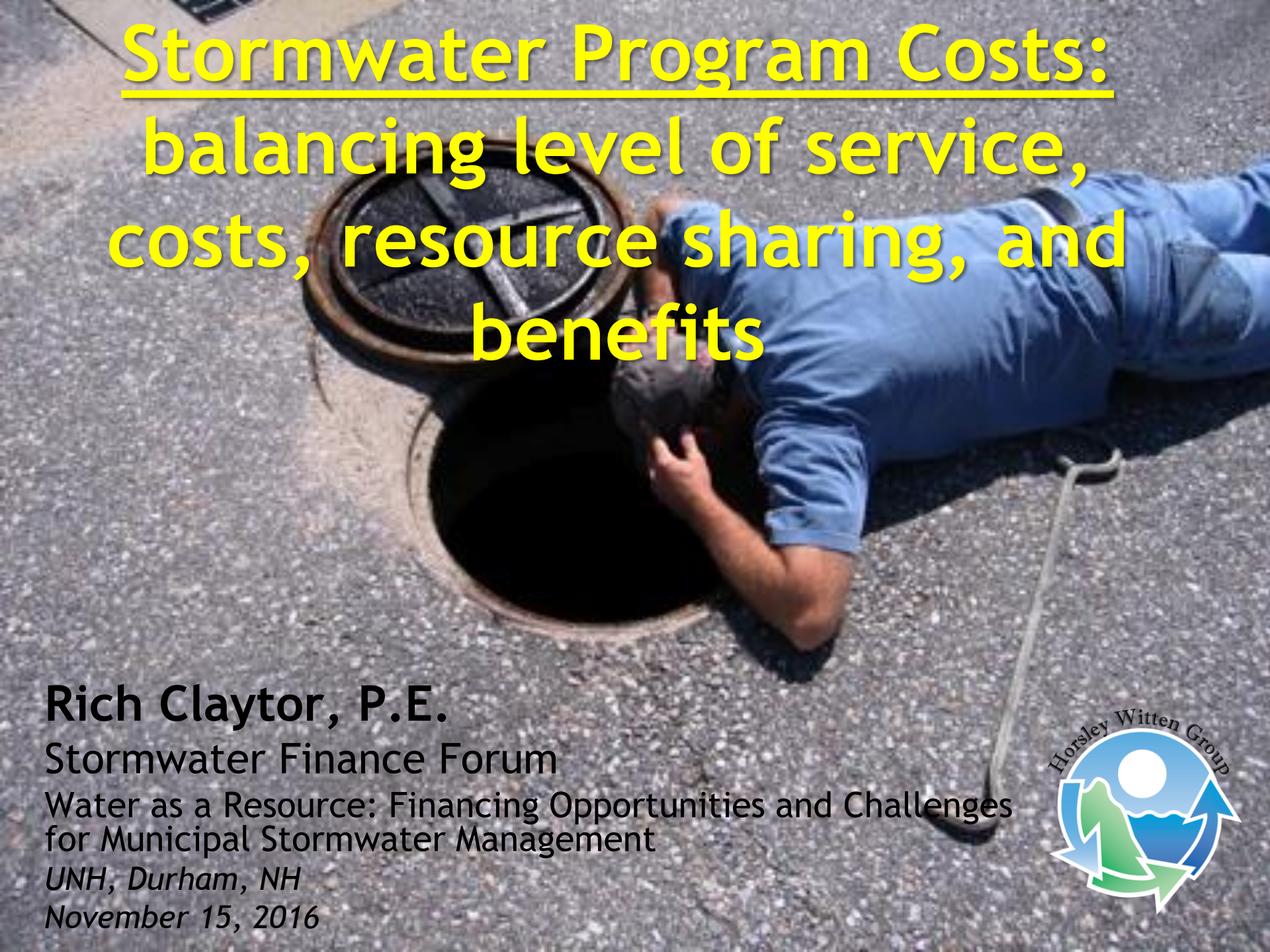
Stormwater Program Costs: balancing level of service, costs, resource sharing, and benefits



Rich Claytor, P.E.
Stormwater Finance Forum

Water as a Resource: Financing Opportunities and Challenges for Municipal Stormwater Management

