1	0.90	71%	79%
Port Elizabeth Reach A		1	0.90	77%	86%
Port Elizabeth Reach A		1	0.90	57%	58%
Port Elizabeth Reach B		2	0.90	79%	83%
Port Elizabeth Reach B		2	0.90	79%	85%
Port Elizabeth Reach B		2	0.90	73%	82%
Hackensack River Reach A		1	0.90	75%	82%
Hackensack River Reach A		1	0.90	71%	74%
Hackensack River Reach A		1	0.90	67%	70%
Mud Dump Site		2	0.90	62%	65%
Mud Dump Site		2	0.90	53%	57%
Mud Dump Site		4	0.95	67%	73%
Elutriate Water Samples					
Arthur Kill Reach A		3	0.91	51%	50%
Arthur Kill Reach A		3	0.92	64%	63%
Arthur Kill Reach A		3	0.90	62%	61%
Arthur Kill Reach B		4	0.92	67%	65%
Arthur Kill Reach B		4	0.96	67%	63%
Arthur Kill Reach B		4	0.94	68%	63%
Arthur Reach Kill C		3	0.74	185%[a]	59%
Arthur Reach Kill C		3	0.83	253%[a]	74%
Arthur Reach Kill C		3	0.90	220%[a]	64%
Port Elizabeth Reach A		3	0.81	61%	59%
Port Elizabeth Reach A		3	0.80	53%	52%
Port Elizabeth Reach A		3	0.79	62%	62%
Port Elizabeth Reach B		3	0.89	53%	51%
Port Elizabeth Reach B		3	0.82	56%	56%
Port Elizabeth Reach B		3	0.89	59%	57%

TABLE B.13. (contd)

Water Treatment	Replicate	Batch	Sample Vol.(L)	Surrogate Recoveries PCB 103	PCB 198
Hackensack River Reach A		4	0.92	54%	52%
Hackensack River Reach A		4	0.95	70%	70%
Hackensack River Reach A		4	0.96	71%	69%
Control		4	0.98	68%	70%
Control		4	0.96	66%	75%

(a) Recovery outside Quality Control range (30-150%).
(b) Mean of replicated sample.

APPENDIX C

Water-Column Toxicity Tests

TABLE C.1. Test Results for 96-Hour *M. beryllina* Reference Toxicant Test, Federal Projects in New York and New Jersey

Copper Concentration (µg/L)	Replicate	*M. beryllina* Live[a]	*M. beryllina* Dead or Missing	Proportion Surviving	Mean Percent Surviving
0	1	10	0	1.00	
0	2	8	2	0.80	
0	3	9	1	0.90	94%
0	4	10	0	1.00	
0	5	10	0	1.00	
16	1	8	2	0.80	
16	2	9	1	0.90	
16	3	9	1	0.90	87%
64	1	10	0	1.00	
64	2	10	0	1.00	
64	3	9	1	0.90	97%
160	1	6	4	0.60	
160	2	10	0	1.00	
160	3	8	2	0.80	80%
400	1	0	10	0.00	
400	2	0	10	0.00	
400	3	0	10	0.00	0%
Brine Control	1	10	0	1.00	
Brine Control	2	10	0	1.00	
Brine Control	3	9	1	0.90	98%
Brine Control	4	10	0	1.00	
Brine Control	5	10	0	1.00	

(a) Survival based on initial exposure of 10 organisms per replicate.

TABLE C.2. Water Quality Summary for 96-Hour *M. beryllina* Reference Toxicant Test, Federal Projects in New York and New Jersey

Copper Concentration (µg/L)	Temperature (°C)		pH		Dissolved Oxygen (mg/L)		Salinity (o/oo)	
	Min	Max	Min	Max	Min	Max	Min	Max
Acceptable Range	18.0	22.0	7.30	8.30	3.0	NA[(a)]	28.0	32.0
0	19.6	20.4	7.57	8.04	4.0	8.0	30.0	31.5
16	19.6	20.4	7.90	8.05	7.0	7.9	30.0	31.5
64	19.6	20.5	7.82	8.05	7.1	7.8	30.0	31.5
160	19.6	20.4	7.89	8.06	7.1	7.8	30.0	32.0
400	19.6	19.8	7.92	8.08	7.3	7.9	30.5	31.0
Brine Control	19.5	20.4	7.71	8.09	6.0	7.5	29.5	31.0

(a) NA Not applicable.

TABLE C.3. Test Results for 96-Hour *M. beryllina* Water-Column Test, Federal Projects in New York and New Jersey

Sediment Treatment	Concentration (Percent SPP)	Replicate	*M. beryllina* Live[a]	*M. beryllina* Dead or Missing	Proportion Surviving	Mean Percent Surviving
Arthur Kill Reach A						
COMP AK-A	0	1	9	1	0.90	
COMP AK-A	0	2	9	1	0.90	
COMP AK-A	0	3	7	3	0.70	84%
COMP AK-A	0	4	8	2	0.80	
COMP AK-A	0	5	9	1	0.90	
COMP AK-A	10	1	10	0	1.00	
COMP AK-A	10	2	8	2	0.80	
COMP AK-A	10	3	9	1	0.90	90%
COMP AK-A	10	4	9	1	0.90	
COMP AK-A	10	5	9	1	0.90	
COMP AK-A	50	1	0	10	0.00	
COMP AK-A	50	2	0	10	0.00	
COMP AK-A	50	3	0	10	0.00	0%
COMP AK-A	50	4	0	10	0.00	
COMP AK-A	50	5	0	10	0.00	
COMP AK-A	100	1	0	10	0.00	
COMP AK-A	100	2	0	10	0.00	
COMP AK-A	100	3	0	10	0.00	0%
COMP AK-A	100	4	0	10	0.00	
COMP AK-A	100	5	0	10	0.00	
Arthur Kill Reach B						
COMP AK-B	0	1	9	1	0.90	
COMP AK-B	0	2	10	0	1.00	
COMP AK-B	0	3	10	0	1.00	98%
COMP AK-B	0	4	10	0	1.00	
COMP AK-B	0	5	10	0	1.00	
COMP AK-B	10	1	10	0	1.00	
COMP AK-B	10	2	10	0	1.00	
COMP AK-B	10	3	9	1	0.90	98%
COMP AK-B	10	4	10	0	1.00	
COMP AK-B	10	5	10	0	1.00	
COMP AK-B	50	1	0	10	0.00	
COMP AK-B	50	2	0	10	0.00	
COMP AK-B	50	3	0	10	0.00	0%
COMP AK-B	50	4	0	10	0.00	
COMP AK-B	50	5	0	10	0.00	
COMP AK-B	100	1	0	10	0.00	
COMP AK-B	100	2	0	10	0.00	
COMP AK-B	100	3	0	10	0.00	0%
COMP AK-B	100	4	0	10	0.00	
COMP AK-B	100	5	0	10	0.00	

TABLE C.3. (contd)

Sediment Treatment	Concentration (Percent SPP)	Replicate	*M. beryllina* Live[a]	*M. beryllina* Dead or Missing	Proportion Surviving	Mean Percent Surviving
Arthur Kill Reach C						
COMP AK-C	0	1	7	3	0.70	
COMP AK-C	0	2	10	0	1.00	
COMP AK-C	0	3	10	0	1.00	92%
COMP AK-C	0	4	10	0	1.00	
COMP AK-C	0	5	9	1	0.90	
COMP AK-C	10	1	8	2	0.80	
COMP AK-C	10	2	9	1	0.90	
COMP AK-C	10	3	9	1	0.90	88%
COMP AK-C	10	4	10	0	1.00	
COMP AK-C	10	5	8	2	0.80	
COMP AK-C	50	1	0	10	0.00	
COMP AK-C	50	2	0	10	0.00	
COMP AK-C	50	3	0	10	0.00	12%
COMP AK-C	50	4	6	4	0.60	
COMP AK-C	50	5	0	10	0.00	
COMP AK-C	100	1	0	10	0.00	
COMP AK-C	100	2	0	10	0.00	
COMP AK-C	100	3	0	10	0.00	0%
COMP AK-C	100	4	0	10	0.00	
COMP AK-C	100	5	0	10	0.00	
Port Elizabeth Reach A						
COMP PE-A	0	1	10	0	1.00	
COMP PE-A	0	2	10	0	1.00	
COMP PE-A	0	3	9	1	0.90	96%
COMP PE-A	0	4	9	1	0.90	
COMP PE-A	0	5	10	0	1.00	
COMP PE-A	10	1	10	0	1.00	
COMP PE-A	10	2	9	1	0.90	
COMP PE-A	10	3	10	0	1.00	98%
COMP PE-A	10	4	10	0	1.00	
COMP PE-A	10	5	10	0	1.00	
COMP PE-A	50	1	4	6	0.40	
COMP PE-A	50	2	7	3	0.70	
COMP PE-A	50	3	8	2	0.80	68%
COMP PE-A	50	4	8	2	0.80	
COMP PE-A	50	5	7	3	0.70	
COMP PE-A	100	1	0	10	0.00	
COMP PE-A	100	2	0	10	0.00	
COMP PE-A	100	3	0	10	0.00	0%
COMP PE-A	100	4	0	10	0.00	
COMP PE-A	100	5	0	10	0.00	

TABLE C.3. (contd)

Sediment Treatment	Concentration (Percent SPP)	Replicate	*M. beryllina* Live[a]	*M. beryllina* Dead or Missing	Proportion Surviving	Mean Percent Surviving
Port Elizabeth Reach B						
COMP PE-B	0	1	9	1	0.90	
COMP PE-B	0	2	9	1	0.90	
COMP PE-B	0	3	10	0	1.00	96%
COMP PE-B	0	4	10	0	1.00	
COMP PE-B	0	5	10	0	1.00	
COMP PE-B	10	1	10	0	1.00	
COMP PE-B	10	2	9	1	0.90	
COMP PE-B	10	3	10	0	1.00	96%
COMP PE-B	10	4	10	0	1.00	
COMP PE-B	10	5	9	1	0.90	
COMP PE-B	50	1	10	0	1.00	
COMP PE-B	50	2	7	3	0.70	
COMP PE-B	50	3	8	2	0.80	84%
COMP PE-B	50	4	7	3	0.70	
COMP PE-B	50	5	10	0	1.00	
COMP PE-B	100	1	0	10	0.00	
COMP PE-B	100	2	0	10	0.00	
COMP PE-B	100	3	0	10	0.00	0%
COMP PE-B	100	4	0	10	0.00	
COMP PE-B	100	5	0	10	0.00	
Hackensack River Reach A						
COMP HR-A	0	1	10	0	1.00	
COMP HR-A	0	2	10	0	1.00	
COMP HR-A	0	3	10	0	1.00	100%
COMP HR-A	0	4	10	0	1.00	
COMP HR-A	0	5	10	0	1.00	
COMP HR-A	10	1	10	0	1.00	
COMP HR-A	10	2	10	0	1.00	
COMP HR-A	10	3	10	0	1.00	92%
COMP HR-A	10	4	8	2	0.80	
COMP HR-A	10	5	8	2	0.80	
COMP HR-A	50	1	6	4	0.60	
COMP HR-A	50	2	4	6	0.40	
COMP HR-A	50	3	5	5	0.50	52%
COMP HR-A	50	4	7	3	0.70	
COMP HR-A	50	5	4	6	0.40	
COMP HR-A	100	1	0	10	0.00	
COMP HR-A	100	2	0	10	0.00	
COMP HR-A	100	3	0	10	0.00	0%
COMP HR-A	100	4	0	10	0.00	
COMP HR-A	100	5	0	10	0.00	

(a) Survival based on initial exposure of 10 organisms per replicate.

TABLE C.4. Water Quality Summary for 96-Hour *M. beryllina* Water-Column Test, Federal projects in New York and New Jersey

Sediment Treatment	Concentration (Percent SPP)	Temperature (C)		pH		Dissolved Oxygen (mg/L)		Salinity (o/oo)	
		Min	Max	Min	Max	Min	Max	Min	Max
Acceptable Range		18.0	22.0	7.30	8.30	3.0	NA[a]	28.0	32.0
Arthur Kill Reach A									
COMP AK-A	0	19.5	20.4	7.81	8.07	6.9	8.6	28.0	30.0
COMP AK-A	10	19.5	20.4	7.84	8.13[b]	7.0	8.4	28.0	30.0
COMP AK-A	50	19.5	20.5	7.51	8.39[b]	6.6	7.2	28.0	30.0
COMP AK-A	100	19.5	19.9	7.33	8.35[b]	3.6	7.0	29.5	30.0
Arthur Kill Reach B									
COMP AK-B	0	19.5	20.5	7.83	8.06	6.9	8.7	28.0	29.0
COMP AK-B	10	19.5	20.4	7.80	8.12[b]	6.9	8.4	28.0	29.0
COMP AK-B	50	19.5	19.9	7.51	8.33[b]	6.3	7.1	28.0	28.0
COMP AK-B	100	19.5	20.0	7.37	8.26	3.5	6.9	28.0	28.0
Arthur Kill Reach C									
COMP AK-C	0	19.5	20.4	7.81	8.07	6.7	8.3	28.0	30.0
COMP AK-C	10	19.5	20.4	7.68	8.15[b]	6.7	8.0	28.5	30.0
COMP AK-C	50	19.6	20.4	7.39	8.39[b]	6.0	7.1	28.5	30.0
COMP AK-C	100	19.6	19.8	7.30	8.39[b]	3.3	7.2	29.0	30.0
Port Elizabeth Reach A									
COMP PE-A	0	19.6	20.5	7.66	8.07	4.5	8.4	28.0	30.0
COMP PE-A	10	19.5	20.4	7.78	8.11[b]	6.8	8.0	28.0	30.0
COMP PE-A	50	19.5	20.4	7.49	8.32[b]	5.2	7.3	28.5	30.0
COMP PE-A	100	19.5	20.0	7.31	8.39[b]	4.1	7.2	28.0	30.0
Port Elizabeth Reach B									
COMP PE-B	0	19.5	20.4	7.80	8.09	7.0	8.3	29.0	30.0
COMP PE-B	10	19.5	20.4	7.84	8.14	6.9	8.0	29.0	30.0
COMP PE-B	50	19.5	20.3	7.54	8.26[b]	3.0	7.2	29.0	30.0
COMP PE-B	100	19.6	19.9	7.54	8.41[b]	4.7	7.2	29.5	30.5
Hackensack River Reach A									
COMP HR-A	0	19.5	20.5	7.82	8.06	6.1	8.7	28.5	30.0
COMP HR-A	10	19.4	20.4	7.89	8.12[b]	6.9	8.6	28.0	30.0
COMP HR-A	50	19.4	20.4	7.53	8.31[b]	6.6	7.4	28.5	30.0
COMP HR-A	100	19.5	20.0	7.38	8.33[b]	4.3	7.3	28.5	30.0

(a) NA Not applicable.
(b) Data point out of range.

TABLE C.5. Test Results for 96-Hour *M. bahia* Reference Toxicant Test, Federal Projects in New York and New Jersey

Copper Concentration (µg/L)	Replicate	M. bahia		Mean Proportion Surviving	Proportion Surviving	Standard Deviation
		Live[(a)]	Dead or Missing			
0	1	10	0	1.00		
0	2	9	1	0.90		
0	3	10	0	1.00	97%	0.06
32	1	10	0	1.00		
32	2	9	1	0.90		
32	3	10	0	1.00	97%	0.06
80	1	10	0	1.00		
80	2	9	1	0.90		
80	3	9	1	0.90	93%	0.06
200	1	8	2	0.80		
200	2	9	1	0.90		
200	3	7	3	0.70	80%	0.10
500	1	0	10	0.00		
500	2	0	10	0.00		
500	3	1	9	0.10	3%	0.06

(a) Survival based on initial exposure of 10 organisms per replicate.

TABLE C.6. Water Quality Summary for 96-Hour *M. bahia* Reference Toxicant Test, Federal Projects in New York and New Jersey

Copper Concentration (µg/L)	Temperature (C)		pH		Dissolved Oxygen (mg/L)		Salinity (o/oo)	
	Min	Max	Min	Max	Min	Max	Min	Max
Acceptable Range	18.0	22.0	7.30	8.30	4.0	NA[a]	28.0	32.0
0	19.5	20.5	7.53	7.99	4.6	7.5	30.5	31.5
32	19.5	20.5	7.42	7.99	3.4[b]	7.5	30.5	32.0
80	19.5	20.6	7.51	7.98	4.9	7.6	30.5	31.5
200	19.6	20.6	7.53	7.98	4.7	7.6	30.5	32.0
500	19.6	20.4	7.71	8.01	5.8	7.6	30.5	32.0

(a) NA Not applicable.
(b) Data point out of range.

TABLE C.7. Test Results for 96-Hour *M. bahia* Water-Column Test, Federal Projects in New York and New Jersey

Sediment Treatment	Concentration (Percent SPP)	Replicate	*M. bahia* Live[a]	*M. bahia* Dead or Missing	Proportion Surviving	Mean Percent Surviving
Arthur Kill Reach A						
COMP AK-A	0 DSW-NSA[b]	1	10	0	1.00	
COMP AK-A	0 DSW-NSA	2	9	1	0.90	97%
COMP AK-A	0 DSW-NSA	3	10	0	1.00	
COMP AK-A	0 MDSW[c]	1	9	1	0.90	
COMP AK-A	0 MDSW	2	10	0	1.00	
COMP AK-A	0 MDSW	3	9	1	0.90	96%
COMP AK-A	0 MDSW	4	10	0	1.00	
COMP AK-A	0 MDSW	5	10	0	1.00	
COMP AK-A	10	1	10	0	1.00	
COMP AK-A	10	2	10	0	1.00	
COMP AK-A	10	3	10	0	1.00	100%
COMP AK-A	10	4	10	0	1.00	
COMP AK-A	10	5	10	0	1.00	
COMP AK-A	50	1	6	4	0.60	
COMP AK-A	50	2	5	5	0.50	
COMP AK-A	50	3	5	5	0.50	56%
COMP AK-A	50	4	7	3	0.70	
COMP AK-A	50	5	5	5	0.50	
COMP AK-A	100	1	0	10	0.00	
COMP AK-A	100	2	0	10	0.00	
COMP AK-A	100	3	0	10	0.00	0%
COMP AK-A	100	4	0	10	0.00	
COMP AK-A	100	5	0	10	0.00	
Arthur Kill Reach B						
COMP AK-B	0 DSW-NSA	1	9	1	0.90	
COMP AK-B	0 DSW-NSA	2	9	1	0.90	90%
COMP AK-B	0 DSW-NSA	3	9	1	0.90	
COMP AK-B	0 MDSW	1	9	1	0.90	
COMP AK-B	0 MDSW	2	10	0	1.00	
COMP AK-B	0 MDSW	3	10	0	1.00	96%
COMP AK-B	0 MDSW	4	10	0	1.00	
COMP AK-B	0 MDSW	5	9	1	0.90	
COMP AK-B	10	1	9	1	0.90	
COMP AK-B	10	2	8	2	0.80	
COMP AK-B	10	3	8	2	0.80	80%
COMP AK-B	10	4	8	2	0.80	
COMP AK-B	10	5	7	3	0.70	
COMP AK-B	50	1	0	10	0.00	
COMP AK-B	50	2	1	9	0.10	
COMP AK-B	50	3	1	9	0.10	14%
COMP AK-B	50	4	3	7	0.30	
COMP AK-B	50	5	2	8	0.20	

TABLE C.7. (contd)

Sediment Treatment	Concentration (Percent SPP)	Replicate	*M. bahia* Live[a]	*M. bahia* Dead or Missing	*M. bahia* Proportion Surviving	*M. bahia* Mean Percent Surviving
COMP AK-B	100	1	0	10	0.00	
COMP AK-B	100	2	0	10	0.00	
COMP AK-B	100	3	0	10	0.00	0%
COMP AK-B	100	4	0	10	0.00	
COMP AK-B	100	5	0	10	0.00	
Arthur Kill Reach C						
COMP AK-C	0 DSW-NSA	1	10	0	1.00	
COMP AK-C	0 DSW-NSA	2	9	1	0.90	93%
COMP AK-C	0 DSW-NSA	3	9	1	0.90	
COMP AK-C	0 MDSW	1	10	0	1.00	
COMP AK-C	0 MDSW	2	10	0	1.00	
COMP AK-C	0 MDSW	3	9	1	0.90	96%
COMP AK-C	0 MDSW	4	10	0	1.00	
COMP AK-C	0 MDSW	5	9	1	0.90	
COMP AK-C	10	1	6	4	0.60	
COMP AK-C	10	2	8	2	0.80	
COMP AK-C	10	3	8	2	0.80	72%
COMP AK-C	10	4	7	3	0.70	
COMP AK-C	10	5	7	3	0.70	
COMP AK-C	50	1	0	10	0.00	
COMP AK-C	50	2	0	10	0.00	
COMP AK-C	50	3	0	10	0.00	0%
COMP AK-C	50	4	0	10	0.00	
COMP AK-C	50	5	0	10	0.00	
COMP AK-C	100	1	0	10	0.00	
COMP AK-C	100	2	0	10	0.00	
COMP AK-C	100	3	0	10	0.00	0%
COMP AK-C	100	4	0	10	0.00	
COMP AK-C	100	5	0	10	0.00	
Port Elizabeth Reach A						
COMP PE-A	0 DSW-NSA	1	4	6	0.40	
COMP PE-A	0 DSW-NSA	2	6	4	0.60	53%
COMP PE-A	0 DSW-NSA	3	6	4	0.60	
COMP PE-A	0 MDSW	1	9	1	0.90	
COMP PE-A	0 MDSW	2	10	0	1.00	
COMP PE-A	0 MDSW	3	10	0	1.00	98%
COMP PE-A	0 MDSW	4	10	0	1.00	
COMP PE-A	0 MDSW	5	10	0	1.00	
COMP PE-A	10	1	10	0	1.00	
COMP PE-A	10	2	9	1	0.90	
COMP PE-A	10	3	10	0	1.00	98%
COMP PE-A	10	4	10	0	1.00	
COMP PE-A	10	5	10	0	1.00	

TABLE C.7. (contd)

Sediment Treatment	Concentration (Percent SPP)	Replicate	*M. bahia* Live[a]	*M. bahia* Dead or Missing	Proportion Surviving	Mean Percent Surviving
COMP PE-A	50	1	9	1	0.90	
COMP PE-A	50	2	9	1	0.90	
COMP PE-A	50	3	10	0	1.00	92%
COMP PE-A	50	4	8	2	0.80	
COMP PE-A	50	5	10	0	1.00	
COMP PE-A	100	1	7	3	0.70	
COMP PE-A	100	2	6	4	0.60	
COMP PE-A	100	3	8	2	0.80	70%
COMP PE-A	100	4	7	3	0.70	
COMP PE-A	100	5	7	3	0.70	
Port Elizabeth Reach B						
COMP PE-B	0 DSW-NSA	1	4	6	0.40	
COMP PE-B	0 DSW-NSA	2	2	8	0.20	27%
COMP PE-B	0 DSW-NSA	3	2	8	0.20	
COMP PE-B	0 MDSW	1	10	0	1.00	
COMP PE-B	0 MDSW	2	9	1	0.90	
COMP PE-B	0 MDSW	3	9	1	0.90	96%
COMP PE-B	0 MDSW	4	10	0	1.00	
COMP PE-B	0 MDSW	5	10	0	1.00	
COMP PE-B	10	1	9	1	0.90	
COMP PE-B	10	2	10	0	1.00	
COMP PE-B	10	3	9	1	0.90	94%
COMP PE-B	10	4	9	1	0.90	
COMP PE-B	10	5	10	0	1.00	
COMP PE-B	50	1	9	1	0.90	
COMP PE-B	50	2	10	0	1.00	
COMP PE-B	50	3	8	2	0.80	92%
COMP PE-B	50	4	10	0	1.00	
COMP PE-B	50	5	9	1	0.90	
COMP PE-B	100	1	4	6	0.40	
COMP PE-B	100	2	7	3	0.70	
COMP PE-B	100	3	8	2	0.80	60%
COMP PE-B	100	4	5	5	0.50	
COMP PE-B	100	5	6	4	0.60	
Hackensack River Reach A						
COMP HR-A	0 DSW-NSA	1	0	10	0.00	
COMP HR-A	0 DSW-NSA	2	0	10	0.00	0%
COMP HR-A	0 DSW-NSA	3	0	10	0.00	
COMP HR-A	0 MDSW	1	9	1	0.90	
COMP HR-A	0 MDSW	2	10	0	1.00	
COMP HR-A	0 MDSW	3	9	1	0.90	94%
COMP HR-A	0 MDSW	4	9	1	0.90	
COMP HR-A	0 MDSW	5	10	0	1.00	

TABLE C.7. (contd)

Sediment Treatment	Concentration (Percent SPP)	Replicate	*M. bahia* Live[a]	*M. bahia* Dead or Missing	*M. bahia* Proportion Surviving	*M. bahia* Mean Percent Surviving
COMP HR-A	10	1	10	0	1.00	
COMP HR-A	10	2	10	0	1.00	
COMP HR-A	10	3	10	0	1.00	100%
COMP HR-A	10	4	10	0	1.00	
COMP HR-A	10	5	10	0	1.00	
COMP HR-A	50	1	9	1	0.90	
COMP HR-A	50	2	9	1	0.90	
COMP HR-A	50	3	10	0	1.00	90%
COMP HR-A	50	4	9	1	0.90	
COMP HR-A	50	5	8	2	0.80	
COMP HR-A	100	1	0	10	0.00	
COMP HR-A	100	2	0	10	0.00	
COMP HR-A	100	3	0	10	0.00	0%
COMP HR-A	100	4	0	10	0.00	
COMP HR-A	100	5	0	10	0.00	

(a) Survival based on initial exposure of 10 organisms per replicate.
(b) DSW-NSA Dredging site water, not salinity adjusted.
(c) MDSW Mud Dump Site Water.

TABLE C.8. Water Quality Summary for 96-Hour *M. bahia* Water-Column Test, Federal Projects in New York and New Jersey

Sediment Treatment	Concentration (Percent SPP)	Temperature (C) Min	Temperature (C) Max	pH Min	pH Max	Dissolved Oxygen (mg/L) Min	Dissolved Oxygen (mg/L) Max	Salinity (o/oo) Min	Salinity (o/oo) Max
Acceptable Range		18.0	22.0	7.30	8.30	3.0	NA[a]	28.0	32.0
Arthur Kill Reach A									
COMP AK-A	0 DSW-NSA[b]	19.4	20.2	7.38	8.02	4.6	9.0	11.0	14.0
COMP AK-A	0 MDSW[c]	19.5	20.4	7.58	8.03	6.1	8.1	28.5	30.0
COMP AK-A	10	19.5	20.5	7.72	8.11[d]	6.0	8.1	29.0	30.5
COMP AK-A	50	19.5	20.5	7.62	8.33[d]	4.1	7.3	29.0	30.5
COMP AK-A	100	19.5	19.9	7.48	8.35[d]	4.6	7.3	29.0	30.0
Arthur Kill Reach B									
COMP AK-B	0 DSW-NSA	19.4	19.6	7.31	8.03	3.6	9.0	12.0	14.0
COMP AK-B	0 MDSW	19.4	20.6	7.65	8.03	6.2	8.2	28.5	30.0
COMP AK-B	10	19.5	20.5	7.85	8.05[d]	5.7	8.0	29.0	30.0
COMP AK-B	50	19.5	20.5	7.75	8.35[d]	5.6	7.4	28.5	30.0
COMP AK-B	100	19.6	19.9	7.65	8.24	5.2	7.5	28.5	29.5
Arthur Kill Reach C									
COMP AK-C	0 DSW-NSA	19.6	20.2	7.37	8.01	4.2	9.0	12.0	14.0
COMP AK-C	0 MDSW	19.5	20.2	7.60	7.94	3.7	7.9	28.5	30.0
COMP AK-C	10	19.5	20.2	7.79	8.00	3.5	7.6	29.0	30.0
COMP AK-C	50	19.5	20.4	7.61	8.34[d]	4.7	7.2	29.0	30.0
COMP AK-C	100	19.6	20.0	7.52	8.25	4.8	5.0	29.5	30.0
Port Elizabeth Reach A									
COMP PE-A	0 DSW-NSA	19.5	20.2	7.37	8.08	3.5	9.2	8.0	10.0
COMP PE-A	0 MDSW	19.6	20.5	7.58	8.00	3.9	9.1	29.0	30.5
COMP PE-A	10	19.6	20.5	7.47	7.90	3.4	7.8	28.5	30.0
COMP PE-A	50	19.6	20.5	7.58	8.12[d]	3.4	7.1	28.5	30.0
COMP PE-A	100	19.6	20.5	7.54	8.31[d]	3.5	7.1	28.5	30.0
Port Elizabeth Reach B									
COMP PE-B	0 DSW-NSA	19.5	20.3	6.37[d]	7.83	5.2	8.7	9.0	12.0
COMP PE-B	0 MDSW	19.6	20.3	7.57	7.95	3.6	8.0	29.0	30.0
COMP PE-B	10	19.5	20.4	7.67	7.99	3.6	7.9	28.5	30.0
COMP PE-B	50	19.5	20.3	7.55	8.14	3.9	7.1	29.0	31.0
COMP PE-B	100	19.5	20.3	7.59	8.29	3.9	7.3	30.0	30.0
Hackensack River Reach A									
COMP HR-A	0 DSW-NSA	19.5	19.6	7.72	7.81	9.3	9.4	4.0	4.0
COMP HR-A	0 MDSW	19.5	20.6	7.65	8.03	5.0	8.2	28.0	30.0
COMP HR-A	10	19.6	20.6	7.86	8.07	4.8	8.1	28.5	30.0
COMP HR-A	50	19.5	20.6	7.68	8.29[d]	4.3	7.4	29.0	30.0
COMP HR-A	100	19.7	20.6	7.54	8.37[d]	4.4	7.1	28.5	30.0

(a) NA Not applicable.
(b) DSW-NSA Dredging site water, not salinity adjusted.
(c) MDSW Mud Dump Site Water.
(d) Data point out of range.

TABLE C.9. Test Results for 72-Hour *M. edulis* Reference Toxicant Test, Federal Projects in New York and New Jersey

Copper Concentration (µg/L)	Replicate	Mean Stocking Density	Number Normal	Proportion Normal	Number Surviving	Proportion Surviving	Mean Proportion Normal	Mean Proportion Surviving	Standard Deviation[a]
Reference Toxicant Test 1									
0	1	276	133	0.48	140	0.57			
0	2	276	179	0.65	198	0.81			
0	3	276	163	0.59	172	0.70	0.59	0.72	0.09
0	4	276	176	0.64	198	0.81			
0	5	276	167	0.61	180	0.73			
2.9	1	276	186	0.67	203	0.83			
2.9	2	276	126	0.46	129	0.53	0.56	0.67	0.12
2.9	3	276	149	0.54	158	0.64			
9	1	276	34	0.12	160	0.65			
9	2	276	138	0.50	205	0.84	0.23	0.65	0.15
9	3	276	20	0.07	115	0.47			
30	1	276	0	0.00	0	0.00			
30	2	276	0	0.00	3	0.01	0.00	0.01	0.01
30	3	276	4	0.01	4	0.02			
100	1	276	0	0.00	0	0.00			
100	2	276	0	0.00	0	0.00	0.00	0.00	0.00
100	3	276	0	0.00	0	0.00			
Brine Control	1	276	150	0.54	154	0.63			
Brine Control	2	276	177	0.64	183	0.75			
Brine Control	3	276	167	0.61	168	0.68	0.61	0.72	0.06
Brine Control	4	276	155	0.56	176	0.72			
Brine Control	5	276	189	0.69	199	0.81			
Reference Toxicant Test 2									
0	1	245	241	0.98	250	1.00[b]			
0	2	245	268	1.00[b]	282	1.00[b]			
0	3	245	215	0.88	230	0.94	0.95	0.97	0.03
0	4	245	279	1.00[b]	291	1.00[b]			
0	5	245	214	0.87	225	0.92			
2.9	1	245	227	0.93	241	0.98			
2.9	2	245	215	0.88	221	0.90	0.88	0.92	0.04
2.9	3	245	203	0.83	218	0.89			

TABLE C.9. (contd)

Copper Concentration (µg/L)	Replicate	Mean Stocking Density	Number Normal	Proportion Normal	Number Surviving	Proportion Surviving	Mean Proportion Normal	Mean Proportion Surviving	Standard Deviation[a]
9	1	245	209	0.85	222	0.91			
9	2	245	209	0.85	219	0.89	0.89	0.93	0.05
9	3	245	237	0.97	257	1.00[b]			
30	1	245	1	0.00	4	0.02			
30	2	245	3	0.01	4	0.02	0.00	0.02	0.00
30	3	245	1	0.00	4	0.02			
100	1	245	7	0.03	7	0.03			
100	2	245	0	0.00	0	0.00	0.01	0.02	0.02
100	3	245	1	0.00	9	0.04			
Brine Control	1	245	240	0.98	253	1.03[b]			
Brine Control	2	245	219	0.89	231	0.94			
Brine Control	3	245	230	0.94	246	1.00[b]	0.96	0.99	0.03
Brine Control	4	245	247	1.00[b]	267	1.00[b]			
Brine Control	5	245	248	1.00[b]	266	1.00[b]			

(a) Standard deviation is based on proportion surviving.
(b) When number normal or number surviving exceeded the stocking density, a proportion normal and/or proportion survival of 1.00 was used for mean calculations and statistical analysis.

TABLE C.10. Water Quality Summary for 72-Hour *M. edulis* Reference Toxicant Test, Federal Projects in New York and New Jersey

Copper Concentration (mg/L)	Temperature (°C)		pH		Dissolved Oxygen (mg/L)		Salinity (o/oo)	
	Min	Max	Min	Max	Min	Max	Min	Max
Acceptable Range	14.0	18.0	7.30	8.30	4.9	NA[a]	27.0	33.0
Reference Toxicant Test 1								
0	15.3	16.3	7.74	8.05	7.3	8.5	30.5	32.0
2.9	15.4	16.4	7.91	8.03	7.6	8.4	30.0	32.0
9	15.4	16.4	7.95	8.04	7.6	8.6	30.0	32.0
30	15.4	16.4	7.88	8.04	7.7	8.5	30.0	32.0
100	15.4	16.6	7.80	7.98	7.4	8.3	30.0	32.5
Brine Control	15.5	16.1	7.95	7.98	7.8	8.2	29.5	30.0
Reference Toxicant Test 2								
0	15.2	16.2	7.87	8.09	7.6	8.6	30.0	31.5
2.9	15.3	16.3	7.81	8.10	7.7	8.7	30.0	31.5
9	15.3	16.3	7.83	8.09	7.8	8.6	31.0	31.5
30	15.2	16.3	7.83	8.12	7.8	8.6	30.0	31.5
100	15.3	16.3	7.83	8.13	7.9	8.6	30.0	31.5
Brine Control	15.2	15.4	7.87	8.21	7.6	8.6	30.5	34.0[b]

(a) NA Not applicable.
(b) Data point out of range.

TABLE C.11. Test Results for 72-Hour *M. edulis* Water-Column Test, Federal Projects in New York and New Jersey

Sediment Treatment	Concentration (Percent SPP)	Replicate	Mean Stocking Density	Number Normal	Proportion Normal	Number Surviving	Proportion Surviving	Mean Proportion Normal	Mean Proportion Surviving	Standard Deviation[a]
Reference Toxicant Test 2										
Arthur Kill Reach A										
COMP AK-A	0 DSW-NSA[b]	1	245[c]	0	0.00	17	0.07			
COMP AK-A	0 DSW-NSA	2	245	0	0.00	5	0.02	0.00	0.03	0.02
COMP AK-A	0 DSW-NSA	3	245	0	0.00	4	0.02			
COMP AK-A	0 DSW-NSA	4	245	0	0.00	8	0.03			
COMP AK-A	0 DSW-NSA	5	245	0	0.00	4	0.02			
COMP AK-A	0 DSW-SA[d]	1	245	232	0.95	246	1.00[e]			
COMP AK-A	0 DSW-SA	2	245	156	0.64	164	0.67	0.81	0.86	0.14
COMP AK-A	0 DSW-SA	3	245	211	0.86	219	0.89			
COMP AK-A	0 MDSW[f]	1	245	221	0.90	234	0.96			
COMP AK-A	0 MDSW	2	245	232	0.95	242	0.99			
COMP AK-A	0 MDSW	3	245	206	0.84	215	0.88[e]	0.93	0.96	0.05
COMP AK-A	0 MDSW	4	245	246	1.00[e]	252	1.00[e]			
COMP AK-A	0 MDSW	5	245	241	0.98	248	1.00[e]			
COMP AK-A	10	1	245	217	0.89	239	0.98			
COMP AK-A	10	2	245	230	0.94	243	0.99			
COMP AK-A	10	3	245	226	0.92	245	1.00	0.92	0.99	0.02
COMP AK-A	10	4	245	229	0.93	235	0.96			
COMP AK-A	10	5	245	228	0.93	247	1.00[e]			
COMP AK-A	50	1	245	0	0.00	97	0.40			
COMP AK-A	50	2	245	0	0.00	198	0.81			
COMP AK-A	50	3	245	2	0.01	147	0.60	0.00	0.62	0.14
COMP AK-A	50	4	245	0	0.00	148	0.60			
COMP AK-A	50	5	245	2	0.01	173	0.71			
COMP AK-A	100	1	245	0	0.00	24	0.10			
COMP AK-A	100	2	245	2	0.01	24	0.10			
COMP AK-A	100	3	245	0	0.00	21	0.09	0.00	0.11	0.05
COMP AK-A	100	4	245	0	0.00	53	0.22			
COMP AK-A	100	5	245	0	0.00	18	0.07			

TABLE C.11. (contd)

Sediment Treatment	Concentration (Percent SPP)	Replicate	Mean Stocking Density	Number Normal	Proportion Normal	Number Surviving	Proportion Surviving	Mean Proportion Normal	Mean Proportion Surviving	Standard Deviation[a]
Arthur Kill Reach B										
COMP AK-B	0 DSW-NSA	1	245	0	0.00	105	0.43			
COMP AK-B	0 DSW-NSA	2	245	0	0.00	153	0.62			
COMP AK-B	0 DSW-NSA	3	245	0	0.00	154	0.63	0.00	0.43	0.19
COMP AK-B	0 DSW-NSA	4	245	0	0.00	27	0.11			
COMP AK-B	0 DSW-NSA	5	245	0	0.00	83	0.34			
COMP AK-B	0 DSW-SA	1	245	193	0.79	230	0.94			
COMP AK-B	0 DSW-SA	2	245	187	0.76	212	0.87	0.85	0.93	0.06
COMP AK-B	0 DSW-SA	3	245	254	1.00[e]	276	1.00[e]			
COMP AK-B	0 MDSW	1	245	212	0.87	221	0.90			
COMP AK-B	0 MDSW	2	245	233	0.95	239	0.98			
COMP AK-B	0 MDSW	3	245	171	0.70	173	0.71	0.85	0.87	0.10
COMP AK-B	0 MDSW	4	245	232	0.95	234	0.96			
COMP AK-B	0 MDSW	5	245	195	0.80	195	0.80			
COMP AK-B	10	1	245	190	0.78	204	0.83			
COMP AK-B	10	2	245	252	1.00[e]	266	1.00[e]			
COMP AK-B	10	3	245	212	0.87	223	0.91	0.91	0.95	0.07
COMP AK-B	10	4	245	242	0.99	259	1.00[e]			
COMP AK-B	10	5	245	224	0.91	245	1.00			
COMP AK-B	50	1	245	0	0.00	70	0.29			
COMP AK-B	50	2	245	2	0.01	105	0.43			
COMP AK-B	50	3	245	1	0.00	103	0.42	0.00	0.37	0.05
COMP AK-B	50	4	245	2	0.01	87	0.36			
COMP AK-B	50	5	245	1	0.00	86	0.35			
COMP AK-B	100	1	245	0	0.00	0	0.00			
COMP AK-B	100	2	245	0	0.00	19	0.08			
COMP AK-B	100	3	245	0	0.00	5	0.02	0.00	0.04	0.04
COMP AK-B	100	4	245	0	0.00	5	0.02			
COMP AK-B	100	5	245	0	0.00	24	0.10			

TABLE C.11. (contd)

Sediment Treatment	Concentration (Percent SPP)	Replicate	Mean Stocking Density	Number Normal	Proportion Normal	Number Surviving	Proportion Surviving	Mean Proportion Normal	Mean Proportion Surviving	Standard Deviation[a]
Arthur Kill Reach C										
COMP AK-C	0 DSW-NSA	1	276[g]	0	0.00	0	0.00			
COMP AK-C	0 DSW-NSA	2	276	0	0.00	0	0.00			
COMP AK-C	0 DSW-NSA	3	276	0	0.00	0	0.00	0.00	0.00	0.00
COMP AK-C	0 DSW-NSA	4	276	0	0.00	0	0.00			
COMP AK-C	0 DSW-NSA	5	276	0	0.00	0	0.00			
COMP AK-C	0 DSW-SA	1	245[c]	187	0.76	225	0.92			
COMP AK-C	0 DSW-SA	2	245	224	0.91	251	1.00[e]	0.77	0.88	0.11
COMP AK-C	0 DSW-SA	3	245	154	0.63	178	0.73			
COMP AK-C	0 MDSW	1	276[g]	138	0.50	151	0.55			
COMP AK-C	0 MDSW	2	276	150	0.54	155	0.56			
COMP AK-C	0 MDSW	3	276	155	0.56	164	0.59	0.53	0.57	0.04
COMP AK-C	0 MDSW	4	276	156	0.57	175	0.63			
COMP AK-C	0 MDSW	5	276	136	0.49	144	0.52			
COMP AK-C	10	1	276	43	0.16	119	0.43			
COMP AK-C	10	2	276	41	0.15	130	0.47			
COMP AK-C	10	3	276	15	0.05	124	0.45	0.14	0.44	0.03
COMP AK-C	10	4	276	47	0.17	106	0.38			
COMP AK-C	10	5	276	45	0.16	129	0.47			
COMP AK-C	50	1	276	0	0.00	9	0.03			
COMP AK-C	50	2	276	0	0.00	11	0.04			
COMP AK-C	50	3	276	0	0.00	4	0.01	0.00	0.02	0.01
COMP AK-C	50	4	276	0	0.00	0	0.00			
COMP AK-C	50	5	276	0	0.00	5	0.02			
COMP AK-C	100	1	276	0	0.00	0	0.00			
COMP AK-C	100	2	276	0	0.00	0	0.00			
COMP AK-C	100	3	276	0	0.00	5	0.02	0.00	0.01	0.01
COMP AK-C	100	4	276	0	0.00	4	0.01			
COMP AK-C	100	5	276	0	0.00	0	0.00			

TABLE C.11. (contd)

Sediment Treatment	Concentration (Percent SPP)	Replicate	Mean Stocking Density	Number Normal	Proportion Normal	Number Surviving	Proportion Surviving	Mean Proportion Normal	Mean Proportion Surviving	Standard Deviation[a]
Port Elizabeth Reach A										
COMP PE-A	0 DSW-NSA	1	276	0	0.00	0	0.00			
COMP PE-A	0 DSW-NSA	2	276	0	0.00	0	0.00			
COMP PE-A	0 DSW-NSA	3	276	0	0.00	0	0.00	0.00	0.01	0.02
COMP PE-A	0 DSW-NSA	4	276	0	0.00	0	0.00			
COMP PE-A	0 DSW-NSA	5	276	0	0.00	15	0.05			
COMP PE-A	0 DSW-SA	1	245[c]	201	0.82	236	0.96			
COMP PE-A	0 DSW-SA	2	245	176	0.72	196	0.80	0.75	0.84	0.08
COMP PE-A	0 DSW-SA	3	245	172	0.70	189	0.77			
COMP PE-A	0 MDSW	1	276[g]	156	0.57	168	0.61			
COMP PE-A	0 MDSW	2	276	133	0.48	145	0.53			
COMP PE-A	0 MDSW	3	276	202	0.73	209	0.76	0.58	0.62	0.08
COMP PE-A	0 MDSW	4	276	170	0.62	179	0.65			
COMP PE-A	0 MDSW	5	276	142	0.51	149	0.54			
COMP PE-A	10	1	276	178	0.64	187	0.68			
COMP PE-A	10	2	276	155	0.56	168	0.61			
COMP PE-A	10	3	276	173	0.63	191	0.69	0.60	0.65	0.03
COMP PE-A	10	4	276	154	0.56	168	0.61			
COMP PE-A	10	5	276	171	0.62	182	0.66			
COMP PE-A	50	1	276	0	0.00	109	0.39			
COMP PE-A	50	2	276	0	0.00	106	0.38			
COMP PE-A	50	3	276	0	0.00	139	0.50	0.00	0.42	0.09
COMP PE-A	50	4	276	1	0.00	76	0.28			
COMP PE-A	50	5	276	0	0.00	143	0.52			
COMP PE-A	100	1	276	0	0.00	3	0.01			
COMP PE-A	100	2	276	1	0.00	12	0.04			
COMP PE-A	100	3	276	1	0.00	8	0.03	0.00	0.02	0.02
COMP PE-A	100	4	276	0	0.00	3	0.01			
COMP PE-A	100	5	276	0	0.00	0	0.00			

TABLE C.11. (contd)

Sediment Treatment	Concentration (Percent SPP)	Replicate	Mean Stocking Density	Number Normal	Proportion Normal	Number Surviving	Proportion Surviving	Mean Proportion Normal	Mean Proportion Surviving	Standard Deviation[a]
Port Elizabeth Reach B										
COMP PE-B	0 DSW-NSA	1	276	0	0.00	0	0.00			
COMP PE-B	0 DSW-NSA	2	276	0	0.00	0	0.00			
COMP PE-B	0 DSW-NSA	3	276	0	0.00	0	0.00	0.00	0.00	0.00
COMP PE-B	0 DSW-NSA	4	276	0	0.00	0	0.00			
COMP PE-B	0 DSW-NSA	5	276	0	0.00	0	0.00			
COMP PE-B	0 DSW-SA	1	245[c]	163	0.67[e]	186	0.76[e]			
COMP PE-B	0 DSW-SA	2	245	257	1.00[e]	283	1.00[e]	0.89	0.92	0.11
COMP PE-B	0 DSW-SA	3	245	259	1.00[e]	280	1.00[e]			
COMP PE-B	0 MDSW	1	276[g]	196	0.71	202	0.73			
COMP PE-B	0 MDSW	2	276	141	0.51	144	0.52			
COMP PE-B	0 MDSW	3	276	179	0.65	185	0.67	0.57	0.58	0.11
COMP PE-B	0 MDSW	4	276	152	0.55	157	0.57			
COMP PE-B	0 MDSW	5	276	113	0.41	116	0.42			
COMP PE-B	10	1	276	167	0.61	180	0.65			
COMP PE-B	10	2	276	144	0.52	156	0.57			
COMP PE-B	10	3	276	141	0.51	146	0.53	0.56	0.62	0.06
COMP PE-B	10	4	276	168	0.61	180	0.65			
COMP PE-B	10	5	276	157	0.57	190	0.69			
COMP PE-B	50	1	276	0	0.00	114	0.41			
COMP PE-B	50	2	276	2	0.01	109	0.39			
COMP PE-B	50	3	276	2	0.01	114	0.41	0.01	0.38	0.03
COMP PE-B	50	4	276	1	0.00	95	0.34			
COMP PE-B	50	5	276	2	0.01	95	0.34			
COMP PE-B	100	1	276	0	0.00	0	0.00			
COMP PE-B	100	2	276	0	0.00	3	0.01			
COMP PE-B	100	3	276	0	0.00	0	0.00	0.00	0.01	0.01
COMP PE-B	100	4	276	1	0.00	11	0.04			
COMP PE-B	100	5	276	0	0.00	3	0.01			

TABLE C.11. (contd)

Sediment Treatment	Concentration (Percent SPP)	Replicate	Mean Stocking Density	Number Normal	Proportion Normal	Number Surviving	Proportion Surviving	Mean Proportion Normal	Mean Proportion Surviving	Standard Deviation[a]
Reference Toxicant Test 2										
Hackensack River Reach A										
COMP HR-A	0 DSW-NSA	1	245[c]	0	0.00	0	0.00			
COMP HR-A	0 DSW-NSA	2	245	0	0.00	0	0.00			
COMP HR-A	0 DSW-NSA	3	245	0	0.00	0	0.00	0.00	0.00	0.00
COMP HR-A	0 DSW-NSA	4	245	0	0.00	0	0.00			
COMP HR-A	0 DSW-NSA	5	245	0	0.00	0	0.00			
COMP HR-A	0 DSW-SA	1	245	100	0.41	185	0.76			
COMP HR-A	0 DSW-SA	2	245	147	0.60	209	0.85	0.48	0.75	0.09
COMP HR-A	0 DSW-SA	3	245	109	0.44	155	0.63			
COMP HR-A	0 MDSW	1	245	185	0.76	197	0.80			
COMP HR-A	0 MDSW	2	245	184	0.75	199	0.81			
COMP HR-A	0 MDSW	3	245	254	1.00[e]	261	1.00[e]	0.88	0.90	0.09
COMP HR-A	0 MDSW	4	245	252	1.00[e]	263	1.00[e]			
COMP HR-A	0 MDSW	5	245	217	0.89	220	0.90			
COMP HR-A	10	1	245	226	0.92	235	0.96			
COMP HR-A	10	2	245	232	0.95	234	0.96			
COMP HR-A	10	3	245	240	0.98	260	1.00[e]	0.96	0.98	0.02
COMP HR-A	10	4	245	270	1.00[e]	291	1.00[e]			
COMP HR-A	10	5	245	239	0.98	262	1.00[e]			
COMP HR-A	50	1	245	0	0.00	236	0.96			
COMP HR-A	50	2	245	0	0.00	220	0.90			
COMP HR-A	50	3	245	2	0.01	227	0.93	0.00	0.96	0.04
COMP HR-A	50	4	245	0	0.00	280	1.00[e]			
COMP HR-A	50	5	245	3	0.01	258	1.00[e]			
COMP HR-A	100	1	245	0	0.00	83	0.34			
COMP HR-A	100	2	245	0	0.00	30	0.12			
COMP HR-A	100	3	245	0	0.00	76	0.31	0.00	0.24	0.09
COMP HR-A	100	4	245	0	0.00	63	0.26			
COMP HR-A	100	5	245	0	0.00	36	0.15			

TABLE C.11. (contd)

Sediment Treatment	Concentration (Percent SPP)	Replicate	Mean Stocking Density	Number Normal	Proportion Normal	Number Surviving	Proportion Surviving	Mean Proportion Normal	Mean Proportion Surviving	Standard Deviation[a]

(a) Standard deviation is based on proportion surviving.
(b) DSW-NSA Dredging site water, not salinity adjusted.
(c) Stocking density for Reference Toxicant Test 2 is 245; corresponds to sediment treatments initiated on 5-11-93.
(d) DSW-SA Dredging site water, salinity adjusted.
(e) When number normal or number surviving exceeded the stocking density, a proportion normal and/or proportion survival of 1.00 was used for mean calculation and statistical analysis.
(f) MDSW Mud Dump Site Water.
(g) Stocking density for Reference Toxicant Test 1 is 276; corresponds to sediment treatments initiated on 5-10-93.

TABLE C.12. Water Quality Summary for 72-Hour *M. edulis* Water-Column Test, Federal Projects in New York and New Jersey

Sediment Treatment	Concentration (Percent SPP)	Temperature (C) Min	Temperature (C) Max	pH Min	pH Max	Dissolved Oxygen (mg/L) Min	Dissolved Oxygen (mg/L) Max	Salinity (o/oo) Min	Salinity (o/oo) Max
Acceptable Range		14.0	18.0	7.30	8.30	4.9	NA[a]	27.0	33.0
Arthur Kill Reach A									
COMP AK-A	0 DSW-NSA[b]	15.5	16.2	7.48	8.21	7.0	9.0	10.0[c]	12.5
COMP AK-A	0 DSW-SA[d]	15.5	16.4	7.54	8.20	7.6	9.3	30.0	31.5
COMP AK-A	0 MDSW[e]	15.5	16.5	7.90	8.16	7.0	9.0	29.0	30.0
COMP AK-A	10	15.5	16.3	7.75	8.26[c]	7.3	8.8	28.5	31.0
COMP AK-A	50	15.4	16.1	7.42	8.49[c]	7.1	8.2	29.5	30.0
COMP AK-A	100	15.4	16.2	7.27[c]	8.60[c]	4.1[c]	8.4	29.0	30.0
Arthur Kill Reach B									
COMP AK-B	0 DSW-NSA	15.5	16.6	7.82	8.08	7.2	9.0	12.0[c]	14.0
COMP AK-B	0 DSW-SA	15.4	16.5	7.77	8.21	7.8	8.6	28.0	30.0
COMP AK-B	0 MDSW	15.4	16.4	7.80	8.22	7.3	8.6	29.0	30.5
COMP AK-B	10	15.5	16.5	7.80	8.23[c]	7.7	8.5	29.5	30.5
COMP AK-B	50	15.4	16.3	7.51	8.42[c]	7.0	8.4	29.0	30.5
COMP AK-B	100	15.5	16.5	7.40	8.54[c]	4.0[c]	8.4	29.0	30.0
Arthur Kill Reach C									
COMP AK-C	0 DSW-NSA	15.3	16.3	7.49	8.22	7.6	9.4	12.0[c]	15.0
COMP AK-C	0 DSW-SA	15.3	16.3	7.44	8.21	7.6	9.4	31.0	33.5[c]
COMP AK-C	0 MDSW	15.4	16.3	7.46	8.22	7.8	9.3	29.5	30.5
COMP AK-C	10	15.5	16.4	7.87	8.22[c]	2.3[c]	8.9	29.5	30.0
COMP AK-C	50	15.4	16.4	7.63	8.47[c]	7.6	8.5	29.5	31.0
COMP AK-C	100	15.4	16.4	7.51	8.59[c]	4.7[c]	8.6	29.5	31.0
Port Elizabeth Reach A									
COMP PE-A	0 DSW-NSA	15.5	16.3	7.10[c]	8.21	6.9	9.4	9.0[c]	11.0
COMP PE-A	0 DSW-SA	15.4	16.3	7.32	8.11	7.6	9.5	29.0	31.0
COMP PE-A	0 MDSW	15.6	16.5	7.66	8.19	7.4	9.5	29.5	30.0
COMP PE-A	10	15.6	16.5	7.59	8.19[c]	7.4	9.2	29.0	30.5
COMP PE-A	50	15.5	16.4	7.71	8.39[c]	7.2	8.3	28.5	31.0
COMP PE-A	100	15.7	16.4	7.60	8.52[c]	5.9	8.2	29.0	31.0
Port Elizabeth Reach B									
COMP PE-B	0 DSW-NSA	15.3	17.5	7.54	8.23	7.6	9.1	10.0[c]	11.0
COMP PE-B	0 DSW-SA	15.4	16.3	7.51	8.23	7.4	9.0	28.5	30.0
COMP PE-B	0 MDSW	15.3	16.3	7.55	8.09	7.6	9.5	30.0	32.0
COMP PE-B	10	15.6	16.6	7.99	8.19[c]	7.7	9.1	30.0	30.5
COMP PE-B	50	15.6	16.5	7.86	8.40[c]	7.5	8.5	30.0	31.0
COMP PE-B	100	15.4	16.4	7.74	8.52[c]	5.4	8.3	30.0	31.0
Hackensack River Reach A									
COMP HR-A	0 DSW-NSA	15.4	16.2	7.83	8.71[c]	7.0	8.8	4.0[c]	5.0
COMP HR-A	0 DSW-SA	15.3	16.5	7.87	8.12	7.2	10.0	30.0	34.5[c]
COMP HR-A	0 MDSW	15.3	16.2	7.84	8.25	7.6	9.0	29.5	30.0
COMP HR-A	10	15.4	16.2	7.76	8.20	8.0	8.7	29.0	30.0
COMP HR-A	50	15.4	16.2	7.42	8.43[c]	6.9	8.4	29.0	30.5
COMP HR-A	100	15.3	16.1	7.25[c]	8.54[c]	3.7[c]	8.4	29.0	30.0

TABLE C.12. (contd)

Sediment Treatment	Concentration (Percent SPP)	Temperature (C) Min	Temperature (C) Max	pH Min	pH Max	Dissolved Oxygen (mg/L) Min	Dissolved Oxygen (mg/L) Max	Salinity (o/oo) Min	Salinity (o/oo) Max

(a) NA Not applicable.
(b) DSW-NSA Dredging site water, not salinity adjusted.
(c) Data point out of range.
(d) DSW-SA Dredging site water, salinity adjusted.
(e) MDSW Mud Dump Site Water.

APPENDIX D

Benthic Acute Toxicity Tests

TABLE D.1. Test Results for 96-Hour *A. abdita* Reference Toxicant Tests, Federal Projects in New York and New Jersey

Cadmium Concentration (mg/L)	Replicate	*A. abdita* Live[(a)]	*A. abdita* Dead or Missing	Proportion Surviving	Mean Percent Surviving
Original Test					
0.00	1	1	19	0.05	
0.00	2	12	8	0.60	50%
0.00	3	17	3	0.85	
0.25	1	17	3	0.85	
0.25	2	15	5	0.75	60%
0.25	3	4	16	0.20	
0.50	1	6	14	0.30	
0.50	2	10	10	0.50	47%
0.50	3	12	8	0.60	
1.00	1	0	20	0.00	
1.00	2	0	20	0.00	0%
1.00	3	0	20	0.00	
2.00	1	0	20	0.00	
2.00	2	0	20	0.00	0%
2.00	3	0	20	0.00	
Repeat Test					
0.00	1	9	11	0.45	
0.00	2	15	5	0.75	60%
0.00	3	12	8	0.60	
0.25	1	11	9	0.55	
0.25	2	9	11	0.45	57%
0.25	3	14	6	0.70	
0.50	1	6	14	0.30	
0.50	2	8	12	0.40	45%
0.50	3	13	7	0.65	
1.00	1	3	17	0.15	
1.00	2	3	17	0.15	17%
1.00	3	4	16	0.20	
2.00	1	0	20	0.00	
2.00	2	0	20	0.00	0%
2.00	3	0	20	0.00	

(a) Survival based on exposure of 20 organisms per replicate.

TABLE D.2. Water Quality Summary for 96-Hour *A. abdita* Reference Toxicant Tests, Federal Projects in New York and New Jersey

Cadmium Concentration (mg/L)	Temperature (°C)		pH		Dissolved Oxygen (mg/L)		Salinity (o/oo)	
	Min	Max	Min	Max	Min	Max	Min	Max
Acceptable Range	18.0	22.0	7.30	8.30	6.7	NA[a]	28.0	32.0
Original Test								
0.00	20.2	20.7	7.58	8.09	6.8	7.3	30.0	30.5
0.25	20.2	20.7	7.83	8.09	6.9	7.6	30.0	32.0
0.50	20.2	20.7	7.62	8.08	7.0	7.5	30.0	31.5
1.00	20.2	20.7	7.72	8.08	6.9	7.4	30.0	31.0
2.00	20.2	20.7	7.69	8.03	6.8	7.4	30.0	30.5
Repeat Test								
0.00	19.3	19.9	7.86	8.14	7.0	7.5	30.5	31.0
0.25	19.3	20.0	7.88	8.13	7.0	7.7	30.0	30.5
0.50	19.3	20.0	7.90	8.10	7.1	7.7	30.0	30.5
1.00	19.2	20.0	7.97	8.09	7.1	7.7	30.0	31.0
2.00	19.3	20.0	7.96	8.05	7.1	7.7	30.5	30.5

(a) NA Not applicable.

TABLE D.3. Test Results for 10-Day *A. abdita* Benthic Toxicity Static Test, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	*A. abdita* Live[(a)]	*A. abdita* Dead or Missing	Proportion Surviving	Mean Percent Surviving
MOTBY Reach A					
COMP MT-A	1	0	20	0.00	
COMP MT-A	2	0	20	0.00	
COMP MT-A	3	1	19	0.05	5%
COMP MT-A	4	1	19	0.05	
COMP MT-A	5	3	17	0.15	
MOTBY Reach B					
COMP MT-B	1	0	20	0.00	
COMP MT-B	2	0	20	0.00	
COMP MT-B	3	0	20	0.00	0%
COMP MT-B	4	0	20	0.00	
COMP MT-B	5	0	20	0.00	
Arthur Kill Reach A					
COMP AK-A	1	0	20	0.00	
COMP AK-A	2	0	20	0.00	
COMP AK-A	3	0	20	0.00	0%
COMP AK-A	4	0	20	0.00	
COMP AK-A	5	0	20	0.00	
Arthur Kill Reach B					
COMP AK-B	1	0	20	0.00	
COMP AK-B	2	0	20	0.00	
COMP AK-B	3	0	20	0.00	0%
COMP AK-B	4	0	20	0.00	
COMP AK-B	5	0	20	0.00	
Arthur Kill Reach C					
COMP AK-C	1	0	20	0.00	
COMP AK-C	2	0	20	0.00	
COMP AK-C	3	0	20	0.00	0%
COMP AK-C	4	0	20	0.00	
COMP AK-C	5	0	20	0.00	
Port Elizabeth Reach A					
COMP PE-A	1	0	20	0.00	
COMP PE-A	2	0	20	0.00	
COMP PE-A	3	0	20	0.00	0%
COMP PE-A	4	0	20	0.00	
COMP PE-A	5	0	20	0.00	
Port Elizabeth Reach B					
COMP PE-B	1	0	20	0.00	
COMP PE-B	2	0	20	0.00	
COMP PE-B	3	0	20	0.00	0%
COMP PE-B	4	0	20	0.00	
COMP PE-B	5	0	20	0.00	

TABLE D.3. (contd)

Sediment Treatment	Replicate	*A. abdita* Live[(a)]	*A. abdita* Dead or Missing	Proportion Surviving	Mean Percent Surviving
Hackensack River Reach A					
COMP HR-A	1	0	20	0.00	
COMP HR-A	2	0	20	0.00	
COMP HR-A	3	0	20	0.00	0%
COMP HR-A	4	0	20	0.00	
COMP HR-A	5	0	20	0.00	
Claremont Reach I					
COMP CL-I	1	0	20	0.00	
COMP CL-I	2	0	20	0.00	
COMP CL-I	3	0	20	0.00	0%
COMP CL-I	4	0	20	0.00	
COMP CL-I	5	0	20	0.00	
Claremont Reach II					
COMP CL-II	1	0	20	0.00	
COMP CL-II	2	0	20	0.00	
COMP CL-II	3	0	20	0.00	0%
COMP CL-II	4	0	20	0.00	
COMP CL-II	5	0	20	0.00	
Claremont Reach III					
COMP CL-III	1	0	20	0.00	
COMP CL-III	2	0	20	0.00	
COMP CL-III	3	0	20	0.00	0%
COMP CL-III	4	0	20	0.00	
COMP CL-III	5	0	20	0.00	
Reference					
Mud Dump Reference	1	15	5	0.75	
Mud Dump Reference	2	7	13	0.35	
Mud Dump Reference	3	15	5	0.75	71%
Mud Dump Reference	4	17	3	0.85	
Mud Dump Reference	5	17	3	0.85	
Controls					
C-AM	1	11	9	0.55	
C-AM	2	9	11	0.45	
C-AM	3	14	6	0.70	61%
C-AM	4	12	8	0.60	
C-AM	5	15	5	0.75	
C-SB	1	12	8	0.60	
C-SB	2	12	8	0.60	
C-SB	3	14	6	0.70	70%
C-SB	4	17	3	0.85	
C-SB	5	15	5	0.75	

(a) Survival based on initial exposure of 20 organisms per replicate.

TABLE D.4. Water Quality Summary for 10-Day *A. abdita* Benthic Toxicity Static Test, Federal Projects in New York and New Jersey

Sediment Treatment	Temperature (C)		pH		Dissolved Oxygen (mg/L)		Salinity (o/oo)	
	Min	Max	Min	Max	Min	Max	Min	Max
Acceptable Range	18.0	22.0	7.30	8.30	6.7	NA[a]	28.0	32.0
MOTBY Reach A and B								
COMP MT-A	20.2	20.7	7.63	8.39[b]	4.5[c]	7.2	28.0	30.0
COMP MT-B	20.1	20.8	7.67	8.53[b]	4.3[c]	7.4	28.5	32.0
Arthur Kill Reach A, B, and C								
COMP AK-A	20.1	20.7	7.44	8.42[b]	5.4[c]	7.2	28.0	30.0
COMP AK-B	20.2	20.8	7.53	8.77[b]	4.7[c]	7.5	28.0	30.5
COMP AK-C	20.2	20.8	7.46	8.42[b]	5.5[c]	7.3	28.0	30.0
Port Elizabeth Reach A and B								
COMP PE-A	20.1	20.7	7.49	8.43[b]	5.9[c]	7.5	28.0	30.0
COMP PE-B	20.1	20.7	7.47	8.43[b]	5.2[c]	7.4	28.0	31.0
Hackensack River Reach A								
COMP HR-A	20.2	20.8	7.36	8.39[b]	5.6[c]	7.4	28.0	30.0
Claremont Reach I, II, and III								
COMP CL-I	20.2	20.7	7.49	8.41[b]	4.1[c]	7.4	28.5	30.0
COMP CL-II	20.1	20.8	7.56	8.51[b]	6.6[c]	7.5	29.0	30.0
COMP CL-III	20.1	20.7	7.61	8.56[b]	5.0[c]	7.6	28.5	31.5
Reference								
Mud Dump Reference	20.1	20.9	7.56	8.16	5.9[c]	7.6	29.0	32.5[b]
Controls								
C-AM	20.1	20.7	7.51	8.15	5.7[c]	7.5	28.0	30.0
C-SB	20.2	20.8	7.58	8.83[b]	5.8[c]	7.5	28.5	32.0

(a) NA Not applicable.
(b) Data point out of range.
(c) Data points for dissoved oxygen were out of range on Day 0 of testing. Thereafter, data points were within range.

TABLE D.5. Test Results for 10-Day *A. abdita* Benthic Toxicity Flow-Through Test, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	*A. abdita* Live[a]	*A. abdita* Dead or Missing	Proportion Surviving	Mean Percent Surviving
MOTBY Reach A					
COMP MT-A	1	12	8	0.60	
COMP MT-A	2	8	12	0.40	
COMP MT-A	3	10	10	0.50	58%
COMP MT-A	4	10	10	0.50	
COMP MT-A	5	18	2	0.90	
MOTBY Reach B					
COMP MT-B	1	18	2	0.90	
COMP MT-B	2	13	7	0.65	
COMP MT-B	3	11	9	0.55	65%
COMP MT-B	4	15	5	0.75	
COMP MT-B	5	8	12	0.40	
Arthur Kill Reach A					
COMP AK-A	1	4	16	0.20	
COMP AK-A	2	7	13	0.35	
COMP AK-A	3	3	17	0.15	30%
COMP AK-A	4	6	14	0.30	
COMP AK-A	5	10	10	0.50	
Arthur Kill Reach B					
COMP AK-B	1	0	20	0.00	
COMP AK-B	2	1	19	0.05	
COMP AK-B	3	0	20	0.00	3%
COMP AK-B	4	0	20	0.00	
COMP AK-B	5	2	18	0.10	
Arthur Kill Reach C					
COMP AK-C	1	0	20	0.00	
COMP AK-C	2	0	20	0.00	
COMP AK-C	3	3	17	0.15	3%
COMP AK-C	4	0	20	0.00	
COMP AK-C	5	0	20	0.00	
Port Elizabeth Reach A					
COMP PE-A	1	4	16	0.20	
COMP PE-A	2	11	9	0.55	
COMP PE-A	3	11	9	0.55	48%
COMP PE-A	4	12	8	0.60	
COMP PE-A	5	10	10	0.50	
Port Elizabeth Reach B					
COMP PE-B	1	9	11	0.45	
COMP PE-B	2	8	12	0.40	
COMP PE-B	3	9	11	0.45	46%
COMP PE-B	4	11	9	0.55	
COMP PE-B	5	9	11	0.45	

TABLE D.5. (contd)

Sediment Treatment	Replicate	*A. abdita* Live[a]	*A. abdita* Dead or Missing	Proportion Surviving	Mean Percent Surviving
Hackensack River Reach A					
COMP HR-A	1	5	15	0.25	
COMP HR-A	2	7	13	0.35	
COMP HR-A	3	11	9	0.55	39%
COMP HR-A	4	9	11	0.45	
COMP HR-A	5	7	13	0.35	
Claremont Reach I					
COMP CL-I	1	7	13	0.35	
COMP CL-I	2	11	9	0.55	
COMP CL-I	3	11	9	0.55	43%
COMP CL-I	4	6	14	0.30	
COMP CL-I	5	8	12	0.40	
Claremont Reach II					
COMP CL-II	1	9	11	0.45	
COMP CL-II	2	10	10	0.50	
COMP CL-II	3	13	7	0.65	56%
COMP CL-II	4	13	7	0.65	
COMP CL-II	5	11	9	0.55	
Claremont Reach III					
COMP CL-III	1	15	5	0.75	
COMP CL-III	2	11	9	0.55	
COMP CL-III	3	15	5	0.75	57%
COMP CL-III	4	11	9	0.55	
COMP CL-III	5	5	15	0.25	
Reference					
Mud Dump Reference	1	19	1	0.95	
Mud Dump Reference	2	18	2	0.90	
Mud Dump Reference	3	17	3	0.85	87%
Mud Dump Reference	4	17	3	0.85	
Mud Dump Reference	5	16	4	0.80	
Controls					
C-AM	1	16	4	0.80	
C-AM	2	18	2	0.90	
C-AM	3	18	2	0.90	89%
C-AM	4	18	2	0.90	
C-AM	5	19	1	0.95	
C-SB	1	18	2	0.90	
C-SB	2	17	3	0.85	
C-SB	3	19	1	0.95	87%
C-SB	4	16	4	0.80	
C-SB	5	17	3	0.85	

(a) Survival based on initial exposure of 20 organisms per replicate.

