WHAT IS OUTFALL PROTECTION?

A storm drain outfall is where a storm drain pipe or channel discharges stormwater runoff to a natural waterbody. There are thousands of these throughout the Prince George’s County. Increased urbanization and stormwater runoff can damage an outfall.

Damaged outfalls can be stabilized or improved through the use of rip-rap, bioengineering techniques and/or vegetation. This also helps reduce the amount of sediment and erosion in the downstream channels and wetlands.

COMMON METHODS INCLUDE:

- rock rip-rap
- bioengineering
- vegetation

Approximately 75% of all sediment pollution in the Anacostia Watershed is caused by in-stream movement in the Northwest and Northeast branches. Restoring outfalls can help solve this problem.

TRANSFORMING STORMWATER MANAGEMENT

Much of Prince George’s County’s development occurred between the 1940s and 1980s before stormwater regulations were put in place.

In 2014, Prince George’s County and Corvias Solutions implemented the Clean Water Partnership as the solution to its stormwater regulatory challenges.

New regulations state that impervious areas should be treated with Best Management Practices (BMPs) such as outfall protection.

The Clean Water Partnership is committed to retrofitting 2,000 acres of impervious area with green stormwater infrastructure by 2017.

www.thecleanwaterpartnership.com
THE CONSTRUCTION PROCESS

Step One

Identify

- Identify appropriate sites based on selection criteria.
- Coordinate with stakeholders including property owners, residents and communities.

Step Two

Design

- Perform a site survey.
- Design a plan to stabilize the outfall.
- Obtain necessary permits.
- Inform nearby residents before construction begins.

Step Three

Construct

- Place all erosion and sediment control devices before construction begins.
- Modify the outfalls and/or stabilize the channel.
- Stabilize the disturbed area with seed or groundcover.

Step Four

Inspect

- Have a third party inspect and approve the outfall protection after construction is complete.
- Remove all erosion and sediment control devices.
- Return on a regular basis to ensure that the outfall protection functions properly.

CONSTRUCTION AND MAINTENANCE

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HOW CAN I HELP?

The Clean Water Partnership is working with community members to learn about local challenges and the best locations to install BMPs. In many cases, the Clean Water Partnership will need to coordinate construction with an individual property owner or a homeowners association. Installed practices will be mapped on the Clean Water Partnership’s website. Please contact us if you notice excessive trash, plant die-off or erosion or any other issues where outfall protection has been constructed.

WHERE CAN I GET MORE INFORMATION?

The Clean Water Partnership is committed to working with communities throughout the entirety of the construction process. Please contact info@thecleanwaterpartnership.com if you have any questions, comments or concerns.
WHAT IS MICRO-BIORETENTION?

A micro-bioretention cell is a small-scale Best Management Practice (BMP) that captures and treats stormwater runoff from buildings, roads or parking lots. It works by collecting stormwater from impervious surfaces and allowing it to pond temporarily. Plants in micro-bioretention include native species that are adaptable to wet and dry soil conditions.

Stormwater runoff flows into the cell and slowly percolates through the soil.

Some of the runoff soaks into the ground or is taken up by plants.

Engineered soil and native plants remove contaminants such as nitrogen, phosphorus and sediment.

Treated water that is not infiltrated or taken up by plants is discharged to the storm drain system by an underdrain.

TRANSFORMING STORMWATER MANAGEMENT

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New regulations state that impervious areas should be treated with best management practices such as micro-bioretention.

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WHAT IS A BIOSWALE?

A bioswale is a Best Management Practice (BMP) that uses plants and an engineered soil mix to treat stormwater runoff. Water is not ponded in a bioswale. It flows across the plants and engineered soil in the swale where runoff is infiltrated or filtered out. The shape of a bioswale can be linear or it can meander along roads or parking lots.

TRANSFORMING STORMWATER MANAGEMENT

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New regulations state that impervious areas should be treated with best management practices such as bioswales. The Clean Water Partnership is committed to retrofitting 2,000 acres of impervious area with green stormwater infrastructure by 2017.

www.thecleanwaterpartnership.com
THE CONSTRUCTION PROCESS

**Step One**
- **Identify**
  - Identify appropriate sites based on selection criteria.
  - Coordinate with stakeholders including property owners, residents and communities.

**Step Two**
- **Design**
  - Perform a site survey.
  - Design the bioswale facility.
  - Obtain necessary permits.
  - Inform nearby residents before construction begins.

