Appendix A

Agency Coordination

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
55 Great Republic Drive
Gloucester, MA 01930-2276

MAR 25 2014

Elizabeth G. Waring
Chief, Operations Branch
Department of the Army
Norfolk Corps of Engineers
Fort Norfolk 803 Front Street
Norfolk, VA 23510-1096

Re: Defense Logistics Agency (DLA) Fuel Pier Replacement Project

Dear Ms. Waring,

We have completed an Endangered Species Act (ESA) section 7 consultation in response to your letter of December 3, 2013, and additional information of February 10, 2014 and February 19, 2014. We concur with your determination that authorization of the project is not likely to adversely affect any species listed by us as threatened or endangered under the ESA of 1973, as amended. Our supporting analysis is provided below.

Proposed Action and Action Area Description
You have been identified as the lead federal action agency for the activities involved with the replacement of the DLA fuel pier at the Joint Base Langley-Eustis (JBLE) on Langley Air Force Base (LAFB) in Hampton, Virginia. The DLA fuel pier is bounded on the west by Building 722 on the LAFB, and on the east by the Southwest Branch of Back River.

The project includes the construction of the new fuel pier, demolition of the existing fuel pier, and new dredging for the proposed fuel pier's turning basin and approach channel. The project footprint is approximately 10.87 acres, and the dredging area is approximately 6.06 acres. Dredging will be accomplished via mechanical or hydraulic cutterhead and will be maintained at -15 feet mean lower low water (MLLW). You estimate that 45,000 cubic yards of material will need to be removed for the turning basin and approach channel, and the permit authorizes the work over a 5-year period. The material will be disposed of at an open ocean site: Norfolk Ocean Disposal Site (NODS), which is located approximately 35 miles east of the site, outside of the Chesapeake Bay. The 50 year-old existing timber pier will be removed via vibration, and a new concrete pier with 176 20-inch concrete piles will be constructed via impact or vibratory pile driving.

NMFS listed species in the Action Area
The action area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR § 402.02). For the project, the action area includes the dredging and disposal areas, as well as all underwater areas where

the effects of dredging may occur, as well as the pier footprint, and vessel routes to and from the action area during construction, dredging, and disposal activities. Based upon analysis of other mechanical dredging activities (Burton, 1993; ACOE, 2007), suspended sediment plumes are expected to be fully dissipated at a distance of 2,034 to 4,921 feet from the dredge site. Based on analysis of hydraulic cutterhead dredging activities (ACOE,1983), increased sediment levels are likely to be present for no more than 1,000 feet downstream of the dredge area.

Marine Mammals

Several endangered species of large whales, including the right whale (*Eubalaena glacialis*), humpback whale (*Megaptera novaeangliae*), finback (*Balaenoptera physalis*), the sei (*Balaenoptera borealis*), and the sperm whale (*Physeter macrocephalus*) may be present along the Atlantic seaboard during certain times of the year. However, the action area, characterized by shallow depths (-15 MLLW), and estuarine waters, does not typify habitat used by these marine mammals along the Virginia coast, and noise will not propagate to areas where suitable habitat exists because of the considerable distance to deeper waters outside the Chesapeake Bay where suitable conditions exist for large whales. As such, we do not expect any effects to these species resulting from the dredging and pile driving activities. However, because the disposal of dredged material will be occurring at an ocean site 35 miles east of the dredge footprint, we consider the presence of these species along the vessel route to and from the disposal site, as well as at the disposal site, itself.

Sea Turtles

Four species of ESA-listed threatened or endangered sea turtles under the jurisdiction of NMFS may be found seasonally in the coastal waters of Virginia and in Chesapeake Bay: the threatened Northwest Atlantic distinct population segment (DPS) of loggerhead (*Caretta caretta*), and the endangered Kemp's ridley (*Lepidochelys kempi*), green (*Chelonia mydas*) and leatherback (*Dermochelys coriacea*) sea turtles, although the latter species tends to frequent offshore habitats more often than coastal habitat. Sea turtles are expected to be in Virginia waters during warmer months. This typically equates to April through November (Morreale, 1999; Morreale, 2003; Morreale and Standora, 2005; Shoop and Kenney, 1992).

Satellite tracking studies of sea turtles has found that foraging turtles mainly occurred in areas where the water depth was between approximately 16 and 49 feet (Ruben and Morreale, 1999). This depth was interpreted not to be as much an upper physiological depth limit for turtles, as a natural limiting depth where light and food are most suitable for foraging turtles (Morreale and Standora, 1990). Sea turtles may move into shallower or deeper waters during migration, resting, and other activities. Leatherback sea turtles feed almost exclusively on jellyfish in offshore marine environments, whereas green sea turtles tend to frequent sea grass beds. Loggerhead sea turtles and Kemp's ridley sea turtles will feed on mollusks and crustaceans in a variety of habitats. Sea turtles have not been shown to exhibit sensitivity to increased suspended sediments; however, if prey items are affected, adverse effects to sea turtles may occur as well. Sea turtles may be present within the action area.

Atlantic sturgeon

Atlantic sturgeon are long-lived (approximately 60 years), late maturing, estuarine dependent, anadromous[1] fish (Bigelow and Schroeder, 1953; Vladykov and Greeley, 1963; Mangin, 1964; Pikitch *et al.,* 2005; Dadswell, 2006; ASSRT, 2007). They are a relatively large fish, even amongst sturgeon species (Pikitch *et al.,* 2005). Diets of adult and migrant subadult Atlantic sturgeon include mollusks, gastropods, amphipods, annelids, decapods, isopods, and fish such as sand lance (Bigelow and Schroeder, 1953; ASSRT, 2007; Guilbard *et al.,* 2007; Savoy, 2007). Juvenile Atlantic sturgeon feed on aquatic insects, insect larvae, and other invertebrates (Bigelow and Schroeder, 1953; ASSRT, 2007; Guilbard *et al.,* 2007).

Atlantic sturgeon originating from the New York Bight, Chesapeake Bay, South Atlantic and Carolina DPSs are listed as endangered, while those from the Gulf of Maine DPS are listed as threatened. The marine range of all five DPSs extends along the Atlantic coast from Canada to Cape Canaveral, Florida. The distribution of Atlantic sturgeon, from any DPS, is strongly associated with prey availability. As a result, Atlantic sturgeon may occur where suitable forage (e.g., benthic invertebrates such as mollusks and crustaceans) and appropriate habitat conditions (e.g., areas of submerged aquatic vegetation (SAV)) are present. Atlantic sturgeon also tend to be at least as tolerant of turbid estuarine and river conditions as other anadromous fish, such as striped bass (Summerfelt and Moiser 1976 and Combs, 1979 in Burton, 1993). Dadswell (1984) reports that sturgeon are more active under lowered light conditions, such as those in turbid waters.

Based on the best available information, the Chesapeake Bay DPS is believed to spawn in upstream reaches of the James River. The 340 mile long James River is Virginia's largest river and the largest tributary to the Chesapeake Bay (Bushnoe *et al.*, 2005). Tidal waters extend from the mouth, west to Richmond, VA, at the river's fall line (Bushnoe *et al.*, 2005). Based on modeling work using features associated with spawning habitat (e.g., suitable substrate), Bushnoe *et al.* (2005) concluded that the Turkey Island oxbow and the James Neck oxbow were potential spawning sites for Atlantic sturgeon in the James River (upstream of river mile 48). Adult sturgeon appear to be absent from the James River for most of the summer until late August when tagged fish are detected in the river (Hager *et al.*, 2011). During the late summer-early fall residency (August-October), fish ascend the river rapidly and congregate in upriver sites between river mile 48 and the fall line near Richmond, VA, likely for spawning activities. As temperature declines in late September or early October, adults disperse through downriver sites and begin to move out of the river (Hager *et al.*, 2011). By November, adults occupy only lower river sites (Hager *et al.*, 2011). By December, adults are undetected on the tracking array and, thus, are presumed to be out of the river (Hager *et al.*, 2011).Based on the best available information, sub adult and adult Atlantic sturgeon originating from any of five DPSs could occur in marine and estuarine habitat along the coast of Virginia and in Chesapeake Bay. Juvenile and early life stages (ELS) of Atlantic sturgeon would not be present based on the tidal marine nature of the habitat in the action area. Juveniles and ELS are not able to withstand the salinity of marine and coastal waters.

[1] Anadromous refers to a fish that is born in freshwater, spends most of its life in the sea, and returns to freshwater to spawn (NEFSC FAQ's, available at http://www.nefsc.noaa.gov/faq/fishfaq1a.html, modified June 16, 2011).

Effects of the Action

Turbidity and Habitat Effects

The proposed dredging will cause a temporary increase in the amount of turbidity in the action area; however, suspended sediment is expected to settle out of the water column within a few hours and any increase in turbidity will be short term. The turbidity plume associated with a typical mechanical dredging operation extends approximately 1,000 feet at the surface and 1,600 feet near the bottom (ACOE, 1983). The maximum distance reported in the literature is 4,921 feet, which occurred in an area with very strong tidal currents (ACOE, 2007). Cutterhead dredging is expected to produce plumes that only extend approximately 1,000 feet downstream from the action area (ACOE, 2007). Several studies have monitored sediment plumes associated with dredging projects along the Atlantic coast. Turbidity levels associated with these sediment plumes typically range from 26-350mg/L for mechanical dredging (ACOE, 2007; Anchor Environmental, 2003) with the highest levels detected adjacent to the dredge bucket and concentrations decreasing with greater distance from the dredge (see ACOE, 2007). Turbidity levels associated with hydraulic dredging activities produce sediment plumes typically ranging in concentrations from 11.5 to 282.0 mg/L (ACOE, 2007, Anchor Environmental, 2003). Disposal activities will occur offshore at a designated disposal site discussed separately in this consultation, and turbidity effects will be discussed in that section.

Studies of the effects of turbid waters on fish suggest that concentrations of suspended solids can reach thousands of milligrams per liter before an acute toxic reaction is expected (Burton, 1993). The studies reviewed by Burton demonstrated lethal effects to fish at concentrations of 580.0 mg/L to 700,000.0 mg/L depending on species. Studies with striped bass adults showed that pre-spawners did not avoid concentrations of 954.0 to 1,920.0 mg/L to reach spawning sites (Summerfelt and Moiser, 1976 and Combs, 1979 in Burton, 1993). While there have been no directed studies on the effects of total suspended solids (TSS) on Atlantic sturgeon, sturgeon sub-adults and adults are often documented in turbid water and Dadswell (1984) reports that sturgeon are more active under lowered light conditions, such as those in turbid waters. Additionally, Atlantic sturgeon tend to frequent the salt fronts of rivers where turbidity is higher than other portions of the waterbody. As such, Atlantic sturgeon are assumed to be as least as tolerant of suspended sediment as shortnose sturgeon and other estuarine fish such as striped bass. Atlantic sturgeon are not likely to be adversely affected by the plume created by dredging activities due to Atlantic sturgeon tolerance of turbid conditions. Limited information is available on the effects of increased turbidity on juvenile and adult sea turtles; however, sea turtles breathe air, and are not subject to the same potential respiratory effects of high turbidity as fish are. As such all direct effects of turbidity associated with sediment removal are discountable.

Sediment removal may also cause effects on sturgeon and sea turtles by reducing prey species through the alteration of the existing biotic assemblages and habitat. The habitat characteristics of the action area are sub-optimal for sea turtle and sturgeon foraging (*i.e.*, no SAV for sea turtles and limited benthic invertebrates for sturgeon and sea turtles). Atlantic sturgeon and sea turtles are not likely to use any portions of the action area as foraging grounds (highly utilized pier where ships offload), and therefore, the alteration of the habitat as a result of sediment removal is not likely to remove critical amounts of prey resources for sturgeon or sea turtles. Therefore,

there would not be any disruption of essential behaviors such as foraging. Based on this information, the effects of sediment removal on Atlantic sturgeon and sea turtle foraging are insignificant and discountable. These nearshore estuarine waters preclude the presence of large whales because of depth and lack of appropriate pelagic prey items. There will be no effect of turbidity or habitat loss on marine mammals.

Direct Interaction with Dredges

Mechanical dredges or cutterhead dredges will be used to remove accumulated sediments in the action area during each maintenance cycle (up to two under this permit duration are possible). Optimal foraging habitat is not likely to be present (*i.e.*, areas of shellfish, seagrass, mudflat habitat) because the areas around the fuel pier are consistently disturbed during docking events. In the unlikely event that adult and sub-adult Atlantic sturgeon or sea turtles were in the action area for reasons besides foraging, they would not be susceptible to entrainment in cutterhead or mechanical dredges. Cutterhead dredge heads are placed within the sediments at the dredge site, and the pipe diameters of the dredges are small (less than 36 inches). The fish that may be in the action area would be sub-adult and adult Atlantic sturgeon, which are quite large, and not subject to entrainment in cutterhead dredges because of their large size and ability to avoid the slow intake velocity of the dredge. Sea turtles are also able to avoid the suction and slow intake velocity of cutterhead dredges.

Mechanical dredges are relatively stationary. The operation entails lowering the open bucket through the water column, closing the bucket after impact on the bottom, lifting the bucket up through the water column, and emptying the bucket into a barge at a slow pace. Additionally, mechanical dredging lacks suction. The combination of these factors allows strong-swimming Atlantic sturgeon and sea turtles to maneuver around this type of dredging activity. All direct effects to Atlantic sturgeon and sea turtles as a result of cutterhead or mechanical dredging will be discountable during all maintenance dredging events.

Noise

The action consists of two potential noise producing activities, including the vibration to remove the old timber piles and concrete pile driving via impact or vibratory hammer. The installation of piles via pile driving can produce underwater sound pressure waves that may affect aquatic species, including Atlantic sturgeon and sea turtles. Effects to fish can range from temporary avoidance of an area to death due to injury of internal organs, such as swim bladders. There is little known about the hearing capabilities of sea turtles; however, several studies have indicated that behavioral modifications or injury to hearing can result from sound levels above certain thresholds for these species. The type and size of pile, type of installation method *(i.e.*, vibratory vs. impact hammer), type and size of the organism (smaller individuals are more susceptible to effects), and distance from the sound source (*i.e.*, sound dissipates over distance so noise levels are greater closer to the source) all contribute to the likelihood of effects to an individual. Generally, the larger the pile and the closer an individual is to the pile, the greater the likelihood of effects.

Increased sound levels in the aquatic environment may affect NMFS listed species in different ways at different decibel levels. McCauley *et al.* (2000) noted that decibel levels of 166 dB re 1μPa_{RMS} were required before any behavioral reaction (*e.g.*, increased swimming speed) was observed in sea turtles, and decibel levels above 175 dB re 1μPa_{RMS} elicited avoidance behavior of sea turtles. The study done by McCauley *et al.* (2000), as well as other studies done to date, used impulsive sources of noise (*e.g.*, air gun arrays) to ascertain the underwater noise levels that produce behavioral modifications in sea turtles. Pile driving is also an impulse noise. As no other studies have been done to assess the effects of noise sources on sea turtles, McCauley *et al.* (2000) serves as the best available information on the levels of underwater noise that may produce a startle, avoidance, and/or other behavioral or physiological response in sea turtles. Based on this and the best available information, NMFS believes any underwater noise levels at or above 166 dB has the potential to adversely affect sea turtles (*e.g.*, behavioral modification, temporary threshold shifts). Injury thresholds for sea turtles are estimated to be much higher at 207 dB_{RMS} re 1μPa_{RMS} (Young, 1991; Keevin and Hempen, 1997; SVT Engineering Consultants, 2010).

Underwater noise and increased sound pressure created by pile driving may affect fish hearing and damage their air containing organs, such as the swim bladder. An interagency work group, including the U.S. Fish and Wildlife Service (USFWS) and NMFS, has reviewed the best available scientific information and developed criteria for assessing the potential of pile driving activities to cause injury to fish (Fisheries Hydroacoustic Working Group (FHWG) 2008). The workgroup established dual sound criteria for injury, measured 10 meters away from the pile, of 206 dB re 1 μPa_{Peak} and 187 dB accumulated sound exposure level (dBcSEL; re: 1μPa^2•sec) (183 dB accumulated SEL for fish less than 2 grams). While this work group is based on the U.S. West Coast, species similar to Atlantic sturgeon were considered in developing this guidance (green sturgeon). As these species are biologically similar to the species being considered herein, it is reasonable to use the criteria developed by the FHWG.

In addition, for purposes of assessing behavioral effects of pile driving at several West Coast projects, NMFS has employed a 150 dB re 1 μPa_{RMS} sound pressure level criterion at several sites, including the San Francisco-Oakland Bay Bridge and the Columbia River Crossings. As we are not aware of any studies that have considered the behavior of Atlantic sturgeon in response to pile driving noise, given the available information from studies on other fish species (*i.e.*, Anderson *et al.*, 2007; Purser and Radford, 2011; Wysocki *et al.*, 2007), we consider 150 dB re 1 μPa_{RMS} to be a reasonable estimate of the noise level at which exposure may result in behavioral modifications. As such, for the purposes of this consultation, we will use 150 dB re 1 μPa_{RMS} as a conservative indicator of the noise level at which there is the potential for behavioral effects. That is not to say that exposure to noise levels of 150 dB re 1 μPa_{RMS} will always result in behavioral modifications, but that there is the potential, upon exposure to noise at this level, to experience some behavioral response (e.g., temporary startle to avoidance of an ensonified area).

Table 1. Estimated average underwater noise levels produced by the driving of timber piles.

Type Pile	Hammer Type	Estimated Peak Noise Level (dB_{Peak})[2]	Estimated Pressure Level (dB_{RMS})[3]	Estimated cumulative sound exposure level (cSEL)[4]
12-inch-24-inch diameter Timber Piles	Impact	180	170	160
10-inch-12-inch diameter Timber Piles	Vibratory[5]	170	160	150
20-inch Concrete Pile	Impact	185	170	160
20-inch Concrete Pile	Vibratory	175	160	150

The usage of vibratory means to remove timber piles is expected to produce noise levels similar to those produced during installation of timber piles. Based on the best available information, peak pressure levels and cSEL levels produced by the vibratory removal of timber piles and impact or vibratory driving of concrete piles considered in this consultation will produce underwater noise levels below 206 dB re 1 μPa_{Peak} and 187cSEL for Atlantic sturgeon, and below 207 dB_{RMS} re 1μPa_{RMS} for sea turtles, within 10 meters of the pile being driven. As such, injury levels for Atlantic sturgeon and sea turtles will not be reached. Behavioral effects, such as avoidance or disruption of foraging activities, may occur in sea turtles at 166 dB re 1μPa_{RMS}, and

[2] Peak sound pressure level is the largest absolute value of the instantaneous sound pressure and is expressed as dB re: 1 µPa.

[3] Root Mean Square (RMS) pressure is the square root of the time average of the squared pressure and is expressed as dB re: 1 µPa. Current thresholds for determining impacts to sea turtles typically center around RMS.

[4] Sound Exposure Level (SEL) is defined as the integration over time of the squared instantaneous sound pressure normalized to a 1-sec period and is expressed as dB re: 1μPa^2•sec. Accumulative or cumulative SEL (cSEL) is calculated as SELcumulative = SELsingle strike + 10 log (# of pile strikes).

[5] Vibratory hammers produce underwater noise levels that are approximately 10-20 dB re: 1µPa lower than those produced by a impact hammer (Laughlin 2005). A worst case scenario of a 10 dB reduction was assumed.

at 150 dB re 1 μPa $_{RMS}$ for Atlantic sturgeon. Under a worst case scenario, at 20 meters from a pile being driven, noise levels will have attenuated below 160 dB re 1 μPa $_{RMS,}$ and are not likely to adversely affect listed sea turtles, and at 30 meters, sound levels will be at 150 dB re 1 μPa $_{RMS}$, which is not likely to adversely affect Atlantic sturgeon. For this pier, the pile driving activities will be occurring in relatively shallow coastal areas, within 400 feet of the shoreline in an estuary, where noise attenuation occurs quickly because of shallow depths and because the shoreline creates an obstacle to the propagation of sound waves. Sound propagates faster in deeper water where more liquid medium is present. Overall, effects of increased noise levels will be temporary and sporadic and only occupy small areas (20-30 meters (60-90 feet)) of the waterbody where work is being undertaken. For this project, the location of the action is within the estuarine area of Back River, where ample passage to and from Chesapeake Bay is available. At the project site, approximately 3,000 feet is available for passage across the water way at the pier site, and according to the calculations associated with the action, a large zone of passage free of ensonification will be preserved during pile driving activities. Although 176 piles are expected to be put into place during this action, because piles are driven one at a time, and such a large area for passage away from the ensonified area is present and in an area with low potential to provide significant resources to listed species, cumulative noise effects are not expected to occur. As such, the temporary and cumulative increases in noise do not represent a significant barrier to necessary life functions of either sea turtles or Atlantic sturgeon, and any effects of increased underwater noise are insignificant.

Disposal Activities

The use of offshore dredged material disposal sites can affect sea turtles and sturgeon by: exposing them to increased levels of turbidity and suspended sediments; increasing the potential for exposure to contaminants; affecting benthic resources; and, increasing vessel traffic in the area. Dredged material placed at the NODS disposal site must be verified as suitable *(i.e.*, contaminant levels below those known to create adverse effects) before disposal can take place. The material related to this project has been verified as suitable to be disposed of at the NODS.

Dredged material placement operations at the ocean disposal sites are anticipated to have localized and temporary impacts to water quality. Dredged material designated for placement at these sites will be transported to the ocean placement site via bottom dump scow or split hull barges. Upon release from the barge, dredged material will enter the water column as a dense fluid plume, which will descend vertically. The dense fluid plume will descend to the bottom at a high velocity, leaving behind a low-density turbidity cloud, which will contain a small amount of total solids and settle within a few hours (USACE, 2010a). This temporary increase in turbidity in the water column when dredged material is released will cause short-term impacts that may include lower levels of dissolved oxygen for a few hours following material placement at the immediate site. During the discharge of sediment at offshore disposal sites, suspended sediment levels have been reported as high as 500.0 mg/l within 250 feet of the disposal vessel and decreasing to background levels (i.e., 15.0-100.0 mg/l depending on location and sea conditions) within 1,000-6,500 feet (USACE 1983). Total suspended solids near the center of the dredged material placement plume body have been observed to reach near background levels in 35 to 45 minutes (Battele 1994 in USACE and USEPA 2009).

TSS is most likely to affect sea turtles and Atlantic sturgeon if a plume causes a barrier to normal behaviors or if sediment settles on the bottom and affects benthic prey. As sea turtles and Atlantic sturgeon are highly mobile, individuals are likely to be able to avoid any sediment plume that is present and any effect on their movements or behavior is likely to be insignificant due to the small, temporary disruption of normal movements that may result from avoiding the sediment plume.

