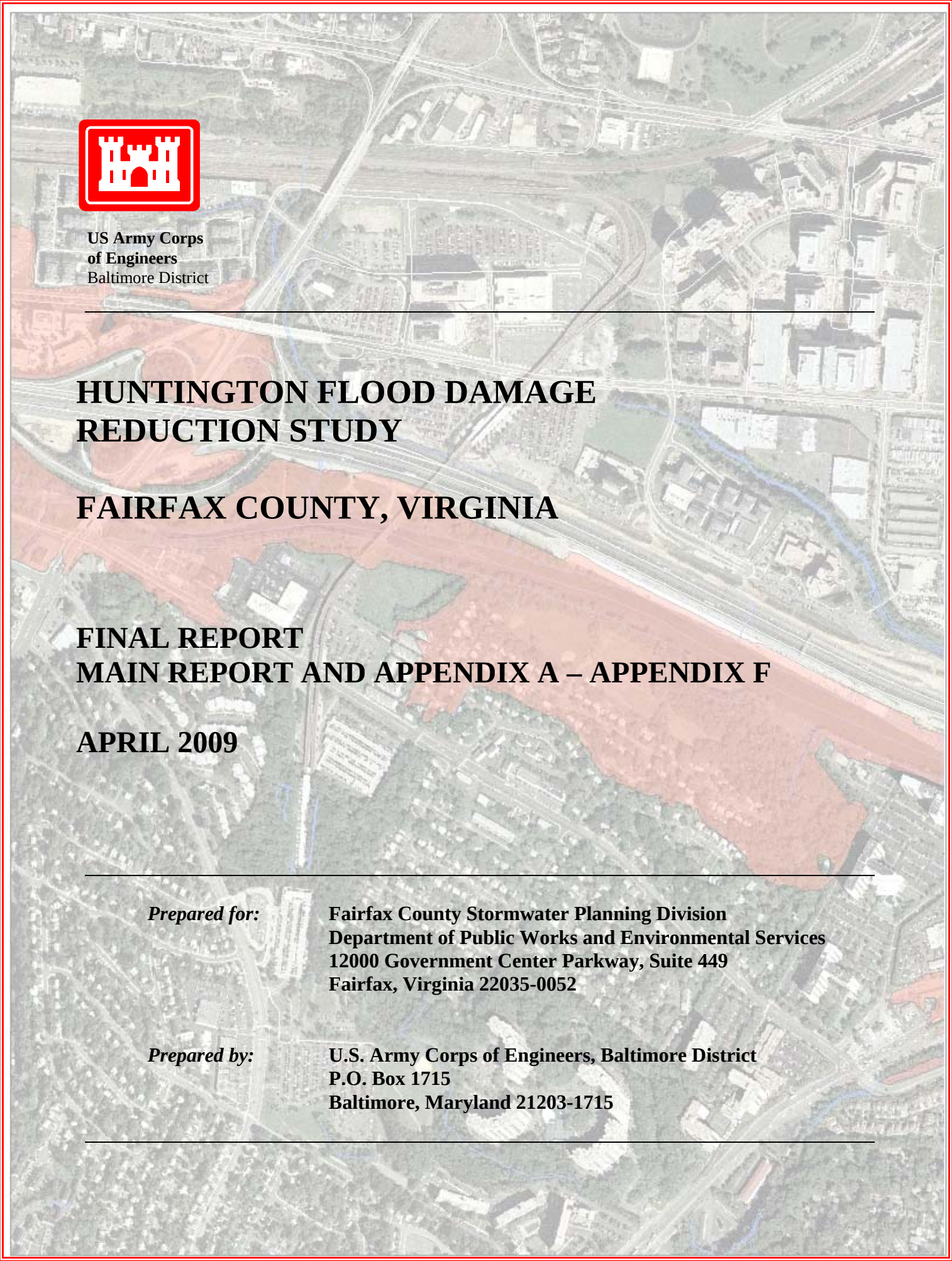

US Army Corps
of Engineers
Baltimore District

HUNTINGTON FLOOD DAMAGE REDUCTION STUDY

FAIRFAX COUNTY, VIRGINIA

FINAL REPORT
MAIN REPORT AND APPENDIX A – APPENDIX F

APRIL 2009

Prepared for: **Fairfax County Stormwater Planning Division**
Department of Public Works and Environmental Services
12000 Government Center Parkway, Suite 449
Fairfax, Virginia 22035-0052

Prepared by: **U.S. Army Corps of Engineers, Baltimore District**
P.O. Box 1715
Baltimore, Maryland 21203-1715

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U.S. Army Corps of Engineers
Baltimore District
P.O. Box 1715
Baltimore, Maryland 21203

FINAL REPORT
APRIL 2009

EXECUTIVE SUMMARY

The Huntington Flood Damage Reduction Study was conducted by the U.S. Army Corps of Engineers (Corps), Baltimore District, at the request of the Fairfax County Stormwater Planning Division, under the Floodplain Management Services Program (FPMS). The FPMS Program provides authority for the Corps to assist county governments with floodplain information and planning assistance. The study was fully funded by Fairfax County, who voluntarily contributed funds to the program. This study was not conducted through the Corps' civil works program, which is used for projects that may ultimately lead to federal construction. Therefore, it does not include NEPA documentation, or other federal requirements such as external technical review.

Significant flooding occurred in the Huntington Subdivision along Cameron Run in Fairfax County, Virginia on June 25 and June 26, 2006. Approximately 160 houses were flooded. Based on the Corps' most recent hydraulic model, there are 180 houses in the Huntington and Huntington Station communities that are located in the 1% annual chance floodplain (100-year floodplain) and are at risk of flooding again in the future. The purpose of this study was to develop and evaluate alternative solutions for mitigating future flooding and to select a final plan for implementation. The flood damage reduction measures that were evaluated include a levee, dredging, buyouts and flood proofing individual buildings.

The flood damage reduction alternatives underwent a three-phase plan formulation process and a public involvement process which led to the selection by Fairfax County and design of a final accepted plan. Concept plans were developed for each of the alternatives and they were evaluated based on how well they mitigated flooding, construction costs, economic benefits (reduction in future damage costs), impacts, risk, and public acceptance. None of the alternatives had an economic benefit-to-cost ratio greater than 1.0, which is required to meet the guidelines for federal funding. The most cost-effective solution that would solve the flooding problem and meet the established project goals and objectives is Final Concept Plan 2C, the construction of a levee. Fairfax County selected this plan for implementation and requested that the Corps conduct further design of the project.

The main components of the selected plan are a levee and a pumping station. As part of this study, the Corps developed the levee to a 65% design level. Further design of the levee will be required to take it to a 100% level so that it may proceed to construction. The Corps does not have the authority under the FPMS program to prepare final designs of flood damage reduction projects. Even if this project was being studied under the Corps' civil works program, the Corps would not have been able to complete the final design because it does not meet the Corps' economic justification requirements needed to proceed forward with the project. Per the scope, the Corps only designed the pumping station to a concept level design stage. This concept plan allowed the team to develop an approximate construction cost estimate. However, significant further design will be required for the pumping station and the accompanying features (such as the flow diversion pipes).

The grassed levee is 2,865 feet long and will tie into high ground upstream and downstream of Huntington. The project is designed to prevent flood damages to the Huntington houses during the 1% annual chance flood event and lower events. The top of the levee will be approximately 10 to 15 feet above the existing ground. The crest elevation at the upstream end of the levee is 19.4 feet (4 feet higher than the 1% annual chance flood elevation); the crest elevation at the downstream end is 17.3 feet (3 feet higher than the 1% annual chance flood elevation). The additional height above the 1% annual chance flood elevation is to allow for risk and uncertainty and sea level rise. Based on the risk and uncertainty analysis, the probability that the levee will not be overtopped during a 1% annual chance event is 99%. The levee height meets FEMA certification standards, however there are other criteria that FEMA would required before the levee could be certified. The levee has a 10-foot wide crest and 1 vertical on 2.5 horizontal side slopes. There is an asphalt recreational path along the top of the levee and ramps that lead over the levee for maintenance and handicap access.

The project also includes excavating part of the open space/park area adjacent to the levee approximately 1-2 feet deeper to elevation 6.0 feet to allow for more rainfall storage during a flood event. A pumping station with a capacity of 100,000 gpm will be necessary to pump the interior drainage across the levee to Cameron Run during a flood event. During a high water event (when the storm drains through the levee are closed) and a 100-year rainfall, the pump station will maintain a maximum pond elevation in the community of 8.0 feet. There would still be some water ponding in the roads and in yards.

Based on hydraulic modeling, the levee will increase the 1% annual chance flood elevations by up to 0.6 feet just upstream of the project. The increase in flood elevations extends upstream to Telegraph Road. This increase will affect four structures just upstream of Huntington. However, two of them have low openings above the 1% annual chance flood, so the levee will have no impact. The other two buildings (Mid-Town High Rise and Huntington Car Care) are already located in the floodplain and would be flooded during a 1% annual chance flood even without the levee.

The project will have an impact to wetlands and forest habitat, however these impacts have been minimized. Approximately 0.02 acres (935 square feet) of palustrine forested wetlands will be impacted by the construction of the project. As a result of levee construction there will be permanent direct adverse impacts to existing flora due to removal of mature trees, saplings, shrubs and other established vegetation along the levee alignment and the 15 foot easement on either side. Approximately 4.85 acres (231,930 square feet) will be impacted. These areas will be seeded and converted to grassy areas. The park area will also be impacted by the project. Due to the excavation of the park area for interior drainage, recreational use of this area may be limited.

The total project cost, including the final design phase, construction management, lands and easements, and escalation (assuming construction will take place between FY11 and

FY13), is estimated to be $20.2 million. The benefit to cost ratio is 0.4. The project construction duration is estimated to be 2 years.

The next phase of the project is the final design of the levee and pump station. In addition to further design, the county will need to obtain the necessary permits and approvals and secure funding prior to construction.

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1.0 INTRODUCTION

1.1 BACKGROUND

The Huntington Flood Damage Reduction Study was conducted by the U.S. Army Corps of Engineers (Corps), Baltimore District, Planning Division at the request of the Fairfax County Stormwater Planning Division, under the Floodplain Management Services Program (FPMS). Significant flooding occurred in the Huntington Subdivision (also referred to as Arlington Terrace) along Cameron Run in Fairfax County, Virginia on June 25 and June 26, 2006 (June 2006 flood event) (Figure 1.1). Approximately 160 houses were flooded. Although this area is already in the floodplain, flood elevations were in excess of 2.0 feet higher than the expected county-adopted 1% annual chance flood elevations (flood having a 1-percent chance of occurring in any given year; also sometimes referred to as the 100-year flood). The 1% annual chance flood elevations were based on a United States Geological Survey (USGS) study completed in 1976 (USGS, 1976). The June 2006 flood event was estimated to be a 2% annual chance event (50-year flood) based on a hydrologic model conducted by the Corps (U.S. Army Corps of Engineers (USACE), May 2007). A study report prepared by the Corps for Fairfax County in January 2007 found the factors contributing to higher flood levels over time at Huntington were channel sedimentation, construction at the U.S. Route 1 Interchange (a component of the Woodrow Wilson Bridge Project), and development within the floodplain including Jones Point (Riverside Apartments) (USACE, January 2007). Based on the latest hydraulic modeling, a portion of the Huntington community is in the 1% annual chance floodplain and is at risk of flooding again in the future (USACE, May 2007).

This study was conducted under the authority of the FPMS Program, which is a program that provides authority for the Corps of Engineers to assist county governments with floodplain information and planning assistance. The study was fully funded by Fairfax County, who voluntarily contributed funds to the FPMS program. This study was not conducted through the Corps' civil works program, which is used for projects that may ultimately lead to federal construction. Therefore, it does not include National Environmental Policy Act (NEPA) documentation, or other federal requirements such as external technical review.

1.2 STUDY PURPOSE

The purpose of this investigation was to develop and evaluate alternative solutions for mitigating future flooding at Huntington and to select a final plan for implementation. Analysis included examination of previous flooding studies and local flood history, and the evaluation of flood damage reduction measures available, such as levees, dredging, buyouts and flood proofing individual buildings. Acceptable alternatives underwent a three-phase plan formulation process which led to the selection and 65% design of the final plan. Under the FPMS program, the Corps cannot take the project further than a 65% design.

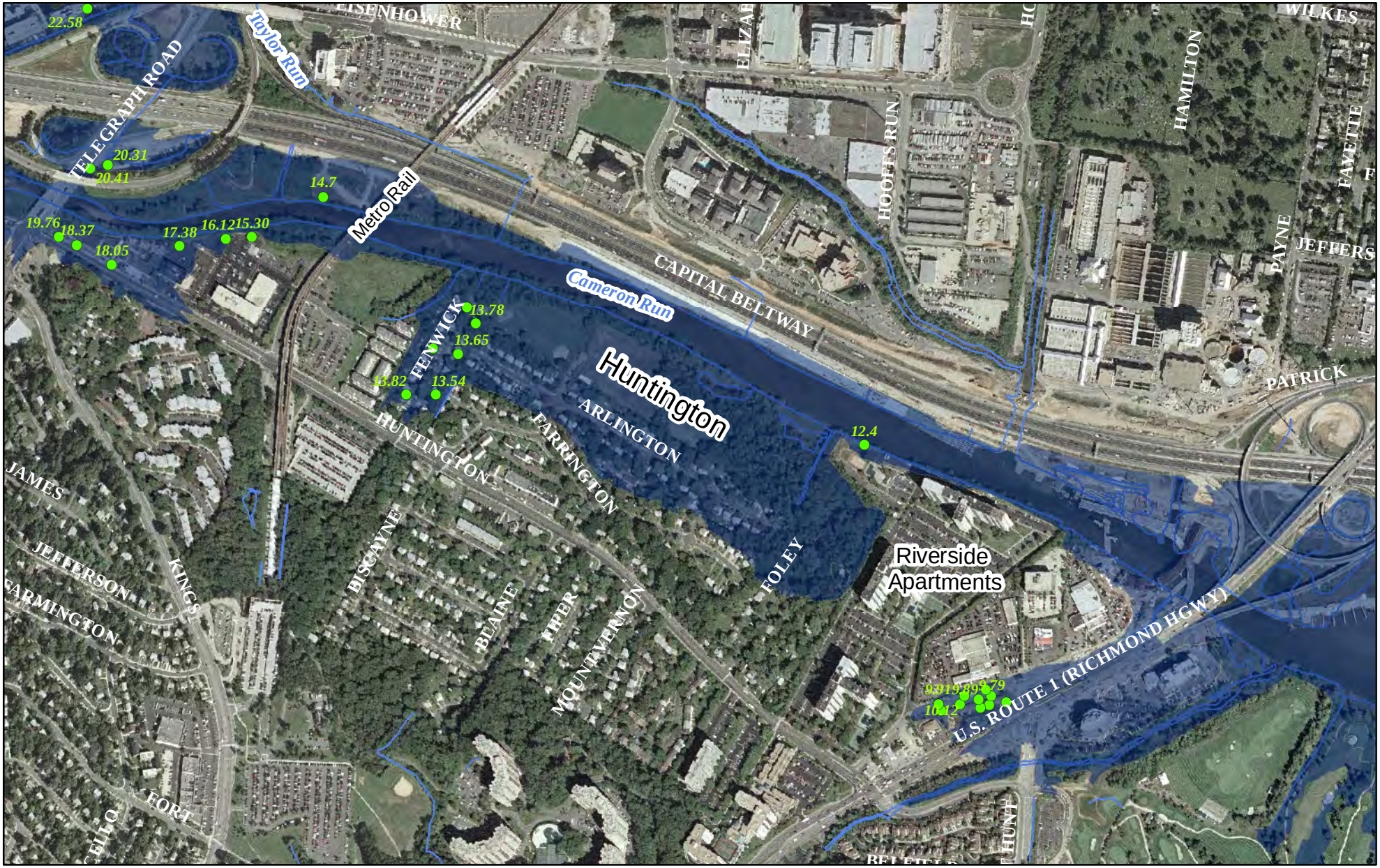

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Figure 1.1

June 2006 Flood Event

0 750 1,500 3,000 Feet

1 inch = 700 feet

Aerial Photograph dated 2004 courtesy of AerialExpress
Elevations referenced to NGVD29 datum

Legend

June 2006 Flooded Areas

VDOT High Water Marks

1.3 STUDY AREA

The flood damage reduction focus area is the Huntington area along Cameron Run in Fairfax County, Virginia (Figure 1.2). It consists of both the Huntington community and the Huntington Station community. Huntington is located on the south bank of Cameron Run, north of Huntington Avenue, east of Telegraph Road, and west of U.S. Route 1. The Huntington community consists of duplex residential structures, the majority of which were built in the late 1940s and early 1950s. Most of the structures have basements, with first floor elevations being roughly 5 feet above the lower lying roadways. Approximately 80 of the structures, or 160 homes, in Huntington and the Huntington Community Center are located in a special flood hazard area (area that will be flooded during the 1% annual chance flood, or 100-yr flood) per the most recent floodplain modeling developed by the Corps.

Just to the west of Huntington is the Huntington Station community, which is also included in the flood damage reduction focus area. It consists of approximately 48 townhouses that were built in the 2003 timeframe. Sixteen of the townhouses are located in a special flood hazard area per the Corps' most recent floodplain modeling. In order to evaluate flood damage reduction alternatives for the Huntington and Huntington Station areas, the overall study area extended upstream and downstream of Huntington. Therefore, the actual study area included Cameron Run from Telegraph Road downstream to the Potomac River (Figure 1.3).

There is a new development under construction just to the southeast of Huntington called Huntington Mews. It will consist of 96 townhomes.

Cameron Run drains 42.0 square miles of highly urbanized lands to its confluence with the Potomac River. The Cameron Run watershed includes areas within Fairfax County, the City of Alexandria, and the City of Falls Church (Figure 1.4). Tributaries such as Holmes Run, Backlick Run, Pike Branch, Tripps Run, and Taylor Run convey stormwater runoff to Cameron Run. Lake Barcroft (137 acres in size) and Fairview Lake (15 acres) are man-made reservoirs located within the watershed.

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Baltimore District

Figure 1.2

Huntington Flood Damage Reduction Focus Area

0 500 1,000 2,000 Feet

1 inch = 500 feet

Aerial Photograph dated 2004 courtesy of AerialExpress

Legend

Focus Area

1% Annual Chance (100-year) Floodplain (USACE 2007 Model)

N

US Army Corps of Engineers
Baltimore District

Figure 1.3

Study Area

0 1,000 2,000 4,000 Feet

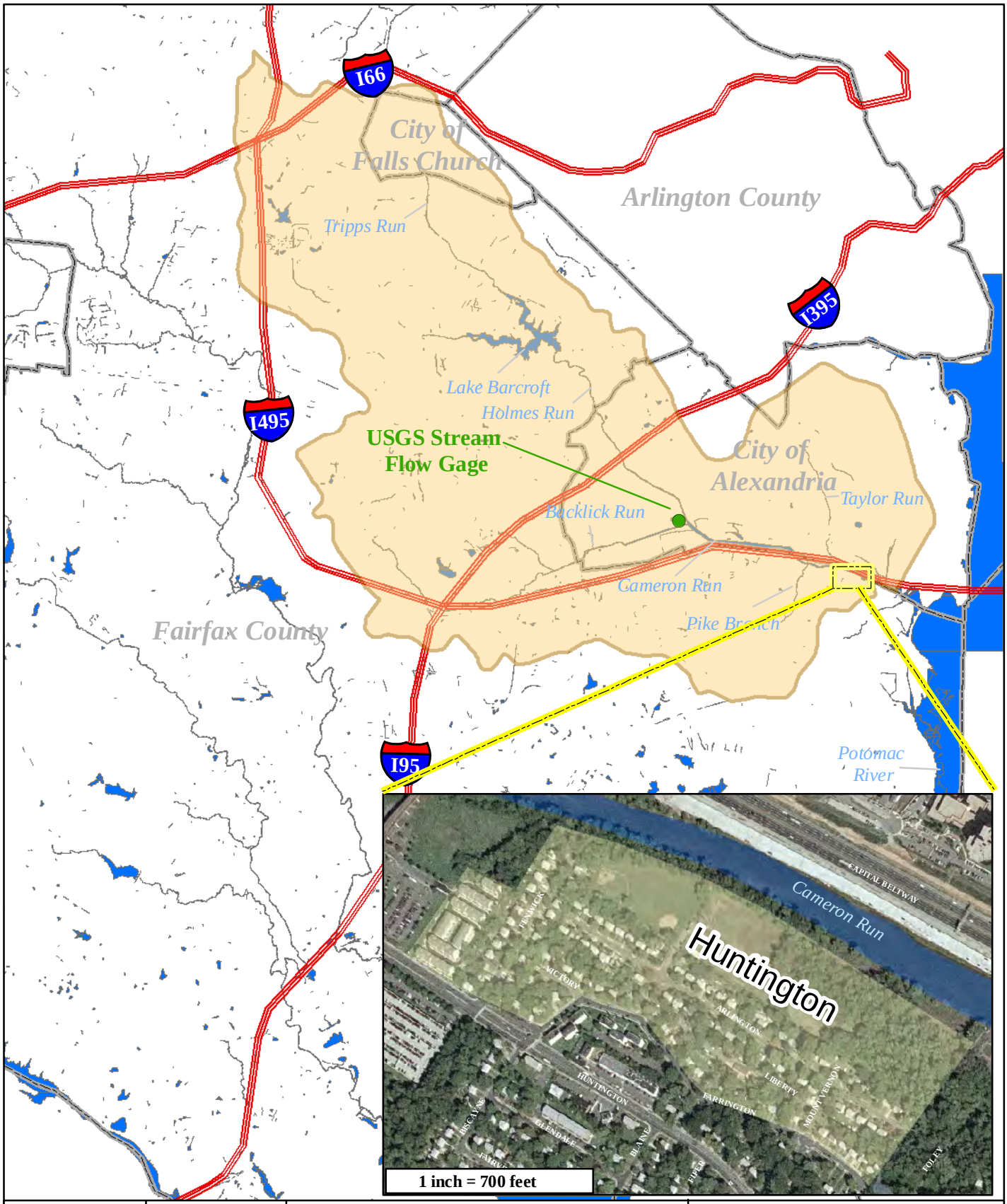
1 inch = 1,000 feet

Aerial Photograph dated 2004 courtesy of AerialExpress

Legend

Study Area

N



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Baltimore District

Figure 1.4
Cameron Run
Watershed Map

0 6,000 12,000 24,000 Feet

1 inch = 10,000 feet

Cameron Run Watershed
U.S. Interstates
Municipal Boundaries

2.0 FLOOD HISTORY, PREVIOUS STUDIES, AND FLOOD RISK

2.1 FLOOD HISTORY IN HUNTINGTON

Flooding has been a concern in the Huntington area for decades. As early as 1966, the Fairfax County Board of Supervisors adopted an ordinance for a regulated 100-year floodplain for Cameron Run. Previous studies and historical information confirm that the most significant type of flood event that would affect Huntington is riverine flooding from Cameron Run. Although the area is susceptible to storm surges from the Potomac River resulting from tropical systems, such as Hurricane Isabel in 2003, flood levels tend to reach higher elevations during riverine events. However, there were some complaints of houses flooding during Hurricane Isabel, but the number is unknown. During Hurricane Isabel, 2 to 3 inches of rainfall fell in the area, and riverine flows along Cameron Run were minimal. In contrast, past riverine events along Cameron Run have produced much higher flood levels in Huntington.

The majority of the residential structures in Huntington were built in the late 1940s and early 1950's. Since that time, and prior to the June 2006 flood event, there have been two significant storm events that have created the potential for riverine flooding in Huntington: Tropical Storms (or remnants thereof) Agnes (1972) and Eloise (1975).

Tropical Storm Agnes

For many years, Tropical Storm Agnes has been the storm of record in the Cameron Run watershed, as well as other watersheds in the mid-Atlantic and Northeast regions of the United States. Tropical Storm Agnes occurred between June 20 and June 25, 1972. Flood damages were recorded throughout the central part of Virginia, but were particularly heavy in the northern part, where Fairfax County reported damages estimated at $25 million (1972 dollars). In the Four Mile Run watershed, damage was estimated at $14 million (United States Geological Survey (USGS), 1975); however, no exact record of the amount of damages in the Cameron Run watershed could be found.

A rainfall gage at Washington National Airport recorded a total of 8.24 inches of rainfall over that 5-day period, with the heaviest rainfall occurring between June 21 and June 22, 1972. During that period, rainfall intensities of just over 1 inch per hour were recorded. This rainfall created a record flow of 19,900 cubic feet per second (cfs) at a USGS stream flow gage (01653000) along Cameron Run (see Figure 1.4).

This flow created flooding in Huntington, but the extent and cause is not well documented. No records of homes damaged during this event are on record with Fairfax County, the Federeal Emergency Management Agency (FEMA), the Corps, or any other entity. In a letter from a homeowner to the Fairfax County government, it is stated that "*Every home in the immediate neighborhood was flooded. Yards and streets were flooded and some homes received structural damage to their basements. One thing that did not become apparent until after the storm was the fact that not one of the homes was flooded by surface water. All flooding incidents were caused by either raw sewage backing into the basements or structural damage caused by severe water*

pressure upon the basements." A subsequent study showed that the sanitary sewer system was adequate; however, flood waters can still enter the sanitary sewer system through manholes and back up into the houses, causing flooding.

It is evident that Tropical Storm Agnes caused damages to Huntington, but the extent of flooding via overland flood flow is not apparent. It appears that the flood levels during Tropical Storm Agnes were lower than the June 2006 flood levels; however, peak flows of 19,900 cfs were recorded at the USGS stream flow gage during Tropical Storm Agnes, and the June 2006 flood event produced peak flows of 16,500 cfs at the same gage.

Tropical Storm Eloise

Rainfall associated with Tropical Storm Eloise occurred in the mid-Atlantic region between September 23 and September 27, 1975. The most significant damages resulting from Tropical Storm Eloise occurred on the tributaries to the Potomac River in and around Washington, D.C. (USACE, 1976), where nearly 400 people were evacuated along Four Mile Run. Rainfall totals of between 8 and 9 inches fell near the Cameron Run watershed. The USGS stream flow gage along Cameron Run recorded a peak flow of 14,400 cfs during the event, the third largest to date behind Tropical Storm Agnes (19,900 cfs) and the June 2006 flood event (16,500 cfs).

As with Tropical Storm Agnes, there is a lack of documentation of the extent of flooding in Huntington. Internal Fairfax County memos indicate that the County as a whole was hit hard by Tropical Storm Eloise, including: damage along Pike Branch; sanitary sewer line problems near Telegraph Road; outfall issues resulting in the flooding of five homes near Kathmoor Street; and storm sewer issues that resulted in homes flooding along Thornwood Drive.

Articles in local newspapers and letters from homeowners to the County verify that flooding was an issue in Huntington during Tropical Storm Eloise, especially in basements, although interviews with residents of Huntington did not confirm this. However, as with Tropical Storm Agnes, it is not apparent that the flooding of these homes was directly from overland flow from Cameron Run, or if it may have been from backed up sanitary sewer lines.

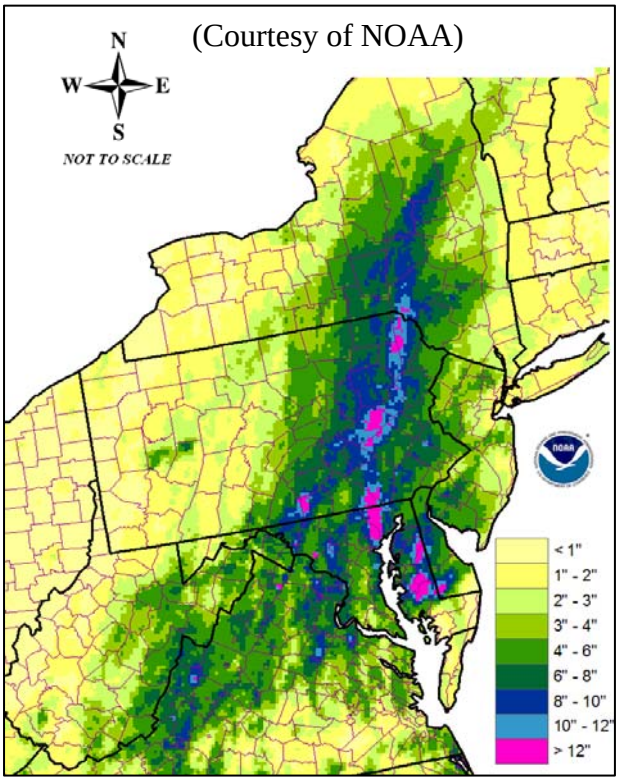
June 2006 Flood

Across the mid-Atlantic and Northeast, exceptionally heavy rainfall occurred during June 22-28, 2006. Rain amounts exceeded 10 inches in some areas (Figure 2.1), with numerous daily and monthly rainfall records set. Flooding was widespread throughout the greater Washington, D.C. area, northward through parts of Pennsylvania and New York (USACE, January 2007).

In the Cameron Run Watershed, the heaviest rainfall occurred between 7:00 pm on June 25 and 1:00 am on June 26. Rainfall intensities of 1.5 to 2.0 inches per hour were recorded at the Ronald Reagan National Airport precipitation gage. Fairfax County precipitation gages recorded 1.0 to 3.5 inches per hour in some locations in or near the watershed. A USGS stream flow gage along Cameron Run, just downstream of the confluence of Backlick Run and Holmes Run, recorded a peak flow of 16,500 cfs, the second largest on record.

The intense runoff from the rainfall created flooding issues throughout the Cameron Run watershed. Several roadways, including Interstate 495 (Capital Beltway) and Telegraph Road were overtopped; commercial and residential structures in the City of Alexandria reported significant flooding; stormwater infrastructure was inundated with larger than design flows causing deep ponding of water on roadways; and Cameron Run, between the George Washington Memorial Highway and the Capital Beltway experienced significant flooding. Huntington was the primary residential area in Fairfax County to receive flood damages during the June 2006 flood event. No fatalities were reported from the flooding; however, approximately 160 homes (per Fairfax County Stormwater Planning Division) suffered damages. News reports estimated damages near $10 million. Although Huntington is mapped as being within the 1% annual chance (100-year) floodplain on FEMA's Flood Insurance Rate Maps (FIRMs), the flood levels were unexpectedly high. Existing county data showed 1% annual chance flood elevations reaching an elevation of 10.8 feet (National Geodetic Vertical Datum of 1929 (NGVD29)) at the downstream end of Huntington, and 11.8 feet (NGVD29) at the upstream end. High water marks surveyed after the event showed that the June 2006 Flood Event was approximately 2.0 feet higher than the expected 100-year elevations. High water marks were recorded at 12.4 feet (NGVD29) at the downstream end of Huntington to 13.9 feet (NGVD29) at the upstream end.

Figure 2.1: Total Precipitation in the Mid-Atlantic, June 23 - June 27, 2006



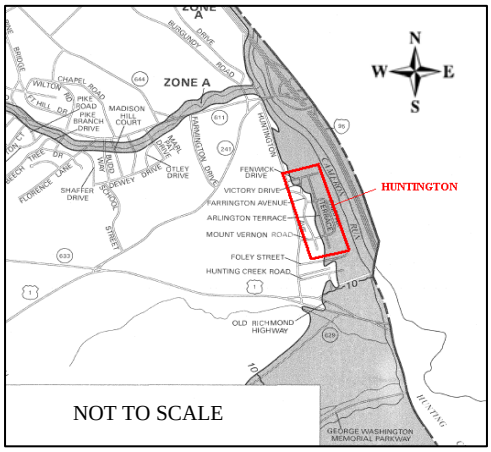
2.2 PREVIOUS STUDIES

Traditionally, the primary source for floodplain information is FEMA. FEMA publishes FIRMs and Flood Insurance Studies (FIS) that are used by local entities for floodplain management purposes. The floodplains for Cameron Run in Fairfax County are delineated as Zone A. Zone A means no detailed hydrologic and hydraulic analyses have been completed, so no exact 1% annual chance (or 100-year) floodplain elevations are shown for Huntington on the FEMA Fairfax County maps and study, which are dated March 5, 1990 (Figure 2.2). However, Zone A indicates the extent of the approximate 1% annual chance flood. FEMA is currently working to update the FIRMs and revise the FIS for Fairfax County. Preliminary revised FIRMS for Fairfax County are expected in Spring 2009.

The flooding in Huntington from Cameron Run has, however, been studied in the past. The earliest documented investigation was dated December 1970, with the most recent being in

January 2007. A summary of previous investigations along Cameron Run that directly impact Huntington are listed below. There have been other studies related to flooding within the Cameron Run watershed; however, the results of those investigations do not directly impact Huntington.

Figure 2.2: Effective FEMA FIRM for Fairfax County, Virginia (dated March 5, 1990)



December 1970: Alexandria, Virginia, Flood Insurance Study, completed by the U.S. Army Corps of Engineers, Baltimore District

The purpose of this investigation was to analyze the flood potential and the damages related thereto in the City of Alexandria, Virginia. The study involved hydrologic and hydraulic studies to create elevation-frequency curves and tables, flood profiles, and floodplain maps along Cameron Run to assist in establishing flood insurance rates within the City of Alexandria. The Immediate Regional Flood elevations, which are equivalent to the 100-year flood elevations, ranged from 12.0 feet mean sea level (msl) at the confluence of Hoofs Run (just downstream of the downstream end of Huntington) to 15.0 feet msl at Telegraph Road (upstream of Huntington) as shown in Figure 2.3. It is assumed, due to the date of this study, that msl is equal to NGVD29.

No modeling is available from the December 1970 study. It is assumed that the results of this study were used to create the effective flood insurance rate maps for the City of Alexandria, dated May 15, 1991 (Figure 2.4). FEMA has not published a flood insurance study for the City of Alexandria; however, water surface elevations and the floodplain presented on the FIRM are consistent with the results of the Corps study. Note that the FIRM maps for the City of Alexandria are currently being revised to reflect better topographic data provided by the City.

Figure 2.3: Flood Profile from December 1970 Flood Insurance Study For Alexandria, Virginia

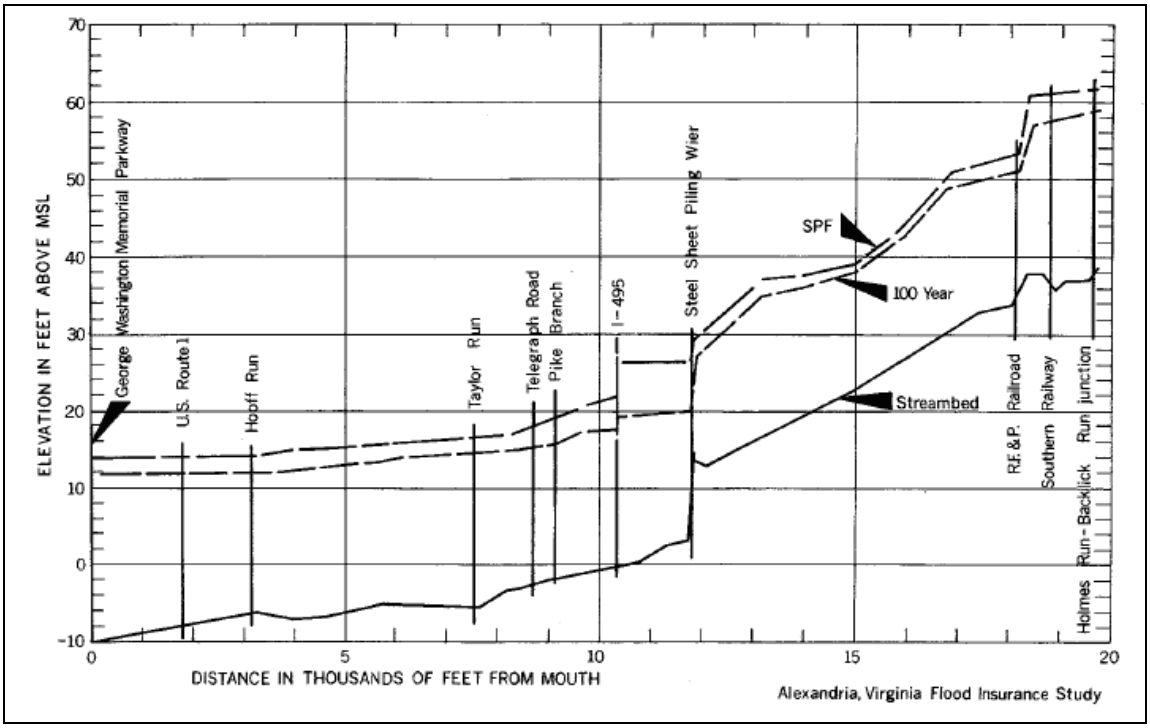
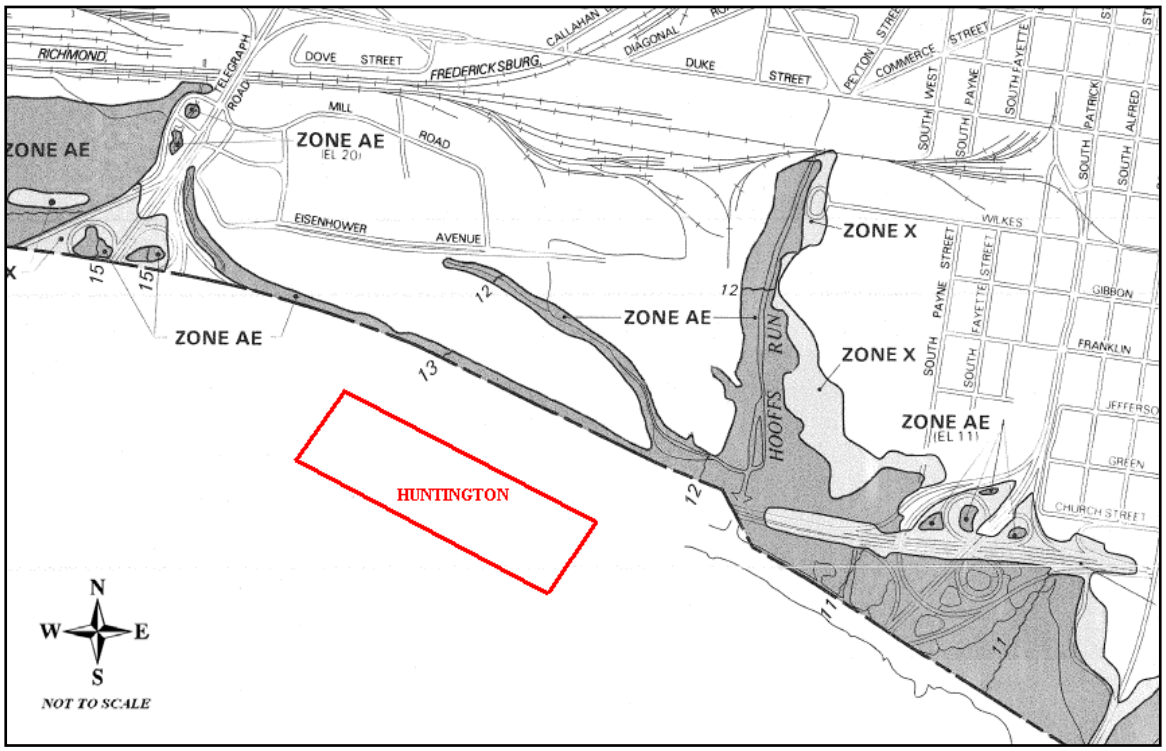


Figure 2.4: Effective FEMA FIRM for Alexandria, Virginia (dated May 15, 1991)



March 1971: Cameron Run, City of Alexandria and Fairfax County, Virginia, Review Report on Flood Control, completed by the U.S. Army Corps of Engineers, Baltimore District

The purpose of this report was to determine the feasibility of providing a project for flood damage reduction along streams that flow through the City of Alexandria, Virginia, with particular reference to Cameron Run and its tributaries. The tasks for this study included: soil surveys; elevation surveys; damage surveys to determine the extent and magnitude of damages caused by flooding; real estate investigations; economic evaluation; hydraulic studies; and analysis of flood protection measures to alleviate flood damages.

Huntington is located in Reach CA-1 in this investigation. The flood of record prior to this investigation was flash flooding that occurred September 14, 1966, which caused a peak flow of 9,300 cfs at the USGS stream gage. Based upon calculations in the investigation, only five residential structures and one commercial structure in Huntington would have been inundated by this 1966 flood, causing minimal damages. The result of this study was the recommendation of a Federal flood damage reduction project along Cameron Run to address flooding issues. However, no flood improvements were made in the Huntington area. In a USACE memo dated September 1977, Survey Report, Potomac River Streams Draining Alexandria Area, Virginia (USACE, 1977), the reason is explained:

"A report on Cameron Run was prepared… which represents a positive recommendation for a Federal flood control project along Cameron, Holmes, and Backlick Runs. Because of the inability to obtain required assurances of local cooperation, the report was not processed further. In 1969, Cameron Run formed part of the boundary between Fairfax County and the City of Alexandria; thus, both jurisdictions were required to provide the local assurances. However, nearly all of the benefits of the proposed project would accrue to the City of Alexandria and, for this reason, Fairfax County would not provide their assurances. In order to overcome this problem, a land transfer was agreed to by the local jurisdictions and became effective 1 January 1973. This land transfer and boundary change placed the entire project area within the City of Alexandria limits."

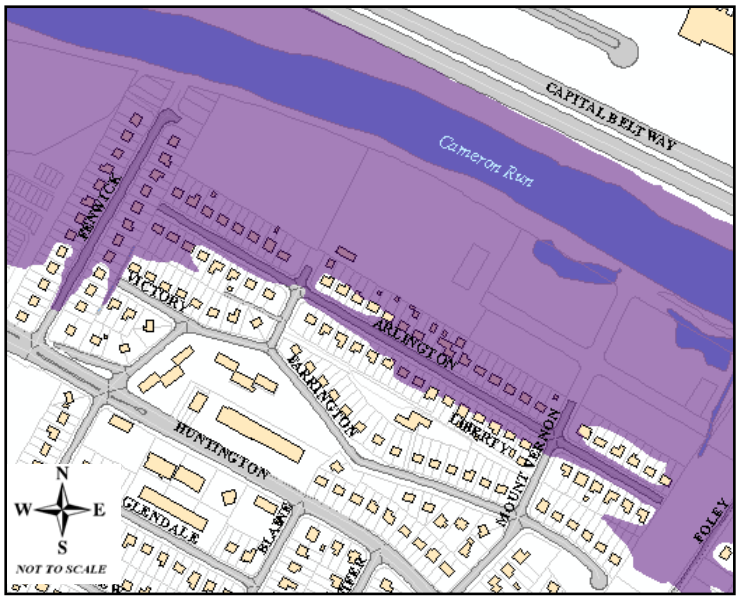
Subsequently, to expedite the construction of the project, the City of Alexandria decided to implement the plan of protection recommended in this report on their own initiative and cost. The recommended plan was to channelize a portion of Cameron Run. Thus, Cameron Run is now channelized upstream of the Capital Beltway; however, it is not a Federal project.

1976: Flood-Plain Delineation for the Cameron Run Basin, Fairfax County-Alexandria City, Virginia, Open File Report 76-443, completed by USGS

The results of this investigation were being used by Fairfax County at the time of the June 2006 event for the management of floodplains along Cameron Run. Floodplain mapping produced in this investigation was adopted by the County Board of Supervisors (Figure 2.5). The purpose of this investigation was to establish floodplain mapping for Cameron Run and its tributaries. It is noted, however, that although this study is dated 1976, the report documents that the field survey in the basin was done in 1961, with supplemental surveys made in 1965. The 100-year peak flows, using the Anderson method for ultimate built-out conditions, were estimated at 21,800 cfs

for the Huntington area. The 100-year flood elevations ranged from 10.3 feet (NGVD29 datum) just upstream of U.S. Route 1, to 13.2 feet just downstream of Telegraph Road.

Figure 2.5: 100-year Floodplain Limits for Huntington from 1976 USGS Study



April 1977: Huntington Drainage Study (Huntington Conservation District), completed by William H. Gordon Associates

The purpose of this study was to develop an updated storm drainage master plan for the Huntington area based upon current design standards and criteria. Although this study dealt more with stormwater infrastructure rather than riverine flooding, the report contains useful information on the history of flooding in Huntington. The report notes that "The houses along Arlington Terrace and closest to Cameron Run have evidently never experienced flooding due to an overflow of the creek's banks. Any flooding of the dwellings has occurred as a direct result of the storm sewer backup or the sanitary sewer backup." Flood waters can enter sanitary sewer pipes through manholes and can back up and flood the houses. Recommendations as a result of this investigation included improving the storm sewer infrastructure and installing subsurface interceptors, among others. It is unknown if any of the recommended improvements were implemented.

December 1977: Proposed Drainage Plan, Cameron Run Watershed, Task Order 3.2 Immediate Action Plan, completed by Parsons, Brinckerhoff, Quade and Douglas

The purpose of the Immediate Action Plan (IAP) was to recommend projects to enable the drainage ways in the Cameron Run Watershed to safely carry stormwater to the Potomac River with minimal disruption to areas adjacent to the streams. A total of 40 projects were recommended throughout the watershed. The study recommended the construction of an earth berm along Cameron Run to alleviate the flooding of homes and structures along Fenwick Drive

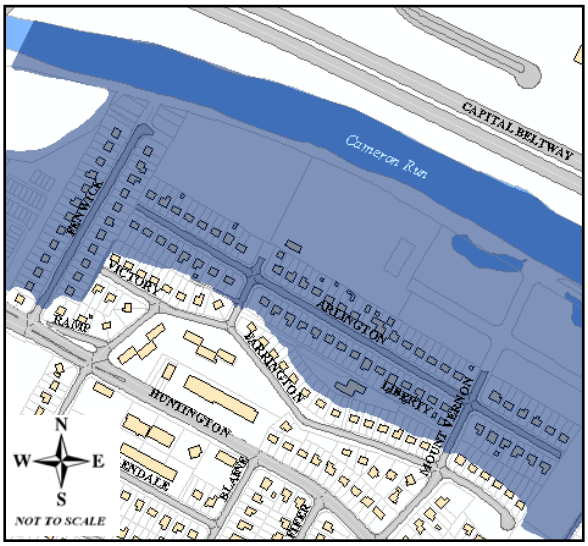
and Arlington Terrace in the Huntington community. The Huntington portion of the study was never implemented.

April 1982: Arlington Terrace Storm Drainage Study, Fairfax County, Virginia, completed by Camp Dresser & McKee (CDM)

The purpose of this study was to perform a comprehensive flood drainage feasibility study for the Huntington community. It includes a detailed definition of the flooding problem in the Huntington community caused by Cameron Run flood flows and Potomac River high tides, and the development of alternate flood control solutions with cost estimates to resolve the flooding problems in the Huntington area. Initial analysis during the investigation concluded that although tidal surge was a flood risk in Huntington, the type of flooding that would cause the most significant damage was riverine flooding from the Cameron Run watershed.

The hydrology for the project was completed using the MIT Catchment Computer Model (MITCAT) and "other well-supported methodology," with peak flows for a 100-year flood event estimated to be 37,785 cfs (for comparison, the 1976 USGS study estimated the 100-year peak flow to be 21,800 cfs). The hydraulic analysis was completed using the USACE HEC-2 program, with the following computed flood elevations for the Huntington community: 10-year flood elevation of 8.63 feet; 25-year elevation of 10.38 feet; 50-year elevation of 11.86 feet; and 100-year elevation of 14.34 feet (all elevations are NGVD29 datum). The study concluded that a 100-year flood event at elevation 14.34 feet would inundate approximately 167 homes in Huntington (Figure 2.6).

Figure 2.6: 100-year Floodplain Limits for Huntington from April 1982 CDM Study



The 1982 CDM study outlined potential flood damage reduction measures such as channelization, levees, floodwalls, floodproofing, dredging, and constriction relief.

The following is a list of the recommendations made in this investigation:

- No protection is required for a 10-year flood, and a levee would provide complete protection from a 25-year event at a lower cost than other alternatives.

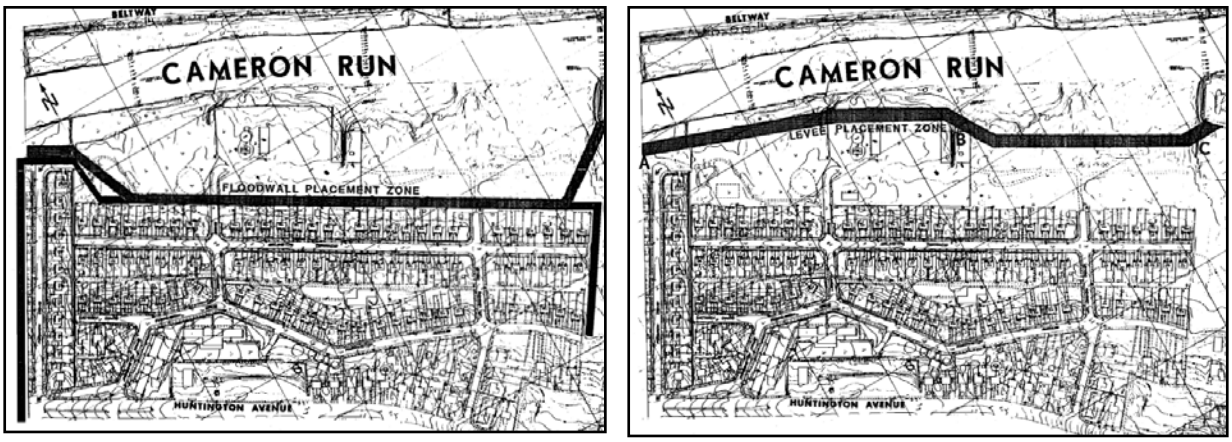
- For a 50-year flood, a levee provides complete protection at a lower cost than other alternatives.

- A floodwall is the only single flood control measure that performs satisfactorily during a 100-year flood, at a 1982 cost of $3,537,000. However, other viable options would be a floodwall and dredging the reach to a width of 100 feet, at a 1982 cost of $3,987,000, and a levee plus dredging to a 200 foot width, at a 1982 cost of $3,206,000 (Figure 2.7).

- Under any plans a channel maintenance program must be established to clear sediment from Cameron Run.

Although options for flood damage mitigation were presented in this report, none were implemented. The reason they were not implemented is uncertain.

Figure 2.7: Potential Floodwall and Levee Placement Zones from April 1982 CDM Study



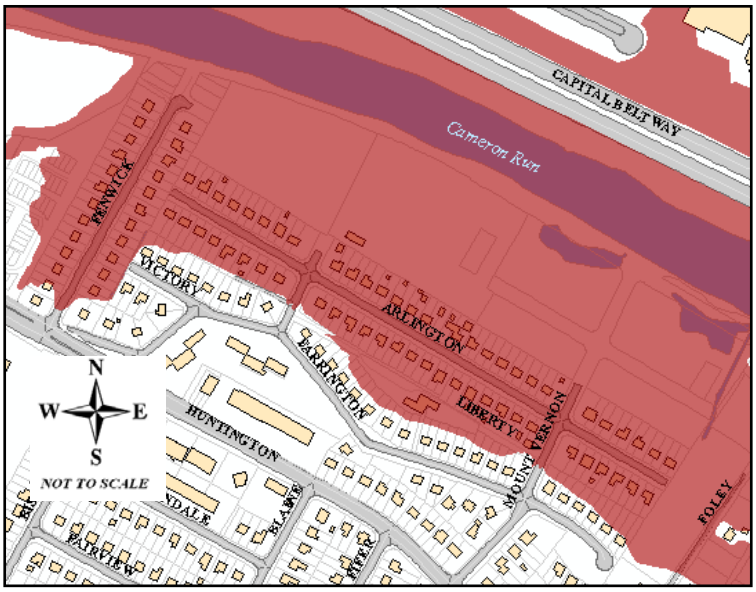
February 2002: Hydrologic and Hydraulic Analysis of Cameron Run, completed by Potomac Crossing Consultants (PCC) for Virginia Department of Transportation (VDOT)

The purpose of this study was to examine the impact that the proposed improvements associated with the Woodrow Wilson Bridge replacement project would have on the existing flood stages and profiles, and to provide necessary hydraulic data for scour computations at proposed bridges and crossings. The study was a compilation of results presented in the following reports: *I-95/Route 1 Interchange Improvement Project, Cameron Run Hydraulic Study Report*, prepared by HNTB in November 2001; and *Interstate 95/495/Telegraph Road Interchange, County of Fairfax/City of Alexandria, Project #0095-96A-105, Hydrologic and Hydraulic Analysis of Cameron Run*, prepared by Dewberry & Davis, LLC, in December 2001.

The report outlines results of a one-dimensional Hydrologic Engineering Center's River Analysis System (HEC-RAS) hydraulic model that starts at the confluence of Cameron Run at the Potomac River and extends upstream to approximately 400 feet west of the Capital Beltway bridge over Cameron Run. All field-surveyed cross-sections for the study were completed in 1999.

The study completed two separate HEC-RAS models. The existing-conditions model reflects the conditions of Cameron Run in 1999, before any improvements to U.S. Route 1, Telegraph Road, or the Woodrow Wilson Bridge were made (Figure 2.8). The proposed-conditions model reflects the conditions of Cameron Run once the entire project is completed.

Figure 2.8: Existing-Conditions 100-year Floodplain Limits for Huntington from 2002 VDOT Study



The hydrology for this study was based on the Anderson method, per FEMA guidance. The Anderson method computed a 100-year peak flow of 25,525 cfs at the U.S. Route 1 Interchange; 23,845 cfs at Telegraph Road; and 22,625 cfs at the Capital Beltway bridge. The hydraulic model was developed using HEC-RAS version 2.2, and the results were verified by other agencies using two-dimensional and three-dimensional modeling.

The results of this VDOT existing conditions modeling showed 100-year flood elevations ranging from 10.8 feet (NGVD29) just upstream of U.S. Route 1 to 18.4 feet just downstream of Telegraph Road; however, the results for Huntington in this study showed much higher 100-year elevations for Huntington than the 1976 USGS investigation. The 1976 USGS investigation computed 100-year flood elevations ranging from 10.8 feet (NGVD29) at the downstream end to 11.7 feet at the upstream end. The VDOT existing-conditions model computed 100-year flood

elevations of 13.7 feet at the downstream end to 14.6 feet at the upstream end. This is an increase of nearly 3 feet. It is noted that the USGS investigation used a 100-year peak discharge of 21,800 cfs, where the VDOT study used a peak discharge of 23,845 cfs.

Based upon the proposed design and construction, the maximum increase in the 100-year flood elevation as a result of the construction of the new U.S. Route 1 bridges is 0.8 feet approximately 300 feet west of the confluence of Hoofs Run. On average, the project will increase flood elevations by roughly 0.5 feet throughout this reach of Cameron Run and within Huntington. VDOT will re-analyze the impacts of the project when construction is complete to account for any design changes during construction.

The February 2002 study and associated modeling were considered the best available data that represented existing-conditions for Cameron Run at the time (pre-Woodrow Wilson Bridge activity). Copies of this report and modeling were not sent to Fairfax County. However, through written correspondence, it is evident that VDOT initiated coordination efforts with the Federal Highway Administration (FHWA), FEMA, and the City of Alexandria through the process. VDOT submitted their final model results to FEMA in December 2001. USACE and USGS were also contacted throughout the process for data coordination efforts.

Following the June 2006 event, Fairfax County adopted the 2002 VDOT 100-year floodplain for floodplain management purposes. They plan to use this floodplain data until FEMA revises the Fairfax County FIS and FIRM.

September 2006: Woodrow Wilson Bridge Project Report on Impacts on Cameron Run Flood Event of June 25, 2006, prepared by Potomac Crossing Consultants (PCC) for Virginia Department of Transportation

The PCC conducted an examination of the severe flooding experienced June 25, 2006 in the Huntington/Arlington Terrace area of Fairfax County. The purpose of the report was to investigate the possibility that the construction activities associated with the Woodrow Wilson Bridge (WWB) Project caused the flooding conditions on June 25 and 26, 2006 in the Huntington area. The study determined that the total impact of the WWB construction attributed to a 5 to 10 inch increase in peak flow elevation in Huntington.

January 2007: June 2006 Flood Investigation for Cameron Run, completed by U.S. Army Corps of Engineers (USACE), Baltimore District, Planning Division

At the request of the Fairfax County Stormwater Planning Division, under the Floodplain Management Services Program (FPMS), a study was conducted by the Corps, Baltimore District, Planning Division to determine specific causes of the higher than expected flood levels experienced during the June 2006 flood event in Huntington, VA. Significant flooding occurred in Huntington along Cameron Run on June 25 and June 26, 2006. Flood elevations were in excess of 2.0 feet higher than the expected county-adopted 100-year flood elevations (flood having a 1-percent chance of occurring in any given year). Based on a statistical analysis of the stream gage along Cameron Run, the June 2006 flood was estimated to have a recurrence interval of 60-70 years.

Based on the study, the factors determined to contribute to higher flood levels over time were channel sedimentation (1.2 to 2 feet), construction at the U.S. Route 1 Interchange which is a component of the Woodrow Wilson Bridge Project (0.5 to 0.9 feet), and development within the floodplain including Jones Point and the Metro Rail and Station (0.2 to 0.4 feet). Factors investigated but found not to contribute to the higher flood levels in Huntington during the June 2006 flood event were Lake Barcroft release rates, a barge blockage at the George Washington Memorial Parkway, and the Potomac River tide stages.

Channel sedimentation had a considerable impact on flood elevations in Huntington during the June 2006 flood event. Based on surveys, between 1965 and 1999 nearly 5 to 6 feet of sediment accumulated between Telegraph Road and U.S. Route 1. Had the channel been at its 1965 condition (same channel depth and width as in 1965), the study determined that flood elevations would have been approximately 1.2 to 2.0 feet lower in Huntington. As discussed later in Section 4.2.2, when the new Cameron Run channel was created during the construction of the Capital Beltway in the early 1960's, the downstream tie-in point had an inverted slope which may have contributed to an accelerated accumulation of sediment in this area.

The temporary construction activity at the U.S. Route 1 interchange caused between a 0.5-foot (at the upstream end) and 0.9-foot (at the downstream end) increase in flood elevations along the Huntington area, which were within the permitted limits established by FEMA. When the Woodrow Wilson Bridge project is completed, the maximum increase in the 100-year flood elevation is estimated to be 0.8 feet approximately 300 feet west of the confluence of Hoofs Run. Therefore, the temporary increase in flood level during the construction of the interchange is similar to the expected future increase in flood levels after the project construction is complete.

Development within the floodplain, including Jones Point and the Metro Rail and Station caused small but notable increases in the flood elevations. The floodplain development caused between a 0.2 and 0.4-foot increase in flood elevations along the Huntington area, which were within established FEMA permitted limits as well.

The results of the January 2007 study are valuable in that explanation is given as to why such high flood elevations were experienced in June 2006. Although the factors mentioned above each increased flood levels to varying degrees, their combination created a significant increase over time. It is of note, however, that some of the houses in Huntington still would have been flooded during the June 2006 flood even if the described activities had not occurred.

May 2007: Hydrologic and Hydraulic Analysis for the Cameron Run Watershed in Northern Virginia, completed by U.S. Army Corps of Engineers (USACE), Baltimore District, for FEMA Region III

The purpose of this investigation was to (1) develop a comprehensive rainfall-runoff model for the Cameron Run watershed to produce accurate, up-to-date peak flood flows and (2) develop a comprehensive hydraulic model to estimate up-to-date flood elevations for all significant flooding sources within the Cameron Run watershed. To determine the existing peak flows for the 10-, 25-, 50-, 100-, and 500-year flood events, the Corps' Hydrologic Modeling System (HMS), version 3.1.0, was used. Table 2.1 shows the peak discharges for various flood

frequencies at locations throughout the lower Cameron Run reach determined as part of this study. Discharges from this May 2007 report were used for the hydraulic analysis for this current study. Figure 1.2 shows the corresponding 1% annual chance floodplain based on these discharges. Based on the rainfall-runoff model developed as part of this study, the June 2006 flood was estimated to have a recurrence interval of 50 years (which differs slightly from the stream gage statistical analysis that was conducted as part of the USACE January 2007 study which determined the interval was 60 to 70 years.)

Table 2.1: Summary of Discharges for the Cameron Run Watershed (Corps, May 2007)

CAMERON RUN							
LOCATION	DRAINAGE AREA (sq. miles)	RIVER MILE	PEAK DISCHARGES (cfs)				
			10-YEAR	25-YEAR	50-YEAR	100-YEAR	500-YEAR
Upstream of U.S. Route 1 Interchange	44.49	0.40	11,203	15,919	20,400	25,414	39,189
At Telegraph Road (and Huntington Area)	39.14	1.78	10,820	15,869	20,400	25,398	39,056
At Confluence with Strawberry Run	36.03	2.10	10,814	15,856	20,397	25,350	38,372
At Railroad Bridge	33.96	3.45	10,434	15,218	19,555	24,275	36,650
At USGS Gage	32.62	3.59	9,922	14,407	18,498	22,944	34,657

2.3 ONGOING STUDIES

Cameron Run/Holmes Run Watershed Feasibility Study, currently underway by USACE, Baltimore District; Fairfax County; and the City of Alexandria

The purpose of this ongoing study, which was initiated in 2004, is to develop a watershed plan to evaluate potential improvements to the watershed. The study goals include restoration of aquatic and riparian habitat, reduction of flood damages, enhancement of channel aesthetics and habitat, development of strategies for maintenance of long-term viability of the recommended measures, and protection of the Potomac River and Chesapeake Bay. The study is expected to be completed in 2010.

2.4 FLOOD RISK

According to FEMA's Flood Insurance Rate Maps for Fairfax County, dated March 5, 1990, a portion of the Huntington Community is designated as Zone A, which means that the area is in the 1% annual chance floodplain (Figure 2.2). Zone A means that no detailed hydrologic and hydraulic analyses have been completed, so no exact 1% annual chance (or 100-year) floodplain elevations are shown for Huntington.

However, a number of the Huntington houses were subsequently removed from the 1% annual chance floodplain via the Letter of Map Amendment (LOMA) process, which revised the FIRM. If a residential structure is located in a floodplain on FEMA's FIRMs, the homeowner is required to purchase flood insurance through NFIP for any Federally-backed loan. Although FEMA uses the most accurate flood hazard information available, limitations of scale or topographic definition of the source maps used to prepare the FIRM may cause small areas that are at or above the 100-year flood elevation to be inadvertently shown within the floodplain boundaries. When this happens, structures or parcels of land may be inadvertently included in the 100-year floodplain on the FIRM. For such situations, the property owner or lessee may apply for a LOMA with FEMA. LOMAs are documents issued by FEMA that officially remove a property and/or structures from the 100-year floodplain limits. The issuance of a LOMA determines that the property/structures is not located in the 100-year floodplain, and eliminates the Federal flood insurance purchase requirement as a condition of Federal or Federally-backed financing; however, ultimately the mortgage lender retains the prerogative to require flood insurance as a condition of any loan. In addition, although a structure is removed from the floodplain, flood insurance may still be purchased by the homeowner at reduced costs.

For structures placed on natural ground or constructed prior to the issuance of the first FEMA maps (as are all structures in Huntington), the determination as to whether a structure would be removed from the floodplain is based upon the comparison of the 100-year flood elevation to the lowest adjacent grade (LAG) elevation. The LAG is the lowest ground touching the outside of the structure, including attached decks and garages. If the LAG is at or above the 100-year flood elevation, the structure may be removed from the floodplain. Note that for structures with basements built on natural ground, such as those in Huntington, the basement elevation is not used in the determination.

The procedure used by FEMA for issuing LOMAs involves obtaining a LAG elevation for the structure from a licensed land surveyor or professional engineer, or in some cases, using community-approved topographic mapping. Next, a 100-year flood elevation is determined at the property. If a 100-year flood elevation is published on the FIRM map or FIS, it will be used for the determination. If the floodplain is delineated as Zone A, meaning no detailed study was completed by FEMA, a 100-year flood elevation must be obtained from other sources. Note that the floodplain for Cameron Run at Huntington is delineated as Zone A.

Nearly 130 property owners in Huntington (note that many structures in Huntington are duplexes) applied for and were granted LOMAs between 1997 and 2000 (Figure 2.9). For these LOMAs, FEMA used the 1976 USGS study results as the source of 100-year flood elevations for the structures in Huntington, with flood elevations ranging from 10.9 feet to 11.8 feet (NGVD29). This was determined to be the best available data at the time for Cameron Run. Therefore, during the June 2006 flood event, many residents did not carry flood insurance.

Figure 2.9: Structures in Huntington with FEMA Letters of Map Amendment (LOMAs)

FEMA is currently revising the Fairfax County FIRMs and the preliminary maps are scheduled to be released in Spring 2009. The exact floodplain will not be known until the maps are released, however, based on current watershed conditions and the Corps' most recent modeling, the floodplain will likely be similar to that shown in Figure 1.2. The Corps' most recent hydraulic model was developed in 2007, which was a revised version of VDOT's 2002 model (PCC, 2002). Based on the Corps' model, the 1% annual chance flood elevation at Fenwick Drive is 15.4 feet and at Foley Drive is 14.3 feet. Figure 2.10 shows the cross sections along Cameron Run used in the model. Table 2.2 shows flood elevations for various flood frequencies at two different cross sections. Note that because Cameron Run slopes downward toward the Potomac River, the flood elevations are lower at the downstream end and higher at the upstream end. Many of the Huntington houses have low openings and first floor elevations in the 9-12 foot range. Table 2.3 shows the number of structures that will incur damages during frequency events. Note that 11 houses will incur some type of flooding (basement and/or first floor) during

a 10-year event (10% annual chance) and 132 will incur flooding during a 25 year event (4% annual chance). During a 100-year event (1% annual chance), 176 structures will be flooded.

Table 2.2: Flood Elevations at Cross Sections along Huntington (feet, NGVD29)

Cross Section	20% annual chance (5-yr)	10% annual chance (10-yr)	4% annual chance (25-yr)	2% annual chance (50-yr)	1% annual chance (100-yr)	0.4% annual chance (250-yr)	0.2% annual chance (500-yr)
660 (Near Foley Dr)	7.4	9.2	11.7	13.0	14.3	15.7	17.5
1389 (Near Fenwick Dr)	8.6	10.5	12.7	14.0	15.4	16.8	18.7

Table 2.3: Number of Structures with Damages During Various Flood Events

Event		Number of Structures with Damage (Basement or other floors)	Number of Structures with First Floor Damage
% Annual Chance	Recurrence Interval (Years)		
50	2	0	0
20	5	1	0
10	10	11	0
4	25	132	2
2	50	160	68
1	100	176	152
0.4	250	182	180
0.2	500	182	182

US Army Corps of Engineers
Baltimore District

Figure 2.10

Hydraulic Model Cross Sections

0 750 1,500 3,000 Feet

1 inch = 700 feet

Aerial Photograph dated 2004 courtesy of AerialExpress
Elevations referenced to NGVD29 datum

Legend

100-year Floodplain (USACE 2007 Model)

3.0 GOALS, OBJECTIVES AND OPPORTUNITIES

3.1 PROJECT GOAL

The goal of this project is to provide adequate flood damage reduction measures that are technically feasible and financially prudent to ensure the safety of the Huntington Community (both people and structures) without increased flood damages in neighboring communities and infrastructure.

3.2 PROJECT OBJECTIVES

At the initiation of the study, Fairfax County established the following objectives for the project:

- Incorporate the needs/desires of the Huntington Community for flood damage reduction to the degree possible;
- Examine a full suite of alternatives (various frequencies of events and types of projects)
- Minimize risk to the community
- Minimize environmental impacts
- Minimize/avoid impacts to the Fairfax County Resource Protection Area (RPA), an area where streams, wetlands and shores should be protected under the Chesapeake Bay Act
- At a minimum, provide protection against the June 2006 flood event (2% annual chance, or 50-year recurrence interval)

The Fairfax County RPA is shown is shown on Figure 3.1. Further information regarding the RPA is included in Section 4.1.2.

3.3 PROJECT OPPORTUNITIES

The project team identified the following potential opportunities to be evaluated while developing alternative solutions to mitigate flooding.:

- Wetland creation if material is dredged from Cameron Run
- Sound/noise reduction if some type of a wall is constructed
- Recreational access/opportunities in the park area, such as a walking trail
- If dredging or modifying the stream, create a channel that is compatible with the goals of the ongoing Cameron Run/Holmes Run watershed restoration study currently underway by the Corps, Fairfax County and the City of Alexandria

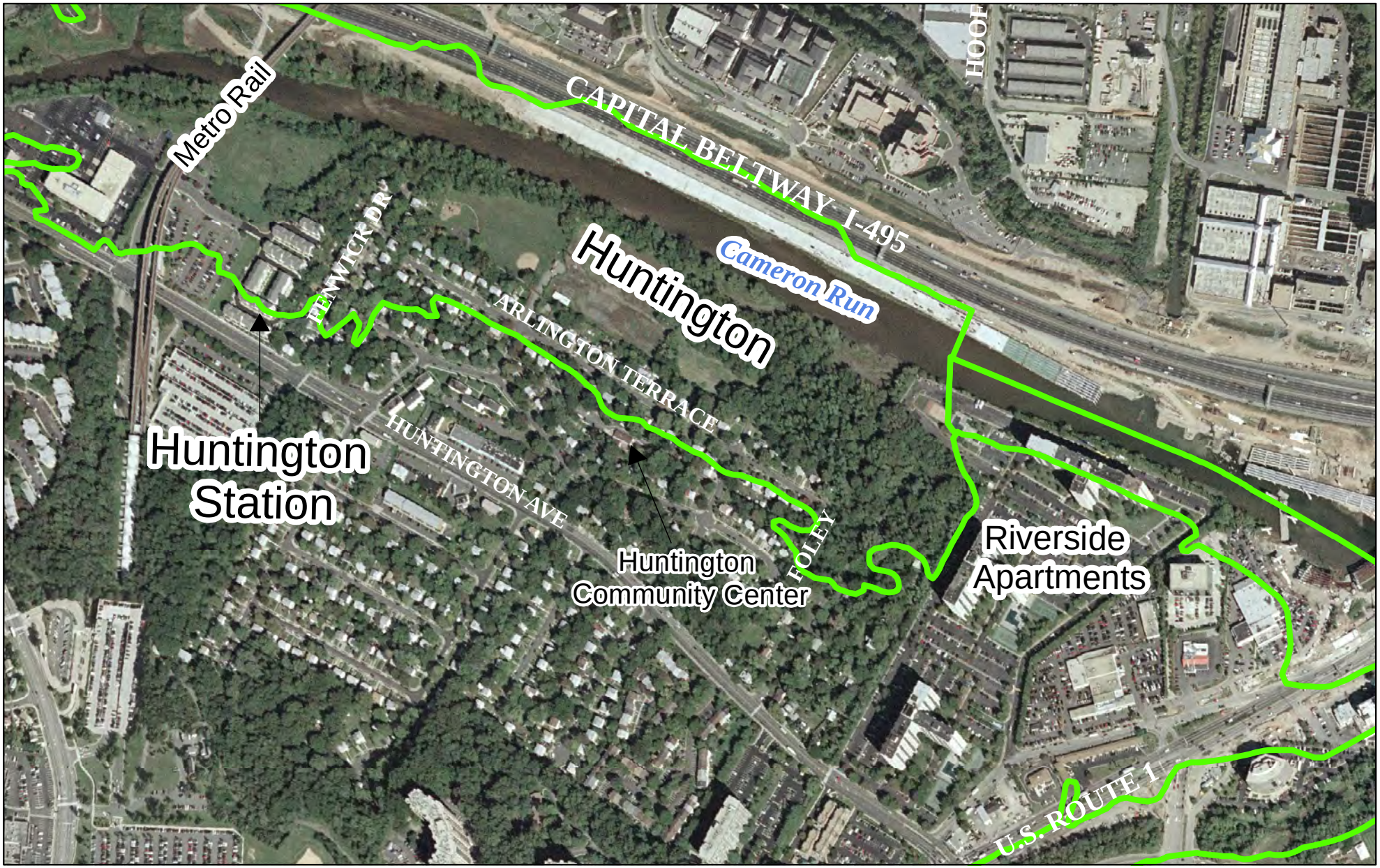


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Figure 3.1

Fairfax County
Resource Protection Area

0 500 1,000 2,000 Feet

Aerial Photograph dated 2004 courtesy of AerialExpress

Legend

Resource Protection Area Boundary

N

4.0 EXISTING CONDITIONS

4.1 ENVIRONMENTAL

This section describes the existing conditions of natural and socioeconomic resources within the area affected by the Huntington Flood Damage Reduction Project. The description of each resource provides a baseline for measuring expected changes in the physical, environmental, cultural, social, and economic settings that would result from implementation of a flood damage reduction project in the study area.

For the purpose of describing existing conditions and environmental effects, the focus area is defined as the area analyzed for flood damage reduction, as described in Section 1.2 (Figure 1.2), which is the Huntington area along Cameron Run in Fairfax County, Virginia. Huntington is located on the south bank of Cameron Run, north of Huntington Avenue, east of Telegraph Road, and west of U.S. Route 1. The focus area is encompassed in the study area that was analyzed for flood damage reduction alternatives, as described in Section 1.3 (Figure 1.3). The study area is approximately bounded by I-495 (the Capital Beltway) to the north and west, Huntington Avenue to the south, and the Potomac River to the east and includes the Huntington (also referred to as Arlington Terrace) and Huntington Station communities.

4.1.1 Topography

The elevation in the focus area ranges from almost sea level adjacent to Cameron Run and the Potomac River and reaches approximately 34 feet above sea level at the high point along Huntington Avenue (Fairfax County, 2004). The topography of the study area is mostly level and very gently undulating, but there are areas of rolling and hilly terrain near the river (Figure 4.1).

4.1.2 Land Use

The project area is intensely developed and is primarily residential with smaller percentages of parkland/recreational and commercial land use. Residential areas include Huntington Station and Mid-Towne Apartments to the west, which are high density dwellings, the Huntington Community, which is comprised of duplex units, and Riverside Apartments to the east. A new townhouse development, Huntington Mews, is currently being constructed to the east, between Huntington and the Riverside Apartments. Huntington Park encompasses nearly 11 acres and is located between Huntington Community and Cameron Run. Commercial areas lie primarily along Huntington Avenue.

A portion of the project area is within a Fairfax County Resource Protection Area (RPA) (Figure 3.1). An RPA provides protection to perennial streams, wetlands, tidal wetlands and tidal shores under the Chesapeake Bay Act and the corresponding Chapter 118 of the Fairfax County Code (Fairfax County Park Authority, 2004). An RPA is defined as areas within 100 feet of tidal shores, tidal wetlands, and perennial streams and associated wetlands, or areas of major

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Figure 4.1

Topography and Delineated Wetlands

0 375 750 1,500 Feet

1 inch = 400 feet

Aerial Photograph dated 2004 courtesy of AerialExpress
Elevations referenced to NGVD29 datum
Topography provided by Fairfax County, 2004

Legend

One Foot Contours

Five Foot Contours

Delineated Wetlands, 2007

floodplains as defined by the Fairfax County Zoning Ordinance. RPAs are protected from most development and are vegetated buffer areas that play a valuable role in reducing sediments, pollutants and other adverse effect of human activities.

