Introducing the New England Stormwater Retrofit Manual

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Manual Team and Manual Funding

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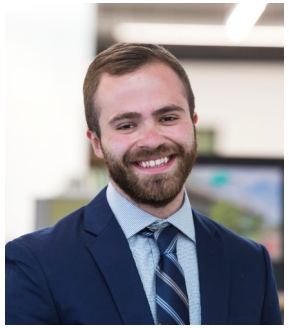

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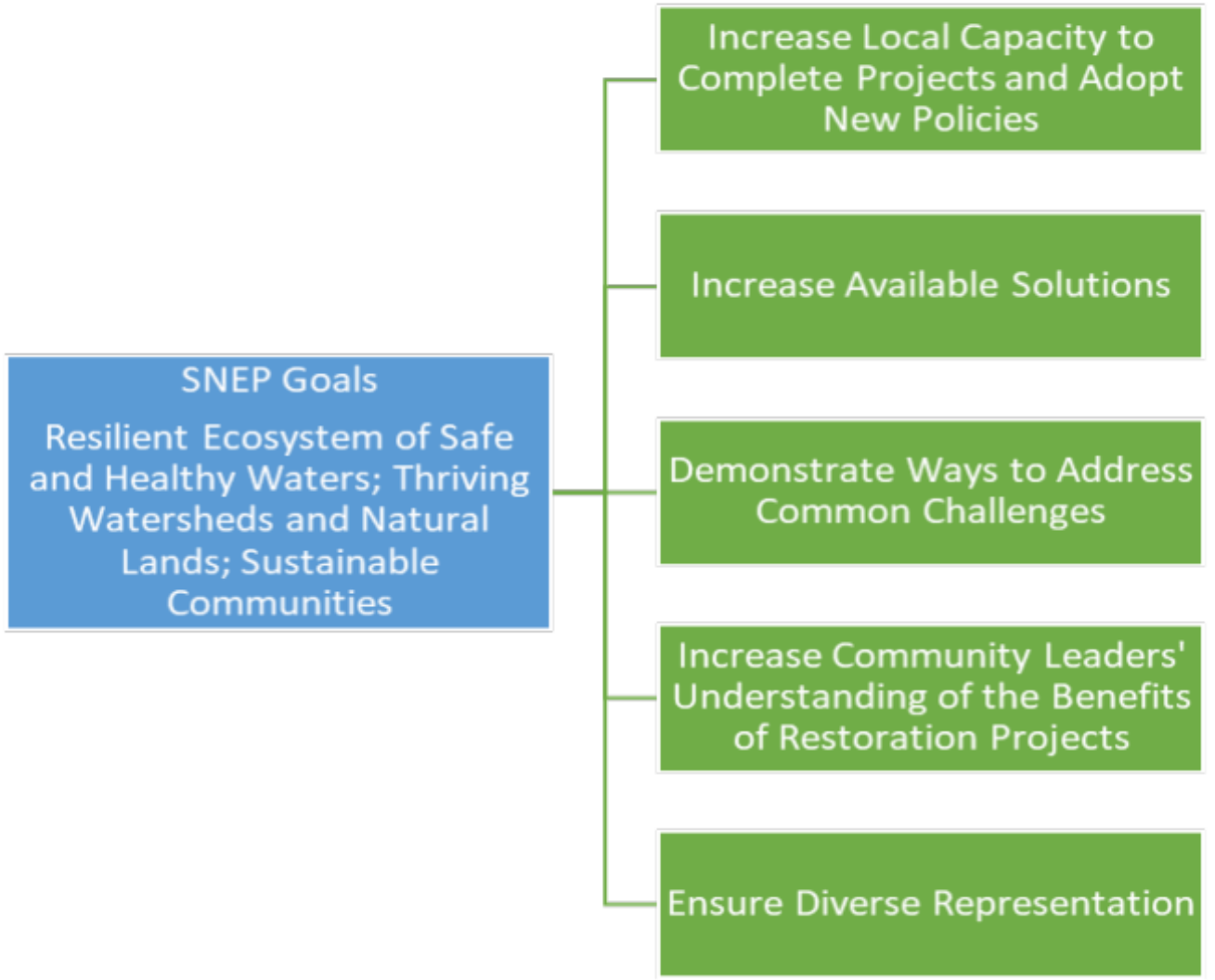
Southeast New England Program (SNEP) Network Context

2021 - 2025 PRIORITY ACTIONS



Source: Southeast New England Program Fact Sheet, February 2021 (epa.gov)

Goals of New England Stormwater Retrofit Manual

- Provide research-based guidance on **planning, siting, and designing** retrofit stormwater control measures (SCMS) **where regulatory requirements to not dictate prescribed specifications**
- Present an approach for **crediting pollutant and runoff volume reductions** associated with these SCMs
- Present a framework for **selecting the optimal SCM** for a specific project/site

