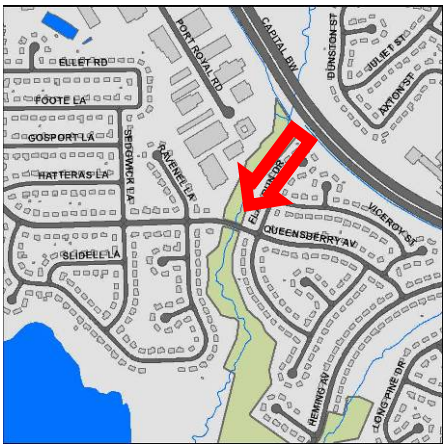
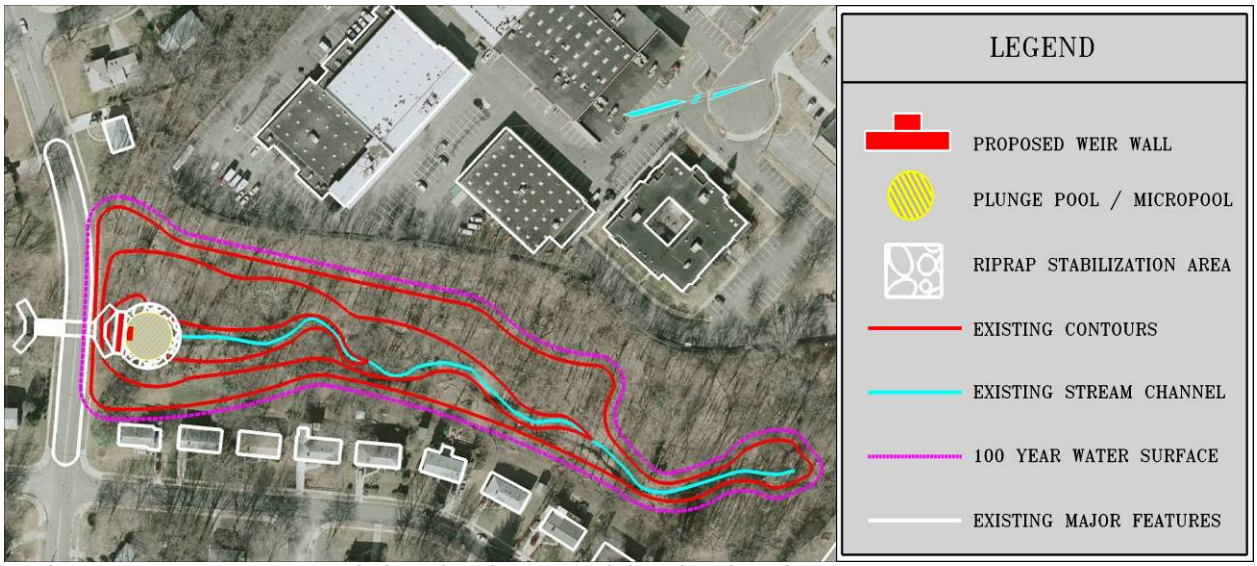
# AC9400 - Culvert Retrofit




| | |
|---|---|
| **Address:** | Under Queensberry Avenue, near the intersection of Flag Run Drive and Queensberry Avenue |
| **Location:** | Lake Accotink Park |
| **Land Owner:** | County - FCPA |
| **PIN:** | 0792 01 0001A |
| **Control Type** | Water Quality |
| **Drainage Area** | 99.86 acres |
| **Receiving Waters** | Flag Run |

**Description:** This project is located on the upstream side of Queensberry Avenue between Flag Run Drive and Ravenel Lane. The upstream floodplain is flat and open with possible wetland areas. This culvert retrofit would add a weir wall control structure on the upstream side of the culvert to regulate discharge of smaller, more frequent storm events and provide water quality treatment.

The project is located downstream of stream restoration project AC9229 and culvert retrofit AC9401. Design of all three projects should be performed concurrently.




*Project Area Map: Conceptual plan showing potential project location*

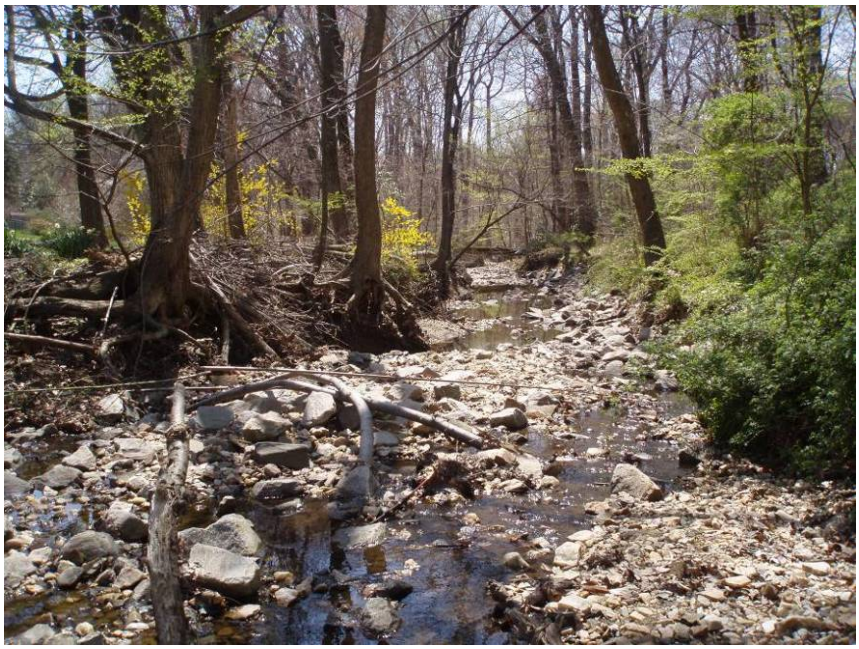
**Project Benefits:** This project has the potential to manage high frequency smaller storms with the addition of a weir wall as a control structure. The retrofit provides detention that will reduce downstream channel erosion by reducing flow rates back to pre-development conditions. The project will also help remove suspended solids through sedimentation. It is estimated that an annual total of 17,390 lbs of sediment, 126 lbs of nitrogen and 19 lbs of phosphorus would be reduced by this project.

**Project Design Considerations:** The upstream floodplain is bordered by a commercial / industrial park and several single family homes located adjacent to the stream channel, which should be considered in the design and construction phases. The base flow component of the control structure will require regular maintenance inspection to prevent clogging. All components of the existing embankment and stream channel should be analyzed to ensure that the integrity is not compromised as a result of the change in hydraulics. Retrofitting this culvert must adhere to FEMA regulations if it is located within the 100-year floodplain. Environmental permitting issues are expected due to the in-stream location of this facility. Moderate tree loss is expected for access and during construction. Existing utility conflicts are not anticipated with this retrofit. Access is good off of Queensberry Avenue.

**Costs:**

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|---|---|---|---|---|
| Plungepool / Micropool | 1 | EA | $400.00 | $400 |
| New Control Structure - Weir | 1 | LS | $12,000.00 | $12,000 |
| Rip Rap Stabilization | 200 | SY | $100.00 | $20,000 |
| | | | Initial Project Costs | **$32,400** |
| Plantings | 1 | LS | 5% of Project | $1,620 |
| Ancillary Items | 1 | LS | 5% of Project | $1,620 |
| Erosion and Sediment Control | 1 | LS | 10% of Project | $3,240 |
| | | | Base Construction Costs | **$38,880** |
| | | | Mobilization (5%) | $1,944 |
| | | | **Subtotal 1** | $40,824 |
| | | | Contingency (25%) | $10,206 |
| | | | **Subtotal 2** | $51,030 |
| | | | Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%) | $22,964 |
| | | | **Estimated Project Cost** | **$74,000** |

*Site Photo: Downstream Side of Existing Culvert Crossing*



*Site Photo: Downstream of Existing Culvert*

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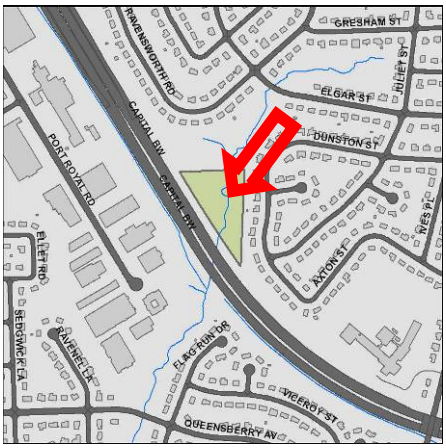
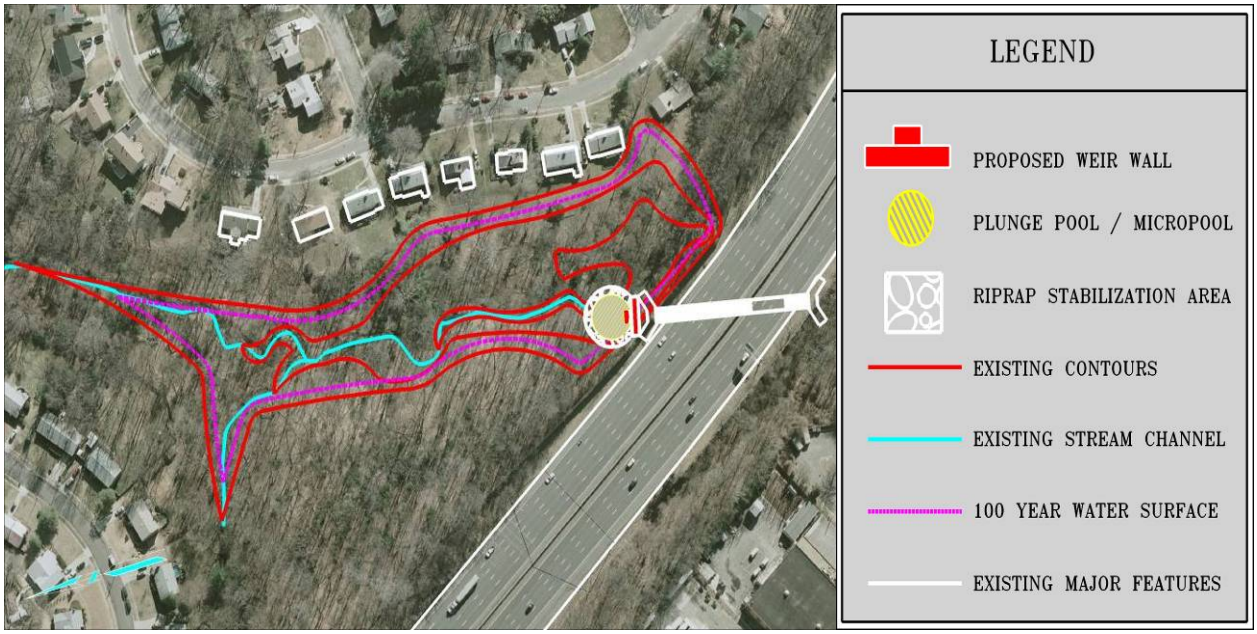
# AC9401 - Culvert Retrofit




| | |
|---|---|
| **Address:** | Under the Capital Beltway, near the intersection of Dunston Street and Juliet Street |
| **Location:** | North Springfield |
| **Land Owner:** | State - VDOT |
| **PIN:** | 0792 01 0002 |
| **Control Type** | Water Quality |
| **Drainage Area** | 203.03 acres |
| **Receiving Waters** | Flag Run |

**Description:** This project is located on the upstream side of the Capital Beltway (I-495) where Flag Run flows through a culvert under the Beltway. The upstream floodplain is bordered by several single family homes along Dunston and Axton Streets that are relatively close to the stream channel. This culvert retrofit would add a weir wall control structure on the upstream side of the culvert to regulate discharge of smaller high frequency storm events.

The project is located in the middle of two segments of stream restoration project AC9229 and upstream of culvert retrofit AC9400. Design of all three projects should be performed concurrently.




*Project Area Map: Conceptual plan showing potential project location*

**Project Benefits:** The installation of a control structure on the upstream side of the existing culvert will provide detention to improve water quality and reduce flow rates and discharge velocities. Both improvements will help to improve the habitat in the downstream channel. Water quality improvements will be obtained through sedimentation during detention and filtering and nutrient uptake by floodplain vegetation. It is estimated that an annual total of 13,983 lbs of sediment, 148 lbs of nitrogen and 27 lbs of phosphorus would be reduced by this project.

**Project Design Considerations:** The base flow component of the control structure will require regular maintenance inspection to prevent clogging. All components of the existing embankment and stream channel should be analyzed to ensure the integrity of the culvert is not compromised as a result of the hydraulic changes. Retrofitting this culvert must adhere to FEMA regulations if it is located within the 100-year floodplain. Environmental permitting issues are expected due to the in-stream location of this facility. Significant tree loss is expected to obtain access and during construction. Existing utility conflicts are not anticipated with this retrofit. Access to this culvert is difficult and would require the use of an existing storm drain / utility easement off of Dunston Street and the crossing of several hundred feet of forested floodplain to get to the culvert.

**Costs:**

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|---|---|---|---|---|
| Plunge Pool / Micropool | 1 | EA | $400.00 | $400 |
| New Control Structure - Weir | 1 | LS | $16,000.00 | $16,000 |
| Rip Rap Stabilization | 200 | SY | $100.00 | $20,000 |
| | | | Initial Project Costs | **$36,400** |
| Plantings | 1 | LS | 5% of Project | $1,820 |
| Ancillary Items | 1 | LS | 5% of Project | $1,820 |
| Erosion and Sediment Control | 1 | LS | 10% of Project | $3,640 |
| | | | Base Construction Costs | **$43,680** |
| | | | Mobilization (5%) | $2,184 |
| | | | **Subtotal 1** | $45,864 |
| | | | Contingency (25%) | $11,466 |
| | | | **Subtotal 2** | $57,330 |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%) | | | | $25,799 |
| | | | **Estimated Project Cost** | **$83,000** |

*Site Photo: Downstream Side of Existing Culvert Crossing*

*Site Photo: Downstream of Existing Culvert*

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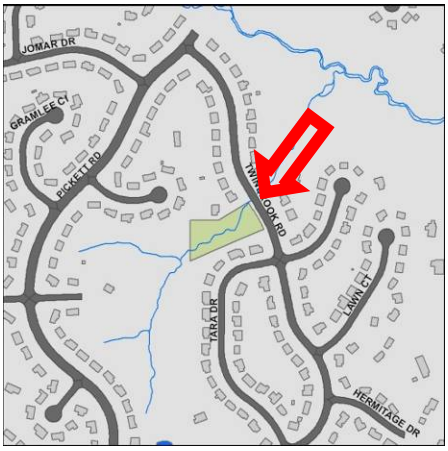
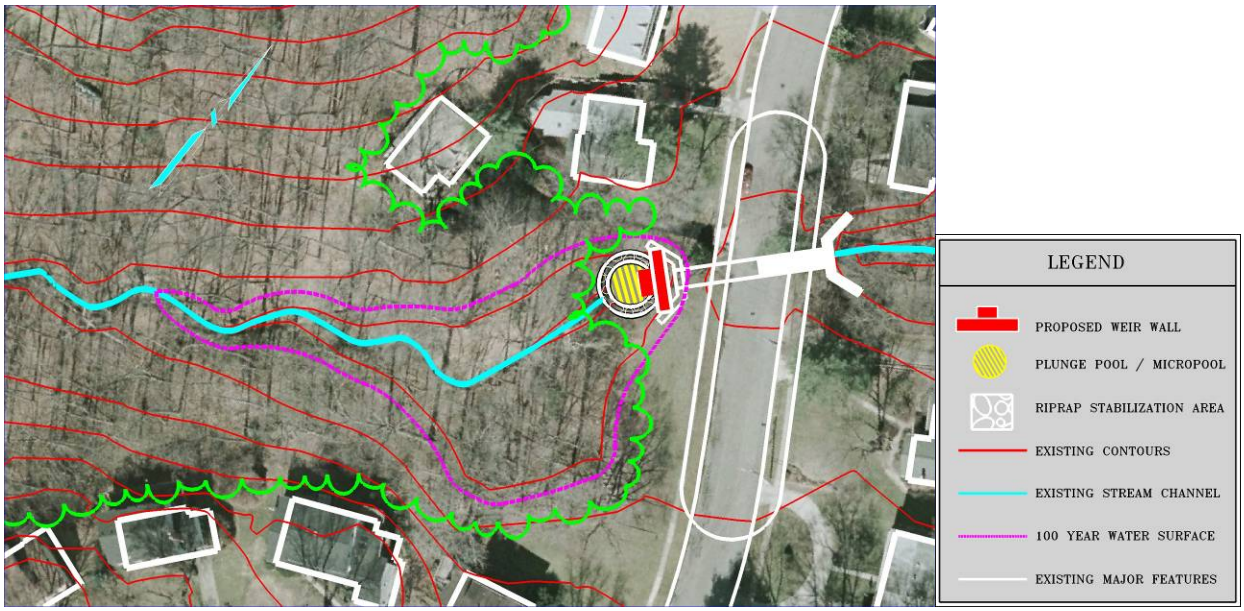
# AC9405 - Culvert Retrofit




| | |
|---|---|
| **Address:** | 4602 Twinbrook Road |
| **Location:** | Old Forge Park |
| **Land Owner:** | County - FCPA |
| **PIN:** | 0691 05 D1 |
| **Control Type** | Water Quality |
| **Drainage Area** | 59.5 acres |
| **Receiving Waters** | Tributary to Long Branch Central |

**Description:** This project is located on the upstream side of Twinbrook Road on a tributary flowing into Long Branch Stream Valley Park. The floodplain at the project site is forested and flat with possible wetland areas. This culvert retrofit would add a weir wall control structure and stabilized micropool to regulate discharge of the smaller, high frequency storm events.




*Project Area Map: Conceptual plan showing potential project location*

**Project Benefits:** Due to the size of the contributing drainage area and presence of base flow at the culvert, it is unlikely that peak flow management of the 2-year and 10-year design storm can be achieved by this project. The detention that will be provided will treat water quality by allowing sediment to settle out on the floodplain. Nutrient uptake by wetland vegetation will also reduce nitrogen and phosphorus loads. It is estimated that an annual total of 3,933 lbs of sediment, 41 lbs of nitrogen and eight lbs of phosphorus would be reduced by this project.

**Project Design Considerations:** Adding an in-stream control structure will cause a change in water levels on the upstream side of the embankment, which should be taken into account during the design phase. The base flow component of the control structure will require regular maintenance to prevent clogging. All components of the existing embankment and stream channel should be analyzed to ensure that the integrity of the cross culvert/stream is not compromised as a result of the change in hydraulic characteristics at this site. This project is located within the 100 year floodplain so any adjustments to the characteristics of stream must adhere to FEMA regulations. Environmental permitting measures are expected due to the in-stream location of this facility. Tree clearing is expected to provide access to the culvert and stream channel. Existing utility conflicts are not anticipated. Access is good from Twinbrook Road.

