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New York State Stormwater Management Design Manual 2023 Update

Monroe County SWCD Stormwater Training
November 29, 2023

General Background

- The Design Manual is referenced in the DEC's Construction General Permit (CGP) and provides standards and specifications for the selection and design of stormwater management practices (SMPs).
- For projects that require post-construction stormwater controls, Owners and Operators of construction projects subject to the CGP must use the Design Manual, or the equivalent, to develop Stormwater Pollution Prevention Plans (SWPPPs).
- Approximately 1,500 construction projects per year are authorized under the CGP with the majority requiring post-construction controls.

Update Background

- Since the initial version of the Design Manual in 2001, the Design Manual has been periodically updated to incorporate changes in technology and add new SMPs
  - 2010 Update – e.g. added green infrastructure
  - 2015 Update – e.g. updated precipitation maps
- DEC contracted with LaBella PC to prepare the 2022 draft Design Manual. The DEC also contracted with the Center for Watershed Protection to complete a peer review of the Design Manual.

Public Comment and Response

- The 2022 draft Design Manual was public noticed for 30 days on DEC's Environmental Notice Bulletin (ENB) beginning on October 19, 2022. Per an extension request, a 30-day extension was applied, with a final deadline for comments of December 18, 2022.
- DEC received comments from 42 parties totaling approximately 600 individual comments.
- Some of the comments addressed sections of the Design Manual which were not part of this update, and others were suggestions for future updates.

Summary of Updates

Changes made to the Design Manual in the 2023 update include guidance on or further information addressing:

- Climate Change
- Site Limitations
- Infiltration Testing
- Infiltration Practices
- Bioretention
- Channel Protection Volume
- New Practices
  - Gravel Wetland
  - Bioslope
- Rainfall Data
- Flow Through Practice Calculations
- Redevelopment WQv Calculations
- Stormwater Hotspots
- Stormwater Design Examples
- SMPs in Urban Areas
- Pollutants of Concern
- Landscaping and Planting
- SMP Maintenance
- CAD Details
- Removed Pocket Pond SMP
- Relocated Appendix C Information

Updates – Climate Change Guidance

Added Climate Change Resiliency Planning (Section 2.7)

New York State is predicted to face challenges from a rapidly changing climate, to include:

- Increasing Temperature: Temperatures are expected to rise, increasing the temperature of stormwater runoff entering heat-vulnerable environments.
- Increasing Precipitation: The intensity and frequency of precipitation events are projected to increase, resulting in the potential for stormwater management and conveyance systems to be overwhelmed.
- Rising Sea Level: Flooding already impacts parts of the State and is projected to worsen as sea levels rise and inundate low-lying coastal areas during high tides.
- Shifting Ecology: Studies indicate that regional ecology, including significant and natural communities, will shift with the change in climate.

Future Updates – Climate Change Guidance

Guidance related to climate resilient SMP design is expected to be included in a future version of the Design Manual. Currently available on DEC's website are the following guidance documents:

- Using Natural Measures to Reduce the Risk of Flooding and Erosion
  - https://www.dec.ny.gov/docs/administration_pdf/crranaturalmeasuresgndc.pdf
- New York State Flood Risk Management Guidance for Implementation of the Community Risk and Resiliency Act
  - https://www.dec.ny.gov/docs/administration_pdf/crrafloodriskmgmtgdnc.pdf
- New York State Flood Risk Management Guidance for Implementation of the Community Risk and Resiliency Act Estimating Guideline Elevations
  - https://www.dec.ny.gov/docs/administration_pdf/crraestelevguidelines.pdf
- Tidal Wetlands Guidance: Living Shoreline Techniques in the Marine District of New York State
  - https://www.dec.ny.gov/docs/fish_marine_pdf/dmrlivingshoreguide.pdf

Updates – Addressed Site Limitations

Guidance for Green Infrastructure and SMPs with poor site conditions

- Section 3.6 specifies site limitations such as high-water table, shallow depth to bedrock, or soils with an infiltration rate less than 0.5 in/hr. Currently addressed on 3.16: default to minimum rrv
- Green Infrastructure practices: developed uniform and consistent design standard requirements, including specifications for locations with site limitations.
- SMPs: separation requirements added to details for site limitations, and now require liners when vertical separation cannot be met to site limitations.