**Step Three**
- **Construct**
  - Install all erosion and sediment control devices before construction begins.
  - Excavate and construct the facility.
  - Stabilize the disturbed area with seed or groundcover.

**Step Four**
- **Inspect**
  - Have a third party inspect and approve the bioswale after construction is complete.
  - Remove all erosion and sediment control devices.
  - Return on a regular basis to ensure that the bioswale protection functions properly.

CONSTRUCTION AND MAINTENANCE

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HOW CAN I HELP?

The Clean Water Partnership is working with community members to learn about local challenges and the best locations to install BMPs. In many cases, the Clean Water Partnership will need to coordinate construction with an individual property owner or a homeowners association. Installed practices will be mapped on the Clean Water Partnership’s website. Please contact us if you notice excessive trash, plant die-off or erosion or any other issues where bioswale practices have been constructed.

WHERE CAN I GET MORE INFORMATION?

The Clean Water Partnership is committed to working with communities throughout the entirety of the construction process. Please contact info@thecleanwaterpartnership.com if you have any questions, comments or concerns.
WHAT IS A TREE BOX FILTER?

A tree box filter is a concrete box filled with engineered soil that can filter out pollutants from stormwater. The soil mix is designed to handle a large flow of water; this allows the device to treat a large impervious area with only a small footprint. This Best Management Practice (BMP) is often used in areas where there is limited space.

The box has an empty chamber that allows sediments to settle out, and a second chamber that holds the soil. The tree helps to take up nutrients such as nitrogen and phosphorus that would otherwise pollute streams and ponds. The treated water is carried by an underdrain and discharged into the storm drain system.

TRANSFORMING STORMWATER MANAGEMENT

Much of Prince George's County's development occurred between the 1940s and 1980s before stormwater regulations were put in place. In 2014, Prince George's County and Corvias Solutions implemented the Clean Water Partnership as the solution to its stormwater regulatory challenges. New regulations state that impervious areas should be treated with best management practices such as tree box filters. The Clean Water Partnership is committed to retrofitting 2,000 acres of impervious area with green stormwater infrastructure by 2017.
THE CONSTRUCTION PROCESS

**Step One**
- **Identify**
  - Identify appropriate sites based on selection criteria such as location, ownership and impervious area.
  - Coordinate with stakeholders including property owners, residents and communities.

**Step Two**
- **Design**
  - Perform a site survey.
  - Design the tree box filter.
  - Obtain necessary permits.
  - Inform nearby residents before construction begins.

**Step Three**
- **Construct**
  - Place all erosion and sediment control devices before construction begins.
  - Excavate and install the tree box filter.
  - Stabilize the disturbed area with seed or groundcover.

**Step Four**
- **Inspect**
  - Have third party inspect and approve the tree box filter after construction is complete.
  - Remove all erosion and sediment control devices.
  - Return on a regular basis to ensure that the tree box functions properly.

CONSTRUCTION AND MAINTENANCE

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HOW CAN I HELP?

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WHERE CAN I GET MORE INFORMATION?

The Clean Water Partnership is committed to working with communities throughout the entirety of the construction process. Please contact info@thecleanwaterpartnership.com if you have any questions, comments or concerns.
A bioretention cell is a medium to large scale Best Management Practice (BMP) that captures and treats stormwater runoff from buildings, roads or parking lots. A bioretention cell reduces stormwater runoff volume and can treat up to 5 acres of impervious area.

Stormwater runoff first enters a pre-treatment area where leaves, coarse sediments and other floating materials are captured. Plants in bioretention cells include native species that are adaptable to both wet and dry soil conditions.

Engineered soil and plants remove contaminants such as nitrogen, phosphorus and sediment.

Runoff is filtered through plants and an engineered soil where the water infiltrates into the ground or discharges to the storm drain system.

TRANSFORMING STORMWATER MANAGEMENT

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CONSTRUCTION AND MAINTENANCE

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HOW CAN I HELP?

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WHERE CAN I GET MORE INFORMATION?

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**PERMEABLE PAVEMENT**

**WHAT IS PERMEABLE PAVEMENT?**

Permeable pavement is an alternative to conventional pavement systems that treats stormwater runoff. The pavement surface allows stormwater to flow through to a gravel storage area underneath. The stormwater infiltrates into the ground or discharges to the storm drain system by an underdrain. Permeable pavement can be found in different applications such as parking spaces, alleys, sidewalks or pedestrian plaza areas.

