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# Complying with New Jersey Stormwater Regulations Workshop

November 1, 2017

Roxbury Senior Center

72 Eyland Avenue, Succasunna NJ

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# Asking the Right Questions in Stormwater Review

Rutgers Cooperative Extension
Water Resources Program
water.rutgers.edu

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# Water Resources Program


Our Mission is to identify and address community water resources issues using sustainable and practical science-based solutions.

The Water Resources Program serves all of New Jersey, working closely with the County Extension Offices.

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*"Protecting Public Health and the Environment"*

# New Jersey Facts

- New Jersey is 8,723 square miles
- Population is 8,864,590 (1,171/mi$^2$)
- 1,055 square miles of impervious cover = 12.1%
- 1” of rain = 18.2 billion gallons
- 90% of NJ’s rivers are impaired
- Localized flooding is problem in most communities
- Erosion and scouring of our streams

# Problem: Stormwater Runoff

Stormwater is the water from rain or melting snows that can become “runoff,” flowing over the ground surface and returning to lakes and streams.

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# Causes of Water Resources Problems in New Jersey

1. **Agriculture Land Uses**

# Causes of Water Resources Problems in New Jersey

2. **Urban/Suburban Land Use**
   **New Development**

# Causes of Water Resources Problems in New Jersey

## 3. Urban/Suburban Land Use Existing Development

# Addressing Impacts from New Development

- Existing regulations may be adequate to minimize impacts
- Existing regulations are not being enforced by municipalities
- Training needs to be provided to help municipalities understand how to ensure new development are complying
- Outreach needs to be provided to help municipalities get started


# Addressing Impacts from Existing Development

**It is all about controlling runoff from impervious surfaces**

## *1st – New Development*

# Asking the Right Questions in Stormwater Review

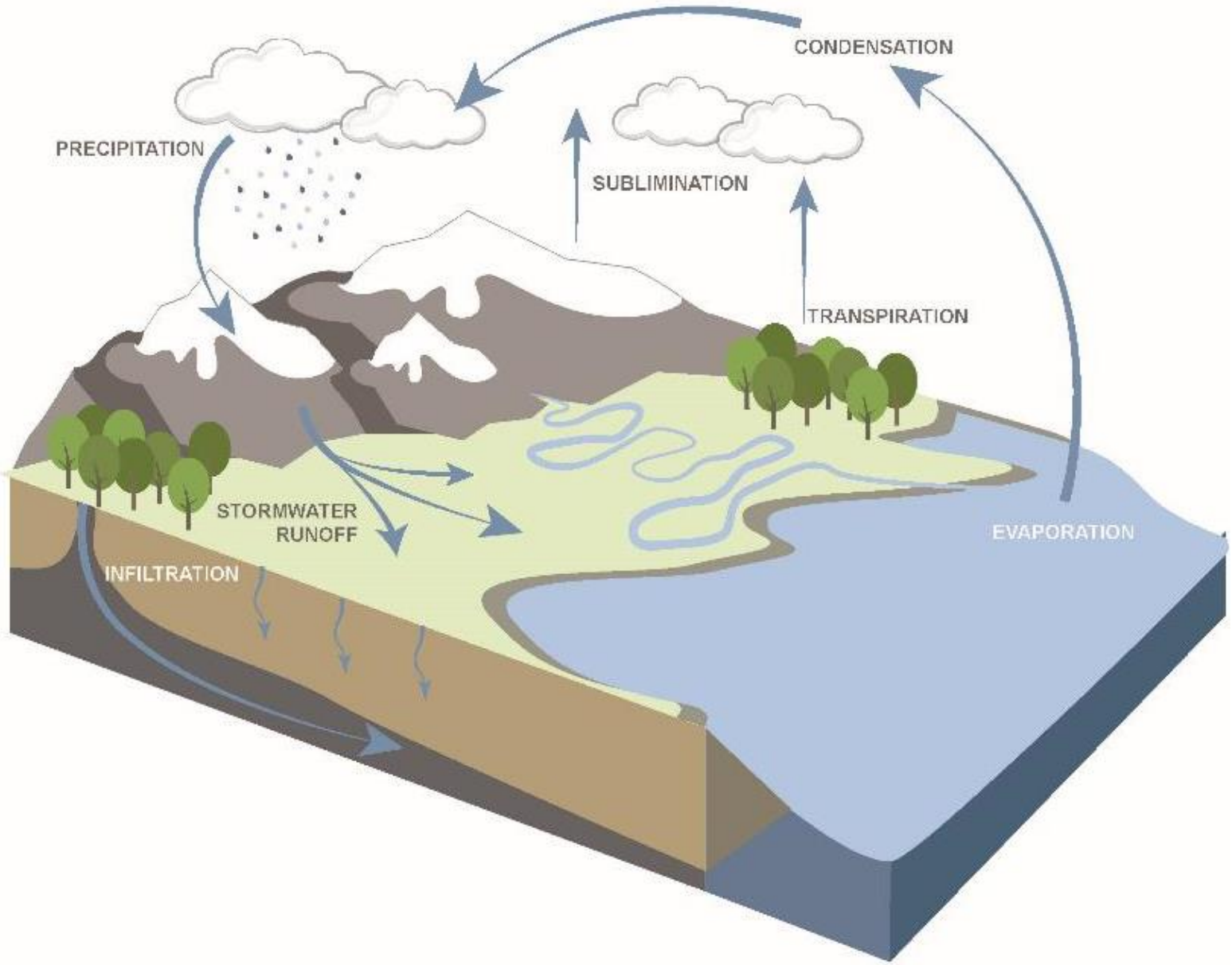
# Important to Remember

The approval of a developer's stormwater management plans lies **solely** with the municipality.

