Stormwater BMPs for Buildings and Grounds

Protect & Preserve Your Water Resources

CITY OF DAYTON

water

Environmental Management

937.333.3725
City of Dayton
National Pollutant Discharge Elimination System (NPDES)
Phase I Stormwater Permit

“When it rains, Dayton drains”
Why Green Roofs?

Benefits of Green Roofs

• Reduce and improve stormwater runoff
• Improve energy efficiency of building
• Increase lifespan of roof
• Aesthetic improvement
• Improve air quality
• Mitigate urban heat island effect
Heat energy radiates from urban areas.

Green areas disband heat accumulation.

Green wall, roofs & parkland absorb heat and cool urban atmosphere.
Schematic of Green Roof

- Walk pad for maintenance
- Doorway to roof area
- Roof drain to Storm Sewer

Size: ~2,000 sq. ft.

Ludlow St.
Third St.

Not Open to Public
Pre and Post Installation
Storm Water Quality Sampling

Sample runoff for:
- Volatile Organic Compounds (VOCs)
- General Chemistry – Phosphate, Nitrate
- Total Metals

City Hall Roof Area

Roof Drain
City Hall
Green Roof
Installed
June 13, 2009
Partnerships

Planning
- Design Firm and Existing Roof Warranty
- Political Figures
- Regulators
- Community-Public
- Environmental Groups
- City Staff
- Contractors

Installation
- Design Firm
- Installation Contractor
- Existing Roof Warranty
- Publicity
- City Staff

Maintenance
- Design Firm – short term maintenance
- Community collaboration – long term maintenance
- City Staff
Community Involvement
Lessons Learned

- Review building structural assessment

- Collaboration between existing roof warranty contractor, designer and installer

- Involve City Departments early in the planning process...i.e. inspectors etc.
Green Roof Resources

- Green Roofs for Healthy Cities
- GSA Green Roof Report
- City of Dayton Engineering Design Standards
- EPA Soak Up the Rain: Green Roofs

- Other green roofs in the area
  - UD Kennedy Union
  - Montgomery County Environmental Services
  - Dayton Metro Library Downtown
  - SD1 Public Service Park in Northern Kentucky
Other Stormwater BMPs

Sediment captured by the Flex-Storm Filter

Cleaned manhole showing “Snout” over outlet
Street Maintenance Parking Lot

Street Maintenance Heavy Equipment Parking Lot Drain Upgrade Project
New Manhole replaced existing catch basin

2x2x2 Catch Basins with FlexStorm Inserts

New 4x10’ deep manhole with snout installed

12”

12”

15”

Ottawa Yards
Street Maintenance Facility
Baysaver Performance

The unit is effective at capturing both solids and oil from the storm water run-off of the “Packer Lot”.

Primary manhole sample

Storage manhole sample
Employee Parking Lot – Pervious Concrete
Community Gardens as BMPs
Street Tree Farms as BMPs
Future BMPs

Lakeside and Pineview Neighborhood

Lake cleanup and inlet protection BMPs

(Under consideration)
The following slides are supplementary information
## Sampling Results

<table>
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<td>sVOC's</td>
<td>microgram/L</td>
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<tr>
<td>Ammonia (undiss N)</td>
<td>mg/L</td>
<td>0.114</td>
<td>na</td>
<td>0.17</td>
<td>0.13</td>
<td>&lt;0.05</td>
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<tr>
<td>Nitrate/Nitrite (N)</td>
<td>mg/L</td>
<td>0.832</td>
<td>1.59</td>
<td>5.6</td>
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<td>Phosphate (PO4)</td>
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<td>&lt;0.1</td>
<td>&lt;0.1</td>
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<tr>
<td><strong>Total Metals</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Antimony</td>
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<td>0.00132</td>
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<td>na</td>
<td>na</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
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<tr>
<td>Arsenic</td>
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<td>&lt;0.004</td>
<td>&lt;0.015</td>
<td>&lt;0.003</td>
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<tr>
<td>Barium</td>
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<td>na</td>
<td>na</td>
<td>0.0276</td>
<td>0.0196</td>
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<td>Beryllium</td>
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<td>Chromium</td>
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<td>0.0032</td>
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<td>Lead</td>
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<td>0.285</td>
<td>0.041</td>
<td>0.105</td>
<td>0.0835</td>
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<td>Mercury</td>
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<td>Nickel</td>
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<td>0.00423</td>
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<td>Selenium</td>
<td>mg/L</td>
<td>&lt;0.004</td>
<td>&lt;0.004</td>
<td>&lt;0.02</td>
<td>&lt;0.005</td>
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<td>&lt;0.01</td>
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<tr>
<td>Silver</td>
<td>mg/L</td>
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<td>&lt;0.01</td>
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<td>&lt;0.0005</td>
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<td>Thallium</td>
<td>mg/L</td>
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<tr>
<td>Zinc</td>
<td>mg/L</td>
<td>0.401</td>
<td>0.666</td>
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<td>na</td>
<td>0.0532</td>
<td>0.0917</td>
<td>0.149</td>
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</table>

