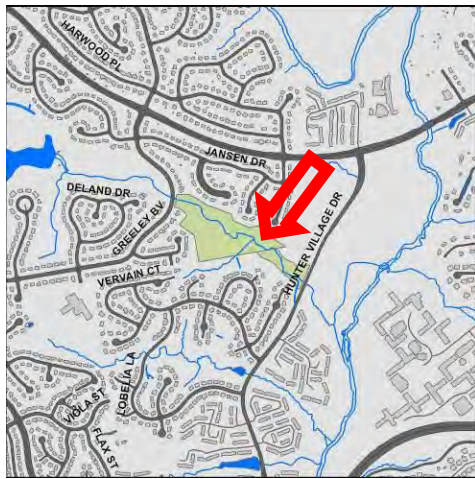


AC9200 – Stream Restoration



Vicinity Map

Address:	Between 7823 and 7829 Greeley Boulevard
Location:	Downstream from Greeley Boulevard / Hunter Village Park
Land Owner:	Private / County - FCPA
PIN:	0892 14 0006A, 0892 14 0030C
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Unknown Tributary of Accotink Creek

Description: This project proposes to restore an eroded section of stream channel located in both private and public areas. Severe erosion is occurring along this channel where the floodplain is constricted by the valley walls. Within this channel concrete slabs are found lying along the banks. In addition, what appears to be an abandoned sanitary sewer vault or junction is also present on the left bank facing downstream. Erosion is also evident from a storm drain outfall that drains Harwood Place and in a tributary channel that drains along Bluecurl Circle. Any restoration should also address these small areas.

Restoration of this channel will focus on regrading and stabilizing eroded stream banks through the use of armor-in-place techniques on outer meander bends and bioengineering techniques on the inside meander bends and any straight portions of the channel. Redirecting future flows away from the currently eroded banks in addition to the use of grade controls or stone-toe protection will prevent future bank instability.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: The goal of this project is to stabilize an eroded section of stream channel that has discharged a large amount of sediment in this channel and watershed. Channel armoring and redirection of flow will help to reduce sediment transport within this channel. Sediment load reductions may also be achieved by preventing bank scour, meander bend migration, and over-widening conditions. It is estimated that a total of 33,371 lbs of sediment, 27 lbs of total nitrogen and 10 lbs of total phosphorus would be reduced by this project.

Project Design Considerations: Access to this project will be difficult and will most likely need to occur from Hunter Village Drive. Access from this point is relatively far from the project site and steep slopes will need to be accounted for. This stream is buffered by forest, so access along the channel and grading of the existing channel and floodplain will require tree removal. The amount of forest impacts due to access and construction may counteract some of the restoration benefits. This project will also require environmental permitting due to modifications to a perennial stream channel. There are a number of Native American sites above the stream channel. Depending on the amount of disturbance to the terrain, this project may require Phase I archaeological survey, and subsequent archaeological work if sites are found.

Removal of several large concrete slabs from the channel will be necessary for this restoration. Several sanitary sewer utilities were found within the project limits including a large concrete vault area that may constrain design and construction.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	604	LF	\$200	\$120,800
Clear and Grub	2.08	AC	\$10,000	\$20,799
Plantings	2.08	AC	\$25,000	\$51,997
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$293,596
Ancillary Items	1	LS	5% of project	\$14,680
Erosion and Sediment Control	1	LS	10% of project	\$29,360
			Base Construction Cost	\$337,636
			Mobilization (5%)	\$16,882
			Subtotal 1	\$354,518
			Contingency (25%)	\$88,630
			Subtotal 2	\$443,148
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				\$199,417
			Estimated Project Cost	\$643,000



Site Photo: Severe bank erosion



Site Photo: Over-widened channel with moderate erosion

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AC9201 - Stream Restoration

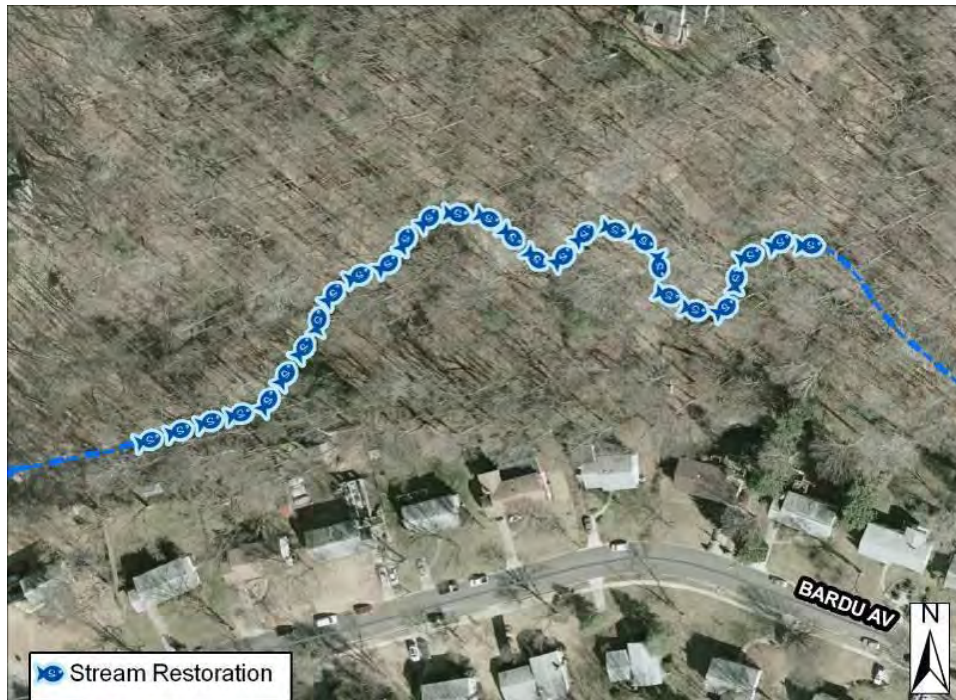


Address: 6100 Block Bardu Ave
Location: Accotink Stream Valley Park
Land Owner: County-FCPA
PIN: 0794 07 0013P
Control Type: Water Quality
Drainage Area: N/A
Receiving Waters: Unknown Tributary of Accotink Creek

Vicinity Map

Description: This project parallels Bardu Avenue, between the culvert under Greeley Boulevard and Lamont Court. The upstream portion of the channel is relatively stable except for minor to moderate erosion occurring in isolated areas, and the downstream portion is very sinuous with moderate to severe erosion and over-widening evident. A partially exposed sanitary sewer crossing is present in the downstream portion of the project site.

Restoration of this channel will focus on changing the current channel dimensions to reconnect the original floodplain; redirecting flows away from eroded meanders, and installing grade controls to dissipate stream energy. Armor-in-place or bioengineering stabilization techniques and stone toe protection may be needed on outer meander bends and at the sewer crossing, depending on peak flows and velocities.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: This project will help to stabilize the channel at the location of an existing sanitary sewer crossing and promote the use of the original floodplain, thus reducing sediment loads currently being transported downstream in this watershed. By reducing sedimentation within this channel and providing stable habitat along restored banks, overall instream water quality and habitat may be also be improved. It is estimated that a total of over 37,902 lbs of sediment, 30 lbs of total nitrogen and 12 lbs of total phosphorus would be reduced by this project.

Project Design Considerations: A partially exposed sanitary sewer pipe and another buried sewer pipe may constrain design and construction along this project. Since access to the floodplain will need to occur from Greeley Boulevard, steep slopes will need to be addressed. This stream is buffered by forest, so access along the channel and grading of the existing channel and floodplain will require significant tree removal. However, in this case, experience has shown that restoration benefits will outweigh overall construction impacts and impacted forest will be replanted. This project will require environmental permitting due to construction and modifications to a perennial stream channel.

Costs:				
ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	795	LF	\$200	\$159,000
Clear and Grub	1.83	AC	\$10,000	\$18,251
Plantings	1.83	AC	\$25,000	\$45,627
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$322,878
Ancillary Items	1	LS	5% of project	\$16,144
Erosion and Sediment Control	1	LS	10% of project	\$32,288
			Base Construction Cost	\$371,310
			Mobilization (5%)	\$18,566
			Subtotal 1	\$389,876
			Contingency (25%)	\$97,469
			Subtotal 2	\$487,345
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	\$219,305
			Estimated Project Cost	\$707,000



Site Photo: Moderate to severe erosion on outside meander bends



Site Photo: Sinuous and over-widened channel with moderate erosion on outside meanders

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AC9202 - Stream Restoration

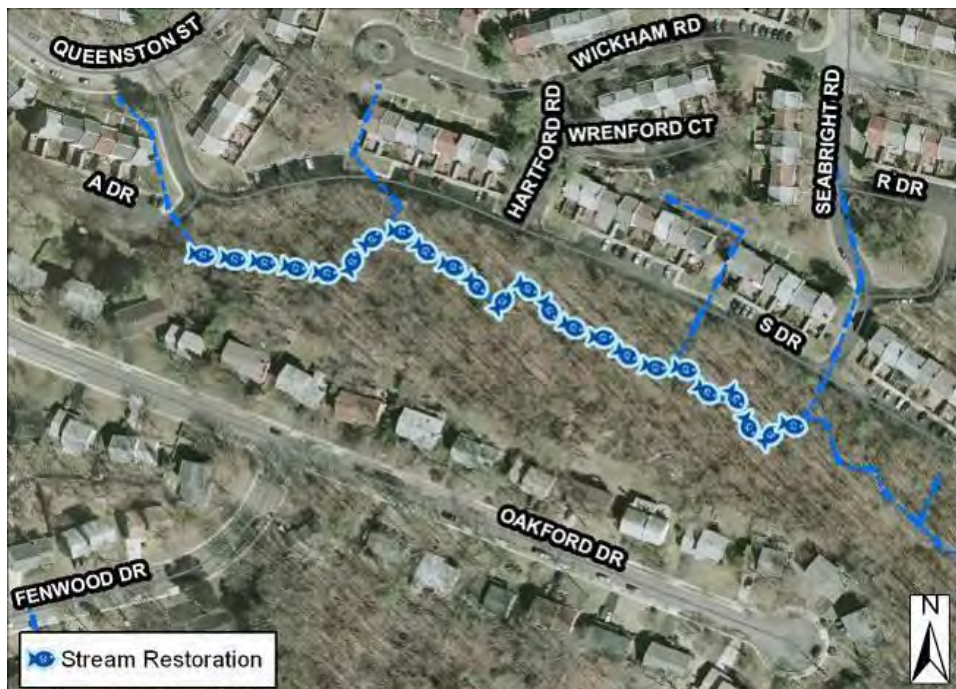


Address:	Between A Drive, S Drive and Oakford Drive
Location:	Charlestowne
Land Owner:	Private - Residential
PIN:	0793 14 0012, 0793 14 A3, 0793 14 A1
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Unknown Tributary of Accotink Creek

Vicinity Map

Description: This project is located between Oakford Drive and S Drive from the intersection of A and S Drives to the intersection of Seabright Road and S Drive. The upstream portion of this project is severely eroded and incised with very tall unstable banks. The downstream portion of the project is also incised, but experiencing only moderate erosion. Bank heights and overall incision gradually dissipate further downstream along the floodplain.

Restoration of the upstream portion of this project will focus on raising the channel bed elevation as well as regrading and stabilizing stream banks. Since the upstream portion of this project is located in an area with tall streambanks, reconnecting this portion of the channel to the floodplain is not feasible. Reconnection the downstream channel to the floodplain is feasible by reducing channel dimensions and raising the bed elevation. Lastly, all storm drain outfalls to this channel should be restored and stabilized with this project.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: This restoration will be designed to withstand large, flashy flows that are discharged from the outfall at the headwaters, along with the other stormwater inputs. Implementation of this project will help to dissipate energy and erosion by restoring the function of the floodplain. This project will also include grade controls to address bank instability and scour, bed incision, and over-widening, which all result in excessive sediment loads being discharged to downstream channels. Reduced sediment loads and new channel creation with a stable habitat along restored banks will also help to improve instream water quality and increase aquatic habitat. It is estimated that a total of over 75,104 lbs of sediment, 60 lbs of total nitrogen and 23 lbs of total phosphorus would be reduced by this project.

Project Design Considerations: This project is entirely contained within private HOA property and will require significant coordination with property owners for access and construction. It will require environmental permitting due to construction and modifications to a perennial stream channel. This stream is buffered by forest, so tree loss is expected to accommodate construction activities. However, in similar projects, experience has shown that restoration benefits will outweigh overall construction impacts. Access most likely will need to occur off of S Drive. Utility impacts are not anticipated with this restoration.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	983	LF	\$200	\$196,600
Clear and Grub	2.26	AC	\$10,000	\$22,567
Plantings	2.26	AC	\$25,000	\$56,416
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$375,583
Ancillary Items	1	LS	5% of project	\$18,779
Erosion and Sediment Control	1	LS	10% of project	\$37,558
			Base Construction Cost	\$431,920
			Mobilization (5%)	\$21,596
			Subtotal 1	\$453,516
			Contingency (25%)	\$113,379
			Subtotal 2	\$566,895
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	\$255,103
			Estimated Project Cost	\$822,000



Site Photo: Incised channel with severe meander bend erosion



Site Photo: Incised and over-widened channel with unstable banks

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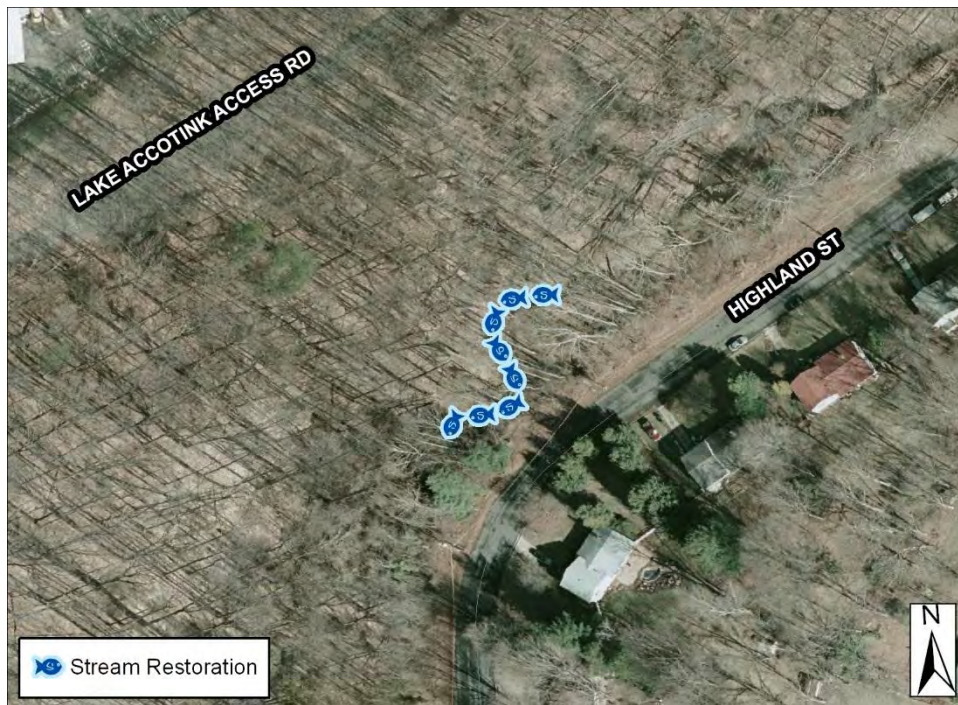
AC9203 - Stream Restoration



Address:	Across from 7600 block of Highland Street
Location:	Lake Accotink Park
Land Owner:	County - FCPA
PIN:	0803 01 0001A
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Unknown Tributary of Accotink Creek

Vicinity Map

Description: This project is entirely contained within County owned park property and is located between Highland Street and Lake Accotink Access Road. This project involves a short section of existing stream channel that parallels Highland Street. The existing stream channel is incised and over-widened with severe erosion occurring on both banks. Restoring this channel will focus on reducing the current channel dimensions, redirecting flows away from eroded meanders, and installing grade controls to dissipate stream energy and prevent further overwidening. Armor-in-place or bioengineering stabilization techniques or stone toe protection may be needed on outer meander bends to prevent erosion.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: This project will help to decrease sediment loads to downstream portions of the watershed by stabilizing the channel bed and banks, especially on outer meanders. By reducing sedimentation within the channel and providing stable habitat along restored banks, overall instream water quality and habitat may be improved. It is estimated that a total of 26,630 lbs of sediment, 23 lbs of total nitrogen and eight lbs of total phosphorus would be reduced annually by this project.

Project Design Considerations: Existing utility impacts are possible with this restoration due to a sanitary sewer easement within the vicinity of the existing stream channel. This utility may impact access as well as design or construction. Access to this project could occur from Highland Street, but would require significant tree removal and manipulation of steep slopes. Although tree loss is expected, restoration benefits will outweigh overall construction impacts. This project will require environmental permitting to allow for construction and modifications to a perennial stream channel and for forest impacts.

Costs:				
ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	194	LF	\$200	\$38,800
Clear and Grub	0.30	AC	\$10,000	\$3,000
Plantings	0.30	AC	\$25,000	\$7,500
Additional Cost, First 500 LF	194	LF	\$200	\$38,800
			Initial Project Cost	\$88,100
Ancillary Items	1	LS	5% of project	\$4,405
Erosion and Sediment Control	1	LS	10% of project	\$8,810
			Base Construction Cost	\$101,315
			Mobilization (5%)	\$5,066
			Subtotal 1	\$106,381
			Contingency (25%)	\$26,595
			Subtotal 2	\$132,976
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	\$59,839
			Estimated Project Cost	\$193,000



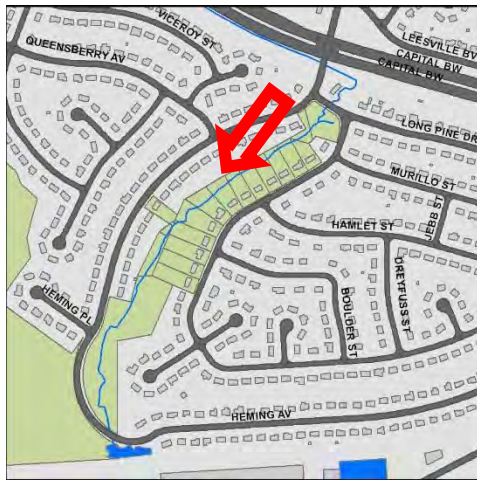
Figure 1: Eroded banks along Highland Street



Figure 2: Eroded banks with large depositional features in the channel

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AC9204 - Stream Restoration



Vicinity Map

Address:	Behind 6500 block of Heming Ave and behind 7600 block of Long Pine Drive
Location:	Lake Accotink Park
Land Owner:	Public - FCPA
PIN:	0792 01 0001A, 0792 0268 B1, 0792 02630011, 10, 9, 8, 7, 6, 5, 4, 3, 2, 0801 0268 A, 0801 0263 B
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Unknown Tributary of Accotink Creek

Description: This project is located between Long Pine Drive and Heming Place. The upper channel is confined in a narrow valley where the stream banks have been stabilized with concrete that is failing. The downstream portions of the stream section include storm drain outfalls that are also failing. The channel is currently incised and overwidened.

Restoration efforts should focus on removing the failed concrete bank stabilization measures in the upper reaches of the stream channel and replacing it with armor-in-place and bioengineering techniques. The channel should be stabilized by installing grade controls to dissipate energy and some stone toe protection to ensure future bank stability. Restoration efforts in the lower reaches should include redirecting flows away from eroding banks and reconnecting the channel to the floodplain. Storm outfalls will need scour protection to reduce the potential for further erosive forces and headcuts.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Restoring this channel will help to protect storm drain and utility infrastructure as well as private residential property. Creating a new channel geometry and reconnecting the channel to the floodplain will allow for reduced sediment loads to downstream channels. Reductions in sedimentation and the creation of stable habitat may provide improved instream water quality and habitat conditions. Removing of the concrete in the channel will alleviate erosion of the stream banks. It is estimated that a total load of 274,031 lbs of sediment, 354 lbs of total nitrogen and 137 lbs of total phosphorus would be reduced annually by this project.