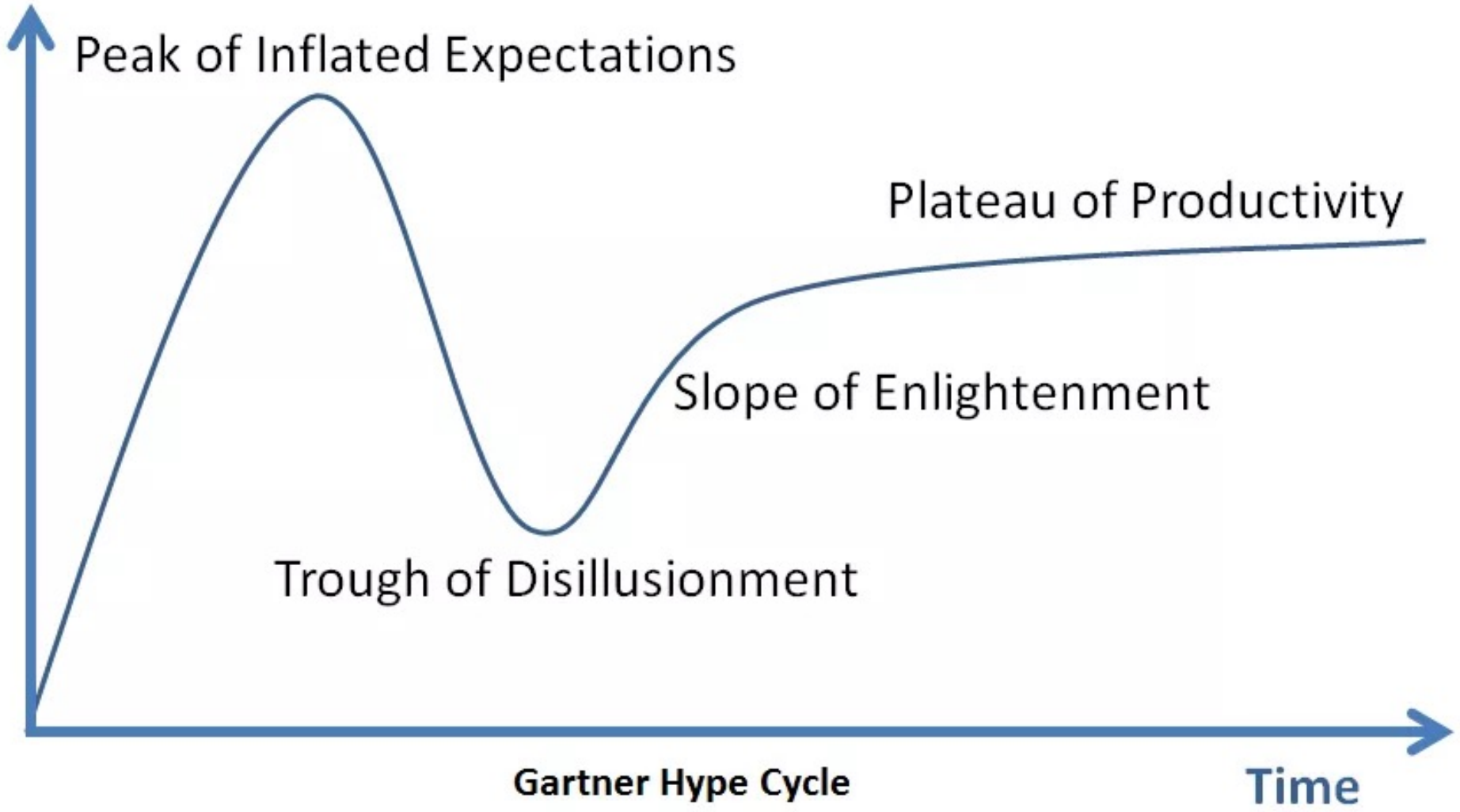
Why this Manual Matters

- This manual fills a gap in existing retrofit guidance by…
  - Encouraging designers to **move beyond prescriptive new/redevelopment mindset**
  - Helping designers **piece SCM components together to arrive at the best SCM** to meet project and site-specific needs
  - **Promoting the use of EPA-developed water quality crediting methods** to quantify SCM impact

NE Retrofit Manual

https://snepnetwork.org/stormwater-retrofit-manual/

Decadal Reflections



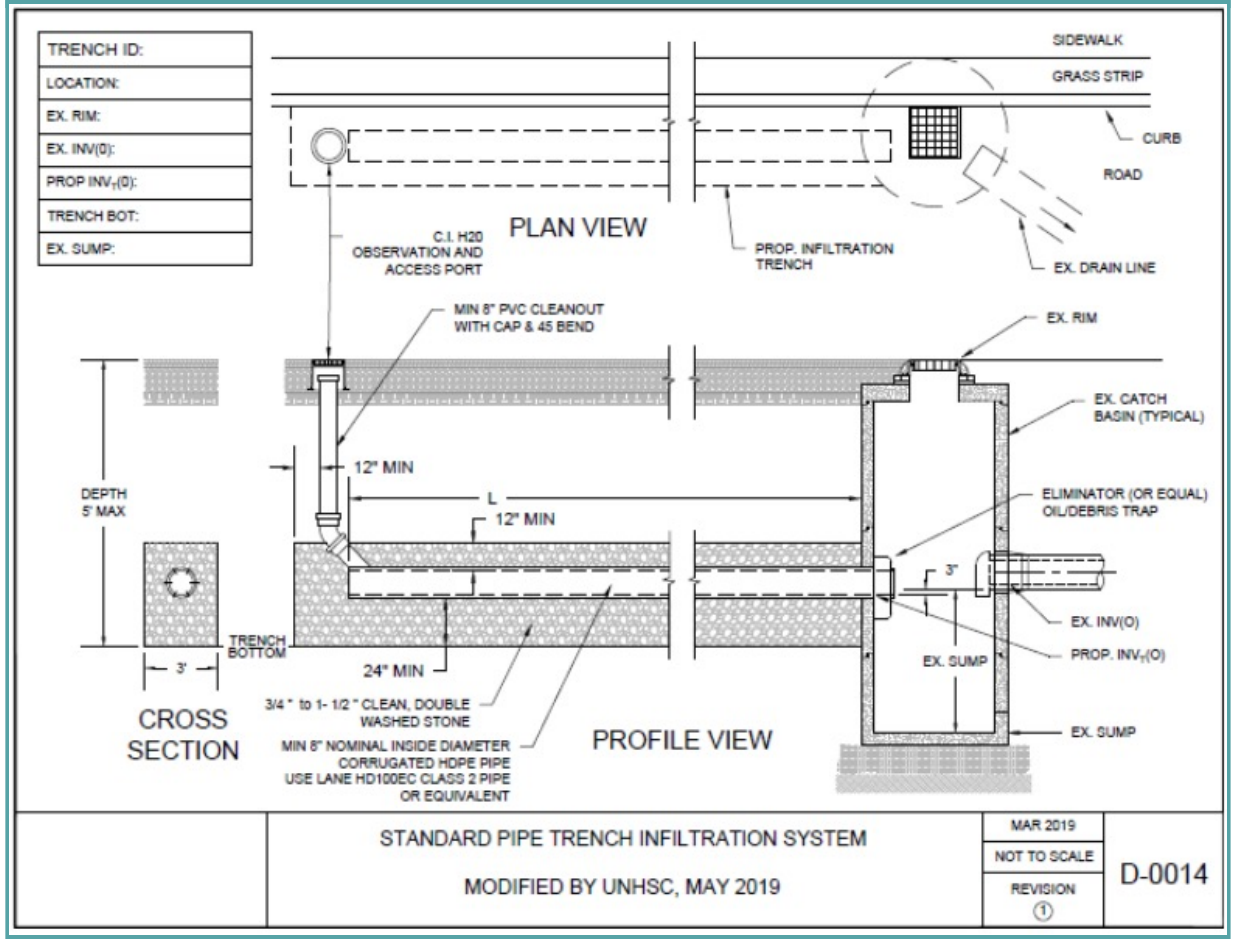
Are we at the Finish Line or the Starting Line?

