



vision

MSD Secures Sustainable Alternative to Wet Weather Plan NACWA 2013 Summer Conference

Metropolitan Sewer District of Greater Cincinnati
MaryLynn Lodor, Deputy Director

MSD's Approach

...how do we get to yes?

- 💧 Plan Approved
- 💧 Negotiate for Options
- 💧 Reach out to the Community
- 💧 Vet Technical Considerations
- 💧 Meet with the Regulators
- 💧 Develop a Sustainable Strategy

VISION

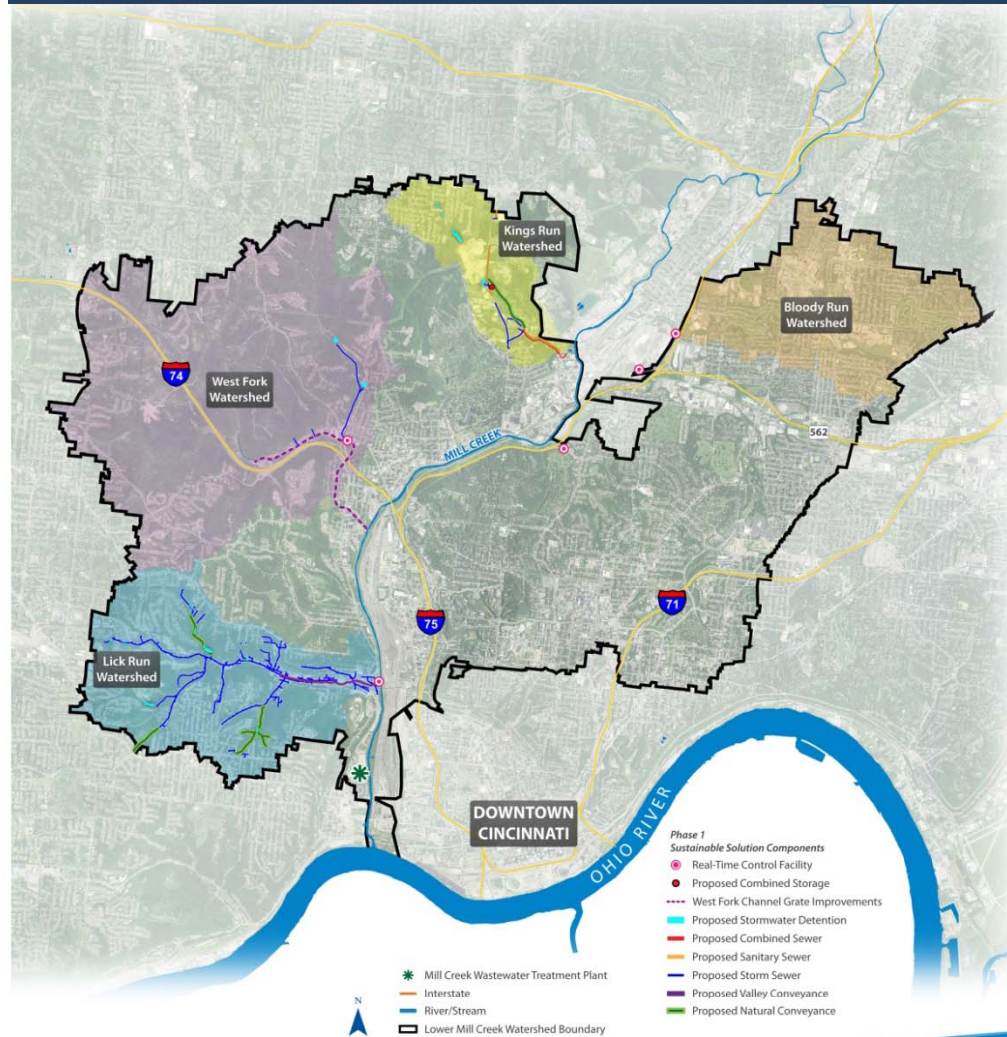


vision

Vision of the future community

APPROVED PLAN

UPDATE: **APPROVED** Lower Mill Creek Sustainable Watershed Solution



Summary of Phase 1 Sustainable Solution

- Sustainable Infrastructure projects in Lick Run, West Fork, and Kings Run watersheds
- Combined storage facility at CSO 217 in Kings Run
- Real-time control (RTC) facilities at CSOs 005, 125, 181, 482, and 487 (already completed)
- West Fork Channel grate modifications in the West Fork Watershed (already completed)

Examples of Sustainable Infrastructure



Sewer Separation



Stormwater Detention Basin



Naturalized Channel



Stream Restoration

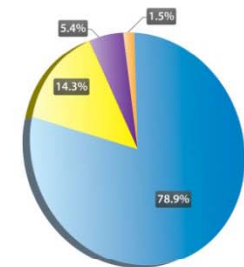
Phase 1 Sustainable Solution Benefits

- 1.78 billion gallon reduction in annual CSO volume
- Surface improvements and increased public acceptance
- Opportunities to leverage private/public funding
- Construction jobs available for local workforce & SBEs
- Less purchased energy
- Adaptable to future water quality needs
- Ability to capture more flow by adding separation areas
- Brownfield remediation and repurposing of land for source control
- Reduction in rain water and natural drainage volume to wastewater treatment plant
- Provides the greatest reduction in peak bacteria levels in Mill Creek
- Returns more base flow to the hydromodified Mill Creek

Summary of Capital Costs (2006 dollars)

Lick Run Watershed	Kings Run Watershed
\$192,696,000	\$34,850,000
West Fork Watershed	Bloody Run Watershed
\$13,214,000	\$3,607,000

Total = \$244,367,000



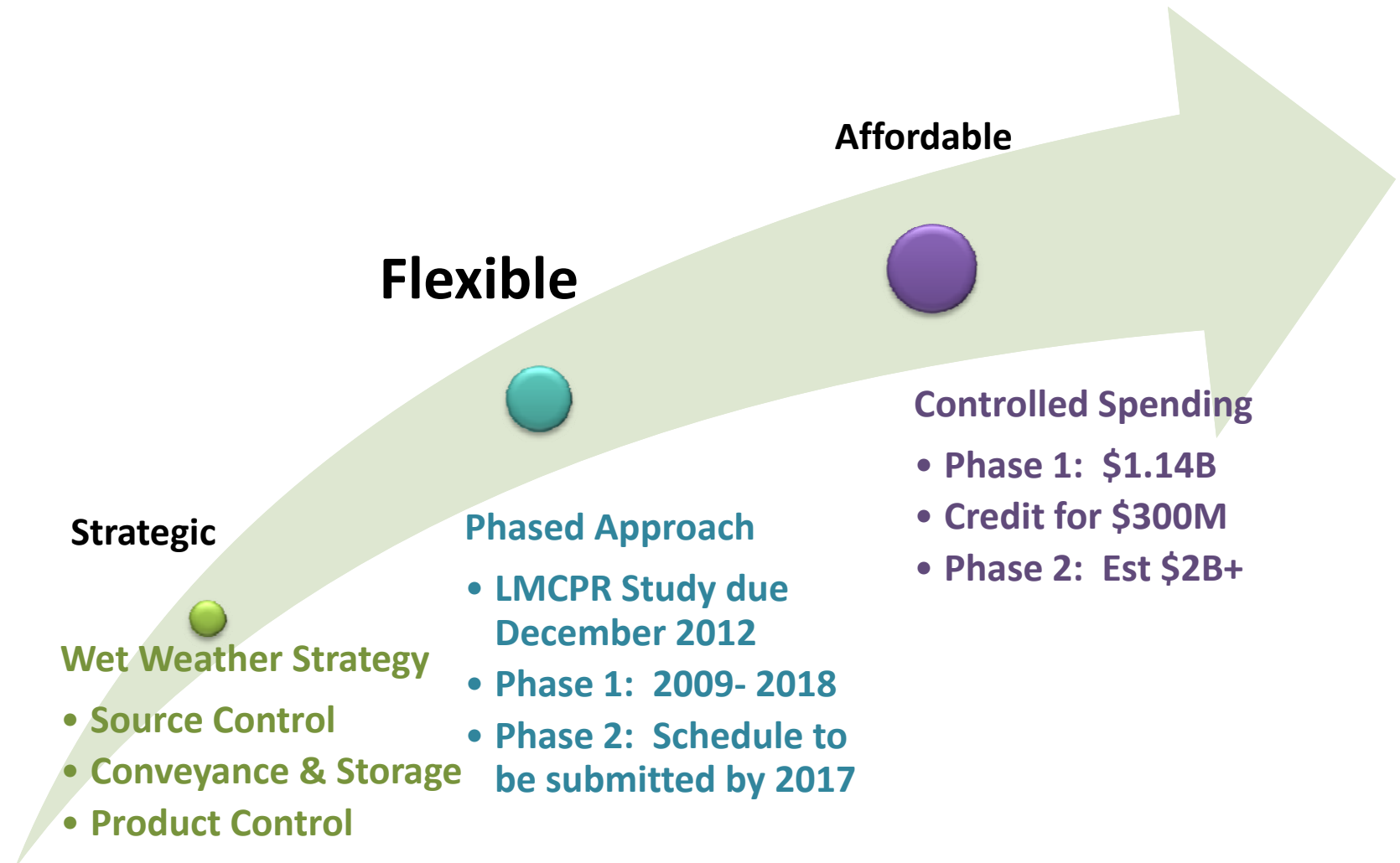
sustainable

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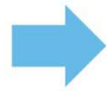
NEGOTIATE FOR OPTIONS

Federal Mandate

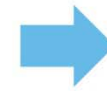
Cincinnati's Consent Decree Elements



Current Conditions
in the Community



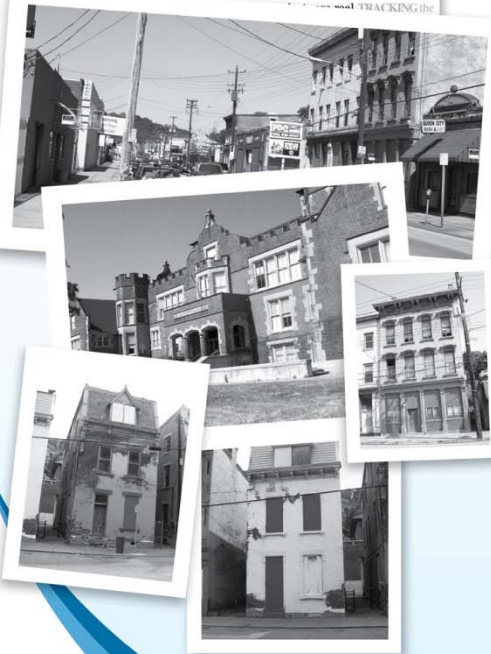
Leverage
MSD's Investment



Community's Vision
for the Future

THE CINCINNATI ENQUIRER

Property value at a substantial decline



Expand & improve
parks and greenspaces

Opportunities for
improved mixed use and
affordable housing

Improve traffic flow,
pedestrian accessibility
and safety

Incentives for
business retention
or redevelopment

MSD

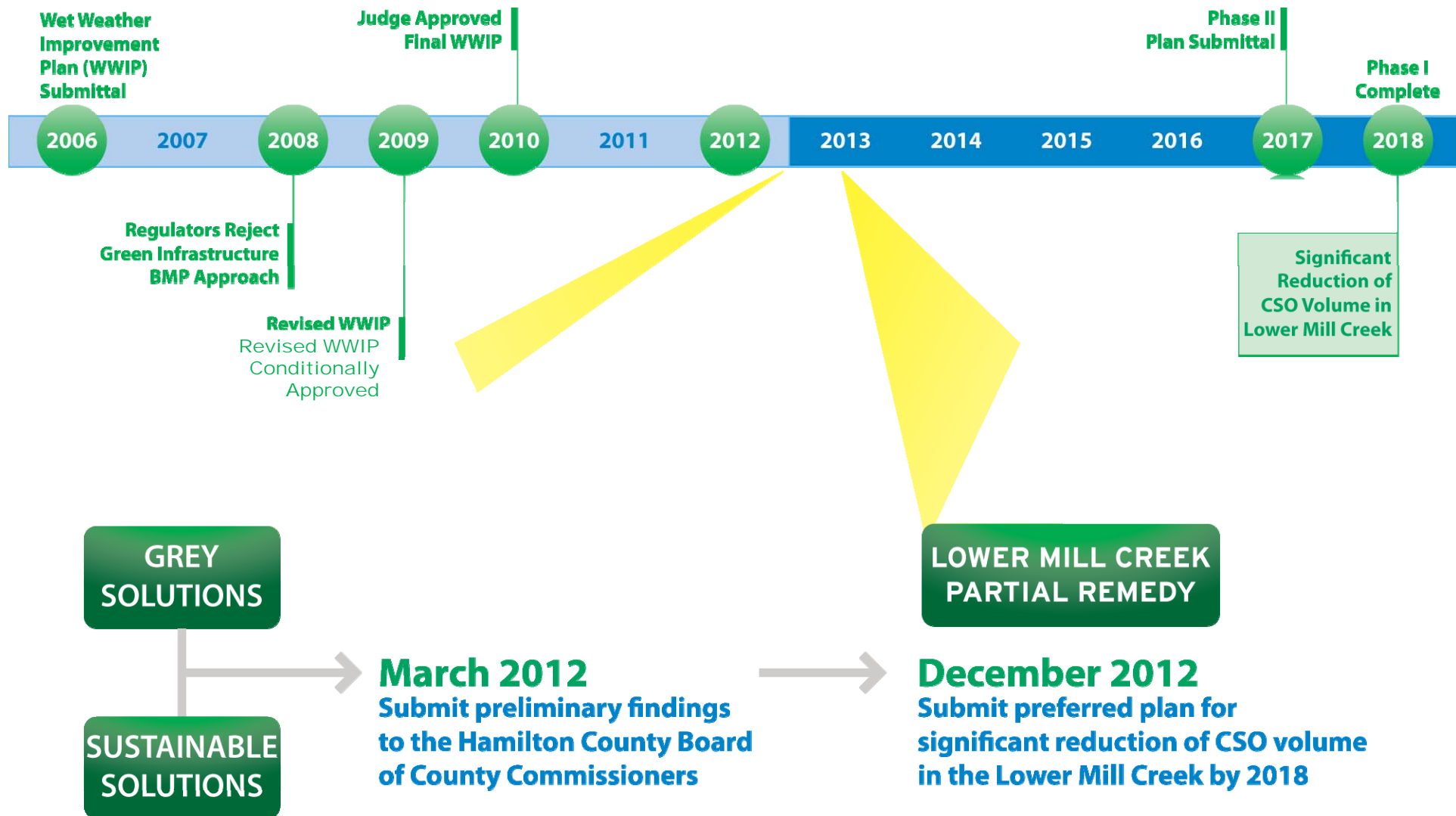
Metropolitan Sewer District

Investment to reduce sewer overflows
and meet federal mandates

economics
sustainability
infill
jobs
bike trails
smart growth
safety
recreational
opportunities
community
gardens
better
education
quality place
community assets



MSD Defined Integrated Watershed Planning through LMCPR



USEPA Guidance Criteria for LMCPR



Information required to be included in the LMC Study report for the Regulators to consider an alternative solution.

Guidance Pertaining to Consideration of Any Proposed Revised Original Lower Mill Creek Partial Remedy Defendants May Choose to Submit in Accordance With Paragraph A.2 of the Wet Weather Improvement Program

Draft for Discussion

Under the consent decrees between the United States, State of Ohio and Ohio River Water Sanitation Commission (the Regulators); and the Board of County Commissioners for Hamilton County and City of Cincinnati (Defendants), Defendants are required under to construct the Lower Mill Creek Partial Remedy (LMCPR) described in Attachment 1C to the Wet Weather Improvement Program (WWIP); in accordance with the schedule, performance criteria and design criteria set forth in Attachments 1A and 1B of the WWIP.

Paragraph A.2.a of the WWIP provides:

Phase 1 will include a 3-year study/detailed design period to examine green measures and other measures to refine the Original LMCPR approach and cost estimates. Defendants may submit to the Regulators proposed changes to, or improvements on, the Original LMCPR remedy as a result of this study, provided the proposed revised remedy ("Revised Original LMCPR") provides equal or greater control of CSO annual volume as the Original LMCPR and is completed by the Phase 1 End Date. Defendants shall submit to the Regulators a LMCPR Study Report and any proposal for a Revised Original LMCPR by December 31, 2012.