Project Design Considerations: Since this restoration is located on mostly private residential properties, coordination with these property owners will be necessary for access and construction. Access for this project will need to occur off of Heming Avenue and Long Pine Drive. Steep slopes, tree removal, and confined areas of movement especially in the upstream portion of this restoration will be encountered with this access. This project will require environmental permitting to allow for construction and modifications to a perennial stream channel. Since this stream is buffered by forest on both banks, access and construction for this project will cause a significant amount of tree loss; however, restoration benefits will outweigh overall construction impacts.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	2161	LF	\$200	\$432,200
Clear and Grub	1.98	AC	\$10,000	\$19,800
Plantings	1.98	AC	\$25,000	\$49,500
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$601,500
Ancillary Items	1	LS	5% of project	\$30,075
Erosion and Sediment Control	1	LS	10% of project	\$60,150
			Base Construction Cost	\$691,725
			Mobilization (5%)	\$34,586
			Subtotal 1	\$726,311
			Contingency (25%)	\$181,578
			Subtotal 2	\$907,889
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	\$408,550
			Estimated Project Cost	\$1,317,000



Figure 1: Severe meander bend erosion



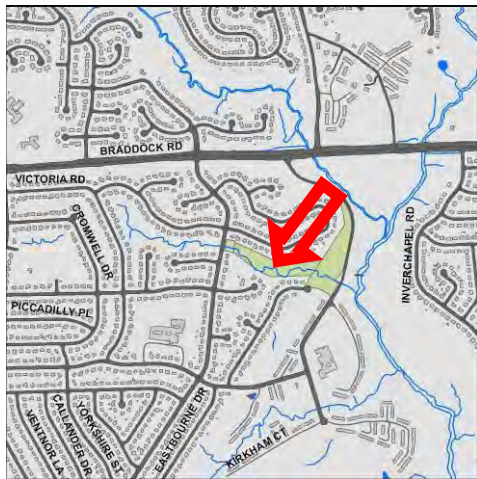
Figure 2: Existing concrete lined channel breaking up



Figure 3: Severe erosion and stormdrain outfall damage

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AC9205 - Stream Restoration

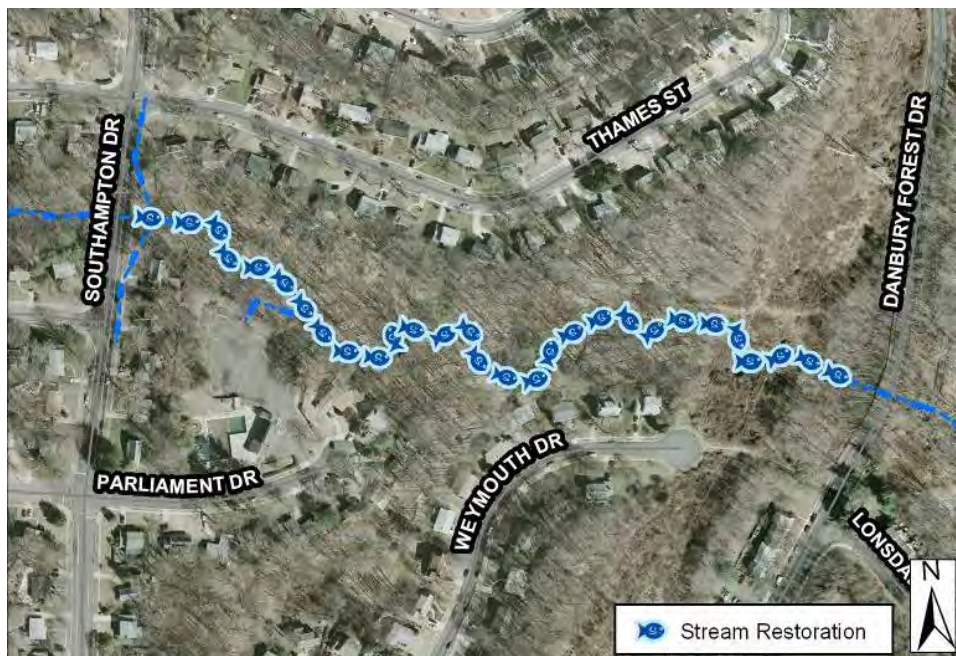


Address:	Behind 8400/8500 Blocks Thames St
Location:	Lake Accotink Park
Land Owner:	County - FCPA
PIN:	0703 04 B1, 0703 12 J, 0703 04 B
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Unknown Tributary of Accotink Creek

Vicinity Map

Description: This project is designed to restore an existing stream channel located within Lake Accotink Park from Southampton Drive to Danbury Forest Drive. This channel is experiencing moderate erosion on outside meander bends and has become over-widened. The conditions in the channel become worse moving downstream. In many cases, the ephemeral channels created by storm drain outfalls that drain to this project are also eroded and unstable.

Restoration will focus on reconnecting this channel to the floodplain by reducing channel dimensions and raising the bed elevation. Reconnection to the floodplain, along with installing grade controls, will help to prevent further incision and over-widening. In areas where the existing channel will be maintained, regrading and stabilization may need to occur with armor-in-place or bioengineering techniques. In particular, these techniques may be required where a sanitary sewer utility is within close proximity or where the channel is eroding the valley walls.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: This project will help to reduce sediment loads that could be transported downstream toward Lake Accotink. Sediment loads to those downstream channels will be reduced through the creation of new channel geometry as well as through the stabilization of existing banks. Reconnecting the channel to the floodplain will also reduce downstream sediment loads by depositing suspended sediment on the floodplain. It is estimated that a total of 266,730 lbs of sediment, 213 lbs of total nitrogen and 83 lbs of total phosphorus would be reduced by this project. This project will also protect a sanitary sewer utility line that runs parallel to this channel on the floodplain.

Project Design Considerations: Access for this project will most likely need to occur from Southampton Drive. An existing sanitary sewer utility clearing can be used from this access point to travel along the floodplain; however, the utility also has the potential to constrain design or construction. Overhead power transmission lines are present in the downstream portion of this project; however, no construction impacts are anticipated. Since this stream is buffered by forest on both banks, construction for this project will likely result in loss of trees. However, as in similar situations, experience has shown that restoration benefits will outweigh overall construction impacts. This project will require environmental permitting due to construction and modifications to a perennial stream channel. Steep slopes, especially where the channel meanders along the valley wall, will require special attention.. This project should also be designed with reference to AC9403 and AC9402, which occur at the upstream and downstream culverts along this stream channel.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	1831	LF	\$200	\$366,200
Clear and Grub	4.20	AC	\$10,000	\$42,034
Plantings	4.20	AC	\$25,000	\$105,085
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$613,319
Ancillary Items	1	LS	5% of project	\$30,666
Erosion and Sediment Control	1	LS	10% of project	\$61,332
			Base Construction Cost	\$705,317
			Mobilization (5%)	\$35,266
			Subtotal 1	\$740,583
			Contingency (25%)	\$185,146
			Subtotal 2	\$925,729
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				\$416,578
			Estimated Project Cost	\$1,343,000



Site Photo: Upstream end with moderate erosion and adjacent sanitary sewer



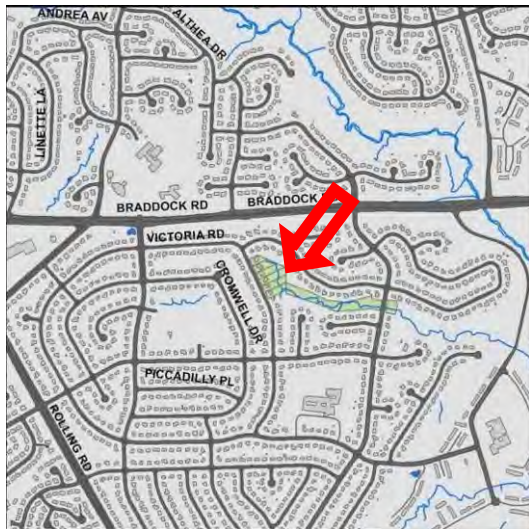
Site Photo: Over-widened channel with moderate meander bend erosion



Site Photo: Downstream end with moderate to severe meander erosion

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AC9206 - Stream Restoration



Vicinity Map

Address:	Behind 8500-8600 Block of Thames Street
Location:	Lake Accotink Park
Land Owner:	Private – Residential / County - FCPA
PIN:	0703 03 0065, 0703 03 0066, 0703 03 0067, 0703 03 0068, 0703 0069, 0703 04 B
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Unknown Tributary of Accotink Creek

Description: This project is located on private residential properties as well as park land and is located between Thames Street, Victoria Street, and Perth Court. The stream channel is experiencing moderate incision and bank erosion with over-widened conditions.

Restoration efforts should focus on reconnecting this channel to the floodplain, which, along with installing grade controls, will help prevent further downcutting and over-widening. As an option, channel relocation could be considered in this situation, to help redirect flows away from existing infrastructure. Several storm drain outfalls drain to this project and should be stabilized in conjunction with channel restoration using armor-in-place or bioengineering techniques. In addition, protection of an existing sanitary sewer crossing and an exposed sewer manhole standpipe should also be addressed with the channel restoration.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: This project will help to stabilize conditions at an existing sanitary sewer manhole and crossing. It will also promote the use of the floodplain, which can reduce sediment loads being transported to downstream portions of this watershed. By reducing sedimentation within this channel and providing stable habitat along restored banks, overall instream water quality and habitat may also be improved with this project. It is estimated that a total of over 181,645 lbs of sediment, 145 lbs of total nitrogen and 56 lbs of total phosphorus would be reduced by this project.

Project Design Considerations: Coordination with private residential property owners for access and construction will be necessary with this project, as the existing stream channel is partially located on many of these privately owned parcels. A partially exposed sanitary sewer pipe and manhole may constrain design and construction along this project, in that it may be more advantageous to redirect stream flow away from the manhole standpipe by relocating those stream segments. Access to the floodplain will require the use of the floodplain upstream adjacent to Southampton Drive, while access might be possible along storm drain easements at the end of Perth Court or Durham Court and along Thames Street and Victoria Road. However, all of these access points will be adjacent to private residential properties and will require construction access approval. This stream is buffered by forest, so access along the channel and grading of the existing channel and floodplain will likely require tree removal. However, in similar projects, experience has shown that restoration benefits will outweigh overall construction impacts. This project will require environmental permitting due to construction and modifications to a perennial stream channel.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	1068	LF	\$200	\$213,600
Clear and Grub	2.45	AC	\$10,000	\$24,518
Plantings	2.45	AC	\$25,000	\$61,295
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$399,413
Ancillary Items	1	LS	5% of project	\$19,971
Erosion and Sediment Control	1	LS	10% of project	\$39,941
			Base Construction Cost	\$459,325
			Mobilization (5%)	\$22,966
			Subtotal 1	\$482,291
			Contingency (25%)	\$120,573
			Subtotal 2	\$602,864
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				\$271,289
			Estimated Project Cost	\$875,000



Site Photo: Moderate erosion on meander banks



Site Photo: Over-widened with moderate erosion



Site Photo: Sanitary sewer manhole in eroded channel

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AC9207 - Stream Restoration

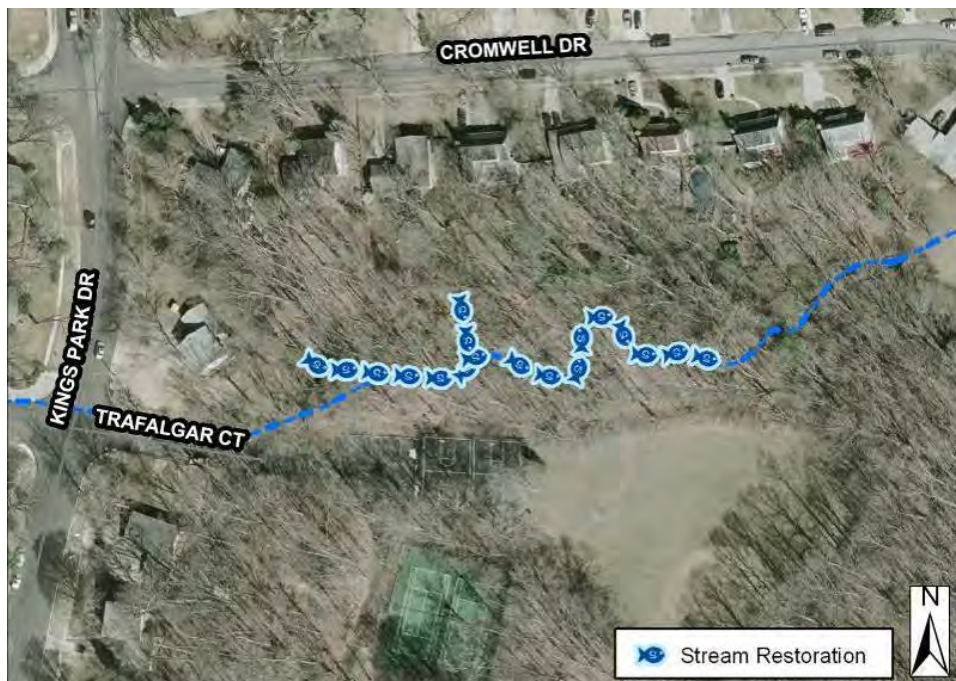


Address:	8717 Trafalgar Ct
Location:	Kings Park
Land Owner:	County - FCPA
PIN:	0703 01 0027
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Unknown Tributary of Accotink Creek

Vicinity Map

Description: This project is located entirely within Kings Park and extends from the end of Trafalgar Court to a culvert under Cromwell Drive. The current sinuous, incised, and over-widened stream channel is eroding on the outside of meander bends as well as along straight segments of the stream. A small tributary channel originating from an outfall off of Cromwell Drive is also eroding and should be restored in conjunction with this project.

Restoration of the channel will focus on creating a nested channel, in which the floodplain and banks of the current channel will be regraded to allow for creation of a new floodplain at an elevation lower than the original. Restoration will include reducing the existing channel dimensions and installing grade controls to dissipate streamflow energy, thus avoiding further incision and over-widening. Armor-in-place stabilization techniques or stone toe protection may also be needed near the 42" outfall or on outer meander bends.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: This restoration will be designed to withstand large, flashy flows that may originate from the 42" outfall. Implementation of the project will effectively provide for a reduction in sediment loads to downstream channels by reducing bank scour and meander bend migration, while also providing a floodplain to dissipate energy and encourage sediment deposition. By providing for a more stable flow regime, instream water quality and habitat may be improved with this project. It is estimated that a total of 246,009 lbs of sediment, 197 lbs of total nitrogen and 76 lbs of total phosphorus would be reduced by this project.

The project will also stabilize several storm drain outfalls and conveyances that drain to this channel. This project is within park property, so it may provide an environmental education or stewardship opportunity for residents of this community and park patrons.

Project Design Considerations: This project will require environmental permitting due to construction and modifications to a perennial stream channel. This stream is buffered by forest, so access along the channel and grading of the existing channel and floodplain will require tree removal. However, in similar projects, experience has shown that restoration benefits will outweigh overall construction impacts.

The project area contains two Native American quarry sites. Both are south of the proposed area of stream restoration and associated with the athletic facilities in the park. It is recommended that those sites be avoided by staging and access activities. Therefore, access for this project will need to occur from the parking lot within Kings Park at the end of Trafalgar Court. Impacts to existing utilities are not anticipated.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	501	LF	\$200	\$100,200
Clear and Grub	1.15	AC	\$10,000	\$11,501
Plantings	1.15	AC	\$25,000	\$28,753
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$240,454
Ancillary Items	1	LS	5% of project	\$12,023
Erosion and Sediment Control	1	LS	10% of project	\$24,045
			Base Construction Cost	\$276,522
			Mobilization (5%)	\$13,826
			Subtotal 1	\$290,348
			Contingency (25%)	\$72,587
			Subtotal 2	\$362,935
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				\$163,321
			Estimated Project Cost	\$527,000



Site Photo: Incised and over-widened with moderate to severe erosion



Site Photo: Over-widened with moderate to severe erosion on meander bends

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AC9208 - Stream Restoration



Address:	5021 King David Boulevard
Location:	Longbranch Falls Park
Land Owner:	County - FCPA
PIN:	0694 01 0017
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Unknown Tributary of Long Branch

Vicinity Map

Description: This project extends from a storm drain outfall at King David Boulevard to a culvert under Windflower Lane. The upstream portion of this channel is stable, as it lies over bedrock. There are, however, isolated areas of erosion evident along the outside meander bends and several segments of this channel have become over-widened. One outside meander, in particular, is encroaching upon a private residential property located along King David Boulevard. The homeowner in question is currently placing yard waste and debris on the outer bank of this meander in an effort to stop future bank erosion.

Restoration of this channel will focus on reducing the current channel dimensions, redirecting flows away from eroded meanders, and installing grade controls to dissipate stream energy and prevent further over-widening. Armor-in-place, bioengineering techniques or stone toe protection may be needed to stabilize outer meander bends.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: This project will help to reduce sediment loads that could be transported to downstream portions of the watershed by stabilizing the channel bed and banks, especially on outer meanders. By reducing sedimentation within the channel and thus providing for stable habitat along restored banks, overall instream water quality and habitat may also be improved. The project's stabilization goal will also help to protect private property located along King David Boulevard. It is estimated that a total of 84,320 lbs of sediment, 68 lbs of total nitrogen and 26 lbs of total phosphorus would be reduced by this project.

Project Design Considerations: The project will require environmental permitting to allow for construction and modifications within a perennial stream channel. This stream is buffered by forest, so access along the channel and grading of the existing channel and floodplain will require moderate tree removal, however, as in similar projects, experience has shown that restoration benefits often outweigh overall construction impacts, as tree removal needs are temporary. Access will need to occur off of King David Boulevard and may involve some steep slopes. Existing utility impacts are not anticipated. Coordination with the impacted homeowner for possible property access along King David Boulevard will likely be necessary.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	620	LF	\$200	\$124,000
Clear and Grub	1.42	AC	\$10,000	\$14,233
Plantings	1.42	AC	\$25,000	\$35,583
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$273,816
Ancillary Items	1	LS	5% of project	\$13,691
Erosion and Sediment Control	1	LS	10% of project	\$27,382
			Base Construction Cost	\$314,889
			Mobilization (5%)	\$15,744
			Subtotal 1	\$330,633
			Contingency (25%)	\$82,658
			Subtotal 2	\$413,291
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	\$185,981
			Estimated Project Cost	\$600,000



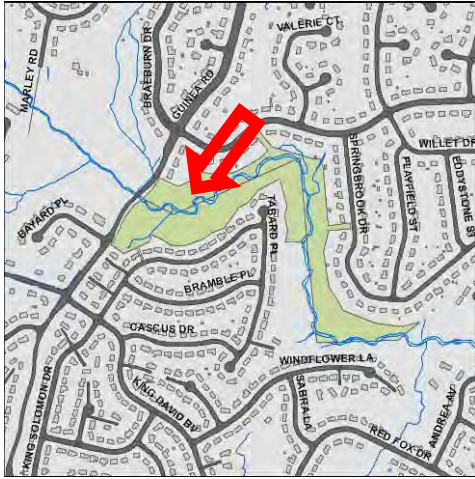
Site Photo: Over-widening channel with moderate to severe erosion



Site Photo: Erosion on meander bend adjacent to property owner

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AC9209 - Stream Restoration



Address:	Behind 4700 / 4800 Block Guinea Road
Location:	Long Branch Park
Land Owner:	County - FCPA
PIN:	0692 15 G, 0692 01 0016
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Long Branch

Description: This project is located within Long Branch Park, immediately downstream of Guinea Road. This currently sinuous, incised, and over-widened stream channel is eroding, primarily on outside meander bends. A small tributary channel originating from a storm drain outfall off of King Solomon Drive is also experiencing severe erosion and should be restored in conjunction with this project.

Restoration of these channels will include regrading and stabilizing eroded stream banks with armor-in-place techniques on outer meander bends and bioengineering techniques on inside meander bends and straight portions of the channel. Raising the bed elevation in these channels and installing grade controls will help to prevent further incision within the channel while reconnecting higher flows to the floodplain.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementation of this project will effectively reduce the sediment supply load to receiving stream channels by reducing bank scour and meander bend migration. Reconnecting these channels to the floodplain will also reduce the amount of sediment in downstream channels by depositing suspended sediment on the floodplain. By reducing sedimentation within the channels and providing stable habitat along restored banks, overall instream water quality and habitat may also be improved. Also, as a result of this project, fish passage will again be possible once the downstream channel bed is raised up to the elevation of the downstream culvert invert.