4.1.3 Geology and Soils

The project area lies in the Atlantic Coastal Plain Physiographic Province which is comprised of mostly unconsolidated sediments that extend inland for more than 100 miles. The Coastal Plain soils are clay, silt, sand, and gravel of marine or fluvial origin. Soil associations for the focus area are Lunt-Marumsco complex, Kingstowne sandy clay loam, Hatboro silt loam, and Urban land-Kingstowne complex (Figure 4.2). The Lunt-Marumsco complex covers a majority of the focus area, and is a complex of the Lunt soils, which are well drained that range from fine sandy clay loam to sandy clay loam with depth, and the Marumsco soils, which are moderately well drained and range from loam to sandy clay loam with depth (USDA, 2008). The Hatboro silt loam is located along Cameron Run that is a poorly drained silt loam to clay loam. The open field is a Kingstowne sandy clay loam that is a well drained sandy clay loam to clay loam. Development and flood control have permanently altered or disturbed the vast majority of the soils in the area.

A geotechnical investigation conducted for this project, in October 2007 and May 2008, reveals three strata within the top 60 feet along the open field portion of the focus area (refer to Appendix G2 for further information). The top stratum is composed of silt, clay, and silty or clayey sand and ranges in thickness from 5 to 16 feet, with an average thickness of 8 feet. Beneath the top stratum, there is a pervious stratum of silty sand and gravel varying from 2 to 13 feet thick. Beneath the second stratum, there is a thick deposit of very hard, lean to fat clay. In the open field area, groundwater was generally encountered approximately 4 to 12 feet below the ground surface, with an average depth of about 5 feet.

Soil testing for a similar study of Huntington Station completed in 1982 determined that the underlying strata along the river channel contained substantial beds of soft and very soft peat and organic silts of increasing thickness downstream. It is also thought that the area between the Huntington Community and Cameron Run contains substantial quantities of uncontrolled fill material (CDM, 1982).

See Section 4.2 for information regarding the sediment within Cameron Run.

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Figure 4.2

Soils

0 375 750 1,500 Feet

1 inch = 400 feet

Aerial Photograph dated 2004 courtesy of AerialExpress
Elevations referenced to NGVD29 datum

Legend

Soils

- 49A - Hatboro Silt Loam
- 66 - Kingstowne Sandy Clay Loam
- 74B - Lunt-Marumsco Complex
- 100 - Urban Land-Kingstowne Complex

N

4.1.4 Prime and Unique Farmlands

Prime farmland, as defined by the USDA, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. Prime farmland produces the highest yields with minimal expenditure of energy and economic resources, and farming it results in the least damage to the environment.

The Lunt-Marumsco complex is classified as a prime farmland soil (USDA, 2008). While a formal survey of the study area has not been conducted, this area is highly developed and is without agricultural uses beyond that of a backyard or community garden.

4.1.5 Hydrology

Cameron Run is a direct tributary of the Potomac River (USGS Hydrologic Unit Code 02070010) and its waters generally flow in an eastward direction. The major tributaries of this 42 square mile watershed start in Fairfax County and collect in the mainstems of Backlick Run and Tripps/Holmes Run. These streams flow through portions of Fairfax County and Falls Church before reaching Alexandria where they combine to form Cameron Run. Cameron Run's flood control channel carries water out of Alexandria and back into Fairfax County where it picks up the discharge from Pikes Branch and changes names to Great Hunting Creek just upstream of its confluence with the Potomac River. Lower Cameron Run is tidally influenced from the Potomac River to just upstream of Huntington at the metro-rail bridge. The Potomac River Basin cradles the Cameron Run watershed and ultimately carries its waters to the Chesapeake Bay (Fairfax County, 2006).

4.1.6 Water Quality

Impervious surfaces are mainly constructed surfaces: rooftops, sidewalks, roads, and parking lots covered by impenetrable materials such as asphalt, concrete, rock, and stone. Increased watershed imperviousness adversely impacts water quantity, water quality, microclimates, habitat, and landscape aesthetics (Fairfax County, 2001). The percentage of land area that is impervious is an indicator of urbanization's impacts on the hydrologic system.

Suburban development (roads, housing, schools, and business development) in the watershed has led to a severe loss of natural habitat, as well as degradation of the streams and tributaries due to impervious surface run-off and other pollution sources. With only 35 percent of forest cover remaining, the watershed has lost nearly three-fourths of its forests, and almost all of its historic (pre-colonial) wetlands (Fairfax County, 2001). Based on continued development in the watershed, it is expected that forest and wetland acreage will continue to decline.

Water quality is tested by the Fairfax County Health Department at Fenwick Drive where Cameron Run enters Fairfax County near Telegraph Road. Water quality in Cameron Run generally meets the Clean Water Acts fishable and swimmable goals with the notable exception of fecal coliform counts. In 1999, 57 percent of samples tested in the "unhealthful" range (greater than 1,000 fecal coliform/100ml). Sources of bacteria contamination have been debated for a number of years. In 2000, a joint effort between the Northern Virginia Regional Commission

and Virginia Tech shed light on the subject by applying DNA analysis to bacteria strains in neighboring Four Mile Run where samples were also taken. The study revealed that waterfowl account for over a third of all bacteria (37 percent), followed by humans (17 percent), raccoons (15 percent), and canines (9 percent). Equally of significance, the study found that the bacteria appear to regrow, through cloning, within storm drains and stream sediments, therefore perpetuating the problem. The Fairfax County Health Department also tests for nitrate nitrogen, total phosphorus, and a variety of heavy metals. The log average for Cameron Run for arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver is consistently below EPA contamination standards. The average nitrate nitrogen level in Cameron Run for 1996 was 0.8 mg/l, which is well below the maximum unhealthful level of 10 mg/l. However, levels have been rising, albeit slowly, from 0.6 mg/l in 1992. Average total phosphorus levels have remained stable at an acceptable 0.1 mg/l. The 1998 Virginia Water Quality Assessment, which reports monitoring by the Virginia Department of Environmental Quality (VADEQ) on a watershed-wide basis, found that all samples in that year for Cameron Run were "good" for total phosphorus. VADEQ findings for nitrogen were less positive. Cameron Run had 36 percent of samples in the good range and 64 percent in the fair range. Overall, this watershed is considered a high priority by the Commonwealth for nonpoint source pollution (City of Alexandria, 2001).

4.1.7 Aquatic Resources

Records maintained by the Virginia Department of Conservation and Recreation, Division of Natural Heritage, reveal the extent to which many species still call the areas stream valleys home. In the Cameron Run watershed there are thirty-seven different species of fish, seventeen species of frogs, salamanders, and toads, five species of turtle, and over twenty species and subspecies of snake, including the poisonous copperhead (City of Alexandria, 2001).

4.1.7.1 Fisheries

Due to its connection to the Potomac River, both resident and migratory fish inhabit the portion of Cameron Run within the study area. Resident fish tend to be smaller than migratory species and often occur in shallow waters, where they feed on a variety of invertebrates. Fish surveys conducted annually by Fairfax County show that the most common resident fish species found in the Fairfax portion of the Cameron Run watershed are blacknose dace (*Rhinicthys atratulus*), white sucker (*Catostomas commersoni*), creek chub (*Semotilus atromaculatus*), swallowtail shiner (*Notropis procne*), tasselated darter (*Etheostoma olmstedi*) and bluntnose minnow (*Pimephales notatus*). These species generally have a high tolerance for poor water quality.

Previous documentation confirmed the presence of anadromous fish in the study area portion of Cameron Run. Alewife (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis)* were recorded from Cameron Run's downstream end (Hunting Creek, upstream to the first gabion drop (grade- control) structure at stream mile 1.6 (Odom et. al. 1988). Alewife and blueback herring are important migratory prey species consumed by bluefish and other managed species in the Chesapeake Bay and mid-Atlantic coastal waters. It is also likely that white and yellow perch (*Morone spp.)* spawn within the same reach of Cameron Run.

Per correspondence dated March 7, 2007, from the National Marine Fisheries Service (NMFS)

(Appendix A), the study area is upstream of designated Essential Fish Habitat (EFH) and occurrence of federally managed species in the Potomac River watershed, and will not directly affect EFH and managed species.

To avoid impacts to migratory fish, the Virginia Department of Game and Inland Fisheries recommended, in a response dated February 26, 2007 (Appendix A), that any instream work, such as dredging, occur outside of the spring migration and spawning period, defined as February 15th - June 30th. A time of year restriction from February 15th - June 15th for instream work was also noted in the March 7, 2007 letter from NMFS. This letter also mentioned the presence of the endangered shortnose sturgeon (*Ancipenser brevirostrum*) in this area (see Section 4.1.10 for more information).

4.1.7.2 Aquatic Habitats Including Wetlands

The majority of the project study area is focused on roughly two miles of Cameron Run from I-495 to the mouth as it enters the Potomac River. Aquatic habitats associated with this tidal portion of Cameron Run include emergent marshes, intertidal flats, and submerged aquatic vegetation (SAV). These are considered Special Aquatic Sites, a component of "Waters of the United States" as defined by the U.S. Environmental Protection Agency's (USEPA) Section 404(b)(l) guidelines.

Field surveys in 1999 identified tidal mud flats and a SAV bed in the Hunting Creek embayment, which extends from the area south of the U.S. Route 1 interchange east to Jones Point Park. Additional flats are present along the Potomac River shoreline adjacent to the George Washington Memorial Parkway (U.S. DOT, 2000).

Industrial, commercial, and residential areas have replaced areas where wetlands and forests once attenuated floodwaters. Currently only small wetland remnants exist in the area. These wetlands are classified as palustrine (as characterized by the tidal wetland adjacent to lower Cameron Run), riverine (areas alongside free flowing water), and lacustrine (areas of open water, such as Lake Barcroft).

According to investigations of the study area in the early 1980s, there are tidal wetlands bordering Cameron Run downstream of the Jefferson Davis Highway (Route 1) bridge, a wetland area on the north side of the stream just upstream of that bridge, and a small wetland area on the south side of the reach just upstream of the Riverside Apartments retaining wall (CDM, 1982). Fieldwork conducted in 1999 as part of the Woodrow Wilson Bridge project identified several temporarily flooded tidal palustrine wetland areas in the vicinity of the focus area ranging in size between 0.1 and 1 acre (U.S. DOT, 2000) which were verified by USACE regulatory staff. These wetland areas were re-surveyed in 2007 by members of the study team, with assistance from Norfolk District regulatory staff. Some of the wetland areas delineated in 1999 are no longer present, while the extent of remaining wetland areas has changed. Current wetlands identified in the project area are shown in Figure 4.1. A wetland report with photographs, data sheets and maps can be found in Appendix B.

As mitigation for impacts to SAV, associated with the Woodrow Wilson Bridge project, a tidal

wetland totaling approximately 2 acres in size has recently been constructed beneath the U.S. Route 1 Bridge (Kibby, 2007).

4.1.8 Floodplain Management

According to the most recent hydrologic and hydraulic modeling, a significant part of the study focus area is located in the 100-year floodplain.

As the Cameron Run Watershed developed, many of the natural stream channels were piped, resulting in a network of storm sewers and culverts. By the late 1960s, the combination of urbanization, impervious surfaces, channelization, and storm sewers led to frequent flash flooding in the lower portion of the watershed, where the study area is located. As a solution, flood control channels were constructed, which included Cameron Run. When the I-495 was widened in the early 1960's, the Cameron Run channel was completely reconstructed (City of Alexandria, 2001).

Huntington Community is a subdivision of residences built in the 1940s adjacent to Cameron Run. A section of this community consisting of about 87 duplex homes lies within the 100 year floodplain limits of Cameron Run and is subject to potential flooding. Huntington Station is a recent development of high density housing units that lies to the west of the Huntington Community. A portion of this community is also within the floodplain.

4.1.9 Terrestrial Resources

4.1.9.1 Flora

Prior to European immigration the area was primarily a forested landscape. During the 1600s and early 1700s farmers converted the forested landscape to agricultural uses that included tobacco, wheat, and corn crops. Since the 1700s, and primarily during the 20th century, the surrounding area has transformed into an "ultra-urban" state.

Vegetation that is native to the area includes associations of poplar (*Populus sp.*), elm (*Ulmus sp.*), sycamore (*Platanus sp.*), beech (*Fagus sp.*), red and water oak (*Quercus sp.*), and ironwood (*Ostrya virginiana*) near major streams, white, red, and water oak (*Quercus sp.*), pin oak (*Quercus palustris*), pine (*Pinus sp.*), hickory (*Carya sp.*), poplar, sweetgum (*Liquidambar sp.*) on side slopes, and pine, chestnut (*Castanea sp.*), white, red, and black oak (*Quercus sp.*), and hickory throughout the higher elevations on terraces (City of Alexandria, 2001).

A detailed survey of flora and habitat along Cameron Run was completed in 2001 for the western portion of the study area. The floodplain section between the tunnels/Huntington Metro rail bridge and I-495 crossing was surveyed in October/November 2001.

4.1.9.2 Fauna

Over 100 birds have been confirmed as breeding or courting within the Cameron Run and its

neighboring Four Mile Run Watershed. Edge species of mammals such as squirrel, beaver, muskrat, and raccoon also inhabit the area.

4.1.10 Rare, Threatened and Endangered Species

In correspondence dated February 26, 2007 (Appendix A), there are no documented occurrences of threatened or endangered wildlife resources under the jurisdiction of the Virginia Department of Game and Inland Fisheries in the proposed project area. However, there is a historical record from the 1930s of the bridle shiner (*Notropis bifrenatus*) in Cameron Run, which is a State Species of Special Concern as well as a Species of Critical Conservation Need (Tier 1). This freshwater minnow is sensitive to environmental changes such as loss of vegetative cover and increased turbidity and has demonstrated a decline in the U.S. and Canada.

Per correspondence dated March 2, 2007 from the USFWS, due to the study area's proximity to the Capital Beltway (I-495) there is low probability of federally-listed rare, threatened or endangered species under their jurisdiction.

In a letter from NMFS, dated March 7, 2007, the endangered shortnose sturgeon (*Ancipenser brevirostrurn*) has been determined to be present in the tidal Potomac River, including the project vicinity, requiring consultation under Section 7 of the Endangered Species Act. Follow-up correspondence with NMFS on March 26, 2007, indicated that no listed species are likely to be present in the project area as long as in-water work was limited to Cameron Run (Appendix A).

4.1.11 Air Quality and Climate

The six air pollutants commonly found throughout the United States are ozone, carbon monoxide, nitrogen dioxide, particulate matter, sulfur dioxide and lead. These pollutants can injure health, harm the environment, and damage property. The USEPA calls these air pollutants "criteria pollutants". According to a response dated March 8, 2007, the Virginia Department of Environmental Quality (VADEQ), the entire Northern Virginia region, which includes Fairfax County, is currently in non-attainment for ozone and particulate matter (Appendix A).

Table 4.1: National Ambient Air Quality Standards.

Pollutant	NAAQS Concentration*	2000 Measured Concentration
Carbon monoxide (CO)	35 ppm, 1-hour average	3.2 ppm
Nitrogen dioxide (NO_2)	0.053 ppm, annual mean	0.022 ppm
Ozone (O_3)	0.120 ppm, 1-hour average	0.109 ppm
Particulate matter (PM_{10})	50 $\mu g/m^3$, annual mean	36 $\mu g/m^3$
Sulfur dioxide (SO_2)	0.030 ppm, annual mean	unknown

**PPM = parts per million; $\mu g/m^3$ = micrograms per cubic meter*

Northern Virginia is generally considered to be a temperate continental climate. The average annual temp for the Northern Virginia metro area is approximately 58 degrees, with average lows in the mid-30s to highs in the upper 70s. Precipitation is generally evenly distributed

throughout the year, with an annual rainfall of 39 inches per year. Snowfalls average 18 inches per year, with perhaps only one or two major snowfalls in a season. It is unusual to have a snowstorm of 10 inches or more within any one particular day. However, there have been rare occurrences of 25-inch snowstorms (Virginia Department of Environmental Quality, 2007).

4.1.12 Noise

Excess noise levels are of concern because it can be annoying and cause adverse health effects. Noise can impact human activities such as conversing, listening to music, working, and sleeping. Noise can also disrupt wildlife behaviors. The project area can be generally classified as suburban/urban with moderate noise impacts. Sources of noise pollution in the study area include vehicles traveling along major roadways (Capital Beltway and U.S. Route 1), local roads, construction and lawn mowing equipment, public gatherings, and recreational activities (e.g. baseball, basketball, and bicycling).

Ambient noise levels through the study area include noise related to traffic along major roadways. In general, the ambient noise levels are moderate. Sensitive noise receptors in the vicinity are mostly residential homes, which are in close proximity to the proposed action, with two homes located within 50 feet or less of the proposed construction area.

4.1.13 Cultural Resources

Although there would have been both prehistoric and historic resources along Cameron Run, these areas have been mostly disturbed by 20th century development. The largely altered condition of the watershed was described in the 2000 Environmental Impact Statement for the Woodrow Wilson Bridge replacement, which stated that “Industrial, commercial, and residential areas are also found in places that once contained broad wetlands and forests that would have helped to slow and absorb floodwaters. The once meandering channels of Cameron Run [and its tributaries] are now straight and in rock-lined or concrete channels [in places] to insure efficient movement of potential floodwaters out of developed areas”. The report states that Cameron and Holmes Run were channelized during the construction of the Capitol Beltway and also used for the placement of storm sewers. (USDOT, 2000).

The Huntington Community is a 1940’s residential area of duplex housing along Arlington Heights Terrace, Farrington Avenue, and Fenwick Drive. Most of the housing in this neighborhood is dated by the County tax office to 1947. Townhouses were recently built just upstream of the duplex community. A review of historic maps for this area suggests that it was an undeveloped portion of Fairfax County, Virginia, prior to the 20th century. Geomorphological testing in 1982 of the river channel between this neighborhood and Cameron Run revealed that the subsoil is composed of a mixture of peat, flood deposited sands and fill material to a depth of at least fifteen feet. Geotechnical investigation conducted in October 2007 and May 2008 revealed three strata along the open fields within the focus area: the top strata consists of silt, clay and silty or clayey sand for an average thickness of eight feet; the second strata consists of silty sand and gravel for a thickness varying from 2 to 13 feet thick; and the bottom strata went to a depth of sixty feet and consisted of a thick deposit of very hard, lean to fat clay. The stiff Potomac clays are prevalent in this area. Four test pits were excavated to a

depth of approximately five feet in October 2007 and a Fairfax County Park Authority cultural resources staff member (Aimee Wells) was on-site during the digging to look for evidence of any cultural resources – none were found. Since the entire property is documented as disturbed, no archeological investigations are warranted.

4.1.14 Transportation

In the vicinity of the project area, bus and subway service is provided by the WMATA (Washington Metropolitan Area Transit Authority). Bus service is provided by the Metro along Telegraph Road and U.S. Route 1 (Jefferson Davis Highway) that define the study area to the east and west. Subway service is provided by the Yellow Line, which terminates at the Huntington Metro station located immediately to the west of the study area. The Huntington Metrorail station is a terminus, it has commuter parking and is a final destination point for north bound Metro buses. Other major roads and transportation features in this area include the Capitol Beltway (I-495), the George Washington Memorial Parkway, and the Woodrow Wilson Bridge.

4.1.15 Utilities

There are several sanitary sewer pipes in the project area. These drain to an inverted siphon consisting of three pipes that cross over Cameron Run, in the vicinity of Hunting Creek Road, to the Alexandria Sanitation Authority**.** Based on the as-built drawings dated January 1981, the top of the concrete encased siphon pipes varies from elevation -2.8 to elevation -4.5 as it crosses Cameron Run. There are also several storm drains in Huntington that empty into the wetland/forested areas along Cameron Run.

There are a few utility and communication lines that cross Cameron Run in the vicinity of the focus area. One crossing is just downstream from Telegraph Road. Communication lines run along the Metro Bridge across Cameron Run and utility lines also cross Cameron Run between Huntington and the Riverside Apartments.

4.1.16 Demographics and Socioeconomic Conditions

The total population for Fairfax County according to the 2000 U.S. Census Bureau data was 969,749 (U.S. Census Bureau, 2000). This represents an increase of 18.5% since the 1990 census. There are approximately 2,500 people living in the project area (census tract 4204). The ethnic break down of Fairfax County according to the 2000 census was 69.9 percent white, 13 percent Asian, 11 percent Hispanic, and 8.6 percent African American. In census tract 4204 the ethnic break down of the community was 59.5 percent white, 13 percent Hispanic, and 12.1 percent African American. Less than 4 percent of the total population is 65 years old or greater. Of the nearly 1,600 housing units present, approximately 14 percent are owner occupied. The median household income for Fairfax County in 2000 was $81,050. The median household income for zip code 22303, which covers the general project area, was $55,948. Household incomes for census tract 4204 in the study area were not available. The per capita income for Fairfax County was $36,888, and in zip code 22303 it was $33,404.

4.1.17 Hazardous, Toxic and Radioactive Substances

A cursory review was conducted to evaluate the potential for hazardous, toxic and radioactive substances in the study area. Seven hazardous waste handlers and two multi- activity facilities lie within close proximity of the proposed project area, based upon a review of the USEPA records [Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS), Resource Conservation and Recovery Act Information System (RCRAInfo), and Toxic Release Information System (TRIS)]. These sites include businesses such as gasoline stations, automotive dealerships, and autobody repair shops (USEPA Envirofacts websearch, March 2007). In addition, the state records indicate the presence of underground storage tanks at a municipal facility on Fairfax Avenue, which is in the Huntington Community (USDOT, 2000).

4.1.18 Recreation

Huntington Park is located between Huntington Community and Cameron Run and is under the jurisdiction of the Fairfax County Park Authority. The park offers basketball courts, baseball diamonds, a hiker/biker trail and playground. The Huntington Community Center, located in the middle of the community, provides indoor and outdoor recreational facilities. It also provides after school programs for students as well as a variety of indoor activities for senior citizens.

4.1.19 Child Health and Safety

In recognition of mounting scientific information demonstrating that America's children suffer disproportionately from environmental health and safety risks, the environmental health and safety risks to children are analyzed in this study.

Based on year 2000 data from the U.S. Census Bureau, 5.9 percent of persons living in zip code 22303 are under 5 years old, and 17.6 percent of the total population is under the age of 18. These percentages are lower than those for the entire state of Virginia (6.7 and 23.6 percent respectively).

4.1.20 Environmental Justice

Environmental justice issues are incorporated in this study to identify and address any disproportionately high and adverse human health or environmental effects impacting minority and low-income populations. As defined by the " Environmental Justice Guidance Under the National Environmental Policy Act" (CEQ, 1997), "minority" includes persons who identify themselves as Asian or Pacific Islander, Native American or Alaskan Native, black (not of Hispanic origin) or Hispanic. A minority population exists where the percentage of minorities in an affected area either exceeds 50 percent or is significantly greater than in the general population. Low-income populations are identified using the Census Bureau's statistical poverty threshold, which is based on income and family size. The Census Bureau defines a "poverty area" as a Census tract with 20 percent or more of its residents below the poverty threshold and an "extreme poverty area" as one with 40 percent or more below the poverty level (U.S. Census

Bureau, 2000). Based on the 2000 Census, Fairfax County and zip code 22303 has 3.0 and 5.6 percent of the population below the poverty line, respectively. Therefore, they would not qualify as "extreme poverty areas".

4.2 CAMERON RUN SEDIMENT STUDY RESULTS

As part of this study, some limited sediment testing within Cameron Run was conducted and the results can be found in Appendix C. Concurrent with this study, a sediment transport analysis was performed, *Cameron Run Sediment Transport Analysis Final Report, April 2008*. This study also involved sediment sampling. This is a stand-alone document and is not included in the appendix. Below are summaries from both of these efforts.

4.2.1 Cameron Run Sediment Testing

While developing concept plans for the dredging alternatives, a few samples were taken from Cameron Run. The chemical and physical characteristics of the sediment and degree of contamination needed to be identified to determine how to properly remove and place the material. In August of 2007, sediment was collected using a hand corer at eight locations along the Run (location of samples can be found in Appendix C). Some of the physical parameters analyzed were grain size, Atterberg limits, total phosphorus (TP), and total kjeldahl nitrogen (TKN). Bulk chemical analyses were performed on both volatile and semivolatile organics, polycyclic aromatic hydrocarbons (PAH's), polychlorinated biphenyls (PCB's), metals, et al.. In addition toxicity characteristic leaching procedure (TCLP) analyses were run on a variety of parameters.

The sampling demonstrated that the material is predominately sand and gravel with little silts and clay. As expected the grain size is a little finer downstream but still predominately sand and gravel. Being so coarse, the level of contamination on the material is minor. The material should be able to be placed in any landfill in the area and could be used for a wider range of beneficial uses. The material is also suitable for open water placement if it were allowed.

The analytical results can be found in Appendix C.

4.2.2 Sediment Transport Analysis

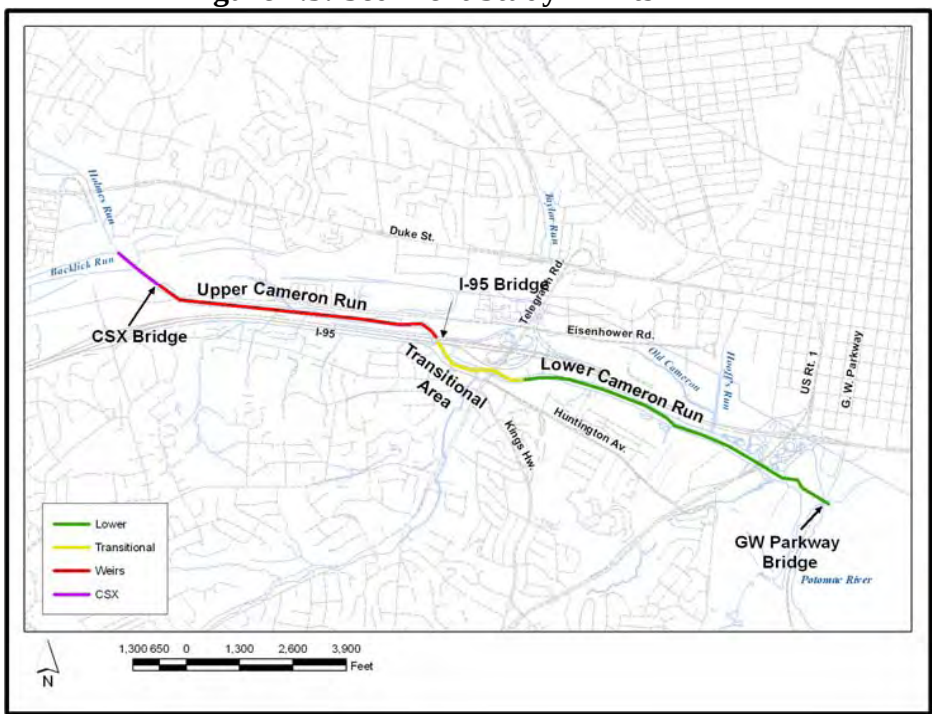
In support of the Cameron Run/Holmes Run Watershed Feasibility Study (currently being conducted by the Corps, Fairfax County and the City of Alexandria) and this Huntington Flood Damage Reduction Study, AB Consultants and Rummel, Klepper & Kahl (RK&K) completed a Cameron Run Sediment Study in April 2008. The study purpose was to determine the amount and rate of sediment accumulation within the mainstem of Cameron Run. Initial efforts focused on sediment continuity throughout the system to determine if Cameron Run has the sediment transport capacity to effectively move sediment delivered from Backlick and Holmes Runs to the Potomac River. The results showed that physical constraints, such as existing bridges and piles, a sanitary siphon, and the channel profile, inhibit sediment transport capacity within Cameron

Run. After determining that the system has a limited sediment transport capacity as currently configured, the focus of the study moved to evaluating dredging alternatives.

Over the last 150 years, stream alteration has been documented in the Cameron Run stream system. These changes have come mostly in the form of channel straightening, reduction in floodplain capacity and interaction, and installation of grade control structures to limit bed migration and protect infrastructure crossings. Sediment accumulation is variable and is highly dependant on storm events within the system. It appears that the sediment delivery was accelerated in the tidal portion of Cameron Run during the 1960's and 1970's. Since that time, the system appears to have adjusted and accumulation rates have slowed.

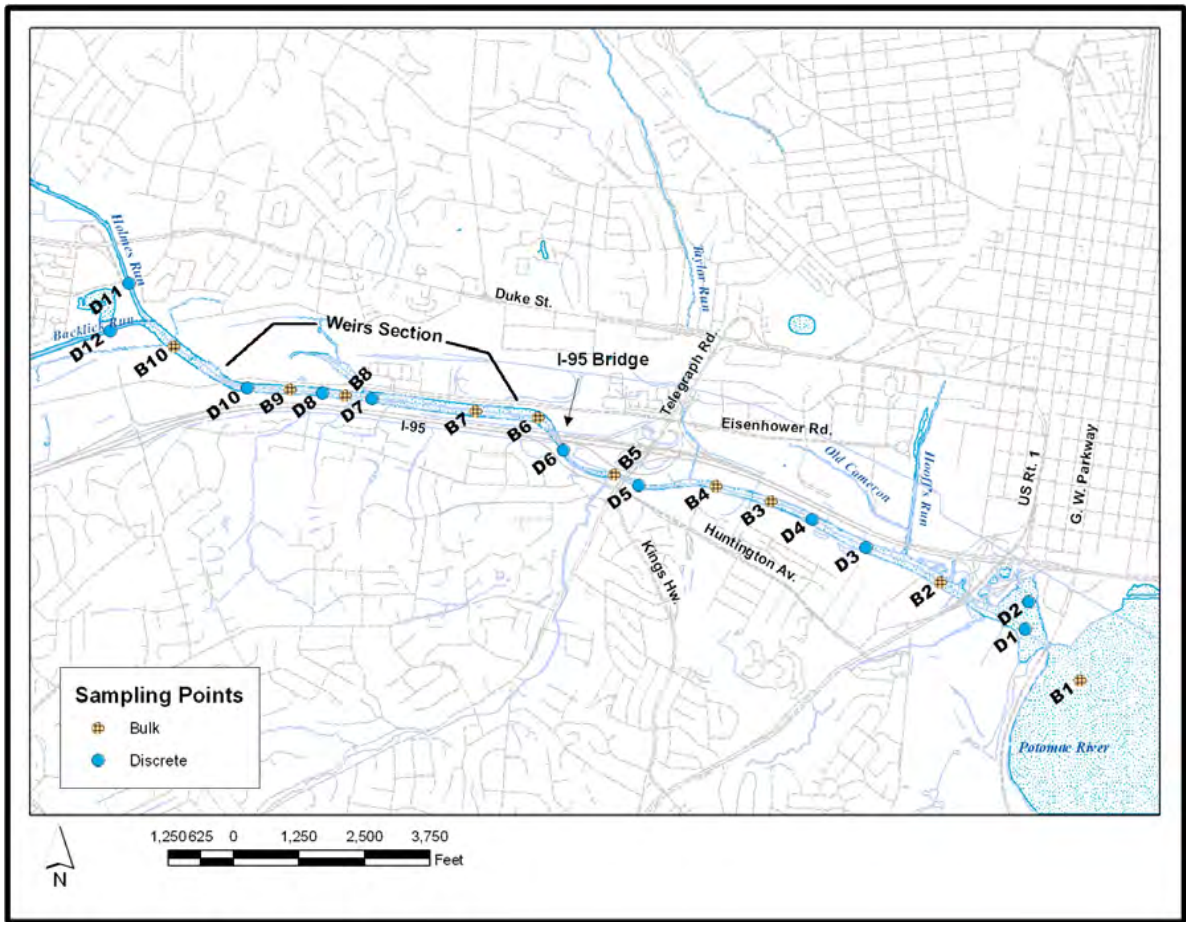
Sediment sampling showed that bed material in Cameron Run varies from fine sands and silts to cobbles and gravel. The lower area of Cameron Run (Telegraph Road downstream to GW Parkway) is dominated by medium to fine sands (Figure 4.3). Analysis of the sediment samples shows that the bed materials in the study area have become organized distinct zones of channel material. These zones reflect the reach conditions that affect sediment transport capacity. Constraints in Cameron Run, such as culvert and bridge crossings, grade control features, and armored stream banks, have impacts on local channel slopes, sediment inputs, and shear stresses. Sediment transport modeling in this study shows that Lower Cameron Run is overwidened, when measured by sediment transport capacity, which is one of the likely causes for the continued aggradation in Cameron Run. A distinct "hinge point" emerges in the analysis at the Metro Rail Line, where sediment transport capacity changes dramatically. Modeling illustrated that flows up to the 25-year event cause aggradation in the lower reach, and that the sediment transport capacity of Upper Cameron Run (CSX Bridge downstream to I-495 bridge) is approximately 3-3.5 times that of Lower Cameron Run.

Figure 4.3: Sediment Study Limits



As part of the analysis, RK&K collected and analyzed thirty (30) sediment samples from twenty-two (22) sampling sites (from south of Duke Street to its confluence with the Potomac River). Sampling sites were chosen in order to capture significant changes in sediment gradation and characteristics throughout the study area (Figure 4.4).

Figure 4.4: Cameron Run Sediment Sampling Sites

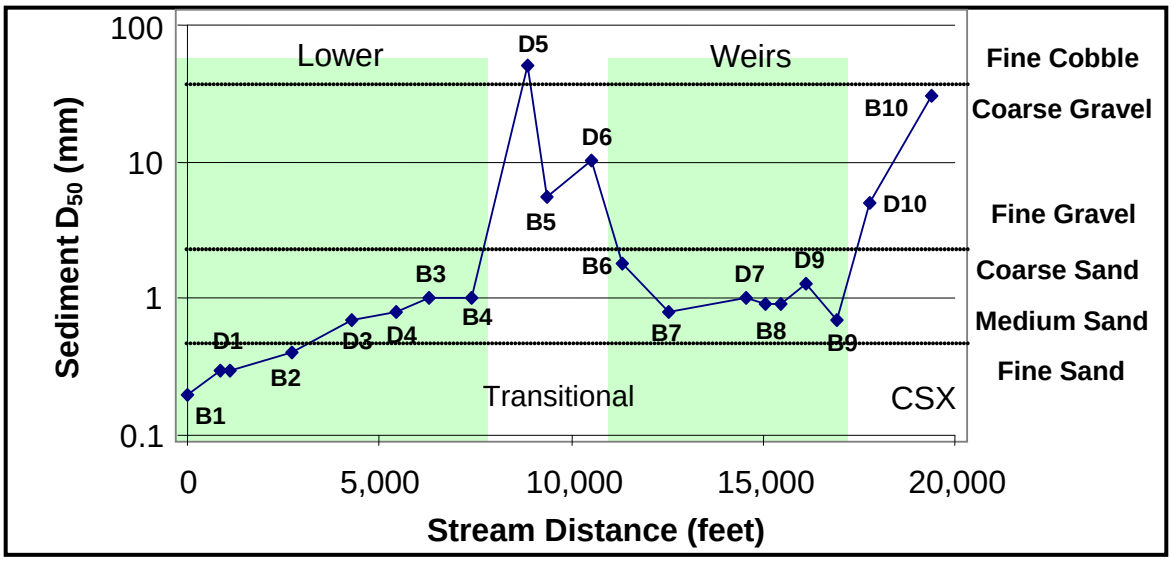


Results on particle sizes ranged from cobble to fine sand; however, the Cameron Run system within the study area can be described as a sand and gravel system. Generally, there was a fining of particle sizes in the downstream direction, which is expected in riverine systems. However, this trend was not true in all locations. Structures, such as the weirs or bridge crossings, change hydraulic and sediment transport regimes, which affects sediment gradation. The results of the particle size analysis show that engineered structures in Cameron Run do affect particle size distribution.

The D_{50} near the confluence of Backlick and Holmes Run was in the fine to coarse gravel range, while in the weirs area (just upstream of the Capital Beltway) the dominant particle size was found to be medium sand. However, instead of fining in the downstream direction, the D_{50} below the I-95 bridge crossing increases into the medium to coarse gravel range. These larger-sized particles (gravels, cobbles) continue downstream just past the Telegraph Road crossing, where a

large gravel/cobble bar has developed approximately 200-500 feet downstream of Telegraph Road. Sediment size becomes increasingly smaller in the downstream direction between the Metro Line (Yellow) and the Potomac confluence with D_{50} values in the fine to medium sand range. The Lower Cameron Run area is tidally influenced, however, the increase in particle size in the upstream direction is evidence of the diminished tidal influence near the Huntington area. See Figure 4.5.

Figure 4.5: Zones of Similar Bed Characteristics



The approximate volume of sediment that has accumulated in or delivered out of each reach in Lower Cameron Run was estimated using the average end-area volume method. The totals in Table 4.2 show that sediment accumulation occurred between 1965 and 1999 between Telegraph Road and the Westgate siphon followed by a reduction in sediment between 1999 and 2007. Anecdotal evidence is available from the City of Alexandria that conditions in 2006 (prior to the June, 2006 event) were similar to 1999 conditions, which points to the June, 2006 event as a potential sediment flushing event in the study area. Taking the sediment reduction into account for Lower Cameron Run between 1999 and 2007, it is evident that accumulation occurs over long periods of time, as shown in the totals of sediment accumulation between 1965 and 2007, with episodic flushing events which transport a portion of the accumulated sediment.

After the sediment transport analysis was completed, a drawing from the construction of the Capital Beltway (I-495) was obtained (Figure 4.6). It shows how Cameron Run was rerouted for the construction of the beltway in the early 1960's, and how the new channel tied into the existing natural channel just south of the Route 1 interchange. At the tie-in point, the channel has an inverted slope; the channel bed slopes up approximately 4-5 feet higher, essentially creating a sediment trap. This could have contributed to the accelerated accumulation of sediment in this reach in the 1960's and 1970's.

Table 4.2: Sediment Accumulation Volumes in Lower Cameron Run

		1965-1999		1999-2007		1965-2007	
Area	LF	Sediment Accumulation (cy)	CY/ LF	Sediment Accumulation (cy)	CY/LF	Sediment Accumulati on (cy)	CY/LF
I-95 to Telegraph Road	1,700	1,502	0.9	-553	-0.3	949	0.6
Telegraph Road to Metro Line	1,700	51,455	30.3	-19,833	-11.7	31,622	18.6
Metro Line to Fenwick Drive	1,000	24,000	24.0	-5,925	-5.9	18,075	18.1
Fenwick Drive to Westgate Siphon	2,100	65,200	31.1	-23,333	-11.1	41,867	19.9
Westgate Siphon to GW Parkway	3,900	6,383	1.6	-3,864	-1.0	2,519	0.7
Total	**10,300**	**148,540**	**14.3**	**-53,508**	**-5.1**	**95,032**	**9.1**

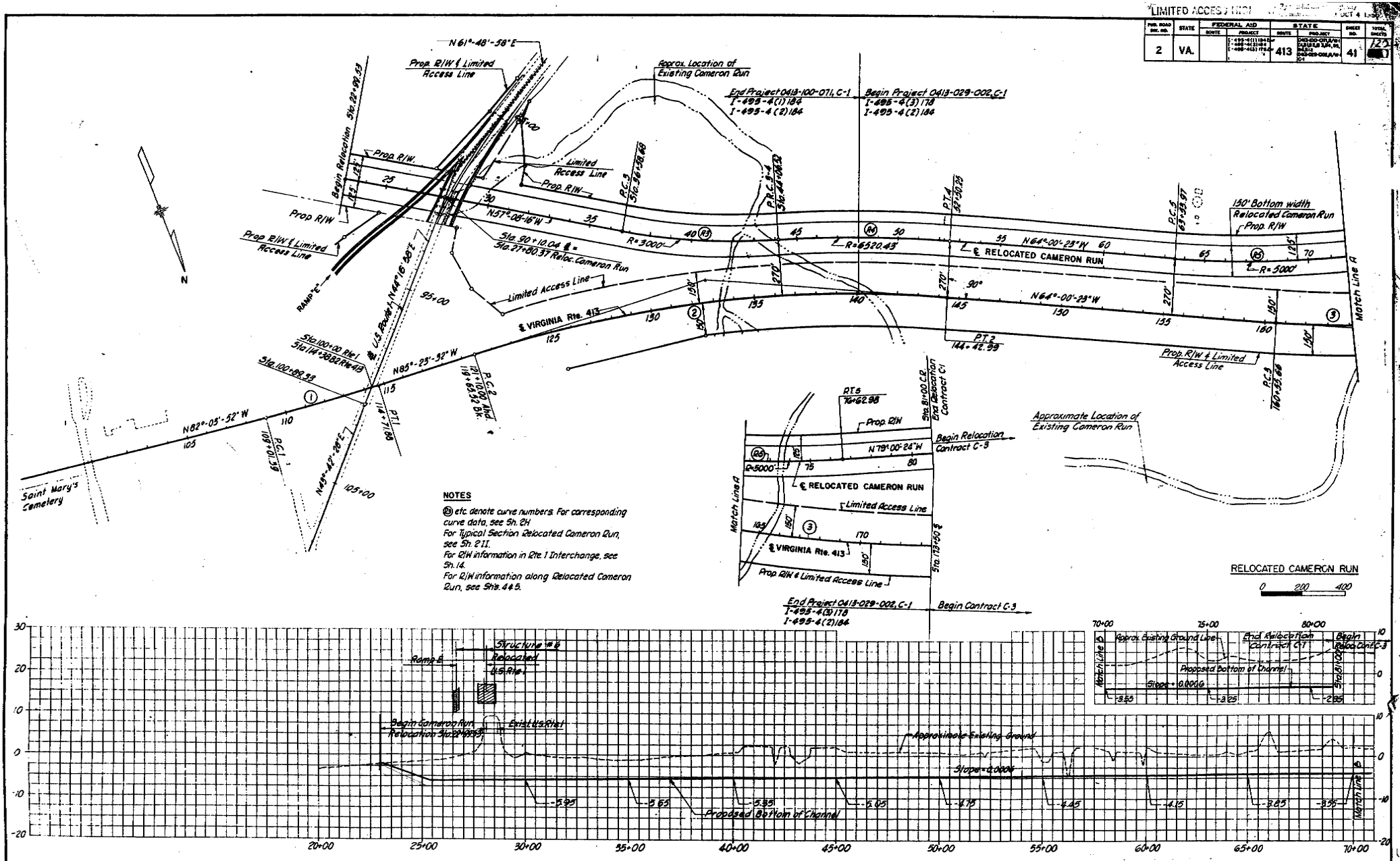


Figure 4.6 Capital Beltway Construction

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5.0 OVERVIEW OF FLOOD DAMAGE REDUCTION MEASURES

Flood damage reduction consists of two basic techniques – structural and non-structural. Structural methods modify the flood and "take the flood away from people" by measures such as levees, floodwalls, dams, dredging and channelization. Non-structural flood damage reduction techniques basically "take the people away from the floods" leaving the flood to pass unmodified. Non-structural techniques consist of measures such as relocation, flood proofing, acquisition, and flood preparedness. The following structural and non-structural flood damage reduction techniques were considered for this study. To familiarize the reader with these flood damage reduction measures, general descriptions are presented below.

5.1 STRUCTURAL TECHNIQUES

The types of structural measures that were considered for Huntington include levees, floodwalls and dredging. Levees and floodwalls are freestanding structures located adjacent to or away from the buildings that prevent the encroachment of floodwaters. Dredging the flood-prone waterway may allow the waterway to carry more floodwater, reducing the depth of floodwaters.

5.1.1 Levees

Typically, levees are constructed of compacted fill taken from locally available impervious soils. Depending upon the availability of suitable local soil, levees may be one of the least expensive flood damage reduction measures. Levees have the advantage of being compatible with the landscape since they are easy to shape and are covered with grass (Figure 5.1).

Figure 5.1: Typical Levee

Unlike other flood proofing measures, a well designed and constructed levee results in no water pressure on the structures themselves. Consequently, as long as the levee holds or is not overtopped, the building should not be exposed to damaging hydrostatic or hydrodynamic forces. Another advantage with this technique is that there is no need to make major structural alterations to the flood prone buildings.

When constructing a levee around buildings or along the side of buildings, sump pumps must be incorporated to provide proper interior drainage from groundwater seeping under the levee and rainwater from the building side of the protection. During a flood, the storm drain pipes that usually take rain water from the community to the river (under or through the levee) are closed so that flood water from the river does not back up and flood the community. Typically, one or more large pump stations are needed during a flood to pump the rain water that is trapped on the land side of the levee over the levee to the river side. The pump also pumps any water that seeps under the levee over to the river side.

Levees require periodic maintenance, including removing debris from any check valves on pump discharge pipes after each storm, inspecting the sump pump for proper operation, and maintenance of the flap gates. In addition, the levees must be inspected for signs of erosion, settlement, animal burrows, and tree growth.

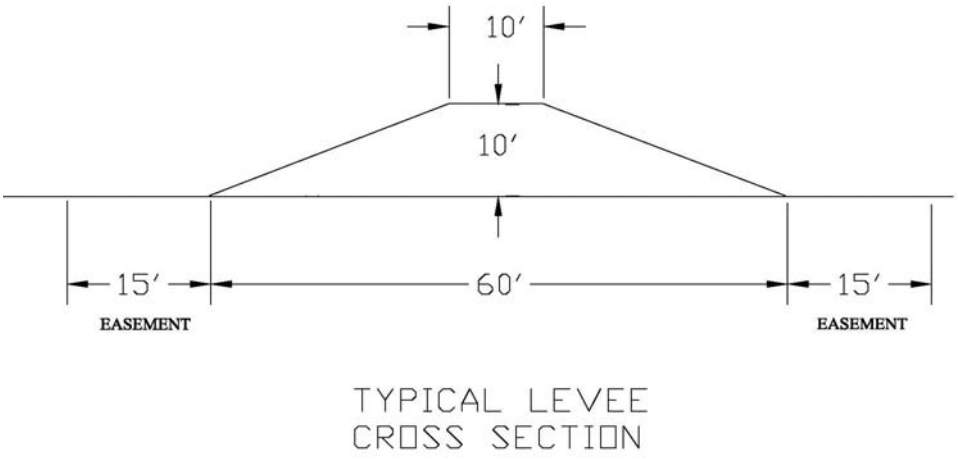
Although levees can provide protection to an area and prevent or reduce flood damages, they are not free from risk. Levees can create a false sense of security about property protection. Every flood is different, and one could exceed the design height and overtop the levee at anytime. For this reason, the protected area should always be evacuated prior to flooding.

If a levee fails due to overtopping or for any other reason, damage to the protected structure will be as great or greater than if no protection was provided. Additional damage could result because it takes longer to remove the flood water from the inside of the levee once flood levels subside.

Although levees may be attractive in terms of economics and appearance, one potential drawback is the amount of property space required. To minimize erosion and to provide adequate stability, their embankment slopes must be fairly gentle, usually a ratio of one vertical to two or three horizontal (Figure 5.2).

Any sewers or drain pipes passing through or under a levee will require closure valves to prevent backup and flooding inside the building and protected area.

Figure 5.2: Typical Simple Cross Section of a Levee
(for 10 foot-high levee)



5.1.2 Floodwalls

Similar to levees, floodwalls also keep water away from the building. However, floodwalls are constructed of stronger materials, are thinner, take less space, and generally require less maintenance than levees. Floodwalls can be constructed using a variety of designs and materials, such as steel sheetpiles and concrete. However, flood walls are typically more expensive than levees and they require closure structures for access to the waterway. Since there is ample space available for a levee to provide protection to the Huntington community, a floodwall was not evaluated any further (Figure 5.3).

Figure 5.3: Typical Floodwall

5.1.3 Dredging

Waterways change over time and sometimes they accrete (fill with sediments) and sometimes they erode. The reach of Cameron Run adjacent to Huntington has filled with sediment over time. Based on available records, it has filled in with approximately 5 feet of sediment during the last 40-50 years since it was re-routed for the construction of the Capital Beltway in the early 1960's. Dredging waterways deeper and/or wider can provide more capacity for floodwaters, lowering the flood elevation; however the dredging must be done on a regular basis. As shown in the Sediment Study (USACE, 2008), Cameron Run near Huntington is a depositional area for sediment, and it is likely to fill in quickly. A site to place the dredged material must also be identified. Dredging portions of Cameron Run was investigated as part of this study.

5.1.4 Channelization

Channelization typically means modifying a stream by activities such as straightening, widening, narrowing and/or lining with concrete. The reach of Cameron Run adjacent to Huntington is already straight as it was reconfigured for the construction of the Capital Beltway. Narrowing the channel would reduce its flood capacity. Widening the channel would be difficult due to the existence of the Riverside Apartment property and the Capital Beltway ramps, and widening, even if possible, would likely increase sedimentation in this area. The only channelization activity that could possibly be effective in this area would be to line the channel with concrete to speed up the flow and possibly reduce water surface elevations. However, creating a concrete channel can have a significant impact on the environment. One of the project objectives was to minimize environmental impacts. In addition, the county and Corps are currently conducting the Cameron Run/Holmes Run watershed study, whose goal is to restore aquatic and riparian habitat in the watershed. Channelization is contrary to these goals, therefore it was not further evaluated during this study.

5.2 NON-STRUCTURAL TECHNIQUES

5.2.1 Flood Proofing

Dry flood proofing typically involves sealing the exterior building walls with waterproofing compounds, impermeable sheeting, or other materials and using shields for covering and protecting openings from floodwaters. Shields can be used on doors, windows, vents, and other openings. Sewer lines need to be fitted with check valves that close when flood waters rise in the sewer to prevent backup and flooding inside the building.

When evaluating the feasibility of flood proofing techniques, there are important analysis/design criteria that must be considered such as flood characteristics (level, duration, and velocity); elevation of the first habitable floor, type and condition of construction, lot size, location and type of utilities, accessibility, etc.; building codes, zoning/site restrictions, flood insurance guidelines, etc.; and owner/community input and reasonable aesthetics. It should be noted, National Flood Insurance Program ordinances do not allow dry flood proofing of residential

structures where substantial damages exist or substantial improvements are to be made. Substantial damages/improvements are defined as restoring or improving the structure for which the costs equals or exceeds 50% of the market value of the structure before the damage occurred or the value of the structure prior to start of the improvements

Generally, dry flood proofing should only be employed on buildings constructed of concrete block or brick veneer on a wood frame. Weaker construction materials may fail at much lower water depths from hydrostatic pressure. Even brick or concrete block walls should not be flood proofed above a height of approximately three feet, due to the danger of structural failure from hydrostatic forces, unless a structural engineer has confirmed that the building is designed to handle the forces.

Dry flood proofing is not a recommended measure for reducing flood risks to structures with basements and the Huntington houses have basements. Only under limited conditions can structures with basements be flood proofed (walls were properly designed and constructed). Based on the flood proofing team's observations, the walls of the structures in Huntington were not constructed with proper reinforcement to withstand hydrostatic pressures that would occur during a storm event.

Therefore, dry flood proofing the Huntington structures is not recommended. However, for the houses where only the basement is vulnerable to flooding, one option is to fill the basement and add more living space that is above the 100-year flood elevation to the side or rear of the house if adequate space is available.

Dry flood proofing the Huntington Community Center, which does not have a basement, is a viable option and was evaluated during this study.

5.2.2 Elevation

Elevation involves raising the flood-prone buildings in place so that the lowest floor is above the flood level for which flood proofing protection is required. The buildings are jacked up and set on new or extended foundations above the level of protection. For houses that include basements (such as Huntington), the basements can be filled in, the house raised, and additional living space can be added to compensate for the lost basement space. Elevating the houses in Huntington is a viable option and was evaluated during this study.

5.2.3 Buy-Outs

A buy-out, also known as acquisition, is when the local government purchases the flood-prone houses and assists the homeowners in locating new houses out of the floodplain. The local government then returns the flood-prone area back to a natural floodplain. Although this can be costly, it does eliminate the risk of flood damages to structures and the risk to human life and safety. Fairfax County did not request that the Corps evaluate this option. However, during flood studies that could possibly lead to the construction of a federal project, the Corps must evaluate all feasible structural and non-structural solutions. Buying out the flood-prone houses in Huntington is a potential non-structural solution that was evaluated during this study.

5.2.4 Flood Warning

The implementation of a flood warning system is also a non-structural technique for reducing damages and protecting lives. A flood warning system was implemented by Fairfax County in September 2008. The county uses the Community Emergency Alert Network, or CEAN, to deliver important emergency alerts, notifications and updates during an emergency, such as flooding to the Huntington Community residents. Fairfax County is also installing more river gages in the areas throughout the region to better understand the risk of potential flood events.

6.0 ALTERNATIVES ANALYSIS

The development and analysis of flood damage reduction alternatives for Huntington consisted of a three-step plan formulation process and is described below.

Phase 1 – Hydraulic Analysis of Preliminary Alternatives – Initially, preliminary alternatives, including levees and dredging, were evaluated using the hydraulic model to determine their effect on flood levels.

Phase 2 – Development and Evaluation of Preliminary Concept Plans - Based on results of Phase 1, Fairfax County and the Corps identified which alternatives should be developed and evaluated further. For these alternatives, which included levees, dredging, buyouts, and flood proofing, the team developed preliminary 5% concept plans and conducted a preliminary economic analysis to determine rough economic costs and benefits. The Phase 2 alternatives were reviewed by Fairfax County. The Phase 2 alternatives that were cost prohibitive, did not solve the flooding problem, and/or were not favored by the residents and/or the county were not pursued further.

Phase 3 – Development and Evaluation of Final Concept Plans - For the remaining alternatives, which included a levee and a levee/dredging combination, the concept designs were further refined to a 25% concept level and the levees were evaluated for three different heights of protection to determine the optimal plan. An economic analysis of these final alternatives was conducted and was used to assist the county in selecting a final plan for design.

6.1 PHASE 1 – HYDRAULIC ANALYSIS OF PRELIMINARY ALTERNATIVES

A hydraulic model was used to determine the effectiveness of alternative plans to reduce flood levels at Huntington. The hydraulic modeling was completed using HEC-RAS version 3.3. The original model is a HEC-RAS model created by VDOT (PCC, 2002) and was updated by the Corps for this study. The HEC-RAS model includes the Route 1 improvements that VDOT has recently completed, however, it does not include the proposed improvements to Telegraph Road and the Capital Beltway (I-495/I-95) upstream of Huntington. The hydrologic flow values were also updated to reflect changes based on a recent hydrologic study performed by the Corps for FEMA for Cameron Run (USACE, May 2007). Table 2.1 shows the discharges based on that report. The 1% annual discharge used for this analysis was 25,410 cfs downstream of Pike Branch at the Telegraph Road Bridge.

The team identified the following preliminary levee and dredging alternatives and evaluated their effectiveness in reducing flood levels at Huntington and their impact on other areas by using the HEC-RAS model. Appendix G3 has further information on this hydraulic analysis.

- **Preliminary Levee Alignment #1 –** This alternative is the construction of a levee as close to Cameron Run as possible, approximately 200 feet from the stream centerline (Figure 6.1). The levee would be high enough to contain the 1% annual chance flood. Advantages of the alignment include more available area behind the levee for interior

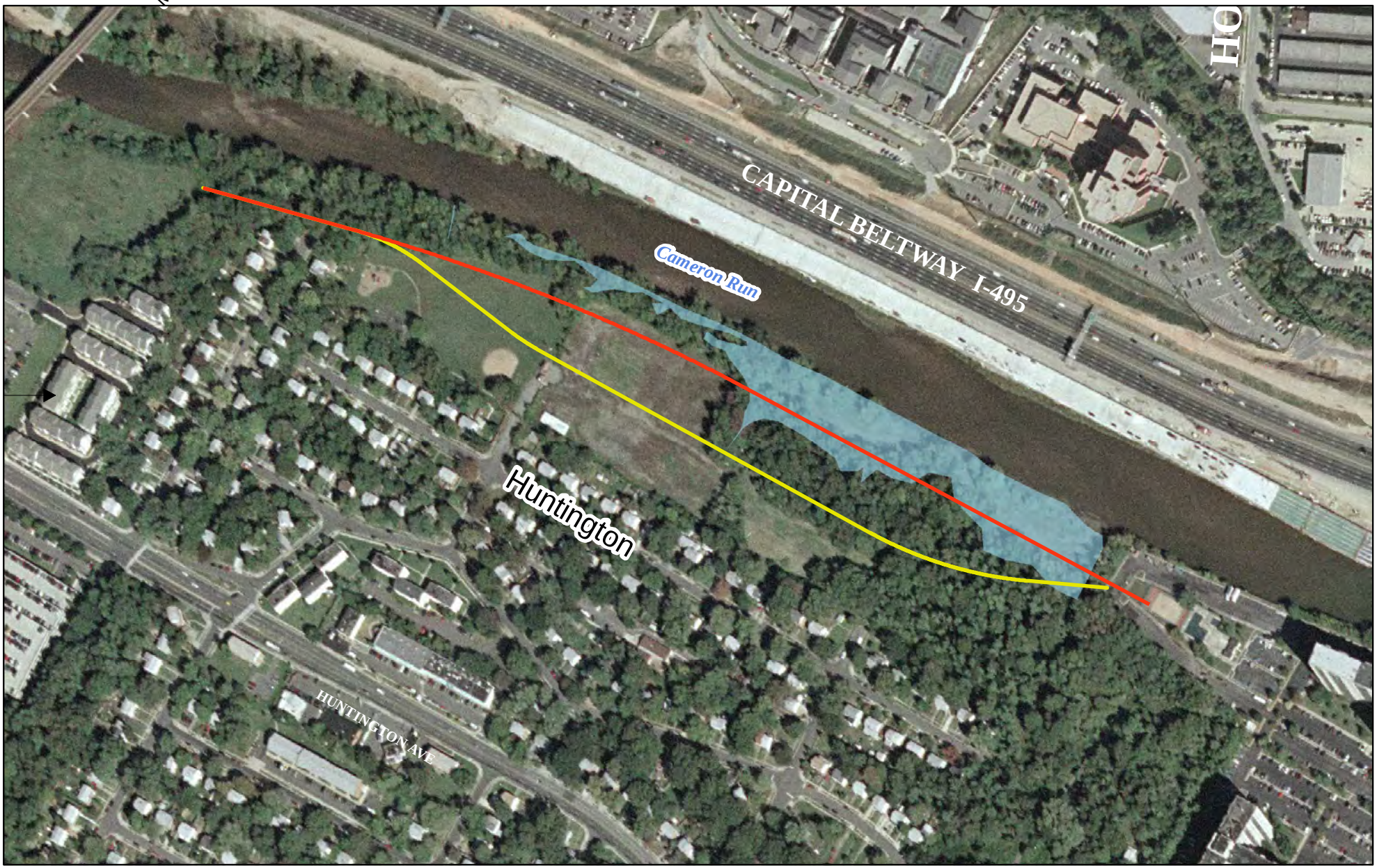


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Figure 6.1

Levee Alignments

0 300 600 1,200 Feet

1 inch = 300 feet

Aerial Photograph dated 2004 courtesy of AerialExpress

Legend

- Levee alignment #1
- Levee Alignment #2
- Delineated Wetlands

N

flooding storage and for recreational purposes. Disadvantages include impacts to existing wetlands and higher increase in flood levels upstream of Huntington. The hydraulic model shows that Levee Alignment #1 would contain the 1% annual chance flood and provide protection to Huntington. However, it would raise the 1% annual chance flood levels by up to 0.7 feet upstream of the levee.

- **Preliminary Levee Alignment #2** – This alternative is the construction of a levee further away from the channel bank, approximately 350 feet from the stream centerline (Figure 6.1). The levee would be high enough to contain the 1% annual chance flood. Advantages of this alignment include increased flood capacity of the channel and avoidance of the wetland areas. Disadvantages include decreased interior flood storage and major impact to the recreational areas.

  The hydraulic model shows that Levee Alignment #2 would contain the 1 percent annual chance flood and provide protection to Huntington. However, it would raise the 1 percent annual chance flood levels by up to 0.5 feet upstream of the levee.

  Note that aligning the levee as far from Cameron run and as close to the houses as possible was not considered due to interior drainage concerns. Ample storage space is required on the landward side of the levee for the interior rainfall to collect and pond before it can be pumped over the levee to the stream. Not providing this space would likely cause the houses to flood from this interior rainfall.

- **Preliminary Dredging Alternative #1 –** This alternative includes dredging the Cameron Run channel from Telegraph Road downstream to the confluence with the Potomac River (Figure 6.2). The channel would be dredged 5 feet below the current channel bottom for a width of 150 feet (Figure 6.3). Deepening the channel by 5 feet would restore the channel back to a condition similar to its shape in the 1960's in the Huntington area. The 1965 cross section shown on the figure is from the USGS Floodplain Delineation (USGS, 1976) and the 1999 cross section is from the VDOT Woodrow Wilson Bridge Report (PCC, 2002). For this dredging alternative, the channel invert slope was set at 0.0004 to maintain a constant slope throughout the system. An advantage of this alternative is more flood capacity within the channel. Disadvantages include project sustainability since the channel would have to be routinely dredged and infrastructure issues would have to be resolved. One impediment to this alternative is that there is a major sanitary pipe system (sanitary siphon with 3 large pipes) located just downstream of Huntington that is only about 3 feet below the channel bed. This pipe system would have to be relocated deeper. It may also be difficult to dredge around the many bridge piers in the channel without adversely affecting their stability. This would have to be evaluated in depth. Another disadvantage to dredging is that there could be environmental impacts such as disturbing aquatic and benthic habitat.

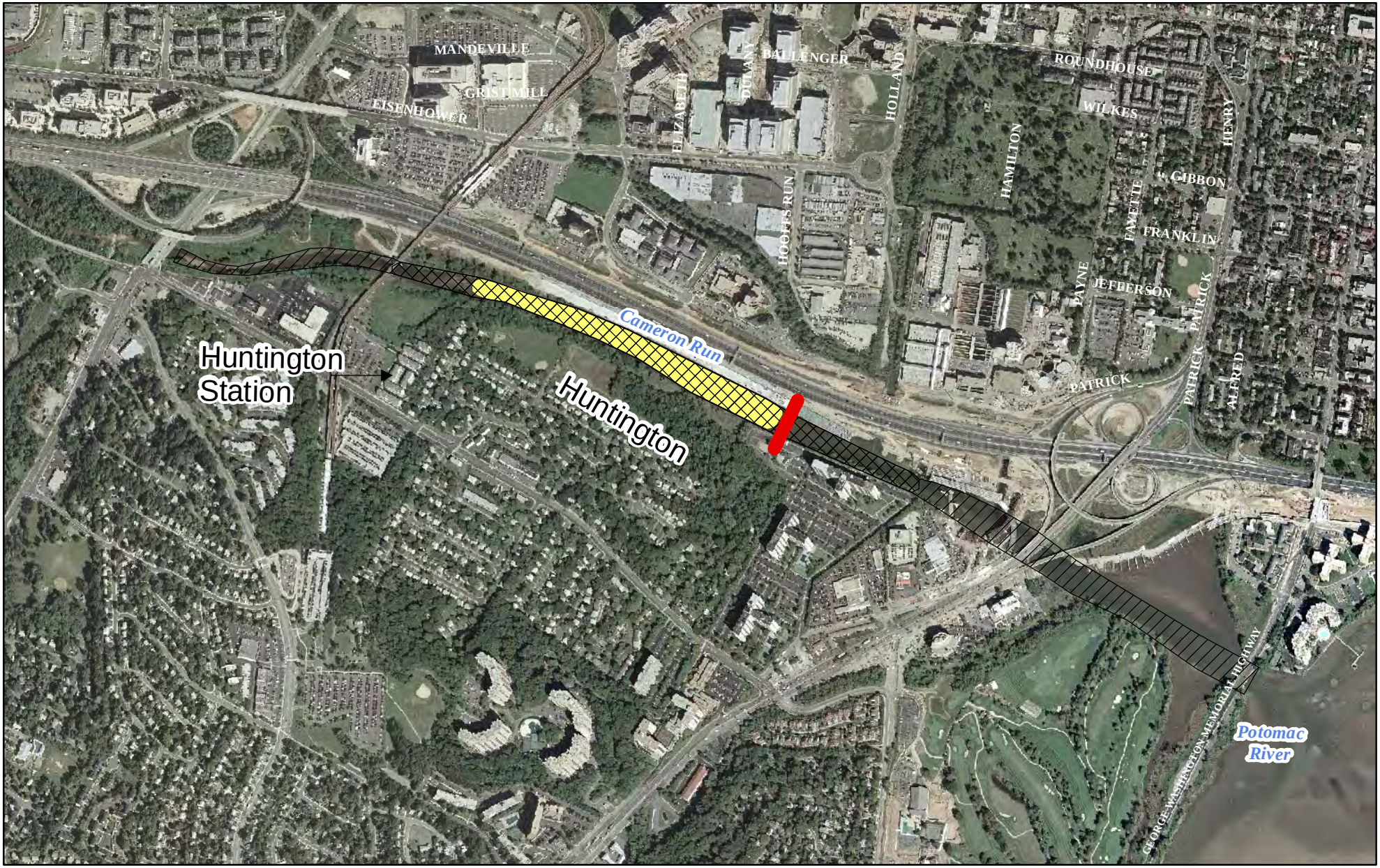

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Figure 6.2

Preliminary Dredging Alternatives

0 1,000 2,000 4,000 Feet

1 inch = 1,000 feet

Aerial Photograph dated 2004 courtesy of AerialExpress

Legend

- Preliminary Dredging Alternative #1
- Preliminary Dredging Alternative #2
- Preliminary Dredging Alternative #3
- Sanitary Siphon

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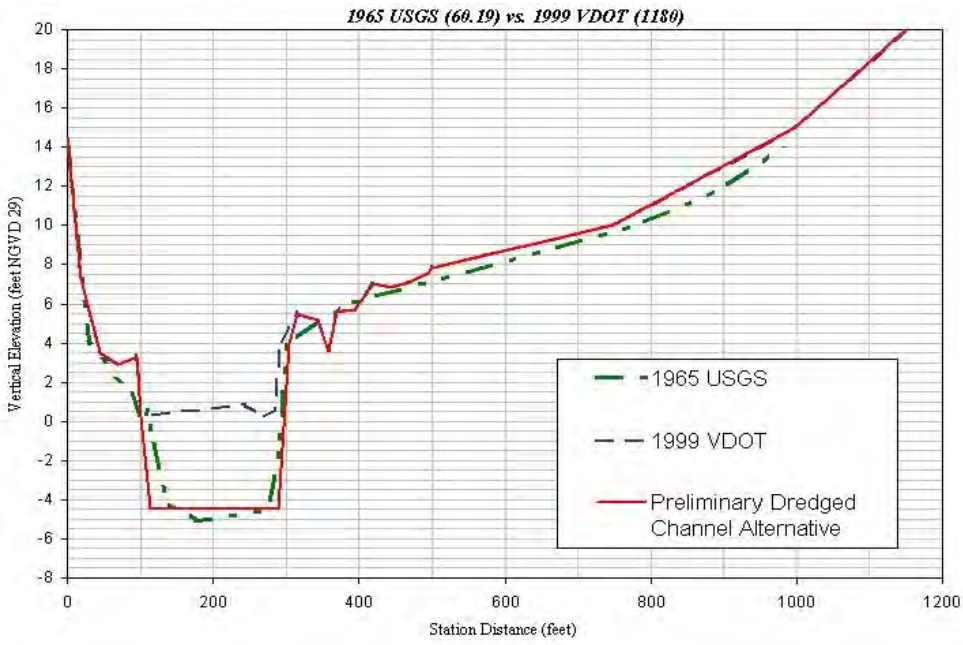
Figure 6.3: Dredging Alternative at Cross Section #1180 (VDOT)



The hydraulic model shows that Dredging Alignment #1 would lower the 1% annual chance flood levels by approximately 1.7 feet at Huntington; which would not be enough to prevent damages to all of the houses Approximately 157 houses would still be flooded during a 1% annual chance flood with this alternative.

- **Preliminary Dredging Alternative #2 –** This alternative is similar to Alignment #1 except that the extent of dredging is limited. The dredging would extend from the Metro bridge upstream of Huntington downstream to just upstream of the Route 1 bridge (Figure 6.2). There would be more flood capacity within the channel than there currently is, however, it would be less than Alignment #1. The project sustainability and sanitary siphon are still disadvantages. This alternative would have less issues regarding the impact on the bridge piers since the dredging stops prior to Route 1. However, since the dredging is stopped near Route 1 and does not continue to the confluence, there would be an inverse slope created at the Route 1 bridge, and therefore, the channel would likely fill in more quickly.

  The hydraulic model shows that Dredging Alignment #2 would lower the 1 percent annual chance flood levels by approximately 1.2 feet at Huntington. Approximately 160 houses would still be flooded during a 1% annual chance flood with this alternative.

- **Preliminary Dredging Alternative #3 –** This alternative is similar to the other two dredging alternatives except that the extent of dredging is more limited to avoid the relocation of the sanitary siphon. The dredging would extend from upstream of the Huntington community downstream to just upstream of the sanitary siphon (Figure 6.2).

The advantages and disadvantages of this alternative are similar to Dredging Alignment #2, except that the sanitary siphon would not have to be relocated.

The hydraulic model shows that Dredging Alignment #3 would lower the 1 percent annual chance flood levels by approximately 0.6 feet at Huntington. A minimum of 160 houses would still be flooded during a 1% annual chance flood with this alternative.

- **Preliminary Combined Dredging and Levee Alternative #1 –** This alternative combines Dredging Alternative #2 and Levee Alignment #2 so that the dredging would lower the flood levels enough to offset the increase created by constructing a levee.

  The hydraulic model shows that this alternative would contain the 1 percent annual chance flood and provide protection to Huntington, and would lower the 1 percent annual chance flood level by approximately 1 foot. Therefore, there would be no increase in flood levels caused by the levee.

- **Preliminary Combined Dredging and Levee Alternative #2 –** This alternative combines the shortest dredging plan, Dredging Alternative #3, with a refined levee alignment (Levee Alignment #3). The third dredging option extends from the upstream end of Huntington to the sanitary sewer pipe. Levee Alignment #3 is similar to Levee Alignment #2 with some refinements made to avoid wetland areas and tie into high ground (Figure 6.4). Levee alignment #2 was used to model Levee Alignment #3 because the minor differences in the levee alignments have a negligible effect on the flood stages.

  The advantages of this combination of alternatives are largely based on constructability and cost rather than hydraulic factors, but do include the benefits of dredging offsetting the increased flooding created by the levee. The sanitary siphon would not have to be relocated. Disadvantages are the same as those associated with Levee Alignment #2 including decreased interior flood storage.

  The hydraulic model shows that this alternative would contain the 1 percent annual chance flood and provide protection to Huntington, and would lower the 1 percent annual chance flood level by approximately 0.4 feet. Therefore, there would be no increase in flood levels caused by the levee.

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Baltimore District

Figure 6.4

Levee Alignment #3

0 300 600 1,200 Feet

1 inch = 300 feet

Aerial Photograph dated 2004 courtesy of AerialExpress

Legend

Levee Alignment #3

Delineated Wetlands

N

6.2 PHASE 2 – DEVELOPMENT AND EVALUATION OF PRELIMINARY CONCEPT PLANS (5%)

Based on the results of Phase 1, the County identified alternatives to be pursued further. For these alternatives, the team developed a preliminary concept plan (5% design) and conducted an economic analysis to determine rough costs and benefits. The concept plans are described below. A table comparing the alternatives is at the end of Section 6.2.

6.2.1 Dredging and Levee Preliminary Concept Plans

Preliminary Dredging Concept Plans D1a and D1b– This concept plan was based on Preliminary Dredging Alternative #1 and would include dredging a 5-foot deep and 100 to 150-foot wide channel from Telegraph Road to the Potomac River for a distance of 9,100 feet. The channel would be dredged a maximum of 100 feet wide (base of trapezoid), except in the area adjacent to Huntington, where the waterway is wider and could be dredged 150 feet wide.

For cost estimating purposes, a location to place the dredged material had to be assumed. At the time of the analysis, no sediment testing had been performed so it was unknown whether or not there were any contamination concerns. For Concept Plan D1a, it was assumed that the material was "clean" and could be placed at the nearby Anderson landfill in Prince George's County (approximately 25 miles from Huntington). Plan D1b assumed the material had some contaminants and would need to be placed at a site that would accept it; the King and Queen County landfill was assumed for Plan D1b (approximately 130 miles from Huntington). Cost estimates for these two placement sites were developed. However, a third option is to place the material at Dyke Marsh for wetland restoration if the material is suitable. If dredging is pursued, this could be a viable option and should certainly be considered.

This concept plan would include dredging approximately 187,000 cubic yards of material for the initial dredging. It was assumed that the dredging would be accomplished mechanically (using a track hoe or similar equipment) and trucking the material for disposal. To estimate operation and maintenance costs, a sedimentation rate of 0.2 feet/year was used (based on 1982 CDM study). It was assumed that 75,000 cy of material would have to be dredged every 10 years to remove 2 feet of sediment.

For this concept plan, it was assumed that the set of sanitary pipes (referred to as sanitary siphon) that run approximately 3 feet under the channel just downstream of Huntington would be relocated (for an approximate cost of $7 million, cost provided by Fairfax County) and would not be an impediment to dredging. Dredging around the many piers that exist in the channel (under Route 1 bridge and along the Capital Beltway) could be physically challenging (Figure 6.5). A detailed evaluation of how far the dredged channel must be from the piers would be needed. This could impact the effectiveness of dredging.

Figure 6.5: Route 1 Bridge Ramps Downstream of Huntington

As the hydraulic model showed for Dredging Alignment #1, this concept plan would lower the 1% annual chance flood levels by approximately 1.7 feet at Huntington. This analysis assumed the channel could be dredged close to the piers, which is probably unlikely. Therefore, the actual reduction in flood levels would likely be less. Based on the flood levels being lowered by 1.7 feet, approximately 157 houses would still be flooded during a 1% annual chance flood with this alternative.

The initial dredging for Concept Plan D1a (including relocating the sanitary siphon) is estimated to cost $21.9 million. The maintenance dredging, that would need to occur approximately every 10 years (and could be more frequently) would cost $5.5 million each cycle.

The initial dredging for Concept Plan D1b (placing material at King and Queen County Landfill) is estimated to cost $26.6 million. The maintenance dredging, that would need to occur approximately every 10 years would cost $7.2 million each cycle.

