Stormwater Success 201
Environmental Site Design (ESD) Communities

Association Summit - May 2025

Environmental Site Design (ESD)
Best Management Practices (BMP)

The type and number vary widely across ESD communities

Objectives

- Make understanding and maintenance of HOA-owned stormwater management systems seem less overwhelming

- Identify resources available to HOAs

- Provide information that is helpful for:
  - -- Maintaining BMPs and conveyance systems
  - -- Passing County inspections
  - -- Pricing BMPs and lifespans
  - -- Hiring BMP service providers
  - -- Estimating common repair costs
  - -- Ensuring quality Reserve Studies (House Bill 107)

Example: One HOA's Annual Stormwater Management Budget

HOA Stormwater Remediation Fee

- $800 (50% credit)

Annual planned maintenance

- $10,500 Contract (no options)

Additional unplanned maintenance

- $1,500 General repairs - low
- $6,000 Landscape enhancements (turf, plants, pests) - high

Reserve Account funding

- $8,400 (practices, inlets, manholes, gutters, pipes)

Emergency Funds

11% – 16% of Budget

46 Types of 22,245 Privately-owned BMPs Anne Arundel County*

Non-Structural

- Disconnection of rooftop runoff 21.1%
- Drywells 17.7%
- Swales 9.0%
- Disconnection of non-rooftop runoff 5.2%
- Rain gardens 5.0%
- Micro-bioretention 3.0%
- Bioswale 1.0%
- Rainwater harvesting 1.8%
- Sheet flow to conservation areas 1.0%
- Enhanced filters 0.1%

Structural

- Detention Ponds 1.9%
- Infiltration 1.5%
- Retention Ponds 1.1%
- Open channel systems 0.7%
- Wetlands 0.4%
- Step Pool Storm Conveyance (SPSC) 0.2%
- Filtering systems 0.1%

* DPW data as of Apr 25

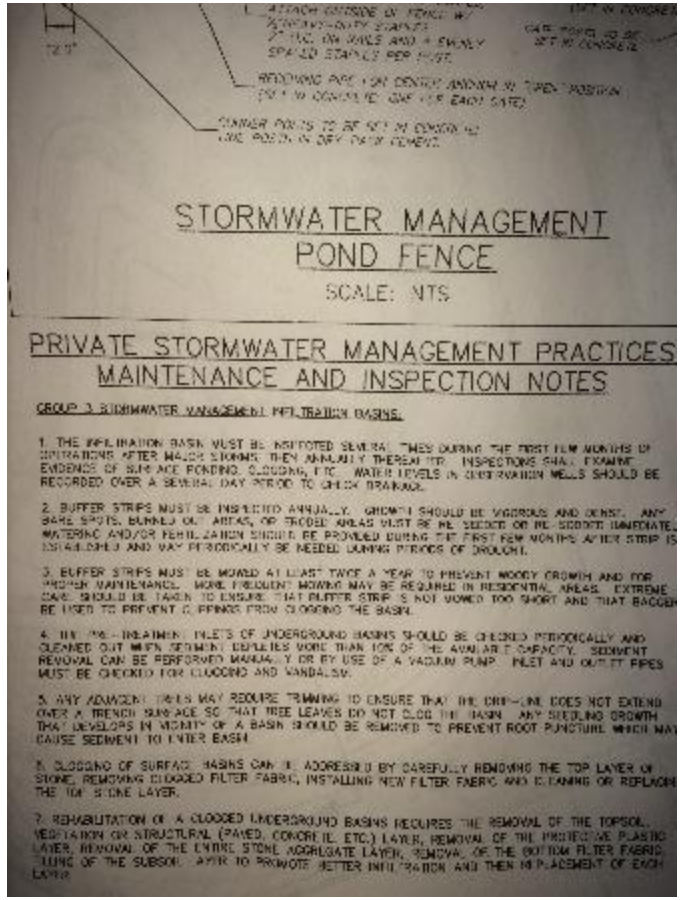
ESD Communities – Large & Small

BMPs may be in HOA Common Area and/or on Private Lots

Stormwater Success 101 – Key Takeaways

- Important Documents
  - County Stormwater Inspection & Maintenance Agreement
  - Declaration of Covenants, Conditions & Restrictions,
  - Stormwater Management Plan (SWMP)
    - Private Storm Drain Profiles
    - Planting Plan
  - County Maintenance Checklists
  - County Inspection Checklists
- Annual Maintenance Schedule

Maintenance Planning – Working Materials



STORMWATER MANAGEMENT
POND FENCE
SCALE: NTS

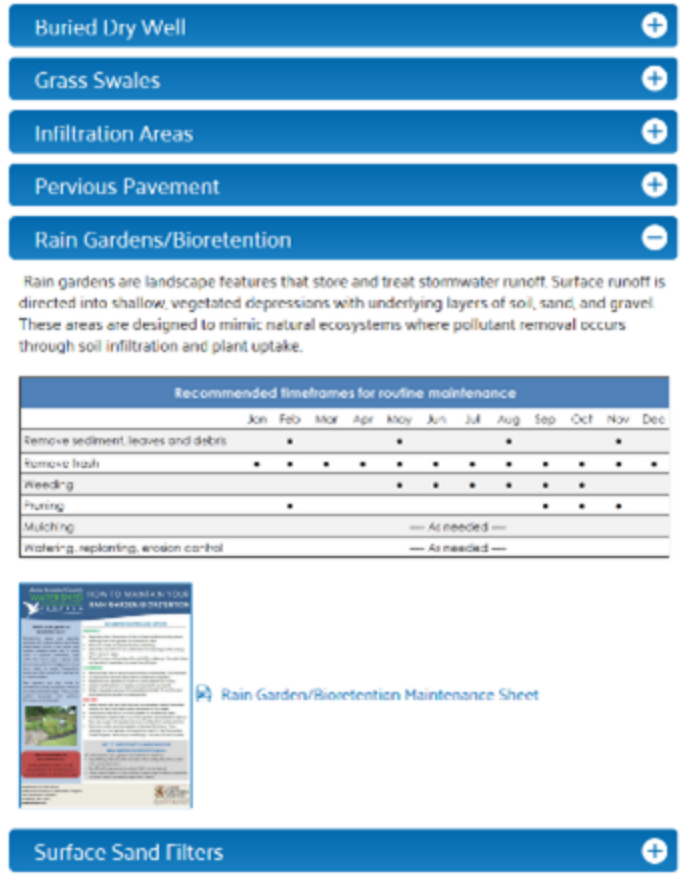
PRIVATE STORMWATER MANAGEMENT PRACTICES
MAINTENANCE AND INSPECTION NOTES

Stormwater Management Plan
Maintenance Notes

Table G-1. Maintenance Schedule for Bioretention Areas

1.0 Plant Care		Spring			Summer			Fall			Winter		
1.1	Trimming, Pruning, & Thinning	■							■	■			
1.2	Mowing		■	■	■	■	■	■	■				
1.3	Weeding		■	■	■	■	■	■	■				
1.4	Watering (estab. & drought)												
1.5	Fertilizing												
1.6	Pest Management		■	■	■	■	■	■	■				
1.7	Plant Replacement												
2.0 Infiltration Maintenance		**Spring**			**Summer**			**Fall**			**Winter**		
2.1	Ponding and Drainage												
2.2	Trash and Debris Removal												
2.3	Composting												
2.4	Mulching	■					■						
2.5	Pet Waste Removal												
2.6	Snow Removal												
2.7	De-Icing												

