City Commission Meeting

Project Update

Tuesday, December 12, 2017
5:30 p.m.
Understanding of Local Challenges Key to CSMP Success

- 3 Major Watersheds – 5 Total
- River/Creek Flood Influences
- Floodwall/ Pump Stations
- Flat Topography Downtown
- Steep Topography in Upland Areas
- Combined Sewer System
Major Watershed Characteristics Influence Study Approach

- **Natural Channel Conveyance Systems**
  - Bridges/Large Culverts
  - Floodplain
  - Natural Flood Storage

- **Closed Pipe Conveyance Systems**
  - Combined Sewers
  - Separate Storm Sewers
  - Urban Area
Approximately 49 regulators direct and redirect flow in the combined system across multiple watersheds depending on the wet and dry weather flow.
Understanding the Existing System
Floodwall is a Critical Stormwater Management Element

Floodwall Protection:
~11,000 acres
~20,000 people
~$1.2 billion in assets

SYSTEM OPERATION BELOW OHIO RIVER STAGE 27.5 FEET
Understanding the Existing System
Floodwall is a Critical Stormwater Management Element

- Floodwall Protection:
  - ~11,000 acres
  - ~20,000 people
  - ~$1.2 billion in assets

SYSTEM OPERATION ABOVE OHIO RIVER STAGE 27.5 FEET
Community Outreach and Citizen Feedback Informs Problem Area Identification

- Public Information Advertisements and Online Survey Access

- Public Meeting #1
  - Attendees – 65
  - Questionnaires Received – 48

- Public Meeting #2
  - Attendees – 32
  - Questionnaires Received – 13
  - Flyers Distributed Prior to Meeting – 700

- Structures/Parcels Impacted by Modeled 2015 Flooding – 804
  - Additional 933 within 10 foot buffer
CSMP Survey Results
Compilation of Data Received To Date

- 61 questionnaires completed
  - 48 from Public Meeting No. 1
  - 13 Additional from Public Meeting No. 2

![Structure Flooding](image)

- Number of Responses
- Yes: 40, No: 10

![Number of Flooding Occurences](image)

- Number of Flooding Occurences
- 1: 5, 2: 10, 3-4: 15, 5 of More: 20

![Location of Structure Flooding](image)

- Number of Responses
- Basement: 15, First Floor: 10, Crawl Space: 5

![How Water Entered Flooded Structures](image)

- Number of Responses
- Door: 20, Window: 5, Floor Drain: 10, Seeped Through Walls: 20, Toilet Drain: 5, Drain Backup: 5
Past and Present Drainage Complaints Help Target Problem Area Identification

Legend
- 2017 Drainage Questionnaire
- Drainage Complaints (2007 - 2016)

- Cross Creek
- Island Creek
- Perkins Creek
- Perkins Creek - Urban Area
- Urban Watershed
Urban Area Stormwater Modeling

- XP-SWMM 2D Modeling
  - Combined an existing JSA sewer model with City GIS databases
  - Conducted field surveys to bridge data gaps
  - Integrated LIDAR topographic data for flood mapping
  - Utilized Nexrad imaging data for rainfall distribution

- XP-SWMM 2D Results
  - Provides more accurate representation of flood storage areas and volumes
  - Improves simulation of overland flood conveyance routes
  - Includes dynamic, real-time visual flood mapping tool
Open Channel Stormwater Modeling

• HEC-HMS Modeling
  - Started with 2014 FEMA Effective Model
  - Added Detailed Watershed Hydrology
  - Incorporated existing detention and floodplain storage areas
  - Utilized Nexrad imaging for rainfall distribution

• HEC-RAS
  - Started with 2014 FEMA Effective Model
  - Corrected/Modified bridge characteristics and cross section geometry based on field survey
  - Calibrated the model to the July 7, 2015 storm event
Flood Mapping Calibration Efforts Provide Foundation for Alternatives Evaluation

Input Aids Calibration Efforts

Initial flood mapping output.

Updated flood mapping output based on specific review comments.
Initial flood mapping output shows flooding at the Hospital entrance.

Photo evidence corroborates model output.
Initial flood mapping output shows flooding along Buckner Lake Circle.

Photo evidence corroborates model output.

Preliminary Flood Mapping Calibration Evaluation
Photographic Evidence Supports Calibration Efforts
Problem Area Identification

<table>
<thead>
<tr>
<th>Number of Problem Areas</th>
<th>Structures Flooded In Problem Areas</th>
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<tbody>
<tr>
<td></td>
<td>10 Year</td>
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<tr>
<td>23</td>
<td>75</td>
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Example Area #1
Clay and Madison
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<th>Problem Area</th>
<th>Number of Structures Flooded</th>
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<tbody>
<tr>
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<td>10 Year</td>
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<tr>
<td>23rd at Clay</td>
<td>5</td>
</tr>
<tr>
<td>Harrison and Madison at 24th</td>
<td>28</td>
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**Legend**
- 2017 Drainage Questionnaire
- Property Flooding
- Property Flooding - Sewer Backup
- Structure Flooding
- Structure Flooding - Sewer Backup
- Drainage Complaints (2007 - 2016)
- Sinkhole
- Structural
- System Maintenance
- Yard Flooding

**10 Year Event**

- Depth
  - 0.0 - 0.25
  - 0.25 - 0.5
  - 0.5 - 1.5
  - 1.5 - 2.5
  - 2.5 - 5.0
  - 5.0 - 11.5
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<tr>
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<td>4</td>
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<tr>
<td>23rd at Clay</td>
<td>5</td>
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Problem Area Identification

Example Area #2
The Branch

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<td>10 Year</td>
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<tr>
<td>23</td>
<td>75</td>
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Problem Area | Number of Structures Flooded | 10 Year | 25 Year | July 7, 2015
--- | --- | --- | --- | ---
The Branch | 0 | 10 | 20 |
25 Year

