Green Infrastructure Impact Assessment
Louisville Metropolitan Sewer District
NACWA 2012 Winter Conference

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URS Corporation
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MSD Overview

- Flood protection
- Wastewater treatment
- Stormwater management
**MSD Facilities**

- 385 sq. miles
- Pop. 700,000
- Ohio River Flood Protection System
- 16 flood pump stations
- 29 miles of floodwall
- 6 regional WQTCs
- 14 small WQTCs
- 286 pump stations
- 3,200 miles of sewers
Louisville MSD’s Green Program

Practice Types
- Downspout disconnection
- Pervious pavement
- Tree boxes
- Green alleys
- Bio-infiltration
- Rain gardens
- Urban reforestation

Impervious Surfaces in the CSS

The following is a breakdown of the primary landuse types and distribution of the total impervious area throughout the CSS.
- Roads: 26 percent impervious
- Single Family: 27 percent impervious
- Industrial Property: 17 percent impervious
- Commercial Property: 13 percent impervious
- Other: 17 percent impervious
Goals and Objectives of Green Program

• Optimize green practice opportunities
  ✓ Green to gray cost effectiveness
  ✓ Maximize GMP drainage capture
  ✓ Meet IOAP requirements

• Develop right sizing approach for future basins
Collaboration on Green

First CRADA Community

- 3 year effort-potential for up to 10 years
- EPA’s involvement in GI validation process
- Establish gallons removed compared to gray
- Evaluate and establish long term trends
- Standardize design criteria/O&M
- Standardize modeling parameters
- Other ancillary benefits
- Partner with University of Louisville
Key Project Components

- Site selection criteria
- Modeling
- Sewer flow monitoring/GMP practice monitoring
- Outreach and education
- Business case analysis
- Practice survey and infiltration testing
- Design and construction
Typical Year Rainfall Distribution by Rainfall Amount using 2001 data

- **Total Annual Rainfall Depth**: 42.84 inches
- **2 Storms greater than 2 inches**: 99.6% Yearly Rainfall Capture
- **4 Storms greater than 1.5 inches**: 96.9% Yearly Rainfall Capture
- **10 Storms greater than 1 inch**: 89.8% Yearly Rainfall Capture
- **29 Storms greater than 0.5 inches**: 68.9% Yearly Rainfall Capture

Rainfall Amount (inches)
Private vs. Public

- 10% or 16 Practices on Private Property in CSO 190
- All 22 Practices in CSO 130 are in Public Right of Way
- Private Drainage Area Routed to a Practice
  - Property Owner Cooperation to Disconnect Downspouts and Drain Over Surface
  - Re-routing Directly Connected Downspouts Directly into the GMP
CSO 130 GMP Model Results

**CSO 130 Spill Occurrences**

<table>
<thead>
<tr>
<th>Date/Event</th>
<th>Existing Conditions Vol (MG)</th>
<th>Post GMP Solutions (MG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11/29/01 08:29:41 AM</td>
<td>1 0.1973</td>
<td>0.14018</td>
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<tr>
<td>09/09/01 11:57:20 PM</td>
<td>2 0.1895</td>
<td></td>
</tr>
<tr>
<td>05/07/01 11:58:20 PM</td>
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<td>0.00353</td>
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*2001 Typical Year; Start = 10/5/1001; Duration = 8 weeks
**6 storms triggering overflows in the existing conditions model occurred during this time period
## Final CSO 130 Practice Suite

<table>
<thead>
<tr>
<th>GMP ID</th>
<th>Description</th>
<th>Length (ft)</th>
<th>Width (ft)</th>
<th>Infiltration Loss (in/hr)</th>
<th>Estimated Cost</th>
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<tbody>
<tr>
<td>10A</td>
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<tr>
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<td>$17,600</td>
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**TOTAL:** $652,500
CSO 130 Results

- Volume and Overflows Predicted Doubled
- Total Green Project Costs Still Below Original IOAP
- 10,760 Square Feet of Permeable Pavement
- 34 Tree Boxes

<table>
<thead>
<tr>
<th>Option</th>
<th>Total Cost</th>
<th>POST AAOV</th>
<th>POST # OF / YR</th>
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<tbody>
<tr>
<td>Gray Only</td>
<td>$1,576,476</td>
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<td>Green Only</td>
<td>$652,500</td>
<td>0.28 MG</td>
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Adams Street Installation
Adams Street Installation
**CSO 190 GMP Model Results**

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<td>1</td>
<td>2.28</td>
</tr>
<tr>
<td>09/09/01 01:00:04 PM</td>
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<td>2.23</td>
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<td>11/28/01 03:00:08 PM</td>
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**6 storms triggering overflows in the existing conditions model occurred during this time period**
## CSO 190 Results

- 440 Tree Boxes
- 41,020 Square Feet Permeable Pavement
- 180 Linear Feet on Infiltration Trench
- 345 Bioswales
- 2,038 Square Feet of Rain Garden

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<th>Total Cost</th>
<th>POST AAOV</th>
<th>POST # OF / YR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gray Only</td>
<td>$5,201,140</td>
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<tr>
<td>Green Only</td>
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Project Feasibility & Implementation Plan

- Property owner participation
- Phased construction approach
- Long-term community project
  - Tree planting expansion CSO 130
  - Park and open space
  - Vacant land usage
Community Park Opportunities
Tree Planting Opportunities
Monitoring Lead – USEPA ORD
Detailed QAPP

Helps document the steps necessary for compliance with the Integrated Overflow Abatement Plan (IOAP)

The goals of the QAPP:

- Document the process and monitoring of each GMP’s hydrologic performance to reduce CSO discharge volume and frequency
- Develop specific objectives for determining the effectiveness of each GMP
- Transportability of data
Implementation and Monitoring

- Infiltration Rates at Various Depths
- Individual GMP & Collective Stormwater Reductions
- Anticipated & Measured Overflow Reductions
- Long Term Inspection & Maintenance
- Local Rainfall Gages
- Ambient and Surface Temperatures
- Amended Soil Moisture Conditions
- Process & Case Study Development
Monitoring in Louisville
Green Infrastructure Placement & Design Process

Infiltration Trench

**INфиLTRAЦИя TRENCH**

| Phase 1 Contributing Surface Area: | 74,559sf |
| Less Green Roof: | -12,570sf |
| Net Contributing Surface Area: | 61,989sf |
| Storage Volume Provided: | 8,826cf |
| Gallons of Water Treated: | 66,018gal |

*(The gallons treated are based on a 3/4” 1st flush rain event.)*
Next Steps

- Regulatory check in
- Project construction
- Monitoring equipment installation
- Post construction impact analysis
- Relative cost from gray to green
- Long term maintenance & function
- Ancillary benefits of green?
- Expand Implementation to Other Areas
Thank you

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