Preliminary Dredging Concept Plan D2a and D2b – This concept plan was based on Preliminary Dredging Alternative #2 and would include dredging a 5-foot deep and 100 to 150-foot wide channel from the Metro bridge to just upstream of the Route 1 bridge for a distance of 3,550 feet. As in Plan D1a, the channel would be dredged a maximum of 100 feet, except in the area adjacent to Huntington, where the channel is wider and a width of 150 feet was assumed. Placement of the material at the two landfills was evaluated.

This concept plan would include dredging approximately 85,000 cubic yards of material for the initial dredging. It was assumed that the dredging would be accomplished mechanically and trucking the material for disposal. To estimate operation and maintenance costs, a sedimentation rate of 0.2 feet/year was used (based on 1982 CDM study). It was assumed that 34,000 cy of material would have to be dredged every 10 years to remove 2 feet of sediment.

As in D1a, it was assumed that the set of sanitary pipes would be relocated as part of this concept plan and would not be an impediment to dredging. With this concept plan, the dredging stops

prior to the Route 1 bridge, so it avoids the challenge of dredging around these bridge piers; however there are still bridge piers along the Capital Beltway ramp that would have to be considered.

As the hydraulic model showed for Dredging Alignment #2, this concept plan would lower the 1% annual chance flood levels by approximately 1.2 feet at Huntington. Approximately 160 houses would still be flooded during a 1% annual chance flood with this alternative.

The initial dredging for Concept Plan D2a (including relocating the sanitary siphon and placing the material at the Anderson Landfill) is estimated to cost $14.3 million, assuming a dredging and hauling cost of $60/cy. The maintenance dredging, that would need to occur approximately every 10 years, would cost $2.5 million each cycle.

The initial dredging for Concept Plan D2b (placing material at King and Queen County Landfill) is estimated to cost $16.3 million, assuming a dredging and hauling cost of $80/cy. The maintenance dredging, that would need to occur approximately every 10 years would cost $3.3 million each cycle.

Preliminary Levee Concept Plan L1 – The levee #2 alignment was refined and adjusted to minimize impacts to the wetlands and tie into high ground (alignment now referred to as levee alignment #3). The concept levee is approximately 2,600 feet in length with a maximum height of about 11 feet. The top of the levee elevation is equivalent to the 1% annual chance flood elevation (with no height added to account for risk and uncertainty). At the upstream end, the top elevation is 15.6 feet, at the downstream end it is 13.9 feet. It has a 10-foot wide crest and 2.5H:1V side slopes. The levee embankment would be constructed of select earth material. Since no soil borings had been taken during this phase of the study, it was assumed that the soil conditions were poor (based on previous studies) and that the project would include excavating and replacing 6 feet of the foundation over the whole length.

A pumping station would be required as part of this concept plan. Based on a preliminary analysis, it was estimated that a 45,000 gpm pump would be required to prevent existing homes from incurring flood damages from interior drainage.

Based on hydraulic modeling, this levee concept plan would increase the 1% annual chance flood elevation by 0.5 feet just upstream of the project.

The project cost for Concept Plan L1 is estimated to be $15.6 million. The cost to operate and maintain the project is estimated to cost $150,000 annually. Maintenance tasks will include items such as mowing and repairing the levee as needed, dredging the outfall channels, and repairing and replacing parts of the pump station and drainage structures as needed.

Preliminary Levee/Dredging Combination Concept Plans LD2a and LD2b – Concept Plans LD2a and LD2b combined Levee Alignment #3 (Preliminary Concept Plan L1) and the shorter dredging plan (Preliminary Dredging Concept Plan D2). The purpose of combining the levee with a dredging plan was to reduce the hydraulic impact of the levee on the area upstream of Huntington. All of the project features of both Plan L1 and Plan D2 would be part of this

concept plan. Concept Plan LD2a assumes that the dredged material will be placed at the Anderson Landfill and Concept Plan LD2b assumes that it will be placed at the King and Queen County Landfill.

With this concept plan, there would be no increases in the 1% annual chance flood elevation caused by the project.

The project cost for Plan LD2a is estimated to be $29.9 million and the maintenance dredging would cost $2.5 million approximately every 10 years.

The project cost for Plan LD2b is estimated to be $31.9 million and the maintenance dredging would cost $3.3 million approximately every 10 years.

6.2.2 Buy-Out Preliminary Concept Plans (B1a and B1b)

Another flood damage reduction option that was considered during the study was the acquisition (or "buy-out") of the floodprone houses. It is Corps' policy during flood studies that could possibly lead to the construction of a federal project, that all feasible structural and non-structural solutions should be evaluated, including buy-outs. Under a buy-out, the government could purchase the houses and restore the land back to a natural floodplain. This could potentially include wetland restoration or other natural restoration. Development on the land would be prohibited or limited.

For this concept plan, the cost was based on fair market value for the houses, demolition costs, administrative costs, and housing benefits and moving costs. Two cost estimates were developed: voluntary buyout and involuntary buyout. The only difference is that for a voluntary buyout, only tenants receive housing benefits and moving costs; for an involuntary buyout, tenants and owners receive housing benefits and moving costs.

The cost estimates assumed acquisition of 166 duplex houses in Huntington in the 1% annual chance floodplain and restoring the land back to natural floodplain. The estimated cost for a voluntary buyout (Preliminary Concept Plan B1a) is $96 million and for an involuntary buyout (Preliminary Concept Plan B1b) is $99 million.

6.2.3 Flood Proofing Preliminary Concept Plans

As part of the study, two flood proofing techniques were considered for the Huntington duplex houses, one was evaluated for the community center, and one for the Huntington Station townhouses. Each of the three areas – the Huntington duplexes, the community center and the Huntington Station townhouses – could be flood proofed using separate measures providing flood protection to the entire study area. The flood proofing plans would not impact the hydraulics along Cameron Run; the 1% annual chance flood elevation would remain as it currently is.

Preliminary Flood Proofing Concept Plan FP1 – This concept plan involves filling in the basements of the Huntington duplex houses and providing additional living space on the back

side of the first floor, 18" above the 1% annual chance floodplain elevation (Figure 6.6), to compensate for the lost basement space. Fairfax County requires that all new structures or substantial improvements to existing structures must be located 18" above the floodplain. Improvements/additions not classified as substantial can be located just at the floodplain. For this concept plan, it was assumed that the additional living space would be constructed 18" above the floodplain. In figure 6.6, it shows the new addition being at the same elevation as the current first floor, however, this may not be the case for a number of the houses. Many of the new additions may be higher than the first floor and there may need to be steps up to the new addition, The heating/cooling equipment and other utilities would be relocated to the new 1st floor, above the floodplain. There were a number of houses that only had basements flood during the June 2006 event, and this plan would prevent flood damages to the basements since the basements would be eliminated. However, the level of protection varies with each house because the existing house will not be elevated above the existing flood elevation (as in Concept Plan FP2 below). Each house would only be protected from damages up to the existing first floor elevation.

A disadvantage of this concept plan is that exterior items, such as sheds, would be flooded during a storm event. Vehicles would incur damages unless they were moved to higher ground prior to the flood. Residents would also need to relocate away from their home for approximately 6 weeks during construction. Another concern is the dual ownership of the structure. Both owners would have to agree on the flood proofing plan.

The estimated project cost for this concept plan is $13.6 million.

Figure 6.6: Concept Plan FP1 Showing New Addition to Backs of Houses

Front View

Rear View

Preliminary Flood Proofing Concept Plan FP2 – This concept plan involves filling in the basements of the Huntington duplex houses, elevating the house 18" above the 1% annual chance floodplain elevation (per county regulations), and providing additional living space on the back side of the new first floor (Figure 6.7). The heating/cooling equipment and other utilities would be relocated to the new 1st floor. The modified houses would be protected from the 1% annual chance flood.

As in the previous flood proofing plan, a disadvantage of this concept plan is that vehicles and all other exterior items are not protected. Residents would also need to relocate away from their home for approximately 12 weeks during this extensive construction. Another concern is the dual

ownership of the structure. Both owners would have to agree on the flood proofing plan. The estimated project cost for this concept plan is $23.4 million

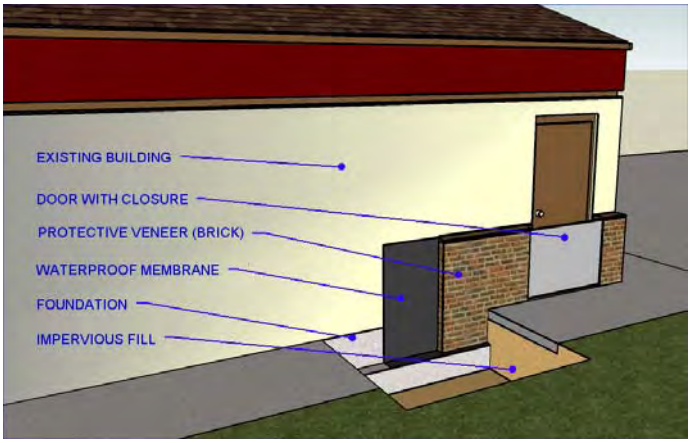
Figure 6.7: Concept Plan FP2 Showing Elevation of House and New Addition

Front View Rear View

Preliminary Flood Proofing Concept Plan FP3 – This concept plan involves dry flood proofing the Huntington Community Center (Figure 6.8) as part of an overall flood proofing plan. The first floor of the community center is at elevation 12.5 feet and the 1% annual chance flood elevation is approximately 14.7 feet. For this concept plan, a water proof membrane and protective covering would be applied to the exterior of existing walls. It would protect up to an elevation 18 inches above the 1% annual chance flood elevation. Therefore, the building would be protected against the 1% annual chance flood event. Closure structures would be placed across all opening, which must be manually closed prior to a flood. Interior sump pumps with emergency power would be installed.

The estimated project cost for Concept Plan FP3 is $172,000.

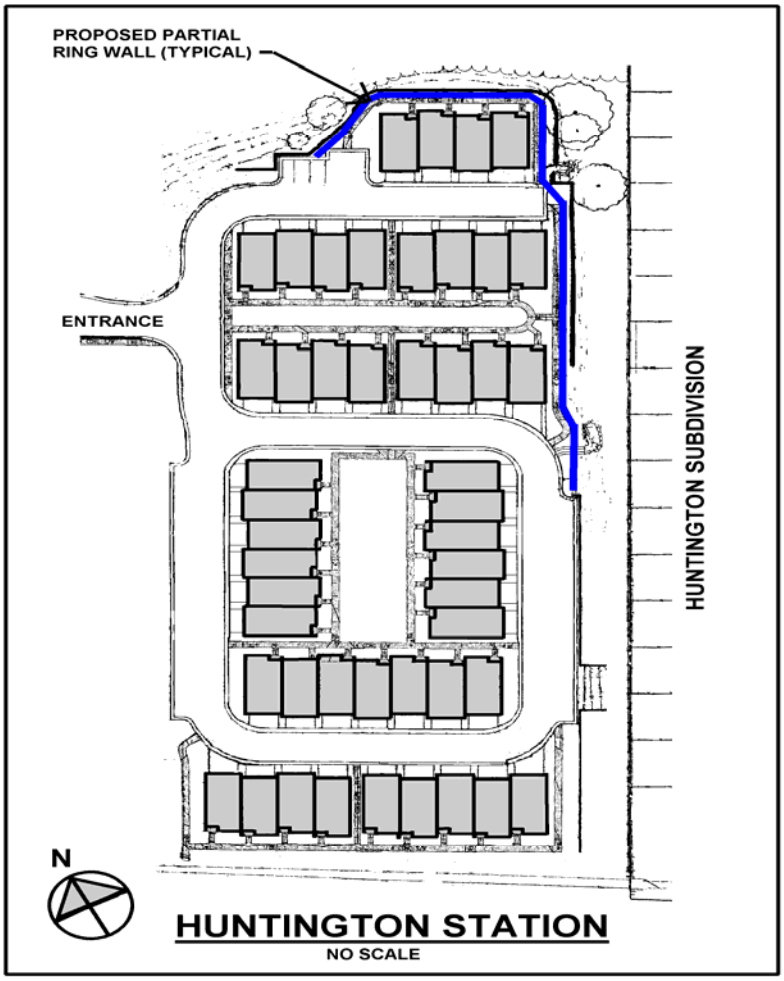
Figure 6.8: Preliminary Flood Proofing Concept Plan FP3 (Huntington Community Center)



Preliminary Flood Proofing Concept Plan FP4 – This concept plan involves constructing a partial ringwall around the northeast corner of the Huntington Station Community (Figure 6.9) as part of an overall flood proofing plan. Since there is a lower risk of flooding in this area and the flood levels would be low during a 1% annual chance flood, it was decided that the plan would be to construct a low masonry or concrete wall. The top of the wall would be equivalent to the 1% annual chance flood elevation. Higher levels of protection may be possible but they would increase the cost significantly. This low partial ring wall, however, would not meet FEMA certification requirements and the Huntington Station residents in the floodplain would still be required to purchase flood insurance. As part of this concept plan, the interior drainage would have to be modified and sump pumps with emergency power would be installed. The stormwater and sanitary sewer systems would be modified to prevent the backflow of flood waters.

The estimated project cost for Concept Plan FP4 is $276,000.

Figure 6.9: Preliminary Flood Proofing Concept Plan FP4 (Huntington Station Ringwall)



6.2.4 Evaluation and Comparison of Preliminary Concept Plans

As part of the study, Fairfax County requested that the Corps conduct an economic analysis of the alternative plans to determine if any of the plans would meet the requirements for federal funding. An analysis was conducted to compare the costs and economic benefits of each of the alternative plans. For a project to meet the requirements for federal funding, the annualized benefits must be larger than the annualized costs, and the benefit-to-cost ratio must be greater than 1.0. Costs were estimated based on the 5% concept plans and are preliminary. Project costs include the construction cost, design cost, construction management costs, real estate costs, escalation costs, and contingency.

The economic benefits of each alternative plan were estimated as the estimated reduction in future damage costs. The calculation takes into account the reduction in damages to structures (both residential and commercial), vehicles, utilities, as well as the reduction of costs related to emergency services during and following a flood event. Using various models, future flood elevations are predicted and the amount of flood damages that would occur are estimated for each of the flood events. These damages are then translated into an estimated annual damages figure. The estimated future without-project damages are compared to the future with-project damages (compare damages without a levee against damages with a levee). The difference between these two figures is the annual economic benefit of the project.

The details of the economic analysis are included in Appendix D. An alternatives analysis matrix showing the costs and benefits for each alternative plan is shown in Table 6.1. The table includes the construction cost without escalation (using 2007 prices) that was used in the economic analysis. It also includes the construction cost with escalation, assuming that construction will begin in FY10. A rough annual cost for operation and maintenance has been estimated, for items such as mowing the levee, repairing and replacing parts of the pump station and drainage structures, and maintenance dredging. The costs and benefits were estimated for a 50-year duration, and then were translated into annualized costs and benefits. The annualized net benefits for the alternative are the annualized benefits minus the annualized costs. The benefit-cost-ratio is the annualized benefits divided by the annualized costs. As mentioned previously, for a project to meet the requirements for federal funding, the annualized benefits must be larger than the annualized costs, and the benefit-to-cost ratio must be greater than 1.0. The summary table also includes whether or not the alternative addresses the 2% annual chance (or 50-year) flood, a description of the main risks associated with each plan, and some additional notes of interest.

For the preliminary alternative plans that were evaluated during this study, all of the benefit-to-cost ratios were well under 1.0.

Dredging alone would not provide the level of protection set out in the project objectives (to provide a minimum of 50-year level of protection). The county and the residents, based on the public meetings, were not interested in flood proofing the individual houses. The County Supervisor is in support of maintaining the community and therefore, buy-outs are not favored. Furthermore, buyouts are the most expensive plan. Therefore, the county pursued two plans: a levee and levee/dredging combination.

Table 6.1: Phase 2 of Plan Formulation
Huntington Flood Damage Reduction 5% Concept Plan Alternatives Analysis Matrix
Prepared 10 July 2007

Alternative	Cost without escalation used for economic analysis (w/design, const mgmt, any real estate)	Escalation Cost	Construction Year	Total Project Cost	O&M Cost	Annualized Costs	Annualized Benefits (each low opening)[1]	Benefit to Cost Ratio (BCR)[2]	Addresses 50-Year Event (6/06) or Greater and Meets Local Requirements/Guidelines	Reason If "No"	Main Risk	NOTES
D1a - Longer dredge (5 feet deep from Telegraph Rd to Potomac), place at Anderson landfill	$20.4M	$1.5M	FY10	$21.9M	$5.5M every 10 years	$1.5M	$343,000	0.22	No	Not adequate protection; Only reduces flood levels by approx. 1.4' during 100-year flood	Channel may fill in with sediment quickly, especially following a storm event, and may not have expected reduction in flood levels	Does not provide adequate protection (reduces 100-yr flood level by approx. 1.4'); assumes "clean" dredged material that can be placed at Anderson landfill; assumes sanitary siphon relocated for $7M; O&M rate of dredging 2 feet every 10 yrs based on CDM study rate of 0.2 feet/year but could be more or less frequent; reduction in flood levels based on being able to dredge up to VDOT piles - may need setback which will make flood levels higher; would require dredging permit
D1b- Longer dredge (5 feet deep from Telegraph Rd to Potomac), King and Queen Co landfill	$24.8M	$1.8M	FY10	$26.6M	$7.2M every 10 years	$1.9M	$343,000	0.18	No	Not adequate protection; Only reduces flood levels by approx. 1.4' during 100-year flood	Channel may fill in with sediment quickly, especially following a storm event, and may not have expected reduction in flood levels	Does not provide adequate protection (reduces 100-yr flood level by approx. 1.4'); assumes "poor" dredged material with chemical contaminants; assumes sanitary siphon relocated for $7M; O&M rate of dredging 2 feet every 10 yrs based on CDM study rate of 0.2 feet/year but could be more or less frequent; reduction in flood levels based on being able to dredge up to VDOT piles - may need setback which will make flood levels higher;would require dredging permit
D2a - Shorter dredge (5 feet deep from U/S end of Huntington down to U/S end of Route 1), place at Anderson landfill	$13.3M	$1M	FY10	$14.3M	$2.5M every 10 years	$900,000	$207,000	0.23	No	Not adequate protection; Only reduces flood levels by max. of 0.8-1' during 100-year flood	Channel may fill in with sediment quickly, especially following a storm event, and may not have expected reduction in flood levels	Does not provide adequate protection (reduces 100-yr flood level by max. of 0.8-1'); assumes "clean" dredged material; assumes sanitary siphon relocated for $7M; O&M rate of dredging 2 feet every 10 yrs based on CDM study rate of 0.2 feet/year but could be more or less frequent; reduction in flood levels based on being able to dredge up to VDOT piles - may need setback which will make flood levels higher; would require dredging permit
D2b - Shorter dredge (5 feet deep from U/S end of Huntington down to U/S end of Route 1), King and Queen Co landfill	$15.2M	$1.1M	FY10	$16.3M	$3.3M every 10 years	$1.1M	$207,000	0.19	No	Not adequate protection; Only reduces flood levels by max. of 0.8-1' during 100-year flood	Channel may fill in with sediment quickly, especially following a storm event, and may not have expected reduction in flood levels	Does not provide adequate protection (reduces 100-yr flood level by max. of 0.8-1'); assumes "poor" dredged material with chemical contaminants; assumes sanitary siphon relocated for $7M; O&M rate of dredging 2 feet every 10 yrs based on CDM study rate of 0.2 feet/year but could be more frequent; reduction in flood levels based on being able to dredge up to VDOT piles - may need setback which will make flood levels higher; would require dredging permit
L1 - Levee with pumping station	$14.2M	$1.4M	FY10-FY12	$15.6M	$150,000 each year	$900,000	$560,000	0.61	No	Levee increases 100-yr flood elevation by up to 0.5' u/s which is not within County guidelines	Higher flood event could overtop levee and cause more catastrophic damages	Assumes top of levee at 100-year flood elevation; levee increases 100-yr flood elevation by up to 0.5' u/s which is not within County guidelines; project costs/benefits do not reflect mitigation or induced damages; cost includes 1 pumping station (very rough analysis showed need for 45,000 gpm capacity); levee can be overtopped which can cause more catastrophic damages
LD2a - Levee and dredging combination, place at Anderson landfill	$27.5M	$2.4M	FY10-FY12	$29.9M	$2.5M every 10 years, and $150,000 each year	$1.8M	$560,000	0.31	Yes		Higher flood event could overtop levee and cause more catastrophic damages; also, channel may fill in with sediment quickly and may not have expected reduction in flood levels (levee may increase flood levels upstream)	Top of levee at 100-year flood elevation; levee can be overtopped which can cause more catastrophic damages; assumes "clean" dredged material; assumes sanitary siphon relocated for $7M; O&M rate of dredging 2 feet every 10 yrs based on CDM study rate of 0.2 feet/year but could be more or less frequent; no increase in flood levels; reduction in flood levels based on being able to dredge up to VDOT piles - may need setback which will make flood levels higher; would require dredging permit
LD2b - Levee and dredging combination, place at King and Queen Co landfill	$29.4M	$2.5M	FY10-FY12	$31.9M	$3.3M every 10 years, and $150,000 each year	$2M	$560,000	0.28	Yes		Higher flood event could overtop levee and cause more catastrophic damages; also, channel may fill in with sediment quickly and may not have expected reduction in flood levels (levee may increase flood levels upstream)	Top of levee at 100-year flood elevation; levee can be overtopped which can cause more catastrophic damages; assumes "poor" dredged material with chemical contaminants; assumes sanitary siphon relocated for $7M; O&M rate of dredging 2 feet every 10 yrs based on CDM study rate of 0.2 feet/year but could be more or less frequent; no increase in flood levels; reduction in flood levels based on being able to dredge up to VDOT piles - may need setback which will make flood levels higher; would require dredging permit
B1a - Voluntary buyout	$90M	$19M	FY10	$96M	minimal (assume $0)	$4.8M	$700,000	0.15	Yes		None	Includes $11M for demolition; includes admin costs, fair market value ($375k), housing benefits and moving costs for tenants only; includes 1% escalation cost per month; could restore land to natural floodplain, add to existing wetlands, redevelop area
B1b - Involuntary buyout	$92M	$19M	FY10	$99M	minimal (assume $0)	$4.9M	$700,000	0.15	Yes		None	Includes $11M for demolition; includes admin costs, fair market value ($375k), housing benefits and moving costs for tenants and owners; includes 1% escalation cost per month; could restore land to natural floodplain, add to existing wetlands, redevelop area
FP1 - Hunt duplex, fill basement, add room	$12.4M	$1.2M	FY10-FY12	$13.6M	$0	$670,000	$380,000	0.57	No	Protects houses up to first floor elevation (some less than 50-yr protection), but vehicles, other exterior structures not protected	Exterior items not protected; existing first floors not protected	Duplexes are protected up to first floor elevation (no basements to be flooded); vehicles, other exterior items are not protected; residents must relocate for approx 6 wks during construction; dual ownership problematic; not favored by residents
FP2 - Hunt duplex, elevate, fill basement, add room	$21.4M	$2M	FY10-FY12	$23.4M	$0	$1.15M	$490,000	0.43	Yes/No	Protects houses to 18" above 100-year elevation, but vehicles, other exterior structures not protected	Exterior items not protected	Duplexes are elevated to 18 inches above the 100-year flood elevation; vehicles, other exterior items are not protected; residents must relocate for approx 12 wks during construction; dual ownership problematic; not favored by residents
FP3 - Hunt Community Ctr veneer wall	$160,000	$12,000	FY10	$172,000	minimal (assume $0)	$8,600	$3,300	0.38	Yes		Gates must be closed prior to flood event for protection	Closures must be manually closed prior to flood; provides protection to 18" above 100-year flood elevation
FP4 - Hunt Station ring wall	$257,000	$19,000	FY10	$276,000	minimal (assume $0)	$13,800	$6,100	0.44	Yes		Higher flood event could overtop ring wall	Top of low masonry or concrete wall at 100-year flood elevation; install back flow preventers and pumps with emergency power

Notes:

Project costs are based on 5% concept-level plans and are subject to change

For costing purposes, the team identified two potential placement sites - Anderson Landfill and King and Queen County landfill; however, additional placement sites such as Dyke Marsh should be considered if dredging is pursued

1/Benefits based on using low opening elevations for each structure

2/To meet Corps economic justification requirements, benefit-to-cost ratio must be greater than 1.0; however, due to limited funding, the Corps is prioritizing projects and only the projects with the highest BCR's are being included in the budget

6.3 PHASE 3 - DEVELOPMENT AND EVALUATION OF FINAL CONCEPT PLANS

For the remaining two alternatives, a levee and a levee/dredging combination, the concept designs were fine-tuned to a 25% concept level and the levees were evaluated for three different heights of protection to determine the most cost-effective flood damage reduction plan for the county to implement. The three tops of protection included the 1% annual chance (100-yr) elevation, the 2% annual chance (50-yr) flood elevation plus additional height for risk and uncertainty, and the 1% annual chance flood plus additional height for risk and uncertainty. The reason higher tops of protection above the 1% and 2% annual chance flood elevations were evaluated is that the project must incorporate risk and uncertainty. If the levee is constructed exactly to the 1% annual chance flood elevation, it may not be able to contain the 1 % annual chance flood. There are uncertainties in the analysis, such as the hydrology and the hydraulic model, therefore, a higher levee is needed to be relatively certain that it will protect against the 1% annual chance flood. See Appendix G3 for additional information regarding the risk and uncertainty analysis. An economic analysis of these final alternatives was conducted and was used to assist the county in selecting a final plan for design (Appendix D).

6.3.1 Final Concept Plan 2 - Levee

Final Concept Plan 2 is a modified version of Preliminary Concept Plan L1. The levee would be constructed along alignment #3. Three top of protection elevations were evaluated for the levee:

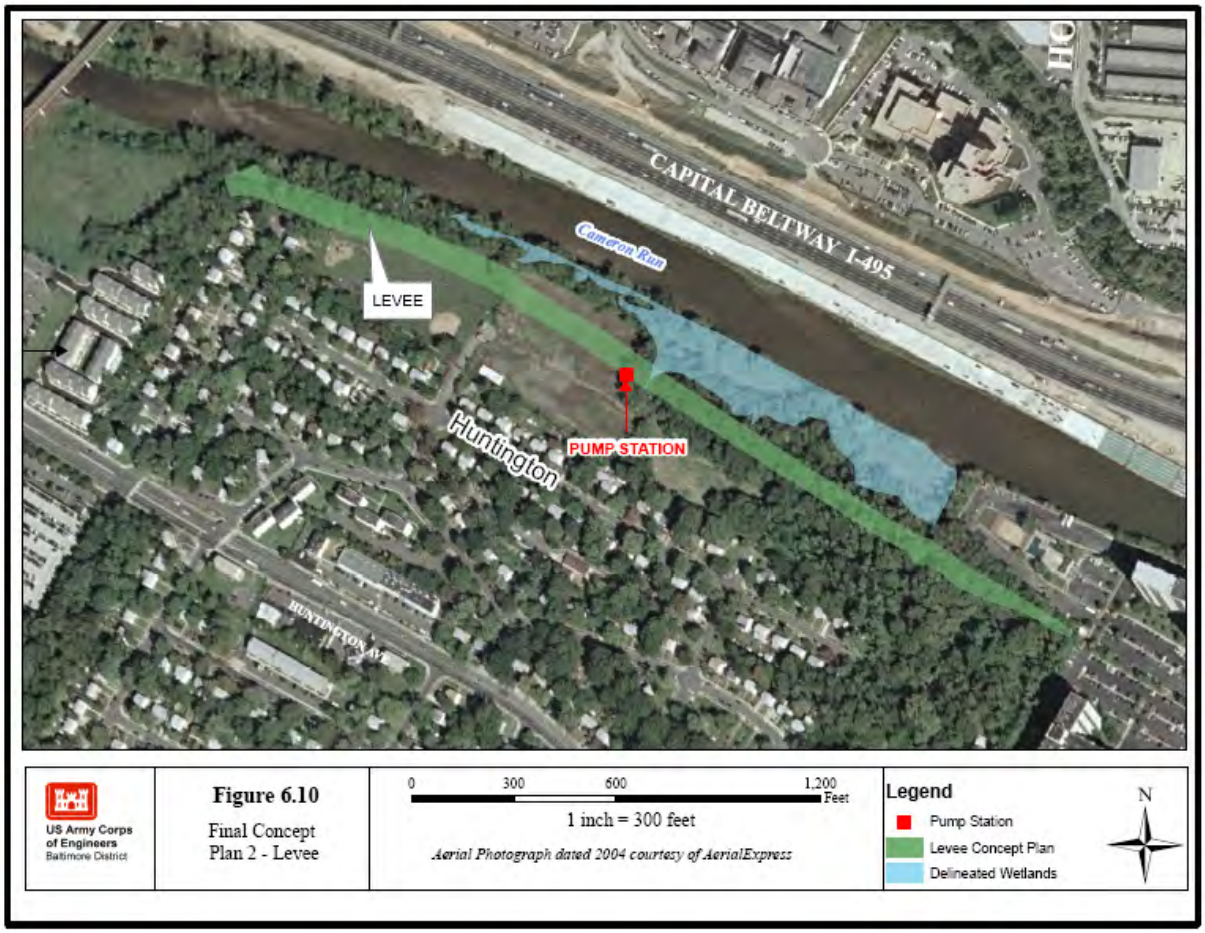
Plan 2a – Levee with a crest elevation at the upstream end of 15.6 feet (equivalent to the 1% annual chance flood elevation)

Plan 2b - Levee with a crest elevation at the upstream end of 17.6 feet (equivalent to 3.4 feet above the 2% annual chance flood event (50-yr) at the upstream end or 2 feet above the 1% annual chance flood elevation)

Plan 2c – Levee with a crest elevation at the upstream end of 19.6 feet (equivalent to 4 feet above the 1% annual chance flood elevation at the upstream end)

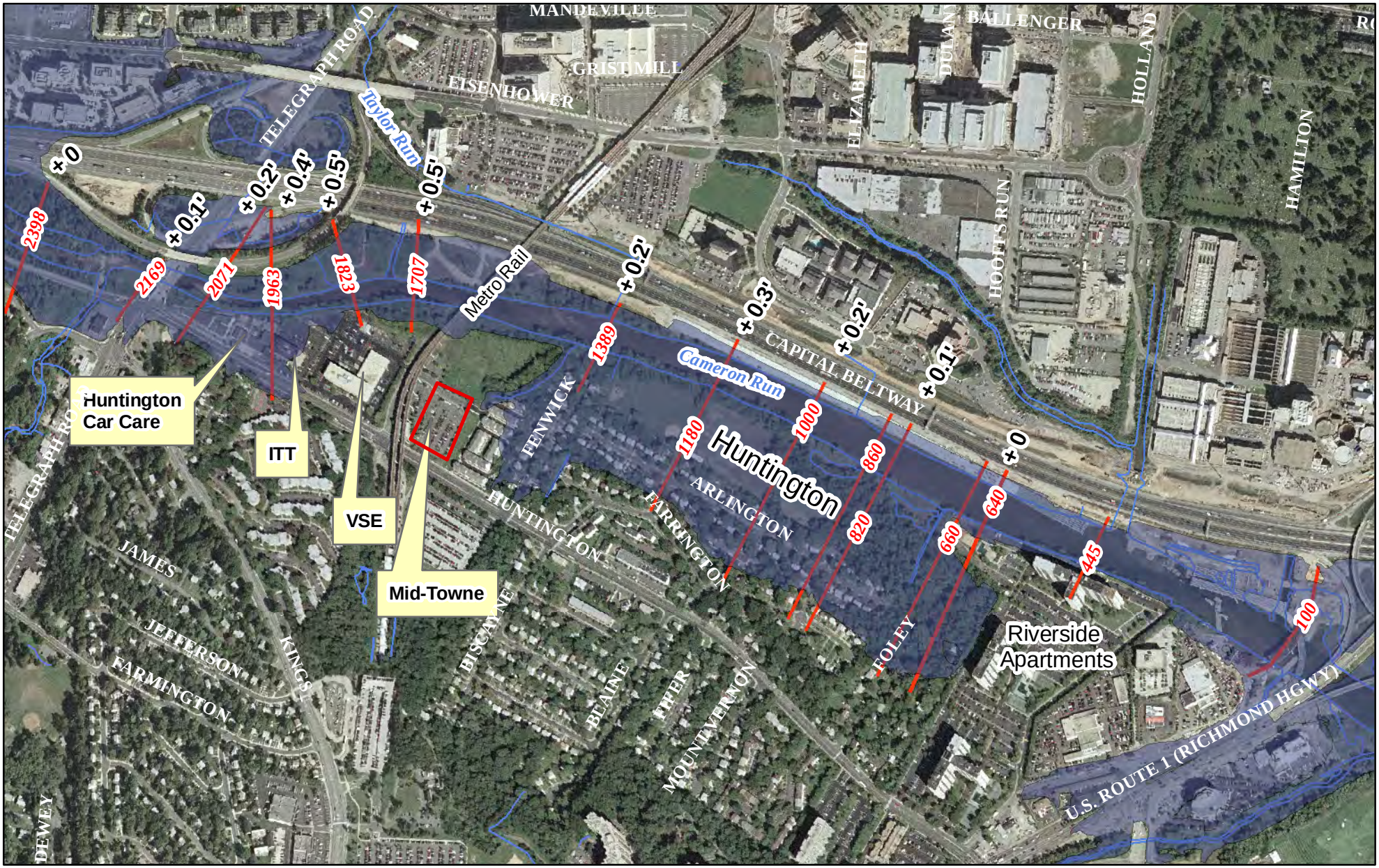
The concept levee is approximately 2,600 feet in length (varies for the three different tops of protection). The maximum heights range from about 10 feet (Plan 2a) to 15 feet (Plan 2c). The levee has a 10-foot wide crest and 2.5 (horizontal) to 1 (vertical) side slopes. The levee embankment would be constructed of select earth material. Since no soil borings had been taken during this phase of the study, it was assumed that the soil conditions were poor (based on previous studies) and that the project would include excavating and replacing 6 feet of the foundation over the whole length. Figure 6.10 shows the concept layout of Plan 2.

Figure 6.10: Plan 2 – Levee Concept Plan



A pumping station would be required as part of this concept plan. A preliminary interior residual flooding analysis was conducted and it was determined that a 60,000 gpm pump would be required for interior drainage to maintain a pond elevation of 9.0 feet during a 100-year rainfall. The lowest low opening into the Huntington houses is elevation 9.1 feet; just below this is considered the "zero damage" elevation. When the original residual flooding analysis was conducted, it was done to determine what size pump would keep the residual ponding level below the lowest opening and the zero damage elevation (see Appendix G5 for further information).

Based on hydraulic modeling, these levee concept plans would increase the 1% annual chance flood elevation by up to 0.6 feet just upstream of the project. Figure 6.11 shows the increase in 1% annual chance flood elevation caused by the levee.



US Army Corps of Engineers
Baltimore District

Figure 6.11

Increases in 1% Annual Chance Flood Elevations Caused by Levee

0 750 1,500 3,000 Feet

1 inch = 700 feet

Aerial Photograph dated 2004 courtesy of AerialExpress
Elevations referenced to NGVD29 datum

Legend

100-year Floodplain (USACE 2007 Model)

N

The increase in flood elevations extends from Huntington upstream to Telegraph Road. This increase will affect four structures just upstream of Huntington. However, two of them have low openings above the 1% annual chance flood, so the levee will have no impact during a 1% annual chance flood. The other two buildings, Mid-Town High Rise (only the loading dock/underground garage, not the first floor) and Huntington Car Care, are already located in the floodplain and would be flooded during a 1% annual chance flood with or without the levee. Table 6.2 shows the existing flood stages and the flood stages with the construction of the levee.

Table 6.2: Existing and With-Levee Flood Stages for the Properties Upstream of Huntington

Name	Mid-Town High Rise	VSE Building	ITT Building	Huntington Car Care
Address	2451 Midtown Ave.	2550 Huntington Ave.	2560 Huntington Ave.	2600 Huntington Ave.
Function	Condominiums	Office Building	Office Building	Auto Repair
Cross Section	1597	1823	1963	1963
Year Built	2001	1969	1976	1963
# of Floors	15	5	5	1
1% Annual Chance Flood (100 Year Flood Stage), Existing Conditions	15.6	15.9	16.6	16.6
1% Annual Chance Flood (100 Year Flood Stage), With Levee	16.2	16.4	17	17
First Floor	16.71	20.48	20.57	15.23
Low Point	12.61 – Loading Dock/Entrance to Underground Garage	18.58– rear entrance	20.57 – no basement	15.23 – no basement

These increases in the 1% annual chance water surface elevations may be allowed by FEMA. Fairfax County's Public Facilities Manual (PFM 6-1403.4E) states that there should be no adverse effect upon the adopted 100-yr floodplain. Notwithstanding, Fairfax County's Zoning Ordinance (ZO 2-903.7) permits all public uses and public improvements performed by or at the direction of the county. Since these two buildings are already vulnerable to flooding, flood proofing the individual buildings could be considered.

Upstream of Telegraph Road, the levee has no impact to the water surface elevations. The increase in 1% annual chance flood elevation at Telegraph Road is 0.1 feet, so the impact to the

bridge is negligible. The Corps and Fairfax County have coordinated closely with VDOT throughout this study, and the hydraulic analysis was provided to VDOT for their review in November 2007.

Project cost estimates were developed for the three levee plans (Table 6.3). The costs include design, construction management, real estate, contingency and escalation.

Table 6.3: Project Costs for Final Concept Plan 2

Plan	Total Estimated Project Cost
Plan 2a	$16.3 million
Plan 2b	$17.6 million
Plan 2c	$19.1 million

6.3.2 Final Concept Plan 1 - Combination Levee and Dredging

Final Concept Plan 1 is a modified version of Preliminary Concept Plan LD2a and would include both the construction of a levee and dredging. The levee component is the same as the Final Concept Plan 2 as described above, with the same three levee heights. For this final concept plan, the dredging component was adjusted based on the sediment modeling that was conducted.

The three variations of Plan 1 are:

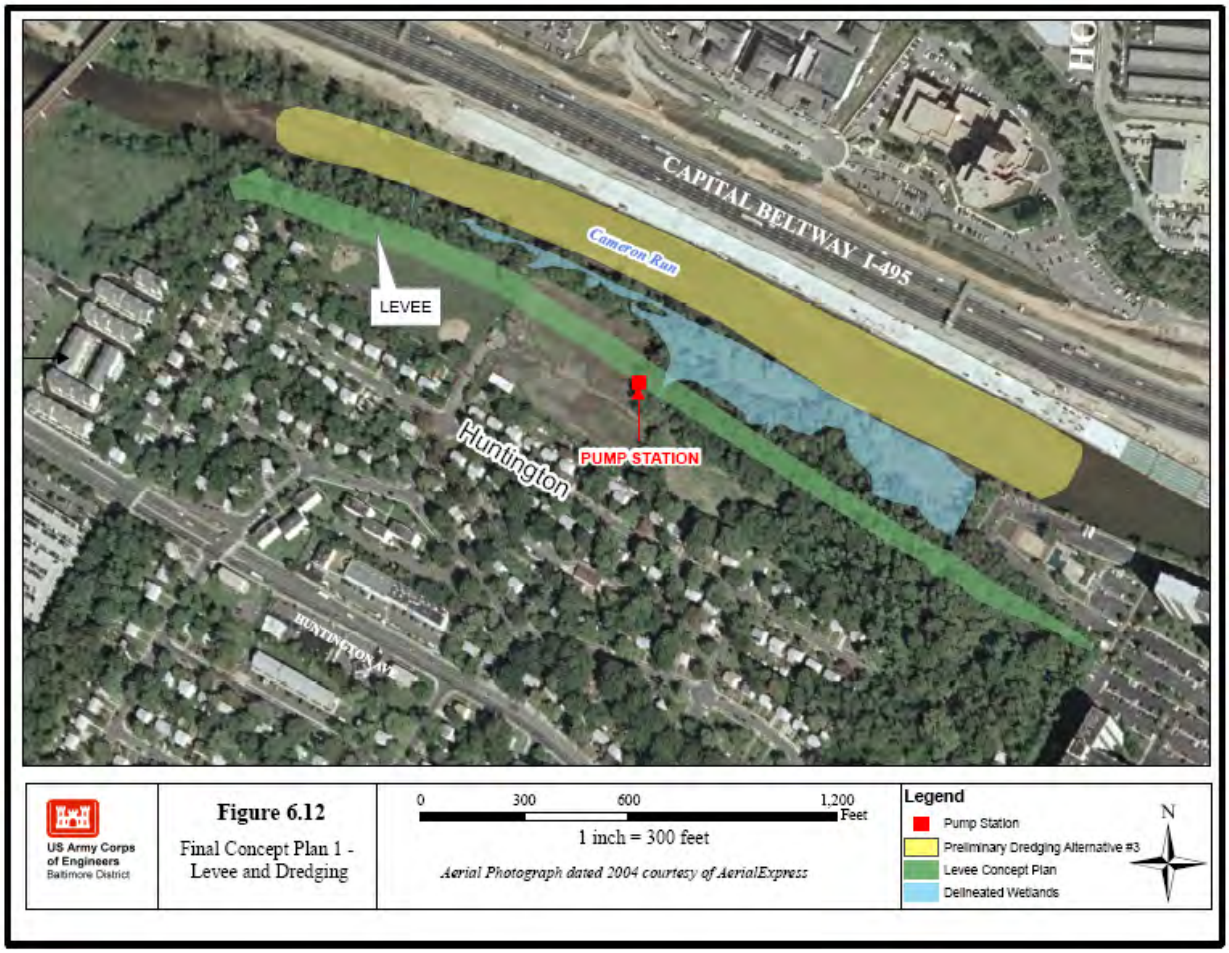
Plan 1a – Levee with a crest elevation at the upstream end of 15.6 feet (equivalent to the 1% annual chance flood elevation) **and shortened dredging**

Plan 1b - Levee with a crest elevation at the upstream end of 17.6 feet (equivalent to 3.4 feet above the 2% annual chance flood event (50-yr) at the upstream end or 2 feet above the 1% annual chance flood elevation) **and shortened dredging**

Plan 1c – Levee with a crest elevation at the upstream end of 19.6 feet (equivalent to 4 feet above the 1% annual chance flood elevation at the upstream end) **and shortened dredging**

Since the levee would increase flood elevations slightly upstream of Huntington, dredging to offset this increase was evaluated. The team determined the area and depth of dredging that would be required to offset the levee impacts. It was decided that since the sanitary siphon below Cameron Run would cost approximately $7 million to relocate, the dredging would begin just upstream of the siphon to avoid relocating it. This would also avoid the challenges of dredging through and around the bridge piers. The sediment study that was done concurrently with this study determined that a channel must be dredged 2.5 feet deep from the Metro rail to just upstream of the sanitary siphon to offset the impacts of the levee. Since the channel will fill in with sediment, the plan includes dredging 5’ deep to allow space for the sediment to fill in and when the sediment fills back in to a depth of 2.5 feet, the channel will be dredged again. This dredging would be conducted in addition to the construction of the levee (Figure 6.12).

Figure 6.12: Final Concept Plan 1 - Levee and Dredging



The trapezoidal channel would be approximately 5 feet deep, up to 150 feet wide, and 3,100 feet in length. Maintenance dredging would need to be performed on an as-needed basis, as soon as the channel filled in with approximately 2.5 feet of sediment. The sediment study indicated that this would occur roughly every 5 years or after a 10-year storm event; however, dredging should not be performed unless bathymetric surveys or other measures verify the sediment deposition. It is estimated that 86,000 cy of material would be dredged during the initial construction, and 43,000 cy would be dredged every 5 years for maintenance.

Three potential placement sites had been identified – King and Queen County landfill, Anderson Company landfill and Dyke Marsh. Based on physical and chemical sampling, the material is sandy and the parameters tested appear to have levels low enough for placement into typical landfills and may be suitable for restoration at Dyke Marsh. For cost estimating purposes, the assumption was made to take the material to the Anderson Company landfill in Prince George's County.

It was assumed that dredging would be accomplished using mechanical means (using a back hoe or similar equipment) and then transported by truck for disposal. Prior to transport, it is

anticipated that the material would need to be placed onsite for drying (approximately 3 days). Ramps would have to be included in the levee design for dredging and transport. Existing roads should be used whenever possible for transport of the material. Based on the calculation that each truck would hold roughly 10 cy of material, approximately 8,600 trucks would be required for the initial dredging and 4,300 for subsequent dredging.

The duration of dredging is dependent on several factors including community concerns, traffic, bucket size, weather conditions, and the current operating hours of the landfill, but is expected to be between 150 and 180 days (5 to 6 months) for the initial dredging and 75 to 90 days for maintenance dredging (2.5 to 3 months). Recommendations from the National Oceanic and Atmospheric Administration, National Marine Fisheries Service and the Virginia Department of Game and Inland Fisheries include a time of year restriction for the protection of alewife and blueback herring from February 15th to June 30th each year. Initial dredging and maintenance dredging will also disturb aquatic and benthic habitat, temporarily increase turbidity and may temporarily impact water quality.

Project cost estimates were developed for the three combination levee/dredging plans (Table 6.4). The dredging cost was based on a dredging and hauling cost of $45/cy. The costs include design, construction management, real estate, contingency and escalation.

Table 6.4: Project Costs for Final Concept Plan 1

Plan	Total Estimated Project Cost
Plan 1a	$21.5 million
Plan 1b	$22.8 million
Plan 1c	$24.2 million

6.3.3 Evaluation and Comparison of Final Concept Plans

The economic benefits, project costs and risks were evaluated for each of the Plan 1 and Plan 2 final concept plans. They were evaluated both with a pumping station and without one. The details of the economic analysis are included in Appendix D. The Phase 3 alternatives analysis matrices compare the final plans (Table 6.5 shows plans with a pumping station and Table 6.6 shows plans without a pumping station). The tables are located at the end of this section. The tables include the construction cost without escalation (using 2007 prices) that was used in the economic analysis. They also include the construction cost with escalation, assuming that construction will begin in FY10. A rough annual cost for operation and maintenance has been estimated. The costs and benefits were estimated for a 50-year duration, and then were translated into annualized costs and benefits. The benefit-cost-ratio is the annualized benefits divided by the annualized costs. For a project to meet the requirements for federal funding, the annualized benefits must be larger than the annualized costs, and the benefit-to-cost ratio must be greater than 1.0. The summary table includes whether or not the alternative meets the current local requirements, a description of the main risks associated with each plan, and some additional notes of interest. The table also includes the probability of non-exceedance for the event with a

1% chance of occurrence. This is based on the preliminary risk and uncertainty analysis and shows the probability that the levee will not be overtopped during the 1% annual chance flood event.

All of the benefit-to-cost ratios for the final concept plans were well under 1.0; the highest BCR for a plan with a pumping station is 0.5 for Plan 2c. Plans 1c and 2c with a pump station have a high probability of non-exceedance (98%) based on an initial analysis. For FEMA certification of a levee, it must have a probability of non-exceedance above 90%.

For the alternatives without a pumping station, Plan 2c has the highest BCR, 0.6. This BCR is higher than the same plan with a pumping station because the cost of the levee project without a pump station is much less than the cost with one. Based on the concept plan, the pump station increases the cost by approximately $4.5 million, which lowers the BCR. However, there is a greater risk of flood damages to homes due to interior ponding without a pump station. The annual damages that would be prevented (or benefits of the plan) are $509,000 for the without pump plan and $565,000 for the with pump plan. There is not a large difference in damages in the with-project condition between the with and without pumps scenarios due to the relatively few structures that are impacted by ponding. For the rainfall event with a return interval of 10 years it is expected that two structures would receive damages. For the 25-year event, that number is expected to increase to ten and for the 50-year event, 19. Expected annual damage for the with-project condition under both scenarios is weighted more heavily by the infrequent events resulting in overtopping of the levee/floodwall system. To prevent any houses from flooding from rainfall on the landward side of the levee, a pump station would be required.

6.3.4 Selection of Final Plan

Based on the evaluation and comparison of the final concept plans, Fairfax County selected Plan 2c (the highest levee alternative) with a pumping station for implementation. The county funded the Corps, using voluntary contributions, to design the levee project to approximately a 65% level of design. Additional technical work, such as surveys, soil borings and testing were conducted in order to complete the design. The design work is discussed in Section 7.

Table 6.5:**Phase 3**
Huntington Flood Damage Reduction Concept Plan Alternatives Analysis
Alternatives with Pump Station
Prepared 14 Jan 2008

Alternative	Cost without escalation used for economic analysis (w/design, const mgmt, any real estate)[1]	Escalation Cost	Construction Year	Total Project Cost	O&M Cost	Annualized Costs	Annualized Benefits (each low opening)[2]	Benefit to Cost Ratio (BCR)[3]	Height of Protection	Probability of Non-Exceedence for the Event with a 1 % Chance of Occurrence[4]	Meets Current Local Guidelines	Reason If "No"	Main Risk	NOTES
Plan 1a - Levee and Dredging with 60,000 gpm pump; levee top elevation at 15.6 feet at Fenwick; dredge from Metro rail to siphon	$19,600,000	$1,900,000	FY10-FY12	$21.5M	$2.4M every 5 years, and $150,000 each year	$1,690,000	$372,000	0.22	15.6 feet at Fenwick is equivalent to the 100-yr flood elevation	54%	Yes		Higher flood event could overtop levee and cause more catastrophic damages; also, channel may fill in with sediment quicker than expected and may not have expected reduction in flood levels (levee may increase flood levels upstream)	Top of levee at elevation 15.6' (100-year flood elevation with no additional height for risk and uncertainty); one pumping station with 60,000 gpm capacity to maintain 100-y rainfall peak pond elevation at 9 feet; O&M rate of dredging 2.5 feet every 5 yrs (43,000 cy); no increase in flood levels for 100-yr event; initial dredging of 86,000 cy material (dredge cost is $5.2M); dreding permit would be required
Plan 1b - Levee and Dredging with 60,000 gpm pump; levee top elevation at 17.6 feet at Fenwick; dredge from Metro rail to siphon	$20,800,000	$2,000,000	FY10-FY12	$22.8M	$2.4M every 5 years, and $150,000 each year	$1,758,000	$452,000	0.26	17.6 feet at Fenwick is equivalent to the 50-year flood elevation plus 2.4 feet at downstream end and 3.4 feet at upstream end (allows for some risk and uncertainty)	80%	Yes		Higher flood event could overtop levee and cause more catastrophic damages; also, channel may fill in with sediment quicker than expected and may not have expected reduction in flood levels (levee may increase flood levels upstream)	Top of levee at elevation 17.6' at Fenwick; one pumping station with 60,000 gpm capacity to maintain 100-yr rainfall peak pond elevation at 9 feet; O&M rate of dredging 2.5 feet every 5 yrs (43,000 cy); no increase in flood levels for 100-yr event; initial dredging of 86,000 cy material (dredge cost is $5.2M); dreding permit would be required
Plan 1c - Levee and Dredging with 60,000 gpm pump; levee top elevation at 19.6 feet at Fenwick; dredge from Metro rail to siphon	$22,000,000	$2,200,000	FY10-FY12	$24.2M	$2.4M every 5 years, and $150,000 each year	$1,826,000	$565,000	0.31	19.6 feet at Fenwick is equivalent to the 100-year flood elevation plus 3 feet at downstream end and 4 feet at upstream end (allows for some risk and uncertainty)	98%	Yes		Higher flood event could overtop levee and cause more catastrophic damages; also, channel may fill in with sediment quicker than expected and may not have expected reduction in flood levels (levee may increase flood levels upstream)	Top of levee at elevation 19.6' at Fenwick; one pumping station with 60,000 gpm capacity to maintain 100-yr rainfall peak pond elevation at 9 feet; O&M rate of dredging 2.5 feet every 5 yrs (43,000 cy); no increase in flood levels for 100-yr event; initial dredging of 86,000 cy material (dredge cost is $5.2M); dreding permit would be required
Plan 2a - Levee with 60,000 gpm pump; top elevation 15.6 feet at Fenwick	$14,800,000	$1,500,000	FY10-FY12	$16.3M	$150,000 each year	$985,000	$340,000	0.35	15.6 feet at Fenwick is equivalent to the 100-yr flood elevation	49%	No	Levee increases 100-yr flood elevation by up to 0.6' u/s which is not within current County guidelines	Higher flood event could overtop levee and cause more catastrophic damages	Top of levee at elevation 15.6' at Fenwick; one pumping station with 60,000 gpm capacity to maintain 100-yr rainfall peak pond elevation at 9 feet; levee increases 100-yr flood elevation by up to 0.5' u/s which is not within County requirements; project cos includes increased damages at upstream buildings;
Plan 2b - Levee with 60,000 gpm pump; top elevation 17.6 feet at Fenwick	$16,000,000	$1,600,000	FY10-FY12	$17.6M	$150,000 each year	$1,053,000	$447,000	0.42	17.6 feet at Fenwick is equivalent to the 50-year flood elevation plus 2.4 feet at downstream end and 3.4 feet at upstream end (allows for some risk and uncertainty)	79%	No	Levee increases 100-yr flood elevation by up to 0.6' u/s which is not within current County guidelines	Higher flood event could overtop levee and cause more catastrophic damages	Top of levee at elevation 17.6' at Fenwick; one pumping station with 60,000 gpm capacity to maintain 100-yr rainfall peak pond elevation at 9 feet; levee increases 100-yr flood elevation by up to 0.5' u/s which is not within County requirements; project cos includes increased damages at upstream buildings;
Plan 2c - Levee with 60,000 gpm pump; top elevation 19.6 feet at Fenwick	$17,400,000	$1,700,000	FY10-FY12	$19.1M	$150,000 each year	$1,132,000	$565,000	0.50	19.6 feet at Fenwick is equivalent to the 100-year flood elevation plus 3 feet at downstream end and 4 feet at upstream end (allows for some risk and uncertainty)	98%	No	Levee increases 100-yr flood elevation by up to 0.6' u/s which is not within current County guidelines	Higher flood event could overtop levee and cause more catastrophic damages	Top of levee at elevation 19.6' at Fenwick; one pumping station with 60,000 gpm capacity to maintain 100-yr rainfall peak pond elevation at 9 feet; levee increases 100-yr flood elevation by up to 0.5' u/s which is not within County requirements; project cos includes increased damages at upstream buildings;

Notes:
1/Project costs are based on concept-level plans and are subject to change; for costing purposes, the team identified a potential upland placement site
2/Benefits based on using low opening elevations for each structure

3/To meet Corps economic justification requirements, benefit-to-cost ratio must be greater than 1.0; however, due to limited funding, the Corps is prioritizing projects and only the projects with the highest BCR's are being included in the budget
4/Probability of Non-Exceedence for the event with a 1% chance of occurrence - Probability that the levee will not be overtopped during the 100-yr event (based on risk and uncertainty using the FDA model; however, H&H risk/uncertainty not included)

Table 6.6: **Phase 3**
Huntington Flood Damage Reduction Concept Plan Alternatives Analysis
Alternatives without Pump Station
Prepared 14 Jan 2008

Alternative	Cost without escalation used for economic analysis (w/design, const mgmt, any real estate)[1]	Escalation Cost	Construction Year	Total Project Cost	O&M Cost	Annualized Costs	Annualized Benefits (each low opening)[2]	Benefit to Cost Ratio (BCR)[3]	Height of Protection	Probability of Non-Exceedence for the Event with a 1 % Chance of Occurrence[4]	Meets Current Local Guidelines	Reason If "No"	Main Risk	NOTES
Plan 1a - Levee and Dredging with no pump; levee top elevation at 15.6 feet at Fenwick; dredge from Metro rail to siphon	$15,400,000	$1,300,000	FY10-FY12	$16.7M	$2.4M every 5 years, and $75,000 each year	$1,379,000	$319,000	0.23	15.6 feet at Fenwick is equivalent to the 100-yr flood elevation	54%	Yes		Structures will incur damages due to interior ponding during the 10-year rainfall and higher; Higher flood event could overtop levee and cause more catastrophic damages; also, channel may fill in with sediment quicker than expected and may not have expected reduction in flood levels (levee may increase flood levels upstream)	Does not solve problem because some of the houses may still flood from interior ponding since it does not include a pump station; top of levee at elevation 15.6' (100-year flood elevation with no additional height for risk and uncertainty); O&M rate of dredging 2.5 feet every 5 yrs (43,000 cy); no increase in flood levels for 100-yr event; initial dredging of 86,000 cy material (dredge cost is $5.2M)
Plan 1b - Levee and Dredging with no pump; levee top elevation at 17.6 feet at Fenwick; dredge from Metro rail to siphon	$16,600,000	$1,600,000	FY10-FY12	$18.2M	$2.4M every 5 years, and $75,000 each year	$1,446,000	$436,000	0.30	17.6 feet at Fenwick is equivalent to the 50-year flood elevation plus 2.4 feet at downstream end and 3.4 feet at upstream end (allows for some risk and uncertainty)	80%	Yes		Structures will incur damages due to interior ponding during the 10-year rainfall and higher; Higher flood event could overtop levee and cause more catastrophic damages; also, channel may fill in with sediment quicker than expected and may not have expected reduction in flood levels (levee may increase flood levels upstream)	Does not solve problem because some of the houses may still flood from interior ponding since it does not include a pump station; top of levee at elevation 17.6' at Fenwick; O&M rate of dredging 2.5 feet every 5 yrs (43,000 cy); no increase in flood levels for 100-yr event; initial dredging of 86,000 cy material (dredge cost is $5.2M)
Plan 1c - Levee and Dredging with no pump; levee top elevation at 19.6 feet at Fenwick; dredge from Metro rail to siphon	$17,900,000	$1,700,000	FY10-FY12	$19.6M	$2.4M every 5 years, and $75,000 each year	$1,520,000	$509,000	0.33	19.6 feet at Fenwick is equivalent to the 100-year flood elevation plus 3 feet at downstream end and 4 feet at upstream end (allows for some risk and uncertainty)	98%	Yes		Structures will incur damages due to interior ponding during the 10-year rainfall and higher; Higher flood event could overtop levee and cause more catastrophic damages; also, channel may fill in with sediment quicker than expected and may not have expected reduction in flood levels (levee may increase flood levels upstream)	Does not solve problem because some of the houses may still flood from interior ponding since it does not include a pump station; top of levee at elevation 19.6' at Fenwick; O&M rate of dredging 2.5 feet every 5 yrs (43,000 cy); no increase in flood levels for 100-yr event; initial dredging of 86,000 cy material (dredge cost is $5.2M)
Plan 2a - Levee with no pump; top elevation 15.6 feet at Fenwick	$10,600,000	$1,000,000	FY10-FY12	$11.6M	$75,000 each year	$674,000	$313,000	0.46	15.6 feet at Fenwick is equivalent to the 100-yr flood elevation	49%	No	Levee increases 100-yr flood elevation by up to 0.6' u/s which is not within current County guidelines	Structures will incur damages due to interior ponding during the 10-year rainfall and higher; Higher flood event could overtop levee and cause more catastrophic damages	Does not solve problem because some of the houses may still flood from interior ponding since it does not include a pump station; top of levee at elevation 15.6' at Fenwick; levee increases 100-yr flood elevation by up to 0.5' u/s which is not within County requirements; project cost includes increased damages at upstream buildings;
Plan 2b - Levee with no pump; top elevation 17.6 feet at Fenwick	$11,800,000	$1,200,000	FY10-FY12	$13M	$75,000 each year	$742,000	$435,000	0.59	17.6 feet at Fenwick is equivalent to the 50-year flood elevation plus 2.4 feet at downstream end and 3.4 feet at upstream end (allows for some risk and uncertainty)	79%	No	Levee increases 100-yr flood elevation by up to 0.6' u/s which is not within current County guidelines	Structures will incur damages due to interior ponding during the 10-year rainfall and higher; Higher flood event could overtop levee and cause more catastrophic damages	Does not solve problem because some of the houses may still flood from interior ponding since it does not include a pump station; top of levee at elevation 17.6' at Fenwick; levee increases 100-yr flood elevation by up to 0.5' u/s which is not within County requirements; project cost includes increased damages at upstream buildings;
Plan 2c - Levee with no pump; top elevation 19.6 feet at Fenwick	$13,100,000	$1,300,000	FY10-FY12	$14.42M	$75,000 each year	$815,000	$509,000	0.62	19.6 feet at Fenwick is equivalent to the 100-year flood elevation plus 3 feet at downstream end and 4 feet at upstream end (allows for some risk and uncertainty)	98%	No	Levee increases 100-yr flood elevation by up to 0.6' u/s which is not within current County guidelines	Structures will incur damages due to interior ponding during the 10-year rainfall and higher; Higher flood event could overtop levee and cause more catastrophic damages	Does not solve problem because some of the houses may still flood from interior ponding since it does not include a pump station; top of levee at elevation 19.6' at Fenwick; levee increases 100-yr flood elevation by up to 0.5' u/s which is not within County requirements; project cost includes increased damages at upstream buildings;

Notes:
1/Project costs are based on concept-level plans and are subject to change; for costing purposes, the team identified a potential upland placement site
2/Benefits based on using low opening elevations for each structure

3/To meet Corps economic justification requirements, benefit-to-cost ratio must be greater than 1.0; however, due to limited funding, the Corps is prioritizing projects and only the projects with the highest BCR's are being included in the budget
4/Probability of Non-Exceedence for the event with a 1% chance of occurrence - Probability that the levee will not be overtopped during the 100-yr event (based on risk and uncertainty using the FDA model; however, H&H risk/uncertainty not included)

7.0 DESIGN OF FINAL PLAN

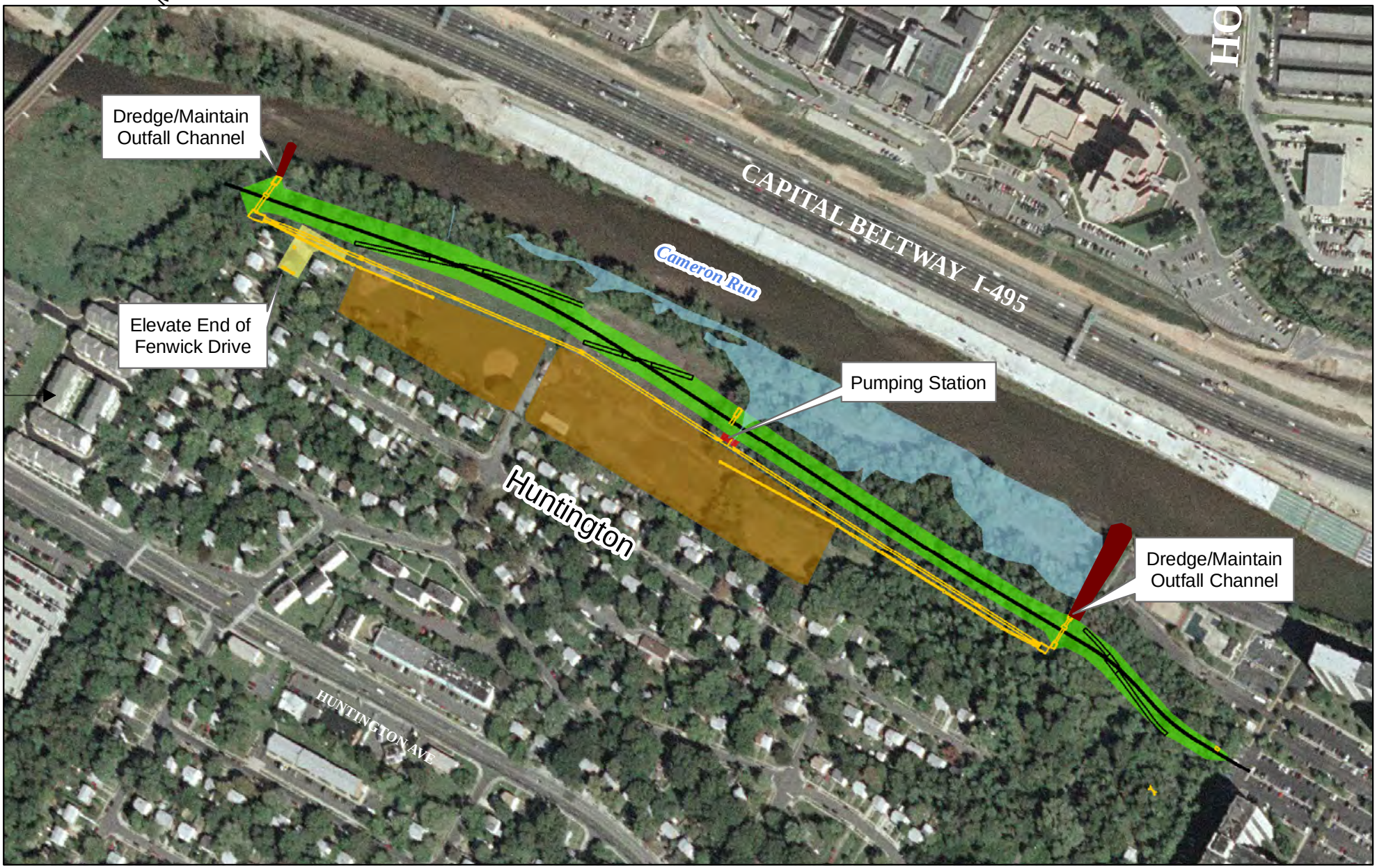
The main components of the selected plan (Final Concept Plan 2c) are a levee and a pumping station. As part of this study, the Corps developed the levee to a 65% design level. Further design of the levee will be required to take it to a 100% level so that it may proceed to construction. The Corps only designed the pumping station to a concept level design stage. This concept plan allowed the team to develop an approximate construction cost estimate. However, significant further design will be required for the pumping station and the accompanying features (such as the flow diversion pipes). The project design is described in this section. For further design details, refer to the Engineering Appendix G.

7.1 LEVEE DESIGN

Figure 7.1 shows a plan view of the project. The levee is 2,865 feet long and will tie into high ground upstream and downstream of Huntington. The project consists of two drainage structures, one near each end, to allow stormwater to flow through the levee. There are flow diversion pipes to divert flow to the pumping station during high water events, when the drainage structures are closed. There is an 8-foot wide asphalt recreational path along the top of the levee and ramps that lead over the levee for maintenance and handicap access. The detailed civil engineering drawings of the project can be found in Appendix G1.

The project is designed to prevent flood damages to the Huntington houses during the 1% annual chance flood event (100-year flood) and lower events. The crest elevation at the upstream end of the levee is 19.4 feet (4 feet higher than the 1% annual chance flood elevation); the crest elevation at the downstream elevation is 17.3 (3 feet higher than the 1% annual chance flood elevation). The additional height above the 1% annual chance flood elevation is to allow for risk and uncertainty and sea level rise (see sections below for more details). The levee height meets FEMA certification standards. The top of the levee will be approximately 10 to 15 feet above the existing ground.

A typical cross section of the levee embankment is shown on Figure 7.2. The proposed embankment has a 10-foot wide crest and 1 vertical on 2.5 horizontal (1.0V:2.5H) side slopes. A 6-foot deep trapezoidal impervious cutoff/inspection trench will be located beneath the levee along the alignment centerline. The embankment will be constructed primarily using select earth material from a borrow source obtained by the contractor. The select earth material will consist of most impervious materials available in the area. The levee will be covered with grass. A combination blanket and toe drain will be placed along the landside toe of the levee embankment. The combination blanket and toe drain will intercept seepage through the semi-pervious foundation blanket layer and will reduce potential uplift pressures along the base of the levee. The blanket drain will also provide a means of collecting any possible internal seepage and provide an exit for the collected seepage at the landside levee toe. A trapezoidal toe drain will be placed to a depth of about 5 feet below the existing ground surface at the levee toe at



US Army Corps of Engineers
Baltimore District

Figure 7.1

Levee Project
Plan View

0 300 600 1,200 Feet

1 inch = 300 feet

Aerial Photograph dated 2004 courtesy of AerialExpress

Legend

- Levee
- Elevate Road
- Excavated Area for Ponding
- Pumping Station
- Delineated Wetlands
- Dredge/Maintain Outfall
- New Drainage Pipe
- Recreation Trail
- Maintenance/Handicap Ramp

N

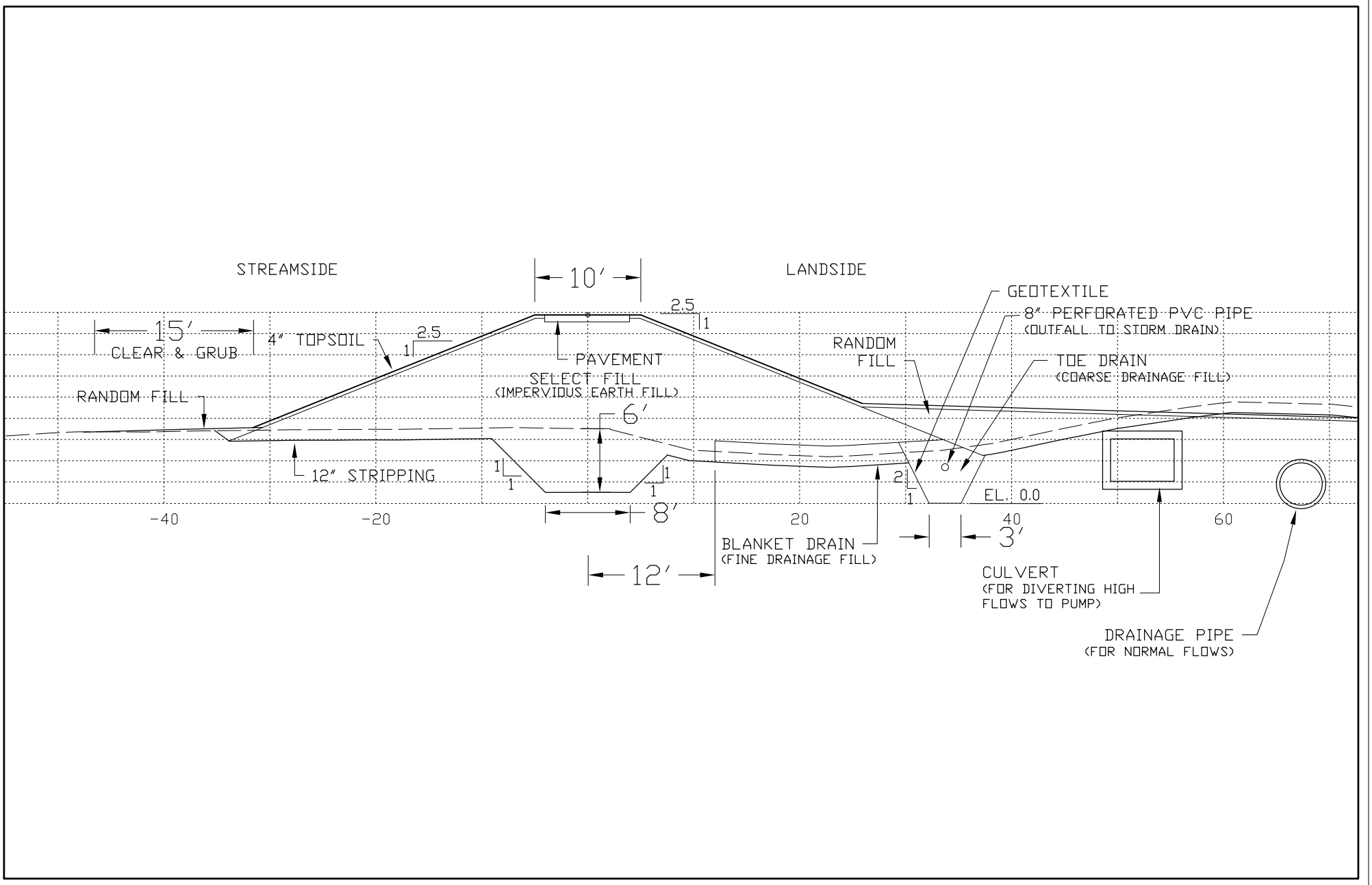


Figure 7.2 Cross-Sectional View of Levee

US Army Corps of Engineers
Baltimore District

HUNTINGTON
FLOOD DAMAGE REDUCTION STUDY
FAIRFAX COUNTY, VIRGINIA

DATE: OCT 2008
SCALE: NOT TO SCALE
FIGURE 7.2

elevation 0.0. An 8-inch perforated plastic pipe will be installed in the toe drain to collect and convey the seepage flow beyond the levee toe. The gravel toe drain will be surrounded by geotextile filter to prevent contamination of the gravel by the fine grained foundation soils. The fine and coarse aggregates for the drains will be obtained from off-site commercial sources.

The project will also include excavating part of the open space/park area approximately 1-2 feet deeper to elevation 6.0 feet to allow for more rainfall storage during a flood event. This is discussed further in the interior residual flooding analysis Section 7.3.

7.1.1 Levee Drainage Structures

Currently, the Huntington community is drained to Cameron Run by six drainage channels/pipes. It is advantageous to provide a few large gravity outlets rather than numerous smaller outlets. Two gravity drainage structures through the levee are proposed, one at each end of the levee. The two drainage structures will have flap gates and sluice gates. The flap gates are designed to close automatically when floodwaters rise. The sluice gates provide a secondary way to prevent backflow if the flap gates fail. An additional drainage structure was investigated near the middle of the levee, but it would require excavating and maintaining an outfall channel through wetlands. The County, Corps team and Corps' Wetland Regulatory personnel discussed this issue and to avoid impacts to the wetlands, it was decided that the third drainage structure would not be included in the project. A storm drain system adjacent to the levee is proposed to direct normal flows to the drainage structures. This system will be susceptible to siltation due to the mild slope, so frequent maintenance is expected.

The existing storm drain outfalls are set very low, within the tidal range. The new drainage structures will likewise be set low. Based on the Cameron Run cross-sections, it appears that the stream has silted in above the existing storm drain outfall elevations. Therefore, the area along Cameron Run near the outfalls and the storm drain outfall channels should be dredged. Since this stream rises rapidly, the system is heavily dependent on the automatic flap gates. As a result, maintenance dredging of the outfall channels down to elevation -2.5 will be required to maintain operation of the gates. This may require some maintenance dredging of Cameron Run as well.

To minimize excavation and stream impacts, the westernmost drainage structure is aligned with the existing drainage channel. For the inlet and outlet structure, non-flared walls were chosen for the same reason. The backwall of the structures are parallel to the levee contour to avoid warping the levee slope, and the box culvert will extend beyond the outlet structure to facilitate the flap gate. This design is based on similar structures used at nearby Fourmile Run.

Box culverts were chosen by the hydraulic engineer for the drainage structures through the levee. Corps' engineering guidance only discusses using circular concrete pipe for levees and also specifies using joints that are pressure rated. Since precast box culverts typically do not have pressure-tight joints, cast-in-place box culverts are assumed for the box culverts beneath the levee. Further investigation of precast box culvert joints, or alternative circular pipes, should be done during the next phase. Drainage fill is provided around the landside ends of the pipes. For

pipes *beneath the levee foundation*, outletting the drainage fill to the surface by encapsulating the next manhole in drainage fill is required. This is the case for the sanitary drainage structure.

