Watershed-Based Stormwater Compliance For NH MS4 Communities

2016 NH Water & Watershed Conference

September 8, 2015

BY

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Emily Scerbo, P.E., Tighe & Bond

Watershed Approach to Stormwater Management & Compliance

Watershed Scale Education & Outreach :

- **Recognize that the Vast Majority of Property is Privately Owned (municipalities controls very little)**
- **Open a dialog with residents and businesses about water quality issues and their role in the Watershed**
- **Create a Sustained Watershed based Education & Outreach Program**
- **Maintain continuity between all projects in how they relate to the watershed solution**

Economics of Stormwater Management - NO QUICK FIX - :

Structural stormwater BMP are expensive:

- **+$2,000 to treat 1 lb of N or P annually**
- **No BMP for Chloride yet…..**

Multiply by Removal of TONS* of Pollutants:

- **Exeter River X 49.8 Tons/Yr N**
- **Oyster River X 12.7 Tons/Yr N**
- **Winnicut River X 7.4 Tons/Yr N**

**** To protect eelgrass in downstream subestuaries***

Economics of Stormwater Management:

At +$2,000 to treat 1 lb of N or P annually with Stormwater BMPs - WE MUST:

- **Maximize the use of ever dollar spent**
- **Make lasting and easy to maintain BMPs**
- **Incorporate Outreach Elements in all projects to Educate and Engage residents and business**
- **Use last year to build on this year's work.**

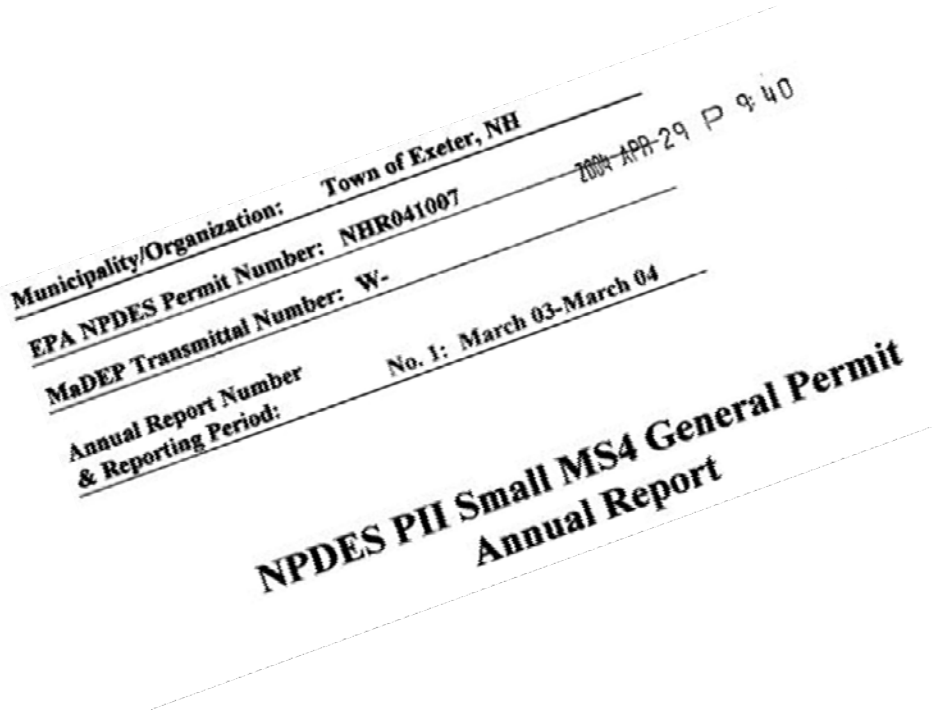
WATERSHED APPROACH IS A LONG TERM COMMITMENT:

LONG TERM SOLUTION:

- **Educate Multiple Generations**
- **Sustained & Fresh Social Media Content**
- **Maintain a Geographical Watershed Connection**
- **Collaborate with your target audiences**
  (Upstream Towns, Schools, Watershed & Conservation groups, RPCs, Neighborhood orgs, Churches)
- **Develop an Intern Program**

WATERSHED APPROACH EXAMPLES:

Exeter, New Hampshire



Municipality/Organization: Town of Exeter, NH

EPA NPDES Permit Number: NHR041007

MaDEP Transmittal Number: W-

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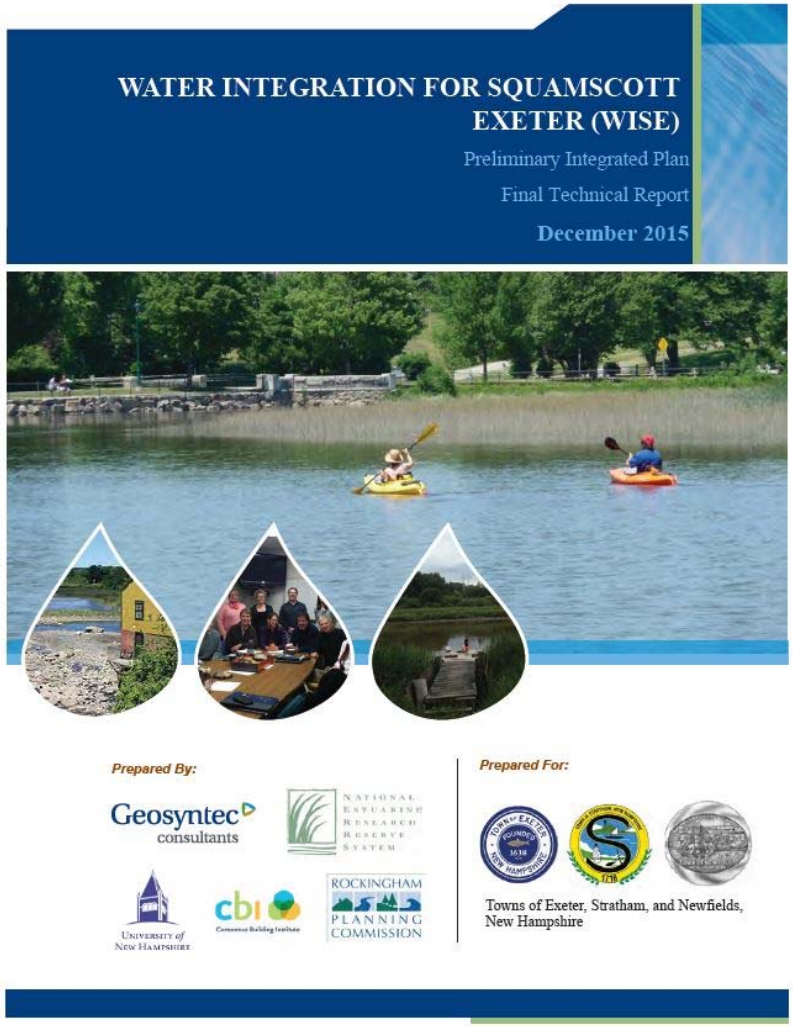
Annual Report Number & Reporting Period: No. 1: March 03-March 04

