Metropolitan Planning Council

80 Years of Reinventing the Region

Weather Proof
Collaborative Stormwater Solutions

Tuesday, April 8, 2014

@metroplanners #weatherproof

JOSH ELLIS
METROPOLITAN PLANNING COUNCIL

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Stormwater Management: Regional Collaboration and Decision Tools for MS4 Permit Compliance

Metropolitan Planning Council

April 8, 2014

Presented by:

CH2MHILL.

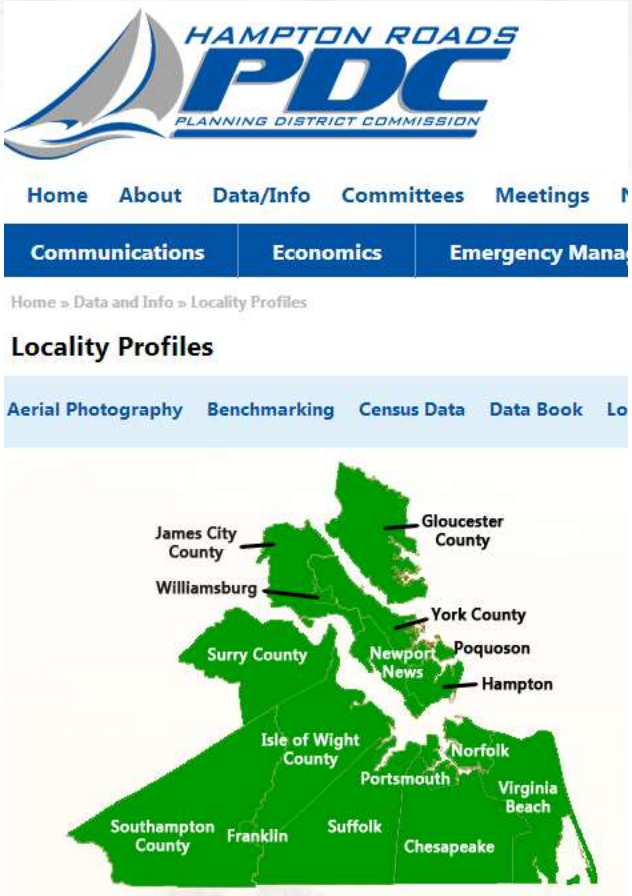
Presentation Outline

- **Examples of Collaborative Regional Stormwater Programs for MS4 Permits and Climate Resilience**
- **Green Infrastructure Programs at City/County Scale:**
  - Onondaga County NY
  - Lancaster PA
- **Tools:**
  - Site Evaluation Tools – Business Case Analysis
  - Triple Bottom Line Analysis
  - Innovative Financing:
    - Impervious Area Based Stormwater Utility Fees
    - Credits/Rebates
    - Public Private Partnerships

Collaborative Regional Stormwater Program Examples: HR Storm

(HRstorm.org and askHRGreen.org)

- Stormwater education program of the Hampton Roads Planning District Commission (HRPDC), in Tidewater VA
- Coalition of local government staff members from 16 cities/counties to share ideas and pool resources for targeted educational program efforts about stormwater management
- Started by HRPDC's Regional Stormwater Management Committee in 1992 after NPDES Phase 1 stormwater permits.



Collaborative Regional Stormwater Program Examples: HR Storm

(HRstorm.org and askHRGreen.org)

FROM THE HOMEFRONT TO THE WATERFRONT

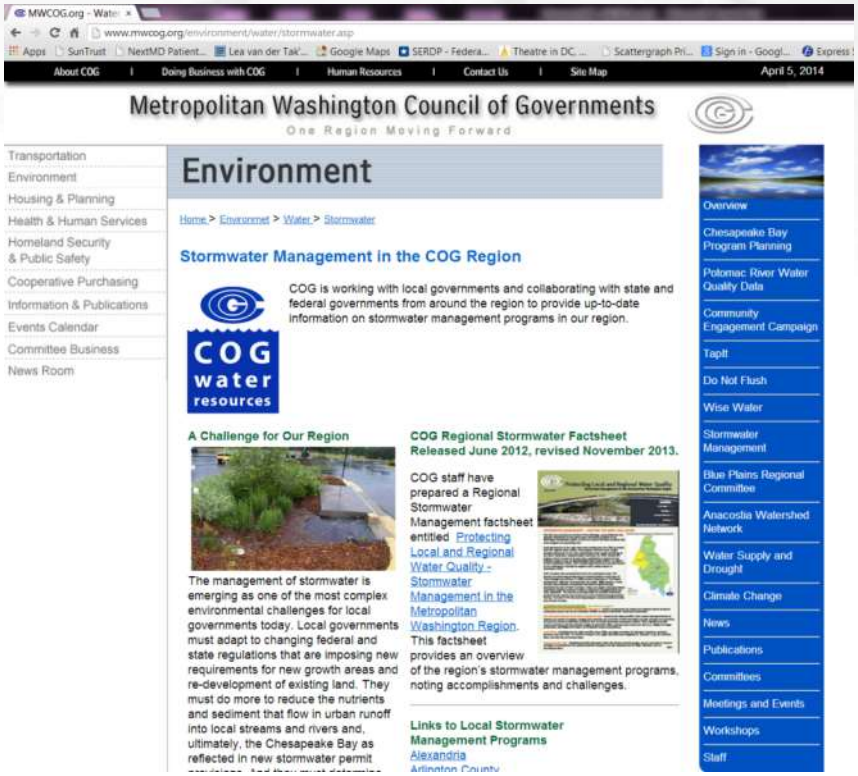
H R STORM

CLEAN WATERWAYS BEGIN WITH YOU

- **HRStorm replaced in 2011 with broader program (stormwater, FOG, recycling, water awareness), and rebranded as askHRgreen.org:**
  - Materials (brochures)
  - Tools
  - Media kits
  - Tips
- **Surveys and annual reports (3 online surveys – 2010-2013):**
  - Gauge the region's environmental literacy
  - • Identify target audiences for specific behaviors
  - • Establish a baseline for evaluating campaign progress

Collaborative Regional Stormwater Program Examples: Washington DC Region (COG) and Local (TWG)

- **MWCOG (http://www.mwcog.org/environment/water/stormwater.asp)**
  - MWCOG's water resources committee facilitates regular meetings on regional regulatory and stormwater management issues for DC, MD, VA localities
  - Provides a clearinghouse for resources, though does not produce educational materials
- **Washington DC' Stormwater Technical Working Group (interagency collaboration on policy and regulations):**
  - MS4 reporting
  - Guidance and design criteria
  - Updated regulations



Collaborative Regional Stormwater Program Examples: Southeast Florida Climate Compact

http://southeastfloridaclimatecompact.org/

Regional agreement of 4 counties to address:

- Sea level rise
- Storm surge
- Extreme precipitation

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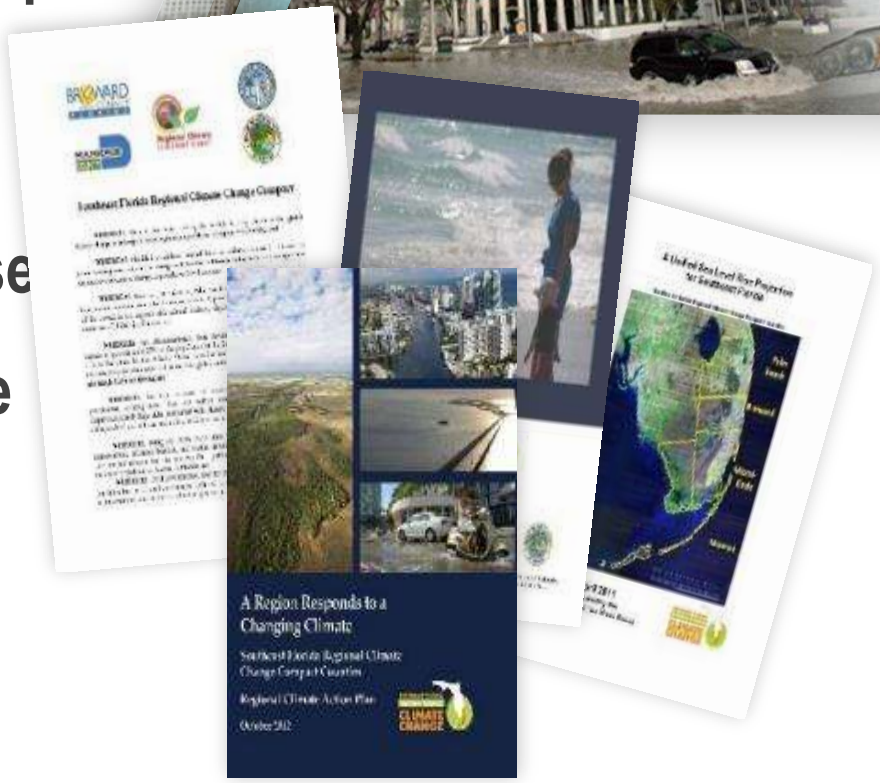

- Studies
- Annual Summit
- Clearinghouse for news, events, documents

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Balanced Approach to Urban Catchment Management: Gray + Green

