The Vermont Stormwater Management Program

Tips for Incorporating LID on Jurisdictional Sites

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Stormwater & LID

Let's bumble through…

The Bumble

Ask questions as we go…

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“There are known knowns. These are things we know that we know. There are known unknowns. That is to say, there are things that we know we don't know. But there are also unknown unknowns. There are things we don't know we don't know.”

-Donald Rumsfeld

Discussion Agenda

1. ***Quick overview of stormwater regulations & treatment standards***

2. Known knowns
- What we know we know

3. Known unknowns
- What we know we don’t know

4. Unknown unknowns
- What we don’t know we don’t know
Well, sort of…

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Stormwater Permit Programs

Operational

Impervious Surface

(State Stormwater Discharge Permit, 9015, 9010, INDS)

Construction

Earth Disturbance

(CGP, 9020, INDC)

Multi-Sector

Industrial activity

(MSGP, 9003)

MS4

"Big picture" permit for concentrated population centers

RDA

Residual Designation Authority

(9030)

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State Stormwater Permit

Jurisdictional Threshold

- Legislature passed Water Pollution Control law
  - Title 10, VSA Chapter 47 1263 & 1264
- Stormwater Management Rules
  - Chapter 18 & 22

- Jurisdictional threshold is based on the area of new and/or redeveloped impervious surface
  - *"Impervious Surface: those [hu]man made surfaces, including, but not limited to, paved and unpaved roads, parking areas, roofs, driveways and walkways, from which precipitation runs off rather than infiltrates."*

- A permit is required for:
  - New impervious
  - Redevelopment of existing impervious
  - Expansions >5000 square feet with ≥ 1 acre of total resulting impervious
    - Considered cumulative since 7/4/2005
    - Waiver does not apply to expansions of new impervious created after 7/4/2005

- The rules say: *Discharges of regulated stormwater runoff must obtain permit coverage consistent with the treatment standards within the Vermont Stormwater Management Manual*

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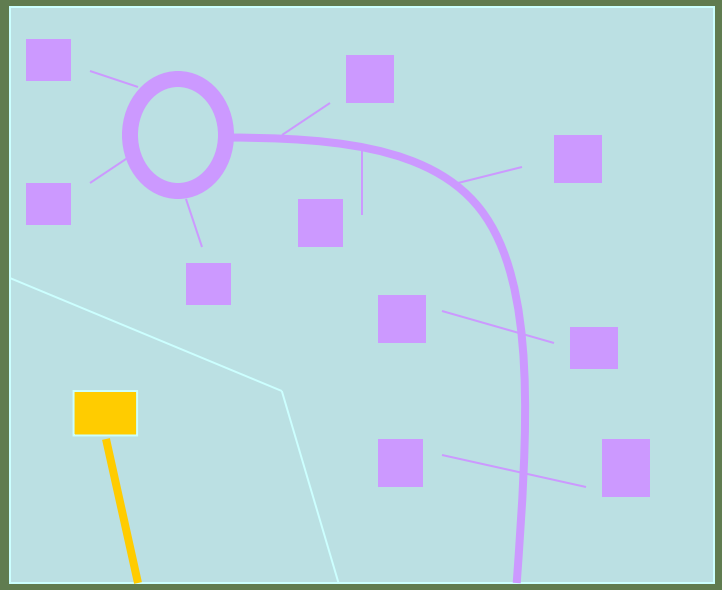
JURISDICTION

Expansions: "Total Resulting Impervious"
Determinations takes into account the **common plan of development**
Phased development is considered as a whole



- Area = 0.95 acres
- Area = 0.15 acres
- Total = 1.20 acres
  - A permit is required only for new expansion
  - No treatment is required for existing impervious

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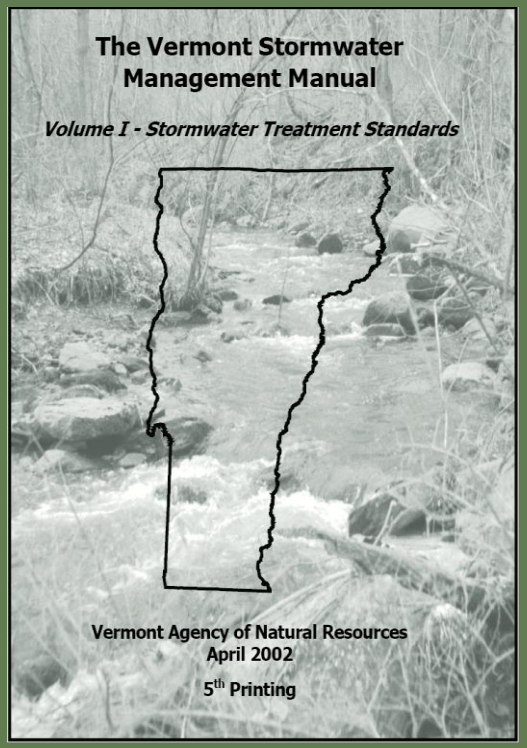
The 2002 Vermont Stormwater Management Manual (VSWMM)