The purpose of this document is to provide the Metropolitan Sewer District of Great Cincinnati (MSDGC) with guidance on certain issues that Defendants should consider if they choose to submit a proposed Revised Original LMCPR to the Regulators in accordance with Paragraph A.2.a of the WWIP. This document does not replace, revise, or amend the WWIP itself, or the consent decrees.

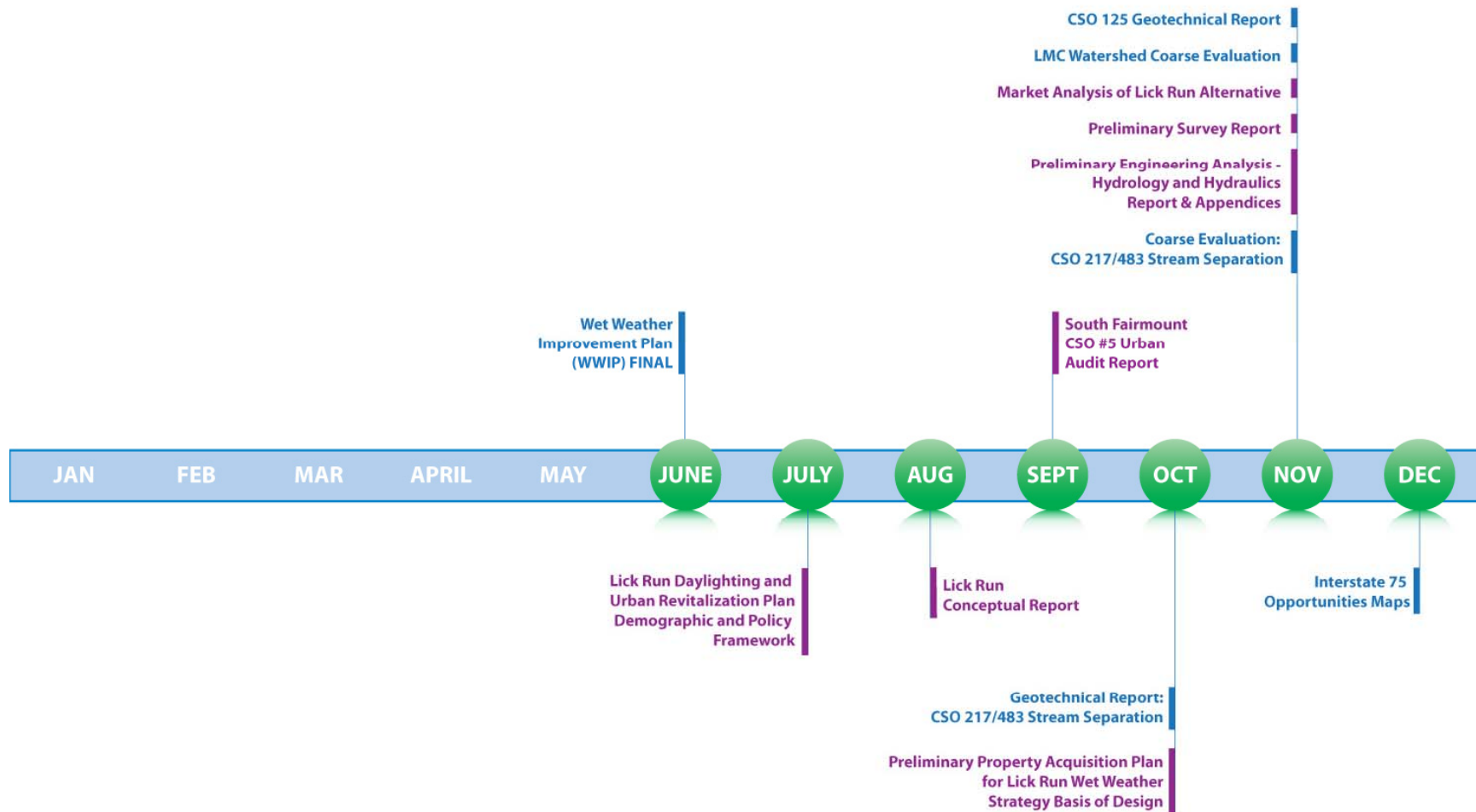
1. The primary means of determining if green control measures are equivalent to a planned grey infrastructure control measure will be model runs. The Hydrology and Hydraulic Model would be used to simulate the effects of the source control and green infrastructure measures (along with grey infrastructure elements that would be built) and provide specific information on the volume of overflows in a typical year. The Regulators will need to have a good understanding of the assumptions that were used in the model run, e.g., adjustments to the Hydrology inputs to reflect the source control/green infrastructure projects in order to conduct a review and concur on the model run results.

2. In addition to the model runs, a proposed Revised Original LMCPR should include the following:

(a) A detailed description of the source control/green infrastructure project(s), including specific technologies to be employed, project dimensions and configurations, material specifications and characteristics, project drawings that include the drainage area tributary to the proposed project, intended mode(s) of operation, and any other available information that may aid the Regulators in their assessment of the proposed project.

LMC Study Technical Evaluation & Analysis

2009



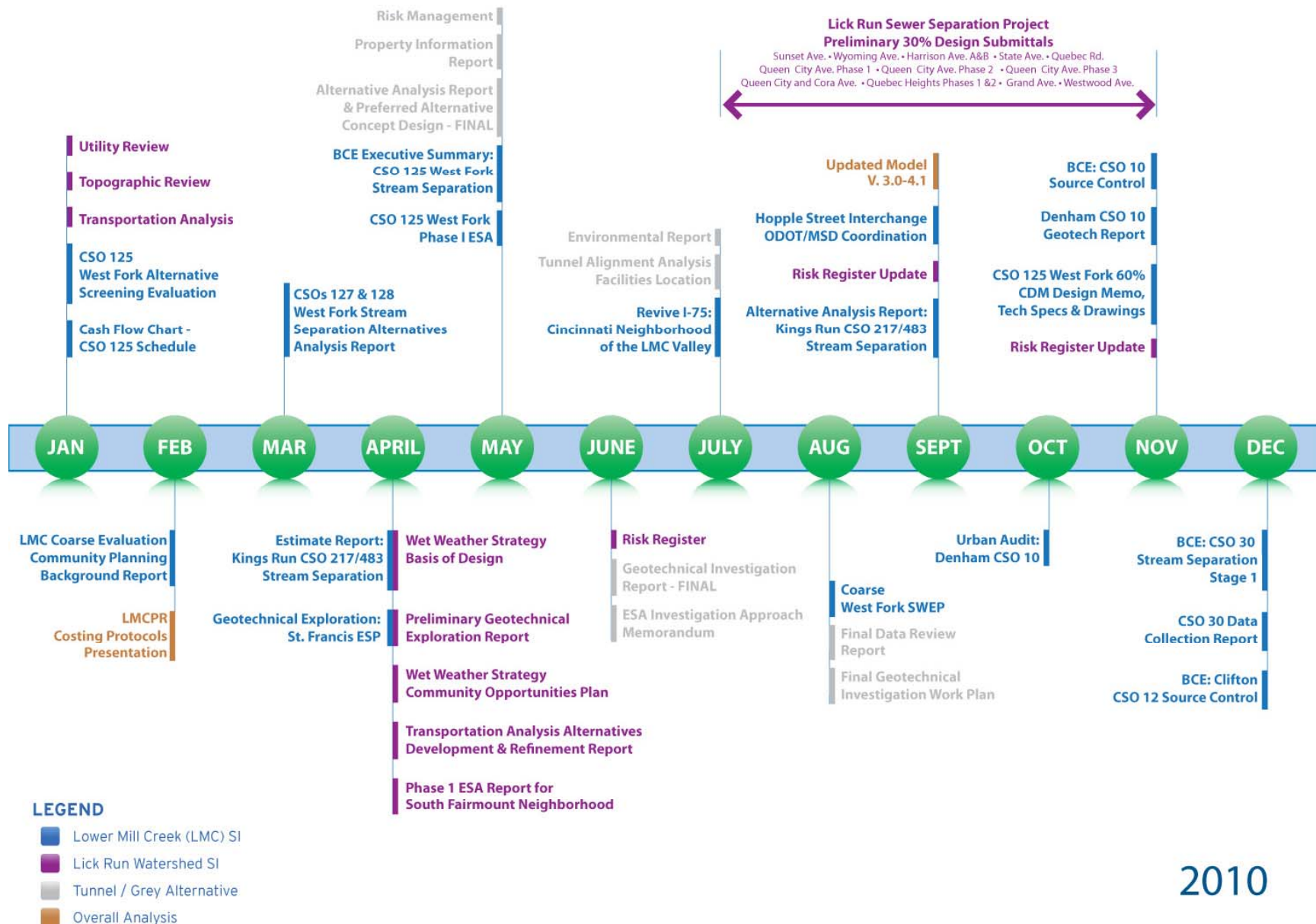
LEGEND

- Lower Mill Creek (LMC) SI
- Lick Run Watershed SI
- Tunnel / Grey Alternative
- Overall Analysis

2009

LMC Study Technical Evaluation & Analysis

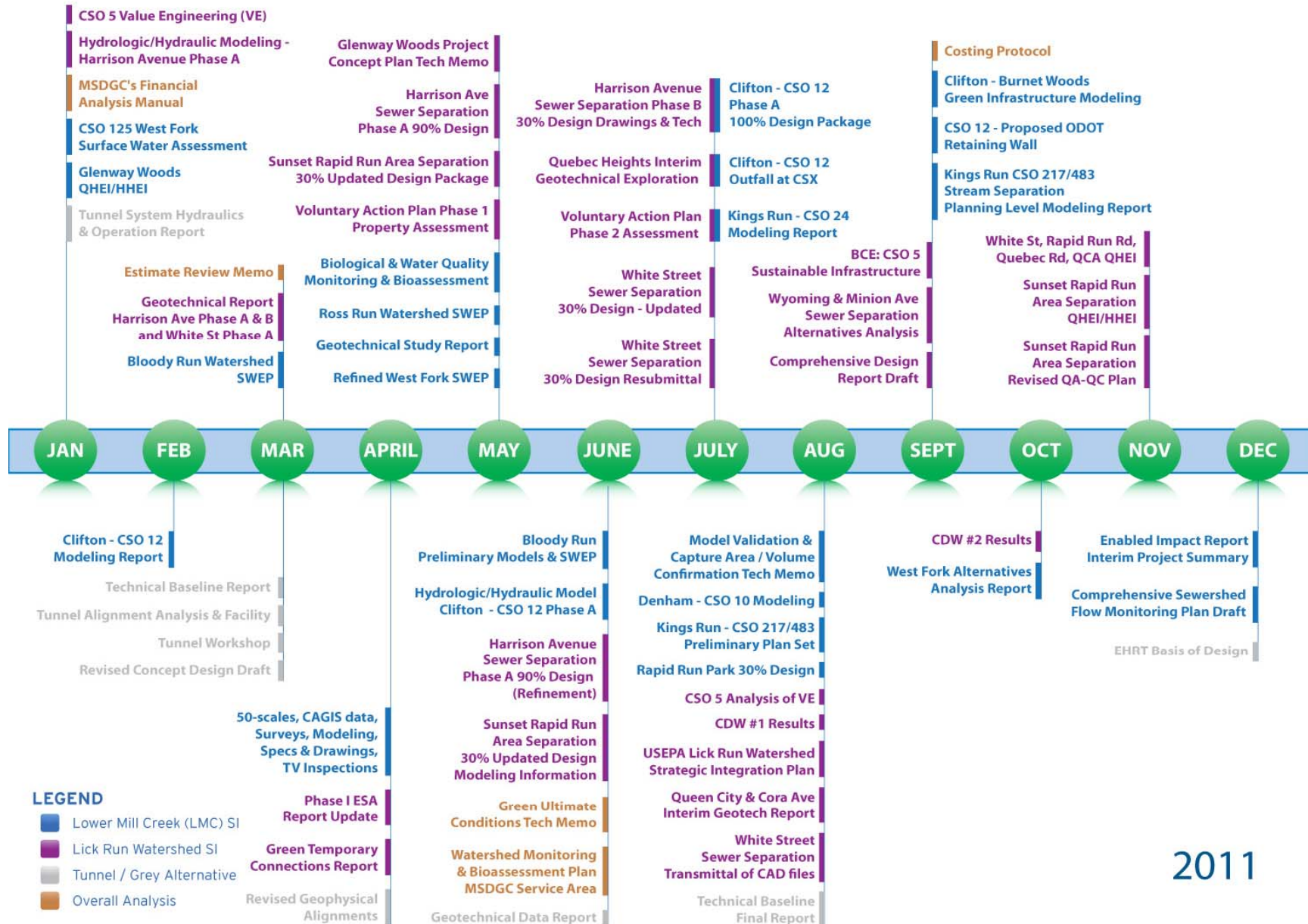
2010



2010

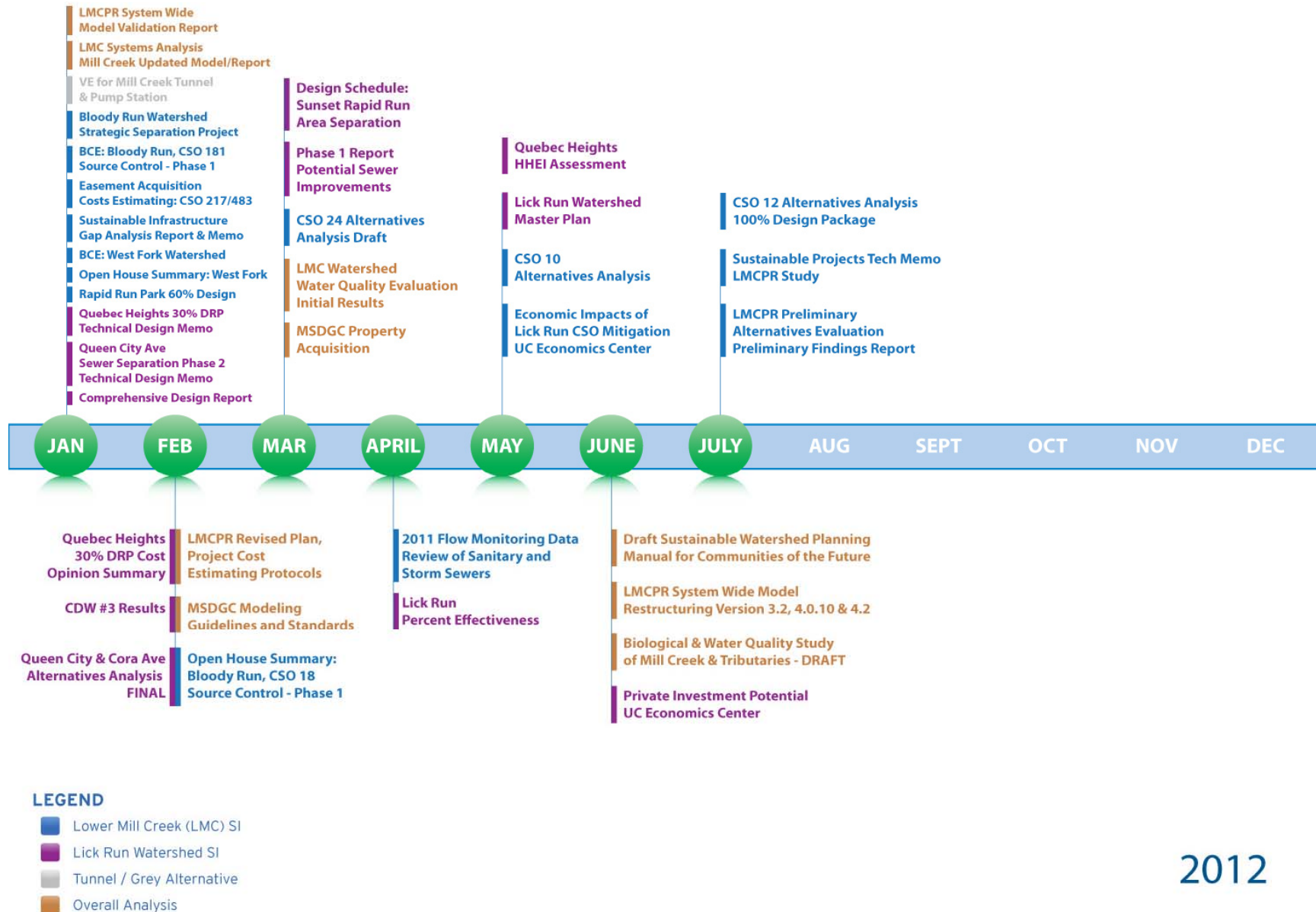
LMC Study Technical Evaluation & Analysis

2011



2011

LMC Study Technical Evaluation & Analysis 2012



2012



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REACH OUT TO THE COMMUNITY

We met with the Community...



