# Use of a Nutrient Control Plan by the City of Rochester, New Hampshire to Develop a Long-term Plan to Reduce Nutrient Loads to Receiving Waters

#### Annual NEWEA Conference January 23, 2017







### Acknowledgements

**City of Rochester** 

- John Storer, PE Director of City DPW,
- Mike Bezanson, PE City Engineer
- Owen Friend-Gray, PE Assistant City Engineer
- David Green Wastewater Chief Operator

#### Other Contributing Consultants

- Renee Bourdeau, PE Project Manager, Horsley-Witten Group
- Mark Allenwood, PE Wastewater Consultant, Brown and Caldwell

# Background: Rochester, NH

- Approx. 30,000 people
- 29,000 acres of land area
  - o 9.2% impervious cover
  - o 49% forested
  - o 20% residential
- 42% (12,300 acres) of City is within MS4 Regulated Area
  - o 15% impervious cover
  - o 31% residential
- Wastewater Treatment Plant serving 14,700 customers (3.9 MGD)



### Background: Great Bay Watershed

- 2009 NHDES established numeric nutrient criterion for nitrogen. NHDES lists Great Bay and 11 of the 18 sub-estuaries as impaired for nitrogen
- **2010** NHDES established existing loads and load reductions. NHDES estimates non-point source is a significant load source within the Great Bay Watershed
- 2014 As result of a court approved settlement and peer review findings, NHDES will cease to use numeric nutrient thresholds
- 2014 EPA delays issuance of Final NPDES Permit with conditions to develop a Nutrient Control Plan to achieve substantial reductions in nitrogen loads from non-point and point sources



# **Background: Regulations**

- NPDES Wastewater:
  - City currently operates under the continued 1997 NPDES Wastewater Treatment Facility Permit
    - No effluent limits for Total Nitrogen
    - 3.9 MGD Average Flowrate
  - New Permit EPA indicates Effluent Limit for Nitrogen to Limit of Technology (3 mg/L)
  - Could Require WWTF upgrade of ~ \$25 million
- NPDES MS4 Stormwater Permit:
  - City operated under the continued **2003** NPDES Small Phase II MS4 Permit
    - No Total Nitrogen limits
  - New Permit (issued 1/18/17) will require Nutrient Control Plan for nutrient impaired waters

Approach: Nutrient Control Plan (Potential Cost-Effective Measures)

- 1. Baseline Load Estimates
- 2. Target Load Reductions
- 3. Scenario Analysis to Meet Targets
- 4. Implementation Plan

### Approach: Baseline Load Estimates



### 2010 Baseline Nitrogen Load Estimate



#### Approach: Load Reduction Goal Setting

- No Water Quality Reduction Targets (i.e., no TMDL, no numeric water quality standard)
- Select target load reduction based on financial capability and planned capital improvements (stormwater vs. wastewater)
- Minimize costly WWTF upgrades by implementing more costeffective non-point source controls
  - Burden of WWTF upgrades falls on 50% of the community (rate payers), whereas non-point source controls are funded through general fund (100% of all tax payers)

# **Scenarios Description**

ID	Description	WWTF Avg. TN Conc.	SW Non-Structural	Septic	
1	2010 Baseline Load (untreated load)	40 mg/L			
2	2015 WW Optimized Operation	8 mg/L	<ul> <li>Street Sweeping (1x/yr)</li> <li>Catch Basin Cleaning (every other year)</li> </ul>		
3	Projected 5 Year Future Load @ 8	8 mg/L	<ul> <li>Street Sweeping (2x/yr)</li> <li>Catch Basin Cleaning (1x/yr)</li> </ul>	Extend sewer to 100 homes w/in buffer	
4	Projected 5 Year Future Load @ 3	3 mg/L	<ul> <li>Residential lawn fertilizer program</li> <li>Pet Waste Program</li> </ul>		

