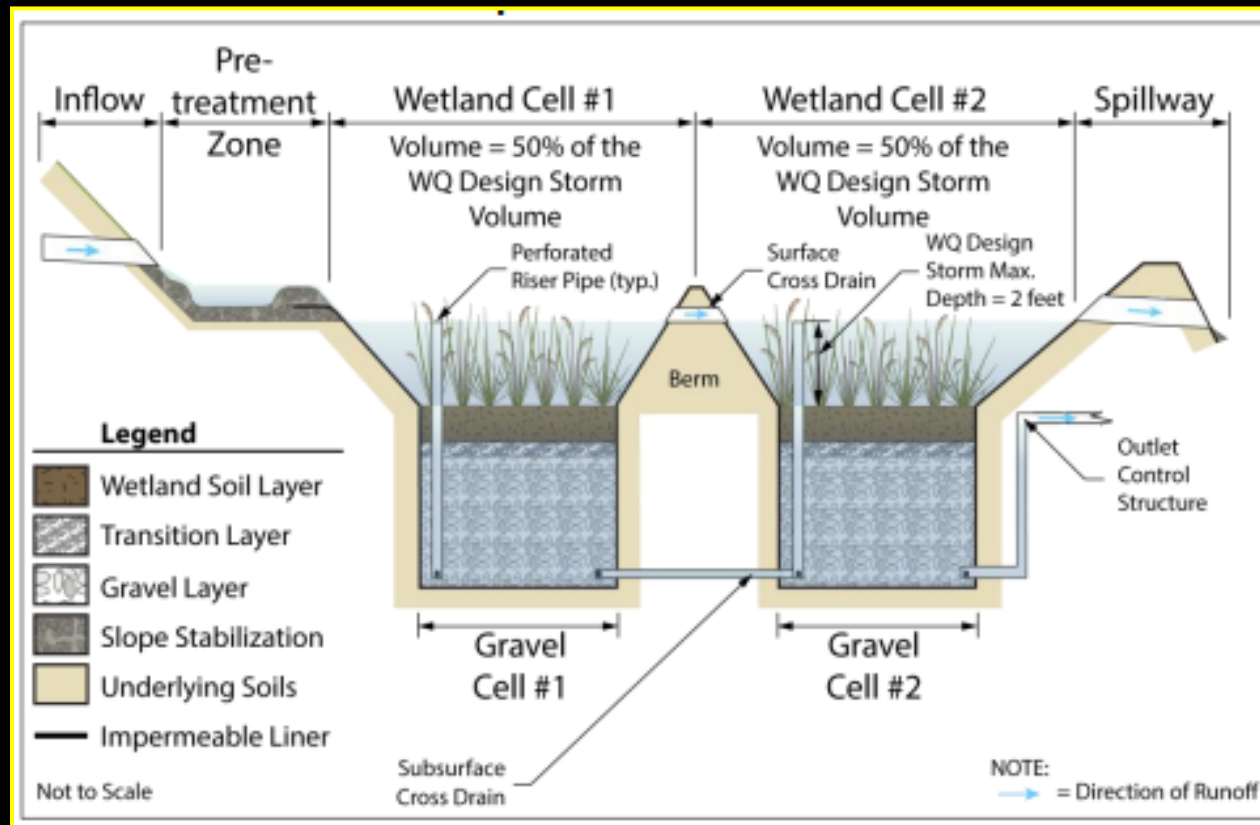


GRANT APPLICATION TO QUANTIFY THE POLLUTANT REMOVAL CAPABILITIES OF SELECT STORMWATER BEST MANAGEMENT PRACTICES



August 24, 2018

Pinelands Policy and Implementation Committee

2018 Water Quality Restoration Grants
for Nonpoint Source Pollution

**BARNEGAT BAY WATERSHED REQUEST FOR
PROPOSALS**



Westecunk Creek, Eagleswood Township, Ocean County (photo credit: NJDEP)

**New Jersey Department of Environmental Protection
Division of Water Monitoring and Standards
Bureau of Environmental Analysis, Restoration and Standards**

Issuance Date: May 23, 2018
Proposal Due Date: August 31, 2018

NEED FOR STORMWATER MANAGEMENT

Stormwater runoff causes havoc when not properly managed.

