



EFFICIENCY CITIES NETWORK

Forthcoming EPA Stormwater Regulations – Impacts for Local Governments and Communities

Tuesday, April 30, 2013

1pm Eastern

Moderator:

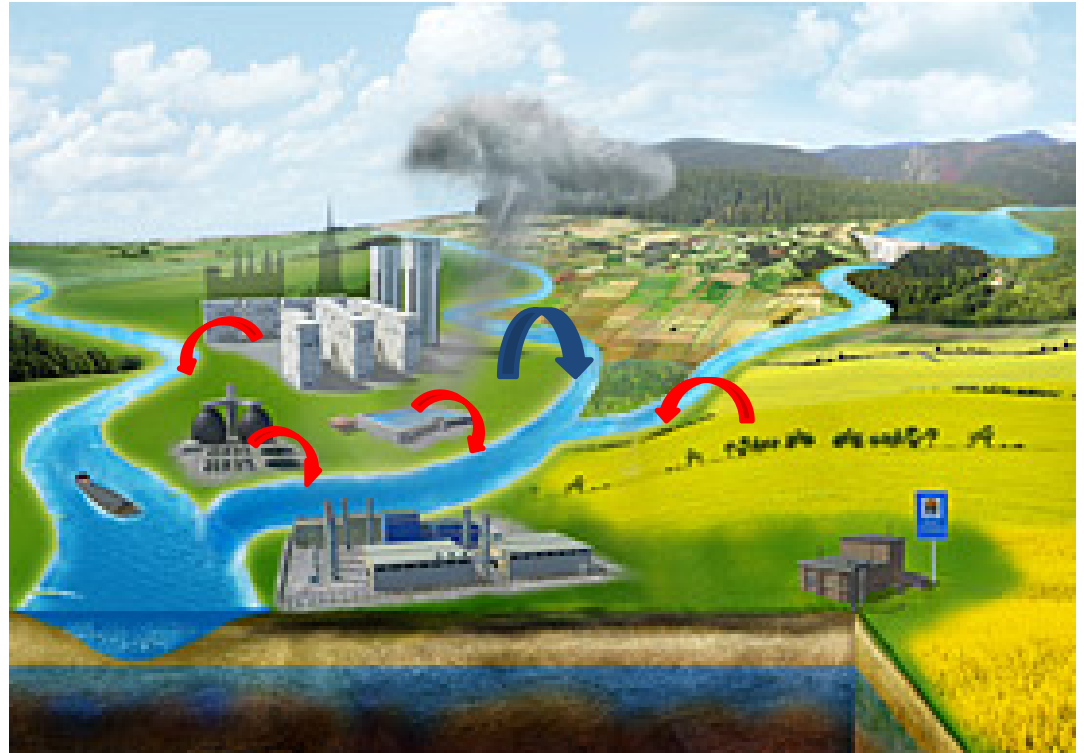
Satya Rhodes Conway, Mayors Innovation Project

Agenda

- Welcome
- Introduction
- Presentations
 - **Mayor David Pope**, Oak Park IL
 - **Christopher Kloss**, US EPA
 - **Kevin Shafer**, Milwaukee Metropolitan Sewerage District
 - **Michele Adams**, Meliora Designs
 - **Charlotte Katzenmoyer**, City of Lancaster, PA
- Questions and discussion
- Close

Overview of Watershed Inputs

1. Agricultural Runoff
2. Wastewater Treatment Plant Effluent
3. Separate Sewer Overflows
4. Combined Sewer Overflows
5. Urban Stormwater Runoff (MS4)



Current Regulatory Gaps

- Limited regulatory requirements for agricultural runoff – nutrient concerns
- Tendency to try to over regulate MS4's and NPDES permittees

National Stormwater Policy Considerations

- New Development/Redevelopment Standards
 - EPA is contemplating inclusion of an on-site performance standard
 - Should be flexible to allow local decision makers the ability to set their own standards specific to their watersheds
 - Should have a separate standard for new development and for redevelopment to encourage redevelopment

National Stormwater Policy Considerations

- Retrofit Requirements
 - Stormwater management approaches should deal with new development and redevelopment and should not require retrofitting impervious areas that are still in good shape

National Stormwater Policy Considerations

- Expand Area Subject to Federal MS4 Jurisdiction
 - Include residential subdivision or large commercial properties outside regulated MS4's
 - Levels the redevelopment “playing field”
 - EPA or the States should regulate these expanded areas

National Stormwater Policy Considerations

- Clean Water Act requires stormwater pollutant reduction to consider “Maximum Extent Practicable” (MEP)
- MEP means that costs must be considered for municipalities to meet permit requirements

National Stormwater Policy

Green Infrastructure

- The stormwater rule creates a unique opportunity to promote green infrastructure and its multiple benefits
- Green Jobs



Convergence with Integrated Planning Framework

EPA's integrated planning framework provides an opportunity for the stormwater rule to facilitate "common sense" prioritization of watershed management approaches



Convergence with Integrated Planning

A topographic map of Chattanooga, Tennessee, showing the Tennessee River and surrounding terrain. The river is highlighted in a dark blue color, winding through the landscape. The terrain is depicted with light brown and tan shades, indicating elevation changes. A dark blue horizontal band across the center of the map contains the title text.

Chattanooga, Tennessee

MS4 Rainwater Management

CHATTANOOGA, TENNESSEE

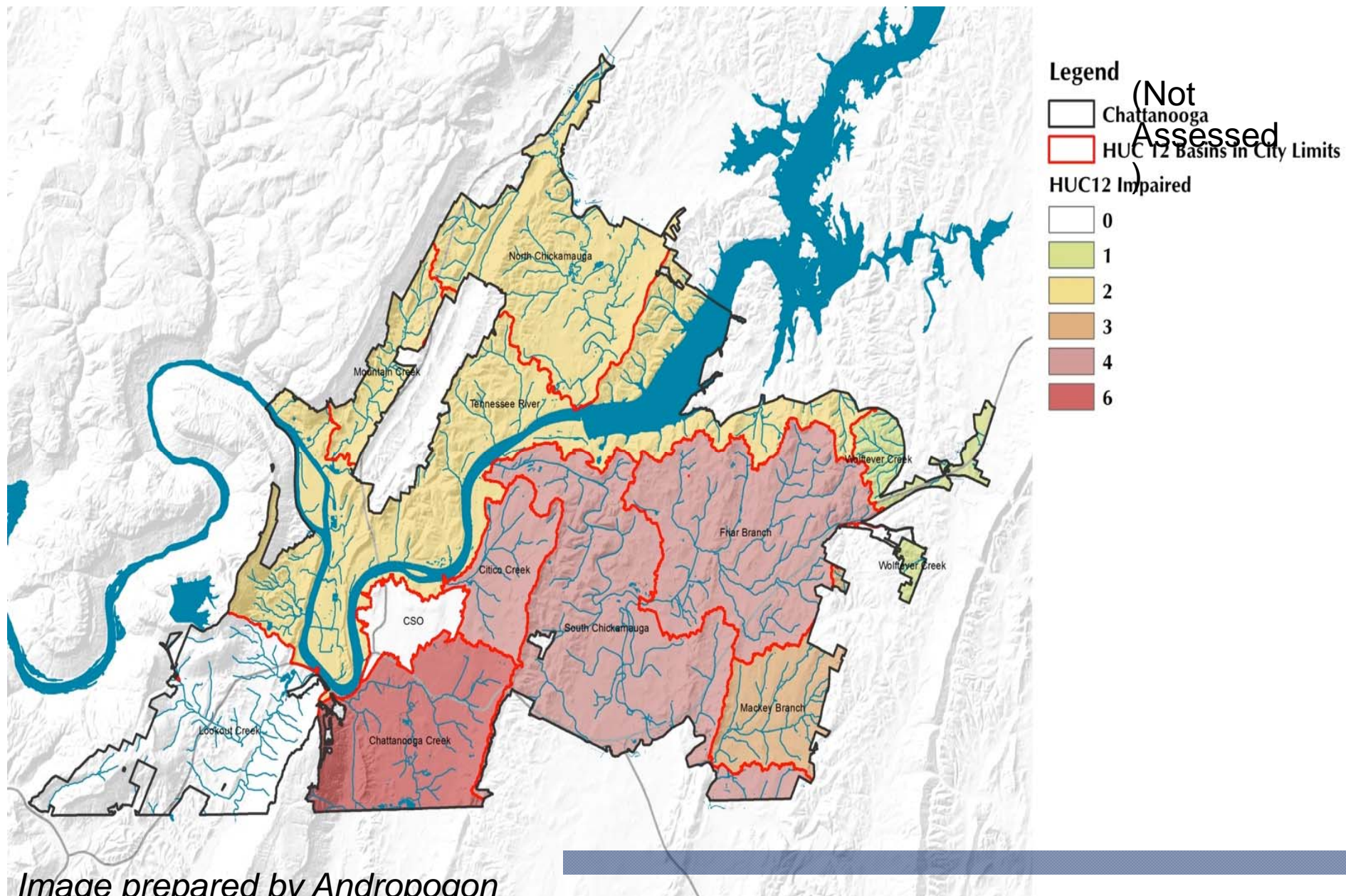
- Population 167,000
- Southeast Tennessee, Hamilton County
- 143 square mile area
- 52 inches annual precipitation
- Ridge and valley
- Tennessee River (tributary of Ohio river)



Citizen visioning and long-range goals
Redevelopment of Waterfront
Extensive greenway
Industry
Leveraging public/private partnerships
Sustainability
LEED



IMPAIRED WATERSHEDS

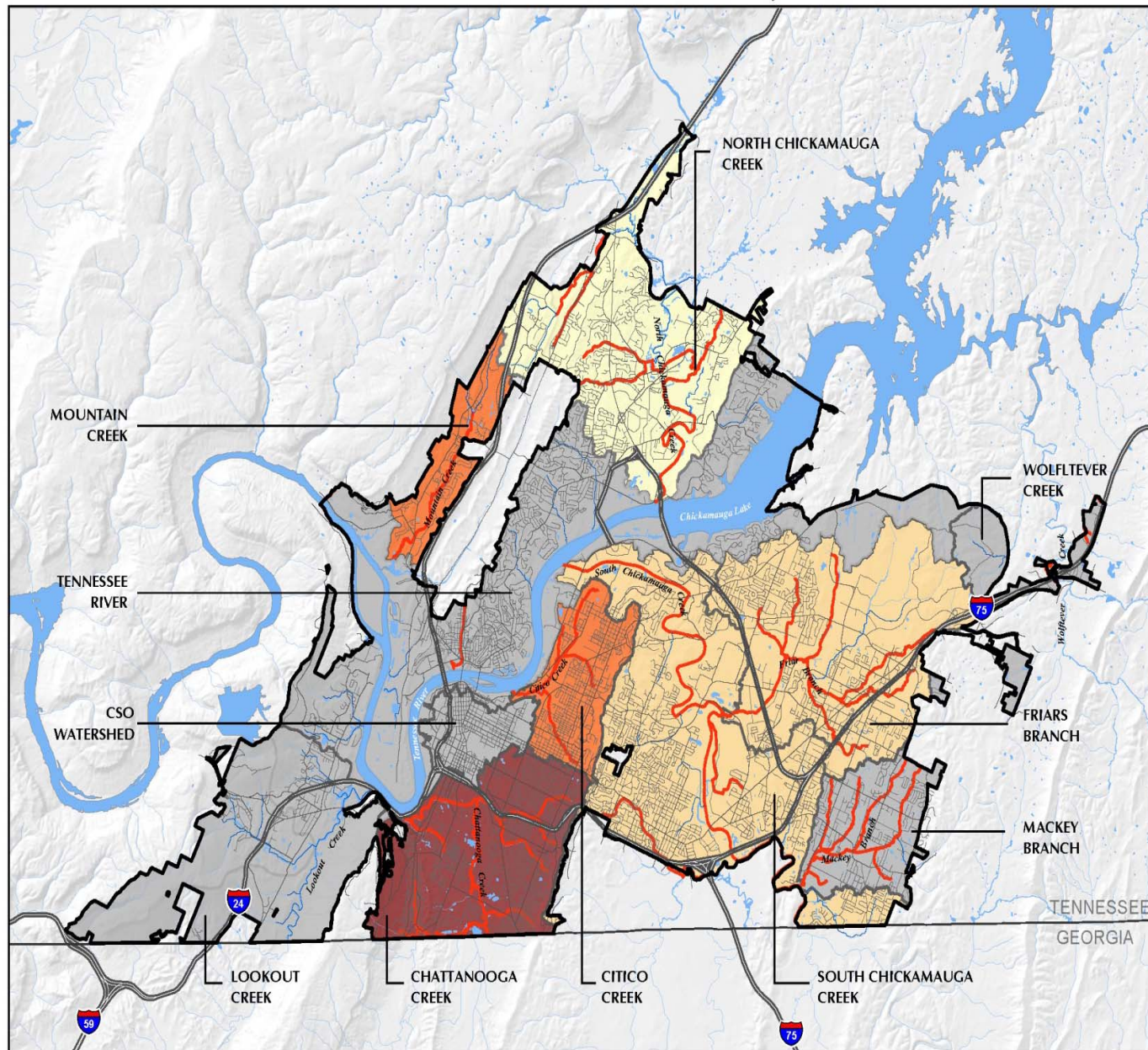


WATERSHEDS WITH KNOWN TSS REDUCTION REQUIREMENTS

Total Suspended Solids
Reduction, According to
2006 TMDL Report

Legend

- 78% Required TSS Load Reduction
- 65% Required TSS Load Reduction
- 61% Required TSS Load Reduction
- 29% Required TSS Load Reduction
- TSS Reduction not Specified
- TDEC Impaired Stream (303d)
- City Boundary

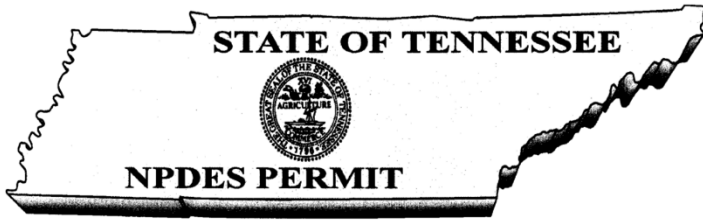



*“Develop design standards for all new and redevelopment... designed, built, and maintained to infiltrate, evapotranspire, harvest, and/or use, at a minimum, the **first inch of rainfall, with no discharge to surface water**”.*

Develop and Implement Strategies to establish, protect, maintain...

