Non-Traditional Options – Getting to 2025… Pond Retrofits and BMPs Aren't the Only Answer

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Mary Roman, PE, CFM

Claire Weinrib, EIT

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Chesapeake Bay TMDL

- Developed by the EPA in 2010
  - Limits on TN, TP, and TSS entering the Bay and its tidal rivers
- 2025 deadline for implementing control measures to restore the Bay
- States/DC developed WIPs detailing strategies to meet TMDL

Source: https://en.wikipedia.org/wiki/Category:Chesapeake_Bay_watershed

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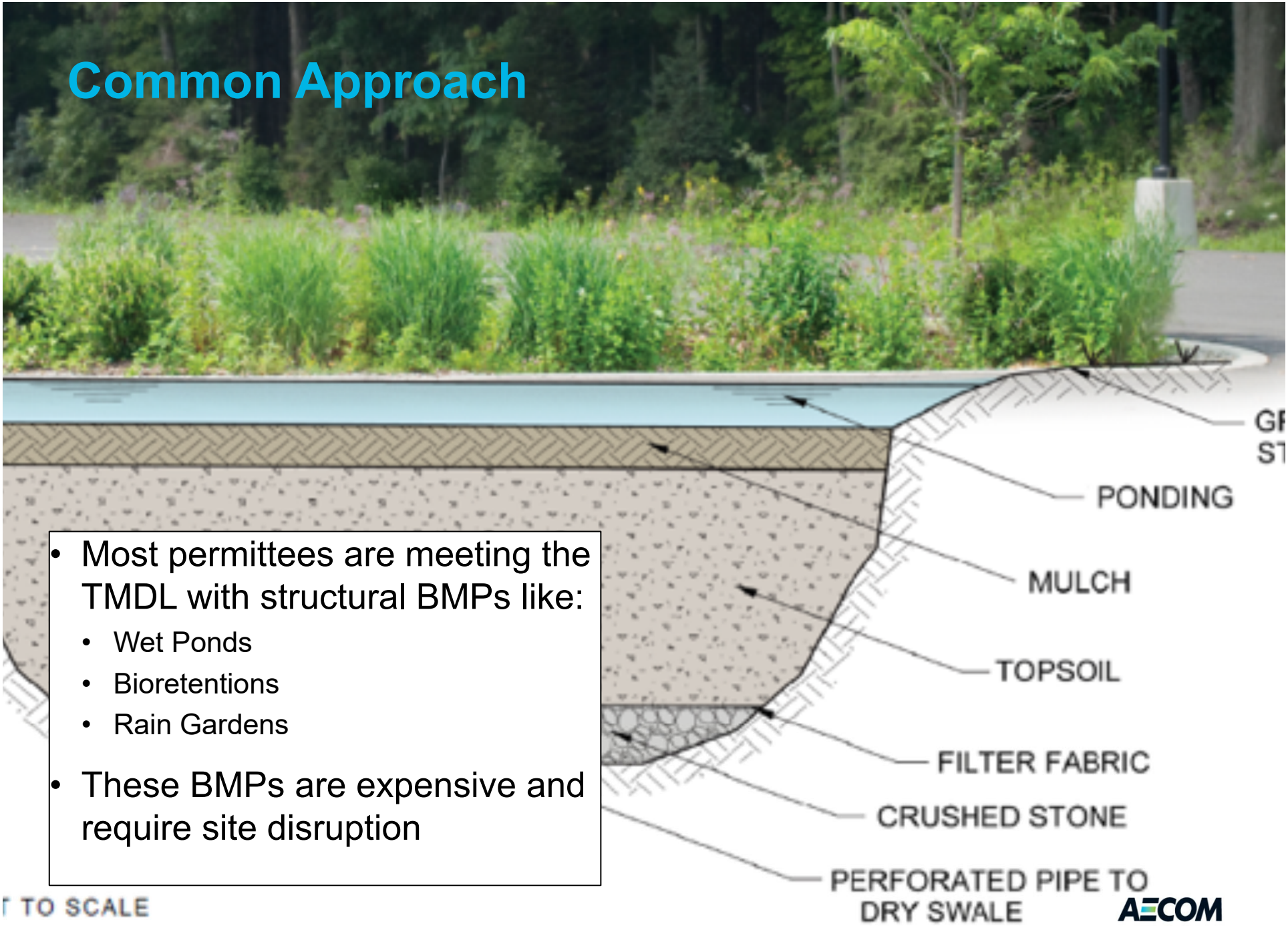
Common Approach