TABLE D.6. Water Quality Summary for 10-day *A. abdita* Benthic Toxicity Flow-Through Test, Federal Projects in New York and New Jersey

Sediment Treatment	Temperature (C)		pH		Dissolved Oxygen (mg/L)		Salinity (o/oo)		Flow Rate (mL/min)	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Acceptable Range	18.0	22.0	7.30	8.30	6.7	NA(a)	28.0	32.0	35	45
MOTBY REACH A and B										
COMP MT-A	19.4	20.9	7.57	8.11	7.0	8.1	29.0	31.0	36	44
COMP MT-B	19.7	20.9	7.72	8.16	6.9	8.1	28.0	31.0	36	44
Arthur Reach A, B, and C										
COMP AK-A	19.3	20.9	7.61	8.17	6.9	8.0	28.0	31.0	34(b)	44
COMP AK-B	19.5	20.9	7.65	8.12	7.0	7.9	28.0	31.0	36	44
COMP AK-C	19.0	20.8	7.59	8.18	6.5(b)	7.8	28.0	31.5	36	44
Port Elizabeth Reach A and B										
COMP PE-A	19.6	20.9	7.47	8.12	6.9	8.0	27.5(b)	32.0	36	44
COMP PE-B	19.3	20.8	7.53	8.17	7.0	8.0	28.0	31.0	36	44
Hackensack River Reach A										
COMP HR-A	19.2	20.9	7.68	8.14	7.1	8.1	28.0	31.0	36	44
Claremont Reach I, II, and III										
COMP CL-I	19.8	20.8	7.55	8.14	6.9	7.9	28.0	32.0	36	44
COMP CL-II	19.5	20.8	7.62	8.13	7.0	8.0	28.0	32.0	36	44
COMP CL-III	19.4	21.0	7.69	8.12	6.8	8.0	28.0	31.0	36	44
Reference										
Mud Dump Reference	19.7	20.8	7.57	8.12	6.8	8.0	29.0	31.0	36	44
Controls										
C-AM	19.5	20.8	7.61	8.17	6.9	8.2	29.0	30.5	36	44
C-SB	19.5	20.9	7.69	8.17	6.9	7.9	30.0	30.5	36	44

(a) NA Not applicable.
(b) Data point out of range.

Table D.7. Test Results for 96-Hour *R. abronius* Reference Toxicant Test, Federal Projects in New York and New Jersey

Cadmium Concentration (mg/L)	Replicate	*R. abronius* Live[a]	*R. abronius* Dead or Missing	Proportion Surviving	Mean Percent Surviving
0.0	1	23[b]	0	1.00	
0.0	2	19	1	0.95	98%
0.0	3	20	0	1.00	
0.5	1	10	10	0.50	
0.5	2	7	13	0.35	38%
0.5	3	6	14	0.30	
1.0	1	6	14	0.30	
1.0	2	2	18	0.10	15%
1.0	3	1	19	0.05	
2.0	1	4	16	0.20	
2.0	2	1	19	0.05	10%
2.0	3	1	19	0.05	
4.0	1	0	20	0.00	
4.0	2	0	20	0.00	0%
4.0	3	0	20	0.00	

(a) Survival based on intitial exposure of 20 organisms per replicate.
(b) Based on exposure of 23 organisms.

TABLE D.8. Water Quality Summary for 96-Hour *R. abronius* Reference Toxicant Test, Federal Projects in New York and New Jersey

Cadmium Concentration (mg/L)	Temperature (°C)		pH		Dissolved Oxygen (mg/L)		Salinity (o/oo)	
	Min	Max	Min	Max	Min	Max	Min	Max
Acceptable Range	12.0	16.0	7.30	8.30	7.6	NA[a]	28.0	32.0
0.0	15.2	15.6	7.73	8.08	7.6	8.5	30.5	32.0
0.5	15.2	15.4	7.78	8.07	7.5[b]	8.6	30.5	32.0
1.0	15.2	15.5	7.78	8.05	7.6	8.7	30.5	32.0
2.0	15.2	15.5	7.75	8.01	7.6	8.9	30.5	32.0
4.0	15.2	15.6	7.67	7.95	7.5[b]	8.7	30.5	31.5

(a) NA Not applicable.
(b) Data point out of range.

TABLE D.9. Test Results for 10-Day *R. abronius* Benthic Toxicity Static Test, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	*R. abronius* Live[a]	*R. abronius* Dead or Missing	Proportion Surviving	Mean Percent Surviving
MOTBY Reach A					
COMP MT-A	1	1	19	0.05	
COMP MT-A	2	3	17	0.15	
COMP MT-A	3	1	19	0.05	9%
COMP MT-A	4	1	19	0.05	
COMP MT-A	5	3	17	0.15	
MOTBY Reach B					
COMP MT-B	1	0	20	0.00	
COMP MT-B	2	0	20	0.00	
COMP MT-B	3	0	20	0.00	1%
COMP MT-B	4	1	19	0.05	
COMP MT-B	5	0	20	0.00	
Arthur Kill Reach A					
COMP AK-A	1	0	20	0.00	
COMP AK-A	2	0	20	0.00	
COMP AK-A	3	0	20	0.00	0%
COMP AK-A	4	0	20	0.00	
COMP AK-A	5	0	20	0.00	
Arthur Kill Reach B					
COMP AK-B	1	0	20	0.00	
COMP AK-B	2	0	20	0.00	
COMP AK-B	3	0	20	0.00	0%
COMP AK-B	4	0	20	0.00	
COMP AK-B	5	0	20	0.00	
Arthur Kill Reach C					
COMP AK-C	1	0	20	0.00	
COMP AK-C	2	0	20	0.00	
COMP AK-C	3	0	20	0.00	0%
COMP AK-C	4	0	20	0.00	
COMP AK-C	5	0	20	0.00	
Port Elizabeth Reach A					
COMP PE-A	1	2	18	0.10	
COMP PE-A	2	0	20	0.00	
COMP PE-A	3	4	16	0.20	10%
COMP PE-A	4	1	19	0.05	
COMP PE-A	5	3	17	0.15	
Port Elizabeth Reach B					
COMP PE-B	1	0	20	0.00	
COMP PE-B	2	0	20	0.00	
COMP PE-B	3	0	20	0.00	3%
COMP PE-B	4	0	20	0.00	
COMP PE-B	5	3	17	0.15	

TABLE D.9. (contd)

Sediment Treatment	Replicate	*R. abronius* Live[(a)]	*R. abronius* Dead or Missing	Proportion Surviving	Mean Percent Surviving
Hackensack River Reach A					
COMP HR-A	1	0	20	0.00	
COMP HR-A	2	0	20	0.00	
COMP HR-A	3	0	20	0.00	0%
COMP HR-A	4	0	20	0.00	
COMP HR-A	5	0	20	0.00	
Claremont Reach I					
COMP CL-I	1	0	20	0.00	
COMP CL-I	2	0	20	0.00	
COMP CL-I	3	0	20	0.00	0%
COMP CL-I	4	0	20	0.00	
COMP CL-I	5	0	20	0.00	
Claremont Reach II					
COMP CL-II	1	0	20	0.00	
COMP CL-II	2	1	19	0.05	
COMP CL-II	3	0	20	0.00	1%
COMP CL-II	4	0	20	0.00	
COMP CL-II	5	0	20	0.00	
Claremont Reach III					
COMP CL-III	1	2	18	0.10	
COMP CL-III	2	0	20	0.00	
COMP CL-III	3	0	20	0.00	2%
COMP CL-III	4	0	20	0.00	
COMP CL-III	5	0	20	0.00	
Mud Dump Reference Site					
MUD DUMP REF	1	18	2	0.90	
MUD DUMP REF	2	18	2	0.90	
MUD DUMP REF	3	18	2	0.90	90%
MUD DUMP REF	4	19	1	0.95	
MUD DUMP REF	5	17	3	0.85	
Controls					
C-SB	1	16	4	0.80	
C-SB	2	20	0	1.00	
C-SB	3	15	5	0.75	81%
C-SB	4	15	5	0.75	
C-SB	5	15	5	0.75	
C-WB	1	20	0	1.00	
C-WB	2	19	1	0.95	
C-WB	3	20	0	1.00	97%
C-WB	4	19	1	0.95	
C-WB	5	19	1	0.95	

(a) Survival based on initial exposure of 20 organisms per replicate.

Table D.10. Water Quality Summary for 10-Day *R. abronius* Benthic Toxicity Static Test, Federal Projects in New York and New Jersey

Sediment Treatment	Temperature (°C)		pH		Dissolved Oxygen (mg/L)		Salinity (o/oo)	
	Min	Max	Min	Max	Min	Max	Min	Max
Acceptable Range	12.0	16.0	7.30	8.30	7.6	NA[a]	28.0	32.0
MOTBY Reach A and B								
COMP MT-A	14.2	15.9	7.80	8.41[b]	6.9[c]	8.7	29.0	31.5
COMP MT-B	14.0	15.9	7.71	8.47[b]	6.7[c]	8.9	28.5	31.5
Arthur Kill Reach A, B, and C								
COMP AK-A	14.1	15.8	7.51	8.51[b]	7.1[c]	8.9	29.0	30.5
COMP AK-B	14.2	15.8	7.53	8.44[b]	6.6[c]	8.9	28.0	30.5
COMP AK-C	14.4	15.9	7.63	8.48[b]	6.3[c]	8.5	28.5	31.0
Port Elizabeth Reach A and B								
COMP PE-A	14.0	15.8	7.70	8.48[b]	7.4[c]	8.5	28.0	30.5
COMP PE-B	14.0	15.9	7.72	8.45[b]	7.4[c]	8.9	28.5	31.0
Hackensack River Reach A								
COMP HR-A	14.3	15.9	7.61	8.51[b]	7.4[c]	8.4	28.0	30.0
Claremont Reach I, II, and III								
COMP CL-I	14.2	15.8	7.71	8.50[b]	7.2[c]	8.9	29.5	31.0
COMP CL-II	14.1	15.8	7.66	8.55[b]	7.2[c]	8.4	29.5	32.0
COMP CL-III	14.2	15.8	7.69	8.48[b]	7.2[c]	8.4	29.0	31.0
Mud Dump Reference Site								
MUD DUMP REF	14.2	15.8	7.59	8.12	7.2[c]	8.4	30.5	32.0
Controls								
C-SB	14.0	15.8	7.64	8.61[b]	6.9[c]	8.4	30.0	32.0
C-WB	14.1	15.8	7.53	8.13	7.4[c]	8.5	30.0	32.0

(a) NA Not applicable.
(b) Data point out of range.
(c) Data points for dissolved oxygen were out of range on Day 0 of testing. Thereafter, data points were within range.

Table D.11. Test Results for 10-Day *R. abronius* Benthic Toxicity Flow-Through Test, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	*R. abronius* Live[a]	*R. abronius* Dead or Missing	Proportion Surviving	Mean Percent Surviving
MOTBY Reach A					
COMP MT-A	1	2	18	0.10	
COMP MT-A	2	1	19	0.05	
COMP MT-A	3	1	19	0.05	6%
COMP MT-A	4	0	20	0.00	
COMP MT-A	5	2	18	0.10	
MOTBY Reach B					
COMP MT-B	1	0	20	0.00	
COMP MT-B	2	0	20	0.00	
COMP MT-B	3	0	20	0.00	0%
COMP MT-B	4	0	20	0.00	
COMP MT-B	5	0	20	0.00	
Arthur Kill Reach A					
COMP AK-A	1	7	13	0.35	
COMP AK-A	2	7	13	0.35	
COMP AK-A	3	3	17	0.15	37%
COMP AK-A	4	11	9	0.55	
COMP AK-A	5	9	11	0.45	
Arthur Kill Reach B					
COMP AK-B	1	0	20	0.00	
COMP AK-B	2	2	18	0.10	
COMP AK-B	3	1	19	0.05	4%
COMP AK-B	4	1	19	0.05	
COMP AK-B	5	0	20	0.00	
Arthur Kill Reach C					
COMP AK-C	1	3	17	0.15	
COMP AK-C	2	3	17	0.15	
COMP AK-C	3	4	16	0.20	17%
COMP AK-C	4	4	16	0.20	
COMP AK-C	5	3	17	0.15	
Port Elizabeth Reach A					
COMP PE-A	1	5	15	0.25	
COMP PE-A	2	3	17	0.15	
COMP PE-A	3	4	16	0.20	27%
COMP PE-A	4	8	12	0.40	
COMP PE-A	5	7	13	0.35	
Port Elizabeth Reach B					
COMP PE-B	1	3	17	0.15	
COMP PE-B	2	6	14	0.30	
COMP PE-B	3	3	17	0.15	28%
COMP PE-B	4	8	12	0.40	
COMP PE-B	5	8	12	0.40	

TABLE D.11. (contd)

Sediment Treatment	Replicate	*R. abronius* Live[(a)]	*R. abronius* Dead or Missing	Proportion Surviving	Mean Percent Surviving
Hackensack River Reach A					
COMP HR-A	1	7	13	0.35	
COMP HR-A	2	10	10	0.50	
COMP HR-A	3	7	13	0.35	32%
COMP HR-A	4	4	16	0.20	
COMP HR-A	5	4	16	0.20	
Claremont Reach I					
COMP CL-I	1	2	18	0.10	
COMP CL-I	2	3	17	0.15	
COMP CL-I	3	5	15	0.25	24%
COMP CL-I	4	6	14	0.30	
COMP CL-I	5	8	12	0.40	
Claremont Reach II					
COMP CL-II	1	0	20	0.00	
COMP CL-II	2	3	17	0.15	
COMP CL-II	3	6	14	0.30	16%
COMP CL-II	4	4	16	0.20	
COMP CL-II	5	3	17	0.15	
Claremont Reach III					
COMP CL-III	1	3	17	0.15	
COMP CL-III	2	2	18	0.10	
COMP CL-III	3	1	19	0.05	11%
COMP CL-III	4	2	18	0.10	
COMP CL-III	5	3	17	0.15	
Mud Dump Reference Site					
MUD DUMP REF	1	18	2	0.90	
MUD DUMP REF	2	19	1	0.95	
MUD DUMP REF	3	16	4	0.80	92%
MUD DUMP REF	4	19	1	0.95	
MUD DUMP REF	5	20	0	1.00	
Controls					
C-SB	1	19	1	0.95	
C-SB	2	17	3	0.85	
C-SB	3	18	2	0.90	90%
C-SB	4	17	3	0.85	
C-SB	5	19	1	0.95	
C-WB	1	20	0	1.00	
C-WB	2	20	0	1.00	
C-WB	3	19	1	0.95	95%
C-WB	4	18	2	0.90	
C-WB	5	18	2	0.90	

(a) Survival based on initial exposure of 20 organisms per replicate.

Table D.12. Water Quality Summary for 10-Day *R. abronius* Benthic Toxicity Flow-Through Test, Federal Projects in New York and New Jersey

Sediment Treatment	Temperature (°C)		pH		Dissolved Oxygen (mg/L)		Salinity (o/oo)		Flow Rate (mL/min)	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Acceptable Range	12.0	16.0	7.30	8.30	7.6	NA[a]	28.0	32.0	35	45
MOTBY Reach A and B										
COMP MT-A	13.5	14.0	7.55	8.24	7.6	9.2	30.0	31.5	36	45
COMP MT-B	13.5	14.2	7.62	8.21	8.0	9.1	30.0	32.0	35	44
Arthur Kill Reach A, B, and C										
COMP AK-A	13.6	14.4	7.58	8.24	8.0	9.3	29.5	32.0	36	44
COMP AK-B	13.4	14.3	7.59	8.25	8.0	9.2	30.0	31.5	35	44
COMP AK-C	13.4	14.1	7.54	8.25	7.8	9.5	30.0	31.0	36	44
Port Elizabeth Reach A and B										
COMP PE-A	13.5	14.0	7.42	8.26	8.0	9.2	30.0	31.5	35	45
COMP PE-B	13.5	14.1	7.64	8.22	8.0	9.1	30.0	31.5	36	44
Hackensack River Reach A										
COMP HR-A	13.5	14.0	7.56	8.26	8.0	9.0	29.5	31.0	36	45
Claremont Reach I, II, and III										
COMP CL-I	13.5	14.2	7.63	8.25	7.9	9.3	30.0	31.5	36	44
COMP CL-II	13.6	14.0	7.65	8.25	7.9	9.3	30.0	31.0	35	44
COMP CL-III	13.5	14.0	6.72[b]	8.21	8.0	9.1	29.5	31.0	36	44
Mud Dump Reference Site										
MUD DUMP REF	13.5	14.2	7.37	8.24	8.0	9.2	30.0	31.5	36	44
Controls										
C-SB	13.5	14.2	7.40	8.19	8.0	8.9	30.0	32.0	36	44
C-WB	13.5	14.2	7.62	8.26	7.9	9.2	30.0	32.0	36	45

(a) NA Not applicable.
(b) Data point out of range.

TABLE D.13. Test Results for 10-Day *M. bahia* Benthic Toxicity Static Test, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	*M. bahia* Live[a]	*M. bahia* Dead or Missing	Proportion Surviving	Mean Percent Surviving
Arthur Kill Reach A					
COMP AK-A	1	0	20	0.00	
COMP AK-A	2	0	20	0.00	
COMP AK-A	3	0	20	0.00	0%
COMP AK-A	4	0	20	0.00	
COMP AK-A	5	0	20	0.00	
Arthur Kill Reach B					
COMP AK-B	1	0	20	0.00	
COMP AK-B	2	0	20	0.00	
COMP AK-B	3	0	20	0.00	2%
COMP AK-B	4	2	18	0.10	
COMP AK-B	5	0	20	0.00	
Arthur Kill Reach C					
COMP AK-C	1	0	20	0.00	
COMP AK-C	2	0	20	0.00	
COMP AK-C	3	0	20	0.00	0%
COMP AK-C	4	0	20	0.00	
COMP AK-C	5	0	20	0.00	
Port Elizabeth Reach A					
COMP PE-A	1	1	19	0.05	
COMP PE-A	2	4	16	0.20	
COMP PE-A	3	6	14	0.30	14%
COMP PE-A	4	3	17	0.15	
COMP PE-A	5	0	20	0.00	
Port Elizabeth Reach B					
COMP PE-B	1	0	20	0.00	
COMP PE-B	2	2	18	0.10	
COMP PE-B	3	0	20	0.00	14%
COMP PE-B	4	5	15	0.25	
COMP PE-B	5	7	13	0.35	
Hackensack River Reach A					
COMP HR-A	1	0	20	0.00	
COMP HR-A	2	0	20	0.00	
COMP HR-A	3	0	20	0.00	3%
COMP HR-A	4	0	20	0.00	
COMP HR-A	5	3	17	0.15	
Mud Dump Reference Site					
MUD DUMP REF	1	19	1	0.95	
MUD DUMP REF	2	20	0	1.00	
MUD DUMP REF	3	18	2	0.90	96%
MUD DUMP REF	4	19	1	0.95	
MUD DUMP REF	5	20	0	1.00	

TABLE D.13. (contd)

Sediment Treatment	Replicate	*M. bahia* Live[(a)]	*M. bahia* Dead or Missing	Proportion Surviving	Mean Percent Surviving
Controls					
C-SB	1	20	0	1.00	
C-SB	2	19	1	0.95	
C-SB	3	19	1	0.95	96%
C-SB	4	20	0	1.00	
C-SB	5	18	2	0.90	

(a) Survival based on initial exposure of 20 organisms per replicate.

TABLE D.14. Water Quality Summary for 10-Day *M. bahia* Benthic Toxicity Static Test, Federal Projects in New York and New Jersey

Sediment Treatment	Temperature (C)		pH		Dissolved Oxygen (mg/L)		Salinity (o/oo)	
	Min	Max	Min	Max	Min	Max	Min	Max
Acceptable Range	18.0	22.0	7.30	8.30	6.7	NA[a]	28.0	32.0
Arthur Kill Reach A, B, and C								
COMP AK-A	19.2	20.1	7.97	8.39[b]	6.2[b]	7.5	28.0	30.0
COMP AK-B	19.3	20.0	7.96	8.36[b]	6.5[b]	7.9	27.5[b]	30.0
COMP AK-C	19.3	20.0	7.92	8.36[b]	6.7	7.3	28.0	30.0
Port Elizabeth Reach A and B								
COMP PE-A	19.3	20.0	7.97	8.34[b]	6.7	7.3	27.0[b]	29.0
COMP PE-B	19.3	20.1	7.82	8.37[b]	6.4[b]	7.4	28.0	29.5
Hackensack River Reach A								
COMP HR-A	19.4	20.1	7.87	8.45[b]	5.9[b]	7.5	27.5[b]	30.5
Mud Dump Reference Site								
MUD DUMP REF	19.4	20.1	7.74	8.06	6.3[b]	7.7	30.0	32.0
Control								
C-SB	19.2	20.1	7.83	8.62[b]	4.2[b]	7.3	29.0	32.0

(a) NA Not applicable.
(b) Data point out of range.

APPENDIX E

Bioaccumulation Tests

TABLE E.1. Test Results for 96-Hour *N. virens* Reference Toxicant Tests, Federal Projects in New York and New Jersey

Copper Concentration (µg/L)	Replicate	*N. virens* Live[(a)]	*N. virens* Dead or Missing	Proportion Surviving	Mean Percent Surviving
Original Test					
0	1	10	0	1.00	
0	2	8	2	0.80	93%
0	3	10	0	1.00	
310	1	0	10	0.00	
310	2	0	10	0.00	0%
310	3	0	10	0.00	
630	1	0	10	0.00	
630	2	0	10	0.00	0%
630	3	0	10	0.00	
1250	1	0	10	0.00	
1250	2	0	10	0.00	0%
1250	3	0	10	0.00	
2500	1	0	10	0.00	
2500	2	0	10	0.00	0%
2500	3	0	10	0.00	
5000	1	0	10	0.00	
5000	2	0	10	0.00	0%
5000	3	0	10	0.00	
Repeat Test					
0	1	10	0	1.00	
0	2	10	0	1.00	100%
63	1	9	1	0.90	
63	2	10	0	1.00	95%
125	1	6	4	0.60	
125	2	10	0	1.00	80%
250	1	0	10	0.00	
250	2	0	10	0.00	0%
500	1	0	10	0.00	
500	2	0	10	0.00	0%

(a) Survival based on initial exposure of 10 individuals per replicate.

TABLE E.2. Water Quality Summary for 96-Hour *N. virens* Reference Toxicant Tests, Federal Projects in New York and New Jersey

Copper Concentration (µg/L)	Temperature (°C)		pH		Dissolved Oxygen (mg/L)		Salinity (o/oo)	
	Min	Max	Min	Max	Min	Max	Min	Max
Acceptable Range	18.0	22.0	7.30	8.30	4.5	NA[a]	28.0	32.0
Original Test								
0	18.6	19.8	7.55	7.95	0.7	7.9	30.0	32.0
310	18.3	19.8	6.91[b]	7.91	0.5[b]	8.3	30.0	32.0
630	17.8[b]	19.2	7.08[b]	7.85	3.6[b]	8.2	30.0	32.0
1250	17.9[b]	19.2	7.21[b]	7.93	3.5[b]	8.3	30.0	32.0
2500	18.6	19.2	7.06[b]	7.81	2.0[b]	8.3	30.0	32.0
5000	17.6[b]	19.9	7.01[b]	7.72	0.7[b]	8.2	30.0	32.0
Repeat Test								
0	19.2	20.0	7.61	8.18	7.2	7.8	30.0	31.5
63	19.2	19.9	7.52	8.19	6.5	7.5	30.0	32.0
125	19.1	19.9	7.48	8.11	6.5	7.5	30.0	32.0
250	19.1	20.0	7.18[b]	8.12	1.5[b]	7.4	30.0	32.0
500	19.0	20.0	7.28[b]	8.05	3.3[b]	7.0	30.0	32.0

(a) NA Not applicable.
(b) Data point out of range.

TABLE E.3. Test Results for 28-Day *N. virens* Bioaccumulation Test, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	*N. virens* Live[a]	*N. virens* Dead or Missing	Proportion Surviving	Mean Percent Surviving
MOTBY Reach A					
COMP MT-A	1	24	6	0.80	
COMP MT-A	2	21	9	0.70	
COMP MT-A	3	29	1	0.97	82%
COMP MT-A	4	29	1	0.97	
COMP MT-A	5	20	10	0.67	
MOTBY Reach B					
COMP MT-B	1	19	11	0.63	
COMP MT-B	2	25	5	0.83	
COMP MT-B	3	21	9	0.70	75%
COMP MT-B	4	26	4	0.87	
COMP MT-B	5	22	8	0.73	
Arthur Kill Reach A					
COMP AK-A	1	15	15	0.50	
COMP AK-A	2	26	4	0.87	
COMP AK-A	3	29	1	0.97	79%
COMP AK-A	4	21	9	0.70	
COMP AK-A	5	27	3	0.90	
Arthur Kill Reach B					
COMP AK-B	1	13	17	0.43	
COMP AK-B	2	20	10	0.67	
COMP AK-B	3	20	10	0.67	69%
COMP AK-B	4	26	4	0.87	
COMP AK-B	5	25	5	0.83	
Arthur Kill Reach C					
COMP AK-C	1	24	6	0.80	
COMP AK-C	2	15	15	0.50	
COMP AK-C	3	19	11	0.63	65%
COMP AK-C	4	17	13	0.57	
COMP AK-C	5	23	7	0.77	

TABLE E.3. (contd)

Sediment Treatment	Replicate	*N. virens* Live[(a)]	*N. virens* Dead or Missing	Proportion Surviving	Mean Percent Surviving
Port Elizabeth Reach A					
COMP PE-A	1	20	10	0.67	
COMP PE-A	2	12	18	0.40	
COMP PE-A	3	23	7	0.77	63%
COMP PE-A	4	23	7	0.77	
COMP PE-A	5	17	13	0.57	
Port Elizabeth Reach B					
COMP PE-B	1	25	5	0.83	
COMP PE-B	2	22	8	0.73	
COMP PE-B	3	27	3	0.90	75%
COMP PE-B	4	16	14	0.53	
COMP PE-B	5	23	7	0.77	
Hackensack River Reach A					
COMP HR-A	1	21	9	0.70	
COMP HR-A	2	24	6	0.80	
COMP HR-A	3	26	4	0.87	76%
COMP HR-A	4	22	8	0.73	
COMP HR-A	5	21	9	0.70	
Mud Dump Reference Site					
MUD DUMP REF	1	25	5	0.83	
MUD DUMP REF	2	24	6	0.80	
MUD DUMP REF	3	23	7	0.77	76%
MUD DUMP REF	4	21	9	0.70	
MUD DUMP REF	5	21	9	0.70	
Controls					
C-NR	1	28	2	0.93	
C-NR	2	22	8	0.73	89%
C-NR	3	30	0	1.00	

(a) Survival based on initial exposure of 30 organisms per replicate.

TABLE E.4. Water Quality Summary for 28-Day *N. virens* Bioaccumulation Test, Federal Projects in New York and New Jersey

Sediment Treatment	Temperature (C) Min	Temperature (C) Max	pH Min	pH Max	Dissolved Oxygen (mg/L) Min	Dissolved Oxygen (mg/L) Max	Salinity (o/oo) Min	Salinity (o/oo) Max	Flow Rate (mL/min) Min	Flow Rate (mL/min) Max
Acceptable Range	18.0	22.0	7.30	8.30	4.5	NA[a]	28.0	32.0	115	135
MOTBY Reach A and B										
COMP MT-A	18.2	20.8	7.43	8.13	5.9	8.2	29.5	31.0	116	134
COMP MT-B	18.4	20.7	7.54	8.13	5.6	8.1	30.0	32.0	116	134
Arthur Kill Reach A, B, and, C										
COMP AK-A	17.8[b]	20.8	6.98[b]	8.09	6.0	8.0	30.0	31.5	116	132
COMP AK-B	18.2	20.7	7.45	8.08	5.3	7.9	29.5	31.0	31[b]	134
COMP AK-C	18.2	20.7	7.37	8.09	5.1	8.0	30.0	31.0	116	134
Port Elizabeth Reach A and B										
COMP PE-A	18.5	20.7	7.37	8.08	4.2[b]	8.2	29.5	31.0	52[b]	120
COMP PE-B	18.2	20.8	7.40	8.12	5.9	8.2	30.0	31.0	116	135
Hackensack River Reach A										
COMP HR-A	18.3	20.7	7.34	8.09	5.7	8.2	30.0	32.0	116	132
Mud Dump Reference Site										
MUD DUMP REF	18.4	20.7	7.52	8.08	6.1	8.5	30.0	31.0	116	135
Control										
C-NR	18.4	20.8	7.64	8.04	6.0	8.0	30.0	30.5	116	135

(a) NA Not applicable.
(b) Data point out of range.

TABLE E.5. Test Results for 96-Hour *M. nasuta* Reference Toxicant Tests, Federal Projects in New York and New Jersey

Copper Concentration (µg/L)	Replicate	*M. nasuta* Live[a]	*M. nasuta* Dead or Missing	Proportion Surviving	Mean Percent Surviving
Original Test					
0	1	10	0	1.00	
0	2	10	0	1.00	100%
0	3	10	0	1.00	
630	1	4	6	0.40	
630	2	1	9	0.10	27%
630	3	3	7	0.30	
1250	1	3	7	0.30	
1250	2	1	9	0.10	17%
1250	3	1	9	0.10	
2500	1	0	10	0.00	
2500	2	0	10	0.00	3%
2500	3	1	9	0.10	
5000	1	0	10	0.00	
5000	2	0	10	0.00	0%
5000	3	0	10	0.00	
10,000	1	0	10	0.00	
10,000	2	0	10	0.00	0%
10,000	3	0	10	0.00	
Repeat Test					
0	1	10	0	1.00	
0	2	10	0	1.00	100%
0	3	10	0	1.00	
125	1	10	0	1.00	
125	2	10	0	1.00	100%
125	3	10	0	1.00	
250	1	10	0	1.00	
250	2	8	2	0.80	93%
250	3	10	0	1.00	
500	1	10	0	1.00	
500	2	9	1	0.90	90%
500	3	8	2	0.80	

TABLE E.5. (contd)

Copper Concentration (µg/L)	Replicate	*M. nasuta* Live[a]	Dead or Missing	Proportion Surviving	Mean Percent Surviving
1000	1	7	3	0.70	
1000	2	4	6	0.40	53%
1000	3	5	5	0.50	

(a) Survival based on initial exposure of 10 organisms per replicate.

TABLE E.6. Water Quality Summary for 96-Hour *M. nasuta* Reference Toxicant Tests, Federal Projects in New York and New Jersey

Copper Concentration (µg/L)	Temperature (°C)		pH		Dissolved Oxygen (mg/L)		Salinity (o/oo)	
	Min	Max	Min	Max	Min	Max	Min	Max
Acceptable Range	12.0	16.0	7.30	8.30	5.0	NA[a]	28.0	32.0
Original Test								
0	13.8	15.8	7.62	7.93	7.0	8.7	30.0	31.5
630	13.9	16.5[b]	7.68	7.98	7.0	8.7	30.0	31.0
1250	13.8	16.2[b]	7.67	7.98	6.9	8.7	30.0	31.0
2500	13.9	16.1[b]	7.51	7.90	6.5	8.8	30.0	31.0
5000	14.0	16.1[b]	7.30	7.89	6.3	8.7	30.0	31.0
10,000	13.9	16.4[b]	7.31	7.91	6.7	8.6	29.5	31.5
Repeat Test								
0	13.9	15.4	7.65	8.03	7.5	10.2	30.0	30.0
125	13.9	15.2	7.54	8.03	6.8	10.1	30.0	30.0
250	13.9	15.3	7.62	8.02	7.0	10.0	29.5	30.0
500	13.9	15.9	7.53	8.02	5.9	10.2	30.0	30.0
1000	13.9	15.2	7.29[b]	7.98	2.5[b]	10.1	30.0	30.0

(a) NA Not applicable.
(b) Data point out of range.

TABLE E.7. Test Results for 28-Day *M. nasuta* Bioaccumulation Test, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	*M. nasuta* Live[a]	*M. nasuta* Dead or Missing	Proportion Surviving	Mean Percent Surviving
Arthur Kill Reach A					
COMP AK-A	1	23	2	0.92	
COMP AK-A	2	25	0	1.00	
COMP AK-A	3	24	1	0.96	91%
COMP AK-A	4	20	5	0.80	
COMP AK-A	5	22	3	0.88	
Arthur Kill Reach B					
COMP AK-B	1	25	0	1.00	
COMP AK-B	2	24	1	0.96	
COMP AK-B	3	24	1	0.96	95%
COMP AK-B	4	22	3	0.88	
COMP AK-B	5	24	1	0.96	
Arthur Kill Reach C					
COMP AK-C	1	20	5	0.80	
COMP AK-C	2	21	4	0.84	
COMP AK-C	3	22	3	0.88	80%
COMP AK-C	4	18	7	0.72	
COMP AK-C	5	19	6	0.76	
Port Elizabeth Reach A					
COMP PE-A	1	25	0	1.00	
COMP PE-A	2	25	0	1.00	
COMP PE-A	3	21	4	0.84	94%
COMP PE-A	4	22	3	0.88	
COMP PE-A	5	24	1	0.96	
Port Elizabeth Reach B					
COMP PE-B	1	24	1	0.96	
COMP PE-B	2	23	2	0.92	
COMP PE-B	3	23	2	0.92	93%
COMP PE-B	4	23	2	0.92	
COMP PE-B	5	23	2	0.92	

TABLE E.7. (contd)

Sediment Treatment	Replicate	*M. nasuta* Live[(a)]	*M. nasuta* Dead or Missing	*M. nasuta* Proportion Surviving	*M. nasuta* Mean Percent Surviving
Hackensack River Reach A					
COMP HR-A	1	22	3	0.88	
COMP HR-A	2	23	2	0.92	
COMP HR-A	3	25	0	1.00	93%
COMP HR-A	4	22	3	0.88	
COMP HR-A	5	24	1	0.96	
Mud Dump Reference Site					
MUD DUMP REF	1	21	4	0.84	
MUD DUMP REF	2	22	3	0.88	
MUD DUMP REF	3	23	2	0.92	90%
MUD DUMP REF	4	23	2	0.92	
MUD DUMP REF	5	23	2	0.92	
Controls					
C-SB	1	24	1	0.96	
C-SB	2	25	0	1.00	93%
C-SB	3	21	4	0.84	

(a) Survival based on initial exposure of 25 organisms per replicate.

TABLE E.8. Water Quality Summary for 28-day *M. nasuta* Bioaccumulation Test, Federal Projects in New York and New Jersey

Sediment Treatment	Temperature (C)		pH		Dissolved Oxygen (mg/L)		Salinity (o/oo)		Flow Rate (mL/min)	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Acceptable Range	12.0	16.0	7.30	8.30	5.0	NA[a]	28.0	32.0	115	135
Arthur Kill Reach A, B, and C										
COMP AK-A	14.0	16.8[b]	7.55	8.14	7.0	8.5	30.0	31.5	116	132
COMP AK-B	13.9	13.9	7.61	9.95[b]	6.5	8.6	30.0	31.0	115	132
COMP AK-C	13.8	15.8	7.62	8.14	7.2	8.6	30.0	31.0	116	132
Port Elizabeth Reach A and B										
COMP PE-A	14.3	16.2[b]	7.58	8.06	7.4	8.7	30.0	31.5	52[b]	120
COMP PE-B	14.0	16.1[b]	7.52	8.16	6.9	8.5	30.0	31.0	112[b]	132
Hackensack River Reach A										
COMP HR-A	14.0	15.7	7.53	8.16	6.3	8.6	29.0	31.5	116	132
Mud Dump Reference Site										
MUD DUMP REF	14.3	15.8	7.52	8.15	7.6	8.6	30.0	32.0	116	132
Control										
C-SB	14.2	15.6	7.61	8.10	7.1	8.5	30.0	31.0	116	132

(a) NA Not applicable.
(b) Data point out of range.

APPENDIX F

Nereis virens Tissue Chemical Analyses

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects

PARAMETER: Metals

LABORATORY: Battelle/Marine Sciences Laboratory, Sequim, Washington

MATRIX: Worms (*Nereis virens*)

QA/QC DATA QUALITY OBJECTIVES

	Reference Method	Range of Recovery	SRM Accuracy	Relative Precision	Detection Limit (dry wt)
Arsenic	ICP/MS	75-125%	≤20%	≤20%	1.0
Cadmium	ICP/MS	75-125%	≤20%	≤20%	0.1
Chromium	ICP/MS	75-125%	≤20%	≤20%	0.2
Copper	ICP/MS	75-125%	≤20%	≤20%	1.0
Lead	ICP/MS	75-125%	≤20%	≤20%	0.1
Mercury	CVAA	75-125%	≤20%	≤20%	0.02
Nickel	ICP/MS	75-125%	≤20%	≤20%	0.1
Silver	ICP/MS	75-125%	≤20%	≤20%	0.1
Zinc	ICP/MS	75-125%	≤20%	≤20%	1.0

METHOD

Nine metals were analyzed for the New York Federal Project: silver (Ag), arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), mercury (Hg), nickel (Ni), lead (Pb) and zinc (Zn). Hg was analyzed using cold-vapor atomic absorption spectroscopy (CVAA) according to the EPA Method 245.6. The remaining metals were analyzed by inductively coupled plasma mass spectrometry (ICP/MS) following a procedure based on EPA Method 200.8 (EPA 1991)

To prepare tissue for analysis, samples were freeze-dried and blended in a Spex mixer-mill. Approximately 5 g of mixed sample was ground in a ceramic ball mill. For ICP/MS and CVAA analyses, 0.2- to 0.5-g aliquots of dried homogenous sample were digested using a mixture of nitric acid and hydrogen peroxide following EPA Method 200.3 (EPA 1991).

HOLDING TIMES

A total of 55 tissue samples was received on 6/04/93 in good condition. Samples were logged into Battelle's log-in system, frozen to -80°C and subsequently freeze-dried within approximately seven days of sample receipt. Samples were all analyzed within 180 days of collection. The following table summarizes all analysis dates:

Task	Date Performed
Sample Digestion	9/27/93
ICP-MS	10/27/93
CVAA-Hg	11/04-05/93

QA/QC SUMMARY/METALS (contd)

DETECTION LIMITS Four samples of a background *Nereis* sample were analyzed as four separate replicates. The standard deviation of these results were multiplied by 3.5 to determine a method detection limit (MDL). Target detection limits were exceeded for a number of metals; however, these metals were detected above the MDLs in all samples. Therefore, no corrective actions were necessary.

METHOD BLANKS A total of three method blanks was analyzed. Levels detected were all below the target detection limits. All data are corrected for the average of the three blank concentrations.

MATRIX SPIKES Three samples were spiked with all nine metals. All recoveries were within the QC limits of 75%-125%, with the exception of Zn at 272% and Hg at 74% in one of the three spiked samples. Since Zn values for the other two spikes and for the standard reference materials (SRMs) were acceptable, no further action was taken.

REPLICATES Three samples were digested in triplicate. Precision for triplicate analyses is reported by calculating the relative standard deviation (RSD) between the replicate results. RSD values were all within the QC limits of ±20%, with the exception of Ag and Zn in one of the three sets of triplicates.

SRMs SRM 1566a (oyster tissue from the National Institute of Standards and Technology [NIST]), was analyzed for all metals. Results for all metals were within ±20 % of mean certified value, with the exception of Cr and Hg in one of the three SRMs and Ni in two of the three SRMs.

REFERENCES

EPA (U.S. Environmental Protection Agency). 1991 *Methods for the Determination of Metals in Environmental Samples.* EPA-600/4-91-010. U.S. Environmental Protection Agency, Office of Research and Development, Washington, D.C.

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects

PARAMETER: Chlorinated Pesticides

LABORATORY: Battelle/Marine Sciences Laboratory, Sequim, Washington

MATRIX: Worm (*Nereis virens*)

QA/QC DATA QUALITY OBJECTIVES

Reference Method	Surrogate Recovery	Spike Recovery	Relative Precision	Detection Limit
GC/ECD	30-150%	50-120%	≤30%	0.4 ng/g

SAMPLE CUSTODY A total of 55 *Nereis* worm samples was received on 6/4/93 in good condition. Samples were logged into Battelle's log-in system and stored frozen until extraction.

METHOD Tissues were homogenized wet using a stainless steel blade. An aliquot of tissue sample was extracted with methylene chloride using the roller technique under ambient conditions following a procedure based on methods used by the National Oceanic and Atmospheric Administration for the Status and Trends Program (Krahn et al. 1988). Samples were then cleaned using silica/alumina (5% deactivated) chromatography followed by high performance liquid chromatography (HPLC) cleanup (Krahn et al. 1988). Extracts were analyzed for 15 chlorinated pesticides using gas chromatography/electron capture detection (GC/ECD) following a procedure based on EPA Method 8080 (EPA 1986). The column used was a J&W DB-17, and the confirmatory column was a DB-1701, both capillary columns (30m x 0.25mm I.D.).

HOLDING TIMES Samples were extracted in two batches: 7/21 and 7/29/93. Extracts were analyzed by GC/ECD. Samples from batch 1 were analyzed on 8/20/93, and batch 2 was analyzed on 8/24-8/26/93, within the established holding time of 40 days.

DETECTION LIMITS Target detection limits were met for all pesticides. Actual method detection limits ranged from 0.05 to 0.25 μg/kg wet weight, depending on the pesticide compound. Method detection limits (MDLs) were reported corrected for average sample wet weight extracted for each extraction batch. MDLs were determined from multiplying the standard deviation of seven spiked replicates of *Nereis* tissue by the Student's t value.

METHOD BLANKS One method blank was extracted with each extraction batch for a total of three method blanks. No pesticides were detected in any of the method blanks.

QA/QC SUMMARY/CHLORINATED PESTICIDES (contd)

SURROGATES

Two compounds, PCB congeners 103 and 198, were added to all samples prior to extraction to assess the efficiency of the analysis. Sample surrogate recoveries were all within the QC guidelines of 30%-150%.

MATRIX SPIKES

Ten out of the 15 pesticides analyzed were spiked into one sample per extraction batch. Matrix spike recoveries ranged from 56% to 109%, within the control limit range of 50%-120%.

REPLICATES

One sample from each extraction batch was analyzed in triplicate. Precision was measured by calculating the relative standard deviation (RSD) between the replicate results. RSDs for all detectable values were below the target precision goal of ≤30%, indicating acceptable precision.

SRMs

SRM 1974, a mussel tissue obtained from the National Institute for Standards and Technology (NIST), was analyzed with each batch. All detectable values were within ±30% of the noncertified values, with the exception of a-chlordane and 4,4'-DDD in all three SRMs, 2,4'-DDD in one of the three SRMs, and trans-nonachlor in all three SRMs. Only 9 out of the 15 pesticides have values reported by NIST, and of these, three (dieldrin, 2,4'-DDT and 4,4'-DDT), are less than 10 times the MDL.

MISCELLANEOUS

4,4'-DDT coelutes with PCB congener 187 on the primary column and with PCB congener 138 on the confirmation column. For this reason, it is possible to get false positive hits for 4,4'-DDT. All DDT results for samples with both DDT and congener 187 and 138 detections are flagged with an "I" to indicate that there is coelution and that the values may be either false positives and/or biased high due to interference.

REFERENCES

Krahn, M. M., C. A. Wigren, R. W. Pearce, L. K. Moore, R. G. Bogar, W. D. MacLeod, Jr., S.-L. Chan, and D. W. Brown. 1988. *New HPLC Cleanup and Revised Extraction Procedures for Organic Contaminants.* NOAA Technical Memorandum NMFS F/NWC-153, Seattle, Washington.

EPA (U.S. Environmental Protection Agency). 1986. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods.* SW-846. U.S. Document No. 955-001-00000, U.S. Environmental Protection Agency, Washington D.C.

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects

PARAMETER: PCB Congeners

LABORATORY: Battelle/Marine Sciences Laboratory, Sequim, Washington

MATRIX: Worm (*Nereis virens*)

QA/QC DATA QUALITY OBJECTIVES

Reference Method	Surrogate Recovery	Spike Recovery	Relative Precision	Detection Limit
GC/ECD	30-150%	50-120%	≤30%	0.4 ng/g

SAMPLE CUSTODY *Nereis* worm samples were received on 6/5/93 in good condition. Samples were logged into Battelle log-in system and stored frozen until extraction.

METHOD Tissues were homogenized wet using a stainless-steel blade. An aliquot of tissue sample was extracted with methylene chloride using the roller technique under ambient conditions following a procedure based on methods used by the National Oceanic and Atmospheric Administration for the Status and Trends Program (Krahn et al. 1988). Samples were then cleaned using silica/alumina (5% deactivated) chromatography followed by high performance liquid chromatography (HPLC) cleanup (Krahn et al. 1988). Extracts were analyzed for 22 PCB congeners using gas chromatography/electron capture detection (GC/ECD) following a procedure based on EPA Method 8080 (EPA 1986). The column used was a J&W DB-17, and the confirmatory column was a DB-1701, both capillary columns (30m x 0.25mm I.D.).

HOLDING TIMES Samples were extracted in three batches: 7/12, 7/14, and 7/19/93. Extracts were analyzed by GC/ECD. Samples from batch 1 were analyzed on 7/26/93, and batch 2 was analyzed on 8/2/93, within the established holding time of 40 days.

DETECTION LIMITS Target detection limits were met for PCB congeners in tissues. Actual method detection limits (MDLs) ranged from 0.08 to 0.43 μg/kg wet weight, depending on the congener. MDLs were reported corrected for average sample wet weight extracted for each extraction batch. MDLs were determined from multiplying the standard deviation of 7 spiked replicates of *Nereis* tissue by the Student's t value.

METHOD BLANKS One method blank was extracted with each extraction batch for a total of three method blanks. No PCB congeners were detected above the MDL in any of the method blanks.

SURROGATES Two compounds, PCB congeners 103 and 198, were added to all samples prior to extraction to assess the efficiency of the analysis. Sample surrogate recoveries were all within the QC guidelines of 30%-150%.

QA/QC SUMMARY/PCB CONGENERS (contd)

MATRIX SPIKES

Five out of the 19 congeners analyzed were spiked into one sample per extraction batch. Matrix spike recoveries ranged from 76% to 129%, within the control limit range of 50% to 120% with the exception of PCB 138 in batch 2. However, greater than 80% of the recoveries were within the QC limits; therefore, no corrective action was taken.

REPLICATES

One sample from each extraction batch was analyzed in triplicate. Precision was measured by calculating the relative standard deviation (RSD) between the replicate results. RSDs for all detectable values were below the target precision goal of ≤30%, indicating acceptable precision.

SRMs

SRM 1974, a mussel tissue obtained from the National Institute for Standards and Technology (NIST), was analyzed with each batch. Only 13 out of the 19 congeners have noncertified values reported by NIST. Values for all three replicates for 9 out of these 13 congeners were within ±30% of the noncertified values. Values for 4 of the congeners exceeded the target limits by up to 100% (i.e., PCB 18); however, values obtained for these congeners were reproducible between the replicates.

MISCELLANEOUS

All congener results are confirmed using a second dissimilar column. Results for each column must be within a factor of 2 of each other to be considered a confirmed value.

REFERENCES

Krahn, M. M., C. A. Wigren, R. W. Pearce, L. K. Moore, R. G. Bogar, W. D. MacLeod, Jr., S.-L. Chan, and D. W. Brown. 1988. *New HPLC Cleanup and Revised Extraction Procedures for Organic Contaminants.* NOAA Technical Memorandum NMFS F/NWC-153, Seattle, Washington.

EPA (U.S. Environmental Protection Agency). 1986. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods.* SW-846. U.S. Document No. 955-001-00000, U.S. Environmental Protection Agency, Washington D.C.

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects

PARAMETER: Polychlorinated Dibenzo-p-dioxins and Dibenzofurans

LABORATORY: Battelle Columbus Laboratory, Columbus, Ohio

MATRIX: Worm (*Nereis virens*)

QA/QC DATA QUALITY OBJECTIVES

Reference Method	MS Recovery	Surrogate Recovery	SRM Accuracy	Relative Precision	Detection Limit (wet wt)
EPA 8290	50 - 120%	40 - 135%	≤30%	≤25%	1 pg/g - 5 pg/g

METHOD General procedures in EPA Method 8290 were followed for the analysis of polychlorinated dibenzo-p-dioxins and dibenzofurans. Samples were solvent-extracted and processed through acid/base silica, alumina, and carbon column cleanup procedures. Samples were analyzed by gas chromatography/high resolution mass spectrometry (GC/HRMS) on a DB-5 column.

HOLDING TIMES All samples were extracted and analyzed within 30 days of sample receipt at the laboratory.

DETECTION LIMITS Target detection limits ranged from 1 pg/g to 5 pg/g. Detection limits for a few of the congeners slightly exceeded these target values.

METHOD BLANKS The method blanks analyzed with the samples were undetected for all the dioxin/furan congeners except for OCDD in three blanks and OCDF in one blank. These blanks values were all less than three times the method detection limit (MDL); therefore, no corrective action was taken.

SURROGATES All except nine surrogate recoveries were within the 40%-135% control limits.

MATRIX SPIKES Matrix spike recoveries of 2,3,7,8-TCDF and 1,2,3,7,8,9-HxCDD were slightly above the 50%-120% limit; however, the remaining 15 analytes (more than 80% of the total number of analytes) were within limits.

REPLICATES Relative standard deviations for all triplicates were ≤25%, except for 1,2,3,6,7,8-HxCDF (42%) in batch 2; however, the detected values were less than 10 times the MDL.

SRMs Recoveries of all analytes except for 2,3,7,8-TCDF (68%) in batch 4 were within 30 percent of the certified levels.

QA/QC SUMMARY/DIOXIN-FURANS (contd)

REFERENCES

EPA (U.S. Environmental Protection Agency). 1986. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods.* SW-846. U.S. Document No. 955-001-00000, U.S.Environmental Protection Agency, Washington D.C.

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects

PARAMETER: Polynuclear Aromatic Hydrocarbons (PAH) and 1,4-Dichlorobenzene

LABORATORY: Battelle/Marine Sciences Laboratory, Sequim, Washington

MATRIX: Worm (*Nereis virens*)

QA/QC DATA QUALITY OBJECTIVES

Reference Method	MS Recovery	Surrogate Recovery	SRM Accuracy	Relative Precision	Detection Limit (wet wt)
GC/MS/SIM	50-120%	30-150%	≤30%	≤30%	4 ng/g

METHOD

Tissue samples were extracted with methylene chloride using a roller under ambient conditions following a procedure based on methods used by the National Oceanic and Atmospheric Administration for the Status and Trends Program (Krahn et al. 1988). Samples were then cleaned using silica/alumina (5% deactivated) chromatography followed by high performance liquid chromatography (HPLC) cleanup.

Extracts were quantified using gas chromatography/mass spectrometry (GC/MS) in the selected ion mode (SIM) following a procedure based on EPA Method 8270 (EPA 1986).

HOLDING TIMES

Fifty five samples were received on 6/4/93 in good condition. Samples were logged into Battelle's log-in system and stored at approximately -20° C until extraction. The following summarizes the extraction dates and GC/MS/SIM analysis dates:

Batch	Extraction	Analysis
Batch 1	7/12/93	7/27/93
Batch 2	7/14/93	8/7/93
Batch 3	7/19/93	8/11/93

DETECTION LIMITS

Target detection limits of 4 ng/g wet wt were met for all PAH compounds. Achieved detection limits were determined by multiplying the standard deviation of seven spiked replicates by the Student's t value.

METHOD BLANKS

One method blank was extracted with each extraction batch. Ten out of the 12 PAHs were detected in at least one of the method blanks analyzed. Although the concentration of some of the PAHs in the blanks were greater than three times the method detection limit (MDL), the values were all less than three times the target MDL of 4 ng/g wet wt. Any sample values that were less than five times the value of the method blank associated with that blank were flagged with a "B."

QA/QC SUMMARY/PAHs (contd)

SURROGATES

Five isotopically labeled compounds were added prior to extraction to assess the efficiency of the method. These were d8-naphthalene, d8-acenaphthene, d12-chrysene, d10-pyrene and d4-1,4 dichlorobenzene. Recoveries of all surrogates were within the quality control limits of 30%-150%, with the exception of one sample, which had recoveries ranging from 20% to 32%. Due to limited sample quantities, no re-extraction was possible.

MATRIX SPIKES

One sample from each batch was spiked with all PAH compounds. Matrix spike recoveries for all compounds in all spikes were within QC limits of 50%-120%.

REPLICATES

One sample from each batch was extracted and analyzed in triplicate. Precision was measured by calculating the relative standard deviation (RSD) between the replicate results. The RSDs were $\leq$30% for analytes greater than 10 times the MDL, except for benzo(k)fluoranthene in batch 1 (RSD of 38%), and indeno(123)pyrene in batch 2 (RSD of 33%).

SRMs

SRM 1974, a marine mussel tissue obtained by the National Institute for Science and Technology, was analyzed with each batch. Eight of the 16 PAH compounds analyzed are certified. All PAHs were detected within 30% of the certified mean, with the exception of anthracene, benzo(b)fluoranthene, indeno(123)pyrene and benzo(ghi)perylene in all three batches. Pyrene and benzo(a)pyrene recoveries were outside of SRM certified range in one or two of the batches.

MISCELLANEOUS

Some of the compounds are flagged with * to indicate that the ion ratio for that compound was outside of the QC range. Primarily, this is due to low levels of the compound of interest. Because the confirmation ion is present at only a fraction of the level of the parent ion, when the native level of the compound is low, the amount of error in the concentration measurement of the confirmation ion increases. The compound is quantified only from the parent ion; therefore, this will not affect the quality of the data. For sample values that are relatively high (>5 times the MDL), it may be an indication of some sort of interference.

REFERENCES

Krahn, M. M., C. A. Wigren, R. W. Pearce, L. K. Moore, R. G. Bogar, W. D. MacLeod, Jr., S.-L. Chan, and D. W. Brown. 1988. *New HPLC Cleanup and Revised Extraction Procedures for Organic Contaminants.* NOAA Technical Memorandum NMFS F/NWC-153, Seattle, Washington.

EPA (U.S. Environmental Protection Agency). 1986. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods.* SW-846. U.S. Document No. 955-001-00000, U.S. Environmental Protection Agency, Washington D.C.

TABLE F.1. Metals, Dry Weight, in Tissue of *N. virens*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*N. virens* Metals (mg/kg dry weight) Ag ICP/MS	As ICP/MS	Cr ICP/MS	Cd ICP/MS	Cu ICP/MS	Hg CVAA	Ni ICP/MS	Pb ICP/MS	Zn ICP/MS
Target DL[a]				0.1	1.0	0.2	0.1	1.0	0.02	0.1	0.1	1.0
Achieved DL				0.01	0.01	0.04	0.119	0.01	0.001	0.038	0.030	0.06
MDL[b] verification				0.017	1.7	0.71	0.279	2.68	0.012	0.98	0.253	3.0
MOTBY Reach A												
Comp MT-A	1	1	15.04	0.088	14.2	1.42	0.822	11.8	0.046	1.98	1.41	74.2
Comp MT-A	2	1	14.58	0.052	15.0	1.39	0.870	12.2	0.057	2.07	1.15	94.6
Comp MT-A	3	1	14.37	0.148	16.0	2.21	1.35	20.0	0.078	3.27	2.19	67.2
Comp MT-A	4	1	15.60	0.116	15.7	1.50	1.38	18.7	0.068	2.44	1.81	110
Comp MT-A	5	1	15.47	0.129	15.1	1.21	0.903	10.3	0.053	1.35	1.29	63.6
MOTBY Reach B												
Comp MT-B	1	1	14.21	0.151	12.3	1.31	0.772	14.2	0.050	1.83	1.55	96.5
Comp MT-B	2	1	13.54	0.131	12.5	1.36	0.793	9.93	0.043	2.22	1.41	74.9
Comp MT-B	3	1	14.24	0.145	15.3	1.51	1.22	14.6	0.063	2.40	1.83	80.2
Comp MT-B	4	1	13.74	0.148	14.1	1.31	1.69	16.9	0.078	2.11	1.73	126
Comp MT-B	5	1	15.06	0.133	14.0	1.32	0.819	13.6	0.048	1.99	1.43	69.2
Arthur Kill Reach A												
Comp AK-A	1	1	15.36	0.073	13.7	1.26	0.763	11.7	0.045	1.54	1.28	50.2
Comp AK-A	2	1	15.46	0.030	12.4	1.09	0.809	11.3	0.038	1.71	1.50	60.1
Comp AK-A	3	1	15.32	0.207	13.7	3.66	1.23	20.1	0.146	3.34	4.06	106
Comp AK-A	4	1	13.73	0.034	13.8	1.34	0.902	11.7	0.047	2.18	1.29	83.3
Comp AK-A	5	1	15.10	0.150	13.2	2.17	1.12	18.0	0.078	3.34	2.36	81.4
Arthur Kill Reach B												
Comp AK-B	1	1	14.83	0.044	12.0	0.933	0.752	12.0	0.055	1.34	1.23	331
Comp AK-B	2	1	15.35	0.064	14.6	1.41	1.21	18.3	0.089	2.22	1.95	118
Comp AK-B	3	1	15.14	0.078	14.1	1.73	1.36	21.3	0.070	3.61	1.99	97.8
Comp AK-B	4	1	14.70	0.080	14.5	2.33	1.17	19.2	0.103	3.35	3.16	116
Comp AK-B	5	1	14.51	0.134	12.3	1.55	1.06	22.1	0.074	2.98	1.81	121

TABLE F.1. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*N. virens* Metals (mg/kg dry weight) Ag ICP/MS	As ICP/MS	Cr ICP/MS	Cd ICP/MS	Cu ICP/MS	Hg CVAA	Ni ICP/MS	Pb ICP/MS	Zn ICP/MS
Arthur Kill Reach C												
Comp AK-C	1	1	15.09	0.098	14.7	1.37	0.941	14.5	0.052	2.70	1.50	60.1
Comp AK-C	2	1	14.50	0.099	12.6	1.06	0.778	13.1	0.045	1.88	1.26	316
Comp AK-C Replicate 1	3	1	14.31	0.046	13.1	1.03	0.837	13.9	0.056	1.65	1.23	72.7
Comp AK-C Replicate 2	3	1	14.31	0.091	13.4	1.04	0.730	12.4	0.040	1.55	1.27	210
Comp AK-C Replicate 3	3	1	14.31	0.053	13.2	1.03	0.848	14.0	0.050	1.69	1.34	82.9
Comp AK-C	4	1	15.22	0.030	14.5	1.03	0.732	11.0	0.049	1.53	1.22	64.4
Comp AK-C	5	1	14.89	0.226	14.6	1.44	0.926	17.1	0.068	1.71	1.54	71.7
Port Elizabeth Reach A												
Comp PE-A	1	1	14.84	0.075	16.7	1.52	1.18	15.9	0.068	2.24	1.82	138
Comp PE-A	2	1	16.58	0.051	13.7	0.920	0.361	6.60	0.041	0.657	0.982	49.5
Comp PE-A	3	1	14.91	0.015	12.8	1.16	0.962	14.1	0.068	1.86	1.65	110
Comp PE-A	4	1	15.00	0.106	14.0	1.50	1.40	17.9	0.078	2.54	2.16	68.0
Comp PE-A	5	1	15.54	0.067	14.1	1.24	0.887	14.1	0.048	1.42	1.64	83.8
Port Elizabeth Reach B												
Comp PE-B	1	1	15.59	0.138	15.5	1.57	1.03	15.6	0.061	2.96	1.85	94.6
Comp PE-B	2	1	13.67	0.018	12.0	1.21	0.829	10.9	0.044	1.54	1.64	342
Comp PE-B	3	1	14.55	0.097	14.7	1.61	1.21	17.8	0.065	3.41	1.75	78.0
Comp PE-B	4	1	15.12	0.192	12.8	1.45	0.757	14.0	0.060	1.91	1.66	117
Comp PE-B	5	1	14.92	0.127	15.4	1.66	1.45	21.1	0.074	3.04	1.96	127
Hackensack River Reach A												
Comp HR-A	1	1	15.33	0.087	16.0	2.37	1.25	15.2	0.075	2.04	2.45	97.8
Comp HR-A	2	1	15.42	0.097	14.7	1.85	1.22	17.6	0.063	2.56	1.92	65.5
Comp HR-A	3	1	15.14	0.143	15.6	5.19	0.925	18.5	0.090	3.64	2.96	83.3
Comp HR-A	4	1	15.84	0.060	14.9	7.25	1.35	14.9	0.141	4.59	4.67	219
Comp HR-A	5	1	14.94	0.251	13.8	2.91	0.928	14.3	0.104	2.03	2.38	72.5
Reference												
Mud Dump Reference	1	1	15.88	0.268	15.5	1.80	0.915	12.7	0.065	1.49	1.52	173
Mud Dump Reference	2	1	15.09	0.310	18.1	1.18	0.971	13.9	0.084	1.55	1.17	73.5
Mud Dump Reference, Replicate 1	3	1	14.18	0.262	15.3	1.27	1.01	12.0	0.070	1.30	1.06	57.6
Mud Dump Reference, Replicate 2	3	1	14.18	0.269	15.7	1.35	1.11	13.1	0.073	1.36	1.11	59.1
Mud Dump Reference, Replicate 3	3	1	14.18	0.241	15.6	1.28	0.989	11.9	0.070	1.37	1.09	56.2
Mud Dump Reference	4	1	14.43	0.244	14.0	1.35	1.03	14.2	0.081	1.61	1.55	345
Mud Dump Reference	5	1	14.59	0.215	14.1	0.815	0.842	10.1	0.054	0.825	1.12	72.2

TABLE F.1. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*N. virens* Metals (mg/kg dry weight) Ag ICP/MS	As ICP/MS	Cr ICP/MS	Cd ICP/MS	Cu ICP/MS	Hg CVAA	Ni ICP/MS	Pb ICP/MS	Zn ICP/MS
Controls												
C-NR	1	1	15.13	0.046	17.6	1.38	1.07	12.6	0.072	1.82	1.30	84.8
C-NR	2	1	14.47	0.089	14.9	1.44	1.16	16.4	0.068	1.91	1.57	92.7
C-NR	3	1	14.59	0.064	17.7	1.47	1.02	12.0	0.058	1.79	1.29	199
Background												
N. virens Background	1	1	14.52	0.028	17.8	1.09	0.511	13.6	0.113	4.03	0.408	99.7
N. virens Background	2	1	14.86	0.018	16.1	1.03	0.532	13.2	0.144	3.48	0.449	120
N. virens Background Replicate 1	3	1	13.35	0.010 U[c]	13.2	0.970	0.458	11.6	0.117	2.70	0.471	67.5
N. virens Background Replicate 2	3	1	13.35	0.010 U	13.7	1.09	0.514	12.3	0.114	3.02	0.492	69.5
N. virens Background Replicate 3	3	1	13.35	0.010 U	13.9	1.12	0.519	12.3	0.123	2.93	0.493	70.6
N. virens Background	4	1	17.31	0.055	14.8	1.32	0.729	10.3	0.050	1.40	0.732	59.6
N. virens Background	5	1	17.89	0.109	14.4	2.25	1.08	13.9	0.057	3.22	0.944	71.7
N. virens Background	6	1	16.65	0.070	15.1	1.32	0.766	10.2	0.048	1.42	0.898	55.5
N. virens Background Replicate 1	7	1	16.20	0.054	14.5	1.64	0.792	11.0	0.050	1.87	0.926	53.0
N. virens Background Replicate 2	7	1	16.20	0.060	13.6	1.34	0.659	9.77	0.042	1.49	0.766	51.7
N. virens Background Replicate 3	7	1	16.20	0.065	14.7	1.83	0.831	11.3	0.048	1.95	0.886	53.3
N. virens Background Replicate 4	7	1	16.20	0.063	14.2	1.65	0.821	11.4	0.045	2.16	0.909	224

(a) DL Detection limit.
(b) MDL Method detection limit.
(c) U Undetected at or above given concentration.

TABLE F.2. Metals, Wet Weight, in Tissue of *N. virens*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	*N. virens* Metals (mg/kg wet weight) Ag ICP/MS	As ICP/MS	Cr ICP/MS	Cd ICP/MS	Cu ICP/MS	Hg CVAA	Ni ICP/MS	Pb ICP/MS	Zn ICP/MS
MOTBY Reach A											
COMP MT-A	1	1	0.0132	2.13	0.214	0.124	1.78	0.00692	0.298	0.212	11.2
COMP MT-A	2	1	0.00758	2.18	0.203	0.127	1.78	0.00831	0.302	0.168	13.8
COMP MT-A	3	1	0.0213	2.30	0.318	0.194	2.88	0.0112	0.470	0.315	9.66
COMP MT-A	4	1	0.0181	2.45	0.234	0.215	2.92	0.0106	0.381	0.283	17.1
COMP MT-A	5	1	0.0200	2.33	0.187	0.140	1.60	0.00820	0.209	0.200	9.84
MOTBY Reach B											
COMP MT-B	1	1	0.0215	1.74	0.186	0.110	2.02	0.00711	0.260	0.221	13.7
COMP MT-B	2	1	0.0177	1.69	0.184	0.107	1.34	0.00582	0.300	0.191	10.1
COMP MT-B	3	1	0.0206	2.18	0.215	0.174	2.08	0.00897	0.342	0.261	11.4
COMP MT-B	4	1	0.0203	1.93	0.180	0.232	2.33	0.0107	0.290	0.238	17.3
COMP MT-B	5	1	0.0200	2.11	0.199	0.123	2.05	0.00723	0.300	0.216	10.4
Arthur Kill Reach A											
COMP AK-A	1	1	0.0112	2.10	0.194	0.117	1.80	0.00691	0.237	0.197	7.72
COMP AK-A	2	1	0.00464	1.91	0.169	0.125	1.75	0.00587	0.264	0.232	9.30
COMP AK-A	3	1	0.0317	2.10	0.561	0.188	3.08	0.0224	0.512	0.622	16.2
COMP AK-A	4	1	0.00467	1.89	0.184	0.124	1.61	0.00645	0.299	0.177	11.4
COMP AK-A	5	1	0.0227	1.99	0.328	0.169	2.72	0.0118	0.504	0.357	12.3
Arthur Kill Reach B											
COMP AK-B	1	1	0.00653	1.78	0.138	0.111	1.78	0.00816	0.199	0.183	49.1
COMP AK-B	2	1	0.00982	2.24	0.216	0.186	2.81	0.0137	0.341	0.300	18.1
COMP AK-B	3	1	0.0118	2.13	0.262	0.206	3.23	0.0106	0.547	0.302	14.8
COMP AK-B	4	1	0.0118	2.13	0.343	0.172	2.83	0.0151	0.493	0.465	17.0
COMP AK-B	5	1	0.0194	1.78	0.225	0.154	3.21	0.0107	0.432	0.263	17.5
Arthur Kill Reach C											
COMP AK-C	1	1	0.0148	2.22	0.207	0.142	2.19	0.00785	0.407	0.227	9.07
COMP AK-C	2	1	0.0144	1.82	0.154	0.113	1.90	0.00653	0.273	0.183	45.8
COMP AK-C Replicate 1	3	1	0.00658	1.87	0.147	0.120	1.99	0.00801	0.236	0.176	10.4
COMP AK-C Replicate 2	3	1	0.0130	1.91	0.149	0.101	1.78	0.00572	0.222	0.182	30.0
COMP AK-C Replicate 3	3	1	0.00758	1.89	0.147	0.121	2.01	0.00716	0.242	0.192	11.9
COMP AK-C	4	1	0.00457	2.20	0.157	0.111	1.68	0.00746	0.233	0.186	9.81
COMP AK-C	5	1	0.0337	2.17	0.214	0.138	2.55	0.0101	0.255	0.230	10.7

TABLE F.2. (contd)

Sediment Treatment	Replicate	Batch	*N. virens* Metals (mg/kg wet weight) Ag ICP/MS	As ICP/MS	Cr ICP/MS	Cd ICP/MS	Cu ICP/MS	Hg CVAA	Ni ICP/MS	Pb ICP/MS	Zn ICP/MS
Port Elizabeth Reach A											
COMP PE-A	1	1	0.0111	2.48	0.226	0.175	2.36	0.0101	0.332	0.270	20.5
COMP PE-A	2	1	0.00846	2.27	0.153	0.0599	1.09	0.00680	0.109	0.163	8.21
COMP PE-A	3	1	0.00224	1.91	0.173	0.143	2.11	0.0101	0.277	0.246	16.4
COMP PE-A	4	1	0.0159	2.10	0.225	0.210	2.69	0.0117	0.381	0.324	10.2
COMP PE-A	5	1	0.0104	2.19	0.193	0.138	2.20	0.00746	0.221	0.255	13.0
Port Elizabeth Reach B											
COMP PE-B	1	1	0.0215	2.41	0.245	0.161	2.44	0.00951	0.462	0.289	14.8
COMP PE-B	2	1	0.00246	1.64	0.165	0.113	1.49	0.00601	0.211	0.224	46.7
COMP PE-B	3	1	0.0141	2.14	0.234	0.176	2.59	0.00946	0.496	0.255	11.4
COMP PE-B	4	1	0.0290	1.93	0.219	0.115	2.12	0.00907	0.289	0.251	17.7
COMP PE-B	5	1	0.0189	2.29	0.248	0.216	3.15	0.0110	0.454	0.293	18.9
Hackensack River Reach A											
COMP HR-A	1	1	0.0133	2.45	0.363	0.192	2.33	0.0115	0.313	0.376	15.0
COMP HR-A	2	1	0.0150	2.26	0.285	0.188	2.72	0.00971	0.395	0.296	10.1
COMP HR-A	3	1	0.0217	2.36	0.786	0.140	2.81	0.0136	0.551	0.448	12.6
COMP HR-A	4	1	0.00950	2.36	1.15	0.214	2.36	0.0223	0.727	0.740	34.7
COMP HR-A	5	1	0.0375	2.06	0.435	0.139	2.14	0.0155	0.303	0.356	10.8
Reference											
Mud Dump Reference	1	1	0.0426	2.46	0.286	0.145	2.02	0.0103	0.237	0.242	27.4
Mud Dump Reference	2	1	0.0468	2.73	0.178	0.147	2.10	0.0120	0.234	0.177	11.1
Mud Dump Reference, Rep 1	3	1	0.0371	2.17	0.180	0.143	1.71	0.00993	0.184	0.151	8.17
Mud Dump Reference, Rep 2	3	1	0.0381	2.22	0.191	0.157	1.86	0.0104	0.193	0.158	8.38
Mud Dump Reference, Rep 3	3	1	0.0342	2.21	0.182	0.140	1.69	0.00993	0.194	0.155	7.97
Mud Dump Reference	4	1	0.0352	2.02	0.195	0.149	2.05	0.0117	0.232	0.224	49.8
Mud Dump Reference	5	1	0.0314	2.05	0.119	0.123	1.48	0.00788	0.120	0.164	10.5
Controls											
C-NR	1	1	0.00696	2.66	0.209	0.162	1.91	0.0109	0.275	0.197	12.8
C-NR	2	1	0.0129	2.15	0.208	0.168	2.38	0.00984	0.276	0.227	13.4
C-NR	3	1	0.00934	2.58	0.214	0.149	1.76	0.00846	0.261	0.189	29.0

TABLE F.2. (contd)

Sediment Treatment	Replicate	Batch	*N. virens* Metals (mg/kg wet weight) Ag ICP/MS	As ICP/MS	Cr ICP/MS	Cd ICP/MS	Cu ICP/MS	Hg CVAA	Ni ICP/MS	Pb ICP/MS	Zn ICP/MS
Background											
N. virens Background	1	1	0.00407	2.58	0.158	0.0742	1.98	0.0164	0.585	0.0592	14.5
N. virens Background	2	1	0.00267	2.39	0.153	0.0791	1.97	0.0214	0.517	0.0667	17.8
N. virens Background Rep 1	3	1	0.00134 U[(a)]	1.76	0.129	0.0611	1.55	0.0156	0.360	0.0629	9.02
N. virens Background Rep 2	3	1	0.00134 U	1.83	0.146	0.0686	1.65	0.0152	0.403	0.0657	9.28
N. virens Background Rep 3	3	1	0.00134 U	1.85	0.150	0.0693	1.65	0.0164	0.391	0.0658	9.43
N. virens Background	4	1	0.00952	2.56	0.228	0.126	1.79	0.00866	0.242	0.127	10.3
N. virens Background	5	1	0.0195	2.57	0.403	0.193	2.49	0.0102	0.576	0.169	12.8
N. virens Background	6	1	0.0117	2.51	0.220	0.127	1.70	0.00799	0.236	0.150	9.25
N. virens Background Rep 1	7	1	0.00875	2.35	0.266	0.128	1.79	0.00810	0.303	0.150	8.59
N. virens Background Rep 2	7	1	0.00972	2.20	0.217	0.107	1.58	0.00680	0.241	0.124	8.38
N. virens Background Rep 3	7	1	0.0105	2.38	0.296	0.135	1.84	0.00778	0.316	0.144	8.64
N. virens Background Rep 4	7	1	0.0102	2.30	0.267	0.133	1.85	0.00729	0.350	0.147	36.3

(a) Undetected at or above given concentration.

