

# Storm Water Management in the Rhode Island Coastal Zone

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**Environmental Business Council of New England**

***Energy Environment Economy***

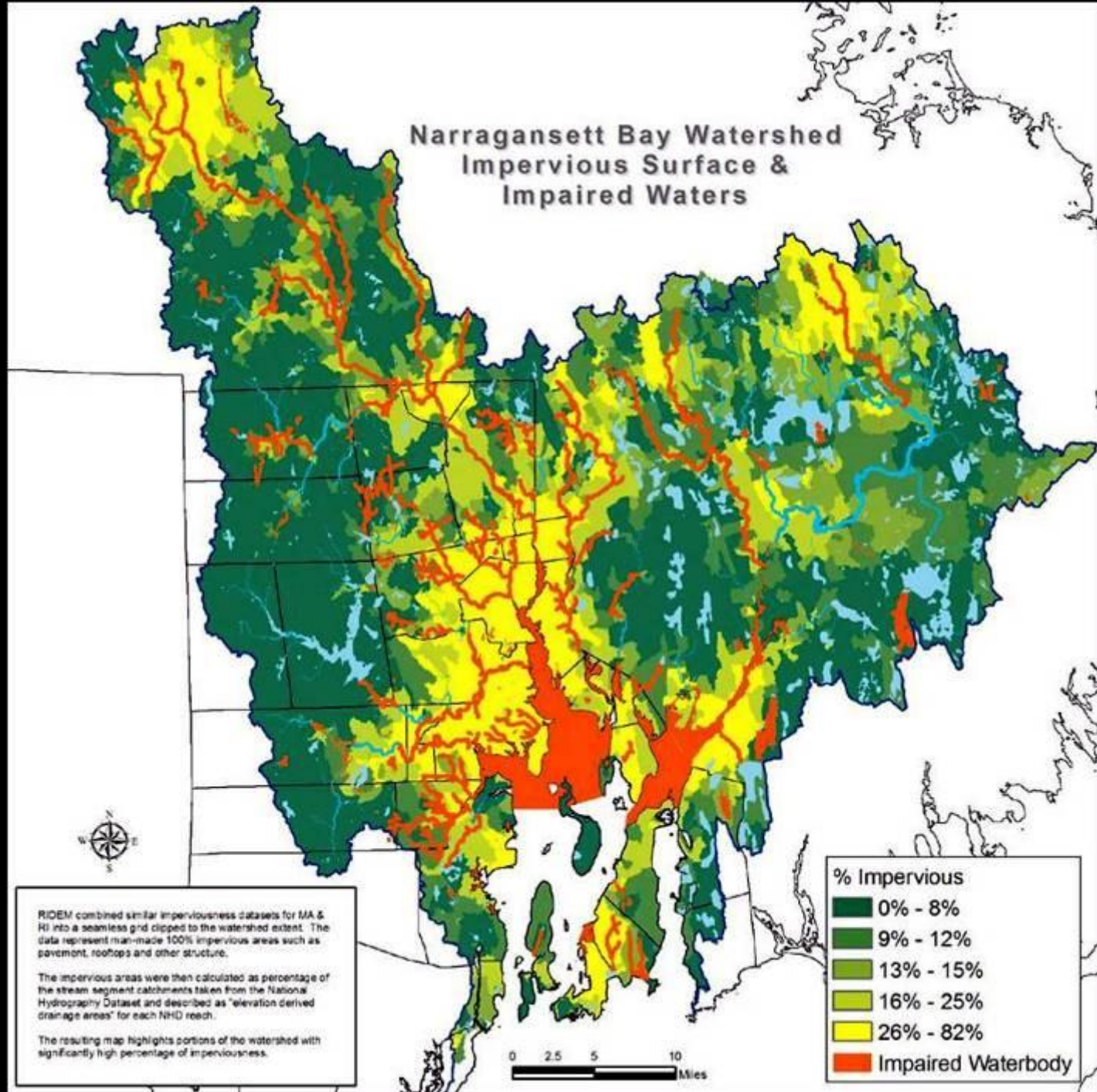


# Stormwater Management in the Rhode Island Coastal Zone

Environmental Business Council of New England  
Rhode Island Chapter Program  
***New Frontiers in Stormwater Management***  
October 10, 2013



# Narragansett Bay Watershed Impervious Surface & Impaired Waters



# Nonpoint Source Pollution

Polluted Stormwater Runoff is the #1  
Water Quality Problem in the U.S.\*

1987 amendments of the Clean Water Act  
included the National Pollution Discharge  
Elimination System (NPDES)

\* USEPA



# Coastal Zone Management Act - 1990 Amendments

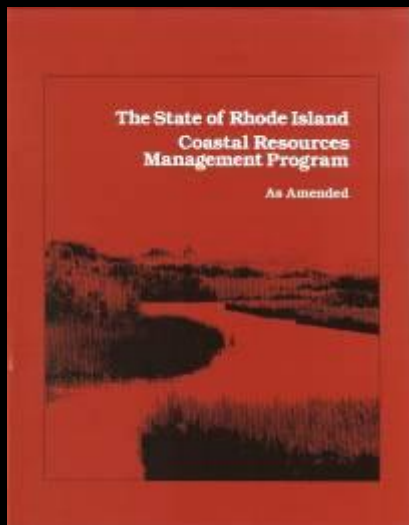
## 16 U.S.C. § 1455b. Protecting Coastal Waters

### Subsection (g)(5)

“For purposes of this subsection, the term "management measures" means economically achievable measures for the control of the addition of pollutants from existing and new categories and classes of nonpoint sources of pollution, which reflect the greatest degree of pollutant reduction achievable through the application of the best available nonpoint pollution control practices, technologies, processes, siting criteria, operating methods, or other alternatives.”