Volume I – Stormwater Treatment Standards



Revised through rulemaking

- Section 1 – STP Practice Sizing Criteria
  - Water Quality (WQv)
  - Channel Protection (Cpv)
  - Groundwater Recharge (Rev)
  - Overbank Flood Protection (Qp10)
  - Extreme Flood Protection (Qp100)
- Section 2 – Acceptable STPs
  - Required Design Elements
  - Design Guidance
  - Cold Climate Considerations
- Section 3 – Voluntary Stormwater Management Credits

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STP Practice Sizing Criteria

Water quality (WQv)

- Capture 90% of annual storm events
  - Remove 80% total suspended solids & 40% total phosphorus
  - No waivers…

Groundwater recharge (Rev)

  - Recharge groundwater
  - Waivers for redevelopment, hotspots, HSG D soils, proximity to drinking supplies, among others…

Channel Protection (Cpv) - 1-year storm event

- Waivers for:
  - "Pre-routed post-development" flow is less than 2 cubic feet per second
  - Less than one acre of "new" impervious
  - Receiving water greater than 10 square miles

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STP Practice Sizing Criteria

Overbank Flood Protection (Qp10) - 10-year storm event

- 10% Rule…
- Receiving water greater than 10 square miles

Extreme Storm Protection (Qp100) - 100-year storm event

- Less than ten acres of "new" impervious
- Receiving water greater than 10 square miles

Redeveloped impervious

- Does not need to meet Rev, Cpv, Qp10 and Qp100…

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Known knowns…

What we know we know

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Where's the Green Infrastructure?

Section 3.8 – Other Strategies to Reduce Impervious Cover

- Innovative site plan features should include:

  "Preservation of forested (vegetated) areas, stream buffer, reduced parking ratios, compact and pervious overflow parking spaces and use of vegetated stormwater practices such as filter strips and bioretention areas."

It's in there…

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Pervious/Porous Surfaces

- Not considered a jurisdictional surface; does not need permit coverage
- Cannot be used as a pervious surface for disconnections, but could be designed as a STP…

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Green Roofs

- Considered a jurisdictional surface because stormwater must be routed off roof
- Could be designed as a treatment practice (i.e. bioretention or surface sand filter) to meet WQv
- However, an appropriate, lower Curve Number (CN) can be used perhaps between 60 – 80…

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Voluntary Stormwater Management Credits

Section 3:

- Credit 1 – Natural Area Conservation
- Credit 2 – Disconnection of Rooftop Runoff
- Credit 3 – Disconnection of Non-Rooftop Runoff
- Credit 4 – Stream Buffers
- Credit 5 – Grass Channels
- Credit 6 – Environmentally Sensitive Rural Development

Voluntary Stormwater Management Credits

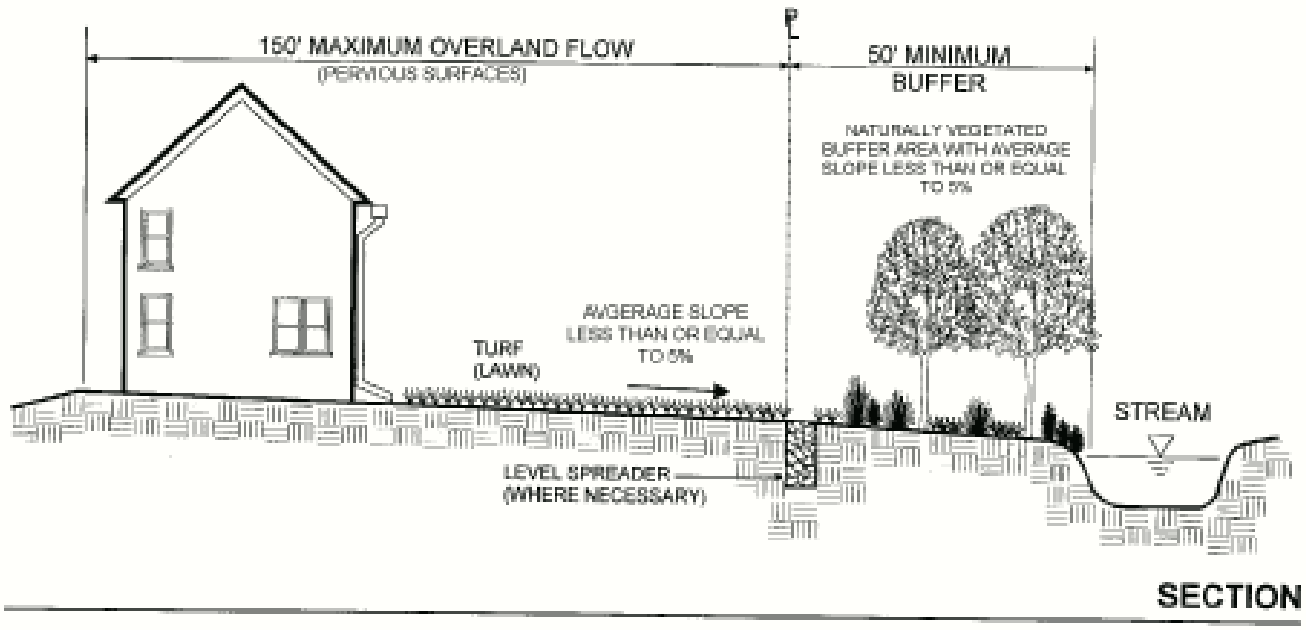

Figure 3.3 Example of Stream Buffer Credit Option

Maximize sheet flow and infiltration

No need to "collect" intentionally disconnected impervious in order to meet ***Cpv,*** *Qp10 or Qp100…*