NPDES PII Small MS4 General Permit Annual Report



WATER INTEGRATION FOR SQUAMSCOTT EXETER (WISE)

Preliminary Integrated Plan

Final Technical Report

December 2015

Prepared By:

Geosyntec consultants

National Estuarine Research Reserve System

University of New Hampshire

cbi

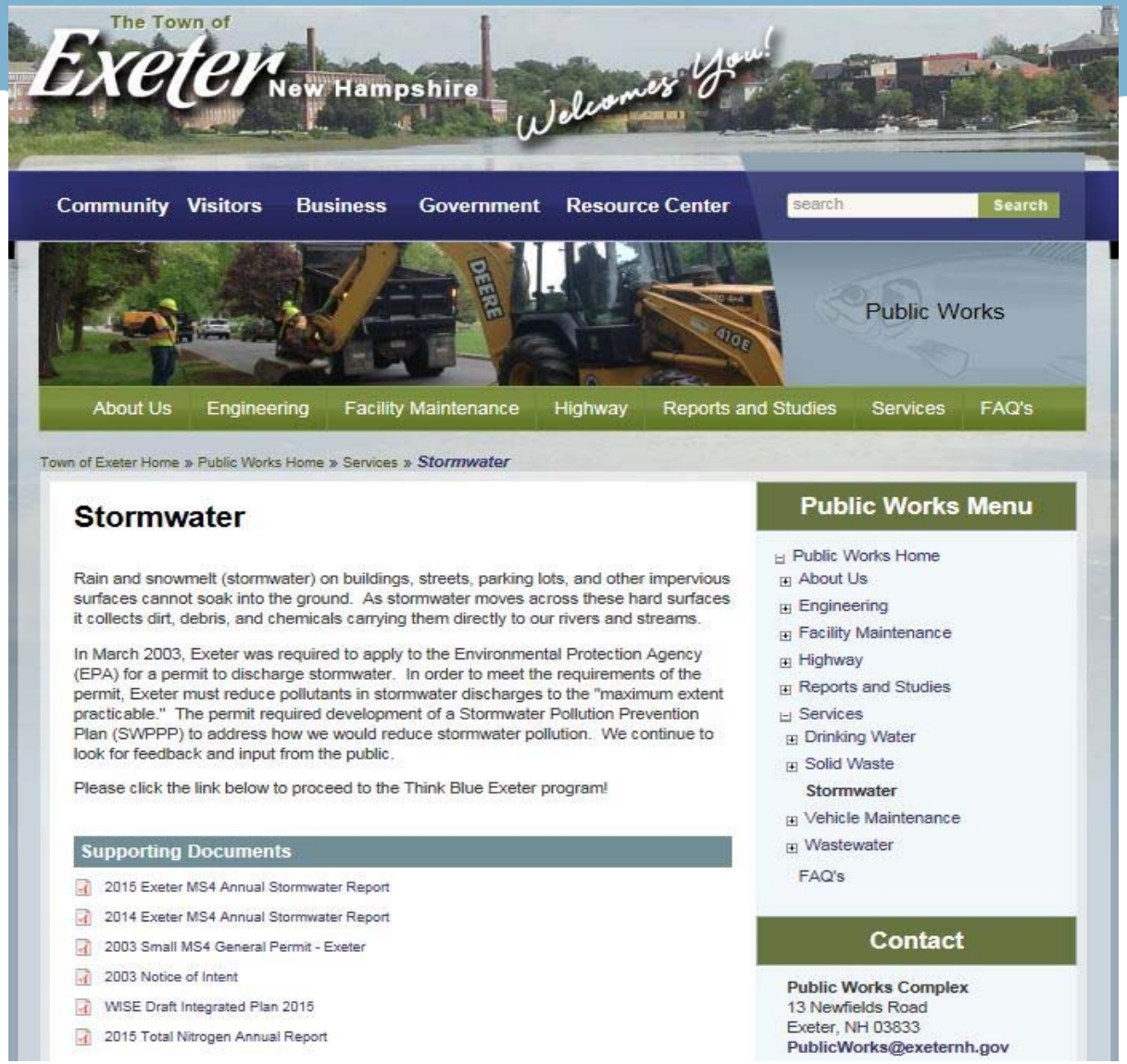
Rockingham Planning Commission

Prepared For:

