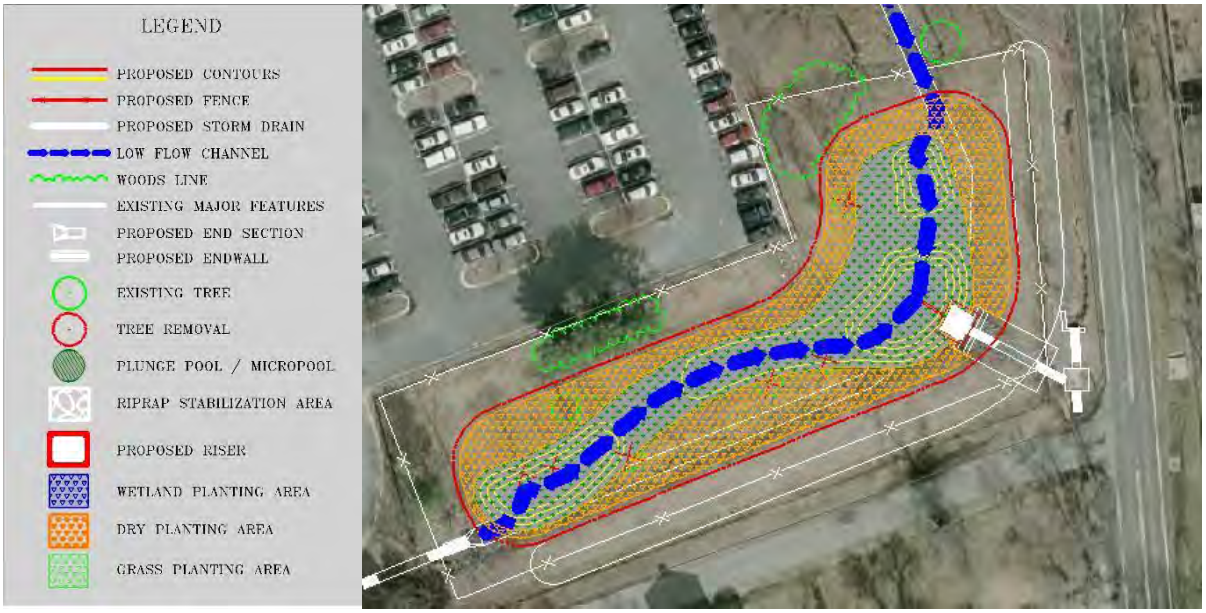
BE9100 Stormwater Pond Retrofit

Vicinity Map

Address:	6500 Quander Road
Location:	West Potomac High School
Land Owner:	County - FCPS
PIN:	0931 01 0054
Control Type	Water Quality and Quantity
Drainage Area	42.28 acres
Receiving Waters	Quander Brook

Description: This project is designed to retrofit an existing detention basin adjacent to West Potomac High School by converting it to a shallow wetland. The pond collects runoff from a part of the High School and medium density residential area west of the site through an existing storm drain network. The bottom of the detention basin will be excavated to incorporate wetland planting zones and meandering flow channels. A new control structure will be installed on the existing barrel pipe to increase the pond's detention time.



Project Area Map

Project Benefits: This facility has the potential to meet the water quality treatment requirement for the contributing drainage area by incorporating a wetland component into this facility. The permanent wet storage will promote uptake of nutrients, removal of pollutants to downstream channels, and suspension of floatables. It is estimated that a total over 3,360 lbs of sediment, 1.2 lbs of total nitrogen and 5.6 lbs of total phosphorus would be reduced by this project. Peak flow management of the 2-year storm can be provided by installing a new riser structure. This action will reduce erosive velocities exiting the facility and preserve downstream channel conditions. The proposed location of this facility is on the West Potomac High School grounds, which will eliminate or reduce the need for land purchase or acquisition and provides an environmental education/stewardship opportunity for students and parents within the Belle Haven community.

Project Design Considerations: The maximum storage volume in this facility is not capable of reducing 10-year discharge volumes to pre-development conditions. Signs promoting safety and environmental education/stewardship can be used at this site to educate students and parents in the community. Minimal tree removal is required for this retrofit. Environmental permitting issues are expected due to the presence of stream baseflow and wetlands in the facility. Access to the proposed facility is good. Existing utilities conflicts are not anticipated.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Clear and Grub	0.59	AC	$8,500.00	$5,015
Excavate to create low-flow channel	381	LF	$25.00	$9,525
Curb Opening	1	EA	$2,000.00	$2,000
Tree Removal	6	EA	$2,000.00	$12,000
New Riser	1	LS	$8,000.00	$8,000
Embedded Dewatering Pipe	1	EA	$500.00	$500
Grading and Excavation	876	CY	$35.00	$30,660
Remove Existing Headwall	1	LS	$1,200.00	$1,200
Soil Borings	1	LS	$7,500.00	$7,500
			Initial Project Costs	**$76,400**
Plantings	1	LS	5% of Project	$3,820
Ancillary Items	1	LS	5% of Project	$3,820
Erosion and Sediment Control	1	LS	10% of Project	$7,640
			Base Construction Cost	**$91,680**
			Mobilization (5%)	$4,584
			Subtotal 1	$96,264
			Contingency (25%)	$24,066
			Subtotal 2	$120,330
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$54,149
			Estimated Project Cost	**$174,000**

BE9100_1.jpg: View of pond inflow

BE9100_2.jpg: View of existing pond

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BE9102 New Stormwater Pond

Vicinity Map

Address:	6701 Fort Hunt Road
Location:	Belle View Elementary School
Land Owner:	County – FCPS
PIN:	0932 01 0005
Control Type	Water Quality and Quantity
Drainage Area	4.12 acres
Receiving Waters	Belle Haven West Channel

Description: This project proposes implementation of an extended detention dry pond at Belle View Elementary School. Project BE9102 will treat runoff from Belle View Elementary School rooftops and parking lots. Implementation of the project will increase the detention time and improve the water quality of runoff from the project sites.

Project Area Map

Project Benefits: This facility has the potential to provide water quality via extended detention of the one-half inch, 48 hour storm, and provide 2-year and 10-year peak flow management for the drainage area. This facility will promote removal of suspended solids and floatables to downstream channels, reduce future erosion of downstream channels, and improve overall water quality and habitat. It is estimated that a total of 840 lbs of sediment, 8.4 lbs of total nitrogen and 1.9 lbs of total phosphorus would be reduced by this project. The proposed location of this facility can provide an environmental education/stewardship opportunity for residents of the Belle Haven community.

Project Design Considerations: A potential loss of recreation area at the school will result from construction of this facility. A fence around proposed facility is recommended to promote public safety. No environmental permitting issues are anticipated for this project. Access to the proposed facility is good. Existing utility conflicts are not anticipated. Modifications of existing storm drain systems are necessary to convey runoff from impervious surfaces to the proposed facility.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Clear and Grub	0.2	AC	$8,500.00	$1,700
New Inlet	1	EA	$2,500.00	$2,500
New Endwall	1	EA	$2,500.00	$2,500
New Riser	1	LS	$8,000.00	$8,000
Drainage Pipe	50	LF	$125.00	$6,250
Rip Rap Stabilization	71	SY	$100.00	$7,100
Excavate to create low-flow channel	184	LF	$25.00	$4,600
Grading and Excavation	1705	CY	$35.00	$59,675
Embankment	426	CY	$50.00	$21,300
Soil Borings	1	LS	$7,500.00	$7,500
			Initial Project Costs	**$121,125**
Plantings	1	LS	5% of Project	$6,056
Ancillary Items	1	LS	5% of Project	$6,056
Erosion and Sediment Control	1	LS	10% of Project	$12,113
			Base Construction Cost	**$145,350**
			Mobilization (5%)	$7,268
			Subtotal 1	$152,618
			Contingency (25%)	$38,155
			Subtotal 2	$190,773
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$85,848
			Estimated Project Cost	**$277,000**

BE9102_1.jpg: Open area for proposed pond at Belle View ES

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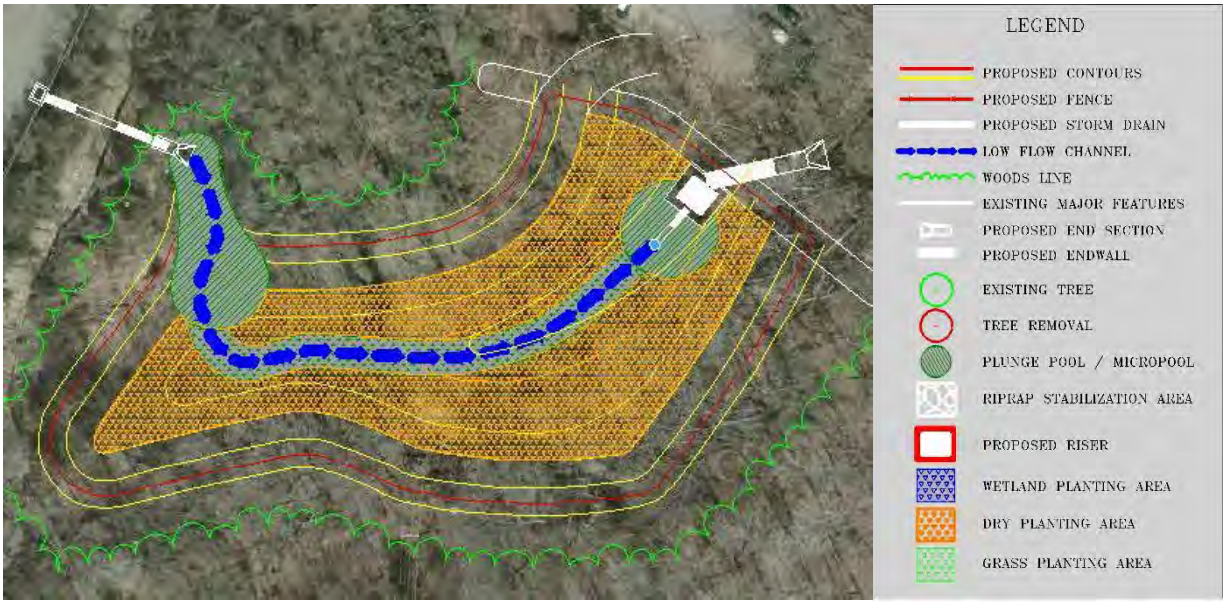
BE9103 New Stormwater Pond

Vicinity Map

Address:	Richmond Hwy and Fairview Dr
Location:	Fairchild Property
Land Owner:	County
PIN:	0833 01 0024
Control Type	Water Quality and Quantity
Drainage Area	97.93 acres
Receiving Waters	Quander Brook

Description: This project is proposed to create an extended detention dry pond with a sediment forebay at Fairchild Property. The pond is designed for multiple benefits: to provide quantity and quality control for a large untreated impervious area upstream, to reduce erosive flows downstream, to work with the proposed stream restoration projects in Quander Brook and to improve conditions at adjacent storm drain outfalls. Runoff from commercial, industrial and residential area along Richmond Highway will be treated by this pond for pollutants including nitrogen, phosphorus and total suspended solids.