TABLE F.3. Quality Control Summary for Metals, Dry Weight, in Tissue of *N. virens*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	*N. virens* Metals (mg/kg dry weight) Ag ICP/MS	As ICP/MS	Cr ICP/MS	Cd ICP/MS	Cu ICP/MS	Hg CVAA	Ni ICP/MS	Pb ICP/MS	Zn ICP/MS
Method Blanks											
Blank		1	0.14	0.02	0.07	0.119 U[a]	0.07	0.001 U	0.038 U	0.050	0.06
Blank		1	0.02	0.02	0.05	0.119 U	0.01	0.001 U	0.038 U	0.030	0.10
Blank		1	0.02	0.01	0.04	0.119 U	0.12	0.001 U	0.038 U	0.034	0.34
Mean Blank			0.06	0.02	0.05	0.119 U	0.07	0.001 U	0.038 U	0.038	0.17
Standard Reference Material											
Certified Values			1.68 ±0.15	14.0 ±1.2	1.43 ±0.46	4.15 ±0.38	66.3 ±4.3	0.064 ±0.0067	2.25 ±0.44	0.371 ±0.014	830 ±57
1566a		1	1.46	13.1	1.44	4.19	64.3	0.057	1.59[b]	0.318	804
1566a		1	1.48	13.0	1.32[b]	4.14	63.6	0.057[b]	2.15	0.403	797
1566a		1	1.43	12.3	1.01[b]	3.98	59.4	0.051[b]	1.52[b]	0.375	733
Matrix Spikes											
COMP AK-C[c]	3	1	0.063	13.2	1.03	0.805	13.5	0.049	1.63	1.28	122
COMP AK-C MS		1	1.77	63.5	6.13	2.83	62.0	1.55	6.88	6.25	258
Concentration Recovered			1.71	50.3	5.10	2.03	48.5	1.50	5.25	4.97	136
Amount Spiked			2.00	50.0	5.00	2.00	50.0	2.00	5.00	5.00	50.0
Percent Recovery			86%	101%	102%	102%	97%	75%	105%	99%	272%[d]
Mud Dump Reference[c]	3	1	0.257	15.5	1.30	1.04	12.4	0.071	1.34	1.09	57.7
Mud Dump Site, MS		1	2.09	67.8	6.39	3.02	61.2	1.62	6.48	5.73	115
Concentration Recovered			1.83	52.3	5.09	1.98	48.8	1.55	5.14	4.64	57.3
Amount Spiked			2.00	50.0	5.00	2.00	50.0	2.00	5.00	5.00	50.0
Percent Recovery			92%	105%	102%	99%	98%	78%	103%	93%	115%
N. virens Background	3	1	0.010 U	13.6	1.06	0.497	12.1	0.118	2.88	0.485	69.2
N. virens Background MS		1	1.64	62.4	6.05	2.47	58.2	1.60	7.99	5.49	118
Concentration Recovered			1.64	48.8	4.99	1.97	46.1	1.48	5.11	5.01	48.8
Amount Spiked			2.00	50.0	5.00	2.00	50.0	2.00	5.00	5.00	50.0
Percent Recovery			82%	98%	100%	99%	92%	74%[d]	102%	100%	98%

TABLE F.3. (contd)

Sediment Treatment	Replicate	Batch	*N. virens* Metals (mg/kg dry weight) Ag ICP/MS	As ICP/MS	Cr ICP/MS	Cd ICP/MS	Cu ICP/MS	Hg CVAA	Ni ICP/MS	Pb ICP/MS	Zn ICP/MS
Analytical Triplicates											
COMP AK-C Replicate 1	3	1	0.046	13.1	1.03	0.837	13.9	0.056	1.65	1.23	72.7
COMP AK-C Replicate 2	3	1	0.091	13.4	1.04	0.730	12.4	0.040	1.55	1.27	210
COMP AK-C Replicate 3	3	1	0.053	13.2	1.03	0.848	14.0	0.050	1.69	1.34	82.9
RSD			38%(e)	1%	1%	8%	7%	17%	4%	4%	63%(e)
Mud Dump Reference, Replicate 1	3	1	0.262	15.3	1.27	1.01	12.0	0.070	1.30	1.06	57.6
Mud Dump Reference, Replicate 2	3	1	0.269	15.7	1.35	1.11	13.1	0.073	1.36	1.11	59.1
Mud Dump Reference, Replicate 3	3	1	0.241	15.6	1.28	0.989	11.9	0.070	1.37	1.09	56.2
RSD			6%	1%	3%	6%	5%	2%	3%	2%	3%
N. virens Background Replicate 1	3	1	0.000	13.2	0.970	0.458	11.6	0.117	2.70	0.471	67.5
N. virens Background Replicate 2	3	1	0.000	13.7	1.09	0.514	12.3	0.114	3.02	0.492	69.5
N. virens Background Replicate 3	3	1	0.000	13.9	1.12	0.519	12.3	0.123	2.93	0.493	70.6
RSD			NA(f)	3%	7%	7%	3%	4%	6%	3%	2%

(a) U Undetected at or above the given concentration.
(b) Outside SRM range ±20%.
(c) Mean of replicated sample.
(d) Outside quality Control range of 75-125%.
(e) Outside Relative Standard Deviation range ≤20%.
(f) NA Not applicable.
NOTE: All data blank-corrected.

TABLE F.4. Chlorinated Pesticides (alphabetical, Aldrin - 2,4'-DDT), Wet Weight, in Tissue of *N. virens*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Surrogate Percent Recoveries PCB 103	Surrogate Percent Recoveries PCB 198	*N. virens* Pesticides (µg/kg wet weight) Aldrin	a-Chlordane	Dieldrin	2,4'-DDD	2,4'-DDE	2,4'-DDT
Target DL[a]					0.4	0.4	0.4	0.4	0.4	0.4
Achieved DL					0.07	0.05	0.13	0.16	0.05	0.18
MDL[b] verification					0.20	0.22	0.21	0.30	0.30	0.21
MOTBY Reach A										
Comp MT-A	1	1	85	91	1.62	1.59	1.38	0.16 U[c]	0.05 U	0.18 U
Comp MT-A	2	1	79	95	1.79	1.80	1.60	0.16 U	0.05 U	0.18 U
Comp MT-A	3	3	74	80	0.09 U	1.61	1.66	0.20 U	0.07 U	0.22 U
Comp MT-A	4	2	68	71	0.09 U	1.68	1.76	0.20 U	0.06 U	0.22 U
Comp MT-A	5	1	65	67	1.63	1.54	1.42	0.16 U	0.05 U	0.18 U
MOTBY Reach B										
Comp MT-B	1	3	72	80	1.57	1.48	1.12	0.20 U	0.07 U	0.22 U
Comp MT-B	2	1	65	76	1.34	1.37	1.01	0.16 U	0.05 U	0.18 U
Comp MT-B	3	3	68	78	1.49	1.48	1.21	0.20 U	0.07 U	0.22 U
Comp MT-B	4	3	73	84	1.67	1.36	1.16	0.20 U	0.07 U	0.22 U
Comp MT-B	5	1	78	127	1.19	1.48	1.24	0.16 U	0.05 U	0.18 U
Arthur Kill Reach A										
Comp AK-A	1	1	69	78	0.07 U	2.74	1.36	10.3	0.05 U	0.18 U
Comp AK-A	2	2	62	68	1.79	2.77	1.58	10.7	0.06 U	0.22 U
Comp AK-A	3	2	67	78	1.90	2.74	1.46	10.6	0.06 U	0.22 U
Comp AK-A	4	1	75	102	1.34	2.42	1.21	9.07	0.05 U	0.18 U
Comp AK-A Replicate 1	5	2	83	95	1.75	2.43	1.39	9.18	0.06 U	0.22 U
Comp AK-A Replicate 2	5	2	56	60	1.78	2.45	1.35	9.11	0.06 U	0.22 U
Comp AK-A Replicate 3	5	2	80	100	1.77	2.44	1.42	9.20	0.06 U	0.22 U
Arthur Kill Reach B										
Comp AK-B	1	2	77	86	1.39	2.29	1.91	22.8	0.06 U	0.22 U
Comp AK-B	2	2	79	96	2.21	3.19	2.66	34.5	0.06 U	0.22 U
Comp AK-B	3	1	75	89	0.76	2.93	2.13	29.4	0.05 U	0.18 U
Comp AK-B Replicate 1	4	1	70	79	1.03	3.18	2.59	36.1	1.71	0.18 U
Comp AK-B Replicate 2	4	1	68	88	0.95	3.23	2.80	36.7	1.74	0.18 U
Comp AK-B Replicate 3	4	1	73	83	0.93	3.00	2.39	34.1	1.61	0.18 U
Comp AK-B	5	2	81	94	1.10	3.33	2.85	38.5	2.77	0.22 U

TABLE F.4. (contd)

Sediment Treatment	Replicate	Batch	Surrogate Percent Recoveries PCB 103	PCB 198	*N. virens* Pesticides (µg/kg wet weight) Aldrin	a-Chlordane	Dieldrin	2,4'-DDD	2,4'-DDE	2,4'-DDT
Arthur Kill Reach C										
Comp AK-C	1	1	79	103	1.07	2.73	3.85	9.34	0.05 U	0.18 U
Comp AK-C	2	1	60	66	1.35	3.79	5.64	12.5	0.05 U	0.18 U
Comp AK-C	3	1	76	88	1.15	3.33	3.83	10.8	0.05 U	0.18 U
Comp AK-C	4	1	71	84	1.07	3.14	4.15	10.4	0.05 U	0.18 U
Comp AK-C	5	1	74	91	0.82	2.61	3.40	9.23	0.05 U	0.18 U
Port Elizabeth Reach A										
Comp PE-A	1	1	72	77	0.94	1.76	1.31	0.16 U	0.05 U	0.18 U
Comp PE-A	2	2	68	77	1.18	1.95	1.43	0.20 U	0.06 U	0.22 U
Comp PE-A	3	2	59	63	1.52	2.22	1.77	0.20 U	0.06 U	0.22 U
Comp PE-A	4	2	33	32	1.39	2.38	1.34	0.20 U	0.06 U	0.22 U
Comp PE-A	5	1	76	102	1.41	2.65	1.59	0.16 U	0.05 U	0.18 U
Port Elizabeth Reach B										
Comp PE-B	1	2	49	53	1.96	2.14	1.40	5.13	0.06 U	0.22 U
Comp PE-B	2	2	75	84	1.92	2.05	1.34	0.20 U	0.06 U	0.22 U
Comp PE-B	3	3	69	74	2.20	2.48	1.70	0.20 U	0.07 U	0.22 U
Comp PE-B	4	1	66	81	1.49	2.14	1.07	0.16 U	0.05 U	0.18 U
Comp PE-B	5	2	63	73	1.91	2.19	1.45	0.20 U	0.06 U	0.22 U
Hackensack River Reach A										
Comp HR-A	1	2	83	93	1.68	1.79	1.52	0.20 U	0.06 U	0.22 U
Comp HR-A	2	2	45	48	1.93	2.04	1.70	0.20 U	0.06 U	0.22 U
Comp HR-A	3	2	46	45	2.22	2.46	1.67	0.20 U	0.06 U	0.22 U
Comp HR-A	4	2	68	73	1.70	2.19	1.49	0.20 U	0.06 U	0.22 U
Comp HR-A	5	1	60	68	1.51	1.49	0.96	0.16 U	0.05 U	0.18 U
Reference										
Mud Dump Reference	1	2	79	91	0.09 U	0.25 U	0.16 U	0.20 U	0.06 U	0.22 U
Mud Dump Reference	2	2	82	90	0.09 U	0.25 U	0.16 U	0.20 U	0.66	0.22 U
Mud Dump Reference	3	1	80	94	0.07 U	0.27	0.13 U	0.16 U	0.05 U	0.18 U
Mud Dump Reference	4	1	75	85	0.07 U	0.05 U	0.13 U	0.16 U	0.05 U	0.18 U
Mud Dump Reference	5	3	69	80	0.09 U	0.25 U	0.16 U	0.20 U	0.07 U	0.22 U

TABLE F.4. (contd)

Sediment Treatment	Replicate	Batch	Surrogate Percent Recoveries PCB 103	PCB 198	*N. virens* Pesticides (µg/kg wet weight) Aldrin	a-Chlordane	Dieldrin	2,4'-DDD	2,4'-DDE	2,4'-DDT
Controls										
C-NR Replicate 1	1	3	71	78	0.09 U	0.25 U	0.16 U	0.20 U	0.07 U	0.22 U
C-NR Replicate 2	1	3	70	79	0.09 U	0.25 U	0.16 U	0.20 U	0.07 U	0.22 U
C-NR Replicate 3	1	3	71	78	0.09 U	0.25 U	0.16 U	0.20 U	0.07 U	0.22 U
C-NR	2	3	77	84	0.09 U	0.25 U	0.16 U	0.20 U	0.07 U	0.22 U
C-NR	3	3	60	65	0.09 U	0.25 U	0.16 U	0.20 U	0.07 U	0.22 U
Background										
N. virens Background	1	3	68	77	0.09 U	0.25 U	0.16 U	0.20 U	0.07 U	0.22 U
N. virens Background	2	3	64	75	0.09 U	0.25 U	0.16 U	0.20 U	0.07 U	0.22 U
N. virens Background	3	3	70	85	0.09 U	0.25 U	0.16 U	0.87	0.07 U	0.22 U
N. virens Background	4	3	70	81	0.09 U	0.25 U	0.16 U	0.20 U	0.07 U	0.22 U
N. virens Background	5	3	69	77	0.09 U	0.25 U	0.16 U	0.20 U	0.07 U	0.22 U
N. virens Background	6	3	72	83	0.09 U	0.25 U	0.16 U	0.20 U	0.07 U	0.22 U
N. virens Background	7	3	71	82	0.09 U	0.25 U	0.49	0.20 U	0.07 U	0.22 U

(a) DL Detection limit.
(b) MDL Method detection limit.
(c) U Undetected at or above given concentration.

TABLE F.5. Chlorinated Pesticides (alphabetical, 4,4'-DDD - Trans Nonachlor), Wet Weight, In Tissue of *N. virens*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Surrogate Percent Recoveries PCB 103	PCB 198	*N. virens* Pesticides (µg/kg wet weight) 4,4'-DDD	4,4'-DDE	4,4'-DDT	Endo-Sulfan I	Endo-Sulfan II	Endo-Sulfan Sulfate	Hepta-chlor	Hepta-chlor Epoxide	Trans Nonachlor
Target DL[a]					0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Achieved DL					0.19	0.06	0.14	0.20	0.20	0.20	0.06	0.20	0.05
MDL[b] verification					0.20	0.30	0.28	NA[c]	NA	NA	0.24	0.24	0.14
MOTBY Reach A													
Comp MT-A	1	1	85	91	4.35	1.27	5.46 I[d]	0.20 U[e]	0.20 U	0.20 U	0.73	0.20 U	1.16
Comp MT-A	2	1	79	95	5.29	1.49	6.44 I	0.20 U	0.20 U	0.20 U	0.76	0.20 U	1.37
Comp MT-A	3	3	74	80	5.46	1.45	6.02 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	1.02
Comp MT-A	4	2	68	71	5.04	1.53	6.13 I	0.25 U	0.25 U	0.25 U	0.87	1.83	0.97
Comp MT-A	5	1	65	67	3.96	1.03	7.64 I	0.20 U	0.20 U	0.20 U	0.06 U	0.20 U	1.43
MOTBY Reach B													
Comp MT-B	1	3	72	80	2.53	1.55	3.80 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.80
Comp MT-B	2	1	65	76	1.89	1.02	2.62 I	0.20 U	0.20 U	0.20 U	0.06 U	0.58	0.87
Comp MT-B	3	3	68	78	2.40	1.27	2.85 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.82
Comp MT-B	4	3	73	84	2.49	1.60	2.93 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.67
Comp MT-B	5	1	78	127	1.88	0.90	2.55 I	0.20 U	0.20 U	0.20 U	0.06 U	0.56	0.90
Arthur Kill Reach A													
Comp AK-A	1	1	69	78	18.4	3.39	4.14 I	0.20 U	0.20 U	0.20 U	0.06 U	0.67	1.52
Comp AK-A	2	2	62	68	20.4	4.88	4.90 I	0.25 U	0.25 U	0.25 U	0.81	0.76	1.35
Comp AK-A	3	2	67	78	13.7	6.19	5.12 I	0.25 U	0.25 U	0.25 U	0.84	0.82	1.49
Comp AK-A	4	1	75	102	14.3	2.80	4.24 I	0.20 U	0.20 U	0.20 U	0.06 U	0.58	1.53
Comp AK-A Replicate 1	5	2	83	95	21.5	5.59	4.27 I	0.25 U	0.25 U	0.25 U	0.08 U	0.72	1.33
Comp AK-A Replicate 2	5	2	56	60	19.4	5.43	4.19 I	0.25 U	0.25 U	0.25 U	0.76	0.72	1.16
Comp AK-A Replicate 3	5	2	80	100	21.8	5.71	4.15 I	0.25 U	0.25 U	0.25 U	0.08 U	0.75	1.37
Arthur Kill Reach B													
Comp AK-B	1	2	77	86	57.8	0.07 U	6.04 I	0.25 U	0.25 U	0.25 U	0.08 U	0.68	1.38
Comp AK-B	2	2	79	96	113	20.0	10.4 I	0.25 U	0.25 U	0.25 U	0.08 U	0.95	1.59
Comp AK-B	3	1	75	89	98.8	16.3	10.5 I	0.20 U	0.20 U	0.20 U	0.41	0.83	1.80
Comp AK-B Replicate 1	4	1	70	79	109	14.0	8.48 I	0.20 U	0.20 U	0.20 U	0.06 U	0.94	1.53
Comp AK-B Replicate 2	4	1	68	88	110	15.0	12.2 I	0.20 U	0.20 U	0.20 U	0.06 U	0.91	1.83
Comp AK-B Replicate 3	4	1	73	83	103	13.0	7.85 I	0.20 U	0.20 U	0.20 U	0.06 U	0.84	1.29
Comp AK-B	5	2	81	94	138	32.0	14.3 I	0.25 U	0.25 U	0.25 U	1.21	1.05	1.62

TABLE F.5. (contd)

Sediment Treatment	Replicate	Batch	Surrogate Percent Recoveries PCB 103	PCB 198	*N. virens* Pesticides (µg/kg wet weight) 4,4'-DDD	4,4'-DDE	4,4'-DDT	Endo-Sulfan I	Endo-Sulfan II	Endo-Sulfan Sulfate	Hepta-chlor	Hepta-chlor Epoxide	Trans Nonachlor
Arthur Kill Reach C													
Comp AK-C	1	1	79	103	16.7	7.48	5.31 I	0.20 U	0.20 U	0.20 U	0.46	1.08	1.37
Comp AK-C	2	1	60	66	23.8	9.28	5.99 I	0.20 U	0.20 U	0.20 U	0.06 U	1.31	1.59
Comp AK-C	3	1	76	88	18.4	8.58	5.46 I	0.20 U	0.20 U	0.20 U	0.06 U	1.21	1.40
Comp AK-C	4	1	71	84	19.0	7.73	5.28 I	0.20 U	0.20 U	0.20 U	0.06 U	1.18	1.42
Comp AK-C	5	1	74	91	13.7	15.6	5.35 I	0.20 U	0.20 U	0.20 U	0.06 U	0.99	1.19
Port Elizabeth Reach A													
Comp PE-A	1	1	72	77	2.29	0.90	3.62 I	0.20 U	0.20 U	0.20 U	0.06 U	0.20 U	1.04
Comp PE-A	2	2	68	77	2.93	0.95	5.53 I	0.25 U	0.25 U	0.25 U	0.08 U	0.62	1.19
Comp PE-A	3	2	59	63	4.02	1.60	4.34 I	0.25 U	0.25 U	0.25 U	0.08 U	0.69	1.07
Comp PE-A	4	2	33	32	3.08	1.41	4.98 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
Comp PE-A	5	1	76	102	4.08	1.89	4.97 I	0.20 U	0.20 U	0.20 U	0.06 U	0.20 U	1.59
Port Elizabeth Reach B													
Comp PE-B	1	2	49	53	5.66	3.28	2.85 I	0.25 U	0.25 U	0.25 U	0.87	0.71	0.74
Comp PE-B	2	2	75	84	5.58	3.44	3.33 I	0.25 U	0.25 U	0.25 U	0.85	0.73	1.00
Comp PE-B	3	3	69	74	6.97	4.11	3.84 I	0.25 U	0.25 U	0.25 U	1.04	0.24 U	1.18
Comp PE-B	4	1	66	81	3.01	1.08	4.57 I	0.20 U	0.20 U	0.20 U	0.06 U	0.58	1.24
Comp PE-B	5	2	63	73	5.61	2.58	3.68 I	0.25 U	0.25 U	0.25 U	0.08 U	0.79	0.95
Hackensack River Reach A													
Comp HR-A	1	2	83	93	2.57	1.85	3.10 I	0.25 U	0.25 U	0.25 U	0.08 U	0.85	0.86
Comp HR-A	2	2	45	48	3.03	2.35	4.23 I	0.25 U	0.25 U	0.25 U	0.87	1.00	0.06 U
Comp HR-A	3	2	46	45	3.60	3.06	4.85 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.91
Comp HR-A	4	2	68	73	2.86	2.50	4.98 I	0.25 U	0.25 U	0.25 U	0.82	0.99	1.14
Comp HR-A	5	1	60	68	1.88	1.93	4.18 I	0.20 U	0.20 U	0.20 U	0.57	0.66	0.77
Reference													
Mud Dump Reference	1	2	79	91	0.24 U	0.07 U	0.18 U	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
Mud Dump Reference	2	2	82	90	0.24 U	0.07 U	0.18 U	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
Mud Dump Reference	3	1	80	94	0.19 U	0.06 U	0.14 U	0.20 U	0.20 U	0.20 U	0.06 U	0.20 U	0.05 U
Mud Dump Reference	4	1	75	85	0.19 U	0.06 U	0.14 U	0.20 U	0.20 U	0.20 U	0.06 U	0.20 U	0.32
Mud Dump Reference	5	3	69	80	0.24 U	0.07 U	0.18 U	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U

TABLE F.5. (contd)

Sediment Treatment	Replicate	Batch	Surrogate Percent Recoveries PCB 103	PCB 198	*N. virens* Pesticides (µg/kg wet weight) 4,4'-DDD	4,4'-DDE	4,4'-DDT	Endo-Sulfan I	Endo-Sulfan II	Endo-Sulfan Sulfate	Hepta-chlor	Hepta-chlor Epoxide	Trans Nonachlor
Controls													
C-NR Replicate 1	1	3	71	78	0.24 U	0.07 U	0.18 U	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
C-NR Replicate 2	1	3	70	79	0.24 U	0.07 U	0.18 U	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
C-NR Replicate 3	1	3	71	78	0.24 U	0.07 U	0.18 U	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
C-NR	2	3	77	84	0.24 U	0.07 U	0.18 U	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
C-NR	3	3	60	65	0.24 U	0.07 U	0.18 U	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
Background													
N. virens Background	1	3	68	77	0.24 U	0.07 U	0.18 U	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
N. virens Background	2	3	64	75	0.24 U	0.07 U	0.18 U	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
N. virens Background	3	3	70	85	0.24 U	0.07 U	0.18 U	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
N. virens Background	4	3	70	81	0.24 U	0.07 U	0.18 U	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
N. virens Background	5	3	69	77	0.24 U	0.07 U	0.18 U	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
N. virens Background	6	3	72	83	0.24 U	0.07 U	0.18 U	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
N. virens Background	7	3	71	82	0.24 U	0.07 U	0.18 U	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U

(a) DL Detection limit.
(b) MDL Method detection limit.
(c) NA Not applicable.
(d) I 4,4' DDT coelutes with PCB Congeners on both primary and confirmation columns. Value may be false positive or biased high.
(e) U Undetected at or above given concentration.

TABLE F.6. Chlorinated Pesticides (alphabetical, Aldrin - 2,4' DDT), Dry Weight, in Tissue of *N. virens*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*N. virens* Pesticides (µg/kg dry weight) Aldrin	a-Chlordane	Dieldrin	2,4'-DDD	2,4'-DDE	2,4'-DDT
MOTBY Reach A									
Comp MT-A	1	1	15.04	10.8	10.6	9.18	1.06 U[a]	0.332 U	1.20 U
Comp MT-A	2	1	14.58	12.3	12.3	11.0	1.10 U	0.343 U	1.23 U
Comp MT-A	3	3	14.37	0.626 U	11.2	11.6	1.39 U	0.487 U	1.53 U
Comp MT-A	4	2	15.60	0.577 U	10.8	11.3	1.28 U	0.385 U	1.41 U
Comp MT-A	5	1	15.47	10.5	9.95	9.18	1.03 U	0.323 U	1.16 U
MOTBY Reach B									
Comp MT-B	1	3	14.21	11.1	10.4	7.88	1.41 U	0.493 U	1.55 U
Comp MT-B	2	1	13.54	9.90	10.1	7.46	1.18 U	0.369 U	1.33 U
Comp MT-B	3	3	14.24	10.5	10.4	8.50	1.40 U	0.492 U	1.54 U
Comp MT-B	4	3	13.74	12.2	9.90	8.44	1.46 U	0.509 U	1.60 U
Comp MT-B	5	1	15.06	7.90	9.83	8.23	1.06 U	0.332 U	1.20 U
Arthur Kill Reach A									
Comp AK-A	1	1	15.36	0.456 U	17.8	8.85	66.9	0.326 U	1.17 U
Comp AK-A	2	2	84.60	2.14	3.32	1.89	12.8	0.072 U	0.263 U
Comp AK-A	3	2	15.32	12.4	17.9	9.53	69.3	0.392 U	1.44 U
Comp AK-A	4	1	13.73	9.76	17.6	8.81	66.1	0.364 U	1.31 U
Comp AK-A Replicate 1	5	2	15.10	11.6	16.1	9.21	60.8	0.397 U	1.46 U
Comp AK-A Replicate 2	5	2	15.10	11.8	16.2	8.94	60.3	0.397 U	1.46 U
Comp AK-A Replicate 3	5	2	15.10	11.7	16.2	9.40	60.9	0.397 U	1.46 U
Arthur Kill Reach B									
Comp AK-B	1	2	14.83	9.37	15.4	12.9	154	0.405 U	1.48 U
Comp AK-B	2	2	15.35	14.4	20.8	17.3	225	0.391 U	1.43 U
Comp AK-B	3	1	15.14	5.02	19.4	14.1	194	0.330 U	1.19 U
Comp AK-B Replicate 1	4	1	14.70	7.01	21.6	17.6	245	11.6	1.22 U
Comp AK-B Replicate 2	4	1	14.70	6.46	22.0	19.0	250	11.8	1.22 U
Comp AK-B Replicate 3	4	1	14.70	6.33	20.4	16.3	232	11.0	1.22 U
Comp AK-B	5	2	14.51	7.58	22.9	19.6	266	19.1	1.52 U

TABLE F.6. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*N. virens* Pesticides (µg/kg dry weight) Aldrin	a-Chlordane	Dieldrin	2,4'-DDD	2,4'-DDE	2,4'-DDT
Arthur Kill Reach C									
Comp AK-C	1	1	15.09	7.09	18.1	25.5	61.9	0.331 U	1.19 U
Comp AK-C	2	1	14.50	9.31	26.1	38.9	86.5	0.345 U	1.24 U
Comp AK-C	3	1	14.31	8.04	23.3	26.8	75.1	0.349 U	1.26 U
Comp AK-C	4	1	15.22	7.03	20.6	27.3	68.4	0.329 U	1.18 U
Comp AK-C	5	1	14.89	5.51	17.5	22.8	62.0	0.336 U	1.21 U
Port Elizabeth Reach A									
Comp PE-A	1	1	14.84	6.33	11.9	8.83	1.08 U	0.337 U	1.21 U
Comp PE-A	2	2	16.58	7.12	11.8	8.62	1.21 U	0.362 U	1.33 U
Comp PE-A	3	2	14.91	10.2	14.9	11.9	1.34 U	0.402 U	1.48 U
Comp PE-A	4	2	15.00	9.27	15.9	8.93	1.33 U	0.400 U	1.47 U
Comp PE-A	5	1	15.54	9.07	17.1	10.2	1.03 U	0.322 U	1.16 U
Port Elizabeth Reach B									
Comp PE-B	1	2	15.59	12.6	13.7	8.98	32.9	0.385 U	1.41 U
Comp PE-B	2	2	13.67	14.0	15.0	9.80	1.46 U	0.439 U	1.61 U
Comp PE-B	3	3	14.55	15.1	17.0	11.7	1.37 U	0.481 U	1.51 U
Comp PE-B	4	1	15.12	9.85	14.2	7.08	1.06 U	0.331 U	1.19 U
Comp PE-B	5	2	14.92	12.8	14.7	9.72	1.34 U	0.402 U	1.47 U
Hackensack River Reach A									
Comp HR-A	1	2	15.33	11.0	11.7	9.92	1.30 U	0.391 U	1.44 U
Comp HR-A	2	2	15.42	12.5	13.2	11.0	1.30 U	0.389 U	1.43 U
Comp HR-A	3	2	15.14	14.7	16.2	11.0	1.32 U	0.396 U	1.45 U
Comp HR-A	4	2	15.84	10.7	13.8	9.41	1.26 U	0.379 U	1.39 U
Comp HR-A	5	1	14.94	10.1	9.97	6.43	1.07 U	0.335 U	1.20 U
Reference									
Mud Dump Reference	1	2	15.88	0.567 U	1.57 U	1.01 U	1.26 U	0.378 U	1.39 U
Mud Dump Reference	2	2	15.09	0.596 U	1.66 U	1.06 U	1.33 U	4.37	1.46 U
Mud Dump Reference	3	1	14.18	0.494 U	1.90	0.917 U	1.13 U	0.353 U	1.27 U
Mud Dump Reference	4	1	14.43	0.485 U	0.35 U	0.901 U	1.11 U	0.347 U	1.25 U
Mud Dump Reference	5	3	14.59	0.617 U	1.71 U	1.10 U	1.37 U	0.480 U	1.51 U

TABLE F.6. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*N. virens* Pesticides (µg/kg dry weight) Aldrin	a-Chlordane	Dieldrin	2,4'-DDD	2,4'-DDE	2,4'-DDT
Controls									
C-NR Replicate 1	1	3	15.13	0.595 U	1.65 U	1.06 U	1.32 U	0.463 U	1.45 U
C-NR Replicate 2	1	3	15.13	0.595 U	1.65 U	1.06 U	1.32 U	0.463 U	1.45 U
C-NR Replicate 3	1	3	15.13	0.595 U	1.65 U	1.06 U	1.32 U	0.463 U	1.45 U
C-NR	2	3	14.47	0.622 U	1.73 U	1.11 U	1.38 U	0.484 U	1.52 U
C-NR	3	3	14.59	0.617 U	1.71 U	1.10 U	1.37 U	0.480 U	1.51 U
Background									
N. virens Background	1	3	14.52	0.620 U	1.72 U	1.10 U	1.38 U	0.482 U	1.52 U
N. virens Background	2	3	14.66	0.606 U	1.68 U	1.08 U	1.35 U	0.471 U	1.48 U
N. virens Background	3	3	13.35	0.674 U	1.87 U	1.20 U	6.52	0.524 U	1.65 U
N. virens Background	4	3	17.31	0.520 U	1.44 U	0.924 U	1.16 U	0.404 U	1.27 U
N. virens Background	5	3	17.89	0.503 U	1.40 U	0.894 U	1.12 U	0.391 U	1.23 U
N. virens Background	6	3	16.60	0.542 U	1.51 U	0.964 U	1.20 U	0.422 U	1.33 U
N. virens Background	7	3	16.20	0.556 U	1.54 U	3.02	1.23 U	0.432 U	1.36 U

(a) U Undetected at or above given concentration.

TABLE F.7. Chlorinated Pesticides (alphabetical, 4,4'-DDD - Trans Nonachlor), Dry Weight, In Tissue of *N. virens*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*N. virens* Pesticides (µg/kg dry weight) 4,4'-DDD	4,4'-DDE	4,4'-DDT	Endosulfan I	Endosulfan II	Endosulfan Sulfate	Heptachlor	Heptachlor Epoxide	Trans Nonachlor
MOTBY Reach A												
Comp MT-A	1	1	15.04	29.0	8.47	36.4 I[a]	1.33 U[b]	1.33 U	1.33 U	4.87	1.33 U	7.73
Comp MT-A	2	1	14.58	36.2	10.2	44.1 I	1.37 U	1.37 U	1.37 U	5.21	1.37 U	9.38
Comp MT-A	3	3	14.37	38.0	10.1	41.9 I	1.74 U	1.74 U	1.74 U	0.557 U	1.67 U	7.10
Comp MT-A	4	2	15.60	32.3	9.81	39.3 I	1.60 U	1.60 U	1.60 U	5.58	11.7	6.22
Comp MT-A	5	1	15.47	25.6	6.66	49.4 I	1.29 U	1.29 U	1.29 U	0.388 U	1.29 U	9.24
MOTBY Reach B												
Comp MT-B	1	3	14.21	17.8	10.9	26.7 I	1.76 U	1.76 U	1.76 U	0.563 U	1.69 U	5.63
Comp MT-B	2	1	13.54	14.0	7.53	19.4 I	1.48 U	1.48 U	1.48 U	0.443 U	4.28	6.43
Comp MT-B	3	3	14.24	16.9	8.92	20.0 I	1.76 U	1.76 U	1.76 U	0.562 U	1.69 U	5.76
Comp MT-B	4	3	13.74	18.2	11.7	21.4 I	1.82 U	1.82 U	1.82 U	0.584 U	1.75 U	4.89
Comp MT-B	5	1	15.06	12.5	5.98	16.9 I	1.33 U	1.33 U	1.33 U	0.398 U	3.72	5.98
Arthur Kill Reach A												
Comp AK-A	1	1	15.36	119	22.0	26.7 I	1.30 U	1.30 U	1.30 U	0.390 U	4.35	9.91
Comp AK-A	2	2	84.60	24.4	5.84	5.86 I	0.299 U	0.299 U	0.299 U	0.969	0.910	1.62
Comp AK-A	3	2	15.32	89.6	40.4	33.4 I	1.63 U	1.63 U	1.63 U	5.48	5.35	9.73
Comp AK-A	4	1	13.73	104	20.4	30.9 I	1.46 U	1.46 U	1.46 U	0.437 U	4.22	11.1
Comp AK-A Replicate 1	5	2	15.10	142	37.0	28.3 I	1.66 U	1.66 U	1.66 U	0.530 U	4.77	8.81
Comp AK-A Replicate 2	5	2	15.10	129	36.0	27.8 I	1.66 U	1.66 U	1.66 U	5.03	4.77	7.68
Comp AK-A Replicate 3	5	2	15.10	145	37.8	27.5 I	1.66 U	1.66 U	1.66 U	0.530 U	4.97	9.07
Arthur Kill Reach B												
Comp AK-B	1	2	14.83	391	0.473 U	40.8 I	1.69 U	1.69 U	1.69 U	0.541 U	4.59	9.32
Comp AK-B	2	2	15.35	739	131	67.5 I	1.63 U	1.63 U	1.63 U	0.521 U	6.19	10.4
Comp AK-B	3	1	15.14	652	108	69.3 I	1.32 U	1.32 U	1.32 U	2.71	5.48	11.9
Comp AK-B Replicate 1	4	1	14.70	743	95.1	57.7 I	1.36 U	1.36 U	1.36 U	0.408 U	6.40	10.4
Comp AK-B Replicate 2	4	1	14.70	746	102	82.7 I	1.36 U	1.36 U	1.36 U	0.408 U	6.19	12.4
Comp AK-B Replicate 3	4	1	14.70	701	88.4	53.4 I	1.36 U	1.36 U	1.36 U	0.408 U	5.71	8.78
Comp AK-B	5	2	14.51	950	22.0	98.5 I	1.72 U	1.72 U	1.72 U	8.34	7.24	11.2

TABLE F.7. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*N. virens* Pesticides (µg/kg dry weight) 4,4'-DDD	4,4'-DDE	4,4'-DDT	Endosulfan I	Endosulfan II	Endosulfan Sulfate	Heptachlor	Heptachlor Epoxide	Trans Nonachlor
Arthur Kill Reach C												
Comp AK-C	1	1	15.09	111	49.5	35.2 I	1.32 U	1.32 U	1.32 U	3.05	7.15	9.07
Comp AK-C	2	1	14.50	164	64.0	41.3 I	1.38 U	1.38 U	1.38 U	0.414 U	9.03	11.0
Comp AK-C	3	1	14.31	129	60.0	38.2 I	1.40 U	1.40 U	1.40 U	0.419 U	8.46	9.78
Comp AK-C	4	1	15.22	125	50.8	34.7 I	1.31 U	1.31 U	1.31 U	0.394 U	7.75	9.33
Comp AK-C	5	1	14.89	91.8	105	35.9 I	1.34 U	1.34 U	1.34 U	0.403 U	6.65	7.99
Port Elizabeth Reach A												
Comp PE-A	1	1	14.84	15.5	6.08	24.4 I	1.35 U	1.35 U	1.35 U	0.404 U	1.35 U	7.02
Comp PE-A	2	2	16.58	17.7	5.73	33.4 I	1.51 U	1.51 U	1.51 U	0.483 U	3.74	7.18
Comp PE-A	3	2	14.91	27.0	10.7	29.1 I	1.68 U	1.68 U	1.68 U	0.537 U	4.63	7.18
Comp PE-A	4	2	15.00	20.5	9.40	33.2 I	1.67 U	1.67 U	1.67 U	0.533 U	1.60 U	0.400 U
Comp PE-A	5	1	15.54	26.2	12.2	32.0 I	1.29 U	1.29 U	1.29 U	0.386 U	1.29 U	10.2
Port Elizabeth Reach B												
Comp PE-B	1	2	15.59	36.3	21.0	18.3 I	1.60 U	1.60 U	1.60 U	5.58	4.55	4.74
Comp PE-B	2	2	13.67	40.8	25.2	24.4 I	1.83 U	1.83 U	1.83 U	6.22	5.34	7.32
Comp PE-B	3	3	14.55	47.9	28.3	26.4 I	1.72 U	1.72 U	1.72 U	7.15	1.65 U	8.11
Comp PE-B	4	1	15.12	19.9	7.14	30.2 I	1.32 U	1.32 U	1.32 U	0.397 U	3.84	8.20
Comp PE-B	5	2	14.92	37.6	17.3	24.7 I	1.68 U	1.68 U	1.68 U	0.536 U	5.30	6.37
Hackensack River Reach A												
Comp HR-A	1	2	15.33	16.8	12.1	20.3 I	1.63 U	1.63 U	1.63 U	0.523 U	5.55	5.62
Comp HR-A	2	2	15.42	19.7	15.2	27.4 I	1.62 U	1.62 U	1.62 U	5.64	6.49	0.389 U
Comp HR-A	3	2	15.14	23.8	20.2	32.0 I	1.65 U	1.65 U	1.65 U	0.523 U	1.59 U	6.01
Comp HR-A	4	2	15.84	18.1	15.8	31.4 I	1.58 U	1.58 U	1.58 U	5.18	6.25	7.20
Comp HR-A	5	1	14.94	12.6	12.9	28.0 I	1.34 U	1.34 U	1.34 U	3.82	4.42	5.15
Reference												
Mud Dump Reference	1	2	15.88	1.51 U	0.440 U	1.13 U	1.57 U	1.57 U	1.57 U	0.503 U	1.51 U	0.377 U
Mud Dump Reference	2	2	15.09	1.59 U	0.464 U	1.19 U	1.66 U	1.66 U	1.66 U	0.530 U	1.59 U	0.398 U
Mud Dump Reference	3	1	14.18	1.34 U	0.423 U	0.987 U	1.41 U	1.41 U	1.41 U	0.423 U	1.41 U	0.353 U
Mud Dump Reference	4	1	14.43	1.32 U	0.416 U	0.970 U	1.39 U	1.39 U	1.39 U	0.416 U	1.39 U	2.22
Mud Dump Reference	5	3	14.59	1.64 U	0.480 U	1.23 U	1.71 U	1.71 U	1.71 U	0.548 U	1.65 U	0.411 U

TABLE F.7. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*N. virens* Pesticides (µg/kg dry weight) 4,4'-DDD	4,4'-DDE	4,4'-DDT	Endosulfan I	Endosulfan II	Endosulfan Sulfate	Heptachlor	Heptachlor Epoxide	Trans Nonachlor
Controls												
C-NR Replicate 1	1	3	15.13	1.59 U	0.463 U	1.19 U	1.65 U	1.65 U	1.65 U	0.530 U	1.59 U	0.397 U
C-NR Replicate 2	1	3	15.13	1.59 U	0.463 U	1.19 U	1.66 U	1.66 U	1.66 U	0.530 U	1.59 U	0.397 U
C-NR Replicate 3	1	3	15.13	1.59 U	0.463 U	1.19 U	1.65 U	1.65 U	1.65 U	0.530 U	1.59 U	0.397 U
C-NR	2	3	14.47	1.66 U	0.484 U	1.24 U	1.73 U	1.73 U	1.73 U	0.553 U	1.66 U	0.415 U
C-NR	3	3	14.59	1.64 U	0.480 U	1.23 U	1.71 U	1.71 U	1.71 U	0.548 U	1.65 U	0.411 U
Background												
N. virens Background	1	3	14.52	1.66 U	0.483 U	1.24 U	1.72 U	1.72 U	1.72 U	0.552 U	1.66 U	0.414 U
N. virens Background	2	3	14.66	1.62 U	0.471 U	1.21 U	1.68 U	1.68 U	1.68 U	0.538 U	1.62 U	0.404 U
N. virens Background	3	3	13.35	1.86 U	0.524 U	1.35 U	1.87 U	1.87 U	1.87 U	0.599 U	1.80 U	0.449 U
N. virens Background	4	3	17.31	1.39 U	0.404 U	1.04 U	1.44 U	1.44 U	1.44 U	0.462 U	1.39 U	0.347 U
N. virens Background	5	3	17.89	1.34 U	0.391 U	1.01 U	1.40 U	1.40 U	1.40 U	0.447 U	1.34 U	0.335 U
N. virens Background	6	3	16.60	1.45 U	0.422 U	1.08 U	1.51 U	1.51 U	1.51 U	0.482 U	1.45 U	0.361 U
N. virens Background	7	3	16.20	1.48 U	0.432 U	1.11 U	1.54 U	1.54 U	1.54 U	0.494 U	1.48 U	0.370 U

(a) I 4,4' DDT coelutes with PCB Congeners on both primary and confirmation columns. Value may be false positive or biased high.
(b) U Undetected at or above the given concentration.

TABLE F.8. Quality Control Data for Chlorinated Pesticides (alphabetical, Aldrin - 2,4'-DDT), Wet Weight, in Tissue of *N. virens*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	*N. virens* Pesticides (µg/kg wet weight) Aldrin	a-Chlordane	Dieldrin	2,4'-DDD	2,4'-DDE	2,4'-DDT
Method Blanks								
Blank		1	0.07 U[a]	0.05 U	0.13 U	0.16 U	0.05 U	0.18 U
Blank		2	0.09 U	0.25 U	0.16 U	0.20 U	0.06 U	0.22 U
Blank		3	0.09 U	0.25 U	0.16 U	0.20 U	0.06 U	0.22 U
Matrix Spikes								
Comp MT-A	4	2	0.09 U	1.68[b]	1.76	0.20 U	0.06 U	0.22 U
Comp MT-A MS		2	1.72	NA	3.51	NA	NA	NA
Concentration Recovered			1.72	NA	1.75	NA	NA	NA
Amount Spiked			2.50	NS[c]	2.50	NS	NS	NS
Percent Recovery			69%	NA	70%	NA	NA	NA
Comp AK-C	5	1	0.82	2.61	3.40	9.23	0.05 U	0.18 U
Comp AK-C MS		1	2.95	NA	5.97	NA	NA	NA
Concentration Recovered			2.13	NA	2.57	NA	NA	NA
Amount Spiked			2.70	NS	2.70	NS	NS	NS
Percent Recovery			79%	NA	95%	NA	NA	NA
C-NR	2	3	0.09 U	0.25 U	0.16 U	0.20 U	0.07 U	0.22 U
C-NR MS		3	2.35	NA	3.10	NA	NA	NA
Concentration Recovered			2.35	NA	3.10	NA	NA	NA
Amount Spiked			3.35	NS	3.35	NS	NS	NS
Percent Recovery			70%	NA	93%	NA	NA	NA
Standard Reference Material								
Non-Certified Values			NC[d]	3.2 ±0.2	1.0 ±0.5	2.5 ±0.9	0.72 ±0.07	0.4 ±0.2
SRM 1974		1	0.07 U	4.72[e]	1.02	2.89	0.05 U	0.18 U
SRM 1974		2	0.09 U	5.13[e]	0.97	2.99	0.06 U	0.22 U
SRM 1974		3	0.09 U	4.74[e]	0.95	3.27	0.06 U	0.22 U

TABLE F.8. (contd)

Sediment Treatment	Replicate	Batch	*N. virens* Pesticides (µg/kg wet weight) Aldrin	a-Chlordane	Dieldrin	2,4'-DDD	2,4'-DDE	2,4'-DDT
Analytical Triplicates								
Comp AK-A Replicate 1	5	2	1.75	2.43	1.39	9.18	0.06 U	0.22 U
Comp AK-A Replicate 2	5	2	1.78	2.45	1.35	9.11	0.06 U	0.22 U
Comp AK-A Replicate 3	5	2	1.77	2.44	1.42	9.20	0.06 U	0.22 U
RSD			1%	0%	3%	1%	NA	NA
Comp AK-B Replicate 1	4	1	1.03	3.18	2.59	36.1	1.71	0.18 U
Comp AK-B Replicate 2	4	1	0.95	3.23	2.80	36.7	1.74	0.18 U
Comp AK-B Replicate 3	4	1	0.93	3.00	2.39	34.1	1.61	0.18 U
RSD			5%	4%	8%	4%	4%	NA
C-NR Replicate 1	1	3	0.09 U	0.25 U	0.16 U	0.20 U	0.07 U	0.22 U
C-NR Replicate 2	1	3	0.09 U	0.25 U	0.16 U	0.20 U	0.07 U	0.22 U
C-NR Replicate 3	1	3	0.09 U	0.25 U	0.16 U	0.20 U	0.07 U	0.22 U
RSD			NA	NA	NA	NA	NA	NA

(a) U Undetected at or above given concentration.
(b) NA Not applicable.
(c) NS Not spiked.
(d) NC Not certified.
(e) Outside SRM range for QC criteria (±30%)

TABLE F.9. Quality Control Data for Chlorinated Pesticides (alphabetical, 4,4'-DDD - Trans Nonachlor), Wet Weight, in Tissue of *N. virens*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	*N. virens* Pesticides (µg/kg wet weight) 4,4'-DDD	4,4'-DDE	4,4'-DDT	Endo-Sulfan I	Endo-Sulfan II	Endo-Sulfan Sulfate	Hepta-chlor	Hepta-chlor Epoxide	Trans Nonachlor
Method Blanks											
Blank		1	0.19 U[a]	0.06 U	0.14 U	0.20 U	0.20 U	0.20 U	0.06 U	0.20 U	0.05 U
Blank		2	0.24 U	0.07 U	0.18 U	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
Blank		3	0.24 U	0.07 U	0.18 U	0.25 U	0.25 U	0.25 U	0.07 U	0.24 U	0.06 U
Matrix Spikes											
Comp MT-A	4	2	5.04	1.53	6.13 I[b]	0.25 U	0.25 U	0.25 U	0.87	1.83	0.97
Comp MT-A MS		2	6.88	3.26	7.52	1.49	2.18	2.25	2.30	3.22	NA[c]
Concentration Recovered			1.84	1.73	1.39	1.49	2.18	2.25	1.43	1.39	NA
Amount Spiked			2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	NS[d]
Percent Recovery			74%	69%	56%	60%	87%	90%	57%	56%	NA
Comp AK-C	5	1	13.7	15.6	5.35 I	0.20 U	0.20 U	0.20 U	0.06 U	0.99	1.19
Comp AK-C MS		1	16.2	17.9	7.46	2.17	2.46	2.51	2.93	3.00	NA
Concentration Recovered			2.49	2.28	2.11	2.17	2.46	2.51	2.93	2.01	NA
Amount Spiked			2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	NS
Percent Recovery			92%	84%	78%	80%	91%	93%	109%	74%	NA
C-NR	2	3	0.24 U	0.07 U	0.18 U	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
C-NR MS		3	3.02	3.03	3.01	2.47	3.04	2.78	3.22	3.19	NA
Concentration Recovered			3.02	3.03	3.01	2.47	3.04	2.78	3.22	3.19	NA
Amount Spiked			3.35	3.35	3.35	3.35	3.35	3.35	3.35	3.35	NS
Percent Recovery			90%	90%	90%	74%	91%	83%	96%	95%	NA
Standard Reference Material											
Non-Certified Values			8.4 ±0.4	5.9 ±0.2	0.3 ±0.3	NC[e]	NC	NC	NC	NC	2.6 ±0.6
SRM 1974		1	4.79[f]	6.94	6.50 I[b]	0.20 U	0.20 U	0.20 U	0.06 U	0.20 U	1.70[f]
SRM 1974		2	5.27[f]	7.61	7.10 I[b]	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	1.84[f]
SRM 1974		3	5.11[f]	7.29	6.70 I[b]	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	1.77[f]

TABLE F.9. (contd)

Sediment Treatment	Replicate	Batch	*N. virens* Pesticides (µg/kg wet weight) 4,4'-DDD	4,4'-DDE	4,4'-DDT	Endo-Sulfan I	Endo-Sulfan II	Endo-Sulfan Sulfate	Hepta-chlor	Hepta-chlor Epoxide	Trans Nonachlor
Analytical Triplicates											
Comp AK-A Replicate 1	5	2	21.50	5.59	4.27	0.25 U	0.25 U	0.25 U	0.08 U	0.72	1.33
Comp AK-A Replicate 2	5	2	19.40	5.43	4.19	0.25 U	0.25 U	0.25 U	0.76	0.72	1.16
Comp AK-A Replicate 3	5	2	21.80	5.71	4.15	0.25 U	0.25 U	0.25 U	0.08 U	0.75	1.37
RSD			6%	3%	1%	NA	NA	NA	NA	2%	9%
Comp AK-B Replicate 1	4	1	109 D(g)	14.0	8.48	0.20 U	0.20 U	0.20 U	0.06 U	0.94	1.53
Comp AK-B Replicate 2	4	1	110 D(g)	15.0	12.2	0.20 U	0.20 U	0.20 U	0.06 U	0.91	1.83
Comp AK-B Replicate 3	4	1	103 D(g)	13.0	7.85	0.20 U	0.20 U	0.20 U	0.06 U	0.84	1.29
RSD			4%	7%	25%	NA	NA	NA	NA	6%	17%
C-NR Replicate 1	1	3	0.24 U	0.07 U	0.18 U	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
C-NR Replicate 2	1	3	0.24 U	0.07 U	0.18 U	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
C-NR Replicate 3	1	3	0.24 U	0.07 U	0.18 U	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
RSD			NA	NA	NA	NA	NA	NA	NA	NA	NA

(a) U Undetected at or above the given concentration.
(b) I 4,4' DDT coelutes with PCB Congeners on both primary and confirmation columns. Value may be false positive or biased high.
(c) NA Not applicable.
(d) NS Not spiked.
(e) NC Not certified.
(f) Outside SRM range for QC criteria (±30%).
(g) D Diluted sample (1:5).

TABLE F.10. Polychlorinated Biphenyls (PCBs) 8 through 49, Wet Weight, Including Surrogate Percent Recoveries, in Tissue of *N. virens*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Surrogate Percent Recoveries PCB 103	PCB 198	*N. virens* PCBs (µg/kg, wet weight) PCB 8	PCB 18	PCB 28	PCB 52	PCB 44	PCB 49
Target DL[a]					0.4	0.4	0.4	0.4	0.4	0.4
Achieved Low DL					0.33	0.34	0.16	0.29	0.13	0.02
Achieved High DL					0.41	0.43	0.20	0.36	0.16	0.20
MDL[b] verification					0.57	0.30	0.19	0.16	0.23	NA[c]
MOTBY Reach A										
Comp MT-A	1	1	85	91	0.33 U[d]	3.89	4.73	11.7	2.83	5.18
Comp MT-A	2	1	79	95	0.33 U	4.37	5.69	13.9	3.24	6.61
Comp MT-A	3	3	74	80	0.41 U	4.33	5.35	13.6	3.21	6.07
Comp MT-A	4	2	68	71	0.41 U	4.60	5.58	13.8	3.06	6.53
Comp MT-A	5	1	65	67	0.33 U	3.17	3.71	11.4	2.49	4.63
MOTBY Reach B										
Comp MT-B	1	3	72	80	0.41 U	2.74	3.91	5.73	2.01	2.95
Comp MT-B	2	1	65	76	0.33 U	2.55	3.14	5.33	2.02	2.42
Comp MT-B	3	3	68	78	0.41 U	2.90	3.71	6.08	2.25	2.77
Comp MT-B	4	3	73	84	0.41 U	2.45	4.21	6.00	2.75	3.22
Comp MT-B	5	1	78	127	0.33 U	2.25	2.98	4.89	2.33	2.22
Arthur Kill Reach A										
Comp AK-A	1	1	69	78	0.33 U	2.68	3.52	6.59	2.47	3.50
Comp AK-A	2	2	62	68	0.41 U	2.73	4.21	8.02	2.85	4.66
Comp AK-A	3	2	67	78	0.41 U	4.05	5.40	8.58	3.22	5.32
Comp AK-A	4	1	75	102	0.33 U	2.19	2.58	5.57	2.16	2.54
Comp AK-A Replicate 1	5	2	83	95	0.41 U	3.29	4.36	7.38	2.70	4.42
Comp AK-A Replicate 2	5	2	56	60	0.41 U	2.69	4.36	7.63	2.69	4.48
Comp AK-A Replicate 3	5	2	80	100	0.41 U	3.33	4.46	7.37	2.75	4.41
Arthur Kill Reach B										
Comp AK-B	1	2	77	86	0.41 U	3.48	2.62	6.11	1.26	2.10
Comp AK-B	2	2	79	96	0.41 U	7.43	7.28	11.6	4.14	6.04
Comp AK-B	3	1	75	89	0.33 U	5.64	5.02	10.1	3.38	4.34
Comp AK-B	5	2	81	94	0.41 U	9.58	10.2	14.0	5.83	8.03
Comp AK-B Replicate 1	4	1	70	79	0.33 U	6.49	6.36	10.8	3.46	5.08
Comp AK-B Replicate 2	4	1	68	88	0.33 U	6.36	6.45	10.6	3.64	5.04
Comp AK-B Replicate 3	4	1	73	83	0.33 U	6.38	6.17	10.5	4.28	4.72

TABLE F.10. (contd)

Sediment Treatment	Replicate	Batch	Surrogate Percent Recoveries PCB 103	Surrogate Percent Recoveries PCB 198	*N. virens* PCBs (µg/kg, wet weight) PCB 8	PCB 18	PCB 28	PCB 52	PCB 44	PCB 49
Arthur Kill Reach C										
Comp AK-C	1	1	79	103	0.33 U	7.13	7.32	14.5	4.88	6.05
Comp AK-C	2	1	60	66	0.33 U	9.16	10.1	8.73	2.17	5.37
Comp AK-C	3	1	76	88	0.33 U	7.40	8.37	7.76	1.94	4.70
Comp AK-C	4	1	71	84	0.33 U	7.59	9.08	7.46	5.87	4.62
Comp AK-C	5	1	74	91	0.33 U	5.90	5.98	13.6	4.17	5.44
Port Elizabeth Reach A										
Comp PE-A	1	1	72	77	0.33 U	1.37	1.44	4.00	1.14	1.08
Comp PE-A	2	2	68	77	0.41 U	1.57	1.62	4.36	0.71	1.18
Comp PE-A	3	2	59	63	0.41 U	2.65	2.96	6.30	1.55	2.41
Comp PE-A	4	2	33	32	0.41 U	0.43 U	2.13	5.80	1.15	1.99
Comp PE-A	5	1	76	102	0.33 U	2.30	2.94	6.39	1.97	2.33
Port Elizabeth Reach B										
Comp PE-B	1	2	49	53	0.41 U	5.25	6.88	9.40	3.69	5.06
Comp PE-B	2	2	75	84	0.41 U	4.64	5.80	8.49	3.52	4.65
Comp PE-B	3	3	69	74	0.41 U	6.27	8.24	10.6	4.70	6.01
Comp PE-B	4	1	66	81	0.33 U	2.06	2.16	5.51	1.65	1.73
Comp PE-B	5	2	63	73	0.41 U	2.97	4.84	8.37	2.59	3.94
Hackensack River Reach A										
Comp HR-A	1	2	83	93	0.41 U	3.11	4.22	7.59	2.51	3.36
Comp HR-A	2	2	45	48	0.41 U	3.67	5.43	9.79	3.33	4.41
Comp HR-A	3	2	46	45	0.41 U	3.91	5.72	11.0	3.58	5.33
Comp HR-A	4	2	68	73	0.41 U	3.71	4.29	7.94	2.78	3.75
Comp HR-A	5	1	60	68	0.33 U	3.20	4.52	8.08	2.71	3.71
Reference										
Mud Dump Reference	1	2	79	91	0.41 U	0.43 U	0.20 U	0.36 U	0.16 U	0.03 U
Mud Dump Reference	2	2	82	90	0.41 U	0.43 U	0.20 U	0.36 U	0.16 U	0.03 U
Mud Dump Reference	3	1	80	94	0.33 U	0.34 U	0.16 U	0.29 U	0.13 U	0.02 U
Mud Dump Reference	4	1	75	85	0.33 U	0.34 U	0.16 U	0.29 U	0.13 U	0.02 U
Mud Dump Reference	5	3	69	80	0.41 U	0.43 U	0.20 U	0.36 U	0.16 U	0.03 U

TABLE F.10. (contd)

Sediment Treatment	Replicate	Batch	Surrogate Percent Recoveries PCB 103	Surrogate Percent Recoveries PCB 198	*N. virens* PCBs (µg/kg, wet weight) PCB 8	PCB 18	PCB 28	PCB 52	PCB 44	PCB 49
Controls										
C-NR Replicate 1	1	3	71	78	0.41 U	0.43 U	0.20 U	0.36 U	0.16 U	0.25 U
C-NR Replicate 2	1	3	70	79	0.41 U	0.43 U	0.20 U	0.36 U	0.16 U	0.27 U
C-NR Replicate 3	1	3	71	78	0.41 U	0.43 U	0.20 U	0.36 U	0.16 U	0.26 U
C-NR	2	3	77	84	0.41 U	0.43 U	0.20 U	0.36 U	0.16 U	0.26 U
C-NR	3	3	60	65	0.41 U	0.43 U	0.20 U	0.36 U	0.16 U	0.17 U
Background										
N. virens Background	1	3	68	77	0.41 U	0.43 U	0.20 U	0.36 U	0.16 U	0.19 U
N. virens Background	2	3	64	75	0.41 U	0.43 U	0.20 U	0.36 U	0.16 U	0.19 U
N. virens Background	3	3	70	85	0.41 U	0.43 U	0.20 U	0.36 U	0.16 U	0.18 U
N. virens Background	4	3	70	81	0.41 U	0.43 U	0.20 U	0.36 U	0.16 U	0.20 U
N. virens Background	5	3	69	77	0.41 U	0.43 U	0.20 U	0.36 U	0.16 U	0.19 U
N. virens Background	6	3	72	83	0.41 U	0.43 U	0.20 U	0.36 U	0.16 U	0.18 U
N. virens Background	7	3	71	82	0.41 U	0.43 U	0.20 U	0.36 U	0.16 U	0.19 U

(a) DL Detection limit.
(b) MDL Method detection limit.
(c) NA Not applicable.
(d) U Undetected at or above given concentration.

TABLE F.11. Polychlorinated Biphenyls (PCBs) 66 through 184, Wet Weight, in Tissue of *N. virens*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	*N. virens* PCBs (µg/kg wet weight) PCB 66	PCB 101	PCB 87	PCB 118	PCB 153	PCB 105	PCB 138	PCB 183	PCB 184
Target DL[a]			0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Achieved Low DL			0.07	0.12	0.13	0.24	0.10	0.09	0.23	0.02	0.02
Achieved High DL			0.10	0.15	0.16	0.29	0.12	0.11	0.29	0.20	0.20
MDL[b] verification			0.32	0.25	0.33	0.27	0.19	0.16	0.19	NA[c]	NA
MOTBY Reach A											
Comp MT-A	1	1	5.97	4.32	0.13 U[d]	2.02	7.66	0.09 U	3.97	0.02 U	0.77
Comp MT-A	2	1	6.83	4.87	0.52	2.80	8.49	1.44	4.62	0.02 U	0.93
Comp MT-A	3	3	6.15	4.65	0.50	2.23	7.31	1.41	3.93	0.18 U	0.18 U
Comp MT-A	4	2	6.61	4.79	1.13	2.23	7.63	1.19	4.53	0.03 U	0.77
Comp MT-A	5	1	5.97	4.29	0.35	2.03	9.55	1.41	4.95	0.02 U	1.13
MOTBY Reach B											
Comp MT-B	1	3	4.30	4.03	0.55	2.57	5.04	1.49	3.50	0.19 U	0.64
Comp MT-B	2	1	3.81	3.22	0.13 U	1.60	3.59	0.09 U	2.62	0.02 U	0.42
Comp MT-B	3	3	3.99	3.53	0.45	1.80	3.63	1.19	2.50	0.17 U	0.41
Comp MT-B	4	3	4.28	3.85	0.16 U	2.28	3.91	1.16	3.15	0.20 U	0.37
Comp MT-B	5	1	3.63	2.79	0.34	1.24	3.36	1.00	2.46	0.02 U	0.34
Arthur Kill Reach A											
Comp AK-A	1	1	4.90	4.14	0.13 U	2.30	5.12	1.74	4.26	0.02 U	0.67
Comp AK-A	2	2	5.60	4.78	0.16 U	2.80	5.53	1.99	5.51	0.03 U	0.74
Comp AK-A	3	2	6.19	5.41	0.76	3.40	5.20	2.05	4.64	0.03 U	0.91
Comp AK-A	4	1	4.44	3.49	0.13 U	1.84	5.25	1.71	4.25	0.02 U	0.77
Comp AK-A Replicate 1	5	2	5.37	4.65	0.65	2.85	4.55	1.77	4.03	0.03 U	0.58
Comp AK-A Replicate 2	5	2	5.45	4.69	0.68	2.89	4.64	1.50	4.41	0.03 U	0.56
Comp AK-A Replicate 3	5	2	5.40	4.69	0.70	2.79	4.49	1.81	3.63	0.03 U	0.54
Arthur Kill Reach B											
Comp AK-B	1	2	4.51	3.13	0.16 U	0.29 U	5.02	1.95	6.52	0.03 U	0.64
Comp AK-B	2	2	7.73	5.74	0.73	3.21	5.65	2.54	9.43	0.03 U	0.80
Comp AK-B	3	1	6.86	5.33	0.34	3.24	6.53	2.73	7.76	0.02 U	1.03
Comp AK-B Replicate 1	4	1	7.33	5.50	0.58	3.16	6.31	2.76	9.23	0.03 U	0.69
Comp AK-B Replicate 2	4	1	7.47	5.59	0.61	2.98	5.89	2.71	8.69	0.03 U	0.80
Comp AK-B Replicate 3	4	1	7.03	5.39	0.47	2.81	5.99	2.55	9.30	0.03 U	0.66
Comp AK-B	5	2	9.29	6.81	0.16 U	4.11	5.93	2.80	9.96	0.03 U	0.85

TABLE F.11. (contd)

Sediment Treatment	Replicate	Batch	*N. virens* PCBs (µg/kg wet weight) PCB 66	PCB 101	PCB 87	PCB 118	PCB 153	PCB 105	PCB 138	PCB 183	PCB 184
Arthur Kill Reach C											
Comp AK-C	1	1	9.91	7.47	0.57	4.39	7.33	3.76	7.38	0.02 U	1.12
Comp AK-C	2	1	12.4	9.40	0.81	5.66	9.03	4.49	9.96	0.02 U	1.32
Comp AK-C	3	1	11.0	8.19	0.44	5.15	7.88	3.97	8.03	0.02 U	1.10
Comp AK-C	4	1	11.0	8.09	0.58	4.71	7.91	3.99	7.85	0.02 U	1.15
Comp AK-C	5	1	9.28	6.97	0.13 U	3.85	7.35	3.46	7.29	0.02 U	1.06
Port Elizabeth Reach A											
Comp PE-A	1	1	3.51	2.66	0.13 U	1.28	4.57	1.31	3.61	0.02 U	0.73
Comp PE-A	2	2	4.04	3.26	0.16 U	1.59	6.84	1.89	5.66	0.03 U	1.18
Comp PE-A	3	2	4.59	4.46	0.16 U	2.38	5.47	1.87	4.61	0.03 U	0.78
Comp PE-A	4	2	4.36	4.07	0.16 U	2.25	6.79	1.60	7.00	0.03 U	1.00
Comp PE-A	5	1	5.32	4.79	0.13 U	2.70	6.48	2.17	5.52	0.02 U	1.12
Port Elizabeth Reach B											
Comp PE-B	1	2	6.25	4.67	0.64	2.91	3.78	1.46	3.48	0.03 U	0.35
Comp PE-B	2	2	5.89	4.81	0.16 U	2.98	4.07	1.80	3.78	0.03 U	0.48
Comp PE-B	3	3	7.14	5.59	1.07	3.75	4.91	2.18	3.93	0.19 U	0.63
Comp PE-B	4	1	4.70	3.54	0.13 U	1.81	6.56	2.06	5.41	0.02 U	1.03
Comp PE-B	5	2	5.86	5.07	0.57	3.18	5.07	2.17	4.67	0.03 U	0.62
Hackensack River Reach A											
Comp HR-A	1	2	5.14	4.06	0.64	2.17	4.04	1.56	2.86	0.03 U	0.40
Comp HR-A	2	2	6.24	5.27	0.73	3.01	5.84	1.89	4.21	0.03 U	0.58
Comp HR-A	3	2	7.24	6.28	0.54	3.81	7.01	2.36	6.27	0.03 U	0.03 U
Comp HR-A	4	2	5.80	4.96	0.67	2.93	6.74	2.06	4.69	0.03 U	0.82
Comp HR-A	5	1	3.15	4.66	0.29	2.44	6.53	1.47	3.26	0.02 U	0.73
Reference											
Mud Dump Reference	1	2	0.10 U	0.15 U	0.16 U	0.29 U	0.12 U	0.11 U	0.29 U	0.03 U	0.03 U
Mud Dump Reference	2	2	0.10 U	0.15 U	0.16 U	0.29 U	0.12 U	0.11 U	0.29 U	0.03 U	0.03 U
Mud Dump Reference	3	1	0.42	0.12 U	0.13 U	0.24 U	0.60	0.09 U	0.23 U	0.02 U	0.02 U
Mud Dump Reference	4	1	0.42	0.12 U	0.13 U	0.24 U	0.53	0.09 U	0.23 U	0.02 U	0.02 U
Mud Dump Reference	5	3	0.10 U	0.15 U	0.16 U	0.29 U	0.39	0.11 U	0.29 U	0.03 U	0.03 U

TABLE F.11. (contd)

Sediment Treatment	Replicate	Batch	*N. virens* PCBs (µg/kg wet weight) PCB 66	PCB 101	PCB 87	PCB 118	PCB 153	PCB 105	PCB 138	PCB 183	PCB 184
Controls											
C-NR Replicate 1	1	3	0.10 U	0.15 U	0.16 U	0.29 U	0.12 U	0.11 U	0.29 U	0.25 U	0.25 U
C-NR Replicate 2	1	3	0.10 U	0.15 U	0.16 U	0.29 U	0.12 U	0.11 U	0.29 U	0.27 U	0.27 U
C-NR Replicate 3	1	3	0.10 U	0.15 U	0.16 U	0.29 U	0.43	0.11 U	0.29 U	0.26 U	0.26 U
C-NR	2	3	0.10 U	0.15 U	0.16 U	0.29 U	0.29	0.11 U	0.29 U	0.26 U	0.26 U
C-NR	3	3	0.10 U	0.15 U	0.16 U	0.29 U	0.42	0.11 U	0.29 U	0.17 U	0.17 U
Background											
N. virens Background	1	3	0.10 U	0.15 U	0.16 U	0.29 U	3.66	0.21	0.29 U	0.19 U	0.54
N. virens Background	2	3	0.10 U	0.15 U	0.16 U	0.29 U	2.99	0.20	0.29 U	0.19 U	0.33
N. virens Background	3	3	0.10 U	0.15 U	0.16 U	0.29 U	2.23	0.11 U	0.29 U	0.18 U	0.25
N. virens Background	4	3	0.10 U	0.15 U	0.16 U	0.29 U	0.30	0.11 U	0.29 U	0.20 U	0.20 U
N. virens Background	5	3	0.10 U	0.15 U	0.16 U	0.29 U	0.30	0.11 U	0.29 U	0.19 U	0.19 U
N. virens Background	6	3	0.10 U	0.15 U	0.16 U	0.29 U	0.26	0.11 U	0.29 U	0.18 U	0.18 U
N. virens Background	7	3	0.10 U	0.15 U	0.16 U	0.29 U	0.39	0.11 U	0.29 U	0.19 U	0.19 U

(a) DL Detection limit.
(b) MDL Method detection limit.
(c) NA Not applicable.
(d) U Undetected at or above given concentration.

