City Commission Meeting No. 3

Project Update

Tuesday, July 10th, 2018
5:30 p.m.
City Commission - Meeting No. 3

Agenda

• Public Involvement Update
• Level of Service Determination
• Review of Project Alternatives
• Funding Stream Development
Project Implementation Overview

City’s Technical Advisory Group – Continuous Involvement Throughout

**Preliminary Engineering**
- Review Exist. Information
- CSMP Goal Setting
- Identify Data Gaps
- Define Key Policy Decisions
- Refine Study/Master Plan Approach

**Baseline Analysis**
- Develop Exist. Condition H&H Models
- Perform Targeted System Inventory
- Establish LOS Parameters
- Correlate Problem Areas w/Probable Causes

**Alternatives Evaluation**
- Model & Evaluate Alternatives
- Develop Watershed Solutions Matrices
- Consider Strategic Partnership Opportunities
- Validate Alt’s./Acceptability

**Develop CIP**
- Define Discrete Improvement Projects
- Identify Early Action Projects
- Establish Ranking Methodology
- Prepare Cost Opinions
- Conduct BCA Evaluations

**Funding & Programming**
- Evaluate Funding Options
- Define CIP Implementation Approach
- Integrate Asset Management Program Needs
- Develop Financial Model for Program Implementation

**Implement CIP**
- Implement Capital Projects in Accordance with Commission Directives

**TASK ORDER NO. 1**

**Citizens**

**Stakeholders**

**Community Partners**

**Commission**

COMMUNITY ENGAGEMENT PROCESS
Task 11 – Flood Mitigation Alternatives Development and Evaluation

Task Outline
• Develop Alternatives Matrix
• Use Model Tools to Evaluate Alternatives
• Present Preliminary Alternatives to SWAC
• Refine Alternatives and Present to SWAC
• Present Alternatives to Public
• Reduce and Further Refine Alternatives
• Present Final Recommendations to City Commission
• Continue with Task Order 2 to Evaluate Funding Opportunities
Preliminary Analysis
How are Alternatives Developed and Evaluated

- Number of Primary Structures Impacted
- Reduced or Eliminated Flooding
- Projected Damage Reduction Benefit
- Rough Order of Magnitude Cost (ROM)
- Benefit-Cost Ratio
## Urban Area 100 Year (1% Chance) Analysis Results

<table>
<thead>
<tr>
<th>Magnitude of Design</th>
<th>Madison Sag</th>
<th>6' x 6' with Storage</th>
<th>Madison/Cali Through Park</th>
<th>Madison Overland</th>
<th>Madison Overland with Cali Ct</th>
<th>Kentucky Avenue Areas</th>
<th>Kentucky Avenue with Madison/Cali</th>
<th>Kruger at 26th</th>
<th>Kruger at 26th with Mildred Relief</th>
<th>Branch Pipe and Storage</th>
<th>Branch Open Channel</th>
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<tbody>
<tr>
<td>Structures with Reduced Flooding</td>
<td>107</td>
<td>132</td>
<td>115</td>
<td>185</td>
<td>146</td>
<td>144</td>
<td>77</td>
<td>58</td>
<td>42</td>
<td>104</td>
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<tr>
<td>Structures with Eliminated Flooding</td>
<td>60</td>
<td>43</td>
<td>24</td>
<td>129</td>
<td>161</td>
<td>81</td>
<td>201</td>
<td>11</td>
<td>20</td>
<td>47</td>
<td>47</td>
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</table>

**Combined ROM Project Cost** - $43.1 - $47.6 Million

**Benefit-Cost Ratio** - 0.79 - 1.07
Challenges

Why does it cost so much?

• History of Widespread Flooding
• Combined Sewer System
• Floodwall Impact
• Coordination with other Agencies
  • FEMA, USACE
  • JSA, McCracken County
  • KYTC, Railroads
Level of Service Comparison – 26th to Madison

Case Study Information
• Conveyance Only Sizing
• Rough Order of Magnitude (ROM) Cost
• Annualized Base Line Benefit Analysis

Findings
• Alternative Downsizing does not Necessarily Sacrifice Benefits
  • Reduce from 100 to 25 year Design
    • 26% Reduction in Cost,
    • 2% Reduction in Benefit
  • Reduce from 100 to 10 year Design
    • 40% Reduction in Cost
    • 13% Reduction in Benefit