Manual Highlights: Planning and Crediting

Retrofit Approach: Opportunistic Approach

- Incorporation of SCMs into already planned and needed construction projects
- Key Considerations:
  - **Be proactive in identifying opportunities.**
  - **Develop a suite of typical SCMs.**
  - **Be willing to be flexible with the project specifications**
  - **Tailor the scale and type of SCMs to the project**

Arlington, MA Standardized Trench Design

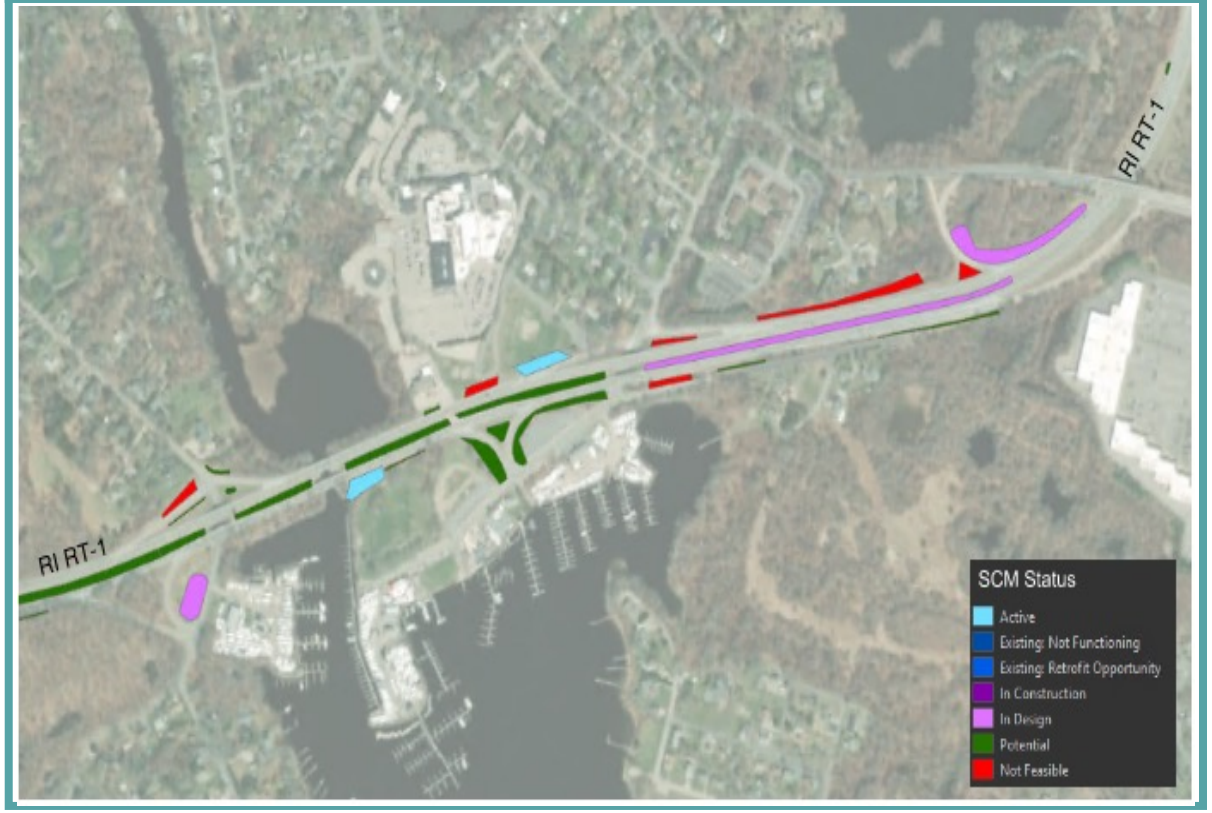


Source: https://www3.epa.gov/region1/npdes/stormwater/tools/arlington-ma-infiltration-trench-conceptual-design.pdf

Retrofit Approach: Planning Approach

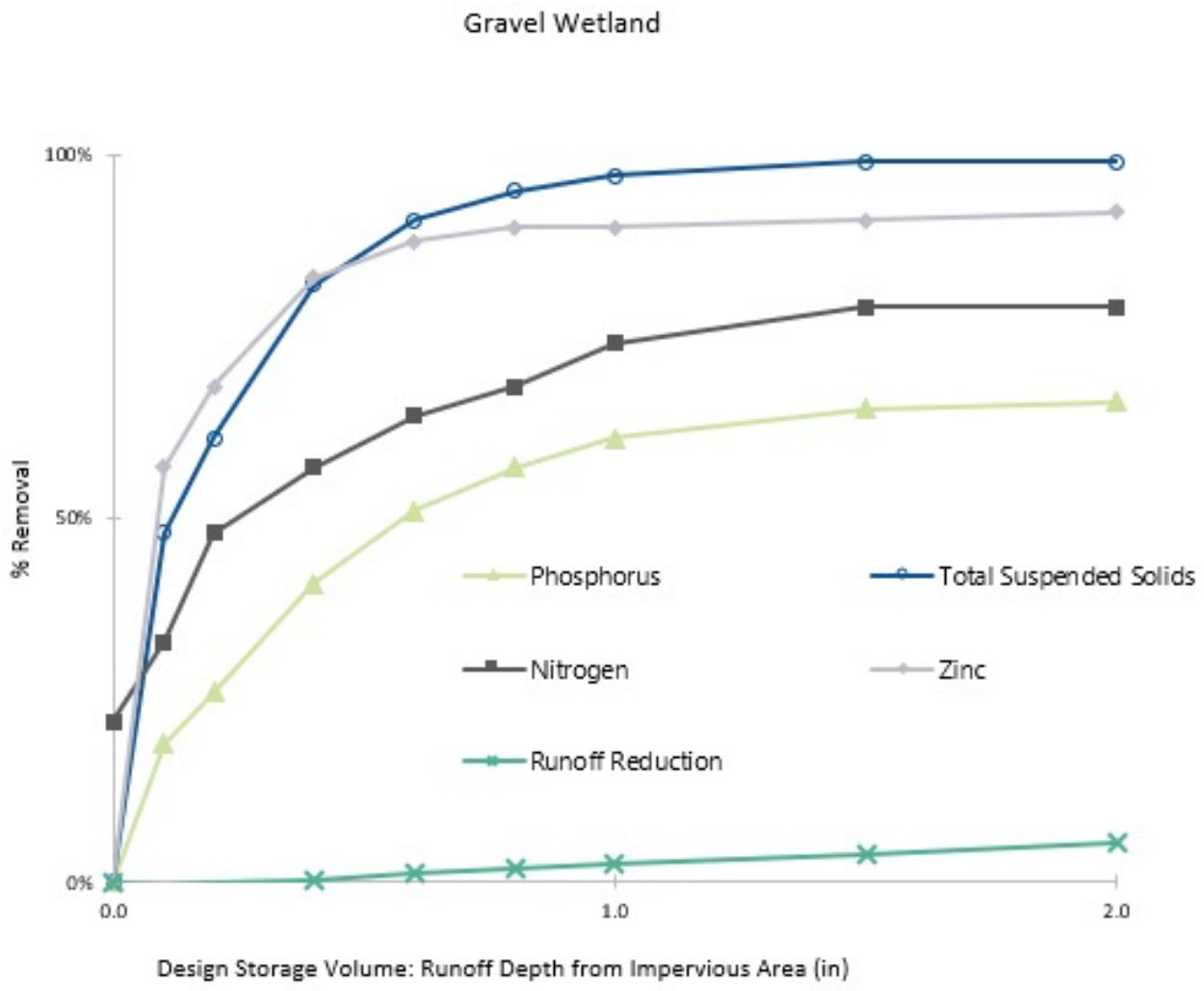
- Proactively planning retrofits and prioritizing sites
- Steps:
  1. **Understand and Quantify Goals**
  2. **Identify Potential Sites**
  3. **Identify SCMs**
  4. **Prioritize Sites and Controls**
  5. **Implement SCMs**