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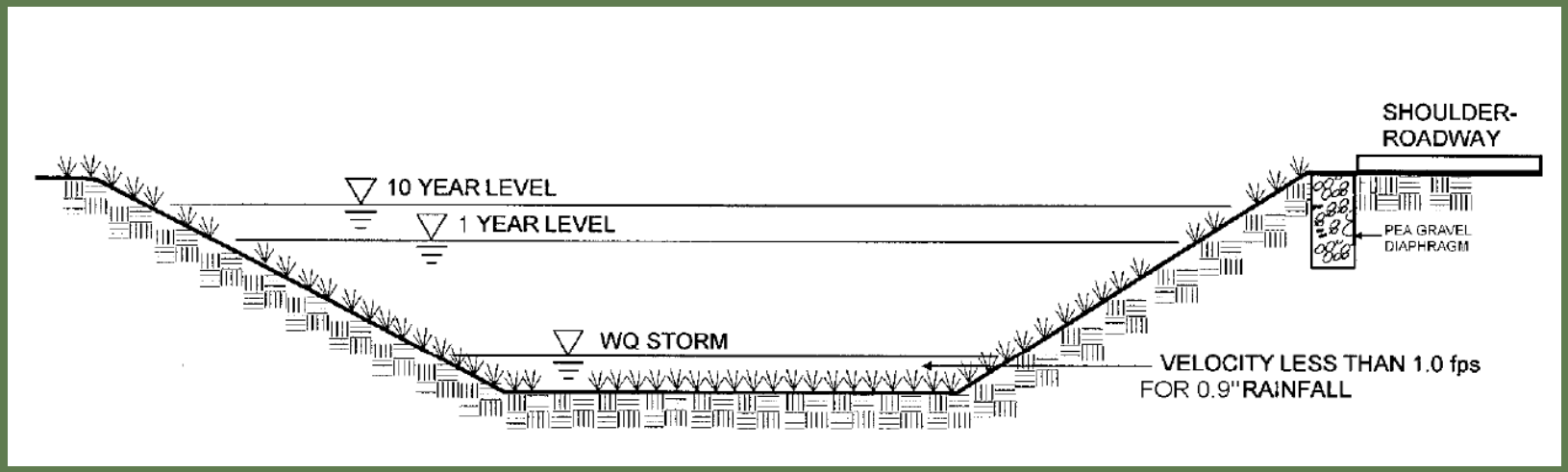
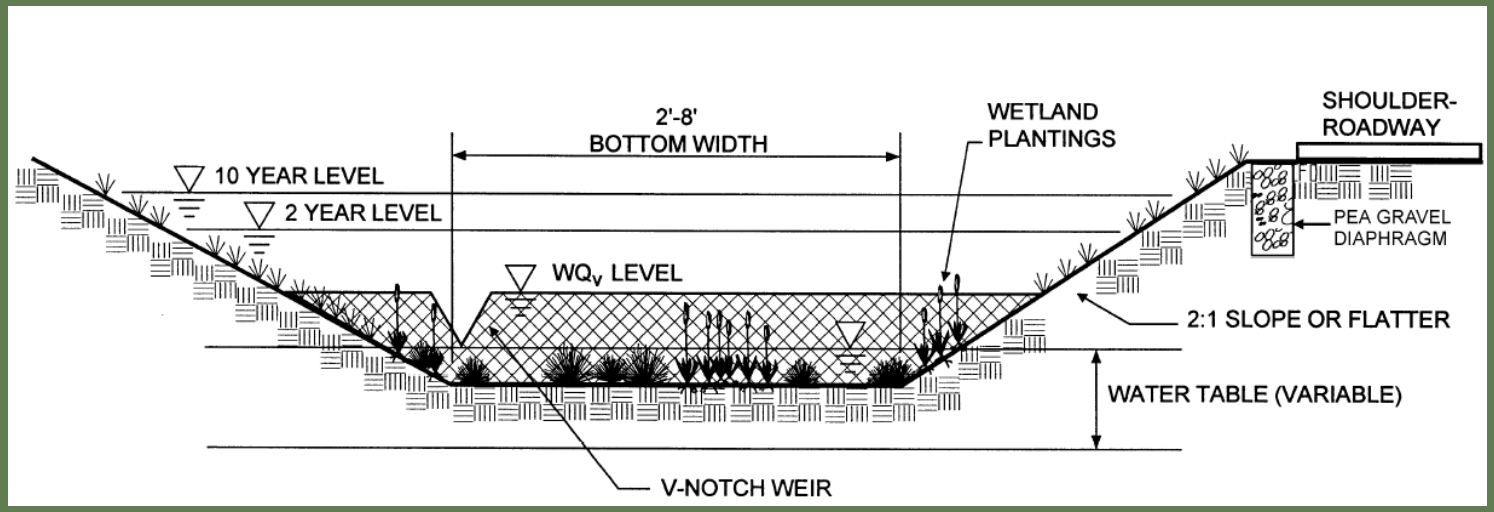
Vegetative Swales (O-1 Thru O-3)