### Section 300.6

### RI Coastal Nonpoint Pollution Control Plan – July 1995



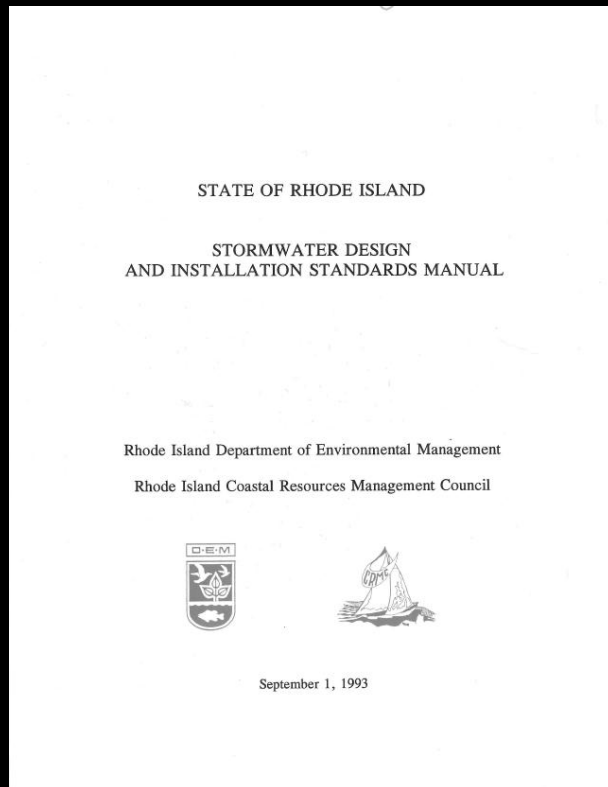
# Coastal Nonpoint Pollution Control Program (§ 6217)

## *New Development*

- 1) By design or performance:
  - a) After construction has been completed and the site is permanently stabilized, reduce the average annual total suspended solid (TSS) loadings by 80%. For the purposes of this measure, an 80% TSS reduction is to be determined on an average annual basis\*, or
  - b) Reduce the postdevelopment loadings of TSS so that the average annual TSS loadings are no greater than predevelopment loadings, and
- 2) To the extent practicable, maintain postdevelopment peak runoff rate and average volume at levels that are similar to predevelopment levels.

\*Based on the average annual TSS loadings from all storms less than or equal to the 2-year/24-hour storm. TSS loadings from storms greater than the 2-year/24-hour storm are not expected to be included in the calculation of the average annual TSS loadings.

# 1993 Stormwater Rules



Typical detention pond design



# Urban Coastal Greenways Policy

For the Metro Bay Region  
Cranston, East Providence, Pawtucket, and Providence

An Amendment to the Providence Harbor  
Special Area Management Plan



Adopted by the RI Coastal Resources Management Council  
on October 10, 2006  
As Amended August 28, 2007





# Narragansett Bay Commission

NARRAGANSETT BAY COMMISSION

RULES AND REGULATIONS FOR  
USE OF WASTEWATER FACILITIES  
WITHIN THE NARRAGANSETT  
BAY COMMISSION DISTRICT



THE NARRAGANSETT BAY COMMISSION  
ONE SERVICE ROAD  
PROVIDENCE, RHODE ISLAND 02905  
(401) 461-8848

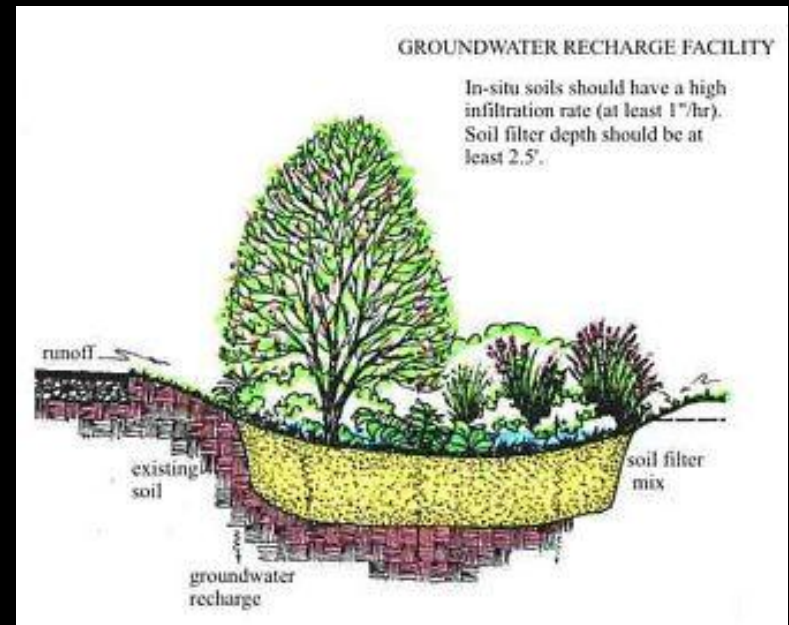
## 4.4 Stormwater Connections

No person(s) shall make direct or indirect connections or shed stormwater from roof down spouts, foundation drains, areaway drains, or other sources of stormwater which in turn are connected to any public sewer unless the NBC determines that a combined sewer is the only reasonable means available for disposal and such connection receives NBC approval. It shall be the responsibility of the user to execute, and bear the cost of, a Storm Water Mitigation Plan if required by the NBC in this regard. The Storm Water Mitigation Plan, may include, but not be limited to, the following studies and/or evaluations:

- A. Investigation of mitigating measures to eliminate or reduce storm flow from the project;
- B. The use of Low Impact Development and Design methods to eliminate or reduce storm flow from the project;
- C. Best Management Practices approach to stormwater management to eliminate or reduce storm flow from the project;
- D. Investigation of alternative options available to direct discharges into natural waterways;