Onondaga County, NY's *Save the Rain*
Green Combined Sewer Overflow Program

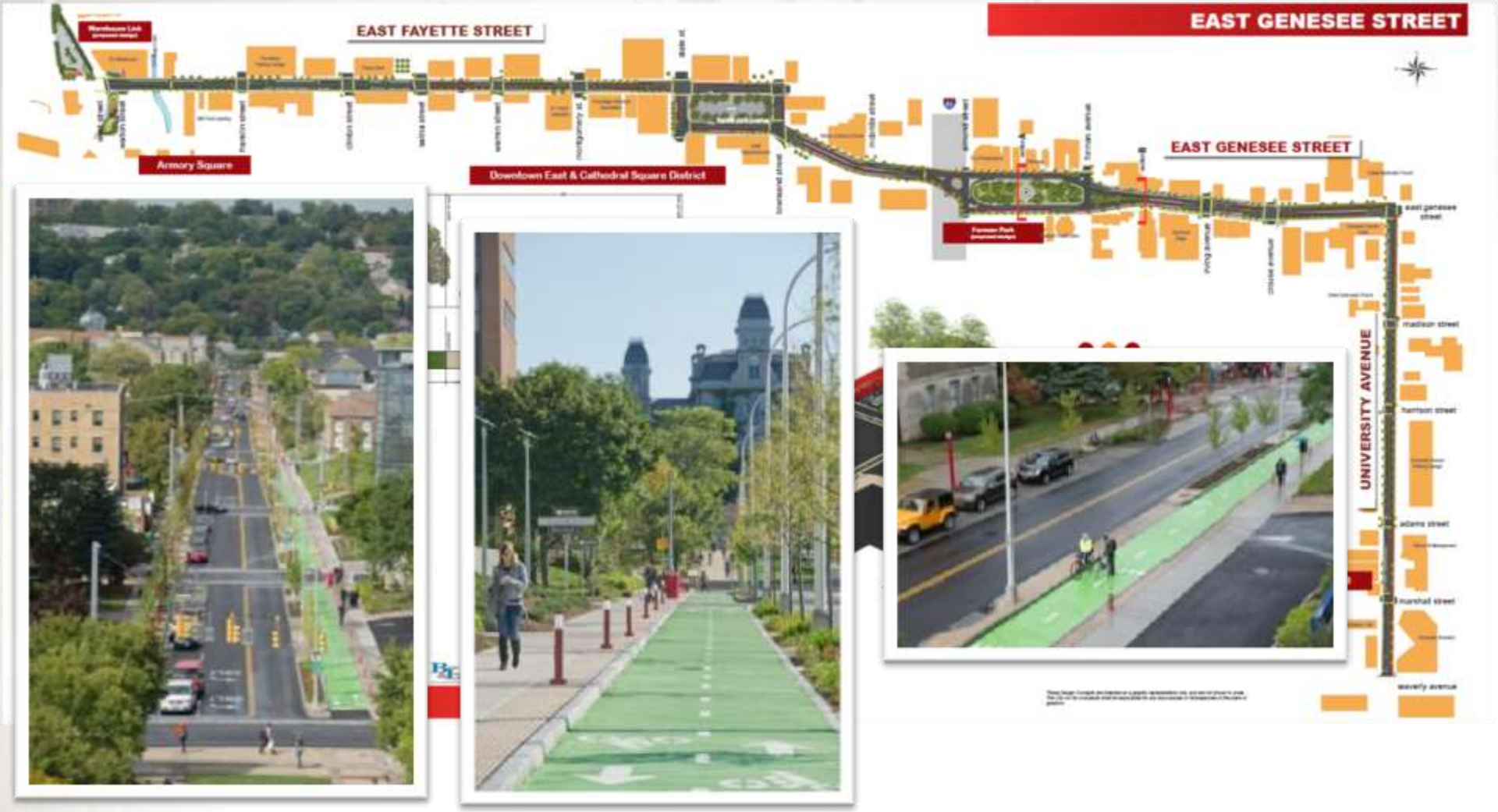
- Led a rapid planning, analysis, and negotiation process to **amend the federal Consent Judgment** to a balanced green-grey approach
- Formed close partnership between County and City of Syracuse agencies to enable GI implementation
- Completed ***Project 50*** in 2011 – over 50 distinct GI projects in a single year
- Local, regional, and **national recognition** for the client
- **Signature green projects**: Streets, Parks, Libraries, Post Offices, the Zoo, and:
  - War Memorial Cistern Rainwater Reuse System
  - **1st U.S. Hockey Team to Play on "Green Ice"**
  - OnCenter Convention Center Green Roof
  - **2nd Largest Green Roof in NY** (66,000 SF)
  - Harbor Brook CSO Wetland Treatment System
  - **1st CSO Treatment Wetland in NY**
  - Connective Corridor – **USGBC Leadership Award**

Over 120 GI projects constructed since 2009

Align Regulatory and Community Goals: Water Quantity and Quality Objectives with Quality of Life Impacts

Provide incentives for retrofitting impervious area on private property

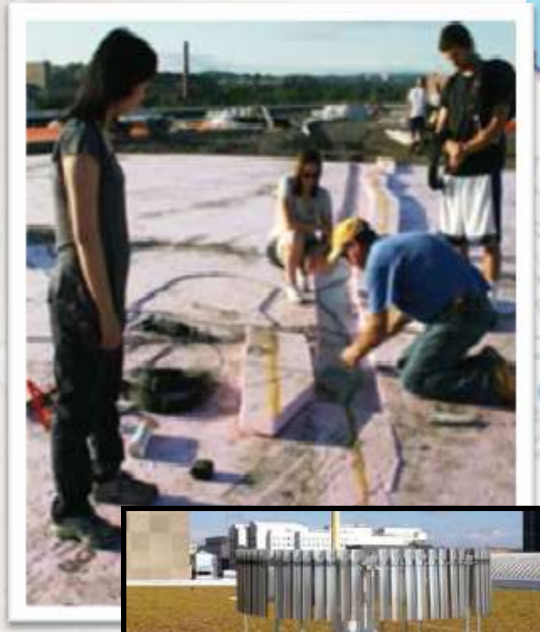
Understand Infrastructure Drivers, as they can and will Influence Funding

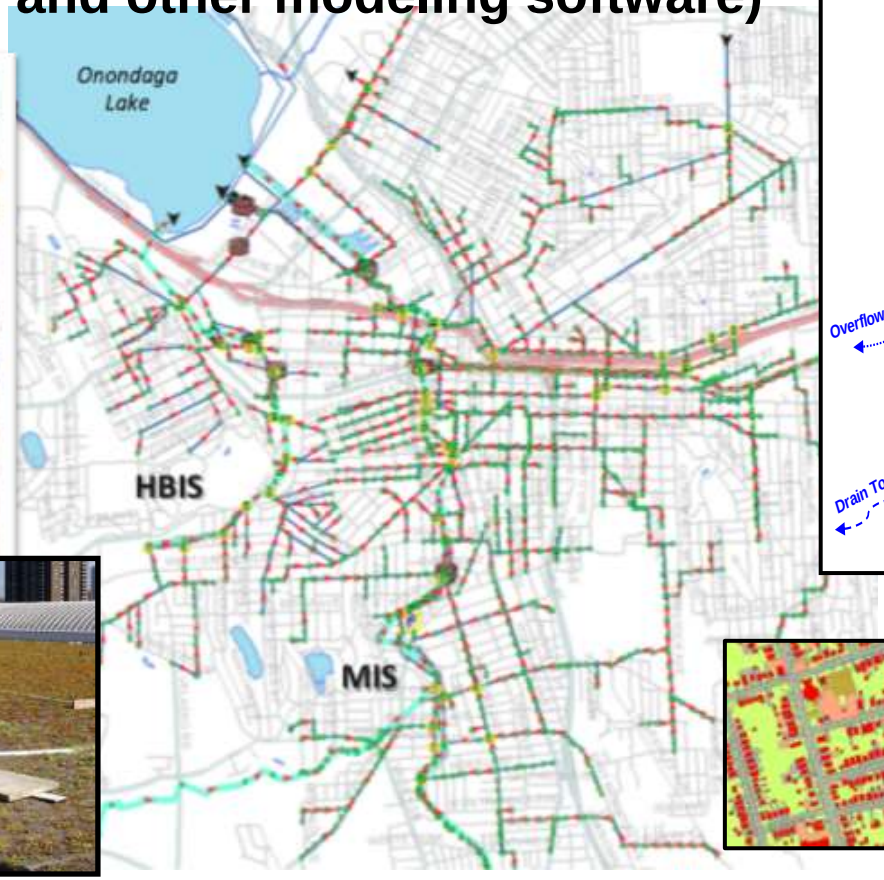


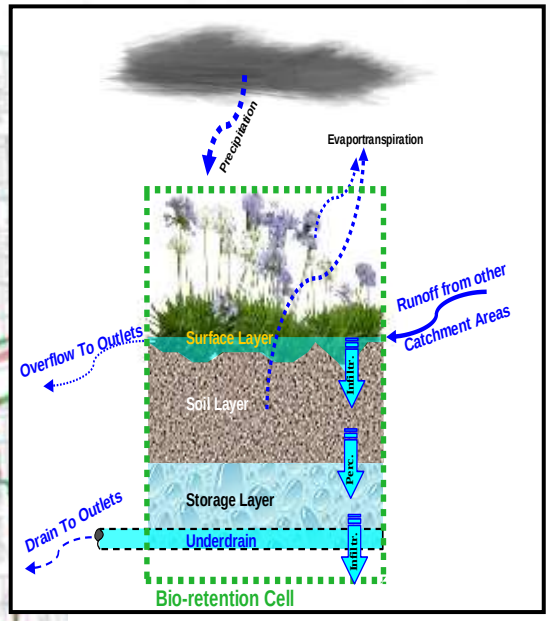
Connective Corridor Project (Onondaga County, NY)

Develop Quality Verification Systems to Track Performance and Create Regulatory Transparency

- Parcel level mapping of impervious surfaces, and retrofits
- Robust Monitoring Program (Micro and Macro)
- Modeling (SWMM and other modeling software)







Develop Quality Verification Systems to Track Performance and Create Regulatory Transparency

- **Maintenance Program based on holistic Asset Management (Gray + Green)**

2222847

2222847 - Porous Pavement Vacuuming Lot # 3

WATER ENVIRONMENT PROTECTION

Work Description

WO: 2222847 Report Date: 1/31/2012 10:30:41 AM Reported By: HJOHNS

Work Type: PM Status: WSCH Supervisor: PCENTO

Job Plan: 5384 SMP-01 Porous Pavement Vacuuming Asset: 15193 Porous Asphalt Parking Lot Location: 10714 E-06 City Lot # 3 Oswego Blvd

WO #	Meas. Point	Value	Date	Observation
2222848				
2222849				
2222850				
2222851				
2222852				
2222853				

Onondaga County, New York
Save the Rain Program
Green Infrastructure
Maintenance Manual

Prepared for
Onondaga County, New York

Prepared by
CH2MHILL

January 2012

Save the Rain

Lancaster, PA Green Infrastructure Program

- $75M GI Implementation Program
- Chesapeake Bay Watershed
- Partnering with US EPA R3 to pilot an integrated municipal planning approach to reduce CSO/MS4 discharges and nutrients
- Integrated Water Quality, Transportation and Community Enhancements
- Public Private partnership improves local businesses and adds clean water Infrastructure at less cost

Status	Number of Projects	Impervious Area Managed (sq. ft.)	Impervious Area Managed (acres)	Annual Runoff Capture (Gal/yr)
Constructed / Under Construction	24	611,400	14	12,117,000
In Design for Construction	21	636,600	15	11,240,000
Conceptual Designs (non-PV/GGP)	28	730,400	17	9,026,000
Conceptual Designs (PENNVEST)	31	584,300	13	10,432,000
Growing Greener Plus Concepts	2	29,400	0.7	588,000
In Project Planning	43	-	-	-
Total	149	2,592,100	60	43,403,000

