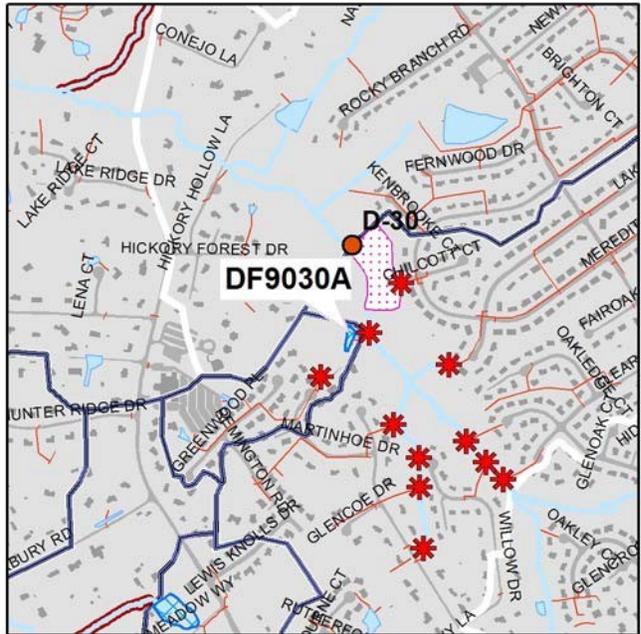


Project Number: DF9030A
Catchment Code: DFRB0005
Candidate Site: D-30

Project Type: Pond Retrofit
Project Size: 0.2 acres
Treated Area: 20.1 acres

Project Location: At the end of the cul-de-sac on Martinhoe Drive.

Project Description: To improve water quality treatment, this existing dry facility would be converted into a shallow wetland incorporating deeper micropool areas at the two concentrated inflow locations and vegetated marsh areas throughout. A dry swale would replace the long ditch directing impervious runoff into this facility. The channel protection volume can be met by excavating within the pond boundaries and installing a multistage riser structure. Additionally, there is a channel carved out by erosion that connects the cul-de-sac at the end of Martinhoe Drive to the pond outfall that should be redirected and stabilized to ensure that runoff from the residential area upstream does not bypass the facility.



Potential Project Benefits:

| | |
|---------------|---|
| Streamflow | Approximately 90% of the channel protection volume can be met. |
| Water Quality | Converting the existing dry pond to a wetland and installing a dry swale in the long channel conveying runoff to this facility will improve water quality.. |

Potential Project Constraints:

| | |
|---------------------|--|
| Environmental | There are no significant environmental constraints or permit issues. Projects in RPAs may require exceptions or waivers. |
| Facility Access | An existing maintenance road provides excellent access exists to the facility. |
| Design/Construction | No significant design or construction constraints have been identified. County staff will coordinate with the facility owner to implement the project. |

Costs:

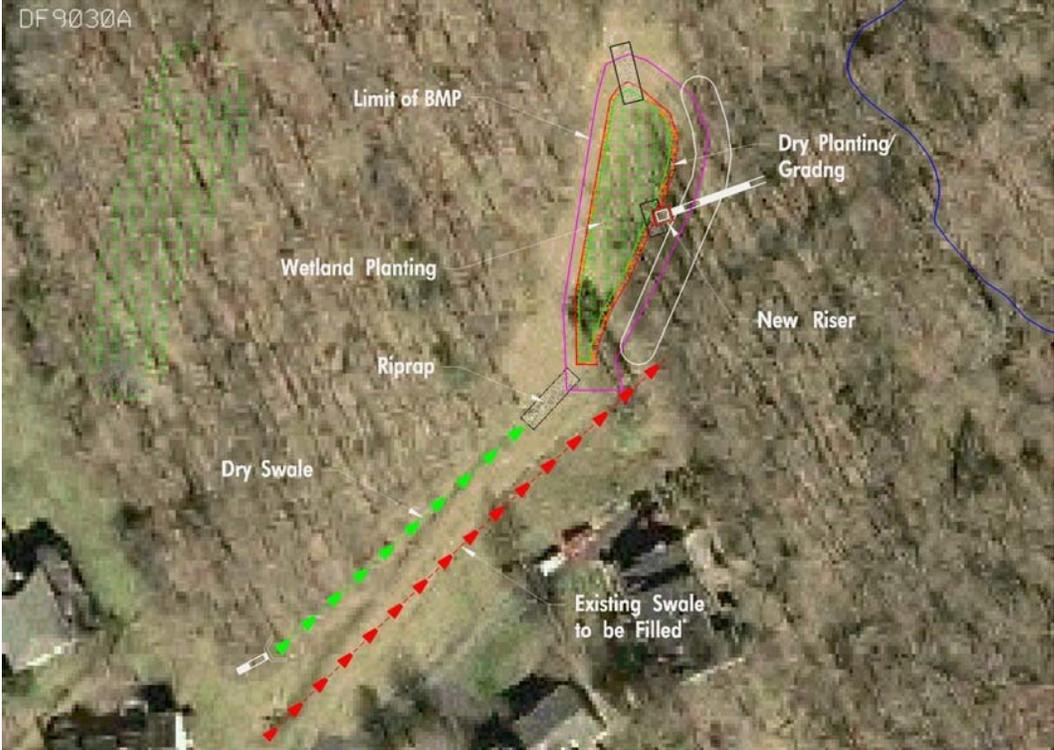
| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|-------------|-----------------|
| Clear and Grub | 0.1 | AC | \$5,000.00 | \$500 |
| Remove Pilot Channels | 150 | LF | \$6.00 | \$900 |
| Grading and Excavation | 317 | CY | \$30.00 | \$9,510 |
| Dry Swale | 195 | LF | \$35.00 | \$6,825 |
| Riser | 1 | LS | \$10,000.00 | \$10,000 |
| Wetland Planting | 420 | SY | \$2.00 | \$840 |
| Dry Landscaping | 123 | SY | \$2.50 | \$307 |
| Base Construction Cost | | | | \$28,883 |
| Mobilization (5%) | | | | \$1,444 |
| Subtotal 1 | | | | \$30,327 |
| Contingency (25%) | | | | \$7,582 |
| Subtotal 2 | | | | \$37,908 |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$17,059 |
| Estimated Project Cost | | | | \$55,000 |

*This project is part of the alternative project group for Regional Pond D-30.
See Table 5-2 for the recommended disposition.*

Site Photo:



Concept Sketch:

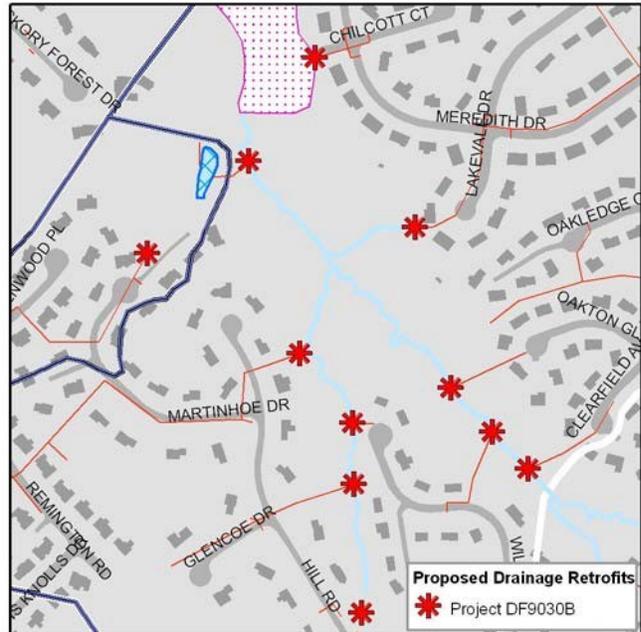


Project Number: DF9030B
Catchment Code: DFRB0005
Candidate Site: D-30

Project Type: Drainage Retrofit
Project Size: 11 Outfalls

Project Location: This project is distributed throughout the catchment where piped drainage systems discharge into natural channels.

Project Description: This project consists of reconfiguring outfalls or retrofitting energy dissipation structures to reduce scour and erosion where flows from the storm drainage system enter the stream. Reduction of erosive velocities will reduce the amount of sediment transported downstream.



Potential Project Benefits:

| | |
|---------------|--|
| Streamflow | The project will reduce velocity from the outfalls and help reduce erosive potential immediately downstream. |
| Water Quality | Water quality improvements would be associated with the reduction of scour at outfall locations and within the downstream channels. Habitat would be improved by reducing sediment loads from erosion. |

Potential Project Constraints:

| | |
|-----------------------|---|
| Environmental | Environmental impacts and permit requirements are not anticipated for this project; however, projects in RPAs may require exceptions or waivers |
| Facility Access | Access to these sites can usually be obtained from the roadway and driveways. |
| Design / Construction | No unusual design or construction issues were identified. |

Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|------------|------------------|
| Outfall Protection | 11 | EA | \$8,000.00 | \$88,000 |
| Base Construction Cost | | | | \$88,000 |
| Mobilization (5%) | | | | \$4,400 |
| Subtotal 1 | | | | \$92,400 |
| Contingency (25%) | | | | \$23,100 |
| Subtotal 2 | | | | \$115,500 |
| Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$51,975 |
| Estimated Project Cost | | | | \$167,000 |

This project is part of the alternative project group for Regional Pond D-30. See Table 5-2 for the recommended disposition.

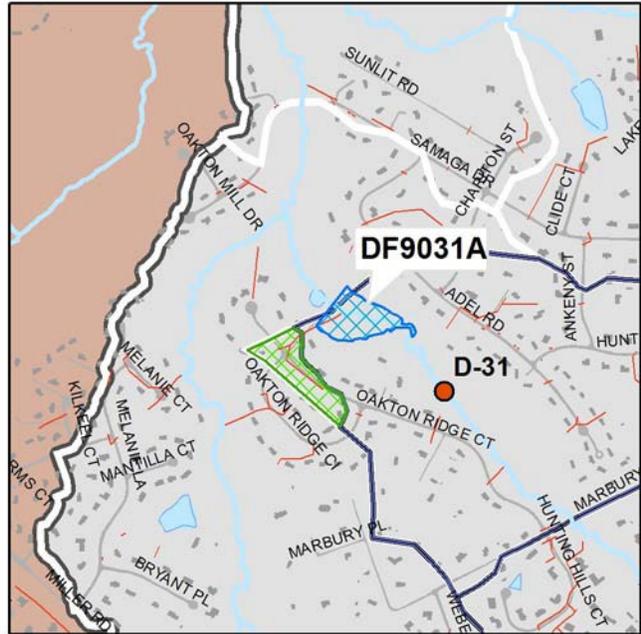
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Project Number: DF9031A
Catchment Code: DFRB9802
Candidate Site: D-31

Project Type: Pond Retrofit
Project Size: 3.5 acres
Treated Area: 110.4 acres

Project Location: At the northernmost intersection of Oakton Ridge Circle and Oakton Ridge Court

Project Description: This facility is an in-stream triple culvert that allows uninterrupted baseflow through an embankment, with detention provided to manage the 2, 10, and 100-year events. The floodplain directly upstream of the culvert is densely wooded. The stream channel at the outfall appears stable with riprap and established grasses in and along its banks. This site has potential to provide extended detention for higher frequency, smaller storm events. However, due to the 250+ acre drainage area to this location, complete 24-hour detention of the 1-year rainfall volume does not appear to be feasible. Consideration should be given to extended detention of a portion of the 1-year storm. Peak flow attenuation can be improved by constructing a weir across the upstream side of all three 60" culverts with a low-flow orifice sized to allow passage of base flow while raising the water surface elevation during the 1 year storm event.



Constructing a dry swale at the outfall of a closed storm drain system on the upstream side of the embankment will provide treatment of the runoff from the surrounding residential area prior to entering the stream.

Potential Project Benefits:

| | |
|---------------|---|
| Streamflow | This project will provide about 30% of the channel protection volume. |
| Water Quality | A dry swale constructed at a nearby storm drain outfall will improve water quality before it enters the stream. Downstream water quality will be improved by reducing stream erosion. |

Potential Project Constraints:

| | |
|-----------------------|---|
| Environmental | Since there is an existing impoundment in the stream, environmental permitting would be minimal. Projects in RPAs may require exceptions or waivers |
| Facility Access | This facility has a paved maintenance access road to the embankment. |
| Design / Construction | The existence of a stable, uninterrupted stream channel as well as dense woods located directly upstream of this facility prevent clearing and excavation to create additional storage volume. County staff will coordinate with the facility owner to implement the project. |

This project is part of the alternative project group for Regional Pond D-31. See Table 5-2 for the recommended disposition.

Difficult Run Watershed Management Plan
 Concept Plans
 Rocky Branch

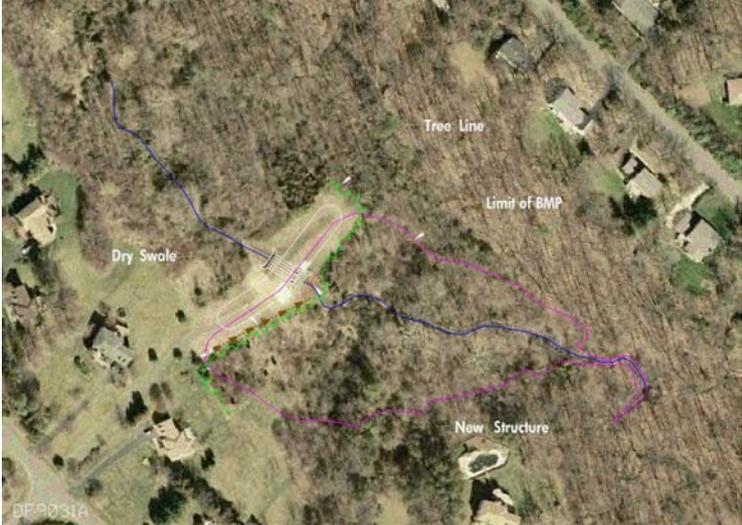
Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|-------------|-----------------|
| Clear and Grub | 0.1 | AC | \$5,000.00 | \$500 |
| Dry Swale | 175 | LF | \$35.00 | \$6,125 |
| Riser | 1 | LS | \$10,000.00 | \$10,000 |
| Base Construction Cost | | | | \$16,625 |
| Mobilization (5%) | | | | \$831 |
| Subtotal 1 | | | | \$17,456 |
| Contingency (25%) | | | | \$4,364 |
| Subtotal 2 | | | | \$21,820 |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$9,819 |
| Estimated Project Cost | | | | \$32,000 |

Site Photo:



Concept Sketch:

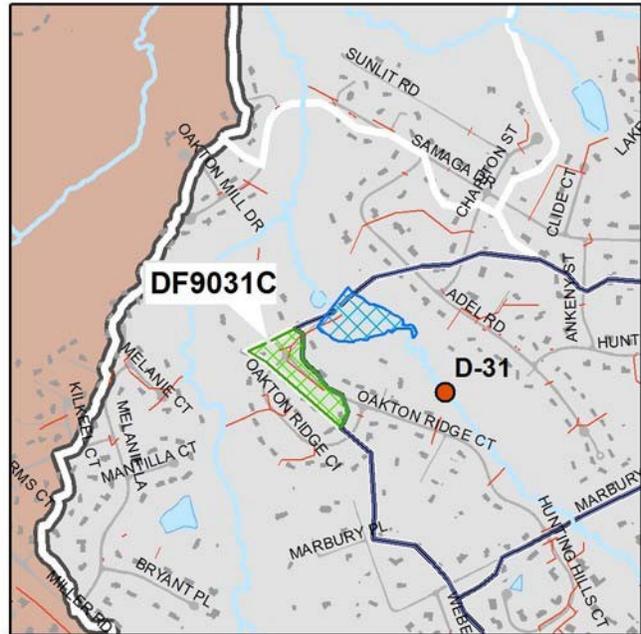


Project Number: DF9031C
Catchment Code: DFRB9802
Candidate Site: D-31

Project Type: LID Retrofit
Project Size: 0.01 acres
Treated Area: 3.9 acres

Project Location: Northernmost intersection of Oakton Ridge Circle and Oakton Ridge Court, adjacent to pond access road.

Project Description: This project would consist of replacing a grassed swale that receives runoff from the roadway and private property with a bioswale, engineered to provide filtration and vegetative uptake of pollutants. The existing modified yard inlet could remain in place to collect flow from an underdrain system and provide overflow protection to the adjacent residence.



Potential Project Benefits:

| | |
|---------------|--|
| Streamflow | This project would provide peak flow reduction through infiltration and evapotranspiration. The amount of peak flow reduction that could be achieved would be minimal with respect to the overall catchment, but could serve as a neighborhood educational facility. |
| Water Quality | This project could provide significant treatment to the managed lawns and roadway runoff that drain to it. Overall improvements to the catchment would not be as noticeable because of the relatively small drainage area. |

Potential Project Constraints:

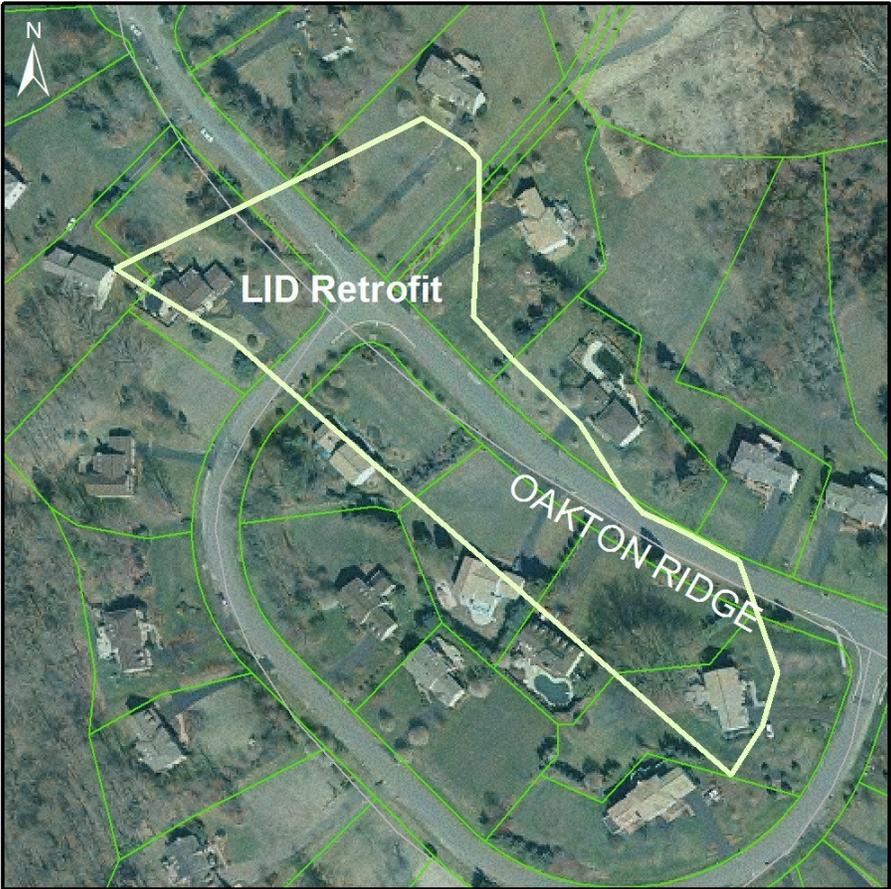
| | |
|-----------------------|---|
| Environmental | No environmental permitting issues would be anticipated for this project. |
| Facility Access | There is a paved maintenance road adjacent to this project. |
| Design / Construction | No significant design or construction constraints are anticipated. |

Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|-----------|-----------------|
| LID Structural Control | 63.0 | SY | \$120.00 | \$7,560 |
| Base Construction Cost | | | | \$7,560 |
| Mobilization (5%) | | | | \$378 |
| Subtotal 1 | | | | \$7,938 |
| Contingency (25%) | | | | \$1,985 |
| Subtotal 2 | | | | \$9,923 |
| Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$4,465 |
| Estimated Project Cost | | | | \$14,000 |

This project is part of the alternative project group for Regional Pond D-31. See Table 5-2 for the recommended disposition.

Project Site:

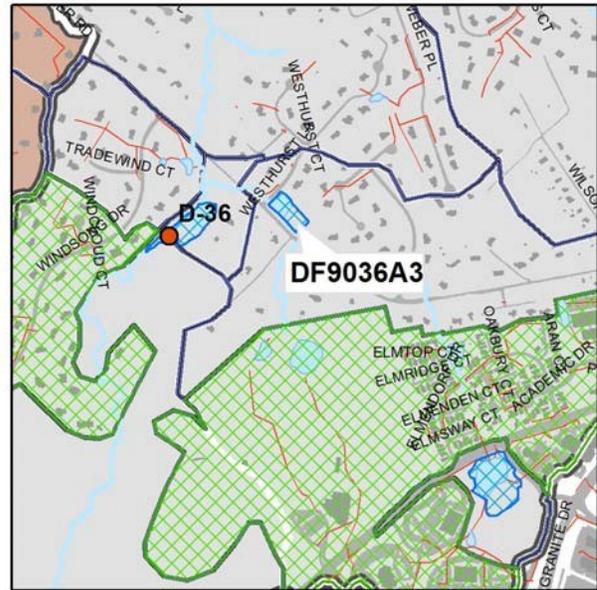


Project Number: DF9036A3
Catchment Code: DFRB0001
Candidate Site: D-36

Project Type: Pond Retrofit
Project Size: 1.1 acres
Treated Area: 80.6 acres

Project Location: This project is along Westhurst Lane and Miller Road

Project Description: This dry pond has lost a significant amount of volume due to aggradation and is currently vegetated with grasses, small shrubs, and scattered trees. A riprap ditch along Westhurst Lane directs runoff from a residential neighborhood into the pond. Work should be performed to return the basin to its original design storage. By modifying the existing weir, the ability of this facility to provide attenuation of higher frequency, lower intensity storm events can be improved. There is space available to construct a forebay at the concentrated inflow into the pond from Westhurst Lane which would be effective in filtering out sediment prior to entering the stream. Woody vegetation larger than 6 inches in diameter was noticed along the embankment bordering Miller Road. All woody vegetation should be removed and/or monitored to prevent seepage through the embankment and under the roadway.