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Vegetative Swales

VSMM:

- Readily meets WQv & Rev
- May meet Cpv via <2cfs waiver
- May meet Qp10 via 10% rule
- Use with:
    - Check dams
    - Outlet structure/weir

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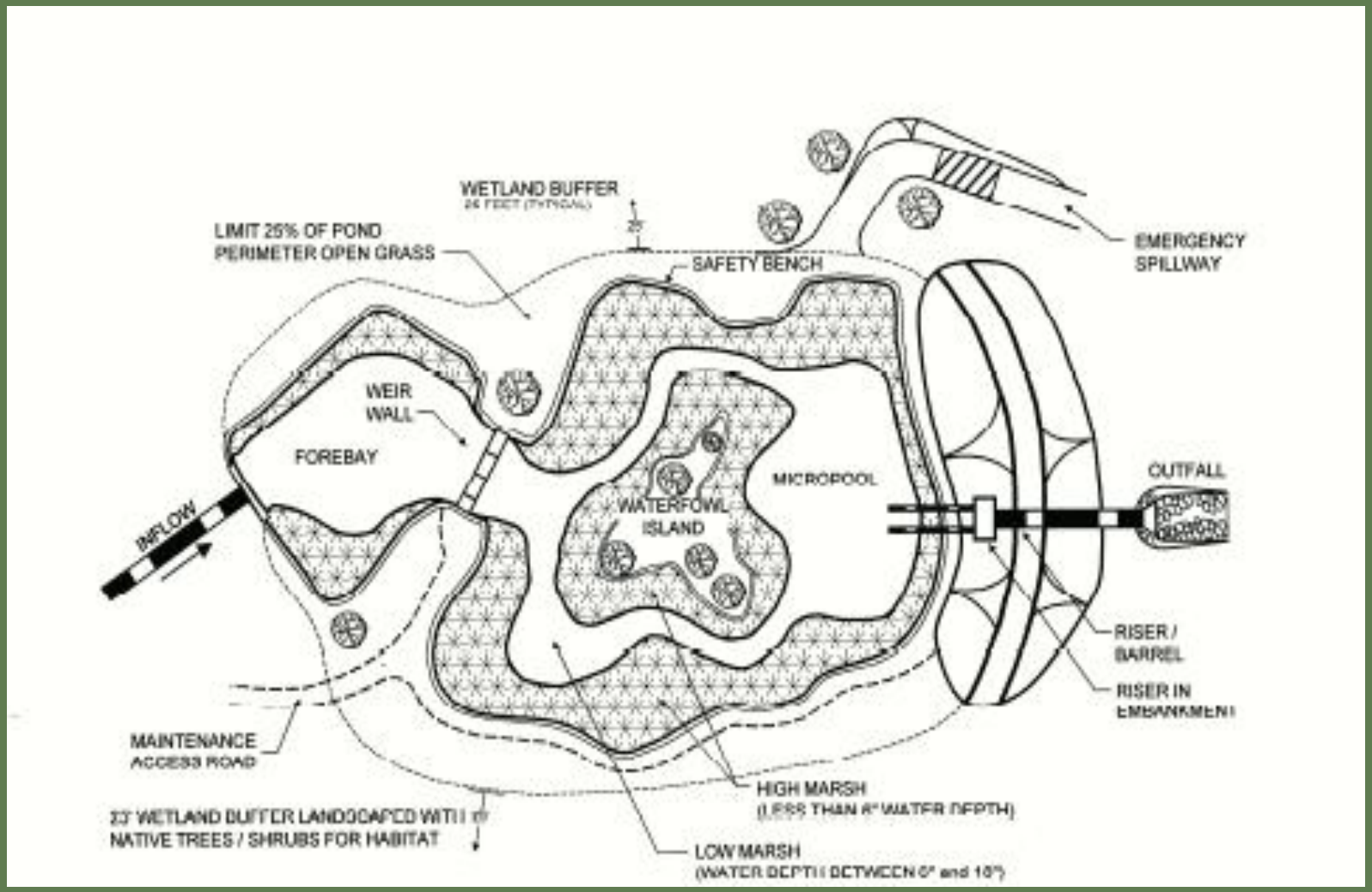
Constructed Wetlands (W-1 Thru W-4)



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Constructed Wetlands

VSMM:

- Readily meets WQv, Cpv, Qp10 & Qp100
- Does not meet Rev
- Different types: gravel, pond, shallow, ED