7.1.2 Access Routes

The levee can be accessed from three locations as shown on Figure 7.1 and on drawings in Appendix G1 (shown as maintenance/handicap ramps). Two of the routes are to be elevated above the anticipated interior ponding elevation (8.0 feet), but the Fenwick Drive access point is below the anticipated interior ponding elevation (8.0 feet). The end of Fenwick Drive is shown to be raised to accommodate the diversion culverts; however, it will still be up to 1-foot below the ponding elevation.

Ramps are provided to the top of the levee and down to the riverside toe. To allow for recreational access, two handicap accessible ramps are provided. The surface of the ramps and levee crest will be paved. A maintenance route is shown along the riverside toe to allow for maintenance of the drainage structure outfalls.

7.1.3 Sanitary Sewer Impacts

The line of protection will cross an existing 48" sanitary sewer pipe and an existing 16" sewer pipe near the east end of the levee. The Corps' engineering manual discourages pipes beneath levees, and allows them only if they meet certain criteria. The criteria typically requires upgrading the pipe and adding provisions for emergency closure to prevent floodwaters from backing up through the pipe.

Since the 48" pipe crosses the line of protection, a drainage structure with a sluice gate would be required to prevent backflow of floodwater, assuming that the pipe would be flooded by Cameron Run. This sluice gate control manhole would need to be monitored during a flood event, and the sluice gate would only be closed if backflow was observed. Construction of a sluice gate on an existing 48" sanitary sewer pipe raises the following concerns:

1. Sewage flow would need to be maintained during construction.
2. It would require personnel on the ready to close the gate during a storm.
3. Since this stream rises rapidly, it would be difficult to close the gate in time.
4. Closing the gate would cause sewage flows to overflow into the protected area.
5. Closing the gate would impact the Jones Point Pumping Station.
6. The sewage flows may have to be considered in the stormwater pumping station design.

Due to these concerns, the assumption that the sewer would be flooded was investigated. The as-built drawings for the 48" sewer were reviewed for possible flood entry points:

- The manhole located just on the riverside of the levee is susceptible to flooding. However, it may be possible to waterproof and anchor it to avoid flooding.

- The 48” sewer transitions into an inverted siphon in order to pass beneath Cameron Run. The influent chamber to the siphon is underground, but it has an above-ground access structure with a low opening around el. 15.0. This is above the 100-year water surface profile, but below the top of protection.

- The siphon consists of ductile iron pipes encased in concrete and supported on piles as it crosses below Cameron Run. Risk of flooding appears minimal.

- The outlet chamber for the siphon is underground, but it has a 10” air vent pipe with an opening around el. 15.0. This is above the 100-year water surface profile, but below the top of protection.

- The next manhole north of the beltway is elevated above the levee, and flooding is not expected.

The risk of sewer flooding was discussed with the Corps’ engineering technical leaders, and the conclusion was that this 65% design should include a sluice gate drainage structure on the 48” sanitary sewer.

The 48” pipe beneath the levee was reviewed for conformance with the strength and watertightness requirements. As-built plans for the 48” pipe are dated 1980. The pipe is noted as ASTM C-76, Class IV RCP on a concrete cradle. It is buried 10-feet deep, and an additional 5-feet of levee will be constructed on top of it. This type of pipe meets the minimum requirements, but there is no indication of the type of joints used. Therefore, since a portion of the pipe will have to be removed anyway to construct the sluice gate structure, all of the pipe beneath the levee will be replaced. Drainage fill is provided around the landside end of the pipe. For pipes *beneath the levee foundation*, the engineering manual requires outletting the drainage fill to the surface by encapsulating the next manhole in drainage fill.

The 16” pipe could be relocated to avoid crossing the levee, or it could be modified to meet the criteria. Relocation has the advantage of less risk, but may be more costly. This was discussed with the Corps’ engineering technical leaders, and the conclusion was that the feasibility design should include relocating the 15” pipe.

The 16” sewer pipe outfalls to a pumping station (Jones Point Pumping Station) located near the east end of the levee. Based on the as-built plans, the wet well will not flood until flood waters rise above elevation 18.0; therefore, direct flooding of the well is not expected. As a precaution, backflow preventers are recommended on all sanitary house connections to prevent sewage backflow in the event that the pumping station fails; however, they are not included in the levee project or the levee project cost estimate.

The stormwater pumping system will also impact the sanitary sewer system. If interior ponding behind the levee extends over the sanitary manholes, stormwater could flood the manholes. Stormwater and sewage could then backup into basements through the sanitary house connections. It is assumed that the manholes within the ponding area are not watertight. Therefore, they should be waterproofed and modified with watertight manhole lids. They may

also need to be modified to prevent flotation. Stormwater and sewage could also backup into the basements through any house cleanouts that may exist within the ponding areas. Therefore, backflow preventers may be needed on all sanitary house connections.

7.1.4 Other Utility Impacts

As shown on the project drawings in Appendix G1, light poles and a television line will need to be reconstructed. The roadway work will also require raising some manholes, meter covers, valve covers, and a hydrant.

7.1.5 Regulatory/Compliance Considerations

Construction of the project will affect existing wetlands, streams, tidal waters, and trees. Required permits/approvals may include: erosion and sediment control, NPDES, possible forest conservation (if applicable), and state and federal authorization to work in streams and wetlands.

7.2 TOP OF PROTECTION

7.2.1 Risk and Uncertainty Analysis

At the request of Fairfax County, a risk and uncertainty analysis was performed for Plan 1c (highest levee with a pump and no dredging) and Plan 2c (highest levee with a pump and dredging) although this is currently not a requirement by FEMA for levee certification. The FEMA requirement is that the levee needs to be a minimum of 3 feet higher than the 1% annual chance flood elevation. If the county constructs this project without the Corps' involvement, they are required to meet that standard. The risk and uncertainty analysis that was conducted is a Corps of Engineers requirement for levee certification.

The purpose of a risk and uncertainty analysis is to provide decision-makers more information with which to select the appropriate size of the project. Risk and uncertainty is encountered in three areas: hydrology and hydraulics, geotechnical design, and economics. A Hydrologic Engineering Center-Flood Damage Analysis (HEC-FDA) Program is used to evaluate the risk and uncertainty in projects. The analysis attempts to describe the error based on uncertainty and present the results to the decision-maker in terms of project reliability. The FDA model is a program that calculates flood damages allowing relationships between H&H variables and economic variables to be uncertain. With regard to H&H it recognizes the uncertainty in the flow frequency relationship and the flow stage relationship. For economic magnitudes it allows for uncertainty in structure value, content value, damages that occur at each stage of flooding, and first floor and start of damage elevations. A Monte Carlo simulation is used to capture this uncertainty in the estimation of damages. The damages are then converted to an annual value. The results of the analysis are summarized below; for further details, see the risk and uncertainty sections in Appendix D (Economics) and Appendix G3 (Hydrology and Hydraulics).

HEC- FDA through a project performance analysis determines the degree of "assurance" (i.e., conditional non-exceedance probability) that each frequency event will be contained by the levee

or floodwall in each reach (and the levee will not be overtopped). A value of at least 90% assurance is required to meet levee certification requirements.

The HEC-FDA analysis was performed for Plan 1c and Plan 2c and Table 7.1 below presents results for Plan 2c.

Table 7.1: Risk and Uncertainty Results for Plan 2c

Risk and Uncertainty Analysis Results						
For Plan 2c						
	Conditional Non-Exceedance Probability by Events					
	10%	4%	2%	1%	0.4%	0.2%
Plan 2c	0.9999	0.9997	0.9986	0.9921	0.9783	0.9705

As shown in the table, the non-exceedance probability for the 1% flood is 99.21% for Plan 2c. The conditional non-exceedance probability is above the required 90% for the stream reach for Plan 2c for the 1% (or 100-year) flood. Therefore, the project meets the levee certification requirements for assuring that it provides a 100-year level of flood protection. The non-exceedance probability for Plan 2c is much larger than required, which indicates that a lower top of protection may be possible.

At the time of the analysis, Plans 1c and 2c were still being considered. It was decided to investigate the possibility of decreasing the top of protection profile for Plan 1c (levee and dredging) by 0.5 feet. The FDA model was run with this new lower levee and it showed that the conditional non-exceedance probability for the 1% annual chance event would be 96.7%. The original Plan 1c had a conditional non-exceedance probability for the 1% annual chance event of 99.5%. It is assumed that Plan 2c would have a similar reduction in probability.

To meet Corps levee certification requirements for projects, levees that are 3 ft or higher above the 1% chance event water surface elevations must have a non-exceedance probability of at least 90%; whereas, those with less than a 3 ft increment must have a non-exceedance probability of at least 95%. The non-exceedance probability for the 1% event of the lower top of protection plan 1c is 96.7%, which still meets the requirement of 95% for levees with less than a 3 ft increment above the 1% chance exceedance event water surface elevation. It is likely that if Plan 2c was lowered by 0.5 feet, that it would also have a probability greater than 95%. Therefore, the decreased top of protection would likely still meet the risk and uncertainty requirements for levee certification by the Corps. However, concurrent with the risk and uncertainty analysis, a sea level rise analysis was being conducted that also affected the levee crest elevation.

7.2.2 Sea Level Rise Analysis

After the team conducted the risk and uncertainty analysis and determined that the levee could be lowered by 0.5 feet so that the downstream end would be 2.5 feet higher than the 1% annual chance flood and the upstream end would be 3.5 feet higher than the 1% annual chance flood, the team conducted an analysis of the impact sea level rise (SLR) might have on the final design

crest height of the levee. To determine this impact, existing HEC-RAS models were re-run to measure the impact that raising the downstream section water level might have on the upstream area where the levee sits. Impacts were measured for the 1% annual chance flood, which is the project design flood, for both sea level rise over a 50-yr period and a 90-yr period. A 50-year period was chosen because that is typically the duration that is used when determining the economic costs and benefits of a Corps flood damage reduction project. The project team also wanted to look at the impact over a longer period of time and since the National Research Council (NRC) report (NRC, 1987) only makes SLR predictions to the year 2100, we selected a 90-year period (assumes the year 2010 to year 2100). Current Corps standards call for consideration of local historic rates, projected NRC rates, and projected Intergovernmental Panel on Climate Change (IPCC) rates (IPCC, 2007) when planning and designing projects that could be affected by sea level rise. Estimates for both the 50-yr and 90-yr SLR rates were made from each of these reports and then run in HEC-RAS to determine their impact on future water levels at the levee. Details of the sea level rise analysis can be found in Appendix G4.

The best sources of information for historic sea level trends are local tide gauges. For this study, data from the nearest NOAA tide gauge, Station ID 8594900, in Washington D.C. were used to estimate SLR for Huntington. According to this gauge, mean sea level has risen roughly 0.933 ft per 90-yrs based on monthly mean sea level data from 1924 to 2006. Likewise, the 50-yr local historic SLR estimate is 0.52 ft per half century.

The 1987 NRC report and its estimates are based on the assumption that there is a high probability that global SLR will greatly accelerate with time and that there are uncertainties associated with these estimations. To account for the uncertainties of future SLR accelerations, the NRC report examines three eustatic rises to the year 2100 from 1987: 1.64 ft (0.5 m), 3.28 ft (1 m), and 4.92 ft (1.5 m). The Corps chose the highest and lowest NRC predictions (Curve 1 and Curve 3 from the NRC report) for this analysis.

The 2007 IPCC report examines six climate evolution scenarios. However, only the rise and rate of rise for two scenarios (B1 and A1F1, smallest and greatest, respectively) were evaluated as part of this analysis. Based on the IPCC rates, A1F1 provides sea level rises of 1.94 ft per 90-yrs and 1.08 ft per half century. Likewise, B1 provides 1.25 ft per 90-yrs and 0.69 ft per half century.

The impact of SLR was incorporated into the HEC-RAS models by simply adding the SLR values to the downstream known water surface elevation at the mouth of Cameron Run and the confluence with the Potomac River. The steady flow model was then run for the 1% annual chance flood event and the resulting water level compared to the previously accepted plan in which the downstream end of the levee is at elevation 16.8 ft (2.5 ft above the 1% annual chance elevation) and the upstream end is at elevation 18.9 ft (3.5 ft above).

The SLR values used were the minimums and maximums from the NRC report and the IPCC report for both the 50-yr and 90-yr periods. Since the local historic estimates are less than both the NRC and IPCC estimates, they were not included in the HEC-RAS modeling. Table 7.2 below shows the resulting change in water surface elevation (WSE) at both the upstream and downstream ends of the Huntington levee for each SLR value. This change is measured with

respect to the WSE for the current plan as described above. Note that only the SLR of 4.66 ft by year 2100 from Curve 3 in the NRC report causes any increase in the predicted WSE at the levee. This increase is 0.3 ft at the upstream end of the levee and 0.35 ft at the downstream end.

Table 7.2: NRC and IPCC SLR Rates used for HEC-RAS Modeling and their Corresponding Impact on 1 % Annual Chance Flood WSE Upstream Near the Levee along Cameron Run

Method		Sea Level Rise (ft)		WSE Change at Levee (ft)	
		50-yr	90-yr	50-yr	90-yr
NRC	Curve 1	0.46	1.51	0	0
	Curve 3	1.38	4.66	0	0.35 D/S, 0.3 U/S
IPCC	A1F1	1.08	1.94	0	0
	B1	0.69	1.25	0	0

As described above, the Corps and County evaluated a levee that is 3 feet above the 1% annual chance flood elevation at the downstream end and 4 feet above at the upstream end. Based on the results of the risk and uncertainty analysis, the county was considering lowering the top of levee to 2.5 feet above the 1% annual chance flood elevation at the downstream end and 3.5 feet above at the upstream end. However, based on the sea level rise analysis, Fairfax County decided to increase the top of levee back up to the original elevations (3 feet above and 4 feet above at the downstream and upstream ends, respectively). This is a conservative decision, as the sea level rise analysis showed that only the most extreme prediction (4.66 feet rise in 90-years) has an impact at Huntington, and the impact is only 0.35 feet. Table 7.3 shows the final top of levee elevations at various cross sections.

Table 7.3: Levee Top of Protection Elevations

River Cross Section	Levee Crest Elevation (Top of Protection), feet (NGVD 29)
1389	19.4
1240	19.0
1100	18.6
1000	18.3
860	17.9
760	17.6
660	17.3

7.3 HYDRAULIC IMPACT OF PROJECT

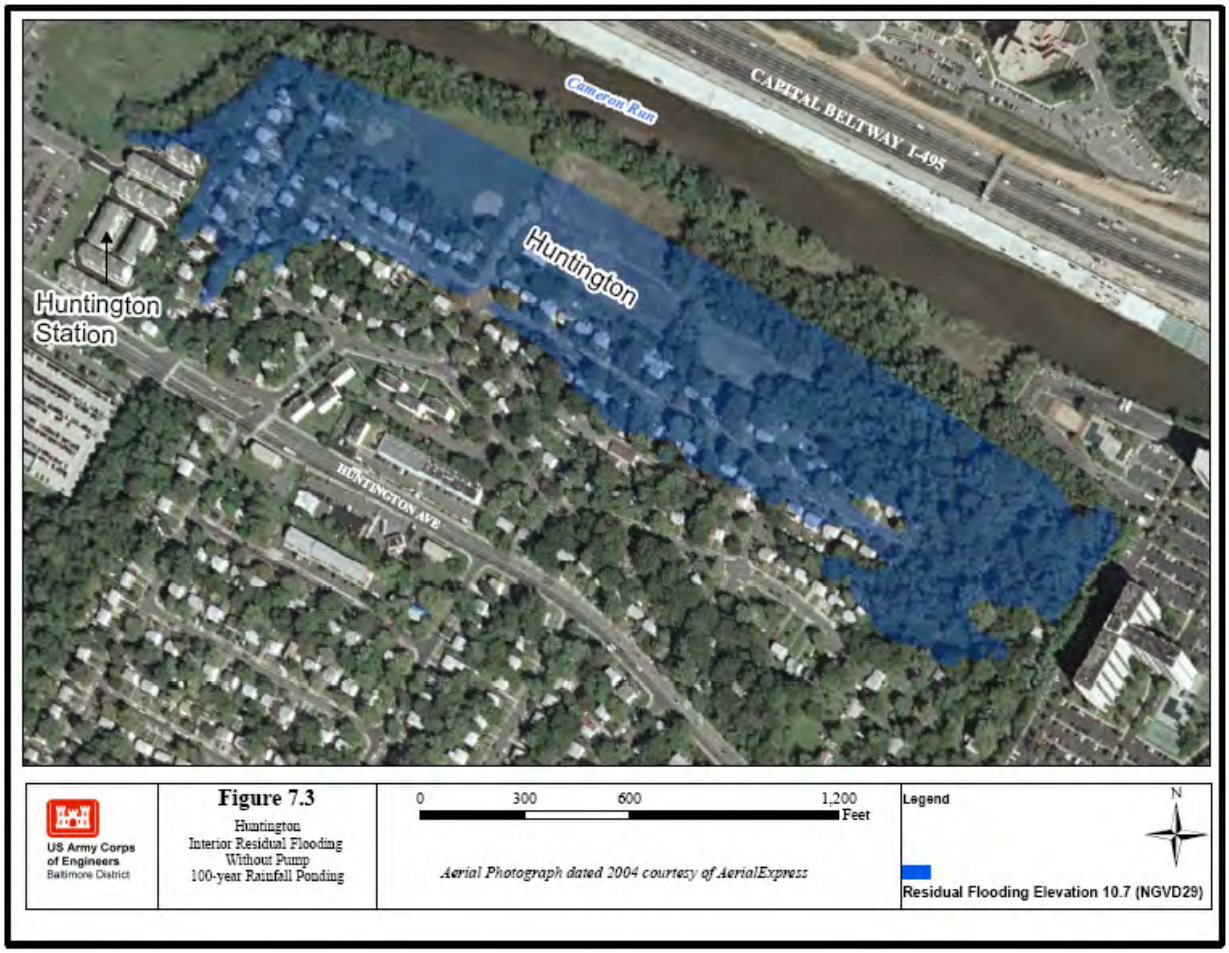
The selected levee plan will have an impact on the 1% annual chance flood elevations adjacent to and upstream of the levee. Based on hydraulic modeling, this project will increase the 1% annual chance flood elevation by up to 0.6 feet just upstream of the project (See Appendix G3). These impacts are the same as the Final Concept Plan 2c impacts; see Section 6.3.1 for further information on these impacts.

7.4 INTERIOR RESIDUAL FLOODING ANALYSIS

When the levee is constructed and the storm drain pipes are closed during high water events (to keep the flood waters from Cameron Run from backing up through the pipes and flooding Huntington), rainfall runoff will have nowhere to go. This rainfall runoff will pond on the landward side of the levee. A preliminary interior residual flooding analysis was conducted as part of this study to determine how high the water will pond behind the levee and to determine what size pumping station would be needed to pump the water over the levee into Cameron Run. The details of this analysis can be found in Appendix G5.

The preliminary analysis determined that if the flow of water in Cameron Run is higher than the storm drain outfalls (and the flap gates close) and a 100-year frequency rainfall occurs at Huntington, the water behind the levee will pond to a peak elevation of 10.7 feet (Figure 7.3). This would cause a number of houses in Huntington to flood from this interior drainage. Fairfax County decided to design a pumping station that would handle the 100-year rainfall without causing any damages to structures. The lowest low opening into a house is elevation 9.1 feet. The Corps and County evaluated various alternative methods for reducing the peak interior ponding elevation below elevation 9.1 feet. Initially, it was decided that the pumping capacity should be determined to lower the peak pond elevations to 9.0 feet. After running a number of different pumping capacities, it was determined that for the 100-year rainfall event, the pumping capacity needed to lower the peak pond elevation from 10.7 feet to 9.0 feet is 60,000 gallons per minute (gpm) (this was size of pump assumed for the final concept plans). However, there would still be significant ponding in yards and streets. Later during the 65% design, it was decided to reduce the peak ponding water surface elevation to a maximum of 8 feet to keep the flood waters further from the houses. There would still be some ponding along yards and roads. The required pumping capacity to maintain a maximum peak elevation of 7.8 feet was determined to be 140,000 gpm.

Figure 7.3: Interior Residual Flooding Without Pump, 100-year Rainfall

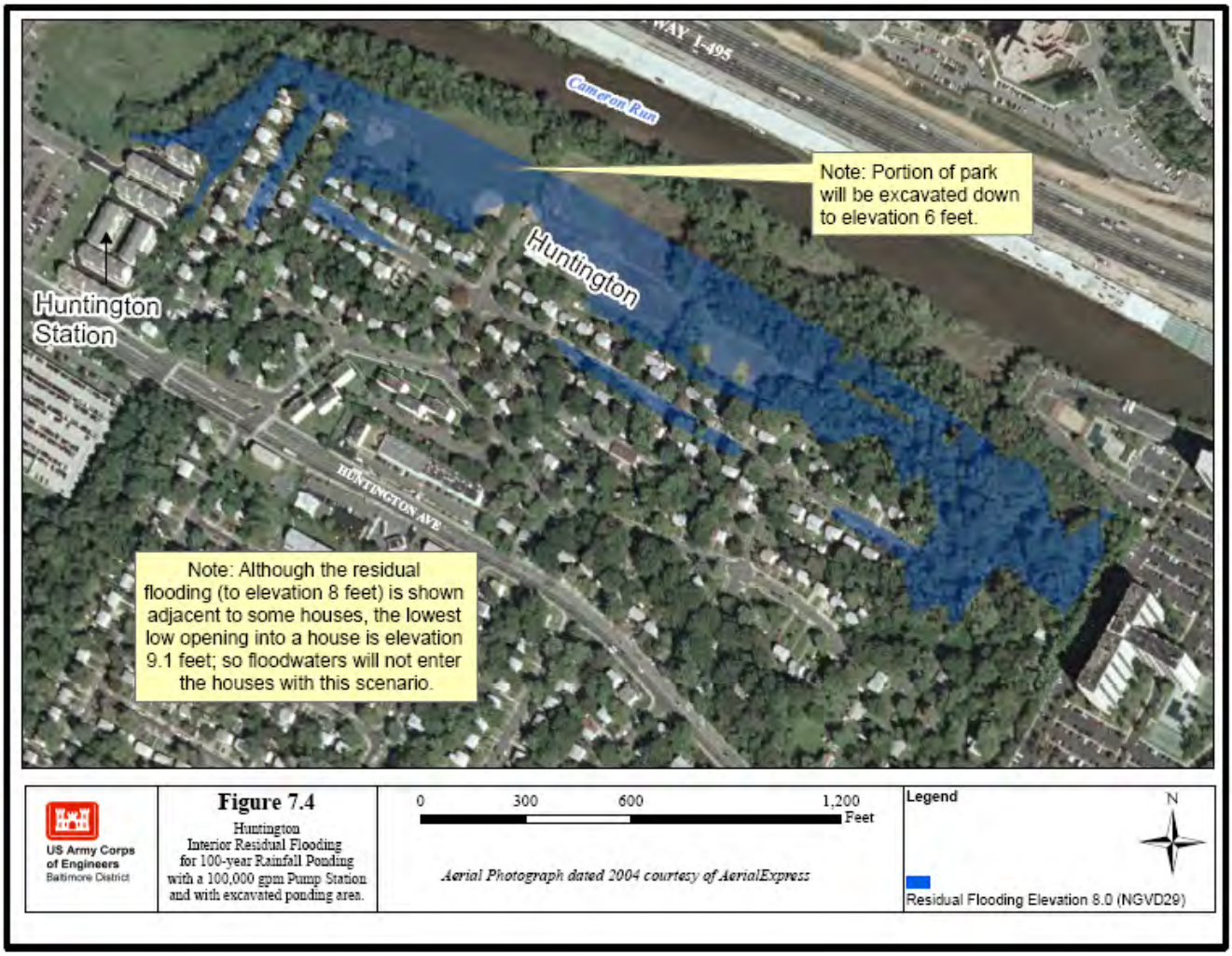


In order to reduce this large pumping requirement and gain more pond storage capacity, the county requested that the Corps investigate excavating down part of the open space/park area. The excavated area was limited to the park adjacent to the levee, but does not extend into the wooded areas. Geotechnical limitations required keeping the bottom at elevation 6.0 feet or greater. Higher uplift gradients caused by seepage beneath the levee are a concern if the area is excavated any deeper. Due to this, the only way to provide significant storage is to grade the entire area down to elevation 6.0 feet. As a result, the area will drain poorly, and will likely not be suitable for park activities. The area that will be excavated lower is shown on the levee plan, Figure 7.1. At the request of the County, this excavated ponding area is part of the final project and is included in the cost estimate. The interior residual flooding analysis was re-run with this area excavated down to elevation 6 feet and it was determined that the total pumping capacity necessary for the project is now 100,000 gpm (Table 7.4). Figure 7.4 shows where the water will pond up to elevation 8 feet during a 100-year rainfall.

Table 7.4: Pumping Capacities for Various Interior Drainage Alternatives

Interior Drainage Alternative	Pumping Capacity Required (gpm)
Maintain Peak Pond Elevation at 9 Feet	60,000
Maintain Peak Pond Elevation at 7.8 Feet	140,000
Excavate Open Space to Elevation 6 Feet and Maintain Peak Pond Elevation at 8 Feet	100,000

Figure 7.4: Interior Residual Flooding for 100-year Rainfall with 100,000 gpm Pump and with Excavated Ponding Area



7.5 HIGH FLOW DIVERSION AND PUMPING STATION CONCEPT PLAN

During a high-water event, the drainage structure gates will be closed, and flows will be diverted to a centrally located pump station via a separate drainage system. Both ditches and pipes were

considered for the diversion system, and conceptual plans were developed. A ditch would be a significant feature in this park, and it would remain wet due to the mild slope. Therefore, a piped system was chosen. Precast box culverts are acceptable for the diversion system. The diversion culverts were offset from the levee toe so that the trench excavation line would not affect the levee toe. However, the culvert was located near the toe at the westernmost end to avoid private property impacts (at the request of Fairfax County).

The pumping station was not detail-designed for this study, and an alternatives analysis was not done. Pumping stations can discharge over the levee or through the levee. For the purpose of developing a conceptual cost estimate, it is assumed that the pumping station will receive drainage from multiple pipes, and they discharges through the line of protection by way of a discharge chamber and gravity pipe. To avoid excavating and maintaining a discharge channel through the wetland, the discharge pipe will be elevated a few feet above the wetland. Energy dissipation should be incorporated into the discharge outlet.

The diversion system was designed to begin diverting flows to the pumping station when water in the main outfall channels reaches elevation 3.5. Mean higher high water in Cameron Run is approximately elevation 2.7 feet (USACE, AB Consultants, Inc & RK and K, LLP, 2008), so flow will likely be diverted to the pumping station when a storm event coincides with a significant flow in Cameron Run. To reduce the pumping frequency, gates could be installed on the inlet end of the diversion system and opened only during a significant storm event. If this is done, these gates should be opened at the beginning of the significant storm event due to how quickly rainfall runoff will reach the proposed levee.

As discussed in the Interior residual flooding analysis Section, it was determined that a pumping capacity of 100,000 gpm will be required to maintain a peak ponding elevation of 8 feet during a 100-year rainfall if the pond storage area is excavated to elevation 6.0. The concept design of this pump station includes three pumps that start when the water in the pumping station reaches differing levels:

1st pump is 20,000 gpm with a pump start elevation of 6.0 feet.
2nd pump is 40,000 gpm pump with a pump start elevation of 6.5 feet.
3rd pump is 40,000 gpm pump with a pump start elevation of 7.0 feet.
Total pumping capacity of the pumping station is 100,000 gpm

Figures 7.5 and 7.6 show concept drawings of the pumping station. The multiple chambers shown on Figure 7.5 that will receive flow from the box culvert flow diversion will actually be underground. Figure 7.6 shows the river side of the pumping station, where the discharge pipe will be located. The structure will be made of reinforced concrete and will be approximately 50 feet by 46 feet in size, not including the built out embankment that is required for vehicular access to the overhead door. The pump station will be located adjacent to the levee on the landward side. Access to the station will most likely be along the levee toe. The roof of the pump station is assumed to be constructed with steel framing members that support a light gage metal deck. It was assumed that adequate communications lines would be made available for connection to the pump station. For the concept plan, it was estimated that the sump will be approximately 18 feet deep.

Figure 7.5: Pump Station Concept Drawing (Landward Side)

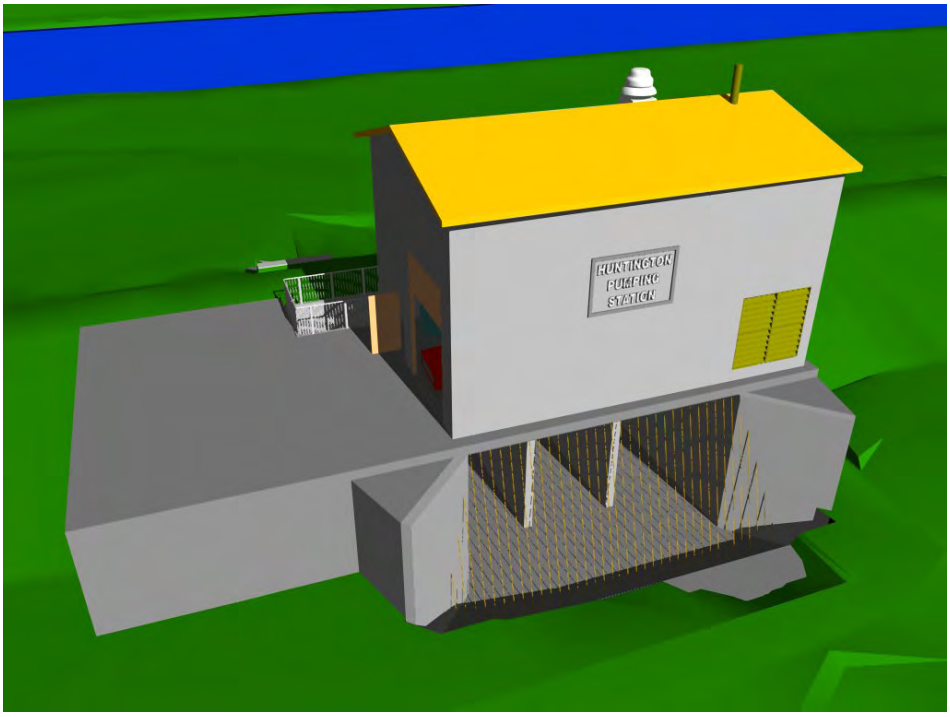
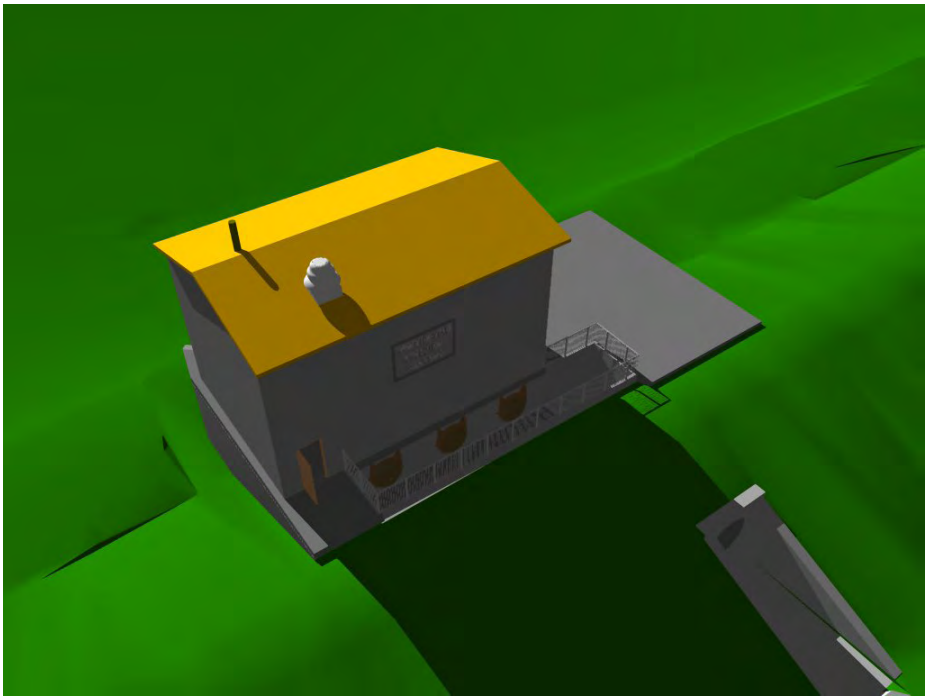


Figure 7.6: Pump Station Concept Drawing (Riverside View)



The cost estimate assumed that the pump station will be constructed on a mat foundation. No geotechnical design was performed for the pump station; however, based on the one boring in the area, it appears that a mat foundation would be suitable. Depending on the final depth of the sump, dewatering may be required to construct the foundation mat. Additional drilling and testing will be required to complete the foundation design for the pump station.

According to the available maps, there is three phase aerial power in the area. If the overhead lines are not large enough for the significant pumping station load, the local power company will have to upgrade their system.

There are two options for back-up power to the pumping station should power be lost during the flood event. One option is to have an emergency generator, and the other is to provide an alternative service feeder.

An alternative service feeder has not been investigated as part of this study. Depending on the distance and cost of running an independent feed it might be more cost effective than the generator option. If the generator is not being used, the automatic transfer switch would be eliminated and quite possibly the motor reduced voltage starters. But a primary selective switch would have to be added to the transformer (or a stand alone primary selective switch) to switch the pumping station between the two incoming feeder sources.

For the purposes of this pump station concept plan and cost estimate, it was assumed that an emergency generator would be part of the design instead of using an alternative service feeder (but this should be investigated during the next phase of study). Having a generator will require solid state reduced voltage starters for 2-500 HP and 1–300 HP motors (controls require time delay between motor starts) as well as an automatic transfer switch, which are quite expensive.

The pumps are assumed to be 460 Volts. There might be a cost savings by having the motor utilization be at a higher voltage (e.g. 4160 Volts).

7.6 RIP RAP ANALYSIS

An analysis to determine the need for erosion protection for the Huntington project was conducted using the with-project Plan 1C and Plan 2C HEC-RAS models for the design event (100-year). The water depth and velocity information was determined at each cross section along the proposed project. The levee side slope of 2.5 horizontal to 1 vertical was used.

The average channel velocities along the proposed project range from 5.4 fps to 6.8 fps for Plan 1C and 5.9 fps to 7.2 fps for Plan 2C. Riprap16 models were developed for the cross sections where the channel velocity was greater than or equal to 5.7 fps. Riprap requirements are not determined solely on velocities, but also the results of the Riprap16 model which takes into account channel side slope, flow depth and the curvature of the river. Results from the Riprap16 analysis showed that no riprap protection was required. Cameron Run is fairly straight and the levee slope is located away from the main channel, this coupled with the reasonable channel velocities contributed to the lack of required riprap protection.

To check how the project affects channel velocities upstream and downstream, a comparison was performed between the channel velocities from the Plan 1C and Plan 2C HEC-RAS model results and the channel velocities from the existing conditions HEC-RAS model results for the 100 year event. There was no increase in channel velocity upstream or downstream of the proposed levee, therefore, no riprap protection is required upstream or downstream of the tie outs.

7.7 REAL ESTATE REQUIREMENTS

Fairfax County, the Fairfax County Park Authority and the Fairfax County Water Authority own the majority of lands between the Huntington subdivision and Cameron Run. A new residential development is in planning stages along what is currently known as Hunting Creek Road on the eastern end of the study site. Private parcels at the western end of the project are located within the flood plain and are, as such, not developable.

The placement of a levee along Cameron Run will be located primarily on existing county land with tie-ins at both ends to private residential or residential development lands. Access would be by public roads Fenwick Drive and Mt. Vernon Drive in the Huntington subdivision and via an access road through the proposed residential development at the eastern end.

Construction of the levee and associated ponding area, and access through the development land on the east will require the acquisition of fee interests in private residential or residential development lands, temporary easements for construction access and staging areas, utility relocations and jurisdictional transfers of portions of county park lands to a common county entity for operation and maintenance, and permanent easements for access. Based on a preliminary analysis, it appears the project will require six (6) transfers of jurisdiction among county entities if they so choose, the acquisition of a minimum six (6) fee parcels plus one (1) easement from two private residential owners and two (2) commercial land development companies. There are public utilities in the area including telephone, electric, water and sewer. The extent of utility relocations has not yet been determined. Pending final plans and specifications, additional land may be required for temporary construction access and or staging areas, although considerable county land is available in the immediate vicinity of the project. Additionally, it is not known at this time if offsite material disposal areas will be required. Additional information regarding the real estate requirements can be found in Appendix E.

7.8 OPERATION AND MAINTENANCE

Operation and maintenance (O&M) of a levee project is critical in order for it to be effective in preventing and/or reducing flood damages. In general, the operation and maintenance of a levee project includes:

- Formation of an organization responsible for the operation and maintenance of the project.
- Inspection of the project every 90 days, and at the beginning of the flood season.
- Preparation of a semi-annual report.

- Maintenance of the easements on both sides of the levee, clear of any vegetation other than grass.
- Maintenance of healthy grass cover on the levee and regular mowing.
- Operation and maintenance of the drainage structure gates every 90 days.
- Maintenance of the drainage structure outlet channels, including regular dredging to keep the gates operating freely.
- Maintenance of a reserve supply of materials for emergencies.
- Operation and maintenance of the pump station.

Regulations pertaining to the operation and maintenance of federal flood control projects is covered in the code of Federal Regulations, Title 33-Navigation and Navigable Waters, Chapter II, Corps of Engineers, Department of the Army, Part 208-Flood Control Regulations, Maintenance and Operation of Flood Control Works (regulation can be found at the end of Appendix G1). It is recommended that Fairfax County follow these regulations even if it is not a federal flood control project. A detailed O&M manual should be prepared based on the above regulations, as well as the guidance found in the Corps of Engineers ER 1130-2-530.

7.9 PROJECT CONSTRUCTION COST ESTIMATE

A project cost estimate was developed for Plan 2c, which includes a levee with a top of protection elevation of 19.6 feet at the upstream end, the excavation of part of the park area down to elevation 6 feet to allow for a ponding area during flood events, and a 100,000 gpm capacity pumping station that will maintain a maximum interior ponding water surface elevation of 8 feet during a 100-year rainfall. The total project cost is estimated to be $20,230,000. The project cost estimate is based on 1 October 2008 costs, escalated into the future. The Preconstruction Engineering and Design (PED) costs are escalated to the year FY10 and construction is estimated to take place between FY11 and FY13, so the construction costs were escalated to a midpoint of FY12. The construction duration is estimated to be approximately 2 years.

The levee and pump station costs are separated into two line items since the levee has been designed to a 65% design level and the pump station has only been designed to a concept level. The pump station cost includes the pump station building and all accompanying features of the interior drainage system such as the flow diversion and the excavated pond area. A 25% contingency has been used for the levee cost estimate and a 30% contingency has been used for the pump station cost estimate. A summary of the cost estimate is shown in Table 7.5; the detailed cost estimate information can be found in Appendix G6.

The cost to operate and maintain the project each year could vary significantly based on the age and condition of the pump station and drainage structures, and the severity of floods and their impact on the levee and channels. For cost estimating purposes, the operation and maintenance cost is estimated to be $150,000 annually.

Table 7.5: Summary of Project Costs (Plan 2c)

Project Feature	Cost (escalated to FY 2012 $)
Levee	$6,795,000
Pump Station and Features (Flow Diversion)[1]	$9,900,000
Total Construction	**$16,695,000**
LERRs[2]	$75,000
Preconstruction Engineering and Design (PED)[3]	$1,475,000
Construction Management[4]	$1,985,000
Total Project Cost	**$20,230,000**
Annual Operation and Maintenance Cost	**$150,000**

[1]Pump capacity is 100,000 gpm to maintain maximum pond elevation of 8 feet (with excavation of park area)
[2]LERRs stands for lands, easements, rights of way, and roadway requirements
[3]PED is to complete the final design and prepare the plans and specifications, escalated to FY 2010 costs
[4]Construction Management is estimated to be 10% of the project construction cost (plus contingency and escalation)

7.10 ECONOMIC ANALYSIS OF FINAL PLAN

A final economic analysis was conducted on the selected plan. The expected annual benefits of Plan 2c are $540,000 and the expected annual costs are $1,230,000 for a 50-year project period. The benefit-to-cost ratio is 0.4. The project has a 99% chance of containing the flooding event with a 1% chance of occurrence. This project is expected to prevent nearly all of the annual flooding damage at an investment or first cost of $20.2 million (or $20.9 million including interest during construction). See Appendix D for further details regarding the economic analysis.

7.11 FLOOD RISK WITH THE LEVEE PROJECT

The Huntington levee project has been designed to prevent damages to the Huntington houses and community center from a 1% annual chance flood. According to the risk and uncertainty analysis, there is a 99% chance that the levee will not be overtopped during a 1% annual chance event. However, even with the levee, the community is not without risk. If a larger flood event should occur, say the 0.4% annual chance flood (250-yr) or 0.2% annual chance flood (500 yr), the levee could be overtopped and the community could experience flooding. Also, if the project is not operated and maintained properly, as described in Section 7.8, the levee system could fail during any flood event and the community could incur damages. It is critical that the levee and pump station system be operated and maintained as necessary to minimize the risk to the community.

It is important to note that although the levee is designed to prevent Cameron Run from flooding the community during a 1% annual chance, there will still be water ponding on the landward side of the levee from the interior stormwater runoff during a high water event. The pump station will pump this water over the levee to Cameron Run, however, depending on the amount of rainfall, there could be standing water throughout the community, particularly in the park area and along the roads. Although the pump station is designed to maintain a maximum pond elevation of 8 feet for a 100-year rainfall, which should prevent damages to houses and the community center, this residual flooding could cause some damages to the community.

8.0 PROJECT IMPACTS

This section describes the impacts of the final levee plan on the natural and socioeconomic resources discussed in Section 4. The impacts discussed are those anticipated from construction and operation of the levee in the final plan. Environmental effects of the levee project were determined from previous project documentation, agency coordination, and analysis of construction activities necessary to implement the project. Operation of the project was also considered to determine potential long-term impacts after construction is completed.

8.1.1 Topography

The total land area that would be disturbed during construction of the levee and associated excavation for ponding within the park and elevation of Fenwick Drive is approximately 10.3 acres. The levee would range from 10 to 15 feet higher than existing elevations and would be approximately 75 feet wide, resulting in minor permanent impacts to topography totaling approximately 4.5 acres. Staging areas would be returned to their existing condition to the extent practicable immediately after construction. Approximately 5.6 acres will be excavated 1-2 feet to an elevation of 6.0 feet within the fields of Huntington Park to address ponding issues due to stormwater runoff trapped by the levee. Fenwick Drive will be elevated by a maximum of 4 feet to accommodate the diversion culverts.

8.1.2 Land Use

Residential land use is not expected to change after implementation of the proposed action. Project construction is expected to preserve the existing density of residential land use by reducing flood damages to duplex homes and townhouses. Permanent minor impacts to parkland/recreational land use would occur since some of this area would be converted to open space due to the land requirements of levee construction.

Impacts to the RPA were unavoidable but minimized. The selected levee alignment minimized impacts to wetlands and the vegetated buffer to the wetlands and Cameron Run.

8.1.3 Geology and Soils

The embankment will be constructed primarily using earth materials obtained from local and commercial borrow sources provided by the contractor. The materials required to construct the various structures associated with the levee include: select (impervious earth) and random fills, processed sand and gravel drainage materials (aggregates), riprap, topsoil, pavement and sidewalk materials (concrete, asphalt, etc.), concrete, and various geosynthetics and plastic pipe. Soils from required excavation will be used to the extent practicable for levee construction in the random fill zone.

8.1.4 Prime and Unique Farmlands

No adverse impacts as a result of the proposed project are anticipated since area surrounding the

project area is widely developed and previous land disturbing activities within the project area have altered native soils.

8.1.5 Hydrology

The levee project will impact overland sheetflow of stormwater from the project area to Cameron Run. Drainage structures will be placed along the levee to mitigate this impact. Ponding may occur on the landward side of the levee during high water events, when the storm drain pipes are closed, and the stormwater runoff from the community backs up behind the levee. An Interior Residual Flooding Analysis is located in Appendix G5 that presents an analysis of pumping station requirements to prevent ponding on the landward side of the levee during high water events.

8.1.6 Water Quality

No beneficial or adverse impacts to water quality are expected to occur as a result of the proposed project. Implementation of best management practices and adherence to the erosion and sediment control plan should minimize the risk of unintentional water quality effects.

8.1.7 Aquatic Resources

8.1.7.1 Fisheries

No beneficial or adverse impacts to fisheries are expected to occur as a result of the proposed project.

8.1.7.2 Aquatic Habitats Including Wetlands

Permanent direct adverse impacts to wetlands would occur as a result of the proposed project. The levee alignment was altered early in the planning phase to avoid such impacts to the extent practicable. Approximately 935 square feet (~0.02 acres) of palustrine forested wetlands would be converted to levee and roughly an additional 850 square feet (~0.02 acres) would be cleared of woody vegetation on both sides of the levee to allow for a 15- foot easement. Impacts to wetlands are shown in Figure 7.1. All appropriate Federal, state and local permits required for impacting wetlands would be obtained prior to any construction activities.

8.1.8 Floodplain Management

As a result of levee construction, it is anticipated that the FEMA FIRMs will be revised and the structures in Huntington will be removed from the special flood hazard area and the requirement to purchase flood insurance. However, flood insurance can be purchased at a lower rate and is highly recommended to reduce risk to home owners from the high costs of repairs from flood damages.

The levee project could increase the flood elevations upstream by a maximum of 0.6 feet during a 1 % annual chance event. Figure 6.10 shows the increases in flood levels during the 1% annual chance flood. The increase in flood elevations only extends upstream to Telegraph Road. This increase will affect four structures just upstream of Huntington. However, two of them have low openings above the 1% annual chance flood, so the levee will have no impact. The other two buildings (Mid-Town High Rise and Huntington Car Care) are already located in the floodplain and would be flooded during a 1% annual chance flood even without the levee.

8.1.9 Terrestrial Resources

8.1.9.1 Flora

As a result of levee construction there would be permanent direct adverse impacts to existing flora due to removal of mature trees, saplings, shrubs and other established vegetation. Approximately 4.85 acres (231,928 square feet) of forest are proposed for removal within the levee alignment, the 15-foot easement on both sides, and the ponding area (Figure 7.1). These areas would be seeded and converted to grassy areas. Temporary direct adverse impacts would occur to areas used for staging and access. These areas would be restored to pre-existing conditions post construction.

8.1.9.2 Fauna

Permanent direct adverse impacts would occur to existing fauna due to the conversion of forested areas to grassy areas.

8.1.10 Rare, Threatened and Endangered Species

Due to the study area's proximity to the Capital Beltway, the United States Fish and Wildlife Service responded that there is low probability of federally-listed rare, threatened or endangered species under their jurisdiction. There are also no documented occurrences of threatened or endangered wildlife resources under the jurisdiction of the Virginia Department of Game and Inland Fisheries in the proposed project area. Refer to Appendix A for copies of these letters.

8.1.11 Air Quality and Climate

The levee project would have minor, short-term, adverse impacts to air quality in the project area due to construction equipment emissions and dust from construction activities. All appropriate regulations on dust control measures will be complied with. There will be some dust generated during construction, but this will be short term and temporary. No lasting air quality problems should be attributed to this project when construction has been completed.

No impacts to climate are anticipated.

8.1.12 Noise

There would be no permanent changes to the noise levels in the project area. Minor and temporary increases in noise would occur primarily during the daylight hours of construction. Such noise would be produced by construction equipment such as backhoes, front-end loaders and dump trucks. Material placement and back-up alarms will produce the loudest sounds, but these sounds are periodic in nature. Sound levels from back-up alarms can vary from 85 to 110 dBA at 50 feet. The placement and excavation of material during construction will also generate sound levels in this range. These activities would occur only during daytime hours. A sound at the 110 dBA level attenuates to daytime background levels within 10,000 ft of the source. Construction of the levee would take no more than two and half years to complete.

The proposed construction work is located in parkland/open space, which is adjacent to residential neighborhoods. Short-term and minor impacts to local residents adjacent to the construction site are anticipated during construction. Due to the close proximity of the project to existing residents, measures to minimize noise, such as equipment mufflers, would be required of the construction contractor. In accordance with the Fairfax County noise ordinance, construction would only occur from sun up to sun down to prevent noise disturbance to residents of the area. Noise associated with this temporary construction is not expected to significantly impact wildlife in the area. Therefore, no long-term impacts are anticipated.

8.1.13 Cultural Resources

Because the proposed project area between the Huntington Community and Cameron Run was formerly a marshland, and contains a considerable amount of fill material, the area is considered disturbed and no archeological investigations are warranted for this project.

An evaluation of the historic nature of the Huntington Community found that the entire neighborhood is composed of 1947 brick duplex housing. The Baltimore District determined that there were no significant architectural resources within the view shed of the proposed project.

Therefore, proposed construction of a levee along Cameron Run in the vicinity of the Huntington Community neighborhood would have no effect upon cultural resources.

8.1.14 Transportation

Short term, minor, adverse impacts to transportation would occur during construction along roadways surrounding the project area, including Huntington Avenue, Fenwick Drive, and Arlington Terrace, as a result of additional construction-related traffic. Numerous trucks and equipment would be needed for levee construction. Parking areas, trails, sidewalks or roads damaged during construction would be properly repaired and replaced as needed.

8.1.15 Utilities

The project design includes the modification of two sanitary sewer pipes (16 and 48 inches in diameter). Both of these pipes are located at the eastern end of the proposed levee. No service interruptions are planned so no adverse impacts are expected. Please refer to Section 7.1.3 for further information.

8.1.16 Demographics and Socioeconomic Conditions

No impacts to demographics and socioeconomic conditions are anticipated.

8.1.17 Hazardous, Toxic and Radioactive Substances

The proposed construction area appears to have no negative impacts from hazardous wastes and the discovery of hazardous materials during construction is highly unlikely and not anticipated.

8.1.18 Recreation

Adverse impacts to the park are anticipated as a result of levee construction. The baseball field would likely be replaced with other forms of recreation due to a shortened outfield. Due to the excavation to promote interior drainage, drainage within the field will be slowed resulting in the field being wet for a longer period of time after rain events. Recreational uses of this area may be limited. Minor, permanent, beneficial impacts would also result from construction of a hiker/biker trail on top of the levee and potentially a pier overlooking the wetland area on the east side of the levee along Cameron Run.

8.1.19 Child Health and Safety

Risks to children during construction would be minimized by use of appropriate construction practices. The contractor would be expected to comply with safety standards at all times, to ensure a safe area around the construction site. All equipment on site would be locked during non-working hours. In accordance with Fairfax County's noise ordinances, construction would only occur from sun up to sun down. To the extent practicable, the construction site would be marked or fenced off to prevent access of unauthorized persons.

8.1.20 Environmental Justice

No significant, long-term, direct, or adverse impacts to minority populations, in terms of environmental justice, are expected to result from the proposed project. The flood damage reduction project would improve conditions within the project area and are not expected to result in disproportionately high and adverse human health or environmental effects on minority or low-income populations.

9.0 PUBLIC INVOLVEMENT PROGRAM

A flood damage reduction project at Huntington would provide benefits to the public. As such, coordination with the appropriate Federal, state, regional and local agencies, and the public was an integral part of the planning process. This section describes the coordination actions taken for this study.

On February 5, 2007, letters were sent to various federal, state regional and local agencies by the USACE on behalf of Fairfax County announcing the beginning of the Huntington Community Flood Damage Reduction Study. The letters explained that the study was being conducted under the Floodplain Management Services Program and provided information about the study and alternatives under evaluation. Several responses from local, state and federal agencies were received. An example of the letters mailed, mailing list, and responses received can be found in Appendix A.

Three Community Meetings were held during the study at the Walt Whitman Middle School. The first meeting was held on January 11, 2007 and had approximately 300 people in attendance. This meeting presented the findings in the *June 2006 Flood Investigation for Cameron Run* report, which was completed in January 2007, and also provided an overview of work to be completed through the Huntington Flood Damage Reduction Study.

Roughly 100 residents attended the second meeting on April 24, 2007. During the meeting, preliminary flood damage reduction alternatives were presented and input was received from the community. Additional input was received through questionnaires, which were distributed during the meeting. Approximately 20 questionnaires were completed by the public. Of the questionnaires that were received, many residents were in favor of the dredging, levee, and/or combination levee/dredging alternatives, and were against the flood proofing alternative. An equal number of responses were in favor of buyouts as were opposed.

The third public meeting was held on January 15, 2008 with approximately 85 residents in attendance. The purpose of this meeting was to present the final two flood damage reduction alternatives to the community (levee and levee/dredging combination) and discuss residents' issues and concerns. Comment cards were handed out during the meeting, and eight responses were received. A number of the comments made during the meeting and on the comment cards favored some amount of dredging as part of any solution.

Two newsletters were created and mailed to residents and other interested parties during the study. The first newsletter was sent in September 2007 and the second newsletter was mailed in May 2008. The intent of these newsletters was to keep the people informed of the study's progress, provide additional information relevant to flood damage reduction in the community, and answer questions or concerns raised during previous meetings or through questionnaire or comment card responses. Refer to Appendix F for copies of the newsletters, which include a summary of meetings held and questionnaire/comment card responses.

10.0 FINDINGS AND CONCLUSIONS

Significant flooding occurred in the Huntington Subdivision along Cameron Run in Fairfax County, Virginia on June 25 and June 26, 2006 and approximately 160 houses were damaged. Based on the Corps' most recent hydraulic modeling, there are 180 houses in the Huntington and Huntington Station communities that are located in the 1 % annual chance floodplain (100-year floodplain) and are at risk of flooding again in the future. The purpose of this study was to develop and evaluate alternative solutions for mitigating future flooding and to select a final plan for implementation. The flood damage reduction measures that were evaluated include a levee, dredging, buyouts and flood proofing individual buildings.

The flood damage reduction alternatives underwent a three-phase plan formulation process and a public involvement process which led to the selection and design of a final accepted plan. Concept plans were developed for each of the alternatives and they were evaluated based on construction costs, economic benefits (reduction in future damage costs), impacts, risk, and public acceptance. None of the alternatives had an economic benefit to cost ratio greater than 1.0, which is required to meet the guidelines for federal funding. The most cost-effective solution that would solve the flooding problem and meet the established project goals and objectives is Final Concept Plan 2C, the construction of a levee. Fairfax County selected this plan for implementation and requested that the Corps conduct further design of the project.

The main components of the selected plan are a levee and a pumping station. As part of this study, the Corps developed the levee to a 65% design level. Further design of the levee will be required to take it to a 100% level so that it may proceed to construction. The Corps only designed the pumping station to a concept level design stage. This concept plan allowed the team to develop an approximate construction cost estimate. However, significant further design will be required for the pumping station and the accompanying features (such as the flow diversion pipes).

The grassed levee is 2,865 feet long and will tie into high ground upstream and downstream of Huntington. The project is designed to prevent flood damages to the Huntington houses during the 1% annual chance flood event (100-year flood) and lower events. The top of the levee will be approximately 10 to 15 feet above the existing ground. The crest elevation at the upstream end of the levee is 19.4 feet (4 feet higher than the 1% annual chance flood elevation); the crest elevation at the downstream end is 17.3 feet (3 feet higher than the 1% annual chance flood elevation). The additional height above the 1% annual chance flood elevation is to allow for risk and uncertainty and sea level rise. Based on the risk and uncertainty analysis, the probability that the levee will not be overtopped during a 1% annual chance event is 99%. The levee height meets FEMA certification standards. The levee has a 10-foot wide crest and 1 vertical on 2.5 horizontal side slopes.

The project consists of two drainage structures, one near each end, to allow stormwater to flow through the levee. There are flow diversion pipes to divert flow to the pumping station during high water events, when the drainage structures are closed. There is an 8-foot wide asphalt

recreational path along the top of the levee and ramps that lead over the levee for maintenance and handicap access.

The project also includes excavating part of the open space/park area adjacent to the levee approximately 1-2 feet deeper to elevation 6.0 feet to allow for more rainfall storage during a flood event. A pumping station with a capacity of 100,000 gpm will be constructed to pump the interior drainage across the levee to Cameron Run during a flood event. During a high water event (when the storm drains through the levee are closed) and a 100-year rainfall, the pump station will maintain a maximum pond elevation in the community of 8.0 feet. There would still be some water ponding in the roads and in yards.

Based on hydraulic modeling, the levee would increase the 1% annual chance flood elevations by up to 0.6 feet just upstream of the project. The increase in flood elevations extends upstream to Telegraph Road. This increase will affect four structures just upstream of Huntington. However, two of them have low openings above the 1% annual chance flood, so the levee will have no impact. The other two buildings (Mid-Town High Rise and Huntington Car Care) are already located in the floodplain and would be flooded during a 1% annual chance flood even without the levee. Therefore, there would be no increase in flood damages during a 1% annual chance flood caused by the levee.

The project will have an impact to wetlands and forest habitat, however these impacts have been minimized. Approximately 0.02 acres (935 square feet) of palustrine forested wetlands would be impacted by the construction of the project. As a result of levee construction there would be permanent direct adverse impacts to existing flora due to removal of mature trees, saplings, shrubs and other established vegetation along the levee alignment and the 15 foot easement on either side. Approximately 4.85 acres (231,928 square feet) would be impacted. These areas would be seeded and converted to grassy areas. The park will also be impacted by the project. Due to the excavation of the park area for interior drainage, recreational use of this area may be limited.

The total project cost, including the final design phase, construction management, lands and easements, and escalation (assuming construction will take place between FY11 and FY13), is estimated to be $20.2 million. The benefit to cost ratio is 0.4. The project construction duration is estimated to be 2 years.

The next step for the project is the final design of the levee and pump station. In addition to further design, the county will need to obtain the necessary permits and approvals and secure funding prior to construction.

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APPENDIX A. COORDINATION/CORRESPONDENCE

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, U.S. ARMY CORPS OF ENGINEERS
P.O. BOX 1715
BALTIMORE, MD 21203-1715

REPLY TO
ATTENTION OF

February 5, 2007

Planning Division

Mr. Randy Bartlett
Director, Stormwater Planning Division
Fairfax County Department of Public Works
and Environmental Services
12000 Government Center Parkway, suite 449
Fairfax, Virginia 22035-0052

Dear Mr. Bartlett,

On behalf of Fairfax County, Virginia, the U.S. Army Corps of Engineers, Baltimore District (Corps), is sending this letter to provide information regarding the Huntington Community Flood Damage Reduction Study, and to request any data or other information your office may have that could assist us in this study.

Following severe flooding from a June 2006 rainfall, Fairfax County requested that the Corps investigate flood damage reduction alternatives for the Huntington Community under the Floodplain Management Services Program. The Huntington Community is adjacent to Cameron Run, located between Telegraph Road and Jefferson Davis Highway (Enclosures 1 and 2). The community has approximately 160 duplex homes which experienced significant flooding in June 2006.

The Corps will conduct the study to develop and evaluate various flood damage reduction alternatives for the Huntington Community, including dredging, flood proofing individual houses, floodwall construction, levee construction, and resident relocation (buyouts). Some of the tasks to be performed include environmental analysis, economic analysis, real estate assessment, hydrologic and hydraulic analyses, and geotechnical investigations. If the County selects a plan for implementation, the final product of this study will be a 65 percent design for the recommended solution. The entire study is anticipated to take approximately eighteen months to complete, with a recommended plan being identified within the first nine to twelve months.

In order to assist the Corps and Fairfax County, and make this study as accurate as possible, we request that you submit any information you may have, within your agency's area of expertise, regarding potential physical, economic, social or environmental factors that may have an impact on the design or implementation of flood damage reduction methods at this location. This letter is being sent to Federal, state, and local agencies and organizations with a known interest in the study area (Enclosure 3). Please provide a copy of this letter to any additional parties or agencies which may have an interest in, or information regarding, this project.

Please submit any information and/or comments by February 26, 2007 to Ms. Stacey Underwood, CENAB-PL-E, P.O. Box 1715, Baltimore, Maryland 21203-1715. If you have any questions, please contact Ms. Underwood at 410-962-4977.

Sincerely,

Robert F. Gore
Chief, Planning and Environmental Services Branch

Encl

Enclosure 3:
HUNTINGTON COMMUNITY FLOOD DAMAGE REDUCTION STUDY
Coordination Mailing List

I. FEDERAL AGENCIES

Mr. John Nichols
Habitat Conservation Division
National Marine Fisheries Service, NOAA
904 South Morris Street
Oxford, MD 21654-0279

Mr. Donald S. Welsh
Regional Director
U.S. EPA, Region III
1650 Arch Street (3ES30)
Philadelphia, PA 19103-2029

Mr. John P. Wolflin
Field Supervisor
Chesapeake Bay Field Office
U.S. Fish and Wildlife Service
177 Admiral Cochrane Drive
Annapolis, MD 21401

Mr. Mark R. Bennett
Director
USGS Virginia Water Science Center
1730 East Parham Road
Richmond, VA 23228

Mr. Bob Hume
Chief, Regulatory Branch
U.S. Army Corps of Engineers - Norfolk District
803 Front Street
Norfolk, VA 23510-1096

II. STATE AGENCIES (COMMONWEALTH OF VIRGINIA)

Mr. Joseph H Maroon
Director
Virginia Department of
Conservation and Recreation
203 Governor Street, Suite 302
Richmond, Virginia 23219-2094

Mr. David K. Paylor
Director
Department of Environmental Quality
Commonwealth of Virginia
629 East Main Street
Richmond, VA 23219

Mr. Jeffery A. Steers
Regional Director
Northern Virginia Region
Department of Environmental Quality
13901 Crown Court
Woodbridge, Virginia 22193

Ms. M. Denise Doetzer
State Conservationist
USDA Natural Resources Conservation Service
Culpeper Building
1606 Santa Rosa Road, Suite 209
Richmond, Virginia 23229-5014

Mr. Robert W. Grabb
Chief, Habitat Management
Marine Resources Commission
Commonwealth of Virginia
2600 Washington Avenue, Third Floor
Newport News, VA 23607-0756

Mr. J. Carlton Courter III
Director
Virginia Department of Game & Inland Fisheries
4010 West Broad Street
West End, Virginia 23230

Mr. Pierce Homer
Secretary of Transportation
Virginia Department of Transportation
202 North Ninth Street – 5th floor
Richmond, VA 23219

Mr. Michael M. Cline
State Coordinator
Virginia Department of Emergency Management
10501 Trade Court
Richmond, VA 23236

III. REGIONAL OFFICES

Mr. Joseph K. Hoffman
Executive Director
Interstate Commission on the Potomac
River Basin
6110 Executive Boulevard, Suite 300
Rockville, MD 20852-3903

IV. LOCAL OFFICES

Mr. Richard Baier
City of Alexandria
Director, Transportation and Environmental Services
301 King Street
Alexandria, VA 22314

Mr. Timothy White
Deputy Director
Fairfax County Government
12055 Government Center Pkwy., Suite 946
Fairfax, VA 22035-1118

Ms. Marion Welton
Department of Planning and Zoning
Fairfax County Government
12055 Government Center Pkwy.
Fairfax, VA 22035-1118

V. PROJECT SPONSORS

Mr. Randy Bartlett
Director, Stormwater Planning Division
Fairfax County Department of Public Works
and Environmental Services
12000 Government Center Parkway, suite 449
Fairfax, Virginia 22035-0052

COMMONWEALTH of VIRGINIA

Department of Emergency Management

MICHAEL M. CLINE
State Coordinator

JANET L. CLEMENTS
Deputy Coordinator

JAMES W. KECK
Deputy Coordinator

10501 Trade Court
Richmond, Virginia 23236-3713
(804) 897-6500
(TDD) 674-2417
FAX (804) 897-6506

February 21, 2007

Mr. Robert F. Gore
Chief, Planning & Environmental Services Branch
Baltimore District, U.S. Army Corps of Engineers
P.O. Box 1715
Baltimore, MD 21203-1715

Re: Huntington Community Flood Damage Reduction Study

Dear Mr. Gore:

Thank you for the update on the subject study. The Department of Emergency Management worked with Fairfax County, the Department of Homeland Security, Federal Emergency Management Agency, the U.S. Small Business Administration and state agencies to provide flood recovery support to the communities impacted by the late June and early July flooding events in northern Virginia. Huntington was especially hard hit and has experienced repeated flooding that has become more severe through the years as the impervious surface in the Cameron Run watershed has expanded with urban development. In addition, lack of scheduled, proactive drainage system maintenance through the years may have contributed to the flooding situation.

While our staff does not have specific anecdotal or technical expertise regarding the specific hydrologic and hydraulic factors contributing to repetitive Cameron Run flooding events, we support the study and look forward to its results so that we can assist Fairfax County and the Huntington Community with long-term hazard mitigation options. With that regard, please contact Deborah G. Mills, Hazard Mitigation Program Manager, at (804) 897-6500 ext. 6563 or Deborah.Mills@vdem.virginia.gov for further assistance.

Sincerely,

Michael M. Cline

"Working to Protect People, Property and Our Communities"

COMMONWEALTH of VIRGINIA

Office of the Governor

Pierce R. Homer
Secretary of Transportation

P.O. Box 1475
Richmond, Virginia 23218

(804) 786-8032
Fax: (804) 786-6683
TTY: (800) 828-1120

February 21, 2007

Mr. Robert F. Gore
Chief, Planning and Environmental Services Branch
U.S. Army Corp of Engineers
Post Office Box 1715
Baltimore, Maryland 21203-1715

Dear Mr. Gore:

I am in receipt of you letter dated February 5 requesting information that would be of assistance to the U.S. Army Corp of Engineers (USACE) in completing the Huntington Community Flood Damage Reduction Study.

I have attached a copy of the Virginia Department of Transportation (VDOT) study on the severe flooding that followed the June 2006 rainfall, "Woodrow Wilson Bridge Project: Report of Impacts on Cameron Run Flood Event of June 25, 2006." This report examines the attributes and history of Cameron Run, and examines the role the construction activities and other factors played in the flooding that occurred in the Huntington community.

I have requested that VDOT staff with the Woodrow Wilson Bridge Project provide you with any information they may have that could assist the USACE with its study, including but not limited to the comprehensive study completed in 2001 by VDOT and the Potomac Crossing Consultants of Cameron Run and the impacts of the Woodrow Wilson Bridge Project on the future conditions of Cameron Run. A copy of this letter is attached for your information.

Please feel free to contact me if you have any questions.

Sincerely,

Pierce R. Homer

Pierce R. Homer

Attachments (2)

PRH:es

Copy: Mr. Ronaldo Nicholson

Grundy, Jo Ann NAB02

From: Andrew Zadnik [Andrew.Zadnik@dgif.virginia.gov]
Sent: Monday, February 26, 2007 2:18 PM
To: Grundy, Jo Ann NAB02; Underwood, Stacey M NAB02
Cc: ProjectReview (E-mail); Frances Greenway; Ray Fernald
Subject: COE_Huntington flood reduction analysis_CameronRun_Fairfax_ESS 23473

We have reviewed the subject project and offer the following comments and recommendations. The Department of Game and Inland Fisheries (VDGIF), as the Commonwealth's wildlife and freshwater fish management agency, exercises enforcement and regulatory jurisdiction over those resources, inclusive of state or federal endangered or threatened species, but excluding listed insects. We are a consulting agency under the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.), and we provide environmental analysis of projects or permit applications coordinated through the Virginia Department of Environmental Quality, the Virginia Marine Resources Commission, the U.S. Army Corps of Engineers, and other state or federal agencies. Our role in these procedures is to determine likely impacts upon fish and wildlife resources and habitats, and to recommend appropriate measures to avoid, reduce, or compensate for those impacts.

This project involves the development and evaluation of various flood damage reduction alternatives for the Huntington Community, Fairfax Co.
Potential alternatives include dredging, flood proofing individual houses, floodwall construction, levee construction, and residential relocation.

The Huntington Community is located within the 100-year floodplain of Cameron Run, a tributary of the Potomac River. According to our current records, there have been no documented occurrences of threatened or endangered wildlife resources under our jurisdiction within the project area. However, we have an historic record of the State Special Concern bridle shiner in Cameron Run. The bridle shiner also is considered a Species of Critical Conservation Need (Tier I) according to the Virginia Wildlife Action Plan. In addition, Cameron Run is a Potential Anadromous Fish Use Area. We are concerned that project alternatives involving instream activities and further manipulation of Cameron Run may result in adverse impacts upon these and other fish and wildlife resources. If the selected alternative involves instream work, such as dredging, we recommend that it be scheduled to avoid the spring migration and spawning period, defined as February 15 - June 30. We recommend that this project consider alternatives that will improve the habitat quality in and adjacent to Cameron Run, while providing a means to capture, store, and dissipate flood waters. This could be through improved stormwater controls (e.g., LID retrofit projects), wetland creation and/or restoration, and riparian buffer restoration.

Thank you for the opportunity to comment on this project. Please contact me if we can be of further assistance.

Sincerely,

Andrew K. Zadnik
Environmental Services Section Biologist Department of Game and Inland Fisheries 4010 West Broad Street Richmond, VA 23230

(804) 367-2733
(804) 367-2427 (fax)

DEPARTMENT OF TRANSPORTATION
AND ENVIRONMENTAL SERVICES
P.O. Box 178 - City Hall
Alexandria, Virginia 22313
703-838-4966

Alexandriava.gov

February 27, 2007

Mr. Robert F. Gore
Department of the Army
Chief, Planning and Environmental Services Branch
Baltimore district, U.S. Army Corps of Engineers
P.O. Box 1715
Baltimore, MD 21203-1715

Dear Mr. Gore,

In response to your letter of February 5, regarding the Huntington community Flood Damage Reduction Study, I would like to inform you that we have met with Stacey Underwood and provided her with all available data.

Attached is a copy of a letter from the City Manger, Jim Hartmann to Mr. Anthony Griffin, County Executive with Fairfax County, for your information.

If I can be of further help, please do not hesitate to call me at 703-838-4966

Sincerely,

Richard J. Baier, P.E.
Director

Attachment

→ Larry

L. Preston Bryant, Jr.
Secretary of Natural
Resources

Joseph H. Maroon
Director

COMMONWEALTH of VIRGINIA

DEPARTMENT OF CONSERVATION AND RECREATION
203 Governor Street, Suite 302
Richmond, Virginia 23219-2010
Phone: (804) 786-6124 Fax: (804) 786-6141

February 28, 2007

Robert F. Gore, Chief
Planning and Environmental Services Branch
Department of the Army
Baltimore District, U. S. Army Corps of Engineers
P. O. Box 1716
Baltimore, MD 21203-1715

RE: Huntington Community Flood Damage Reduction Study

Dear Mr. Gore:

This letter is in response to your February 5, 2007 letter requesting the Department of Conservation and Recreation's suggestions on topics for the Corps to consider as it begins the referenced study. We offer the following:

1. Determine the impact of sediment loading deposits to the floodplain and specify the removal requirements that are needed to maintain the floodplain functions.
2. Give consideration of the impacts to historic, rare, threatened and endangered species.
3. Conduct a review of FEMA's Letters of Map Change that have been issued for structures in the designated floodplain, cancel letters with inaccurate data and issue new letters that accurately reflect the flooding risk.
4. The study results should become a part of FEMA's Flood Insurance Rate Maps and update the existing Maps with the newly acquired data.

We appreciate the opportunity of being involved at the first phase of the Corps study and if needed, the Department's Floodplain Staff is available to assist further.

Please direct future correspondence to William G. Browning, Dam Safety and Floodplain Management Division Director at 804-786-3914 or bill.browning@dcr.virginia.gov.

Sincerely,

Joseph H. Maroon
Director

c: William G. Browning, Dam Safety and Floodplain Management Division Director

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

March 1, 2007

Ms. Stacey Underwood
Baltimore District, Army Corps of Engineers
CENAB-PL-E
P.O. Box 1715
Baltimore, Maryland 21203

RE: Huntington Community Flood Damage Reduction Study

Dear Ms. Underwood:

We are responding to the February 5, 2007 from Robert Gore of your office to the DEQ Director (received March 1, 2007), requesting information and advice on environmental factors that may affect the design or implementation of flood damage reduction methods for the Huntington Community in Fairfax County, Virginia. According to the letter, the Baltimore District of the Corps of Engineers has been asked by Fairfax County to undertake a study of flood damage reduction alternatives in light of flooding along Cameron Run in June 2006. We assume that the "65 percent design for the recommended solution" (third paragraph of the letter) will include an environmental assessment (EA) or environmental impact statement (EIS), along with a federal consistency determination covering the proposed actions and alternatives.

The Department of Environmental Quality, through its Office of Environmental Impact Review (this Office), coordinates Virginia's review of federal environmental documents prepared pursuant to the National Environmental Policy Act and responds to appropriate federal officials on behalf of the Commonwealth. The Department of Environmental Quality (DEQ) is also the lead agency for Virginia's review of federal consistency determinations prepared under the Coastal Zone Management Act.

<u>Environmental Review and Scoping</u>

We are sharing the letter with selected state agencies, the affected locality, and the Northern Virginia Regional Commission, all of which will be

invited to comment on the EA or EIS and the federal consistency determination. These agencies will include the following (note: starred (*) agencies administer one or more of the Enforceable Programs of the Virginia Coastal Resources Management Program; see "Federal Consistency...," below):

Department of Environmental Quality:
- Office of Environmental Impact Review (this Office)
- Northern Virginia Regional Office*
- Water Resources Division*

Department of Game and Inland Fisheries*
Department of Conservation and Recreation:
- Division of Chesapeake Bay Local Assistance*
- Division of Soil and Water Conservation*
- Division of Planning and Recreation Resources

Department of Health, Office of Drinking Water
Marine Resources Commission*
Department of Transportation
Department of Emergency Management
Department of Historic Resources
Northern Virginia Regional Commission
Fairfax County.

In order to ensure an effective coordinated review of the resulting EA or EIS and the federal consistency determination, we will require 18 copies of the document when it is published (additional copies may be needed for local government reviewers). While this Office does not participate in scoping efforts beyond the advice given herein, other agencies and entities are free to provide scoping comments as they see fit.

Federal Consistency under the Coastal Zone Management Act

Pursuant to the Coastal Zone Management Act of 1972, as amended, federal activities affecting Virginia's coastal resources or coastal uses must be consistent with the Virginia Coastal Resources Management Program (VCP) (see section 307(c)(1) of the Act and the Federal Consistency Regulations, 15 CFR Part 930, sub-part C). The Corps must provide a consistency determination which involves an analysis of the proposed activities in light of the Enforceable Policies of the VCP (first enclosure), and a commitment to comply with the Enforceable Policies. In addition, we invite your attention to the Advisory Policies of the VCP (second enclosure). The federal consistency determination may be provided as part of the NEPA documentation or independently, depending on

your agency's preference. We recommend that it be provided with the NEPA documentation to save time for both the Corps and the Commonwealth.