Potential Project Benefits:

| | |
|---------------|---|
| Streamflow | Peak discharge reduction of smaller storms can be improved at this location; however, only 20% of the calculated channel protection volume can be provided. |
| Water Quality | Although creating wet storage volume is not feasible, water quality treatment can be improved with the addition of a forebay. |

Potential Project Constraints:

| | |
|-----------------------|--|
| Environmental | Environmental permitting issues should be minimal. Projects in RPAs may require exceptions or waivers |
| Facility Access | Access is excellent from public roads. |
| Design / Construction | Grading and excavation of aggraded material is necessary to return this basin to its original storage volume. County staff will coordinate with the facility owner to implement the project. |

Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|-------------|-----------------|
| Clear and Grub | 0.5 | AC | \$5,000.00 | \$2,500 |
| Forebay | 489 | CY | \$45.00 | \$22,005 |
| Riser | 1 | LS | \$10,000.00 | \$10,000 |
| Dry Landscaping | 2425 | SY | \$2.50 | \$6,062 |
| Base Construction Cost | | | | \$40,568 |
| Mobilization (5%) | | | | \$2,028 |
| Subtotal 1 | | | | \$42,596 |
| Contingency (25%) | | | | \$10,649 |
| Subtotal 2 | | | | \$53,245 |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$23,960 |
| Estimated Project Cost | | | | \$77,000 |

This project is part of the alternative project group for Regional Pond D-36. See Table 5-2 for the recommended disposition.

Site Photo:



Concept Sketch:

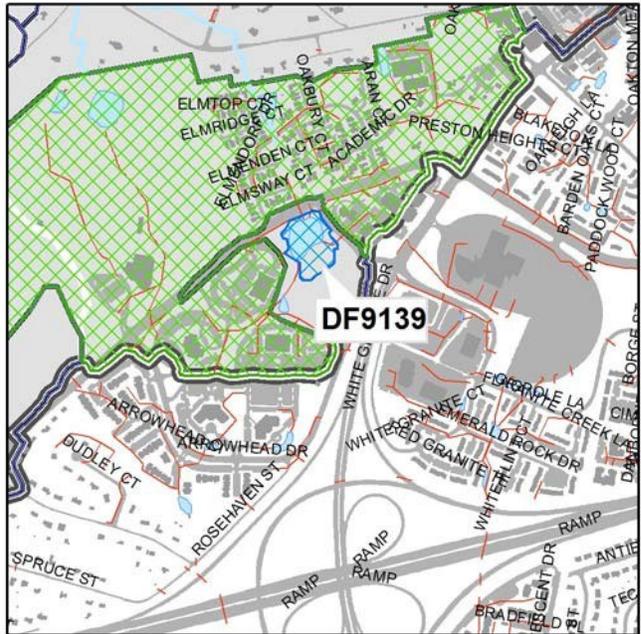


Project Number: DF9139
Catchment Code: DFRB9901
Candidate Site: C39

Project Type: Pond Retrofit
Project Size: 3.2 acres
Treated Area: 14.1 acres

Project Location: This project is located near the intersection of Rosehaven Street and Jermantown Road

Project Description: The existing wet pond collects flow from several storm drainage systems. Expansion of the pond is constrained by roadways and buildings bordering three sides of the property. The wooded area along the back side of the pond is currently being used as a recreational area. In addition, any excavation within the facility will require clearing of the dense forest and therefore is not recommended. Extended detention of the 1 year storm event can be achieved at this location by installing a multistage riser on the existing pipe outlet, optimizing the existing storage volume to meet the channel protection volume. Due to the proximity of this facility to an existing wet pond downstream, water quality treatment at this location is not necessary.



Potential Project Benefits:

| | |
|---------------|---|
| Streamflow | 100% of the calculated channel protection volume can be achieved by installing a multistage riser. |
| Water Quality | The water quality volume requirement for this facility can be met in the available wet storage of a wet pond located approximately 500 feet downstream. |

Potential Project Constraints:

| | |
|-----------------------|---|
| Environmental | Environmental permitting issues should be manageable for this project. Projects in RPAs may require exceptions or waivers. |
| Facility Access | Access to this area is very good. |
| Design / Construction | Dense woods throughout this facility prevent excavation to create additional storage volume. County staff will coordinate with the facility owner to implement the project. |

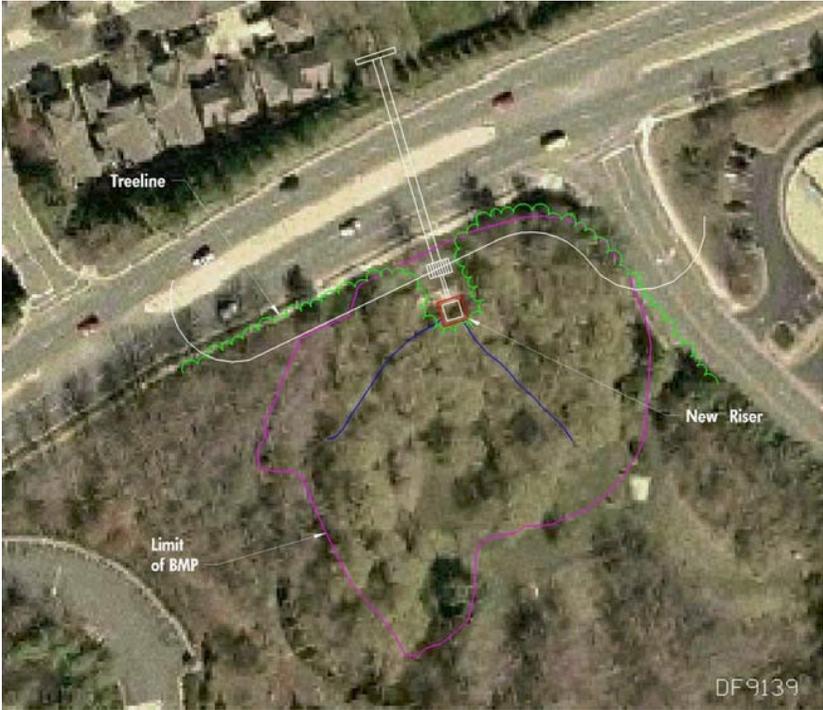
Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|-------------|-----------------|
| Clear and Grub | 0.1 | AC | \$5,000.00 | \$2500 |
| Riser | 1 | LS | \$10,000.00 | \$10,000 |
| Base Construction Cost | | | | \$10,500 |
| Mobilization (5%) | | | | \$525 |
| Subtotal 1 | | | | \$11,025 |
| Contingency (25%) | | | | \$3,756 |
| Subtotal 2 | | | | \$13,781 |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$6,202 |
| Estimated Project Cost | | | | \$20,000 |

Site Photo:



Concept Sketch:

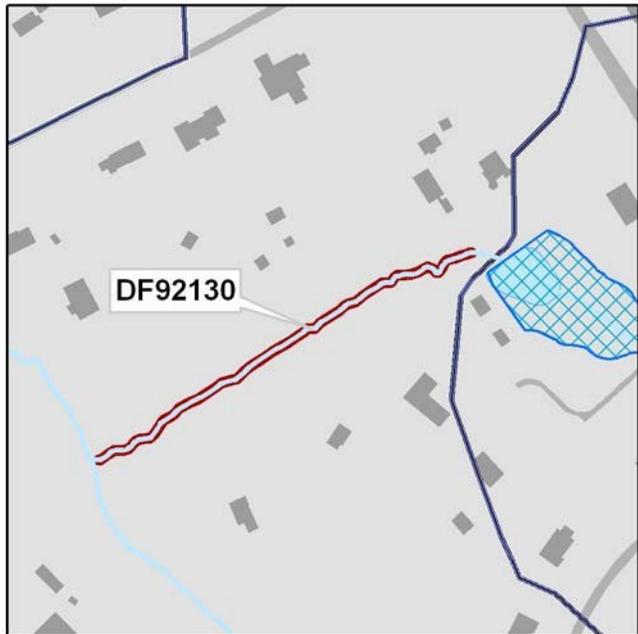


Project Number: DF92130
Catchment Code: DFRB9801
Candidate Site: S130

Project Type: Stream Restoration
Project Size: 918 Linear Feet

Project Location: This project is located west of Mystic Meadow Road and south of Hunter Mill Road.

Project Description: This stream has raw, eroding, near-vertical banks and is moderately to severely incised. The bed has eroded to weathered rock and there is no well-defined riffle pool sequence. The stream is located between several private residences. The proposed restoration would involve reconstruction to provide a pattern, dimension, and profile more consistent with a natural stream. The riparian buffer will be restored. This will prevent further erosion from channel widening and bank failure, improve instream habitat, and provide access to a functional floodplain.



Potential Project Benefits:

| | |
|------------------|---|
| Stream Stability | Reconstructing the stream to more natural dimensions and improving the connection to the floodplain should restore stability. |
| Water Quality | Water quality will be improved by a significant reduction in current and future bank and bed erosion. |
| Instream Habitat | Erosion reduction, improved bed morphology, and establishing a riparian buffer will improve physical habitat conditions. |

Potential Project Constraints:

| | |
|-----------------------|--|
| Environmental | The site will not require forest clearing or impacts to jurisdictional wetlands. However, it will require a permit from both the U.S. Army Corps of Engineers and VDEQ. Projects in RPAs may require exceptions or waivers |
| Facility Access | Access to this facility will require an easement on private property. Modifications to existing fences will be required. |
| Design / Construction | Design efforts are moderate compared to other stream restoration projects. General constructability is good. Fences on private property will have to be set back to accommodate the proposed project. |

Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------------|-------|-----------|------------------|
| Reconstruct new pattern and profile | 918 | LF | \$250.00 | \$229,500 |
| Buffer restoration | included above | LF | \$25.00 | \$0 |
| Add'l cost, first 500 LF | 500 | LF | \$200.00 | \$100,000 |
| Base Construction Cost | | | | \$329,500 |
| Mobilization (5%) | | | | \$16,475 |
| Subtotal 1 | | | | \$345,975 |
| Contingency (25%) | | | | \$86,494 |
| Subtotal 2 | | | | \$432,469 |
| Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$194,611 |
| Estimated Project Cost | | | | \$627,000 |

Concept Sketch

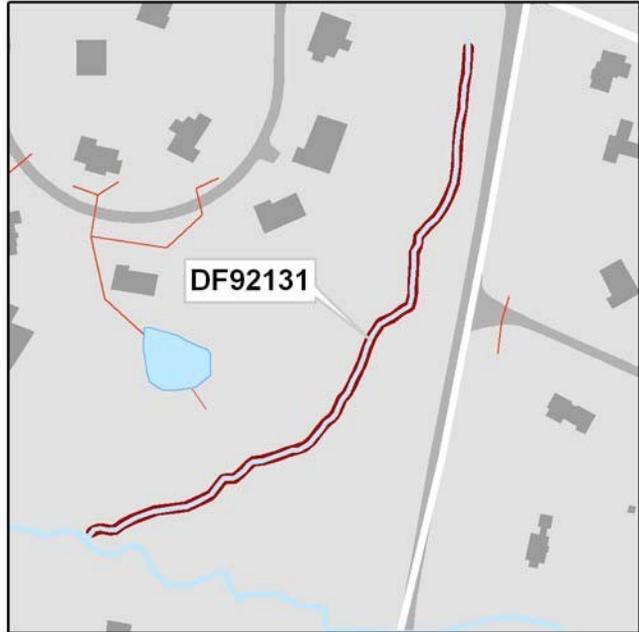


Project Number: DF92131
Catchment Code: DFRB0007
Candidate Site: S131

Project Type: Stream Restoration
Project Size: 1265 Linear Feet

Project Location: This project is located west of Hunter Mill Road just before the intersection with Vale Road.

Project Description: This stream has raw, eroding, near-vertical banks and is moderately to severely incised. The bed has eroded to weathered rock and a well-defined riffle pool sequence is absent. The stream is located primarily on community property. The proposed restoration will provide a pattern, dimension, and profile more consistent with a natural stream. This will prevent further erosion from channel widening and bank failure, improve instream habitat, and provide access to a functional floodplain.



Potential Project Benefits:

| | |
|------------------|---|
| Stream Stability | Reconstructing the stream to more natural dimensions and improving the connection to the floodplain should restore stability. |
| Water Quality | Water quality will be improved by a significant reduction in current and future bank and bed erosion. |
| Instream Habitat | Erosion reduction, created bed features, and establishing a riparian buffer will improve physical habitat conditions. |

Potential Project Constraints:

| | |
|-----------------------|---|
| Environmental | The site will not require forest clearing or impacts to jurisdictional wetlands. However, it will require a permit from both the U.S. Army Corps of Engineers and VDEQ. Projects in RPAs may require exceptions or waivers. |
| Facility Access | Access to this facility is open and unconstrained adjacent to the stream. |
| Design / Construction | Design efforts are moderate compared to other stream restoration projects. General constructability is good. Some landscaping adjacent to the stream will have to be removed. |

Difficult Run Watershed Management Plan
 Concept Plans
 Rocky Branch

Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------------|-------|-----------|------------------|
| Reconstruct new pattern and profile | 1265 | LF | \$250.00 | \$316,250 |
| Buffer restoration | included above | LF | \$25.00 | \$0 |
| Add'l cost, first 500 LF | 500 | LF | \$200.00 | \$100,000 |
| Base Construction Cost | | | | \$416,250 |
| Mobilization (5%) | | | | \$20,813 |
| Subtotal 1 | | | | \$437,063 |
| Contingency (25%) | | | | \$109,266 |
| Subtotal 2 | | | | \$546,328 |
| Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$245,848 |
| Estimated Project Cost | | | | \$792,000 |

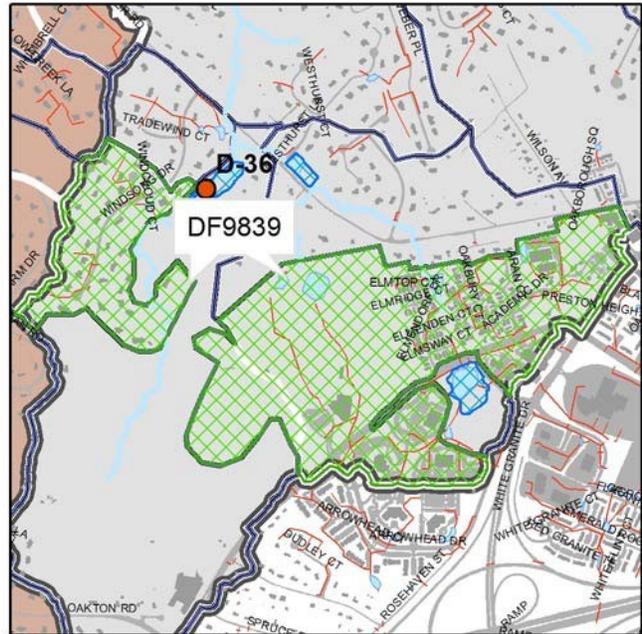
Concept Sketch



Project Number: DF9839
Catchment Code: DFRB9901
Candidate Site: C39

Project Type: LID Retrofit
Project Size: 1 acre
Treated Area: 198.4 acres

Project Location: This project will be constructed at distributed locations around the intersection of Jermantown Road and Route 123 in Oakton.



Project Description: This catchment includes several highly impervious areas which were developed over several decades. While there are several ponds (both wet and dry) contained within this area, much of this project area has no identifiable stormwater management. This project consists of a holistic LID approach to reducing the volume and peak rates of runoff from these areas, treating the water quality at the source, and attempting to restore the natural hydrologic regime. Most of the impairment observed in this catchment relates to excessive nutrients in the stream. Therefore, an additional area in the vicinity of the golf facility is included in this LID Retrofit, with the primary focus being on retrofits to reduce nitrogen and phosphorus loadings.

Potential Project Benefits:

| | |
|---------------|---|
| Streamflow | The LID approach is expected to reduce runoff volume through infiltration. Minor reductions in peak flow rates could be expected. |
| Water Quality | The project would treat 100% of the water quality volume, which would provide significant improvements. |

Potential Project Constraints:

| | |
|-----------------------|--|
| Environmental | Environmental permitting issues would not be anticipated for this project. |
| Facility Access | Access to this area is very good by way of public roads. |
| Design / Construction | There are no significant design or construction issues. |

Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|-----------|--------------------|
| LID Structural Control | 4,681.0 | SY | \$120.00 | \$561,720 |
| Base Construction Cost | | | | \$561,720 |
| Mobilization (5%) | | | | \$28,086 |
| Subtotal 1 | | | | \$589,806 |
| Contingency (25%) | | | | \$147,452 |
| Subtotal 2 | | | | \$737,258 |
| Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$331,766 |
| Estimated Project Cost | | | | \$1,069,000 |

Concept Sketch

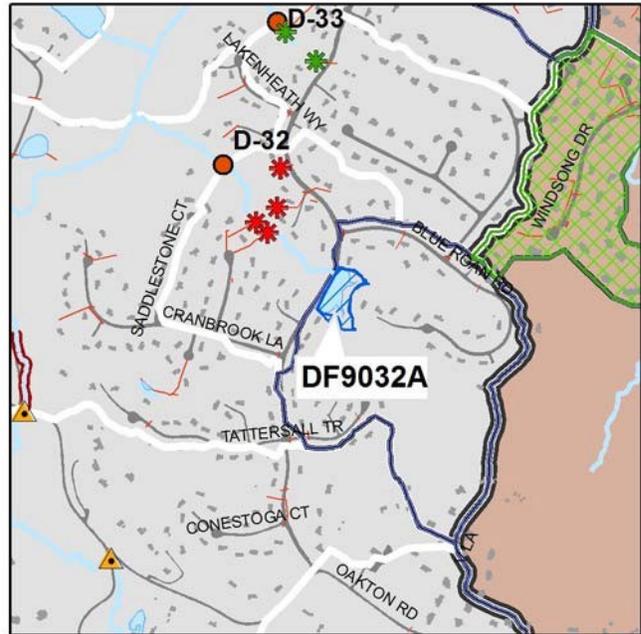


Project Number: DF9032A
Catchment Code: DFDF9101
Candidate Site: D-32

Project Type: Culvert Retrofit
Project Size: 2.3 acres
Treated Area: 66.4 acres

Project Location: This project is at the Miller Heights Road stream crossing.

Project Description: This project consists of a retrofit to the culvert at Miller Heights Road to provide detention. The roadway at this location allows for a maximum depth of storage of five feet. The primary goal for this facility is channel protection, with a secondary goal of improving runoff quality.



Potential Project Benefits:

| | |
|---------------|--|
| Streamflow | The project will provide 100% of the channel protection volume. |
| Water Quality | 100% of the water quality volume can be provided as extended detention. Use of wetland vegetation and a micro-pool will improve treatment effectiveness. |

Potential Project Constraints:

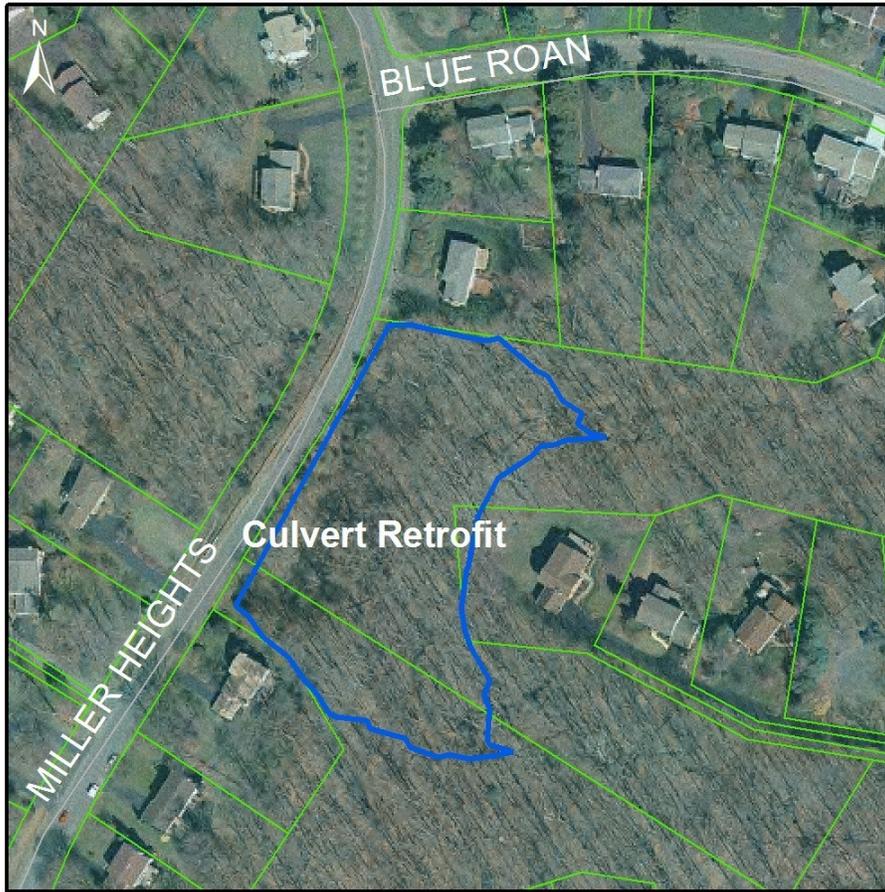
| | |
|-----------------------|--|
| Environmental | Environmental permitting issues would be anticipated for any activity in and around a stream corridor. Forest and wetland impacts are anticipated during construction. Projects in RPAs may require exceptions or waivers. |
| Facility Access | Access is very good from the roadway |
| Design / Construction | No significant design or construction issues were noted. |

Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|------------|------------------|
| Clear and Grub | 0.4 | AC | \$5,000.00 | \$2,000 |
| Excavation | 1,680 | CY | \$35.00 | \$58,800 |
| Impoundment Structure | 1 | LS | \$5,000.00 | \$5,000 |
| Landscaping | 1,820 | SY | \$2.50 | \$4,550 |
| Wetland Planting | 610 | SY | \$2.00 | \$1,220 |
| Base Construction Cost | | | | \$71,570 |
| Mobilization (5%) | | | | \$3,579 |
| Subtotal 1 | | | | \$75,149 |
| Contingency (25%) | | | | \$18,787 |
| Subtotal 2 | | | | \$93,936 |
| Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$42,271 |
| Estimated Project Cost | | | | \$136,000 |

*This project is part of the alternative project group for Regional Pond D-32.
 See Table 5-2 for the recommended disposition.*

Concept Sketch

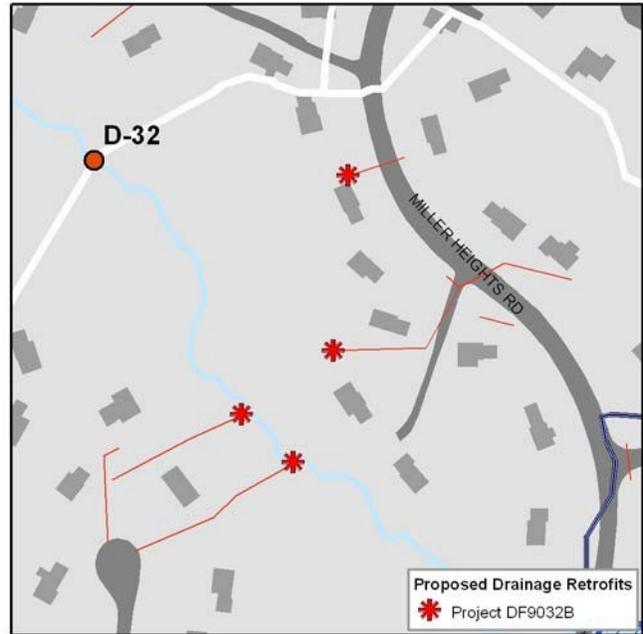


Project Number: DF9032B
Catchment Code: DDF9101
Candidate Site: D-32

Project Type: Drainage Retrofit
Project Size: 7 Outfalls

Project Location:
 At various locations distributed throughout the catchment.