**Costs:**

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|---|---|---|---|---|
| Plungepool / Micropool | 1 | EA | $600.00 | $600 |
| New Control Structure - Weir | 1 | LS | $12,000.00 | $12,000 |
| | | | Initial Project Costs | **$12,600** |
| Plantings | 1 | LS | 5% of Project | $630 |
| Ancillary Items | 1 | LS | 5% of Project | $630 |
| Erosion and Sediment Control | 1 | LS | 10% of Project | $1,260 |
| | | | Base Construction Costs | **$15,120** |
| | | | Mobilization (5%) | $756 |
| | | | **Subtotal 1** | $15,876 |
| | | | Contingency (25%) | $3,969 |
| | | | **Subtotal 2** | $19,845 |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits | | | (45%) | $8,930 |
| | | | **Estimated Project Cost** | **$29,000** |

*Site Photo: Existing Control Structure*

*Site Photo: Existing Stream Channel*

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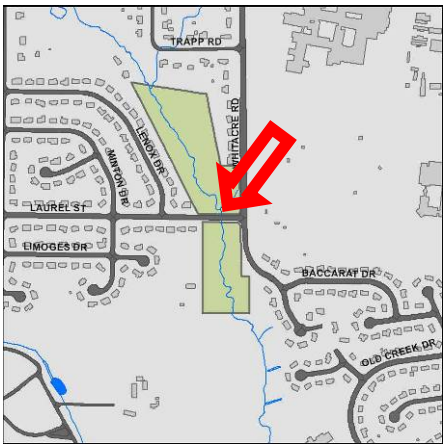
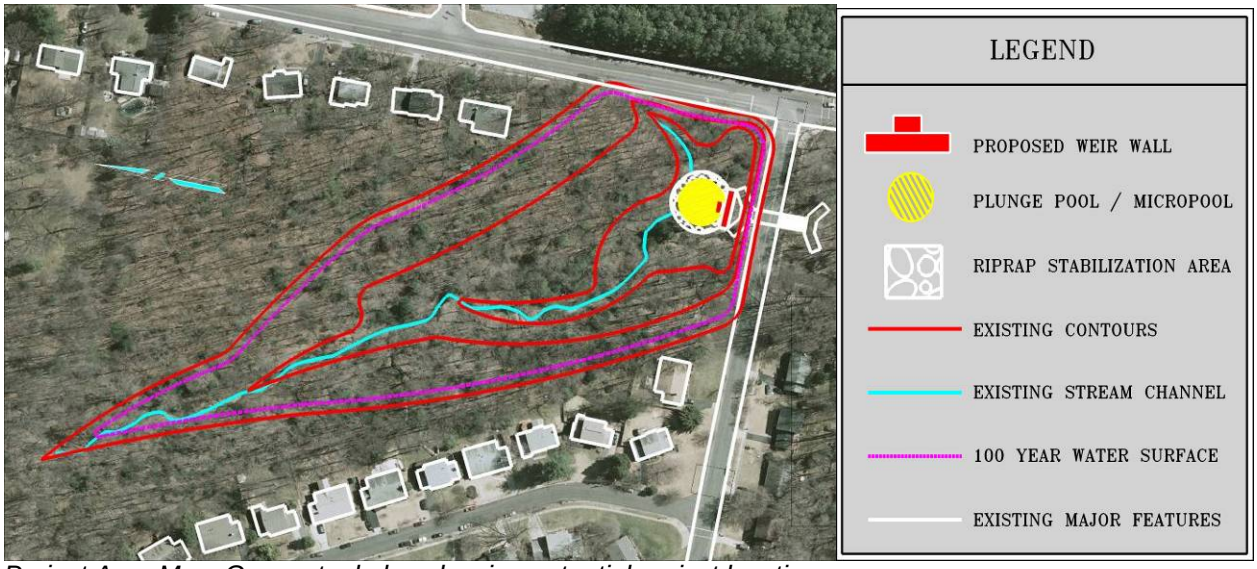
# AC9406 - Culvert Retrofit




| | |
|---|---|
| **Address:** | Under Laurel Street, near the intersection of Whitacre Road and Laurel Street |
| **Location:** | Long Branch Park |
| **Land Owner:** | County - FCPA |
| **PIN:** | 0583 01 0004 |
| **Control Type** | Water Quality |
| **Drainage Area** | 161.16 acres |
| **Receiving Waters** | Long Branch |

**Description:** This project is located on the upstream side of Laurel Street between Lenox Drive and Whitacre Road. The upstream floodplain is bordered by several single family homes along Lenox Drive, which are located relatively close to the stream channel. This culvert retrofit would add a weir wall control structure on the upstream side of the culvert to regulate discharge of smaller, high frequency storm events.




*Project Area Map: Conceptual plan showing potential project location*

**Project Benefits:** This project has the potential to manage high frequency design storms with the addition of a control structure. Managing these frequent design storms will help to reduce flow rates and discharge velocities back to pre-development conditions. This will prevent further eroded conditions in the downstream channel and improve instream habitat. Installation of a control structure may also improve the health of the downstream channel by allowing suspended solids to settle out, and allow for nutrient uptake and filtering in the floodplain. It is estimated that an annual total of 9,219 lbs of sediment, 88 lbs of nitrogen and 18 lbs of phosphorus would be reduced by this project.

**Project Design Considerations:** All components of the existing embankment and stream channel should be analyzed to ensure that the integrity of the cross culvert is not compromised with the change in hydraulic characteristics. The base flow component of the control structure will require regular maintenance to inspect for clogging. Retrofitting this culvert must adhere to FEMA regulations if it is located within the 100-year floodplain. Environmental permitting issues are expected due to the instream location of this facility. Moderate tree loss is expected for access along the channel. Existing utility conflicts are not anticipated with this retrofit. Access is good from Laurel Street.

**Costs:**

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|---|---|---|---|---|
| Plunge Pool / Micropool | 1 | EA | $400.00 | $400 |
| New Control Structure - Weir | 1 | LS | $16,000.00 | $16,000 |
| Rip Rap Stabilization | 200 | SY | $100.00 | $20,000 |
| | | | Initial Project Costs | **$36,400** |
| Plantings | 1 | LS | 5% of Project | $1,820 |
| Ancillary Items | 1 | LS | 5% of Project | $1,820 |
| Erosion and Sediment Control | 1 | LS | 10% of Project | $3,640 |
| | | | Base Construction Costs | **$43,680** |
| | | | Mobilization (5%) | $2,184 |
| | | | **Subtotal 1** | $45,864 |
| | | | Contingency (25%) | $11,466 |
| | | | **Subtotal 2** | $57,330 |
| | | | Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%) | $25,799 |
| | | | **Estimated Project Cost** | **$83,000** |

*Site Photo: Downstream Floodplain of Culvert*

*Site Photo: Existing Culvert*

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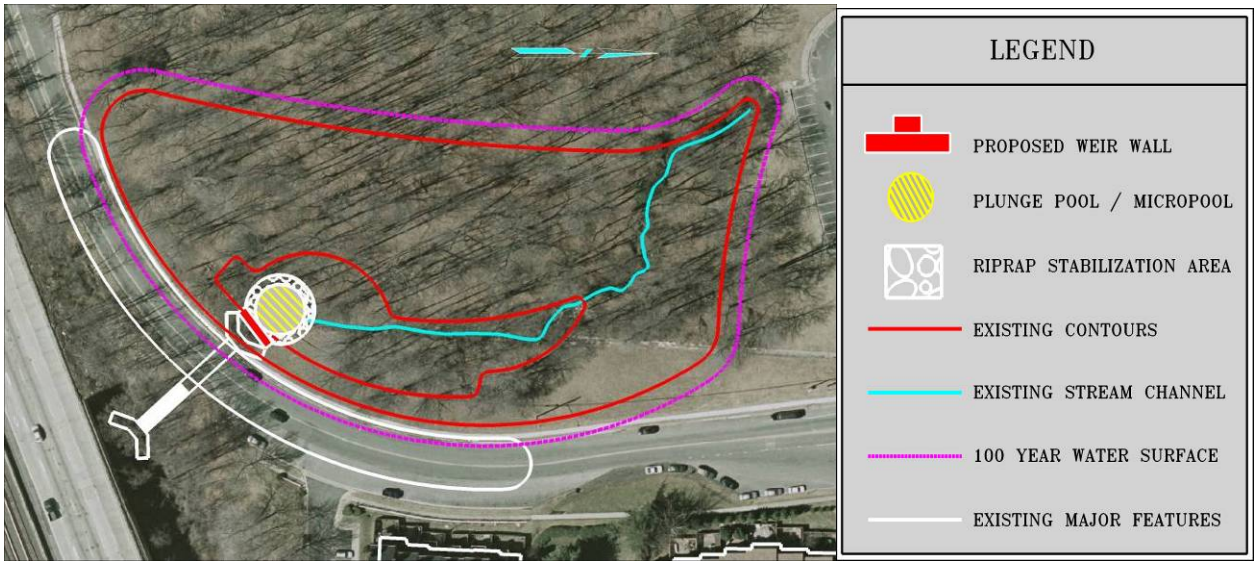
# AC9409 - Culvert Retrofit


| | |
|---|---|
| **Address:** | Under Sutton Road, near the intersection of Sutton Green Court and Sutton Road |
| **Location:** | Oakton High School |
| **Land Owner:** | County - FCPS |
| **PIN:** | 0481 01 0111 |
| **Control Type** | Water Quality |
| **Drainage Area** | 42.10 acres |
| **Receiving Waters** | Unknown tributary of Accotink Creek |

**Description:** This project is located on the upstream side of Sutton Road near Oakton High School. The floodplain upstream of Sutton Road is mostly forested in the area of the culvert. This culvert retrofit would add a weir wall control structure on the upstream side of the culvert to regulate discharge of smaller, more frequent storms.




*Project Area Map: Conceptual plan showing potential project location*

**Project Benefits:** The newly installed control structure will help prevent future downstream channel erosion by by reducing flow rates from smaller storms back to pre-development conditions. This project will also improve water quality through detention, settling of suspended solids, and filtration and uptake of nutrients by floodplain vegetation. The project would also provide an excellent environmental education or stewardship opportunity for students and parents of Oakton High School. It is estimated that an annual total of 4,183 lbs of sediment, 42 lbs of nitrogen and nine lbs of phosphorus would be reduced by this project.

**Project Design Considerations:** Moderate tree removal is anticipated in order to obtain access from Sutton Road, to clear the upstream embankment, and for construction around the channel. All components of the existing embankment and stream channel should be analyzed to ensure that the integrity is not compromised. Retrofitting this culvert must adhere to FEMA regulations if it is located within the 100-year floodplain. The base flow component of the control structure will require regular maintenance inspections to prevent clogging. Environmental permitting issues are expected due to the instream location of this facility.

**Costs:**

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|---|---|---|---|---|
| Plunge Pool / Micropool | 1 | EA | $400.00 | $400 |
| New Control Structure - Weir | 1 | LS | $8,000.00 | $8,000 |
| Rip Rap Stabilization | 200 | SY | $100.00 | $20,000 |
| | | | Initial Project Costs | **$28,400** |
| Plantings | 1 | LS | 5% of Project | $1,420 |
| Ancillary Items | 1 | LS | 5% of Project | $1,420 |
| Erosion and Sediment Control | 1 | LS | 10% of Project | $2,840 |
| | | | Base Construction Costs | **$34,080** |
| | | | Mobilization (5%) | $1,704 |
| | | | **Subtotal 1** | $35,784 |
| | | | Contingency (25%) | $8,946 |
| | | | **Subtotal 2** | $44,730 |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%) | | | | $20,129 |
| | | | **Estimated Project Cost** | **$65,000** |

*Site Photo: Erosion in Upstream Channel*

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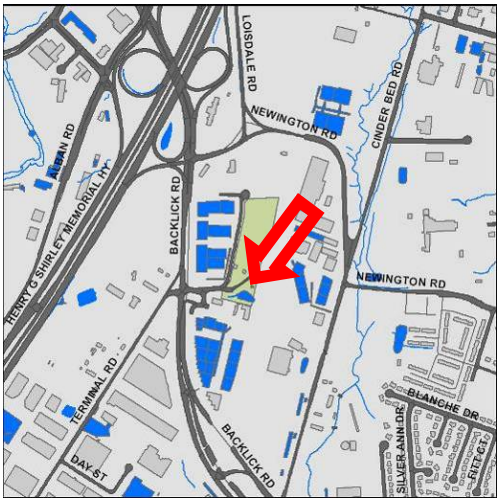
# AC9501-BMP/LID




| | |
|---|---|
| **Address:** | 8201 Terminal Road |
| **Location:** | Terminal Drive |
| **Land Owner:** | Private - Industrial |
| **PIN:** | 0993 01 0038 |
| **Control Type** | Water Quality |
| **Drainage Area** | 0.98 acres |
| **Receiving Waters** | Unknown tributary of Long Branch South |

**Description:** The installation of a vegetated swale is proposed to treat the runoff from an industrial trucking facility on Terminal Drive. This site currently drains untreated runoff via a rip rap channel to a ditch along the railroad tracks. The vegetated swale could be either a dry swale (with underdrain) or a wet swale.


*Project Area Map: Conceptual plan showing potential project location*

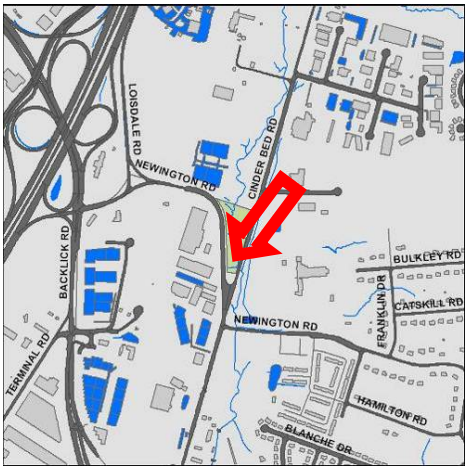
**Project Benefits:** Given the heavy truck use of this industrial property, the potential for discharge of pollutants such as sediment, heavy metals, nutrients, trash, and oil is relatively high. Implementation of a vegetated swale will provide better water quality treatment for this parking lot during storm events than the existing rip rap channel. The vegetated swale will filter pollutants as it conveys runoff off the property. It is estimated that an annual total of 574 lbs of sediment, five lbs of nitrogen and one lb of phosphorus would be reduced by this project.

**Project Design Considerations:** No environmental constraints or permitting issues are anticipated. Access to the proposed site is constrained by a stormwater pond to the north and a large building to the south. The property is privately owned and coordination with the owner will be necessary for this project. No permanent negative impacts to the property are anticipated.

**Costs:**

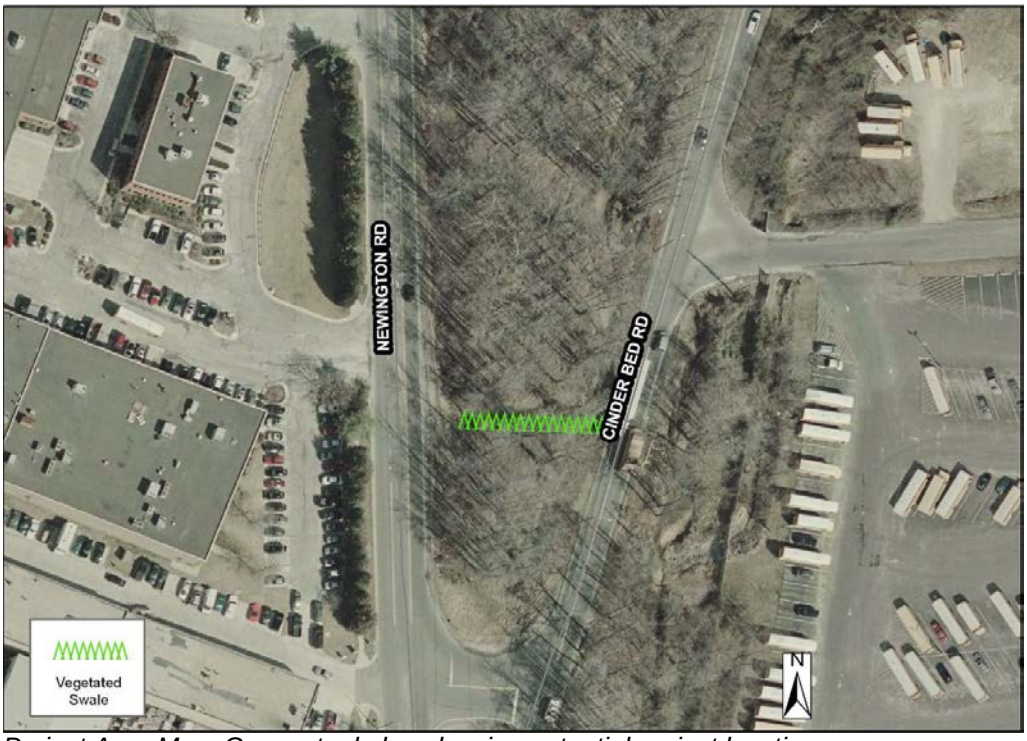
| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|---|---|---|---|---|
| Vegetated Swale | 178 | SY | $150.00 | $26,700 |
| | | | **Initial Project Cost** | **$26,700** |
| Ancillary Items | 1 | LS | 5% of project | $1,335 |
| Erosion and Sediment Control | 1 | LS | 10% of project | $2,670 |
| | | | Base Construction Cost | **$30,705** |
| | | | Mobilization (5%) | $1,535 |
| | | | **Subtotal 1** | **$32,240** |
| | | | Contingency (25%) | $8,060 |
| | | | **Subtotal 2** | **$40,300** |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%) | | | | $18,135 |
| | | | **Estimated Project Cost** | **$59,000** |

# AC9502-BMP/LID




| | |
|---|---|
| **Address:** | 7002 Newington Dr |
| **Location:** | Newington Road |
| **Land Owner:** | Private |
| **PIN:** | 0992 01 0009 |
| **Control Type** | Water Quality |
| **Drainage Area** | 2.39 acres |
| **Receiving Waters** | Unknown tributary of Long Branch South |

**Description:** Installation of a vegetated swale is proposed to treat the runoff from an industrial facility on Newington Road. Runoff from this site currently drains across Newington Road and into an open channel with heavy sedimentation before discharging to Long Branch South. The channel could be redesigned as a vegetated swale to improve pollutant removal and runoff reduction.




*Project Area Map: Conceptual plan showing potential project location*

**Project Benefits:** Implementation of a vegetated swale in this location will essentially serve as a forebay and provide water quality treatment for the storm drainage system and the impervious area it serves. The vegetated swale will remove sediment and other pollutants from the stormwater runoff before it enters Long Branch South. It is estimated that an annual total of 406 lbs of sediment, four lbs of nitrogen and one lb of phosphorus would be reduced by this project.

**Project Design Considerations:** The project's forested area location may lead to greater permitting issues compared to other retrofits in the watershed. A wetland delineation would need to be performed prior to final design. Access to the proposed site is fair and moderate tree removal may be necessary for construction. The standing water in the existing channel and the potential low head availability may make a wet swale more appropriate here than a dry swale with an underdrain.

**Costs:**

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|---|---|---|---|---|
| Vegetated Swale | 310 | SY | $150.00 | $46,500 |
| | | | **Initial Project Cost** | **$46,500** |
| Ancillary Items | 1 | LS | 5% of project | $2,325 |
| Erosion and Sediment Control | 1 | LS | 10% of project | $4,650 |
| | | | Base Construction Cost | **$53,475** |
| | | | Mobilization (5%) | $2,674 |
| | | | **Subtotal 1** | **$56,149** |
| | | | Contingency (25%) | $14,037 |
| | | | **Subtotal 2** | **$70,186** |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%) | | | | $31,584 |
| | | | **Estimated Project Cost** | **$102,000** |

*Site photo: Outlet of storm drainage system on east side of Newington Road.*

*Site photo: Sediment-filled channel and discharge point to Long Branch South*

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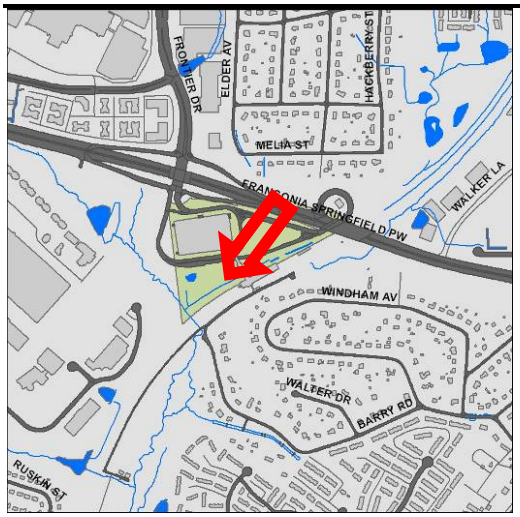
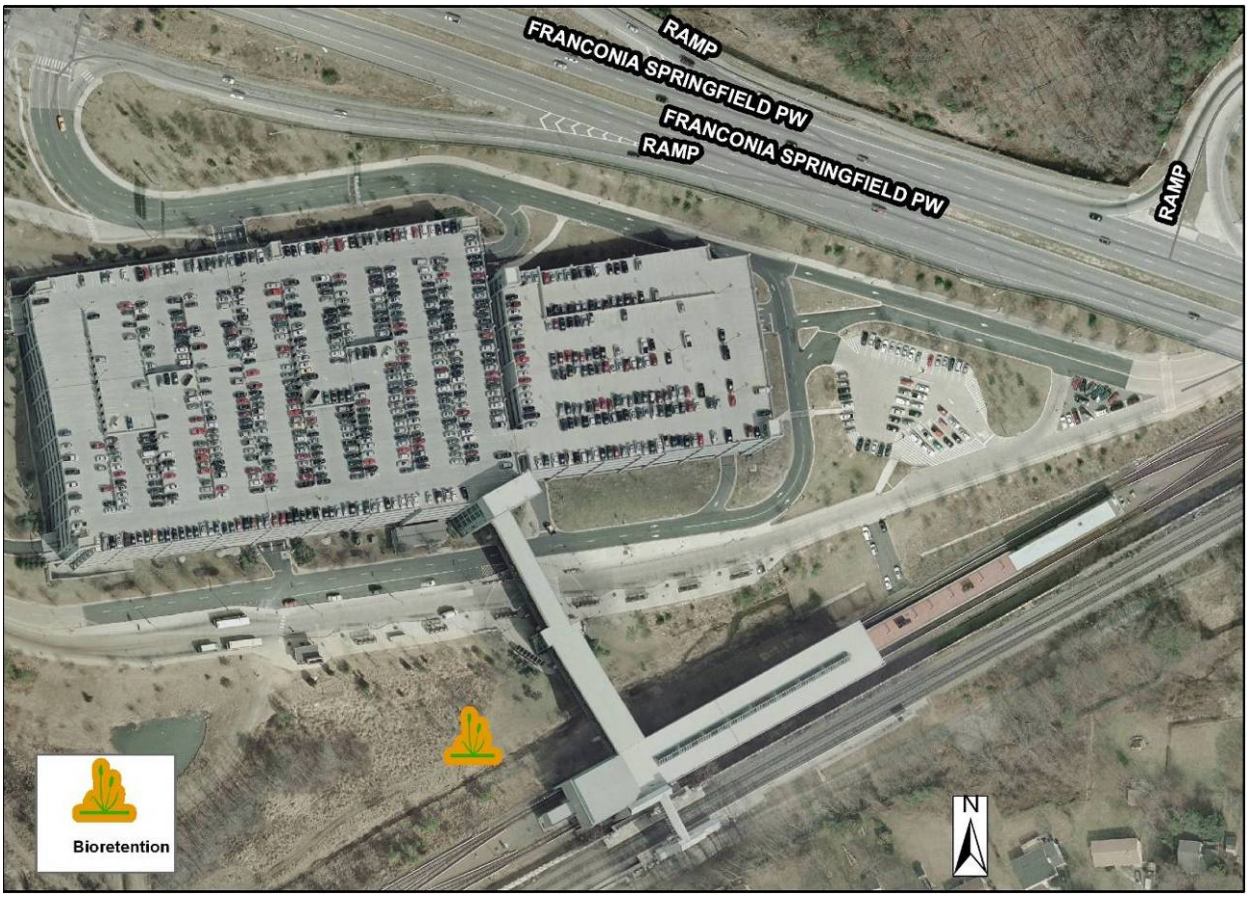
# AC9503-BMP/LID




| | |
|---|---|
| **Address:** | 6775 Frontier Dr |
| **Location:** | Franconia/Springfield Metro |
| **Land Owner:** | Public - Metro |
| **PIN:** | 0902 01 0061B |
| **Control Type** | Water Quality |
| **Drainage Area** | 2.64 acres |
| **Receiving Waters** | Unknown tributary of Accotink Creek |

**Description:** Installation of a bioretention filter is proposed to treat the runoff from one of the stormwater outlets from the Franconia/Springfield Metro. This stormwater outfall conveys runoff from several of the station's parking lots to a ditch along the Metro tracks.