Section 930.39 of the Federal Consistency Regulations and Virginia's Federal Consistency Information Package give content requirements for federal consistency determinations. The Federal Consistency Information Package is available on DEQ's web site, This gives you access to the Information Package.

I hope this information is helpful to you. If you have questions, please feel free to call me (telephone (804) 698-4325) or Charlie Ellis of this Office (telephone (804) 698-4488).

Sincerely,

Ellie L. Irons
Program Manager
Office of Environmental Impact Review

Enclosures

cc: Thomas A. Faha, DEQ-NVRO
Joseph P. Hassell, DEQ-DWR
Andrew K. Zadnik, DGIF
Robert S. Munson, DCR
Susan E. Douglas, VDH
Tony Watkinson, MRC
Tonia W. Horton, DHR
Alice R. T. Baird, CBLAD
Michael Cline, VDEM
Mary T. Stanley, VDOT-EQD
G. Mark Gibb, NVRC
Noel F. Kaplan, Fairfax County DPZ
Ann Grundy, Baltimore Corps

COMMONWEALTH of VIRGINIA

L. Preston Bryant, Jr.
Secretary of Natural Resources

Marine Resources Commission
2600 Washington Avenue
Third Floor
Newport News, Virginia 23607

Steven G. Bowman
Commissioner

March 6, 2007

Ms. Stacey Underwood
CENAB-PL-E
P.O. Box 1715
Baltimore, MD 21203-1715

RE: Huntington Community Flood Damage Reduction Study

Dear Ms. Underwood:

We are in receipt of your letter dated February 5, 2007 regarding the Huntington Community Flood Damage Reduction Study in Fairfax County.

Please be advised that the Marine Resources Commission, pursuant to Section 28.2-1204 of the Code of Virginia, has jurisdiction over any encroachments in, on, or over any State-owned rivers, streams, or creeks in the Commonwealth. Accordingly, if any portion of the subject projects involves any encroachments channelward of ordinary high water along natural rivers and streams, a permit may be required from our agency.

Please contact me if you have further questions. I can be reached at (757) 247-8027 or Elizabeth.Gallup@mrc.virginia.gov.

Sincerely,

Elizabeth Gallup
Environmental Engineer

EG/moj
HM

Grundy, Jo Ann NAB02

Subject: FW: Huntington Flood Study

-----Original Message-----
From: Kimberly_Smith@fws.gov [mailto:Kimberly_Smith@fws.gov]
Sent: Tuesday, March 06, 2007 3:02 PM
To: Grundy, Jo Ann NAB02
Subject: RE: Huntington Flood Study

Eric has already reviewed the project and determined that it is not likely to adversely affect federally listed species. I would be interested in reviewing the impacts to waters and wetlands. Kim ~~~~~~~~~~~~~~~~~~~~ Kimberly Smith Fish and Wildlife Biologist U.S. Fish & Wildlife Service
6669 Short Lane
Gloucester, VA 23061
Kimberly_Smith@fws.gov
(804) 693-6694 ext. 126; (804) 693-9032 FAX http://www.fws.gov/northeast/virginiafield/
"Grundy, Jo AnnNAB02" <Jo.Ann.Grundy@nab02.usace.army.mil, <kimberly_smith@fws.gov>
03/05/2007 10:15AM
Subject: RE: Huntington Flood Study

Good morning Kimberly,

Eric Davis informed me (see e-mail below) that you would be the POC for a flood damage reduction study underway for the Huntington Community in Fairfax County, VA. He mentioned a low probability for federally listed species inside the beltway. The project is actually just south of the beltway. A bald eagle nest was identified in 1998 just across the river in Oxon Hill area and impacts were evaluated in a Biological Assessemnt for the Wilson Bridge project in 2000. I was hoping for a review of any known RTE in the area during the study phase of this project. I faxed/mailed a study notice to Eric's attention last week. Hopefully he will forward it to you for review.

Thank you in advance for your time,

Jo Ann Grundy, Biologist
U.S. Army Corps of Engineers
Baltimore District, Planning Division
410-962-6136 (Telephone)
410-962-4698 (Fax)

-----Original Message-----
From: Eric_Davis@fws.gov [mailto:Eric_Davis@fws.gov]
Sent: Friday, March 02, 2007 8:31 AM
To: Grundy, Jo Ann NAB02
Subject: Re: Huntington Flood Study

Jo Ann,

The project is inside the beltway, so it is not likely to adversely affect federally listed species. When a plan is available to review, our office's POC will be Kimberly Smith, , 804-693-6694 x 124.

Eric Davis
USFWS, Virginia Field Office
(804) 693-6694 ext. 104

"Grundy, Jo Ann NAB02"
<Jo.Ann.Grundy@nab02.usace.army.mil,<eric_davis@fws.gov>
03/01/2007 11:06AM
Subject: Huntington Flood Study

Hi Eric,

FAIRFAX COUNTY PARK AUTHORITY

12055 Government Center Parkway, Suite 927
Fairfax, VA 22035-1118

March 7, 2007

Ms. Stacey Underwood
CENAB-PL-E
P.O. Box 1715
Baltimore, MD 21203-4977

Re: Huntington Community Flood Damage Reduction Study

Dear Ms. Underwood:

Thank you for the opportunity to comment early on this project.

The Park Authority currently owns five parcels in the study area, totaling approximately sixteen acres. These parcels are operated as Huntington Park. In addition, approximately six acres has been proffered to the Park Authority and will be added to Huntington Park. The entirety of the existing park and future dedicated parcel is within the 2002 VDOT 100-year floodplain.

Huntington Park is designated as a Community Park that serves the active and passive recreation needs of the adjacent residents. The park has the following existing facilities; one 60 foot diamond athletic field, a multi-use court, open play areas, playground, benches and trails. These facilities serve a large number of residents in an area of the county that is currently highly deficient in parkland and recreational facilities as determined by the Park Authority's *2004 Needs Assessment.*

The Park Authority initiated a Master Plan Revision process in March 2006 to add new parcels acquired to the Master Plan and determine which additional facilities should be constructed at Huntington Park. A public information meeting was held in the spring of 2006 which was well attended by a variety of park users and neighbors who expressed interest in retaining natural areas as well as consideration of new or improved facilities including play equipment, a dog park and a major trail connection. Following the floods of June 2006, the master plan process was placed on hold pending the recommendations of the Huntington Community Flood Damage Reduction Study.

If the flood control recommendations contained within the Camp, Dressler, and McKee report of 1982 are an indication of the kinds of flood control options under consideration, there will be a major impact to the existing and continued operations at Huntington Park. The recommendations contained in the 1982 study included two flood containment options: a floodwall or a levee. Either option would require use of Huntington Park and would

significantly limit its recreation uses. In addition, impacts to the natural and potential cultural resources within this park may likewise be significant.

If a floodwall were placed in the general location shown in the 1982 study, it would effectively cut off the park from the neighborhood, limiting access to the park property on the Cameron Run side of the floodwall. This would not allow the park to be operated as an active recreation park. The park has already been used through the years as an attractive area for homeless camps and other undesirable activities. Limiting access and views into the park land may exacerbate these activities.

A levee through the park would also significantly impact park usage. Depending upon levee design it could impact a number of the existing facilities negatively. If the Park Authority were able to assist in levee design it is possible that the levee could be integrated as a green feature for the neighborhood. Additionally, the planned Cameron Run Stream Valley Trail could be integrated into the levee design. A levee may also remove portions of the park from the floodplain allowing for the construction of additional active recreation facilities.

Thank you again for the opportunity to participate in this project. If you have further questions, you are welcome to contact Senior Planner, Scott Sizer at (703) 324-8725 or ssizer@fairfaxcounty.gov.

Sincerely,

Timothy K. White
Chief Operating Officer

cc: Gerald Hyland, Board of Supervisors, Mount Vernon District
Gilbert S. McCutcheon, Park Authority Board, Mount Vernon District
Michael A. Kane, Director
Cindy Messinger, Director, Resource Management Division
Charles Bittenbring, Acting Director, Planning and Development Division
Randy Bartlett, Director, Stormwater Planning Division, DPWES
Carnylyn Lewis, Stormwater Engineer, SPD, DPWES
Sandy Stallman, Manager, Planning Branch
Scott Sizer, Senior Planner, Planning Branch

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Habitat Conservation Division
Chesapeake Bay Program Office
410 Severn Ave., Suite 107A
Annapolis, Maryland 21403

March 7, 2007

MEMORANDUM TO: Stacey Underwood
Planning & Environmental Services Branch

FROM: John Nichols JSN

SUBJECT: CENAB-PL-E, Huntington Community Flood Damage Reduction Study

This pertains to your request for information, dated February 5, 2007, regarding National Marine Fisheries Service (NMFS) resources that may be affected by the proposed Huntington Community Flood Damage Reduction Study in Fairfax County, Virginia.

There is documentation that Cameron Run supports spawning activity of alewife and blueback herring, from its confluence with Hunting Creek, upstream to the first gabion drop (grade-control) structure at stream mile 1.6 (Odom et al., 1988)*. It is also likely that white perch and yellow perch spawn within the same reach of Cameron Run.

Flood reduction alternatives considered under this study should be sensitive to the ecological and habitat requirements of anadromous fish in Cameron Run. Options considered should focus on conservation of tidal wetlands, wetland and forested riparian zone, and shallow water habitat by minimizing fill and/or dredging of such habitats. Additionally, instream work that will disrupt migratory, spawning, and/or nursery activities of these species should be restricted from February 15 through June 15.

Essential Fish Habitat (EFH)
The project area lies upstream of designated EFH and occurrence of federally managed species in the Potomac River watershed, and will not directly affect EFH and managed species. However, the project will affect ecologically important migratory prey species, such as alewife and blueback herring, which are consumed by bluefish and other managed species in the Chesapeake Bay and mid-Atlantic coastal waters. Therefore, your agency has the option of consulting with NMFS regarding secondary effects to federally managed species from impacts on the reproductive activities of important prey species, such as river herring. An EFH assessment submitted for this project should follow the standard protocol for EFH assessments; i.e., 1) your assessment should be a separate document, or distinct section of the NEPA document prepared for this project; and, 2) contain a complete project description, analysis of impacts on prey species, your agency's determination of effects on EFH, and mitigative measures applied by your agency.

Protected Resources
The endangered shortnose sturgeon (*Ancipenser brevirostrum*) has been determined by NMFS to be present in the tidal Potomac River, including the project vicinity. Therefore, you should contact Julie Crocker, (978) 281-9328, ext. 6530, or, (Julie.Crocker@NOAA.GOV) of our Protected Resources Division in Gloucester, MA, regarding your Section 7 consultation responsibilities for this project under the Endangered Species Act.

If you have any questions, you may contact me at (410) 267-5675, or John.Nichols@NOAA.GOV.

*Odom, Michael, R. J. Neves, and J. J. Ney. 1988. Use of Virginia's Tributaries of the Potomac River by Anadromous Fish. Final Report. Department of Fisheries & Wildlife Sciences, Virginia Polytechnic Institute and State University, Blacksburg, VA.

L. Preston Bryant, Jr.
Secretary of Natural Resources

Joseph H. Maroon
Director

COMMONWEALTH of VIRGINIA

DEPARTMENT OF CONSERVATION AND RECREATION

203 Governor Street
Richmond, Virginia 23219-2010
(804) 786-6124

MEMORANDUM

DATE: March 19, 2007

TO: JoAnn Grundy, USACE

FROM: Robert S. Munson, Planning Bureau Manager, DCR-DPRR

SUBJECT: DCR 07-039: DOA-Corps of Engineers-Huntington Community Flood Damage Reduction Study

Department of Conservation and Recreation (DCR) Flood Plain Management Section has reviewed the above project and submitted comments in a letter dated February 28, 007. Upon further review DCR would like to offer the following comments in addition to those already submitted.

The DCR's Division of Natural Heritage has searched its Biotics Data System for occurrences of natural heritage resources from the area outlined on the submitted map. Natural heritage resources are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.

Biotics documents the presence of natural heritage resources in the project area. However, due to the scope of the activity and the distance to the resources, we do not anticipate that this project will adversely impact these natural heritage resources.

Under a Memorandum of Agreement, DCR represents the Virginia Department of Agriculture and Consumer Services (VDACS) in comments regarding potential impacts on state-listed threatened and endangered plant and insect species. The current activity will not affect any documented state-listed plants or insects.

In addition, our files do not indicate the presence of any State Natural Area Preserves under DCR's jurisdiction in the project vicinity.

Any absence of data may indicate that the project area has not been surveyed, rather than confirm that the area lacks natural heritage resources. New and updated information is continually added to Biotics. Please contact DCR for an update on this natural heritage information if a significant amount of time passes before it is utilized.

The Virginia Department of Game and Inland Fisheries maintains a database of wildlife locations, including threatened and endangered species, trout streams, and anadromous fish waters, that may contain

information not documented in this letter. Their database may be accessed from www.dgif.virginia.gov/wildlifeinfo_map/index.html, or contact Shirl Dressler at (804) 367-6913.

Finally, all proposed land disturbance, clearing, or grading related to activity must comply with the *Chesapeake Bay Preservation Area Designation and Management Regulations* as enforced through locally adopted Chesapeake Bay Preservation Area (CBPA) ordinances and managed by Fairfax County.

Thank you for the opportunity to comment on this project.

Grundy, Jo Ann NAB02

From: Julie Crocker [Julie.Crocker@Noaa.Gov]
Sent: Monday, March 26, 2007 9:01 AM
To: Grundy, Jo Ann NAB02
Subject: Re: Shortnose Sturgeon & Sect 7

Follow Up Flag: Follow up
Flag Status: Yellow

Attachments: Julie.Crocker.vcf

Julie.Crocker.vcf
(370 B)

Hi Jo Ann.

Provided that all work would take place in Cameron Run and no in-water work was going to take place in the Potomac River, NMFS would determine that there are no listed species (i.e., shortnose sturgeon) likely to be present in the project area and that no section 7 consultation would be necessary.

Hope that helps,

Julie

Grundy, Jo Ann NAB02 wrote:

Dear Ms. Crocker,

I was advised to contact you in a letter from John Nichols, dated March 7, 2007. In this letter he mentions that shortnose sturgeon may be located in the proposed project vicinity. We're currently studying the feasibility of a flood damage reduction project along Cameron Run for the Huntington Community in Fairfax County, VA. Possible actions may include dredging the river and constructing a floodwall or levee. This portion of Cameron Run is approximately 1 mile upstream of the Potomac River. Please advise me on our Section 7 consultation responsibilities and if you would like a copy of the study notice, which was mailed to John last month.

Thank you in advance for your time,

Jo Ann Grundy
Biologist
U.S. Army Corps of Engineers
Planning Division - Civil Projects Development Branch
410-962-6136 (telephone)
410-962-4698 (fax)

INTERSTATE COMMISSION ON THE POTOMAC RIVER BASIN

51 Monroe Street, Suite PE-08
Rockville, MD 20850
(301) 984-1908
FAX (301) 984-5841
http://www.potomacriver.org

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Hamid Karimi

Vice Chairman
Robert M. Summers

District of Columbia
Hamid Karimi (*)
Lloyd Preslar
John Wennersten (a)
Anne D. Snodgrass (a)

Maryland
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Minny Pohlmann (a)

Pennsylvania
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Rep. Bob Bastian (a)
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Virginia
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Del. Marian Van Landingham (a)

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United States
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Frederick R. Eames (a)
Mel M. Baughman (a)
Howard Graeffe (a)

Executive Director
Joseph K. Hoffman

General Counsel
Robert L. Bolle

(*)--Executive Committee
(a)--Alternate

March 26, 2007

Ms. Stacey Underwood
CENAB-PL-E
Baltimore District , U.S. Army Corps of Engineers
P.O. Box 1715
Baltimore, MD 21203-1715

Dear Ms. Underwood:

This letter is in regard to Mr. Robert F. Gore's correspondence to the Interstate Commission on the Potomac River Basin (ICPRB) regarding the Huntington Community Flood Damage Reduction Study which we received on March 1, 2007. A search of our library and internal documents has not produced any documents specific to the project area; however, Mr. Jim Cummins, ICPRB Director for Living Resources, has visited this site in the past in considering potential restoration activities along Four Mile Run. We have the following general comments about the study area based upon Mr. Cummins' visit and review of materials provided with Mr. Gore's letter;

1) Modifications of the stream banks and channel should use the opportunity to help restore fish and wildlife habitat functions which have been compromised by both anthropogenic changes in hydrology and the existing flood protection structures. As you are aware, a variety of innovative stream enhancements have been employed in the Anacostia River watershed which could be incorporated in this study area. However, based upon the Anacostia experience, we advise that a different approach should be taken to more actively re-vegetate the area's stream banks. Riparian vegetation serves many important functions such as providing habitat, improving water quality, moderating stream water temperatures, and producing a natural looking end product which is more aesthetically pleasing. Lessons learned from the Anacostia River and many other projects have demonstrated that management decisions between riparian vegetation and hard structure flood conveyance should be balanced.

2) This area is currently used by anadromous fishes including the blueback and alewife herrings (Alosa aestivalis and A. pseudoharengus) which would benefit

The ICPRB is an interstate compact commission established by Congress in 1940. Its mission is the enhancement, protection, and conservation of the water resources of the Potomac River and its tributaries through regional and interstate cooperation. Represented by appointed commissioners, the ICPRB includes the District of Columbia, Maryland, Pennsylvania, Virginia, West Virginia, and the federal government.

from reconfiguration of the stream channel to support migration. Construction activities should be planned, designed, and coordinated to minimize disturbance during critical spawning and nursery time periods.

In closing, we are hopeful that these comments will be helpful and look forward to further communications. Please retain ICPRB on the mailing list for this project. Mr. Cummins will be our point of contact.

Sincerely,

Joseph K. Hoffman
Executive Director

cc J. Cummins

United States Department of Agriculture

NRCS

Natural Resources Conservation Service
1606 Santa Rosa Road, Suite 209
Richmond, VA 23229-5014

Telephone: 804/287-1691
Fax: 804/287-1737

March 30, 2007

Ms. Stacey Underwood
CENAB-PL-E
Department of the Army
Baltimore District, U.S. Army Corps of Engineers
P.O. Box 1715
Baltimore, MD 21203-1715

Dear Ms. Underwood:

In response to your letter of February 5, 2007 regarding the Huntington Community Flood Reduction Study in Fairfax County, NRCS did respond to a request from the City of Alexandria for Emergency Watershed Protection Program (EWP) assistance following the flood event of June, 2006. A team of three NRCS employees met with several City officials and one FEMA employee and visited potential sites on Cameron Run and Backlick Run on September 18, 2006 to determine eligibility for EWP program funds. After a review of proposed cobble and sediment removal plans by FEMA, the NRCS team concluded that there were no additional sites with blockages on these streams that would qualify for EWP funding. It was also concluded that future work by the City should involve channel maintenance. NRCS has not conducted any further evaluation or studies of these waterways or of the watersheds being considered by your agency.

We appreciate your inquiry regarding this matter and the opportunity to provide input. If NRCS can be of further assistance, please contact Wade Biddix, Assistant State Conservationist for Water Resources, at 804-287-1675.

Sincerely,

W. Ray Dusett

JOHN A. BRICKER ACTING
State Conservationist

Cc: Arlen Ricke, DC, Fairfax, VA
John Myers, Acting ASTC (Field Operations), Harrisonburg, VA
Wade Biddix, ASTC (Water Resources), Richmond, VA

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
Street address: 629 East Main Street, Richmond, Virginia 23219
Mailing address: P.O. Box 1105, Richmond, Virginia 23218
Fax (804) 698-4500 TDD (804) 698-4021
www.deq.virginia.gov

L. Preston Bryant, Jr.
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
1-800-592-5482

March 30, 2007

Ms. Stacey Underwood
CENAB-PL-E
P.O. Box 1715
Baltimore, Maryland 21203-1715

RE: Scoping comments for the preparation of a Flood Damage Reduction Study for the Huntington Community in Fairfax County.

Dear Ms. Underwood:

This letter is in response to the February 5, 2007 letter (received March 5) from Mr. Robert Gore requesting scoping comments for the preparation of the Huntington Community Flood Damage Reduction Study.

Project Description

According to the letter, the Corps will conduct the study to develop and evaluate various flood damage reduction alternatives for the Huntington Community, including dredging, flood proofing individual houses, floodwall construction, levee construction, and residential relocation (buyouts). Some of the tasks to be performed include environmental analysis, economic analysis, real estate assessment, hydrologic and hydraulic analysis, and geotechnical investigations.

The Department of Environmental Quality's (DEQ) Office of Environmental Impact Review (OEIR) does not coordinate scoping comments for the preparation of environmental studies. However, OEIR's roles with respect to the review of any future environmental documents that may be prepared for the implementation of the study recommendations are described below.

NEPA and Federal Consistency Review Authorities

First, DEQ-OEIR will coordinate Virginia's review of environmental documents prepared pursuant to the National Environmental Policy Act (NEPA) and comment to the Corps

on behalf of the Commonwealth. A similar review process pertains to federal consistency determinations submitted pursuant to the Coastal Zone Management Act (CZMA). If a federal consistency determination prepared for a direct federal action is included as part of a NEPA document (i.e., EA or EIS), there can be a single review taking 60 days as allowed by the Federal Consistency Regulations (15 CFR Part 930, §930.41(a)). We recommend this approach to save time and extra effort for the Corps as well as for the Commonwealth.

Alternatively, where federal financial assistance is provided to a locality to implement study recommendations, a consistency certification may be submitted to OEIR under federal consistency regulations for federal financial assistance to state and local governments, and Executive Order 12372, the Intergovernmental Review of Federal Programs (15 CFR Part 930, §930.90 et seq.). Federal consistency reviews for federal financial assistance to state and local governments may be performed "in house" by OEIR staff or may include the participation of other departments or agencies as appropriate. Typically in-house reviews can be performed in 30 days or less. However, proposals with significant environmental impacts and requiring a coordinated review may take more than 30 days.

Pursuant to the Coastal Zone Management Act of 1972, as amended, federal activities affecting Virginia's coastal resources or coastal uses must be consistent with the Virginia Coastal Resources Management Program (VCP) (see section 307(c)(1) of the Act and the Federal Consistency Regulations, 15 CFR Part 930, sub-part C, Consistency for Federal Agency Activities, or sub-part F, Consistency for Federal Assistance to State and Local Governments). This Office must be provided with a consistency determination/certification which involves an analysis of the activities in light of the Enforceable Policies of the VCP (first enclosure), and a commitment to comply with the Enforceable Policies. In addition, we invite your attention to the Advisory Policies of the VCP (second enclosure). A federal consistency determination/certification may be provided as part of any NEPA documentation developed for the proposal; as indicated above, we recommend this approach.

Section 930.39 of the Federal Consistency Regulations and Virginia's Federal Consistency Information Package available on DEQ's web site at http://www.deq.virginia.gov/eir/federal.html, give content requirements for a consistency determination/certification.

Environmental Review Participants

The following state and local Virginia agencies are likely to be included in the coordinated review of environmental documents submitted for a direct federal action (note: starred (*) agencies administer one or more of the Enforceable Policies of the Virginia Coastal Resources Management Program; see "Federal Consistency...," below):

Department of Environmental Quality:
- Office of Environmental Impact Review
- Northern Regional Office*
- Water Division
- Air Division*
- Waste Division

Department of Game and Inland Fisheries*
Department of Conservation and Recreation:
- Division of Chesapeake Bay Local Assistance*
- Division of Soil and Water Conservation*
- Division of Planning and Recreation Resources

Department of Health*
Marine Resources Commission*
Department of Historic Resources
Department of Mines, Minerals, and Energy
Department of Agriculture and Consumer Services
Department of Forestry
Department of Transportation
Northern Virginia Regional Commission
Fairfax County

In order to ensure an effective coordinated review of any NEPA document and the consistency determination, we may require up to 20 copies of the document when it is published. The document should include one or more U.S. Geological Survey topographic maps as part of its information. While this Office does not participate in scoping efforts beyond the advice given herein, other agencies may independently provide scoping comments to you concerning the preparation of a NEPA document and consistency determination/certification for the proposed project.

If you have questions about the environmental review process, or the federal consistency review process, please feel free to call me at (804) 698-4339.

I hope this information is helpful to you.

Sincerely,

John E. Fisher
Office of Environmental Impact Review

cc: Tom Faha, DEQ-TRO
Kotur S. Narasimhan, DEQ-Air
Paul Kohler, DEQ-Waste
Dave Davis, DEQ-Water Protection
Andrew K. Zadnik, DGIF

Robbie Rhur, DCR
Susan Douglas, VDH
Tony Watkinson, MRC
Ethel R. Eaton, DHR
Mary Stanley, VDOT
Keith Tignor, VDACS
Matt Heller, DMME
Todd Groh, VDF
Anthony Griffin, Fairfax County
G. Mark Gibb, Northern Virginia Regional Commission

COMMONWEALTH of VIRGINIA

DAVID S. EKERN, P.E.
COMMISSIONER

DEPARTMENT OF TRANSPORTATION
WOODROW WILSON BRIDGE PROJECT
2901 EISENHOWER AVENUE
ALEXANDRIA, VA 22314
Phone (703) 329-0300
Fax (703) 329-3741

January 7, 2008

Stacey M. Underwood, P.E.
U.S. Army Corps of Engineers
Baltimore District, Planning Division
P.O. Box 1715
Baltimore, MD 21203-1715

Ref: Woodrow Wilson Bridge Project

Subject: Email on Huntington Project

Dear Ms. Underwood,

We have reviewed your e-mail dated December 20, 2007 (copy enclosed) requesting concurrence with a statement to be included in your proposed levee presentation for the January 15, 2008 public meeting. Your statement proposed by US Army Corps of Engineers' (USACOE) indicates "We have been coordinating closely with VDOT - the levee would have no adverse impact on VDOT infrastructure."

Our hydraulic engineers in the Virginia Department of Transportation (VDOT) Central Office and in the Woodrow Wilson Bridge project (WWB) have reviewed the most recent hydraulic models you have provided to us, in order to determine the validity of such a statement. Because we do not have background data supporting your hydraulic models, we cannot reach a conclusion that the levee will have no adverse impact on VDOT infrastructure. Therefore, we do not concur with the statement and ask that you not use it in your presentation.

VDOT will continue to cooperate with you and Fairfax County and appreciates the opportunity to review and comment on your hydraulic models. If you have any questions, please feel free to contact me at (703) 329-0300.

Sincerely,

Ronaldo T. Nicholson, P.E.
Regional Transportation Program Director

Enclosure

cc: Randy Bartlett, Fairfax County, DPWES

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

REPLY TO
ATTENTION OF:

October 11, 2007

Northern Virginia Regulatory Section
NAO-2007-03706 (Huntington Wetlands)

U.S. Army Corps of Engineers
Baltimore District
Planning Division
Attn: Ms. Jo Ann Grundy
P.O. Box 1715
Baltimore, Maryland 21203-1715

Gentlemen:

This is regarding your request for verification of a jurisdictional wetlands delineation. The limits of the jurisdictional wetlands regulated under Section 404 of the Clean Water Act (33 C.F.R. 1344) are shown on the drawing entitled "Huntington Wetlands", dated July 2007, submitted to the Corps by the U.S. Army Corps of Engineers, Baltimore District, Planning Division. Nontidal and tidal wetlands and/or waters have been identified on the site. This jurisdictional determination is valid for a period of five years from the date of this letter.

Our basis for this determination is the application of the Corps' 1987 Wetland Delineation Manual and the positive indicators of wetland hydrology, hydric soils, and hydrophytic vegetation. The wetland is a water of the United States and is part of a tributary system to interstate waters (33 CFR 328.3(a)). These waters meet the Corps' definition of waters of the United States, are part of a tributary system to interstate waters (33 CFR 328.3 (a)) and have an ordinary high water mark.

Please be advised that work in the jurisdictional areas may require a Department of Army permit and possibly authorization by State and local authorities. Please note that this is simply a jurisdictional determination for the subject property. This letter does not authorize the placement of dredged or fill material or mechanized land clearing in wetlands or waters of the United States. Proposed work on the property, which would potentially result in the placement of dredged or fill material into wetlands or waters of the United States, would be subject to review by the Corps and any appropriate State and local agencies prior to the start of any fill activities. The term discharge of dredged material is defined as "any addition, including any redeposit, of dredged material, including excavated material, into waters of the United States which is incidental to any activity including mechanized landclearing, ditching, channelization, or other excavation (33 CFR Part 232.2(1)(iii)).

A condition of this jurisdictional determination is that you maintain the locations of the wetland delineation flags as they are now situated on the site. Once a plan of development is formulated, we recommend that you have the actual wetland boundary located by survey and superimposed on any future proposed plan to determine whether jurisdictional wetlands would be impacted by the proposed development, and to determine whether a Department of the Army permit would be required.

This letter contains an approved jurisdictional determination for your subject site. If you object to this determination, you may request an administrative appeal under Corps regulations at 33 CFR Part 33 1. Enclosed you will find a Notification of Appeal Process (NAP) fact sheet and Request for Appeal (RFA) form. If you request to appeal this determination you must submit a completed RFA form to the North Atlantic Division Office at the following address:

James Haggerty, Regulatory Appeals Review Officer
Phone: (718) 765-7150 Fax (718) 765-7210
United States Army Corps of Engineers North Atlantic Division
Building 301, General Lee Avenue
Fort Hamilton Military Community
Brooklyn, NY 11252

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 C.F.R. part 33 1.5, and that it has been received by the Division Office within 60 days of the date of the NAP. Should you decide to submit an RFA form, it must be received at the above address by ****December 11, 2007.**** It is not necessary to submit an RFA form to the Division office if you do not object to the determination in this letter.

If you have any questions, please contact Ms. Theresita Crockett-Augustine in the Northern Virginia Field Office at 18139 Triangle Plaza, Suite 213, Dumfries, Virginia 22026, (703) 221-9736, for and on behalf of, Keith B. Lockwood, Chief, Northern Virginia Regulatory Section.

Sincerely,

Theresita Crockett-Augustine
Project Manager
Northern Virginia Regulatory Section

Copy Furnished: DEQ, Woodbridge.

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: U.S. Army Corps of Engineers, Baltimore District, Planning Division	File Number: NAO-2007-03706	Date: 10-11-2007
Attached is:		See Section below
	INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)	A
	PROFFERED PERMIT (Standard Permit or Letter of permission)	B
	PERMIT DENIAL	C
X	APPROVED JURISDICTIONAL DETERMINATION	D
	PRELIMINARY JURISDICTIONAL DETERMINATION	E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://usace.army.mil/inet/functions/cw/cecwo/reg or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.

- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.

- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.

- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact:

Theresita Crockett Augustine
Environmental Scientist
Phone: (703) 221-9736
Fax: (703) 221-6575
Email: theresita.m.crockett-augustine@nao02.usace.army.mil

If you only have questions regarding the appeal process you may also contact:

United States Army Corps of Engineers
North Atlantic Division
ATTN: James Haggerty, Regulatory Appeals Review Officer
Building 301, General Lee Avenue
Fort Hamilton Military Community
Brooklyn, NY 11252
Phone: (718) 765-7150

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.		
_____ Signature of appellant or agent.	Date:	Telephone number:

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

REPLY TO
ATTENTION OF:

October 15, 2007

Supplemental Preapplication Information

1. A search of the Virginia Department of Historic Resources Data Sharing System revealed the following:

__X__No known historic properties are located on the property.

____The following known architectural resources are located on the property (see attached map and listing)

____ The following known archaeological resources are located on the property (see attached map and listing)

2. A search of the Virginia Department of Conservation and Recreation data revealed the following:

__X__No known populations of federally listed threatened or endangered species are located on the property.

____The property is within a known concentration area for the following species:

3. We suggest the following avoidance, minimization, and compensatory mitigation measures be incorporated into any plans you prepare for the property:

Please note this information is being provided to you based on the preliminary data you submitted to the Corps relative to project boundaries and project plans. Consequently, these findings and recommendations are subject to change if the project scope changes or new information becomes available and the accuracy of the data. Lastly, the Corps only consulted the federally-listed species in the Virginia Department of Conservation & Recreation's database. You may also want to consult the Virginia Department of Game and Inland Fisheries' database at www.dgif.va.state.us

APPENDIX B. WETLAND DELINEATION

2007 WETLAND DELINEATION

1.0 INTRODUCTION

1.1 STUDY PURPOSE

The purpose of this investigation was for the U.S. Army Corps of Engineers, Baltimore District (Corps) to confirm and adjust the waters and wetlands delineated in 1999 within the Huntington Flood Damage Reduction Focus Area to assist with the plan and design of the project. These waters and wetlands were previously delineated for the Woodrow Wilson Bridge Project (USDOT, 2000). This purpose was achieved through (1) a review of the delineation and report from the 1999 delineation; (2) a site visit by the U.S. Army Corps of Engineers, Baltimore District, Planning Division and Norfolk District, Regulatory Branch to confirm and make adjustments to the waters and wetlands delineation where necessary; and (3) a report and map of the findings to support a Jurisdictional Determination. The delineation conducted in 1997 and 1999 and the confirmation and adjustments of wetlands conducted in 2007 followed the 1987 *Corps of Engineers Wetland Delineation Manual*.

1.2 STUDY AREA

The study area for this investigation is the Huntington Flood Damage Reduction Study Focus Area. The study area is bounded by Cameron Run to the north, Huntington Avenue to the south, Fenwick Avenue to the west and Foley Street and the Riverside Apartments. The majority of the area is residential and Huntington Park is located to the north of the homes. Huntington Park consists of a baseball field, mowed lawns and fill areas, with a wooded buffer between the park and Cameron Run. Wetlands exist within the wooded buffer along Cameron Run and along the southern bank of Cameron Run.

2.0 METHODS

2.1 DATA COLLECTION AND ANALYSIS

The Corps reviewed the 1997 and 1999 wetland delineations completed for the Woodrow Wilson Bridge Project for the location and descriptions of wetland areas within the Huntington Flood Damage Reduction Focus Area. The Corps also collected information from USGS topographic quadrangles (USGS, 1983), USDA soil surveys (USDA, 1963; USDA, 2008), aerial photography (Aerials Express, 2004), and U.S. Fish and Wildlife Service's National Wetland Inventory (NWI) maps (USFWS, 2005) to further assess the potential for wetlands to occur within the study area. A composite map was created in GIS by overlaying the collected data, including the 1997 and 1999 wetland delineation, aerial photography, topography, soils and NWI data. Previously identified wetlands and potential wetland areas were identified to be verified in the field.

2.2 WETLAND DELINEATION

The wetland delineations in 1997, 1999 and 2007 were performed pursuant to the 1987 *Corps of Engineers Wetland Delineation Manual* and subsequent guidance memoranda, as Federal and state agencies require use of these documents for jurisdictional investigations. The 2007 delineation field work was conducted on 23 July 2007 by the Corps, Baltimore District Planning Division and Norfolk District Regulatory Branch. Previously delineated wetland boundaries were confirmed or adjusted and marked with flagging where necessary.

2.3 GLOBAL POSITIONING SYSTEM (GPS) METHODOLOGY

Updated wetland boundaries were surveyed using Global Positioning System (GPS) technology. The objective of the GPS survey was to collect location data for each new wetland delineation flag. This survey horizontally references the North American Datum of 1983 (NAD83), Virginia North State Plane Coordinate System (Zone 4501). The survey utilized the Trimble GeoXT handheld GPS system for GIS data collection yielding sub-meter horizontal accuracy. This data was then transferred into ArcGIS 9.3 for analysis and mapping.

3.0 FINDINGS

3.1 WOODROW WILSON BRIDGE PROJECT WETLAND DELINEATION

Two wetland areas were delineated within the Huntington Flood Damage Reduction Focus Area during the 1997 and 1999 wetland delineations (see Attachment 1 for a map of the wetland delineation and datasheets). Both of these wetlands are along the southern bank of Cameron Run. Wetland 12C is located on the northwestern side of Huntington Park and is a small circular wetland that is approximately 0.54 acres. Wetland 12C is classified as a palustrine, forested, broadleaf deciduous, semi-permanently flooded, tidal wetland. Wetland 13 is a complex of wetlands that includes Wetland 13A and Wetland 13B. This wetland complex is located on the northeastern corner of Huntington Park. Wetland 13 surrounds Wetlands 13A and 13B and is classified as a palustrine, forested, broadleaf decidous, temporarily flooded, tidal wetland. Wetlands 13A and 13B are immediately adjacent to Cameron Run and are classified as palustrine, emergent, temporarily flooded, tidal wetland.

3.2 2007 WETLAND DELINEATION

The two wetland areas identified in 1997 and 1999 were observed during the 2007 delineation, but have decreased in size with portions of these wetlands converted to uplands (see Attachment 2 – map entitled "2007 Wetland Delineation"). Photographs and datasheets for these two wetland areas are attached as Attachment 3 and Attachment 4, respectively.

Wetland 12C shifted from a circular wetland to a linear feature that is influenced by tides in Cameron Run from the Potomac River. At the time of the visit, this wetland was flagged to be approximately 0.006 acres (264 square feet), which is a significant decrease in area since 1997 and 1999. This wetland is still a palustrine forested wetland and is dominated by red maple (*Acer rubrum*), box elder (*Acer negundo*), green ash (*Fraxinus pennsylvanicum*), and spotted ladysthumb (*Polygonum persicaria*). Evidence of wetland hydrology included water marks on trees, sediment deposits and wetland drainage patterns. The soils are mapped as hydric, and showed low chroma colors with common and distinct mottles. Saturated soils were observed at a depth of 12 inches.

A large portion of Wetland 13 also converted to uplands, leaving a small portion of Wetland 13 disconnected from the larger main complex. The palustrine forested Wetland 13 remains forested but has decreased significantly in size and is approximately 1.8 acres, including the disconnected portion. Wetland 13A is approximately 1.3 acres and Wetland 13B is approximately 0.9 acres. It appears that while the forested portion of the wetland complex has decreased in size, the emergent wetland areas may have slightly increased over time. The forested wetland, Wetland 13, is dominated by green ash, with red maple, box elder, American sycamore (*Platanus occidentalis*) and silver maple (*Acer saccharinum*) scattered throughout.

Evidence of wetland hydrology within the forested wetland includes water marks on trees, sediment deposits and wetland drainage patterns. A drainage channel from a pipe discharging stormwater into Wetland 13 is apparent from the long finger of Wetland 13 that extends south into the park on the southwestern side of the wetland. The soils are mapped as hydric, and showed low chroma colors with common and distinct mottles. Wetlands 13A and 13B are immediately adjacent to Cameron Run and are still surrounded by the forested Wetland 13. There is a small stretch of Wetland 13 that divides these two palustrine emergent wetlands. The eastern edge of Wetland 13 is lined by a stormwater drainage channel. Dominant species in both Wetland 13A and 13B are the same and include spatterdock/yellow pond-lily (*Nuphar advena*), rice cutgrass (*Leersia oryzoides*), spotted ladysthumb, and jewelweed (*Impatiens capensis*). At the time of the visit, both Wetlands 13A and 13B were inundated. These wetlands are influenced by tides in Cameron Run from the Potomac River.

4.0 CONCLUSIONS

Wetlands 12C, 13, 13A and 13B are all jurisdictional wetlands under Section 404 of the Clean Water Act. A letter of Jurisdictional Determination is attached (Attachment 5), exerting regulatory authority over these wetlands by the Corps, Norfolk District, Regulatory Branch. Any activity that would result in the discharge or placement of fill or any mechanized land clearing activities within these wetland areas will require a permit from the Department of the Army and possibly authorizations from the State and local authorities.

5.0 REFERENCES

Aerials Express. 2004. Aerial Photography, Washington, D.C.

U.S. Department of Agriculture (USDA). 1963. Soil Survey of Fairfax County, Virginia. Soil Conservation Service in cooperation with Virginia Agricultural Experiment Station and Fairfax County, Virginia.

USDA. 2008. Soil Data Mart, VA059 – Fairfax County, Virginia. Natural Resources Conservation Service.

U.S. Department of Transportation (USDOT). May 2000. Woodrow Wilson Bridge Project, Final Supplemental Impact Statement/Section 4(f) Evaluation. Federal Highway Administration, Virginia Department of Transportation, Maryland State Highway Administration, District of Columbia Department of Public Works.

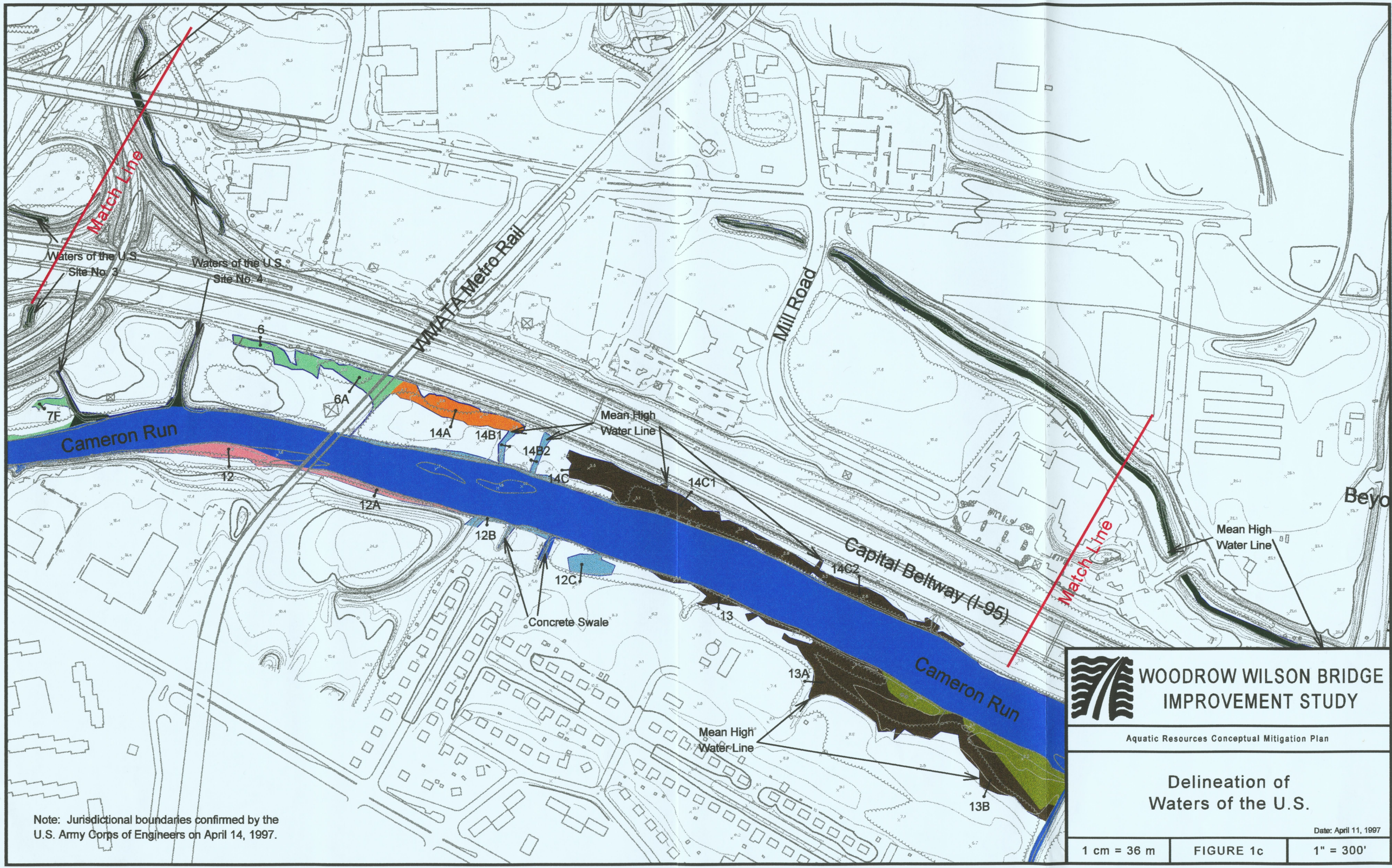
U.S. Fish and Wildlife Service (USFWS). 2005. National Wetland Inventory (NWI) mapping. Washington, D.C.

U.S. Geological Survey (USGS). 1983. Alexandria, VA. – D.C. – MD. Quadrangle. 7.5-minute topographic series. Scale 1:24,000. 1 Sheet. U.S. Department of the Interior.

ATTACHMENT 1 – MAPS AND DATASHEETS FROM WOODROW WILSON BRIDGE PROJECT – 1997 AND 1999 WETLAND DELINEATION

FIGURE 1a

DESCRIPTION	COWARDIN CLASS	COLOR
TIDAL FORESTED		
Palustrine, forested, broadleaf deciduous, seasonally flooded-tidal	PFO1R	
Palustrine, forested, broadleaf deciduous, semipermanently flooded-tidal	PFO1T	
Palustrine, forested, broadleaf deciduous, temporarily flooded-tidal	PFO1S	
TIDAL SCRUB-SHRUB		
Palustrine, scrub shrub, broadleaf, seasonally flooded-tidal	PSS1R	
Palustrine, scrub shrub, broadleaf, semipermanently flooded-tidal	PSS1T	
TIDAL EMERGENT		
Palustrine, emergent, persistent, semipermanently flooded-tidal	PEM1T	
Palustrine, emergent, nonpersistent, semipermanently flooded-tidal	PEM2T	
Palustrine, emergent, nonpersistent, permanently flooded-tidal	PEM2V	
Palustrine, emergent, persistent, temporarily flooded-tidal	PEM1S	
Palustrine, emergent, persistent, seasonally flooded-tidal	PEM1R	
TIDAL AQUATIC BED		
Riverine, tidal, aquatic bed	R1AB (SAV)	
TIDAL FLAT		
Riverine, tidal flat	R1FL	
RIVERINE (Waters of the U.S.)		
Riverine, tidal, open water	R1OW/UB (Potomac River)	
Riverine, tidal, unconsolidated shore	R1US	
Riverine, lower perenial, stream bed	R2SB	
Riverine, upper perenial, stream bed	R3SB	
Riverine, lower perenial, modified channel (concrete)	R2MODC	
NON TIDAL FORESTED		
Palustrine, forested, broadleaf deciduous, temporarily flooded	PFO1A	
Palustrine, forested, broadleaf deciduous, seasonally flooded	PFO1C	
NON TIDAL EMERGENT		
Palustrine, emergent, persistent, seasonally flooded	PEM1C	



Note: Jurisdictional boundaries confirmed by the U.S. Army Corps of Engineers on April 14, 1997.

WOODROW WILSON BRIDGE IMPROVEMENT STUDY

Aquatic Resources Conceptual Mitigation Plan

Delineation of Waters of the U.S.

Date: April 11, 1997

1 cm = 36 m	FIGURE 1c	1" = 300'

CORPS DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Woodrow Wilson Bridge Improvement Study
Applicant: FHWA, VDOT, MSHA, DCDPW
Investigator: Eileen Straughan
Do Normal Circumstances exist on the site? ☒ Yes ☐ No
Is the site significantly disturbed (Atypical Situation)? ☐ Yes ☒ No
Is the area a Problem Area? ☐ Yes ☒ No

Date: April 24, 1997
County: Fairfax
State: Virginia
Community ID:
Transect ID:
Plot ID: 12c wetland

VEGETATION

Dominant Plant Species	Stratum	Indicator
Fraxinus pennsylvanica	Tree	FACW
Acer rubrum	Tree	FAC
Acer rubrum	Sapling	FACW+
Impatiens capensis	Herb	FACW
Eulalia viminea	Herb	FAC
Chasmanthium laxum	Herb	FAC

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 100.00%

Remarks
Sample area satisfies hydrophytic vegetation criterion.

HYDROLOGY

Recorded Data (explain in remarks)
☐ Stream, Lake or Tide Gauge
☐ Aerial Photographs
☐ Other
☒ No Recorded Data Available

Field Observations
Depth of surface water 2 (in.)
Depth to free water in pit surface (in.)
Depth to saturated soil surface (in.)

Primary Wetland Hydrology Indicators
☒ Inundated
☒ Saturated in Upper 12 Inches
☒ Water Marks
☐ Drift Lines
☒ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Wetland Hydrology Indicators
☐ Oxidized Root Channels in Upper 12"
☐ Water-Stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (Explain in Remarks)

Remarks
Field indicators of supporting wetland hydrology observed; satisfies criterion.

CORPS DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Woodrow Wilson Bridge Improvement Study	Date: April 24, 1997
Applicant: FHWA, VDOT, MSHA, DCDPW	County: Fairfax
Investigator: Eileen Straughan	State: Virginia
Do Normal Circumstances exist on the site? ☒ Yes ☐ No	Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐ Yes ☒ No	Transect ID:
Is the area a Problem Area? ☐ Yes ☒ No	Plot ID: 12c wetland

SOILS

Soil Map Unit Name: Mixed alluvial — Drainage Class: unknown

Soil Tax Subgroup: Unknown — Confirm Map Type: ☒ Yes ☐ No

Soil Profile Description:

Depth (inches)	Horizon	Matrix Color (munsell moist)	Mottle Colors (munsell moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-4	A	2.5Y 4/2	10YR 5/8	com., med, distinct	clay loam, saturated
4-18	B	2.5Y 4/1	10YR 5/8	com., med, distinct	clay loam, saturated

Soil Indicators

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☒ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Hydric Soils List
- ☐ Other (explain in Remarks)

Remarks

Indicators of reducing soil conditions; area satisfies hydric soils criterion.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? ☒ Yes ☐ No

Wetland Hydrology Present? ☒ Yes ☐ No

Hydric Soils Present? ☒ Yes ☐ No

Is this Sampling within a Wetland? ☒ Yes ☐ No

Remarks

Sample area does satisfy three mandatory wetland criteria.

CORPS DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Woodrow Wilson Bridge Improvement Study

Applicant: FHWA, VDOT, MSHA, DCDPW

Investigator: Eileen Straughan

Do Normal Circumstances exist on the site? ☒ Yes ☐ No

Is the site significantly disturbed (Atypical Situation)? ☐ Yes ☒ No

Is the area a Problem Area? ☐ Yes ☒ No

Date: April 10, 1997

County: FAirfax

State: Virginia

Community ID:

Transect ID:

Plot ID: 12c upland

VEGETATION

Dominant Plant Species	Stratum	Indicator
Betula nigra	Tree	FACW
Acer negundo	Sapling	FAC+
Acer negundo	Shrub	FAC+
Acer negundo	Herb	FAC+
Lonicera japonica	Herb	FAC-
Impatiens capensis	Herb	FACW
Allium canadense	Herb	FACU

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 71.43%

If the FAC-neutral test is used, this data provides a secondary indicator of wetland hydrology

Remarks

Sample area satisfies hydrophytic vegetation criterion.

HYDROLOGY

Recorded Data (explain in remarks)

☐ Stream, Lake or Tide Gauge
☐ Aerial Photographs
☐ Other
☒ No Recorded Data Available

Field Observations

Depth of surface water none (in.)

Depth to free water in pit >18 (in.)

Depth to saturated soil > 18 (in.)

Primary Wetland Hydrology Indicators

☐ Inundated
☐ Saturated in Upper 12 Inches
☐ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Wetland Hydrology Indicators

☐ Oxidized Root Channels in Upper 12"
☐ Water-Stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (Explain in Remarks)

Remarks

No indicators of supporting wetland hydrology observed; does not satisfy criterion.

CORPS DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Woodrow Wilson Bridge Improvement Study	Date: April 10, 1997
Applicant: FHWA, VDOT, MSHA, DCDPW	County: FAirfax
Investigator: Eileen Straughan	State: Virginia
Do Normal Circumstances exist on the site? ☒ Yes ☐ No	Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐ Yes ☒ No	Transect ID:
Is the area a Problem Area? ☐ Yes ☒ No	Plot ID: 12c upland

SOILS

Soil Map Unit Name: Mixed alluvial — Drainage Class: unknown

Soil Tax Subgroup: Unknown — Confirm Map Type: ☒ Yes ☐ No

Soil Profile Description:

Depth (inches)	Horizon	Matrix Color (munsell moist)	Mottle Colors (munsell moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-4	A	10YR 4/2			silt loam, dry
4-18	B	10YR 4/4			clay loam , moist

Soil Indicators

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Hydric Soils List
- ☐ Other (explain in Remarks)

Remarks

No field indicators of reducing soil conditions present. Soil does not satisfy hydric soil criterion.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? ☒ Yes ☐ No

Wetland Hydrology Present? ☐ Yes ☒ No

Hydric Soils Present? ☐ Yes ☒ No

Is this Sampling within a Wetland? ☐ Yes ☒ No

Remarks

Sample area does not satisfy three mandatory wetland criteria.
The upland data plot for 12b up and 12c up are the same. Upland sample was taken on the piece of upland separating the two adjacent wetland areas.

CORPS DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Woodrow Wilson Bridge Improvement Study	Date: April 24, 1997
Applicant: FHWA, VDOT, MSHA, DCDPW	County: Fairfax
Investigator: Eileen Straughan	State: Virginia
Do Normal Circumstances exist on the site? ☒ Yes ☐ No	Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐ Yes ☒ No	Transect ID:
Is the area a Problem Area? ☐ Yes ☒ No	Plot ID: 13 wetland

VEGETATION

Dominant Plant Species	Stratum	Indicator
Acer negundo	Tree	FAC:
Acer rubrum	Sapling	FAC
Acer negundo	Sapling	FAC+
Cornus amomum	Shrub	FACW
Lonicera japonica	Herb	FAC-

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 80.00%

If the FAC-neutral test is used, this data provides a secondary indicator of wetland hydrology

Remarks

Sample area satisfies hydrophytic vegetation criterion.

HYDROLOGY

Recorded Data (explain in remarks)

- ☐ Stream, Lake or Tide Gauge
- ☐ Aerial Photographs
- ☐ Other
- ☒ No Recorded Data Available

Field Observations

Depth of surface water 2 (in.)

Depth to free water in pit surface (in.)

Depth to saturated soil surface (in.)

Primary Wetland Hydrology Indicators

- ☒ Inundated
- ☒ Saturated in Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Wetland Hydrology Indicators

- ☐ Oxidized Root Channels in Upper 12"
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

Remarks

Field indicators of supporting wetland hydrology observed; satisfies criterion.

CORPS DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Woodrow Wilson Bridge Improvement Study	Date: April 24, 1997
Applicant: FHWA, VDOT, MSHA, DCDPW	County: Fairfax
Investigator: Eileen Straughan	State: Virginia
Do Normal Circumstances exist on the site? ☒ Yes ☐ No	Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐ Yes ☒ No	Transect ID:
Is the area a Problem Area? ☐ Yes ☒ No	Plot ID: 13 wetland

SOILS

Soil Map Unit Name: Unmapped

Drainage Class: unknown

Soil Tax Subgroup: Unknown

Confirm Map Type: ☐ Yes ☒ No

Soil Profile Description:

Depth (inches)	Horizon	Matrix Color (munsell moist)	Mottle Colors (munsell moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-4	A	10YR 3/1	none	none	clay loam, saturated
4-18	B	5GY 3/1	none	none	clay loam, saturated

Soil Indicators

- ☐ Histosol
- ☐ Histic Epipedon
- ☒ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☒ Reducing Conditions
- ☒ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Hydric Soils List
- ☐ Other (explain in Remarks)

Remarks

Sulfidic odor in surface layer. Field indicators of reducing soil conditions; sample area satisfies hydric soil criterion.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? ☒ Yes ☐ No

Wetland Hydrology Present? ☒ Yes ☐ No

Hydric Soils Present? ☒ Yes ☐ No

Is this Sampling within a Wetland? ☒ Yes ☐ No

Remarks

Sample area satisfies all three mandatory wetland criteria.

CORPS DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Woodrow Wilson Bridge Improvement Study	Date: April 10, 1997
Applicant: FHWA, VDOT, MSHA, DCDPW	County: Fairfax
Investigator: Eileen Straughan	State: Virginia
Do Normal Circumstances exist on the site? ☒ Yes ☐ No	Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐ Yes ☒ No	Transect ID:
Is the area a Problem Area? ☐ Yes ☒ No	Plot ID: 13 upland

VEGETATION

Dominant Plant Species	Stratum	Indicator
Robinia pseudoacacia	Tree	FACU-
Platanus occidentalis	Tree	FACW-
Robinia pseudoacacia	Herb	FACU-
Lonicera japonica	Herb	FAC-
Geum canadense	Herb	FACU

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 20.00%

If the FAC-neutral test is used, this data does NOT provide a secondary indicator of wetland hydrology

Remarks

Sample area does not satisfy hydrophytic vegetation criterion.

HYDROLOGY

Recorded Data (explain in remarks)

- ☐ Stream, Lake or Tide Gauge
- ☐ Aerial Photographs
- ☐ Other
- ☒ No Recorded Data Available

Field Observations

Depth of surface water none (in.)

Depth to free water in pit >18 (in.)

Depth to saturated soil > 18 (in.)

Primary Wetland Hydrology Indicators

- ☐ Inundated
- ☐ Saturated in Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Wetland Hydrology Indicators

- ☐ Oxidized Root Channels in Upper 12"
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

Remarks

No indicators of supporting wetland hydrology observed; does not satisfy criterion.

CORPS DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Woodrow Wilson Bridge Improvement Study	Date: April 10, 1997
Applicant: FHWA, VDOT, MSHA, DCDPW	County: Fairfax
Investigator: Eileen Straughan	State: Virginia
Do Normal Circumstances exist on the site? ☒ Yes ☐ No	Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐ Yes ☒ No	Transect ID:
Is the area a Problem Area? ☐ Yes ☒ No	Plot ID: 13 upland

SOILS

Soil Map Unit Name: Unmapped — Drainage Class: unknown

Soil Tax Subgroup: Unknown — Confirm Map Type: ☐ Yes ☐ No

Soil Profile Description:

Depth (inches)	Horizon	Matrix Color (munsell moist)	Mottle Colors (munsell moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-18	B	10YR 4/4	none		sandy loam,moist

Soil Indicators

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Hydric Soils List
- ☐ Other (explain in Remarks)

Remarks

No field indicators of reducing soil conditions present. Sample area does not satisfy hydric soil criterion.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? ☐ Yes ☒ No

Wetland Hydrology Present? ☐ Yes ☒ No

Hydric Soils Present? ☐ Yes ☒ No

Is this Sampling within a Wetland? ☐ Yes ☒ No

Remarks

Sample area does not satisfy all three mandatory wetland criteria.

CORPS DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Woodrow Wilson Bridge Improvement Study	Date: April 24, 1997
Applicant: FHWA, VDOT, MSHA, DCDPW	County: Fairfax
Investigator: Eileen Straughan	State: Virginia
Do Normal Circumstances exist on the site? ☒ Yes ☐ No	Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐ Yes ☒ No	Transect ID:
Is the area a Problem Area? ☐ Yes ☒ No	Plot ID: 13a wetland

VEGETATION

Dominant Plant Species	Stratum	Indicator
Acer rubrum	Tree	FAC
Platanus occidentalis	Tree	FACW-
Nyssa sylvatica	Sapling	FACW+
Toxicodendron radicans	Vine	FAC
Toxicodendron vernix	Shrub	OBL
Ulmus americana	Shrub	FACW-
Lonicera japonica	Herb	FAC-

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 85.71%

If the FAC-neutral test is used, this data provides a secondary indicator of wetland hydrology

Remarks

Sample area satisfies hydrophytic vegetation criterion.

HYDROLOGY

Recorded Data (explain in remarks)

- ☐ Stream, Lake or Tide Gauge
- ☐ Aerial Photographs
- ☐ Other
- ☒ No Recorded Data Available

Field Observations

Depth of surface water none (in.)

Depth to free water in pit 5 (in.)

Depth to saturated soil surface (in.)

Primary Wetland Hydrology Indicators

- ☐ Inundated
- ☒ Saturated in Upper 12 Inches
- ☒ Water Marks
- ☒ Drift Lines
- ☒ Sediment Deposits
- ☒ Drainage Patterns in Wetlands

Secondary Wetland Hydrology Indicators

- ☐ Oxidized Root Channels in Upper 12"
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

Remarks

Field indicators of supporting wetland hydrology observed; satisfies criterion.
Area inundated by daily tide.

CORPS DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Woodrow Wilson Bridge Improvement Study	Date: April 24, 1997
Applicant: FHWA, VDOT, MSHA, DCDPW	County: Fairfax
Investigator: Eileen Straughan	State: Virginia
Do Normal Circumstances exist on the site? ☒ Yes ☐ No	Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐ Yes ☒ No	Transect ID:
Is the area a Problem Area? ☐ Yes ☒ No	Plot ID: 13a wetland

SOILS

Soil Map Unit Name: Mixed alluvial

Drainage Class: unknown

Soil Tax Subgroup: Unknown

Confirm Map Type: ☒ Yes ☐ No

Soil Profile Description:

Depth (inches)	Horizon	Matrix Color (munsell moist)	Mottle Colors (munsell moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2	A	10YR 4/3	7.5YR 4/6	few, med., faint	silt loam, part. decomposed org. matter
2-16	B	5Y 3/1	10YR 4/4	few, course, prominent	silt loam, saturated
16-21	B2	5Y 6/2			sandy loam, saturated

Soil Indicators

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☒ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Hydric Soils List
- ☐ Other (explain in Remarks)

Remarks

Sample area satisfies hydric soils criterion.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? ☒ Yes ☐ No

Wetland Hydrology Present? ☒ Yes ☐ No

Hydric Soils Present? ☒ Yes ☐ No

Is this Sampling within a Wetland? ☒ Yes ☐ No

Remarks

Sample area does satisfy three mandatory wetland criteria.

CORPS DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Woodrow Wilson Bridge Improvement Study
Applicant: FHWA, VDOT, MSHA, DCDPW
Investigator: Eileen Straughan
Do Normal Circumstances exist on the site? ☒ Yes ☐ No
Is the site significantly disturbed (Atypical Situation)? ☐ Yes ☒ No
Is the area a Problem Area? ☐ Yes ☒ No

Date: April 11, 1997
County: City of Alexandria
State: Virginia
Community ID:
Transect ID:
Plot ID: 13a upland

VEGETATION

Dominant Plant Species	Stratum	Indicator
Quercus sp	Tree	UNK
Prunus serotina	Tree	FACU
Prunus serotina	Sapling	FACU
Smilax rotundifolia	Vine	FAC
Lonicera japonica	Herb	FAC-
Allium canadense	Herb	FACU

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 16.67%

If the FAC-neutral test is used, this data does NOT provide a secondary indicator of wetland hydrology

Remarks
Sample area does not satisfy hydrophytic vegetation criterion.

HYDROLOGY

Recorded Data (explain in remarks)
- ☐ Stream, Lake or Tide Gauge
- ☐ Aerial Photographs
- ☐ Other
- ☒ No Recorded Data Available

Field Observations
Depth of surface water none (in.)
Depth to free water in pit >18 (in.)
Depth to saturated soil > 18 (in.)

Primary Wetland Hydrology Indicators
- ☐ Inundated
- ☐ Saturated in Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Wetland Hydrology Indicators
- ☐ Oxidized Root Channels in Upper 12"
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

Remarks
No indicators of supporting wetland hydrology observed; does not satisfy criterion.

CORPS DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Woodrow Wilson Bridge Improvement Study
Applicant: FHWA, VDOT, MSHA, DCDPW
Investigator: Eileen Straughan
Do Normal Circumstances exist on the site? ☒ Yes ☐ No
Is the site significantly disturbed (Atypical Situation)? ☐ Yes ☒ No
Is the area a Problem Area? ☐ Yes ☒ No

Date: April 11, 1997
County: City of Alexandria
State: Virginia
Community ID:
Transect ID:
Plot ID: 13a upland

SOILS

Soil Map Unit Name: Mixed alluvial
Drainage Class: poor
Soil Tax Subgroup: Unknown
Confirm Map Type: ☐ Yes ☒ No

Soil Profile Description:

Depth (inches)	Horizon	Matrix Color (munsell moist)	Mottle Colors (munsell moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-12	A	10YR 5/6			sandy clay, moist
12-18	B	10YR 5/3	7.5YR 5/8	few, coarse, prominent	sandy clay, moist

Soil Indicators

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Hydric Soils List
- ☐ Other (explain in Remarks)

Remarks

No field indicators of reducing soil conditions present. Soil does not satisfy hydric soil criterion.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? ☐ Yes ☒ No
Wetland Hydrology Present? ☐ Yes ☒ No
Hydric Soils Present? ☐ Yes ☒ No
Is this Sampling within a Wetland? ☐ Yes ☒ No

Remarks

Sample area does not satisfy three mandatory wetland criteria.

CORPS DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Woodrow Wilson Bridge Improvement Study	Date: April 11, 1997
Applicant: FHWA, VDOT, MSHA, DCDPW	County: Fairfax
Investigator: Eileen Straughan	State: Virginia
Do Normal Circumstances exist on the site? ☒ Yes ☐ No	Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐ Yes ☒ No	Transect ID:
Is the area a Problem Area? ☐ Yes ☒ No	Plot ID: 13b wetland

VEGETATION

Dominant Plant Species	Stratum	Indicator
Platanus occidentalis	Tree	FACW-
Acer saccharinum	Tree	FACW
Toxicodendron vernix	Shrub	OBL
Lonicera japonica	Herb	FAC-
Impatiens capensis	Herb	FACW

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 80.00%

If the FAC-neutral test is used, this data provides a secondary indicator of wetland hydrology

Remarks

Sample area satisfies hydrophytic vegetation criterion.

HYDROLOGY

Recorded Data (explain in remarks)

- ☐ Stream, Lake or Tide Gauge
- ☐ Aerial Photographs
- ☐ Other
- ☒ No Recorded Data Available

Field Observations

Depth of surface water none (in.)

Depth to free water in pit 8 (in.)

Depth to saturated soil 4 (in.)

Primary Wetland Hydrology Indicators

- ☐ Inundated
- ☒ Saturated in Upper 12 Inches
- ☒ Water Marks
- ☒ Drift Lines
- ☒ Sediment Deposits
- ☒ Drainage Patterns in Wetlands

Secondary Wetland Hydrology Indicators

- ☐ Oxidized Root Channels in Upper 12"
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

Remarks

Field indicators of supporting wetland hydrology observed; satisfies criterion.
Area inundated by daily tide.

CORPS DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Woodrow Wilson Bridge Improvement Study	Date: April 11, 1997
Applicant: FHWA, VDOT, MSHA, DCDPW	County: Fairfax
Investigator: Eileen Straughan	State: Virginia
Do Normal Circumstances exist on the site? ☒ Yes ☐ No	Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐ Yes ☒ No	Transect ID:
Is the area a Problem Area? ☐ Yes ☒ No	Plot ID: 13b wetland

SOILS

Soil Map Unit Name: Unmapped

Drainage Class: unknown

Soil Tax Subgroup: Unknown

Confirm Map Type: ☐ Yes ☐ No

Soil Profile Description:

Depth (inches)	Horizon	Matrix Color (munsell moist)	Mottle Colors (munsell moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-8	A	10YR 3/2	7.5YR 4/6	few, fine, prom.	silt loam, moist
8-14	B	2.5Y 5/2	10YR 5/6 /	few, fine, prom.	clay loam, saturated
			N 2.5/1	com., med., prom.	
14+	refusal				auger/shovel refusal @ 14"

Soil Indicators

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☒ Reducing Conditions
- ☒ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Hydric Soils List
- ☐ Other (explain in Remarks)

Remarks

Indicators of reducing soil conditions; area satisfies hydric soil criterion.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? ☒ Yes ☐ No

Wetland Hydrology Present? ☒ Yes ☐ No

Hydric Soils Present? ☒ Yes ☐ No

Is this Sampling within a Wetland? ☒ Yes ☐ No

Remarks

Sample area satisfies all three mandatory wetland criteria.

CORPS DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Woodrow Wilson Bridge Improvement Study	Date: April 11, 1997
Applicant: FHWA, VDOT, MSHA, DCDPW	County: Fairfax
Investigator: Eileen Straughan	State: Virginia
Do Normal Circumstances exist on the site? ☒ Yes ☐ No	Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐ Yes ☒ No	Transect ID:
Is the area a Problem Area? ☐ Yes ☒ No	Plot ID: 13b upland

VEGETATION

Dominant Plant Species	Stratum	Indicator
Platanus occidentalis	Tree	FACW-
Populus deltoides	Tree	FAC
Prunus serotina	Sapling	FACU
Rosa multiflora	Shrub	FACU
Lonicera japonica	Herb	FAC-
Smilax rotundifolia	Vine	FAC

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 50.00%

If the FAC-neutral test is used, this data does NOT provide a secondary indicator of wetland hydrology

Remarks

Sample area does not satisfy hydrophytic vegetation criterion.

HYDROLOGY

Recorded Data (explain in remarks)

- ☐ Stream, Lake or Tide Gauge
- ☐ Aerial Photographs
- ☐ Other
- ☒ No Recorded Data Available

Field Observations

Depth of surface water none (in.)

Depth to free water in pit >18 (in.)

Depth to saturated soil > 18 (in.)

Primary Wetland Hydrology Indicators

- ☐ Inundated
- ☐ Saturated in Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Wetland Hydrology Indicators

- ☐ Oxidized Root Channels in Upper 12"
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

Remarks

No indicators of supporting wetland hydrology observed; does not satisfy criterion.

CORPS DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Woodrow Wilson Bridge Improvement Study	Date: April 11, 1997
Applicant: FHWA, VDOT, MSHA, DCDPW	County: Fairfax
Investigator: Eileen Straughan	State: Virginia
Do Normal Circumstances exist on the site? ☒ Yes ☐ No	Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐ Yes ☒ No	Transect ID:
Is the area a Problem Area? ☐ Yes ☒ No	Plot ID: 13b upland

SOILS

Soil Map Unit Name: Mixed alluvium — Drainage Class: poor

Soil Tax Subgroup: Unknown — Confirm Map Type: ☐ Yes ☒ No

Soil Profile Description:

Depth (inches)	Horizon	Matrix Color (munsell moist)	Mottle Colors (munsell moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-10	A	10YR 4/4	None		silt loam, moist
10-20	B	2.5YR 4/3	None		clay loam, moist

Soil Indicators

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Hydric Soils List
- ☐ Other (explain in Remarks)

Remarks

No field indicators of reducing soil conditions present. Soil does not satisfy hydric soil criterion.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? ☐ Yes ☒ No

Wetland Hydrology Present? ☐ Yes ☒ No

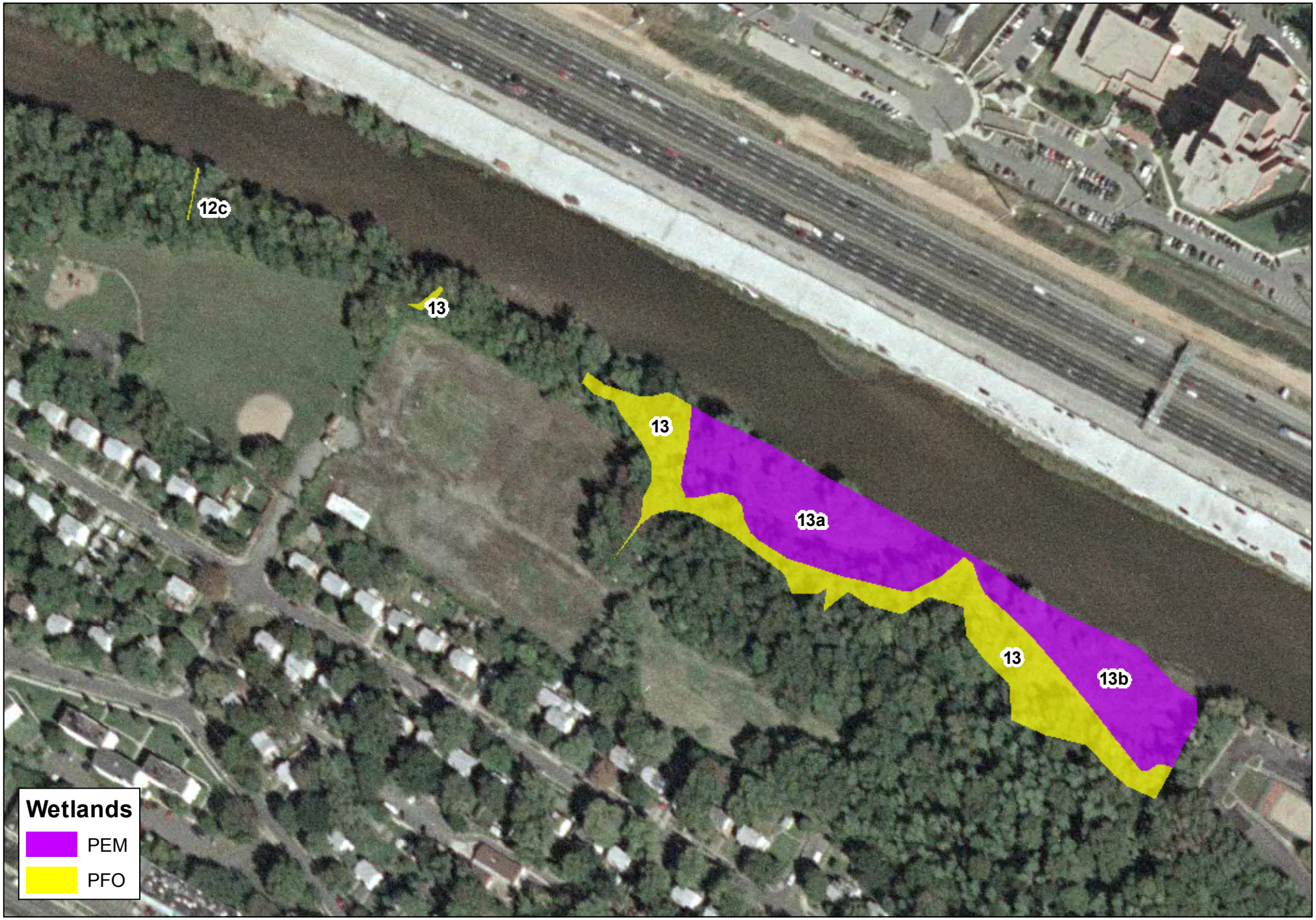
Hydric Soils Present? ☐ Yes ☒ No

Is this Sampling within a Wetland? ☐ Yes ☒ No

Remarks

Sample area does not satisfy three mandatory wetland criteria.