- Most permittees are meeting the TMDL with structural BMPs like:
  - Wet Ponds
  - Bioretentions
  - Rain Gardens
- These BMPs are expensive and require site disruption

Source: https://www.lyngsogarden.com/community-resources/bioretention-cells-what-do-they-do/

Alternative BMPs requiring construction

- Stream Restoration
- Shoreline Management

Stream Restoration and Shoreline Management

- Shoreline Management – 0.04 IA credits per 1,000 LF
- Stream Restoration – Credit given has recently increased by 100% and 200%, depending on the project region (coastal vs. non-coastal)
  - MDE *Stream Restoration Crediting Clarification for MS4 Permitting Purposes* (Memorandum)

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Looking for an approach that doesn't involve a CIP project?

Options to consider..

- Street Sweeping
- Disconnection of Non-Rooftop runoff
- Grass Swales
- Other Alternative BMPs (requiring low-moderate construction)

Street Sweeping

Routine program for debris and sediment removal from roadways

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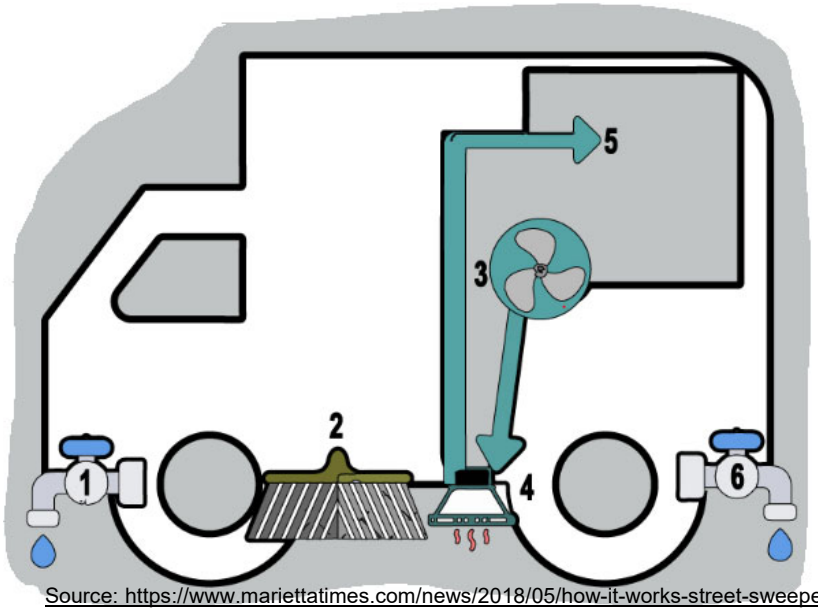
Source: https://pubs.usgs.gov/sir/2007/5156/

Street Sweeping Methods

- Regenerative Air Sweepers (RAS)
  - **Most effective method**
  - Penetrates potholes and cracks
  - Removes dust from air before discharging it
  - Best at collecting fine materials
- Vacuum Air Sweepers (VAS)
  - Good at collecting fine materials
  - Can emit dust into air
  - Not suited for roadways with cracks and potholes
- Mechanical Broom Sweepers (MBS)
  - **Least effective method**
  - Not suited for roadways with cracks and potholes
  - Good at collecting coarse materials only