Towns of Exeter, Stratham, and Newfields, New Hampshire

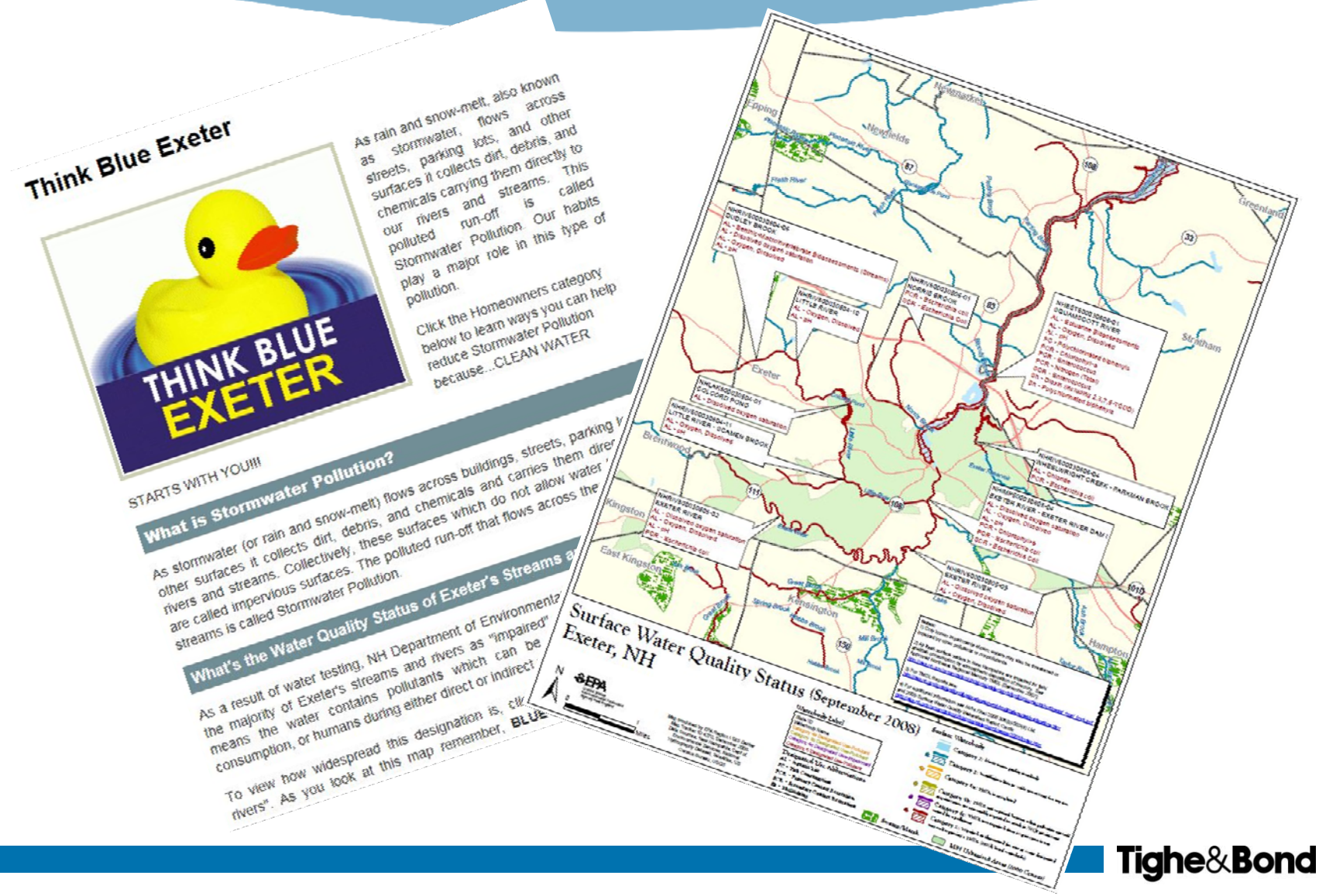
Tighe&Bond

WATERSHED APPROACH EXAMPLES:



WATERSHED APPROACH EXAMPLES:

Exeter, New Hampshire



ATERSHED APPROACH EXAMPLES:

Exeter, New Hampshire

CAPE: Climate Adaptation Plan for Exeter

BACKGROUND:

The climate in which we live has always changed over time, requiring us to adjust or adapt to these changes. While some people disagree with the science of global warming, there are some things we can all agree upon.

The Exeter community has seen a marked increase in flooding and the adage "an ounce of prevention is worth a pound of cure" rings

hatever the ultimate cause, whether it is manmade or a natural cycle, there are ecisions that need to be made today and in the future that will impact how nfrastructure, and natural resources fare. To prepare for these changes, while local people about local priorities, the Town of Exeter partnered with a multi- team from the University of New Hampshire and Great Bay National Estuarine Reserve to study the vulnerabilities in Exeter and to then develop an plan.

Great Bay Pollution Tracking and Accounting Pilot Project (PTAPP)

What is PTAPP?

The Great Bay estuary exhibits symptoms of pollution: low dissolved oxy- tal rivers, increased macroalgae, and declining eelgrass. Most pol- sources spread across the watershed including septic ir pollution. Stormwater runoff from developed y for pollutants.

ies are facing regulatory measures to improve water and its tributaries. These requirements include imple- king of pollution control activities; however, tracking oject success is challenging and expensive. Communities al coordination is needed to leverage scarce financial re- lop a consistent, effective tracking system.

Aerial View of Great Bay

a cooperative forum for communities to work toward identifying key components, needs, and next steps for successful on of a consistent regional system. Goals include progress toward development of: 1.) a **Tracking Tool** to track activities ollutant loads, and 2.) an **Accounting System** to credit activities and estimate pollutant load reductions.

Process, Outcomes and Benefits

PP process includes six facilitated workgroup meetings held over the course of one year beginning in February 2015. During gs, participants will develop a shared agreement and understanding of principal technical components, resource needs, and steps for regional tracking and accounting. Each meeting will have an identified goal and outcome and will build on results similar efforts such as those conducted in Chesapeake Bay and Long Island Sound. The PTAPP process will ultimately result in implementation Framework describing system recommendations and next steps for implementation including approach, roles, ources, and timeline. **Summary of anticipated PTAPP outcomes**:

This bioretention unit is an example of a storm- water management activity that would be

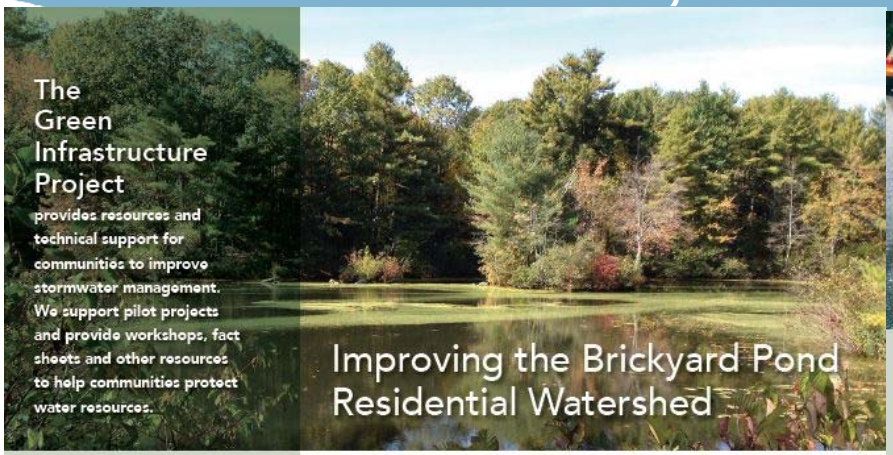
- Progress toward regional agreement is achieved.
- Additional needs are identified (funding, technology, etc.).
- Roles and responsibilities are described.
- Implementation Framework is created.

Municipalities in the Great Bay region seek to create a regional tracking system that is economical, easy to implement, and meets regulatory needs. PTAPP **benefits** include the following:

- *Economic*: Financial resources are leveraged at the regional level so that municipalities do not shoulder costs individually.
- *Regulatory*: A consistent regional accounting system and tracking tool will help meet municipal permit requirements.
- *Social*: Regional coordination promotes common, understanding of needs and identifies opportunities for collaboration and resource-sharing.
- *Environmental*: Regional pollution management and tracking will likely result in measurable water quality improvement over time.