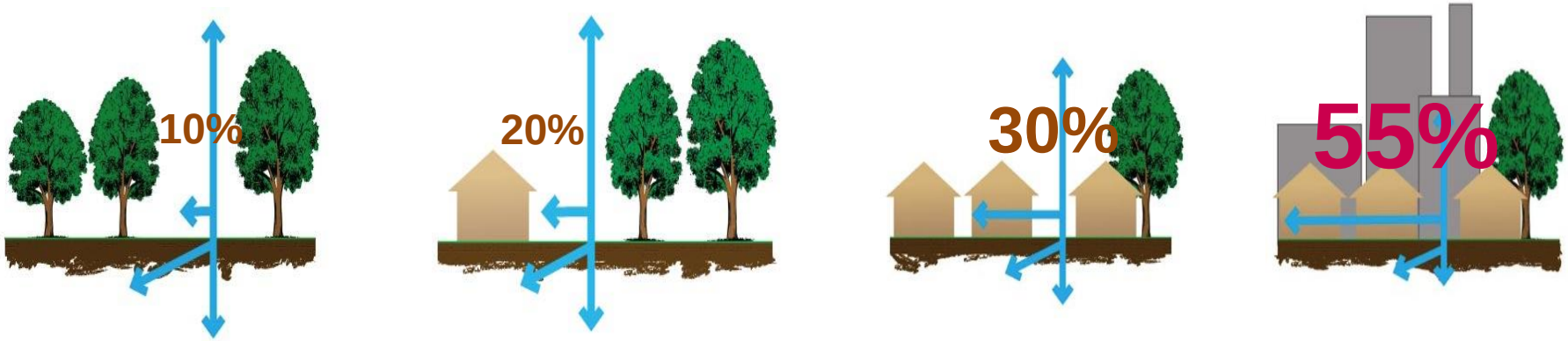
Municipalities are **required** under their *Municipal Separate Storm Sewer System (MS4) General Permit* to enforce statewide basic requirements for post-construction stormwater management in new development and redevelopment.

# What happens to the rain?

# The Natural Hydrologic Cycle



# The Impact of Development on Stormwater Runoff




*More development* → *More impervious surfaces* → *More stormwater runoff*

# What is impervious cover?

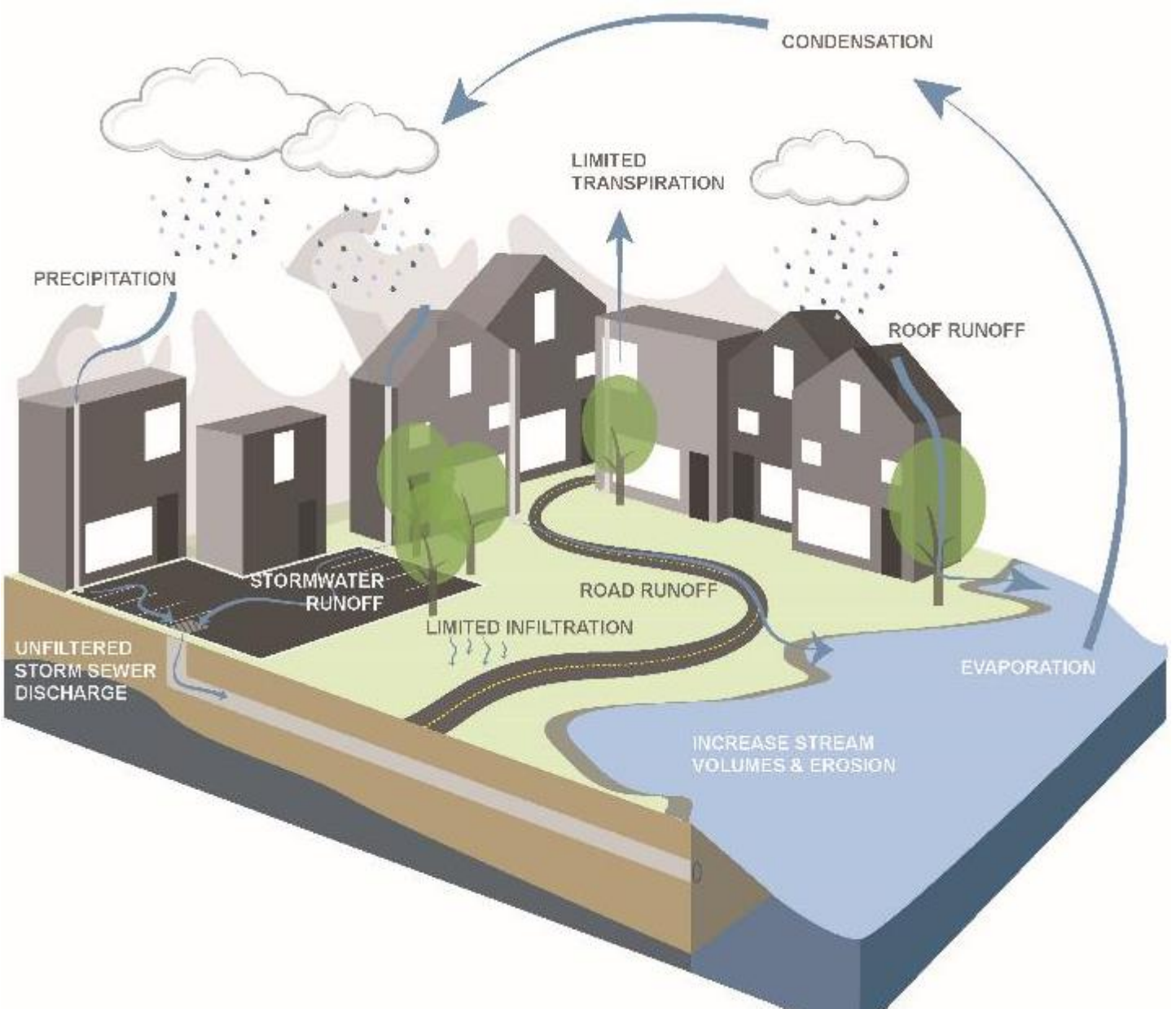
Roads, rooftops, parking lots, and other hard surfaces that do not allow stormwater to soak into the ground.