UNH, Durham, NH
November 15, 2016

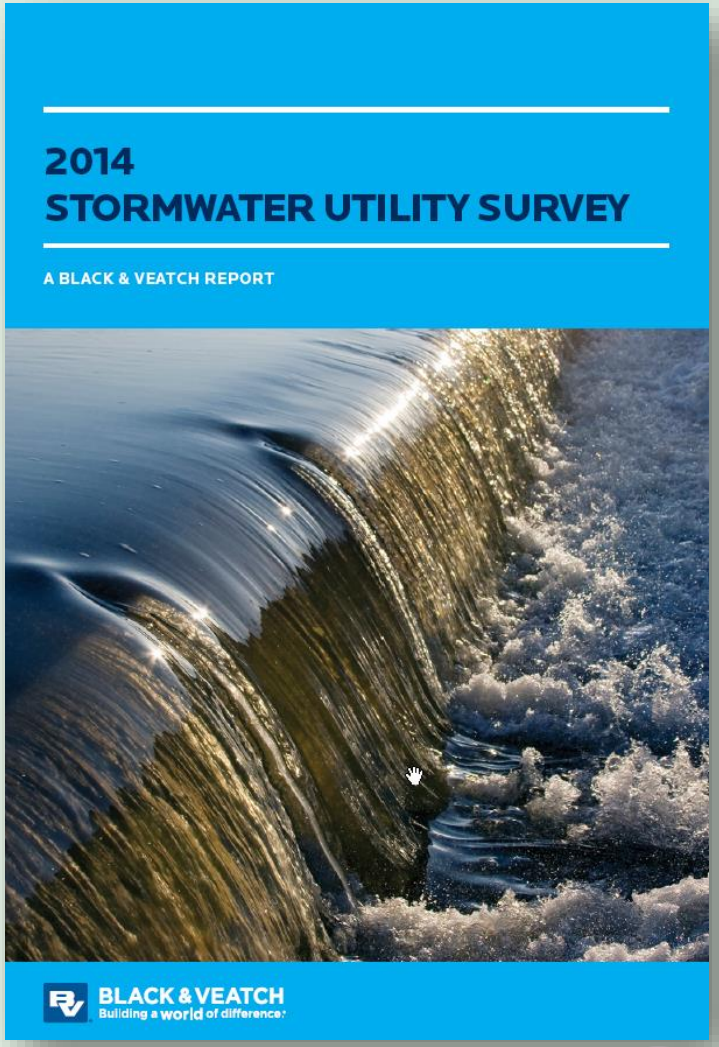
Horsley Witten Group

Topics

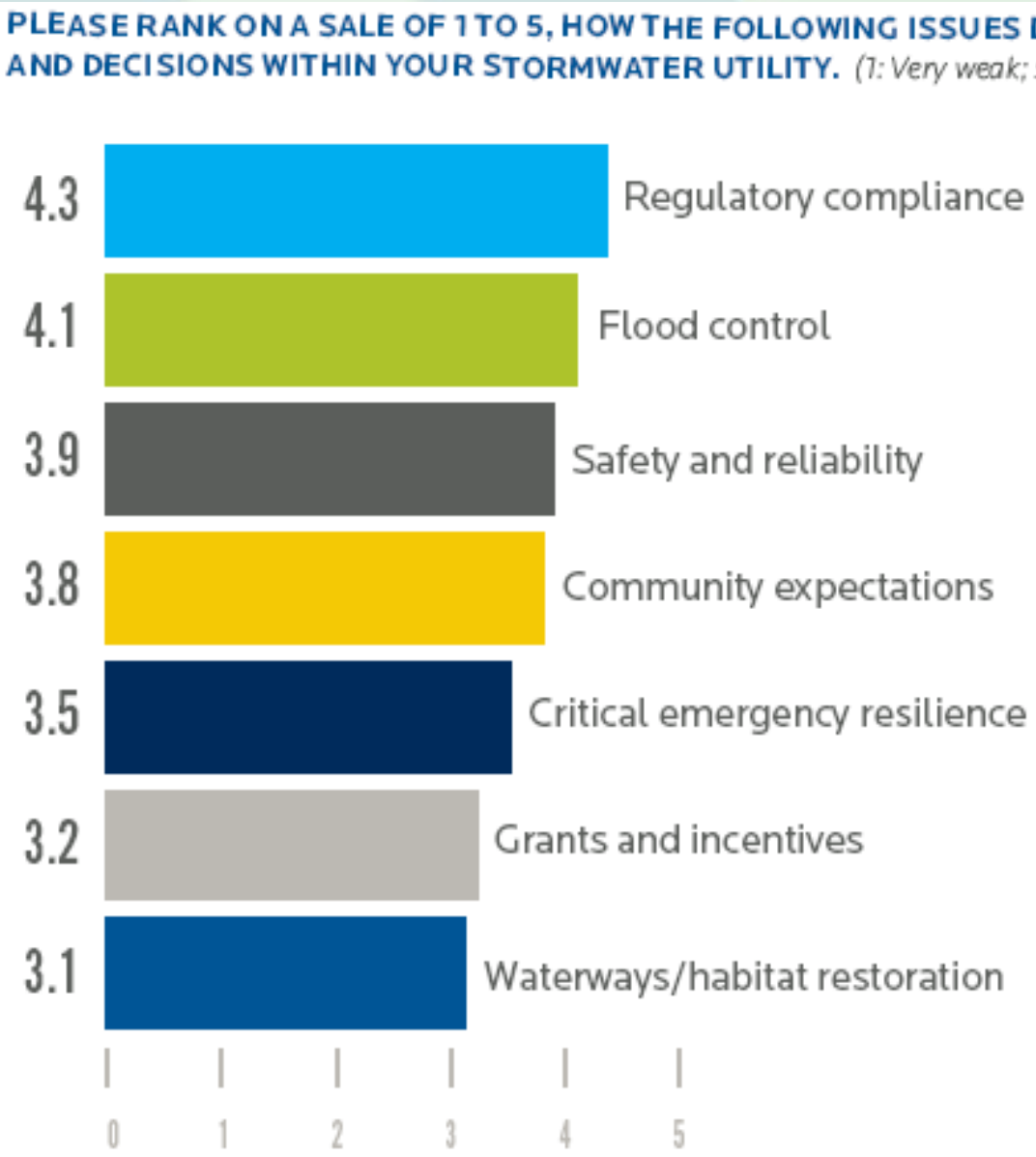
- What drives the need for sustainable stormwater funding?
- What's free and what's not today and tomorrow?
- Common municipal departments/costs and opportunities for sharing
- Example

Stormwater Quiz

What is the main issue driving stormwater infrastructure investment/spending according to a recent Stormwater Utility survey?



Drivers (Black & Veatch, 2014)



- Aging/failing infrastructure;
- Development pressures;
- Quality of Life;
- Property values;
- Drinking water protection/replenishment;
- Recreation (fishing, boating, swimming);
- Lawsuits

United States Environmental Protection Agency (EPA)
National Pollutant Discharge Elimination System (NPDES)

GENERAL PERMITS FOR STORMWATER DISCHARGES FROM SMALL MUNICIPAL SEPARATE STORM SEWER SYSTEMS IN MASSACHUSETTS

AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Clean Water Act (CWA), as amended (33 U.S.C. §1251 *et seq.*), and the Massachusetts Clean Waters Act, as amended (M.G.L. Chap.21 §§ 26-53), any operator of a small municipal separate storm sewer system whose system:

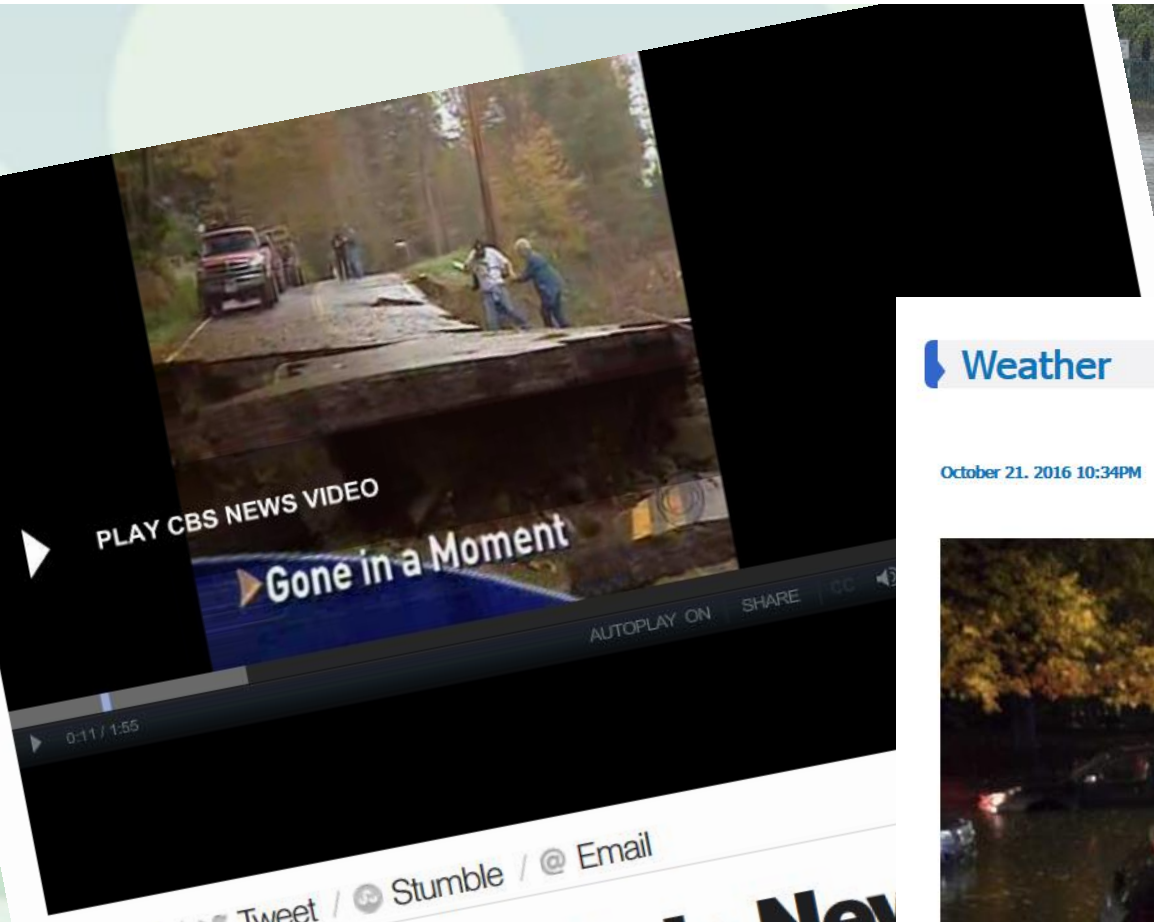
c. The permittee is encouraged to maintain an adequate funding source for the implementation of this program. Adequate funding means that a consistent source of revenue exists for the program. (Some funding information can be found in the fact sheet and at: http://www.epa.gov/region1/npdes/stormwater/assets/pdfs/FundingStormwater.pdf).

is authorized to discharge in accordance with the conditions and the requirements set forth herein.

The following appendices are also included as part of these permits:

Appendix A – Definitions, Abbreviations, and Acronyms;
Appendix B – Standard permit conditions applicable to all authorized discharges;
Appendix C – Endangered Species Act Eligibility Guidance;
Appendix D – National Historic Preservation Act Eligibility Guidance;
Appendix E – Information required for the Notice of Intent (NOI);
Appendix F – Requirements for MA Small MS4s Subject to Approved TMDLs;