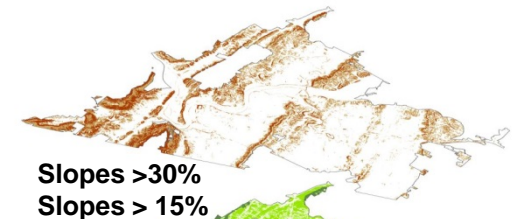
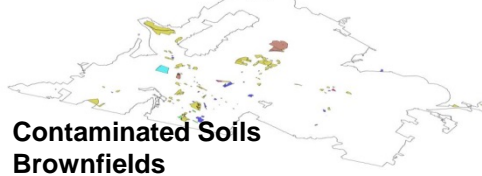
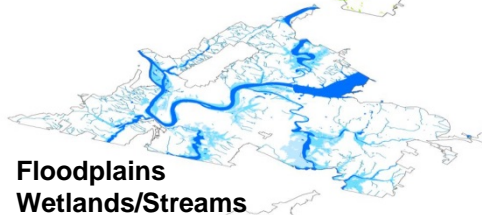
- Incentive program for Green Infrastructure
- Pollutant reduction standards
- Water Quality Buffers
- Flexibility to meet standards
- Incentives for
 - Redevelopment, brownfields, high-density, vertical-density, mixed use, transit-oriented

Aggressive timeline mandated by permit

 <p>STATE OF TENNESSEE</p> <p>NPDES PERMIT</p>	
<p>No. TNS068063</p>	
<p>Authorization to discharge under the National Pollutant Discharge Elimination System (NPDES)</p>	
<p>Issued By</p>	
<p>Tennessee Department of Environment and Conservation Division of Water Pollution Control 401 Church Street 6th Floor, L & C Annex Nashville, Tennessee 37243-1534</p>	
<p><small>Under authority of the Tennessee Water Quality Control Act of 1977 (T.C.A. 69-3-101 <u>et seq.</u>) and the delegation of authority from the United States Environmental Protection Agency under the Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977 (33 U.S.C. 1251, <u>et seq.</u>)</small></p>	
<p><small>Discharger: The City of Chattanooga, Hamilton County, Tennessee</small></p>	
<p><small>is authorized to discharge stormwater runoff, in accordance with the following stormwater quality management program(s), effluent limitations, monitoring requirements and other provisions as set forth in Parts I through IX herein, from all portions of the MS4, owned or operated by any permittee listed above, to Waters of the State of Tennessee.</small></p>	
<p>This permit shall become effective on:</p>	<p>December 1, 2010</p>
<p>This permit shall expire on:</p>	<p>November 30, 2015</p>
<p>Issuance date:</p>	<p>November 12, 2010</p>
<p style="text-align: center;">  Paul E. Davis, Director Division of Water Pollution Control </p>	
<p><small>CN-0759</small></p>	<p><small>RDAs 2352 and 2366</small></p>

A MULTI-TIERED APPROACH TO IMPROVING WATER QUALITY

- Evaluate existing land use ordinances
- Map resources to inform planning



A MULTI-TIERED APPROACH TO IMPROVING WATER QUALITY

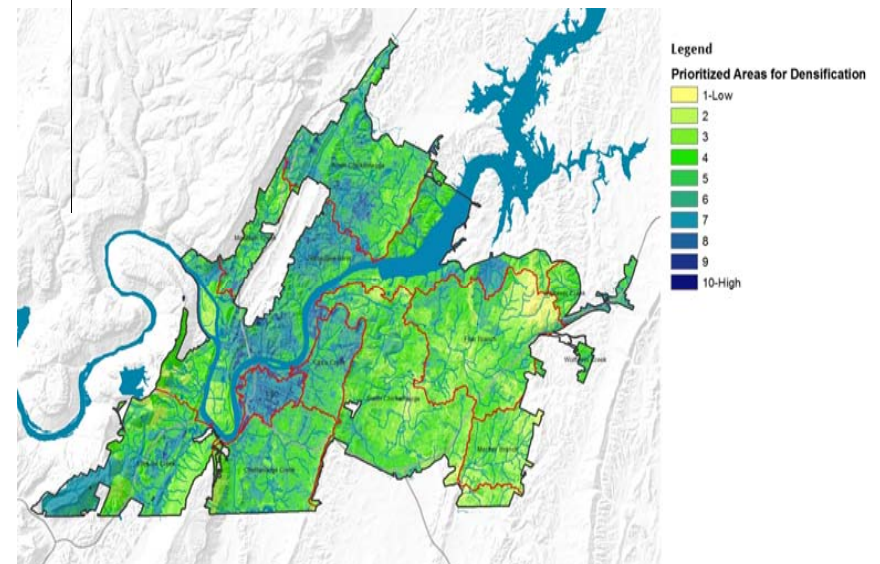
- Evaluate existing land use ordinances
- Map resources to inform planning
- Create incentives and protect resources
- Revise ordinances and codes



Section 2: Promote Efficient, Compact Development Patterns and Infill

2.A—Support Infill and Redevelopment	Tools and Policies	Points Available	Points Received or N/A
<p>(1) Question: Are policy incentives in place to direct development to previously developed areas?</p> <p>Goal: Municipalities implement a range of policies and tools to direct development to specific areas.</p>	<p>Adopt Plans/Educate:</p> <ul style="list-style-type: none"> • Local plans identify potential brownfield sites and support their redevelopment. • Capital improvement plans include infrastructure improvements (water, sewer, road, sidewalk, etc. upgrades) for identified brownfield and greyfield sites. 	<p>1</p> <p>1</p>	

Prioritized Areas for Compact Development & TOD



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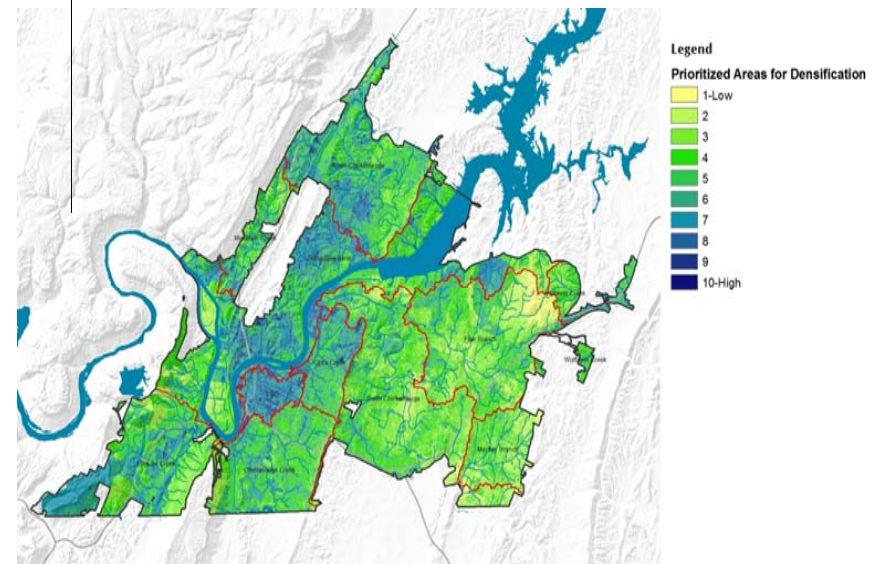
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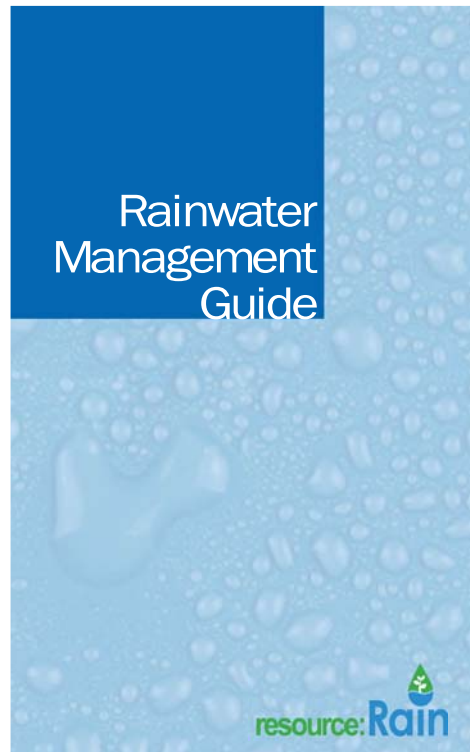
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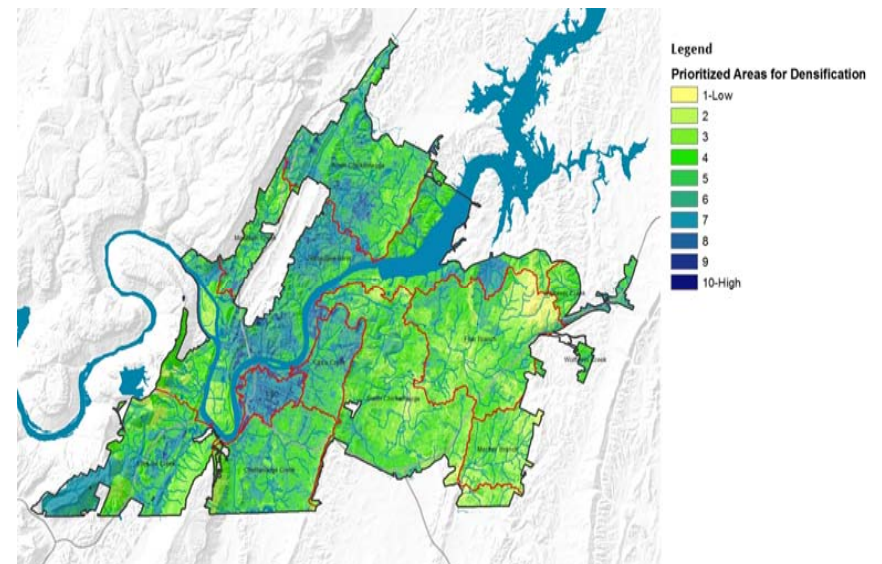
A MULTI-TIERED APPROACH TO IMPROVING WATER QUALITY

- Evaluate existing land use ordinances
- Map resources to inform planning
- Create incentives and protect resources
- Revise ordinances and codes
- Manual

Stormwater is a problem but Rainwater is an Opportunity

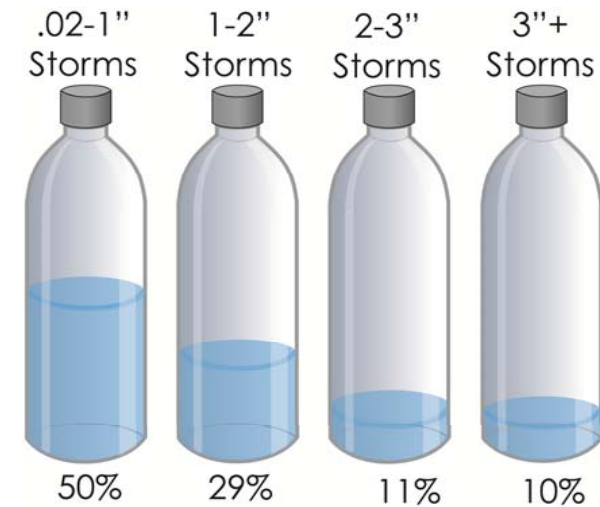
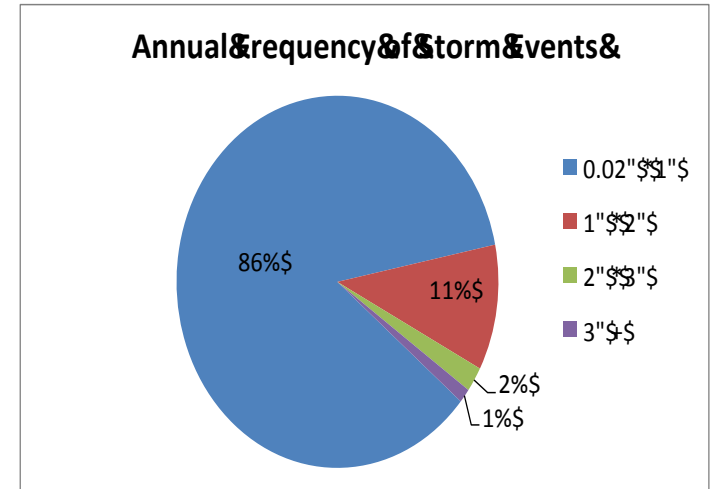