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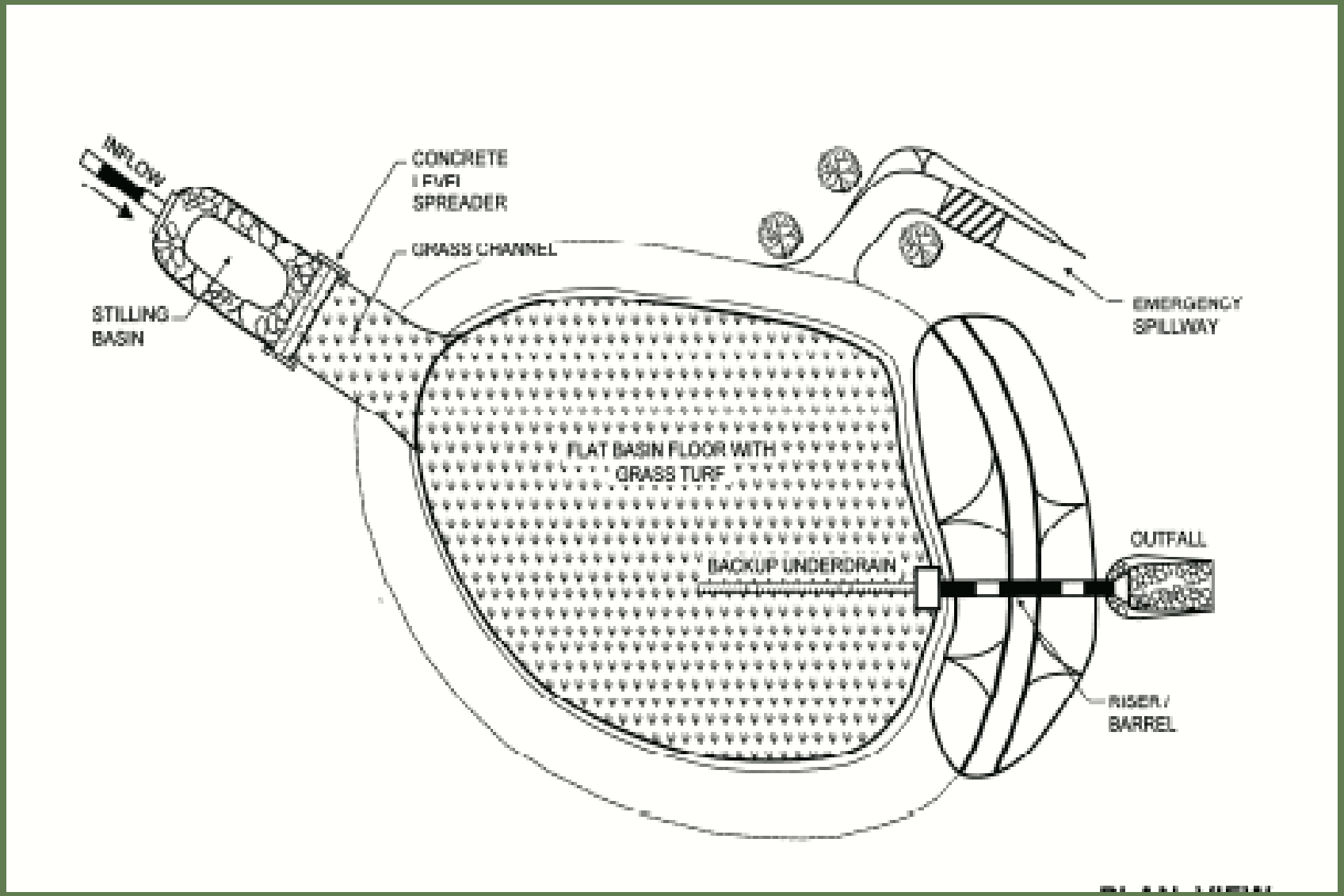
Infiltration Galleries (I-1 & I-2)



Infiltration Galleries

VSMM:

- Readily meets all five treatment standards
- How about VSMM - Volume II Appendix D-1, Table D-1?

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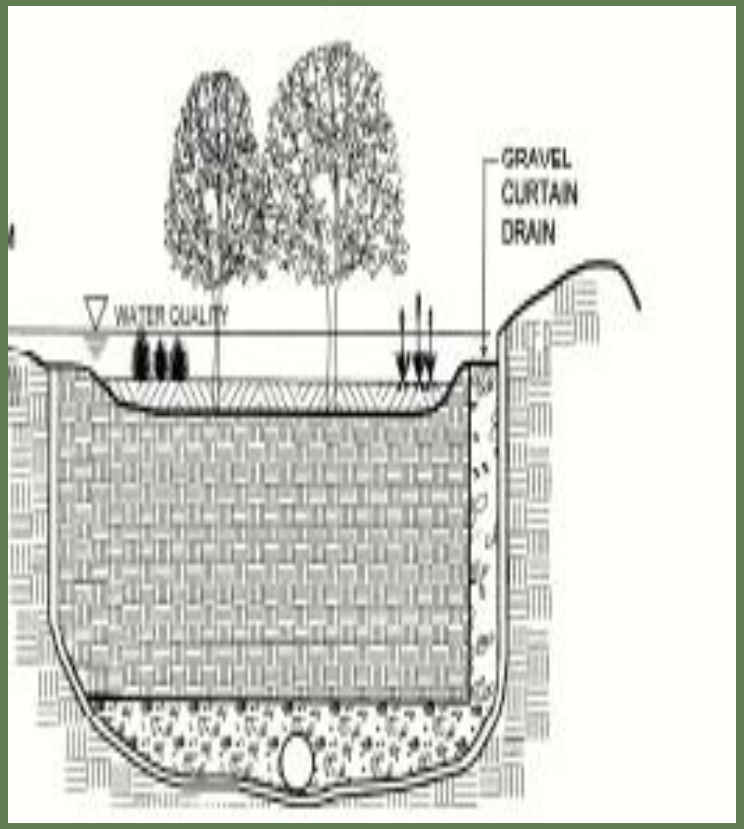
Rain Garden = Bioretention (F-5)