Torrential rain causes flash flooding across southern New Hampshire



Share / Tweet / Stumble / Email

Deadly Floods In Nev Hampshire

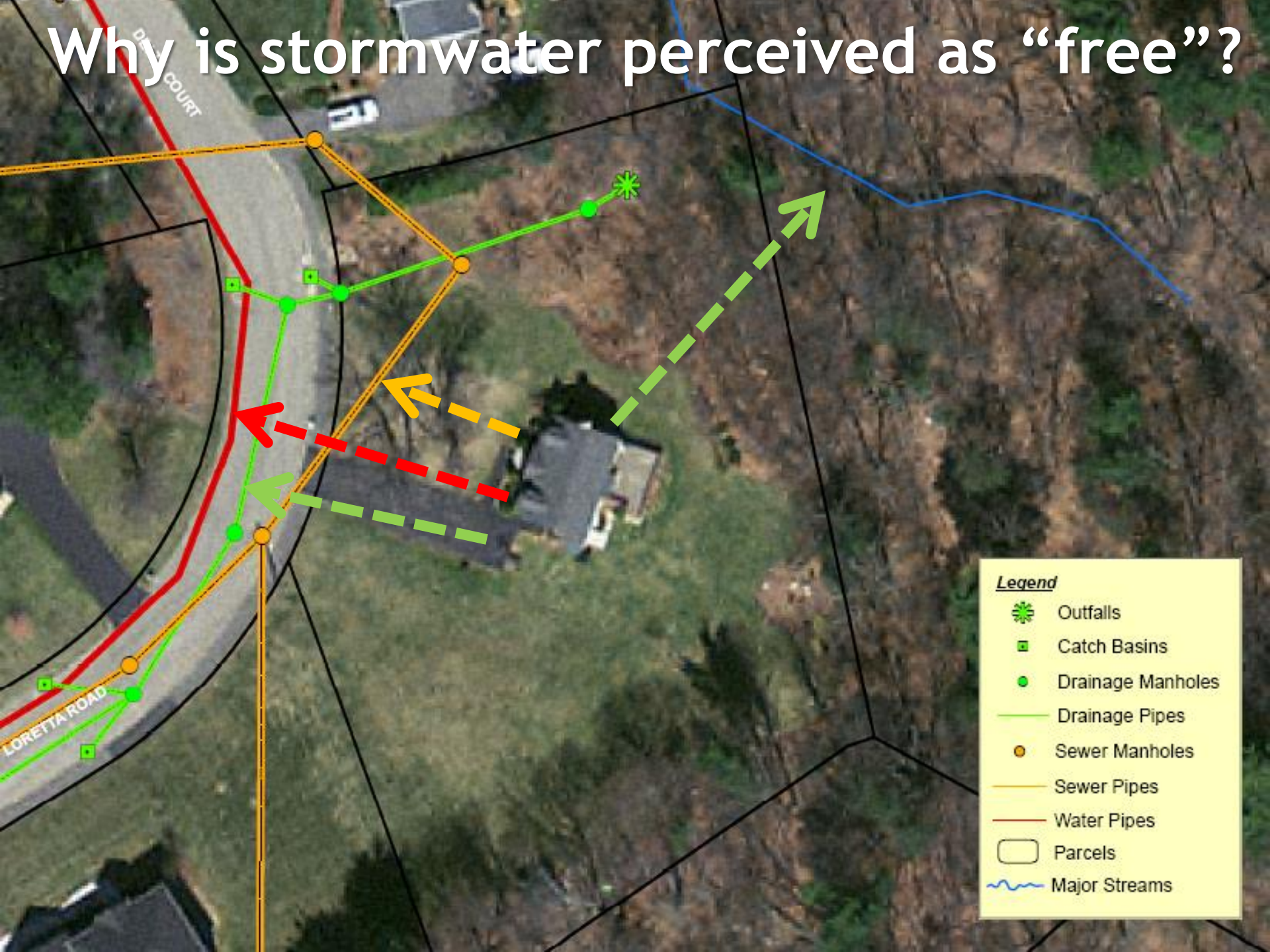
OCTOBER 12, 2005, 0:31 AM | The Northeast

Weather

October 21. 2016 10:34PM

Heavy rains caused flooding in parts of Manchester Friday night, including on West Clarke Street. (Jeff Hastings)

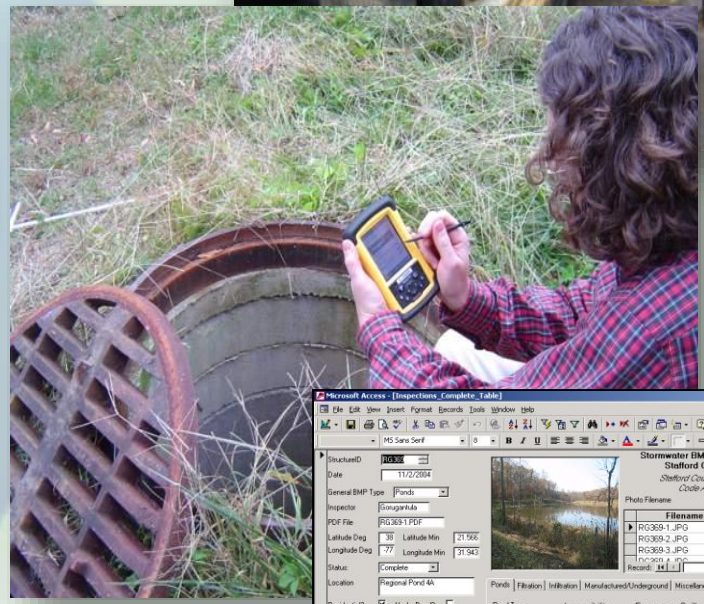
Why is stormwater perceived as “free”?

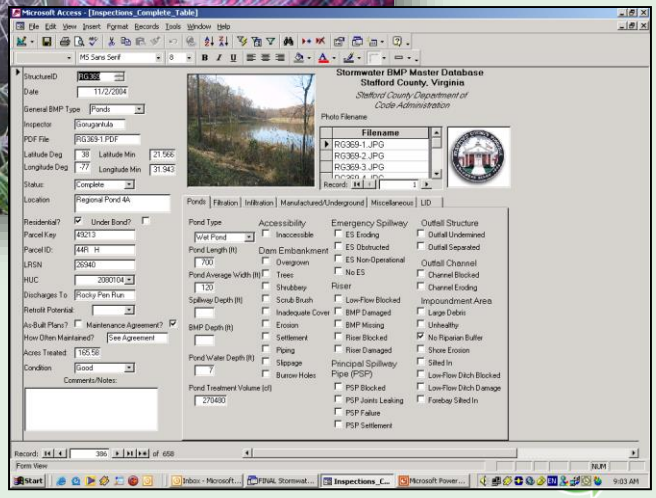


Stormwater Quiz

Which of these are free?

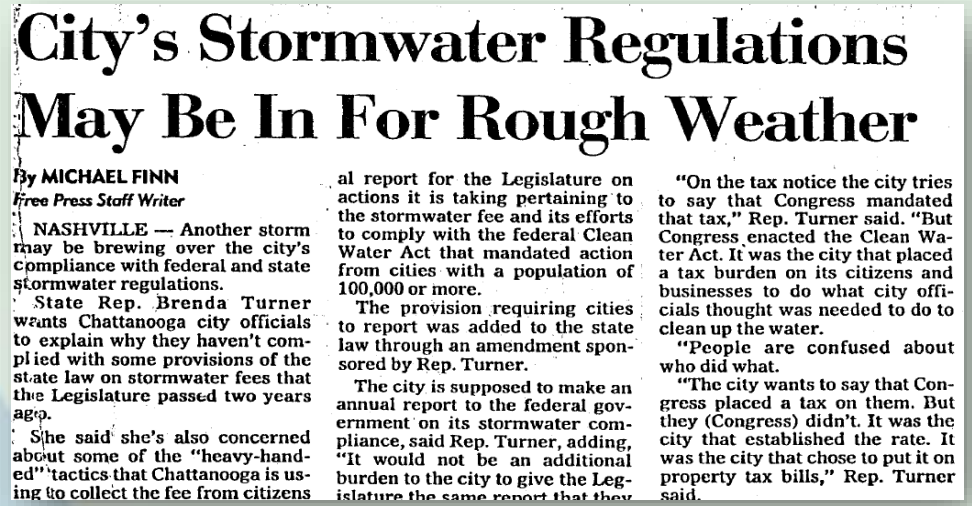
a) Infrastructure mapping
b) Catch basin cleaning
c) Drainage repairs
d) Stormwater retrofits
e) Illicit discharge detection and elimination
f) Complaint hotline





Which of these consumes more time and $?

Stormwater Management is Complex



City's Stormwater Regulations May Be In For Rough Weather

By MICHAEL FINN
Free Press Staff Writer

NASHVILLE — Another storm may be brewing over the city's compliance with federal and state stormwater regulations.

State Rep. Brenda Turner wants Chattanooga city officials to explain why they haven't complied with some provisions of the state law on stormwater fees that the Legislature passed two years ago.