WATERSHED APPROACH EXAMPLES:

Exeter, New Hampshire



The Green Infrastructure Project

provides resources and technical support for communities to improve stormwater management. We support pilot projects and provide workshops, fact sheets and other resources to help communities protect water resources.

Improving the Brickyard Pond Residential Watershed

Exeter, New Hampshire

What Is Green Infrastructure?

Green infrastructure is the utilization of natural processes to help control rain runoff.

This can include **constructed systems** such as **raingardens** or **buffers** along streams that treat runoff by filtering the water.

There are also **non-structural strategies** such as **incentives** or **education** to encourage homeowners to protect water quality, and **regulations** that require better stormwater control for new construction.

A **complete community approach** uses green infrastructure throughout all aspects of community planning.

THE PROBLEM

Brickyard Pond, once a community gathering place and natural playground, has deteriorated steadily over the years. As excess fertilizer, soil, oils, salt, and other components of stormwater pollution flow through stormdrains from a neighboring community and enter the pond, a food smorgasbord is created for unwanted plants and algae. The plants and algae grow in excess, reducing the overall water quality and degrading the habitat for fish.

THE SOLUTION

Neighbors in the Marshall Farms community expressed their concerns. Working with the town and with support from a Green Infrastructure grant, they learned what small changes they could make on their property to work toward improving the pond's condition. Their focus was on making these changes using three Green Infrastructure tools: **Lawn Care, Rain Barrels** and **Rain Gardens.**

Why Do We Care About Stormwater And How Does Green Infrastructure Help?

Stormwater is **rain runoff** that flows across parking lots, roads or other hard surfaces. The runoff contributes to **flooding** and can carry **pollutants** including road salt and nitrogen into our rivers, lakes and the Great Bay.

Existing stormwater management systems designed to control runoff and protect life and property are not always able to handle the large **storm events** that New Hampshire has experienced over the last several years. Better water resource management will reduce infrastructure costs and help to alleviate flooding.

This project is funded by the **NERRs Science Collaborative** to a project team led by the **University of New Hampshire Stormwater Center** and the **Great Bay National Estuarine Research Reserve.** It supports Green Infrastructure implementation with local municipal, non-profit and private sector partners.

For more information please visit **southeastwatershedalliance.org/green-infrastructure**

Improving the Brickyard Pond Residential Watershed

Exeter, New Hampshire

The town of Exeter and residents living near Brickyard Pond participated in an education program that was followed by implementation of several residential stormwater treatment systems. The project combined education with water treatment and monitoring and engaged a wide range of stakeholders. In the initial stages of this program, seven rain barrels and rain gardens were installed and, most importantly, a relationship was established between residents and the town to resolve issues with stormwater and the health of Brickyard Pond.

LAWN CARE

In a neighborhood workshop, residents learned about the importance of letting soil conditions, not past habits, dictate what their lawns need for fertilizer. By committing to the Happy Lawns-Blue Waters campaign, residents agreed to opt for slow release, phosphorus-free fertilizers unless soil tests indicate otherwise. In addition, they committed to cleaning up after their pets, reducing yet another source of excess nutrients. When mowing lawns, they would cut to three inches or higher to encourage stronger grass root growth and leave the cut grass on the lawn to take advantage of the free fertilizer provided as clippings decompose.

RAIN BARRELS

Residents were offered the opportunity to purchase SkyJuice rain barrels at a discounted rate. Rain barrels capture clean water from rooftops through gutter downspouts and store it for use whenever houseplants, gardens, or flowerbeds need watering. The result is not only a free water source for the residents, but a reduction in the amount of stormwater that leaves the property. So how much water can you save? A half-inch rainfall falling on a 1,000 square foot roof will provide 300 gallons of water.

RAIN GARDENS

A rain garden in its simplest form is a depression in your yard that uses soil, mulch, and plants to capture, absorb, and treat stormwater. This helps reduce the amount of stormwater coming from your property and to recharge groundwater.

Two neighborhood rain gardens were installed in this community. They were designed by Ironwood Design Group LLC with donations and assistance from Rye Beach Landscaping and Churchill's Gardens. Residents were invited to participate in construction to gain hands-on experience. They then applied their newly acquired skills to construct a rain garden on their own property.

GREEN INFRASTRUCTURE FOR STORMWATER MANAGEMENT IN NH COASTAL COMMUNITIES

Tighe&Bond

WATERSHED APPROACH EXAMPLES:

Durham, New Hampshire

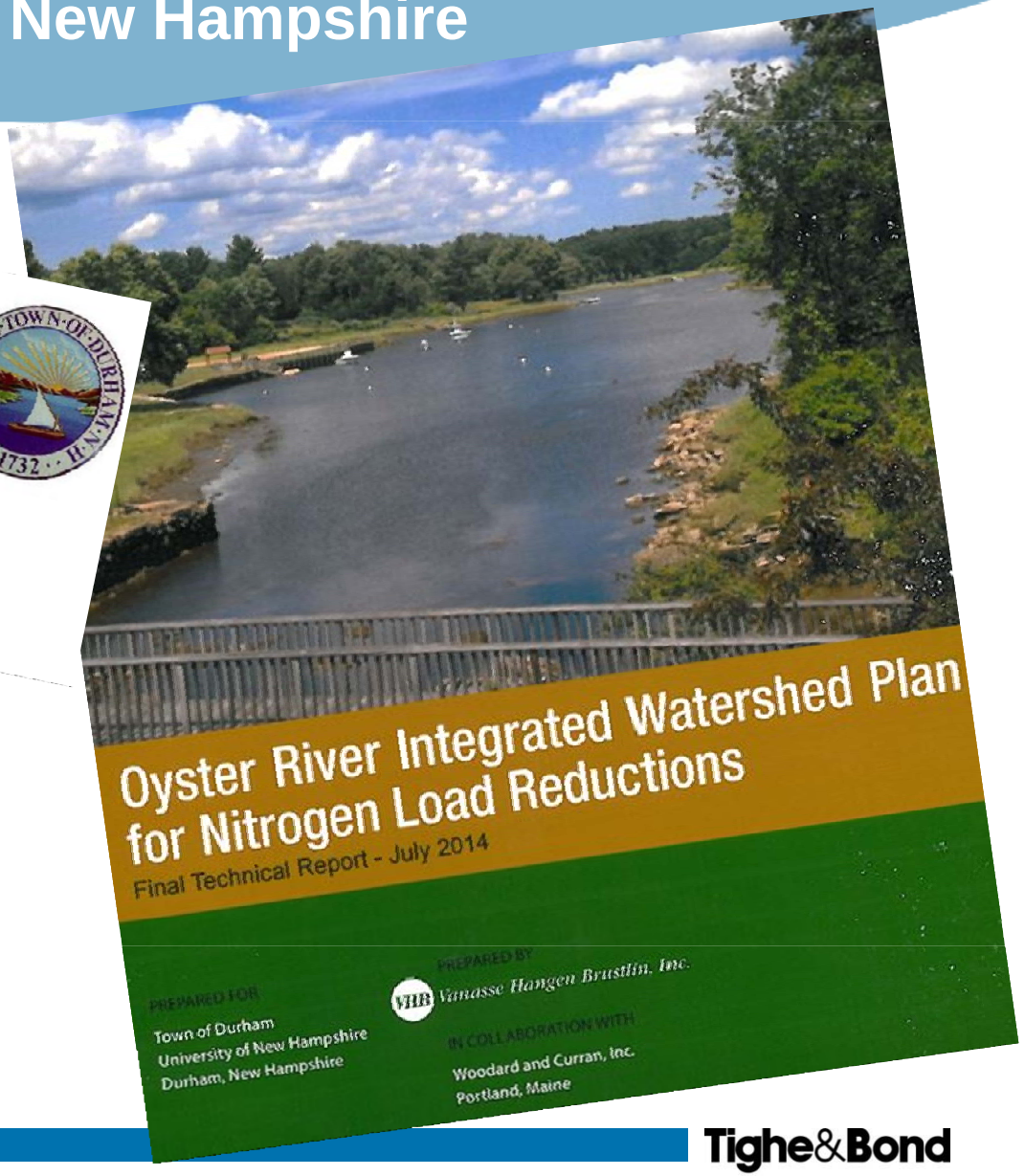
Municipality/Organization: Town of Durham, NH