Lancaster Green Infrastructure Program

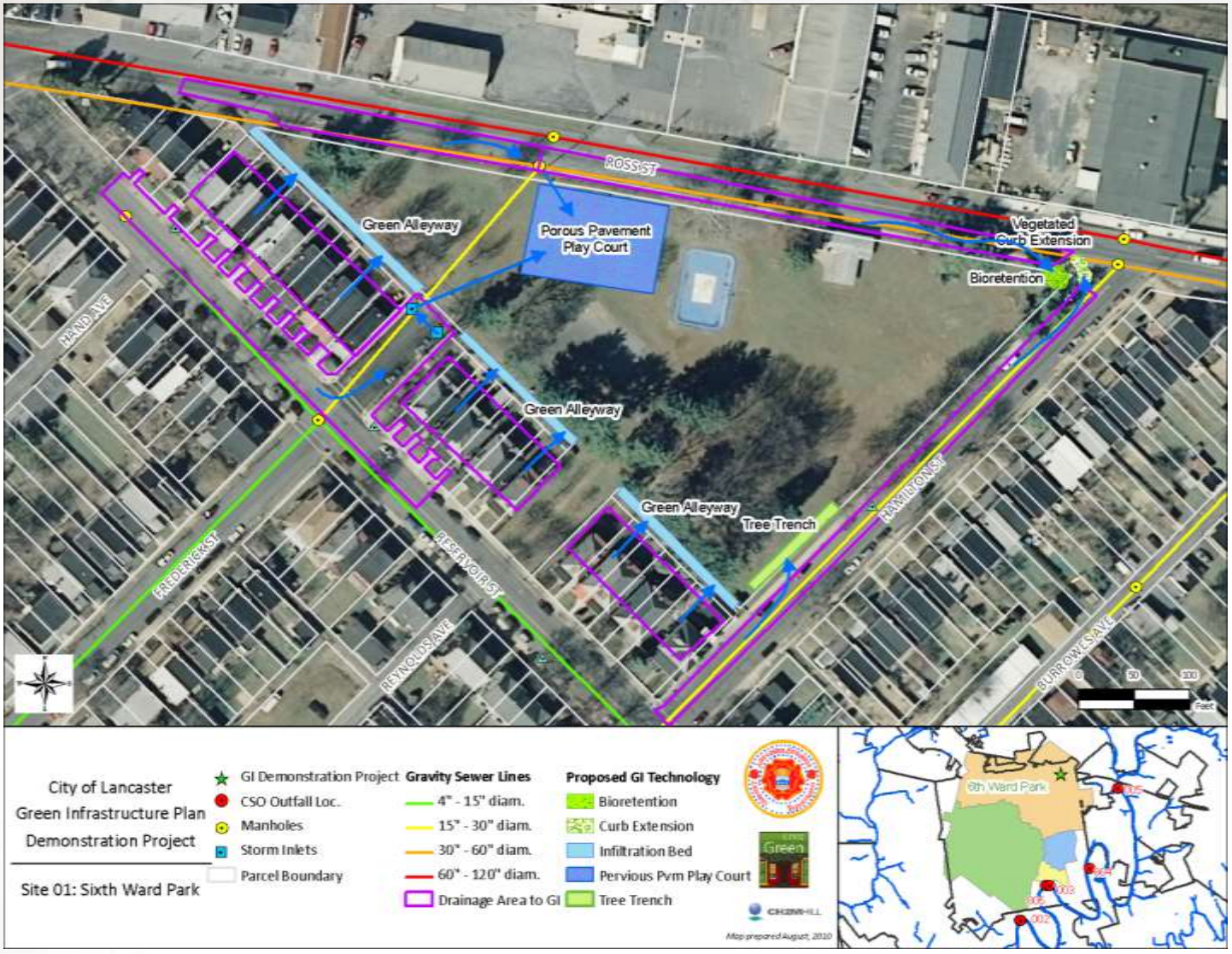
Roads & Alleys

Parking

Rooftops

21

Project Concepts in GI Plan Document Managed Impervious Areas and Secured $11.5 M in Funds

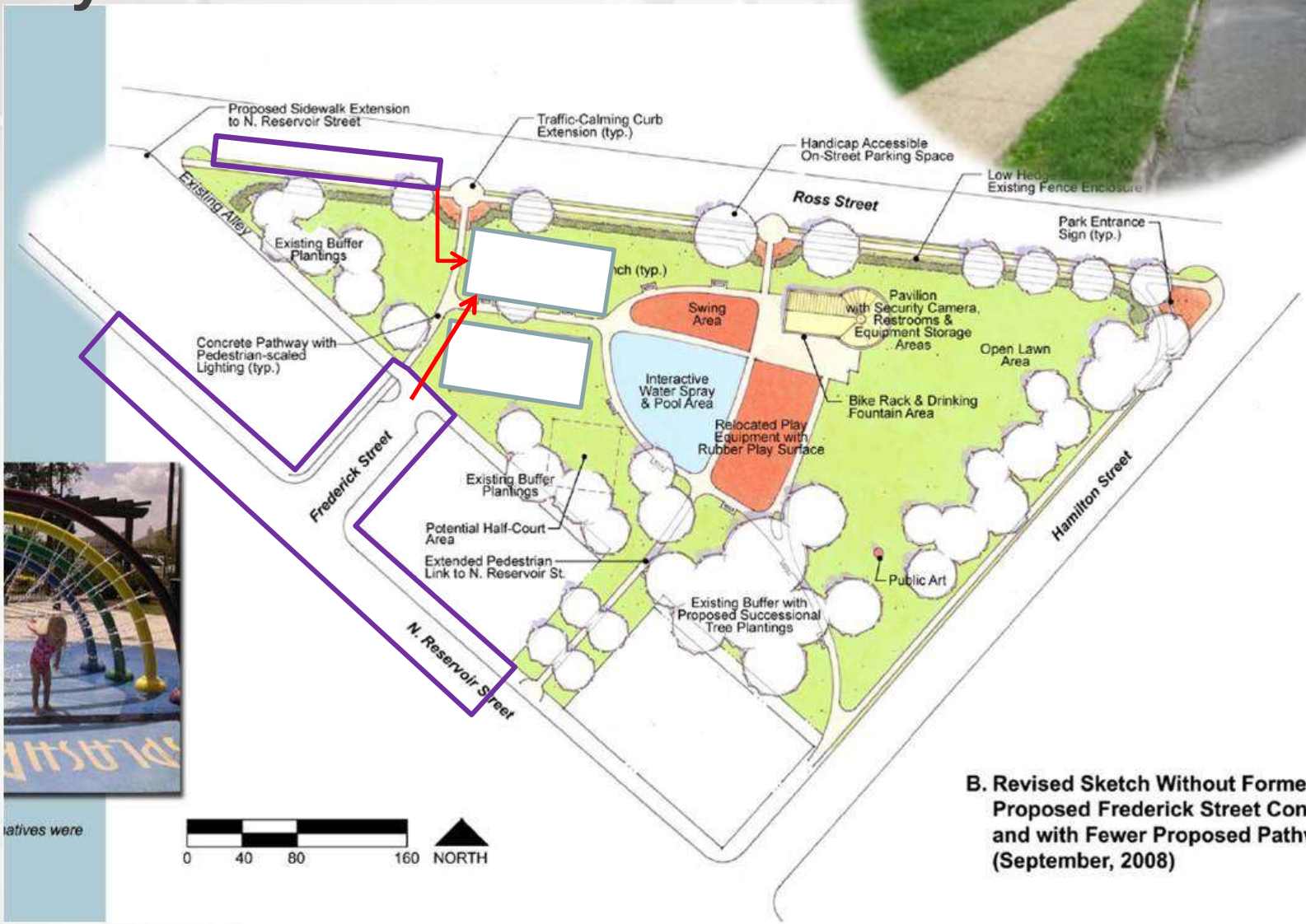


Implementation Programs

Based on Integrated Infrastructure:

- Green Streets & Alleys
- Green Parks
- Green Parking Lots
- Vegetated Roofs
- Enhanced Tree Planting
- Green Schools & Public Facilities
- Private Property

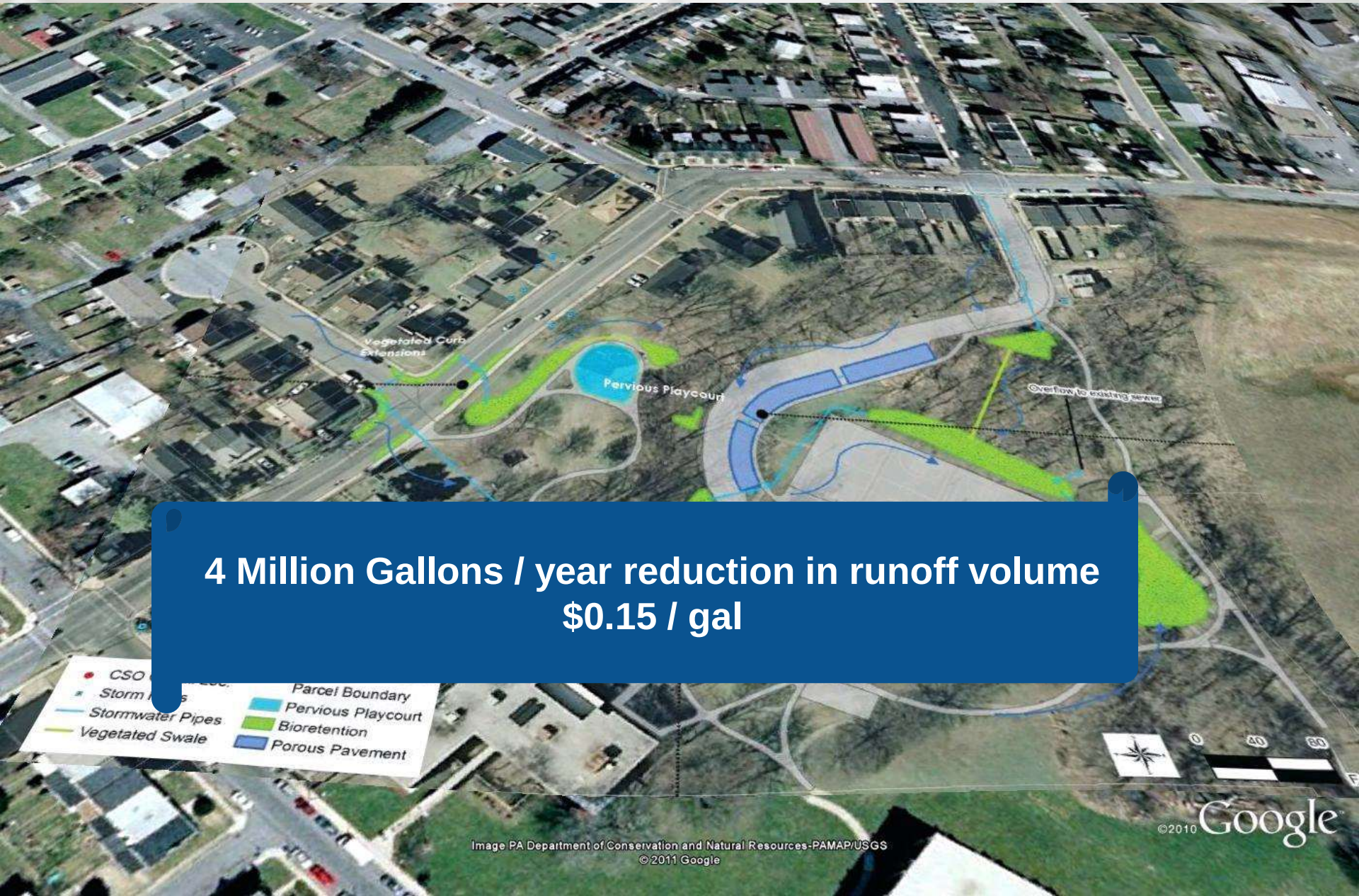
6th Ward Park Plan – Extending the Benefit of the Playcourt



B. Revised Sketch Without Formerly Proposed Frederick Street Connection and with Fewer Proposed Pathways (September, 2008)

