MSD Integrated Watershed Management Planning Approach to Achieve Sustainable Communities

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MSD of Greater Cincinnati

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April 4, 2013
Overview

• MSD’s Environmental Challenge
• Our Wet Weather Strategy
• Opportunities for Integrated Watershed Planning
• Case Studies: Sustainable Infrastructure Alternatives
• Next Steps
Cincinnati, Hamilton County, Ohio

- Publicly Owned/Operated Wastewater Utility Serving Southwest Ohio (Hamilton County)
- Serves a Population of about 855,000
  - 230,000 Residential and 250 Industrial Users
  - Operates 7 Wastewater Treatment Plants; treating 70 Billion Gallons/yr
Historical Drainage Perspective

75 miles of existing streams, 603 miles of combined sewers
Wet Weather Impacts

Guerley Road & Sunset Avenue
Lick Run Watershed

CSO #5
Lick Run

CSO #483
Kings Run
MSD’s Environmental Challenge

212 Combined Sewer Overflow (CSO) Locations
78 Sanitary Sewer Overflows (SSOs) Locations
MSD’s Approved Consent Order Elements

Wet Weather Strategy
- Source Control
- Conveyance & Storage
- Product Control

Phased Approach
- Phase 1: 2009 – 2018
- Phase 2: Schedule to be submitted by 2017

Controlled Spending
- Phase 1: $1.145B
- Credit for $300M in projects
- Phase 2: To Be Determined

Flexible
CSO LMC Control Mandates

**WHAT**

- Wet Weather Improvement Plan (WWIP) Submittal
- Judge Approved Final WWIP
- Regulators Reject Green Infrastructure BMP Approach
- Revised WWIP Conditionally Approved
- March 2012: Submit preliminary findings to the Hamilton County Board of County Commissioners
- December 2012: Submit preferred plan for significant reduction of CSO volume in the Lower Mill Creek by 2018
- Phase I Plan Submittal
- Significant Reduction of CSO Volume in Lower Mill Creek
- Phase I Complete
PROJECT GROUNDWORK
in Your Community

Protecting the Environment
Partnering with our Communities
Revitalizing the Economy
Designing Innovative Solutions

Project Groundwork is your program. It's an investment in your community for generations to come.

METROPOLITAN SEWER DISTRICT OF GREATER CINCINNATI
“Default” Solution for Lower Mill Creek

The “default” solution specified in MSD’s Consent Decree is an underground storage tunnel parallel to Mill Creek.

- **$244+ million**
  Estimated cost (in 2006 dollars)

- **$1,100 per MG of treatment**
  Estimated operations and maintenance costs

- **547,800 megawatts**
  Estimated power demand of pumping 2 Billion Gallons over 10 years

- **377,739 metric tons**
  Estimated CO₂ emissions from pumping 2 Billion Gallons over 10 years
MSD is focusing on watersheds within the Lower Mill Creek that experience high volumes of combined sewer overflows (CSOs).

7.6 BG annual CSO volume
MSD’s Wet Weather Strategy

Hydraulic Grade Line inside sewer
Information required to be included in the LMC Study report for the Regulators to consider an alternative solution.

**USEPA Guidance Criteria for LMCPR**

**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.a 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.
USEPA Integrated Planning Framework

MEMORANDUM

JUN - 5 2012

SUBJECT: Integrated Municipal Stormwater and Wastewater Planning Approach Framework

FROM: Nancy Stoner
Acting Assistant Administrator
Office of Water

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
USEPA Integrated Municipal Planning Framework

Use the flexibility of EPA’s existing regulations and policies and encourage municipalities to evaluate how best to meet all of their CWA requirements and within their financial capability. Elements include:

- Water quality, human health and regulatory issues
- Identifying, evaluating, and selecting alternatives and proposing implementation schedules
- Existing wastewater and stormwater systems’ current performance
- Measuring success of projects
- Community stakeholders in the planning and selection
- Improvements to the Plan
What if...? a sewer project...
• ... could be more than a sewer project?

