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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Baltimore District

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 µg/m^3, annual mean	36 µg/m^3
Sulfur dioxide (SO_2)	0.030 ppm, annual mean	unknown

**PPM = parts per million; µg/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

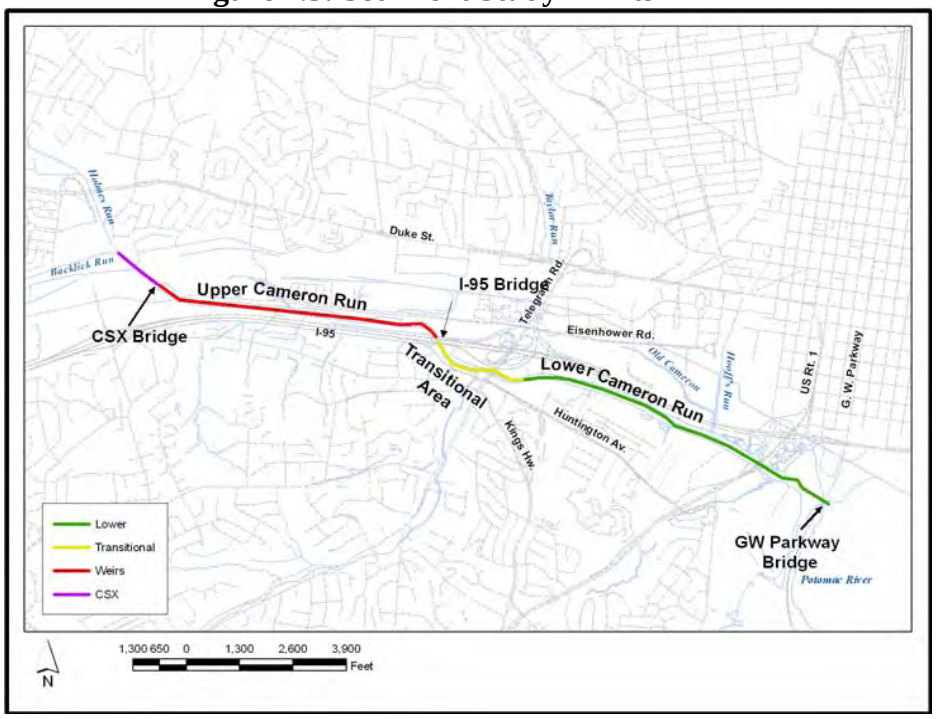
In support of the Cameron Run/Holmes Run Watershed Feasibility Study (currently being conducted by the Corps, Fairfax County and the City of Alexandria) and this Huntington Flood Damage Reduction Study, AB Consultants and Rummel, Klepper & Kahl (RK&K) completed a Cameron Run Sediment Study in April 2008. 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.