6th Ward Park Re-dedication Ceremony

Brandon Park



4 Million Gallons / year reduction in runoff volume
$0.15 / gal

Alley 148 Greened for 10% Additional Cost

Before (July 2011) ~$20.30/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 ~$20.30/SF
(8-inch reinforced concrete)

After (February 2012) ~$22.40/SF

Green alley retrofit ~$22.40/SF
(permeable pavers with infiltration trench)

Composite prioritization criteria for Pavement Assessment, ADA Ramps, and GI

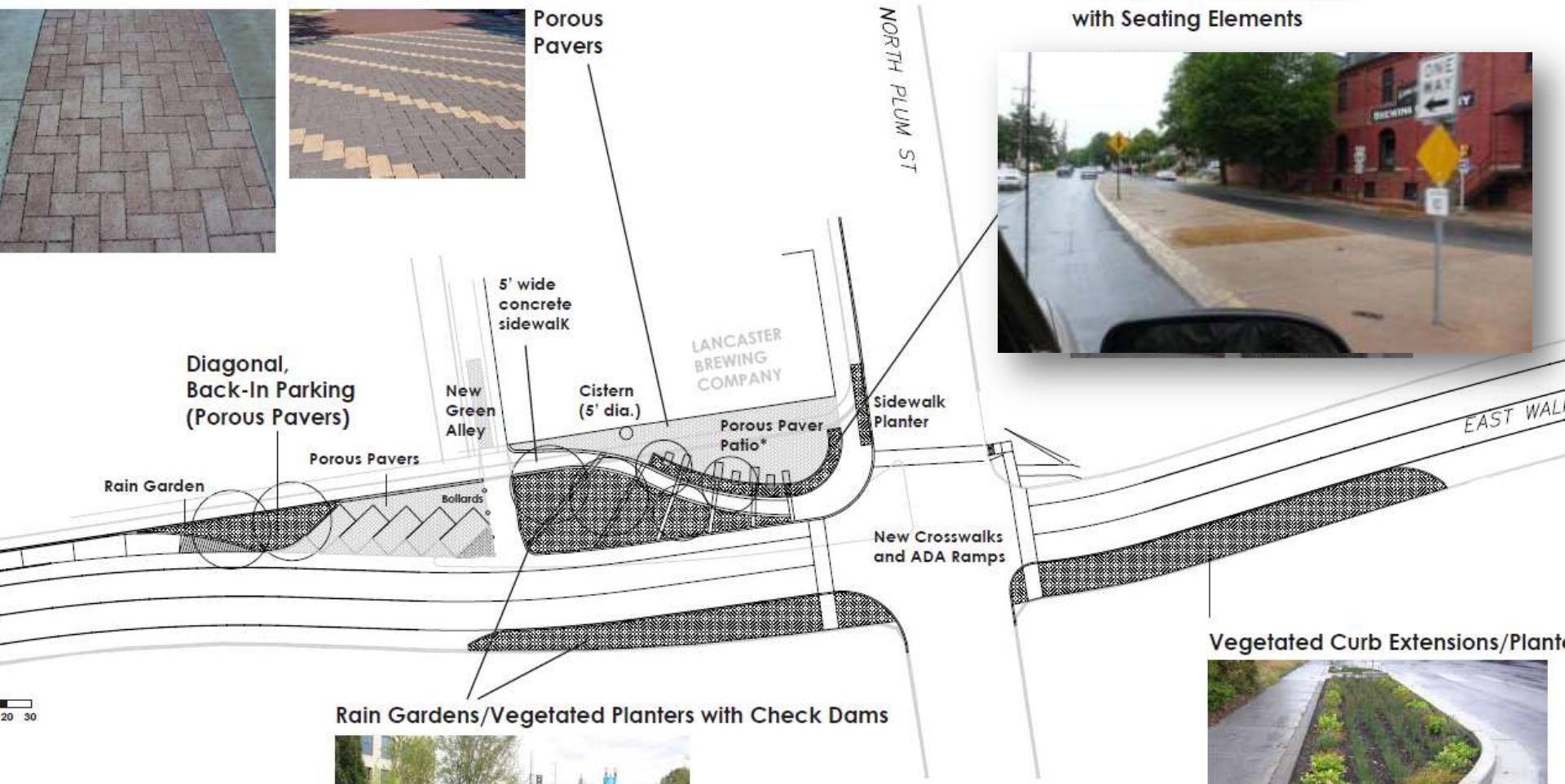
Green Street Potential

Conventional Pavement Restoration

Using traffic safety and transportation funding to reduce accidents *and* runoff

Porous Pavers

Potential Curvilinear Planter with Seating Elements



Rain Gardens/Vegetated Planters with Check Dams

Vegetated Curb Extensions/Plant

ize = approx. 2000 sf

ed Seating for at least 50
based on approximate

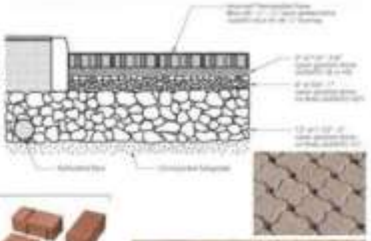
Public Outreach/Education

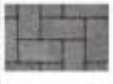
Permeable Paver System Examples

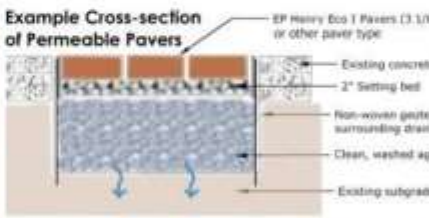
Alley 148, Lancaster, PA

"Boardwalk" Permeable Pavers, University Avenue, Syracuse, NY

Hanover Permeable Pavers







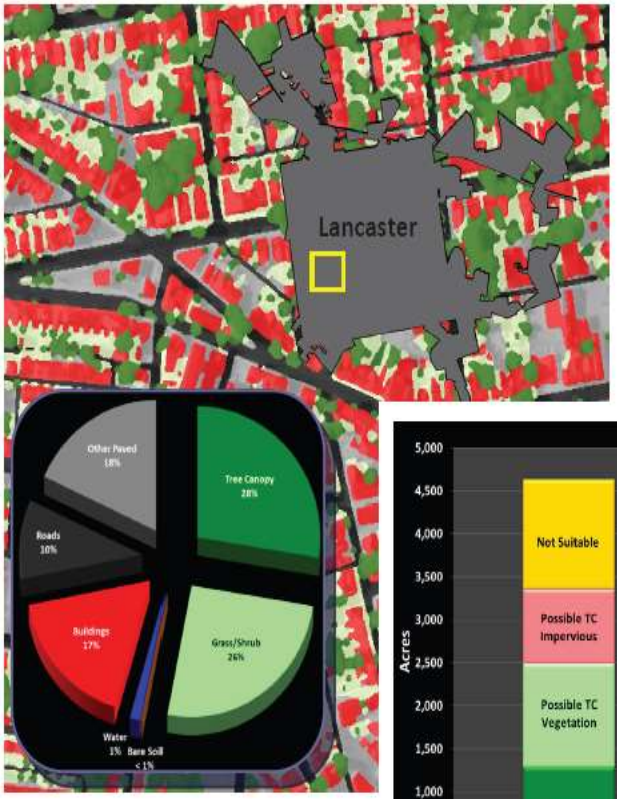
the city of Lancaster
a city authentic

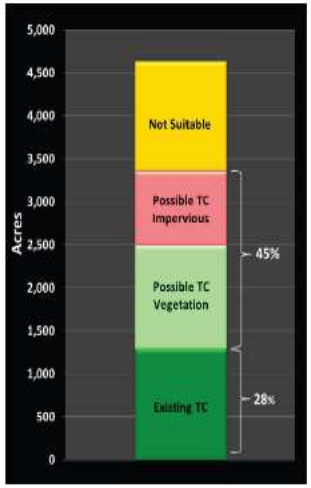
Mifflin St. public Parking lot emphasizes safety and tree canopy

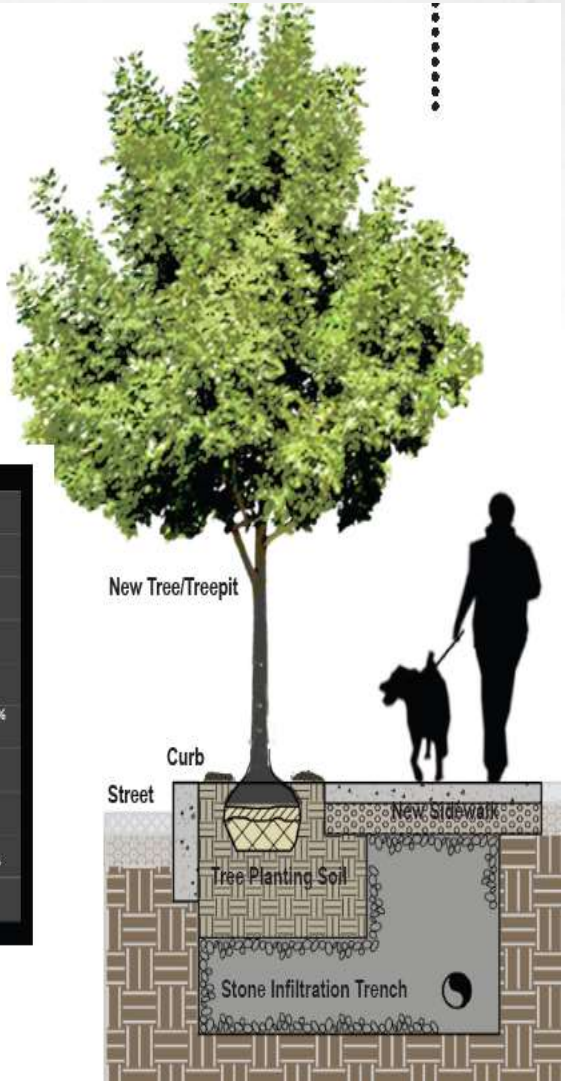
Annual SW Capture = 614,000 gallons

Urban Tree Canopy Assessment & Enhanced Tree Plantings

- Funded by PA-DCNR Bureau of Forestry
- GIS analysis of existing tree canopy by Univ. of Vermont
- Prioritize potential planting areas and locations for canopy preservation
- Model for other urban Chesapeake Bay watershed communities
- Follow-Up Tree Inventory







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Develop Cost Effective Business Case Model to Facilitate Planning and Decision Making

GIF CALCULATOR FOR MAXIMUM FUNDING AMOUNT TOWARDS GREEN INFRASTRUCTURE (GI) COSTS

User Inputs Shaded in Green

Project Name: ABC Corporation
Project Location: CSO-006
Priority Level: High

Step One

Global Inputs:

Average Annual Rainfall (in/yr)	39.34
Funding Limit for GI ($/gal/yr runoff reduction)	$ 0.39