TABLE F.12. Polychlorinated Biphenyls (PCBs) 187 through 209, Wet Weight, in Tissue of *N. virens*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	*N. virens* PCBs (µg/kg wet weight)						
			PCB 187	PCB 128	PCB 180	PCB 170	PCB 195	PCB 206	PCB 209
Target DL[a]			0.4	0.4	0.4	0.4	0.4	0.4	0.4
Achieved Low DL			0.10	0.12	0.15	0.13	0.08	0.09	0.08
Achieved High DL			0.13	0.15	0.18	0.17	0.10	0.11	0.10
MDL[b] verification			0.16	0.16	0.19	0.16	0.19	0.23	0.26
MOTBY Reach A									
Comp MT-A	1	1	2.07	0.12 U[c]	2.58	1.26	0.08 U	0.09 U	0.08 U
Comp MT-A	2	1	2.96	0.66	2.95	1.42	0.08 U	0.29	0.08 U
Comp MT-A	3	3	2.60	0.57	2.67	1.29	0.10 U	0.28	0.10 U
Comp MT-A	4	2	2.56	0.63	2.52	1.21	0.10 U	0.32	0.10 U
Comp MT-A	5	1	3.64	0.69	3.42	1.62	0.08 U	0.41	0.08 U
MOTBY Reach B									
Comp MT-B	1	3	1.52	0.74	2.08	0.99	0.10 U	0.26	0.10 U
Comp MT-B	2	1	0.07	0.51	1.58	0.73	0.08 U	0.31	0.08 U
Comp MT-B	3	3	1.08	0.54	1.40	0.67	0.10 U	0.19	0.10 U
Comp MT-B	4	3	1.14	0.52	1.48	0.73	0.10 U	0.23	0.10 U
Comp MT-B	5	1	1.08	0.49	1.42	0.67	0.08 U	0.09 U	0.08 U
Arthur Kill Reach A									
Comp AK-A	1	1	0.92	0.12 U	2.47	1.25	0.08 U	0.09 U	0.08 U
Comp AK-A	2	2	1.67	0.83	2.49	1.31	0.10 U	0.45	0.10 U
Comp AK-A	3	2	1.58	0.81	2.38	1.28	0.10 U	0.41	0.10 U
Comp AK-A	4	1	1.68	0.74	2.45	1.26	0.08 U	0.34	0.08 U
Comp AK-A Replicate 1	5	2	1.38	0.71	2.00	1.05	0.10 U	0.37	0.10 U
Comp AK-A Replicate 2	5	2	1.33	0.69	2.04	1.07	0.10 U	0.38	0.10 U
Comp AK-A Replicate 3	5	2	1.35	0.70	2.04	1.10	0.10 U	0.31	0.10 U
Arthur Kill Reach B									
Comp AK-B	1	2	1.49	0.75	2.39	1.24	0.10 U	0.29	0.10 U
Comp AK-B	2	2	1.83	0.83	2.72	1.56	0.10 U	0.36	0.10 U
Comp AK-B	3	1	1.90	0.93	3.25	1.69	0.08 U	0.38	0.08 U
Comp AK-B Replicate 1	4	1	1.66	0.89	2.69	1.42	0.08 U	0.09 U	0.08 U
Comp AK-B Replicate 2	4	1	2.01	0.93	2.86	1.49	0.08 U	0.38	0.08 U
Comp AK-B Replicate 3	4	1	1.65	0.93	2.80	1.53	0.08 U	0.33	0.08 U
Comp AK-B	5	2	1.86	1.00	2.86	1.65	0.10 U	0.33	0.10 U

TABLE F.12. (contd)

Sediment Treatment	Replicate	Batch	*N. virens* PCBs (µg/kg wet weight) PCB 187	PCB 128	PCB 180	PCB 170	PCB 195	PCB 206	PCB 209
Arthur Kill Reach C									
Comp AK-C	1	1	1.91	1.31	3.25	1.60	0.08 U	0.38	0.08 U
Comp AK-C	2	1	2.82	1.64	4.42	2.12	0.08 U	0.09 U	0.08 U
Comp AK-C	3	1	1.88	1.40	3.69	1.80	0.08 U	0.39	0.08 U
Comp AK-C	4	1	2.02	1.44	3.79	1.82	0.08 U	0.48	0.08 U
Comp AK-C	5	1	2.42	1.22	3.26	1.62	0.08 U	0.31	0.08 U
Port Elizabeth Reach A									
Comp PE-A	1	1	1.56	0.59	2.58	1.22	0.08 U	0.09 U	0.08 U
Comp PE-A	2	2	2.33	0.88	3.86	1.77	0.10 U	0.50	0.10 U
Comp PE-A	3	2	1.72	0.74	2.72	1.25	0.10 U	0.37	0.10 U
Comp PE-A	4	2	2.17	0.86	3.16	1.50	0.10 U	0.11 U	0.10 U
Comp PE-A	5	1	1.89	0.98	3.67	1.73	0.08 U	0.45	0.08 U
Port Elizabeth Reach B									
Comp PE-B	1	2	0.99	0.15 U	1.53	0.78	0.10 U	0.25	0.10 U
Comp PE-B	2	2	1.18	0.66	1.79	0.90	0.10 U	0.37	0.10 U
Comp PE-B	3	3	1.41	0.70	2.14	1.08	0.10 U	0.30	0.10 U
Comp PE-B	4	1	2.15	0.88	3.18	1.52	0.08 U	0.51	0.08 U
Comp PE-B	5	2	1.48	0.83	2.11	1.02	0.10 U	0.25	0.10 U
Hackensack River Reach A									
Comp HR-A	1	2	1.13	0.49	1.54	0.75	0.10 U	0.11 U	0.10 U
Comp HR-A	2	2	1.73	0.66	1.99	0.98	0.10 U	0.11 U	0.10 U
Comp HR-A	3	2	1.96	0.84	2.58	1.24	0.10 U	0.35	0.10 U
Comp HR-A	4	2	2.04	0.75	2.48	1.18	0.10 U	0.30	0.10 U
Comp HR-A	5	1	1.85	0.60	2.21	1.10	0.08 U	0.29	0.08 U
Reference									
Mud Dump Reference	1	2	0.13 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.10 U
Mud Dump Reference	2	2	0.13 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.10 U
Mud Dump Reference	3	1	0.10 U	0.12 U	0.18	0.13 U	0.08 U	0.09 U	0.08 U
Mud Dump Reference	4	1	0.10 U	0.12 U	0.15 U	0.13 U	0.08 U	0.09 U	0.08 U
Mud Dump Reference	5	3	0.13 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.10 U

TABLE F.12. (contd)

Sediment Treatment	Replicate	Batch	*N. virens* PCBs (µg/kg wet weight) PCB 187	PCB 128	PCB 180	PCB 170	PCB 195	PCB 206	PCB 209
Controls									
C-NR Replicate 1	1	3	0.13 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.10 U
C-NR Replicate 2	1	3	0.13 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.10 U
C-NR Replicate 3	1	3	0.13 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.10 U
C-NR	2	3	0.13 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.10 U
C-NR	3	3	0.13 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.10 U
Background									
N. virens Background	1	3	1.33	0.18	1.46	0.63	0.10 U	0.28	0.10 U
N. virens Background	2	3	1.04	0.19	1.10	0.48	0.10 U	0.11 U	0.10 U
N. virens Background	3	3	0.72	0.15 U	0.81	0.37	0.10 U	0.11 U	0.10 U
N. virens Background	4	3	0.13 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.10 U
N. virens Background	5	3	0.13 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.10 U
N. virens Background	6	3	0.13 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.10 U
N. virens Background	7	3	0.13 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.10 U

(a) DL Detection limit.
(b) MDL Method detection limit.
(c) U Undetected at or above given concentration.

TABLE F.13. Polychlorinated Biphenyls (PCBs) 8 through 49, Dry Weight, in Tissue of *N. virens*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*N. virens* PCBs (µg/kg, dry weight) PCB 8	PCB 18	PCB 28	PCB 52	PCB 44	PCB 49
MOTBY Reach A									
Comp MT-A	1	1	15.04	2.19 U[a]	25.9	31.4	77.8	18.8	34.4
Comp MT-A	2	1	14.58	2.26 U	30.0	39.0	95.3	22.2	45.3
Comp MT-A	3	3	14.37	2.85 U	30.1	37.2	94.4	22.3	42.2
Comp MT-A	4	2	15.60	2.63 U	29.5	35.8	88.5	19.6	41.9
Comp MT-A	5	1	15.47	2.13 U	20.5	24.0	73.7	16.1	29.9
MOTBY Reach B									
Comp MT-B	1	3	14.21	2.89 U	19.3	27.5	40.3	14.1	20.8
Comp MT-B	2	1	13.54	2.44 U	18.8	23.2	39.4	14.9	17.9
Comp MT-B	3	3	14.24	2.88 U	20.4	26.1	42.7	15.8	19.5
Comp MT-B	4	3	13.74	2.98 U	17.8	30.6	43.7	20.0	23.4
Comp MT-B	5	1	15.06	2.19 U	14.9	19.8	32.5	15.5	14.7
Arthur Kill Reach A									
Comp AK-A	1	1	15.36	2.15 U	17.4	22.9	42.9	16.1	22.8
Comp AK-A	2	2	15.50	2.65 U	17.6	27.2	51.7	18.4	30.1
Comp AK-A	3	2	15.32	2.68 U	26.4	35.2	56.0	21.0	34.7
Comp AK-A	4	1	13.73	2.40 U	16.0	18.8	40.6	15.7	18.5
Comp AK-A Replicate 1	5	2	15.10	2.72 U	21.8	28.9	48.9	17.9	29.3
Comp AK-A Replicate 2	5	2	15.10	2.72 U	17.8	28.9	50.5	17.8	29.7
Comp AK-A Replicate 3	5	2	15.10	2.72 U	22.1	29.5	48.8	18.2	29.2
Arthur Kill Reach B									
Comp AK-B	1	2	14.83	2.76 U	23.5	17.7	41.2	8.50	14.2
Comp AK-B	2	2	15.35	2.67 U	48.4	47.4	75.6	27.0	39.3
Comp AK-B	3	1	15.14	2.18 U	37.3	33.2	66.7	22.3	28.7
Comp AK-B Replicate 1	4	1	14.70	2.24 U	44.1	43.3	73.5	23.5	34.6
Comp AK-B Replicate 2	4	1	14.70	2.24 U	43.3	43.9	72.1	24.8	34.3
Comp AK-B Replicate 3	4	1	14.70	2.24 U	43.4	42.0	71.4	29.1	32.1
Comp AK-B	5	2	14.51	2.83 U	66.0	70.0	96.5	40.2	55.3

TABLE F.13. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*N. virens* PCBs (µg/kg, dry weight) PCB 8	PCB 18	PCB 28	PCB 52	PCB 44	PCB 49
Arthur Kill Reach C									
Comp AK-C	1	1	15.09	2.19 U	47.2	48.5	96.1	32.3	40.1
Comp AK-C	2	1	14.50	2.28 U	63.2	69.7	60.2	15.0	37.0
Comp AK-C	3	1	14.31	2.31 U	51.7	58.5	54.2	13.6	32.8
Comp AK-C	4	1	15.22	2.17 U	49.9	59.7	49.0	38.6	30.4
Comp AK-C	5	1	14.89	2.22 U	39.6	40.2	91.3	28.0	36.5
Port Elizabeth Reach A									
Comp PE-A	1	1	14.84	2.22 U	9.23	9.70	27.0	7.68	7.28
Comp PE-A	2	2	16.58	2.47 U	9.47	9.77	26.3	4.28	7.12
Comp PE-A	3	2	14.91	2.75 U	17.8	19.9	42.3	10.4	16.2
Comp PE-A	4	2	15.00	2.73 U	2.87 U	14.2	38.7	7.67	13.3
Comp PE-A	5	1	15.54	2.12 U	14.8	18.9	41.1	12.7	15.0
Port Elizabeth Reach B									
Comp PE-B	1	2	15.59	2.63 U	33.7	44.1	60.3	23.7	32.5
Comp PE-B	2	2	13.67	3.00 U	33.9	42.4	62.1	25.7	34.0
Comp PE-B	3	3	14.55	2.82 U	43.1	56.6	72.9	32.3	41.3
Comp PE-B	4	1	15.12	2.18 U	13.6	14.3	36.4	10.9	11.4
Comp PE-B	5	2	14.92	2.75 U	19.9	32.4	56.1	17.4	26.4
Hackensack River Reach A									
Comp HR-A	1	2	15.33	2.67 U	20.3	27.5	49.5	16.4	21.9
Comp HR-A	2	2	15.42	2.66 U	23.8	35.2	63.5	21.6	28.6
Comp HR-A	3	2	15.14	2.71 U	25.8	37.8	72.7	23.6	35.2
Comp HR-A	4	2	15.84	2.59 U	23.4	27.1	50.1	17.6	23.7
Comp HR-A	5	1	14.94	2.21 U	21.4	30.3	54.1	18.1	24.8
Reference									
Mud Dump Reference	1	2	15.88	2.58 U	2.71 U	1.26 U	2.27 U	1.01 U	0.189 U
Mud Dump Reference	2	2	15.09	2.72 U	2.85 U	1.33 U	2.39 U	1.06 U	0.199 U
Mud Dump Reference	3	1	14.18	2.33 U	2.40 U	1.13 U	2.05 U	0.917 U	0.141 U
Mud Dump Reference	4	1	14.43	2.29 U	2.36 U	1.11 U	2.01 U	0.901 U	0.139 U
Mud Dump Reference	5	3	14.59	2.81 U	2.95 U	1.37 U	2.47 U	1.10 U	0.206 U

TABLE F.13. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*N. virens* PCBs (µg/kg, dry weight) PCB 8	PCB 18	PCB 28	PCB 52	PCB 44	PCB 49
Controls									
C-NR Replicate 1	1	3	15.13	2.71 U	2.84 U	1.32 U	2.38 U	1.06 U	1.65 U
C-NR Replicate 2	1	3	15.13	2.71 U	2.84 U	1.32 U	2.38 U	1.06 U	1.78 U
C-NR Replicate 3	1	3	15.13	2.71 U	2.84 U	1.32 U	2.38 U	1.06 U	1.72 U
C-NR	2	3	14.47	2.83 U	2.97 U	1.38 U	2.49 U	1.11 U	1.80 U
C-NR	3	3	14.59	2.81 U	2.95 U	1.37 U	2.47 U	1.10 U	1.17 U
Background									
N. virens Background	1	3	14.52	2.82 U	2.96 U	1.38 U	2.48 U	1.10 U	1.31 U
N. virens Background	2	3	14.86	2.76 U	2.89 U	1.35 U	2.42 U	1.08 U	1.28 U
N. virens Background	3	3	13.35	3.07 U	3.22 U	1.50 U	2.70 U	1.20 U	1.35 U
N. virens Background	4	3	17.31	2.37 U	2.48 U	1.16 U	2.08 U	0.924 U	1.16 U
N. virens Background	5	3	17.89	2.29 U	2.40 U	1.12 U	2.01 U	0.894 U	1.06 U
N. virens Background	6	3	16.60	2.47 U	2.59 U	1.20 U	2.17 U	0.964 U	1.08 U
N. virens Background	7	3	16.20	2.53 U	2.65 U	1.23 U	2.22 U	0.988 U	1.17 U

(a) U Undetected at or above given concentration.

TABLE F.14. Polychlorinated Biphenyls (PCBs) 66 through 184, Dry Weight, in Tissue of *N. virens*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*N. virens* PCBs (µg/kg dry weight) PCB 66	PCB 101	PCB 87	PCB 118	PCB 153	PCB 105	PCB 138	PCB 183	PCB 184
MOTBY Reach A												
Comp MT-A	1	1	15.04	39.7	28.7	0.864 U[a]	13.4	50.9	0.598 U	26.4	0.133 U	5.12
Comp MT-A	2	1	14.58	46.8	33.4	3.57	19.2	58.2	9.88	31.7	0.137 U	6.38
Comp MT-A	3	3	14.37	42.8	32.4	3.48	15.5	50.9	9.81	27.3	1.25 U	1.25 U
Comp MT-A	4	2	15.60	42.4	30.7	7.24	14.3	48.9	7.63	29.0	0.192 U	4.94
Comp MT-A	5	1	15.47	38.6	27.7	2.26	13.1	61.7	9.11	32.0	0.129 U	7.30
MOTBY Reach B												
Comp MT-B	1	3	14.21	30.3	28.4	3.87	18.1	35.5	10.5	24.6	1.34 U	4.50
Comp MT-B	2	1	13.54	28.1	23.8	0.960 U	11.8	26.5	0.665 U	19.4	0.148 U	3.10
Comp MT-B	3	3	14.24	28.0	24.8	3.16	12.6	25.5	8.36	17.6	1.19 U	2.88
Comp MT-B	4	3	13.74	31.1	28.0	1.16 U	16.6	28.5	8.44	22.9	1.46 U	2.69
Comp MT-B	5	1	15.06	24.1	18.5	2.26	8.23	22.3	6.64	16.3	0.133 U	2.26
Arthur Kill Reach A												
Comp AK-A	1	1	15.36	31.9	27.0	0.846 U	15.0	33.3	11.3	27.7	0.130 U	4.36
Comp AK-A	2	2	15.50	36.1	30.8	1.03 U	18.1	35.7	12.8	35.5	0.194 U	4.77
Comp AK-A	3	2	15.32	40.4	35.3	4.96	22.2	33.9	13.4	30.3	0.196 U	5.94
Comp AK-A	4	1	13.73	32.3	25.4	0.947 U	13.4	38.2	12.5	31.0	0.146 U	5.61
Comp AK-A Replicate 1	5	2	15.10	35.6	30.8	4.30	18.9	30.1	11.7	26.7	0.199 U	3.84
Comp AK-A Replicate 2	5	2	15.10	36.1	31.1	4.50	19.1	30.7	9.93	29.2	0.199 U	3.71
Comp AK-A Replicate 3	5	2	15.10	35.8	31.1	4.64	18.5	29.7	12.0	24.0	0.199 U	3.58
Arthur Kill Reach B												
Comp AK-B	1	2	14.83	30.4	21.1	1.08 U	1.96 U	33.9	13.1	44.0	0.202 U	4.32
Comp AK-B	2	2	15.35	50.4	37.4	4.76	20.9	36.8	16.5	61.4	0.195 U	5.21
Comp AK-B	3	1	15.14	45.3	35.2	2.25	21.4	43.1	18.0	51.3	0.132 U	6.80
Comp AK-B Replicate 1	4	1	14.70	49.9	37.4	3.95	21.5	42.9	18.8	62.8	0.204 U	4.69
Comp AK-B Replicate 2	4	1	14.70	50.8	38.0	4.15	20.3	40.1	18.4	59.1	0.204 U	5.44
Comp AK-B Replicate 3	4	1	14.70	47.8	36.7	3.20	19.1	40.7	17.3	63.3	0.204 U	4.49
Comp AK-B	5	2	14.51	64.0	46.9	1.10 U	28.3	40.9	19.3	68.6	0.207 U	5.86

TABLE F.14. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*N. virens* PCBs (µg/kg dry weight) PCB 66	PCB 101	PCB 87	PCB 118	PCB 153	PCB 105	PCB 138	PCB 183	PCB 184
Arthur Kill Reach C												
Comp AK-C	1	1	15.09	65.7	49.5	3.78	29.1	48.6	24.9	48.9	0.133 U	7.42
Comp AK-C	2	1	14.50	85.5	64.8	5.59	39.0	62.3	31.0	68.7	0.138 U	9.10
Comp AK-C	3	1	14.31	76.9	57.2	3.07	36.0	55.1	27.7	56.1	0.140 U	7.69
Comp AK-C	4	1	15.22	72.3	53.2	3.81	30.9	52.0	26.2	51.6	0.131 U	7.56
Comp AK-C	5	1	14.89	62.3	46.8	0.873 U	25.9	49.4	23.2	49.0	0.134 U	7.12
Port Elizabeth Reach A												
Comp PE-A	1	1	14.84	23.7	17.9	0.876 U	8.63	30.8	8.83	24.3	0.135 U	4.92
Comp PE-A	2	2	16.58	24.4	19.7	0.965 U	9.59	41.3	11.4	34.1	0.181 U	7.12
Comp PE-A	3	2	14.91	30.8	29.9	1.07 U	16.0	36.7	12.5	30.9	0.201 U	5.23
Comp PE-A	4	2	15.00	29.1	27.1	1.07 U	15.0	45.3	10.7	46.7	0.200 U	6.67
Comp PE-A	5	1	15.54	34.2	30.8	0.837 U	17.4	41.7	14.0	35.5	0.129 U	7.21
Port Elizabeth Reach B												
Comp PE-B	1	2	15.59	40.1	30.0	4.11	18.7	24.2	9.36	22.3	0.192 U	2.25
Comp PE-B	2	2	13.67	43.1	35.2	1.17 U	21.8	29.8	13.2	27.7	0.219 U	3.51
Comp PE-B	3	3	14.55	49.1	38.4	7.35	25.8	33.7	15.0	27.0	1.31 U	4.33
Comp PE-B	4	1	15.12	31.1	23.4	0.860 U	12.0	43.4	13.6	35.8	0.132 U	6.81
Comp PE-B	5	2	14.92	39.3	34.0	3.82	21.3	34.0	14.5	31.3	0.201 U	4.16
Hackensack River Reach A												
Comp HR-A	1	2	15.33	33.5	26.5	4.17	14.2	26.4	10.2	18.7	0.196 U	2.61
Comp HR-A	2	2	15.42	40.5	34.2	4.73	19.5	37.9	12.3	27.3	0.195 U	3.76
Comp HR-A	3	2	15.14	47.8	41.5	3.57	25.2	46.3	15.6	41.4	0.198 U	0.198 U
Comp HR-A	4	2	15.84	36.6	31.3	4.23	18.5	42.6	13.0	29.6	0.189 U	5.18
Comp HR-A	5	1	14.94	21.1	31.2	1.94	16.3	43.7	9.84	21.8	0.134 U	4.89
Reference												
Mud Dump Reference	1	2	15.88	0.630 U	0.945 U	1.01 U	1.83 U	0.756 U	0.693 U	1.83 U	0.189 U	0.189 U
Mud Dump Reference	2	2	15.09	0.663 U	0.994 U	1.06 U	1.92 U	0.795 U	0.729 U	1.92 U	0.199 U	0.199 U
Mud Dump Reference	3	1	14.18	2.96	0.846 U	0.917 U	1.69 U	4.23	0.635 U	1.62 U	0.141 U	0.141 U
Mud Dump Reference	4	1	14.43	2.91	0.832 U	0.901 U	1.66 U	3.67	0.624 U	1.59 U	0.139 U	0.139 U
Mud Dump Reference	5	3	14.59	0.685 U	1.03 U	1.10 U	1.99 U	2.67	0.754 U	1.99 U	0.206 U	0.206 U

TABLE F.14. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*N. virens* PCBs (µg/kg dry weight) PCB 66	PCB 101	PCB 87	PCB 118	PCB 153	PCB 105	PCB 138	PCB 183	PCB 184
Controls												
C-NR Replicate 1	1	3	15.13	0.661 U	0.991 U	1.06 U	1.92 U	0.793 U	0.727 U	1.92 U	1.65 U	1.65 U
C-NR Replicate 2	1	3	15.13	0.661 U	0.991 U	1.06 U	1.92 U	0.793 U	0.727 U	1.92 U	1.78 U	1.78 U
C-NR Replicate 3	1	3	15.13	0.661 U	0.991 U	1.06 U	1.92 U	2.84	0.727 U	1.92 U	1.72 U	1.72 U
C-NR	2	3	14.47	0.691 U	1.04 U	1.11 U	2.00 U	2.00	0.760 U	2.00 U	1.80 U	1.80 U
C-NR	3	3	14.59	0.685 U	1.03 U	1.10 U	1.99 U	2.88	0.754 U	1.99 U	1.17 U	1.17 U
Background												
N. virens Background	1	3	14.52	0.689 U	1.03 U	1.10 U	2.00 U	25.2	1.45	2.00 U	1.31 U	3.72
N. virens Background	2	3	14.86	0.673 U	1.01 U	1.08 U	1.95 U	20.1	1.35	1.95 U	1.28 U	2.22
N. virens Background	3	3	13.35	0.749 U	1.12 U	1.20 U	2.17 U	16.7	0.824 U	2.17 U	1.35 U	1.87
N. virens Background	4	3	17.31	0.578 U	0.867 U	0.924 U	1.68 U	1.73	0.635 U	1.68 U	1.16 U	1.16 U
N. virens Background	5	3	17.89	0.559 U	0.838 U	0.894 U	1.62 U	1.68	0.615 U	1.62 U	1.06 U	1.06 U
N. virens Background	6	3	16.60	0.602 U	0.904 U	0.964 U	1.75 U	1.57	0.663 U	1.75 U	1.08 U	1.08 U
N. virens Background	7	3	16.20	0.617 U	0.926 U	0.988 U	1.79 U	2.41	0.679 U	1.79 U	1.17 U	1.17 U

(a) U Undetected at or above given concentration.

TABLE F.15. Polychlorinated Biphenyls (PCBs) 187 through 209, Dry Weight, in Tissue of *N. virens*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*N. virens* PCBs (µg/kg dry weight) PCB 187	PCB 128	PCB 180	PCB 170	PCB 195	PCB 206	PCB 209
MOTBY Reach A										
Comp MT-A	1	1	15.04	13.8	0.798 U[a]	17.2	8.38	0.532 U	0.598 U	0.532 U
Comp MT-A	2	1	14.58	20.3	4.53	20.2	9.74	0.549 U	1.99	0.549 U
Comp MT-A	3	3	14.37	18.1	3.97	18.6	8.98	0.696 U	1.95	0.696 U
Comp MT-A	4	2	15.60	16.4	4.04	16.2	7.76	0.641 U	2.05	0.641 U
Comp MT-A	5	1	15.47	23.5	4.46	22.1	10.5	0.517 U	2.65	0.517 U
MOTBY Reach B										
Comp MT-B	1	3	14.21	10.7	5.21	14.6	6.97	0.704 U	1.83	0.704 U
Comp MT-B	2	1	13.54	0.547	3.77	11.7	5.39	0.591 U	2.29	0.591 U
Comp MT-B	3	3	14.24	7.58	3.79	9.83	4.71	0.702 U	1.33	0.702 U
Comp MT-B	4	3	13.74	8.30	3.78	10.8	5.31	0.728 U	1.67	0.728 U
Comp MT-B	5	1	15.06	7.17	3.25	9.43	4.45	0.531 U	0.598 U	0.531 U
Arthur Kill Reach A										
Comp AK-A	1	1	15.36	5.99	0.781 U	16.1	8.14	0.521 U	0.586 U	0.521 U
Comp AK-A	2	2	15.50	10.8	5.35	16.1	8.45	0.645 U	2.90	0.645 U
Comp AK-A	3	2	15.32	10.3	5.29	15.5	8.36	0.653 U	2.68	0.653 U
Comp AK-A	4	1	13.73	12.2	5.39	17.8	9.18	0.583 U	2.48	0.583 U
Comp AK-A Replicate 1	5	2	15.10	9.14	4.70	13.2	6.95	0.662 U	2.45	0.662 U
Comp AK-A Replicate 2	5	2	15.10	8.81	4.57	13.5	7.09	0.662 U	2.52	0.662 U
Comp AK-A Replicate 3	5	2	15.10	8.94	4.64	13.5	7.28	0.662 U	2.05	0.662 U
Arthur Kill Reach B										
Comp AK-B	1	2	14.83	10.0	5.06	16.1	8.36	0.674 U	1.96	0.674 U
Comp AK-B	2	2	15.35	11.9	5.41	17.7	10.2	0.651 U	2.35	0.651 U
Comp AK-B	3	1	15.14	12.5	6.14	21.5	11.2	0.528 U	2.51	0.528 U
Comp AK-B Replicate 1	4	1	14.70	13.7	6.33	19.5	10.1	0.554 U	2.59	0.544 U
Comp AK-B Replicate 2	4	1	14.70	11.2	6.33	19.0	10.4	0.544 U	2.24	0.544 U
Comp AK-B Replicate 3	4	1	14.70	11.3	6.05	18.3	9.66	0.544 U	0.610 U	0.544 U
Comp AK-B	5	2	14.51	12.8	6.89	19.7	11.4	0.689 U	2.27	0.689 U

TABLE F.15. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*N. virens* PCBs (µg/kg dry weight) PCB 187	PCB 128	PCB 180	PCB 170	PCB 195	PCB 206	PCB 209
Arthur Kill Reach C										
Comp AK-C	1	1	15.09	12.7	8.68	21.5	10.6	0.530 U	2.52	0.530 U
Comp AK-C	2	1	14.50	19.4	11.3	30.5	14.6	0.552 U	0.621 U	0.552 U
Comp AK-C	3	1	14.31	13.1	9.78	25.8	12.6	0.559 U	2.73	0.559 U
Comp AK-C	4	1	15.22	13.3	9.46	24.9	12.0	0.526 U	3.15	0.526 U
Comp AK-C	5	1	14.89	16.3	8.19	21.9	10.9	0.537 U	2.08	0.537 U
Port Elizabeth Reach A										
Comp PE-A	1	1	14.84	10.5	3.98	17.4	8.22	0.539 U	0.606 U	0.539 U
Comp PE-A	2	2	16.58	14.1	5.31	23.3	10.7	0.603 U	3.02	0.603 U
Comp PE-A	3	2	14.91	11.5	4.96	18.2	8.38	0.671 U	2.48	0.671 U
Comp PE-A	4	2	15.00	14.5	5.73	21.1	10.0	0.667 U	0.733 U	0.667 U
Comp PE-A	5	1	15.54	12.2	6.31	23.6	11.1	0.515 U	2.90	0.515 U
Port Elizabeth Reach B										
Comp PE-B	1	2	15.59	6.35	0.962 U	9.81	5.00	0.641 U	1.60	0.641 U
Comp PE-B	2	2	13.67	8.63	4.83	13.1	6.58	0.732 U	2.71	0.732 U
Comp PE-B	3	3	14.55	9.69	4.81	14.7	7.42	0.687 U	2.06	0.687 U
Comp PE-B	4	1	15.12	14.2	5.82	21.0	10.1	0.529 U	3.37	0.529 U
Comp PE-B	5	2	14.92	9.92	5.56	14.1	6.84	0.670 U	1.68	0.670 U
Hackensack River Reach A										
Comp HR-A	1	2	15.33	7.37	3.20	10.0	4.89	0.652 U	0.718 U	0.652 U
Comp HR-A	2	2	15.42	11.2	4.28	12.9	6.36	0.649 U	0.713 U	0.649 U
Comp HR-A	3	2	15.14	12.9	5.55	17.0	8.19	0.661 U	2.31	0.661 U
Comp HR-A	4	2	15.84	12.9	4.73	15.7	7.45	0.631 U	1.89	0.631 U
Comp HR-A	5	1	14.94	12.4	4.02	14.8	7.36	0.535 U	1.94	0.535 U
Reference										
Mud Dump Reference	1	2	15.88	0.819 U	0.945 U	1.13 U	1.07 U	0.630 U	0.693 U	0.630 U
Mud Dump Reference	2	2	15.09	0.861 U	0.994 U	1.19 U	1.13 U	0.663 U	0.729 U	0.663 U
Mud Dump Reference	3	1	14.18	0.705 U	0.846 U	1.27	0.917 U	0.564 U	0.635 U	0.564 U
Mud Dump Reference	4	1	14.43	0.693 U	0.832 U	1.04 U	0.901 U	0.554 U	0.624 U	0.554 U
Mud Dump Reference	5	3	14.59	0.891 U	1.03 U	1.23 U	1.17 U	0.685 U	0.754 U	0.685 U

TABLE F.15. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*N. virens* PCBs (µg/kg dry weight) PCB 187	PCB 128	PCB 180	PCB 170	PCB 195	PCB 206	PCB 209
Controls										
C-NR Replicate 1	1	3	15.13	0.859 U	0.991 U	1.19 U	1.12 U	0.661 U	0.727 U	0.661 U
C-NR Replicate 2	1	3	15.13	0.859 U	0.991 U	1.19 U	1.12 U	0.661 U	0.727 U	0.661 U
C-NR Replicate 3	1	3	15.13	0.859 U	0.991 U	1.19 U	1.12 U	0.661 U	0.727 U	0.661 U
C-NR	2	3	14.47	0.898 U	1.04 U	1.24 U	1.17 U	0.691 U	0.760 U	0.691 U
C-NR	3	3	14.59	0.891 U	1.03 U	1.23 U	1.17 U	0.685 U	0.754 U	0.685 U
Background										
N. virens Background	1	3	14.52	9.16	1.24	10.1	4.34	0.689 U	1.93	0.689 U
N. virens Background	2	3	14.86	7.00	1.28	7.40	3.23	0.673 U	0.740 U	0.673 U
N. virens Background	3	3	13.35	5.39	1.12 U	6.07	2.77	0.749 U	0.824 U	0.749 U
N. virens Background	4	3	17.31	0.751 U	0.867 U	1.04 U	0.98 U	0.578 U	0.635 U	0.578 U
N. virens Background	5	3	17.89	0.727 U	0.838 U	1.01 U	0.95 U	0.559 U	0.615 U	0.559 U
N. virens Background	6	3	16.60	0.783 U	0.904 U	1.08 U	1.02 U	0.602 U	0.663 U	0.602 U
N. virens Background	7	3	16.20	0.802 U	0.926 U	1.11 U	1.05 U	0.617 U	0.679 U	0.617 U

(a) U Undetected at or above given concentration.

TABLE F.16. Quality Control Data for Polychlorinated Biphenyls (PCBs) 8 through 49, Wet Weight, Including Surrogate Percent Recoveries, in Tissue of *N. virens*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Surrogate Percent Recoveries PCB 103	PCB 198	*N. virens* PCBs (µg/kg, wet weight) PCB 8	PCB 18	PCB 28	PCB 52	PCB 44	PCB 49
Method Blanks										
Blank		1	86	97	0.33 U[a]	0.34 U	0.16 U	0.29 U	0.13 U	0.02 U
Blank		2	67	69	0.41 U	0.43 U	0.20 U	0.36 U	0.16 U	0.03 U
Blank		3	83	91	0.41 U	0.43 U	0.20 U	0.36 U	0.16 U	0.20 U
Matrix Spikes										
COMP MT-A	4	2	68	71	0.41 U	4.60	5.58	13.8	3.06	6.53
COMP MT-A MS		2	45	43	NA[b]	NA	8.02	19.8	NA	NA
Concentration Recovered					NA	NA	2.44	6.03	NA	NA
Amount Spiked					NS[c]	NS	3.19	6.65	NS	NS
Percent Recovery					NA	NA	76%	91%	NA	NA
COMP AK-C	5	1	74	91	0.33 U	5.90	5.98	13.6	4.17	5.44
COMP AK-C MS		1	75	87	NA	NA	9.31	19.6	NA	NA
Concentration Recovered					NA	NA	3.33	6.00	NA	NA
Amount Spiked					NS	NS	3.44	7.18	NS	NS
Percent Recovery					NA	NA	97%	84%	NA	NA
C-NR	2	3	77	84	0.41 U	0.43 U	0.20 U	0.36 U	0.16 U	0.26 U
C-NR MS		3	71	81	NA	NA	4.01	8.45	NA	NA
Concentration Recovered					NA	NA	4.01	8.45	NA	NA
Amount Spiked					NS	NS	4.27	8.91	NS	NS
Percent Recovery					NA	NA	94%	95%	NA	NA
Standard Reference Material										
Non-Certified Value					NC[d]	3 ±1	7.6 ± 0.4	12 ±5	8 ±3	NC
SRM 1974		1	60	88	0.33 U	5.51[e]	5.08[e]	12.7	8.05	6.03
SRM 1974		2	90	82	0.41 U	6.02[e]	10.6 [e]	13.8	8.84	6.44
SRM 1974		3	64	77	0.41 U	6.02[e]	10.9 [e]	14.1	8.91	12.3

TABLE F.16. (contd)

Sediment Treatment	Replicate	Batch	Surrogate Percent Recoveries PCB 103	PCB 198	*N. virens* PCBs (µg/kg, wet weight) PCB 8	PCB 18	PCB 28	PCB 52	PCB 44	PCB 49
Analytical Triplicates										
COMP AK-B Replicate 1	NA	1	70	79	0.33 U	6.49	6.36	10.8	3.46	5.08
COMP AK-B Replicate 2	NA	1	68	88	0.33 U	6.36	6.45	10.6	3.64	5.04
COMP AK-B Replicate 3	NA	1	73	83	0.33 U	6.38	6.17	10.5	4.28	4.72
RSD					NA	1%	2%	1%	11%	4%
COMP AK-A Replicate 1	NA	2	83	95	0.41 U	3.29	4.36	7.38	2.70	4.42
COMP AK-A Replicate 2	NA	2	56	60	0.41 U	2.69	4.36	7.63	2.69	4.48
COMP AK-A Replicate 3	NA	2	80	100	0.41 U	3.33	4.46	7.37	2.75	4.41
RSD					NA	12%	1%	2%	1%	1%
C-NR Replicate 1	NA	3	71	78	0.41 U	0.43 U	0.20 U	0.36 U	0.16 U	0.25 U
C-NR Replicate 2	NA	3	70	79	0.41 U	0.43 U	0.20 U	0.36 U	0.16 U	0.27 U
C-NR Replicate 3	NA	3	71	78	0.41 U	0.43 U	0.20 U	0.36 U	0.16 U	0.26 U
RSD					NA	NA	NA	NA	NA	NA

(a) U Undetected at or above given concentration.
(b) NA Not applicable.
(c) NS Not spiked.
(d) NC Not certified.
(e) Value exceeds SRM range of ±30%.

TABLE F.17. Quality Control Data for Polychlorinated Biphenyls (PCBs) 66 through 184, Wet Weight, in Tissue of *N. virens*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	*N. virens* PCBs (µg/kg wet weight) PCB 66	PCB 101	PCB 87	PCB 118	PCB 153	PCB 105	PCB 138	PCB 183	PCB 184
Method Blanks											
Blank		1	0.07 U[a]	0.12 U	0.13 U	0.24 U	0.10 U	0.09 U	0.23 U	0.02 U	0.02 U
Blank		2	0.10 U	0.15 U	0.16 U	0.29 U	0.12 U	0.11 U	0.29 U	0.03 U	0.03 U
Blank		3	0.10 U	0.15 U	0.16 U	0.29 U	0.12 U	0.11 U	0.29 U	0.20 U	0.20 U
Matrix Spikes											
Comp MT-A	4	2	6.61[b]	4.79	1.13	2.23	7.63	1.19	4.53	0.03 U	0.77
Comp MT-A MS		2	NA	8.55	NA	NA	10.6	NA	7.17	NA	NA
Concentration Recovered			NA	3.76	NA	NA	2.97	NA	2.64	NA	NA
Amount Spiked			NS[c]	4.51	NS	NS	2.64	NS	2.04[d]	NS	NS
Percent Recovery			NA	83%	NA	NA	113%	NA	129%[d]	NA	NA
Comp AK-C	5	1	9.28	6.97	0.13 U	3.85	7.35	3.46	7.29	0.02 U	1.06
Comp AK-C MS		1	NA	11.5	NA	NA	10.2	NA	9.37	NA	NA
Concentration Recovered			NA	4.53	NA	NA	2.85	NA	2.08	NA	NA
Amount Spiked			NS	4.87	NS	NS	2.85	NS	2.20	NS	NS
Percent Recovery			NA	93%	NA	NA	100%	NA	95%	NA	NA
C-NR	2	3	0.10 U	0.15 U	0.16 U	0.29 U	0.29	0.11 U	0.29 U	0.26 U	0.26 U
C-NR MS		3	NA	6.16	NA	NA	3.68	NA	2.73	NA	NA
Concentration Recovered			NA	6.16	NA	NA	3.39	NA	2.73	NA	NA
Amount Spiked			NS	6.05	NS	NS	3.53	NS	2.73	NS	NS
Percent Recovery			NA	102%	NA	NA	96%	NA	100%	NA	NA
Standard Reference Material											
Non-Certified Value			13.6 ±0.6	13 ±1	NC[e]	13.6 ±0.6	18 ±1	5.6 ±0.4	14 ±1	NC	NC
SRM 1974		1	17.1	14.9	0.13 U	11.7	11.1[f]	5.10	10.4	0.02 U	1.29
SRM 1974		2	18.0[f]	16.0	0.16 U	12.8	12.2[f]	5.67	11.5	0.03 U	1.46
SRM 1974		3	19.0[f]	16.6	0.16 U	12.4	11.8[f]	5.36	11.2	0.19	1.43
Analytical Triplicates											
Comp AK-A Replicate 1	5	2	5.37	4.65	0.65	2.85	4.55	1.77	4.03	0.03 U	0.58
Comp AK-A Replicate 2	5	2	5.45	4.69	0.68	2.89	4.64	1.50	4.41	0.03 U	0.56
Comp AK-A Replicate 3	5	2	5.40	4.69	0.70	2.79	4.49	1.81	3.63	0.03 U	0.54
RSD			1%	0%	4%	2%	2%	10%	10%	NA	4%

TABLE F.17. (contd)

Sediment Treatment	Replicate	Batch	*N. virens* PCBs (µg/kg wet weight) PCB 66	PCB 101	PCB 87	PCB 118	PCB 153	PCB 105	PCB 138	PCB 183	PCB 184
Comp AK-B Replicate 1	4	1	7.33	5.50	0.58	3.16	6.31	2.76	9.23	0.03 U	0.69
Comp AK-B Replicate 2	4	1	7.47	5.59	0.61	2.98	5.89	2.71	8.69	0.03 U	0.80
Comp AK-B Replicate 3	4	1	7.03	5.39	0.47	2.81	5.99	2.55	9.30	0.03 U	0.66
RSD			3%	2%	13%	6%	4%	4%	4%	NA	10%
C-NR Replicate 1	1	3	0.10 U	0.15 U	0.16 U	0.29 U	0.12 U	0.11 U	0.29 U	0.25 U	0.25 U
C-NR Replicate 2	1	3	0.10 U	0.15 U	0.16 U	0.29 U	0.12 U	0.11 U	0.29 U	0.27 U	0.27 U
C-NR Replicate 3	1	3	0.10 U	0.15 U	0.16 U	0.29 U	0.43	0.11 U	0.29 U	0.26 U	0.26 U
RSD			NA	NA	NA	NA	NA	NA	NA	NA	NA

(a) U Undetected at or above given concentration.
(b) NA Not applicable.
(c) NS Not spiked.
(d) Recovery exceeds quality control range (40%-120%).
(e) NC Not certified.
(f) Value exceeds SRM range of ±30%.

TABLE F.18. Quality Control Data for Polychlorinated Biphenyls (PCBs) 187 through 209, Wet Weight, in Tissue of *N. virens*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	*N. virens* PCBs (µg/kg wet weight) PCB 187	PCB 128	PCB 180	PCB 170	PCB 195	PCB 206	PCB 209
Method Blanks									
Blank		1	0.10 U[a]	0.12 U	0.15 U	0.13 U	0.08 U	0.09 U	0.08 U
Blank		2	0.13 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.10 U
Blank		3	0.13 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.10 U
Matrix Spikes									
COMP MT-A	4	2	2.56	0.63	2.52	1.21	0.10 U	0.32	0.10 U
COMP MT-A MS		2	NA[b]	NA	NA	NA	NA	NA	NA
Concentration Recovered			NA	NA	NA	NA	NA	NA	NA
Amount Spiked			NS[c]	NS	NS	NS	NS	NS	NS
Percent Recovery			NA	NA	NA	NA	NA	NA	NA
COMP AK-C	5	1	2.42	1.22	3.26	1.62	0.08 U	0.31	0.08 U
COMP AK-C MS		1	NA	NA	NA	NA	NA	NA	NA
Concentration Recovered			NA	NA	NA	NA	NA	NA	NA
Amount Spiked			NS	NS	NS	NS	NS	NS	NS
Percent Recovery			NA	NA	NA	NA	NA	NA	NA
C-NR	2	3	0.13 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.10 U
C-NR MS		3	NA	NA	NA	NA	NA	NA	NA
Concentration Recovered			NA	NA	NA	NA	NA	NA	NA
Amount Spiked			NS	NS	NS	NS	NS	NS	NS
Percent Recovery			NA	NA	NA	NA	NA	NA	NA
Standard Reference Material									
Non-Certified Value			3.7 ±0.1	1.9 ±0.3	1.7 ±0.2	NC[d]	NC	NC	NC
SRM 1974		1	2.91	1.98	1.06	0.13 U	0.08 U	0.09 U	0.08 U
SRM 1974		2	3.26	2.07	1.13	0.17 U	0.10 U	0.11 U	0.10 U
SRM 1974		3	3.11	2.06	1.13	0.17 U	0.10 U	0.11 U	0.10 U
Analytical Triplicates									
COMP AK-A Replicate 1	5	2	1.33	0.69	2.04	1.07	0.10 U	0.38	0.10 U
COMP AK-A Replicate 2	5	2	1.38	0.71	2.00	1.05	0.10 U	0.37	0.10 U
COMP AK-A Replicate 3	5	2	1.35	0.70	2.04	1.10	0.10 U	0.31	0.10 U
RSD			2%	1%	1%	2%	NA	11%	NA

TABLE F.18. (contd)

Sediment Treatment	Replicate	Batch	*N. virens* PCBs (µg/kg wet weight) PCB 187	PCB 128	PCB 180	PCB 170	PCB 195	PCB 206	PCB 209
COMP AK-B Replicate 1	4	1	2.01	0.93	2.86	1.49	0.08 U	0.38	0.08 U
COMP AK-B Replicate 2	4	1	1.65	0.93	2.80	1.53	0.08 U	0.33	0.08 U
COMP AK-B Replicate 3	4	1	1.66	0.89	2.69	1.42	0.08 U	0.09 U	0.08 U
RSD			12%	3%	3%	4%	NA	NA	NA
C-NR Replicate 1	1	3	0.13 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.10 U
C-NR Replicate 2	1	3	0.13 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.10 U
C-NR Replicate 3	1	3	0.13 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.10 U
RSD			NA	NA	NA	NA	NA	NA	NA

(a) U Undetected at or above given concentration.
(b) NA Not applicable.
(c) NS Not spiked.
(d) NC Not certified.

TABLE F.19. Dioxin Congeners in Tissue of *N. virens*, Wet Weight, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	*N. virens* Dioxins (pg/g wet weight) 2378-TCDD	12378-PeCDD	123478-HxCDD	123678-HxCDD	123789-HxCDD	1234678-HpCDD	OCDD
Target DL[a]			1.0	1.0	2.5	2.5	2.5	2.5	5.0
Achieved DL			0.2-1.0	0.2-2.0	0.2-1.5	0.2-3.0	0.3-1.8	0.8-8.4	<2.32
MDL[b] verification			0.35	2.1	5.3	2.8	4.9	2.8	3.9
MOTBY Reach A									
Comp MT-A	1	1	2.60	NA[c]	NA	NA	NA	NA	NA
Comp MT-A	2	1	1.95	NA	NA	NA	NA	NA	NA
Comp MT-A	3	1	1.77	NA	NA	NA	NA	NA	NA
Comp MT-A	4	1	1.57	NA	NA	NA	NA	NA	NA
Comp MT-A	5	1	1.88	NA	NA	NA	NA	NA	NA
MOTBY Reach B									
Comp MT-B	1	1	1.71	NA	NA	NA	NA	NA	NA
Comp MT-B	2	1	1.34	NA	NA	NA	NA	NA	NA
Comp MT-B	3	1	1.11	NA	NA	NA	NA	NA	NA
Comp MT-B Replicate 1	4	1	1.77	NA	NA	NA	NA	NA	NA
Comp MT-B Replicate 2	4	1	1.14	NA	NA	NA	NA	NA	NA
Comp MT-B Replicate 3	4	1	1.15	NA	NA	NA	NA	NA	NA
Comp MT-B	5	1	1.26	NA	NA	NA	NA	NA	NA
Arthur Kill Reach A									
Comp AK-A	1	3	3.9	1.0 U[d]	0.6 U	1.8 U	1.6 U	2.88	15.34
Comp AK-A	2	3	4.19	1.1 U	0.5 U	1.6 U	1.0 U	3.37	18.26
Comp AK-A	3	4	3.10	0.6 U	0.2 U	1.2 U	0.6 U	2.71	17.95
Comp AK-A	4	2	4.37	1.0 U	0.6 U	1.6 U	1.8 U	3.03	19.31
Comp AK-A Replicate 1	5	4	3.53	0.7 U	0.3 U	1.1 U	0.5 U	2.33	14.25
Comp AK-A Replicate 2	5	4	3.43	0.7 U	0.3 U	1.1 U	0.5 U	2.15	14.24
Comp AK-A Replicate 3	5	4	3.63	0.7 U	0.3 U	1.3 U	0.5 U	2.31	14.20
Arthur Kill Reach B									
Comp AK-B	1	3	0.6 U	0.4 U	0.5 U	0.4 U	0.6 U	1.9 U	4.31
Comp AK-B	2	4	3.73	1.0 U	0.4 U	1.7 U	0.6 U	2.41	14.79
Comp AK-B	3	2	4.92	1.7 U	0.8 U	2.3 U	1.4 U	3.50	21.02
Comp AK-B	4	2	3.16	1.2 U	0.7 U	1.6 U	0.8 U	2.64	19.51
Comp AK-B	5	4	3.73	0.9 U	0.3 U	1.6 I	0.7 U	3.18	19.89

TABLE F.19. (contd)

Sediment Treatment	Replicate	Batch	*N. virens* Dioxins (pg/g wet weight) 2378-TCDD	12378-PeCDD	123478-HxCDD	123678-HxCDD	123789-HxCDD	1234678-HpCDD	OCDD
Arthur Kill Reach C									
Comp AK-C	1	2	3.38	1.7 U	1.0 U	2.8 U	1.6 U	3.65	25.09
Comp AK-C	2	3	3.41	1.4 U	0.7 U	2.5 U	1.5 U	8.4 U	20.01
Comp AK-C	3	3	3.2	1.5 U	1.0 U	3.0 U	1.8 U	3.56	25.75
Comp AK-C	4	2	2.89	1.1 U	0.5 U	0.83	0.8 U	3.22	23.78
Comp AK-C	5	2	2.84	2.0 U	0.6 U	2.7 U	1.8 U	3.45	24.5
Port Elizabeth Reach A									
Comp PE-A	1	2	5.87	1.0 U	0.7 U	1.0 U	1.1 U	2.47	18.71
Comp PE-A	2	3	6.71	1.3 U	0.6 U	1.3 U	0.9 U	2.19	14.21
Comp PE-A	3	4	4.10	0.5 U	0.3 U	1.0 U	0.4 U	2.37	15.46
Comp PE-A	4	3	6.54	0.9 U	0.5 U	1.1 U	0.9 U	2.32	13.55
Comp PE-A	5	2	6.02	1.1 U	0.5 U	1.1 U	0.8 U	2.32	17.09
Port Elizabeth Reach B									
Comp PE-B	1	4	3.81	0.5 U	0.3 U	1.1 U	0.5 U	3.03	18.70
Comp PE-B	2	3	5.5	1.6 U	0.8 U	1.8 U	0.9 U	2.78	15.61
Comp PE-B	3	4	4.05	0.7 U	0.4 U	1.9 U	0.7 U	2.74	16.35
Comp PE-B	4	2	6.29	0.9 U	1.5 U	1.3 U	0.6 U	3.04	18.32
Comp PE-B	5	4	4.41	0.8 U	0.2 U	1.1 U	0.4 U	2.38	13.89
Hackensack River Reach A									
Comp HR-A Replicate 1	1	3	14.41	1.6 U	0.6 U	2.3 U	1.4 U	4.09	19.85
Comp HR-A Replicate 2	1	3	13.96	1.7 U	0.9 U	2.6 U	1.3 U	3.59	18.15
Comp HR-A Replicate 3	1	3	14.56	1.0 U	0.5 U	2.5 U	1.4 U	3.37	18.62
Comp HR-A	2	4	13.52	1.1 U	0.3 U	1.6 U	0.6 U	2.78	13.94
Comp HR-A	3	4	11.12	0.9 U	0.3 U	1.5 U	0.7 U	2.47	15.90
Comp HR-A	4	3	14.6	1.4 U	0.8 U	2.1 U	1.5 U	2.71	16.14
Comp HR-A	5	2	12.69	1.1 U	0.7 U	1.9 U	1.1 U	2.72	16.38

TABLE F.19. (contd)

Sediment Treatment	Replicate	Batch	*N. virens* Dioxins (pg/g wet weight) 2378-TCDD	12378-PeCDD	123478-HxCDD	123678-HxCDD	123789-HxCDD	1234678-HpCDD	OCDD
Reference									
Mud Dump Reference	1	4	0.4 U	0.2 U	0.1 U	0.2 U	0.3 U	1.1 U	4.03
Mud Dump Reference	2	4	0.6 U	0.2 U	0.2 U	0.2 U	0.3 U	1.3 U	4.79
Mud Dump Reference Replicate 1	3	2	1.0 U	0.8 U	0.8 U	0.7 U	0.9 U	2.2 U	8.47
Mud Dump Reference Replicate 2	3	2	0.9 U	1.0 U	0.4 U	0.6 U	0.5 U	1.8 U	7.29
Mud Dump Reference Replicate 3	3	2	0.8 U	0.4 U	0.6 U	0.5 U	0.6 U	2.1 U	5.66
Mud Dump Reference	4	2	0.8 U	0.7 U	0.6 U	0.5 U	0.8 U	1.6 U	6.29
Mud Dump Reference	5	3	3.84	1.2 U	1.0 U	2.1 U	1.8 U	3.34	17.41
Controls									
C-NR	1	4	0.3 U	0.3 U	0.1 U	0.3 U	0.3 U	1.1 U	3.20
C-NR	2	4	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	1.3 U	3.76
C-NR	3	4	0.2 U	0.3 U	0.3 U	0.3 U	0.3 U	1.2 U	3.69
Background									
N. virens Background	1	1	0.34 U	NA	NA	NA	NA	NA	NA
N. virens Background	2	1	0.45 U	NA	NA	NA	NA	NA	NA
N. virens Background	3	1	0.47 U	NA	NA	NA	NA	NA	NA
N. virens Background	1	2	0.4 U	0.3 U	0.2 U	0.5 U	0.4 U	1.2 U	4.9
N. virens Background	2	2	0.4 U	0.6 U	0.7 U	0.6 U	0.6 U	1.7 U	6.72
N. virens Background	3	2	ND(e)	ND	0.6 U	1.1 U	0.8 U	2.7 U	6.54

(a) DL Detection limit.
(b) MDL Method detection limit.
(c) NA Not analyzed.
(d) U Undetected at or above the given concentration.
(e) ND No data.

TABLE F.20. Dioxin Congeners in Tissue of *N. virens*, Dry Weight, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*N. virens* Dioxins (pg/g dry weight) 2378-TCDD	12378-PeCDD	123478-HxCDD	123678-HxCDD	123789-HxCDD	1234678-HpCDD	OCDD
MOTBY Reach A										
Comp MT-A	1	1	15.04	17.3	NA[a]	NA	NA	NA	NA	NA
Comp MT-A	2	1	14.58	13.4	NA	NA	NA	NA	NA	NA
Comp MT-A	3	1	14.37	12.3	NA	NA	NA	NA	NA	NA
Comp MT-A	4	1	15.60	10.1	NA	NA	NA	NA	NA	NA
Comp MT-A	5	1	15.47	12.2	NA	NA	NA	NA	NA	NA
MOTBY Reach B										
Comp MT-B	1	1	14.21	12.0	NA	NA	NA	NA	NA	NA
Comp MT-B	2	1	13.54	9.90	NA	NA	NA	NA	NA	NA
Comp MT-B	3	1	14.24	7.79	NA	NA	NA	NA	NA	NA
Comp MT-B Replicate 1	4	1	13.74	12.9	NA	NA	NA	NA	NA	NA
Comp MT-B Replicate 2	4	1	13.74	8.30	NA	NA	NA	NA	NA	NA
Comp MT-B Replicate 3	4	1	13.74	8.37	NA	NA	NA	NA	NA	NA
Comp MT-B	5	1	15.06	8.37	NA	NA	NA	NA	NA	NA
Arthur Kill Reach A										
Comp AK-A	1	3	15.36	25.4	6.51 U[b]	3.91 U	11.7 U	10.4 U	18.8	99.9
Comp AK-A	2	3	15.50	27.0	7.10 U	3.23 U	10.3 U	6.45 U	21.7	118
Comp AK-A	3	4	15.32	20.2	3.92 U	1.31 U	7.83 U	3.92 U	17.7	117
Comp AK-A	4	2	13.73	31.8	7.28 U	4.37 U	11.7 U	13.1 U	22.1	141
Comp AK-A Replicate 1	5	4	15.10	23.4	4.64 U	1.99 U	7.28 U	3.31 U	15.4	94.4
Comp AK-A Replicate 2	5	4	15.10	22.7	4.64 U	1.99 U	7.28 U	3.31 U	14.2	94.3
Comp AK-A Replicate 3	5	4	15.10	24.0	4.64 U	1.99 U	8.61 U	3.31 U	15.3	94.0
Arthur Kill Reach B										
Comp AK-B	1	3	14.83	4.05 U	2.70 U	3.37 U	2.70 U	4.05 U	12.8 U	29.1
Comp AK-B	2	4	15.35	24.3	6.51 U	2.61 U	11.1 U	3.91 U	15.7	96.4
Comp AK-B	3	2	15.14	32.5	11.2 U	5.28 U	15.2 U	9.25 U	23.1	139
Comp AK-B	4	2	14.51	21.8	8.27 U	4.82 U	11.0 U	5.51 U	18.2	134
Comp AK-B	5	4	14.70	25.4	6.12 U	2.04 U	10.9 U	4.76 U	21.6	135

TABLE F.20. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*N. virens* Dioxins (pg/g dry weight) 2378-TCDD	12378-PeCDD	123478-HxCDD	123678-HxCDD	123789-HxCDD	1234678-HpCDD	OCDD
Arthur Kill Reach C										
Comp AK-C	1	2	15.09	22.4	11.3 U	6.63 U	18.6 U	10.6 U	24.2	166
Comp AK-C	2	3	14.50	23.5	9.66 U	4.83 U	17.2 U	10.3 U	57.9 U	138
Comp AK-C	3	3	14.31	22.4	10.5 U	6.99 U	21.0 U	12.6 U	24.9	180
Comp AK-C	4	2	15.22	19.0	7.23 U	3.29 U	5.45	5.26 U	21.2	156
Comp AK-C	5	2	14.89	19.1	13.4 U	4.03 U	18.1 U	12.1 U	23.2	165
Port Elizabeth Reach A										
Comp PE-A	1	2	14.84	39.6	6.74 U	4.72 U	6.74 U	7.41 U	16.6	126
Comp PE-A	2	3	16.58	40.5	7.84 U	3.62 U	7.84 U	5.43 U	13.2	85.7
Comp PE-A	3	4	14.91	27.5	3.35 U	2.01 U	6.71 U	2.68 U	15.9	104
Comp PE-A	4	3	15.00	43.6	6.00 U	3.33 U	7.33 U	6.00 U	15.5	90.3
Comp PE-A	5	2	15.54	38.7	7.08 U	3.22 U	7.08 U	5.15 U	14.9	110
Port Elizabeth Reach B										
Comp PE-B	1	4	15.59	24.4	3.21 U	1.92 U	7.06 U	3.21 U	19.4	120
Comp PE-B	2	3	13.67	40.2	11.7 U	5.85 U	13.2 U	6.58 U	20.3	114
Comp PE-B	3	4	14.55	27.8	4.81 U	2.75 U	13.1 U	4.81 U	18.8	112
Comp PE-B	4	2	15.12	41.6	5.95 U	9.92 U	8.60 U	3.97 U	20.1	121
Comp PE-B	5	4	14.92	29.6	5.36 U	1.34 U	7.37 U	2.68 U	16.0	93.1
Hackensack River Reach A										
Comp HR-A Replicate 1	1	3	15.33	94.0	10.4 U	3.91 U	15.0 U	9.13 U	26.7	129
Comp HR-A Replicate 2	1	3	15.33	91.1	11.1 U	5.87 U	17.0 U	8.48 U	23.4	118
Comp HR-A Replicate 3	1	3	15.33	95.0	6.52 U	3.26 U	16.3 U	9.13 U	22.0	121
Comp HR-A	2	4	15.42	87.7	7.13 U	1.95 U	10.4 U	3.89 U	18.0	90.4
Comp HR-A	3	4	15.14	73.4	5.94 U	1.98 U	9.91 U	4.62 U	16.3	105
Comp HR-A	4	3	15.84	92.2	8.84 U	5.05 U	13.3 U	9.47 U	17.1	102
Comp HR-A	5	2	14.94	84.9	7.36 U	4.69 U	12.7 U	7.36 U	18.2	110

TABLE F.20. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*N. virens* Dioxins (pg/g dry weight) 2378-TCDD	12378-PeCDD	123478-HxCDD	123678-HxCDD	123789-HxCDD	1234678-HpCDD	OCDD
Reference										
Mud Dump Reference	1	4	15.88	2.52 U	1.26 U	0.63 U	1.26 U	1.89 U	6.93 U	25.4
Mud Dump Reference	2	4	15.09	3.98 U	1.33 U	1.33 U	1.33 U	1.99 U	8.61 U	31.7
Mud Dump Reference Replicate 1	3	2	14.18	7.05 U	5.64 U	5.64 U	4.94 U	6.35 U	15.5 U	59.7
Mud Dump Reference Replicate 2	3	2	14.18	6.35 U	7.05 U	2.82 U	4.23 U	3.53 U	12.7 U	51.4
Mud Dump Reference Replicate 3	3	2	14.18	5.64 U	2.82 U	4.23 U	3.53 U	4.23 U	14.8 U	39.9
Mud Dump Reference	4	2	14.43	5.54 U	4.85 U	4.16 U	3.47 U	5.54 U	11.1 U	43.6
Mud Dump Reference	5	3	14.59	26.3	8.22 U	6.85 U	14.4 U	12.3 U	22.9	119
Controls										
C-NR	1	4	15.13	1.98 U	1.98 U	0.661 U	1.98 U	1.98 U	7.27 U	21.2
C-NR	2	4	14.47	2.07 U	2.07 U	2.07 U	2.07 U	2.07 U	8.98 U	26.0
C-NR	3	4	14.59	1.37 U	2.06 U	2.06 U	2.06 U	2.06 U	8.22 U	25.3
Background										
N. virens Background	1	1	17.31	1.96 U	NA	NA	NA	NA	NA	NA
N. virens Background	2	1	17.89	2.52 U	NA	NA	NA	NA	NA	NA
N. virens Background	3	1	16.60	2.83 U	NA	NA	NA	NA	NA	NA
N. virens Background	1	2	14.52	2.75 U	2.07 U	1.38 U	3.44 U	2.75 U	8.26 U	33.7
N. virens Background	2	2	14.86	2.69 U	4.04 U	4.71 U	4.04 U	4.04 U	11.4 U	45.2
N. virens Background	3	2	13.35	ND(c)	ND	4.49 U	8.24 U	5.99 U	20.2 U	49.0

(a) NA Not analyzed.
(b) U Undetected at or above the given concentration.
(c) ND No data.

TABLE F.21. Quality Control Data for Dioxin Congeners in Tissue of *N. virens*, Wet Weight, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	*N. virens* Dioxins (pg/g wet weight) 2378-TCDD	12378-PeCDD	123478-HxCDD	123678-HxCDD	123789-HxCDD	1234678-HpCDD	OCDD
Method Blanks									
Blank 1		1	0.41 U[a]	NA[b]	NA	NA	NA	NA	NA
Blank 2		2	0.4 U	0.6 U	0.4 U	0.4 U	0.8 U	1.3 U	2.80
Blank 3		3	0.3 U	0.3 U	0.3 U	0.3 U	0.6 U	1.2 U	2.32
Blank 4		4	0.2 U	0.3 U	0.4 U	0.3 U	0.4 U	0.8 U	2.47
Matrix Spikes									
N. virens Background	1	1	0.47 U	NA	NA	NA	NA	NA	NA
N. virens Background MS		1	23.53	NA	NA	NA	NA	NA	NA
Concentration Recovered			23.53	NA	NA	NA	NA	NA	NA
Amount Spiked			19.86	NS[c]	NS	NS	NS	NS	NS
Percent Recovery			118%	NA	NA	NA	NA	NA	NA
Comp AK-B	4	2	3.16	1.2 U	0.7 U	1.6 U	0.8 U	2.64	19.51
Comp AK-B MS	4	2	24.79	104.27	105.06	100.8	122.36	116.38	223.03
Concentration Recovered			21.60	104.27	105.06	100.8	122.36	113.70	203.50
Amount Spiked			20.0	99.9	99.9	99.9	99.9	99.9	199.8
Percent Recovery			108%	104%	105%	101%	123%[d]	114%	102%
Comp HR-A	4	3	14.6	1.4 U	0.8 U	2.1 U	1.5 U	2.71	16.14
Comp HR-A MS	4	3	35.73	112.9	115.77	109.46	121.53	114.86	242.78
Concentration Recovered			21.1	112.9	115.77	109.46	121.53	112.20	226.60
Amount Spiked			19.9	99.5	99.5	99.5	99.5	99.5	198.9
Percent Recovery			106%	114%	116%	110%	122%[d]	113%	114%
C-NR	3	4	0.20 U	0.3 U	0.3 U	0.3 U	0.3 U	1.20 U	3.69
C-NR MS	3	4	19.72	103.18	110.78	104.92	123.81	110.97	217.66
Concentration Recovered			19.72	103.18	110.78	104.92	123.81	110.97	214.0
Amount Spiked			19.9	99.3	99.3	99.3	99.3	99.3	198.5
Percent Recovery			99%	104%	112%	106%	125%[d]	112%	108%
Standard Reference Material									
Certified Value		1	500	NA	NA	NA	NA	NA	NA
Standard Reference Material			478.53	NA	NA	NA	NA	NA	NA
Percent Recovery			96%	NA	NA	NA	NA	NA	NA

TABLE F.21. (contd)

Sediment Treatment	Replicate	Batch	*N. virens* Dioxins (pg/g wet weight) 2378-TCDD	12378-PeCDD	123478-HxCDD	123678-HxCDD	123789-HxCDD	1234678-HpCDD	OCDD
Certified Value		2	500	1000	1000	1000	1000	1500	3500
Fortified Reference Material			465.5	985.2	958.2	913.5	1000.7	1546.0	3153.4
Percent Recovery			93%	99%	96%	91%	100%	103%	90%
Certified Value		3	500	1000	1000	1000	1000	1500	3500
Fortified Reference Material			426.3	889.8	882.7	798.3	897.9	1497.1	3019.1
Percent Recovery			85%	89%	88%	80%	90%	100%	86%
Certified Value		4	500	1000	1000	1000	1000	1500	3500
Fortified Reference Material			381.8	823.5	983.5	826.3	946.5	1458.2	2935.0
Percent Recovery			76%	82%	98%	83%	95%	97%	84%
Analytical Triplicates									
Comp AK-A Replicate 1	5	4	3.53	0.7 U	0.3 U	1.1 U	0.5 U	2.33	14.25
Comp AK-A Replicate 2	5	4	3.43	0.7 U	0.3 U	1.1 U	0.5 U	2.15	14.24
Comp AK-A Replicate 3	5	4	3.63	0.7 U	0.3 U	1.3 U	0.5 U	2.31	14.20
RSD			3%	NA	NA	NA	NA	4%	0%
Comp HR-A Replicate 1	1	3	14.41	1.6 U	0.6 U	2.3 U	1.4 U	4.09	19.85
Comp HR-A Replicate 2	1	3	13.96	1.7 U	0.9 U	2.6 U	1.3 U	3.59	18.15
Comp HR-A Replicate 3	1	3	14.56	1.0 U	0.5 U	2.5 U	1.4 U	3.37	18.62
RSD			2%	NA	NA	NA	NA	10%	5%
Mud Dump Reference Replicate 1	3	2	NA	NA	NA	NA	NA	NA	8.47
Mud Dump Reference Replicate 2	3	2	NA	NA	NA	NA	NA	NA	7.29
Mud Dump Reference Replicate 3	3	2	NA	NA	NA	NA	NA	NA	5.66
RSD			NA	NA	NA	NA	NA	NA	20%

TABLE F.21. (contd)

Sediment Treatment	Replicate	Batch	*N. virens* Dioxins (pg/g wet weight) 2378-TCDD	12378-PeCDD	123478-HxCDD	123678-HxCDD	123789-HxCDD	1234678-HpCDD	OCDD
Comp MT-B Replicate 1	4	1	1.77 (e)	NA	NA	NA	NA	NA	NA
Comp MT-B Replicate 2	4	1	1.44 (e)	NA	NA	NA	NA	NA	NA
Comp MT-B Replicate 3	4	1	1.15 (e)	NA	NA	NA	NA	NA	NA
RSD			27% (f)	NA	NA	NA	NA	NA	NA

(a) U Undetected at or above the given concentration.
(b) NA Not analyzed.
(c) NS Not spiked.
(d) Recovery outside quality control range of 50%-120%.
(e) Value is less than 10 times MDL.
(f) Recovery outside Relative Standard Deviation 25%.