- Flooding



Brick
August 2018

- Beach closings



Beachwood
Beach
July 2018

NEED FOR STORMWATER MANAGEMENT

Stormwater runoff causes havoc when not properly managed.

- Eutrophication



Buena
Borough
Sept. 2014

STORMWATER IS A VALUABLE RESOURCE

- Annual average rainfall in South Jersey $\approx 44''$ over 938,000 acres
 $\approx 3,439,333$ acre-feet
 $\approx 1.12071 \times 10^{12}$ gallons
- > **One trillion, one hundred-twenty billion gallons** of precipitation falls on the Pinelands each year

Of the 44'' of total rainfall $\approx 24''$ runs-off or evapotranspires

24'' over 938,000 acres ≈ 1.8 million acre-feet $\approx 6.1129637 \times 10^{11}$ gallons

- > **Six hundred-eleven billion + gallons** of non-infiltrating rainfall each year

STORMWATER MANAGEMENT IN THE PINELANDS AREA

- The CMP prohibits the direct discharge of stormwater runoff to:
 - Wetlands;
 - Wetlands buffers; and
 - Surface water bodies.
 - No change to natural hydrology (surface water and ground water levels, natural water chemistry , erosion / sedimentation, wetlands species composition).
 - Recognizes stormwater runoff as a natural resource and necessary to the maintenance of groundwater levels in the unconfined Kirkwood Cohansey aquifer.
- The CMP prohibits (to the maximum extent practical) the direct discharge of stormwater to farm fields to protect crops from flooding, erosion and long term soil saturation.

STORMWATER MANAGEMENT IN THE PINELANDS AREA

CMP has long addressed stormwater **runoff quantity** issues

CMP **rate controls**:

- The rate (c.f./sec.) that stormwater exits a parcel can not increase in the post-development condition compared to the pre-development condition.

CMP recharge **volume controls**:

- The volume of stormwater generated from new impervious surfaces by a 10 year storm of 24 hour duration must be retained and infiltrated onsite.
 - For much of the Pinelands Area, the 10 year , 24 hour storm is an approximate 5 inch rainfall over a full day.
 - This storm would produce nearly 15,000 gallons of runoff from an area the size of a basketball court (94' x 50'); enough water to fill 14' x 28'x 5' deep swimming pool.
 - The CMP ensures that this significant volume of water is recharged to the K/C Aquifer.

STORMWATER MANAGEMENT IN THE PINELANDS AREA

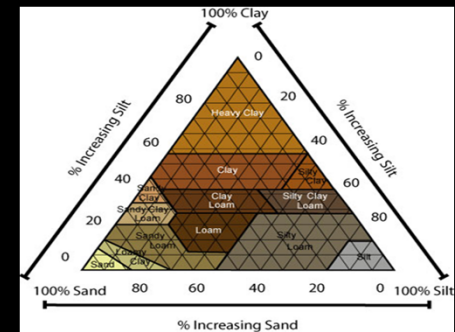
CMP rate and volume standards are typically addressed by installation of an infiltration basin (BMP). Many developers install much larger basins, large enough to infiltrate the 100 year storm.

In siting an infiltration basin the engineer must demonstrate:

- that there is at least 2 feet of vertical separation between the bottom of the basin and the seasonal high water table;
- that groundwater mounding below the basin will not adversely impact (cause flooding of) adjacent below grade structures (e.g. basements, septic fields, etc.); and
- that the basin will fully drain within seventy-two hours after the end of the storm event.

STORMWATER MANAGEMENT IN THE PINELANDS AREA

To insure that volume of stormwater can infiltrate and recharge the aquifer, the CMP requires :



Laboratory Tube Permeameter

2.4 Litre Mold
Cat. No. 38-T0182 Con

1 Litre Mold
Cat. No. 38-T0180 Con

Both these comprise:-
• Mold Base,
• Mold Body,
• Collar with drain,
• Confinement Clamp,
• Porous Stone,
• Surcharge Disc and
• Spacer.