<table>
<thead>
<tr>
<th>Storm Event</th>
<th>Scenario</th>
<th>Estimated Lifetime Benefit (Millions)</th>
<th>ROM Project Cost (Millions)</th>
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<tbody>
<tr>
<td>10 year</td>
<td>6' x 6'</td>
<td>$13.5</td>
<td>$12.6</td>
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<tr>
<td>25 Year</td>
<td>6' x 9'</td>
<td>$15.4</td>
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<tr>
<td>100 Year</td>
<td>7' x 12'</td>
<td>$15.6</td>
<td>$21.8</td>
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## Conclusion for Case Study Analysis

<table>
<thead>
<tr>
<th>Magnitude of Design</th>
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<th>Alternative Cost Range</th>
<th>BCR Range</th>
<th>Primary Structures Removed from Flooding in 100 Year Event</th>
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<td>$37.6 - $46.2</td>
<td>$43.1 - $47.6</td>
<td>0.79 - 1.07</td>
<td>270-300</td>
<td>240-265</td>
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<tr>
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<td>$36.8 - $45.3</td>
<td>$32.8 - $36.2</td>
<td>1.02 - 1.38</td>
<td>160-180</td>
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<td>105-120</td>
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# Level of Service Defines Alternative Design Basis

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Selected
25 Year Level of Service Determination
Stormwater Advisory Committee Feedback

• I was/am leaning toward the 25 year target. Given the flooding of this morning and last Friday it just proves this is a dynamic problem.

• My short answer is 25 year BCR is a good place to start. However, I don’t believe there is one specific answer for all the projects that you will evaluate.

• I originally thought the 10 year Level of Service would be my choice but now, after hearing further discussion at the meeting, I feel the 25 year level would be better, aiming higher to allow some headroom.

• Based on what I saw at the last presentation, and with my firm belief that climate change is affecting the intensity and frequency of rain totals in storms in our area, I think that we need to opt for the highest level of service (100 year/1% chance).
Problem Areas
Cross Creek Golf Course Restrictors
Proposed 25 Year

Flooding Eliminated
Flooded Reduced
Lifetime Benefit
Project Cost
BCR

<p>| | | | | |</p>
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<th></th>
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<td>19</td>
<td>25</td>
<td>$14.3</td>
<td>$0.5</td>
<td>28.6</td>
</tr>
</tbody>
</table>

Legend

- XPSWMM Links
- Structures
  - Flooded
  - Flooding Reduced
  - Flooding Eliminated

Cross Creek Alt 1 - 25 Year
Depth (ft)
12.7 - 0
Cross Creek Golf Course Restrictors, Culvert Upsizing Proposed 25 Year

Flooding Eliminated | Flooded Reduced | Lifetime Benefit | Project Cost | BCR
--- | --- | --- | --- | ---
40 | 4 | $19.4 | $7.1 | 2.73

Legend
- XPSWMM Links
- Structures
  - Flooded
  - Flooding Reduced
  - Flooding Eliminated

Cross Creek Alt 2 - 25 Year
Depth (ft)
8.4
0
## Cross Creek Alternatives

<table>
<thead>
<tr>
<th>Scenario</th>
<th>25 Year Design (4% Chance)</th>
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<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Flooding Eliminated</td>
<td>Flooded Reduced</td>
<td>Lifetime Benefit</td>
<td>Project Cost (Millions)</td>
<td>Structure Only BCR</td>
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<tr>
<td>Golf Course Restrictions</td>
<td>19</td>
<td>25</td>
<td>$14.3</td>
<td>$0.5</td>
<td>28.6</td>
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<tr>
<td>Add Parallel Culverts</td>
<td>40</td>
<td>4</td>
<td>$19.4</td>
<td>$7.1</td>
<td>2.73</td>
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</table>

BCR – Benefit Cost Ratio  
ROM – Rough Order of Magnitude
Pecan Drive Area
25 Year Bridge Basin Retrofits
25 Year

Flooding Eliminated: 10
Flooding Reduced: 20
Lifetime Benefit: $2.3
Project Cost: $0.45
BCR: 5.11

Legend
Buildings
- Flooded
- Flooding Reduced
- Flooding Eliminated
Crooked Creek Alt 1 - 25 Year
Depth (ft)
- 9.0
- 0
Pecan Drive Area
100 Year Bridge, Basin Modifications
Proposed 25 Year