TABLE F.22. Surrogate Recoveries for Dioxin Congeners in Tissue of *N. virens*. Wet Weight, Including Quality Control Data, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	*N. virens* (pg/g wet weight) 2378-TCDD-13C12	12378-PeCDD	123478-HxCDD	123678-HxCDD	1234678-HpCDD	OCDD-13C12	2378-TCDD-37Cl
MOTBY Reach A									
Comp MT-A	1	1	91	NA[a]	NA	NA	NA	NA	113
Comp MT-A	2	1	48	NA	NA	NA	NA	NA	86
Comp MT-A	3	1	84	NA	NA	NA	NA	NA	86
Comp MT-A	4	1	90	NA	NA	NA	NA	NA	NA
Comp MT-A	5	1	93	NA	NA	NA	NA	NA	96
MOTBY Reach B									
Comp MT-B	1	1	95	NA	NA	NA	NA	NA	100
Comp MT-B	2	1	99	NA	NA	NA	NA	NA	107
Comp MT-B	3	1	74	NA	NA	NA	NA	NA	75
Comp MT-B Replicate 1	4	1	89	NA	NA	NA	NA	NA	93
Comp MT-B Replicate 2	4	1	86	NA	NA	NA	NA	NA	94
Comp MT-B Replicate 3	4	1	105	NA	NA	NA	NA	NA	111
Comp MT-B	5	1	92	NA	NA	NA	NA	NA	100
Arthur Kill Reach A									
Comp AK-A	1	3	67	66	52	52	50	52	70
Comp AK-A	2	3	78	66	80	78	66	77	77
Comp AK-A	3	4	76	63	73	73	56	48	77
Comp AK-A	4	2	71	70	58	67	66	59	71
Comp AK-A Replicate 1	5	4	86	89	87	90	60	49	86
Comp AK-A Replicate 2	5	4	87	78	85	75	62	57	92
Comp AK-A Replicate 3	5	4	86	80	76	82	63	51	94
Arthur Kill Reach B									
Comp AK-B	1	3	71	57	69	68	59	62	77
Comp AK-B	2	4	78	70	99	100	90	73	99
Comp AK-B	3	2	79	78	66	81	81	76	83
Comp AK-B	4	2	73	78	65	75	74	66	71
Comp AK-B	5	4	76	65	77	75	64	52	81

TABLE F.22. (contd)

Sediment Treatment	Replicate	Batch	*N. virens* (pg/g wet weight) 2378-TCDD-13C12	12378-PeCDD	123478-HxCDD	123678-HxCDD	1234678-HpCDD	OCDD-13C12	2378-TCDD-37Cl
Arthur Kill Reach C									
Comp AK-C	1	2	77	77	63	67	70	64	75
Comp AK-C	2	3	68	62	68	75	62	53	64
Comp AK-C	3	3	75	64	63	59	57	53	65
Comp AK-C	4	2	64	57	68	64	57	61	63
Comp AK-C	5	2	86	77	58	83	72	70	73
Port Elizabeth Reach A									
Comp PE-A	1	2	70	66	61	67	60	52	75
Comp PE-A	2	3	64	49	62	65	58	61	67
Comp PE-A	3	4	75	69	71	73	59	57	78
Comp PE-A	4	3	78	66	75	77	59	62	83
Comp PE-A	5	2	78	69	82	81	67	60	85
Port Elizabeth Reach B									
Comp PE-B	1	4	81	75	93	91	76	62	83
Comp PE-B	2	3	67	66	62	63	57	52	66
Comp PE-B	3	4	84	74	82	84	59	58	91
Comp PE-B	4	2	85	82	78	80	79	64	92
Comp PE-B	5	4	88	77	79	82	69	56	97
Hackensack River Reach A									
Comp HR-A Replicate 1	1	3	79	77	82	82	70	75	88
Comp HR-A Replicate 2	1	3	72	69	77	73	72	73	77
Comp HR-A Replicate 3	1	3	65	64	66	69	75	68	68
Comp HR-A	2	4	89	91	78	82	69	55	100
Comp HR-A	3	4	82	62	85	89	74	68	91
Comp HR-A	4	3	67	59	72	63	53	56	71
Comp HR-A	5	2	75	75	82	91	74	68	79

TABLE F.22. (contd)

Sediment Treatment	Replicate	Batch	*N. virens* (pg/g wet weight) 2378-TCDD-13C12	12378-PeCDD	123478-HxCDD	123678-HxCDD	1234678-HpCDD	OCDD-13C12	2378-TCDD-37Cl
Reference									
Mud Dump Reference	1	4	81	68	82	80	70	58	91
Mud Dump Reference	2	4	79	70	81	73	66	54	84
Mud Dump Reference Replicate 1	3	2	47	41	54	49	40	41	52
Mud Dump Reference Replicate 2	3	2	80	72	90	77	83	75	91
Mud Dump Reference Replicate 3	3	2	81	65	68	77	59	62	91
Mud Dump Reference	4	2	71	65	69	68	73	62	78
Mud Dump Reference	5	3	70	75	61	65	70	55	70
Controls									
C-NR	1	4	83	66	81	79	73	57	94
C-NR	2	4	74	63	70	73	63	53	80
C-NR	3	4	78	69	85	82	68	55	85
Background									
N. virens Background Replicate 1		1	91	NA	NA	NA	NA	NA	100
N. virens Background Replicate 2		1	86	NA	NA	NA	NA	NA	100
N. virens Background Replicate 3		1	80	NA	NA	NA	NA	NA	85
N. virens Background Replicate 1		2	80	79	76	79	76	74	90
N. virens Background Replicate 2		2	75	72	67	67	56	70	83
N. virens Background Replicate 3		2	ND[b]	ND	82	86	60	69	ND
Quality Control Data									
Method Blanks									
Blank 1	NA	1	173[c]	NA	NA	NA	NA	NA	189[c]
Blank 2	NA	2	82	70	90	82	71	74	91
Blank 3	NA	3	76	75	83	78	86	76	82
Blank 4	NA	4	85	90	77	82	76	63	87

TABLE F.22. (contd)

Sediment Treatment	Replicate	Batch	*N. virens* (pg/g wet weight) 2378-TCDD-13C12	12378-PeCDD	123478-HxCDD	123678-HxCDD	1234678-HpCDD	OCDD-13C12	2378-TCDD-37Cl
Matrix Spikes									
Comp AK-B MS	4	2	89	85	67	72	72	73	92
Comp HR-A MS	4	3	78	79	80	74	78	68	83
C-NR MS	3	4	82	67	74	71	70	55	85
N. virens Background MS		1	100	NA	NA	NA	NA	NA	141(c)
Standard Reference Material									
Reference Material		1	100	NA	NA	NA	NA	NA	119
Fortified Reference Material		2	79	86	86	78	80	77	90
Fortified Reference Material		3	83	83	83	86	69	71	90
Fortified Reference Material		4	87	84	84	86	69	65	93
Analytical Triplicates									
Comp MT-B Replicate 1	4	1	89	NA	NA	NA	NA	NA	93
Comp MT-B Replicate 2	4	1	86	NA	NA	NA	NA	NA	94
Comp MT-B Replicate 3	4	1	105	NA	NA	NA	NA	NA	111
RSD			11%	NA	NA	NA	NA	NA	10%
Comp AK-A	5	4	86	89	87	90	60	49	86
Comp AK-A	5	4	87	78	85	75	62	57	92
Comp AK-A	5	4	86	80	76	82	63	51	94
RSD			1%	7%	7%	9%	2%	8%	5%
Comp HR-A	1	3	79	77	82	82	70	75	88
Comp HR-A	1	3	72	69	77	73	72	73	77
Comp HR-A	1	3	65	64	66	69	75	68	68
RSD			10%	9%	11%	9%	3%	5%	13%
Mud Dump Reference Replicate 1	3	2	47	41	54	49	40	41	52
Mud Dump Reference Replicate 2	3	2	80	72	90	77	83	75	91
Mud Dump Reference Replicate 3	3	2	81	65	68	77	59	62	91
RSD			28%	27%	26%	24%	36%	29%	29%

TABLE F.22. (contd)

Sediment Treatment	Replicate	Batch	*N. virens* (pg/g wet weight) 2378-TCDD-13C12	12378-PeCDD	123478-HxCDD	123678-HxCDD	1234678-HpCDD	OCDD-13C12	2378-TCDD-37Cl
N. virens Background Replicate 1		1	91	NA	NA	NA	NA	NA	100
N. virens Background Replicate 2		1	86	NA	NA	NA	NA	NA	100
N. virens Background Replicate 3		1	80	NA	NA	NA	NA	NA	85
RSD			6%	NA	NA	NA	NA	NA	9%
N. virens Background Replicate 1		2	80	79	76	79	76	74	90
N. virens Background Replicate 2		2	75	72	67	67	56	70	83
N. virens Background Replicate 3		2	ND	ND	82	86	60	69	ND
RSD			NA	NA	10%	12%	17%	4%	NA

(a) NA Not analyzed.
(b) ND No data.
(c) Value outside quality control range of 40%-135%.

TABLE F.23. Furan Analysis in Tissue of N. virens, Wet Weight, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	N. virens Furans (pg/g wet weight) 2378-TCDF	12378-PeCDF	23478-PeCDF	123478-HxCDF	123678-HxCDF	123789-HxCDF	234678-HxCDF	1234678-HpCDF	1234789-HpCDF	OCDF
Target DL[a]			1	--- [b]	---	---	---	---	---	---	---	---
Achieved DL			0.1-1.1	0.2-5.6	0.1-4.4	0.2-3.1	0.2-4.3	0.7-2.0	0.1-1.3	0.6-2.6	0.2-2.0	0.8-6.1
MDL[c] verification			0.7	0.7	1.8	3.9	2.1	2.1	1.1	0.4	2.1	6.0
MOTBY Reach A												
COMP MT-A	1	1	37.02 [d]U[e]	NA [f]	NA	NA	NA	NA	NA	NA	NA	NA
COMP MT-A	2	1	11.74 [d]U	NA	NA	NA	NA	NA	NA	NA	NA	NA
COMP MT-A	3	1	2.06	NA	NA	NA	NA	NA	NA	NA	NA	NA
COMP MT-A	4	1	2.35	NA	NA	NA	NA	NA	NA	NA	NA	NA
COMP MT-A	5	1	2.41	NA	NA	NA	NA	NA	NA	NA	NA	NA
MOTBY Reach B												
COMP MT-B	1	1	9.04 [d]U	NA	NA	NA	NA	NA	NA	NA	NA	NA
COMP MT-B	2	1	2.12	NA	NA	NA	NA	NA	NA	NA	NA	NA
COMP MT-B	3	1	1.64	NA	NA	NA	NA	NA	NA	NA	NA	NA
COMP MT-B Replicate 1	4	1	3.13	NA	NA	NA	NA	NA	NA	NA	NA	NA
COMP MT-B Replicate 2	4	1	1.80	NA	NA	NA	NA	NA	NA	NA	NA	NA
COMP MT-B Replicate 3	4	1	1.59	NA	NA	NA	NA	NA	NA	NA	NA	NA
COMP MT-B	5	1	1.51	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arthur Kill Reach A												
COMP AK-A	1	3	2.04	0.81	1.15	1.48	1.76	1.2 U	0.6 U	1.79	1.2 U	1.62
COMP AK-A	2	3	2.83	2.6 U	1.09	2.8 U	1.4 U	1.6 U	0.5 U	1.55	1.2 U	2.46
COMP AK-A	3	4	2.11	1.7 U	0.93	1.15	2.10	0.45	0.3 U	2.10	0.9 U	1.67
COMP AK-A	4	2	1.98	4.0 U	1.13	1.23	1.99	1.3 U	0.6 U	1.63	1.7 U	2.44
COMP AK-A Replicate 1	5	4	2.67	0.78	0.94	1.21	0.81	0.47	0.4 U	1.63	0.9 U	2.01
COMP AK-A Replicate 2	5	4	2.29	0.86	0.89	1.11	0.68	0.44	0.2 U	1.48	0.7 U	1.63
COMP AK-A Replicate 3	5	4	1.90	0.65	0.93	1.20	0.46	0.45	0.2 U	1.47	0.6 U	1.63
Arthur Kill Reach B												
COMP AK-B	1	3	0.29	0.5 U	0.5 U	0.4 U	0.4 U	0.9 U	0.4 U	0.8 U	0.8 U	1.4 U
COMP AK-B	2	4	3.31	2.27	1.73	1.75	3.42	0.56	0.5 U	1.71	1.4 U	2.97
COMP AK-B	3	2	3.00	2.23	1.75	2.03	2.67	0.92	0.7 U	2.41	1.7 U	3.00
COMP AK-B	4	2	2.58	1.43	1.23	1.74	1.94	0.51	0.7 U	1.68	1.2 U	2.9
COMP AK-B	5	4	2.98	2.34	1.50	1.80	2.95	0.68	0.4 U	2.66	0.9 U	2.08

TABLE F.23. (contd)

Sediment Treatment	Replicate	Batch	N. virens Furans (pg/g wet weight)								
			2378-TCDF	12378-PeCDF	23478-PeCDF	123478-HxCDF	123678-HxCDF	123789-HxCDF	234678-HxCDF	1234678-HpCDF	1234789-HpCDF	OCDF
Arthur Kill Reach C												
COMP AK-C	1	2	3.38	5.6 U	1.96	2.44	1.9	0.9	0.8 U	2.49	1.8 U	2.81
COMP AK-C	2	3	4.21	1.96	2.56	2.15	1.59	0.75	1.0 U	1.79	1.7 U	2.42
COMP AK-C	3	3	3.63	2.19	2.21	2.44	2.00	0.91	0.9 U	2.4	1.6 U	3.59
COMP AK-C	4	2	3.48	1.87	1.86	2.37	2.15	0.92	0.7 U	2.08	1.1 U	3.75
COMP AK-C	5	2	3.62	2.75	1.75	2.65	2.49	0.79	1.3 U	2.81	2.0 U	3.19
Port Elizabeth Reach A												
COMP PE-A	1	2	1.4	2.3 U	1.02	1.01	1.95	1.1 U	0.7 U	1.46	1.1 U	2.5
COMP PE-A	2	3	1.96	1.9 U	1.09	3.1 U	1.7 U	1.3 U	0.6 U	1.61	1.4 U	3.8 U
COMP PE-A	3	4	1.47	0.58	0.70	1.02	1.55	0.39	0.2 U	1.97	0.5 U	1.99
COMP PE-A	4	3	2.19	2.0 U	1.11	1.21	1.0 U	1.0 U	0.3 U	1.64	0.9 U	1.79
COMP PE-A	5	2	1.97	2.3 U	0.89	1.18	2.36	0.46	0.4 U	1.46	0.8 U	2.25
Port Elizabeth Reach B												
COMP PE-B	1	4	1.62	1.10	0.89	1.19	2.37	0.48	0.2 U	1.87	0.9 U	2.24
COMP PE-B	2	3	2.36	2.8 U	1.1	1.47	1.38	0.73	0.3 U	1.72	1.0 U	1.7
COMP PE-B	3	4	1.50	0.58	0.86	1.22	0.93	0.44	0.2 U	3.97	1.7 U	4.91
COMP PE-B	4	2	2.12	2.3 U	0.97	1.25	1.34	0.45	0.5 U	1.86	1.0 U	6.1 U
COMP PE-B	5	4	1.84	1.08	1.1	0.97	2.11	0.37	0.3 U	1.48	0.6 U	1.62
Hackensack River Reach A												
COMP HR-A Replicate 1	1	3	2.79	1.64	2.00	6.66	1.55	0.7	0.6 U	7.43	1.4 U	6.27
COMP HR-A Replicate 2	1	3	2.86	1.47	2.06	6.8	1.54	0.82	0.6 U	7.2	1.4 U	6.18
COMP HR-A Replicate 3	1	3	2.71	1.65	2.38	6.88	1.58	0.65	0.9 U	7.33	1.6 U	6.78
COMP HR-A	2	4	2.58	1.78	2.13	6.4	3.57	0.65	0.3 U	6.47	1.0 U	4.5
COMP HR-A	3	4	2.05	3.70	1.69	5.21	6.96	0.70	0.5 U	6.18	1.1 U	4.78
COMP HR-A	4	3	3.46	1.52	1.86	7.08	4.3 U	2.0 U	0.6 U	6.66	1.9 U	5.65
COMP HR-A	5	2	1.79	2.37	1.31	6.33	5.02	0.46	0.3 U	11.2	2.0 U	10.39

TABLE F.23. (contd)

Sediment Treatment	Replicate	Batch	N. virens Furans (pg/g wet weight) 2378-TCDF	12378-PeCDF	23478-PeCDF	123478-HxCDF	123678-HxCDF	123789-HxCDF	234678-HxCDF	1234678-HpCDF	1234789-HpCDF	OCDF
Reference												
Mud Dump Reference	1	4	0.32	0.3 U	0.2 U	0.2 U	0.4 U	0.28	0.1 U	0.8 U	0.2 U	1.0 U
Mud Dump Reference	2	4	0.23	0.3 U	0.3 U	0.2 U	0.5 U	0.23	0.2 U	0.8 U	0.2 U	0.77
Mud Dump Reference Replicate 1	3	2	0.9 U	0.7 U	0.8 U	1.1 U	1.0 U	1.5 U	0.9 U	1.7 U	1.3 U	1.82
Mud Dump Reference Replicate 2	3	2	0.8 U	0.6 U	0.4 U	0.3 U	0.5 U	1.0 U	0.4 U	1.1 U	0.7 U	1.36
Mud Dump Reference Replicate 3	3	2	1.1 U	1.1 U	0.5 U	0.7 U	0.7 U	1.1 U	0.4 U	1.2 U	0.8 U	1.20
Mud Dump Reference	4	2	0.41	1.1 U	0.6 U	0.4 U	0.9 U	1.1 U	0.5 U	1.3 U	0.9 U	3.1 U
Mud Dump Reference	5	3	2.84	3.4 U	4.4 U	1.87	1.9 U	1.13	1.2 U	1.83	1.6 U	3.7 U
Controls												
C-NR	1	4	0.20	0.2 U	0.2 U	0.2 U	0.2 U	0.8 U	0.1 U	0.8 U	0.2 U	0.8 U
C-NR	2	4	0.23	0.2 U	0.2 U	0.3 U	0.3 U	0.21	0.1 U	0.8 U	0.3 U	1.0 U
C-NR	3	4	0.23	0.2 U	0.1 U	0.2 U	0.2 U	0.27	0.1 U	0.8 U	0.3 U	0.8 U
Background												
N. virens Background	1	1	0.27	NA	NA	NA	NA	NA	NA	NA	NA	NA
N. virens Background	2	1	0.48 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
N. virens Background	3	1	0.40 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
N. virens Background	1	2	0.61	1.3 U	0.3 U	0.4 U	0.69	0.9 U	0.2 U	1.4 U	0.4 U	0.74
N. virens Background	2	2	0.87	0.71	0.6 U	1.0 U	1.73	0.9 U	0.5 U	0.9 U	0.4 U	0.68
N. virens Background	3	2	ND (g)	ND	ND	0.5 U	1.42	0.8 U	0.5 U	2.6 U	0.7 U	1.8 U

(a) DL Detection limit.
(b) Not specified in work plan.
(c) MDL Method detection limit.
(d) Coeluting ether interference causing high detection limit
(e) U Undetected at or above the given concentration.
(f) NA Not analyzed.
(g) ND No data.

TABLE F.24. Furan Analysis in Tissue of *N. virens*, Dry Weight, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*N. virens* Furans (pg/g dry weight) 2378-TCDF	12378-PeCDF	23478-PeCDF	123478-HxCDF	123678-HxCDF	123789-HxCDF	234678-HxCDF	1234678-HpCDF	1234789-HpCDF	OCDF
MOTBY Reach A													
Comp MT-A	1	1	15.04	246 (a)U(b)	NA(c)	NA	NA	NA	NA	NA	NA	NA	NA
Comp MT-A	2	1	14.58	80.5 (a)U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Comp MT-A	3	1	14.37	14.3	NA	NA	NA	NA	NA	NA	NA	NA	NA
Comp MT-A	4	1	15.60	15.1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Comp MT-A	5	1	15.47	15.6	NA	NA	NA	NA	NA	NA	NA	NA	NA
MOTBY Reach B													
Comp MT-B	1	1	14.21	63.6 (a)U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Comp MT-B	2	1	13.54	15.7	NA	NA	NA	NA	NA	NA	NA	NA	NA
Comp MT-B	3	1	14.24	11.5	NA	NA	NA	NA	NA	NA	NA	NA	NA
Comp MT-B Replicate 1	4	1	13.74	22.8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Comp MT-B Replicate 2	4	1	13.74	13.1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Comp MT-B Replicate 3	4	1	13.74	11.6	NA	NA	NA	NA	NA	NA	NA	NA	NA
Comp MT-B	5	1	15.06	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arthur Kill Reach A													
Comp AK-A	1	3	15.36	13.3	5.27	7.49	9.64	11.5	7.81 U	3.91 U	11.7	7.81 U	10.5
Comp AK-A	2	3	15.50	18.3	16.8 U	7.03	18.1 U	9.03 U	10.3 U	3.23 U	10.0	7.74 U	15.9
Comp AK-A	3	4	15.32	13.8	11.1 U	6.07	7.51	13.7	2.94	1.96 U	13.7	5.87 U	10.9
Comp AK-A	4	2	13.73	14.4	29.1 U	8.23	8.96	14.5	9.47 U	4.37 U	11.9	12.4 U	17.8
Comp AK-A Replicate 1	5	4	15.10	17.7	5.17	6.23	8.01	5.36	3.11	2.65 U	10.8	5.96 U	13.3
Comp AK-A Replicate 2	5	4	15.10	15.2	5.70	5.89	7.35	4.50	2.91	1.32 U	9.80	4.64 U	10.8
Comp AK-A Replicate 3	5	4	15.10	12.6	4.30	6.16	7.95	3.05	2.98	1.32 U	9.74	3.97 U	10.8
Arthur Kill Reach B													
Comp AK-B	1	3	14.83	1.96	3.37 U	3.37 U	2.70 U	2.70 U	6.07 U	2.70 U	5.39 U	5.39 U	9.44 U
Comp AK-B	2	4	15.35	21.6	14.8	11.3	11.4	22.3	3.65	3.26 U	11.1	9.12 U	19.3
Comp AK-B	3	2	15.14	19.8	14.7	11.6	13.4	17.6	6.08	4.62 U	15.9	11.2 U	19.8
Comp AK-B	4	2	14.51	17.8	9.86	8.48	12.0	13.4	3.51	4.82 U	11.6	8.27 U	20.0
Comp AK-B	5	4	14.70	20.3	15.9	10.2	12.2	20.1	4.63	2.72 U	18.1	6.12 U	14.1

TABLE F.24. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*N. virens* Furans (pg/g dry weight) 2378-TCDF	12378-PeCDF	23478-PeCDF	123478-HxCDF	123678-HxCDF	123789-HxCDF	234678-HxCDF	1234678-HpCDF	1234789-HpCDF	OCDF
Arthur Kill Reach C													
Comp AK-C	1	2	15.09	22.4	37.1 U	13.0	16.2	12.6	5.96	5.30 U	16.5	11.9 U	18.6
Comp AK-C	2	3	14.50	29.0	13.5	17.7	14.8	11.0	5.17	6.90 U	12.3	11.7 U	16.7
Comp AK-C	3	3	14.31	25.4	15.3	15.4	17.1	14.0	6.36	6.29 U	16.8	11.2 U	25.1
Comp AK-C	4	2	15.22	22.9	12.3	12.2	15.6	14.1	6.04	4.60 U	13.7	7.23 U	24.6
Comp AK-C	5	2	14.89	24.3	18.5	11.8	17.8	16.7	5.31	8.73 U	18.9	13.4 U	21.4
Port Elizabeth Reach A													
Comp PE-A	1	2	14.84	9.43	15.5 U	6.87	6.81	13.1	7.41 U	4.72 U	9.84	7.41 U	16.8
Comp PE-A	2	3	16.58	11.8	11.5 U	6.57	18.7 U	10.3 U	7.84 U	3.62 U	9.71	8.44 U	22.9 U
Comp PE-A	3	4	14.91	9.86	3.89	4.69	6.84	10.4	2.62	1.34 U	13.2	3.35 U	13.3
Comp PE-A	4	3	15.00	14.6	13.3 U	7.40	8.07	6.67 U	6.67 U	2.00 U	10.9	6.00 U	11.9
Comp PE-A	5	2	15.54	12.7	14.8 U	5.73	7.59	15.2	2.96	2.57 U	9.40	5.15 U	14.5
Port Elizabeth Reach B													
Comp PE-B	1	4	15.59	10.4	7.06	5.71	7.63	15.2	3.08	1.28 U	12.0	5.77 U	14.4
Comp PE-B	2	3	13.67	17.3	20.5 U	8.05	10.8	10.1	5.34	2.19 U	12.6	7.32 U	12.4
Comp PE-B	3	4	14.55	10.3	3.99	5.91	8.38	6.39	3.02	1.37 U	27.3	11.7 U	33.7
Comp PE-B	4	2	15.12	14.0	15.2 U	6.42	8.27	8.86	2.98	3.31 U	12.3	6.61 U	40.3 U
Comp PE-B	5	4	14.92	12.3	7.24	7.37	6.50	14.1	2.48	2.01 U	9.92	4.02 U	10.9
Hackensack River Reach A													
Comp HR-A Replicate 1	1	3	15.33	18.2	10.7	13.0	43.4	10.1	4.57	3.91 U	48.5	9.13 U	40.9
Comp HR-A Replicate 2	1	3	15.33	18.7	9.59	13.4	44.4	10.0	5.35	3.91 U	47.0	9.13 U	40.3
Comp HR-A Replicate 3	1	3	15.33	17.7	10.8	15.5	44.9	10.3	4.24	5.87 U	47.8	10.4 U	44.2
Comp HR-A	2	4	15.42	16.7	11.5	13.8	41.5	23.2	4.22	1.95 U	42.0	6.49 U	29.2
Comp HR-A	3	4	15.14	13.5	24.4	11.2	34.4	46.0	4.62	3.30 U	40.8	7.27 U	31.6
Comp HR-A	4	3	15.84	21.8	9.60	11.7	44.7	27.1 U	12.6 U	3.79 U	42.0	12.0 U	35.7
Comp HR-A	5	2	14.94	12.0	15.9	8.77	42.4	33.6	3.08	2.01 U	75.2	13.4 U	69.5

TABLE F.24. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*N. virens* Furans (pg/g dry weight) 2378-TCDF	12378-PeCDF	23478-PeCDF	123478-HxCDF	123678-HxCDF	123789-HxCDF	234678-HxCDF	1234678-HpCDF	1234789-HpCDF	OCDF
Reference													
Mud Dump Reference	1	4	15.88	2.02	1.89 U	1.26 U	1.26 U	2.52 U	1.76	0.630 U	5.04 U	1.26 U	6.30 U
Mud Dump Reference	2	4	15.09	1.52	1.99 U	1.99 U	1.33 U	3.31 U	1.52	1.33 U	5.30 U	1.33 U	5.10
Mud Dump Reference Rep 1	3	2	14.18	6.35 U	4.94 U	5.64 U	7.76 U	7.05 U	10.6 U	6.35 U	12.0 U	9.17 U	12.8
Mud Dump Reference Rep 2	3	2	14.18	5.64 U	4.23 U	2.82 U	2.12 U	3.53 U	7.05 U	2.82 U	7.76 U	4.94 U	9.59
Mud Dump Reference Rep 3	3	2	14.18	7.76 U	7.76 U	3.53 U	4.94 U	4.94 U	7.76 U	2.82 U	8.46 U	5.64 U	8.46
Mud Dump Reference	4	2	14.43	2.84	7.62 U	4.16 U	2.77 U	6.24 U	7.62 U	3.47 U	9.01 U	6.24 U	21.5 U
Mud Dump Reference	5	3	14.59	19.5	23.3 U	30.2 U	12.8	13.0 U	7.75	8.22 U	12.5	11.0 U	25.4 U
Controls													
C-NR	1	4	15.13	1.32	1.32 U	1.32 U	1.32 U	1.32 U	5.29 U	0.66 U	5.29 U	1.32 U	5.29 U
C-NR	2	4	14.47	1.59	1.38 U	1.38 U	2.07 U	2.07 U	1.45	0.69 U	5.53 U	2.07 U	6.91 U
C-NR	3	4	14.59	1.58	1.37 U	0.69 U	1.37 U	1.37 U	1.85	0.69 U	4.11 U	2.06 U	5.48 U
Background													
N. virens Background	1	1	17.31	1.56	NA	NA	NA	NA	NA	NA	NA	NA	NA
N. virens Background	2	1	17.89	2.68 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
N. virens Background	3	1	16.60	2.41 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
N. virens Background	1	2	14.52	4.20	8.95 U	2.07 U	2.75 U	4.75	6.20 U	1.38 U	9.64 U	2.75 U	5.10
N. virens Background	2	2	14.86	5.85	4.78	4.04 U	6.73 U	11.6	6.06 U	3.36 U	6.06 U	2.69 U	4.58
N. virens Background	3	2	13.35	ND(d)	ND	ND	3.75 U	10.6	5.99 U	3.75 U	19.5 U	5.24 U	13.5 U

(a) Coeluting ether interference causing high detection limits.
(b) U Undetected at or above the given concentration.
(c) NA Not analyzed.
(d) ND No data.

TABLE F.25. Quality Control Summary for Furan Congeners in *N. virens* Tissue Samples (Wet Weight) Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	*N. virens* Furans (pg/g wet weight) 2378-TCDF	12378-PeCDF	23478-PeCDF	123478-HxCDF	123678-HxCDF	123789-HxCDF	234678-HxCDF	1234678-HpCDF	1234789-HpCDF	OCDF
Method Blanks												
Blank 1		1	0.15 U[a]	NA[b]	NA	NA	NA	NA	NA	NA	NA	NA
Blank 2		2	0.3 U	0.5 U	0.3 U	0.4 U	0.3 U	1.0 U	0.8 U	0.9 U	1.0 U	1.08
Blank 3		3	0.2 U	0.4 U	0.3 U	0.3 U	0.2 U	0.9 U	0.5 U	0.8 U	0.8 U	1.7 U
Blank 4		4	0.1 U	0.2 U	0.3 U	0.3 U	0.3 U	0.29	0.3 U	0.6 U	0.4 U	1.0 U
Matrix Spikes												
N. virens Background	1	1	0.40 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
N. virens Background MS		1	18.08	NA	NA	NA	NA	NA	NA	NA	NA	NA
Amount Recovered			18.08	NA	NA	NA	NA	NA	NA	NA	NA	NA
Amount Spiked			19.86	NA	NA	NA	NA	NA	NA	NA	NA	NA
Percent Recovery			91%	NA	NA	NA	NA	NA	NA	NA	NA	NA
Comp AK-B	4	2	2.58 J[c]	1.43	1.23	1.74	1.94	0.51	0.7 U	1.68	1.2 U	2.9
Comp AK-B MS	4	2	27.66	110.07	104.86	111.39	106.68	100.76	109.6	93.43	109.43	195.47
Amount Recovered			25.1	108.6	103.6	109.6	104.7	100.3	109.6	91.8	109.4	192.6
Amount Spiked			20.0	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	199.8
Percent Recovery			126%[d]	109%	104%	110%	105%	100%	110%	92%	110%	96%
Comp HR-A	4	3	3.46	1.52	1.86	7.08	4.3 U	2.0 U	0.6 U	6.66	1.9 U	5.65
Comp HR-A MS	4	3	27.52	117.48	111.97	121.74	113.84	108.42	116.89	109.3	118.2	235.32
Amount Recovered			24.1	116.0	110.1	114.7	113.8	108.4	116.9	102.6	118.2	229.7
Amount Spiked			19.9	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5	198.9
Percent Recovery			121%[d]	117%	111%	115%	115%	109%	118%	103%	119%	115%
C-NR	3	4	0.23	0.2 U	0.1 U	0.2 U	0.2 U	0.27	0.1 U	0.6 U	0.3 U	0.8 U
C-NR MS	3	4	18.22	90.62	92.24	96.90	94.30	93.79	97.56	88.24	104.93	207.11
Amount Recovered			18.0	90.6	92.2	96.9	94.3	93.5	97.6	88.2	104.9	207.1
Amount Spiked			19.9	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3	198.5
Percent Recovery			91%	91%	93%	98%	95%	94%	98%	89%	106%	104%
Reference Material												
Certified Value		1	500	NA	NA	NA	NA	NA	NA	NA	NA	NA
Standard Reference Material			427.51	NA	NA	NA	NA	NA	NA	NA	NA	NA
Percent Recovery			86%	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE F.25. (contd)

Sediment Treatment	Replicate	Batch	2378-TCDF	12378-PeCDF	23478-PeCDF	123478-HxCDF	123678-HxCDF	123789-HxCDF	234678-HxCDF	1234678-HpCDF	1234789-HpCDF	OCDF
			N. virens Furans (pg/g wet weight)									
Certified Value		2	500	1000	1000	1000	1000	1000	1000	1500	1500	2500
Fortified Reference Material			423.8	978.4	942.9	997.5	924.2	925.8	1026.6	1355.9	1588.6	2356.4
Percent Recovery			85%	98%	94%	100%	92%	93%	103%	90%	106%	94%
Certified Value		3	500	1000	1000	1000	1000	1000	1000	1500	1500	2500
Fortified Reference Material			381.2	825.1	828.7	964.9	862.4	858.9	942.5	1238.9	1437.1	2162.7
Percent Recovery			76%	83%	83%	97%	86%	86%	94%	83%	96%	87%
Certified Value		4	500	1000	1000	1000	1000	1000	1000	1500	1500	2500
Fortified Reference Material			338.0	808.8	802.2	858.9	814.8	813.1	839.1	1145.8	1305.7	1916.4
Percent Recovery			68%(e)	81%	80%	86%	82%	81%	84%	76%	87%	77%
Analytical Triplicates												
Comp AK-A Replicate 1	5	4	2.67	0.78	0.94	1.21	0.81	0.47	0.4 U	1.63	0.9 U	2.01
Comp AK-A Replicate 2	5	4	2.29	0.86	0.89	1.11	0.68	0.44	0.2 U	1.48	0.7 U	1.63
Comp AK-A Replicate 3	5	4	1.90	0.65	0.93	1.20	0.46	0.45	0.2 U	1.47	0.6 U	1.63
RSD			17%	14%	3%	5%	27%	4%	NA	6%	NA	12%
Comp HR-A Replicate 1	1	3	2.79	1.64	2.00	6.66	1.55	0.7	0.6 U	7.43	1.4 U	6.27
Comp HR-A Replicate 2	1	3	2.86	1.47	2.06	6.8	1.54	0.82	0.6 U	7.2	1.4 U	6.18
Comp HR-A Replicate 3	1	3	2.71	1.65	2.38	6.88	1.58	0.65	0.9 U	7.33	1.6 U	6.78
RSD			3%	6%	9%	2%	1%	12%	NA	2%	NA	5%
Mud Dump Reference Rep 1	3	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.82
Mud Dump Reference Rep 2	3	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.36
Mud Dump Reference Rep 3	3	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.20
RSD			NA	NA	NA	NA	NA	NA	NA	NA	NA	22%

TABLE F.25. (contd)

Sediment Treatment	Replicate	Batch	*N. virens* Furans (pg/g wet weight) 2378-TCDF	12378-PeCDF	23478-PeCDF	123478-HxCDF	123678-HxCDF	123789-HxCDF	234678-HxCDF	1234678-HpCDF	1234789-HpCDF	OCDF
Comp MT-B Replicate 1	4	1	3.13(f)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Comp MT-B Replicate 2	4	1	1.80(f)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Comp MT-B Replicate 3	4	1	1.59(f)	NA	NA	NA	NA	NA	NA	NA	NA	NA
RSD			38%(g)	NA	NA	NA	NA	NA	NA	NA	NA	NA

(a) U Undetected at or above the given concentration.
(b) NA Not analyzed.
(c) J Analyte detected below method detection limit (MDL).
(d) Recovery outside quality control range of 50%-120% limit.
(e) Recovery outside quality control range of ±30%.
(f) Value is less than 10 times the MDL.
(g) Recovery outside relative standard deviation (≤25%).

TABLE F.26. Surrogate Recoveries for Furan Congeners in Tissue of *N. virens*, Including Quality Control Data, Federal Projects in New York and New Jersey.

Sediment Treatment	Replicate	Batch	*N. virens* (pg/g wet weight) 2378-TCDF-13C12	12378-PeCDF	23478-PeCDF	123478-HxCDF	123678-HxCDF	123789-HxCDF	234678-HxCDF	1234678-HpCDF	1234789-HpCDF
MOTBY Reach A											
COMP MT-A	1	1	104	NA [a]	NA	NA	NA	NA	NA	NA	NA
COMP MT-A	2	1	55	NA	NA	NA	NA	NA	NA	NA	NA
COMP MT-A	3	1	94	NA	NA	NA	NA	NA	NA	NA	NA
COMP MT-A	4	1	99	NA	NA	NA	NA	NA	NA	NA	NA
COMP MT-A	5	1	104	NA	NA	NA	NA	NA	NA	NA	NA
MOTBY Reach B											
COMP MT-B	1	1	106	NA	NA	NA	NA	NA	NA	NA	NA
COMP MT-B	2	1	101	NA	NA	NA	NA	NA	NA	NA	NA
COMP MT-B	3	1	99	NA	NA	NA	NA	NA	NA	NA	NA
COMP MT-B Replicate 1	4	1	96	NA	NA	NA	NA	NA	NA	NA	NA
COMP MT-B Replicate 2	4	1	96	NA	NA	NA	NA	NA	NA	NA	NA
COMP MT-B Replicate 3	4	1	119	NA	NA	NA	NA	NA	NA	NA	NA
COMP MT-B	5	1	103	NA	NA	NA	NA	NA	NA	NA	NA
Arthur Kill Reach A											
COMP AK-A	1	3	61	54	69	54	56	54	56	59	52
COMP AK-A	2	3	71	56	68	81	80	85	81	74	71
COMP AK-A	3	4	74	59	63	68	71	73	72	53	42
COMP AK-A	4	2	65	55	70	60	61	63	61	61	56
COMP AK-A Replicate 1	5	4	81	79	83	80	86	86	77	64	55
COMP AK-A Replicate 2	5	4	84	47	77	77	79	81	78	69	57
COMP AK-A Replicate 3	5	4	86	72	78	77	81	80	79	69	63
Arthur Kill Reach B											
COMP AK-B	1	3	64	50	66	68	70	73	78	71	63
COMP AK-B	2	4	80	66	68	100	102	103	102	63	44
COMP AK-B	3	2	78	65	83	75	81	86	83	79	73
COMP AK-B	4	2	68	70	81	62	68	71	68	75	72
COMP AK-B	5	4	73	59	58	80	82	84	80	52	31 [b]

TABLE F.26. (contd)

Sediment Treatment	Replicate	Batch	*N. virens* (pg/g wet weight) 2378-TCDF-13C12	12378-PeCDF	23478-PeCDF	123478-HxCDF	123678-HxCDF	123789-HxCDF	234678-HxCDF	1234678-HpCDF	1234789-HpCDF
Arthur Kill Reach C											
COMP AK-C	1	2	70	65	77	59	67	67	67	71	73
COMP AK-C	2	3	57	53	64	59	59	60	61	56	52
COMP AK-C	3	3	66	55	70	57	58	58	57	68	52
COMP AK-C	4	2	57	47	61	60	64	66	65	53	60
COMP AK-C	5	2	74	66	79	58	72	72	77	69	64
Port Elizabeth Reach A											
COMP PE-A	1	2	58	54	63	66	68	62	63	64	53
COMP PE-A	2	3	60	44	59	58	60	64	66	63	57
COMP PE-A	3	4	71	65	68	71	73	73	73	57	46
COMP PE-A	4	3	70	60	72	73	74	80	79	66	61
COMP PE-A	5	2	75	48	69	76	78	84	81	78	70
Port Elizabeth Reach B											
COMP PE-B	1	4	82	75	80	93	91	96	92	76	56
COMP PE-B	2	3	61	57	71	57	59	59	60	65	61
COMP PE-B	3	4	79	68	70	82	82	84	83	55	54
COMP PE-B	4	2	81	70	77	76	83	82	82	72	69
COMP PE-B	5	4	89	70	74	78	78	80	81	69	55
Hackensack River Reach A											
COMP HR-A Replicate 1	1	3	73	66	78	80	82	83	83	73	76
COMP HR-A Replicate 2	1	3	67	58	71	67	73	74	73	77	77
COMP HR-A Replicate 3	1	3	64	55	69	70	69	72	70	79	71
COMP HR-A	2	4	91	87	89	79	78	81	81	67	64
COMP HR-A	3	4	77	64	62	87	94	90	93	70	56
COMP HR-A	4	3	57	49	59	57	61	63	66	61	47
COMP HR-A	5	2	71	59	69	82	82	92	89	82	78
Reference											
Mud Dump Reference	1	4	77	62	65	80	82	84	85	57	39 (b)
Mud Dump Reference	2	4	76	63	66	75	76	79	78	56	53
Mud Dump Reference Replicate 1	3	2	41	34 (b)	38 (b)	46	45	43	44	43	39 (b)
Mud Dump Reference Replicate 2	3	2	74	64	77	81	85	85	76	81	75
Mud Dump Reference Replicate 3	3	2	74	53	70	74	74	75	69	72	66
Mud Dump Reference	4	2	65	56	64	66	73	71	68	77	68
Mud Dump Reference	5	3	66	65	82	60	67	66	62	62	58

TABLE F.26. (contd)

Sediment Treatment	Replicate	Batch	*N. virens* (pg/g wet weight) 2378-TCDF-13C12	12378-PeCDF	23478-PeCDF	123478-HxCDF	123678-HxCDF	123789-HxCDF	234678-HxCDF	1234678-HpCDF	1234789-HpCDF
Controls											
C-NR	1	4	84	67	66	82	83	80	80	67	69
C-NR	2	4	73	57	62	71	75	76	75	64	53
C-NR	3	4	80	60	63	84	87	87	81	73	52
Background											
N. virens Background Replicate 1		1	99	NA	NA	NA	NA	NA	NA	NA	NA
N. virens Background Replicate 2		1	113	NA	NA	NA	NA	NA	NA	NA	NA
N. virens Background Replicate 3		1	83	NA	NA	NA	NA	NA	NA	NA	NA
N. virens Background Replicate 1		2	77	66	81	72	74	76	75	76	73
N. virens Background Replicate 2		2	68	58	66	60	64	66	67	67	60
N. virens Background Replicate 3		2	ND [c]	ND	ND	79	81	81	80	66	66
Quality Control Data											
Method Blanks											
Blank 1		1	196 [b]	NA	NA	NA	NA	NA	NA	NA	NA
Blank 2		2	73	59	68	84	86	85	82	89	86
Blank 3		3	67	63	88	90	87	90	86	99	94
Blank 4		4	80	78	86	76	73	78	82	72	64
Matrix Spikes											
COMP AK-B MS	4	2	70	69	81	66	70	73	77	72	74
COMP HR-A MS	4	3	71	64	76	76	76	76	80	74	69
C-NR MS	3	4	79	67	63	82	85	86	87	74	65
N. virens Background MS		1	86	NA	NA	NA	NA	NA	NA	NA	NA

TABLE F.26. (contd)

Sediment Treatment	Replicate	Batch	*N. virens* (pg/g wet weight) 2378-TCDF-13C12	12378-PeCDF	23478-PeCDF	123478-HxCDF	123678-HxCDF	123789-HxCDF	234678-HxCDF	1234678-HpCDF	1234789-HpCDF
Standard Reference Material											
Reference Material		1	129	NA	NA	NA	NA	NA	NA	NA	NA
Fortified Reference Material		2	74	71	90	74	78	83	83	85	74
Fortified Reference Material		3	76	65	89	75	77	76	81	76	66
Fortified Reference Material		4	84	67	70	88	87	92	94	81	75
Analytical Triplicates											
COMP MT-B Replicate 1	4	1	96	NA	NA	NA	NA	NA	NA	NA	NA
COMP MT-B Replicate 2	4	1	96	NA	NA	NA	NA	NA	NA	NA	NA
COMP MT-B Replicate 3	4	1	119	NA	NA	NA	NA	NA	NA	NA	NA
RSD			13%	NA	NA	NA	NA	NA	NA	NA	NA
COMP AK-A Replicate 1	5	4	81	79	83	80	86	86	77	64	55
COMP AK-A Replicate 2	5	4	84	47	77	77	79	81	78	69	57
COMP AK-A Replicate 3	5	4	86	72	78	77	81	80	79	69	63
RSD			3%	25%	4%	2%	4%	4%	1%	4%	7%
COMP HR-A Replicate 1	1	3	73	66	78	80	82	83	83	73	76
COMP HR-A Replicate 2	1	3	67	58	71	67	73	74	73	77	77
COMP HR-A Replicate 3	1	3	64	55	69	70	69	72	70	79	71
RSD			7%	10%	7%	9%	9%	8%	9%	4%	4%
Mud Dump Reference Replicate 1	3	2	41	34 (b)	38 (b)	46	45	43	44	43	39 (b)
Mud Dump Reference Replicate 2	3	2	74	64	77	81	85	85	76	81	75
Mud Dump Reference Replicate 3	3	2	74	53	70	74	74	75	69	72	66
RSD			30%	30%	34%	28%	30%	32%	27%	30%	31%

(a) NA Not analyzed.
(b) Recovery outside quality control range of 40%-135% limit.
(c) ND No data.

TABLE F.27. Total Polynuclear Aromatic Hydrocarbons (PAHs), Wet Weight, in Tissue of *N. virens*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	*N. virens* PAHs (µg/kg wet weight) Total Low Molecular Weight PAHs	Total High Molecular Weight PAHs	Total PAHs
MOTBY Reach A					
COMP MT-A	1	1	18	94	112
COMP MT-A	2	1	20	101	121
COMP MT-A	3	3	18	86	104
COMP MT-A	4	2	24	109	133
COMP MT-A	5	1	18	60	78
MOTBY Reach B					
COMP MT-B	1	3	18	61	79
COMP MT-B	2	1	17	49	67
COMP MT-B	3	3	18	69	87
COMP MT-B	4	3	20	65	85
COMP MT-B	5	1	22	74	96
Arthur Kill Reach A					
COMP AK-A	1	1	16	68	84
COMP AK-A	2	2	23	99	122
COMP AK-A	3	2	18	92	110
COMP AK-A	4	1	16	52	68
COMP AK-A Replicate 1	5	2	16	75	91
COMP AK-A Replicate 2	5	2	15	78	93
COMP AK-A Replicate 3	5	2	15	77	92
Arthur Kill Reach B					
COMP AK-B	1	2	17	63	80
COMP AK-B	2	2	41	124	165
COMP AK-B	3	1	19	60	79
COMP AK-B Replicate 1	4	1	29	112	141
COMP AK-B Replicate 2	4	1	26	103	129
COMP AK-B Replicate 3	4	1	29	103	132
COMP AK-B	5	2	32	131	163
Arthur Kill Reach C					
COMP AK-C	1	1	25	81	106
COMP AK-C	2	1	27	88	115
COMP AK-C	3	1	25	96	121
COMP AK-C	4	1	22	97	119
COMP AK-C	5	1	22	65	87

TABLE F.27. (contd)

Sediment Treatment	Replicate	Batch	*N. virens* PAHs (µg/kg wet weight) Total Low Molecular Weight PAHs	Total High Molecular Weight PAHs	Total PAHs
Port Elizabeth Reach A					
COMP PE-A	1	1	21	55	76
COMP PE-A	2	2	25	74	99
COMP PE-A	3	2	37	117	154
COMP PE-A	4	2	31	100	131
COMP PE-A	5	1	25	71	96
Port Elizabeth Reach B					
COMP PE-B	1	2	71	224	295
COMP PE-B	2	2	57	181	238
COMP PE-B	3	3	107	328	435
COMP PE-B	4	1	42	65	107
COMP PE-B	5	2	44	145	189
Hackensack River Reach A					
COMP HR-A	1	2	497	804	1301
COMP HR-A	2	2	524	1005	1529
COMP HR-A	3	2	731	1150	1881
COMP HR-A	4	2	741	1102	1843
COMP HR-A	5	1	787	971	1758
Reference					
Mud Dump Reference	1	2	12	26	38
Mud Dump Reference	2	2	10	34	44
Mud Dump Reference	3	1	8	9	17
Mud Dump Reference	4	1	11	9	20
Mud Dump Reference	5	3	5	10	15
Controls					
C-NR Replicate 1	1	3	9	10	19
C-NR Replicate 2	1	3	11	12	23
C-NR Replicate 3	1	3	11	12	23
C-NR	2	3	7	10	17
C-NR	3	3	4	8	12

TABLE F.27. (contd)

Sediment Treatment	Replicate	Batch	*N. virens* PAHs (µg/kg wet weight) Total Low Molecular Weight PAHs	Total High Molecular Weight PAHs	Total PAHs
Background					
N. virens Background	1	3	4	7	11
N. virens Background	2	3	5	7	12
N. virens Background	3	3	3	6	9
N. virens Background	4	3	3	4	7
N. virens Background	5	3	6	7	13
N. virens Background	6	3	4	6	10
N. virens Background	7	3	4	8	12

TABLE F.28. Low Molecular Weight Polynuclear Aromatic Hydrocarbons (LPAHs), Wet Weight, in Tissue of *N. virens*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	*N. virens* LPAHs (µg/g wet weight) Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene
Target DL[a]			4	4	4	4	4	4
Achieved DL			0.71	0.66	0.63	1.10	0.52	1.78
MDL[b] verification			4.1	4.1	3.7	4.7	6.7	7.4
MOTBY Reach A								
COMP MT-A	1	1	1.81 B[c]	1.84[d]	6.10	2.54[d]	2.82	2.68
COMP MT-A	2	1	1.56[d] B	1.54[d]	6.59	2.92	3.43	3.80[d]
COMP MT-A	3	3	1.69[d] B	1.36[d]	5.80	1.70	4.31	2.86[d]
COMP MT-A	4	2	2.73[d] B	2.32[d]	8.49	3.26	4.48 B	3.21
COMP MT-A	5	1	1.64[d] B	1.42[d]	6.72	2.58	2.49	3.34[d]
MOTBY Reach B								
COMP MT-B	1	3	2.03 B	1.51[d]	6.41	2.05	2.86	3.08[d]
COMP MT-B	2	1	1.95 B	1.44[d]	5.68	2.70[d]	2.27	3.25
COMP MT-B	3	3	1.47[d] B	1.33[d]	7.05	2.00	3.32	2.86[d]
COMP MT-B	4	3	1.64[d] B	1.53[d]	7.25	2.19	4.20	3.22[d]
COMP MT-B	5	1	2.16 B	1.55[d]	7.54	3.17	3.28	3.86
Arthur Kill Reach A								
COMP AK-A	1	1	1.94 B	2.05[d]	3.59	2.46[d]	2.77	3.37
COMP AK-A	2	2	3.39 B	2.44[d]	4.50	3.37[d]	4.81 B	4.61
COMP AK-A	3	2	1.63[d] B	1.56[d]	3.02	2.25	4.19 B	4.98
COMP AK-A	4	1	1.51[d] B	1.51[d]	3.33	2.77[d]	2.42	3.96
COMP AK-A Replicate 1	5	2	1.58[d] B	1.76[d]	2.92[d]	1.96	3.58 B	3.92
COMP AK-A Replicate 2	5	2	1.17[d] B	1.50[d]	3.05	1.90[d]	3.50 B	4.26
COMP AK-A Replicate 3	5	2	1.23[d] B	1.53[d]	3.11	1.90	3.47 B	4.04
Arthur Kill Reach B								
COMP AK-B	1	2	2.32[d] B	2.27[d]	3.58	2.67	3.09 B	3.53
COMP AK-B	2	2	2.84[d] B	2.93	7.56	4.84	13.4	9.00
COMP AK-B	3	1	1.83[d] B	1.74[d]	3.68	3.00[d]	3.89	5.26
COMP AK-B Replicate 1	4	1	3.55[d] B	3.16[d]	5.19	4.23[d]	6.52	6.72
COMP AK-B Replicate 2	4	1	2.99[d] B	2.83[d]	4.50	3.89	5.81	5.90
COMP AK-B Replicate 3	4	1	3.33[d] B	3.19[d]	5.02	4.44	6.64	6.77
COMP AK-B	5	2	2.39[d] B	2.70[d]	5.22	4.13[d]	9.10	8.33
Arthur Kill Reach C								
COMP AK-C	1	1	1.67[d] B	1.74[d]	5.10	3.70	6.18[d]	6.45
COMP AK-C	2	1	2.17[d] B	2.25[d]	4.95	4.10	7.21	6.07
COMP AK-C	3	1	2.18 B	2.14[d]	4.59	3.40	6.51	6.10
COMP AK-C	4	1	1.70[d] B	1.69	3.61	3.25	5.80	6.36
COMP AK-C	5	1	1.68[d] B	1.55[d]	4.60	3.18	5.23	5.56
Port Elizabeth Reach A								
COMP PE-A	1	1	1.49[d] B	1.58[d]	8.14	2.70	3.31	3.81
COMP PE-A	2	2	2.52[d] B	2.44	9.07	3.13	4.81 B	3.37
COMP PE-A	3	2	2.32[d] B	2.74[d]	14.6	4.47	8.58	4.16[d]
COMP PE-A	4	2	2.94[d] B	2.46[d]	12.5	3.68	5.99 B	3.58[d]
COMP PE-A	5	1	1.57[d] B	1.84[d]	10.5	2.98	3.84	4.14

TABLE F.28. (contd)

Sediment Treatment	Replicate	Batch	*N. virens* LPAHs (µg/g wet weight) Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene
Port Elizabeth Reach B								
COMP PE-B	1	2	3.44(d)B	3.12(d)	27.1	6.85	22.9	7.83
COMP PE-B	2	2	2.91(d)B	2.89(d)	20.6	5.68	17.9	7.01
COMP PE-B	3	3	2.01 B	2.18(d)	42.0	10.7	38.3	11.4
COMP PE-B	4	1	2.24 B	2.37(d)	22.1	4.25	5.69	5.43
COMP PE-B	5	2	3.00 B	2.79(d)	15.7	5.07	11.6	5.43
Hackensack River Reach A								
COMP HR-A	1	2	6.00 B	7.63	187	37.1	199	60.7
COMP HR-A	2	2	7.50 B	9.17	193	45.2	206	63.5
COMP HR-A	3	2	6.63 B	10.8	263	60.8	297	93.0
COMP HR-A	4	2	9.70 B	10.8	257	57.8	311	94.4
COMP HR-A	5	1	12.2	11.0	313	80.8	277	93.1
Reference								
Mud Dump Reference	1	2	2.39 B	1.84(d)	3.12(d)	2.43(d)	2.08 B	2.23 U(e)
Mud Dump Reference	2	2	2.41(d)B	1.77(d)	2.42(d)	2.24(d)	1.64(d)B	2.23 U
Mud Dump Reference	3	1	1.47(d)B	1.16(d)	1.91	2.05	1.53(d)	1.78 U(d)
Mud Dump Reference	4	1	1.42 B	1.03(d)	1.87(d)	2.20	1.75(d)B	2.60
Mud Dump Reference	5	3	1.53 B	0.82 U	1.39(d)	1.38 U	1.75(d)B	2.23 U
Controls								
C-NR Replicate 1	1	3	2.01(d)B	0.99 U	2.80(d)	1.69	2.40(d)	2.67 U
C-NR Replicate 2	1	3	2.41(d)B	1.15 U	3.31(d)	2.00	2.85	3.12 U
C-NR Replicate 3	1	3	2.60(d)B	1.15 U	3.58(d)	1.99	2.88(d)	3.12 U
C-NR	2	3	1.80(d)B	1.15 U	2.51(d)	1.93 U	2.50(d)	3.12 U
C-NR	3	3	1.12(d)B	0.66 U	1.47(d)	1.10 U	1.59(d)	1.78 U
Background								
N. virens Background	1	3	1.25(d)B	0.82 U	1.53	1.38 U	1.64(d)	2.23 U
N. virens Background	2	3	1.51(d)B	0.82 U	1.89	1.38 U	1.75(d)	2.23 U
N. virens Background	3	3	1.45(d)B	0.66 U	0.63 U	1.10 U	1.45(d)	1.78 U
N. virens Background	4	3	1.38(d)B	0.82 U	0.78 U	1.38 U	1.79(d)	2.23 U
N. virens Background	5	3	1.14(d)B	0.82 U	1.48(d)	1.38	1.64(d)	2.23 U
N. virens Background	6	3	1.17 B	0.66 U	1.21	1.10 U	1.41(d)	1.78 U
N. virens Background	7	3	1.27 B	0.82 U	0.78	1.38 U	1.65(d)	2.23 U

(a) DL Detection limit.
(b) MDL Method detection limit.
(c) B Analyte detected at a concentration greater than 3 times the MDL in the method blank associated with the sample batch.
(d) Indicates ion ratio out or confirming ion not found.
(e) U Undetected at or above given concentration.

TABLE F.29. High Molecular Weight Polynuclear Aromatic Hydrocarbons (PAHs), (Elution Order Fluoranthene - Benzo(k)fluoranthene), Wet Weight, in Tissue of *N. virens*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	*N. virens* HPAHs (µg/g wet weight) Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene
Target DL[a]			4	4	4	4	4	4
Achieved DL			1.64	1.18	1.88	0.52	0.22	0.66
MDL[b] verification			8.7	7.7	5.3	6.4	8.1	6.5
MOTBY Reach A								
COMP MT-A	1	1	25.9	26.4	4.45 B[c]	11.4	5.57[d]	4.64[d]
COMP MT-A	2	1	37.8	34.2	4.69 B	11.6	5.18[d]	3.37
COMP MT-A	3	3	28.4	28.8	3.47 B	10.5	3.17[d]	3.83[d]
COMP MT-A	4	2	29.3	31.0	5.05 B	13.5	6.60[d]B	5.50[d]B
COMP MT-A	5	1	22.1	20.0	3.17 B	7.04	2.88[d]	2.93[d]
MOTBY Reach B								
COMP MT-B	1	3	19.1	13.1	3.69 B	8.57	5.46[d]	4.59
COMP MT-B	2	1	18.4	13.7	3.35 B	6.63	2.85[d]	3.01[d]
COMP MT-B	3	3	22.3	17.0	3.49 B	8.84	5.25[d]	4.03
COMP MT-B	4	3	19.6	17.0	3.64 B	8.68	5.53[d]	4.54
COMP MT-B	5	1	27.4	20.1	4.20 B	7.87	4.82	3.28[d]
Arthur Kill Reach A								
COMP AK-A	1	1	12.6	13.6	4.69 B	11.3	5.72[d]	4.78
COMP AK-A	2	2	20.0	22.1	6.39 B	17.7	7.70[d]B	5.97[d]B
COMP AK-A	3	2	21.1	22.1	5.91 B	18.3	4.02[d]B	5.34[d]B
COMP AK-A	4	1	12.9	11.6	4.30 B	10.8	4.89	3.67[d]
COMP AK-A Replicate 1	5	2	16.2 B	17.5	4.58 B	14.5	6.77[d]B	4.72[d]B
COMP AK-A Replicate 2	5	2	18.5 B	19.4	4.83 B	14.6	6.85[d]B	5.24[d]B
COMP AK-A Replicate 3	5	2	17.1 B	18.3	4.60 B	14.3	6.81[d]B	5.34[d]B
Arthur Kill Reach B								
COMP AK-B	1	2	8.91 B	8.58[d]B	4.81 B	9.33	5.85[d]B	6.85[d]B
COMP AK-B	2	2	35.2	27.8	8.40 B	23.2	7.82[d]B	6.18 B
COMP AK-B	3	1	14.4	14.1	4.74 B	13.1	2.94[d]	3.48
COMP AK-B Replicate 1	4	1	18.1	19.2	6.98 B	16.8	8.59[d]	17.1 [d]
COMP AK-B Replicate 2	4	1	16.6	17.5	6.23 B	15.3	7.55[d]	15.6 [d]
COMP AK-B Replicate 3	4	1	18.2	19.4	7.18 B	17.0	8.67[d]	7.52[d]

TABLE F.29. (contd)

Sediment Treatment	Replicate	Batch	*N. virens* HPAHs (μg/g wet weight) Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene
Arthur Kill Reach C								
COMP AK-C	1	1	24.3(d)	21.8	6.23(d)B	17.3	5.82(d)	3.73
COMP AK-C	2	1	18.8	18.6	6.23 B	15.7	6.32	4.76(d)
COMP AK-C	3	1	22.1	22.7	5.69 B	16.7	6.01(d)	4.89(d)
COMP AK-C	4	1	28.8	28.1	6.96 B	18.7	6.25	3.79
COMP AK-C	5	1	17.6	15.4	5.18 B	14.1	4.98	3.58(d)
Port Elizabeth Reach A								
COMP PE-A	1	1	20.3	13.0	4.03 B	7.96	4.60	3.49
COMP PE-A	2	2	17.4 B	13.7 B	4.67 B	9.97	4.81(d)B	5.49(d)B
COMP PE-A	3	2	37.7	28.1	5.95 B	14.3	6.78 B	5.93 B
COMP PE-A	4	2	26.1	21.9	5.35 B	14.6	6.64 B	5.84(d)B
COMP PE-A	5	1	27.8	17.1	4.64 B	11.5	2.95(d)	3.77
Port Elizabeth Reach B								
COMP PE-B	1	2	87.2	66.9	8.35 B	24.6	8.48 B	6.35(d)B
COMP PE-B	2	2	66.3	50.3	7.85 B	20.3	8.30 B	6.11(d)B
COMP PE-B	3	3	145	113	11.0 B	31.1	10.5	6.44
COMP PE-B	4	1	26.7	14.8	4.96 B	9.21	3.70(d)	4.00
COMP PE-B	5	2	50.4	37.4	7.72 B	20.2	7.34 B	6.67 B
Hackensack River Reach A								
COMP HR-A	1	2	436	177	41.1	79.5	18.0 B	12.4 B
COMP HR-A	2	2	541	203	55.3	101	27.5	18.4 B
COMP HR-A	3	2	661	260	49.5	99.5	21.5 B	13.6 B
COMP HR-A	4	2	604	274	54.3	86.6	22.7 B	15.0 B
COMP HR-A	5	1	526	222	56.3	85.3	25.0	13.8
Reference								
Mud Dump Reference	1	2	5.00(d)B	3.06(d)B	3.84(d)B	0.65 U(e)	4.82(d)B	0.82(d)U
Mud Dump Reference	2	2	4.11(d)B	3.09(d)B	3.63(d)B	0.65 U	4.82(d)B	4.90(d)B
Mud Dump Reference	3	1	2.05(d)	0.94 U	2.28(d)B	0.52 U	2.86(d)	0.66 U
Mud Dump Reference	4	1	2.01(d)	0.94 U	2.20(d)B	0.52 U	2.86(d)	0.66 U
Mud Dump Reference	5	3	1.81(d)B	1.18 U	2.69 B	0.65 U	0.28 U	0.82 U

TABLE F.29. (contd)

Sediment Treatment	Replicate	Batch	*N. virens* HPAHs (µg/g wet weight) Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene
Controls								
C-NR Replicate 1	1	3	2.58(d)	1.42 U	3.11(d)B	1.32(d)	0.33 U	0.99 U
C-NR Replicate 2	1	3	2.93(d)	1.65 U	3.68(d)B	1.55(d)	0.39 U	1.15 U
C-NR Replicate 3	1	3	3.01(d)	1.65 U	3.56(d)B	1.55(d)	0.39 U	1.15 U
C-NR	2	3	2.59(d)	1.65 U	3.75(d)B	0.91 U	0.39 U	1.15 U
C-NR	3	3	1.72(d)	0.94 U	2.21(d)B	0.52 U	0.22 U	0.66 U
Background								
N. virens Background	1	3	1.86(d)	1.18 U	2.76(d)B	0.65 U	0.28 U	0.82 U
N. virens Background	2	3	1.90(d)	1.18 U	2.80(d)B	0.65 U	0.28 U	0.82 U
N. virens Background	3	3	1.40(d)	0.94 U	2.20(d)B	0.52 U	0.22 U	0.66 U
N. virens Background	4	3	1.87(d)	1.18 U	2.42(d)B	0.65 U	0.28 U	0.82 U
N. virens Background	5	3	1.93(d)	1.18 U	2.57(d)B	0.65 U	0.28 U	0.82 U
N. virens Background	6	3	1.56(d)	0.94 U	2.16(d)B	0.52 U	0.22 U	0.66 U
N. virens Background	7	3	1.87(d)	1.18 U	2.70(d)B	0.65 U	0.28 U	3.78(d)

(a) DL Detection limit.
(b) MDL Method detection limit.
(c) B Analyte detected at a concentration greater than 3 times the MDL in the method blank associated with the sample batch.
(d) Indicates ion ratio out or confirming ion not found.
(e) U Undetected at or above the given concentration.

TABLE F.30. High Molecular Weight Polynuclear Aromatic Hydrocarbons (PAHs), (Elution Order Benzo(a)pyrene - 1,4 Dichlorobenzene), Wet Weight, in Tissue of N. virens, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	*N. virens* HPAHs (µg/g wet weight) Benzo(a)-pyrene	Indeno-(1,2,3-cd) pyrene	Dibenzo-(a,h) anthra-cene	Benzo-(g,h,i) perylene	1,4 Di-chloro-benzene
Target DL[a]			4	4	4	4	4
Achieved DL			0.79	2.17	2.34	1.94	1.0
MDL[b] verification			7.7	5.8	4.1	4.7	9.5
MOTBY Reach A							
COMP MT-A	1	1	3.54(c)	4.23	3.00(c)	4.59	1.0 U(d)
COMP MT-A	2	1	1.45(c)	2.31	2.34 U	1.94(c)U(e)	1.0 U
COMP MT-A	3	3	2.21(c)	2.29	2.34(c)U	3.01(c)B	1.0 U
COMP MT-A	4	2	4.55(c)B	4.90 B	3.67(c)	5.18	1.0 U
COMP MT-A	5	1	1.63(c)	2.17 U	2.34 U	1.94 U	1.0 U
MOTBY Reach B							
COMP MT-B	1	3	2.81(c)	2.71 U	2.92 U	3.25 B	1.0 U
COMP MT-B	2	1	1.53(c)	2.17 U	2.34 U	1.94 U	1.0 U
COMP MT-B	3	3	2.25(c)	2.50	2.34 U	3.25 B	1.0 U
COMP MT-B	4	3	2.79(c)	2.71 U	2.92 U	3.29 B	1.0 U
COMP MT-B	5	1	1.47(c)	2.17 U	2.34 U	5.09	1.0 U
Arthur Kill Reach A							
COMP AK-A	1	1	3.59(c)	4.26	3.08	4.55	1.0 U
COMP AK-A	2	2	4.60(c)B	4.88 B	3.88	5.41	1.0 U
COMP AK-A	3	2	7.16(c)B	3.65 B	2.92 U	4.88	1.0 U
COMP AK-A	4	1	1.45(c)	2.41(c)B	2.34 U	1.94 U	1.0 U
COMP AK-A Replicate 1	5	2	3.13(c)B	3.20(c)B	2.92 U	4.07	1.0 U
COMP AK-A Replicate 2	5	2	2.74(c)B	5.70 B	2.92 U	2.42 U	1.0 U
COMP AK-A Replicate 3	5	2	2.74(c)B	3.47 B	2.92 U	4.78	1.0 U
Arthur Kill Reach B							
COMP AK-B	1	2	4.46(c)B	5.00 B	3.67(c)	5.12	1.0 U
COMP AK-B	2	2	4.39(c)B	6.50 B	4.04(c)	2.42 U	1.0 U
COMP AK-B	3	1	1.44	2.97(c)	2.34(c)U	3.19	1.0 U
COMP AK-B Replicate 1	4	1	6.48(c)	6.52(c)	5.04(c)	6.85	1.0 U
COMP AK-B Replicate 2	4	1	5.47(c)	7.59(c)	4.49(c)	6.83	1.0 U
COMP AK-B Replicate 3	4	1	6.35(c)	7.01	5.21(c)	6.90	1.0 U
COMP AK-B	5	2	4.40(c)	5.33 B	4.09	6.24	1.0 U
Arthur Kill Reach C							
COMP AK-C	1	1	1.36(c)	2.17 U	2.34(c)U	1.94 U	1.0 U
COMP AK-C	2	1	5.88(c)	4.04	3.14(c)	4.76	1.0 U
COMP AK-C	3	1	3.57(c)	5.40	3.39(c)	5.39	1.0 U
COMP AK-C	4	1	1.46(c)	2.17 U	2.34 U	2.91	1.0 U
COMP AK-C	5	1	1.39(c)	2.99	2.34 U	1.94 U	1.0 U
Port Elizabeth Reach A							
COMP PE-A	1	1	1.49(c)	2.17 U	2.34(c)U	1.94 U	1.0 U
COMP PE-A	2	2	4.50(c)B	4.84(c)B	3.85(c)	4.88	1.0 U
COMP PE-A	3	2	4.52(c)B	4.59(c)B	3.89	5.16(c)	1.0 U
COMP PE-A	4	2	5.28(c)B	4.97(c)B	3.82(c)	5.41(c)	1.0 U
COMP PE-A	5	1	1.46(c)	2.30	2.34 U	1.94 U	1.0 U

TABLE F.30 . (contd)

Sediment Treatment	Replicate	Batch	*N. virens* HPAHs (µg/g wet weight) Benzo(a)-pyrene	Indeno-(1,2,3-cd) pyrene	Dibenzo-(a,h) anthracene	Benzo-(g,h,i) perylene	1,4 Dichlorobenzene
Port Elizabeth Reach B							
COMP PE-B	1	2	7.67 B	5.15 B	3.80	5.62	1.0 U
COMP PE-B	2	2	7.48 B	5.01 B	3.86	5.79	1.0 U
COMP PE-B	3	3	7.05 (c)	2.71 U	2.92 U	4.07 B	1.0 U
COMP PE-B	4	1	1.96 (c)	2.17 U	2.34 U (c)	1.94 U	1.0 U
COMP PE-B	5	2	4.49 (c) B	6.47 B	3.96 (c)	2.42 U	1.0 U
Hackensack River Reach A							
COMP HR-A	1	2	20.5 B	7.53 B	4.47 (c)	7.82	1.0 U
COMP HR-A	2	2	30.5	11.4 B	6.27	11.0	1.0 U
COMP HR-A	3	2	24.2	7.19 B	4.81	8.82	1.0 U
COMP HR-A	4	2	24.5	7.35 B	5.12	8.83	1.0 U
COMP HR-A	5	1	24.7	7.56	2.59	8.11	1.0 U
Reference							
Mud Dump Reference	1	2	4.40 (c) B	4.51 (c) B	2.92 U	2.42 U (c)	1.0 U
Mud Dump Reference	2	2	4.46 B	4.30 (c) B	2.92 U	4.25	1.0 U
Mud Dump Reference	3	1	1.50 (c)	2.17 U	2.34 U	1.94 U	1.0 U
Mud Dump Reference	4	1	1.53 (c)	2.17 U	2.34 U	1.94 U (c)	1.0 U
Mud Dump Reference	5	3	2.84	2.71 U	2.92 U	2.57	1.0 U
Controls							
C-NR Replicate 1	1	3	3.45 (c)	3.26 U	3.51 U	2.90 U	1.0 U
C-NR Replicate 2	1	3	3.96	3.80 U	4.09 U	3.39 U	1.0 U
C-NR Replicate 3	1	3	3.96	3.80 U	4.09 U	3.39 U	1.0 U
C-NR	2	3	3.91	3.80 U	4.09 U	3.39 U	1.0 U
C-NR	3	3	2.40	2.17 U	2.34 U	1.94 B	1.0 U
Background							
N. virens Background	1	3	2.85	2.71 U	2.92 U	2.42 U	1.0 U
N. virens Background	2	3	2.29 (c)	2.71 U	2.92 U	2.42 U	1.0 U
N. virens Background	3	3	1.93 (c)	2.17 U	2.34 U	1.94 U	1.0 U
N. virens Background	4	3	0.79 U	2.71 U	2.92 U	2.42 U	1.0 U
N. virens Background	5	3	2.33 (c)	2.71 U	2.92 U	2.42 U	1.0 U
N. virens Background	6	3	2.25	2.17 U	2.34 U	1.94 U	1.0 U
N. virens Background	7	3	0.79 U	2.71 U	2.92 U	2.42 U	1.0 U

(a) DL Detection limit.
(b) MDL Method detection limit.
(c) Indicates ion ratio out or confirming ion not found.
(d) U Undetected at or above the given concentration.
(e) B Analyte detected at a concentration greater than 3 times the MDL in the method blank associated with the sample batch.