Updates – Infiltration Testing

Update to Appendix D: Infiltration Testing:
Appendix D has been updated to include testing requirements for all standard SMP's and green infrastructure practices that can be designed for infiltration.

- Feasibility testing: elaborated on testing requirements and goals Can you put infiltration on the site at all?? Wasn't being done before.
- Design testing: added and expanded upon the requirements from Technical FAQs Do infiltration testing at particular site OF PRACTICE to be sure it works.
- Laboratory testing of fill: now requires a factor of safety of 2, and field testing to confirm results after fill is placed

Updates – Infiltration Practices

Enhanced guidance for infiltration practices:
The 2023 Design Manual clarifies the requirements for pretreatment, separation to groundwater, and practices in fill.

- Requirements for when drainage areas over 5 acres is allowed added for 10, 25, and 50 acre areas.
- Underground infiltration design standard moved from Chapter 10 to Chapter 6
- Pretreatment requirements for fast draining soils relaxed, from 50% at 2.00 in/hr and 100% at 5.00 in/hr to 25% for up to 10.00 in/hr and 50% when above 10.00 in/hr.
- Table listing all separation requirements added for clarity.

Updates – Bioretention

Enhanced guidance for bioretention filters:

Also a standard for Ph-impaired sites. Goal to reduce N loads to receiving larger watershed.

- New standard and enhanced soil media specification
- k factor changed from 0.5 ft/day to 1 ft/day
- Increased WQv ponding depth from 6" to 12", and a maximum of 18" during the 100-year storm Need hydric plants to survive.
- Clarified separation requirements including conditions requiring an impermeable liner
- Added specification and detail for infiltration bioretention

Updates – Bioretention

Bioretention sizing calculation:

Filtering practices 1-5 use this equation:

$$A_f = \frac{(WQ_v)(d_f)}{(k)(h_f + d_f)(t_f)}$$

Where:

A_f = Filter area (sf)

WQ_v = Water Quality Volume (cf)

d_f = Depth of filter (ft)

k = Permeability flow rate of filter media (1 ft/day)

h_f = Average height of ponding (ft) (0.5 ft max.)

t_f = Maximum filter bed drain time (days) (use 1.67 days for sand filters, 2 days for bioretention)

Updates – Channel Protection Volume

The Channel Protection Volume requirements may be waived if:

- Reduction of the entire CPv is achieved at a site through runoff reduction or infiltration systems.
- CPv is not required at sites where the 1-year post-development peak discharge is less than or equal to 2.0 cfs.
- Where a CPv control orifice is provided, the minimum orifice size shall be 3 inches, with acceptable external rack or internal orifice protection (See Appendix C for details of a low flow orifice and trash rack options).
- The site directly discharges into a fifth order or larger water body (streams, rivers, or lakes) or tidal waters, where the increase in smaller flows will not impact the stream bank or channel integrity.

Updates – New Practices: Gravel Wetland

Gravel Wetland Design Standard (Section 6.2)

- Design guidance for Gravel Wetland was added based on research conducted of other states' stormwater programs
  - Provides anaerobic and aerobic treatment for nutrient removal.