Project Description:
 This project consists of reconfiguring outfalls or retrofitting energy dissipation structures to reduce scour and erosion where flows from the storm drainage system enter the stream. Reduction of erosive velocities will reduce the amount of sediment transported downstream.



Potential Project Benefits:

| | |
|---------------|--|
| Streamflow | The project will reduce velocity from the outfalls and help reduce erosive potential immediately downstream. |
| Water Quality | Water quality improvements would be associated with the reduction of scour at outfall locations and within the downstream channels. Habitat would be improved by reducing sediment loads from erosion. |

Potential Project Constraints:

| | |
|-----------------------|---|
| Environmental | Environmental impacts and permit requirements are not anticipated for this project; however, projects in RPAs may require exceptions or waivers |
| Facility Access | Access to these sites can usually be obtained from the roadway and driveways. |
| Design / Construction | No unusual design or construction issues were identified. |

Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|------------|------------------|
| Outfall Protection | 7 | EA | \$8,000.00 | \$56,000 |
| Base Construction Cost | | | | \$56,000 |
| Mobilization (5%) | | | | \$2,800 |
| Subtotal 1 | | | | \$58,800 |
| Contingency (25%) | | | | \$14,700 |
| Subtotal 2 | | | | \$73,500 |
| Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$33,075 |
| Estimated Project Cost | | | | \$107,000 |

This project is part of the alternative project group for Regional Pond D-32. See Table 5-2 for the recommended disposition.

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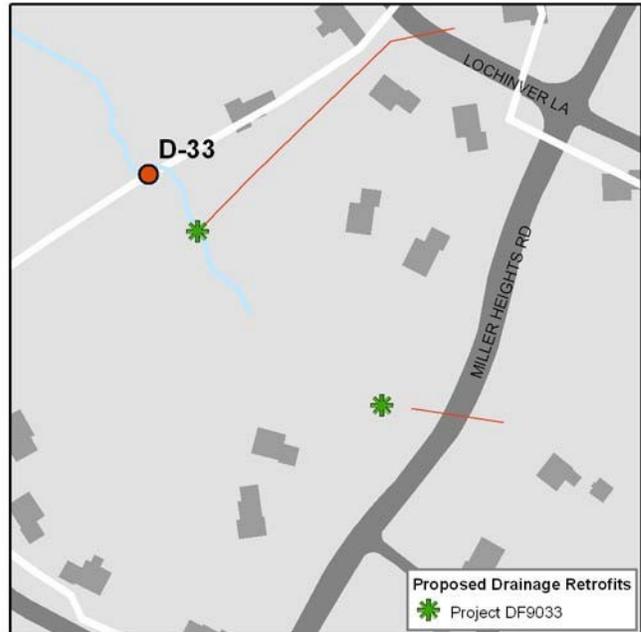
Project Number: DF9033
Catchment Code: DFDF8701
Candidate Site: D-33

Project Type: Drainage Retrofit
Project Size: 2 Outfalls

Project Location:

This project will be distributed throughout the catchment. Particular attention should be paid to the downstream outlet of the culvert under Miller Heights Road.

Project Description: This project consists of reconfiguring outfalls or retrofitting energy dissipation structures to reduce scour and erosion where flows from the storm drainage system enter the stream. Reduction of erosive velocities will reduce the amount of sediment transported downstream.



Potential Project Benefits:

| | |
|---------------|--|
| Streamflow | The project will reduce velocity from the outfalls and help reduce erosive potential immediately downstream. |
| Water Quality | Water quality improvements would be associated with the reduction of scour at outfall locations and within the downstream channels. Habitat would be improved by reducing sediment loads from erosion. |

Potential Project Constraints:

| | |
|-----------------------|---|
| Environmental | Environmental impacts and permit requirements are not anticipated for this project; however, projects in RPAs may require exceptions or waivers |
| Facility Access | Access to these sites can usually be obtained from the roadway and driveways. |
| Design / Construction | No unusual design or construction issues were identified. |

Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|------------|-----------------|
| Outfall Protection | 2 | EA | \$8,000.00 | \$16,000 |
| Base Construction Cost | | | | \$16,000 |
| Mobilization (5%) | | | | \$800 |
| Subtotal 1 | | | | \$16,800 |
| Contingency (25%) | | | | \$4,200 |
| Subtotal 2 | | | | \$21,000 |
| Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$9,450 |
| Estimated Project Cost | | | | \$30,000 |

This project is part of the alternative project group for Regional Pond D-33. See Table 5-2 for the recommended disposition.

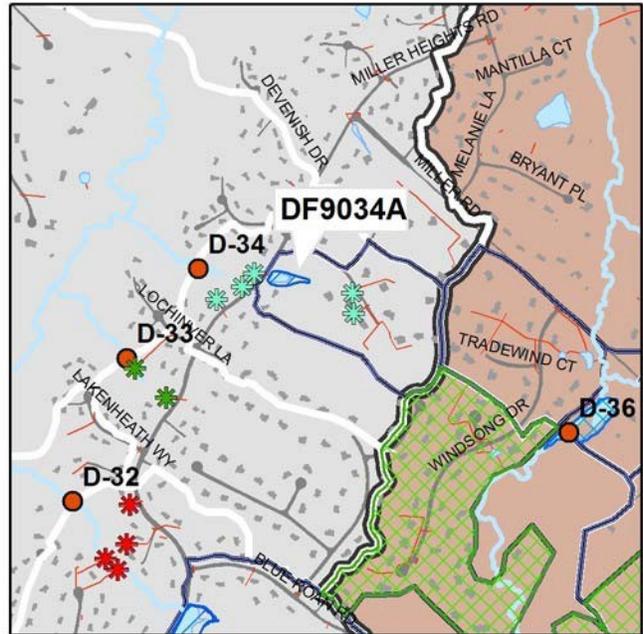
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Project Number: DF9034A
Catchment Code: DFDF8501
Candidate Site: D-34

Project Type: Culvert Retrofit
Project Size: 0.5 acres
Treated Area: 24.4 acres

Project Location: Upstream of the culvert under Miller Heights Road.

Project Description: This project would consist of replacing regional pond D-34 with a culvert retrofit upstream of Miller Heights Road. A redundant embankment would be created for detention storage, with the primary goal of reducing erosive streamflows



Potential Project Benefits:

| | |
|---------------|---|
| Streamflow | This retrofit would provide 100% of the channel storage volume and help to reduce erosive flows downstream. |
| Water Quality | There is sufficient storage to detain 80% of the water quality volume. Improvements to the water quality would be obtained through the reduction in scour forming discharges downstream, and sedimentation and vegetative uptake at the site. |

Potential Project Constraints:

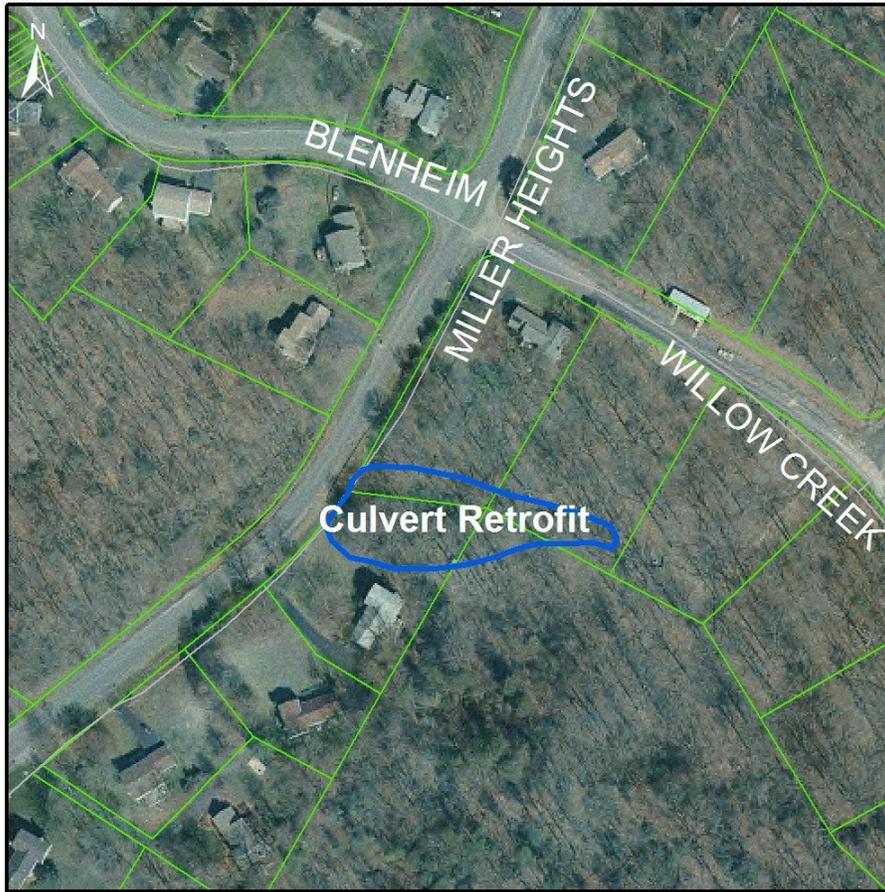
| | |
|-----------------------|---|
| Environmental | There may be some permitting issues associated with the temporary impoundment of runoff in the floodplain above this culvert. Projects in RPAs may require exceptions or waivers. |
| Facility Access | Access to this project is excellent from the roadway. |
| Design / Construction | No unusual design or construction issues were noted. |

Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|------------|-----------------|
| Clear and Grub | 0.2 | AC | \$5,000.00 | \$1,000 |
| Excavation | 380 | CY | \$35.00 | \$13,300 |
| Impoundment Structure | 1 | LS | \$5,000.00 | \$5,000 |
| Landscaping | 490 | SY | \$2.50 | \$1,225 |
| Wetland Planting | 170 | SY | \$2.00 | \$340 |
| Base Construction Cost | | | | \$20,865 |
| Mobilization (5%) | | | | \$1,043 |
| Subtotal 1 | | | | \$21,908 |
| Contingency (25%) | | | | \$5,477 |
| Subtotal 2 | | | | \$27,385 |
| Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$12,323 |
| Estimated Project Cost | | | | \$40,000 |

This project is part of the alternative project group for Regional Pond D-34. See Table 5-2 for the recommended disposition.

Concept Sketch:

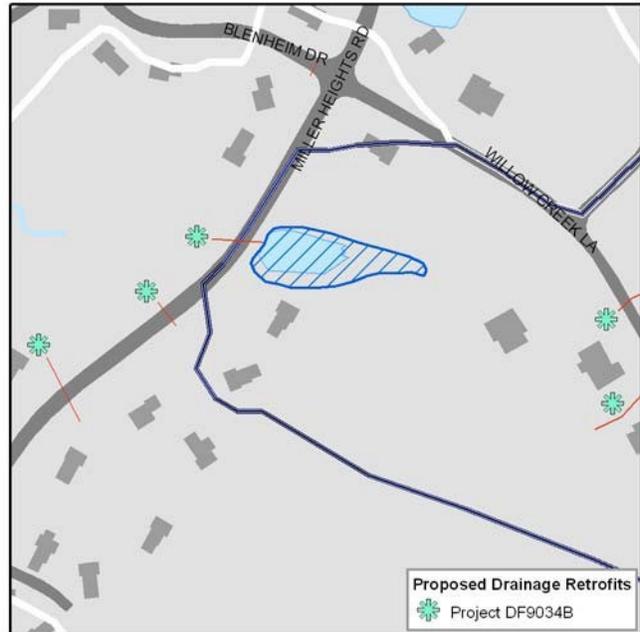


Project Number: DF9034B
Catchment Code: DFDF8501
Candidate Site: D-34

Project Type: Drainage Retrofit
Project Size: 5 Outfalls

Project Location:
 This project will be distributed throughout the catchment.

Project Description:
 This project consists of reconfiguring outfalls or retrofitting energy dissipation structures to reduce scour and erosion where flows from the storm drainage system enter the stream. Reduction of erosive velocities will reduce the amount of sediment transported downstream.



Potential Project Benefits:

| | |
|---------------|--|
| Streamflow | The project will reduce velocity from the outfalls and help reduce erosive potential immediately downstream. |
| Water Quality | Water quality improvements would be associated with the reduction of scour at outfall locations and within the downstream channels. Habitat would be improved by reducing sediment loads from erosion. |

Potential Project Constraints:

| | |
|-----------------------|---|
| Environmental | Environmental impacts and permit requirements are not anticipated for this project; however, projects in RPAs may require exceptions or waivers |
| Facility Access | Access to these sites can usually be obtained from the roadway and driveways. |
| Design / Construction | No unusual design or construction issues were identified. |

Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|------------|-----------------|
| Outfall Protection | 5 | EA | \$8,000.00 | \$40,000 |
| Base Construction Cost | | | | \$40,000 |
| Mobilization (5%) | | | | \$2,000 |
| Subtotal 1 | | | | \$42,000 |
| Contingency (25%) | | | | \$10,500 |
| Subtotal 2 | | | | \$52,500 |
| Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$23,625 |
| Estimated Project Cost | | | | \$76,000 |

This project is part of the alternative project group for Regional Pond D-34. See Table 5-2 for the recommended disposition.

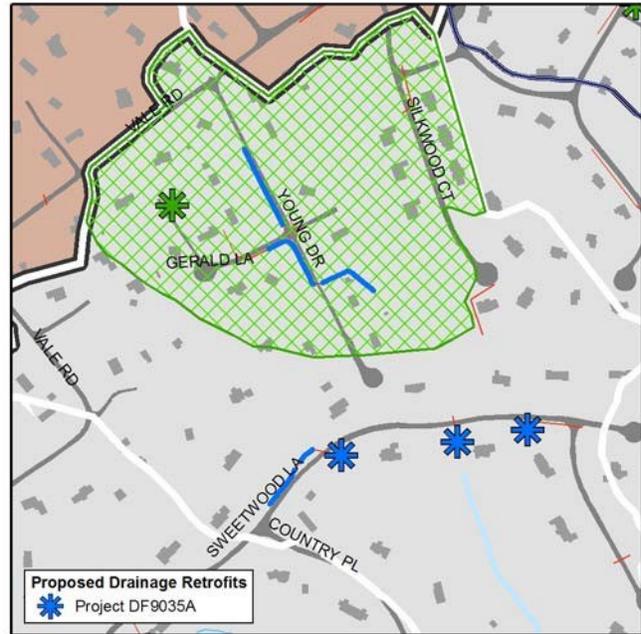
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Project Number: DF9035A
Catchment Code: DFDF8101
Candidate Site: D-35

Project Type: Drainage Retrofit
Project Size: 4 Outfalls and 1101 feet of ditch removal

Project Location: This project is distributed throughout the catchment where piped drainage systems or concrete ditches discharge into natural channels.

Project Description: This project will consist of two major phases of drainage retrofit. The first phase will be the elimination of paved roadside ditches with dry swale systems with an underdrain, which will increase filtration and infiltration. The second phase of this project will be the improvement of outlet protection at outfalls throughout the catchment.



Potential Project Benefits:

| | |
|---------------|--|
| Streamflow | The project will reduce velocity from the outfalls and erosive potential immediately downstream. Swales will reduce both volume and velocity. |
| Water Quality | Replacing ditches with swales will provide treatment before stormwater reaches the stream system. Water quality will also benefit from the reduction of sediment loads associated from scour at the outfall locations. |

Potential Project Constraints:

| | |
|-----------------------|---|
| Environmental | Environmental impacts and permit requirements are not anticipated for this project; however, projects in RPAs may require exceptions or waivers |
| Facility Access | Access to these sites can usually be obtained. |
| Design / Construction | Design of swales should incorporate check dams or other features to ensure flow velocity is not erosive. |

Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|------------|------------------|
| Paved Ditch Demolition (Haul Away) | 1101 | LF | \$18.00 | \$19,818 |
| Dry Swale w/ Underdrain | 1101 | LF | \$50.00 | \$55,050 |
| Outfall Protection | 4 | EA | \$8,000.00 | \$32,000 |
| Base Construction Cost | | | | \$106,868 |
| Mobilization (5%) | | | | \$5,343 |
| Subtotal 1 | | | | \$112,211 |
| Contingency (25%) | | | | \$28,052 |
| Subtotal 2 | | | | \$140,264 |
| Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$63,119 |
| Estimated Project Cost | | | | \$203,000 |

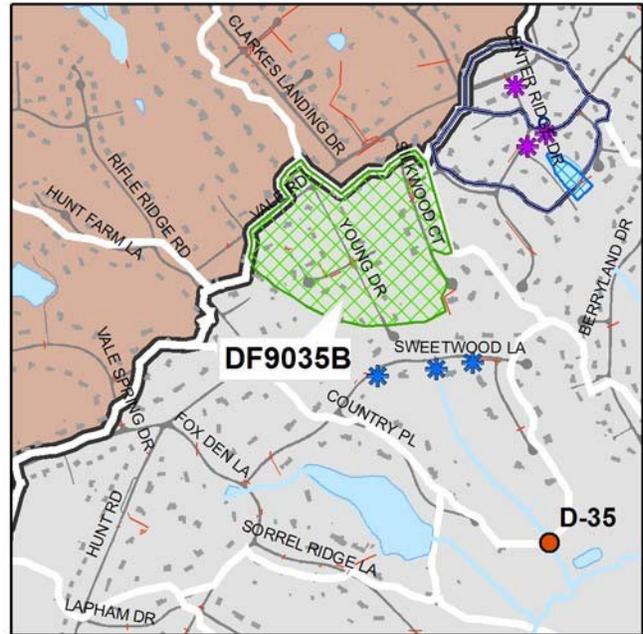
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Project Number: DF9035B
Catchment Code: DFDF8101
Candidate Site: D-35

Project Type: LID Retrofit
Project Size: 0.1 acres
Treated Area: 35 acres

Project Location:
 This project is located behind private residences on east side of Young Drive.

Project Description:
 This project consist of: a) replacing a paved drainage swale from Young Drive to the rear of the properties with a Bioswale; b) partially daylighting an existing piped system conveying runoff from Silkwood Court; and c) creating a bioretention facility or conventional detention facility at the intersection of three properties where an existing drainage easement crosses another property. The drainage to these areas currently creates a muddy bog in the rear yard of a private property before continuing downstream. This project could reduce the flow significantly, returning a portion of the private property that is unusable back to the property owner.



Potential Project Benefits:

| | |
|---------------|--|
| Streamflow | This project could result in a reduction to the volume and peak rate of runoff through replacing piped drainage with swales. |
| Water Quality | This project has been designed to treat 100% of the water quality volume for the site. |

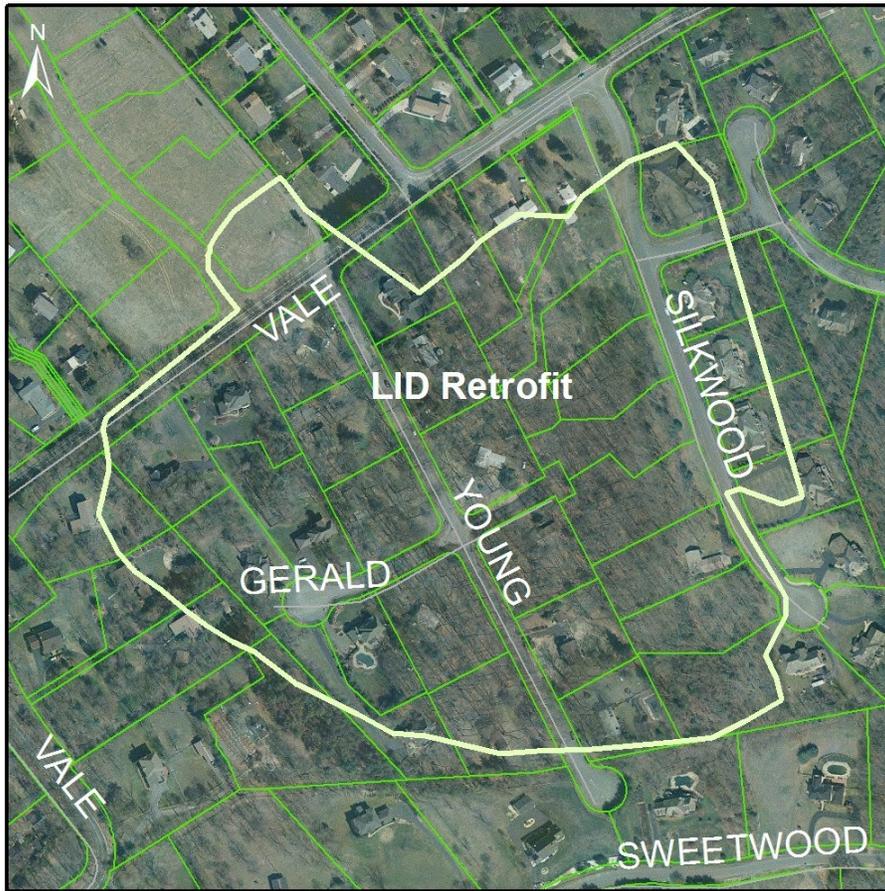
Potential Project Constraints:

| | |
|-----------------------|--|
| Environmental | No significant environmental issues have been identified. |
| Facility Access | Access to this project is limited and a temporary construction easement would need to be provided. |
| Design / Construction | Education and community support will be a significant factor in the success of this project. |

Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|-----------|------------------|
| LID Structural Control | 437.0 | SY | \$120.00 | \$52,440 |
| Base Construction Cost | | | | \$52,440 |
| Mobilization (5%) | | | | \$2,622 |
| Subtotal 1 | | | | \$55,062 |
| Contingency (25%) | | | | \$13,766 |
| Subtotal 2 | | | | \$68,828 |
| Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$30,972 |
| Estimated Project Cost | | | | \$100,000 |

Concept Sketch:

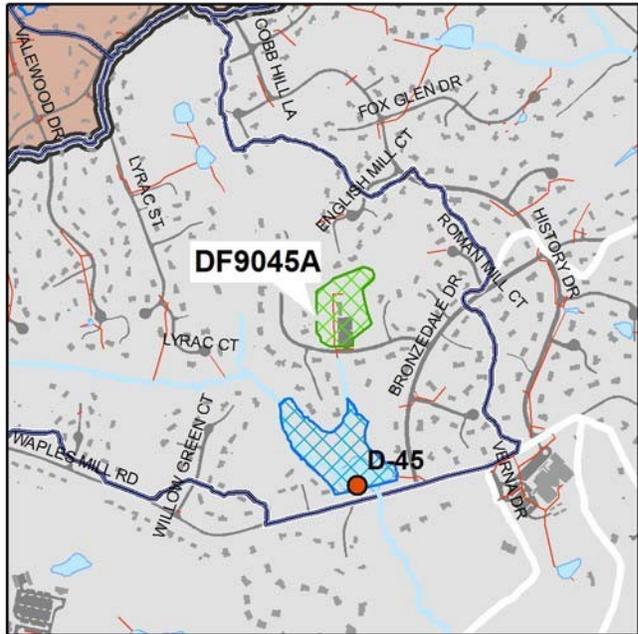


Project Number: DF9045A
Catchment Code: DFDF9203
Candidate Site: D-45

Project Type: LID Retrofit
Project Size: 0.04 acres
Treated Area: 4.6 acres

Project Location:
 This project will be located next to the drive at the Oakton Swim and Racquet Club.