Stabilizing the migration of outer meander bends in this area will also protect an existing access road that parallels this channel from eroding. An existing access road on the floodplain of this project parallels the stream channel. Using this road during construction will help to reduce the amount of tree removal needed for construction access. It is estimated that a total of 548,046 lbs of sediment, 438 lbs of total nitrogen and 170 lbs of total phosphorus would be reduced by this project.

Project Design Considerations: This project will require environmental permitting due to the need for construction and modifications within perennial stream channels. The stream is buffered by forest, so some tree loss is expected to allow access to the channel and to clear the eroded areas during construction. This tree loss will be minimized to the extent possible, especially if the existing access road is able to be used for construction purposes. As in similar projects, experience has shown that restoration benefits often outweigh overall construction impacts. Other than the tree removal, construction access is good at this project off of Guinea Road to the existing access road. An existing sanitary sewer line parallels the stream channel and is within close proximity to the eroded banks. Design and construction may be constrained due to the location of this utility. This entire project is surrounded by County park land and residential properties are at a safe distance from the proposed work. It should be noted that the area has moderate potential to contain Native American artifacts.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	1791	LF	\$200	\$358,200
Clear and Grub	6.17	AC	\$10,000	\$61,674
Plantings	6.17	AC	\$25,000	\$154,184
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$674,058
Ancillary Items	1	LS	5% of project	\$33,703
Erosion and Sediment Control	1	LS	10% of project	\$67,406
			Base Construction Cost	\$775,167
			Mobilization (5%)	\$38,758
			Subtotal 1	\$813,925
			Contingency (25%)	\$203,481
			Subtotal 2	\$1,017,406
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				\$457,833
			Estimated Project Cost	\$1,476,000



Site Photo: Severe meander bend erosion



Site Photo: Erosion along tributary channel

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AC9210 - Stream Restoration



Address:	Behind 8000 Block Braddock Road
Location:	Wakefield Park
Land Owner:	County - FCPA
PIN:	0704 01 0002
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Unknown Tributary of Accotink Creek

Vicinity Map

Description: This project involves restoring three stream channels located within Wakefield Park draining commercial areas located along Braddock Road and the Capital Beltway. These channels are currently incised and over-widened with moderate to severe erosion occurring on meander bends and along straight sections.

Restoration of these channels will focus on reducing the channel dimensions and raising the bed elevations to reconnect each channel to the floodplain. The bed elevation of the downstream channel is several feet lower than the invert of the culvert that flows under I-495. Reconnection with the floodplain, along with the installation of grade controls, will help to prevent further incision and over-widening. In areas where the existing channel is to be maintained, regrading and stabilization may need to occur with armor-in-place or bioengineering techniques.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Restoration of these channels by stabilizing the banks and establishing a new channel geometry will help to reduce sediment loads. Reconnecting the channels to the floodplain will also reduce downstream sediment transport by depositing suspended sediment along the floodplain. It is estimated that 393,312 lbs of sediment, 315 lbs of nitrogen and 122 lbs of phosphorus would be reduced by this project annually.

An existing sanitary sewer utility and clearing may be utilized for access near this channel that may reduce the amount of tree removal needed for construction. This project could also provide an educational opportunity for residents using Wakefield Park.

Project Design Considerations: These stream are both buffered by forest, so access and construction will cause a significant amount of tree loss. However, as with similar projects, restoration benefits often outweigh overall construction impacts over the long term. This project will also require environmental permitting due to the need for construction in, and modifications to, a perennial stream channel. An existing sanitary sewer line parallels the stream channel originating from I-495. This sanitary sewer is not within close proximity to the existing banks. The culvert under I-495 should be analyzed during the channel design to determine if modifications to the channel or floodplain will cause any adverse impacts to this infrastructure. Park operations, including mountain bike trails in the vicinity of the stream, will need to be identified and included in the design. There are three archeological sites in the vicinity that should be avoided during construction access or staging.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	1741	LF	\$200	\$348,200
Clear and Grub	6.00	AC	\$10,000	\$59,952
Plantings	6.00	AC	\$25,000	\$149,879
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$658,031
Ancillary Items	1	LS	5% of project	\$32,902
Erosion and Sediment Control	1	LS	10% of project	\$65,803
			Base Construction Cost	\$756,736
			Mobilization (5%)	\$37,837
			Subtotal 1	\$794,573
			Contingency (25%)	\$198,643
			Subtotal 2	\$993,216
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				\$446,947
			Estimated Project Cost	\$1,441,000



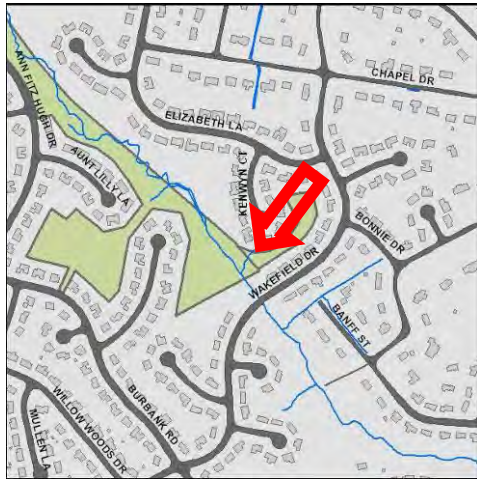
Site Photo: Over-widened channel downstream of I-495



Site Photo: Moderate to severe erosion on meander bends

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AC9211 - Stream Restoration



Vicinity Map

Address:	129530 Kenwen Ct
Location:	Truro, between Kenwen Court and Wakefield Drive
Land Owner:	Private - Residential
PIN:	0701 12 0107, 0701 12 H, 0701 12 M
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Unknown Tributary of Turkey Run

Description: This project is located between Kenwen Court and Wakefield Drive. The project involves the restoration of a short section of existing stream channel that starts at a large storm drain outfall and extends southwest to the mainstem of Turkey Run. Currently, this channel is incised with moderate erosion on both banks.

Restoration of the channel will include regrading and stabilizing eroded stream banks with natural channel design to direct flows, armoring-in-place including natural rock and bioengineering materials. Stone-toe protection may be needed near the storm drain outfall and underneath the foot bridge to prevent future erosion. Raising the bed elevation of this channel and installing grade controls will help to prevent further incision within the channel and will effectively reconnect higher flows to the floodplain.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementation of this project will reduce bank erosion and bank scour thus reducing sediment transport to downstream channels. Raising the bed elevation will also allow flows to enter the floodplain, which will also dissipate energy and reduce suspended sediment loads available for transport downstream. Overall, instream water quality and habitat may also be improved due to the restoration of stable habitat and reduced sediment loads. It is estimated that 17,340 lbs of sediment, 14 lbs of nitrogen and five lbs of phosphorus would be reduced by this project annually.

This project will stabilize a trail footbridge and protect the storm drain outfall and a nearby sanitary sewer utility from future scour and erosion. The asphalt walking trail near this project may be used for access during construction to limit forest impacts and to provide an educational opportunity for residents.

Project Design Considerations: Access to the project site is good and should occur from Wakefield Drive. An existing trail on the floodplain may be used as access to the channel. Environmental permitting is necessary due to need for construction and modifications within the existing channel. Moderate tree loss is anticipated. Mature trees will be preserved as much as possible. Experience has shown that restoration benefits often outweigh overall construction impacts.

This project is entirely contained within private property and will require significant coordination with property owners for access during construction. Design possibilities and construction may be constrained due to the location of an existing sanitary sewer utility located along the channel. This project is located downstream of proposed projects AC9212 and AC9213. To ensure proper design and construction sequencing, the combined projects should be constructed from upstream to downstream with this project occurring last.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	170	LF	\$200	\$34,000
Clear and Grub	0.39	AC	\$10,000	\$3,903
Plantings	0.39	AC	\$25,000	\$9,757
Additional Cost, First 500 LF	170	LF	\$200	\$34,000
			Initial Project Cost	\$81,660
Ancillary Items	1	LS	5% of project	\$4,083
Erosion and Sediment Control	1	LS	10% of project	\$8,166
			Base Construction Cost	\$93,909
			Mobilization (5%)	\$4,695
			Subtotal 1	\$98,604
			Contingency (25%)	\$24,651
			Subtotal 2	\$123,255
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				\$55,465
			Estimated Project Cost	\$179,000



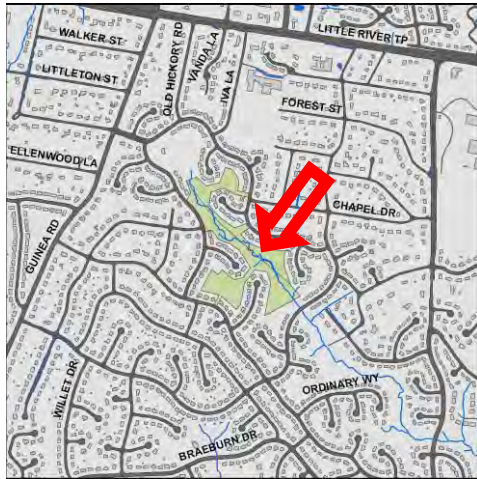
Site Photo: Moderate erosion under footbridge



Site Photo: Moderate bank erosion

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AC9212 - Stream Restoration



Vicinity Map

Address:	4200-4300 blocks of Elizabeth Lane
Location:	Truro, between Elizabeth Lane and Aunt Lilly Lane
Land Owner:	Private - Residential
PIN:	0701 12 G, M
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Unknown Tributary of Turkey Run

Description: This project involves a stream channel located between Elizabeth Lane, Aunt Lilly Lane, Kenwen Court, and Ossian Hall Lane. This sinuous channel is currently incised, and over-widened. It has eroded primarily on outside meander bends and along some straight sections. The severity of erosion and incision increases downstream.

In conjunction with restoration of the channel, storm drain outfalls and their drainage channels should also be stabilized. Restoration efforts should focus on reconnecting this channel to the floodplain by reducing channel dimensions and raising bed elevations, along with grade controls to help prevent further downcutting and over-widening. Channel relocation may also be beneficial where the existing channel meanders close to private property boundaries along Elizabeth Lane. Natural channel design to redirect stream flows and the use of natural rocks or boulders, should be used to the extent possible.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Reductions in channel downcutting, bank scour, over-widening, and meander bend migration will from restoration result in reducing sediment loads and protecting private property. Reconnecting the channel to the original floodplain will also help to dissipate the energy associated with high flows that may cause erosion and will effectively reduce downstream sediment loads as suspended sediment will deposit on the reconnected floodplain. This project will also stabilize storm drain outfalls and conveyances and protect walking trails and infrastructure. It is estimated that a total of 88,913 lbs of sediment, 71 lbs of total nitrogen and 28 lbs of total phosphorus would be reduced by this project.

Project Design Considerations: This project is entirely contained within private residential property and will require significant coordination with property owners for access and construction. It will also require environmental permitting, as construction and modifications to a perennial stream channel are required. As this stream is buffered by forest, significant tree loss can be expected to allow access to the channel during construction, but mature trees will be preserved to the maximum extent possible. Restoration benefits will likely outweigh overall construction impacts in the long term.

Access is limited and may have to occur along Elizabeth Lane where there is a break in residential properties. An existing trail on the floodplain may be utilized for some access to the project site. Design and construction may be constrained due to the location of the existing channel near two properties along Elizabeth Lane. Existing utility impacts are not anticipated. This project is located between proposed projects AC9211 and AC9213. Therefore, to ensure proper design and construction sequencing, the projects should be constructed in conjunction with one another, and should occur from upstream to downstream, starting with AC9213.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	872	LF	\$200	\$174,400
Clear and Grub	2.00	AC	\$10,000	\$20,018
Plantings	2.00	AC	\$25,000	\$50,046
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$344,464
Ancillary Items	1	LS	5% of project	\$17,223
Erosion and Sediment Control	1	LS	10% of project	\$34,446
			Base Construction Cost	\$396,133
			Mobilization (5%)	\$19,807
			Subtotal 1	\$415,940
			Contingency (25%)	\$103,985
			Subtotal 2	\$519,925
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				\$233,966
			Estimated Project Cost	\$754,000



Site Photo: Incised channel with severe meander bank erosion



Site Photo: Incised and over-widened channel with moderate bank erosion

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AC9213 - Stream Restoration



Vicinity Map

Address: 4200-4300 blocks of Ann Fitzhugh Drive
Location: Truro, between Ann Fitzhugh Drive, Mary Lee Lane and Elizabeth Lane
Land Owner: Private - Residential
PIN: 0584 21 B, 0701 12 G, 0701 12 M
Control Type: Water Quality
Drainage Area: N/A
Receiving Waters: Unknown Tributary of Turkey Run

Description: This project is located between Ann Fitzhugh Drive, Aunt Lilly Lane, Turkey Creek Court, and Mary Lee Lane. Currently, there is an exposed sanitary sewer concrete casing acting as grade control for an active headcut in the stream channel near the end of Mary Lee Lane. On either side of the sewer utility the stream channel is beginning to over-widen. Although the sewer line is acting to maintain the upstream bed elevation, storm flow will eventually result in scouring out the sewer crossing.

Restoring this channel will include raising the stream bed using natural materials to reconnect the channel to the floodplain and installing grade controls of natural stone and boulders to help prevent future downcutting and over-widening. Natural channel techniques using rock to redirect stream flows would be used to the maximum extent possible. All storm drain outfalls that drain to the project site would also be stabilized during the channel restoration.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Restoring this channel will prevent erosion in the channel and stabilize and protect the exposed sanitary sewer casing, storm drain outfalls, walking trails along the channel, and floodplain from advancing erosion. The project will reconnect the channel back to the original floodplain allowing sediment to be deposited along the floodplain. It will also effectively reduce overall stream energy and reduce sediment discharge to downstream channels by correcting channel downcutting, bank scour, over-widening and meander bend migration. It is estimated that a total of 237,966 lbs of sediment, 190 lbs of total nitrogen and 74 lbs of total phosphorus would be reduced by this project.

Project Design Considerations: Environmental permitting will be necessary with this restoration due to the need for construction and modifications within a perennial stream channel. In addition there will be impacts to forest resources, however, as with similar projects, restoration benefits often outweigh overall construction impacts over the long term and mature trees will be protected to the extent possible.

This project is entirely contained within private residential property and will require significant coordination with property owners for access and construction. Access will most likely occur off of Ann Fitzhugh Drive where the channel and floodplain are adjacent to this road. An existing trail on the floodplain may also be used for construction access. The exposed sanitary sewer casing within the project limits may constrain design of the proposed channel. This project is located upstream of proposed projects AC9211 and AC9212. To ensure proper design and construction sequencing, the projects should be constructed from upstream to downstream, starting with this project.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	1291	LF	\$200	\$258,200
Clear and Grub	2.96	AC	\$10,000	\$29,637
Plantings	2.96	AC	\$25,000	\$74,093
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$461,930
Ancillary Items	1	LS	5% of project	\$23,097
Erosion and Sediment Control	1	LS	10% of project	\$46,193
			Base Construction Cost	\$531,220
			Mobilization (5%)	\$26,561
			Subtotal 1	\$557,781
			Contingency (25%)	\$139,445
			Subtotal 2	\$697,226
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				\$313,752
			Estimated Project Cost	\$1,011,000



Site Photo: Exposed sanitary sewer casing and headcut



Site Photo: Incising and over-widening channel with moderate bank erosion

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AC9214 - Stream Restoration



Vicinity Map

Address:	4200 block of Woodlark Drive
Location:	Wakefield Park
Land Owner:	County - FCPA
PIN:	0702 02 P
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Unknown Tributary of Accotink Creek

Description: The existing stream channel to be restored starts at the stream culvert under Woodlark Drive and extends downstream past two private residential properties. A sanitary sewer utility also parallels the channel. Currently, the Woodlark Drive stream culvert inverts are much higher than the bed elevation of the downstream channel. Moderate to severe erosion is also evident along the channel. Homeowner attempts to stabilize the channel with landscaping and vegetation have not been effective.

Restoring the channel will focus on regrading and stabilizing eroded stream banks with armor-in-place or bioengineering techniques and raising the current bed elevation of the channel up to the elevation of the stream culvert under Woodlark Drive. Stone-toe protection may also be needed to prevent future bank instability, and installing grade controls will help to dissipate stream energy and prevent over-widening.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: This restoration will help to protect the existing sanitary sewer and private residential properties adjacent to the channel. Stabilizing the area below the culvert under Woodlark Drive and modifying the channel bed and banks will reduce sediment loads currently discharging to downstream channels. Reducing sediment will provide more stable aquatic habitat along the restored channel and improve overall instream water quality. It is estimated that a total of 124,458 lbs of sediment, 100 lbs of total nitrogen and 39 lbs of total phosphorus would be reduced by this project.

Project Design Considerations: Access for this project will need to occur off of Woodlark Drive. Fairfax County property includes the existing stream channel and sanitary sewer utility; however, this property is fairly narrow and coordination with adjacent residential property owners will be necessary for access during construction. One property owner is landscaping areas that may need to be used for access or construction thus requiring additional effort and cost to replace landscaping impacted during construction.

The existing sanitary sewer also poses a design constraint. This project will require environmental permitting as it will involve construction and modifications within a perennial stream channel. Minor to moderate tree removal will be necessary for access and construction. Despite some impacts to the forest, experience has shown that restoration benefits will outweigh overall construction impacts over the long run.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	655	LF	\$200	\$131,000
Clear and Grub	1.50	AC	\$10,000	\$15,037
Plantings	1.50	AC	\$25,000	\$37,592
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$283,629
Ancillary Items	1	LS	5% of project	\$14,181
Erosion and Sediment Control	1	LS	10% of project	\$28,363
			Base Construction Cost	\$326,173
			Mobilization (5%)	\$16,309
			Subtotal 1	\$342,482
			Contingency (25%)	\$85,621
			Subtotal 2	\$428,103
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	\$192,646
			Estimated Project Cost	\$621,000



Site Photo: Severe erosion next to sanitary sewer and property owner



Site Photo: Downstream side of culvert under Woodlark Drive

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AC9215 - Stream Restoration



Vicinity Map

Address:	8220 Little River Turnpike
Location:	Mill Creek Park
Land Owner:	Private / State - VDOT
PIN:	0594 02010003
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Unknown Tributary of Accotink Creek

Description: This project is located just upstream of the VDOT culvert under Little River Turnpike, adjacent to Calvary Church of the Nazarene. The project involves a short section of an existing stream channel with a ditch that runs along Little River Turnpike and drains runoff from the Church and Turnpike. The stream channel is incised and over-widened with moderate to severe erosion occurring on the outside of meanders. The ditch along the Turnpike is also eroded and is currently incising.

Restoration of this channel will include regrading and stabilizing eroded stream banks with armor-in-place and bioengineering techniques. Altering the current stream alignment is recommended to redirect flows away from eroded outside meanders. Stone-toe protection may also be needed on outside meanders to prevent future erosion. Grade controls and armor-in-place techniques could be used to stabilize the ditch. Most of the project is within forested conditions.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Stabilization of this channel and ditch will help to reduce erosion and downstream sediment transport. Restoration will protect the VDOT culvert under Little River Turnpike by redirecting flows away from the side of the concrete headwall structure. Instream water quality and habitat may be improved due to new channel creation and reduced sedimentation.

Project Design Considerations: Drainage associated with this project appears to flow across several properties including those owned by the Calvary Church of the Nazarene, a residential property along Little River Turnpike, and VDOT. The project will require significant coordination with property owners for access and construction. Construction access will need to occur off of Little River Turnpike. Steep slopes may be encountered as well as overhead power lines running along the road embankment. An existing sanitary sewer is also present on the upstream side of the Little River Turnpike which slopes down to the floodplain; however, the sewer line will not impact design or construction. The project will require environmental permitting as construction and modifications to a perennial stream channel are involved. Minor to moderate tree removal will be necessary for access and construction.