Project Area Map

Project Benefits: This facility can meet the water quality treatment requirement for the contributing drainage area via extended detention of the one-half inch, 48 hour storm, as well as peak flow management of the 2-year and 10-year peak runoff volumes. This facility will promote uptake of nutrients, removal of pollutants to downstream channels, suspension of floatables, promote a healthier habitat, and help prevent future erosion of downstream channels. It is estimated that a total over 15,000 lbs of sediment, 158.0 lbs of total nitrogen and 24.4 lbs of total phosphorus would be reduced by this project. Peak flow rates, erosive velocities, and channel sediment loads will also be reduced.

Project Design Considerations: The proposed facility would require a significant amount of forest/tree removal and existing stream channel removal. Environmental permitting issues are expected due to the in-stream location. Access to the proposed facility could be achieved behind the commercial property along Richmond Highway (Rte. 1); however modification of steep slopes, modification of incised channel banks, and significant amounts of tree removal would be necessary for construction equipment. Construction of this facility will require a large amount of excavation and grading to achieve the required volume and the proposed embankment may warrant an elevated hazard classification and/or dam breach analysis. In-stream construction will require base flow diversion.

As the land may be conveyed to the Fairfax County Park Authority in the future, project design and implmentation should be coordinated closely with the FCPA and should allow for park amenities such as trails and planting. The parcel contains two significant sites located on archaeological surveys, and testing or data recovery/avoidance may be required.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Clear and Grub (heavy)	3.32	AC	$12,750.00	$42,330
Drain Pipe	125	LF	$125.00	$15,625
Plungepool / Micropool	2	EA	$500.00	$1,000
New Inlet	1	EA	$2,500.00	$2,500
New Endwall	2	EA	$2,500.00	$5,000
New Riser	1	LS	$8,000.00	$8,000
Embedded Dewatering Pipe	1	EA	$500.00	$500
Excavate to create low-flow channel	368	LF	$25.00	$9,200
Rip Rap Stabilization	73	SY	$100.00	$7,300
Grading and Excavation	6484	CY	$35.00	$226,940
Soil Borings	1	LS	$10,000.00	$10,000
			Initial Project Costs	**$328,395**
Plantings	1	LS	5% of Project	$16,420
Ancillary Items	1	LS	5% of Project	$16,420
Erosion and Sediment Control	1	LS	10% of Project	$32,840
			Base Construction Cost	**$394,075**
			Mobilization (5%)	$19,704
			Subtotal 1	$413,779
			Contingency (25%)	$103,445
			Subtotal 2	$517,224
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$232,751
			Estimated Project Cost	**$750,000**

BE9103_1.jpg: View of proposed pond site

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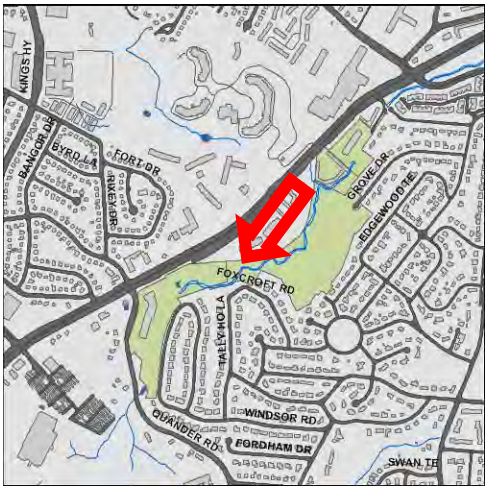
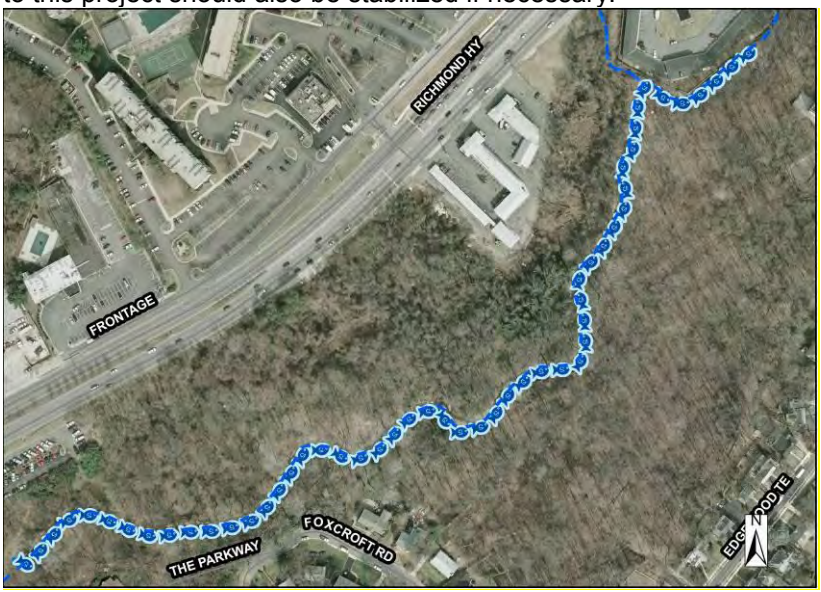
BE9200 Stream Restoration



Vicinity Map

Address:	Between Richmond Hwy, Foxcroft Rd, and Edgewood Terrace
Location:	Belle Haven Park
Land Owner:	County - FCPA
PIN:	0833 01 0053F, 0833 01 0052B, 0833 01 0059
Control Type	Water Quality
Drainage Area	NA
Receiving Waters	Quander Brook

Description: This project proposes to restore an eroded section of Quander Brook located between Richmond Highway, Foxcroft Road, and Edgewood Terrace. Most of this project is within Belle Haven Park property; however, the upstream and downstream portions are within privately-owned commercial properties. Currently, this channel is experiencing severe bank and bed erosion. At this time, stormwater controls are not present upstream of this proposed restoration. However, projects BE9103, BE9202, and BE9601 have been proposed upstream and restoration of this channel should follow the design and construction of these projects to allow for proper sequencing. Restoration of this channel will include regrading and stabilizing eroded stream banks with armor-in-place and bioengineering techniques, and installation of grade controls to dissipate energy. All stormdrain outfalls and tributary channel connections to this project should also be stabilized if necessary.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementation of this project will provide a reduction in sediment supply to receiving stream channels by reducing bank scour and stream bed incision. Benefits from implementing BE9103, BE9202, and BE9601 will also help to provide water quality and quantity benefits to this restored channel. 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 over 622,000 lbs of sediment, 498.0 lbs of total nitrogen and 193.0 lbs of total phosphorus would be reduced by this project. This project is mostly contained within park property, which alleviates some of the need for land purchase or acquisition.

Project Design Considerations: Since the upstream and downstream most portions of this project are contained within private commercial properties, significant coordination with these property owners will be necessary for access and construction. Access to the upstream portion of this project could occur from the car dealership parking lot adjacent to Richmond Highway, at the end of Foxcroft Lane, or at the end of Windsor Road. Access from any of these points along the proposed restoration will require significant tree removal and manipulation of steep slopes. Access to the downstream portion of this project could occur at the end of Grove Drive. Significant 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 not anticipated with this restoration.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Clear and Grub	4.5	Ac	$10,000.00	$45,000
Plantings	4.5	Ac	$25,000.00	$112,500
Construct New Channel	2400	LF	$200.00	$480,000
Additional Cost, First 500 LF	500	LF	$200.00	$100,000
			Initial Project Costs	**$737,500**
Ancillary Items	1	LS	5% of Project	$36,875
Erosion and Sediment Control	1	LS	10% of Project	$73,750
			Base Construction Cost	**$848,125**
			Mobilization (5%)	$42,406
			Subtotal 1	$890,531
			Contingency (25%)	$222,633
			Subtotal 2	$1,113,164
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$500,924
			Estimated Project Cost	**$1,614,000**