■ Required
■ Required at low frequency
Required as necessary



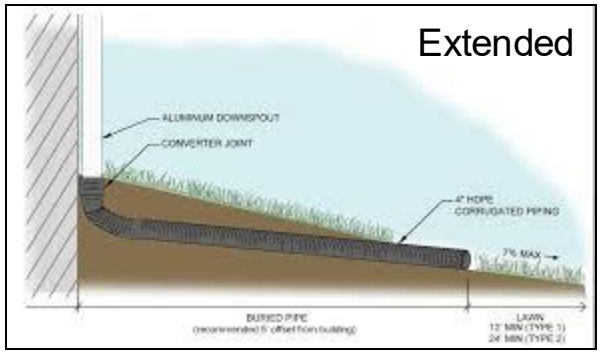
AAC
Maintenance Checklists

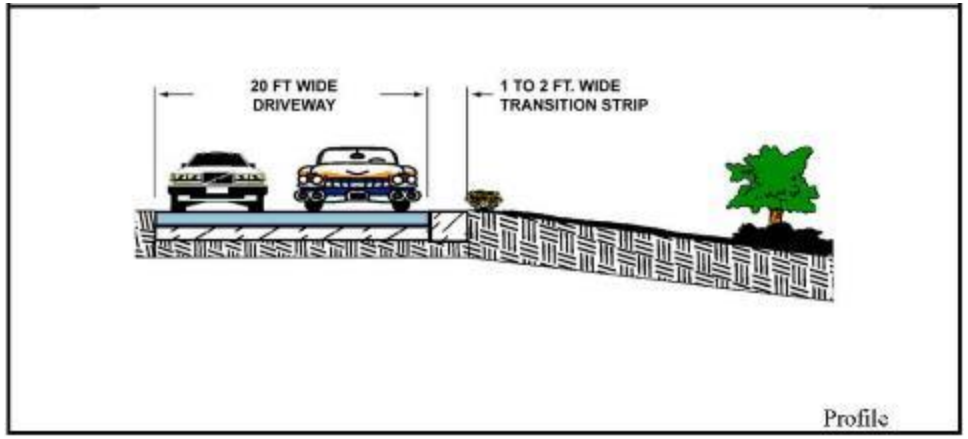
Consider doing a BMP walkthrough with a County Inspector or Stormwater Consultant

BMP Maintenance / Inspection

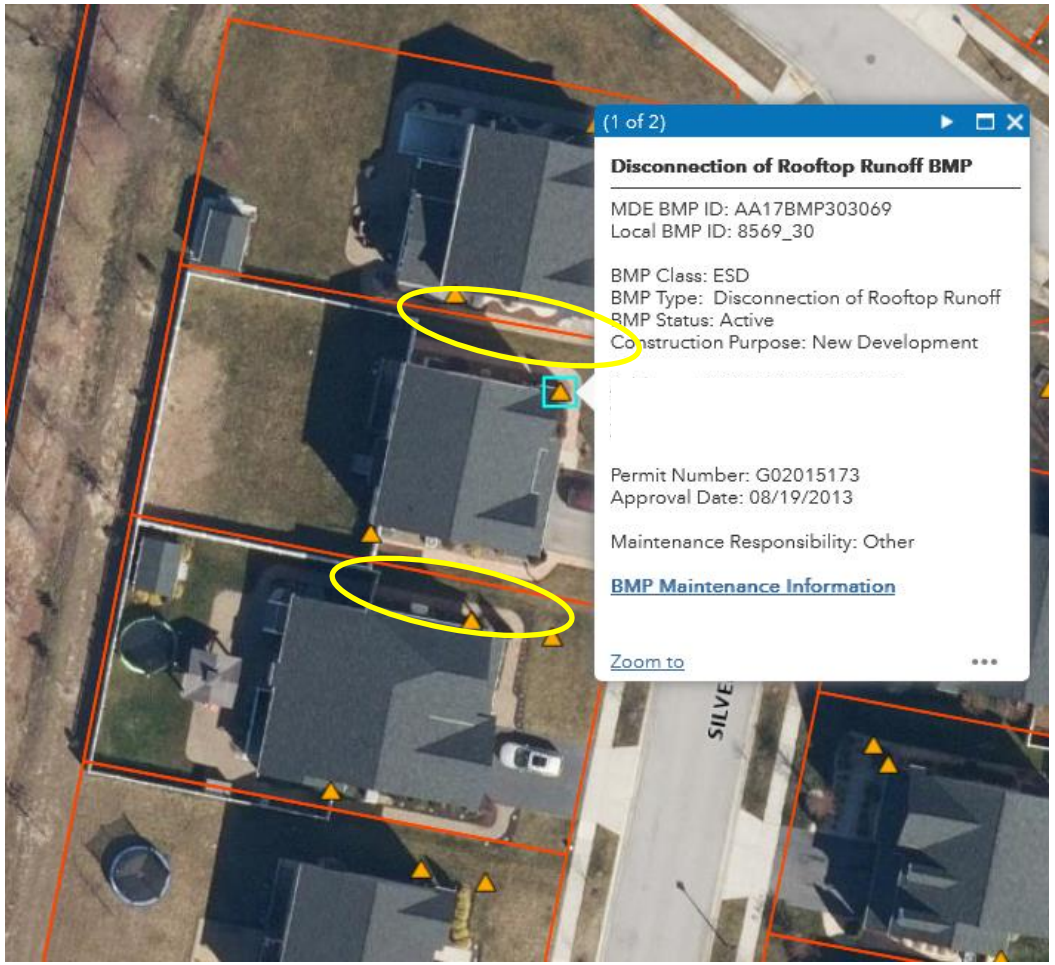
Rooftop/Non-Rooftop Disconnect

- Disconnection involves directing flow from downspouts or impervious surfaces onto vegetated areas
- Runoff soaks into or filters over the ground
- Keep gutters clean; “disconnected” area unobstructed





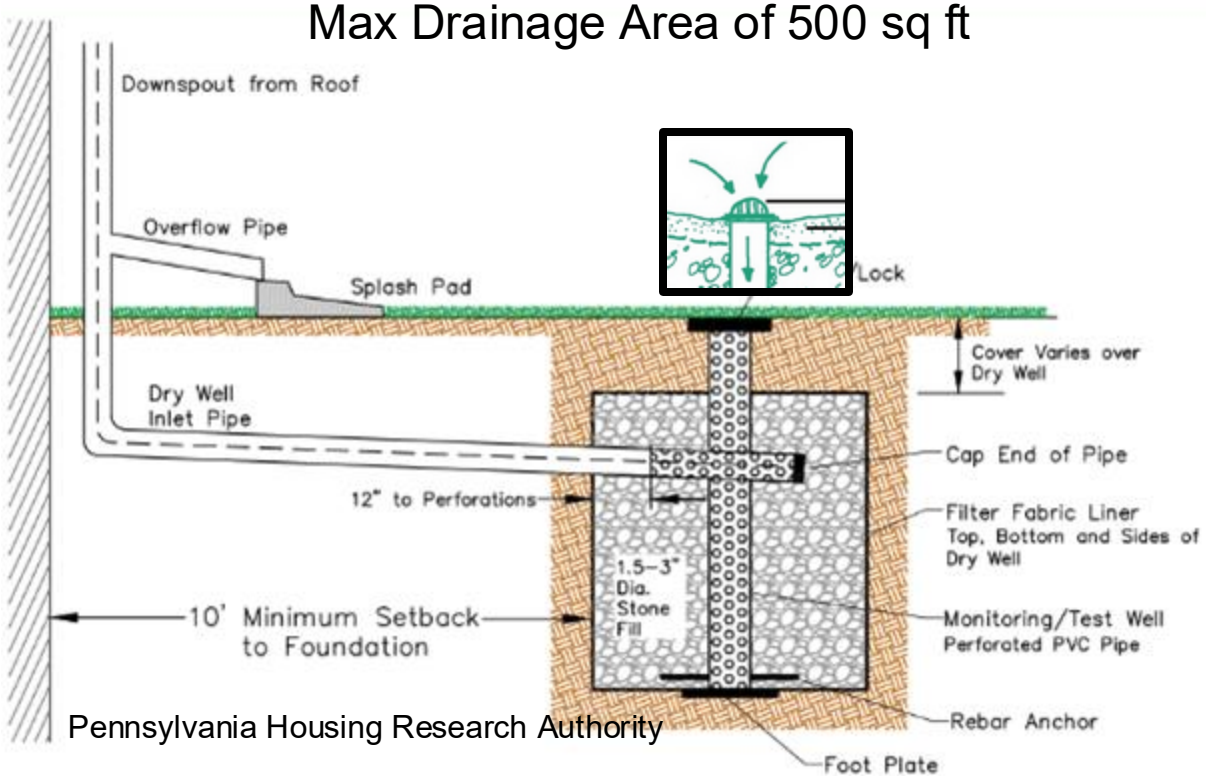
Rooftop/Non-Rooftop Disconnect



Hardscape pathways or other structures should not interfere with roof top disconnect drainage areas

Dry Wells

Max Drainage Area of 500 sq ft



Pennsylvania Housing Research Authority

- Check Declaration about ownership
- Clean system regularly to include gutters
- Watch for early overflow from downspout or ponding

Raingardens

- Treat property-generated runoff from rooftops, sidewalks, driveway, etc
- Filter runoff through plants and soil (ponding < 8”)
- Site selection is important (soil group, distance from foundation, open space)
- Drains within 48 hours