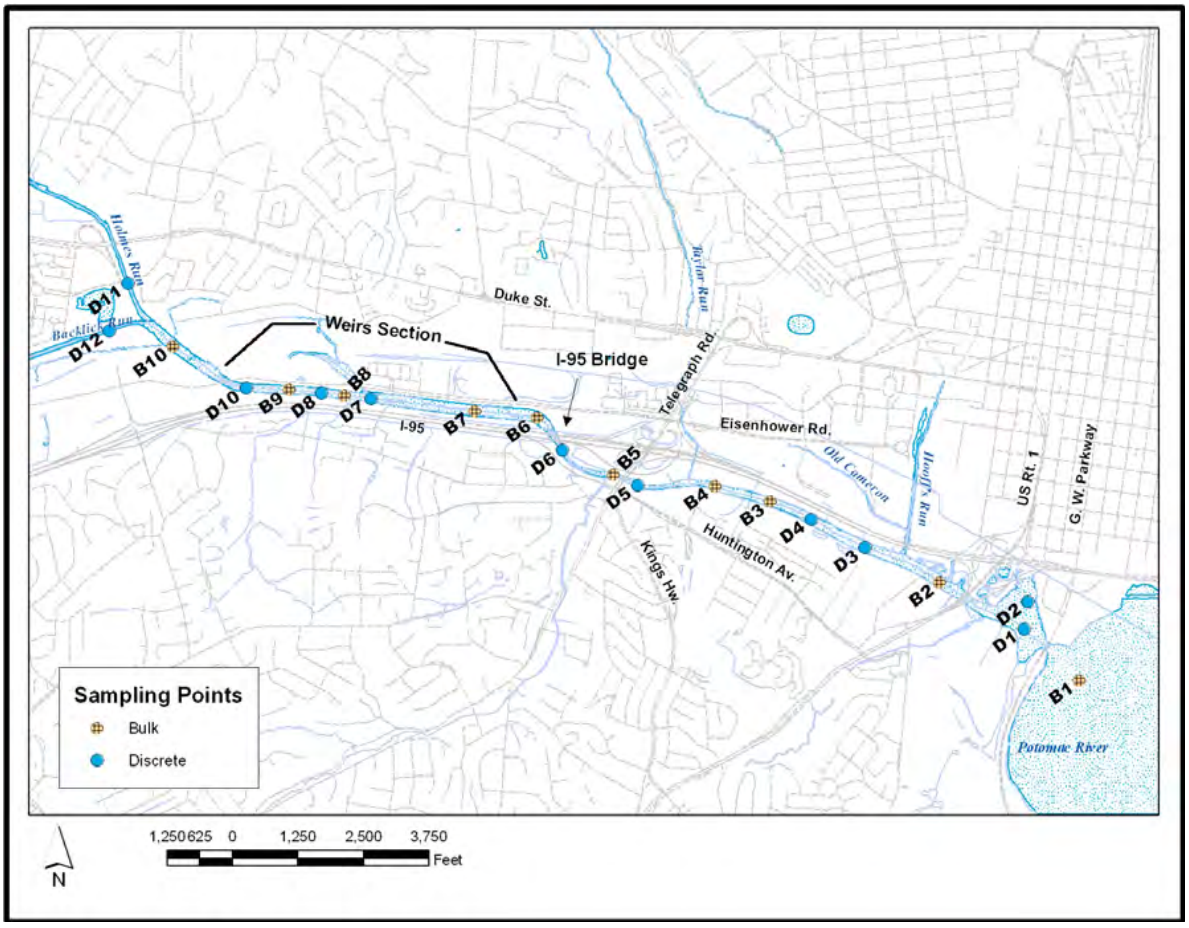
Sediment sampling showed that bed material in Cameron Run varies from fine sands and silts to cobbles and gravel. The lower area of Cameron Run (Telegraph Road downstream to GW Parkway) is dominated by medium to fine sands (Figure 4.3). Analysis of the sediment samples shows that the bed materials in 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

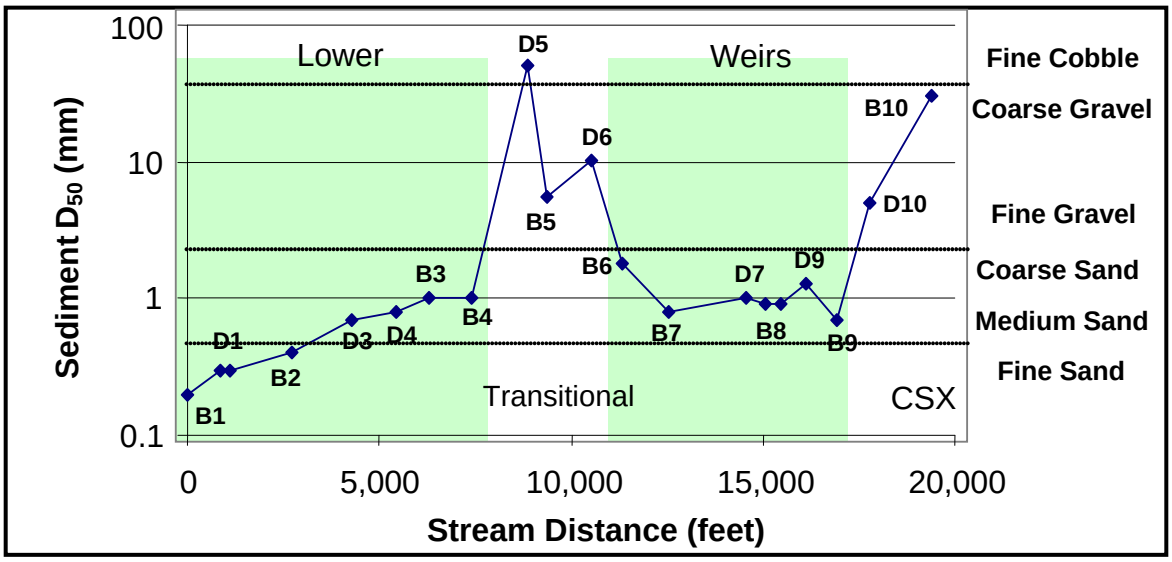


Results on particle sizes ranged from cobble to fine sand; however, the Cameron Run system within the study area can be described as a sand and gravel system. Generally, there was a fining of particle sizes in the downstream direction, which is expected in riverine systems. However, this trend was not 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 Accumulation (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**