- provides a surface for accumulation of pollutants
- leads to increased polluted runoff and flooding
- inhibits recharge of groundwater

# Increases in Impervious Cover Leads to:

- More stormwater runoff volume
- Higher peak stormwater runoff rates
- Increased nonpoint source pollution
- Less groundwater recharge

# The sub/urban Hydrologic Cycle



# History of Stormwater Management

# 1st Attempt at Stormwater Management

***Capture all runoff, pipe it, and send it directly to the river . . .prior to mid 1970's***

# 2nd Iteration of Stormwater Management

***Capture runoff, detain it, release it slowly to the river…mid 1970's to 2004***

- Detain peak flow during large storm events
- Reduce downstream flooding during major storms
- Use concrete low flow channels to minimize erosion, reduce standing water, quickly discharge low flows
- Does not manage runoff from smaller storms
- Directly discharges stormwater runoff to nearby stream, waterway, or municipal storm sewer system (at a controlled/managed rate)

# 3rd Generation of Stormwater Management

- Reduce peak flows

**…and….**

- Maintain infiltration and groundwater recharge
- Reduce pollution discharged to local waterways

# Stormwater Management Key Objectives

- Protect communities from increases in stormwater volume and peak flows as a result of new development
- Maintain groundwater recharge
- Protect waterways from pollution carried in stormwater runoff

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# New Jersey Stormwater Management Rules

- Rules apply to any “Major Development” defined as a project disturbing more than 1 acre or increasing impervious surfaces by ¼ acre or more
- Design and Performance Standards established in NJAC 7:8-5, for:
  - Nonstructural Stormwater Management Strategies
  - Stormwater Quantity
  - Groundwater Recharge
  - Stormwater Quality
  - Stormwater Maintenance Plan

# Nonstructural Strategies

- Plan the project using Low Impact Development (LID) Principles
- Collect, infiltrate and where possible reuse stormwater near its source
- Capture runoff from small storm events in vegetated systems to protect water quality and promote recharge
- Minimize and disconnect impervious surfaces

# Water Quantity Performance Standards

## *Water Quantity*

- Demonstrate that post-development 2, 10, and 100-year storm event hydrographs do not exceed pre-development hydrographs

***or***

- Demonstrate that hydrograph peaks will not increase and that increase in volume or change in timing won't increase flood damage downstream

***or***

- Design BMPs so that 2, 10, and 100-year pre-development hydrographs are reduced to 50%, 75%, and 80%, respectively
  - 2-year rainfall (3.3 inches)
  - 10-year rainfall (5.0 inches)
  - 100-year rainfall (8.3 inches)

# Groundwater Recharge Performance Standards

***Groundwater Recharge***

- Maintain 100% of average annual groundwater recharge volume

***or***

- Infiltrate increase in the post development runoff volume for the 2-year storm

# Water Quality Performance Standards

## *Water Quality*

- Install BMPs to reduce at least 80% of total suspended solids (TSS) loads
- Install BMPs to provide nutrient removal to maximum extent feasible

| BMP | TSS Removal Rate |
|---|---|
| **Bioretention** | **90%** |
| **Constructed Wetlands** | **90%** |
| **Forested Buffers** | **70%** |
| **Extended Detention Basin** | **40-60%** |
| **Infiltration Structure** | **80%** |
| **Sand Filter** | **80%** |
| **Vegetative Filter Strip** | **50%** |
| **Wet Pond** | **60-90%** |

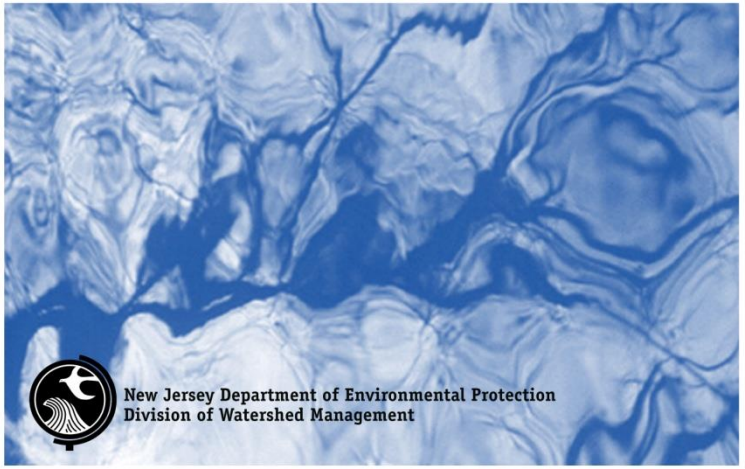
SOURCE: NJ Stormwater Management Rules and BMP Manual

# NJ Stormwater Guidance

**Tier A**

**Municipal Stormwater Guidance Document**
NJPDES General Permit No NJ0141852


New Jersey
**Stormwater**
**Best Management Practices Manual**




For more information, visit: [www.njstormwater.org](http://www.njstormwater.org)

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# Bottom line - what does the developer really need to do?

1. Maintain groundwater recharge on the site
2. Reduce sediment and nutrient runoff from the site
3. Reduce the peak stormwater runoff rates from the site

# How should a developer do this?

**1st** Use Nonstructural Strategies to achieve 1, 2, and 3

# Nine Nonstructural Strategies

1. **Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss**
2. **Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces**
3. Maximize the protection of natural drainage features and vegetation
4. Minimize the decrease in the "time of concentration" from pre-construction to post-construction
5. **Minimize land disturbance including clearing and grading**
6. Minimize soil compaction
7. **Provide low-maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers and pesticides**
8. **Provide vegetated open-channel conveyance systems discharging into and through stable vegetated areas**
9. Provide other source controls to prevent or minimize the use or exposure of pollutants at the site to prevent or minimize the release of those pollutants into stormwater runoff

# 9 Strategies to 4 Categories

1. Vegetation and Landscaping
   - ✓ Preservation of natural areas (forested areas, riparian corridors, high recharge areas)
   - ✓ Native ground cover (limit turf grass areas)
   - ✓ Vegetative filters and buffers (protect them or plant new ones)

2. Minimizing Site Disturbance
   - ✓ Fit the development into the terrain
   - ✓ Minimize clearing and grading
   - ✓ Minimizing soil compaction
   - ✓ Build on low permeability soil areas