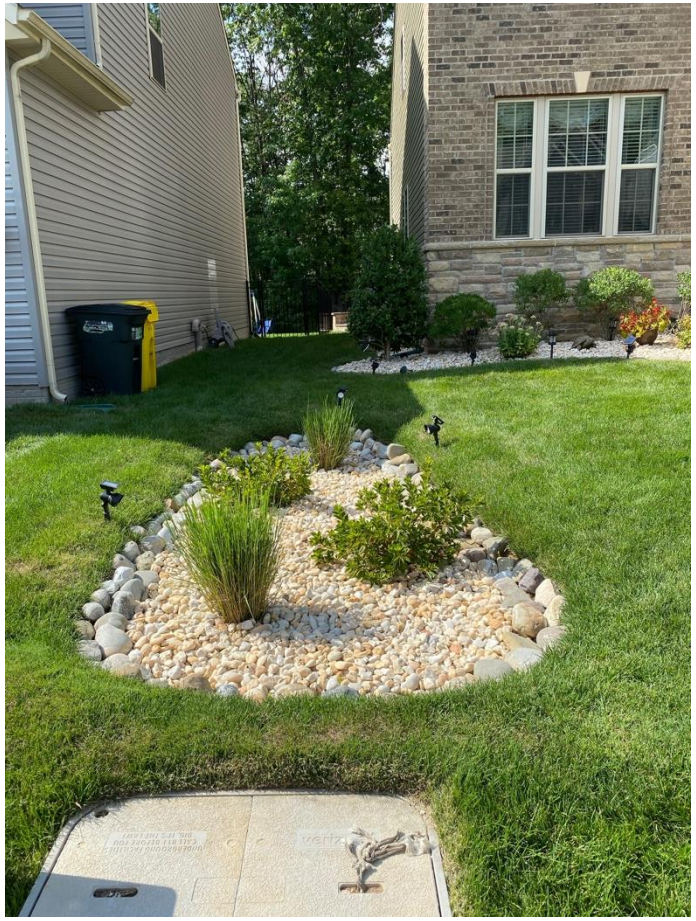
Raingardens – Check the Declaration

1. Maintenance of Rain Gardens.

(a) In furtherance of the rights and obligations of the Association and Lot Owners under Section 7.2(g) of the HOA Declaration, Owners of Lots containing Rain Gardens shall not neglect, adversely alter or remove the Rain Gardens. The Association shall maintain the Rain Gardens in a good state of condition and repair. Owners of Lots containing Rain Gardens shall ensure that any Rain Garden contained on such Owner's Lot is readily accessible to the Association to perform the maintenance obligations set forth herein. All costs associated with the inspection, maintenance, repair and/or replacement of the Rain Gardens shall be borne by the Association, except to the extent any damage is caused by the owner of a Lot, in which event the owner of the Lot shall pay all such costs. If the owner of the Lot fails to repair any damage caused by the Owner to a Rain Garden, the Association shall undertake to do so and all costs and expenses incurred by the Association in connection with such maintenance, repair or replacement shall be collectible by the Association in the same manner as Assessments.

(b) The Rain Gardens shall be maintained in accordance with the criteria contained on Grading & Sediment Control Plan entitled "Rain Gardens Details and Notes", a copy of which is attached hereto and made a part there of as **Exhibit "C"** to the HOA Declaration.