*Project Area Map: Conceptual plan showing potential project location*

**Project Benefits:** This stormwater outlet receives untreated runoff from a large impervious drainage area, mainly parking lots. Clear evidence of trash, sediment, and other pollutants are visible at the site. Implementation of a bioretention facility would provide water quality treatment for this parking lot during storm events and reduce these pollutants through sedimentation, filtration, and biological processes. In addition, this site is highly visible, and would be a good opportunity for educational signage. It is estimated that an annual total of 3,543 lbs of sediment, 35 lbs of nitrogen and nine lbs of phosphorus would be reduced by this project.

**Project Design Considerations:** No environmental constraints or permitting issues are anticipated. Access to the proposed site is excellent, While the property is publicly owned, coordination with the Washington Metropolitan Area Transit Authority will be essential for this project. The grassy area surrounding the proposed bioretention facility would also be a good candidate for reforestation.

**Costs:**

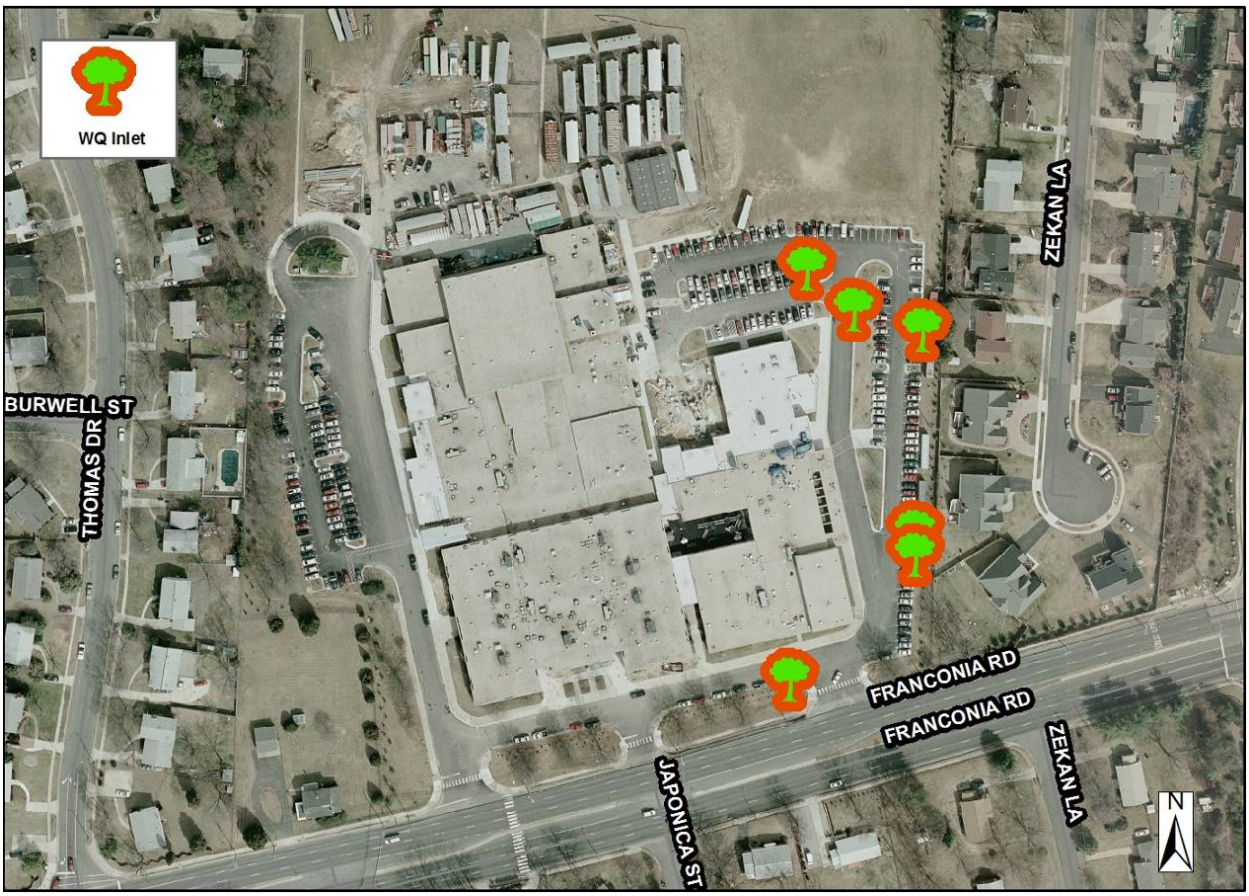
| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|---|---|---|---|---|
| Bioretention Filter and Basin | 304 | SY | $150.00 | $45,600 |
| | | | **Initial Project Cost** | **$45,600** |
| Ancillary Items | 1 | LS | 5% of project | $2,280 |
| Erosion and Sediment Control | 1 | LS | 10% of project | $4,560 |
| | | | Base Construction Cost | **$52,440** |
| | | | Mobilization (5%) | $2,622 |
| | | | **Subtotal 1** | **$55,062** |
| | | | Contingency (25%) | $13,766 |
| | | | **Subtotal 2** | **$68,828** |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%) | | | | $30,973 |
| | | | **Estimated Project Cost** | **$100,000** |

*Site photo: Outfall to be treated by bioretention facility.*

# AC9505-BMP/LID


| | |
|---|---|
| **Address:** | 6404 Franconia Road |
| **Location:** | Francis Scott Key Middle School |
| **Land Owner:** | County - FCPS |
| **PIN:** | 0813 01 0022B |
| **Control Type** | Water Quality |
| **Drainage Area** | 1.47 acres |
| **Receiving Waters** | Unknown tributary of Long Branch South |

**Description:** The installation of Tree Box Filters is proposed to treat the runoff from the parking lot at Francis Scott Key School. The facilities would be located at the existing storm drain inlets and sized to treat the total impervious area. Currently, there are no existing stormwater management practices at the site and runoff flows directly into the storm drain system.




*Project Area Map: Conceptual plan showing potential project location*

**Project Benefits:** The impervious surface from the parking lot produces high volumes of runoff and associated pollutants. Implementation of the proposed facilities will provide water quality treatment during storm events, reducing runoff volume, rate of flow, and pollutant loads. In addition, the location of this project on school grounds may provide significant educational benefits. It is estimated that an annual total of 589 lbs of sediment, six lbs of nitrogen and two lbs of phosphorus would be reduced by this project.

**Project Design Considerations:** No environmental constraints or permitting issues are anticipated. Underground utilities may be present in the area; however, there should be sufficient space available to avoid them. Access to the proposed sites is excellent from the adjacent parking lot. Coordination with the school district will be necessary for this site and construction during the summer months would be preferred.

**Costs:**

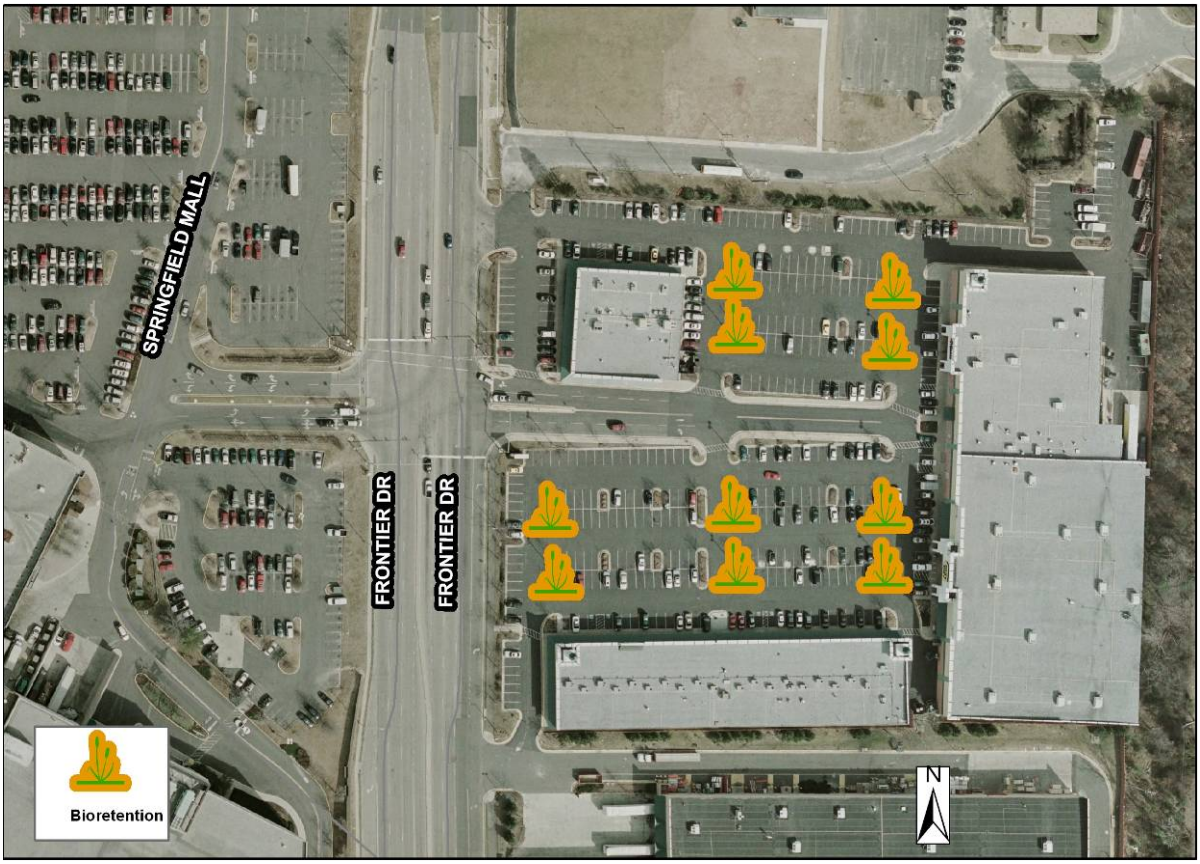
| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|---|---|---|---|---|
| Tree Box Filters | 6 | EA | $10,000.00 | $60,000 |
| | | | Initial Project Cost | **$60,000** |
| Ancillary Items | 1 | LS | 5% of project | $3,000 |
| Erosion and Sediment Control | 1 | LS | 10% of project | $6,000 |
| | | | Base Construction Cost | **$69,000** |
| | | | Mobilization (5%) | $3,450 |
| | | | **Subtotal 1** | $72,450 |
| | | | Contingency (25%) | $18,113 |
| | | | **Subtotal 2** | $90,563 |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%) | | | | $40,753 |
| | | | **Estimated Project Cost** | **$132,000** |

*Site photo: Proposed location of one tree box filter adjacent to storm drain inlet in parking median.*

# AC9506-BMP/LID


| | |
|---|---|
| **Address:** | 6691 Frontier Dr |
| **Location:** | Commercial Parking Lot |
| **Land Owner:** | Private - Commercial |
| **PIN:** | 0902 01 0101A1 |
| **Control Type** | Water Quality |
| **Drainage Area** | 2.52 acres |
| **Receiving Waters** | Unknown tributary of Long Branch South |

**Description:** The installation of multiple bioretention filters and basins is proposed to treat the runoff from a large commercial parking lot located along Frontier Drive. The parking lot is heavily used at times, but numerous islands in the parking lot could be converted into bioretention facilities. The property appears to have underground detention for control of large storm events, but the detention was not designed for water quality treatment.




*Project Area Map: Conceptual plan showing potential project location*

**Project Benefits:** Implementation of bioretention facilities will provide water quality treatment for this parking lot during storm events and treat the sediment, nutrient, and oil pollution common in runoff from commercial parking lots. It is estimated that an annual total of 2,953 lbs of sediment, 27 lbs of nitrogen and five lbs of phosphorus would be reduced by this project.

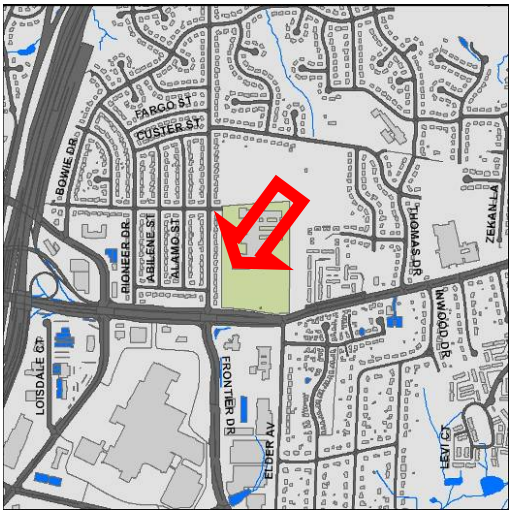
**Project Design Considerations:** No environmental constraints or permitting issues are anticipated. Access to the proposed sites is excellent from the commercial parking lot. The property is privately owned and coordination with the shopping center will be necessary for these sites.

**Costs:**

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|---|---|---|---|---|
| Bioretention Filter and Basin | 345 | SY | $150.00 | $51,750 |
| | | | **Initial Project Cost** | **$51,750** |
| Ancillary Items | 1 | LS | 5% of project | $2,588 |
| Erosion and Sediment Control | 1 | LS | 10% of project | $5,175 |
| | | | Base Construction Cost | **$59,513** |
| | | | Mobilization (5%) | $2,976 |
| | | | **Subtotal 1** | **$62,488** |
| | | | Contingency (25%) | $15,622 |
| | | | **Subtotal 2** | **$78,110** |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%) | | | | $35,150 |
| | | | **Estimated Project Cost** | **$114,000** |

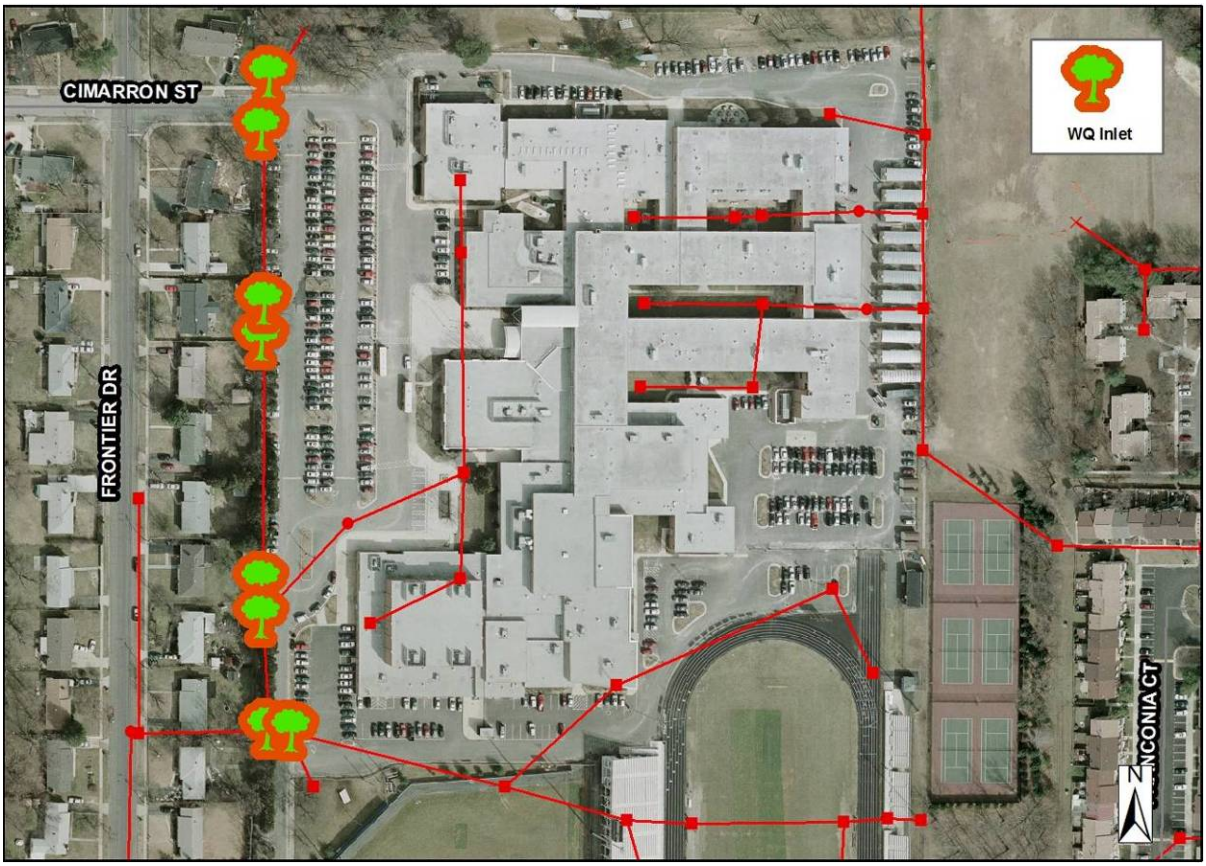

*Site photo: Parking lot with multiple islands.*

# AC9508-BMP/LID




| | |
|---|---|
| **Address:** | 6540 Franconia Road |
| **Location:** | Robert E. Lee High School |
| **Land Owner:** | County - FCPS |
| **PIN:** | 0804 01 0037 |
| **Control Type** | Water Quality |
| **Drainage Area** | 3.01 acres |
| **Receiving Waters** | Unknown tributary to Long Branch South |

**Description:** The installation of Tree Box Filters is proposed to treat the runoff from the western portion of the parking lot for Robert E. Lee High School. The facilities would be located at the existing storm drain inlets.




*Project Area Map: Conceptual plan showing potential project location*

**Project Benefits:** This parking lot is likely to exhibit the runoff characteristics typical of heavily used parking lots –high levels of hydrocarbons, trash, sediment and nutrients. Implementation of the Tree Box Filters at the edge of the parking lot will provide water quality treatment for this area during storm events, intercepting and treating the runoff before it enters the storm drain system. It is estimated that an annual total of 486 lbs of sediment, five lbs of nitrogen and one lb of phosphorus would be reduced by this project.

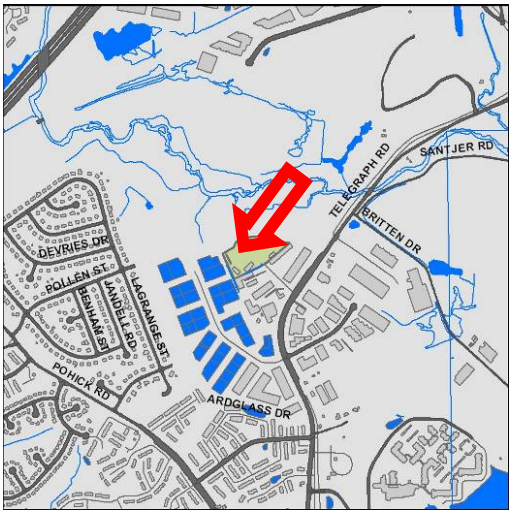
**Project Design Considerations:** No environmental constraints or permitting issues are anticipated. Access to the proposed sites is excellent from the existing parking lot. Coordination with the school district will be necessary for this site.