BE9200_1.jpg: View of stream section

BE9200_2.jpg: View of erosion along the banks

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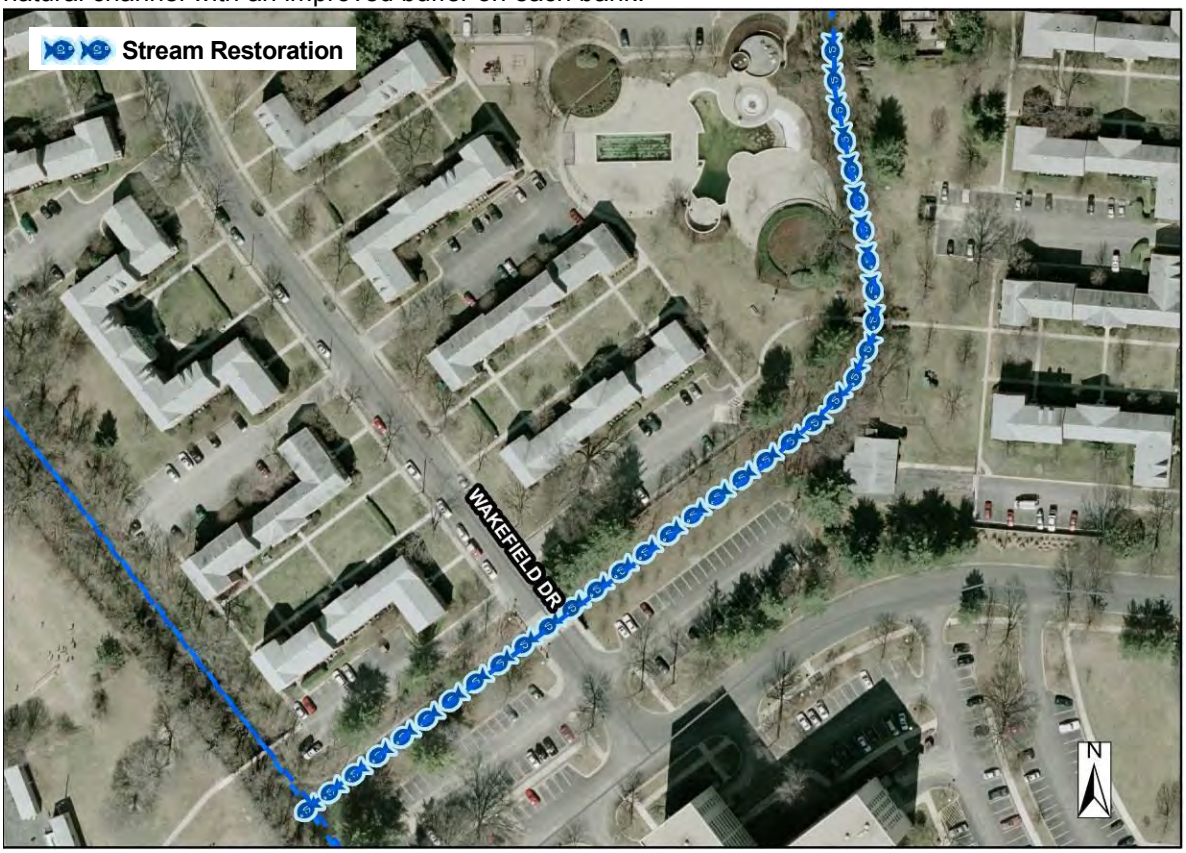
BE9201 Stream Restoration

Vicinity Map

Address:	W Wakefield Dr and Wakefield Dr
Location:	Belle View Condos
Land Owner:	Private - Residential
PIN:	Various
Control Type	Water Quality
Drainage Area	NA
Receiving Waters	Belle Haven West Channel

Description: This project is located between Potomac Avenue and Wakefield Drive and extends from Belle View Boulevard downstream to the confluence with the Belle Haven West Channel. Currently, this channel is concrete lined and very straight with mowed grass or trees on each side of the channel. Restoration efforts should focus on removing the existing 1130 feet of concrete channel and replacing it with a more natural channel with an improved buffer on each bank.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Removal of the concrete channel will create instream habitat and riparian plantings along the channel where feasible, will shade the stream and provide some additional bank protection and habitat. A natural channel would help to slow erosive velocities, reduce water temperatures, and allow for nutrient uptake from plantings. Note that removing the concrete will allow for the creation of a natural channel that will be connected to reaches above and below the restoration area that are currently stable.
Property owners along this project might welcome the aesthetic changes of the current channel to a natural, restored channel.

Project Design Considerations: This project is entirely contained within private property and will require significant coordination with property owners for access and construction. This project will require environmental permitting due to construction and modifications to a stream channel. Adequate area for construction and development of a true natural channel may be lacking at this site. Site is very accessible. No major design or construction issues anticipated. Minimal tree loss can be expected with this project. Both upstream and downstream reaches have been assessed as good condition. Restoring this area will connect the reaches with better habitat conditions.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Concrete channel removal	1130	LF	$30.00	$33,900
Clear and Grub	1.25	Ac	$10,000.00	$12,500
Plantings	1.25	Ac	$25,000.00	$31,250
Construct New Channel	1130	LF	$200.00	$226,000
Additional Cost, First 500 LF	500	LF	$200.00	$100,000
			Initial Project Costs	**$403,650**
Ancillary Items	1	LS	5% of Project	$20,183
Erosion and Sediment Control	1	LS	10% of Project	$40,365
			Base Construction Cost	**$464,198**
			Mobilization (5%)	$23,210
			Subtotal 1	$487,408
			Contingency (25%)	$121,852
			Subtotal 2	$609,260
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$274,167
			Estimated Project Cost	**$883,000**

BE9201_1.jpg: View of concrete channel section

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BE9202 Stream Restoration

Vicinity Map

Address:	6240 Shields Ave
Location:	Upstream of Quander Rd
Land Owner:	Private - Residential
PIN:	0833 01 0025
Control Type	Water Quality
Drainage Area	NA
Receiving Waters	Quander Brook

Description: This project is located along Vanport Street and extends from the outlet of the proposed stormwater facility BE9103 to just upstream of the culvert under Quander Road. Currently this channel is mostly straight, incised, over-widened, and contains a riparian buffer that is comprised of many invasive species. At this time, stormwater controls are not present upstream of this proposed restoration. Restoration of this channel should follow the design and construction of project BE9103 to allow for proper sequencing of stream design for appropriate flows and velocities. Restoration of this channel will include regrading and stabilizing eroded stream banks with armor-in-place and bioengineering techniques. Restoration will also include the installation of grade controls to dissipate energy and some stone toe protection to ensure future bank stability. Buffer restoration along regraded areas and where extensive amounts of invasive vegetation are present will be necessary to promote future stability and to restore ecological function. Since this restoration is entirely contained within private residential property and the floodplain is confined due to topography, raising the bed elevation of this channel to reconnect higher flows to the floodplain or regrading the floodplain to create a new bench is not desirable. Most of the current floodplain is forested on both sides of the existing channel.

Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementation of this project will provide a reduction in sediment supply to receiving stream channels by reducing bank scour and stream bed incision. Benefits from implementing BE9103 will also help to provide water quality and quantity benefits to this restored channel. It is estimated that a total of over 340,000 lbs of sediment, 271.8 lbs of total nitrogen and 105.3 lbs of total phosphorus would be reduced by this project. Overall, stream habitat and water quality may be improved due to stable habitat creation and reductions in available sediment supply. Restoring the existing riparian buffer along this reach will also provide future channel stability and ecological benefits.

Project Design Considerations: This project is entirely contained within private residential land and will require significant coordination with property owners for access and construction. Access to this project will need to occur from either Vanport Street or off of Quander Road. Access from either of these points along the proposed restoration will require tree removal and manipulation of some steep slopes. Significant tree loss is expected with this restoration; however, restoration benefits and proposed buffer enhancements 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 not anticipated with this restoration.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Clear and Grub	0.5	Ac	$10,000.00	$5,000
Plantings	0.5	Ac	$25,000.00	$12,500
Construct New Channel	400	LF	$200.00	$80,000
Additional Cost, First 500 LF	400	LF	$200.00	$80,000
			Initial Project Costs	**$177,500**
Ancillary Items	1	LS	5% of Project	$8,875
Erosion and Sediment Control	1	LS	10% of Project	$17,750
			Base Construction Cost	**$204,125**
			Mobilization (5%)	$10,206
			Subtotal 1	$214,331
			Contingency (25%)	$53,583
			Subtotal 2	$267,914
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$120,561
			Estimated Project Cost	**$388,000**

BE9202_1.jpg: View of stream section

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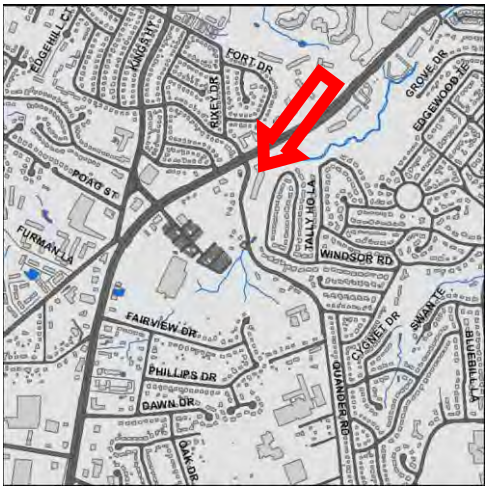
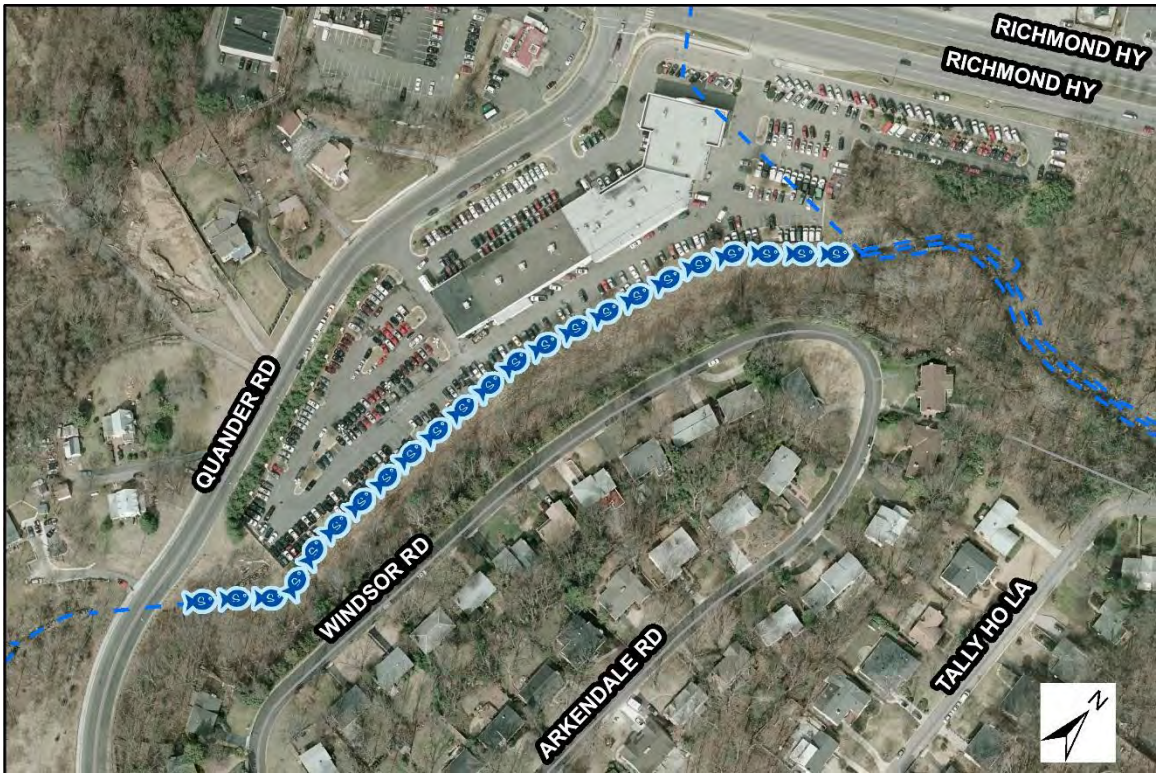
BE9203 Stream Restoration



