Appendix A
Task Report Listing

Task 2: Stream Visual Assessments, July 2011 (Report)

Task 3: Technical Analysis, July 2011 (Report)

Task 4: Set Plan Objectives, September 14, 2011 (Technical Memorandum)

Task 5: Management Strategies, March 22, 2012 (Technical Memorandum)

Appendix B
Advisory Committees

Stakeholder Advisory Committee

Steering Committee

Metedeconk Stakeholder Advisory Committee (shaded members also served on the Steering Committee)

Name	Affiliation
Eileen Althouse	CDM Smith
Lisa Auermuller	Jacques Cousteau NERR
Greg Auriemma, Esq.	New Jersey Sierra Club
Ron Baker	U.S Geological Survey, NJ Water Science Center
Todd Bates	Asbury Park Press
Bethany Bearmore	NOAA Restoration Center, James J. Howard Marine Fisheries Laboratory
Richard Bizub	Pinelands Preservation Alliance
Ian Borden	Professional Design Services, LLC
Richard Borys	Commissioner, Jackson Township MUA; Jackson Environmental Commission
Tom Bovino	Leigh Realty Company
Clemens Bremer	Point Pleasant Beach
Linda Brennen, P.P., AICP	Monmouth County Planning Board
Steve Buente, P.E.	New Jersey Turnpike Authority
Daniel Burke, P.E., P.P., CME	Jackson Township
Allan E. Cartine	Chairman, Brick Township MUA
John A. Catalano	Commissioner, Brick Township MUA
George Cevasco	Commissioner, Brick Township MUA
Nicole Ciccaglione	USDA Farm Service Agency
Elissa Commins	Brick Township, Birdsall Engineering
Scott Conklin	Ocean County Utilities Authority
Chris Constantino	Point Pleasant Borough
John Costigan	Howell Farmland Preservation Cmte.
Kira Dacanay	NJDEP, Division of Fish & Wildlife
Courtney Davidson	Freehold Soil Conservation District
William deCamp	Save Barnegat Bay
Michael DeLuca	Rutgers University IMCS JCNERR
Barbara Dixel	Howell Township
Walt Durrua	Jersey Paddler
Tracy Fay	NJDEP, Water Monitoring & Standards
Carl Feltz	Point Pleasant Borough
Michael Fiure	Ocean County Parks and Recreation
Justin Flancbaum	Lakewood Township MUA
Robert Forsyth	Point Pleasant Borough, Remington, Vernick & Vena Engineers
Michael Fowler, P.P., AICP	Brick Township
David Friedman	Ocean County Soil Conservation District
Denise Garner	S.P.A.R.E. Jackson
James Giordano	Point Pleasant Borough
Ariane Giudicelli	NJDEP, Water Monitoring & Standards
Mira Gorska	NJDEP, Water Monitoring & Standards
Nancy Grbelja	Mayor, Millstone Township
Ines Grimm	Freehold Soil Conservation District
Beverly Guz	Howell Township
Scott Haag	Rutgers University CRSSA JCNERR
Stan Hales, Ph.D.	Barnegat Bay National Estuary Program
Debra Hammond	NJDEP, Bureau of Water Quality Standards and Assessment
David Harpell	Jackson Township MUA
Paul Hartelius, P.E.	New Jersey-American Water
Tom Hartman	Ocean County Engineering Department
Helen Henderson	American Littoral Society
James R. Herrman, P.E.	Howell Township, Birdsall Engineering
Michael Hill	Freehold Soil Conservation District
Kathleen Hitchner	NJDEP, Office of Policy Implementation and Watershed Restoration
Kyra Hoffmann	NJDEP, Office of Policy Implementation and Watershed Restoration

Metedeconk Stakeholder Advisory Committee (shaded members also served on the Steering Committee)

Name	Affiliation
Patricia Ingelido	NJDEP, Water Monitoring & Standards
Robert Karl	Project Manager, Brick Township MUA
Michael Kennish, Ph.D.	Rutgers University IMCS
Robert Koches	Freehold Townshp
Ginger Kopkash	NJDEP, Office of Policy Implementation and Watershed Restoration
Ernest Kuhlwein, P.E., P.P.	Ocean County Dept. of Solid Waste Management
James Lacey, C.P.W.M.	Brick Township MUA
Richard Lathrop, Ph.D.	Rutgers University CRSSA
Danni Logue	Jenkinson's Aquarium Watershed Program
Tim Lurie, P.E., P.P., CME	D.W. Smith Associates, LLC
Joseph Maggio, P.E.	Brick Township MUA
Mark Maimone, Ph.D., PE, BCEE	CDM Smith
Joe Malison	John S. Truhan Consulting Engineers
Robert Mancini	NJDEP (retired)
Michael Mangum	Ocean County Parks and Recreation
James Manuel	Ocean County Environmental Agency
Steve Mars	U.S. Fish & Wildlife Service, NJ Field Office
Martha Maxwell-Doyle	Barnegat Bay National Estuary Program
Leslie McGeorge	NJDEP, Water Monitoring & Standards
John McHugh, Jr.	Point Pleasant Borough
David McKeon, P.P., AICP	Ocean County Planning Department
Ed McLaughlin	Federal Realty Investment Trust
Richard Mohr	Georgian Court University
Kirk Moore	Asbury Park Press
Wilma Morrissey	Wall Township
Cara Muscio	Rutgers Cooperative Extension of Ocean County
Harold Nebling	NJDEP
Ray Nichols	NJDEP
Robert Nicholson	U.S Geological Survey, NJ Water Science Center
Jennifer Noblejas	NJDEP
Daniel O'Rourke	Project Manager, CDM Smith
Helen Pang	NJDEP, Water Monitoring & Standards
Tara Paxton, P.P., AICP	Brick Township
Vicki Peccioli	Ocean County Planning Department
Robert Pennington, P.E., BCEE	CDM Smith
David Pollison	Barnegat Bay Watershed & Estuary Foundation
Victor Poretti	NJDEP, Bureau of Freshwater and Biological Monitoring
Vincent Poulsen Sr.	Monmouth County Mosquito Commission
David Pringle	New Jersey Environmental Federation
Richard Quigley	Jackson Township MUA
Christine Raabe	Ocean County Soil Conservation District
Jillian Reilly	New Jersey-American Water
Ann Richardson	resident
John Rissel	Brick Township MUA (retired)
Cindy Roberts	Trust for Public Land
Susan Rogers	Council President, Point Pleasant Borough
Terri Romagna	NJDEP, Office of Policy Implementation and Watershed Restoration
Matthew Rutkowski	Monmouth County Department of Public Works & Engineering
Frank Scarantino	Ocean County Engineering Department
Ken Schafer	Brick Township
Janet Scher	resident
Helene Schlegel	Howell Township
William Schroeder	Mayor, Point Pleasant Borough

Metedeconk Stakeholder Advisory Committee (shaded members also served on the Steering Committee)

Name	Affiliation
Robert Shertenlieb	Ocean County Utilities Authority, NWPCF
Don Smith	Howell Township
David Sorensen	Monmouth County Health Department
Mary Ann Sorensen Allacci, Ph.D.	PEHKA
Steve Specht, P.E.	Brick Township MUA
Barbara Spinweber	USEPA Region 2, Estuaries and Oceans Section
Jay Springer	NJDEP, Water Monitoring & Standards
Kenneth Stegemann	Ocean County Utilities Authority, NWPCF
William Stevens, P.E.	Professional Design Services, LLC
Peggi Sturmfels	New Jersey Environmental Federation
Heidi Tabor	Brick Township MUA
Ken Thoman	Monmouth County Park System
Tim Thomas	Freehold Soil Conservation District
John Tiedemann, Ph.D.	Monmouth University
John Truhan, P.E., P.P., CME	John S. Truhan Consulting Engineers
Vincent Turner	U.S. Fish & Wildlife Service
Jim Vasslides	Barnegat Bay National Estuary Program
Joseph Verruni	Wall Township
Benjamin Waldron	Monmouth-Ocean Development Council
Kenneth Wenrich	Ocean County Health Department
Britta Wenzel	Save Barnegat Bay
Timothy White	Freehold Townshp
Christine Wieben	U.S Geological Survey, NJ Water Science Center
John Wnek	Ocean County Vo-Tech School, MATES
Gina Wooley	Shore Builders Association of Central New Jersey
Louise Wootton, Ph.D.	Georgian Court University
Matthew Zohorsky, P.E., CME	Wall Township

Appendix C
Description of Management Strategies

Resource Conservation/Protection

Conservation of remaining natural resources through protection and preservation is the most holistic strategy for sustainably achieving the watershed objectives. Protection of sensitive aquatic resources can be achieved by maintaining vegetated riparian buffer zones. Preservation of existing high quality ecosystems provides water storage, filtration, and treatment services with many other cumulative benefits and minimal maintenance. There are almost 200 parcels that have been identified by the Trust for Public Land for 'protection priority' which could be considered for this management strategy (see TPL, 2008). In addition, much of the riparian corridor throughout the watershed has been identified as a 'conservation priority' by the University of Massachusetts (see Barten et al, 2003).

Improvement Potential	***Resource Conservation /Protection Benefits***
High ●	***Water Quantity*** ●
Average ◐	***Sediment*** ●
Low ○	***Nutrients*** ●
	Bacteria ●
	Habitat ●
	Demonstration ◐

2. Urban Green Stormwater Infrastructure

Infiltration of stormwater runoff from impervious surfaces in urbanized or downtown areas can be accomplished through construction of green stormwater infrastructure, or GSI. Examples of these types of infrastructure include stormwater bump-outs, infiltration trenches and stormwater planters. These can be retrofit into existing downtown areas and within commercial land uses with large areas of impervious cover (parking lots, shopping malls, etc.).

UGSI Benefits
Water Quantity ●
Sediment ●
Nutrients ●
Bacteria ●
Habitat ◐
Demonstration ●

t3. Infiltration Basin

A facility which collects and provides temporary storage of stormwater runoff to promote infiltration through highly permeable soils. Sediment and nutrient removal as well as groundwater recharge are achieved.