RIDOT Stormwater Control Plans

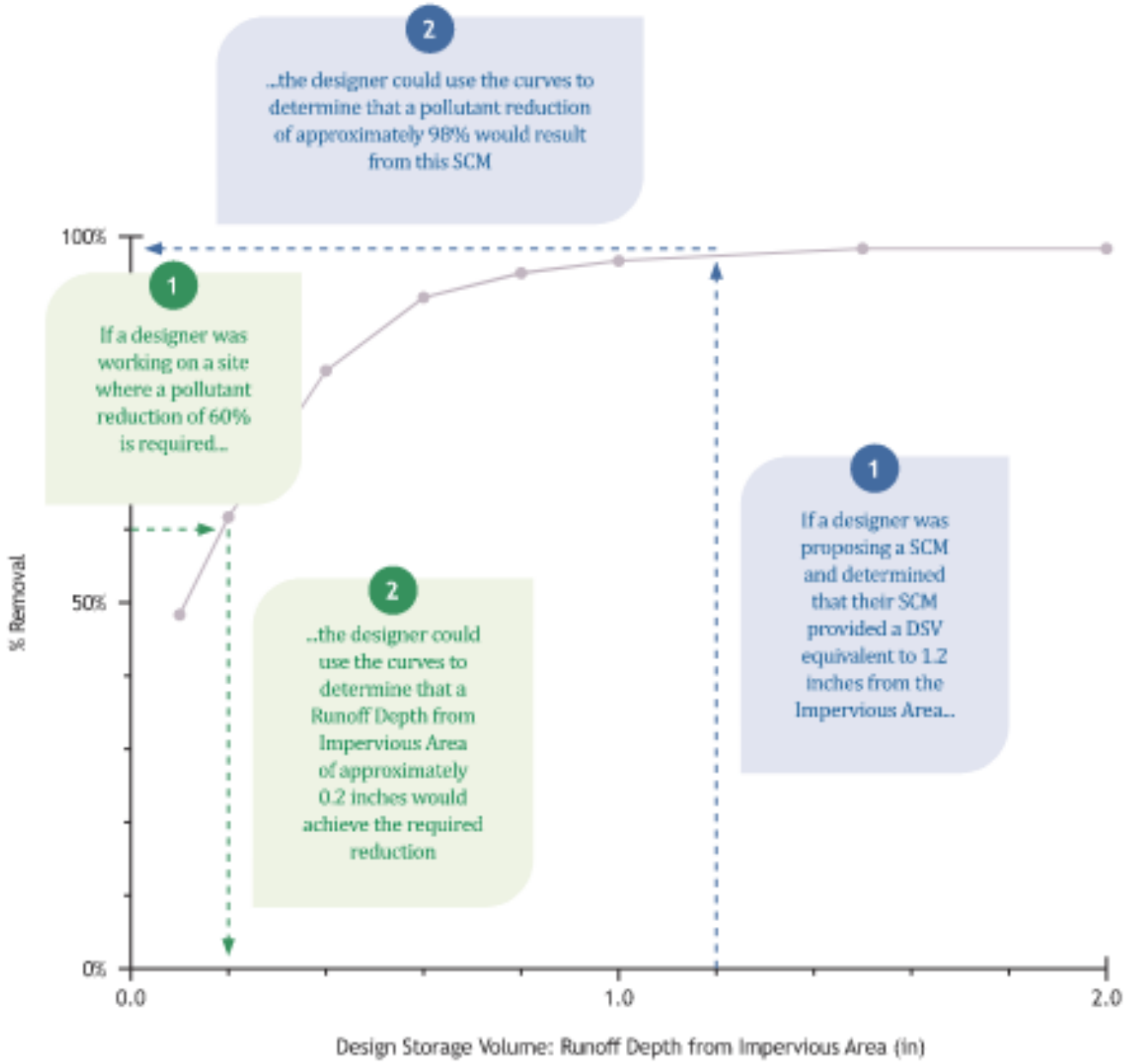


Source: https://www.arcgis.com/apps/webappviewer/index.html?id=b516ed62a55847e28d0243ac07206856

Crediting Approach: SCM Performance Curves



See our handout for more information on SCM Performance Curves and how to utilize them!


2
..the designer could use the curves to determine that a pollutant reduction of approximately 98% would result from this SCM
100%
1
If a designer was working on a site where a pollutant reduction of 60% is required...
% Removal
50%
2
...the designer could use the curves to determine that a Runoff Depth from Impervious Area of approximately 0.2 inches would achieve the required reduction
1
If a designer was proposing a SCM and determined that their SCM provided a DSV equivalent to 1.2 inches from the Impervious Area...
0%
0.0
1.0
2.0
Design Storage Volume: Runoff Depth from Impervious Area (in)

Sizing for Performance

Sizing Details

System	WQV ft^3 (m^3)	Actual WQV ft^3 (m^3)	% of normal design	Rain Event in (mm)	Sizing Method
SGWSC	7,577 (214.6)	720 (20.4)	10%	0.10 (2.5)	Static
IBSCS	1,336 (37.8)	310 (8.8)	23%	0. 23 (5.8)	Dynamic