Source: https://www.mariettatimes.com/news/2018/05/how-it-works-street-sweeper-combines-water-brooms-vacuum/

Approach

- Program must conduct street sweeping at least biweekly
- Weight of sweeper material collected must be measured
- Removal efficiency depends on the type of sweeper vehicle used
  - RAS or VAS are better than MBS because they remove fine sediment, though the mass loading approach would not account for this difference

Source: https://www.seattle.gov/utilities/environment-and-conservation/projects/sewage-overflow-prevention/street-sweeping

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Crediting

Street Lane VS. Mass Loading Approach

- Mass Loading – street debris collected is measured in tons and converted into pounds of TN, TP, and TSS removal.
- Street Lane – number of lane miles swept during the entire year is reported and converted into pounds of TN, TP, and TSS removal.
  - MBS receives a lower pollutant removal efficiency than RAS or VAS
  - Difference in efficiency between MBS and RAS/VAS is especially apparent for TSS (10% vs. 25%)

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Crediting

2014 MDE Guidance vs 2016 Expert Panel Guidance

- MDE is the governing body for Maryland NPDES permittees, but the expert panel uses more advanced techniques to determine credit.
- Until MDE adopts the expert panel method, it is safer to use the MDE method. However, the expert panel method can be used to plan for future compliance.

Street Sweeping

MDE:
Mass loading OR;
Street lane approach

Expert Panel:
Mass loading preferred OR;
Street lane approach using different nutrient loads per acre

Catch Basin Cleaning

MDE:
Mass loading

Expert Panel:
Updated Mass loading that differentiates between wet sediment (0.7*mass) and wet organic matter (0.2*mass) when calculating dry mass. Also uses different nutrient factors.

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More Expert Panel Recommendations for Street Cleaning Practices (SCP)

- Maintain records, including parking conditions/controls
- Periodic nutrient sampling of sweeper wastes
- Develop verification program to document efforts and monitor collection characteristics

Pollutant Reductions Associated with Different Street Cleaning Practices					
Practice #	Description [1]	Approx Passes/Yr [2]	TSS Removal (%)	TN Removal (%)	TP Removal (%)
SCP-1	AST- 2 PW	~100	21	4	10
SCP-2	AST- 1 PW	~50	16	3	8
SCP-3	AST- 1 P2W	~25	11	2	5
SCP-4	AST- 1 P4W	~10	6	1	3
SCP-5	AST- 1 P8W	~6	4	0.7	2
SCP-6	AST- 1 P12W	~4	2	0	1
SCP-7	AST- S1 or S2	~15	7	1	4
SCP-8	AST- S3 or S4	~20	10	2	5
SCP-9	MBT- 2PW	~100	0.7	0	0
SCP-10	MBT- 1 PW	~50	0.5	0	0
SCP-11	MBT- 1 P4W	~10	0.1	0	0

AST: Advanced Sweeping Technology MBT: Mechanical Broom Technology
[1] See Table 15 for the codes used to define street cleaning frequency
[2] Depending on the length of the winter shutdown, the number of passes/yr may be 10 to 15% lower than shown

Source: 2015 Expert Panel Report on Street and Storm Drain Cleaning

Success Stories…..

- MAA has received **89.8** impervious acre credits for street sweeping
- MDTA has received **254.3** impervious acre credits for street sweeping