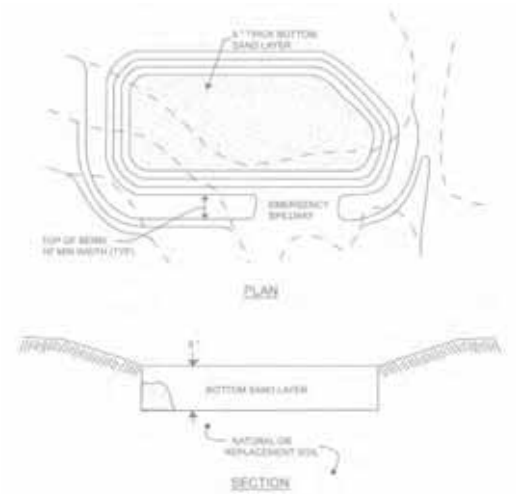


Figure of Infiltration Basin from NJ BMP Manual

Infiltration Basin Benefits

Water Quantity	○
Sediment	●
Nutrients	●
Bacteria	●
Habitat	○
Demonstration	○

t3. Upland Reforestation

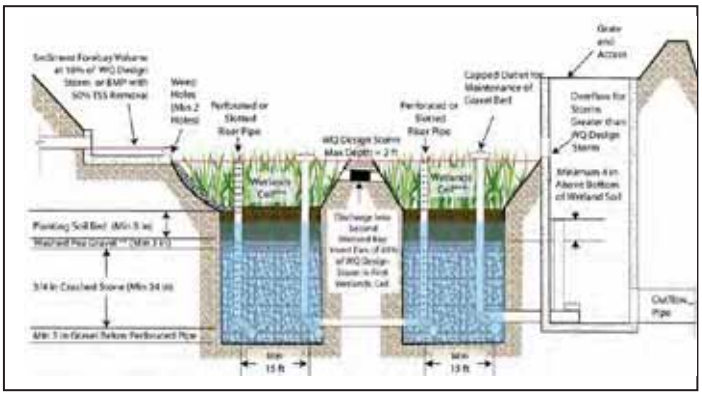
Restoration of upland and riparian forests capitalize on available, unused land to return pre-development hydrology. Tree canopy cover and leaf debris ground cover captures rainfall where it falls, protects soils from erosion, maximizes infiltration, and sequesters nutrients. Trees can be planted as individuals or clusters in urban areas, strategically along riparian buffers, or broadly across expansive former agricultural lands to realize water quantity, quality, and habitat benefits which are maximized with minimal maintenance requirements. Other benefits associated with reforestation include improved scenery and air quality.

Reforestation Benefits

Water Quantity	●
Sediment	●
Nutrients	●
Bacteria	●
Habitat	●
Demonstration	○

t5. Constructed Stormwater Gravel Wetland

Constructed stormwater gravel wetlands are similar to the constructed stormwater wetlands described above, except they rely more on a dense root mat, crushed stone, and an anaerobic and microbe-rich subsurface to remove pollutants, espeically nutrients such as total nitrogen and total phosphorus. Because of their considerable nitrogen removal capabilities, constructed stormwater gravel wetlands are being evaluated as one of the primary BMPs for the Barengat Bay estuary.



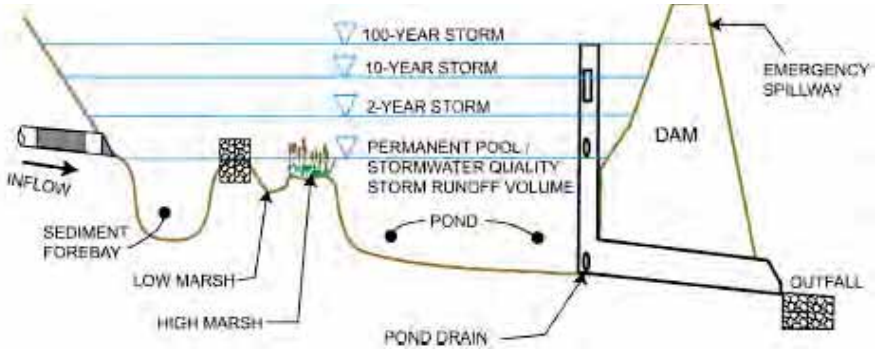
Constructed Gravel Wetland Benefits

- ***Water Quantity*** ○
- ***Sediment*** ●
- ***Nutrients*** ●
- ***Bacteria*** ○
- ***Habitat*** ●
- ***Demonstration*** ○

Figure of Constructed Stormwater Gravel Wetland from NJ BMP Manual

t5. Constructed Stormwater Wetland

Constructed stormwater wetlands are wetland systems designed to maximize the removal of pollutants from stormwater runoff through settling and both uptake and filtering by vegetation. Constructed stormwater wetlands are used to remove a wide range of stormwater pollutants from land development sites as well as provide wildlife habitat and aesthetic features. They can also be used to reduce peak runoff rates when designed as a multi-stage, multi-function facility.



Constructed Wetland Benefits

- ***Water Quantity*** ○
- ***Sediment*** ●
- ***Nutrients*** ●
- ***Bacteria*** ○
- ***Habitat*** ●
- ***Demonstration*** ○

Figure of Constructed Stormwater Wetland from NJ BMP Manual

t5. Private Property BMPs

Private property BMPs are stormwater practices that individual property owners can implement. While the individual benefit of implementing these practices may not be significant, if implemented throughout the watershed they can provide significant cumulative water quality and quantity benefit. Much of the water quality concerns throughout the Metedeconk River watershed are from non-point sources from stormwater. Therefore, implementation of a large scale non-point solution would be beneficial. Some of the types of structural stormwater practices that can be implemented by private property owners and are recommended for this watershed include rain barrels, rain gardens, rain gutter downspout redirection, and cisterns. To some degree, the passing of the New Jersey Fertilizer Law (A2290) is a private property BMP in which restrictions on fertilization have been placed both in terms of when and how much fertilizer can be applied as well as the content of the fertilizer itself.

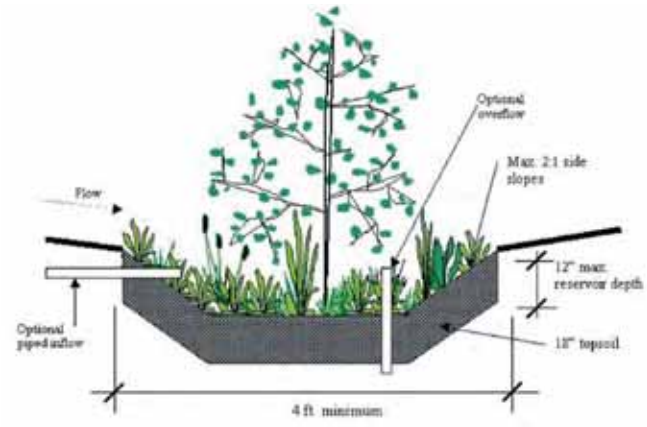


Figure of Rain Garden from EPA

Private Property BMP Benefits

Water Quantity	●
Sediment	●
Nutrients	●
Bacteria	○
Habitat	◐
Demonstration	●

8. Bioretention Basin

A bioretention system consists of a soil bed planted with suitable native vegetation. Stormwater runoff entering the bioretention system is filtered through the soil planting bed before being either conveyed downstream by an underdrain system or infiltrated into the existing subsoil below the soil bed. Vegetation in the soil planting bed provides uptake of pollutants and runoff and helps maintain the pores and associated infiltration rates of the soil in the bed. They can be installed in lawns, median strips, parking lot islands, unused lot areas, and certain easements. They are intended to receive and filter storm runoff from both impervious areas and lawns.

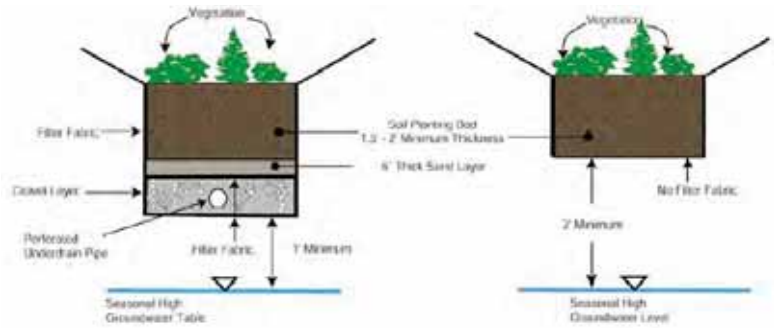


Figure of Bioretention Cell from NJ BMP Manual

Bioretention Basin Benefits

Water Quantity	○
Sediment	●
Nutrients	●
Bacteria	●
Habitat	◐
Demonstration	○

t9. Retrofit Existing Stormwater Basin

Numerous existing stormwater basins were identified in the stream visual assessments and other studies (i.e. Rutgers/JCNERR) with the potential for retrofit to extended detention (see below) or bioretention. The perimeter area around the basin can be improved with native vegetative cover, rather than just turf grass.

Numerous basins within Ocean County have been retrofit as part of the Stormwater Basin Retrofit Implementation Project between 2002 and 2008 (funded under the Atlantic Coastal Watershed Program Grant to support the Barnegat Bay Watershed).

Basin Retrofit Benefits

Water Quantity	●
Sediment	◐
Nutrients	◐
Bacteria	◐
Habitat	◐
Demonstration	○

t9. Agricultural BMPs

Many agricultural BMPs exist to control runoff from crops and livestock of all kinds. BMPs on active agricultural lands can significantly reduce the sediment from tilling and cattle traffic, as well as reduce nutrients from fertilizer and livestock waste. A few visual assessment sites identified a potential need for agricultural BMPs.

Site SHB-1: Lush growth along stream bank near nursery indicates that a BMP may be beneficial.

Agricultural BMP Benefits

Water Quantity	○
Sediment	●
Nutrients	●
Bacteria	●
Habitat	○
Demonstration	○

t9. Buffer Restoration

Restoration of riparian buffers with native vegetation is especially important for the health of the stream system and provides water quality and ecosystem benefits. Vegetated buffers minimize erosion and filter runoff before it enters the stream channel. Based on the stream visual assessments conducted under Task 2, a number of areas have been identified that would benefit from restoration of riparian buffers.

Buffer Restoration Benefits

Water Quantity	○
Sediment	●
Nutrients	●
Bacteria	●
Habitat	○
Demonstration	●

t9. Vegetated Filter Strip

A vegetated filter strip involves runoff from a parking lot or other impervious surface being discharged into a vegetated filter strip, which generally consists of a 30-foot wide grassed or thick ground covered buffer. The sheet flow infiltrates into the vegetated filter strip, providing water quality and quantity benefit.

