Comparing Treatment and Siting Criteria for Stormwater BMPs near Drinking Water Supply Areas

Are Restrictions on these Infiltration BMPs Enough to Protect Wellhead Protection Areas, Stream Buffer Zones and Surface Drinking Water Supplies?

Categories of Stormwater BMPs

Infiltration Practices
- Infiltration Trenches and Basins

Filtering Practices
- Proprietary Media Filters
- Sand & Organic Filters
- Bioretention Areas and Rain Gardens

Constructed Stormwater Wetlands
- Gravel, Basin & Pocket Wetlands
- Dry Detention Basins
- Subsurface Structures

Pretreatment Devices
- Deep Sump & Leaching Catch Basins
- Oil & Grit Separators
- Check Dam/Stone Weir
- Proprietary Separators
- Vegetated Filter Strips
- Dry Wells

MA State Requirements for Infiltration BMPs

Immediate Wellhead Protection Area Setback (Sanitary Radius)	**Wellhead Protection Area (Zone II) Setback (Model generated WHPA)**	**Surface Water – Zone A & Within 200ft**	**Surface Water Zone B**
Prohibited unless essential to the operation of a public water supply	Prohibited	Allowed with additional pretreatment to remove at least **44%** of TSS Total TSS Removal with Pretreatment must be **80%**	Allowed with additional pretreatment to remove at least **44%** of TSS Total TSS Removal with Pretreatment must be **80%**

NH State Requirements for Infiltration, Filtering and Ground Water Recharge Practices

	Wellhead Protection Area Setback:	**Surface Water Intake Area Setback:**	
	Minimum **75–400 ft** set-back between any stormwater treatment practice and public drinking water well depending on well production. *Allowed* in ground water protection area if stormwater from high-load area provided system has source control plan. Infiltration prohibited in areas if stormwater comes from areas with USTs or have contaminants in GW above ambient GW standards or soil standards. Infiltration must have 4 ft of vertical separation from Seasonal High Water Table. No discharge from dry wells to public water area within **1,000 ft.** of a public wellhead protection Area	Discharge setback of **100 ft** within water supply intake protections areas as specified under EnvWq 1508(b). Infiltration must have **4 ft of vertical separation** from Seasonal High Water Table Filtering practices must have **1 ft vertical separation**.	

MA State Design Requirements for Infiltration BMPs

BMP	Wellhead Protection Area (Zone II) Setback	Surface Water (Zone A & Within 200ft)	Surface Water B Setback:
All **Infiltration Trenches:** Recommended outside of Zone I Restricted to small drainage areas (<5 acres). **Infiltration Basins:** Designed to treat 15 acres of less	**Min. of 80% TSS removal prior to discharge.** *Highly recommended* with pretreatment to prevent clogging Must avoid creating mounding near Chapter 21E sites. Oil & grit separator or sand filter required 2 ft separation from groundwater required	**Minimum of 80% TSS removal prior to discharge.** Recommended outside of Zone A.	**Minimum of 80% TSS removal prior to discharge.** *Highly recommended* with pretreatment to prevent clogging Must avoid creating mounding near Chapter 21E sites. Oil & grit separator or Sand filter required 2 ft separation from groundwater required

NH State Design Requirements for Infiltration BMPs

	Wellhead Protection Area	**Surface Water Intake Area**	
	•**TSS Removal** - State Requires 90% TSS Removal for Infiltration BMPs	•**TSS Removal** - State Requires 90% TSS Removal for Infiltration BMPs	

•**Water-Tight Design** - If system serves a bulk plant or terminal where bulk petroleum products or hazardous materials are transferred.