TABLE F.31. Total Polynuclear Aromatic Hydrocarbons (PAHs), Dry Weight, in Tissue of *N. virens*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Percent Dry Weight	N. virens PAHs (µg/kg dry weight) Total Low Molecular Weight PAHs	Total High Molecular Weight PAHs	Total PAHs
MOTBY Reach A						
COMP MT-A	1	1	15.04	119	623	742
COMP MT-A	2	1	14.58	136	689	825
COMP MT-A	3	3	14.37	123	596	719
COMP MT-A	4	2	15.60	157	701	858
COMP MT-A	5	1	15.47	118	387	505
MOTBY Reach B						
COMP MT-B	1	3	14.21	126	426	552
COMP MT-B	2	1	13.54	128	365	493
COMP MT-B	3	3	14.24	127	484	611
COMP MT-B	4	3	13.74	146	474	620
COMP MT-B	5	1	15.06	143	493	636
Arthur Kill Reach A						
COMP AK-A	1	1	15.36	105	444	549
COMP AK-A	2	2	15.46	150	638	788
COMP AK-A	3	2	15.32	115	603	718
COMP AK-A	4	1	13.73	113	379	492
COMP AK-A Replicate 1	5	2	15.10	101	494	595
COMP AK-A Replicate 2	5	2	15.10	102	515	617
COMP AK-A Replicate 3	5	2	15.10	104	513	617
Arthur Kill Reach B						
COMP AK-B	1	2	14.83	118	422	540
COMP AK-B	2	2	15.35	264	805	1069
COMP AK-B	3	1	15.14	128	399	527
COMP AK-B Replicate 1	4	1	14.70	200	759	959
COMP AK-B Replicate 2	4	1	14.70	176	702	878
COMP AK-B Replicate 3	4	1	14.70	200	703	903
COMP AK-B	5	2	14.51	220	900	1120
Arthur Kill Reach C						
COMP AK-C	1	1	15.09	165	533	698
COMP AK-C	2	1	14.50	185	607	792
COMP AK-C	3	1	14.31	174	671	845
COMP AK-C	4	1	15.22	147	637	784
COMP AK-C	5	1	14.89	146	438	584
Port Elizabeth Reach A						
COMP PE-A	1	1	14.84	142	370	512
COMP PE-A	2	2	16.58	153	447	600
COMP PE-A	3	2	14.91	247	784	1031
COMP PE-A	4	2	15.00	208	666	874
COMP PE-A	5	1	15.54	160	460	620

TABLE F.31. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	N. virens PAHs (µg/kg dry weight) Total Low Molecular Weight PAHs	Total High Molecular Weight PAHs	Total PAHs
Port Elizabeth Reach B						
COMP PE-B	1	2	15.59	457	1437	1894
COMP PE-B	2	2	13.67	416	1327	1743
COMP PE-B	3	3	14.55	731	2255	2986
COMP PE-B	4	1	15.12	278	432	710
COMP PE-B	5	2	14.92	292	971	1263
Hackensack River Reach A						
COMP HR-A	1	2	15.33	3247	5237	8484
COMP HR-A	2	2	15.42	3403	6524	9927
COMP HR-A	3	2	15.14	4821	7604	12425
COMP HR-A	4	2	15.84	4680	6967	11647
COMP HR-A	5	1	14.94	5269	6494	11763
Reference						
Mud Dump Reference	1	2	15.88	75	162	237
Mud Dump Reference	2	2	15.09	69	223	292
Mud Dump Reference	3	1	14.18	57	61	118
Mud Dump Reference	4	1	14.43	75	60	135
Mud Dump Reference	5	3	14.59	32	68	100
Controls						
C-NR Replicate 1	1	3	15.13	59	69	128
C-NR Replicate 2	1	3	15.13	70	80	150
C-NR Replicate 3	1	3	15.13	73	80	153
C-NR	2	3	14.47	47	71	118
C-NR	3	3	14.59	29	57	86
Background						
N. virens Background	1	3	14.52	30	51	81
N. virens Background	2	3	14.86	35	47	82
N. virens Background	3	3	13.35	22	41	63
N. virens Background	4	3	17.31	18	25	43
N. virens Background	5	3	17.89	32	38	70
N. virens Background	6	3	16.65	23	36	59
N. virens Background	7	3	16.20	23	52	75

TABLE F.32. Low Molecular Weight Polynuclear Aromatic Hydrocarbons (LPAHs), Dry Weight, in Tissue of *N. virens*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Percent Dry Weight	N. virens LPAHs (µg/g dry weight) Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene
MOTBY Reach A									
COMP MT-A	1	1	15.04	12.1 B(a)	12.3 (b)	40.6	16.9(b)	18.8	17.8
COMP MT-A	2	1	14.58	10.7(b)B	10.5 (b)	45.2	20.0	23.5	26.1
COMP MT-A	3	3	14.37	11.8(b)B	9.49(b)	40.4	11.8	30.0	19.9(b)
COMP MT-A	4	2	15.60	17.5(b)B	14.9 (b)	54.4	20.9	28.7 B	20.5
COMP MT-A	5	1	15.47	10.6(b)B	9.19(b)	43.5	16.7	16.1	21.6(b)
MOTBY Reach B									
COMP MT-B	1	3	14.21	14.3 B	10.6 (b)	45.1	14.4	20.1	21.7(b)
COMP MT-B	2	1	13.54	14.4 B	10.6 (b)	42.0	19.9(b)	16.7	24.0
COMP MT-B	3	3	14.24	10.3 B	9.34(b)	49.5	14.0	23.3	20.1(b)
COMP MT-B	4	3	13.74	11.9(b)B	11.1 (b)	52.8	15.9	30.6	23.4(b)
COMP MT-B	5	1	15.06	14.4 B	10.3 (b)	50.1	21.0	21.8	25.6
Arthur Kill Reach A									
COMP AK-A	1	1	15.36	12.6 B	13.3 (b)	23.3	16.0(b)	18.1	21.9
COMP AK-A	2	2	15.46	21.9 B	15.8 (b)	29.1	21.8(b)	31.1 B	29.8
COMP AK-A	3	2	15.32	10.6 B	10.2 (b)	19.7	14.7	27.4 B	32.5
COMP AK-A	4	1	13.73	11.0 (b)B	11.0 (b)	24.3(b)	20.1(b)	17.6	28.8
COMP AK-A Replicate 1	5	2	15.10	10.5 (b)B	11.6 (b)	19.3(b)	13.0	23.7 B	26.0
COMP AK-A Replicate 2	5	2	15.10	7.77(b)B	9.96(b)	20.2	12.6(b)	23.2 B	28.2
COMP AK-A Replicate 3	5	2	15.10	8.12(b)B	10.1 (b)	20.6	12.6	23.0 B	26.7
Arthur Kill Reach B									
COMP AK-B	1	2	14.83	15.6(b)B	15.3(b)	24.1	18.0	20.9 B	23.8
COMP AK-B	2	2	15.35	18.5(b)B	19.1	49.2	31.6(b)	87.2	58.6
COMP AK-B	3	1	15.14	12.1(b)B	11.5(b)	24.3	19.8(b)	25.7	34.7
COMP AK-B Replicate 1	4	1	14.70	24.2(b)B	21.5(b)	35.3	28.8(b)	44.3	45.7
COMP AK-B Replicate 2	4	1	14.70	20.3(b)B	19.3(b)	30.6	26.4	39.5	40.2
COMP AK-B Replicate 3	4	1	14.70	22.6(b)B	21.7(b)	34.2	30.2	45.1	46.0
COMP AK-B	5	2	14.51	16.4(b)B	18.6(b)	36.0	28.5(b)	62.7	57.4

TABLE F.32. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	N. virens LPAHs (μg/g dry weight) Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene
Arthur Kill Reach C									
COMP AK-C	1	1	15.09	11.1(b)B	11.5(b)	33.8	24.5	41.0(b)	42.8
COMP AK-C	2	1	14.50	15.0(b)B	15.5(b)	34.2	28.3	49.7	41.9
COMP AK-C	3	1	14.31	15.2 B	15.0(b)	32.1	23.7	45.5	42.6
COMP AK-C	4	1	15.22	11.2(b)B	11.1	23.7	21.3	38.1	41.8
COMP AK-C	5	1	14.89	11.3(b)B	10.4(b)	30.9	21.4	35.1	37.3
Port Elizabeth Reach A									
COMP PE-A	1	1	14.84	10.0(b)B	10.6(b)	54.9	18.2	22.3	25.6
COMP PE-A	2	2	16.58	15.2(b)B	14.7	54.7	18.9	29.0 B	20.3
COMP PE-A	3	2	14.91	15.5(b)B	18.3(b)	98.1	30.0	57.5	27.9
COMP PE-A	4	2	15.00	19.6(b)B	16.4(b)	83.6	24.5	39.9 B	23.9(b)
COMP PE-A	5	1	15.54	10.1(b)B	11.9(b)	67.4	19.1	24.7	26.7
Port Elizabeth Reach B									
COMP PE-B	1	2	15.59	22.1(b)B	20.0(b)	174	43.9	147	50.2
COMP PE-B	2	2	13.67	21.3(b)B	21.2(b)	150	41.6	131	51.3
COMP PE-B	3	3	14.55	13.8 B	14.9(b)	288	73.3	263	78.1
COMP PE-B	4	1	15.12	14.8 B	15.6(b)	146	28.1	37.7	35.9
COMP PE-B	5	2	14.92	20.1 B	18.7(b)	105	34.0	77.7	36.4
Hackensack River Reach A									
COMP HR-A	1	2	15.33	39.1 B	49.8	1220	242	1300	396
COMP HR-A	2	2	15.42	48.6 B	59.5	1250	293	1340	412
COMP HR-A	3	2	15.14	43.8 B	71.0	1730	402	1960	614
COMP HR-A	4	2	15.84	61.2 B	67.9	1620	365	1970	596
COMP HR-A	5	1	14.94	81.7	73.6	2100	541	1850	623
Reference									
Mud Dump Reference	1	2	15.88	15.0 B	11.6 (b)	19.6	15.3(b)	13.1 B	14.0 U(c)
Mud Dump Reference	2	2	15.09	16.0(b)B	11.7 (b)	16.0(b)	14.8(b)	10.9(b)B	14.8 U
Mud Dump Reference	3	1	14.18	10.4(b)B	8.16(b)	13.5	14.5	10.8	12.6 U
Mud Dump Reference	4	1	14.43	9.83 B	7.16(b)	13.0	15.3	12.1(b)	18.0 (b)
Mud Dump Reference	5	3	14.59	10.5 B	5.62 U	9.53(b)	9.46 U	12.0(b)B	15.3 U

TABLE F.32. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	N. virens LPAHs (µg/g dry weight) Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene
Controls									
C-NR Replicate 1	1	3	15.13	13.3 (b) B	6.54 U	18.5 (b)	11.2	15.9 (b)	17.6 U
C-NR Replicate 2	1	3	15.13	15.9 (b) B	7.60 U	21.9 (b)	13.2	18.9	20.6 U
C-NR Replicate 3	1	3	15.13	17.2 (b) B	7.60 U	23.6 (b)	13.1	19.0	20.6 U
C-NR	2	3	14.47	12.4 (b) B	7.95 U	17.3 (b)	13.3 U	17.3 (b)	21.6 U
C-NR	3	3	14.59	7.67 (b) B	4.52 U	10.0 (b)	7.54 U	10.9 (b)	12.2 U
Background									
N. virens Background	1	3	14.52	8.58 (b) B	5.65 U	10.5	9.50 U	11.3 (b)	15.4 U
N. virens Background	2	3	14.86	10.2 (b) B	5.52 U	12.7	9.29 U	11.8 (b)	15.0 U
N. virens Background	3	3	13.35	10.9 (b) B	4.94 U	4.72 U	8.24 U	10.8 (b)	13.3 U
N. virens Background	4	3	17.31	7.96 (b) B	4.74 U	4.51 U	7.97 U	10.3 (b)	12.9 U
N. virens Background	5	3	17.89	6.36 (b) B	4.58 U	8.28 (b)	7.71	9.16 (b)	12.5 U
N. virens Background	6	3	16.65	7.05 B	3.96 U	7.27	6.61 U	8.44	10.7 U
N. virens Background	7	3	16.20	7.83 B	5.06 U	4.81	8.52 U	10.2 (b)	13.8 U

(a) B Analyte detected at a concentration greater than 3 times the MDL in the method blank associated with the sample batch.
(b) Indicates ion ratio out or confirming ion not found.
(c) U Undetected at or above the detection limit shown.

TABLE F.33. High Molecular Weight Polynuclear Aromatic Hydrocarbons (HPAHs), (Elution Order Fluoranthene - Benzo(k)fluoranthene), Dry Weight, in Tissue of *N. virens*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*N. virens* HPAHs (µg/g dry weight) Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene
MOTBY Reach A									
COMP MT-A	1	1	15.04	172	176	29.6 B(a)	75.7	37.1(b)	30.8(b)
COMP MT-A	2	1	14.58	259	234	32.1 B	79.5	35.5	23.1
COMP MT-A	3	3	14.37	198	200	24.1 B	73.1	22.0(b)	26.6(b)
COMP MT-A	4	2	15.60	188	199	32.3 B	86.7	42.3(b)B	35.2(b)B
COMP MT-A	5	1	15.47	143	130	20.5 B	45.5	18.6(b)	19.0(b)
MOTBY Reach B									
COMP MT-B	1	3	14.21	134	92.3	25.9 B	60.3	38.4(b)	32.3
COMP MT-B	2	1	13.54	136	101	24.7 B	48.9	21.1(b)	22.2(b)
COMP MT-B	3	3	14.24	156	120	24.5 B	62.1	36.9(b)	28.3
COMP MT-B	4	3	13.74	143	124	26.5 B	63.2	40.3(b)	33.0
COMP MT-B	5	1	15.06	182	133	27.9 B	52.3	32.0	21.8(b)
Arthur Kill Reach A									
COMP AK-A	1	1	15.36	81.8	88.8	30.5 B	73.7	37.2(b)	31.1
COMP AK-A	2	2	15.46	130	143	41.3 B	114	49.8(b)B	38.6(b)B
COMP AK-A	3	2	15.32	138	144	38.6 B	119	26.2(b)B	34.8(b)B
COMP AK-A	4	1	13.73	94.0	84.6	31.3 B	78.8	35.6	26.8(b)
COMP AK-A Replicate 1	5	2	15.10	107 B	116	30.3 B	96.0	44.8(b)B	31.3(b)B
COMP AK-A Replicate 2	5	2	15.10	122 B	128	32.0 B	96.8	45.3(b)B	34.7(b)B
COMP AK-A Replicate 3	5	2	15.10	114 B	121	30.5 B	94.4	45.1(b)B	35.4(b)B
Arthur Kill Reach B									
COMP AK-B	1	2	14.83	60.1 B	57.9(b)B	32.4 B	62.9	39.4(b)B	46.2(b)B
COMP AK-B	2	2	15.35	230	181	54.7 B	151	51.0B	40.3 B
COMP AK-B	3	1	15.14	95.2	93.2	31.3 B	86.6	19.4(b)	23.0
COMP AK-B Replicate 1	4	1	14.70	123	131	47.5 B	114	58.4(b)	116 (b)
COMP AK-B Replicate 2	4	1	14.70	113	119	42.4 B	104	51.4(b)	106 (b)
COMP AK-B Replicate 3	4	1	14.70	124	132	48.8 B	115	59.0(b)	51.1(b)
COMP AK-B	5	2	14.51	199	234	56.7 B	171	56.5 B	44.5

TABLE F.33. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*N. virens* HPAHs (µg/g dry weight) Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene
Arthur Kill Reach C									
COMP AK-C	1	1	15.09	161(b)	144	41.3(b) B	115	38.5(b)	24.7
COMP AK-C	2	1	14.50	129	128	42.9 B	108	43.6	32.8(b)
COMP AK-C	3	1	14.31	155	159	39.8 B	117	42.0(b)	34.1(b)
COMP AK-C	4	1	15.22	189	185	45.7 B	123	41.0	24.9
COMP AK-C	5	1	14.89	118	104	34.8 B	94.7	33.5	24.0(b)
Port Elizabeth Reach A									
COMP PE-A	1	1	14.84	137	87.6	27.1 B	53.7	31.0	23.5
COMP PE-A	2	2	16.58	105 B	82.3 B	28.2 B	60.1	29.0(b) B	33.1(b) B
COMP PE-A	3	2	14.91	253	188	39.9 B	95.8	45.5 B	39.8 B
COMP PE-A	4	2	15.00	174	146	35.6 B	97.3	44.3 B	38.9(b) B
COMP PE-A	5	1	15.54	179	110	29.9	73.9	19.0(b) B	24.3
Port Elizabeth Reach B									
COMP PE-B	1	2	15.59	559	429	53.6 B	158	54.4 B	40.7(b) B
COMP PE-B	2	2	13.67	485	368	57.4 B	149	60.7 B	44.7(b) B
COMP PE-B	3	3	14.55	997	775	75.8 B	214	72.3	44.3
COMP PE-B	4	1	15.12	176	98.1	32.8 B	60.9	24.5(b)	26.5
COMP PE-B	5	2	14.92	338	251	51.7 B	136	49.2 B	44.7 B
Hackensack River Reach A									
COMP HR-A	1	2	15.33	2840	1150	268	519	117 B	80.6 B
COMP HR-A	2	2	15.42	3510	1320	359	654	178	119 B
COMP HR-A	3	2	15.14	4370	1720	327	657	142 B	90.1 B
COMP HR-A	4	2	15.84	3820	1730	343	547	143 B	94.9 B
COMP HR-A	5	1	14.94	3520	1480	377	571	167	92.1
Reference									
Mud Dump Reference	1	2	15.88	31.5(b) B	19.3(b) B	24.2(b) B	4.09 U(c)	30.4(b) B	5.16 U
Mud Dump Reference	2	2	15.09	27.2(b) B	20.5(b) B	24.1(b) B	4.31 U	31.9(b) B	32.5(b) B
Mud Dump Reference	3	1	14.18	14.5(b)	6.63 U	16.0(b) B	3.67 U	20.2(b)	4.65 U
Mud Dump Reference	4	1	14.43	13.9	6.51 U	15.2(b) B	3.60 U	19.8(b)	4.57 U
Mud Dump Reference	5	3	14.59	12.4(b) B	8.09 U	18.5 B	4.46 U	1.92 U	5.62 U

TABLE F.33. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*N. virens* HPAHs (µg/g dry weight) Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene
Controls									
C-NR Replicate 1	1	3	15.13	17.0(b)	9.39 U	20.6(b)B	8.74(b)	2.18 U	6.54 U
C-NR Replicate 2	1	3	15.13	19.4(b)	10.9 U	24.3(b)B	10.3 (b)	2.58 U	7.60 U
C-NR Replicate 3	1	3	15.13	19.9(b)	10.9 U	23.5(b)B	10.2 (b)	2.58 U	7.60 U
C-NR	2	3	14.47	17.9(b)	11.4 U	25.9(b)B	6.29 U	2.70 U	7.95 U
C-NR	3	3	14.59	11.8(b)	6.44 U	15.1(b)B	3.56 U	1.51 U	4.52 U
Background									
N. virens Background	1	3	14.52	12.8 (b)	8.13 U	19.0(b)B	4.48 U	1.93 U	5.65 U
N. virens Background	2	3	14.86	12.8 (b)	7.94 U	18.9(b)B	4.37 U	1.88 U	5.52 U
N. virens Background	3	3	13.35	10.5 (b)	7.04 U	16.5(b)B	3.90 U	1.65 U	4.94 U
N. virens Background	4	3	17.31	10.8 (b)	6.82 U	14.0(b)B	3.76 U	1.62 U	4.74 U
N. virens Background	5	3	17.89	10.8 (b)	6.60 U	14.4(b)B	3.63 U	1.57 U	4.58 U
N. virens Background	6	3	16.65	9.37(b)	5.65 U	13.0(b)B	3.12 U	1.32 U	3.96 U
N. virens Background	7	3	16.20	11.5 (b)	7.28 U	16.7(b)B	4.01 U	1.73 U	23.3(b)

(a) B Analyte detected at a concentration greater than 3 times the MDL in the method blank associated with the sample batch.
(b) Indicates ion ratio out or confirming ion not found.
(c) U Undetected at or above the detection limit shown.

TABLE F.34. High Molecular Weight Polynuclear Aromatic Hydrocarbons (HPAHs), (Elution Order Benzo(a)pyrene - 1,4 Dichlorobenzene), Dry Weight, in Tissue of *N. virens*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*N. virens* HPAHs (µg/g dry weight) Benzo(a)-pyrene	Indeno-(1,2,3-cd) pyrene	Dibenzo-(a,h) anthra-cene	Benzo-(g,h,i) perylene	1,4 Di-chloro-benzene
MOTBY Reach A								
COMP MT-A	1	1	15.04	23.5 (a)	28.1	19.9 (a)	30.5	6.65 U (b)
COMP MT-A	2	1	14.58	9.97 (a)	15.8	16.0 U	13.3 (a) U (c)	6.86 U
COMP MT-A	3	3	14.37	15.4 (a)	16.0	16.3 U (a)	20.9 B	6.96 U
COMP MT-A	4	2	15.60	29.1 (a) B	31.4 B	23.5	33.2	6.41 U
COMP MT-A	5	1	15.47	10.5 (a)	14.0 U	15.1 U	12.5 U	6.46 U
MOTBY Reach B								
COMP MT-B	1	3	14.21	19.8 (a)	19.1 U	20.5 U	22.9 B	7.04 U
COMP MT-B	2	1	13.54	11.3 (a)	16.0 U	17.3 U	14.3 U	7.39 U
COMP MT-B	3	3	14.24	15.8 (a)	17.5	16.4 U	22.8 B	7.02 U
COMP MT-B	4	3	13.74	20.3 (a)	19.7 U	21.3 U	23.9 B	7.28 U
COMP MT-B	5	1	15.06	9.73 (a)	14.4 U	15.5 U	33.8	6.64 U
Arthur Kill Reach A								
COMP AK-A	1	1	15.36	23.4 (a)	27.7	20.1	29.6	6.51 U
COMP AK-A	2	2	15.46	29.8 (a) B	31.6 B	25.1	35.0	6.47 U
COMP AK-A	3	2	15.32	46.7 (a) B	23.8 B	19.1 U	31.8	6.53 U
COMP AK-A	4	1	13.73	10.5 (a)	17.6 (a)	17.0 U	14.1 U	7.28 U
COMP AK-A Replicate 1	5	2	15.10	20.8 (a) B	21.2 (a) B	19.3 U	27.0	6.62 U
COMP AK-A Replicate 2	5	2	15.10	18.2 (a) B	37.8 B	19.3 U	16.0 U	6.62 U
COMP AK-A Replicate 3	5	2	15.10	18.1 (a) B	23.0 B	19.3 U	31.7	6.62 U
Arthur Kill Reach B								
COMP AK-B	1	2	14.83	30.1 (a) B	33.7 B	24.8 (a)	34.5	6.74 U
COMP AK-B	2	2	15.35	28.6 (a) B	42.3 B	26.3 (a)	15.8 U	6.51 U
COMP AK-B	3	1	15.14	9.54 (a)	19.6 (a)	15.5 U (a)	21.0	6.61 U
COMP AK-B Replicate 1	4	1	14.70	44.1 (a)	44.4 (a)	34.3 (a)	46.6	6.80 U
COMP AK-B Replicate 2	4	1	14.70	37.2 (a)	51.6	30.6 (a)	46.4	6.80 U
COMP AK-B Replicate 3	4	1	14.70	43.2	47.7	35.4 (a)	46.9	6.80 U
COMP AK-B	5	2	14.51	30.3	36.7 B	28.2	43.0	6.89 U

TABLE F.34. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*N. virens* HPAHs (µg/g dry weight) Benzo(a)-pyrene	Indeno-(1,2,3-cd) pyrene	Dibenzo-(a,h) anthra-cene	Benzo-(g,h,i) perylene	1,4 Di-chloro-benzene
Arthur Kill Reach C								
COMP AK-C	1	1	15.09	8.99(a)	14.4 U	15.5 U	12.9 U	6.63 U
COMP AK-C	2	1	14.50	40.5 (a)	27.9	21.7 (a)	32.8	6.90 U
COMP AK-C	3	1	14.31	24.9 (a)	37.7	23.7 (a)	37.7	6.99 U
COMP AK-C	4	1	15.22	9.61(a)	14.3 U	15.4 U	19.1	6.57 U
COMP AK-C	5	1	14.89	9.36(a)	20.1	15.7 U	13.0 U	6.72 U
Port Elizabeth Reach A								
COMP PE-A	1	1	14.84	10.0 (a)	14.6 U	15.8 U	13.1 U	6.74 U
COMP PE-A	2	2	16.58	27.1 (a)B	29.2 B	23.2 (a)	29.5	6.03 U
COMP PE-A	3	2	14.91	30.3 (a)B	30.8(a)B	26.1	34.6	6.71 U
COMP PE-A	4	2	15.00	35.2 (a)B	33.1(a)B	25.5 (a)	36.0(a)	6.67 U
COMP PE-A	5	1	15.54	9.39(a)	14.8	15.1 U	12.5 U	6.44 U
Port Elizabeth Reach B								
COMP PE-B	1	2	15.59	49.2 B	33.0 B	24.4	36.0	6.41 U
COMP PE-B	2	2	13.67	54.7 B	36.6 B	28.2	42.4	7.32 U
COMP PE-B	3	3	14.55	48.5	18.6 U	20.1 U	27.9 B	6.87 U
COMP PE-B	4	1	15.12	12.9(a)	14.4 U	15.5 U	12.8 U	6.61 U
COMP PE-B	5	2	14.92	30.1(a)B	43.4 B	26.6(a)	16.2 U	6.70 U
Hackensack River Reach A								
COMP HR-A	1	2	15.33	133 B	49.1 B	29.2(a)	51.0	6.52 U
COMP HR-A	2	2	15.42	198	74.1 B	40.7	71.6	6.49 U
COMP HR-A	3	2	15.14	160	47.5 B	31.8	58.3	6.61 U
COMP HR-A	4	2	15.84	155	46.4 B	32.3	55.8	6.31 U
COMP HR-A	5	1	14.94	165	50.6	17.3	54.3	6.69 U
Reference								
Mud Dump Reference	1	2	15.88	27.7(a)B	28.4(a)B	18.4 U	15.2 U	6.30 U
Mud Dump Reference	2	2	15.09	29.6(a)B	28.5(a)B	19.4 U	28.2(a)	6.63 U
Mud Dump Reference	3	1	14.18	10.6(a)	15.3 U	16.5 U	13.7 U	7.05 U
Mud Dump Reference	4	1	14.43	10.6(a)	15.0 U	16.2 U	13.4 U	6.93 U
Mud Dump Reference	5	3	14.59	19.5	18.6 U	20.0 U	17.6(a)	6.85 U

TABLE F.34. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*N. virens* HPAHs (µg/g dry weight) Benzo(a)-pyrene	Indeno-(1,2,3-cd) pyrene	Dibenzo-(a,h) anthracene	Benzo-(g,h,i) perylene	1,4 Dichlorobenzene
Controls								
C-NR Replicate 1	1	3	15.13	22.8	21.5 U	23.2 U	19.2 U	6.61 U
C-NR Replicate 2	1	3	15.13	26.2(a)	25.1 U	27.0 U	22.4 U	6.61 U
C-NR Replicate 3	1	3	15.13	26.1	25.1 U	27.0 U	22.4 U	6.61 U
C-NR	2	3	14.47	27.0	26.3 U	28.3 U	23.4 U	6.91 U
C-NR	3	3	14.59	16.4	14.9 U	16.0 U	13.3 B	6.85 U
Background								
N. virens Background	1	3	14.52	19.6	18.7 U	20.1 U	16.7 U	6.89 U
N. virens Background	2	3	14.86	15.4(a)	18.2 U	19.7 U	16.3 U	6.73 U
N. virens Background	3	3	13.35	14.4(a)	16.3 U	17.5 U	14.5 U	7.49 U
N. virens Background	4	3	17.31	4.56 U	15.7 U	16.9 U	14.0 U	5.78 U
N. virens Background	5	3	17.89	13.0(a)	15.1 U	16.3 U	13.5 U	5.59 U
N. virens Background	6	3	16.65	13.5	13.0 U	14.1 U	11.7 U	6.01 U
N. virens Background	7	3	16.20	4.88 U	16.7 U	18.0 U	14.9 U	6.17 U

(a) Indicates ion ratio out or confirming ion not found.
(b) U Undetected at or above the detection limit shown.
(c) B Analyte detected at a concentration greater than 3 times the MDL in the method blank associated with the sample batch.

TABLE F.35. Quality Control Data for Low Molecular Weight Polynuclear Aromatic Hydrocarbons (LPAHs), Wet Weight, in Tissue of *N. virens*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	*N. virens* LPAHs (µg/g wet weight) Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene
Method Blank								
Blank	NA[a]	1	0.71[c]	0.66 U[b]	0.63 U	1.10 U	0.52 U	1.78 U
Blank	NA	2	2.18[c]	0.82 U	0.78 U	1.38 U	1.39[c]	2.23 U
Blank	NA	3	0.80	0.82 U	0.78 U	1.38 U	0.65 U	2.23 U
Matrix Spikes								
COMP MT-A	4	2	2.73[c]B[d]	2.32[c]	8.49	3.26	4.48 B	3.21
COMP MT-A MS		2	34.8	29.8	38.8	33.9	36.9	28.7
Concentration Recovered			32.0	27.4	30.3	30.6	32.4	25.5
Amount Spiked			32.8	31.4	33.9	32.5	32.6	24.7
Percent Recovery			98%	87%	89%	94%	99%	103%
COMP AK-C	5	1	1.68[c]B	1.55[c]	4.60	3.18	5.23	5.56
COMP AK-C MS		1	33.9	31.6	35.7	34.2	35.0	30.9
Concentration Recovered			32.3	30.0	31.1	31.0	29.7	25.4
Amount Spiked			35.5	34.0	36.7	35.1	35.3	26.7
Percent Recovery			91%	88%	85%	88%	84%	95%
C-NR	2	3	1.80[c]B	1.15 U	2.51[c]	1.93 U	2.50[c]	3.12 U
C-NR MS		3	46.5	41.6	45.8	43.9	48.7	39.7
Concentration Recovered			44.7	41.6	43.3	43.9	46.2	39.7
Amount Spiked			43.9	42.0	45.4	43.5	43.7	33.1
Percent Recovery			102%	99%	95%	101%	106%	120%
Standard Reference Material								
Certified Value			NC[e]	NC	NC	NC	5.6 ±1.4	0.75 ±0.21
SRM 1974		1	2.47[c]B	2.08[c]	2.10[c]	3.45	5.69	4.92[f]
SRM 1974		2	2.98 B	2.75[c]	2.50[c]	2.92[c]	6.05 B	4.35[f]
SRM 1974		3	2.40 B	1.70[c]	1.53[c]	1.72[c]	5.97	3.88[f]

TABLE F.35. (contd)

Sediment Treatment	Replicate	Batch	*N. virens* LPAHs (µg/g wet weight) Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene
Analytical Triplicates								
COMP AK-A Replicate 1	5	2	1.58(c)B	1.76(c)	2.92(c)	1.96	3.58 B	3.92
COMP AK-A Replicate 2	5	2	1.17(c)B	1.50(c)	3.05	1.90(c)	3.50 B	4.26
COMP AK-A Replicate 3	5	2	1.23(c)B	1.53(c)	3.11	1.90	3.47 B	4.04
RSD			14%	7%	3%	1%	1%	3%
COMP AK-B Replicate 1	4	1	3.55(c)B	3.16(c)	5.19	4.23(c)	6.52	6.72
COMP AK-B Replicate 2	4	1	2.99(c)B	2.83(c)	4.50	3.89	5.81	5.90
COMP AK-B Replicate 3	4	1	3.33(c)B	3.19(c)	5.02	4.44	6.64	6.77
RSD			7%	5%	6%	5%	6%	6%
C-NR Replicate 1	1	3	2.01(c)B	0.99 U	2.80(c)	1.69	2.40(c)	2.67 U
C-NR Replicate 2	1	3	2.41(c)B	1.15 U	3.31(c)	2.00	2.85	3.12 U
C-NR Replicate 3	1	3	2.60 B	1.15 U	3.58(c)	1.99	2.88	3.12 U
RSD			11%	NA	10%	7%	8%	NA

(a) NA Not applicable.
(b) U Undetected at or above the detection limit shown.
(c) Indicates ion ratio out or confirming ion not found.
(d) B Analyte detected at a concentration greater than 3 times the MDL in the method blank associated with the sample batch.
(e) NC Not certified.
(f) Outside SRM range for QC criteria (±30%).

TABLE F.36. Quality Control Data for High Molecular Weight Polynuclear Aromatic Hydrocarbons (HPAHs) (Elution Order Fluoranthene - Benzo(k)fluoranthene), Wet Weight, in Tissue of *N. virens*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	*N. virens* HPAHs (µg/g wet weight) Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene
Method Blank								
Blank		1	1.32 U[a]	0.94 U[b]	1.88[b]	0.52 U	0.22 U[b]	0.66 U[b]
Blank		2	3.71 [b]	3.16 [b]	3.39[b]	0.65 U	4.79 [b]	7.43 [b]
Blank		3	1.64 U	1.18 U	2.41[b]	0.65 U	0.28 U	0.82 U
Matrix Spikes								
COMP MT-A	4	2	29.3	31.0	5.05 B[c]	13.5	6.60[b]B	5.50[b]B
COMP MT-A MS		2	56.5	57.5	29.5	39.7	32.8	30.7
Concentration Recovered			27.3	26.5	24.5	26.2	26.2	25.2
Amount Spiked			32.8	32.7	28.4	32.9	32.8	32.5
Percent Recovery			83%	81%	86%	80%	80%	78%
COMP AK-C	5	1	17.6	15.4	5.18 B	14.1	4.98	3.58[b]
COMP AK-C MS		1	50.9	45.7	37.6	41.8	36.4	31.9
Concentration Recovered			33.3	30.2	32.4	27.7	31.4	28.3
Amount Spiked			35.5	35.4	30.7	35.6	35.5	35.2
Percent Recovery			94%	85%	105%	78%	89%	80%
C-NR	2	3	2.59[b]	1.65 U	3.75[b]B	0.91 U	0.39 U	1.15 U
C-NR MS		3	49.4	44.2	47.3	41.8	52.1	48.0
Concentration Recovered			46.8	44.2	43.6	41.8	52.1	48.0
Amount Spiked			43.9	43.8	38.0	44.0	43.9	43.5
Percent Recovery			107%	101%	115%	95%	119%	110%
Standard Reference Material								
Certified Values			33.6 ±5.8	34.1 ±3.7	NC[d]	NC	6.5 ±1.2	NC
SRM 1974		1	32.8	28.0	6.48 B	13.0	9.77[e]	4.79
SRM 1974		2	28.5	26.9	7.20 B	15.5	10.2[e]B	6.55 B
SRM 1974		3	25.6	23.0[e]	6.24 B	13.4	10.4[e]	5.24

TABLE F.36. (contd)

Sediment Treatment	Replicate	Batch	*N. virens* HPAHs (µg/g wet weight) Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene
Analytical Triplicates								
COMP AK-A Replicate 1	5	2	16.2 B	17.5	4.58 B	14.5	6.77[b]B	4.72[b]B
COMP AK-A Replicate 2	5	2	18.5 B	19.4	4.83 B	14.6	6.85[b]B	5.24[b]B
COMP AK-A Replicate 3	5	2	17.1 B	18.3	4.60 B	14.3	6.81[b]B	5.34[b]B
RSD			5%	4%	2%	1%	0%	5%
COMP AK-B Replicate 1	4	1	18.1	19.2	6.98	16.8	8.59[b]	17.1[b]
COMP AK-B Replicate 2	4	1	16.6	17.5	6.23	15.3	7.55[b]	15.6[b]
COMP AK-B Replicate 3	4	1	18.2	19.4	7.18	17.0	8.67[b]	7.52[b]
RSD			4%	5%	6%	5%	6%	31%[f]
C-NR Replicate 1	1	3	2.58[b]	1.42 U	3.11[b]B	1.32[b]	0.33 U	0.99 U
C-NR Replicate 2	1	3	2.93[b]	1.65 U	3.68[b]B	1.55[b]	0.39 U	1.15 U
C-NR Replicate 3	1	3	3.01[b]	1.65 U	3.56[b]B	1.55[b]	0.39 U	1.15 U
RSD			7%	NA[g]	7%	7%	NA	NA

(a) U Undetected at or above the detection limit shown.
(b) Indicates ion ratio out or confirming ion not found.
(c) B Analyte detected at a concentration greater than 3 times the MDL in the method blank associated with the sample batch.
(d) NC Not certified.
(e) Outside SRM range for QC criteria (±30%).
(f) Outside RSD range for QC criteria (±30%).
(g) NA Not applicable.

TABLE F.37. Quality Control Data for High Molecular Weight Polynuclear Aromatic Hydrocarbons (HPAHs)(Elution Order Benzo(a)pyrene - 1,4 Dichlorobenzene), Wet Weight, in Tissue of *N. virens*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	*N. virens* HPAHs (µg/g wet weight) Benzo(a)-pyrene	Indeno-(1,2,3-cd) pyrene	Dibenzo-(a,h) anthra-cene	Benzo-(g,h,i) perylene	1,4 Di-chloro-benzene
Method Blank							
Blank		1	0.63 U[a]	2.17 U	2.34 U	1.94 U	1.0 U
Blank		2	4.61 [b]	4.32 [b]	2.92 U	2.42 U	1.0 U
Blank		3	0.79 U	2.71 U	2.92 U	2.66 [b]	1.0 U
Matrix Spikes							
COMP MT-A	4	2	4.55[b]B[c]	4.90 B	3.67[b]	5.18	1.0 U
COMP MT-A MS		2	30.3	32.4	28.4	30.4	14.1[b]
Concentration Recovered			25.7	27.5	24.7	25.3	13.1
Amount Spiked			29.5	29.0	24.5	29.2	24.8
Percent Recovery			87%	95%	101%	87%	53%
COMP AK-C	5	1	1.39[b]	2.99	2.34 U	1.94 U	1.0 U
COMP AK-C MS		1	30.6	29.9	23.9	28.5	27.7[b]
Concentration Recovered			29.2	26.9	23.9	28.5	26.7
Amount Spiked			31.9	31.3	26.5	31.5	26.9
Percent Recovery			92%	86%	90%	90%	99%
C-NR	2	3	3.91	3.80 U	4.09 U	3.39 U	1.0 U
C-NR MS		3	43.0	40.9	32.2	38.1	36.9
Concentration Recovered			39.1	40.9	32.2	38.1	35.9
Amount Spiked			39.5	38.8	32.8	39.1	33.3
Percent Recovery			99%	105%	98%	98%	108%
Standard Reference Material							
Certified Values			2.29 ±0.47	1.80 ±0.33	NC[d]	2.47 ±0.28	NC
SRM 1974		1	1.84[b]	2.74[e]	2.92 U	3.41[e]	1.0 U
SRM 1974		2	5.32[e]B	5.88[e]	3.81	6.24[e]	1.0 U
SRM 1974		3	3.44[e]	3.67[e]	2.34 U	3.87[e]B	1.0 U

TABLE F.37 . (contd)

Sediment Treatment	Replicate	Batch	*N. virens* HPAHs (µg/g wet weight) Benzo(a)-pyrene	Indeno-(1,2,3-cd) pyrene	Dibenzo-(a,h) anthra-cene	Benzo-(g,h,i) perylene	1,4 Di-chloro-benzene
Analytical Triplicates							
COMP AK-A Replicate 1	5	2	3.13(b)B	3.20(b)B	2.92 U	4.07	1.0 U
COMP AK-A Replicate 2	5	2	2.74(b)B	5.70 B	2.92 U	2.42 U	1.0 U
COMP AK-A Replicate 3	5	2	2.74(b)B	3.47 B	2.92 U	4.78	1.0 U
RSD			6%	27%(f)	NA(g)	NA	NA
COMP AK-B Replicate 1	4	1	6.48(b)	6.52(b)	5.04(b)	6.85	1.0 U
COMP AK-B Replicate 2	4	1	5.47(b)	7.59(b)	4.49(b)	6.83	1.0 U
COMP AK-B Replicate 3	4	1	6.35(b)	7.01	5.21(b)	6.90	1.0 U
RSD			7%	6%	6%	0%	NA
C-NR Replicate 1	1	3	3.45	3.26 U	3.51 U	2.90 U	1.0 U
C-NR Replicate 2	1	3	3.96(b)	3.80 U	4.09 U	3.39 U	1.0 U
C-NR Replicate 3	1	3	3.96	3.80 U	4.09 U	3.39 U	1.0 U
RSD			6%	NA	NA	NA	NA

(a) U Undetected at or above the detection limit shown.
(b) Indicates ion ratio out or confirming ion not found.
(c) B Analyte detected at a concentration greater than 3 times the MDL in the method blank associated with the sample batch.
(d) NC Not certified.
(e) Outside SRM range for QC criteria (±30%).
(f) Outside RSD range for QC criteria (±30%).
(g) NA Not applicable.

TABLE F.38. Surrogate Percent Recoveries for Polynuclear Aromatic Hydrocarbons (PAHs), Including Quality Control Data, in Tissue of *N. virens*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Surrogate Percent Recoveries				
			Naptha-lene d8	Acenaph-thene d10	Chrysene d12	Perylene d12	1,4 Dichloro-benzene d4
MOTBY Reach A							
COMP MT-A	1	1	78	89	102	76	63
COMP MT-A	2	1	64	71	79	77	52
COMP MT-A	3	3	72	78	83	72	71
COMP MT-A	4	2	63	68	77	64	54
COMP MT-A	5	1	55	58	65	61	48
MOTBY Reach B							
COMP MT-B	1	3	67	73	84	75	66
COMP MT-B	2	1	58	66	74	69	49
COMP MT-B	3	3	60	68	79	71	56
COMP MT-B	4	3	67	75	90	74	64
COMP MT-B	5	1	70	76	87	84	59
Arthur Kill Reach A							
COMP AK-A	1	1	64	74	87	64	52
COMP AK-A	2	2	51	63	76	60	41
COMP AK-A	3	2	65	71	81	64	64
COMP AK-A	4	1	66	75	83	79	54
COMP AK-A Replicate 1	5	2	49	54	65	49	46
COMP AK-A Replicate 2	5	2	71	83	93	77	66
COMP AK-A Replicate 3	5	2	78	87	98	78	75
Arthur Kill Reach B							
COMP AK-B	1	2	63	78	96	71	48
COMP AK-B	2	2	74	83	97	86	63
COMP AK-B	3	1	66	73	82	75	55
COMP AK-B Replicate 1	4	1	72	81	88	68	61
COMP AK-B Replicate 2	4	1	73	83	95	71	61
COMP AK-B Replicate 3	4	1	69	77	90	68	58
COMP AK-B	5	2	82	90	98	89	69
Arthur Kill Reach C							
COMP AK-C	1	1	68	76	89	83	56
COMP AK-C	2	1	61	67	76	58	51
COMP AK-C	3	1	75	85	97	70	63
COMP AK-C	4	1	63	71	77	74	52
COMP AK-C	5	1	69	74	86	78	62
Port Elizabeth Reach A							
COMP PE-A	1	1	62	68	79	70	51
COMP PE-A	2	2	64	73	84	67	51
COMP PE-A	3	2	58	62	71	60	49
COMP PE-A	4	2	24	28	32	31	20
COMP PE-A	5	1	68	77	85	78	55

TABLE F.38. (contd)

Sediment Treatment	Replicate	Batch	Surrogate Percent Recoveries: Naphthalene d8	Acenaphthene d10	Chrysene d12	Perylene d12	1,4 Dichlorobenzene d4
Port Elizabeth Reach B							
COMP PE-B	1	2	43	47	54	50	38
COMP PE-B	2	2	66	77	97	71	51
COMP PE-B	3	3	63	70	79	69	63
COMP PE-B	4	1	57	63	71	66	49
COMP PE-B	5	2	59	64	70	64	50
Hackensack River Reach A							
COMP HR-A	1	2	79	87	95	87	67
COMP HR-A	2	2	43	46	50	46	39
COMP HR-A	3	2	41	44	48	44	36
COMP HR-A	4	2	63	69	74	70	54
COMP HR-A	5	1	58	63	72	65	49
Reference							
Mud Dump Reference	1	2	76	85	90	87	63
Mud Dump Reference	2	2	80	85	90	86	70
Mud Dump Reference	3	1	69	76	88	81	61
Mud Dump Reference	4	1	65	72	79	76	54
Mud Dump Reference	5	3	63	68	72	73	62
Controls							
C-NR Replicate 1	1	3	61	68	77	71	59
C-NR Replicate 2	1	3	62	67	73	72	62
C-NR Replicate 3	1	3	63	69	74	71	61
C-NR	2	3	68	75	79	76	68
C-NR	3	3	54	59	62	58	54
Background							
N. virens Background	1	3	69	73	72	71	71
N. virens Background	2	3	65	70	77	67	67
N. virens Background	3	3	73	79	85	74	74
N. virens Background	4	3	72	77	81	70	73
N. virens Background	5	3	63	69	69	70	63
N. virens Background	6	3	66	72	71	73	66
N. virens Background	7	3	66	70	72	74	65
Quality Control Data							
Method Blanks							
Blank		1	85	87	96	94	77
Blank		2	62	67	77	61	54
Blank		3	81	83	84	93	83

TABLE F.38. (contd)

Sediment Treatment	Replicate	Batch	Surrogate Percent Recoveries				
			Naptha-lene d8	Acenaph-thene d10	Chrysene d12	Perylene d12	1,4 Dichloro-benzene d4
Matrix Spikes							
COMP MT-A	4	2	63	68	77	64	54
COMP MT-A MS		2	34	38	45	39	30
COMP AK-C	5	1	69	74	86	78	62
COMP AK-C MS		1	67	73	82	78	58
C-NR	2	3	68	75	79	76	68
C-NR MS		3	58	66	74	69	56
Standard Reference Material							
SRM 1974		1	69	76	89	82	59
SRM 1974		2	61	74	93	81	48
SRM 1974		3	62	72	97	72	59
Analytical Triplicates							
COMP AK-A Replicate 1	5	2	49	54	65	49	46
COMP AK-A Replicate 2	5	2	71	83	93	77	66
COMP AK-A Replicate 3	5	2	78	87	98	78	75
COMP AK-B Replicate 1	4	1	72	81	88	68	61
COMP AK-B Replicate 2	4	1	73	83	95	71	61
COMP AK-B Replicate 3	4	1	69	77	90	68	58
C-NR Replicate 1	1	3	61	68	77	71	59
C-NR Replicate 2	1	3	62	67	73	72	62
C-NR Replicate 3	1	3	63	69	74	71	61

TABLE F.39. Lipids in Tissue of *N. virens*, Dry Weight, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Percent Dry Weight
Method Blank	1	1	ND[a]
N. virens Background	1	1	9.30
N. virens Background	1	1	8.00
N. virens Background	1	1	7.70

(a) ND No data.

APPENDIX G

Macoma nasuta Tissue Chemical Analyses

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects

PARAMETER: Metals

LABORATORY: Battelle/Marine Sciences Laboratory, Sequim, Washington

MATRIX: Clams (*Macoma nasuta*)

QA/QC DATA QUALITY OBJECTIVES

	Reference Method	Range of Recovery	SRM Accuracy	Relative Precision	Detection Limit (dry wt)
Arsenic	ICP/MS	75-125%	≤20%	≤20%	1.0
Cadmium	ICP/MS	75-125%	≤20%	≤20%	0.1
Chromium	ICP/MS	75-125%	≤20%	≤20%	0.2
Copper	ICP/MS	75-125%	≤20%	≤20%	1.0
Lead	ICP/MS	75-125%	≤20%	≤20%	0.1
Mercury	CVAA	75-125%	≤20%	≤20%	0.02
Nickel	ICP/MS	75-125%	≤20%	≤20%	0.1
Silver	ICP/MS	75-125%	≤20%	≤20%	0.1
Zinc	ICP/MS	75-125%	≤20%	≤20%	1.0

METHOD

Nine metals were analyzed for the New York Federal Project: silver (Ag), arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), mercury (Hg), nickel (Ni), lead (Pb) and zinc (Zn). Hg was analyzed using cold-vapor atomic absorption spectroscopy (CVAA) according to the EPA Method 24.5.5 (EPA 1991). The remaining metals were analyzed by inductively coupled plasma mass spectrometry (ICP/MS), following a procedure based on EPA Method 200.8 (EPA 1991)

To prepare tissue for analysis, samples were freeze-dried and blended in a Spex mixer-mill. Approximately 5 g of mixed sample was ground in a ceramic ball mill. For ICP/MS and CVAA analyses, 0.2- to 0.5-g aliquots of dried homogenous sample were digested using a mixture of nitric acid and hydrogen peroxide, following EPA Method 200.3 (EPA 1991). Samples were digested in three batches. Batches 1 and 2 were digested and analyzed together. Batch 3 consisted of the re-analysis of Comp AK-A, Rep. 5, and the method detection limit (MDL) verification samples. All QC samples were analyzed with each batch.

HOLDING TIMES

A total of 41 tissue samples was received on 6/04/93 in good condition. Samples were logged into Battelle's log-in system, frozen to -80°C, and subsequently freeze-dried within approximately 7 days of sample receipt. Samples were all analyzed within 180 days of collection. The following table summarizes all analysis dates:

Task	Date Performed
Sample Digestion	8/20/93
ICP-MS	10/28/93
CVAA-Hg	11/09/93

QA/QC SUMMARY/METALS (contd)

DETECTION LIMITS

Four samples of a background *Macoma* sample were analyzed as four separate replicates. The standard deviation of these results were multiplied by 3.5 to determine an MDL. Target detection limits were met for all metals, with the exception of Cr, Ni, Pb and Zn. These metals were detected above the MDLs in all samples; therefore, no corrective actions were necessary.

METHOD BLANKS

A total of 4 method blanks was analyzed. Levels detected were all at or below the target detection limits with the exception of Ni in one of the blanks. Ni was not detected in any of the other blanks. All data are corrected for the average of the four blank concentrations.

MATRIX SPIKES

Three samples were spiked with all nine metals. All recoveries were within the QC limits of 75%-125%, with the exception of Ag at 69% in one of the three spiked samples. Since Ag values for the other two spikes were acceptable, no further action was taken.

REPLICATES

Two samples were digested in triplicate; however, one of the triplicates for batch 1 was lost. Since a set of four replicates was analyzed as an MDL verification study with these samples, this set of triplicates was not re-analyzed. Results for the remaining two replicates are reported, and precision for these samples is reported as the relative percent difference (RPD). Precision for triplicate analyses is reported by calculating the relative standard deviation (RSD) between the replicate results. RSD and RPD values were all within the QC limits of ±20%, indicating good precision.

SRMs

SRM 1566a (Oyster tissue from the National Institute of Standards and Technology [NIST]), was analyzed for all metals. Results for all metals were within ±20 % of mean certified value, with the exception of Ag in three of the four SRMs analyzed. Values were just below the lower control limit.

REFERENCES

Bloom, N. S., and E.A. Crecelius. 1983. "Determination of Mercury in Seawater at Sub-Nanogram per Liter Levels." Mar. Chem. 14:49-59.

EPA (U.S. Environmental Protection Agency). 1991 *Methods for the Determination of Metals in Environmental Samples.* EPA-600/4-91-010. U.S. Environmental Protection Agency, Office of Research and Development, Washington, D.C.

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects

PARAMETER: Chlorinated Pesticides

LABORATORY: Battelle/Marine Sciences Laboratory, Sequim, Washington

MATRIX: Clams (*Macoma nasuta*)

QA/QC DATA QUALITY OBJECTIVES

Reference Method	Surrogate Recovery	Spike Recovery	Relative Precision	Detection Limit
GC/ECD	30-150%	50-120%	≤30%	0.4 ng/g

SAMPLE CUSTODY Forty-one *Macoma* clam samples were received on 6/4/93 in good condition. Samples were logged into Battelle's log-in system and stored frozen until extraction.

METHOD Tissues were homogenized wet using a stainless-steel blade. An aliquot of tissue sample was extracted with methylene chloride using the roller technique under ambient conditions, following a procedure based on methods used by the National Oceanic and Atmospheric Administration for the Status and Trends Program (Krahn et al. 1988). Samples were then cleaned using silica/alumina (5% deactivated) chromatography followed by high performance liquid chromatography (HPLC) cleanup (Krahn et al. 1988). Extracts were analyzed for 15 chlorinated pesticides using gas chromatography/electron capture detection (GC/ECD) following a procedure based on EPA Method 8080 (EPA 1986). The column used was a J&W DB-17, and the confirmatory column was a DB-1701, both capillary columns (30m x 0.25mm I.D.).

HOLDING TIMES Samples were extracted in two batches: 7/21 and 7/29/93. Extracts were analyzed by GC/ECD. Samples from batch 1 were analyzed on 8/20/93, batch 2 was analyzed on 8/24-8/26/93, within the established holding time of 40 days.

DETECTION LIMITS Target detection limits were met for all pesticides. Actual method detection limits (MDLs) ranged from 0.06 to 0.25 μg/kg wet weight, depending on the pesticide compound. MDLs were reported corrected for average sample wet weight extracted for each extraction batch. MDLs were determined by multiplying the standard deviation of seven spiked replicates of *Macoma* tissue by the Student's t value.

METHOD BLANKS One method blank was extracted with each extraction batch for a total of two method blanks. No pesticides were detected above the MDL in any of the method blanks.

SURROGATES Two compounds, PCB congeners 103 and 198, were added to all samples prior to extraction to assess the efficiency of the analysis. Sample surrogate recoveries were all within the QC guidelines of 30%-150%, with the exception of one sample with surrogate recoveries of 29% and 27%, respectively.

QA/QC SUMMARY/CHLORINATED PESTICIDES (contd)

MATRIX SPIKES Ten out of the 15 pesticides analyzed were spiked into one sample per extraction batch. Matrix spike recoveries were within the control limit range of 50%-120%.

REPLICATES One sample from each extraction batch was analyzed in triplicate. Precision was measured by calculating the relative standard deviation (RSD) between the replicate results. No pesticide was detected in any of the three replicates; therefore, no RSDs could be calculated.

SRMs SRM 1974, a mussel tissue obtained from the National Institute for Standards and Technology (NIST), was analyzed with each batch. Only 9 out of the 15 pesticides have values reported by NIST, and of these, three of them are less than 10 times the MDL. Concentrations of α-chlordane, trans-nonachlor, 2,4'-DDD, and 4,4'-DDD were out of control in at least one of the two SRMs. However, all values are within 50% of the certified value.

MISCELLANEOUS

4,4'-DDT coelutes with PCB congener 187 on the primary column and with PCB congener 138 on the confirmation column. For this reason, it is possible to get false positive hits for 4,4'-DDT. All DDT results for samples with both DDT and congener 187 and 138 detections are flagged with an "I" to indicate that there is coelution and that the values may be either false positives and/or biased high due to interference.

REFERENCES

Krahn, M. M., C. A. Wigren, R. W. Pearce, L. K. Moore, R. G. Bogar, W. D. MacLeod, Jr., S.-L. Chan, and D. W. Brown. 1988. *New HPLC Cleanup and Revised Extraction Procedures for Organic Contaminants.* NOAA Technical Memorandum NMFS F/NWC-153, Seattle, Washington.

EPA (U.S. Environmental Protection Agency). 1986. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods.* SW-846. U.S. Document No. 955-001-00000, U.S. Environmental Protection Agency, Washington D.C.

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects

PARAMETER: PCB Congeners

LABORATORY: Battelle/Marine Sciences Laboratory, Sequim, Washington

MATRIX: Clams (*Macoma nasuta*)

QA/QC DATA QUALITY OBJECTIVES

Reference Method	Surrogate Recovery	Spike Recovery	Relative Precision	Detection Limit
GC/ECD	30-150%	50-120%	≤30%	0.4 ng/g

SAMPLE CUSTODY Forty-one *Macoma* clam samples were received on 6/4/93 in good condition. Samples were logged into Battelle's log-in system and stored frozen until extraction.

METHOD Tissues were homogenized wet using a stainless-steel blade. An aliquot of tissue sample was extracted with methylene chloride using the roller technique under ambient conditions, following a procedure based on methods used by the National Oceanic and Atmospheric Administration for the Status and Trends Program (Krahn et al. 1988). Samples were then cleaned using silica/alumina (5% deactivated) chromatography followed by high performance liquid chromatography (HPLC) cleanup (Krahn et al. 1988). Extracts were analyzed for 22 PCB congeners using gas chromatography/electron capture detection (GC/ECD) following a procedure based on EPA Method 8080 (EPA 1986). The column used was a J&W DB-17, and the confirmatory column was a DB-1701, both capillary columns (30m x 0.25mm I.D.).

HOLDING TIMES Samples were extracted in two batches: 7/21 and 7/29/93. Extracts were analyzed by GC/ECD. Samples from batch 1 were analyzed on 8/20/93, batch 2 was analyzed on 8/24-8/26/93, within the established holding time of 40 days.

DETECTION LIMITS Target detection limits were met for PCB congeners in tissues. Actual method detection limits (MDLs) ranged from 0.09 to 0.43 μg/kg wet weight, depending on the congener. MDLs were reported corrected for average sample wet weight extracted for each extraction batch. MDLs were determined from multiplying the standard deviation of seven spiked replicates of *Macoma* tissue by the Student's t value.

METHOD BLANKS One method blank was extracted with each extraction batch for a total of two method blanks. No pesticides were detected above the MDL in any of the method blanks.

SURROGATES Two compounds, PCB congeners 103 and 198, were added to all samples prior to extraction to assess the efficiency of the analysis. Sample surrogate recoveries were all within the QC guidelines of 30%-150% with the exception of one sample, with surrogate recoveries of 29% and 27%, respectively.

QA/QC SUMMARY/PCB CONGENERS (contd)

MATRIX SPIKES

Five out of the 19 congeners analyzed were spiked in to one sample per extraction batch. All matrix spike recoveries within the control limit range of 50%-120% with the exception of PCB 28 in batch 2. However, greater than 80% of the recoveries were within the QC limits; therefore no corrective action was taken.

REPLICATES

One sample from each extraction batch was analyzed in triplicate. Precision was measured by calculating the relative standard deviation (RSD) between the replicate results. No congener was detected in any of the three replicates; therefore, no RSDs were calculated.

SRMs

SRM 1974, a mussel tissue obtained from the National Institute for Standards and Technology (NIST) was analyzed with each batch. Only 13 out of the 19 congeners have noncertified values reported by NIST. Values for both replicates for 11 out of these 13 congeners were within ±30% of the noncertified values. Values for two of the congeners exceeded the target limits by up to 50%; however, values obtained for these congeners were reproducible between the replicates.

MISCELLANEOUS

All congener results were confirmed using a second dissimilar column. Results for each column must be within a factor of 2 of each other to be considered a confirmed value.

REFERENCES

Krahn, M. M., C. A. Wigren, R. W. Pearce, L. K. Moore, R. G. Bogar, W. D. MacLeod, Jr., S.-L. Chan, and D. W. Brown. 1988. *New HPLC Cleanup and Revised Extraction Procedures for Organic Contaminants.* NOAA Technical Memorandum NMFS F/NWC-153, Seattle, Washington.

EPA (U.S. Environmental Protection Agency). 1986. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods.* SW-846. U.S. Document No. 955-001-00000, U.S. Environmental Protection Agency, Washington D.C.

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects

PARAMETER: Polynuclear Aromatic Hydrocarbons (PAH) and 1,4-Dichlorobenzene

LABORATORY: Battelle/Marine Sciences Laboratory, Sequim, Washington

MATRIX: Clams (*Macoma nasuta*)

QA/QC DATA QUALITY OBJECTIVES

Reference Method	MS Recovery	Surrogate Recovery	SRM Accuracy	Relative Precision	Detection Limit (wet wt)
GC/MS/SIM	50-120%	30-150%	≤30%	≤30%	4 ng/g

METHOD

Tissue samples were extracted with methylene chloride using a roller under ambient conditions following a procedure based on methods used by the National Oceanic and Atmospheric Administration for the Status and Trends Program (Krahn et al. 1988). Samples were then cleaned using sSilica/alumina (5% deactivated) chromatography followed by high performance liquid chromatography (HPLC) cleanup.

Extracts were quantified using gas chromatography/mass spectrometry (GC/MS) in the selected ion mode (SIM) following a procedure based on EPA Method 8270 (EPA 1986).

HOLDING TIMES

Forty-one samples were received on 6/04/93 in good condition. Samples were logged into Battelle's log-in system and stored at approximately -20° C until extraction. The following summarizes the extraction dates and GC/MS/SIM analysis dates:

Batch	Extraction	Analysis
Batch 1	7/21/93	8/28/93
Batch 2	7/29/93	8/31/93

DETECTION LIMITS

Target detection limits of 4 ng/g wet wt were met for all PAH compounds. Achieved detection limits were determined by multiplying the standard deviation of seven spiked replicates by the Student's t value.

METHOD BLANKS

One method blank was extracted with each extraction batch. Six (6) out of the 12 PAHs were detected in at least one of the method blanks analyzed. Although the concentration of some of the PAHs in the blanks were greater than three times the method detection limit (MDL), the values were all less than the target MDL of 4 ng/g wet wt. Any sample values that were less than five times the value of the method blank associated with that blank were flagged with a "B."

SURROGATES

Five isotopically labeled compounds were added prior to extraction to assess the efficiency of the method. These were d8-naphthalene, d8-acenaphthene, d12-chrysene, d10-pyrene and d4-1,4 dichlorobenzene. Recoveries of all surrogates were within the quality

control limits of 30%-150% with the exception of one sample that had recoveries ranging from 19% to 29%. Due to limited sample quantities, no re-extraction was possible.

MATRIX SPIKES

One sample from each batch was spiked with all PAH compounds. Matrix spike recoveries for all compounds in all spikes were within QC limits of 50%-120%.

REPLICATES

One sample from each batch was extracted and analyzed in triplicate. Precision was measured by calculating the relative standard deviation (RSD) between the replicate results. The RSDs were $\leq$30% for analytes greater than 10 times the MDL, except for pyrene in both batches (RSD of 32% and 31%, respectively).

SRMs

SRM 1974, a marine mussel tissue obtained by the National Institute for Science and Technology, was analyzed with each batch. Eight of the 16 PAH compounds analyzed are certified. All PAHs were detected within 30% of the certified mean, with the exception of anthracene, benzo(b)fluoranthene, benzo(a)pyrene, indeno(123)pyrene and benzo(ghi)perylene in one or both batches.

MISCELLANEOUS

Some of the compounds are flagged with * to indicate that the ion ratio was outside of the QC range. This is due primarily to low levels of the compound of interest. Because the confirmation ion is present at only a fraction of the level of the parent ion, when the native level of the compound is low, the amount of error in the concentration measurement of the confirmation ion increases. The compound is quantified only from the parent ion; therefore, this will not likely affect the quality of the data. For sample values that are relatively high (>5 times the MDL), it may be an indication of some sort of interference.

REFERENCES

Krahn, M. M., C. A. Wigren, R. W. Pearce, L. K. Moore, R. G. Bogar, W. D. MacLeod, Jr., S.-L. Chan, and D. W. Brown. 1988. *New HPLC Cleanup and Revised Extraction Procedures for Organic Contaminants.* NOAA Technical Memorandum NMFS F/NWC-153, Seattle, Washington.

EPA (U.S. Environmental Protection Agency). 1986. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods.* SW-846. U.S. Document No. 955-001-00000, U.S. Environmental Protection Agency, Washington D.C.

TABLE G.1. Metals, Wet Weight, in Tissue of *M. nasuta*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* Metals (mg/kg wet weight) Ag ICP/MS	As ICP/MS	Cr ICP/MS	Cd ICP/MS	Cu ICP/MS	Hg CVAA	Ni ICP/MS	Pb ICP/MS	Zn ICP/MS
Aurthur Kill Reach A												
Comp AK-A	1	1	13.54	0.0306	2.87	0.493	0.0520	2.54	0.0253	0.531	0.757	10.6
Comp AK-A	2	2	13.14	0.0245	2.70	0.616	0.0422	2.25	0.0268	0.767	0.951	10.6
Comp AK-A	3	2	13.61	0.0445	3.45	0.723	0.0419	3.41	0.0354	0.523	1.21	13.7
Comp AK-A	4	2	14.41	0.0293	2.71	0.473	0.0331	2.28	0.0229	0.424	0.722	13.3
Comp AK-A	5	3	13.73	0.0213	2.85	0.387	0.0324	1.91	0.0224	0.371	0.592	11.5
Aurthur Kill Reach B												
Comp AK-B	1	1	15.11	0.0204	4.35	0.461	0.0468	2.06	0.0326	0.453	0.606	18.9
Comp AK-B	2	1	12.15	0.0197	2.55	0.277	0.0305	1.72	0.0192	0.334	0.458	11.7
Comp AK-B	3	1	14.88	0.0153	3.90	0.280	0.0412	1.58	0.0176	0.376	0.412	14.7
Comp AK-B	4	1	15.39	0.0163	3.92	0.229	0.0332	1.68	0.0179	0.477	0.395	12.0
Comp AK-B	5	1	16.48	0.0216	3.69	0.428	0.0432	2.18	0.0311	0.483	0.598	15.6
Aurthur Kill Reach C												
Comp AK-C	1	1	15.89	0.0205	4.18	0.432	0.0388	2.74	0.0256	0.402	0.748	13.3
Comp AK-C	2	1	15.12	0.0233	4.38	0.366	0.0423	2.53	0.0249	0.494	0.788	13.4
Comp AK-C	3	1	14.72	0.0255	4.37	0.308	0.0322	2.49	0.0183	0.325	0.625	13.0
Comp AK-C	4	2	13.30	0.0185	3.11	0.235	0.0283	1.83	0.0152	0.346	0.786	9.75
Comp AK-C	5	2	14.21	0.0171	2.92	0.433	0.0428	2.45	0.0284	0.490	0.708	14.6
Port Elizabeth Reach A												
Comp PE-A	1	1	15.83	0.0416	3.31	0.822	0.0469	2.98	0.0275	0.537	1.54	16.1
Comp PE-A	2	1	15.37	0.0346	3.09	0.639	0.0413	2.31	0.0206	0.449	1.22	12.8
Comp PE-A	3	2	15.26	0.0378	3.08	0.818	0.0404	2.98	0.0241	0.534	1.46	12.2
Comp PE-A Replicate 1	4	2	15.04	0.0271	3.29	0.552	0.0367	2.23	0.0171	0.466	1.10	13.0
Comp PE-A Replicate 1	4	2	15.04	0.0283	3.29	0.534	0.0335	2.17	0.0193	0.465	1.06	12.9
Comp PE-A Replicate 1	4	2	15.04	0.0268	3.25	0.550	0.0352	2.14	0.0197	0.460	1.12	12.7
Comp PE-A	5	1	17.28	0.0347	3.38	1.01	0.0550	2.79	0.0349	0.560	1.74	16.3
Port Elizabeth Reach B												
Comp PE-B	1	1	17.79	0.0384	3.32	0.873	0.0450	3.16	0.0363	0.608	1.39	14.0
Comp PE-B	2	2	17.17	0.0325	4.84	0.725	0.0396	2.50	0.0268	0.587	1.06	14.7
Comp PE-B	3	2	14.99	0.0330	2.85	0.726	0.0468	2.52	0.0282	0.604	1.03	15.1
Comp PE-B	4	1	13.24	0.0234	2.69	0.610	0.0354	2.11	0.0262	0.442	0.867	11.3
Comp PE-B	5	1	15.30	0.0376	3.34	0.745	0.0493	2.73	0.0312	0.601	1.05	15.9

TABLE G.1. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* Metals (mg/kg wet weight) Ag ICP/MS	As ICP/MS	Cr ICP/MS	Cd ICP/MS	Cu ICP/MS	Hg CVAA	Ni ICP/MS	Pb ICP/MS	Zn ICP/MS
Hackensack River Reach A												
Comp HR-A	1	1	15.67	0.0396	3.16	0.863	0.0329	2.42	0.0244	0.414	0.906	14.4
Comp HR-A	2	2	14.58	0.0156	2.90	0.528	0.0299	1.29	0.0188	0.382	0.510	14.1
Comp HR-A	3	1	14.46	0.0215	3.18	0.622	0.0399	1.96	0.0240	0.427	0.648	14.4
Comp HR-A	4	1	15.64	0.0225	3.95	0.715	0.0325	1.99	0.0217	0.350	0.760	16.4
Comp HR-A	5	1	14.44	0.0202	3.64	0.498	0.0296	1.71	0.0175	0.342	0.473	12.5
Reference												
Mud Dump Reference	1	2	14.81	0.0298	3.49	0.499	0.0327	1.89	0.0230	0.504	0.785	16.9
Mud Dump Reference	2	1	12.76	0.0327	2.92	0.376	0.0174	1.80	0.0157	0.306	0.513	9.62
Mud Dump Reference	3	2	14.21	0.0374	2.58	0.354	0.0200	1.68	0.0153	0.327	0.608	10.0
Mud Dump Reference	4	2	14.14	0.0334	2.23	1.98	0.0239	1.73	0.0158	0.392	0.612	12.2
Mud Dump Reference Rep 1	5	1	14.80	0.0376	3.52	0.573	0.0346	2.55	0.0240	0.450	0.842	13.3
Mud Dump Reference Rep 2	5	1	14.80	0.0400	3.48	0.521	0.0326	2.43	0.0231	0.451	0.786	12.8
Control												
C-SB	1	1	14.90	0.0158	3.48	0.353	0.0274	1.90	0.0106	0.490	0.191	11.6
C-SB	2	2	14.83	0.0129	3.45	0.394	0.0268	1.80	0.0111	0.620	0.206	12.5
C-SB	3	1	15.03	0.0108	2.03	0.245	0.0195	1.03	0.00586	0.364	0.149	7.75
Background												
M. nasuta Background	1	1	14.47	0.0204	2.92	0.648	0.0392	1.79	0.0106	0.922	0.178	12.6
M. nasuta Background	2	1	14.28	0.0129	2.94	0.477	0.0334	1.62	0.0124	0.750	0.158	11.0
M. nasuta Background Rep 1	3	3	14.82	0.0179	3.02	0.341	0.0314	1.68	0.0120	0.698	0.163	14.6
M. nasuta Background Rep 2	3	3	14.82	0.0185	3.08	0.372	0.0298	1.71	0.0108	0.634	0.161	14.7
M. nasuta Background Rep 3	3	3	14.82	0.0188	3.05	0.338	0.0295	1.67	0.0107	0.651	0.152	14.4
M. nasuta Background Rep 4	3	3	14.82	0.0179	3.05	0.365	0.0304	1.71	0.0108	0.708	0.166	14.7

TABLE G.2. Metals, Dry Weight, in Tissue of *M. nasuta*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* Metals (mg/kg dry weight) Ag ICP/MS	As ICP/MS	Cr ICP/MS	Cd ICP/MS	Cu ICP/MS	Hg CVAA	Ni ICP/MS	Pb ICP/MS	Zn ICP/MS
Target DL[a]				0.1	1	0.2	0.1	1	0.02	0.1	0.1	1
Achieved DL				0.02	0.01	0.07	0.042	0.03	0.001	0.086	0.018	0.01
Aurthur Kill Reach A												
Comp AK-A	1	1	13.54	0.226	21.2	3.64	0.384	18.7	0.187	3.92	5.59	78.6
Comp AK-A	2	2	13.14	0.186	20.6	4.69	0.321	17.1	0.204	5.84	7.24	80.9
Comp AK-A	3	2	13.61	0.327	25.4	5.31	0.308	25.0	0.260	3.84	8.86	101
Comp AK-A	4	2	14.41	0.203	18.8	3.28	0.230	15.8	0.159	2.94	5.01	92.3
Comp AK-A	5	3	13.73	0.155	20.8	2.82	0.236	13.9	0.163	2.70	4.31	83.7
Aurthur Kill Reach B												
Comp AK-B	1	1	15.11	0.135	28.8	3.05	0.310	13.6	0.216	3.00	4.01	125
Comp AK-B	2	1	12.15	0.162	21.0	2.28	0.251	14.1	0.158	2.75	3.77	96.6
Comp AK-B	3	1	14.88	0.103	26.2	1.88	0.277	10.6	0.118	2.53	2.77	98.8
Comp AK-B	4	1	15.39	0.106	25.5	1.49	0.216	10.9	0.116	3.10	2.57	78.0
Comp AK-B	5	1	16.48	0.131	22.4	2.60	0.262	13.2	0.189	2.93	3.63	94.5
Aruthur Kill Reach C												
Comp AK-C	1	1	15.89	0.129	26.3	2.72	0.244	17.2	0.161	2.53	4.71	83.5
Comp AK-C	2	1	15.12	0.154	29.0	2.42	0.280	16.7	0.165	3.27	5.21	88.9
Comp AK-C	3	1	14.72	0.173	29.7	2.09	0.219	16.9	0.124	2.21	4.25	88.0
Comp AK-C	4	2	13.30	0.139	23.4	1.77	0.213	13.7	0.114	2.60	5.91	73.3
Comp AK-C	5	2	14.21	0.120	20.6	3.05	0.301	17.2	0.200	3.45	4.98	103
Port Elizabeth Reach A												
Comp PE-A	1	1	15.83	0.263	20.9	5.19	0.296	18.8	0.174	3.39	9.73	102
Comp PE-A	2	1	15.37	0.225	20.1	4.16	0.269	15.0	0.134	2.92	7.96	83.4
Comp PE-A	3	2	15.26	0.248	20.2	5.36	0.265	19.5	0.158	3.50	9.58	79.9
Comp PE-A Replicate 1	4	2	15.04	0.180	21.9	3.67	0.244	14.8	0.114	3.10	7.31	86.2
Comp PE-A Replicate 2	4	2	15.04	0.188	21.9	3.55	0.223	14.4	0.128	3.09	7.08	85.8
Comp PE-A Replicate 3	4	2	15.04	0.178	21.6	3.66	0.234	14.2	0.131	3.06	7.42	84.7
Comp PE-A	5	1	17.28	0.201	19.6	5.84	0.318	16.1	0.202	3.24	10.05	94.4

TABLE G.2. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* Metals (mg/kg dry weight) Ag ICP/MS	As ICP/MS	Cr ICP/MS	Cd ICP/MS	Cu ICP/MS	Hg CVAA	Ni ICP/MS	Pb ICP/MS	Zn ICP/MS
Port Elizabeth Reach B												
Comp PE-B	1	1	17.79	0.216	18.7	4.91	0.253	17.7	0.204	3.42	7.82	78.9
Comp PE-B	2	2	17.17	0.189	28.2	4.22	0.230	14.5	0.156	3.42	6.19	85.4
Comp PE-B	3	2	14.99	0.220	19.0	4.84	0.312	16.8	0.188	4.03	6.90	101
Comp PE-B	4	1	13.24	0.177	20.3	4.61	0.267	15.9	0.198	3.34	6.55	85.6
Comp PE-B	5	1	15.30	0.246	21.8	4.87	0.322	17.8	0.204	3.93	6.86	104
Hackensack River Reach A												
Comp HR-A	1	1	15.67	0.253	20.2	5.51	0.210	15.4	0.156	2.64	5.78	91.6
Comp HR-A	2	2	14.58	0.107	19.9	3.62	0.205	8.88	0.129	2.62	3.50	96.5
Comp HR-A	3	1	14.46	0.149	22.0	4.30	0.276	13.5	0.166	2.95	4.48	99.7
Comp HR-A	4	1	15.64	0.144	25.3	4.57	0.208	12.7	0.139	2.24	4.86	105
Comp HR-A	5	1	14.44	0.140	25.2	3.45	0.205	11.8	0.121	2.37	3.28	86.9
Reference												
Mud Dump Reference	1	2	14.81	0.201	23.6	3.37	0.221	12.7	0.155	3.40	5.30	114
Mud Dump Reference	2	1	12.76	0.256	22.9	2.95	0.136	14.1	0.123	2.40	4.02	75.4
Mud Dump Reference	3	2	14.21	0.263	18.2	2.49	0.141	11.8	0.108	2.30	4.28	70.1
Mud Dump Reference	4	2	14.14	0.236	15.8	14.0	0.169	12.2	0.112	2.77	4.33	86.1
Mud Dump Reference Rep 1	5	1	14.80	0.254	23.8	3.87	0.234	17.2	0.162	3.04	5.69	90.0
Mud Dump Reference Rep 2	5	1	14.80	0.270	23.5	3.52	0.220	16.4	0.156	3.05	5.31	86.6
Control												
C-SB	1	1	14.90	0.106	23.4	2.37	0.184	12.7	0.071	3.29	1.28	78.1
C-SB	2	2	14.83	0.087	23.3	2.66	0.181	12.1	0.075	4.18	1.39	84.1
C-SB	3	1	15.03	0.072	13.5	1.63	0.130	6.88	0.039	2.42	0.99	51.6

TABLE G.2. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* Metals (mg/kg dry weight) Ag ICP/MS	As ICP/MS	Cr ICP/MS	Cd ICP/MS	Cu ICP/MS	Hg CVAA	Ni ICP/MS	Pb ICP/MS	Zn ICP/MS
Background												
M. nasuta Background	1	1	14.47	0.141	20.2	4.48	0.271	12.3	0.073	6.37	1.23	87.4
M. nasuta Background	2	1	14.28	0.090	20.6	3.34	0.234	11.3	0.087	5.25	1.11	76.8
M. nasuta Background Rep 1	3	3	14.82	0.121	20.4	2.30	0.212	11.3	0.081	4.71	1.10	98.8
M. nasuta Background Rep 2	3	3	14.82	0.125	20.8	2.51	0.201	11.5	0.073	4.28	1.09	98.9
M. nasuta Background Rep 3	3	3	14.82	0.127	20.6	2.28	0.199	11.2	0.072	4.39	1.03	97.5
M. nasuta Background Rep 4	3	3	14.82	0.121	20.6	2.46	0.205	11.5	0.073	4.78	1.12	99.1

(a) DL Detection limit.