What if...
• ... it could be a *strategic investment*?
• ... it could be a *catalyst* for community transformation?
• ... it could be a *regional model* for a new watershed-based approach to community planning?
• ... if it could be a national model for green infrastructure planning/design?
• ... it could involve the community and many public and private partners?
• ... it did more than improve stormwater management and reduce combined sewer overflows?
  » ... it created a network of community assets that attracted new interest and investment?
  » ... if it left behind open spaces, enhanced streetscapes and opportunities for green buildings? ... if it served as a model for a sustainable 21st century community?
Current Conditions in the Community

Leverage MSD’s Investment

Community’s Vision for the Future

THE CINCINNATI ENQUIRER
Property value at a substantial decline

MSD
Metropolitan Sewer District
Investment to reduce sewer overflows and meet federal mandates

Economics
Infill
Jobs
Bike trails
Smart growth
Safety
Recreational opportunities
Community gardens
Better education
Quality place
Community assets
Parks
Active recreation areas
Greenways
Sustainability
Revitalization
Opportunities for improved mixed use and affordable housing
Incentives for business retention or redevelopment

Expand & improve parks and greenspaces

Improve traffic flow, pedestrian accessibility, and safety
### Communities of the Future Model:
Creating a Network of Community Partners

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

<table>
<thead>
<tr>
<th>Community of the Future Advisory Committee</th>
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<tbody>
<tr>
<td>• Cincinnati Parks</td>
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<td>• Cincinnati City Planning &amp; Buildings</td>
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<td>• UC Center for Sustainable Urban Engineering</td>
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<td>• Green Partnership for Greater Cincinnati</td>
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<td>• Hamilton County Planning &amp; Development</td>
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<td>• Cincinnati Office of Environmental Quality</td>
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<td>• City Code Enforcement</td>
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<td>• Community Building Institute</td>
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<td>• Cincinnati City Council</td>
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<td>• Mill Creek Restoration Project</td>
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<td>• OKI Regional Council of Governments</td>
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<tr>
<td>• Cincinnati Dept. of Transportation &amp; Engineering</td>
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<td>• Ohio Dept. of Development</td>
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<td>• Cincinnati State</td>
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<td>• Port Authority</td>
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<td>• UC Architect</td>
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<tr>
<td>• Chamber of Commerce</td>
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<td>• Metro</td>
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<td>• CDC Assoc. of Greater Cincinnati</td>
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<td>• Hamilton County Administration</td>
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<td>• Hamilton County Commissioners</td>
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<td>• Ohio House of Representatives</td>
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<td>• Sierra Club</td>
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<td>• Cincinnati Preservation Association</td>
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<td>• USGBC Cincinnati</td>
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<td>• Greater Cincinnati Energy Alliance</td>
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<td>• Agenda 360</td>
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<td>• LISC</td>
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<td>• Price Hill Civic Club</td>
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Communities of the Future (CFAC): Working Groups Focus Areas

Inform and Influence
- Identifying Community Stakeholders
- Developing Communication Plan for Ratepayers, and affected Communities
- Preparing for Community Outreach Opportunities

Policy
- Integration with ongoing planning efforts
- Expanding green infrastructure use into the private sector
- Analyzing the effectiveness of City and County Stormwater Regulations
- Compliance with Regulators

Economic Development
- Brownfield restoration and redevelopment
- Property Acquisition
- Identifying investment opportunities
- Business Case Evaluation
- Identifying possible sources of funding for streetscape enhancements

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Lower Mill Creek Watershed: Integrated Planning for Sustainable CSO Solutions

- 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
3 Prong Approach to MSD Sustainable Infrastructure Solutions

Direct Impact Projects
- Large & Regional Scale – business case evaluations
- MSD as the implementer
- 100% ratepayer funded
- Owned and operated by MSD to support its core mission
  - Remove liability of stormwater

Enabled Impact Projects (36)
- Anticipated annual stormwater runoff capture volume of 40 MG
- ODOT Coordination
- MSD partners with property owners to offset the cost of installation
  - Bioinfiltration practices, green roofs, pervious/porous paving

Inform & Influence
- Programmatic Elements to support sustainable infrastructure solutions
- Integrated Planning
- Advisory Committee
- Community Engagement
- Comprehensive Plan
- Land Development Code Updates
### MSD Sustainable Watershed Evaluation Planning

#### Objectives
- Define initial watershed goals and objectives
- Collect existing data
- Identify initial issues
- Develop watershed condition models
- Develop watershed strategy (source control, conveyance, storage, and product control)
- Identify opportunities, constraints, and desired level of service
- Identify watershed and subwatershed alternatives
- Evaluate affordability and level of service
- Develop watershed synthesis plan with recommended watershed projects
- Define enterprise-level project responsibilities
- Preliminary Engineering Plans
- Develop a prioritized action plan for all project types
- Develop Master Plan
- Implement Plan
- Monitor, Report, Evaluate
  - Conduct performance monitoring to evaluate success of projects
  - Adaptive management based on monitoring results
  - Identify lessons learned