Vicinity Map

Address:	Behind 6129 Richmond Hwy
Location:	Downstream of Quander Rd
Land Owner:	Private - Commercial
PIN:	0833 01 0052
Control Type	Peak flow control
Drainage Area	
Receiving Waters	Quander Brook

Description: Based on the modeled 100-year flow, buildings that are currently on the upstream and downstream sides of Quander Road appear to be affected due to two culverts under Quander Road and just downstream which may not be sufficient for this large flow. The proposed projects will daylight the culvert adjacent to the car dealership which will help to reduce the back water effect in this area. Restoration of this channel should follow the design and construction of BE9103 and BE9202 to allow for proper stream design and construction between projects. It should also be noted that BE9200 is located just downstream of this project and should be considered when designing the new channel for this project.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Daylighting Quander Brook will produce a stable, natural channel that may provide instream habitat, flood relief, and water quality benefits. Additional benefits from implementing BE9103 and BE9202 will help to provide water quality and quantity benefits to the proposed channel. It would also be a benefit to the community by providing recreational opportunities and potential educational benefits by demonstrating stream restoration techniques.

Project Design Considerations: The existing culvert runs adjacent to and potentially under the car dealership along Quander Road. Due to the proximity of this project, the owners of the car dealership will need to be involved and coordinated with during this project. Residential and commercial structures are close to the project site. Significant tree impacts and environmental permitting can be expected.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Concrete structures/channel removal	1	LS	$50,000.00	$50,000
Clear and Grub	3.5	Ac	$10,000.00	$35,000
Plantings	3.5	Ac	$25,000.00	$87,500
Construct New Channel	1700	LF	$200.00	$340,000
			Initial Project Cost	$512,500
Ancillary Items	1	LS	5% of project	$25,625
Erosion and Sediment Control	1	LS	10% of project	$51,250
			Base Construction Cost	**$589,375**
			Mobilization (5%)	$29,469
			Subtotal 1	**$618,844**
			Contingency (25%)	$154,711
			Subtotal 2	**$773,555**
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$348,100
			Estimated Project Cost	**$1,122,000**

BE9601_1.jpg: View of Pipe downstream of Quander Road

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BE9500 BMP/LID

Vicinity Map

Address:	Richmond Hwy and Huntington Ave
Location:	Shops at Huntington Gateway
Land Owner:	Private - Commercial
PIN:	0833 01 0076
Control Type	Water Quality
Drainage Area	1.64 acres
Receiving Waters	Quander Brook

Description: The proposed project is to create bioretention areas and install tree box filters to treat the roof and parking lot runoff from the Shops at Huntington Gateway. The tree box filters will be installed at the existing storm drain inlets in the parking lot and bioretention areas will be created by grading the existing medians.

Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementation of tree box filters and bioretention filters and basins will provide water quality treatment for the commercial parking lot runoff during storm events. These facilities remove suspended solids, heavy metals, nutrients including phosphorus and nitrogen, oil and grease from storm water runoff. It is estimated that a total over 990 lbs of sediment, 1.4 lbs of total nitrogen and total phosphorus each would be reduced by this project. The project will also prevent trash and debris from entering the storm drain system and will reduce runoff temperature.

Project Design Considerations: No environmental constraints or permitting issues are anticipated. Access to the proposed sites is excellent from the commercial parking lot; however, the property ownership is private and coordination with the owners/management will be necessary. A potential loss of parking spaces may be expected with these sites.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Tree Box Filters	2	EA	$10,000.00	$20,000
Bioretention Filters & Basin	173	SY	$150.00	$25,950
			Initial Project Cost	**$45,950**
Plantings	1	LS	5% of project (excluding pervious pavement)	$2,298
Ancillary Items	1	LS	5% of project	$2,298
Erosion and Sediment Control	1	LS	10% of project	$4,595
			Base Construction Cost	**$55,141**
			Mobilization (5%)	$2,757
			Subtotal 1	**$57,898**
			Contingency (25%)	$14,475
			Subtotal 2	**$72,373**
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$32,568
			Estimated Project Cost	**$105,000**

BE9500_1.jpg: View of existing storm drain inlet

BE9500_2.jpg: View of existing median to be graded

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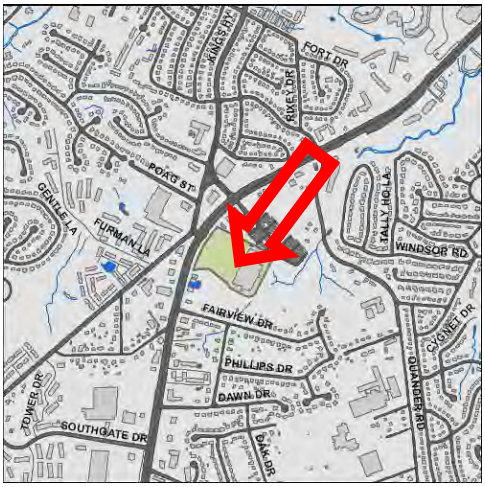
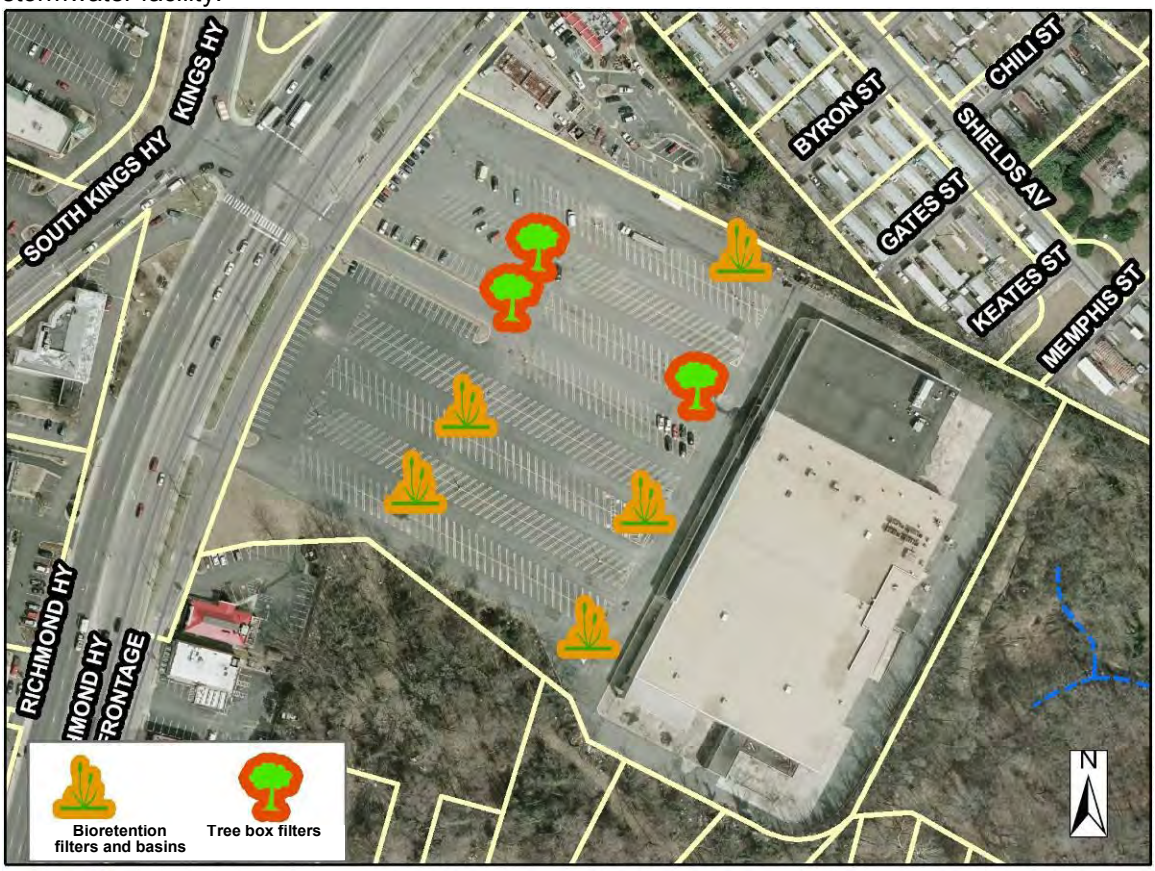
BE9501 BMP/LID



Vicinity Map

Address:	6303 Richmond Hwy
Location:	Wal-Mart and Chuck E. Cheese parking lot
Land Owner:	Private - Commercial
PIN:	0833 01 0024A
Control Type	Water Quality
Drainage Area	5.04 acres
Receiving Waters	Quander Brook

Description: Installation of bioretention filters and basins and tree box filters is proposed to treat the runoff from a large commercial strip mall parking lot located along Richmond Highway. A portion of this parking lot in the north is used for a park and ride. The majority of the south parking lot is not used and little grading would be necessary. This project is located just upstream of project BE9103, which is a proposed stormwater facility.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementation of the project will provide water quality treatment for this parking lot during storm events. These stormwater facilities remove suspended solids, heavy metals, nutrients and oil and grease from stormwater runoff. It is estimated that a total over 6,010 lbs of sediment, 79.5 lbs of total nitrogen and 12.4 lbs of total phosphorus would be reduced by this project. They also prevent trash and debris from entering the storm drain system and reduce runoff temperature.

