APPENDIX B

MPRSA, SECTION 103 EVALUATION REPORT

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US Army Corps
of Engineers
Norfolk District

MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT (MPRSA) SECTION 103 EVALUATION

SKIFFES CREEK CHANNEL
FORT EUSTIS, NEWPORT NEWS, VIRGINIA

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April 2014

MARINE PROTECTION RESEARCH AND SANCTUARIES ACT (MPRSA)
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1. DREDGING AND PLACEMENT PROJECT INFORMATION.

Skiffes Creek is located adjacent to Fort Eustis, Newport News, Virginia. The Skiffes Creek Channel provides a navigable channel from the James River to the mouth of Skiffes Creek and serves as the entrance to Third Port. The Third Port is a deepwater port used to train personnel in cargo logistics and vessel operations. The facility provides a safe harbor for the 7th Sustainment Transportation Group at the U.S. Army Transportation Center, Fort Eustis and serves as a deployment platform for Army units. In addition, it is a joint service training facility for watercraft operators and cargo handlers. U.S. Army vessels assigned to the Third Port include tugs, Logistics Support Vessels, Landing Utility Craft, 100-ton Barge Cranes, and a Floating Machine Shop.

Sedimentation has reduced the channel depths from required dimensions, and vessels are currently subject to running aground at lower tides, impeding navigation. With the current shoaling concerns, underkeel clearances are jeopardized, causing increased maintenance, repairs and downtime for the larger vessels. Maintenance dredging is necessary to restore minimal operational depths for deeper draft vessels during all tidal stages to support the transportation training mission of Joint Base Langley – Fort Eustis.

The subject of this evaluation is maintenance dredging of the Skiffes Creek Channel (Figure 1), and the subsequent placement of the dredged material in the Norfolk Ocean Disposal Site (NODS) (Figure 2). The NODS was identified as the location for placement proposed for dredging from the Skiffes Creek Channel Project because: 1) the NODS is designated to provide capacity for long-term management of dredged material from the lower Chesapeake Bay region, 2) it is close to the project location, and 3) it has the capacity to accept the material.

For this project, the Skiffes Creek Channel dredging footprint was divided into five (5) dredging units (DUs) (see Figure 1). One composite sediment sample for each dredging unit (each composite consisting of material collected from two sampling locations) was tested for ocean placement requirements.

The Willoughby Bank reference site (Figure 2) was chosen as the reference site for this project based on the assumption that the material proposed for dredging would be primarily fine-grained with limited sand content. The Willoughby Bank reference area has been used for other recent ocean placement evaluations for the NODS (EA 2009; EA 2010a, b, c; EA 2011, EA 2012; EA 2013b).

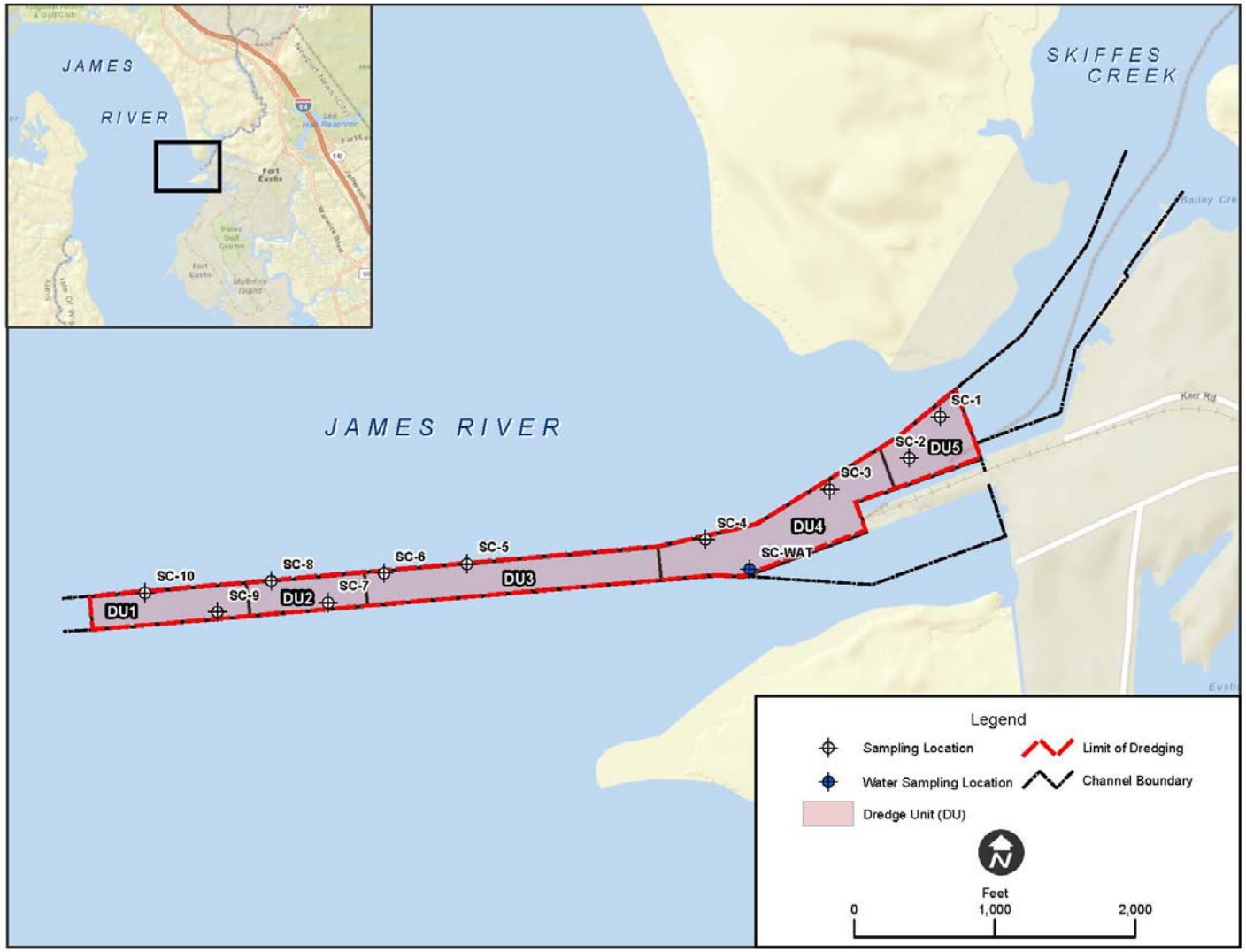

Figure 1. Dredging Units and 2013 sampling locations for the Skiffes Creek Channel

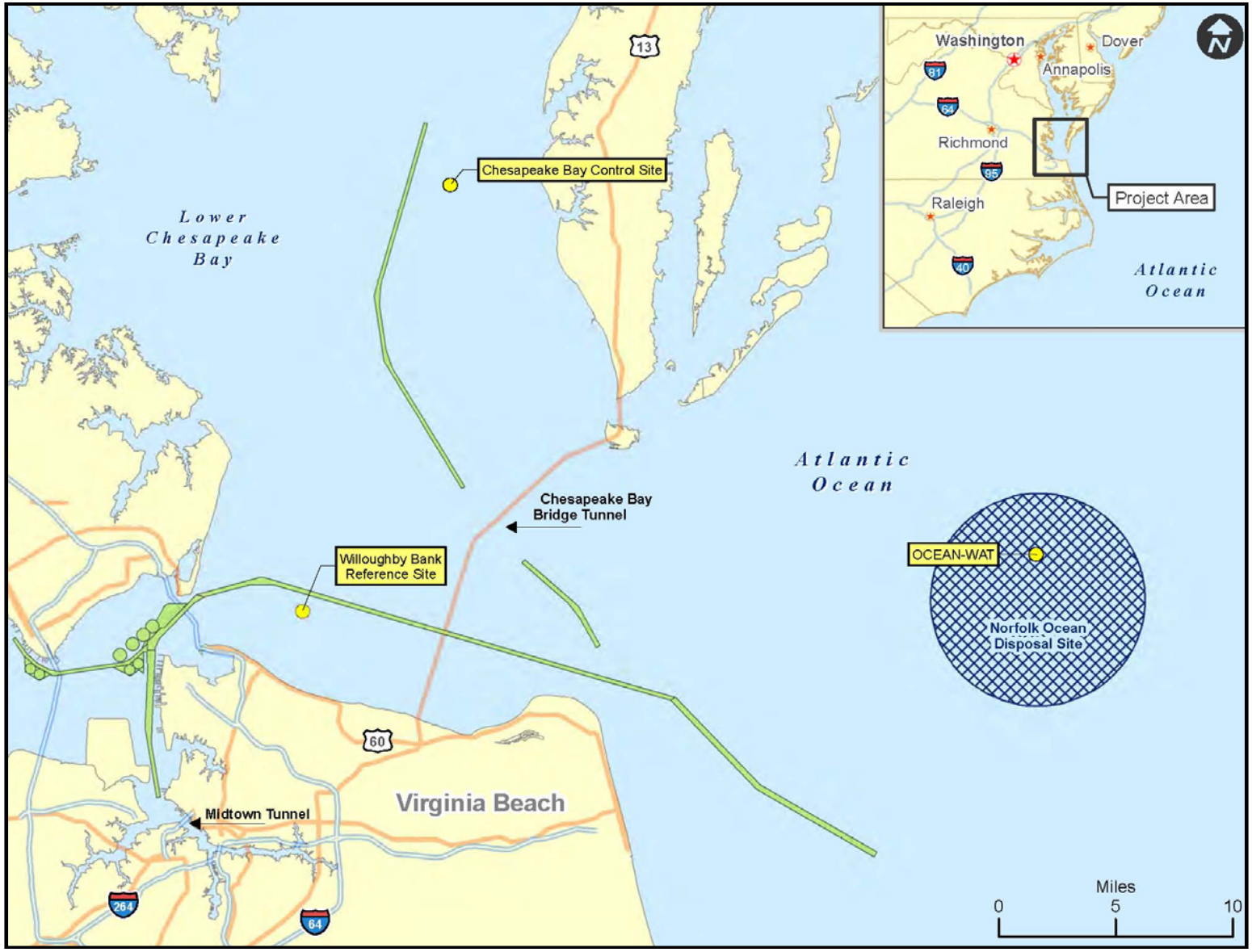

Figure 2. Willoughby Bank reference site, the Chesapeake Bay Control Site, and the Norfolk Ocean Disposal Site.

a. Dredging Location. Skiffes Creek is a tributary to the James River (Figure 1). Skiffes Creek Channel is a Federally-authorized project, and the project provides for the following three channel segments:

- A channel 20 feet deep, approximately 7,800 ft in length, and 240 ft wide;
- A channel 17 feet deep, approximately 690 ft in length, and 365 ft wide; and
- A channel 11 feet deep, approximately 715 ft in length, and a variable width from 300 to 500 ft.

To meet mission requirements, maintenance dredging of the 20 ft deep channel segment of the project will be required to establish minimum operational depths and restore safe navigation. During the current maintenance cycle dredging will restore channel depths to a maximum of -21 ft Mean Lower Low Water (MLLW), including required, allowable, and non-pay overdepths. The most recent bathymetric survey was completed in March 2014 (Attachment I). Existing water depths in the channel area proposed for dredging range from approximately 13.4 ft MLLW to 19.4 ft MLLW.

b. Core Borings. Sediment cores ranging in depth from approximately 3.5 ft to 6.7 ft below sediment surface were collected from ten locations (SC-01 through SC-10 – see Figure 1) in the proposed dredging area. The cores were collected to a depth of -21 ft MLLW.

c. Volume of Material to be Dredged. Based on the bathymetric survey conducted in March 2014, the proposed project will require the dredging and placement of a maximum of approximately 325,000 cubic yards (cy) of material. The project will be dredged to a maximum depth of -21 ft MLLW [18 ft MLLW +2 ft allowable pay overdepth + 1 ft non-pay overdepth]. The estimated approximate volume by dredging unit is as follows: DU1 = 65,000 cy; DU2 = 50,000 cy; DU3 = 60,000 cy; DU4 = 95,000 cy; and DU5 = 55,000 cy.

d. Grain Size of Dredged Material. Results of grain size analysis for both discrete and composite sediment samples from the Skiffes Creek Channel ranged from 82 to 99.3 percent silt+clay (Tables 1A and B, Figure 3). The silt-clay content was slightly higher in the sediments collected in the portion of the channel in the James River (locations SC-05 through SC-10), as opposed to samples collected directly at the mouth of the creek (locations SC-01 through SC-04). The sediment from the Willoughby Bank reference site was comprised of 74.3 percent sand, 23.4 percent silt+clay, and 2.3 percent gravel.

e. Bathymetric Information. Existing water depths in the proposed dredging area range from approximately 13.4 to 19.4 ft. A bathymetric survey of the Skiffes Creek Channel was conducted in March 2014, and the bathymetry data for the area to be dredged are included in Attachment I.

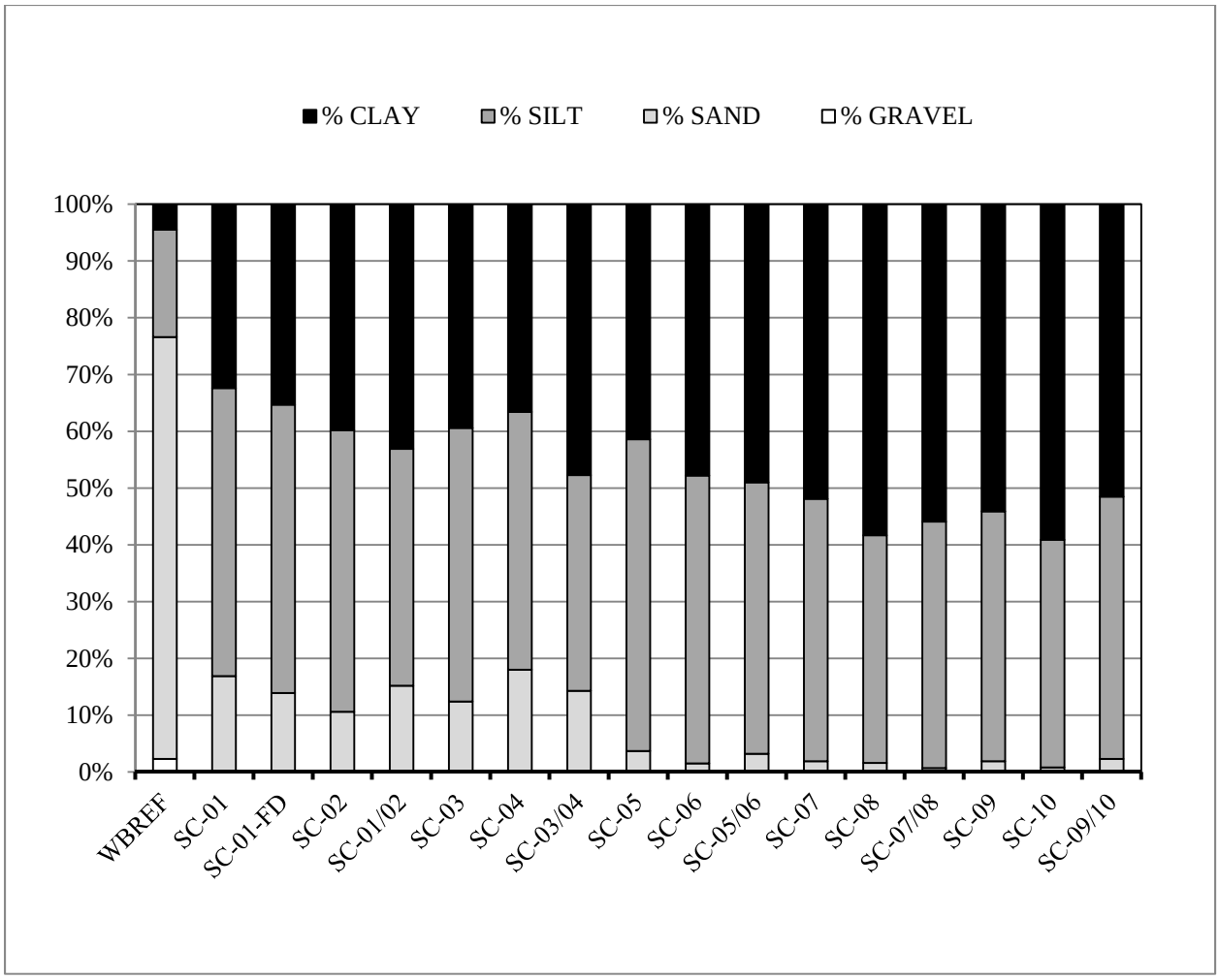

Figure 3. Grain size distribution in sediment samples from the Skiffes Creek Channel and the Willoughby Bank Reference Site.

f. Description of the Disposal Area. The Norfolk Ocean Disposal Site (NODS) is located in the Atlantic Ocean approximately 17 miles east of Cape Henry and is approximately 50 square nautical miles in size (40 CFR Part 228). The site is circular with a radius of 4 nautical miles and the water depth ranges from 43 to 85 ft [U.S. Army Corps of Engineers (USACE)-Norfolk District/Virginia Port Authority (VPA) 2008]. The Chesapeake Light Tower is located approximately 2 statute miles south/southeast of the site.

The center point coordinate of the Norfolk Ocean Disposal Site is (40 CFR Part 228):

Latitude: 36º 59’ 00” N Longitude: 75º 39’ 00” W

The NODS has unlimited capacity and is designated for use as an alternate site for lower Chesapeake Bay channels as well as a placement location for suitable materials from the Inner Harbor channels within the Port of Hampton Roads (CENAO 1994 cited by USACE 2005). The

Final Environmental Impact Statement (FEIS) for the designation of the NODS (U.S. Environmental Protection Agency [USEPA] Region 3 1992) states that the site was intended to provide capacity for long-term management of dredged material from the lower Chesapeake Bay and suitable materials from Norfolk Harbor. However, the FEIS also states that the site could be used for placement of material from other dredging projects that meet the requirements of Section 103 of Marine Protection Research and Sanctuaries Act (MPRSA) of 1972. The designation of the site in 40 CFR Part 228.15 indicates the "site shall be limited to suitable dredged material which passed the criteria for ocean dumping."

Until recently, the only prior use of the NODS was by the U.S. Navy in August 1993. Approximately 51,000 cy of dredged material from the Naval Supply Center Cheatham Annex and 475,000 cy of dredged material from the Naval Weapons Station Yorktown was placed at the site. Dredged materials from both projects were primarily comprised of silts and clays (EA 2012a, 2013). Other projects currently utilizing the NODS or approved for future placement at the NODS include the Craney Island Eastern Expansion project (24 mcy of dredged material), the new Midtown Tunnel construction (2 mcy of dredged material), and maintenance dredging for Cheatham Annex (48,000 cy of dredged material), and Naval Weapons Station Yorktown (42,000 cy of dredged material). In addition, the NODS serves as a back-up placement option for maintenance materials from the Upper Chesapeake Bay approach channels to the Port of Baltimore that pass the ocean placement criteria.

A site management and monitoring plan (SMMP) for the NODS became effective in 1998 and was renewed in February 2009. Its goal is to protect the marine environment and document the dredged material placement activities at the NODS (USEPA Region 3 1997). The objective of the SMMP is to provide guidelines in making management decisions necessary to fulfill the mandated responsibilities to protect the marine environment. The specific management objectives of the NODS include: 1) protection of the marine environment, living resources, and human health and welfare; 2) documentation of disposal activities at the NODS and provision of information that is useful in managing the dredged material placement activities; and 3) beneficial use of dredged material whenever practical (USEPA Region 3 1997).

g. Expected Start, Duration, and End of Dredging. It is anticipated that dredging at the Skiffes Creek Channel will be initiated in November 2014 and will be completed in April 2015 (an approximate 5 to 6-month dredging/placement duration). Actual dredging periods will be dependent on the duration of the Federal acquisition process and timing of contract award.

h. Location of Placement Within the NODS. The dredged material will be mechanically excavated (bucket dredge), transported to the NODS using bottom dump scows, and placed in a designated placement zone within the NODS where it will be evenly distributed. The USEPA Region 3 and USACE-Norfolk District have designated two zones within the NODS for placement of material from Skiffes Creek Channel (Figure 4). Progress surveys of portions of the active zones during placement periods will be utilized, if warranted, to ensure proper placement of materials. Before and after placement bathymetric surveys will be conducted at the placement zone prior to and after completion of placement activities.

Split hull dump scows will be used to transport the material to the offshore disposal site and they will be equipped with Automated Scow Monitoring Systems in compliance with the USACE National Dredging Quality Management (DQM) System requirements. These systems collect, store, and transmit barge draft, location in transit, and verification data for offshore material placement. This information will be available daily and will be transmitted to USACE and USEPA (per DQM requirements), and/or the dredging contractor's management team, and these data will serve as quality assurance (QA) and quality control (QC) for the offshore placement activities.

i. Compliance With NODS Site Designation Conditions. USEPA and USACE manage the NODS through a joint SMMP. Use of the site for dredged material placement will comply with site requirements. USACE-Norfolk District conducts periodic bathymetric surveys of the ocean disposal sites when site activity warrants. A baseline bathymetric survey of a portion of the NODS was most recently conducted by USACE-Norfolk District in 2009 to survey the area targeted for placement of material from the Craney Island Eastern Expansion project. The material from the Skiffes Creek Channel will be placed in a different section of the NODS, which has been designated by USEPA Region 3 and USACE-Norfolk District (Figure 4).

2. EXCLUSIONARY CRITERIA

The exclusionary criteria apply to material which meets any of the following three criteria (40 CFR Part 227.13) to be considered environmentally acceptable for ocean placement without further testing:

1. The dredged material is comprised predominately of sand, gravel, rock, or any other naturally occurring bottom material with particle sizes larger than silt, and the material is found in areas of high current or wave energy.

2. Dredged material is for beach nourishment or restoration and is comprised predominately of sand, gravel, or shell with particle sizes comparable with material on the receiving beaches.

3. The material proposed for placement is substantially the same as the substrate at the proposed disposal site and the site from which the material proposed for disposal is to be taken is far removed from known existing and historical sources of pollution as to provide reasonable assurance that such material has not been contaminated by such pollution.

The material proposed for dredging for the Skiffes Creek Channel project is primarily comprised of silts and clays; is not suitable for beach nourishment; and is not physically the same as the placement site sediments. Therefore, the proposed dredged material from the Skiffes Creek Channel does not meet the exclusionary criteria.

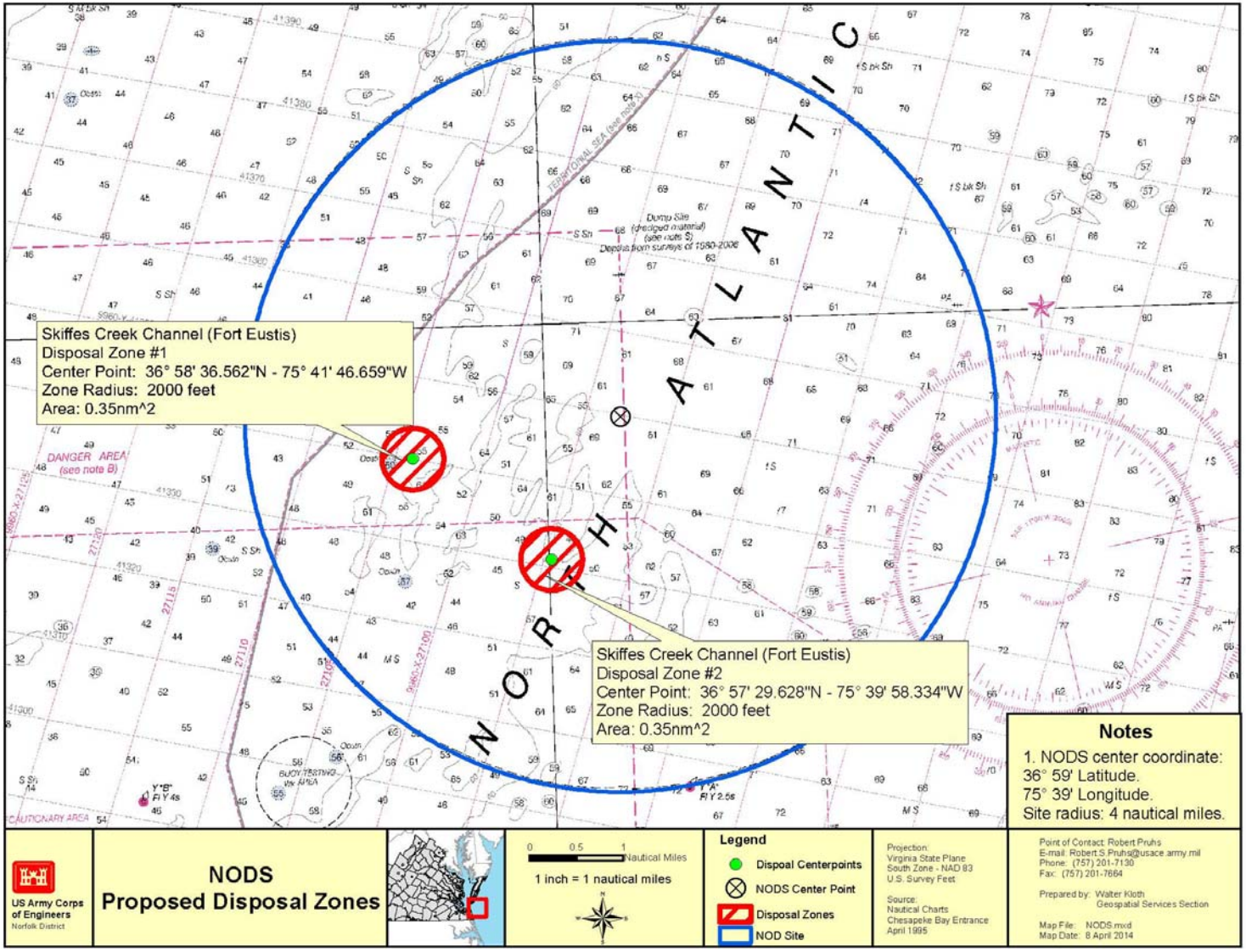

Figure 4. NODS Proposed Disposal Zones, Skiffes Creek Channel

3. NEED FOR TESTING FOR OCEAN PLACEMENT

a. Requirement for Testing. The Skiffes Creek Channel maintenance material consists primarily of a mixture of silts and clays, and does not fully meet the exclusionary criteria set forth under Section 40 CFR 227.13(b). Therefore, tiered testing in accordance with 40 CFR Section 227.32, and following protocols in *The Ocean Testing Manual* (USEPA/USACE 1991) and the *Mid-Atlantic Regional Implementation Manual: Dredged Material Evaluation for Norfolk and Dam Neck Ocean Disposal Sites* (USEPA Region 3 2000) were conducted to determine if the proposed dredged material from the Skiffes Creek Channel meets the limiting permissible concentration (LPC) for ocean placement.

b. Dates of Previous Dredging. The project under consideration is maintenance dredging. Previous maintenance dredging of the Skiffes Creek Channel was completed in 2004. At that time, the channel was dredged to a depth of -25 ft MLLW. Historically, maintenance dredging frequency has been conducted approximately every five to seven years. Approximately 725,000 cubic yards (cy) of dredged material were removed during the last maintenance dredging cycle and placed upland in the Fort Eustis Dredge Material Management Area (FEDMMA).

c. Results of Previous Testing. Chemical data for sediments proposed for dredging in the Fort Eustis navigation channel (Skiffes Creek Channel) are documented for two previous dredging events (Environmental Testing Services (ETS) 1987; IMS Environmental Services 2002). No ocean placement testing has previously been conducted for sediments in Skiffes Creek Channel.

In 1987, sediment cores were collected from seven (7) locations in the main navigation channel with a gravity corer to a depth of approximately 1 meter (m) (3 ft) (ETS 1987). Samples were split with two intervals (0-0.5 m and 0.5–1 m) and were analyzed for metals, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), cyanide, sulfide, extractable organic halogens (EOX), kepone, and polychlorinated biphenyls (PCBs). Results indicated detectable concentrations of cadmium, total chromium, nickel, and EOX. Comparison to current sediment quality guidelines (MacDonald et al. 1996) indicates that detected concentrations of cadmium were between the Threshold Effect Level (TEL) and Probable Effect Level (PEL) values, and detected concentrations of chromium and nickel did not exceed TELs. The majority of tested VOCs, SVOCs, and other organic constituents were not detected.

In 2002, eight sediment samples were collected in a proposed dredging area for pier reconstruction at Fort Eustis (IMS Environmental Services 2002). Direct push Geoprobe® sampling was conducted below the deck of the existing pier. Cores were collected to a depth of approximately -28 ft to -30 ft MLLW and were representative of approximately 6 ft to 9 ft below sediment surface. Sediment cores were composited and tested for metals, PCB aroclors, and chlorinated pesticides. Results were compared to USEPA Region 3 Risk-Based Concentrations (RBCs) – Industrial Standards (October 2001). Arsenic (ranging from 5.2 to 7.1 mg/kg) was the only constituent that exceeded the industrial RBC (3.82 mg/kg). An estimation factor (1/20) was used to determine an approximate Toxicity Characteristic Leachate Procedure (TCLP) concentration using the highest detected arsenic concentration. The estimated TCLP concentration for arsenic was 0.36 mg/L, which was below the TCLP threshold value of 5 mg/L.

d. Locations for Previous Testing. Locations for previous testing are provided in Figure 5.

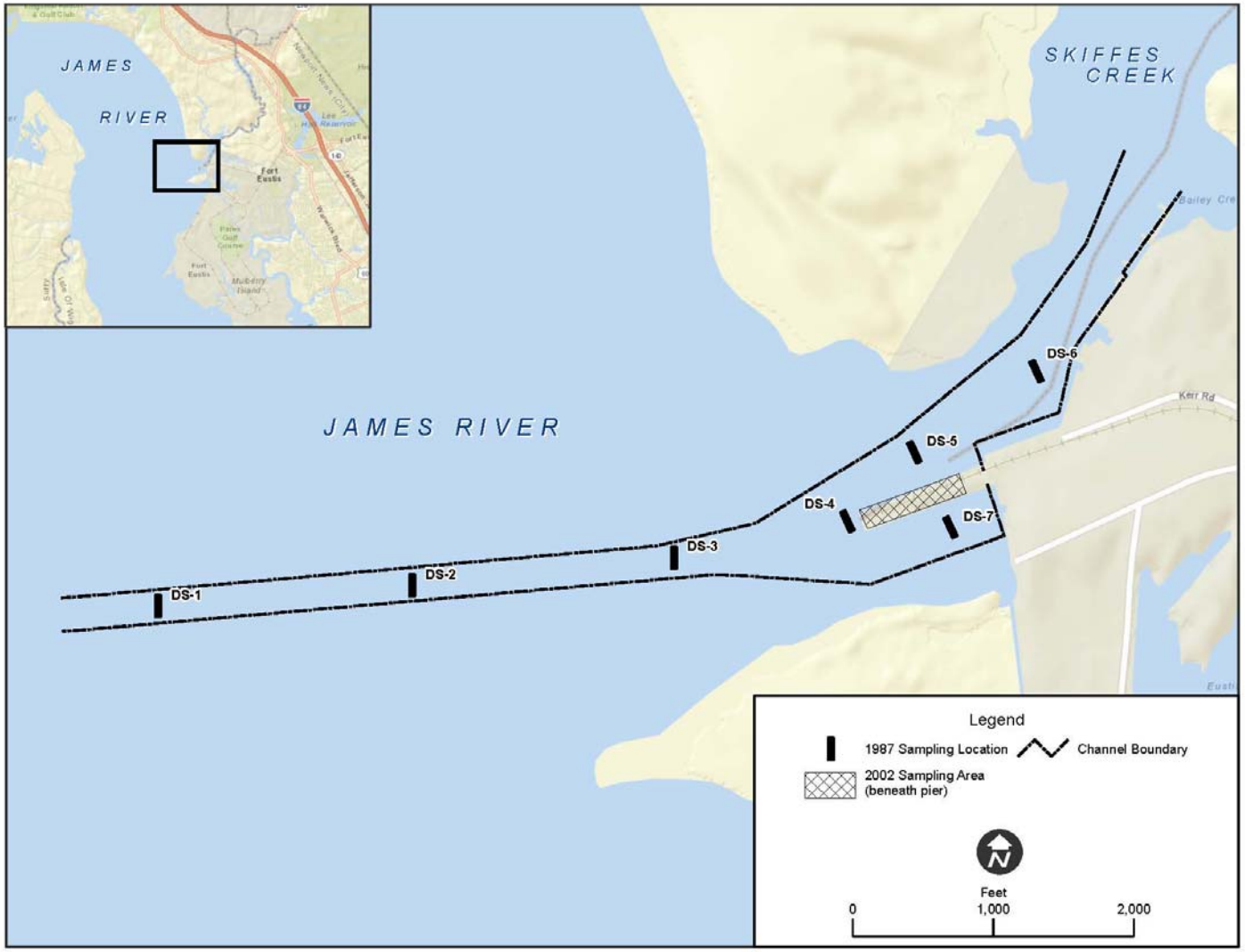

Figure 5. Locations for previous sampling events in Skiffes Creek Channel (Environmental Testing Services 1987; IMS Environmental Services 2002)

e. Recent Events Influencing Testing Results. There are no known recent events that have occurred in the vicinity of the project area immediately before or after the October 2013 sampling event.