BMP Performance Analysis - Massachusetts

Stormwater Infiltration BMPs	Pathogen Removal	TSS Removal	Metals Removal (Cu, Pb, Zn, Cd)	Nutrient Removal (N/P)	Site Considerations Near Source Waters
Infiltration Trenches	Up to **90%**	**80**% with pretreatment	**85-90%**	**40-70%** Nitrogen **60-70%** Phosp.	Recommended outside of Zone I (Wellhead Protection Area or Zone A (Surface Water Protection Area. Restricted to small drainage areas (<5 acres).
Infiltration Basins	Up to **90%**	**80%** with pretreatment	**85-90%**	**50-60%** Nitrogen 60-70% Phosp.	Highly recommended with pretreatment to remove oil & grease. Recommended for contributing areas of 15 acres or less.
Proprietary Media Filters	Performance varies with specific unit selected, the targeted pollutants	Variable	Variable	Variable	Pretreatment device only. Media Filters must be sized to target land use loadings and storm event.
Sand & Organic Filters	Not rated	**80**% TSS removal with pretreatment	**50-90%**	**20-40%** Nitrogen Removal **10-50%** Phosp. Removal	Restricted to small drainage areas (1-10 acres).
Bioretention Areas & Raingardens	Not rated	90% with adequate pretreatment (vegetated filter strip or equivalent)	**40-90%**	**30%-50%** Nitrogen Removal **30-90%** Phosp. Removal	Pretreatment required for infiltration practices for runoff from land uses with high concentrations of oil and grease.

BMP Performance Analysis - Massachusetts

Stormwater Infiltration BMPs	Pathogen Removal	TSS Removal	Metals Removal (Cu, Pb, Zn, Cd)	Nutrient Removal (N/P)	Site Considerations Near Source Waters
Dry Wells-	Not rated	80%	Not rated	Not rated	Allowed only to treat roof runoff from non-metal roofs within wellhead protection areas. May not be used near parking lot areas.
Deep Sump Catch Basins	Not rated	Not rated	Not rated	Not rated	Pretreatment device only that provide additional TSS removal.
Leaching Catch Basins	Not rated	80% if combined with deep sump catch basin	Not rated	Not rated	Pretreatment device only that provide additional TSS removal.
Subsurface Structures	Not rated	80% TSS removal with pretreatment	Not rated	Not rated	Pretreatment device only. Required for areas with high potential for pollutant loadings
Constructed Stormwater Wetlands	Up to 75%	80% TSS removal with pretreatment	20-85%	Total N – 20-55% Total P – 40-60%	Recommended for source water protection areas. Effective at nutrient removal.

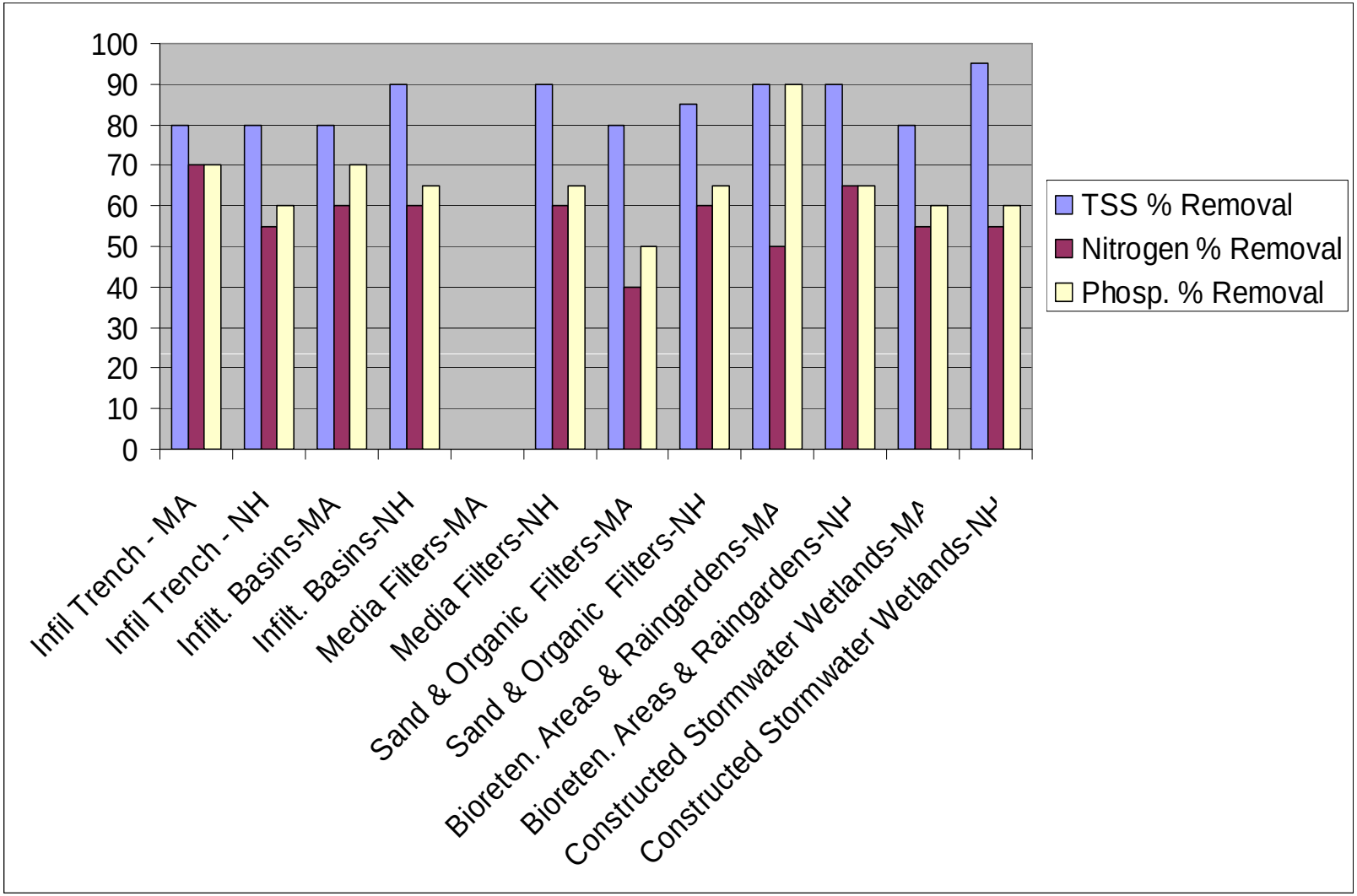
BMP Performance Analysis – New Hampshire