# Scenario 2: 2015 Nitrogen Load with Optimized WWTF Operation



#### Scenario 3: Projected Future Nitrogen Load

@ 8 mg/L



Reduction

TOTAL DELIVERED LOAD: 214,700 lbs/year or 107.4 tons/year

64% REDUCTION (compared to 2010 Baseline)

# Scenario 4: Projected Future Nitrogen Load @ 3 mg/L



# Results: Scenario Comparison – Load vs. Cost (5-YR Period)



# Results: Scenario Comparison – 5-Year Capital Cost



### Stormwater BMP Cost per LB Nitrogen Removed

	BMPs	CATEGORY	AVERAGE COST PER LB N TREATED SIZE FOR 0.25" CAPTURE			
Г	Residential Lawn Fertilizer Program	SW - Non-Structural	\$ 20		٦	
L	Slow Release Fertilizer - Agriculture	SW - Non-Structural	\$ 30			
L	Pet Waste Stations	SW - Non-Structural	\$ 30			
L	Cover Crops - Agriculture	SW - Non-Structural	\$ 50			More cost
L	Catch basin cleaning (once per year)	SW - Non-Structural	\$ 150		$\geq$	effective
	Street Sweeping (2x per year)	SW - Non-Structural	\$ 160			11 TATTAT
L	Dry Well/Infiltration Trench	SW - Structural	\$ 341			than www
L	Gravel Wetland	SW - Structural	\$ 558			
L	Wet Pond	SW - Structural	\$ 812	-	J	
۲	High-efficiency Bioretention	SW - Structural	Ş 1,241			
	Bioretention	SW - Structural	\$ 1,585			
	Tree Box Filter	SW - Structural	\$ 1,997			
	Septic - On-site Denitrification (inside 200m buffer)	WW - Septic	\$ 2,190			
	Septic - On-site Aeration (inside 200m buffer)	WW - Septic	\$ 2,370			
	Subsurface Infiltration	SW - Structural	\$ 3,823			
	Subsurface Sand Filter	SW - Structural	\$ 4,321			
	Septic - On-site Denitrification (outside 200m buffer)	WW - Septic	\$ 5,000			
	Septic - On-site Aeration (outside 200m buffer)	WW - Septic	\$ 5,450			
Sewer Extensions (inside 200m buffer)		WW - Septic	\$ 8,000			
Porous Pavement		SW - Structural	\$ 14,970			

# Conclusions

Nutrient Control Plan Benefits (Big Picture):

- Evaluating all sources in the watershed helps to identify most cost-effective measures (Biggest Bang for \$\$).
- Opportunity to identify measures with multiple benefits and improve water quality over a larger area.
- Enables an adaptive management approach to achieve the "long-hanging fruit" and reassess need for more costly measures.

### Rochester Selected by EPA for Pilot Study to Evaluate Community SW Planning Tool

- Oct 2016 EPA launches new guide for developing longterm community storm water plans.
- Integrating stormwater and waste water planning to meet water quality goals.
- Identify most cost-effective management measures in the watershed to achieve multiple benefits.

#### Community Solutions for Stormwater Management

A Guide for Voluntary Long-Term Planning



# Next Steps

- Develop an Implementation Plan:
  - Define timeline and sequence of stormwater and NPS controls
  - Delayed schedule for going to LoT (3 mg/L) contingent on initial results.
- EPA plans to develop a DRAFT NPDES Permit in 2017 that integrates the stormwater and WWTF measures.
- City to incorporate planned measures into long-term
   Capital Improvement Plan.

# Questions

**SPEAKERS:** 

- John Storer, PE Director of City Services, City of Rochester, NH(john.storer@rochesternh.net)
- Bill Arcieri, CPESC, CPSWQ Senior Water Quality Specialist, VHB (barcieri@VHB.com)
- Daniel Bourdeau, PE Senior Engineer, Geosyntec (Dbourdeau@Geosyntec.com)