Project Description:
 This project will serve as an educational demonstration site for LID facilities. The topography of this area is ideally suited for a bioretention system or rain garden. The public access at this area makes it an excellent alternative to provide an educational and outreach opportunity for the community.



Potential Project Benefits:

| | |
|---------------|---|
| Streamflow | While designed primarily for water quality, this project would reduce the amount of runoff through reduction of impervious area, infiltration and evapotranspiration. |
| Water Quality | This project has been designed to treat 100% of the water quality volume for the site. |

Potential Project Constraints:

| | |
|-----------------------|--|
| Environmental | No environmental constraints are anticipated for this project. |
| Facility Access | Facility access is excellent. |
| Design / Construction | The property for this project is privately owned. Coordination and support will have to be a part of this project's success. |

Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|-----------|-----------------|
| LID Structural Control | 194.0 | SY | \$120.00 | \$23,280 |
| Interpretive Signs | 1 | LS | \$1000.00 | \$1000 |
| Base Construction Cost | | | | \$24,280 |
| Mobilization (5%) | | | | \$1,214 |
| Subtotal 1 | | | | \$25,494 |
| Contingency (25%) | | | | \$6,374 |
| Subtotal 2 | | | | \$31,868 |
| Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$4,340 |
| Estimated Project Cost | | | | \$46,000 |

This project is part of the alternative project group for Regional Pond D-45. See Table 5-2 for the recommended disposition.

Concept Sketch

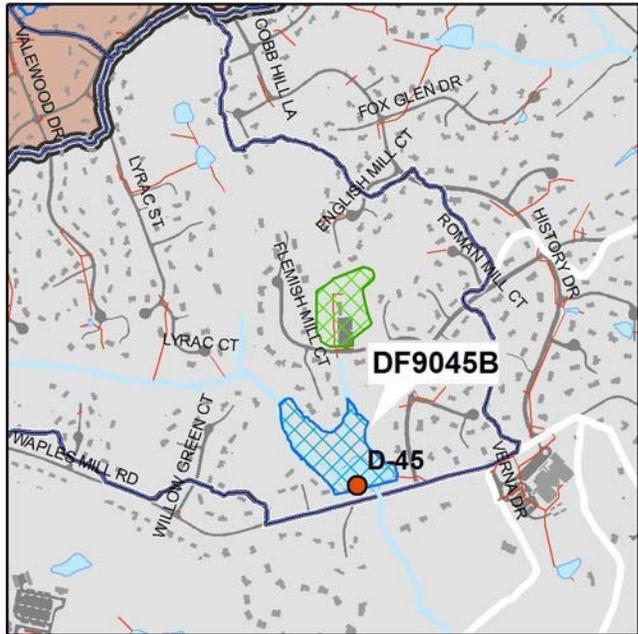


Project Number: DF9045B
Catchment Code: DFDF9203
Candidate Site: D-45

Project Type: Pond Retrofit
Project Size: 7.7 acres
Treated Area: 252.4 acres

Project Location: This project will be located next to Waples Mill Road and Bronzedale Drive.

Project Description: There is enough available volume within the facility to achieve the necessary channel protection volume without excavation. This volume will be created by constructing a weir with an orifice sized for channel protection and to allow uninterrupted passage of baseflow in front of the existing culvert. Since this pond is located in-stream in a well-forested area, it is not recommended to clear established vegetation to the sole purpose of creating water quality volume. Small pockets of marsh areas currently function as water quality components that provide a degree of settling of sediment and removal of nutrients. Finally, erosion was observed on the spillway as well as on the backside of the embankment. Maintenance and stabilization of these areas is recommended.



Potential Project Benefits:

| | |
|---------------|---|
| Streamflow | Installing a multi-stage control structure will provide detention of 100% of the channel protection volume. |
| Water Quality | The pond will remain a dry facility and water quality improvements will be relatively minor; however, improvements to water quality would be obtained through the reduction in scour forming discharges downstream. |

Potential Project Constraints:

| | |
|-----------------------|--|
| Environmental | Since there is an existing impoundment in the stream, environmental permitting would be minimal. Projects in RPAs may require exceptions or waivers. |
| Facility Access | This facility has an access road to the embankment. |
| Design / Construction | No design or construction issues have been identified. County staff will coordinate with the facility owner to implement the project. |

Costs:

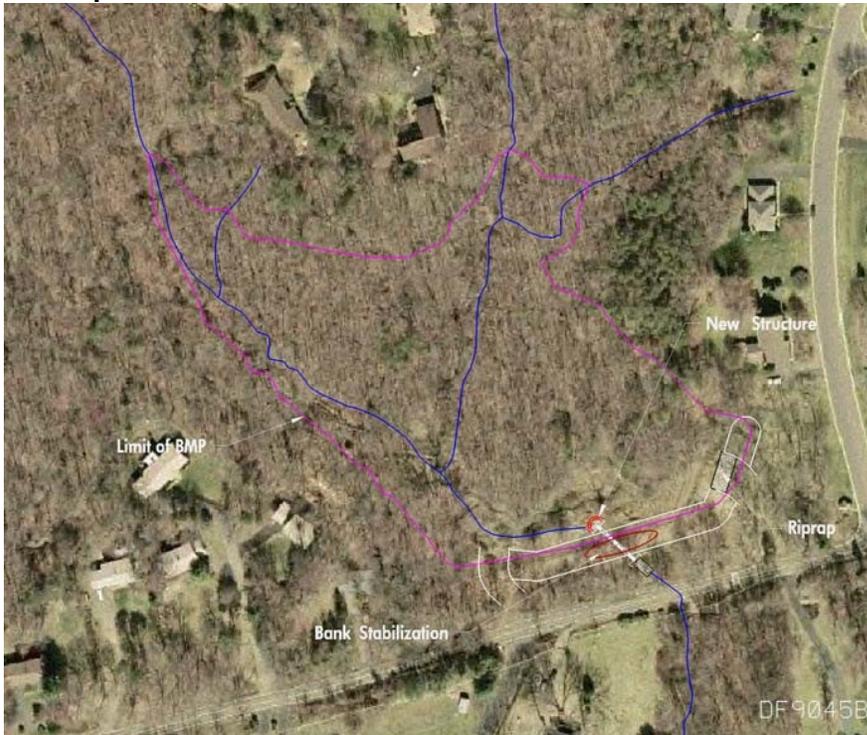
| ITEM | QUANTITY | UNIT S | UNIT COST | TOTAL |
|--|----------|--------|-------------|-----------------|
| Clear and Grub | 0.1 | AC | \$5,000.00 | \$500 |
| Riser | 1 | LS | \$10,000.00 | \$10,000 |
| Rip Rap Stabilization | 30 | LF | \$50.00 | \$1,500 |
| Base Construction Cost | | | | \$12,000 |
| Mobilization (5%) | | | | \$600 |
| Subtotal 1 | | | | \$12,600 |
| Contingency (25%) | | | | \$3,150 |
| Subtotal 2 | | | | \$15,750 |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$7,088 |
| Estimated Project Cost | | | | \$23,000 |

This project is part of the alternative project group for Regional Pond D-45. See Table 5-2 for the recommended disposition.

Site Photo:



Concept Sketch:

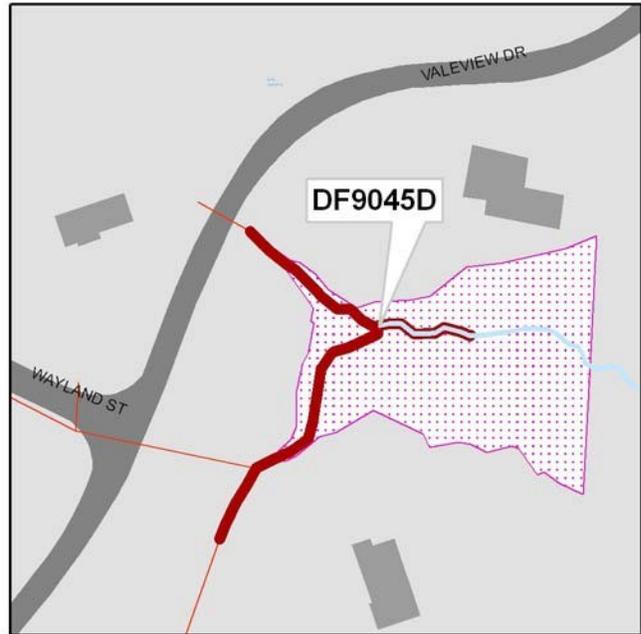


Project Number: DF9045D
Catchment Code: DFDF9203
Candidate Site: D-45

Project Type: Stream Restoration
Project Size: 481 Linear Feet

Project Location: This project is located east of the intersection of Valeview Drive and Wayland St.

Project Description: The stream appears to have eroded from incision moving upstream. There are two headcut points where the stream is holding grade. The project will create a step-pool system to lower the effective slope of the stream, and stabilize portions by regrading the banks. Stream buffers will be restored on all project reaches.



Potential Project Benefits:

| | |
|------------------|---|
| Stream Stability | The step pool system will restore the stream profile to a more stable condition. |
| Water Quality | Water quality will be improved by a significant reduction in current and future bank and bed erosion. |
| Instream Habitat | Erosion reduction, created bed features, and establishing a riparian buffer will improve physical habitat conditions. |

Potential Project Constraints:

| | |
|-----------------------|---|
| Environmental | The site will require some tree removal and impacts to jurisdictional wetlands. It will require a permit from both the U.S. Army Corps of Engineers and VDEQ. Projects in RPAs may require exceptions or waivers. |
| Facility Access | Access to this facility will require an easement on private property. |
| Design / Construction | Design efforts are average compared to other stream restoration projects. General constructability is good. |

This project is part of the alternative project group for Regional Pond D-45. See Table 5-2 for the recommended disposition.

Difficult Run Watershed Management Plan
 Concept Plans
 Upper Difficult Run

Costs

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------------|-------|-----------|------------------|
| Change channel type -- step pools | 337 | LF | \$225.00 | \$75,825 |
| Stabilize in place -- grading | 144 | LF | \$175.00 | \$25,200 |
| Buffer restoration | included above | LF | \$25.00 | \$0 |
| Add'l cost, first 500 LF | 481 | LF | \$200.00 | \$96,200 |
| Base Construction Cost | | | | \$197,225 |
| Mobilization (5%) | | | | \$9,861 |
| Subtotal 1 | | | | \$207,086 |
| Contingency (25%) | | | | \$51,772 |
| Subtotal 2 | | | | \$258,858 |
| Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$116,486 |
| Estimated Project Cost | | | | \$375,000 |

Concept Sketch

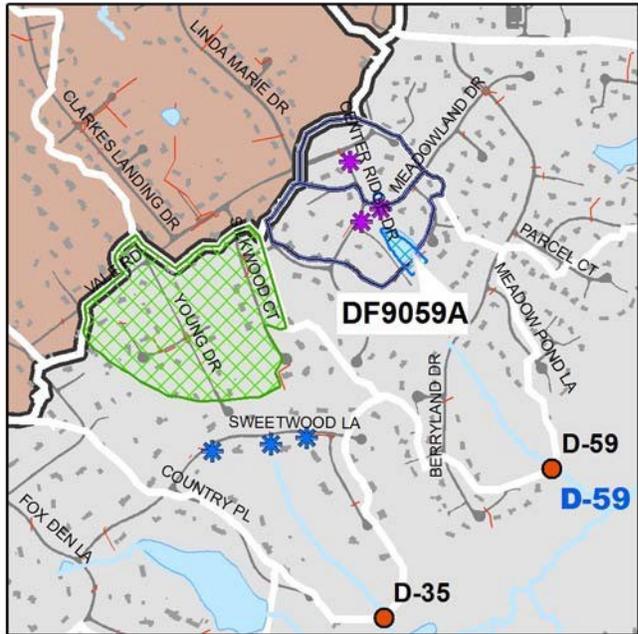


Project Number: DF9059A
Catchment Code: DFDF7901
Candidate Site: D-59

Project Type: Pond Retrofit
Project Size: 1.2 acres
Treated Area: 15.8 acres

Project Location: This project is located at the farm pond along Center Ridge Drive.

Project Description: The existing facility has more than enough volume to meet its calculated water quality volume as well as enough excess wet storage to provide water quality treatment for the dry pond located directly upstream, project DF9059C. To create adequate channel protection volume, a new multistage riser can be placed over the existing iron standpipe, or a weir can be placed across the entrance to the emergency spillway. Finally, there is an abundance of woody vegetation along the embankment and it is recommended that it be removed.



Potential Project Benefits:

| | |
|---------------|--|
| Streamflow | 100% of the calculated channel protection can be achieved with a multi-stage control structure. |
| Water Quality | The water quality improvement potential for this project is excellent. There is sufficient storage to meet more than 100% of the water quality volume for this site. |

Potential Project Constraints:

| | |
|-----------------------|---|
| Environmental | The use of an existing pond for a stormwater management retrofit would minimize environmental impacts, however, some permit negotiation and mitigation could be expected. Projects in RPAs may require exceptions or waivers. |
| Property Ownership | The pond is on private property. |
| Design / Construction | The final design should enhance the facility's use as a neighborhood amenity. County staff will coordinate with the facility owner to implement the project. |

Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|-------------|-----------------|
| Clear and Grub | 0.3 | AC | \$5,000.00 | \$1,500 |
| Outlet Protection | 1 | EA | \$8,000.00 | \$8,000 |
| Riser | 1 | LS | \$10,000.00 | \$10,000 |
| Rip Rap Stabilization | 125 | LF | \$50.00 | \$6,250 |
| Base Construction Cost | | | | \$25,750 |
| Mobilization (5%) | | | | \$1,288 |
| Subtotal 1 | | | | \$27,038 |
| Contingency (25%) | | | | \$6,759 |
| Subtotal 2 | | | | \$33,797 |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$15,209 |
| Estimated Project Cost | | | | \$49,000 |

This project is part of the alternative project group for Regional Pond D-59. See Table 5-2 for the recommended disposition.

Site Photo:



Concept Sketch:

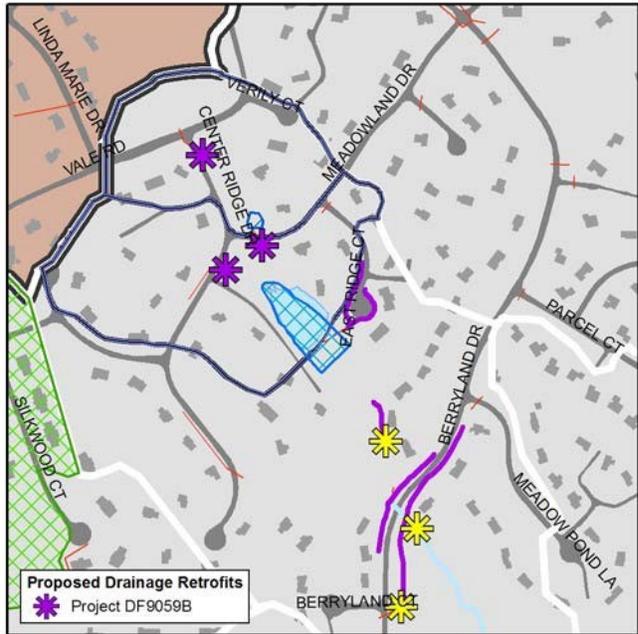


Project Number: DF9059B
Catchment Code: DFDF7901
Candidate Site: D-59

Project Type: Drainage Retrofit
Project Size: 6 Outfalls and 1950 ft of ditch removal

Project Location: This project is distributed throughout the catchment where piped drainage systems discharge into natural channels.

Project Description: This project consists of retrofitting the drainage system to reduce scour and erosion where flows from the storm drainage system enter the stream. In some instances (e.g. below Berryland Drive) structural energy dissipation may be required. Concrete roadside ditches which are prevalent will be removed and replaced with dry swale systems. Where necessary stone may be used to control velocities and stabilize the ditches.



Potential Project Benefits:

| | |
|---------------|--|
| Streamflow | The project will reduce velocity from the outfalls and erosive potential immediately downstream. Swales will reduce both volume and velocity. |
| Water Quality | Replacing ditches with swales will provide treatment before stormwater reaches the stream system. Water quality will also benefit from the reduction of sediment loads associated from scour at the outfall locations. |

Potential Project Constraints:

| | |
|-----------------------|--|
| Environmental | Environmental impacts and permit requirements are not anticipated for this project; however, projects in RPAs may require exceptions or waivers |
| Facility Access | Access to these sites can usually be obtained from the roadway and driveways. |
| Design / Construction | No unusual design or construction issues were identified. Design should incorporate check dams or other features to ensure flow velocity is not erosive. |

Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|------------|------------------|
| Paved Ditch Demolition (Haul Away) | 1950 | LF | \$18.00 | \$35,100 |
| Dry Swale w/ Underdrain | 1950 | LF | \$50.00 | \$97,500 |
| Outfall Protection | 6 | EA | \$8,000.00 | \$48,000 |
| Base Construction Cost | | | | \$180,600 |
| Mobilization (5%) | | | | \$9,030 |
| Subtotal 1 | | | | \$189,630 |
| Contingency (25%) | | | | \$47,408 |
| Subtotal 2 | | | | \$237,038 |
| Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$106,667 |
| Estimated Project Cost | | | | \$344,000 |

This project is part of the alternative project group for Regional Pond D-59. See Table 5-2 for the recommended disposition.

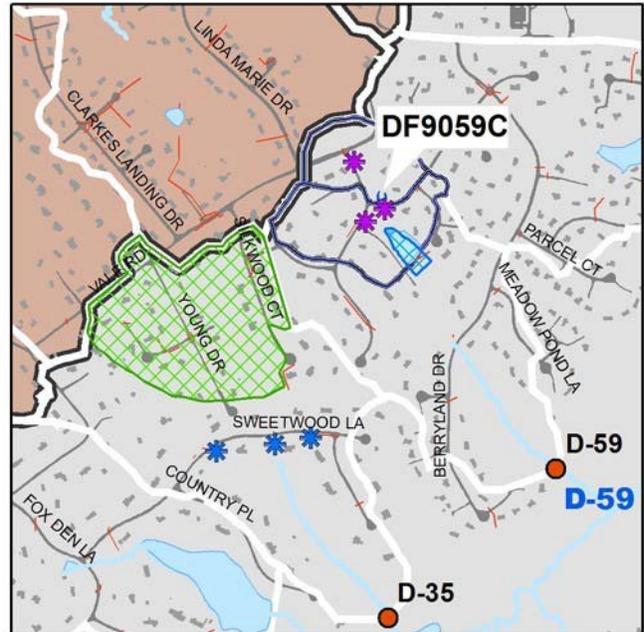
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Project Number: DF9059C
Catchment Code: DFDF7901
Candidate Site: D-59

Project Type: Pond Retrofit
Project Size: 0.1 acres
Treated Area: 10.3 acres

Project Location: Upstream of the culvert at Meadowland Drive

Project Description: Retrofitting this dry pond for channel protection involves installing a new multi-stage riser on the existing 18 inch pipe and excavation to optimize the space available for detention. The project will remain a dry pond and the ground will be re-graded to restore the current use and aesthetic nature of this area.



Potential Project Benefits:

| | |
|---------------|---|
| Streamflow | 100% of the calculated channel protection requirement for this facility can be met by installing a multistage control structure and excavation. |
| Water Quality | 100% of the water quality volume requirement can be met in project DF9059A downstream. |

Potential Project Constraints:

| | |
|-----------------------|---|
| Environmental | No environmental constraints are anticipated. Projects in RPAs may require exceptions or waivers. |
| Facility Access | Access to the project is excellent from Meadowland Drive. |
| Design / Construction | Any changes will likely require approval by the community association. County staff will coordinate with the facility owner to implement the project. |

Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|-------------|------------------|
| Clear and Grub | 0.6 | AC | \$5,000.00 | \$3,000 |
| Grading and Excavation | 2560 | CY | \$30.00 | \$76,800 |
| Riser | 1 | LS | \$10,000.00 | \$10,000 |
| Dry Landscaping | 2570 | SY | \$2.50 | \$6,425 |
| Base Construction Cost | | | | \$96,225 |
| Mobilization (5%) | | | | \$4,811 |
| Subtotal 1 | | | | \$101,036 |
| Contingency (25%) | | | | \$25,259 |
| Subtotal 2 | | | | \$126,295 |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$56,833 |
| Estimated Project Cost | | | | \$183,000 |

This project is part of the alternative project group for Regional Pond D-59. See Table 5-2 for the recommended disposition.