Project Design Considerations: No environmental constraints or permitting issues are anticipated. Access to the proposed sites is excellent from roads and the commercial parking lot. Property ownership is private and coordination with the shopping center owner/management will be necessary**.** A loss of parking spaces may be expected with these sites.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Tree Box Filters	3	EA	$10,000.00	$30,000
Bioretention Filters & Basin	627	SY	$150.00	$94,050
			Initial Project Cost	**$124,050**
Plantings	1	LS	5% of project (excluding pervious pavement)	$6,203
Ancillary Items	1	LS	5% of project	$6,203
Erosion and Sediment Control	1	LS	10% of project	$12,405
			Base Construction Cost	**$148,861**
			Mobilization (5%)	$7,443
			Subtotal 1	**$156,304**
			Contingency (25%)	$39,076
			Subtotal 2	**$195,380**
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$87,921
			Estimated Project Cost	**$283,000**

BE9501_1.jpg: View of existing parking lot

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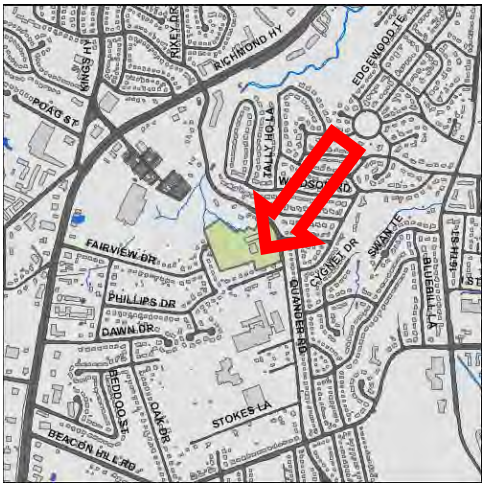
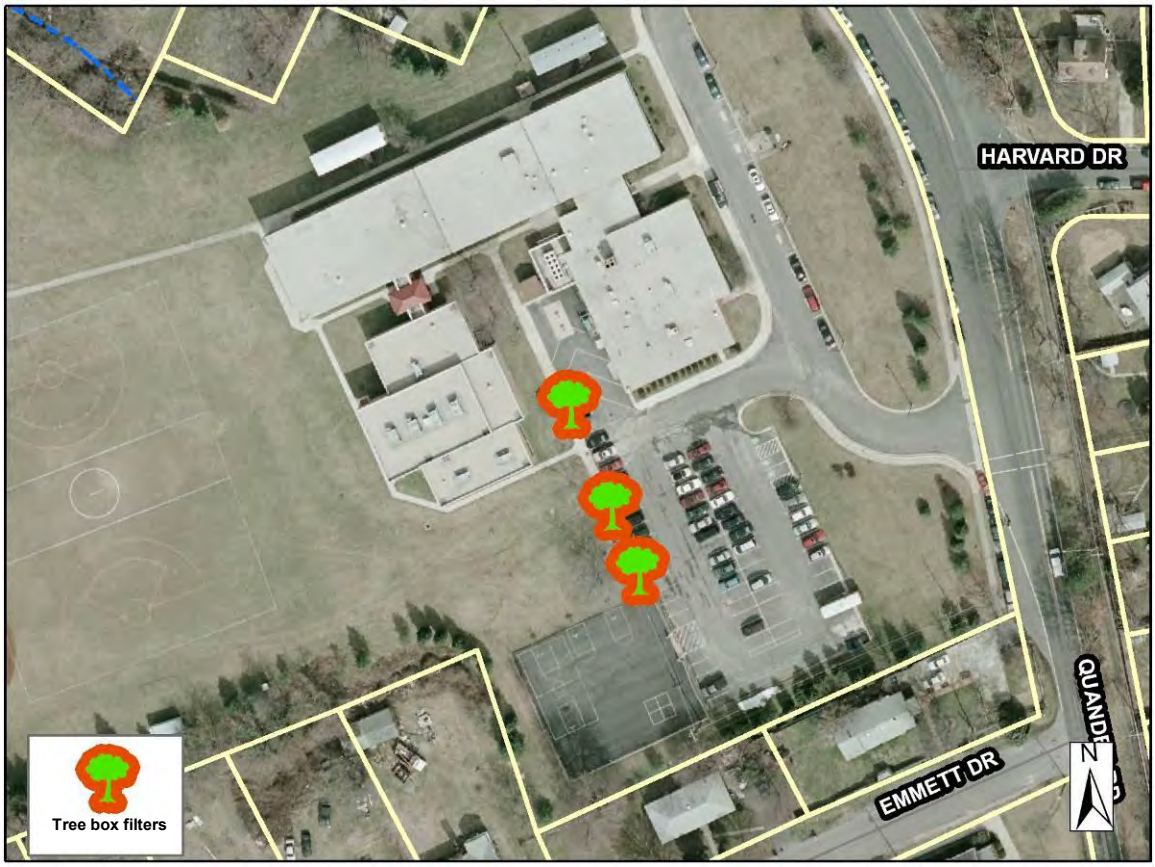
BE9502 BMP/LID



Vicinity Map

Address:	6400 Quander Road
Location:	Quander Road School
Land Owner:	County - FCPS
PIN:	0931 03 0005
Control Type	Water Quality
Drainage Area	0.92 acres
Receiving Waters	Quander Brook

Description: The proposed project is to install tree box filters to receive parking lot runoff at Quander Road School. The project site is the parking lot east of the school near the entrance. Tree box filters will be installed at three existing inlets in the parking lot.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementation of tree box filters will provide water quality treatment for the Quander Road School parking lot runoff during storm events. Tree box filters remove oil and grease, heavy metals, nutrients including phosphorus and nitrogen, and suspended solids from storm water runoff. It is estimated that a total over 830 lbs of sediment and 1.0 lbs of total phosphorus would be reduced by this project, total nitrogen reduction is negligible. They also prevent trash and debris from entering the storm drain system and have the ability to cool down warm runoff. Access to the proposed sites is excellent from the school parking lot. This site will provide an environmental education/stewardship opportunity for students and parents within the Belle Haven community.

Project Design Considerations: No environmental constraints or permitting issues are anticipated. Signs promoting environmental education/stewardship could be used at this site to educate students and parents in the community. Access to the proposed sites is excellent from the Quander Road School parking lot. Modifications to the existing storm drain system may be necessary to drain the proposed Bioretention Filters and Basins sites. Portions of the school parking lot may be temporarily closed due to construction and could interfere with morning arrival and afternoon dismissal during the school year.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Tree Box Filters	3	EA	$10,000.00	$30,000
			Initial Project Cost	**$30,000**
Plantings	1	LS	5% of project (excluding pervious pavement)	$1,500
Ancillary Items	1	LS	5% of project	$1,500
Erosion and Sediment Control	1	LS	10% of project	$3,000
			Base Construction Cost	**$36,000**
			Mobilization (5%)	$1,800
			Subtotal 1	**$37,800**
			Contingency (25%)	$9,450
			Subtotal 2	**$47,250**
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$21,263
			Estimated Project Cost	**$69,000**

BE9502_1.jpg: View of existing parking lot

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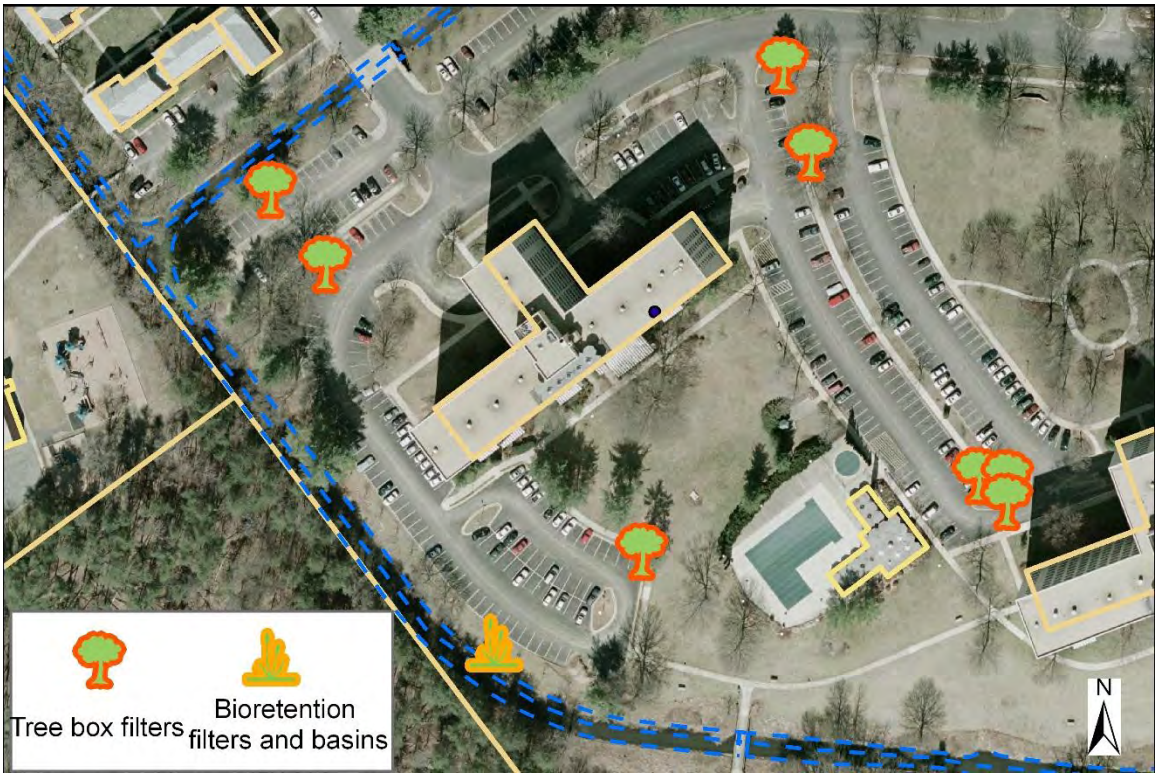
BE9503 BMP/LID