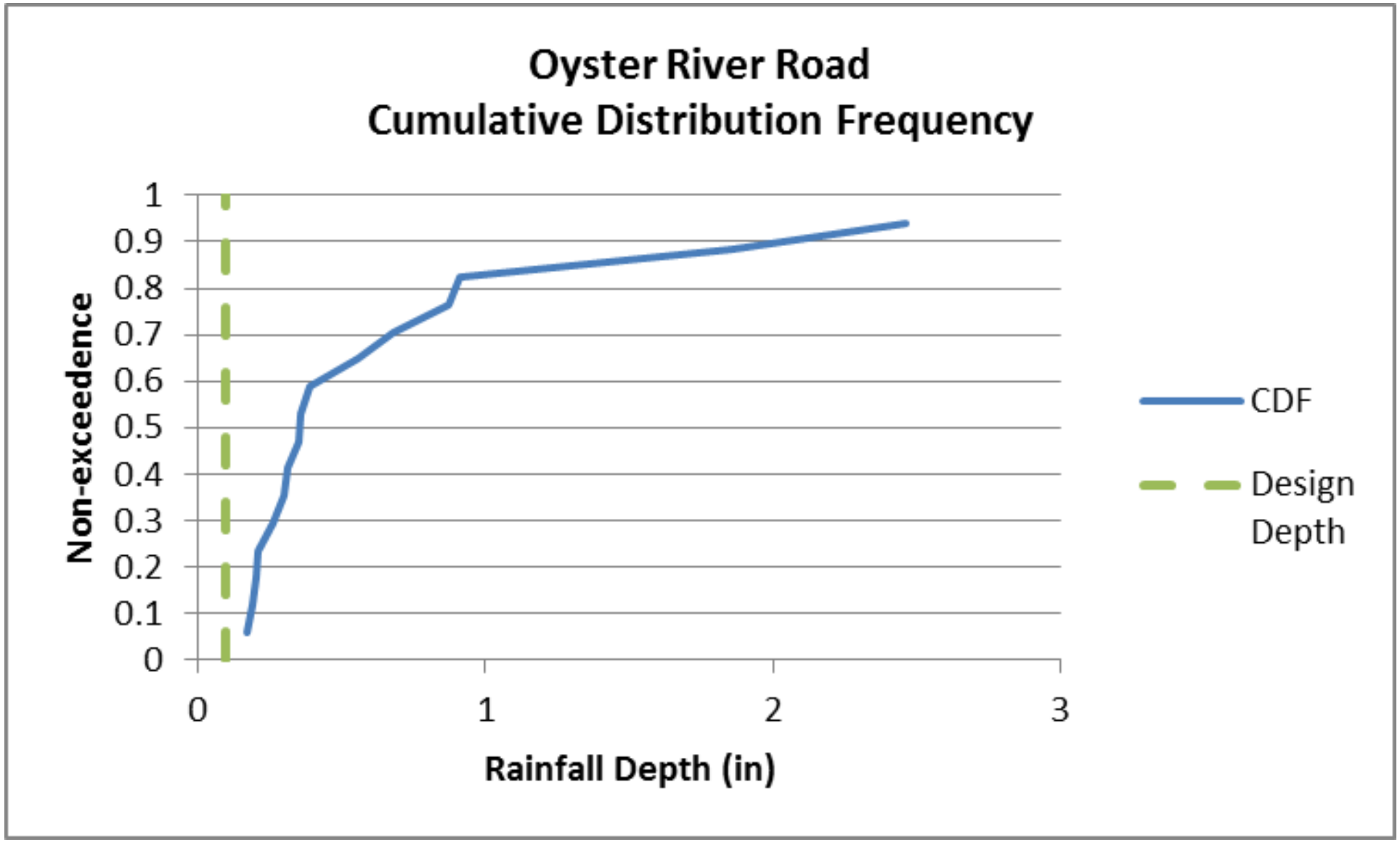
$$WQV = \left(\frac{P}{12}\right) x\ IA$$