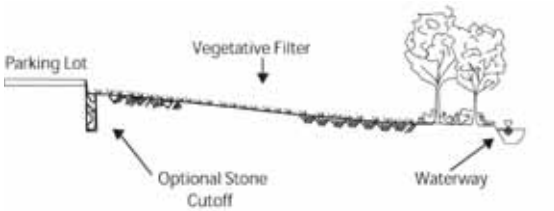


Figure of Vegetated Filter Strip from NJ BMP Manual

Vegetated Filter Strip Benefits

Water Quantity	○
Sediment	●
Nutrients	●
Bacteria	○
Habitat	○
Demonstration	○

t9. Removal of Impervious Surface

Unutilized or under-utilized impervious surfaces, such as extra parking, are replaced with native or maintained vegetation. This can directly eliminate the source of runoff, allowing infiltration where the rain falls, and potentially enable infiltration from other impervious surface runoff. In addition, for new commercial development, the use of infiltration trenches between parking spaces as opposed to elevated curb cuts would be beneficial.

Removal of Impervious Surface Benefits

Water Quantity	●
Sediment	○
Nutrients	○
Bacteria	○
Habitat	●
Demonstration	○

t14. Improve/Repair Failing Septic System

Improvement/repair of failing septic systems or conversion to sewer service can reduce the level of nutrients seeping into the groundwater and eventually into the waterways. Many areas throughout the Metedconk River watershed continue to be served by individiual on-site septic systems as a means of wastewater disposal. Where these systems have been installed decades ago and are on very small lots, they can essentially act as point sources of contamination (particularly nitrate as nitrogen) to the groundwater.

Repair Failing Septic Benefits

Water Quantity	○
Sediment	○
Nutrients	●
Bacteria	●
Habitat	○
Demonstration	○

t14. Rainwater Harvesting (non-residential)

Rainwater harvesting is the collection of rainwater from non-residential rooftops into cisterns, rain barrels, or similar containers for later release with potential for irrigation or other uses. Collection and reuse reduces offsite runoff and associated pollutant migration.

Rainwater Harvesting Benefits

Water Quantity	○
Sediment	○
Nutrients	○
Bacteria	○
Habitat	○
Demonstration	●

t14. Sand Filter

Sand Filters are used to treat runoff prior to entering the stormwater system by filtering the runoff through a thick layer of sand, typically discharging to an outlet pipe at the bottom of the trench.

Sand Filter Benefits

Water Quantity	○
Sediment	●
Nutrients	●
Bacteria	○
Habitat	○
Demonstration	○

t14. Stream Restoration

Restoration of fluvial systems to approach pre-development conditions where a sinuous channel is reconnected to an expansive floodplain, ideally integrated with riparian wetlands, maximizes natural floodplain retention and treatment potential, elevates the groundwater table, and expands, connects, and nourishes the riparian ecosystem. Stream restoration projects can vary significantly from moderate streambank stabilization to stabilization as well as full re-

Stream Restoration Benefits

Water Quantity	○
Sediment	●
Nutrients	○
Bacteria	○
Habitat	●
Demonstration	●

development of the riparian corridor. Several potential stream restoration sites were identified during the stream visual assessments conducted by BTMUA.

t18. Grassed Swale

Grassed swales are open-channels stabilized with grass or other vegetation that provide treatment through sedimentation and filtration while conveying concentrated flows.

Grassed Swale Benefits

Water Quantity	○
Sediment	●
Nutrients	○
Bacteria	○
Habitat	●
Demonstration	○

t18. Offline Regional Treatment

Larger scale wetlands or wet ponds located adjacent to, but not within an existing stream or constructed drainage channel can mimic the function of an expansive floodplain by detaining and providing treatment of channelized flows. As storm flows increase in an existing stream or drainage channel and overtop the banks, the excess flow enters into an offline treatment BMP, where it is detained and either slowly released over two to three days back into the stream or channel or is detained until it infiltrates or evaporates.

Offline Regional Treatment Benefits

Water Quantity	○
Sediment	●
Nutrients	○
Bacteria	○
Habitat	○
Demonstration	○

t20. Extended Detention

An extended detention basin is a facility constructed through filling and/or excavation that provides temporary storage of stormwater runoff. It has an outlet structure that detains and attenuates runoff inflows and promotes the settlement of pollutants. An extended detention basin is normally designed as a multistage facility that provides runoff storage and attenuation for both stormwater quality and quantity management.

Extended Detention Benefits

Water Quantity	○
Sediment	○
Nutrients	○
Bacteria	○
Habitat	○
Demonstration	○

t20. Pervious Paving

Pervious paving systems are paved areas that produce less stormwater runoff than areas paved with conventional paving. This reduction is achieved primarily through the infiltration of a greater portion of the rain falling on the area than would occur with conventional paving. This increased infiltration occurs either through the paving material itself (asphalt or concrete) or through void spaces between individual paving blocks known as pavers.

Pervious Paving Benefits

Water Quantity	●
Sediment	○
Nutrients	○
Bacteria	○
Habitat	○
Demonstration	●

t20. Wet Pond

Also known as a retention basin, a wet pond has a permanent pool which performs the same storage function as dry detention, with the added treatment capability of a permanent pool. Wet ponds can provide significant solids removal through settling, with some nutrient uptake. They can also provide significant peak flow reduction. However, wet ponds are not infiltration based strategies and some water is lost to evaporation that may be otherwise recharged using an infiltration based strategy.

Wet Pond Benefits

Water Quantity	○
Sediment	●
Nutrients	◐
Bacteria	○
Habitat	◐
Demonstration	○

23. Dry Well

A dry well stores and infiltrates runoff directly from roofs into a structural chamber or excavated pit filled with aggregate. Because of the limited nutrient and solids concentration from rooftop runoff, the primary benefit is the reduction in runoff volume and contribution to groundwater recharge through surrounding soils.

Dry Well Benefits

Water Quantity	●
Sediment	○
Nutrients	○
Bacteria	○
Habitat	○
Demonstration	◐

t23. Green Roof (non-residential)

A green roof is defined by flat or very mild sloping roof tops with drainage material and vegetated cover over an impermeable membrane for non-residential buildings, such as office, commercial, and industrial buildings. The roof vegetation can retain and evapo-transpire rainfall, and reduce and filter the atmospheric deposition of nitrogen in runoff at the source as well as reduce energy use. While this BMP is somewhat effective at minimizing run-off and stormwater pollutant loading, it may not be the most appropriate for the Metedeconk River watershed due to the lack of groundwater recharge it would provide (which in turn would improve baseflow).

Green Roof Benefits

Water Quantity	○
Sediment	○
Nutrients	○
Bacteria	○
Habitat	○
Demonstration	◐

t23. Source Control (Pet Waste/Fertilizer/Geese Management)

Pet waste and fertilizer management have the potential to reduce pathogen and nutrient contributions from cultural sources at the household scale. Goose management programs have beeen recommended for implementation in the fecal coliform and total coliform TMDLs throughout the watershed. Pet waste control is addressed by the NJDEP stormwater rules and model ordinances and educational materials can be found online.

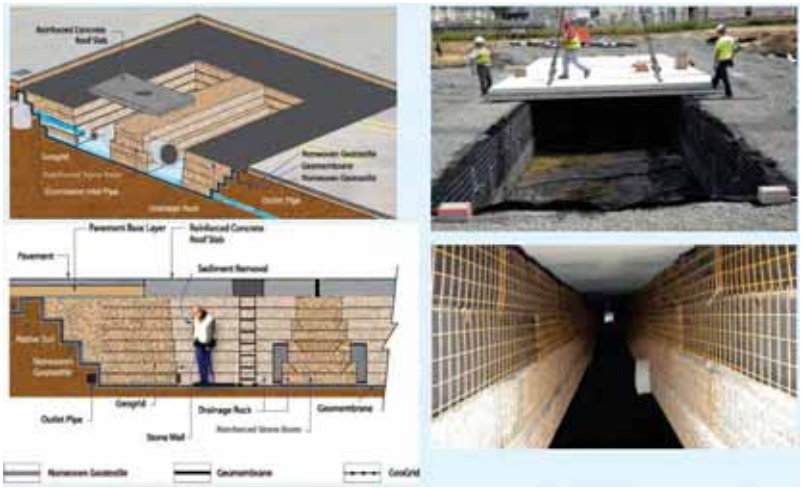
Source Control Benefits

Water Quantity	○
Sediment	○
Nutrients	●
Bacteria	●
Habitat	◐
Demonstration	◐

t26. Manufactured Devices

A manufactured treatment device is a pre-fabricated stormwater treatment structure with one or more methods for removing pollutants from stormwater runoff. Removal processes can be settling, filtration, absorptive/adsorptive materials, vortex separation, vegetative components, and/or other appropriate technologies. These devices are adequate for small drainage areas that contain a predominance of impervious cover and that are likely to contribute high hydrocarbon and sediment loadings, such as small parking lots and gas stations. Devices are normally used for pretreatment of runoff before discharging to other, more effective stormwater quality treatment facilities.

Manufactured devices can also be utilized on a larger scale, such as an industrial complex or areas with large impervious surfaces. These structures can be constructed below ground surface and collect water for storage and sediement removal.



Example of an underground stormwater storage system (from GeoStorage Corp; http://www.geostoragecorp.com/

Manufactured Devices Benefits

Water Quantity	○
Sediment	●
Nutrients	○
Bacteria	○
Habitat	○
Demonstration	○

t26. Runoff Redirection

The practice of removing impervious surfaces from direct connection to surface waters through the drainage system and redirecting it to pervious areas provides water quality and quantity benefit through infiltration.

Runoff Redirection Benefits

Water Quantity	●
Sediment	○
Nutrients	○
Bacteria	○
Habitat	○
Demonstration	○

28. Improved Street Sweeping / Retrofit of Catch Basin Structures

Street sweeping methods and frequencies may be improved to further reduce the pollutants entrained in the runoff from impervious streets and parking lots. A widespread floatables issue has been identified during the stream visual assessments throught the watershed. Many of the catch basins in the watershed are somewhat antiquated in which the inlet is wide enough to allow the capture of plastic bottles and other debris. These basins should be retrofitted with smaller inlets or traps so that many floatables do not have a direct route to the stream.