<table>
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<tr>
<th>Problem Area</th>
<th>Number of Structures Flooded</th>
<th>10 Year</th>
<th>25 Year</th>
<th>July 7, 2015</th>
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<td>The Branch</td>
<td></td>
<td>0</td>
<td>10</td>
<td>20</td>
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Legend:
- 2017 Drainage Questionnaire
- Property Flooding
- Property Flooding - Sewer Backup
- Structure Flooding
- Structure Flooding - Sewer Backup
- Drainage Complaints (2007 - 2016)
- Sinkhole
- Structural
- System Maintenance
- Yard Flooding

25 Year Event

Depth:
- 0 - 0.25
- 0.25 - 0.5
- 0.5 - 1.5
- 1.5 - 2.5
- 2.5 - 5
- 5.0 - 12.6
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Problem Area Identification

Example Area #3
Cross Creek at Old Mayfield

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<td>75</td>
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Problem Area | Number of Structures Flooded | 10 Year | 25 Year | July 7, 2015
--- | --- | --- | --- | ---
Cross at 21st | 10 Year | 0 | 0 | 10
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<tr>
<td></td>
<td>10 Year</td>
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<tr>
<td>Cross at 21st</td>
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- Property Flooding - Sewer Backup
- Structure Flooding
- Structure Flooding - Sewer Backup
- Drainage Complaints (2007 - 2016)
- Sinkhole
- Structural
- System Maintenance
- Yard Flooding

July 7, 2015 Event
- Depth
  - 0 - 0.25
  - 0.25 - 0.5
  - 0.5 - 1.5
  - 1.5 - 2.5
  - 2.5 - 5.0
  - 5.0 - 14.2
Problem Area Identification

<table>
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<th>Number of Problem Areas</th>
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<td>23</td>
<td>10 Year: 75  25 Year: 208  July 7, 2015: 416</td>
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Example Area #4 Buckner Lane
Problem Area: Buckner Lane

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<th>25 Year</th>
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<tr>
<td>Buckner Lane</td>
<td>6</td>
<td>11</td>
<td>32</td>
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</table>

Legend:
- 2017 Drainage Questionnaire
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10 Year Event

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- 0 - 0.25
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- 0.5 - 1.5
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July 7, 2015

Depth
- 0 - 0.25
- 0.25 - 0.5
- 0.5 - 1.5
- 1.5 - 2.5
- 2.5 - 5
- 5.0 - 12.6

Legend
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25 Year Event
Problem Area | Number of Structures Flooded
--- | --- | ---
Buckner Lane | 6 | 11 | 32

**July 7, 2015**

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**July 7, 2015 Event**

Depth:
- 0 - 0.25
- 0.25 - 0.5
- 0.5 - 1.5
- 1.5 - 2.5
- 2.5 - 5.0
- 5.0 - 14.2
Next Steps
Task 10 - Establish Ten Priority Areas for Alternatives Evaluation

Selection Criteria

- Number/Concentration of Structure Flooding
- Property Damage Complaints
- Emergency Access/Public Safety Concerns
- Flood Frequency
- Problem Area Interdependency
- Complexity
Next Steps

• Continue to Review And Refine Model Based On Public Feedback
• Initiate Discussion On Level of Service
• Review Spectrum of Control Scenarios With City
• Initiate Alternatives Evaluation
• Develop Preliminary Costs
Project Implementation Overview

City’s Technical Advisory Group – Continuous Involvement Throughout

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

**Baseline Analysis**
- Develop Existing 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

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**COMMUNITY ENGAGEMENT PROCESS**

WE ARE HERE

Citizens Stakeholders Community Partners Commission

City of Paducah Comprehensive Stormwater Master Plan
Schedule Overview

What are the Expectations for Schedule?

- Preliminary Engineering Evaluation
- Completion of Master Plan
- Identification of Early Action Projects
- Determination of Funding Approach
- Implementation of Master Plan Projects
Task Order 2 Scope of Services
Initiates Prior to Conclusion of Task Order 1

Proposed Scope of Services

• Determine Cost of Service to Implement Stormwater Management Program
  ➢ Develop Operation and Maintenance budget
  ➢ Develop Capital Improvement Program budget
  ➢ Determine MS4 Compliance Costs
  ➢ Evaluate staffing and equipment needs

• Stormwater Utility Study
  ➢ Identify area, extent and level of service
  ➢ Calculate impervious area within service area
  ➢ Develop Equivalent Residential Unit (ERU)
  ➢ Measure impervious surface of non-residential properties
  ➢ Develop credit policy
Proposed Scope of Services

- Public Outreach/Engagement Program
  - Meetings with Stormwater Advisory Committee (SWAC)
  - Meetings with City Council
  - Meetings with key stakeholders
  - Meetings with general public

- Development of Program Implementation Plan
  - Development of utility ordinances
  - Development of Master Account File
  - Staffing evaluation and budget development

- MS4 Program Audit
  - Revise storm sewer system design requirements
  - O&M Plan and facility audits
  - IDDE Plan
### Task Order 2 Scope of Services

**Initiates Prior to Conclusion of Task Order 1**

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“Public Education and Community Outreach is key to successful implementation of CSMP.”
Schedule Overview

What are the Expectations for Schedule?

- Preliminary Engineering Evaluation
- Completion of Master Plan
- Identification of Early Action Projects
- Determination of Funding Approach
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Implement CIP
- Implement Capital Projects in Accordance with Commission Directives

TASK ORDER NO.1

Citizens
Stakeholders
Community Partners
Commission

COMMUNITY ENGAGEMENT PROCESS

WE ARE HERE
Excellence in Engineering Since 1946