4. WATER COLUMN DETERMINATIONS

In November through January 2013, tiered testing following protocols in *The Green Book* (USEPA/USACE 1991) and the *Mid-Atlantic Regional Implementation Manual* (USEPA Region 3 2000) was conducted for composite samples collected from locations within the proposed dredging area. Results of the studies and a description of the sampling and chemical testing methodologies are detailed in the Sampling and Analysis Plan (SAP) (EA 2013a) and in *Evaluation of Dredged Material: Skiffes Creek Channel, Fort Eustis, Newport News, Virginia* (EA 2014).

Sediment cores were collected from ten (10) locations, representing five dredging units, within the Skiffes Creek Channel using a vibracoring system. A Van Veen grab sampler was used to collect surface sediment from the Willoughby Bank reference site and from the USEPA-designated control site in the lower Chesapeake Bay (Figure 2). The site water/elutriate preparation water sample (SC-WAT) was collected from a single location near the mouth of Skiffes Creek. Receiving water was collected for one location in the Atlantic Ocean in the vicinity of the NODS (Figure 2).

a. Sediment Testing. Ten discrete samples (SC-01, SC-02, SC-03, SC-04, SC-05, SC-06, SC-07, SC-08, SC-09, and SC-10) and five composite samples each representing a dredging unit (DU1=SC-09/10, DU2=SC-07/08, DU3=SC-05/06, DU4=SC-03/04, and DU5=SC-01/02) were tested for physical and chemical constituents. Target analytes for the sediment testing were based on consultation with USEPA Region 3 and USACE-Norfolk District. Bulk sediments were tested for the following target constituents:

- metals,
- Polycyclic Aromatic Hydrocarbons (PAHs),
- PCB congeners,
- dioxins and furan congeners,
- chlorinated pesticides,
- organophosphorus pesticides,
- SVOCs,
- butyltins,
- ammonia (NH_3-N),
- total cyanide,
- total sulfide, and
- Total Organic Carbon (TOC).

In addition, the following physical analyses were conducted for the bulk sediment samples:

- grain size determination,
- specific gravity, and

- moisture content.

Results of the physical and chemical testing of the bulk sediment from the Skiffes Creek Channel and comparisons to marine Sediment Quality Guidelines (SQGs) (MacDonald et al. 1996) are summarized in Tables 1 to 9. Detailed results of the bulk sediment testing are provided in *Evaluation of Dredged Material: Skiffes Creek Channel, Fort Eustis, Newport News, Virginia* (EA 2014).

b. Water Column Elutriate Testing. Five (5) standard elutriates from the Skiffes Creek Channel were prepared using the sediment composites (SC-01/02, SC-03/04, SC-05/06, SC-07/08, and SC-09/10) and the site water from Skiffes Creek. Results of the elutriate and site water chemical analyses and comparisons to USEPA saltwater acute water quality criteria for aquatic life (USEPA 2014) are summarized in Tables 10 to 17. Details of the elutriate analysis are provided in *Evaluation of Dredged Material: Skiffes Creek Channel, Fort Eustis, Newport News, Virginia* (EA 2014).

Elutriate preparation water (dredging site water) chemistry results indicated that several constituents were detected in the elutriate preparation water from the Skiffes Creek Channel. The majority of detected constituents were metals and none of the detected concentrations exceeded USEPA saltwater acute water quality criteria.

To determine the LPC compliance for dredged material from the Skiffes Creek Channel, the USACE Short-Term Fate of Dredged Material Disposal in Open Water (STFATE) model was used to model the behavior of the sediment during placement at the NODS (Attachment II). Modeling of the dilution rate using the specifications (i.e., dimensions and water column properties) of the NODS was conducted to confirm that sufficient dilution would be achieved within the 4-hour period inside the boundary of the NODS to achieve USEPA acute water quality standards. Receiving water concentrations at the NODS were used as background inputs for the STFATE model. The modeling initially assumed a placement volume of 4,000 cy of material placed per event. Additional model runs were performed to identify the maximum barge load per placement event for each dredging unit that would meet the LPC for both water quality criteria and water column toxicity.

c. Water Column Bioassays. Three water column species, *Mytilus galloprovincialis* (blue mussel), *Americamysis bahia* (opossum shrimp), and *Menidia beryllina* (inland silverside), were exposed to a standard dilution series of elutriates (100, 50, 10, and 1 percent) created from the project sediment composites. In addition, the elutriate preparation water (site water) and a laboratory control were tested in each of the water column bioassays. The blue mussel tests measured developmental effects to embryos, and the opossum shrimp and inland silverside tests measured effects to organism survival. The test protocols are detailed in the SAP (EA 2013a) and in *Evaluation of Dredged Material: Skiffes Creek Channel, Fort Eustis, Newport News, Virginia* (EA 2014). Results for water column bioassays are summarized in Table 18.

STFATE modeling was conducted using the specifications (i.e., dimensions and water column properties) of the NODS to determine if the results of the water column bioassays would meet the water column LPC for ocean placement. The modeling initially assumed a placement volume

of 4,000 cy of material placed per event. Additional model runs were performed to identify the maximum barge load per placement event for each dredging unit that would meet the LPC for water column toxicity.

5. BENTHC DETERMINATIONS

a. Benthic Toxicity Evaluation. Whole sediment bioassays were conducted using two benthic species, *Leptocheirus plumulosus* (estuarine amphipod) and *Neanthes arenaceodentata* (marine worm). The tests were conducted as static, non-renewal tests with 10 days of exposure to the whole sediments and overlying water and measured survival in channel sediment as compared to survival in the reference sediment. The test protocols are detailed in the SAP (EA 2013a) and in *Evaluation of Dredged Material: Skiffes Creek Channel, Fort Eustis, Newport News, Virginia* (EA 2014). Results for whole sediment bioassays are summarized in Table 19.

b. Benthic Bioaccumulation. Sediments from the Skiffes Creek Channel were evaluated in 28-day bioaccumulation studies with *Nereis virens* (sand worm) and *Macoma nasuta* (blunt-nose clam). The studies measured survival of the test organisms (Table 20) and the potential for bioaccumulation of contaminants in organism tissue as a result of exposure to Skiffes Creek Channel sediment samples. The bioaccumulation exposure protocols are detailed in the SAP (EA 2013a) and in *Evaluation of Dredged Material: Skiffes Creek Channel, Fort Eustis, Newport News, Virginia* (EA 2014).

Tissue Contaminant Analysis

Following review of the bulk sediment data and completion of the 28-day bioaccumulation exposures, USACE-Norfolk District consulted with USEPA Region 3 to determine the target constituents of concern for tissue analysis. USEPA Region 3 requested that the Skiffes Creek Channel tissue samples be analyzed for lipids, moisture content, metals, PAHs, PCB congeners, dioxin and furan congeners, and select chlorinated pesticides (DDD, DDE, DDT series) (Searfoss, USEPA Region 3, personal communication, January 2014). The results from individual replicates were evaluated to determine if there was variability (such as an outlier in the dataset) that could trigger statistical exceedances. Pre-test and reference tissues were also submitted for analysis. Additionally, detected concentrations of nonpolar organic constituents were lipid-normalized to account for partitioning of organic chemicals within organism tissue to facilitate comparison of data from different tissue replicates and comparisons to reference tissue and pre-test tissue concentrations.

Summary of Tissue Chemical Analyses for Skiffes Creek Channel

Dredging Unit (Sample Composite)	Chemical Analyses				
	Metals	PAHs	PCB Congeners	Dioxin/Furan Congeners	Chlorinated Pesticides*
Willoughby Bank Reference	X	X	X	X	X
Pre-Test and Control Tissue	X	X	X	X	X
DU5 (SC-01/02)	X	X	X	X	X
DU4 (SC-03/04)	X				X
DU3 (SC-05/06)	X				X
DU2 (SC-07/08)	X			X	
DU1 (SC-09/10)	X				

* an abbreviated list of chlorinated pesticides (DDE, DDD, DDT) was tested.

Tissue Chemistry Results
Detailed results of the tissue chemistry analysis are provided in *Evaluation of Dredged Material: Skiffes Creek Channel, Fort Eustis, Newport News, Virginia* (EA 2014). Results of the tissue analysis for *N. virens* and *M. nasuta* are summarized in Tables 21 to 25. Pre-test tissue concentrations that compare post-exposure tissue concentrations to pre-exposure tissue concentrations are also provided in Tables 21 to 25. Upper 95 percent confidence levels of the mean (UCLM) tissue-residue concentrations for applicable metals and chlorinated pesticides in worm and clam tissues exposed to the sediments from the Skiffes Creek Channel project were compared to U.S. Food and Drug Administration (USFDA) Values (USFDA 2001) (Table 26). None of the UCLM values for the Skiffes Creek Channel project tissues exceeded the USFDA Action/Guidance/Tolerance Values.

6. RESULTS FOR EACH DREDGING UNIT

a. Dredging Unit 1 (SC-09/10)

Dredging Unit 1 (DU1) represents area from station 2+00 to 13+00 in the western portion of the channel in the James River (Figure 1). DU1 requires the removal of approximately 65,000 cy of maintenance dredged material.

Two locations (SC-09 and SC-10) were sampled in DU1 and a composite sample (SC-09/10) was tested for ocean placement. The results of the bulk sediment analysis indicated that concentrations of four metals (copper, lead, mercury, and zinc) and total PCBs (ND=RL) were between the TEL and PEL values (Tables 3B and 5B). None of the tested constituents exceeded PEL values.

Water Quality Criteria (WQC)
In the standard elutriate, the ammonia concentration exceeded the USEPA saltwater acute water quality criterion (4.91 micrograms per liter [µg/L]) by a factor of 4.1 (Table 10). Receiving water concentrations at the NODS were used as background inputs for the STFATE model, and the model output indicated that ammonia required a dilution of 3.2 to meet the water quality criteria LPC. STFATE modeling (Attachment II) indicated that the required dilution would occur within four hours following placement at the NODS and the plume would stay within the site boundary. *Therefore, the standard elutriate from Skiffes Creek Channel DU1 meets the LPC for water quality criteria.*

Water Column Toxicity
The water column bioassay for *M. galloprovinciallis* had an EC_{50} of 24.2 percent elutriate, and the median lethal concentrations (LC_{50}) for the *A. bahia* and *M. beryllina* bioassays were both greater than 100 percent elutriate (Table 18). Based on the EC_{50} for *M. galloprovincialis*, a 413-fold dilution is required to meet the LPC compliance for water column toxicity. The STFATE model indicated that a 417-fold dilution would occur within four hours with a placement event of 5,600 cy of dredged material (Attachment II). *Therefore, based on the results of the STFATE modeling of water column toxicity, the Skiffes Creek Channel DU1 elutriate meets the LPC for water column toxicity for placement volumes up to 5,600 cy.*

Benthic Toxicity
Survival in the whole sediment bioassays for DU1 (SC-09/10) was not statistically different from the reference site for either *N. arenaceodentata* or *L. plumulosus* (Table 20). *Therefore, the Skiffes Creek Channel DU1 sediments meet the LPC for benthic toxicity.*

Benthic Bioaccumulation
The mean concentration of nickel in clam tissue for DU1 (SC-09/10) statistically exceeded the mean reference site and pre-test concentration (Table 21). The UCLM for nickel, however, did not exceed the USEPA Region 4 Background Concentration for nickel (USEPA/USACE 2008) (Table 27).

Based on the assessment of metals in tissues exposed to DU1 sediments, it is not anticipated that the ocean placement of the dredged material at the NODS will result in ecologically significant bioaccumulation. *Therefore, the dredged material from Skiffes Creek Channel DU1 (SC-09/10) meets the LPC for benthic bioaccumulation, and complies with the benthic criteria of 40 CFR Part 227.13 (c) (3).*

Sediments from the Skiffes Creek Channel Dredging Unit 1 (SC-09/10) meet the criteria for the LPC for WQC, water column toxicity, benthic toxicity, and benthic bioaccumulation, indicating that ocean placement of the dredged material is a viable placement option. Based on the results of the STFATE modeling, a barge volume up to 5,600 cy complies with the LPC.

b. Dredging Unit 2 (SC-07/08)

Dredging Unit 2 (DU2) represents area from station 13+00 to 21+00 in the western portion of the channel in the James River (Figure 1). DU2 requires the removal of approximately 50,000 cy of maintenance dredged material.

Two locations (SC-07 and SC-08) were sampled in DU2 and a composite sample (SC-07/08) was tested for ocean placement. The results of the bulk sediment analysis indicated that concentrations of five metals (copper, lead, nickel, mercury, and zinc), and total PCBs (ND=RL) had concentrations between TEL and PEL values (Tables 3B and 5B). None of the tested constituents exceeded PEL values.

Water Quality Criteria (WQC)
In the standard elutriate, the ammonia concentration exceeded the USEPA saltwater acute water quality criterion (4.91 micrograms per liter [µg/L]) by a factor of 4.1 (Table 10). Receiving water concentrations at the NODS were used as background inputs for the STFATE model, and the model output indicated that ammonia required a dilution of 3.2 to meet the water quality criteria LPC. STFATE modeling (Attachment II) indicated that the required dilution would occur within four hours following placement at the NODS and the plume would stay within the site boundary. *Therefore, the standard elutriate from Skiffes Creek Channel DU2 meets the LPC for water quality criteria.*

Water Column Toxicity

The water column bioassay for *M. galloprovinciallis* had an EC_{50} of 27.6 percent elutriate, and the median lethal concentrations (LC_{50}) for the *A. bahia* and *M. beryllina* bioassays were both greater than 100 percent elutriate (Table 18). Based on the EC_{50} for *M. galloprovincialis*, a 362-fold dilution is required to meet the LPC compliance for water column toxicity. The STFATE model indicated that a 365-fold dilution would occur within four hours with a placement event of 6,800 cy of dredged material (Attachment II). *Therefore, based on the results of the STFATE modeling of water column toxicity, the Skiffes Creek Channel DU2 elutriate meets the LPC for water column toxicity for placement volumes up to 6,800 cy.*

Benthic Toxicity

Survival in the whole sediment bioassays for DU2 (SC-07/08) was not statistically different from the reference site for either *N. arenaceodentata* or *L. plumulosus* (Table 20). *Therefore, the Skiffes Creek Channel DU2 sediments meet the LPC for benthic toxicity.*

Benthic Bioaccumulation

The mean concentration of OCDD in clam tissue (*M. nasuta*) for DU2 (SC-07/08) statistically exceeded the mean reference site and pre-test concentrations (Table 24). The mean dioxin TEQ (ND=RL) did not statistically exceed the mean reference site or pre-test TEQ (ND=RL).

Based on the assessment of metals and dioxin/furan congeners in tissues exposed to DU2 sediments, it is not anticipated that the ocean placement of the dredged material at the NODS will result in ecologically significant bioaccumulation. *Therefore, the dredged material from Skiffes Creek Channel DU2 (SC-07/08) meets the LPC for benthic bioaccumulation, and complies with the benthic criteria of 40 CFR Part 227.13 (c) (3).*

Sediments from the Skiffes Creek Channel Dredging Unit 2 (SC-07/08) meet the criteria for the LPC for WQC, water column toxicity, benthic toxicity, and benthic bioaccumulation, indicating that ocean placement of the dredged material is a viable placement option. Based on the results of the STFATE modeling, a barge volume up to 6,800 cy complies with the LPC.

c. Dredging Unit 3 (SC-05/06)

Dredging Unit 3 (DU3) represents area from station 21+00 to 40+00 in the portion of the channel located immediately west of the mouth of Skiffes Creek (Figure 1). DU3 requires the removal of approximately 60,000 cy of maintenance dredged material.

Two locations (SC-05 and SC-06) were sampled in DU3 and a composite sample (SC-05/06) was tested for ocean placement. The results of the bulk sediment analysis indicated that concentrations of four metals (copper, lead, nickel, and zinc), one (1) individual PAH (acenaphthylene), and total PCBs (ND=RL) had concentrations between TEL and PEL values (Tables 3A, 4A, and 5A). None of the tested constituents exceeded PEL values.

Water Quality Criteria (WQC)

In the standard elutriate, the ammonia concentration exceeded the USEPA saltwater acute water quality criterion (4.91 micrograms per liter [µg/L]) by a factor of 3.1 (Table 10). Receiving water concentrations at the NODS were used as background inputs for the STFATE model, and the model output indicated that ammonia required a dilution of 2.1 to meet the water quality criteria LPC. STFATE modeling (Attachment II) indicated that the required dilution would occur within four hours following placement at the NODS and the plume would stay within the site boundary. *Therefore, the standard elutriate from Skiffes Creek Channel DU3 meets the LPC for water quality criteria.*

Water Column Toxicity

The water column bioassay for *M. galloprovinciallis* had an EC_{50} of 26.3 percent elutriate, and the median lethal concentrations (LC_{50}) for the *A. bahia* and *M. beryllina* bioassays were both greater than 100 percent elutriate (Table 18). Based on the EC_{50} for *M. galloprovincialis*, a 380-fold dilution is required to meet the LPC compliance for water column toxicity. The STFATE model indicated that a 382-fold dilution would occur within four hours with a placement event of 6,500 cy of dredged material (Attachment II). *Therefore, based on the results of the STFATE modeling of water column toxicity, the Skiffes Creek Channel DU3 elutriate meets the LPC for water column toxicity for placement volumes up to 6,500 cy.*

Benthic Toxicity

Survival in the whole sediment bioassays for DU3 (SC-05/06) was not statistically different from the reference site for either *N. arenaceodentata* or *L. plumulosus* (Table 20). *Therefore, the Skiffes Creek Channel DU3 sediments meet the LPC for benthic toxicity.*

Benthic Bioaccumulation

The mean concentration of nickel in clam tissue for DU3 (SC-05/06) statistically exceeded the mean reference site and pre-test concentration (Table 21). The UCLM for nickel, however, did not exceed the USEPA Region 4 Background Concentration for nickel (USEPA/USACE 2008) (Table 27).

Based on the assessment of metals and select chlorinated pesticides in tissues exposed to DU3 sediments, it is not anticipated that the ocean placement of the dredged material at the NODS will result in ecologically significant bioaccumulation. *Therefore, the dredged material from Skiffes Creek Channel DU3 (SC-05/06) meets the LPC for benthic bioaccumulation, and complies with the benthic criteria of 40 CFR Part 227.13 (c) (3).*

Sediments from the Skiffes Creek Channel Dredging Unit 3 (SC-05/06) meet the criteria for the LPC for WQC, water column toxicity, benthic toxicity, and benthic bioaccumulation, indicating that ocean placement of the dredged material is a viable placement option. Based on the results of the STFATE modeling, a barge volume up to 6,500 cy complies with the LPC.

c. Dredging Unit 4 (SC-03/04)

Dredging Unit 4 (DU4) represents area from station 40+00 to 59+00 in the portion of the channel and bend located at the mouth of Skiffes Creek (Figure 1). DU4 requires the removal of approximately 95,000 cy of maintenance dredged material.

Two locations (SC-03 and SC-04) were sampled in DU4 and a composite sample (SC-03/04) was tested for ocean placement. The results of the bulk sediment analysis indicated that concentrations of four metals (copper, lead, nickel, and zinc), one (1) individual PAH (acenaphthylene), and total PCBs (ND=RL) had concentrations between TEL and PEL values (Table 3A, 4A, and 5A). None of the tested constituents exceeded PEL values.

Water Quality Criteria (WQC)

In the standard elutriate, the ammonia concentration exceeded the USEPA saltwater acute water quality criterion (4.91 micrograms per liter [µg/L]) by a factor of 3.3 (Table 10). Receiving water concentrations at the NODS were used as background inputs for the STFATE model, and the model output indicated that ammonia required a dilution of 2.3 to meet the water quality criteria LPC. STFATE modeling (Attachment II) indicated that the required dilution would occur within four hours following placement at the NODS and the plume would stay within the site boundary. *Therefore, the standard elutriate from Skiffes Creek Channel DU4 meets the LPC for water quality criteria.*

Water Column Toxicity

The water column bioassay for *M. galloprovinciallis* had an EC_{50} of 23.1 percent elutriate, and the median lethal concentrations (LC_{50}) for the *A. bahia* and *M. beryllina* bioassays were both greater than 100 percent elutriate (Table 18). Based on the EC_{50} for *M. galloprovincialis*, a 433-fold dilution is required to meet the LPC compliance for water column toxicity. The STFATE model indicated that a 438-fold dilution would occur within four hours with a placement event of 4,900 cy of dredged material (Attachment II). *Therefore, based on the results of the STFATE modeling of water column toxicity, the Skiffes Creek Channel DU4 elutriate meets the LPC for water column toxicity for placement volumes up to 4,900 cy.*

Benthic Toxicity

Survival in the whole sediment bioassays for DU4 (SC-03/04) was not statistically different from the reference site for either *N. arenaceodentata* or *L. plumulosus* (Table 20). *Therefore, the Skiffes Creek Channel DU4 sediments meet the LPC for benthic toxicity.*

Benthic Bioaccumulation

None of the mean concentrations of constituents detected in the clam or worm tissue from DU4 (SC-03/04) statistically exceeded the mean reference site and pre-test concentrations (Tables 21 to 25).

Based on the assessment of metals and select chlorinated pesticides in tissues exposed to DU4 sediments, it is not anticipated that the ocean placement of the dredged material at the NODS will result in ecologically significant bioaccumulation. *Therefore, the dredged material from*

Skiffes Creek Channel DU4 (SC-03/04) meets the LPC for benthic bioaccumulation, and complies with the benthic criteria of 40 CFR Part 227.13 (c) (3).

Sediments from the Skiffes Creek Channel Dredging Unit 4 (SC-03/04) meet the criteria for the LPC for WQC, water column toxicity, benthic toxicity, and benthic bioaccumulation, indicating that ocean placement of the dredged material is a viable placement option. Based on the results of the STFATE modeling, a barge volume up to 4,900 cy complies with the LPC.

e. Dredging Unit 5 (SC-01/02)

Dredging Unit 5 (DU5) represents area from station 59+00 to 66+63 inside and northeast of the mouth of Skiffes Creek (Figure 1). DU5 requires the removal of approximately 55,000 cy of maintenance dredged material.

Two locations (SC-01 and SC-02) were sampled in DU5 and a composite sample (SC-01/02) was tested for ocean placement. The results of the bulk sediment analysis indicated that concentrations of four metals (copper, lead, nickel, and zinc), nine (9) individual PAHs, total PAHs, and total PCBs (ND=RL) had concentrations between TEL and PEL values (Tables 3A, 4A, and 5A). None of the tested constituents exceeded PEL values.

Water Quality Criteria (WQC)

In the standard elutriate, the ammonia concentration exceeded the USEPA saltwater acute water quality criterion (4.91 micrograms per liter [µg/L]) by a factor of 3.8 (Table 10). Receiving water concentrations at the NODS were used as background inputs for the STFATE model, and the model output indicated that ammonia required a dilution of 2.9 to meet the water quality criteria LPC. STFATE modeling (Attachment II) indicated that the required dilution would occur within four hours following placement at the NODS and the plume would stay within the site boundary. *Therefore, the standard elutriate from Skiffes Creek Channel DU5 meets the LPC for water quality criteria.*

Water Column Toxicity

The water column bioassay for *M. galloprovinciallis* had an EC_{50} of 22.5 percent elutriate, and the median lethal concentrations (LC_{50}) for the *A. bahia* and *M. beryllina* bioassays were both greater than 100 percent elutriate (Table 18). Based on the EC_{50} for *M. galloprovincialis*, a 444-fold dilution is required to meet the LPC compliance for water column toxicity. The STFATE model indicated that a 449-fold dilution would occur within four hours with a placement event of 4,600 cy of dredged material (Attachment II). *Therefore, based on the results of the STFATE modeling of water column toxicity, the Skiffes Creek Channel DU5 elutriate meets the LPC for water column toxicity for placement volumes up to 4,600 cy.*

Benthic Toxicity

Survival in the whole sediment bioassays for DU5 (SC-01/02) was not statistically different from the reference site for either *N. arenaceodentata* or *L. plumulosus* (Table 20). *Therefore, the Skiffes Creek Channel DU5 sediments meet the LPC for benthic toxicity.*

Benthic Bioaccumulation

The mean concentrations of OCDD in both clam and worm tissue for DU5 (SC-01/02) statistically exceeded the mean reference site and pre-test concentrations (Table 24). The mean dioxin TEQ (ND=RL) did not statistically exceed the mean reference site or pre-test TEQ (ND=RL) for either clams or worms.

Based on the assessment of metals, PAHs, PCB congeners, dioxin/furan congeners, and select chlorinated pesticides in tissues exposed to DU5 sediments, it is not anticipated that the ocean placement of the dredged material at the NODS will result in ecologically significant bioaccumulation. *Therefore, the dredged material from Skiffes Creek Channel DU5 (SC-01/02) meets the LPC for benthic bioaccumulation, and complies with the benthic criteria of 40 CFR Part 227.13 (c) (3).*

Sediments from the Skiffes Creek Channel Dredging Unit 5 (SC-01/02) meet the criteria for the LPC for WQC, water column toxicity, benthic toxicity, and benthic bioaccumulation, indicating that ocean placement of the dredged material is a viable placement option. Based on the results of the STFATE modeling, a barge volume up to 4,600 cy complies with the LPC.

7. MPRSA SECTION 103 OCEAN DISPOSAL CRITERIA COMPLIANCE EVALUATION

a. Compliance With 40 CFR Part 227 Subpart B – Environmental Impact. The following criteria were evaluated to determine that the proposed dredged material placement would not degrade the marine environment, and that the dredged material placement would not produce an unacceptable adverse effect on human health or on the ocean for other future uses.

1) The material to be dredged from the project area does not contain any of the prohibited materials listed in 40 CFR Section 227.5 including radioactive waste, material used in radiological, chemical or biological warfare, or persistent inert synthetic or natural materials that may float and thus interfere with legitimate uses of the ocean. In addition, the material has been sufficiently described to make this determination.

2) The material does not contain any of the constituents prohibited as other than trace contaminants listed in 40 CFR Section 227.6 including organohalogen compounds, mercury and mercury compounds, cadmium and cadmium compounds, oil, or known carcinogens, mutagens, or teratogens.

3) The material to be placed in the NODS is composed of naturally occurring sediment to be dredged from waters of the U.S. and does not meet the definition of waste materials listed in 40 CFR Section 227.7.

4) The material does not contain toxic waste as regulated under 40 CFR Section 227.8.

5) Although large quantities of dredged material are proposed for placement at the NODS, the site was designated with these quantities in mind and was located in an area and sized such that unacceptable impacts would not occur as described in 40 CFR Section 227.9.

6) The designation of the NODS took into account possible hazards to fishing, navigation, shorelines, and beaches. The material proposed for placement at the NODS will be placed in such a manner as to not result in adverse impacts to the listed resources and as not to interfere with coastal navigation as described in 40 CFR Section 227.10.

7) The material proposed for placement at the NODS is not required to be containerized as described in 40 CFR Section 227.11.

8) The dredged material does not contain any inert synthetic or natural material that may float or remain in suspension. Dredged material is natural sediment dredged from the waterways of the U.S. and is not considered to be solid waste as described in 40 CFR Section 227.12.

   The materials to be dredged from the project area were not considered to meet the exclusionary criteria. Appropriate testing has been performed and is described in earlier sections of this Section 103 Evaluation. The material has been determined to be in compliance with the requirements of 40 CFR Section 227.6 and there would be no violation of marine water quality criteria after the allowance for mixing. Bioassays on the suspended particulate phase (elutriate) and solid phase (whole sediment bioassay) show that the material can be discharged so as not to exceed the LPC described in paragraph (b) of 40 CFR Section 227.27.

b. Compliance With 40 CFR Part 227 Subpart C – Need for Ocean Disposal.

Materials from previous maintenance dredging of Skiffes Creek Channel have been placed upland at the Fort Eustis Dredge Material Management Area (FEDMMA). The FEDMMA is currently at capacity and will require new construction to build future capacity. The FEDMMA site construction is scheduled for fiscal year (FY) 2015 and will not be available for dredged material placement until FY 2016.

Upland placement at privately-owned upland facilities (such as Port Tobacco at Weanack-Shirley Plantation) and upland landfill disposal were both considered as placement options for the dredged material from the Skiffes Creek Channel. The dredged material meets the Proposed Virginia Exclusionary Criteria requirements for upland placement at Port Tobacco at Weanack, the requirements for upland placement at some regional landfills, and the requirements for ocean placement at the NODS. Upland dredged material placement capacity is limited in the southern Virginia region and is preferential for projects with contaminated sediments that cannot meet the requirements for ocean or open-water placement.

Beneficial use (ex., beach nourishment and shoreline stabilization) was also considered as a placement option for the dredged material from Skiffes Creek Channel. The dredged material from the project site is primarily comprised of fine-grained silts and clays that are not suitable for beneficial use projects, particularly in high-energy environments.

In additional to the NODS, another alternative identified to be feasible for dredged material placement of sediments from the Skiffes Creek Channel was Craney Island Dredged Material Management Area (CIDMMA). Dredged material from the Skiffes Creek Channel is precluded from placement at CIDMMA because CIDMMA is restricted to placement of material from dredging to support navigation in Norfolk Harbor and adjacent waters [U.S. Army Corps of Engineers (USACE)-Norfolk District Policy Memorandum WRD-01]. Material from non-navigation transportation projects and projects beyond CIDMMA's geographic service area are specifically precluded from placement at CIDMMA unless the material is clean and needed for dike construction. Physical and chemical testing of the dredged material from the Skiffes Creek Channel indicated that the sediments would not be suitable for dike construction at CIDMMA.

Therefore, because of the need to reserve limited upland placement capacity within the region for future projects with contaminated sediment, because the Skiffes Creek Channel material meets the ocean placement criteria, and because that material is not located within the geographic area approved for placement at CIDMMA nor is the dredged material suitable for dike construction at CIDMMA, placement of the dredged material at the NODS is the most viable option. Following the guidance in the *Ocean Testing Manual* (USEPA/USACE 1991), Tier II and Tier III testing was completed by examining physical and chemical properties of the sediment, water column and whole sediment bioassays, and bioaccumulation potential (tissue chemistry) (EA 2014). Because the material meets the ocean placement requirements and because the NODS has sufficient capacity for the material, the most viable option for the dredged material from Skiffes Creek Channel is ocean placement at the NODS. Ocean placement of the dredged material from Skiffes Creek Channel will reserve upland placement capacity for contaminated sediments and will be protective of the resources at the NODS.

c. Compliance With 40 CFR Part 227 Subpart D – Impact of the Proposed Dumping on Aesthetic, Recreational, and Economic Values. The following factors have been considered in making the determination that the proposed placement will not impact aesthetic, recreational, or economic values of the Atlantic Ocean in the vicinity of the NODS:

1) The area has been used in the past for the placement of dredged material and has not resulted in negative impacts to potential recreational or commercial activities. The Chesapeake Light Tower is located approximately 2 statute miles south/southeast of the NODS and is a heavily utilized recreational fishing area during the summer months. In addition, the mound configurations proposed for similar placement activities have been shown to benefit fish by creating structure in an otherwise flat sea bottom.

2) Based on past use of the area and the characteristics of the material proposed for placement, no impact to water quality is to be expected. The material will be discharged from bottom dump scows with the initial point of discharge being approximately 14 ft below the surface of the water. Based on results of the STFATE model, no applicable water quality standards will be violated by the proposed activity.

3) The material proposed for discharge contains substantial quantities of silt and clay. The point of initial discharge is below the surface of the water and because the material is somewhat consolidated, the majority of the material will be entrained into the disposal

surge, which is in a downward direction because of gravity. Studies indicate that any turbidity caused by placement is restricted to the immediate vicinity of the dump scow and persists for only a short period of time.

4) Pathogenic organisms are not expected to be present in the material. However, if present they would likely be fecal coliforms that are killed by saline waters and therefore would not pose any impact to fisheries. No shellfisheries are located in the vicinity of the NODS.