Costs:				
ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	302	LF	\$200	\$60,400
Clear and Grub	1.04	AC	\$10,000	\$10,399
Plantings	1.04	AC	\$25,000	\$25,999
Additional Cost, First 500 LF	302	LF	\$200	\$60,400
			Initial Project Cost	\$157,198
Ancillary Items	1	LS	5% of project	\$7,860
Erosion and Sediment Control	1	LS	10% of project	\$15,720
			Base Construction Cost	\$180,778
			Mobilization (5%)	\$9,039
			Subtotal 1	\$189,817
			Contingency (25%)	\$47,454
			Subtotal 2	\$237,271
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	\$106,772
			Estimated Project Cost	\$345,000



Site Photo: Severe erosion on meander bend upstream of Little River Turnpike



Site Photo: Eroded ditch paralleling Little River Turnpike

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AC9216 - Stream Restoration

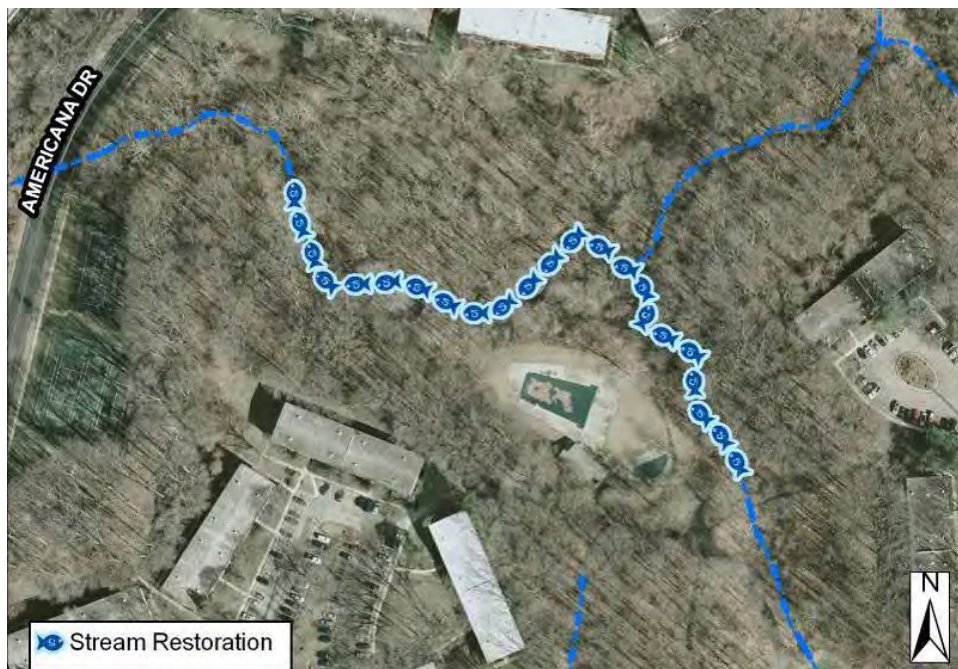


Vicinity Map

Address:	4300 block of Americana Drive
Location:	Lafayette Forest
Land Owner:	Private - Residential
PIN:	Unknown
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Unknown Tributary of Accotink Creek

Description: This project involves the restoration of two existing stream channels, both located in private apartment complex property between Americana Drive and Donnybrook Court. The main channel starts upstream at the confluence of a tributary channel originating from an existing dry pond (DP0627) and extending downstream to within several hundred feet of the culvert under Americana Drive. Both channels are currently incised and over-widened and eroding on meander bends and straight sections.

Restoration will focus on reducing channel dimensions and raising the bed elevations to reconnect each channel to its floodplain. Installation of grade controls will be necessary to prevent future incision and over-widening. Regrading and stabilization may be needed in areas where the existing banks will be maintained or where peak flows warrant protection, such as the areas around the outfall of DP0627 and where the existing main channel is directed toward the valley wall. Repairing or replacing failing storm drain outfalls should be incorporated into the project.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Restoring this channel by stabilizing existing banks and establishing improved channel geometry will help to reduce erosion and sediment transported to downstream portions of the watershed. Reconnecting the channels to their original floodplains will also reduce the amount of sediment deposited downstream. This project will also stabilize storm drain outfalls and conveyances as well as protect the sanitary sewer and an existing apartment complex swimming pool located next to the stream. It is estimated that a total of 463,845 lbs of sediment, 371 lbs of total nitrogen and 144 lbs of total phosphorus would be reduced by the restoration.

Project Design Considerations: This project will require environmental permitting as it involves construction and modifications within perennial stream channels. This stream is buffered by forest, so moderate tree loss is expected however, as in similar projects, restoration benefits will likely outweigh overall construction impacts in the long term.

Construction access to the floodplain is good and includes a paved access road that starts at an apartment building parking lot along Americana Drive and leads to the stream channel downstream of DP0627. This paved road is used to access the apartment complex swimming pool. This project will require significant coordination with property owners for access and construction. An existing sanitary sewer manhole is located on the floodplain; however, this utility is not expected to constrain design or construction. Special consideration must be given to the location and activities of the apartment swimming pool when coordinating access, signaling, and construction activity. Construction may need to occur during non-summer months to avoid these concerns. Projects AC9217 and AC9166, which occur upstream of this project, should be completed first to ensure proper design and construction sequencing.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	844	LF	\$200	\$168,800
Clear and Grub	2.91	AC	\$10,000	\$29,063
Plantings	2.91	AC	\$25,000	\$72,658
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$370,521
Ancillary Items	1	LS	5% of project	\$18,526
Erosion and Sediment Control	1	LS	10% of project	\$37,052
			Base Construction Cost	\$426,099
			Mobilization (5%)	\$21,305
			Subtotal 1	\$447,404
			Contingency (25%)	\$111,851
			Subtotal 2	\$559,255
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				\$251,665
			Estimated Project Cost	\$811,000



Site Photo: Severe bank erosion along meanders



Site Photo: Over-widened channel with moderate to severe bank erosion

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AC9217 - Stream Restoration



Vicinity Map

Address:	4200 block of Americana Drive
Location:	Between Americana Drive and Donnybrook Ct
Land Owner:	Private - Residential
PIN:	Unknown
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Unknown Tributary of Accotink Creek

Description: This project is intended to restore a stream channel located between Americana Drive and Donnybrook Court. The proposed restoration extends from the end of Donnybrook Court to the stream’s confluence with a tributary which would be restored under project AC9216. The project also includes a small section of channel draining a stormwater outfall from Americana Drive. The upstream portion of the project is incised and over-widened while the downstream portion is incised and eroded. Riparian buffers on the right bank facing downstream, are deficient and are currently maintained as mowed lawn.

Channel restoration will focus on reconnecting higher flows with the original floodplain to dissipate energy and encourage the deposition of sediment on the floodplain. Other restoration components include reducing the existing channel dimensions, raising the bed elevation of the channel, installing grade controls to prevent further incision and over-widening and restoring areas of deficient riparian buffers.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementation of this project will reduce the sediment supply to receiving stream channels by reducing bank scour and stream bed incision. Reconnecting this channel to the original floodplain will also reduce the amount of sediment flowing to downstream channels by allowing suspended sediment to be deposited along the floodplain. Enhancement of riparian buffers especially in the upstream portion of this project will also serve to improve the ecological function of this area by filtering overland flow and protecting the stream banks from erosion. It is estimated that a total of 227,985 lbs of sediment, 182 lbs of total nitrogen and 71 lbs of total phosphorus would be reduced by the restoration.

Project Design Considerations: This project is entirely contained within private property and will require significant coordination with property owners for access and construction. Access will most likely occur off of Americana Drive between two apartment building parking lots. Steep slopes would be encountered with this access point. This project will require environmental permitting as it requires construction and modifications within a perennial stream channel and floodplain. The channel is at least partially buffered by forest, so tree loss is expected, however, as with similar projects, restoration benefits often outweigh overall construction impacts. No existing utility impacts are expected during design or construction. This project should be completed before project AC9216, which occurs downstream, to ensure proper design and construction sequencing.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	975	LF	\$200	\$195,000
Clear and Grub	3.36	AC	\$10,000	\$33,574
Plantings	3.36	AC	\$25,000	\$83,936
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$412,510
Ancillary Items	1	LS	5% of project	\$20,626
Erosion and Sediment Control	1	LS	10% of project	\$41,251
			Base Construction Cost	\$474,387
			Mobilization (5%)	\$23,719
			Subtotal 1	\$498,106
			Contingency (25%)	\$124,527
			Subtotal 2	\$622,633
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	\$280,185
			Estimated Project Cost	\$903,000



Site Photo: Upstream end is over-widened with moderate bank erosion



Site Photo: Incised channel with severe bank erosion in downstream portion of project

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AC9218 - Stream Restoration



Vicinity Map

Address:	3700 block of Hummer Road and Pleasant Ridge Road
Location:	Pleasant Ridge
Land Owner:	Private - Residential
PIN:	0603 02 0024D, 0603 02 0025, 0603 02 0030, 29, 28
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Unknown Tributary of Coon Branch

Description: This project is located between Hummer Road and Pleasant Ridge Road and extends from a culvert under Hummer Road downstream to a culvert under Walton Lane. The existing stream channel parallels several homes along Pleasant Ridge Road and in some cases is located within close proximity to buildings and homes. This channel is actively incising and widening especially on outer meander bends.

Restoring this channel will involve regrading and stabilizing eroded stream banks with armor-in-place and bioengineering techniques, installing grade controls to dissipate energy and prevent further bed incision, and restoring the riparian buffer in areas where vegetation is not present. Reconnecting this channel back to the original floodplain is not advised due to the location of driveway culverts and personal property, including homes and landscaping that may be impacted during storm events.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementing this project will decrease sediment supply to receiving stream channels by reducing bank scour and stream bed incision. Overall, stream habitat and water quality will be improved due to stable habitat creation and reductions in available sediment supply. Restoring the existing riparian buffer will also provide additional channel stability and ecological benefits. It is estimated that a total of 70,687 lbs of sediment, 57 lbs of total nitrogen and 22 lbs of total phosphorus would be reduced annually by this project.

Project Design Considerations: This project is entirely contained within private residential properties and will require significant coordination with property owners for access and construction. In some cases, property owners have landscaped and placed structures within close proximity to the existing channel. Access to this project could occur from the upstream limit at Hummer Road and the downstream limit at Walton Lane. Both of these access points will require some tree removal and will disturb residential lawns. This project will require environmental permitting to allow for construction and modifications to a perennial stream channel. Existing utility impacts are not anticipated with this restoration.

Costs:				
ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	850	LF	\$200	\$170,000
Clear and Grub	0.78	AC	\$10,000	\$7,800
Plantings	0.78	AC	\$25,000	\$19,500
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$297,300
Ancillary Items	1	LS	5% of project	\$14,865
Erosion and Sediment Control	1	LS	10% of project	\$29,730
			Base Construction Cost	\$341,895
			Mobilization (5%)	\$17,095
			Subtotal 1	\$358,990
			Contingency (25%)	\$89,748
			Subtotal 2	\$448,738
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	\$201,932
			Estimated Project Cost	\$651,000



Figure 1: Eroded banks near the intersection of Pleasant Ridge Road and Walton Lane



Figure 2: Channel is actively incising with eroded banks

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AC9219 - Stream Restoration



Vicinity Map

Address:	3401 Woodburn Road
Location:	Pine Ridge Park
Land Owner:	County - FCPA
PIN:	0591 01 0020, 0591 01 0018
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Unknown Tributary of Accotink Creek

Description: This project would restore two existing stream channels and a ditch located within Pine Ridge Park as well as a third stream channel within Accotink Stream Valley Park. The two channels located within Pine Ridge Park drain most of the runoff from the park, a large portion of the hospital property along Gallows Road, and a residential community along Collins Street. All three channels are currently incised and over-widened with moderate to severe erosion occurring on meander bends and along straight sections. There is severe erosion exposing a sanitary sewer line and creating a scour pool.

Restoration will focus on reducing channel dimensions and raising bed elevations to reconnect each channel to its floodplain, which will help to prevent further incision and over-widening. The two areas with severe erosion should be stabilized with using armor-in-place or bioengineering techniques.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementing this project will reduce the sediment supply to receiving stream channels by reducing bank scour and stream bed incision. Reconnecting these channels to the original floodplain will also help to dissipate energy within the channel, resulting in suspended sediment being deposited on the floodplain. Restoring and stabilizing these channels will also protect infrastructure, including an exposed sanitary sewer line, several storm drain outfalls, culvert structures, and a park trail near the intersection of Guinevere Drive and Launcelot Way. This project could provide an educational opportunity for residents using park trails.

Project Design Considerations: This project will require environmental permitting as construction and modification within a perennial stream channels is required. All of these channels are buffered by forest, so access and construction for this project will cause a significant amount of tree loss. In similar projects, however, experience has shown that restoration benefits will outweigh construction impacts.

Access to the channels upstream of Chivalry Road can be gained from multiple locations including an access area off of Chivalry Road and Launcelot Way, off of Bannerwood Drive and Collins Street, or off the parking lot of Pine Ridge High School Site Park. Access to the downstream channel can be gained from an access area off of Guinevere Road or at the end of Robey Avenue. An existing sanitary sewer line is currently exposed, but no impacts are expected during design or construction. Changes in the upstream floodplain from Chivalry Road will be analyzed during channel design to determine if modifications will cause any adverse impacts.

The project site is adjacent to and crosses through Native American site 44FX1367, The Sons and Daughters of Liberty, Cemetery #2. In addition, the stream bed contains large boulders of high quality stone, and may have been quarried to make stone tools by Native Americans. An archaeological survey is recommended with subsequent archaeological testing for eligibility for inclusion into the National Register of Historic Places. If sites are found eligible, they would require avoidance or data recovery.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	2060	LF	\$200	\$412,000
Clear and Grub	7.09	AC	\$10,000	\$70,937
Plantings	7.09	AC	\$25,000	\$177,342
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$760,279
Ancillary Items	1	LS	5% of project	\$38,014
Erosion and Sediment Control	1	LS	10% of project	\$76,028
			Base Construction Cost	\$874,321
			Mobilization (5%)	\$43,716
			Subtotal 1	\$918,037
			Contingency (25%)	\$229,509
			Subtotal 2	\$1,147,546
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				\$516,396
			Estimated Project Cost	\$1,664,000



Site Photo: Incising and over-widening channel in Pine Ridge High School Site Park



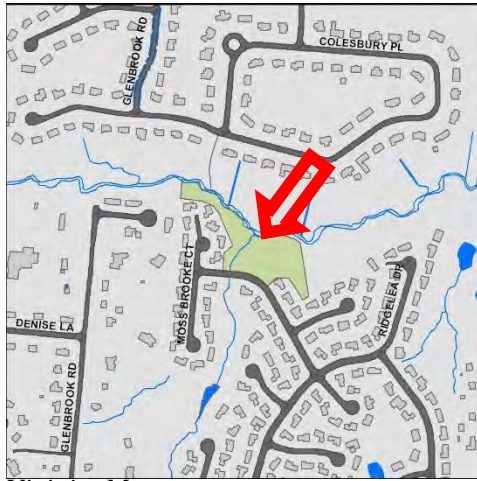
Site Photo: Severe bank erosion in channel near Collins Street



Site Photo: Eroded downstream channel starts at culvert near Guinevere Drive and Launcelot Way

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AC9220 - Stream Restoration



Vicinity Map

Address:	3700 Block Moss Brooke Court
Location:	Ridgelea Hills
Land Owner:	Private
PIN:	0584 28 C
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Unknown Tributary of Crook Branch

Description: This project is located between Glade Hill Road and Colesbury Place and extends from the a culvert under Glade Hill Road to the confluence with Crook Branch. The existing stream channel is very incised and over-widened with severe erosion occurring along the downstream portion. The downstream confluence with Crook Branch also corresponds with Project AC9221, which is proposed to restore a portion of the mainstem of Crook Branch. These two projects should be coordinated with Project AC9221 designed and constructed before this project.

Restoring this channel will include regrading and stabilizing eroded stream banks with armor-in-place and bioengineering techniques, raising the bed elevation to meet the confluence elevation with Project AC9221, and installing grade controls or step pools to dissipate energy and prevent further bed incision.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementing this project will decrease sediment supply to receiving stream channels by reducing bank scour and channel bed incision. Additionally, by reducing sedimentation and providing stable habitat along restored banks, overall instream water quality and habitat may be improved. It is estimated that a total of 33,592 lbs of sediment, 27 lbs of total nitrogen and ten lbs of total phosphorus would be reduced annually by this project.

Project Design Considerations: This project is entirely contained on private property along Glade Hill Road and will require significant coordination with the property owners for access and construction. Access to this project would need to occur off of Glade Hill Drive and will require some tree removal. This project will require environmental permitting due to construction and modifications to a perennial stream channel. Existing utility impacts are not anticipated with this restoration. This project should be designed and constructed during the implementation of Project AC9221 to ensure proper channel elevations and alignment.

Costs:				
ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	247	LF	\$200	\$49,400
Clear and Grub	0.22	AC	\$10,000	\$2,200
Plantings	0.22	AC	\$25,000	\$5,500
Additional Cost, First 500 LF	247	LF	\$200	\$49,400
			Initial Project Cost	\$106,500
Ancillary Items	1	LS	5% of project	\$5,325
Erosion and Sediment Control	1	LS	10% of project	\$10,650
			Base Construction Cost	\$122,475
			Mobilization (5%)	\$6,124
			Subtotal 1	\$128,599
			Contingency (25%)	\$32,150
			Subtotal 2	\$160,749
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	\$72,337
			Estimated Project Cost	\$234,000



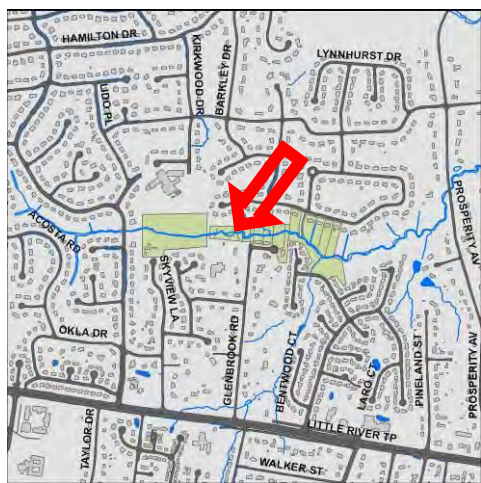
Figure 1: Eroded banks downstream of Glade Hill Drive.



Figure 2: Eroded and incised confluence with Crook Branch

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AC9221 - Stream Restoration

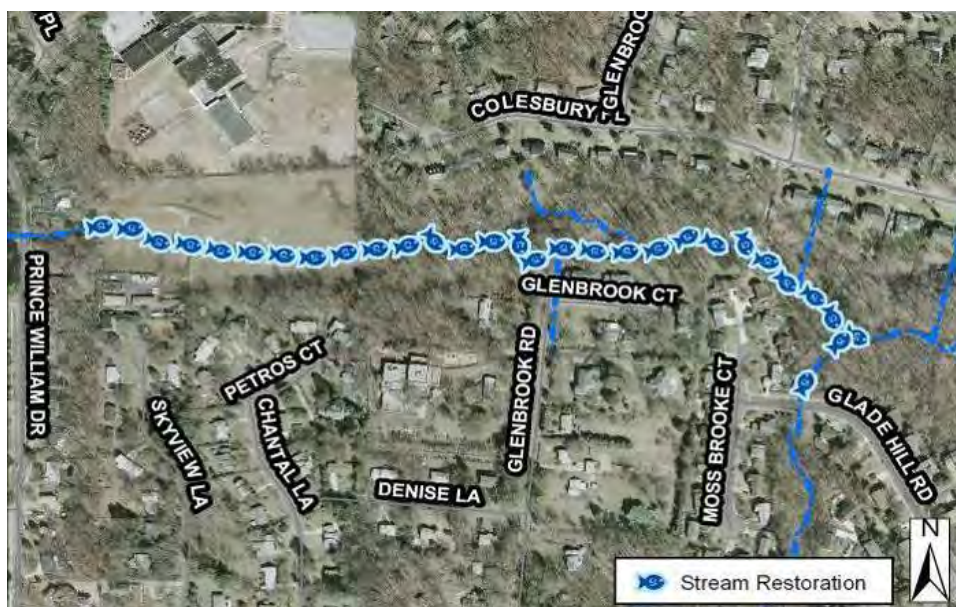


Address:	Beginning at 3801 Sky View Lane through 8913 Glade Hill Road
Location:	Mantua, Ridgelea Hills
Land Owner:	Private
PIN:	0584 01 0054; 0584 14 0015-0024; 0584 16 0020-0024; 0584 14 E1, F, G, H, J
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Crook Branch

Vicinity Map

Description: This project involves the restoration of a portion of Crook Branch, flowing west to east along Colesbury Place and extending just downstream of Prince William Drive to a confluence with a channel that originates upstream of Glade Hill Road. A small portion of this confluence channel is also included in this restoration project. Most of the project site is over-widened, unstable, and incised with eroded banks. The upstream portion of the channel has been partially reinforced with concrete debris and there is no riparian buffer. Additionally, several small sections have been armored previously with rip-rap, specifically near a recently installed footbridge at the end of Moss Brooke Court.