#### Steps

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<tr>
<th>Step 1</th>
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<tbody>
<tr>
<td>Develop Watershed Goals and Objectives and Associated KPIs</td>
<td>Conduct Existing Conditions Modeling</td>
<td>Identify Watershed Alternatives</td>
<td>Present Watershed Synthesis Plan to CAFEX</td>
<td>Detailed Field Surveys</td>
<td>Performance Monitoring</td>
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<tr>
<td>Compile Natural and Built Systems Data, MSDGC Asset Data</td>
<td>Identify Opportunities for Goals and Objectives</td>
<td>Conduct Modeling and Develop Levels of Service for Alternatives</td>
<td>Capital Improvement Planning and Prioritization</td>
<td>Operations and Maintenance</td>
<td>Project Monitoring Report</td>
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<tr>
<td>Define Project Boundary</td>
<td>Identify Watershed Constraints</td>
<td>Class IV Lifecycle Cost Estimates, Affordability Analysis</td>
<td>Preliminary Engineering Plans</td>
<td>Project-Specific Business Case Evaluations</td>
<td>Adaptive Management</td>
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<tr>
<td>Compile Policy Issues and Planned Watershed Projects</td>
<td>Develop a Watershed Strategy (identify source control, conveyance, storage, product control options)</td>
<td>Coordinate with Watershed Partners, Revise Watershed Goals and Objectives</td>
<td>Develop Watershed Business Case Evaluation</td>
<td>Project-Specific Implementation Plans</td>
<td>Updated Project Monitoring Plan</td>
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<td>Conduct Urban Audit</td>
<td>Opportunities and Constraints Report</td>
<td>Evaluate Alternatives and Refine to Subwatershed Level</td>
<td>CFAC Engagement</td>
<td>30%, 60%, and 90% Design Plans</td>
<td>CIP Tracking</td>
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<td>Inventory Analysis</td>
<td>CFAC Engagement</td>
<td>Conduct Modeling and Field Work, Develop Levels of Service</td>
<td>Community Engagement: Open House</td>
<td>Construction</td>
<td>Benchmarking</td>
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<td>Identify and Coordinate with Watershed Partners</td>
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<td>Develop Class IV Lifecycle Cost Estimates and Conduct Affordability Analyses</td>
<td>Final Construction Plans</td>
<td>Lessons Learned Report</td>
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<td>Sustainability LENS Tool</td>
<td>Collection Systems Model</td>
<td>Alternatives Analysis Tool</td>
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<td>WWTP Models</td>
<td>Risk Register</td>
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<td>Peak Flow Monitoring Tools</td>
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Current Utility Conditions

- Decline in # of Account
- Increasing Energy costs
- Positive or Negative environmental externalities from utility operations – TRIPLE BOTTOM LINE APPROACH
SUNDAY FORUM
SUNDAY, JULY 18, 2010 IN SECTION F
RAIN WASHES BILLIONS OF GALLONS OF RAW SEWAGE THROUGH MILES OF PIPES RUNNING UNDER HAMILTON COUNTY. THE PROBLEM REQUIRES...
A $3.5 BILLION FIX

And the customers are stuck with the bill

March 1, 2010 Broadcast
“Sewer Rate Hikes Expected for MSD Customers”
Demographics
Lick Run Watershed

Continued Decline = Fewer Customer Base, Rate Payers

Since 1970:
• Cincinnati population decreased by 34%
• Hamilton County decreased by 25%
Assuming current trends, the rate of household decline equates to a loss of 200 households within 1 mile, resulting in a loss of more than $5.7 million (in 2008 dollars)
Brownfield Cleanup / Repurposing Land
Infrastructure – Transportation

- Replacements/Elimination
- Enhancement - Mode Choices
- Construction Coordination
- Green Streets Installation
Natural Resources

- Surface Water Assets – quality and quantity
- Habitat Modifications
- Greenway Trail
Natural Resources
Watershed Monitoring & Bioassessment

Mill Creek Basin

- Basin (4 year rotation)
- Initiated Summer 2011
- Approx 100 sites, geometric, spatially derived for collection of biological, chemical and physical water quality data
- 2012 Integrated Priority System for identification of:
  - stressors
  - water quality impacts
  - water quality actions
You See Challenges...

