

## AC9208 - Stream Restoration



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

**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.

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	<b>\$100,000</b>
			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	<b>\$314,889</b>
			Mobilization (5%)	\$15,744
			<b>Subtotal 1</b>	\$330,633
			Contingency (25%)	\$82,658
			<b>Subtotal 2</b>	\$413,291
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	\$185,981
			<b>Estimated Project Cost</b>	<b>\$600,000</b>



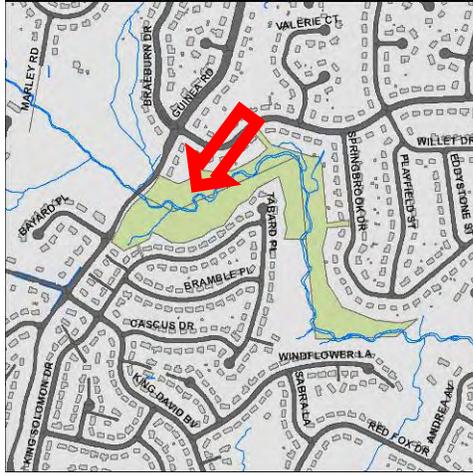
*Site Photo: Over-widening channel with moderate to severe erosion*



*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 Stream Valley  
Park  
**Land Owner:** County - FCPA  
**PIN:** 0692 15 G, 0692 01 0016  
**Control Type** Water Quality  
**Drainage Area** N/A  
**Receiving Waters** Long Branch Central

**Description:** This project is located within Long Branch Stream Valley 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.

<b>Costs:</b>				
<b>ITEM</b>	<b>QUANTITY</b>	<b>UNITS</b>	<b>UNIT COST</b>	<b>TOTAL</b>
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	<b>\$100,000</b>
			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	<b>\$775,167</b>
			Mobilization (5%)	\$38,758
			<b>Subtotal 1</b>	\$813,925
			Contingency (25%)	\$203,481
			<b>Subtotal 2</b>	\$1,017,406
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				\$457,833
			<b>Estimated Project Cost</b>	<b>\$1,476,000</b>



*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 neighborhood  
**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 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	<b>\$100,000</b>
			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	<b>\$756,736</b>
			Mobilization (5%)	\$37,837
			<b>Subtotal 1</b>	\$794,573
			Contingency (25%)	\$198,643
			<b>Subtotal 2</b>	\$993,216
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	\$446,947
			<b>Estimated Project Cost</b>	<b>\$1,441,000</b>



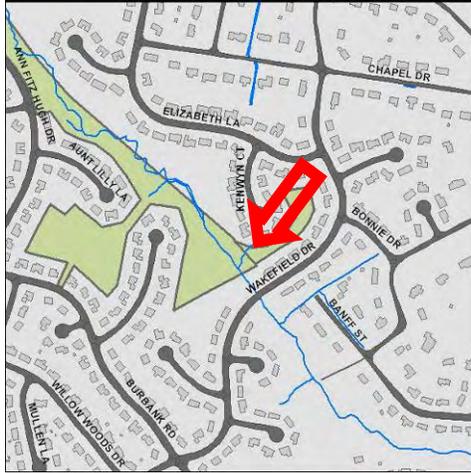
*Site Photo: Over-widened channel downstream of I-495*



*Site Photo: Moderate to severe erosion on meander bends*

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## AC9211 - Stream Restoration



**Address:** Between Kenwen Court and Wakefield Drive  
**Location:** Truro neighborhood  
**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 and 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, a tributary to Mainstem 3. 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	<b>\$34,000</b>
			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	<b>\$93,909</b>
			Mobilization (5%)	\$4,695
			<b>Subtotal 1</b>	\$98,604
			Contingency (25%)	\$24,651
			<b>Subtotal 2</b>	\$123,255
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	\$55,465
			<b>Estimated Project Cost</b>	<b>\$179,000</b>