<u>VSMM</u>:

- Readily meets WQv & Rev
- *Should* not be used for Cpv, Qp10 or Qp100
- How about the "Alternative Design Standard"?
- Remember: Section 3.8 says, "…use of vegetated stormwater practices such as filters strips and *bioretention areas."*

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Known unknowns…

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Channel Protection (CPv)
Alternative Design Standard

VSMM – Volume I, Section 1.1.2, last bullet (page 1-6) states:

- For projects that have disconnected the majority of impervious surfaces per use of the credits in Section 3 such that routing to a detention facility is not achieved, the designer may use an alternative design standard. In these cases, the designer shall demonstrate that the post-developed peak discharge from the disconnected portion of the site for the one-year storm is no greater than the peak discharge from the same portion of the site as modeled as if 12-hour detention were provided.

Keys to potential success:

- No “detention facilities” are provided
- Majority of impervious surface is disconnected
- Large natural/vegetated areas are preserved

<u>Note</u>:

Off-site drainage should be “considered”

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Infiltration Testing

VSMM – Volume II, Appendix D-1, Table D.1(page 159) states:

Table D.1. Infiltration Testing Summary

Type of Facility	Initial Feasibility Testing	Concept Design Testing (initial testing yields a rate greater than 0.5"/hr)	Concept Design Testing (initial testing yields a rate lower than 0.5"/hr)
I-1 (trench)	1 field percolation test, test pit not required	1 infiltration test and 1 test pit per 50' of trench	practice not acceptable
I-2 (basin)	1 field percolation test, test pit not required	1 infiltration test* and 1 test pit per 200 sf of	practice not acceptable
F-1 (sand filter	1 field percolation test, test pit not required	test pit per 200 sf of filter area (no underdrains required**)	required
F-5 (bioretention)	1 field percolation test, test pit not required	1 infiltration test and 1 test pit per 200 sf of filter area (no underdrains required**)	underdrains required

*feasibility test information already counts for one test location
** underdrain installation still strongly suggested

Keys to potential success:

- Verify feasibility and depth to groundwater
- Soil test pits – horizon and texture analysis

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Detention vs. Retention

Let's chat about Cpv, Qp10 and Qp100…

- Collected, conveyed or routed stormwater requires detention
- Therefore, needs to meet these "detention" standards

Properly "disconnected" surfaces do not need to be recollected in order to be detained, as per Sections 3.2, 3.3 & 3.6

This includes drywells and bioretention (i.e. rain gardens) which must be designed to meet WQv and can be unplugged from the hydrologic modeling for larger storms, but must be designed to safely pass them

Hence retention (attenuation) vs. detention (control)

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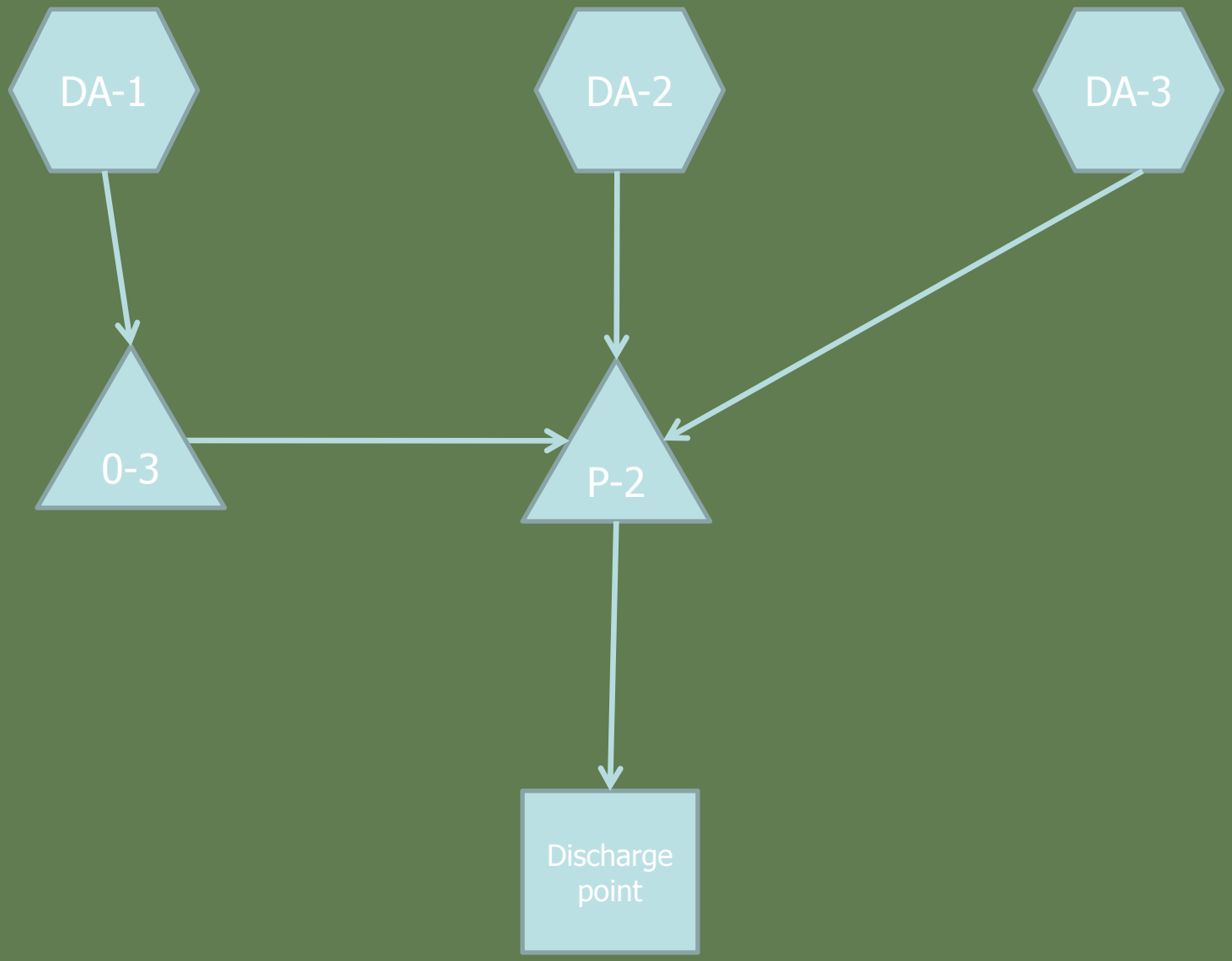