Possible Issues with Individual BMP Owners



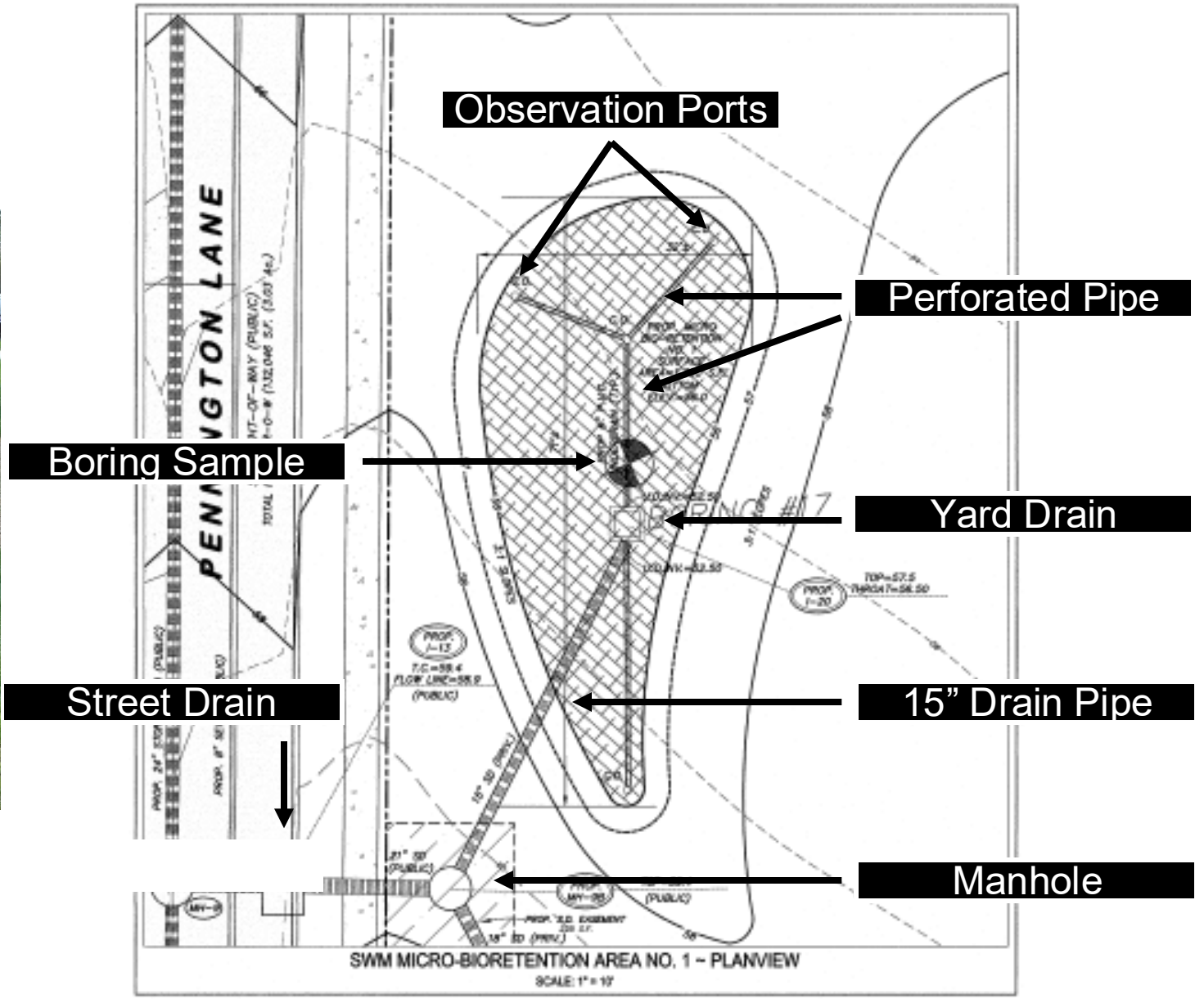
Modified

Not Regularly Maintained

Removed

Bioretention

Bioretention Area Components



Bioretention Area Below Ground

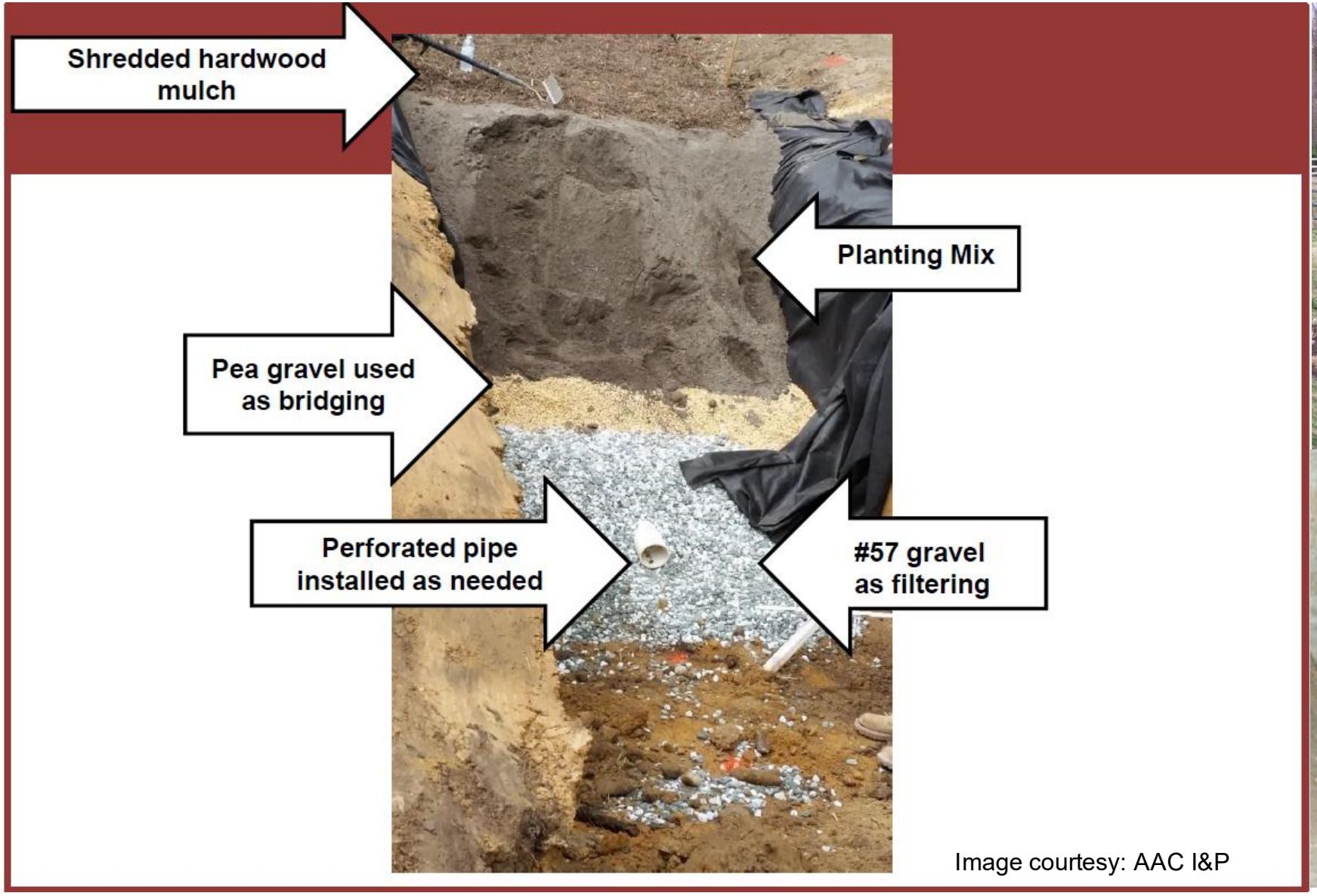


Image courtesy: AAC I&P

Landscaping

Mix of Plants
(Example)

- Trees: 4
- Shrubs: 14
- Herbaceous: 168

Varied, dense vegetation is an essential part of most BMPs

Mulch

Single shredded hardwood bark mulch

Vegetation in Stormwater Management
Best Practices, Nov 2019, MDE

Triple-shredded hardwood bark mulch

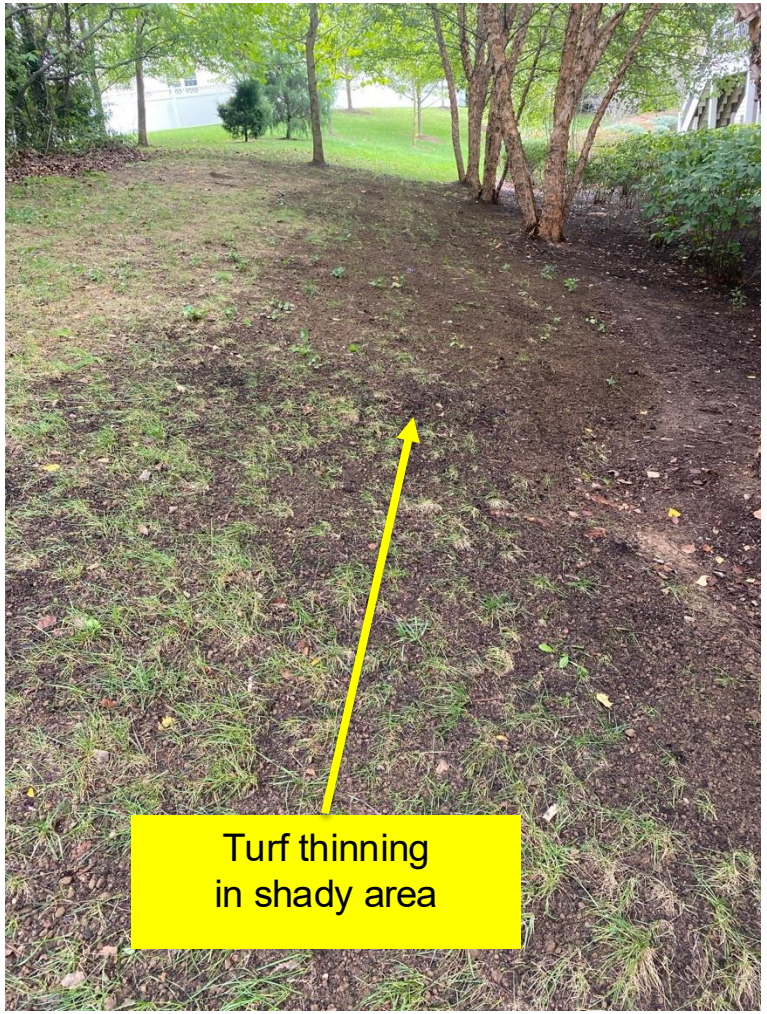
- Filters runoff, controls weeds, retains moisture
- Depth of 2 – 3”
- Rake periodically
- Remove/replenish annually

http://www.stopwaste.org/at-work/built-environment/landscapes/compost-mulch-soil/mulch-calculator