5) No toxic chemical constituents are present in the dredged material in concentrations suspected of affecting humans either directly or indirectly through the food chain. There are no constituents in the dredged material that would impact living marine resources of any value.

d. Compliance With 40 CFR Part 227 Subpart E – Impact of the Proposed Dumping on Other Uses of the Ocean. The proposed placement of dredged material in the NODS would have no long-term impact on any other uses of the ocean including, but not limited to, commercial and recreational fishing, commercial and recreational navigation, mineral exploration or development, or scientific research. Short-term impacts may occur because of the presence of the tugs and scows in the NODS; however, this is short term and all uses of the ocean would continue to use the area between placement events. No irreversible or irretrievable commitment of resources would result from the proposed material placement.

8. MPRSA SECTION 103 CONDITIONS

a. Requirements to Meet Ocean Disposal Criteria. The placement of maintenance sediments from each Skiffes Creek Channel dredging unit will be limited to the maximum placement volumes as determined by the STFATE model to ensure compliance with the LPC for water column toxicity. No other special requirements have been designated.

b. Requirements of Site Designation Conditions. Placement shall occur no less than 330 ft (100 meters) inside the NODS boundaries to comply with 40 CFR 227.28. Two placement zones within the NODS have been designated for the project sediment by USEPA Region 3 and USACE-Norfolk District (Figure 4). Placement will target even distribution of the dredged material across the placement zone. Before and after placement bathymetric surveys of the designated placement zone within the NODS will be performed. Other bathymetric surveys may be performed as warranted should concerns be raised concerning the placement of dredged material.

c. Requirements of the Site Monitoring and Management Plan (SMMP). The SMMP was recently renewed by USEPA Region 3 and USACE-Norfolk District. Because the dredging will be conducted mechanically (bucket dredge), it is not anticipated that monitoring and precautions necessary to protect sea turtles will be required. It is not anticipated that placement operations will impact sea turtles or other marine mammals. Placement activities (vessel traffic to and from the NODS from the Skiffes Creek Channel project site) will be conducted in compliance with the NOAA Fisheries Right Whale Ship Strike Reduction Rule (50 CFR 224.105), which limits vessels greater than 65 ft to speeds less than 10 knots during migration and calving periods.

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TABLE 1A. PHYSICAL CHARACTERISTICS OF SEDIMENT

SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

Analyte	Unit	Willoughby Bank Reference Site	Dredging Unit 5				Dredging Unit 4			Dredging Unit 3		
			SC-01	SC-01 Field Duplicate	SC-02	SC-01/02	SC-03	SC-04	SC-03/04	SC-05	SC-06	SC-05/06
GRAVEL	%	**2.3**	--	--	--	--	--	--	--	--	--	--
SAND	%	**74.3**	16.9	13.9	10.6	15.2	12.4	18	14.3	3.7	1.5	3.2
Coarse Sand	%	**0.8**	0.3	0.4	0	0	0	0	0	0.1	0	0
Medium Sand	%	**3**	0.1	0.1	0.2	0.1	0.2	0.2	0.2	0.1	0.1	0.1
Fine Sand	%	**70.5**	16.5	13.4	10.4	15.1	12.2	17.8	14.1	3.5	1.4	3.1
SILT	%	**18.9**	50.7	50.8	49.6	41.7	48.2	45.4	38	54.9	50.7	47.8
CLAY	%	**4.5**	32.4	35.3	39.8	43.1	39.4	36.6	47.7	41.4	47.8	49
SILT+CLAY	%	**23.4**	83.1	86.1	89.4	84.8	87.6	82	85.7	96.3	98.5	96.8
SPECIFIC GRAVITY	--	**2.68**	2.67	2.68	2.68	2.63	2.68	2.69	2.66	2.7	2.65	2.64
PERCENT MOISTURE	%	**30.3**	47.5	47.2	58.4	55.6	56.6	57.9	57.3	63.1	62.2	62.4

TABLE 1B. PHYSICAL CHARACTERISTICS OF SEDIMENT

SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

Analyte	Unit	Willoughby Bank Reference Site	Dredging Unit 2			Dredging Unit 1		
			SC-07	SC-08	SC-07/08	SC-09	SC-10	SC-09/10
GRAVEL	%	**2.3**	--	--	--	--	--	--
SAND	%	**74.3**	1.9	1.6	0.7	1.9	0.8	2.3
Coarse Sand	%	**0.8**	0	0	0	0	0	0
Medium Sand	%	**3**	0.1	0.6	0	0.1	0	0.1
Fine Sand	%	**70.5**	1.8	1	0.7	1.8	0.8	2.2
SILT	%	**18.9**	46.2	40.1	43.4	44	40.1	46.2
CLAY	%	**4.5**	51.9	58.3	55.9	54.1	59.1	51.5
SILT+CLAY	%	**23.4**	98.1	98.4	99.3	98.1	99.2	97.7
SPECIFIC GRAVITY	--	**2.68**	2.66	2.68	2.66	2.67	2.66	2.66
PERCENT MOISTURE	%	**30.3**	62.5	61.5	61.7	60.6	60.5	60.8

TABLE 2A. GENERAL CHEMISTRY PARAMETERS IN SEDIMENT

SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

Analyte	Unit	Average RL	Willoughby Bank Reference Site	Dredging Unit 5				Dredging Unit 4			Dredging Unit 3		
				SC-01	SC-01 Field Duplicate	SC-02	SC-01/02	SC-03	SC-04	SC-03/04	SC-05	SC-06	SC-05/06
AMMONIA (NH3), AS N	MG/KG	12.5	**11 B**	**180 B**	**190 B**	**260 B**	**220 B**	**240 B**	**200 B**	**240 B**	**290 B**	**270 B**	**220 B**
CYANIDE, TOTAL	MG/KG	0.618	0.35 U	0.49 U	0.47 U	0.64 U	0.58 U	0.59 U	0.62 U	0.58 U	0.69 U	0.71 U	0.65 U
TOTAL ORGANIC CARBON	%	0.25	**0.71**	**1.5**	**1.6**	**2.4**	**1.8**	**2.0**	**2.1**	**2.0**	**2.2**	**2.2**	**2.3**
TOTAL SULFIDE	MG/KG	74	**82 B**	**330 B**	**360 B**	**430 B**	**250 B**	**480 B**	**360 B**	**570 B**	**660 B**	**380**	**290 B**

There are no sediment quality guidelines for the general chemistry parameters

NOTES: Bold values represent detected concentrations
RL is reported for non-detected constituents
RL = range of reporting limits

B = detected in the laboratory method blank
J = compound was detected, but below the reporting limit (value is estimated)
U = compound was analyzed, but not detected

TABLE 2B. GENERAL CHEMISTRY PARAMETERS IN SEDIMENT

SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

Analyte	Unit	Average RL	Willoughby Bank Reference Site	Dredging Unit 2			Dredging Unit 1		
				SC-07	SC-08	SC-07/08	SC-09	SC-10	SC-09/10
AMMONIA (NH3), AS N	MG/KG	12.5	**11 B**	**280 B**	**280 B**	**230 B**	**250 B**	**390 B**	**280 B**
CYANIDE, TOTAL	MG/KG	0.618	0.35 U	0.67 U	0.31 U	0.64 U	0.66 U	0.62 U	0.62 U
TOTAL ORGANIC CARBON	%	0.25	**0.71**	**2.5**	**2.2**	**2.3**	**2.4**	**2.5**	**2.4**
TOTAL SULFIDE	MG/KG	74	**82 B**	**630**	**280**	**380**	**310**	**250**	**250**

There are no sediment quality guidelines for the general chemistry parameters

NOTES: Bold values represent detected concentrations
RL is reported for non-detected constituents

RL = range of reporting limits

B = detected in the laboratory method blank

J = compound was detected, but below the reporting limit (value is estimated)

U = compound was analyzed, but not detected

TABLE 3A. METALS CONCENTRATIONS IN SEDIMENT

SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

ANALYTE	UNITS	Average RL	TEL	PEL	Willoughby Bank Reference Site	Dredging Unit 5				Dredging Unit 4			Dredging Unit 3		
						SC-01	SC-01 Field Duplicate	SC-02	SC-01/02	SC-03	SC-04	SC-03/04	SC-05	SC-06	SC-05/06
ALUMINUM	MG/KG	3.563	--	--	**4,200 B**	**15,000**	**16,000**	**21,000**	**20,000**	**23,000**	**22,000**	**22,000**	**30,000**	**28,000**	**29,000**
ANTIMONY	MG/KG	0.238	--	--	**0.06 J B**	**0.18 J**	**0.19**	**0.23 J**	**0.22**	**0.23**	**0.23**	**0.23**	**0.3**	**0.27**	**0.29**
ARSENIC	MG/KG	0.123	7.24	41.6	**2.2**	**4.4**	**4.6**	**5.9**	**5.3**	**5.7**	**5.4**	**5.6**	**6.9**	**6.8**	**6.5**
BARIUM	MG/KG	1.197	--	--	**11 B**	**51 B**	**55 B**	**68 B**	**63 B**	**70 B**	**74 B**	**71 B**	**98 B**	**92 B**	**100 B**
BERYLLIUM	MG/KG	0.120	--	--	**0.2**	**0.84**	**0.88**	**1.2**	**1.1**	**1.2**	**1.1**	**1.2**	**1.5**	**1.4**	**1.6**
CADMIUM	MG/KG	0.120	0.676	4.21	**0.1**	**0.34**	**0.35**	**0.44**	**0.42**	**0.41**	**0.37**	**0.38**	**0.48**	**0.45**	**0.51**
CALCIUM	MG/KG	11.969	--	--	**9,500 B**	**1,100**	**1,100**	**2,800**	**1,300**	**1,300**	**1,500**	**1,200**	**1,600**	**1,500**	**1,600**
CHROMIUM	MG/KG	0.238	52.3	160.4	**10 B**	**24 B**	**25 B**	**32 B**	**30 B**	**31 B**	**31 B**	**31 B**	**39 B**	**37 B**	**41 B**
COBALT	MG/KG	0.059	--	--	**3 B**	**7.8 B**	**8.2 B**	**11 B**	**9.8 B**	**11 B**	**11 B**	**11 B**	**15 B**	**14 B**	**16 B**
COPPER	MG/KG	0.238	18.7	108.2	**4.4 B**	**20 B**	**22 B**	**27 B**	**25 B**	**25 B**	**23 B**	**24 B**	**29 B**	**28 B**	**31 B**
IRON	MG/KG	5.944	--	--	**8,400 B**	**24,000**	**25,000**	**32,000**	**29,000**	**31,000**	**30,000**	**31,000**	**40,000**	**39,000**	**42,000**
LEAD	MG/KG	0.120	30.24	112.18	**6.6 B**	**23 B**	**25 B**	**31 B**	**29 B**	**32 B**	**30 B**	**31 B**	**41 B**	**39 B**	**43 B**
MAGNESIUM	MG/KG	11.969	--	--	**2,800 B**	**3,000**	**3,100**	**4,500**	**4,000**	**4,400**	**4,200**	**4,300**	**5,800**	**5,500**	**5,700**
MANGANESE	MG/KG	0.594	--	--	**99 B**	**350 B**	**370 B**	**480 B**	**420 B**	**520 B**	**560 B**	**570 B**	**910 B**	**910 B**	**980 B**
MERCURY	MG/KG	0.039	0.130	0.696	**0.0**	**0.07**	**0.08**	**0.1**	**0.092**	**0.1**	**0.097**	**0.11**	**0.13**	**0.13**	**0.13**
NICKEL	MG/KG	0.120	15.9	42.8	**5.6 B**	**13 B**	**13 B**	**17 B**	**16 B**	**18 B**	**18 B**	**18 B**	**24 B**	**23 B**	**25 B**
POTASSIUM	MG/KG	11.969	--	--	**1,000**	**1,800**	**1,700**	**2,400**	**2,200**	**2,300**	**2,400**	**2,300**	**3,000**	**2,800**	**3,000**
SELENIUM	MG/KG	0.594	--	--	**0.27 J**	**0.73**	**0.78**	**0.98**	**0.86**	**0.92**	**0.9**	**0.93**	**1.2**	**1.1**	**1.2**
SILVER	MG/KG	0.120	0.730	1.77	**0.025 J**	**0.15 B**	**0.19 B**	**0.18 B**	**0.16 B**	**0.18 B**	**0.17 B**	**0.18 B**	**0.24 B**	**0.23 B**	**0.25 B**
SODIUM	MG/KG	11.969	--	--	**3,600 B**	**2,600**	**2,600**	**4,600**	**3,800**	**4,300**	**4,300**	**4,100**	**5,300**	**5,200**	**4,900**
THALLIUM	MG/KG	0.120	--	--	**0.068 J**	**0.2**	**0.22**	**0.28**	**0.27**	**0.28**	**0.28**	**0.28**	**0.36**	**0.34**	**0.37**
VANADIUM	MG/KG	0.123	--	--	**10.0**	**33**	**36**	**47**	**43**	**48**	**46**	**50**	**62**	**61**	**58**
ZINC	MG/KG	0.594	124	271	**38 B**	**120 B**	**140 B**	**160 B**	**150 B**	**140 B**	**120 B**	**120 B**	**140 B**	**130 B**	**140 B**

**Source* : MacDonald et al. 1996. Ecotoxicology 5: 253-278.

NOTES: Bold values represent detected concentrations. Shaded concentrations exceed sediment quality guidelines

RL is reported for non-detected constituents

TEL = threshold effects level

PEL = probable effects level

B = compound was detected in the laboratory method blank

J = compound was detected, but below the reporting limit (value is estimated)

TABLE 3B. METALS CONCENTRATIONS IN SEDIMENT

SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

ANALYTE	UNITS	Average RL	TEL	PEL	Willoughby Bank Reference Site	Dredging Unit 2			Dredging Unit 1		
						SC-07	SC-08	SC-07/08	SC-09	SC-10	SC-09/10
ALUMINUM	MG/KG	3.563	--	--	**4,200 B**	**27,000**	**28,000**	**27,000**	**27,000**	**27,000**	**25,000**
ANTIMONY	MG/KG	0.238	--	--	**0.06 J B**	**0.27**	**0.28**	**0.27 J**	**0.26**	**0.29**	**0.26**
ARSENIC	MG/KG	0.123	7.24	41.6	**2.2**	**6.7**	**6.2**	**6.7**	**6.4**	**6.8**	**6.3**
BARIUM	MG/KG	1.197	--	--	**11 B**	**90 B**	**99 B**	**92 B**	**95 B**	**98 B**	**89 B**
BERYLLIUM	MG/KG	0.120	--	--	**0.2**	**1.4**	**1.5**	**1.5**	**1.4**	**1.4**	**1.4**
CADMIUM	MG/KG	0.120	0.676	4.21	**0.1**	**0.45**	**0.47**	**0.46**	**0.44**	**0.49**	**0.45**
CALCIUM	MG/KG	11.969	--	--	**9,500 B**	**1,600**	**1,700**	**1,600**	**1,600**	**1,800**	**1,700**
CHROMIUM	MG/KG	0.238	52.3	160.4	**10 B**	**37 B**	**37 B**	**38 B**	**36 B**	**37 B**	**35 B**
COBALT	MG/KG	0.059	--	--	**3 B**	**14 B**	**14 B**	**15 B**	**14 B**	**14 B**	**14 B**
COPPER	MG/KG	0.238	18.7	108.2	**4.4 B**	**28 B**	**28 B**	**29 B**	**27 B**	**28 B**	**27 B**
IRON	MG/KG	5.944	--	--	**8,400 B**	**38,000**	**38,000**	**39,000**	**38,000**	**38,000**	**37,000**
LEAD	MG/KG	0.120	30.24	112.18	**6.6 B**	**39 B**	**40 B**	**39 B**	**38 B**	**41 B**	**39 B**
MAGNESIUM	MG/KG	11.969	--	--	**2,800 B**	**5,400**	**5,400**	**5,500**	**5,300**	**5,400**	**5,100**
MANGANESE	MG/KG	0.594	--	--	**99 B**	**980**	**1,100**	**1,100**	**1,100**	**1,200**	**1,100**
MERCURY	MG/KG	0.039	0.130	0.696	**0.028**	**0.14**	**0.13**	**0.14**	**0.13**	**0.14**	**0.14**
NICKEL	MG/KG	0.120	15.9	42.8	**5.6 B**	**23 B**	**23 B**	**23 B**	**22 B**	**23 B**	**22 B**
POTASSIUM	MG/KG	11.969	--	--	**1,000**	**2,700**	**2,700**	**2,800**	**2,700**	**2,600**	**2,500**
SELENIUM	MG/KG	0.594	--	--	**0.27 J**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**
SILVER	MG/KG	0.120	0.730	1.77	**0.025 J**	**0.23 B**	**0.24 B**	**0.24 B**	**0.22 B**	**0.25 B**	**0.24 B**
SODIUM	MG/KG	11.969	--	--	**3,600 B**	**4,900**	**4,500**	**4,800**	**4,700**	**4,100**	**4,400**
THALLIUM	MG/KG	0.120	--	--	**0.068 J**	**0.33**	**0.34**	**0.34**	**0.33**	**0.34**	**0.32**
VANADIUM	MG/KG	0.123	--	--	**10.0**	**57**	**55**	**58**	**56**	**60**	**55**
ZINC	MG/KG	0.594	124	271	**38 B**	**120 B**	**130 B**	**130 B**	**120 B**	**120 B**	**120 B**

**Source*: MacDonald et al. 1996. Ecotoxicology 5: 253-278.

NOTES: Bold values represent detected concentrations. Shaded concentrations exceed sediment quality guidelines

RL is reported for non-detected constituents

TEL = threshold effects level

PEL = probable effects level

B = compound was detected in the laboratory method blank

J = compound was detected, but below the reporting limit (value is estimated)

TABLE 4A. PAH CONCENTRATIONS IN SEDIMENT
SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

ANALYTE	UNITS	Average RL	TEL*	PEL*	Willoughby Bank Reference Site	Dredging Unit 5				Dredging Unit 4			Dredging Unit 3		
						SC-01	SC-01 Field Duplicate	SC-02	SC-01/02	SC-03	SC-04	SC-03/04	SC-05	SC-06	SC-05/06
LOW MOLECULAR WEIGHT PAHs															
1-METHYLNAPHTHALENE	UG/KG	62.9	--	--	**1.2 J**	**44**	**50**	43 U	**29 J**	39 U	41 U	79 U	92 U	46 U	90 U
2-METHYLNAPHTHALENE	UG/KG	62.9	20.2	201	**1.4 J**	**85**	**110**	**5.1 J**	**64 J**	39 U	**4.4 J**	79 U	92 U	**4.2 J**	90 U
ACENAPHTHENE	UG/KG	62.9	6.71	88.9	**1.8 J**	**360**	**320**	**6.1 J**	**210**	39 U	41 U	79 U	92 U	46 U	90 U
ACENAPHTHYLENE	UG/KG	62.9	5.87	128	9.4 U	**8.8 J**	**5.8 J**	**9.5 J**	77 U	39 U	**7.9 J**	79 U	92 U	**8.1 J**	90 U
ANTHRACENE	UG/KG	62.9	46.9	245	**4.3 J**	**53**	**31**	**19 J**	**46 J**	**9.1 J**	**9.9 J**	**14 J**	**14 J**	**11 J**	**11 J**
FLUORENE	UG/KG	62.9	21.2	144	**2.6 J**	**240**	**210**	**8.9 J**	**180**	39 U	41 U	79 U	92 U	46 U	90 U
NAPHTHALENE	UG/KG	62.9	34.6	391	**1.9 J**	**39**	**34**	43 U	77 U	39 U	41 U	79 U	92 U	46 U	90 U
PHENANTHRENE	UG/KG	62.9	86.7	544	**13**	**500**	**330**	**37 J**	**380**	**21 J**	**25 J**	**27 J**	**33 J**	**27 J**	**25 J**
TOTAL LPAHs (ND=RL)	UG/KG	--	--	--	**30.9**	**1,321**	**1,085**	**162**	**986**	**225**	**203**	**436**	**507**	**226**	**486**
HIGH MOLECULAR WEIGHT PAHs															
BENZO(A)ANTHRACENE	UG/KG	62.9	74.8	693	**12**	**47**	**31**	**50**	**64 J**	**33 J**	**35 J**	**46 J**	**47 J**	**35 J**	**36 J**
BENZO(A)PYRENE	UG/KG	62.9	88.8	763	**14**	**33**	**23**	**44**	**51 J**	**35 J**	**39 J**	**39 J**	**50 J**	**37 J**	**47 J**
BENZO(B)FLUORANTHENE	UG/KG	62.9	--	--	**16**	**49**	**32**	**60**	**62 J**	**41**	**45**	**55 J**	**49 J**	**58**	**58 J**
BENZO(GHI)PERYLENE	UG/KG	62.9	--	--	**17**	**29**	**18**	**37 J**	**37 J**	**25 J**	**30 J**	**25 J**	**33 J**	**31 J**	**35 J**
BENZO(K)FLUORANTHENE	UG/KG	62.9	--	--	1.8 U	**21**	**15**	**24 J**	**37 J**	**20 J**	**29 J**	**20 J**	**50 J**	**17 J**	**21 J**
CHRYSENE	UG/KG	62.9	108	846	**11**	**58**	**41**	**64**	**78**	**35 J**	**50**	**42 J**	**63 J**	**46**	**46 J**
DIBENZO(A,H)ANTHRACENE	UG/KG	62.9	6.22	135	1 U	**8 J**	**5.4 J**	43 U	77 U	39 U	41 U	79 U	92 U	46 U	90 U
FLUORANTHENE	UG/KG	62.9	113	1,494	**14**	**180**	**98**	**99**	**200**	**56**	**69**	**71 J**	**85 J**	**64**	**65 J**
INDENO(1,2,3-CD)PYRENE	UG/KG	62.9	--	--	**11**	**24**	**15**	**29 J**	**33 J**	**21 J**	**23 J**	**23 J**	**30 J**	**24 J**	**25 J**
PYRENE	UG/KG	62.9	153	1,398	**19**	**140**	**79**	**98**	**150**	**64**	**78**	**67 J**	**96**	**71**	**64 J**
TOTAL HPAHs (ND=RL)	UG/KG	--	--	--	**115**	**466**	**277**	**398**	**620**	**262**	**312**	**344**	**433**	**299**	**348**
TOTAL PAHs															
TOTAL PAHs (ND=RL)	UG/KG	--	1,684	16,770	**153**	**1,919**	**1,448**	**720**	**1,852**	**633**	**650**	**982**	**1,194**	**663**	**1,063**

**Source* : MacDonald et al. 1996. Ecotoxicology 5: 253-278.

NOTES: Bold values represent detected concentrations. Shaded concentrations exceed sediment quality guidelines.

RL is reported for non-detected constituents

LPAH = low molecular weight PAHs

HPAH = high molecular weight PAHs

TEL = threshold effects level

PEL = probable effects level

J = compound was detected, but below the reporting limit (value is estimated)

U = compound was analyzed, but not detected

TABLE 4B. PAH CONCENTRATIONS IN SEDIMENT
SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

ANALYTE	UNITS	Average RL	TEL*	PEL*	Willoughby Bank Reference Site	Dredging Unit 2			Dredging Unit 1		
						SC-07	SC-08	SC-07/08	SC-09	SC-10	SC-09/10
LOW MOLECULAR WEIGHT PAHs (LPAHs)											
1-METHYLNAPHTHALENE	UG/KG	62.9	--	--	**1.2 J**	88 U	42 U	89 U	86 U	85 U	84 U
2-METHYLNAPHTHALENE	UG/KG	62.9	20.2	201	**1.4 J**	88 U	42 U	89 U	86 U	85 U	84 U
ACENAPHTHENE	UG/KG	62.9	6.71	88.9	**1.8 J**	88 U	42 U	89 U	86 U	85 U	84 U
ACENAPHTHYLENE	UG/KG	62.9	5.87	128	9.4 U	88 U	42 U	89 U	86 U	85 U	84 U
ANTHRACENE	UG/KG	62.9	46.9	245	**4.3 J**	**13 J**	42 U	**12 J**	**11 J**	**13 J**	**10 J**
FLUORENE	UG/KG	62.9	21.2	144	**2.6 J**	88 U	42 U	89 U	86 U	85 U	84 U
NAPHTHALENE	UG/KG	62.9	34.6	391	**1.9 J**	88 U	42 U	89 U	86 U	85 U	84 U
PHENANTHRENE	UG/KG	62.9	86.7	544	**13**	**31 J**	**9 J**	**21 J**	**23 J**	**23 J**	**21 J**
TOTAL LPAHs (ND=RL)	UG/KG	--	--	--	**30.9**	**484**	**261**	**478**	**464**	**461**	**451**
HIGH MOLECULAR WEIGHT PAHs (HPAHs)											
BENZO(A)ANTHRACENE	UG/KG	62.9	74.8	693	**12**	**42 J**	**18 J**	**34 J**	**34 J**	**37 J**	**30 J**
BENZO(A)PYRENE	UG/KG	62.9	88.8	763	**14**	**39 J**	**20 J**	**38 J**	**37 J**	**43 J**	**35 J**
BENZO(B)FLUORANTHENE	UG/KG	62.9	--	--	**16**	**57 J**	**29 J**	**42 J**	**46 J**	**51 J**	**50 J**
BENZO(GHI)PERYLENE	UG/KG	62.9	--	--	**17**	**34 J**	42 U	**31 J**	**27 J**	**31 J**	**27 J**
BENZO(K)FLUORANTHENE	UG/KG	62.9	--	--	1.8 U	**22 J**	**10 J**	**24 J**	**19 J**	**19 J**	84 U
CHRYSENE	UG/KG	62.9	108	846	**11**	**43 J**	**22 J**	**35 J**	**44 J**	**46 J**	**39 J**
DIBENZO(A,H)ANTHRACENE	UG/KG	62.9	6.22	135	1 U	88 U	42 U	89 U	86 U	85 U	84 U
FLUORANTHENE	UG/KG	62.9	113	1,494	**14**	**65 J**	**23 J**	**50 J**	**60 J**	**62 J**	**52 J**
INDENO(1,2,3-CD)PYRENE	UG/KG	62.9	--	--	**11**	**24 J**	42 U	**23 J**	**22 J**	**23 J**	**24 J**
PYRENE	UG/KG	62.9	153	1,398	**19**	**78 J**	**30 J**	**51 J**	**57 J**	**60 J**	**52 J**
TOTAL HPAHs (ND=RL)	UG/KG	--	--	--	**115**	**355**	**155**	**297**	**318**	**333**	**292**
TOTAL PAHs											
TOTAL PAHs (ND=RL)	UG/KG	--	1,684	16,770	**153**	**1,064**	**581**	**984**	**982**	**1,003**	**1,012**

**Source*: MacDonald et al. 1996. Ecotoxicology 5: 253-278.

NOTES: Bold values represent detected concentrations. Shaded concentrations exceed sediment quality guidelines.

RL is reported for non-detected constituents

TEL = threshold effects level

PEL = probable effects level

J = compound was detected, but below the reporting limit (value is estimated)

U = compound was analyzed, but not detected

TABLE 5A. PCB CONGENER CONCENTRATIONS IN SEDIMENT

SKIFFES CREEK, BACK RIVER, VIRGINIA

ANALYTE	UNITS	Average RL	TEL**	PEL**	Willoughby Bank Reference Site	Dredging Unit 5				Dredging Unit 4			Dredging Unit 3		
						SC-01	SC-01 Field Duplicate	SC-02	SC-01/02	SC-03	SC-04	SC-03/04	SC-05	SC-06	SC-05/06
PCB 8 (BZ)*	UG/KG	1.24	--	--	**0.12 J P**	**0.39 J P**	**0.2 J P**	**0.46 J P**	**0.56 J P**	**0.32 J P**	**0.99 J P**	**0.61 J P**	**0.47 J P**	**0.65 J P**	**0.97 J P**
PCB 18 (BZ)*	UG/KG	1.24	--	--	**0.36 J**	**0.12 J P**	0.95 U	**0.64 J**	**0.24 J P**	**0.26 J**	**0.29 J P**	**0.26 J P**	1.4 U	**0.15 J P**	**0.67 J P**
PCB 28 (BZ)*	UG/KG	1.24	--	--	0.7 U	**0.38 J P**	**0.26 J P**	**0.34 J P**	1.1 U	**0.35 J P**	**0.3 J P**	**0.31 J P**	**0.53 J P**	**0.37 J P**	**0.29 J P**
PCB 44 (BZ)*	UG/KG	1.24	--	--	0.7 U	**0.25 J P**	**0.2 J P**	**0.17 J**	1.1 U	**0.14 J**	**0.15 J**	**0.14 J**	**0.25 J**	**0.14 J P**	1.3 U
PCB 49 (BZ)	UG/KG	1.24	--	--	0.7 U	**0.34 J P**	**0.38 J**	**0.3 J P**	**0.4 J**	**0.12 J P**	1.2 U	**0.23 J**	**0.33 J**	**0.34 J**	**0.22 J**
PCB 52 (BZ)*	UG/KG	1.24	--	--	0.7 U	**0.29 J B**	0.95 U	1.3 U	1.1 U	1.2 U	1.2 U	1.2 U	1.4 U	1.4 U	1.3 U
PCB 66 (BZ)*	UG/KG	1.24	--	--	0.7 U	**0.37 J P**	**0.32 J P**	**0.39 J P**	**0.31 J P**	**0.37 J P**	1.2 U	**0.32 J P**	**0.47 J P**	**0.31 J P**	**0.32 J P**
PCB 77 (BZ)*	UG/KG	1.24	--	--	0.7 U	**2.5 B**	**2.2 B**	**2.5 B**	**1.3 P B**	1.2 U	**1.8 B**	**1.7 B**	**1.8 B**	**1.6 B**	**1.3 B**
PCB 87 (BZ)	UG/KG	1.24	--	--	0.7 U	**0.07 J P**	**0.069 J P**	**0.095 J P**	1.1 U	1.2 U	**0.077 J P**	1.2 U	**0.12 J P**	1.4 U	1.3 U
PCB 101 (BZ)*	UG/KG	1.24	--	--	0.7 U	**0.68 J P**	**0.56 J P**	**0.91 J**	**0.89 J**	**0.84 J**	**0.5 J P**	**0.65 J**	**0.81 J**	**0.71 J**	**0.68 J**
PCB 105 (BZ)*	UG/KG	1.24	--	--	0.7 U	0.98 U	0.95 U	1.3 U	1.1 U	1.2 U	1.2 U	1.2 U	1.4 U	1.4 U	1.3 U
PCB 118 (BZ)*	UG/KG	1.24	--	--	0.7 U	**0.36 J**	**0.21 J**	**0.34 J**	1.1 U	**0.29 J**	1.2 U	**0.25 J**	**0.46 J**	**0.33 J**	1.3 U
PCB 126 (BZ)*	UG/KG	1.24	--	--	0.7 U	0.98 U	0.95 U	1.3 U	1.1 U	1.2 U	1.2 U	1.2 U	1.4 U	1.4 U	1.3 U
PCB 128 (BZ)*	UG/KG	1.24	--	--	0.7 U	**0.42 J**	**0.19 J P**	**0.32 J P**	**0.24 J P**	**0.4 J**	**0.21 J P**	**0.17 J P**	**0.19 J P**	**0.16 J P**	**0.14 J P**
PCB 138 (BZ)*	UG/KG	1.24	--	--	0.7 U	**0.45 J P**	**0.32 J P**	**0.99 J**	**0.46 J P**	**0.5 J P**	**0.5 J P**	**0.38 J P**	**0.51 J**	**0.4 J P**	**0.37 J P**
PCB 153 (BZ)*	UG/KG	1.24	--	--	0.7 U	**1.7**	**1.4**	**1.7**	**1.6**	**1.4**	**1.2**	**1.1 J**	**1.3 J**	**1.1 J**	**0.94 J**
PCB 156 (BZ)	UG/KG	1.24	--	--	0.7 U	0.98 U	0.95 U	1.3 U	1.1 U	1.2 U	1.2 U	1.2 U	1.4 U	1.4 U	1.3 U
PCB 169 (BZ)*	UG/KG	1.24	--	--	0.7 U	0.98 U	0.95 U	1.3 U	1.1 U	1.2 U	1.2 U	1.2 U	1.4 U	1.4 U	1.3 U
PCB 170 (BZ)*	UG/KG	1.24	--	--	0.7 U	**0.71 J**	**0.54 J**	**0.81 J**	**0.75 J**	**0.69 J**	**0.57 J**	**0.55 J**	**0.59 J**	**0.45 J**	**0.49 J**
PCB 180 (BZ)*	UG/KG	1.24	--	--	0.7 U	**0.74 J**	**0.58 J**	**0.86 J**	**0.77 J**	**0.7 J**	**0.56 J**	**0.52 J**	**0.56 J**	**0.48 J**	**0.4 J**
PCB 183 (BZ)	UG/KG	1.24	--	--	0.7 U	**0.2 J P**	**0.17 J P**	**0.32 J**	**0.26 J**	**0.27 J**	**0.24 J**	**0.25 J**	**0.17 J P**	**0.15 J P**	1.3 U
PCB 184 (BZ)	UG/KG	1.24	--	--	0.7 U	0.98 U	0.95 U	1.3 U	**0.12 J P**	1.2 U	1.2 U	1.2 U	1.4 U	1.4 U	1.3 U
PCB 187 (BZ)*	UG/KG	1.24	--	--	0.7 U	**0.41 J P**	**0.33 J P**	**0.53 J P**	**0.37 J P**	**0.37 J P**	**0.33 J P**	**0.26 J P**	**0.29 J P**	**0.28 J P**	**0.21 J P**
PCB 195 (BZ)	UG/KG	1.24	--	--	0.7 U	0.98 U	0.95 U	1.3 U	1.1 U	1.2 U	1.2 U	1.2 U	1.4 U	1.4 U	1.3 U
PCB 206 (BZ)	UG/KG	1.24	--	--	0.7 U	**0.14 J**	**0.14 J**	**0.12 J**	**0.1 J**	**0.11 J**	**0.083 J**	**0.11 J**	**0.15 J P**	**0.12 J**	**0.69 J**
PCB 209 (BZ)	UG/KG	1.24	--	--	0.7 U	**0.63 J**	**1.2**	**0.87 J**	**0.61 J**	**0.76 J**	**0.69 J**	**0.79 J**	**1.2 J**	**0.98 J**	**0.88 J**
TOTAL PCBs (ND=RL)	UG/KG	--	21.6	189	**34.6**	**34.1**	**33.7**	**43.5**	**40.0**	**37.4**	**41.0**	**36.4**	**42.8**	**39.8**	**45.7**

* PCB congeners used for Total PCB summation, as per Table 9-3 of the ITM (USEPA/USACE 1998)

***Source*: MacDonald et al. 1996. Ecotoxicology 5: 253-278.

NOTES: Bold values represent detected concentrations. Shaded concentrations exceed sediment quality guidelines.