Step Two									Step Three			Step Four	THESE COLUMNS ARE SPECIFIC FOR CISTERN SYSTEMS	
Column A	Column C	Column D	Column E	Column F	Column G	Column H	Column N	Column O	Column P	Column Q	Column R	Column M	Column S	Column T
Proposed Green Technology	Typical GI Unit Cost	Unit	Proposed GI Quantity	Parcel Controlled Impervious Drainage Area (SF)	Annual Runoff Volume (gal/yr)	Capture Volume (in.) [must be between 0.125 and 2 inches]	Estimated Annual Runoff Capture (%)	Estimated Annual Runoff Capture (gal)	Potential Funding Limit based on Capture	Required GI Storage for Drainage Area (CF)	Potential Funding Limit Based on Typical Unit GI Costs	Total Average $/gal/yr Cost Based on Typical Unit GI Costs	Recommended Maximum Funding Limit (Lesser of Capture and Unit Cost Funding Limits)	Cistern Capture Volume (in.)	Cistern Volume Required for 1 inch Capture (gal)
Porous Pavement	$ 12.00	SF				1.00	90%						$0	N/A	N/A
			Total:	0				0	$0	0	$0		$0		

Additional Required Work: $

GI Construction $/gal/yr:

Step Six

Cost Summary Table

	Requested Funding (Based on Application)	Maximum Funding (Based on Calculator)	Maximum Funding (Lesser of Application versus Calculator)
GI Construction		$0.00	$0.00
GI Engineering		$0.00	$0.00
Field Testing		$0.00	$0.00
Final Maximum Funding (NTE Actual):			$0.00

Green Infrastructure Measure	Description	Unit	Unit Cost
Rain Garden	Intended to collect runoff volume in a depression that ponds volume and may or may not include overflow piping	SF	$ 10
Bio-Retention	Similar to a rain garden, and includes subsurface storage and underground piping, and an overflow system of some type	SF	$ 15
Underground Infiltration System	Subsurface stormwater storage system consisting of clean gravel, modular storage (such as arch chambers, etc.), and deep enough to penetrate below frost depth; intended to store full runoff volume while infiltration occurs over time (commensurate with soil infiltration testing); typically manages runoff from an area at least 5 times its own area	SF	$ 25
Green Roof	Intended to be able to collect 1.0 inch of runoff before overflow, or system will be prorated by OCDWEP accordingly (unit cost funding may be higher if Green Roof is only GI option available on property)	SF	$ 12
Porous Pavement	All types, including adequate subbase to store runoff volumes in accordance with site requirements; typically designed to manage runoff from adjacent impervious area (conventional pavement, roof areas, etc.)	SF	$ 12
Tree	Caliper size must be 2 inches or greater	Ea	$ 400
Tree Pit/Trench	Must exhibit characteristics of Underground Infiltration System	SF	$ 25
Cistern Capture & Release	The "Funding Limit for GI" ($/gal) is pro-rated at 75% when using this type of system	Gal	$ 10
Cistern Reuse	The "Estimated Annual Runoff Capture" is pro-rated at 75% when using this type of system	Gal	$ 10
Added Green Space	Also known as "removal of impervious area." Impervious area and subbase (if any) must be completely removed, subgrade adequately prepared, and suitable soils installed	SF	$ 5
Dry Well	These are evaluated on a case-by-case basis, as they come in many shapes and sizes depending on the application; expectation is that they perform similar to Underground Infiltration Systems; contact OCDWEP to confirm Unit Cost	Gal	$ 10

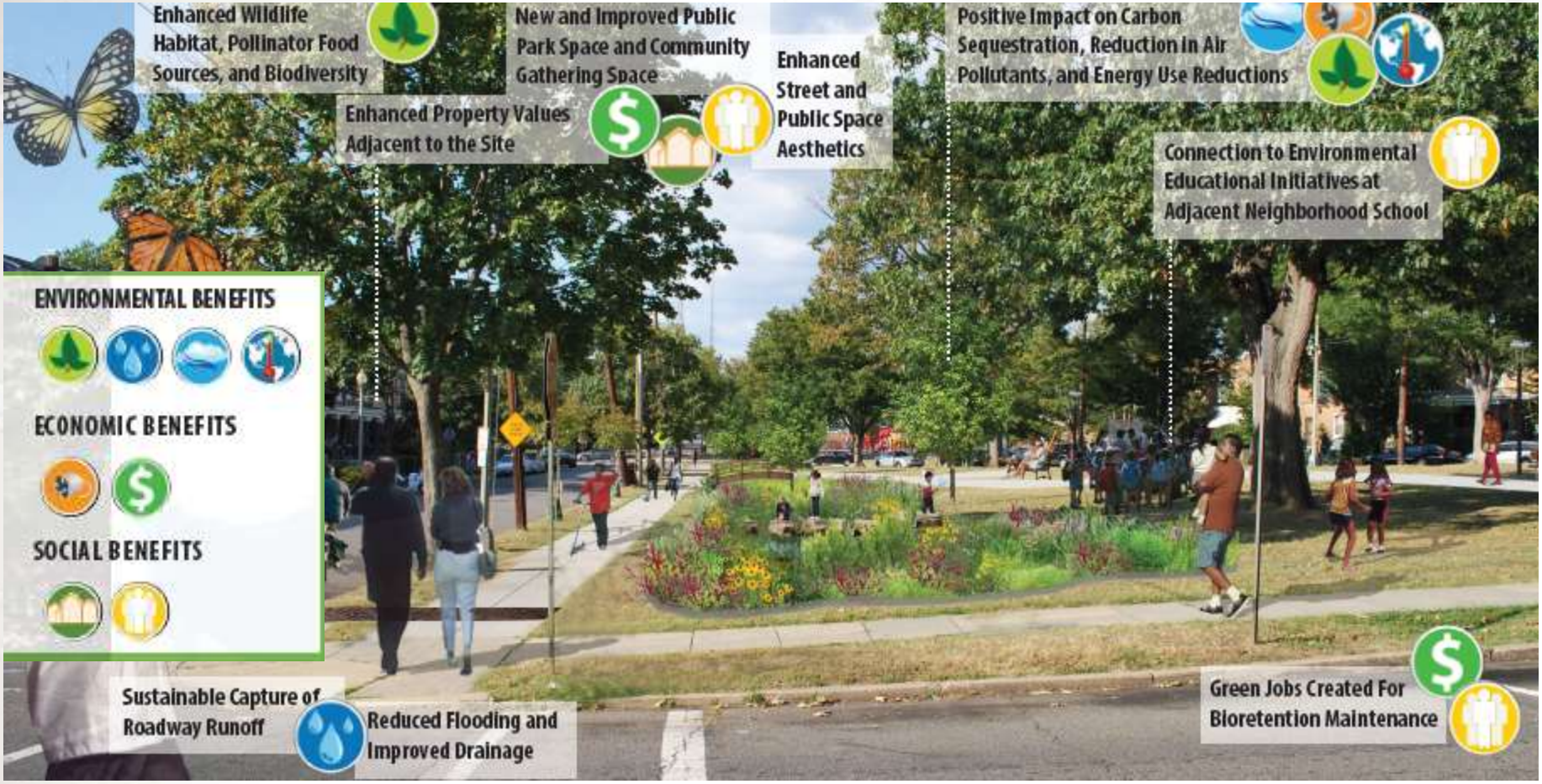
Green Roof Unit Costs	
Roof Priority	Unit Cost per SF
Low	$ 4
Medium	$ 8
High	$ 12
Priority	High

Notes:

1. This calculator has been revised to reflect the most recent GIF program modifications (June 2013). It should not be used to calculate award values for previously reviewed projects.
2. This calculator is solely for the purposes of Save the Rain GIF application funding determinations, and specifically not for design, sizing, or other GI purposes.
3. Save the Rain is not responsible for potential calculator errors, and all values are subject to review, approval, and verification by Onondaga County.
4. If actual GI construction cost is expected or known to be less than the Maximum Funding (based on calculator), this value should be entered accordingly.

Triple Bottom Line Analysis of Adaptation Strategies Promotes Mitigation and Other Co-Benefits (Economic, Social, Environmental)

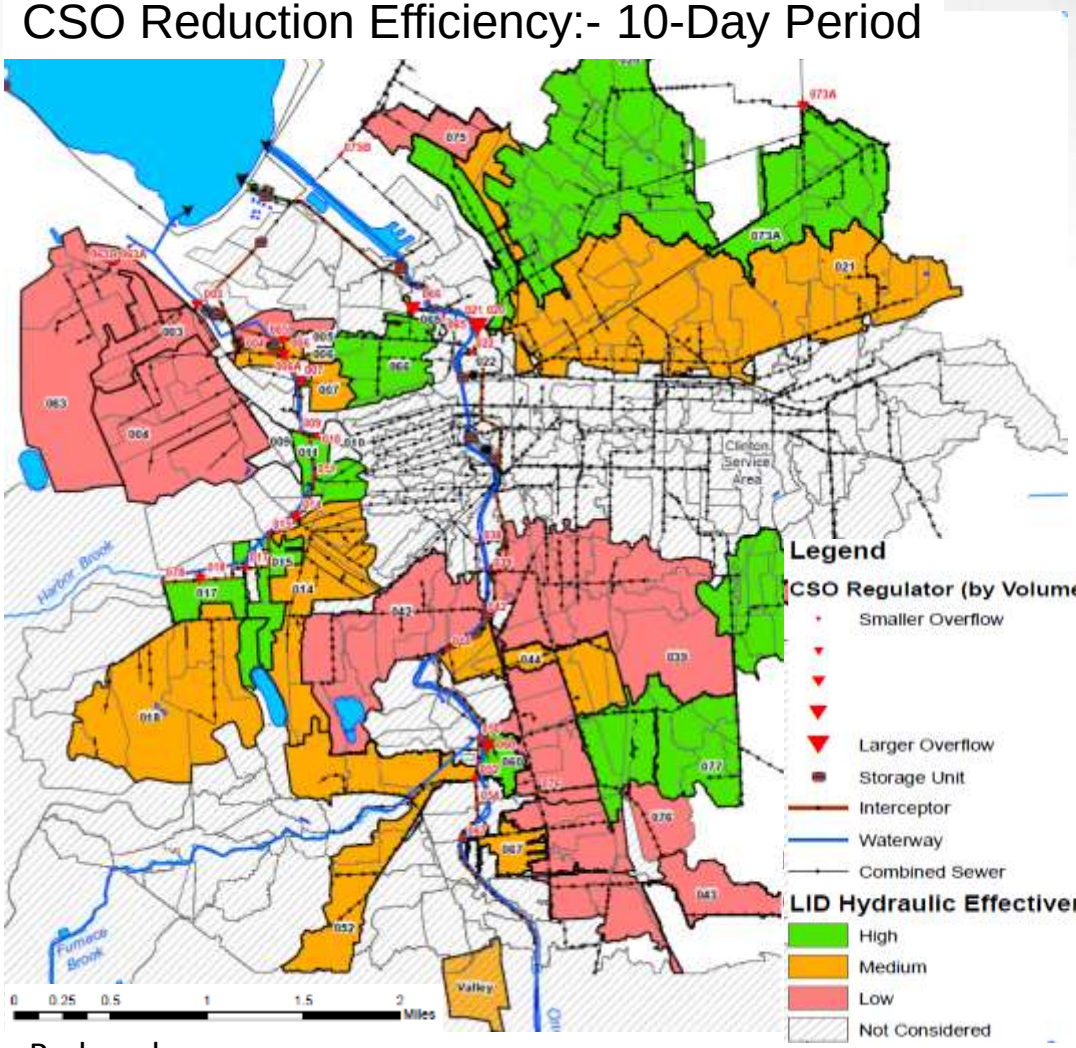
DC Water GI Challenge Award Submissions



Modeling and Optimization Tools Can Target GI Retrofits for Maximum CSO Reduction Efficiency

