Water Quality Enhanced by Sustainable Watershed Evaluation and Planning Process at the Metropolitan Sewer District of Greater Cincinnati

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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/Year
Cincinnati Regulatory Timeline shows the commitment to livable communities.
What if…?
... 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?
Sustainable Watershed Management Planning Process provides a framework for livable communities.

The role of the sustainable watershed evaluation and planning process is to help MSDGC meet the Consent Decree requirements, identify and evaluate green alternatives, and, simultaneously, identify opportunities to collaborate with local communities in the watershed.
Step 1 – Data Compilation and Inventory Analysis

Step 2 – Identify Opportunities and Constraints

Step 3 – Develop and Evaluate Opportunities
SWEPP – Framework Steps 4 - 6

Step 4 – Develop Master Plan

Step 5 – Implementation of Master Plan

Step 6 – Monitoring, Reporting and Evaluation
Upper South Branch Overview

- 12 CSOs
- 2 SSOs
- 7 hydrologic zones
- Interceptors
  - Mill Creek
  - Auxiliary Mill Creek
- Septic Systems
- Impaired Creeks
- Industrial Areas
- Basement Backup
- Major Highway
Selecting key performance indicators shows an understanding of regulatory requirements and community requirements

- **CSOs remaining volume of overflow and 85% capture**
- **SSOs controlled to a 2 year design storm**
- **Basement backups HGL < 3 feet above crown**
- **Combined and Sanitary sewers – controlled to 2 year design storm**
- **Show improvement to Water Quality**
- **Solve local problems not global**
Developing an understanding of the watershed, both natural and built systems provides the first step in sustainable planning.
Selecting hydrologic zones with similar characteristics allows the team to focus on communities solutions

- Landuse
- Topography
- CSO drainage areas
- SSO drainage areas
Using the Existing Tools – Hydraulic Model Validation

Congress Run Meter did not Validate

Flow Path Validation
Hydraulic Validation
Congress Run Meter - Recalibrated

Step 1: Data Compilation and Inventory and Analysis

Congress Run Meter - Recalibrated
Baseline Projects are projects that will be implemented and MSDGC should take credit for these projects as the starting point for all solutions.

- Pipe replacements downstream of SSO 1029
- Pipe replacements along Congress Run to prevent manhole overflows upstream of SSO 1043
- Reduction of RDII to 5% for the entire area upstream of the Congress Run meter MM-MC-007;
- Complete separation of flow from I-75 in the basins of CSOs 488 and 490 related to ODOT plans for highway reconstruction;
- 95% separation of flow in sections of St. Bernard related to finished and planned projects by the Storm Water Management team in St. Bernard.
Performance Metrics are based up regulatory and community drivers

<table>
<thead>
<tr>
<th>Overflow</th>
<th>Name/Location</th>
<th>Performance Goal</th>
<th>Existing Model</th>
<th>Baseline Model</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Volume</td>
<td>Capture</td>
<td>Volume</td>
</tr>
<tr>
<td>CSO 033</td>
<td>Bank Ave. Regulator</td>
<td>15.1</td>
<td>85%</td>
<td>20.6</td>
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<tr>
<td>CSO 037</td>
<td>Maple St. Div. Dam</td>
<td>1.3</td>
<td>85%</td>
<td>0.6</td>
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<tr>
<td>CSO 039</td>
<td>64th St. Div. Dam</td>
<td>2.2</td>
<td>85%</td>
<td>8.6</td>
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<tr>
<td>CSO 171</td>
<td>Vine &amp; Decamp Div. Dam</td>
<td>23.0</td>
<td>85%</td>
<td>102.4</td>
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<tr>
<td>CSO 485</td>
<td>Along AMCI</td>
<td>29.1</td>
<td>85%</td>
<td>–</td>
</tr>
<tr>
<td>CSO 488</td>
<td>68th St. Div. Dam</td>
<td>35.3</td>
<td>85%</td>
<td>76.0</td>
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<tr>
<td>CSO 490</td>
<td>Lockland Grating</td>
<td>0.9</td>
<td>85%</td>
<td>16.2</td>
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<tr>
<td>CSO 535</td>
<td>146 Ridgeway Grating</td>
<td>–</td>
<td>85%</td>
<td>0.6</td>
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<tr>
<td>CSO 537</td>
<td>40 Sherry Grating</td>
<td>0.2</td>
<td>85%</td>
<td>0.3</td>
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<tr>
<td>CSO 544</td>
<td>Vine St. Div. Dam</td>
<td>0.1</td>
<td>85%</td>
<td>1.3</td>
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<tr>
<td>CSO 560</td>
<td>60 St. Clair Ave. Grating</td>
<td>–</td>
<td>85%</td>
<td>0.5</td>
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<tr>
<td>CSO 653</td>
<td>Murray Rd. Div. Dam</td>
<td>0.4</td>
<td>85%</td>
<td>1.0</td>
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</table>