**Costs:**

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|---|---|---|---|---|
| Tree Box Filters | 8 | SY | $10,000.00 | $80,000 |
| | | | **Initial Project Cost** | **$80,000** |
| Ancillary Items | 1 | LS | 5% of project | $4,000 |
| Erosion and Sediment Control | 1 | LS | 10% of project | $8,000 |
| | | | Base Construction Cost | **$92,000** |
| | | | Mobilization (5%) | $4,600 |
| | | | **Subtotal 1** | **$96,600** |
| | | | Contingency (25%) | $24,150 |
| | | | **Subtotal 2** | **$120,750** |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%) | | | | $54,338 |
| | | | **Estimated Project Cost** | **$176,000** |

*Site photo: Parking spaces to be removed for bioretention facility.*

# AC9509-BMP/LID




| | |
|---|---|
| **Address:** | 7300 Telegraph Square Dr. |
| **Location:** | Lockport Industrial Park |
| **Land Owner:** | Private - Industrial |
| **PIN:** | 1081 01 0003D |
| **Control Type** | Water Quality |
| **Drainage Area** | 4.49 acres |
| **Receiving Waters** | Unknown tributary of Accotink Creek |

**Description:** The installation of a bioretention filter is proposed to treat the runoff from the parking lot of a trucking company located in the Lockport Industrial Park. Currently the parking lot drains untreated via overland flow directly to the floodplain of a small tributary to Accotink Creek.


*Project Area Map: Conceptual plan showing potential project location*

**Project Benefits:** Given the heavy truck use of this parking lot, its potential for discharge of pollutants, such as sediment, heavy metals, nutrients, trash, and oil is relatively high. Implementation of a bioretention facility will provide water quality treatment for the runoff from this parking lot. The bioretention facility will intercept the overland flow before it reaches the floodplain of the Accotink Creek tributary and remove many of these pollutants. It is estimated that an annual total of 1,770 lbs of sediment, 12 lbs of nitrogen and two lbs of phosphorus would be reduced by this project.

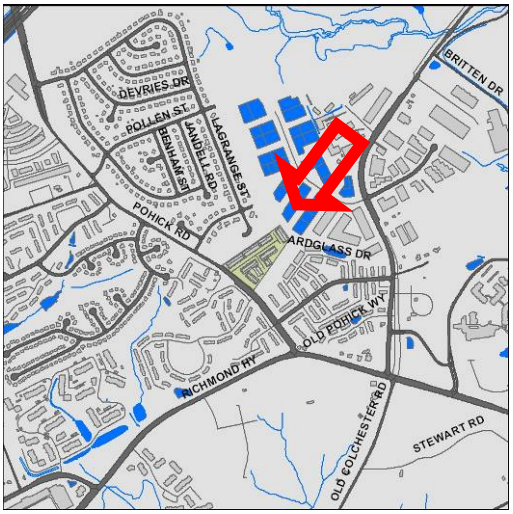
**Project Design Considerations:** No environmental constraints or permitting issues are anticipated. Access to the proposed sites is good from the parking lot; however, existing electric lines in the area may require design modifications or specific construction considerations. The property is privately owned and coordination with the Lockport Industrial Park will be necessary. Temporary loss of parking spaces can be expected during construction.

**Costs:**

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|---|---|---|---|---|
| Bioretention Filter and Basin | 647 | SY | $150.00 | $97,050 |
| | | | **Initial Project Cost** | **$97,050** |
| Ancillary Items | 1 | LS | 5% of project | $4,853 |
| Erosion and Sediment Control | 1 | LS | 10% of project | $9,705 |
| | | | Base Construction Cost | **$111,608** |
| | | | Mobilization (5%) | $5,580 |
| | | | **Subtotal 1** | **$117,188** |
| | | | Contingency (25%) | $29,297 |
| | | | **Subtotal 2** | **$146,485** |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%) | | | | $65,918 |
| | | | **Estimated Project Cost** | **$213,000** |

*Site photo: Discharge point from parking lot where the bioretention facility could be installed.*

# AC9510-BMP/LID




| | |
|---|---|
| **Address:** | 7408 Lockport Pl |
| **Location:** | Lockport Industrial Park |
| **Land Owner:** | Private - Industrial |
| **PIN:** | 1081 01 0001M |
| **Control Type** | Water Quality |
| **Drainage Area** | 54.7 acres |
| **Receiving Waters** | Unknown tributary of Accotink Creek |

**Description:** This project would install thirty-three tree box filters at existing inlet locations throughout the Lockport Industrial Park. The site is highly impervious, with very little space available for alternative retrofits. Tree box filters would provide water quality benefits without requiring much additional space.

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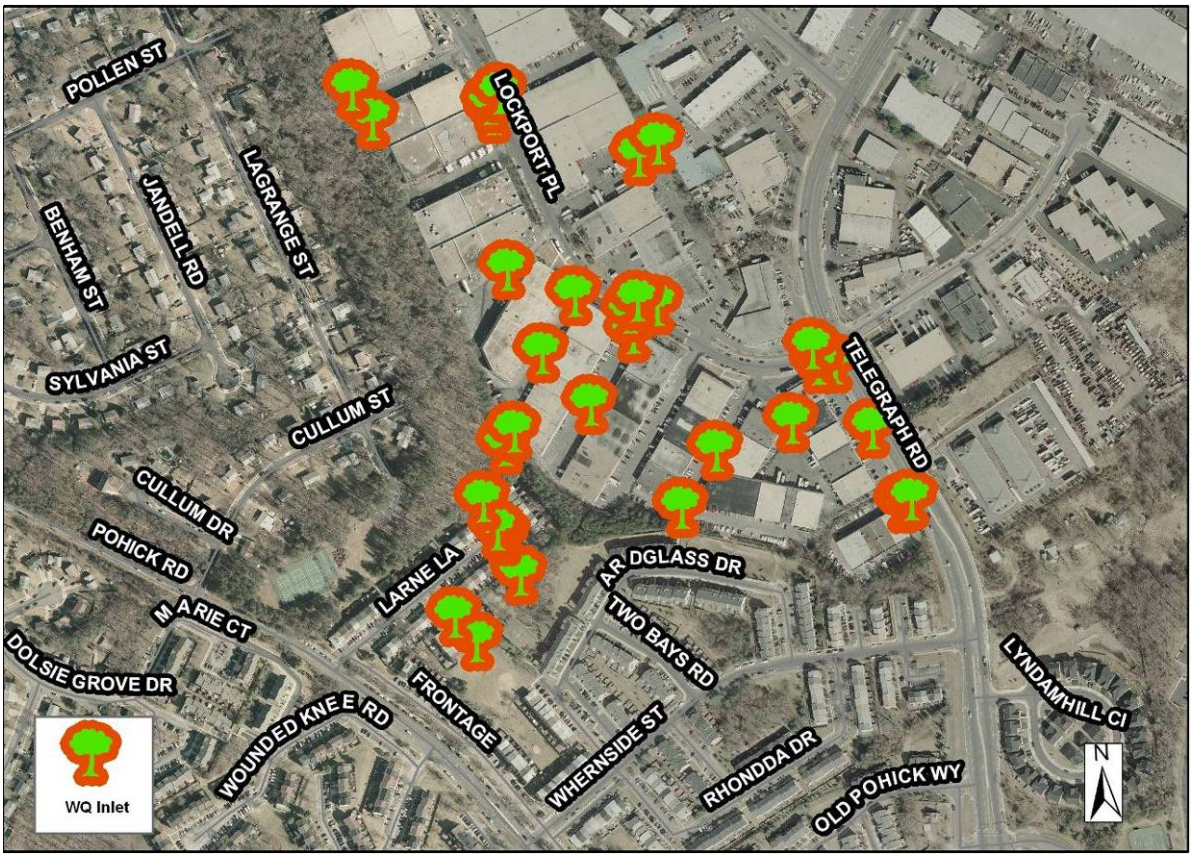



*Project Area Map: Conceptual plan showing potential project location*

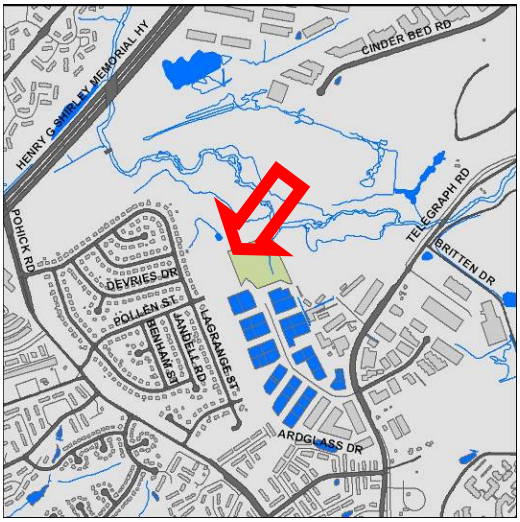
**Project Benefits:** Tree Box Filters will provide water quality treatment for much of the industrial park. The site exhibits heavy pollutant loads typical of industrial facilities, including trash, oils, grease, and sediment. Tree Box Filters would help remove these pollutants before the runoff enters the storm drain system. It is estimated that an annual total 22,456 lbs of sediment, 222 lbs of nitrogen, and 33 lbs of phosphorus would be reduced by this project.

**Project Design Considerations:** No environmental constraints or permitting issues are anticipated. Most of the existing inlets are easily accessible from the parking lots and roads. The property is privately owned and coordination with the industrial park management, as well as the individual businesses, will be necessary for this project. A temporary loss of parking spaces can be expected during construction. As the proposed locations for the tree box filters are based on existing inlet locations, some individual locations may have large drainage areas, and must be designed accordingly.

**Costs:**

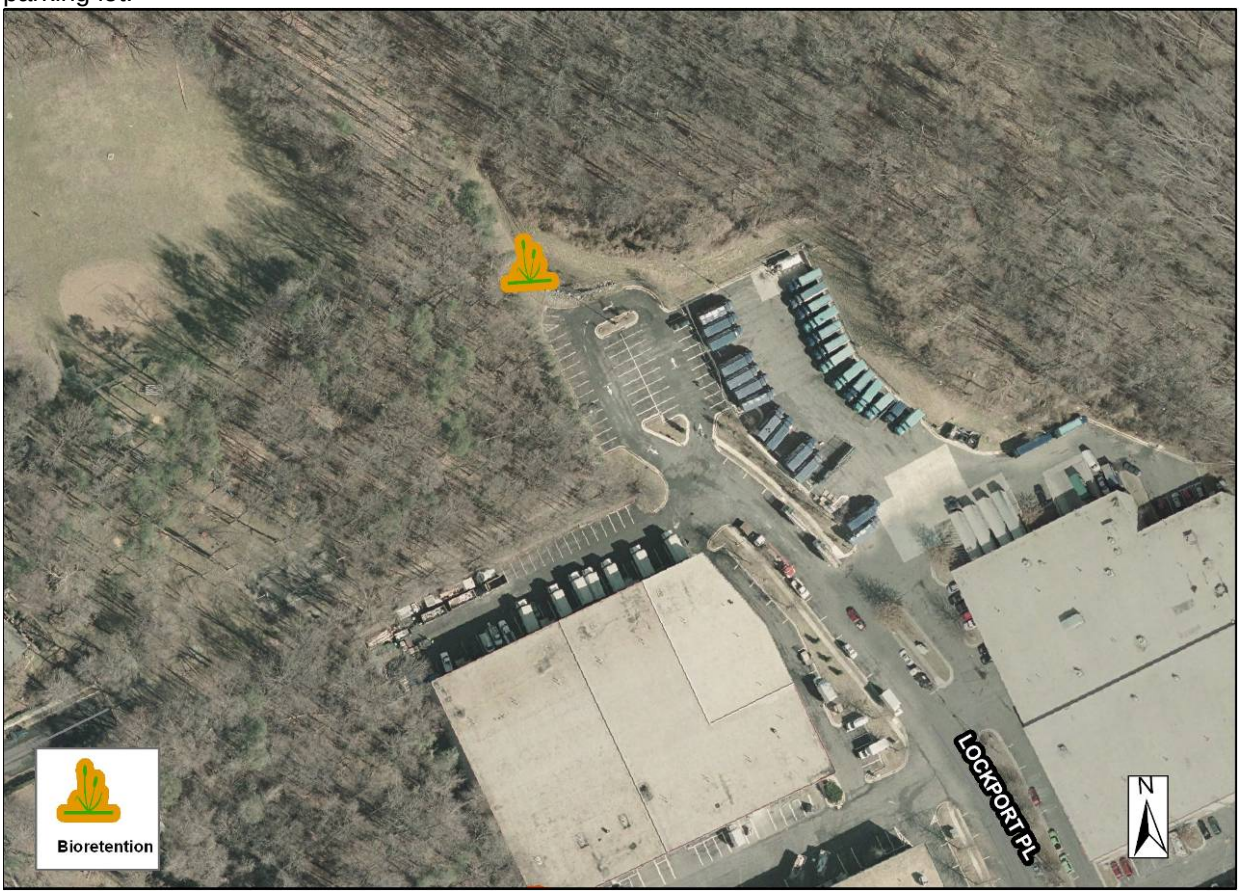
| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|---|---|---|---|---|
| Tree Box Filters | 33 | EA | $10,000.00 | $330,000 |
| | | | **Initial Project Cost** | **$330,000** |
| Ancillary Items | 1 | LS | 5% of project | $16,500 |
| Erosion and Sediment Control | 1 | LS | 10% of project | $33,000 |
| | | | Base Construction Cost | **$379,500** |
| | | | Mobilization (5%) | $18,975 |
| | | | **Subtotal 1** | **$398,475** |
| | | | Contingency (25%) | $99,619 |
| | | | **Subtotal 2** | **$498,094** |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%) | | | | $224,142 |
| | | | **Estimated Project Cost** | **$723,000** |

# AC9511-BMP/LID




| | |
|---|---|
| **Address:** | 7408 Lockport Pl |
| **Location:** | Deer Park parking lot |
| **Land Owner:** | Private - Industrial |
| **PIN:** | 1081 01 0001N |
| **Control Type** | Water Quality |
| **Drainage Area** | 1.32 acres |
| **Receiving Waters** | Unknown tributary of Accotink Creek |

**Description:** The installation of a bioretention filter is proposed to treat the runoff from a parking lot in the Lockport Industrial Park. The proposed facility will be located in a grassy area directly adjacent to the parking lot.




*Project Area Map: Conceptual plan showing potential project location*

**Project Benefits:** Implementation of a bioretention filter in this location will provide water quality treatment for the runoff from this parking lot. The bioretention facility will intercept trash, oil, grease, sediments, and nutrients. It is estimated that an annual total of 277 lbs of sediment, one lb of nitrogen and one-third lb of phosphorus would be reduced by this project.

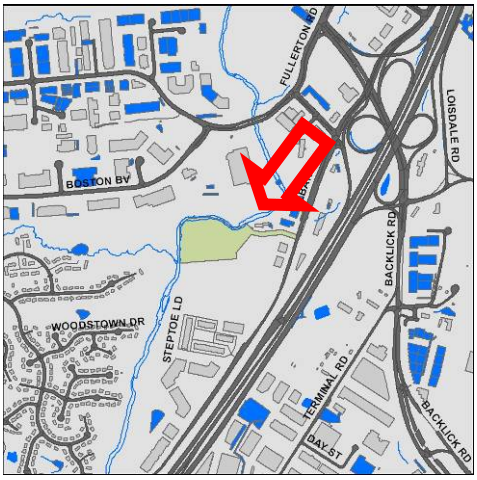
**Project Design Considerations:** No environmental constraints or permitting issues are anticipated. Access to the proposed site is excellent from the adjacent parking lot and construction of the facility will cause minimal disruption to the property. The property is privately owned and coordination with the owner/management of the site will be. Due to high trash and sediment loads expected in this location, a forebay and regular maintenance may be necessary.

**Costs:**

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|---|---|---|---|---|
| Bioretention Filter and Basin | 190 | SY | $150.00 | $28,500 |
| | | | **Initial Project Cost** | **$28,500** |
| Ancillary Items | 1 | LS | 5% of project | $1,425 |
| Erosion and Sediment Control | 1 | LS | 10% of project | $2,850 |
| | | | Base Construction Cost | **$32,775** |
| | | | Mobilization (5%) | $1,639 |
| | | | **Subtotal 1** | **$34,414** |
| | | | Contingency (25%) | $8,603 |
| | | | **Subtotal 2** | **$43,017** |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%) | | | | $19,358 |
| | | | **Estimated Project Cost** | **$63,000** |

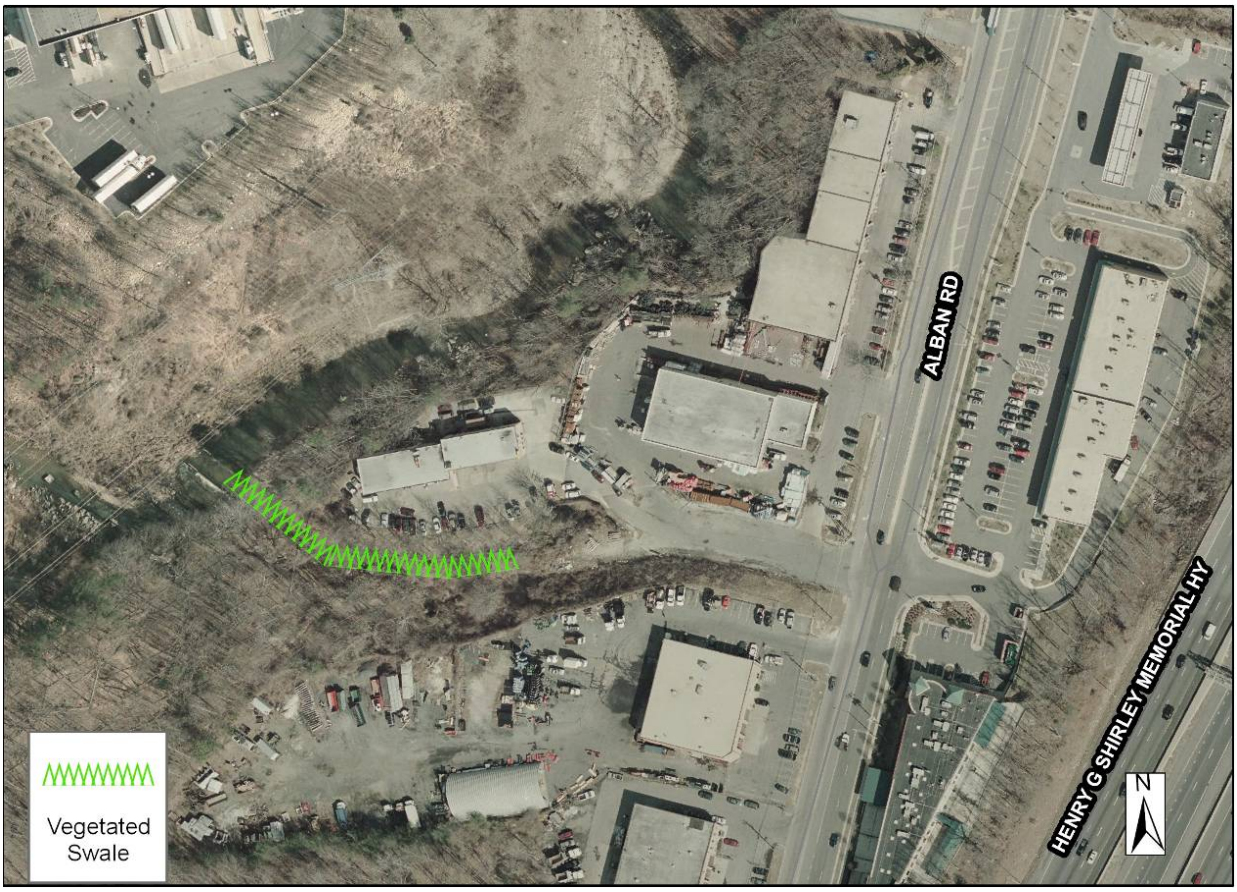
*Site photo: Parking lot and bioretention facility location.*

# AC9512-BMP/LID




| | |
|---|---|
| **Address:** | 8100A Alban Road |
| **Location:** | HRM Automotive |
| **Land Owner:** | Private - Industrial |
| **PIN:** | 0991 01 0003B |
| **Control Type** | Water Quality |
| **Drainage Area** | 26.23 acres |
| **Receiving Waters** | Unknown tributary of Accotink Creek |

**Description:** The installation of a vegetated swale is proposed to address a severely eroding channel adjacent to the HRM Automotive parking lot. The existing channel discharges directly into Accotink Creek. The proposed project is located next to a recently developed property that includes a detention pond and a stabilized outfall to the eroding channel.