- **Factors affecting LID impact**
  - Baseline condition overflow
    - Degree / frequency of surcharge
  - Regulator hydraulics
  - Hydraulic interactivity from adjacent basins

CSO Reduction Efficiency:- 10-Day Period

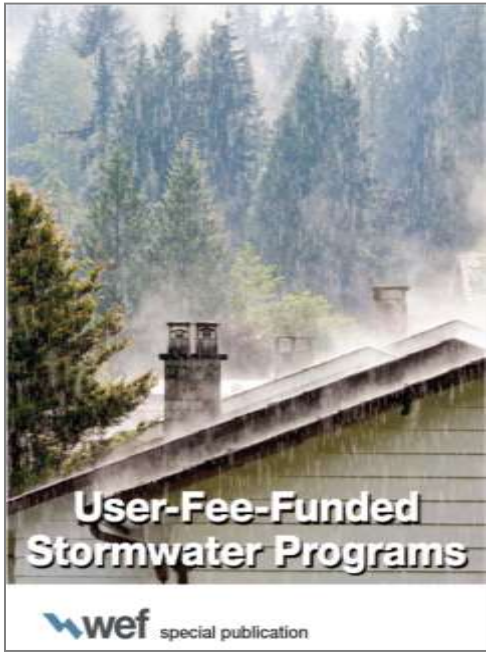


Efficiency = CSO volume Reduced ÷ Inflow Volume Reduced

Stormwater user fees are an equitable mechanism for funding stormwater programs

- ***Regulatory compliance requirements***
- ***Stormwater management needs***
- ***Economic development initiatives***

To address these issues, a *reliable*, *dedicated* funding mechanism is needed



Leveraging Grants and SRF Loans to Incentivize Green Infrastructure Investments

- **Incentive Programs** Encourage Installation of Stormwater Projects on Private Property, Helping with MS4 and CSO Permit Requirements

- Incentives come in 2 forms:
  - **Rebates or Grants** 1 time assistance with construction cost:
    - For example up to $1,200 for residences, $5,000 for businesses to install GI
  - **Credits** – a percentage reduction in the annual impervious area fee:
    - For example up to 50% for businesses treating impervious area with green infrastructure projects

RiverSmart Homes
clean water starts here

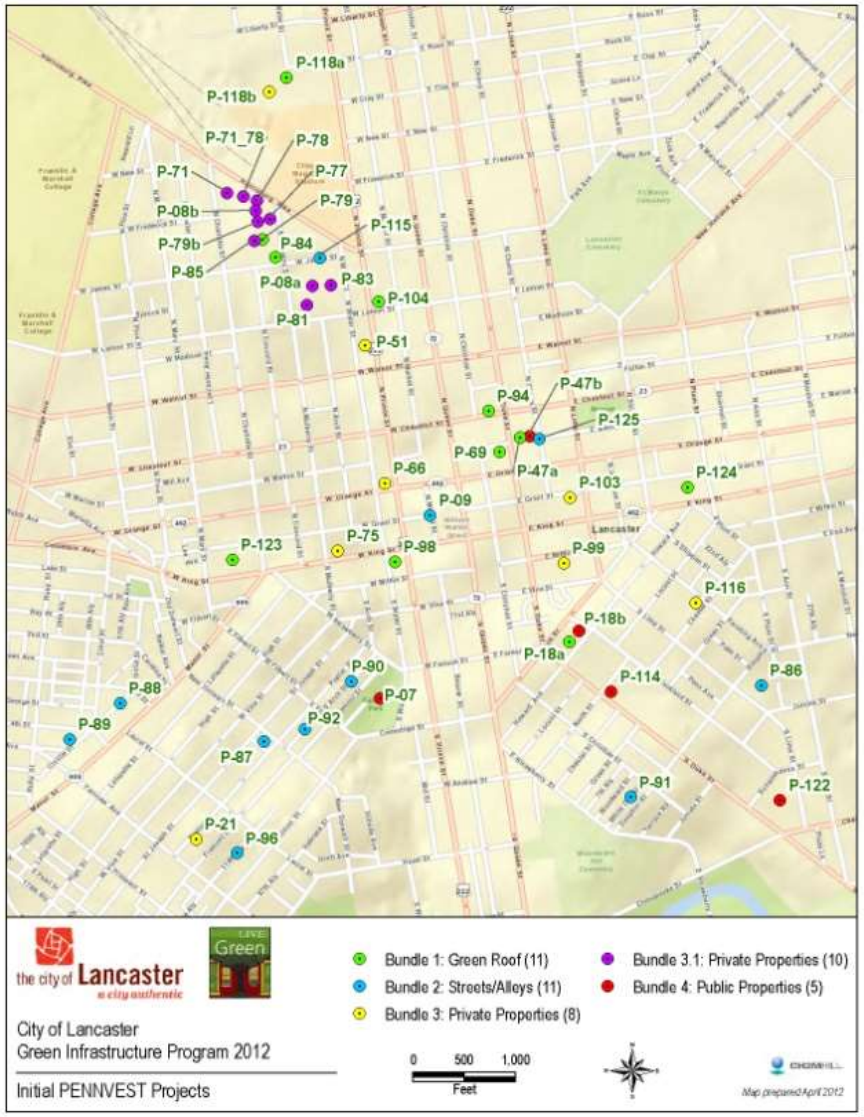
Department of Environmental Protection
RainScapes Rewards Rebates Program

Clean River Rewards
contain the rain

Save the Rain
Green Improvement Fund (GIF)

Innovative Financing: Using the SRF to create Public-Private Partnerships

- $7 M SRF Loan
- 2 Programs
  - Green Roofs
  - Other
- Private Landowners provide
  - 10% of construction costs
  - 30 yr maintenance agreement
- City is also implementing a Green Alley Program that residents pay $500 into repaving costs



Innovative Financing: Using the SRF to create Public-Private Partnerships

Onondaga County NY, Green Improvement Fund - Lessons Learned

- **Demand Exists!**
  - $ 6 M in awards
  - 121 applications submitted for grant funding to-date
  - 40 Grant awarded project completed
  - 20 Projects currently under construction
  - 40 Projects under contract for 2014 Construction Season
- **Transparency of Process is Paramount**
- **It's OK to modify program-Must adapt as program evolves**
  - A project in 2013 will not necessarily receive the same grant funding as a project in 2010
  - Funding Caps Promote Bad Behavior
  - Tiered Approach allows for both small and large scale projects
  - Small scale projects contribute to community support
  - Business case ensures value to City and County
  - A thorough review process will ensure a good outcome

Green Up DC web site makes it easy

for property owners to make decisions about green projects

Solar and Energy Conservation Projects

St
Projects

Plan

Explore

Track

Learn

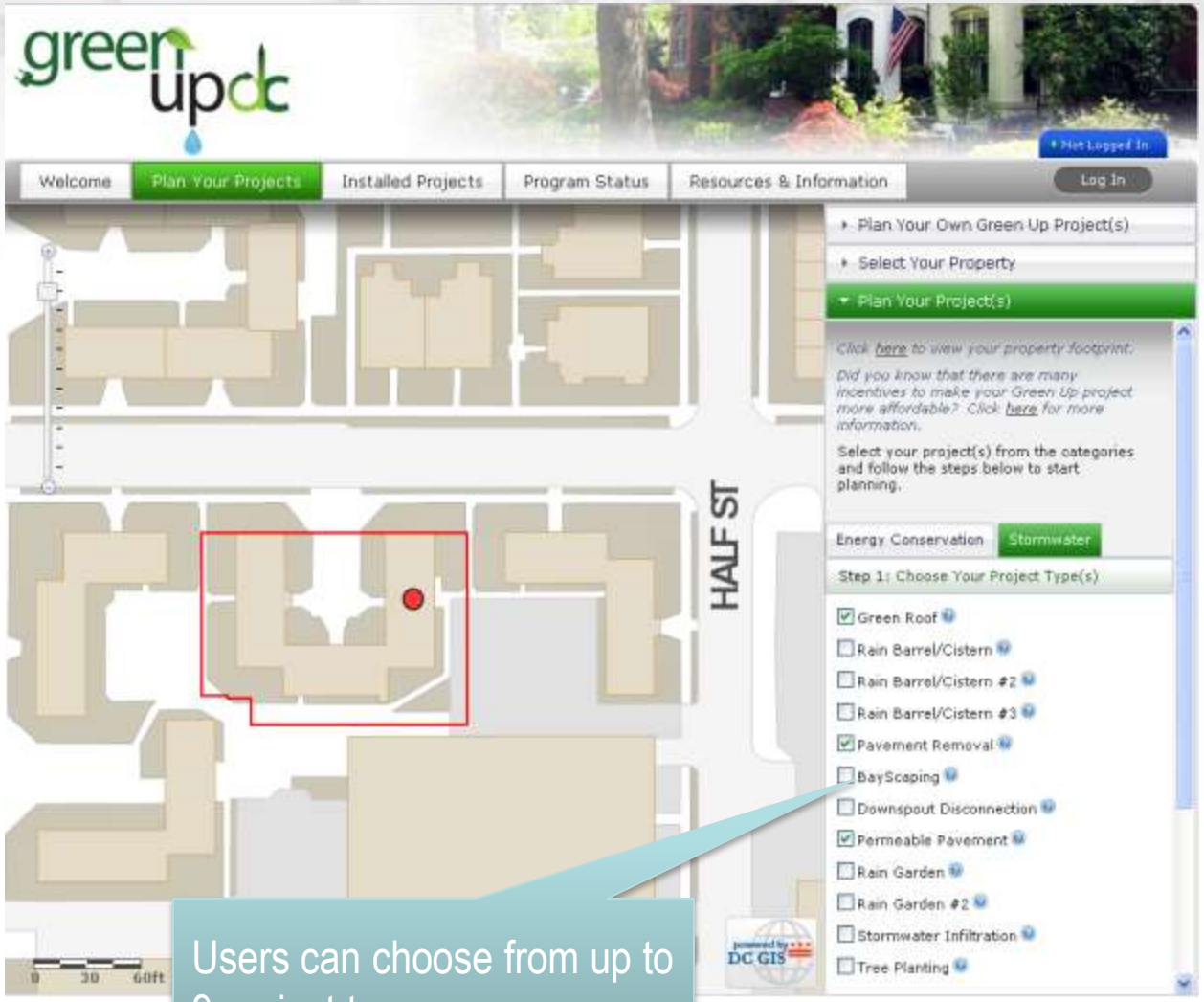
Resources & Information

Find what you'll need, from getting started to completion.

runoff calculated with rainfall-runoff method

from center for watershed protection

- Pre-loaded impervious area data
- 9 project types
- Context-sensitive information
- Runoff before treatment is calculated from preloaded impervious area information