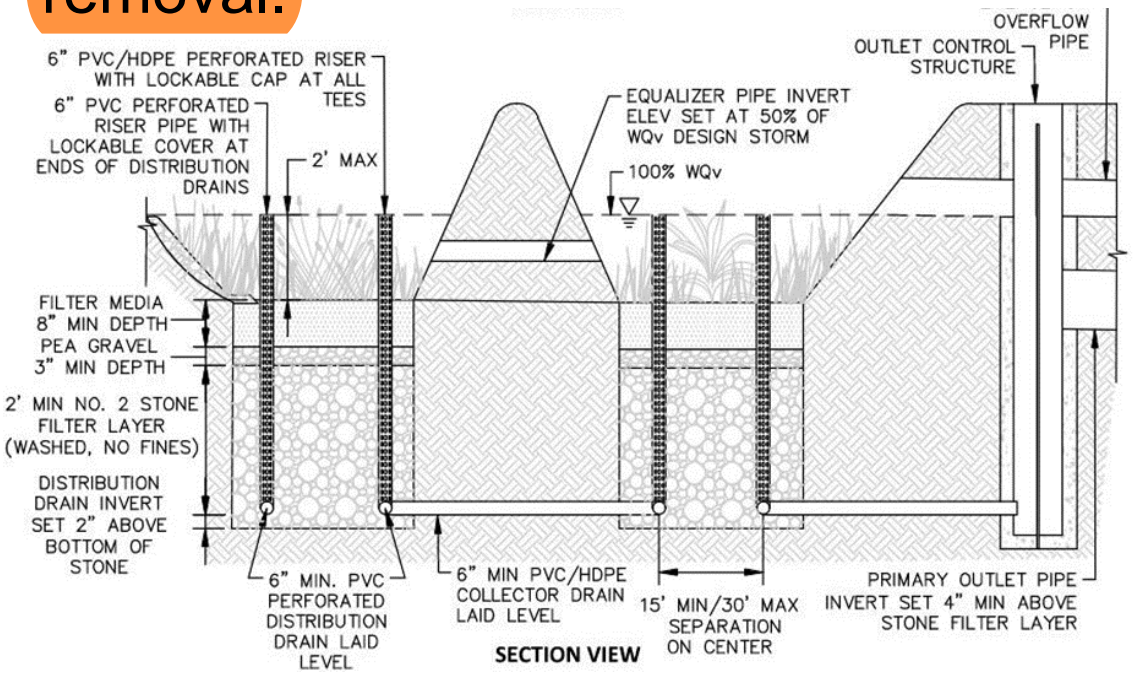

Photo Source: UNH Stormwater Center

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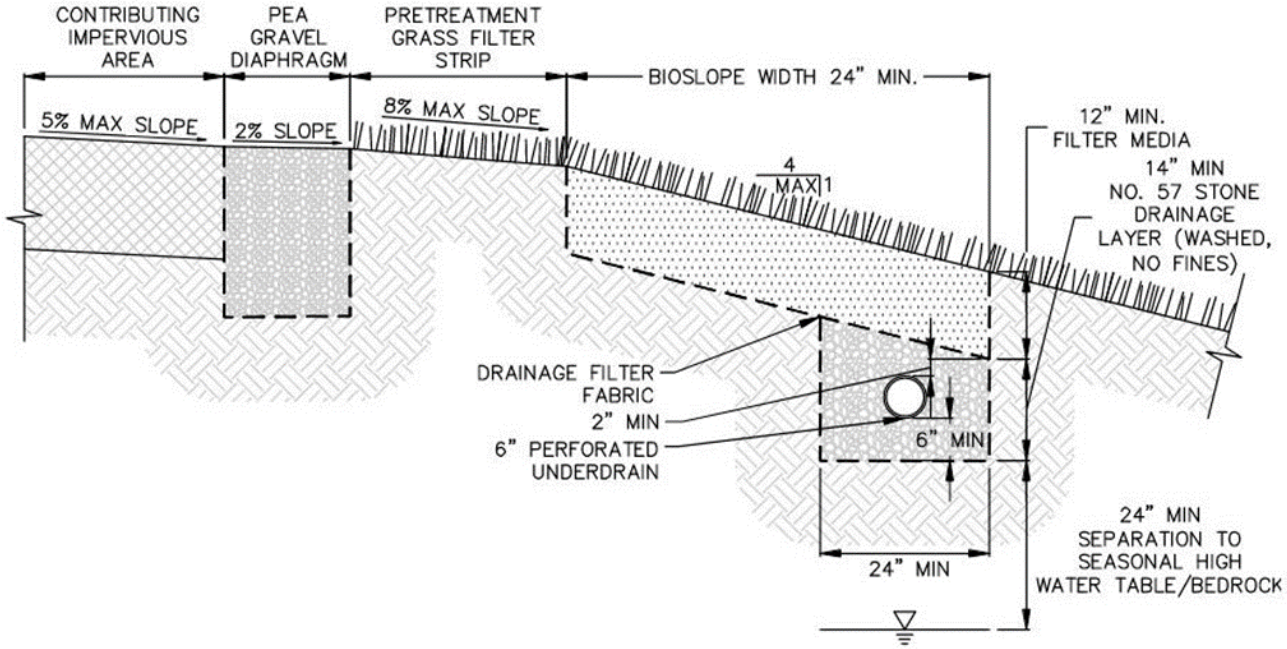
Updates – New Practices: Bioslope