Conform to AS 1289.6.7

POTENTIAL POLLUTANTS IN STORMWATER RUNOFF

- Nitrogen
- Phosphorous
- Bacterial pathogens
- Deicing salts
- Heavy metals
- Oil
- Gasoline
- Sediment
- Mercury
- Pesticides
- Herbicides
- Temperature



MANAGING POLLUTANTS IN STORMWATER RUNOFF

CMP makes inroads into addressing stormwater quality issues

CMP requires add'l stormwater controls prior to recharge in:

High Pollutant Load Areas (HPLA) – fueling stations, garden centers, etc.

- Minimize the areal extent
- Cover the area to minimize exposure to rainfall
- Curb and segregate the runoff from non-HPLA stormwater
- Pretreat HPLA stormwater to remove 90% of TSS
- Oil/grease separator to remove petroleum hydrocarbons, if present

Pinelands Stormwater Control Ordinance requires:

- Reduction of the nutrient load in stormwater runoff from the post-developed site to the maximum extent practicable.

MANAGING POLLUTANTS IN STORMWATER RUNOFF

What constitutes pollutant removal “to the maximum extent practical”?
50%, 60%, 70%, 80%, 90%, higher

Typical Phosphorus and Nitrogen Removal Rates for BMPs (Adapted from NJDEP BMP Manual)		
Best Management Practice (BMP)	Total Phosphorus Removal Rate (%)	Total Nitrogen Removal Rate (%)
Bioretention Basin	60	30
Constructed Stormwater Wetland	50	30
Extended Detention Basin	20	20
Infiltration Basin	60	50
Manufactured Treatment Devices	See N.J.A.C 7:8-5.7(d)	See N.J.A.C 7:8-5.7(d)
Pervious paving	60	50
Sand Filter	50	35
Vegetative Filter	30	30
Wet Pond	50	30
Subsurface Gravel Wetlands	None Reported	90

“Typical” total N removal rates from specific BMPs

1. Vegetative Filter = 30%
2. Constructed Stormwater Wetland = 30%
3. Wet Pond = 30%
4. Infiltration Basin = 50%

BMPs can be linked in series (a **“treatment train”**) to attain a higher pollutant removal rate.

However, the actual removal rate is not simply additive. Using the DEP’s “typical” data:

Linking each of the four BMPs together in a treatment train produces only an 86% TN removal rate.

2018 WATER QUALITY RESTORATION GRANTS FOR NONPOINT SOURCE POLLUTION

- \$10M is being offered by NJDEP for watershed restoration, enhancement, and protection strategies that address NPS pollution in the Barnegat Bay watershed.
- The Pinelands Commission proposes to partner with the USGS New Jersey Water Science Center to quantify the nutrient and pathogen removal capabilities of existing stormwater BMPs in the Barnegat Bay Watershed.
- The Pinelands Area serves as the headwaters to the Bay and occupies 38 percent of the total land area that comprises the Barnegat Bay Watershed.
- The Pinelands National Reserve occupies fully 58.7 percent of the Barnegat Bay Watershed.

2018 WATER QUALITY RESTORATION GRANTS FOR NONPOINT SOURCE POLLUTION

- Both the Pinelands Commission and NJDEP share the common goal of controlling nitrogen discharges to the environment.
- Pinelands Commission staff actively participate on several Barnegat Bay Partnership Committees including the Science, Advisory, and Education Committees.
- State government agencies are eligible to apply for this water quality restoration grant funding.
- Points will be awarded to applicants that have previously received grant funding from NJDEP and successfully met all project deliverables.

2018 WATER QUALITY RESTORATION GRANTS FOR NONPOINT SOURCE POLLUTION

- Additional points will be awarded to applicants that contribute their own funding the proposed project.
- Our project funding goal:
 - \$200,000 from DEP grant
 - Up to \$40,000 from the Pinelands Commission
 - Up to \$60,000 from the USGS
 - Project total = \$300,000

EVALUATING THE POLLUTANT REMOVAL CAPABILITIES OF BMPS

Why is this research needed?

- The estimated “typical” pollutant removal rates identified in the NJDEP Stormwater BMP Manual may not be representative of actual BMP performance in the NJ Coastal Plain.
- Nutrient and pathogen removal is dependent on physical, microbiological and geochemical processes. This research would determine if BMPs in the Pinelands Area perform equal to, less than or better than indicated in the NJDEP’s guidance document.
 - For example denitrification requires sufficient alkalinity and a suitable pH range that may or may not be present in the Pinelands Area.