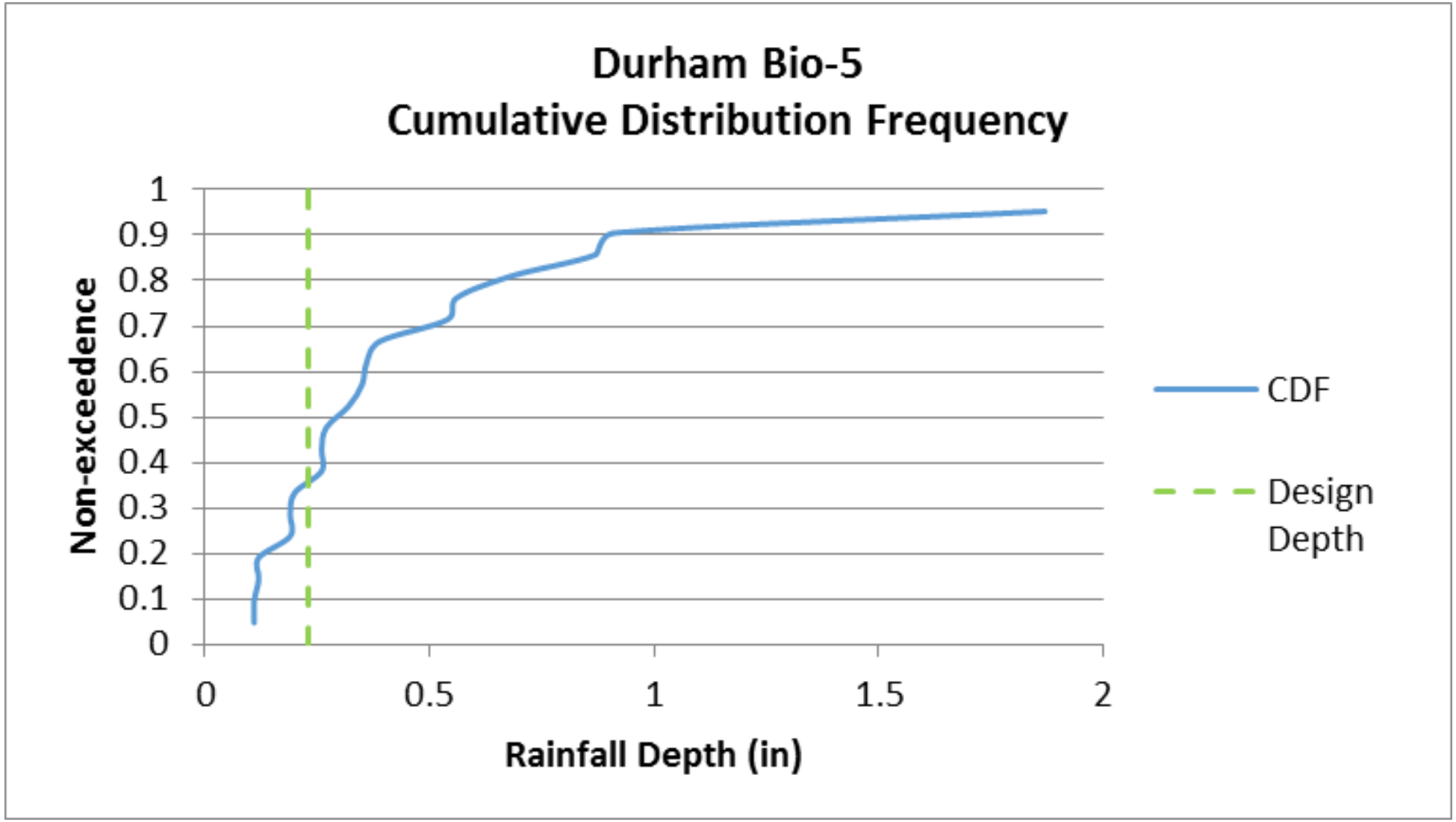
Dynamic Bioretention Sizing

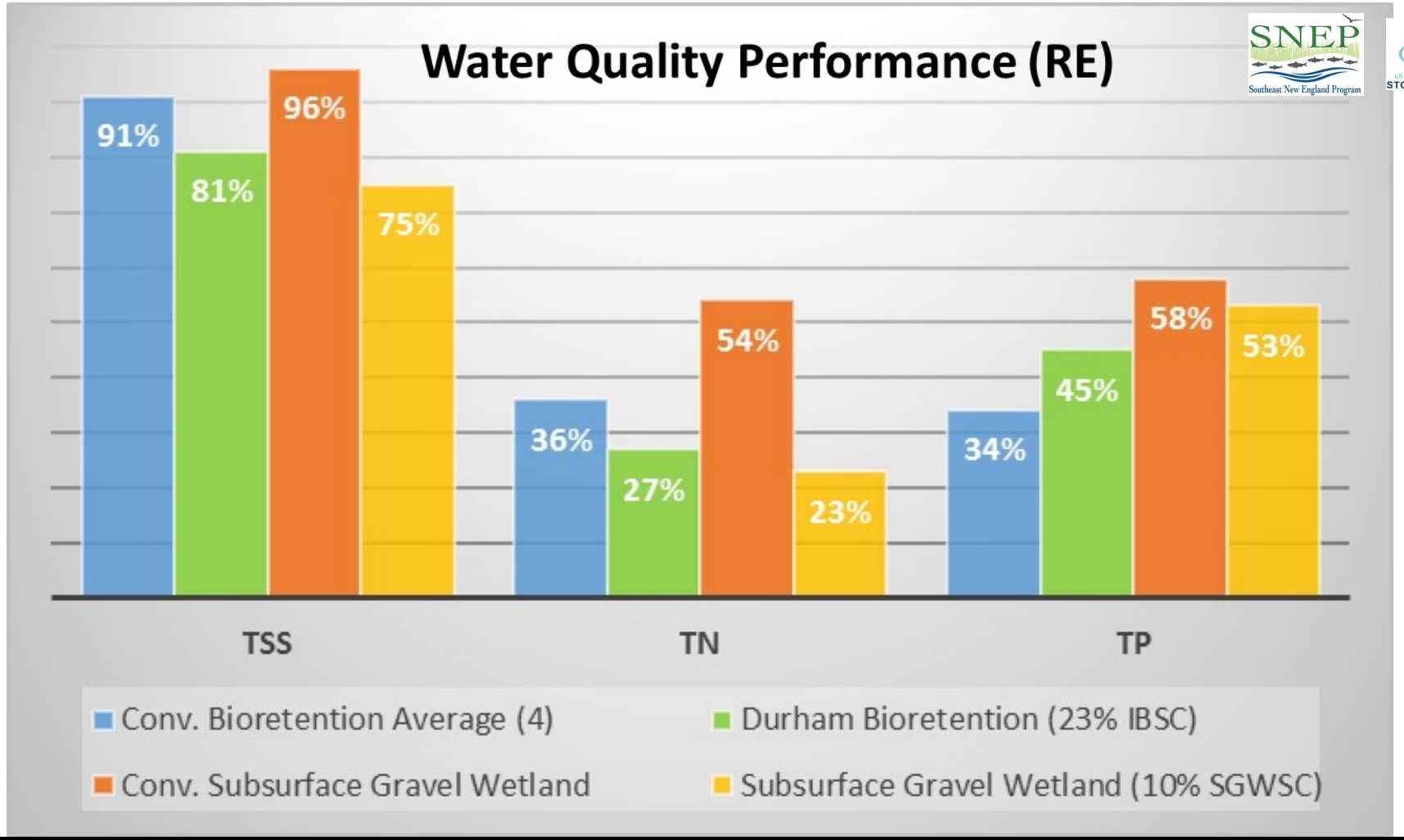
$$Af = Vwq * \frac{df}{(i(hf + df)tf)}$$

Static SGW System Sizing

$$Q = CdA\sqrt{2gh}$$


Oyster River Road
Cumulative Distribution Frequency
Non-exceedence
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
1
2
3
Rainfall Depth (in)
CDF
Design Depth


Durham Bio-5
Cumulative Distribution Frequency
Non-exceedence
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
0.5
1
1.5
2
Rainfall Depth (in)
CDF
Design Depth



System	TSS	TN	TP
Conv. Bioretention Average (4)	91%	36%	34%
Durham Bioretention (23% IBSC)	81%	27%	45%
Conv. Subsurface Gravel Wetland	96%	54%	58%
Subsurface Gravel Wetland (10% SGWSC)	75%	23%	53%

SCM Selection and Design: Treatment Unit Operations and Processes (UOPs)

UOPs: Unit Operations and Processes

Operations: methods of treatment in which application of *Physical* and *Hydrologic* forces dominate.

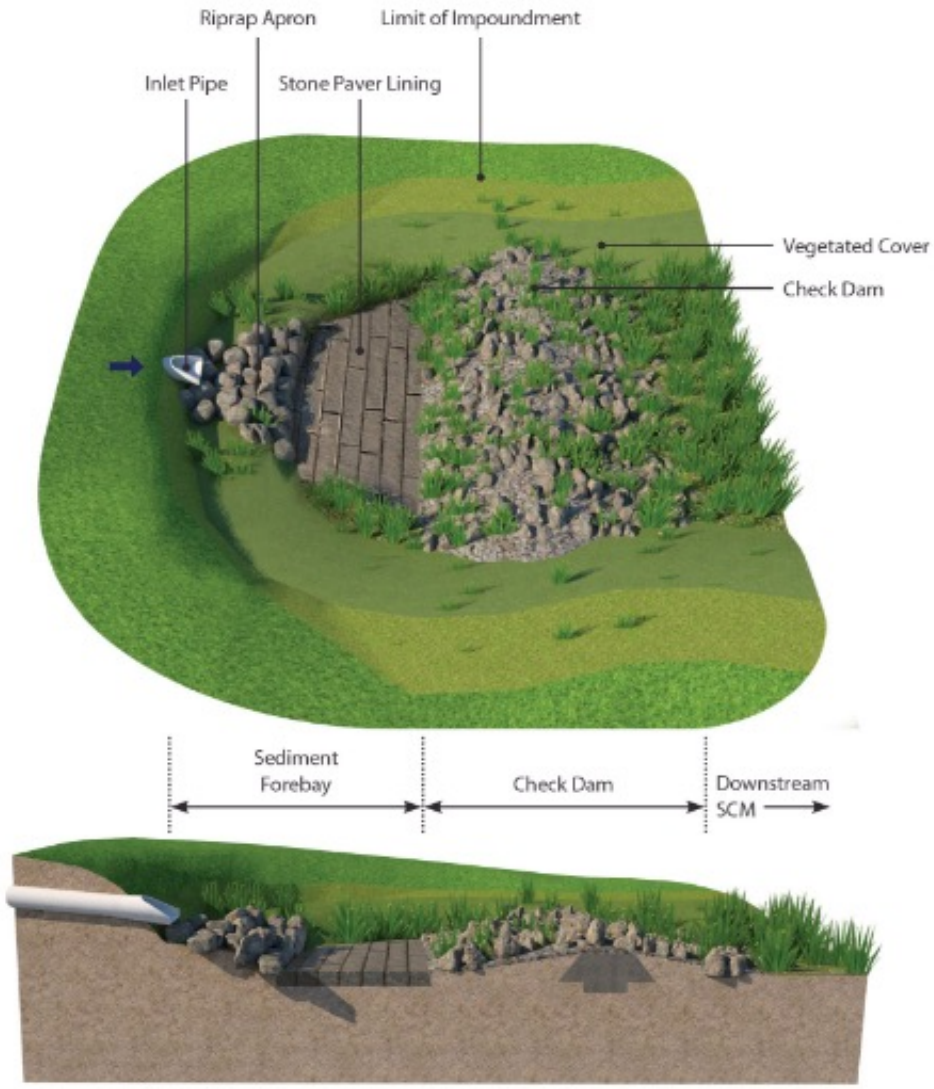
Processes: methods of treatment in which *Chemical* or *Biological* activities are involved.