**TYPES OF PERMEABLE PAVEMENT**

- Porous asphalt
- Pervious concrete
- Interlocking concrete pavers

**TRANSFORMING STORMWATER MANAGEMENT**

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New regulations state that impervious areas should be treated with Best Management Practices (BMPs) such as permeable pavement.

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www.thecleanwaterpartnership.com
WHERE CAN I GET MORE INFORMATION?

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THE CONSTRUCTION PROCESS

**Step One**
- **Identify**
  - Identify appropriate sites based on selection criteria.
  - Coordinate with stakeholders including property owners, residents and communities.

**Step Two**
- **Design**
  - Perform a site survey.
  - Design the permeable pavement facility.
  - Obtain necessary permits.
  - Inform nearby residents before construction begins.

**Step Three**
- **Construct**
  - Place all erosion and sediment control devices before construction begins.
  - Excavate and construct the facility.
  - Stabilize the disturbed area with seed or groundcover.

**Step Four**
- **Inspect**
  - Have a third party inspect and approve the permeable pavement after construction is complete.
  - Remove all erosion and sediment control devices.
  - Return on a regular basis to ensure that the permeable pavement functions properly.

CONSTRUCTION AND MAINTENANCE

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HOW CAN I HELP?

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WHAT IS A SUBMERGED GRAVEL WETLAND?

A submerged gravel wetland is a Best Management Practice (BMP) that can be placed in wet or poor-draining soil areas. The wetland is filled with gravel and covered with a layer of soil. Native emergent plants are then planted in the wetland. They remove nutrients such as nitrogen, phosphorus and sediment. A submerged gravel wetland will stay wet at all times so it must be located in larger drainage areas to sustain the plants and ecosystem.

The water continues into the wetland where it is fully treated.

Water flows into a small pool where sediments and large particles are captured.

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Emergent plants in the wetland

native grasses and shrubs on the wetland edge

Photos courtesy of Stormwater Maintenance, LLC.

THE CONSTRUCTION PROCESS

Step One
- Identify
  - Identify appropriate sites based on selection criteria.
  - Coordinate with stakeholders including property owners, residents and communities.

Step Two
- Design
  - Perform a site survey.
  - Design the submerged gravel wetlands facility.
  - Obtain necessary permits.
  - Inform nearby residents before construction begins.

Step Three
- Construct
  - Place all erosion and sediment control devices before construction begins.
  - Excavate and construct the facility.
  - Stabilize the disturbed area with seed or groundcover.

Step Four
- Inspect
  - Have a third party inspect and approve the submerged gravel wetland after construction is complete.
  - Remove all erosion and sediment control devices.
  - Return on a regular basis to ensure that the wetland functions properly.

CONSTRUCTION AND MAINTENANCE

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WHERE CAN I GET MORE INFORMATION?

The Clean Water Partnership is committed to working with communities throughout the entirety of the construction process. Please contact info@thecleanwaterpartnership.com if you have any questions, comments or concerns.
WHAT IS A WET SWALE?

A wet swale combines the functions of a wetland and a swale. The wet swale safely conveys stormwater to a natural outfall such as a wetland or stream. The wetland in the bottom of the swale slows down the flow of stormwater and filters out pollutants. A wet swale can be used along roadways or parking lots where the groundwater table is high and the soil is damp. Native plantings or turf are both appropriate for different areas. A wet swale will often have large piles of stone or check dams where water will pond to help slow and maintain the water flow. This allows the device to filter pollutants such as nitrogen, phosphorus and sediments.

TRANSFORMING STORMWATER MANAGEMENT

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www.thecleanwaterpartnership.com
**THE CONSTRUCTION PROCESS**

**Step One**
- Identify appropriate sites based on selection criteria.
- Coordinate with stakeholders including property owners, residents and communities.

**Step Two**
- Perform a site survey.
- Design the wet swale facility.
- Obtain necessary permits.
- Inform nearby residents before construction begins.

**Step Three**
- Place all erosion and sediment control devices before construction begins.
- Excavate and construct the facility.
- Stabilize the disturbed area with seed or groundcover.

**Step Four**
- Have a third party inspect and approve the wet swale after construction is complete.
- Remove all erosion and sediment control devices.
- Return on a regular basis to ensure that the wet swale functions properly.