Street Sweeping / Catch Basin Benefits

Water Quantity	○
Sediment	●
Nutrients	●
Bacteria	●
Habitat	○
Demonstration	○

Appendix D
Conceptual Layouts

Install educational signage at river crossings.

Retrofit all catch basin inlets with grate plates (some exist).

Retrofit with pre-treatment systems (Filterra or similar)

Modify curbs at parking lot islands to allow runoff to infiltrate.

Can install pervious asphalt or pavers in various parking stalls.

Opportunity for some channel improvements (heavily silted areas)

Basis for Selection:

1. High visibility. Good site for public education.
2. Potential to break up impervious cover which would have a direct impact on stream.
3. Visual Assessment Rating: POOR
4. Good demonstration of decentralized urban BMPs.

BRICK UTILITIES

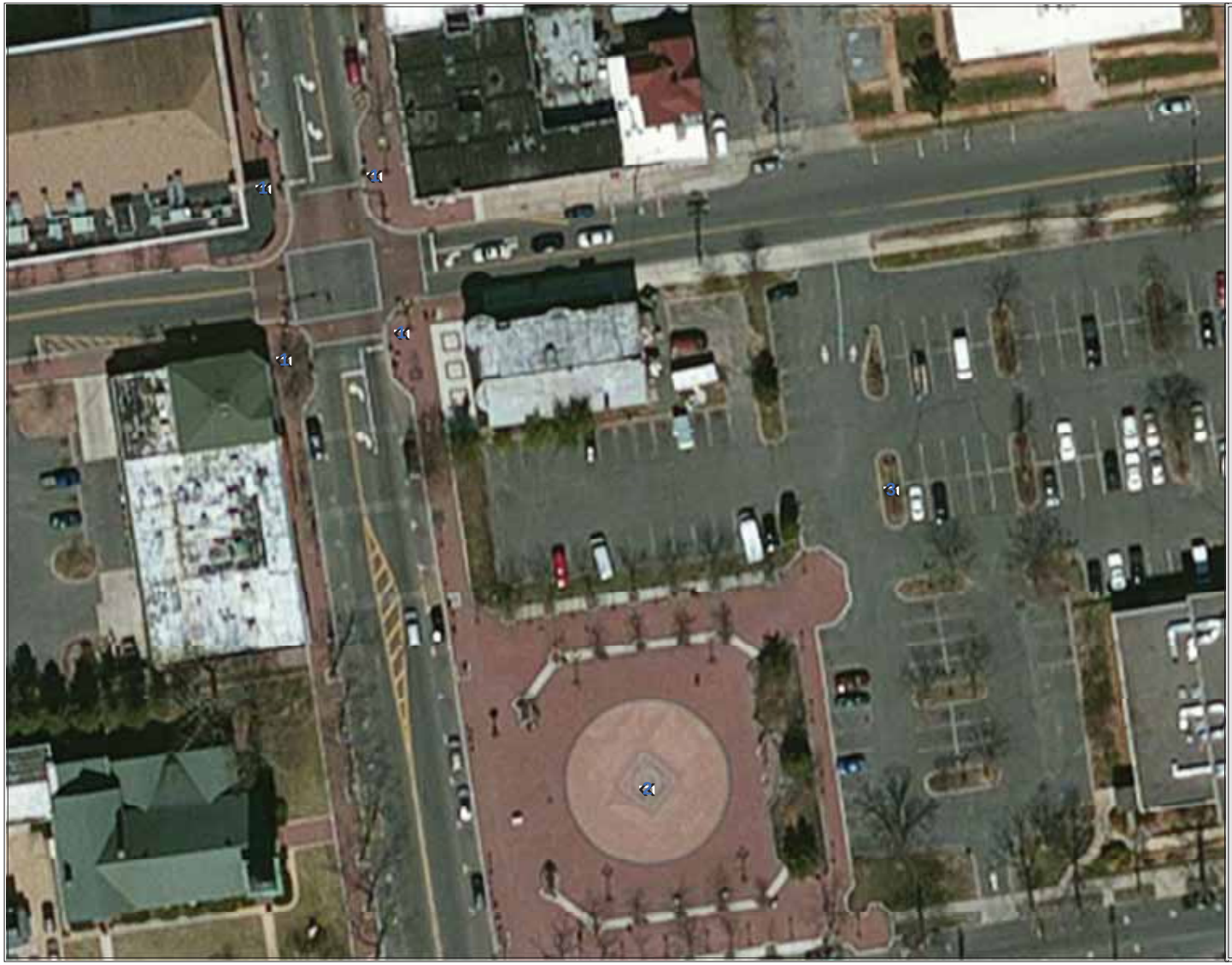
CDM Smith

John S. Truhan Consulting Engineers, Inc.

0 25 50 100 Feet

Note:
Although this site would be a great opportunity for project visibility and education/outreach, since it is a privately owned commercial site, the feasibility of implementing this project may be limited. Outreach with site owner should occur early to determine interest.

Brick Plaza
Visual Assessment Site CBB-3
Brick, New Jersey



Excellent potential for stormwater bump-out.

Plaza area could be used as an educational area with appropriate signage describing stormwater issues and locally installed stormwater infrastructure.
High visibility near municipal bldg.

Replace some portions of brick and replace with pervious pavers.

Modify existing planters.

Modify curb along parking islands to allow stormwater to infiltrate vegetated island.

(photo from Manasquan Reservoir)

Basis for Selection:

1. Highly visible site, promoting education and awareness
2. BMPs would promote infiltration & water quality.
3. Accessed by thousands of people daily.

BRICK UTILITIES

CDM Smith

John S. Truhan Consulting Engineers, Inc.

0 25 50 100 Feet

Downtown Lakewood
Clifton Avenue between Third and Fourth Streets
Lakewood, New Jersey

Note:
Need to contact Howell FD to determine use of property/pond.

Enhance existing linear bioretention system along Maxim Southard Road

Potential basin retrofit. Modify existing pond to allow additional flow from stream and install weir at outlet to create settling basin. Lack of flow to pond and geese presence is creating a point source to the stream (see photos on map).

Establish meadow on property. Particularly a buffer around pond/BMP.

Basis for Selection:
1. Property owned by Howell FD.
2. Eliminates a point source and helps implement coliform TMDL. Also reduces sediment and nutrient load.
3. Visual Assessment Rating: POOR

BRICK UTILITIES

CDM Smith John S. Truhan Consulting Engineers, Inc.

Howell Township Fire Substation
Visual Assessment Site GH-1
Howell, New Jersey

Potential for bioretention behind fence at stormwater outfall.
Post information signage behind fence.

Re-route runoff from catch basins to bioretention area.

Install decentralized BMPs throughout catchment neighborhood (Filterra or similar). Photo from www.filterra.com.

Locations on map for illustration purposes only (not specifically sited)

Infiltration tree trench.
Photo from Philadelphia Water Department

Basis for Selection:
1. High visibility.
2. BMPs would promote infiltration & water quality.
3. Visual Assessment Rating: POOR
4. Good demonstration of decentralized pretreatment in residential area without existing basins.

BRICK UTILITIES

CDM Smith John S. Truhan Consulting Engineers, Inc.

0 25 50 100 Feet

Outfall at Maypink Lane & Juniper Place
Visual Assessment Site GR2
Howell, New Jersey

Basin Retrofit

Remove low flow channel or install dams within flow channel to force stormwater onto grass area.

Supplemental planting.

Soil decompaction within basin

Modify outlet structure

*May also want to consider retrofitting outlet structure from basin located off of Netty Street (east of stream).

Basis for Selection:
1. Large basin that captures a large volume of residential runoff.
2. BMPs would promote infiltration & water quality.
3. Relatively simple to retrofit.
4. Removed from residential view. Short periods of standing water should not result in complaints.

BRICK UTILITIES

CDM Smith

John S. Truhan Consulting Engineers, Inc.

0 50 100 200 Feet

Stormwater Basin off of Moses Milch Drive
Visual Assessment Site GR4
Howell, New Jersey

84-inch outfall discharges directly to NB Metedeconk River

BTMUA Sample Site NF-14

Potential to re-direct a portion of flow to utility right-of-way.

Bioretention BMP would be located beneath power lines and may be a permitting issue.

Requires extensive excavation installation of 100+ ft of pipe.

Utility right-of-way is approximately 0.9 acres in size.

Shown as hatched area on layout

Knowledge of ownership is needed.
Right of way currently used by apartment complex for dog walking and other activities.

Basis for Selection:

1. Very extensive drainage area and stormwater runoff to outfall. Water quality concerns.
2. BMPs would promote infiltration & water quality.
3. Extensive baseline water quality data available.
4. Treatment area would need to be large, but utility right-of-way immediately to the east of outfall.

BRICK UTILITIES

CDM Smith

John S. Truhan Consulting Engineers, Inc.

0 25 50 100 Feet

Stormwater Outfall at Route 9
Visual Assessment Site NF14
Lakewood, New Jersey

Headwater of reach from 36 inch outfall. Source unknown, but likely Route 9.

Potentially cut pipe back and route to offline storage / treatment.

Location for storage and treatment potentially to the immediate east of reach. Need to verify owner.

Treatment potentially settling basin for solids and trash. Potentially small infiltration basin with overflow to reach.

Potentially install decentralized bioretention systems (Filterra or similar) upstream of catch basins to remove solids and nutrients.

Stabilize surrounding areas to limit solids loading.

Potentially route catch basin(s) to small bioretention area to the east of the stream.

Excavation, modification of catch basin piping required.

Knowledge of ownership is needed.
Grate plate retrofits on catch basins would be beneficial.
Check for plans for future transportation improvements.

Basis for Selection:

1. Highly visible site, promoting education and awareness
2. BMPs would promote infiltration & water quality.
3. Heavy traffic area.
4. Next to school (Bais Rivka). Students could be potential partners/stewards of site.
5. Stream Visual Assessment Rating: POOR

BRICK UTILITIES

CDM Smith John S. Truhan Consulting Engineers, Inc.

0 12.5 25 50 Feet

Culvert Beneath Pine Street (West of Cedar St)
Visual Assessment Site SE-P
Lakewood, New Jersey

Possible retrofit of wet pond.

Maintenance/modification of plantings as needed.

Re-route stormwater discharge pipes through BMPs within park area.

Southernmost pipe collects discharge from S. Lake Drive and flows to depression in park (wet)

Pipe that discharges directly to Metedeconk can be cut back and re-routed to BMPs.

Discharges runoff from Hope Chapel Road.