Disposal operations can also affect foraging animals by burying benthic prey. Direct impacts to fish or other mobile species during placement of the dredged material would be expected to be minimal due to the small contact footprint of the fluidized sediments as they leave the barge (typically 50 foot by 100 foot). Given the small area impacted by the disposal event, mobile species are expected to be able to avoid the falling sediment and would not be subject to burial. The only species that are likely to be buried are immobile benthic organisms. Sea grasses and macroalgae that green sea turtles forage on are not present at the disposal sites. The species that leatherback sea turtles forage on are mobile and not likely to be vulnerable to burial. Some species of mollusks and gastropods that loggerheads, Kemp's ridleys, and Atlantic sturgeon feed on have limited mobility and could be buried during disposal operations. The loss of potential benthic prey species would be minimized spatially and temporally through use of a grid system for the placement of dredged material. Some buried animals will be able to unbury themselves. Areas where dredged material will be placed are expected to be recolonized by individuals from nearby similar habitats. Because the characteristics of the sediment from the project would be similar to those in and around the disposal sites, benthic invertebrates would be expected to quickly recolonize the cells used for the placement of this material. Thus, any reduction in benthic prey at the disposal site will be temporary and limited to the small area where dredged material will be placed. Green and leatherback sea turtles will not have any reduction in prey. The potential loss of prey for loggerhead and Kemp's ridley sea turtles, and Atlantic sturgeon will be extremely small, as only a fraction of the benthic prey species will be affected, and those losses will occur in a very small area. Effects to foraging loggerhead and Kemp's ridley sea turtles, as well as Atlantic sturgeon foraging on similar benthic invertebrates will be insignificant. Marine mammals feed on pelagic prey and would also not be affected by the disposal activities associated with this project.

Vessel Traffic

While the exact number of Atlantic sturgeon, sea turtles, and marine mammals killed as a result of being struck by boat hulls or propellers is unknown, it is a concern in some areas. No ship strikes have been reported in the action for these species. Ship strikes are most common for Atlantic sturgeon in narrow areas of the James River where the fish cannot maneuver away from vessels. During dredging operations, small incremental increases in vessel traffic at the dredge and disposal areas will occur. Additionally, dredging will restore the fuel pier action area to deeper depths so more vessels will be able to move into the project area. Also, the movement of vessels and dredged material to the disposal site during disposal activities will be temporarily increased. However, we know that Atlantic sturgeon and marine mammals, particularly, are more vulnerable to being struck by faster moving vessels with deep drafts (e.g., large container/cargo ships). Typically barges (holding dredge machinery or dredged material) move at slow speeds (i.e., less than 10 knots) and have very shallow drafts. Vessels moving into the

fuel pier area may increase slightly [but because the area has already been used for these purposes] any increases will be minimal. As stated previously, the action area surrounding the fuel pier where vessel traffic may be increased is not known to support suitable foraging habitat for our protected species. As such, it is extremely unlikely for Atlantic sturgeon or sea turtles to be struck by vessels during the dredging and disposal of material, or by vessels using the fuel pier following replacement. Based on the best available information, we are able to conclude that the effects of interactions between Atlantic sturgeon and sea turtles with vessels are insignificant. For marine mammals, most ship strikes have occurred at vessel speeds of 13-15 knots or greater (Jensen and Silber 2003; Laist *et al.* 2001). Because vessels will be moving at speeds below 10 knots, collision during open ocean disposal activities is not likely to occur. All effects of vessel interactions of marine mammals are insignificant and/or discountable.

Conclusions

Based on the analysis that any effects to listed species will be insignificant or discountable, we are able to concur with your determination that the proposed project is not likely to adversely affect any listed species under NMFS jurisdiction. Therefore, no further consultation pursuant to section 7 of the ESA is required. Re-initiation of consultation is required and shall be requested by the Federal agency or by the Service, where discretionary Federal involvement or control over the project has been retained or is authorized by law and: (a) If new information reveals effects of the project that may affect listed species or critical habitat in a manner or to an extent not previously considered in the consultation; (b) If the identified project is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the consultation; or (c) If a new species is listed or critical habitat designated that may be affected by the identified project. No take is anticipated or exempted. If there is any incidental take of a listed species, reinitiation would be required. Should you have any questions about this correspondence please contact Chris Vaccaro at (978) 281-9167or by e-mail (Christine.Vaccaro@Noaa.gov).

Sincerely,

for John K. Bullard
Regional Administrator

File Code: H:\Section 7 Team\Section 7\Non-Fisheries\ACOE/Informal/2013/Norfolk/DLA Fuel Pier
PCTS: NER-2014-10761

Ec: Vaccaro F/NER3
O'Brien F/NER 4
D'onofrio, ACOE

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COMMONWEALTH of VIRGINIA

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December 19, 2013

Kristen I. Donofrio
Environmental Scientist/Project Manager
U.S. Army Corps of Engineers - Norfolk District
803 Front Street
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Re: Defense Logistics Agency (DLA) Fuel Pier Replacement Project
City of Hampton, Virginia
DHR File No. 2013-3847
Received November 26, 2013

Dear Ms. Donofrio:

Thank you for requesting our comments on the referenced project through our ePIX system.

As you have noted, the proposed fuel pier replacement is located within the boundaries of the Langley Field Historic District (DHR ID# 114-0165), a district that has been determined eligible for the National Register of Historic Places. However, the proposed actions will not affect the qualities that make the district significant. For this reason we concur with your determination of No Adverse Effect on historic properties.

If you have any questions concerning our comments, or if we may provide any further assistance, please do not hesitate to contact me (for archaeology) at (804) 482-6088; fax (804) 367-2391; e-mail ethel.eaton@dhr.virginia.gov or Marc Holma (for architectural issues) at (804) 482-6090; e-mail marc.holma@dhr.virginia.gov. We look forward to working with you on future projects.

Sincerely,

Ethel R Eaton

Ethel R. Eaton, Ph.D., Senior Policy Analyst
Division of Resource Services and Review

NOAA FISHERIES
NORTHEAST REGIONAL OFFICE
EFH ASSESSMENT WORKSHEET FOR
FEDERAL AGENCIES
(modified 08/04)

Introduction:

The Magnuson-Stevens Fishery Conservation and Management Act mandates that federal agencies conduct an EFH consultation with NOAA Fisheries regarding any of their actions authorized, funded, or undertaken that may adversely effect essential fish habitat (EFH). An adverse effect means any impact that reduces the quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

This worksheet has been designed to assist Federal agencies in determining whether an EFH consultation is necessary, and developing the needed information should a consultation be required. This worksheet will lead you through a series of questions that will provide an initial screening to determine if an EFH consultation is necessary, and help you assemble the needed information for determining the extent of the consultation required. The information provided in this worksheet may also be used to develop the required EFH Assessment.

Consultation through NOAA Fisheries regarding other NOAA-trust resources may also be necessary if a proposed action results in adverse impacts. Part 6 of the worksheet is designed to help assess the effects of the action on other NOAA-trust resources. This helps maintain efficiency in our interagency coordination process. In addition, consultation with NOAA Fisheries may be required if a proposed action impacts marine mammals or threatened and endangered species for which we are responsible. Staff from our Northeast Regional Office, Protected Resources Division should be contacted regarding potential impacts to marine mammals or threatened and endangered species.

Instructions for Use:

An EFH Assessment must be submitted by a Federal agency to NOAA Fisheries as part of the EFH consultation. An EFH Assessment must include the following information:
1) A description of the proposed action.
2) An analysis of the potential adverse effects of the action on EFH, and the managed species.
3) The Federal agency=s conclusions regarding the effects of the action on EFH.
4) Proposed mitigation if applicable.

In some cases, this worksheet can be used as an EFH Assessment. If the Federal agency determines that the action will not cause substantial impacts to EFH, then this worksheet may suffice. If the action may cause substantial adverse effects on EFH, then a more thorough discussion of the action and its

impacts in a separate EFH Assessment will be necessary. The completed worksheet should be forwarded to NOAA Fisheries Northeast Regional Office, Habitat Conservation Division (HCD) for review.

The information contained on the HCD website (http://www.nero.noaa.gov/hcd/) will assist you in completing this worksheet. The HCD web site contains information regarding: the EFH consultation process; Guide to EFH Designations which provides a geographic species list; Guide to EFH Species Descriptions which provides the legal description of EFH as well as important ecological information for each species and life stage; and other EFH reference documents including examples of EFH Assessments and EFH Consultations.

EFH ASSESSMENT WORKSHEET FOR FEDERAL AGENCIES (modified 08/04)

PROJECT NAME: DLA FUEL PIER REPLACEMENT PROJECT **DATE:** 25-NOV-13

PROJECT NO.: TBD **LOCATION:** JOINT BASE LANGLEY-EUSTIS, DLA

PREPARER: KRISTEN DONOFRIO

Step 1. Use the Habitat Conservation Division EFH webpage, Guide to Essential Fish Habitat Designations in the Northeastern United States to generate the list of designated EFH for federally-managed species for the geographic area of interest (http://www.nero.noaa.gov/hcd/index2a.htm). Use the species list as part of the initial screening process to determine if EFH for those species occurs in the vicinity of the proposed action. Attach that list to the worksheet because it will be used in later steps. Make a preliminary determination on the need to conduct an EFH Consultation.

1. INITIAL CONSIDERATIONS		
EFH Designations	**Yes**	**No**
Is the action located in or adjacent to EFH designated for eggs?	X	
Is the action located in or adjacent to EFH designated for larvae?	X	
Is the action located in or adjacent to EFH designated for juveniles?	X	
Is the action located in or adjacent to EFH designated for adults?	X	
Is the action located in or adjacent to EFH designated for spawning adults?		X
If you answered no to all questions above, then EFH consultation is not required -go to Section 5. If you answered yes to any of the above questions proceed to Section 2 and complete remainder of the worksheet.		

Step 2. In order to assess impacts, it is critical to know the habitat characteristics of the site before the activity is undertaken. Use existing information, to the extent possible, in answering these questions. Please note that, there may be circumstances in which new information must be collected to appropriately characterize the site and assess impacts.

2. SITE CHARACTERISTICS	
Site Characteristics	**Description**
Is the site intertidal, sub-tidal, or water column?	The dredging area is sub-tidal. Dredged material will be placed overboard at the authorized ocean disposal site.
What are the sediment characteristics?	Sediment sampling and analysis is currently being conducted and will be characterized prior to any dredging activity.
Is Habitat Area of Particular Concern (HAPC) designated at or near the site? If so what type, size, characteristics?	Important nursery and pupping grounds have been identified in shallow areas and the mouth of the lower Chesapeake Bay for the sandbar shark (*Carcharhinus plumbeus*).
Is there submerged aquatic vegetation (SAV) at or adjacent to project site? If so describe the spatial extent.	There are no SAV at or adjacent to the project site (identified using CorpsMap with VIMS SAV 2012 data). See attachment A.
What is typical salinity and temperature regime/range?	The average range in salinity is 14.81 – 23.54 ppt. The average range in temperature is 33.116^{o}F – 85.172 ^{o}F.
What is the normal frequency of site disturbance, both natural and man-made?	This project is new work.
What is the area of proposed impact (work footprint & far afield)?	See attachment B for proposed area of impact.

Step 3. This section is used to describe the anticipated impacts from the proposed action on the physical/chemical/biological environment at the project site and areas adjacent to the site that may be affected.

3. DESCRIPTION OF IMPACTS			
Impacts	**Y**	**N**	**Description**
Nature and duration of activity(s)			Mechanically or hydraulically dredge the approach channel and turning basin areas to a maximum depth of -15ft MLLW. Dredged material will be transported by barge/scow for disposal at the authorized ocean disposal site.
Will benthic community be disturbed?	X		Dredging and dredged material placement operations will impact non-motile benthic organisms within the dredging and placement areas through direct removal of substrate in the channel prism and placement activities at the ocean disposal site. Once dredging is complete, benthic organisms will repopulate the area.
Will SAV be impacted?		X	See attachment A.
Will sediments be altered and/or sedimentation rates change?	X		Dredging will remove sediments from the channel and turning basin and place sediments at the designated ocean disposal site. Short-term impacts will occur during the dredging and dredged material placement operations. There will be no impact to sedimentation rates in the dredging area.
Will turbidity increase?	X		There will be temporary increase at the ocean disposal site during dredged material placement and around the dredge's clamshell/bucket if dredged mechnically or draghead if dredged hydraulically; however, impacts should be temporary and minimal.
Will water depth change?	X		Dredging will remove new work material to increase the maximum depth to -15ft MLLW.
Will contaminants be released into sediments or water column?		X	Sediment sampling and analysis is currently being conducted prior to any dredging activity to insure the sediment is free of contaminants.
Will tidal flow, currents or wave patterns be altered?	X		Dredging will increase both the tidal flow and flushing rates in the project area.
Will ambient salinity or temperature regime change?		X	
Will water quality be altered?	X		Short-term impacts to dissolved oxygen through increased turbidity and sedimentation may occur. Impacts should be temporary and minimal.

Step 4. This section is used to evaluate the consequences of the proposed action on the functions and values of EFH as well as the vulnerability of the EFH species and their life stages. Identify which species from the EFH species list (generated in Step 1) will be adversely impacted from the action. Assessment of EFH impacts should be based upon the site characteristics identified in Step 2 and the nature of the impacts described within Step 3. The Guide to EFH Descriptions webpage (http://www.nero.noaa.gov/hcd/list.htm) should be used during this assessment to determine the ecological parameters/preferences associated with each species listed and the potential impact to those parameters.

4. EFH ASSESSMENT			
Functions and Values	**Y**	**N**	**Describe habitat type, species and life stages to be adversely impacted**
Will functions and values of EFH be impacted for:			
Spawning		X	
Nursery	X		Important nursing and pupping grounds in shallow waters during the summer for the sandbar shark (*Carcharhinus plumbeus*).
Forage	X		Species in the area are not exclusively non-motile benthic feeders.
Shelter		X	
Will impacts be temporary or permanent?			Impacts are anticipated to be temporary. Species present in the project area will likely relocate during the dredging activities and return once the work is complete.
Will compensatory mitigation be used?		X	

Step 5. This section provides the Federal agency=s determination on the degree of impact to EFH from the proposed action. The EFH determination also dictates the type of EFH consultation that will be required with NOAA Fisheries.

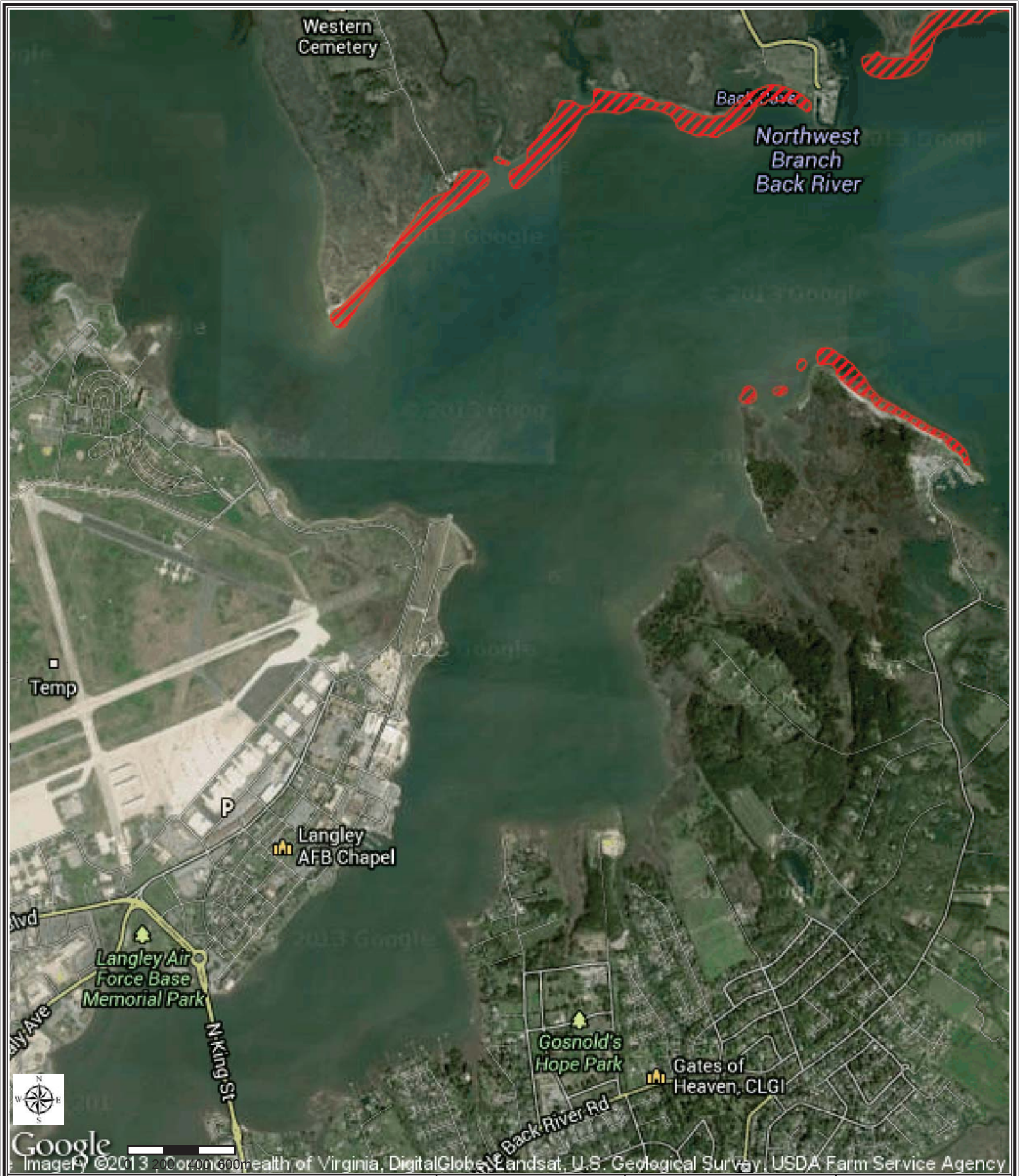
5. DETERMINATION OF IMPACT		
	/	**Federal Agency=s EFH Determination**
Overall degree of adverse effects on EFH (not including compensatory mitigation) will be: **(check the appropriate statement)**		**There is no adverse effect on EFH** **EFH Consultation is not required**
	X	**The adverse effect on EFH is not substantial.** **This is a request for an abbreviated EFH consultation. This worksheet is being submitted to NMFS to satisfy the EFH Assessment requirement.**
		The adverse effect on EFH is substantial. **This is a request for an expanded EFH consultation. A detailed written EFH assessment will be submitted to NMFS expanding upon the impacts revealed in this worksheet.**

Step 6. Consultation with NOAA Fisheries may also be required if the proposed action results in adverse impacts to other NOAA-trust resources, such as anadromous fish, shellfish, crustaceans, or their habitats. Some examples of other NOAA-trust resources are listed below. Inquiries regarding potential impacts to marine mammals or threatened/endangered species should be directed to NOAA Fisheries' Protected Resources Division.

6. OTHER NOAA-TRUST RESOURCES IMPACT ASSESSMENT	
Species known to occur at site (list others that may apply)	**Describe habitat impact type (i.e., physical, chemical, or biological disruption of spawning and/or egg development habitat, juvenile nursery and/or adult feeding or migration habitat).**

ATTACHMENT A:

Map Identifying No Known SAV in Project Area
(Identified using CorpsMap with 2012 VIMS SAV data)

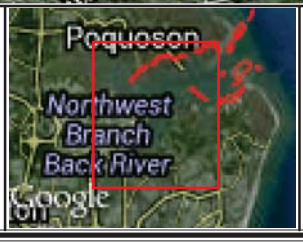


CorpsMap VIMS SAV 2012 Data

Displays location of SAV beds.

Date Printed: 11.05.2013

Map Scale: 1:27084



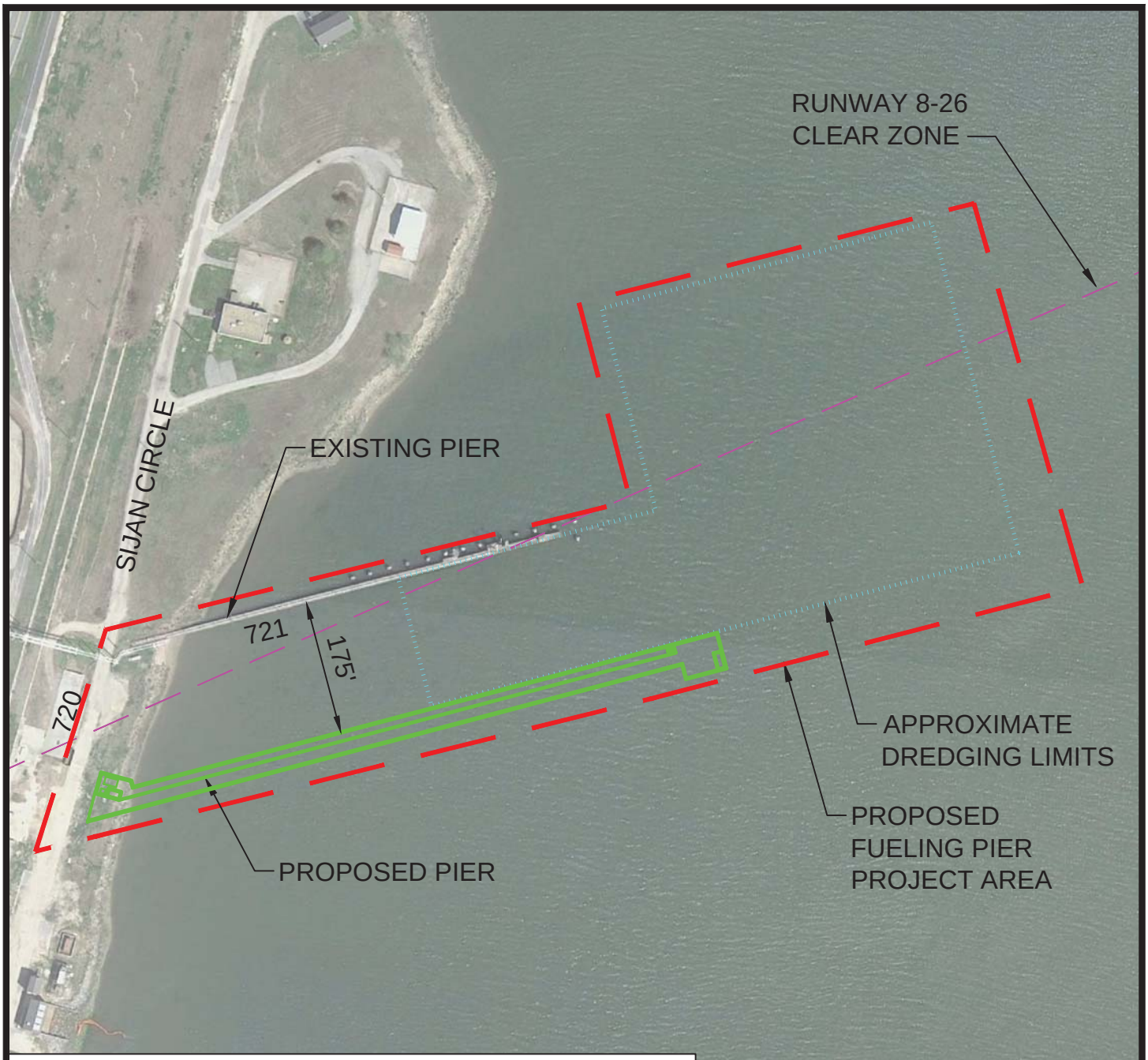
VIMS SAV Beds (2012)

SAV 2012 Coverage

Developed By: Geospatial Section, USACE Norfolk District
Via CorpsMap:
https://corpsmap.usace.army.mil/nao
Email: geospatial@usace.army.mil

ATTACHMENT B:

Proposed Area of Impact – DLA Fuel Pier Project



NOTE:

1. ACTIVITIES IN RUNWAY 8-26 CLEAR ZONE LIMITED TO PIER DEMOLITION, DREDGING AND INSTALLATION OF FUEL PIPING.

2. THE HEIGHT OF THE 7:1 TRANSITIONAL SURFACE FOR RUNWAY 8-26 IS APPROXIMATELY 70' ABOVE GRADE AT THE FUEL PIER ENTRANCE.