RL is reported for non-detected constituents.

B = compound was detected in the laboratory method blank

J = compound was detected, but below the reporting limit (value is estimated)

P = the percent difference between the original and confirmation analysis is greater than 40%

U = compound was analyzed, but not detected

TABLE 5B. PCB CONGENER CONCENTRATIONS IN SEDIMENT

SKIFFES CREEK, BACK RIVER, VIRGINIA

ANALYTE	UNITS	Average RL	TEL**	PEL**	Willoughby Bank Reference Site	Dredging Unit 2			Dredging Unit 1		
						SC-07	SC-08	SC-07/08	SC-09	SC-10	SC-09/10
PCB 8 (BZ)*	UG/KG	1.24	--	--	**0.12 J P**	**0.21 J P**	**0.55 J P**	**0.6 J P**	**0.34 J P**	**0.29 J P**	**0.28 J P**
PCB 18 (BZ)*	UG/KG	1.24	--	--	**0.36 J**	1.3 U	1.3 U	**0.25 J P**	1.3 U	**0.42 J**	**0.74 J**
PCB 28 (BZ)*	UG/KG	1.24	--	--	0.7 U	**0.61 J P**	**0.52 J P**	**0.25 J P**	**0.54 J P**	**0.61 J P**	**0.41 J P**
PCB 44 (BZ)*	UG/KG	1.24	--	--	0.7 U	**0.23 J**	**0.23 J**	1.3 U	**0.19 J P**	**0.21 J P**	**0.14 J**
PCB 49 (BZ)	UG/KG	1.24	--	--	0.7 U	**0.21 J P**	**0.22 J P**	1.3 U	**0.46 J**	**0.49 J**	**0.16 J P**
PCB 52 (BZ)*	UG/KG	1.24	--	--	0.7 U	1.3 U	1.3 U	1.3 U	**0.25 J P B**	**0.53 J B**	1.3 U
PCB 66 (BZ)*	UG/KG	1.24	--	--	0.7 U	**0.48 J P**	**0.38 J P**	**0.3 J P**	**0.57 J P**	**0.56 J P**	1.3 U
PCB 77 (BZ)*	UG/KG	1.24	--	--	0.7 U	**1.9 B**	**1.6 B**	**1.4 B**	**2.1 B**	**2.4 B**	**1.7 B**
PCB 87 (BZ)	UG/KG	1.24	--	--	0.7 U	**0.11 J P**	**0.09 J P**	1.3 U	**0.11 J P**	**0.084 J P**	1.3 U
PCB 101 (BZ)*	UG/KG	1.24	--	--	0.7 U	**0.85 J**	**0.47 J P**	**0.63 J**	**1.1 J**	**1.1 J**	**0.68 J**
PCB 105 (BZ)*	UG/KG	1.24	--	--	0.7 U	1.3 U	1.3 U	1.3 U	**0.25 J**	1.3 U	1.3 U
PCB 118 (BZ)*	UG/KG	1.24	--	--	0.7 U	1.3 U	1.3 U	**0.3 J**	**0.52 J**	1.3 U	**0.36 J**
PCB 126 (BZ)*	UG/KG	1.24	--	--	0.7 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
PCB 128 (BZ)*	UG/KG	1.24	--	--	0.7 U	**0.21 J P**	**0.17 J P**	**0.15 J P**	**0.23 J P**	**0.21 J P**	**0.12 J P**
PCB 138 (BZ)*	UG/KG	1.24	--	--	0.7 U	**0.49 J P**	**0.42 J P**	**0.35 J P**	**0.58 J P**	**0.43 J P**	**0.35 J P**
PCB 153 (BZ)*	UG/KG	1.24	--	--	0.7 U	**1.3**	**1.1 J**	**1 J**	**1.6**	**1.4**	**1 J**
PCB 156 (BZ)	UG/KG	1.24	--	--	0.7 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
PCB 169 (BZ)*	UG/KG	1.24	--	--	0.7 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
PCB 170 (BZ)*	UG/KG	1.24	--	--	0.7 U	**0.55 J**	**0.45 J**	**0.32 J P**	**0.53 J P**	**0.6 J**	**0.41 J**
PCB 180 (BZ)*	UG/KG	1.24	--	--	0.7 U	**0.55 J**	**0.47 J**	**0.41 J**	**0.65 J**	**0.58 J**	**0.4 J**
PCB 183 (BZ)	UG/KG	1.24	--	--	0.7 U	**0.28 J**	**0.15 J P**	**0.14 J P**	**0.21 J P**	**0.25 J**	**0.15 J P**
PCB 184 (BZ)	UG/KG	1.24	--	--	0.7 U	**0.37 J**	**0.17 J P**	1.3 U	1.3 U	**0.22 J P**	1.3 U
PCB 187 (BZ)*	UG/KG	1.24	--	--	0.7 U	**0.27 J P**	**0.26 J P**	**0.21 J P**	**0.36 J P**	**0.28 J P**	**0.21 J P**
PCB 195 (BZ)	UG/KG	1.24	--	--	0.7 U	1.3 U	1.3 U	1.3 U	**0.24 J**	1.3 U	1.3 U
PCB 206 (BZ)	UG/KG	1.24	--	--	0.7 U	**0.18 J**	**0.12 J**	**0.15 J**	**0.18 J**	**0.18 J**	**0.12 J**
PCB 209 (BZ)	UG/KG	1.24	--	--	0.7 U	**1.2 J**	**1 J**	**0.95 J**	**1.4**	**1.3**	**0.9 J**
TOTAL PCBs (ND=RL)	UG/KG	--	21.6	189	**1.23**	**40.8**	**37.5**	**40.8**	**37.8**	**39.9**	**39.7**

* PCB congeners used for Total PCB summation, as per Table 9-3 of the ITM (USEPA/USACE 1998)

***Source* : MacDonald et al. 1996. Ecotoxicology 5: 253-278.

NOTES: Bold values represent detected concentrations. Shaded concentrations exceed sediment quality guidelines.

RL is reported for non-detected constituents.

B = compound was detected in the laboratory method blank

J = compound was detected, but below the reporting limit (value is estimated)

P = the percent difference between the original and confirmation analysis is greater than 40%

U = compound was analyzed, but not detected

TABLE 6A. DIOXIN AND FURAN CONGENERS CONCENTRATIONS IN SEDIMENT

SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

ANALYTE	UNITS	Average RL	TEF*	Willoughby Bank Reference Site	Dredging Unit 5				Dredging Unit 4			Dredging Unit 3		
					SC-01	SC-01 Field Duplicate	SC-02	SC-01/02	SC-03	SC-04	SC-03/04	SC-05	SC-06	SC-05/06
2,3,7,8-TCDD	NG/KG	1.19	1	0.98 U	**0.14 Q J**	**0.26 Q J**	1.2 U	**0.43 Q J**	**0.41 Q J**	**0.5 Q J**	**0.12 Q J**	**0.55 Q J**	**0.61 Q J**	**0.059 Q J**
1,2,3,7,8-PECDD	NG/KG	5.99	1	**0.25 J**	**1.2 Q J**	**1.3 Q J**	5.9 U	**1.8 Q J**	**1.5 J**	**1.7 J**	**0.27 Q J**	**1.3 Q J**	**2.2 Q J**	**0.45 Q J**
1,2,3,4,7,8-HXCDD	NG/KG	5.99	0.1	**0.67 J**	**2 Q J**	**2.4 Q J**	5.9 U	**3.7 J**	**3.9 J**	**2.5 Q J**	**0.49 J**	**4.3 J**	**4.1 J**	**0.73 Q J**
1,2,3,6,7,8-HXCDD	NG/KG	5.99	0.1	**0.9 J**	**5.2**	**5.5**	**7.6**	**7.7**	**7.2 Q**	**5.3 J**	**0.68 Q J**	**8.1**	**8.5**	**1.6 Q J**
1,2,3,7,8,9-HXCDD	NG/KG	5.99	0.1	**2.2 B J**	**8.8**	**9.4 Q**	**13**	**12**	**14**	**11**	**1.2 Q J**	**14 Q**	**16**	**3.1 Q J**
1,2,3,4,6,7,8-HPCDD	NG/KG	5.99	0.01	**26 B**	**150 B**	**170 B**	**250 B**	**230 B**	**240 B**	**200 B**	**26 B**	**270 B**	**290 B**	**63 B**
OCDD	NG/KG	11.9	0.0003	**390 B**	**3800 B**	**3800 B**	**6500 B**	**5800 B**	**6600 B**	**5400 B**	**730 B**	**7000 B**	**6800 B**	**1600 B**
2,3,7,8-TCDF	NG/KG	1.19	0.1	**0.16 Q J**	**1.8**	**2 Q**	**2.7**	**2.7**	**3.2**	**2.7**	**0.32 Q J**	**4.7 Q**	**4.1**	**1.1 Q J**
1,2,3,7,8-PECDF	NG/KG	5.99	0.03	**0.13 Q J**	**0.76 J**	**0.48 Q J**	5.9 U	**1 Q J**	**0.71 Q J**	**0.78 Q J**	5.6 U	**1.5 J**	**1.5 Q J**	**0.23 J**
2,3,4,7,8-PECDF	NG/KG	5.99	0.3	4.9 U	**0.99 J**	**1.2 J**	5.9 U	**1.4 Q J**	**1.4 Q J**	**1.4 Q J**	**0.22 J**	**1.9 Q J**	**2 Q J**	**0.58 Q J**
1,2,3,4,7,8-HXCDF	NG/KG	5.99	0.1	**0.26 Q J**	**1.6 J**	**2.1 Q J**	5.9 U	**1.4 J**	**2.3 Q J**	**2 Q J**	**0.24 J**	**1.9 Q J**	**3.1 J**	**0.48 Q J**
1,2,3,6,7,8-HXCDF	NG/KG	5.99	0.1	**0.19 Q J**	**1.5 Q J**	**2.1 Q J**	5.9 U	**2 J**	**2 J**	**1.9 Q J**	**0.22 Q J**	**2.5 Q J**	**2.5 Q J**	**0.38 Q J**
2,3,4,6,7,8-HXCDF	NG/KG	5.99	0.1	**0.16 Q J**	**0.64 J**	**0.8 J**	5.9 U	**0.91 J**	**1 J**	**1.1 J**	**0.079 Q J**	**1.4 Q J**	**1.5 Q J**	**0.33 Q J**
1,2,3,7,8,9-HXCDF	NG/KG	5.99	0.1	4.9 U	5 U	**0.17 J**	5.9 U	**0.2 Q J**	**0.057 Q J**	**0.23 J**	5.6 U	**0.1 Q J**	6.4 U	**0.056 Q J**
1,2,3,4,6,7,8-HPCDF	NG/KG	5.99	0.01	**0.88 Q B J**	**9.3 B**	**9.9 B**	**13 B**	**16 B**	**15 B**	**11 Q B**	**1.9 B J**	**17 B**	**19 B**	**3.7 Q B J**
1,2,3,4,7,8,9-HPCDF	NG/KG	5.99	0.01	**0.066 Q B J**	**0.79 J**	**0.78 Q J**	5.9 U	**1.4 J**	**0.93 Q J**	**0.96 J**	**0.068 Q J**	**1.2 Q J**	**1.4 J**	**0.21 J**
OCDF	NG/KG	11.9	0.0003	**1.8 B J**	**15 B**	**17 B**	**20 B**	**24 B**	**16 B**	**15 B**	**2.2 B J**	**23 B**	**23 B**	**4.4 Q B J**
DIOXIN TEQ (ND=RL)	NG/KG		--	**3.94**	**5.37**	**3.95**	**19.0**	**7.66**	**8.44**	**7.37**	**1.37**	**6.26**	**9.37**	**1.12**

**Source* : Van den Berg, M, et al. 2006. The 2005 World Health Organization Re-evaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-Like Compounds.

Toxicological Sciences 93(2):223-241. There are no sediment quality guidelines for dioxin and furan congeners

NOTES: Bold values represent detected concentrations; RL is reported for non-detected constituents.

TEF = toxicity equivalency factor

B = compound was detected in the laboratory method blank

J = compound was detected, but below the reporting limit (value is estimated)

Q = compound was detected, but as an estimated maximum concentration

U = compound was analyzed, but not detected

TABLE 6B. DIOXIN AND FURAN CONGENERS CONCENTRATIONS IN SEDIMENT

SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

ANALYTE	UNITS	Average RL	TEF*	Willoughby Bank Reference Site	Dredging Unit 2			Dredging Unit 1		
					SC-07	SC-08	SC-07/08	SC-09	SC-10	SC-09/10
2,3,7,8-TCDD	NG/KG	1.19	1	0.98 U	**0.37 Q J**	**0.17 Q J**	**0.079 Q J**	**0.079 Q J**	**0.11 Q J**	**0.067 Q J**
1,2,3,7,8-PECDD	NG/KG	5.99	1	**0.25 J**	**1.7 Q J**	**0.73 Q J**	**0.87 Q J**	**0.39 J**	**0.059 Q J**	**0.16 Q J**
1,2,3,4,7,8-HXCDD	NG/KG	5.99	0.1	**0.67 J**	**4.3 J**	**1.6 J**	**2.6 J**	**0.45 Q J**	**0.6 J**	**0.16 Q J**
1,2,3,6,7,8-HXCDD	NG/KG	5.99	0.1	**0.9 J**	**9.9**	**2.6 Q J**	**5 J**	**0.92 J**	**0.63 J**	**1.3 Q J**
1,2,3,7,8,9-HXCDD	NG/KG	5.99	0.1	**2.2 B J**	**16**	**4.9 J**	**8.5**	**1.6 J**	**0.7 Q J**	**2 J**
1,2,3,4,6,7,8-HPCDD	NG/KG	5.99	0.01	**26 B**	**280 B**	**97 B**	**150 B**	**41 B**	**20 B**	**39 B**
OCDD	NG/KG	11.9	0.0003	**390 B**	**6200 B**	**2200 B**	**3600 B**	**970 B**	**470 B**	**1000 B**
2,3,7,8-TCDF	NG/KG	1.19	0.1	**0.16 Q J**	**30**	**1.6 Q**	**2.5**	**0.44 Q J**	**0.31 J**	**0.42 Q J**
1,2,3,7,8-PECDF	NG/KG	5.99	0.03	**0.13 Q J**	**1.1 J**	**0.66 J**	**0.72 Q J**	**0.15 Q J**	**0.16 Q J**	**0.15 Q J**
2,3,4,7,8-PECDF	NG/KG	5.99	0.3	4.9 U	**2.4 J**	**0.6 Q J**	**1.1 Q J**	**0.063 Q J**	**0.2 Q J**	**0.21 Q J**
1,2,3,4,7,8-HXCDF	NG/KG	5.99	0.1	**0.26 Q J**	**3.6 J**	**0.63 Q J**	**1.7 Q J**	**0.42 Q J**	**0.3 J**	**0.23 Q J**
1,2,3,6,7,8-HXCDF	NG/KG	5.99	0.1	**0.19 Q J**	**2.5 Q J**	**0.69 Q J**	**1.3 Q J**	**0.44 J**	**0.24 Q J**	**0.44 J**
2,3,4,6,7,8-HXCDF	NG/KG	5.99	0.1	**0.16 Q J**	**1.3 J**	**0.45 Q J**	**0.57 Q J**	**0.071 Q J**	**0.096 Q J**	**0.24 J**
1,2,3,7,8,9-HXCDF	NG/KG	5.99	0.1	4.9 U	**0.23 Q J**	6.2 U	**0.099 Q J**	6.2 U	6.2 U	6.2 U
1,2,3,4,6,7,8-HPCDF	NG/KG	5.99	0.01	**0.88 Q B J**	**18 B**	**5.1 Q B J**	**9.7 B**	**2.2 B J**	**1.6 Q B J**	**2.5 Q B J**
1,2,3,4,7,8,9-HPCDF	NG/KG	5.99	0.01	**0.066 Q B J**	**1.3 J**	**0.23 Q J**	**0.73 J**	**0.27 Q J**	6.2 U	6.2 U
OCDF	NG/KG	11.9	0.0003	**1.8 B J**	**21 B**	**6.9 B J**	**13 B**	**1.8 Q B J**	**3.6 Q B J**	**3.9 B J**
DIOXIN TEQ (ND=RL)	NG/KG		--	**3.94**	**12.1**	**2.92**	**4.55**	**2.03**	**1.21**	**1.64**

**Source* : Van den Berg, M, et al. 2006. The 2005 World Health Organization Re-evaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-Like Compounds.

Toxicological Sciences 93(2):223-241. There are no sediment quality guidelines for dioxin and furan congeners

NOTES: Bold values represent detected concentrations; RL is reported for non-detected constituents.

TEF = toxicity equivalency factor

B = compound was detected in the laboratory method blank

J = compound was detected, but below the reporting limit (value is estimated)

Q = compound was detected, but as an estimated maximum concentration

U = compound was analyzed, but not detected

TABLE 7A. CHLORINATED AND ORGANOPHOSPHORUS PESTICIDE CONCENTRATIONS IN SEDIMENT

SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

ANALYTE	UNITS	Average RL	TEL*	PEL*	Willoughby Bank Reference Site	Dredging Unit 5				Dredging Unit 4			Dredging Unit 3		
						SC-01	SC-01 Field Duplicate	SC-02	SC-01/02	SC-03	SC-04	SC-03/04	SC-05	SC-06	SC-05/06
2,4'-DDD	UG/KG	0.513	--	--	0.29 U	**0.039 J P**	**0.22 J**	**0.079 J P**	**0.19 J**	**0.049 J P**	0.51 U	**0.2 J**	0.58 U	**0.28 J**	**0.13 J**
2,4'-DDE	UG/KG	0.513	--	--	0.29 U	0.41 U	0.39 U	0.53 U	0.48 U	0.49 U	0.51 U	0.49 U	0.58 U	0.57 U	0.56 U
2,4'-DDT	UG/KG	0.513	--	--	0.29 U	**0.079 J**	0.39 U	0.53 U	0.48 U	0.49 U	0.51 U	0.49 U	0.58 U	0.57 U	0.56 U
4,4'-DDD	UG/KG	0.513	1.22	7.81	**0.079 J B**	**0.56 P**	**1.2**	**0.83**	**0.56**	**0.43 J P**	**0.76**	**0.7**	**0.77**	**0.76**	**0.69**
4,4'-DDE	UG/KG	0.513	2.07	374	0.29 U	**0.44**	**0.41**	**0.43 J**	**0.24 J**	**0.35 J**	**0.38 J**	**0.36 J**	**0.44 J**	**0.52 J**	**0.36 J**
4,4'-DDT	UG/KG	0.513	1.19	4.77	0.29 U	**0.65**	**0.28 J P**	**0.41 J P**	**0.23 J P**	**0.49**	**0.37 J P**	**0.28 J P**	**0.22 J P**	**0.62**	**0.14 J P**
Total DDTs (ND=RL)	UG/KG	---	---	---	0.659	1.65	1.89	1.67	1.03	1.27	1.51	1.34	1.43	1.9	1.19
CHLORINATED PESTICIDES															
ALDRIN	UG/KG	0.513	--	--	0.29 U	**0.077 J P**	0.39 U	0.53 U	0.48 U	0.49 U	0.51 U	0.49 U	0.58 U	0.57 U	0.56 U
ALPHA-BHC	UG/KG	0.513	--	--	0.29 U	0.41 U	0.39 U	0.53 U	0.48 U	0.49 U	0.51 U	0.49 U	0.58 U	0.57 U	0.56 U
BETA-BHC	UG/KG	0.513	--	--	0.29 U	0.41 U	0.39 U	0.53 U	0.48 U	0.49 U	0.51 U	0.49 U	0.58 U	0.57 U	0.56 U
CHLORDANE (TECHNICAL)	UG/KG	5.13	--	--	2.9 U	4.1 U	3.9 U	5.3 U	4.8 U	4.9 U	5.1 U	4.9 U	5.8 U	5.7 U	5.6 U
ALPHA-CHLORDANE	UG/KG	0.513	2.26	4.79	0.29 U	0.41 U	0.39 U	0.53 U	0.48 U	0.49 U	0.51 U	0.49 U	0.58 U	0.57 U	0.56 U
GAMMA-CHLORDANE	UG/KG	0.513	--	--	0.29 U	**0.3 J**	**0.18 J P**	**0.29 J**	**0.16 J**	**0.28 J**	**0.29 J**	**0.24 J**	**0.21 J P**	**0.24 J P**	0.56 U
CHLOROBENSIDE	UG/KG	0.513	--	--	0.29 U	0.41 U	0.39 U	0.53 U	0.48 U	0.49 U	0.51 U	0.49 U	0.58 U	0.57 U	0.56 U
DACHTAL	UG/KG	0.513	--	--	0.29 U	0.41 U	0.39 U	0.53 U	0.48 U	0.49 U	0.51 U	0.49 U	0.58 U	0.57 U	0.56 U
DELTA-BHC	UG/KG	0.513	--	--	0.29 U	**0.38 J P**	**0.38 J P**	**0.091 J P**	0.48 U	**0.078 J P**	0.51 U	0.49 U	**0.092 J P**	0.57 U	0.56 U
DIELDRIN	UG/KG	0.513	0.715	4.3	0.29 U	0.41 U	**0.12 J P**	0.53 U	**0.11 J**	0.49 U	**0.25 J**	**0.18 J**	**0.21 J**	**0.23 J**	0.56 U
ENDOSULFAN I	UG/KG	0.513	--	--	0.29 U	0.41 U	0.39 U	0.53 U	0.48 U	0.49 U	0.51 U	0.49 U	0.58 U	0.57 U	0.56 U
ENDOSULFAN II	UG/KG	0.513	--	--	0.29 U	0.41 U	0.39 U	0.53 U	0.48 U	0.49 U	0.51 U	0.49 U	0.58 U	0.57 U	0.56 U
ENDOSULFAN SULFATE	UG/KG	0.513	--	--	0.29 U	**0.16 J B**	**0.091 J B**	**0.18 J B**	0.48 U	**0.14 J P B**	**0.084 J P B**	**0.12 J P B**	**0.066 J P B**	**0.08 J B**	0.56 U
ENDRIN	UG/KG	0.513	--	--	0.29 U	**0.14 J P**	0.39 U	**0.12 J P**	0.48 U	**0.13 J P**	**0.15 J P**	**0.12 J P**	**0.14 J P**	**0.18 J P**	**0.11 J P**
ENDRIN ALDEHYDE	UG/KG	0.513	--	--	0.29 U	0.41 U	0.39 U	0.53 U	0.48 U	0.49 U	0.51 U	0.49 U	0.58 U	0.57 U	0.56 U
ENDRIN KETONE	UG/KG	0.513	--	--	0.29 U	0.41 U	**0.096 J P**	0.53 U	0.48 U	0.49 U	**0.093 J P**	0.49 U	**0.095 J P**	0.57 U	0.56 U
GAMMA-BHC	UG/KG	0.513	0.32	0.99	0.29 U	0.41 U	**0.084 J**	0.53 U	0.48 U	0.49 U	0.51 U	0.49 U	0.58 U	0.57 U	0.56 U
HEPTACHLOR	UG/KG	0.513	--	--	0.29 U	0.41 U	0.39 U	0.53 U	0.48 U	0.49 U	0.51 U	0.49 U	0.58 U	0.57 U	0.56 U
HEPTACHLOR EPOXIDE	UG/KG	0.513	--	--	0.29 U	0.41 U	0.39 U	0.53 U	0.48 U	0.49 U	0.51 U	0.49 U	0.58 U	0.57 U	0.56 U
METHOXYCHLOR	UG/KG	1.03	--	--	0.58 U	**1.2**	0.79 U	1.1 U	0.96 U	**0.91 J P**	1 U	0.98 U	1.2 U	1.1 U	1.1 U
MIREX	UG/KG	0.513	--	--	0.29 U	0.41 U	0.39 U	0.53 U	0.48 U	0.49 U	0.51 U	0.49 U	0.58 U	0.57 U	0.56 U
TOXAPHENE	UG/KG	20.5	--	--	12 U	16 U	16 U	21 U	19 U	20 U	20 U	20 U	23 U	23 U	22 U
ORGANOPHOSPHORUS PESTICIDES															
AZINPHOS-METHYL	UG/KG	204	--	--	120 U	160 U	160 U	210 U	190 U	190 U	**150 J P B**	190 U	230 U	230 U	220 U
DEMETON, TOTAL	UG/KG	406	--	--	230 U	320 U	310 U	420 U	380 U	390 U	400 U	390 U	460 U	450 U	440 U
DEMETON-O	UG/KG	204	--	--	120 U	160 U	160 U	210 U	190 U	190 U	200 U	190 U	230 U	230 U	220 U
DEMETON-S	UG/KG	204	--	--	120 U	160 U	160 U	210 U	190 U	190 U	200 U	190 U	230 U	230 U	220 U
MALATHION	UG/KG	204	--	--	120 U	160 U	160 U	210 U	190 U	190 U	200 U	190 U	230 U	230 U	220 U
METHYL PARATHION	UG/KG	204	--	--	120 U	160 U	160 U	210 U	190 U	190 U	200 U	190 U	230 U	230 U	220 U
PARATHION	UG/KG	204	--	--	120 U	160 U	160 U	210 U	190 U	190 U	200 U	190 U	230 U	230 U	220 U

**Source*: MacDonald et al. 1996. Ecotoxicology 5: 253-278.

NOTES: Bold values represent detected conc **J** = compound was detected, but below the reporting limit (value is estimated)

TEL = threshold effects level **P** = the percent difference between the original and confirmation analysis is greater than 40%

PEL = probable effects level **U** = compound was analyzed, but not detected

TABLE 7B. CHLORINATED AND ORGANOPHOSPHORUS PESTICIDE CONCENTRATIONS IN SEDIMENT

SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

ANALYTE	UNITS	Average RL	TEL*	PEL*	Willoughby Bank Reference Site	Dredging Unit 2			Dredging Unit 1		
						SC-07	SC-08	SC-07/08	SC-09	SC-10	SC-09/10
2,4'-DDD	UG/KG	0.513	--	--	0.29 U	**0.27 J**	**0.061 J P**	**0.21 J**	**0.26 J**	**0.058 J P**	**0.19 J**
2,4'-DDE	UG/KG	0.513	--	--	0.29 U	0.55 U	0.52 U	0.55 U	0.53 U	0.53 U	0.52 U
2,4'-DDT	UG/KG	0.513	--	--	0.29 U	0.55 U	0.52 U	0.55 U	0.53 U	0.53 U	0.52 U
4,4'-DDD	UG/KG	0.513	1.22	7.81	**0.079 J B**	**0.77 B**	**0.76 B**	**0.62 B**	**0.85 B**	**0.84 B**	**0.59 B**
4,4'-DDE	UG/KG	0.513	2.07	374	0.29 U	**0.51 J**	**0.38 J**	**0.36 J**	**0.41 J**	**0.48 J**	**0.36 J**
4,4'-DDT	UG/KG	0.513	1.19	4.77	0.29 U	**0.24 J P B**	**0.49 J B**	**0.25 J P B**	**0.53 B**	**0.59 B**	0.52 U
Total DDTs ND=RL	UG/KG	---	---	---	0.659	1.52	1.63	1.23	1.79	1.91	1.47
CHLORINATED PESTICIDES											
ALDRIN	UG/KG	0.513	--	--	0.29 U	0.55 U	0.52 U	0.55 U	0.53 U	0.53 U	0.52 U
ALPHA-BHC	UG/KG	0.513	--	--	0.29 U	0.55 U	0.52 U	0.55 U	0.53 U	0.53 U	0.52 U
BETA-BHC	UG/KG	0.513	--	--	0.29 U	0.55 U	0.52 U	0.55 U	0.53 U	0.53 U	0.52 U
CHLORDANE (TECHNICAL)	UG/KG	5.13	--	--	2.9 U	5.5 U	5.2 U	5.5 U	5.3 U	5.3 U	5.2 U
ALPHA-CHLORDANE	UG/KG	0.513	2.26	4.79	0.29 U	0.55 U	0.52 U	0.55 U	0.53 U	0.53 U	0.52 U
GAMMA-CHLORDANE	UG/KG	0.513	--	--	0.29 U	**0.24 J P**	0.52 U	0.55 U	0.53 U	**0.22 J P**	**0.17 J P**
CHLOROBENSIDE	UG/KG	0.513	--	--	0.29 U	0.55 U	0.52 U	0.55 U	0.53 U	0.53 U	0.52 U
DACHTAL	UG/KG	0.513	--	--	0.29 U	0.55 U	0.52 U	0.55 U	0.53 U	0.53 U	0.52 U
DELTA-BHC	UG/KG	0.513	--	--	0.29 U	0.55 U	0.52 U	0.55 U	**0.084 J P**	0.53 U	0.52 U
DIELDRIN	UG/KG	0.513	0.715	4.3	0.29 U	**0.23 J**	0.52 U	**0.14 J**	**0.19 J**	**0.12 J**	**0.17 J**
ENDOSULFAN I	UG/KG	0.513	--	--	0.29 U	0.55 U	0.52 U	0.55 U	0.53 U	0.53 U	0.52 U
ENDOSULFAN II	UG/KG	0.513	--	--	0.29 U	0.55 U	0.52 U	0.55 U	0.53 U	0.53 U	0.52 U
ENDOSULFAN SULFATE	UG/KG	0.513	--	--	0.29 U	0.55 U	0.52 U	**0.058 J P B**	**0.14 J B**	0.53 U	**0.058 J B**
ENDRIN	UG/KG	0.513	--	--	0.29 U	**0.16 J P**	**0.13 J P**	**0.11 J P**	**0.12 J P**	**0.16 J P**	**0.12 J P**
ENDRIN ALDEHYDE	UG/KG	0.513	--	--	0.29 U	0.55 U	0.52 U	0.55 U	0.53 U	0.53 U	0.52 U
ENDRIN KETONE	UG/KG	0.513	--	--	0.29 U	0.55 U	0.52 U	0.55 U	0.53 U	**0.086 J P**	0.52 U
GAMMA-BHC	UG/KG	0.513	0.32	0.99	0.29 U	0.55 U	0.52 U	0.55 U	0.53 U	0.53 U	0.52 U
HEPTACHLOR	UG/KG	0.513	--	--	0.29 U	0.55 U	0.52 U	0.55 U	0.53 U	0.53 U	0.52 U
HEPTACHLOR EPOXIDE	UG/KG	0.513	--	--	0.29 U	0.55 U	0.52 U	0.55 U	0.53 U	0.53 U	0.52 U
METHOXYCHLOR	UG/KG	1.03	--	--	0.58 U	**0.4 J P**	1 U	1.1 U	1.1 U	1.1 U	1 U
MIREX	UG/KG	0.513	--	--	0.29 U	0.55 U	0.52 U	0.55 U	0.53 U	**0.12 J**	**0.077 J P**
TOXAPHENE	UG/KG	20.5	--	--	12 U	22 U	21 U	22 U	21 U	21 U	21 U
ORGANOPHOSPHORUS PESTICIDES											
AZINPHOS-METHYL	UG/KG	204	--	--	120 U	220 U	210 U	220 U	210 U	210 U	210 U
DEMETON, TOTAL	UG/KG	406	--	--	230 U	440 U	420 U	430 U	420 U	420 U	410 U
DEMETON-O	UG/KG	204	--	--	120 U	220 U	210 U	220 U	210 U	210 U	210 U
DEMETON-S	UG/KG	204	--	--	120 U	220 U	210 U	220 U	210 U	210 U	210 U
MALATHION	UG/KG	204	--	--	120 U	220 U	210 U	220 U	210 U	210 U	210 U
METHYL PARATHION	UG/KG	204	--	--	120 U	220 U	210 U	220 U	210 U	210 U	210 U
PARATHION	UG/KG	204	--	--	120 U	220 U	210 U	220 U	210 U	210 U	210 U