To understand the community's needs & desires, a variety of input and feedback mechanisms were established:

- ◆ Community Open House & Design Workshops
- ◆ Meetings with the Community Council
- ◆ Meetings with Business Association
- ◆ Meetings with Several Key Stakeholder Groups
- ◆ Meetings with Individual Business & Property Owners
- ◆ Meetings with the Communities of the Future Advisory Committee
- ◆ Meetings with Key Public Agency Partners
- ◆ Meetings with Key Regulators



MSD's SUSTAINABLE SOLUTION FOR LOWER MILL CREEK (PHASE 1)

MSD is required to remove 1.78 billion gallons of combined sewer overflows (CSOs) from the Mill Creek by 2018. In December, MSD submitted a "sustainable solution" that focuses on reducing the amount of stormwater entering the combined sewer system. The Regulators are anticipated to make a decision in spring 2013.

Summary of Phase 1 Sustainable Solution

- Sustainable Infrastructure projects in Lick Run, West Fork, and Kings Run watersheds
- Combined storage facility at CSO 217 in Kings Run
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Examples of Sustainable Infrastructure



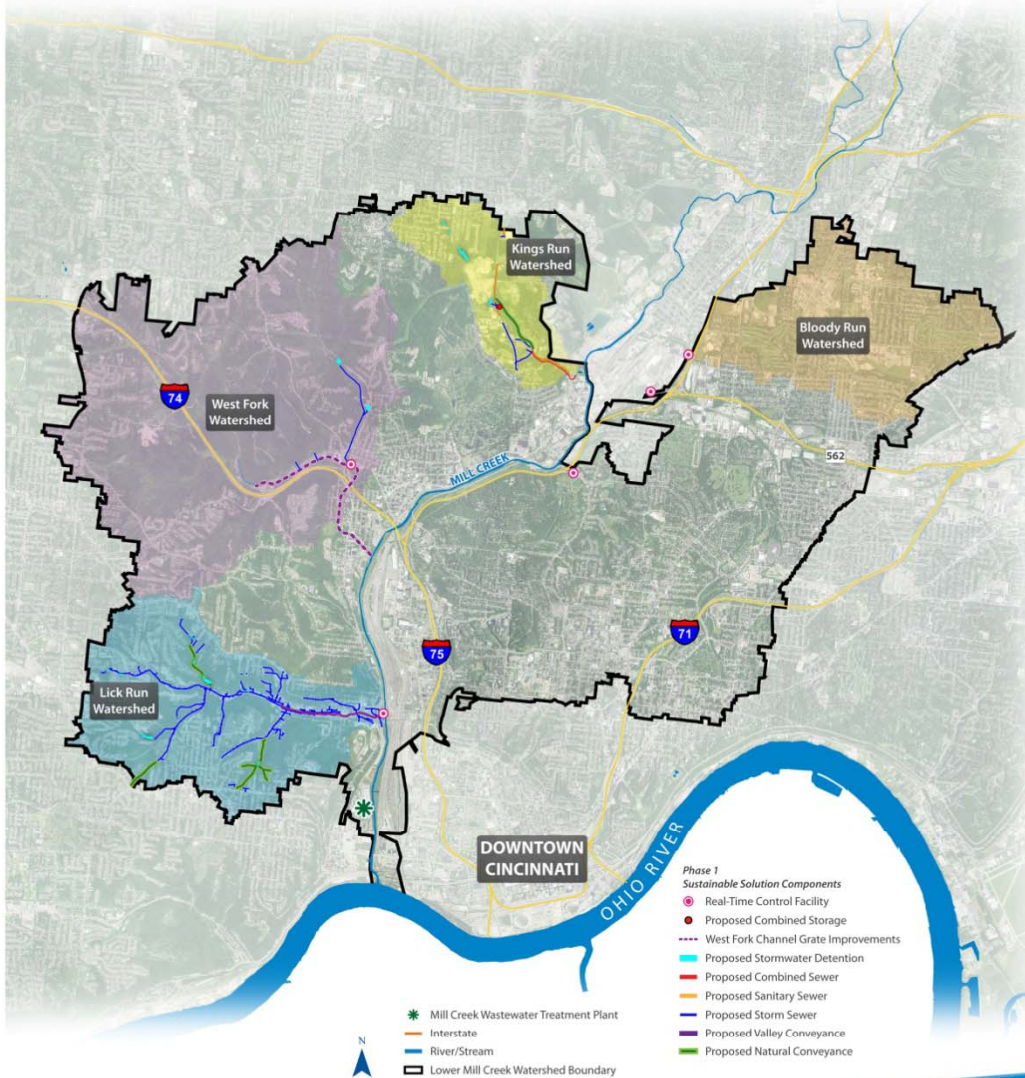
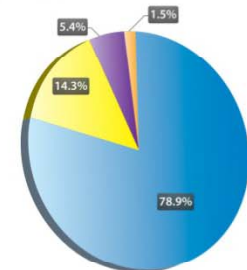
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Planning for the Community of the Future

Broad Vision; it goes far beyond the “end-of-pipe” focus of traditional approaches and solutions and recognizes the value in challenges and opportunities.

New partnerships and ways to engage stakeholders and communities in the process, to develop a strategy to solve wet weather problems

Watershed framework and land-use principles

A key basis for selecting MSDGC’s watershed alternatives is the need to manage water resources by different zones and tiers within the watershed.

Planning Principles for Watershed Management:

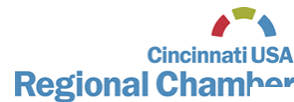
- 1) Coordinate policies and leverage investment
- 2) Promote an integrated network of green infrastructure
- 3) Revitalize communities through creation of jobs and growth opportunities for local businesses
- 4) Support existing communities
- 5) Benefit the watershed communities through environmentally, socially, and economically sustainable solutions
- 6) Provide more transportation choices
- 7) Promote a balanced mixed-use neighborhood
- 8) Use quality design to create an attractive public/private realm



Communities of the Future Model

Creating a Network of Community Partners **WHO**

Representation from around the region were a part of MSDGC's Community of the Future Advisory Committee since March 2010:



- Green Partnership for Greater Cincinnati
- Ohio Dept. of Development
- Cincinnati State
- Port Authority
- Chamber of Commerce
- Metro
- Sierra Club
- Cincinnati Preservation Association
- USGBC Cincinnati
- Greater Cincinnati Energy Alliance
- Agenda 360
- LISC



How could MSD's investment support future public/private investments?



University of Cincinnati's Economics Center study estimates \$18 to \$28 million of private reinvestment could result from the Lick Run project

Sustainable Solutions

Cincinnati, Indianapolis, and Pittsburgh
are working to clean up water pollution by
building green stormwater infrastructure
and creating good jobs in the process.

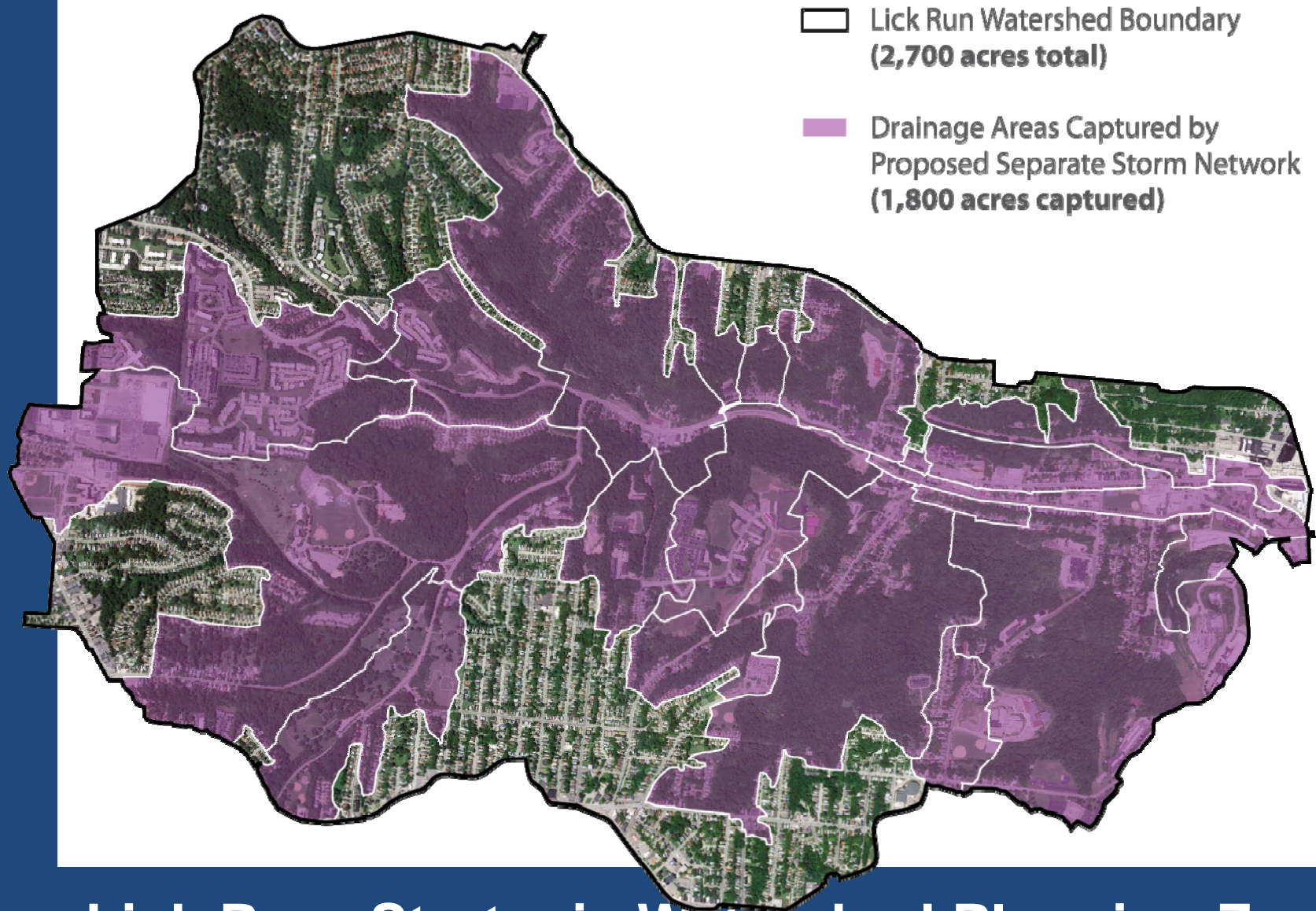


- Strategic Separation
- Hydraulic Model
- Business Case Alternatives Evaluation

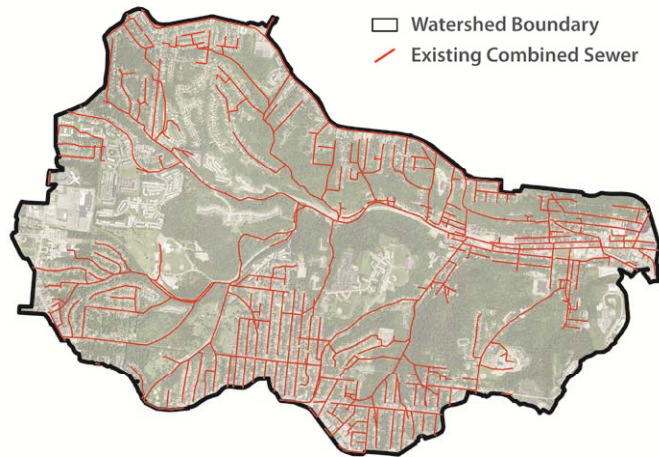
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VET TECHNICAL CONSIDERATIONS

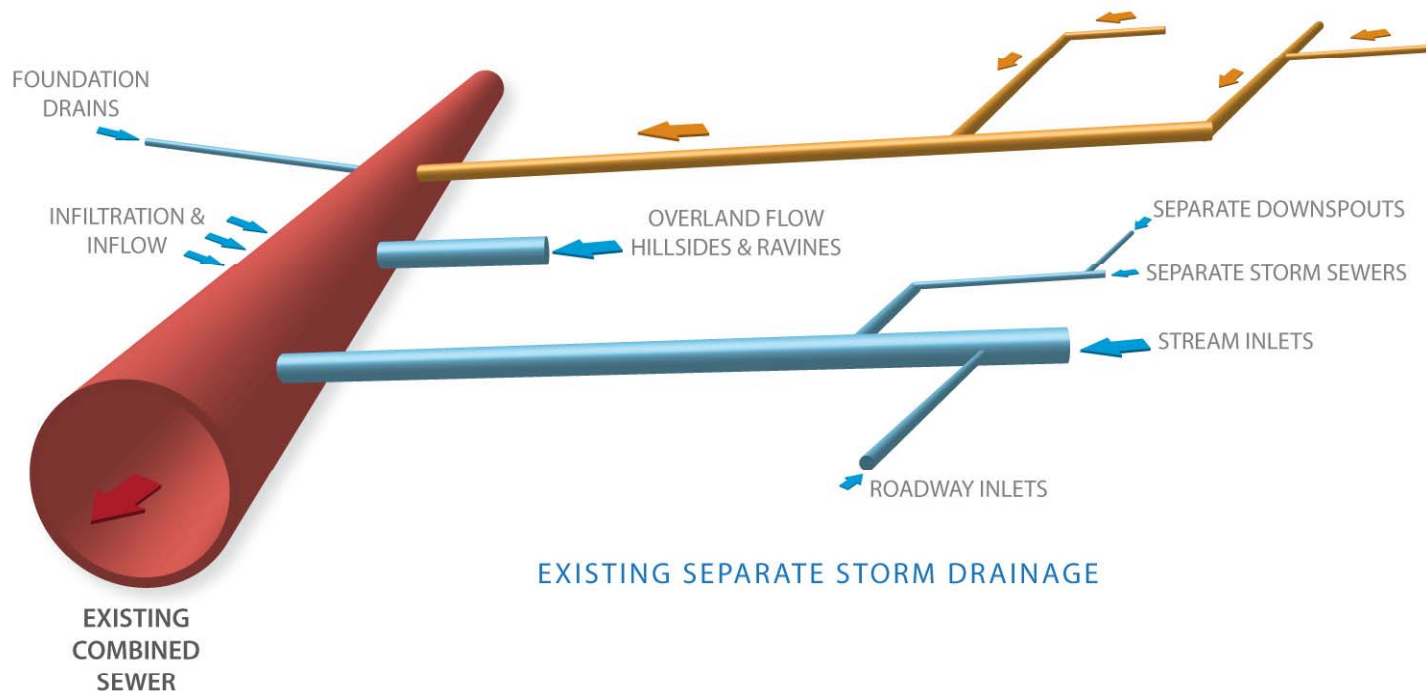
Strategic Separation - Watershed Evaluations



Lick Run: Strategic Watershed Planning Zones

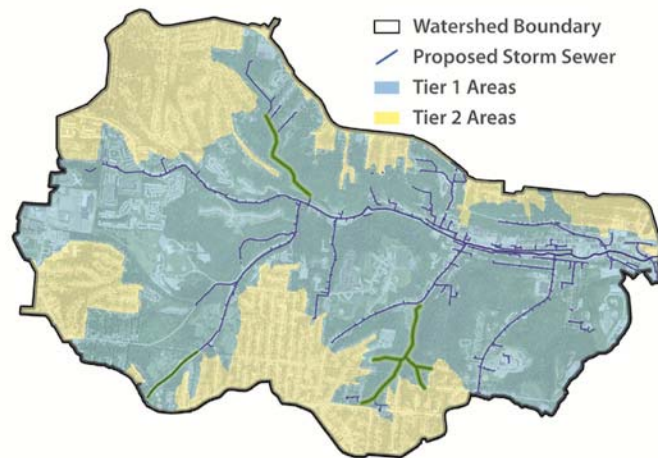


Existing CSS Infrastructure



CONFIGURATION OF THE COLLECTIONS SYSTEM
EXISTING CONDITIONS
 IMAGE NOT TO SCALE
 HUMAN NATURE, INC.