**Comments**

Replanted some seedlings and added media. It was also one of the first good rains in awhile. First rain in a while.
<table>
<thead>
<tr>
<th>Element Description</th>
<th>Description</th>
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<tbody>
<tr>
<td>Module sizes (nominal)</td>
<td>2 ft x 2 ft x 4 in&lt;br&gt;2 ft x 4 ft x 4 in</td>
</tr>
<tr>
<td>Depth of modules (three depths)</td>
<td>2.5 in, 4 in, and 8 in</td>
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<tr>
<td>Weight of planted modules (when wet)</td>
<td>2.5-in depth – Approx. 11-13 lb/ ft2&lt;br&gt;4-in depth – Approx. 18-22 lb/ ft2</td>
</tr>
<tr>
<td>Module material</td>
<td>100% post-industrial recycled High Molecular Weight Polyethylene. Protected with UV inhibitors and stabilizers. – 150 mil (2.5 and 4 in)</td>
</tr>
<tr>
<td>Module drainage clearance above roof</td>
<td>0.5 in</td>
</tr>
<tr>
<td>Drainage/root resistance medium</td>
<td>3-oz spunbonded polypropylene geotextile</td>
</tr>
<tr>
<td>Botanic Name</td>
<td>Common Name</td>
</tr>
<tr>
<td>--------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>Sedum floriferum</td>
<td>Weihenstephaner Gold</td>
</tr>
<tr>
<td>Sedum kamtschaticum</td>
<td>Kamtschaticum Stonecrop</td>
</tr>
<tr>
<td>Sedum reflexum</td>
<td>Reflexum Stonecrop</td>
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<tr>
<td>Sedum sexangular</td>
<td>Sexangulare Stonecrop</td>
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<tr>
<td>Sedum spurium 'Fuldaglut'</td>
<td>Fuldaglut Stonecrop</td>
</tr>
<tr>
<td>Sedum spurium 'John Creech'</td>
<td>John Creech Stonecrop</td>
</tr>
</tbody>
</table>
INSTALLATION

• Modules arrive pre-planted, palletized, and shrink-wrapped for stability.
• Palletized modules hoisted to the roof (crane).
• Delivery of Materials by a 53-foot Tractor Trailer
• Crane set up along on Ludlow (east end of building)

GreenGrid® Green Roof Logistics
• Coordinated in advance to minimize disruptions (Saturday installation)
• Installation ~8 hours

Equipment Requirements:

40-ton Crane (minimum)
• Safety Equipment (flags, cones, caution tape, etc)
• Hose for irrigation

Labor Requirements:

1 Foreman/Safety Monitor
1 Crane Operator
1 Rigger
1 Crane Signaler
4 Laborers to offload/install modules
The City of Dayton upgraded a three (3) catch basin storm sewer which captures run-off from a one (1) acre heavy equipment parking lot associated with our Street Maintenance Department. The purpose of the upgrade is to reduce or prevent oils and debris from flowing to the MS4 which discharges to the Mad River and subsequently to the Great Miami River. This was accomplished by adding filter inserts to the catch basins and replacing the last catch basin with a new outlet structure to act as a sediment/oil trap.

The upgrade included placing custom made Flexstorm® inlet filters in all three catch basins and enlarging the outlet catch basin with a manhole structure to create a sump for the capture of sediments. A Nyloplast® Snout® Structure has been installed on the discharge pipe to prevent oils and other floatables from discharging to the MS4.

As part of the structures performance evaluation, the catch basins and manhole were cleaned and the sediments and the amount of water recovered were measured. A total of 7500 lbs. of water and debris were removed from the separator, including ~1 cubic yard of sandy sediment and 800 gallons of water.

Diagrams depicting the two options are as follows.