Vicinity Map

Address:	6631 Wakefield Drive,
Location:	River Towers
Land Owner:	Private – Residential
PIN:	Various
Control Type	Water Quality
Drainage Area	3.54 acres
Receiving Waters	Belle Haven West Channel

Description: This project is at River Towers on Wakefield Drive. The project proposes installation of tree box filters at the existing inlets and creation of a bioretention area to treat the runoff from the west side parking lot. Eight existing inlets will be installed with tree box filters and the open area next to the western-most parking lots will be graded and converted to a bioretention area.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementation of tree box filters and bioretention filters and basins will provide water quality treatment for the River Towers housing development parking lot runoff during storm events. These treatment systems remove suspended solids, heavy metals, nutrients including phosphorus and nitrogen, oil and grease from storm water runoff. It is estimated that a total over 1,000 lbs of sediment, 12.4 lbs of total nitrogen and 2.4 lbs of total phosphorus would be reduced by this project. They also prevent trash and debris from entering the storm drain system and have the ability to reduce runoff temperatures.

Project Design Considerations: No environmental constraints or permitting issues are anticipated. Minimal tree removal will be required. Construction access to the location is excellent from the River Towers parking lots; however, the property ownership is private and coordination with the River Towers owners/management will be necessary. A temporary or permanent loss of parking spaces can be expected.

Costs:

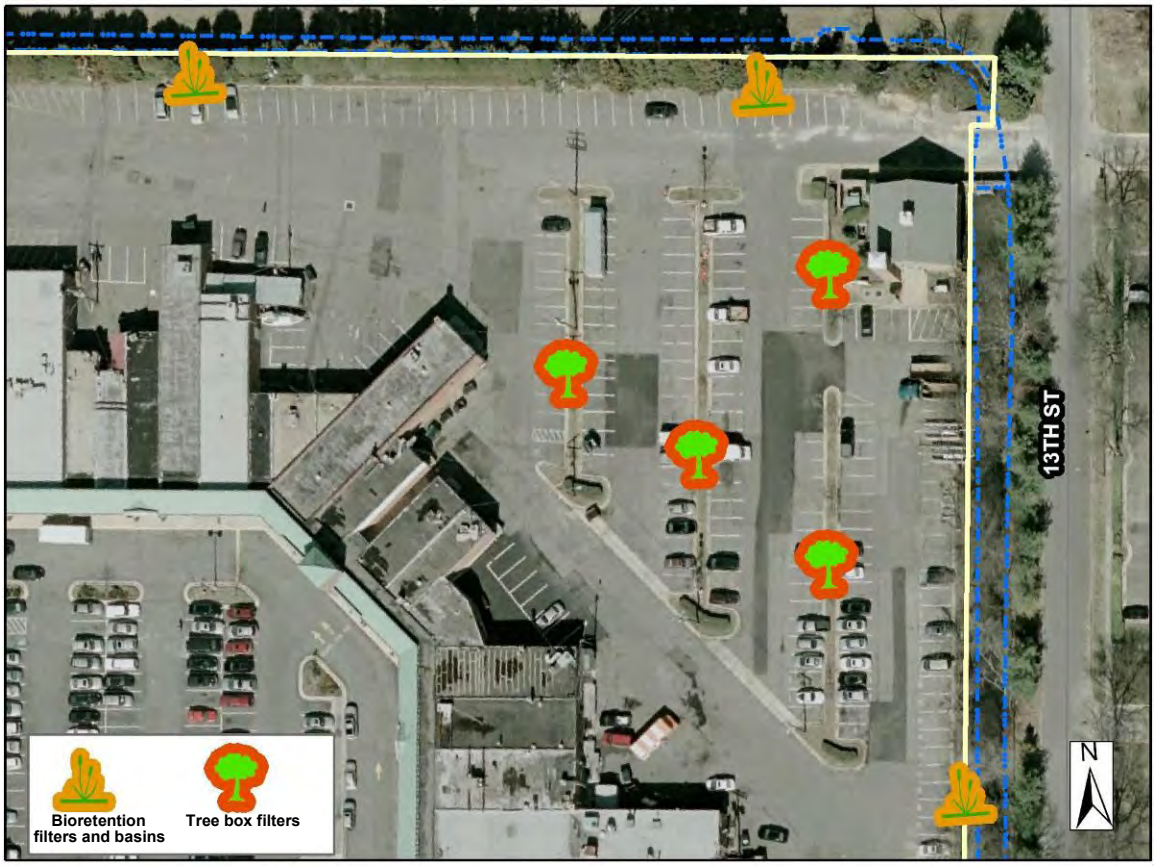
ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Tree Box Filters	8	EA	$10,000.00	$80,000
Bioretention Filters & Basin	198	SY	$150.00	$29,700
			Initial Project Cost	**$109,700**
Plantings	1	LS	5% of project (excluding pervious pavement)	$5,485
Ancillary Items	1	LS	5% of project	$5,485
Erosion and Sediment Control	1	LS	10% of project	$10,970
			Base Construction Cost	**$131,640**
			Mobilization (5%)	$6,582
			Subtotal 1	**$138,222**
			Contingency (25%)	$34,556
			Subtotal 2	**$172,778**
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$77,750
			Estimated Project Cost	**$251,000**

BE9504 BMP/LID

Vicinity Map

Address:	1600 Block, Belle View Blvd
Location:	Belle View Shopping Center
Land Owner:	Private - Commercial
PIN:	0932 01 0002
Control Type	Water Quality
Drainage Area	2.92 acres
Receiving Waters	Belle Haven West Channel

Description: The proposed project is designed to install tree box filters and create bioretention areas to receive runoff from the northern section of parking lot at Belle View Shopping Center on Belle View Blvd. Tree box filters will be installed at four existing inlets and medians will be graded to create bioretention areas.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementation of tree box filters and bioretention filters and basins will provide water quality treatment for the Belle View Shopping Center runoff during storm events. These facilities remove suspended solids, heavy metals, nutrients including phosphorus and nitrogen, oil and grease from storm water runoff. It is estimated that a total over 3,930 lbs of sediment, 52.3 lbs of total nitrogen and 8.1 lbs of total phosphorus would be reduced by this project. They also prevent trash and debris from entering the storm drain system and have the ability to cool down warm runoff.

Project Design Considerations: No environmental constraints or permitting issues are anticipated. Minimal tree removal may be required for construction. Access to the proposed sites is excellent from roads and the Belle View Shopping Center parking lot. Property ownership is private and coordination with the shopping center owner/management will be necessary. A temporary or permanent loss of parking spaces can be expected.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Tree Box Filters	4	EA	$10,000.00	$40,000
Bioretention Filters & Basin	156	SY	$150.00	$23,400
			Initial Project Cost	**$63,400**
Plantings	1	LS	5% of project (excluding pervious pavement)	$3,170
Ancillary Items	1	LS	5% of project	$3,170
Erosion and Sediment Control	1	LS	10% of project	$6,340
			Base Construction Cost	**$76,080**
			Mobilization (5%)	$3,804
			Subtotal 1	**$79,884**
			Contingency (25%)	$19,971
			Subtotal 2	**$99,855**
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$44,935
			Estimated Project Cost	**$145,000**