NORTH

0 200' 400'

SCALE IN FEET

FY15 DESC1607 REPLACE FUEL PIER AND GROUND VEHICLE FUELING FACILITY
JOINT BASE LANGLEY EUSTIS, VIRGINIA

date 5/20/2013

designed MCG

project -

contract -

dwg. no. SK-01

rev. -

ATTACHMENT C:

EFH Designations
(Identified using NOAA website)

Summary of Essential Fish Habitat (EFH) Designations

10□ x 10□ Square Coordinates:

Boundary	North	East	South	West
Coordinate	37° 10.0□ N	76° 20.0□ W	37° 00.0□ N	76° 30.0□ W

Square Description (i.e. habitat, landmarks, coastline markers): Waters within the square within Chesapeake Bay affecting the following: the Northwest and Southwest Branches of the Back River, Hampton, VA., Newmarket Creek, Willoughby Pt., Hampton River, Black Kiln Creek, Amorys Wharf, Lloyd Bay, Bennet Creek, White Horse Cove, Bay Pt., Roberts Creek, Hunts Pt., Lambs Creek, Quarter March Creek, Poquoson River, Yorkville, VA., Patricks Creek, and southeast Fish Neck.

Species	Eggs	Larvae	Juveniles	Adults
Atlantic cod *(Gadus morhua)*				
haddock *(Melanogrammus aeglefinus)*				
pollock *(Pollachius virens)*				
whiting *(Merluccius bilinearis)*				
offshore hake *(Merluccius albidus)*				
red hake *(Urophycis chuss)*				
white hake *(Urophycis tenuis)*				
redfish *(Sebastes fasciatus)*	n/a			
witch flounder *(Glyptocephalus cynoglossus)*				
winter flounder *(Pseudopleuronectes americanus)*				
yellowtail flounder *(Limanda ferruginea)*				
windowpane flounder *(Scophthalmus aquosus)*			X	X
American plaice *(Hippoglossoides platessoides)*				
ocean pout *(Macrozoarces americanus)*				
Atlantic halibut *(Hippoglossus hippoglossus)*				
Atlantic sea scallop *(Placopecten magellanicus)*				

Atlantic sea herring *(Clupea harengus)*				
monkfish *(Lophius americanus)*				
bluefish *(Pomatomus saltatrix)*			X	X
long finned squid *(Loligo pealeii)*	n/a	n/a		
short finned squid *(Illex illecebrosus)*	n/a	n/a		
Atlantic butterfish *(Peprilus triacanthus)*	X	X	X	X
Atlantic mackerel *(Scomber scombrus)*				
summer flounder *(Paralichthys dentatus)*		X	X	X
scup *(Stenotomus chrysops)*	n/a	n/a		
black sea bass *(Centropristis striata)*	n/a		X	X
surf clam *(Spisula solidissima)*	n/a	n/a		
ocean quahog *(Artica islandica)*	n/a	n/a		
spiny dogfish *(Squalus acanthias)*	n/a	n/a		
tilefish *(Lopholatilus chamaeleonticeps)*				
king mackerel *(Scomberomorus cavalla)*	X	X	X	X
Spanish mackerel *(Scomberomorus maculatus)*	X	X	X	X
cobia *(Rachycentron canadum)*	X	X	X	X
red drum *(Sciaenops occelatus)*	X	X	X	X
dusky shark *(Carcharhinus obscurus)*		X	X	
sandbar shark *(Carcharhinus plumbeus)*		X	X	X
sandbar shark *(Carcharhinus plumbeus)*		HAPC	HAPC	HAPC

Appendix B

Coastal Consistency Determination and
Clean Air Act General Conformity Rule

DEPARTMENT OF THE ARMY
NORFOLK DISTRICT, CORPS OF ENGINEERS
FORT NORFOLK, 803 FRONT STREET
NORFOLK, VIRGINIA 23510-1096

REPLY TO
ATTENTION OF:

April 10, 2014

Operations Branch

Ms. Ellie L. Irons
EIR Manager
Office of Environmental Impact Review
Virginia Department of Environmental Quality
629 East Main Street
Richmond, VA 23219

Dear Ms. Irons:

I have enclosed the U.S. Army Corps of Engineers, Norfolk District's Coastal Consistency Determination (CCD) for the replacement of the existing fuel pier at Joint Base Langley-Eustis (JBLE), known as the DLA Fuel Pier Replacement Project. The project includes construction of the new fuel pier, demolition of the existing fuel pier, new work dredging for the proposed fuel pier's turning basin and approach channel, and a new government refueling station to replace the existing facility. Approximately 6.06 acres will be hydraulically or mechanically dredged to provide a maintained depth of 15 feet mean lower low water (MLLW). Approximately 45,000 cubic yards (CY) of material will be removed to provide for a turning basin and berthing area. Dredged material will be placed overboard for ocean disposal at Norfolk Ocean Disposal Site (NODS).

The Norfolk District has determined that the proposed Federal agency action has reasonably foreseeable effects on Virginia's coastal uses and resources and is consistent to the maximum extent practicable with the enforceable policies of Virginia's Coastal Resource Management Program.

Should you have any questions regarding this CCD, please contact Ms. Kristen Donofrio at (757) 201-7843.

Sincerely,

Elizabeth G. Waring

Elizabeth G. Waring
Chief, Operations Branch

Coastal Zone Management Act (CZMA) Consistency Determination for the Defense Logistics Agency (DLA) Fuel Pier located at the Joint Base Langley-Eustis (JBLE) on Langley Air Force Base (LAFB) in Hampton, Virginia

On behalf of the DLA at JBLE-Langley, this document provides the Commonwealth of Virginia with the U.S. Army Corps of Engineers, Norfolk District's (Corps) Coastal Consistency Determination (CCD) under CZMA section 307(c)(1) and 15 CFR Part 930, sub-part C, DLA Fuel Pier Project at the JBLE on LAFB in Hampton, Virginia. The information in this CCD is provided pursuant to 15 CFR Section 930.39.

Proposed Federal Agency Activity

The proposed federal action is the replacement of the DLA's existing fuel pier at JBLE on LAFB in Hampton, Virginia. The project includes construction of the new fuel pier, demolition of the existing fuel pier, new work dredging for the proposed fuel pier's turning basin and approach channel, and a new government refueling station to replace the existing facility. The project area is bounded to the west by the Building 722 foundation and on the east by the Southwest Branch of Back River. Approximately 6.06 acres will be hydraulically or mechanically dredged to provide a maintained depth of 15 feet mean lower low water (MLLW). Approximately 45,000 cubic yards (CY) of material will be removed to provide for a turning basin and approach channel. Dredged material will be placed overboard for ocean disposal. Drawings attached.

Background

Established in 1917, LAFB is the oldest continuously active air force base in the United States. Located approximately 180 miles south of Washington, D.C. near the southern end of the lower Virginia Peninsula, the base is between the Northwest Branch and Southwest Branch of Back River, a tidal estuary of the Chesapeake Bay. LAFB covers approximately 3,152 acres and contains an airfield and support facilities, research and development facilities, testing facilities, fuel docking and storage facilities, ordnance housing, golf courses, and various recreational areas.

The DLA Fuel Pier Project will provide reliable and maintainable fuel receipt and distribution capabilities through the replacement of the existing pier system and refueling station with environmentally safe, long-term solutions.

Enforceable Policies

The Virginia Coastal Resources Management Program (VCP) contains the below enforceable policies (A-I). More information can be found in the Final Environmental Assessment for this project.

A. Fisheries Management

This program stresses the conservation and enhancement of finfish and shellfish resources and the promotion of commercial and recreational fisheries to maximize food production and recreational opportunities.

A Virginia Marine Resources Commission (VMRC) private oyster lease is present within the project area's dredging limits. The project will be coordinated with the VMRC through the NEPA and permitting process.

B. Subaqueous Lands Management

This management program for subaqueous lands establishes conditions for granting or denying permits to use state-owned bottomlands based on considerations of potential effects on marine and fisheries resources, wetlands, adjacent or nearby properties, anticipated public and private benefits, and water quality standards established by the Department of Environmental Quality, Water Division.

Impacts to water quality will be minor and temporary, consisting of localized increases in turbidity due to dredging. There is no Submerged Aquatic Vegetation within the project area; therefore, no impacts are anticipated. JBLE-Langley and other related vessels will benefit from this project as it will create access to the proposed fuel pier.

C. Wetlands Management

The purpose of the wetlands management program is to preserve tidal and non-tidal wetlands, prevent their despoliation, and accommodate economic development in a manner consistent with wetlands preservation.

Wetlands are located near the project area. There are no wetlands located in the project area; therefore, no impacts are anticipated.

D. Dunes Management

Dune protection is carried out pursuant to the Coastal Primary Sand Dune Protection Act and is intended to prevent destruction or alteration of primary dunes.

There are no sand dunes located in the project area; therefore, no impacts are anticipated.

E. Non-point Source Pollution Control

Virginia's Erosion and Sediment Control Law requires soil-disturbing projects to be designed to reduce soil erosion and to decrease inputs of chemical nutrients and sediments to the Chesapeake Bay, its tributaries, and other rivers and waters of the Commonwealth.

Erosion and sediment control (ESC) and storm water management (SWM) best management practices will be incorporated into the project design to ensure compliance with state

programs. The contract plans and specifications will address requirements to achieve reduction of soil erosion and storm water management. On-site inspections will ensure compliance with government contract plans and specifications and the applicable state program to the maximum extent practicable.

F. Point Source Pollution Control

Point source pollution control is accomplished through the implementation of the National Pollutant Discharge Elimination System permit program established pursuant to Section 402 of the Federal Clean Water Act and administered in Virginia as the Virginia Pollutant Discharge Elimination System permit program.

A Virginia Pollutant Discharge Elimination System (VPDES) permit is not required for the dredging portion of this project since dredging projects, which are regulated under Section 404 of the Clean Water Act, are exempt from VPDES regulations. A VPDES permit is required for the replacement of the existing refueling station and will be obtained by the contractor prior to construction.

G. Shoreline Sanitation

The purpose of this program is to regulate the installation of septic tanks, set standards concerning soil types suitable for septic tanks, and specify minimum distances that tanks must be placed away from streams, rivers, and other waters of the Commonwealth.

Replacement of the existing fuel pier and refueling station does not involve septic tanks; therefore, adherence to this program is not applicable.

H. Air Pollution Control

The program implements the Federal Clean Air Act to provide a legally enforceable State Implementation Plan for the attainment and maintenance of the National Ambient Air Quality Standards (NAAQS).

The Clean Air Act prohibits Federal entities from taking actions which do not conform to the State implementation plan (SIP) for attainment and maintenance of the national ambient air quality standards (NAAQS).

Air emissions due to the replacement of the DLA's existing fuel pier and associated dredging will be minor and temporary. The use of trucks and other heavy equipment and machinery will generate minor amounts of criteria pollutants. This project will conform to the Virginia's State Implementation Plan (SIP).

I. Coastal Lands Management

Coastal Lands Management is a state-local cooperative program administered by the DCR's Division of Stormwater Management – Local Implementation (previously the Division of

Chesapeake Bay Local Assistance) and 88 localities in Tidewater, Virginia established pursuant to the Chesapeake Bay Preservation Act; Virginia Code §§ 10.1-2100 through 10.1-2114 and Chesapeake Bay Preservation Area Designation and Management Regulations; Virginia Administrative code 9 VAC10-20-10 et seq.

While NOAA has determined that the CZMA does not grant states regulatory authority over activities on federal lands, federal activities affecting Virginia's coastal resources must be consistent with the Bay Act and the Regulations as one of the enforceable programs of Virginia's Coastal Zone Management Program.

Replacement of the existing fuel pier and fueling station does not involve land development; therefore, this project is not subject to the Chesapeake Bay Preservation Act.

Advisory Policies for Geographic Area of Particular Concern

a. *Coastal Natural Resource Areas*

Coastal Natural Resource Areas are areas that have been designated as vital to estuarine and marine ecosystems and/or are of great importance to areas immediately inland of the shoreline. These areas include the following resources: wetlands, aquatic spawning, nursing, and feeding grounds, coastal primary sand dunes, barrier islands, significant wildlife habitat areas, public recreation areas, sand gravel resources, and underwater historic sites.

The project area may contain spawning, nursing, and/or feeding grounds for finfish and shellfish. Habitat for finfish and shellfish will not be harmed and may be improved as a result of this project. An Essential Fish Habitat (EFH) Assessment is being coordinated with NOAA Fisheries and will be included with the EA.

b. *Coastal Natural Hazard Areas*

This policy covers areas vulnerable to continuing and severe erosion and areas susceptible to potential damage from wind, tidal, and storm related events including flooding. New buildings and other structures should be designed and sited to minimize the potential for property damage due to storms or shoreline erosion. The areas of concern are highly erodible areas and coastal high hazard areas, including flood plains.

The project area contains no coastal natural hazard areas; therefore, adherence to this program is not applicable.

c. *Waterfront Development Areas*

These areas are vital to the Commonwealth because of the limited number of areas suitable for waterfront activities. The areas of concern are commercial ports, commercial fishing piers, and community waterfronts.

There are no commercial fishing piers and/or community waterfronts located in the project area. This project supports waterfront access activities by providing a turning basin and approach channel to the proposed fuel pier.

Advisory Policies for Shorefront Access Planning and Protection

a. *Virginia Public Beaches*

These public shoreline areas will be maintained to allow public access to recreational resources.

There are no public beaches within the project area; consequently this project will not affect public access to beaches.

b. *Virginia Outdoors Plan (VOP)*

The VOP, which is published by Virginia's Department of Conservation and Recreation (DCR), identifies recreational facilities in the Commonwealth that provide recreational access. Prior to initiating any project, consideration should be given to the proximity of the project site to recreational resources identified in the VOP.

This project is consistent with the Virginia Outdoor Plan for Region 23, Hampton Roads, whose main recreational activities revolve around water access and boating. This project will provide access to the DLA's proposed fuel pier for JBLE-Langley and other related vessels.

c. *Parks, Natural Areas, and Wildlife Management Areas*

The recreational values of these areas should be protected and maintained.

The project area contains no Parks, Natural Areas, or Wildlife Management Areas.

d. *Waterfront Recreational Land Acquisition*

It is the policy of the Commonwealth to protect areas, properties, lands, or any estate or interest therein, of scenic beauty, recreational utility, historical interest, or unusual features which may be acquired, preserved, and maintained for the citizens of the Commonwealth.

The JBLE-Langley is currently a federally-owned and maintained facility. This project does not limit the ability of the Commonwealth in any way to acquire, preserve, or maintain waterfront recreational lands.

e. *Waterfront Recreational Facilities*

Boat ramps, public landings, and bridges shall be designed, constructed, and maintained to provide points of water access when and where practicable.

This project does not involve the design, construction, or maintenance of any boat ramps, public landings, or bridges.

f. *Waterfront Historic Properties*

The Commonwealth has a long history of settlement and development, and much of that history has involved both shorelines and near-shore areas. The protection and preservation of historic shorefront properties is primarily the responsibility of the Virginia Department of Historic Resources.

The National Historic Preservation Act - Section 106 consultation with the Department of Historic Resources (VDHR) is currently ongoing. This project will not affect historic properties or their viewshed; therefore, the Corps is requesting VDHR concurrence with the 'no effect' conclusion.

Determination

Based upon the following information, data, and analysis, the U.S. Army Corps of Engineers, Norfolk District, on behalf of the DLA at JBLE-Langley, finds that the replacement of the existing fuel pier and refueling station and associated dredging is consistent to the maximum extent practicable with the enforceable policies of the Virginia Coastal Resources Management Program.

Pursuant to 15 CFR Section 930.41, the Virginia Coastal Resources Management Program has 60 days from the receipt of this letter in which to concur with or object to this Consistency Determination, or to request an extension under 15 CFR section 930.41(b). Virginia's concurrence will be presumed if its response is not received by the U.S. Army Corps of Engineers on the 60th day from receipt of this determination.

4/10/14
Date

Elizabeth G. Waring
Chief, Operations Branch

Clean Air Act – General Conformity Rule
Record of Non-Applicability
for the Defense Logistics Agency (DLA)
DLA Fuel Pier Replacement Project
at the Langley Air Force Base located in Hampton, Virginia

The Clean Air Act as amended requires Federal actions to conform to an approved state implementation plan (SIP) designed to achieve or maintain an attainment designation for air pollutants as defined by the National Ambient Air Quality Standard (NAAQS). The General Conformity Rule (40 CFR Parts 51 and 93) implements these requirements for actions occurring in air quality nonattainment areas.

The DLA Fuel Pier project site is located in the Air Quality Control Region (AQCR) known as Hampton Roads Intrastate ACQR in Virginia (42 CFR 481.93). This region is in attainment for all the NAAQSs.

The proposed federal action is the replacement of the DLA's existing fuel pier at JBLE on Langley Air Force Base (LAFB) in Hampton, Virginia. The project includes construction of the new fuel pier and fueling service station, demolition of the existing fuel pier and fueling service station, and both maintenance and new work dredging for the proposed fuel pier's turning basin and approach channel. Approximately 6.06 acres will be hydraulically or mechanically dredged to provide a maintained depth of 15 feet mean lower low water (MLLW). Approximately 45,000 cubic yards (CY) of material will be removed to provide for a turning basin and approach channel. Dredged material will be placed overboard for ocean disposal at the Norfolk Ocean Disposal Site (NODS).

Previous maintenance dredging was conducted in the project area vicinity (Back River-Messick Point Federal Navigation Channel) in April/May 2002. A remedial investigation was conducted in 2000 to characterize potential contamination identified during previous investigations, conduct a baseline ecological risk assessment and human health risk assessment, and evaluate potential impacts to the Back River from LAFB environmental restoration program sites. A risk based clean-up occurred in November 2010 in a portion of the Southwest Branch of Back River shoreline, which is adjacent to/within the project's footprint.

The current fuel pier is a 7' wide wooden structure in poor condition with no spill containment and no fire protection. The existing pier is approaching 65 years of active service, with the piles exceeding their life expectancy, and has the potential to fail structurally. The loss of the pier would inhibit the First Fighter Wing's ability to deploy and support fighter and transient aircraft, as well as limit its ability to carry out missions assigned in support of operations. Without the pier, LAFB aircraft usage would require truck delivery of approximately 315,000 gallons of fuel per week on average. Additionally, the existing service station's small space and system

components are not safe. The small space does not meet the minimum spill retention basin requirements and creates safety issues with traffic flow problems and overcrowding. The existing system components, including the tanks, do not meet the minimum standard to operate the facility at a safe level. If a catastrophic spill were to occur, the fuel is not contained and would flow directly into the Back River channel and adjoining shorelines.

The Environmental Protection Agency (EPA) has ruled that some Federal actions are exempt from the conformity requirement as these actions have been determined to result in no emission increase or an increase that is clearly *de minimis*. Because the activities taking place after the completion of the Proposed Action are similar in scope and operation to activities currently being conducted and the existing structures are being repaired via replacement, this project meets the exemption requirements for non-applicability to the general conformity rule.

To the best of my knowledge the information provided is correct and accurate. I concur in the finding that the proposed action meets the exemptions stated above and thus will conform to the SIP.

4/10/14
Date

Elizabeth G. Waring
Chief, Operations Branch

Appendix C

Threatened and Endangered Species Lists

Natural Heritage Resources

Your Criteria

Taxonomic Group: Select All

Global Conservation Status Rank: Select All

State Conservation Status Rank: Select All

Federal Legal Status: Select All

State Legal Status: Select All

County: Hampton (City)

Search Run: 3/19/2014 18:57:43 PM

Click scientific names below to go to NatureServe report.

Click column headings for an explanation of species and community ranks.

Common Name/Natural Community	Scientific Name	Global Conservation Status Rank	State Conservation Status Rank	Federal Legal Status	State Legal Status	Statewide Occurrences
Hampton (City)						
AMPHIBIANS						
Mabee's Salamander	Ambystoma mabeei	G4	S1S2	None	LT	17
BIRDS						

Common Name/Natural Community	Scientific Name	Global Conservation Status Rank	State Conservation Status Rank	Federal Legal Status	State Legal Status	Statewide Occurrences
Piping Plover	Charadrius melodus	G3	S2B,S1N	LT	LT	16
Gull-billed Tern	Gelochelidon nilotica	G5	S2B	None	LT	19
COLEOPTERA (BEETLES)						
Northeastern Beach Tiger Beetle	Cicindela dorsalis dorsalis	G3G4T2	S2	LT	LT	18
FISH						
Atlantic Sturgeon	Acipenser oxyrinchus	G3	S2	LE	LE	2
REPTILES						
Canebrake Rattlesnake	Crotalus horridus [Coastal Plain population]	G4T4	S1	None	LE	19
VASCULAR PLANTS						
Virginia Least Trillium	Trillium pusillum var. virginianum	G3T2	S2	SOC	None	33

Note: On-line queries provide basic information from DCR's databases at the time of the request. They are NOT to be substituted for a project review or for on-site surveys required for environmental assessments of specific project areas.

For Additional Information on locations of Natural Heritage Resources please submit an information request.

To Contribute information on locations of natural heritage resources, please fill out and submit a rare species sighting form.

U.S. Fish and Wildlife Service

Natural Resources of Concern

This resource list is to be used for planning purposes only — it is not an official species list.