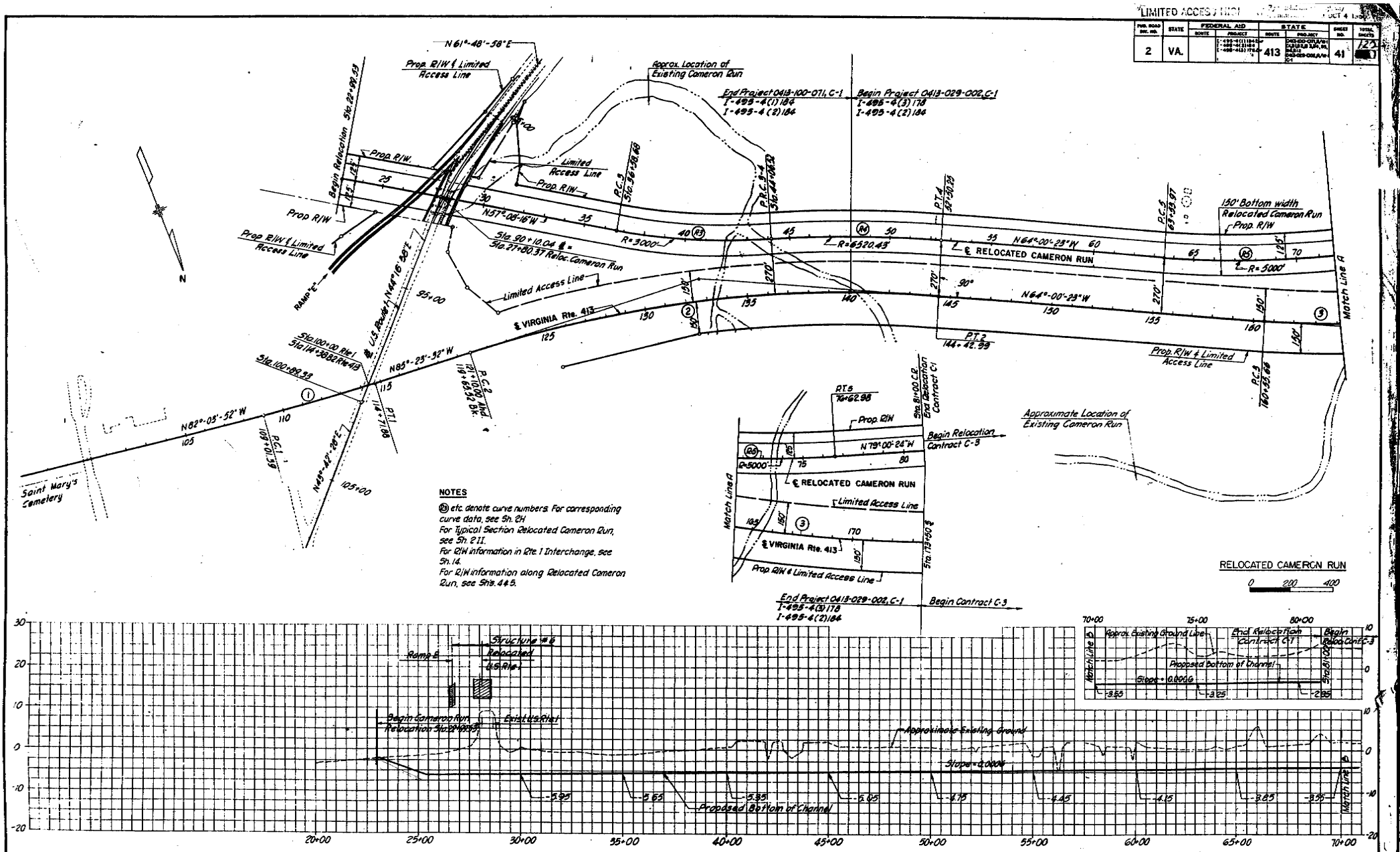


Figure 4.6 Capital Beltway Construction