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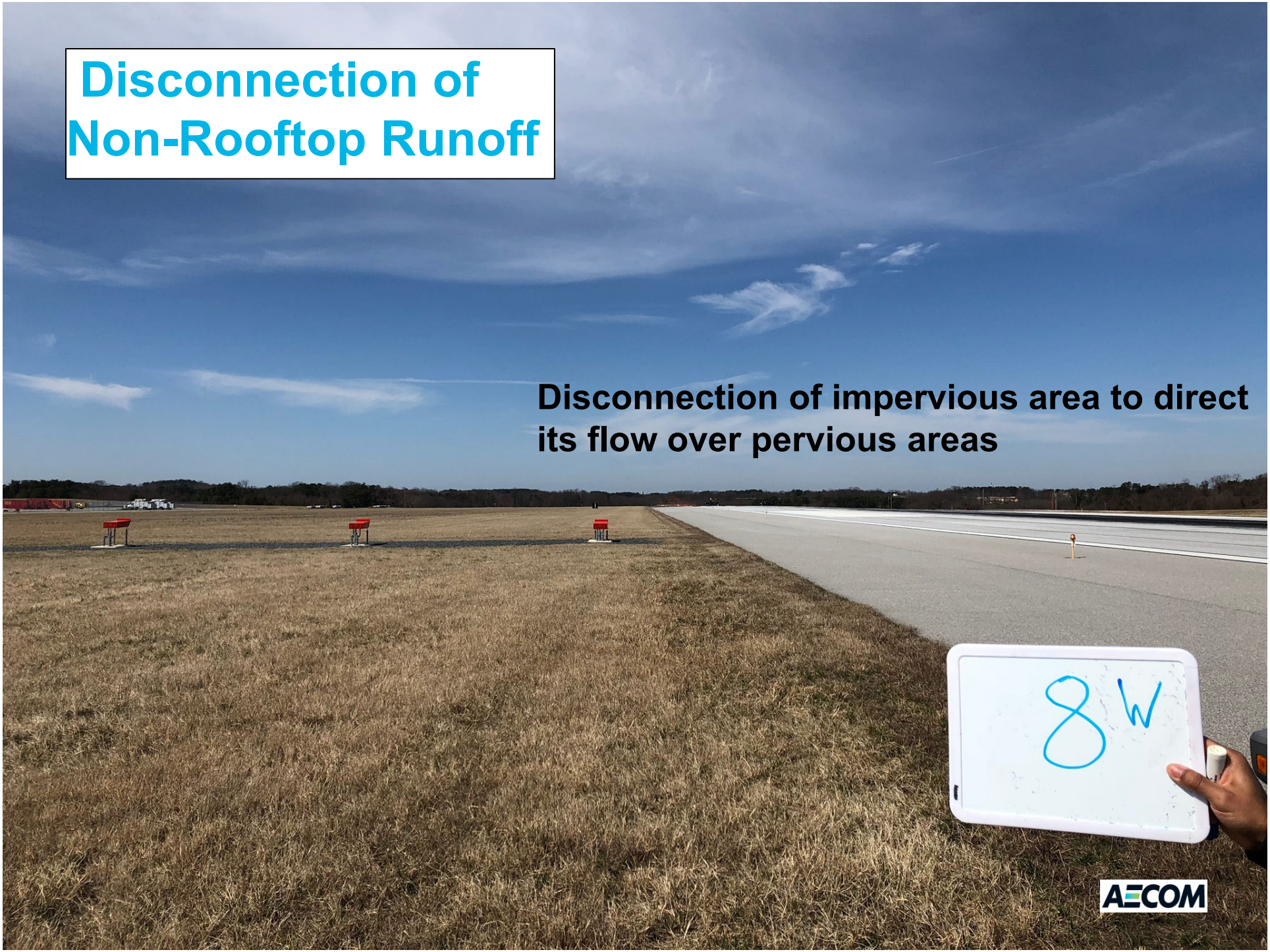