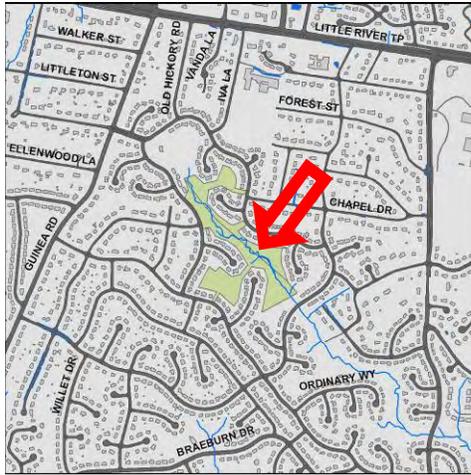
*Site Photo: Moderate erosion under footbridge*



*Site Photo: Moderate bank erosion*

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## AC9212 - Stream Restoration



**Address:** 4200-4300 blocks of Elizabeth Lane  
**Location:** Truro neighborhood  
**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	<b>\$100,000</b>
			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	<b>\$396,133</b>
			Mobilization (5%)	\$19,807
			<b>Subtotal 1</b>	\$415,940
			Contingency (25%)	\$103,985
			<b>Subtotal 2</b>	\$519,925
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	\$233,966
			<b>Estimated Project Cost</b>	<b>\$754,000</b>



*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



**Address:** Between Ann Fitzhugh Drive, Mary Lee Lane and Elizabeth Lane

**Location:** Truro neighborhood

**Land Owner:** Private - Residential

**PIN:** 0584 21 B, 0701 12 G, 0701 12 M

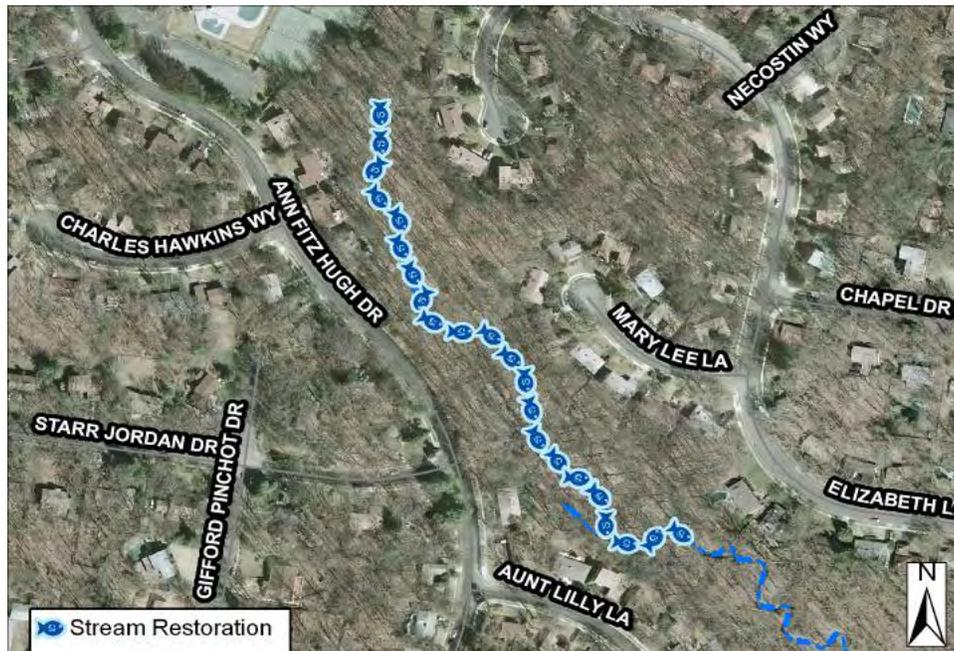
**Control Type:** Water Quality

**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	<b>\$100,000</b>
			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	<b>\$531,220</b>
			Mobilization (5%)	\$26,561
			<b>Subtotal 1</b>	\$557,781
			Contingency (25%)	\$139,445
			<b>Subtotal 2</b>	\$697,226
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				\$313,752
			<b>Estimated Project Cost</b>	<b>\$1,011,000</b>