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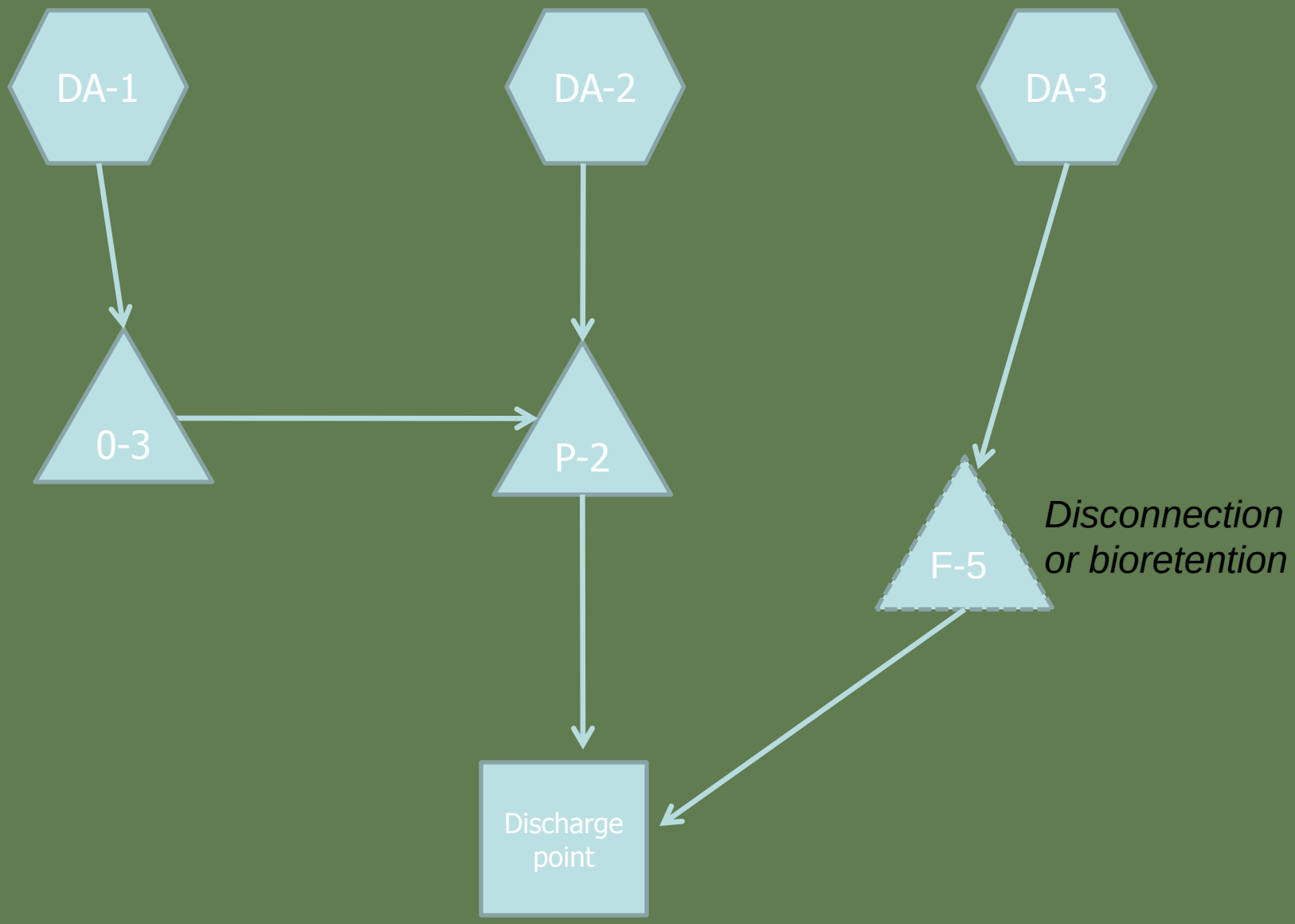