Site Photo:



Concept Sketch:

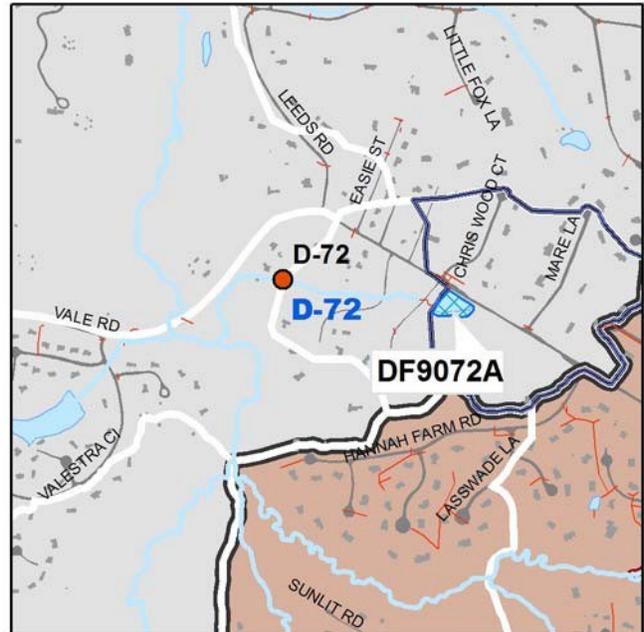


Project Number: DF9072A
Catchment Code: DFDF7701
Candidate Site: D-72

Project Type: Pond Retrofit
Project Size: 0.9 acres
Treated Area: 50.1 acres

Project Location: This project will be on private property across Vale Road from Chris Wood Court.

Project Description: The embankment should be stabilized and the existing outlet pipe repaired or replaced because of corrosion before recommendations for improvements can be made. It is necessary to remove all woody vegetation along the embankment. This pond can be retrofit for peak flow attenuation by installing a multistage riser structure. The existing volume within this pond is adequate to meet the required water quality volume. Treatment will be enhanced by constructing an aquatic bench around part of the perimeter of the pond.



Potential Project Benefits:

| | |
|---------------|--|
| Streamflow | About 40% of the required channel protection volume can be met at this site. |
| Water Quality | 100% of the required water quality volume exists as wet storage. |

Potential Project Constraints:

| | |
|-----------------------|--|
| Environmental | No significant environmental constraints have been identified. Projects in RPAs may require exceptions or waivers. |
| Facility Access | Facility access is very good from Vale Road and from the private drive. |
| Design / Construction | Embankment restoration measures are required for retrofit improvements to function as designed. County staff will coordinate with the facility owner to implement the project. |

Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|-------------|------------------|
| Clear and Grub | 0.1 | AC | \$5,000.00 | \$500 |
| Remove Barrel Pipe | 60 | LF | \$77.00 | \$4,620 |
| Excavation/Grading (aquatic bench) | 95 | CY | \$30.00 | \$2,850 |
| Outlet Protection | 1 | EA | \$8,000.00 | \$8,000 |
| Reconstruct Embankment | 500 | CY | \$60.00 | \$30,000 |
| Riser | 1 | LS | \$10,000.00 | \$10,000 |
| Outflow Pipe | 60 | LF | \$35.00 | \$2,100 |
| Wetland Planting (aquatic bench) | 73 | SY | \$2.00 | \$146 |
| Base Construction Cost | | | | \$58,216 |
| Mobilization (5%) | | | | \$2,911 |
| Subtotal 1 | | | | \$61,127 |
| Contingency (25%) | | | | \$15,282 |
| Subtotal 2 | | | | \$76,409 |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$34,384 |
| Estimated Project Cost | | | | \$111,000 |

This project is part of the alternative project group for Regional Pond D-72. See Table 5-2 for the recommended disposition.

Site Photo:



Concept Sketch:

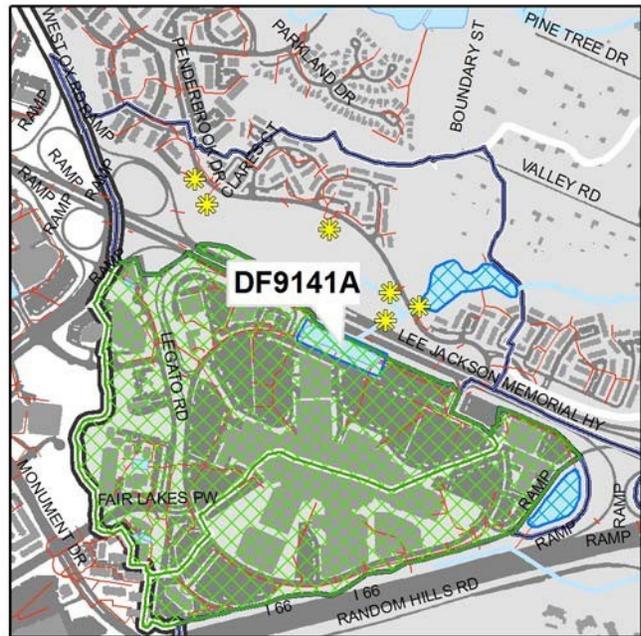


Project Number: DF9141A
Catchment Code: DFDF0009
Candidate Site: C41

Project Type: Pond Retrofit
Project Size: 3.0 acres
Treated Area: 98.4 acres

Project Location: This project is on Fair Oaks Mall property, adjacent to Lee Jackson Memorial Highway.

Project Description: This pond discharges into another wet pond, project DF9141B, located approximately 200 feet downstream. The water quality volume is met within the existing wet storage of this pond. To create channel protection, the control structure would be replaced with a multistage riser. This will provide peak flow attenuation of higher frequency storm events but is not capable of meeting the channel protection volume. Proper anti-clogging measures and routine maintenance are important factors to ensure reliability and function of this stormwater management facility.



Project Benefits:

| | |
|---------------|---|
| Streamflow | Approximately 40% of the calculated channel protection volume can be met. |
| Water Quality | 100% of the calculated water quality volume exists within this pond. |

Project Constraints:

| | |
|-----------------------|---|
| Environmental | Environmental permitting issues are not anticipated for this project. Projects in RPAs may require exceptions or waivers. |
| Facility Access | Access to this project is excellent. |
| Design / Construction | No design or construction issues have been identified. County staff will coordinate with the facility owner to implement the project. |

Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|-------------|-----------------|
| Clear and Grub | 0.3 | AC | \$5,000.00 | \$1,500. |
| Riser | 1 | LS | \$10,000.00 | \$10,000 |
| Fencing | 1540 | LF | \$20.00 | \$30,800 |
| Rip Rap Stabilization | 35 | LF | \$50.00 | \$1,750 |
| Dry Landscaping | 1332 | SY | \$2.50 | \$3,330 |
| Base Construction Cost | | | | \$47,380 |
| Mobilization (5%) | | | | \$2,369 |
| Subtotal 1 | | | | \$49,749 |
| Contingency (25%) | | | | \$12,437 |
| Subtotal 2 | | | | \$62,186 |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$27,984 |
| Estimated Project Cost | | | | \$90,000 |

Site Photo:



Concept Sketch:

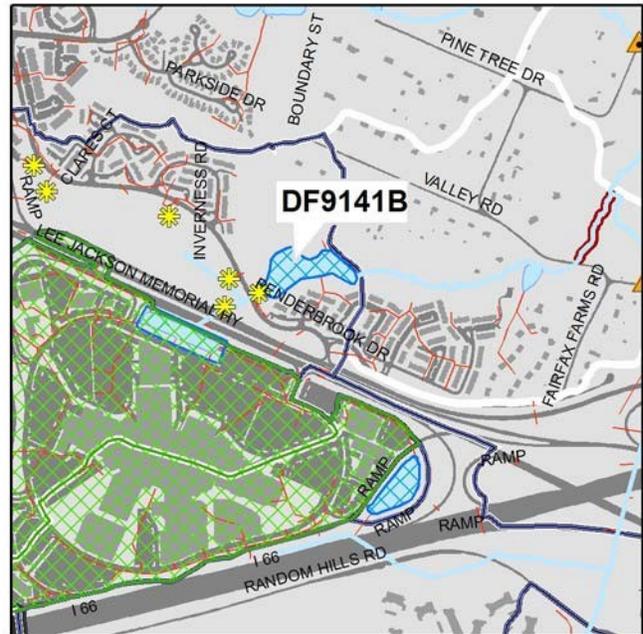


Project Number: DF9141B
Catchment Code: DFDF0009
Candidate Site: C41

Project Type: Pond Retrofit
Project Size: 3.4 acres
Treated Area: 96.2 acres

Project Location: This project is on the golf course off of Penderbrook Drive.

Project Description: Flow exiting from project DF9141A is directed under Lee Jackson Memorial Highway and into this pond. The recommendations to retrofit this facility will not affect the aesthetic appeal of the pond. A simple modification to the riser structure will allow this facility to provide the channel protection volume. The wet storage within this pond meets the water quality volume. An aquatic bench is proposed around the perimeter of the pond to increase the uptake of nutrients and improve overall water quality treatment function at this location.



Project Benefits:

| | |
|---------------|---|
| Streamflow | 100% of the required channel protection volume can be met at this location. |
| Water Quality | 100% of the required water quality volume exists as wet storage. |

Project Constraints:

| | |
|-----------------------|---|
| Environmental | Environmental permitting issues are not anticipated for this project. Projects in RPAs may require exceptions or waivers. |
| Facility Access | Access to this project is very good from Penderbrook Drive. |
| Design / Construction | As this project is located on a private golf course, care should be taken during the construction phase to not damage the existing greens. County staff will coordinate with the facility owner to implement the project. |

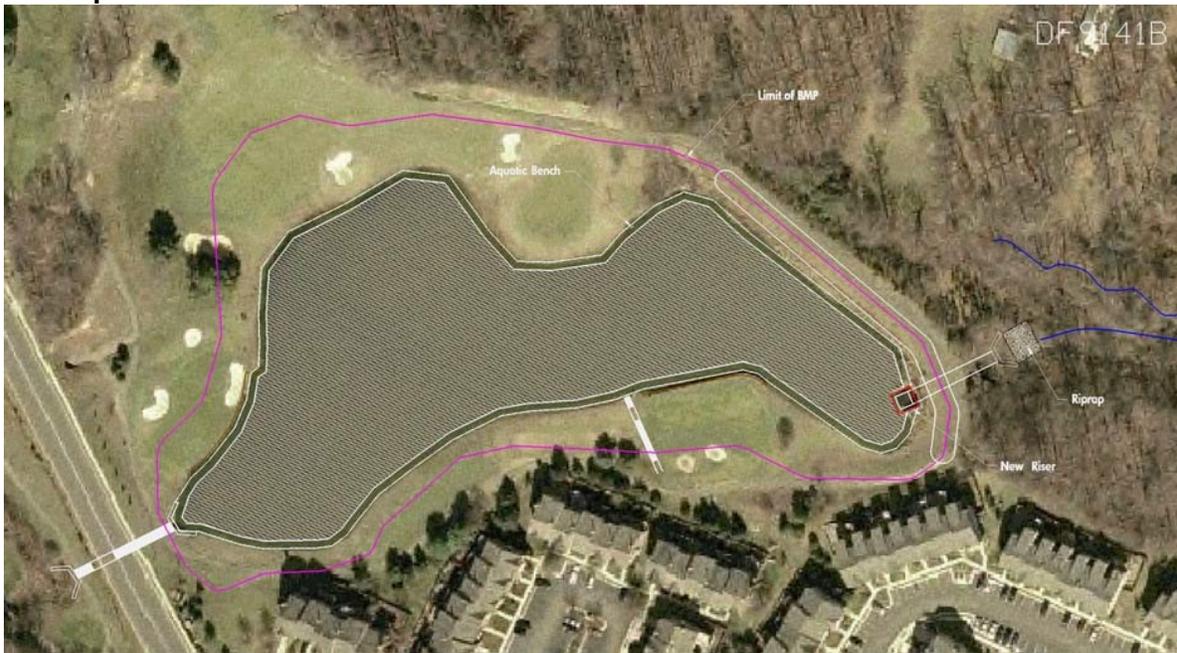
Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|-------------|------------------|
| Clear and Grub | 0.4 | AC | \$5,000.00 | \$2,000 |
| Excavation/Grading (aquatic bench) | 6100 | CY | \$30.00 | \$183,000 |
| Riser | 1 | LS | \$10,000.00 | \$10,000 |
| Rip Rap Stabilization | 35 | LF | \$50.00 | \$1,750 |
| Wetland Planting (aquatic bench) | 1765 | SY | \$2.00 | \$3,530 |
| Base Construction Cost | | | | \$200,280 |
| Mobilization (5%) | | | | \$10,014 |
| Subtotal 1 | | | | \$210,294 |
| Contingency (25%) | | | | \$52,574 |
| Subtotal 2 | | | | \$262,868 |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$118,290 |
| Estimated Project Cost | | | | \$381,000 |

Site Photo:



Concept Sketch:

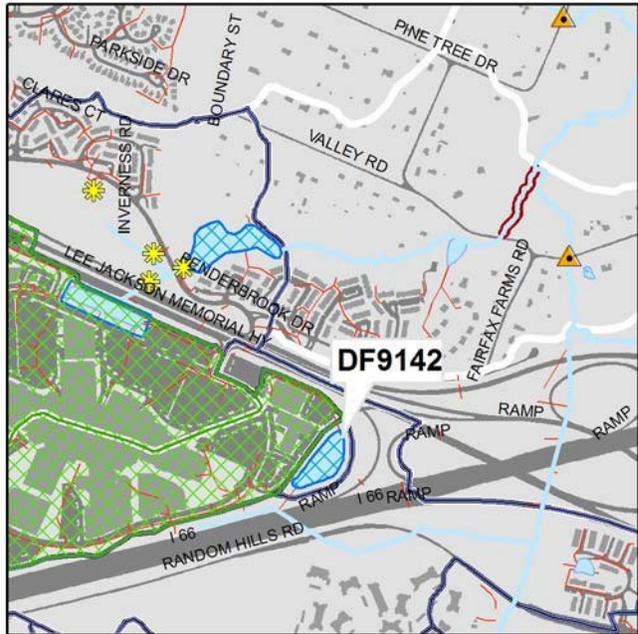


Project Number: DF9142
Catchment Code: DFDF0005
Candidate Site: C42

Project Type: Pond Retrofit
Project Size: 2.0 acres
Treated Area: 60.7 acres

Project Location: This project is on the east end of the Fair Oaks Mall property.

Project Description: This wet pond is located between the mall parking lot and the interchange of I-66 and Lee Jackson Memorial Highway. The control structure should be upgraded to a multi-stage riser. In addition, due to surrounding conditions, anti clogging measures should be incorporated into the multistage riser design. The wet storage within this pond meets the water quality volume. An aquatic bench is proposed around the perimeter of the pond to increase the uptake of nutrients and improve overall water quality treatment function at this location.



Potential Project Benefits:

| | |
|---------------|--|
| Streamflow | This project should achieve 100% of the channel protection volume. |
| Water Quality | 100% of the water quality volume can be met at this location. |

Potential Project Constraints:

| | |
|-----------------------|---|
| Environmental | Environmental permitting should not be an issue for this project. Projects in RPAs may require exceptions or waivers. |
| Facility Access | Access to this project is very good from the roadway. |
| Design / Construction | No design or construction issues were identified for this project. County staff will coordinate with the facility owner to implement the project. |

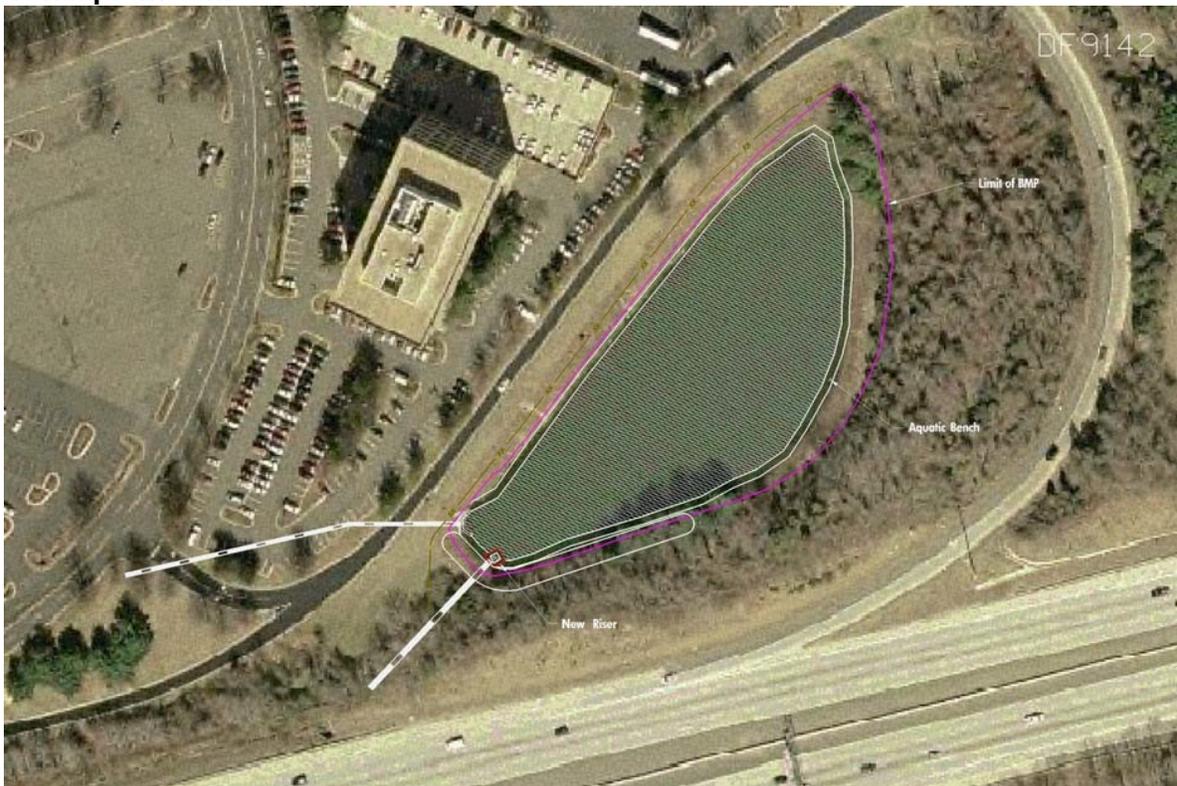
Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|-------------|------------------|
| Clear and Grub | 0.3 | AC | \$5,000.00 | \$1,500. |
| Excavation/Grading (aquatic bench) | 3467 | CY | \$30.00 | \$104,010 |
| Riser | 1 | LS | \$10,000.00 | \$10,000 |
| Fencing | 684 | LF | \$20.00 | \$13,680 |
| Wetland Planting (aquatic bench) | 1156 | SY | \$2.00 | \$2,312 |
| Base Construction Cost | | | | \$131,502 |
| Mobilization (5%) | | | | \$6,575 |
| Subtotal 1 | | | | \$138,077 |
| Contingency (25%) | | | | \$34,519 |
| Subtotal 2 | | | | \$172,596 |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$77,668 |
| Estimated Project Cost | | | | \$250,000 |

Site Photo:



Concept Sketch:

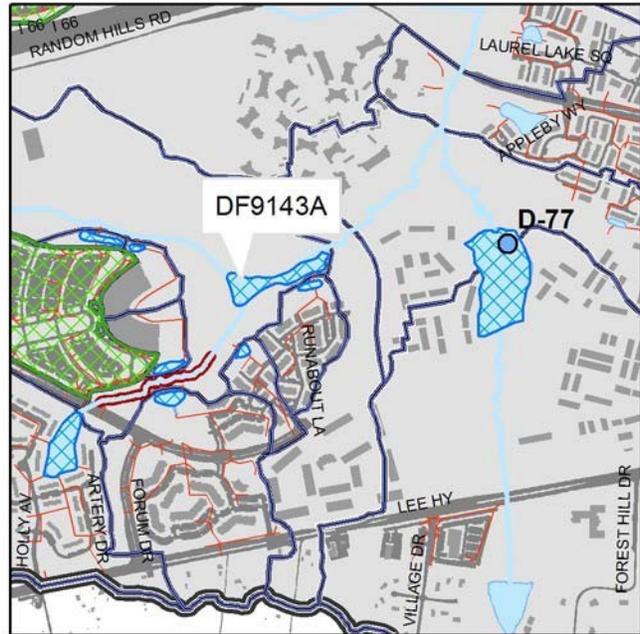


Project Number: DF9143A
Catchment Code: DFDF0001
Candidate Site: C43

Project Type: Pond Retrofit
Project Size: 2.1 acres
Treated Area: 67.8 acres

Project Location: East of the Fairfax County Government Center.

Project Description: This project consists of two amenity ponds in series that were not designed to act as stormwater management facilities. The wet storage within these ponds is enough to meet the calculated water quality volume for not only this location, but also an additional eight dry pond facilities located upstream. The retrofit design for these eight upstream facilities, projects DF9143B1, DF9143B2, DF9143C, DF9143D, DF9143E, DF9143F1, DF9143F2, and DF9143G, utilizes the available storage volume within each to provide channel protection while the water quality treatment is met within DF9143A.



Potential Project Benefits:

| | |
|---------------|---|
| Streamflow | Streamflow benefits at this site are provided by projects upstream. |
| Water Quality | 100% of the water quality volume is available for this pond as well as for eight other dry ponds directly upstream. |

Potential Project Constraints:

| | |
|-----------------------|--|
| Environmental | Permits are expected to be minimal for this retrofit project. There may be forest impacts during construction. Projects in RPAs may require exceptions or waivers. |
| Facility Access | Access is available from Government Center, but site is forested. |
| Design / Construction | No significant design or construction issues were identified for this project. County staff will coordinate with the facility owner to implement the project. |

Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|-------------|-----------------|
| Clear and Grub | 0.1 | AC | \$5,000.00 | \$500 |
| Outlet Protection | 1 | EA | \$8,000.00 | \$8,000 |
| Riser | 1 | LS | \$10,000.00 | \$10,000 |
| Outflow Pipe | 75 | LF | \$35.00 | \$2,625 |
| Outlet Stabilization | 100 | LF | \$50.00 | \$5,000 |
| Base Construction Cost | | | | \$26,125 |
| Mobilization (5%) | | | | \$1,306 |
| Subtotal 1 | | | | \$27,431 |
| Contingency (25%) | | | | \$6,858 |
| Subtotal 2 | | | | \$34,289 |
| Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$15,430 |
| Estimated Project Cost | | | | \$50,000 |

Site Photo 1: Amenity pond 1.