Restoring this channel will focus on creating a nested channel, where the floodplain and banks of the current channel will be regraded to allow for a new floodplain at an elevation lower than the current one. Other restoration components include installing grade controls and restoring areas of deficient riparian buffers. The asphalt walking trail behind the houses along Moss Brooke Court is currently being undermined by stream bank erosion and may need to be stabilized. Channels from storm drain outfalls should also be incorporated into this project to provide stability.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Stabilizing existing banks and creating a new channel geometry will result in reduced sediment loads. By reconnecting this channel to its floodplain, erosive flows will dissipate and downstream sediment loads can be reduced as suspended sediment will be deposited on the floodplain. This project will also stabilize storm drain outfalls and conveyances as well as protect walking trails and other infrastructure. Enhancing riparian buffers, especially in the upstream portion of this project, will improve the overall ecological function of this area. It is estimated that a total of 377,726 lbs of sediment, 302 lbs of total nitrogen and 117 lbs of total phosphorus would be reduced by the restoration.

Project Design Considerations: The project lies entirely on private property and will require significant coordination with property owners for access and construction. Structures along Glenbrook Court and Moss Brooke Court are within close proximity to the existing stream channel. Sanitary sewer manholes, pipes, and stream crossings, as well as a walking trail and pedestrian bridge, may constrain design and construction. Access may need to occur from several locations to reach all portions of the channel. Several possible points of access include: the end of Glenbrooke Road or Glenbrooke Court, off of Glade Hill Road, off of Colesbury Place in a road easement between properties, and off of the Mantua Elementary School property. This project will require environmental permitting as construction and modifications within a perennial stream channel and floodplain are needed. Significant tree loss is expected, however, in similar projects, experience has shown that restoration benefits will outweigh overall construction impacts.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	2578	LF	\$200	\$515,600
Clear and Grub	5.92	AC	\$10,000	\$59,183
Plantings	5.92	AC	\$25,000	\$147,957
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$822,740
Ancillary Items	1	LS	5% of project	\$41,137
Erosion and Sediment Control	1	LS	10% of project	\$82,274
			Base Construction Cost	\$946,151
			Mobilization (5%)	\$47,308
			Subtotal 1	\$993,459
			Contingency (25%)	\$248,365
			Subtotal 2	\$1,241,824
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				\$558,821
			Estimated Project Cost	\$1,801,000



Site Photo: Downstream end with severe erosion and impacts to walking trail/storm drain inflow



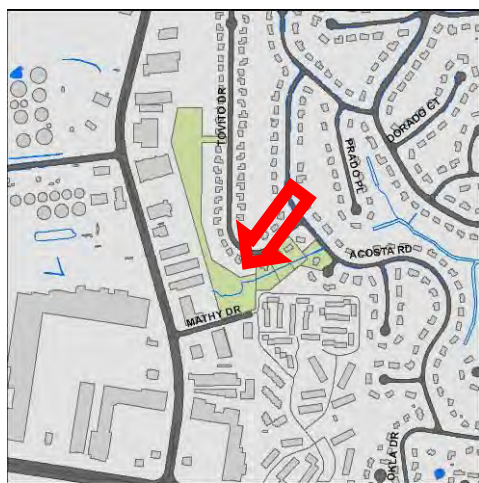
Site Photo: Over-widened channel with severe bank erosion



Site Photo: Upstream end with moderate erosion and no riparian buffer

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AC9222 - Stream Restoration

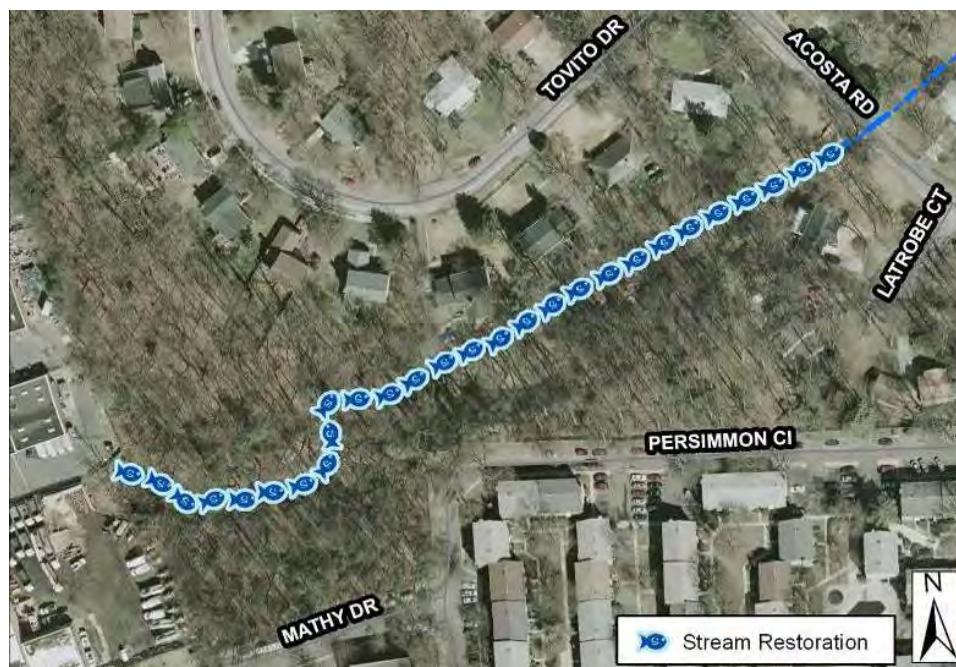


Vicinity Map

Address:	Behind 9300 Block Tovito Drive
Location:	Mantua Hills, Stockbridge
Land Owner:	Private - Residential
PIN:	0584 26 A, 0584 18 0004
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Unknown Tributary of Crook Branch

Description: This project extends from a storm drain outfall behind a commercial area off of Pickett Road to the culvert under Acosta Road. The upstream portion of the project is severely eroded with high, unstable banks. The downstream portion is channelized and contains areas of rip-rap and failing v-shaped concrete channel.

Restoring the upstream portion of this channel will include regrading and stabilizing eroded stream banks with armor-in-place techniques on the outer meander bends and using bioengineering techniques along straight portions to create a stable channel. Restoration will include grade controls to dissipate energy and will require some installation of stone-toe protection to ensure future bank stability. One storm drain outfall that drains to this channel from Persimmon Circle should also be stabilized. Restoring the downstream portion of the channel will include removing the existing rip-rap and concrete channel and replacing it with a natural channel designed to withstand urban peak flows and provide habitat.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: This project will effectively reduce erosion and downstream sediment transport by reducing bank instability, scour, and meander bend migration. Removing concrete and rip rap in the downstream portion and creating stable habitat along restored banks in the upstream portion will also allow for improvements in water quality and instream habitat. Property owners along the downstream portion of this project might welcome the aesthetic changes of the current channel to a natural, restored channel. It is estimated that a total of 146,737 lbs of sediment, 117 lbs of total nitrogen and 46 lbs of total phosphorus would be reduced by the restoration.

Project Design Considerations: This project is entirely contained within private residential properties along Tovito Drive and will require significant coordination with property owners for access and construction. In some cases, property owners along Tovito Drive have landscaped and placed structures close to the existing channel that may constrain new channel design. Access to this project may need to occur from several locations: off of Acosta Road, Persimmon Circle, and from behind the commercial area off of Pickett Road. All of these access points will require tree removal. Access from Acosta Road will also require the use of residential yards. Significant tree loss is expected, however, in similar projects, experience has shown that restoration benefits will outweigh overall construction impacts. This project will require environmental permitting as construction and modifications within a perennial stream channel are needed. Existing utility impacts are not anticipated.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	993	LF	\$200	\$198,600
Clear and Grub	2.28	AC	\$10,000	\$22,796
Plantings	2.28	AC	\$25,000	\$56,990
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$378,386
Ancillary Items	1	LS	5% of project	\$18,919
Erosion and Sediment Control	1	LS	10% of project	\$37,839
			Base Construction Cost	\$435,144
			Mobilization (5%)	\$21,757
			Subtotal 1	\$456,901
			Contingency (25%)	\$114,225
			Subtotal 2	\$571,126
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	\$257,007
			Estimated Project Cost	\$829,000



Site Photo: Severe bank erosion in upstream portion



Site Photo: Concrete/rip rap in downstream portion

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AC9223 - Stream Restoration

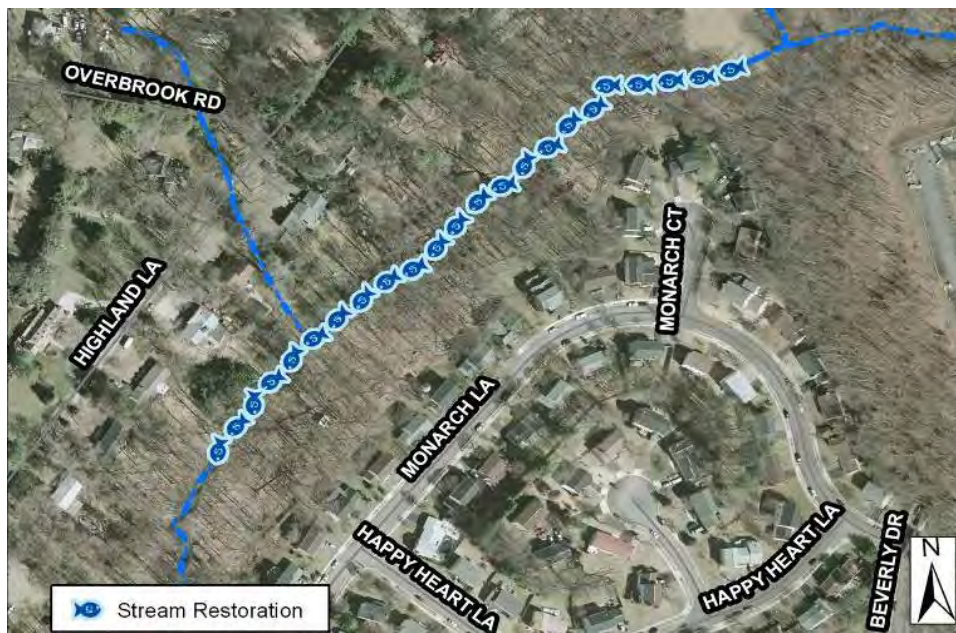


Vicinity Map

Address:	Behind the 3100/3200 blocks of Highland Lane
Location:	Pine Ridge
Land Owner:	Private-Residential
PIN:	0493 08 0039, 0493 08 0040, 0493 08 0041, 0493 08 0042, 0493 08 0043, 0493 08 0044, 0493 08 0039A, 0591 27 F
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Unknown Tributary of Accotink Creek

Description: This project is located between Monarch and Highland Lanes, extending from the outlet of Detention Pond DP0384 to the rear of 3225 Highland Lane. The channel is predominately straight, incised, over-widened, and is lacking a riparian buffer in several areas along the right bank. The dry detention facility has a large, low-flow orifice that may be contributing to the eroded conditions in the receiving channel. Restoring this channel will include regrading and stabilizing eroded stream banks with armor-in-place techniques on outer meander bends and bioengineering techniques on straight portions.

Grade controls will be used to dissipate energy and installing stone toe protection will ensure future bank stability. One storm drain outfall and two ditches that flow to this channel should also be stabilized. Buffer restoration in various locations along the right bank will be necessary to further improve restored areas. Since this restoration is entirely contained within private residential property, raising the bed elevation to reconnect to the floodplain or regrading the floodplain to create a new bench is not desirable.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementing this project will help to protect adjacent private properties and structures. Stabilizing the channel will reduce downstream sediment loads by preventing bank scour and channel incision. By reducing sediment transport within the channel and providing stable habitat along restored banks, overall instream water quality and habitat may be improved. Restoring the riparian buffer will also provide future channel stability and ecological benefits. It is estimated that a total of 122,808 lbs of sediment, 98 lbs of total nitrogen and 38 lbs of total phosphorus would be reduced by the restoration.

Project Design Considerations: This project is entirely contained within private residential properties along Highland Lane and will require significant coordination with property owners for access and construction. Access to the project will need to occur from the access road that extends off of Willow Oaks Corporate Drive. This access road appears to be used to access existing ponds DP0374 and DP0384. The access road leads to the upstream end of this project. Moderate tree loss is expected with this restoration, however, in similar projects, experience has shown that restoration benefits and proposed buffer enhancements may outweigh overall construction impacts. This project will require environmental permitting as construction and modifications within a perennial stream channel are needed. Overhead power lines and a sanitary sewer line were noted near the DP0384 facility embankment but existing utilities are not anticipated to impact the design or construction of this restoration.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	1204	LF	\$200	\$240,800
Clear and Grub	2.76	AC	\$10,000	\$27,640
Plantings	2.76	AC	\$25,000	\$69,100
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$437,540
Ancillary Items	1	LS	5% of project	\$21,877
Erosion and Sediment Control	1	LS	10% of project	\$43,754
			Base Construction Cost	\$503,171
			Mobilization (5%)	\$25,159
			Subtotal 1	\$528,330
			Contingency (25%)	\$132,083
			Subtotal 2	\$660,413
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	\$297,186
			Estimated Project Cost	\$958,000



Site Photo: Over-widened channel with moderate to severe erosion



Site Photo: Erosion with no riparian buffer

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AC9224 - Stream Restoration



Vicinity Map

Address:	Unknown
Location:	I-66 at Prosperity Ave
Land Owner:	State – VDOT
PIN:	N/A
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Unknown Tributary of Long Branch

Description: This project is located between I-66 and Prosperity Avenue and extends from a culvert under an I-66 access road downstream toward the confluence with Long Branch. This project represents a short section of existing stream channel that parallels I-66 and drains outfalls from I-66, commercial parking lots, and residential areas. The existing stream channel is incised and over-widened with severe erosion occurring on both banks. There is a headcut located downstream of the culvert under the I-66 access road culvert that is migrating upstream toward the culvert.

Restoring this channel will include regrading and stabilizing eroded stream banks with armor-in-place and bioengineering techniques. Raising the bed elevation and installing grade controls or step pools may be necessary to dissipate energy and prevent future channel incision.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Stabilizing this channel will help to decrease sediment loads to downstream channels by preventing bank scour and stream bed incision. Restoration will help to protect the VDOT culvert under the access road by preventing future headcut migration. Overall, stream habitat and water quality may be improved due to stable habitat creation and reductions in available sediment supply. It is estimated that a total of 21,165 lbs of sediment, 17 lbs of total nitrogen and seven lbs of total phosphorus would be reduced annually by this project.

Project Design Considerations: This project will require significant coordination with VDOT for access and construction. Access to this project could occur from Prosperity Avenue or the I-66 access road and will require significant tree removal and manipulation of steep slopes. Tree loss is expected with this restoration; however, restoration benefits will outweigh overall construction impacts. This project will require environmental permitting to allow for construction and modifications to a perennial stream channel and for forest impacts.

Costs:				
ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	249	LF	\$200	\$49,800
Clear and Grub	0.50	AC	\$10,000	\$5,000
Plantings	0.50	AC	\$25,000	\$12,500
Additional Cost, First 500 LF	249	LF	\$200	\$49,800
			Initial Project Cost	\$117,100
Ancillary Items	1	LS	5% of project	\$5,855
Erosion and Sediment Control	1	LS	10% of project	\$11,710
			Base Construction Cost	\$134,665
			Mobilization (5%)	\$6,733
			Subtotal 1	\$141,398
			Contingency (25%)	\$35,350
			Subtotal 2	\$176,748
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	\$79,537
			Estimated Project Cost	\$257,000



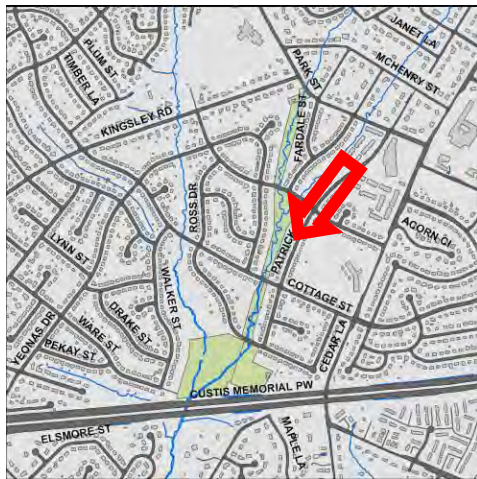
Figure 1: Severe bank erosion



Figure 2: Incised and eroded stream channel along I-66

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AC9225 - Stream Restoration

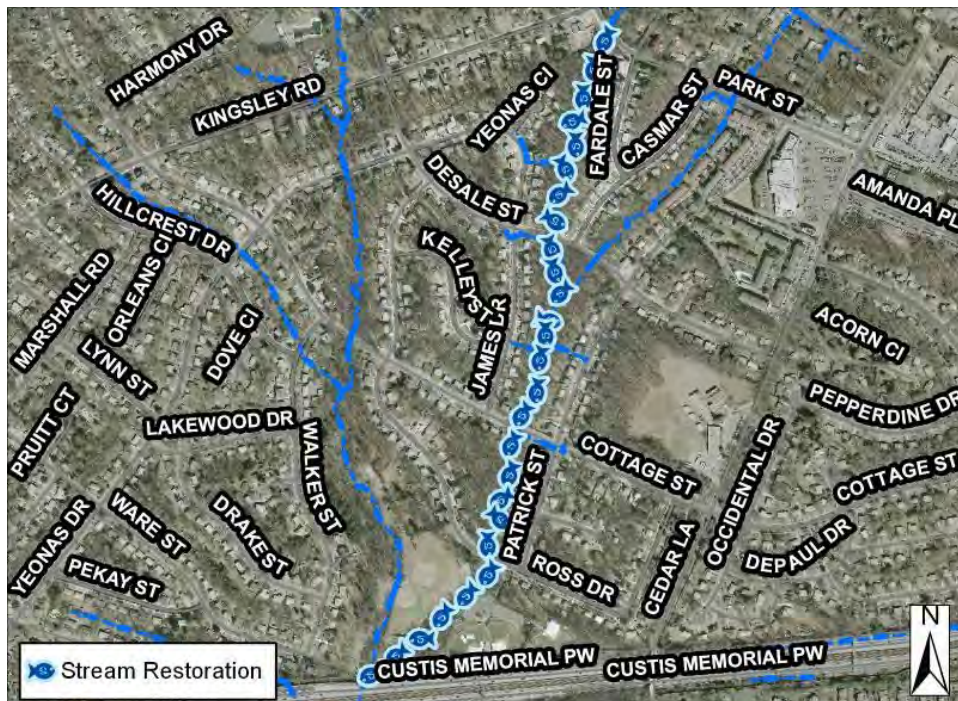


Vicinity Map

Address:	Yeonas Park
Location:	Between Desale and I-66
Land Owner:	Private / Town of Vienna
PIN:	0393 04 0004B, 0482 02 0013B, 0482 03 2360A, 0491 02 0004, 0491 08 2380A, 0491 08 2498P, 0491 08 2513A, 0491 08 2629P
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Unknown Tributary of Bear Branch

Description: This stream restoration project is primarily within Town of Vienna park land, with the upstream limit of this located at Park Street. The downstream limit is located at the culvert under I-66 in South Side Park. Several road crossings including Desale Street, Cottage Street, and Ross Drive and many storm drain outfalls are located along the project length. Most of the existing channel within the project limits is overwidened and incised, with moderate to severe erosion occurring on outside meanders and straight sections. While areas of the channel are sinuous, most of the channel is relatively straight.