3. Impervious Area Management
   - ✓ Minimum street widths and sidewalks
   - ✓ Limit parking and driveway areas
   - ✓ Use pervious paving materials
   - ✓ Disconnect impervious surfaces from draining directly to waterways
   - ✓ Vegetated roofs

4. Time of Concentration Modifications (slow down runoff)
   - ✓ Surface roughness changes
   - ✓ Slope reduction
   - ✓ Vegetated conveyances

# #1 Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss

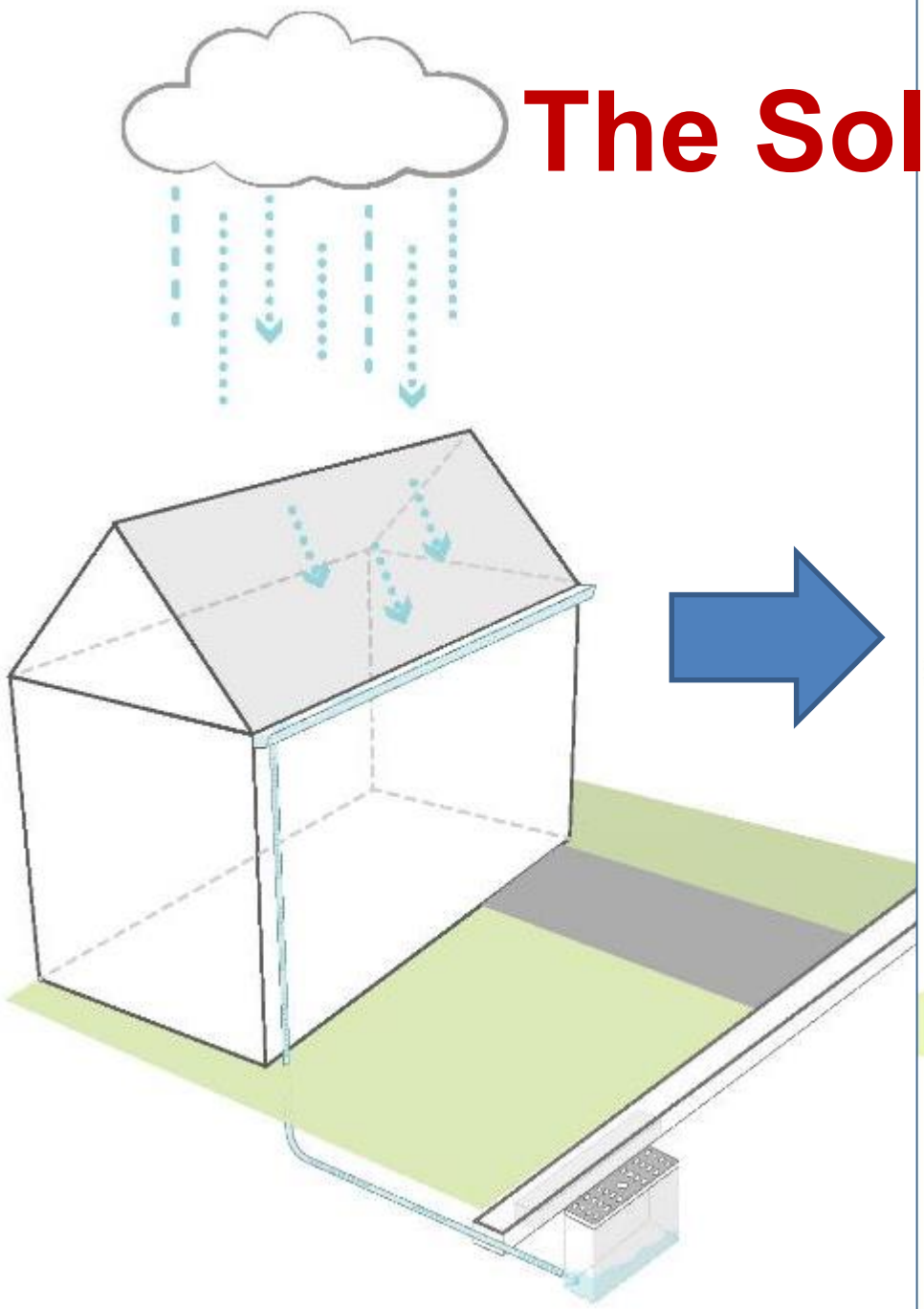

Vegetative Buffers

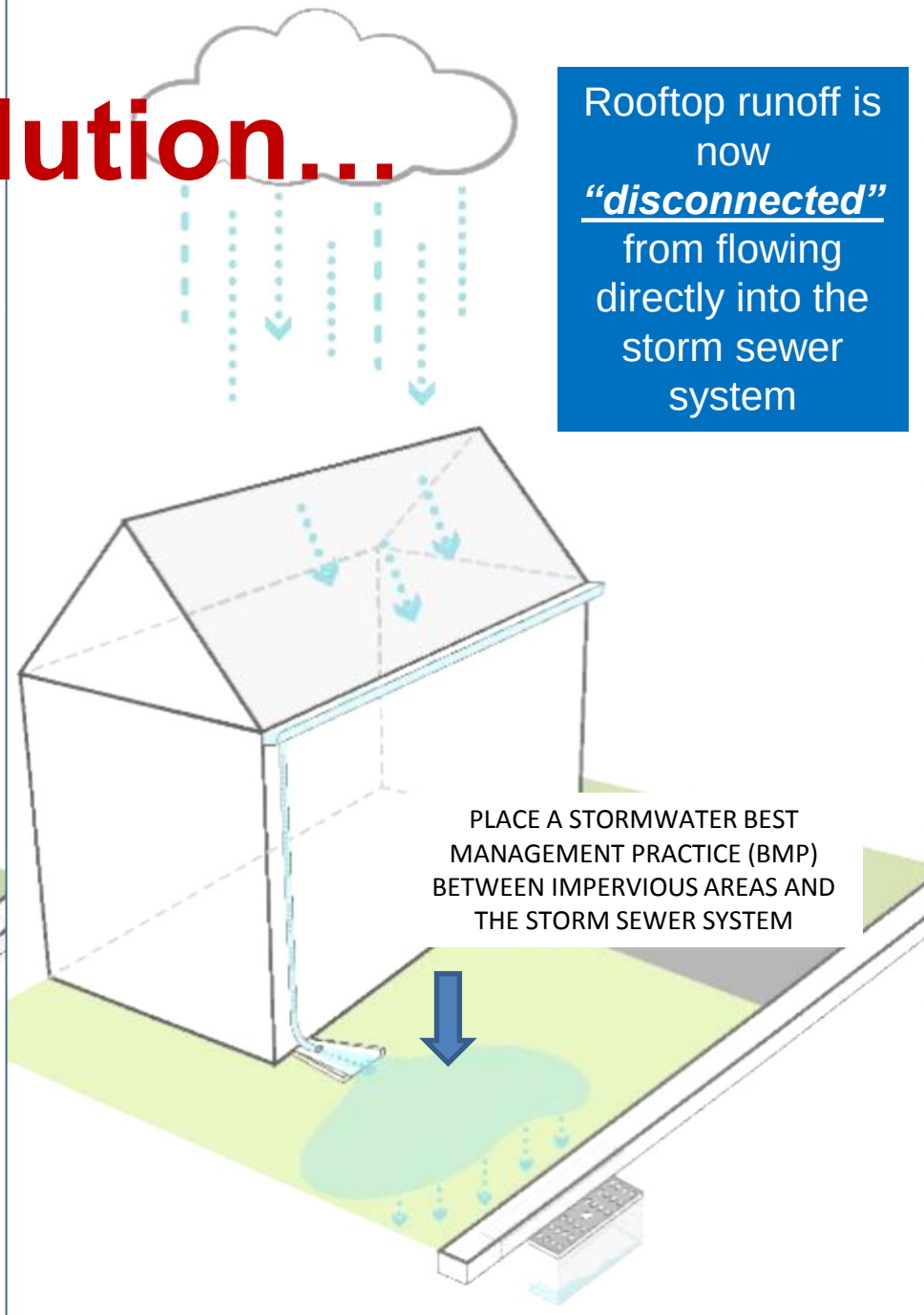
# #2: Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces

# Disconnected Impervious Surfaces

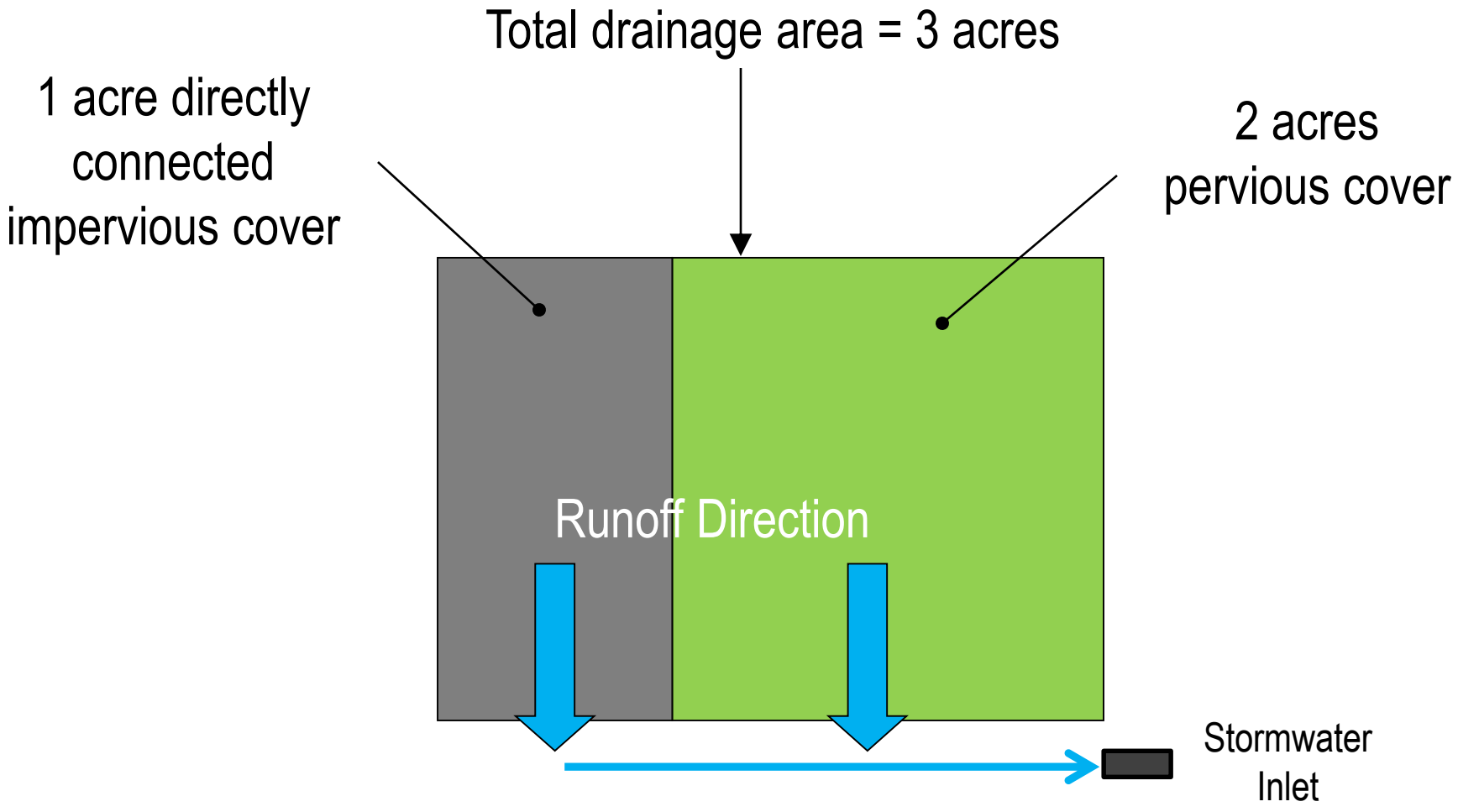
# The Solution…

Rooftop runoff is now ***"disconnected"*** from flowing directly into the storm sewer system