Stormwater Infiltration BMPs	Pathogen Removal	Total Suspended Solids Removal	Metals Removal (Cu, Pb, Zn, Cd)	Nutrient Removal (N/P)	Site Considerations Near Source Waters
Infiltration Trenches	Not rated	90%	Not rated	Total N:10-55% Total P: 60%	Not located in ground water protection areas from high load areas unless source control plan.
Infiltration Basins	Not rated	90%	Not rated	Total N:10-60% Total P: 65%	Not located in ground water protection areas from high load areas unless source control plan.
Proprietary Media Filters	Not rated	85-90%	Not rated	Total N:10-60% Total P: 65%	Performance varies with specific unit selected.
Sand & Organic Filters	Not rated	85-90% TSS depending on distance from surface water	50-90%	Total N:10-60% Total P:45-65%	Performance varies with specific unit selected. Units variable in treatment for metals and nutrients.
Bioretention Areas & Raingardens (Filtering)	Not rated	90% with adequate pretreatment (vegetated filter strip or equivalent)	Not rated	Total N:65% Total P:65%	Performance varies with specific unit selected.

BMP Performance Analysis – NH

Stormwater Infiltration BMPs	Pathogen Removal	TSS Removal	Metals Removal (Cu, Pb, Zn, Cd)	Nutrient Removal (N/P)	Site Considerations Near Source Waters
Dry Wells	Not identified as a BMP	80%	Not rated	Not rated	Not identified as a BMP.
Deep Sump Catch Basins (Pretreatment)	Not rated	15%	Not rated	Total N – 5% Total P – 5%	Pretreatment device only
Leaching Catch Basins (Pretreatment)	Not rated	80% if combined with deep sump catch basin	Not rated	Not rated	Pretreatment device only. Not recommended for cold-water fisheries.
Subsurface Structures (Flow-thru Devices)	Not rated	35% TSS removal with pretreatment 72% - For multichamber system	Not rated	Total N – 10% Total P – 5% Total N – 10% Total P – 9%	Pretreatment device only. Required for areas with high potential for pollutant loadings.
Constructed Stormwater Wetlands	Not rated	70-95% removal with pretreatment	Not rated	Total N – 20-55% Total P – 40-60%	Recommended for source water protection areas. Effective at nutrient removal.