Prioritized Areas for Compact Development & TOD



RESTORING WATER QUALITY

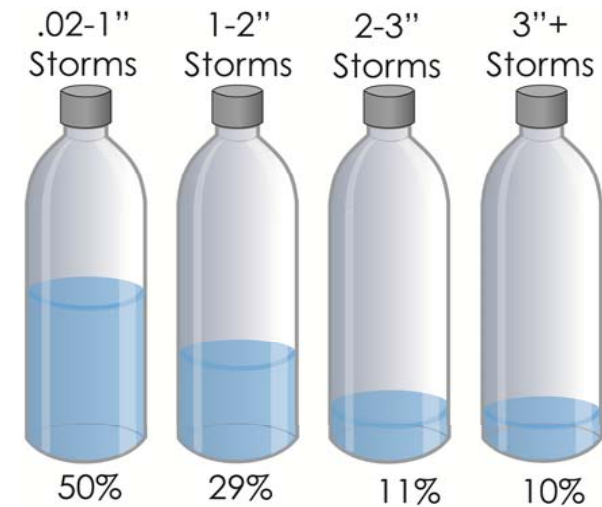
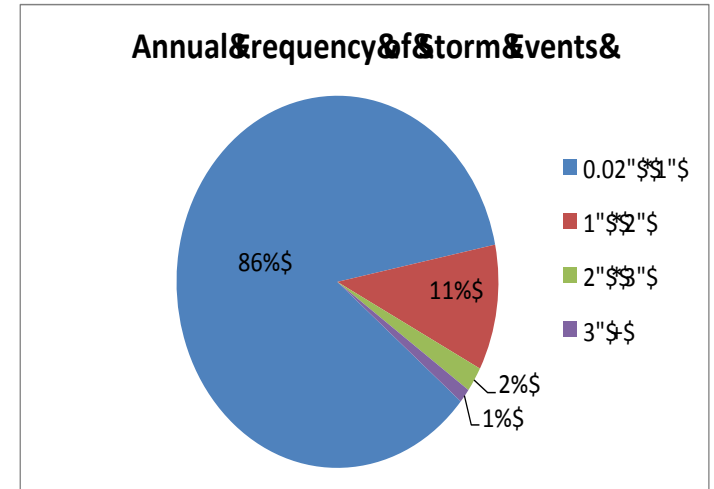
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- “Stay-on-Volume” or SOV
- 5,000 square feet disturbance threshold



Annual Volume

RESTORING WATER QUALITY

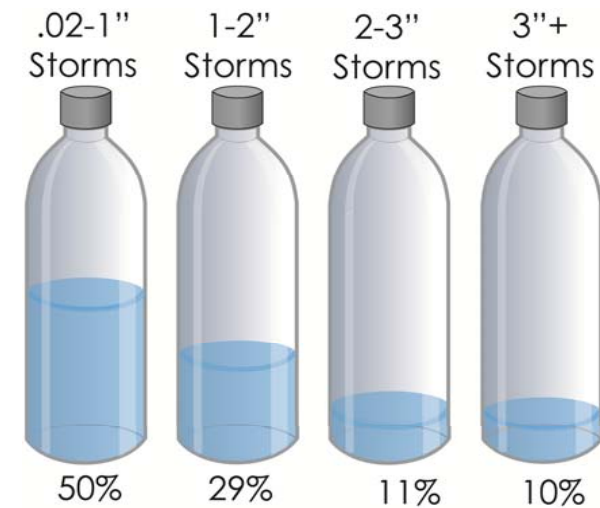
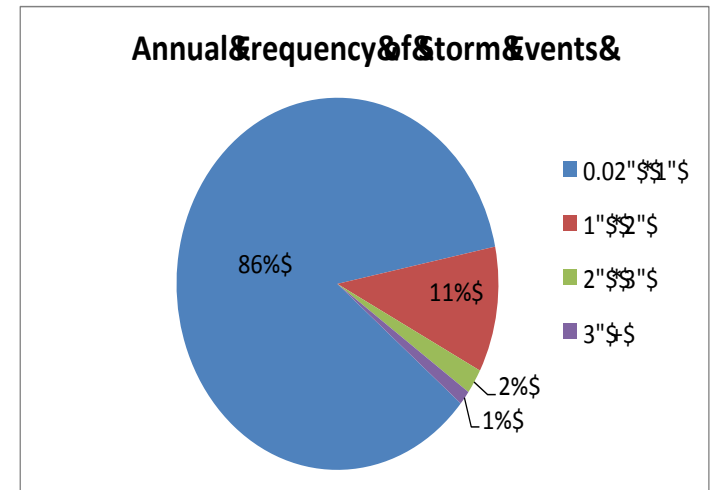
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 - Land use, water quality modeling (WinSLAMM), and 47 years of rainfall



Annual Volume

RESTORING WATER QUALITY

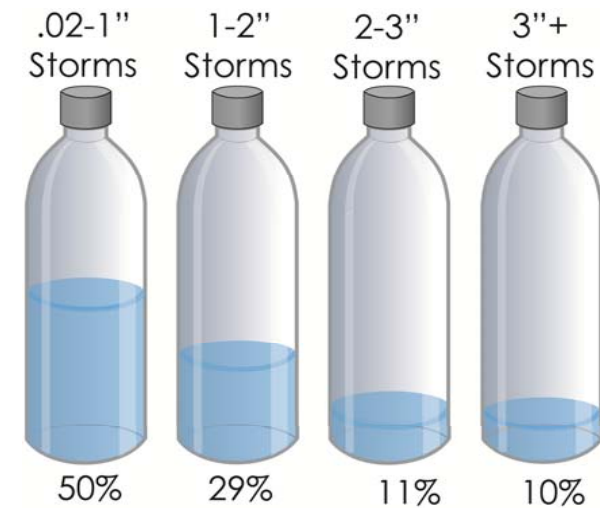
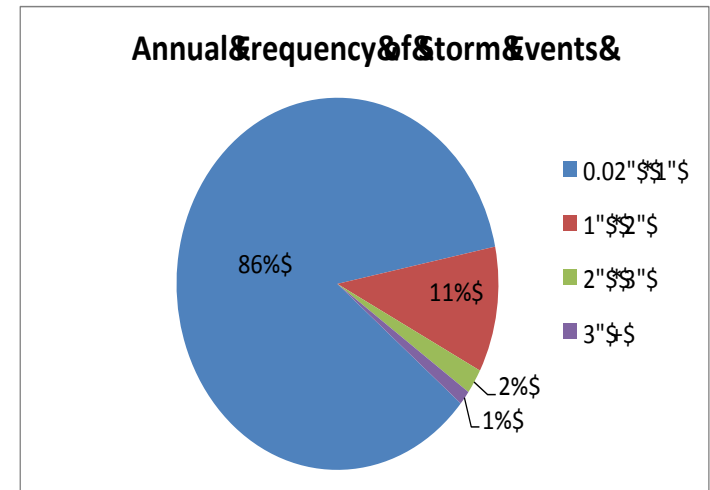
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- Design and Approval Process
 - Concept Plan
 - Final Plan



Annual Volume

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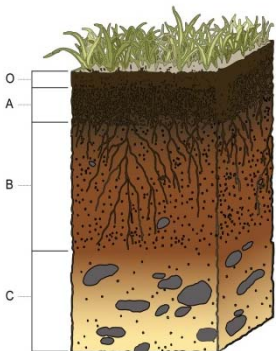
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- Three Tiers of BMPs in Manual
 1. Protection of Natural Systems
 2. Built BMPs
 3. Restoration



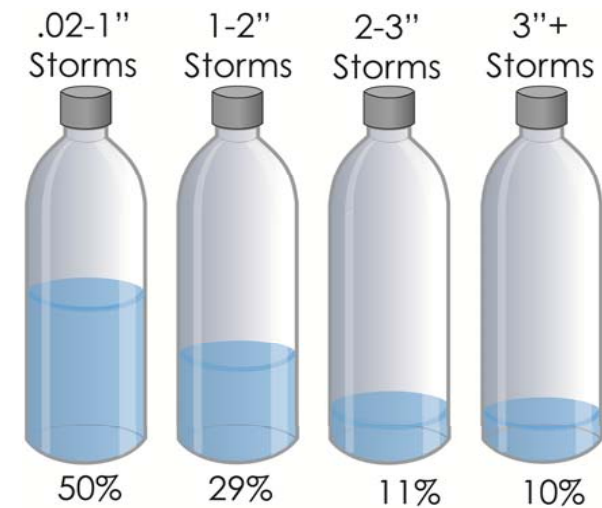
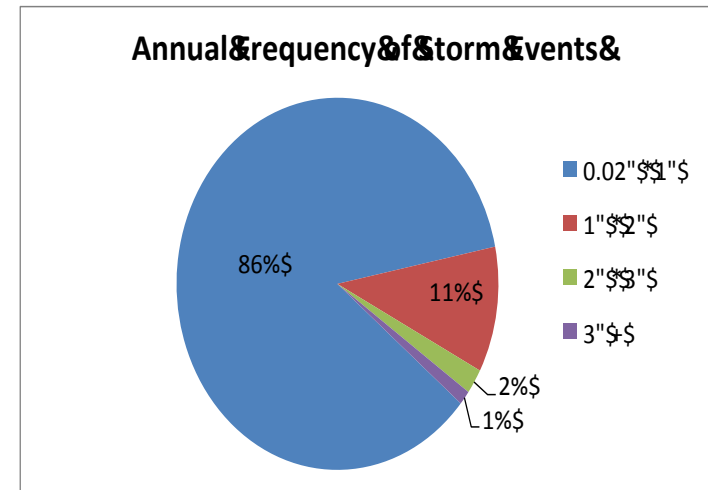
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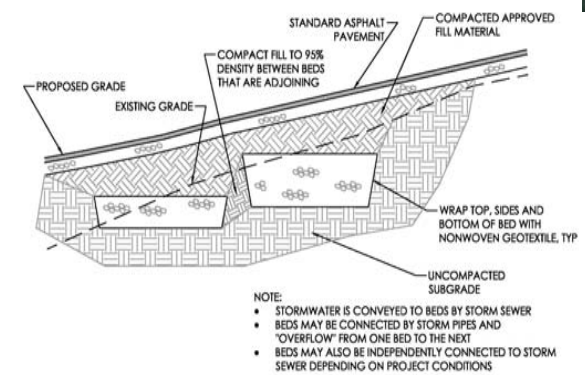


Protected areas excluded from volume management



Annual Volume

STRUCTURAL BMPs



STORMWATER INFILTRATION BEDS ON STEEP SLOPE AND BELOW FILL MATERIAL
FIGURE 5.3.2-9 NTS

- No-Mow Lawns
- Meadows
- Old Fields and Savannas (woody vegetation within the matrix of a meadow)
- Woodlands
- Mature Forest

Guidance for Design, Construction, and Maintenance

Volume credit



NEXT STEPS FOR CHATTANOOGA

- Leveraging Public / Private Partnerships
 - Commercial mid-town revitalization
 - Public School
 - Commercial redevelopment
 - Roadway Improvement
 - Residential Revitalization





Clean Waterways *in*Wilmington:

Green Infrastructure Planning and
Implementation to Improve Water
Quality and Support Public Space

WILMINGTON, DE

- Population 70,800
- Northern Delaware, New Castle County
- “Corporate” capital
- Fall line separating coastal plain and piedmont
- 43 inches annual precipitation
- Christina River and Delaware Bay