Endangered Species Act species list information for your project is available online and listed below for the following FWS Field Offices:

Virginia Ecological Services Field Office
6669 SHORT LANE
GLOUCESTER, VA 23061
(804) 693-6694
http://www.fws.gov/northeast/virginiafield/

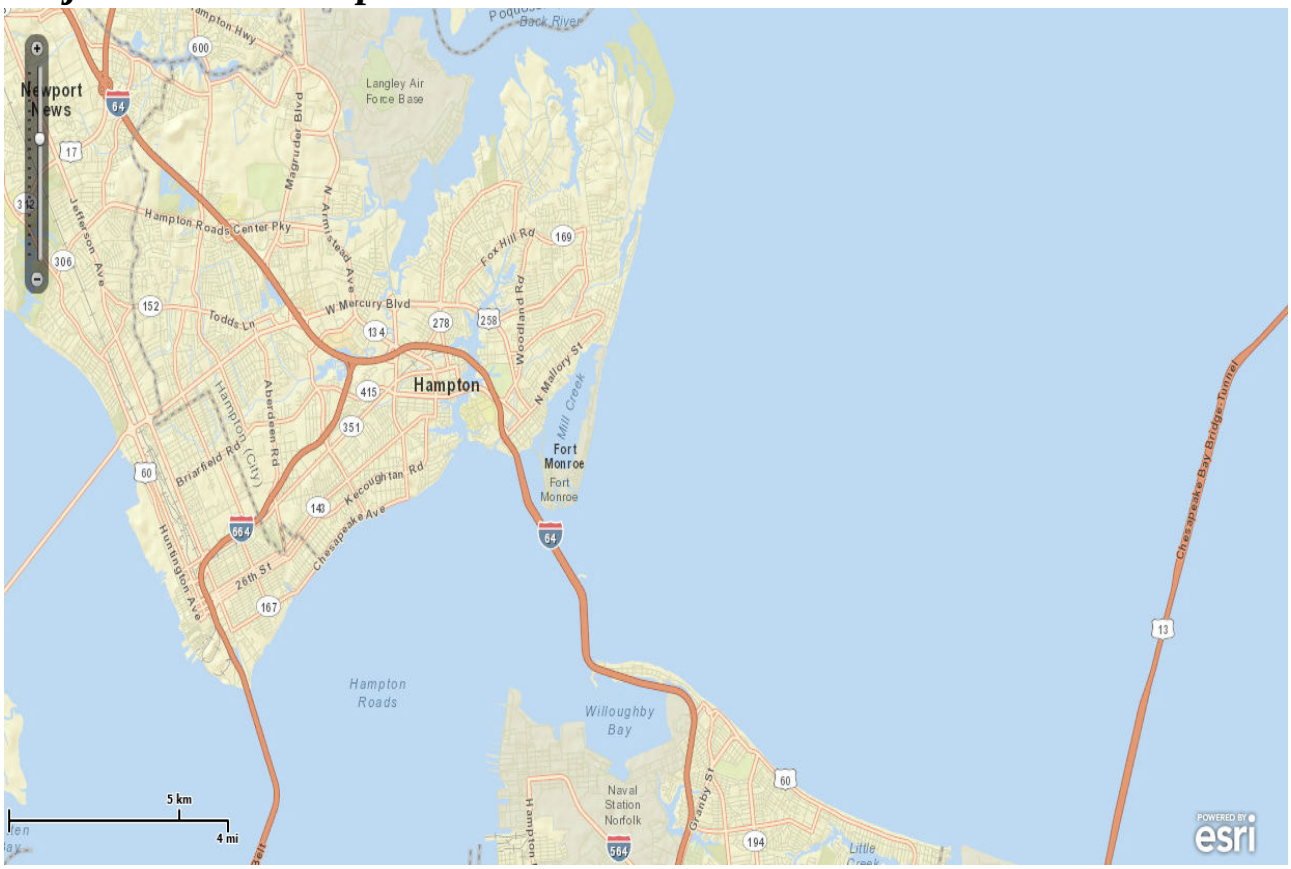
Project Name:

DLA iPac

U.S. Fish and Wildlife Service

Natural Resources of Concern

Project Location Map:



Project Counties:

Hampton, VA

Geographic coordinates (Open Geospatial Consortium Well-Known Text, NAD83):

MULTIPOLYGON (((-76.3398042 37.087415, -76.3312211 37.0835806, -76.3377443 37.0748157, -76.3535371 37.07372, -76.3398042 37.087415)))

Project Type:

Dredge / Excavation

U.S. Fish and Wildlife Service

Natural Resources of Concern

Endangered Species Act Species List (USFWS Endangered Species Program).

There are no listed species found within the vicinity of your project.

Critical habitats within your project area:

There are no critical habitats within your project area.

FWS National Wildlife Refuges (USFWS National Wildlife Refuges Program).

There are no refuges found within the vicinity of your project.

FWS Migratory Birds (USFWS Migratory Bird Program).

Most species of birds, including eagles and other raptors, are protected under the Migratory Bird Treaty Act (16 U.S.C. 703). Bald eagles and golden eagles receive additional protection under the Bald and Golden Eagle Protection Act (16 U.S.C. 668). The Service's Birds of Conservation Concern (2008) report identifies species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become listed under the Endangered Species Act as amended (16 U.S.C 1531 et seq.).

Migratory bird information is not available for your project location.

NWI Wetlands (USFWS National Wetlands Inventory).

The U.S. Fish and Wildlife Service is the principal Federal agency that provides information on the extent and status of wetlands in the U.S., via the National Wetlands Inventory Program (NWI). In addition to impacts to wetlands within your immediate project area, wetlands outside of your project area may need to be considered in any evaluation of project impacts, due to the hydrologic nature of wetlands (for example, project activities may affect local hydrology within, and outside of, your immediate project area). It may be helpful to refer to the USFWS National Wetland Inventory website. The designated FWS office can also assist you. Impacts to wetlands and other aquatic habitats from your project may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal Statutes. Project Proponents should discuss the relationship of these requirements to their project with the Regulatory Program of the appropriate U.S. Army Corps of Engineers District.

U.S. Fish and Wildlife Service

Natural Resources of Concern

IPaC is unable to display wetland information at this time.

Appendix D

Draft Final Marine Protection, Research, and Sanctuaries Act (MPRSA) Section 103 Evaluation

DRAFT FINAL

US Army Corps
of Engineers
Norfolk District

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

LANGLEY-DLA FUEL PIER REPLACEMENT PROJECT
BACK RIVER, VIRGINIA

Submitted to:
U.S. Environmental Protection Agency
Region 3
1650 Arch St
Philadelphia, PA 19103

Submitted by:
Department of the Army
U.S. Army Corps of Engineers
Norfolk District
803 Front St.
Norfolk, VA 23510

Prepared by:
EA Engineering, Science, and Technology, Inc.
225 Schilling Circle, Suite 400
Hunt Valley, Maryland 21031

April 2014

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

LANGLEY-DLA FUEL PIER REPLACEMENT PROJECT,
BACK RIVER, HAMPTON, VIRGINIA

April 2014

1. DREDGING AND PLACEMENT PROJECT INFORMATION.

The Langley-Defense Logistics Agency (DLA) Fuel Pier Replacement Project is located at Joint Base Langley-Eustis in Hampton, Virginia on the Back River. The Back River is a tidal estuary which discharges into the Chesapeake Bay. The project will replace the aging and structurally deficient wooden fueling pier with a concrete fuel pier, fender piles, and mooring dolphin that will be located approximately 175 feet (ft) south of the existing wooden pier.

The combined length of the proposed concrete pier and dolphin will be approximately 857 feet (ft) and will include:

- an 800 ft long by 30 ft wide access trestle,
- a 57 ft long by 50 ft wide fueling pier structure, and
- one mooring dolphin located at the head of the pier.

The subject of this evaluation is dredging of the berthing area and turning basin at the Langley-DLA Fuel Pier Replacement project (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 Langley-DLA Fuel Pier Replacement 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.

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).

a. Dredging Location. The existing Langley-DLA Fuel Pier is located at Joint Base Langley-Eustis in Hampton, Virginia on the Back River (Figure 1). The project will include a combination of maintenance and new work dredging. The proposed berthing area adjacent to the pier will be approximately 54 ft wide and 50 ft long to accommodate barges and tugs. The berthing area will be dredged to a maximum depth of -15 ft mean lower low water (MLLW) [12 ft MLLW +2 ft allowable pay overdepth + 1 ft non-pay overdepth] to support current and planned future use by vessels with 10 ft drafts. A 450 ft turning basin to the proposed fuel pier will be also constructed as part of the project. The most recent bathymetric surveys were completed in May 2013 (Attachment I). Existing water depths range from 3.8ft MLLW in the berthing area to 12.4 ft MLLW in the turning basin.

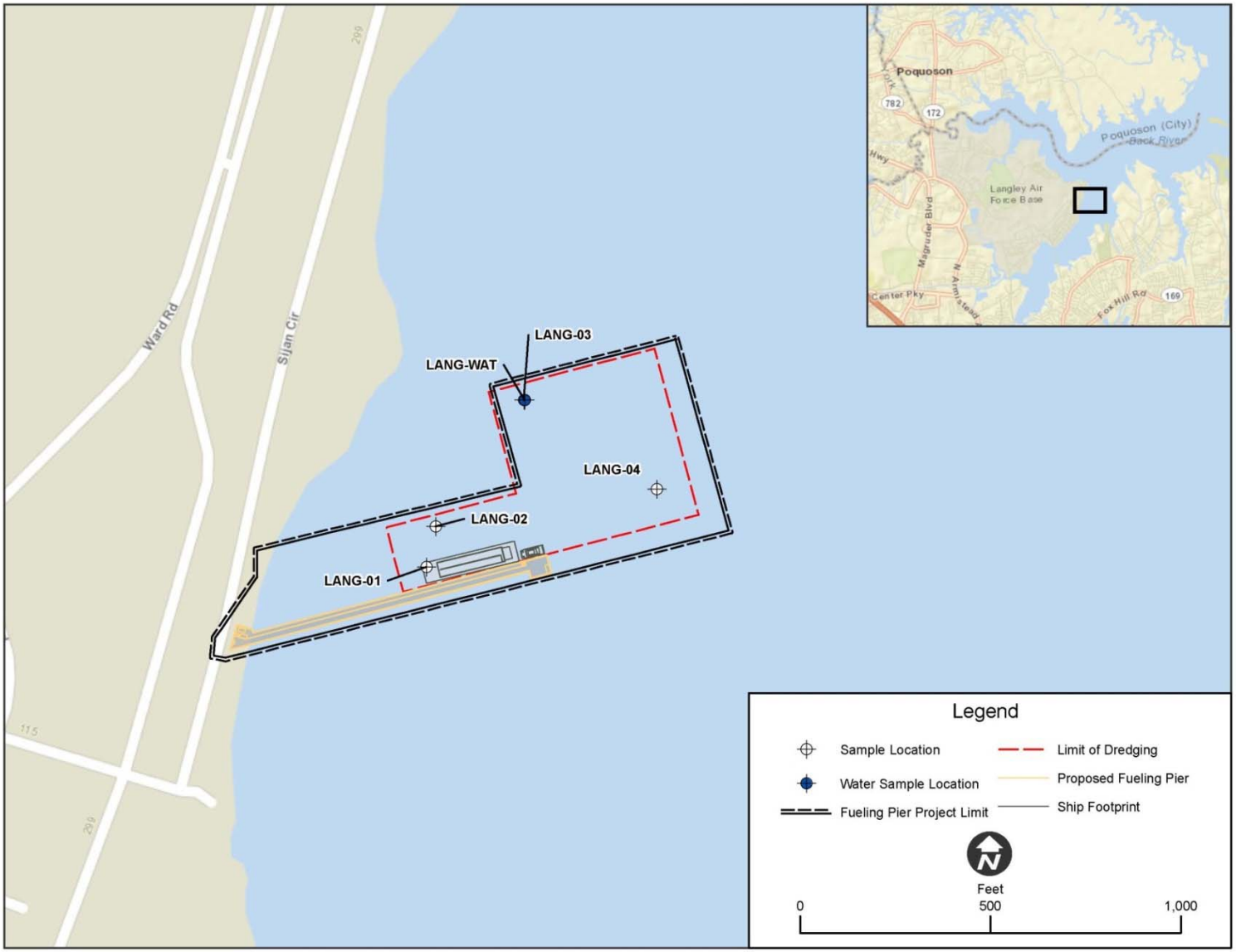


Figure 1. Sampling locations for the Langley-DLA Fuel Pier Replacement Project

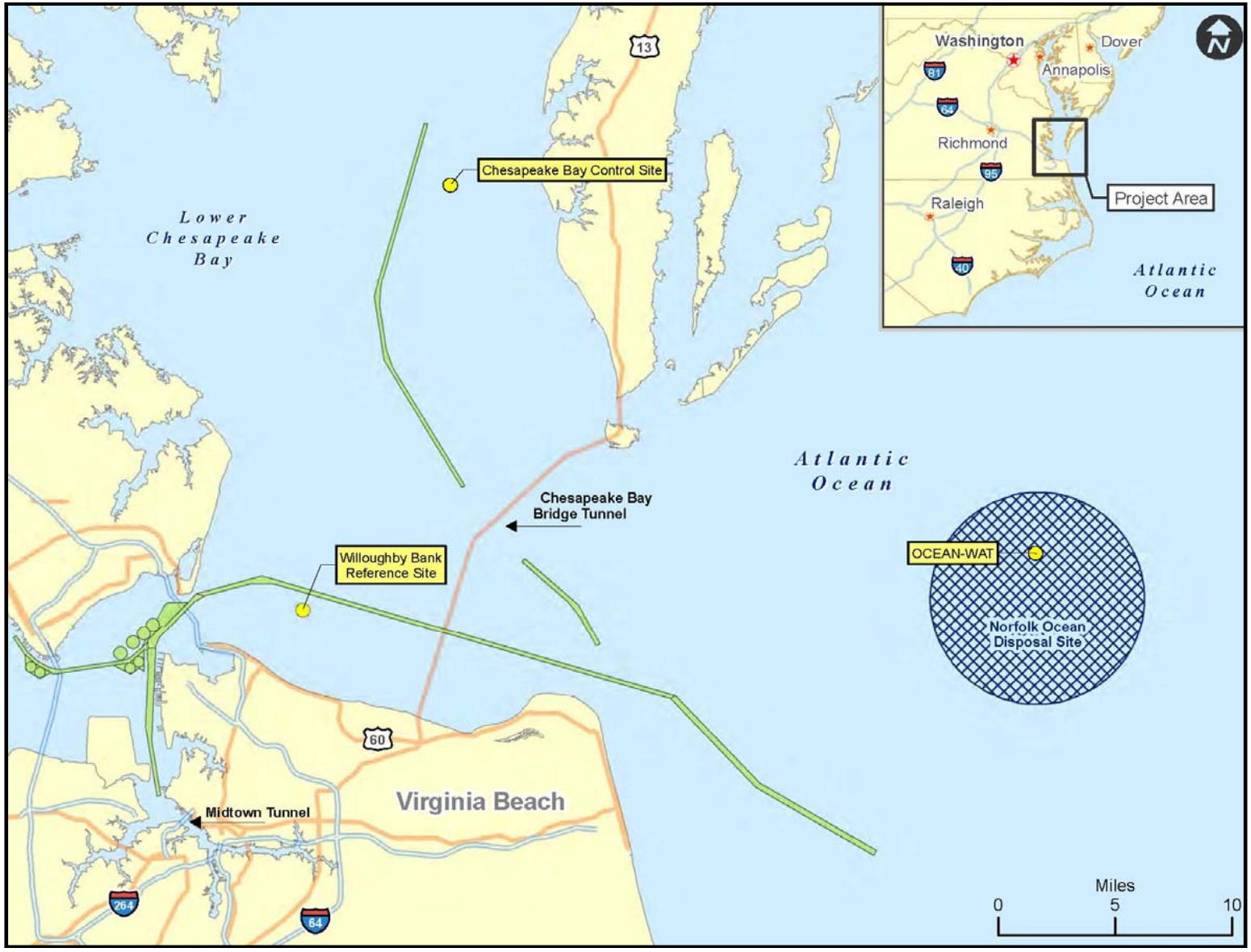


Figure 2. Willoughby Bank reference site, the Chesapeake Bay Control Site, and the Norfolk Ocean Disposal Site.

b. Core Borings. Sediment cores ranging in depth from 5 ft to 10 ft below sediment surface were collected from four locations (LANG 01, LANG-02, LANG-03, and LANG-04 – see Figure 1) in the proposed dredging area (two locations in the berthing area and two locations in the turning basin area). The cores were collected to a depth of -16 ft MLLW.

c. Volume of Material to be Dredged. Based on the bathymetric survey conducted in May 2013, the proposed project will require the dredging and placement of a maximum of approximately 65,000 cubic yards (cy) of material. The project will be dredged to a maximum depth of -15 ft MLLW [12 ft MLLW +2 ft allowable pay overdepth + 1 ft non-pay overdepth].

d. Grain Size of Dredged Material. Results of grain size analysis for both discrete and composite sediment samples from the Langley-DLA Fuel Pier Replacement Project ranged from 87.4 to 96.9 percent silt+clay (Table 1, Figure 3). 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.

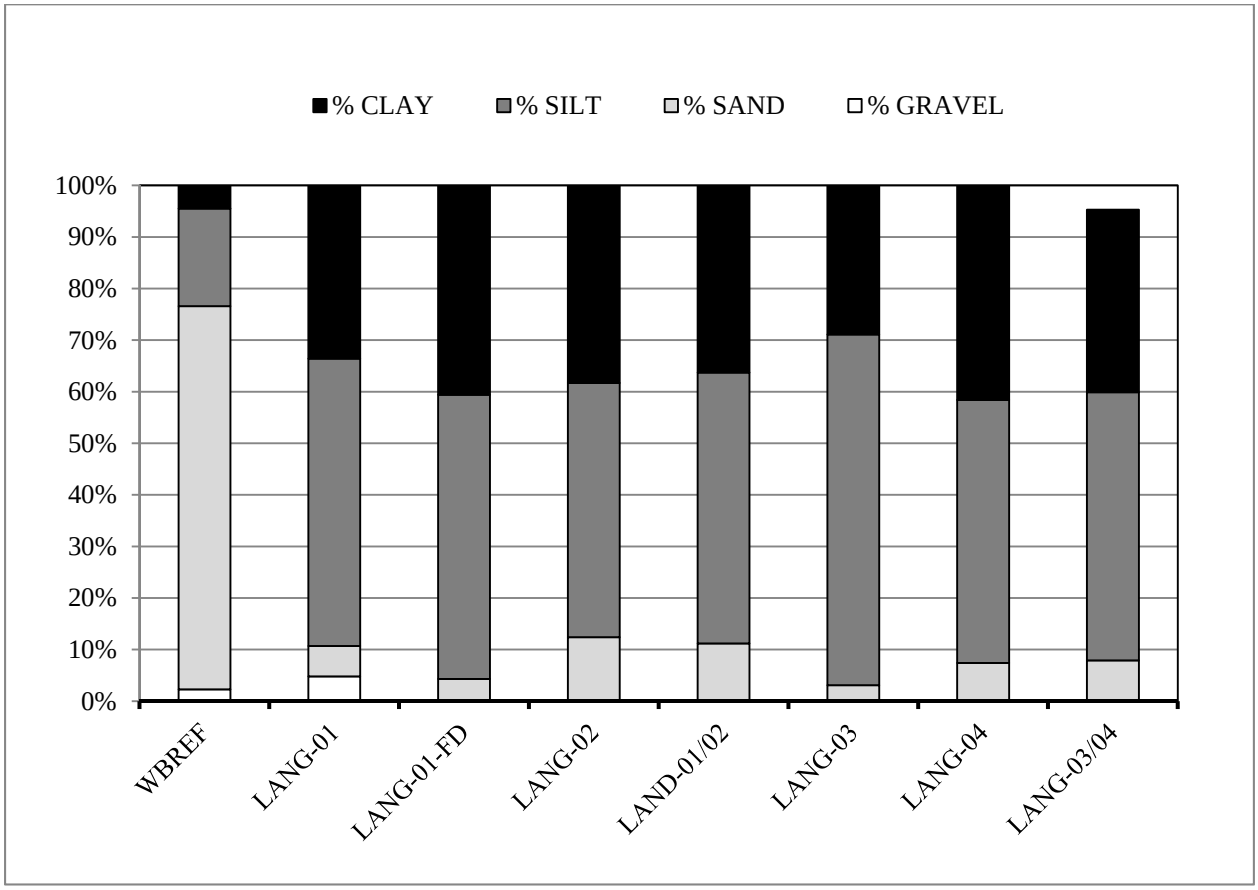


Figure 3. Grain size distribution in sediment samples from the Langley-DLA Fuel Pier Replacement project and the Willoughby Bank Reference Site.

e. Bathymetric Information. Existing water depths in the proposed dredging area are from approximately 3.8 to 12.4 ft. Bathymetric surveys of the Langley-DLA Fuel Pier Replacement project were conducted in May 2013, and the bathymetry data for the area to be dredged are included in Attachment I.

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 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 Langley-DLA Fuel Pier Replacement project will be initiated in early June 2015 and will be completed in late September 2015 (approximate 4-month dredging/placement duration). The fiscal year execution for the project is currently being evaluated and is subject to change based on availability and prioritization of funds.

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 proposed placement zone within the NODS for the Langley-DLA Fuel Pier Replacement material will be determined based on consultation with USEPA Region 3 and USACE-Norfolk District prior to the initiation of the dredging. Progress surveys of portions of the active zone 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 Norfolk ODMDS 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 Langley-DLA Fuel Pier Replacement project will be placed in a different section of the NODS, which has been designated by USEPA Region 3 and USACE-Norfolk District (Figure 4).