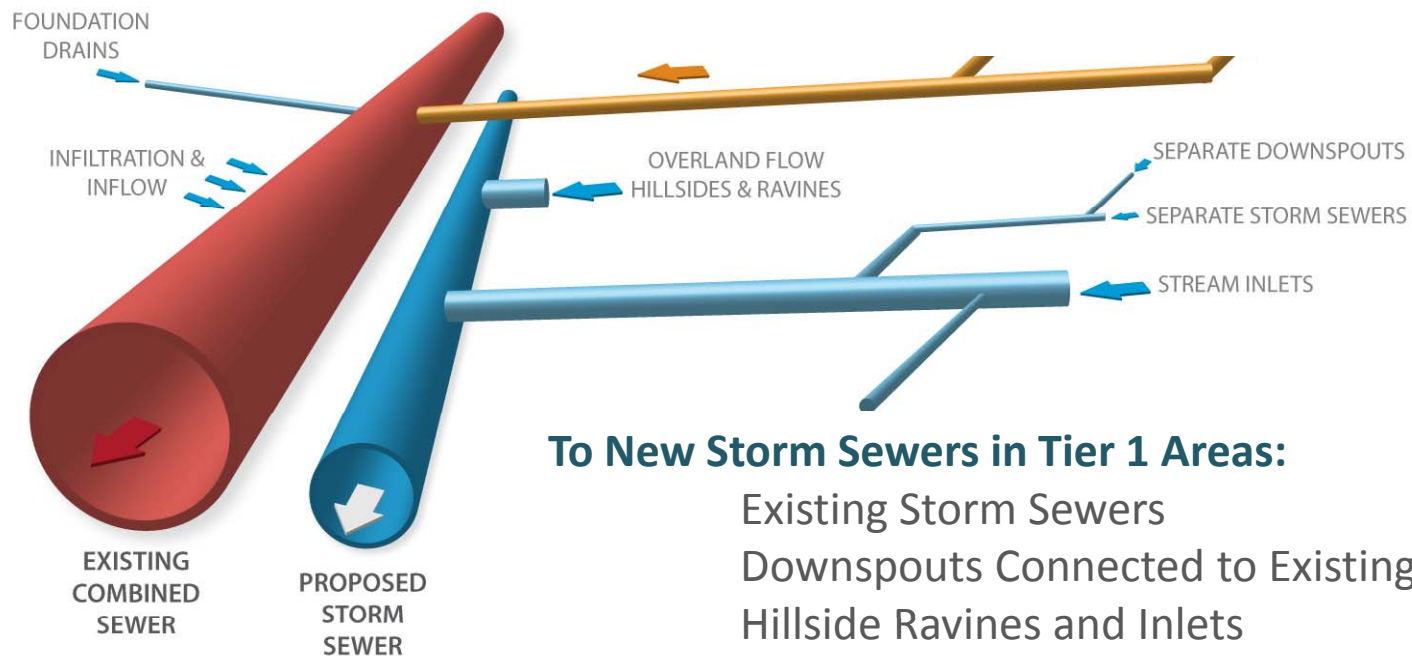
- LEGEND**
- EXISTING SEPARATE STORM DRAINAGE
 - EXISTING COMBINED SEWER
 - EXISTING SEPARATE SANITARY



Strategic Separation Approach

To Existing Combined Sewers:

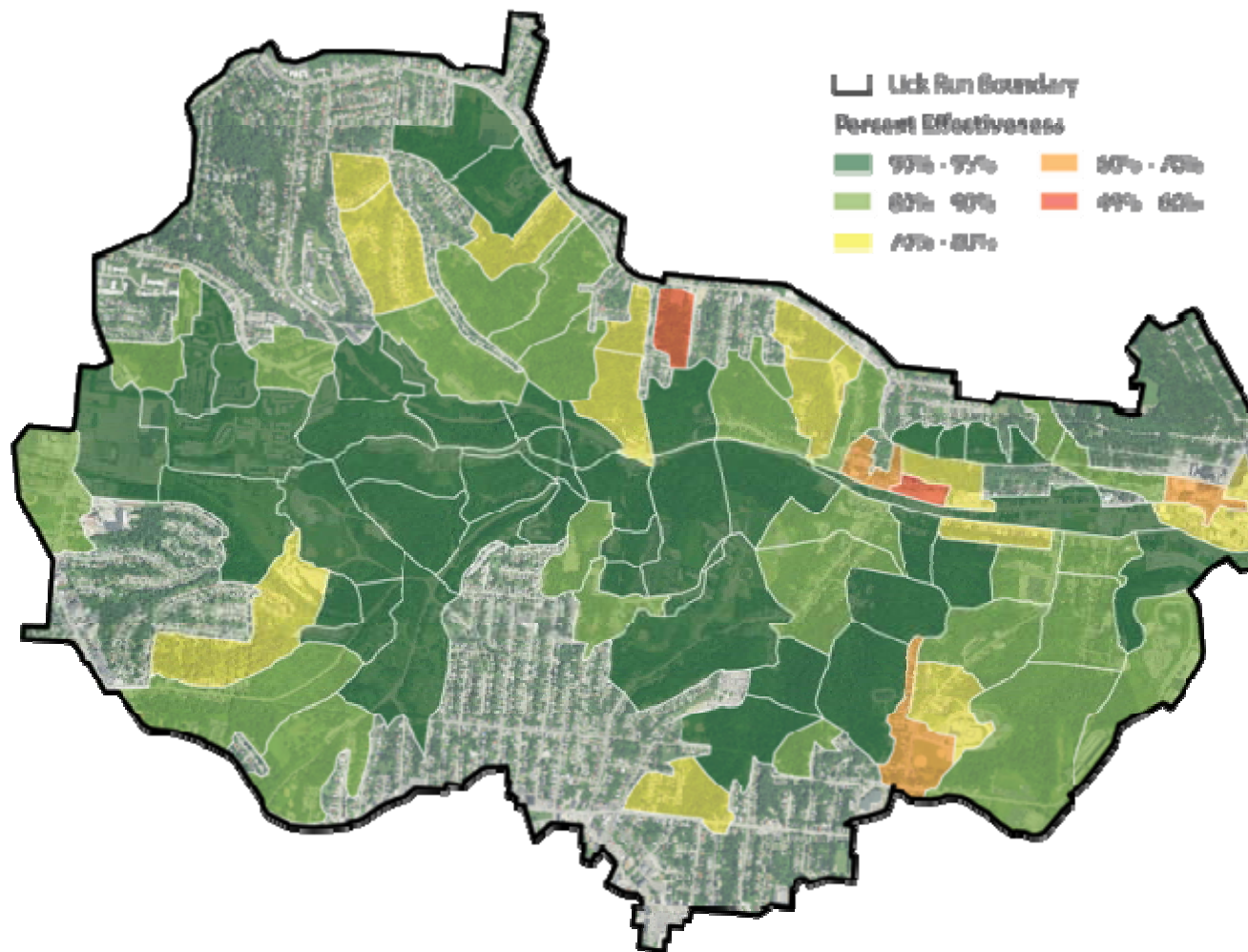
- Foundation Drains
- Downspouts Connected to Existing CSS
- Inflow and Infiltration
- Stream Inlets In Tier 2 Areas
- Roadway Inlets in Tier 2 Areas



To New Storm Sewers in Tier 1 Areas:

- Existing Storm Sewers
- Downspouts Connected to Existing Storm
- Hillside Ravines and Inlets
- Stream Inlets
- Roadway Inlets
- Overland Flow (Tier 2 also)

Strategic Separation - Percent Capture



Strategic Separation - Detailed Evaluations

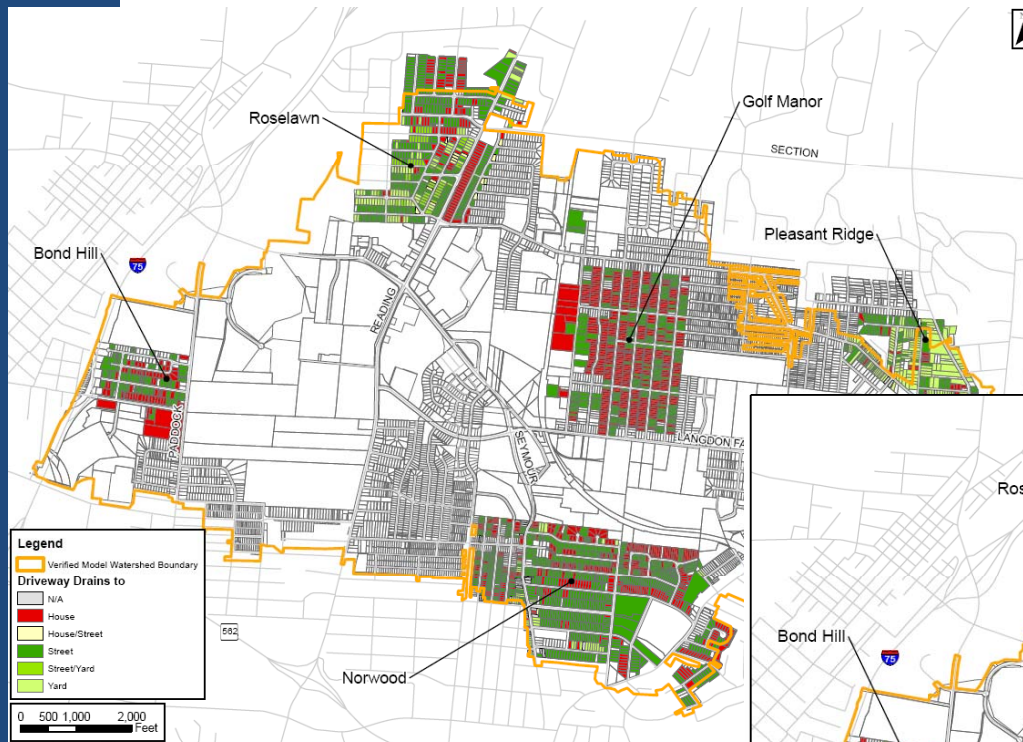


Figure 12 Field Reconnaissance Depicting Drainage Patterns of Residential Grounds

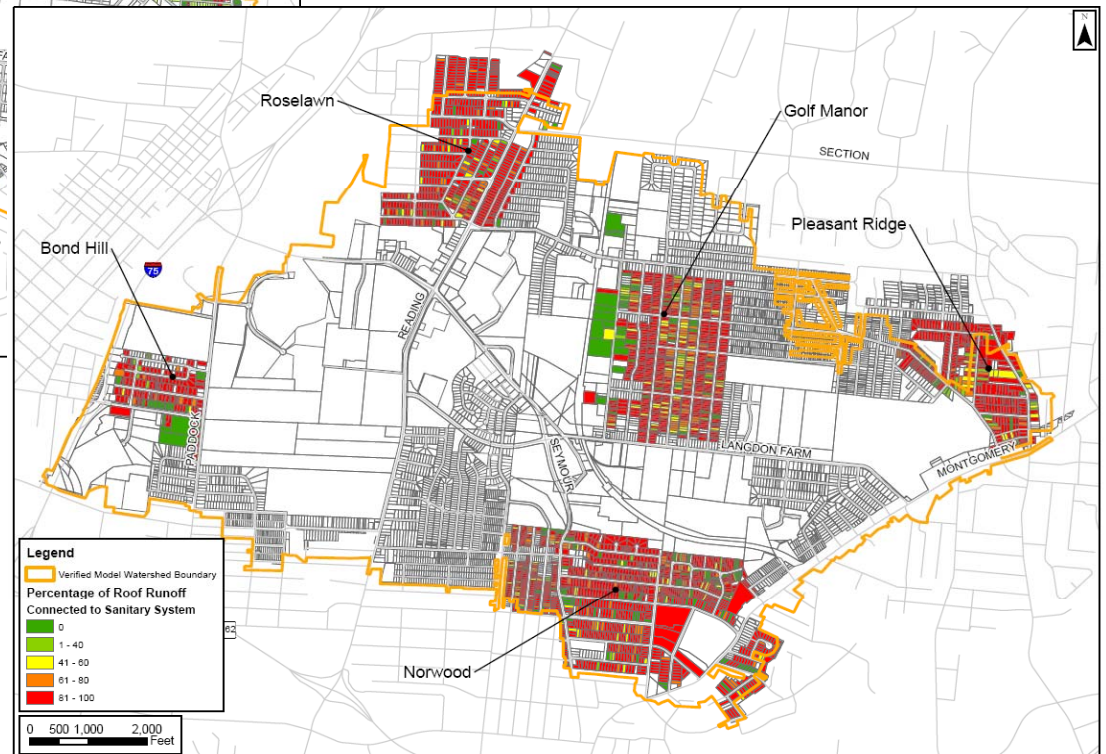


Figure 13 Bloody Run Field Data Roof Drainage

CDM

CDM

Strategic Separation - Refine Assumptions

FA-2

Part of Queen City and Cora Avenues R/W
Sewer Separation

Lick Run Conceptual Plan:

Estimated Percent Effectiveness - 90%

Detailed Impervious Evaluation:

Estimated Percent Effectiveness - 82%

Catchment Area: 27.18 Acres

Roadway: 0.15 Acres

Building: 1.72 Acres

Parking: 0.30 Acres

Driveways and Sidewalks: 1.08 Acres

Miscellaneous Impervious: 0.01 Acres

Total Pervious Area: 23.93 Acres

Percent Impervious: 12%

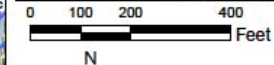
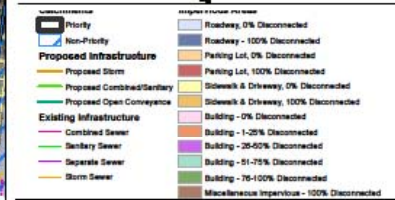
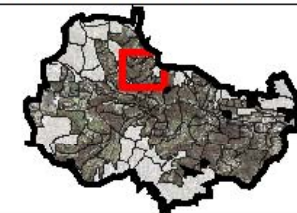
Area Removed:

Impervious: 1.60 Acres

Pervious: 23.93 Acres

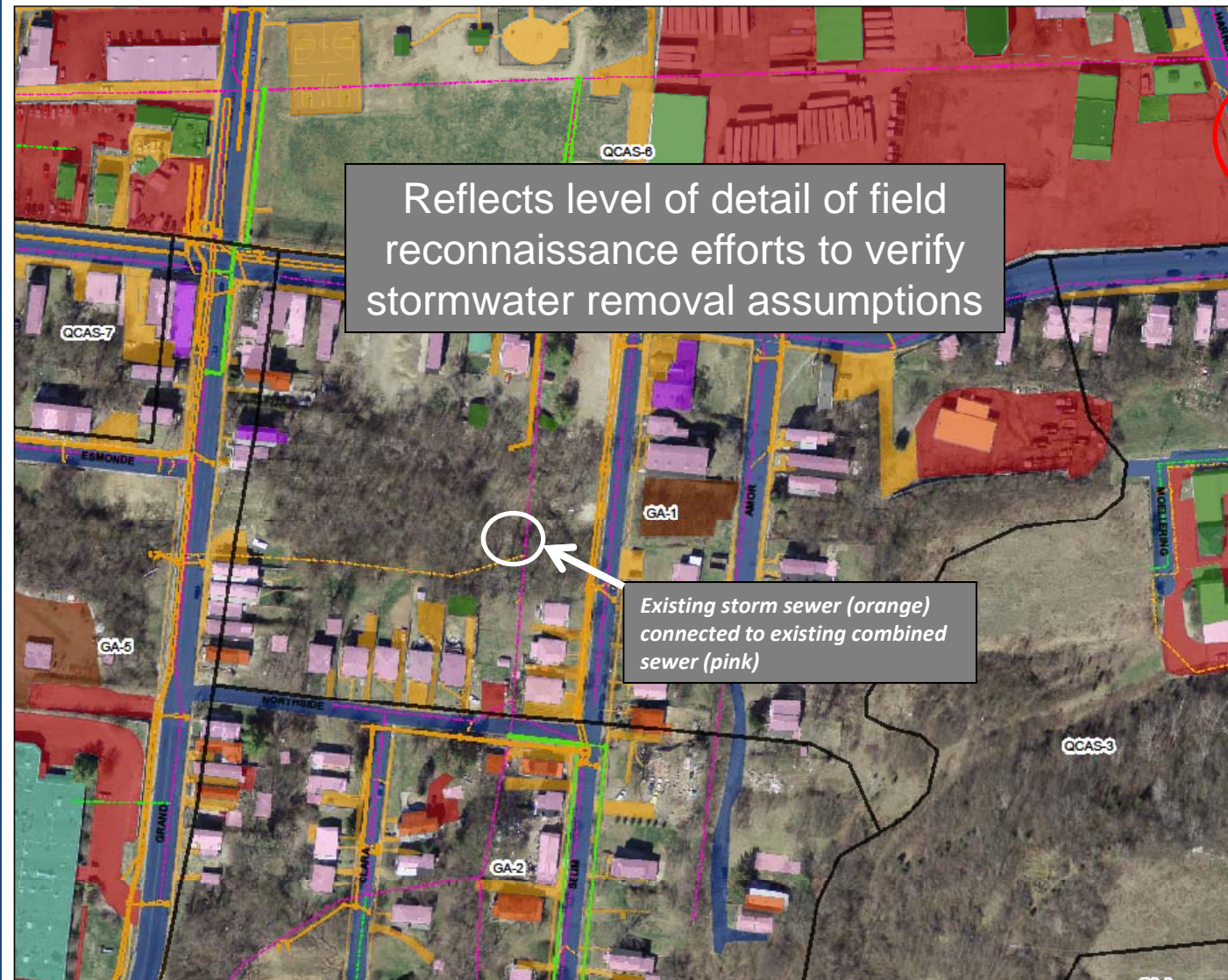
Total Area: 25.53 Acres

Percent of Catchment Area: 94%



Existing storm sewer (orange)
connected to existing combined
sewer (pink)