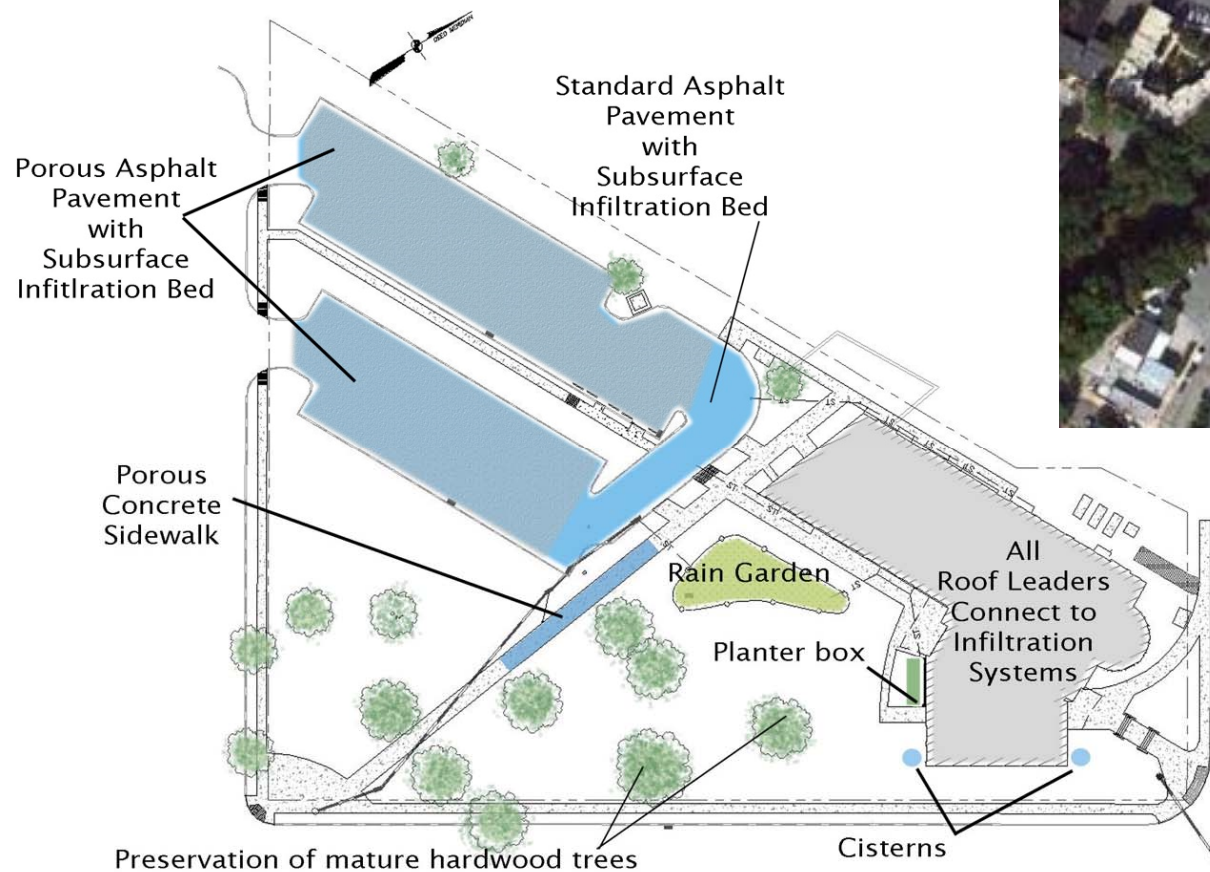
*Early Green Infrastructure
Longterm Control Plan Projects*



Wilmington CSO Areas

EARLY DEMONSTRATION: WOODLAWN BRANCH LIBRA

- 2005 – 2006
- Former Department of Motor Vehicles Site
- Urban Neighborhood



NATIVE PLANTINGS, NO-MOW LAWN



CISTERN, SIGNAGE, NATURALIZED AREAS



RAINGARDENS



RAINGARDENS



STORMWATER PLANTER BOXES



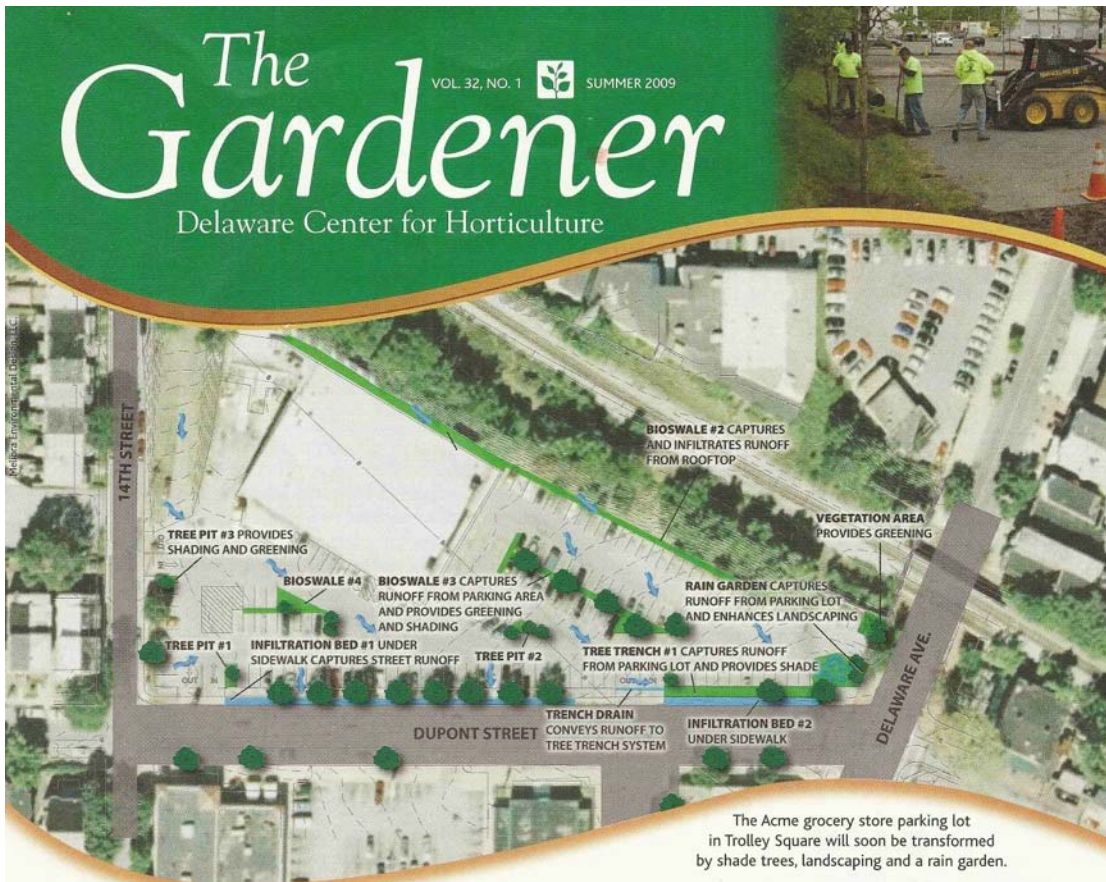
STORMWATER PLANTER BOXES



POROUS ASPHALT PAVEMENT (Happy Trees)



GREEN INFRASTRUCTURE AT AN URBAN GROCERY STORE



- Economic Development
- Center for Horticulture
- State, county, local funding
- EPA Urban Heat Island Funding

Many Partnerships

Revitalize neighborhood, walkable, healthy food source, bus stop, community gathering space

Hot in the City

New plantings capture stormwater and reduce summer heat

Anyone who has walked across a paved road on a bright summer afternoon knows that black asphalt radiates shimmering heat. And in the search for parking, one of life's small victories is finding a spot with some shade.

Cities and suburban areas are always warmer than the surrounding countryside, a phenomenon known as the "urban heat island effect." Streets, parking lots and buildings absorb the

What's blooming in this issue...

Rare Plant Auction report | page 2

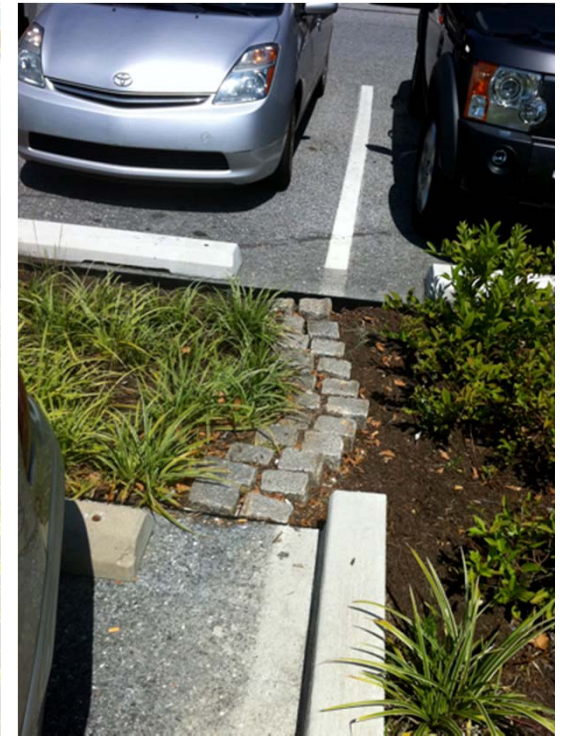
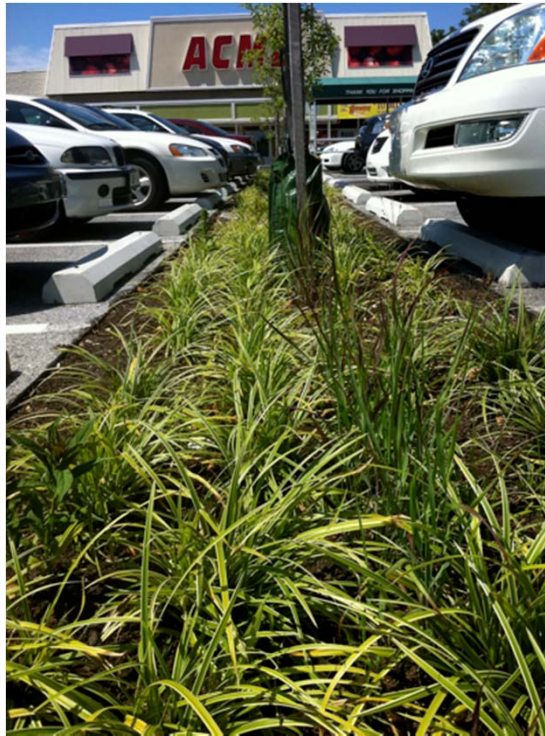
Go Ask Alice | page 3

Survey highlights | page 4

Water Garden Tour | page 5



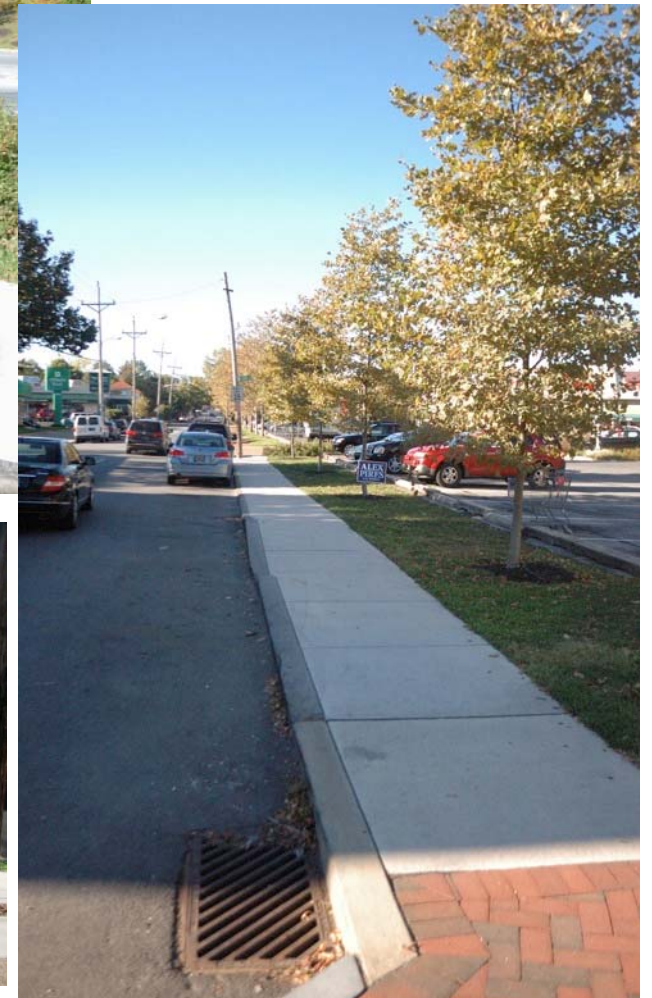
INFILTRATION TRENCHES BETWEEN CARS



BIORETENTION IN UNUSED PARKING AREAS



TREE TRENCH AND NEW SIDEWALK ALONG STREET



INFILTRATION TRENCHES BETWEEN CARS

- Rain Garden by Bus Stop
- Signage
- Contaminated Soils

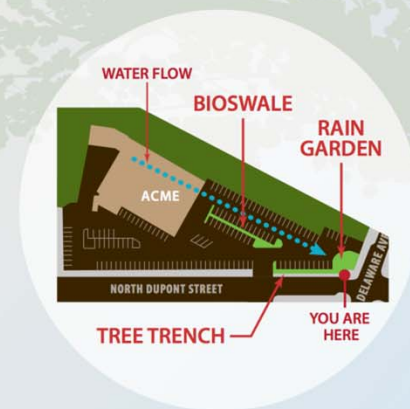


Landscaping for Rainwater Management

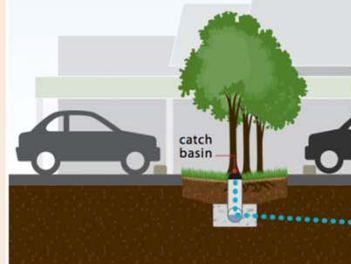
A special system to reduce the water in our storm drains is hidden in this parking lot. Can you see it?

When Trolley Square was first built, pipes were installed under the street to carry both rainwater and sewage out to the Brandywine River. Small streams were also buried in pipes and redirected through the same plumbing as the rain and sewage. For instance, a stream called Rattlesnake Run is flowing under your feet.

Today the pipes are routed through a treatment plant, but in heavy rains, the combined system is overwhelmed and polluted water still dumps directly into the river. In this parking lot, trees and a series of underground holding tanks are filtering, absorbing and slowing down the rainwater before it enters our storm drains.