BE9504_1.jpg: View of existing inlet and median in parking lot

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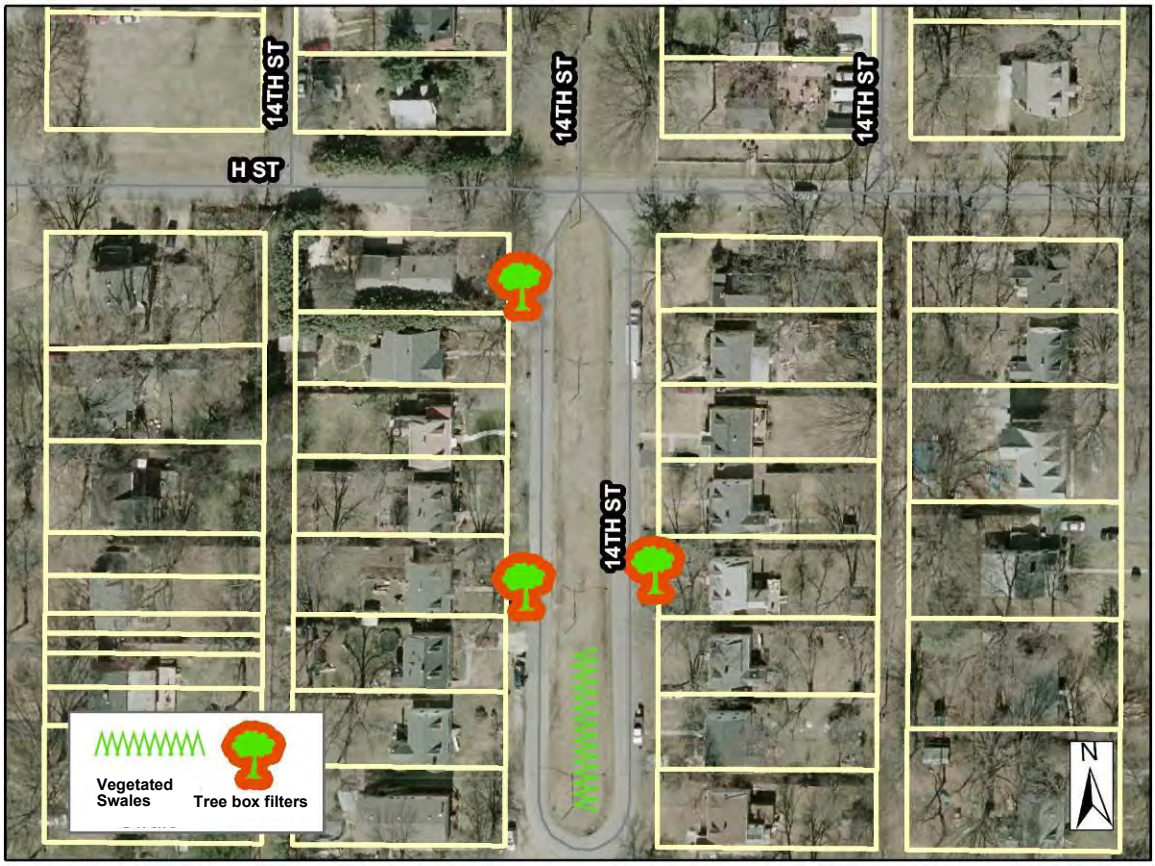
BE9505 BMP/LID

Vicinity Map

Address:	6400 Block, 14th St
Location:	14th St between H St and I St
Land Owner:	State - VDOT
PIN:	NA
Control Type	Water Quality
Drainage Area	1.96 acres
Receiving Waters	Belle Haven West Channel

Description: This project proposes installation of vegetated swale in the median of 14th Street and installation of tree box filters at the inlets along the roadway. The proposed swale will receive the roadway runoff and roof runoff from the medium density residential area north of the project site. Three tree box filters will be installed on the existing inlets and the median will be graded to create a vegetated swale.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementation of a vegetated swale will provide water quality treatment for residential runoff during storm events, trapping suspended solids, reducing trace metals, and reducing nutrients including phosphorus and nitrogen from storm water runoff. It is estimated that a total over 1,520 lbs of sediment, 20.6 lbs of total nitrogen and 3.8 lbs of total phosphorus would be reduced by this project. The swale can also promote infiltration and can reduce the flow velocity of storm water runoff.

Project Design Considerations: No environmental constraints or permitting issues are anticipated. No tree removal is required for this site. Access to the proposed site is excellent from H Street and 14th Street. Property ownership is most likely private and coordination with the property owners will be necessary for this site.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Tree Box Filters	3	EA	$10,000.00	$30,000
Vegetated Swale	125	SY	$50.00	$6,250
			Initial Project Cost	**$36,250**
Plantings	1	LS	5% of project (excluding pervious pavement)	$1,813
Ancillary Items	1	LS	5% of project	$1,813
Erosion and Sediment Control	1	LS	10% of project	$3,625
			Base Construction Cost	**$43,501**
			Mobilization (5%)	$2,175
			Subtotal 1	**$45,676**
			Contingency (25%)	$11,419
			Subtotal 2	**$57,095**
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$25,693
			Estimated Project Cost	**$83,000**

BE9505_1.jpg: View of median in 14th Street

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BE9506 BMP/LID

Vicinity Map

Address:	1700 Block, Belle View Blvd
Location:	Belle View Blvd
Land Owner:	State - VDOT
PIN:	NA
Control Type	Water Quality
Drainage Area	1.31 acres
Receiving Waters	Belle Haven West Channel

Description: The project proposes installation of tree box filters along the shoulders and in the medians of Belle View Boulevard. Four existing inlets will be retrofitted with tree box filters so that they will treat a portion of roadway runoff.

Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementation of tree box filters will provide water quality treatment for portions of the Belle View Shopping Center and Belle View Boulevard runoff during storm events. Tree box filters remove suspended solids, heavy metals, nutrients including phosphorus and nitrogen, oil and grease from storm water runoff. It is estimated that a total over 2,170 lbs of sediment, 20.4 lbs of total nitrogen and 4.7 lbs of total phosphorus would be reduced by this project. These filters also prevent trash and debris from entering the storm drain system and have the ability to cool down warm runoff.

Project Design Considerations: No environmental constraints or permitting issues are anticipated. No tree removal is required for the sites. Access is excellent from Belle View Boulevard and the Belle View Shopping Center parking lot. Maintenance of traffic will be needed along Belle View Boulevard during construction. The construction of new storm drain may be necessary to provide and underdrain for the sites along Belle View Boulevard.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Tree Box Filters	4	EA	$10,000.00	$40,000
			Initial Project Cost	**$40,000**
Plantings	1	LS	5% of project (excluding pervious pavement)	$2,000
Ancillary Items	1	LS	5% of project	$2,000
Erosion and Sediment Control	1	LS	10% of project	$4,000
			Base Construction Cost	**$48,000**
			Mobilization (5%)	$2,400
			Subtotal 1	**$50,400**
			Contingency (25%)	$12,600
			Subtotal 2	**$63,000**
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$28,350
			Estimated Project Cost	**$91,000**

BE9506_1.jpg: View of median and inlet on Belle View Blvd

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BE9507 BMP/LID

Vicinity Map

Address:	1600 Block, Belle View Blvd
Location:	Belle View Shopping Center
Land Owner:	Private – Commercial
PIN:	0932 01 0001
Control Type	Water Quality
Drainage Area	5.14 acres
Receiving Waters	Belle Haven West Channel

Description: The proposed projects is at the parking lot in front of Belle View Shopping Center on Belle View Blvd. One tree box filter will be installed and the medians between the parking lot will be graded to create bioretention areas. The runoff from the parking lot will be treated for water quality primarily for nitrogen, phosphorus and total suspended solids.

Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementation of tree box filters and bioretention filters and basins will provide water quality treatment for the Belle View Shopping Center runoff during storm events. These facilities remove suspended solids, heavy metals, nutrients including phosphorus and nitrogen, oil and grease from storm water runoff. It is estimated that a total over 4,000 lbs of sediment, 52.6 lbs of total nitrogen and 8.2 lbs of total phosphorus would be reduced by this project. They also prevent trash and debris from entering the storm drain system and have the ability to reduce runoff temperature.

Project Design Considerations: No environmental constraints or permitting issues are anticipated. Minimal tree removal may be required for construction. Access to the proposed sites is excellent from roads and the Belle View Shopping Center parking lot. Property ownership is private and coordination with the shopping center owner/management will be necessary for these sites. A temporary or permanent loss of parking spaces can be expected with these sites. The construction of a new storm drain system to drain the proposed sites to the existing storm drain system may be necessary.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Tree Box Filters	1	EA	$10,000.00	$10,000
Bioretention Filters & Basin	684	SY	$150.00	$102,600
			Initial Project Cost	**$112,600**
Plantings	1	LS	5% of project (excluding pervious pavement)	$5,630
Ancillary Items	1	LS	5% of project	$5,630
Erosion and Sediment Control	1	LS	10% of project	$11,260
			Base Construction Cost	**$135,120**
			Mobilization (5%)	$6,756
			Subtotal 1	**$141,876**
			Contingency (25%)	$35,469
			Subtotal 2	**$177,345**
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$79,805
			Estimated Project Cost	**$257,000**

BE9507_1.jpg: View of medians at Belle View Shopping Center

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BE9508 BMP/LID

Vicinity Map

Address:	6701 Fort Hunt Road
Location:	Belle View School
Land Owner:	County – FCPS
PIN:	0932 01 0005
Control Type	Water Quality
Drainage Area	1.54 acres
Receiving Waters	Belle Haven West Branch

Description: Belle View Elementary School parking lot runoff will be treated by installing bioretention filters and basins in the medians and adjacent grassy areas. This project is located just upstream of project BE9102, which is a proposed stormwater pond.

Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementation of bioretention filters and basins will provide water quality treatment for the Belle View Elementary School parking lot runoff during storm events. These facilities remove oil and grease, heavy metals, nutrients including phosphorus and nitrogen, and suspended solids from storm water runoff. It is estimated that a total over 1,700 lbs of sediment, 18.6 lbs of total nitrogen and 4.3 lbs of total phosphorus would be reduced by this project. They also prevent trash and debris from entering the storm drain system and have the ability to cool down warm runoff. Since this site is located on school grounds, the need for land purchase or acquisition is eliminated while providing an environmental education/stewardship opportunity for students and parents within the Belle Haven community.

Project Design Considerations: No environmental constraints or permitting issues are anticipated. Signs promoting environmental education/stewardship could be used at this site to educate students and parents in the community. No tree removal is required for installation. Access to the proposed sites is excellent from the Belle View Elementary School parking lot. Modifications to the existing storm drain system may be necessary to drain the proposed sites. Portions of the school parking lot may be temporarily closed due to construction and could interfere with morning arrival and afternoon dismissal if work was undertaken during the school year.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Bioretention Filters & Basin	180	SY	$150.00	$27,000
			Initial Project Cost	**$27,000**
Plantings	1	LS	5% of project (excluding pervious pavement)	$1,350
Ancillary Items	1	LS	5% of project	$1,350
Erosion and Sediment Control	1	LS	10% of project	$2,700
			Base Construction Cost	**$32,400**
			Mobilization (5%)	$1,620
			Subtotal 1	**$34,020**
			Contingency (25%)	$8,505
			Subtotal 2	**$42,525**
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	$19,136
			Estimated Project Cost	**$62,000**

BE9508_1.jpg: View of medians at Belle View School

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BE9509 BMP/LID

Vicinity Map

Address:	2017 Belle View Blvd
Location:	Mt. Vernon Recreation Center
Land Owner:	County – FCPA
PIN:	0931 24090004A
Control Type	Water Quality
Drainage Area	2.83 acres
Receiving Waters	Belle Haven West Channel

Description: The project proposes installation of tree box filters at eleven inlets which receive runoff from the parking lot at Mt. Vernon Recreation Center and Sports Complex.