She said she's also concerned about some of the "heavy-handed" tactics that Chattanooga is using to collect the fee from citizens

al report for the Legislature on actions it is taking pertaining to the stormwater fee and its efforts to comply with the federal Clean Water Act that mandated action from cities with a population of 100,000 or more.

The provision requiring cities to report was added to the state law through an amendment sponsored by Rep. Turner.

The city is supposed to make an annual report to the federal government on its stormwater compliance, said Rep. Turner, adding, "It would not be an additional burden to the city to give the Legislature the same report that they

"On the tax notice the city tries to say that Congress mandated that tax," Rep. Turner said. "But Congress enacted the Clean Water Act. It was the city that placed a tax burden on its citizens and businesses to do what city officials thought was needed to do to clean up the water.

"People are confused about who did what.

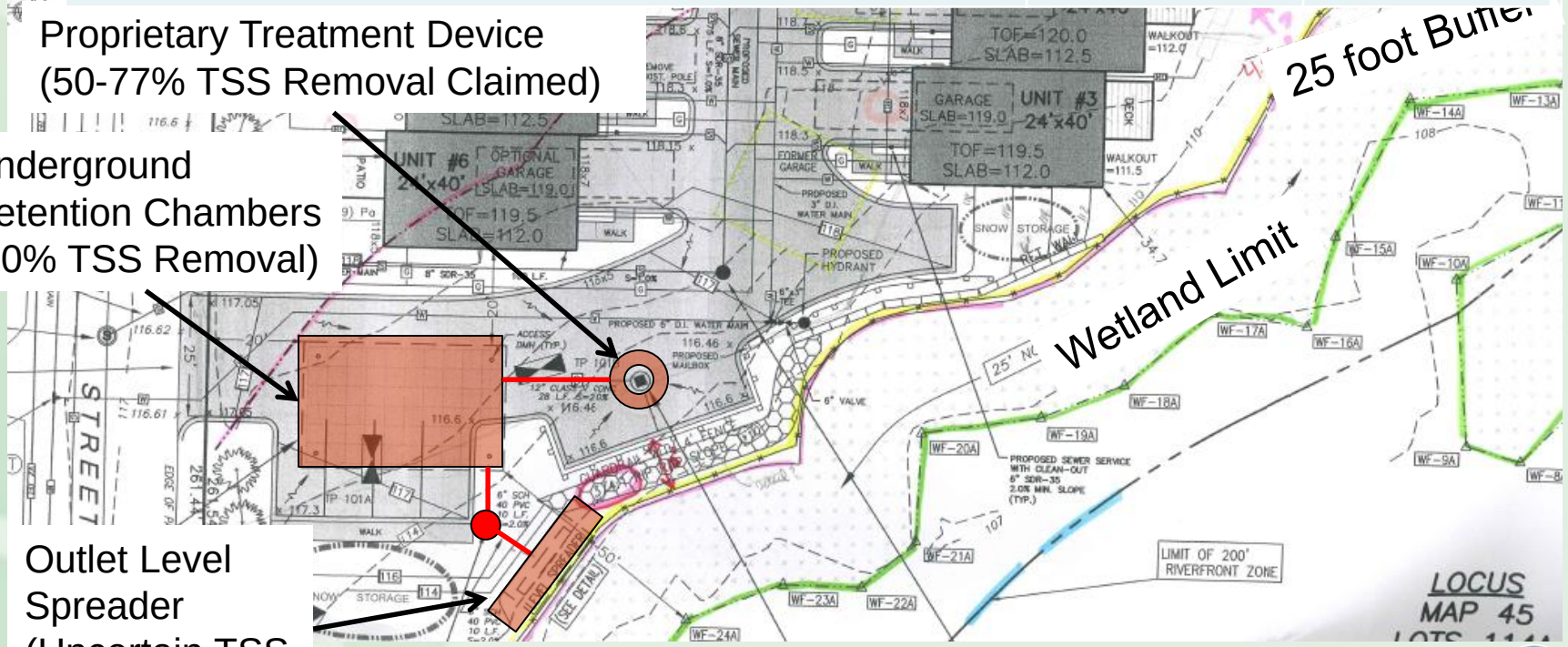
"The city wants to say that Congress placed a tax on them. But they (Congress) didn't. It was the city that established the rate. It was the city that chose to put it on property tax bills," Rep. Turner said.

- Multiple regulations:
  - NPDES/MS4
  - TMDL
  - CSO
  - Zoning
  - Subdivision
  - WPA
- And regulators:
  - Federal
  - State
  - Local

- Multiple management objectives
- Lots of standards and minimum measures
- Various structural and non-structural practices
- A ton of municipal services…

Results in complex applications

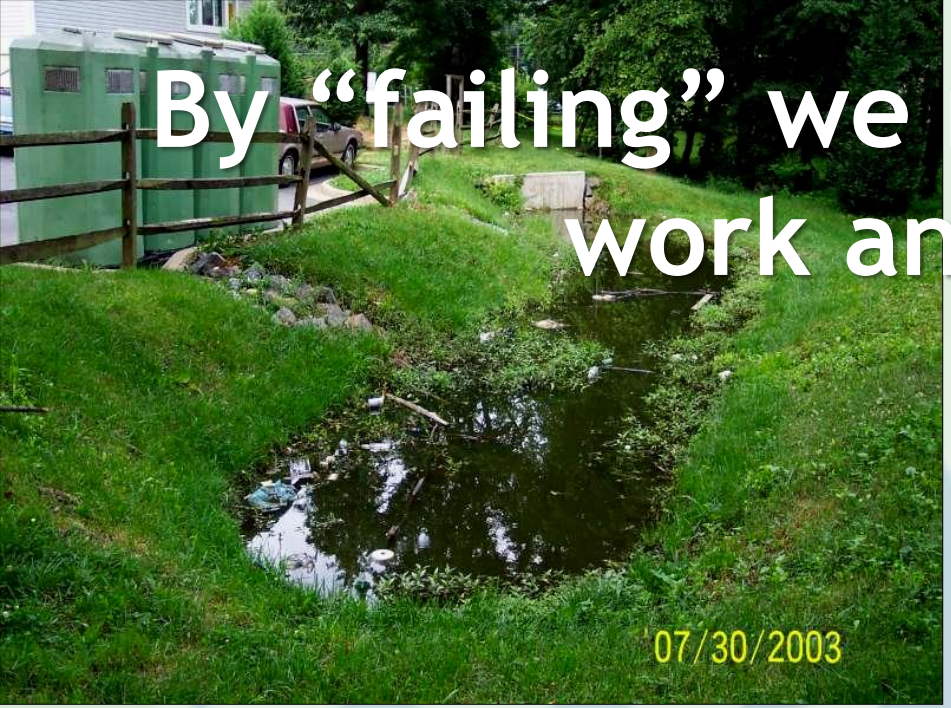
BMP	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load
Proprietary Widget	60%	1.0	0.60	0.40
Underground Ext Det.	50%	0.4	0.20	0.20
Total TSS Removal = 80%				



Range of Municipal Stormwater Services

- Flood reduction/protection;
- Stream channel erosion protection/restoration;
- Street sweeping and catch basin cleaning;
- Culvert repairs;
- Improved stormwater planning/watershed management;
- Leaf litter pick-up/disposal
- Public ed/outreach;
- Mapping of drainage network/BMPs;
- IDDE
- Site inspections;
- Construction of new capital facilities;
- Maintenance of existing and new stormwater practices
- Monitoring

By “failing” we mean they don’t work anymore…



Which would you rather maintain?

How much of a town's budget goes here?

ADVISORY

High levels of BACTERIA have been detected in this WATER.

N.H. Dept. of Environmental Services

WATER CURRENTLY NOT SUITABLE FOR WADING OR SWIMMING!

Exposure to this water may cause nausea, vomiting, diarrhea, or fever.

Children, the elderly and others with sensitive immune systems are especially vulnerable.

All current advisories posted at www.des.nh.gov. Click "beach advisory" in left column

CONTACT INFORMATION:
NHDES Beach Program
29 Hazen Dr.; Concord, NH
(603) 271-0698
beaches@des.nh.gov

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

Stormwater Program Costs

- Operations and Maintenance;
- System Rehabilitation;
- Stormwater BMP retrofits for water quality and flood control;
- Design review and oversight;
- Regulatory compliance/TMDLs;
- Public outreach and education;
- Administration;
- Increased effort under new MS4 permit

amec

Horsley Witten Group, Inc.