Potential to develop a stormwater park. Site topography could allow for a cascading affect that discharges to a bioretention area or wetland.

Site very visible from road. Can install information signs along S. Lake Drive

Basis for Selection:

1. High visibility.
2. BMPs would promote infiltration & water quality.
3. Potential to develop a stormwater park with aesthetically pleasing features to promote education and outreach.
4. Directly dicharging to South Branch of Metedeconk.

BRICK UTILITIES

CDM Smith

John S. Truhan Consulting Engineers, Inc.

0 25 50 100 Feet

Park along S. Lake Drive
Visual Assessment Site SG
Lakewood, New Jersey

Potential for above ground BMPs for roof drains.

Downspout flow-through planters, rain barrels, cisterns.

Parking on grass is causing erosion. Grass pavers or pervious pavers may be an option for stabilizing and increasing parking, but not impervious cover.

Algae growth within channel indication of excessive nutrients.

Potential in-channel restoration (grading, planting, stabilization) and planting a buffer is an option.

Groundwater is very shallow at this site which would limit infiltration capacity of bioretention systems.

Baseflow contributing area to creek should be evaluated.

Fertilizer and road salt use should be evaluated to minimize the amount of nutrients and TDS entering creek.

Basis for Selection:
1. School and residential development at headwaters.
2. Excellent educational opportunity at school.
3. Stream Visual Assessment Rating: POOR

BRICK UTILITIES

CDM Smith

John S. Truhan Consulting Engineers, Inc.

0 50 100 200 Feet

Stormwater Discharge Pipe at Newbury School
Visual Assessment Site SPC-1
Howell, New Jersey

Potential opportunity for green roof(s) on bus shelter. Can serve as a high visibility educational tool.

Educational signage installed on north and south ends of shelter to inform bus passengers about the various green infrastructure installed at the site.

Potential for perimeter bioretention buffer / vegetated filter strip to treat sheet flow discharging from parking lot.

Modification/lining of existing stone retaining wall, excavation, tree removal, regrading.

Potential to install bioretention within limits of hatched out no parking zones. If spots are desired for parking, potentially replace with porous pavement or pavers.

Potential porous pavement/pavers in several parking stalls. Potential for bioretention at inlet. Catch basin discharges to outfalls. Retrofit inlet of catch basin with grate plate.

Modify curb along strip of parking to allow stormwater to infiltrate vegetated island.

Note that the owner of the parking strip where catch basin is located is the commercial plaza to the north. Outreach/permission required.

Basis for Selection:
1. Highly visible site, promoting education and awareness
2. BMPs would promote infiltration & water quality
3. Visual Assessment Rating: POOR

BRICK UTILITIES

CDM Smith John S. Truhan Consulting Engineers, Inc.

0 25 50 100 Feet

Vegetated Filter Strip
Green Roof
Bioretention Cells

Brick Park & Ride Site
Visual Assessment Site TR 1-2
Lanes Mill Road and Burke Lane; Brick, New Jersey

Stormwater outfall submerged.

Drains runoff from large residential development between S. New Prospect Road and Aldrich Road

Potential to install linear bioretention system along edge of athletic field to intercept outfall pipe. Excavate and cut pipe back approx. 100 ft.

Excavation, regrading, tree removal, modification of existing stormwater pipe.

Potential BMPs to manage sheet runoff from parking lot to prevent erosion at edge leading to buffer area.

Excavation, regrading, potential alteration of parking lot

Basis for Selection:

1. Stormwater pipe discharges a large volume of residential runoff.
2. BMPs would promote infiltration & water quality.
3. Athletic field provides good opportunity for public education and outreach. Informational signage can be displayed in parking lot.

BRICK UTILITIES

CDM Smith

John S. Truhan Consulting Engineers, Inc.

0 50 100 200 Feet

Stormwater Discharge Pipe Near Arkansas Drive
Visual Assessment Site TR23-1
Jackson, New Jersey

Appendix E
Education & Outreach Program

Metedeconk Watershed Education and Outreach Program

The Metedeconk River watershed community has a key role in ensuring the successful implementation of the Watershed Protection & Restoration Plan and the long-term health of the Metedeconk River. Nonpoint source pollution and stormwater runoff are the main causes of the problems facing the watershed. Site-specific restoration projects will only go so far to address these issues. What remains must be dealt with through the actions of people living, working or otherwise spending time in the watershed. An education and outreach program will provide the community with a sound understanding of their watershed and the changes they can make to improve the quality of their water resources.

Education and Outreach Program Objectives

1. Work in concert with the Barnegat Bay Partnership and other organizations involved in education and outreach to:
    a. Expand the public's understanding of the watershed and Metedeconk River Watershed Protection & Restoration Plan;
    b. Encourage public participation and support for improving watershed health;
    c. Promote public involvement in the implementation of the plan and its watershed management and restoration strategies;
2. Focus outreach efforts on specific water quality impairment issues, such as stormwater management; and
3. Develop targeted public outreach materials and approaches that will not only inform and educate, but also initiate actions and changes in behavior to create positive results.

Education and Outreach Program Initiatives

The Metedeconk River watershed encompasses a diverse community which is an important consideration for the education and outreach program. The program is most effective if its messages are crafted and targeted towards smaller segments of the community which are broken down based upon location, watershed role, etc. This "targeted outreach" approach results in messages that are clear, specific and better understood and, ultimately, more likely to result in individual actions or changes in behavior.

The following sections describe education and outreach initiatives for the general watershed community and numerous target audiences. These initiatives were developed in consultation with a group of education and outreach professionals from various stakeholder organizations with highly regarded programs. The Metedeconk project team drew extensively from the group's collective experience and expertise to identify target audiences, the important messages that need to be communicated, and the best approaches to getting those messages across. In some cases, other watershed stakeholders were consulted for their input on specific aspects. It is important to note that while efforts have been made to be as comprehensive as possible in identifying the various groups and initiatives, additions or modifications may be necessary in the future as the effectiveness of the program is evaluated.

- *Target audience: General watershed community*

The following initiatives, messages and outreach approaches are applicable to the entire watershed community:

1. Establish and maintain a Metedeconk watershed website with information about the watershed, protection & restoration plan and implementation efforts. Elements may include:
    a. Water quality data and water quality standard/designated use attainment status;
    b. Action-oriented outreach materials for specific target audiences (e.g. rain garden construction, commercial BMP's, septic management, winter de-icing, etc.);

    c. BMP installation or rain barrel tracking website;
    d. Land preservation status;
2. Maintain the Metedeconk Stakeholder Advisory Committee (in some form) as a forum for watershed stakeholder interaction and plan implementation support;
3. Develop and utilize a slogan in outreach materials (e.g. “It’s your watershed, tap into it!”);
4. Issue press announcements about the plan to local news media;
5. Create a pamphlet to briefly describe the Metedeconk Watershed Protection & Restoration Plan;
6. Display informational signs at the sites of BMP/restoration projects and distribute brief fact sheets (examples attached) to describe and promote the project, particularly within the surrounding area;
7. Install road signs at the watershed boundary and stream crossings to raise awareness of the Metedeconk River and its use for water supply (potentially work with Ocean County sign shop or acquire sponsors);
8. Promote green stormwater infrastructure in densely developed areas and corridors;
9. Implement a “river friendly” certification/recognition campaigns for residents, businesses, golf courses, marinas, etc.;
10. Implement an “adopt-a-stream” program for regular trash and floatables removal;
11. Coordinate river/stream/lake cleanup events throughout the watershed;
12. Provide exhibits (incl. Enviroscape model) and/or distribute outreach materials at public events (e.g. Barnegat Bay Festival, county fairs, Earth Day events, municipal stormwater education events, etc.); and
13. Publicize and build upon watershed plan successes.

- *Target audience: Municipal and county officials; planning and zoning boards of adjustment; environmental commissions*

Watershed health is determined, in large part, by policies and decisions made at the local level, particularly those pertaining to land use. Ideally, the protection of water resources is a priority and serves as an important consideration that officials weigh as they carry out the challenging task of balancing fiscal, economic, social, environmental and other issues on a day-to-day basis. Outreach to local elected and appointed officials is an effective means of raising awareness about watershed issues and bringing about positive changes that lead to water resources protection. The following initiatives, messages and outreach approaches are applicable to this target audience:

1. Promote the watershed plan and participation in its implementation;
2. Provide a portfolio of BMP’s specifically applicable to the towns and promote their use;
3. Communicate the need for/benefits of LID ordinances and provide solid, legally-defensible model ordinances for consideration and adoption (perhaps in conjunction with the BMP portfolio);
4. Stress the importance of BMP maintenance;
5. Work to implement demonstration projects at municipal- and county-owned facilities, and hold workshops to showcase them and facilitate additional implementation projects;
6. Examine and present opportunities for shared services that may exist;
7. Approach the municipalities and counties directly (e.g. public and private meetings) and through the media;
8. Specifically provide municipal planning and zoning boards with education and outreach materials that are tailored to their unique role in making land use decisions, including:
    a. Illustrating how past development activities have affected local water resources and the importance of stormwater management and NPS pollution control;
    b. Reviewing stormwater BMP’s (NJDEP BMP Manual) along with the benefits/drawbacks of each, as applied to the Metedeconk watershed;
    c. Promoting more progressive stormwater management alternatives (i.e. LID non-structural strategies, zero runoff development);

d. Reinforcing the importance of their land use decisions for local water resources, and how they can offset development impacts and shape future water resource conditions;
e. Highlighting the Barnegat Bay Initiative, water supply/conservation measures and good landscaping practices; and
f. The boards should be approached through the chairperson to discuss and coordinate outreach, including informational packets for new Board members with periodic follow up correspondence and/or meeting presentations or workshops.

- *Target audience: Public works departments and highway agencies*

By the nature of their work, public works department and highway agency operations can contribute to nonpoint source pollution. The State's MS4 stormwater permitting program includes various provisions to reduce nonpoint source pollution from DPW and highway operations, such as stormwater pollution prevention plans, standard operating procedures, maintenance requirements and annual employee training. The following initiatives, messages and outreach approaches are applicable to this target audience:

1. Promote the watershed plan and participation in its implementation;
2. Communicate the importance of stormwater BMP maintenance;
3. Provide fact sheets or other outreach materials on stormwater BMP/restoration projects that are completed within a given department's/agency's jurisdiction for education and demonstration purposes;
4. Create a training module about the Metedeconk watershed plan that can be incorporated into MS4 stormwater permit-required annual employee training programs; and
5. Approach DPW and highway agencies through the appropriate officials or managers.