EPA NPDES Permit Number: NHR041006

MaDEP Transmittal Number: W-

Annual Report Number & Reporting Period: No.1 - May 1, 2003 to April 30, 2004

NPDES PII Small MS4 General Permit Annual Report



Tighe&Bond

ATERSHED APPROACH EXAMPLES:

Durham, New Hampshire

ATERSHED APPROACH EXAMPLES:

Durham, New Hampshire

Oyster River High School, Durham, NH

ATERSHED APPROACH EXAMPLES:

Durham, New Hampshire

Great Bay Pollution Tracking and Accounting Pilot Project (PTAPP)

What is PTAPP?

The Great Bay estuary exhibits symptoms of pollution: low dissolved oxygen in tidal rivers, increased macroalgae, and declining eelgrass. Most pollution originates from sources spread across the watershed including septic systems, fertilizers and air pollution. Stormwater runoff from developed areas is a major pathway for pollutants.

Aerial View of Great Bay

Watershed communities are facing regulatory measures to improve water quality in Great Bay and its tributaries. These requirements include implementation and tracking of pollution control activities; however, tracking and quantifying project success is challenging and expensive. Communities agree that regional coordination is needed to leverage scarce financial resources and develop a consistent, effective tracking system.

The PTAPP is a cooperative forum for communities to work toward identifying key components, needs, and next steps for successful implementation of a consistent regional system. Goals include progress toward development of: 1.) a **Tracking Tool** to track activities that affect pollutant loads, and 2.) an **Accounting System** to credit activities and estimate pollutant load reductions.

PTAPP Process, Outcomes and Benefits

The PTAPP process includes six facilitated workgroup meetings held over the course of one year beginning in February 2015. During meetings, participants will develop a shared agreement and understanding of principal technical components, resource needs, and next steps for regional tracking and accounting. Each meeting will have an identified goal and outcome and will build on results from similar efforts such as those conducted in Chesapeake Bay and Long Island Sound. The PTAPP process will ultimately result in an Implementation Framework describing system recommendations and next steps for implementation including approach, roles, resources, and timeline. **Summary of anticipated PTAPP outcomes:**

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- *Social*: Regional coordination promotes common, understanding of needs and identifies opportunities for collaboration and resource-sharing.
- *Environmental*: Regional pollution management and tracking will likely result in measurable water quality improvement over time.

ATERSHED APPROACH EXAMPLES:

Durham, New Hampshire

Durham Urine Diversion and Recycle

Senior Capstone Design Project

CIE/ENE 788

ril 14, 2014

100% Submission

Adam Carignan

Elizabeth McCrary

Alyson Packhem

Taylor Walter, Project Manager

Faculty Advisor:

Nancy Kinner

Technical Advisor:

David Cedarholm

ATERSHED APPROACH EXAMPLES:

Durham, New Hampshire

Mast Way Elementary School and
Lee Church Congregational, Lee, NH

ATERSHED APPROACH EXAMPLES:

Durham, New Hampshire

Green Infrastructure

for New Hampshire Coastal Watershed Communities

what is Green Infrastructure

Green Infrastructure is a programmatic use of Low Impact Development (LID) and other management measures to control drainage and pollution in a watershed or municipal setting. LID techniques mimic natural processes to capture and treat stormwater close to its source and enhance overall environmental quality. As a general principal, green infrastructure engineered systems use soils and vegetation to infiltrate and/or treat runoff. Structural examples include bioretention systems and rain gardens; permeable pavements; tree filters and stormwater planters; and vegetated roofs. Non-structural elements may include incorporating best practices into site design; regulations requiring better infrastructure performance; and incentives or education to encourage property owners to protect water quality.

VALUE OF EEN INFRASTRUCTURE

NG IN GREEN INFRASTRUCTURE CAN PROVIDE ALITIES WITH A RANGE OF LONG-TERM ECONOMIC, NMENTAL, AND SOCIAL BENEFITS INCLUDING:

- he potential to reduce municipal osts for stormwater management by ecreasing a reliance on costly grey frastructure
- educing stress to aging municipal rey infrastructure and minimizing the eed for capacity increases (i.e., utters, storm sewers)
- nproving water quality in our reams, rivers, ponds, and estuaries
- creasing groundwater aquifer echarge to support drinking water and ream baseflow
- inimizing flooding and building siliency to extreme storm events
- creasing the usage of green spaces r water management and improving ommunity aesthetics
- ultivating public education pportunities by connecting people ore directly with natural resources

the Green Infrastructure PROJECT

Researchers from the University of New Hampshire, and Geosyntec, as well as staff from the Southeast Watershed Alliance, Strafford Regional Planning Commission, Rockingham Planning Commission, Antioch University, and the Great Bay National Estuarine Research Reserve partnered to deliver customized technical assistance and educational resources focused on stormwater management in the coastal watershed. One of the primary goals of this project was to communicate with municipalities on the values of green infrastructure in order to assist them in deciding where, when, and to what extent green infrastructure practices should become part of future planning, development, and redevelopment efforts.