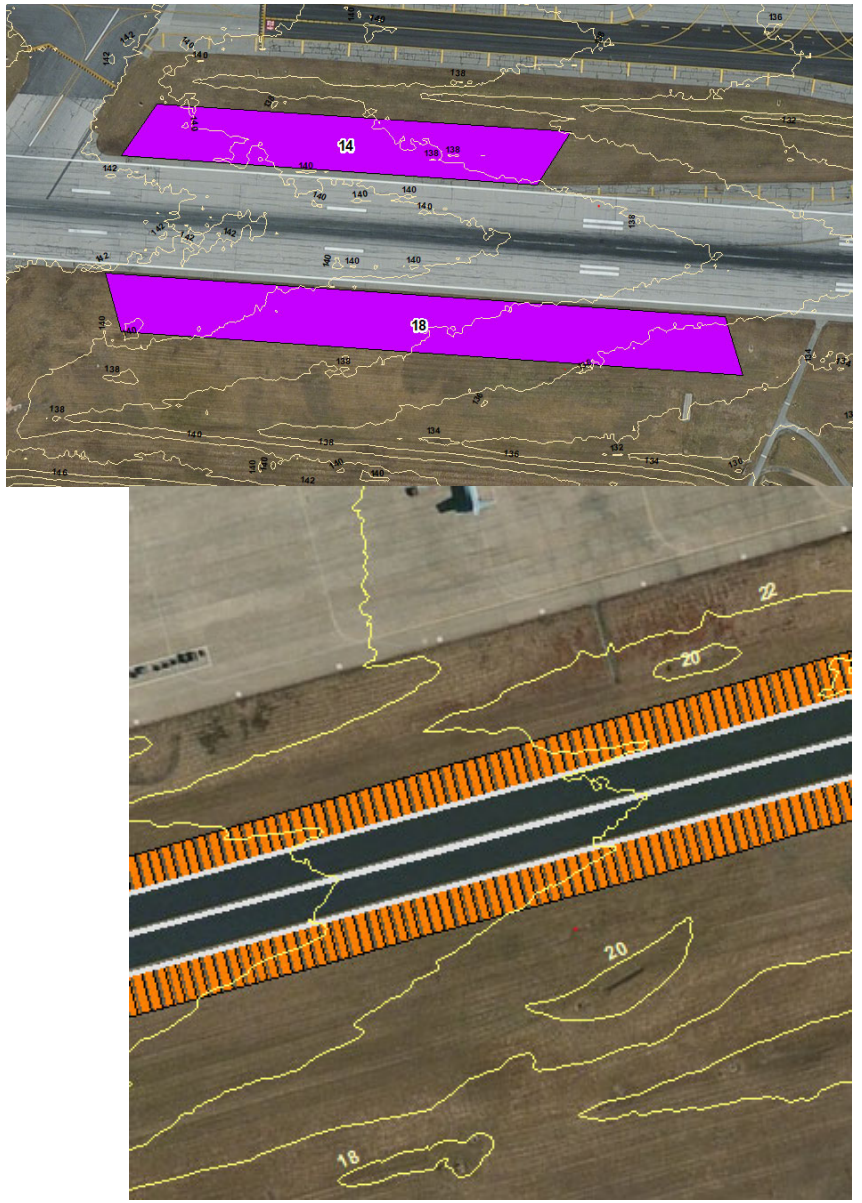
Disconnection of Non-Rooftop Runoff