**CONSTRUCTION AND MAINTENANCE**

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**HOW CAN I HELP?**

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**WHERE CAN I GET MORE INFORMATION?**

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CLEAN WATER PARTNERSHIP

REGENERATIVE STEP POOL STORM CONVEYANCE fact sheet

WHAT IS A REGENERATIVE STEP POOL STORM CONVEYANCE?

Regenerative Step Pool Storm Conveyance (SPSC) is a best management practice that is located at the ends of storm drain pipes or man-made channels. SPSC is designed to stabilize and restore eroded outfalls. A series of small pools and riffles help to remove sediment and control downstream erosion. A sand and woodchip stream bed filters pollutants and promotes infiltration into the natural ground water system.

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www.thecleanwaterpartnership.com
THE CONSTRUCTION PROCESS

Step One
- **Identify**
  - Identify appropriate sites based on selection criteria.
  - Coordinate with stakeholders including property owners, residents and communities.

Step Two
- **Design**
  - Perform a site survey.
  - Design the SPSC facility.
  - Obtain necessary permits.
  - Inform nearby residents before construction begins.

Step Three
- **Construct**
  - Place all erosion and sediment control devices before construction begins.
  - Excavate and construct the facility.
  - Stabilize the disturbed area with seed or groundcover.

Step Four
- **Inspect**
  - Have a third party inspect and approve the SPSC after construction is complete.
  - Remove all erosion and sediment control devices.
  - Return on a regular basis to ensure that the SPSC functions properly.

CONSTRUCTION AND MAINTENANCE

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HOW CAN I HELP?

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WHERE CAN I GET MORE INFORMATION?

The Clean Water Partnership is committed to working with communities throughout the entirety of the construction process. Please contact info@thecleanwaterpartnership.com if you have any questions, comments or concerns.
WHAT IS STREAM RESTORATION?

Stream restoration is a major construction project that stabilizes eroded streams. Stabilization of stream banks can help to reduce erosion and down cutting of channels. This is done by installing grade controls such as adding rocks at the bottom of the streambed, re-grading the side slopes and stabilizing the banks with rocks and vegetation. The projects may also reconnect the stream with the natural floodplain to reduce downstream flooding and help re-establish natural habitat areas in and along the stream. The overall condition of the stream can be improved through the proper management of a healthy riparian buffer. Even small riparian zones have been shown to bring great benefits to stream health and wildlife habitat.

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www.thecleanwaterpartnership.com
THE RESTORATION PROCESS

Step One: Identify
- Identify appropriate sites based on selection criteria.
- Coordinate with stakeholders including property owners, residents, and communities.

Step Two: Design
- Perform a site survey and select stream restoration practices.
- Design the stream restoration plan.
- Obtain necessary permits.
- Inform nearby residents before construction begins.

Step Three: Construct
- Place all erosion and sediment control devices before construction begins.
- Implement and construct stream restoration practices.
- Stabilize the disturbed area with seed or groundcover.

Step Four: Inspect
- Have a third party inspect and approve the stream restoration after construction is complete.
- Remove all erosion and sediment control devices.
- Return on a regular basis to ensure that the stream restoration functions properly.

CONSTRUCTION AND MAINTENANCE

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HOW CAN I HELP?

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WHERE CAN I GET MORE INFORMATION?

The Clean Water Partnership is committed to working with communities throughout the entirety of the construction process. Please contact info@thecleanwaterpartnership.com if you have any questions, comments or concerns.
A pocket sand filter is a Best Management Practice (BMP) designed to remove pollutants by filtering water through a bed of sand. Pocket sand filters are a small depression in the ground filled with sand. These often look like a small volleyball court or sandbox. After flowing through the BMP, the treated water is either absorbed by the soil under the sand filter or is conveyed into the storm drain system by an underdrain. Pocket sand filters can be found in open spaces near buildings or parking areas.

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THE CONSTRUCTION PROCESS

**Step One**
- **identify**
  - Identify appropriate sites based on selection criteria.
  - Coordinate with stakeholders including property owners, residents and communities.

**Step Two**
- **design**
  - Perform a site survey.
  - Design the pocket sand filter facility.
  - Obtain necessary permits.
  - Inform nearby residents before construction begins.

**Step Three**
- **construct**
  - Place all erosion and sediment control devices before construction begins.
  - Excavate and construct the facility and any required pipes.
  - Stabilize the disturbed area with seed or groundcover.