**Source*: MacDonald et al. 1996. Ecotoxicology 5: 253-278.

NOTES: Bold values represent detected conce **J** = compound was detected, but below the reporting limit (value is estimated)

TEL = threshold effects level **P** = the percent difference between the original and confirmation analysis is greater than 40%

PEL = probable effects level **U** = compound was analyzed, but not detected

TABLE 8A. SEMIVOLATILE ORGANIC COMPOUND CONCENTRATIONS IN SEDIMENT

SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

ANALYTE	UNITS	Average RL	TEL*	PEL*	Willoughby Bank Reference Site	Dredging Unit 5				Dredging Unit 4			Dredging Unit 3		
						SC-01	SC-01 Field Duplicate	SC-02	SC-01/02	SC-03	SC-04	SC-03/04	SC-05	SC-06	SC-05/06
1,2,4-TRICHLOROBENZENE	UG/KG	310	--	--	46 U	64 U	62 U	210 U	380 U	190 U	200 U	390 U	460 U	230 U	440 U
1,2-DICHLOROBENZENE	UG/KG	310	--	--	46 U	64 U	62 U	210 U	380 U	190 U	200 U	390 U	460 U	230 U	440 U
1,2-DIPHENYLHYDRAZINE	UG/KG	310	--	--	46 U	64 U	62 U	210 U	380 U	190 U	200 U	390 U	460 U	230 U	440 U
1,3-DICHLOROBENZENE	UG/KG	310	--	--	46 U	64 U	62 U	210 U	380 U	190 U	200 U	390 U	460 U	230 U	440 U
1,4-DICHLOROBENZENE	UG/KG	310	--	--	46 U	64 U	62 U	210 U	380 U	190 U	200 U	390 U	460 U	230 U	440 U
2,2'-OXYBIS[1-CHLOROPROPANE]	UG/KG	63	--	--	9.4 U	13 U	13 U	43 U	77 U	39 U	41 U	79 U	92 U	46 U	90 U
2,4,5-TRICHLOROPHENOL	UG/KG	310	--	--	46 U	64 U	62 U	210 U	380 U	190 U	200 U	390 U	460 U	230 U	440 U
2,4,6-TRICHLOROPHENOL	UG/KG	310	--	--	46 U	64 U	62 U	210 U	380 U	190 U	200 U	390 U	460 U	230 U	440 U
2,4-DICHLOROPHENOL	UG/KG	63	--	--	9.4 U	13 U	13 U	43 U	77 U	39 U	41 U	79 U	92 U	46 U	90 U
2,4-DIMETHYLPHENOL	UG/KG	310	--	--	46 U	64 U	62 U	210 U	380 U	190 U	200 U	390 U	460 U	230 U	440 U
2,4-DINITROPHENOL	UG/KG	1,591	--	--	240 U	330 U	320 U	1100 U	2000 U	1000 U	1000 U	2000 U	2300 U	1200 U	2300 U
2,4-DINITROTOLUENE	UG/KG	310	--	--	46 U	64 U	62 U	210 U	380 U	190 U	200 U	390 U	460 U	230 U	440 U
2,6-DINITROTOLUENE	UG/KG	310	--	--	46 U	64 U	62 U	210 U	380 U	190 U	200 U	390 U	460 U	230 U	440 U
2-CHLORONAPHTHALENE	UG/KG	63	--	--	9.4 U	13 U	13 U	43 U	77 U	39 U	41 U	79 U	92 U	46 U	90 U
2-CHLOROPHENOL	UG/KG	310	--	--	46 U	64 U	62 U	210 U	380 U	190 U	200 U	390 U	460 U	230 U	440 U
2-METHYLPHENOL	UG/KG	310	--	--	46 U	64 U	62 U	210 U	380 U	190 U	200 U	390 U	460 U	230 U	440 U
2-NITROANILINE	UG/KG	1591	--	--	240 U	330 U	320 U	1100 U	2000 U	1000 U	1000 U	2000 U	2300 U	1200 U	2300 U
2-NITROPHENOL	UG/KG	310	--	--	46 U	64 U	62 U	210 U	380 U	190 U	200 U	390 U	460 U	230 U	440 U
3,3'-DICHLOROBENZIDINE	UG/KG	310	--	--	46 U	64 U	62 U	210 U	380 U	190 U	200 U	390 U	460 U	230 U	440 U
3-NITROANILINE	UG/KG	1,591	--	--	240 U	330 U	320 U	1100 U	2000 U	1000 U	1000 U	2000 U	2300 U	1200 U	2300 U
4,6-DINITRO-2-METHYLPHENOL	UG/KG	1,591	--	--	240 U	330 U	320 U	1100 U	2000 U	1000 U	1000 U	2000 U	2300 U	1200 U	2300 U
4-BROMOPHENYL PHENYL ETHER	UG/KG	310	--	--	46 U	64 U	62 U	210 U	380 U	190 U	200 U	390 U	460 U	230 U	440 U
4-CHLORO-3-METHYLPHENOL	UG/KG	310	--	--	46 U	64 U	62 U	210 U	380 U	190 U	200 U	390 U	460 U	230 U	440 U
4-CHLOROANILINE	UG/KG	310	--	--	46 U	64 U	62 U	210 U	380 U	190 U	200 U	390 U	460 U	230 U	440 U
4-CHLOROPHENYL PHENYL ETHER	UG/KG	310	--	--	46 U	64 U	62 U	210 U	380 U	190 U	200 U	390 U	460 U	230 U	440 U
4-NITROANILINE	UG/KG	1,591	--	--	240 U	330 U	320 U	1100 U	2000 U	1000 U	1000 U	2000 U	2300 U	1200 U	2300 U
4-NITROPHENOL	UG/KG	1,591	--	--	240 U	330 U	320 U	1100 U	2000 U	1000 U	1000 U	2000 U	2300 U	1200 U	2300 U
BENZIDINE	UG/KG	6,294	--	--	940 U	1300 U	1300 U	4300 U	7700 U	3900 U	4100 U	7900 U	9200 U	4600 U	9000 U
BENZOIC ACID	UG/KG	1,591	182	2,647	240 U	330 U	320 U	1100 U	2000 U	1000 U	1000 U	2000 U	2300 U	1200 U	2300 U
BENZYL ALCOHOL	UG/KG	310	--	--	46 U	64 U	62 U	210 U	380 U	190 U	200 U	390 U	460 U	230 U	440 U
BIS(2-CHLOROETHOXY)METHANE	UG/KG	310	--	--	46 U	64 U	62 U	210 U	380 U	190 U	200 U	390 U	460 U	230 U	440 U
BIS(2-CHLOROETHYL)ETHER	UG/KG	63	--	--	9.4 U	13 U	13 U	43 U	77 U	39 U	41 U	79 U	92 U	46 U	90 U
BIS(2-ETHYLHEXYL) PHTHALATE	UG/KG	626	--	--	94 U	69 J	130 U	430 U	770 U	390 U	410 U	780 U	920 U	460 U	890 U
BUTYL BENZYL PHTHALATE	UG/KG	310	--	--	46 U	13 J	62 U	210 U	380 U	190 U	200 U	390 U	460 U	230 U	440 U
CARBAZOLE	UG/KG	63	--	--	9.4 U	70	120	43 U	50 J	39 U	41 U	79 U	92 U	46 U	90 U
DIBENZOFURAN	UG/KG	310	--	--	46 U	110	100	210 U	110 J	190 U	200 U	390 U	460 U	230 U	440 U
DIETHYL PHTHALATE	UG/KG	310	--	--	46 U	13 J	12 J	44 J	71 J	42 J	53 J	390 U	460 U	36 J	440 U
DIMETHYL PHTHALATE	UG/KG	310	--	--	46 U	64 U	62 U	210 U	380 U	190 U	200 U	390 U	460 U	230 U	440 U
DI-N-BUTYL PHTHALATE	UG/KG	310	--	--	46 U	64 U	62 U	210 U	380 U	190 U	200 U	390 U	460 U	230 U	440 U
DI-N-OCTYL PHTHALATE	UG/KG	310	--	--	46 U	64 U	62 U	210 U	380 U	190 U	200 U	390 U	460 U	230 U	440 U
HEXACHLOROBENZENE	UG/KG	63	--	--	9.4 U	13 U	13 U	43 U	77 U	39 U	41 U	79 U	92 U	46 U	90 U
HEXACHLOROBUTADIENE	UG/KG	63	--	--	9.4 U	13 U	13 U	43 U	77 U	39 U	41 U	79 U	92 U	46 U	90 U
HEXACHLOROCYCLOPENTADIENE	UG/KG	310	--	--	46 U	64 U	62 U	210 U	380 U	190 U	200 U	390 U	460 U	230 U	440 U
HEXACHLOROETHANE	UG/KG	310	--	--	46 U	64 U	62 U	210 U	380 U	190 U	200 U	390 U	460 U	230 U	440 U
ISOPHORONE	UG/KG	310	--	--	46 U	64 U	62 U	210 U	380 U	190 U	200 U	390 U	460 U	230 U	440 U
METHYLPHENOL, 3 & 4	UG/KG	310	--	--	46 U	64 U	62 U	210 U	380 U	190 U	200 U	390 U	460 U	230 U	440 U
NITROBENZENE	UG/KG	626	--	--	94 U	130 U	130 U	430 U	770 U	390 U	410 U	780 U	920 U	460 U	890 U
N-NITROSODIMETHYLAMINE	UG/KG	310	--	--	46 U	64 U	62 U	210 U	380 U	190 U	200 U	390 U	460 U	230 U	440 U
N-NITROSODI-N-PROPYLAMINE	UG/KG	63	--	--	9.4 U	13 U	13 U	43 U	77 U	39 U	41 U	79 U	92 U	46 U	90 U
N-NITROSODIPHENYLAMINE	UG/KG	310	--	--	46 U	64 U	62 U	210 U	380 U	190 U	200 U	390 U	460 U	230 U	440 U
PENTACHLOROPHENOL	UG/KG	310	--	--	46 U	64 U	62 U	210 U	380 U	190 U	200 U	390 U	460 U	230 U	440 U
PHENOL	UG/KG	63	--	--	**12**	13 U	13 U	43 U	77 U	39 U	41 U	79 U	92 U	46 U	90 U

* *Source:* MacDonald et al. 1996. Ecotoxicology 5:253-278

NOTES: Bold values represent detected concentr **J** = compound was detected, but below the reporting limit (value is estimate

TEL = threshold effects leve **U** = compound was analyzed, but not detecte

PEL = probable effects leve

TABLE 8B. SEMIVOLATILE ORGANIC COMPOUND CONCENTRATIONS IN SEDIMENT

SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

ANALYTE	UNITS	Average RL	TEL*	PEL*	Willoughby Bank Reference Site	Dredging Unit 2			Dredging Unit 1		
						SC-07	SC-08	SC-07/08	SC-09	SC-10	SC-09/10
1,2,4-TRICHLOROBENZENE	UG/KG	310.38	--	--	46 U	440 U	210 U	440 U	420 U	420 U	410 U
1,2-DICHLOROBENZENE	UG/KG	310.4	--	--	46 U	440 U	210 U	440 U	420 U	420 U	410 U
1,2-DIPHENYLHYDRAZINE	UG/KG	310.4	--	--	46 U	440 U	210 U	440 U	420 U	420 U	410 U
1,3-DICHLOROBENZENE	UG/KG	310.4	--	--	46 U	440 U	210 U	440 U	420 U	420 U	410 U
1,4-DICHLOROBENZENE	UG/KG	310.4	--	--	46 U	440 U	210 U	440 U	420 U	420 U	410 U
2,2'-OXYBIS[1-CHLOROPROPANE]	UG/KG	62.9	--	--	9.4 U	88 U	42 U	89 U	86 U	85 U	84 U
2,4,5-TRICHLOROPHENOL	UG/KG	310.38	--	--	46 U	440 U	210 U	440 U	420 U	420 U	410 U
2,4,6-TRICHLOROPHENOL	UG/KG	310.4	--	--	46 U	440 U	210 U	440 U	420 U	420 U	410 U
2,4-DICHLOROPHENOL	UG/KG	63	--	--	9.4 U	88 U	42 U	89 U	86 U	85 U	84 U
2,4-DIMETHYLPHENOL	UG/KG	310.4	--	--	46 U	440 U	210 U	440 U	420 U	420 U	410 U
2,4-DINITROPHENOL	UG/KG	1590.6	--	--	240 U	2200 U	1100 U	2200 U	2200 U	2100 U	2100 U
2,4-DINITROTOLUENE	UG/KG	310.38	--	--	46 U	440 U	210 U	440 U	420 U	420 U	410 U
2,6-DINITROTOLUENE	UG/KG	310.4	--	--	46 U	440 U	210 U	440 U	420 U	420 U	410 U
2-CHLORONAPHTHALENE	UG/KG	62.9	--	--	9.4 U	88 U	42 U	89 U	86 U	85 U	84 U
2-CHLOROPHENOL	UG/KG	310.4	--	--	46 U	440 U	210 U	440 U	420 U	420 U	410 U
2-METHYLPHENOL	UG/KG	310.4	--	--	46 U	440 U	210 U	440 U	420 U	420 U	410 U
2-NITROANILINE	UG/KG	1590.6	--	--	240 U	2200 U	1100 U	2200 U	2200 U	2100 U	2100 U
2-NITROPHENOL	UG/KG	310.4	--	--	46 U	440 U	210 U	440 U	420 U	420 U	410 U
3,3'-DICHLOROBENZIDINE	UG/KG	310.4	--	--	46 U	440 U	210 U	440 U	420 U	420 U	410 U
3-NITROANILINE	UG/KG	1590.625	--	--	240 U	2200 U	1100 U	2200 U	2200 U	2100 U	2100 U
4,6-DINITRO-2-METHYLPHENOL	UG/KG	1590.6	--	--	240 U	2200 U	1100 U	2200 U	2200 U	2100 U	2100 U
4-BROMOPHENYL PHENYL ETHER	UG/KG	310.4	--	--	46 U	440 U	210 U	440 U	420 U	420 U	410 U
4-CHLORO-3-METHYLPHENOL	UG/KG	310	--	--	46 U	440 U	210 U	440 U	420 U	420 U	410 U
4-CHLOROANILINE	UG/KG	310.375	--	--	46 U	440 U	210 U	440 U	420 U	420 U	410 U
4-CHLOROPHENYL PHENYL ETHER	UG/KG	310.4	--	--	46 U	440 U	210 U	440 U	420 U	420 U	410 U
4-NITROANILINE	UG/KG	1590.63	--	--	240 U	2200 U	1100 U	2200 U	2200 U	2100 U	2100 U
4-NITROPHENOL	UG/KG	1590.63	--	--	240 U	2200 U	1100 U	2200 U	2200 U	2100 U	2100 U
BENZIDINE	UG/KG	6293.75	--	--	940 U	8800 U	4200 U	8900 U	8600 U	8500 U	8400 U
BENZOIC ACID	UG/KG	1590.6	182	2,647	240 U	2200 U	1100 U	2200 U	2200 U	2100 U	2100 U
BENZYL ALCOHOL	UG/KG	310.4	--	--	46 U	440 U	210 U	440 U	420 U	420 U	410 U
BIS(2-CHLOROETHOXY)METHANE	UG/KG	310.4	--	--	46 U	440 U	210 U	440 U	420 U	420 U	410 U
BIS(2-CHLOROETHYL)ETHER	UG/KG	62.9	--	--	9.4 U	88 U	42 U	89 U	86 U	85 U	84 U
BIS(2-ETHYLHEXYL) PHTHALATE	UG/KG	626.3	--	--	94 U	880 U	420 U	880 U	860 U	840 U	830 U
BUTYL BENZYL PHTHALATE	UG/KG	310.4	--	--	46 U	440 U	210 U	440 U	420 U	420 U	410 U
CARBAZOLE	UG/KG	62.94	--	--	9.4 U	88 U	42 U	89 U	86 U	85 U	84 U
DIBENZOFURAN	UG/KG	310.38	--	--	46 U	440 U	210 U	440 U	420 U	420 U	410 U
DIETHYL PHTHALATE	UG/KG	310.4	--	--	46 U	67 J	57 J	240 J	66 J	86 J	130 J
DIMETHYL PHTHALATE	UG/KG	310.4	--	--	46 U	440 U	210 U	440 U	420 U	420 U	410 U
DI-N-BUTYL PHTHALATE	UG/KG	310.4	--	--	46 U	440 U	210 U	440 U	420 U	420 U	410 U
DI-N-OCTYL PHTHALATE	UG/KG	310.4	--	--	46 U	440 U	210 U	440 U	420 U	420 U	410 U
HEXACHLOROBENZENE	UG/KG	62.9	--	--	9.4 U	88 U	42 U	89 U	86 U	85 U	84 U
HEXACHLOROBUTADIENE	UG/KG	62.9	--	--	9.4 U	88 U	42 U	89 U	86 U	85 U	84 U
HEXACHLOROCYCLOPENTADIENE	UG/KG	310.4	--	--	46 U	440 U	210 U	440 U	420 U	420 U	410 U
HEXACHLOROETHANE	UG/KG	310.4	--	--	46 U	440 U	210 U	440 U	420 U	420 U	410 U
ISOPHORONE	UG/KG	310.4	--	--	46 U	440 U	210 U	440 U	420 U	420 U	410 U
METHYLPHENOL, 3 & 4	UG/KG	310.4	--	--	46 U	440 U	210 U	440 U	420 U	420 U	410 U
NITROBENZENE	UG/KG	626.3	--	--	94 U	880 U	420 U	880 U	860 U	840 U	830 U
N-NITROSODIMETHYLAMINE	UG/KG	310.4	--	--	46 U	440 U	210 U	440 U	420 U	420 U	410 U
N-NITROSODI-N-PROPYLAMINE	UG/KG	62.94	--	--	9.4 U	88 U	42 U	89 U	86 U	85 U	84 U
N-NITROSODIPHENYLAMINE	UG/KG	310.4	--	--	46 U	440 U	210 U	440 U	420 U	420 U	410 U
PENTACHLOROPHENOL	UG/KG	310.4	--	--	46 U	440 U	210 U	440 U	420 U	420 U	410 U
PHENOL	UG/KG	62.94	--	--	**12**	88 U	42 U	89 U	86 U	85 U	84 U

* *Source:* MacDonald et al. 1996. Ecotoxicology 5:253-278.

NOTES: Bold values represent detected concen **J** = compound was detected, but below the reporting limit (value is estimated

TEL = threshold effects level **U** = compound was analyzed, but not detected

PEL = probable effects level

TABLE 9A. BUTYLTIN CONCENTRATIONS IN SEDIMENT

SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

Analyt	Units	Average RL	Willoughby Bank Reference Site	Dredging Unit 5				Dredging Unit 4			Dredging Unit 3		
				SC-01	SC-01 Field Duplicate	SC-02	SC-01/02	SC-03	SC-04	SC-03/04	SC-05	SC-06	SC-05/06
DIBUTYLTIN	UG/KG	3.2	6.9 U	2.5 U	2.4 U	3.3 U	3 U	3.1 U	3.2 U	3.1 U	3.6 U	3.6 U	3.4 U
MONOBUTYLTIN	UG/KG	12.3	1.8 U	9.7 U	9.4 U	13 U	11 U	12 U	12 U	12 U	14 U	14 U	13 U
TRIBUTYLTIN	UG/KG	3.71	2.1 U	2.9 U	2.8 U	3.8 U	3.4 U	3.6 U	3.7 U	3.6 U	4.2 U	4.2 U	4 U
TETRABUTYLTIN	UG/KG	4.21	2.3 U	3.3 U	3.2 U	4.3 U	3.9 U	4.1 U	4.2 U	4.1 U	4.8 U	4.8 U	4.5 U

NOTE: RL is reported for non-detected constituents.

RL = average reporting limit

U = compound was analyzed, but not detected

TABLE 9B. BUTYLTIN CONCENTRATIONS IN SEDIMENT

SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

Analyt	Units	Average RL	Willoughby Bank Reference Site	Dredging Unit 2			Dredging Unit 1		
				SC-07	SC-08	SC-07/08	SC-09	SC-10	SC-09/10
DIBUTYLTIN	UG/KG	3.2	6.9 U	3.5 U	3.2 U	3.4 U	3.4 U	3.3 U	3.2 U
MONOBUTYLTIN	UG/KG	12.3	1.8 U	13 U	12 U	13 U	13 U	13 U	12 U
TRIBUTYLTIN	UG/KG	3.71	2.1 U	4 U	3.7 U	4 U	3.9 U	3.8 U	3.7 U
TETRABUTYLTIN	UG/KG	4.21	2.3 U	4.5 U	4.2 U	4.5 U	4.4 U	4.3 U	4.2 U

NOTE: RL is reported for non-detected constituents.

RL = average reporting limit

U = compound was analyzed, but not detected

TABLE 10. GENERAL CHEMISTY RESULTS FOR SITE WATER AND STANDARD ELUTRIATES

SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

ANALYTE	UNITS	Average RL	USEPA Acute Criteria	Site Water	Dredging Unit 5	Dredging Unit 4	Dredging Unit 3	Dredging Unit 2	Dredging Unit 1
					SC-01/02	SC-03/04	SC-05/06	SC-07/08	SC-09/10
AMMONIA	MG/L	0.433	4.91[a]	**0.062 J B**	**19 B**	**16 B**	**15 B**	**20 B**	**20 B**
CYANIDE, TOTAL	UG/L	10	1[b]	10 U	10 U	10 U	10 U	10 U	10 U
DISSOLVED ORGANIC CARBON	MG/L	1	--	**5.2**	**5.7**	**7.1**	**7.2**	**8.1**	**7.8**
SULFIDE	MG/L	3	--	3 U	**1.9 J**	**0.99 J**	**1.5 J**	**0.68 J**	**1.2 J**
TOTAL SUSPENDED SOLIDS	MG/L	2.02	--	**41**	**3.2**	**3.3**	**4**	**3.2**	**2.8**

(a) Ammonia criteria calculated based on salinity, water temperature, and pH at the NODS during receiving water collection

(b) USEPA 2014. *National Recommended Water Quality Criteria*

NOTES: Bold values represent detected concentrations; RL is reported for non-detected constituents

B = compound was detected in the laboratory method blank

J = compound was detected, but below the reporting limit (value is estimated)

U = compound was analyzed, but not detected

TABLE 11. METAL CONCENTRATIONS IN SITE WATER AND STANDARD ELUTRIATES

SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

ANALYTE	UNITS	Average RL	USEPA ACUTE CRITERIA *	Site Water	Dredging Unit 5	Dredging Unit 4	Dredging Unit 3	Dredging Unit 2	Dredging Unit 1
					SC-01/02	SC-03/04	SC-05/06	SC-07/08	SC-09/10
ALUMINUM	UG/L	125	--	**0.37**	150 U	150 U	150 U	150 U	150 U
ANTIMONY	UG/L	8.34	--	**0.00022 J**	**0.4 J**	**0.43 J**	**0.47 J**	**0.55 J**	**0.61 J**
ARSENIC	UG/L	4.17	69	**0.0064**	**15**	**16**	**16**	**19**	**20**
BARIUM	UG/L	41.7	--	**0.05**	**150**	**140**	**180**	**180**	**190**
BERYLLIUM	UG/L	4.17	--	0.005 U	**0.46 J**	**0.33 J**	5 U	**0.24 J**	**0.24 J**
CADMIUM	UG/L	4.17	40	0.005 U	5 U	5 U	5 U	5 U	5 U
CALCIUM	UG/L	417	--	**110 B**	**110,000**	**110,000**	**110,000**	**110,000**	**110,000**
CHROMIUM	UG/L	8.34	1,100	**0.0034 J**	**25**	**28**	**30**		**31**
COBALT	UG/L	2.08	--	**0.00043 J**	**1.2 J**	**1.4 J**	**2.1 J**	**2.5**	**2.7**
COPPER	UG/L	8.34	4.8	**0.0035 J**	**3.5 J**	**2.4 J**	**2.5 J**	**3.2 J**	**2.8 J**
IRON	UG/L	208	--	**0.48**	**160 J**	**190 J**	**1,200**	**1,100**	**2,100**
LEAD	UG/L	4.17	210	**0.00049 J B**	5 U	5 U	5 U	5 U	5 U
MAGNESIUM	UG/L	417	--	**340**	**340,000**	**340,000**	**350,000**	**350,000**	**350,000**
MANGANESE	UG/L	20.8	--	**0.028**	**2,300**	**2,700**	**5,300**	**3,600**	**3,200**
MERCURY	UG/L	0.20	1.8	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
NICKEL	UG/L	4.17	74	**0.0012 J**	**7.3 B**	**7.5 B**	**8.5 B**	**9.4 B**	**9.5 B**
SELENIUM	UG/L	20.8	290	**0.026 B**	**64**	**71**	**72**	**77**	**78**
SILVER	UG/L	4.17	1.9	0.005 U	5 U	5 U	5 U	5 U	5 U
THALLIUM	UG/L	4.17	--	**0.00016 J**	5 U	5 U	5 U	5 U	5 U
VANADIUM	UG/L	4.17	--	**0.0034 J B**	**4.1 J B**	5 U	**8.7 B**	**0.69 J B**	**9.9 B**
ZINC	UG/L	20.8	90	**0.01 J B**	**9.1 J**	**6.6 J**	**6.8 J**	**7.2 J**	**6.5 J**

**Source* : USEPA 2014. *National Recommended Water Quality Criteria*

NOTES: Bold values represent detected concentrations. Shaded concentrations exceed water quality criteria

R L is reported for non-detected constituents

B = compound was detected in the laboratory method blank

J = compound was detected, but below the reporting limit (value is estimated)

U = compound was analyzed, but not detected

TABLE 12. PAH CONCENTRATIONS SITE WATER AND STANDARD ELUTRIATES
SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

ANALYTE	UNITS	Average RL	Site Water	Dredging Unit 5	Dredging Unit 4	Dredging Unit 3	Dredging Unit 2	Dredging Unit 1
				SC-01/02	SC-03/04	SC-05/06	SC-07/08	SC-09/10
LOW MOLECULAR WEIGHT PAHs (LPAHs)								
1-METHYLNAPHTHALENE	UG/L	0.21	0.19 U	**0.47**	0.22 U	0.21 U	0.2 U	0.22 U
2-METHYLNAPHTHALENE	UG/L	0.21	0.19 U	**0.48**	0.22 U	0.21 U	0.2 U	0.22 U
ACENAPHTHENE	UG/L	0.21	0.19 U	**1.1**	0.22 U	0.21 U	0.2 U	0.22 U
ACENAPHTHYLENE	UG/L	0.21	0.19 U	**0.041 J**	0.22 U	0.21 U	0.2 U	0.22 U
ANTHRACENE	UG/L	0.2	0.19 U	**0.024 J**	0.22 U	0.21 U	0.2 U	0.22 U
FLUORENE	UG/L	0.2	0.19 U	**0.37**	0.22 U	0.21 U	0.2 U	0.22 U
NAPHTHALENE	UG/L	0.21	0.19 U	**1.5**	0.22 U	0.21 U	0.2 U	0.22 U
PHENANTHRENE	UG/L	0.2	0.19 U	**0.22**	0.22 U	0.21 U	0.2 U	0.22 U
TOTAL LPAHs (ND=RL)	UG/L	--	**1.33**	**4.16**	**1.54**	**1.47**	**1.4**	**1.54**
HIGH MOLECULAR WEIGHT PAHs (HPAHs)								
BENZO(A)ANTHRACENE	UG/L	0.2	0.19 U	0.19 U	0.22 U	0.21 U	0.2 U	0.22 U
BENZO(A)PYRENE	UG/L	0.21	0.19 U	0.19 U	0.22 U	0.21 U	0.2 U	0.22 U
BENZO(B)FLUORANTHENE	UG/L	0.2	0.19 U	0.19 U	0.22 U	0.21 U	0.2 U	0.22 U
BENZO(GHI)PERYLENE	UG/L	0.21	0.19 U	0.19 U	0.22 U	0.21 U	0.2 U	0.22 U
BENZO(K)FLUORANTHENE	UG/L	0.21	0.19 U	0.19 U	0.22 U	0.21 U	0.2 U	0.22 U
CHRYSENE	UG/L	0.2	0.19 U	0.19 U	0.22 U	0.21 U	0.2 U	0.22 U
DIBENZO(A,H)ANTHRACENE	UG/L	0.2	0.19 U	0.19 U	0.22 U	0.21 U	0.2 U	0.22 U
FLUORANTHENE	UG/L	0.2	0.19 U	**0.032 J**	0.22 U	0.21 U	0.2 U	0.22 U
INDENO(1,2,3-CD)PYRENE	UG/L	0.2	0.19 U	0.19 U	0.22 U	0.21 U	0.2 U	0.22 U
PYRENE	UG/L	0.2	0.19 U	**0.026 J**	0.22 U	0.21 U	0.2 U	0.22 U
TOTAL HPAHs (ND=RL)	UG/L	--	**1.14**	**0.818**	**1.32**	**1.26**	**1.2**	**1.32**
TOTAL PAHs								
TOTAL PAHs (ND=RL)	UG/L	--	**3.42**	**5.78**	**3.96**	**3.78**	**3.6**	**3.96**

There are no USEPA criteria for aquatic life for the tested PAHs or total PAH concentrations.

