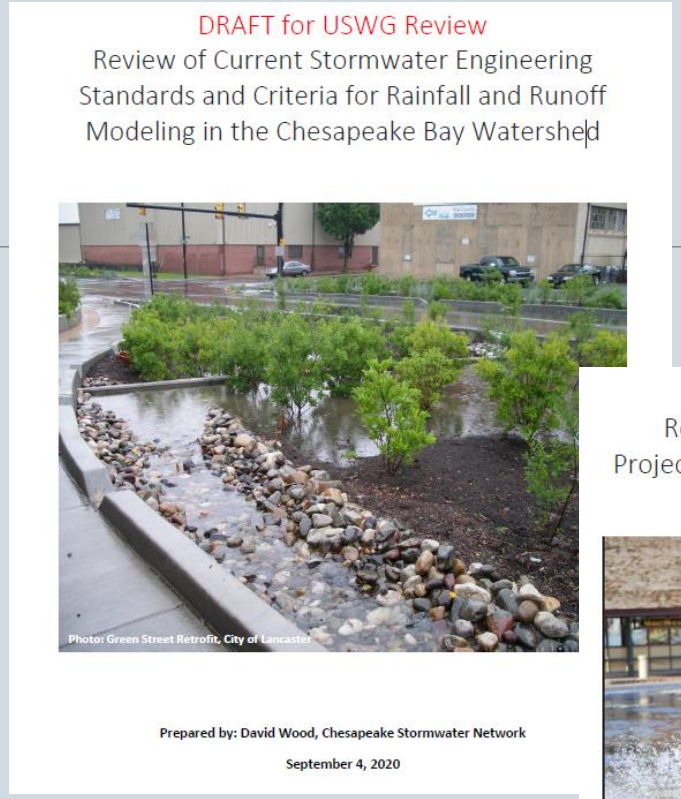
Lightning Update: Maintaining Resilience of Stormwater and Restoration Practices

MODELING WORKGROUP

OCTOBER 6, 2020

Overview

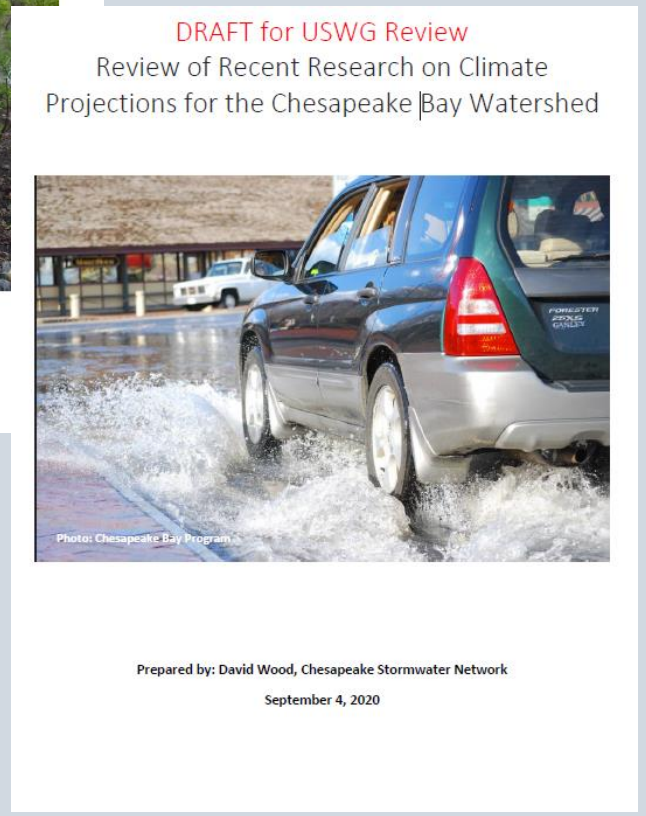
- 2 New Memos Released as Draft
- Final memo on the way by November
- Memo 2: Review of Current Stormwater Engineering Standards and Criteria for Rainfall and Runoff Modeling in the Chesapeake Bay Watershed
- Memo 3: Review of Recent Research on Climate Projections for the Chesapeake Bay Watershed


DRAFT for USWG Review

Review of Current Stormwater Engineering Standards and Criteria for Rainfall and Runoff Modeling in the Chesapeake Bay Watershed

