Pervious Pavement
A Strategic Plan For NYC DOT

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Spring 2012 Capstone
April 24, 2012
Agenda

- Project Summary
- Case Study Findings
- Site Selection Analysis
- Recommended Locations
- Implementation Plan

Pervious Asphalt

Impervious Asphalt

Image courtesy of: Jason King at Landscape + Urbanism
Project Summary

- Sustainability Problem: Combined Sewer Overflows (CSO)
  - 27 billion gallons/year = 41,000 Olympic-size swimming pools

*Image courtesy of: EPA Stormwater Management*
Project Summary

- NYC’s Comprehensive Plan to address CSOs
  - Grey & Green Infrastructure
  - Goal is to reduce runoff from 10% of impervious surfaces by 2030

<table>
<thead>
<tr>
<th>Grey</th>
<th>Green</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newtown Creek Digester Eggs</td>
<td>Pervious Pavement</td>
</tr>
<tr>
<td></td>
<td>Green Roof</td>
</tr>
<tr>
<td></td>
<td>Bioswale</td>
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</tbody>
</table>

Images courtesy of: NYC DEP, the Calhoun School, and TecEco Ltd.
Role of DOT in alleviating CSO problem

- DOT has jurisdiction over streets & sidewalks
- Streets are 24% of all impervious surfaces
- DOT must install green infrastructure on hundreds of streets by 2030 to meet this target
### Client Needs

- DOT wanted NYC to be first major U.S. city to deploy pervious pavement in significant volume, but needed guidance on how or where to start.
- Our main objective was to develop a new decision tool for DOT to locate, evaluate, and install potential sites for pervious pavement.

### Table: Client Need and Deliverables

<table>
<thead>
<tr>
<th>Client Need</th>
<th>Deliverable</th>
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<tbody>
<tr>
<td>A. Show decision makers that PP can be effective</td>
<td>Case Studies</td>
</tr>
<tr>
<td>B. Provide Design &amp; Construction teams with list of suitable locations</td>
<td>Site Recommendations</td>
</tr>
<tr>
<td>C. Vision of initial roll-out and expansion of PP to meet 10% impervious capture target</td>
<td>Implementation Plan</td>
</tr>
<tr>
<td>D. Internal documentation to request funding</td>
<td>Capital Project Initiation Documentation</td>
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</table>
Project Scope

- Two Priority Watersheds
  - Flushing Bay Watershed
  - Newtown Creek Watershed

- DOT Parameters
  - Streets
  - Porous Asphalt
Methodology & Approach

Best Practices Research
- Reviewed 70 documents
- Interviewed 12 experts

Case Studies
- Reviewed 85
- Selected 10

Definition of Site Selection Criteria
- Identified 16 criteria that make a site ideal for PP

GIS Data Collection & Analysis
- Compiled 45 data layers
- Used 20 layers for analysis

Site Visits
- Completed 25 visits
- Verified road condition

Implementation Planning
- Brainstorming with DOT
- Funding Research

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Case Study Findings

- 85 cases reviewed, 10 selected
- Domestic
  - Small-scale installations
  - Parking lots
- International
  - Standardized practice in Germany and Japan
  - Integrated into the stormwater management system
- Illustrates PP has been installed globally and is an effective green infrastructure measure
GIS Analysis

- Excluded blocks using various filters to arrive at recommendations

All blocks in Flushing Bay & Newtown Creek Watersheds: 6,919

- Over 1000 sq. feet
- No bus, truck routes
- No railroad or subway
- No major or collector roads
- Poor or fair road condition

Transport Network:
- 6,774
- No major or collector roads
- Poor or fair road condition

Geotechnical Requirements:
- 4,111
- Soil type
- Slope
- Depth to Bedrock

Built Environment:
- 2,390
- Setback
- Commercial
- Street Tree Density

Site Visits:
- 514
- Validation of Analysis
- Visual Road Condition

Selected Blocks: ~15
# Site Selection based on GIS Analysis

## GIS Analysis Table

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Site Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth to bedrock</td>
<td>473.8 feet</td>
</tr>
<tr>
<td>Depth to watertable</td>
<td>76.2 feet</td>
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<tr>
<td>Slope</td>
<td>2.00%</td>
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<tr>
<td>Hydrologic soil group</td>
<td>B</td>
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<tr>
<td>Permeability</td>
<td>Moderate</td>
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<tr>
<td>Clay content</td>
<td>&lt; 20%</td>
</tr>
<tr>
<td>Road designation</td>
<td>Local</td>
</tr>
<tr>
<td>Major road</td>
<td>No</td>
</tr>
<tr>
<td>Bus route</td>
<td>No</td>
</tr>
<tr>
<td>Truck route</td>
<td>No</td>
</tr>
<tr>
<td>Subway line</td>
<td>No</td>
</tr>
<tr>
<td>Railroad line</td>
<td>No</td>
</tr>
<tr>
<td>Building setback</td>
<td>&gt; 10'</td>
</tr>
<tr>
<td>Residential zoning</td>
<td>Yes</td>
</tr>
<tr>
<td>Street tree density</td>
<td>&lt; 3 / K sq. ft.</td>
</tr>
<tr>
<td>Pavement condition</td>
<td>Fair</td>
</tr>
</tbody>
</table>

Verified through Site Visit

- 68th Rd between 110th and 112th St, Queens, NY
Site Visits

Road Condition

Curb Condition

Street Features
Recommended Locations – Phase I

- Newtown Creek: 5 Locations
- Flushing Bay: 10 Locations
Implementation Plan

Phase 1

- Albert Rd. 6 Blocks
- Shovels in the Ground
- End of Bloomberg Admin.

Expected Pervious Pavement Installations

- 2012: 15
- 2013: 80
- 2014: 400-800

Remaining Milestones

- End of PlaNYC

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Implementation Plan: Phase 1

Backcasting Exercise with DOT
What do you do today to achieve your future vision?

End of Phase 1

1. Site Recommendations
2. Draft CPI
3. Determine DOT Capability
4. Finalize Street Limits
5. Scope (Design Details)
6. Funding Approvals
7. Issue CPI
8. Pre-Monitoring
9. Design & Construction
10. Public Outreach

Present
Capital Project Initiation (CPI)

- Completed draft documentation (one for each watershed) to begin design & construction
- Will directly lead to funding allocations from DOT and DEP
Recommended Locations – Future Phases

- Newtown Creek Watershed
- Flushing Bay Watershed
Conclusion

- Main sustainability issue are CSOs
- Pervious pavement is an effective green infrastructure measure
- DOT wants NYC to “pave the way”
- Our team provided DOT with:
  - Case Studies = Internal Buy-in
  - GIS Analysis = Recommended Sites
  - CPI = Funding
  - Implementation Plan → 2030

Image courtesy of: Sundt Construction
Questions?

DOT Client:
“This is going to help us so much in moving the discussion forward within DOT and making pervious pavement a reality.”