NOTES: Bold values represent detected concentrations. RL is reported for non-detected constituents

J = compound was detected, but below the reporting limit (value is estimated)

U = compound was analyzed, but not detected

TABLE 13. PCB CONGENER CONCENTRATIONS IN SITE WATER AND STANDARD ELUTRIATES

SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

ANALYTE	UNITS	Average RL	Site Water	Dredging Unit 5	Dredging Unit 4	Dredging Unit 3	Dredging Unit 2	Dredging Unit 1
				SC-01/02	SC-03/04	SC-05/06	SC-07/08	SC-09/10
PCB 8 (BZ)*	NG/L	0.9767	**1.4**	**0.28 J P B**	1 U	**0.34 J B**	**0.53 J B**	**0.39 J P**
PCB 18 (BZ)*	NG/L	0.9767	**0.31 J P**	**0.23 J B**	**0.32 J B**	0.98 U	**0.22 J P B**	1 U
PCB 28 (BZ)*	NG/L	0.9767	0.95 U	0.94 U	1 U	0.98 U	0.99 U	1 U
PCB 44 (BZ)*	NG/L	0.9767	0.95 U	0.94 U	1 U	0.98 U	0.99 U	1 U
PCB 49 (BZ)	NG/L	0.9767	0.95 U	0.94 U	1 U	0.98 U	0.99 U	1 U
PCB 52 (BZ)*	NG/L	0.9767	0.95 U	0.94 U	1 U	0.98 U	0.99 U	1 U
PCB 66 (BZ)*	NG/L	0.9767	0.95 U	0.94 U	1 U	0.98 U	0.99 U	1 U
PCB 77 (BZ)*	NG/L	0.9767	0.95 U	0.94 U	1 U	0.98 U	**0.24 J P**	1 U
PCB 87 (BZ)	NG/L	0.9767	0.95 U	0.94 U	1 U	0.98 U	0.99 U	1 U
PCB 101 (BZ)*	NG/L	0.9767	0.95 U	0.94 U	1 U	0.98 U	0.99 U	1 U
PCB 105 (BZ)*	NG/L	0.9767	0.95 U	0.94 U	1 U	0.98 U	0.99 U	1 U
PCB 118 (BZ)*	NG/L	0.9767	0.95 U	0.94 U	1 U	0.98 U	0.99 U	1 U
PCB 126 (BZ)*	NG/L	0.9767	0.95 U	0.94 U	1 U	0.98 U	0.99 U	1 U
PCB 128 (BZ)*	NG/L	0.9767	0.95 U	0.94 U	1 U	0.98 U	0.99 U	1 U
PCB 138 (BZ)*	NG/L	0.9767	0.95 U	0.94 U	1 U	0.98 U	0.99 U	1 U
PCB 153 (BZ)*	NG/L	0.9767	0.95 U	0.94 U	1 U	0.98 U	0.99 U	1 U
PCB 156 (BZ)	NG/L	0.9767	0.95 U	0.94 U	1 U	0.98 U	0.99 U	1 U
PCB 169 (BZ)*	NG/L	0.9767	0.95 U	0.94 U	1 U	0.98 U	0.99 U	1 U
PCB 170 (BZ)*	NG/L	0.9767	0.95 U	0.94 U	1 U	0.98 U	0.99 U	1 U
PCB 180 (BZ)*	NG/L	0.9767	0.95 U	0.94 U	1 U	0.98 U	0.99 U	1 U
PCB 183 (BZ)	NG/L	0.9767	0.95 U	0.94 U	1 U	0.98 U	0.99 U	1 U
PCB 184 (BZ)	NG/L	0.9767	0.95 U	0.94 U	1 U	0.98 U	0.99 U	1 U
PCB 187 (BZ)*	NG/L	0.9767	0.95 U	0.94 U	1 U	0.98 U	0.99 U	1 U
PCB 195 (BZ)	NG/L	0.9767	0.95 U	0.94 U	1 U	0.98 U	0.99 U	1 U
PCB 206 (BZ)	NG/L	0.9767	0.95 U	0.94 U	1 U	0.98 U	0.99 U	1 U
PCB 209 (BZ)	NG/L	0.9767	0.95 U	0.94 U	1 U	0.98 U	0.99 U	1 U
TOTAL PCBs (ND=RL)	NG/L	--	**49.0**	**46.1**	**50.6**	**49.7**	**47.5**	**50.8**

* PCB congeners used for Total PCB summation, as per Table 9-3 of the ITM (USEPA/USACE 1998)

NOTES: Bold values represent detected concentrations. RL is reported for non-detected constituents

J = compound was detected, but below the reporting limit (value is estimated)
P = the percent difference between the original and confirmation analysis is greater than 40%

U = compound was analyzed, but not detected

TABLE 14. DIOXIN AND FURAN CONGENER CONCENTRATIONS IN SITE WATER AND STANDARD ELUTRIATES

SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

ANALYTE	UNITS	Average RL	TEF*	Site Water	Dredging Unit 5	Dredging Unit 4	Dredging Unit 3	Dredging Unit 2	Dredging Unit 1
					SC-01/02	SC-03/04	SC-05/06	SC-07/08	SC-09/10
2,3,7,8-TCDD	PG/L	9.780	**1**	9.4 U	9.5 U	10 U	**0.39 Q J**	9.7 U	10 U
1,2,3,7,8-PECDD	PG/L	49.60	**1**	47 U	48 U	52 U	49 U	48 U	51 U
1,2,3,4,7,8-HXCDD	PG/L	49.60	**0.1**	47 U	48 U	52 U	**4.4 J**	**4.7 Q J**	**0.26 Q J**
1,2,3,6,7,8-HXCDD	PG/L	49.60	**0.1**	47 U	**260 B**	**1.4 Q B J**	**16 B J**	**8.5 Q B J**	**2.2 Q B J**
1,2,3,7,8,9-HXCDD	PG/L	49.60	**0.1**	**0.32 Q J**	48 U	**0.95 Q J**	**4.5 Q J**	**5 Q J**	**1.7 Q J**
1,2,3,4,6,7,8-HPCDD	PG/L	49.60	**0.01**	**1.8 Q B J**	**6,000 B**	**77 B**	**340 B**	**240 B**	**92 B**
OCDD	PG/L	97.8	**0.0003**	**37 B J**	**17,000 B**	**1,200 B**	**1,600 B**	**2,600 B**	**1,800 B**
2,3,7,8-TCDF	PG/L	9.78	**0.1**	9.4 U	9.5 U	10 U	9.7 U	9.7 U	10 U
1,2,3,7,8-PECDF	PG/L	49.60	**0.03**	**0.15 Q J**	48 U	52 U	49 U	48 U	51 U
2,3,4,7,8-PECDF	PG/L	49.60	**0.3**	47 U	48 U	52 U	**1.4 Q J**	48 U	51 U
1,2,3,4,7,8-HXCDF	PG/L	49.60	**0.1**	47 U	48 U	52 U	**3.3 Q J**	**7 Q J**	51 U
1,2,3,6,7,8-HXCDF	PG/L	49.60	**0.1**	47 U	**63 Q**	52 U	**2.3 Q J**	**6.6 Q J**	**0.78 Q J**
2,3,4,6,7,8-HXCDF	PG/L	49.60	**0.1**	47 U	48 U	52 U	**26 Q J**	**6.6 Q J**	**0.4 Q J**
1,2,3,7,8,9-HXCDF	PG/L	49.60	**0.1**	47 U	48 U	52 U	**4.8 Q B J**	**5.3 Q B J**	51 U
1,2,3,4,6,7,8-HPCDF	PG/L	49.60	**0.01**	47 U	**2,700 B**	**9.8 B J**	**140 B**	**59 B**	**12 B J**
1,2,3,4,7,8,9-HPCDF	PG/L	49.60	**0.01**	47 U	**210**	**0.31 Q J**	49 U	48 U	**0.47 Q J**
OCDF	PG/L	97.8	**0.0003**	**0.69 Q B J**	**10,000 Q B**	**22 B J**	**540 Q B**	**280 B**	**26 Q B J**
DIOXIN TEQ (ND=RL)	PG/L	--	--	**101**	**218**	**107**	**59.3**	**78.8**	**90.6**

**Source* : Van den Berg, M, et al. 2006. The 2005 World Health Organization Re-evaluation of Human and Mammalian Toxic Equivalency Factors *for Dioxins and Dioxin-Like Compounds. Toxicological Sciences 93(2):223-241.*

NOTES: Bold values represent detected concentrations; RL is reported for non-detected constituents.

RL = average reporting limit

TEF = toxicity equivalency factor

TEQ = toxicity equivalency quotient

B = detected in the laboratory method blank

J = compound was detected, but below the reporting limit (value is estimated)

Q = estimated maximum possible concentration

U = compound was analyzed, but not detected

TABLE 15. SEMIVOLATILE ORGANIC COMPOUND CONCENTRATIONS IN SITE WATER AND STANDARD ELUTRIATES

SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

ANALYTE	UNITS	Average RL	USEPA ACUTE CRITERIA **	Site Water	Dredging Unit 5	Dredging Unit 4	Dredging Unit 3	Dredging Unit 2	Dredging Unit 1
					SC-01/02	SC-03/04	SC-05/06	SC-07/08	SC-09/10
1,2,4-TRICHLOROBENZENE	UG/L	1.02	--	0.95 U	0.95 U	1.1 U	1 U	1 U	1.1 U
1,2-DICHLOROBENZENE	UG/L	1.0	--	0.95 U	0.95 U	1.1 U	1 U	1 U	1.1 U
1,2-DIPHENYLHYDRAZINE	UG/L	1.0	--	0.95 U	0.95 U	1.1 U	1 U	1 U	1.1 U
1,3-DICHLOROBENZENE	UG/L	1.0	--	0.95 U	0.95 U	1.1 U	1 U	1 U	1.1 U
1,4-DICHLOROBENZENE	UG/L	1.0	--	0.95 U	0.95 U	1.1 U	1 U	1 U	1.1 U
2,2'-OXYBIS[1-CHLOROPROPANE]	UG/L	0.2	--	0.19 U	0.19 U	0.22 U	0.21 U	0.2 U	0.22 U
2,4,5-TRICHLOROPHENOL	UG/L	1.02	--	0.95 U	0.95 U	1.1 U	1 U	1 U	1.1 U
2,4,6-TRICHLOROPHENOL	UG/L	1.0	--	0.95 U	0.95 U	1.1 U	1 U	1 U	1.1 U
2,4-DICHLOROPHENOL	UG/L	0	--	0.19 U	0.19 U	0.22 U	0.21 U	0.2 U	0.22 U
2,4-DIMETHYLPHENOL	UG/L	1.0	--	0.95 U	0.95 U	1.1 U	1 U	1 U	1.1 U
2,4-DINITROPHENOL	UG/L	5.1	--	4.8 U	4.8 U	5.4 U	5.2 U	5 U	5.6 U
2,4-DINITROTOLUENE	UG/L	1.02	--	0.95 U	0.95 U	1.1 U	1 U	1 U	1.1 U
2,6-DINITROTOLUENE	UG/L	1.0	--	0.95 U	0.95 U	1.1 U	1 U	1 U	1.1 U
2-CHLORONAPHTHALENE	UG/L	0.2	--	0.19 U	0.19 U	0.22 U	0.21 U	0.2 U	0.22 U
2-CHLOROPHENOL	UG/L	1.0	--	0.95 U	0.95 U	1.1 U	1 U	1 U	1.1 U
2-METHYLPHENOL	UG/L	1.0	--	0.95 U	0.95 U	1.1 U	1 U	1 U	1.1 U
2-NITROANILINE	UG/L	5.1	--	4.8 U	4.8 U	5.4 U	5.2 U	5 U	5.6 U
2-NITROPHENOL	UG/L	1.0	--	0.95 U	0.95 U	1.1 U	1 U	1 U	1.1 U
3,3'-DICHLOROBENZIDINE	UG/L	1.0	--	0.95 U	0.95 U	1.1 U	1 U	1 U	1.1 U
3-NITROANILINE	UG/L	5.13	--	4.8 U	4.8 U	5.4 U	5.2 U	5 U	5.6 U
4,6-DINITRO-2-METHYLPHENOL	UG/L	5.1	--	4.8 U	4.8 U	5.4 U	5.2 U	5 U	5.6 U
4-BROMOPHENYL PHENYL ETHER	UG/L	1.0	--	0.95 U	0.95 U	1.1 U	1 U	1 U	1.1 U
4-CHLORO-3-METHYLPHENOL	UG/L	1	--	0.95 U	0.95 U	1.1 U	1 U	1 U	1.1 U
4-CHLOROANILINE	UG/L	1.02	--	0.95 U	0.95 U	1.1 U	1 U	1 U	1.1 U
4-CHLOROPHENYL PHENYL ETHER	UG/L	1.0	--	0.95 U	0.95 U	1.1 U	1 U	1 U	1.1 U
4-NITROANILINE	UG/L	5.13	--	4.8 U	4.8 U	5.4 U	5.2 U	5 U	5.6 U
4-NITROPHENOL	UG/L	5.13	--	4.8 U	4.8 U	5.4 U	5.2 U	5 U	5.6 U
BENZIDINE	UG/L	20.50	--	19 U	19 U	22 U	21 U	20 U	22 U
BENZOIC ACID	UG/L	5.1	--	4.8 U	4.8 U	**1.9 J**	5.2 U	**4 J**	5.6 U
BENZYL ALCOHOL	UG/L	1.0	--	0.95 U	0.95 U	1.1 U	1 U	1 U	1.1 U
BIS(2-CHLOROETHOXY)METHANE	UG/L	1.0	--	0.95 U	0.95 U	1.1 U	1 U	1 U	1.1 U
BIS(2-CHLOROETHYL)ETHER	UG/L	0.2	--	0.19 U	0.19 U	0.22 U	0.21 U	0.2 U	0.22 U
BIS(2-ETHYLHEXYL) PHTHALATE	UG/L	2.1	--	1.9 U	1.9 U	2.2 U	2.1 U	2 U	2.2 U
BUTYL BENZYL PHTHALATE	UG/L	1.0	--	0.95 U	0.95 U	1.1 U	**0.15 J**	1 U	1.1 U
CARBAZOLE	UG/L	0.21	--	0.19 U	**0.14 J**	0.22 U	0.21 U	0.2 U	0.22 U
DIBENZOFURAN	UG/L	1.02	--	0.95 U	**0.2 J**	1.1 U	1 U	1 U	1.1 U
DIETHYL PHTHALATE	UG/L	1.0	--	0.95 U	**0.22 J**	**0.21 J**	**0.23 J**	**0.37 J**	**0.2 J**
DIMETHYL PHTHALATE	UG/L	1.0	--	0.95 U	0.95 U	1.1 U	1 U	1 U	1.1 U
DI-N-BUTYL PHTHALATE	UG/L	1.0	--	0.95 U	0.95 U	1.1 U	1 U	1 U	1.1 U
DI-N-OCTYL PHTHALATE	UG/L	1.0	--	0.95 U	0.95 U	1.1 U	1 U	1 U	1.1 U
HEXACHLOROBENZENE	UG/L	0.2	--	0.19 U	0.19 U	0.22 U	0.21 U	0.2 U	0.22 U
HEXACHLOROBUTADIENE	UG/L	0.2	--	0.19 U	0.19 U	0.22 U	0.21 U	0.2 U	0.22 U
HEXACHLOROCYCLOPENTADIENE	UG/L	1.0	--	0.95 U	0.95 U	1.1 U	1 U	1 U	1.1 U
HEXACHLOROETHANE	UG/L	1.0	--	0.95 U	0.95 U	1.1 U	1 U	1 U	1.1 U
ISOPHORONE	UG/L	1.0	--	0.95 U	0.95 U	1.1 U	1 U	1 U	1.1 U
METHYLPHENOL, 3 & 4	UG/L	1.0	--	0.95 U	0.95 U	1.1 U	1 U	1 U	1.1 U
NITROBENZENE	UG/L	2.1	--	1.9 U	1.9 U	2.2 U	2.1 U	2 U	2.2 U
N-NITROSODIMETHYLAMINE	UG/L	1.0	--	0.95 U	0.95 U	1.1 U	1 U	1 U	1.1 U
N-NITROSODI-N-PROPYLAMINE	UG/L	0.21	--	0.19 U	0.19 U	0.22 U	0.21 U	0.2 U	0.22 U
N-NITROSODIPHENYLAMINE	UG/L	1.0	--	0.95 U	0.95 U	1.1 U	1 U	1 U	1.1 U
PENTACHLOROPHENOL	UG/L	1.0	13	0.95 U	0.95 U	1.1 U	1 U	1 U	1.1 U
PHENOL	UG/L	0.21	--	0.19 U	0.19 U	0.22 U	0.21 U	0.2 U	0.22 U

**Source* : USEPA 2014. *National Recommended Water Quality Criteria*

NOTES: Bold values represent detected concentrations. RL is reported for non-detected constituents.

J = compound was detected, but below the reporting limit (value is estimated

U = compound was analyzed, but not detectec

TABLE 16. PESTICIDE CONCENTRATIONS IN SITE WATER AND STANDARD ELUTRIATES

SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

ANALYTE	UNITS	Average RL	USEPA ACUTE CRITERIA *	Site Water	Dredging Unit 5	Dredging Unit 4	Dredging Unit 3	Dredging Unit 2	Dredging Unit 1
					SC-01/02	SC-03/04	SC-05/06	SC-07/08	SC-09/10
2,4'-DDD	UG/L	0.001	--	0.0012 U	0.0012 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U
2,4'-DDE	UG/L	0.001	--	0.0012 U	**0.00026 J**	**0.00041 J**	**0.00037 J P**	**0.00063 J**	**0.00025 J P**
2,4'-DDT	UG/L	0.001	--	0.0012 U	0.0012 U	**0.00054 J P**	0.0013 U	**0.00038 J P**	**0.00049 J P**
4,4'-DDD	UG/L	0.001	--	0.0012 U	0.0012 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U
4,4'-DDE	UG/L	0.001	--	0.0012 U	0.0012 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U
4,4'-DDT	UG/L	0.001	0.13	0.0012 U	0.0012 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U
Total DDTs (ND=RL)	UG/L	---	---	0.0036	0.0036	0.0039	0.0039	0.0039	0.0039
ALDRIN	UG/L	0.001	1.3	0.0012 U	0.0012 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U
ALPHA-BHC	UG/L	0.001	--	0.0012 U	0.0012 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U
BETA-BHC	UG/L	0.001	--	0.0012 U	**0.0028**	0.0013 U	**0.0035 P**	**0.0012 J P**	**0.0012 J P**
CHLORDANE (TECHNICAL)	UG/L	0.012	0.09	0.012 U	**0.016**	**0.012 J P**	**0.024**	**0.019**	0.013 U
ALPHA-CHLORDANE	UG/L	0.001	0.09	0.0012 U	0.0012 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U
GAMMA-CHLORDANE	UG/L	0.001	0.09	0.0012 U	0.0012 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U
CHLOROBENSIDE	UG/L	0.003	--	0.003 U	0.003 U	0.0032 U	0.0031 U	0.0031 U	0.0032 U
DACHTAL	UG/L	0.002	--	0.0024 U	0.0024 U	**0.0005 J**	0.0025 U	0.0024 U	**0.0011 J**
DELTA-BHC	UG/L	0.001	--	0.0012 U	**0.0016**	**0.0011 J P**	**0.0019**	**0.0022**	**0.0019**
DIELDRIN	UG/L	0.001	0.71	0.0012 U	0.0012 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U
ENDOSULFAN I	UG/L	0.001	0.034	0.0012 U	0.0012 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U
ENDOSULFAN II	UG/L	0.001	0.034	0.0012 U	0.0012 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U
ENDOSULFAN SULFATE	UG/L	0.001	--	0.0012 U	0.0012 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U
ENDRIN	UG/L	0.001	0.037	0.0012 U	0.0012 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U
ENDRIN ALDEHYDE	UG/L	0.001	--	0.0012 U	0.0012 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U
ENDRIN KETONE	UG/L	0.001	--	0.0012 U	0.0012 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U
GAMMA-BHC	UG/L	0.001	0.16	0.0012 U	0.0012 U	0.0013 U	**0.0022**	0.0013 U	**0.0025 P**
HEPTACHLOR	UG/L	0.001	0.053	0.0012 U	0.0012 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U
HEPTACHLOR EPOXIDE	UG/L	0.001	0.053	0.0012 U	0.0012 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U
METHOXYCHLOR	UG/L	0.002	--	0.0024 U	0.0024 U	0.0025 U	0.0025 U	0.0024 U	0.0025 U
MIREX	UG/L	0.001	--	0.0012 U	0.0012 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U
TOXAPHENE	UG/L	0.097	0.21	0.094 U	0.094 U	0.1 U	0.098 U	0.097 U	0.1 U
ORGANOPHOSPHORUS PESTICIDES									
AZINPHOS-METHYL	UG/L	1.0	--	0.95 U	0.94 U	1 U	1 U	1 U	1 U
DEMETON, TOTAL	UG/L	2.0	--	1.9 U	1.9 U	2 U	2 U	2 U	2 U
DEMETON-O	UG/L	1.0	--	0.95 U	0.94 U	1 U	1 U	1 U	1 U
DEMETON-S	UG/L	1.0	--	0.95 U	0.94 U	1 U	1 U	1 U	1 U
MALATHION	UG/L	1.0	--	0.95 U	0.94 U	1 U	1 U	1 U	1 U
METHYL PARATHION	UG/L	1.0	--	0.95 U	0.94 U	1 U	1 U	1 U	1 U
PARATHION	UG/L	1.0	--	0.95 U	0.94 U	1 U	1 U	1 U	1 U

**Source*: USEPA 2014. *National Recommended Water Quality Criteria*

NOTES: Bold values represent detected concentrations. Shaded concentrations exceed sediment quality guidelines

RL is reported for non-detected constituents.

J = compound was detected, but below the reporting limit (value is estimated)

P = the percent difference between the original and confirmation analysis is greater than 40%

U = compound was analyzed, but not detected

TABLE 17. BUTYLTIN CONCENTRATIONS IN SITE WATER AND STANDARD ELUTRIATES

SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

Analyt	unit	Average RL	Site Water	Dredging Unit 5	Dredging Unit 4	Dredging Unit 3	Dredging Unit 2	Dredging Unit 1
				SC-01/02	SC-03/04	SC-05/06	SC-07/08	SC-09/10
MONOBUTYLTIN	UG/L	0.495	0.48 U	0.47 U	0.51 U	0.49 U	0.49 U	0.53 U
DIBUTYLTIN	UG/L	0.038	0.037 U	0.037 U	0.039 U	0.038 U	0.04	0.041 U
TRIBUTYLTIN	UG/L	0.044	0.043 U	0.042 U	0.045 U	0.044 U	0.044 U	0.048 U
TETRABUTYLTIN	UG/L	0.050	0.048 U	0.047 U	0.051 U	0.049 U	0.049 U	0.053 U
TOTAL ORGANOTINS	UG/L	--	0.361	0.354	0.383	0.369	0.370	0.399

NOTES: RL is reported for non-detected constituents.

U = compound was analyzed, but not detected

TABLE 18. RESULTS OF WATER COLUMN BIOASSAYS

SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

Channel Reach		*Mytilus galloprovincialis*			*Menidia beryllina*			*Americamysis bahia*		
		48-hour EC_{50} (% elutriate)	Statistical Difference 100% vs. Control[(a)]	Dilution Required to Achieve 0.01 EC_{50}[(b)]	96-hour LC_{50} (% elutriate)	Statistical Difference 100% vs. Control[(a)]	Dilution Required to Achieve 0.01 LC_{50}	96-hour LC_{50} (% elutriate)	Statistical Difference 100% vs. Control[(a)]	Dilution Required to Achieve 0.01 LC_{50}
Dredging Unit 5	**SC-01/02-SED**	22.5	Yes	443	>100	No	--	>100	No	--
Dredging Unit 4	**SC-03/04-SED**	23.1	Yes	432	>100	No	--	>100	No	--
Dredging Unit 3	**SC-05/06-SED**	26.3	Yes	379	>100	No	--	>100	No	--
Dredging Unit 2	**SC-07/08-SED**	27.6	Yes	361	>100	No	--	>100	No	--
Dredging Unit 1	**SC-09/10-SED**	24.2	Yes	412	>100	No	--	>100	No	--

(a) Statistical significance analyzed at p=0.05; survival (LC_{50}) or effect (EC_{50}) in 100% elutriate concentration significantly lower than the control.

(b) Dilution adjusted by STFATE model using receiving water concentration as input for background concentrations.

TABLE 19. RESULTS OF 10-DAY WHOLE SEDIMENT BIOASSAYS

SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

Sample Identification		*Neanthes arenaceodentata*			*Leptocheirus plumulosus*		
		No. Alive/No. Exposed[(a)]	10-Day Mean Percent Survival	Statistical Difference vs. Reference [(c)]	No. Alive/No. Exposed[(b)]	10-Day Mean Percent Survival	Statistical Difference vs. Reference [(c)]
Willoughby Bank Reference		25 / 25	100	NA	97 / 100	97	NA
Dredging Unit 5	**SC-01/02-SED**	25/25	100	No	100/100	100	No
Dredging Unit 4	**SC-03/04-SED**	25/25	100	No	98/100	98	No
Dredging Unit 3	**SC-05/06-SED**	25/25	100	No	96/100	96	No
Dredging Unit 2	**SC-07/08-SED**	25/25	100	No	101/102	99	No
Dredging Unit 1	**SC-09/10-SED**	26/27	97	No	98/100	98	No
Lab Control		24 / 25	96	No	98 / 100	98	No
Chesapeake Bay Control		24 / 25	96	No	97 / 100	97	No

(a) Total for five replicates of five animals, unless otherwise stated.

(b) Total for five replicates of twenty animals, unless otherwise stated.

(c) Statistical significance analyzed at p=0.05; channel sediments statistically compared to Willoughby Bank reference site.

NA = not applicable; reference is not compared to itself

TABLE 20. SUMMARY OF SURVIVAL AND RECOVERY RESULTS FOR BIOACCUMULATION TESTS
SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

		Nereis virens			*Macoma nasuta*		
		No. Alive/No. Exposed[a]	**28-Day Mean Survival (percent)**	**Statistical Difference vs. Reference [b]**	**No. Alive/No. Exposed[c]**	**28-Day Mean Survival (percent)**	**Statistical Difference vs. Reference [b]**
Willoughby Bank Reference		105 / 105	100	NA	230 / 235	98	NA
Lab Control		63 / 63	100	No	139 / 141	99	No
Dredging Unit 5	**SC-01/02-SED**	101 / 105	96	No	224 / 235	95	No
Dredging Unit 4	**SC-03/04-SED**	103 / 105	98	No	231 / 235	98	No
Dredging Unit 3	**SC-05/06-SED**	104 / 105	99	No	229 / 235	97	No
Dredging Unit 2	**SC-07/08-SED**	102 / 105	97	No	232 / 235	99	No
Dredging Unit 1	**SC-09/10-SED**	100 / 105	95	No	232 / 235	99	No

(a) Total for five replicates of twenty-one animals. Lab control had three replicates of twenty-one organisms.

(b) Statistical significance analyzed at p=0.05; site sediments statistically compared to Willoughby Bank reference site.

(c) Total for five replicates of forty-seven animals. Lab control had three replicates of forty-seven organisms.

TABLE 21. MEAN METAL CONCENTRATIONS IN TISSUES

SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

		PRETEST		Willoughy Bank Reference		Dredging Unit 5		Dredging Unit 4		Dredging Unit 3		Dredging Unit 2		Dredging Unit 1	
						SC-01/02		SC-03/04		SC-05/06		SC-07/08		SC-09/10	
		Worms	Clams	Worms	Clams	Worms	Clams	Worms	Clams	Worms	Clams	Worms	Clams	Worms	Clams
ANALYTE	**UNITS**	**Lipids = 0.75%**	**Lipids = 0.71%**	**Lipids = 0.68%**	**Lipids = 0.48%**	**Lipids =0.69%**	**Lipids = 0.56%**	**Lipids = 0.72%**	**Lipids = 0.61%**	**Lipids = 0.74%**	**Lipids = 0.57%**	**Lipids = 0.70%**	**Lipids =0.52%**	**Lipids = 0.76%**	**Lipids = 0.50%**
ANTIMONY	MG/KG	0.00693	0.0183	0.024	0.0246	0.0223	0.026	0.0164	0.0318	0.0196	0.0276	0.0184	0.0136	0.0142	0.0396
ARSENIC	MG/KG	1.77	2.8	2.32	2.44	1.74	2.5	1.88	2.38	1.84	**2.7**	1.84	2.56	1.76	2.54
BERYLLIUM	MG/KG	ND	ND	ND	ND	0.0784	ND	0.0814	0.0711	ND	ND	ND	ND	0.0754	0.0739
CADMIUM	MG/KG	ND	0.021	0.0258	0.0789	0.02	0.0236	0.022	0.0186	0.021	0.0154	0.022	0.0196	0.0202	0.0332
CHROMIUM	MG/KG	0.11	0.149	0.15	0.228	0.166	0.105	0.35	0.154	0.118	0.29	0.163	0.252	0.363	**0.314**
COPPER	MG/KG	1.17	3.4	1.12	2.16	1.06	1.72	1.12	1.96	1.01	**2.54**	1.01	2.5	1.07	2.28
LEAD	MG/KG	0.0817	0.143	0.0856	0.192	0.123	0.174	0.203	0.17	0.0878	0.208	0.0868	0.198	0.164	0.198
MERCURY	MG/KG	0.024	ND	0.025	0.0134	0.0156	ND	0.0172	ND	0.012	**0.018**	0.0174	0.0202	0.0298	0.0144
NICKEL	MG/KG	0.22	0.423	0.244	0.458	0.27	0.396	0.332	0.43	0.214	**0.558**	0.218	**0.532**	0.312	**0.546**
SELENIUM	MG/KG	0.427	0.483	0.3	0.428	0.25	0.334	0.268	0.386	0.268	**0.48**	0.284	**0.484**	0.302	**0.474**
SILVER	MG/KG	0.0257	0.0387	0.0143	0.0146	0.0105	0.0142	0.0129	0.0131	0.014	**0.0216**	0.0132	0.0202	0.014	**0.021**
THALLIUM	MG/KG	ND	ND	ND	0.0398	0.023	0.0752	0.0776	0.0205	0.0794	0.0064	ND	0.0307	0.0737	0.071
ZINC	MG/KG	8.23	15.3	15.8	14.4	11	12.2	16.2	13	11.3	15.2	14.8	14	23.5	14.2

NOTE: For pre-test and control tissues n = 3 and for all other tissue tests n = 5.

Nereis virens species used for worm tissue tests and *Macoma nasuta* used for clam tissue tests.

ND = not detected or was detected below the reporting limit in each of the tested tissue replicates.

analyte concentration is significantly higher than the Willoughby Bank reference site concentration (p>0.05)

analyte concentration is significantly higher than the Willoughby Bank reference site concentration (p>0.05) and the pre-test tissue concentration (p>0.05)

TABLE 22. MEAN PAH CONCENTRATIONS IN TISSUES

SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

		PRETEST		Willoughy Bank Reference		Dredging Unit 5		Dredging Unit 4		Dredging Unit 3		Dredging Unit 2		Dredging Unit 1	
						SC-01/02		SC-03/04		SC-05/06		SC-07/08		SC-09/10	
		Worms	Clams	Worms	Clams	Worms	Clams	Worms	Clams	Worms	Clams	Worms	Clams	Worms	Clams
ANALYTE	**UNITS**	**Lipids = 0.75%**	**Lipids = 0.71%**	**Lipids = 0.68%**	**Lipids = 0.48%**	**Lipids =0.69%**	**Lipids = 0.56%**	**Lipids = 0.72%**	**Lipids = 0.61%**	**Lipids = 0.74%**	**Lipids = 0.57%**	**Lipids = 0.70%**	**Lipids =0.52%**	**Lipids = 0.76%**	**Lipids = 0.50%**
ACENAPHTHENE	UG/KG	ND	ND	ND	ND	ND	74	---	---	---	---	---	---	---	---
ACENAPHTHYLENE	UG/KG	ND	ND	ND	ND	ND	ND	---	---	---	---	---	---	---	---
ANTHRACENE	UG/KG	ND	ND	ND	ND	ND	34.3	---	---	---	---	---	---	---	---
BENZO[A]ANTHRACENE	UG/KG	ND	ND	ND	ND	ND	ND	---	---	---	---	---	---	---	---
BENZO[A]PYRENE	UG/KG	ND	ND	ND	ND	ND	ND	---	---	---	---	---	---	---	---
BENZO[B]FLUORANTHENE	UG/KG	ND	ND	ND	ND	ND	ND	---	---	---	---	---	---	---	---
BENZO[G,H,I]PERYLENE	UG/KG	ND	ND	ND	ND	ND	ND	---	---	---	---	---	---	---	---
BENZO[K]FLUORANTHENE	UG/KG	ND	ND	ND	ND	ND	ND	---	---	---	---	---	---	---	---
CHRYSENE	UG/KG	ND	ND	ND	ND	ND	ND	---	---	---	---	---	---	---	---
DIBENZ(A,H)ANTHRACENE	UG/KG	ND	ND	ND	ND	ND	ND	---	---	---	---	---	---	---	---
FLUORANTHENE	UG/KG	ND	ND	ND	ND	ND	80.5	---	---	---	---	---	---	---	---
FLUORENE	UG/KG	ND	ND	ND	ND	ND	60.3	---	---	---	---	---	---	---	---
INDENO[1,2,3-CD]PYRENE	UG/KG	ND	ND	ND	ND	ND	ND	---	---	---	---	---	---	---	---
NAPHTHALENE	UG/KG	ND	ND	ND	ND	ND	ND	---	---	---	---	---	---	---	---
PHENANTHRENE	UG/KG	ND	ND	ND	ND	ND	142	---	---	---	---	---	---	---	---
PYRENE	UG/KG	ND	ND	ND	ND	ND	46.9	---	---	---	---	---	---	---	---
TOTAL PAHs (ND=1/2RL)	UG/KG	ND	ND	ND	ND	ND	1,040	---	---	---	---	---	---	---	---
TOTAL PAHs (ND=RL)	UG/KG	ND	ND	ND	ND	ND	1,660	---	---	---	---	---	---	---	---

NOTE: For pre-test and control tissues n = 3 and for all other tissue tests n = 5.

Nereis virens species used for worm tissue tests and *Macoma nasuta* used for clam tissue tests.