- *Target audience: Developers, engineers and planners*

Development alters the landscape of the watershed to meet the needs of a growing human population. Developers and their engineering and planning professionals play a key role in shaping the future condition of water resources, for better or worse, through their projects. The following initiatives, messages and outreach approaches are applicable to this target audience:

1. Promote the Metedeconk watershed plan, the use of the structural and nonstructural stormwater management strategies it identifies, and an understanding of the performance results it aims to achieve (e.g. minimizing runoff and NPS pollutants, improving groundwater recharge);
2. Communicate the need for more progressive non-structural stormwater management alternatives (i.e. LID strategies, zero runoff development) in future site designs;
3. Facilitate voluntary conformance with any model ordinances or design performance standards that may be developed as part of the Metedeconk watershed plan;
4. Publicize BMP demonstration projects and performance results;
5. Advocate for BMP demonstration sites in new construction;
6. Facilitate compliance with the (forthcoming) soil health standards; and
7. Approach developers and their professionals directly with outreach materials, and through professional organizations and development-related education/training opportunities (e.g. soil health conference, pending soil restoration legislation training, etc.).

- *Target audience: Residents (homeowners/renters/visitors)*

Approximately thirty percent of the land in the Metedeconk watershed falls into a "residential" land use/land cover category, more than any other type. As such, the watershed residents can make a big difference in helping to improve the health of the Metedeconk River through their everyday activities around their homes and elsewhere. The following initiatives, messages and outreach approaches are applicable to this target audience:

1. Promote the fundamental aspects of the Metedeconk watershed plan and its implementation;
2. Encourage and facilitate simple, cost-effective, and easy to replicate BMP's or other actions that residents can undertake to decrease runoff and NPS pollution and conserve water (e.g. rain gardens, rain barrels, improve lawn care practices, reduce household water consumption, septic management, etc.);
3. Provide basic stormwater/nonpoint source pollution education materials;
4. Establish educational exhibits in popular recreation areas (e.g. Brick Reservoir, Traders Cove, trout fishing spots, etc.) to foster watershed awareness;
5. Promote the connection to Barnegat Bay in the headwater towns and communities;
6. Communicate the relevance of water resources protection to public health (e.g. pathogens);
7. Distribute fact sheets to promote stormwater BMP's or other implementation projects to those who live or work nearby;
8. Approach residents with outreach materials through:
    a. Metedeconk watershed website (establish links from other sites);
    b. Mass media
        i. Print (e.g. Brick Communicator, Tri-Town News);
        ii. Newsletters (e.g. Barnegat Bay Beat, water utilities, resident associations, etc.);
        iii. Social media (e.g. Facebook);
        iv. Television (e.g. municipal channels, Eye on Ocean County segment);
    c. Posters, pamphlets, postcards, placemats, water bill inserts, etc.;
    d. Workshops and seminars (e.g. rain gardens, rain barrels, native landscaping);
    e. Promotions or competitions with prizes to encourage participation (e.g. rain barrel painting);
    f. Outreach through or in coordination with:
        i. Homeowners associations boards and complex managers;
        ii. Age-restricted (55+) residential communities;
        iii. Realtors associations' materials packets;
        iv. Schools (pre-school through college) and day care centers;
        v. Municipal recreation programs;
        vi. Civic groups (e.g. boy scouts, girl scouts, 4H, rotary clubs, etc.);
        vii. Garden/landscape supply centers and nurseries (native landscaping, rain barrels, rain gardens, nutrient loading);
        viii. Canoe rentals/sales (e.g. Jersey Paddler);
        ix. Lakewood BlueClaws/BlueClaws Charities;
        x. Healthcare industry (health-related articles); and
        xi. Businesses (e.g. Wawa coffee cup wrappers).

- *Target audience: Businesses; commercial and industrial property owners and managers*

Commercial and industrial complexes are commonly associated with higher stormwater and nonpoint source pollutant loads than other land use categories due to greater impervious surface coverage, vehicular traffic, housekeeping challenges, landscaping demands, etc. Efforts to address stormwater runoff problems and eliminate NPS pollution on commercial and industrial properties have a direct benefit for the watershed. They may also have educational value by exposing a large number of customers and employees to watershed-friendly property management practices. The following initiatives, messages and outreach approaches are applicable to this target audience:

1. Promote the fundamental aspects of the Metedeconk watershed plan and its implementation;
2. Encourage and facilitate simple, cost-effective, and easy to replicate BMP's or other actions that businesses can undertake to decrease runoff and NPS pollution and conserve water (e.g. parking island retrofits, improve landscaping practices, reduce water consumption, improve housekeeping, etc.);

3. Communicate the importance and benefits (environmental, social, economic) of green stormwater infrastructure and low impact development;
4. Showcase and recognize BMP or other projects that are implemented as demonstration projects (e.g. signs or certifications; see “river friendly” program above);
5. Approach the business community and commercial and industrial property owners and management companies through:
    a. Printed outreach materials (e.g. fact sheets - “what your plaza/marina/etc. can do”; regulatory updates);
    b. Chambers of commerce (e.g. printed materials, presentations, newsletter articles, etc.);
    c. Lakewood Industrial Commission and similar organizations;
    d. Provide specific outreach to:
        i. Commercial sites where BMP’s would be particularly effective;
        ii. Parent companies of large chain stores, particularly “big box” stores;
        iii. Landscapers (Healthy Lawns Healthy Water)
        iv. Landscape suppliers (native plants, soil health, rain gardens, rain barrels); and
        v. Marina owners (NJ Clean Marina Program, Manasquan Clean Marinas Initiative);

- *Target audience: Parks and recreation managers, golf courses, and residential complex managers*

There are large tracts of cultivated lawns in the Metedeconk watershed within parks, golf courses and residential complexes. For the most part, these sites are owned, managed and maintained by a relatively small number of individuals. Outreach to this subset of the watershed community about applying or improving sustainable landscaping practices would have numerous benefits (e.g. reduced water consumption, reduced fertilizer and pesticide use, reduced maintenance costs, improved infiltration, etc.). Because many of these sites have stormwater basins or other BMP’s, outreach about stormwater management is also important. The following initiatives, messages and outreach approaches are applicable to this target audience:

1. Promote the fundamental aspects of the Metedeconk watershed plan and its implementation;
2. Communicate the benefits of sustainable landscaping practices, both at the site and watershed scales, and facilitate their use;
3. Promote successful BMP demonstration projects in the watershed and the implementation of similar projects;
4. Communicate the importance of stormwater BMP maintenance;
5. Facilitate other site improvements such as loosening compaction on recreation fields (e.g. Verti-Quake rotary aerator);
6. Approach this audience through printed outreach materials, workshops, and coordination with grounds maintenance-related organizations or associations.

- *Target audience: Agricultural community*

Agricultural operations account for a relatively small percentage of the watershed area, but if not managed properly they can have significant impacts on local waterways. Nonpoint source pollutants commonly associated with farms and nurseries may include sediment, pathogens, nutrients and pesticides. Agricultural Best Management Practices can reduce nonpoint source pollution in runoff and result in better protection for sensitive areas such as wetlands and stream corridors. The following initiatives, messages and outreach approaches are applicable to this target audience:

1. Promote the fundamental aspects of the Metedeconk watershed plan and its implementation;
2. Communicate the importance of agricultural best management practices;
3. Facilitate compliance with regulatory changes (e.g. NJ Animal Waste Management Rule); and
4. Approach the agricultural community through printed outreach materials and coordination with agriculture-related vendors, agencies or organizations; provide outreach specifically to agricultural operations that may be known or suspected nonpoint pollution sources.

Potential Education and Outreach Program Partnerships and Resources

There are many opportunities to build partnerships to effectively accomplish the education and outreach objectives of the Metedeconk River Watershed Protection & Restoration Plan. Outreach about water resources, watersheds and the environment is being conducted by numerous organizations at the State, regional and local levels, particularly for Barnegat Bay. Efforts should be made to coordinate with these groups and align common messages to the greatest extent possible. Similarly, there are opportunities to forge new partnerships with organizations that may not be involved in outreach per se but have the ability to reach a substantial number of people through their memberships, affiliations or patrons. Coordinating with these groups may be particularly effective for reaching new audiences. There is also a wealth of professionally produced and field tested outreach materials available in the public domain that can be utilized in the Metedeconk watershed. By forging partnerships, leveraging existing programs and resources, and drawing from the variety of available educational materials, the resources available for Metedeconk education and outreach will provide the greatest possible benefit.

The following is a listing of potential partner organizations and other resources available for the education and outreach program:

Potential partner organizations:

- American Littoral Society (www.littoralsociety.org)
- Barnegat Bay Partnership (http://bbp.ocean.edu/)
    - Communication and Education Committee (http://bbp.ocean.edu/pages/314.asp)
- Brick Township Municipal Utilities Authority (www.brickmua.com)
- Brookdale Community College (www.brookdalecc.edu)
- Business partners (commercial or industrial)
- Chambers of commerce
- Freehold Soil Conservation District (www.freeholdscd.org)
- Georgian Court University (www.georgian.edu)
- Jackson Township MUA (www.jacksonmua.com)
- Jacques Cousteau National Estuarine Research Reserve (www.jcnerr.org)
- Lakewood Township MUA (www.lakewoodmua.com)
- Libraries
- Monmouth County (www.visitmonmouth.com)
- Municipalities (incl. environmental commissions, stormwater coordinators):
    - Brick Township (www.twp.brick.nj.us)
    - Freehold Township (www.twp.freehold.nj.us)
    - Howell Township (www.twp.howell.nj.us)
    - Jackson Township, incl. Going Green Committee (www.jacksontwpnj.net)
    - Lakewood Township (www.lakewoodnj.gov)
    - Millstone Township (www.millstone.nj.us)
    - Point Pleasant Beach (www.pointpleasantbeach.org)
    - Point Pleasant Borough (www.ptboro.com)
    - Wall Township (www.wallnj.com)
- New Jersey-American Water (www.amwater.com/njaw)
- New Jersey Clean Communities (www.njclean.org)
- New Jersey Department of Environmental Protection:
    - Barnegat Bay Comprehensive Action Plan (www.state.nj.us/dep/barnegatbay)
    - Healthy Lawns Healthy Water (http://www.nj.gov/dep/healthylawnshealthywater/)
    - Stormwater Management Program (www.njstormwater.org)
    - Watershed Ambassadors (www.nj.gov/dep/watershedmgt/outreach_education.htm#njwap)