Strategic Separation - Refine Assumptions



GA-1

Part of Grand and Selim Avenues Sewer Separation

Lick Run Conceptual Plan:

Estimated Percent Effectiveness - 75%

Detailed Impervious Evaluation:

Estimated Percent Effectiveness - 83%

Catchment Area: 13.28 Acres

Roadway: 1.61 Acres

Building: 1.34 Acres

Parking: 0.51 Acres

Driveways and Sidewalks: 1.04 Acres

Miscellaneous Impervious: 0.20 Acres

Total Pervious Area: 8.57 Acres

Percent Impervious: 35%

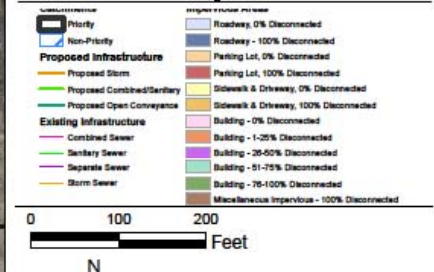
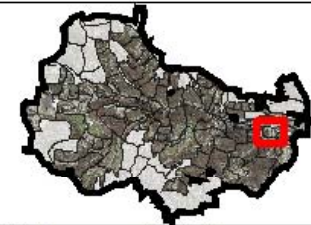
Area Removed:

Impervious: 3.53 Acres

Pervious: 8.57 Acres

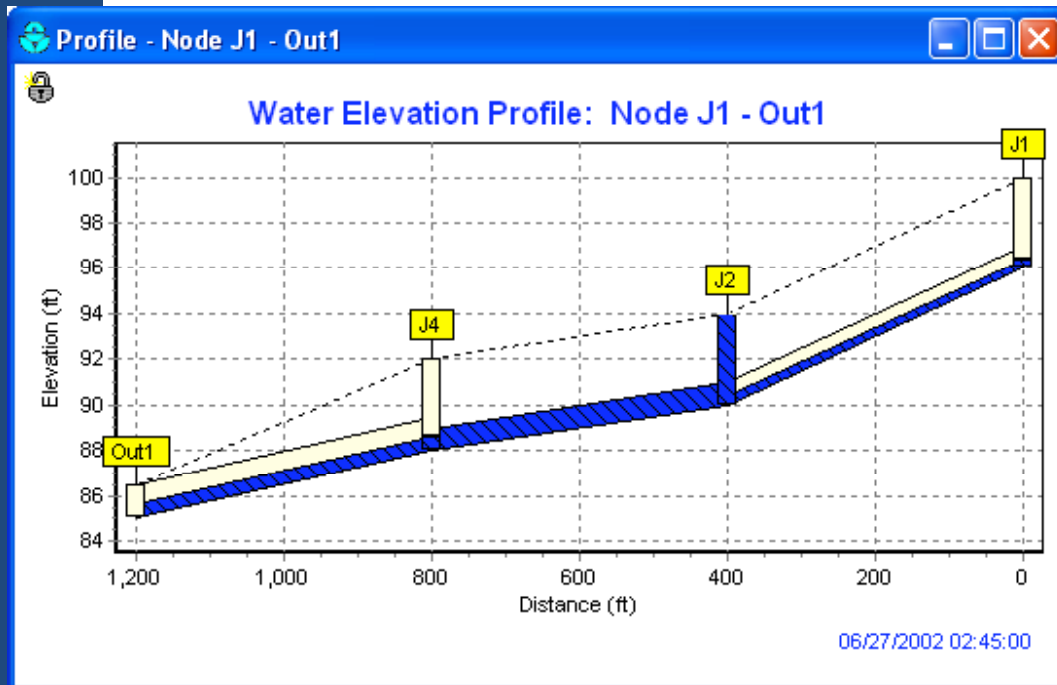
Total Area: 12.11 Acres

Percent of Catchment Area: 91%



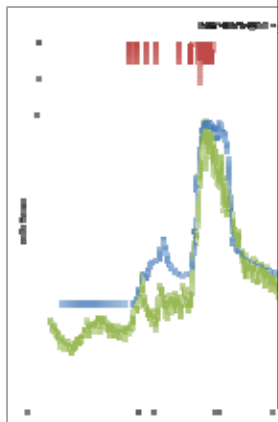
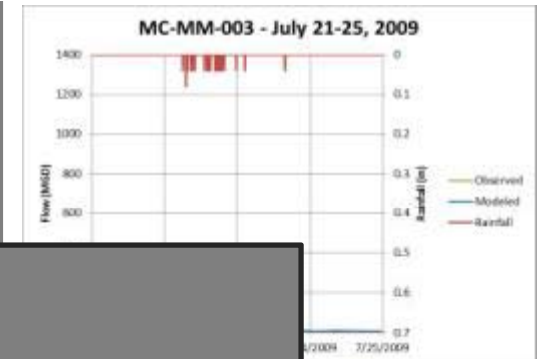
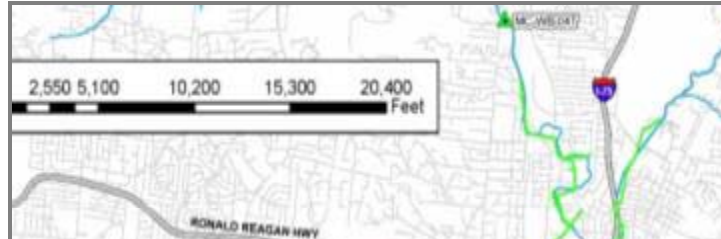
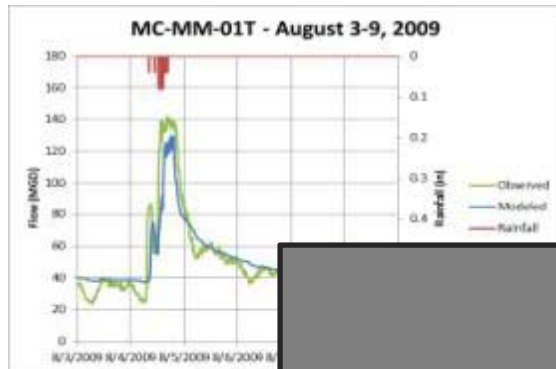
Hydraulic Model – Conversion from Kinematic Wave Model to Dynamic Model

Dynamic model simulates reverse flow & pressurized flow to keep more flow in the system



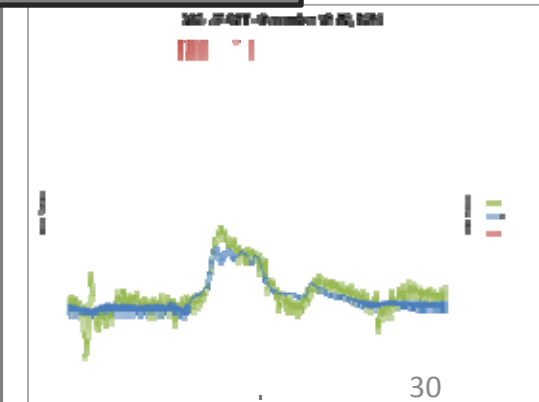
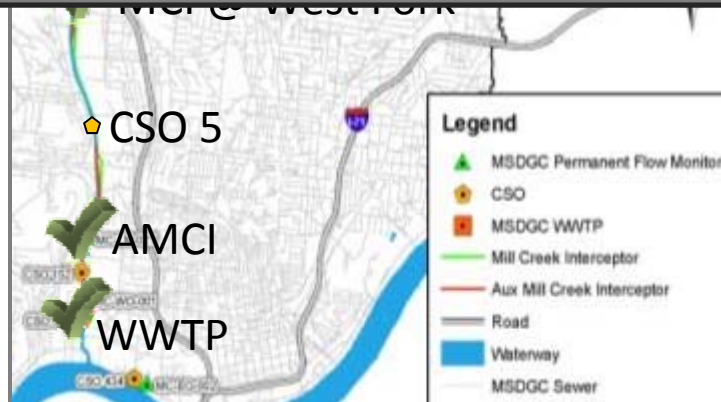
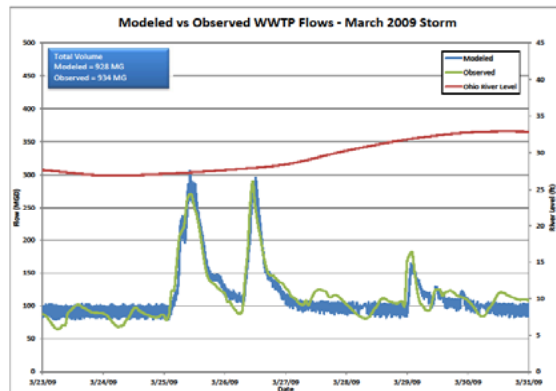
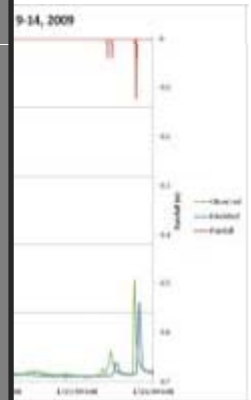
- Dynamic Model Allows for Backwater and Surge
- Dynamic Model allows for interaction between CSO regulating structures and the interceptor
- Dynamic Model solves a more robust set of flow equations – the full St. Venant Equations
- Dynamic Model takes into account the inherent storage in the sewer system upstream of the CSOs

Hydraulic Model Updated Results



“Every model is wrong, some are useful enough to make decisions.”

Mark Klingenstein
USEPA Technical Consultant



Business Case for Wet Weather Strategy

Real Time Control

- Low cost/gallon removal
- Limited opportunity – 4 locations within Lower Mill Creek: installation complete
- Estimated reduction of approximately 610 MG (400 MG credited towards 2 BG)

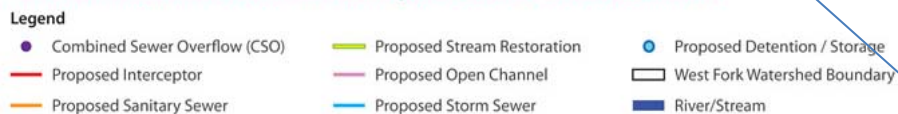
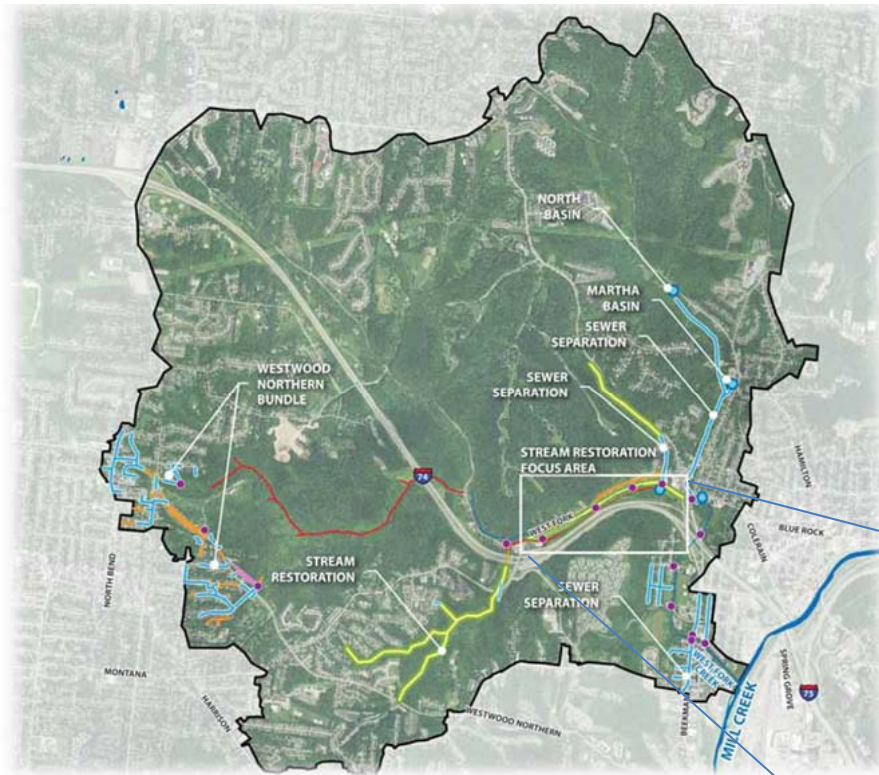
Storage, Conveyance & Treatment

- High Capital Cost - Phase 1 Tunnel (7600 ft) to capture 1.6 BG
- High O&M Cost: pumping & treating large volume of stormwater

Source Control

- Lower cost/gallon removal
- Strategic focus on large scale opportunities
- Lowers future O&M cost by removing stormwater from pumping & treatment
- Improves water quality and increases natural drainage to Mill Creek

Preliminary West Fork Source Control/Stream Restoration



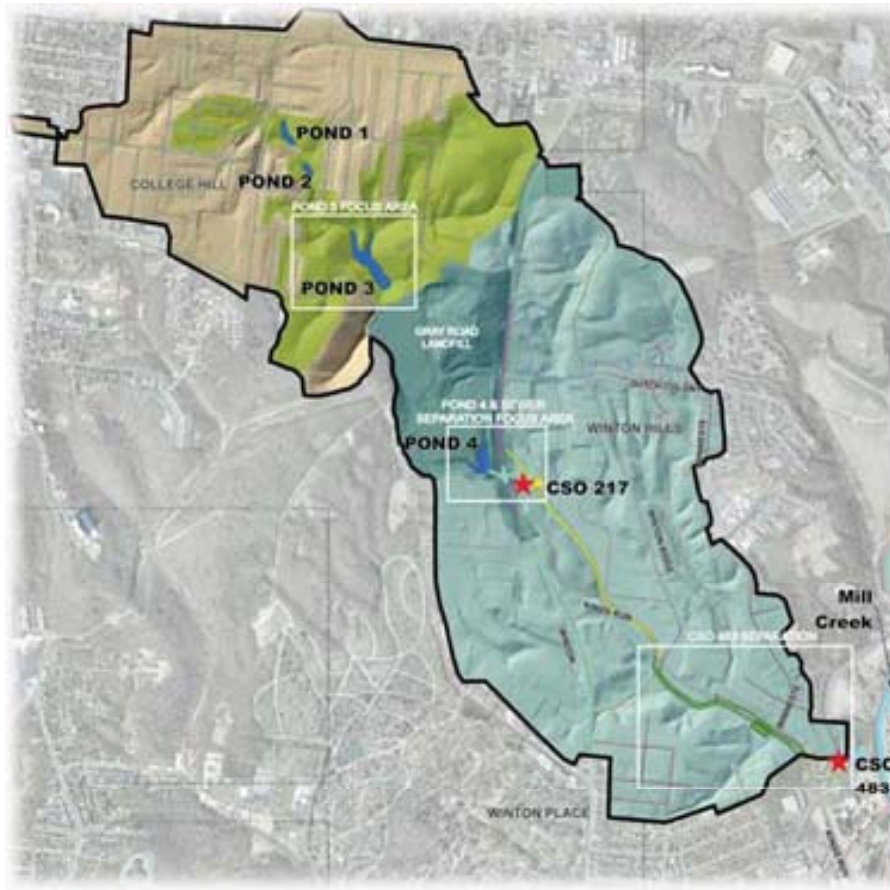
Existing Condition:
Concrete channel w/grates and overflow structures



Potential Solution: Separate flow from combined, consolidate overflows and construct natural conveyance



Preliminary Kings Run Source Control



Kings Run Sub-Watershed: Overview of Proposed Source Control Solutions



Potential Solution: Intercept stormwater runoff and release it back into combined sewer system, stabilize stream banks, direct stormwater to Mill Creek

- Stormwater detention basins
- Separate storm & sanitary sewers
 - Dedicated storm sewer along Winton Road, Kings Run Road, & Winton Ridge Road (to Kings Run stream)
 - New combined sewer along Kings Run Road & convert existing to storm (to Mill Creek)
- Stream Restoration
 - Stabilize banks & minimize erosion
 - Improve CSO discharge conveyance

vision

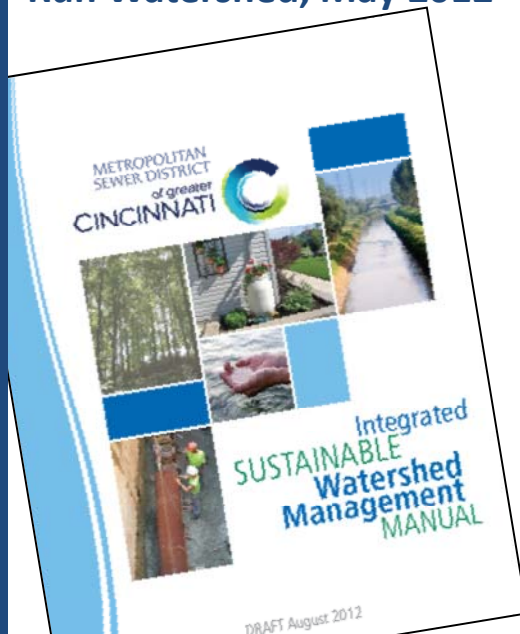
Vision of the future community

MEET WITH THE REGULATORS

We met with the Regulators...