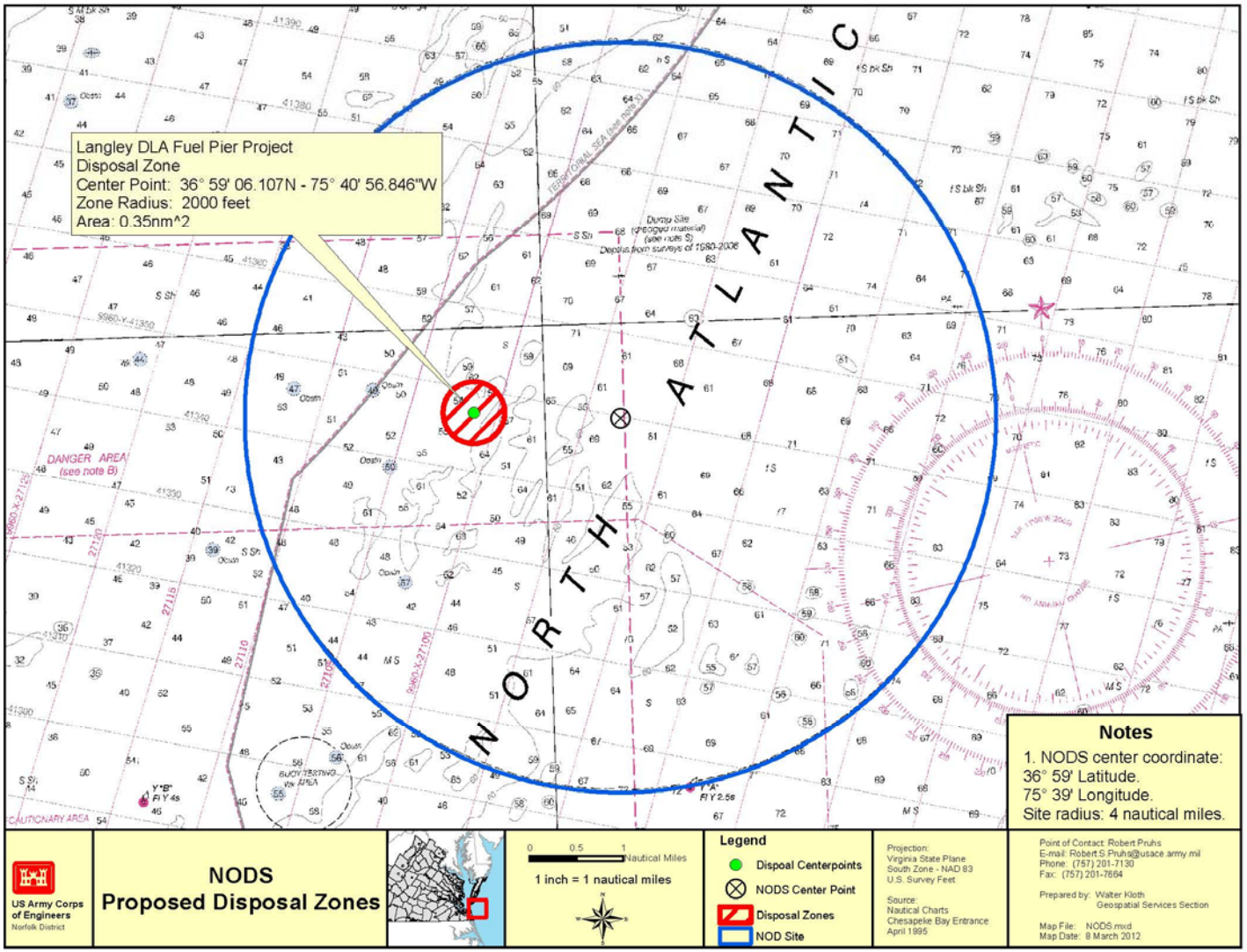


Figure 4. NODS Proposed Disposal Zone, Langley-DLA Fuel Pier Replacement Project

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 Langley-DLA Fuel Pier Replacement 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 Langley-DLA Fuel Pier Replacement project does not meet the exclusionary criteria.

3. NEED FOR TESTING FOR OCEAN PLACEMENT

a. Requirement for Testing. The Langley-DLA Fuel Pier Replacement project 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 Langley-DLA Fuel Pier Replacement project dredging footprint meets the limiting permissible concentration (LPC) for ocean placement.

b. Dates of Previous Dredging. The project under consideration is a combination of maintenance and new work dredging. The fuel pier basin was last maintenance dredged (to a depth of 14 ft MLLW) in April/May 2002. The previous dredging was conducted in as a portion of the maintenance dredging for the entire Back River Federal Navigation Channel which removed a total of 220,000 cy of material. The material was placed at the Messick Point confined disposal site (a 19-acre privately-owned facility).

c. Results of Previous Testing. No analytical data are available for previous maintenance dredging. Ocean placement testing has not previously been conducted for material from the site.

A remedial investigation (RI) was conducted in 2000 in the southwest branch of Back River to characterize potential contamination identified during previous investigations, conduct a baseline ecological risk assessment (ERA) and human health risk assessment (HHRA), and evaluate potential impacts to the Back River from Langley Air Force Base (LAFB) environmental restoration program (ERP) sites. The RI included the collection and analysis of surface water, sediment, and biota (bivalves, crabs, sport fish, and small fish) for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), chlorinated pesticides, polychlorinated biphenyl (PCBs), polychlorinated terphenyls (PCTs), chlorinated herbicides, and metals. Based on the RI, the shoreline of the Southwest Branch of the Back River (ERP Site SS-63) was identified to be one of two sites containing elevated concentrations of chemicals.

LAFB issued a proposed plan (PP) in December 2007 identifying the preferred alternative, Dry Excavation with Off-site Disposal, for addressing the contaminated sediment. A Remedial Design/Remedial Action Work Plan (RD/RAWP) was finalized in 2010 to detail the approach and procedures used to implement the final remedial action (RA).

The final RA included temporary erosion and sediment control measures such as silt fencing, diversion dikes, heavy equipment staging areas, decant/waste staging areas, and a stabilized construction entrance. The Fuel Pier site remedial activities included construction of a 1,090 linear feet interlocking sheetpile cofferdam to "block out" the Back River during excavation of the sediment and to inhibit tidal flow into the work area during removal activities

d. Locations for Previous Testing. No previous testing has occurred at the site. A remedial investigation was previously conducted in the southwest branch of the Back River.

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 four 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: Langley-Defense Logistics Agency (DLA) Fuel Pier Replacement, Joint Base Langley/Ft. Eustis, Back River, Hampton, Virginia* (EA 2014).

Sediment cores were collected from four (4) locations within the Langley-DLA Fuel Pier Replacement project area (two locations in the berthing area and two locations in the turning basin area) 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 was collected from a single location in the Back River in the vicinity of the existing fuel pier/basin.

Receiving water was collected for one location in the Atlantic Ocean in the vicinity of the NODS (Figure 2).

a. Sediment Testing. Four discrete samples (LANG-01, LANG-02, LANG-03, and LANG-04) and two composite samples (LANG-01/02 and LANG-03/04) 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 Langley-DLA Fuel Pier Replacement project 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: Langley-Defense Logistics Agency (DLA) Fuel Pier Replacement, Joint Base Langley/Ft. Eustis, Back River, Hampton, Virginia* (EA 2014).

Overall, five chemical constituents were detected at concentrations between the TEL and PEL values. None of the detected constituents in the Langley-DLA Fuel Pier Replacement sediments exceeded PEL values. In the LANG-01/02 sediment composite, total PCBs (ND=RL) concentrations were between TEL and PEL value. In the LANG-03/04 sediment composite, a total of three metals (arsenic, copper, and nickel), one individual PAH (dibenzo(a,h)anthracene), and total PCBs (ND=RL) concentrations were between TEL and PEL values.

b. Water Column Elutriate Testing. Two standard elutriates from the Langley-DLA Fuel Pier Replacement project were prepared using the sediment composites (LANG-01/02 and LANG-03/04) and the site water from the Back River. 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: Langley-Defense Logistics Agency (DLA) Fuel Pier Replacement, Joint Base Langley/Ft. Eustis, Back River, Hampton, Virginia* (EA 2014).

Elutriate preparation water (dredging site water) chemistry results indicated that several chemical constituents were detected in the elutriate preparation water from the Langley-DLA Fuel Pier Replacement project. Each of the constituents detected in the elutriate preparation water were below USEPA saltwater acute water quality criteria, with the exception of copper, which exceeded the acute water quality criterion (4.8 µg/L) by a factor of 1.4.

In the standard elutriates, ammonia, arsenic, and copper concentrations exceeded the acute criteria for the protection of aquatic life. Arsenic was the constituent requiring the greatest dilution (1.6) to achieve acute water quality criteria for LANG-01/02, and ammonia was the constituent requiring the greatest dilution (3.5) to achieve acute water quality criteria for LANG-03/04.

To determine the LPC compliance for dredged material from the Langley-DLA Fuel Pier Replacement project, 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. 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 that would meet the LPC for both water quality criteria and water column toxicity.

Receiving water concentrations at the NODS were used as background inputs for the STFATE model, and the model output indicated that arsenic required a dilution of 0.7 and ammonia required a dilution of 2.5 to meet the water quality criteria LPC. STFATE modeling indicated that the required dilution would occur within 4 hours following placement at the NODS and the plume would stay within the boundary, which would meet the USEPA saltwater acute water quality criterion for both constituents. ***Therefore, the standard elutriates from Langley-DLA Fuel Pier Replacement project meet the LPC for water quality criteria.***

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: Langley-Defense Logistics Agency (DLA) Fuel Pier Replacement, Joint Base Langley/Ft. Eustis, Back River, Hampton, 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 that would meet the LPC for water column toxicity.

For LANG-01/02, the water column bioassay for *M. galloprovincialis* had an EC_{50} of 86.8 percent elutriate, and the LC_{50} for the *M. beryllina* and *A. bahia* bioassays were each greater than 100 percent elutriate. Based on the EC_{50} for *M. galloprovincialis*, a 114-fold dilution is required to meet the LPC compliance for water column toxicity. The STFATE model indicated that a 163-fold dilution would occur within the four hours with a placement event of 20,000 cy of dredged material.

For LANG-03/04, the water column bioassay for *M. galloprovincialis* had an EC_{50} of 40.2 percent elutriate, and the LC_{50} for the *M. beryllina* and *A. bahia* bioassays were each greater than 100 percent elutriate. Based on the EC_{50} for *M. galloprovincialis*, a 248-fold dilution is required to meet the LPC compliance for water column toxicity. The STFATE model indicated that a 248-fold dilution would occur within the first four hours with placements events of up to 9,000 cy of dredged material.

Based on the overall results of the STFATE modeling of water column toxicity, the Langley-DLA Fuel Pier Replacement project elutriates meet the LPC for water column toxicity for placement volumes up to 9,000 cy.

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: Langley-Defense Logistics Agency (DLA) Fuel Pier Replacement, Joint Base Langley/Ft. Eustis, Back River, Hampton, Virginia* (EA 2014). Results for whole sediment bioassays are summarized in Table 19.

Survival in the whole sediment bioassays for both LANG-01/02 and LANG-03/04 was not statistically different from the reference site for either *N. arenaceodentata* or *L. plumulosus*. ***Therefore, the Langley-DLA Fuel Pier Replacement project sediments meet the LPC for benthic toxicity.***

b. Benthic Bioaccumulation. Sediments from the Langley-DLA Fuel Pier Replacement project 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 Langley-DLA Fuel Pier Replacement project sediment samples. The bioaccumulation exposure protocols are detailed in the SAP (EA 2013a) and in *Evaluation of Dredged Material: Langley-*

Defense Logistics Agency (DLA) Fuel Pier Replacement, Joint Base Langley/Ft. Eustis, Back River, Hampton, 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 Langley-DLA Fuel Pier Replacement project tissue samples be analyzed for lipids, moisture content, metals, 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.

Tissue Chemistry Results

Detailed results of the tissue chemistry analysis are provided in *Evaluation of Dredged Material: Langley-Defense Logistics Agency (DLA) Fuel Pier Replacement, Joint Base Langley/Ft. Eustis, Back River, Hampton, Virginia* (EA 2014). Results of the tissue analysis for *N. virens* and *M. nasuta* are summarized in Tables 21 to 23. Pre-test tissue concentrations that compare post-exposure tissue concentrations to pre-exposure tissue concentrations are also provided in Tables 21 to 23. 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 Langley-DLA Fuel Pier Replacement project were compared to U.S. Food and Drug Administration (USFDA) Values (USFDA 2001) (Table 24). None of the UCLM values for Langley-DLA Fuel Pier Replacement project tissues exceeded the USFDA Action/Guidance/Tolerance Values.

For the tissue samples from LANG-01/02, concentrations of lead in *N. virens* (worm) statistically exceeded mean reference site and pre-test concentrations, but the UCLM did not exceed the USEPA Region 4 background concentration range (USEPA/USACE 2008). For the tissue samples from LANG-03/04, concentrations of OCDD in *M. nasuta* (clam) statistically exceeded mean reference site and pre-test concentrations. However, the mean dioxin TEQ for clams did not statistically exceed the mean reference site or pre-test TEQ.

Based on the assessment of metals, dioxin/furan congeners, and chlorinated pesticides in tissues exposed to the Langley-DLA Fuel Pier Replacement project sediments, it is anticipated that ocean placement of the dredged material from the Langley-DLA Fuel Pier Replacement project at the NODS is not expected to result in ecologically significant bioaccumulation of contaminants and that the dredged material would comply with the benthic bioaccumulation criteria in 40 CFR Part 227.13 (c) (3).

Overall, sediments from the Langley-DLA Fuel Pier Replacement project 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 9,000 cy complies with the LPC.

6. 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. 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 Langley-DLA Fuel Pier Replacement project. 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 Langley-DLA Fuel Pier Replacement project. 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 Langley-DLA Fuel Pier Replacement project was Craney Island Dredged Material Management Area (CIDMMA). Dredged material from the Langley-DLA Fuel Pier Replacement project 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 is 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 Langley-DLA Fuel Pier Replacement project indicated that the sediments would not be suitable for dike construction.

Therefore, because of the need to reserve limited upland placement capacity within the region for future projects with contaminated sediment, because the Langley-DLA Fuel Pier Replacement project 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 Langley-DLA Fuel Pier Replacement project is ocean placement at the NODS. Placement of the dredged material from Langley-DLA Fuel Pier Replacement project 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.

7. MPRSA SECTION 103 CONDITIONS

a. Requirements to Meet Ocean Disposal Criteria. No special requirements are required to meet the ocean placement criteria.

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. A placement zone within the NODS has 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 Langley-DLA Fuel Pier Replacement 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.

8. REFERENCES

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TABLE 1. PHYSICAL CHARACTERISTICS OF SEDIMENT

LANGLEY-DLA FUEL PIER REPLACEMENT PROJECT, BACK RIVER, VIRGINIA

Analyte	Unit	Average RL	Willoughby Bank Reference Site	LANG-01	LANG-01 Field Duplicate	LANG-02	LANG-01/02	LANG-03	LANG-04	LANG-03/04
GRAVEL	%	--	**2.3**	**4.8**	**0**	**0**	**0**	**0**	**0**	**4.7**
SAND	%	--	**74.3**	**5.9**	**4.3**	**12.4**	**11.2**	**3.1**	**7.1**	**7.9**
Coarse Sand	%	--	**0.8**	**0.5**	**0**	**0**	**0**	**0**	**0**	**0.3**
Medium Sand	%	--	**3**	**0.3**	**0.5**	**1.8**	**0.1**	**0.3**	**0.3**	**0.2**
Fine Sand	%	--	**70.5**	**5.1**	**3.8**	**10.6**	**11.1**	**2.8**	**6.8**	**7.4**
SILT	%	--	**18.9**	**55.7**	**55.1**	**49.3**	**52.5**	**68**	**51**	**52**
CLAY	%	--	**4.5**	**33.6**	**40.6**	**38.3**	**36.3**	**28.9**	**41.9**	**35.4**
SILT+CLAY	%	--	**23.4**	**89.3**	**95.7**	**87.6**	**88.8**	**96.9**	**92.9**	**87.4**
SPECIFIC GRAVITY	--	--	**2.68**	**2.74**	**2.73**	**2.74**	**2.71**	**2.68**	**2.71**	**2.71**
PERCENT MOISTURE	%	0.1	**30.3**	**43.8**	**42.5**	**37.6**	**42.4**	**54.6**	**48.8**	**51.6**

TABLE 2. GENERAL CHEMISTRY PARAMETERS IN SEDIMENT

LANGLEY-DLA FUEL PIER REPLACEMENT PROJECT, BACK RIVER, VIRGINIA

Analyte	Units	Average RL	Willoughby Bank Reference Site	LANG-01	LANG-01 Field Duplicate	LANG-02	LANG-01/02	LANG-03	LANG-04	LANG-03/04
AMMONIA (NH3), AS N	MG/KG	8.60	**11 B**	**44 B**	**47 B**	**37 B**	**52 B**	**290 B**	**100 B**	**92 B**
CYANIDE, TOTAL	MG/KG	0.429	0.35 U	0.43 U	0.45 U	0.41 U	0.42 U	0.59 U	0.47 U	0.45 U
TOTAL ORGANIC CARBON	%	0.17	**0.71**	**1.3**	**1.4**	**1.1**	**1.1**	**1.9**	**1.2**	**1.4**
TOTAL SULFIDE	MG/KG	51	**82 B**	**17 JB**	**13 JB**	50 U	**15 JB**	**970**	**11 JB**	**38 J**

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 3. METALS CONCENTRATIONS IN SEDIMENT

LANGLEY-DLA FUEL PIER REPLACEMENT PROJECT, BACK RIVER, VIRGINIA

ANALYTE	UNITS	Average RL	TEL*	PEL*	Willoughby Bank Reference Site	LANG-01	LANG-01 Field Duplicate	LANG-02	LANG-01/02	LANG-03	LANG-04	LANG-03/04
ALUMINUM	MG/KG	2.44	--	--	**4,200 B**	**17,000**	**15,000**	**14,000**	**14,000**	**17,000**	**18,000**	**14,000**
ANTIMONY	MG/KG	0.17	--	--	**0.06 J B**	**0.075 J B**	**0.062 J B**	**0.065 J B**	**0.061 J B**	**0.11 J B**	**0.082 J B**	**0.076 J B**
ARSENIC	MG/KG	0.09	7.24	41.6	**2.2**	**5.7**	**6.5**	**6.8**	**6.2**	**7.4**	**7.1**	**6.6**
BARIUM	MG/KG	0.81	--	--	**11 B**	**26 B**	**24 B**	**21 B**	**22 B**	**36 B**	**30 B**	**25 B**
BERYLLIUM	MG/KG	0.08	--	--	**0.2**	**0.8**	**0.8**	**0.7**	**0.7**	**0.9**	**0.9**	**0.7**
CADMIUM	MG/KG	0.08	0.68	4.21	**0.1**	**0.3**	**0.3**	**0.2**	**0.3**	**0.5**	**0.3**	**0.3**
CALCIUM	MG/KG	8.13	--	--	**9,500 B**	**2,600 B**	**2,600 B**	**3,700 B**	**4,000 B**	**5,100 B**	**3,200 B**	**2,200 B**
CHROMIUM	MG/KG	0.17	52.3	160.4	**10 B**	**33 B**	**32 B**	**29 B**	**29 B**	**40 B**	**38 B**	**31 B**
COBALT	MG/KG	0.04	--	--	**3 B**	**6 B**	**5.9 B**	**5.7 B**	**5.6 B**	**6.5 B**	**7.5 B**	**6 B**
COPPER	MG/KG	0.17	18.70	108.20	**4.4 B**	**6.6 B**	**6.7 B**	**6.5 B**	**6.5 B**	**20 B**	**9.1 B**	**11 B**
IRON	MG/KG	4.07	--	--	**8,400 B**	**21,000 B**	**21,000 B**	**21,000 B**	**20,000 B**	**23,000 B**	**25,000 B**	**20,000 B**
LEAD	MG/KG	0.08	30.2	112.2	**6.6 B**	**11 B**	**11 B**	**9.9 B**	**11 B**	**30 B**	**16 B**	**18 B**
MAGNESIUM	MG/KG	8.13	--	--	**2,800 B**	**5,900 B**	**5,900 B**	**5,400 B**	**5,400 B**	**6,000 B**	**6,800 B**	**5,400 B**
MANGANESE	MG/KG	0.41	--	--	**99 B**	**130 B**	**130 B**	**130 B**	**130 B**	**180 B**	**160 B**	**140 B**
MERCURY	MG/KG	0.03	0.13	0.70	**0.0**	**0.019 J**	**0.017 J**	**0.016 J**	**0.02 J**	**0.1**	**0.027 J**	**0.1**
NICKEL	MG/KG	0.08	15.9	42.8	**5.6 B**	**15 B**	**14 B**	**13 B**	**13 B**	**16 B**	**18 B**	**14 B**
POTASSIUM	MG/KG	8.13	--	--	**1,000**	**3,200**	**3,000**	**2,800**	**2,700**	**3,100**	**3,500**	**2,700**
SELENIUM	MG/KG	0.41	--	--	**0.27 J**	**0.6**	**0.6**	**0.5**	**0.6**	**0.9**	**0.7**	**0.6**
SILVER	MG/KG	0.08	0.73	1.77	**0.025 J**	**0.064 J**	**0.065 J**	**0.057 J**	**0.1**	**0.6**	**0.1**	**0.3**
SODIUM	MG/KG	8.13	--	--	**3,600 B**	**5,800 B**	**5,600 B**	**5,300 B**	**5,600 B**	**9,200 B**	**6,200 B**	**6,500 B**
THALLIUM	MG/KG	0.08	--	--	**0.068 J**	**0.2**	**0.2**	**0.1**	**0.2**	**0.2**	**0.2**	**0.2**
VANADIUM	MG/KG	0.09	--	--	**10.0**	**28.0**	**27.0**	**25.0**	**25.0**	**33.0**	**33.0**	**28.0**
ZINC	MG/KG	0.41	124	271	**38 B**	**38 B**	**39 B**	**35 B**	**35 B**	**89 B**	**53 B**	**55 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