Restoring the channel will focus on reducing the current channel dimensions and raising the bed elevation to reconnect the channel to the floodplain. The existing channel in South Side Park is constrained and reconnecting this portion of the channel to the floodplain does not appear to be feasible. In areas such as this, regrading and stabilization may be required using armor-in-place or bioengineering techniques.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementing this project will effectively reduce the sediment supply to receiving stream channels by reducing bank scour and stream bed incision. Reconnecting the channel to the floodplain will also reduce the amount of sediment in downstream channels as suspended sediment will be deposited on the floodplain.. Restoring and stabilizing this channel will also help to protect storm drain, road crossing, and utility infrastructure located in the channel and floodplain. This project could provide an educational opportunity for residents using South Side Park. It is estimated that a total of 551,504 lbs of sediment, 441 lbs of total nitrogen and 171 lbs of total phosphorus would be reduced by the restoration.

Project Design Considerations: Coordination with private residential owners will be necessary where the existing channel and floodplain are within close proximity to private properties. Several road crossings, storm drain outfalls and underground utilities may constrain design and construction. Access to the floodplain will need to occur off of Park Street, Desale Street, Cottage Street, and Ross Drive. Since this stream is buffered by forest, access along the channel and grading of the existing channel and floodplain will require significant tree removal. In similar projects, experience has shown that restoration benefits will outweigh overall construction impacts. This project will require environmental permitting as construction and modifications within a perennial stream channel is needed.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	4977	LF	\$200	\$995,400
Clear and Grub	11.43	AC	\$10,000	\$114,256
Plantings	11.43	AC	\$25,000	\$285,640
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$1,495,296
Ancillary Items	1	LS	5% of project	\$74,765
Erosion and Sediment Control	1	LS	10% of project	\$149,530
			Base Construction Cost	\$1,719,591
			Mobilization (5%)	\$85,980
			Subtotal 1	\$1,805,571
			Contingency (25%)	\$451,393
			Subtotal 2	\$2,256,964
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	\$1,015,634
			Estimated Project Cost	\$3,273,000



Site Photo: Over-widened channel with moderate bank erosion



Site Photo: Incised channel with moderate to severe bank erosion

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AC9226 - Stream Restoration



Vicinity Map

Address:	7124 Barry Road
Location:	Windsor Estates
Land Owner:	Private - Residential
PIN:	0902 08 0036, 0902 08 0037, 0904 08 0038, 0904 08 0039, 0904 08 0040, 0904 08 0041, 0904 10 M
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Long Branch

Description: This project is intended to repair an eroding stream at a sewer manhole located within the active channel, restore the actively widening stream, and remove a debris jam. The project is located between Barry Road and the Washington Metropolitan Area Transit Authority (WMATA) metro tracks.

Restoring this channel will include regrading and stabilizing eroded stream banks with armor-in-place and/or bioengineering techniques, removing the debris jam, and adjusting the channel to protect the manhole. This project is located within forested conditions.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementing this project will reduce sediment supply to receiving stream channels by reducing erosion related to an existing debris jam. Overall stream habitat and water quality may be improved due to stable habitat creation and reductions in available sediment supply. Restoring and stabilizing the channel will help to protect an exposed utility located within the channel and floodplain. It is estimated that a total load of 29,589 lbs of sediment, 24 lbs of total nitrogen and nine lbs of total phosphorus would be reduced annually by this project.

Project Design Considerations: This area is wooded with private residential properties near the access points to the stream. Coordination with these property owners will be necessary for access and construction. The WMATA Metro tracks are located to the west of the stream. Access to the project site could occur through residential properties located on Barry Street. Tree loss is expected with this restoration; however, restoration benefits will outweigh overall construction impacts. This project will require environmental permitting due to construction and modifications to a perennial stream channel and forest impacts. Existing utility impacts are possible as well as a sewer line parallels the stream.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	765	LF	\$200	\$153,000
Clear and Grub	0.70	AC	\$10,000	\$7,000
Plantings	0.70	AC	\$25,000	\$17,500
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$277,500
Ancillary Items	1	LS	5% of project	\$13,875
Erosion and Sediment Control	1	LS	10% of project	\$27,750
			Base Construction Cost	\$319,125
			Mobilization (5%)	\$15,956
			Subtotal 1	\$335,081
			Contingency (25%)	\$83,770
			Subtotal 2	\$418,851
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	\$188,483
			Estimated Project Cost	\$608,000



Figure 1: Exposed sanitary sewer manhole on streambank



Figure 2: Debris jam and active channel widening

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AC9227 - Stream Restoration

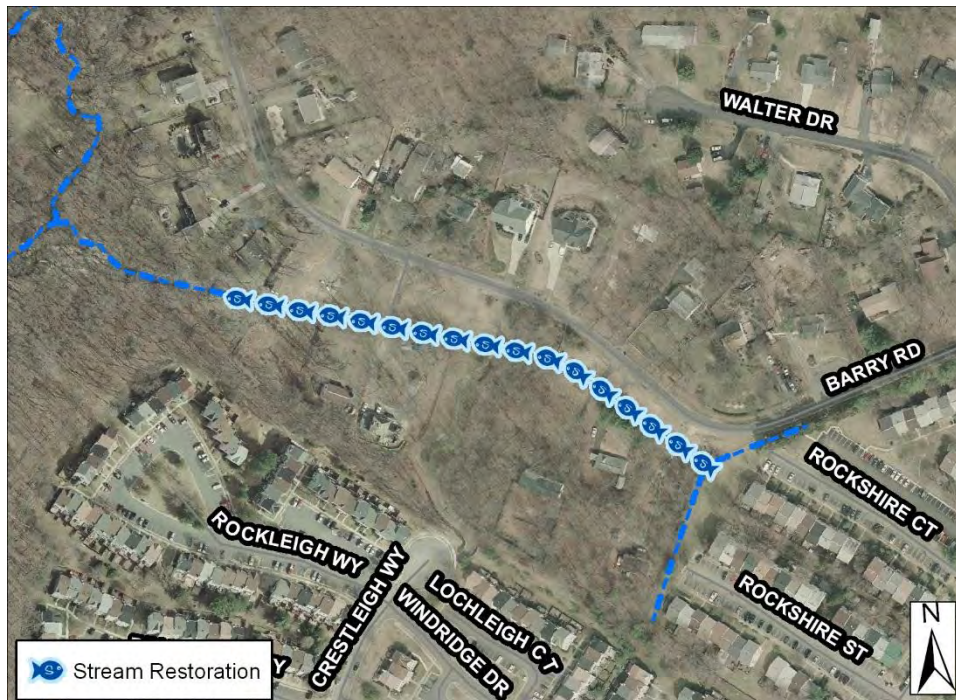


Address: Along 7100 block of Barry Road
Location: Windsor Estates
Land Owner: Private - Residential
PIN: 0904 09 G, 0904 08 0043, 44, 45, 46, 47, 48, 49, 50, 51
Control Type Water Quality
Drainage Area N/A
Receiving Waters Unknown Tributary of Long Branch

Vicinity Map

Description: This project starts at a large stormdrain outfall located off of Barry Road at the end of Rockshire Court and extends downstream to the end of Rockleigh Way. Currently, the existing stream channel is concrete-lined with several private residential driveway bridges crossing the channel. The riparian buffer is a mix of trees and lawn.

This project is proposed to remove the concrete from the channel and restore it using natural channel design. The alignment of the proposed channel and the existing driveway bridges will likely need to be altered during restoration. Creating a riparian buffer is also proposed along the newly created channel.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Removing the existing concrete channel and creating stable habitat along the restored banks in the upstream portion will allow for improvements in water quality and instream habitat. Property owners along the proposed project might welcome the aesthetic changes of the current channel to a natural, restored channel. There are no estimated pollutant removal benefits at the site, since the project will replace a stable concrete channel with a stable natural channel. The primary benefits of the project will be to extend habitat further upstream.

Project Design Considerations: Since this project is contained within private residential properties, many with driveway bridges over the channel, coordinating with property owners will be necessary for access and construction. Access to this site is good from Barry Road. Impacts to homeowner driveways and property will occur and should be assessed before design and construction. This project will require environmental permitting due to construction and modifications to a perennial stream channel.

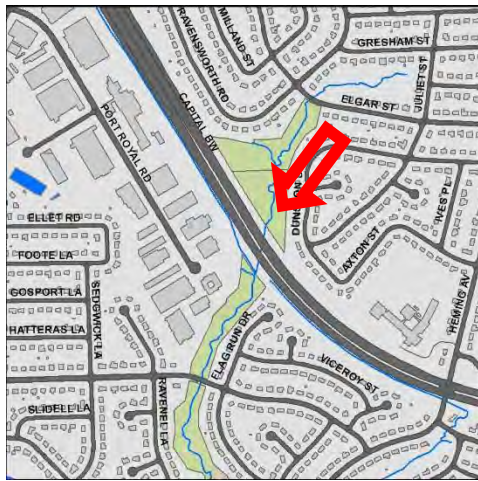
Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	930	LF	\$200	\$186,000
Clear and Grub	0.64	AC	\$10,000	\$6,400
Plantings	0.64	AC	\$25,000	\$16,000
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$308,400
Ancillary Items	1	LS	5% of project	\$15,420
Erosion and Sediment Control	1	LS	10% of project	\$30,840
			Base Construction Cost	\$354,660
			Mobilization (5%)	\$17,733
			Subtotal 1	\$372,393
			Contingency (25%)	\$93,098
			Subtotal 2	\$465,491
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	\$209,471
			Estimated Project Cost	\$675,000



Figure 1: Existing concrete lined stream channel with private driveway bridge

AC9229 - Stream Restoration

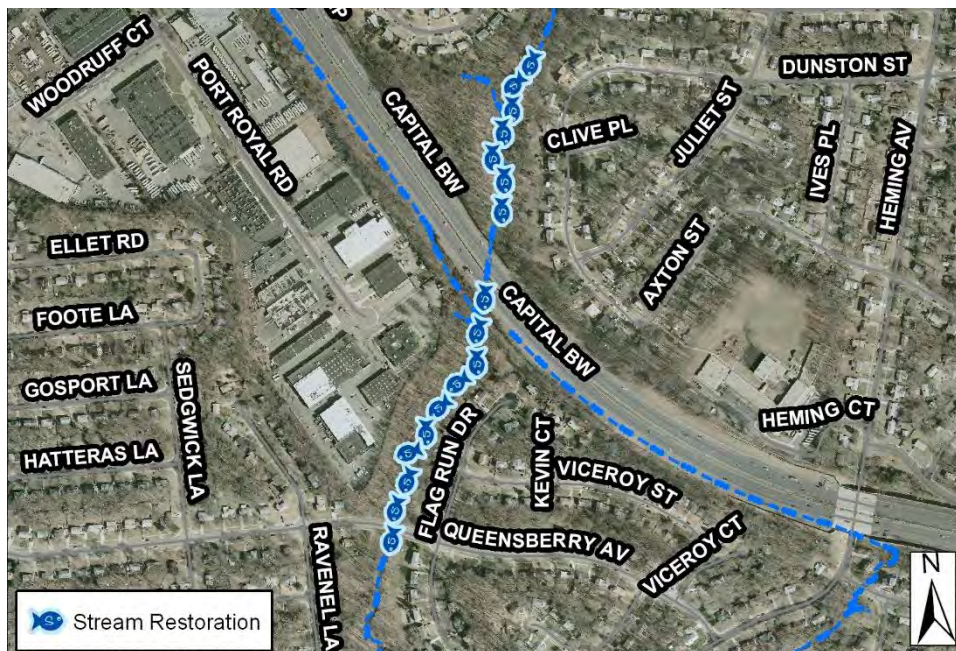


Vicinity Map

Address:	Behind 5500 block of Flag Run Drive and behind 7600 block of Dunston St
Location:	Flag Run Park, Lake Accotink Park / I-495
Land Owner:	County - FCPA / State - VDOT
PIN:	0792 01 0001A, 0792 01 0002, 0704 01 0006
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Flag Run

Description: This project is intended to restore an eroded section of Flag Run located between the north side of the Capital beltway (I-495) and the south side of Queensberry Avenue. Currently, this channel is experiencing severe bank and bed erosion. An existing pipeline south of I-495 is exposed and the channel is continuing to degrade threatening the integrity of the pipe. Culverts and storm drains along the reach are also experiencing erosion.

Restoring the channel will include re-grading and stabilizing eroded stream banks with armor-in-place and bioengineering techniques and installing grade controls to dissipate energy. Fill, grading and scour protection will also be necessary for protection of all storm drain outfalls discharging to the stream. Replacing the existing culvert with a bottomless arch culvert would greatly improve hydraulic and hydrologic processes through this stream reach providing a natural stream substrate with grade control structures.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementing this project will reduce sediment supply to receiving stream channels by reducing bank scour and stream bed incision. Other benefits include improving fish and aquatic passage and improving overall stream quality by creating stable habitat and reducing sediment supply. Restoring and stabilizing this channel will help to protect storm drain, road crossing, and utility infrastructure located in the channel and on the floodplain. It is estimated that a total of 194,738 lbs of sediment, 156 lbs of total nitrogen and 60 lbs of total phosphorus would be reduced annually by this project.

Project Design Considerations: Access to the proposed restoration north of I-495 will require use of the easement along the noise wall. This is a narrow and steep slope between the newly constructed noise wall and existing development and forest. Access on the south side of I-495 may be obtained from Queensberry Road. Some tree removal and manipulation of steep slopes may be required. Restoration benefits will outweigh overall construction impacts. This project will require environmental permitting due to construction and modifications to a perennial stream channel and forest impacts.

The project is located upstream of culvert retrofit AC9400 and on either side of culvert retrofit AC9401. Design of all three projects should be performed concurrently.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	2291	LF	\$200	\$458,200
Clear and Grub	2.10	AC	\$10,000	\$21,000
Plantings	2.10	AC	\$25,000	\$52,500
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$631,700
Ancillary Items	1	LS	5% of project	\$31,585
Erosion and Sediment Control	1	LS	10% of project	\$63,170
			Base Construction Cost	\$726,455
			Mobilization (5%)	\$36,323
			Subtotal 1	\$762,778
			Contingency (25%)	\$190,695
			Subtotal 2	\$953,473
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	\$429,063
			Estimated Project Cost	\$1,383,000



Figure 1: Severe bank erosion just upstream of I-495



Figure 2: Severe erosion and downcutting at a storm drain outfall

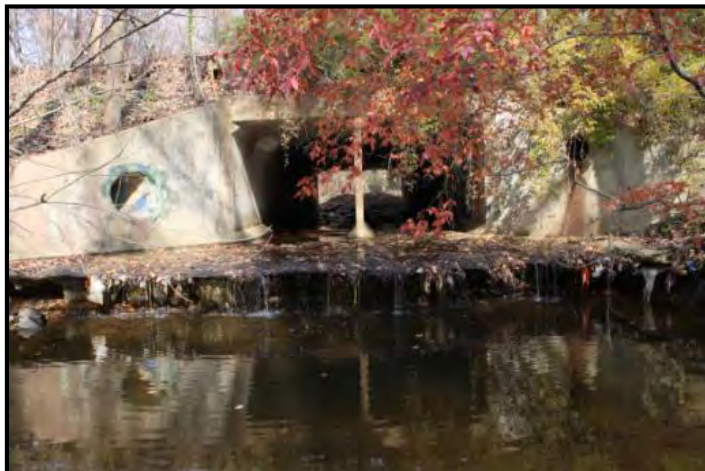


Figure 3: Downcutting and a large scour pool at the Queensberry Avenue culvert

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AC9230 - Stream Restoration



Vicinity Map

Address:	Behind 8300 block of Queen Elizabeth Bv
Location:	Wakefield Park
Land Owner:	County - FCPA
PIN:	0704 01 0002
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Unknown Tributary of Accotink Creek

Description: This project entails restoring the existing stream channel located in Wakefield Park between I-495 and Queen Elizabeth Boulevard. The project extends from an overhead power line clearing downstream to the confluence with Accotink Creek. Currently, this channel is deeply incised and experiencing severe bank and bed erosion.

Restoring the channel will include regrading and stabilizing eroded stream banks with armor-in-place and bioengineering techniques, and installing grade controls to dissipate energy. Since this project is located within a park, the floodplain and project limits are within forested conditions except for an overhead power line utility clearing.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementing this project will decrease sediment supply to Accotink Creek by reducing bank scour and stream bed incision. Overall, stream habitat and water quality may be improved due to stable habitat creation and reductions in available sediment supply. It is estimated that the project will reduce pollutants by 66,319 lbs of sediment, 53 lbs of nitrogen and 21 lbs of tot phosphorus annually.

Project Design Considerations: Coordination with the appropriate utility agencies will be necessary for access and construction. Access to this project could occur from the utility easement, if permissible. Minor to moderate tree loss is expected with this restoration; however, restoration benefits will outweigh overall construction impacts. This project will require environmental permitting due to construction and modifications to a perennial stream channel and forest impacts.

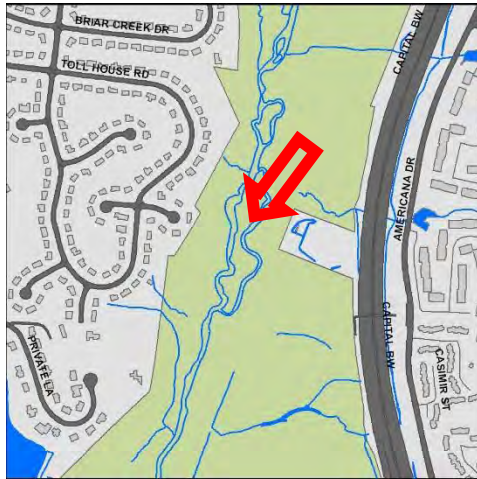
Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	1040	LF	\$200	\$208,000
Clear and Grub	0.96	AC	\$10,000	\$9,600
Plantings	0.96	AC	\$25,000	\$24,000
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$341,600
Ancillary Items	1	LS	5% of project	\$17,080
Erosion and Sediment Control	1	LS	10% of project	\$34,160
			Base Construction Cost	\$392,840
			Mobilization (5%)	\$19,642
			Subtotal 1	\$412,482
			Contingency (25%)	\$103,121
			Subtotal 2	\$515,603
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	\$232,021
			Estimated Project Cost	\$748,000



Figure 1: Deeply incised channel with severe erosion

AC9231 - Stream Restoration



Vicinity Map

Address:	Behind 8200 block of Strong Spring Ct
Location:	Wakefield Park
Land Owner:	County - FCPA
PIN:	0704 01 0002
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Accotink Creek

Description: This project entails restoring overflow stream channels located within the eastern floodplain of Accotink Creek between I-495 and Toll House Road. Currently, these channels are deeply incised with bank and bed erosion. Each of the overflow channels convey heavy loads of sand and other sediment to Accotink Creek during large precipitation events.

Restoring these channels will include regrading and stabilizing eroded stream banks with armor-in-place and bioengineering techniques, and installing grade controls to dissipate energy. The floodplain and project limits are all within forested conditions.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementing this project will decrease sediment supply to Accotink Creek by reducing bank scour and stream bed incision. Overall, stream habitat and water quality may be improved due to stable habitat creation and reductions in available sediment supply. It is estimated that a total of 39,948 lbs of sediment, 32 lbs of nitrogen and 12 lbs of total phosphorus would be reduced annually by this project.