Flooded Eliminated
Flooding Reduced
Lifetime Benefit
Project Cost
BCR

<table>
<thead>
<tr>
<th></th>
<th>Flooded</th>
<th>Reduced</th>
<th>Benefit</th>
<th>Cost</th>
<th>BCR</th>
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<tbody>
<tr>
<td></td>
<td>17</td>
<td>15</td>
<td>$3.0</td>
<td>$0.6</td>
<td>5.0</td>
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Legend
Buildings
- Flooding Reduced
- Flooding Eliminated
Crooked Creek Alt 2 - 25 Year

Value
9.0
0
## Crooked Creek Alternatives

<table>
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<tr>
<th>Scenario</th>
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<th>Flooding Eliminated</th>
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<tbody>
<tr>
<td>Bridge Replacement/ Culvert Installation</td>
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<td>10</td>
<td>20</td>
<td>$2.3</td>
<td>$0.45</td>
<td>5.11</td>
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<tr>
<td>Additional Building Acquisition, Flood Fringe Modifications, Basin Retrofits</td>
<td></td>
<td>17</td>
<td>15</td>
<td>$3.0</td>
<td>$0.6</td>
<td>5.0</td>
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</table>
Madison Areas
Sag Relief 25 Year

Flooding Eliminated  Flooding Reduced  Lifetime Benefit  Project Cost  BCR
60  93  $23.8  $17.7  1.29

Legend
- Proposed Infrastructure
- XP5WMM Links
Structures
- Flooded
- Flooding Reduced
- Flooding Eliminated
Madison Sag Relief - 25 Year
Depth (ft) 7.6 0

Costs:
- BC: $17.7
- BCR: 1.29
- Project: $23.8

Legend:
- Proposed Infrastructure
- XP5WMM Links
- Structures
- Flooded
- Flooding Reduced
- Flooding Eliminated
Madison Sag Relief - 25 Year
Depth (ft) 7.6 0
Madison Areas
Sag Relief Plus Storage

Flooding Eliminated: 61
Flooding Reduced: 75
Lifetime Benefit: $20.6
Project Cost: $14.9
BCR: 1.38
Madison Areas
Sag Relief/Storage with California Ct Through Park
25 Year

Flooding | Flooded | Reduced | Lifetime Benefit | Project Cost | BCR
---|---|---|---|---|---
94 | 118 | $35.4 | $20.1 | 1.76
Madison Areas
Overland Flow Path

Flooding Eliminated
Flooded Reduced Lifetime Benefit Project Cost BCR
101 122 $32.9 $23.4 1.40

Legend
- Proposed Infrastructure
- XPSWMM Links

Structures
- Flooded
- Flooding Reduced
- Flooding Eliminated

Madison Overland Flow Path - 25 Year Depth (ft)
- 7.8
- 0
Madison Areas
Storage Only
25 Year

Flooding Eliminated | Flooded Reduced | Lifetime Benefit | Project Cost | BCR
---|---|---|---|---
75 | 102 | $15.4 | $9.4 | 1.64

Legend
- XPSSWMM Links
- Structures
  - Flooded
  - Flooding Reduced
  - Flooding Eliminated
- Madison Basins Only
  - Depth (ft)
  - 7.6
  - 0
## Madison Areas Alternatives

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<td>1.76</td>
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<td>101</td>
<td>122</td>
<td>$32.9</td>
<td>$23.4</td>
<td>1.40</td>
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Selected
Options for Funding Stormwater Management Projects

- General Fund
- Taxes
  - Property Taxes
  - Ad Valorem Taxes
  - Sales Tax
- Fees
  - Permitting and Fees
  - New Development Impact Fees
- Grants
- Stormwater Utility (User Fees)

Stormwater User Fee vs. Tax
National Averages

- 1491 Storm Water Utilities in the United States
- Median monthly storm water utility fee is $3.50 for those communities using the equivalent residential unit (ERU) system
- Median ERU is 2842 square feet impervious
Stormwater Program Funding in Kentucky

- 12 Stormwater Utilities
  - 8 are ERU based
  - 2 are two level system (residential/commercial)
  - 1 is tier based ERU for commercial only
- Bowling Green – General Fund – 1% increase in Occupational Tax
- Owensboro – tax applied to occupational/net profit tax
- Elizabethtown – General Fund
Equivalent Residential Unit