# Why use LID methods to manage stormwater runoff?

1. LID site designs generate lower volumes of runoff
2. LID designs promote groundwater recharge
3. LID designs attenuate impacts from extreme storms modified by climate change
4. LID designs generally have higher pollutant removal capabilities

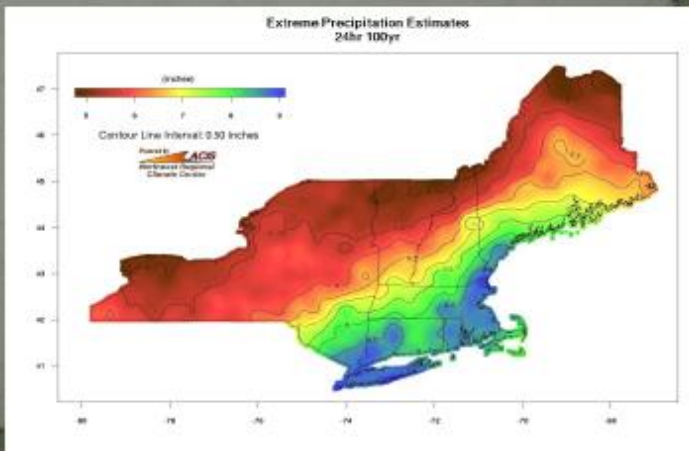
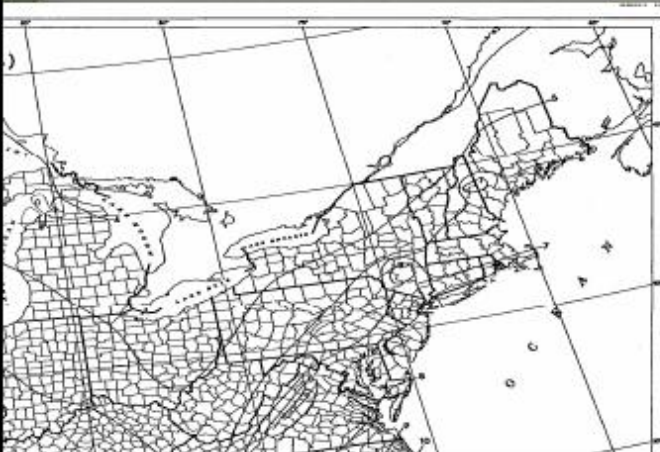


# Climate Change is Impacting the Way We Must Manage Stormwater Now and in the Future

## Frequency

Most significant in the 25 to 100 yr recurrence interval.

1 Day Return period	TP-40 from 1961	NRCC Draft 2010 <a href="http://www.precip.net">http://www.precip.net</a>
Event in years	Inches in 24 hours	Inches in 24 hours
2	3.25	3.26
10	4.75	4.86
25	5.50	6.15
50	6.15	7.30
100	7.00	8.70



Graphic Courtesy of David Vallee NWS/Northeast River Forecast Center

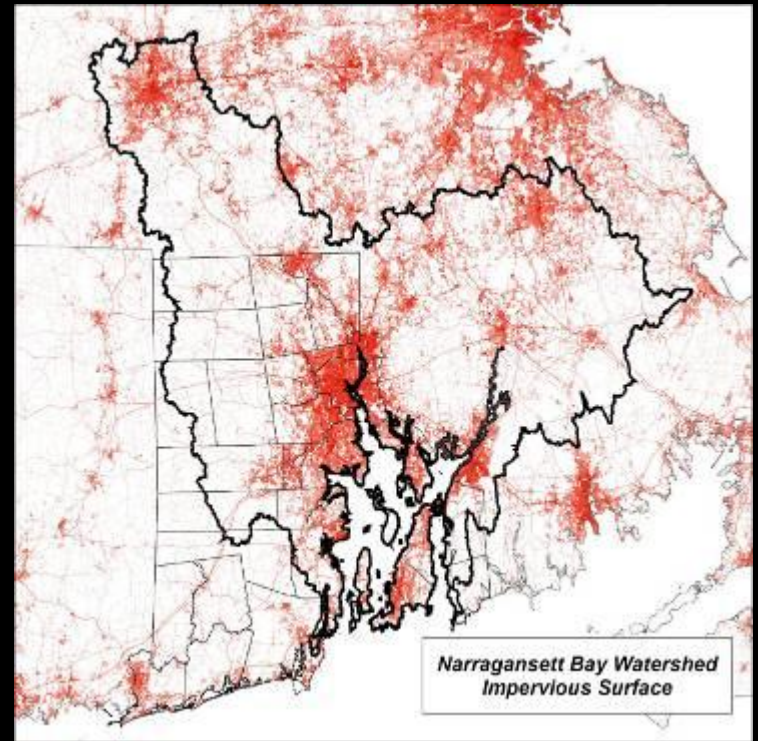


# Flooding is Increasing as a Result of Urbanization and Climate Change

## Pawtuxet River Historical Crests

Rank	Height	Date
1	20.79 ft	3/31/2010
2	14.98 ft	3/15/2010
3	14.50 ft	6/7/1982
4	13.68 ft	10/15/2005
5	13.26 ft	1/26/1979
6	13.11 ft	4/25/1983
7	12.57 ft	6/8/2006
8	12.40 ft	4/17/2007
9	11.88 ft	3/25/2010
10	11.86 ft	3/31/2001

Source: [www.water.weather.gov/ahps](http://www.water.weather.gov/ahps)