B = compound was detected in the laboratory method blank

TEL = threshold effects level

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

PEL = probable effects level

TABLE 4. PAH CONCENTRATIONS IN SEDIMENT

LANGLEY-DLA FUEL PIER REPLACEMENT PROJECT, BACK RIVER, VIRGINIA

ANALYTE	UNITS	Average RL	TEL*	PEL*	Willoughby Bank Reference Site	LANG-01	LANG-01 Field Duplicate	LANG-02	LANG-01/02	LANG-03	LANG-04	LANG-03/04
LOW MOLECULAR WEIGHT PAHs (LPAH)												
1-METHYLNAPHTHALENE	UG/KG	25.83	--	--	**1.2 J**	29 U	29 U	27 U	28 U	39 U	32 U	30 U
2-METHYLNAPHTHALENE	UG/KG	25.83	20.2	201	**1.4 J**	29 U	29 U	27 U	28 U	39 U	32 U	30 U
ACENAPHTHENE	UG/KG	25.83	6.71	88.9	**1.8 J**	29 U	29 U	27 U	28 U	39 U	32 U	30 U
ACENAPHTHYLENE	UG/KG	25.83	5.87	128	9.4 U	29 U	29 U	27 U	28 U	39 U	32 U	30 U
ANTHRACENE	UG/KG	25.8	46.9	245	**4.3 J**	29 U	29 U	27 U	28 U	39 U	32 U	30 U
FLUORENE	UG/KG	25.8	21.2	144	**2.6 J**	29 U	29 U	27 U	28 U	39 U	32 U	30 U
NAPHTHALENE	UG/KG	25.83	34.6	391	**1.9 J**	29 U	29 U	27 U	28 U	39 U	32 U	30 U
PHENANTHRENE	UG/KG	25.8	86.7	544	**13**	29 U	29 U	27 U	28 U	**20 J**	32 U	**5.7 J**
TOTAL LPAHs (ND=RL)	UG/KG	--	--	--	**26.2**	**203**	**203**	**189**	**196**	**254**	**224**	**186**
HIGH MOLECULAR WEIGHT PAHs (HPAH)												
BENZO(A)ANTHRACENE	UG/KG	25.8	74.8	693	**12**	29 U	29 U	27 U	28 U	**36 J**	32 U	**11 J**
BENZO(A)PYRENE	UG/KG	25.83	88.8	763	**14**	29 U	29 U	27 U	28 U	**39**	32 U	**10 J**
BENZO(B)FLUORANTHENE	UG/KG	25.83	--	--	**16**	29 U	29 U	27 U	28 U	**57**	32 U	**15 J**
BENZO(GHI)PERYLENE	UG/KG	25.83	--	--	**17**	29 U	29 U	27 U	28 U	**44**	32 U	30 U
BENZO(K)FLUORANTHENE	UG/KG	25.83	--	--	1.8 U	29 U	29 U	27 U	28 U	**22 J**	32 U	**6 J**
CHRYSENE	UG/KG	25.8	108	846	**11**	29 U	29 U	27 U	28 U	**47**	32 U	**10 J**
DIBENZO(A,H)ANTHRACENE	UG/KG	25.8	6.22	135	1 U	29 U	29 U	27 U	28 U	**12 J**	32 U	30 U
FLUORANTHENE	UG/KG	25.8	113	1,494	**14**	29 U	29 U	27 U	28 U	**68**	32 U	**16 J**
INDENO(1,2,3-CD)PYRENE	UG/KG	25.8	--	--	**11**	29 U	29 U	27 U	28 U	**38 J**	32 U	30 U
PYRENE	UG/KG	25.8	153	1,398	**19**	29 U	29 U	27 U	28 U	**58**	32 U	**17 J**
TOTAL HPAHs (ND=RL)	UG/KG	--	--	--	**86**	**174**	**174**	**162**	**168**	**260**	**192**	**94**
TOTAL PAHs												
TOTAL PAHs (ND=RL)	UG/KG	--	1,684	16,770	**153**	**522**	**522**	**486**	**504**	**714**	**576**	**391**

**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 5. PCB CONGENER CONCENTRATIONS IN SEDIMENT

LANGLEY-DLA FUEL PIER REPLACEMENT PROJECT, BACK RIVER, VIRGINIA

ANALYTE	UNITS	Average RL	TEL**	PEL**	Willoughby Bank Reference Site	LANG-01	LANG-01 Field Duplicate	LANG-02	LANG-01/02	LANG-03	LANG-04	LANG-03/04
PCB 8 (BZ)*	UG/KG	0.8560	--	--	**0.12 J P**	0.88 U	0.87 U	0.82 U	**0.2 J P B**	1.2 U	0.95 U	**0.24 J P B**
PCB 18 (BZ)*	UG/KG	0.8560	--	--	**0.36 J**	**0.71 J B**	**0.65 J B**	**0.71 J B**	**0.41 J B**	**0.25 J P B**	**0.68 J B**	0.87 U
PCB 28 (BZ)*	UG/KG	0.8560	--	--	0.7 U	0.88 U	0.87 U	0.82 U	0.85 U	**0.45 J P**	0.95 U	0.87 U
PCB 44 (BZ)*	UG/KG	0.8560	--	--	0.7 U	0.88 U	0.87 U	0.82 U	0.85 U	1.2 U	0.95 U	0.87 U
PCB 49 (BZ)	UG/KG	0.8560	--	--	0.7 U	0.88 U	0.87 U	0.82 U	0.85 U	1.2 U	0.95 U	0.87 U
PCB 52 (BZ)*	UG/KG	0.8560	--	--	0.7 U	0.88 U	0.87 U	0.82 U	0.85 U	1.2 U	0.95 U	0.87 U
PCB 66 (BZ)*	UG/KG	0.8560	--	--	0.7 U	0.88 U	0.87 U	0.82 U	0.85 U	**0.35**	0.95 U	0.87 U
PCB 77 (BZ)*	UG/KG	0.8560	--	--	0.7 U	0.88 U	0.87 U	0.82 U	0.85 U	**1.3**	0.95 U	**0.41 J**
PCB 87 (BZ)	UG/KG	0.8560	--	--	0.7 U	0.88 U	0.87 U	0.82 U	0.85 U	1.2 U	0.95 U	0.87 U
PCB 101 (BZ)*	UG/KG	0.8560	--	--	0.7 U	0.88 U	0.87 U	0.82 U	0.85 U	**0.53 J P**	0.95 U	0.87 U
PCB 105 (BZ)*	UG/KG	0.8560	--	--	0.7 U	0.88 U	0.87 U	0.82 U	0.85 U	1.2 U	0.95 U	0.87 U
PCB 118 (BZ)*	UG/KG	0.8560	--	--	0.7 U	0.88 U	0.87 U	0.82 U	0.85 U	**0.28 J P**	0.95 U	0.87 U
PCB 126 (BZ)*	UG/KG	0.8560	--	--	0.7 U	0.88 U	0.87 U	0.82 U	0.85 U	1.2 U	0.95 U	0.87 U
PCB 128 (BZ)*	UG/KG	0.8560	--	--	0.7 U	0.88 U	0.87 U	0.82 U	0.85 U	1.2 U	0.95 U	0.87 U
PCB 138 (BZ)*	UG/KG	0.8560	--	--	0.7 U	0.88 U	0.87 U	0.82 U	0.85 U	1.2 U	0.95 U	0.87 U
PCB 153 (BZ)*	UG/KG	0.8560	--	--	0.7 U	0.88 U	0.87 U	0.82 U	0.85 U	**3.4**	0.95 U	**0.28 J**
PCB 156 (BZ)	UG/KG	0.8560	--	--	0.7 U	0.88 U	0.87 U	0.82 U	0.85 U	1.2 U	0.95 U	0.87 U
PCB 169 (BZ)*	UG/KG	0.8560	--	--	0.7 U	0.88 U	0.87 U	0.82 U	0.85 U	1.2 U	0.95 U	0.87 U
PCB 170 (BZ)*	UG/KG	0.8560	--	--	0.7 U	0.88 U	0.87 U	0.82 U	0.85 U	**0.38 J P**	0.95 U	0.87 U
PCB 180 (BZ)*	UG/KG	0.8560	--	--	0.7 U	0.88 U	0.87 U	0.82 U	0.85 U	1.2 U	0.95 U	0.87 U
PCB 183 (BZ)	UG/KG	0.8560	--	--	0.7 U	0.88 U	0.87 U	0.82 U	0.85 U	1.2 U	0.95 U	0.87 U
PCB 184 (BZ)	UG/KG	0.8560	--	--	0.7 U	0.88 U	0.87 U	0.82 U	0.85 U	1.2 U	0.95 U	0.87 U
PCB 187 (BZ)*	UG/KG	0.8560	--	--	0.7 U	0.88 U	0.87 U	0.82 U	0.85 U	1.2 U	0.95 U	0.87 U
PCB 195 (BZ)	UG/KG	0.8560	--	--	0.7 U	0.88 U	0.87 U	0.82 U	0.85 U	**0.25 J P**	0.95 U	0.87 U
PCB 206 (BZ)	UG/KG	0.8560	--	--	0.7 U	0.88 U	0.87 U	0.82 U	0.85 U	1.2 U	0.95 U	0.87 U
PCB 209 (BZ)	UG/KG	0.8560	--	--	0.7 U	0.88 U	0.87 U	0.82 U	0.85 U	1.2 U	0.95 U	0.87 U
TOTAL PCBs (ND=RL)	UG/KG	--	21.6	189	**34.6**	**45.4**	**44.8**	**42.4**	**42.0**	**55.2**	**48.9**	**41.9**

* 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.

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

B = compound was detected in the laboratory method blank

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

U = compound was analyzed, but not detected

TABLE 6. DIOXIN AND FURAN CONGENER CONCENTRATIONS IN SEDIMENT

LANGLEY-DLA FUEL PIER REPLACEMENT PROJECT, BACK RIVER, VIRGINIA

ANALYTE	UNITS	Average RL	TEF*	Willoughby Bank Reference Site	LANG-01	LANG-01 Field Duplicate	LANG-02	LANG-01/02	LANG-03	LANG-04	LANG-03/04
2,3,7,8-TCDD	NG/KG	0.994	1	0.98 U	**0.42 J**	1 U	0.98 U	0.99 U	1.1 U	0.98 U	1 U
1,2,3,7,8-PECDD	NG/KG	4.98	1	**0.25 J**	**4.7 Q J**	**4.8 J**	**5**	**4.5 J**	**4 J**	**5.5 Q**	**4.9 J**
1,2,3,4,7,8-HXCDD	NG/KG	4.98	0.1	**0.67 J**	**8.4**	**8**	**7.9**	**9.1**	**6.9**	**9.5**	**8.9**
1,2,3,6,7,8-HXCDD	NG/KG	4.98	0.1	**0.9 J**	**12**	**12**	**12**	**13**	**12**	**16**	**12**
1,2,3,7,8,9-HXCDD	NG/KG	4.98	0.1	**2.2 B J**	**33**	**30**	**30**	**36**	**28**	**39**	**32**
1,2,3,4,6,7,8-HPCDD	NG/KG	4.98	0.01	**26 B**	**260**	**200**	**260**	**320**	**320**	**340**	**280**
OCDD	NG/KG	9.94	0.0003	**390 B**	**3,100 B**	**2,000 B**	**3,200 B**	**4,000 B**	**5,400 B**	**4,300 B**	**3,500 B**
2,3,7,8-TCDF	NG/KG	0.994	0.1	**0.16 Q J**	0.97 U	1 U	0.98 U	0.99 U	**1.2 Q**	**0.27 Q J**	**0.71 Q J**
1,2,3,7,8-PECDF	NG/KG	4.98	0.03	**0.13 Q J**	4.8 U	5 U	4.9 U	5 U	**0.97 J**	4.9 U	**0.41 Q J**
2,3,4,7,8-PECDF	NG/KG	4.98	0.3	4.9 U	4.8 U	5 U	4.9 U	5 U	**1.2 Q J**	**0.5 J**	**0.4 Q J**
1,2,3,4,7,8-HXCDF	NG/KG	4.98	0.1	**0.26 Q J**	4.8 U	5 U	4.9 U	5 U	**1.9 Q J**	**1.2 J**	**0.94 Q J**
1,2,3,6,7,8-HXCDF	NG/KG	4.98	0.1	**0.19 Q J**	4.8 U	5 U	4.9 U	5 U	**1.1 Q J**	**0.49 Q J**	**0.6 Q J**
2,3,4,6,7,8-HXCDF	NG/KG	4.98	0.1	**0.16 Q J**	4.8 U	5 U	4.9 U	5 U	**0.98 J**	**0.5 Q J**	**0.51 Q J**
1,2,3,7,8,9-HXCDF	NG/KG	4.98	0.1	4.9 U	4.8 U	5 U	4.9 U	5 U	5.5 U	4.9 U	5.1 U
1,2,3,4,6,7,8-HPCDF	NG/KG	4.98	0.01	**0.88 Q B J**	**0.33 Q J**	**0.29 J**	4.9 U	**0.6 J**	**11**	**5**	**4.4 J**
1,2,3,4,7,8,9-HPCDF	NG/KG	4.98	0.01	**0.066 Q B J**	4.8 U	5 U	4.9 U	5 U	**0.74 J**	4.9 U	**0.3 Q J**
OCDF	NG/KG	9.94	0.0003	**1.8 B J**	**0.3 J**	10 U	9.8 U	**0.75 J**	**15**	**6.2 J**	**5.1 J**
DIOXIN TEQ (ND=RL)	NG/KG	--	--	**3.94**	**12.9**	**17.2**	**18.3**	**19.5**	**15.4**	**13.1**	**15.6**

**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.

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 7. CHLORINATED AND ORGANOPHOSPHORUS PESTICIDE CONCENTRATIONS IN SEDIMENT

LANGLEY-DLA FUEL PIER REPLACEMENT PROJECT, BACK RIVER, VIRGINIA

ANALYTE	UNITS	Average RL	TEL*	PEL*	Willoughby Bank Reference Site	LANG-01	LANG-01 Field Duplicate	LANG-02	LANG-01/02	LANG-03	LANG-04	LANG-03/04
2,4'-DDD	UG/KG	0.187	--	--	0.29 U	**0.0088 J P**	**0.084**	**0.017 J P**	**0.021 J P**	**0.27 P**	**0.038 J P**	**0.17 J P**
2,4'-DDE	UG/KG	0.187	--	--	0.29 U	0.073 U	**0.02 J P**	0.068 U	**0.054 J**	**0.018 J P**	0.16 U	0.37 U
2,4'-DDT	UG/KG	0.187	--	--	0.29 U	0.073 U	0.072 U	0.068 U	0.14 U	**0.024 J**	0.16 U	0.37 U
4,4'-DDD	UG/KG	0.187	1.22	7.81	**0.079 J B**	**0.02 J**	**0.037 J P**	**0.028 J**	**0.12 J**	**1**	**0.082 J**	**0.37**
4,4'-DDE	UG/KG	0.187	2.07	374	0.29 U	**0.02 J**	**0.041 J P**	**0.015 J P**	**0.22**	**1.8**	**0.14 J**	**0.67**
4,4'-DDT	UG/KG	0.187	1.19	4.77	0.29 U	**0.021 J P**	**0.078 P**	0.068 U	**0.03 J P**	**0.23 P**	**0.069 J P**	0.37 U
Total DDT (ND=RL)	UG/KG	--	--	--	0.659	0.061	0.156	0.111	0.37	3.03	0.291	1.41
ALDRIN	UG/KG	0.187	--	--	0.29 U	0.073 U	0.072 U	0.068 U	0.14 U	**0.021 J P**	0.16 U	0.37 U
ALPHA-BHC	UG/KG	0.187	--	--	0.29 U	0.073 U	0.072 U	0.068 U	**0.032 J**	**0.023 J P**	0.16 U	0.37 U
BETA-BHC	UG/KG	0.187	--	--	0.29 U	0.073 U	0.072 U	0.068 U	**0.048 J P**	0.097 U	0.16 U	0.37 U
CHLORDANE (TECHNICAL)	UG/KG	1.87	--	--	2.9 U	0.73 U	0.72 U	0.68 U	1.4 U	0.97 U	1.6 U	3.7 U
ALPHA-CHLORDANE	UG/KG	0.187	2.26	4.79	0.29 U	0.073 U	0.072 U	0.068 U	0.14 U	0.097 U	0.16 U	0.37 U
GAMMA-CHLORDANE	UG/KG	0.187	--	--	0.29 U	**0.016 J P**	**0.029 J P**	0.068 U	0.14 U	**0.2 P**	0.16 U	**0.094 J P**
CHLOROBENSIDE	UG/KG	0.19	--	--	0.29 U	0.073 U	0.072 U	0.068 U	0.14 U	0.097 U	0.16 U	0.37 U
DACHTAL	UG/KG	0.187	--	--	0.29 U	0.073 U	0.072 U	0.068 U	0.14 U	0.097 U	0.16 U	0.37 U
DELTA-BHC	UG/KG	0.187	--	--	0.29 U	0.073 U	0.072 U	**0.017 J P**	**0.027 J P**	0.097 U	0.16 U	0.37 U
DIELDRIN	UG/KG	0.187	0.715	4.3	0.29 U	**0.029 J c**	**0.026 J c**	0.068 U	0.14 U	0.097 U	0.16 U	0.37 U
ENDOSULFAN I	UG/KG	0.187	--	--	0.29 U	0.073 U	0.072 U	0.068 U	0.14 U	**0.019 J P**	0.16 U	0.37 U
ENDOSULFAN II	UG/KG	0.187	--	--	0.29 U	0.073 U	0.072 U	0.068 U	0.14 U	**0.047 J**	0.16 U	0.37 U
ENDOSULFAN SULFATE	UG/KG	0.187	--	--	0.29 U	0.073 U	**0.01 J P**	0.068 U	0.14 U	**0.029 J P**	0.16 U	0.37 U
ENDRIN	UG/KG	0.187	--	--	0.29 U	0.073 U	**0.076**	**0.024 J P**	0.14 U	**0.26 P**	**0.063 J**	**0.17 J**
ENDRIN ALDEHYDE	UG/KG	0.187	--	--	0.29 U	**0.075**	0.072 U	0.068 U	0.14 U	**0.033 J P**	0.16 U	0.37 U
ENDRIN KETONE	UG/KG	0.187	--	--	0.29 U	0.073 U	0.072 U	0.068 U	0.14 U	0.097 U	0.16 U	0.37 U
GAMMA-BHC	UG/KG	0.187	0.32	0.99	0.29 U	0.073 U	0.072 U	**0.031 J P**	**0.027 J P**	**0.045 J P**	**0.043 J**	0.37 U
HEPTACHLOR	UG/KG	0.187	--	--	0.29 U	0.073 U	0.072 U	0.068 U	0.14 U	**0.041 J P**	0.16 U	0.37 U
HEPTACHLOR EPOXIDE	UG/KG	0.187	--	--	0.29 U	0.073 U	0.072 U	0.068 U	0.14 U	**0.044 J P**	0.16 U	0.37 U
METHOXYCHLOR	UG/KG	0.373	--	--	0.58 U	**0.13 J P**	**0.13 J P**	**0.037 J P**	0.28 U	**0.37 P**	0.32 U	0.74 U
MIREX	UG/KG	0.187	--	--	0.29 U	0.073 U	0.072 U	0.068 U	0.14 U	0.097 U	0.16 U	0.37 U
TOXAPHENE	UG/KG	7.5	--	--	12 U	2.9 U	2.9 U	2.7 U	5.6 U	3.9 U	6.4 U	15 U
ORGANOPHOSPHORUS PESTICIDES												
AZINPHOS-METHYL	UG/KG	161.0	--	--	120 U	140 U	140 U	140 U	140 U	380 U	160 U	150 U
DEMETON, TOTAL	UG/KG	321.0	--	--	230 U	290 U	290 U	270 U	280 U	770 U	320 U	290 U
DEMETON-O	UG/KG	161.0	--	--	120 U	140 U	140 U	140 U	140 U	380 U	160 U	150 U
DEMETON-S	UG/KG	161.0	--	--	120 U	140 U	140 U	140 U	140 U	380 U	160 U	150 U
MALATHION	UG/KG	161.0	--	--	120 U	140 U	140 U	140 U	140 U	380 U	160 U	150 U
METHYL PARATHION	UG/KG	161.0	--	--	120 U	140 U	140 U	140 U	140 U	380 U	160 U	150 U
PARATHION	UG/KG	161.0	--	--	120 U	140 U	140 U	140 U	140 U	380 U	160 U	150 U

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

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

TEL = threshold effects level

PEL = probable effects level

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 8. SEMIVOLATILE ORGANIC COMPOUND CONCENTRATIONS IN SEDIMENT

LANGLEY-DLA FUEL PIER PROJECT, BACK RIVER, VIRGINIA

ANALYTE	UNITS	Average RL	TEL*	PEL*	Willoughby Bank Reference Site	LANG-01	LANG-01 Field Duplicate	LANG-02	LANG-01/02	LANG-03	LANG-04	LANG-03/04
1,2,4-TRICHLOROBENZENE	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
1,2-DICHLOROBENZENE	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
1,2-DIPHENYLHYDRAZINE	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
1,3-DICHLOROBENZENE	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
1,4-DICHLOROBENZENE	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
2,2'-OXYBIS[1-CHLOROPROPANE]	UG/KG	26	--	--	9.4 U	29 U	29 U	27 U	28 U	39 U	32 U	30 U
2,4,5-TRICHLOROPHENOL	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
2,4,6-TRICHLOROPHENOL	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
2,4-DICHLOROPHENOL	UG/KG	26	--	--	9.4 U	29 U	29 U	27 U	28 U	39 U	32 U	30 U
2,4-DIMETHYLPHENOL	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
2,4-DINITROPHENOL	UG/KG	660	--	--	240 U	750 U	740 U	700 U	720 U	990 U	820 U	760 U
2,4-DINITROTOLUENE	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
2,6-DINITROTOLUENE	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
2-CHLORONAPHTHALENE	UG/KG	26	--	--	9.4 U	29 U	29 U	27 U	28 U	39 U	32 U	30 U
2-CHLOROPHENOL	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
2-METHYLPHENOL	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
2-NITROANILINE	UG/KG	660	--	--	240 U	750 U	740 U	700 U	720 U	990 U	820 U	760 U
2-NITROPHENOL	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
3,3'-DICHLOROBENZIDINE	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
3-NITROANILINE	UG/KG	660	--	--	240 U	750 U	740 U	700 U	720 U	990 U	820 U	760 U
4,6-DINITRO-2-METHYLPHENOL	UG/KG	660	--	--	240 U	750 U	740 U	700 U	720 U	990 U	820 U	760 U
4-BROMOPHENYL PHENYL ETHER	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
4-CHLORO-3-METHYLPHENOL	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
4-CHLOROANILINE	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
4-CHLOROPHENYL PHENYL ETHER	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
4-NITROANILINE	UG/KG	660	--	--	240 U	750 U	740 U	700 U	720 U	990 U	820 U	760 U
4-NITROPHENOL	UG/KG	660	--	--	240 U	750 U	740 U	700 U	720 U	990 U	820 U	760 U
BENZIDINE	UG/KG	2583	--	--	940 U	2900 U	2900 U	2700 U	2800 U	3900 U	3200 U	3000 U
BENZOIC ACID	UG/KG	660	182	2,647	240 U	750 U	740 U	700 U	720 U	990 U	820 U	760 U
BENZYL ALCOHOL	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
BIS(2-CHLOROETHOXY)METHANE	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
BIS(2-CHLOROETHYL)ETHER	UG/KG	26	--	--	9.4 U	29 U	29 U	27 U	28 U	39 U	32 U	30 U
BIS(2-ETHYLHEXYL) PHTHALATE	UG/KG	257	--	--	94 U	290 U	290 U	270 U	280 U	390 U	320 U	**42 J**
BUTYL BENZYL PHTHALATE	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
CARBAZOLE	UG/KG	26	--	--	9.4 U	29 U	29 U	27 U	28 U	39 U	32 U	30 U
DIBENZOFURAN	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
DIETHYL PHTHALATE	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
DIMETHYL PHTHALATE	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
DI-N-BUTYL PHTHALATE	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
DI-N-OCTYL PHTHALATE	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
HEXACHLOROBENZENE	UG/KG	26	--	--	9.4 U	29 U	29 U	27 U	28 U	39 U	32 U	30 U
HEXACHLOROBUTADIENE	UG/KG	26	--	--	9.4 U	29 U	29 U	27 U	28 U	39 U	32 U	30 U
HEXACHLOROCYCLOPENTADIENE	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
HEXACHLOROETHANE	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
ISOPHORONE	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
METHYLPHENOL, 3 & 4	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
NITROBENZENE	UG/KG	257	--	--	94 U	290 U	290 U	270 U	280 U	390 U	320 U	300 U
N-NITROSODIMETHYLAMINE	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
N-NITROSODI-N-PROPYLAMINE	UG/KG	26	--	--	9.4 U	29 U	29 U	27 U	28 U	39 U	32 U	30 U
N-NITROSODIPHENYLAMINE	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
PENTACHLOROPHENOL	UG/KG	128	--	--	46 U	140 U	140 U	140 U	140 U	190 U	160 U	150 U
PHENOL	UG/KG	26	--	--	**12**	29 U	29 U	27 U	28 U	39 U	32 U	30 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 estimated)
TEL = threshold effects leve **U** = compound was analyzed, but not detecte
PEL = probable effects level

TABLE 9. BUTYLTIN CONCENTRATIONS IN SEDIMENT

LANGLEY-DLA FUEL PIER REPLACEMENT PROJECT, BACK RIVER, VIRGINIA

Analyt	UNITS	Average RL	Willoughby Bank Reference Site	LANG-01	LANG-01 Field Duplicate	LANG-02	LANG-01/02	LANG-03	LANG-04	LANG-03/04
MONOBUTYLTIN	UG/KG	8.53	6.9 U	8.6 U	8.7 U	8.2 U	8.3 U	12 U	9.6 U	8.9 U
DIBUTYLTIN	UG/KG	2.21	1.8 U	2.2 U	2.3 U	2.1 U	2.2 U	3.1 U	2.5 U	2.3 U
TRIBUTYLTIN	UG/KG	2.6	2.1 U	2.6 U	2.6 U	2.5 U	2.5 U	3.5 U	2.9 U	2.7 U
TETRABUTYLTIN	UG/KG	3	2.3 U	2.9 U	2.9 U	2.8 U	2.8 U	4 U	3.3 U	3 U

NOTES: RL is reported for non-detected constituents.