Nancy Stoner, County Commissioner Portune, Director Parrott touring Lick Run Watershed, May 2012



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

JUN - 5 2012

MEMORANDUM

SUBJECT: Integrated Municipal Stormwater and Wastewater Planning Approach Framework

FROM: Nancy Stoner *NK*
Acting Assistant Administrator
Office of Water

Cynthia Giles *Cynthia Giles*
Assistant Administrator
Office of Enforcement and Compliance Assurance

TO: EPA Regional Administrators
Regional Permit and Enforcement Division Directors

In recent years, EPA has increasingly embraced integrated planning approaches to municipal wastewater and stormwater management. EPA further committed to work with states and communities to implement and utilize these approaches in its October 27, 2011 memorandum "Achieving Water Quality Through Municipal Stormwater and Wastewater Plans." Integrated planning will assist municipalities on their critical paths to achieving the human health and water quality objectives of the Clean Water Act by identifying efficiencies in implementing requirements that arise from distinct wastewater and stormwater programs, including how to best prioritize capital investments. Integrated planning can also facilitate the use of sustainable and comprehensive solutions, including green infrastructure, that protect human health, improve water quality, manage stormwater as a resource, and support other economic benefits and quality of life attributes that enhance the vitality of communities.

To provide further guidance on developing and implementing effective integrated plans under this approach, we have developed, with extensive public input, the attached Integrated Municipal Stormwater and Wastewater Planning Approach Framework document. We are posting the framework document on our website and, as they become available, will provide practical examples of how municipalities are implementing this approach. We would like to thank Regions 2, 4, 5, 7 and 10 for their assistance in conducting public workshops to gain input on the draft framework. We encourage all Regions to work with their States to identify

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Recycled/Recyclable • Printed with Vegetable Oil Based Inks on Recycled Paper (Minimum 25% Postconsumer)

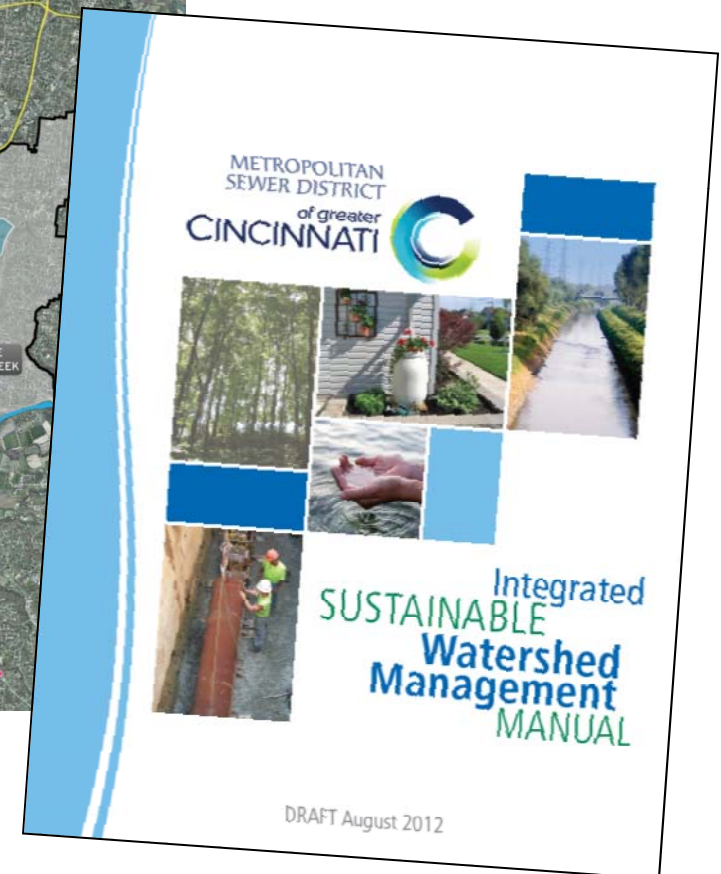
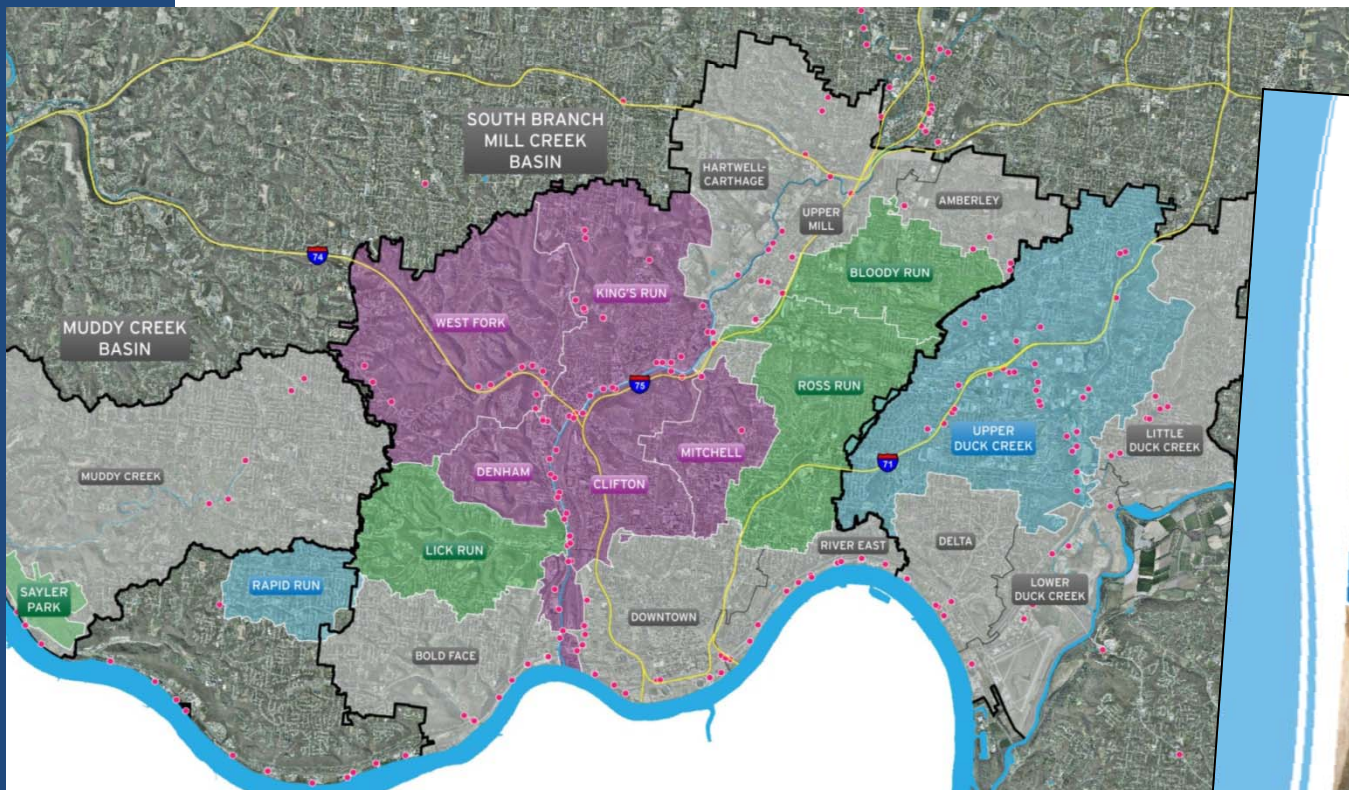
National Guidance Framework Released June 2012

- Watershed Planning
- Water Quality Assessments
- Green Infrastructure
- Putting it all Together

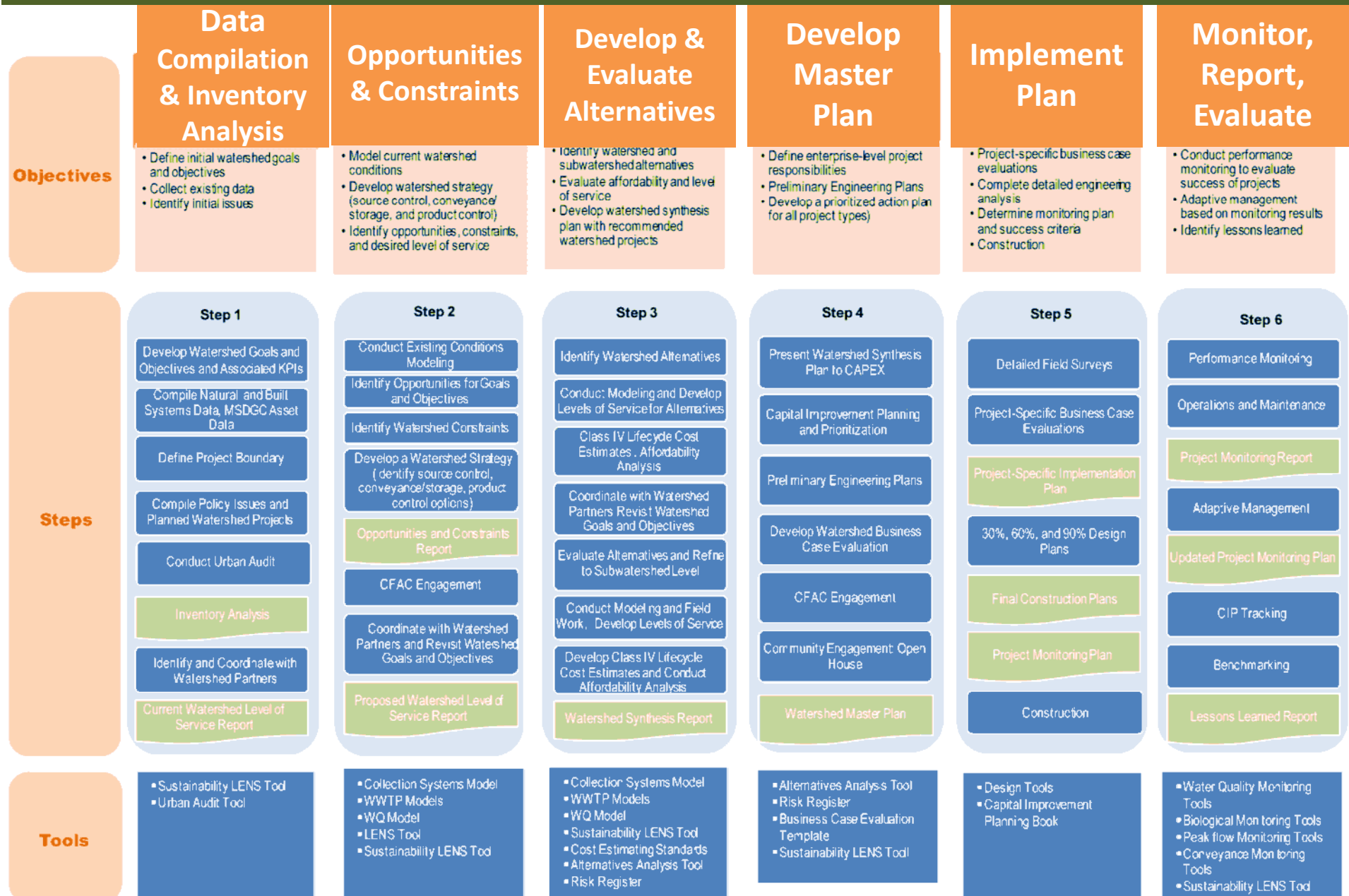
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DEVELOP A SUSTAINABLE STRATEGY

MSD Integrated Sustainable Watershed Approach



MSD Sustainable Watershed Evaluation Planning



MSD Sustainable Watershed Evaluation Planning

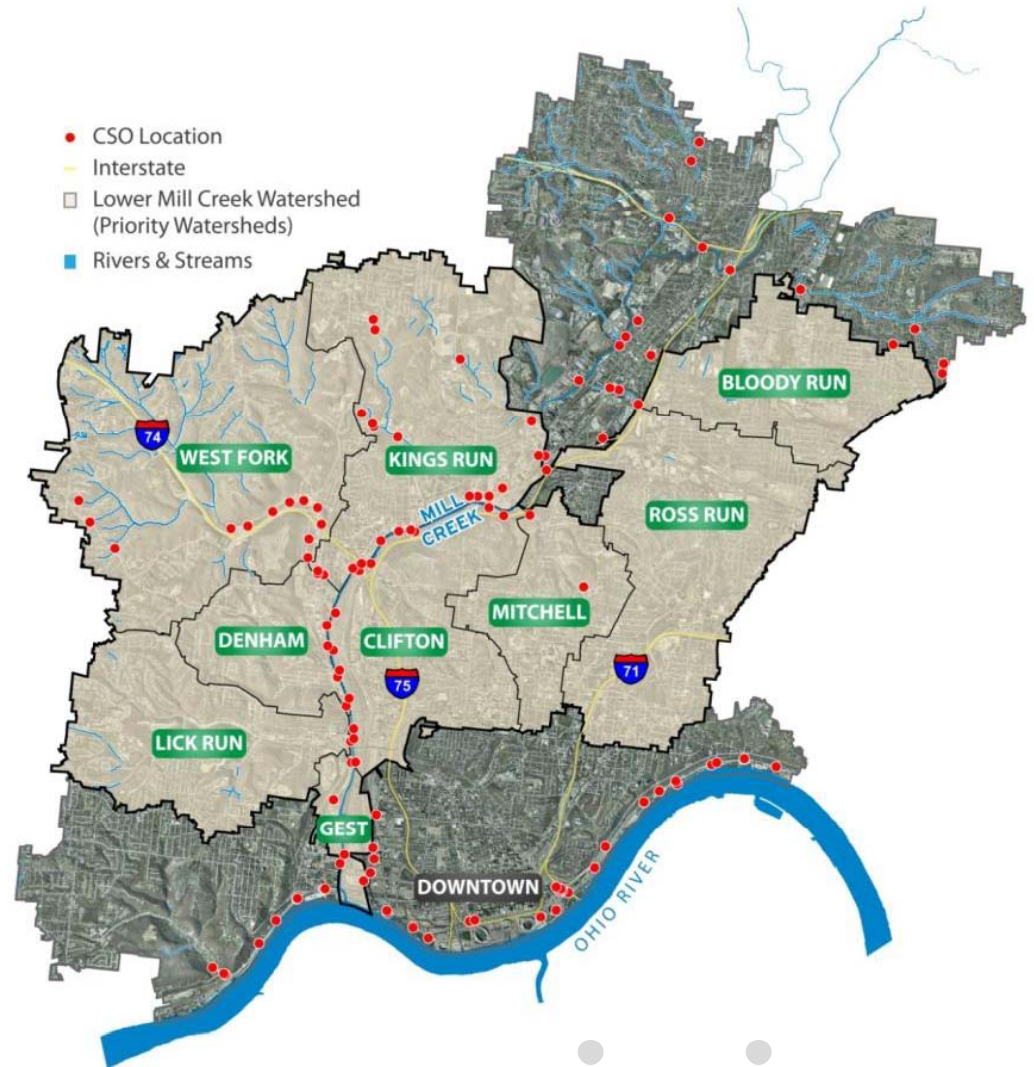
Key Outcomes of SWEPP

- ◆ Understanding of watershed existing conditions – water quantity and quality issues as drivers
- ◆ Identification of Source Control Opportunities and Preliminary Benefits
- ◆ Development of Recommended Watershed Strategy and Preliminary Master Plan