*Project Area Map: Conceptual plan showing potential project location*

**Project Benefits:** Implementing a vegetated swale in this location will greatly reduce erosion in the channel and sediment loading to Accotink Creek, as well as treating the runoff from the project site through filtration and biological processes. The vegetated swale will stabilize this channel and reduce the chances of property damage due to erosion. It is estimated that an annual total of 1,654 lbs of sediment, 16 lbs of nitrogen, and 2 lbs of phosphorus would be reduced by this project.

**Project Design Considerations:** Environmental permits may be necessary as the project would be done in a defined channel that is directly connected to Accotink Creek. Access to the site is constrained due to utilities, steep slopes, and a lack of space. These constraints will likely lead to a project design that is not long or wide enough to treat the entire water quality volume, but stabilizing the channel will be a major benefit. The property is privately owned and coordination with the owner/management will be necessary for this project.

**Costs:**

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|---|---|---|---|---|
| Vegetated Swale | 321 | SY | $150.00 | $48,150 |
| | | | **Initial Project Cost** | **$48,150** |
| Ancillary Items | 1 | LS | 5% of project | $2,408 |
| Erosion and Sediment Control | 1 | LS | 10% of project | $4,815 |
| | | | Base Construction Cost | **$55,373** |
| | | | Mobilization (5%) | $2,769 |
| | | | **Subtotal 1** | **$58,142** |
| | | | Contingency (25%) | $14,536 |
| | | | **Subtotal 2** | **$72,678** |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%) | | | | $32,705 |
| | | | **Estimated Project Cost** | **$106,000** |

*Site photo: Outfall to existing channel*

*Site photo: Eroded channel*

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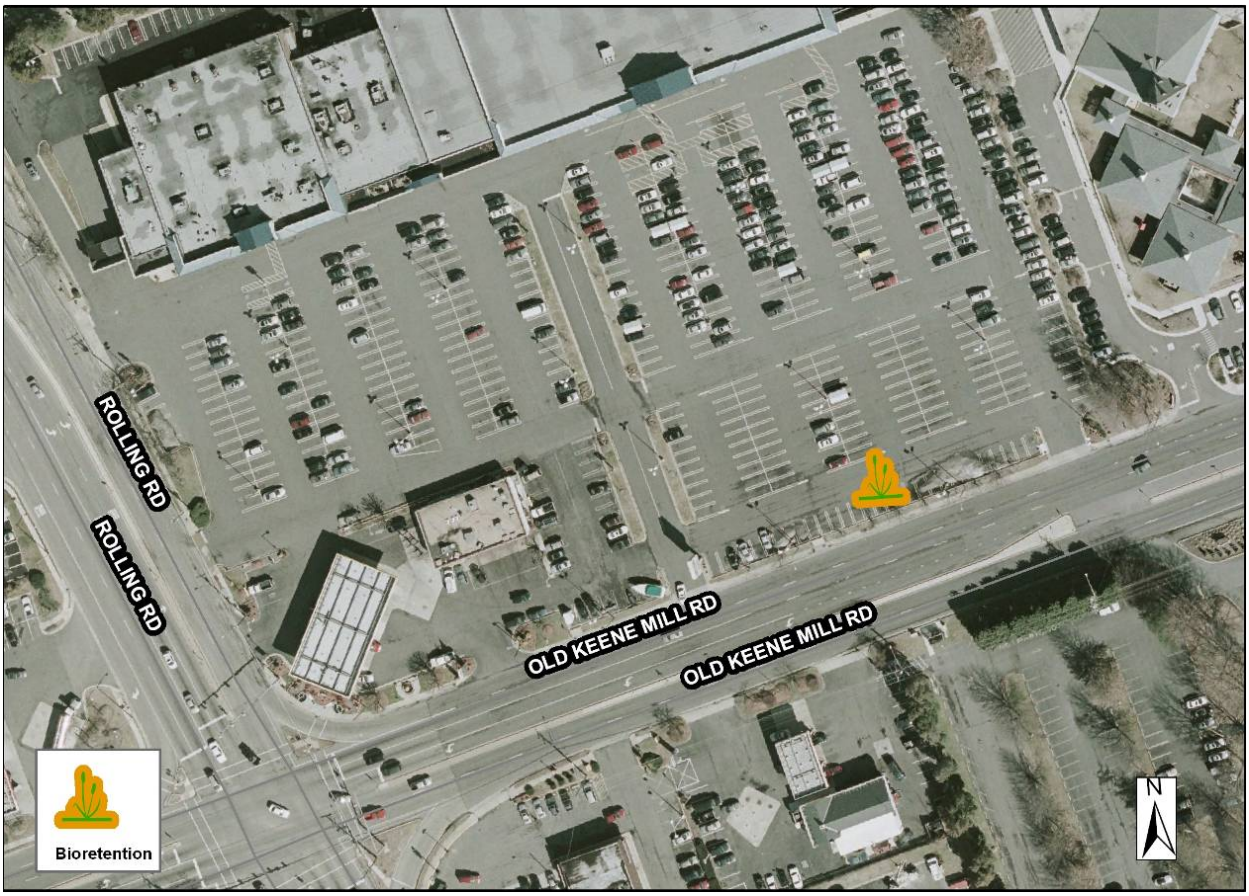
# AC9514-BMP/LID


| | |
|---|---|
| **Address:** | 8316-8332 Old Keene Mill |
| **Location:** | Cardinal Forest Plaza |
| **Land Owner:** | Private - Commercial |
| **PIN:** | 0793 08 0005D |
| **Control Type** | Water Quality |
| **Drainage Area** | 3.0 acres |
| **Receiving Waters** | Unknown tributary of Accotink Creek |

**Description:** A bioretention filter is proposed to treat the runoff from from the Cardinal Forest Plaza parking lot located along Old Keene Mill Road. Runoff from the entire parking lot drains south toward Old Keene Mill Road and is discharged off site with no treatment. Based on the topography, it would be possible to intercept this runoff with a bioretention facility and treat the east half of this parking lot.




*Project Area Map: Conceptual plan showing potential project location*

**Project Benefits:** This parking lot is likely to exhibit the runoff characteristics typical of heavily used commercial parking lots – high nutrient, oil, and trash discharges, as well as sediment. Implementing a bioretention facility at the downhill end of the parking lot will provide water quality treatment for this parking lot during storm events by intercepting and treating the runoff before it enters the storm drain system. It is estimated that an annual total of 784 lbs of sediment, 9 lbs of nitrogen and 2 lbs of phosphorus would be reduced by this project.

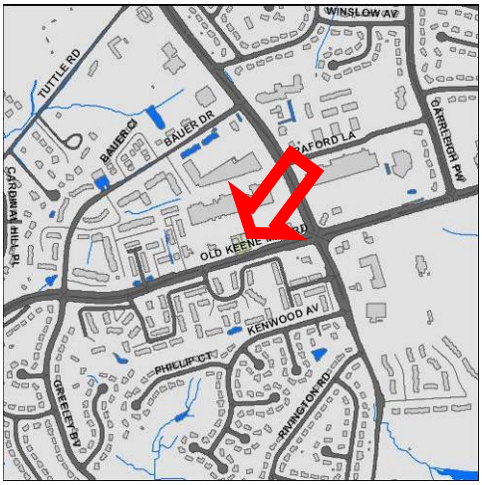
**Project Design Considerations:** No environmental constraints or permitting issues are anticipated. Access to the proposed sites is excellent from roads and the parking lot. Underground electric lines that service the parking lot lights are likely to present minimal conflicts. As the lot is privately owned, coordination with and cooperation from the shopping center owner and management will be necessary during design.

**Costs:**

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|---|---|---|---|---|
| Bioretention Filter and Basin | 432 | SY | $150.00 | $64,800 |
| | | | **Initial Project Cost** | **$64,800** |
| Ancillary Items | 1 | LS | 5% of project | $3,240 |
| Erosion and Sediment Control | 1 | LS | 10% of project | $6,480 |
| | | | Base Construction Cost | **$74,520** |
| | | | Mobilization (5%) | $3,726 |
| | | | **Subtotal 1** | **$78,246** |
| | | | Contingency (25%) | $19,562 |
| | | | **Subtotal 2** | **$97,808** |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%) | | | | $44,014 |
| | | | **Estimated Project Cost** | **$142,000** |

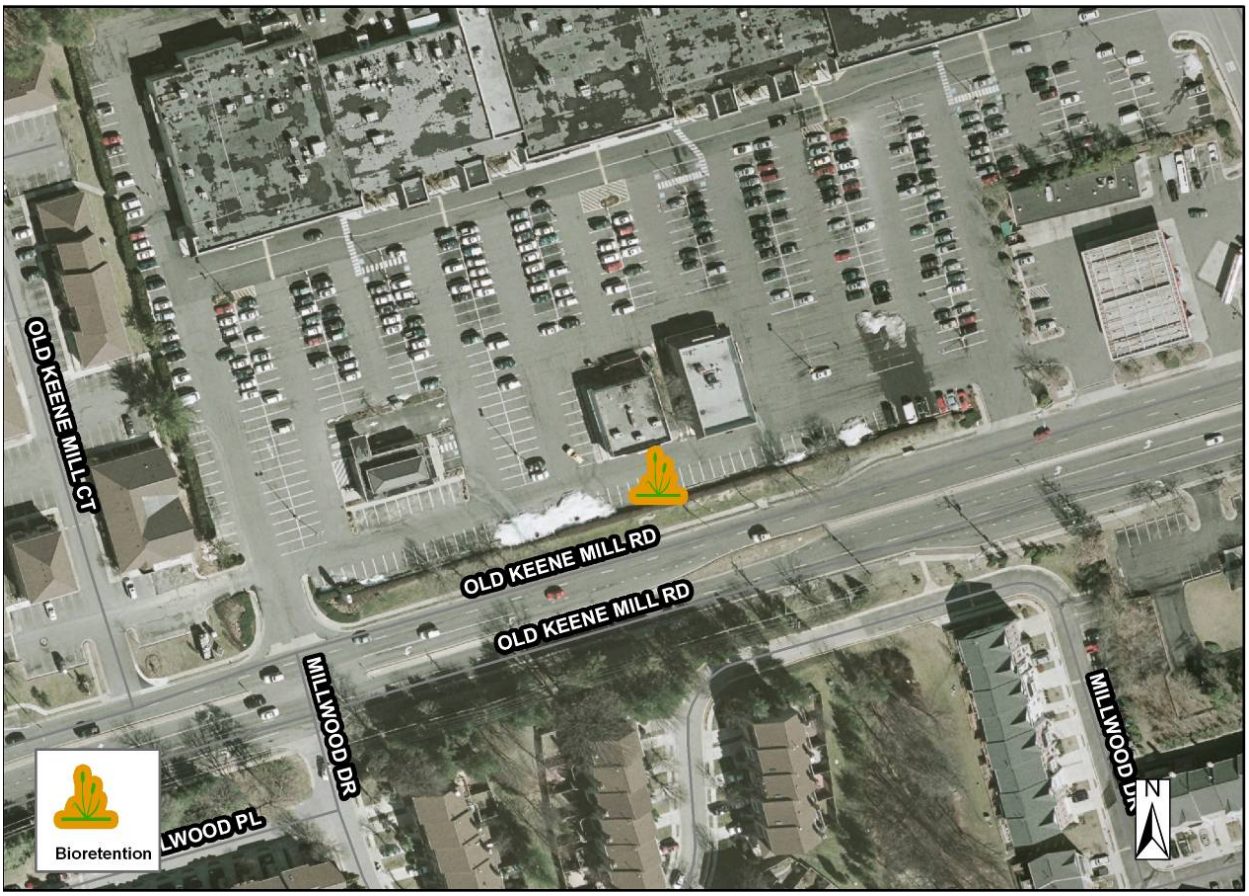
*Site photo: Parking lot that could be treated by the bioretention facility.*

# AC9515-BMP/LID




| | |
|---|---|
| **Address:** | 8434 Old Keene Mill Road |
| **Location:** | Old Keene Mill Shopping Center |
| **Land Owner:** | Private - Commercial |
| **PIN:** | 0793 05 0003A |
| **Control Type** | Water Quality |
| **Drainage Area** | 4.3 acres |
| **Receiving Waters** | Unknown tributary of Accotink Creek |

**Description:** A bioretention filter is proposed to treat the runoff from the Old Keene Mill Shopping Center parking lot located along Old Keene Mill Road. Runoff from the entire parking lot drains south toward Old Keene Mill Road and is discharged off site with no treatment. The majority of this runoff could be intercepted and treated by a bioretention facility at the south end of the lot.




*Project Area Map: Conceptual plan showing potential project location*

**Project Benefits:** The potential for the discharge of pollutants such as sediment, heavy metals, nutrients, trash, and oil, is relatively high in a large parking lot such as this. Implementing a bioretention facility at the downhill end of the parking lot will provide water quality treatment by intercepting and treating the runoff before it enters the storm drain system. It is estimated that an annual total of 1,176 lbs of sediment, 16 lbs of nitrogen and 2 lbs of phosphorus would be reduced by this project.

**Project Design Considerations:** No environmental constraints or permitting issues are anticipated. Access to the proposed sites is good from roads and the shopping center parking lot. Underground electric lines that service the parking lot lights and other property uses may present minor conflicts. As the lot is privately owned, coordination with and cooperation from the shopping center owner/management will be necessary for this site.

**Costs:**

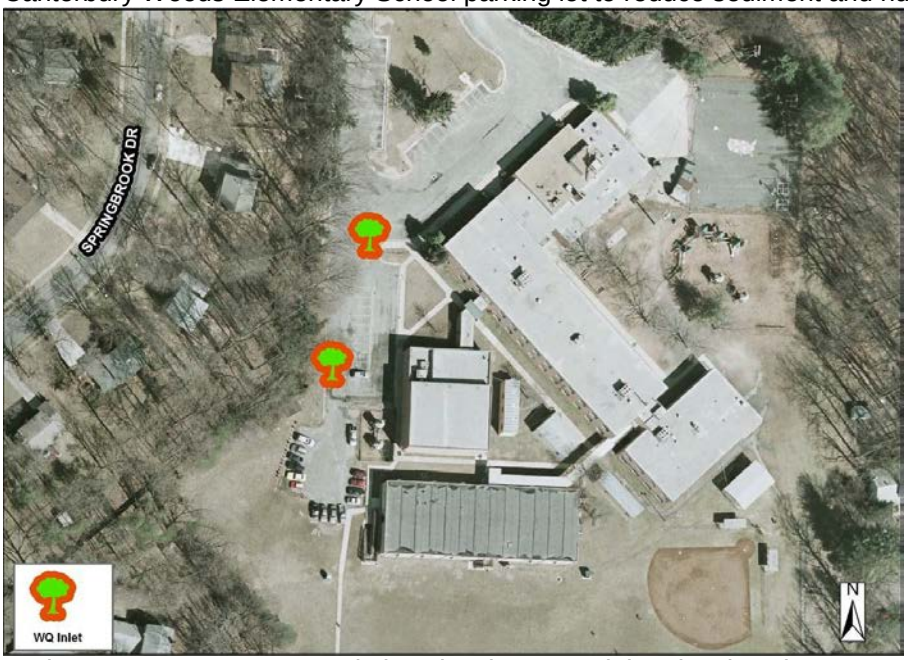
| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|---|---|---|---|---|
| Bioretention Filter and Basin | 619 | SY | $150.00 | $92,850 |
| | | | **Initial Project Cost** | **$92,850** |
| Ancillary Items | 1 | LS | 5% of project | $4,643 |
| Erosion and Sediment Control | 1 | LS | 10% of project | $9,285 |
| | | | Base Construction Cost | **$106,778** |
| | | | Mobilization (5%) | $5,339 |
| | | | **Subtotal 1** | **$112,117** |
| | | | Contingency (25%) | $28,029 |
| | | | **Subtotal 2** | **$140,146** |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%) | | | | $63,066 |
| | | | **Estimated Project Cost** | **$204,000** |

*Site photo: Parking lot runoff could be treated by replacing end parking spaces with a bioretention filter.*

# AC9529-BMP/LID


| | |
|---|---|
| **Address:** | 4910 Willet Dr |
| **Location:** | Canterbury Woods Elementary School |
| **Land Owner:** | County - FCPS |
| **PIN:** | 0701 01 0005 |
| **Control Type** | Water Quality |
| **Drainage Area** | 0.8 acres |
| **Receiving Waters** | Unknown tributary of Long Branch Central |

**Description:** This parking lot of this school site drains to several inlets with no stormwater management. While there is limited space in which to implement potential projects, water quality treatment at the inlets is feasible. The proposed project would add two tree box filters in catch basins to the west of the Canterbury Woods Elementary School parking lot to reduce sediment and nutrients in runoff.




*Project Area Map: Conceptual plan showing potential project location*

**Project Benefits:** Implementing tree box filters will provide water quality benefits, including sediment capture and removal of associated pollutants. The site would also be appropriate for education / outreach signage. It is estimated that an annual total of 187 lbs of sediment, 2 lbs of total nitrogen and one-half lb of total phosphorus would be reduced by this project.

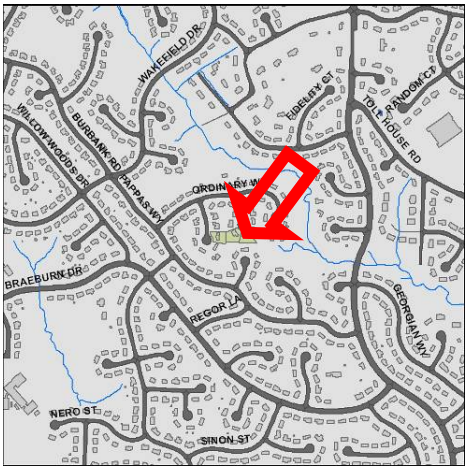
**Project Design Considerations:** No environmental constraints or permitting issues are anticipated. Access to the proposed sites is excellent from roads and the school's parking lot. Property ownership is public (Fairfax County Public Schools).

**Costs:**

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|---|---|---|---|---|
| Tree Box Filters | 2 | EA | $10,000.00 | $20,000 |
| | | | **Initial Project Cost** | **$20,000** |
| Ancillary Items | 1 | LS | 5% of project | $1,000 |
| Erosion and Sediment Control | 1 | LS | 10% of project | $2,000 |
| | | | Base Construction Cost | **$23,000** |
| | | | Mobilization (5%) | $1,150 |
| | | | **Subtotal 1** | **$24,150** |
| | | | Contingency (25%) | $6,038 |
| | | | **Subtotal 2** | **$30,188** |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%) | | | | $13,584 |
| | | | **Estimated Project Cost** | **$44,000** |

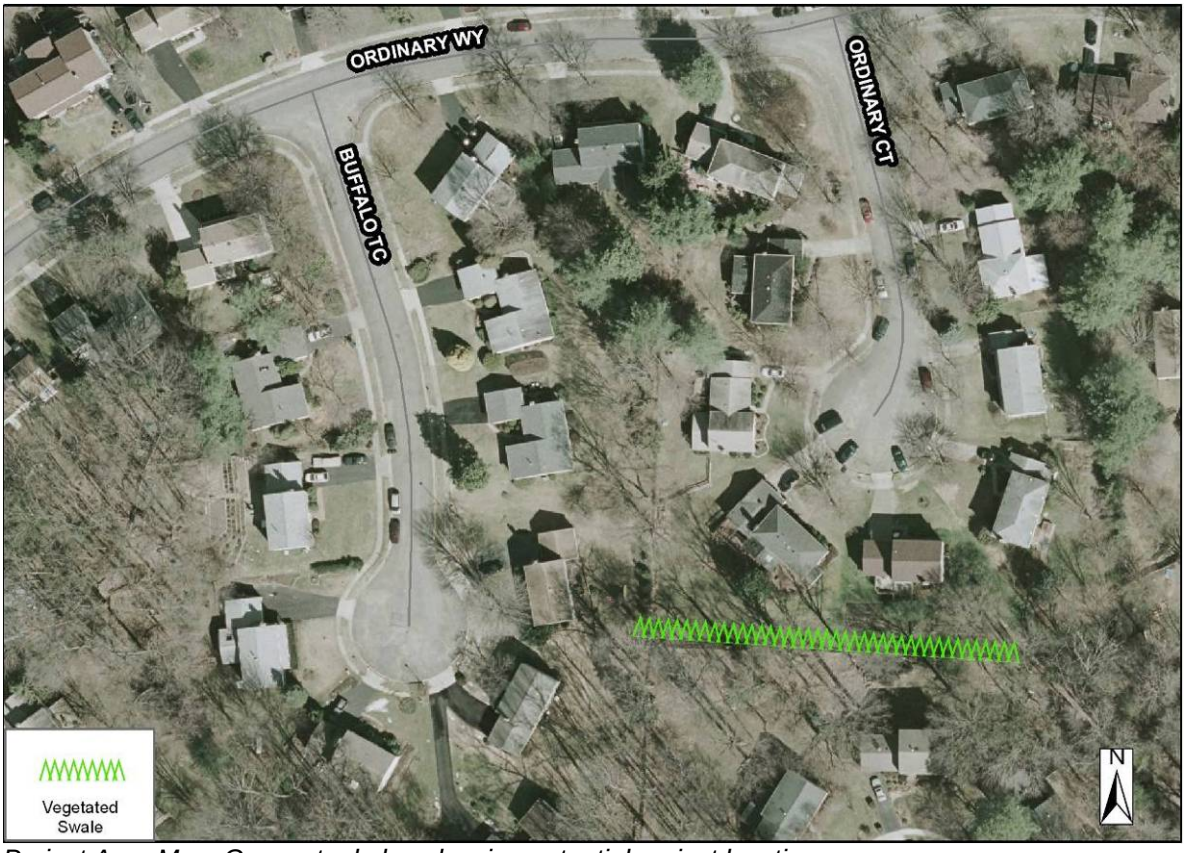
*Site photo: Aerial view of inlets to be treated (source: www.bing.com).*

# AC9535-BMP/LID




| | |
|---|---|
| **Address:** | 4606 Ordinary Court |
| **Location:** | Wakefield Chapel Estates |
| **Land Owner:** | Private - Residential |
| **PIN:** | 0701 21 0022 |
| **Control Type** | Water Quality |
| **Drainage Area** | 31.5 acres |
| **Receiving Waters** | Unknown tributary of Turkey Run |

**Description:** Installation of a vegetated swale with check dams is proposed to treat runoff flowing behind two residential properties on Ordinary Court. Drainage complaints from the property owners had previously been filed due to backyard flooding. Much of the runoff flowing through the property is from the upstream cul-de-sac. The proposed dry swale will slow and infiltrate runoff and decrease erosion. Further, the upstream drainage area was identified as a target area for individual on-site runoff reduction practices such as homeowner rain gardens or rain barrels.