Prepared by: David Wood, Chesapeake Stormwater Network

September 4, 2020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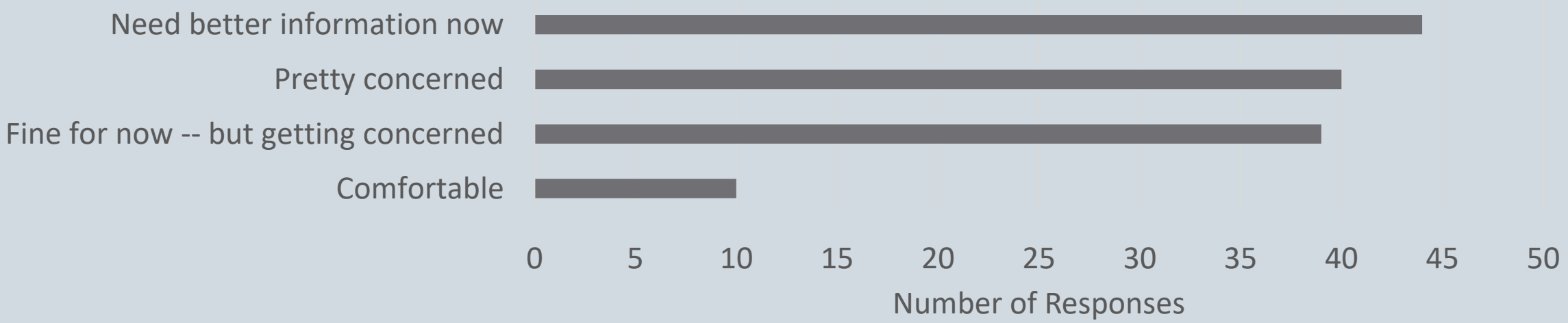
Memo 2

From Memo 1:

How comfortable are you with the quality and utility of the engineering design criteria on future rainfall intensity provided to you by state and/or federal authorities in your community?



https://chesapeakestormwater.net/wp-content/uploads/dlm_uploads/2020/02/FINAL-Climate-Change-and-Stormwater-Survey-Memo.pdf

Memo 2 Highlights

- Floodplains: 52% of NFIP communities have not had their FEMA floodplain hazard map updated in the last five years and 26% have not been updated in the last 10 years
- Changing climate impacts more about stormwater modeling than just the 24-hour design storm
- There is tremendous variability across and within states with regard to design criteria
- Age of precipitation data matters – Atlas 14 is already 20 years old and differs from TP for larger events
- With one or two exceptions, last wave of stormwater manual updates occurred in 2006-2013. It is time to start considering the next generation of design needs (more than just sizing).

Memo 3

Precipitation

Rainfall volume and intensity both expected to increase

Assuming historical climate data is representative of future conditions can lead to underestimate of extreme precipitation events

Intense storm events are more likely to:

- Bypass treatment in stormwater BMPs.
- Require more frequent maintenance to address erosion at inlets, clogging of filter media, and other potential performance-altering impacts

Table 2. Percent change in rainfall volume as compared to 1995 (CBP, 2019)

Geography	**Year 2025**	**Year 2035**	**Year 2045**	**Year 2055**
Delaware	2.06%	3.10%	4.14%	6.23%
Maryland	3.09%	4.13%	4.92%	6.70%
Virginia	2.56%	3.68%	5.23%	6.50%
Pennsylvania	3.28%	4.46%	5.07%	6.32%
District of Columbia	3.14%	4.11%	5.07%	6.83%
West Virginia	2.72%	3.73%	5.23%	6.53%
New York	5.00%	6.09%	5.99%	6.24%
CB Watershed	**3.11%**	**4.23%**	**5.19%**	**6.44%**

Downscaling Studies

- Stormwater models require precipitation at finer resolutions than is produced by global and regional climate models
- Projection and downscaling methods vary, and different approaches may yield significantly different results.
- Five Chesapeake Bay downscaling studies from the past 5 years were analyzed
- To date, there are limited examples of projections being used to update design sizing criteria

Table 6. Summary of Select Mid-Century Rainfall Intensity Projections (in/hr) in downscaling studies[1].