Stormwater Program Elements

- The 6 Minimum Control Measures Outlined in MS4 Permits
  1. Public Education and Outreach
  2. Public Involvement and Participation
  3. Illicit Discharge Detection and Elimination
  4. Construction Site Runoff Control
  5. Post-Construction Runoff Management
  6. Municipal Pollution Prevention/Good Housekeeping
- And 2 Other “required elements:
  7. Maintenance
  8. Program Evaluation and Reporting

Municipality Program Cost Factors

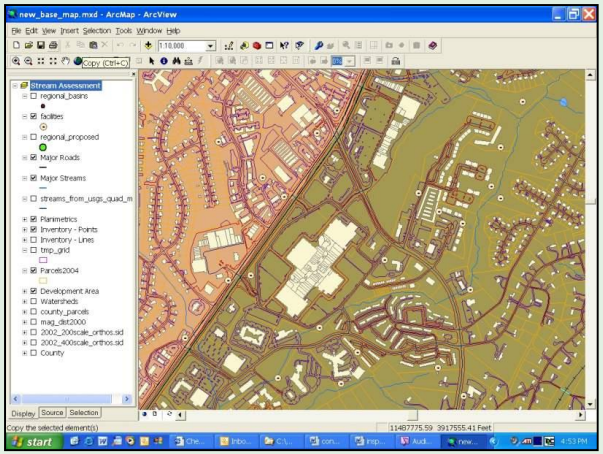
1. Public Education and Outreach
2. Public Involvement and Participation
3. Illicit Discharge Detection and Elimination
4. Construction Site Runoff Control
5. Post-Construction Runoff Management
6. Municipal Pollution Prevention/Good Housekeeping
7. Maintenance
8. Program Evaluation

- Size of community – Target Audience
- Level of existing watershed awareness
- Ability to tie into other municipal /3rd Party education programs
- Type of education and outreach media used (e.g. radio) – 2 messages to each audience/5 years
- Number of available volunteer activities/programs (e.g. tree planting, rainbarrel programs)
- Municipal Education Coordinator on staff
- Methods of Measuring Success

Municipal Program Cost Factors

1. Public Education and Outreach
2. Public Involvement and Participation
3. Illicit Discharge Detection and Elimination
4. Construction Site Runoff Control
5. Post-Construction Runoff Management
6. Municipal Pollution Prevention/Good Housekeeping
7. Maintenance
8. Program Evaluation and Reporting

- Age and extent of infrastructure
- Map status – must map entire drainage system
- Complaint-based vs proactive detection (IDDE Hotline)
- Staff/contractor/equipment to detect discharges and identify sources
- Actual repairs
- Response tracking database for reporting and program evaluation
- Annual Employee Training


new_base_map.mxd - ArcMap - ArcView
File Edit View Insert Selection Tools Window Help
Stream Assessment
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facilities
regional_proposed
Major Roads
Major Streams
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Planimetrics
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Inventory - Lines
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Watersheds
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Copy the selected element(s)
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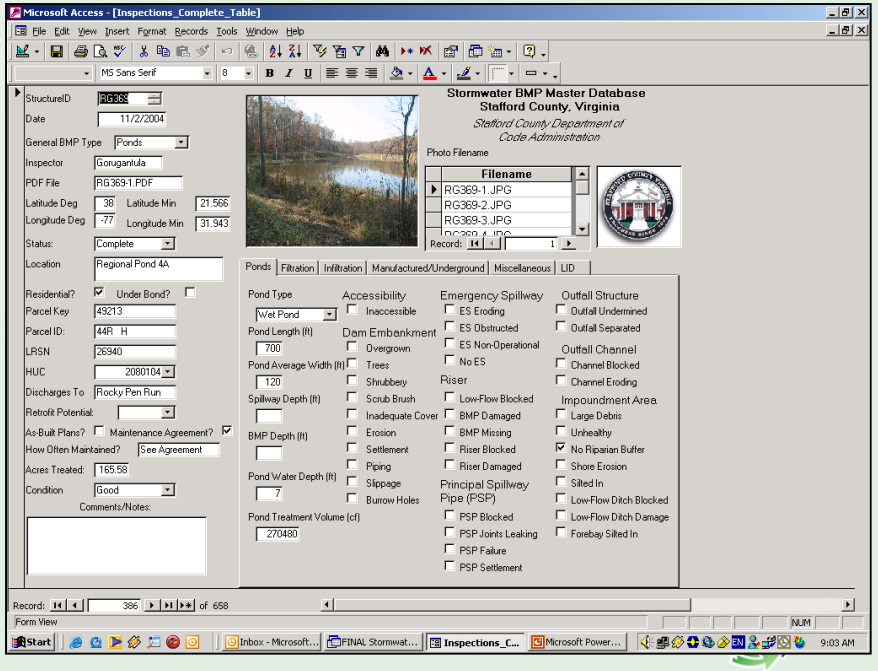
start


VACCON


Microsoft Access - [Inspections_Complete_Table]
File Edit View Insert Format Records Tools Window Help
MS Sans Serif
StructureID RG369
Date 11/2/2004
General BMP Type Ponds
Inspector Gorugantula
PDF File RG369-1.PDF
Latitude Deg 38 Latitude Min 21.566
Longitude Deg -77 Longitude Min 31.943
Status: Complete
Location Regional Pond 4A
Residential? Under Bond?
Parcel Key 49213
Parcel ID: 44R H
LRSN 26940
HUC 2080104
Discharges To Rocky Pen Run
Retrofit Potential:
As-Built Plans? Maintenance Agreement?
How Often Maintained? See Agreement
Acres Treated: 165.58
Condition Good
Comments/Notes:
Stormwater BMP Master Database
Stafford County, Virginia
Stafford County Department of Code Administration
Photo Filename
Filename
RG369-1.JPG
RG369-2.JPG
RG369-3.JPG
Record: 1
Ponds Filtration Infiltration Manufactured/Underground Miscellaneous LID
Pond Type Wet Pond
Pond Length (ft) 700
Pond Average Width (ft) 120
Spillway Depth (ft)
BMP Depth (ft)
Pond Water Depth (ft) 7
Pond Treatment Volume (cf) 270480
Accessibility
Inaccessible
Dam Embankment
Overgrown
Trees
Shrubbery
Scrub Brush
Inadequate Cover
Erosion
Settlement
Piping
Slippage
Burrow Holes
Emergency Spillway
ES Eroding
ES Obstructed
ES Non-Operational
No ES
Riser
Low-Flow Blocked
BMP Damaged
BMP Missing
Riser Blocked
Riser Damaged
Principal Spillway Pipe (PSP)
PSP Blocked
PSP Joints Leaking
PSP Failure
PSP Settlement
Outfall Structure
Outfall Undermined
Outfall Separated
Outfall Channel
Channel Blocked
Channel Eroding
Impoundment Area
Large Debris
Unhealthy
No Riparian Buffer
Shore Erosion
Silted In
Low-Flow Ditch Blocked
Low-Flow Ditch Damage
Forebay Silted In
Record: 386 of 658
Form View
NUM
Start
Inbox - Microsoft...
FINAL Stormwat...
Inspections_C...
Microsoft Power...
9:03 AM

Municipal Program Cost Factors

1. Public Education and Outreach
2. Public Involvement and Participation
3. Illicit Discharge Detection and Elimination
4. Construction Site Runoff Control
5. Post-Construction Runoff Management
6. Municipal Pollution Prevention/Good Housekeeping
7. Maintenance
8. Program Evaluation and Reporting

- # of active construction sites >1 acre (or local threshold)
- Ratio of review/inspection staff to avg # of const. sites
- Development projects in the pipeline
- Average # of inspections per site
- Current compliance record (contractors pretty good or always in violation)
- Municipal vs 3rd party inspection
- Performance bonds in use
- Efficiency of enforcement (stop work on first infraction)

Municipal Program Cost Factors

1. Public Education and Outreach
2. Public Involvement and Participation
3. Illicit Discharge Detection and Elimination
4. Construction Site Runoff Control
5. **Post-Construction Runoff Management**
6. Municipal Pollution Prevention/Good Housekeeping
7. Maintenance
8. Program Evaluation and Reporting