# December 12, 2008 Tidal Flood Event A Glimpse into the Future of Waterplace Park?



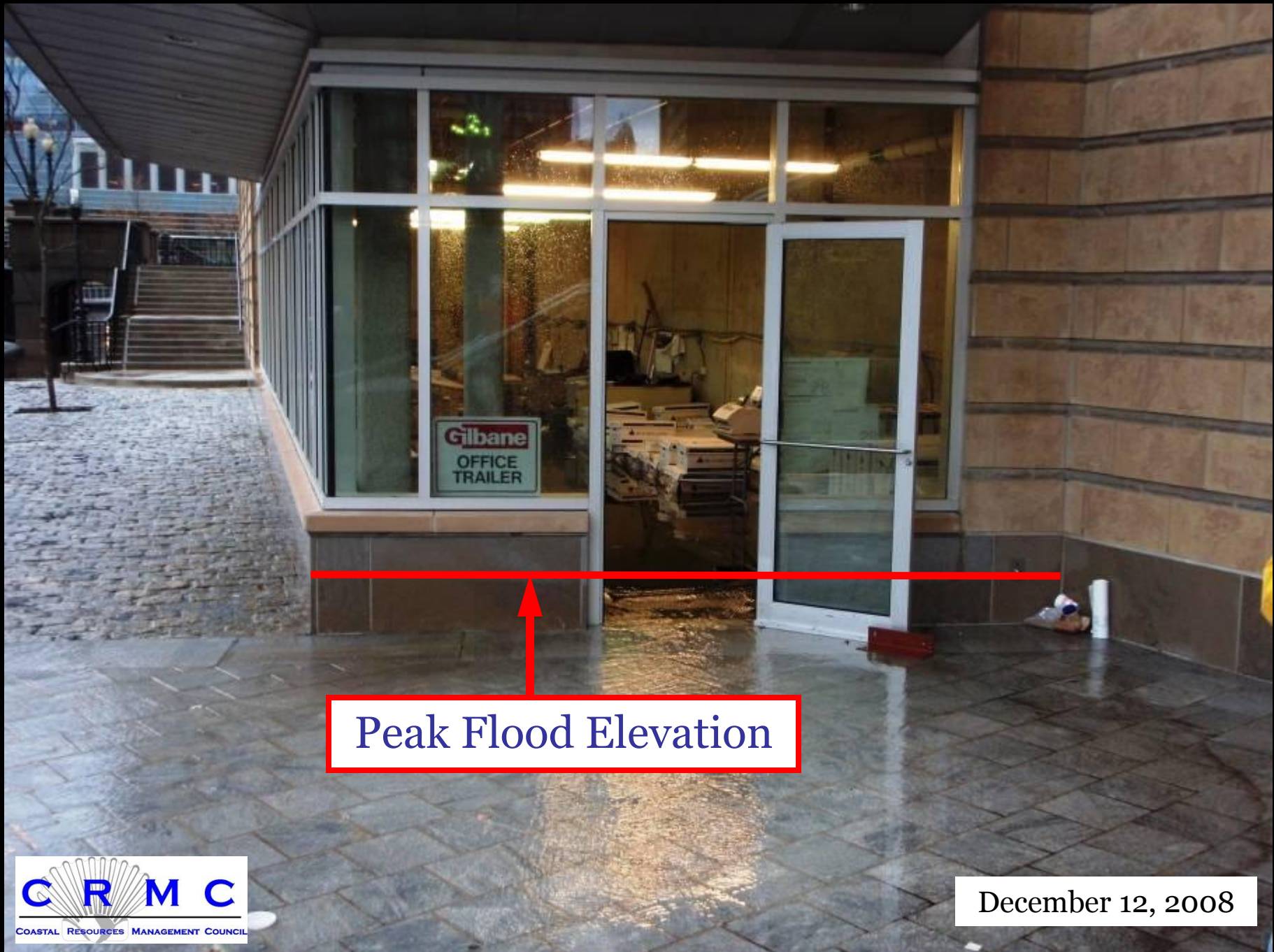
James Boyd

RI Coastal Resources Management Council







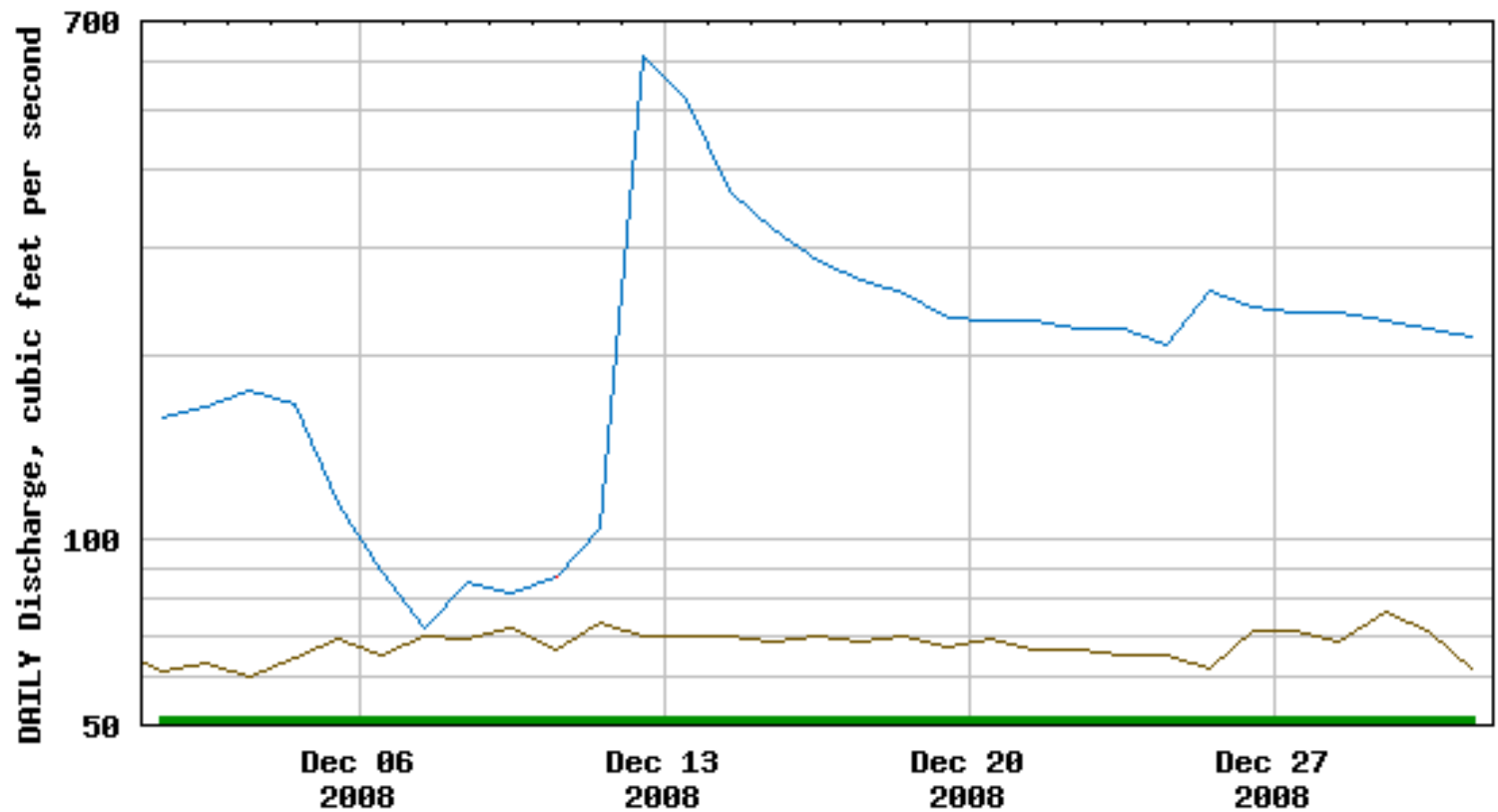


# Factors Contributing to Extreme Tidal Flood Event on December 12, 2008 in the Providence Inner Harbor

- Full Moon – December 12, 2008 – coincidental orbit closer to Earth
- Earth's orbit location – close proximity to Sun – Winter Solstice
  - The above 2 factors combined to form stronger gravitational forces that influenced tidal ranges
- 4.85 inches of rainfall over a 24-hr period preceding the high tide of December 12
- Strong southwesterly winds (53 mph gust recorded at TF Green Airport) early that morning of December 12 driving tidal waters up the Bay
- The Fox Point Hurricane Barrier was NOT closed!



## USGS 01114500 WOONASQUATUCKET RIVER AT CENTERDALE, RI



Median daily statistic (67 years)