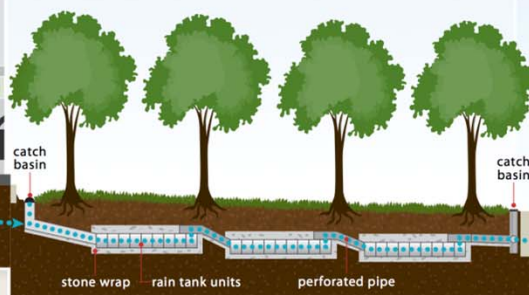
BIOSWALE



How a bioswale works

Large shade trees, shrubs and grasses capture rain flowing down the parking lot. Roots of these plants filter and absorb the first phase of water. A small catch basin at the low end gathers overflow.

TREE TRENCH



More than a row of trees...

Buried under a row of large shade trees along Dupont Street are three stepped storage tanks. They are connected to the bioswale overflow by a pipe under the parking lot. The storage tanks are open at the bottom, allowing rain to slowly soak back into the soil and water the trees.

RAIN GARDEN



LOOK FOR THESE FLOWERS...



Lobelia



Amsonia



Solidago

What is a rain garden?

This rain garden collects water from two directions: the extra water flowing down the parking lot plus overflow from the storage tanks in the tree trench. If this low area fills up during heavy rain, it eventually enters the storm pipes. An assortment of shrubs, grasses and flowering plants has been specially selected to tolerate a wide range of water conditions — from completely dry to temporarily submerged.

PROJECT SPONSORS

- New Castle County Conservation District
- US Forest Service
- City of Wilmington - Office of Economic Development
- City of Wilmington - Department of Public Works
- DE Department of Natural Resources & Environmental Control
- Acme
- Delaware Nature Society
- US Environmental Protection Agency





GREEN INFRASTRUCTURE PLANNING

Wilmington CS04A Green Infrastructure Plan

- 28% of overflows in the city
- Plan to manage first 1.5 inches of runoff from 30 acres of impervious surface



GREEN INFRASTRUCTURE PLANNING

Wilmington CS04A Green Infrastructure Plan

- 28% of overflows in the city
- Plan to manage first 1.5 inches of runoff from 30 acres of impervious surface
- Identify Areas that can “capture” significant runoff volumes



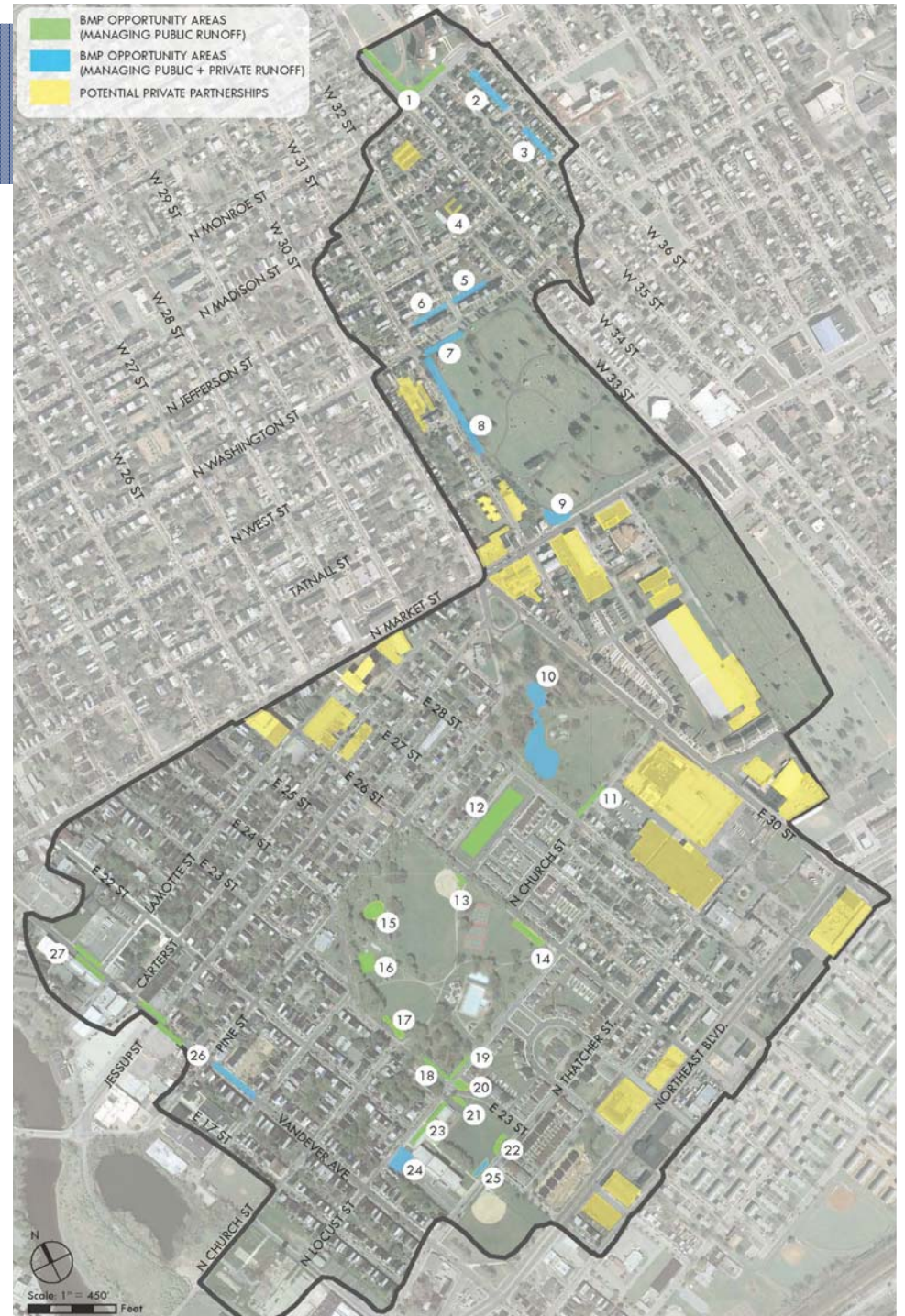
LOCUST STREET TREE TRENCH BEFORE



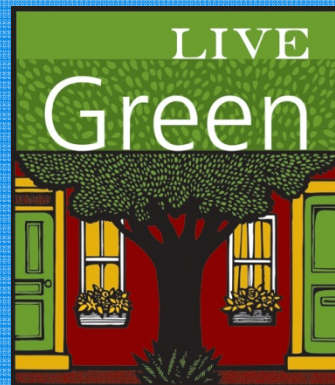
LOCUST STREET TREE TRENCH AFTER



COST EFFECTIVE MEASURES THAT BENEFIT ALL



SUSTAINABLE LANDSCAPES, SUSTAINABLE CITY





THE PROBLEM

The image features a white background with two large, overlapping geometric shapes. On the left, a blue shape is composed of two triangles meeting at a diagonal line. The upper triangle is a lighter blue with a fine grid pattern, while the lower triangle is a solid, darker blue. To the right of the blue shape is a large, solid green shape that also overlaps with the lower part of the blue shape. The text 'THE PROBLEM' is written in a bold, black, sans-serif font, oriented diagonally and positioned between the two main shapes.



750 million gal. polluted
stormwater discharge
= 1150 Olympic-
sized swimming
pools



Cost of Solutions Are Significant

Previous
Solution

\$300 Million
Gray
Infrastructure

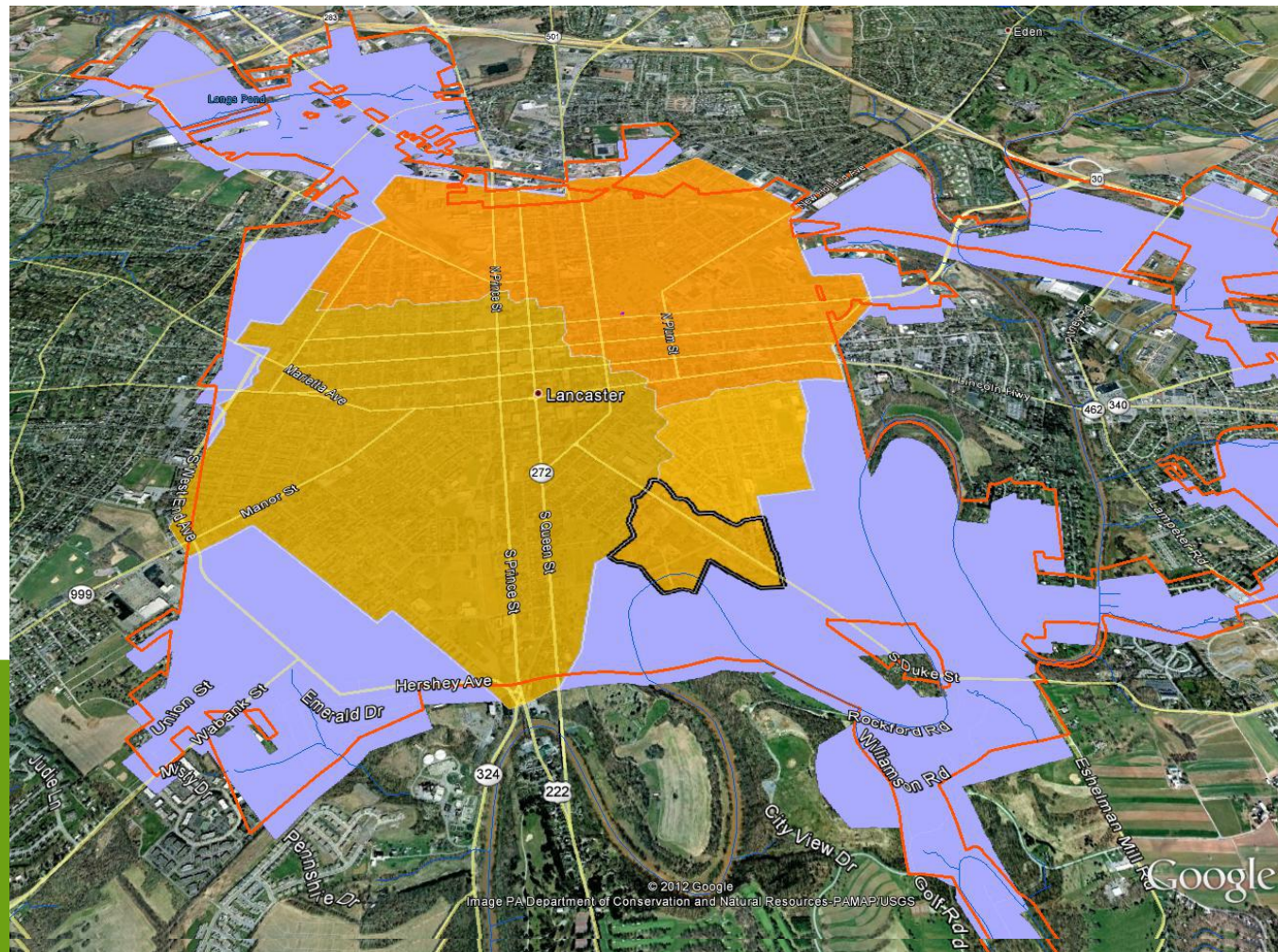
Proposed
Solution

\$140 Million
Green
Infrastructure

Doing Nothing is
Not an Option

“Lancaster is in violation of the AO, and needs to address these deficiencies as soon as possible. Violation of the terms of the AO may result in **further EPA enforcement** action for violation of the order and for the underlying violations including, but not limited to, imposition of **administrative penalties**, 33 U.S.C § 1319(g), and/or initiation of judicial proceedings that allow for **civil penalties of up to \$37,500 per day**, 33 U.S.C § 119 (b) and (d), for each day of violation.”