ATTACHMENT 2 – 2007 WETLAND DELINEATION MAP



US Army Corps of Engineers
Baltimore District

2007 Wetland Delineation
Huntington Community, Fairfax Co, VA

1 inch equals 200 feet

0 50 100 200 300 400 Feet

ATTACHMENT 3 – PHOTOGRAPHS

In addition to the plants pictured below, also observed in the PEM area were *Pontederia cordata* (pickerelweed), *Mentha spp*. (mint), *Iris*, and *Typha spp.* (cattail). Vegetation in the PFO areas included *Acer negundo* (box elder), *Fraxinus pennsylvanica* (green ash), *Toxicodendron radicans* (poison ivy), Plantanus occidentalis (American sycamore), and *Acer saccharinum* (silver maple).

Picture 4645 – Wetlands Wildlife: turtle possibly laying eggs on western side of Wetland 13

Picture 4646 – Looking West at Tidal Wetland along western end of Wetland 13. Emergent plants are believed to be *Polygonum pennsylvanicum L*. (Lady's thumb smartweed).

Picture 4647 – Up on bank from Tidal Wetland looking west at Wetland 13

Picture 4648 – Part of wet 13 – westernmost finger looking south

Picture 4649 – Wetland 13a, looking east at PEM wetland bordered by PFO wetland 13 on south

Picture 4650 – PEM Wetland 13a, looking east

Picture 4651 –Close up of *Nuphar advena* (Spatterdock) in flower. To immediate left are two *Impatiens capensis* (jewelweed).

Picture 4652 – *Nuphar advena* (Spatterdock)

Picture 4653 – Looking west up Cameron Run at PEM wetland 13a

Picture 4654 – *Peltandra virginica* (Arrow arum) in flower.

Picture 4655 –Group of plants on right side, believed to be *Polygonum pennsylvanicum L*. (Lady's thumb smartweed) next to *Peltandra virginica* (Arrow arum).

Picture 4656 – PEM Wetland 13b, looking east. Dominant plant is Nuphar advena (spatterdock).

4657 – Wetland 13a looking west

Picture 4658 – Linear wetland feature coming south from wetland 13, PFO

Picture 4659 – Culvert, connected to wetland 13 by linear wetland feature shown in picture 4658

Picture 4660 – Sewer Manhole Cover

Picture 4661 – Abandoned building inside fence

ATTACHMENT 4 – 2007 WETLAND DATASHEETS

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Huntington Community		Date: 23 July 2007
Applicant / Owner: Fairfax County		County: Fairfax
Investigator(s): T. Crockett-Augustine, R. Stouffer, J. Grundy, S. Madden		State: VA
Do Normal Circumstances exist on the site?	Yes	Community ID: PFO
Is the site significantly disturbed (Atypical Situation)?	No	Transect ID: 12c
Is the area a potential Problem Area? (If needed, explain on reverse)	No	Plot ID: Wetland

VEGETATION

Dominant Plant Species	Stratum	Indicator	**Non**-Dominant Plant Species	Stratum	Indicator
1. Acer rubrum	Tree	FAC	9.		
2. Fraxinus pennsylvanicum	Sap	FACW	10.		
3. Acer negundo	Tree	FAC+	11.		
4. Acer negundo	Tree	FAC+	12.		
5. Polygonum persicaria	Herb	FACW	13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): 100%

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks)
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☒ Other

☐ No Recorded Data Available

FIELD OBSERVATIONS

Depth of Surface Water	N/A (in)
Depth to Free Water in Pit	N/A (in)
Depth to Saturated Soil	12 (in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:
- ☐ Inundated
- ☐ Saturated in Upper 12 Inches
- ☒ Water Marks
- ☐ Drift Lines
- ☒ Sediment Deposits
- ☒ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):
- ☐ Oxidized Root Channels in Upper 12 Inches
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

SOILS

Wetland 12c

Map Unit Name (Series and Phase): Hatboro silt loam	Drainage Class: Poorly drained
Taxonomy (Subgroup):	Field Observations Confirm Mapped Type?

PROFILE DESCRIPTION

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-4	A	10YR4/2	10YR5/8	com, med, distinct	sand
4-12	B	10YR4/2	10YR5/8	com, med, distinct	sandy loam

HYDRIC SOIL INDICATORS:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☒ Reducing Conditions
- ☒ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Y	Is this Sampling Point Within a Wetland? YES
Wetland Hydrology Present?	Y	
Hydric Soils Present?	Y	

Remarks
This wetland was previously delineated as a larger area in the 1997 delineation for the Woodrow Wilson Bridge. Currently, it is a linear feature influenced by tides in Cameron Run from the Potomac River.

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Huntington Community		Date: 23 July 2007
Applicant / Owner: Fairfax County		County: Fairfax
Investigator(s): T. Crockett-Augustine, R. Stouffer, J. Grundy, S. Madden		State: VA
Do Normal Circumstances exist on the site?	Yes	Community ID: PEM/PFO
Is the site significantly disturbed (Atypical Situation)?	No	Transect ID: 13
Is the area a potential Problem Area? (If needed, explain on reverse)	No	Plot ID: Wetland

VEGETATION

Dominant Plant Species	Stratum	Indicator	**Non**-Dominant Plant Species	Stratum	Indicator
1. Leersia oryzoides	Herb	OBL	9.		
2. Polygonum sp. (sample)	Herb		10.		
3. Polygonum persicaria	Herb	FACW	11.		
4. Fraxinus pennsylvanica	Sap	FACW	12.		
5. Nuphar advena	Herb	OBL	13.		
6. Impatiens capensis	Herb	FACW	14.		
7.			15.		
8.			16.		
Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): 83%					
Remarks:					

HYDROLOGY

☐ Recorded Data (Describe in Remarks)
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☒ Other

☐ No Recorded Data Available

FIELD OBSERVATIONS

Depth of Surface Water	N/A (in)
Depth to Free Water in Pit	N/A (in)
Depth to Saturated Soil	6 (in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:
- ☐ Inundated
- ☒ Saturated in Upper 12 Inches
- ☒ Water Marks
- ☐ Drift Lines
- ☒ Sediment Deposits
- ☒ Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required):
- ☐ Oxidized Root Channels in Upper 12 Inches
- ☒ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

SOILS

Wetland 13

Map Unit Name (Series and Phase): Hatboro silt loam	Drainage Class: Poorly drained
Taxonomy (Subgroup):	Field Observations Confirm Mapped Type?

PROFILE DESCRIPTION

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2	A	10YR4/2	10YR4/6	___, med, faint	sand
2-6	B1	10YR3/1	10YR4/6	common, med., distinct	sandy loam
6-12	B2	10YR3/1			sandy loam

HYDRIC SOIL INDICATORS:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☒ Reducing Conditions
- ☒ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Y	Is this Sampling Point Within a Wetland? YES
Wetland Hydrology Present?	Y	
Hydric Soils Present?	Y	

Remarks
This wetland was previously delineated as a larger area in the 1997 delineation for the Woodrow Wilson Bridge. Surrounding areas are now upland. Wetland is influenced by tides and high water in Cameron Run.

ATTACHMENT 5 – LETTER OF JURISDICTIONAL DETERMINATION

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

REPLY TO
ATTENTION OF:

October 11, 2007

Northern Virginia Regulatory Section
NAO-2007-03706 (Huntington Wetlands)

U.S. Army Corps of Engineers
Baltimore District
Planning Division
Attn: Ms. Jo Ann Grundy
P.O. Box 1715
Baltimore, Maryland 21203-1715

Gentlemen:

This is regarding your request for verification of a jurisdictional wetlands delineation. The limits of the jurisdictional wetlands regulated under Section 404 of the Clean Water Act (33 C.F.R. 1344) are shown on the drawing entitled "Huntington Wetlands", dated July 2007, submitted to the Corps by the U.S. Army Corps of Engineers, Baltimore District, Planning Division. Nontidal and tidal wetlands and/or waters have been identified on the site. This jurisdictional determination is valid for a period of five years from the date of this letter.

Our basis for this determination is the application of the Corps' 1987 Wetland Delineation Manual and the positive indicators of wetland hydrology, hydric soils, and hydrophytic vegetation. The wetland is a water of the United States and is part of a tributary system to interstate waters (33 CFR 328.3(a)). These waters meet the Corps' definition of waters of the United States, are part of a tributary system to interstate waters (33 CFR 328.3 (a)) and have an ordinary high water mark.

Please be advised that work in the jurisdictional areas may require a Department of Army permit and possibly authorization by State and local authorities. Please note that this is simply a jurisdictional determination for the subject property. This letter does not authorize the placement of dredged or fill material or mechanized land clearing in wetlands or waters of the United States. Proposed work on the property, which would potentially result in the placement of dredged or fill material into wetlands or waters of the United States, would be subject to review by the Corps and any appropriate State and local agencies prior to the start of any fill activities. The term discharge of dredged material is defined as "any addition, including any redeposit, of dredged material, including excavated material, into waters of the United States which is incidental to any activity including mechanized landclearing, ditching, channelization, or other excavation (33 CFR Part 232.2(1)(iii)).

A condition of this jurisdictional determination is that you maintain the locations of the wetland delineation flags as they are now situated on the site. Once a plan of development is formulated, we recommend that you have the actual wetland boundary located by survey and superimposed on any future proposed plan to determine whether jurisdictional wetlands would be impacted by the proposed development, and to determine whether a Department of the Army permit would be required.

This letter contains an approved jurisdictional determination for your subject site. If you object to this determination, you may request an administrative appeal under Corps regulations at 33 CFR Part 33 1. Enclosed you will find a Notification of Appeal Process (NAP) fact sheet and Request for Appeal (RFA) form. If you request to appeal this determination you must submit a completed RFA form to the North Atlantic Division Office at the following address:

James Haggerty, Regulatory Appeals Review Officer
Phone: (718) 765-7150 Fax (718) 765-7210
United States Army Corps of Engineers North Atlantic Division
Building 301, General Lee Avenue
Fort Hamilton Military Community
Brooklyn, NY 11252

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 C.F.R. part 33 1.5, and that it has been received by the Division Office within 60 days of the date of the NAP. Should you decide to submit an RFA form, it must be received at the above address by ****December 11, 2007.**** It is not necessary to submit an RFA form to the Division office if you do not object to the determination in this letter.

If you have any questions, please contact Ms. Theresita Crockett-Augustine in the Northern Virginia Field Office at 18139 Triangle Plaza, Suite 213, Dumfries, Virginia 22026, (703) 221-9736, for and on behalf of, Keith B. Lockwood, Chief, Northern Virginia Regulatory Section.

Sincerely,

Theresita Crockett-Augustine
Project Manager
Northern Virginia Regulatory Section

Copy Furnished: DEQ, Woodbridge.

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: U.S. Army Corps of Engineers, Baltimore District, Planning Division	File Number: NAO-2007-03706	Date: 10-11-2007
Attached is:		See Section below
	INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)	A
	PROFFERED PERMIT (Standard Permit or Letter of permission)	B
	PERMIT DENIAL	C
X	APPROVED JURISDICTIONAL DETERMINATION	D
	PRELIMINARY JURISDICTIONAL DETERMINATION	E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://usace.army.mil/inet/functions/cw/cecwo/reg or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.

- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.

- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.

- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact:

Theresita Crockett Augustine
Environmental Scientist
Phone: (703) 221-9736
Fax: (703) 221-6575
Email: theresita.m.crockett-augustine@nao02.usace.army.mil

If you only have questions regarding the appeal process you may also contact:

United States Army Corps of Engineers
North Atlantic Division
ATTN: James Haggerty, Regulatory Appeals Review Officer
Building 301, General Lee Avenue
Fort Hamilton Military Community
Brooklyn, NY 11252
Phone: (718) 765-7150

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.		
_____ Signature of appellant or agent.	Date:	Telephone number:

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

REPLY TO
ATTENTION OF:

October 15, 2007

Supplemental Preapplication Information

1. A search of the Virginia Department of Historic Resources Data Sharing System revealed the following:

__X__No known historic properties are located on the property.

____The following known architectural resources are located on the property (see attached map and listing)

____ The following known archaeological resources are located on the property (see attached map and listing)

2. A search of the Virginia Department of Conservation and Recreation data revealed the following:

__X__No known populations of federally listed threatened or endangered species are located on the property.

____The property is within a known concentration area for the following species:

3. We suggest the following avoidance, minimization, and compensatory mitigation measures be incorporated into any plans you prepare for the property:

Please note this information is being provided to you based on the preliminary data you submitted to the Corps relative to project boundaries and project plans. Consequently, these findings and recommendations are subject to change if the project scope changes or new information becomes available and the accuracy of the data. Lastly, the Corps only consulted the federally-listed species in the Virginia Department of Conservation & Recreation's database. You may also want to consult the Virginia Department of Game and Inland Fisheries' database at www.dgif.va.state.us

APPENDIX C. SEDIMENT SAMPLING IN CAMERON RUN

SEDIMENT SAMPLING AT CAMERON RUN
FAIRFAX COUNTY, VIRGINIA

Prepared for

Department of the Army
U.S. Army Corps of Engineers
Baltimore District
10 South Howard Street
Baltimore, Maryland 21201

Prepared by

EA Engineering, Science, and Technology, Inc.
15 Loveton Circle
Sparks, Maryland 21152
(410) 771-4950

October 2007

62132.21

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APPENDICES

APPENDIX A: LABORATORY CHAIN-OF-CUSTODIES

APPENDIX B: GRAIN SIZE CURVES

LIST OF FIGURES

Title

Huntington Flood Damage Reduction Study Potential Dredging Alternatives and Sample Locations

LIST OF TABLES

Title

Table 1 Laboratory Analysis Program, Cameron Run

Table 2 General Chemistry Parameters in Sediment, Cameron Run

Possum Point VDEQ Forms for Sediment Quality at Cameron Run Sampling Locations

1.0 INTRODUCTION

As part of a flood control investigation for the Huntington and Huntington Station communities adjacent to Cameron Run, dredging is being evaluated as an option to help reduce flooding. The degree of contamination, if any, of the sediment to be removed and the quantity of the sediment determines the placement site. Since this sediment has not been tested recently, a sampling and analysis program was undertaken.

1.1 PROJECT LOCATION

Sediment sampling was completed along Cameron Run as shown in the figure that follows. Eight stations were sampled and analyzed for parameters as shown in Table 1.

2.0 FIELD ACTIVITIES

Sampling on Cameron Run took place on 22 August 2007. Sediment was collected at eight locations using a hand corer. Depth of penetration and depth of core recovery are shown on Table 2. A sanitary pipe crossing as identified on the map that follows was located and depth below sediment was determined to be 3.2 feet.

2.1 SAMPLE LOCATION DETERMINATION

Sampling locations for the project were defined by USACE-Baltimore District in terms of alternative segments proposed for dredging. Northing and easting coordinates (Maryland State Plane NAD83) are provided in the figure for dredging segments and sampling locations.

Positioning was determined using a Trimble ProXR DGPS (Differential Global Positioning System). The ProXR uses the United States Coast Guard Differential Beacon System to obtain sub-meter accuracy.

2.2 SEDIMENT SAMPLING

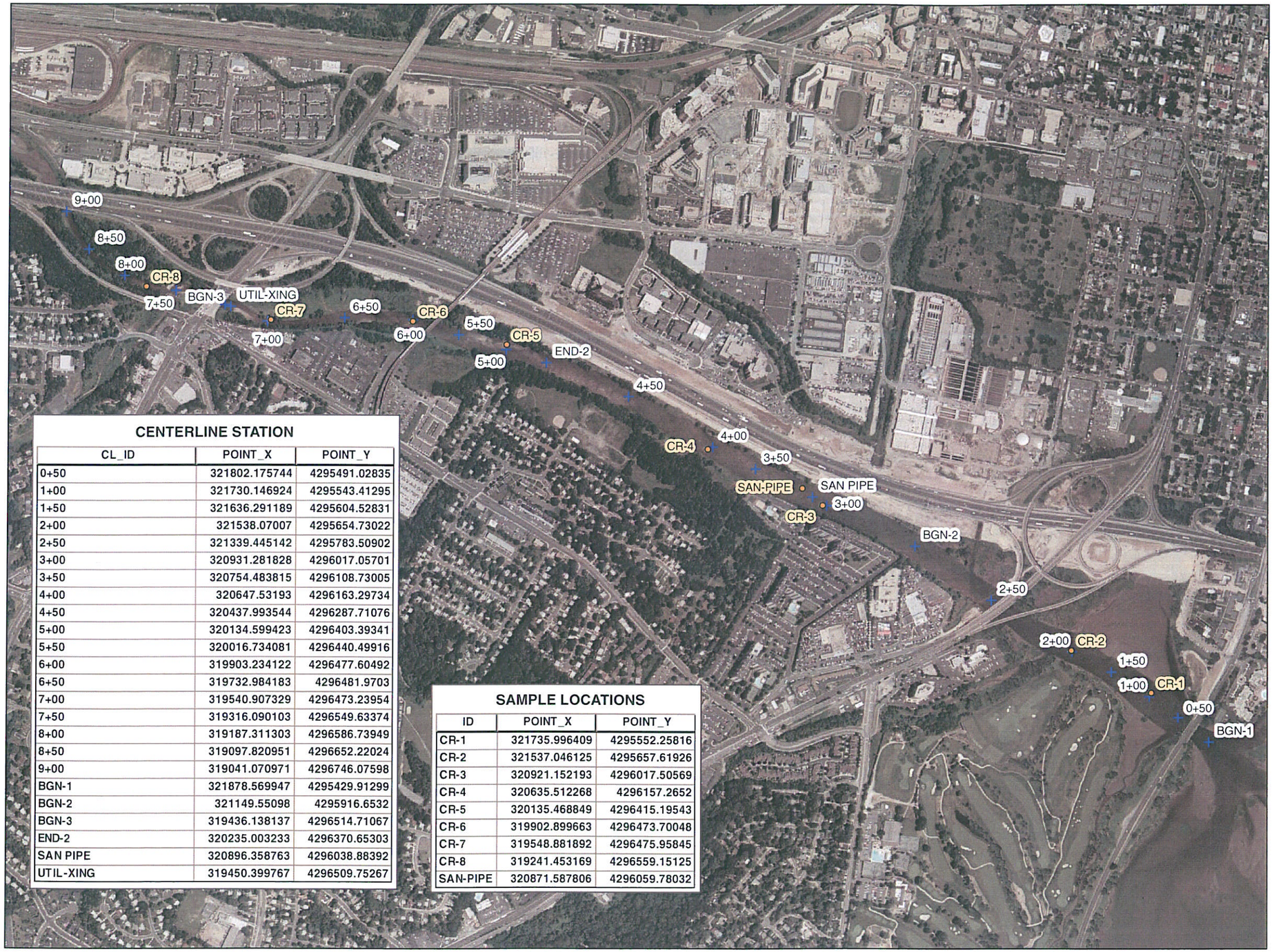
The sediment core was removed from the barrel, capped, taped, and labeled. Sediment cores were stored on ice during the project duration until delivery to EA's facility in Sparks, Maryland. Upon delivery, cores were placed in a refrigerated unit at 4^0 Celsius.

3.0 ANALYTICAL METHODS

Analytical testing of sediment was completed by STL-Pittsburgh. Appendix A contains the laboratory chain-of-custodies submitted with the samples upon completion of field sampling. Methods are shown on Table 1. The analytical program is in accordance with the requirements for disposal at Possum Point as defined by the facility's permit from VDEQ.

4.0 ANALYTICAL RESULTS

Results for grain size, Atterberg limits, nutrients and total organic carbon are presented in Table 2. Results for metals, volatile organics, semivolatile organics, PAH, PCB Aroclors, chlorinated pesticides, tributyltin, total petroleum hydrocarbons, and cyanide as well as the TCLP analytes are reported on the Virginia Department of Environmental Quality Dredge Spoil Monitoring Forms that follow Table 2.

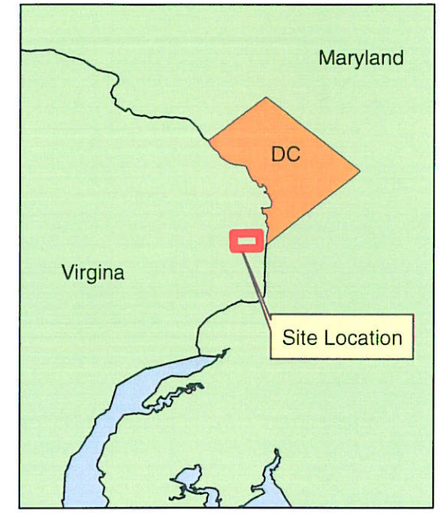


CENTERLINE STATION

CL_ID	POINT_X	POINT_Y
0+50	321802.175744	4295491.02835
1+00	321730.146924	4295543.41295
1+50	321636.291189	4295604.52831
2+00	321538.07007	4295654.73022
2+50	321339.445142	4295783.50902
3+00	320931.281828	4296017.05701
3+50	320754.483815	4296108.73005
4+00	320647.53193	4296163.29734
4+50	320437.993544	4296287.71076
5+00	320134.599423	4296403.39341
5+50	320016.734081	4296440.49916
6+00	319903.234122	4296477.60492
6+50	319732.984183	4296481.9703
7+00	319540.907329	4296473.23954
7+50	319316.090103	4296549.63374
8+00	319187.311303	4296586.73949
8+50	319097.820951	4296652.22024
9+00	319041.070971	4296746.07598
BGN-1	321878.569947	4295429.91299
BGN-2	321149.55098	4295916.6532
BGN-3	319436.138137	4296514.71067
END-2	320235.003233	4296370.65303
SAN PIPE	320896.358763	4296038.88392
UTIL-XING	319450.399767	4296509.75267

SAMPLE LOCATIONS

ID	POINT_X	POINT_Y
CR-1	321735.996409	4295552.25816
CR-2	321537.046125	4295657.61926
CR-3	320921.152193	4296017.50569
CR-4	320635.512268	4296157.2652
CR-5	320135.468849	4296415.19543
CR-6	319902.899663	4296473.70048
CR-7	319548.881892	4296475.95845
CR-8	319241.453169	4296559.15125
SAN-PIPE	320871.587806	4296059.78032



Legend

+ Centerline Station

o Sampling Locations

Huntington Flood Damage Reduction Study
Potential Dredging Alternatives

Prepared By: EA Engineering, Science, and Technology, Inc.

Q:\PROJECTS\GIS\6213221\CAMERON.MXD

Cameron Run - Laboratory Analyses Required

	Physical Analyses							Bulk Chemistry Parameters													TCLP Analyses									
Sample ID	Atterberg Limits(D4318)	Total Kjeldahl Nitrogen(351.3)	Total Phosphorus(365.2)	Sulfide by Titration(SW 9030B/9034)	Total Organic Combustion by High Temp. Combustion	Grain Size(ASTM D422)		Solids	Chromium VI(7196A)	Volatile Organics by GC/MS(SW 8260B)	Semivolatile Organics by GC/MS(SW 8270C)	Metals(SW 6010B/7471A)	PAHs(SW 8310)	PCB Aroclors(SW 8082)	Chlorinated Pesticides(SW 8081A)	Organophosphorus Pesticides by GC(SW 8141A)	Tributyltin(STL-SOP)	Total Petroleum Hydrocarbons(SW 9035)	Cyanide by Automated Colorimetry(SW 9012A)		Semivolatile Organics by GC/MS(SW 1311/8270C)	Metals(SW 1311/6010B/7470A)	Pesticides(SW1311/8081A)	Volatiles(SW 1311/8260B)	Herbicides(SW 1311/8151A)	TCLP Extraction(SW 1311)	ZHE Extraction(SW 1311)	Corrosivity(SW 9045C)	Ignitibility(SW 1010)	
CR07-1*	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	
CR07-2*	X	X	X	X	X	X																								
CR07-3	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	
CR07-4	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	
CR07-5	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	
CR07-6*	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	
CR07-7*	X	X	X	X	X	X																								
CR07-8	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	

* - samples will be combined for chemical analyses; physical analyses for each location

Table 2 Cameron Run Sediment General Chemistry and Physical Parameters

ANALYTE	UNITS	AVGRL	CR07-1	CR07-2	CR07-3	CR07-4	CR07-5	CR07-6	CR07-7	CR07-8
DEPTH OF PENETRATION	Feet		4	3	3.7	4.3	4	3.5	2.2	3.3
DEPTH OF RECOVERY	Feet		3.2	2.5	3.1	3.2	3.2	2.2	0.8	1.8
GENERAL CHEMISTRY										
TOTAL KJELDAHL NITROGEN	MG/KG	195.5	158 B	150 B	154 B	232	257	145 B	178 B	107 B
TOTAL ORGANIC CARBON	MG/KG	1951.3	8920	955 B	1570	4220	2580	1180 B	2250	924 B
TOTAL PHOSPHORUS	MG/KG	26.3	280	68.8	73.7	77	195	105	56.1	54.4
TOTAL SULFIDE	MG/KG	39.1	41.3 U	39.3 U	40.4 U	40.6 U	38.5 U	38.1 U	37.3 U	37.3 U
GRAIN SIZE										
CLAY	%	--	21.1	0.8	2.1	3.1	4.4	1.6	12.7	0.9
GRAVEL	%	--	0	5	1.5	2.9	13.2	11.7	40.2	46.9
SILT	%	--	20.9	4.5	1.5	8.8	5.2	5.3	19.8	1.6
COARSE SAND	%	--	0	0.8	2.5	2.4	9.8	5.7	6.3	11.4
FINE SAND	%	--	45.4	44.4	37.3	42.9	19.5	25.6	4.3	12.4
MEDIUM SAND	%	--	12.6	44.5	55.1	39.9	48	50	16.8	26.8
SAND	%	--	58	89.7	94.9	85.2	77.3	81.3	27.4	50.6
PHYSICAL PROPERTIES										
LIQUID LIMIT	--	--	0	0	0	0	0	0	0	0
PLASTIC LIMIT	--	--	0	0	0	0	0	0	0	0
PLASTICITY INDEX	--	--	NP	NP	NP	NP	NP	NP	NP	NP

B = Estimated result. Result is between the method detection limit (MDL) and reporting limit (RL).
U = Result is less than the reporting limit (RL).

DEPARTMENT OF ENVIRONMENTAL QUALITY
Dredge Spoils Monitoring
Attachment B, Page 1 of 4

Facility Name: Virginia Power--Possum Point **VPDES PERMIT NO.: VA0002017**
DATE: **PROJECT: Cameron Run CR07-1/2**

DEQ Parameter No.	EPA CAS Number	Parameter	EPA Analysis No.	Quantification [1] Level (mg/l)	Reporting [2] Results (mg/l)	Sample [3] Type	Threshold Levels (mg/l)
Toxicity Characteristic Leaching Procedure Parameters with Threshold Levels (Part A)							
033	7440-38-2	Arsenic	1311	0.5	**0.19**	C	5
151	7440-39-3	Barium	1311	10	**0.26**	C	100
216	71-43-2	Benzene	1311	0.05	0.05	C	3
096	7440-43-9	Cadmium	1311	0.1	0.1	C	1
236	56-23-5	Carbon tetrachloride	1311	0.05	0.05	C	0.5
333	57-74-9	Chlordane	1311	0.005	0.005	C	0.03
280	108-90-7	Chlorobenzene	1311	0.05	0.05	C	100
223	67-66-3	Chloroform	1311	0.05	0.05	C	6
016	7440-47-3	Chromium	1311	0.5	**0.0025**	C	5
510	95-48-7	o-Cresol*	---	---	---	---	200
509	108-39-4	m-Cresol*	---	---	---	---	200
511	106-44-5	p-Cresol*	---	---	---	---	200
512	---	Cresols, Total	1311	0.05	0.05	C	200
266	106-46-7	1,4-Dichlorobenzene	1311	0.05	0.05	C	7.5
260	107-06-2	1,2-Dichloroethane	1311	0.05	0.05	C	0.5
258	75-35-4	1,1-Dichloroethylene	1311	0.05	0.05	C	0.7
239	121-14-2	2,4-Dinitrotoluene	1311	0.05	0.05	C	0.13
339	72-20-8	Endrin	1311	0.0005	0.0005	C	0.02
341	76-44-8	Heptachlor	1311	0.0005	0.0005	C	0.008
289	118-74-1	Hexachlorobenzene	1311	0.05	0.05	C	0.13
290	87-68-3	Hexachlorobutadiene	1311	0.05	0.05	C	0.5
291	67-72-1	Hexachloroethane	1311	0.05	0.05	C	5
034	7439-92-1	Lead	1311	0.50	**0.034**	C	5
342	58-89-9	Hexachlorocyclohexane (Lindane)	1311	0.0005	0.0005	C	0.4
042	7439-97-6	Mercury	1311	0.0002	0.0002	C	0.2
344	72-43-5	Methoxychlor	1311	0.001	0.001	C	10
---	78-93-3	Methyl Ethyl Ketone (MEK)	1311	0.05	0.05	C	200
294	98-95-3	Nitrobenzene	1311	0.05	0.05	C	2
210	87-86-5	Pentachlorophenol	1311	0.25	0.25	C	100
---	110-86-1	Pyridine	1311	0.25	0.25	C	5
152	7782-49-2	Selenium	1311	0.25	0.25	C	1
037	7440-22-4	Silver	1311	0.5	0.5	C	5
220	127-18-4	Tetrachloroethylene	1311	0.05	0.05	C	0.7
349	8001-35-2	Toxaphene	1311	0.02	0.02	C	0.5
602	79-01-6	Trichloroethylene	1311	0.05	0.05	C	0.5
601	95-95-4	2,4,5-Trichlorophenol	1311	0.05	0.05	C	400
602	88-06-2	2,4,6-Trichlorophenol	1311	0.05	0.05	C	2
173	75-01-4	Vinyl chloride	1311	0.05	0.05	C	0.2

* If o-, m-, and p-Cresol concentrations cannot be differentiated, the total cresol concentration is used.

DEPARTMENT OF ENVIRONMENTAL QUALITY
Dredge Spoils Monitoring
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Facility Name: Virginia Power--Possum Point **VPDES PERMIT NO.: VA0002017**
DATE: **PROJECT: Cameron Run CR07-1/2**

DEQ Parameter No.	EPA CAS Number	Parameter	EPA Analysis No.	Quantification [1] Level (mg/kg)	Reporting [2] Results (mg/kg)	Units	Sample [3] Type
Metals (Part B.1.)							
178	7440-36-0	Antimony	SW6010B-T	0.1	**0.4**	mg/kg	C
457	7440-38-2	Arsenic	SW6010B-T	0.2	**1.5**	mg/kg	C
441	7440-47-3	Chromium	SW6010B-T	0.1	**8.2**	mg/kg	C
231	18540-29-9	Chromium, VI	SW7196	0.17	0.17	mg/kg	C
442	7440-50-8	Copper	SW6010B-T	0.1	**8.5**	mg/kg	C
445	7440-02-0	Nickel	SW6010B-T	0.1	**4.9**	mg/kg	C
---	7440-28-0	Thallium	SW6010B-T	0.31	0.31	mg/kg	C
448	7440-66-6	Zinc	SW6010B-T	0.3	**36.5**	mg/kg	C
Pesticides/PCBs (Part B.2.)							
332	309-00-2	Aldrin	SW8081A	0.0016	**0.0034**	mg/kg	C
334	2921-88-2	Chlorpyrifos	SW8141A	0.032	0.032	mg/kg	C
---	72-54-8	4,4'-DDD	SW8081A	0.0016	**0.00043**	mg/kg	C
---	72-55-9	4,4'-DDE	SW8081A	0.0016	**0.0017**	mg/kg	C
335	50-29-3	4,4'-DDT	SW8081A	0.0016	0.0016	mg/kg	C
336	8065-48-3	Demeton	SW8141A	0.032	0.032	mg/kg	C
337	60-57-1	Dieldrin	SW8081A	0.0016	0.0016	mg/kg	C
746	959-98-8	Endosulfan I	SW8081A	0.0016	0.0016	mg/kg	C
640	33213-65-9	Endosulfan II	SW8081A	0.0016	0.0016	mg/kg	C
617	1031-07-8	Endosulfan sulfate	SW8081A	0.0016	**0.00046**	mg/kg	C
---	7421-93-4	Endrin aldehyde	SW8081A	0.0016	0.0016	mg/kg	C
340	86-50-0	Azinphos methyl	SW8141A	0.032	0.032	mg/kg	C
---	1024-57-3	Heptachlor epoxide	SW8081A	0.0016	0.0016	mg/kg	C
---	319-84-6	Alpha-BHC	SW8081A	0.0016	0.0016	mg/kg	C
---	319-85-7	Beta-BHC	SW8081A	0.0016	0.0016	mg/kg	C
---	143-50-0	Kepone	SW8270C	1.2	1.2	mg/kg	C
343	121-75-5	Malathion	SW8141A	0.03	0.032	mg/kg	C
345	2385-85-5	Mirex	SW8081A	0.0016	0.0016	mg/kg	C
346	56-38-2	Methyl parathion	SW8141A	0.032	0.032	mg/kg	C
---	1336-36-3	Total PCB	---	---	---	---	---
641	53469-21-9	Aroclor 1242	SW8082	0.016	0.016	mg/kg	C
642	11097-69-1	Aroclor 1254	SW8082	0.016	0.016	mg/kg	C
643	11104-28-2	Aroclor 1221	SW8082	0.016	0.016	mg/kg	C
644	11141-16-5	Aroclor 1232	SW8082	0.016	0.016	mg/kg	C
645	12672-29-6	Aroclor 1248	SW8082	0.016	**0.014**	mg/kg	C
618	11096-82-5	Aroclor 1260	SW8082	0.016	0.016	mg/kg	C
646	12674-11-2	Aroclor 1016	SW8082	0.016	**0.023**	mg/kg	C
Base Neutral Extractable (Part B.3.)							
273	83-32-9	Acenaphthene	SW8310	0.032	0.032	mg/kg	C
275	120-12-7	Anthracene	SW8310	0.0064	**0.0043**	mg/kg	C
---	92-87-5	Benzidine	SW8270C	6.3	6.3	mg/kg	C
276	56-55-3	Benzo(a)anthracene	SW8310	0.0064	**0.019**	mg/kg	C

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Dredge Spoils Monitoring
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Facility Name: Virginia Power--Possum Point **VPDES PERMIT NO.: VA0002017**
DATE: **PROJECT: Cameron Run CR07-1/2**

DEQ Parameter No.	EPA CAS Number	Parameter	EPA Analysis No.	Quantification [1] Level (mg/kg)	Reporting [2] Results (mg/kg)	Units	Sample [3] Type
648	205-99-2	Benzo(b)fluoranthene	SW8310	0.006	**0.048**	mg/kg	C
278	207-08-9	Benzo(k)fluoranthene	SW8310	0.006	**0.022**	mg/kg	C
277	50-32-8	Benzo(a)pyrene	SW8310	0.006	**0.03**	mg/kg	C
---	111-44-4	Bis(2-Chloroethyl) Ether	SW8270C	0.064	0.064	mg/kg	C
486	85-68-7	Butyl benzyl phthalate	SW8270C	0.31	0.31	mg/kg	C
---	91-58-7	2-Chloronaphthalene	SW8270C	0.064	0.064	mg/kg	C
282	218-01-9	Chrysene	SW8310	0.006	**0.03**	mg/kg	C
654	53-70-3	Dibenzo(a,h)anthracene	SW8310	0.006	0.0064	mg/kg	C
206	84-74-2	Di-n-butyl phthalate	SW8270C	0.31	0.31	mg/kg	C
259	95-50-1	1,2-Dichlorobenzene	SW8270C	0.064	0.064	mg/kg	C
264	541-73-1	1,3-Dichlorobenzene	SW8270C	0.064	0.064	mg/kg	C
527	91-94-1	3,3'-Dichlorobenzidine	SW8270C	0.31	0.31	mg/kg	C
285	84-66-2	Diethyl Phthalate	SW8270C	0.31	0.31	mg/kg	C
170	117-81-7	Bis(2-Ethylhexyl) Phthalate	SW8270C	0.31	**0.26**	mg/kg	C
286	131-11-3	Dimethyl phthalate	SW8270C	0.31	0.31	mg/kg	C
535	122-66-7	1,2-Diphenylhydrazine	SW8270C	0.064	0.064	mg/kg	C
287	206-44-0	Fluoranthene	SW8310	0.006	**0.055**	mg/kg	C
288	86-73-7	Fluorene	SW8310	0.006	**0.0027**	mg/kg	C
538	77-47-4	Hexachlorocyclopentadiene	SW8270C	0.31	0.31	mg/kg	C
651	193-39-5	Indeno(1,2,3-cd)pyrene	SW8310	0.006	**0.025**	mg/kg	C
650	78-59-1	Isophorone	SW8270C	0.31	0.31	mg/kg	C
293	91-20-3	Naphthalene	SW8310	0.032	0.032	mg/kg	C
573	62-75-9	N-Nitrosodimethylamine	SW8270C	0.31	0.31	mg/kg	C
574	86-30-6	N-Nitrosodiphenylamine	SW8270C	0.31	0.31	mg/kg	C
575	621-64-7	N-Nitrosodi-N-Propylamine	SW8270C	0.064	0.064	mg/kg	C
296	129-00-0	Pyrene	SW8310	0.006	**0.043**	mg/kg	C
263	120-82-1	1,2,4-Trichlorobenzene	SW8270C	0.31	0.31	mg/kg	C
Volatiles (Part B.4.)							
171	107-02-8	Acrolein	SW8260B	0.14	0.14	mg/kg	C
204	107-13-1	Acrylonitrile	SW8260B	0.14	0.14	mg/kg	C
484	75-25-2	Bromoform	SW8260B	0.0069	0.0069	mg/kg	C
652	124-48-1	Chlorodibromomethane	SW8260B	0.0069	0.0069	mg/kg	C
649	75-09-2	Methylene Chloride	SW8260B	0.0069	0.0025	mg/kg	C
244	75-27-4	Dichlorobromomethane	SW8260B	0.0069	0.0069	mg/kg	C
262	156-60-5	Trans-1,2-Dichloroethene	SW8260B	0.0069	0.0069	mg/kg	C
261	78-87-5	1,2-Dichloropropane	SW8260B	0.0069	0.0069	mg/kg	C
265	542-75-6	1,3-Dichloropropene	---	---	---	---	---
172	100-41-4	Ethylbenzene	SW8260B	0.0069	0.0019	mg/kg	C
---	74-83-9	Bromomethane	SW8260B	0.0069	0.0069	mg/kg	C
---	78-93-3	Methyl Ethyl Ketone (MEK)	SW8260B	0.0069	0.0023	mg/kg	C
596	79-34-5	1,1,2,2-Tetrachloroethane	SW8260B	0.0069	0.0069	mg/kg	C

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Facility Name: Virginia Power--Possum Point **VPDES PERMIT NO.: VA0002017**
DATE: **PROJECT: Cameron Run CR07-1/2**

DEQ Parameter No.	EPA CAS Number	Parameter	EPA Analysis No.	Quantification [1] Level (mg/kg)	Reporting [2] Results (mg/kg)	Units	Sample [3] Type
222	108-88-3	Toluene	SW8260B	0.0069	0.0069	mg/kg	C
373	79-00-5	1,1,2-Trichloroethane	SW8260B	0.0069	0.0069	mg/kg	C
155	79-01-6	Trichloroethylene	SW8260B	0.0069	0.0069	mg/kg	C
Acids Extractables (Part B.5.)							
267	95-57-8	2-Chlorophenol	SW8270C	0.31	0.31	mg/kg	C
268	120-83-2	2,4-Dichlorophenol	SW8270C	0.064	0.064	mg/kg	C
269	105-67-9	2,4-Dimethylphenol	SW8270C	0.31	0.31	mg/kg	C
---	534-52-1	2-Methyl-4,6-Dinitrophenol	SW8270C	1.5	1.5	mg/kg	C
270	51-28-5	2,4-Dinitrophenol	SW8270C	1.6	1.6	mg/kg	C
175	108-95-2	Phenol	SW8270C	0.064	0.064	mg/kg	C
Miscellaneous (Part B.6.)							
018	57-12-5	Cyanide, Total	SW9012A	0.69	**0.24**	mg/kg	C
306	---	Dioxin	---	---	---	---	---
350	1461-22-9	Tributyltin	STL	0.002	0.002	mg/kg	C
257	---	Total Petroleum Hydrocarbons (TPH)	SW9035	229	229	mg/kg	C

I certify under penalty of law that this documenta and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the pweson or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment for knowing violations. See 18 U.S.C. P1001 and 33 U.S.C. P 1319. (Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years.)

Name of Principal Executive Officer or Authorized Agent | Title

Signature of Principal Executive Officer or Authorized Agent | Date

Footnotes to Water Quality Monitoring Attachment B

[1] Quantification Level (QL) is defined as the lowest concentration used for the calibration of a measurement system when the calibration is in accordance with the procedures published for the required method. In this case it is the Reporting Limit (RL).

[2] Results for chemicals that were detected are in bold and shaded.

[3] Sample Type: C = core sample

Any Approved method presented in 40 CFR Part 136

The QL is at the discretion of the permittee. For any substance addressed in 40CFR Part 136, the permittee shall use one of the approved methods in 40 CFR Par 136.

DEPARTMENT OF ENVIRONMENTAL QUALITY
Dredge Spoils Monitoring
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Facility Name: Virginia Power--Possum Point **VPDES PERMIT NO.: VA0002017**
DATE: **PROJECT: Cameron Run CR07-3**

DEQ Parameter No.	EPA CAS Number	Parameter	EPA Analysis No.	Quantification [1] Level (mg/l)	Reporting [2] Results (mg/l)	Sample [3] Type	Threshold Levels (mg/l)
Toxicity Characteristic Leaching Procedure Parameters with Threshold Levels (Part A)							
033	7440-38-2	Arsenic	1311	0.5	**0.18**	C	5
151	7440-39-3	Barium	1311	10	**0.18**	C	100
216	71-43-2	Benzene	1311	0.05	0.05	C	3
096	7440-43-9	Cadmium	1311	0.1	0.1	C	1
236	56-23-5	Carbon tetrachloride	1311	0.05	0.05	C	0.5
333	57-74-9	Chlordane	1311	0.005	0.005	C	0.03
280	108-90-7	Chlorobenzene	1311	0.05	0.05	C	100
223	67-66-3	Chloroform	1311	0.05	0.05	C	6
016	7440-47-3	Chromium	1311	0.5	**0.0083**	C	5
510	95-48-7	o-Cresol*	---	---	---	---	200
509	108-39-4	m-Cresol*	---	---	---	---	200
511	106-44-5	p-Cresol*	---	---	---	---	200
512	---	Cresols, Total	1311	0.05	0.05	C	200
266	106-46-7	1,4-Dichlorobenzene	1311	0.05	0.05	C	7.5
260	107-06-2	1,2-Dichloroethane	1311	0.05	0.05	C	0.5
258	75-35-4	1,1-Dichloroethylene	1311	0.05	0.05	C	0.7
239	121-14-2	2,4-Dinitrotoluene	1311	0.05	0.05	C	0.13
339	72-20-8	Endrin	1311	0.0005	0.0005	C	0.02
341	76-44-8	Heptachlor	1311	0.0005	0.0005	C	0.008
289	118-74-1	Hexachlorobenzene	1311	0.05	0.05	C	0.13
290	87-68-3	Hexachlorobutadiene	1311	0.05	0.05	C	0.5
291	67-72-1	Hexachloroethane	1311	0.05	0.05	C	5
034	7439-92-1	Lead	1311	0.5	**0.051**	C	5
342	58-89-9	Hexachlorocyclohexane (Lindane	1311	0.0005	0.0005	C	0.4
042	7439-97-6	Mercury	1311	0.0002	0.0002	C	0.2
344	72-43-5	Methoxychlor	1311	0.001	0.001	C	10
---	78-93-3	Methyl Ethyl Ketone (MEK)	1311	0.05	0.05	C	200
294	98-95-3	Nitrobenzene	1311	0.05	0.05	C	2
210	87-86-5	Pentachlorophenol	1311	0.25	0.25	C	100
---	110-86-1	Pyridine	1311	0.25	0.25	C	5
152	7782-49-2	Selenium	1311	0.25	0.25	C	1
037	7440-22-4	Silver	1311	0.5	0.5	C	5
220	127-18-4	Tetrachloroethylene	1311	0.05	0.05	C	0.7
349	8001-35-2	Toxaphene	1311	0.02	0.02	C	0.5
602	79-01-6	Trichloroethylene	1311	0.05	0.05	C	0.5
601	95-95-4	2,4,5-Trichlorophenol	1311	0.05	0.05	C	400
602	88-06-2	2,4,6-Trichlorophenol	1311	0.05	0.05	C	2
173	75-01-4	Vinyl chloride	1311	0.05	0.05	C	0.2

* If o-, m-, and p-Cresol concentrations cannot be differentiated, the total cresol concentration is used.

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Facility Name: Virginia Power--Possum Point **VPDES PERMIT NO.: VA0002017**
DATE: **PROJECT: Cameron Run CR07-3**

DEQ Parameter No.	EPA CAS Number	Parameter	EPA Analysis No.	Quantification [1] Level (mg/kg)	Reporting [2] Results (mg/kg)	Units	Sample [3] Type
Metals (Part B.1.)							
178	7440-36-0	Antimony	SW6010B-T	0.09	0.087	mg/kg	C
457	7440-38-2	Arsenic	SW6010B-T	0.2	**2.1**	mg/kg	C
441	7440-47-3	Chromium	SW6010B-T	0.1	**33.1**	mg/kg	C
231	18540-29-9	Chromium, VI	SW7196	0.17	0.17	mg/kg	C
442	7440-50-8	Copper	SW6010B-T	0.1	**25.8**	mg/kg	C
445	7440-02-0	Nickel	SW6010B-T	0.1	**5.9**	mg/kg	C
---	7440-28-0	Thallium	SW6010B-T	0.30	**0.77**	mg/kg	C
448	7440-66-6	Zinc	SW6010B-T	0.3	**57.4**	mg/kg	C
Pesticides/PCBs (Part B.2.)							
332	309-00-2	Aldrin	SW8081A	0.0016	**0.0018**	mg/kg	C
334	2921-88-2	Chlorpyrifos	SW8141A	0.031	0.031	mg/kg	C
---	72-54-8	4,4'-DDD	SW8081A	0.0016	**0.0011**	mg/kg	C
---	72-55-9	4,4'-DDE	SW8081A	0.0016	**0.0018**	mg/kg	C
335	50-29-3	4,4'-DDT	SW8081A	0.0016	0.0016	mg/kg	C
336	8065-48-3	Demeton	SW8141A	0.031	0.031	mg/kg	C
337	60-57-1	Dieldrin	SW8081A	0.0016	**0.00061**	mg/kg	C
746	959-98-8	Endosulfan I	SW8081A	0.0016	0.0016	mg/kg	C
640	33213-65-9	Endosulfan II	SW8081A	0.0016	**0.00042**	mg/kg	C
617	1031-07-8	Endosulfan sulfate	SW8081A	0.0016	**0.00043**	mg/kg	C
---	7421-93-4	Endrin aldehyde	SW8081A	0.0016	0.0016	mg/kg	C
340	86-50-0	Azinphos methyl	SW8141A	0.031	0.031	mg/kg	C
---	1024-57-3	Heptachlor epoxide	SW8081A	0.0016	**0.00035**	mg/kg	C
---	319-84-6	Alpha-BHC	SW8081A	0.0016	0.0016	mg/kg	C
---	319-85-7	Beta-BHC	SW8081A	0.0016	0.0016	mg/kg	C
---	143-50-0	Kepone	SW8270C	1.2	1.2	mg/kg	C
343	121-75-5	Malathion	SW8141A	0.031	0.031	mg/kg	C
345	2385-85-5	Mirex	SW8081A	0.0016	0.0016	mg/kg	C
346	56-38-2	Methyl parathion	SW8141A	0.031	0.031	mg/kg	C
---	1336-36-3	Total PCB	---	---	---	---	---
641	53469-21-9	Aroclor 1242	SW8082	0.016	0.016	mg/kg	C
642	11097-69-1	Aroclor 1254	SW8082	0.016	0.016	mg/kg	C
643	11104-28-2	Aroclor 1221	SW8082	0.016	0.016	mg/kg	C
644	11141-16-5	Aroclor 1232	SW8082	0.016	0.016	mg/kg	C
645	12672-29-6	Aroclor 1248	SW8082	0.016	**0.037**	mg/kg	C
618	11096-82-5	Aroclor 1260	SW8082	0.016	0.016	mg/kg	C
646	12674-11-2	Aroclor 1016	SW8082	0.016	**0.044**	mg/kg	C
Base Neutral Extractable (Part B.3.)							
273	83-32-9	Acenaphthene	SW8310	0.031	0.031	mg/kg	C
275	120-12-7	Anthracene	SW8310	0.0063	**0.0058**	mg/kg	C
---	92-87-5	Benzidine	SW8270C	6.2	6.2	mg/kg	C
276	56-55-3	Benzo(a)anthracene	SW8310	0.006	**0.033**	mg/kg	C

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Facility Name: Virginia Power--Possum Point **VPDES PERMIT NO.: VA0002017**
DATE: **PROJECT: Cameron Run CR07-3**

DEQ Parameter No.	EPA CAS Number	Parameter	EPA Analysis No.	Quantification [1] Level (mg/kg)	Reporting [2] Results (mg/kg)	Units	Sample [3] Type
648	205-99-2	Benzo(b)fluoranthene	SW8310	0.006	**0.082**	mg/kg	C
278	207-08-9	Benzo(k)fluoranthene	SW8310	0.006	**0.025**	mg/kg	C
277	50-32-8	Benzo(a)pyrene	SW8310	0.006	**0.074**	mg/kg	C
---	111-44-4	Bis(2-Chloroethyl) Ether	SW8270C	0.062	0.062	mg/kg	C
486	85-68-7	Butyl benzyl phthalate	SW8270C	0.31	0.31	mg/kg	C
---	91-58-7	2-Chloronaphthalene	SW8270C	0.062	0.062	mg/kg	C
282	218-01-9	Chrysene	SW8310	0.006	**0.052**	mg/kg	C
654	53-70-3	Dibenzo(a,h)anthracene	SW8310	0.0063	0.0063	mg/kg	C
206	84-74-2	Di-n-butyl phthalate	SW8270C	0.31	0.31	mg/kg	C
259	95-50-1	1,2-Dichlorobenzene	SW8270C	0.062	0.062	mg/kg	C
264	541-73-1	1,3-Dichlorobenzene	SW8270C	0.062	0.062	mg/kg	C
527	91-94-1	3,3'-Dichlorobenzidine	SW8270C	0.31	0.31	mg/kg	C
285	84-66-2	Diethyl Phthalate	SW8270C	0.31	0.31	mg/kg	C
170	117-81-7	Bis(2-Ethylhexyl) Phthalate	SW8270C	0.3	**0.1**	mg/kg	C
286	131-11-3	Dimethyl phthalate	SW8270C	0.31	0.31	mg/kg	C
535	122-66-7	1,2-Diphenylhydrazine	SW8270C	0.062	0.062	mg/kg	C
287	206-44-0	Fluoranthene	SW8310	0.006	**0.099**	mg/kg	C
288	86-73-7	Fluorene	SW8310	0.0063	**0.0044**	mg/kg	C
538	77-47-4	Hexachlorocyclopentadiene	SW8270C	0.31	0.31	mg/kg	C
651	193-39-5	Indeno(1,2,3-cd)pyrene	SW8310	0.01	**0.08**	mg/kg	C
650	78-59-1	Isophorone	SW8270C	0.31	0.31	mg/kg	C
293	91-20-3	Naphthalene	SW8310	0.031	0.031	mg/kg	C
573	62-75-9	N-Nitrosodimethylamine	SW8270C	0.31	0.31	mg/kg	C
574	86-30-6	N-Nitrosodiphenylamine	SW8270C	0.31	0.31	mg/kg	C
575	621-64-7	N-Nitrosodi-N-Propylamine	SW8270C	0.062	0.062	mg/kg	C
296	129-00-0	Pyrene	SW8310	0.006	**0.073**	mg/kg	C
263	120-82-1	1,2,4-Trichlorobenzene	SW8270C	0.31	0.31	mg/kg	C
Volatiles (Part B.4.)							
171	107-02-8	Acrolein	SW8260B	0.13	0.13	mg/kg	C
204	107-13-1	Acrylonitrile	SW8260B	0.13	0.13	mg/kg	C
484	75-25-2	Bromoform	SW8260B	0.0067	0.0067	mg/kg	C
652	124-48-1	Chlorodibromomethane	SW8260B	0.0067	0.0067	mg/kg	C
649	75-09-2	Methylene Chloride	SW8260B	0.0067	**0.0017**	mg/kg	C
244	75-27-4	Dichlorobromomethane	SW8260B	0.0067	0.0067	mg/kg	C
262	156-60-5	Trans-1,2-Dichloroethene	SW8260B	0.0067	0.0067	mg/kg	C
261	78-87-5	1,2-Dichloropropane	SW8260B	0.0067	0.0067	mg/kg	C
265	542-75-6	1,3-Dichloropropene	---	---	---	---	---
172	100-41-4	Ethylbenzene	SW8260B	0.0067	0.0067	mg/kg	C
---	74-83-9	Bromomethane	SW8260B	0.0067	0.0067	mg/kg	C
---	78-93-3	Methyl Ethyl Ketone (MEK)	SW8260B	0.0067	0.0067	mg/kg	C
596	79-34-5	1,1,2,2-Tetrachloroethane	SW8260B	0.0067	0.0067	mg/kg	C

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Facility Name: Virginia Power--Possum Point **VPDES PERMIT NO.: VA0002017**
DATE: **PROJECT: Cameron Run CR07-3**

DEQ Parameter No.	EPA CAS Number	Parameter	EPA Analysis No.	Quantification [1] Level (mg/kg)	Reporting [2] Results (mg/kg)	Units	Sample [3] Type
222	108-88-3	Toluene	SW8260B	0.0067	0.0067	mg/kg	C
373	79-00-5	1,1,2-Trichloroethane	SW8260B	0.0067	0.0067	mg/kg	C
155	79-01-6	Trichloroethylene	SW8260B	0.0067	0.0067	mg/kg	C
Acids Extractables (Part B.5.)							
267	95-57-8	2-Chlorophenol	SW8270C	0.31	0.31	mg/kg	C
268	120-83-2	2,4-Dichlorophenol	SW8270C	0.062	0.062	mg/kg	C
269	105-67-9	2,4-Dimethylphenol	SW8270C	0.31	0.31	mg/kg	C
---	534-52-1	2-Methyl-4,6-Dinitrophenol	SW8270C	1.5	1.5	mg/kg	C
270	51-28-5	2,4-Dinitrophenol	SW8270C	1.6	1.6	mg/kg	C
175	108-95-2	Phenol	SW8270C	0.062	0.062	mg/kg	C
Miscellaneous (Part B.6.)							
018	57-12-5	Cyanide, Total	SW9012A	0.67	**0.21**	mg/kg	C
306	---	Dioxin	---	---	---	---	---
350	1461-22-9	Tributyltin	STL	0.002	0.002	mg/kg	C
257	---	Total Petroleum Hydrocarbons (TPH)	SW9035	225	225	mg/kg	C

I certify under penalty of law that this documenta and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the pweson or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment for knowing violations. See 18 U.S.C. P1001 and 33 U.S.C. P 1319. (Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years.)

Name of Principal Executive Officer or Authorized Agent | Title

Signature of Principal Executive Officer or Authorized Agent | Date

Footnotes to Water Quality Monitoring Attachment B

[1] Quantification Level (QL) is defined as the lowest concentration used for the calibration of a measurement system when the calibration is in accordance with the procedures published for the required method. In this case it is the Reporting Limit (RL).

[2] Results for chemicals that were detected are in bold and shaded.

[3] Sample Type: C = core sample

Any Approved method presented in 40 CFR Part 136

The QL is at the discretion of the permittee. For any substance addressed in 40CFR Part 136, the permittee shall use one of the approved methods in 40 CFR Par 136.

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Facility Name: Virginia Power--Possum Point **VPDES PERMIT NO.: VA0002017**
DATE: **PROJECT: Cameron Run CR07-4**

DEQ Parameter No.	EPA CAS Number	Parameter	EPA Analysis No.	Quantification [1] Level (mg/l)	Reporting [2] Results (mg/l)	Sample [3] Type	Threshold Levels (mg/l)
Toxicity Characteristic Leaching Procedure Parameters with Threshold Levels (Part A)							
033	7440-38-2	Arsenic	1311	0.5	**0.2**	C	5
151	7440-39-3	Barium	1311	10	**0.2**	C	100
216	71-43-2	Benzene	1311	0.05	0.05	C	3
096	7440-43-9	Cadmium	1311	0.1	0.1	C	1
236	56-23-5	Carbon tetrachloride	1311	0.05	0.05	C	0.5
333	57-74-9	Chlordane	1311	0.005	0.005	C	0.03
280	108-90-7	Chlorobenzene	1311	0.05	0.05	C	100
223	67-66-3	Chloroform	1311	0.05	0.05	C	6
016	7440-47-3	Chromium	1311	0.5	**0.024**	C	5
510	95-48-7	o-Cresol*	---	---	---	---	200
509	108-39-4	m-Cresol*	---	---	---	---	200
511	106-44-5	p-Cresol*	---	---	---	---	200
512	---	Cresols, Total	1311	0.05	0.05	C	200
266	106-46-7	1,4-Dichlorobenzene	1311	0.05	0.05	C	7.5
260	107-06-2	1,2-Dichloroethane	1311	0.05	0.05	C	0.5
258	75-35-4	1,1-Dichloroethylene	1311	0.05	0.05	C	0.7
239	121-14-2	2,4-Dinitrotoluene	1311	0.05	0.05	C	0.13
339	72-20-8	Endrin	1311	0.0005	0.0005	C	0.02
341	76-44-8	Heptachlor	1311	0.0005	0.0005	C	0.008
289	118-74-1	Hexachlorobenzene	1311	0.05	**0.05**	C	0.13
290	87-68-3	Hexachlorobutadiene	1311	0.05	0.05	C	0.5
291	67-72-1	Hexachloroethane	1311	0.05	0.05	C	5
034	7439-92-1	Lead	1311	0.5	0.08	C	5
342	58-89-9	Hexachlorocyclohexane (Lindane)	1311	0.0005	0.0005	C	0.4
042	7439-97-6	Mercury	1311	0.0002	0.0002	C	0.2
344	72-43-5	Methoxychlor	1311	0.001	0.001	C	10
---	78-93-3	Methyl Ethyl Ketone (MEK)	1311	0.05	0.05	C	200
294	98-95-3	Nitrobenzene	1311	0.05	0.05	C	2
210	87-86-5	Pentachlorophenol	1311	0.25	0.25	C	100
---	110-86-1	Pyridine	1311	0.25	0.25	C	5
152	7782-49-2	Selenium	1311	0.25	0.25	C	1
037	7440-22-4	Silver	1311	0.5	0.5	C	5
220	127-18-4	Tetrachloroethylene	1311	0.05	0.05	C	0.7
349	8001-35-2	Toxaphene	1311	0.02	0.02	C	0.5
602	79-01-6	Trichloroethylene	1311	0.05	0.05	C	0.5
601	95-95-4	2,4,5-Trichlorophenol	1311	0.05	0.05	C	400
602	88-06-2	2,4,6-Trichlorophenol	1311	0.05	0.05	C	2
173	75-01-4	Vinyl chloride	1311	0.05	0.05	C	0.2

* If o-, m-, and p-Cresol concentrations cannot be differentiated, the total cresol concentration is used.

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Facility Name: Virginia Power--Possum Point **VPDES PERMIT NO.: VA0002017**
DATE: **PROJECT: Cameron Run CR07-4**

DEQ Parameter No.	EPA CAS Number	Parameter	EPA Analysis No.	Quantification [1] Level (mg/kg)	Reporting [2] Results (mg/kg)	Units	Sample [3] Type
Metals (Part B.1.)							
178	7440-36-0	Antimony	SW6010B-T	0.09	**0.21**	mg/kg	C
457	7440-38-2	Arsenic	SW6010B-T	0.22	**0.53**	mg/kg	C
441	7440-47-3	Chromium	SW6010B-T	0.1	**4.7**	mg/kg	C
231	18540-29-9	Chromium, VI	SW7196	0.17	0.17	mg/kg	C
442	7440-50-8	Copper	SW6010B-T	0.1	**5.1**	mg/kg	C
445	7440-02-0	Nickel	SW6010B-T	0.1	**2.8**	mg/kg	C
---	7440-28-0	Thallium	SW6010B-T	0.30	**0.51**	mg/kg	C
448	7440-66-6	Zinc	SW6010B-T	0.3	**19.4**	mg/kg	C
Pesticides/PCBs (Part B.2.)							
332	309-00-2	Aldrin	SW8081A	0.0016	**0.0018**	mg/kg	C
334	2921-88-2	Chlorpyrifos	SW8141A	0.031	0.031	mg/kg	C
---	72-54-8	4,4'-DDD	SW8081A	0.0016	**0.00038**	mg/kg	C
---	72-55-9	4,4'-DDE	SW8081A	0.0016	**0.00087**	mg/kg	C
335	50-29-3	4,4'-DDT	SW8081A	0.0016	0.0016	mg/kg	C
336	8065-48-3	Demeton	SW8141A	0.031	0.031	mg/kg	C
337	60-57-1	Dieldrin	SW8081A	0.0016	0.0016	mg/kg	C
746	959-98-8	Endosulfan I	SW8081A	0.0016	0.0016	mg/kg	C
640	33213-65-9	Endosulfan II	SW8081A	0.0016	0.0016	mg/kg	C
617	1031-07-8	Endosulfan sulfate	SW8081A	0.0016	0.0016	mg/kg	C
---	7421-93-4	Endrin aldehyde	SW8081A	0.0016	0.0016	mg/kg	C
340	86-50-0	Azinphos methyl	SW8141A	0.031	0.031	mg/kg	C
---	1024-57-3	Heptachlor epoxide	SW8081A	0.0016	0.0016	mg/kg	C
---	319-84-6	Alpha-BHC	SW8081A	0.0016	0.0016	mg/kg	C
---	319-85-7	Beta-BHC	SW8081A	0.0016	0.0016	mg/kg	C
---	143-50-0	Kepone	SW8270C	1.2	1.2	mg/kg	C
343	121-75-5	Malathion	SW8141A	0.031	0.031	mg/kg	C
345	2385-85-5	Mirex	SW8081A	0.0016	0.0016	mg/kg	C
346	56-38-2	Methyl parathion	SW8141A	0.031	0.031	mg/kg	C
---	1336-36-3	Total PCB	---	---	---	---	---
641	53469-21-9	Aroclor 1242	SW8082	0.016	0.016	mg/kg	C
642	11097-69-1	Aroclor 1254	SW8082	0.016	0.016	mg/kg	C
643	11104-28-2	Aroclor 1221	SW8082	0.016	0.016	mg/kg	C
644	11141-16-5	Aroclor 1232	SW8082	0.016	0.016	mg/kg	C
645	12672-29-6	Aroclor 1248	SW8082	0.016	**0.018**	mg/kg	C
618	11096-82-5	Aroclor 1260	SW8082	0.016	0.016	mg/kg	C
646	12674-11-2	Aroclor 1016	SW8082	0.016	0.016	mg/kg	C
Base Neutral Extractable (Part B.3.)							
273	83-32-9	Acenaphthene	SW8310	0.16	0.16	mg/kg	C
275	120-12-7	Anthracene	SW8310	0.032	**0.042**	mg/kg	C
---	92-87-5	Benzidine	SW8270C	6.2	6.2	mg/kg	C
276	56-55-3	Benzo(a)anthracene	SW8310	0.03	**0.2**	mg/kg	C

DEPARTMENT OF ENVIRONMENTAL QUALITY
Dredge Spoils Monitoring
Attachment B, Page 3 of 4

Facility Name: Virginia Power--Possum Point **VPDES PERMIT NO.: VA0002017**
DATE: **PROJECT: Cameron Run CR07-4**

DEQ Parameter No.	EPA CAS Number	Parameter	EPA Analysis No.	Quantification [1] Level (mg/kg)	Reporting [2] Results (mg/kg)	Units	Sample [3] Type
648	205-99-2	Benzo(b)fluoranthene	SW8310	0.03	**0.24**	mg/kg	C
278	207-08-9	Benzo(k)fluoranthene	SW8310	0.03	**0.12**	mg/kg	C
277	50-32-8	Benzo(a)pyrene	SW8310	0.03	**0.2**	mg/kg	C
---	111-44-4	Bis(2-Chloroethyl) Ether	SW8270C	0.063	0.063	mg/kg	C
486	85-68-7	Butyl benzyl phthalate	SW8270C	0.31	0.31	mg/kg	C
---	91-58-7	2-Chloronaphthalene	SW8270C	0.063	0.063	mg/kg	C
282	218-01-9	Chrysene	SW8310	0.03	**0.21**	mg/kg	C
654	53-70-3	Dibenzo(a,h)anthracene	SW8310	0.032	0.032	mg/kg	C
206	84-74-2	Di-n-butyl phthalate	SW8270C	0.31	0.31	mg/kg	C
259	95-50-1	1,2-Dichlorobenzene	SW8270C	0.063	0.063	mg/kg	C
264	541-73-1	1,3-Dichlorobenzene	SW8270C	0.063	0.063	mg/kg	C
527	91-94-1	3,3'-Dichlorobenzidine	SW8270C	0.31	0.31	mg/kg	C
285	84-66-2	Diethyl Phthalate	SW8270C	0.31	0.31	mg/kg	C
170	117-81-7	Bis(2-Ethylhexyl) Phthalate	SW8270C	0.31	**0.099**	mg/kg	C
286	131-11-3	Dimethyl phthalate	SW8270C	0.31	0.31	mg/kg	C
535	122-66-7	1,2-Diphenylhydrazine	SW8270C	0.063	0.063	mg/kg	C
287	206-44-0	Fluoranthene	SW8310	0.03	**0.44**	mg/kg	C
288	86-73-7	Fluorene	SW8310	0.032	**0.017**	mg/kg	C
538	77-47-4	Hexachlorocyclopentadiene	SW8270C	0.31	0.31	mg/kg	C
651	193-39-5	Indeno(1,2,3-cd)pyrene	SW8310	0.03	**0.15**	mg/kg	C
650	78-59-1	Isophorone	SW8270C	0.31	0.31	mg/kg	C
293	91-20-3	Naphthalene	SW8310	0.16	0.16	mg/kg	C
573	62-75-9	N-Nitrosodimethylamine	SW8270C	0.31	0.31	mg/kg	C
574	86-30-6	N-Nitrosodiphenylamine	SW8270C	0.31	0.31	mg/kg	C
575	621-64-7	N-Nitrosodi-N-Propylamine	SW8270C	0.063	0.063	mg/kg	C
296	129-00-0	Pyrene	SW8310	0.03	**0.32**	mg/kg	C
263	120-82-1	1,2,4-Trichlorobenzene	SW8270C	0.31	0.31	mg/kg	C
Volatiles (Part B.4.)							
171	107-02-8	Acrolein	SW8260B	0.14	0.14	mg/kg	C
204	107-13-1	Acrylonitrile	SW8260B	0.14	0.14	mg/kg	C
484	75-25-2	Bromoform	SW8260B	0.0068	0.0068	mg/kg	C
652	124-48-1	Chlorodibromomethane	SW8260B	0.0068	0.0068	mg/kg	C
649	75-09-2	Methylene Chloride	SW8260B	0.0068	**0.0026**	mg/kg	C
244	75-27-4	Dichlorobromomethane	SW8260B	0.0068	0.0068	mg/kg	C
262	156-60-5	Trans-1,2-Dichloroethene	SW8260B	0.0068	0.0068	mg/kg	C
261	78-87-5	1,2-Dichloropropane	SW8260B	0.0068	0.0068	mg/kg	C
265	542-75-6	1,3-Dichloropropene	---	---	---	---	---
172	100-41-4	Ethylbenzene	SW8260B	0.0068	0.0068	mg/kg	C
---	74-83-9	Bromomethane	SW8260B	0.0068	0.0068	mg/kg	C
---	78-93-3	Methyl Ethyl Ketone (MEK)	SW8260B	0.0068	0.0068	mg/kg	C
596	79-34-5	1,1,2,2-Tetrachloroethane	SW8260B	0.0068	0.0068	mg/kg	C

DEPARTMENT OF ENVIRONMENTAL QUALITY
Dredge Spoils Monitoring
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Facility Name: Virginia Power--Possum Point **VPDES PERMIT NO.: VA0002017**
DATE: **PROJECT: Cameron Run CR07-4**

DEQ Parameter No.	EPA CAS Number	Parameter	EPA Analysis No.	Quantification [1] Level (mg/kg)	Reporting [2] Results (mg/kg)	Units	Sample [3] Type
222	108-88-3	Toluene	SW8260B	0.0068	0.0068	mg/kg	C
373	79-00-5	1,1,2-Trichloroethane	SW8260B	0.0068	0.0068	mg/kg	C
155	79-01-6	Trichloroethylene	SW8260B	0.0068	0.0068	mg/kg	C
Acids Extractables (Part B.5.)							
267	95-57-8	2-Chlorophenol	SW8270C	0.31	0.31	mg/kg	C
268	120-83-2	2,4-Dichlorophenol	SW8270C	0.063	0.063	mg/kg	C
269	105-67-9	2,4-Dimethylphenol	SW8270C	0.31	0.31	mg/kg	C
---	534-52-1	2-Methyl-4,6-Dinitrophenol	SW8270C	1.5	1.5	mg/kg	C
270	51-28-5	2,4-Dinitrophenol	SW8270C	1.6	1.6	mg/kg	C
175	108-95-2	Phenol	SW8270C	0.063	0.063	mg/kg	C
Miscellaneous (Part B.6.)							
018	57-12-5	Cyanide, Total	SW9012A	0.68	**0.16**	mg/kg	C
306	---	Dioxin	---	---	---	---	---
350	1461-22-9	Tributyltin	STL	0.0018	0.0018	mg/kg	C
257	---	Total Petroleum Hydrocarbons (TPH)	SW9035	226	226	mg/kg	C

I certify under penalty of law that this documenta and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the pweson or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment for knowing violations. See 18 U.S.C. P1001 and 33 U.S.C. P 1319. (Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years.)

Name of Principal Executive Officer or Authorized Agent | Title

Signature of Principal Executive Officer or Authorized Agent | Date

Footnotes to Water Quality Monitoring Attachment B

[1] Quantification Level (QL) is defined as the lowest concentration used for the calibration of a measurement system when the calibration is in accordance with the procedures published for the required method. In this case it is the Reporting Limit (RL).

[2] Results for chemicals that were detected are in bold and shaded.

[3] Sample Type: C = core sample

Any Approved method presented in 40 CFR Part 136

The QL is at the discretion of the permittee. For any substance addressed in 40CFR Part 136, the permittee shall use one of the approved methods in 40 CFR Par 136.

DEPARTMENT OF ENVIRONMENTAL QUALITY
Dredge Spoils Monitoring
Attachment B, Page 1 of 4

Facility Name: Virginia Power--Possum Point **VPDES PERMIT NO.: VA0002017**
DATE: **PROJECT: Cameron Run CR07-5**

DEQ Parameter No.	EPA CAS Number	Parameter	EPA Analysis No.	Quantification [1] Level (mg/l)	Reporting [2] Results (mg/l)	Sample [3] Type	Threshold Levels (mg/l)
Toxicity Characteristic Leaching Procedure Parameters with Threshold Levels (Part A)							
033	7440-38-2	Arsenic	1311	0.5	**0.2**	C	5
151	7440-39-3	Barium	1311	10	**0.22**	C	100
216	71-43-2	Benzene	1311	0.05	0.05	C	3
096	7440-43-9	Cadmium	1311	0.1	0.1	C	1
236	56-23-5	Carbon tetrachloride	1311	0.05	0.05	C	0.5
333	57-74-9	Chlordane	1311	0.005	0.005	C	0.03
280	108-90-7	Chlorobenzene	1311	0.05	0.05	C	100
223	67-66-3	Chloroform	1311	0.05	0.05	C	6
016	7440-47-3	Chromium	1311	0.5	**0.0074**	C	5
510	95-48-7	o-Cresol*	---	---	---	---	200
509	108-39-4	m-Cresol*	---	---	---	---	200
511	106-44-5	p-Cresol*	---	---	---	---	200
512	---	Cresols, Total	1311	0.05	0.05	C	200
266	106-46-7	1,4-Dichlorobenzene	1311	0.05	0.05	C	7.5
260	107-06-2	1,2-Dichloroethane	1311	0.05	0.05	C	0.5
258	75-35-4	1,1-Dichloroethylene	1311	0.05	0.05	C	0.7
239	121-14-2	2,4-Dinitrotoluene	1311	0.05	0.05	C	0.13
339	72-20-8	Endrin	1311	0.0005	0.0005	C	0.02
341	76-44-8	Heptachlor	1311	0.0005	0.0005	C	0.008
289	118-74-1	Hexachlorobenzene	1311	0.05	0.05	C	0.13
290	87-68-3	Hexachlorobutadiene	1311	0.05	0.05	C	0.5
291	67-72-1	Hexachloroethane	1311	0.05	0.05	C	5
034	7439-92-1	Lead	1311	0.5	**0.074**	C	5
342	58-89-9	Hexachlorocyclohexane (Lindane)	1311	0.0005	0.0005	C	0.4
042	7439-97-6	Mercury	1311	0.0002	0.0002	C	0.2
344	72-43-5	Methoxychlor	1311	0.001	0.001	C	10
---	78-93-3	Methyl Ethyl Ketone (MEK)	1311	0.05	0.05	C	200
294	98-95-3	Nitrobenzene	1311	0.05	0.05	C	2
210	87-86-5	Pentachlorophenol	1311	0.25	0.25	C	100
---	110-86-1	Pyridine	1311	0.25	0.25	C	5
152	7782-49-2	Selenium	1311	0.25	0.25	C	1
037	7440-22-4	Silver	1311	0.5	0.5	C	5
220	127-18-4	Tetrachloroethylene	1311	0.05	0.05	C	0.7
349	8001-35-2	Toxaphene	1311	0.02	0.02	C	0.5
602	79-01-6	Trichloroethylene	1311	0.05	0.05	C	0.5
601	95-95-4	2,4,5-Trichlorophenol	1311	0.05	0.05	C	400
602	88-06-2	2,4,6-Trichlorophenol	1311	0.05	0.05	C	2
173	75-01-4	Vinyl chloride	1311	0.05	0.05	C	0.2

* If o-, m-, and p-Cresol concentrations cannot be differentiated, the total cresol concentration is used.