Selection and Design: Linking SCMs to UOPs and Performance Curves

SCM Type	Primary UOP	Performance Curve Category
Infiltration Swale	Hydrologic: Infiltration	Infiltration Basin
Rain Garden (with underdrain)	Physical: Filtration	Bio-Filtration
Gravel Wet Vegetated Treatment System	Biological: Nitrification/ Denitrification	Gravel Wetland

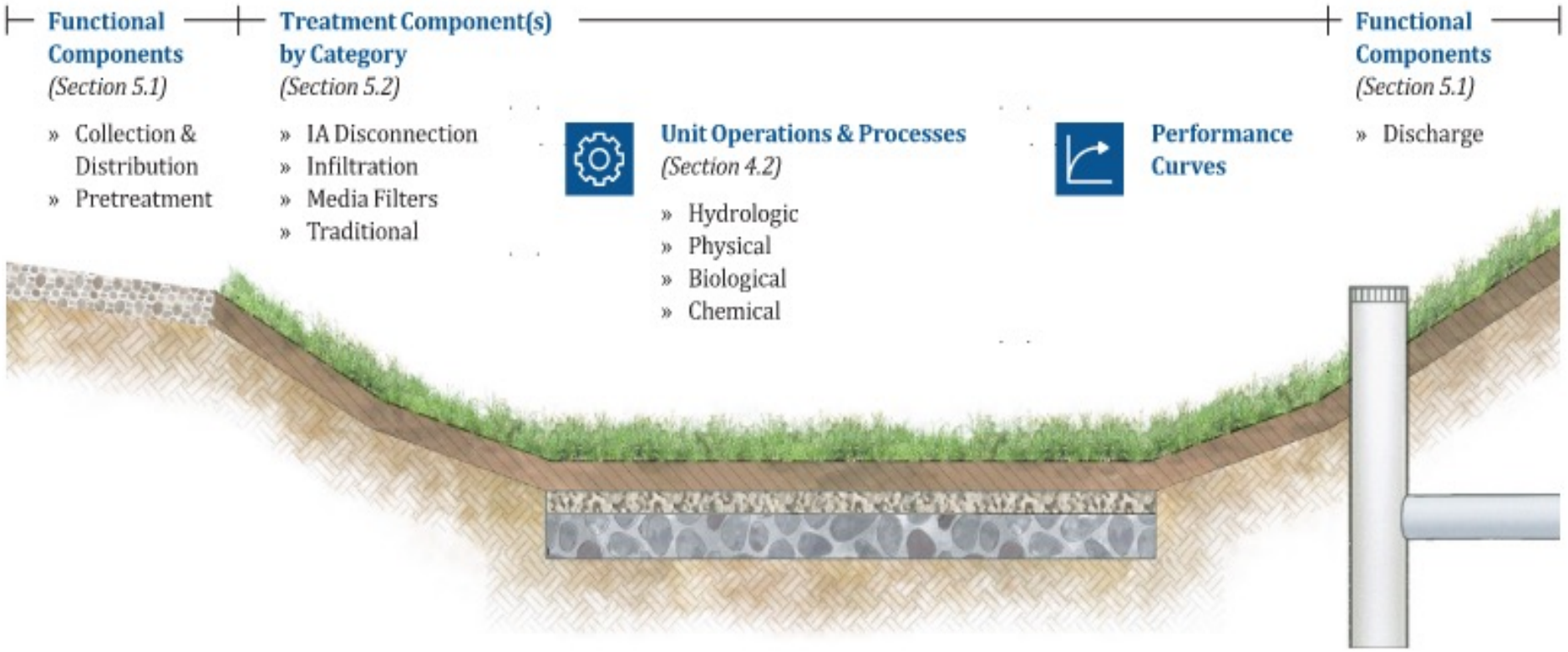
SCM Guidance: Functional Components

- Determine form and function of SCM
- Can be broken down as follows:
  - Collection and Distribution
  - Pretreatment
  - Discharge