STORMWATER RUNOFF IS A COUNTYWIDE ISSUE

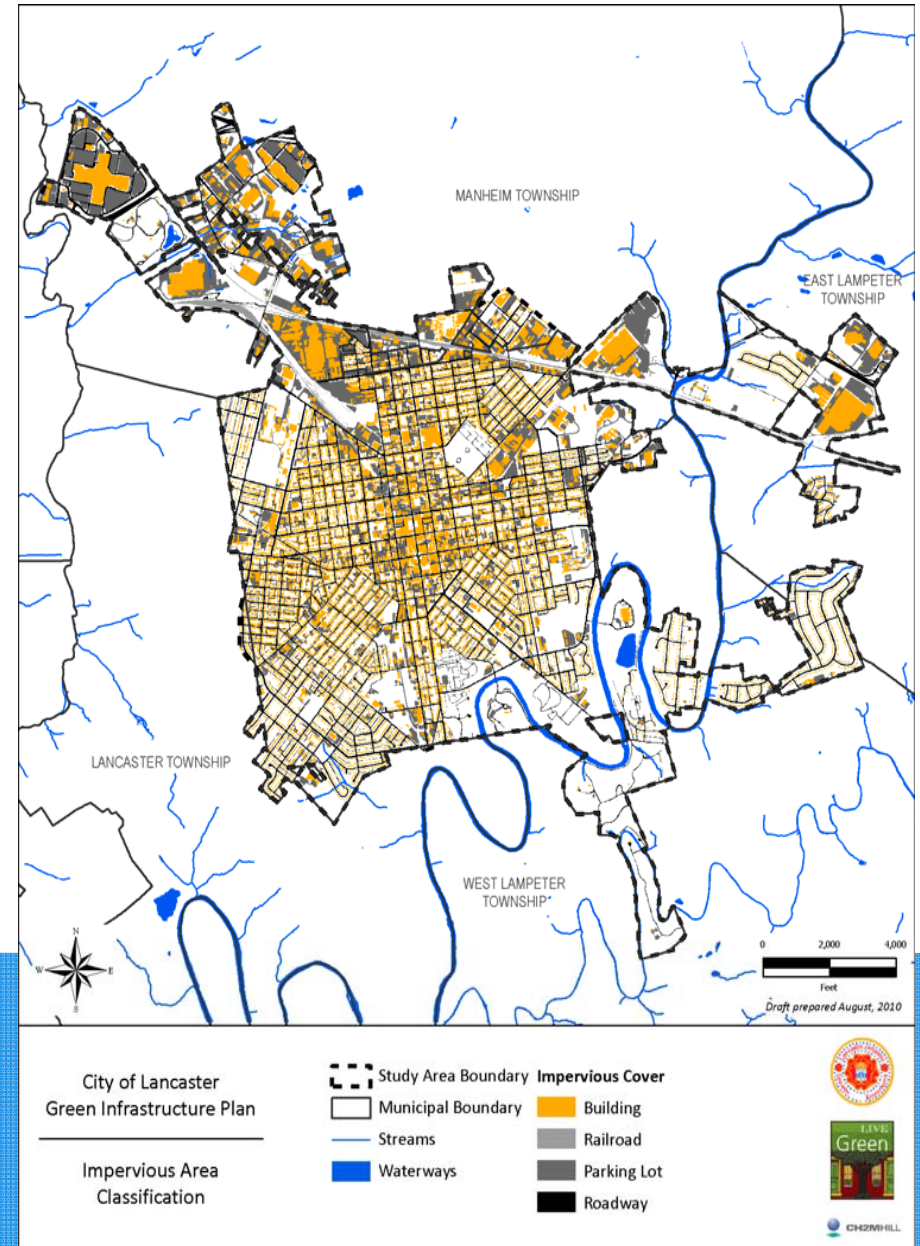
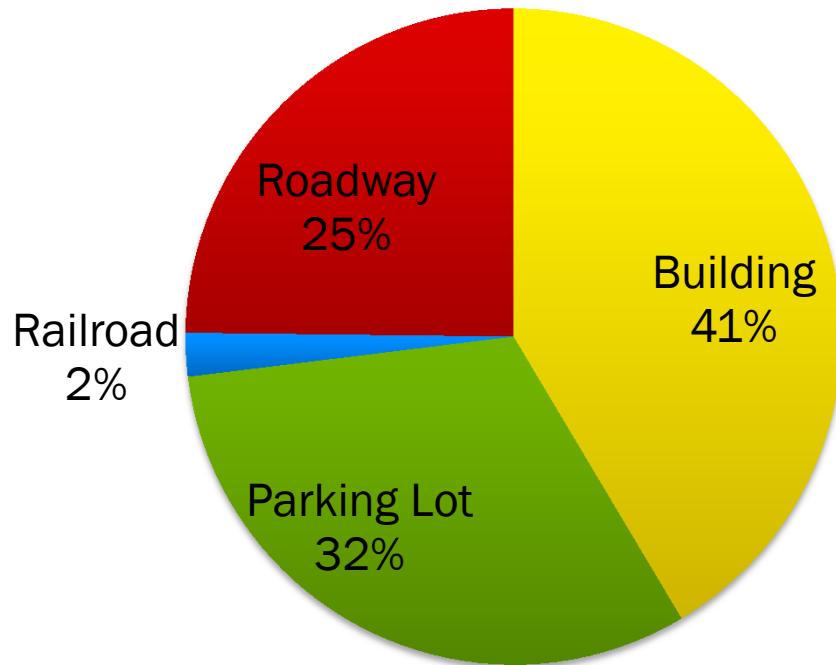


CSO Area



City
separated
sewer area

IMPERVIOUS AREA = 48% OF CITY



THE GREEN INFRASTRUCTURE BENEFIT CALCULATOR

PROJECTS FUTURE BENEFITS FOR CSO AND MS4 AREAS

Table 5-11 – Green Infrastructure Calculator for long-term (approximately 25-year) period

Impervious Area / Impervious Source	Impervious Area Contributing Area (ac)	Impervious Percent	Green Infrastructure Project / Program Type	Assumed Percent of Impervious Area Managed	Impervious Area Managed (acres)	Total SW Runoff (MG/yr)	Assumed BMP Volume	Average Runoff Reduction	Annual Runoff / Reduction (MG/yr)
Roads / Alleys	529	100%	Green Streets	30%	159	513	1.0	86%	132.4
Parks	241	8%	Park Improvements / Greening	85%	17.0	19	1.0	86%	14.2
Sidewalks	124	100%	Disconnection, Porous Pavement	35%	43.3	120	1.0	86%	36.1
Parking Lots	648	100%	Porous Pavement, Bioretention	20%	130	628	2.0	97%	121.3
Flat Roofs	218	100%	Vegetated Roofs / Disconnection	15%	32.7	212	1.0	86%	27.3
Sloping Roofs	654	100%	Disconnection/Rain Gardens	25%	164	635	1.0	86%	136.5
Street Trees	N/A	N/A	Enhanced Tree Planting	N/A	45.1	44	0.3	49%	21.5
Public Schools	175	29%	Green Schools	75%	38.4	50	1.0	86%	32.0
Various (Ordinance)	1274	100%	First-Flush Ordinance	50%	637	1236	1.0	86%	531.6
Total					1,265	3,752			1,053

55%

Pollutant	Average Stormwater Concentration*	Average CSO Discharge Concentration	Pollutant Reduction from Stormwater (lb/yr)	Pollutant Reduction from CSOs (lb/yr)	Total Est. Pollutant Reduction (lb/yr)
Total Suspended Solids (TSS)	1.2	5.5	3,485	24,267	27,752
Total Phosphorus (TP)	0.7	13.5	2,033	59,564	61,597
Total Nitrogen (TN)					

* Based on the midpoint pollutant concentrations in USEPA's CSO Report to Congress, 2001

Pollutant Load Reductions

Manage over 1,200 Acres of Impervious Area

Capture over 1 Billion Gallons of Stormwater Runoff over the long term



THE APPROACH

The image features a minimalist design on a white background. On the left, there is a blue triangular area composed of two overlapping triangles: a lighter blue one on top and a darker blue one on the bottom. To the right of this, a large green polygon extends from the bottom left towards the top right, meeting the blue area. The text 'THE APPROACH' is written in a bold, black, sans-serif font, rotated approximately 45 degrees counter-clockwise, and positioned in the white space between the blue and green shapes.

LEAD BY EXAMPLE

Parks

Green Roofs

Parking Lots

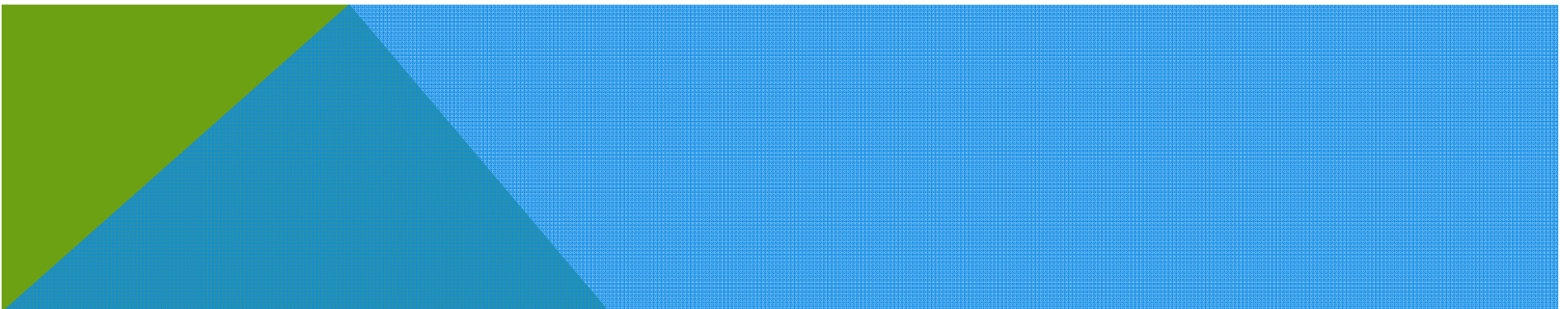
Green Streets & Alleys

Public buildings

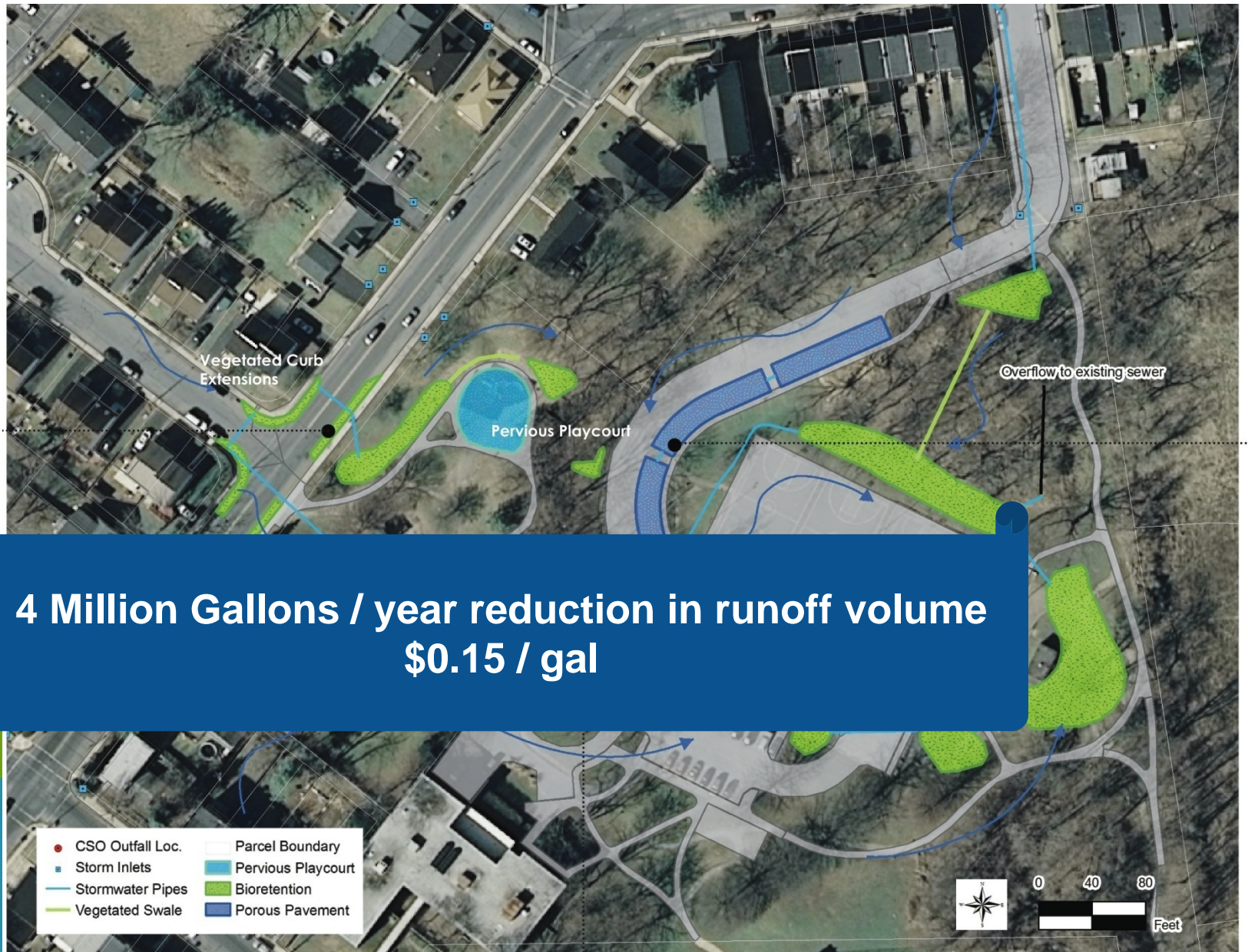
Private Properties

- \$7 M from Pennvest
- 35 GI/BMP sites mostly on private property

NFWF 3 – Private financing of GI retrofits



BRANDON PARK



SUCCESS OF PARKING LOT RETROFITS

Parking Lot	Drainage Area	GI Area	Capture Volume	Capital Costs with Contingency
Plum Street	23,402	4,680	511,000	\$89,862
Dauphin	20,582	4,516	411,000	\$61,822
Penn	22,758	4,219	455,000	\$60,749
Mifflin	13,242	1,324	265,000	\$27,013
TOTAL			1,642,000	\$239,446

COST PER GALLON = \$0.14/gallon



GREEN ROOFS

Over 77,000 square feet of green roofs in Lancaster City.