*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



<b>Address:</b>	4200 block of Woodlark Drive
<b>Location:</b>	Wakefield Park
<b>Land Owner:</b>	County - FCPA
<b>PIN:</b>	0702 02 P
<b>Control Type</b>	Water Quality
<b>Drainage Area</b>	N/A
<b>Receiving Waters</b>	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	<b>\$100,000</b>
			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	<b>\$326,173</b>
			Mobilization (5%)	\$16,309
			<b>Subtotal 1</b>	\$342,482
			Contingency (25%)	\$85,621
			<b>Subtotal 2</b>	\$428,103
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	\$192,646
			<b>Estimated Project Cost</b>	<b>\$621,000</b>



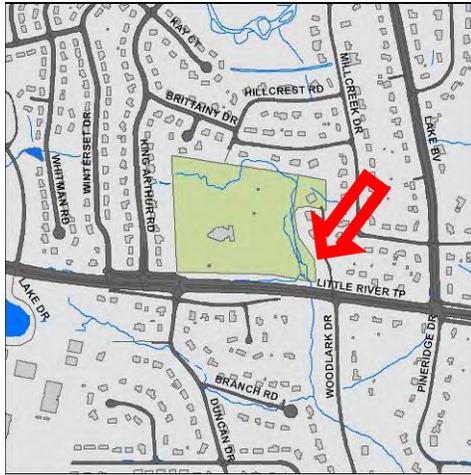
*Site Photo: Severe erosion next to sanitary sewer and property owner*



*Site Photo: Downstream side of culvert under Woodlark Drive*

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## AC9215 - Stream Restoration



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

**Description:** This project is located just upstream of the VDOT road 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. It is estimated that a total of 80,188 lbs of sediment, 64 lbs of total nitrogen and 25 lbs of total phosphorus would be reduced by this project.

**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	<b>\$60,400</b>
			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	<b>\$180,778</b>
			Mobilization (5%)	\$9,039
			<b>Subtotal 1</b>	\$189,817
			Contingency (25%)	\$47,454
			<b>Subtotal 2</b>	\$237,271
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				\$106,772
			<b>Estimated Project Cost</b>	<b>\$345,000</b>



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



*Site Photo: Eroded ditch paralleling Little River Turnpike*

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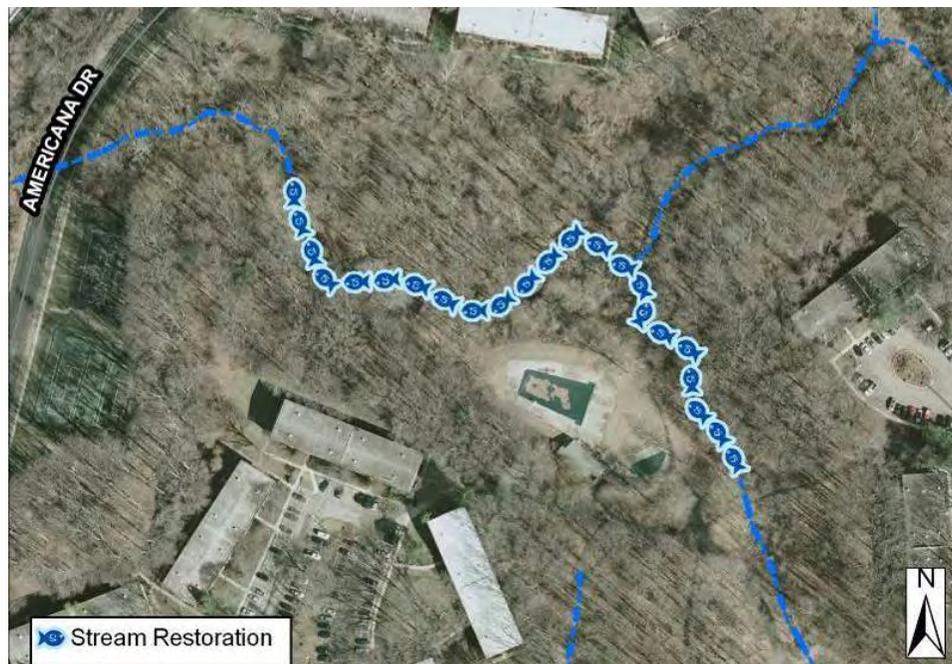
## AC9216 - Stream Restoration