Daily mean discharge

Estimated daily mean discharge

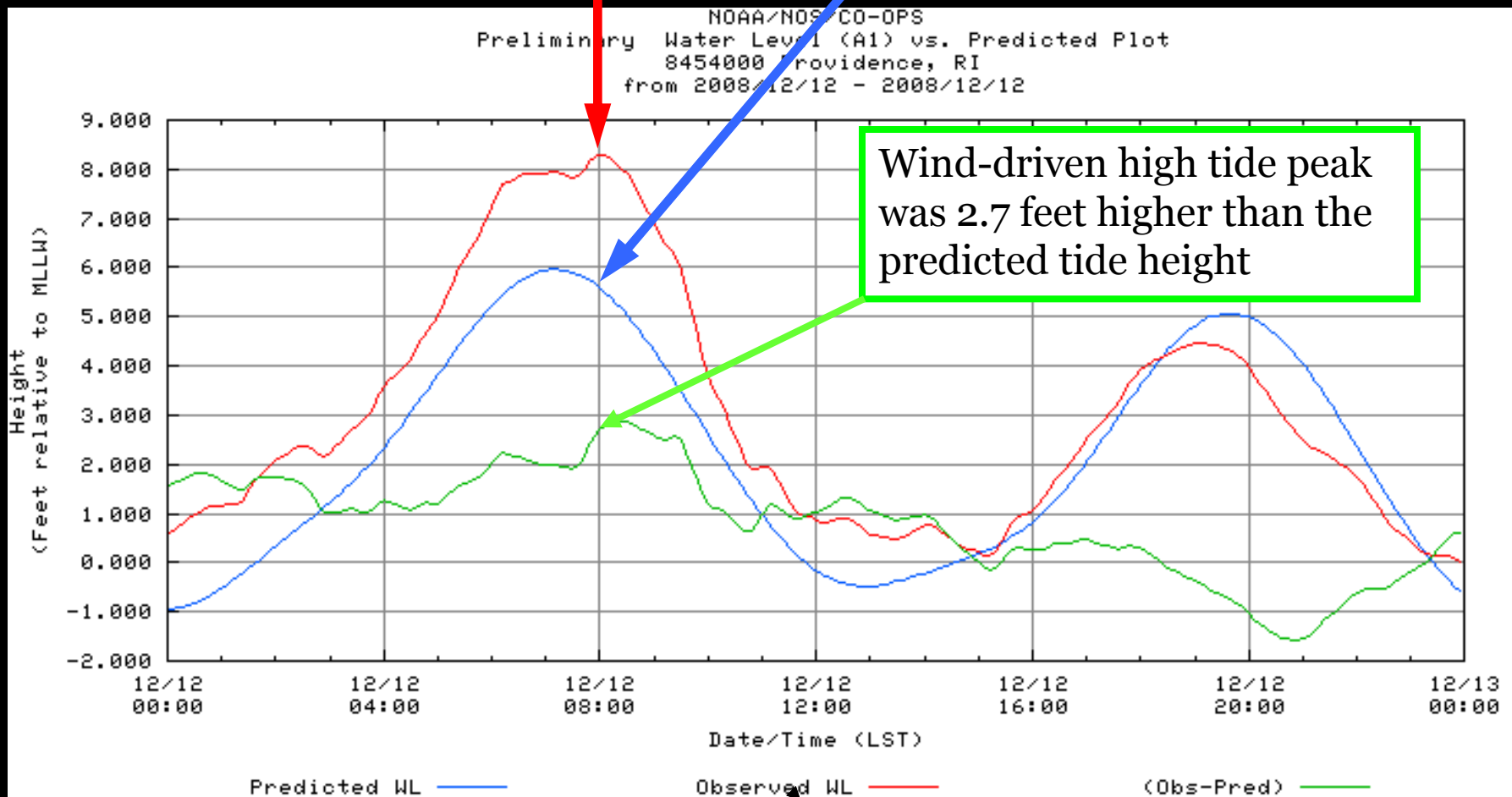
Period of approved data



# December 12, 2008 tides measured at NOAA Station 8454000

Observed Tide Height – 8.3 feet

Predicted Tide Height – 5.6 feet





# New State Stormwater Management Requirements

## RHODE ISLAND STORMWATER DESIGN AND INSTALLATION STANDARDS MANUAL

DECEMBER 2010



RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL  
MANAGEMENT AND



COASTAL RESOURCES MANAGEMENT COUNCIL



“Smart Development for a  
Cleaner Bay Act” RIGL § 45-61.2

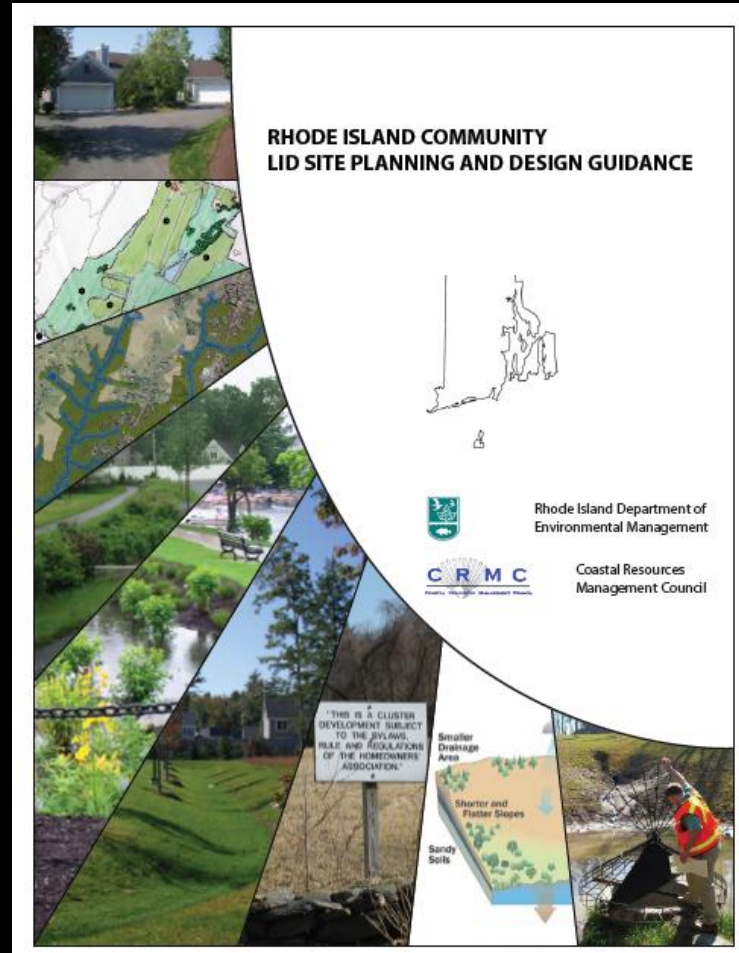
- Maintain groundwater recharge  
∴ infiltration
- Control post-development peak  
discharges
- Use Low Impact Development  
techniques