Rain Garden, Public Library, Durham, NH

Durham Department of Public Works

Bioretention Retrofit, UNH Campus, Durham, NH

UNH Stormwater Center

BECOMING AN IMPLEMENTATION COMMUNITY

The Green Infrastructure project advocates that municipalities take a Complete Community Approach to mitigate the negative effects associated with increasing impervious cover and stormwater runoff, thus minimizing impacts to water quality and protecting ecosystems and water resources.

A Complete Community Approach uses green infrastructure throughout all aspects of community planning. This approach includes: ordinances and regulations; stormwater controls; conservation strategies; reduced impervious cover; long-term commitments to fund and maintain stormwater controls; opportunities for outreach.

t funded by the NERRs Science Collaborative to a project team led by the University of New Hampshire Stormwater Center

GOAL

THE GOAL OF THIS PUBLIC INFRASTRUCTURE REPAIR AND IMPROVEMENT PROJECT WAS TO DISCONNECT THE STORMWATER RUNOFF GENERATED FROM THE NEIGHBORHOOD AND REDUCE NON-POINT SOURCE POLLUTION ON THE OYSTER RIVER. THE UNH STORMWATER CENTER ASSISTED BY DEVELOPING DESIGN PLANS AND PROVIDED BUILDING OVERSIGHT FOR THE PROJECT. THE TOWN OF DURHAM AND THEIR SELECTED CONTRACTORS FINALIZED THE CONSTRUCTION IN THE SPRING OF 2016.

"A WIN-WIN-WIN"

This subsurface gravel wetland installation created an eventual win-win-win, where we reduced dissolved nutrient contributions from yard waste, prevented localized soil erosion, and improved water quality control of a 10-acre residential area discharging directly to the Oyster River.

JAMIE HOULE,
PROGRAM MANAGER, UNH STORMWATER CENTER

BEFORE

DURHAM'S COMMITMENT TO GREEN INFRASTRUCTURE

2010 INCORPORATED STORMWATER REGULATIONS WITH LOW IMPACT DEVELOPMENT INCENTIVES IN SITE PLAN REVIEW AND SUBDIVISION REGULATIONS

2011 PARTNERED WITH THE UNH STORMWATER CENTER TO RETROFIT A CUSTOM DESIGNED STATE OF THE ART NITROGEN TREATMENT BIORETION STRUCTURE IN A BUSY DOWNTOWN PARKING LOT

2012 TOWN PARTNERED WITH THE OYSTER RIVER HIGH SCHOOL TO DESIGN AND CONSTRUCT A 1,000 SQUARE-FOOT RAIN GARDEN TO DISCONNECT AND TREAT STORMWATER RUNOFF FROM 10,000 SQUARE FEET OF THE HIGH SCHOOL MAIN PARKING LOT

2013 ADOPTED A NEW WATER ORDINANCE, WHICH INCLUDES PROTECTION OF ALL THE TOWN'S WATER RESOURCES FROM DISCHARGES OF POLLUTED STORMWATER RUNOFF AND ILLICIT DISCHARGES

LOCAL PLANNING: TOWN OF DURHAM

DESIGN AND CONSTRUCTION OF A STORMWATER RETROFIT AT THE INTERSECTION OF OYSTER RIVER ROAD AND GARDEN LANE

IDENTIFIED NEED

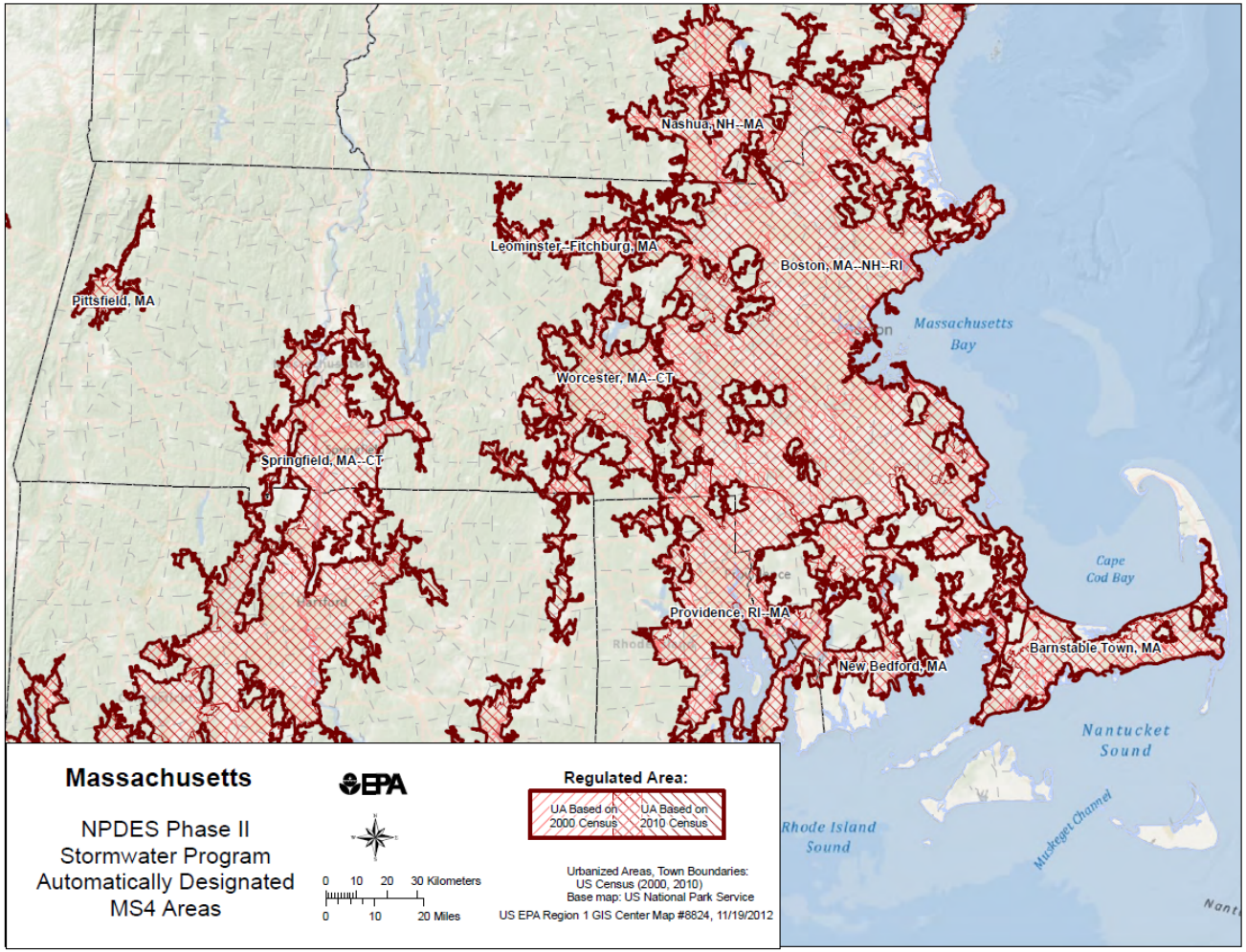
The Town of Durham's Department of Public Works recognized that a stormwater outfall in a residential neighborhood had fallen into serious disrepair and was discharging directly into the Oyster River. The existing drainage structure and outlet pipe were under capacity and severely degraded. The site contained a highly eroded trench that had undermined a 20' section of corrugated metal pipe (see picture, middle left), which according to the UNH Stormwater Center, was responsible for releasing approximately 30 dump truck loads of fine sediment per year into the river. The undercutting from the existing pipe resulted in massive erosion, slope instability, and water quality issues. Due to these factors, staff from the Durham Public Works Department submitted a grant application to evaluate the contributing drainage area and existing stormwater management infrastructure, design an engineered green solution, and install a control measure.