Study (Projection Location)[2]	Duration	Frequency	Atlas 14	Mid-Century Projection	Percent Change
New York (Elmira)	1hr	2yr	1.02	1.10	8%
		10yr	1.51	1.53	1%
		100yr	2.34	2.56	9%
	24hr	2yr	0.10	0.12	20%
		10yr	0.16	0.17	6%
		100yr	0.24	0.28	17%
Maryland Eastern Shore (Easton)	1hr	2yr	1.47	2.1	9%
		10yr	2.15	3.0	16%
		100yr	3.16	4.5	27%
	24hr	2yr	0.139	0.2	44%
		10yr	0.217	0.3	32%
		100yr	0.375	0.5	33%
Virginia Beach	1hr				
	24hr	2yr	3.37	4.4	31%
		10yr	5.58	6.5	16%
		100yr	9.37	11.9	27%

Other Memo Highlights

Summary of common downscaling methodologies

More details on the methodologies used for each Chesapeake Bay study

Review of CBPO, National Climate Assessment, and IPCC projections for:

- Temperature
- Stream Flow
- Sea Level Rise

Summary of potential water quality impacts resulting from projected changes

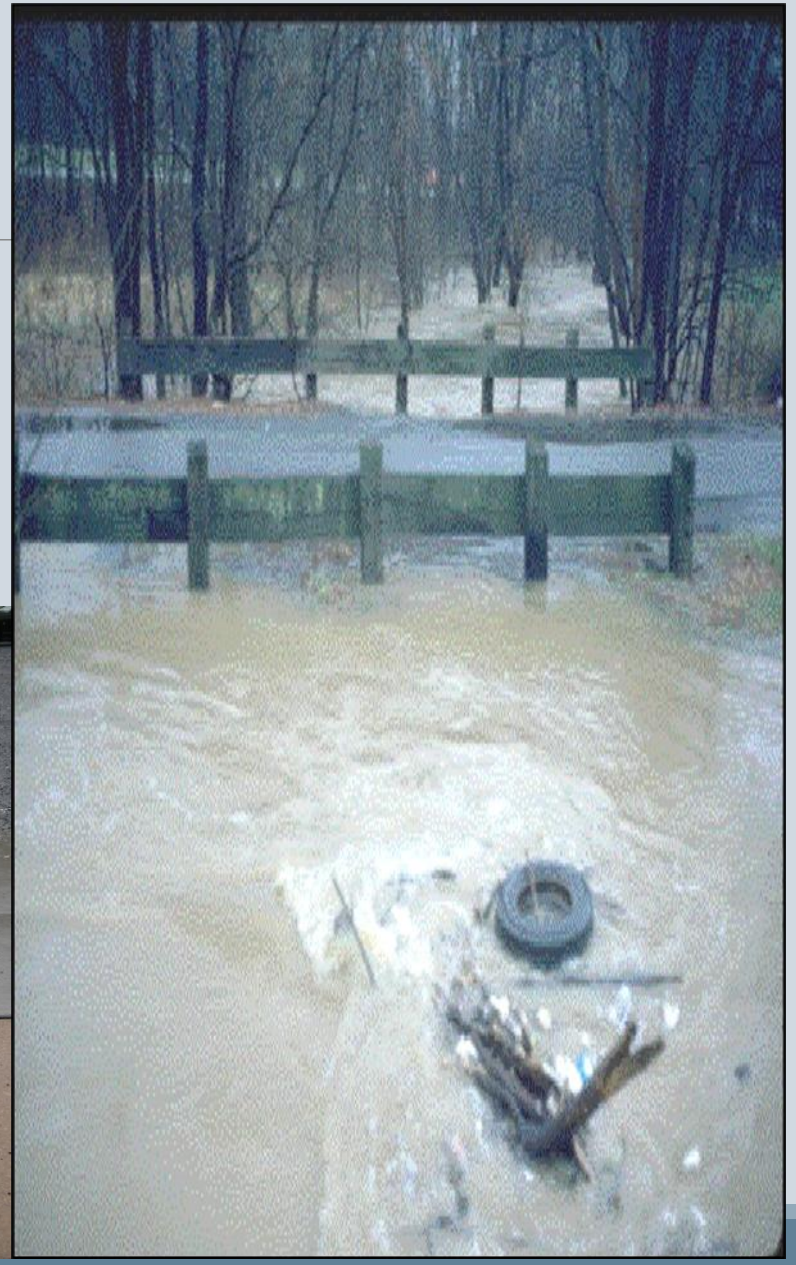
BMP Vulnerability Analysis

LOOKING AHEAD TO MEMO 4

What BMPs are at risk

Upland vs Stream Corridor

Drainage Area – Distributed LID vs Detention Ponds



What does failure look like

What are potential design adaptations

Shorter practice lifespans?

Retrofits/makeovers?

More BMPs “treatment trains”?

Improved plumbing (bypass/overflows)?

Providing factor of safety (freeboard)?

Questions?