TABLE G.3. Quality Control Summary for Metals, Dry Weight, in Tissue of *M. nasuta* Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	*M. nasuta* Metals (mg/kg dry weight) Ag ICP/MS	As ICP/MS	Cr ICP/MS	Cd ICP/MS	Cu ICP/MS	Hg CVAA	Ni ICP/MS	Pb ICP/MS	Zn ICP/MS
Method Blanks											
Blank		1	0.08	0.02	0.10	0.042 U[a]	0.05	0.001 U	0.63	0.079	0.01
Blank		1	0.03	0.01	0.07	0.042 U	0.08	0.001 U	0.086 U	0.042	0.23
Blank		2	0.05	0.03	0.12	0.042 U	0.07	0.001 U	0.086 U	0.063	0.07
Blank		3	0.02	0.01	0.07	0.042 U	0.03	0.001 U	0.086 U	0.018	0.18
Mean Blank			0.05	0.02	0.09	0.042 U	0.06	0.001 U	0.16	0.051	0.12
Standard Reference Material											
Certified Values			1.68 ±0.15	14.0 ±1.2	1.43 ±0.46	4.15 ±0.38	66.3 ±4.3	0.0642 ±0.0067	2.25 ±0.44	0.371 ±0.014	830 ±57
1566a		1	1.35[b]	12.8	1.35	4.11	62.5	0.065	2.08[b]	0.383	810
1566a		1	1.33[b]	12.5	1.30	4.05	62.0	0.061	1.74[b]	0.345	799
1566a		2	1.31[b]	12.6	1.33[b]	4.09	62.5	0.067	2.46	0.321	794
1566a		3	1.28[b]	12.4	1.02[b]	3.98	61.2	0.058	2.66	0.300	775
Matrix Spikes											
COMP PE-A	4	2	0.182	21.8	3.63	0.234	14.5	0.124	3.08	7.27	85.5
COMP PE-A MS			1.70	70.6	8.66	2.12	61.6	1.99	7.96	12.2	133
Concentration Recovered			1.52	48.8	5.03	1.89	47.1	1.86	4.88	4.93	47.5
Amount Spiked			2.00	50.0	5.00	2.00	50.0	2.00	5.00	5.00	50.0
Percent Recovery			76%	98%	101%	94%	94%	93%	98%	99%	95%
Mud Dump Reference[c]	5	1	0.262	23.6	3.70	0.227	16.8	0.159	3.05	5.50	88.3
Mud Dump Reference MS			1.80	70.1	8.36	2.14	62.8	1.99	7.70	10.2	131
Concentration Recovered			1.54	46.5	4.67	1.91	46.0	1.83	4.66	4.75	42.6
Amount Spiked			2.00	50.0	5.00	2.00	50.0	2.00	5.00	5.00	50.0
Percent Recovery			77%	93%	93%	96%	92%	92%	93%	95%	85%
M. nasuta Background	3	3	0.123	20.58	2.39	0.204	11.42	0.075	4.54	1.08	98.6
M. nasuta Background MS			1.51	69.06	7.82	2.05	58.36	2.14	9.87	6.32	150
Concentration Recovered			1.39	48.5	5.43	1.85	46.95	2.07	5.33	5.24	51.3
Amount Spiked			2.00	50.0	5.00	2.00	50.0	2.00	5.00	5.00	50.0
Percent Recovery			69%[d]	97%	109%	92%	94%	103%	107%	105%	103%

TABLE G.3. (contd)

Sediment Treatment	Replicate	Batch	*M. nasuta* Metals (mg/kg dry weight) Ag ICP/MS	As ICP/MS	Cr ICP/MS	Cd ICP/MS	Cu ICP/MS	Hg CVAA	Ni ICP/MS	Pb ICP/MS	Zn ICP/MS
Analytical Duplicates											
Mud Dump Reference Rep 1	5	1	0.254	23.8	3.87	0.234	17.2	0.162	3.04	5.69	90.1
Mud Dump Reference Rep 2	5	1	0.270	23.5	3.52	0.220	16.4	0.156	3.05	5.31	86.7
RPD			6%	1%	9%	6%	5%	4%	0%	7%	4%
I-Stat			0.03	0.01	0.05	0.03	0.02	0.02	0.00	0.03	0.02
Analytical Triplicates											
Comp PE-A Replicate 1	4	2	0.180	21.9	3.67	0.244	14.8	0.114	3.10	7.31	86.3
Comp PE-A Replicate 2	4	2	0.188	21.9	3.55	0.223	14.4	0.128	3.09	7.08	85.9
Comp PE-A Replicate 3	4	2	0.178	21.6	3.66	0.234	14.2	0.131	3.06	7.42	84.8
RSD			3%	1%	2%	4%	2%	7%	1%	2%	1%

(a) U Undetected at or above the given concentration.
(b) Outside SRM range of ±20%.
(c) Mean of replicated sample.
(d) Outside quality control range of 75-125%.
(e) Replicate 2 spilled during preparation.
NOTE: All data blank-corrected.

TABLE G.4. Chlorinated Pesticides (alphabetical, Aldrin - 2,4'-DDT), Wet Weight, in Tissue of *M. nasuta*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* Pesticides (µg/kg wet weight)					
				Aldrin	a-Chlordane	Dieldrin	2,4'-DDD	2,4'-DDE	2,4'-DDT
Target DL[a]				0.4	0.4	0.4	0.4	0.4	0.4
Achieved DL				0.09	0.25	0.16	0.20	0.07	0.18
Arthur Kill Reach A									
Comp AK-A	1	2	13.54	1.10	2.62	1.98	9.71	7.94	0.22 U[b]
Comp AK-A	2	2	13.14	0.94	2.28	1.58	8.02	6.51	0.22 U
Comp AK-A	3	2	13.61	0.80	2.15	1.67	8.04	6.28	0.22 U
Comp AK-A	4	2	14.41	0.87	2.24	1.76	8.27	6.67	0.22 U
Comp AK-A	5	2	13.73	0.92	2.23	1.71	8.05	6.53	0.22 U
Arthur Kill Reach B									
Comp AK-B	1	1	15.11	1.23	1.40	0.16 U	3.27	5.92	0.22 U
Comp AK-B	2	2	12.15	1.15	0.25 U	0.16 U	28.6	24.0	0.22 U
Comp AK-B	3	1	14.88	1.19	0.25 U	0.16 U	28.2	27.7	0.22 U
Comp AK-B	4	1	15.39	1.02	0.25 U	0.16 U	27.9	26.1	0.22 U
Comp AK-B	5	1	16.48	1.26	0.25 U	0.16 U	25.2	24.9	0.22 U
Arthur Kill Reach C									
Comp AK-C	1	1	15.89	0.09 U	0.25 U	3.66	1.89	4.68	0.22 U
Comp AK-C	2	1	15.12	1.64	0.25 U	0.16 U	36.0	35.3	0.22 U
Comp AK-C	3	1	14.72	0.09 U	0.25 U	4.32	5.48	5.10	0.22 U
Comp AK-C	4	2	13.30	1.27	1.51	2.74	3.51	6.14	0.22 U
Comp AK-C	5	2	14.21	1.96	0.25 U	0.16 U	5.87	12.3	0.22 U
Port Elizabeth Reach A									
Comp PE-A	1	1	15.83	1.41	1.91	1.19	0.20 U	1.82	0.22 U
Comp PE-A	2	1	15.37	1.37	1.63	1.05	0.20 U	1.70	0.22 U
Comp PE-A	3	2	15.26	1.30	1.84	1.28	0.20 U	1.83	0.22 U
Comp PE-A	4	1	15.04	1.38	1.93	1.26	0.20 U	1.98	0.22 U
Comp PE-A	5	1	17.28	0.09 U	2.29	0.16 U	0.20 U	0.07 U	0.22 U

TABLE G.4. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* Pesticides (µg/kg wet weight) Aldrin	a-Chlordane	Dieldrin	2,4'-DDD	2,4'-DDE	2,4'-DDT
Port Elizabeth Reach B									
Comp PE-B	1	1	17.79	0.09 U	2.13	0.16 U	4.36	4.13	0.22 U
Comp PE-B	2	2	17.17	1.07	1.75	1.03	3.70	2.47	0.22 U
Comp PE-B	3	2	14.99	1.22	2.01	1.13	4.26	3.32	0.22 U
Comp PE-B	4	1	13.24	1.06	1.66	0.99	3.42	0.07 U	0.22 U
Comp PE-B	5	2	15.30	1.27	2.03	1.19	4.27	3.04	0.22 U
Hackensack River Reach A									
Comp HR-A	1	1	15.67	0.89	0.96	0.87	0.20 U	0.07 U	0.22 U
Comp HR-A	2	2	14.58	0.80	0.97	0.89	0.20 U	0.07 U	0.22 U
Comp HR-A	3	1	14.46	1.01	1.38	1.14	0.20 U	0.07 U	0.22 U
Comp HR-A	4	1	15.64	0.90	1.13	0.96	0.20 U	0.07 U	0.22 U
Comp HR-A	5	1	14.44	0.97	1.39	1.13	0.20 U	0.07 U	0.22 U
Reference									
Mud Dump Reference	1	2	14.81	0.37	0.25 U	0.40	0.20 U	0.07 U	0.22 U
Mud Dump Reference	2	1	12.76	0.80	0.25 U	0.16 U	0.20 U	0.07 U	0.22 U
Mud Dump Reference	3	1	14.21	0.28	0.94	0.28	0.20 U	0.77	0.22 U
Mud Dump Reference	4	2	14.14	0.80	0.25 U	0.18	0.20 U	0.07 U	0.22 U
Mud Dump Reference	5	1	14.80	0.80	0.25 U	0.32	0.20 U	0.07 U	0.22 U
Controls									
C-SB	1	2	14.90	0.09 U	0.25 U	0.16 U	0.31	0.07 U	0.22 U
C-SB	2	2	14.83	0.09 U	0.25 U	0.16 U	0.20 U	0.07 U	0.22 U
C-SB Replicate 1	3	1	15.03	0.09 U	0.25 U	0.16 U	0.20 U	0.07 U	0.22 U
C-SB Replicate 2	3	1	15.03	0.09 U	0.25 U	0.16 U	0.20 U	0.07 U	0.22 U
C-SB Replicate 3	3	1	15.03	0.09 U	0.25 U	0.16 U	0.20 U	0.07 U	0.22 U

TABLE G.4. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* Pesticides (µg/kg wet weight)					
				Aldrin	a-Chlordane	Dieldrin	2,4'-DDD	2,4'-DDE	2,4'-DDT
Background									
M. nasuta Background	1	2	14.47	0.09 U	0.25 U	0.16 U	0.20 U	0.07 U	0.22 U
M. nasuta Background Replicate 1	2	2	14.28	0.09 U	0.25 U	0.16 U	0.29	0.07 U	0.22 U
M. nasuta Background Replicate 2	2	2	14.28	0.09 U	0.25 U	0.16 U	0.20 U	0.07 U	0.22 U
M. nasuta Background Replicate 3	2	2	14.28	0.09 U	0.25 U	0.16 U	0.20 U	0.07 U	0.22 U
M. nasuta Background	3	2	14.82	0.09 U	0.25 U	0.16 U	0.20 U	0.07 U	0.22 U

(a) DL Detection limit.
(b) U Undetected at or above given concentration.

TABLE G.5. Chlorinated Pesticides (alphabetical, 4,4'-DDD - Trans-Nonachlor), Wet Weight, in Tissue of *M. nasuta*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* Pesticides (µg/kg wet weight) 4,4'-DDD	4,4'-DDE	4,4'-DDT	Endosulfan I	Endosulfan II	Endosulfan Sulfate	Heptachlor	Heptachlor Epoxide	Trans-Nonachlor
Target DL[a]				0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Achieved DL				0.23	0.07	0.18	0.25	0.25	0.25	0.08	0.24	0.06
Arthur Kill Reach A												
Comp AK-A	1	2	13.54	24.2	17.6	2.93 I[b]	0.25 U[c]	0.25 U	0.25 U	0.08 U	0.24 U	0.82
Comp AK-A	2	2	13.14	19.2	14.7	2.43 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.58
Comp AK-A	3	2	13.61	20.4	14.6	5.17 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
Comp AK-A	4	2	14.41	19.8	15.1	3.43 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.59
Comp AK-A	5	2	13.73	19.6	15.4	3.70 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.62
Arthur Kill Reach B												
Comp AK-B	1	1	15.11	7.02	12.2	1.69 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
Comp AK-B	2	2	12.15	93.6	35.6	5.40 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
Comp AK-B	3	1	14.88	101	39.8	5.63 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
Comp AK-B	4	1	15.39	98.5	38.4	4.74 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
Comp AK-B	5	1	16.48	87.4	34.8	3.16 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24	0.06 U
Arthur Kill Reach C												
Comp AK-C	1	1	15.89	10.5	15.6	2.02 I	0.25 U	0.25 U	0.25 U	1.66	0.24 U	0.06 U
Comp AK-C	2	1	15.12	121	45.0	4.14 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
Comp AK-C	3	1	14.72	11.6	17.1	1.74 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
Comp AK-C	4	2	13.30	8.04	13.5	2.32 I	0.25 U	0.30	0.25 U	0.08 U	0.24 U	0.06 U
Comp AK-C	5	2	14.21	14.1	20.9	2.39 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
Port Elizabeth Reach A												
Comp PE-A	1	1	15.83	3.93	6.49	2.76 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.44
Comp PE-A	2	1	15.37	3.36	6.06	2.55 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.29
Comp PE-A	3	2	15.26	3.58	7.11	3.99 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
Comp PE-A	4	1	15.04	3.80	6.71	3.15 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.49
Comp PE-A	5	1	17.28	4.71	7.74	3.31 I	0.25 U	0.25 U	0.25 U	1.26	0.24 U	0.06 U

TABLE G.5. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* Pesticides (µg/kg wet weight) 4,4'-DDD	4,4'-DDE	4,4'-DDT	Endosulfan I	Endosulfan II	Endosulfan Sulfate	Heptachlor	Heptachlor Epoxide	Transnonachlor
Port Elizabeth Reach B												
Comp PE-B	1	1	17.79	5.67	10.0	2.81 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
Comp PE-B	2	2	17.17	4.57	8.70	3.33 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.42
Comp PE-B	3	2	14.99	5.11	10.0	3.89 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.53
Comp PE-B	4	1	13.24	4.41	7.30	2.47 I	0.25 U	0.25 U	0.25 U	0.70	0.24 U	0.41
Comp PE-B	5	2	15.30	5.58	10.4	3.82 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.55
Hackensack River Reach A												
Comp HR-A	1	1	15.67	1.86	6.18	2.04 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
Comp HR-A	2	2	14.58	1.69	5.25	2.32 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
Comp HR-A	3	1	14.46	2.29	6.64	2.31 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.35
Comp HR-A	4	1	15.64	1.82	5.67	2.27 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
Comp HR-A	5	1	14.44	2.43	6.76	2.36 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
Reference												
Mud Dump Reference	1	2	14.81	1.80	2.87	2.55 I	0.25 U	0.25 U	0.25 U	0.38	0.24 U	0.06 U
Mud Dump Reference	2	1	12.76	1.36	2.02	1.61 I	0.25 U	0.25 U	0.25 U	0.29	0.24 U	0.06 U
Mud Dump Reference	3	1	14.21	1.84	2.80	2.03 I	0.25 U	0.25 U	0.25 U	0.26	0.24 U	0.06 U
Mud Dump Reference	4	2	14.14	1.22	2.04	1.86 I	0.25 U	0.25 U	0.25 U	0.30	0.24 U	0.06 U
Mud Dump Reference	5	1	14.80	1.49	2.04	1.52 I	0.25 U	0.25 U	0.25 U	0.28	0.24 U	0.06 U
Controls												
C-SB	1	2	14.90	0.23 U	0.43	0.18 U	0.25 U	0.25 U	0.25 U	0.40	0.24 U	0.06 U
C-SB	2	2	14.83	0.23 U	0.48	0.59 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
C-SB Replicate 1	3	1	15.03	0.23 U	0.43	0.18 U	0.25 U	0.25 U	0.25 U	0.21	0.24 U	0.06 U
C-SB Replicate 2	3	1	15.03	0.23 U	0.48	0.18 U	0.25 U	0.25 U	0.25 U	0.21	0.24 U	0.06 U
C-SB Replicate 3	3	1	15.03	0.23 U	0.37	0.18 U	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U

TABLE G.5. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* Pesticides (µg/kg wet weight) 4,4'-DDD	4,4'-DDE	4,4'-DDT	Endosulfan I	Endosulfan II	Endosulfan Sulfate	Heptachlor	Heptachlor Epoxide	Transnonachlor
Background												
M. nasuta Background	1	2	14.47	0.23 U	0.07 U	0.18 U	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
M. nasuta Background Rep 1	2	2	14.28	0.23 U	0.07 U	0.18 U	0.25 U	0.25 U	0.25 U	0.33	0.24 U	0.06 U
M. nasuta Background Rep 2	2	2	14.28	0.23 U	0.07 U	0.18 U	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
M. nasuta Background Rep 3	2	2	14.28	0.23 U	0.07 U	0.41 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
M. nasuta Background	3	2	14.82	0.23 U	0.07 U	0.18 U	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U

(a) DL Detection limit.
(b) I Interference on both primary and confirmation column; value may be false positive or biased high.
(c) U Undetected at or above given concentration.

TABLE G.6. Chlorinated Pesticides (alphabetical, Aldrin - 2,4'DDT), Dry Weight, in Tissue of *M. nasuta*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* Pesticides (µg/kg dry weight)					
				Aldrin	a-Chlordane	Dieldrin	2,4'-DDD	2,4'-DDE	2,4'-DDT
Arthur Kill Reach A									
Comp AK-A	1	2	13.54	8.12	19.4	14.6	71.7	58.6	1.62 U[a]
Comp AK-A	2	2	13.14	7.15	17.4	12.0	61.0	49.5	1.67 U
Comp AK-A	3	2	13.61	5.88	15.8	12.3	59.1	46.1	1.62 U
Comp AK-A	4	2	14.41	6.04	15.5	12.2	57.4	46.3	1.53 U
Comp AK-A	5	2	13.73	6.70	16.2	12.5	58.6	47.6	1.60 U
Arthur Kill Reach B									
Comp AK-B	1	1	15.11	8.14	9.27	1.06 U	21.6	39.2	1.46 U
Comp AK-B	2	2	12.15	9.47	2.06 U	1.32 U	235	197	1.81 U
Comp AK-B	3	1	14.88	8.00	1.68 U	1.08 U	190	186	1.48 U
Comp AK-B	4	1	15.39	6.63	1.62 U	1.04 U	181	170	1.43 U
Comp AK-B	5	1	16.48	7.65	1.52 U	.971 U	153	151	1.33 U
Arthur Kill Reach C									
Comp AK-C	1	1	15.89	0.566 U	1.57 U	23.0	11.9	29.5	1.38 U
Comp AK-C	2	1	15.12	10.8	1.65 U	1.06 U	238	233	1.46 U
Comp AK-C	3	1	14.72	0.611 U	1.70 U	29.3	37.2	34.6	1.49 U
Comp AK-C	4	2	13.30	9.55	11.4	20.6	26.4	46.2	1.65 U
Comp AK-C	5	2	14.21	13.8	1.76 U	1.13 U	41.3	86.6	1.55 U
Port Elizabeth Reach A									
Comp PE-A	1	1	15.83	8.91	12.1	7.52	1.26 U	11.5	1.39 U
Comp PE-A	2	1	15.37	8.91	10.6	6.83	1.30 U	11.1	1.43 U
Comp PE-A	3	2	15.26	8.52	12.1	8.39	1.31 U	12.0	1.44 U
Comp PE-A	4	1	15.04	9.18	12.8	8.38	1.33 U	13.2	1.46 U
Comp PE-A	5	1	17.28	0.521 U	13.3	0.926 U	1.16 U	0.405 U	1.27 U
Port Elizabeth Reach B									
Comp PE-B	1	1	17.79	0.506 U	12.0	0.899 U	24.5	23.2	1.24 U
Comp PE-B	2	2	17.17	6.23	10.2	6.00	21.5	14.4	1.28 U
Comp PE-B	3	2	14.99	8.14	13.4	7.54	28.4	22.1	1.47 U
Comp PE-B	4	1	13.24	8.01	12.5	7.48	25.8	0.529 U	1.66 U
Comp PE-B	5	2	15.30	8.30	13.3	7.78	27.9	19.9	1.44 U

TABLE G.6. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* Pesticides (µg/kg dry weight)					
				Aldrin	a-Chlor-dane	Dieldrin	2,4'-DDD	2,4'-DDE	2,4'-DDT
Hackensack River Reach A									
Comp HR-A	1	1	15.67	5.68	6.13	5.55	1.28 U	0.447 U	1.40 U
Comp HR-A	2	2	14.58	5.49	6.65	6.10	1.37 U	0.480 U	1.51 U
Comp HR-A	3	1	14.46	6.98	9.54	7.88	1.38 U	0.484 U	1.52 U
Comp HR-A	4	1	15.64	5.75	7.23	6.14	1.28 U	0.448 U	1.41 U
Comp HR-A	5	1	14.44	6.72	9.63	7.83	1.39 U	0.485 U	1.52 U
Reference									
Mud Dump Reference	1	2	14.81	2.50	1.69 U	2.70	1.35 U	0.473 U	1.49 U
Mud Dump Reference	2	1	12.76	6.27	1.96 U	1.25 U	1.57 U	0.549 U	1.72 U
Mud Dump Reference	3	1	14.21	1.97	6.62	1.97	1.41 U	5.42	1.55 U
Mud Dump Reference	4	2	14.14	5.66	1.77 U	1.27	1.41 U	0.495 U	1.56 U
Mud Dump Reference	5	1	14.80	5.41	1.69 U	2.16	1.35 U	0.473 U	1.49 U
Controls									
C-SB	1	2	14.90	0.604 U	1.68 U	1.07 U	2.08	0.470 U	1.48 U
C-SB	2	2	14.83	0.607 U	1.69 U	1.08 U	1.35 U	0.472 U	1.48 U
C-SB Replicate 1	3	1	15.03	0.599 U	1.66 U	1.06 U	1.33 U	0.466 U	1.46 U
C-SB Replicate 2	3	1	15.03	0.599 U	1.66 U	1.06 U	1.33 U	0.466 U	1.46 U
C-SB Replicate 3	3	1	15.03	0.599 U	1.66 U	1.06 U	1.33 U	0.466 U	1.46 U
Background									
M. nasuta Background	1	2	14.47	0.622 U	1.73 U	1.11 U	1.38 U	0.484 U	1.52 U
M. nasuta Background Replicate 1	2	2	14.28	0.630 U	1.75 U	1.12 U	2.03	0.490 U	1.54 U
M. nasuta Background Replicate 2	2	2	14.28	0.630 U	1.75 U	1.12 U	1.40 U	0.490 U	1.54 U
M. nasuta Background Replicate 3	2	2	14.28	0.630 U	1.75 U	1.12 U	1.40 U	0.490 U	1.54 U
M. nasuta Background	3	2	14.82	0.607 U	1.69 U	1.08 U	1.35 U	0.472 U	1.48 U

(a) U Undetected at or above given concentration.

TABLE G.7. Chlorinated Pesticides (alphabetical, 4,4'-DDD - Trans-Nonachlor), Dry Weight, in Tissue of *M. nasuta*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* Pesticides (µg/kg dry weight) 4,4'-DDD	4,4'-DDE	4,4'-DDT	Endosulfan I	Endosulfan II	Endosulfan Sulfate	Heptachlor	Heptachlor Epoxide	Trans-Nonachlor
Arthur Kill Reach A												
Comp AK-A	1	2	13.54	179	130	21.6 I[a]	1.85 U[b]	1.85 U	1.85 U	0.591 U	1.77 U	6.06
Comp AK-A	2	2	13.14	146	112	18.5 I	1.90 U	1.90 U	1.90 U	0.609 U	1.83 U	4.41
Comp AK-A	3	2	13.61	150	107	38.0 I	1.84 U	1.84 U	1.84 U	0.588 U	1.76 U	0.441 U
Comp AK-A	4	2	14.41	137	105	23.8 I	1.73 U	1.73 U	1.73 U	0.555 U	1.67 U	4.09
Comp AK-A	5	2	13.73	143	112	26.9 I	1.82 U	1.82 U	1.82 U	0.583 U	1.75 U	4.52
Arthur Kill Reach B												
Comp AK-B	1	1	15.11	46.5	80.7	11.2 I	1.65 U	1.65 U	1.65 U	0.529 U	1.59 U	0.397 U
Comp AK-B	2	2	12.15	770	293	44.4 I	2.06 U	2.06 U	2.06 U	0.658 U	1.98 U	0.494 U
Comp AK-B	3	1	14.88	679	267	37.8 I	1.68 U	1.68 U	1.68 U	0.538 U	1.61 U	0.403 U
Comp AK-B	4	1	15.39	640	250	30.8 I	1.62 U	1.62 U	1.62 U	0.520 U	1.56 U	0.390 U
Comp AK-B	5	1	16.48	530	211	19.2 I	1.52 U	1.52 U	1.52 U	0.485 U	1.46	0.364 U
Arthur Kill Reach C												
Comp AK-C	1	1	15.89	66.1	98.2	12.7 I	1.57 U	1.57 U	1.57 U	10.4	1.51 U	0.378 U
Comp AK-C	2	1	15.12	800	298	27.4 I	1.65 U	1.65 U	1.65 U	0.529 U	1.59 U	0.397 U
Comp AK-C	3	1	14.72	78.8	116	11.8 I	1.70 U	1.70 U	1.70 U	0.543 U	1.63 U	0.408 U
Comp AK-C	4	2	13.30	60.5	102	17.4 I	1.88 U	2.26	1.88 U	0.602 U	1.80 U	0.451 U
Comp AK-C	5	2	14.21	99.2	147	16.8 I	1.76 U	1.76 U	1.76 U	0.563 U	1.69 U	0.422 U
Port Elizabeth Reach A												
Comp PE-A	1	1	15.83	24.8	41.0	17.4 I	1.58 U	1.58 U	1.58 U	0.505 U	1.52 U	2.78
Comp PE-A	2	1	15.37	21.9	39.4	16.6 I	1.63 U	1.63 U	1.63 U	0.520 U	1.56 U	1.89
Comp PE-A	3	2	15.26	23.5	46.6	26.1 I	1.64 U	1.64 U	1.64 U	0.524 U	1.57 U	0.393 U
Comp PE-A	4	1	15.04	25.3	44.6	20.9 I	1.66 U	1.66 U	1.66 U	0.532 U	1.60 U	3.26
Comp PE-A	5	1	17.28	27.3	44.8	19.2 I	1.45 U	1.45 U	1.45 U	7.29	1.39 U	0.347 U
Port Elizabeth Reach B												
Comp PE-B	1	1	17.79	31.9	56.2	15.8 I	1.41 U	1.41 U	1.41 U	0.450 U	1.35 U	0.337 U
Comp PE-B	2	2	17.17	26.6	50.7	19.4 I	1.46 U	1.46 U	1.46 U	0.466 U	1.40 U	2.45
Comp PE-B	3	2	14.99	34.1	66.7	26.0 I	1.67 U	1.67 U	1.67 U	0.534 U	1.60 U	3.54
Comp PE-B	4	1	13.24	33.3	55.1	18.7 I	1.89 U	1.89 U	1.89 U	5.29	1.81 U	3.10
Comp PE-B	5	2	15.30	36.5	68.0	25.0 I	1.63 U	1.63 U	1.63 U	0.523 U	1.57 U	3.59

TABLE G.7. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* Pesticides (µg/kg dry weight) 4,4'-DDD	4,4'-DDE	4,4'-DDT	Endosulfan I	Endosulfan II	Endosulfan Sulfate	Heptachlor	Heptachlor Epoxide	Transnonachlor
Hackensack River Reach A												
Comp HR-A	1	1	15.67	11.9	39.4	13.0 I	1.60 U	1.60 U	1.60 U	0.511 U	1.53 U	0.383 U
Comp HR-A	2	2	14.58	11.6	36.0	15.9 I	1.71 U	1.71 U	1.71 U	0.549 U	1.65 U	0.412 U
Comp HR-A	3	1	14.46	15.8	45.9	16.0 I	1.73 U	1.73 U	1.73 U	0.553 U	1.66 U	2.42
Comp HR-A	4	1	15.64	11.6	36.3	14.5 I	1.60 U	1.60 U	1.60 U	0.512 U	1.53 U	0.384 U
Comp HR-A	5	1	14.44	16.8	46.8	16.3 I	1.73 U	1.73 U	1.73 U	0.554 U	1.66 U	0.416 U
Reference												
Mud Dump Reference	1	2	14.81	12.15	19.38	17.22 I	1.69 U	1.69 U	1.69 U	2.57	1.62 U	0.41 U
Mud Dump Reference	2	1	12.76	10.66	15.83	12.62 I	1.96 U	1.96 U	1.96 U	2.27	1.88 U	0.47 U
Mud Dump Reference	3	1	14.21	12.95	19.70	14.29 I	1.76 U	1.76 U	1.76 U	1.83	1.69 U	0.42 U
Mud Dump Reference	4	2	14.14	8.63	14.43	13.15 I	1.77 U	1.77 U	1.77 U	2.12	1.70 U	0.42 U
Mud Dump Reference	5	1	14.80	10.07	13.78	10.27 I	1.69 U	1.69 U	1.69 U	1.89	1.62 U	0.41 U
Controls												
C-SB	1	2	14.90	1.54 U	2.89	1.21 U	1.68 U	1.68 U	1.68 U	2.68	1.61 U	0.40 U
C-SB	2	2	14.83	1.55 U	3.24	3.98 I	1.69 U	1.69 U	1.69 U	0.54 U	1.62 U	0.40 U
C-SB Replicate 1	3	1	15.03	1.53 U	2.86	1.20 U	1.66 U	1.66 U	1.66 U	1.40	1.60 U	0.40 U
C-SB Replicate 2	3	1	15.03	1.53 U	3.19	1.20 U	1.66 U	1.66 U	1.66 U	1.40	1.60 U	0.40 U
C-SB Replicate 3	3	1	15.03	1.53 U	2.46	1.20 U	1.66 U	1.66 U	1.66 U	0.53 U	1.60 U	0.40 U
Background												
M. nasuta Background	1	2	14.47	1.5895 U	0.4838 U	1.24 U	1.73 U	1.73 U	1.73 U	0.553 U	1.66 U	0.415 U
M. nasuta Background Replicate 1	2	2	14.28	1.6106 U	0.4902 U	1.26 U	1.75 U	1.75 U	1.75 U	2.31	1.68 U	0.420 U
M. nasuta Background Replicate 2	2	2	14.28	1.6106 U	0.4902 U	1.26 U	1.75 U	1.75 U	1.75 U	0.560 U	1.68 U	0.420 U
M. nasuta Background Replicate 3	2	2	14.28	1.6106 U	0.4902 U	2.87 I	1.75 U	1.75 U	1.75 U	0.560 U	1.68 U	0.420 U
M. nasuta Background	3	2	14.82	1.552 U	0.4723 U	1.21 U	1.69 U	1.69 U	1.69 U	0.540 U	1.62 U	0.405 U

(a) I Interference on both primary and confirmation column; value may be false positive or biased high.
(b) U Undetected at or above given concentration.

TABLE G.8. Quality Control Data for Chlorinated Pesticides (alphabetical, Aldrin - 2,4'DDT), Wet Weight, in Tissue of *M. nasuta*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* Pesticides (µg/kg wet weight) Aldrin	a-Chlordane	Dieldrin	2,4'-DDD	2,4'-DDE	2,4'-DDT
Method Blanks									
Blank		1	NA[a]	0.09 U[b]	0.25 U	0.16 U	0.20 U	0.07 U	0.22 U
Blank		2	NA	0.09 U	0.25 U	0.16 U	0.20 U	0.07 U	0.22 U
Matrix Spikes									
Comp PE-A	2	1	15.37	1.37	1.63	1.05	0.20 U	1.70	0.22 U
Comp PE-A MS		1	NA	3.24	NA	3.09	NA	NA	NA
Concentration Recovered				1.87	NA	2.04	NA	NA	NA
Amount Spiked				2.50	NS[c]	2.50	NS	NS	NS
Percent Recovery				75%	NA	82%	NA	NA	NA
C-SB	1	2	14.90	0.09 U	0.25 U	0.16 U	0.31	0.07 U	0.22 U
C-SB MS		2	NA	1.81	NA	1.94	NA	NA	NA
Concentration Recovered				1.81	NA	1.94	NA	NA	NA
Amount Spiked				2.45	NS	2.45	NS	NS	NS
Percent Recovery				74%	NA	79%	NA	NA	NA
Standard Reference Material									
Non-Certified Values				NC[d]	3.2 ± 0.2	1.0 ±0.5	2.5 ±0.9	0.72 ± 0.07	0.4 ±0.2
SRM 1974		1	NA	0.09 U	4.18[e]	1.07	2.61	0.07 U	0.22 U
SRM 1974		2	NA	0.09 U	4.03	0.87	3.27[e]	0.07 U	0.22 U
Analytical Triplicates									
C-SB Replicate 1	3	1	15.03	0.09 U	0.25 U	0.16 U	0.20 U	0.07 U	0.22 U
C-SB Replicate 2	3	1	15.03	0.09 U	0.25 U	0.16 U	0.20 U	0.07 U	0.22 U
C-SB Replicate 3	3	1	15.03	0.09 U	0.25 U	0.16 U	0.20 U	0.07 U	0.22 U
RSD				NA	NA	NA	NA	NA	NA

TABLE G.8. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* Pesticides (µg/kg wet weight)					
				Aldrin	a-Chlordane	Dieldrin	2,4'-DDD	2,4'-DDE	2,4'-DDT
M. nasuta Background Replicate 1	2	2	14.28	0.09 U	0.25 U	0.16 U	0.29	0.07 U	0.22 U
M. nasuta Background Replicate 2	2	2	14.28	0.09 U	0.25 U	0.16 U	0.20 U	0.07 U	0.22 U
M. nasuta Background Replicate 3	2	2	14.28	0.09 U	0.25 U	0.16 U	0.20 U	0.07 U	0.22 U
RSD				NA	NA	NA	NA	NA	NA

(a) NA Not applicable.
(b) U Undetected at or above given concentration.
(c) NS Not spiked.
(d) NC Not certified.
(e) Value exceeds SRM range of ±30%.

TABLE G.9. Quality Control Data for Chlorinated Pesticides (alphabetical, 4,4'-DDD - Trans-Nonachlor), Wet Weight, in Tissue of *M. nasuta*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* Pesticides (µg/kg wet weight) 4,4'-DDD	4,4'-DDE	4,4'-DDT	Endosulfan I	Endosulfan II	Endosulfan Sulfate	Heptachlor	Heptachlor Epoxide	Trans-Nonachlor
Method Blanks												
Blank		1	NA[a]	0.23 U[b]	0.07 U	0.18 U	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
Blank		2	NA	0.23 U	0.07 U	0.18 U	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
Matrix Spikes												
Comp PE-A	2	1	15.37	3.36	6.06	2.55 I[c]	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.29
Comp PE-A MS		1	NA	5.53	8.38	4.43	1.88	2.05	2.28	2.75	2.65	NA
Concentration Recovered				2.17	2.32	1.88	1.88	2.05	2.28	2.75	2.65	NA
Amount Spiked				2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	NS[d]
Percent Recovery				87%	93%	75%	75%	82%	91%	110%	106%	NA
C-SB	1	2	14.90	0.23 U	0.43	0.18 U	0.25 U	0.25 U	0.25 U	0.40	0.24 U	0.06 U
C-SB MS		2	NA	2.01	2.28	2.04	1.82	2.03	2.23	2.65	2.54	NA
Concentration Recovered				2.01	1.85	2.04	1.82	2.03	2.23	2.25	2.3	NA
Amount Spiked				2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	NS
Percent Recovery				82%	76%	83%	74%	83%	91%	92%	94%	NA
Standard Reference Material												
Non-Certified Values				8.4 ±0.4	5.9 ±0.2	0.3 ±0.3	NC[e]	NC	NC	NC	NC	2.6 ± 0.6
SRM 1974		1	NA	5.04[f]	7.24	7.70 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	1.26[f]
SRM 1974		2	NA	4.75[f]	6.74	7.03 I	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	1.68[f]
Analytical Triplicates												
C-SB Replicate 1	3	1	15.03	0.23 U	0.43	0.18 U	0.25 U	0.25 U	0.25 U	0.21	0.24 U	0.06 U
C-SB Replicate 2	3	1	15.03	0.23 U	0.48	0.18 U	0.25 U	0.25 U	0.25 U	0.21	0.24 U	0.06 U
C-SB Replicate 3	3	1	15.03	0.23 U	0.37	0.18 U	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
RSD				NA	11%	NA	NA	NA	NA	NA	NA	NA

TABLE G.9. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* Pesticides (µg/kg wet weight) 4,4'-DDD	4,4'-DDE	4,4'-DDT	Endosulfan I	Endosulfan II	Endosulfan Sulfate	Heptachlor	Heptachlor Epoxide	Transnonachlor
M. nasuta Background Rep 1	2	2	14.28	0.23 U	0.07 U	0.18 U	0.25 U	0.25 U	0.25 U	0.33	0.24 U	0.06 U
M. nasuta Background Rep 2	2	2	14.28	0.23 U	0.07 U	0.18 U	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
M. nasuta Background Rep 3	2	2	14.28	0.23 U	0.07 U	0.41	0.25 U	0.25 U	0.25 U	0.08 U	0.24 U	0.06 U
RSD				NA	0%	NA	NA	NA	NA	NA	NA	NA

(a) NA Not applicable.
(b) U Undetected at or above given concentration.
(c) I Interference on both primary and confirmation column; value may be false positive or biased high.
(d) NS Not spiked.
(e) NC Not certified.
(f) Value exceeds SRM range of ±30%.

TABLE G.10. Polychlorinated Biphenyls (PCBs) 18 through 49, Wet Weight, Including Surrogate Percent Recoveries, in Tissue of *M. nasuta*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Surrogate Percent Recoveries PCB 103	Surrogate Percent Recoveries PCB 198	*M. nasuta* PCBs (µg/kg wet weight) PCB 8	PCB 18	PCB 28	PCB 52	PCB 44	PCB 49
Target DL[a]			NA[b]	NA	0.4	0.4	0.4	0.4	0.4	0.4
Achieved DL			NA	NA	0.41	0.43	0.20	0.36	0.17	0.19-0.26
Arthur Kill Reach A										
Comp AK-A	1	2	73%	70%	0.78	6.72	12.6	11.4	6.47	13.1
Comp AK-A	2	2	58%	55%	0.41 U[c]	5.57	10.7	9.37	5.37	11.0
Comp AK-A	3	2	60%	58%	0.41 U	5.35	12.1	9.65	4.72	11.3
Comp AK-A	4	2	64%	61%	0.41 U	5.76	12.1	9.31	4.90	11.1
Comp AK-A	5	2	64%	62%	0.41 U	5.22	11.1	9.11	5.03	10.4
Arthur Kill Reach B										
Comp AK-B	1	1	57%	55%	0.41 U	6.04	11.2	10.6	5.68	8.16
Comp AK-B	2	2	75%	69%	4.00	10.9	14.4	11.2	6.87	11.0
Comp AK-B	3	1	69%	66%	3.56	11.0	15.6	12.0	6.65	11.5
Comp AK-B	4	1	83%	75%	3.19	10.3	15.5	11.8	7.08	11.5
Comp AK-B	5	1	74%	67%	0.41 U	9.86	14.0	11.0	6.50	10.1
Arthur Kill Reach C										
Comp AK-C	1	1	100%	75%	2.54	7.66	15.4	10.6	3.78	10.9
Comp AK-C	2	1	80%	58%	4.20	15.1	18.4	14.5	9.33	14.3
Comp AK-C	3	1	103%	69%	1.83	8.77	16.6	10.8	3.68	12.2
Comp AK-C	4	2	71%	68%	1.83	7.64	13.4	11.6	6.29	9.23
Comp AK-C	5	2	68%	60%	5.17	15.1	20.1	19.0	11.3	14.8
Port Elizabeth Reach A										
Comp PE-A	1	1	66%	63%	0.41 U	5.62	9.81	9.00	4.12	6.95
Comp PE-A	2	1	76%	74%	0.41 U	5.16	8.93	8.39	4.51	6.53
Comp PE-A	3	2	29%[d]	27%[d]	0.41 U	5.73	10.4	9.35	5.06	7.32
Comp PE-A	4	1	63%	63%	0.41 U	5.15	10.2	9.10	4.53	7.09
Comp PE-A	5	1	63%	57%	0.41 U	7.57	11.4	10.6	3.54	3.45

TABLE G.10. (contd)

Sediment Treatment	Replicate	Batch	Surrogate Percent Recoveries PCB 103	PCB 198	*M. nasuta* PCBs (µg/kg wet weight) PCB 8	PCB 18	PCB 28	PCB 52	PCB 44	PCB 49
Port Elizabeth Reach B										
Comp PE-B	1	1	77%	72%	0.41 U	6.57	13.2	10.9	3.53	3.58
Comp PE-B	2	2	70%	69%	0.40 U	5.51	11.8	9.36	3.95	8.40
Comp PE-B	3	2	66%	62%	0.41 U	6.82	13.8	11.1	6.06	9.88
Comp PE-B	4	1	63%	62%	0.41 U	5.61	9.48	8.42	4.48	7.28
Comp PE-B	5	2	61%	60%	0.41 U	7.72	16.5	12.4	6.90	10.8
Hackensack River Reach A										
Comp HR-A	1	1	35%	32%	0.41 U	5.53	10.3	9.57	2.91	6.90
Comp HR-A	2	2	70%	72%	0.41 U	4.90	9.38	8.21	2.98	6.26
Comp HR-A	3	1	68%	67%	0.41 U	6.50	10.7	10.1	3.94	7.71
Comp HR-A	4	1	61%	62%	0.41 U	4.23	9.74	8.51	2.67	6.52
Comp HR-A	5	1	61%	60%	0.41 U	5.52	10.6	10.3	3.80	7.62
Reference										
Mud Dump Reference	1	2	62%	66%	1.46	1.45	5.03	3.53	0.58	3.27
Mud Dump Reference	2	1	44%	47%	0.88	0.47	2.62	1.62	0.17 U	1.75
Mud Dump Reference	3	1	58%	65%	0.41 U	0.84	3.74	2.86	0.17 U	2.89
Mud Dump Reference	4	2	68%	73%	0.41 U	0.66	3.54	2.08	0.22	2.01
Mud Dump Reference	5	1	54%	57%	0.48	0.86	2.71	2.07	0.19	1.89
Controls										
C-SB	1	2	62%	67%	2.57	0.43 U	0.20 U	0.36 U	0.17 U	0.20 U
C-SB	2	2	58%	59%	0.41 U	0.43 U	0.20 U	0.36 U	0.17 U	0.20 U
C-SB Replicate 1	3	1	62%	72%	0.41 U	0.43 U	0.20 U	0.36 U	0.17 U	0.26 U
C-SB Replicate 2	3	1	63%	72%	0.41 U	0.43 U	0.20 U	0.36 U	0.17 U	0.26 U
C-SB Replicate 3	3	1	61%	65%	0.41 U	0.43 U	0.20 U	0.36 U	0.17 U	0.26 U

TABLE G.10. (contd)

Sediment Treatment	Replicate	Batch	Surrogate Percent Recoveries PCB 103	Surrogate Percent Recoveries PCB 198	*M. nasuta* PCBs (µg/kg wet weight) PCB 8	PCB 18	PCB 28	PCB 52	PCB 44	PCB 49
Background										
M. nasuta Background	1	2	64%	78%	0.41 U	0.43 U	0.20 U	0.36 U	0.17 U	0.20 U
M. nasuta Background Replicate 1	2	2	61%	72%	0.41 U	0.43 U	0.20 U	0.36 U	0.17 U	0.26 U
M. nasuta Background Replicate 2	2	2	62%	74%	0.41 U	0.43 U	0.20 U	0.36 U	0.17 U	0.26 U
M. nasuta Background Replicate 3	2	2	62%	79%	0.41 U	0.43 U	0.20 U	0.36 U	0.17 U	0.26 U
M. nasuta Background	3	2	64%	75%	0.41 U	0.43 U	0.20 U	0.36 U	0.17 U	0.19 U

(a) DL Detection limit.
(b) NA Not applicable.
(c) U Undetected at or above given concentration.
(d) Recovery outside quality control range of (30% to 150%).

TABLE G.11. Polychlorinated Biphenyls (PCBs) 66 through 184, Wet Weight, in Tissue of *M. nasuta*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	*M. nasuta* PCBs (µg/kg wet weight) PCB 66	PCB 101	PCB 87	PCB 118	PCB 153	PCB 105	PCB 138	PCB 183	PCB 184
Target DL[a]			0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Achieved DL			0.09	0.15	0.16	0.29	0.12	0.11	0.13	0.19-0.26	0.19-0.26
Arthur Kill Reach A											
Comp AK-A	1	2	9.62	6.88	2.37	3.90	2.91	1.63	2.82	0.20 U[b]	0.25
Comp AK-A	2	2	8.20	5.87	1.98	3.56	2.57	1.42	2.46	0.20 U	0.26
Comp AK-A	3	2	8.48	5.89	2.30	3.87	2.35	1.29	2.30	0.19 U	0.28
Comp AK-A	4	2	8.43	5.99	2.00	4.00	2.57	1.42	2.48	0.20 U	0.38
Comp AK-A	5	2	8.13	5.96	2.00	3.91	2.74	1.50	2.69	0.20 U	0.20 U
Arthur Kill Reach B											
Comp AK-B	1	1	9.22	5.04	2.05	3.49	1.83	1.40	1.88	0.20 U	0.20 U
Comp AK-B	2	2	9.31	5.52	1.96	3.32	1.98	0.11 U	1.93	0.19 U	0.19 U
Comp AK-B	3	1	10.0	5.78	2.17	3.29	1.95	0.11 U	2.03	0.20 U	0.20 U
Comp AK-B	4	1	9.83	5.87	1.99	3.33	2.06	0.11 U	4.69	0.20 U	0.20 U
Comp AK-B	5	1	8.73	5.26	1.91	3.13	1.97	0.11 U	3.22	0.20 U	0.20 U
Arthur Kill Reach C											
Comp AK-C	1	1	12.0	6.36	2.62	4.11	2.17	1.86	2.32	0.20 U	0.25
Comp AK-C	2	1	11.6	6.96	2.30	3.93	2.43	1.77	3.76	0.20 U	0.20 U
Comp AK-C	3	1	13.0	6.82	2.80	4.50	2.31	1.95	2.42	0.20 U	0.20 U
Comp AK-C	4	2	10.30	5.44	2.38	3.56	1.56	1.20	1.62	0.20 U	0.20 U
Comp AK-C	5	2	15.40	8.44	3.54	5.46	2.83	2.32	3.03	0.20 U	0.29
Port Elizabeth Reach A											
Comp PE-A	1	1	7.79	6.53	2.29	3.92	3.20	1.71	3.32	0.20 U	0.37
Comp PE-A	2	1	7.16	5.66	2.13	3.34	2.86	1.44	2.88	0.20 U	0.29
Comp PE-A	3	2	8.07	6.80	2.60	4.67	3.80	1.80	4.09	0.20 U	0.60
Comp PE-A	4	1	7.95	6.74	2.43	4.00	3.61	1.78	3.62	0.20 U	0.20 U
Comp PE-A	5	1	9.30	3.88	2.77	4.52	3.99	2.03	4.12	0.20 U	0.47
Port Elizabeth Reach B											
Comp PE-B	1	1	9.68	5.07	2.43	4.12	3.15	1.81	3.14	0.20 U	0.31
Comp PE-B	2	2	8.77	6.16	2.29	3.84	2.67	1.57	2.74	0.20 U	0.44
Comp PE-B	3	2	10.10	7.08	2.73	5.11	3.18	1.77	3.16	0.20 U	0.52
Comp PE-B	4	1	7.59	5.88	1.55	3.43	2.35	1.42	2.31	0.20 U	0.26
Comp PE-B	5	2	10.90	7.54	2.75	4.54	3.07	1.87	3.20	0.20 U	0.50

TABLE G.11. (contd)

Sediment Treatment	Replicate	Batch	*M. nasuta* PCBs (µg/kg wet weight) PCB 66	PCB 101	PCB 87	PCB 118	PCB 153	PCB 105	PCB 138	PCB 183	PCB 184
Hackensack River Reach A											
Comp HR-A	1	1	7.64	5.81	1.77	4.02	2.37	1.48	2.47	0.20 U	0.20 U
Comp HR-A	2	2	6.81	4.83	1.55	3.09	2.23	1.32	1.95	0.20 U	0.24
Comp HR-A	3	1	8.01	5.85	1.82	3.72	2.72	1.59	2.42	0.20 U	0.26
Comp HR-A	4	1	7.11	5.23	1.47	3.65	2.69	1.38	2.17	0.20 U	0.23
Comp HR-A	5	1	8.05	5.81	0.16 U	3.95	2.59	1.64	2.52	0.20 U	0.20 U
Reference											
Mud Dump Reference	1	2	5.18	4.40	1.64	3.00	2.50	1.02	2.19	0.20 U	0.30
Mud Dump Reference	2	1	3.16	2.35	0.66	1.74	1.77	0.11 U	1.27	0.20 U	0.20 U
Mud Dump Reference	3	1	4.38	3.35	1.18	2.31	2.17	0.78	1.75	0.20 U	0.20
Mud Dump Reference	4	2	3.44	2.42	0.62	1.85	1.62	0.53	0.59	0.18 U	0.18 U
Mud Dump Reference	5	1	3.20	2.43	0.56	1.75	1.58	0.11 U	1.18	0.20 U	0.20 U
Controls											
C-SB	1	2	0.19	0.15 U	0.16 U	0.29 U	0.12 U	0.11 U	0.13 U	0.20 U	0.20 U
C-SB	2	2	0.11	0.15 U	0.16	0.29 U	0.12 U	0.11 U	0.13 U	0.20 U	0.20 U
C-SB Replicate 1	3	1	0.09 U	0.15 U	0.16 U	0.29 U	0.12 U	0.11 U	0.13 U	0.26 U	0.26 U
C-SB Replicate 2	3	1	0.09 U	0.15 U	0.16 U	0.29 U	0.12 U	0.11 U	0.13 U	0.26 U	0.26 U
C-SB Replicate 3	3	1	0.09 U	0.15 U	0.16 U	0.29 U	0.12 U	0.11 U	0.13 U	0.26 U	0.26 U
Background											
M. nasuta Background	1	2	0.09 U	0.15 U	0.16 U	0.29 U	0.12 U	0.11 U	0.13 U	0.20 U	0.20 U
M. nasuta Background Replicate 1	2	2	0.09 U	0.15 U	0.16 U	0.29 U	0.12 U	0.11 U	0.13 U	0.26 U	0.26 U
M. nasuta Background Replicate 2	2	2	0.13	0.15 U	0.16 U	0.29 U	0.12 U	0.11 U	0.13 U	0.26 U	0.26 U
M. nasuta Background Replicate 3	2	2	0.09 U	0.15 U	0.16 U	0.29 U	0.12 U	0.11 U	0.13 U	0.26 U	0.26 U
M. nasuta Background	3	2	0.15	0.15 U	0.16 U	0.29 U	0.12 U	0.11 U	0.13 U	0.19 U	0.19 U

(a) DL Detection limit.
(b) U Undetected at or above given concentration.

TABLE G.12. Polychlorinated Biphenyls (PCBs) 187 through 209, Wet Weight, in Tissue of *M. nasuta*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	*M. nasuta* PCBs (µg/kg wet weight) PCB 187	PCB 128	PCB 180	PCB 170	PCB 195	PCB 206	PCB 209
Target DL[a]			0.4	0.4	0.4	0.4	0.4	0.4	0.4
Achieved DL			0.29	0.15	0.18	0.17	0.10	0.11	0.09
Arthur Kill Reach A									
Comp AK-A	1	2	0.29 U[b]	0.51	0.87	0.17 U	0.10 U	0.11 U	0.09 U
Comp AK-A	2	2	0.29 U	0.44	0.65	0.17 U	0.10 U	0.11 U	0.09 U
Comp AK-A	3	2	0.29 U	0.15 U	0.67	0.17 U	0.10 U	0.11 U	0.09 U
Comp AK-A	4	2	0.29 U	0.39	0.76	0.17 U	0.10 U	0.11 U	0.09 U
Comp AK-A	5	2	0.29 U	0.49	0.88	0.17 U	0.10 U	0.11 U	0.09 U
Arthur Kill Reach B									
Comp AK-B	1	1	0.31	0.48	0.18 U	0.17 U	0.10 U	0.11 U	0.09 U
Comp AK-B	2	2	0.29 U	0.23	0.41	0.17 U	0.10 U	0.11 U	0.09 U
Comp AK-B	3	1	0.29 U	0.15 U	0.35	0.17 U	0.10 U	0.11 U	0.09 U
Comp AK-B	4	1	0.29 U	0.22	0.43	0.17 U	0.10 U	0.11 U	0.09 U
Comp AK-B	5	1	0.29 U	0.15 U	0.46	0.17 U	0.10 U	0.11 U	0.09 U
Arthur Kill Reach C									
Comp AK-C	1	1	0.53	0.55	0.63	0.17 U	0.10 U	0.11 U	0.09 U
Comp AK-C	2	1	0.29 U	0.33	0.40	0.17 U	0.10 U	0.11 U	0.09 U
Comp AK-C	3	1	0.44	0.44	0.58	0.17 U	0.10 U	0.11 U	0.09 U
Comp AK-C	4	2	0.48	0.15 U	0.41	0.17 U	0.23	0.11 U	0.09 U
Comp AK-C	5	2	0.96	0.59	0.69	0.17 U	0.10 U	0.11 U	0.09 U
Port Elizabeth Reach A									
Comp PE-A	1	1	0.78	0.60	1.17	0.17 U	0.10 U	0.14	0.09 U
Comp PE-A	2	1	0.69	0.49	1.14	0.17 U	0.10 U	0.11 U	0.09 U
Comp PE-A	3	2	0.99	0.65	1.39	0.17 U	0.10 U	0.11 U	0.09 U
Comp PE-A	4	1	1.01	0.64	1.38	0.17 U	0.10 U	0.18	0.09 U
Comp PE-A	5	1	1.04	0.71	1.41	0.17 U	0.10 U	0.11 U	0.09 U
Port Elizabeth Reach B									
Comp PE-B	1	1	0.78	0.62	1.03	0.17 U	0.10 U	0.11 U	0.09 U
Comp PE-B	2	2	0.67	0.57	0.80	0.17 U	0.10 U	0.11 U	0.09 U
Comp PE-B	3	2	0.97	0.49	0.99	0.17 U	0.10 U	0.11 U	0.09 U
Comp PE-B	4	1	0.51	0.53	0.68	0.17 U	0.10 U	0.11 U	0.09 U
Comp PE-B	5	2	0.90	0.65	0.86	0.17 U	0.10 U	0.11 U	0.09 U

TABLE G.12. (contd)

Sediment Treatment	Replicate	Batch	*M. nasuta* PCBs (µg/kg wet weight) PCB 187	PCB 128	PCB 180	PCB 170	PCB 195	PCB 206	PCB 209
Hackensack River Reach A									
Comp HR-A	1	1	0.30	0.34	0.59	0.17 U	0.10 U	0.11 U	0.09 U
Comp HR-A	2	2	0.40	0.41	0.62	0.17 U	0.10 U	0.11 U	0.09 U
Comp HR-A	3	1	0.36	0.51	0.73	0.17 U	0.10 U	0.11 U	0.09 U
Comp HR-A	4	1	0.33	0.44	0.69	0.17 U	0.10 U	0.11 U	0.09 U
Comp HR-A	5	1	0.30	0.44	0.70	0.17 U	0.10 U	0.11 U	0.09 U
Reference									
Mud Dump Reference	1	2	0.46	0.47	0.60	0.17 U	0.10 U	0.11 U	0.09 U
Mud Dump Reference	2	1	0.29 U	0.25	0.42	0.17 U	0.10 U	0.11 U	0.09 U
Mud Dump Reference	3	1	0.54	0.35	0.60	0.17 U	0.10 U	0.11 U	0.09 U
Mud Dump Reference	4	2	0.29 U	0.21	0.36	0.17 U	0.10 U	0.11 U	0.09 U
Mud Dump Reference	5	1	0.29 U	0.22	0.35	0.17 U	0.10 U	0.11 U	0.09 U
Controls									
C-SB	1	2	0.29 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.09 U
C-SB	2	2	0.29 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.09 U
C-SB Replicate 1	3	1	0.29 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.09 U
C-SB Replicate 2	3	1	0.29 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.09 U
C-SB Replicate 3	3	1	0.29 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.09 U
Background									
M. nasuta Background	1	2	0.29 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.09 U
M. nasuta Background Replicate 1	2	2	0.29 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.09 U
M. nasuta Background Replicate 2	2	2	0.29 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.09 U
M. nasuta Background Replicate 3	2	2	0.29 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.09 U
M. nasuta Background	3	2	0.29 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.09 U

(a) DL Detection limit.
(b) U Undetected at or above given concentration.

TABLE G.13. Polychlorinated Biphenyls (PCBs) 8 through 49, Dry Weight, in Tissue of *M. nasuta*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* PCBs (µg/kg dry weight) PCB 8	PCB 18	PCB 28	PCB 52	PCB 44	PCB 49
Arthur Kill Reach A									
Comp AK-A	1	2	13.54	5.76	49.6	93.1	84.2	47.8	96.8
Comp AK-A	2	2	13.14	3.12 U[a]	42.4	81.4	71.3	40.9	83.4
Comp AK-A	3	2	13.61	3.01 U	39.3	88.9	70.9	34.7	83.0
Comp AK-A	4	2	14.41	2.85 U	40.0	84.0	64.6	34.0	77.0
Comp AK-A	5	2	13.73	2.99 U	38.0	80.5	66.4	36.6	75.7
Arthur Kill Reach B									
Comp AK-B	1	1	15.11	2.71 U	40.0	74.1	70.2	37.6	54.0
Comp AK-B	2	2	12.15	32.9	89.7	119	92.2	56.5	90.5
Comp AK-B	3	1	14.88	23.9	73.9	105	80.6	44.7	77.3
Comp AK-B	4	1	15.39	20.7	66.9	101	76.7	46.0	74.7
Comp AK-B	5	1	16.48	2.49 U	59.8	85.0	66.7	39.4	61.3
Arthur Kill Reach C									
Comp AK-C	1	1	15.89	16.0	48.2	96.9	66.7	23.8	68.6
Comp AK-C	2	1	15.12	27.8	99.9	122	95.9	61.7	94.6
Comp AK-C	3	1	14.72	12.4	59.6	113	73.4	25.0	82.9
Comp AK-C	4	2	13.30	13.8	57.4	101	87.2	47.3	69.4
Comp AK-C	5	2	14.21	36.4	106	141	134	79.5	104
Port Elizabeth Reach A									
Comp PE-A	1	1	15.83	2.59 U	35.5	62.0	56.9	26.0	43.9
Comp PE-A	2	1	15.37	2.67 U	33.6	58.1	54.6	29.3	42.5
Comp PE-A	3	2	15.26	2.69 U	37.5	68.2	61.3	33.2	48.0
Comp PE-A	4	1	15.04	2.73 U	34.2	67.8	60.5	30.1	47.1
Comp PE-A	5	1	17.28	2.37 U	43.8	66.0	61.3	20.5	20.0
Port Elizabeth Reach B									
Comp PE-B	1	1	17.79	2.30 U	36.9	74.2	61.3	19.8	20.1
Comp PE-B	2	2	17.17	2.33 U	32.1	68.7	54.5	23.0	48.9
Comp PE-B	3	2	14.99	2.74 U	45.5	92.1	74.0	40.4	65.9
Comp PE-B	4	1	13.24	3.10 U	42.4	71.6	63.6	33.8	55.0
Comp PE-B	5	2	15.30	2.68 U	50.5	108	81.0	45.1	70.6

TABLE G.13. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* PCBs (µg/kg dry weight) PCB 8	PCB 18	PCB 28	PCB 52	PCB 44	PCB 49
Hackensack River Reach A									
Comp HR-A	1	1	15.67	2.62 U	35.3	65.7	61.1	18.6	44.0
Comp HR-A	2	2	14.58	2.81 U	33.6	64.3	56.3	20.4	42.9
Comp HR-A	3	1	14.46	2.84 U	45.0	74.0	69.8	27.2	53.3
Comp HR-A	4	1	15.64	2.62 U	27.0	62.3	54.4	17.1	41.7
Comp HR-A	5	1	14.44	2.84 U	38.2	73.4	71.3	26.3	52.8
Reference									
Mud Dump Reference	1	2	14.81	9.86	9.79	34.0	23.8	3.92	22.1
Mud Dump Reference	2	1	12.76	6.90	3.68	20.5	12.7	1.33 U	13.7
Mud Dump Reference	3	1	14.21	2.89 U	5.91	26.3	20.1	1.20 U	20.3
Mud Dump Reference	4	2	14.14	2.90 U	4.67	25.0	14.7	1.56	14.2
Mud Dump Reference	5	1	14.80	3.24	5.81	18.3	14.0	1.28	12.8
Controls									
C-SB	1	2	14.90	17.2	2.89 U	1.34 U	2.42 U	1.14 U	1.34 U
C-SB	2	2	14.83	2.76 U	2.90 U	1.35 U	2.43 U	1.15 U	1.35 U
C-SB Replicate 1	3	1	15.03	2.73 U	2.86 U	1.33 U	2.40 U	1.13 U	1.73 U
C-SB Replicate 2	3	1	15.03	2.73 U	2.86 U	1.33 U	2.40 U	1.13 U	1.73 U
C-SB Replicate 3	3	1	15.03	2.73 U	2.86 U	1.33 U	2.40 U	1.13 U	1.73 U
Background									
M. nasuta Background	1	2	14.47	2.83 U	2.97 U	1.38 U	2.49 U	1.17 U	1.38 U
M. nasuta Background Replicate 1	2	2	14.28	2.87 U	3.01 U	1.40 U	2.52 U	1.19 U	1.82 U
M. nasuta Background Replicate 2	2	2	14.28	2.87 U	3.01 U	1.40 U	2.52 U	1.19 U	1.82 U
M. nasuta Background Replicate 3	2	2	14.28	2.87 U	3.01 U	1.40 U	2.52 U	1.19 U	1.82 U
M. nasuta Background	3	2	14.82	2.77 U	2.90 U	1.35 U	2.43 U	1.15 U	1.28 U

(a) U Undetected at or above given concentration.