Site Photo 2: Amenity pond 2.

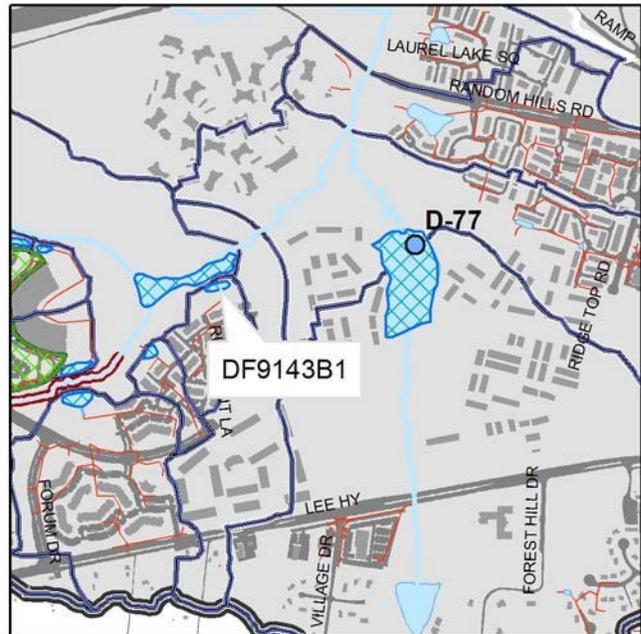


Project Number: DF9143B1
Catchment Code: DFDF0001
Candidate Site: C43

Project Type: Pond Retrofit
Project Size: 0.2 acres
Treatment Area: 9.9 acres

Project Location: Immediately south of project DF9143A

Project Description: This dry pond flows directly into a wet pond, project DF9143A. The storage volume from the design plans for this pond is adequate for extended detention of the 1-year event. However, the pond shows evidence of sedimentation, reducing volume available to manage storm water. This project includes removal of the sediment to return this facility to its original design storage. It will then be possible to modify the riser to meet the channel protection volume requirement. Also, any established vegetation disturbed should be returned/replanted. Finally, the water quality volume requirement for this facility will be met in the excess wet storage available in the wet amenity pond located directly downstream if it is retrofitted.



Potential Project Benefits:

| | |
|---------------|--|
| Streamflow | 100% of the channel protection volume requirement can be met with sediment removal and by modifying the riser. |
| Water Quality | Water quality treatment can be met in project DF9143A downstream. |

Potential Project Constraints:

| | |
|-----------------------|---|
| Environmental | Environmental permitting should not be an issue for this project. Projects in RPAs may require exceptions or waivers. |
| Facility Access | Access is adequate from the existing access road. |
| Design / Construction | No design or construction issues were identified for this project. County staff will coordinate with the facility owner to implement the project. |

Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|-------------------------------|-----------------|
| Clear and Grub | 0.1 | AC | \$5,000.00 | \$500 |
| Riser | 1 | LS | \$10,000.00 | \$10,000 |
| | | | Base Construction Cost | \$10,500 |
| | | | Mobilization (5%) | \$525 |
| | | | Subtotal 1 | \$11,025 |
| | | | Contingency (25%) | \$2,756 |
| | | | Subtotal 2 | \$13,781 |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$6,202 |
| | | | Estimated Project Cost | \$20,000 |

Site Photo:



Concept Sketch:

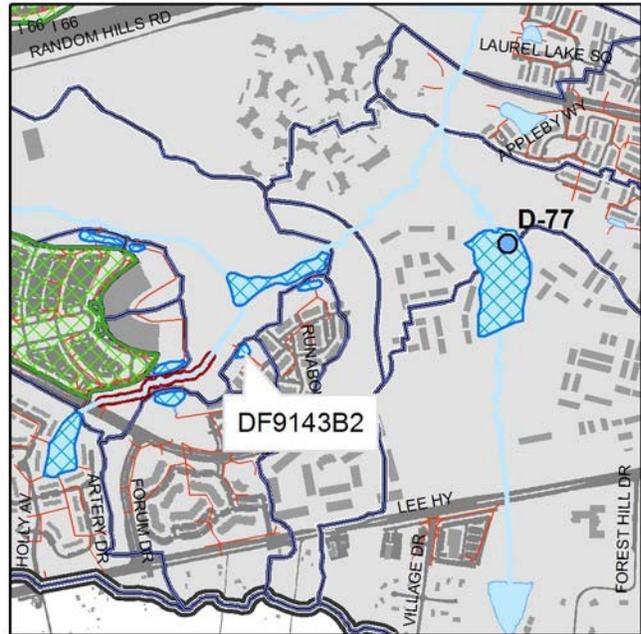


Project Number: DF9143B2
Catchment Code: DFDF0001
Candidate Site: C43

Project Type: Pond Retrofit
Project Size: 0.2 acres
Treated Area: 4.8 acres

Project Location: North of Rockaway Lane.

Project Description: There is a concrete channel leading from the one inflow to the riser structure. To provide the channel protection volume, the concrete pilot channel should be removed, redesigned, and the available area within the existing pond footprint excavated to its optimum storage volume. Due to the proximity to residences, positive grading will maintain this as a dry facility. The excavated areas will be re-sodded for aesthetic purposes and the riprap channel at the single concentrated inflow point should be replaced. In addition, sagging and erosion of the downstream side of the embankment was noticed in some areas and should be stabilized.



Potential Project Benefits:

| | |
|---------------|---|
| Streamflow | 100% of the channel protection volume can be met with excavation. |
| Water Quality | Water quality treatment can be met in project DF9143A downstream. |

Potential Project Constraints:

| | |
|-----------------------|---|
| Environmental | Environmental permitting should not be an issue for this project. Projects in RPAs may require exceptions or waivers. |
| Facility Access | Access is adequate from the high-density residential area. |
| Design / Construction | No design or construction issues were identified for this project. County staff will coordinate with the facility owner to implement the project. |

Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|-------------|-----------------|
| Clear and Grub | 0.2 | AC | \$5,000.00 | \$1,000 |
| Remove Pilot Channels | 30 | LF | \$6.00 | \$180 |
| Grading and Excavation | 190 | CY | \$30.00 | \$5,700 |
| Riser | 1 | LS | \$10,000.00 | \$10,000 |
| Dry Landscaping | 775 | SY | \$2.505 | \$1,937 |
| Base Construction Cost | | | | \$18,818 |
| Mobilization (5%) | | | | \$941 |
| Subtotal 1 | | | | \$19,758 |
| Contingency (25%) | | | | \$4,940 |
| Subtotal 2 | | | | \$24,698 |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$11,114 |
| Estimated Project Cost | | | | \$36,000 |

Site Photo:



Concept Sketch:

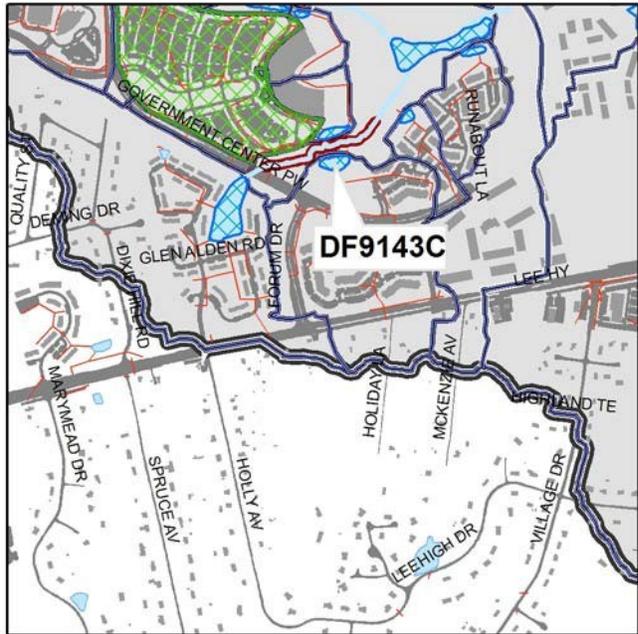


Project Number: DF9143C
Catchment Code: DFDF0001
Candidate Site: C43

Project Type: Pond Retrofit
Project Size: 0.4 acres
Treated Area: 40.9 acres

Project Location: North of Government Center Parkway and Forum Drive.

Project Description: The pond has aggraded approximately 3 feet since it was constructed, which limits its potential for meeting its design requirements, and the upstream channel shows signs of degrading and erosion. Although removing established wetland vegetation is not usually recommended, because sediment removal is necessary and would require excavation to clean out this facility, much of the vegetation throughout would be disturbed, so further excavation to maximize the available storage is proposed. The water quality volume that is not met within this facility will be treated in the project DF 9143A. Finally, the upstream channel located on the backside of this facility should be stabilized.



Potential Project Benefits:

| | |
|---------------|---|
| Streamflow | 75% of the channel protection volume can be met with excavation and modifications to the riser. |
| Water Quality | Water quality treatment can be met in project DF9143A downstream. |

Potential Project Constraints:

| | |
|-----------------------|---|
| Environmental | Environmental permitting should not be an issue for this project. Projects in RPAs may require exceptions or waivers. |
| Facility Access | Access is adequate from the existing access road. |
| Design / Construction | No design or construction issues were identified for this project. County staff will coordinate with the facility owner to implement the project. |

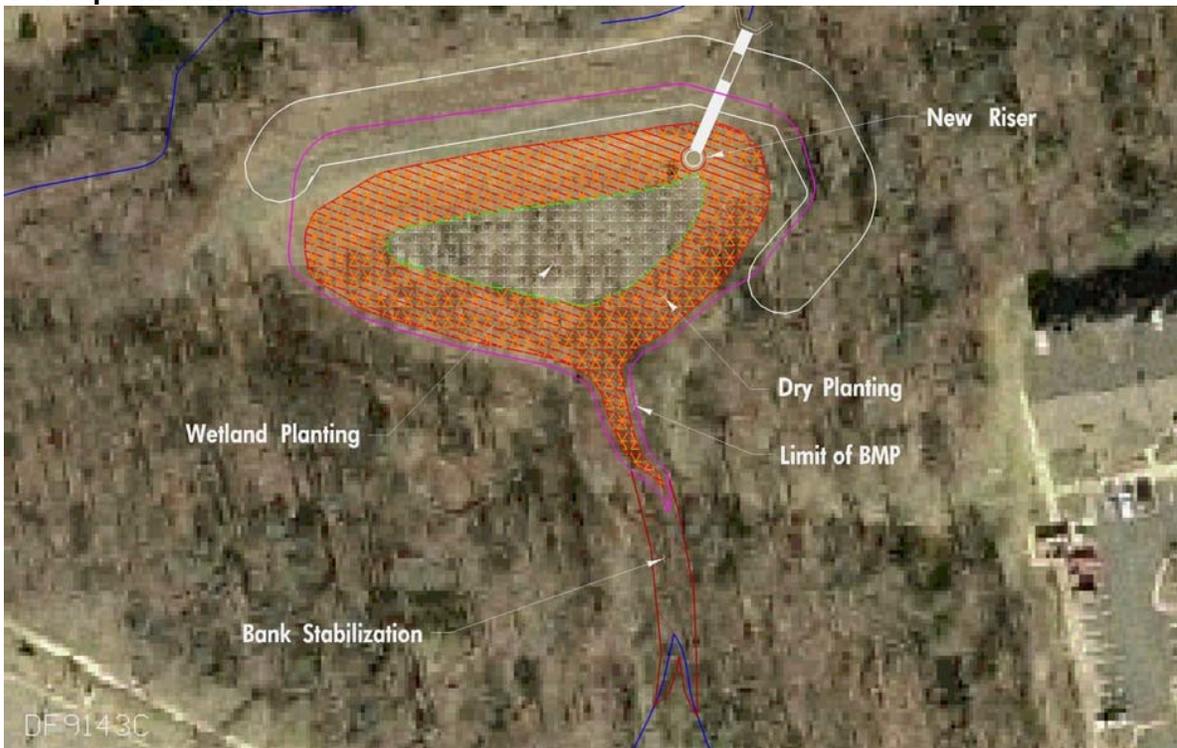
Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|-------------|------------------|
| Clear and Grub | 0.5 | AC | \$5,000.00 | \$2,500. |
| Excavation/Grading | 2068 | CY | \$30.00 | \$62,040 |
| Riser | 1 | LS | \$10,000.00 | \$10,000 |
| Rip Rap Stabilization | 100 | LF | \$50.00 | \$5,000 |
| Wetland Planting | 672 | SY | \$2.00 | \$1,344 |
| Dry Landscaping | 1690 | SY | \$2.50 | \$4,225 |
| Base Construction Cost | | | | \$85,109 |
| Mobilization (5%) | | | | \$4,255 |
| Subtotal 1 | | | | \$89,364 |
| Contingency (25%) | | | | \$22,341 |
| Subtotal 2 | | | | \$111,706 |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$50,268 |
| Estimated Project Cost | | | | \$162,000 |

Site Photo:



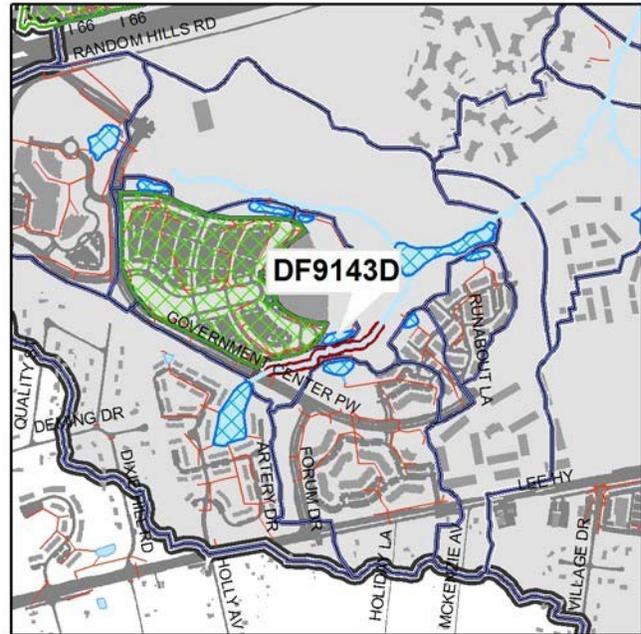
Concept Sketch:



Project Number: DF9143D
Catchment Code: DFDF0001
Candidate Site: C43

Project Type: Pond Retrofit
Project Size: 0.3 acres
Treated Area: 7.5 acres

Project Location: South of the Fairfax Government Center



Project Description: The channel protection volume can be met by modifying the existing control structure to better utilize the available storage volume within this dry pond. Cutting back the dewatering orifice to the base of the riser will maximize the flow length and detention time. It is also recommended to remove the existing concrete channels and create vegetated, natural channels. The water quality volume for this site can be met in the excess wet storage available at project DF9143A) located downstream. Also, sediment forebays are proposed at each of the 3 three inflows. The size and type of each component can be determined with further analysis for each individually.

Potential Project Benefits:

| | |
|---------------|--|
| Streamflow | 100% of the channel protection volume requirement can be met by modifying the riser. |
| Water Quality | This facility will remain a dry pond. Water quality treatment can be met in project DF9143A downstream.. |

Potential Project Constraints:

| | |
|-----------------------|---|
| Environmental | Environmental permitting should not be an issue for this project. Projects in RPAs may require exceptions or waivers. |
| Facility Access | Access is adequate from the parking area of the Government Center. |
| Design / Construction | No design or construction issues were identified for this project. County staff will coordinate with the facility owner to implement the project. |

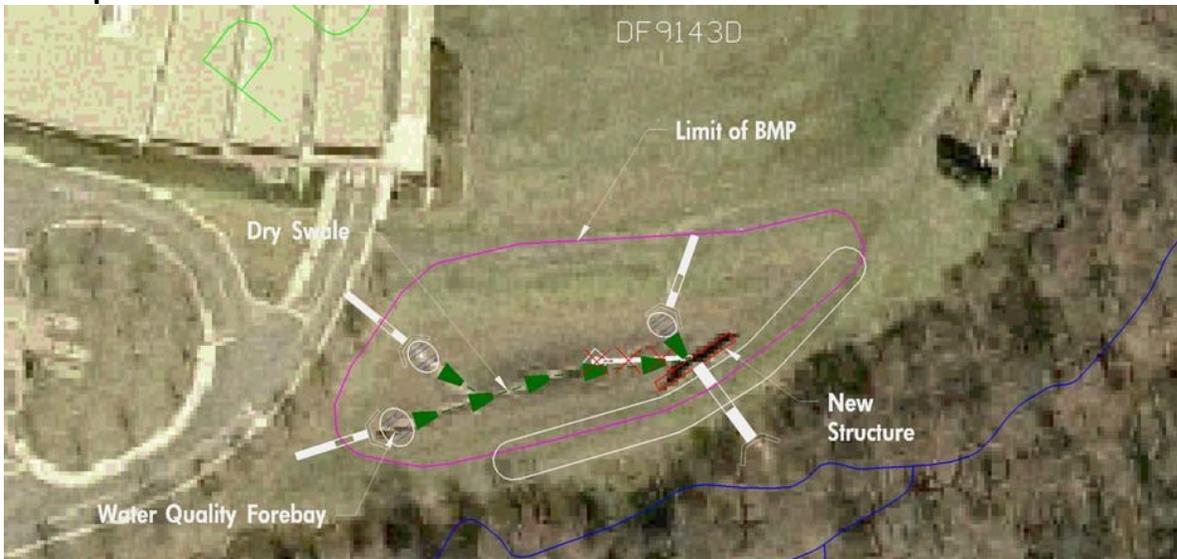
Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|-------------|-----------------|
| Clear and Grub | 0.1 | AC | \$5,000.00 | \$500 |
| Remove Pilot Channels | 200 | LF | \$6.00 | \$1,200 |
| Dry Swale | 200 | LF | \$35.00 | \$7,000 |
| Forebays (3 locations) | 131 | CY | \$45.00 | \$5,895 |
| Riser | 1 | LS | \$10,000.00 | \$10,000 |
| Base Construction Cost | | | | \$24,595 |
| Mobilization (5%) | | | | \$1,230 |
| Subtotal 1 | | | | \$25,825 |
| Contingency (25%) | | | | \$6,456 |
| Subtotal 2 | | | | \$32,281 |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$14,526 |
| Estimated Project Cost | | | | \$47,000 |

Site Photo:



Concept Sketch:



Site Photo:



Concept Sketch:

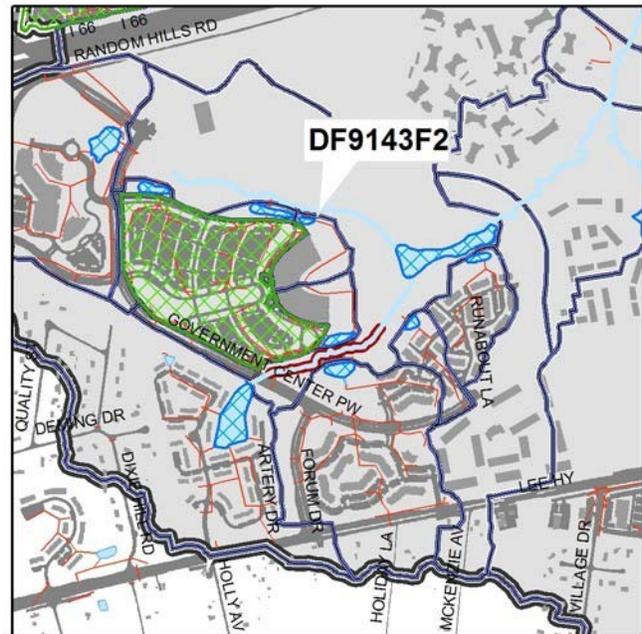


Project Number: DF9143F2
Catchment Code: DFDF0001
Candidate Site: C43

Project Type: Pond Retrofit
Project Size: 0.1 acres
Treated Area: 5.6 acres

Project Location: This project is north of the Government Center building.

Project Description: This dry pond appears to manage the 2, 10, and 100-year events. Three pilot channels direct flow from concentrated inflow points to a dewatering orifice located in the center of the pond. Cutting back the dewatering orifice to the base of the riser will maximize the flow length and detention time. It is also recommended to remove the existing concrete channels and create vegetated, natural channels. Although the water quality volume requirement for this facility can be met in the excess wet storage available at project DF9143A located downstream, sediment forebays are proposed at each of the 3 three inflows to improve pollutant removal and ease of maintenance. The size and type of each component can be determined with further analysis for each individually.