ND = not detected or was detected below the reporting limit in each of the tested tissue replicates.

analyte concentration is significantly higher than the Willoughby Bank reference site concentration (p>0.05)

analyte concentration is significantly higher than the Willoughby Bank reference site concentration (p>0.05) and the pre-test tissue concentration (p>0.05)

TABLE 23. MEAN PCB CONGENER CONCENTRATIONS IN TISSUES

SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

		PRETEST		Willoughy Bank Reference		Dredging Unit 5		Dredging Unit 4		Dredging Unit 3		Dredging Unit 2		Dredging Unit 1	
						SC-01/02		SC-03/04		SC-05/06		SC-07/08		SC-09/10	
		Worms	Clams	Worms	Clams	Worms	Clams	Worms	Clams	Worms	Clams	Worms	Clams	Worms	Clams
ANALYTE	**UNITS**	**Lipids = 0.75%**	**Lipids = 0.71%**	**Lipids = 0.68%**	**Lipids = 0.48%**	**Lipids =0.69%**	**Lipids = 0.56%**	**Lipids = 0.72%**	**Lipids = 0.61%**	**Lipids = 0.74%**	**Lipids = 0.57%**	**Lipids = 0.70%**	**Lipids =0.52%**	**Lipids = 0.76%**	**Lipids = 0.50%**
PCB 8 (BZ) *	UG/KG	0.515	1.15	1.24	1.42	ND	1.07	---	---	---	---	---	---	---	---
PCB 18 (BZ) *	UG/KG	0.29	0.162	ND	1.75	ND	1.55	---	---	---	---	---	---	---	---
PCB 28 (BZ) *	UG/KG	0.246	0.31	ND	1.84	ND	ND	---	---	---	---	---	---	---	---
PCB 44 (BZ) *	UG/KG	ND	0.999	ND	ND	ND	ND	---	---	---	---	---	---	---	---
PCB 49 (BZ)	UG/KG	ND	ND	ND	ND	0.442	1.56	---	---	---	---	---	---	---	---
PCB 52 (BZ) *	UG/KG	ND	ND	ND	ND	ND	ND	---	---	---	---	---	---	---	---
PCB 66 (BZ) *	UG/KG	ND	ND	ND	ND	ND	ND	---	---	---	---	---	---	---	---
PCB 77 (BZ) *	UG/KG	0.649	ND	ND	ND	0.408	1.13	---	---	---	---	---	---	---	---
PCB 87 (BZ)	UG/KG	ND	ND	ND	ND	ND	ND	---	---	---	---	---	---	---	---
PCB 101 (BZ) *	UG/KG	0.273	ND	1.24	ND	0.525	0.517	---	---	---	---	---	---	---	---
PCB 105 (BZ) *	UG/KG	ND	ND	ND	ND	ND	ND	---	---	---	---	---	---	---	---
PCB 118 (BZ) *	UG/KG	0.567	ND	ND	ND	ND	ND	---	---	---	---	---	---	---	---
PCB 126 (BZ) *	UG/KG	ND	ND	ND	ND	1.2	ND	---	---	---	---	---	---	---	---
PCB 128 (BZ) *	UG/KG	0.559	ND	ND	ND	ND	ND	---	---	---	---	---	---	---	---
PCB 138 (BZ) *	UG/KG	0.491	ND	0.288	ND	0.52	ND	---	---	---	---	---	---	---	---
PCB 153 (BZ) *	UG/KG	1.55	ND	1.48	ND	1.61	ND	---	---	---	---	---	---	---	---
PCB 156 (BZ)	UG/KG	ND	ND	ND	ND	ND	ND	---	---	---	---	---	---	---	---
PCB 169 (BZ) *	UG/KG	ND	ND	ND	ND	ND	ND	---	---	---	---	---	---	---	---
PCB 170 (BZ) *	UG/KG	0.366	ND	0.706	ND	0.43	ND	---	---	---	---	---	---	---	---
PCB 180 (BZ) *	UG/KG	0.441	ND	0.869	ND	0.55	ND	---	---	---	---	---	---	---	---
PCB 183 (BZ)	UG/KG	ND	ND	ND	ND	ND	ND	---	---	---	---	---	---	---	---
PCB 184 (BZ)	UG/KG	ND	ND	ND	ND	ND	ND	---	---	---	---	---	---	---	---
PCB 187 (BZ) *	UG/KG	0.701	ND	0.951	ND	0.468	ND	---	---	---	---	---	---	---	---
PCB 195 (BZ)	UG/KG	ND	ND	ND	ND	ND	ND	---	---	---	---	---	---	---	---
PCB 206 (BZ)	UG/KG	0.185	ND	0.734	ND	0.931	ND	---	---	---	---	---	---	---	---
PCB 209 (BZ)	UG/KG	ND	ND	ND	ND	1	ND	---	---	---	---	---	---	---	---
TOTAL PCBs (ND=1/2RL)	UG/KG	19.5	23.6	25.5	37.3	24.6	30.1	---	---	---	---	---	---	---	---
TOTAL PCBs (ND=RL)	UG/KG	29.3	46.1	45.5	74	40.6	58.9	---	---	---	---	---	---	---	---

*PCB congeners used for Total PCB summation, as per Table 9-3 of the *ITM* (USEPA/USACE 1998)

NOTE: For pre-test and control tissues n = 3 and for all other tissue tests n = 5.

Nereis virens species used for worm tissue tests and *Macoma nasuta* used for clam tissue tests.

ND = not detected or was detected below the reporting limit in each of the tested tissue replicates.

analyte concentration is significantly higher than the Willoughby Bank reference site concentration (p>0.05)

analyte concentration is significantly higher than the Willoughby Bank reference site concentration (p>0.05) and the pre-test tissue concentration (p>0.05)

TABLE 24. MEAN DIOXIN AND FURAN CONGENER CONCENTRATIONS IN TISSUES

SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

			PRETEST		Willoughy Bank Reference		Dredging Unit 5		Dredging Unit 4		Dredging Unit 3		Dredging Unit 2		Dredging Unit 1	
							SC-01/02		SC-03/04		SC-05/06		SC-07/08		SC-09/10	
			Worms	Clams	Worms	Clams	Worms	Clams	Worms	Clams	Worms	Clams	Worms	Clams	Worms	Clams
ANALYTE	**UNITS**	**TEF***	**Lipids = 0.75%**	**Lipids = 0.71%**	**Lipids = 0.68%**	**Lipids = 0.48%**	**Lipids =0.69%**	**Lipids = 0.56%**	**Lipids = 0.72%**	**Lipids = 0.61%**	**Lipids = 0.74%**	**Lipids = 0.57%**	**Lipids = 0.70%**	**Lipids =0.52%**	**Lipids = 0.76%**	**Lipids = 0.50%**
2,3,7,8-TCDD	NG/KG	1	ND	ND	ND	1.4	ND	ND	---	---	---	---	ND	ND	---	---
1,2,3,7,8-PECDD	NG/KG	1	ND	ND	ND	6.99	4.52	ND	---	---	---	---	5.96	8.53	---	---
1,2,3,4,7,8-HXCDD	NG/KG	0.1	ND	ND	ND	6.17	ND	ND	---	---	---	---	ND	8.17	---	---
1,2,3,6,7,8-HXCDD	NG/KG	0.1	4.73	ND	ND	0.12	5.95	ND	---	---	---	---	ND	**8.17**	---	---
1,2,3,7,8,9-HXCDD	NG/KG	0.1	ND	ND	ND	0.135	ND	ND	---	---	---	---	ND	ND	---	---
1,2,3,4,6,7,8-HPCDD	NG/KG	0.01	3.21	4.97	1.41	1.9	**2.21**	**2.54**	---	---	---	---	1.5	2.48	---	---
OCDD	NG/KG	0.0003	11.7	1.31	12.2	28.3	**24.5**	**64.6**	---	---	---	---	**16.8**	**64.3**	---	---
2,3,7,8-TCDF	NG/KG	0.1	1.08	ND	1.3	0.551	1	ND	---	---	---	---	0.761	1.75	---	---
1,2,3,7,8-PECDF	NG/KG	0.03	ND	ND	ND	ND	ND	ND	---	---	---	---	ND	8.52	---	---
2,3,4,7,8-PECDF	NG/KG	0.3	ND	ND	ND	8.82	5.8	ND	---	---	---	---	5.97	6.24	---	---
1,2,3,4,7,8-HXCDF	NG/KG	0.1	ND	ND	ND	4.35	0.158	ND	---	---	---	---	4.55	6.4	---	---
1,2,3,6,7,8-HXCDF	NG/KG	0.1	2.28	ND	0.677	4.77	0.738	7.79	---	---	---	---	0.681	6.46	---	---
2,3,4,6,7,8-HXCDF	NG/KG	0.1	ND	ND	ND	ND	ND	ND	---	---	---	---	ND	8.16	---	---
1,2,3,7,8,9-HXCDF	NG/KG	0.1	ND	ND	ND	ND	ND	ND	---	---	---	---	ND	6.38	---	---
1,2,3,4,6,7,8-HPCDF	NG/KG	0.01	2.44	ND	3.32	4.78	0.273	4.05	---	---	---	---	3.19	8.6	---	---
1,2,3,4,7,8,9-HPCDF	NG/KG	0.01	ND	ND	ND	ND	ND	ND	---	---	---	---	ND	ND	---	---
OCDF	NG/KG	0.0003	4.68	ND	3.91	7.73	5.9	10.9	---	---	---	---	5.99	8.52	---	---
DIOXIN TEQ (ND=1/2RL)	NG/KG	--	8.31	9.24	9.47	8.61	6.62	11.6	---	---	---	---	7.58	9.94	---	---
DIOXIN TEQ (ND=RL)	NG/KG	--	16.6	18.5	18.9	17.2	13.1	23.2	---	---	---	---	15.1	19.9	---	---

**Source* : Van den Berg, M, et al. 2006. *The 2005 World Health Organization Re-evaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-Like Compounds. Toxicological Sciences 93(2):223-241.*

NOTE: For pre-test and control tissues n = 3 and for all other tissue tests n = 5.

Nereis virens species used for worm tissue tests and *Macoma nasuta* used for clam tissue tests.

ND = not detected or was detected below the reporting limit in each of the tested tissue replicates.

TEF = toxicity equivalency factor

TEQ = toxicity equivalency quotient

analyte concentration is significantly higher than the Willoughby Bank reference site concentration (p>0.05)

analyte concentration is significantly higher than the Willoughby Bank reference site concentration (p>0.05) and the pre-test tissue concentration (p>0.05)

TABLE 25. MEAN PESTICIDE CONCENTRATIONS IN TISSUES

SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

		PRETEST		Willoughy Bank Reference		Dredging Unit 5		Dredging Unit 4		Dredging Unit 3		Dredging Unit 2		Dredging Unit 1	
						SC-01/02		SC 03/04		SC-05/06		SC-07/08		SC-09/10	
		Worms	Clams	Worms	Clams	Worms	Clams	Worms	Clams	Worms	Clams	Worms	Clams	Worms	Clams
ANALYTE	**UNITS**	**Lipids = 0.75%**	**Lipids = 0.71%**	**Lipids = 0.68%**	**Lipids = 0.48%**	**Lipids =0.69%**	**Lipids = 0.56%**	**Lipids = 0.72%**	**Lipids = 0.61%**	**Lipids = 0.74%**	**Lipids = 0.57%**	**Lipids = 0.70%**	**Lipids =0.52%**	**Lipids = 0.76%**	**Lipids = 0.50%**
2,4'-DDD	UG/KG	0.371	ND	ND	ND	0.282	0.379	ND	0.39	0.501	0.643	---	---	---	---
2,4'-DDE	UG/KG	ND	0.161	ND	ND	ND	0.559	ND	0.465	ND	0.596	---	---	---	---
2,4'-DDT	UG/KG	ND	ND	ND	0.566	ND	ND	ND	ND	ND	ND	---	---	---	---
4,4'-DDD	UG/KG	0.403	ND	0.518	ND	0.198	0.611	0.194	0.566	0.206	0.502	---	---	---	---
4,4'-DDE	UG/KG	ND	0.529	ND	0.477	ND	0.347	ND	0.343	ND	0.464	---	---	---	---
4,4'-DDT	UG/KG	ND	0.576	0.535	ND	0.593	0.666	0.53	0.613	0.551	ND	---	---	---	---

NOTE: For pre-test and control tissues n = 3 and for all other tissue tests n = 5.

Nereis virens species used for worm tissue tests and *Macoma nasuta* used for clam tissue tests.

ND = not detected or was detected below the reporting limit in each of the tested tissue replicates.

analyte concentration is significantly higher than the Willoughby Bank reference site concentration (p>0.05)

analyte concentration is significantly higher than the Willoughby Bank reference site concentration (p>0.05) and the pre-test tissue concentration (p>0.05)

TABLE 26. COMPARISON OF UPPER 95% CONFIDENCE LEVELS OF THE MEAN TISSUE CONCENTRATION TO U.S. FOOD AND DRUG ADMINISTRATION (USFDA) ACTION/GUIDANCE/TOLERANCE LEVELS

SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

		USFDA Action/Guidance/Tolerance Levels[(a)]		Dredging Unit 5		Dredging Unit 4		Dredging Unit 3		Dredging Unit 2		Dredging Unit 1	
				SC-01/02		SC-03/04		SC-05/06		SC-07/08		SC-09/10	
ANALYTE(c)	**UNITS**	**Worms**	**Clams**	**Worms**	**Clams**	**Worms**	**Clams**	**Worms**	**Clams**	**Worms**	**Clams**	**Worms**	**Clams**
ARSENIC	MG/KG	76	86	1.96	2.65	1.96	2.59	1.89	2.82	1.98	2.73	1.81	2.68
CADMIUM	MG/KG	4	3	0.02	0.03	0.03	0.03	0.02	0.02	0.02	0.03	0.02	0.07
CHROMIUM	MG/KG	12	13	0.42	0.13	0.76	0.22	0.19	0.42	0.24	0.32	0.71	0.36
LEAD	MG/KG	1.5	1.7	0.21	0.19	0.46	0.19	0.10	0.22	0.11	0.23	0.33	0.21
MERCURY	MG/KG	1	1	0.02	ND	0.03	ND	0.01	0.02	0.03	0.03	0.04	0.02
NICKEL	MG/KG	70	80	0.38	0.42	0.52	0.48	0.23	0.63	0.26	0.60	0.47	0.58
Total PCBs	UG/KG	2,000	2,000	44.30	69.48	NT	NT	NT	NT	NT	NT	NT	NT
4,4'-DDT	UG/KG	5,000	5,000	0.66	0.98	0.71	0.77	0.64	ND	NT	NT	NT	NT

NT= not tested

(a) *Source:* USFDA 2001. Fish and Fishery Products Hazards and Controls Guidance. Third Edition. U.S. Food and Drug Administration, Center for Food Safety and Applied Nutrition. June.

(c) Values provided only for chemical constituents that were tested in this program.

ND = not detected or was detected below the reporting limit in each of the tested tissue replicates.

Exceeds USFDA Action/Guidance/Tolerance Levels

TABLE 27. COMPARISON OF UPPER 95% CONFIDENCE LEVELS OF THE MEAN TISSUE CONCENTRATION TO USEPA REGION 4 BACKGROUND CONCENTRATIONS

SKIFFES CREEK, NEWPORT NEWS, VIRGINIA

		USEPA Region 4 Background Concentration - South Atlantic Bight[b]		Dredging Unit 5		Dredging Unit 4		Dredging Unit 3		Dredging Unit 2		Dredging Unit 1	
				SC-01/02		SC-03/04		SC-05/06		SC-07/08		SC-09/10	
ANALYTE(c)	**UNITS**	**Worms**	**Clams**	**Worms**	**Clams**	**Worms**	**Clams**	**Worms**	**Clams**	**Worms**	**Clams**	**Worms**	**Clams**
NICKEL	MG/KG	1.6-3.5	0.9-3.7	--	--	--	--	--	0.63	--	--	--	0.58
OCDD	NG/KG	--	--	31.52	76.20	--	--	--	--	--	80.11	--	--

(b) *Source:* Southeast Regional Implementation Manual (SERIM), USACE/USEPA 2008

(c) Values provided only for chemical constituents in tissue that were tested and exceeded reference and pre-test tissue concentrations in this program.

ND = not detected or was detected below the reporting limit in each of the tested tissue replicates.

Exceeds USEPA Region 4 Background Concentration - South Altantic Bight

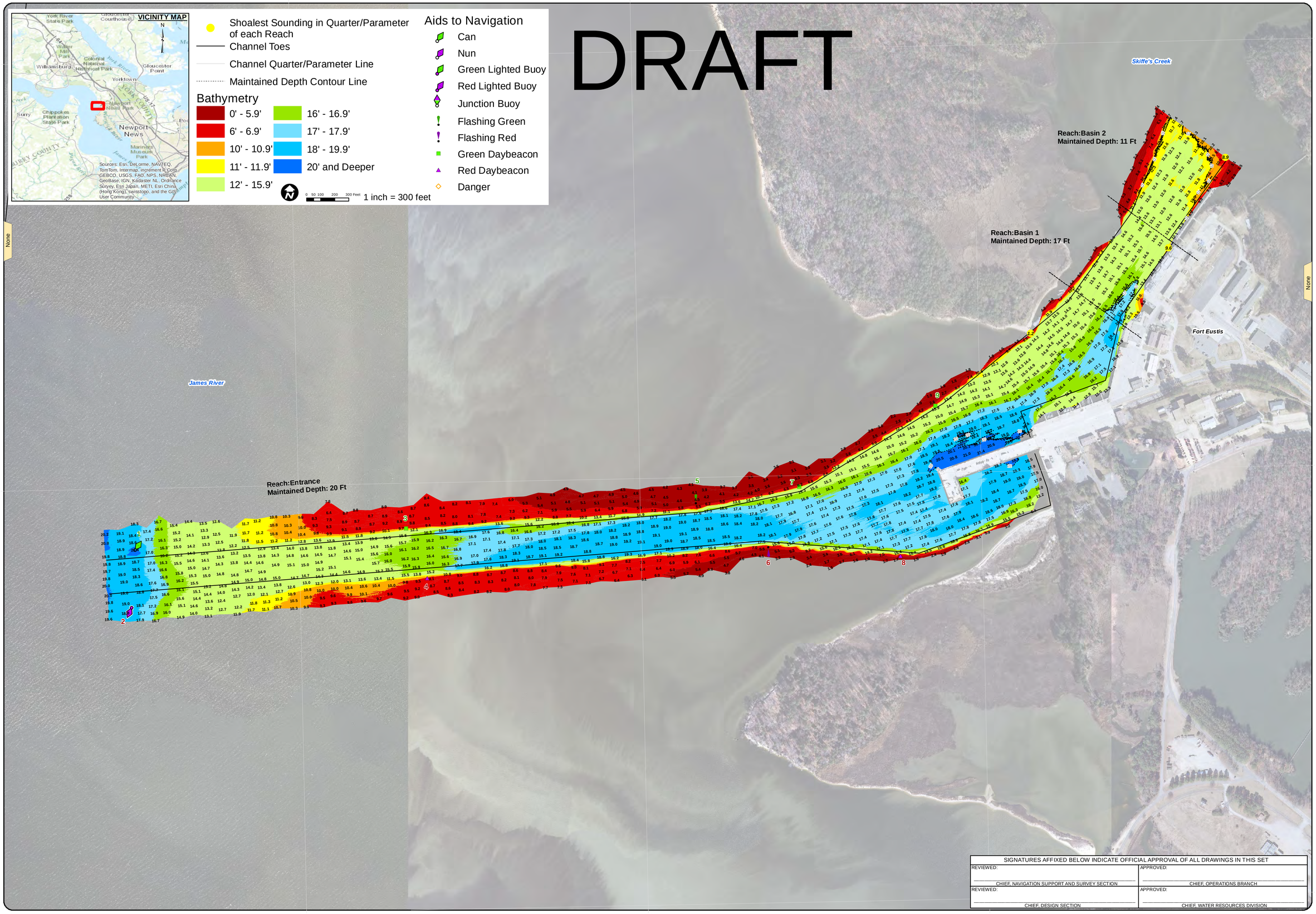
MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT (MPRSA) SECTION 103 EVALUATION:

Skiffes Creek Channel

Newport News, Virginia

Attachment I

BATHYMETRIC SURVEY MAP



US Army Corps of Engineers
Norfolk District

NOTES:
1. PROJECT: SKIFFE'S CREEK NAVIGATION CHANNEL SERVES THE THIRD PORT, LOCATED AT JOINT BASE LANGLEY-EUSTIS. THE PROJECT CONSISTS OF THREE AREAS: AN ENTRANCE AREA 7,800 FOOT LONG AREA MAINTAINED TO A DEPTH OF 20 FEET, BASIN 1 A 680 FOOT LONG AREA MAINTAINED TO A DEPTH OF 17 FEET, AND A 715 FOOT LONG AREA MAINTAINED TO A DEPTH OF 11 FEET. ALL AREAS HAVE A 100 FOOT WIDTH.
2. THE INFORMATION DEPICTED ON THIS MAP REPRESENTS THE RESULTS OF SURVEYS MADE ON THE DATE(S) INDICATED AND CAN ONLY BE CONSIDERED AS INDICATING THE GENERAL CONDITIONS EXISTING AT THAT TIME.
3. SOUNDINGS: SHOWN IN FEET CENTERED ON POINT OF SHOALEST DEPTH IN 50 FT RADIUS GENERATED FROM HYDROSURVEY DATA
4. BACKGROUND: VGIN IMAGERY 2009.
5. AIDS TO NAVGATION LOCATED WITH SURVEY VESSEL +/- 3 METERS ON SURVEY DATE SHOWN ON MAP.
6. SURVEY XYZ (*.XYZ) AND METADATA (*.MET) FILE NAME: SK_01_SKC_20140328_CS

PROJECTED COORDINATE SYSTEM: STATE PLANE DATUM NAME: NAD 83 HORIZONTAL ZONE: VIRGINIA SOUTH ZONE PROJECTED COORDINATE UNITS: US SURVEY FEET INPUTED VERTICAL UNITS: US SURVEY FEET HORIZONTAL CONTROL MONUMENTS: USCG DGPS	VERTICAL REFERENCE DATUM: NGS MLLW VERTICAL UNCERTAINTY: 0.25 FEET IMPLIED VERTICAL ACCURACY: +/- 0.5 FEET SYSTEM/METHOD: CDOM CV3 SINGLE-BEAM BIN SIZE: N/A
GAUGE INFORMATION - VERTICAL CONTROL MONUMENTS NGS MLLW NTDE 1983 - 2001 TIDAL EPOCH	
GAUGE: THIRD POINT AT FORT EUSTIS (Direct)	MONUMENT: USACE PORT - 2001
TIDE RANGE: 2.4'	MLLW: 7.79'
AREA: Entire Project	

SKIFFES CREEK
PROJECT CONDITION SURVEY
28 March 2014
SURVEY DATES:
March 27 & 28, 2014
FILE NO: SKF.2014.03.27.CS

SIGNATURES AFFIXED BELOW INDICATE OFFICIAL APPROVAL OF ALL DRAWINGS IN THIS SET

REVIEWED:	APPROVED:
CHIEF, NAVIGATION SUPPORT AND SURVEY SECTION	CHIEF, OPERATIONS BRANCH
REVIEWED:	APPROVED:
CHIEF, DESIGN SECTION	CHIEF, WATER RESOURCES DIVISION

SHEET 1 of 1

MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT (MPRSA) SECTION 103 EVALUATION:

Skiffes Creek Channel

Newport News, Virginia

Attachment II

STFATE MODEL RESULTS

SKIFFES CREEK

STFATE Compliance Summary and Model Inputs
SC-01/02

Summary of STFATE Modeling for Placement of Dredge Material from Skiffes Creek DU 01/02 into the Norfolk ODMDS.

	1-hr		4-hrs			
Placement Volume (cuy)	Dilution Factor	Feet Traveled	Dilution Factor	Feet Traveled	Tier II WQ Violation?	Tier III WQ Violation?
3,000	21	1,140	632	4,173	No	No
4,000	18	1,140	502	4,173	No	No
4,600	16	1,140	449	4,173	No	No
4,700	16	1,140	441	4,173	No	Yes
5,000	15	1,140	421	4,173	No	Yes

STFATE Model Inputs: Skiffs Creek DU 01/02

INPUT PARAMETER	UNITS	VALUE
SITE DESCRIPTION		
Disposal Site Name		Norfolk ODMDS
Number of grid points (L-R, +z dir)		96
Number of grid points (T-B, +x dir)		96
Grid spacing (Left to Right) Z-Axis	ft	100
Grid spacing (Top to Bottom) X-Axis	ft	100
Constant water depth	ft	65
Bottom roughness	ft	0.005
Bottom slope (x-dir)	deg	0
Bottom slope (z-dir)	deg	0.001
Number of points in density profile		2
0 ft	g/cc	1.0237
30	g/cc	1.0237
65	g/cc	1.0250

AMBIENT VELOCITY		
Type of velocity profile (>= 0.1 fps)		Depth-Averaged
Logarithmic Profile		No
Depth ft	Velocity X (fps)	Velocity Z (fps)
65	0.232	0.232

STFATE Model Inputs: Skiffs Creek DU 01/02

INPUT PARAMETER	UNITS	VALUE
DISPOSAL OPERATION		
Disposal point top of grid (X-Axis)	ft	4,800
Disposal point left edge of grid (Z-Axis)	ft	4,800
Dumpint Over Depression		No
Bottom depression length x-direction	ft	0
Bottom depression length z-direction	ft	0
Bottom depression average depth	ft	0
Location of Disposal Site		
Upper Left Corner Distance from Top Edge (X)	ft	500
Uper Left Corner Distance from Left Edge (Z)	ft	500
Lower Right Corner Distance from Top Edge (X)	ft	8,600
Lower Right Corner Distance from Left Edge (Z)	ft	8,600
Length of vessel bin	ft	165
Width of vessel bin	ft	45
Distance Between Bins	ft	5
Predisposal draft	ft	20
Postdisposal draft	ft	10
Time to empty vessel	s	90
Number of Bins that Open Simultaneously	s	1
Number of Discrete Openings of Sets of Bins	s	1
Vessel velocity in x-direction	ft/s	1.7
Vessel velocity in z-direction	ft/s	0
Number of layers		1
Volume of each layer	yd^3	4,000
COEFFICIENTS		
Settling coef (BETA)		0.000
Apparent mass coefficient (CM)		1.000
Drag coefficient (CD)		0.500
Form drag collapse cloud (CDRAG)		1.000
Skin friction collapse cloud (CFRIC)		0.010
Drag ellipse wedge (CD3)		0.100
Drag plate (CD4)		1.000
Friction between cloud and bottom (FRICTN)		0.010
4/3 Law horizontal diffusion coefficient (ALAMDA)		0.001
Unstratified vertical diffusion coefficient (AKY0)		0.025
Cloud/ambient density gradient ratio (GAMA)		0.250
Turbulent thermal entrainment (ALPHA0)		0.235
Entrainment collapse (ALPHAC)		0.100
Stripping factor (CSTRIP)		0.003
INPUT, EXECUTION & OUTPUT KEYS		
Process to simulate		Disp. from Split-Hull Barge/Scow
Duration of simulation	s	14,400
Long Term Time Step	s	600

STFATE Model Inputs: Skiffs Creek DU 01/02

INPUT PARAMETER	UNITS	VALUE
Convective descent output		
Collapse phase output option		
Number of print times for diffusion		
Number of depths for output		4
Depths for output	ft	0, 15, 30, 45, 65

DREDGE MATERIAL

Location		Skiffs Creek
Bulking Factor		1.0 (sand/gravel), 1.0 (silt/clay)
Site Water Density	g/cc	1.0053

Water Quality - Tier II

Contaminant		Ammonia
Acute Water Quality Criteria at Edge of Mixing Zone (C_{wq})	mg/L	4.91
Predicted initial concentration in fluid (C_s)	mg/L	19
Background concentration (C_{ds})	mg/L	0.12
Dilution Required (D_r)		2.94

Toxicity - Tier III

		Lowest
EC50	% Elutriate	22.5

SKIFFES CREEK

Tier 2 Water Quality Criteria LPC
SC-01/02

Limiting Constituent = Ammonia
Placement Volume = 4,600 cubic yards

TIER 2 STFATE MODEL RESULTS SUMMARY: Skiffes Creek DU 01/02
Norfolk Ocean Disposal Site, Norfolk, VA

Scenario: **Skiffes Creek DU 01/02** **Placement Volume: 4,600**

Tier II - Water Quality Criteria

Analyte: Ammonia

Water Quality Criterion: 4.91
Elutriate Concentration (C_s): 19
Background concentration (C_{ds}): 0.12
Dilution Required: 2.9
Dilution Factor Achieved: 447

WQC Initial Mixing Computation Results: 4-Hour Criterion

Time (hours)	Depth (ft)	Maximum Contaminant Concentration (C_{max}) on Grid	Dilution on Grid ($D_{a\text{-}wq}$)
4.0	0	1.20E-01	3.93E+24
4.0	15	1.20E-01	1.99E+14
4.0	30	1.20E-01	1.26E+07
4.0	45	1.29E-01	2.00E+03
4.0	65	1.26E-01	3.31E+03
4.0	54.3	1.62E-01	4.47E+02

WQC Initial Mixing Computation Results: Disposal Site Boundary Criterion

Depth (ft)	Time Corresponding to C_{max} Outside Disposal Site (hours)	Maximum Contaminant Concentration (C_{max}) Outside Disposal Site (percent)	Dilution Outside Disposal Site ($D_{a\text{-}wq}$)
0	NA	NA	NA
15	NA	NA	NA
30	NA	NA	NA
45	NA	NA	NA
65	NA	NA	NA
54.3	NA	NA	NA

$D_{a\text{-}wq}$ = $(C_s - C_{max}) / (C_{max} - C_{ds})$; where C_s = elutriate concentration and C_{ds} = background concentration

Shaded row = depth of maximum concentration

1. Concentration above backgrond ($C_{max} - C_{ds}$) = 0.

SKIFFES CREEK

Tier 3 Water Column Toxicity LPC
SC-01/02

EC_{50} = 22.5 Percent Elutriate
Placement Volume = 4,600 cubic yards

TIER 3 STFATE MODEL RESULTS SUMMARY: Skiffes Creek DU 01/02
Norfolk Ocean Disposal Site, Norfolk, VA

Scenario: **Skiffes Creek DU 01/02** **Placement Volume (cy): 4,600**

Tier III - Water Column Toxicity

Species: ***Mytilis*** **LPC: 0.225**

Dilution Required: 443

Dilution Achieved: 449

Toxicity Initial Mixing Computation Results: 4-Hour Criterion

Time (hours)	Depth (ft)	Maximum Contaminant Concentration (C_{tox}) on Grid	Dilution on Grid ($D_{a\text{-}tox}$)
4.0	0	2.52E-23	3.97E+24
4.0	15	4.98E-13	2.01E+14
4.0	30	7.87E-06	1.27E+07
4.0	45	4.97E-02	2.01E+03
4.0	65	3.00E-02	3.33E+03
4.0	54.3	2.22E-01	4.49E+02

Toxicity Initial Mixing Computation Results: Disposal Site Boundary Criterion

Depth (ft)	Time Corresponding to C_{tox} Outside Disposal Site (hours)	Maximum Contaminant Concentration (C_{tox}) Outside Disposal Site (percent)	Dilution Outside Disposal Site ($D_{a\text{-}tox}$)
0	NA	NA	NA
15	NA	NA	NA
30	NA	NA	NA
45	NA	NA	NA
65	NA	NA	NA
54.3	NA	NA	NA

$D_{a\text{-}tox}$ = $(100 - C_{tox}) / C_{tox}$

Shaded row = depth of maximum concentration

1. Concentration outside disposal site (Ctox - C_{ds}) = 0.

SKIFFES CREEK

STFATE Compliance Summary and Model Inputs
SC-03/04

Summary of STFATE Modeling for Placement of Dredge Material from Skiffes Creek DU 03/04 into the Norfolk ODMDS.