Conclusions and Lessons Learned

- Regional collaboration increases effectiveness of stormwater programs, particularly for education and financing
- Regional collaboration successes tied to strong leadership and clear goals and funding
- Balancing grey with green infrastructure approaches can lead to cost effective compliance, and alignment of community and regulatory goals
- Tools are available to target stormwater retrofits, align infrastructure asset management programs, and incentivize private sector participation

SUSAN HARPER
SEATTLE PUBLIC UTILITIES

RAINWISE 2013

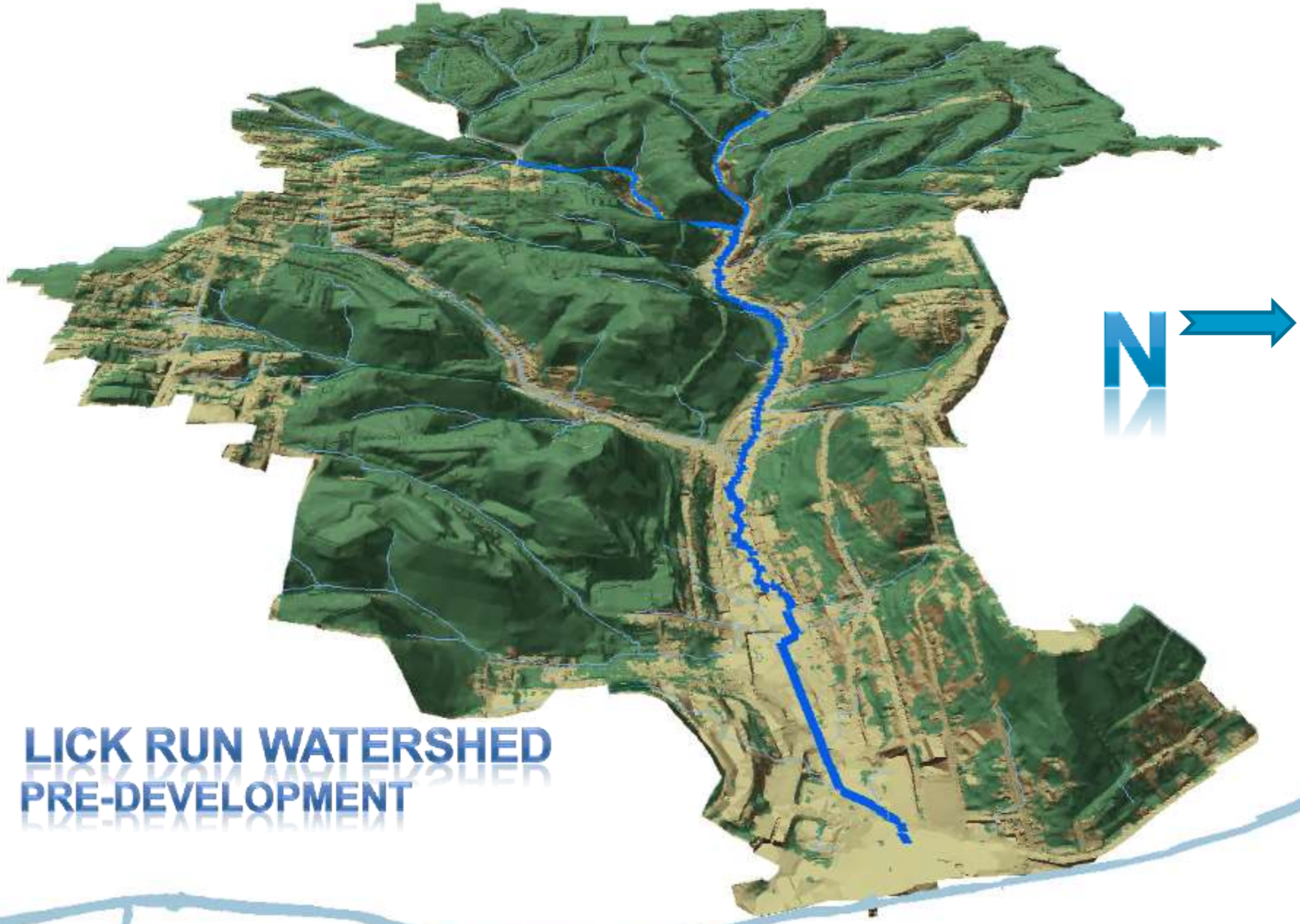
BOB NEWPORT
US EPA REGION 5

Collaborative Stormwater Solutions

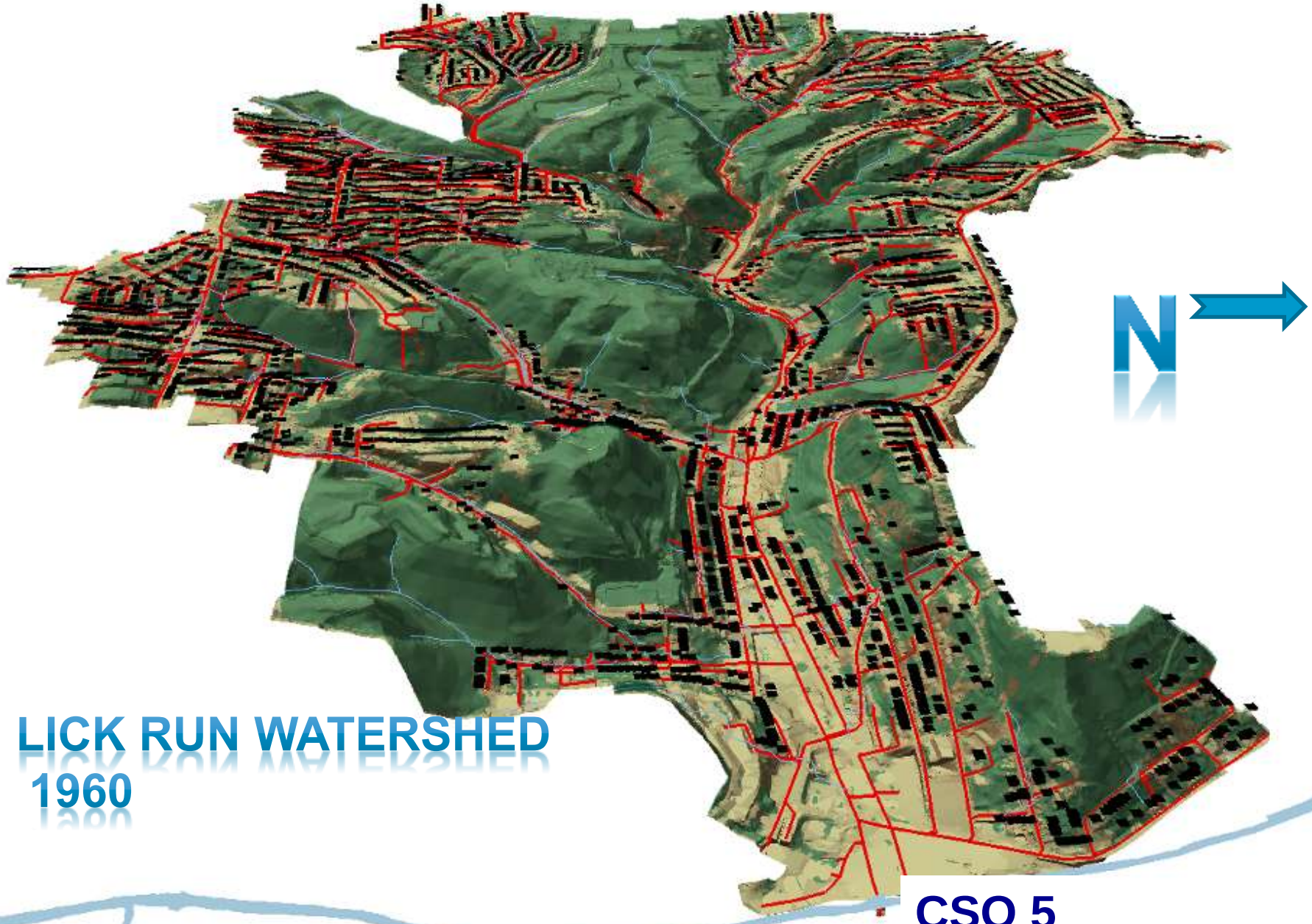
Bob Newport

April 8, 2014

Case Study- Cincinnati



Case Study - Cincinnati



Implementation Example
Cincinnati

A "Win" for the Cincinnati CSO Program

(Lower Mill Creek Service Area)

Default solution: Tunnel

Alternative solution: Keep water out of the system (strategic sewer separation, "green corridor) and "right size" grey infrastructure components

Reduction in CSOs: 1.78 billion gallons (in a typical year for these sewersheds)

Costs

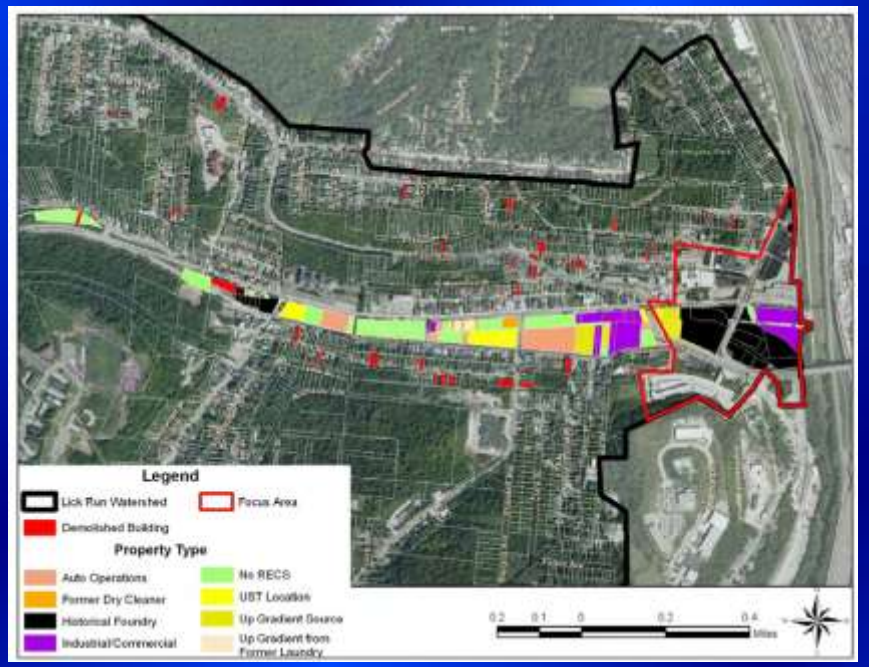
- **Default: $414.4 million (2006 dollars)**
- **Alternative: $244.3 million (2006 dollars)**

A Potential "Win" for the Community

- Adjoining streets will be "parkside drives"
  - Economic revitalization opportunities
- Open space and recreation
  - Neighborhood amenities
  - Health benefits

But Logistically More Complicated for the Sewer District

- **Land acquisition**
- **Brownfield issues**
- **Demolitions**
- **Historic preservation**
- **Re-route surface transportation network**
- **Zoning**
- **Community involvement**
- **Maintenance**