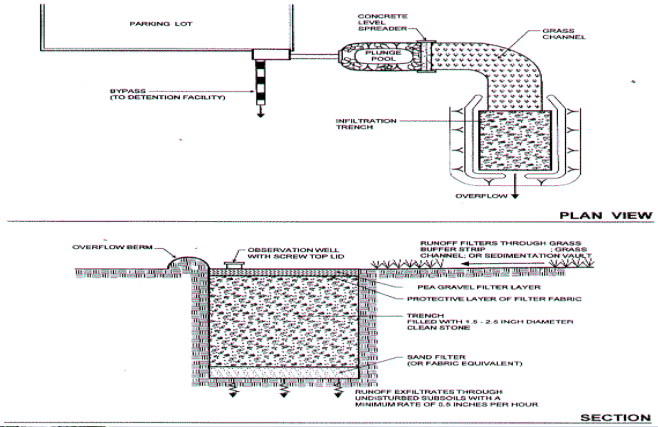
State BMP Rating/Performance Mass & NH



Infiltration Trenches -Restrictions & Performance

- Provides high levels of pollutant removals (including pathogens and metals)
- Restrictions – Best suited for small contributing areas
- Not usually allowed

  in WHPAs but allowed in surface water areas outside intake zone or stream buffer zones



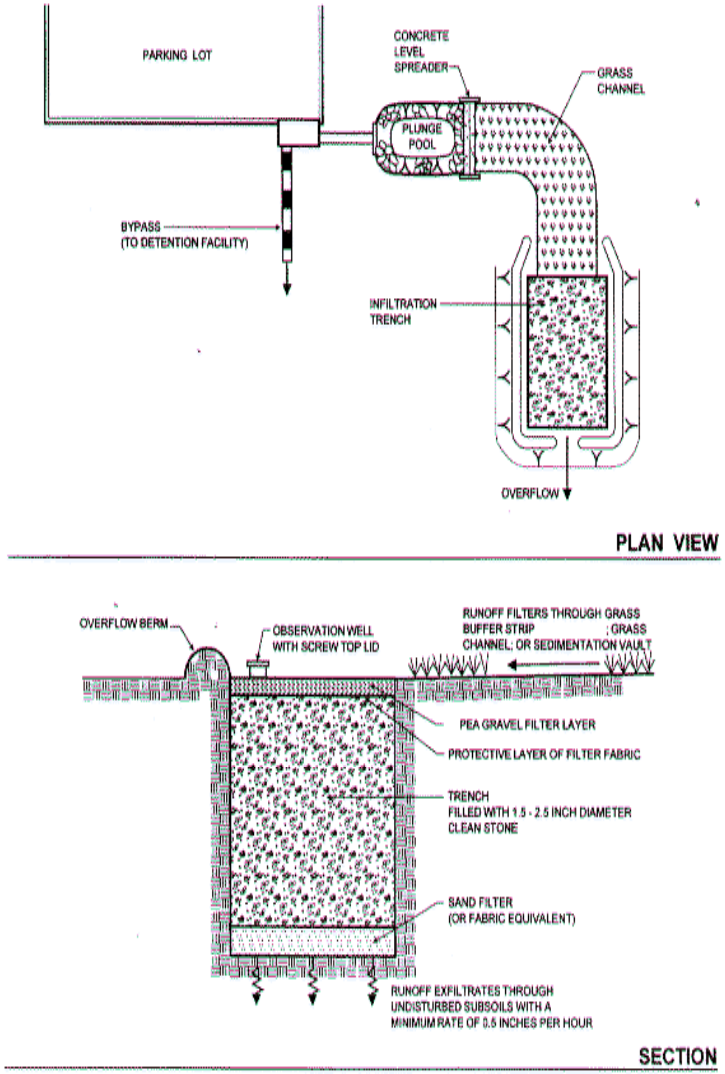
Infiltration Basin-Restrictions & Performance

- Provides high levels of pollutant removals (including pathogens and metals)

- Effective at treating stormwater from large contributing areas (up to 15 acres)

Biofilters -Restrictions & Performance

- TSS and metals removal
- Requires 5-7% of area
- Used for parking lots and retrofit situations
- Must be lined with and impermeable liner – Not Class 5 well.



Artificial Wetlands -Restrictions & Performance

Gravel Wetlands

- Not Considered a Class 5 Underground Injection Well – NH considers this a filtration practice

- Provides high level of pollutant removal but not recharge

UIC Class V Restrictions:

Connecticut: CT's Aquifer Protection Regulations

Prohibit most industrial activities from installing dry wells or other infiltration devices**.** Infiltration of stormwater is *not recommended less than 75 feet from public drinking water supply protection areas.*

Maine: Stormwater Rules &

State rules prohibit either infiltration galleries or dry well recharge from stormwater within the delineated contributing area of a public supply well

Rhode Island:

1. Infiltration facilities shall be located at least **400 feet** horizontally from any public drinking water supply well.