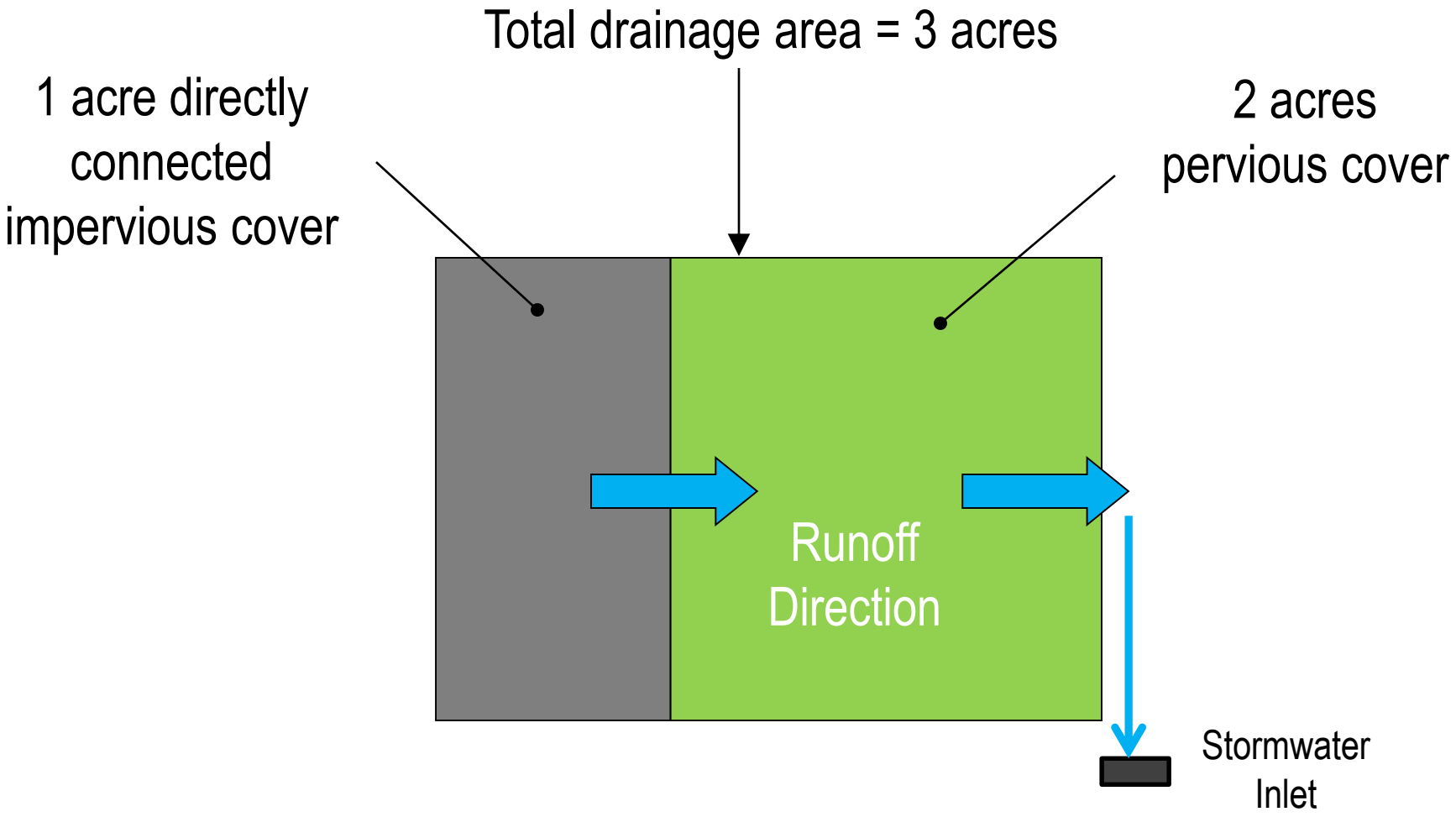




For 1.25 inch storm, 3,811 cubic feet of runoff = **28,500 gallons**



For 1.25 inch storm, 581 cubic feet of runoff = **4,360 gallons**



| | Volume of Runoff | | |
|---|---|---|---|
| **Design Storm** | **Connected (gallons)** | **Disconnected (gallons)** | **Percent Difference** |
| 1.25 inches (water quality storm) | 28,500 | 4,360 | 85% |

Impervious area is now ***"disconnected"*** from flowing directly into the storm sewer system

# #5 Minimize land disturbance including clearing and grading

# Preserving Natural Lands

# Not Preserving Natural Lands

**#7 Provide low-maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers and pesticides**

# #8 Provide vegetated open-channel conveyance systems discharging into and through stable vegetated areas

# Vegetated Conveyances

| No. | Nonstructural Strategy | Yes | No |
|---|---|---|---|
| 1. | Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss | | |
| 2. | Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces | | |
| 3. | Maximize the protection of natural drainage features and vegetation | | |
| 4. | Minimize the decrease in the pre-construction time of concentration | | |
| 5. | Minimize land disturbance including clearing and grading | | |
| 6. | Minimize soil compaction | | |
| 7. | Provide low maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers, and pesticides | | |
| 8. | Provide vegetated open-channel conveyance systems discharge into and through stable vegetated areas | | |
| 9. | Provide preventative source controls | | |

**Explain why any one of these is "NO." Engineering, environmental and/or safety reasons are only acceptable.**

# Bottom line - what does the developer really need to do?

1. Maintain groundwater recharge on the site
2. Reduce sediment and nutrients runoff from the site
3. Reduce the peak stormwater runoff from the site