	1-hr		4-hrs			
Placement Volume (cuy)	Dilution Factor	Feet Traveled	Dilution Factor	Feet Traveled	Tier II WQ Violation?	Tier III WQ Violation?
3,000	22	1,140	648	4,173	No	No
4,000	18	1,140	514	4,173	No	No
4,900	16	1,140	438	4,173	No	No
5,000	16	1,140	432	4,173	No	Yes

STFATE Model Inputs: Skiffs Creek DU 03/04

INPUT PARAMETER	UNITS	VALUE
SITE DESCRIPTION		
Disposal Site Name		Norfolk ODMDS
Number of grid points (L-R, +z dir)		96
Number of grid points (T-B, +x dir)		96
Grid spacing (Left to Right) Z-Axis	ft	100
Grid spacing (Top to Bottom) X-Axis	ft	100
Constant water depth	ft	65
Bottom roughness	ft	0.005
Bottom slope (x-dir)	deg	0
Bottom slope (z-dir)	deg	0.001
Number of points in density profile		2
0 ft	g/cc	1.0237
30	g/cc	1.0237
65	g/cc	1.0250

AMBIENT VELOCITY		
Type of velocity profile (>= 0.1 fps)		Depth-Averaged
Logarithmic Profile		No
Depth ft	Velocity X (fps)	Velocity Z (fps)
65	0.232	0.232

STFATE Model Inputs: Skiffs Creek DU 03/04

INPUT PARAMETER	UNITS	VALUE
DISPOSAL OPERATION		
Disposal point top of grid (X-Axis)	ft	4,800
Disposal point left edge of grid (Z-Axis)	ft	4,800
Dumpint Over Depression		No
Bottom depression length x-direction	ft	0
Bottom depression length z-direction	ft	0
Bottom depression average depth	ft	0
Location of Disposal Site		
Upper Left Corner Distance from Top Edge (X)	ft	500
Uper Left Corner Distance from Left Edge (Z)	ft	500
Lower Right Corner Distance from Top Edge (X)	ft	8,600
Lower Right Corner Distance from Left Edge (Z)	ft	8,600
Length of vessel bin	ft	165
Width of vessel bin	ft	45
Distance Between Bins	ft	5
Predisposal draft	ft	20
Postdisposal draft	ft	10
Time to empty vessel	s	90
Number of Bins that Open Simultaneously	s	1
Number of Discrete Openings of Sets of Bins	s	1
Vessel velocity in x-direction	ft/s	1.7
Vessel velocity in z-direction	ft/s	0
Number of layers		1
Volume of each layer	yd^3	4,000
COEFFICIENTS		
Settling coef (BETA)		0.000
Apparent mass coefficient (CM)		1.000
Drag coefficient (CD)		0.500
Form drag collapse cloud (CDRAG)		1.000
Skin friction collapse cloud (CFRIC)		0.010
Drag ellipse wedge (CD3)		0.100
Drag plate (CD4)		1.000
Friction between cloud and bottom (FRICTN)		0.010
4/3 Law horizontal diffusion coefficient (ALAMDA)		0.001
Unstratified vertical diffusion coefficient (AKY0)		0.025
Cloud/ambient density gradient ratio (GAMA)		0.250
Turbulent thermal entrainment (ALPHA0)		0.235
Entrainment collapse (ALPHAC)		0.100
Stripping factor (CSTRIP)		0.003
INPUT, EXECUTION & OUTPUT KEYS		
Process to simulate		Disp. from Split-Hull Barge/Scow
Duration of simulation	s	14,400
Long Term Time Step	s	600

STFATE Model Inputs: Skiffs Creek DU 03/04

INPUT PARAMETER	UNITS	VALUE
Convective descent output		
Collapse phase output option		
Number of print times for diffusion		
Number of depths for output		4
Depths for output	ft	0, 15, 30, 45, 65

DREDGE MATERIAL

Location		Skiffs Creek
Bulking Factor		1.0 (sand/gravel), 1.0 (silt/clay)
Site Water Density	g/cc	1.0053

Water Quality - Tier II

Contaminant		Ammonia
Acute Water Quality Criteria at Edge of Mixing Zone (C_{wq})	mg/L	4.91
Predicted initial concentration in fluid (C_s)	mg/L	16
Background concentration (C_{ds})	mg/L	0.12
Dilution Required (D_r)		2.32

Toxicity - Tier III		**Lowest**
EC50	% Elutriate	23.1

SKIFFES CREEK

Tier 2 Water Quality Criteria LPC
SC-03/04

Limiting Constituent = Ammonia
Placement Volume = 4,900 cubic yards

TIER 2 STFATE MODEL RESULTS SUMMARY: Skiffes Creek DU 03/04
Norfolk Ocean Disposal Site, Norfolk, VA

Scenario: **Skiffes Creek DU 03/04** **Placement Volume: 4,900**

Tier II - Water Quality Criteria

Analyte: Ammonia

Water Quality Criterion: 4.91
Elutriate Concentration (C_s): 16
Background concentration (C_{ds}): 0.12
Dilution Required: 2.3
Dilution Factor Achieved: 435

WQC Initial Mixing Computation Results: 4-Hour Criterion

Time (hours)	Depth (ft)	Maximum Contaminant Concentration (C_{max}) on Grid	Dilution on Grid ($D_{a\text{-}wq}$)
4.0	0	1.20E-01	8.77E+23
4.0	15	1.20E-01	8.54E+13
4.0	30	1.20E-01	8.63E+06
4.0	45	1.29E-01	1.80E+03
4.0	65	1.25E-01	3.22E+03
4.0	54.1	1.56E-01	4.35E+02

WQC Initial Mixing Computation Results: Disposal Site Boundary Criterion

Depth (ft)	Time Corresponding to C_{max} Outside Disposal Site (hours)	Maximum Contaminant Concentration (C_{max}) Outside Disposal Site (percent)	Dilution Outside Disposal Site ($D_{a\text{-}wq}$)
0	NA	NA	NA
15	NA	NA	NA
30	NA	NA	NA
45	NA	NA	NA
65	NA	NA	NA
54.1	NA	NA	NA

$D_{a\text{-}wq}$ = $(C_s - C_{max}) / (C_{max} - C_{ds})$; where C_s = elutriate concentration and C_{ds} = background concentration

Shaded row = depth of maximum concentration

1. Concentration above backgrond ($C_{max} - C_{ds}$) = 0.

SKIFFES CREEK

Tier 3 Water Column Toxicity LPC
SC-03/04

EC_{50} = 23.1 Percent Elutriate
Placement Volume = 4,900 cubic yards

TIER 3 STFATE MODEL RESULTS SUMMARY: Skiffes Creek DU 03/04

Norfolk Ocean Disposal Site, Norfolk, VA

Scenario: **Skiffes Creek DU 03/04** **Placement Volume (cy): 4,900**

Tier III - Water Column Toxicity

Species: ***Mytilis*** **LPC: 0.231**

Dilution Required: 432

Dilution Achieved: 438

Toxicity Initial Mixing Computation Results: 4-Hour Criterion

Time (hours)	Depth (ft)	Maximum Contaminant Concentration (C_{tox}) on Grid	Dilution on Grid ($D_{a\text{-}tox}$)
4.0	0	1.13E-22	8.85E+23
4.0	15	1.16E-12	8.62E+13
4.0	30	1.15E-05	8.70E+06
4.0	45	5.51E-02	1.81E+03
4.0	65	3.08E-02	3.25E+03
4.0	54.1	2.28E-01	4.38E+02

Toxicity Initial Mixing Computation Results: Disposal Site Boundary Criterion

Depth (ft)	Time Corresponding to C_{tox} Outside Disposal Site (hours)	Maximum Contaminant Concentration (C_{tox}) Outside Disposal Site (percent)	Dilution Outside Disposal Site ($D_{a\text{-}tox}$)
0	NA	NA	NA
15	NA	NA	NA
30	NA	NA	NA
45	NA	NA	NA
65	NA	NA	NA
54.1	NA	NA	NA

$D_{a\text{-}tox}$ = $(100 - C_{tox}) / C_{tox}$

Shaded row = depth of maximum concentration

1. Concentration outside disposal site (Ctox - C_{ds}) = 0.

SKIFFES CREEK

STFATE Compliance Summary and Model Inputs
LANG-05/06

Summary of STFATE Modeling for Placement of Dredge Material from Skiffes Creek DU 05/06 into the Norfolk ODMDS.

	1-hr		4-hrs			
Placement Volume (cuy)	Dilution Factor	Feet Traveled	Dilution Factor	Feet Traveled	Tier II WQ Violation?	Tier III WQ Violation?
3,000	24	1,140	703	4,173	No	No
4,000	20	1,140	558	4,173	No	No
5,000	17	1,140	468	4,173	No	No
6,000	16	1,140	407	4,173	No	No
6,500	15	1,140	382	4,173	No	No
6,600	15	1,140	378	4,173	No	Yes
7,000	14	1,140	361	4,173	No	Yes

STFATE Model Inputs: Skiffs Creek DU 05/06

INPUT PARAMETER	UNITS	VALUE
SITE DESCRIPTION		
Disposal Site Name		Norfolk ODMDS
Number of grid points (L-R, +z dir)		96
Number of grid points (T-B, +x dir)		96
Grid spacing (Left to Right) Z-Axis	ft	100
Grid spacing (Top to Bottom) X-Axis	ft	100
Constant water depth	ft	65
Bottom roughness	ft	0.005
Bottom slope (x-dir)	deg	0
Bottom slope (z-dir)	deg	0.001
Number of points in density profile		2
0 ft	g/cc	1.0237
30	g/cc	1.0237
65	g/cc	1.0250

AMBIENT VELOCITY		
Type of velocity profile (>= 0.1 fps)		Depth-Averaged
Logarithmic Profile		No
Depth ft	Velocity X (fps)	Velocity Z (fps)
65	0.232	0.232

STFATE Model Inputs: Skiffs Creek DU 05/06

INPUT PARAMETER	UNITS	VALUE
DISPOSAL OPERATION		
Disposal point top of grid (X-Axis)	ft	4,800
Disposal point left edge of grid (Z-Axis)	ft	4,800
Dumpint Over Depression		No
Bottom depression length x-direction	ft	0
Bottom depression length z-direction	ft	0
Bottom depression average depth	ft	0
Location of Disposal Site		
Upper Left Corner Distance from Top Edge (X)	ft	500
Uper Left Corner Distance from Left Edge (Z)	ft	500
Lower Right Corner Distance from Top Edge (X)	ft	8,600
Lower Right Corner Distance from Left Edge (Z)	ft	8,600
Length of vessel bin	ft	165
Width of vessel bin	ft	45
Distance Between Bins	ft	5
Predisposal draft	ft	20
Postdisposal draft	ft	10
Time to empty vessel	s	90
Number of Bins that Open Simultaneously	s	1
Number of Discrete Openings of Sets of Bins	s	1
Vessel velocity in x-direction	ft/s	1.7
Vessel velocity in z-direction	ft/s	0
Number of layers		1
Volume of each layer	yd^3	4,000
COEFFICIENTS		
Settling coef (BETA)		0.000
Apparent mass coefficient (CM)		1.000
Drag coefficient (CD)		0.500
Form drag collapse cloud (CDRAG)		1.000
Skin friction collapse cloud (CFRIC)		0.010
Drag ellipse wedge (CD3)		0.100
Drag plate (CD4)		1.000
Friction between cloud and bottom (FRICTN)		0.010
4/3 Law horizontal diffusion coefficient (ALAMDA)		0.001
Unstratified vertical diffusion coefficient (AKY0)		0.025
Cloud/ambient density gradient ratio (GAMA)		0.250
Turbulent thermal entrainment (ALPHA0)		0.235
Entrainment collapse (ALPHAC)		0.100
Stripping factor (CSTRIP)		0.003
INPUT, EXECUTION & OUTPUT KEYS		
Process to simulate		Disp. from Split-Hull Barge/Scow
Duration of simulation	s	14,400
Long Term Time Step	s	600

STFATE Model Inputs: Skiffs Creek DU 05/06

INPUT PARAMETER	UNITS	VALUE
Convective descent output		
Collapse phase output option		
Number of print times for diffusion		
Number of depths for output		4
Depths for output	ft	0, 15, 30, 45, 65

DREDGE MATERIAL

Location		Skiffs Creek
Bulking Factor		1.0 (sand/gravel), 1.0 (silt/clay)
Site Water Density	g/cc	1.0053

Water Quality - Tier II

Contaminant		Ammonia
Acute Water Quality Criteria at Edge of Mixing Zone (C_{wq})	mg/L	4.91
Predicted initial concentration in fluid (C_s)	mg/L	15
Background concentration (C_{ds})	mg/L	0.12
Dilution Required (D_r)		2.11

Toxicity - Tier III

		Lowest
EC50	% Elutriate	26.3

SKIFFES CREEK

Tier 2 Water Quality Criteria LPC
SC-05/06

Limiting Constituent = Ammonia
Placement Volume = 6,500 cubic yards

TIER 2 STFATE MODEL RESULTS SUMMARY: Skiffes Creek DU 05/06
Norfolk Ocean Disposal Site, Norfolk, VA

Scenario: **Skiffes Creek DU 05/06** **Placement Volume:** **6,500**

Tier II - Water Quality Criteria

Analyte: Ammonia

Water Quality Criterion: **4.91**
Elutriate Concentration (C_s): **15**
Background concentration (C_{ds}): **0.12**
Dilution Required: **2.1**
Dilution Factor Achieved: **380**

WQC Initial Mixing Computation Results: 4-Hour Criterion

Time (hours)	Depth (ft)	Maximum Contaminant Concentration (C_{max}) on Grid	Dilution on Grid ($D_{a\text{-}wq}$)
4.0	0	1.20E-01	8.27E+20
4.0	15	1.20E-01	1.68E+12
4.0	30	1.20E-01	1.47E+06
4.0	45	1.33E-01	1.11E+03
4.0	65	1.25E-01	2.81E+03
4.0	53.5	1.59E-01	3.80E+02

WQC Initial Mixing Computation Results: Disposal Site Boundary Criterion

Depth (ft)	Time Corresponding to C_{max} Outside Disposal Site (hours)	Maximum Contaminant Concentration (C_{max}) Outside Disposal Site (percent)	Dilution Outside Disposal Site ($D_{a\text{-}wq}$)
0	NA	NA	NA
15	NA	NA	NA
30	NA	NA	NA
45	NA	NA	NA
65	NA	NA	NA
53.5	NA	NA	NA

$D_{a\text{-}wq}$ = $(C_s - C_{max}) / (C_{max} - C_{ds})$; where C_s = elutriate concentration and C_{ds} = background concentration

Shaded row = depth of maximum concentration

1. Concentration above backgrond ($C_{max} - C_{ds}$) = 0.

SKIFFES CREEK

Tier 3 Water Column Toxicity LPC
SC-05/06

EC_{50} = 26.3 Percent Elutriate
Placement Volume = 6,500 cubic yards

TIER 3 STFATE MODEL RESULTS SUMMARY: Skiffes Creek DU 05/06

Norfolk Ocean Disposal Site, Norfolk, VA

Scenario: **Skiffes Creek DU 05/06** **Placement Volume (cy): 6,500**

Tier III - Water Column Toxicity

Species: ***Mytilis*** **LPC: 0.263**

Dilution Required: 379

Dilution Achieved: 382

Toxicity Initial Mixing Computation Results: 4-Hour Criterion

Time (hours)	Depth (ft)	Maximum Contaminant Concentration (C_{tox}) on Grid	Dilution on Grid ($D_{a\text{-}tox}$)
4.0	0	1.20E-19	8.33E+20
4.0	15	5.90E-11	1.69E+12
4.0	30	6.72E-05	1.49E+06
4.0	45	8.91E-02	1.12E+03
4.0	65	3.53E-02	2.83E+03
4.0	53.5	2.61E-01	3.82E+02

Toxicity Initial Mixing Computation Results: Disposal Site Boundary Criterion

Depth (ft)	Time Corresponding to C_{tox} Outside Disposal Site (hours)	Maximum Contaminant Concentration (C_{tox}) Outside Disposal Site (percent)	Dilution Outside Disposal Site ($D_{a\text{-}tox}$)
0	NA	NA	NA
15	NA	NA	NA
30	NA	NA	NA
45	NA	NA	NA
65	NA	NA	NA
53.5	NA	NA	NA

$D_{a\text{-}tox}$ = $(100 - C_{tox}) / C_{tox}$

Shaded row = depth of maximum concentration

1. Concentration outside disposal site (Ctox - C_{ds}) = 0.

SKIFFES CREEK

STFATE Compliance Summary and Model Inputs
SC-07/08

Summary of STFATE Modeling for Placement of Dredge Material from Skiffes Creek DU 07/08 into the Norfolk ODMDS.

	1-hr		4-hrs			
Placement Volume (cuy)	Dilution Factor	Feet Traveled	Dilution Factor	Feet Traveled	Tier II WQ Violation?	Tier III WQ Violation?
3,000	23	1,140	693	4,173	No	No
4,000	20	1,140	551	4,173	No	No
5,000	17	1,140	462	4,173	No	No
6,000	15	1,140	402	4,173	No	No
6,800	14	1,140	365	4,173	No	No
6,900	14	1,140	361	4,173	No	Yes
7,000	14	1,140	357	4,173	No	Yes

STFATE Model Inputs: Skiffs Creek DU 07/08

INPUT PARAMETER	UNITS	VALUE
SITE DESCRIPTION		
Disposal Site Name		Norfolk ODMDS
Number of grid points (L-R, +z dir)		96
Number of grid points (T-B, +x dir)		96
Grid spacing (Left to Right) Z-Axis	ft	100
Grid spacing (Top to Bottom) X-Axis	ft	100
Constant water depth	ft	65
Bottom roughness	ft	0.005
Bottom slope (x-dir)	deg	0
Bottom slope (z-dir)	deg	0.001
Number of points in density profile		2
0 ft	g/cc	1.0237
30	g/cc	1.0237
65	g/cc	1.0250

AMBIENT VELOCITY		
Type of velocity profile (>= 0.1 fps)		Depth-Averaged
Logarithmic Profile		No
Depth ft	Velocity X (fps)	Velocity Z (fps)
65	0.232	0.232

STFATE Model Inputs: Skiffs Creek DU 07/08

INPUT PARAMETER	UNITS	VALUE
DISPOSAL OPERATION		
Disposal point top of grid (X-Axis)	ft	4,800
Disposal point left edge of grid (Z-Axis)	ft	4,800
Dumpint Over Depression		No
Bottom depression length x-direction	ft	0
Bottom depression length z-direction	ft	0
Bottom depression average depth	ft	0
Location of Disposal Site		
Upper Left Corner Distance from Top Edge (X)	ft	500
Uper Left Corner Distance from Left Edge (Z)	ft	500
Lower Right Corner Distance from Top Edge (X)	ft	8,600
Lower Right Corner Distance from Left Edge (Z)	ft	8,600
Length of vessel bin	ft	165
Width of vessel bin	ft	45
Distance Between Bins	ft	5
Predisposal draft	ft	20
Postdisposal draft	ft	10
Time to empty vessel	s	90
Number of Bins that Open Simultaneously	s	1
Number of Discrete Openings of Sets of Bins	s	1
Vessel velocity in x-direction	ft/s	1.7
Vessel velocity in z-direction	ft/s	0
Number of layers		1
Volume of each layer	yd^3	4,000
COEFFICIENTS		
Settling coef (BETA)		0.000
Apparent mass coefficient (CM)		1.000
Drag coefficient (CD)		0.500
Form drag collapse cloud (CDRAG)		1.000
Skin friction collapse cloud (CFRIC)		0.010
Drag ellipse wedge (CD3)		0.100
Drag plate (CD4)		1.000
Friction between cloud and bottom (FRICTN)		0.010
4/3 Law horizontal diffusion coefficient (ALAMDA)		0.001
Unstratified vertical diffusion coefficient (AKY0)		0.025
Cloud/ambient density gradient ratio (GAMA)		0.250
Turbulent thermal entrainment (ALPHA0)		0.235
Entrainment collapse (ALPHAC)		0.100
Stripping factor (CSTRIP)		0.003
INPUT, EXECUTION & OUTPUT KEYS		
Process to simulate		Disp. from Split-Hull Barge/Scow
Duration of simulation	s	14,400
Long Term Time Step	s	600

STFATE Model Inputs: Skiffs Creek DU 07/08

INPUT PARAMETER	UNITS	VALUE
Convective descent output		
Collapse phase output option		
Number of print times for diffusion		
Number of depths for output		4
Depths for output	ft	0, 15, 30, 45, 65

DREDGE MATERIAL

Location		Skiffs Creek
Bulking Factor		1.0 (sand/gravel), 1.0 (silt/clay)
Site Water Density	g/cc	1.0053

Water Quality - Tier II

Contaminant		Ammonia
Acute Water Quality Criteria at Edge of Mixing Zone (C_{wq})	mg/L	4.91
Predicted initial concentration in fluid (C_s)	mg/L	20
Background concentration (C_{ds})	mg/L	0.12
Dilution Required (D_r)		3.15

Toxicity - Tier III

		Lowest
EC50	% Elutriate	27.6

SKIFFES CREEK

Tier 2 Water Quality Criteria LPC
SC-07/08

Limiting Constituent = Ammonia
Placement Volume = 6,800 cubic yards

TIER 2 STFATE MODEL RESULTS SUMMARY: Skiffes Creek DU 07/08

Norfolk Ocean Disposal Site, Norfolk, VA

Scenario: **Skiffes Creek DU 09/10** **Placement Volume: 6,800**

Tier II - Water Quality Criteria

Analyte: Ammonia

Water Quality Criterion: 4.91

Elutriate Concentration (C_s): 20

Background concentration (C_{ds}): 0.12

Dilution Required: 3.2

Dilution Factor Achieved: 358

WQC Initial Mixing Computation Results: 4-Hour Criterion

Time (hours)	Depth (ft)	Maximum Contaminant Concentration (C_{max}) on Grid	Dilution on Grid ($D_{a\text{-}wq}$)
4.0	0	1.20E-01	2.70E+20
4.0	15	1.20E-01	8.84E+11
4.0	30	1.20E-01	1.09E+06
4.0	45	1.40E-01	9.98E+02
4.0	65	1.28E-01	2.65E+03
4.0	53.3	1.75E-01	3.58E+02

WQC Initial Mixing Computation Results: Disposal Site Boundary Criterion

Depth (ft)	Time Corresponding to C_{max} Outside Disposal Site (hours)	Maximum Contaminant Concentration (C_{max}) Outside Disposal Site (percent)	Dilution Outside Disposal Site ($D_{a\text{-}wq}$)
0	NA	NA	NA
15	NA	NA	NA
30	NA	NA	NA
45	NA	NA	NA
65	NA	NA	NA
53.3	NA	NA	NA

$D_{a\text{-}wq}$ = $(C_s - C_{max}) / (C_{max} - C_{ds})$; where C_s = elutriate concentration and C_{ds} = background concentration

Shaded row = depth of maximum concentration

1. Concentration above backgrond ($C_{max} - C_{ds}$) = 0.

SKIFFES CREEK

Tier 3 Water Column Toxicity LPC
SC-07/08

EC_{50} = 27.6 Percent Elutriate
Placement Volume = 6,800 cubic yards

TIER 3 STFATE MODEL RESULTS SUMMARY: Skiffes Creek DU 07/08

Norfolk Ocean Disposal Site, Norfolk, VA

Scenario: **Skiffes Creek DU 07/08** **Placement Volume (cy): 6,800**

Tier III - Water Column Toxicity

Species: ***Mytilis*** **LPC: 0.276**

Dilution Required: 361

Dilution Achieved: 365

Toxicity Initial Mixing Computation Results: 4-Hour Criterion

Time (hours)	Depth (ft)	Maximum Contaminant Concentration (C_{tox}) on Grid	Dilution on Grid ($D_{a\text{-}tox}$)
4.0	0	3.88E-19	2.58E+20
4.0	15	1.15E-10	8.70E+11
4.0	30	9.18E-05	1.09E+06
4.0	45	9.85E-02	1.01E+03
4.0	65	3.70E-02	2.70E+03
4.0	53.3	2.73E-01	3.65E+02

Toxicity Initial Mixing Computation Results: Disposal Site Boundary Criterion

Depth (ft)	Time Corresponding to C_{tox} Outside Disposal Site (hours)	Maximum Contaminant Concentration (C_{tox}) Outside Disposal Site (percent)	Dilution Outside Disposal Site ($D_{a\text{-}tox}$)
0	NA	NA	NA
15	NA	NA	NA
30	NA	NA	NA
45	NA	NA	NA
65	NA	NA	NA
53.3	NA	NA	NA

$D_{a\text{-}tox}$ = $(100 - C_{tox}) / C_{tox}$

Shaded row = depth of maximum concentration

1. Concentration outside disposal site (Ctox - C_{ds}) = 0.

SKIFFES CREEK

STFATE Compliance Summary and Model Inputs
SC-09/10

Summary of STFATE Modeling for Placement of Dredge Material from Skiffes Creek DU 09/10 into the Norfolk ODMDS.

	1-hr		4-hrs			
Placement Volume (cuy)	Dilution Factor	Feet Traveled	Dilution Factor	Feet Traveled	Tier II WQ Violation?	Tier III WQ Violation?
3,000	23	1,140	684	4,173	No	No
4,000	19	1,140	542	4,173	No	No
5,000	17	1,140	456	4,173	No	No
5,600	16	1,140	417	4,173	No	No
5,700	16	1,140	412	4,173	No	Yes
6,000	15	1,140	396	4,173	No	Yes

STFATE Model Inputs: Skiffs Creek DU 09/10

INPUT PARAMETER	UNITS	VALUE
SITE DESCRIPTION		
Disposal Site Name		Norfolk ODMDS
Number of grid points (L-R, +z dir)		96
Number of grid points (T-B, +x dir)		96
Grid spacing (Left to Right) Z-Axis	ft	100
Grid spacing (Top to Bottom) X-Axis	ft	100
Constant water depth	ft	65
Bottom roughness	ft	0.005
Bottom slope (x-dir)	deg	0
Bottom slope (z-dir)	deg	0.001
Number of points in density profile		2
0 ft	g/cc	1.0237
30	g/cc	1.0237
65	g/cc	1.0250

AMBIENT VELOCITY		
Type of velocity profile (>= 0.1 fps)		Depth-Averaged
Logarithmic Profile		No
Depth ft	Velocity X (fps)	Velocity Z (fps)
65	0.232	0.232

STFATE Model Inputs: Skiffs Creek DU 09/10

INPUT PARAMETER	UNITS	VALUE
DISPOSAL OPERATION		
Disposal point top of grid (X-Axis)	ft	4,800
Disposal point left edge of grid (Z-Axis)	ft	4,800
Dumpint Over Depression		No
Bottom depression length x-direction	ft	0
Bottom depression length z-direction	ft	0
Bottom depression average depth	ft	0
Location of Disposal Site		
Upper Left Corner Distance from Top Edge (X)	ft	500
Uper Left Corner Distance from Left Edge (Z)	ft	500
Lower Right Corner Distance from Top Edge (X)	ft	8,600
Lower Right Corner Distance from Left Edge (Z)	ft	8,600
Length of vessel bin	ft	165
Width of vessel bin	ft	45
Distance Between Bins	ft	5
Predisposal draft	ft	20
Postdisposal draft	ft	10
Time to empty vessel	s	90
Number of Bins that Open Simultaneously	s	1
Number of Discrete Openings of Sets of Bins	s	1
Vessel velocity in x-direction	ft/s	1.7
Vessel velocity in z-direction	ft/s	0
Number of layers		1
Volume of each layer	yd^3	4,000
COEFFICIENTS		
Settling coef (BETA)		0.000
Apparent mass coefficient (CM)		1.000
Drag coefficient (CD)		0.500
Form drag collapse cloud (CDRAG)		1.000
Skin friction collapse cloud (CFRIC)		0.010
Drag ellipse wedge (CD3)		0.100
Drag plate (CD4)		1.000
Friction between cloud and bottom (FRICTN)		0.010
4/3 Law horizontal diffusion coefficient (ALAMDA)		0.001
Unstratified vertical diffusion coefficient (AKY0)		0.025
Cloud/ambient density gradient ratio (GAMA)		0.250
Turbulent thermal entrainment (ALPHA0)		0.235
Entrainment collapse (ALPHAC)		0.100
Stripping factor (CSTRIP)		0.003
INPUT, EXECUTION & OUTPUT KEYS		
Process to simulate		Disp. from Split-Hull Barge/Scow
Duration of simulation	s	14,400
Long Term Time Step	s	600

STFATE Model Inputs: Skiffs Creek DU 09/10

INPUT PARAMETER	UNITS	VALUE
Convective descent output		
Collapse phase output option		
Number of print times for diffusion		
Number of depths for output		4
Depths for output	ft	0, 15, 30, 45, 65

DREDGE MATERIAL

Location		Skiffs Creek
Bulking Factor		1.0 (sand/gravel), 1.0 (silt/clay)
Site Water Density	g/cc	1.0053

Water Quality - Tier II

Contaminant		Ammonia
Acute Water Quality Criteria at Edge of Mixing Zone (C_{wq})	mg/L	4.91
Predicted initial concentration in fluid (C_s)	mg/L	20
Background concentration (C_{ds})	mg/L	0.12
Dilution Required (D_r)		3.15

Toxicity - Tier III

		Lowest
EC50	% Elutriate	24.2

SKIFFES CREEK

Tier 2 Water Quality Criteria LPC
SC-09/10

Limiting Constituent = Ammonia
Placement Volume = 5,600 cubic yards

TIER 2 STFATE MODEL RESULTS SUMMARY: Skiffes Creek DU 09/10
Norfolk Ocean Disposal Site, Norfolk, VA

Scenario: **Skiffes Creek DU 09/10** **Placement Volume:** **5,600**

Tier II - Water Quality Criteria

Analyte: Ammonia

Water Quality Criterion: **4.91**
Elutriate Concentration (C_s): **20**
Background concentration (C_{ds}): **0.12**
Dilution Required: **3.2**
Dilution Factor Achieved: **415**

WQC Initial Mixing Computation Results: 4-Hour Criterion

Time (hours)	Depth (ft)	Maximum Contaminant Concentration (C_{max}) on Grid	Dilution on Grid (D_{a-wq})
4.0	0	1.20E-01	3.55E+22
4.0	15	1.20E-01	1.41E+13
4.0	30	1.20E-01	3.86E+06
4.0	45	1.34E-01	1.46E+03
4.0	65	1.26E-01	3.07E+03
4.0	53.8	1.68E-01	4.15E+02

WQC Initial Mixing Computation Results: Disposal Site Boundary Criterion

Depth (ft)	Time Corresponding to C_{max} Outside Disposal Site (hours)	Maximum Contaminant Concentration (C_{max}) Outside Disposal Site (percent)	Dilution Outside Disposal Site (D_{a-wq})
0	NA	NA	NA
15	NA	NA	NA
30	NA	NA	NA
45	NA	NA	NA
65	NA	NA	NA
53.8	NA	NA	NA

D_{a-wq} = $(C_s - C_{max}) / (C_{max} - C_{ds})$; where C_s = elutriate concentration and C_{ds} = background concentration

Shaded row = depth of maximum concentration

1. Concentration above backgrond ($C_{max} - C_{ds}$) = 0.

SKIFFES CREEK

Tier 3 Water Column Toxicity LPC
SC-09/10

EC_{50} = 24.2 Percent Elutriate
Placement Volume = 5,600 cubic yards

TIER 3 STFATE MODEL RESULTS SUMMARY: Skiffes Creek DU 09/10
Norfolk Ocean Disposal Site, Norfolk, VA

Scenario: **Skiffes Creek DU 09/10** **Placement Volume (cy): 5,600**

Tier III - Water Column Toxicity

Species: ***Mytilis*** **LPC: 0.242**

Dilution Required: 412

Dilution Achieved: 417

Toxicity Initial Mixing Computation Results: 4-Hour Criterion

Time (hours)	Depth (ft)	Maximum Contaminant Concentration (C_{tox}) on Grid	Dilution on Grid ($D_{a\text{-}tox}$)
4.0	0	2.80E-21	3.57E+22
4.0	15	7.06E-12	1.42E+13
4.0	30	2.58E-05	3.88E+06
4.0	45	6.80E-02	1.47E+03
4.0	65	3.24E-02	3.09E+03
4.0	53.8	2.39E-01	4.17E+02

Toxicity Initial Mixing Computation Results: Disposal Site Boundary Criterion

Depth (ft)	Time Corresponding to C_{tox} Outside Disposal Site (hours)	Maximum Contaminant Concentration (C_{tox}) Outside Disposal Site (percent)	Dilution Outside Disposal Site ($D_{a\text{-}tox}$)
0	NA	NA	NA
15	NA	NA	NA
30	NA	NA	NA
45	NA	NA	NA
65	NA	NA	NA
53.8	NA	NA	NA

$D_{a\text{-}tox}$ = $(100 - C_{tox}) / C_{tox}$

Shaded row = depth of maximum concentration

1. Concentration outside disposal site (Ctox - C_{ds}) = 0.