- Non-governmental organizations
- Ocean County (www.co.ocean.nj.us)
- Ocean County College (www.ocean.edu)
- Ocean County Soil Conservation District (www.ocscd.org)
- Ocean County Utilities Authority (www.ocua.com)
- Rutgers NJAES Water Resources Program (http://water.rutgers.edu/)
- Rutgers Cooperative Extensions of Monmouth / Ocean Counties (http://njaes.rutgers.edu/county/)

Sources for education and outreach materials:

- American Water Works Association (www.drinktap.org)
- Association of New Jersey Environmental Commissions (www.anjec.org)
- Barnegat Bay Partnership Education & Outreach (http://bbp.ocean.edu/pages/145.asp)
- Freehold Soil Conservation District (www.freeholdscd.org)
- Low Impact Development (LID) Urban Design Tools (www.lid-stormwater.net)
- Low Impact Development Center (www.lowimpactdevelopment.org)
- National Resources Conservation Service (www.nrcs.usda.gov)
- New Jersey Department of Environmental Protection:
    - Environmental education (http://www.nj.gov/dep/seeds/)
    - Healthy Lawns Healthy Water (http://www.nj.gov/dep/healthylawnshealthywater/)
    - Stormwater Management Program (www.njstormwater.org)
- New Jersey Water Supply Authority (www.raritanbasin.org)
- Ocean County Soil Conservation District (www.ocscd.org)
- Rouge River National Wet Weather Demonstration Project (www.rougeriver.com)
- Stony Brook-Millstone Watershed Association (www.thewatershed.org)
    - The Watershed Institute (www.thewatershedinstitute.org)
- U.S. Environmental Protection Agency:
    - Education Resources (http://www.epa.gov/owow_keep/NPS/eduinfo.html)
    - Low Impact Development (www.epa.gov/owow/NPS/lid/)
    - Nonpoint Source Pollution (http://www.epa.gov/owow_keep/NPS/index.html)
    - NPS Toolbox (http://cfpub.epa.gov/npstbx/index.html)
    - Stormwater Program (http://cfpub.epa.gov/npdes/home.cfm?program_id=6)

Potential education and outreach funding sources:

- Barnegat Bay Partnership Public Participation and Education grants (http://bbp.ocean.edu/)
- BlueClaws Charities (http://www.blueclawscharities.com/)
- Geraldine R. Dodge Foundation (http://www.grdodge.org/)
- OceanFirst Foundation (http://www.oceanfirstfdn.org/index.php)
- NJDEP nonpoint source 319(h) grants (www.nj.gov/dep/watershedmgt/319grant.htm)
- Trust for Public Land Barnegat Bay Environmental Grant Fund (www.tpl.org)
- USEPA Environmental Education Grants Program (www.epa.gov/enviroed)

Education & Outreach Program Evaluation

Evaluation is an important component of the Metedeconk watershed education and outreach program. Gauging the effectiveness of the program provides a better understanding about whether its messages are reaching the intended audiences and resulting in the desired actions or changes in behavior. Where necessary, adaptations can be made to improve or eliminate ineffective components and ensure that those that are working are supported or enhanced. The following measures of effectiveness have been identified for the Metedeconk program:

- Google Analytics;

- Counts of education and outreach materials distributed;
- Tracking of implementation projects;
- General surveys about knowledge of watershed issues;
- Rates of participation in educational programs or workshops;
- Pre- and post-workshop evaluations; and
- Numbers of public inquiries about the plan or requests for assistance.

Metedeconk Education & Outreach Program Sub-Committee

Lisa Auermuller, Jacques Cousteau National Estuarine Research Reserve
Denise Garner, Jackson Township Environmental Commission
Kyra Hoffmann, New Jersey Department of Environmental Protection
Robert Karl, Brick Township Municipal Utilities Authority
Cara Muscio, Rutgers Cooperative Extension of Ocean County
Daniel O'Rourke, CDM Smith
Christine Raabe, Ocean County Soil Conservation District
Karen Rowe, Freehold Soil Conservation District
Karen Walzer, Barnegat Bay Partnership
Louise Wootton, Georgian Court University

THE BENEFITS OF A RAIN GARDEN

- Improve water quality
- Reduce flooding
- Increase the amount of water filtering into the ground
- Enhance the beauty of your yard
- Requires less maintenance then lawns
- Increase the number of native plant and animal habitats available

BRICK UTILITIES
THE BRICK TOWNSHIP MUNICIPAL UTILITIES AUTHORITY

1551 Highway 88 West—Brick, New Jersey 08724-2399

Phone: (732) 458-7000

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ECO-TIPS:

BUILDING A RAIN GARDEN

WHAT IS A RAIN GARDEN?

A Rain Garden is a planted part of your landscape designed to reduce the amount of rainwater that flows untreated into storm drains and ultimately into our lakes and streams. Rather than having stormwater run over your roof, down your driveway and into the streets where it can pick up pollutants, you can direct that runoff into a specially designed rain garden where it can be absorbed into the ground or used by the plants.

A rain garden is different from a regular flower garden because it is built to collect and hold extra rain water, over and above what naturally falls in that particular patch of land. You can divert the rainwater that falls on your impervious surfaces into the garden.

By building a rain garden in your yard, you can provide a focal point for your landscaping and habitat for wildlife, while improving your property's drainage and making a positive impact on your waterways.

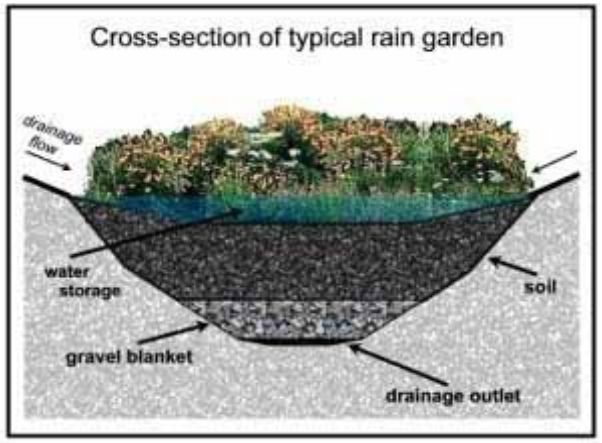
HOW CAN RAINWATER BE HARMFUL?

In developed areas, where impervious surfaces like concrete or macadam pavement, and even hard packed lawns,, have replaced the meadows, farms and forests, rainwater can no longer soak into the soil to be filtered and replenish groundwater supplies. Instead it travels over surfaces like roofs, driveways, streets and parking lots, picking up any pollutants found along the way. Some of the pollutants that can flow with rainwater include pesticides and fertilizers from lawns, biological contaminants from pet waste, gas and oil leaked from vehicles, road salts and light weight litter. Reducing the stormwater runoff reduces the amount of pollutants that eventually end up in our waterways.

HOW DOES A RAIN GARDEN WORK?

Rain gardens are built in the parts of the landscape known to receive high amounts of runoff, such as at the end of drain pipes. Shallow depressions are dug to intercept run-off before pooling occurs. They can be located almost anywhere, at least 10' away from any building foundation and are often only 8-18" deep. They can be any shape or size, depending on your needs. The typical rain garden will hold a few inches of rainwater after a storm, allowing it to slowly soak into the soil.

The best type of soil to use is loose and absorbent, so the water can filter through. Plants selected for the garden should be native so they can tolerate variations in your local climate. They should readily absorb water, but also be able to withstand dry periods.



If every yard had a rain garden, imagine how much rainwater would soak into the ground and help recharge our aquifers. Imagine the birds and butterflies that could use these gardens for food and cover. Imagine the beautiful variety of flowers and shrubs we would see around us.

Rain Garden at Brick Utilities Reservoir

HOW DO YOU DESIGN A RAIN GARDEN?

Building a rain garden is something every homeowner can easily do, even if you don't have much gardening experience. There are many internet websites you can go to for tips or even for detailed directions for planning and building your garden.

Here are the basic steps:

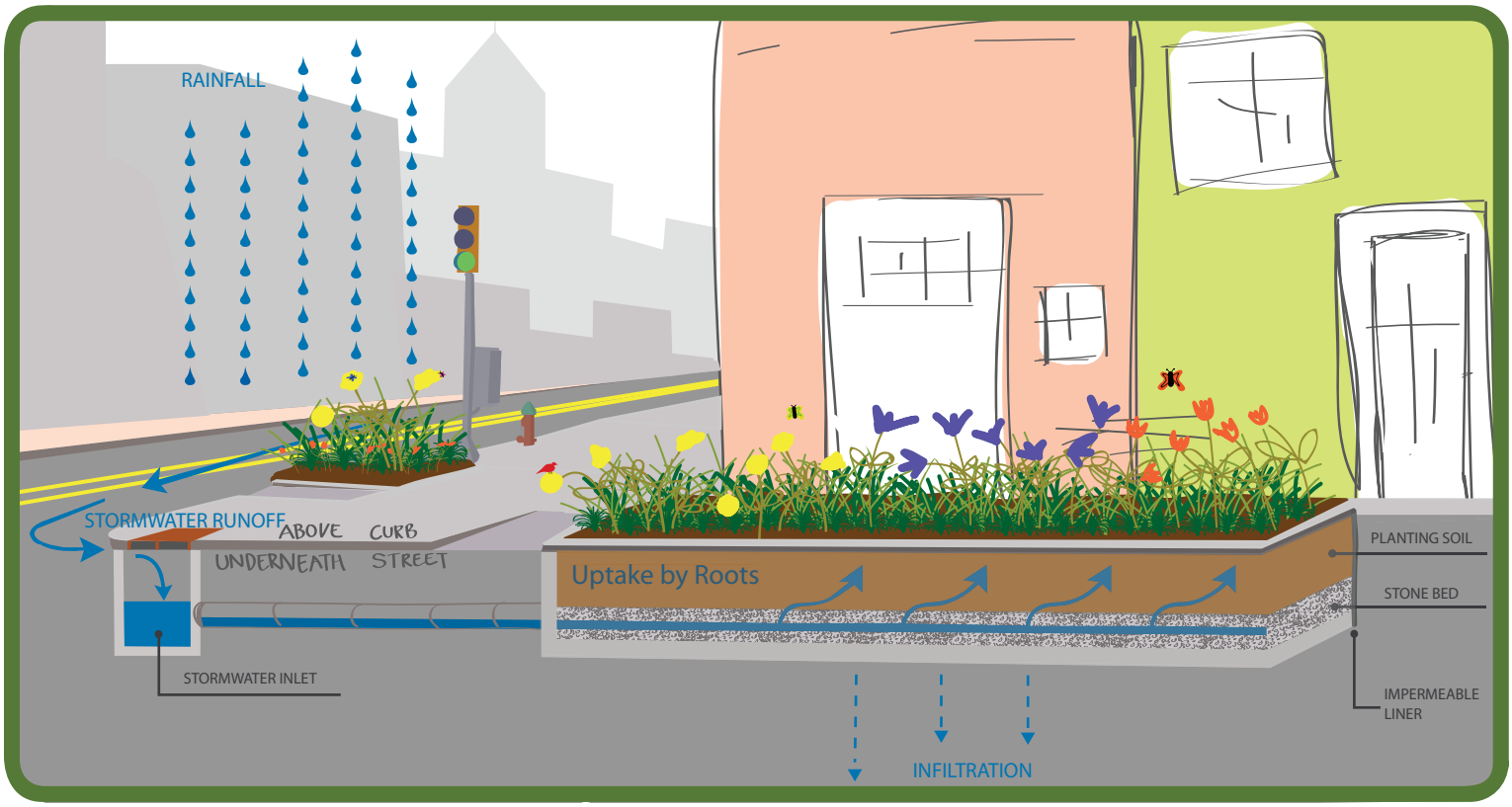
1. Watch what happens in your yard during and after a storm. Where does the water go? Make notes.
2. What kind of soil do you have? Is it suitable for a rain garden, or will you need to replace it? Do you need to add a sand layer for infiltration? Contact the Rutgers Cooperative Extension Service (732) 431-7260 for low-cost soil testing.
3. Always call before you dig! Utility lines can be almost anywhere. New Jersey law requires you to call "NJ One Call" at 1-800-272-1000 before you do any digging.
4. Pick your site. It should be an area you know will collect water when it rains. An area near a drain spout will work well, but make sure your garden is far enough away from buildings to prevent flooding basements or lower levels. Install a rain barrel if you need to slow down the flow into your garden.
5. Decide on the size and shape that will work best for your yard. If you have a sloping lawn, you might need some kind of edging, like blocks or a soil berm on the down-slope side to hold the water.
6. Research what plants would work best for your site. Pick native plants that can survive in both wet and dry conditions. A mix of plants that bloom at different times and grow to different heights will keep your garden interesting. Check your local garden centers to be sure the plants you choose are available.
7. Once you have all your information, draw up a plan and decide when to start construction.

You will probably need to water the garden for the first few weeks after planting, but once the native plants take hold, they should require very little maintence. Just sit back and enjoy the view.

Green City, Clean Waters

GREEN STREETS: Stormwater Bump-out

A green street acts as a natural stormwater management system, capturing rain or melting snow (stormwater), allowing it to soak into soil, filtering it and at the same time, reducing the amount of stormwater that would otherwise go into Philadelphia's sewer pipes. By creating green stormwater management systems that capture rain or slow the flow to storm drains, we can reduce pollution and flooding that impacts our waterways and that beautify our communities.



What is a Stormwater Bump-out?

A stormwater bump-out is a vegetated curb extension that protrudes into the street either mid-block or at an intersection, creating a new curb some distance from the existing curb. A bump-out is composed of a layer of stone that is topped with soil and plants.

How does it work?

An inlet or curb-cut directs runoff into the bump-out structure where it can be stored, infiltrated, and taken up by the plants (evapotranspiration). Excess runoff is permitted to leave the system and flow to an existing inlet.

The vegetation of the bump-out will be short enough to allow for open site lines of traffic. Aside from managing stormwater, bump-outs also help with traffic-calming, and when located at crosswalks, they provide a pedestrian safety benefit by reducing the street crossing distance.

What are the benefits:

-Reduces Combined Sewer Overflows (CSOs)
-Enhances the beauty of our streets and neighborhoods
-Promotes a safer and healthier community
-Reduces the urban heat island effect (city's temperature)
-Improves air quality
-Calms traffic flow
-Decreases water pollution

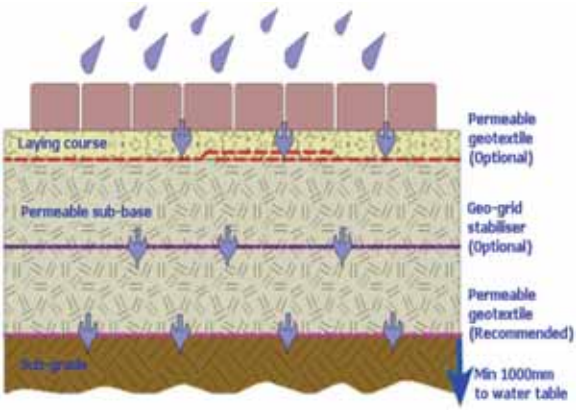
Action 6: Porous Pavement

Target Objectives

4. Control and reduce high flows to reduce flooding
5. Improve water quality
6. Restore instream and riparian habitat
7. Ensure sufficient low flows

Problem: Excessive Urban Runoff

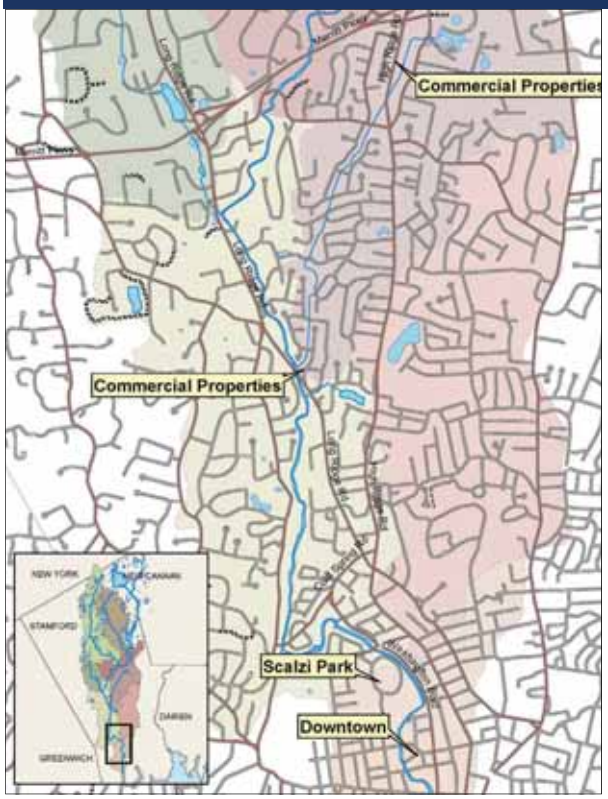
Impermeable pavements in urban areas increase runoff which is conveyed offsite to receiving surface water resources. Runoff contains harmful pollutants including heavy metals, alkali-chlorides, and suspended solids which adversely affect receiving water habitat.



Brief Description of Action

Porous pavement may be installed in parking lots, light use roadways, driveways, sidewalks, and commercial developments where impervious surfaces are prevalent as in medium to high residential and urban settings. Examples include Scalzi Park, residences, and the commercial areas on Long Ridge Rd and High Ridge Rd.

Action Item Summary



Expected Benefits

Permeable pavements increase rain water infiltration, decrease stormwater peak flows, and improve overall stormwater quality before discharge to surface water resources.

Responsible Parties

- City of X
- Commercial/Residential Property Owners

Pollutant	Estimated Basin-Wide % Reduction in Loading
Biological Oxygen Demand	4%
Metals	1-3%
Fecal Bacteria	<1%
Nutrients	0-3%
Sediment	3%

CDM Smith

Action: City Ordinances for Low Impact Development (LID)

Target Objectives

1. Increase public awareness, education, and community involvement
5. Improve water quality
6. Restore instream and riparian habitat
8. Promote sustainability mission of City of

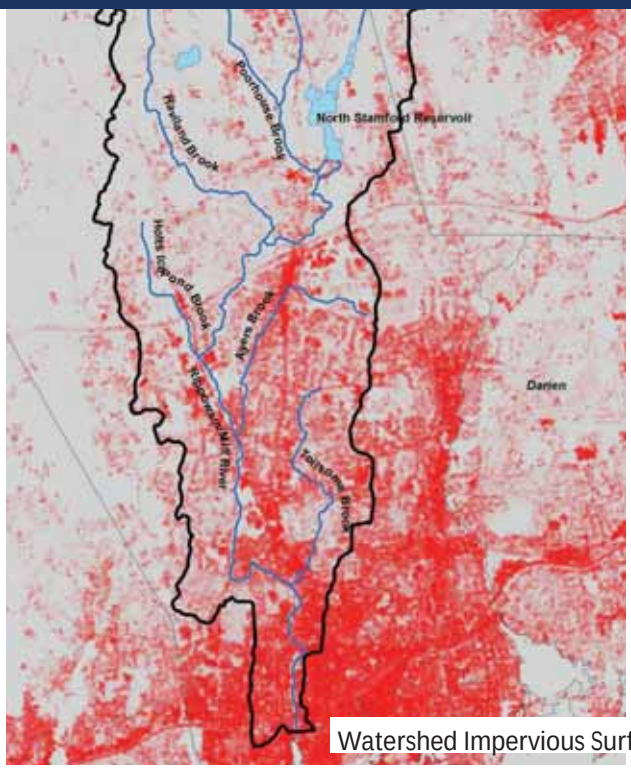
Problem: Storm Water Runoff Pollutants

Pollutants contained in storm water runoff eventually drain into the river, causing damage to the river's ecological health.

Brief Description of Action

City ordinances should require the incorporation of LID in construction projects where previously undeveloped land is being made impervious.

Action Item Summary



Watershed Impervious Surfaces

Expected Benefits

This action item primarily prevents continued degradation of the stream caused by future development. LID will decrease the amount of storm water runoff pollution draining into the river from land that is converted from impervious to pervious.

Responsible Parties

- City of , private developers

Cost

DRAFT: $50,000 to $100,000 to develop educational materials and enforce regulations

CDM Smith