Desktop Analysis

Parameters -

- No hotspot runoff
- Impervious flow path between 10 and 75 feet
- Disconnection flow path greater than or equal to contributing imperious flow path
- Slope <= 5%
- 1-2 ft wide gravel transition strip between impervious flow area and pervious disconnection



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Crediting

Table 5.7. ESD Sizing Factors for Non-Rooftop Disconnection

Ratio of Disconnection Length to Contributing Length					
Impervious Ratio	0.2:1	0.4:1	0.6:1	0.8:1	1:1
Pervious Ratio	0.1:1	0.2:1	0.3:1	0.4:1	0.5:1
P_E (in.) =	**0.2**	**0.4**	**0.6**	**0.8**	**1.0**

Table 3. Impervious Acre Credit for Treatment Above and Below 1 Inch of Rainfall

Rainfall Depth Treated (inches)	Impervious Acre Credit per Acre of Watershed Impervious Area	Impervious Acre Credit per 50 Acres of Watershed Impervious Area
0.5	0.5	25
0.75	0.75	37.5
1.0	1	50
1.4	1.1	55
1.8	1.2	60
2.2	1.3	65
2.6	1.4	70

Sources:
Top – MDE's *Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated*
Bottom – MDE's *Stormwater Design Manual. Chapter 5*

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Success Story…

- MAA has obtained over **90** imperious acres of credit for NDNRs

Grass Swales

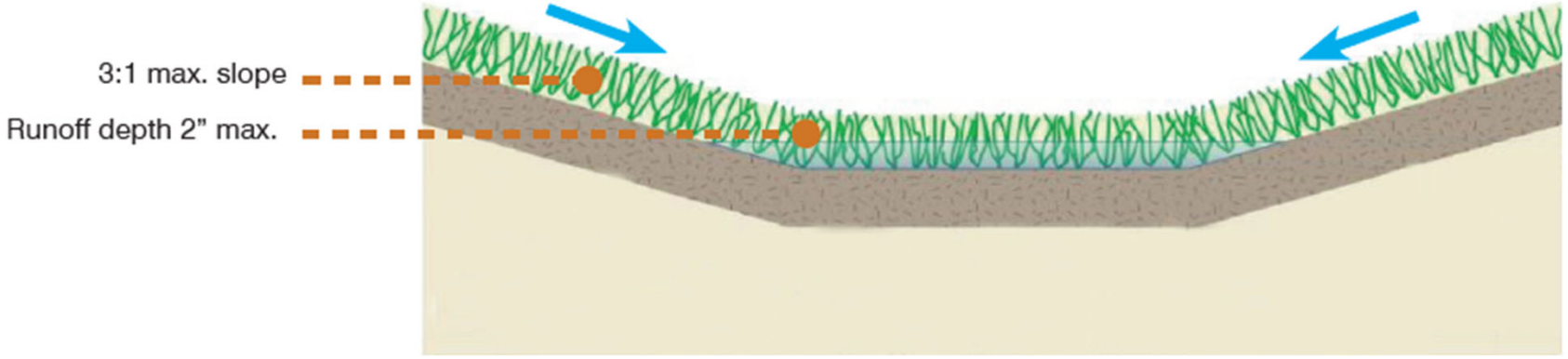
Stabilized turf channel used to convey runoff or encourage infiltration

Source:: https://www.pinterest.com/pin/435582595190669883/

Desktop Analysis

Parameters: (MDE *Stormwater Design Manual, Chapter 5* guidance)

- Swale bottom area at least 2% of overall DA to swale
- Side slopes 3H:1V or flatter
- Equivalent flat bottom width between 2 and 8 feet
- Channel slope 4% or less
- No hotspot runoff
- Best for soils of HSG A, B, or C



Source: https://developersguide.njfuture.org/what-is-green-infrastructure/small-landscape-practices/grass-swale/

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Crediting

- Grassed swales are an “RR” practice

Table 2.E. Removal Rates for ESD/RR and ST Practices

Runoff Depth Treated (inches)	TSS		TP		TN	
	ESD/RR	ST	ESD/RR	ST	ESD/RR	ST
0.00	0%	0%	0%	0%	0%	0%
0.25	40%	37%	38%	29%	32%	19%
0.50	56%	52%	52%	41%	44%	26%
0.75	64%	60%	60%	47%	52%	30%
1.00	70%	66%	66%	52%	57%	33%
1.25	76%	71%	70%	55%	60%	35%
1.50	80%	74%	74%	58%	64%	37%
1.75	83%	77%	77%	61%	66%	39%
2.00	86%	80%	80%	63%	69%	40%
2.25	88%	83%	82%	65%	71%	41%
2.50	90%	85%	85%	66%	72%	42%

Note: Where runoff reduction or ESD
ESD/RR curves should be used.