Potential Project Benefits:

| | |
|---------------|---|
| Streamflow | 90% of the channel protection volume can be achieved by modifying the control structure and without excavation. |
| Water Quality | Water quality treatment can be met in project DF9143A downstream. |

Potential Project Constraints:

| | |
|-----------------------|--|
| Environmental | Environmental permitting should not be an issue for this retrofit project. There are no significant environmental constraints. Projects in RPAs may require exceptions or waivers. |
| Facility Access | Access is very good from the parking areas. |
| Design / Construction | No design or construction issues were identified for this project. County staff will coordinate with the facility owner to implement the project. |

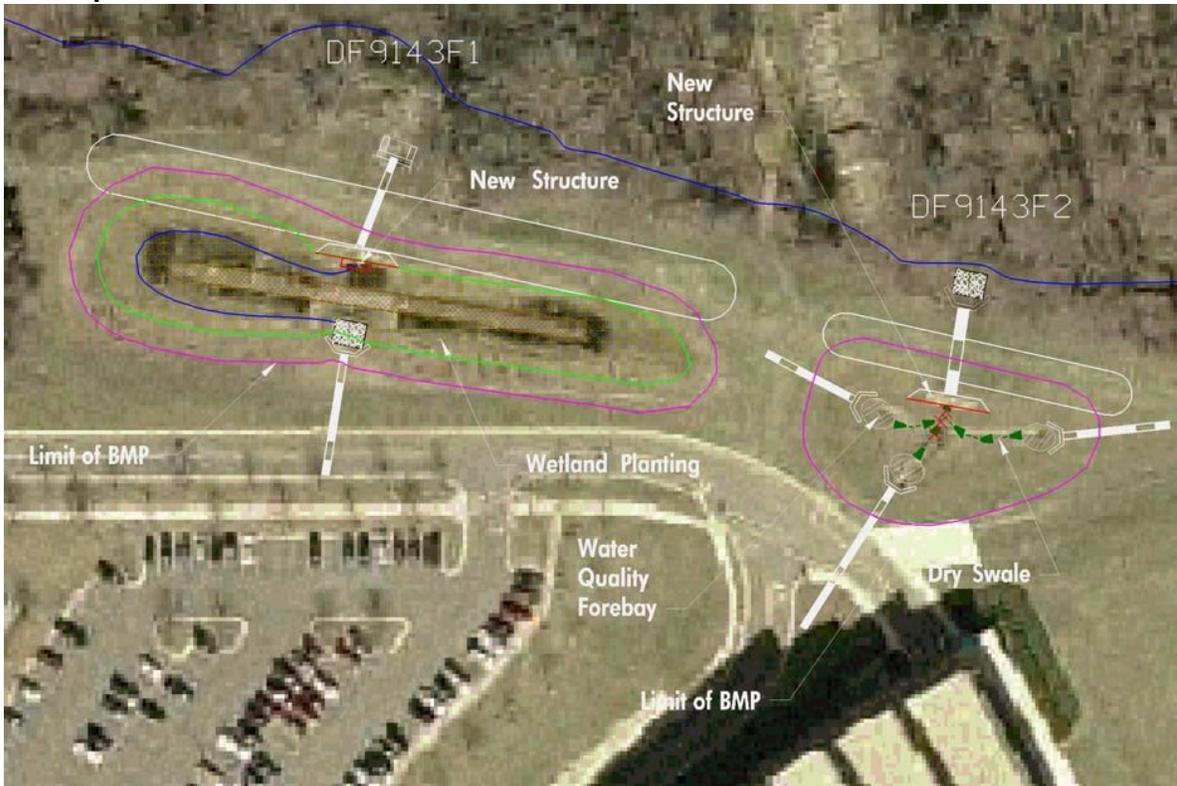
Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|-------------|-----------------|
| Clear and Grub | 0.1 | AC | \$5,000.00 | \$500 |
| Forebays (3 locations) | 45 | CY | \$45.00 | \$2,025 |
| Riser | 1 | LS | \$10,000.00 | \$10,000 |
| Base Construction Cost | | | | \$12,525 |
| Mobilization (5%) | | | | \$626 |
| Subtotal 1 | | | | \$13,151 |
| Contingency (25%) | | | | \$3,288 |
| Subtotal 2 | | | | \$16,439 |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$7,398 |
| Estimated Project Cost | | | | \$24,000 |

Site Photo:



Concept Sketch:

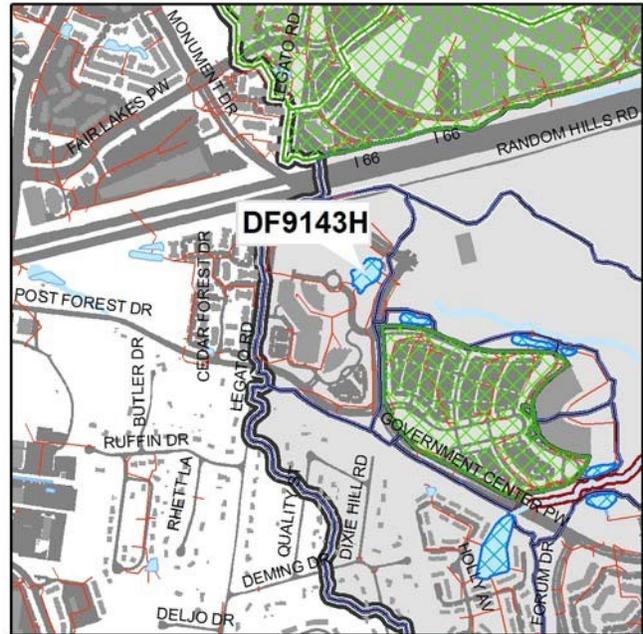


Project Number: DF9143H
Catchment Code: DDF0001
Candidate Site: C43

Project Type: Pond Retrofit
Project Size: 0.9 acres
Treated Area: 36.5 acres

Project Location: This project is at the corner of Government Center Parkway and Monument Drive.

Project Description: The existing volume within the pond meets the water quality volume. There is enough excess wet storage volume to construct an aquatic bench around the entire perimeter of this facility. At this location, impacts of construction and aesthetic appeal of this component must be carefully considered. This feature is included in the project costs shown below. The channel protection volume can be met above the water surface elevation by modifying the control structure.



Potential Project Benefits:

| | |
|---------------|---|
| Streamflow | 100% of the calculated channel protection volume can be met by modifying the control structure of this wet pond. |
| Water Quality | 100% of the required water quality volume exists as wet storage within this pond. Additional components such as an aquatic bench can be added to improve treatment function if desired. |

Potential Project Constraints:

| | |
|-----------------------|---|
| Environmental | Environmental permitting should not be an issue for this project. Projects in RPAs may require exceptions or waivers. |
| Facility Access | Access is very good from the public roads. |
| Design / Construction | No design or construction issues were identified for this project. County staff will coordinate with the facility owner to implement the project. |

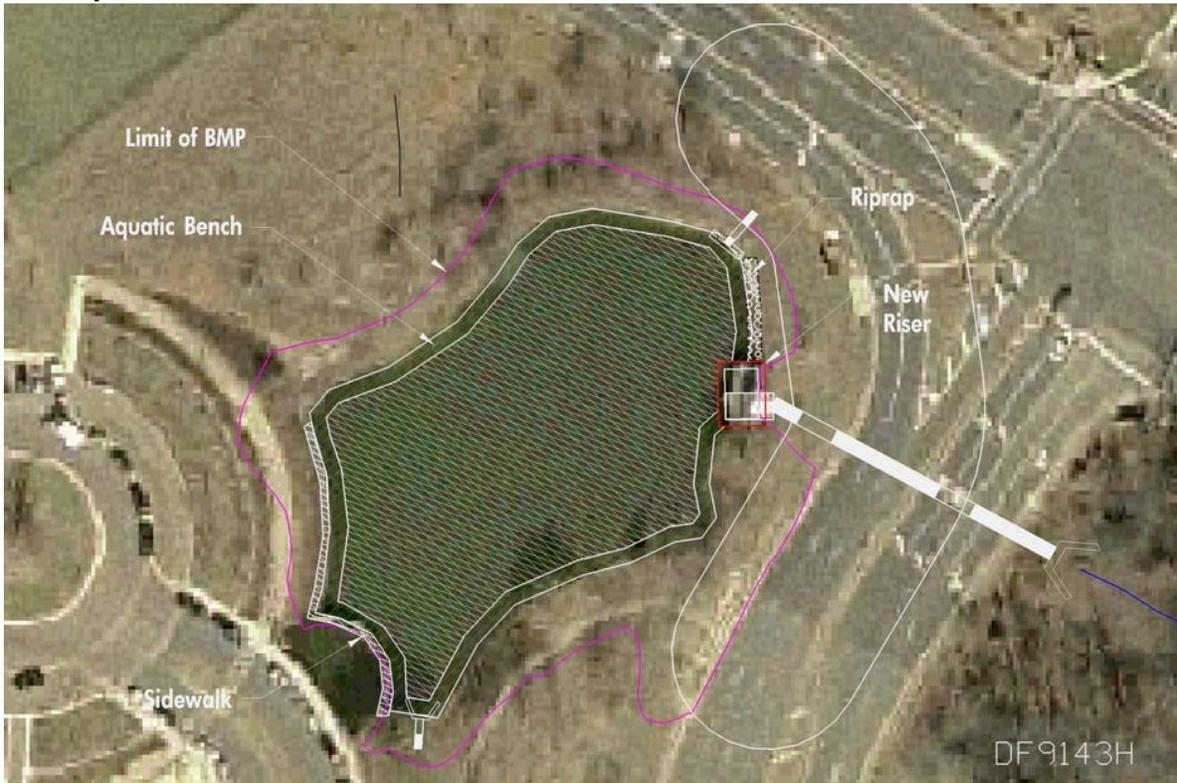
Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|-------------|------------------|
| Clear and Grub | 0.2 | AC | \$5,000.00 | \$1,000 |
| Excavation/Grading (aquatic bench) | 2173 | CY | \$30.00 | \$65,190 |
| Riser | 1 | LS | \$10,000.00 | \$10,000 |
| Wetland Planting (aquatic bench) | 650 | SY | \$2.00 | \$1,300 |
| Base Construction Cost | | | | \$77,490 |
| Mobilization (5%) | | | | \$3,875 |
| Subtotal 1 | | | | \$81,365 |
| Contingency (25%) | | | | \$20,341 |
| Subtotal 2 | | | | \$101,706 |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$45,768 |
| Estimated Project Cost | | | | \$147,000 |

Site Photo:



Concept Sketch:

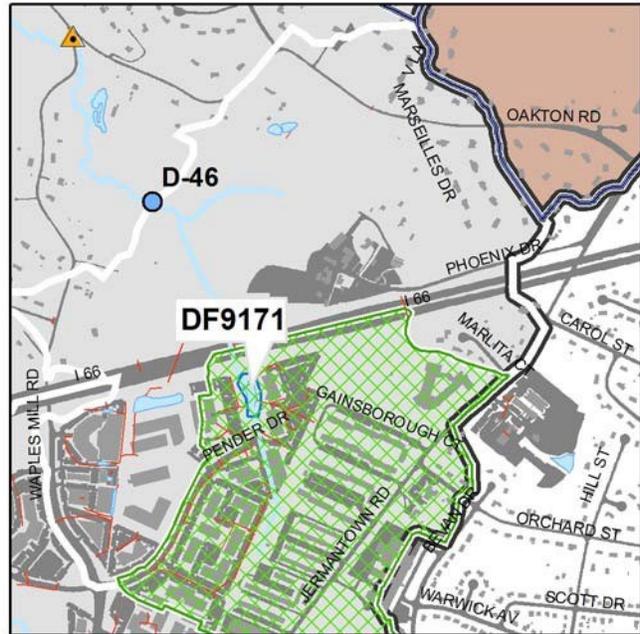


Project Number: DF9171
Catchment Code: DFDF9501
Candidate Site: C71

Project Type: Pond Retrofit
Project Size: 0.9 acres
Treated Area: 0.9 acres

Project Location: At the eastern end of Pender Drive

Project Description: Commercial buildings, parking lots, and trees completely surround this wet pond. Although the drainage area to this location is large, some improvements can be made to optimize the onsite stormwater management. One recommendation is to reduce the size of the orifice at the normal water surface elevation. Also, placement of riprap in the downstream channel at the outfall will provide an additional measure to reduce exiting flow velocities. Although the wet storage within this pond is a fraction of the required water quality volume, installing water quality treatment components (ie. forebays) at each concentrated inflow location can promote nutrient removal and sedimentation. Also, the emergency spillway shows signs of erosion and requires maintenance.



Potential Project Benefits:

| | |
|---------------|---|
| Streamflow | Modifying the control structure can create approximately 15% of the calculated channel protection volume. |
| Water Quality | The existing wet storage in this pond is only 20% of the water quality volume; however, components to improve water quality treatment can be implemented in multiple locations where closed storm drains enter. |

Potential Project Constraints:

| | |
|-----------------------|---|
| Environmental | Environmental permitting issues would not be anticipated for this project. Projects in RPAs may require exceptions or waivers. |
| Facility Access | Access to this area is decent by way of public roads and parking areas. |
| Design / Construction | No specific design or construction issues were noted for this project. County staff will coordinate with the facility owner to implement the project. |

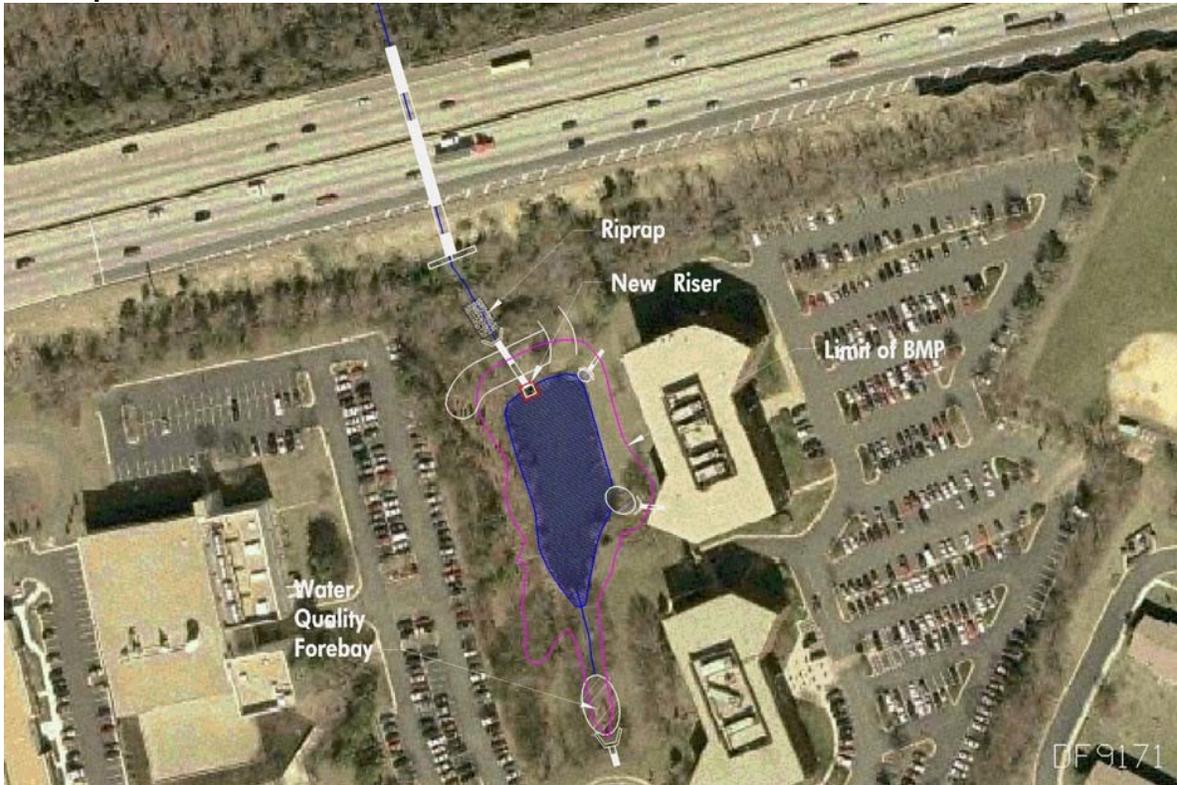
Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|-------------|------------------|
| Clear and Grub | 0.1 | AC | \$5,000.00 | \$500 |
| Forebays (3 locations) | 900 | CY | \$45.00 | \$40,500 |
| Riser | 1 | LS | \$10,000.00 | \$10,000 |
| Rip Rap Stabilization | 30 | LF | \$50.00 | \$1,500 |
| Base Construction Cost | | | | \$52,500 |
| Mobilization (5%) | | | | \$2,625 |
| Subtotal 1 | | | | \$55,125 |
| Contingency (25%) | | | | \$13,781 |
| Subtotal 2 | | | | \$68,906 |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$31,008 |
| Estimated Project Cost | | | | \$100,000 |

Site Photo:



Concept Sketch:

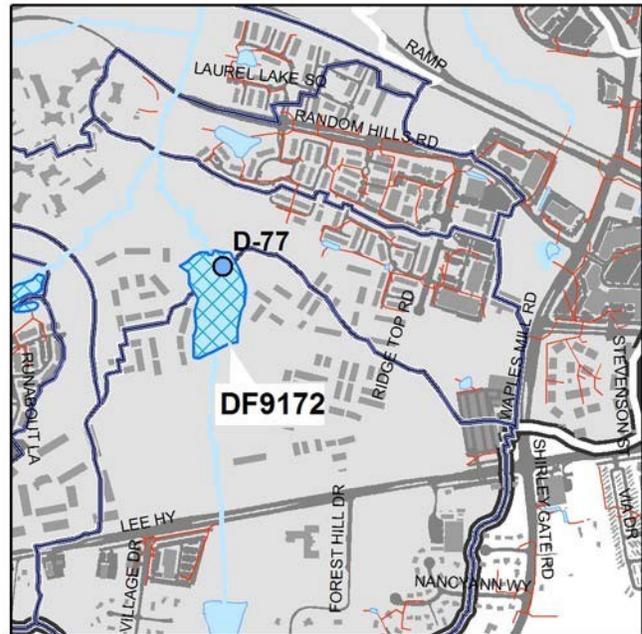


Project Number: DF9172
Catchment Code: DDF9901
Candidate Site: C72

Project Type: Pond Retrofit
Project Size: 6.4 acres
Treated Area: 241.8 acres

Project Location: This project is located east of Lower Park Drive.

Project Description: This facility can be retrofitted to manage the required channel protection volume by modifying the riser. Potential water quality improvements at this location are limited by the existence of base flow and surrounding woods. It is not recommended to clear established vegetation for the sole purpose of creating water quality volume. Although the calculated water quality volume will not be met at this location, a number of water quality components already exist within this facility which will improve pollutant removal. A forebay constructed at the outflow of the closed storm drain system can treat the impervious runoff prior to it entering the stream.



Potential Project Benefits:

| | |
|---------------|---|
| Streamflow | 100% of the required channel protection volume can be achieved by modifying the existing control structure. |
| Water Quality | Interrupting the stream channel to create a permanent wet storage volume is not recommended, however, a variety of components to improve water quality treatment can be implemented at this location. |

Potential Project Constraints:

| | |
|-----------------------|---|
| Environmental | No environmental constraints are anticipated. Projects in RPAs may require exceptions or waivers. |
| Facility Access | Access to this area is very good by way of a paved access road. |
| Design / Construction | No design or construction issues are anticipated for this project. County staff will coordinate with the facility owner to implement the project. |

Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|-------------|-----------------|
| Clear and Grub | 0.1 | AC | \$5,000.00 | \$500 |
| Forebay | 484 | CY | \$45.00 | \$21,780 |
| Riser | 1 | LS | \$10,000.00 | \$10,000 |
| Wetland Planting | 445 | SY | \$2.00 | \$890 |
| Base Construction Cost | | | | \$33,170 |
| Mobilization (5%) | | | | \$1,659 |
| Subtotal 1 | | | | \$34,829 |
| Contingency (25%) | | | | \$8,707 |
| Subtotal 2 | | | | \$43,536 |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$19,591 |
| Estimated Project Cost | | | | \$63,000 |

Site Photo:



Concept Sketch:

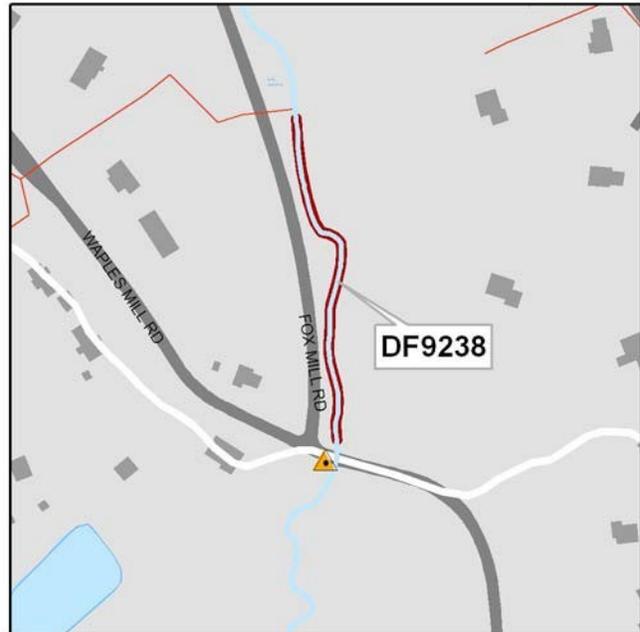


Project Number: DF9238
Catchment Code: DFDF0017
Candidate Site: S38

Project Type: Buffer Restoration
Project Size: 593 Linear Feet

Project Location: This project is located east of Fox Mill Road and north of the intersection with Waples Mill Road.

Project Description: The riparian zone along the right streambank is largely in pasture. There are areas of streambank erosion along the reach. The stream is located on private property. The proposed restoration would involve planting a forested buffer along the right streambank and riparian zone.



Potential Project Benefits:

| | |
|------------------|--|
| Stream Stability | The project will not significantly affect stream stability. |
| Water Quality | Water quality may be improved by the nutrient uptake potential of the forested buffer. |
| Instream Habitat | The buffer will provide thermal shading and organic inputs. |

Potential Project Constraints:

| | |
|-----------------------|--|
| Environmental | The site will not require forest clearing or impacts to jurisdictional wetlands. No permit will be required. Projects in RPAs may require exceptions or waivers. |
| Property Ownership | This project appears to be located on private property. |
| Facility Access | Access to this facility will require an easement on private property but is open and unconstrained adjacent to the stream. |
| Design / Construction | Design efforts are minimal compared to other stream restoration projects. No earthwork or structures are required |

Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|-----------|-----------------|
| Buffer restoration | 593 | LF | \$25.00 | \$14,825 |
| Base Construction Cost | | | | \$14,825 |
| Mobilization (5%) | | | | \$741 |
| Subtotal 1 | | | | \$15,566 |
| Contingency (25%) | | | | \$3,891 |
| Subtotal 2 | | | | \$19,457 |
| Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$8,756 |
| Estimated Project Cost | | | | \$28,000 |

Concept Sketch

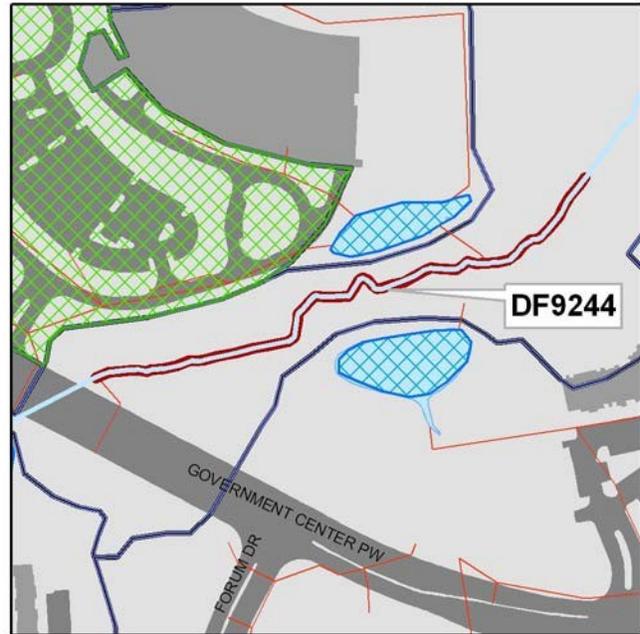


Project Number: DF9244
Catchment Code: DFDF0001
Candidate Site: S44

Project Type: Stream Restoration
Project Size: 1016 Linear Feet

Project Location: This project is located on the Fairfax Government Center property to the north of Government Center Parkway.