Pest & Weed Control

Use Integrated Pest Management (IPM) strategies

Turf & Tree Management



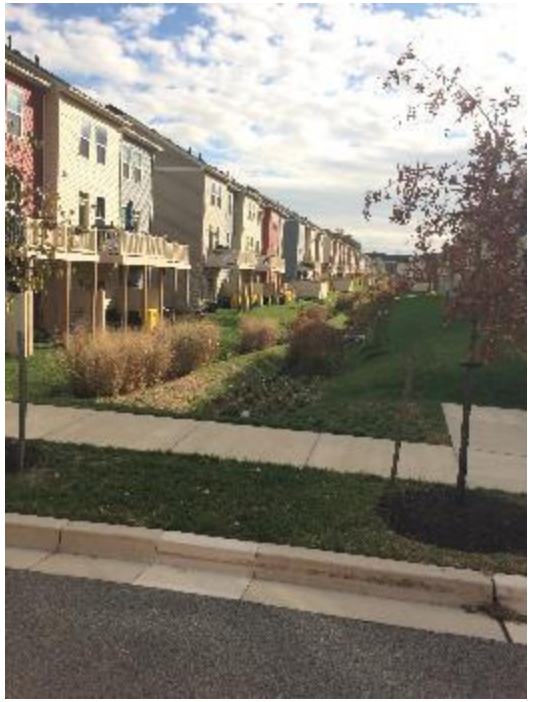
Late/Early Season Maintenance

- Consider replanting/mulching
- Remove leaves and debris
- Repair erosion

Impact of Winter Road Salt

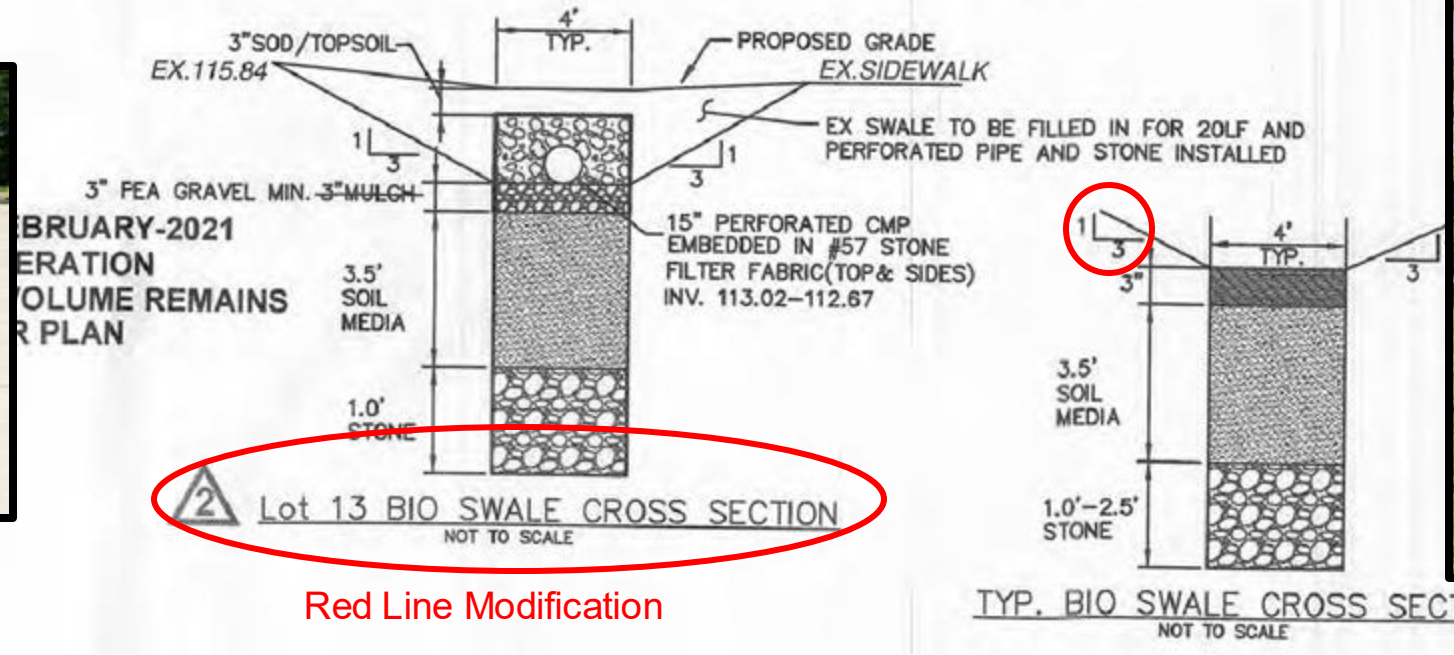
- Curb cutouts allow road salt to be deposited into BMPs
- BMP plants can sustain damage depending on:
  - type of salt. Rock salt is the worst
  - frequency and amount of salting
  - volume of fresh water entering the BMP
- Coordinate with contractors providing plowing/salting services

Bioswales



Slows runoff and allows it to infiltrate

Bioswales (Street Drainage) on Lots



Red Line Modification

- Maintained like a bioswale
- Declarations may say HOA maintains it even if it's on a private Lot
- Owner may be responsible for any triennial inspection corrective action

Observing Rain Event – Bioswale Example

Observing Rain Event - Bioretention Example

- Soil drained within 48 hours
- No sediment accumulation
- Mulch remains intact,
- Rake as needed

Inspecting Observation Wells

A typical cleanout, extending higher than 12 in. above the ground surface.

View inside the observation well, clear of water and sediment.

Inspect 48 hours after storm event

Stormwater Management Ponds

Ownership of stormwater pond determines maintenance actions

Pond Maintenance

- Repair damaged fencing

- Remove debris

- Repair animal burrows

- Manage vegetation

- Repair erosion

Pond Sediment Removal

Mobilization and demobilization of machinery associated costs: $1,000 to $10,000

Dredging associated costs: $13 per cubic yard to $48 per cubic yard

Disposal associated costs: Trucking costs can range between $325-$400 per truck, depending on the distance to the dump site, material type, and fuel costs

Chesapeake Bay Stormwater Network

Stormwater Conveyance Systems

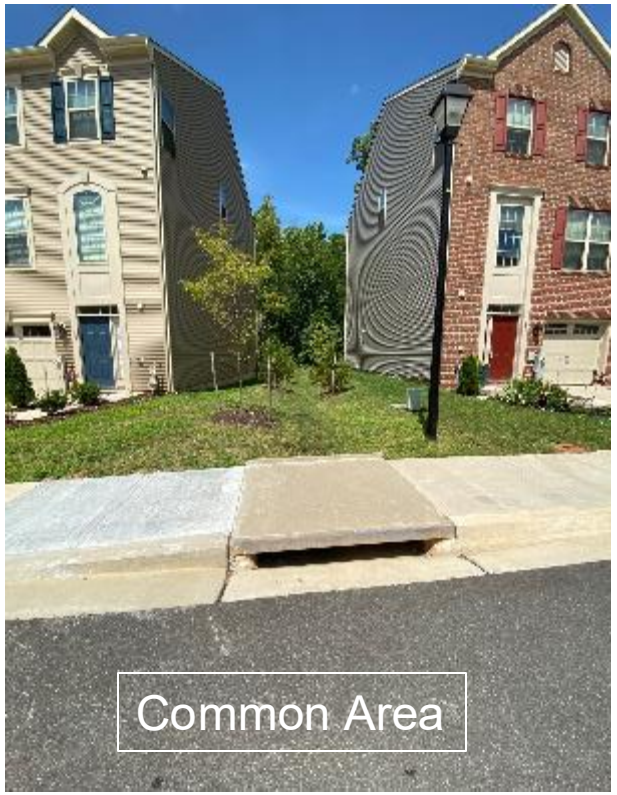
- Many HOAs own and have responsibility for maintaining conveyance systems
  - Open Channel (grass swales, wet swales)
  - Closed Channel (storm drains, drainage pipes, inlets/outlets, manholes)

- Private may be integrated with publicly owned and maintained stormwater conveyance systems

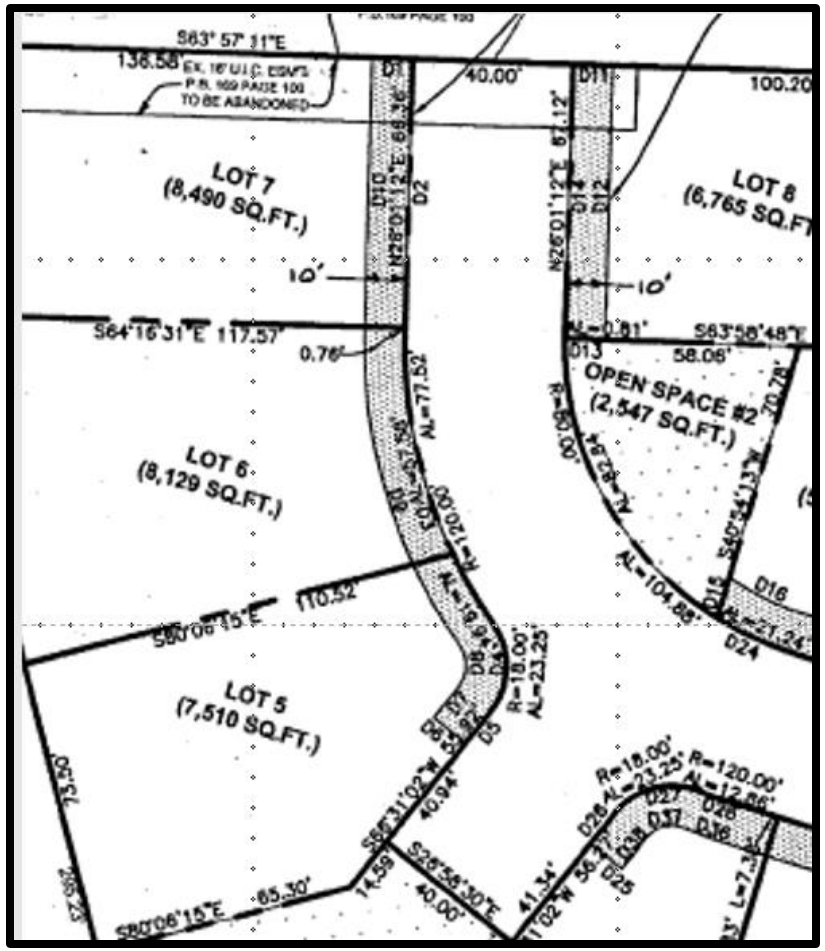
- Maintenance will require likely require support from professional service providers

Grass Swales

- Maintain vegetation (grass height 3” – 6”)
- Inspect check dams/underdrains
- Watch for ponding more than 48 hours after storm
- Not inspected by I&P