SPECIFIC RESULTS OF THIS PROJECT

AFTER

- *Stabilization of 50 feet of heavily eroded and entrenched gully discharging directly to the Oyster River*
- *Installation of a subsurface gravel wetland system at the outfall to slow flow and provide water quality treatment from 6 acres of untreated residential land uses*
- *Employ a regenerative stormwater conveyance approach that will use the existing eroded gully as the excavation for the treatment area and will result in less than 750 square feet of temporary disturbance associated with an access for construction; no additional impervious area is proposed*
- *Overall improvement to the aesthetics of the site, which in its former condition had become a dumping ground for nutrient laden lawn and leaf debris from local yards*

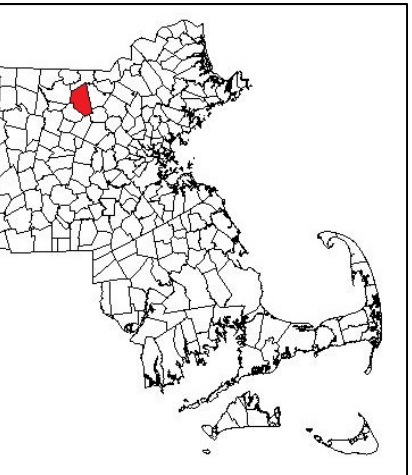
hat about Your Regulated Neighbors in Massachusetts?



hat about Your Regulated Neighbors in Massachusetts?

Case Study: Evolution of Stormwater Management in Westford

- Challenge of Funding Stormwater
- Political Support: Importance of Local Champions
- Why a Stormwater Management Master Plan?
- Internal and External Outreach Strategy for SWMMP



- **About Westford**
  - Population: 22,000
  - Largely farm land and textile mills converted to a bedroom community
  - Thriving businesses (retail, restaurants, tech) along two main roadways, Rt 40 and Rt 110
  - Nearly all urbanized

Westford's MS4 Program

ept the momentum going since 2003

- Steady progress to meet *all of 2003 requirements* and many new requirements
- Westford's Stormwater Compliance Budget: **$385,000**
- Excludes Capital Improvement Projects
- Includes Portion of Staff Time: Town Engineer, Assistant Engineer, Highway Department, GIS Director

w and steady

Political Support: Importance of Local Champions

Engineering Department has advocated for a strong stormwater program

Education & outreach has been critical

- **Living Lab Program has engaged <u>500</u> 5th grade students over 10 years**

Maintain the stormwater conversation with voters and decision makers

Watershed Action Plan in 2007

Political Support: Importance of Local Champions

Other Local Champions include:

- Westford Stream Team
- Westford Conservation Trust
- Healthy Lakes & Ponds Collaborative
- Westford Watershed Conservation Organization
- Westford Environmental News & Action Committee

Why a Stormwater Management Master Plan?

Time to redouble stormwater efforts!

- Anticipation of the new MA Small MS4 General Permit
- Soften the financial blow by getting ahead now
- Be sensible and strategic with the Town's natural and financial resources

Town Meeting approved the Master Plan appropriation with *no questions asked*

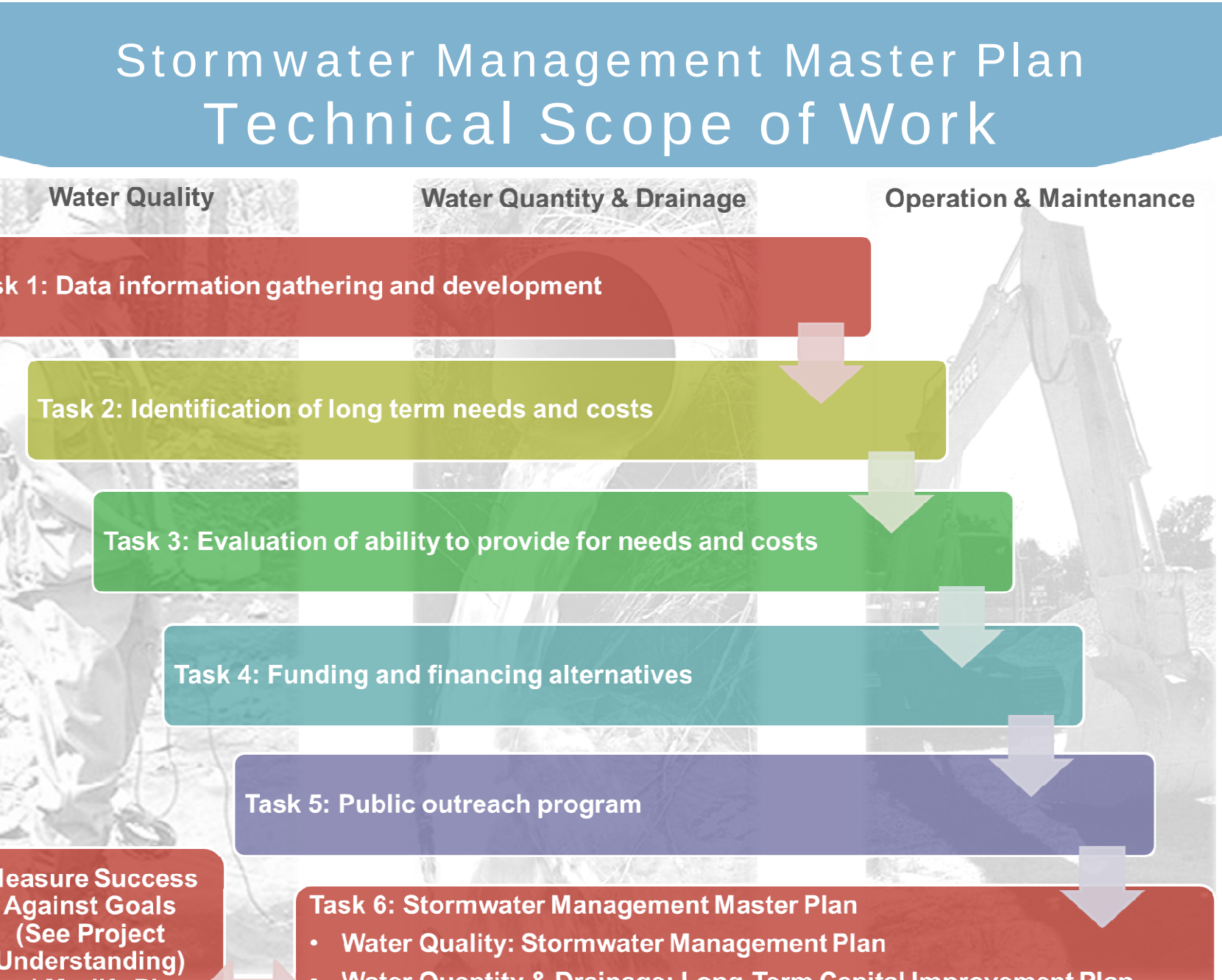
Stormwater Management Master Plan
Strategic Vision