Project Design Considerations: A power line easement is within the vicinity of the stream; therefore, coordination with the appropriate utility agencies will be necessary for access and construction. Access to the project site could occur from the utility easement, if permissible, but will require some tree removal. Tree loss is expected with the restoration; however, restoration benefits will outweigh overall construction impacts. This project will require environmental permitting due to construction and modifications to a perennial stream channel and forest impacts. Other than the overhead power line utility, no other utility conflicts are anticipated with this restoration.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	904	LF	\$200	\$180,800
Clear and Grub	2.17	AC	\$10,000	\$21,700
Plantings	2.17	AC	\$25,000	\$54,250
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$356,750
Ancillary Items	1	LS	5% of project	\$17,838
Erosion and Sediment Control	1	LS	10% of project	\$35,675
			Base Construction Cost	\$410,263
			Mobilization (5%)	\$20,513
			Subtotal 1	\$430,776
			Contingency (25%)	\$107,694
			Subtotal 2	\$538,470
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	\$242,312
			Estimated Project Cost	\$781,000



Figure 1: Overflow channel with erosion and large deposits of sand



Figure 2: Overflow channel with large sand deposits

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AC9232 - Stream Restoration



Vicinity Map

Address:	Between 8200 block of Toll House Road and I-495 (Capitol Beltway)
Location:	Wakefield Park
Land Owner:	County - FCPA
PIN:	0704 01 0002
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Unknown Tributary of Accotink Creek

Description: This project entails restoring the existing stream channel located within Wakefield Park that is located between I-495 and Toll House Road which extends from the culvert under I-495 downstream to the confluence with Accotink Creek. Currently, this channel is experiencing severe bank and bed erosion and the channel is deeply incised.

Restoration will include regrading and stabilizing eroded stream banks with armor-in-place and bioengineering techniques, and installing grade controls to dissipate energy. Since this project is located within a park, the floodplain and project limits are all within forested conditions except for an overhead power line utility.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementing this project will decrease sediment supply to Accotink Creek by reducing bank scour and stream bed incision. Overall, stream habitat and water quality may be improved due to stable habitat creation and reducing the available sediment supply. It is estimated that a total of 147,421 lbs of sediment, 118 lbs of nitrogen and 46 lbs of phosphorus would be reduced annually by this project.

Project Design Considerations: A power line easement is within the vicinity of the stream; therefore, coordination with the appropriate utility agencies will be necessary for access and construction. Access to the project site could occur from the utility easement if permissible, but will require significant tree removal. Although tree loss is expected with this restoration, restoration benefits will outweigh overall construction impacts. Environmental permitting will be required to allow for construction and modifications to a perennial stream channel and for forest impacts. Other than the overhead power line utility, no utility conflicts are anticipated with this restoration.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	940	LF	\$200	\$188,000
Clear and Grub	0.86	AC	\$10,000	\$8,600
Plantings	0.86	AC	\$25,000	\$21,500
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$318,100
Ancillary Items	1	LS	5% of project	\$15,905
Erosion and Sediment Control	1	LS	10% of project	\$31,810
			Base Construction Cost	\$365,815
			Mobilization (5%)	\$18,291
			Subtotal 1	\$384,106
			Contingency (25%)	\$96,027
			Subtotal 2	\$480,133
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	\$216,060
			Estimated Project Cost	\$697,000



Figure 1: Incised channel with severe bank erosion

AC9233 - Stream Restoration



Vicinity Map

Address: Between 8100 Briar Creek Drive and I-495 (Capitol Beltway)
Location: Wakefield Park
Land Owner: County - FCPA
PIN: 0704 01 0002
Control Type: Water Quality
Drainage Area: N/A
Receiving Waters: Unknown Tributary of Accotink Creek

Description: This project entails restoring an existing stream channel located within Wakefield Park located between I-495 and Briar Creek Drive. The channel extends from the downstream side of the culvert under I-495 downstream to the confluence with Accotink Creek. Currently, this channel is experiencing severe bank and bed erosion and the channel is deeply incised.

Restoring this channel will include regrading and stabilizing eroded stream banks with armor-in-place and bioengineering techniques, and installing grade controls to dissipate energy. The floodplain and project limits are all within forested conditions except for an overhead power line utility.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementing this project will reduce sediment supply to Accotink Creek by reducing bank scour and stream bed incision. Overall, stream habitat and water quality may be improved due to stable habitat creation and reductions in available sediment supply. It is estimated that 35,489 lbs of sediment, 28 lbs of nitrogen and 11 lbs of phosphorus would be reduced annually by this project.

Project Design Considerations: A power line easement is within the vicinity of the stream; therefore, coordination with the appropriate utility agencies will be necessary for access and construction. Access to the project site could occur from the utility easement, if allowed. Access to the proposed restoration will require significant tree removal and manipulation of steep slopes; however, restoration benefits will outweigh overall construction impacts. This project will require environmental permitting to allow for construction and modifications to a perennial stream channel and forest impacts.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	953	LF	\$200	\$190,600
Clear and Grub	0.87	AC	\$10,000	\$8,700
Plantings	0.87	AC	\$25,000	\$21,750
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$321,050
Ancillary Items	1	LS	5% of project	\$16,053
Erosion and Sediment Control	1	LS	10% of project	\$32,105
			Base Construction Cost	\$369,208
			Mobilization (5%)	\$18,460
			Subtotal 1	\$387,668
			Contingency (25%)	\$96,917
			Subtotal 2	\$484,585
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	\$218,063
			Estimated Project Cost	\$703,000



Figure 1: Incised channel with severe bank erosion

AC9234 - Stream Restoration



Vicinity Map

Address:	Behind 3200 block of Wynford Drive and Amberley Lane, and behind 3300 block of Mantua Drive
Location:	Sutton Place, Mantua Woods
Land Owner:	Private - Residential
PIN:	0591 18 0079, 80, 81, 82, 83, 0591 24 0019, 18, 17, 16, 15, 14, 13, 0591 18 0046, 0591 18 0045
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Long Branch

Description: This project is intended to restore an eroded and over-widened section of Long Branch North located between Wynford Drive, Amberley Lane, and Mantua Drive. Restoring the channel will include raising the bed elevation and reducing channel dimensions to reconnect the channel with the floodplain, installing grade control structures, re-grading and stabilizing eroded stream banks with armor-in-place and bioengineering techniques, and stabilizing all stormdrain outfalls and tributary channel connections along the channel. Buffer restoration along re-graded areas and where extensive amounts of invasive vegetation are present will be necessary to promote future stability and to restore ecological function. Coordinating between Project AC9235, which is just upstream of this project, and this project will be necessary during design and construction to ensure compatibility between the two projects. The floodplain and project limits are all forested.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: This project will help to reduce sediment loads to Long Branch and Accotink Creek. New channel geometry and stabilizing existing banks and eroded connections to this channel will allow for reduced sediment loads to downstream channels. Reconnecting this channel to the floodplain will also reduce downstream sediment loads allowing suspended sediment to deposit on the floodplain. By reducing sedimentation and providing stable habitat along restored banks, overall water quality and habitat may be improved. This project will also remove the invasive bamboo along the stream banks. It is estimated that a total of 185,997 lbs of sediment, 149 lbs of total nitrogen and 58 lbs of total phosphorus would be reduced annually by this project.

Project Design Considerations: Since private residential properties adjoin the stream, coordination with these property owners will be necessary for access and construction. Access to this project will be difficult and may need to occur from Copeland Pond Court using the existing access to the stormwater pond located adjacent to the stream. Access may also be possible along Wynford Drive using existing utility easements; however, this access would require going through private residences. Access from either of these points will require some tree removal. Although tree loss is expected, restoration benefits will outweigh overall construction impacts. This project will require environmental permitting to allow for construction and modifications to a perennial stream channel and for forest impacts. Existing utility impacts are possible as a sewer line parallels the stream. This project should be designed and constructed in conjunction with Project AC9235 to ensure proper channel elevations and alignment.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	1563	LF	\$200	\$312,600
Clear and Grub	1.60	AC	\$10,000	\$16,000
Plantings	1.60	AC	\$25,000	\$40,000
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$468,600
Ancillary Items	1	LS	5% of project	\$23,430
Erosion and Sediment Control	1	LS	10% of project	\$46,860
			Base Construction Cost	\$538,890
			Mobilization (5%)	\$26,945
			Subtotal 1	\$565,835
			Contingency (25%)	\$141,459
			Subtotal 2	\$707,294
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				\$318,282
			Estimated Project Cost	\$1,026,000



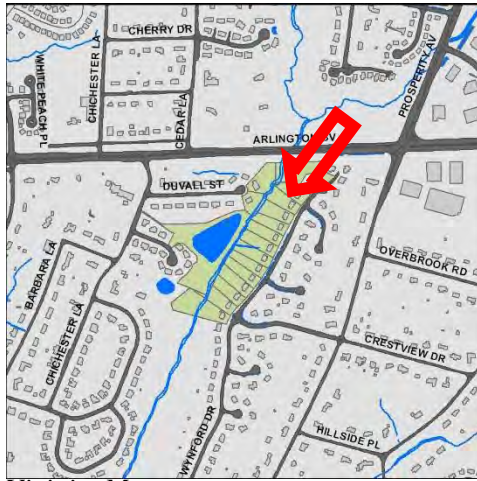
Figure 1: Over-widened channel with severe bank erosion and large depositional features



Figure 2: Over-widened channel with bank erosion and large depositional features

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AC9235 - Stream Restoration

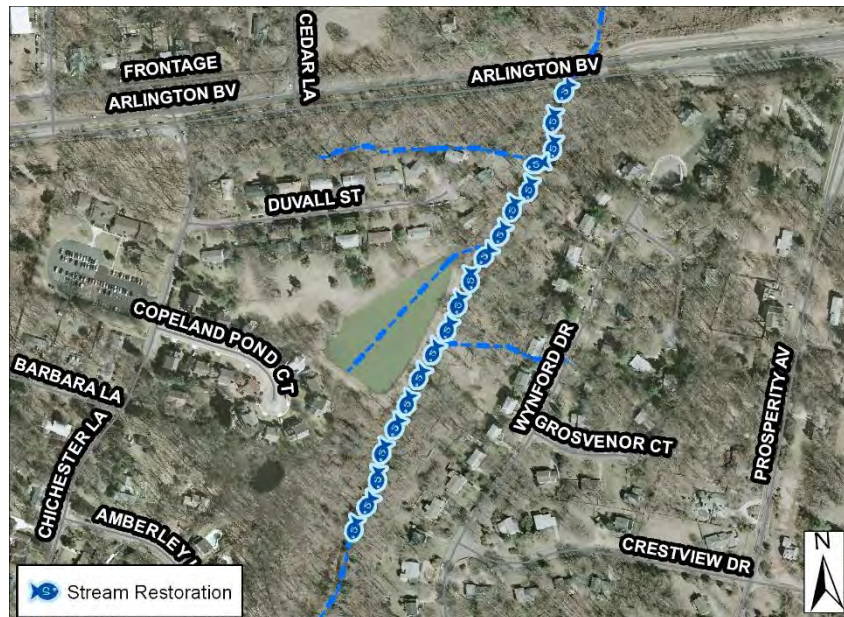


Vicinity Map

Address:	Behind 3100 block of Wynford Drive and behind 8700 block of Duvall St
Location:	Sutton Place, Copeland Pond
Land Owner:	Private - Residential
PIN:	0493 18 0062A, 0493 18 0063, 0493 18 0065, 66, 67, 68, 69, 70, 71, 72, 73, 74, 0493 25 A, 0493 07 0010, 0493 07 0009, 0493 31 A
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Long Branch

Description: This project proposes to restore an eroded and previously stabilized section of Long Branch. The proposed restoration starts downstream of the culvert under Arlington Boulevard to approximately the end of Copeland Pond Court. The upstream portion of this channel has been stabilized with large rip rap around a manhole and a utility. Downstream of this utility there is severe bank erosion and overwidening. The downstream portion parallels a large wet pond and contains gabion baskets within and along the banks as well as grade control structures to control the slope of the existing channel.

Restoration would include re-shaping the channel to provide more protection for the manhole, bank protection measures and channel adjustment, replacing outdated engineered features with natural channel design structures to prevent downstream scouring. Reconnecting this channel to the floodplain in the downstream portion of this restoration may also be possible. Coordination between Project AC9234, which is just downstream of this project, will be necessary during design and construction.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementing this project will decrease sediment supply to Long Branch and Accotink Creek by reducing bank scour and channel bed incision. By reducing sedimentation within the channel and providing stable habitat along restored banks, overall instream water quality and habitat may be improved. Restoring and stabilizing this channel will also help to protect infrastructure located within the channel and on the floodplain. The riparian buffer will also be improved providing additional channel stability and ecological benefits. It is estimated that a total of 191,233 lbs of sediment, 153 lbs of total nitrogen and 59 lbs of total phosphorus would be reduced annually by this project.

Project Design Considerations: This project is entirely contained within private residential properties and will require significant coordination with the property owners for access and construction. A portion of this reach parallels a wet pond embankment, where it may not be desirable to remove the existing stabilization measures or promote a riparian buffer. Access to this project could occur from Copeland Pond Court using the existing access to the stormwater pond located adjacent to the stream. Tree loss is expected with this restoration; however, restoration benefits will outweigh overall construction impacts. This project will require environmental permitting due to the need for construction and modifications to a perennial stream channel and impacting forested area. Existing utility impacts are possible with this restoration as a sewer line parallels the stream. This project should be designed and constructed in conjunction with Project AC9234 to ensure proper channel elevations and alignment.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	1607	LF	\$200	\$321,400
Clear and Grub	1.47	AC	\$10,000	\$14,700
Plantings	1.47	AC	\$25,000	\$36,750
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$472,850
Ancillary Items	1	LS	5% of project	\$23,643
Erosion and Sediment Control	1	LS	10% of project	\$47,285
			Base Construction Cost	\$543,778
			Mobilization (5%)	\$27,189
			Subtotal 1	\$570,967
			Contingency (25%)	\$142,742
			Subtotal 2	\$713,709
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				\$321,169
			Estimated Project Cost	\$1,035,000



Figure 1: Severe channel incision and erosion



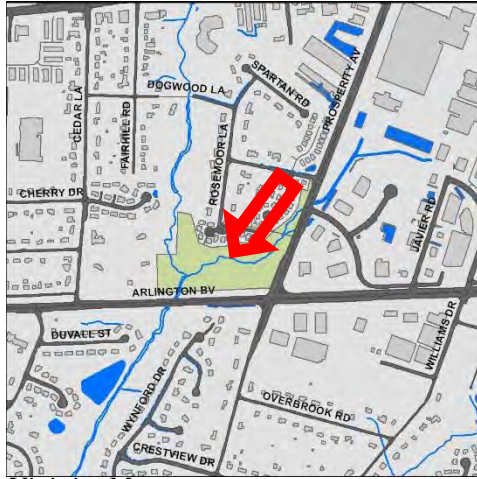
Figure 2: Existing gabion baskets within the channel



Figure 3: Existing stabilized channel with gabion banks

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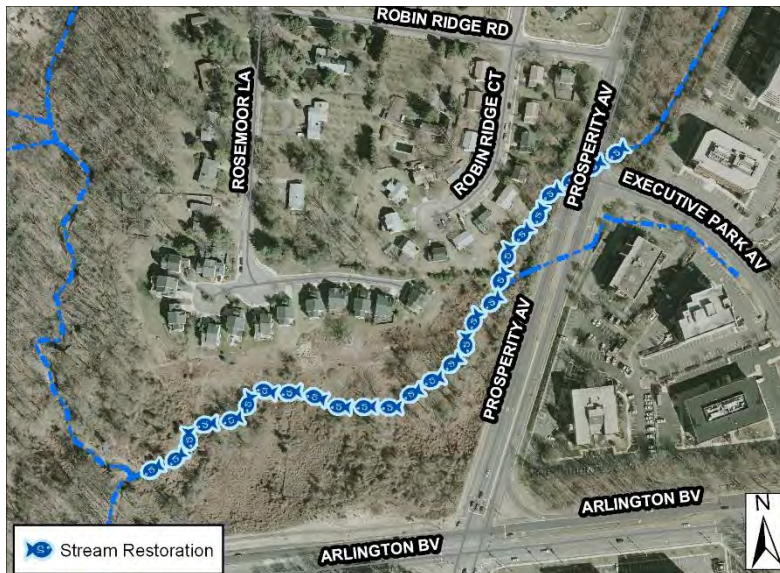
AC9236 - Stream Restoration



Vicinity Map

Address:	Behind 3000 block of Robin Ridge Court and Rosemoor Lane
Location:	Retreat at Sycamore Ridge
Land Owner:	Private - Residential
PIN:	0493 24 A, 0493 30 A
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Unknown Tributary of Long Branch

Description: This project starts at the downstream side of the culvert under Prosperity Avenue and extends downstream to the confluence with Long Branch. Upstream portions of the channel are concrete-lined. The channel downstream of Prosperity Avenue is deeply incised with scoured banks and several stands of invasive bamboo. Restoring this channel will include raising the bed elevation and reducing channel dimensions to reconnect the channel with the floodplain, installing grade control structures, re-grading and stabilizing eroded stream banks with armor-in-place and bioengineering techniques, and retrofitting all storm drain outlet structures along the restoration reach. Buffer restoration along re-graded areas and where extensive amounts of invasive vegetation are present will be necessary to promote future stability and to restore ecological function. The floodplain and project limits are all forested.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: This project will help to decrease sediment loads to downstream portions of the watershed, especially Long Branch. This will be accomplished by creating a new channel geometry and stabilizing existing banks and eroded connections to the channel. Reconnecting the channel to the floodplain will also reduce downstream sediment loads by allowing suspended sediment to deposit on the floodplain. By reducing sedimentation within the channel and providing stable habitat along restored banks, overall instream water quality and habitat may be improved. Restoring the existing riparian buffer will also provide additional channel stability and ecological benefits. It is estimated that a total of 208,510 lbs of sediment, 167 lbs of total nitrogen and 65 lbs of total phosphorus would be reduced annually by this project.

Project Design Considerations: This project lies entirely within private property and will require significant coordination with property owners for access and construction. Access will need to occur from Prosperity Avenue and will require tree removal and manipulation of slopes. Confluences with other stream channels and storm drain outfalls with their associated conveyances should also be addressed during this restoration. Although tree loss is expected, restoration benefits and proposed buffer enhancements will outweigh overall construction impacts. This project will require environmental permitting to allow for construction and modifications to a perennial stream channel and forest impacts.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	1568	LF	\$200	\$313,600
Clear and Grub	1.44	AC	\$10,000	\$14,400
Plantings	1.44	AC	\$25,000	\$36,000
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$464,000
Ancillary Items	1	LS	5% of project	\$23,200
Erosion and Sediment Control	1	LS	10% of project	\$46,400
			Base Construction Cost	\$533,600
			Mobilization (5%)	\$26,680
			Subtotal 1	\$560,280
			Contingency (25%)	\$140,070
			Subtotal 2	\$700,350
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	\$315,158
			Estimated Project Cost	\$1,016,000



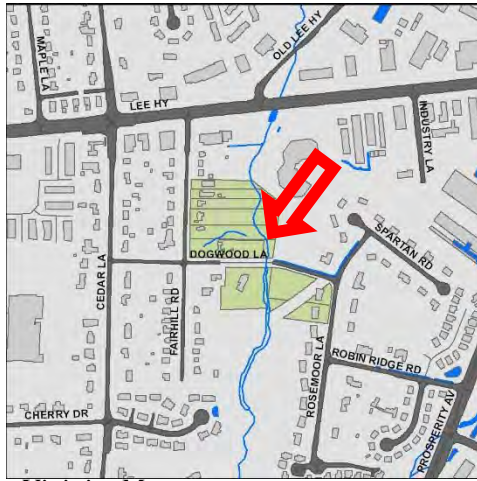
Figure 1: Severly eroded banks with invasive bamboo



Figure 2: Severly eroded banks at a confluence

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AC9237 - Stream Restoration



Vicinity Map

Address:	Behind 2900 block of Fairhill Road and Rosemoor Lane
Location:	Fairhill on the Boulevard
Land Owner:	Private - Residential
PIN:	0493 06 0023, 24, 25, 26, 28, 29A, 0493 01 0028A, 0493 16 0010
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Long Branch

Description: This project is designed to restore an eroded section of Long Branch that originates north of Cherry Drive and extends to approximately 400 feet south of culvert under Lee Highway. Currently the channel banks are eroding severely, with undercutting, large channel bars, channel bed incision and no access to the floodplain. The channel has also eroded around a sewer manhole. One pedestrian bridge is also present and efforts to protect the bridge abutments and trees within the bridge vicinity are failing.