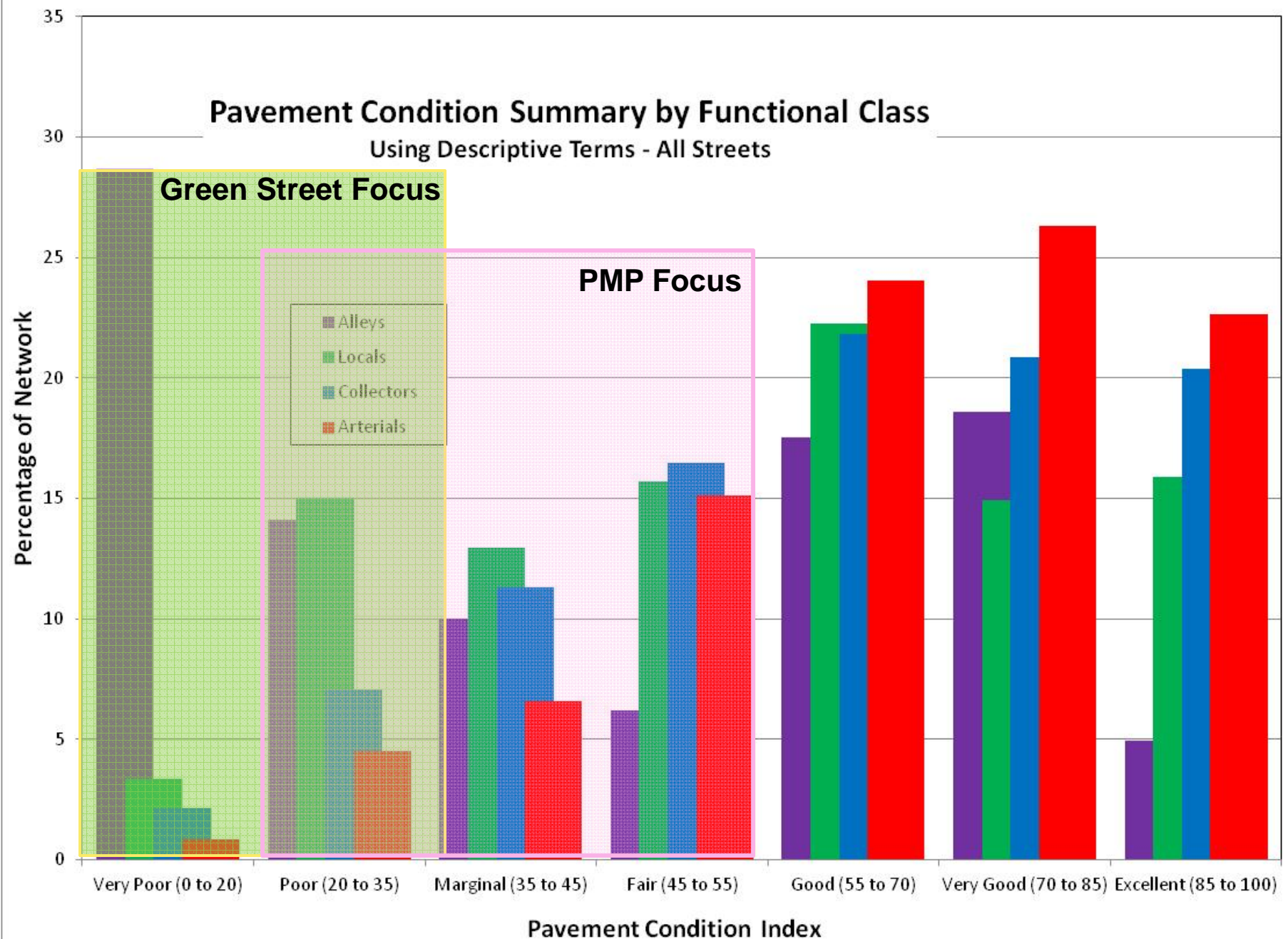
More than one square foot per person!

Additional 100,000 square feet under design for next year using PENNVEST funds



Pavement Condition Summary by Functional Class

Using Descriptive Terms - All Streets



FIRST GREEN ALLEY



ALLEY 148 GREENED FOR 10% ADDITIONAL COST + CAPTURES 200,000 GALLONS PER YEAR

Before (July 2011) ~\$20.30/SF



After (February 2012) ~\$22.40/SF

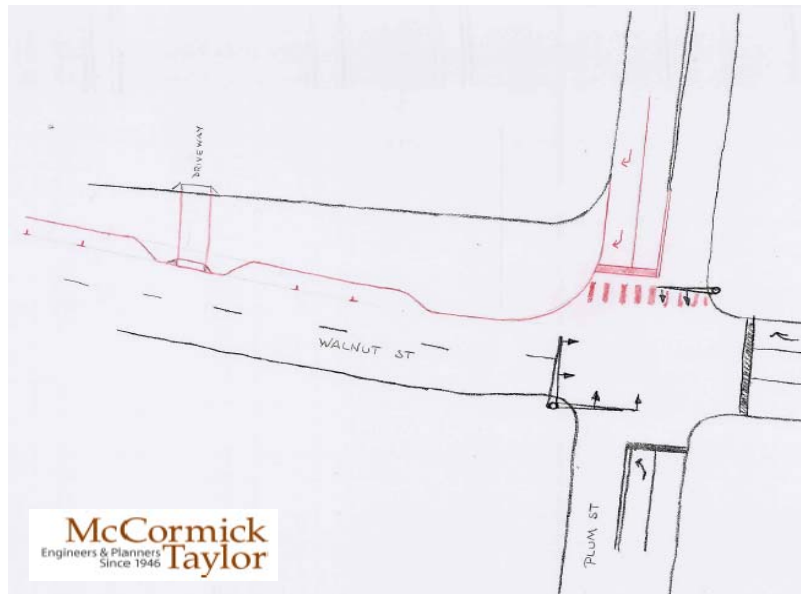


Component	Conventional Unit Cost (\$/square foot)	Green Unit Costs (\$/SF)
Pavement Removal/Excavation	\$1.08	\$1.08
Crushed Stone w/ geotextile	\$0.35	\$1.39
Pipes/Cleanouts/etc.	---	\$0.82
8-inch reinforced concrete	\$18.89	\$18.89
Permeable Pavers	---	\$19.44
Total Weighted Average	\$20.32	\$22.37
Additional Green Cost (\$/SF)	---	\$2.05
Additional Green Cost (%)	---	10%

**Conventional reconstruction
(8-inch reinforced concrete)**

**Green alley retrofit
(permeable pavers with infiltration trench)**

PLUM & WALNUT STREET INTERSECTION



The Lancaster Brewing Company “Beer Garden” is Coming!

Thanks to the “City of Lancaster” for the Walnut Street Project!

1. The project will capture stormwater run-off from Walnut and Plum Streets by allowing water to soak into the ground in “Water Collection Areas”. The City of Lancaster will save money with this “natural” treatment of stormwater while saving our friends down stream from us.
2. The intersection will get a huge improvement with safe crosswalks!

3. There will be a right turn on red from Plum onto Walnut Street - to keep the flow of traffic moving just like it does now.
4. Lancaster Brewing will get an awesome new brick patio with outdoor seating for you to enjoy a cold one and meal with friends!
5. The project is slated to start mid-summer with a fall completion.

Take a brochure from our friends from Live Green Lancaster to learn more about Green Projects around Lancaster

City of Lancaster “Green Infrastructure Project” for Stormwater Collection



**1.7 Million Gallons / year reduction in runoff volume
< \$0.20 / gal**

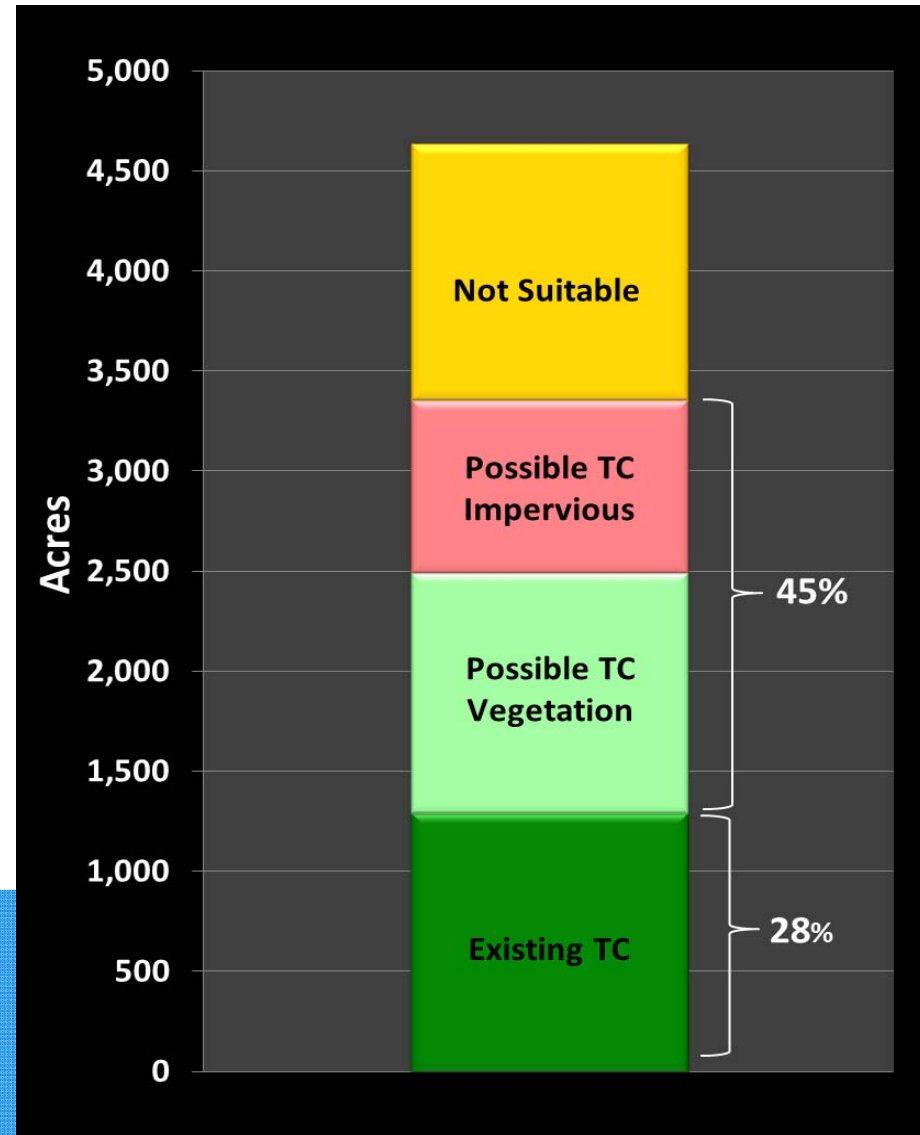
Rendering by **McCormick
Engineers & Planners
Since 1946 Taylor**

URBAN TREE CANOPY

Current: 28%

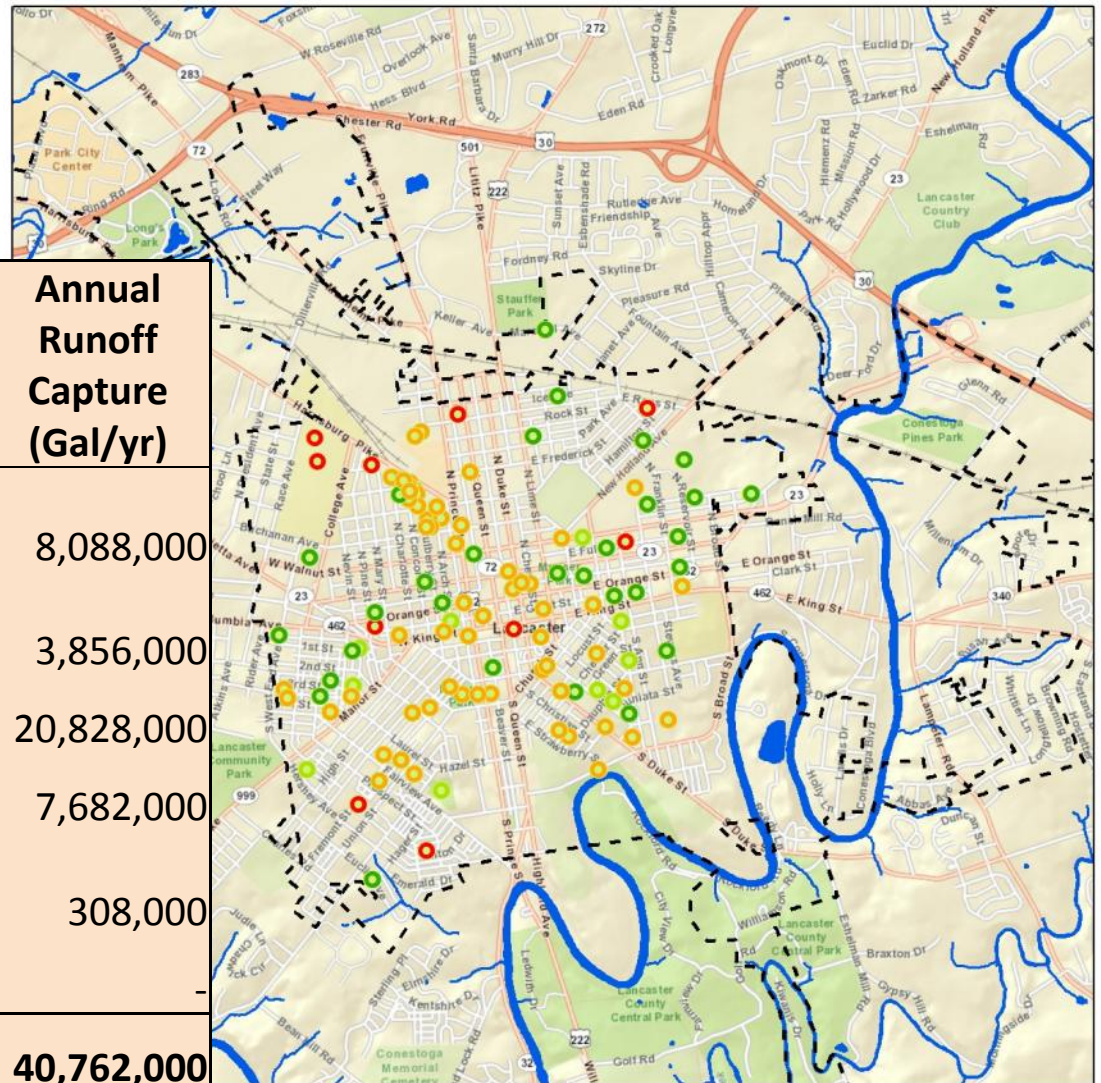
Potential: 45%

Goal: 40%



STATUS

Status	# of Projects	Impervious Area Managed (acres)	Annual Runoff Capture (Gal/yr)
Constructed /Under Construction	18	8.8	8,088,000
In Design for Construction	6	5.5	3,856,000
<i>Pennvest</i>	44	23.7	20,828,000
Conceptual Designs	16	8.6	7,682,000
<i>Growing Greener Plus</i>	5	2.0	308,000
In Project Planning	35	-	-
Total	124	48.5	40,762,000