U = compound was analyzed, but not detected

TABLE 10. GENERAL CHEMISTRY CONCENTRATIONS IN SITE WATER AND STANDARD ELUTRIATES

LANGLEY-DLA FUEL PIER REPLACEMENT PROJECT, BACK RIVER, VIRGINIA

ANALYTE	UNITS	Average RL	Acute Criteria	LANG-WAT	LANG-01/02	LANG-03/04
AMMONIA AS NITROGEN	MG/L	0.30	4.91[a]	**0.055 J**	**6 B**	**17 B**
CYANIDE	UG/L	10	1[b]	10 U	10 U	**3.7 J**
DISSOLVED ORGANIC CARBON	MG/L	1	--	**1.3**	**4.3**	**4.5**
SULFIDE	MG/L	3	--	3 U	3 U	**1.2 J**
TOTAL SUSPENDED SOLIDS	MG/L	2.1	--	**21**	**4**	**5.2**

(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. METALS CONCENTRATIONS IN SITE WATER AND STANDARD ELUTRIATES
LANGLEY-DLA FUEL PIER REPLACEMENT PROJECT, BACK RIVER, VIRGINIA

ANALYTE	UNITS	Average RL	USEPA ACUTE CRITERIA *	LANG-WAT	LANG-01/02	LANG-03/04
ALUMINUM	UG/L	150	--	**520**	**14 J**	150 U
ANTIMONY	UG/L	10	--	**0.31 J**	**3.7 J**	**2.7 J**
ARSENIC	UG/L	5	69	**12**	**110**	**47**
BARIUM	UG/L	50	--	**26 J**	**43 J**	**51**
BERYLLIUM	UG/L	5	--	**0.29 J**	**0.18 J**	**0.84 J**
CADMIUM	UG/L	5	40.0	5 U	5 U	5 U
CALCIUM	UG/L	500	--	**220,000 B**	**220,000**	**220,000**
CHROMIUM	UG/L	10	1,100	**4.3 J**	**41**	**46**
COBALT	UG/L	3	--	**0.71 J**	**0.78 J**	**1 J**
COPPER	UG/L	10	4.8	**6.8 J**	**6.6 J**	**4 J**
IRON	UG/L	250	--	**530**	**260**	**270**
LEAD	UG/L	5	210	**1.1 J B**	**0.25 J**	5 U
MAGNESIUM	UG/L	500	--	**720,000**	**810,000 B**	**850,000 B**
MANGANESE	UG/L	25	--	**17 J**	**17 J B**	**140 B**
MERCURY	UG/L	0	1.8	0.2 U	0.2 U	0.2 U
NICKEL	UG/L	5	74	**2.4 J**	**15 B**	**16 B**
POTASSIUM	UG/L	500	--	**220,000 B**	**290,000 B**	**290,000 B**
SELENIUM	UG/L	25	290	**45 B**	**190**	**180**
SILVER	UG/L	5	1.9	5 U	5 U	5 U
SODIUM	UG/L	5,000	--	**6,800,000 B**	**7,000,000**	**7,200,000**
THALLIUM	UG/L	5	--	**0.32 J**	5 U	**0.55 J**
VANADIUM	UG/L	5	--	**2.9 J B**	**53 B**	**9.6 B**
ZINC	UG/L	25	90	**41 B**	**8.5 J**	**7.2 J**

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

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

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 12. PAH CONCENTRATIONS IN SITE WATER AND STANDARD ELUTRIATES

LANGLEY-DLA FUEL PIER REPLACEMENT PROJECT, BACK RIVER, VIRGINIA

ANALYTE	UNITS	Average RL	LANG-WAT	LANG-01/02	LANG-03/04
LOW MOLECULAR WEIGHT PAHs (LPAHs)					
1-METHYLNAPHTHALENE	UG/L	0.21	0.19 U	0.23 U	0.22 U
2-METHYLNAPHTHALENE	UG/L	0.21	0.19 U	0.23 U	0.22 U
ACENAPHTHENE	UG/L	0.21	0.19 U	0.23 U	0.22 U
ACENAPHTHYLENE	UG/L	0.21	0.19 U	0.23 U	0.22 U
ANTHRACENE	UG/L	0.21	0.19 U	0.23 U	0.22 U
FLUORENE	UG/L	0.21	0.19 U	0.23 U	0.22 U
NAPHTHALENE	UG/L	0.21	0.19 U	0.23 U	0.22 U
PHENANTHRENE	UG/L	0.21	0.19 U	0.23 U	0.22 U
TOTAL LPAHs (ND=RL)	UG/L	--	**1.33**	**1.61**	**1.54**
HIGH MOLECULAR WEIGHT PAHs (HPAHs)					
BENZO(A)ANTHRACENE	UG/L	0.21	0.19 U	0.23 U	0.22 U
BENZO(A)PYRENE	UG/L	0.21	0.19 U	0.23 U	0.22 U
BENZO(B)FLUORANTHENE	UG/L	0.21	0.19 U	0.23 U	0.22 U
BENZO(GHI)PERYLENE	UG/L	0.21	0.19 U	0.23 U	0.22 U
BENZO(K)FLUORANTHENE	UG/L	0.21	0.19 U	0.23 U	0.22 U
CHRYSENE	UG/L	0.21	0.19 U	0.23 U	0.22 U
DIBENZO(A,H)ANTHRACENE	UG/L	0.21	0.19 U	0.23 U	0.22 U
FLUORANTHENE	UG/L	0.21	0.19 U	0.23 U	0.22 U
INDENO(1,2,3-CD)PYRENE	UG/L	0.21	0.19 U	0.23 U	0.22 U
PYRENE	UG/L	0.21	0.19 U	0.23 U	0.22 U
TOTAL HPAHs (ND=RL)	UG/L	--	**1.14**	**1.38**	**1.32**
TOTAL PAHs					
TOTAL PAHs (ND=RL)	UG/L	--	**3.42**	**4.14**	**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

U = compound was analyzed, but not detected

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

LANGLEY-DLA FUEL PIER REPLACEMENT PROJECT, BACK RIVER, VIRGINIA

ANALYTE	UNITS	Average RL	LANG-WAT	LANG-01/02	LANG-03/04
PCB 8 (BZ)*	NG/L	0.97	**0.3 J P**	**0.21 J P**	0.99 U
PCB 18 (BZ)*	NG/L	0.97	**0.29 J P**	1 U	0.99 U
PCB 28 (BZ)*	NG/L	0.97	0.95 U	1 U	0.99 U
PCB 44 (BZ)*	NG/L	0.97	0.95 U	1 U	0.99 U
PCB 49 (BZ)	NG/L	0.97	0.95 U	1 U	0.99 U
PCB 52 (BZ)*	NG/L	0.97	0.95 U	1 U	0.99 U
PCB 66 (BZ)*	NG/L	0.97	0.95 U	1 U	0.99 U
PCB 77 (BZ)*	NG/L	0.97	0.95 U	1 U	0.99 U
PCB 87 (BZ)	NG/L	0.97	0.95 U	1 U	0.99 U
PCB 101 (BZ)*	NG/L	0.97	0.95 U	1 U	0.99 U
PCB 105 (BZ)*	NG/L	0.97	0.95 U	1 U	0.99 U
PCB 118 (BZ)*	NG/L	0.97	0.95 U	1 U	0.99 U
PCB 126 (BZ)*	NG/L	0.97	0.95 U	1 U	0.99 U
PCB 128 (BZ)*	NG/L	0.97	0.95 U	1 U	0.99 U
PCB 138 (BZ)*	NG/L	0.97	0.95 U	1 U	0.99 U
PCB 153 (BZ)*	NG/L	0.97	0.95 U	1 U	0.99 U
PCB 156 (BZ)	NG/L	0.97	0.95 U	1 U	0.99 U
PCB 169 (BZ)*	NG/L	0.97	0.95 U	1 U	0.99 U
PCB 170 (BZ)*	NG/L	0.97	0.95 U	1 U	0.99 U
PCB 180 (BZ)*	NG/L	0.97	0.95 U	1 U	0.99 U
PCB 183 (BZ)	NG/L	0.97	0.95 U	1 U	0.99 U
PCB 184 (BZ)	NG/L	0.97	0.95 U	1 U	0.99 U
PCB 187 (BZ)*	NG/L	0.97	0.95 U	1 U	0.99 U
PCB 195 (BZ)	NG/L	0.97	0.95 U	1 U	0.99 U
PCB 206 (BZ)	NG/L	0.97	0.95 U	1 U	0.99 U
PCB 209 (BZ)	NG/L	0.97	0.95 U	1 U	0.99 U
TOTAL PCBs (ND=RL)	NG/L	--	**46.8**	**50.4**	**51.5**

* 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

LANGLEY-DLA FUEL PIER REPLACEMENT PROJECT, BACK RIVER, VIRGINIA

ANALYTE	UNITS	Average RL	TEF*	LANG-WAT	LANG-01/02	LANG-03/04
2,3,7,8-TCDD	PG/L	10.1	**1**	9.6 U	11 U	10 U
1,2,3,7,8-PECDD	PG/L	50.8	**1**	**0.084 Q J**	57 U	50 U
1,2,3,4,7,8-HXCDD	PG/L	50.8	**0.1**	**0.6 Q B J**	57 U	50 U
1,2,3,6,7,8-HXCDD	PG/L	50.8	**0.1**	**0.51 J**	**1.4 Q B J**	50 U
1,2,3,7,8,9-HXCDD	PG/L	50.8	**0.1**	**1 J**	**2.1 Q J**	**6.2 J**
1,2,3,4,6,7,8-HPCDD	PG/L	50.8	**0.01**	**8.6 B J**	**46 B J**	**43 Q B J**
OCDD	PG/L	100.5	**0.0003**	**150 B**	**1,000 B**	**880 B**
2,3,7,8-TCDF	PG/L	10.1	**0.1**	9.6 U	11 U	10 U
1,2,3,7,8-PECDF	PG/L	50.8	**0.03**	48 U	57 U	**0.18 Q J**
2,3,4,7,8-PECDF	PG/L	50.8	**0.3**	48 U	57 U	50 U
1,2,3,4,7,8-HXCDF	PG/L	50.8	**0.1**	**0.42 Q J**	57 U	**0.2 Q J**
1,2,3,6,7,8-HXCDF	PG/L	50.8	**0.1**	**0.35 J**	57 U	**0.43 Q J**
2,3,4,6,7,8-HXCDF	PG/L	50.8	**0.1**	**0.36 Q B J**	57 U	**0.92 Q J**
1,2,3,7,8,9-HXCDF	PG/L	50.8	**0.1**	**0.065 Q J**	57 U	50 U
1,2,3,4,6,7,8-HPCDF	PG/L	50.8	**0.01**	**1 Q J**	**3.4 B J**	**2.5 Q B J**
1,2,3,4,7,8,9-HPCDF	PG/L	50.8	**0.01**	**0.59 Q J**	57 U	50 U
OCDF	PG/L	100.5	**0.0003**	**9.1 B Q J**	**16 Q B J**	**11 B J**
DIOXIN TEQ (ND=RL)	PG/L	--	**--**	**26.7**	**118**	**92**

**Source* : Van den Berg, M, et al. 2006. The 2005 World Health Organization Re-evaluation of Human and Mammalian Toxic Equivalency Factor *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 ELUTRIATE

LANGLEY-DLA FUEL PIER REPLACEMENT PROJECT, BACK RIVER, VIRGINIA

ANALYTE	UNITS	Average RL	USEPA ACUTE CRITERIA *	LANG-WAT	LANG-01/02	LANG-03/04
1,2,4-TRICHLOROBENZENE	UG/L	1.048	--	0.95 U	1.2 U	1.1 U
1,2-DICHLOROBENZENE	UG/L	1.048	--	0.95 U	1.2 U	1.1 U
1,2-DIPHENYLHYDRAZINE(AS AZOBENZEN	UG/L	1.048	--	0.95 U	1.2 U	1.1 U
1,3-DICHLOROBENZENE	UG/L	1.048	--	0.95 U	1.2 U	1.1 U
1,4-DICHLOROBENZENE	UG/L	1.048	--	0.95 U	1.2 U	1.1 U
2,2'-OXYBIS[1-CHLOROPROPANE]	UG/L	0.208	--	0.19 U	0.23 U	0.22 U
2,4,5-TRICHLOROPHENOL	UG/L	1.048	--	0.95 U	1.2 U	1.1 U
2,4,6-TRICHLOROPHENOL	UG/L	1.048	--	0.95 U	1.2 U	1.1 U
2,4-DICHLOROPHENOL	UG/L	0.208	--	0.19 U	0.23 U	0.22 U
2,4-DIMETHYLPHENOL	UG/L	1.048	--	0.95 U	1.2 U	1.1 U
2,4-DINITROPHENOL	UG/L	5.175	--	4.8 U	5.8 U	5.4 U
2,4-DINITROTOLUENE	UG/L	1.048	--	0.95 U	1.2 U	1.1 U
2,6-DINITROTOLUENE	UG/L	1.048	--	0.95 U	1.2 U	1.1 U
2-CHLORONAPHTHALENE	UG/L	0.208	--	0.19 U	0.23 U	0.22 U
2-CHLOROPHENOL	UG/L	1.048	--	0.95 U	1.2 U	1.1 U
2-METHYLPHENOL	UG/L	1.048	--	0.95 U	1.2 U	1.1 U
2-NITROANILINE	UG/L	5.175	--	4.8 U	5.8 U	5.4 U
2-NITROPHENOL	UG/L	1.048	--	0.95 U	1.2 U	1.1 U
3,3'-DICHLOROBENZIDINE	UG/L	1.048	--	0.95 U	1.2 U	1.1 U
3-NITROANILINE	UG/L	5.175	--	4.8 U	5.8 U	5.4 U
4,6-DINITRO-2-METHYLPHENOL	UG/L	5.175	--	4.8 U	5.8 U	5.4 U
4-BROMOPHENYL PHENYL ETHER	UG/L	1.048	--	0.95 U	1.2 U	1.1 U
4-CHLORO-3-METHYLPHENOL	UG/L	1.048	--	0.95 U	1.2 U	1.1 U
4-CHLOROANILINE	UG/L	1.048	--	0.95 U	1.2 U	1.1 U
4-CHLOROPHENYL PHENYL ETHER	UG/L	1.048	--	0.95 U	1.2 U	1.1 U
4-NITROANILINE	UG/L	5.175	--	4.8 U	5.8 U	5.4 U
4-NITROPHENOL	UG/L	5.175	--	4.8 U	5.8 U	5.4 U
BENZIDINE	UG/L	20.750	--	19 U	23 U	22 U
BENZOIC ACID	UG/L	5.175	--	4.8 U	**2.1 J**	**2 J**
BENZYL ALCOHOL	UG/L	1.048	--	0.95 U	1.2 U	1.1 U
BIS(2-CHLOROETHOXY)METHANE	UG/L	1.048	--	0.95 U	1.2 U	1.1 U
BIS(2-CHLOROETHYL)ETHER	UG/L	0.208	--	0.19 U	0.23 U	0.22 U
BIS(2-ETHYLHEXYL) PHTHALATE	UG/L	2.075	--	1.9 U	2.3 U	2.2 U
BUTYL BENZYL PHTHALATE	UG/L	1.048	--	0.95 U	1.2 U	1.1 U
CARBAZOLE	UG/L	0.208	--	0.19 U	0.23 U	0.22 U
DIBENZOFURAN	UG/L	1.048	--	0.95 U	1.2 U	1.1 U
DIETHYL PHTHALATE	UG/L	1.048	--	0.95 U	**0.25 J**	**0.2 J**
DIMETHYL PHTHALATE	UG/L	1.048	--	0.95 U	1.2 U	1.1 U
DI-N-BUTYL PHTHALATE	UG/L	1.048	--	0.95 U	1.2 U	1.1 U
DI-N-OCTYL PHTHALATE	UG/L	1.048	--	0.95 U	1.2 U	1.1 U
HEXACHLOROBENZENE	UG/L	0.208	--	0.19 U	0.23 U	0.22 U
HEXACHLOROBUTADIENE	UG/L	0.208	--	0.19 U	0.23 U	0.22 U
HEXACHLOROCYCLOPENTADIENE	UG/L	1.048	--	0.95 U	1.2 U	1.1 U
HEXACHLOROETHANE	UG/L	1.048	--	0.95 U	1.2 U	1.1 U
ISOPHORONE	UG/L	1.048	--	0.95 U	1.2 U	1.1 U
METHYLPHENOL, 3 & 4	UG/L	1.048	--	0.95 U	1.2 U	1.1 U
NITROBENZENE	UG/L	2.075	--	1.9 U	2.3 U	2.2 U
N-NITROSODIMETHYLAMINE	UG/L	1.048	--	0.95 U	1.2 U	1.1 U
N-NITROSODI-N-PROPYLAMINE	UG/L	0.208	--	0.19 U	0.23 U	0.22 U
N-NITROSODIPHENYLAMINE	UG/L	1.048	--	0.95 U	1.2 U	1.1 U
PENTACHLOROPHENOL	UG/L	1.048	13	0.95 U	1.2 U	1.1 U
PHENOL	UG/L	0.208	--	0.19 U	0.23 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 detected

TABLE 16. PESTICIDE CONCENTRATIONS IN SITE WATER AND STANDARD ELUTRIATES

LANGLEY-DLA FUEL PIER REPLACEMENT PROJECT, BACK RIVER, VIRGINIA

ANALYTE	UNITS	Average RL	USEPA ACUTE CRITERIA *	LANG-WAT	LANG-01/02	LANG-03/04
2,4'-DDD	UG/L	0.00125	--	0.0012 U	0.0013 U	0.0013 U
2,4'-DDE	UG/L	0.00125	--	0.0012 U	**0.0004 J P**	**0.00022 J P**
2,4'-DDT	UG/L	0.00125	--	0.0012 U	0.0013 U	**0.00034 J P**
4,4'-DDD	UG/L	0.00125	--	**0.00075 J**	0.0013 U	0.0013 U
4,4'-DDE	UG/L	0.00125	--	0.0012 U	0.0013 U	0.0013 U
4,4'-DDT	UG/L	0.00125	0.13	**0.0011 J**	0.0013 U	0.0013 U
Total DDTs (ND=RL)	UG/L	---	---	0.00305	0.0039	0.0039
CHLORINATED PESTICIDES						
ALDRIN	UG/L	0.001	1.3	0.0012 U	0.0013 U	0.0013 U
ALPHA-BHC	UG/L	0.00125	--	0.0012 U	**0.00091 J P**	**0.0016 P**
BETA-BHC	UG/L	0.001	--	0.0012 U	**0.0016 P**	**0.0054 P**
CHLORDANE (TECHNICAL)	UG/L	0.01	0.09	0.012 U	**0.014 P**	0.013 U
ALPHA-CHLORDANE	UG/L	0.00125	0.09	0.0012 U	0.0013 U	0.0013 U
GAMMA-CHLORDANE	UG/KG	0.00	0.09	0.0012 U	0.0013 U	0.0013 U
CHLOROBENSIDE	UG/L	0.00	--	0.003 U	0.0032 U	0.0032 U
DACHTAL	UG/L	0.002	--	0.0024 U	0.0025 U	**0.0006 J**
DELTA-BHC	UG/L	0.001	--	**0.0008 J P**	**0.0011 J P**	**0.0011 J P**
DIELDRIN	UG/L	0.001	0.71	0.0012 U	0.0013 U	0.0013 U
ENDOSULFAN I	UG/L	0.001	0.034	0.0012 U	0.0013 U	0.0013 U
ENDOSULFAN II	UG/L	0.001	0.034	0.0012 U	0.0013 U	0.0013 U
ENDOSULFAN SULFATE	UG/L	0.001	--	0.0012 U	0.0013 U	0.0013 U
ENDRIN	UG/L	0.001	0.037	0.0012 U	0.0013 U	0.0013 U
ENDRIN ALDEHYDE	UG/L	0.001	--	0.0012 U	0.0013 U	0.0013 U
ENDRIN KETONE	UG/KG	0.00	--	0.0012 U	0.0013 U	0.0013 U
GAMMA-BHC	UG/L	0.001	0.16	0.0012 U	**0.00085 J**	**0.0015 P**
HEPTACHLOR	UG/L	0.001	0.053	**0.0015 P**	0.0013 U	0.0013 U
HEPTACHLOR EPOXIDE	UG/L	0.001	0.053	0.0012 U	0.0013 U	**0.0012 J P**
METHOXYCHLOR	UG/L	0.002	--	0.0024 U	0.0025 U	0.0025 U
MIREX	UG/L	0.00125	--	0.0012 U	0.0013 U	0.0013 U
TOXAPHENE	UG/L	0.1	0.21	0.095 U	0.1 U	0.1 U
ORGANOPHOSPHORUS PESTICIDES						
AZINPHOS-METHYL	UG/KG	0.98	--	0.95 U	1 U	1 U
DEMETON, TOTAL	UG/KG	1.95	--	1.9 U	2 U	2 U
DEMETON-O	UG/KG	0.98	--	0.95 U	1 U	1 U
DEMETON-S	UG/KG	0.98	--	0.95 U	1 U	1 U
MALATHION	UG/KG	0.98	--	0.95 U	1 U	1 U
METHYL PARATHION	UG/KG	0.98	--	0.95 U	1 U	1 U
PARATHION	UG/KG	0.98	--	0.95 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

LANGLEY-DLA FUEL PIER REPLACEMENT PROJECT, BACK RIVER, VIRGINIA

ANALYTE	UNIT	Average RL	LANG-WAT	LANG-01/02	LANG-03/04
MONOBUTYLTIN	UG/KG	0.503	0.48 U	0.54 U	0.51 U
DIBUTYLTIN	UG/KG	0.039	0.037 U	0.042 U	0.039 U
TRIBUTYLTIN	UG/KG	0.045	0.043 U	0.049 U	0.045 U
TETRABUTYLTIN	UG/KG	0.050	0.048 U	0.054 U	0.051 U

NOTES: RL is reported for non-detected constituents.