Project Description: This stream reach is moderately to severely eroding its banks. The bed has eroded to weathered rock and is severely incised. The stream is located in a lightly wooded area between the government center parking area and a pedestrian trail behind a town home. The proposed restoration would involve excavating a floodplain bench and reshaping the streambanks and creating stable features in the upper and middle portions of the reach.



Potential Project Benefits:

| | |
|------------------|--|
| Stream Stability | The stream banks will be graded to a stable angle and a floodplain bench will be created. Stable bed features will be created. |
| Water Quality | Water quality will be improved by a significant reduction in current and future bank and bed erosion. |
| Instream Habitat | Erosion reduction and created bed features will improve physical habitat conditions. |

Potential Project Constraints:

| | |
|-----------------------|---|
| Environmental | The site will require some forest clearing and limited impacts to jurisdictional wetlands. However, it will require a permit from both the U.S. Army Corps of Engineers and VDEQ. Projects in RPAs may require exceptions or waivers. |
| Facility Access | Access to this facility will be along the pedestrian trail and from the government center parking lot. |
| Design / Construction | Design efforts are minimal compared to other stream restoration projects. General constructability is good. |

Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|-----------|------------------|
| Change channel type -- nested channel | 1016 | LF | \$200.00 | \$203,200 |
| Add'l cost, first 500 LF | 500 | LF | \$200.00 | \$100,000 |
| Base Construction Cost | | | | \$303,200 |
| Mobilization (5%) | | | | \$15,160 |
| Subtotal 1 | | | | \$318,360 |
| Contingency (25%) | | | | \$79,590 |
| Subtotal 2 | | | | \$397,950 |
| Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$179,078 |
| Estimated Project Cost | | | | \$577,000 |

This project is part of the alternative project group for Regional Pond D-59. See Table 5-2 for the recommended disposition.

Concept Sketch:

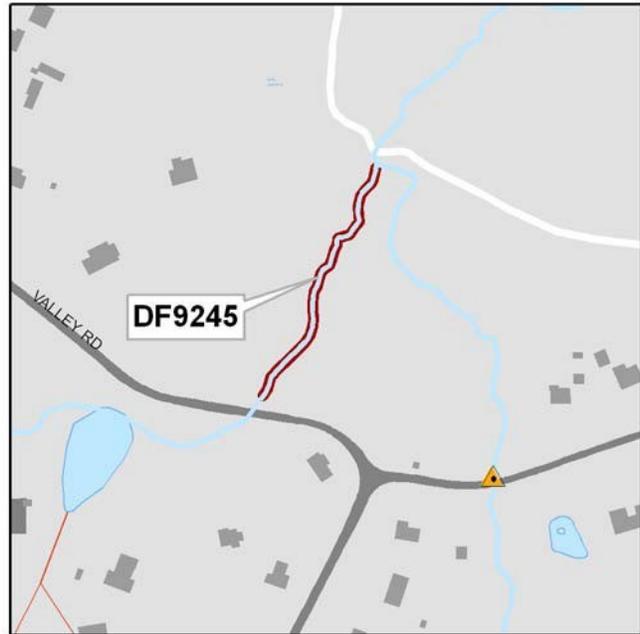


Project Number: DF9245
Catchment Code: DFDF0011
Candidate Site: S45

Project Type: Stream Restoration
Project Size: 587 Linear Feet

Project Location: This project is located to the north of Valley Road just past the intersection of Fairfax Farms Road.

Project Description: This stream reach has moderately incised eroding streambanks. Floodplain redevelopment and point bar formation indicate that the stream is recovering. The project is located on several private properties. The site lacks a forested buffer on both sides of the stream. The proposed restoration would involve excavating a floodplain bench and reshaping the streambanks. The new floodplain would be planted with native woody vegetation and grasses. A forested buffer would be established.



Potential Project Benefits:

| | |
|------------------|--|
| Stream Stability | The streambanks will be regarded and a floodplain bench will be excavated. This will reduce and prevent further bank instability |
| Water Quality | Water quality will be improved by a significant reduction in current and future bank erosion. |
| Instream Habitat | Erosion reduction and establishing a riparian buffer will improve physical habitat conditions. |

Potential Project Constraints:

| | |
|-----------------------|---|
| Environmental | The site will not require forest clearing or impacts to jurisdictional wetlands. However, it will require a permit from both the U.S. Army Corps of Engineers and VDEQ. Projects in RPAs may require exceptions or waivers. |
| Facility Access | Access to this facility will require an easement on private property but is open and unconstrained adjacent to the stream. |
| Design / Construction | Design efforts are moderate compared to other stream restoration projects. General constructability is good. |

Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|-----------|------------------|
| Change channel type -- step pools | 587 | LF | \$225.00 | \$132,075 |
| Add'l cost, first 500 LF | 500 | LF | \$200.00 | \$100,000 |
| Base Construction Cost | | | | \$232,075 |
| Mobilization (5%) | | | | \$11,604 |
| Subtotal 1 | | | | \$243,679 |
| Contingency (25%) | | | | \$60,920 |
| Subtotal 2 | | | | \$304,598 |
| Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$137,069 |
| Estimated Project Cost | | | | \$442,000 |

Concept Sketch:

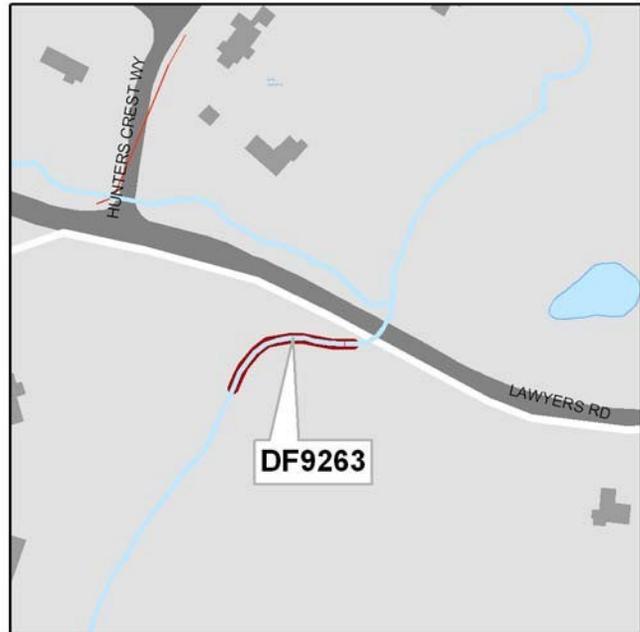


Project Number: DF9263
Catchment Code: DFDF0029
Candidate Site: S63

Project Type: Stream Restoration
Project Size: 255 linear feet

Project Location: This project is located to the southwest of Lawyers Road just before Hunters Crest Way to the northwest.

Project Description: The stream is slightly incised with raw and erosive streambanks. Bed features are inconsistent and poorly developed. The stream is located in an open pasture. The proposed restoration would entail excavating a floodplain bench and reshaping the streambanks. This would prevent further erosion and improve floodplain dynamics. The new floodplain would be planted with native woody vegetation and grasses. A forested buffer will be established on both sides of the stream.



Potential Project Benefits:

| | |
|------------------|---|
| Stream Stability | The streambanks will be reshaped and planted to improve stability. |
| Water Quality | Water quality will be improved by a significant reduction in current and future bank and bed erosion. |
| Instream Habitat | Erosion reduction, created bed features, and establishing a riparian buffer will improve physical habitat conditions. |

Potential Project Constraints:

| | |
|-----------------------|--|
| Environmental | The site will not require forest clearing or impacts to jurisdictional wetlands. It will require a permit from the U.S. Army Corps of Engineers. Projects in RPAs may require exceptions or waivers. |
| Facility Access | Access to this facility will require an easement on private property but is open and unconstrained adjacent to the stream. |
| Design / Construction | Design efforts are minor compared to other stream restoration projects. General constructability is good. |

Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|-----------|------------------|
| Change channel type -- nested channel | 255 | LF | \$200.00 | \$51,000 |
| Add'l cost, first 500 LF | 255 | LF | \$200.00 | \$51,000 |
| Base Construction Cost | | | | \$102,000 |
| Mobilization (5%) | | | | \$5,100 |
| Subtotal 1 | | | | \$107,100 |
| Contingency (25%) | | | | \$26,775 |
| Subtotal 2 | | | | \$133,875 |
| Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$60,244 |
| Estimated Project Cost | | | | \$194,000 |

Concept Sketch:

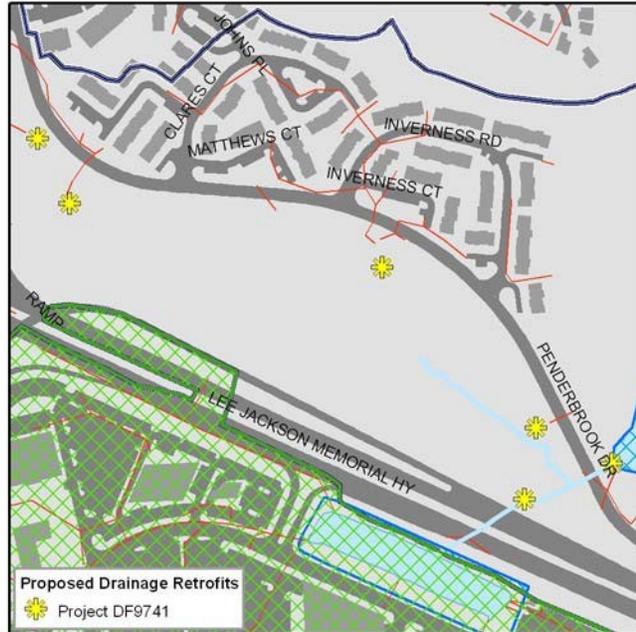


Project Number: DF9741
Catchment Code: DFDF0009
Candidate Site: C41

Project Type: Drainage Retrofit
Project Size: 6 Outfalls

Project Location: This project is distributed throughout the catchment.

Project Description: This project consists of reconfiguring outfalls or retrofitting energy dissipation structures to reduce scour and erosion where flows from the storm drainage system enter the stream. Reduction of erosive velocities will reduce the amount of sediment transported downstream.



Potential Project Benefits:

| | |
|---------------|--|
| Streamflow | The project will reduce velocity from the outfalls and help reduce erosive potential immediately downstream. |
| Water Quality | Water quality improvements would be associated with the reduction of scour at outfall locations and within the downstream channels. Habitat would be improved by reducing sediment loads from erosion. |

Potential Project Constraints:

| | |
|-----------------------|---|
| Environmental | Environmental impacts and permit requirements are not anticipated for this project; however, projects in RPAs may require exceptions or waivers |
| Facility Access | Access to these sites can usually be obtained from the roadway and driveways. |
| Design / Construction | No unusual design or construction issues were identified. |

Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|-------------------------------|-----------------|
| Outfall Protection | 6 | EA | \$8,000.00 | \$48,000 |
| | | | Base Construction Cost | \$48,000 |
| | | | Mobilization (5%) | \$2,400 |
| | | | Subtotal 1 | \$50,400 |
| | | | Contingency (25%) | \$12,600 |
| | | | Subtotal 2 | \$63,000 |
| Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$28,350 |
| | | | Estimated Project Cost | \$91,000 |

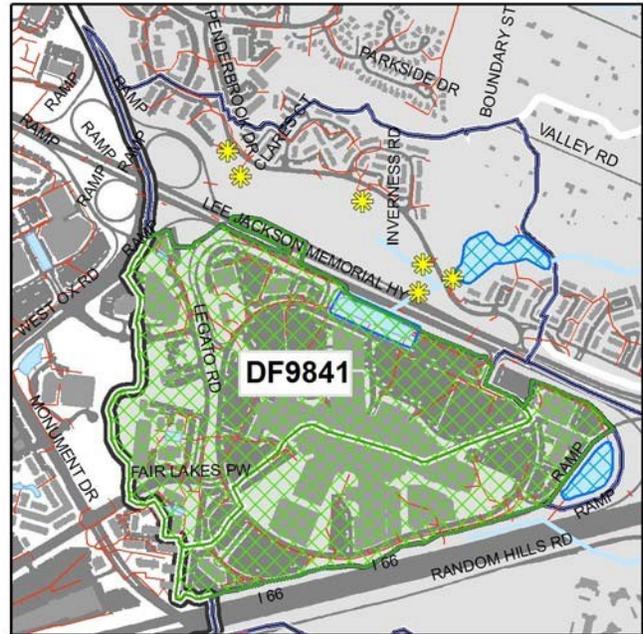
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Project Number: DF9841/DF9842
Catchment Code: DFDF0009
Candidate Site: C41/C42

Project Type: LID Retrofit
Project Size: 2.0 acres
Treated Area: 155 acres

Project Location: This project would be implemented throughout the entire developed portion area on or around Fair Oaks Mall.

Project Description: This project consists of a holistic LID retrofit to the developed area on and around Fair Oaks Mall. This area is almost entirely impervious, with the small areas of pervious surface being hydrologically disconnected and non-functioning. The goal of this project would be to reduce imperviousness, lengthen hydraulic flow times, increase infiltration and improve water quality.



Potential Project Benefits:

| | |
|---------------|---|
| Streamflow | Peak flow reduction should be significant due to reduction in impervious area. Volume losses to infiltration are not assumed to be very significant for this project. |
| Water Quality | This project has been designed to treat 100% of the water quality volume for the site. |

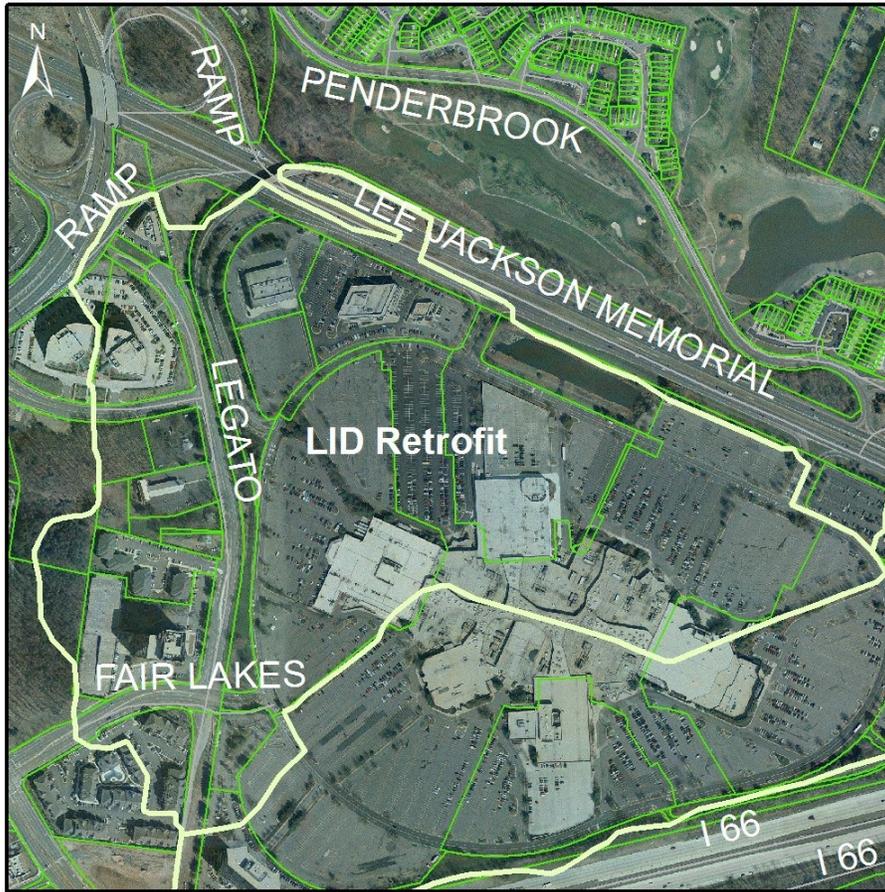
Potential Project Constraints:

| | |
|-----------------------|---|
| Environmental | Environmental permitting issues are not anticipated for this project. |
| Facility Access | Access to this project is excellent. |
| Design / Construction | All of this property appears to be privately owned and operated. Projects could be implemented with a public / private partnership. |

Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|------------------------|----------|-------|--|--------------------|
| LID Structural Control | 9,702.0 | SY | \$120.00 | \$1,164,240 |
| | | | Base Construction Cost | \$1,164,240 |
| | | | Mobilization (5%) | \$58,212 |
| | | | Subtotal 1 | \$1,222,452 |
| | | | Contingency (25%) | \$305,613 |
| | | | Subtotal 2 | \$1,528,065 |
| | | | Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%) | \$687,629 |
| | | | Estimated Project Cost | \$2,216,000 |

Concept Sketch

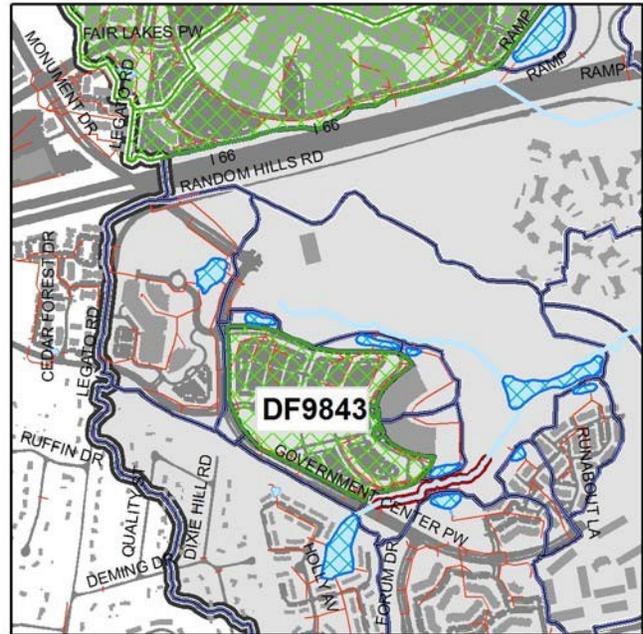


Project Number: DF9843
Catchment Code: DFDF0001
Candidate Site: C43

Project Type: LID Retrofit
Project Size: 0.3 acres
Treated Area: 29.6 acres

Project Location: This project is the entire parking area for the Government Center.

Project Description: This project consists of retrofits to the parking area for the Fairfax County Government Center. Individual LID retrofits could include inlet filtration, removal of pavement or porous pavement, and bioretention in parking islands.



Potential Project Benefits:

| | |
|---------------|---|
| Streamflow | This project is expected to reduce runoff volume and flows rate through reduction of effective imperviousness, evapotranspiration, and infiltration.. |
| Water Quality | Significant water quality improvement may be expected through filtration and infiltration with LID systems. The project is designed to treat 100% of the water quality volume for the site. |

Potential Project Constraints:

| | |
|-----------------------|---|
| Environmental | Environmental permitting should not be an issue for this project. |
| Facility Access | Access is excellent. |
| Design / Construction | No design or construction issues were identified for this project |

Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|-----------|------------------|
| LID Structural Control | 1,440.0 | SY | \$120.00 | \$172,800 |
| Interpretive Signs | 1 | LS | \$2,000 | \$2,000 |
| Base Construction Cost | | | | \$174,800 |
| Mobilization (5%) | | | | \$8,740 |
| Subtotal 1 | | | | \$183,540 |
| Contingency (25%) | | | | \$45,885 |
| Subtotal 2 | | | | \$229,425 |
| Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$103,241 |
| Estimated Project Cost | | | | \$333,000 |

Concept Sketch

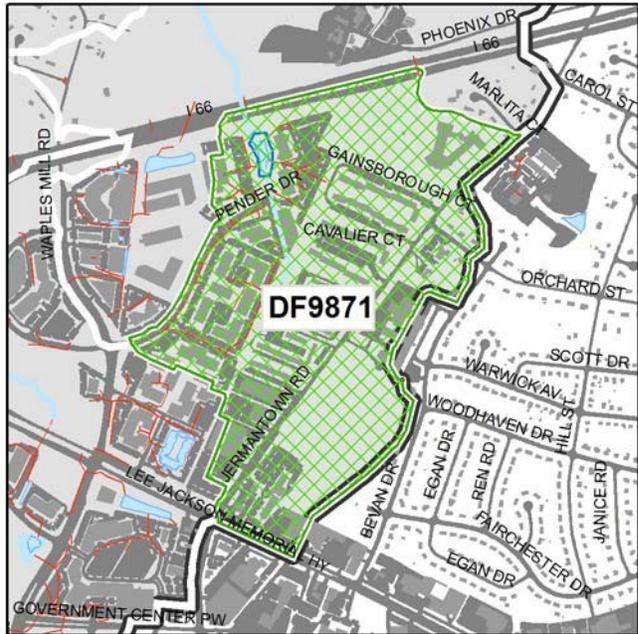


Project Number: DF9871
Catchment Code: DFDF9501
Candidate Site: C71

Project Type: LID Retrofit
Project Size: 1.1 acres
Treated Area: 136.1 acres

Project Location: This project includes part of Pender Bus Park, Sidney Lanier Middle School, and the area in between.

Project Description: The project consists of retrofits to parking areas for all of the sites east of Pender Drive. Individual LID retrofits could include inlet filtration, removal of pavement or porous pavement, and bioretention in parking islands.



Potential Project Benefits:

| | |
|---------------|---|
| Streamflow | This project is expected to reduce runoff volume and flows rate through reduction of effective imperviousness, evapotranspiration, and infiltration. |
| Water Quality | Significant water quality improvement may be expected through filtration and infiltration with LID systems. The project is designed to treat 100% of the water quality volume for the site. |

Potential Project Constraints:

| | |
|-----------------------|--|
| Environmental | Environmental permitting issues would not be anticipated for this project. |
| Facility Access | Access to the site is very good from roads and parking areas. |
| Design / Construction | No design or construction issues were identified. |

Costs:

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|--|----------|-------|-------------------------------|--------------------|
| LID Structural Control | 5,283.0 | SY | \$120.00 | \$633,960 |
| | | | Base Construction Cost | \$633,960 |
| | | | Mobilization (5%) | \$31,698 |
| | | | Subtotal 1 | \$665,658 |
| | | | Contingency (25%) | \$166,415 |
| | | | Subtotal 2 | \$832,073 |
| Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%) | | | | \$374,433 |
| | | | Estimated Project Cost | \$1,207,000 |

Concept Sketch