Implementation through CRMP Section 300.6





# RI Community LID Site Planning and Design Guidance Manual – 2011



# Comparison of Conventional vs. LID Site Planning

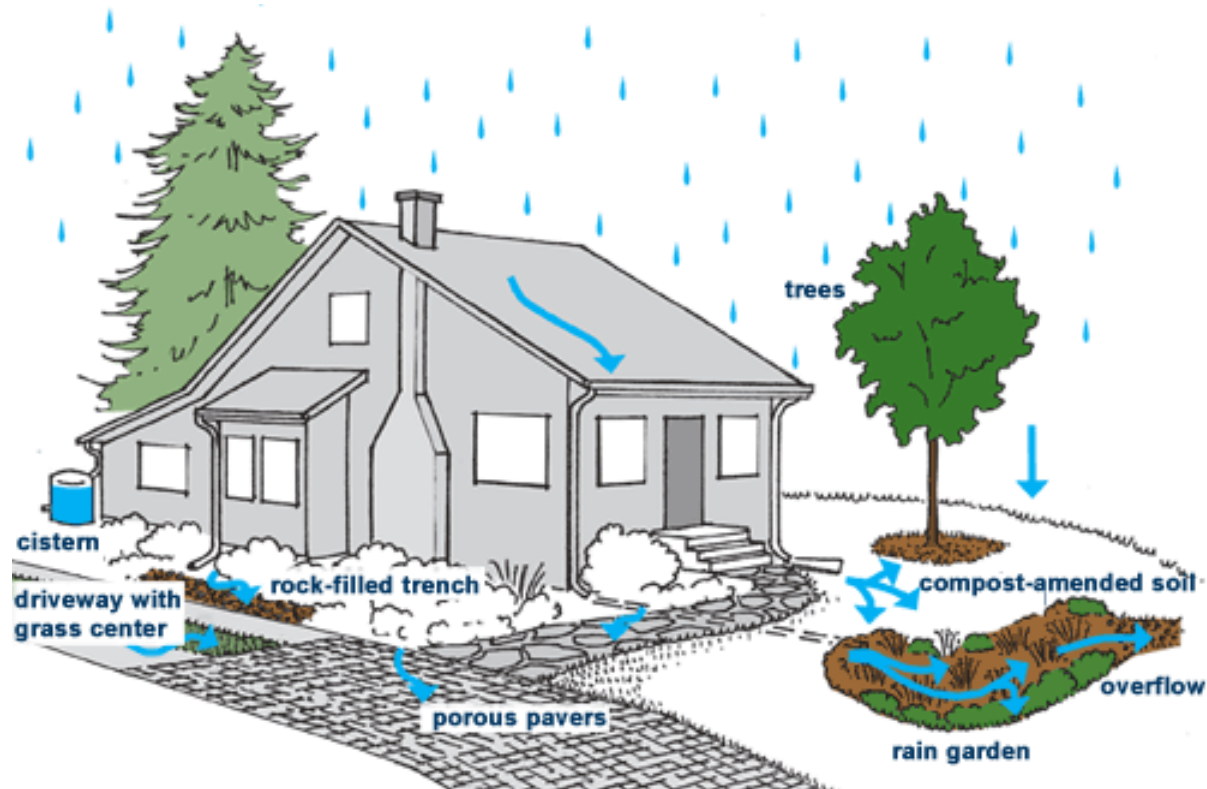




# Managing Stormwater Runoff on Single-family Residential Sites



Typical



Low Impact Development

# RI Single-Family Lot Guidance

## State of Rhode Island Stormwater Management Guidance for Individual Single-Family Residential Lot Development

Section 300.6 of the RI Coastal Resources Management Program (RICRMP) and Rule 7.12 of the DEM Rules and Regulations Governing the Administration of the RI Freshwater Wetlands Act require stormwater management for projects on individual single-family residential lots that create 600 square feet or more of new impervious roof surface area, and all new driveway and parking areas. This document provides guidance for meeting those requirements, and may also be used by applicants under the jurisdiction of CRMC Freshwater Wetlands in the Vicinity of the Coast.

The guidance provided in this document may not be used to meet stormwater requirements for residential subdivisions or any project types other than individual single-family residential lot development.

### CRMC Supplemental Stormwater Application Requirements:

- ☐ Completed CRMC application (4 copies) including all forms, fees and required enclosures.
- ☐ 8.5 x 11 inch site plan that depicts the information detailed in the checklist under Step 5 on page of this document.

### DEM Application Requirements:

- ☐ Completed DEM Application package including all forms, fees and required enclosures (see DEM Rules 7.00 and either 9.00 or 10.00 as applicable)
- ☐ Ensure site plans (DEM Rule 7.03) include all elements detailed in the checklist under Step 5 on page 17 of this document.

### Residential Stormwater Management Overview

A single residential lot might not be the most obvious source of pollution problems, but behind a suburban landscape, there may be activities that can threaten water quality. Pollutants commonly present on residential lots include pesticides fertilizers used in landscaping. Other pollutants may include sediment from erosion-prone areas, yard waste such as leaves and grass clippings, pet waste and oil and gas from driveway surfaces. Even runoff from rooftops can contain pollutants known to occur in rainfall. These have the potential to be transported in stormwater to surface water bodies, posing risks to the environment and human health. While the contribution from an individual yard may seem small, the cumulative effects of stormwater runoff coming from hundreds or thousands of homes within a watershed can be significant. Reducing the amount of stormwater that leaves your property as runoff helps to prevent pollutants from reaching our streams, lakes, ponds and coastal waters.

### Rule Applicability

Under RICRMP Section 300.6 and DEM Rule 7.12, applicants for individual single-family residential projects are required to treat the water quality volume, or one inch of stormwater runoff from any new rooftop impervious surfaces of 600 square feet or greater in size, and all new driveways and parking areas. This guidance document describes stormwater management practices for reducing runoff volumes and pollutant levels. It also provides guidance for designing, installing and maintaining stormwater management practices that meet the requirements for new or enlarged single-family dwellings, driveways and parking areas. The practices discussed in this document are part of a stormwater management approach known as low impact development or LID. This document is meant to be used as a generalized guide to help applicants meet storm water management requirements on individual single-family residential lots. For more complex projects, and for more detailed information on the design of storm water management practices, see the most recent version of the Rhode Island Stormwater Design and Installation Standards Manual for additional information at [www.dem.ri.gov/pubs/regs/regs/water/swmanual.pdf](http://www.dem.ri.gov/pubs/regs/regs/water/swmanual.pdf).



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Stormwater  
Manual  
Appendix A  
Checklist  
[\(pdf format\)](#)  
[\(word  
format\)](#)

The Department of Environmental Management adopted the new [Stormwater Design and Installation Standards Manual](#) and filed new regulations that require the use of the new Manual for all OWR permitting programs. The revised manual became effective on January 1, 2011 and will be applied to permit applications received on or after that date.



All applicable development proposals must include a Stormwater Management Plan for review by the Department of Environmental Management.