U = compound was analyzed, but not detected

TABLE 18: RESULTS OF WATER COLUMN BIOASSAYS

LANGLEY-DLA FUEL PIER REPLACEMENT PROJECT, BACK RIVER, 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}**
LANG-01/02-SED	86.8	Yes	114	> 100	No	--	>100	No	--
LANG-03/04-SED	40.2	Yes	248	> 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

LANGLEY-DLA FUEL PIER REPLACEMENT PROJECT, BACK RIVER, 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
LANG-01/02-SED	25/25	100	No	97 / 100	97	No
LANG-03/04-SED	25 / 25	100	No	98 / 101	97	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 RESULTS FOR BIOACCUMULATION TESTS
LANGLEY-DLA FUEL PIER REPLACEMENT PROJECT, BACK RIVER, 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
LANG-01/02-SED	102 / 105	97	No	234 / 235	99	No
LANG-03/04-SED	103 / 105	98	No	226 / 235	96	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 (MG/KG) IN TISSUES

LANGLEY-DLA FUEL PIER REPLACEMENT PROJECT, BACK RIVER, VIRGINIA

		PRETEST		Willoughy Bank Reference		LANG-01/02		LANG-03/04	
		Worms	Clams	Worms	Clams	Worms	Clams	Worms	Clams
ANALYTE	UNITS	Lipids = 0.75%	Lipids = 0.71%	Lipids = 0.68%	Lipids = 0.48%	Lipids = 0.83%	Lipids = 0.48%	Lipids = 0.72%	Lipids = 0.54%
ANTIMONY	MG/KG	0.00693	0.0183	0.024	0.0246	0.0346	0.034	0.00806	0.0282
ARSENIC	MG/KG	1.77	2.8	2.32	2.44	2.02	2.48	1.86	2.48
BERYLLIUM	MG/KG	ND	ND	ND	ND	ND	ND	ND	ND
CADMIUM	MG/KG	ND	0.021	0.0258	0.0789	ND	0.0778	0.0797	0.0787
CHROMIUM	MG/KG	0.11	0.149	0.15	0.228	0.103	0.172	0.157	0.42
COPPER	MG/KG	1.17	3.4	1.12	2.16	1.13	2	1.04	2.02
LEAD	MG/KG	0.0817	0.143	0.0856	0.192	0.12	0.146	**0.115**	0.2
MERCURY	MG/KG	0.024	ND	0.025	0.0134	0.028	ND	ND	ND
NICKEL	MG/KG	0.22	0.423	0.244	0.458	0.194	0.386	0.264	0.46
SELENIUM	MG/KG	0.427	0.483	0.3	0.428	**0.484**	**0.456**	**0.492**	0.424
SILVER	MG/KG	0.0257	0.0387	0.0143	0.0146	0.0182	0.0172	**0.0246**	**0.0216**
THALLIUM	MG/KG	ND	ND	ND	0.0398	0.00704	0.0782	0.0597	0.0213
ZINC	MG/KG	8.23	15.3	15.8	14.4	18.2	13.8	24	13.4

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 DIOXIN AND FURAN CONCENTRATIONS (NG/KG) IN TISSUES

LANGLEY-DLA FUEL PIER REPLACEMENT PROJECT, BACK RIVER, VIRGINIA

			PRETEST		Willoughy Bank Reference		LANG-01/02		LANG-03/04	
			Worms	Clams	Worms	Clams	Worms	Clams	Worms	Clams
ANALYTE	UNITS	TEF*	Lipids = 0.75%	Lipids = 0.71%	Lipids = 0.68%	Lipids = 0.48%	Lipids = 0.83%	Lipids = 0.48%	Lipids = 0.72%	Lipids = 0.54%
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	ND	ND	ND	ND
1,2,3,4,7,8-HXCDD	NG/KG	0.1	ND	ND	ND	6.17	ND	ND	ND	ND
1,2,3,6,7,8-HXCDD	NG/KG	0.1	4.73	ND	ND	0.12	ND	ND	ND	ND
1,2,3,7,8,9-HXCDD	NG/KG	0.1	ND	ND	ND	0.135	ND	ND	ND	**7.4**
1,2,3,4,6,7,8-HPCDD	NG/KG	0.01	3.21	4.97	1.41	1.9	1.4	1.7	**1.77**	**2.69**
OCDD	NG/KG	0.0003	11.7	1.31	12.2	28.3	14.9	28.9	17.3	**41.2**
2,3,7,8-TCDF	NG/KG	0.1	1.08	ND	1.3	0.551	0.631	ND	0.727	ND
1,2,3,7,8-PECDF	NG/KG	0.03	ND	ND	ND	ND	ND	ND	ND	ND
2,3,4,7,8-PECDF	NG/KG	0.3	ND	ND	ND	8.82	ND	ND	ND	ND
1,2,3,4,7,8-HXCDF	NG/KG	0.1	ND	ND	ND	4.35	5.5	ND	6.52	ND
1,2,3,6,7,8-HXCDF	NG/KG	0.1	2.28	ND	0.677	4.77	0.845	ND	0.769	ND
2,3,4,6,7,8-HXCDF	NG/KG	0.1	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,7,8,9-HXCDF	NG/KG	0.1	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,4,6,7,8-HPCDF	NG/KG	0.01	2.44	ND	3.32	4.78	3.21	ND	3.19	ND
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	0.59	ND	9.58	7.72
DIOXIN TEQ (ND=1/2RL)	NG/KG	--	8.31	9.24	9.47	8.61	8.03	13.6	9.31	11.4
DIOXIN TEQ (ND=RL)	NG/KG	--	16.6	18.5	18.9	17.2	16	27.1	18.6	22.8

**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 23. MEAN PESTICIDE CONCENTRATIONS (UG/KG) IN TISSUES
LANGLEY-DLA FUEL PIER REPLACEMENT PROJECT, BACK RIVER, VIRGINIA

		PRETEST		Willoughy Bank Reference		LANG-01/02		LANG-03/04	
		Worms	Clams	Worms	Clams	Worms	Clams	Worms	Clams
ANALYTE	UNITS	Lipids = 0.75%	Lipids = 0.71%	Lipids = 0.68%	Lipids = 0.48%	Lipids = 0.83%	Lipids = 0.48%	Lipids = 0.72%	Lipids = 0.54%
2,4'-DDD	UG/KG	0.371	ND	ND	ND	ND	0.789	ND	0.657
2,4'-DDE	UG/KG	ND	0.161	ND	ND	ND	ND	ND	0.655
2,4'-DDT	UG/KG	ND	ND	ND	0.566	ND	ND	ND	ND
4,4'-DDD	UG/KG	0.403	ND	0.518	ND	0.184	0.667	0.194	0.411
4,4'-DDE	UG/KG	ND	0.529	ND	0.477	ND	0.795	0.487	0.629
4,4'-DDT	UG/KG	ND	0.576	0.535	ND	ND	ND	ND	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 24. COMPARISON OF UPPER 95% CONFIDENCE LEVELS OF THE MEAN TISSUE CONCENTRATION TO U.S. FOOD AND DRUG ADMINISTRATION (USFDA) ACTION/GUIDANCE/TOLERANCE LEVELS

LANGLEY-DLA FUEL PIER REPLACEMENT PROJECT, BACK RIVER, VIRGINIA

ANALYTE[c]	UNITS	USFDA Action/Guidance/Tolerance Levels[a]		LANG-01/02		LANG-03/04	
		Worms	Clams	Worms	Clams	Worms	Clams
ARSENIC	MG/KG	76	86	2.177	2.697	1.988	2.584
CADMIUM	MG/KG	4	3	ND	0.114	0.118	0.117
CHROMIUM	MG/KG	12	13	0.166	0.198	0.355	0.685
LEAD	MG/KG	1.5	1.7	0.16	0.16	0.15	0.21
MERCURY	MG/KG	1	1	0.04	ND	ND	ND
NICKEL	MG/KG	70	80	0.22	0.42	0.36	0.55
4,4'-DDT	UG/KG	5000	5000	ND	ND	ND	ND

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

(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 in tissue that were tested in this program.

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

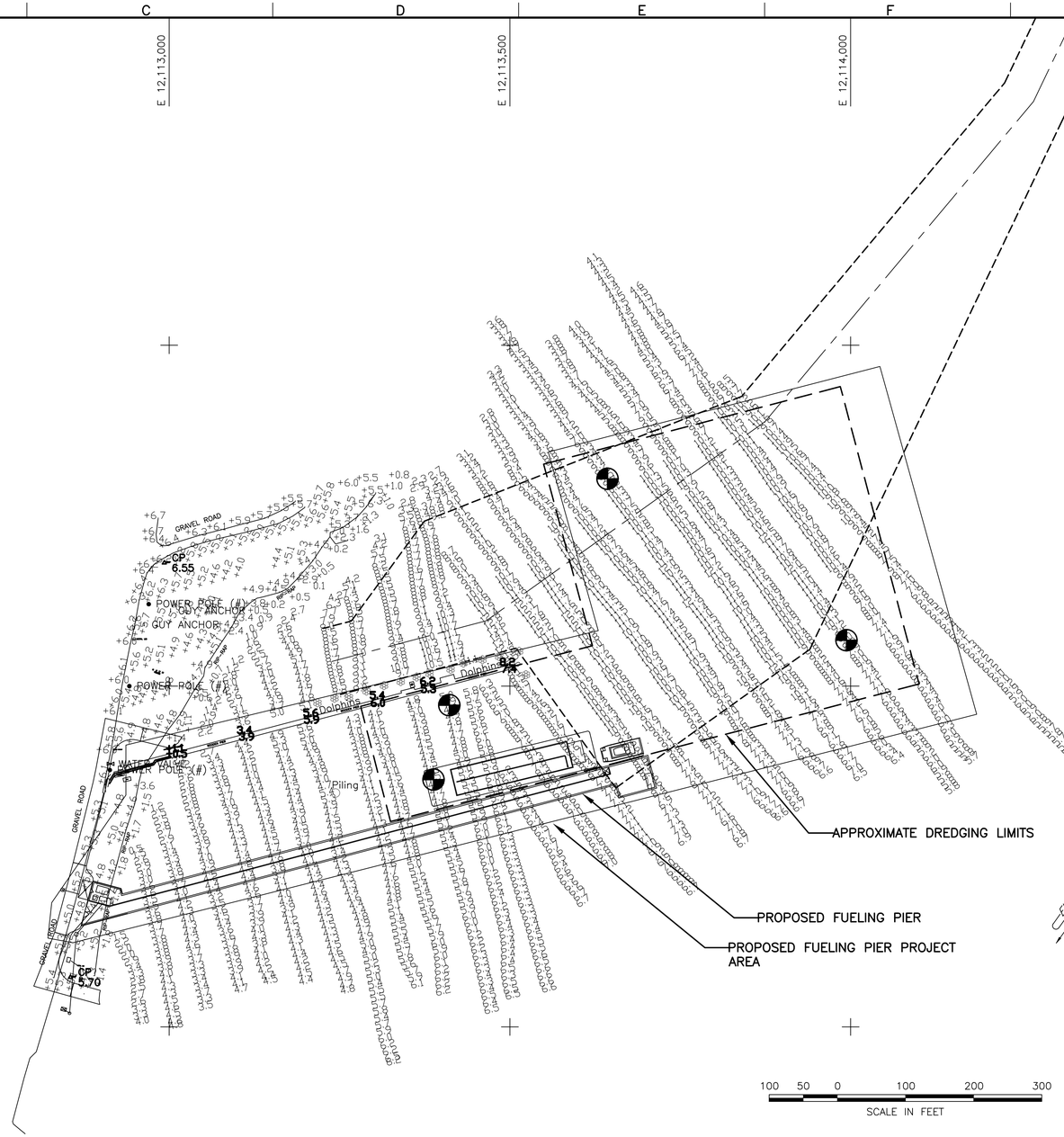
Exceeds USFDA Action/Guidance/Tolerance Levels

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

Langley-DLA Fuel Pier Replacement
Back River, Hampton, Virginia

Attachment I

BATHYMETRIC SURVEY MAP



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.

US Army Corps of Engineers
Norfolk District

REV.	DATE	DESCRIPTION	BY	APP.

DESIGNED: R.W.S.
DRAWN: P.M.R.
SUBMITTED: M.L.A.
NORFOLK DISTRICT FILE NO.: LFP.SP
DRAWING NO.: (2)
DATE: 14 MAY 13
SCALE: AS SHOWN
SURVEYED BY: M.A.W.

NORFOLK DISTRICT
CORPS OF ENGINEERS
NORFOLK, VIRGINIA

LANGLEY AIR FORCE BASE
FUEL PIER CHANNEL
PROJECT CONDITION
SURVEY OF MAY 2013
HAMPTON, VIRGINIA

SHEET 2 OF 2

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

Langley-DLA Fuel Pier Replacement
Back River, Hampton, Virginia

Attachment II

STFATE MODEL RESULTS

LANGLEY-DLA FUEL PIER REPLACEMENT

STFATE Compliance Summary and Model Inputs
LANG-01/02

Summary of STFATE Modeling for Placement of Dredge Material from the Langley-DLA Fuel Pier Project 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?
5,000	16	1,140	434	4,173	No	No
10,000	10	1,140	259	4,173	No	No
20,000	9	1,140	163	4,173	No	No

STFATE Model Inputs: Langley 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: Langley 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

STFATE Model Inputs: Langley DU 01/02

INPUT PARAMETER	UNITS	VALUE
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
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		Langley-DLA Fuel Pier Project: DU 01/02
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	52
Background concentration (C_{ds})	mg/L	0.12
Dilution Required (D_r)		9.83
Toxicity - Tier III		**Lowest**
EC50	% Elutriate	86.8

LANGLEY-DLA FUEL PIER REPLACEMENT

Tier 2 Water Quality Criteria LPC
LANG-01/02

Limiting Constituent = Arsenic
Placement Volume = 20,000 cubic yards

TIER 2 STFATE MODEL RESULTS SUMMARY: Langley DU 01/02

Norfolk Ocean Disposal Site, Norfolk, VA

Scenario: **Langley DU 01/02** **Placement Volume:** **20,000**

Tier II - Water Quality Criteria

Analyte: Arsenic

Water Quality Criterion: **0.069**

Elutriate Concentration (C_s): **0.11**

Background concentration (C_{ds}): **0.0095**

Dilution Required: **0.7**

Dilution Factor Achieved: **149**

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	9.50E-03	4.31E+23
4.0	15	9.50E-03	3.59E+13
4.0	30	9.50E-03	3.22E+06
4.0	45	9.66E-03	6.27E+02
4.0	65	9.59E-03	1.10E+03
4.0	54.2	1.02E-02	1.49E+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
54.2	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.

LANGLEY-DLA FUEL PIER REPLACEMENT

Tier 3 Water Column Toxicity LPC
LANG-01/02

EC_{50} = 86.8 Percent Elutriate
Placement Volume = 20,000 cubic yards

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

Scenario: **Langley DU 01/02** **Placement Volume (cy): 20,000**

Tier III - Water Column Toxicity

Species: ***Mytilis*** **LPC: 0.868**

Dilution Required: 114

Dilution Achieved: 163

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	2.11E-22	4.74E+23
4.0	15	2.55E-12	3.92E+13
4.0	30	2.83E-05	3.53E+06
4.0	45	1.45E-01	6.89E+02
4.0	65	8.26E-02	1.21E+03
4.0	54.2	6.11E-01	1.63E+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
54.2	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.

LANGLEY-DLA FUEL PIER REPLACEMENT

STFATE Compliance Summary and Model Inputs
LANG-03/04

Summary of STFATE Modeling for Placement of Dredge Material from the Langley-DLA Fuel Pier Project 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?**
5,000	14	1,140	387	4,173	No	No
9,000	10	1,140	248	4,173	No	No
9,100	10	1,140	246	4,173	No	***Yes***

STFATE Model Inputs: Langley 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: Langley 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

STFATE Model Inputs: Langley DU 03/04

INPUT PARAMETER	UNITS	VALUE
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
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		Langley-DLA Fuel Pier Project: DU 03/04
Bulking Factor		1.0 (sand/gravel), 1.0 (silt/clay)
Site Water Density	g/cc	1.0059
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	92
Background concentration (C_{ds})	mg/L	0.12
Dilution Required (D_r)		18.18
Toxicity - Tier III		**Lowest**
EC50	% Elutriate	40.2

LANGLEY-DLA FUEL PIER REPLACEMENT

Tier 2 Water Quality Criteria LPC
LANG-03/04

Limiting Constituent = Ammonia
Placement Volume = 9,000 cubic yards

TIER 2 STFATE MODEL RESULTS SUMMARY: Langley DU 03/04

Norfolk Ocean Disposal Site, Norfolk, VA

Scenario: **Langley DU 03/04** **Placement Volume:** **9,000**

Tier II - Water Quality Criteria

Analyte: Ammonia

Water Quality Criterion: **4.91**

Elutriate Concentration (C_s): **17**

Background concentration (C_{ds}): **0.12**

Dilution Required: **2.5**

Dilution Factor Achieved: **246**

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	1.36E+17
4.0	15	1.20E-01	1.14E+10
4.0	30	1.20E-01	1.38E+05
4.0	45	1.54E-01	4.93E+02
4.0	65	1.29E-01	1.83E+03
4.0	52.4	1.88E-01	2.46E+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
52.4	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.

LANGLEY-DLA FUEL PIER REPLACEMENT

Tier 3 Water Column Toxicity LPC
LANG-03/04

EC_{50} = 40.2 Percent Elutriate
Placement Volume = 9,000 cubic yards

TIER 3 STFATE MODEL RESULTS SUMMARY: Langley DU 03/04
Norfolk Ocean Disposal Site, Norfolk, VA

Scenario: **Langley DU 03/04** **Placement Volume (cy): 9,000**

Tier III - Water Column Toxicity

Species: ***Mytilis*** **LPC: 0.402**

Dilution Required: 248

Dilution Achieved: 248

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	7.32E-16	1.37E+17
4.0	15	8.73E-09	1.15E+10
4.0	30	7.15E-04	1.40E+05
4.0	45	2.01E-01	4.97E+02
4.0	65	5.44E-02	1.84E+03
4.0	52.4	4.02E-01	2.48E+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
52.4	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.

Appendix E

DLA Fuel Pier Utility and Grading Plan

RUNWAY 8-26
CLEAR ZONE

EXISTING
PIER

RAMP SLOPED TO WATER
TO PROVIDE CLEAR PATH
FOR CONTAINMENT BOOM
DEPLOYMENT

PROPOSED FUEL PIER
SEE STRUCTURAL PLANS

PIER FIRE PROTECTION SYSTEM
SEE FIRE PROTECTION PLAN

NEW FUEL PIPE
SEE MECHANICAL
DRAWINGS

RAMP SLOPED TO WATER TO
PROVIDE CLEAR PATH FOR
CONTAINMENT BOOM DEPLOYMENT

PROPOSED
HIGH VOLTAGE
DUCTBANK

EXISTING
MANHOLE

NEW
4-WAY
SWITCH

RIP-RAP

CONNECT POTABLE
WATER SUPPLY FOR
PIER TO EXISTING MAIN

BACKFLOW
PREVENTER VAULT
SEE FIRE
PROTECTION PLAN

PROPOSED
TRANSFORMER

GRAVEL ROAD

CONNECT TO EXISTING MAIN

GRAVEL ROAD

CONNECT PIER FIRE
PROTECTION SYSTEM
TO EXISTING MAIN

PROPOSED PIER ACCESS
SEE NOTE 2

PROPOSED FIRE HYDRANT

PROPOSED
COMMUNICATIONS
DUCTBANK

PROPOSED PIER ACCESS
SEE NOTE 2

MATCHLINE - SEE CONTINUATION, THIS SHEET

COMM HANDHOLE PB75A

MATCHLINE - SEE CONTINUATION, THIS SHEET

NOTES:

1. EXISTING CONTOURS SHOWN ARE FROM LANGLEY AIR FORCE BASE FUEL PIER CHANNEL PROJECT CONDITION SURVEY OF MAY 2013 PROVIDED BY USACE-NORFOLK DISTRICT.
2. PROPOSED PIER ACCESS ROAD AND ADJACENT SITE TO BE RAISED TO THE APPROXIMATE PROPOSED FUEL PIER DECK ELEVATION OF +11.00' MLLW.

N

0 10' 20' 40'

SCALE:1"=20'

PRELIMINARY - NOT FOR CONSTRUCTION

US ARMY CORPS
OF ENGINEERS
OMAHA DISTRICT

MARK	DESCRIPTION	DATE	APPR
A	CONCEPT DESIGN	06-25-2013	
B	PRELIMINARY DESIGN		

DESIGNED BY: MCC
DATE: MAY 2013
DRAWN BY: ATE
CKD BY:
SUBMITTED BY:
SOLICITATION NO.: W9126F-0X-X00XX
CONTRACT NO.: W9126F-0X-C-00XX
FILE NAME: LA04G-CG201.DWG
FILE NUMBER: A4151-30-01
SIZE: 24X22
PLOT SCALE: AS SHOWN
PLOT DATE: 6/24/2013

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA, NEBRASKA

BURNS & MCDONNELL
9400 WARD PARKWAY
KANSAS CITY, MISSOURI

FY15 DESC1607 REPLACE FUEL PIER AND DISTRIBUTION FACILITY
JOINT BASE LANGLEY - EUSTIS, VIRGINIA

FUEL PIER
UTILITY & GRADING PLAN

SHEET IDENTIFICATION NUMBER
CG201

I:\USCOE_OMAHA\73617\CAD\CIVIL\LA04G-CG201.DWG 6/24/2013 11:40 AM AEWIGMAN