Identify sensible, cost effective solutions

Meet multiple Town objectives for water resources and infrastructure simultaneously

Understand and manage the financial burden for residents and businesses

Stormwater Management Master Plan
Technical Scope of Work



Stormwater Management Master Plan
More Public Outreach

The Stormwater Master Plan will be data driven and based upon sound science and engineering

However…

The barriers to implementation will not be technical!

Stormwater Management Master Plan
Stormwater Advisory Group

The SwAG is critical to:

- Build consensus along the way
- Guide the planning process
- Raise resident and business concerns early in the process so they can be addressed though outreach

Majority of group members are residents, and represent:

- Engineering Department
- Water Department
- Highway Department
- Financial Committee
- Capital Planning Committee
- Town Manager's Office
- Conservation Commission
- Planning Department
- Local Businesses / Developers
- Northern Middlesex Council of Governments (NMCOG)
- Northern Middlesex Stormwater Collaborative

Stormwater Management Master Plan
Branding and Messaging

t http://westfordma.gov/stormwater
more information on Westford's
rmwater Management Program


Town of Westford

ormwater Management
ASTER PLAN

JECT FACT SHEET

SUMMER 2015

Clean water
begins with YOU.

The Town of Westford is developing a Stormwater Management Master Plan (SWMMP) to manage runoff from rain storms and melting snow (known as "stormwater"). One e objectives of the master plan is to prevent

About the Project:

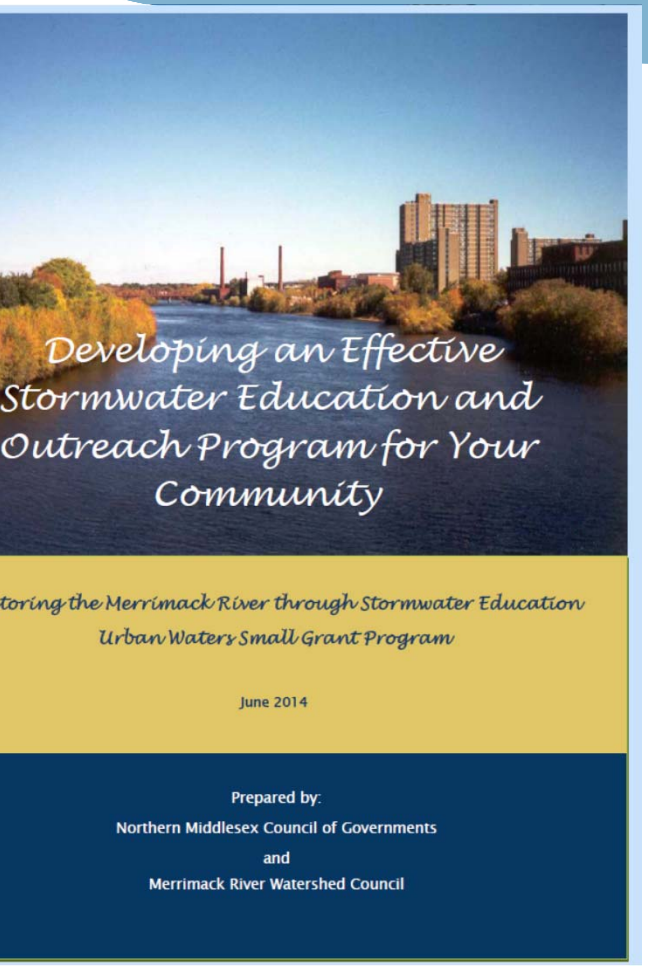
Over the years, the Town of Westford has made environmental stewardship a priority. These efforts have included a proactive municipal stormwater program and ongoing improvements to the Town's drainage system to prevent flooding and protect our water quality. Developing a Stormwater Management Master Plan (SWMMP) will allow us to continue to invest wisely and strategically in both our infrastructure and natural resources. The Plan will evaluate our current stormwater management practices and identify future needs and options for funding a sustainable stormwater program. It will also help us keep pace with more stringent federal regulations that we expect to receive from the U.S. Environmental Protection Agency (EPA) within a year.

The SWMMP will provide the necessary guidance for

RVA
Celebrating 35 Years
Est. 1978

"We treasure living, working and playing in the scenic landscape of Westford. Together we can protect the quality of our lakes and ponds and maintain clean drinking water." – Stormwater Advisory Group, **Westford, Massachusetts** .

More Resources



http://www.nmstormwater.org/for-municipalities

atershed Approach CONCLUSIONS:

- **Focus on the Long Term - Big Picture**
- **Educate Multiple Generations**
- **Sustained & Fresh Social Media Content**
- **Maintain a Geographical Watershed Connection**
- **Collaborate With Your Target Audiences**
- **WMPs are a Starting Point and <u>Not</u> Meant to Sit on a Shelf**
- **Develop an Intern Program**

Questions & Discussion

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