Restoring this channel will include regrading and stabilizing eroded stream banks with armor-in-place and bioengineering techniques, adjusting the channel to protect the sewer manhole, removing concrete and riprap from the pedestrian bridge area and replacing it with bioengineering techniques to preserve the trees. Additionally, grade controls will be installed to dissipate energy and some stone toe protection will be placed to ensure future bank stability. The current floodplain is forested on both sides of the existing channel.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementing this project will decrease sediment supply to Long Branch and Accotink Creek by reducing bank scour and stream bed incision. By reducing sedimentation within these channels and providing stable habitat along restored banks, overall instream water quality and habitat may be improved. It is estimated that 169,271 lbs of sediment, 135 lbs of nitrogen and 53 lbs of phosphorus would be reduced annually by this project. Restoring and stabilizing this channel will help to protect infrastructure located within the channel and on the floodplain. Restoring the riparian buffer will also provide additional channel stability and ecological benefits.

Project Design Considerations: Since this project is contained within private residential properties, coordination with property owners will be necessary for access and construction. The pedestrian bridge as well as the exposed sanitary sewer may constrain restoration design and construction. Confluences with other stream channels and storm drain outfalls with their associated conveyances should also be addressed during the restoration. Access to this project will need to occur from Dogwood Lane or Cherry Drive which will require tree removal and manipulation of slopes. Although tree loss is expected, restoration benefits and proposed buffer enhancements will outweigh overall construction impacts. This project will also require environmental permitting to allow for construction and modifications to a perennial stream channel and impacts to forests.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	797	LF	\$200	\$159,400
Clear and Grub	0.73	AC	\$10,000	\$7,300
Plantings	0.73	AC	\$25,000	\$18,250
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$284,950
Ancillary Items	1	LS	5% of project	\$14,248
Erosion and Sediment Control	1	LS	10% of project	\$28,495
			Base Construction Cost	\$327,693
			Mobilization (5%)	\$16,385
			Subtotal 1	\$344,078
			Contingency (25%)	\$86,020
			Subtotal 2	\$430,098
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				\$193,544
			Estimated Project Cost	\$624,000



Figure 1: Existing incised and severely eroded channel causing trees to fall



Figure 2: Exposed sanitary sewer manhole along the eroded streambank

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AC9238 - Stream Restoration



Address:	Behind 8400 Block Berea Dr
Location:	Dunn Loring Woods, Prosperity Business Campus
Land Owner:	Private
PIN:	0493 05 0001, 0491 15 A1, 0491 19 H, 0491 18 A2, 0491 01 0008, 0491 09K 0069, 68, 67, 66, 65, 62, 61, 60, 52, 51, 50, 49, 48, 39, 38, 37, 36, 35, 32, 31, 30, 0491 09I A
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Long Branch

Vicinity Map

Description: This project is intended to restore an eroded section of Long Branch that originates north of Cottage Street and extends downstream to Lee Highway. There are several road crossings and many storm drain outfalls along the project length. Currently, this channel is over-widened and incised with scoured banks with many stands of invasive species of bamboo.

Restoring this channel will include raising the bed elevation to address an existing headcut, installing grade control structures, stabilizing eroded stream banks, and moving a utility pole currently in the stream channel. Stone toe protection will also need to be installed to ensure future bank stability. Buffer restoration along re-graded areas and where extensive amounts of invasive vegetation are present is recommended to promote additional stability and to restore ecological function. All tributary and stormdrain conveyances to the restoration reach should also be stabilized as necessary. Due to a constrained floodplain and infrastructure constraints, raising the bed elevation to reconnect it to the floodplain or regrading the floodplain to create a new bench is not desirable.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementing this project will decrease sediment supply to Long Branch and ultimately Accotink Creek by reducing bank scour and stream bed incision. By reducing sedimentation within these channels and providing stable habitat along restored banks, overall instream water quality and habitat may be improved. It is estimated that a total of 587,423 lbs of sediment, 470 lbs of total nitrogen and 182 lbs of total phosphorus would be reduced annually by this project. Restoring and stabilizing this channel will help to protect storm drain, road crossing, and utility infrastructure located within the channel and floodplain. Restoring the existing riparian buffer along this reach will also provide future channel stability and ecological benefits.

Project Design Considerations: Since this project is contained within private residential and commercial properties, coordination with these property owners will be necessary for access and construction. Several road crossings and storm drain outfalls as well as underground utilities may constrain design and construction. Confluences with other stream channels and storm drain outfalls with their associated conveyances should also be addressed during restoration. Access to the project site will need to occur from either from Cottage Street, Hilltop Road or Lee Highway. Access from these points along the proposed restoration may require tree removal and manipulation of slopes. Although tree loss is expected, restoration benefits and proposed buffer enhancements will outweigh overall construction impacts. This project will require environmental permitting to allow for construction and modifications to a perennial stream channel and impacts to forests.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	4953	LF	\$200	\$990,600
Clear and Grub	4.55	AC	\$10,000	\$45,500
Plantings	4.55	AC	\$25,000	\$113,750
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$1,249,850
Ancillary Items	1	LS	5% of project	\$62,493
Erosion and Sediment Control	1	LS	10% of project	\$124,985
			Base Construction Cost	\$1,437,328
			Mobilization (5%)	\$71,866
			Subtotal 1	\$1,509,194
			Contingency (25%)	\$377,299
			Subtotal 2	\$1,886,493
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				\$848,922
			Estimated Project Cost	\$2,736,000



Figure 1: Severe headcut just downstream of the culvert under CottageStreet



Figure 2: Severe bank erosion and channel incision



Figure 3: Severe meander bend erosion with large depositional feature

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AC9239 - Stream Restoration



Vicinity Map

Address:	Various along Hunter Road and Ellenwood Dr
Location:	Covington / Villa Lee Park, Arrowhead Park
Land Owner:	Private / County - FCPA
PIN:	0484 01 0042A, 0484 18 D, 0484 01 0044, 0484 17 D, 0484 21 E, 0484 21 I, 0484 17 F, 0484 01 0054B, 0484 13 E, 0484 0340 E1, 0482 0744 D
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Bear Branch

Description: This project is intended to restore an eroded section of Bear Branch that originates north of Lee Highway and extends downstream to the end of Readsborough Court. There are several road crossings including Lee Highway and Arlington Boulevard as well as many storm drain outfalls within the project limits. Currently, this channel is experiencing severe bank and bed erosion. Two metal beams are located parallel to the stream north of Lee Highway that are starting to cause downcutting and scour pools in the downstream reach.

Restoring this channel would include stabilizing outfalls, regrading and stabilizing eroded stream banks with armor-in-place and bioengineering techniques, installing grade controls to dissipate energy, removing the metal beams, and reconnecting the stream to the floodplain by raising bed elevations and reducing channel dimensions. All tributary channel connections to this project should also be stabilized as necessary. The floodplain and project limits are all within forested conditions.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementing this project will decrease sediment supply to Accotink Creek by reducing bank scour and stream bed incision. By reducing sedimentation within these channels and providing stable habitat along restored banks, overall instream water quality and habitat may be improved. It is estimated that a total of 735,368 lbs of sediment, 588 lbs of total nitrogen and 228 lbs of total phosphorus would be reduced annually by this project. Restoring and stabilizing this channel will help to protect storm drain, road crossing, and utility infrastructure located within the channel and floodplain. This project could provide an educational opportunity for residents using parkland for recreation.

Project Design Considerations: Since private residential and commercial properties adjoin the stream, coordination with these property owners will be necessary for access and construction. Several road crossings and storm drain outfalls as well as underground utilities may constrain design and construction. Confluences with other stream channels and storm drain outfalls with their associated conveyances should also be addressed during this restoration. Access to the upstream portion of this project could occur from Hunter Road and access to the downstream portion could occur from Arlington Boulevard. Access from either point along the proposed restoration will require tree removal and manipulation of steep slopes. Tree loss is expected; however, restoration benefits will outweigh overall construction impacts. This project will require environmental permitting to allow for construction and modifications to a perennial stream channel and for forest impacts.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	5916	LF	\$200	\$1,183,200
Clear and Grub	5.43	AC	\$10,000	\$54,300
Plantings	5.43	AC	\$25,000	\$135,750
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$1,473,250
Ancillary Items	1	LS	5% of project	\$73,663
Erosion and Sediment Control	1	LS	10% of project	\$147,325
			Base Construction Cost	\$1,694,238
			Mobilization (5%)	\$84,712
			Subtotal 1	\$1,778,950
			Contingency (25%)	\$444,738
			Subtotal 2	\$2,223,688
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				\$1,000,660
			Estimated Project Cost	\$3,225,000



Figure 1: Severe bank erosion, exposed roots, and deposition south of Lee Highway



Figure 2: Severe bank erosion and channel incision south of Lee Highway



Figure 3: Channel is over-widened with large depositional features south of Arlington Boulevard

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AC9240 - Stream Restoration



Vicinity Map

Address:	Yeonas Drive
Location:	South Side Park
Land Owner:	Town of Vienna
PIN:	0482 03 2585B, 0482 03 2567A, 0482 03 2350A, 0482 02 0013B, 0482 01 0003, 0482 31 0004, 0482 31 D
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Bear Branch

Description: This stream restoration project along Bear Branch is primarily within Town of Vienna park land. The upstream limit is located at Yeonas Drive and extends to I-66. Several road crossings including Yeonas Drive, Cottage Street, and I-66 as well as many storm drain outfalls exist within the project limits. Currently, this channel is experiencing severe bank and bed erosion. The condition of many of the road culverts are preventing fish passage. Additionally, there are stands of invasive bamboo along the stream channel.

Restoring this channel would include repairing broken outfalls, regrading and stabilizing eroded stream banks with armor-in-place and bioengineering techniques, installing grade controls to dissipate energy, and removing invasive species. Due to a fairly constrained floodplain and close proximity to private residential properties, raising the bed elevation to reconnect it to the floodplain or regrading the floodplain to create a new bench is not desirable. This project should be coordinated with Project AC9225, in which these channels flow together just upstream of the culvert under I-66 in South Side Park.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementing this project will decrease sediment supply to Accotink Creek by reducing bank scour and stream bed incision. By reducing sedimentation within these channels and providing stable habitat along restored banks, overall instream water quality and habitat may be improved. It is estimated that a total of 481,365 lbs of sediment, 385 lbs of total nitrogen and 149 lbs of total phosphorus would be reduced annually by this project. Restoring and stabilizing this channel will help to protect storm drain, road crossing, and utility infrastructure located within the channel and floodplain. This project could also provide an educational opportunity for residents using parkland for recreation.

Project Design Considerations: Even though this project is mostly within park land, the existing channel and floodplain is surrounded by residential properties. Coordination with private owners will be necessary where the existing channel is within close proximity to these properties. Several road crossings and storm drain outfalls as well as underground utilities may constrain design and construction. Access to the upstream portion of this project could occur from Cottage Street or from Yeonas Drive and access to the downstream portion could occur from local parks. Access from any of these points along the proposed restoration will require significant tree removal and manipulation of steep slopes. Although tree loss is expected, restoration benefits will outweigh overall construction impacts. This project will require environmental permitting to allow for construction and modifications to a perennial stream channel and for forest impacts. The project should be coordinated with Culvert Retrofit project AC9408, a 25-year project within the same stream reach.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	3980	LF	\$200	\$796,000
Clear and Grub	3.65	AC	\$10,000	\$36,500
Plantings	3.65	AC	\$25,000	\$91,250
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$1,023,750
Ancillary Items	1	LS	5% of project	\$51,188
Erosion and Sediment Control	1	LS	10% of project	\$102,375
			Base Construction Cost	\$1,177,313
			Mobilization (5%)	\$58,866
			Subtotal 1	\$1,236,179
			Contingency (25%)	\$309,045
			Subtotal 2	\$1,545,224
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				\$695,351
			Estimated Project Cost	\$2,241,000



Figure 1: Eroded and incised channel near Yeonas Drive



Figure 2: Eroded and undermined storm drain outfall south of Yeonas Drive



Figure 3: Existing concrete utility casing within the channel near the culvert under I-66

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AC9241 - Stream Restoration



Vicinity Map

Address:	Various along Nutley Street, Mantua Park
Location:	Stonehurst / Eakin Community Park
Land Owner:	Private / County - FCPA
PIN:	0484 18 A, 0582 10 A, 0582 01 0012, 0484 01 0010, 0484 01 0049B, 0484 01 0012B, 0484 11 A1, 0484 01 0012C, 0484 11 B
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Hunters Branch

Description: This project is proposed to restore an eroded section of Hunter’s Branch that originates at the confluence of Hunter’s Branch with Accotink Creek and extends upstream to near the intersection of Bailey Lane and Stonehurst Drive. Most of the downstream portion of this project is within County park property; however, the upstream portion is privately-owned residential and commercial properties. Currently, this channel is experiencing severe bank and bed erosion. Several utility crossings within the stream channel are stabilized with large riprap, which is leading to downstream scour pools and erosion.

Restoring this channel would include removing riprap and creating more stable stream crossings, repairing scour pools, regrading and stabilizing eroded stream banks with armor-in-place and bioengineering techniques, installing grade controls to dissipate energy, and removing invasive species. Restoration efforts should also focus on reconnecting this channel to the floodplain by reducing channel dimensions and raising bed elevations.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Restoring this channel will help to reduce sediment loads to Accotink Creek by reducing bed scour, bank scour, over-widening, and meander bend migration. Reconnecting the channel to the original floodplain will dissipate high flows that could cause erosion and can reduce downstream sediment loads by allowing suspended sediment to be deposited on the floodplain. This project will also improve instream habitat by limiting the amount of sedimentation due to bank and bed erosion and creating stable habitat within the newly constructed channel. It is estimated that a total of 369,145 lbs of sediment, 295 lbs of total nitrogen and 114 lbs of total phosphorus would be reduced annually by this project. Paved walking paths parallel this project and may be used for access during construction to limit forest impacts and to provide an educational opportunity for residents.

Project Design Considerations: Since private residential and commercial properties adjoin the stream, coordination with these property owners will be necessary for access and construction. Access to the upstream portion of this project could occur from Nutley Street or from adjoining condominium properties and access to the downstream portion could occur from existing paved walking paths that adjoin the stream channel. Access from any of these points along the proposed restoration will require significant tree removal. Although tree loss is expected, restoration benefits will outweigh overall construction impacts. This project will require environmental permitting to allow for construction and modifications to a perennial stream channel and for forest impacts. Existing utility impacts are also possible as a sewer line parallels the stream and several utility crossings were noted within the existing channel.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	3722	LF	\$200	\$744,400
Clear and Grub	4.27	AC	\$10,000	\$42,700
Plantings	4.27	AC	\$25,000	\$106,750
Additional Cost, First 500 LF	500	LF	\$200	\$100,000
			Initial Project Cost	\$993,850
Ancillary Items	1	LS	5% of project	\$49,693
Erosion and Sediment Control	1	LS	10% of project	\$99,385
			Base Construction Cost	\$1,142,928
			Mobilization (5%)	\$57,146
			Subtotal 1	\$1,200,074
			Contingency (25%)	\$300,019
			Subtotal 2	\$1,500,093
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				\$675,042
			Estimated Project Cost	\$2,176,000



Figure 1: Severe bed and bank erosion just downstream of a utility covered by riprap near the confluence with Accotink Creek



Figure 2: Large debris and severely eroded banks south of Arlington Boulevard

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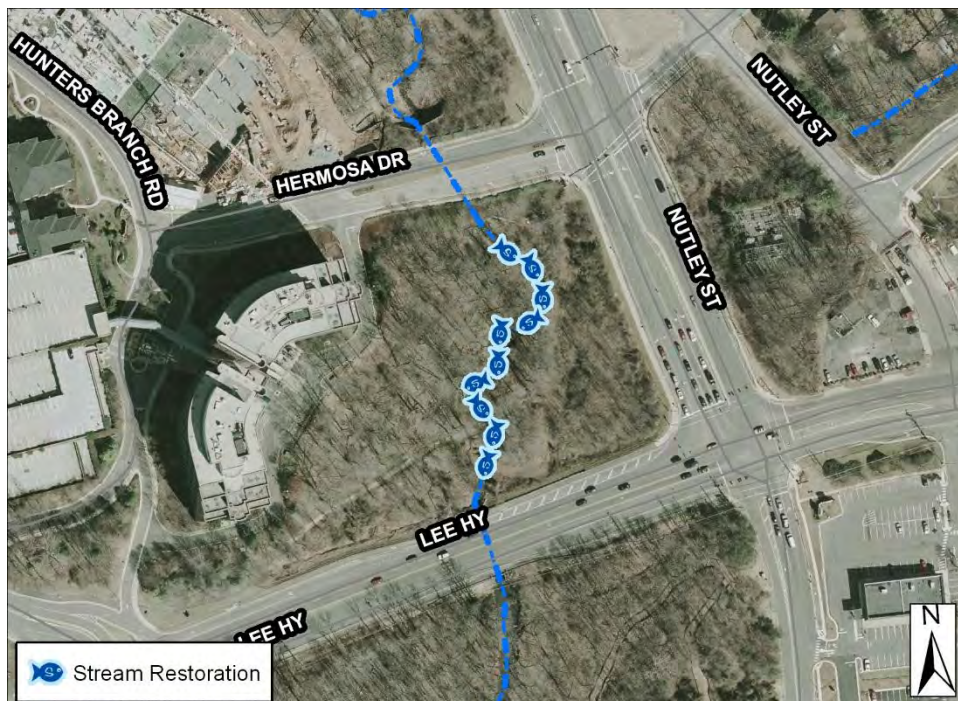
AC9242 - Stream Restoration



Vicinity Map

Address:	9302 Lee Highway
Location:	Lee Hwy and Nutley St
Land Owner:	Private
PIN:	0484 01 0001G, 0484 01 0001E
Control Type	Water Quality
Drainage Area	N/A
Receiving Waters	Hunters Branch

Description: This project is designed to restore an eroded section of Hunter's Branch immediately upstream and downstream of a pedestrian bridge between Hermosa Drive and Lee Highway. The streambank in this location is eroding around the bridge, leading to severe scour at the edges of the bridge and possible future bridge failure. Restoring this channel would include regrading and stabilizing eroded stream banks with armor-in-place and bioengineering techniques and repairing the existing pedestrian bridge.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementing this project will stabilize the streambank and improve pedestrian safety as local residents use this bridge and its associated walking paths. This project will address bank instability and scour and overwidening, which all produce excessive sediment loads to downstream channels. Reduced sediment loads and new channel creation with stable habitat along restored banks will all help to improve instream water quality and aquatic habitat. It is estimated that a total of 41,752 lbs of sediment, 33 lbs of total nitrogen and 13 lbs of total phosphorus would be reduced annually by this project.

Project Design Considerations: Since private residential and commercial properties adjoin the stream, coordination with these property owners will be necessary for access and construction. Access to this project could occur from Nutley Street or from adjoining condominium properties. Access from any of these points along the proposed restoration will require significant tree removal and manipulation of steep slopes. Although tree loss is expected, restoration benefits will outweigh overall construction impacts. This project will require environmental permitting to allow for construction and modifications to a perennial stream channel and for forest impacts. Existing utility impacts are possible with this restoration as a sewer line parallels the stream.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	409	LF	\$200	\$81,800
Clear and Grub	0.40	AC	\$10,000	\$4,000
Plantings	0.40	AC	\$25,000	\$10,000
Additional Cost, First 500 LF	409	LF	\$200	\$81,800
			Initial Project Cost	\$177,600
Ancillary Items	1	LS	5% of project	\$8,880
Erosion and Sediment Control	1	LS	10% of project	\$17,760
			Base Construction Cost	\$204,240
			Mobilization (5%)	\$10,212
			Subtotal 1	\$214,452
			Contingency (25%)	\$53,613
			Subtotal 2	\$268,065
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	\$120,629
			Estimated Project Cost	\$389,000



Figure 1: Eroded banks and scour at a footbridge near Lee Highway

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