All volumes in MG.

**SSO 1043** – 6.9 MG overflow – 2 year design storm

Other overflowing elements – 3.8 MG
Water Quality Monitoring of Mill Creek and Tributary Streams gives the baseline picture

Parameters –
- TSS
- BOD5
- TN
- TP
- Fecal
- Cu
- Zn
- Pb
Opportunities - Start with Sustainable

- Porous Pavements
- Infiltration Trenches / Beds
- Vegetated Curb Extensions
- Vegetated Swales (Bioswales)
- Bioswale w/ Infiltration Trench
- Vegetated Infiltration Basins (Meadow Basins)
- Bioretention (Rain Gardens)
- Vegetated Roofs
- Tree Infiltration Trenches / Enhanced Street Trees

Factors: maintenance, cost, aesthetics, space, constructability, integration with other site features, etc
MSDGC looked at the opportunities in the watershed at three different levels:

- **Direct Projects** – those projects that MSDGC will build and own
- **Enabled projects** – those projects that MSDGC will work with the community or property owner to build
- **Influence** – those projects that MSDGC will influence but will be developed, constructed and owned by others in the watershed
North Hillside Zone

Sylvan Lane SSO – Pipes
Under capacity – Sanitary Sewers R Value – 5% - source control not a viable option.
Upsize Pipe Baseline Project

CSO 560
87% Percent Capture
.5 MG Overflow
Change in pipe size downstream opened up the interceptor
Enabled Project – Rain Garden

Congress Run Sewer –
High I/I rate, manholes overflowing, under capacity
Direct Project – Replace Pipe and Partner with Stormwater Utility for Stream Restoration

CSO 537 – 90% Capture <.5 MG Overflow
Elmwood Place Zone

CSO 488 49% PC
2 MG Tank

CSO 039 48%
Partial Separation

CSOs 037/655 95% PC
Partial Separation

Regional Detention Pond
Watershed Strategy

Reduce RDII and Replace Sewer in Creek, Stream Restoration

Sewer Separation, Regulator Modification, and Green Roofs

Sewer Separation

Upsize Sewer Downstream of SSO, Stream Restoration, Rain Garden, Storage Tank at SSO 1043

Sewer Separation, Infiltration Trenches, Storage Tank at CSO 171

Sewer Separation and Infiltration Trenches Drain to a Water Feature
Watershed Benefits

- CSO
- SSO
- Basement Backups
- Combined/Sanitary Pipes
- Water Quality

<table>
<thead>
<tr>
<th>Category</th>
<th>TSS</th>
<th>BOD5</th>
<th>TN</th>
<th>TP</th>
<th>Fecal</th>
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<tbody>
<tr>
<td>Untreated domestic wastewater</td>
<td>225</td>
<td>500</td>
<td>102.5</td>
<td>9.5</td>
<td>10^8</td>
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<td>Treated wastewater - secondary</td>
<td>17.5</td>
<td>17.5</td>
<td>20</td>
<td>3</td>
<td>200</td>
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<td>Urban stormwater runoff</td>
<td>84</td>
<td>130</td>
<td>0.7</td>
<td>1.2</td>
<td>10^5</td>
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<td>Pond-treated stormwater runoff</td>
<td>25.2</td>
<td>91</td>
<td>0.3</td>
<td>0.5</td>
<td>10^5</td>
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<tr>
<td>CSO</td>
<td>275</td>
<td>112.5</td>
<td>13.5</td>
<td>5.5</td>
<td>10^6</td>
</tr>
</tbody>
</table>
Next Steps

Master Plan

Construction

Evaluation
Questions?

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