*Project Area Map: Conceptual plan showing potential project location*

**Project Benefits:** Implementing the vegetated swale will reduce runoff, decrease erosion, and provide water quality treatment of runoff during storm events. Vegetated swales function similarly to bioretention facilities to remove suspended solids, heavy metals, phosphorus and nitrogen and oil and grease from storm water runoff. It is estimated that an annual total of 2,279 lbs of sediment, 25 lbs of total nitrogen and six lbs of total phosphorus would be reduced by this project.

**Project Design Considerations:** It is important to note that this project will not eliminate all flooding concerns. In order to address these larger issues, the upstream drainage area must be targeted for the implementation of runoff reduction practices such as the rain barrel outreach program planned for this area (AC9904). No environmental constraints or permitting issues are anticipated. Access to the proposed sites will be challenging since they are located on residential backyards. Property ownership is private and coordination with the homeowners will be necessary. Utilities appear to be present near the proposed project area and should be confirmed prior to final project design.

**Costs:**

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|---|---|---|---|---|
| Vegetated Swale | 572 | SY | $150.00 | $85,800 |
| | | | **Initial Project Cost** | **$85,800** |
| Ancillary Items | 1 | LS | 5% of project | $4,290 |
| Erosion and Sediment Control | 1 | LS | 10% of project | $8,580 |
| | | | Base Construction Cost | **$98,670** |
| | | | Mobilization (5%) | $4,934 |
| | | | **Subtotal 1** | **$103,604** |
| | | | Contingency (25%) | $25,901 |
| | | | **Subtotal 2** | **$129,504** |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%) | | | | $58,277 |
| | | | **Estimated Project Cost** | **$188,000** |

*Site photo: Aerial view of site for vegetated swale (source: www.bing.com).*

# AC9538-BMP/LID


| | |
|---|---|
| **Address:** | 4001 Wakefield Chapel Road |
| **Location:** | Northern Virginia Community College parking lot |
| **Land Owner:** | State |
| **PIN:** | 0593 01 0020 |
| **Control Type** | Water Quality |
| **Drainage Area** | 8.2 acres |
| **Receiving Waters** | Unknown tributary of Accotink Creek |

**Description:** This project proposes conversion of three existing dry ponds at Northern Virginia Community College. The dry ponds would be converted to bioretention filters to increase water quality treatment at the site. The bottom of the existing ponds would be excavated and the outlets modified to increase the amount of runoff treatment.


*Project Area Map: Conceptual plan showing potential project location*

**Project Benefits:** Implementing these bioretention facilities would provide water quality treatment for a portion of the parking lot. Bioretention facilities remove suspended solids, heavy metals, phosphorus and nitrogen and hydrocarbons from storm water; pollutants that are typically found in parking lot runoff. Further, bioretention facilities prevent trash and debris from entering the storm drain system and have the ability to cool down warm runoff before it enters the stream system. In addition, the location of this project on the community college campus may provide significant educational benefits. Signs can be placed nearby to educate students, faculty and visitors about the project and the environmental benefits. It is estimated that an annual total of 1,055 lbs of sediment, 11 lbs of total nitrogen and 3 lbs of total phosphorus would be reduced by this project.

**Project Design Considerations:** No environmental constraints or permitting issues are anticipated at this site. Access to the proposed sites is excellent through the parking lots. Property ownership is public but coordination with the college will be necessary. Construction during the summer months or during semester breaks would be preferred. Utility constraints are unlikely but the location of all utilities in close proximity to the proposed locations should be confirmed.

**Costs:**

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|---|---|---|---|---|
| Bioretention Filter and Basin | 1181 | SY | $150.00 | $177,150 |
| | | | Initial Project Cost | **$177,150** |
| Ancillary Items | 1 | LS | 5% of project | $8,858 |
| Erosion and Sediment Control | 1 | LS | 10% of project | $17,715 |
| | | | Base Construction Cost | **$203,723** |
| | | | Mobilization (5%) | $10,186 |
| | | | **Subtotal 1** | $213,909 |
| | | | Contingency (25%) | $53,477 |
| | | | **Subtotal 2** | $267,386 |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%) | | | | $120,324 |
| | | | **Estimated Project Cost** | **$388,000** |

*Site photo: Existing dry pond located in a parking island in the site parking lot.*

*Site photo: Another existing dry pond located in a parking island..*

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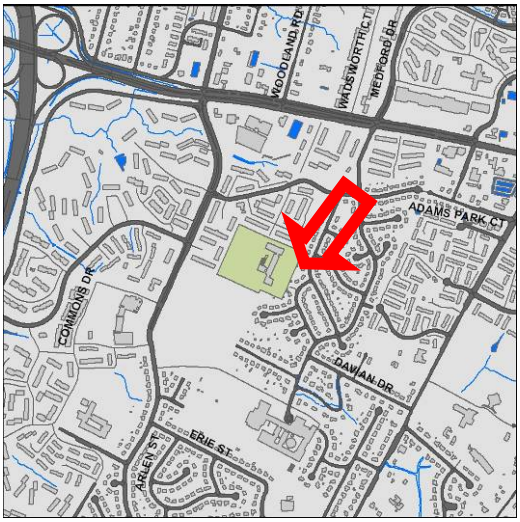
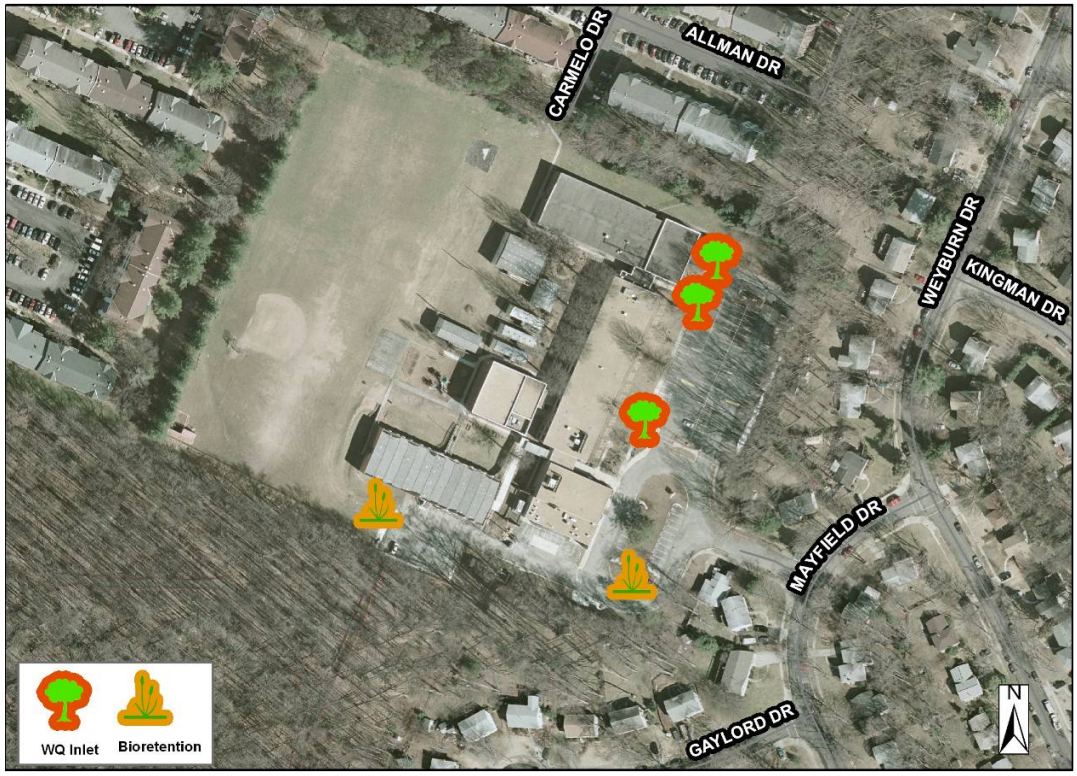
# AC9539-BMP/LID




| | |
|---|---|
| **Address:** | 7604 Herald Street |
| **Location:** | Annandale Terrace Elementary School |
| **Land Owner:** | County - FCPS |
| **PIN:** | 0711 01 0072C |
| **Control Type** | Water Quality |
| **Drainage Area** | 1.1 acres (AC9539A)<br>0.72 acres (AC9539B) |
| **Receiving Waters** | Unknown tributary of Accotink Creek |

**Description:** Installation of two bioretention basins for project AC9539A and three tree box filters for project AC9539B are proposed to treat the parking lot runoff from the Annandale Terrace Elementary School. Currently there are no existing stormwater management practices at the site and runoff flows directly into the storm drain system. Sediment deposition in the parking lot was observed.




*Project Area Map: Conceptual plan showing potential project location*

**Project Benefits:** The project will provide water quality treatment for the two school parking lots during storm events. Moderate sedimentation was observed from impervious areas at the site and sediment deposition was evident in and around existing storm drain inlets. Bioretention and tree box filter retrofits will help to capture sediment and prevent it from entering the storm drain system. In addition, the location of these projects on school grounds may provide significant educational benefits. Signage can be placed to educate nearby residents on the project and the environmental benefits. It is estimated that an annual total of 223 lbs of sediment, two lbs of total nitrogen and one lb of total phosphorus would be reduced by this project.

**Project Design Considerations:** No environmental constraints or permitting issues are anticipated. Access to the proposed sites is excellent through the parking lot and around the building. Property ownership is public but coordination with the elementary school will be necessary for this site. Construction during the summer months would be preferred.

**Costs:**

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|---|---|---|---|---|
| Bioretention Filter and Basin | 158 | SY | $150.00 | $23,700 |
| Tree Box Filters | 3 | EA | $10,000.00 | $30,000 |
| | | | **Initial Project Cost** | **$53,700** |
| Ancillary Items | 1 | LS | 5% of project | $2,685 |
| Erosion and Sediment Control | 1 | LS | 10% of project | $5,370 |
| | | | Base Construction Cost | **$61,755** |
| | | | Mobilization (5%) | $3,088 |
| | | | **Subtotal 1** | **$64,843** |
| | | | Contingency (25%) | $16,211 |
| | | | **Subtotal 2** | **$81,053** |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%) | | | | $36,474 |
| | | | **Estimated Project Cost** | **$118,000** |

*Site photo: Proposed location for a tree box filter to capture and treat parking lot runoff.*

*Site photo: Proposed location for a bioretention area to capture and treat parking lot runoff.*

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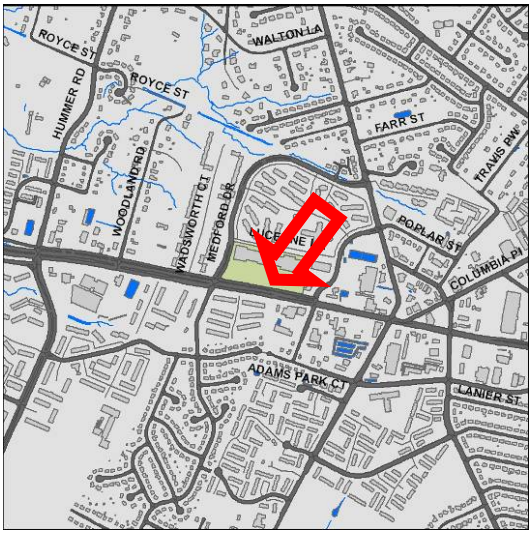
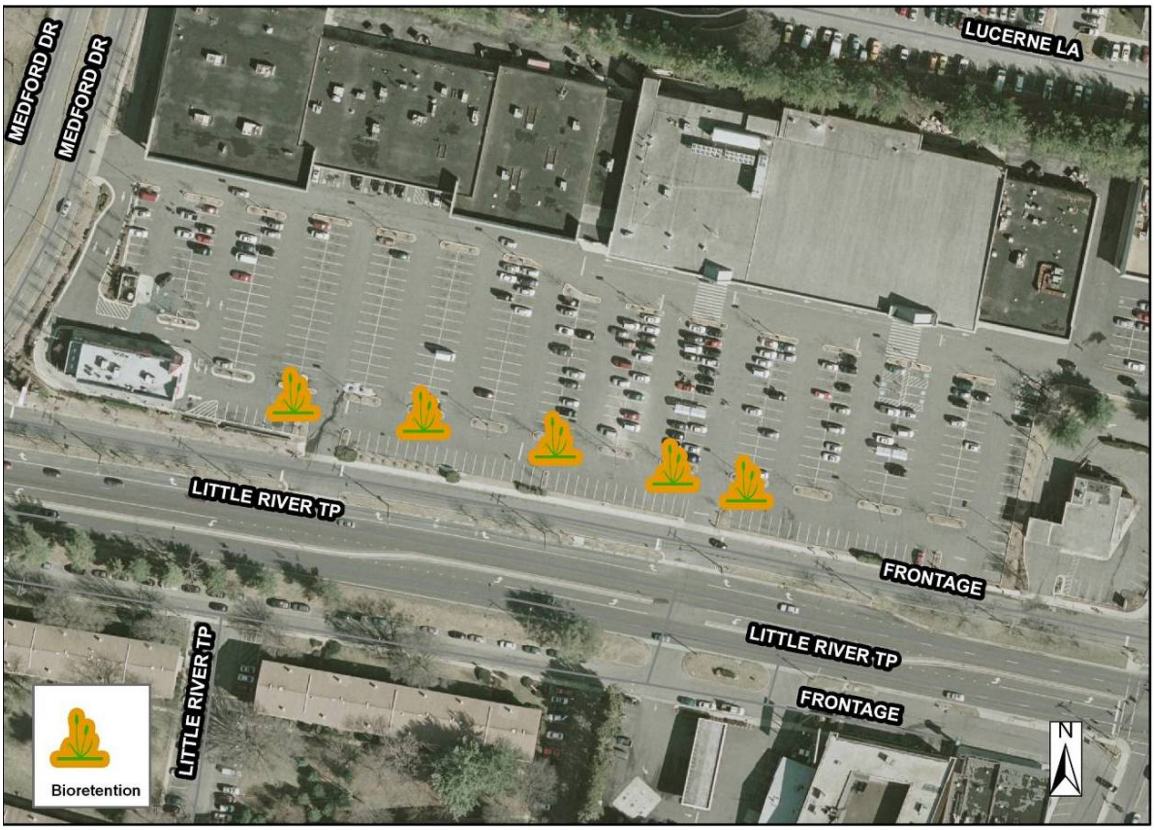
# AC9541-BMP/LID




| | |
|---|---|
| **Address:** | 7450 Little River Turnpike |
| **Location:** | Little River Shopping Center |
| **Land Owner:** | Private - Commercial |
| **PIN:** | 0711 20 0006 |
| **Control Type** | Water Quality |
| **Drainage Area** | 2.1 ac |
| **Receiving Waters** | Unknown tributary of Accotink Creek |

**Description:** Bioretention filters are proposed to treat the runoff from the parking lot of the Little River Shopping Center on Little River Turnpike. The bioretention facilities would be located at the five existing landscaped islands. Underdrains for the facilities would be tied into the existing stormwater infrastructure on the site.




*Project Area Map: Conceptual plan showing potential project location*

**Project Benefits:** Implementing bioretention facilities will provide water quality treatment for the parking lot during storm events. Bioretention facilities remove suspended solids, heavy metals, phosphorus and nitrogen and hydrocarbons from storm water runoff. These are all pollutants that are typically found in parking lot runoff. Further, bioretention facilities prevent trash and debris from entering the storm drain system and have the ability to cool down warm runoff before it enters the stream system. It is estimated that an annual total of 573 lbs of sediment, eight lbs of total nitrogen and one lb of total phosphorus would be reduced by this project.

**Project Design Considerations:** No environmental constraints or permitting issues are anticipated. Access to the proposed sites is excellent from the parking lot. Property ownership is private and coordination with the shopping center owner/management will be necessary for these sites. Some reduction in parking spaces can be expected with these sites during construction. Utility constraints on the site are unlikely but the location of all utilities in close proximity to the proposed locations should be confirmed.

**Costs:**

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|---|---|---|---|---|
| Bioretention Filter and Basin | 303 | SY | $150.00 | $45,450 |
| | | | **Initial Project Cost** | **$45,450** |
| Ancillary Items | 1 | LS | 5% of project | $2,273 |
| Erosion and Sediment Control | 1 | LS | 10% of project | $4,545 |
| | | | Base Construction Cost | **$52,268** |
| | | | Mobilization (5%) | $2,613 |
| | | | **Subtotal 1** | **$54,881** |
| | | | Contingency (25%) | $13,720 |
| | | | **Subtotal 2** | **$68,601** |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%) | | | | $30,870 |
| | | | **Estimated Project Cost** | **$100,000** |

*Site photo: Existing storm drain on site.*


*Site photo: Business complex located off Heritage Drive.*

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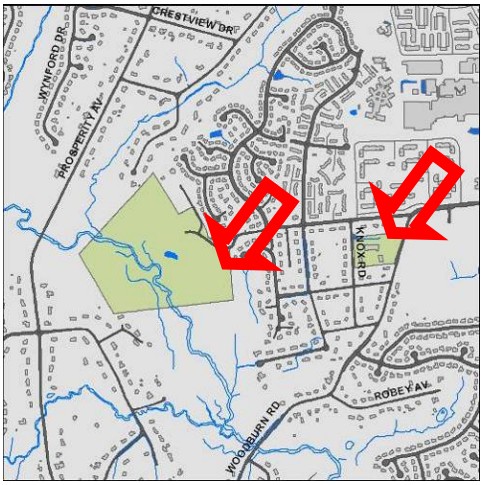
# AC9545-BMP/LID




| | |
|---|---|
| **Address:** | 8515 Tobin Road And 3406 Woodburn Road |
| **Location:** | Eakin Park / Church parking lot |
| **Land Owner:** | County – FCPA / Private |
| **PIN:** | 0591 01 0005<br>0591 01 0021 |
| **Control Type** | Water Quality |
| **Drainage Area** | AC9545A-0.22 acres<br>AC9545B-1.1 acres |
| **Receiving Waters** | Unknown tributary of Accotink Creek |

**Description:** A bioretention basin is proposed for project AC9545A to treat the runoff from a parking lot in Eakin Park. The bioretention facility would be located between the parking lot and the outfield of a baseball diamond.

Bioretention basins are also proposed for project AC9545B to treat the runoff from a church parking lot located along Woodburn Road. In addition, roof drains from the church currently flow to a ditch and are causing severe erosion; a third bioretention facility is proposed to treat this rooftop runoff


*Project Area Map: Conceptual plan showing potential project location*

**Project Benefits:** Implementing the bioretention facility for project AC9545A will provide water quality treatment for this parking lot during storm events, removing pollutants such as sediment, nutrients, and hydrocarbons. This site can also provide public educational opportunities for park users and would be an excellent demonstration project.