Open Channel Systems



Maintenance responsibilities – refer to SWM Plan and Declaration

Closed Channel Components

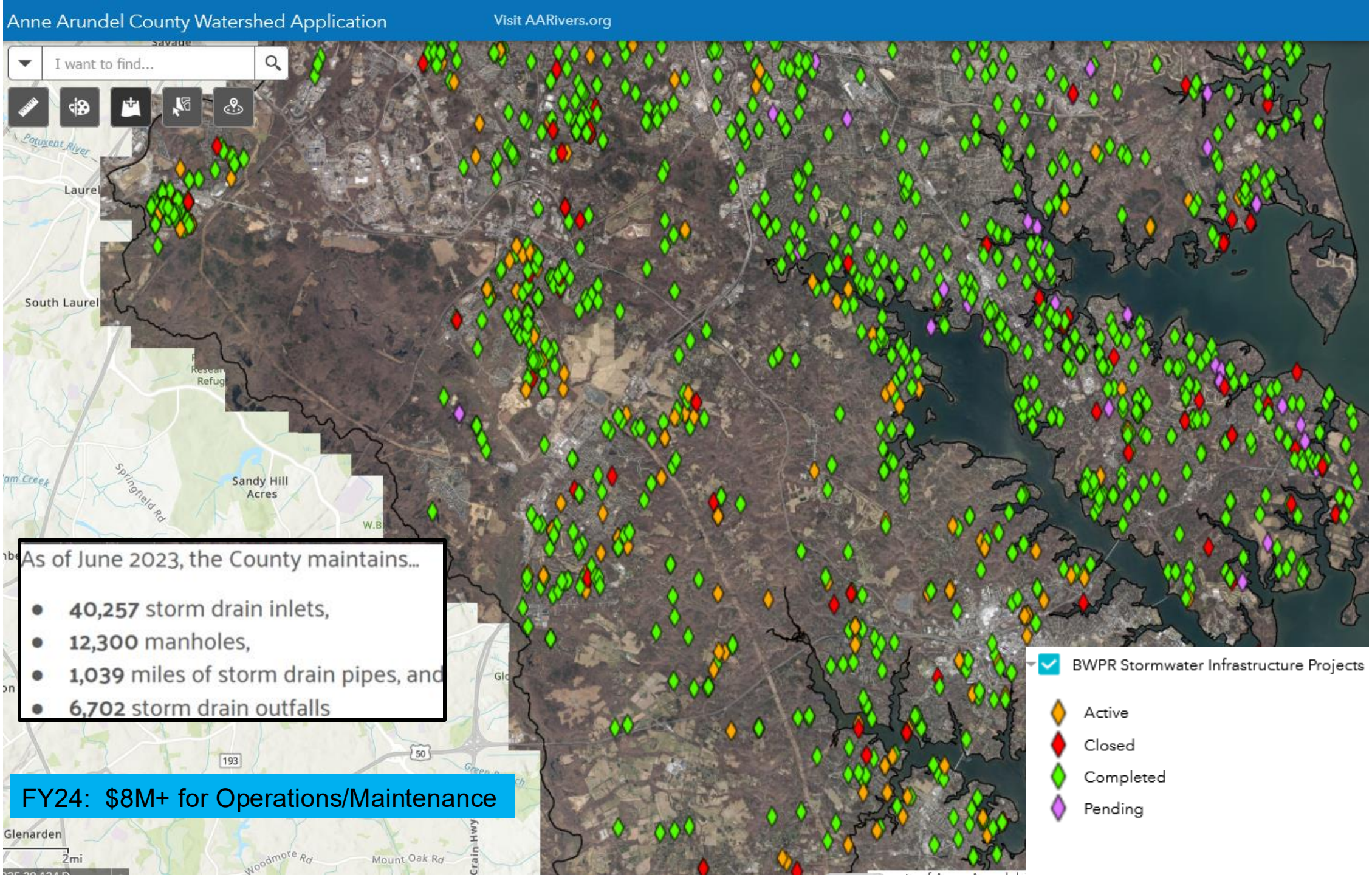
Public & Private Infrastructure Interconnected

- Outfall
- Manhole
- Inlet/storm drain
- Pipe

Yellow is private conveyance infrastructure not necessarily mapped in GIS

Other colors are public conveyance infrastructure mapped in GIS

See MyAnneArundel App


Anne Arundel County Watershed Application
Visit AARivers.org
I want to find...
Patuxent River
Laurel
South Laurel
Sandy Hill Acres
Springfield Rd
Glenarden
2mi
193
50
Woodmore Rd
Mount Oak Rd
Crain Hwy
As of June 2023, the County maintains...
40,257 storm drain inlets,
12,300 manholes,
1,039 miles of storm drain pipes, and
6,702 storm drain outfalls
FY24: $8M+ for Operations/Maintenance
BWPR Stormwater Infrastructure Projects
Active
Closed
Completed
Pending

Inspections – Paperless

- Point & Click
- May include photos
- Reports still the same
- Can request copies

BMP Type Specific Inspection

▸ **Example Image (if available)**

▾ **Micro-Bioretention**

Micro-Bioretention issues: select all that apply

- ☐ No Issues Found
- ☐ Plant vegetation not adequate; replant
- ☐ Sediment, trash, and/or debris accumulation
- ☐ Gravel and/or underdrain system not functioning properly (remove gravel, clean and replace)
- ☐ Erosion at inflow points and/or micro bio-retention needs to be repaired
- ☐ Ponding water for more than 48 hours on surface of micro-bioretention area
- ☐ Inadequate Mulch layer (Not in desired range of 2 to 3 inches)

Comments

Inspections: SWInspections@aacounty.org

Drainage Area (DA) for Bioretention

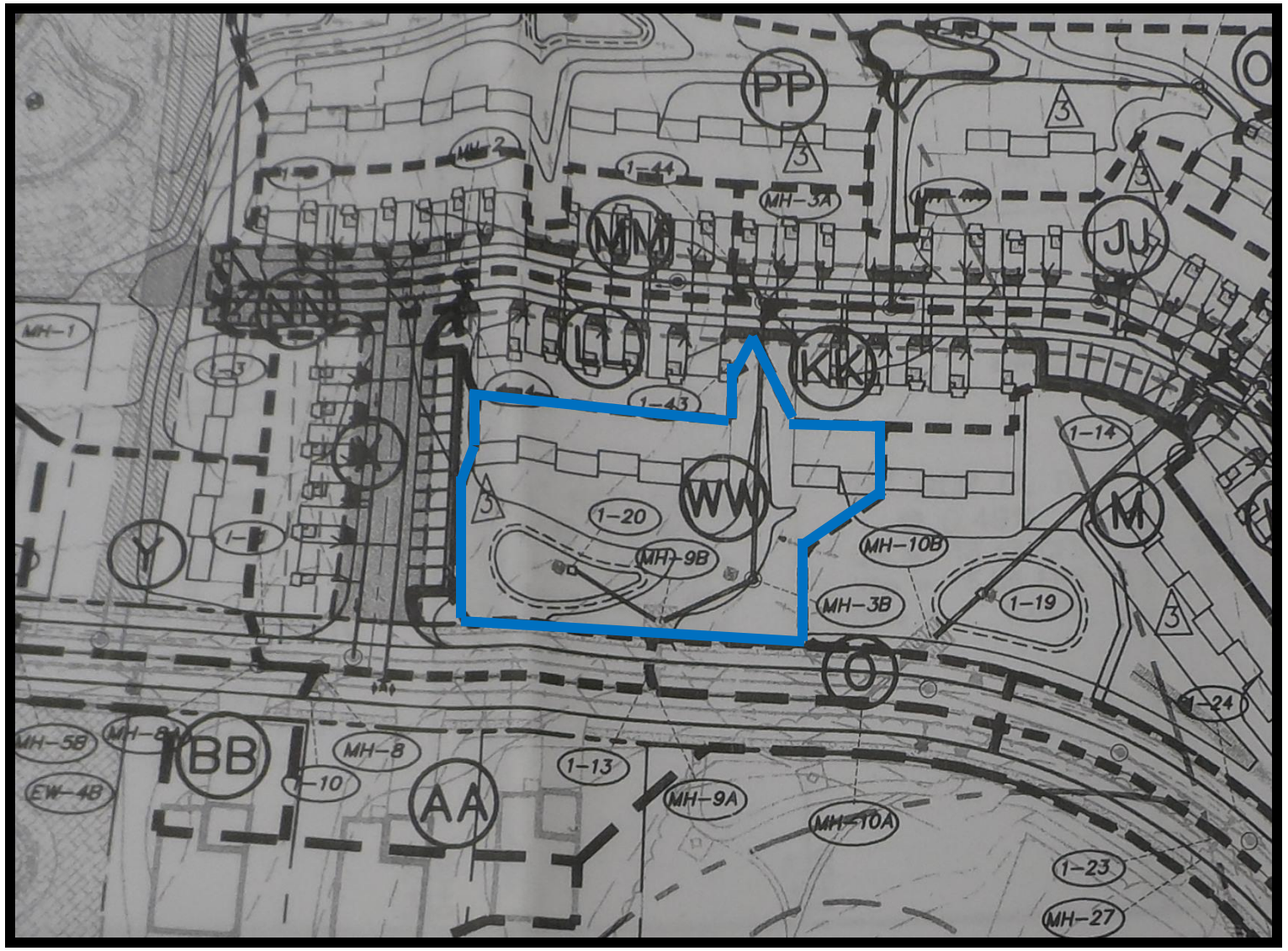
Drainage Area Details

Drain issues: select all that apply

- [ ] No Issues
- [ ] Drainage Area Unstable
- [ ] Eroded / Incised Channel
- [ ] Excessive Debris or Trash
- [ ] Invasive vegetation (Describe, Type, Location, etc.)
- [ ] Sediment accumulation (Describe, Location, Amount, etc.