<table>
<thead>
<tr>
<th>Location</th>
<th>Equivalent Residential Unit</th>
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<tbody>
<tr>
<td>Henderson</td>
<td>$2.00</td>
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<tr>
<td>Hopkinsville</td>
<td>$3.00</td>
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<tr>
<td>Lexington</td>
<td>$4.63</td>
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<td>Louisville</td>
<td>$7.28</td>
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<td>Murray</td>
<td>$1.50</td>
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<tr>
<td>Oldham Co.</td>
<td>$3.91</td>
</tr>
<tr>
<td>Radcliff</td>
<td>$4.50</td>
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<tr>
<td>Warren Co.</td>
<td>$4.00</td>
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<tr>
<td>Danville</td>
<td>$3.36</td>
</tr>
<tr>
<td>Glasgow</td>
<td>$2.00</td>
</tr>
<tr>
<td>Paducah</td>
<td>$0.00</td>
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</table>
Stormwater Utility Mission Statement

Develop and implement a comprehensive, city-wide storm water management program funded through an equitable and sustainable funding mechanism.
Guiding Principles

• Provide adequate and sustainable funding for the program.
• Plan, construct, acquire, regulate, operate and maintain, in a cost-effective manner, a public storm water drainage system to perform within an established level of service within our authority.
• Comply with the Kentucky Pollutant Discharge Elimination System (KPDES) municipal separate storm sewer system (MS4) requirements.
Program Elements
Authorized Elements Including But Not Limited To:

CIP/Project Related Elements
• Capital improvement plan and engineering
• Capital improvements
• Debt service
• KPDES compliance costs
• Professional services
• Plan review

Daily O&M Related Elements
• Flood protection system
• Catch basin and storm sewer cleaning, repair and replacement
• Vehicles/equipment
• Maintenance of publicly controlled channels
• Maintenance of detention/retention basins
• Maintenance and repair within the City’s rights-of-way
• Staffing/program administration
• Street sweeping
Key Components of a Stormwater Utility

- Mission Statement
- Guiding Principals
- Program Elements
- Service Area
- Public vs. Private System
- Impervious Area Rate Methodology
- Residential vs. Non-Residential Parcels
- Cost of Service
- Billing Mechanism
Service Area – City Limits
Public Versus Private System

City is responsible for operating and maintaining any separate storm sewer system including pipes, catch basins and drainage ditches within the City’s authority.

• Note that several subdivisions that maintain their own PRIVATELY owned roads and infrastructure. The City does not assume any ownership or maintenance of these systems.

• Vast majority of stormwater management facilities (detention/retention basins) are owned and maintained by private property owners or subdivision associations.

• Streams, swales, ditches and other storm sewer systems outside the City’s operation and maintenance responsibilities located downstream of publicly operated storm sewers are NOT the City’s responsibility to own or maintain. They are however, within the City’s authority to regulate.
Rate Methodology
City has Selected the Impervious Area Rate Methodology as the Basis for the Stormwater Utility Billing
Impervious areas are surfaces that prohibit or significantly restrict the passage of water into the soils beneath the surface. These types of areas include but are not limited to:

- All rooftops
- Concrete and asphalt surfaces such as roads, sidewalks, drives, and parking lots
- Compacted gravel surfaces such as roads, drives, paths, patios, and inventory/lay down storage lots
Residential and Non-Residential Parcel Definition

- A residential property is defined as one single-family detached home or duplex occupying real estate on one parcel in which the inside and outside of the structure is owned by the same entity.

- Non-residential properties include all other parcels such as condominiums, multi-family dwellings of three families or greater, commercial, industrial, and institutional facilities.
Cost of Service Analysis

Historic Program Spending
• $60,000 – City Stormwater Budget
• $600,000 – Flood Protection System Budget

Calculated Cost of Service
• Recommended O&M and Life Cycle Replacement
  • GIS Analysis – size, age, and material of existing infrastructure
• Capital Improvements
• Personnel/Equipment
• Regulatory Compliance Efforts
• Debt Service
• Other Program Components
Phase II Next Steps

• Complete Impervious Area Evaluation
  • Develop Paducah specific equivalent residential unit (ERU)
  • Calculate impervious area on all non-residential properties
• Complete a Cost of Service Analysis
• Develop Credit Policy
• Review and Update Current Regulations
• Prepare Utility Summary Report
• Conduct Outreach and Engagement Efforts
  • Commission Meetings
  • SWAC Meetings
  • Public Meetings
## Project Schedule

<table>
<thead>
<tr>
<th>Major Task</th>
<th>2018</th>
<th>2019</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>APR MAY JUN JUL AUG SEP OCT NOV DEC JAN FEB</td>
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<tr>
<td>Kick-Off Meeting</td>
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<tr>
<td>ERU Development</td>
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<td>Final Utility FAQs</td>
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- **Overall project schedule**
- **Approval of utility fee by Council impacts**