Implementing AC9545B will provide water quality treatment for the church parking lot during storm events. Bioretention facilities remove suspended solids, heavy metals, phosphorus and nitrogen, and oil and grease from storm water runoff. Bioretention facilities can also reduce runoff and may alleviate excessive erosion and headcutting in the ditch behind the church. The project also provides public education benefits.

It is estimated that an annual total of 164 lbs of sediment, one lb of total nitrogen and one-third lb of total phosphorus would be reduced by this project.

**Project Design Considerations:** No environmental constraints or permitting issues are anticipated for project AC9545A Access to the proposed sites is excellent from roads and the parking lot. Property ownership is public so coordination should not be a problem. Sewer utilities are present and should be accurately located before the project is initiated. In order to bypass the existing storm drain inlet, curb cuts and trench drains through the existing sidewalk will need to be installed on either side of the inlet to allow stormwater to flow into the practice.

There are also no environmental constraints or permitting issues anticipated for project AC9545B. Access to the proposed sites is excellent from roads and the parking lot. Property ownership is most likely private and coordination with the church management will be necessary for these sites. Utilities are present in the project area and should be accurately located during design..

**Costs:**

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|---|---|---|---|---|
| Bioretention Filter and Basin | 32 | SY | $150.00 | $35,700 |
| | | | **Initial Project Cost** | **$35,700** |
| Ancillary Items | 1 | LS | 5% of project | $1,785 |
| Erosion and Sediment Control | 1 | LS | 10% of project | $3,570 |
| | | | Base Construction Cost | **$41,055** |
| | | | Mobilization (5%) | $2,053 |
| | | | **Subtotal 1** | **$43,108** |
| | | | Contingency (25%) | $10,777 |
| | | | **Subtotal 2** | **$53,885** |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%) | | | | $24,248 |
| | | | **Estimated Project Cost** | **$79,000** |

*Site photo: Bioretention filter project location for AC9545A.*

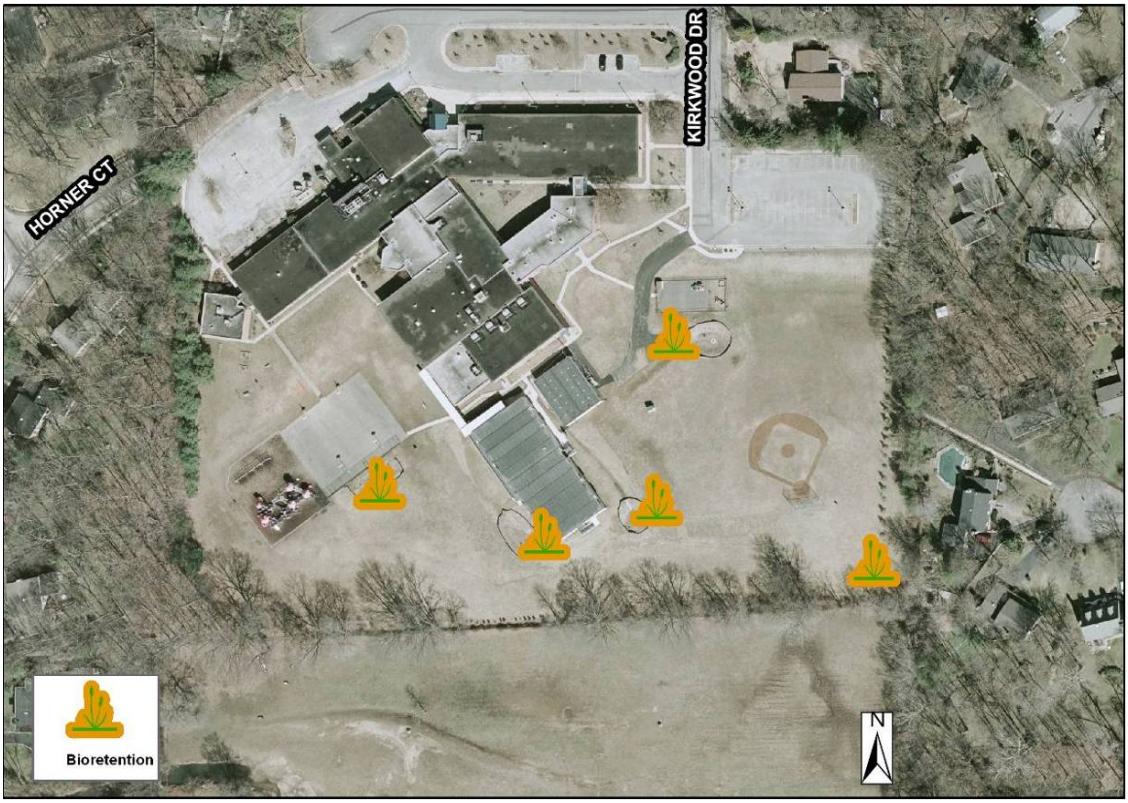
*Site photo: Site photo: Bioretention facility project location for project AC9545B.*

*Site photo: Erosion and headcutting caused by roof drains.*

# AC9546-BMP/LID


| | |
|---|---|
| **Address:** | 9107 Horner Court |
| **Location:** | Mantua Elementary School |
| **Land Owner:** | County - FCPS |
| **PIN:** | 0582 01 0002 |
| **Control Type** | Water Quality |
| **Drainage Area** | 4.5 acres |
| **Receiving Waters** | Crook Branch |

**Description:** Four bioretention filters have been installed on the Mantua Elementary School property. These existing facilities are not functioning as optimally as they could due to a lack of vegetative cover and unstable banks. These sites are candidates for additional amendments to bring them to demonstration quality in this public location. As part of the overall project one additional location for a bioretention filter was noted at an outfall on the southeast portion of the property.




*Project Area Map: Conceptual plan showing potential project location*

**Project Benefits:** Existing bioretention filters at the site are providing some water quality benefit but need vegetation and soil stabilization amendments in order to function more effectively. Bioretention sites will provide greater water quality treatment for several parking lots during storm events by removing suspended solids, heavy metals, nutrients including phosphorus and nitrogen, oil and grease from storm water runoff. The project site has the potential to be a high quality demonstration project and outreach opportunity by upgrading the existing practices. It is estimated that an annual total of 483 lbs of sediment, six lbs of total nitrogen and one lb of total phosphorus would be reduced by this project.

**Project Design Considerations:** No environmental constraints or permitting issues are anticipated. Access to the proposed sites is excellent from existing paved surfaces. Property ownership is public .

**Costs:**

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|---|---|---|---|---|
| Bioretention Filter and Basin | 583 | SY | $75.00 | $43,725 |
| Organic Compost Soil Amendments | 146 | CY | $40.00 | $5,840 |
| | | | Initial Project Cost | **$49,565** |
| Ancillary Items | 1 | LS | 5% of project | $2,478 |
| Erosion and Sediment Control | 1 | LS | 10% of project | $4,957 |
| | | | Base Construction Cost | **$57,000** |
| | | | Mobilization (5%) | $2,850 |
| | | | **Subtotal 1** | $59,850 |
| | | | Contingency (25%) | $14,963 |
| | | | **Subtotal 2** | $74,813 |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%) | | | | $33,666 |
| | | | **Estimated Project Cost** | **$109,000** |

Note: Cost for bioretention facilities estimated at 50% of typical costs, since most of the project involves rehabilitation rather than full construction.

*Site photo: Existing bioretention filter in need of amendments.*

*Site photo: Existing outfall on project site.*

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# AC9547-BMP/LID


| | |
|---|---|
| **Address:** | 9019 Little River Turnpike / Pixie Court |
| **Location:** | Providence Presbyterian Church / Pixie Court |
| **Land Owner:** | Private / State - VDOT |
| **PIN:** | 0584 01 0001<br>0584 17 0005 |
| **Control Type** | Water Quality |
| **Drainage Area** | AC9547A-0.61 acres<br>AC9547B-1.7 acres |
| **Receiving Waters** | Unknown tributary of Crook Branch |

**Description:** This project would add bioretention facilities to two separate sites; one along Little River Turnpike and the second at the Pixie Court cul-de-sac. Installing a bioretention filter with associated disconnection of downspouts is proposed to treat stormwater runoff at Providence Presbyterian Church for project AC9547A.

Curb extension bioretention filters and basins are proposed for installation in the Pixie Court cul-de-sac for project AC9547B. Runoff from Pixie Court currently flows through the cul-de-sac and into a storm drain inlet. The runoff is eventually discharged to a small eroded creek. No real opportunity for stormwater retrofitting exists at the outlet of the pipe. Instead, the best opportunity is to treat the runoff before it enters the inlet with three bioretention facilities at the curb.


*Project Area Map: Conceptual plan showing potential project location*

**Project Benefits:** For Project AC9547A at the Providence Presbyterian Church disconnecting downspouts and implementing a bioretention facility to receive runoff from the disconnected downspouts will provide water quality treatment for a portion of the church property, removing pollutants and reducing runoff volumes. The project's location at a church may also provide educational opportunities at the site.

For project AC9547B, implementing bioretention facilities will provide water quality treatment for Pixie Ct. during storm events, removing pollutants such as sediment, nutrients, and oils. In addition, by collecting and treating this runoff before it is discharged to the stream, erosive forces on the stream may be reduced. It is estimated that an annual total of 836 lbs of sediment, ten lbs of total nitrogen and two lbs of total phosphorus would be reduced by this project.

**Project Design Considerations:** No environmental constraints or permitting issues are anticipated for project AC9547A. Access to the proposed site is good, although recent construction at the church will need to be avoided and may affect placement of the facility. As the property is privately owned, cooperation with Providence Presbyterian Church will be necessary.

There are also no environmental constraints or permitting issues anticipated for project AC9547B. Access to the proposed site is excellent from Pixie Court. The area to be disturbed by construction of the bioretention facilities is in the street itself, so property ownership will not be an issue, however, consultation with the adjacent homeowners would be beneficial. Pavement cuts beyond the footprint of the facilities will be necessary to connect the underdrain to the storm drain system. Utility conflicts, including house connections for sanitary sewer, water, and gas services, are likely to be present and may constrain the design of these facilities.

**Costs:**

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|---|---|---|---|---|
| Bioretention Filter and Basin | 44 | SY | $150.00 | $43,350 |
| | | | **Initial Project Cost** | **$43,350** |
| Ancillary Items | 1 | LS | 5% of project | $2,168 |
| Erosion and Sediment Control | 1 | LS | 10% of project | $4,335 |
| | | | Base Construction Cost | **$49,853** |
| | | | Mobilization (5%) | $2,493 |
| | | | **Subtotal 1** | **$52,345** |
| | | | Contingency (25%) | $13,086 |
| | | | **Subtotal 2** | **$65,431** |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%) | | | | $29,444 |
| | | | **Estimated Project Cost** | **$95,000** |

*Site photo: Connected downspouts at the church for project AC9547A*

*Site photo: Cul-de-sac with space for curb extension at site AC9547B*

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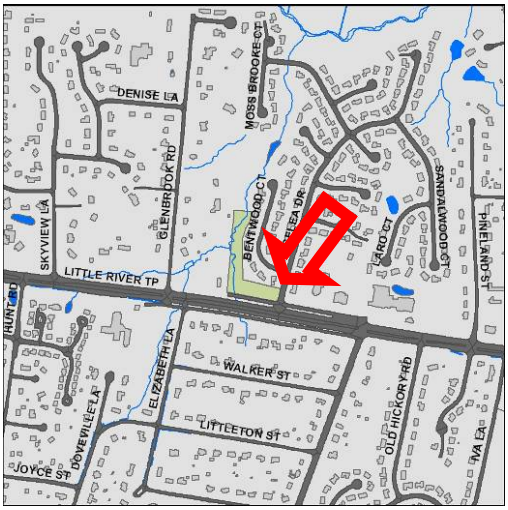
# AC9548-BMP/LID




| | |
|---|---|
| **Address:** | 8930 Little River Turnpike |
| **Location:** | Frontage Road |
| **Land Owner:** | Private |
| **PIN:** | 0584 28 E |
| **Control Type** | Water Quality |
| **Drainage Area** | 28.0 acres |
| **Receiving Waters** | Unknown tributary of Crook Branch |

**Description:** Bioretention filters are proposed to treat runoff from Little River Turnpike and the adjacent Frontage Road near Ridgelea Drive. Given the large drainage area, this project will require a flow splitter to divert water from the main channel to the proposed bioretention cells. The project will be sited in open space next to Frontage Road on property owned by a homeowner association. The drainage area currently collects stormwater from residential, commercial and roadway runoff from Little River Turnpike.


*Project Area Map: Conceptual plan showing potential project location*

**Project Benefits:** Bioretention filters will provide water quality treatment for neighborhood, commercial sites and roadway runoff during storm events. Use of the flow splitter will create an offline bioretention system to remove pollutants including suspended solids, heavy metals, nutrients, and oil and grease. Larger flows will bypass the facilities entirely in the existing channel, reducing the chance for failure or damage. It is estimated that an annual total of 1,643 lbs of sediment, 18 lbs of total nitrogen and three lbs of total phosphorus would be reduced by this project.

**Project Design Considerations:** No environmental constraints or permitting issues are anticipated. Access to the proposed sites is excellent from paved surfaces. Property ownership is private through the local homeowner association and coordination with the owner / management will be necessary. Minimal tree removal at the periphery of the site may be required. Infiltration capacity of the soils should be further assessed and utilities should be identified as part of the design process.

**Costs:**

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|---|---|---|---|---|
| Bioretention Filter and Basin | 1210 | SY | $150.00 | $181,500 |
| | | | **Initial Project Cost** | **$181,500** |
| Ancillary Items | 1 | LS | 5% of project | $9,075 |
| Erosion and Sediment Control | 1 | LS | 10% of project | $18,150 |
| | | | Base Construction Cost | **$208,725** |
| | | | Mobilization (5%) | $10,436 |
| | | | **Subtotal 1** | **$219,161** |
| | | | Contingency (25%) | $54,790 |
| | | | **Subtotal 2** | **$273,952** |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%) | | | | $123,278 |
| | | | **Estimated Project Cost** | **$398,000** |

*Site photo: Outfall to project area*

*Site photo: Project area viewed from Frontage Road.*

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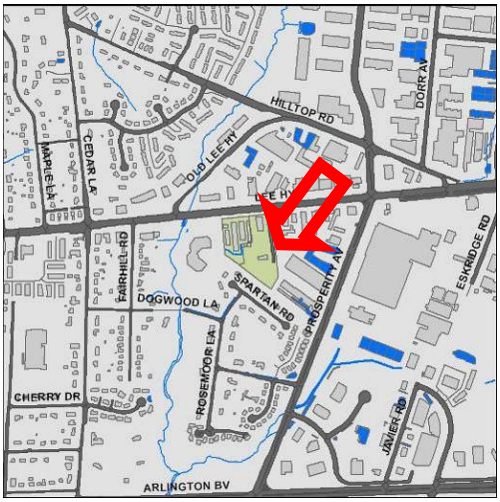
# AC9550-BMP/LID




| | |
|---|---|
| **Address:** | 8505 Lee Highway |
| **Location:** | Industry Lane and Lee Highway |
| **Land Owner:** | Private - Industrial |
| **PIN:** | 0493 01 0050A |
| **Control Type** | Water Quality |
| **Drainage Area** | AC9550A: 1.7 acres<br>AC9550B: 2.1 acres |
| **Receiving Waters** | Long Branch North |

**Description:** Multiple practices are proposed on these industrial properties adjacent to Lee Highway. Installation of two tree box filters and a sand filter is proposed at site AC9550A. A vegetated swale that would replace the existing concrete swale is proposed at site AC9550B.


*Project Area Map: Conceptual plan showing potential project location*

**Project Benefits:** Adding tree box filters and a sand filter will provide water quality treatment for site AC9550A, removing sediment, heavy metals, nutrients and oils from the site, which is a likely hotspot for these pollutants. A vegetated swale will provide significant water quality improvements over the existing concrete channel at site AC9550B. It is estimated that an annual total of 1,134 lbs of sediment, seven lbs of total nitrogen and one lb of total phosphorus would be reduced by this project.

**Project Design Considerations:** No environmental constraints or permitting issues are anticipated. Access to the proposed sites will be constrained, due to tight spaces on the properties. As the properties are privately owned, consultation and cooperation with the property owners will be necessary. The depth of the existing storm drain system may affect how well the sand filter and vegetated swale can be implemented.

**Costs:**

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|---|---|---|---|---|
| Tree Box Filters | 2 | EA | $10,000.00 | $20,000 |
| Sand Filter | 1634 | CF* | $65.00 | $106,210 |
| Vegetated Swale | 267 | SY | $150.00 | $40,050 |
| | | | **Initial Project Cost** | **$166,260** |
| Ancillary Items | 1 | LS | 5% of project | $8,313 |
| Erosion and Sediment Control | 1 | LS | 10% of project | $16,626 |
| | | | Base Construction Cost | **$191,199** |
| | | | Mobilization (5%) | $9,560 |
| | | | **Subtotal 1** | **$200,759** |
| | | | Contingency (25%) | $50,190 |
| | | | **Subtotal 2** | **$250,949** |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%) | | | | $112,927 |
| | | | **Estimated Project Cost** | **$364,000** |

*Note: Sand Filter line item is given based on $65/cf of runoff treated, rather than the actual size of the project installation.

*Site photo: AC9550A, near location of proposed sand filter.*

*Site photo: AC9550B, concrete channel to be replaced with a vegetated swale.*

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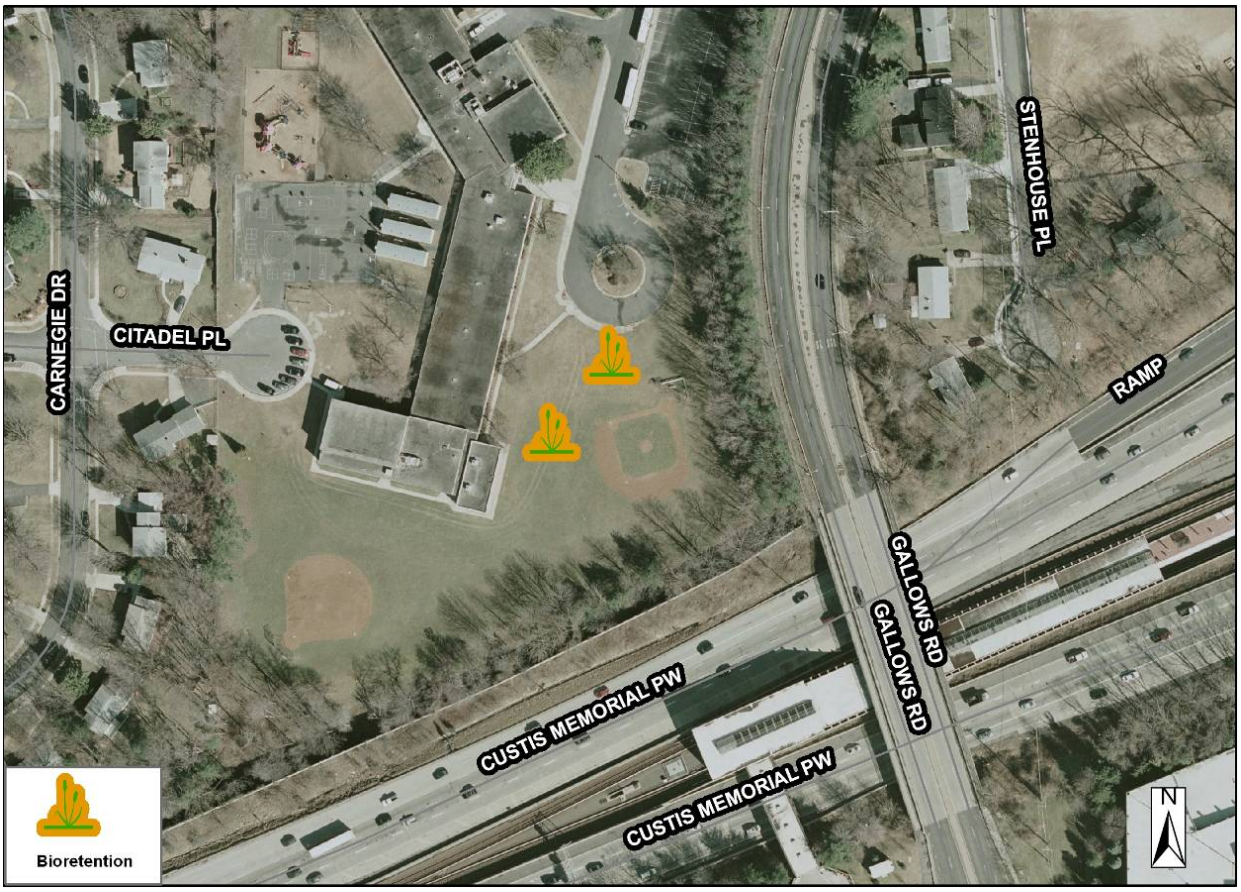
# AC9551-BMP/LID


| | |
|---|---|
| **Address:** | 80526 Gallows Road |
| **Location:** | Stenwood Elementary School |
| **Land Owner:** | County - FCPS |
| **PIN:** | 0492 01 0012 |
| **Control Type** | Water Quality |
| **Drainage Area** | 1.5 acres |
| **Receiving Waters** | Unknown tributary of Long Branch North |

**Description:** Two bioretention filters or basins are proposed to treat the runoff from the rooftop and parking area of Stenwood Elementary School. Runoff from the parking area and rooftop is currently conveyed directly to the storm drain system. Disconnection and routing to the bioretention facilities would allow for water quality treatment before the runoff enters the stream system.