Project Area Map: Conceptual plan showing potential project location

Project Benefits: Tree box filters remove suspended solids, heavy metals, nutrients including phosphorus and nitrogen, and oil and grease from storm water runoff. It is estimated that a total of 144 lbs of sediment, less than 0.5 lbs of total nitrogen and total phosphorus each would be reduced by this project. Since this site is located on public land, the need for land purchase or acquisition is eliminated while providing an environmental education/stewardship opportunity for residents within the Belle Haven community.

Project Design Considerations: No environmental constraints or permitting issues are anticipated. Signs promoting environmental education/stewardship could be used at this site to educate residents in the community. Access to the proposed sites is excellent due to multiple parking lots. Modifications to the existing storm drain system may be necessary to provide an underdrain for the proposed facilities.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Tree Box Filters	11	EA	$10,000.00	$110,000
			Initial Project Cost	**$110,000**
Ancillary Items	1	LS	5% of project	$5,500
Erosion and Sediment Control	1	LS	10% of project	$11,000
			Base Construction Cost	**$126,500**
			Mobilization (5%)	$6,325
			Subtotal 1	**$132,825**
			Contingency (25%)	$33,206
			Subtotal 2	**$166,031**
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$74,714
			Estimated Project Cost	**$241,000**

BE9509_1.jpg: View of Parking lot inlet

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BE9510 BMP/LID

Vicinity Map

Address:	6500 Quander Road
Location:	West Potomac High School
Land Owner:	County - FCPS
PIN:	0931 01 0056
Control Type	Water Quality
Drainage Area	2.37 acres
Receiving Waters	Quander Brook

Description: This project consists of installing bioretention filters along the edges of the parking lot to treat runoff on the west side of West Potomac High School. This project is located just upstream of the stormwater facility retrofit site BE9100.

Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementation of bioretention filters and basins will provide water quality treatment for the West Potomac High School runoff during storm events. These cells remove suspended solids, heavy metals, nutrients including phosphorus and nitrogen, oil and grease from storm water runoff. It is estimated that a total over 210 lbs of sediment, 1.75 lbs of total nitrogen and 0.5 lbs of total phosphorus would be reduced by this project. They also prevent trash and debris from entering the storm drain system and have the ability to cool down warm runoff. Since this site is located on school grounds, the need for land purchase or acquisition is eliminated while providing an environmental education/stewardship opportunity for students and parents within the Belle Haven community.

Project Design Considerations: No environmental constraints or permitting issues are anticipated. Signs promoting environmental education/stewardship could be used at this site to educate students and parents in the community. Minimal tree removal may be required. Access to the proposed sites is excellent from the West Potomac High School parking lot. Modifications to the existing storm drain system may be necessary to drain the proposed sites. Portions of the school parking lot may be temporarily closed due to construction and could interfere with morning arrival and afternoon dismissal if work was undertaken during the school year.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Bioretention Filters & Basin	249	SY	$150.00	$37,350
			Initial Project Cost	**$37,350**
Plantings	1	LS	5% of project (excluding pervious pavement)	$1,868
Ancillary Items	1	LS	5% of project	$1,868
Erosion and Sediment Control	1	LS	10% of project	$3,735
			Base Construction Cost	**$44,821**
			Mobilization (5%)	$2,241
			Subtotal 1	**$47,062**
			Contingency (25%)	$11,766
			Subtotal 2	**$58,828**
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	$26,473
			Estimated Project Cost	**$85,000**

BE9510_1.jpg: View of Parking lot at West Potomac High School

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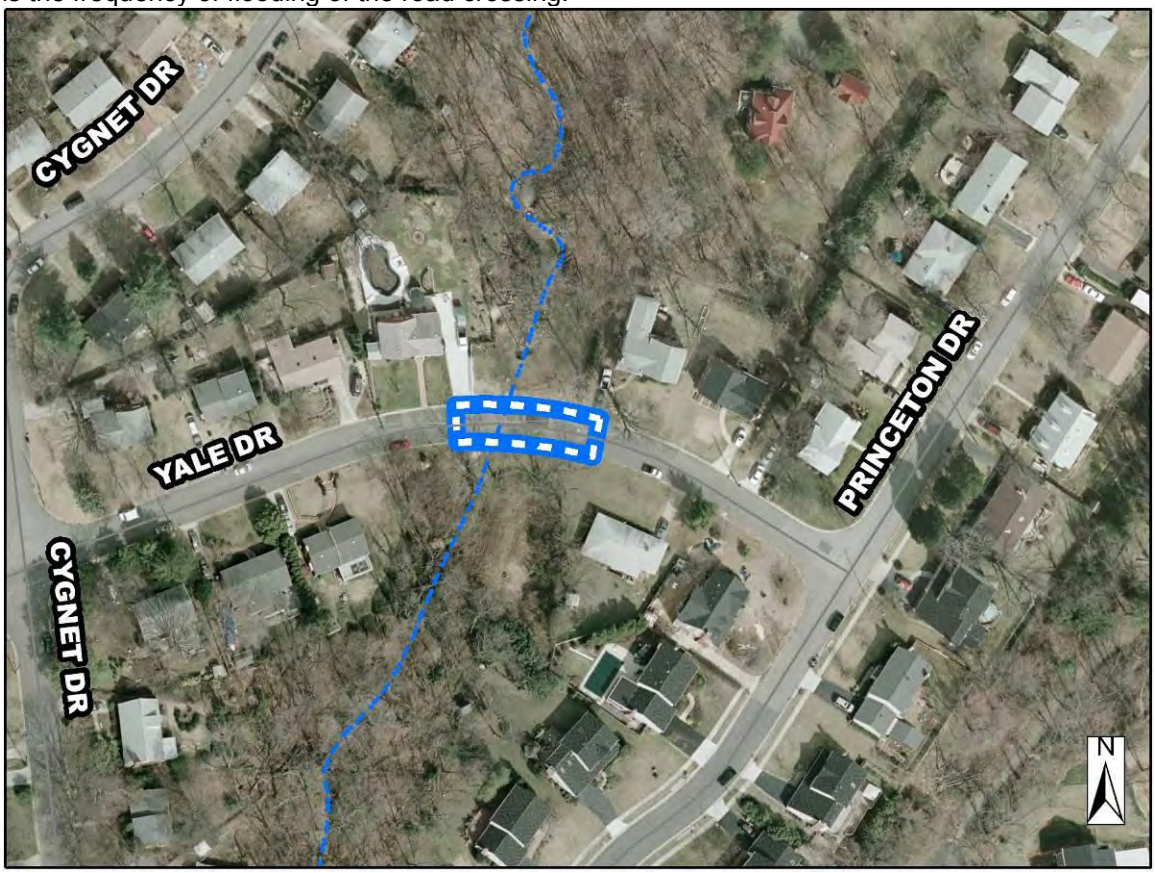
BE9600 Flood Protection/Mitigation

Vicinity Map

Address:	2100 Block, Yale Drive
Location:	Culvert under Yale Drive
Land Owner:	State - VDOT
PIN:	
Control Type	Peak flow control
Drainage Area	
Receiving Waters	Unknown Tributary of Hunting Creek

Description: The storm drain under Princeton Drive is modeled as flooding for the 100-year event, and the crossing at Yale Drive overtops for the 10-year event. The project would consist of reconstruction of the road crossing and storm drain so that it passes the 100-yr flows without overtopping. The primary indicator is the frequency of flooding of the road crossing.



Project Area Map: Conceptual plan showing potential location of project

Project Benefits: The reconstruction of the structure under Yale Dr. will be able to convey the 10-year storm reducing the modeled overtopping at this location and at the upstream culvert.

Project Design Considerations: New stormwater pond project located on Mount Vernon High School which could have an impact on these crossings. No other projects are located within the immediate vicinity. Coordination and sequencing of these two projects should be considered. There are minimal environmental permitting requirements for this project. The project site can be accessed from Yale Drive. An easement may be required. Homes in the vicinity are located close to the project area, therefore specific care should be taken to reduce impacts to private property.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Excavation	3600	CY	$30.00	$108,000
Stabilization graded base	1080	CY	$50.00	$54,000
Structure (3 x 100 ft 4.5 CMP)	300	LF	$175.00	$52,500
Graded Base	1200	SY	$15.00	$18,000
Curb and gutter	300	LF	$30.00	$9,000
Turfgrass establishment	1400	SY	$3.00	$4,200
Placing topsoil	1400	SY	$5.00	$7,000
Soil Stabilization matting	1400	SY	$5.00	$7,000
			Initial Project Cost	**$259,700**
Plantings	1	LS	5% of project	$12,985
Ancillary Items	1	LS	5% of project	$12,985
Erosion and Sediment Control	1	LS	10% of project	$25,970
			Base Construction Cost	**$311,640**
			Mobilization (5%)	$15,582
			Subtotal 1	$327,222
			Contingency (25%)	$81,806
			Subtotal 2	$409,028
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$184,063
			Estimated Project Cost	**$593,000**

BE9600_1.jpg: Upstream side of culvert on Yale Drive

BE9600_2.jpg: Downstream side of culvert on Yale Drive

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