<b>Address:</b>	4300 block of Americana Drive
<b>Location:</b>	Lafayette Forest neighborhood
<b>Land Owner:</b>	Private - Residential
<b>PIN:</b>	N/A
<b>Control Type</b>	Water Quality
<b>Drainage Area</b>	N/A
<b>Receiving Waters</b>	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	<b>\$100,000</b>
			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	<b>\$426,099</b>
			Mobilization (5%)	\$21,305
			<b>Subtotal 1</b>	\$447,404
			Contingency (25%)	\$111,851
			<b>Subtotal 2</b>	\$559,255
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	\$251,665
			<b>Estimated Project Cost</b>	<b>\$811,000</b>



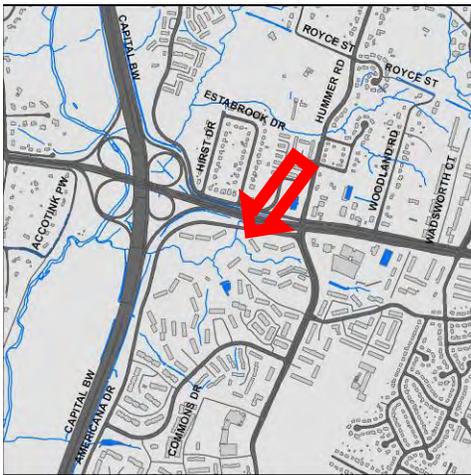
*Site Photo: Severe bank erosion along meanders*



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

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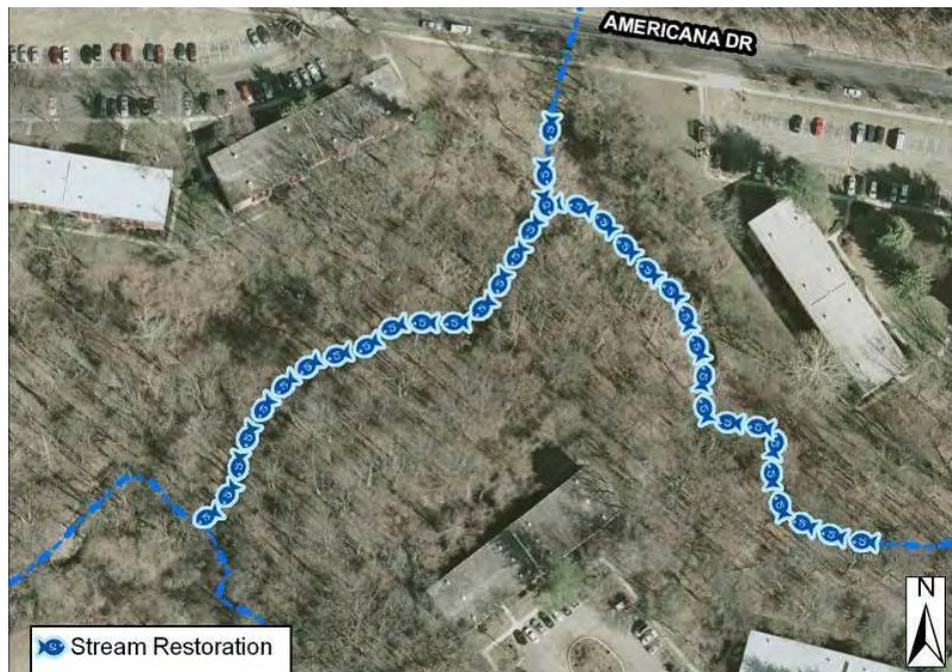
## AC9217 - Stream Restoration



<b>Address:</b>	4200 block of Americana Drive
<b>Location:</b>	Lafayette Forest neighborhood
<b>Land Owner:</b>	Private - Residential
<b>PIN:</b>	N/A
<b>Control Type</b>	Water Quality
<b>Drainage Area</b>	N/A
<b>Receiving Waters</b>	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. This 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	<b>\$100,000</b>
			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	<b>\$474,387</b>
			Mobilization (5%)	\$23,719
			<b>Subtotal 1</b>	\$498,106
			Contingency (25%)	\$124,527
			<b>Subtotal 2</b>	\$622,633
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	\$280,185
			<b>Estimated Project Cost</b>	<b>\$903,000</b>



*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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