Bioretention

- # of development projects requiring municipal review/inspection
- Age and type of existing BMPs
- Enhanced review for site design and land use planning for LID
- Number of review/inspection staff
- Performance bonds collected
- Inhouse or 3rd party inspection staff
- Design guidance, checklists and training
- BMP database
- Extent of retrofitting program
- Code updated to allow/foster green infrastructure

Municipal Program Cost Factors

1. Public Education and Outreach
2. Public Involvement and Participation
3. Illicit Discharge Detection and Elimination
4. Construction Site Runoff Control
5. Post-Construction Runoff Management
6. Municipal Pollution Prevention/Good Housekeeping
7. Maintenance
8. Program Evaluation and Reporting

- # of municipal facilities requiring pollution prevention plans
- Development of pollution prevention plans and spill response strategies
  - Maintenance Garages
  - Public Works Facilities
  - Transfer Stations
- Street sweeping and catch basin cleanout equipment and labor
- Employee Education and Training
- Retrofitting costs
- Construction Site Inspections

Municipal Program Cost Factors

1. Public Education and Outreach
2. Public Involvement and Participation
3. Illicit Discharge Detection and Elimination
4. Construction Site Runoff Control
5. Post-Construction Runoff Management
6. Municipal Pollution Prevention/Good Housekeeping
7. Maintenance
8. Program Evaluation and Reporting

- Level of service and public vs private
- In-house or private inspectors
- Routine vs long-term inspections
- Develop maintenance tracking system (e.g., web or GIS based)
- Develop maintenance and inspection checklists
- Conduct maintenance/repair for BMPs, outfalls, pipes, culverts and utilities
- Dedicated staff
- Technology requirements

Municipal Program Cost Factors

1. Public Education and Outreach
2. Public Involvement and Participation
3. Illicit Discharge Detection and Elimination
4. Construction Site Runoff Control
5. Post-Construction Runoff Management
6. Municipal Pollution Prevention/Good Housekeeping
7. Maintenance
8. Program Evaluation and Reporting

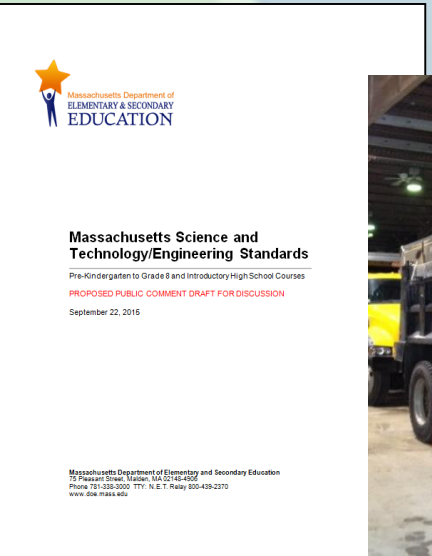
- Monitoring
  - Dry weather outfall screening for all outfalls;
  - Wet weather sampling for vulnerable systems;
  - Basic constituents;
  - For impaired waters, must sample for pollutant causing impairment
- Develop measurable goals and Tracking Indicators
- Annual reports for compliance and other documentation
- Maintain a tracking system
- US EPA MS4 Program Evaluation Guidance manual

Typical Municipal Departments

- DPW/Highway
- Wastewater Mgmt
- Conservation
- Planning Dept
- Fire/Police
- Schools

Sharing resources

- Planning Brd, Conservation Comm, Health Brd- new dev plan reviews
- Codes/ordinances
- Integrated planning for wastewater/stormwater load mgmt
- Public education/school curricula
- Inspections
- Maintenance and equipment


Massachusetts Department of ELEMENTARY & SECONDARY EDUCATION

Massachusetts Science and Technology/Engineering Standards

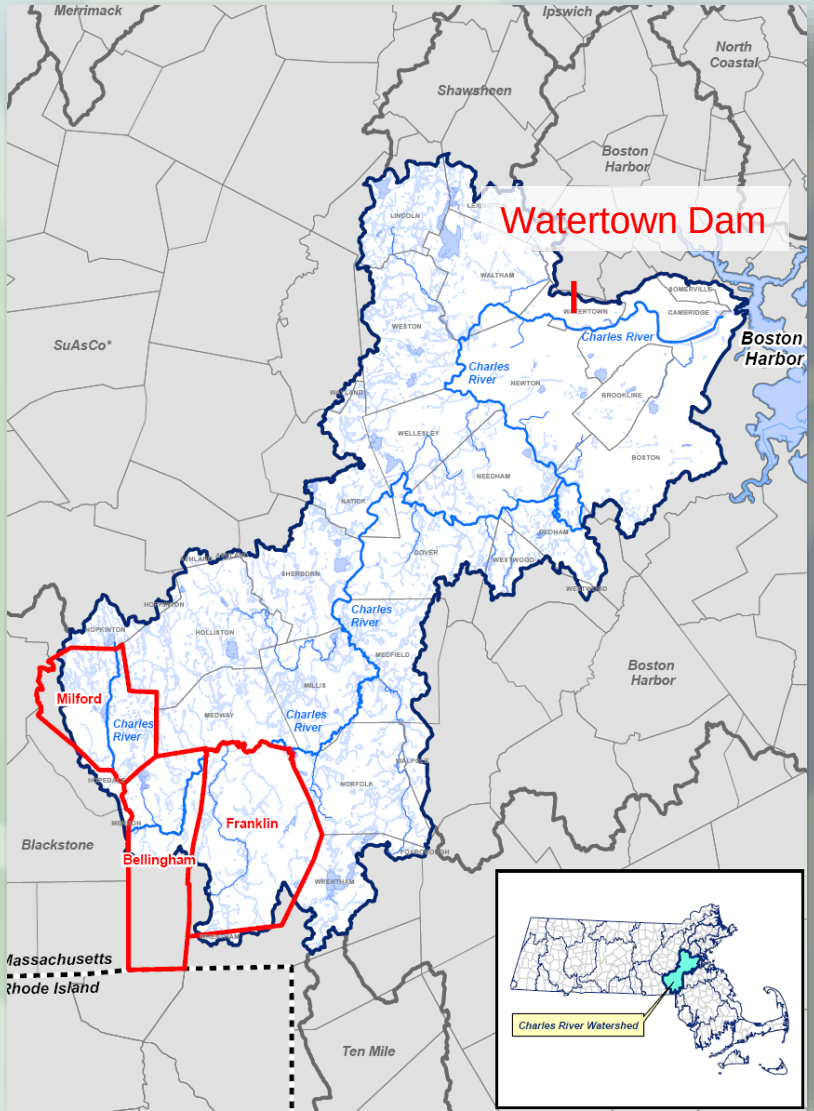
Pre-Kindergarten to Grade 8 and Introductory High School Courses

PROPOSED PUBLIC COMMENT DRAFT FOR DISCUSSION

September 22, 2015

Massachusetts Department of Elementary and Secondary Education
75 Pleasant Street, Malden, MA 02148-4906
Phone 781-338-3000 TTY: N.E.T. Relay 800-439-2370
www.doe.mass.edu

Cost Assessment for 3 Municipalities in the Upper Charles River Watershed (2011)



- Charles River impaired for phosphorus, bacteria & other stressors;
- Phosphorus TMDL Requires 51% reduction of stormwater loads above Watertown Dam;
- Loading reduction requirements for 3 Upper Charles Communities:
  - Bellingham: 52%
  - Franklin: 52%
  - Milford: 57%
- MS4 GP

Horsley Witten Group, Inc.

Cost Estimates Developed for Existing and Future Stormwater Program

based on MS4 permit requirements

- Future program annual operational costs.
- Future capital costs for Phosphorus Reduction.