# How should a developer do this?

**2nd** Focus on incorporating systems that address water quality and groundwater recharge

# Nonpoint Source Pollution (NPS)

- NPS is pollution associated with stormwater runoff
- NPS occurs when runoff collects pollutants on its way to a collection system or water body
- NPS pollution cannot be traced to a direct discharge point such as a wastewater treatment facility

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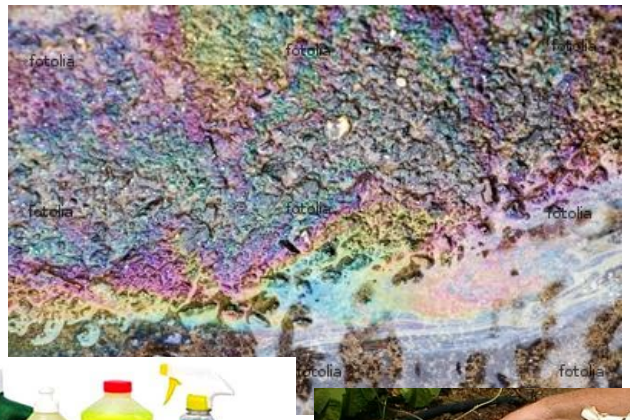
# Examples of NPS

- Oil and grease from cars
- Fertilizers
- Animal waste
- Grass clippings
- Septic systems
- Sewage leaks
- Household cleaning products
- Litter
- Agriculture
- Sediment



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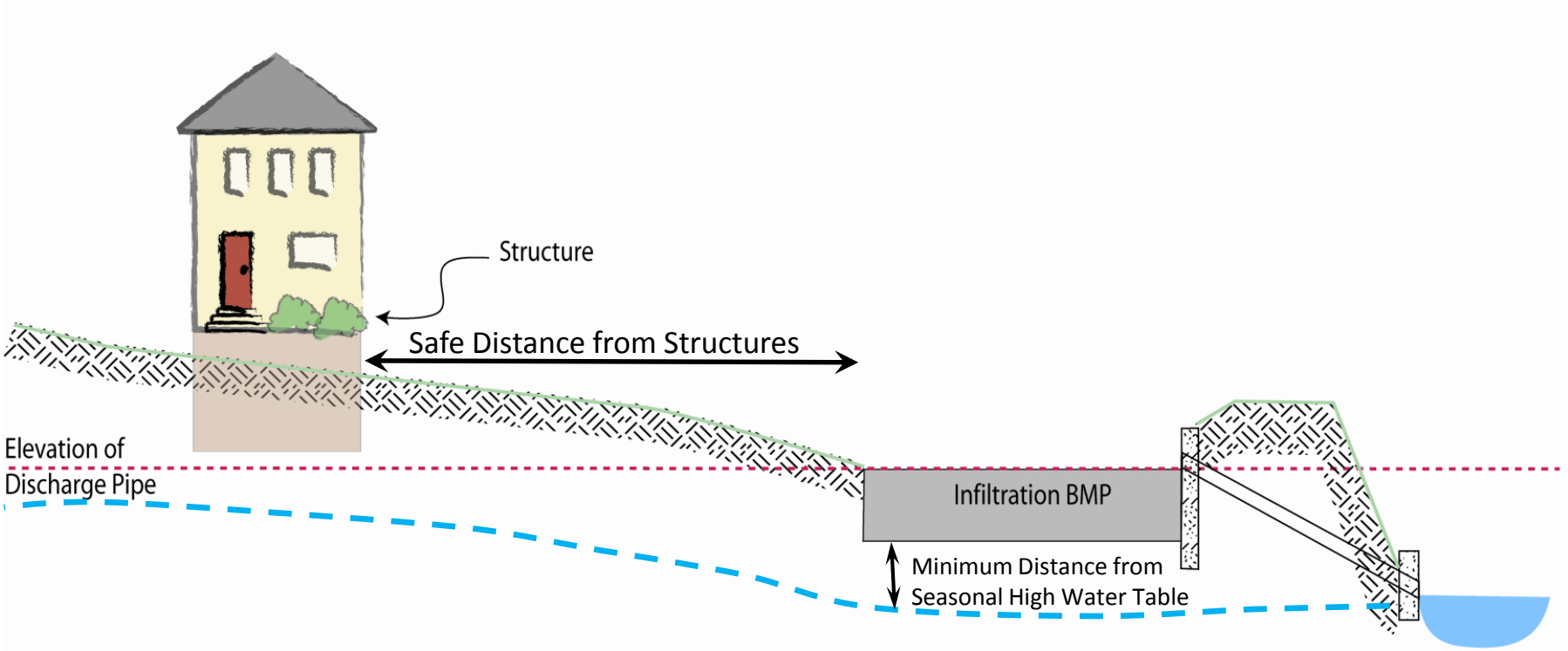
# Impact of NPS

- Fish and wildlife
- Recreational water activities
- Commercial fishing
- Tourism
- Drinking water quality

# Groundwater Recharge Requires…

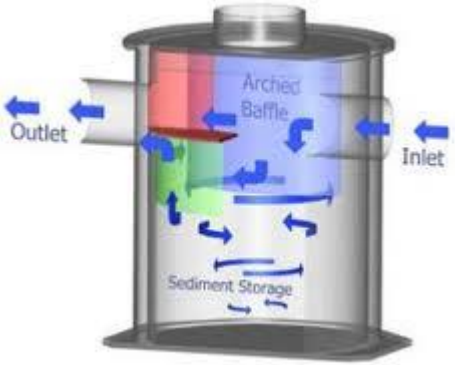
- Healthy soils
  - Permeability
  - Hydraulic conductivity
- Vertical separation from seasonable high water table or groundwater table
- Suitable distance from foundations, basements and septic systems

# Groundwater Recharge…



# Bioretention Systems

# Manufactured Treatment Devices (off-line devices)




http://www.njstormwater.org/treatment.html

# Table 2: TSS Removal Rates for BMPs

| Best Management Practice | TSS Percent Removal Rate |
|---|---|
| Bioretention Systems | 90 |
| Constructed Stormwater Wetland | 90 |
| Extended Detention Basin | 40-60 |
| Infiltration Structure | 80 |
| Sand Filter | 80 |
| Vegetative Filter Strip | 60-80 |
| Wet Pond | 50-90 |
| Manufactured Treatment Device | See N.J.A.C. 7:8-5.7(d) |

# Bottom line - what does the developer really need to do?

1. Maintain groundwater recharge on the site
2. Reduce sediment and nutrients runoff from the site
3. Reduce the peak stormwater runoff from the site

# How should a developer do this?

**3rd** Design systems that reduce peak stormwater runoff rates and meet water quantity requirements.

# WATER QUANTITY (NJAC 7.8-5.4(a)3)

1. **Has the applicant calculated stormwater runoff using NJDEP approved assumptions and factors?**

   These assumptions and factors can be found in the regulations under section NJAC 7:8-5.6. The Township Engineer or Review Engineer should be able to verify that the calculations were done correctly.