DEPARTMENT OF ENVIRONMENTAL QUALITY
Dredge Spoils Monitoring
Attachment B, Page 2 of 4

Facility Name: Virginia Power--Possum Point **VPDES PERMIT NO.: VA0002017**
DATE: **PROJECT: Cameron Run CR07-5**

DEQ Parameter No.	EPA CAS Number	Parameter	EPA Analysis No.	Quantification [1] Level (mg/kg)	Reporting [2] Results (mg/kg)	Units	Sample [3] Type
Metals (Part B.1.)							
178	7440-36-0	Antimony	SW6010B-T	0.09	**0.21**	mg/kg	C
457	7440-38-2	Arsenic	SW6010B-T	0.2	**1.2**	mg/kg	C
441	7440-47-3	Chromium	SW6010B-T	0.1	**9.8**	mg/kg	C
231	18540-29-9	Chromium, VI	SW7196	0.2	0.16	mg/kg	C
442	7440-50-8	Copper	SW6010B-T	0.1	**11.7**	mg/kg	C
445	7440-02-0	Nickel	SW6010B-T	0.1	**4.1**	mg/kg	C
---	7440-28-0	Thallium	SW6010B-T	0.3	**0.5**	mg/kg	C
448	7440-66-6	Zinc	SW6010B-T	0.3	**29.1**	mg/kg	C
Pesticides/PCBs (Part B.2.)							
332	309-00-2	Aldrin	SW8081A	0.0016	**0.0011**	mg/kg	C
334	2921-88-2	Chlorpyrifos	SW8141A	0.032	0.032	mg/kg	C
---	72-54-8	4,4'-DDD	SW8081A	0.0016	**0.0019**	mg/kg	C
---	72-55-9	4,4'-DDE	SW8081A	0.0016	**0.0013**	mg/kg	C
335	50-29-3	4,4'-DDT	SW8081A	0.0016	0.0016	mg/kg	C
336	8065-48-3	Demeton	SW8141A	0.03	0.032	mg/kg	C
337	60-57-1	Dieldrin	SW8081A	0.0016	**0.00018**	mg/kg	C
746	959-98-8	Endosulfan I	SW8081A	0.0016	0.0016	mg/kg	C
640	33213-65-9	Endosulfan II	SW8081A	0.0016	**0.00044**	mg/kg	C
617	1031-07-8	Endosulfan sulfate	SW8081A	0.0016	**0.00076**	mg/kg	C
---	7421-93-4	Endrin aldehyde	SW8081A	0.0016	0.0016	mg/kg	C
340	86-50-0	Azinphos methyl	SW8141A	0.032	0.032	mg/kg	C
---	1024-57-3	Heptachlor epoxide	SW8081A	0.0016	0.0016	mg/kg	C
---	319-84-6	Alpha-BHC	SW8081A	0.0016	0.0016	mg/kg	C
---	319-85-7	Beta-BHC	SW8081A	0.0016	0.0016	mg/kg	C
---	143-50-0	Kepone	SW8270C	1.3	1.3	mg/kg	C
343	121-75-5	Malathion	SW8141A	0.032	0.032	mg/kg	C
345	2385-85-5	Mirex	SW8081A	0.0016	0.0016	mg/kg	C
346	56-38-2	Methyl parathion	SW8141A	0.032	0.032	mg/kg	C
---	1336-36-3	Total PCB	---	---	---	---	---
641	53469-21-9	Aroclor 1242	SW8082	0.016	0.016	mg/kg	C
642	11097-69-1	Aroclor 1254	SW8082	0.016	0.016	mg/kg	C
643	11104-28-2	Aroclor 1221	SW8082	0.016	0.016	mg/kg	C
644	11141-16-5	Aroclor 1232	SW8082	0.016	0.016	mg/kg	C
645	12672-29-6	Aroclor 1248	SW8082	0.016	**0.026**	mg/kg	C
618	11096-82-5	Aroclor 1260	SW8082	0.016	0.016	mg/kg	C
646	12674-11-2	Aroclor 1016	SW8082	0.016	**0.026**	mg/kg	C
Base Neutral Extractable (Part B.3.)							
273	83-32-9	Acenaphthene	SW8310	0.16	0.16	mg/kg	C
275	120-12-7	Anthracene	SW8310	0.032	**0.067**	mg/kg	C
---	92-87-5	Benzidine	SW8270C	6.4	6.4	mg/kg	C
276	56-55-3	Benzo(a)anthracene	SW8310	0.03	**0.16**	mg/kg	C

DEPARTMENT OF ENVIRONMENTAL QUALITY
Dredge Spoils Monitoring
Attachment B, Page 3 of 4

Facility Name: Virginia Power--Possum Point **VPDES PERMIT NO.: VA0002017**
DATE: **PROJECT: Cameron Run CR07-5**

DEQ Parameter No.	EPA CAS Number	Parameter	EPA Analysis No.	Quantification [1] Level (mg/kg)	Reporting [2] Results (mg/kg)	Units	Sample [3] Type
648	205-99-2	Benzo(b)fluoranthene	SW8310	0.03	**0.18**	mg/kg	C
278	207-08-9	Benzo(k)fluoranthene	SW8310	0.032	**0.087**	mg/kg	C
277	50-32-8	Benzo(a)pyrene	SW8310	0.03	**0.14**	mg/kg	C
---	111-44-4	Bis(2-Chloroethyl) Ether	SW8270C	0.064	0.064	mg/kg	C
486	85-68-7	Butyl benzyl phthalate	SW8270C	0.32	0.32	mg/kg	C
---	91-58-7	2-Chloronaphthalene	SW8270C	0.064	0.064	mg/kg	C
282	218-01-9	Chrysene	SW8310	0.03	**0.15**	mg/kg	C
654	53-70-3	Dibenzo(a,h)anthracene	SW8310	0.032	0.032	mg/kg	C
206	84-74-2	Di-n-butyl phthalate	SW8270C	0.32	0.32	mg/kg	C
259	95-50-1	1,2-Dichlorobenzene	SW8270C	0.064	0.064	mg/kg	C
264	541-73-1	1,3-Dichlorobenzene	SW8270C	0.064	0.064	mg/kg	C
527	91-94-1	3,3'-Dichlorobenzidine	SW8270C	0.32	0.32	mg/kg	C
285	84-66-2	Diethyl Phthalate	SW8270C	0.32	0.32	mg/kg	C
170	117-81-7	Bis(2-Ethylhexyl) Phthalate	SW8270C	0.32	**0.09**	mg/kg	C
286	131-11-3	Dimethyl phthalate	SW8270C	0.32	0.32	mg/kg	C
535	122-66-7	1,2-Diphenylhydrazine	SW8270C	0.064	0.064	mg/kg	C
287	206-44-0	Fluoranthene	SW8310	0.032	**0.37**	mg/kg	C
288	86-73-7	Fluorene	SW8310	0.032	**0.017**	mg/kg	C
538	77-47-4	Hexachlorocyclopentadiene	SW8270C	0.32	0.32	mg/kg	C
651	193-39-5	Indeno(1,2,3-cd)pyrene	SW8310	0.03	**0.17**	mg/kg	C
650	78-59-1	Isophorone	SW8270C	0.32	0.32	mg/kg	C
293	91-20-3	Naphthalene	SW8310	0.16	0.16	mg/kg	C
573	62-75-9	N-Nitrosodimethylamine	SW8270C	0.32	0.32	mg/kg	C
574	86-30-6	N-Nitrosodiphenylamine	SW8270C	0.32	0.32	mg/kg	C
575	621-64-7	N-Nitrosodi-N-Propylamine	SW8270C	0.064	0.064	mg/kg	C
296	129-00-0	Pyrene	SW8310	0.03	**0.27**	mg/kg	C
263	120-82-1	1,2,4-Trichlorobenzene	SW8270C	0.32	0.32	mg/kg	C
Volatiles (Part B.4.)							
171	107-02-8	Acrolein	SW8260B	0.13	0.13	mg/kg	C
204	107-13-1	Acrylonitrile	SW8260B	0.13	0.13	mg/kg	C
484	75-25-2	Bromoform	SW8260B	0.0064	0.0064	mg/kg	C
652	124-48-1	Chlorodibromomethane	SW8260B	0.0064	0.0064	mg/kg	C
649	75-09-2	Methylene Chloride	SW8260B	0.0064	**0.002**	mg/kg	C
244	75-27-4	Dichlorobromomethane	SW8260B	0.0064	0.0064	mg/kg	C
262	156-60-5	Trans-1,2-Dichloroethene	SW8260B	0.0064	0.0064	mg/kg	C
261	78-87-5	1,2-Dichloropropane	SW8260B	0.0064	0.0064	mg/kg	C
265	542-75-6	1,3-Dichloropropene	---	---	---	---	---
172	100-41-4	Ethylbenzene	SW8260B	0.0064	0.0064	mg/kg	C
---	74-83-9	Bromomethane	SW8260B	0.0064	0.0064	mg/kg	C
---	78-93-3	Methyl Ethyl Ketone (MEK)	SW8260B	0.0064	0.0064	mg/kg	C
596	79-34-5	1,1,2,2-Tetrachloroethane	SW8260B	0.0064	0.0064	mg/kg	C

DEPARTMENT OF ENVIRONMENTAL QUALITY
Dredge Spoils Monitoring
Attachment B, Page 4 of 4

Facility Name: Virginia Power--Possum Point **VPDES PERMIT NO.: VA0002017**
DATE: **PROJECT: Cameron Run CR07-5**

DEQ Parameter No.	EPA CAS Number	Parameter	EPA Analysis No.	Quantification [1] Level (mg/kg)	Reporting [2] Results (mg/kg)	Units	Sample [3] Type
222	108-88-3	Toluene	SW8260B	0.0064	0.0064	mg/kg	C
373	79-00-5	1,1,2-Trichloroethane	SW8260B	0.0064	0.0064	mg/kg	C
155	79-01-6	Trichloroethylene	SW8260B	0.0064	0.0064	mg/kg	C
Acids Extractables (Part B.5.)							
267	95-57-8	2-Chlorophenol	SW8270C	0.32	0.32	mg/kg	C
268	120-83-2	2,4-Dichlorophenol	SW8270C	0.064	0.064	mg/kg	C
269	105-67-9	2,4-Dimethylphenol	SW8270C	0.32	0.32	mg/kg	C
---	534-52-1	2-Methyl-4,6-Dinitrophenol	SW8270C	1.5	1.5	mg/kg	C
270	51-28-5	2,4-Dinitrophenol	SW8270C	1.6	1.6	mg/kg	C
175	108-95-2	Phenol	SW8270C	0.064	0.064	mg/kg	C
Miscellaneous (Part B.6.)							
018	57-12-5	Cyanide, Total	SW9012A	0.64	**0.12**	mg/kg	C
306	---	Dioxin	---	---	---	---	---
350	1461-22-9	Tributyltin	STL	0.0019	0.0019	mg/kg	C
257	---	Total Petroleum Hydrocarbons (TPH)	SW9035	214	214	mg/kg	C

I certify under penalty of law that this documenta and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the pweson or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment for knowing violations. See 18 U.S.C. P1001 and 33 U.S.C. P 1319. (Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years.)

Name of Principal Executive Officer or Authorized Agent — Title

Signature of Principal Executive Officer or Authorized Agent — Date

Footnotes to Water Quality Monitoring Attachment B

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[2] Results for chemicals that were detected are in bold and shaded.

[3] Sample Type: C = core sample

Any Approved method presented in 40 CFR Part 136

The QL is at the discretion of the permittee. For any substance addressed in 40CFR Part 136, the permittee shall use one of the approved methods in 40 CFR Par 136.

DEPARTMENT OF ENVIRONMENTAL QUALITY
Dredge Spoils Monitoring
Attachment B, Page 1 of 4

Facility Name: Virginia Power--Possum Point **VPDES PERMIT NO.: VA0002017**
DATE: **PROJECT: Cameron Run - CR07-6/7**

DEQ Parameter No.	EPA CAS Number	Parameter	EPA Analysis No.	Quantification [1] Level (mg/l)	Reporting [2] Results (mg/l)	Sample [3] Type	Threshold Levels (mg/l)
Toxicity Characteristic Leaching Procedure Parameters with Threshold Levels (Part A)							
033	7440-38-2	Arsenic	1311	0.5	**0.19**	C	5
151	7440-39-3	Barium	1311	10	**0.22**	C	100
216	71-43-2	Benzene	1311	0.05	0.05	C	3
096	7440-43-9	Cadmium	1311	0.1	0.1	C	1
236	56-23-5	Carbon tetrachloride	1311	0.05	0.05	C	0.5
333	57-74-9	Chlordane	1311	0.005	0.005	C	0.03
280	108-90-7	Chlorobenzene	1311	0.05	0.05	C	100
223	67-66-3	Chloroform	1311	0.05	0.05	C	6
016	7440-47-3	Chromium	1311	0.5	0.5	C	5
510	95-48-7	o-Cresol*	---	---	---	---	200
509	108-39-4	m-Cresol*	---	---	---	---	200
511	106-44-5	p-Cresol*	---	---	---	---	200
512	---	Cresols, Total	1311	0.05	0.05	C	200
266	106-46-7	1,4-Dichlorobenzene	1311	0.05	0.05	C	7.5
260	107-06-2	1,2-Dichloroethane	1311	0.05	0.05	C	0.5
258	75-35-4	1,1-Dichloroethylene	1311	0.05	0.05	C	0.7
239	121-14-2	2,4-Dinitrotoluene	1311	0.05	0.05	C	0.13
339	72-20-8	Endrin	1311	0.0005	0.0005	C	0.02
341	76-44-8	Heptachlor	1311	0.0005	0.0005	C	0.008
289	118-74-1	Hexachlorobenzene	1311	0.05	0.05	C	0.13
290	87-68-3	Hexachlorobutadiene	1311	0.05	0.05	C	0.5
291	67-72-1	Hexachloroethane	1311	0.05	0.05	C	5
034	7439-92-1	Lead	1311	0.5	**0.038**	C	5
342	58-89-9	Hexachlorocyclohexane (Lindane)	1311	0.0005	0.0005	C	0.4
042	7439-97-6	Mercury	1311	0.0002	0.0002	C	0.2
344	72-43-5	Methoxychlor	1311	0.001	0.001	C	10
---	78-93-3	Methyl Ethyl Ketone (MEK)	1311	0.05	0.05	C	200
294	98-95-3	Nitrobenzene	1311	0.05	0.05	C	2
210	87-86-5	Pentachlorophenol	1311	0.25	0.25	C	100
---	110-86-1	Pyridine	1311	0.25	0.25	C	5
152	7782-49-2	Selenium	1311	0.25	0.25	C	1
037	7440-22-4	Silver	1311	0.5	0.5	C	5
220	127-18-4	Tetrachloroethylene	1311	0.05	0.05	C	0.7
349	8001-35-2	Toxaphene	1311	0.02	0.02	C	0.5
602	79-01-6	Trichloroethylene	1311	0.05	0.05	C	0.5
601	95-95-4	2,4,5-Trichlorophenol	1311	0.05	0.05	C	400
602	88-06-2	2,4,6-Trichlorophenol	1311	0.05	0.05	C	2
173	75-01-4	Vinyl chloride	1311	0.05	0.05	C	0.2

* If o-, m-, and p-Cresol concentrations cannot be differentiated, the total cresol concentration is used.

DEPARTMENT OF ENVIRONMENTAL QUALITY
Dredge Spoils Monitoring
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Facility Name: Virginia Power--Possum Point **VPDES PERMIT NO.: VA0002017**
DATE: **PROJECT: Cameron Run - CR07-6/7**

DEQ Parameter No.	EPA CAS Number	Parameter	EPA Analysis No.	Quantification [1] Level (mg/kg)	Reporting [2] Results (mg/kg)	Units	Sample [3] Type
Metals (Part B.1.)							
178	7440-36-0	Antimony	SW6010B-T	0.09	**0.15**	mg/kg	C
457	7440-38-2	Arsenic	SW6010B-T	0.23	**0.78**	mg/kg	C
441	7440-47-3	Chromium	SW6010B-T	0.1	**7.2**	mg/kg	C
231	18540-29-9	Chromium, VI	SW7196	0.17	0.17	mg/kg	C
442	7440-50-8	Copper	SW6010B-T	0.1	**8.9**	mg/kg	C
445	7440-02-0	Nickel	SW6010B-T	0.1	**4.4**	mg/kg	C
---	7440-28-0	Thallium	SW6010B-T	0.32	**0.36**	mg/kg	C
448	7440-66-6	Zinc	SW6010B-T	0.4	**31.3**	mg/kg	C
Pesticides/PCBs (Part B.2.)							
332	309-00-2	Aldrin	SW8081A	0.0017	**0.00094**	mg/kg	C
334	2921-88-2	Chlorpyrifos	SW8141A	0.033	0.033	mg/kg	C
---	72-54-8	4,4'-DDD	SW8081A	0.0017	**0.00053**	mg/kg	C
---	72-55-9	4,4'-DDE	SW8081A	0.0017	**0.00021**	mg/kg	C
335	50-29-3	4,4'-DDT	SW8081A	0.0017	0.0017	mg/kg	C
336	8065-48-3	Demeton	SW8141A	0.033	0.033	mg/kg	C
337	60-57-1	Dieldrin	SW8081A	0.0017	0.0017	mg/kg	C
746	959-98-8	Endosulfan I	SW8081A	0.0017	0.0017	mg/kg	C
640	33213-65-9	Endosulfan II	SW8081A	0.0017	**0.00043**	mg/kg	C
617	1031-07-8	Endosulfan sulfate	SW8081A	0.0017	0.0017	mg/kg	C
---	7421-93-4	Endrin aldehyde	SW8081A	0.0017	0.0017	mg/kg	C
340	86-50-0	Azinphos methyl	SW8141A	0.033	0.033	mg/kg	C
---	1024-57-3	Heptachlor epoxide	SW8081A	0.0017	0.0017	mg/kg	C
---	319-84-6	Alpha-BHC	SW8081A	0.0017	0.0017	mg/kg	C
---	319-85-7	Beta-BHC	SW8081A	0.0017	0.0017	mg/kg	C
---	143-50-0	Kepone	SW8270C	1.3	1.3	mg/kg	C
343	121-75-5	Malathion	SW8141A	0.033	0.033	mg/kg	C
345	2385-85-5	Mirex	SW8081A	0.0017	0.0017	mg/kg	C
346	56-38-2	Methyl parathion	SW8141A	0.033	0.033	mg/kg	C
---	1336-36-3	Total PCB	---	---	---	---	---
641	53469-21-9	Aroclor 1242	SW8082	0.017	0.017	mg/kg	C
642	11097-69-1	Aroclor 1254	SW8082	0.017	0.017	mg/kg	C
643	11104-28-2	Aroclor 1221	SW8082	0.017	0.017	mg/kg	C
644	11141-16-5	Aroclor 1232	SW8082	0.017	0.017	mg/kg	C
645	12672-29-6	Aroclor 1248	SW8082	0.017	0.017	mg/kg	C
618	11096-82-5	Aroclor 1260	SW8082	0.017	0.017	mg/kg	C
646	12674-11-2	Aroclor 1016	SW8082	0.017	0.017	mg/kg	C
Base Neutral Extractable (Part B.3.)							
273	83-32-9	Acenaphthene	SW8310	0.033	0.033	mg/kg	C
275	120-12-7	Anthracene	SW8310	0.0067	**0.0035**	mg/kg	C
---	92-87-5	Benzidine	SW8270C	6.7	6.7	mg/kg	C
276	56-55-3	Benzo(a)anthracene	SW8310	0.007	**0.019**	mg/kg	C

DEPARTMENT OF ENVIRONMENTAL QUALITY
Dredge Spoils Monitoring
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Facility Name: Virginia Power--Possum Point **VPDES PERMIT NO.: VA0002017**
DATE: **PROJECT: Cameron Run - CR07-6/7**

DEQ Parameter No.	EPA CAS Number	Parameter	EPA Analysis No.	Quantification [1] Level (mg/kg)	Reporting [2] Results (mg/kg)	Units	Sample [3] Type
648	205-99-2	Benzo(b)fluoranthene	SW8310	0.007	**0.032**	mg/kg	C
278	207-08-9	Benzo(k)fluoranthene	SW8310	0.007	**0.013**	mg/kg	C
277	50-32-8	Benzo(a)pyrene	SW8310	0.007	**0.027**	mg/kg	C
---	111-44-4	Bis(2-Chloroethyl) Ether	SW8270C	0.067	0.067	mg/kg	C
486	85-68-7	Butyl benzyl phthalate	SW8270C	0.33	0.33	mg/kg	C
---	91-58-7	2-Chloronaphthalene	SW8270C	0.067	0.067	mg/kg	C
282	218-01-9	Chrysene	SW8310	0.007	**0.024**	mg/kg	C
654	53-70-3	Dibenzo(a,h)anthracene	SW8310	0.0067	0.0067	mg/kg	C
206	84-74-2	Di-n-butyl phthalate	SW8270C	0.33	0.33	mg/kg	C
259	95-50-1	1,2-Dichlorobenzene	SW8270C	0.067	0.067	mg/kg	C
264	541-73-1	1,3-Dichlorobenzene	SW8270C	0.067	0.067	mg/kg	C
527	91-94-1	3,3'-Dichlorobenzidine	SW8270C	0.33	0.33	mg/kg	C
285	84-66-2	Diethyl Phthalate	SW8270C	0.33	0.33	mg/kg	C
170	117-81-7	Bis(2-Ethylhexyl) Phthalate	SW8270C	0.33	**0.11**	mg/kg	C
286	131-11-3	Dimethyl phthalate	SW8270C	0.33	0.33	mg/kg	C
535	122-66-7	1,2-Diphenylhydrazine	SW8270C	0.067	0.067	mg/kg	C
287	206-44-0	Fluoranthene	SW8310	0.007	**0.044**	mg/kg	C
288	86-73-7	Fluorene	SW8310	0.0067	**0.00098**	mg/kg	C
538	77-47-4	Hexachlorocyclopentadiene	SW8270C	0.33	0.33	mg/kg	C
651	193-39-5	Indeno(1,2,3-cd)pyrene	SW8310	0.007	**0.029**	mg/kg	C
650	78-59-1	Isophorone	SW8270C	0.33	0.33	mg/kg	C
293	91-20-3	Naphthalene	SW8310	0.033	0.033	mg/kg	C
573	62-75-9	N-Nitrosodimethylamine	SW8270C	0.33	0.33	mg/kg	C
574	86-30-6	N-Nitrosodiphenylamine	SW8270C	0.33	0.33	mg/kg	C
575	621-64-7	N-Nitrosodi-N-Propylamine	SW8270C	0.067	0.067	mg/kg	C
296	129-00-0	Pyrene	SW8310	0.007	**0.042**	mg/kg	C
263	120-82-1	1,2,4-Trichlorobenzene	SW8270C	0.33	0.33	mg/kg	C
Volatiles (Part B.4.)							
171	107-02-8	Acrolein	SW8260B	0.13	0.13	mg/kg	C
204	107-13-1	Acrylonitrile	SW8260B	0.13	0.13	mg/kg	C
484	75-25-2	Bromoform	SW8260B	0.0067	0.0067	mg/kg	C
652	124-48-1	Chlorodibromomethane	SW8260B	0.0067	0.0067	mg/kg	C
649	75-09-2	Methylene Chloride	SW8260B	0.0067	**0.0021**	mg/kg	C
244	75-27-4	Dichlorobromomethane	SW8260B	0.0067	0.0067	mg/kg	C
262	156-60-5	Trans-1,2-Dichloroethene	SW8260B	0.0067	0.0067	mg/kg	C
261	78-87-5	1,2-Dichloropropane	SW8260B	0.0067	0.0067	mg/kg	C
265	542-75-6	1,3-Dichloropropene	---	---	---	---	---
172	100-41-4	Ethylbenzene	SW8260B	0.0067	0.0067	mg/kg	C
---	74-83-9	Bromomethane	SW8260B	0.0067	0.0067	mg/kg	C
---	78-93-3	Methyl Ethyl Ketone (MEK)	SW8260B	0.0067	0.0067	mg/kg	C
596	79-34-5	1,1,2,2-Tetrachloroethane	SW8260B	0.0067	0.0067	mg/kg	C

DEPARTMENT OF ENVIRONMENTAL QUALITY
Dredge Spoils Monitoring
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Facility Name: Virginia Power--Possum Point **VPDES PERMIT NO.: VA0002017**
DATE: **PROJECT: Cameron Run - CR07-6/7**

DEQ Parameter No.	EPA CAS Number	Parameter	EPA Analysis No.	Quantification [1] Level (mg/kg)	Reporting [2] Results (mg/kg)	Units	Sample [3] Type
222	108-88-3	Toluene	SW8260B	0.0067	0.0067	mg/kg	C
373	79-00-5	1,1,2-Trichloroethane	SW8260B	0.0067	0.0067	mg/kg	C
155	79-01-6	Trichloroethylene	SW8260B	0.0067	0.0067	mg/kg	C
Acids Extractables (Part B.5.)							
267	95-57-8	2-Chlorophenol	SW8270C	0.33	0.33	mg/kg	C
268	120-83-2	2,4-Dichlorophenol	SW8270C	0.067	0.067	mg/kg	C
269	105-67-9	2,4-Dimethylphenol	SW8270C	0.33	0.33	mg/kg	C
---	534-52-1	2-Methyl-4,6-Dinitrophenol	SW8270C	1.6	1.6	mg/kg	C
270	51-28-5	2,4-Dinitrophenol	SW8270C	1.7	1.7	mg/kg	C
175	108-95-2	Phenol	SW8270C	0.067	0.067	mg/kg	C
Miscellaneous (Part B.6.)							
018	57-12-5	Cyanide, Total	SW9012A	0.67	0.67	mg/kg	C
306	---	Dioxin	---	---	---	---	---
350	1461-22-9	Tributyltin	STL	0.002	0.002	mg/kg	C
257	---	Total Petroleum Hydrocarbons (TPH)	SW9035	223	223	mg/kg	C

I certify under penalty of law that this documenta and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the pweson or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment for knowing violations. See 18 U.S.C. P1001 and 33 U.S.C. P 1319. (Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years.)

Name of Principal Executive Officer or Authorized Agent | Title

Signature of Principal Executive Officer or Authorized Agent | Date

Footnotes to Water Quality Monitoring Attachment B

[1] Quantification Level (QL) is defined as the lowest concentration used for the calibration of a measurement system when the calibration is in accordance with the procedures published for the required method. In this case it is the Reporting Limit (RL).

[2] Results for chemicals that were detected are in bold and shaded.

[3] Sample Type: C = core sample

Any Approved method presented in 40 CFR Part 136

The QL is at the discretion of the permittee. For any substance addressed in 40CFR Part 136, the permittee shall use one of the approved methods in 40 CFR Par 136.

DEPARTMENT OF ENVIRONMENTAL QUALITY
Dredge Spoils Monitoring
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Facility Name: Virginia Power--Possum Point **VPDES PERMIT NO.: VA0002017**
DATE: **PROJECT: Cameron Run CR07-8**

DEQ Parameter No.	EPA CAS Number	Parameter	EPA Analysis No.	Quantification [1] Level (mg/l)	Reporting [2] Results (mg/l)	Sample [3] Type	Threshold Levels (mg/l)
Toxicity Characteristic Leaching Procedure Parameters with Threshold Levels (Part A)							
033	7440-38-2	Arsenic	1311	0.5	**0.17**	C	5
151	7440-39-3	Barium	1311	10	**0.14**	C	100
216	71-43-2	Benzene	1311	0.05	0.05	C	3
096	7440-43-9	Cadmium	1311	0.1	0.1	C	1
236	56-23-5	Carbon tetrachloride	1311	0.05	0.05	C	0.5
333	57-74-9	Chlordane	1311	0.005	0.005	C	0.03
280	108-90-7	Chlorobenzene	1311	0.05	0.05	C	100
223	67-66-3	Chloroform	1311	0.05	0.05	C	6
016	7440-47-3	Chromium	1311	0.5	**0.0032**	C	5
510	95-48-7	o-Cresol*	---	---	---	---	200
509	108-39-4	m-Cresol*	---	---	---	---	200
511	106-44-5	p-Cresol*	---	---	---	---	200
512	---	Cresols, Total	1311	0.05	0.05	C	200
266	106-46-7	1,4-Dichlorobenzene	1311	0.05	0.05	C	7.5
260	107-06-2	1,2-Dichloroethane	1311	0.05	0.05	C	0.5
258	75-35-4	1,1-Dichloroethylene	1311	0.05	0.05	C	0.7
239	121-14-2	2,4-Dinitrotoluene	1311	0.05	0.05	C	0.13
339	72-20-8	Endrin	1311	0.0005	0.0005	C	0.02
341	76-44-8	Heptachlor	1311	0.0005	0.0005	C	0.008
289	118-74-1	Hexachlorobenzene	1311	0.05	0.05	C	0.13
290	87-68-3	Hexachlorobutadiene	1311	0.05	0.05	C	0.5
291	67-72-1	Hexachloroethane	1311	0.05	0.05	C	5
034	7439-92-1	Lead	1311	0.5	0.5	C	5
342	58-89-9	Hexachlorocyclohexane (Lindane)	1311	0.0005	0.0005	C	0.4
042	7439-97-6	Mercury	1311	0.0002	0.0002	C	0.2
344	72-43-5	Methoxychlor	1311	0.001	0.001	C	10
---	78-93-3	Methyl Ethyl Ketone (MEK)	1311	0.05	0.05	C	200
294	98-95-3	Nitrobenzene	1311	0.05	0.05	C	2
210	87-86-5	Pentachlorophenol	1311	0.25	0.25	C	100
---	110-86-1	Pyridine	1311	0.25	0.25	C	5
152	7782-49-2	Selenium	1311	0.25	0.25	C	1
037	7440-22-4	Silver	1311	0.5	0.5	C	5
220	127-18-4	Tetrachloroethylene	1311	0.05	0.05	C	0.7
349	8001-35-2	Toxaphene	1311	0.02	0.02	C	0.5
602	79-01-6	Trichloroethylene	1311	0.05	0.05	C	0.5
601	95-95-4	2,4,5-Trichlorophenol	1311	0.05	0.05	C	400
602	88-06-2	2,4,6-Trichlorophenol	1311	0.05	0.05	C	2
173	75-01-4	Vinyl chloride	1311	0.05	0.05	C	0.2

* If o-, m-, and p-Cresol concentrations cannot be differentiated, the total cresol concentration is used.

DEPARTMENT OF ENVIRONMENTAL QUALITY
Dredge Spoils Monitoring
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Facility Name: Virginia Power--Possum Point **VPDES PERMIT NO.: VA0002017**
DATE: **PROJECT: Cameron Run CR07-8**

DEQ Parameter No.	EPA CAS Number	Parameter	EPA Analysis No.	Quantification [1] Level (mg/kg)	Reporting [2] Results (mg/kg)	Units	Sample [3] Type
Metals (Part B.1.)							
178	7440-36-0	Antimony	SW6010B-T	0.09	**0.19**	mg/kg	C
457	7440-38-2	Arsenic	SW6010B-T	0.2	**0.3**	mg/kg	C
441	7440-47-3	Chromium	SW6010B-T	0.081	**4.4**	mg/kg	C
231	18540-29-9	Chromium, VI	SW7196	0.16	0.16	mg/kg	C
442	7440-50-8	Copper	SW6010B-T	0.1	**2.5**	mg/kg	C
445	7440-02-0	Nickel	SW6010B-T	0.1	**1.8**	mg/kg	C
---	7440-28-0	Thallium	SW6010B-T	0.32	0.32	mg/kg	C
448	7440-66-6	Zinc	SW6010B-T	0.3	**12.3**	mg/kg	C
Pesticides/PCBs (Part B.2.)							
332	309-00-2	Aldrin	SW8081A	0.0017	**0.0016**	mg/kg	C
334	2921-88-2	Chlorpyrifos	SW8141A	0.033	0.033	mg/kg	C
---	72-54-8	4,4'-DDD	SW8081A	0.0017	0.0017	mg/kg	C
---	72-55-9	4,4'-DDE	SW8081A	0.0017	0.0017	mg/kg	C
335	50-29-3	4,4'-DDT	SW8081A	0.0017	0.0017	mg/kg	C
336	8065-48-3	Demeton	SW8141A	0.033	0.033	mg/kg	C
337	60-57-1	Dieldrin	SW8081A	0.0017	0.0017	mg/kg	C
746	959-98-8	Endosulfan I	SW8081A	0.0017	0.0017	mg/kg	C
640	33213-65-9	Endosulfan II	SW8081A	0.0017	**0.00054**	mg/kg	C
617	1031-07-8	Endosulfan sulfate	SW8081A	0.0017	0.0017	mg/kg	C
---	7421-93-4	Endrin aldehyde	SW8081A	0.0017	0.0017	mg/kg	C
340	86-50-0	Azinphos methyl	SW8141A	0.033	0.033	mg/kg	C
---	1024-57-3	Heptachlor epoxide	SW8081A	0.0017	0.0017	mg/kg	C
---	319-84-6	Alpha-BHC	SW8081A	0.0017	0.0017	mg/kg	C
---	319-85-7	Beta-BHC	SW8081A	0.0017	0.0017	mg/kg	C
---	143-50-0	Kepone	SW8270C	1.3	1.3	mg/kg	C
343	121-75-5	Malathion	SW8141A	0.033	0.033	mg/kg	C
345	2385-85-5	Mirex	SW8081A	0.0017	0.0017	mg/kg	C
346	56-38-2	Methyl parathion	SW8141A	0.033	0.033	mg/kg	C
---	1336-36-3	Total PCB	---	---	---	---	---
641	53469-21-9	Aroclor 1242	SW8082	0.017	0.017	mg/kg	C
642	11097-69-1	Aroclor 1254	SW8082	0.017	0.017	mg/kg	C
643	11104-28-2	Aroclor 1221	SW8082	0.017	0.017	mg/kg	C
644	11141-16-5	Aroclor 1232	SW8082	0.017	0.017	mg/kg	C
645	12672-29-6	Aroclor 1248	SW8082	0.017	0.017	mg/kg	C
618	11096-82-5	Aroclor 1260	SW8082	0.017	0.017	mg/kg	C
646	12674-11-2	Aroclor 1016	SW8082	0.017	0.017	mg/kg	C
Base Neutral Extractable (Part B.3.)							
273	83-32-9	Acenaphthene	SW8310	0.033	0.033	mg/kg	C
275	120-12-7	Anthracene	SW8310	0.0067	**0.0059**	mg/kg	C
---	92-87-5	Benzidine	SW8270C	6.5	6.5	mg/kg	C
276	56-55-3	Benzo(a)anthracene	SW8310	0.007	**0.014**	mg/kg	C

DEPARTMENT OF ENVIRONMENTAL QUALITY
Dredge Spoils Monitoring
Attachment B, Page 3 of 4

Facility Name: Virginia Power--Possum Point **VPDES PERMIT NO.: VA0002017**
DATE: **PROJECT: Cameron Run CR07-8**

DEQ Parameter No.	EPA CAS Number	Parameter	EPA Analysis No.	Quantification [1] Level (mg/kg)	Reporting [2] Results (mg/kg)	Units	Sample [3] Type
648	205-99-2	Benzo(b)fluoranthene	SW8310	0.007	**0.026**	mg/kg	C
278	207-08-9	Benzo(k)fluoranthene	SW8310	0.007	**0.014**	mg/kg	C
277	50-32-8	Benzo(a)pyrene	SW8310	0.01	**0.02**	mg/kg	C
---	111-44-4	Bis(2-Chloroethyl) Ether	SW8270C	0.066	0.066	mg/kg	C
486	85-68-7	Butyl benzyl phthalate	SW8270C	0.32	0.32	mg/kg	C
---	91-58-7	2-Chloronaphthalene	SW8270C	0.066	0.066	mg/kg	C
282	218-01-9	Chrysene	SW8310	0.007	**0.021**	mg/kg	C
654	53-70-3	Dibenzo(a,h)anthracene	SW8310	0.0067	0.0067	mg/kg	C
206	84-74-2	Di-n-butyl phthalate	SW8270C	0.32	0.32	mg/kg	C
259	95-50-1	1,2-Dichlorobenzene	SW8270C	0.066	0.066	mg/kg	C
264	541-73-1	1,3-Dichlorobenzene	SW8270C	0.066	0.066	mg/kg	C
527	91-94-1	3,3'-Dichlorobenzidine	SW8270C	0.32	0.32	mg/kg	C
285	84-66-2	Diethyl Phthalate	SW8270C	0.32	0.32	mg/kg	C
170	117-81-7	Bis(2-Ethylhexyl) Phthalate	SW8270C	0.32	0.32	mg/kg	C
286	131-11-3	Dimethyl phthalate	SW8270C	0.32	0.32	mg/kg	C
535	122-66-7	1,2-Diphenylhydrazine	SW8270C	0.066	0.066	mg/kg	C
287	206-44-0	Fluoranthene	SW8310	0.007	**0.042**	mg/kg	C
288	86-73-7	Fluorene	SW8310	0.007	**0.0011**	mg/kg	C
538	77-47-4	Hexachlorocyclopentadiene	SW8270C	0.32	0.32	mg/kg	C
651	193-39-5	Indeno(1,2,3-cd)pyrene	SW8310	0.007	**0.021**	mg/kg	C
650	78-59-1	Isophorone	SW8270C	0.32	0.32	mg/kg	C
293	91-20-3	Naphthalene	SW8310	0.033	0.033	mg/kg	C
573	62-75-9	N-Nitrosodimethylamine	SW8270C	0.32	0.32	mg/kg	C
574	86-30-6	N-Nitrosodiphenylamine	SW8270C	0.32	0.32	mg/kg	C
575	621-64-7	N-Nitrosodi-N-Propylamine	SW8270C	0.066	0.066	mg/kg	C
296	129-00-0	Pyrene	SW8310	0.007	**0.041**	mg/kg	C
263	120-82-1	1,2,4-Trichlorobenzene	SW8270C	0.32	0.32	mg/kg	C
Volatiles (Part B.4.)							
171	107-02-8	Acrolein	SW8260B	0.12	0.12	mg/kg	C
204	107-13-1	Acrylonitrile	SW8260B	0.12	0.12	mg/kg	C
484	75-25-2	Bromoform	SW8260B	0.0062	0.0062	mg/kg	C
652	124-48-1	Chlorodibromomethane	SW8260B	0.0062	0.0062	mg/kg	C
649	75-09-2	Methylene Chloride	SW8260B	0.0062	**0.0017**	mg/kg	C
244	75-27-4	Dichlorobromomethane	SW8260B	0.0062	0.0062	mg/kg	C
262	156-60-5	Trans-1,2-Dichloroethene	SW8260B	0.0062	0.0062	mg/kg	C
261	78-87-5	1,2-Dichloropropane	SW8260B	0.0062	0.0062	mg/kg	C
265	542-75-6	1,3-Dichloropropene	---	---	---	---	---
172	100-41-4	Ethylbenzene	SW8260B	0.0062	0.0062	mg/kg	C
---	74-83-9	Bromomethane	SW8260B	0.0062	0.0062	mg/kg	C
---	78-93-3	Methyl Ethyl Ketone (MEK)	SW8260B	0.0062	0.0062	mg/kg	C
596	79-34-5	1,1,2,2-Tetrachloroethane	SW8260B	0.0062	0.0062	mg/kg	C

DEPARTMENT OF ENVIRONMENTAL QUALITY
Dredge Spoils Monitoring

Facility Name: Virginia Power--Possum Point **VPDES PERMIT NO.: VA0002017**
DATE: **PROJECT: Cameron Run CR07-8**

DEQ Parameter No.	EPA CAS Number	Parameter	EPA Analysis No.	Quantification [1] Level (mg/kg)	Reporting [2] Results (mg/kg)	Units	Sample [3] Type
222	108-88-3	Toluene	SW8260B	0.0062	0.0062	mg/kg	C
373	79-00-5	1,1,2-Trichloroethane	SW8260B	0.0062	0.0062	mg/kg	C
155	79-01-6	Trichloroethylene	SW8260B	0.0062	0.0062	mg/kg	C
Acids Extractables (Part B.5.)							
267	95-57-8	2-Chlorophenol	SW8270C	0.32	0.32	mg/kg	C
268	120-83-2	2,4-Dichlorophenol	SW8270C	0.066	0.066	mg/kg	C
269	105-67-9	2,4-Dimethylphenol	SW8270C	0.32	0.32	mg/kg	C
---	534-52-1	2-Methyl-4,6-Dinitrophenol	SW8270C	1.5	1.5	mg/kg	C
270	51-28-5	2,4-Dinitrophenol	SW8270C	1.6	1.6	mg/kg	C
175	108-95-2	Phenol	SW8270C	0.066	0.066	mg/kg	C
Miscellaneous (Part B.6.)							
018	57-12-5	Cyanide, Total	SW9012A	0.62	0.62	mg/kg	C
306	---	Dioxin	---	---	---	---	---
350	1461-22-9	Tributyltin	STL	0.0018	0.0018	mg/kg	C
257	---	Total Petroleum Hydrocarbons (TPH)	SW9035	207	207	mg/kg	C

I certify under penalty of law that this documenta and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the pweson or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment for knowing violations. See 18 U.S.C. P1001 and 33 U.S.C. P 1319. (Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years.)

Name of Principal Executive Officer or Authorized Agent | Title

Signature of Principal Executive Officer or Authorized Agent | Date

Footnotes to Water Quality Monitoring Attachment B

[1] Quantification Level (QL) is defined as the lowest concentration used for the calibration of a measurement system when the calibration is in accordance with the procedures published for the required method. In this case it is the Reporting Limit (RL).

[2] Results for chemicals that were detected are in bold and shaded.

[3] Sample Type: C = core sample

Any Approved method presented in 40 CFR Part 136

The QL is at the discretion of the permittee. For any substance addressed in 40CFR Part 136, the permittee shall use one of the approved methods in 40 CFR Par 136.

APPENDIX A

LABORATORY CHAIN-OF-CUSTODIES

C7H240243

Client:
EA Engineering Science, and Technology, Inc.
15 Loveton Circle
Sparks, MD 21152

Project Manager:
Christine Papageorgis
Phone: 410-329-5130

Field Contact:
Todd Ward
Phone: 410-746-1250

Project Name: Cameron Run Sediment
Project#: 62132.21

Page 1 of 3

Parameters/Method Numbers for Analysis

Date	Time	Water	Sediment	Sample Identification	No. of Containers	Amerberg Limits(D4318)	Total Kjeldahl Nitrogen(351.3)	Total Phosphorus(365.2)	Sulfide by Titration(SW9030B/9034)	TOC by High Temp. Combustion	Grain Size(ASTM D422)	Total Solids	Chromium VI(7196A)	Volatile Organics by GC/MS(SW 8260B)	Semivolatile Organics(SW 8270C)	Metals(SW 6010B/7471A)	PAHs(SW 8310)	PCB Aroclors(SW 8082)
8/23/07	1045		X	CR07-1	3	X	X	X	X	X	X							
	1050		X	CR07-2	3	X	X	X	X	X	X							
	1055		X	CR07-1/2	5							X	X	X	X	X	X	X
	1100		X	CR07-3	8	X	X	X	X	X	X	X	X	X	X	X	X	X
	1120		X	CR07-4	8	X	X	X	X	X	X	X	X	X	X	X	X	X
	1140		X	CR07-5	8	X	X	X	X	X	X	X	X	X	X	X	X	X
	1330		X	CR07-6	3	X	X	X	X	X	X							
	1335		X	CR07-7	3	X	X	X	X	X	X							
	1340		X	CR07-6/7	5							X	X	X	X	X	X	X
	1400		X	CR07-8	8	X	X	X	X	X	X	X	X	X	X	X	X	X

Chain of Custody Record

Laboratory:
TestAmerica
301 Alpha Drive
Pittsburgh, PA 15238

phone: 412.963.7058
fax: 412.963.2468

ATTN: Carrie Gamber

Remarks

CR07-3 samples have 2 times, 1100 and 1105. Please disregard second time; sample taken at 1100.

CR07-4 samples taken at 1120. Please disregard 1125 time on jars.

CR07-5 samples taken at 1140. Please disregard 1145 time on jars.

CR07-8 samples taken at 1400. Please disregard 1405 time on jars.

Sampled by: (Signature) Todd Ward
Date/Time 8/23/07 1400

Relinquished by: (Signature)
Date/Time

Relinquished by: (Signature) Todd Ward
Date/Time 8/23/07 1700

Received by Laboratory: (Signature)
Date/Time 8/24/07 1000

[redacted]

C7H240243

Client:
EA Engineering Science, and Technology, Inc.
15 Loveton Circle
Sparks, MD 21152

Project Manager:
Christine Papageorgis
Phone: 410-329-5130
Field Contact:
Todd Ward
Phone: 410-746-1250

Project Name: Cameron Run Sediment
Project#: 62132.21

Page 2 of 3

Parameters/Method Numbers for Analysis

Date	Time	Water	Sediment	Sample Identification	No. of Containers	Chlorinated Pesticides(SW 8081A)	Organophosphorus Pesticides(SW 8141A)	Tributyltin(STL-SOP)	Total Petroleum Hydrocarbons(SW 9035)	Cyanide(SW 9012A)	Semivolatile Organics(SW 1311/8270C)	Metals(SW 1311/6010B/7470A)	Pesticides(SW 1311/8081A)	Volatiles(SW 1311/8260B)	Herbicides(SW 1311/8151A)	TCLP Extraction(SW 1311)	ZHE Extraction(SW 1311)	Corrosivity(SW 9045C)	Remarks
8/23/07	1045		X	CR07-1	3														See page 1 of 3 for remarks
	1050		X	CR07-2	3														
	1055		X	CR07-1/2	5	X	X	X	X	X	X	X	X	X	X	X	X	X	
	1100		X	CR07-3	8	X	X	X	X	X	X	X	X	X	X	X	X	X	
	1120		X	CR07-4	8	X	X	X	X	X	X	X	X	X	X	X	X	X	
	1140		X	CR07-5	8	X	X	X	X	X	X	X	X	X	X	X	X	X	
	1330		X	CR07-6	3							X TW							
	1335		X	CR07-7	3							X TW							
	1340		X	CR07-6/7	5	X	X	X	X	X	X	X	X	X	X	X	X	X	
	1400		X	CR07-8	8	X	X	X	X	X	X	X	X	X	X	X	X	X	

Chain of Custody Record

Laboratory:
TestAmerica
301 Alpha Drive
Pittsburgh, PA 15238

phone: 412.963.7058
fax: 412.963.2468

ATTN: Carrie Gamber

Sampled by: (Signature) Todd Ward	Date/Time 8/23/07 1400	Relinquished by: (Signature) Todd Ward	Date/Time 8/23/07 1700
Relinquished by: (Signature)	Date/Time	Received by Laboratory: (Signature) [illegible]	Date/Time 8/24/07 1000

[redacted]

C7H240243

Client:	Project Manager:
EA Engineering Science, and Technology, Inc. 15 Loveton Circle Sparks, MD 21152	Christine Papageorgis Phone: 410-329-5130 Field Contact: Todd Ward Phone: 410-746-1250

Project Name: Cameron Run Sediment

Project#: 62132.21

Page 3 of 3

Parameters/Method Numbers for Analysis

Chain of Custody Record

Laboratory:
TestAmerica
301 Alpha Drive
Pittsburgh, PA 15238

phone: 412.963.7058
fax: 412.963.2468

ATTN: Carrie Gamber

Date	Time	Water	Sediment	Sample Identification	No. of Containers	Ignitibility(SW 1010)	Remarks
8/23/07	1045		X	CR07-1	3		See page 1 of 3 for remarks.
	1050		X	CR07-2	3		
	1055		X	CR07-1/2	5	X	
	1100		X	CR07-3	8	X	
	1120		X	CR07-4	8	X	
	1140		X	CR07-5	8	X	
	1330		X	CR07-6	3		
	1335		X	CR07-7	3		
	1340		X	CR07-6/7	5	X	
	1400		X	CR07-8	8	X	

Sampled by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time
Todd Ward	8/23/07 1400	Todd Ward	8/23/07 1700
Relinquished by: (Signature)	Date/Time	Received by Laboratory: (Signature)	Date/Time
		[illegible]	8/24/07 1000

[redacted]

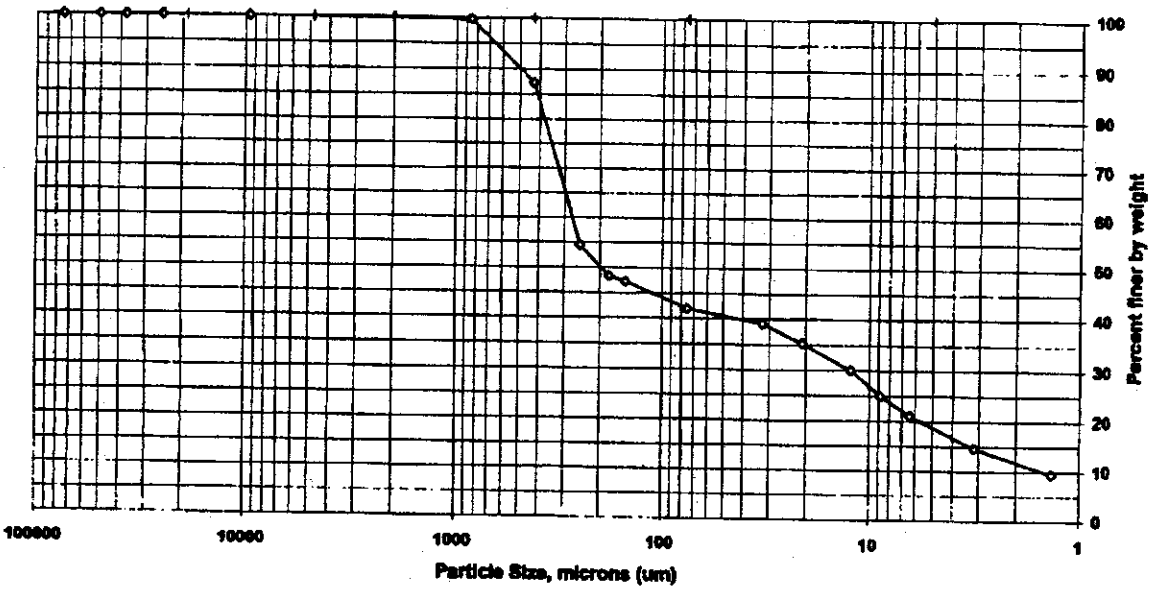
APPENDIX B

GRAIN SIZE CURVES

Particle Size of Soils by ASTM D422

Client Code:	STLPAP	SDG:	7H240243	Date Received:	8/25/2007
Sample ID:	CR07-1	ETR(s):	121802	Start Date:	9/6/2007
Lab ID:	721900			End Date:	9/13/2007

Percent Solids:	64.9%	Non-soil material:	plant
Specific Gravity:	2.650	Shape (> #10):	subangular
Maximum Particle Size:	Crs sand	Hardness (> #10):	hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	100.0	0.0
#10	2000	100.0	0.0
#20	850	99.7	0.3
#40	425	87.3	12.4
#60	250	54.5	32.9
#80	180	48.3	6.1
#100	150	47.2	1.1
#200	75	41.9	5.3
Hydrometer	32.2	39.1	2.8
I	20.7	35.2	3.9
I	12.2	30.1	5.2
I	8.8	24.9	5.2
I	6.4	21.1	3.9
I	3.1	14.8	6.4
V	1.4	9.5	5.2

Soil Classification	Percent of Total Sample
Gravel	0.0
Sand	58.1
Coarse Sand	0.0
Medium Sand	12.6
Fine Sand	45.4
Silt	20.9
Clay	21.1

Preparation Method: D2217
Dispersion Device: Mechanical mixer with a metal paddle.
Dispersion Period: 1 minute

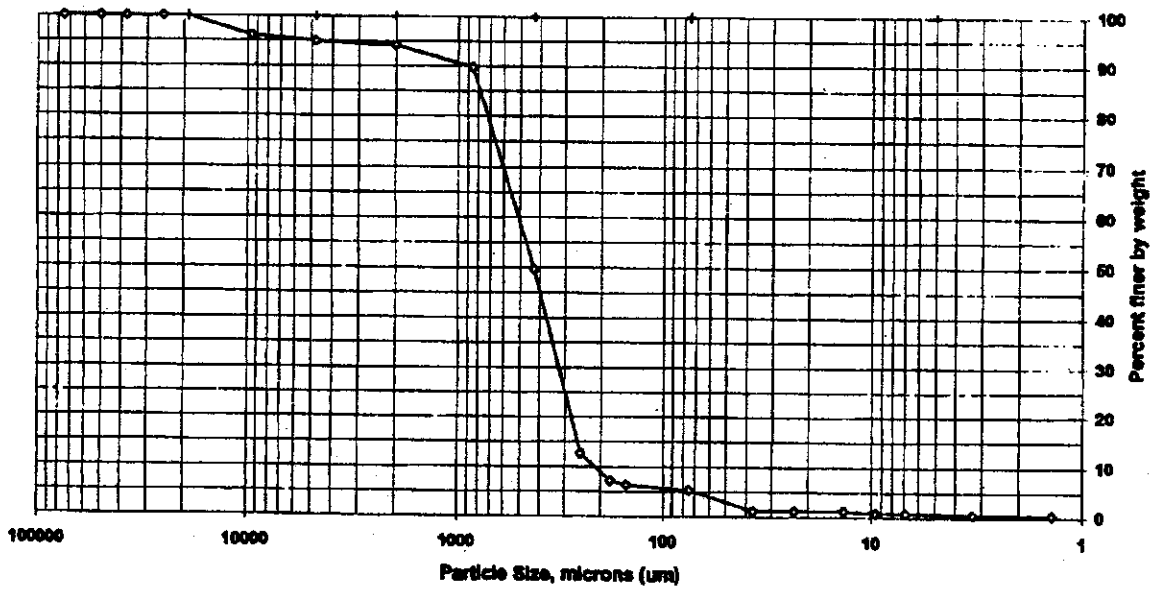
FSL024:07.29.05:0
STL Burlington

7H240243PS 9/14/2007

Particle Size of Soils by ASTM D422

Client Code:	STLPAP	SDG:	7H240243	Date Received:	8/25/2007
Sample ID:	CR07-2	ETR(s):	121602	Start Date:	9/6/2007
Lab ID:	721901			End Date:	9/13/2007

Percent Solids:	79.9%	Non-soil material:	shell, glass
Specific Gravity:	2.650	Shape (> #10):	subangular
Maximum Particle Size:	19 mm	Hardness (> #10):	hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	96.0	4.0
#4	4750	95.0	1.0
#10	2000	94.2	0.8
#20	850	89.8	4.4
#40	425	49.7	40.1
#60	250	12.7	37.0
#80	180	7.1	5.6
#100	150	6.3	0.8
#200	75	5.3	1.0
Hydrometer	36.9	1.2	4.1
I	23.3	1.2	0.0
I	13.5	1.2	0.0
I	9.6	0.8	0.4
I	6.9	0.8	0.0
I	3.3	0.5	0.4
V	1.4	0.5	0.0

Soil Classification	Percent of Total Sample
Gravel	5.0
Sand	89.7
Coarse Sand	0.8
Medium Sand	44.5
Fine Sand	44.4
Silt	4.5
Clay	0.8

Preparation Method: D2217
Dispersion Device: Mechanical mixer with a metal paddle.
Dispersion Period: 1 minute

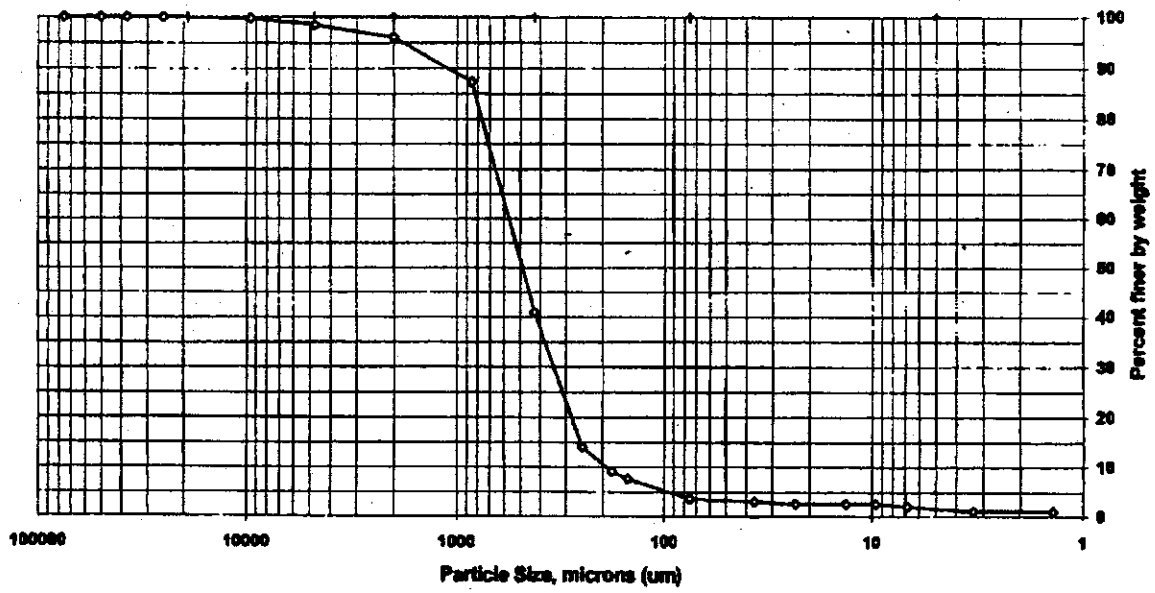
FSL024:07.29.05:0
STL Burlington

7H240243PS 9/14/2007

Particle Size of Soils by ASTM D422

Client Code:	STLPAP	SDG:	7H240243	Date Received:	8/25/2007
Sample ID:	CR07-3	ETR(s):	121602	Start Date:	9/6/2007
Lab ID:	721903			End Date:	9/13/2007

Percent Solids:	74.3%	Non-soil material:	shell
Specific Gravity:	2.650	Shape (> #10):	subangular
Maximum Particle Size:	19 mm	Hardness (> #10):	hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	99.8	0.2
#4	4750	98.5	1.3
#10	2000	96.0	2.5
#20	850	87.4	8.7
#40	425	40.9	46.4
#60	250	14.0	26.9
#80	180	9.0	5.0
#100	150	7.5	1.5
#200	75	3.6	3.9
Hydrometer	36.4	3.1	0.5
I	23.1	2.6	0.5
I	13.4	2.6	0.0
I	9.6	2.6	0.0
I	6.8	2.1	0.5
I	3.3	1.1	1.0
V	1.4	1.1	0.0

Soil Classification	Percent of Total Sample
Gravel	1.5
Sand	94.9
Coarse Sand	2.5
Medium Sand	55.1
Fine Sand	37.3
Silt	1.5
Clay	2.1

Preparation Method: D2217
Dispersion Device: Mechanical mixer with a metal paddle.
Dispersion Period: 1 minute

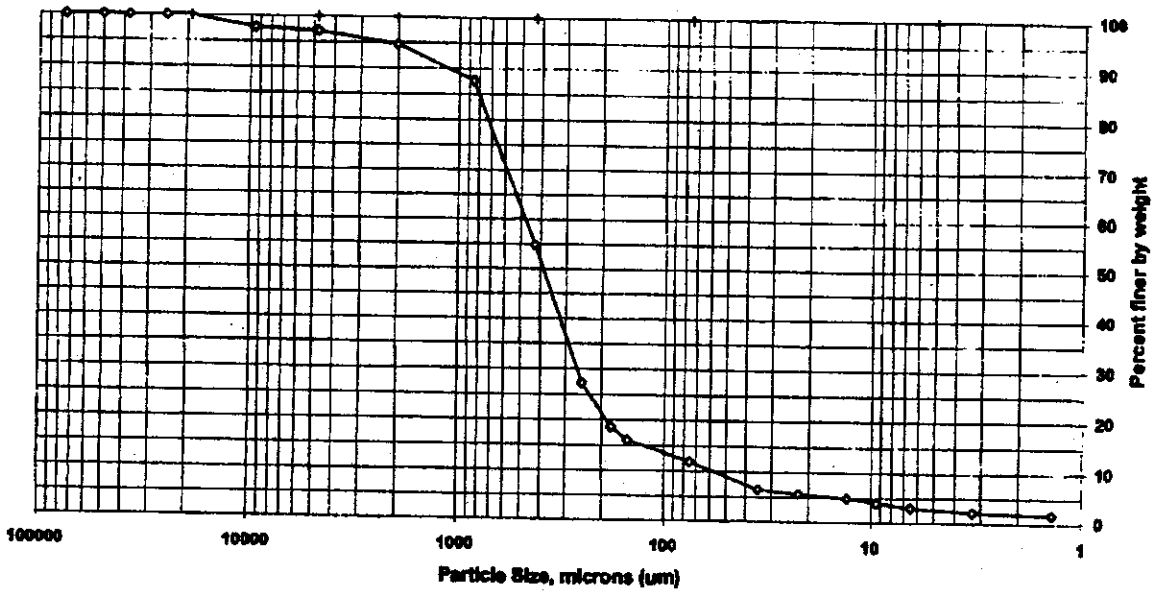
FSL024:07.29.05:0
STL Burlington

7H240243PS 9/14/2007

Particle Size of Soils by ASTM D422

Client Code:	STLPAP	SDG:	7H240243	Date Received:	8/25/2007
Sample ID:	CR07-4	ETR(s):	121602	Start Date:	9/6/2007
Lab ID:	721904			End Date:	9/13/2007

Percent Solids:	80.7%	Non-soil material:	plant
Specific Gravity:	2.650	Shape (> #10):	subangular
Maximum Particle Size:	19 mm	Hardness (> #10):	hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	97.7	2.3
#4	4750	97.1	0.6
#10	2000	94.7	2.4
#20	850	87.6	7.1
#40	425	54.8	32.8
#60	250	27.3	27.6
#80	180	18.6	8.7
#100	150	16.1	2.5
#200	75	11.9	4.2
Hydrometer	34.9	6.5	5.4
	22.3	5.6	0.8
	13.0	4.8	0.8
	9.4	3.9	0.8
	6.8	3.1	0.8
	3.3	2.2	0.8
V	1.4	1.6	0.5

Soil Classification	Percent of Total Sample
Gravel	2.9
Sand	85.3
Coarse Sand	2.4
Medium Sand	39.9
Fine Sand	42.9
Silt	8.6
Clay	3.1

Preparation Method: D2217
Dispersion Device: Mechanical mixer with a metal paddle.
Dispersion Period: 1 minute

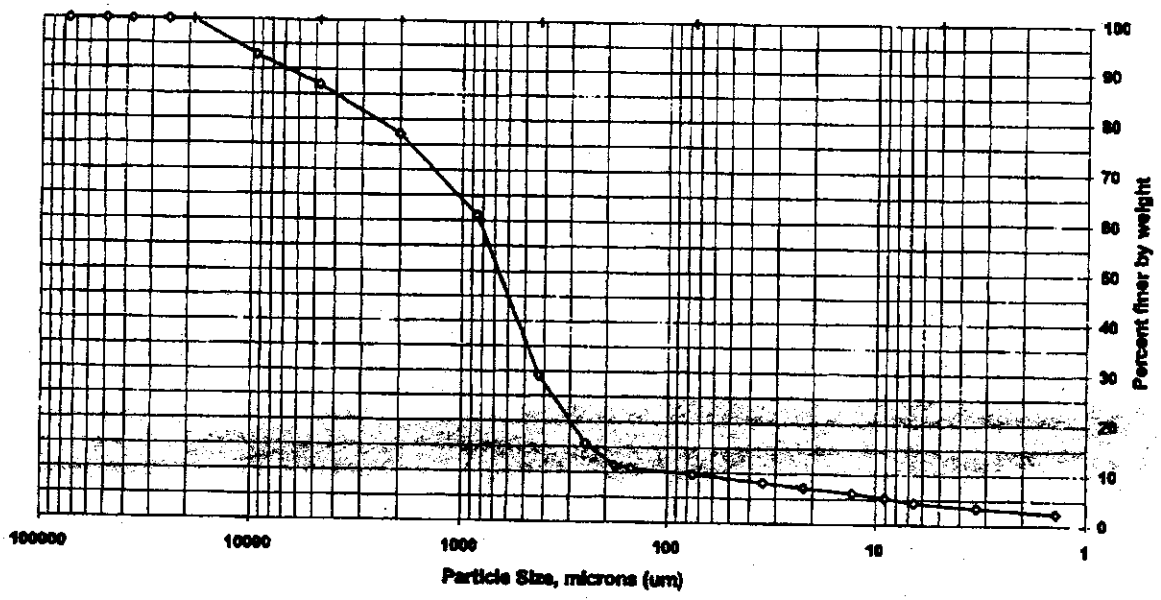
FSL024:07.29.05:0
STL Burlington

7H240243PS 9/14/2007

Particle Size of Soils by ASTM D422

Client Code:	STLPAP	SDG:	7H240243	Date Received:	8/25/2007
Sample ID:	CR07-5	ETR(s):	121602	Start Date:	9/6/2007
Lab ID:	721905			End Date:	9/13/2007

Percent Solids:	78.7%	Non-soil material:	n/a
Specific Gravity:	2.650	Shape (> #10):	subangular
Maximum Particle Size:	19 mm	Hardness (> #10):	hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	92.8	7.2
#4	4750	86.8	6.0
#10	2000	77.1	9.8
#20	850	61.0	16.1
#40	425	29.1	31.9
#60	250	15.7	13.4
#80	180	11.4	4.4
#100	150	10.7	0.6
#200	75	9.6	1.1
Hydrometer	34.5	8.1	1.5
I	22.1	7.2	0.9
I	12.9	6.3	0.9
I	9.0	5.3	0.9
I	6.6	4.4	0.9
I	3.3	3.4	0.9
V	1.4	2.4	1.0

Soil Classification	Percent of Total Sample
Gravel	13.2
Sand	77.2
Coarse Sand	9.8
Medium Sand	48.0
Fine Sand	19.5
Silt	5.2
Clay	4.4

Preparation Method: D2217
Dispersion Device: Mechanical mixer with a metal paddle.
Dispersion Period: 1 minute

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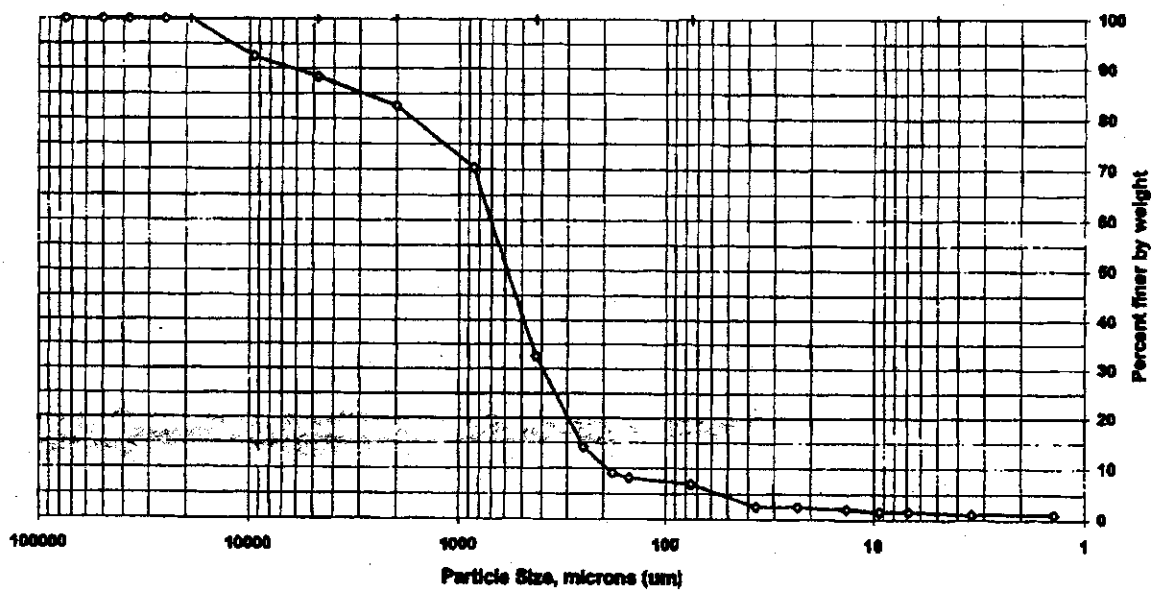
STL Burlington

7H240243PS 9/14/2007

Particle Size of Soils by ASTM D422

Client Code:	STLPAP	SDG:	7H240243	Date Received:	8/25/2007
Sample ID:	CR07-6	ETR(s):	121602	Start Date:	9/6/2007
Lab ID:	721906			End Date:	9/13/2007

Percent Solids:	80.9%	Non-soil material:	plant
Specific Gravity:	2.650	Shape (> #10):	subangular
Maximum Particle Size:	19 mm	Hardness (> #10):	hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	92.4	7.6
#4	4750	88.3	4.1
#10	2000	82.6	5.7
#20	850	70.3	12.3
#40	425	32.5	37.8
#60	250	14.1	18.4
#80	180	9.0	5.1
#100	150	8.1	0.9
#200	75	6.9	1.2
Hydrometer	36.6	2.5	4.4
I	23.1	2.5	0.0
I	13.4	2.0	0.5
I	9.4	1.6	0.5
I	6.8	1.6	0.0
I	3.4	1.1	0.5
V	1.4	1.1	0.0

Soil Classification	Percent of Total Sample
Gravel	11.7
Sand	81.4
Coarse Sand	5.7
Medium Sand	50.0
Fine Sand	25.6
Silt	5.3
Clay	1.6

Preparation Method: D2217
Dispersion Device: Mechanical mixer with a metal paddle.
Dispersion Period: 1 minute

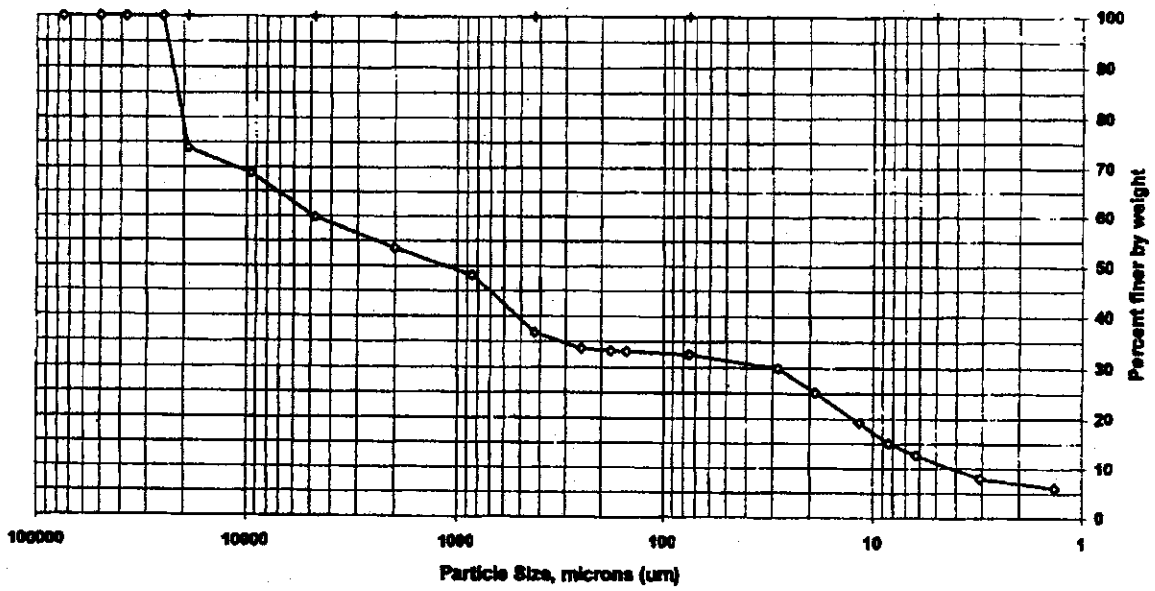
FSL024:07.29.05:0
STL Burlington

7H240243PS 9/14/2007

Particle Size of Soils by ASTM D422

Client Code:	STLPAP	SDG:	7H240243	Date Received:	8/25/2007
Sample ID:	CR07-7	ETR(s):	121602	Start Date:	9/6/2007
Lab ID:	721907			End Date:	9/13/2007

Percent Solids:	76.0%	Non-soil material:	n/a
Specific Gravity:	2.650	Shape (> #10):	subangular
Maximum Particle Size:	25 mm	Hardness (> #10):	hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	73.9	26.1
3/8 inch	9500	68.8	5.0
#4	4750	59.8	9.0
#10	2000	53.6	6.3
#20	850	48.1	5.4
#40	425	36.8	11.4
#60	250	33.7	3.1
#80	180	33.2	0.5
#100	150	33.1	0.1
#200	75	32.5	0.6
Hydrometer	28.2	29.9	2.6
I	18.9	25.2	4.8
I	11.6	19.2	5.9
I	8.4	15.1	4.2
I	6.2	12.7	2.4
I	3.1	7.9	4.8
V	1.4	6.0	1.9

Soil Classification	Percent of Total Sample
Gravel	40.2
Sand	27.3
Coarse Sand	6.3
Medium Sand	16.8
Fine Sand	4.3
Silt	19.6
Clay	12.7

Preparation Method: D2217
Dispersion Device: Mechanical mixer with a metal paddle.
Dispersion Period: 1 minute

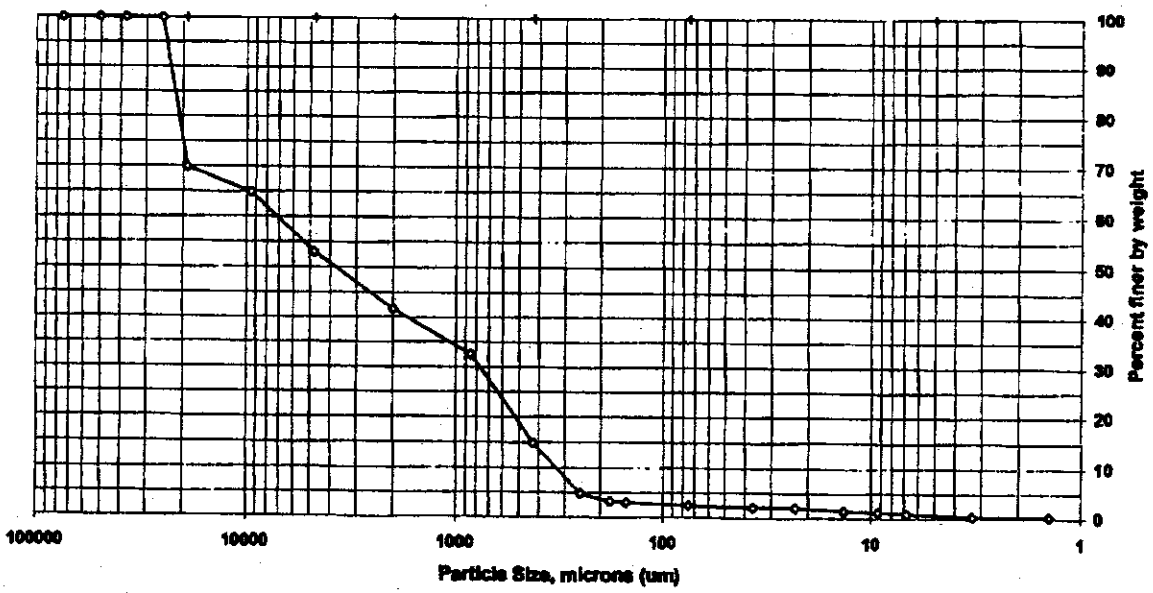
FSL024:07.29.05:0
STL Burlington

7H240243PS 9/14/2007

Particle Size of Soils by ASTM D422

Client Code:	STLPAP	SDG:	7H240243	Date Received:	8/25/2007
Sample ID:	CR07-8	ETR(s):	121602	Start Date:	9/6/2007
Lab ID:	721909			End Date:	9/13/2007

Percent Solids:	86.0%	Non-soil material:	n/a
Specific Gravity:	2.650	Shape (> #10):	subangular
Maximum Particle Size:	25 mm	Hardness (> #10):	hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	69.9	30.1
3/8 inch	9500	64.9	5.0
#4	4750	53.1	11.9
#10	2000	41.7	11.4
#20	850	32.6	9.1
#40	425	14.9	17.8
#60	250	4.7	10.1
#80	180	3.2	1.5
#100	150	3.0	0.2
#200	75	2.5	0.5
Hydrometer	36.5	2.0	0.4
I	23.1	2.0	0.0
I	13.4	1.5	0.6
I	9.2	1.2	0.3
I	6.8	0.9	0.3
I	3.3	0.3	0.6
V	1.4	0.3	0.0

Soil Classification	Percent of Total Sample
Gravel	46.9
Sand	50.6
Coarse Sand	11.4
Medium Sand	26.8
Fine Sand	12.4
Silt	1.6
Clay	0.9

Preparation Method: D2217
Dispersion Device: Mechanical mixer with a metal paddle.
Dispersion Period: 1 minute

FSL024:07.29.05:0
STL Burlington

7H240243PS 9/14/2007

APPENDIX D. ECONOMIC ANALYSIS

HUNTINGTON FLOOD DAMAGE REDUCTION STUDY

CAMERON RUN

FAIRFAX COUNTY, VIRGINIA

FLOOD DAMAGE REDUCTION PROJECT

APPENDIX D

ECONOMIC ASSESSMENT

PREPARED BY:
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
NEW ENGLAND DISTRICT

April 2009

ECONOMIC ASSESSMENT
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INTRODUCTION

The purpose of this report is to provide an economic analysis of potential flood damage reduction benefit in the Huntington flood plain. Expected annual damages are calculated for both the natural and modified conditions. The difference in these magnitudes is a measure of flood damage reduction. Plans to reduce flooding damages are evaluated. For each plan annual benefit is divided by annual cost to determine a benefit cost ratio. This ratio must be equal to or greater than one to one for federal participation in water resource improvement projects. The plan with the greatest difference between annual benefit and annual cost is identified. This plan usually defines the extent of Federal interest in a project.