**Step Four**
- **inspect**
  - Have a third party inspect and approve the pocket sand filter after construction is complete.
  - Remove all erosion and sediment control devices.
  - Return on a regular basis to ensure that the pocket sand filter functions properly.

CONSTRUCTION AND MAINTENANCE

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HOW CAN I HELP?

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WHERE CAN I GET MORE INFORMATION?

The Clean Water Partnership is committed to working with communities throughout the entirety of the construction process. Please contact info@thecleanwaterpartnership.com if you have any questions, comments or concerns.
WHAT IS POND RETROFIT?

The County has a large number of existing stormwater management ponds or public and private properties that do not meet the current water quality standards for stormwater Best Management Practices (BMPs). Retrofits include reconfiguring and re-grading the pond so that they provide a permanent pool of water. Water flows into a fore-bay that captures and settles out pollutants such as sediment and nutrients.

POND RETROFIT TOOLBOX

- fore-bay modification
- sediment dredging
- structure modification

TRANSFORMING STORMWATER MANAGEMENT

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www.thecleanwaterpartnership.com
THE RETROFIT PROCESS

**Step One**
- **identify**
  - Identify appropriate sites based on selection criteria.
  - Coordinate with stakeholders including property owners, residents and communities.

**Step Two**
- **design**
  - Perform a site survey.
  - Design the pond retrofit.
  - Obtain necessary permits.
  - Inform nearby residents before construction begins.

**Step Three**
- **construct**
  - Place all erosion and sediment control devices before construction begins.
  - Perform retrofit activities including any dredging or other modifications.
  - Stabilize the disturbed area with seed or groundcover.

**Step Four**
- **inspect**
  - Have a third party inspect and approve the pond retrofit after construction is complete.
  - Remove all erosion and sediment control devices.
  - Return on a regular basis to ensure that the pond retrofit functions properly.

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WHERE CAN I GET MORE INFORMATION?

The Clean Water Partnership is committed to working with communities throughout the entirety of the construction process. Please contact info@thecleanwaterpartnership.com if you have any questions, comments or concerns.
WHAT IS TREE PLANTING?

Trees are one of the greenest and most economical stormwater Best Management Practices (BMPs). When it rains, trees intercept rainwater and allow it to evaporate or slowly soak into the ground. As water moves through the soil, the roots help to remove pollutants by absorbing nutrients. Trees provide soil stabilization, improve air quality and help keep communities within a healthy temperature range in the summer.

TRANSFORMING STORMWATER MANAGEMENT

Much of Prince George’s County’s development occurred between the 1940s and 1980s before stormwater regulations were put in place.

In 2014, Prince George’s County and Corvias Solutions implemented the Clean Water Partnership as the solution to its stormwater regulatory challenges.

New regulations state that impervious areas should be treated with Best Management Practices (BMPs) such as tree planting.

The Clean Water Partnership is committed to retrofitting 2,000 acres of impervious area with green stormwater infrastructure by 2017.
Tree planting in a city park
Community organized volunteer tree planting event
Photos courtesy of Casey Trees

THE PLANTING PROCESS

**Step One**
- identify
  - Locate areas that are candidates for tree planting.
  - Coordinate with stakeholders including property owners, residents and communities.

**Step Two**
- design
  - Select native trees that complement any existing landscaping and fit the site conditions.
  - Follow local codes and ordinances.

**Step Three**
- construct
  - Plant trees according to appropriate planting practices.
  - Mulch around the tree and provide adequate water.

**Step Four**
- inspect
  - Have a third party inspect and approve the tree planting after construction is complete.
  - Return on a regular basis to ensure that trees are thriving.
  - Replace dead or dying trees.

CONSTRUCTION AND MAINTENANCE

Corvias Solutions is managing the design, construction and long-term maintenance of stormwater BMPs installed by the program. It is committed to utilizing the County’s small, minority and women-owned businesses for 30 – 40 percent of the total project scope. Visit www.thecleanwaterpartnership.com/procurement to learn more about procurement opportunities.

HOW CAN I HELP?

The Clean Water Partnership is working with community members to learn about local challenges and the best locations to install BMPs. In many cases, the Clean Water Partnership will need to coordinate construction with an individual property owner or a homeowners association. Installed practices will be mapped on the Clean Water Partnership’s website. Please contact us if you notice trees that are damaged or deteriorating.

WHERE CAN I GET MORE INFORMATION?

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