   If yes, go to Question #2. If no, application is incomplete at this time.

# WATER QUANTITY (NJAC 7.8-5.4(a)3)

2. **Has the applicant calculated the pre and post-construction peak runoff for the 2-year, 10-year, and 100-year storm events?**

   If yes, has the applicant demonstrated compliance with ONE of the following requirements?

   a. Has the applicant submitted adequate hydrologic and hydraulic analyses demonstrating the post-construction runoff hydrographs (2-yr, 10-yr, and 100-yr) do not exceed the corresponding pre-construction hydrographs?

   b. Has the applicant submitted adequate hydrologic and hydraulic analyses demonstrating that there is no increase as compared to the pre-construction condition in the peak runoff rates leaving the site (2-yr, 10-yr, and 100-yr) and that the increase volume or change in timing will not increase flood damage at or downstream of the project site.

   c. Has the applicant submitted adequate hydrologic and hydraulic analyses demonstrating that the post-construction peak runoff rates (2-yr, 10-yr, and 100-yr) are 50%, 75%, and 80% respectively of the pre-construction runoff rates.

   If the applicant has NOT demonstrated compliance with one of the requirements outlined above, the application is incomplete at this time.

# Summary

The best way for an applicant to meet the NJ Stormwater Management regulations is to:

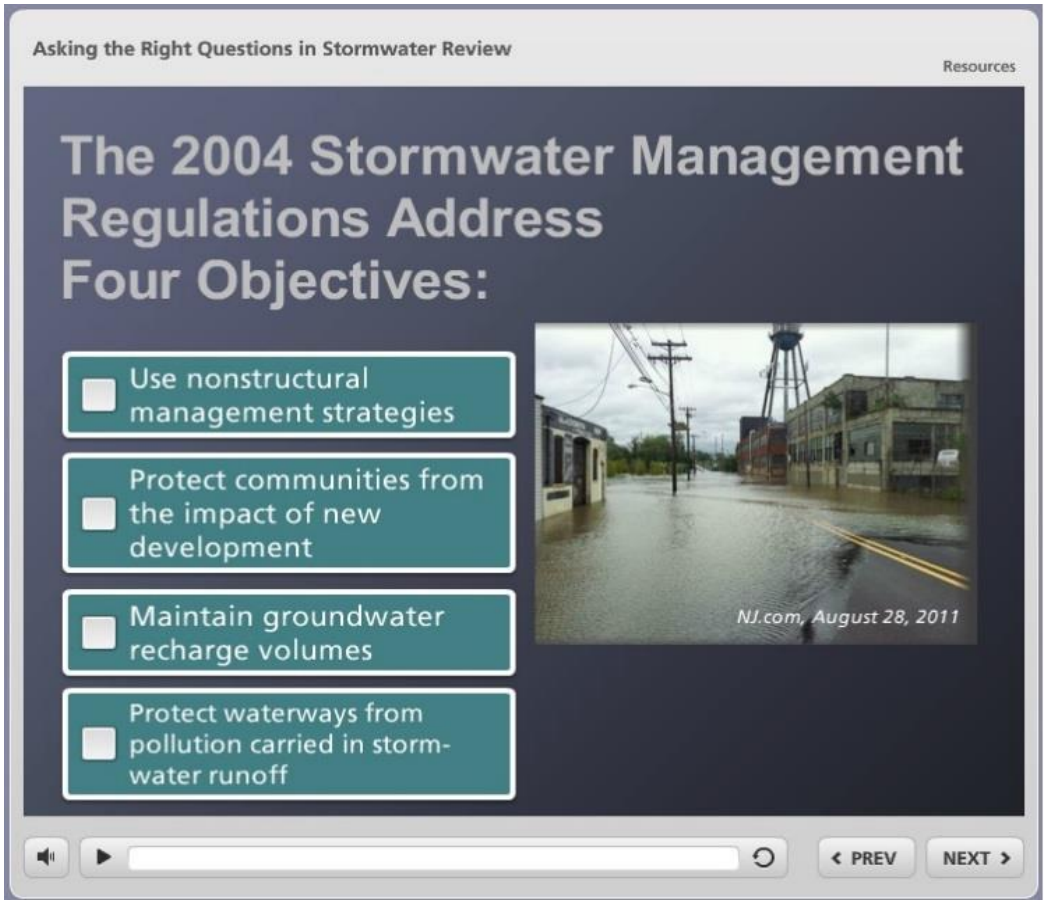
1. Incorporate *nonstructural* strategies
2. Address water *quality* and groundwater *recharge* requirements
3. Ensure that proposed designs meet water *quantity* requirements

# How do we integrate these tools into the review process?

- All questions should be publicly available for all applicants, review engineers, and residents
- Members of the planning and/or zoning boards and/or environmental commission should **be prepared to ask these questions** of the Township's review engineer and applicant
- Understand that these questions outline the **minimum requirements** as defined in the NJ Stormwater Management Rules

# E-learning Tool Available Online

- A **FREE** interactive E-learning tool is available online http://water.rutgers.edu/E-learning.html
- The tool is intended to help you understand if a developer is in compliance with the NJ Stormwater Management Regulations so you can be comfortable in approving or rejecting the developer's plan

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Questions?