TABLE G.14. Polychlorinated Biphenyls (PCBs) 66 through 184, Dry Weight, in Tissue of *M. nasuta*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* PCBs (µg/kg dry weight) PCB 66	PCB 101	PCB 87	PCB 118	PCB 153	PCB 105	PCB 138	PCB 183	PCB 184
Arthur Kill Reach A												
Comp AK-A	1	2	13.54	71.0	50.8	17.5	28.8	21.5	12.0	20.8	1.48 U[a]	1.85
Comp AK-A	2	2	13.14	62.4	44.7	15.1	27.1	19.6	10.8	18.7	1.52 U	1.98
Comp AK-A	3	2	13.61	62.3	43.3	16.9	28.4	17.3	9.48	16.9	1.40 U	2.06
Comp AK-A	4	2	14.41	58.5	41.6	13.9	27.8	17.8	9.85	17.2	1.39 U	2.64
Comp AK-A	5	2	13.73	59.2	43.4	14.6	28.5	20.0	10.9	19.6	1.46 U	1.46 U
Arthur Kill Reach B												
Comp AK-B	1	1	15.11	61.0	33.4	13.6	23.1	12.1	9.27	12.4	1.32 U	1.32 U
Comp AK-B	2	2	12.15	76.6	45.4	16.1	27.3	16.3	0.905 U	15.9	1.56 U	1.56 U
Comp AK-B	3	1	14.88	67.2	38.8	14.6	22.1	13.1	0.739 U	13.6	1.34 U	1.34 U
Comp AK-B	4	1	15.39	63.9	38.1	12.9	21.6	13.4	0.715 U	30.5	1.30 U	1.30 U
Comp AK-B	5	1	16.48	53.0	31.9	11.6	19.0	12.0	0.667 U	19.5	1.21 U	1.21 U
Arthur Kill Reach C												
Comp AK-C	1	1	15.89	75.5	40.0	16.5	25.9	13.7	11.7	14.6	1.26 U	1.57
Comp AK-C	2	1	15.12	76.7	46.0	15.2	26.0	16.1	11.7	24.9	1.32 U	1.32 U
Comp AK-C	3	1	14.72	88.3	46.3	19.0	30.6	15.7	13.2	16.4	1.36 U	1.36 U
Comp AK-C	4	2	13.30	77.4	40.9	17.9	26.8	11.7	9.02	12.2	1.50 U	1.50 U
Comp AK-C	5	2	14.21	108	59.4	24.9	38.4	19.9	16.3	21.3	1.41 U	2.04
Port Elizabeth Reach A												
Comp PE-A	1	1	15.83	49.2	41.3	14.5	24.8	20.2	10.8	21.0	1.26 U	2.34
Comp PE-A	2	1	15.37	46.6	36.8	13.9	21.7	18.6	9.37	18.7	1.30 U	1.89
Comp PE-A	3	2	15.26	52.9	44.6	17.0	30.6	24.9	11.8	26.8	1.31 U	3.93
Comp PE-A	4	1	15.04	52.9	44.8	16.2	26.6	24.0	11.8	24.1	1.33 U	1.33 U
Comp PE-A	5	1	17.28	53.8	22.5	16.0	26.2	23.1	11.7	23.8	1.16 U	2.72
Port Elizabeth Reach B												
Comp PE-B	1	1	17.79	54.4	28.5	13.7	23.2	17.7	10.2	17.7	1.12 U	1.74
Comp PE-B	2	2	17.17	51.1	35.9	13.3	22.4	15.6	9.14	16.0	1.16 U	2.56
Comp PE-B	3	2	14.99	67.4	47.2	18.2	34.1	21.2	11.8	21.1	1.33 U	3.47
Comp PE-B	4	1	13.24	57.3	44.4	11.7	25.9	17.7	10.7	17.4	1.51 U	1.96
Comp PE-B	5	2	15.30	71.2	49.3	18.0	29.7	20.1	12.2	20.9	1.31 U	3.27

TABLE G.14. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* PCBs (µg/kg dry weight) PCB 66	PCB 101	PCB 87	PCB 118	PCB 153	PCB 105	PCB 138	PCB 183	PCB 184
Hackensack River Reach A												
Comp HR-A	1	1	15.67	48.8	37.1	11.3	25.7	15.1	9.44	15.8	1.28 U	1.28 U
Comp HR-A	2	2	14.58	46.7	33.1	10.6	21.2	15.3	9.05	13.4	1.37 U	1.65
Comp HR-A	3	1	14.46	55.4	40.5	12.6	25.7	18.8	11.0	16.7	1.38 U	1.80
Comp HR-A	4	1	15.64	45.5	33.4	9.40	23.3	17.2	8.82	13.9	1.28 U	1.47
Comp HR-A	5	1	14.44	55.7	40.2	1.11 U	27.4	17.9	11.4	17.5	1.39 U	1.39 U
Reference												
Mud Dump Reference	1	2	14.81	35.0	29.7	11.1	20.3	16.9	6.89	14.8	1.35 U	2.03
Mud Dump Reference	2	1	12.76	24.8	18.4	5.17	13.6	13.9	0.862 U	10.0	1.57 U	1.57 U
Mud Dump Reference	3	1	14.21	30.8	23.6	8.30	16.3	15.3	5.49	12.3	1.41 U	1.41
Mud Dump Reference	4	2	14.14	24.3	17.1	4.38	13.1	11.5	3.75	4.17	1.27 U	1.27 U
Mud Dump Reference	5	1	14.80	21.6	16.4	3.78	11.8	10.7	0.743 U	7.97	1.35 U	1.35 U
Controls												
C-SB	1	2	14.90	1.28	1.01 U	1.07 U	1.95 U	0.805 U	0.738 U	0.872 U	1.34 U	1.34 U
C-SB	2	2	14.83	0.742	1.01 U	1.08	1.96 U	0.809 U	0.742 U	0.877 U	1.35 U	1.35 U
C-SB Replicate 1	3	1	15.03	0.599 U	0.998 U	1.06 U	1.93 U	0.798 U	0.732 U	0.865 U	1.73 U	1.73 U
C-SB Replicate 2	3	1	15.03	0.599 U	0.998 U	1.06 U	1.93 U	0.798 U	0.732 U	0.865 U	1.73 U	1.73 U
C-SB Replicate 3	3	1	15.03	0.599 U	0.998 U	1.06 U	1.93 U	0.798 U	0.732 U	0.865 U	1.73 U	1.73 U
Background												
M. nasuta Background	1	2	14.47	0.622 U	1.04 U	1.11 U	2.00 U	0.829 U	0.760 U	0.898 U	1.38 U	1.38 U
M. nasuta Background Replicate 1	2	2	14.28	0.630 U	1.05 U	1.12 U	2.03 U	0.840 U	0.770 U	0.910 U	1.82 U	1.82 U
M. nasuta Background Replicate 2	2	2	14.28	0.910	1.05 U	1.12 U	2.03 U	0.840 U	0.770 U	0.910 U	1.82 U	1.82 U
M. nasuta Background Replicate 3	2	2	14.28	0.630 U	1.05 U	1.12 U	2.03 U	0.840 U	0.770 U	0.910 U	1.82 U	1.82 U
M. nasuta Background	3	2	14.82	1.01	1.01 U	1.08 U	1.96 U	0.810 U	0.742 U	0.877 U	1.28 U	1.28 U

(a) U Undetected at or above given concentration.

TABLE G.15. Polychlorinated Biphenyls (PCBs) 187 through 209, Dry Weight, in Tissue of *M. nasuta*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Percent Dry Weight	M. nasuta PCBs (µg/kg dry weight) PCB 187	PCB 128	PCB 180	PCB 170	PCB 195	PCB 206	PCB 209
Arthur Kill Reach A										
Comp AK-A	1	2	13.54	2.14 U[a]	3.77	6.43	1.26 U	0.739 U	0.812 U	0.665 U
Comp AK-A	2	2	13.14	2.21 U	3.35	4.95	1.29 U	0.761 U	0.837 U	0.685 U
Comp AK-A	3	2	13.61	2.13 U	1.10 U	4.92	1.25 U	0.735 U	0.808 U	0.661 U
Comp AK-A	4	2	14.41	2.01 U	2.71	5.27	1.18 U	0.694 U	0.763 U	0.625 U
Comp AK-A	5	2	13.73	2.11 U	3.57	6.41	1.24 U	0.728 U	0.801 U	0.655 U
Arthur Kill Reach B										
Comp AK-B	1	1	15.11	2.05	3.18	1.19 U	1.13 U	0.662 U	0.728 U	0.596 U
Comp AK-B	2	2	12.15	2.39 U	1.89	3.37	1.40 U	0.823 U	0.905 U	0.741 U
Comp AK-B	3	1	14.88	1.95 U	1.01 U	2.35	1.14 U	0.672 U	0.739 U	0.605 U
Comp AK-B	4	1	15.39	1.88 U	1.43	2.79	1.10 U	0.650 U	0.715 U	0.585 U
Comp AK-B	5	1	16.48	1.76 U	0.910 U	2.79	1.03 U	0.607 U	0.667 U	0.546 U
Arthur Kill Reach C										
Comp AK-C	1	1	15.89	3.34	3.46	3.96	1.07 U	0.629 U	0.692 U	0.566 U
Comp AK-C	2	1	15.12	1.92 U	2.18	2.65	1.12 U	0.661 U	0.728 U	0.595 U
Comp AK-C	3	1	14.72	2.99	2.99	3.94	1.15 U	0.679 U	0.747 U	0.611 U
Comp AK-C	4	2	13.30	3.61	1.13 U	3.08	1.28 U	1.73	0.827 U	0.677 U
Comp AK-C	5	2	14.21	6.76	4.15	4.86	1.20 U	0.704 U	0.774 U	0.633 U
Port Elizabeth Reach A										
Comp PE-A	1	1	15.83	4.93	3.79	7.39	1.07 U	0.632 U	0.884	0.569 U
Comp PE-A	2	1	15.37	4.49	3.19	7.42	1.11 U	0.651 U	0.716 U	0.586 U
Comp PE-A	3	2	15.26	6.49	4.26	9.11	1.11 U	0.655 U	0.721 U	0.590 U
Comp PE-A	4	1	15.04	6.72	4.26	9.18	1.13 U	0.665 U	1.20	0.598 U
Comp PE-A	5	1	17.28	6.02	4.11	8.16	0.984 U	0.579 U	0.637 U	0.521 U
Port Elizabeth Reach B										
Comp PE-B	1	1	17.79	4.38	3.49	5.79	0.956 U	0.562 U	0.618 U	0.506 U
Comp PE-B	2	2	17.17	3.90	3.32	4.66	0.990 U	0.582 U	0.641 U	0.524 U
Comp PE-B	3	2	14.99	6.47	3.27	6.60	1.13 U	0.667 U	0.734 U	0.600 U
Comp PE-B	4	1	13.24	3.85	4.00	5.14	1.28 U	0.755 U	0.831 U	0.680 U
Comp PE-B	5	2	15.30	5.88	4.25	5.62	1.11 U	0.654 U	0.719 U	0.588 U

TABLE G.15. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	M. nasuta PCBs (µg/kg dry weight) PCB 187	PCB 128	PCB 180	PCB 170	PCB 195	PCB 206	PCB 209
Hackensack River Reach A										
Comp HR-A	1	1	15.67	1.91	2.17	3.77	1.08 U	0.638 U	0.702 U	0.574 U
Comp HR-A	2	2	14.58	2.74	2.81	4.25	1.17 U	0.686 U	0.754 U	0.617 U
Comp HR-A	3	1	14.46	2.49	3.53	5.05	1.18 U	0.692 U	0.761 U	0.622 U
Comp HR-A	4	1	15.64	2.11	2.81	4.41	1.09 U	0.639 U	0.703 U	0.575 U
Comp HR-A	5	1	14.44	2.08	3.05	4.85	1.18 U	0.693 U	0.762 U	0.623 U
Reference										
Mud Dump Reference	1	2	14.81	3.11	3.17	4.05	1.15 U	0.675 U	0.743 U	0.608 U
Mud Dump Reference	2	1	12.76	2.27 U	1.96	3.29	1.33 U	0.784 U	0.862 U	0.705 U
Mud Dump Reference	3	1	14.21	3.80	2.46	4.22	1.20 U	0.704 U	0.774 U	0.633 U
Mud Dump Reference	4	2	14.14	2.05 U	1.49	2.55	1.20 U	0.707 U	0.778 U	0.636 U
Mud Dump Reference	5	1	14.80	1.96 U	1.49	2.36	1.15 U	0.676 U	0.743 U	0.608 U
Controls										
C-SB	1	2	14.90	1.95 U	1.01 U	1.21 U	1.14 U	0.671 U	0.738 U	0.604 U
C-SB	2	2	14.83	1.96 U	1.01 U	1.21 U	1.15 U	0.674 U	0.742 U	0.607 U
C-SB Replicate 1	3	1	15.03	1.93 U	0.998 U	1.20 U	1.13 U	0.665 U	0.732 U	0.599 U
C-SB Replicate 2	3	1	15.03	1.93 U	0.998 U	1.20 U	1.13 U	0.665 U	0.732 U	0.599 U
C-SB Replicate 3	3	1	15.03	1.93 U	0.998 U	1.20 U	1.13 U	0.665 U	0.732 U	0.599 U
Background										
M. nasuta Background	1	2	14.47	2.00 U	1.04 U	1.24 U	1.17 U	0.691 U	0.760 U	0.622 U
M. nasuta Background Replicate 1	2	2	14.28	2.03 U	1.05 U	1.26 U	1.19 U	0.700 U	0.770 U	0.630 U
M. nasuta Background Replicate 2	2	2	14.28	2.03 U	1.05 U	1.26 U	1.19 U	0.700 U	0.770 U	0.630 U
M. nasuta Background Replicate 3	2	2	14.28	2.03 U	1.05 U	1.26 U	1.19 U	0.700 U	0.770 U	0.630 U
M. nasuta Background	3	2	14.82	1.96 U	1.01 U	1.21 U	1.15 U	0.675 U	0.742 U	0.607 U

(a) U Undetected at or above given concentration.

TABLE G.16. Quality Control Data for Polychlorinated Biphenyls (PCBs) 18 through 49, Wet Weight, Including Surrogate Percent Recoveries, in Tissue of *M. nasuta*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Surrogate Percent Recoveries PCB 103	Surrogate Percent Recoveries PCB 198	*M. nasuta* PCBs (µg/kg wet weight) PCB 8	PCB 18	PCB 28	PCB 52	PCB 44	PCB 49
Method Blanks										
Blank		1	56%	52%	0.41 U[a]	0.43 U	0.20 U	0.36 U	0.17 U	0.20 U
Blank		2	81%	80%	0.41 U	0.43 U	0.20 U	0.36 U	0.17 U	0.20 U
Matrix Spikes										
Comp PE-A	2	1	76%	74%	0.41 U	5.16	8.93	8.39	4.51	6.53
Comp PE-A MS		1	73%	70%	NA[b]	NA	12.2	14.5	NA	NA
Concentration Recovered					NA	NA	3.27	6.11	NA	NA
Amount Spiked					NS[c]	NS	3.19	6.65	NS	NS
Percent Recovery					NA	NA	103%	92%	NA	NA
C-SB	1	2	62%	67%	2.57	0.43 U	0.20 U	0.36 U	0.17 U	0.20 U
C-SB MS		2	66%	74%	NA	NA	4.03	6.57	NA	NA
Concentration Recovered					NA	NA	4.03	6.57	NA	NA
Amount Spiked					NS	NS	3.19	6.52	NS	NS
Percent Recovery					NA	NA	126%[d]	101%	NA	NA
Standard Reference Material										
Non-Certified Values					NC[e]	3 ± 1	7.6 ± 0.4	12 ± 5	8 ± 3	NC
SRM 1974		1	57%	48%	0.41 U	4.32[f]	6.21	10.8	6.97	7.06
SRM 1974		2	68%	69%	0.41 U	4.58[f]	8.63	12.3	7.84	11.3
Analytical Triplicates										
C-SB Replicate 1	3	1	62%	72%	0.41 U	0.43 U	0.20 U	0.36 U	0.17 U	0.26 U
C-SB Replicate 2	3	1	63%	72%	0.41 U	0.43 U	0.20 U	0.36 U	0.17 U	0.26 U
C-SB Replicate 3	3	1	61%	65%	0.41 U	0.43 U	0.20 U	0.36 U	0.17 U	0.26 U
RSD					NA	NA	NA	NA	NA	NA

TABLE G.16. (contd)

Sediment Treatment	Replicate	Batch	Surrogate Percent Recoveries PCB 103	PCB 198	*M. nasuta* PCBs (µg/kg wet weight) PCB 8	PCB 18	PCB 28	PCB 52	PCB 44	PCB 49
M. nasuta Background Replicate 1	2	2	61%	72%	0.41 U	0.43 U	0.20 U	0.36 U	0.17 U	0.26 U
M. nasuta Background Replicate 2	2	2	62%	74%	0.41 U	0.43 U	0.20 U	0.36 U	0.17 U	0.26 U
M. nasuta Background Replicate 3	2	2	62%	79%	0.41 U	0.43 U	0.20 U	0.36 U	0.17 U	0.26 U
RSD					NA	NA	NA	NA	NA	NA

(a) U Undetected at or above given concentration.
(b) NA Not applicable.
(c) NS Not spiked.
(d) Value exceeds quality control range of (50% to 120%).
(e) NC Not certified
(f) Value exceeds SRM range of ±30%.

TABLE G.18. Quality Control Data for Polychlorinated Biphenyls (PCBs) 187 through 209, Wet Weight, in Tissue of *M. nasuta*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	*M. nasuta* PCBs (µg/kg wet weight) PCB 187	PCB 128	PCB 180	PCB 170	PCB 195	PCB 206	PCB 209
Method Blanks									
Blank		1	0.29 U[a]	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.09 U
Blank		2	0.29 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.09 U
Matrix Spikes									
COMP PE-A	2	1	0.69	0.49	1.14	0.17 U	0.10 U	0.11 U	0.09 U
COMP PE-A MS		1	NA[b]	NA	NA	NA	NA	NA	NA
Concentration Recovered			NA	NA	NA	NA	NA	NA	NA
Amount Spiked			NS[c]	NS	NS	NS	NS	NS	NS
Percent Recovery			NA	NA	NA	NA	NA	NA	NA
C-SB	1	2	0.29 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.09 U
C-SB MS		2	NA	NA	NA	NA	NA	NA	NA
Concentration Recovered			NA	NA	NA	NA	NA	NA	NA
Amount Spiked			NS	NS	NS	NS	NS	NS	NS
Percent Recovery			NA	NA	NA	NA	NA	NA	NA
Standard Reference Material									
Non-Certified Values			3.7 ±0.1	1.9 ± 0.3	1.7 ± 0.2	NC[d]	NC	NC	NC
SRM 1974		1	3.39	2.19	1.16	0.17 U	0.10 U	0.11 U	0.09 U
SRM 1974		2	2.99	2.10	1.19	0.17 U	0.10 U	0.11 U	0.09 U
Analytical Triplicates									
C-SB Replicate 1	3	1	0.29 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.09 U
C-SB Replicate 2	3	1	0.29 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.09 U
C-SB Replicate 3	3	1	0.29 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.09 U
RSD			NA	NA	NA	NA	NA	NA	NA

TABLE G.18. (contd)

Sediment Treatment	Replicate	Batch	*M. nasuta* PCBs (µg/kg wet weight)						
			PCB 187	PCB 128	PCB 180	PCB 170	PCB 195	PCB 206	PCB 209
M. nasuta Background Replicate 1	2	2	0.29 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.09 U
M. nasuta Background Replicate 2	2	2	0.29 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.09 U
M. nasuta Background Replicate 3	2	2	0.29 U	0.15 U	0.18 U	0.17 U	0.10 U	0.11 U	0.09 U
RSD			NA	NA	NA	NA	NA	NA	NA

(a) U Undetected at or above given concentration.
(b) NA Not applicable.
(c) NS Not spiked.
(d) NC Not certified.

TABLE G.19. Total Polynuclear Aromatic Hydrocarbons (TPAHs), Wet Weight, in Tissue of *M. nasuta*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	*M. nasuta* PAHs (µg/g wet weight) Total Low Molecular Weight PAHs	Total High Molecular Weight PAHs	Total PAHs
Arthur Kill Reach A					
Comp AK-A	1	2	125	711	836
Comp AK-A	2	2	106	547	653
Comp AK-A	3	2	123	633	756
Comp AK-A	4	2	118	632	750
Comp AK-A	5	2	100	604	704
Arthur Kill Reach B					
Comp AK-B	1	1	98	441	539
Comp AK-B	2	2	206	635	841
Comp AK-B	3	1	180	701	881
Comp AK-B	4	1	174	614	788
Comp AK-B	5	1	193	597	790
Arthur Kill Reach C					
Comp AK-C	1	1	132	533	665
Comp AK-C	2	1	217	765	982
Comp AK-C	3	1	150	585	735
Comp AK-C	4	2	100	459	559
Comp AK-C	5	2	213	682	895
Port Elizabeth Reach A					
Comp PE-A	1	1	281	1229	1510
Comp PE-A	2	1	233	1157	1390
Comp PE-A	3	2	368	1366	1734
Comp PE-A	4	1	255	1282	1537
Comp PE-A	5	1	358	1412	1770
Port Elizabeth Reach B					
Comp PE-B	1	1	378	1421	1799
Comp PE-B	2	2	405	1270	1675
Comp PE-B	3	2	457	1422	1879
Comp PE-B	4	1	342	1132	1474
Comp PE-B	5	2	493	1562	2055
Hackensack River Reach A					
Comp HR-A	1	1	3134	6946	10080
Comp HR-A	2	2	3508	6099	9607
Comp HR-A	3	1	5060	8143	13203
Comp HR-A	4	1	2752	6959	9711
Comp HR-A	5	1	4389	9783	14172
Reference					
Mud Dump Reference	1	2	21	164	185
Mud Dump Reference	2	1	17	102	119
Mud Dump Reference	3	1	21	160	181
Mud Dump Reference	4	2	20	125	145
Mud Dump Reference	5	1	16	101	117

TABLE G.19. (contd)

Sediment Treatment	Replicate	Batch	*M. nasuta* PAHs (µg/g wet weight) Total Low Molecular Weight PAHs	Total High Molecular Weight PAHs	Total PAHs
Controls					
C-SB	1	2	13	34	47
C-SB	2	2	13	33	46
C-SB Replicate 1	3	1	9	37	46
C-SB Replicate 2	3	1	14	38	52
C-SB Replicate 3	3	1	11	30	41
Background					
M. nasuta Background	1	2	9	23	32
M. nasuta Background Replicate 1	1	2	9	20	29
M. nasuta Background Replicate 2	2	2	12	23	35
M. nasuta Background Replicate 3	3	2	9	21	30
M. nasuta Background	1	2	7	14	21

TABLE G.20. Low Molecular Weight Polynuclear Aromatic Hydrocarbons (LPAHs), Wet Weight, in Tissue of *M. nasuta*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	*M. nasuta* LPAHs (µg/g wet weight) Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene
Target DL[a]			4	4	4	4	4	4
Achieved DL			0.81	0.82	0.78	1.38	0.65	2.23
Arthur Kill Reach A								
Comp AK-A	1	2	4.03	2.87[b]	7.19	12.0	54.5	44.2
Comp AK-A	2	2	2.93	2.70[b]	5.23[b]	9.38	47.5	38.5
Comp AK-A	3	2	3.59	2.86[b]	7.14	12.0	54.8	43.0
Comp AK-A	4	2	3.50	2.60[b]	6.60	11.0	51.8	42.1
Comp AK-A	5	2	3.70	2.60[b]	5.58	9.10	42.9	35.8
Arthur Kill Reach B								
Comp AK-B	1	1	2.43	1.84[b]	3.31[b]	7.35[b]	47.0	35.7
Comp AK-B	2	2	3.06	2.08[b]	8.09	14.9	96.6	81.0
Comp AK-B	3	1	3.16	2.52[b]	6.87	13.2	82.9	71.8
Comp AK-B	4	1	3.23	2.09[b]	6.32	12.2	81.3	69.0
Comp AK-B	5	1	3.19	2.31[b]	7.32	13.4	88.2	78.2
Arthur Kill Reach C								
Comp AK-C	1	1	2.60	1.96[b]	4.59[b]	10.6	65.7	46.1
Comp AK-C	2	1	3.40[b]	2.56[b]	8.90[b]	16.9	102	82.9
Comp AK-C	3	1	2.86	2.06[b]	5.45[b]	12.0	76.0	52.1
Comp AK-C	4	2	2.25	1.84[b]	2.75[b]	6.82	49.0	37.0
Comp AK-C	5	2	3.56	2.43[b]	8.80[b]	17.8	109	71.2
Port Elizabeth Reach A								
Comp PE-A	1	1	4.79	2.89[b]	28.6	28.7	166	50.0
Comp PE-A	2	1	3.93	2.89[b]	20.5	22.2	138	45.2
Comp PE-A	3	2	6.19	3.96[b]	33.8	34.4	222	67.8
Comp PE-A	4	1	4.80	3.17[b]	20.9	22.7	152	51.2
Comp PE-A	5	1	5.87	3.61[b]	37.0	36.8	213	62.2

TABLE G.20. (contd)

Sediment Treatment	Replicate	Batch	*M. nasuta* LPAHs (µg/g wet weight) Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene
Port Elizabeth Reach B								
Comp PE-B	1	1	5.69	4.38(b)	32.2	33.7	221	81.1
Comp PE-B	2	2	5.14	3.89(b)	34.4	36.6	246	78.5
Comp PE-B	3	2	6.20	3.50(b)	42.6	42.5	274	88.0
Comp PE-B	4	1	5.26	2.75(b)	29.5	30.9	195	78.3
Comp PE-B	5	2	6.54	3.32(b)	45.0	46.9	298	93.5
Hackensack River Reach A								
Comp HR-A	1	1	12.5	8.24	250	242	1990	631
Comp HR-A	2	2	22.3	14.0 D(c)	288 D	278 D	2210 D	696 D
Comp HR-A	3	1	31.4	15.1	610	532	2960	912
Comp HR-A	4	1	13.3 D	7.20 D(b)	215 D	204 D	1760 D	552 D
Comp HR-A	5	1	18.4 D	15.5 D	446 D	388 D	2760 D	761 D
Reference								
Mud Dump Reference	1	2	3.12(b)	2.22(b)	1.58	3.17(b)	5.56	5.32(b)
Mud Dump Reference	2	1	2.77(b)	1.84(b)	0.78 U(d)	2.87	4.48 B(e)	4.55(b)
Mud Dump Reference	3	1	3.62	2.19(b)	0.78 U	3.02	5.87 B	5.98
Mud Dump Reference	4	2	2.61(b)	1.87(b)	1.41	2.84(b)	5.37	6.08(b)
Mud Dump Reference	5	1	2.96(b)	1.78(b)	0.78 U	2.57(b)	3.83 B	4.46(b)
Controls								
C-SB	1	2	1.64(b)	0.82 U	1.83(b)	2.63	3.10	3.40(b)
C-SB	2	2	1.88(b)	0.82 U	1.88(b)	2.68(b)	3.19	3.59(b)
C-SB Replicate 1	3	1	2.11(b)	0.82 U	0.78 U	3.31(b)	3.56 B(b)	2.23 U
C-SB Replicate 2	3	1	2.40(b)	0.82 U	0.78 U	3.37	3.78 B	4.65(b)
C-SB Replicate 3	3	1	2.15(b)	0.82 U	0.78 U	1.38 U	3.76 B(b)	4.98(b)

TABLE G.20. (contd)

Sediment Treatment	Replicate	Batch	*M. nasuta* LPAHs (µg/g wet weight) Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene
Background								
M. nasuta Background	1	2	2.03	0.82 U	1.31	2.63	3.31	2.23 U
M. nasuta Background Replicate 1	1	2	2.25	0.82 U	0.78 U	3.13(b)	3.73	2.23 U
M. nasuta Background Replicate 2	2	2	2.71	0.82 U	2.26(b)	3.35	3.94	2.23 U
M. nasuta Background Replicate 3	3	2	2.27	0.82 U	0.78 U	3.10	3.86	2.23 U
M. nasuta Background	1	2	1.80	0.82 U	0.78 U	2.33(b)	2.88	2.23 U

(a) DL Detection limit.
(b) Indicates ion ratio out or confirming ion not found.
(c) D Diluted sample (1:10).
(d) U Undetected at or above the detection limit shown.
(e) B Analyte detected in blank at > 3 times MDL (value flagged is less than five times the blank value).

TABLE G.21. High Molecular Weight Polynuclear Aromatic Hydrocarbons (HPAHs), (Fluoranthene-,--Benzo(k)fluoranthene), Wet Weight, in Tissue of *M. nasuta*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	*M. nasuta* HPAHs (µg/g wet weight) Fluor-anthene	Pyrene	Benzo(a)-anthra-cene	Chrysene	Benzo(b)-fluor-anthene	Benzo(k)-fluor-anthene
Target DL[a]			4	4	4	4	4	4
Achieved DL			1.64	1.78	1.59	0.65	0.28	0.82
Arthur Kill Reach A								
Comp AK-A	1	2	165	203	77.1	110	65.7	15.8
Comp AK-A	2	2	120	151[b]	61.0	90.9	50.5	13.4
Comp AK-A	3	2	142	174[b]	69.6	104	58.7	16.7
Comp AK-A	4	2	148	178	67.8	99.8	56.7	15.0
Comp AK-A	5	2	132	164	64.9	97.6	59.1	16.2
Arthur Kill Reach B								
Comp AK-B	1	1	110	126	50.0	70.5	35.1	8.64 B[c]
Comp AK-B	2	2	172	200	69.6	99.8	39.4	9.95
Comp AK-B	3	1	179	210	76.1	112	52.4	13.0 B
Comp AK-B	4	1	153	183	70.9	100	47.9	10.1 B
Comp AK-B	5	1	145	173	71.9	97.9	47.4	10.0 B
Arthur Kill Reach C								
Comp AK-C	1	1	139	158	59.0	83.6	40.3	8.29 B
Comp AK-C	2	1	199	239	82.7	122	54.4	14.5 B
Comp AK-C	3	1	154	174	64.5	92.8	45.1	10.0 B
Comp AK-C	4	2	116	133	53.5	80.0	32.0	7.98
Comp AK-C	5	2	188	212	71.8	104	45.4	11.4
Port Elizabeth Reach A								
Comp PE-A	1	1	447	364	98.0	121	86.4	25.1 B
Comp PE-A	2	1	413	343	96.6	120	81.0	20.9 B
Comp PE-A	3	2	506	420	106	142	77.0	23.8
Comp PE-A	4	1	444	372	111	137	96.0	25.6 B
Comp PE-A	5	1	499	409	119	149	101	31.4

TABLE G.21. (contd)

Sediment Treatment	Replicate	Batch	*M. nasuta* HPAHs (µg/g wet weight)					
			Fluor-anthene	Pyrene	Benzo(a)-anthra-cene	Chrysene	Benzo(b)-fluor-anthene	Benzo(k)-fluor-anthene
Port Elizabeth Reach B								
Comp PE-B	1	1	475	400	133	158	108	28.5 B
Comp PE-B	2	2	443	366	120	141	83.4	22.9
Comp PE-B	3	2	489	414	135	158	96.1	26.2
Comp PE-B	4	1	385	321	104	132	86.0	19.5 B
Comp PE-B	5	2	575	470	138	159	96.4	24.6
Hackensack River Reach A								
Comp HR-A	1	1	3120	2140	604	520	290	78.9
Comp HR-A	2	2	2710 D(d)	1840 D	540 D	461 D	228 D	66.6 D
Comp HR-A	3	1	3560	2600	679	568	326	83.4
Comp HR-A	4	1	3130	2160	532	511	264	87.0
Comp HR-A	5	1	4370 D	3390 D	649 D	622 D	310 D	106 D
Reference								
Mud Dump Reference	1	2	17.1	51.5	11.0	15.7	24.8	9.57
Mud Dump Reference	2	1	11.1	22.2	7.38	10.5	18.6	7.87 B
Mud Dump Reference	3	1	17.0	42.0	11.5	16.0	26.7	10.7 B
Mud Dump Reference	4	2	13.6	34.5	9.65	12.6	18.9	7.79
Mud Dump Reference	5	1	11.7	23.2	7.86	5.90	18.6	7.12 B
Controls								
C-SB	1	2	8.19	5.71(b)	2.15(b)	1.43	4.46	1.72(b)
C-SB	2	2	7.93	5.31	2.20	1.46	4.63	1.82(b)
C-SB Replicate 1	3	1	7.96	4.63	2.66(b)	1.38	5.58(b)	3.05(b)
C-SB Replicate 2	3	1	8.24	4.80	2.81(b)	1.37	5.59	2.95(b)
C-SB Replicate 3	3	1	8.33	2.49(b)	2.69(b)	1.00(b)	5.50(b)	2.17(b)

TABLE G.21. (contd)

Sediment Treatment	Replicate	Batch	*M. nasuta* HPAHs (µg/g wet weight) Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene
Background								
M. nasuta Background	1	2	5.65	3.06	1.83	0.96	3.36	0.82 U(e)
M. nasuta Background Replicate 1	1	2	7.26	2.33	2.35	1.06	4.36	0.82 U
M. nasuta Background Replicate 2	2	2	7.13	4.40	2.46(b)	1.05(b)	4.92(b)	0.82 U
M. nasuta Background Replicate 3	3	2	6.85	4.11	2.30	0.88	4.36	0.82 U
M. nasuta Background	1	2	4.48	2.29	1.68(b)	0.62	3.18(b)	0.82 U

(a) DL Detection limit.
(b) Indicates ion ratio out or confirming ion not found.
(c) B Analyte detected at a concentration greater than 3 times the MDL in the method blank associated with the sample batch.
(d) D Diluted sample (1:10).
(e) U Undetected at or above the detection limit shown.

TABLE G.22. High Molecular Weight Polynuclear Aromatic Hydrocarbons (HPAHs), (Benzo(a)-Pyrene - 1,4 Dichlorobenzene), Wet Weight, in Tissue of *M. nasuta*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	*M. nasuta* HPAHs (µg/g wet weight) Benzo(a)-pyrene	Indeno-(1,2,3-cd) pyrene	Dibenzo-(a,h) anthracene	Benzo-(g,h,i) perylene	1,4 Dichlorobenzene
Target DL[a]			4	4	4	4	4
Achieved DL			0.79	2.71	2.92	2.42	1.00
Arthur Kill Reach A							
Comp AK-A	1	2	41.9	13.0	3.88	15.5	1.00 U[b]
Comp AK-A	2	2	33.4	11.2	3.07	12.4	1.00 U
Comp AK-A	3	2	37.9	12.7	3.50	14.0	1.00 U
Comp AK-A	4	2	36.1	11.8	3.83	15.1	1.00 U
Comp AK-A	5	2	38.1	12.7	3.62	15.6	1.00 U
Arthur Kill Reach B							
Comp AK-B	1	1	22.7	7.43	2.92 U	11.2	1.00 U
Comp AK-B	2	2	26.0	7.81	2.92 U	10.3	1.00 U
Comp AK-B	3	1	33.9	9.15	2.93	11.5	1.20
Comp AK-B	4	1	30.1	8.01	2.92 U	11.1	1.00 U
Comp AK-B	5	1	31.1	8.42	2.92 U	12.2	1.00 U
Arthur Kill Reach C							
Comp AK-C	1	1	24.1	7.95	2.92 U	12.9	1.00 U
Comp AK-C	2	1	33.7	7.80	2.92 U	12.2	1.00 U
Comp AK-C	3	1	25.2	8.02	2.92 U	11.7	1.00 U
Comp AK-C	4	2	20.2	7.07	2.92 U	9.35	1.00 U
Comp AK-C	5	2	28.4	8.61	2.92 U	12.0	1.00 U
Port Elizabeth Reach A							
Comp PE-A	1	1	48.7	15.7	4.30	18.0	1.04
Comp PE-A	2	1	47.4	14.9	4.04	16.4	1.00 U
Comp PE-A	3	2	50.0	18.3	3.80	18.9	1.00 U
Comp PE-A	4	1	57.2	16.7	4.44	17.6	1.00 U
Comp PE-A	5	1	60.0	17.5	4.58	19.9	1.34
Port Elizabeth Reach B							
Comp PE-B	1	1	70.7	18.6	5.78	22.8	1.23
Comp PE-B	2	2	54.7	16.7	4.42	17.8	1.00 U
Comp PE-B	3	2	61.7	16.4	4.47	19.9	1.05
Comp PE-B	4	1	53.1	12.7	4.09	14.9	1.00 U
Comp PE-B	5	2	59.6	16.2	4.45	19.0	1.00 U
Hackensack River Reach A							
Comp HR-A	1	1	193	2.71 U	2.92 U	2.42 U	1.00 U
Comp HR-A	2	2	149	45.8 D[c]	11.4 D	45.4 D	2.07
Comp HR-A	3	1	222	46.9	11.0	45.3	1.00 U
Comp HR-A	4	1	177	53.1	7.92	37.0	1.00 U
Comp HR-A	5	1	221 D	56.8 D	9.75 D	48.7 D	1.00 U

TABLE G.22. (contd)

Sediment Treatment	Replicate	Batch	*M. nasuta* HPAHs (µg/g wet weight) Benzo(a)-pyrene	Indeno-(1,2,3-cd) pyrene	Dibenzo-(a,h) anthracene	Benzo-(g,h,i) perylene	1,4 Dichlorobenzene
Reference							
Mud Dump Reference	1	2	17.1	9.59	2.92 U	7.84	1.00 U
Mud Dump Reference	2	1	12.9 B(d)	5.74	2.92 U	6.16	1.00 U
Mud Dump Reference	3	1	18.9	8.86	2.92 U	8.42	1.00 U
Mud Dump Reference	4	2	13.6	8.33	2.92 U	6.36	1.00 U
Mud Dump Reference	5	1	12.6 B	7.30	2.92 U	6.58	1.00 U
Controls							
C-SB	1	2	2.11(e)	4.68(e)	2.92 U	3.20(e)	1.00 U
C-SB	2	2	2.25(e)	3.96(e)	2.92 U	3.38	1.00 U
C-SB Replicate 1	3	1	2.78(e)B	4.60(e)	2.92 U	4.06(e)	1.00 U
C-SB Replicate 2	3	1	2.83(e)B	4.95	2.92 U	4.01(e)	0.30
C-SB Replicate 3	3	1	2.92(e)B	4.86(e)	2.92 U	3.19 U	1.00 U
Background							
M. nasuta Background	1	2	2.01	3.50	2.92 U	2.83	1.00 U
M. nasuta Background Replicate 1	1	2	2.76	2.71 U	2.92 U	2.42 U	1.00 U
M. nasuta Background Replicate 2	2	2	2.59(e)	2.71 U	2.92 U	2.42 U	1.00 U
M. nasuta Background Replicate 3	3	2	2.55	2.71 U	2.92 U	2.42 U	1.00 U
M. nasuta Background	1	2	2.11	2.71 U	2.92 U	2.42 U	1.00 U

(a) DL Detection limit.
(b) U Undetected at or above the detection limit shown.
(c) D Diluted sample (1:10).
(d) B Analyte detected at a concentration greater than 3 times the MDL in the method blank associated with the sample batch.
(e) Indicates ion ratio out or confirming ion not found.

TABLE G.23. Total Polynuclear Aromatic Hydrocarbons (TPAHs), Dry Weight, in Tissue of *M. nasuta*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* PAHs (µg/g dry weight) Total Low Molecular Weight PAHs	Total High Molecular Weight PAHs	Total PAHs
Arthur Kill Reach A						
Comp AK-A	1	2	13.54	922	5251	6173
Comp AK-A	2	2	13.14	808	4162	4970
Comp AK-A	3	2	13.61	907	4649	5556
Comp AK-A	4	2	14.41	815	4396	5211
Comp AK-A	5	2	13.73	726	4400	5126
Arthur Kill Reach B						
Comp AK-B	1	1	15.11	646	2948	3594
Comp AK-B	2	2	12.15	1694	5233	6927
Comp AK-B	3	1	14.88	1213	4708	5921
Comp AK-B	4	1	15.39	1131	4017	5149
Comp AK-B	5	1	16.48	1169	3647	4816
Arthur Kill Reach C						
Comp AK-C	1	1	15.89	827	3380	4207
Comp AK-C	2	1	15.12	1433	5091	6524
Comp AK-C	3	1	14.72	1022	4003	5025
Comp AK-C	4	2	13.30	749	3453	4202
Comp AK-C	5	2	14.21	1497	4791	6288
Port Elizabeth Reach A						
Comp PE-A	1	1	15.83	1777	7763	9540
Comp PE-A	2	1	15.37	1513	7530	9043
Comp PE-A	3	2	15.26	2417	8954	11371
Comp PE-A	4	1	15.04	1694	8515	10209
Comp PE-A	5	1	17.28	2054	7874	9928
Port Elizabeth Reach B						
Comp PE-B	1	1	17.79	2123	7992	8215
Comp PE-B	2	2	17.17	2353	7395	9748
Comp PE-B	3	2	14.99	3050	9478	12528
Comp PE-B	4	1	13.24	2578	8554	11132
Comp PE-B	5	2	15.30	3226	10212	13438
Hackensack River Reach A						
Comp HR-A	1	1	15.67	20002	44354	64356
Comp HR-A	2	2	14.58	24109	41814	65923
Comp HR-A	3	1	14.46	34931	56310	91241
Comp HR-A	4	1	15.64	17536	44478	62014
Comp HR-A	5	1	14.44	30384	67815	98199
Reference						
Mud Dump Reference	1	2	14.81	142	1108	1250
Mud Dump Reference	2	1	12.76	129	803	932
Mud Dump Reference	3	1	14.21	146	1128	1274
Mud Dump Reference	4	2	14.14	143	887	1030
Mud Dump Reference	5	1	14.80	105	682	787

TABLE G.23. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* PAHs (µg/g dry weight) Total Low Molecular Weight PAHs	Total High Molecular Weight PAHs	Total PAHs
Controls						
C-SB	1	2	14.90	84.6	226	311
C-SB	2	2	14.83	89.2	222	311
C-SB Replicate 1	3	1	15.03	59.7	244	304
C-SB Replicate 2	3	1	15.03	105	271	376
C-SB Replicate 3	3	1	15.03	92.2	246	338
Background						
M. nasuta Background	1	2	14.47	64.2	160	224
M. nasuta Background Replicate 1	1	2	14.28	63.8	141	205
M. nasuta Background Replicate 2	2	2	14.28	85.9	158	244
M. nasuta Background Replicate 3	3	2	14.28	64.6	147	212
M. nasuta Background	1	2	14.82	47.2	97	144

TABLE G.24. Low Molecular Weight Polynuclear Aromatic Hydrocarbons (LPAHs), Dry Weight, in Tissue of *M. nasuta*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* LPAHs (µg/g dry weight) Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene
Arthur Kill Reach A									
Comp AK-A	1	2	13.54	29.8	21.2(a)	53.1	88.6	403	326
Comp AK-A	2	2	13.14	22.3	20.5(a)	39.8(a)	71.4	361	293
Comp AK-A	3	2	13.61	26.4	21.0(a)	52.5	88.2	403	316
Comp AK-A	4	2	14.41	24.3	18.0(a)	45.8	76.3	359	292
Comp AK-A	5	2	13.73	26.9	18.9(a)	40.6	66.3	312	261
Arthur Kill Reach B									
Comp AK-B	1	1	15.11	16.1	12.2(a)	21.9(a)	48.6(a)	311	236
Comp AK-B	2	2	12.15	25.2	17.1(a)	66.6	123	795	667
Comp AK-B	3	1	14.88	21.2	16.9(a)	46.2	88.7	557	483
Comp AK-B	4	1	15.39	21.0	13.6(a)	41.1	79.3	528	448
Comp AK-B	5	1	16.48	19.4	14.0(a)	44.4	81.0	535	475
Arthur Kill Reach C									
Comp AK-C	1	1	15.89	16.4	12.3(a)	28.9(a)	66.7	413	290
Comp AK-C	2	1	15.12	22.5(a)	16.9(a)	58.9(a)	112	675	548
Comp AK-C	3	1	14.72	19.4	14.0(a)	37.0(a)	81.5	516	354
Comp AK-C	4	2	13.30	16.9	13.8(a)	20.7(a)	51.3	368	278
Comp AK-C	5	2	14.21	25.1	17.1(a)	61.9(a)	125	767	501
Port Elizabeth Reach A									
Comp PE-A	1	1	15.83	30.3	18.3(a)	181	181	1050	316
Comp PE-A	2	1	15.37	25.6	18.8(a)	133	144	898	294
Comp PE-A	3	2	15.26	40.6	26.0(a)	221	225	1460	444
Comp PE-A	4	1	15.04	31.9	21.1(a)	139	151	1010	340
Comp PE-A	5	1	17.28	34.0	20.9(a)	214	213	1230	360
Port Elizabeth Reach B									
Comp PE-B	1	1	17.79	32.0	24.6	181	189	1240	456
Comp PE-B	2	2	17.17	29.9	22.7(a)	200	213	1430	457
Comp PE-B	3	2	14.99	41.4	23.3(a)	284	284	1830	587
Comp PE-B	4	1	13.24	39.7	20.8(a)	223	233	1470	591
Comp PE-B	5	2	15.30	42.7	21.7(a)	294	307	1950	611

TABLE G.24. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* LPAHs (µg/g dry weight) Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene
Hackensack River Reach A									
Comp HR-A	1	1	15.67	79.8	52.6	1600	1540	12700	4030
Comp HR-A	2	2	14.58	153	96.0 D(b)	1980 D	1910 D	15200 D	4770 D
Comp HR-A	3	1	14.46	217	104	4220	3680	20400	6310
Comp HR-A	4	1	15.64	85.0 D	46.0 D(a)	1380 D	1300 D	11200 D	3530 D
Comp HR-A	5	1	14.44	127 D	107 D	3090 D	2690 D	19100 D	5270 D
Reference									
Mud Dump Reference	1	2	14.81	21.1(a)	15.0(a)	10.7	21.4(a)	37.5	35.9
Mud Dump Reference	2	1	12.76	21.7(a)	14.4(a)	6.11 U(c)	22.5	35.1 B(d)	35.7(a)
Mud Dump Reference	3	1	14.21	25.5	15.4(a)	5.49 U	21.3	41.3 B	42.1
Mud Dump Reference	4	2	14.14	18.5	13.2(a)	10.0	20.1(a)	38.0	43.0
Mud Dump Reference	5	1	14.80	20.0(a)	12.0(a)	5.27 U	17.4(a)	25.9 B	30.1(a)
Controls									
C-SB	1	2	14.90	11.0(a)	5.50 U	12.3(a)	17.7	20.8	22.8(a)
C-SB	2	2	14.83	12.7(a)	5.53 U	12.7(a)	18.1	21.5	24.2(a)
C-SB Replicate 1	3	1	15.03	14.0(a)	5.46 U	5.19 U	22.0(a)	23.7 B(a)	14.8 U
C-SB Replicate 2	3	1	15.03	16.0	5.46 U	5.19 U	22.4	25.1 B(a)	30.9(a)
C-SB Replicate 3	3	1	15.03	14.3(a)	5.46 U	5.19 U	9.18 U	25.0 B(a)	33.1(a)
Background									
M. nasuta Background	1	2	14.47	14.0	5.67 U	9.05	18.2	22.9	15.4 U
M. nasuta Background Replicate 1	1	2	14.28	15.8	5.74 U	5.46 U	21.9(a)	26.1	15.6 U
M. nasuta Background Replicate 2	2	2	14.28	19.0	5.74 U	15.8(a)	23.5	27.6	15.6 U
M. nasuta Background Replicate 3	3	2	14.28	15.9	5.74 U	5.46 U	21.7	27.0	15.6 U
M. nasuta Background	1	2	14.82	12.1	5.53 U	5.26 U	15.7(a)	19.4	15.0 U

(a) Indicates ion ratio out or confirming ion not found.
(b) D Diluted sample (1:10).
(c) U Undetected at or above the detection limit shown.
(d) B Analyte detected at a concentration greater than 3 times the MDL in the method blank associated with the sample batch.

TABLE G.25. High Molecular Weight Polynuclear Aromatic Hydrocarbons (HPAHs) (Fluoranthene - Benzo(k) fluoranthene), Dry Weight, in Tissue of *M. nasuta*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* HPAHs (µg/g dry weight) Fluoranthene	Pyrene	Benzo(a)-anthracene	Chrysene	Benzo(b)-fluoranthene	Benzo(k)-fluoranthene
Arthur Kill Reach A									
Comp AK-A	1	2	13.54	1220	1500	569	812	485	117
Comp AK-A	2	2	13.14	913	1150(a)	464	692	384	102
Comp AK-A	3	2	13.61	1040	1280	511	764	431	123
Comp AK-A	4	2	14.41	1030	1240	471	693	393	104
Comp AK-A	5	2	13.73	961	1200	473	711	430	118
Arthur Kill Reach B									
Comp AK-B	1	1	15.11	728	834	331	467	232	57.2 B(b)
Comp AK-B	2	2	12.15	1420	1650	573	821	324	81.9
Comp AK-B	3	1	14.88	1200	1410	511	753	352	87.4 B
Comp AK-B	4	1	15.39	994	1190	461	650	311	65.6 B
Comp AK-B	5	1	16.48	880	1050	436	594	288	60.7 B
Arthur Kill Reach C									
Comp AK-C	1	1	15.89	875	994	371	526	254	52.2 B
Comp AK-C	2	1	15.12	1320	1580	547	807	360	96.0 B
Comp AK-C	3	1	14.72	1050	1180	438	630	306	67.9 B
Comp AK-C	4	2	13.30	872	1000	402	602	241	60.0
Comp AK-C	5	2	14.21	1320	1490	505	732	319	80.2
Port Elizabeth Reach A									
Comp PE-A	1	1	15.83	2820	2300	619	764	546	159 B
Comp PE-A	2	1	15.37	2690	2230	628	781	527	136 B
Comp PE-A	3	2	15.26	3320	2750	695	931	505	156
Comp PE-A	4	1	15.04	2950	2470	738	911	638	170 B
Comp PE-A	5	1	17.28	2890	2370	689	862	584	182

TABLE G.25. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* HPAHs (µg/g dry weight) Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene
Port Elizabeth Reach B									
Comp PE-B	1	1	17.79	2670	2250	748	888	607	160 B
Comp PE-B	2	2	17.17	2580	2130	699	821	486	133
Comp PE-B	3	2	14.99	3260	2760	901	1050	641	175
Comp PE-B	4	1	13.24	2910	2420	785	997	650	147 B
Comp PE-B	5	2	15.30	3760	3070	902	1040	630	161
Hackensack River Reach A									
Comp HR-A	1	1	15.67	19900	13700	3850	3320	1850	504
Comp HR-A	2	2	14.58	18600 D(c)	12600 D	3700 D	3160 D	1560 D	457 D
Comp HR-A	3	1	14.46	24600	18000	4700	3930	2250	577
Comp HR-A	4	1	15.64	20000	13800	3400	3270	1690	556
Comp HR-A	5	1	14.44	30300 D	23500 D	4490 D	4310 D	2150 D	734 D
Reference									
Mud Dump Reference	1	2	14.81	115	348	74.3	106	167	64.6
Mud Dump Reference	2	1	12.76	87.0	174	57.8	82.3	146	61.7 B
Mud Dump Reference	3	1	14.21	120	296	80.9	113	188	75.3 B
Mud Dump Reference	4	2	14.14	96.2	244	68.2	89.1	134	55.1
Mud Dump Reference	5	1	14.80	79.1	157	53.1	39.9	126	48.1 B
Controls									
C-SB	1	2	14.90	55.0	38.3(a)	14.4(a)	9.60	29.9	11.5(a)
C-SB	2	2	14.83	53.5	35.8	14.8	9.84	31.2	12.3(a)
C-SB Replicate 1	3	1	15.03	53.0	30.8	17.7(a)	9.18	37.1(a)	20.3(a)
C-SB Replicate 2	3	1	15.03	54.8	31.9	18.7	9.12	37.2	19.6(a)
C-SB Replicate 3	3	1	15.03	55.4	16.6(a)	17.9(a)	6.65(a)	36.6(a)	14.4(a)

TABLE G.25: (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* HPAHs (µg/g dry weight) Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene
Background									
M. nasuta Background		2	14.47	39.0	21.1	12.6	6.63	23.2	5.67 U(d)
M. nasuta Background	Replicate 1	2	14.28	50.8	16.3	16.5	7.42	30.5	5.74 U
M. nasuta Background	Replicate 2	2	14.28	49.9	30.8	17.2(a)	7.35(a)	34.5(a)	5.74 U
M. nasuta Background	Replicate 3	2	14.28	48.0	28.8	16.1	6.16	30.5	5.74 U
M. nasuta Background		2	14.82	30.2	15.5	11.3(a)	4.18	21.5(a)	5.53 U

(a) Indicates ion ratio out or confirming ion not found.
(b) B Analyte detected at a concentration greater than 3 times the MDL in the method blank associated with the sample batch.
(c) D Diluted Sample (1:10).
(d) U Undetected at or above the detection limit shown.

TABLE G.26. High Molecular Weight Polynuclear Aromatic Hydrocarbons (HPAHs) (Benzo(a)-pyrene - 1,4 Dichlorobenzene), Dry Weight, in Tissue of *M. nasuta*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* HPAHs (µg/g dry weight) Benzo(a)-pyrene	Indeno-(1,2,3-cd) pyrene	Dibenzo-(a,h) anthracene	Benzo-(g,h,i) perylene	1,4 Dichlorobenzene
Arthur Kill Reach A								
Comp AK-A	1	2	13.54	309	96.0	28.7	114	7.39 U[a]
Comp AK-A	2	2	13.14	254	85.2	23.4	94.4	7.61 U
Comp AK-A	3	2	13.61	278	93.3	25.7	103	7.35 U
Comp AK-A	4	2	14.41	251	81.9	26.6	105	6.94 U
Comp AK-A	5	2	13.73	277	92.5	26.4	114	7.28 U
Arthur Kill Reach B								
Comp AK-B	1	1	15.11	150	49.2	19.3 U	74.1	6.62 U
Comp AK-B	2	2	12.15	214	64.3	24.0 U	84.8	8.23 U
Comp AK-B	3	1	14.88	228	61.5	19.7	77.3	8.06
Comp AK-B	4	1	15.39	196	52.0	19.0 U	72.1	6.50 U
Comp AK-B	5	1	16.48	189	51.1	17.7 U	74.0	6.07 U
Arthur Kill Reach C								
Comp AK-C	1	1	15.89	152	50.0	18.4 U	81.2	6.29 U
Comp AK-C	2	1	15.12	223	51.6	19.3 U	80.7	6.61 U
Comp AK-C	3	1	14.72	171	54.5	19.8 U	79.5	6.79 U
Comp AK-C	4	2	13.30	152	53.2	22.0 U	70.3	7.52 U
Comp AK-C	5	2	14.21	200	60.6	20.5 U	84.4	7.04 U
Port Elizabeth Reach A								
Comp PE-A	1	1	15.83	308	99.2	27.2	114	6.57
Comp PE-A	2	1	15.37	308	96.9	26.3	107	6.51 U
Comp PE-A	3	2	15.26	328	120	24.9	124	6.55 U
Comp PE-A	4	1	15.04	380	111	29.5	117	6.65 U
Comp PE-A	5	1	17.28	347	101	26.5	115	7.75

TABLE G.26: (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* HPAHs (µg/g dry weight) Benzo(a)-pyrene	Indeno-(1,2,3-cd) pyrene	Dibenzo-(a,h) anthracene	Benzo-(g,h,i) perylene	1,4 Dichlorobenzene
Port Elizabeth Reach B								
Comp PE-B	1	1	17.79	397	105	32.5	128	6.91
Comp PE-B	2	2	17.17	319	97.3	25.7	104	5.82 U
Comp PE-B	3	2	14.99	412	109	29.8	133	7.00
Comp PE-B	4	1	13.24	401	95.9	30.9	112	7.55 U
Comp PE-B	5	2	15.30	390	106	29.1	124	6.54 U
Hackensack River Reach A								
Comp HR-A	1	1	15.67	1230	17.3 U	18.6 U	15.4 U	6.38 U
Comp HR-A	2	2	14.58	1020	314 D(b)	78.2 D	311 D	14.2
Comp HR-A	3	1	14.46	1540	324	76.1	313	6.92 U
Comp HR-A	4	1	15.64	1130	340	50.6	237	6.39 U
Comp HR-A	5	1	14.44	1530 D	393 D	67.5 D	337 D	6.93 U
Reference								
Mud Dump Reference	1	2	14.81	115	64.8	19.7 U	52.9	6.75 U
Mud Dump Reference	2	1	12.76	101 B(c)	45.0	22.9 U	48.3	7.84 U
Mud Dump Reference	3	1	14.21	133	62.4	20.5 U	59.3	7.04 U
Mud Dump Reference	4	2	14.14	96.2	58.9	20.7 U	45.0	7.07 U
Mud Dump Reference	5	1	14.80	85.1 B	49.3	19.7 U	44.5	6.76 U
Controls								
C-SB	1	2	14.90	14.2(d)	31.4(d)	19.6 U	21.5(d)	6.71 U
C-SB	2	2	14.83	15.2(d)	26.7(d)	19.7 U	22.8	6.74 U
C-SB Replicate 1	3	1	15.03	18.5(d)B	30.6(d)	19.4 U	27.0(d)	6.65 U
C-SB Replicate 2	3	1	15.03	18.8(d)B	32.9	19.4 U	26.7(d)	2.00
C-SB Replicate 3	3	1	15.03	19.4(d)B	32.3(d)	19.4 U	21.2 U	6.65 U

TABLE G.26. (contd)

Sediment Treatment	Replicate	Batch	Percent Dry Weight	*M. nasuta* HPAHs (µg/g dry weight) Benzo(a)-pyrene	Indeno-(1,2,3-cd) pyrene	Dibenzo-(a,h) anthracene	Benzo-(g,h,i) perylene	1,4 Dichlorobenzene
Background								
M. nasuta Background		2	14.47	13.9	24.2	20.2 U	19.6	6.91 U
M. nasuta Background	Replicate 1	2	14.28	19.3	19.0 U	20.4 U	16.9 U	7.00 U
M. nasuta Background	Replicate 2	2	14.28	18.1(d)	19.0 U	20.4 U	16.9 U	7.00 U
M. nasuta Background	Replicate 3	2	14.28	17.9	19.0 U	20.4 U	16.9 U	7.00 U
M. nasuta Background		2	14.82	14.2	18.3 U	19.7 U	16.3 U	6.75 U

(a) U Undetected at or above the detection limit shown.
(b) D Diluted Sample (1:10).
(c) B Analyte detected at a concentration greater than 3 times the MDL in the method blank associated with the sample batch.
(d) Indicates ion ratio out or confirming ion not found.

TABLE G.27. Quality Control Data for Low Molecular Polynuclear Aromatic Hydrocarbons (LPAHs), Wet Weight, in Tissue of *M. nasuta*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	*M. nasuta* LPAHs (µg/g wet weight) Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene
Method Blank								
Blank		1	1.35[a]	0.82 U[b]	0.78 U	1.38 U	2.14[a]	2.23 U
Blank		2	0.81	0.82 U	0.78 U	1.38 U	0.65 U	2.23 U
Matrix Spikes								
Comp PE-A	2	1	3.93	2.89	20.5	22.2	138	45.2
Comp PE-A MS		1	36.2	31.5	52.1	51.9	161	69.1
Amount Recovered			32.2	28.6	31.6	29.7	23.0	23.9
Amount Spiked			32.7	31.3	33.8	32.4	32.6	24.7
Percent Recovery			99%	91%	93%	92%	71%	97%
C-SB	1	2	1.64[a]	0.82 U	1.83[a]	2.63	3.10	3.40[a]
C-SB MS		2	32.3	29.2	32.5	33.2	36.1	27.6
Amount Recovered			30.7	29.2	30.7	30.6	33.0	24.2
Amount Spiked			32.4	31.0	33.5	32.1	32.3	24.4
Percent Recovery			95%	94%	92%	95%	102%	99%
Standard Reference Material								
Certified Value			NC[c]	NC	NC	NC	5.6	0.75
			NC	NC	NC	NC	±1.4	±0.21
SRM 1974		1	3.53[a]	1.83[a]	0.78 U	3.05[a]	6.70	4.79[a][d]
SRM 1974		2	2.1	1.9[a]	2.08[a]	3.24[a]	6.47	3.54[a][d]
Analytical Triplicates								
C-SB Replicate 1	1	1	2.11	0.82 U	0.78 U	3.31	3.56	2.23 U
C-SB Replicate 2	2	1	2.40	0.82 U	0.78 U	3.37	3.78	4.65
C-SB Replicate 3	3	1	2.15	0.82 U	0.78 U	1.38 U	3.76	4.98
RSD			7%	NA[e]	NA	NA	3%	NA

TABLE G.27. (contd)

Sediment Treatment	Replicate	Batch	*M. nasuta* LPAHs (µg/g wet weight) Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene
M. nasuta Background Replicate 1	1	2	2.25	0.82 U	0.78 U	3.13[a]	3.73	2.23 U
M. nasuta Background Replicate 2	2	2	2.71	0.82 U	2.26[a]	3.35	3.94	2.23 U
M. nasuta Background Replicate 3	3	2	2.27	0.82 U	0.78 U	3.10	3.86	2.23 U
RSD			11%	NA	NA	4%	3%	NA

(a) Indicates ion ratio out or confirming ion not found.
(b) U Undetected at or above the detection limit shown.
(c) NC Not certified.
(d) Outside SRM QC criteria (±30%).
(e) NA Not applicable.

TABLE G.28. Quality Control Summary for High Molecular Weight Polynuclear Aromatic Hydrocarbons (HPAHs) (Fluoranthene - Benzo(k)fluoranthene), Wet Weight, in Tissue of *M. nasuta*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	*M. nasuta* HPAHs (µg/g wet weight) Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene
Method Blank								
Blank		1	1.64 U[a]	1.78[b]	1.59[b]	0.65 U	0.28 U	5.78[b]
Blank		2	1.64 U	1.86[b]	1.60[b]	0.65 U	0.28 U	0.82 U
Matrix Spikes								
Comp PE-A	2	1	413	343	96.6	120	81.0	20.9
Comp PE-A MS		1	451.0	378	128.0	157.0	117.0	56.4
Amount Recovered			38.0	35.0	31.4	37.0	36.0	35.5
Amount Spiked			32.7	32.7	28.3	32.8	32.7	32.4
Percent Recovery			116%	107%	111%	113%	110%	110%
C-SB	1	2	8.19	5.71[b]	2.15[b]	1.43	4.46	1.72[b]
C-SB MS		2	44.0	40.8	28.2	32.1	34.1	33.6
Amount Recovered			35.8	35.1	26.1	30.7	29.6	31.9
Amount Spiked			32.4	32.4	28.0	32.5	32.4	32.1
Percent Recovery			111%	108%	93%	94%	91%	99%
Standard Reference Material								
Certified Value			33.6	34.1	NC[c]	NC	6.5	NC
Range			±5.8	±3.7	NC	NC	±1.2	NC
SRM 1974		1	39.5	37.0	5.67	15.7	11.7[d]	6.93[b]
SRM 1974		2	33.8	31.3	5.35	14.5	10.0[d]	3.78
Analytical Triplicates								
C-SB Replicate 1	3	1	7.96	4.63	2.66	1.38	5.58	3.05
C-SB Replicate 2	3	1	8.24	4.80	2.81	1.37	5.59	2.95
C-SB Replicate 3	3	1	8.33	2.49[e]	2.69	1.00	5.50	2.17
RSD			2%	32%[e]	3%	17%	1%	18%

TABLE G.28. (contd)

Sediment Treatment	Replicate	Batch	*M. nasuta* HPAHs (µg/g wet weight) Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene
M. nasuta Background Replicate 1	1	2	7.26	2.33	2.35	1.06	4.36	0.82 U
M. nasuta Background Replicate 2	2	2	7.13	4.40	2.46(b)	1.05	2.46(b)	0.82 U
M. nasuta Background Replicate 3	3	2	6.85	4.11	2.30	0.88	4.36	0.82 U
RSD			3%	31%(e)	3%	10%	7%	NA(f)

(a) U Undetected at or above the detection limit shown.
(b) Indicates ion ratio out or confirming ion not found.
(c) NC Not certified.
(d) Outside SRM QC criteria (± 30%).
(e) Outside RSD QC criteria (± 30%).
(f) NA Not applicable.

TABLE G.29. Quality Control Summary for High Molecular Weight Polynuclear Aromatic Hydrocarbons (HPAHs) (Benzo(a)-pyrene - 1,4 Dichlorobenzene), Wet Weight, in Tissue of *M. nasuta*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	*M. nasuta* (µg/kg wet weight) Benzo(a)-pyrene	Indeno-(1,2,3-cd) pyrene	Dibenzo-(a,h) anthracene	Benzo-(g,h,i) perylene	1,4 Dichlorobenzene
Method Blank							
Blank		1	2.60[a]	2.71 U[b]	2.92 U	2.42 U	1.00 U
Blank		2	0.79 U	2.71 U	2.92 U	2.42 U	1.00 U
Matrix Spikes							
Comp PE-A	2	1	47.4	14.9	4.04	16.4	1.00 U
Comp PE-A MS		1	78.0	33.9	37.6	39.0	27.7
Amount Recovered			30.6	19.0	33.6	22.6	26.7
Amount Spiked			29.4	28.9	24.4	29.1	24.8
Percent Recovery			104%	66%	138%[c]	78%	108%
C-SB	1	2	2.11[a]	4.68[a]	2.92 U	3.20[a]	1.00 U
C-SB MS		2	28.1	28.3	20.3	26.4	24.5
Amount Recovered			26.0	23.6	20.3	23.2	23.5
Amount Spiked			29.1	28.6	24.2	28.8	24.6
Percent Recovery			89%	83%	84%	81%	96%
Standard Reference Material							
Certified Value			2.29	1.80	NC[d]	2.47	NC
Range			±0.47	±0.33	NC	±0.28	NC
SRM 1974		1	3.67[e]	4.38[a][e]	2.92 U	2.42 U	1.00 U
SRM 1974		2	3.34[e]	5.00[e]	2.92 U	4.27[e]	1.00 U
Analytical Triplicates							
C-SB Replicate 1	3	1	2.78	4.60	2.92 U	4.06	1.00 U
C-SB Replicate 2	3	1	2.83	4.95	2.92 U	4.01 U	0.30
C-SB Replicate 3	3	1	2.92	4.86	2.92 U	3.19 U	1.00 U
RSD			2%	4%	NA[f]	NA	NA
M. nasuta Background Replicate 1	1	2	2.76	2.71 U	2.92 U	2.42 U	1.00 U
M. nasuta Background Replicate 2	2	2	2.59[a]	2.71 U	2.92 U	2.42 U	1.00 U
M. nasuta Background Replicate 3	3	2	2.55	2.71 U	2.92 U	2.42 U	1.00 U
RSD			4%	NA	NA	NA	NA

(a) Indicates ion ratio out or confirming ion not found.
(b) U Undetected at or above the detection limit shown.
(c) Outside Matrix Spike QC criteria (50-120%).
(d) NC Not certified.
(e) Outside SRM QC criteria (± 30%).
(f) NA Not applicable.

TABLE G.30. Surrogate Percent Recoveries for Polynuclear Aromatic Hydrocarbons (PAHs), Including Quality Control Data, in Tissue of *M. nasuta*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Surrogate Percent Recoveries: Naphthalene d8	Acenaphthene d10	Chrysene d12	Perylene d12	Dichlorobenzene d4
Arthur Kill Reach A							
Comp AK-A	1	2	56%	68%	75%	78%	34%
Comp AK-A	2	2	44%	52%	63%	62%	30%
Comp AK-A	3	2	51%	58%	67%	65%	36%
Comp AK-A	4	2	53%	60%	64%	67%	37%
Comp AK-A	5	2	52%	60%	65%	68%	34%
Arthur Kill Reach B							
Comp AK-B	1	1	48%	52%	57%	53%	34%
Comp AK-B	2	2	59%	69%	73%	77%	39%
Comp AK-B	3	1	53%	66%	65%	64%	35%
Comp AK-B	4	1	64%	77%	85%	78%	42%
Comp AK-B	5	1	54%	65%	79%	68%	36%
Arthur Kill Reach C							
Comp AK-C	1	1	60%	72%	82%	76%	39%
Comp AK-C	2	1	54%	60%	66%	57%	41%
Comp AK-C	3	1	58%	71%	80%	70%	39%
Comp AK-C	4	2	56%	67%	73%	76%	38%
Comp AK-C	5	2	48%	56%	65%	65%	32%
Port Elizabeth Reach A							
Comp PE-A	1	1	59%	68%	70%	67%	44%
Comp PE-A	2	1	61%	73%	79%	78%	40%
Comp PE-A	3	2	19%	24%	26%	29%	14%
Comp PE-A	4	1	44%	59%	64%	66%	28%
Comp PE-A	5	1	52%	60%	68%	59%	39%
Port Elizabeth Reach B							
Comp PE-B	1	1	60%	74%	79%	72%	39%
Comp PE-B	2	2	53%	66%	76%	79%	35%
Comp PE-B	3	2	52%	61%	68%	69%	35%
Comp PE-B	4	1	55%	63%	65%	61%	41%
Comp PE-B	5	2	50%	57%	65%	65%	34%
Hackensack River Reach A							
Comp HR-A	1	1	28%	33%	34%	31%	20%
Comp HR-A	2	2	36%	42%	46%	40%	38%
Comp HR-A	3	1	54%	65%	69%	69%	37%
Comp HR-A	4	1	61%	69%	60%	63%	40%
Comp HR-A	5	1	64%	70%	56%	67%	42%

TABLE G.30. (contd)

Sediment Treatment	Replicate	Batch	Surrogate Percent Recoveries: Naphthalene d8	Acenaphthene d10	Chrysene d12	Perylene d12	Dichlorobenzene d4
Reference							
Mud Dump Reference	1	2	53%	62%	63%	72%	34%
Mud Dump Reference	2	1	38%	45%	43%	44%	26%
Mud Dump Reference	3	1	47%	60%	61%	63%	32%
Mud Dump Reference	4	2	58%	71%	78%	82%	36%
Mud Dump Reference	5	1	44%	53%	57%	53%	31%
Controls							
C-SB	1	2	55%	62%	65%	69%	38%
C-SB	2	2	45%	53%	56%	62%	31%
C-SB Replicate 1	3	1	56%	65%	73%	68%	40%
C-SB Replicate 2	4	1	56%	66%	73%	74%	37%
C-SB Replicate 3	5	1	50%	57%	67%	63%	35%
Background							
M. nasuta Background		2	65%	72%	74%	82%	45%
M. nasuta Background Replicate 1		2	59%	67%	66%	75%	40%
M. nasuta Background Replicate 2		2	56%	67%	68%	74%	35%
M. nasuta Background Replicate 3		2	66%	75%	76%	80%	45%
M. nasuta Background		2	63%	73%	70%	77%	42%
Quality Control Data							
Method Blank							
Blank		1	47%	50%	49%	50%	83%
Blank		2	71%	76%	85%	92%	53%
Matrix Spikes							
Comp PE-A	2	1	61%	73%	79%	78%	40%
Comp PE-A MS	2	1	60%	69%	74%	74%	43%
C-SB	1	2	55%	62%	65%	69%	38%
C-SB MS	1	2	59%	68%	67%	76%	40%
Standard Reference Material							
SRM 1974		1	39%	46%	48%	48%	26%
SRM 1974		2	63%	71%	82%	80%	43%
Analytical Triplicates							
C-SB Replicate 1	3	1	56%	65%	73%	68%	40%
C-SB Replicate 2	3	1	56%	66%	73%	74%	37%
C-SB Replicate 3	3	1	50%	57%	67%	63%	35%
M. nasuta Background Replicate 1		2	59%	67%	66%	75%	40%
M. nasuta Background Replicate 2		2	56%	67%	68%	74%	35%
M. nasuta Background Replicate 3		2	66%	75%	76%	80%	45%

TABLE G.31. Lipids in Tissue of *M. nasuta*, Federal Projects in New York and New Jersey

Sediment Treatment	Replicate	Batch	Percent Dry Weight
M. nasuta Background	1	1	6.11
M. nasuta Background Replicate 1	1	3	5.26
M. nasuta Background Replicate 2	2	3	5.38
M. nasuta Background Replicate 3	3	3	5.46