Competing public infrastructure needs

Drinking water

Public parks

Railroads

Mass transportation

Electric

Solid waste

Pedestrian

Walkways

Degraded waterways

Flooding

Bridges

Roads

Creeks

Storm water

Air
...We see Opportunity

**Integrated Approach to Infrastructure Needs**

- Water resources management
- Policy
- Land use
- Watershed management
- Transportation
- Community engagement
- Economic development
- Community revitalization
- Parks & Greenways
- Public private partnership
- Restored urban waterways
Sustainable Infrastructure Alternatives

LOWER MILL CREEK PARTIAL REMEDY
Lick Run Revised Original LMCPR

**Goal:** Achieve 624 MG CSO volume reduction
Goal: Achieve 156 MG CSO volume reduction
West Fork Revised Original LMCPR

**Goal:** Achieve 173 MG CSO volume reduction
Goal: Achieve 93 MG CSO volume reduction
Sustainable Infrastructure Alternatives

LICK RUN WATERSHED
The Lick Run Watershed contributes the largest volume of overflows from combined sewers of any watershed in Hamilton County.
Strategic Watershed Planning Zones

- Lick Run Watershed Boundary
  (2,700 acres total)

- Drainage Areas Captured by Proposed Separate Storm Network
  (1,800 acres captured)
Opportunities for Repurposing Land

Declining population and households have resulted in physical decline, foreclosure, and vacancy.

✓ Need for revitalization
✓ Strategic location
Phase I and Phase II ESAs were completed in May 2011 for more than 50% of the corridor.

8,000-linear feet of stormwater conveyance proposed for valley conveyance system
Sustainable Wet Weather Solution
Alignment & Water Quality Features

Proposed Valley Conveyance System
Potential Transportation Network Improvements

- Conceptual transportation improvements are included in the long term vision to promote the communities of the future philosophy but are not part of the Lick Run Sustainable Infrastructure Project.
- Improvements consider flow of traffic, potential neighborhood/business zone, and pedestrian safety.
How could MSD’s investment support future public/private investments?

Preliminary urban waterway concept plan
MSD has engaged residents, property owners, and stakeholders to gain input on the deep tunnel and proposed sustainable infrastructure projects.

62 Community Meetings

Community Design Workshop #1
- 89% support the Lick Run Alternative*
- 11% support the “deep tunnel” default
- 113 attendees

Community Design Workshop #2
- 78% support the Lick Run Alternative*
- 16% support the “deep tunnel” default
- 93 attendees

Community Design Workshop #3
- 93% support the Lick Run Alternative*
- 5% support the “deep tunnel” default
- 98 attendees

Workshop Content:
- Visual Preferences
  - Open Space Corridor
  - Community Core
  - Historic Fabric
  - Hillside & Ridgetop Neighborhoods

- Concept Development
  - Western Gateway Zone
  - Narrow Channel Zone
  - Eastern Gateway Zone
  - Transportation & Trails Network
  - Green Planning Principles

- Preliminary Master Plan
  - “Base Plan”
  - Waterway Character
  - CSO Reduction Solutions
  - Vision Plan
  - Transportation Network & Trails
Watershed-Based Planning

- Use community feedback to synthesize strengths into a refined concept for the proposed urban waterway

- Define near-term opportunities through leveraged investments and public partnerships

- Identify long-term watershed opportunities through public and private partnerships
Sustainable Infrastructure Alternatives

WEST FORK WATERSHED
West Fork Watershed Overview

6,117 acres, including drainage from Mt. Airy Forest
Existing Watershed Conditions

15 CSOs
380 MG CSO volume
“Default” WWIP Solution
Sustainable Wet Weather Solution Alternative

Existing System Wet Weather Volume

- Underflow to Treatment Plant
- CSO

Proposed System Wet Weather Volume

- Underflow to Treatment Plant
- CSO
- Stormwater
West Fork Channel Restoration
Floodplain Restoration, Enhanced Community Use
FEMA Hazard Mitigation Grant
Integrated Watershed Solution
Opportunities for Stakeholder Collaboration

• Northside Community Council & Cincinnati Metropolitan Housing Authority
  – Community Open House
  – Coordination with their Land Use and Community Plans, including community skatepark project

• Cincinnati Parks & Cincinnati Recreation Commission
  – Coordination on potential enabled impact projects on Parks/CRC property, utilizing green infrastructure technologies

• FEMA/OEMA
  – Pre-Disaster Mitigation Program Grant to purchase and demolish properties in the FEMA floodplain along West Fork Channel

• US Army Corps of Engineers
  – Professional Engineering Support for West Fork Channel evaluation
Public Outreach

- Information Sessions
- Community Meetings
- Open House
WHAT’S NEXT?
Next Steps

• Utilizing the Integrated Framework for developing watershed based solutions
• Utilizing water quality needs for developing an Integrated Priority System for water quality needs
• Advancement of LMCPR Study Recommendations
  – USEPA Public Comment Period has ended
• Continued Public Outreach & Partnerships
Thank You!

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