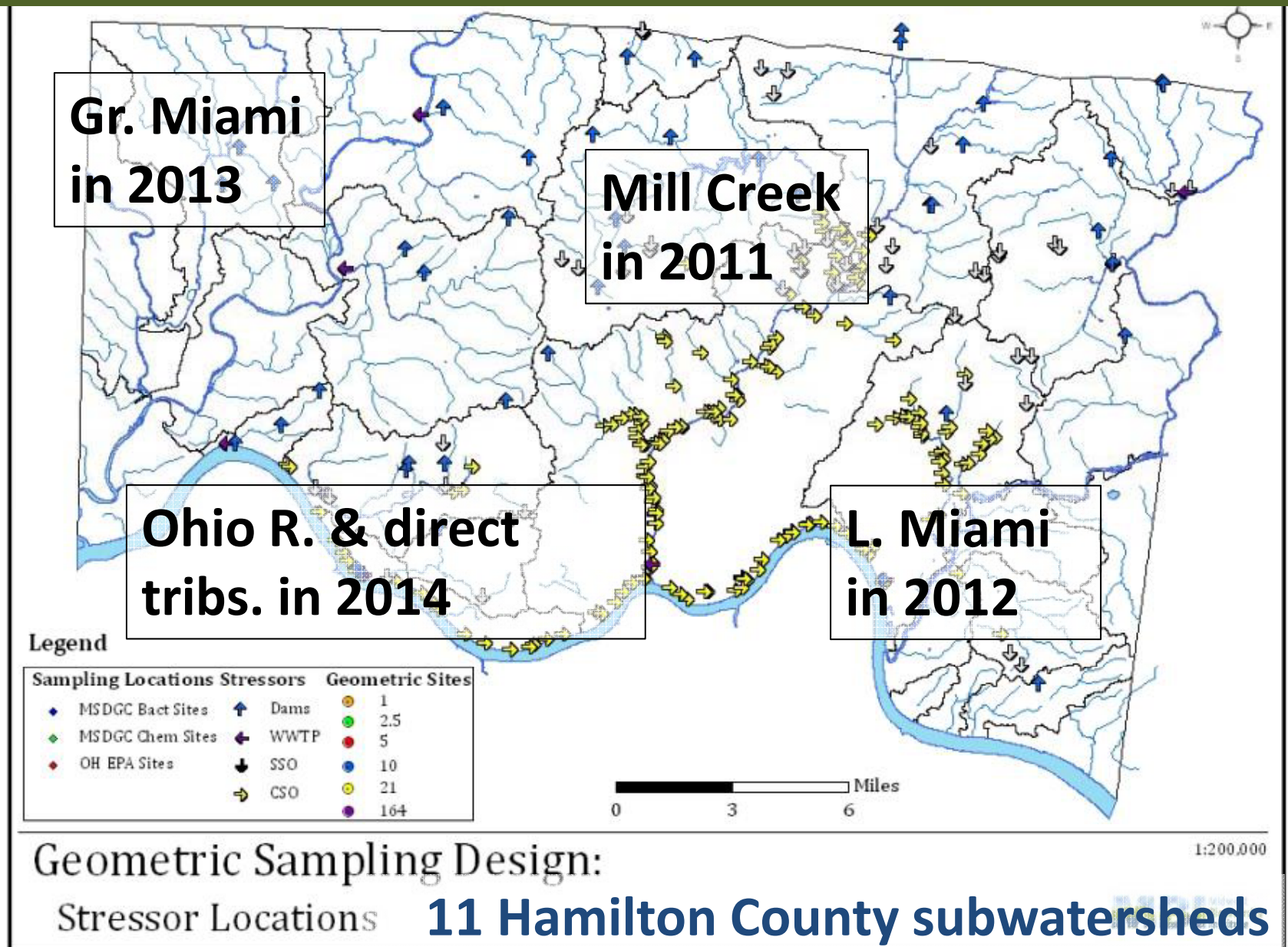
Lower Mill Creek Watershed

- MSD CSO Reduction Planning
- Revive 75 & ODOT Planning for I-75
- Cincinnati Comprehensive Planning
- Go- Cincinnati Plan
- Multi-modal Plans
- Greenway Master Plan
- Green Cincinnati Plan
- Lower Mill Creek Watershed Action Plan



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Water Quality - Watershed Monitoring



Water Quality - Watershed Monitoring

Mill Creek Basin



Midwest Biodiversity Institute
Center for Applied Bioassessment & Biocriteria
P.O. Box 21561
Columbus, OH 43221-0561

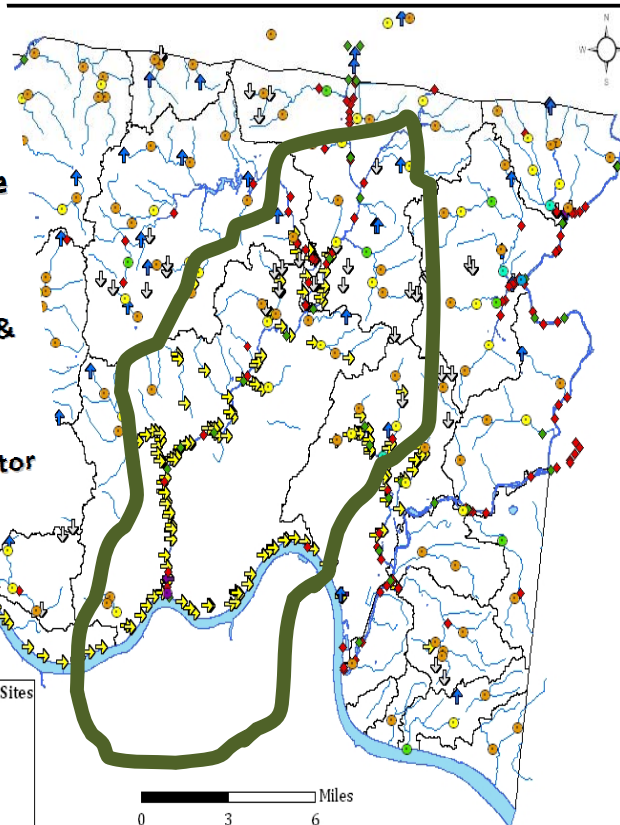
Watershed Monitoring and Bioassessment Plan for the MSD Greater Cincinnati Service Area

Midwest Biodiversity Institute
Center for Applied Bioassessment &
Biocriteria
P.O. Box 21561
Columbus, OH 43221-0561
Chris O. Yoder, Principal Investigator
mbi@mwbinst.com

Legend

Sampling Locations	Stressors	Geometric Sites
◆ MSDGC Bact Sites	↑ Dams	● 1
◆ MSDGC Chem Sites	⬇ WWTP	● 2.5
◆ OH EPA Sites	⬇ SSO	● 5
	⬇ CSO	● 10
		● 21
		● 164


Geometric Sampling Design:
All Sites and Stressors



- 4 year basin rotation
- Kick Off May 2011
- Data Collection
 - Approx 100 sites, geometric, spatially derived for collection of biological, chemical and physical water quality data
- Watershed Assessment:
 - stressors
 - water quality impacts
 - water quality actions
- IPS - 2014

Ohio River Water Quality

Hamilton County: There are no active watches, warnings or advisories. | Clermont County



Helping You Recreate Safely

HOME RECREATION WATER QUALITY MATRIX RIVER REPORT WEATHER CONTACT




Welcome to Recr8OhioRiver!


The Metropolitan Sewer District of Greater Cincinnati (MSD) and its partners, the Ohio River Valley Water Sanitation Commission (ORSANCO) and Sanitation District No. 1 of Northern Kentucky (SD1), are committed to improving water quality in the Ohio River and its tributaries and promoting these local waterways as natural and economic assets to the region.

Toward that goal, the group has developed this recreation management tool to provide useful information about the Ohio River to recreational users and others as they are planning to boat, fish, swim or engage in water sports such as kayaking, paddling, tubing, jet skiing and water skiing.

This tool can help you make informed decisions about where and when to recreate on the Ohio.

What do you want to do today?

 Boating/Fishing  Swimming  Water Sports





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Sprint 10:11 AM

Recr8OhioRiver

What would you like to do today?

 Boating/Fishing >

 Swimming >

 Watersports >

Hamilton County

There are no active watches, warnings or advisories

Home Weather River Twitter More

Green Infrastructure

Managing stormwater at the source while educating the public and ratepayers.

- ◆ Cincinnati State Technical Community College
- ◆ Clark Montessori School
- ◆ Cincinnati Zoo African Savannah
- ◆ WestCURC / Habig's Parking Lot
- ◆ Reforestation along Queen City Avenue
- ◆ San Antonio Church
- ◆ Roselawn Park beginning Spring 2012



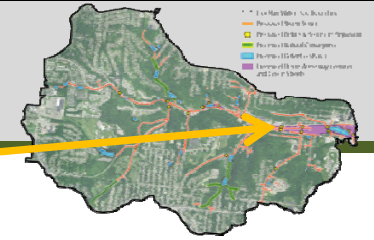
Putting it all Together

The “sustainable” solution is less costly and has more benefits.



vision

Putting it all Together



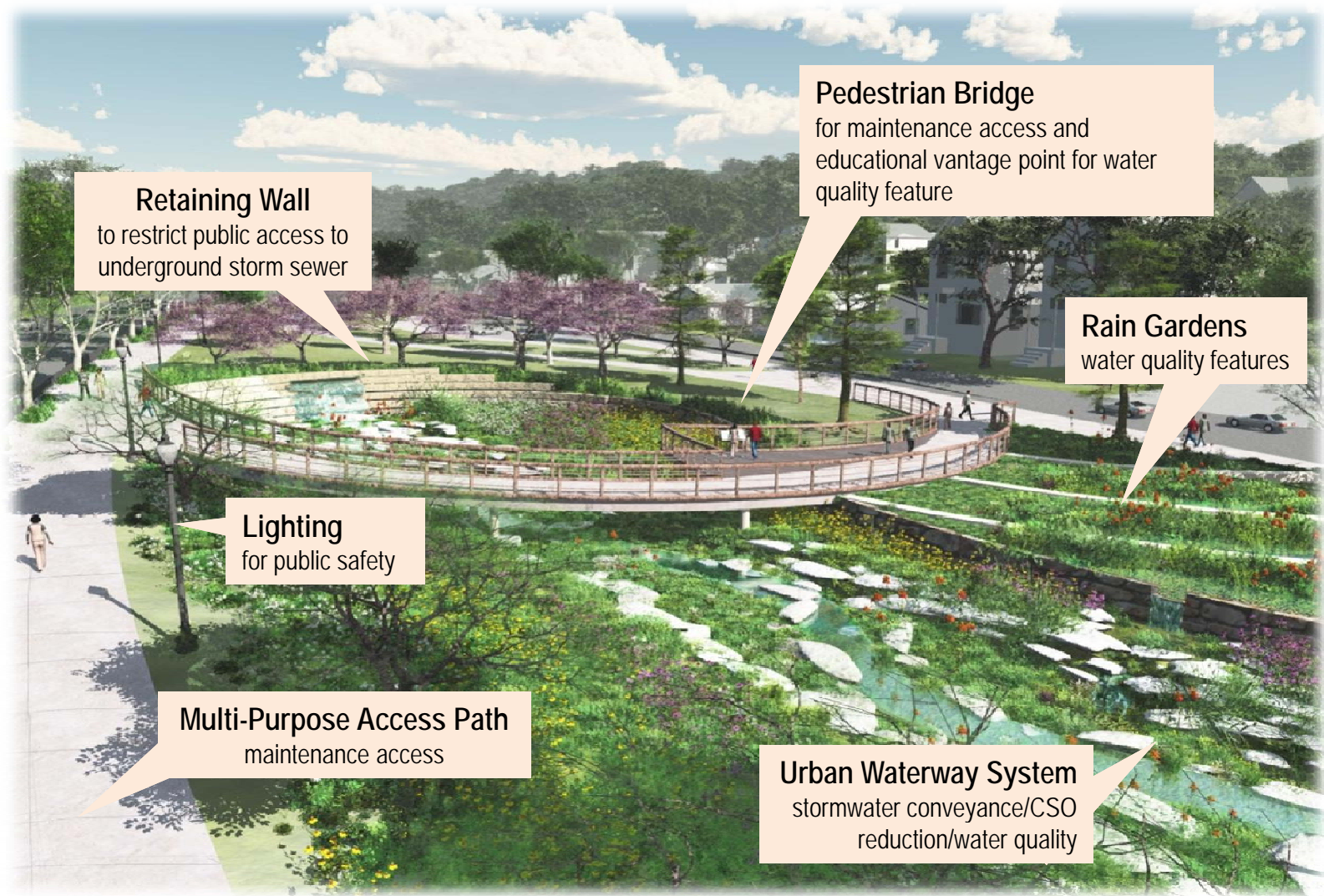
Proposed Valley Conveyance System

Alignment & Water Quality Features

Putting It All Together

Balance water quality, capital investment, and community integration.

Western Gateway Zone



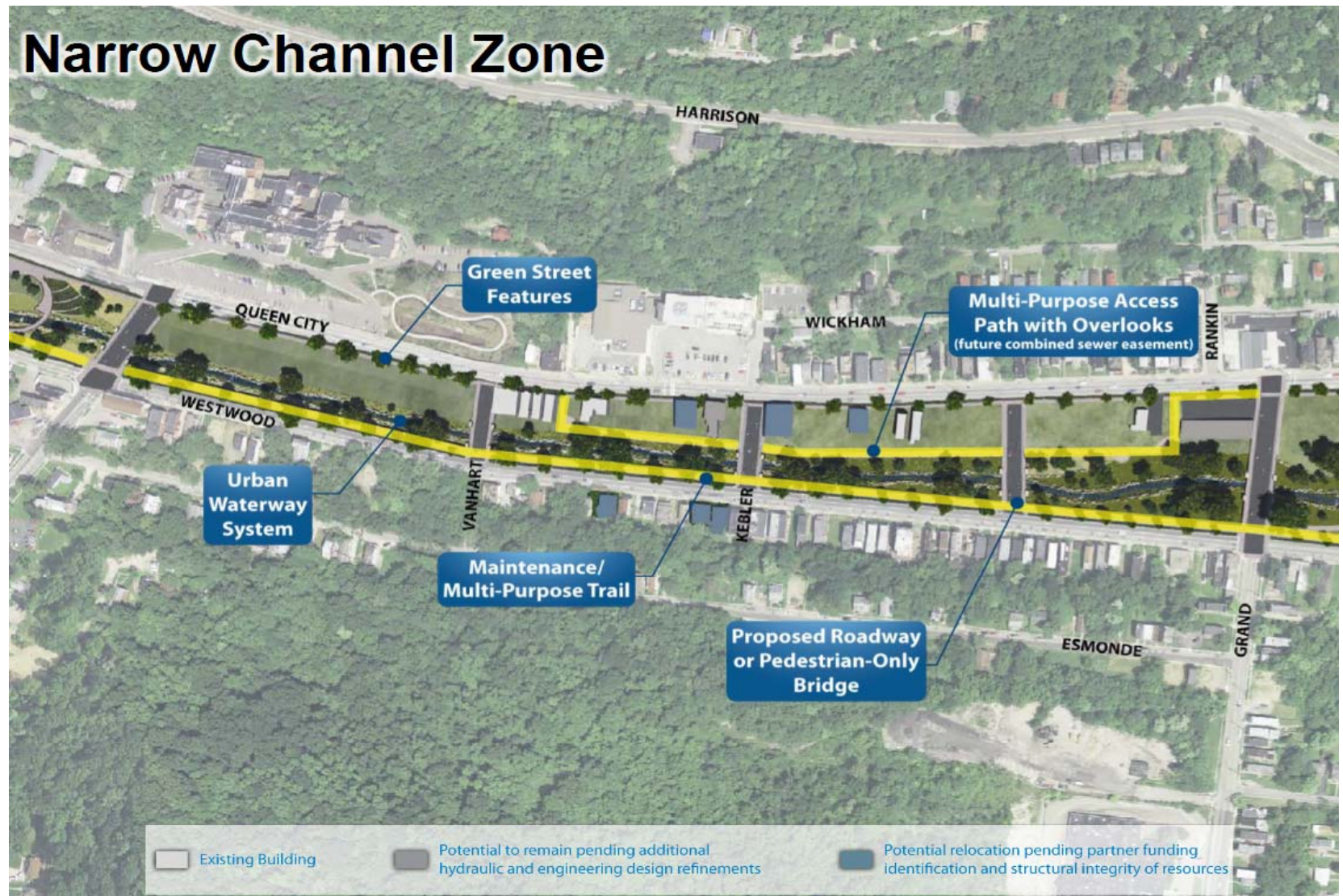
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Looking north towards Queen City

Putting It All Together

Keep an Eye toward the Future.

