Silver Lake Low Impact Development (LID) Retrofit Project

Wilmington, Massachusetts

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5th Annual MA Water Resources Research Conference
Background

- **Silver Lake**
  - Watershed Area: 132 acres
  - Pond Area: 28.5 acres
  - Watershed/Lake Ratio = 4.6:1

- **Ipswich River Watershed**
EPA Targeted Watersheds Program

- Nationwide program designed to encourage and support projects to protect and restore the nation’s water resources through a community-based watershed approach to water quality and water quantity management.

- MA-DCR received one of 14 grants awarded nationally in 2004 and the projects at Silver Lake in Wilmington, Massachusetts comprise two of nine demonstration projects aimed at restoring the Ipswich River through the $1 million grant.
Ipswich River Watershed

- Stretching 45 miles from Burlington, MA to the Atlantic Ocean
- Valuable ecological resource
- Critical source of drinking water
- Designated by American Rivers as the 3rd most endangered river in the nation.
- Impaired by:
  - Extremely low flows
  - Extended periods of no flow
  - Bacterial Pollution (pet waste, waterfowl, septic systems)
  - Threatened groundwater and drinking water supplies

- Studies conducted by the Massachusetts Water Resources Commission have classified the Ipswich River as “highly stressed” due to water withdrawals from tributary streams and polluted stormwater runoff from increasing impervious areas associated with land development.
LID Technologies Demonstrated
Groundwater Recharge!!

Double click on Photo to Animate!!
Goose Problem!

- Bacteria/Pathogen Management: Waterfowl and Pets

Please... don't feed waterfowl.

Feeding can cause:
- Poor nutrition
- Spread of disease
- Aggressive behavior
- Overcrowding
- Beach & Water Pollution
- Delayed migration

Keep wildlife wild.
Permitting Process

- Local Wetland Permitting
- Public Participation!!
- Collaborative effort from the Town of Wilmington, MA Department of Conservation and Recreation, and GeoSyntec Consultants
Construction Obstacles

- **Resident Confusion**
  - “There’s a big hole in my front yard?!”

- **CAUTION: Children at Play**
  - Dirt bike tracks through raingardens
  - Stolen plants from bioretention cells

- **Hidden Treasures**
  - Abandoned septic system, surprisingly not on construction plans.
Silver Lake Avenue Residential Improvements

- Raingardens and Porous Pavers located in the Town right-of-way.
- Required resident cooperation and willingness to “Adopt-A-Raingarden”
- Market the low maintenance required for raingardens.
- Rainwater Harvesting Program
Residential Raingardens
Street Side Parking
Silver Lake Beach
Parking Lot Improvements

- Porous Pavements
  - Porous Asphalt
  - Porous Pavers
  - GravelPave™
  - Flexi-Pave™

- Bioretention Cells

- Vegetated Water Quality Swales
Pre-Construction Conditions

- Porous Pavers
- Porous Asphalt
- Bioretention Cells
- Standard Asphalt
- GravelPave
- Flexi-Pave
- Vegetated Water Quality Swales

Image downloaded from Google Earth™
Parking Lot Improvements
Gravel Pave Installation
Vegetated Water Quality Swales
Infiltration Tests

- Construction ended at the site in May 2006.
- Four infiltration tests were conducted on the Porous Asphalt, Porous Pavers, GravelPave™ and Flexi-Pave™ surfaces on:
  - 9/18/2006 (porous asphalt only)
  - 10/30/2006
  - 2/28/2007
  - 7/02/2007
- The test locations are shown in the following slide.
Infiltration Test Locations

- Porous Asphalt Test Locations
- Porous Pavers Test Location
- GravelPave Test Location
- Flexi-Pave Test Location
Methodology

- The infiltration test was conducted using an 12-inch diameter 5 gallon bucket with the end cut off, which was affixed to the pavement using plumber’s putty (surface area exposed is 11-inches). The plumber’s putty was used to create a leak-free seal on the porous pavement.

- Water was added to a second 5 gallon bucket with marked depth increments, which were used to calculate volume.

- The known volume of water was slowly added to the 5 gallon bucket affixed to the pavement, keeping a constant head of approximately 1-inch in the bucket.

- Time was calculated using a stop watch. The watch was started when the first drop of water hit the porous pavement and ended the last drop of water infiltrated.
Test Apparatus

- 5 Gallon Bucket affixed to Pavement
- 11-inch Diameter
- Plumbers Putty
- Record Pad
<table>
<thead>
<tr>
<th>Porous Surface</th>
<th>Infiltration Rate (in/hr)</th>
<th>Design Infiltration Rate* (in/hr)</th>
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</thead>
<tbody>
<tr>
<td>Porous Asphalt</td>
<td>75</td>
<td>15 - 39</td>
</tr>
<tr>
<td>Porous Pavers</td>
<td>65</td>
<td>40+</td>
</tr>
<tr>
<td>GravelPave™</td>
<td>7,700</td>
<td>15,000</td>
</tr>
<tr>
<td>Flexi-Pave™</td>
<td>10,400</td>
<td>-</td>
</tr>
</tbody>
</table>

*Rates taken from Table 4.4 – Surface Infiltration Rates under Saturated Conditions of Porous Pavements (2005) by Bruce K. Ferguson
USGS Testing and Modeling

- Pre-construction and post-construction runoff volume and water quality measurements
- Parking lot:
  - Monthly groundwater samples
  - Water level monitoring
- Silver Lake Avenue:
  - Continuous storm flow monitoring
  - Quality monitoring (grab samples)
- A model will be developed in hopes of relating precipitation, land use, and water withdrawals to stream flow over the entire Ipswich River watershed.
Silver Lake Ribbon Cutting Ceremony
References

- For more information, please visit:

Acknowledgements

- Sara Cohen, Water Resources Specialist
  MA Department of Conservation and Recreation (DCR)
- Jamie Magaldi, Assistant Public Works Superintendent
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