[Stormwater  
Manual  
Page](#)

[Wetlands  
Rules](#)

[Water  
Quality  
Rules](#)

[RIPDES  
Rules](#)

[RIPDES  
Stormwater  
Program](#)

APPLICATION GUIDANCE - In order to make it easier for applicants to address the requirements in the new Stormwater Design and Installation Standards Manual the Department of Environmental Management has developed a [Stormwater Management Plan Guide](#) which serves to outline key components that must be included in every Stormwater Management Plan submitted for review and approval. The Stormwater Management Plan Guide will help applicants understand how to prepare a Stormwater Management Plan that will satisfy any new requirements contained in the Stormwater Design and Installation Standards Manual as well as any existing regulatory requirements. The key components of a Storm Water Management Plan are provided below:

1. [Application Forms](#) ( DEM Permitting Program Specific Application and a completed Stormwater Design and Installation Standards Manual Appendix A checklist).
2. A [Stormwater Site Planning, Analysis, and Design Report](#).
3. A Construction Phase [Erosion and Sediment Control Plan](#) if the development project will disturb less than 1 acre of land, or a [Storm Water Pollution Prevention Plan \(SWPPP\)](#) if the development project will disturb greater than or equal to 1 acre of land.
4. An [Operation and Maintenance Plan](#) which addresses operations and maintenance (O&M) of the proposed Best Management Practices (BMPs) after construction is completed and the site is in use. The Plan must address the stormwater management system and structural stormwater controls as well as pollution prevention and source controls.

NEW APPLICATION CHECKLIST - Applicants must submit a completed



Details

Add

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## Contents

- ☒ Inundation Surfaces 2013
  - ☐ Hurricane of 1938 Surge Level
  - ☐ MHHW Plus 5' SLR
  - ☐ MHHW Plus 1' SLR and 3' Surge
  - ☐ MHHW Plus 3' SLR
  - ☐ MHHW Plus 1' Sea Level Rise (SLR)
  - ☐ Mean Higher High Water (MHHW)
  - ☐ All Scenarios
- ☐ OrthoImagery, 2011
- ☐ TopoBathy Hillshade
- ☒ Imagery





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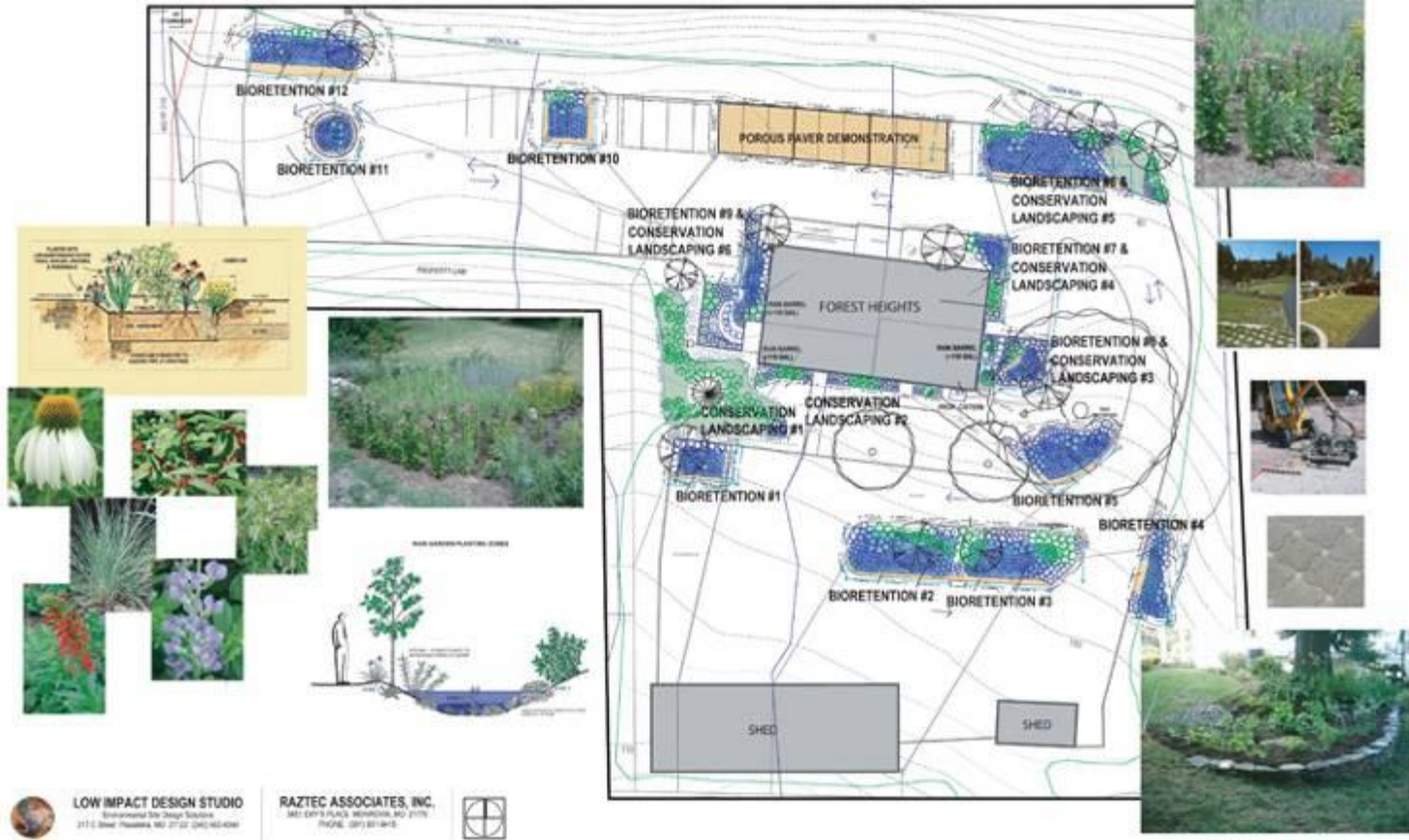


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**STORMWATER RETROFIT PROJECT - FOREST HEIGHTS TOWNSHIP MUNICIPAL BUILDING**  
FOREST HEIGHTS, PG COUNTY, MD



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