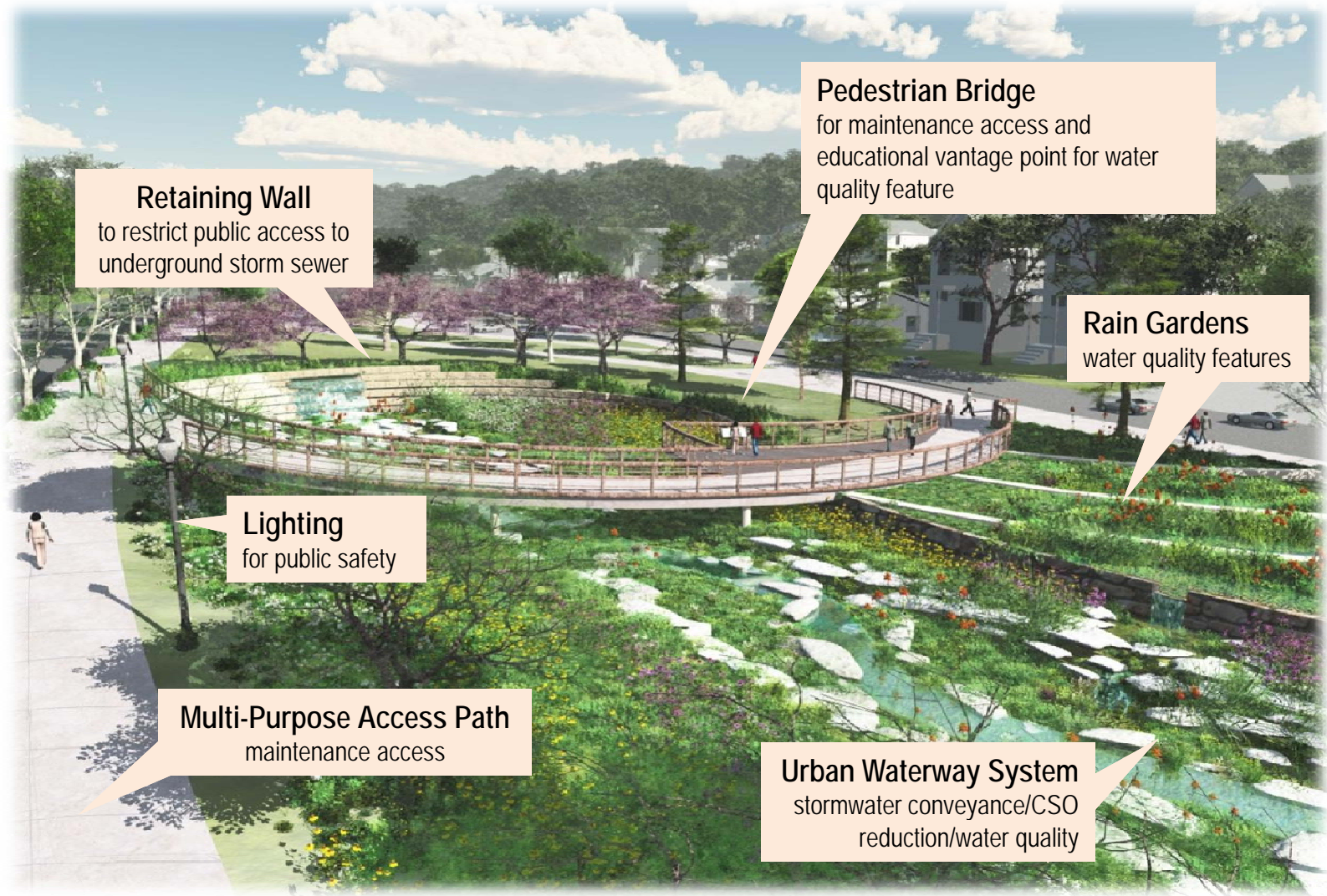
Narrow Channel Zone



Putting It All Together

Leave a legacy for the next generation.

Western Gateway Zone

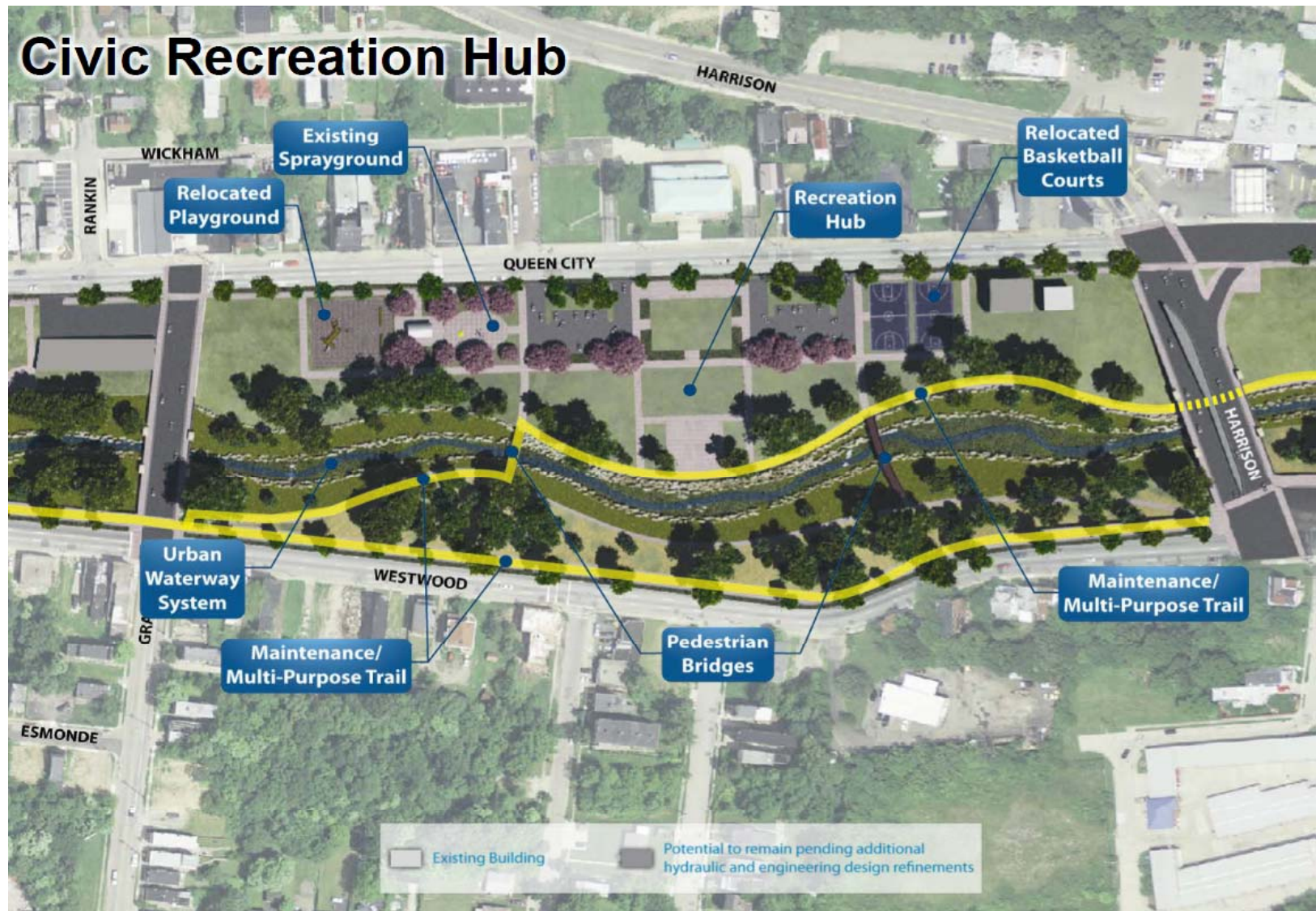


vision

Looking north towards Queen City

Putting It All Together

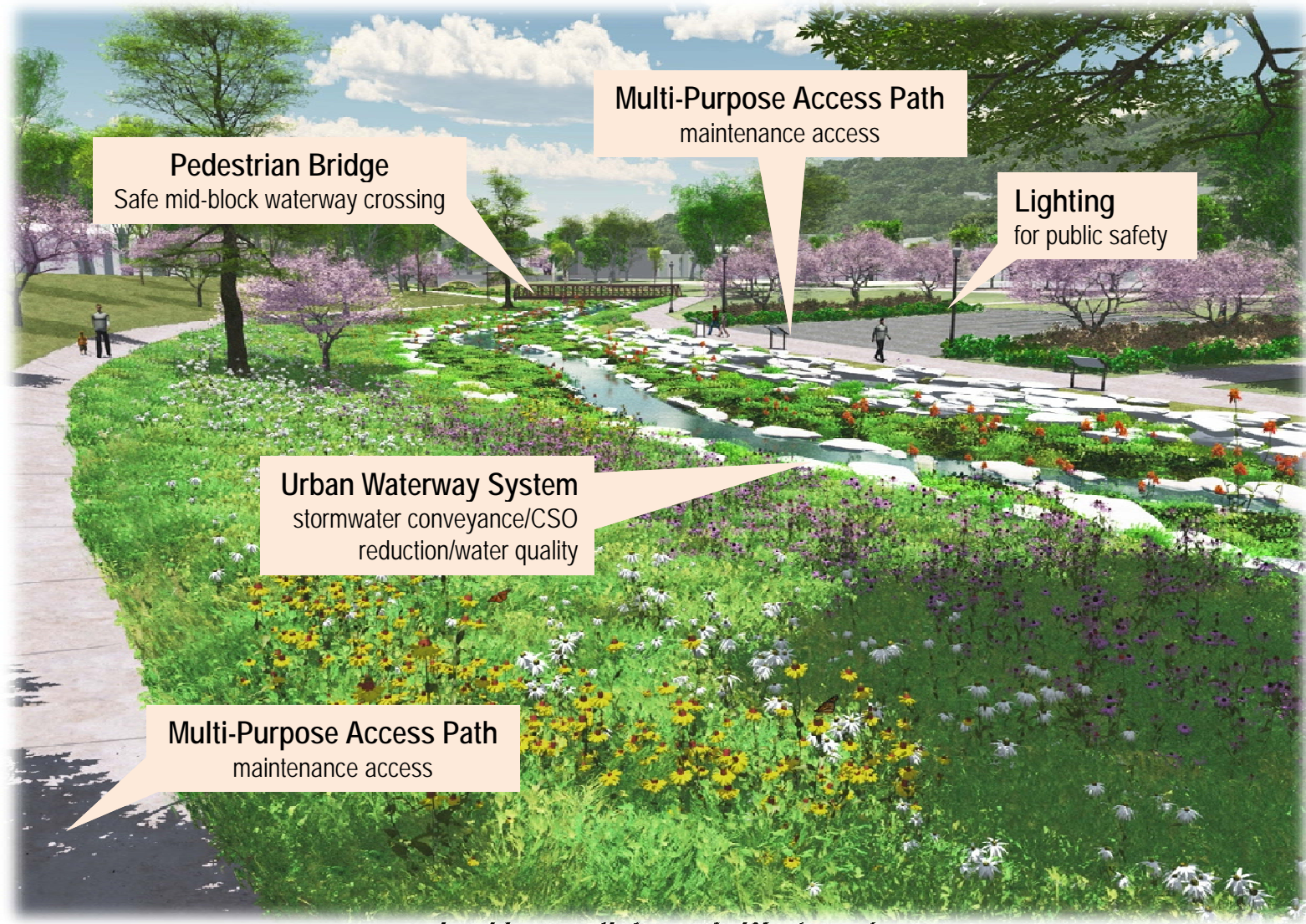
Community involvement is critical for success.



Putting It All Together

Vision for the Future Community.

Civic Recreation Hub



Pedestrian Bridge

Safe mid-block waterway crossing

Multi-Purpose Access Path

maintenance access

Lighting

for public safety

Urban Waterway System

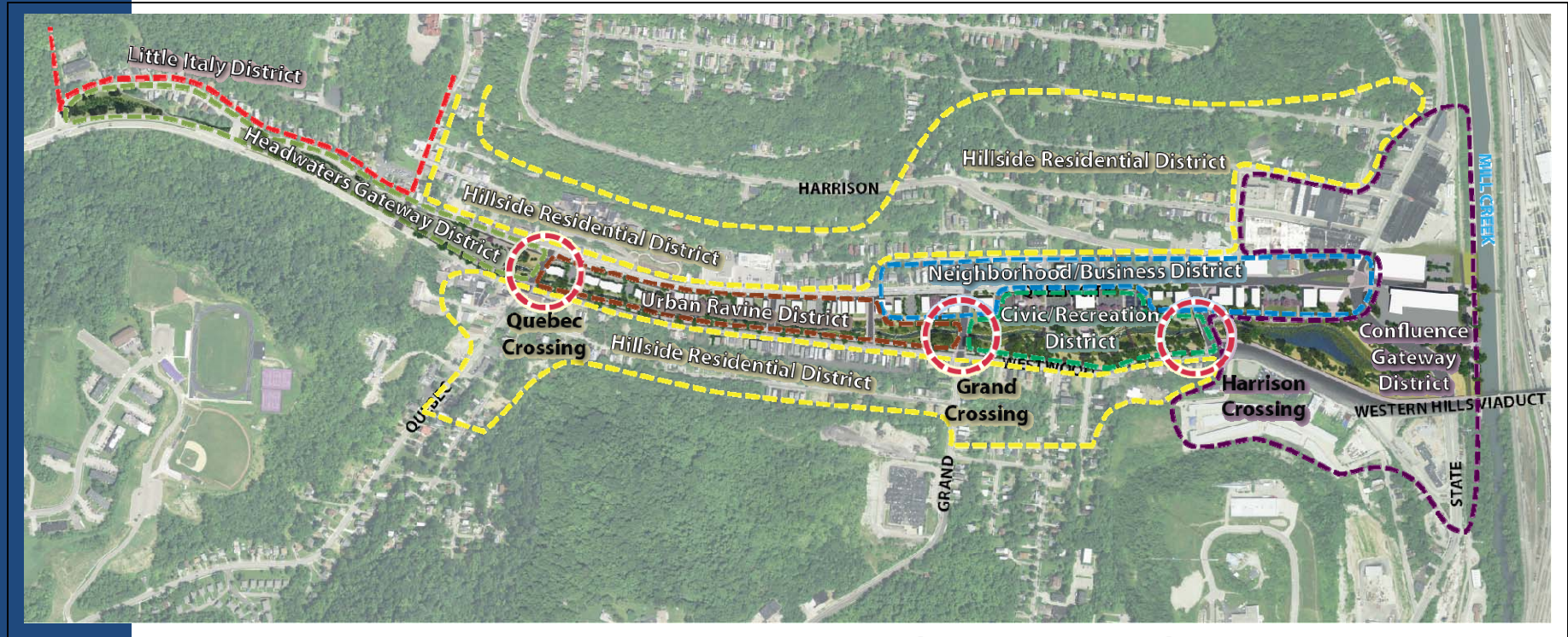
stormwater conveyance/CSO
reduction/water quality

Multi-Purpose Access Path

maintenance access

Looking south towards Westwood

Infrastructure investment today will support future public/private investments



Neighborhood District Concept

vision

Integrated watershed planning resulted in:

- \$200 Million Savings for Phase 1
- Community Supported Investments that bring investments above ground and help create communities vision for the future

Vision of the future community

CONCLUSION



vision

Vision of the future community

THANK YOU