Bioslope Design Standard (Section 6.4)

- Design guidance for Bioslope practice was added based on research conducted of other states' stormwater programs
  - Intended to be used along linear projects.

Along Roadways. Only works on linear projects.



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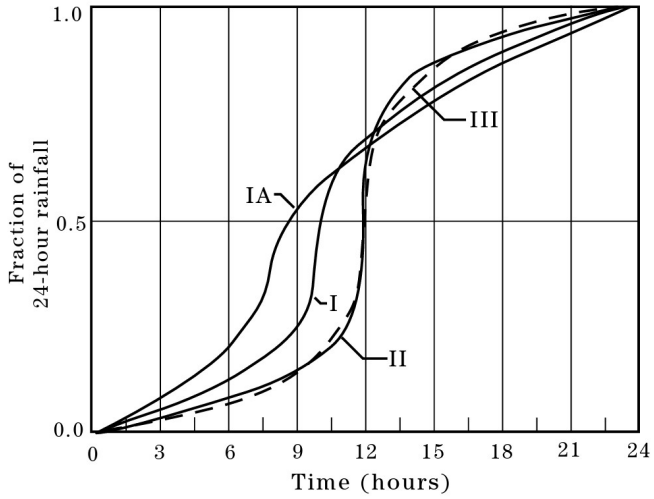
Updates – Rainfall Guidance

Updated rainfall guidance (Section 4.9):

- The outdated 1-, 10- and 100-year isohyet maps were removed. The 2023 Design Manual now requires the use of more current precipitation data from NRCC/NRCS or NOAA.
- Engineers will download site specific rainfall data to generate intensity-duration-frequency (IDF) curves
- These can be used in modelling software to generate rainfall curves more accurate than the generalized type II distribution assumed for the northeast.



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Updates – Flow Through Practices

Guidance on peak flow calculations for flow through practices (Section 9.3 and Appendix B)
The WQv peak flow calculations have been updated in Appendix B, including a detailed walk through using HydroCAD.

- Flow through practices are typically associated with redevelopment, and these requirements are included in Chapter 9.
- Appendix B formula revised to solve for the rain event that will generate the design flow rate, to be input into modeling

$$P_{90} = \frac{S + 2.5Q + (6.25Q^2 + 25SQ)^{0.5}}{5}$$

Updates – Redevelopment WQv

Numbers don't change, just clarified to be easier. Still doing same thing.

Sending 25% of the area to the practice and figuring out what to do with it.

Revised redevelopment WQv calculations (9.2.1.A)

- This section was revised to require a percentage of the redeveloped area to be directed to treatment practices, rather than a percentage of the water quality volume from those areas, simplifying calculations.
- WQv calculations still need to be conducted on a design point basis. Redevelopment projects draining to several design points need to consider each drainage area separately when determining increases in overall impervious area.
- Any increases in impervious area need to have 100% WQv and the required RRv provided.

Updates – Stormwater Hotspots

Enhanced guidance for Hotspots (Section 4.14):

- Clearly separate hotspot vs. non-hotspot drainage areas
- All drainage areas directed to the same SMP as a hotspot area need to meet the hotspot treatment requirements
- Differentiated between Level 1 and Level 2 hotspots