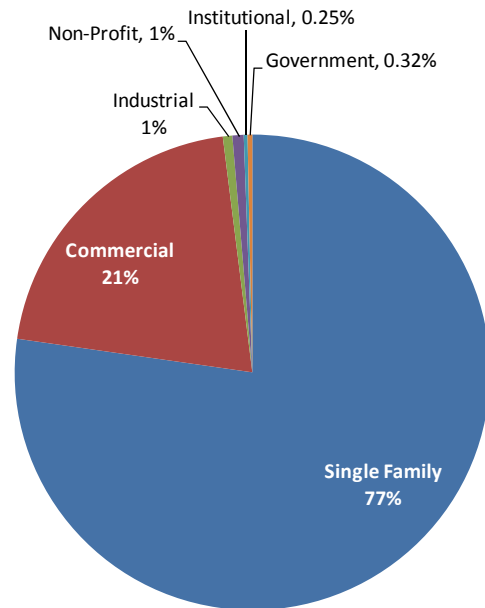




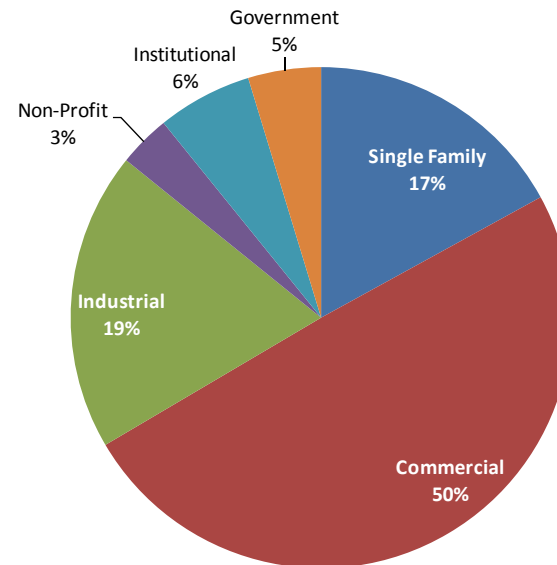
PAYING FOR IT

IMPERVIOUS AREA FEE ANALYSIS

Number of Properties



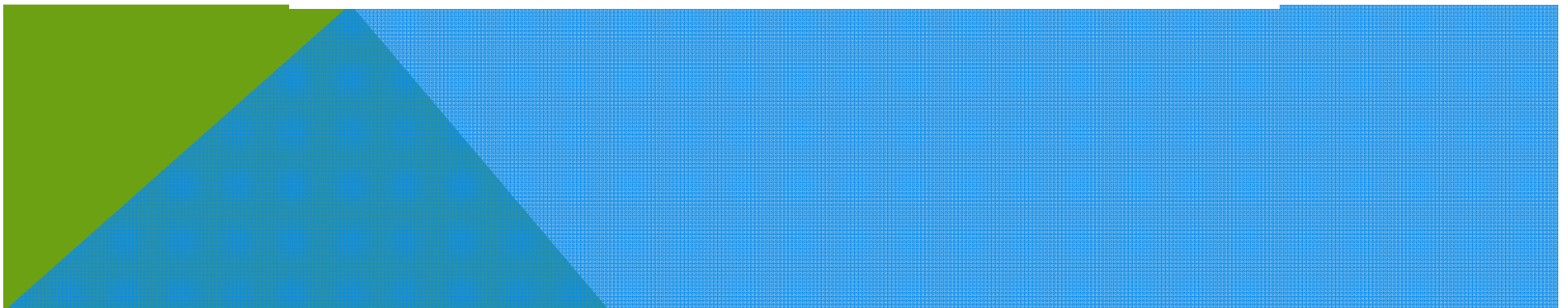
Number of ERUs



Single Family
Non-Profit

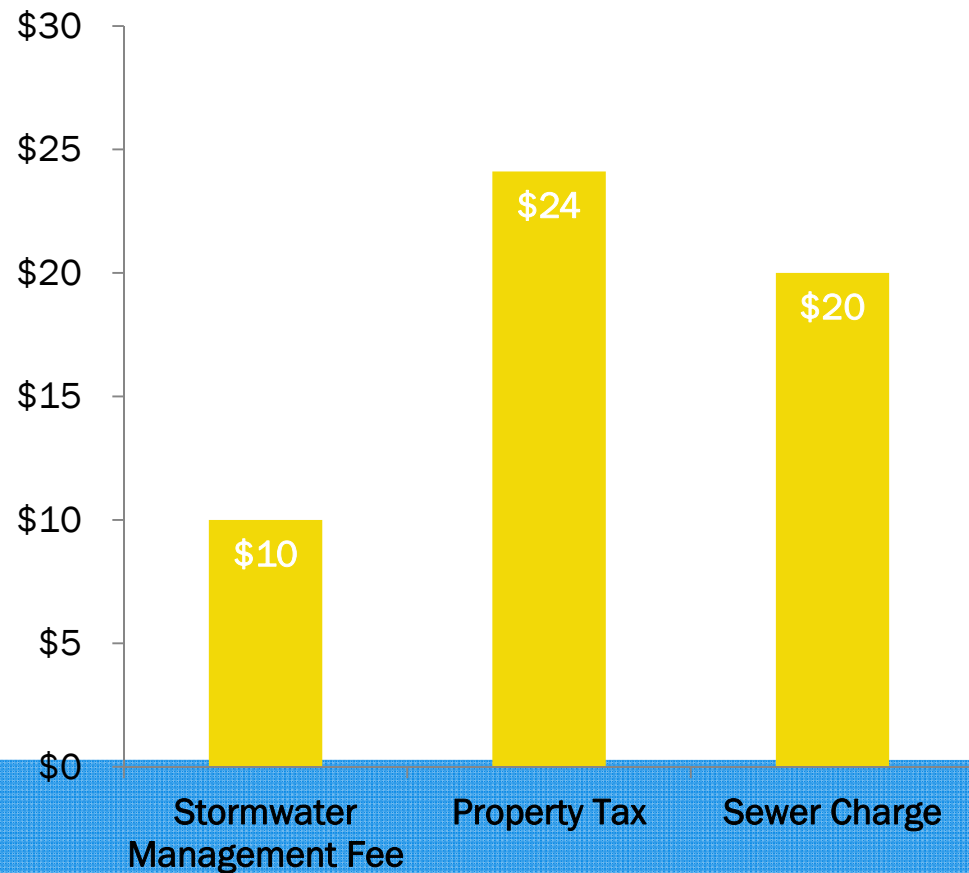
Commercial
Institutional

Industrial
Government



COMPARISON OF CHARGES – AVERAGE RESIDENTIAL

Comparison of Quarterly Charges



Rates and charges assume medium LOS
(\$4,800,000 annual program)

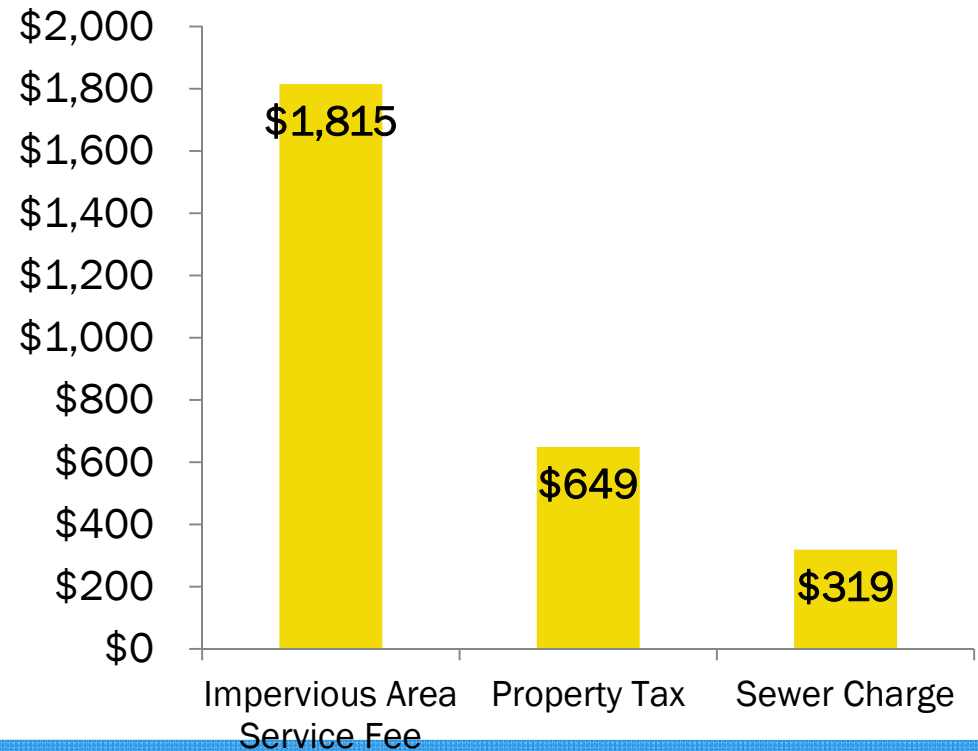


Residential	Impervious Area (sq.ft)	Assessed Value (\$)	Water Total (x1000 gal)
Avg. Value	1,367	72,558	48
Avg. Qtr. Fee	\$10	\$24	\$20
Max.Value	35,441	522,800	912
Max. Qtr. Fee	\$275	\$174	\$385

COMPARISON OF CHARGES -AVERAGE INDUSTRIAL



Comparison of Quarterly Charges



Assessed Value	Estimated Impervious Area (sf)	Estimated 2011 Water Consumption (1000 gal)
\$20,96,900	342,482	295

Rates and charges assume medium LOS
(\$4,800,000 annual program)

COMMUNITY EDUCATION AND OUTREACH



YOUR WATER.
YOUR MONEY.
YOUR CITY.

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[What Can I Do?](#)

[Benefits](#)

[Local Projects](#)

[Resources](#)

[What's New?](#)

[FAQs](#)

WATER HEROES



Chestnut Hill For Doreen Landis, Chestnut Hill Cafe's owner, Lancaster City's stormwater problem hits home. Literally.



Your Water.
Your Money.
Your City.

Lancaster, you can help

SAVE IT!

Lancaster City needs to save 750 million gallons of water annually from entering its combined sewer system to preserve clean drinking water, avoid costly fines and continue to build a healthy, vibrant community. Join our list serve and stay informed!

Enter your email



BABY STEPS:

I've got 5 minutes,
What can I do?

Take a shower instead of a bath.

BIG STEPS:

I've got 5 hours,
What can I do?

Install a rain barrel.

GIANT STEPS:

I've got 5 days,
What can I do?

Install a green roof.

Resources



EFFICIENCY CITIES NETWORK

Efficiency Cities Network – www.efficiencycities.org

Mayors Innovation Project – www.mayorsinnovation.org

American Rivers – www.americanrivers.org/initiatives/pollution/green-infrastructure/

NRDC – www.nrdc.org/water/

Water Environment Federation – www.wef.org/

EPA – <http://water.epa.gov/infrastructure/greeninfrastructure/index.cfm>

– <http://cfpub.epa.gov/npdes/stormwater/rulemaking.cfm>

– http://cfpub.epa.gov/npdes/home.cfm?program_id=6

Contact info for ECN



EFFICIENCY CITIES NETWORK

Administrator - ecn@efficiencycities.org

Listserv - ecnmembers@efficiencycities.org

Website - www.efficiencycities.org

To Join - www.efficiencycities.org/join-us