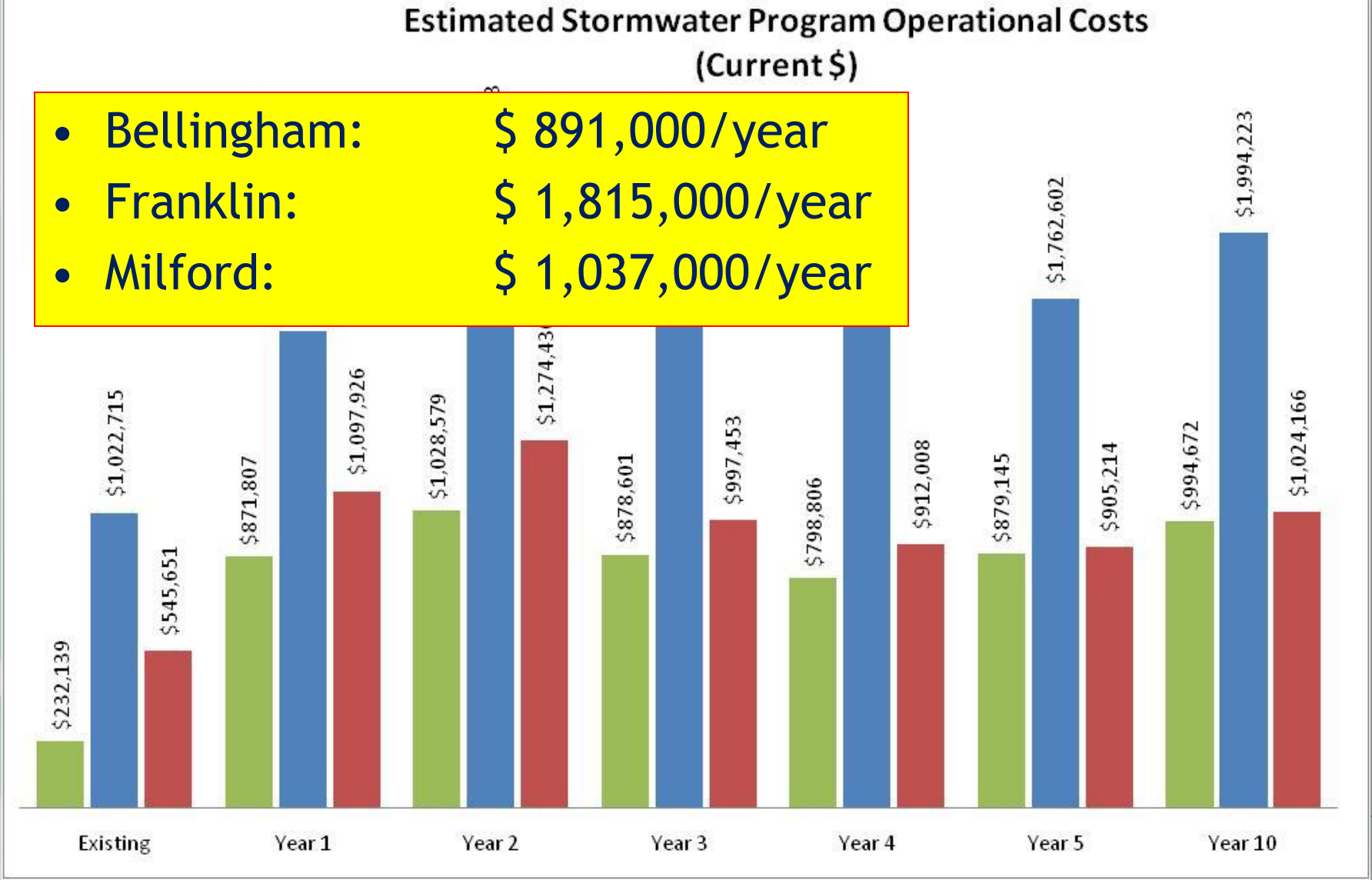
Engineering and Master Planning	**town engineer services to assist planners, DPW, etc with design and planning services**							
Stormwater Master Planning	includes PCP/CIP planning, link with comp plan; planning for infrastructure needs	N/A	$ 92,600	$ 88,100	$ 75,100	$ 75,100	$ 2,520	$ 2
IDDE plan	% of SWMP	N/A	$ 3,995	$ 9,020	$ -	$ -	$ 3,995	
Catchbasin Inventory Plan (CBIP) Plan and Street sweeping optimization	% of SWMP	N/A	$ 6,170	$ 3,670	$ 3,670	$ 3,670	$ 3,670	$
Waterfowl & Pet Waste Management Programs	% of SWMP							

Billing and Finance (for a Utility)	**includes ... of establishing and administering a stormwater utility**				
Financial Management		N/A			
Indirect Cost Allocations		N/A	$ 59,214	$ 58,180	$ 47
Billing, Finance and Customer Services		N/A			
Cost and Rate Analysis		N/A			
General Government Support		N/A			
Subtotal:		$ -	$ 59,214	$ 58,180	$ 47

Regulation/Enforcement	**permit/plan reviews and inspections for dev/redeve projects under stormwater ordinance**				
MS4 Stormwater Permit Administration	review new NPDES permits and enforcement for noncompliance	$ -	$ -	$ -	$
RDA/CMPP Compliance	review new RDA permits and enforcement for noncompliance	N/A			
Stormwater/Drainage System Inspections	inspecting BMPs, catch basins, other components of drainage system	$ 500	$ 626	$ 626	$
	detection and enforcement actions	$ -	$ -	$ 9,750	$

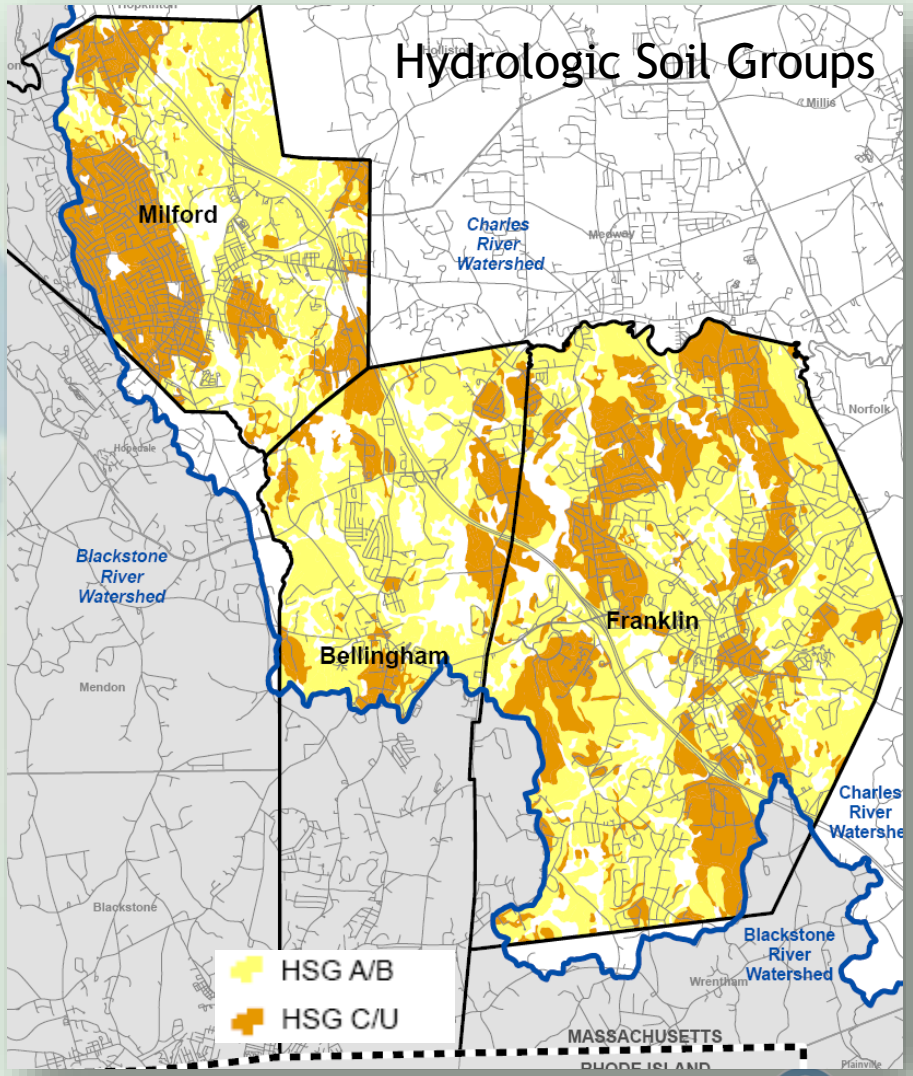
Existing & Future Program Costs for Operational Expenses

- Bellingham: $ 891,000/year
- Franklin: $ 1,815,000/year
- Milford: $ 1,037,000/year