Drainage Area - General Comment

Drainage Area - Rating



BMP sized to capture runoff from this area

Triennial Inspection Results – FY22-24

FY22
6,618 total BMPs inspected
266 corrections
12 violations
no pass rate 4.2%

FY23
6,061 total BMPs inspected
757 corrections
16 violations
no pass rate: 12.7%

FY24
7774 total BMPs inspected
845 corrections
16 violations
no pass rate: 10.9%

Conveyance Inspection Checklist

GOOD HOUSEKEEPING PLAN (GHP)

STORMWATER CONVEYANCE SYSTEM INSPECTION CHECKLIST

Facility Name: _____ **Inspection Date:** _____

Inspector Name: _____ **Inspector Signature:** _____

- The intent of this inspection is to ensure the free flow of stormwater within on-site conveyance systems and prevent damage/flooding.
- **If maintenance is needed, please provide an explanation, and document all corrective actions performed.**
- **Inspections shall include visually accessible infrastructure only; at no time shall inspection personnel enter a confined space.**
- Retain the completed checklists for five (5) years.

Item	Item Checked (Y/N/NA)	Maintenance Needed (Y/N)	CORRECTIVE ACTIONS/COMMENTS *Items which cannot be corrected immediately must be reported to the GHP/NPDES Program Manager*
CATCH BASINS / INLETS			
1. Look for debris and sediment blocking catch basin grates. If found, remove.			
2. Look for damage or cracks to the frame, grate, basin walls or bottom. If found, schedule repairs or replacement.			
3. Look for sediment and debris in the catch basin sump. If sediment fills 60% of the sump or comes within 6" of a pipe it should be scheduled for cleaning.			
4. If any type of filtering device is present, verify that the filter is not clogged, torn, or damaged; clean if clogged, replace if damaged.			
PIPES / CULVERTS			
5. Look for evidence of clogged piping (e.g. visual obstructions, standing water within manholes/inlets structures, etc.). If found, remove or schedule cleaning.			
6. Verify vegetation growth, if present, does not impede water flow. If it does, mow, cut back, or remove.			

Last Revision Date: March 2024

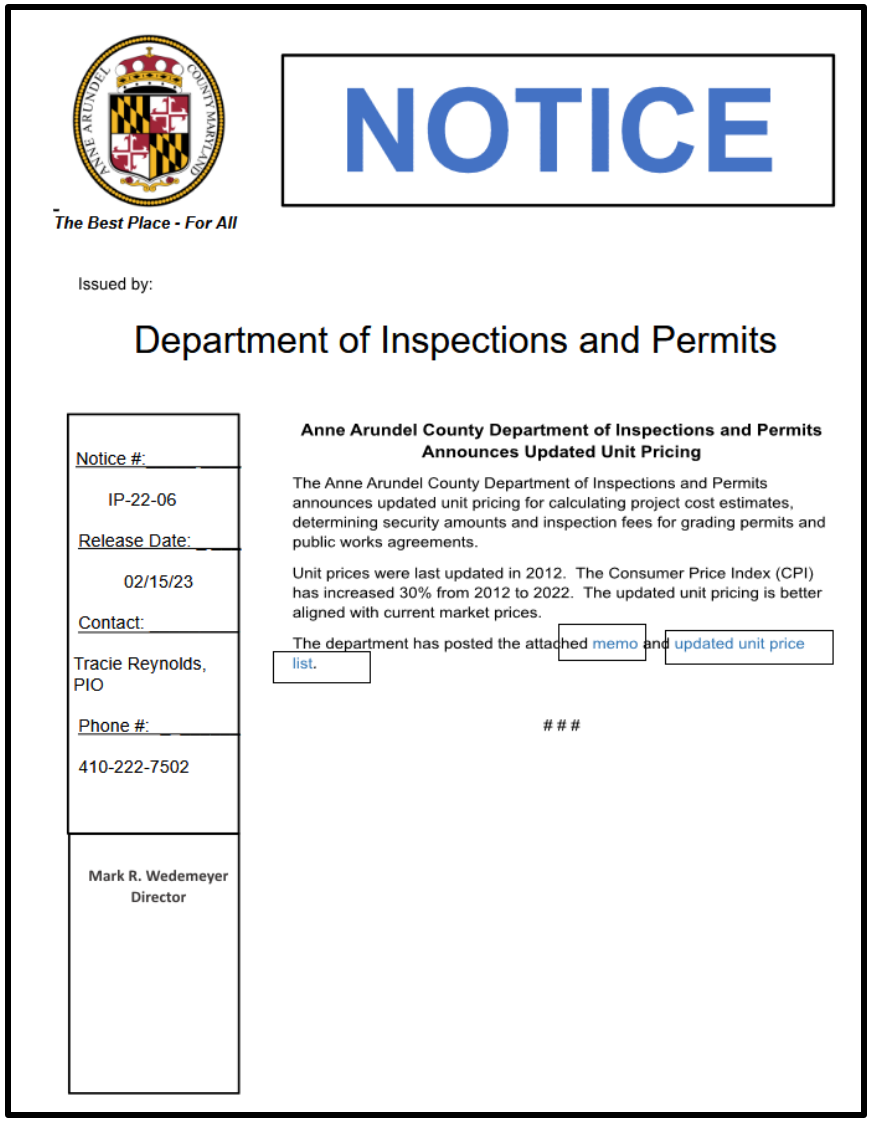
Page 1 of 2

Conveyance Checklist:

https://aacoprod.aacounty.org/AACOServicePublic/rest/SharedDrive/BWPR-MS4/file/11h7Pbrvzx2IGNbRuomtty_lIP9cvQMi7

Cost & Life Span Estimates

Pricing BMPs & Conveyance Systems



NOTICE

The Best Place - For All

Issued by:

Department of Inspections and Permits

Notice #:
IP-22-06
Release Date:
02/15/23
Contact:
Tracie Reynolds, PIO
Phone #:
410-222-7502

Mark R. Wedemeyer
Director

Anne Arundel County Department of Inspections and Permits Announces Updated Unit Pricing

The Anne Arundel County Department of Inspections and Permits announces updated unit pricing for calculating project cost estimates, determining security amounts and inspection fees for grading permits and public works agreements.

Unit prices were last updated in 2012. The Consumer Price Index (CPI) has increased 30% from 2012 to 2022. The updated unit pricing is better aligned with current market prices.

The department has posted the attached memo and updated unit price list.