2. Residential dry wells and infiltration facilities for private driveways shall be located **at least 25 feet** horizontally from all private drinking water wells

3. All other infiltration facilities shall be located at least **200 feet horizontally** from all surface water supplies and tributaries.

Vermont:

Stormwater runoff from designated hot spot land uses or activities must not be directed to infiltration facilities or dry wells.

EPA Region I Stormwater BMP Performance Analysis document

Models stormwater BMPs used for retrofit situations filtration components and predicts decay of pollutants based on calibrations for different storm events and type of land use.

Model predicts decay of pollutants for zinc, total phosphorous, and TSS for different types of BMPs (gravel wetlands, bioretention cells, swales, porous pavement, and wet (and dry) retention ponds)

Models used to generate long-term cumulative performance estimates expressed as performance curves. For each BMP, performance curves were developed for five land uses and three water quality constituents. The land uses consist of commercial, industrial, high-density residential, medium-density residential, low-density residential.

- **EPA Stormwater BMP Performance Analysis document at** www.epa.gov/region1/npdes/stormwater/assets/pdfs/BMP-Performance-Analysis-Report.pdf

Sources Evaluating BMP Performance

- **Technology Acceptance Reciprocity Partnership (TARP) Protocol for Stormwater Best Management Practice Demonstrations**:
  www.dep.state.pa.us/dep/deputate/pollprev/techservices/tarp/pdffiles/Tier2protocol.pdf

- **Massachusetts STEP:** http://www.mastep.net/library.cfm

- **UNH BMP Specifications and Performance Information:**
  http://unh.edu/erg/cstev/fact_sheets/index.htm

- **EPA Urban BMP Performance Tool:**
  http://cfpub.epa.gov/npdes/stormwater/urbanbmp/bmpeffectiveness.cfm

EPA / Other Storm Water Websites – For More Information -

- **Center for Watershed Protections**
  www.cwp.org/cold-climates.htm

- **American Ground Water Trust (Ground Water BMPs only)**
  www.agwt.org/manual.pdf

State Storm Water Websites

CT:
www.ct.gov/dep/lib/dep/water_regulating_and_discharges/stormwater/manual/CH_11_Intro.pdf

MA:
www.mass.gov/envir/smart_growth_toolkit/LID/regional_planning/LID/LID_Links_References.html#MA

ME: www.maine.gov/dep/blwq/docstand/stormwater/group/bmpsynop.pdf

NH:
http://des.nh.gov/organization/divisions/water/stormwater/manual.htm

RI:
www.dem.ri.gov/programs/benviron/water/permits/ripdes/stwater/t3bmp/minmeas1.htm

VT: http://www.anr.state.vt.us/dec/waterq/stormwater/docs/sw_manual-vol1.pdf

Appendix - Stormwater Infiltration Systems New England Setbacks

State	Wellhead Protection Area	Surface Water Drinking Supply
Connecticut	Prohibited within 100 ft of a public well	Prohibited within 200 ft of surface water supplies and their tributaries 100 ft
Maine	Prohibited in contributing area of a public supply well	Allowed with treatment requirements
Massachusetts	Prohibited in Zone I (Immediate Wellhead Protection Areas) Allowed in Zone II or Interim Wellhead Protection Areas with additional Pretreatment	Prohibited in Zone A Surface Water Supply Protection Area (400 ft around Class A source and 200 ft around tributaries to source) Allowed in Zone B Surface Water Supply Protection Areas with additional pretreatment. (Within ½ mile of Class A surface water source)
New Hampshire	Prohibited within given setbacks from a water supply wells ranging from **75 – 400 ft.** Prohibited in groundwater protection areas where the stormwater comes from a high-load areas No infiltration to ground water supplies from high-load areas	Prohibited within water supply intake protection area (area 250 ft of normal high water mark) or to ground water within 100 ft of surface water Allowed within a water supply intake protection area if, the seasonal high water table and bedrock are at least 4 feet below the bottom of the practice
Rhode Island	Prohibited within 400 ft of a public water supply well	Prohibited within 200 ft of surface water supplies and their tributaries
Vermont	Prohibited within 500 ft of a public community water supply well	Prohibited within 500 ft of a public community water supply