Source: MassDOT Stormwater Design Guide, 2022

SCM Guidance: Putting It All Together



Manual Highlights: Breaking through Prescriptive Guidance

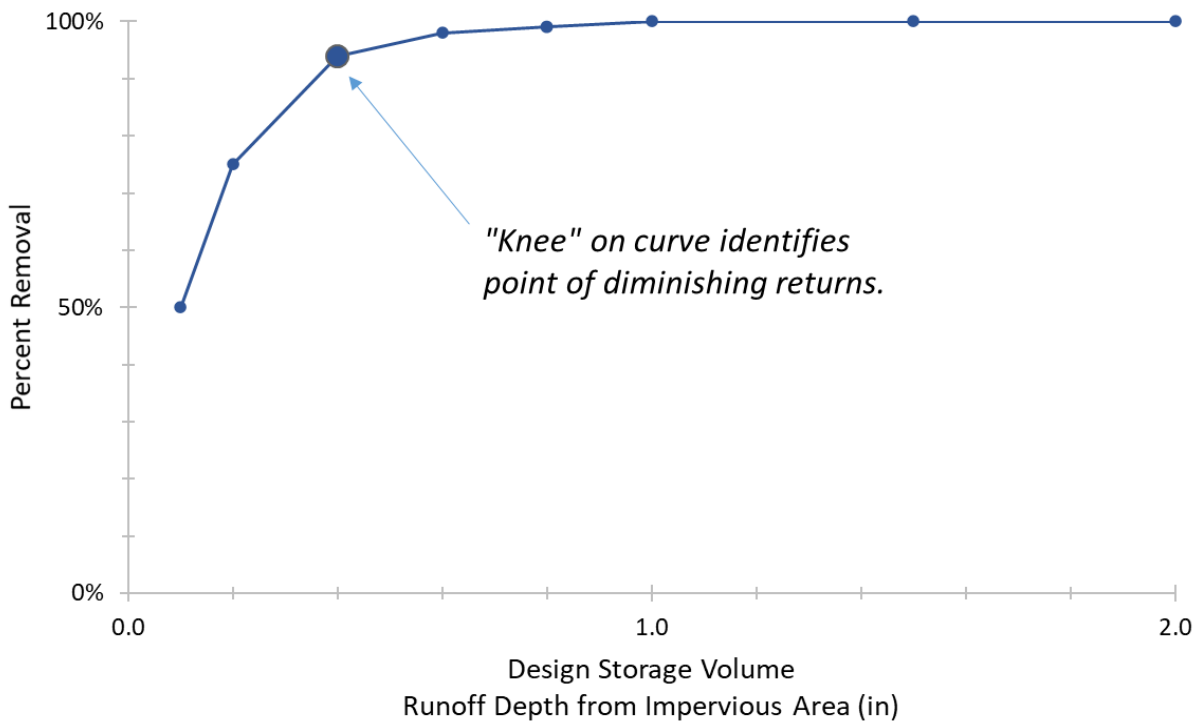
Breaking Through Prescriptive Guidance:
Sizing Requirements

Current Typical Requirement:

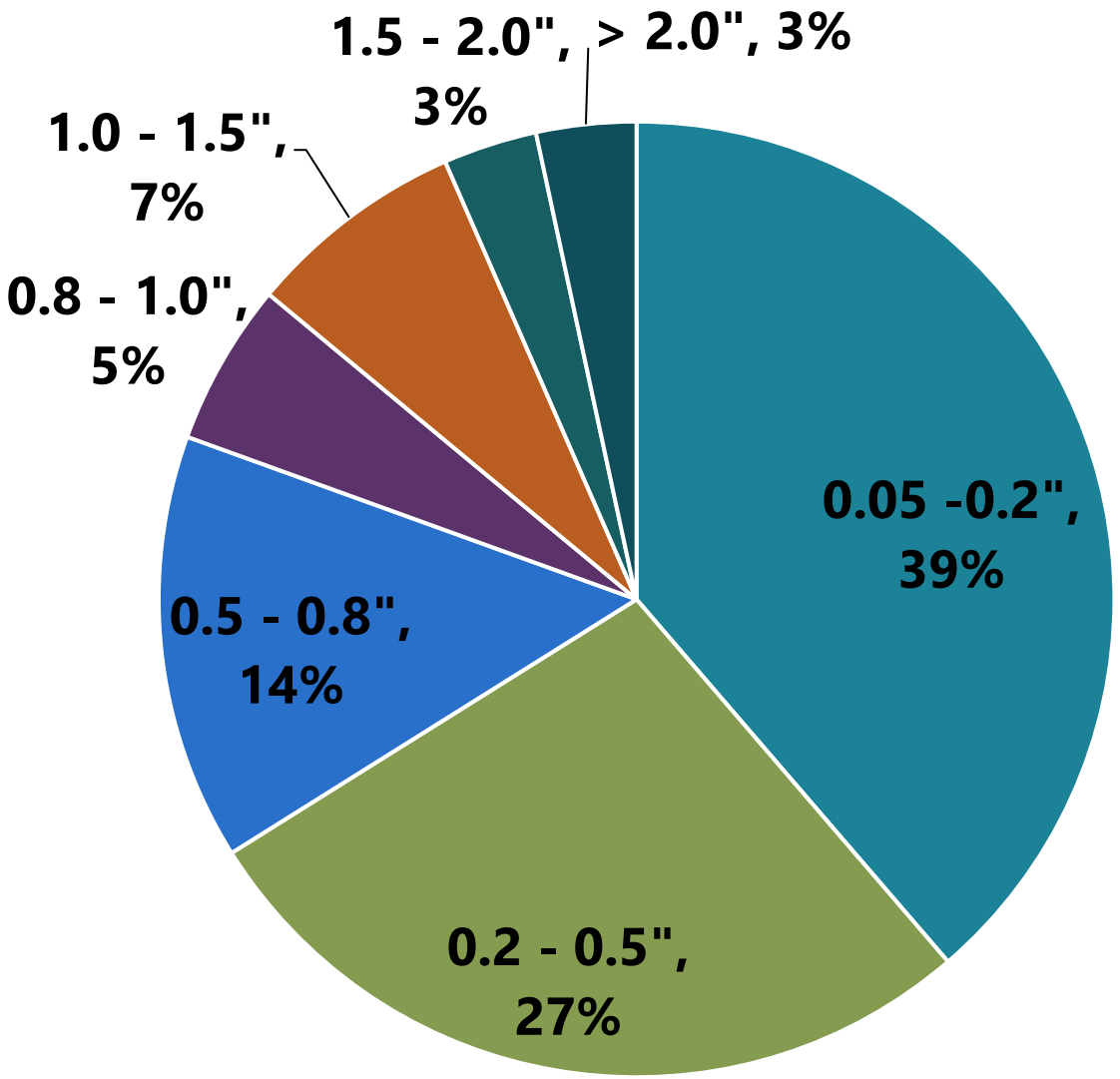
Size SCMs to meet the required WQV (typically 1 inch)

Proposed Retrofit Guidance:

Use SCM Performance Curves to size optimal cost-effective SCMs within a site



Distribution of Precipitation Events by Depth; Boston, MA 1992-2014



Precip Depth (in)	Probability %
0.05-0.2	39
0.2-0.5	66
0.5-0.8	80
0.8-1.0	85
1.0-1.5	92
1.5-2.0	95
>2.0	98

In Summary…

- Be creative in retrofit scenarios!
- Some treatment (even small!) is better than none at all
- The SCM Performance Curves are powerful tools for sizing and crediting SCMs
- Construct an SCM that works best for your site/project
- Don’t be constrained!

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    - Michael Sadler – VT
    - Laura Schifman – MADEP
    - Newt Tedder – EPA


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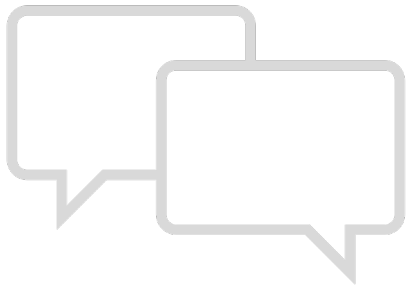

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