*Project Area Map: Conceptual plan showing potential project location*

**Project Benefits:** Bioretention facilities will provide water quality treatment for the rooftop and parking area during storm events. Bioretention facilities remove sediment, trash, nutrients, and oil and grease from storm water runoff. The location of the project could provide educational opportunities for the students of Stenwood Elementary. It is estimated that an annual total of 302 lbs of sediment, three lbs of total nitrogen and one lb of total phosphorus would be reduced by this project.

**Project Design Considerations:** No environmental constraints or permitting issues are anticipated. Access to the proposed sites is excellent from the adjacent parking lot, although the location of the baseball diamond nearby may constrain either the design or access to the project. As the site is a school, coordination and cooperation with the school district will be necessary for these sites. In order to treat the runoff from the parking area, curb cuts will be necessary to bypass the existing catch basin. To treat runoff from the rooftop, the internal downspouts will need to be disconnected from the catch basin and directed into the bioretention facility.

**Costs:**

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|---|---|---|---|---|
| Bioretention Filter and Basin | 151 | SY | $150.00 | $22,650 |
| | | | **Initial Project Cost** | **$22,650** |
| Ancillary Items | 1 | LS | 5% of project | $1,133 |
| Erosion and Sediment Control | 1 | LS | 10% of project | $2,265 |
| | | | Base Construction Cost | **$26,048** |
| | | | Mobilization (5%) | $1,302 |
| | | | **Subtotal 1** | **$27,350** |
| | | | Contingency (25%) | $6,837 |
| | | | **Subtotal 2** | **$34,187** |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%) | | | | $15,384 |
| | | | **Estimated Project Cost** | **$50,000** |

*Site photo: Catch basin In parking area and bioretention facility location.*

*Site photo: Catch basin in field that includes rooftop connections.*

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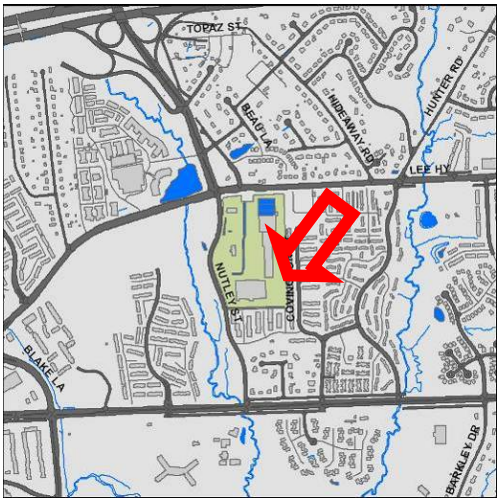
# AC9553-BMP/LID




| | |
|---|---|
| **Address:** | 3091 Nutley Sreet |
| **Location:** | Panam Shopping Center |
| **Land Owner:** | Private |
| **PIN:** | 0484 01 0012F |
| **Control Type** | Water Quality |
| **Drainage Area** | 3.4 acres |
| **Receiving Waters** | Hunters Branch |

**Description:** A series of tree box filters and bioretention basins are proposed to treat the runoff from the Panam Shopping Center parking lot located along Nutley Street and Lee Highway. The facilities will be installed adjacent to storm drain inlets at existing parking medians and along the vegetated area on the west side of the lot. An underdrain will be installed and the existing stormwater infrastructure will be used for overflow.


*Project Area Map: Conceptual plan showing potential project location*

**Project Benefits:** These BMP/LID facilities will provide water quality treatment for this parking lot during storm events. Bioretention facilities remove suspended solids, heavy metals, phosphorus and nitrogen and oil and grease from storm water runoff. They also prevent trash and debris from entering the storm drain system and have the ability to cool down warm runoff before it enters the stream system. It is estimated that an annual total of 878 lbs of sediment, ten lbs of total nitrogen and one lb of total phosphorus would be reduced by this project.

**Project Design Considerations:** No environmental constraints or permitting issues are anticipated. Utilities are present in the project area and should be accounted for in the project design. Access to the proposed sites is excellent from roads and the commercial parking lot. Property ownership is private and coordination with the shopping center owner/management will be necessary.

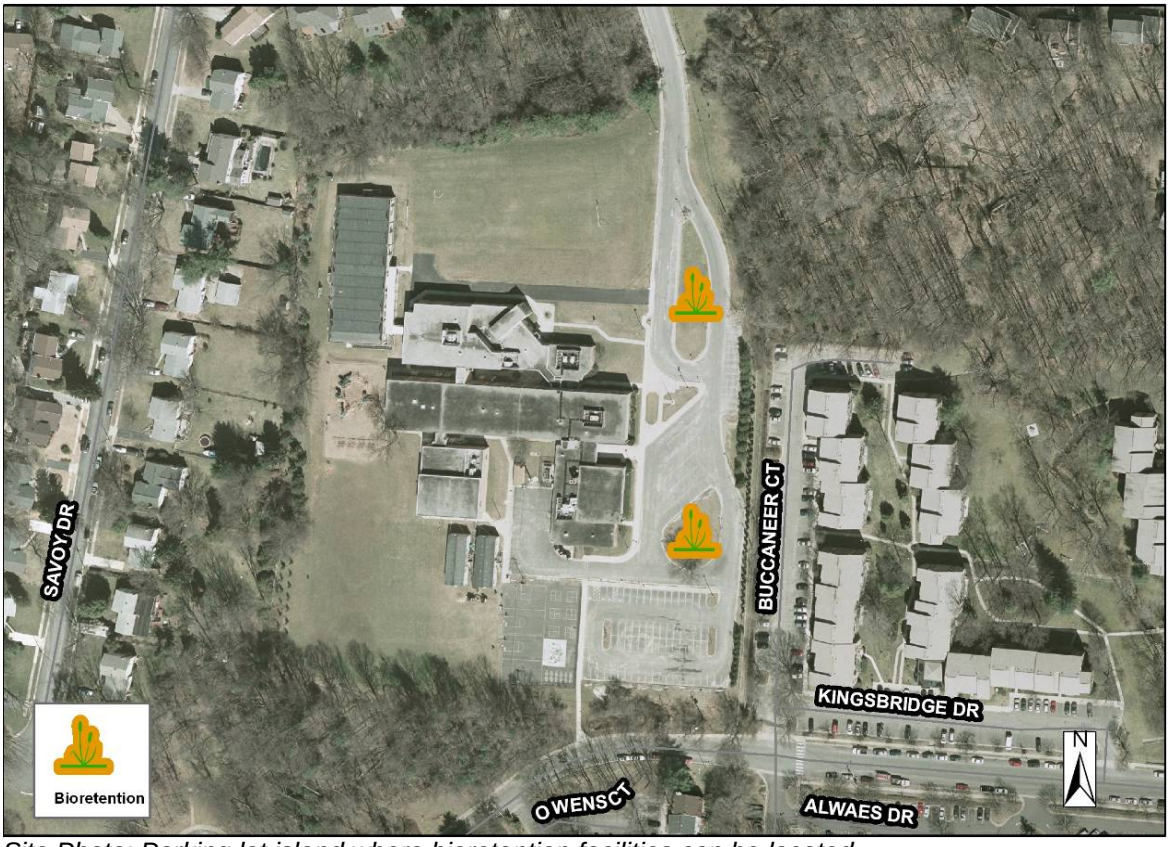
| | | **Costs:** | | |
|---|---|---|---|---|
| Tree Box Filters | 5 | EA | $10,000.00 | $50,000 |
| Bioretention Filter and Basin | 591 | SY | $150.00 | $88,650 |
| | | | Initial Project Costs | **$138,650** |
| Ancillary Items | 1 | LS | 5% of Project | $6,933 |
| Erosion and Sediment Control | 1 | LS | 10% of Project | $13,865 |
| | | | Base Construction Costs | **$159,448** |
| | | | Mobilization (5%) | $7,972 |
| | | | **Subtotal 1** | $167,420 |
| | | | Contingency (25%) | $41,855 |
| | | | **Subtotal 2** | $209,275 |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%) | | | | $94,174 |
| | | | **Estimated Project Cost** | **$304,000** |

*Site photo: Potential tree box filter location.*

# AC9558-BMP/LID


| | |
|---|---|
| **Address:** | 9819 Five Oaks Road |
| **Location:** | Mosby Woods Elementary School |
| **Land Owner:** | County - FCPS |
| **PIN:** | 0483 01 0016 |
| **Control Type** | Water Quality |
| **Drainage Area** | 2.1 acres |
| **Receiving Waters** | Unknown tributary of Accotink Creek |

**Description:** This project proposes to install two bioretention facilities to treat a portion of the parking lot at the Mosby Woods School. Implementation would involve installing curb cuts in existing islands to allow runoff to bypass the storm drains and flow to the new bioretention facilities in the islands. The location provides excellent educational demonstration opportunities for the students of Mosby Woods Elementary School.




*Site Photo: Parking lot island where bioretention facilities can be located.*

**Project Benefits:** Implementing the proposed bioretention facilities will provide water quality treatment for the parking lot during storm events and remove sediment, heavy metal, nutrients and hydrocarbon pollutants. The location of the project at a public school will promote experiential learning opportunities for both students and the general public. It is estimated that an annual total of 285 lbs of sediment, four lbs of total nitrogen and one lb of total phosphorus would be reduced by this project.

**Project Design Considerations:** No environmental constraints or permitting issues are anticipated. Access to the proposed sites is excellent from roads and the school parking lot. Property ownership is public, but coordination with the school district will be necessary.

**Costs:**

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|---|---|---|---|---|
| Bioretention Filter and Basin | 303 | SY | $150.00 | $45,450 |
| | | | **Initial Project Cost** | **$45,450** |
| Ancillary Items | 1 | LS | 5% of project | $2,273 |
| Erosion and Sediment Control | 1 | LS | 10% of project | $4,545 |
| | | | Base Construction Cost | **$52,268** |
| | | | Mobilization (5%) | $2,613 |
| | | | **Subtotal 1** | **$54,881** |
| | | | Contingency (25%) | $13,720 |
| | | | **Subtotal 2** | **$68,601** |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%) | | | | $30,870 |
| | | | **Estimated Project Cost** | **$100,000** |

*Site Photo: Parking lot island where bioretention facilities can be located.*

*Site Photo: Parking lot island where bioretention facilities can be located.*

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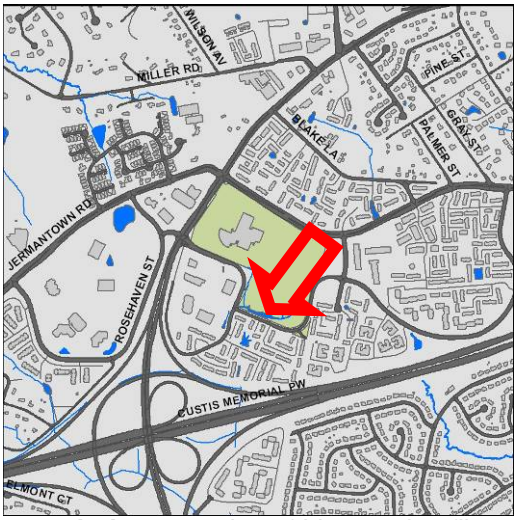
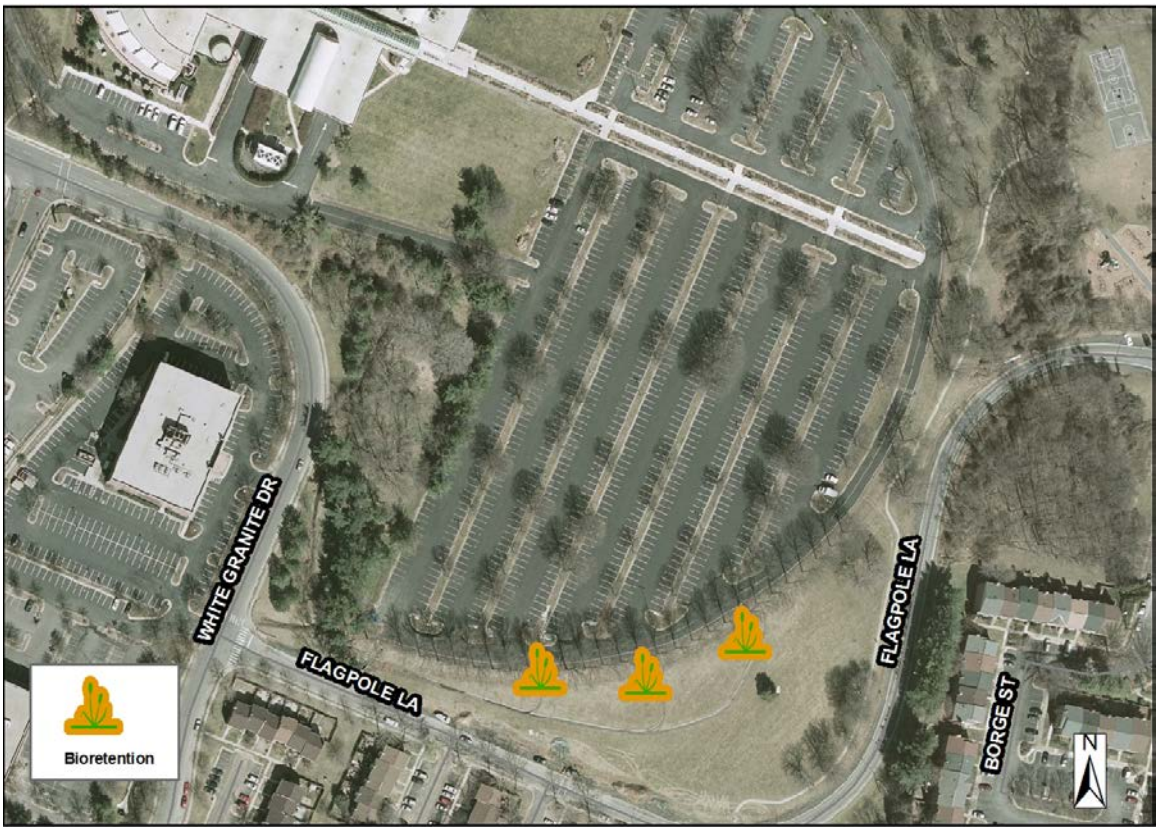
# AC9562-BMP/LID




| | |
|---|---|
| **Address:** | 3033 Chain Bridge Road |
| **Location:** | AT&T office building |
| **Land Owner:** | Private - Commercial |
| **PIN:** | 0472 01 0058 |
| **Control Type** | Water Quality |
| **Drainage Area** | 7.3 acres |
| **Receiving Waters** | Unknown tributary of Accotink Creek |

**Description:** A series of bioretention filters and basins is proposed to treat runoff from the AT&T building and parking lot on Chain Bridge Road. Currently, the parking area drains through three outfalls to a dry pond with a concrete channel located in an open grass field at the south end of the parking lot. There is sufficient space at the inflows to the pond to create bioretention facilities to pre-treat runoff for water quality and maintain the existing detention characteristics of the pond.




*Project Area Map: Conceptual plan showing potential project location*

**Project Benefits:** Currently, runoff is treated in a dry pond that provides no significant water quality treatment. Adding bioretention facilities will improve water quality treatment for the office complex during storm events by removing sediment, heavy metals, oil and nutrients from the runoff. It is estimated that an annual total of 1,917 lbs of sediment, 21 lbs of total nitrogen and three lbs of total phosphorus would be reduced by this project.

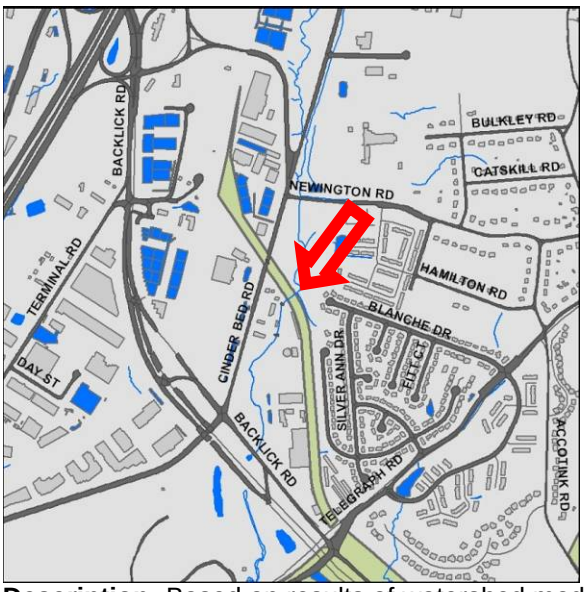
**Project Design Considerations:** No environmental constraints or permitting issues are anticipated. Access to the proposed sites is excellent from adjacent roads. As the property is privately owned, coordination with the owner/management will be necessary. Construction will cause negligible impacts to the use of the property and no loss of parking is anticipated.

**Costs:**

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|---|---|---|---|---|
| Bioretention Filters and Basins | 999 | SY | $150.00 | $149,850 |
| | | | **Initial Project Cost** | **$149,850** |
| Ancillary Items | 1 | LS | 5% of project | $7,493 |
| Erosion and Sediment Control | 1 | LS | 10% of project | $14,985 |
| | | | Base Construction Cost | **$172,328** |
| | | | Mobilization (5%) | $8,616 |
| | | | **Subtotal 1** | **$180,944** |
| | | | Contingency (25%) | $45,236 |
| | | | **Subtotal 2** | **$226,180** |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%) | | | | $101,781 |
| | | | **Estimated Project Cost** | **$328,000** |

*Site photo: One of three bioretention sites, at pond inflow as indicated.*

# AC9600 Flood Protection/Mitigation




| | |
|---|---|
| **Address:** | Behind 8311 Cinder Bed Road |
| **Location:** | Culvert under railroad behind Industrial Park |
| **Land Owner:** | Federal |
| **PIN:** | 1152 01 0001 |
| **Control Type** | Water Quantity |
| **Drainage Area** | N/A |
| **Receiving Waters** | Long Branch South |

**Description:** Based on results of watershed modeling, the culvert under the railroad behind Industrial Park overtops for both the 100-year and the 10-year events. This project will reconstruct the crossing to allow the 100-year flows to pass safely without overtopping.


*Project Area Map*

**Project Benefits:** Reconstructing the culvert under the railroad tracks will allow it to convey the 10- and 100-year storm without overtopping, minimize backwater effects and potentially reduce or eliminate fish passage issues at the downstream end of the culvert.

**Project Design Considerations:** Stormwater pond retrofit projects upstream of the crossing could impact the crossing. No projects are located within the immediate vicinity. The project site can be accessed from Cinder Bed Road. There are minimal environmental permitting requirements anticipated.

**Costs:**

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL |
|---|---|---|---|---|
| Excavation | 1930 | CY | $30.00 | $57,900 |
| Stabilization graded Aggregate Base | 490 | CY | $50.00 | $24,500 |
| Structure (twin box 9 x 5) | 1 | LS | $100,000.00 | $100,000 |
| Graded Base | 145 | SY | $15.00 | $2,175 |
| Curb and Gutter | 200 | LF | $30.00 | $6,000 |
| Turf grass establishment | 470 | SY | $3.00 | $1,410 |
| Placing Topsoil | 470 | SY | $5.00 | $2,350 |
| Soil Stabilization matting | 470 | SY | $5.00 | $2,350 |
| | | | Initial Project Cost | **$196,685** |
| Plantings | 1 | LS | 5% of project (excluding pervious pavement) | $9,834 |
| Ancillary Items | 1 | LS | 5% of project | $9,834 |
| Erosion and Sediment Control | 1 | LS | 10% of project | $19,669 |
| | | | Base Construction Cost | **$236,022** |
| | | | Mobilization (5%) | $11,801 |
| | | | **Subtotal 1** | $247,823 |
| | | | Contingency (25%) | $61,956 |
| | | | **Subtotal 2** | $309,779 |
| Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%) | | | | $139,401 |
| | | | **Estimated Project Cost** | **$450,000** |

*Figure 1: Upstream endwall*

*Figure 2: Downstream endwall*

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