Activities		Illicit Discharge Potential		Level 1 (Infiltration Restricted)	Level 2 (Infiltration Prohibited)
		Closed System	Overland Flow		
Industrial activities that are eligible for coverage under the Multi-Sector General Permit for Stormwater Discharges Associated with Industrial Activities (MSGP) [1]	Industrial activities subject to effluent limitation guidelines	Medium	High		✓
	Industrial activities within Sectors C, J, L or U that are located within watersheds requiring enhanced phosphorus removal	Medium	High		✓
	All other industrial activities	Medium	Medium	✓	
Fueling stations		Medium	High		✓
Petroleum storage facilities		High	High		✓

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Updates – Stormwater Hotspots (Cont'd)

Activities	Illicit Discharge Potential		Level 1 (Infiltration Restricted)	Level 2 (Infiltration Prohibited)
	Closed System	Overland Flow		
Uncovered vehicle, aircraft, boat, and heavy equipment maintenance facilities	Low	Medium	✓	
Uncovered vehicle, aircraft, boat, and heavy equipment cleaning facilities	Low	Low	✓	
Uncovered vehicle, aircraft, boat, and heavy equipment storage areas	Low	Medium	✓	
Uncovered loading/unloading facilities and recessed loading areas	Low	Medium	✓	
Public works yard with salt storage	Medium	High		✓
Public works yard without salt storage	Medium	Medium	✓	
Facilities that generate or store hazardous materials	Low	High		✓
Wastewater treatment/disposal, solid waste, and composting facilities	Low	High		✓
Nurseries/garden centers	Low	Medium	✓	

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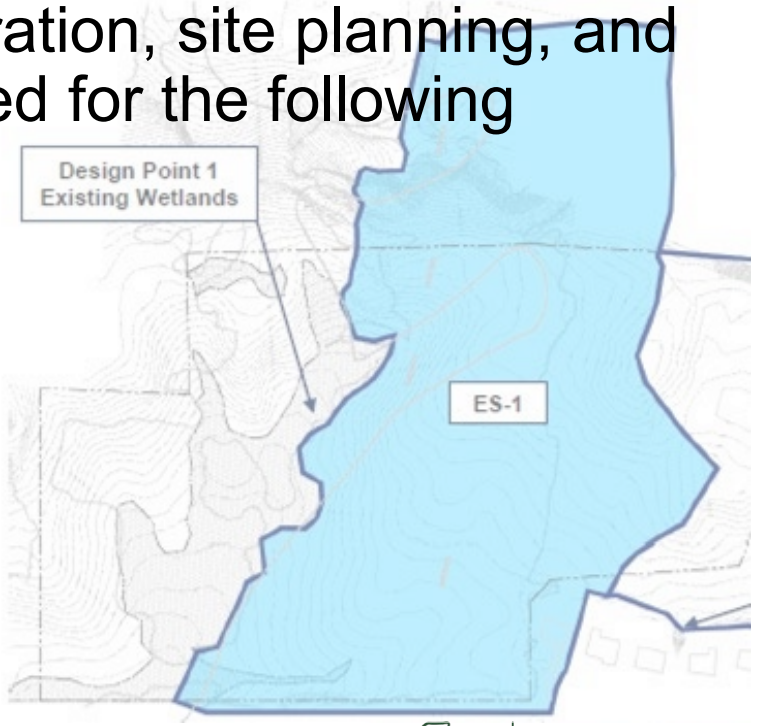
Updates – Stormwater Design Examples

- **Stormwater Management Design Examples (Chapter 7):** Updated calculations, including drainage area delineation, land cover statistics, time of concentration, site planning, and sizing calculations have been provided for the following scenarios:
  - Bioretention and Stormwater pond;
  - Bioretention and Infiltration Basin;
  - Dry Swale; and
  - Dry Wells in series.