Local Factors Influencing Program Cost and Implementation of BMPs

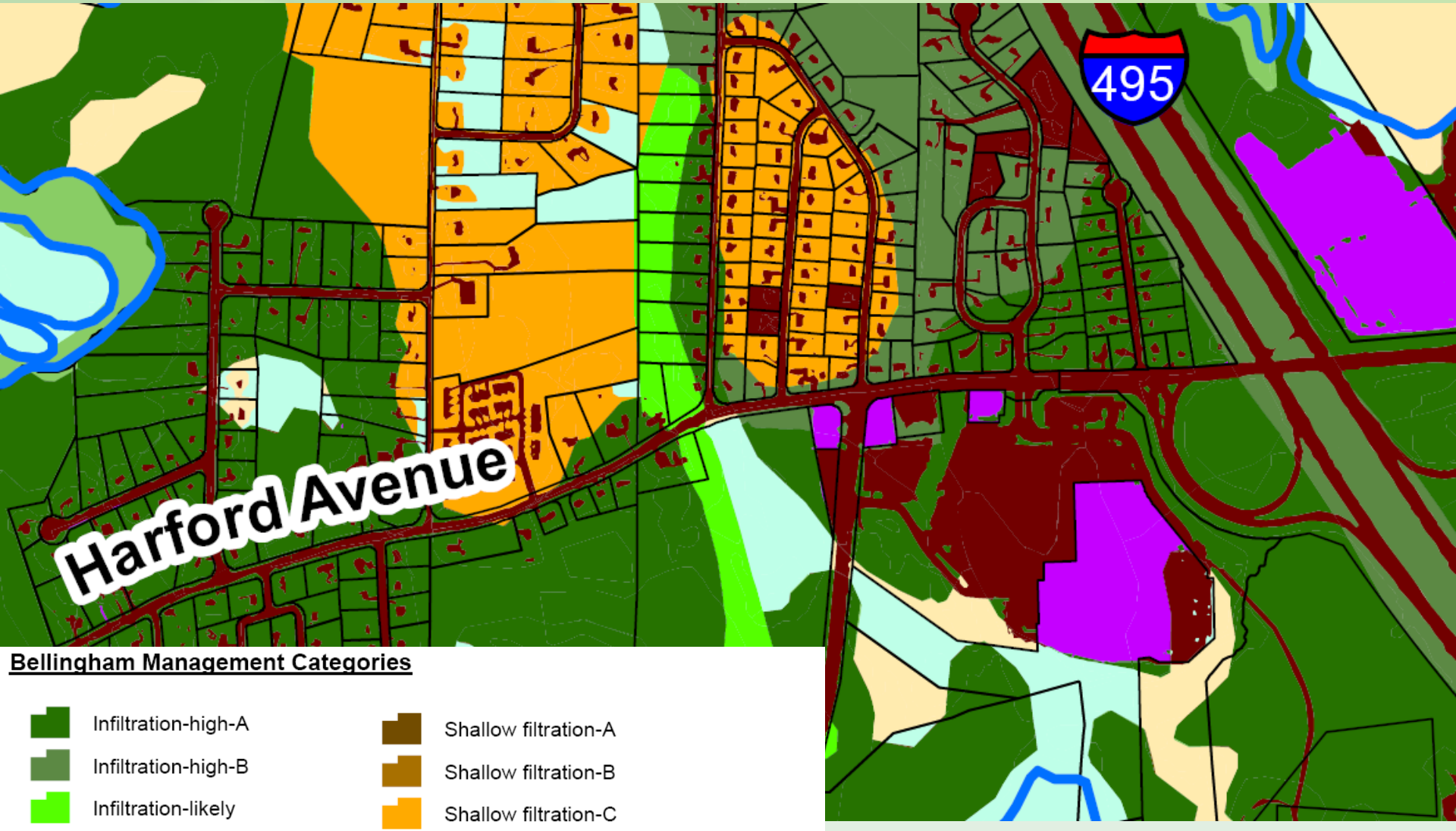
- Land use
- Existing impervious cover
- Soils
- Existing BMPs
- Existing stormwater program capacity
- Other related programs (Sewer & Water)
- Governance structure



Methods/Approaches to estimate future capital costs

1. Tetra Tech/EPA GIS-based spreadsheet parcel-by-parcel assessment;
2. Unit costs based on land use
   - Cost per acre of impervious treated;
   - Cost per pound of phosphorus removed.
3. Comparison to other recent retrofit work (with multipliers to account for land use variability)
4. Actual sample retrofit assessment in each town.

GIS-Based: Management Categories



Bellingham Management Categories

- Infiltration-high-A
- Infiltration-high-B
- Infiltration-likely
- Bio-filtration
- Bio-filtration/infiltration-B
- Bio-filtration-D
- Shallow filtration-A
- Shallow filtration-B
- Shallow filtration-C
- Shallow filtration-D
- Water quality swale/Stormwater wetland
- Impervious, Possible porous pavement

Estimated Total Stormwater Program Costs for operations & to achieve MS4 compliance (2011 dollars)

Total Program Costs (CIP + Annual Operations)

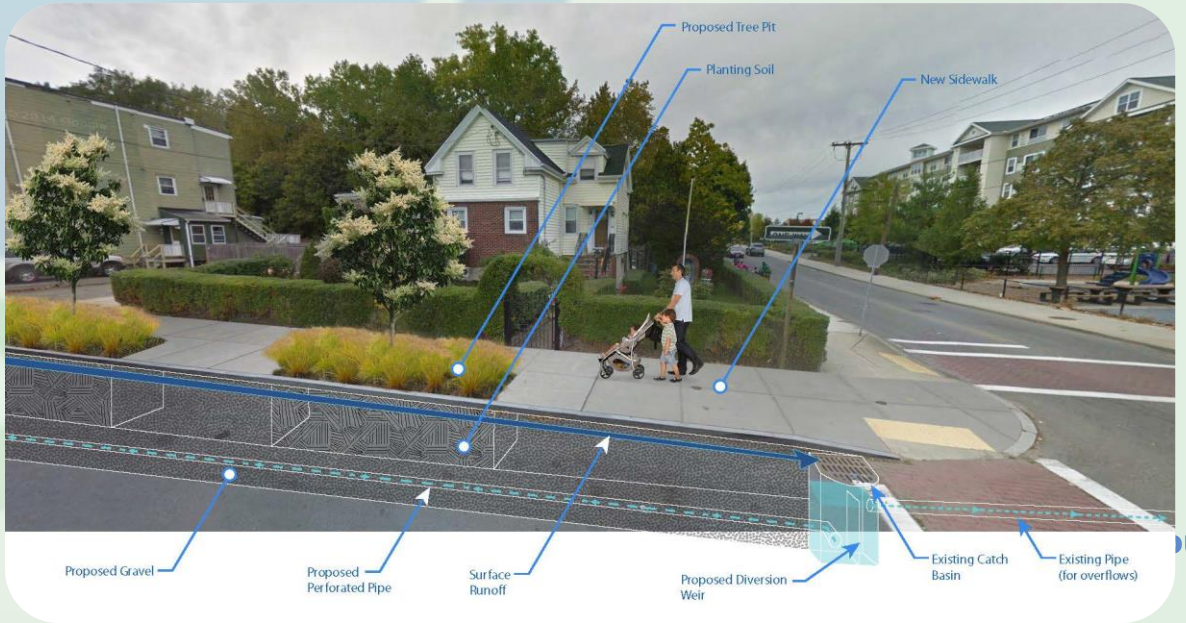
Town	Total CIP	Annual Operating Costs
Bellingham	$29,700,000	$905,000
Franklin	$74,600,000	$1,839,000
Milford	$75,800,000	$1,061,000
Total	**$180,100,000**	**$3,809,000**

Town	Approximate Population
Bellingham	15,800
Franklin	32,000
Milford	27,600

2016 MS4 GP -Appendix F

- Requires Phosphorus Load Reductions of
  - Bellingham: 35%
  - Franklin: 35%
  - Milford: 41%

- Capital cost likely a little lower; but the analysis assumed 15% P reduction from readily available non-structural controls.



New tools to help estimate stormwater implementation costs

- Opti-Tool – Regional excel-based BMP optimization tool
- WMOST – Watershed management optimization support tool
- Others…

"The goal of the tool is to help water resource managers and planners identify cost effective, sustainable green infrastructure options for their local jurisdictions."