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2.2	1.3	65
2.6	1.4	70

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Bottom – MDE’s *Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated*

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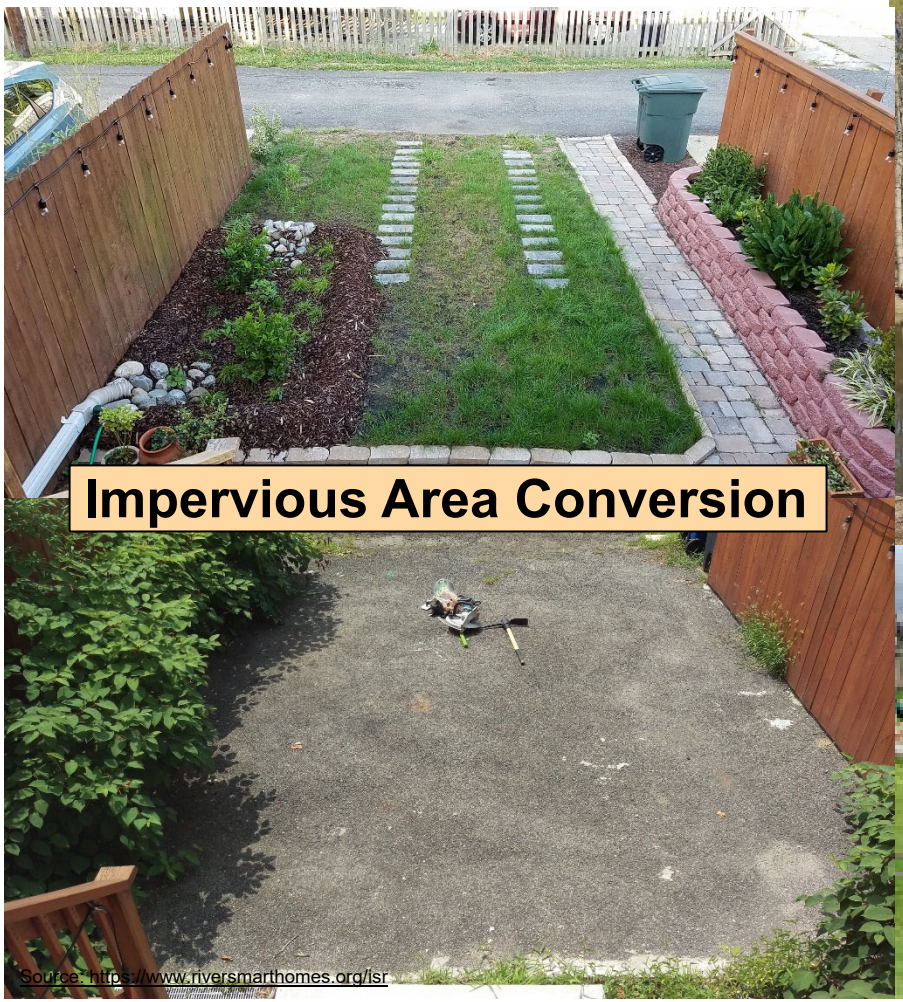
Other related "alternative" approaches to meet Ches Bay TMDL requirements

Source: https://www.straughanenvironmental.com/congratulations-to-mdtas-tmdl-pilot-tree-planting-project/

Tree Planting



Impervious Area Conversion

Source: https://www.riversmarthomes.org/isr

Source: https://aim2flourish.com/innovations/smarter-technology-for-stormwater-infrastructure

CMAC systems

Source: https://www.stormwaterpartners.com/facilities

"Paper Ponds"

Recap

- Standard options for meeting the Chesapeake Bay TMDL can be costly and come with barriers to implementation.
- Communities can avoid high costs of implementation by using methods that do not require construction or new land area.
- BMPs like NDNRs, street sweeping, and grass swales are viable options for meeting regulatory requirements.

Source: https://www.grapewellstormwaterconsulting.com/Chesapeake-Bay-Restoration-Requirements.php

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Questions?