METHODOLOGY

Benefits and costs are made comparable by conversion to average annual equivalents. An interest rate of 4-5/8% as specified in the Federal Register is to be used by Federal agencies in the formulation and evaluation of water and land resource plans for the period 1 October 2008 to 30 September 2009. All costs and benefits are stated at the 2007 price level. The project period of analysis is considered to be 50 years. The analysis of costs and benefits follows standard U.S. Army Corps of Engineers procedures. The reference documents used in the benefit estimation process are ER 1105-2-100, Chapter 6, Section IV, NED Benefit Evaluation Procedures: Urban Flood Damage and ER 1105-2-101, Risk-Based Analysis for Evaluation of Hydrology/Hydraulics, Geo-technical Stability, and Economics in Flood Damage Reduction Studies.

FLOOD DAMAGE ESTIMATES

Flood damage estimates were developed using depth damage relationships developed by the Institute for Water Resources (IWR) and the National Flood Insurance Administration (NFIA). The IWR depth damage curves were developed for residential structures. These are supplemented with the NFIA curves for and nonresidential structures, such as commercial, industrial and public buildings.

These depth damage relationships are used to develop a stage damage function for each structure in the floodplain for each possible flood stage. The floodplain includes residential and public structures. The stage or elevation at which flood damage begins was determined for each property. Estimates of potential damages were then made from the starting point, in one-foot increments of stage, to a level of at least 6 feet above the first floor. Dollar value estimates were made for physical damages to site, structure, contents and utilities. Damages were assumed to start in a building when water reached the first opening. Seepage through the bottom of the foundation was not assumed as the start of damage. Estimates for temporary housing and food were made for residential occupants.

AFFECTED AREA

FLOOD DAMAGE COMPUTATION

Flood damage estimates were developed using the Hydrologic Engineering Center Flood Damage Analysis (HEC-FDA) computer program. Stage-damage information was input for each structure. The elevation of the first floor and the elevation at which damage starts were also input for each structure. Water surface profiles for eight frequencies for each cross section in the hydrologic zone were then input. The computer model combined stage-frequency data and stage-damage information to compute damage frequency distributions and expected annual damage by cross sections. Single flood event damage was determined for several events.

RISK AND UNCERTAINTY

Corps regulations require the use of a risk and uncertainty (R&U) analysis for flood damage reduction studies at the feasibility level of detail. The purpose of R&U is to provide decision-makers more information with which to select the appropriate size of the project.

R & U is encountered in two broad areas in a flood damage reduction study; 1.) hydrology and hydraulics, and 2) economics. The first is discussed in detail in the Hydrologic and Hydraulic Analysis Appendix. The economics portion of risk and uncertainty pertains to the extent of damages associated with different levels of flooding. Flooding damages are developed by stage or height of water over the ground. However, estimates of damages are subject to error. The risk and uncertainty analysis attempts to describe that error and present the results to the decision-maker in terms of project reliability. The major sources of uncertainty in property damage are in the elevations that mark the start of damages and the first floor, in the values of the structure and its contents, the percentage of damage that occurs by depth of flooding, and in hydrologic variables.

Errors may exist in enumerating and classifying structures. Within structure classifications, the depreciated replacement value of structures and content will vary from structure to structure due to size, building material, inside construction, condition and age. The depreciated replacement value may be obtained through structure valuation services, real estate assessments or recent sales prices.

The depreciated value of structure contents may be obtained by applying contents to structures value ratios from Federal Flood Insurance (FIA) claims data or by conducting a survey in the floodplain. FIA claims data do not reflect depreciated replacement costs and thus need to be adjusted before use. This adjustment procedure is a potential source of error. If the floodplain residents are surveyed then that estimate contains error associated with a statistical sample.

The estimate of damages to structures and contents is affected by errors in measurement of the elevations of the first floor and start of damages. These elevations may be obtained with increasing levels of error through field surveys, aerial surveys and topographic maps. The arrangement of contents within a structure can affect the extent of damages. For this study first floor and ground elevations were obtained from surveys conducted by the county.

Hydrologic variables that can affect damages to structures and contents are velocity, sediment, duration and frequency. Flood warning systems can reduce damages provided that there is adequate warning time.

Stage Damage Uncertainty

Stage damage uncertainty in first floor and start of damage elevations are combined with uncertainty in damages to building and contents to determine the stage damage curve with uncertainty. It is assumed that errors in first floor elevations are normally distributed with standard deviation .01 feet. A standard deviation of 0.03 was found in previous Corps studies and is discussed on Page E-30, EC 1105-2-205.

Uncertainty in first floor elevations is combined with uncertainty in building and contents damages to determine the stage damage curve with uncertainty. Standard depth damage relationships are used to represent the average, or most likely, building and contents damage. For the IWR curves representing residential structures, standard deviations for these averages are provided. For other structures, standard deviations are developed by multiplying the average by a coefficient of variation. A coefficient value of 0.2 was used to estimate standard deviations. This estimate of the coefficient of variation is within the range discussed in Corps guidance The range depended on stage and varied from 2.29 at zero damage to 0.16 at 23 feet above zero damage. The mean and standard deviation are used as parameters of a normal distribution. Analytically, the problem is to develop the overall risk and uncertainty associated with the stage damage curve from the risk and uncertainty associated with first floor elevations and depth damage relationships. The parameters of these joint probability distributions are difficult to obtain analytically. The HEC-FDA computer program approximates the stage damage uncertainty numerically with a Monte Carlo simulation. This method involves developing a risk based flood damage model where the various parameters are the probability distributions discussed above. At each flood stage these distributions are sampled and the resulting value of damages recorded. Multiple iterations allow the estimation of the distribution of damages at any stage. By rerunning the model with multiple stages, a complete stage damage curve with uncertainty can be developed.

Each simulation determines damages for various flood frequencies. For each iteration of the simulation, the model chooses from the various parts of each of the probability distributions based on their relative frequencies and calculates the resulting damage. A complete simulation for a specific flood requires multiple iterations of the model to derive an accurate distribution of damages for that flood event. As the number of iterations increases, the simulation generated distribution approaches the "true"

distribution. The number of simulations required to achieve the desired level of accuracy is influenced by a number of factors. The number of iterations increases with: 1) the variance and skew of the variable of interest; 2) reductions in the probability contributory variables; and 3) the number of contributing variables.

FLOOD DAMAGES

Recurring Losses

Recurring flood losses are those potential damages that are estimated to occur at various flood stages. The 100-year flood could cause an estimated $13,016,000 in damages to residential and public structures. Recurring losses by event are presented in Table 1. Also shown in the table is an estimate of the number of structures damaged at each event and of those the number receiving damages to the first floor.

Table 1
Damages by Event
Huntington
Cameron Run
Fairfax County, Va

Event		Number of Structures with Damage	Number of Structures with FF Damage	Damage ($000)
Probability	Recurrence Interval (years)			
0.5	2	0	0	0.0
0.2	5	1	0	5.9
0.1	10	11	0	292.8
0.04	25	132	2	4,455.9
0.02	50	160	68	8,318.2
0.01	100	176	152	13,016.0
0.004	250	182	180	16,657.6
0.002	500	182	182	20,418.0

Annual Losses

Expected annual damages are determined by developing a probability distribution for expected annual damages. The HEC-FDA program uses Monte Carlo simulation to generate the probability distribution. The program combines uncertainty in the stage frequency function with uncertainty stage damage function for each simulation. After thousands of simulations the program calculates the mean of the expected annual damage distribution. The effectiveness of a flood reduction plan is measured by the extent to which it reduces annual losses. Annual losses for Huntington are expected to be $542,300.

IMPROVEMENT PLANS

Improvement plans are of two types, structural and nonstructural. Structural plans evaluated here are the construction of levees and dredging. Plan 1 is a combination of levee and dredging. Plan 1a provides for a levee height to the 100-year profile. Plan 1b provides for a levee height to 50-year profile plus 3 feet downstream and 4 feet upstream. Plan 1c provides for the 100-year profile plus 3 feet downstream and 4 feet at the upstream end. Dredging would reduce water surface profiles upstream of Huntington. Plan 2 is the same as Plan 1 with no dredging. Plans are evaluated with and without pumps to handle interior drainage during storm events.

Nonstructural alternatives were evaluated in an earlier phase of this study but were not carried forward for further evaluation to insufficient damage reduction. These alternatives included raising first floors, filling basements, adding utility rooms and evacuating the flood plain.

ECONOMIC BENEFIT ESTIMATION

Economic benefit is measured as a reduction in inundation damages, reduction in emergency cost associated with flood fighting, and reduction in the cost of temporary housing. Inundation reduction refers to physical damages to buildings and contents including furnishings, equipment, materials and products. Inundation reduction benefit is shown in Table 2. Total annual inundation reduction benefit for Huntington is estimated to vary directly with the extent of protection provided as expected. Annual benefits for the plan without interior drainage pumps are less due to the ponding of rainfall that with the project in place cannot outlet into the river.

Table 2
Expected Value and Probabilistic Values
of EAD and EAD Reduced
Huntington
Cameron Run
Fairfax County, Va

Plan	Expected Annual Damage ($'000)			Probability Damaged Reduced Exceeds Indicated Values		
	Without Plan	With Plan	Damage Reduced	0.75	0.50	0.25
Plan 1a	542.3	192.5	349.8	204.9	329.0	471.6
Plan 1b	542.3	112.9	429.4	238.6	398.4	585.7
Plan 1c	542.3	0.0	542.3	253.2	461.4	746.1
Plan 2a	542.3	224.5	317.8	193.2	302.1	423.4
Plan 2b	542.3	117.7	424.6	237.4	394.9	578.8
Plan 2c	542.3	1.9	540.4	257.3	466.9	747.0
Plan 1a without pumps	542.3	245.3	297	67.7	229.7	457.1
Plan 1b without pumps	542.3	128.6	413.7	168.0	348.8	592.9
Plan 1c without pumps	542.3	55.4	486.9	232.8	422.8	674.6
Plan 2a without pumps	542.3	251.8	290.5	61.1	223.1	450.6
Plan 2b without pumps	542.3	129.4	412.9	167.3	348.1	592.1
Plan 2c without pumps	542.3	55.4	486.9	232.8	422.8	674.6

PLAN COSTS

The anticipated cost of each improvement plan is displayed in Table 3.

Table 3
Project Cost
Huntington
Cameron Run
Fairfax County, Va
$000

Plan	First Cost	Interest During Construction	Investment Cost	Annual Investment Cost	O&M	Induced Damages	Total Annual Project Cost
Plan 1a	19,600.0	893.8	20,493.8	1,058.2	587.6	1.0	1,646.8
Plan 1b	20,800.0	948.5	21,748.5	1,123.0	587.6	1.2	1,711.8
Plan 1c	22,000.0	1,003.2	23,003.2	1,187.8	587.6	1.5	1,776.9
Plan 2a	14,800.0	674.9	15,474.9	799.0	150.0	2.0	951.0
Plan 2b	16,000.0	729.6	16,729.6	863.8	150.0	2.4	1,016.2
Plan 2c	19,980.0	911.1	20,891.1	1,078.7	150.0	2.6	1,231.3
Plan 1a without pumps	15,400.0	702.3	16,102.3	831.4	512.6	1.0	1,345.0
Plan 1b without pumps	16,600.0	757.0	17,357.0	896.2	512.6	1.2	1,410.0
Plan 1c without pumps	17,900.0	816.3	18,716.3	966.4	512.6	1.5	1,480.5
Plan 2a without pumps	10,600.0	483.4	11,083.4	572.3	75.0	2.0	649.3
Plan 2b without pumps	11,800.0	538.1	12,338.1	637.1	75.0	2.4	714.5
Plan 2c without pumps	13,100.0	597.4	13,697.4	707.3	75.0	2.6	784.9

Interest during construction shown in the third column is an economic cost that stops when the project is operational and begins to accrue benefits. It represents the opportunity cost of funds tied up in the project before the project yields benefits. Induced damages shown in Column 7 are the result of higher water surface profiles upstream of the project area. These costs are minor but were estimated anyway. The annual cost of each alternative shown in Column 8 will be compared with the annual benefit of each alternative to assess the economic justification of each alternative.

PLAN JUSTIFICATION

A plan must have a benefit cost ratio greater than one, or net benefit greater than zero, to be justified. Table 4 and Table 5 display the benefit and cost of each alternative. All plans are estimated to have net benefits less than zero and the benefit-cost ratios less than one to one. Although none of the alternatives are economically justified, as levees increase in height the additional damages prevented are less than the additional costs.

Table 4
Expected Value and Probabilistic Values
Net Benefits
Huntington
Cameron Run
Fairfax County, Va

Plan	Expected Annual NED Benefit and NED Cost ($'000)					
	Benefit	Cost	Net Benefit	0.75	0.50	0.25
Plan 1a	349.8	1,646.8	-1,297.0	-1,441.9	-1,317.8	-1,175.2
Plan 1b	429.4	1,711.8	-1,282.4	-1,473.2	-1,313.4	-1,126.1
Plan 1c	542.3	1,776.9	-1,234.6	-1,523.7	-1,315.5	-1,030.8
Plan 2a	317.8	951.0	-633.2	-757.8	-648.9	-527.6
Plan 2b	424.6	1,016.2	-591.6	-778.8	-621.3	-437.4
Plan 2c	540.4	1,231.3	-690.9	-974.0	-764.4	-484.3
Plan 1a without pumps	297	1,345.0	-1,048.0	-1,277.3	-1,115.3	-887.9
Plan 1b without pumps	413.7	1,410.0	-996.3	-1,242.0	-1,061.2	-817.1
Plan 1c without pumps	486.9	1,480.5	-993.6	-1,247.7	-1,057.7	-805.9
Plan 2a without pumps	290.5	649.3	-358.8	-588.2	-426.2	-198.7
Plan 2b without pumps	412.9	714.5	-301.6	-547.2	-366.4	-122.4
Plan 2c without pumps	486.9	784.9	-298.0	-552.1	-362.1	-110.3

The first half of the following tables show the expected damage reduced, expected benefit-cost ratios, and expected net benefits; and the second half of the table shows the cumulative probability distributions for these estimates.

Table 5
Expected Value and Probabilistic Values
Benefit/Cost Ratios
Huntington
Cameron Run
Fairfax County, Va

Plan	Expected Benefit/Cost Ratio			
		0.75	0.50	0.25
Plan 1a	0.2	0.1	0.2	0.3
Plan 1b	0.3	0.1	0.2	0.3
Plan 1c	0.3	0.1	0.3	0.4
Plan 2a	0.3	0.2	0.3	0.4
Plan 2b	0.4	0.2	0.4	0.6
Plan 2c	0.4	0.2	0.4	0.6
Plan 1a without pumps	0.2	0.1	0.2	0.3
Plan 1b without pumps	0.3	0.1	0.2	0.4
Plan 1c without pumps	0.3	0.2	0.3	0.5
Plan 2a without pumps	0.4	0.1	0.3	0.7
Plan 2b without pumps	0.6	0.2	0.5	0.8
Plan 2c without pumps	0.6	0.3	0.5	0.9

PROJECT PERFORMANCE

Table 6 indicates the probability of project failure in any given year and the cumulative probability of failure over ten, twenty and fifty year periods. Failure occurs when water levels reach elevations where significant damages are incurred. In any given year the probability of either Alternative 1c or Alternative 2c being overtopped is very low. The cumulative failure probabilities for these two alternatives over the 50-year period of analysis are also very low.

Table 6
Annual Performance and
Equivalent Long-term Risk
Huntington
Cameron Run
Fairfax County, Va

Plan	Annual Performance (Expected Annual Probability of Design Being Exceeded)	Equivalent Long-term Risk (Probability of Exceedance Over the Indicated Time Period)		
		10 Years	25 Years	50 Years
Without Project	0.0800	0.57	0.88	0.98
Plan 1a	0.0120	0.11	0.26	0.45
Plan 1b	0.0060	0.06	0.14	0.26
Plan 1c	0.0000	0.00	0.01	0.01
Plan 2a	0.0130	0.13	0.29	0.49
Plan 2b	0.0060	0.06	0.15	0.27
Plan 2c	0.0000	0.00	0.00	0.01

Table 7 displays the probabilities that the alternative plans will contain the various events from the 10 % (return interval 10 years) to the 0.2 % (return interval 500 years). Alternative 1a would have about a 54 % chance of containing the 1 % event (return interval 100 years); Alternative 1b would have about an 80 % chance of containing this event; and Alternative 1c would have about a 99 % chance of containing this event. The a, b, c options for Plan 2 have similar probabilities of containing the 1 % flood.

Table 7
Conditional Probability of
Design Non-exceedance
Huntington
Cameron Run
Fairfax County, Va

Plan	Conditional Probability of Design Containing Indicated Event					
	10%	4%	2%	1%	0.40%	0.20%
Without Project	0.69	0.18	0.06	0.02	0.01	0.00
Plan 1a	1.00	0.98	0.81	0.54	0.27	0.15
Plan 1b	1.00	1.00	0.95	0.80	0.52	0.35
Plan 1c	1.00	1.00	1.00	0.99	0.98	0.98
Plan 2a	1.00	0.96	0.77	0.49	0.24	0.14
Plan 2b	1.00	1.00	0.95	0.79	0.51	0.34
Plan 2c	1.00	1.00	1.00	0.99	0.98	0.97

RECOMMENDED PLAN

The recommended plan is Alternative 2c that provides a levee height to the 100-Year profile plus 3 feet in the downstream section and plus 4 feet in the upstream section. This plan is expected to prevent nearly all the annual flooding damage at an investment or first cost of $20,891,100. This plan has a 99 % chance of containing the flooding event with a 1 % chance of occurrence (100 year recurrence interval).

APPENDIX E. REAL ESTATE

PRELIMINARY
REAL ESTATE PLAN
HUNTINGTON FLOOD DAMAGE REDUCTION STUDY

1. GENERAL

2. REAL ESTATE REQUIREMENTS

   a. Description of Land, Easements, Rights-of-Way and Roadway Requirements for Project
   b. Standard Estates
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3. LANDS OWNED BY FAIRFAX COUNTY

4. NAVIGATIONAL SERVITUDE

5. INCREASED FLOODING

6. BASELINE COST ESTIMATE FOR REAL ESTATE

7. PUBLIC LAW 91-646 RELOCATIONS

8. TIMBER RIGHTS AND MINERAL ACTIVITY

9. ASSESSMENT OF NON-FEDERAL SPONSOR ACQUISITION CAPABILITY

10. ZONING

11. ACQUISITION SCHEDULE

12. UTILITY AND FACILITY RELOCATIONS

13. ENVIRONMENTAL CONCERNS

14. ATTITUDES OF THE LANDOWNERS

15. NOTIFICATION TO NON-FEDERAL SPONSOR

16. RISK ANALYSIS

PRELIMINARY REAL ESTATE PLAN

1. GENERAL

The purpose of this Real Estate Plan (REP) is to provide a level of analysis of real estate requirements in support of the Huntington Flood Damage Reduction Project (Huntington FDR), Fairfax County, Virginia. Significant flooding occurred in the Huntington Subdivision (also referred to as Arlington Terrace) along Cameron Run in Fairfax County, Virginia on June 25 and June 26, 2006 (June 2006 flood event). Flood elevations were in excess of 2.0 feet higher than the expected county-adopted 100-year flood elevations (flood having a 1-percent chance of occurring in any given year). The study area is the Huntington Subdivision along Cameron Run in Fairfax County, Virginia. Huntington is located on the south bank of Cameron Run, north of Huntington Avenue, east of Telegraph Road, and west of U.S. Route 1.

2. REAL ESTATE REQUIREMENTS

a. Description of Land, Easements, Rights-of-Way and Roadway Requirements for Project:

The Huntington community consists of duplex residential structures, the majority of which were built in the late 1940s and early 1950s. Most of the structures have basements, with first floor elevations being roughly 5 feet above the lower lying roadways. Nearly 80 of the structures, or 160 homes, in Huntington are located in the 100-year floodplain per the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs). Fairfax County, the Fairfax County Park Authority and the Fairfax County Water Authority own the majority of lands between the subdivision and Cameron Run. A new residential development is in planning stages in the vicinity of what is currently known as Hunting Creek Road on the eastern end of the study site. Private parcels at the western end of the project are located within the flood plain and are, as such, undevelopable.

The placement of a levee along Cameron Run will be located primarily on existing county land with tie-ins at both ends to private residential or residential development lands. Access would be by public roads Fenwick Drive and Mt. Vernon Drive in the Huntington subdivision and via an access road through the proposed residential development at the eastern end.

Construction of a levee, an associated ponding area, and access through the development land on the east will require the acquisition of fee interests or permanent easements in private residential or residential development lands, temporary easements for construction access and staging areas, utility relocations and jurisdictional transfers of portions of county park lands to a common county entity for operation and maintenance, permanent easements for access. Currently it appears there are six (6) transfers of jurisdiction among county entities to a common authority if they so choose, and the acquisition of a minimum four (4) fee parcels or easements from two (2) land development companies. There are public utilities in the area including telephone, electric, water and sewer. The extent of utility relocations has not yet been determined. Pending final plans and specifications, additional land may be required for

temporary construction access and or staging areas, although considerable county land is available in the immediate vicinity of the project. Additionally, it is not known at this time if offsite material disposal areas will be required.

b. Standard Estates:

The minimum estates potentially required for this project are Fee Simple, Channel Improvement Easement, Road Easement, Flowage Easement (Occasional Flooding), Utility and/or Pipeline Easement, and Temporary Work Area Easement for access. Although federal regulation requires only a permanent easement as the minimum standard estate for flood control projects, there is little to nothing an underlying fee owner could use the land for burdened with a flood control structure. Therefore, the acquisition value of land to be utilized for flood structure approximates full fee market value. Additionally, the acquisition of lands in fee simple is in line with the pending guidance for increased emphasis on eliminating encroachments (mostly trees) within 15' of embankment toe. The best way to secure the integrity of flood structure property is fee simple ownership by the sponsoring entity, in this case, Fairfax County. Flowage Easements (Occasional Flooding) may be required in lieu of designed ponding areas.

The standard estate language should include as a minimum, the following:

<u>FEE</u>

The fee simple title to (Tract Nos. ____), subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines.

<u>CHANNEL IMPROVEMENT EASEMENT</u>

A perpetual and assignable right and easement to construct, operate, and maintain channel improvement works on, over, and across (Tract Nos. _____) for the purposes as authorized by Fairfax County, Virginia, approved _(Date)_____, including the right to clear, cut, fell, remove and dispose of any and all timber, trees, underbrush, buildings, improvements and/or other obstructions therefrom; to excavate, dredge, cut away and remove any or all said land and to place thereon dredge or spoil material; and for such other purposes as may be required in connection with said work of improvement; reserving, however, to the owners, their heirs and assigns, all such rights and privileges as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines.

ROAD EASEMENT

A perpetual and assignable easement and right-of-way in, on, over and across (Tract Nos. ____) for the location, construction, operation, maintenance, alteration, and replacement of (a) road(s) and appurtenances thereto; together with the right to trim, cut, fell and remove therefrom all trees, underbrush, obstructions, and any other vegetation, structures, or obstacles within the limits of the right-of-way; reserving, however, to the landowners, their heirs and assigns, the right to cross over or under the right-of-way as access to their adjoining land at the locations indicated in Schedule B; subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines.

FLOWAGE EASEMENT (Occasional Flooding)

The perpetual right, power, privilege and easement occasionally to overflow, flood and submerge (Tract Nos. ____) (and to maintain mosquito control) in connection with the operation and maintenance of the Huntington Flood Damage Reduction Project as authorized by Fairfax County, Virginia, approved _(Date)_____, together with all right, title and interest in and to the structures and improvements now situate on the land, except fencing and also excepting _(if applicable)__; provided that no structures for human habitation shall be constructed or maintained on the land except as may be approved in writing by the representative of Fairfax County in charge of the project, and that no excavation shall be conducted and no landfill placed on the land without such approval as to the location and method of excavation and/or placement of landfill; the above estate is taken subject to existing easements for public roads and highways, public utilities, railroads and pipelines; reserving, however, to the landowners, their heirs and assigns, all such rights and privileges as may be used and enjoyed without interfering with the use of the project for the purposes authorized by Fairfax County or abridging the rights and easement hereby acquired; provided further that any use of the land shall be subject to Federal and State laws with respect to pollution.

UTILITY AND/OR PIPELINE EASEMENT

A perpetual and assignable easement and right-of-way in, on, over and across (Tract Nos. ____) for the location, construction, operation, maintenance, alteration, repair and patrol of (overhead) (underground) (specifically name type of utility or pipeline); together with the right to trim, cut, fell and remove therefrom all trees, underbrush, obstructions, and any other vegetation, structures, or obstacles within the limits of the right-of-way; reserving, however, to the landowners, their heirs and assigns, all such rights and privileges as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however to existing easements for public roads and highways, public utilities, railroads and pipelines.

TEMPORARY WORK AREA EASEMENT

A temporary easement and right-of-way in, on, over and across (Tract Nos. ____), for a period not to exceed _____ years, beginning with date possession of the land is granted to Fairfax County, for use by Fairfax County, its representatives, agents, and contractors as a (borrow area) (work area), including the right to (borrow and/or deposit fill, spoil and waste material thereon) (move, store and remove equipment and supplies,) and erect and remove temporary structures on the land and to perform any other work necessary and incident to the

construction of the Huntington Flood Damage Reduction Project, together with the right to trim, cut, fell and remove therefrom all trees, underbrush, obstructions, and any other vegetation, structures, or obstacles within the limits of the right-of-way; reserving, however, to the landowners, their heirs and assigns, all such rights and privileges as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however to existing easements for public roads and highways, public utilities, railroads and pipelines.

c. Non-Standard Estates:

No non-standard estates are required for this project.

d. Current Ownership:

We are still researching some of the parcel sizes and boundaries. The most current ownership information is as follows:

Parcel Tax ID	Owner	Type	Area	Acquire:	Value
0831 16 0013A	Banks Hunting LLC	Undeveloped - Flood Plain	3950 sf	Fee	$1K
0831 16 013B	Banks Hunting LLC	Undeveloped - Flood Plain	5411 sf	Fee	$1K
0831 16 0014B	Banks Hunting LLC	Undeveloped - Flood Plain	3519 sf	Fee	$1K
0831 16 0019B	Banks Hunting LLC	Undeveloped - Flood Plain	2105 sf	Fee	$1K
0831 14C 0127A	Fairfax County Park Authority	Public	TBD	Partial Transfer	n/a
0831 14C 0110A	Fairfax County Park Authority	Public	TBD	Partial Transfer	n/a
0831 14C 0118A	Fairfax County Park Authority	Public	TBD	Partial Transfer	n/a
0831 14C0 140A	Fairfax County Park Authority	Public	TBD	Partial Transfer	n/a
0831 14C 0153A	Fairfax County Park Authority	Public	TBD	Partial Transfer	n/a
0831 01 0058	Fairfax County Water Authority	Public	TBD	Access Easement	n/a
0831 27A	MHI Huntington LLC	Undeveloped Residential	TBD	Permanent Easements	$25K

Note: Above estimates are rudimentary, without benefit of an in-depth real estate study including but not limited to individual parcel inspections and gross appraisals. Property values in the Northern Virginia market area have fluctuated concurrent but not necessarily in line with the national housing and home finance marketplace. Estimated costs are subject to change.

e. Real Estate Mapping:

Real Estate mapping showing the project area is attached a Exhibit "A".

3. LANDS OWNED BY FAIRFAX COUNTY

Fairfax County, Virginia owns the majority of the proposed project land along Cameron Run. The county lands are separately under the jurisdiction of, and managed by, the Fairfax County Park Authority and the Fairfax County Water Authority.

4. NAVIGATIONAL SERVITUDE

None of the interests in real property to be acquired are subject to navigational servitude.

5. INCREASED FLOODING

Flooding will increase by 0.6 feet immediately upstream of the proposed project.

6. BASELINE COST ESTIMATE FOR REAL ESTATE

The preliminary M-CACES cost estimate for real estate (01 account) is attached as Exhibit "B". The total estimated administrative and estate costs for lands, easements, rights-of-way, and disposal areas, including contingency, is $68,000(R).

7. PUBLIC LAW 91-646 RELOCATIONS

There are no residential or commercial relocations planned for this project.

8. TIMBER RIGHTS AND MINERAL ACTIVITY

None of the interests in real property to be acquired are subject to timber or mineral rights.

9. ASSESSMENT OF FAIRFAX COUNTY ACQUISITION CAPABILITY

Fairfax County, Virginia has successfully performed numerous projects involving real estate acquisitions and is well qualified and staffed to acquire all necessary rights for the construction of this project.

10. ZONING

The enactment of zoning ordinances is not proposed to facilitate acquisition for this project.

11. ACQUISITION SCHEDULE

All realty rights should be acquired and/or transferred prior to submitting a construction project for bid. It is anticipated the acquisition of required real estate for this project could be accomplished in less than six (6) months.

12. UTILITY AND FACILITY RELOCATIONS

There are potential utility relocations necessary for the Huntington FDR including electrical, water and sewer installations.

13. ENVIRONMENTAL CONCERNS

There is no known hazardous, toxic, or radioactive waste (HTRW) contamination in the project area. Any such contamination would be the responsibility of Fairfax County.

14. ATTITUDES OF THE LANDOWNERS

Huntington Subdivison landowners are anxious for relief from flooding.

15. NOTIFICATION TO NON-FEDERAL SPONSOR

Fairfax County requested a study be performed by the Federal Government to determine the feasibility and alternatives for flood damage reduction to the Huntington Subdivision. Fairfax County has been a working partner in the study and will be the primary sponsor of the project. The United States Army Corps of Engineers is not anticipated to be a direct participant in the construction of the project.

16. RISK ANALYSIS

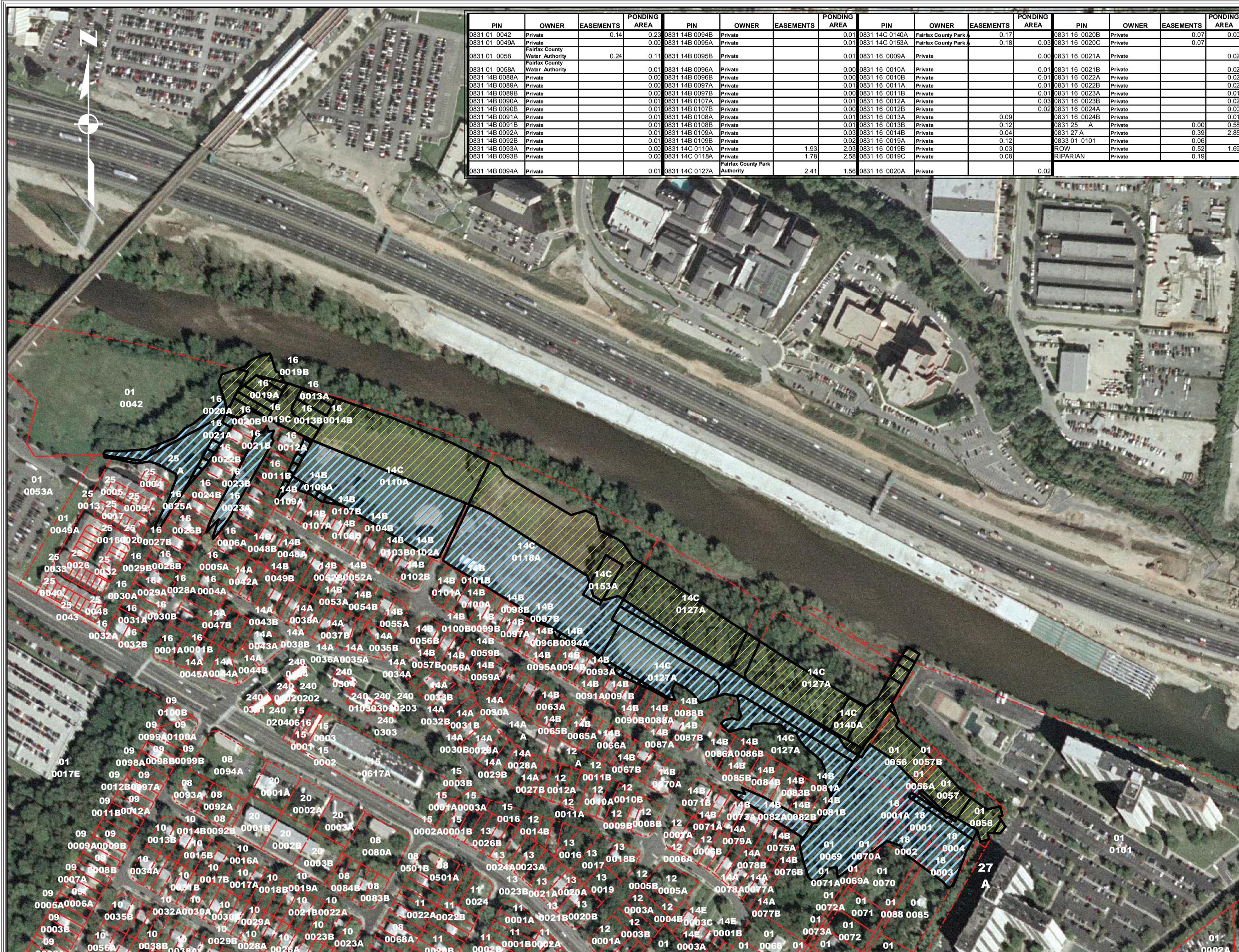
The majority of land required for the project is owned by Fairfax County entities. Four of the private lands are undevelopable, located within the existing flood plain and considered excess land by the single development company owner. One other private parcel is owned by a development company of a proposed subdivision that is amenable to the project. It is anticipated that the owners and/or tenants of improved residential lots in the area will be favorable to increased flood damage control. Therefore, the risk associated with real estate required for the project will be minimal.

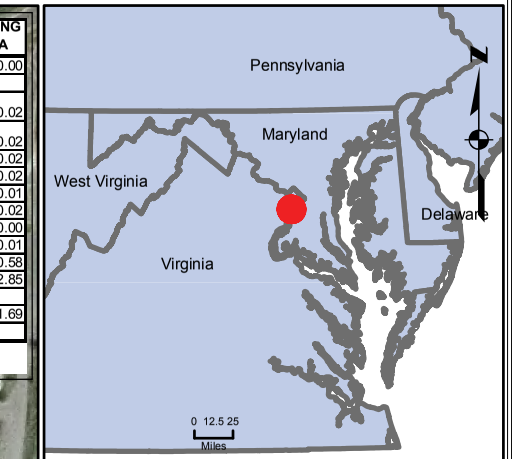
PIN	OWNER	EASEMENTS	PONDING AREA
0831 01 0042	Private	0.14	0.23
0831 01 0049A	Private		0.00
0831 01 0058	Fairfax County Water Authority	0.24	0.11
0831 01 0058A	Fairfax County Water Authority		0.01
0831 14B 0088A	Private		0.00
0831 14B 0089A	Private		0.00
0831 14B 0089B	Private		0.00
0831 14B 0090A	Private		0.01
0831 14B 0090B	Private		0.01
0831 14B 0091A	Private		0.01
0831 14B 0091B	Private		0.01
0831 14B 0092A	Private		0.01
0831 14B 0092B	Private		0.01
0831 14B 0093A	Private		0.00
0831 14B 0093B	Private		0.00
0831 14B 0094A	Private		0.01

PIN	OWNER	EASEMENTS	PONDING AREA
0831 14B 0094B	Private		0.01
0831 14B 0095A	Private		0.01
0831 14B 0095B	Private		0.01
0831 14B 0096A	Private		0.00
0831 14B 0096B	Private		0.00
0831 14B 0097A	Private		0.01
0831 14B 0097B	Private		0.00
0831 14B 0107A	Private		0.01
0831 14B 0107B	Private		0.00
0831 14B 0108A	Private		0.01
0831 14B 0108B	Private		0.01
0831 14B 0109A	Private		0.03
0831 14B 0109B	Private		0.02
0831 14C 0110A	Private	1.93	2.03
0831 14C 0118A	Private	1.78	2.58
0831 14C 0127A	Fairfax County Park Authority	2.41	1.56

PIN	OWNER	EASEMENTS	PONDING AREA
0831 14C 0140A	Fairfax County Park A	0.17	
0831 14C 0153A	Fairfax County Park A	0.18	0.03
0831 16 0009A	Private		0.00
0831 16 0010A	Private		0.01
0831 16 0010B	Private		0.01
0831 16 0011A	Private		0.01
0831 16 0011B	Private		0.01
0831 16 0012A	Private		0.03
0831 16 0012B	Private		0.02
0831 16 0013A	Private	0.09	
0831 16 0013B	Private	0.12	
0831 16 0014B	Private	0.04	
0831 16 0019A	Private	0.12	
0831 16 0019B	Private	0.03	
0831 16 0019C	Private	0.08	
0831 16 0020A	Private		0.02

PIN	OWNER	EASEMENTS	PONDING AREA
0831 16 0020B	Private	0.07	0.00
0831 16 0020C	Private	0.07	
0831 16 0021A	Private		0.02
0831 16 0021B	Private		0.02
0831 16 0022A	Private		0.02
0831 16 0022B	Private		0.02
0831 16 0023A	Private		0.01
0831 16 0023B	Private		0.02
0831 16 0024A	Private		0.00
0831 16 0024B	Private		0.01
0831 25 A	Private	0.00	0.58
0831 27 A	Private	0.39	2.85
0833 01 0101	Private	0.06	
ROW	Private	0.52	1.69
RIPARIAN	Private	0.19	





PROJECT LOCATION

REAL ESTATE PROJECT PLANNING MAP

HUNTINGTON

FLOOD DAMAGE REDUCTION

STUDY

FAIRFAX COUNTY, VIRGINIA

Parcels shown hereon are based on data acquired from Fairfax County (circa 2006). Some areas may have been revised since that time. All acreages and square footages are approximate. An accurate property survey is required in order to properly locate, delineate, and measure the areas indicated on this map.

0 75 150 300
Feet

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
REAL ESTATE DIVISION
BALTIMORE, MARYLAND

PROJECT FILE: RE_REP_R-1.mxd
CREATED BY: RTS
DATE: 29 DEC 2008
SCALE: AS SHOWN

PLATE: **R-1**

APPENDIX F. PUBLIC INVOLVEMENT

A Fairfax County, Va. publication

Huntington Flood Damage Reduction Project

September 2007

Overview

As a result of the devastating flood in June 2006, Fairfax County requested the U.S. Army Corps of Engineers, Baltimore District, to evaluate various alternatives to reduce flood damages in the Huntington and Huntington Station communities. For this study, the Corps is taking on a role similar to a consultant, and is not authorized or funded to implement a project. At the conclusion of the study, the county will decide which alternative to pursue further for funding and implementation.

Levee/Floodwall

One alternative that is being evaluated is a levee or floodwall, which would be located between the affected communities and Cameron Run. This alternative would provide a specific level of protection (e.g. 100-year event) against both tidal and riverine flooding. The levee, which is an earthen embankment, would require more space (e.g. 10 feet high by 60 feet wide) compared to a floodwall, but is typically less expensive. The current alignment for the levee/floodwall is not situated on any existing residential structures or wetlands. Preliminary investigations show that this alternative would increase flood levels in some areas upstream, which may require mitigation. The project team is investigating ways to prevent such a rise, such as dredging on a routine basis.

Dredging

Dredging is also being considered as a stand-alone flood reduction alternative, and varying extents are being evaluated to remove approximately 5 feet of sediment across the width of the channel. Initial modeling results show that dredging would reduce flood levels by a maximum of 1.5 feet in the Huntington area. This alternative would not protect against tidal events. A sanitary siphon — located approximately 3 feet below the current river bottom in the vicinity of Riverside Apartments — may have to be relocated.

Aerial photo showing the potential levee footprint (green shaded area).

Buyouts

Although Supervisor Hyland is not in favor of buyouts, the federal government is required to evaluate all feasible alternatives. Buyouts would involve the government purchasing houses at fair market value and restoring the land back to a natural floodplain.

Flood Proofing

For the Huntington Community, flood proofing would involve filling in the basement, providing additional living space and possibly elevating the house. The Community Center would be protected through the installation of a waterproof wall. For Huntington Station, construction of a partial ring wall around affected buildings would provide flood protection. Flood proofing alternatives would not protect vehicles, other structures or infrastructure.

The county and the Corps are working together to design a project that will provide protection to the community. The Corps will provide concept designs, costs and impacts of chosen alternatives by the end of the year. Part of the ongoing work includes determining the "cost benefit ratio" which is a factor in acquiring federal funding. Based on very preliminary plans, the cost benefit ratios are not meeting the threshold for qualification under current federal flood programs. As more information is gathered, the cost benefit analysis will also be refined. The county is also exploring other funding options including partnering with the state and Alexandria to address flooding along Cameron Run.

A Message From Supervisor Hyland

The June 2006 flood was a traumatic event for the Huntington community. Every rain since triggers a deluge of those memories. No community can endure with the fear that the next downpour may cause the creek to spill its banks and once again destroy what you have worked so hard to rebuild. If I could construct permanent flood protection tomorrow, I would. Fairfax County staff and I continue to work collaboratively with the United States Army Corps of Engineers and surrounding jurisdictions to get closer to our final goal: to keep the water away from your homes! As we near completion of the flood protection study, which is similar to the studies the City of Alexandria performed to obtain permits to channel and dredge Cameron Run, we will continue to update you on our progress. I hope all of you have already signed up for Fairfax County's Community Emergency Alert Network (CEAN). This is the best way for you to remain apprised of alerts or emergencies. If you have any questions, please contact me at 703-780-7518, TTY 711, or by e-mail at mtvernon@fairfaxcounty.gov.

Aerial photo illustrating one dredging alternative and the sanitary pipe location.

Summary of April 24th Community Meeting

Thank you to those who attended this past April's meeting. The purpose of the meeting was to present preliminary flood damage reduction alternatives for the Huntington and Huntington Station communities and to receive important and constructive feedback from the residents.

Approximately 100 people attended the meeting and many questions and concerns were discussed. In this newsletter we hope to answer some of the questions raised and continue to share information.

Questionnaire Responses

At the meeting, questionnaires were provided to attendees. We received valuable feedback through over 20 questionnaire responses. Of the questionnaires received, many residents were in favor of the dredging and levee or floodwall alternative and were against the flood proofing alternative. An equal number of responses were in favor of buyouts as were opposed. Below are some of the most common interests and concerns expressed through the questionnaire:

- Process is taking too long and flood protection is needed now;
- Storm sewers need to be cleaned and maintained on a regular basis;
- Cameron Run should be dredged routinely in this lower reach, similar to the dredging plan already in place by the City of Alexandria, which dredges upstream of the Capital Beltway crossing.

Informal discussion and displays before formal meeting.

Questions and Answers

Below and on the next page are answers to some of the questions raised during the community meeting or through the questionnaire.

Q: Why does the City of Alexandria dredge and Fairfax County doesn't?

A: The City of Alexandria experienced significant flooding in the 1970's, which resulted in studies to identify and evaluate various flood damage reduction alternatives for areas impacted. As a result of such efforts, the city selected a plan, obtained permits, and allocated funding. Part of the plan selected by the city was to dredge Cameron Run, from the Capital Beltway crossing and into Backlick and Holmes Run upstream and to maintain channel depths by repeated dredging.

Fairfax County is undertaking a similar process as the city did previously.

Example of type of equipment suitable for dredging upstream reaches of Cameron Run.

Q: What about the Invisible Flood Control Wall (IFCW) technology?

A: During the meeting, the Invisible Flood Control Wall (IFCW) by Flood Control America (FCA) was suggested as another flood control solution in lieu of a typical levee in hopes of finding a cheaper and faster way to offer flood protection. The IFCW is a removable floodwall erected only when needed and is otherwise stored leaving an un-obscured riverfront view. This technology has been used for other flood control projects. Because the floodwall requires installation prior to each flood event, this technology is only suitable in areas with adequate warning time, which is not the case in Huntington. In addition, similar to the levee alternative, prior to installation of the IFCW, the following analyses would still be required: soil suitability, interior drainage, induced flooding impacts, wetland impacts, various levels of protection, etc. Preliminary cost estimates indicate the IFCW is likely to be comparable to the levee alternative.

Picture of IFCW installed in Breckenridge, MN. Photo courtesy of FCA.

Q: Which alternatives will remove me from the floodplain and will I still need to purchase flood insurance?

A: Other than the buyout alternative, only the levee/floodwall alternative has the potential to remove residents from the 1-percent-annual-chance (100-year) floodplain on a Flood Insurance Rate Map (FIRM). The levee/floodwall must meet stringent design, operation and maintenance criteria in order to be credited and mapped as providing such protection. Even if such criteria were met, the county would still recommend the purchase of flood insurance in the event the structure is overtopped.

Fairfax County's Community Emergency Alert Network (CEAN) delivers important emergency alerts, notifications and updates during a major crisis or emergency and also provides day-to-day notices about weather and traffic. Through the Riverwatch notification group, participants are notified if flooding is anticipated based on rainfall measurements and other data. Messages are delivered to all devices you register, such as e-mail accounts, pagers, and cell phones.

To register, visit:
www.fairfaxcounty.gov/cean/

FEMA Floodplain Mapping

The Federal Emergency Management Agency (FEMA) is in the process of creating new Flood Insurance Rate Maps (FIRMs) for the watershed. This will be combined with revised maps for other areas of the county to create a new countywide FIRM. Under the current schedule, FEMA would advertise their intent to publish new FIRMs in late 2007/ early 2008 and an appeal period of 90 days would follow. They would then assess appeals and the process of adopting new FIRMs, per federal regulations, would follow resulting in the new maps being issued in late 2008.

If your home is currently not shown to be in a special flood hazard area (SFHA) on the existing ("effective") FIRM, and should the new FIRM show your home to be inside the new SFHA, there is a grandfathering provision which allows you to obtain a lower rate on flood insurance even after the maps are revised. The key caveats are that you must have an active policy before these changes occur and that you may not have had more than one claim paid by FEMA. So if you are outside of the current FEMA special flood hazard area, signing up for a flood insurance policy prior to the date of the map change should ensure a lower rate policy in the future. (Note: After fees are submitted, there is a 30-day waiting period before the policy becomes effective.)

For more information on the national flood insurance program, visit: www.fema.gov/hazard/flood/index.shtm and click on the "Buy Flood Insurance" link.

(Questions and Answers continued.)

Q: What exactly is a 100-year flood?

A: The term "100-year flood" is misleading. It is not the flood that will occur once every 100 years. Rather, it is the flood elevation that has a 1-percent chance of being equaled or exceeded each year. Thus, the 100-year flood could occur more than once in a relatively short period of time. The 100-year flood, which is the standard used by most federal and state agencies, is used by the National Flood Insurance Program as the standard for floodplain management and to determine the need for flood insurance. A structure located within a special flood hazard area shown on an NFIP map has a 26 percent chance of suffering flood damage from a 100-year event and 45 percent chance of suffering flood damage from a 50-year event during the term of a 30-year mortgage. An analysis of the June 2006 flood indicates that it was a 50-year event.

Q: Flood proofing individual houses—is this safe? (A flood proofing alternative under consideration for the duplex homes in Huntington is to fill the basement, provide an addition, and raise the first floors above the 100-year elevation. Many people asked whether or not this is a safe practice, especially for older homes.)

A: This type of flood proofing has been in practice for decades. Over 1,000 structures have been elevated throughout the country in the same manner by the U.S. Army Corps of Engineers. These structures range in age from nearly a century to recently constructed. The most important criteria in determining whether or not to elevate a structure is the condition and not the age of the building. Many qualified house-moving contractors know the techniques for elevating a building. The structure is jacked up and temporarily set on cribbing while a new foundation is built underneath. The foundation walls are raised to the flood protection level and the house is lowered onto the new foundation. The result is similar to building a house over a 3-4 foot crawlspace. If the house is raised 4 feet, the front door would be 6 steps higher than before. Utility lines are extended and reconnected, steps are built and, in some cases, the perimeter is backfilled or landscaped to mask the change. The walls of the new foundation must have openings to allow floodwaters to pass under the building. Otherwise, hydrostatic pressure will be placed on the walls and floor, and the foundation would be in danger of cracking or breaking.

Graphic depicting elevating house, filling basement and providing an addition.

Q: If a levee or floodwall is constructed, how will this impact the park?

A: The current proposed alignment for the levee would cut across what is now playground and ball fields. The levee footprint would measure approximately 60 feet wide and a 15 foot easement on either side may be required. Recreational features may be considered if a levee is constructed, such as a hiker and biker trail on top of the levee. A floodwall may be evaluated in place of a levee to reduce the land required.

The Fairfax County Park Authority was developing a Master Plan for this park prior to the June 2006 flood. The project team has been coordinating the potential alternatives with the Park Authority. The Park Authority will resume planning activities for the park after impacts from the potential flood damage reduction activities are better known.

A Fairfax County, Va. publication

Fairfax County
Department of Public Works and Environmental Services
Stormwater Planning Division
12055 Government Center Pkwy
Suite 659
Fairfax, VA 22035-5502

Phone: 703-324-5500
Fax: 703-802-5955
E-mail:
Camylyn.Lewis@fairfaxcounty.gov
or
Randy.Bartlett@fairfaxcounty.gov

Visit us on the Web at:
www.fairfaxcounty.gov/dpwes

Huntington Flood Insurance Program Update

On February 26, 2007, the Fairfax County Board of Supervisors approved an interim flood insurance grant program called the Huntington Flood Insurance Program (HFIP) to serve a sub-area of the existing Huntington community. The purpose of the HFIP is to reimburse income-qualified residents (owner-occupants and renters) of a designated sub-area for the cost of flood insurance for a period of one year. The designated sub-area of the Huntington community includes homes that experienced the June 2006 flooding or were deemed susceptible to future flooding. The Fairfax County Redevelopment and Housing Authority subsequently approved the HFIP on March 8, 2007, and has been administering the program through the Fairfax County Department of Housing and Community Development (DHCD).

On April 20, 2007, letters, including program information, sub-area maps, FEMA flood insurance coverage summaries, and application forms, were sent by certified mail to all the current residents of the designated sub-area. Flood insurance is provided through the Federal Emergency Management Agency's National Flood Insurance Program. As of this time, approximately 25 application forms have been received and are being processed.

In addition, a new program manager, Leslie Jones, was hired to administer the HFIP along with other home improvement loan programs. Jones started working at DHCD on July 9, 2007, and she may be reached on 703-246-5279, TTY 711.

To request this information in an alternate format, call DPWES at 703-324-5500, TTY 800-828-1120.

Cleaning and Maintenance of Storm Sewers

After the June 2006 flood, the county inspected the storm drainage infrastructure throughout the community and performed necessary maintenance. At that time, several underground storm sewer pipes had blockages, which required the pipes to be flushed. In addition, sediment was removed from channels leading to Cameron Run.

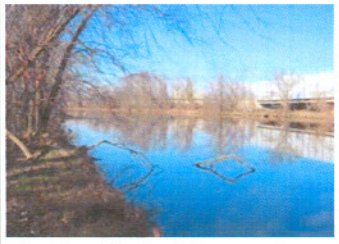
The county continues to proactively perform inspections of the drainage system to identify deficiencies as they arise. Inspections between June 2006 and May 2007 revealed no additional work was required. A more recent inspection, however, revealed that additional flushing and channel cleaning is necessary to enhance functionality. This work is currently underway.

Staff will continue to inspect the storm drainage infrastructure periodically. However, if residents or homeowners observe anything unusual, such as a suspected blockage, please contact Stormwater Maintenance at 703-934-2800, TTY 711.

Culvert carrying stormwater from Huntington to Cameron Run.

Upcoming Tasks

As the project team continues to investigate various flood damage reduction alternatives, the following are some of the tasks scheduled for completion during the next few months:



Southern bank of Cameron Run looking west.

- In-stream soil sampling along Cameron Run and testing for chemical and physical parameters to help determine suitable placement or disposal sites for dredged material if dredging is implemented.
- Excavation (test pits) along potential levee alignment to determine soil composition and suitability for construction.
- Sediment transport analysis for the lower portion of the Cameron Run watershed to estimate frequency of sediment deposition.
- Interior drainage analysis to determine size of potential pump stations needed to transport stormwater from landward side of levee to Cameron Run during a flood event.

Unless otherwise indicated, photos in this publication courtesy of the U.S. Army Corps of Engineers, Baltimore District.

A Fairfax County, Va. publication

Huntington Flood Damage Reduction Project

May 2008

Background

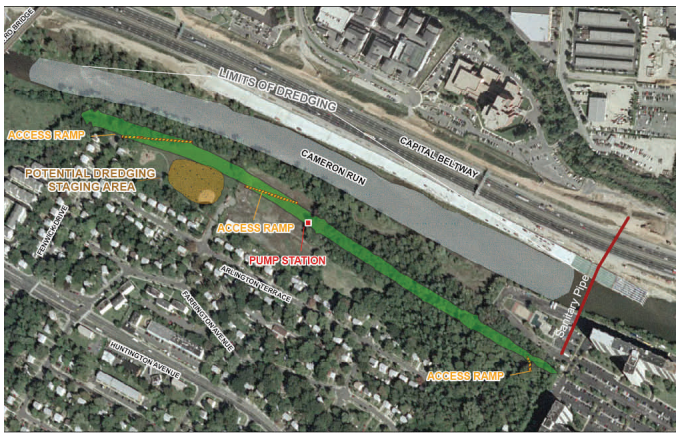
As a result of the devastating flood in June 2006, Fairfax County requested the U.S. Army Corps of Engineers, Baltimore District, to evaluate alternatives to reduce flood damages in the Huntington communities. For this study, the Corps is acting as a consultant, and is not authorized or funded to implement a project.

Alternatives Under Consideration

Levee

Based on the information to date, the county has decided to move forward with a levee design. The county continues to consider whether to include dredging as part of the project. The levee would be located between the affected residents and Cameron Run (see illustration below). The county has asked the Corps to design a levee that would provide a 100-year level of protection and would meet Federal Emergency Management Agency (FEMA) certification requirements. The levee height would range from 10 to 15 feet, depending on existing elevations, and would be approximately 75 feet wide. In addition, a fifteen-foot easement may be required on both sides of the levee. A pump station would be required as part of levee construction in order to drain rainwater from the landward side of the levee since the storm drain outlets would be closed during a flood.

Part of the analysis of various levee heights involved calculating the probability that the levee will not be overtopped during a 100-year event and is based on the uncertainty of the true 100-year flood elevation. The levee would be built 3 to 4 feet higher than the 100-year flood elevation to allow a factor of safety. The preliminary cost for levee construction is estimated at $19.1 million.



Aerial photo illustrating levee (green), dredging extent (grey), sanitary pipe location (red), and other features.

Levee in combination with dredging

The county continues to consider dredging Cameron Run from the upstream end of the Huntington Community to just upstream of the sanitary siphon (see illustration below). This dredging would occur in addition to construction of the levee. Since the various dredging extents previously evaluated do not solve the flooding problem at Huntington, the study is focused on dredging in a limited area to offset the increased water surface elevations caused by levee construction upstream of Huntington. Modeling has shown that water surface elevations would be higher (0.1 to 0.5 feet for the 100-year flood event) for some structures just upstream of Huntington due to levee construction. These buildings are already located in the 100-year floodplain, and would flood regardless of a levee. This plan would include an initial dredging (approximately 5 feet deep and 150 feet wide) followed by maintenance dredging roughly every five years, depending on sediment deposition in the channel after storm events. Two to three access ramps and drying/staging areas would be needed for dredging operations which would impact the park. Material would likely be dredged by an excavator or similar equipment, allowed to dry for up to three days, and hauled away in trucks for disposal. Initial dredging would take approximately 8,000 truckloads and six months to complete with maintenance dredging taking roughly half the number of trucks and months to accomplish. *

A Message From Supervisor Hyland

At our last meeting in January, the Fairfax County Public Works staff and the Corps of Engineers presented their preferred flood control design. Since then, you may have seen engineers and surveyors along the creek, in the park and in your neighborhood. We continue to gather data and refine our designs for a flood control project. Recently, the newspapers drew attention to the Belle Haven Watershed Flood Study's positive benefit cost ratio. Their articles inaccurately assumed that the government's resolve to fund a project there instead of in Huntington was somehow stronger and that your study would be added to the shelves. Nothing is further from the truth! The Cameron Run and Belle Haven Watershed Flood Reduction Projects are not in competition with each other. The community's desire is clear. Now is the time to strengthen your resolve and as one stalwart community voice reach out to your state and federal representatives to urge their support. Please remember to sign up or update your contact information at Fairfax County's Community Emergency Alert Network (CEAN). If you have any questions or comments, please contact me at 703.780.7518,TTY 711 or by e-mail at mtvernon@fairfaxcounty.gov. *

Summary of January 15th Community Meeting

The purpose of the meeting was to present the selected flood damage reduction alternatives for the Huntington communities and discuss residents' likes and dislikes.

Approximately 85 people attended the meeting and several issues and concerns were raised. This newsletter addresses some of the issues discussed and shares additional information.

Comment Card Responses

At the meeting, comment cards were provided to attendees. Eight comment card responses were received. Some of the comments included the following:

- "Dredging should be done now to provide some protection since construction of a levee will take years to complete."
- "Buyouts should be studied further since the levee could fail and the cost over the lifetime of the project would include operation and maintenance."
- "Dredging is needed all the way to the Potomac River past the George Washington Parkway."
- "The county should have tighter controls on impervious surfaces, limit new development, reduce parking lot sizes, and the number of 'big box' stores."
- "The impact of construction of the beltway, which altered the historic Cameron Run floodplain, has been ignored." *

Cameron Run/Holmes Run Watershed Study

Separate from this Huntington Flood Damage Reduction Study, a Cameron Run/Holmes Run watershed study is underway. In 2004, the county, City of Alexandria, and the Corps, with support from the Northern Virginia Regional Commission (NVRC), formed a partnership to develop a watershed plan to evaluate potential actions for preventing and addressing watershed problems. The study is currently in the feasibility phase. The goals of the study are to:

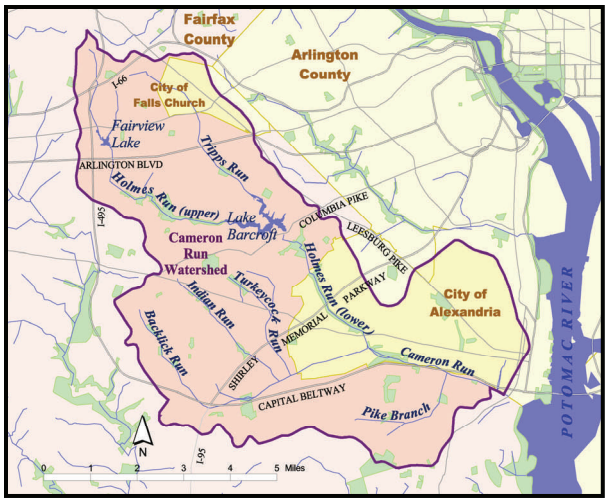
- Reduce storm water impacts on the Cameron Run watershed from impervious areas to help restore and protect streams;
- Preserve and improve watershed habitats to support native flora and fauna;
- Preserve and improve stream water quality to benefit humans and aquatic life;
- Improve stream-based quality of life and recreational opportunities for residents of and visitors to Cameron Run watershed;
- Provide adequate, cost-effective flood protection for adjacent communities along major tributaries in the Cameron Run watershed; and
- Build a framework for long-term regional cooperation.

The Cameron Run/Holmes Run Watershed Feasibility Study benefits from such ongoing efforts in the watershed as the county's Watershed Management Plan for Cameron Run, Alexandria's Water Quality Management Supplement and flood studies within the watershed. The feasibility study is scheduled for completion in September 2010.

The feasibility study is financed by both federal and local partners. The watershed study is the initial step toward potential federal construction of ecosystem restoration and flood damage reduction measures.

To date, stream restoration and habitat improvements have been identified in Backlick, Holmes and the main channel of Cameron Run. In addition, upstream detention concepts have been evaluated to reduce flood levels downstream in an environmentally sensitive manner. One concept plan, that involves a detention basin along Backlick Run, is being investigated further.

Contacts – To subscribe to the Cameron Run/Holmes Run e-newsletter, send an e-mail to mpopkin@novaregion.org. To learn more about Cameron Run projects, visit NVRC's website at www.novaregion.org/cameron. *



Cameron Run/Holmes Run Watershed Study Area

Questions and Answers

Below are answers to some questions raised during the community meeting or through the comment cards

Lower Cameron Run (Hunting Creek) at the George Washington Memorial Parkway (June 2007). Photo courtesy of the Virginia Department of Transportation/Scott Kozel.

Q: How would flood elevations change at Huntington if Cameron Run was dredged from Huntington all the way to the Potomac River?

A: As presented during the April 2007 community meeting, dredging all the way out to the Potomac River will not reduce flood levels sufficiently to prevent homes from flooding should a 50 or 100-year flood event occur. Hydrologic and hydraulic modeling has shown that dredging from the Telegraph Road Bridge to just downstream of the George Washington Memorial Parkway would decrease the 100-year water surface profile in Huntington by 1.5 feet during a 100-year event, which is not enough to eliminate damages to the majority of homes that flooded in the June storm in Huntington. Modeling shows that even if the dredging extended through the tidal flats at the mouth of the Potomac River, the decrease in water surface elevations at Huntington would be the same. The county and its partners are aware that residents want sediment removed in Cameron Run. The Corps, the county and the City of Alexandria are conducting a watershed study, that may include channel restoration along the lower portion of Cameron Run, as part of a recommended plan (for more information see the *Cameron Run/Holmes Run Watershed Study* article on page 2).

Q: If a levee and pump station are constructed, during a flood event how long would it take to pump out the rain water that falls on the landward side of the levee?

A: During a flood event, the storm drain system will be closed off at the levee to prevent floodwaters from backing up and flooding the community. If a 100-year rainfall occurred during a flood event, it would take approximately 16 hours to pump out the water ponded behind the levee (assuming a 60,000 gallon per minute pump was operated). There should be no ponding during this event above an elevation of 9 feet and water would not impact houses, but would collect in open space and roadways.

Aerial photo shows where ponding would occur during a 100-year rainfall event with a pump station.

Q: If a levee or floodwall is constructed, how will this impact the park?

A: The proposed alignment for the levee would cut across what are now playground and ball fields. The levee footprint would measure approximately 75 feet wide and a 15-foot easement on both sides may be required. In February, the project team presented the proposed levee alignment to representatives of the Fairfax County Park Authority. Some of the topics discussed included the park authority's request that an asphalt recreational trail be incorporated into the design for the top of the levee. If dredging is not pursued, the park authority would like to improve such recreational opportunities as new or different ball fields, improved open space, educational signage and a pier overlooking existing wetlands. The park authority plans to resume development of the park's master plan once the levee has been designed. If dredging is pursued, it is likely that the park authority would not maintain this area as recreation due to park impacts associated with routine maintenance dredging.

Q: Why doesn't the county buyout the community and sell the property to a developer, who could build condominiums above the floodplain similar to Mid-Towne?

A: The county is committed to supporting the community, and preserving affordable housing. *

Mid-Towne High Rise Condominiums near Huntington.

A Fairfax County, Va. publication

Fairfax County
Department of Public Works and Environmental Services
Stormwater Planning Division
12000 Government Center Pkwy
Suite 449
Fairfax, VA 22035-5502

Phone: 703-324-5500
Fax: 703-802-5955
E-mail:
Camylyn.Lewis@fairfaxcounty.gov
or
Randy.Bartlett@fairfaxcounty.gov

Visit the Web site at:
www.fairfaxcounty.gov/dpwes

Huntington Flood Insurance Program Continues in 2008

This is an update on the status of the Huntington Flood Insurance Program (HFIP). Some residents (owners and renters) participated in the first year of the program; but many did not. On February 11, 2008, the Fairfax County Board of Supervisors approved a one-year extension of the interim flood insurance grant program to reimburse qualified residents, for the cost of flood insurance offered through the Federal Emergency Management Agency's (FEMA's) National Flood Insurance Program (NFIP). If a resident participated in the first year of the program, he or she may apply again for the grant; if a resident did not participate in the first year of the program, he or she may qualify for the grant now.

On March 25, 2008, letters, including program information, sub-area maps, FEMA flood insurance coverage summaries and application forms, were sent by mail to all current residents of the designated sub-area. The Huntington Flood Program Manager is Ms. Leslie Jones, she may be reached at 703-246-5279, TTY 711. Contact Ms. Jones for applications and documentation. *

Personal property damaged by the June 2006 flood. Photo courtesy of Gary Jean Photoworks.

To request this information in an alternate format, call DPWES at 703-324-5500, TTY 711

Stormwater and Low Impact Development Initiatives

The county recognizes the need to reduce stormwater impacts from impervious areas to help restore and protect streams. The Fairfax County Cameron Run Watershed Plan (August 2007) identifies a total of 624 projects in the watershed, which include retrofitting nearly 100 stormwater management ponds, building new stormwater ponds and constructing more than 400 low impact development (LID) projects.

LID projects are designed to control stormwater runoff volume and improve water quality on a site-by-site scale closer to the source. LID projects may include the following techniques: bioretention areas (rain gardens); pipe outfall retrofits (off-line bioretention); infiltration trenches; grassed swales; tree box filters; rain barrels/cisterns; or permeable pavers.

Not all sites are suitable for LID. Such considerations as soil permeability, depth of water table and slope must be reviewed. LID is easier to implement for new development than retrofitting existing developments. In the case of Cameron Run, the watershed was developed before stormwater regulations were instituted, so the watershed does not have adequate stormwater controls. It would be challenging to implement LID projects to significantly reduce flow volumes and flooding in the lower reaches of the watershed, such as in Huntington. In addition, LID is not designed to work in areas with high ground water tables nor does it have any impact on stream flooding due to tidal fluctuations. *

Recent and Future Tasks

The county and Corps are focused on work related to taking the levee alternative to a more detailed level of design. The following are some of the tasks recently completed or scheduled for completion during the months ahead:

Drill rig used for soil borings.

- Right of entry permissions were obtained from landowners for soil borings along the proposed levee alignment;
- Soil borings were taken and the material is being tested. Test results will be incorporated into the levee design;
- Detailed designs of the levee and associated drainage structures are being developed; and
- Coordination is ongoing with agencies regarding potential environmental impacts as a result of levee construction and dredging operations. *

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, U.S. ARMY CORPS OF ENGINEERS
P. O. BOX 1715
BALTIMORE, MARYLAND 21203-1715

January 10, 2008

Planning Division

Mr. Randy Bartlett
Director, Fairfax County Stormwater Planning Division
Department of Public Works and Environmental Services
12000 Government Center Parkway, Suite 449
Fairfax, Virginia 22035-0052

Dear Mr. Bartlett:

I am writing in response to the Huntington Community Association, Inc. Resolution 2007-2 (Huntington Flood Damage Reduction Project) that was provided to the Fairfax County Board of Supervisors during a Board meeting on November 19, 2007. Your office provided the resolution to the U.S. Army Corps of Engineers (Corps) through a letter, dated November 27, 2007 (enclosed) and requested that the Corps review the resolution and advise the county of our evaluation. In the resolution, the community residents requested that the Corps and Fairfax County ensure that the cost-benefit analysis being conducted as part of the ongoing study include certain factors, such as loss of life, protection of a long-standing community, and the present and potential future value of the community.

As you are aware, the economic analysis that the Corps has conducted is only a small part of the Huntington study. Most of the study is technical work to assist the county in determining an optimal plan for reducing flood damages and keeping the residents of Huntington safe. It is our understanding that the county's decision to build a project will not solely rely on the Corps' economic analysis. The economic analysis was conducted to determine if a project would meet the Corps' economic justification requirements and if the Corps could potentially participate in cost-sharing the construction of a project.

The Corps understands the importance of preventing loss of life, illness and injury, and the value of preserving a long-standing community, however, the Corps has strict regulations as far as what items can be considered in the benefit-cost analysis. As part of the federal government, the Corps must evaluate the costs and economic benefits of a project to the nation. The economic analysis can only address certain items such as expected future damages to structures and contents, vehicles, and infrastructure; the reduction in the need for emergency services; and the reduction in clean-up and relocation costs. Future development can only be included in the analysis if there is a plan in place, and typically such development does not substantially increase the project benefits because new development must be built higher than the 100-year flood elevation to meet local and federal requirements.

For Corps' project-related studies, social and environmental factors may be considered, but are not part of the benefit-cost analysis. The Corps follows specific regulations regarding how the projects are evaluated economically, and generally, only those projects in which the economic benefits outweigh the costs of the project can be considered for Corps' funding. Projects that do not meet the requirements may be implemented by the local governments in whatever manner they choose.

We continue to enjoy working with you and your staff on this project. Please contact Ms. Stacey Underwood, Study Leader, if you have any questions regarding our evaluation of the resolution.

Sincerely,

Robert F. Gore
Chief, Planning and Environmental
Services Branch

Enclosure

County of Fairfax, Virginia

To protect and enrich the quality of life for the people, neighborhoods and diverse communities of Fairfax County

November 27, 2007

Ms. Stacey M. Underwood, P.E.
U. S. Army Corps of Engineers
Baltimore District Planning Division
10 South Howard Street
Baltimore, MD 21201

Reference: Huntington Flood Damage Reduction Project
Resolution 2007-2

Dear Ms. Underwood:

At a regular scheduled Fairfax County Board of Supervisors (BOS) meeting on November 19, 2007, the Board unanimously directed staff to forward the Huntington Community Association, Inc. resolution to the U. S. Army Corps of Engineers for its evaluation. Please advise the Director, Stormwater Management of the result of your evaluation at the address noted below.

Sincerely,

Camyln Lewis, Engineer
Watershed Planning Evaluation Branch

Attachment: As Stated

cc: Gerald E. Connolly, Chairman, Fairfax County Board of Supervisors
Gerald W. Hyland, Supervisor, Mount Vernon District
Anthony H. Griffin, County Executive
Robert A. Stalzer, Deputy County Executive
Jimmie D. Jenkins, Director, Department of Public Works and Environmental Services

Department of Public Works and Environmental Services
Stormwater Planning Division
12000 Government Center Parkway, Suite 449
Fairfax, VA 22035-0052
Phone: 703-324-5500, TTY: 711, FAX: 703-802-5955
www.fairfaxcounty.gov/dpwes

Huntington Community Association, Inc.

Resolution 2007-2 (Huntington Flood Damage Reduction Project)

WHEREAS, the U.S. Army Corps of Engineers is performing a cost-benefit analysis of flood prevention measures for the Huntington community (the Huntington Flood Damage Reduction Project), and

WHEREAS, in lieu of a meeting to advise the community on the progress of the cost-benefit analysis, residents received a newsletter from Fairfax County that stated in part that the preliminary results of the analysis are not meeting the threshold for qualification under Federal programs for funding flood protection, and

WHEREAS, a decision not to implement permanent protection from future flooding will threaten the well-being of the Huntington community and degrade the quality of life and the value of real estate in the area, and

WHEREAS, a decision to implement permanent protection will support the well-being of the Huntington community and enhance the quality of life and the value of real estate in the area,

NOW THEREFORE BE IT RESOLVED, that the Huntington Community Association requests that the U.S. Army Corps of Engineers and Fairfax County ensure that the cost-benefit analysis being undertaken includes, but is not limited to, consideration of the following factors:

- the importance of preventing loss of life, illness and injury,
- the protection of a conserved community of long-standing, with the plan for the conserved community recommending permanent flood protection in order to preserve affordable housing,
- the value of potential development if the conserved community designation should be removed, as the term of this protection is indefinite,
- the value of the community for its impact, positive or negative, on the area surrounding the Huntington Metro station, which serves as a vital transportation link for the Route 1 corridor, and
- the value of the community for its impact, positive or negative, on the nature and value of related development in the area.

BE IT FINALLY RESOLVED, that the U.S. Army Corps of Engineers and Fairfax County consult with and include community residents in the process and analysis prior to any final determination.

Passed unanimously by the general membership on November 1, 2007