EVALUATING THE POLLUTANT REMOVAL CAPABILITIES OF BMPS

- This research would identify BMPs are most effective at removing select stormwater-borne pollutants.
- Local (counties) and state agencies (e.g. DEP, DOT) could apply these findings in their BMP retrofits.
- The highest performing BMPs could be prioritized in state and local regulations and ordinances.
- Field-verified pollutant removal rate data could be used to meet existing and future Total Maximum Daily Loads. (TMDLs)

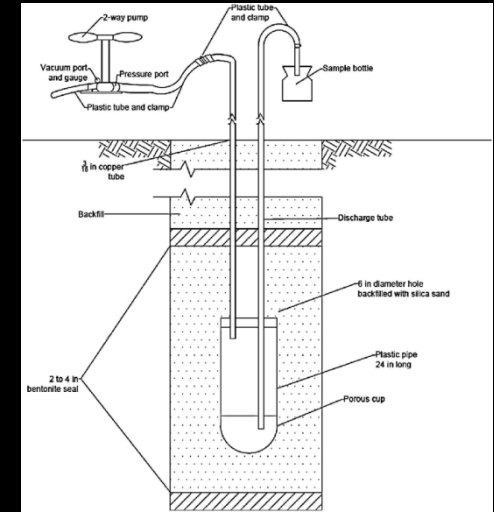
EVALUATING THE POLLUTANT REMOVAL CAPABILITIES OF BMPs

- We would likely select 5 BMPs types to study.
 - Each would be sampled 4 times following significant rainfall events over multiple seasons.
- USGS would sample (raw) stormwater flowing into each BMP at the inflow structure.
- “Treated” stormwater would be sampled from within the BMPs, at the outflow structure (if applicable) and from the subsurface using suction lysimeters and piezometers.
- The devices percent removal efficiency would be calculated for each BMP evaluated and presented in a citable report.

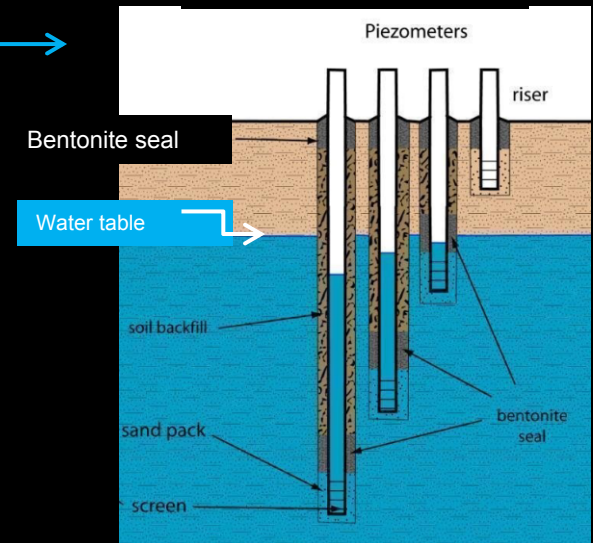


EVALUATING THE POLLUTANT REMOVAL CAPABILITIES OF BMPs

“Treated” stormwater would be sampled from within the BMPs, at the outflow structure (if applicable) and from the subsurface using suction lysimeters and piezometers.



suction lysimeter



piezometers (nested)

The BMPs percent removal efficiency would be calculated and presented in a citable report.

EVALUATING THE POLLUTANT REMOVAL CAPABILITIES OF BMPs



“K5” Sand-Lined Infiltration Basin (Typ.) Garden State Parkway Lacey Township, NJ

EVALUATING THE POLLUTANT REMOVAL CAPABILITIES OF BMPs



Vegetated Infiltration Basin
Pinelands Commission
Campus Pemberton
Township, NJ

EVALUATING THE POLLUTANT REMOVAL CAPABILITIES OF BMPs



Newly constructed K5 sand lined basins



EVALUATING THE POLLUTANT REMOVAL CAPABILITIES OF BMPS



K5 sand lined infiltration basins with volunteer propagules

EVALUATING THE POLLUTANT REMOVAL CAPABILITIES OF BMPS



Stormwater Wet Pond



Retrofitted Dig and Drop and Plant
BMP



Questions?