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Unknown unknowns…

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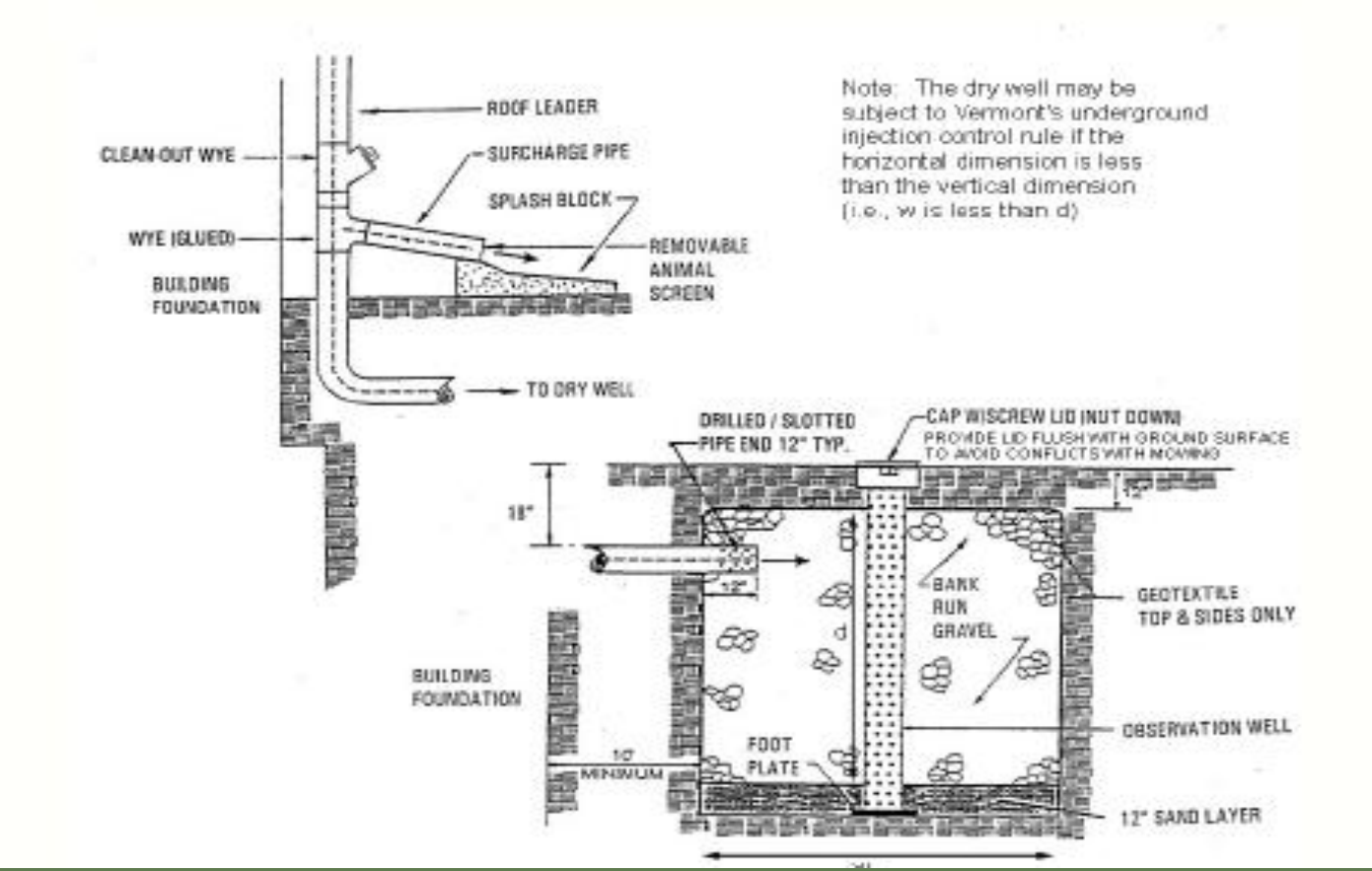
Treating directly at each discrete "source"



For example, a flow path of less than 75 feet can be disconnected via dry well.

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Get it Done…

- It's ultimately up to the designer to use the manual as a tool kit to meet the required standards but also design with principles of green infrastructure in mind
- Stormwater permit application rely upon designer's certification…
- Beyond the manual: Zoning and local ordinances/variances may allow or hinder flexibility for a designer to develop an innovative site plan

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Remember: The Bumble was only grumpy because he had a toothache, which was completely *unknown*. Until Hermey, despite the doubt, solved the menacing problem by being courageous enough to try while relying on his expertise to be successful.

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