###

- Developers use County's price list for calculating project cost estimates which determines security (bond) amounts
- Cost of materials used for constructing BMPs and conveyance systems are itemized on Engineer's Cost Estimate
- Blue Notice "Hand off Meetings" requires BMP "as builts" and cost information related to maintenance to be provided to HOAs

BMP Repair & Replacement Timelines

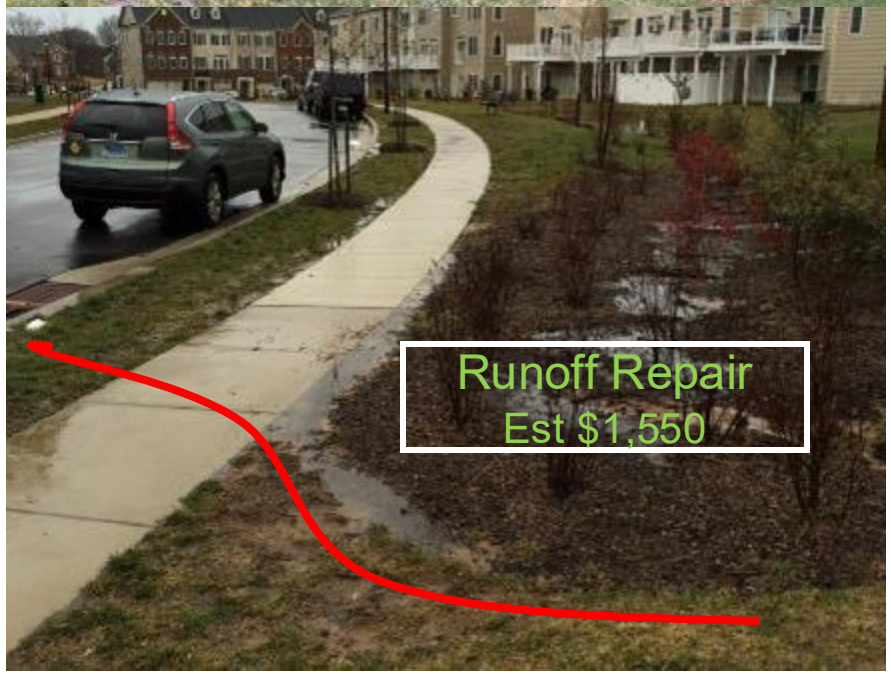
- Life span info difficult to find
- Know the construction date of your facilities
- Characteristics of the contributing drainage area for each BMP affects life span
- Frequency and quality of recurring maintenance is critical to extending life span

Type of BMP	Sediment Removal Frequency	Facility Life Span
Wet Pond	5 to 10 years	20 to 25 years
Dry Pond	2 to 10 years	20 to 50 years
Infiltration Trench	Monthly as needed	10 years
Sand Filter	Every 6 months or as required	20 to 50 years
Bioretention System	5 to 10 years	10 to 25 years
Vegetated Swale	As needed	10 to 25 years
Underground Detention	Annually or as needed	10 to 30 years
Vegetated Rooftop	Every 5 years	25 years
Permeable Paving Materials	3 to 4 times per year	25 years
Manufactured BMP	Annually as required	20 to 100 years

Maintaining BMP'S - A Guidebook for Private Owners/Operators - 2017

Hiring Service Providers for BMP Maintenance

Maintenance – Budgeted/Unbudgeted



Choosing BMP Service Providers

- Types of certifications
  - Above ground maintenance
  - Below ground maintenance
  - Routine and non-routine maintenance

- Sources for finding service providers
  - Chesapeake Bay Landscape Professional Certification
  - Montgomery County (Certification Program)
  - Watershed Stewards Academy
  - Property Management Company
  - Networking

- Ask all service provider candidates for list of HOAs they service and visit those sites virtually (GIS) and/or physically

https://www.montgomerycountymd.gov/water/stormwater/maintenance.html

Example: HOA's Request for Proposal (2017) Stormwater System Maintenance

- Provide annual maintenance (with schedule) for:
  - Five bioretention areas
  - Three bioswales
  - One dry swale
- Requirements (pass an annual inspection)
  - Maintain proper infiltration (mulch, remove debris/sediment)
  - Care for plants (weed, prune, fertilize, control insects, replace plants A/R)
  - Make repairs (maintain health of slopes/repair erosion)
- Contract options
  - Inspection and cleanout of 20 storm drains and 4 manholes
  - Inspect 10 observations ports after a storm event

Site visit was required before offering proposal & three references

Responses to RFP - Maintenance

Cost	Contractor A	Contractor B	Contractor C	Contractor D	
Visits	3	4	-	13	
Basic Service	$8,830[1]	$15,650[2]	$3,500	$7,258[4]	
Cost/Visit	$2,943	$3,913	-	$558.30	
Inlet Maintenance	$1,670	$2,900[3]	-	-	
Trees 10 gal	$350	-	-	$250	
Shrubs 3 gal	$54	-	-	$36	
Perennials 1 gal	$20	-	-	$12	
Remove sediment (5 years)	$4,500				
Clean PVC pipes (10 years)	$2,375				
Inspection	-	$750	-	$400[5]	

Notes:

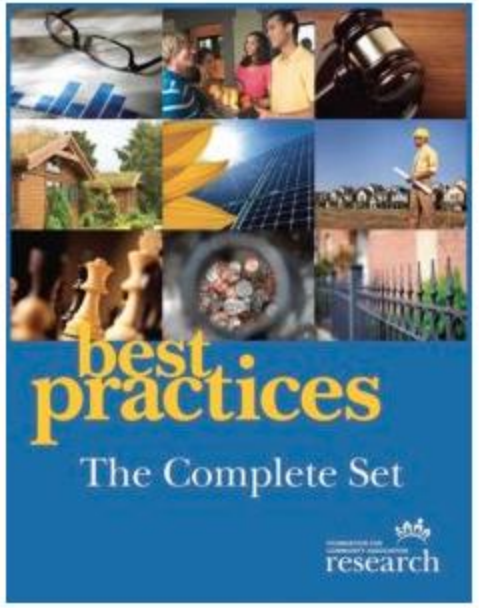
1. Includes annual roto-tilling to 8” depth; removing/replacing mulch
2. Includes replacement of up to 25 shrubs/perennials
3. Estimate for 20 storm drain inlets/4 manholes; 1,000 gals waste
4. Includes plant fertilization
5. Includes inspection of storm drain inlets and waste removal

Contractor D - Cost per square foot: $0.80 (9,046 sq/ft)

Stormwater Management Systems
Reserve Study

Reserve Studies (HB 107)
Stormwater Management Systems

- Define scope of study
  - BMPs
  - Conveyance systems
- Ensure service provider has the requisite expertise
  - Provide the SWM Plan
- Ask to accompany the assessor on inspection
- Get answers to any questions about the report



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- Community Harmony & Spirit
- Community Security
- Energy Efficiency
- Ethics
- Financial Operations
- Governance
- Green Communities
- Natural Disasters
- Reserve Studies
- Strategic Planning
- Transition

Remediation Fee Credit Program

ANNE ARUNDEL COUNTY
MARYLAND

Anne Arundel County's

Watershed Protection and Restoration Program

STORMWATER REMEDIATION FEE

CREDIT POLICY AND GUIDANCE

(Multi-Family, Non-Residential and/or Residential Properties with an Inspection and Maintenance Agreement or Stormwater Remediation Fee Credit Agreement)

December 2023

- Up to 50% credit
- Submitted NLT 1 October
- Processing time of ~90 days

For questions about the WPRF Credit Program
Call 410-222-7536 or wprf@aacounty.org

Key Points of Contact

- I&P
  - FOI Requests: Tracie Reynolds ipreyn26@aacounty.org
  - Inspections: Brad Burnham ipburn22@aacounty.org
- DPW
  - Public BMPs and Conveyance Ryan Rich pwrich25@aacounty.org
- WPRP
  - Stormwater Remediation Fee: Sally Szydlowski pwszyd00@aacounty.org
- Constituent and Community Services
  - Director: Vincent Moulden exmoul00@aacounty.org
- Watershed Stewards Academy
  - Stormwater Success Jeffrey Popp jeff@aawsa.org

Objective of ESD Stormwater Management

David Wallace, Severn Riverkeeper Program, Nov 2000

The Wicomico River, top, and Whites Neck Creek, bottom, flow toward the Potomac River in Charles County, Md., on June 5, 2018. (Photo by Will Parson/Chesapeake Bay Program)

Cleaner Chesapeake Bay

Reserve Study - Stormwater Management Replacement Items & Schedule (2024)

- Stormwater piping (NEL 20 years) - $35,000 (Repair 10 & 30 years)
  - NOTE: Stormwater piping and underground infrastructure seldom need replacement. Typically, work on these components involves repairs to separated pipe joints. This Study provides an allowance for such work which should be revised as empirical data is available regarding historical costs.

- Bio-swale/Detention basins (NEL 20 years) - $10,000 (Repair 10 & 30 years)
  - NOTE: Bio-swales do not typically require dredging. Most of the work conducted on these stormwater control features involves the removal of weeds and other maintenance.

- Stormwater inlet, street drain (NEL 45 years) - $25,000 (36 years)
  - NOTE: None

Does this make sense to the HOA Board?