Partnerships and Stakeholders

Communities of the Future

- City & County Departments
- Mill Creek Restoration Project
- Community Building Institute – Xavier University
- University of Cincinnati
- Local Initiative for Support Corporations (LISC)
- OKI Regional Council of Governments
- Chamber of Commerce Agenda 360
- US Green Building Council

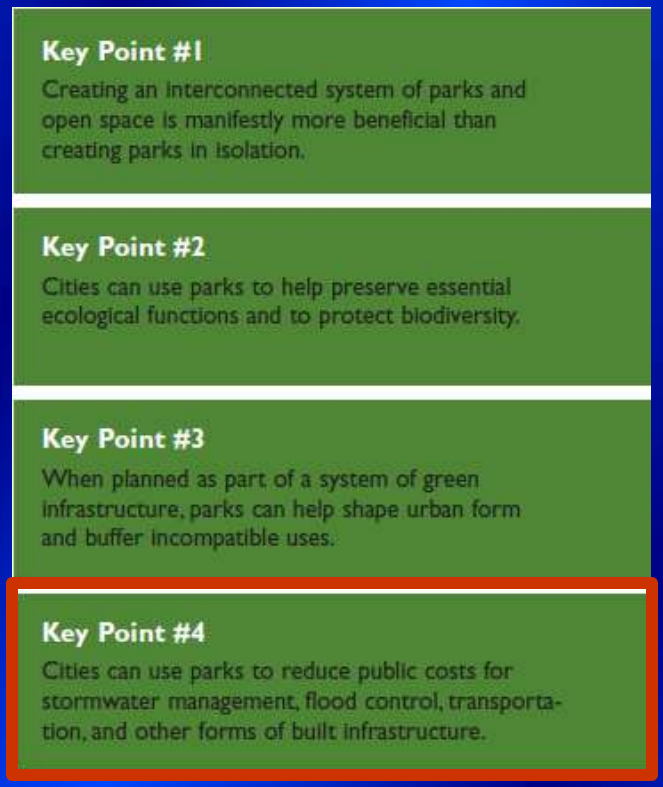
- Business owners in the Corridor
- Neighborhood Organizations
- Green Partnership of Greater Cincinnati
- Cincinnati Preservation
- State of Ohio
- Port Authority of Greater Cincinnati
- Cincinnati Park Board

So Collaboration Can Produce Win-Win Outcomes, and Looking Across Organizational Budgets, It Can Help Save Money

But Providing for Effective Collaboration Can Seem Like A Lot of Work, and There Can Be Many Logistical and Institutional Barriers to Overcome

Collaborations Between Stormwater Authorities and Park Districts

- Parks provide opportunities for stormwater practices
- But there has to has to be something in it for the Park District
  - New and Existing Park Demands
    - Trails and connectivity
    - Natural areas and habitat restoration
  - Reduced Maintenance Costs
    - Mowing grass costs money!
    - Native plantings instead of turf



Village of South Holland
Veterans Memorial Park

Village of South Holland, Veterans Memorial Park

Let's Add a Natural Area!

Naturalized Stormwater Basin


Inverness Park District
Natural Drainage System
at South Park

Geneva School District
Geneva Middle School North

Homeowner Associations

Danada Woods Homeowner Assoc.

Naperville, IL

Corporate Campuses

Tellabs
Naperville, IL

Collaborations between Stormwater Authorities and Transportation Organizations

- **In almost any city there are opportunities for green streets**

Grange Avenue Bioswale
Greendale, WI

Traffic Calming

NE Siskiyou Street
Portland, OR

Collaborations between Stormwater Authorities and Transportation Organizations

Excellent opportunities, but implementation challenges can often be encountered, e.g.,

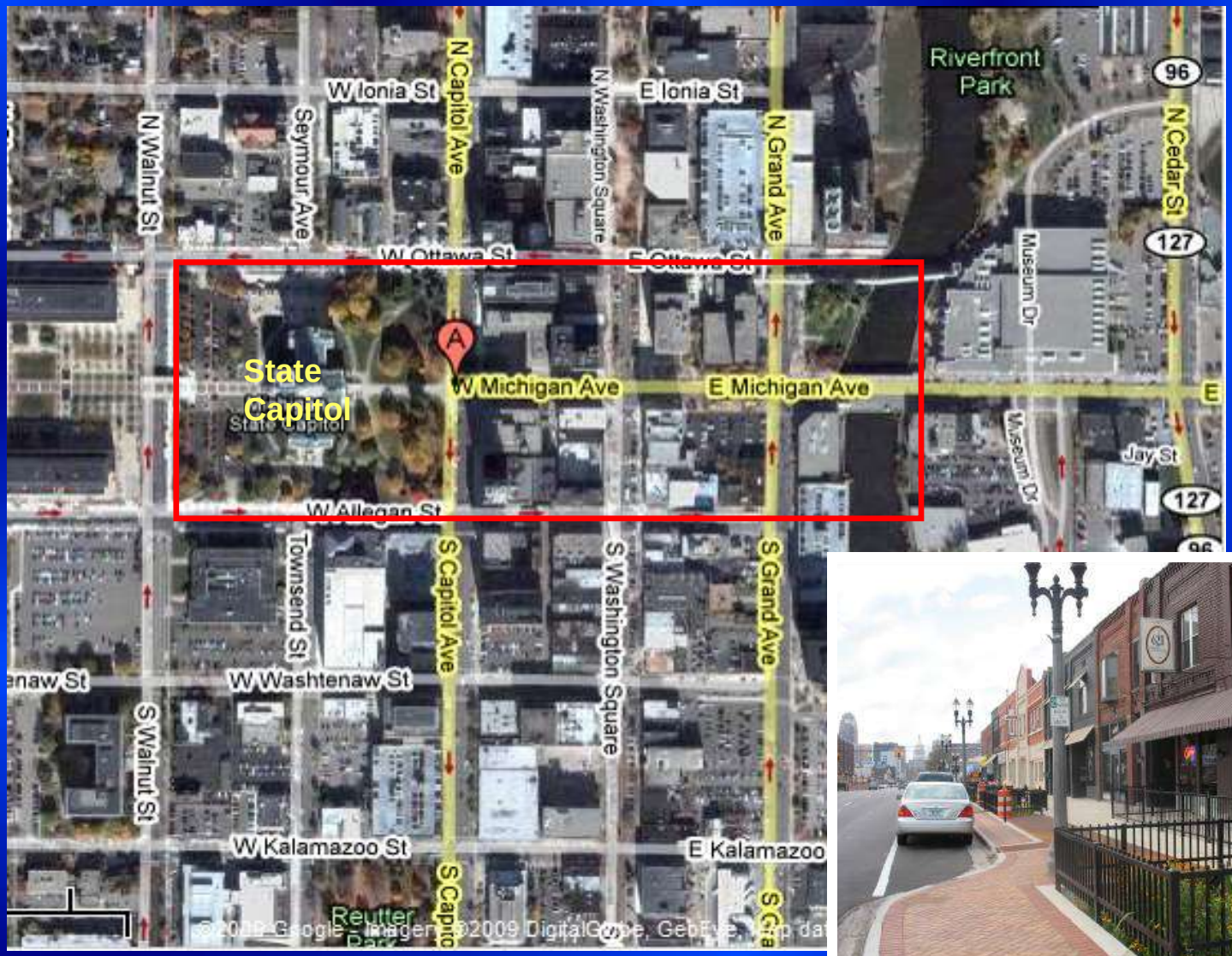
- **Design standards don't seem to accommodate the green practice**
- **Combining funding sources may be logistically complicated**
- **Who will do the maintenance?**

Aligning Schedules

It is almost always less expensive to put in place green features at the time road repairs or replacements are being made

vs. doing the green infrastructure as a stand-alone project

Transportation, Economic Development, and Stormwater - Lansing, MI



Tetra Tech

Michigan Avenue

TetraTech and C2AE

Tetra Tech

TetraTech

Michigan Avenue

- 4 city blocks, both sides
- Typical garden, no overflow for 1-inch event
- 600 block north side, no overflow for 4.1-inches (25-year event)

Economic Development

- Department of Commerce
  - "Green" Industrial Park
- Small Business Administration
  - Firms to perform maintenance

- Entry level landscaping: Job skills with inspiring purpose
- "For the first time, I can go home and tell my mother I'm proud of what I'm doing"

Chicago GreenCorps
at Our Lady Gate of Heaven project site

Brownfields Program

- **Implementing stormwater practices on infill sites and vacant parcels – some may be Brownfield properties**
- **Collaboration with the Brownfields program is needed to make sure all legal requirements are met and to make sure there are no unexpected or unintended consequence from implementation of a stormwater control measure**
- **Example: infiltration practices where there is soil contamination**

Land Banks

$100 million in federal funds to be dispersed to 5 Michigan cities

Detroit to see $52.3 million for blight removal; Flint, Grand Rapids, Pontiac, Saginaw also receiving funds

Author: Joanne Marie Hoopes, ClickOnDetroit.com writer


Challenges After Demolitions
•Basements
•Impervious Surfaces
•Rocks and Debris
•Poor Soils for Vegetation

EPA Region 5
Residential Demolition
Bid Specification Development Tool

Menu of Bid Spec Modifications to Improve Demo Practices

- Soils for Earthwork
- Placement of Fill
- Grading
- Soil Stabilization and Seeding
- Impervious Surface Removal
- Pre-Demolition Survey
- Asbestos NESHAP Compliance
- Managing Harmful Dust
- Waste Management Plan
- Recycling and Salvage
- Waste Handling and Disposal
- Deconstruction

Earthworks Bid Specs

Waste Management Bid Specs

Coordinate Stormwater Program with work on Climate Change, Resiliency, and Flooding

Methods for Effective Collaboration

- Convene discussions with local groups, State agencies, Federal partners
- Convene discussions with business leaders on issues such as how green can contribute to economic revitalization and jobs
- Leveraging funding for related projects (e.g., lining up HUD or DOT funds to combine with stormwater funds)
    - Integrated asset management
- Engage foundations in discussions on opportunities for involvement
- Technical assistance on Brownfield issues
- Technical assistance on property acquisition/assembling parcels
- Technical assistance on historic preservation and adaptive re-use of buildings
- Technical assistance on institutional arrangements (e.g., partnerships with parks, partnerships with schools)
- Technical assistance on updating zoning, codes and ordinances

Methods for Effective Collaboration

- Look for common goals, establish shared vision
- Look for win-win situations, usually should be something in the plan for collaborating partners
  - Multi-purpose projects
- Communicate and quantify
- Identify barriers
  - Budgeting/cost-sharing
  - Timing
  - Ordinances
  - Standard Methods (e.g., DOT Manual)
    - Immediate solutions (variance)
    - Long-term solution (update manual, update ordinance)

Please wait for the microphone; state your name and affiliation

Q & A

Upcoming MPC Roundtables

- Smart Systems, Resilient Regions
  - Tuesday, May 20, 2014
- Progress on the GO TO 2040 Comprehensive Plan
  - Thursday, May 29, 2014
- Register now at metroplanning.org

Metropolitan Planning Council

80 Years of Reinventing the Region

Thank you!

Please return your completed survey.