Updates – SMPs in Urban Areas

New Chapter 8: Urban Stormwater Management:

- Added this chapter to detail the installation of green infrastructure practices in urban settings.
- Practice suitability matrix based on road classification
- Details design restraints and considerations for each practice

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Updates – SMPs in Urban Areas (Cont'd)

Tree Trench installed in Hudson Falls, NY

Rain Gardens installed at SUNY Albany campus

Porous Asphalt parking stalls installed in Cohoes, NY

Bioretention Bumpout (Millburn Environmental Commission)

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Updates – Pollutants of Concern (POCs)

New Chapter 10: Addressing Stormwater Pollutants of Concern:

The 2023 Design Manual adds recommended SMP design modifications intended to enhance pollutant removal for targeted pollutants of concern, including:

- Solids (TSS) Ties into MS4 permit which includes these POCs
- Phosphorus/Nitrogen
- Metals (Copper, Lead, Zinc, Cadmium)
- Pathogens/Bacteria
- Floatables and settleable trash

Updates – Planting Guidance

New Chapter 11 (2015 Appendix H: Landscaping Guidance/Plant Lists):

- The 2023 Design Manual incorporates Planting Guidance for Stormwater Management Practices Facilities as Chapter 11, prepared by Environmental Facilities Corporation (EFC) and their contractor.
- Identifies the steps where a landscape architect needs to be consulted.
- Includes specific plant characteristic recommendations for each practice.

Updates – Maintenance Chapter

New Chapter 12: Maintenance Guidance:

- The March 31, 2017 “Maintenance Guidance – Stormwater Management Practices” document was added to the 2023 Design Manual as a new chapter. It was restructured to be more user friendly and can currently be downloaded for incorporation into the operation and maintenance component of the SWPPP.

Updates – CAD Details

New Standard CAD Details:

- Standard CAD details for the standard SMP's and green infrastructure practices have been added to improve the consistency of SWPPPs.
    - DEC plans to post DWG files to the Construction Stormwater Toolbox webpage.

Updates – Pocket Pond Practice Removed

Removed Pocket Ponds (Chapter 6):

- Research showed that other states either do not allow pocket ponds or that pocket ponds have poor performance. Pocket ponds were removed from the manual and other practices were evaluated for use with smaller drainage areas:
  - Green infrastructure practices:
    - Rain garden (1,000 sq. ft)
    - Stormwater Planter (15,000 sq. ft.)
    - Bioretention (5 acres)
  - Ponds: minimum drainage area of 10 acres unless a water balance study is conducted

Updates – Relocated Content

Relocated Content from Appendix C:

To ensure that all design criteria for each practice are in each design standard, the construction and material specifications presented in the 2015 Appendix C: Construction Standards and Specifications were relocated to Chapters 5 & 6.

Updates – Summary

Review of Updates:

- Changes made to the 2015 Design Manual to make the 2023 Design Manual were intended to increase the clarity and usability of the document.

No Change ! – Sizing Criteria

The following criteria were not changed in the 2023 Design Manual compared to the 2015 Design Manual:

- Water Quality Volume (WQv)
- Runoff Reduction Volume (RRv)
- Overbank Flood Control Criteria (Qp)
- Extreme Flood Control Criteria (Qf)

Reminder: as discussed earlier, changes were made to the Stream Channel Protection Volume Requirements (CPv) in the 2023 Design Manual.

Permit Modification/Transition Policy

- When the 2015 Design Manual was initially posted as an update to the 2010 Design Manual, the following steps were needed to require its use:
  - The CGP was modified to require the use of the new Design Manual.
  - A Transition Policy was implemented to address projects that were already in the local review process with designs prepared using the outdated version of the Design Manual.
- It is expected that similar steps will be taken to require use of the 2023 Design Manual.

Future Updates

- Section 2.7 sets basic climate change requirements in the Design Manual. It is expected that additional climate change language will be included in the future.
- Significant interest was expressed regarding the addition of additives in bioretention media to address removal of phosphorous in impaired watersheds. DEC will continue to monitor research in this area and may include this in future revisions.
- As needed in the future, DEC will consider additional updates to the Design Manual based on new research and other developments in the field.

Stormwater Webpages

Construction Stormwater Toolbox

http://www.dec.ny.gov/environmental-protection/water/water-quality/stormwater/construction-stormwater-toolbox

Stormwater Permit for Construction Activity

http://www.dec.ny.gov/environmental-protection/water/water-quality/stormwater/contruction-activity-permit

*NOTE! DEC website has migrated to a new web content management system in November 2023. New URL's have been created for all DEC webpages.

To those interested, DOW Central Office Staff plan to send email updates when major changes are made to CGP webpages.

Thank You

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