GSI for Increased Resiliency

Case Studies and Examples
Flood Mitigation

Blueprint Columbus
- SSO/GI implementation
- Integrated Solutions
  - Flood Mitigation
  - Inter-Agency Goals

Dellrose Street
- Innovative Design
- Monitoring Opportunities
- Inter-Agency Coordination
  - Reduction of Stormwater Flooding

DPS Regional Basins
- Quantity Control
- Flood Control
- Inter-Agency Coordination
Blueprint Columbus Integrated Planning

- First Water Quality Driven Consent Order in the US
- Addressing WQ
- Mitigating Flooding
- Neighborhood Revitalization/Vacant Parcel Conversion
- Re-training on GI Maintenance
Blueprint Columbus Integrated Planning
Columbus, Ohio

18,400 acres
Blueprint Columbus Integrated Planning

- Boulevards
- Land Bank Parcels
- In-Street and Behind-the-Curb GI
- Permeable Street Pavements
- Bumpouts
**Downspout Disconnection**

**Summary of Downspout Analysis**

<table>
<thead>
<tr>
<th>Category</th>
<th>Acres</th>
<th>Number of Downspouts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Roof Area that Could be Redirected</td>
<td>41.1</td>
<td>5642</td>
</tr>
<tr>
<td>Redirected Roof Area of Low Category</td>
<td>7.4</td>
<td>1049</td>
</tr>
<tr>
<td>Redirected Roof Area of Medium Category</td>
<td>13.7</td>
<td>1885</td>
</tr>
<tr>
<td>Redirected Roof Area of High Category</td>
<td>18.3</td>
<td>1915</td>
</tr>
<tr>
<td>Roof Area not to be Redirected</td>
<td>1.8</td>
<td>793</td>
</tr>
</tbody>
</table>

**Summary for the Project Area with Consideration for Grade**

- % Redirected Roof Area of Low Category: 18%
- % Redirected Roof Area of Medium Category: 33%
- % Redirected Roof Area of High Category: 44%
- % Roof Area not to be Redirected: 4%
Permeable Streets

- Continued Coordination of Permeable Street Locations with DPS via DOSD.
- Richardson Ave. and Warren Ave. between Sullivant Ave. and Broad Street scheduled for resurfacing in 2018
Lessons Learned

Public Perception
• Bump-Outs
• Permeables
• Buy-in from adjacent neighbors

Inter-Agency Coordination
• Workshops
• Spec Development
• Buy-in from all agencies involved

Integrated Planning is a Win-Win
• BP vision has evolved
• Water Quality first but direct benefit with Quantity
• Cost effective
Dellrose Street Green Infrastructure
Pittsburgh, Pennsylvania
Dellrose Street-Sawmill Watershed
Dellrose Street-Sawmill Watershed

- It is encouraged, where feasible to use best management practices (BMPs) to achieve an approved method of surface/stormwater collection, conveyance, detention, and/or retention for stormwater which may minimize or even eliminate the use of PWSA sewer conveyance conduits. Stormwater facilities on private property are usually regulated by other agencies including, but not limited to City of Pittsburgh, Allegheny County Health Department (ACHD), and Pennsylvania Department of Environmental Protection (DEP). The Stormwater Management Manual for the City of Pittsburgh provides detailed property surface/stormwater management information for the City of Pittsburgh. This information is available at the end of Chapter 2. There are county/state stormwater management manuals as well.
Lessons Learned

Permeables Work!
• Minimal space disruption
• Integrated into the existing corridor
• Water quality benefit
• Steep slopes are manageable

Inter-Agency Coordination
• Leveraging agency dollars from different departments
• Life-cycle costs
• Collaboration on specs.

Integrated Planning is a Win-Win

- > 100 in/hr Rainfall Accepted by Permeable Pavers
- 15,000 gallons Retained as Subsurface Storage
- 18,000 gallons Retained/Conveyed (Design Storm)
- 8.1 cfs (~3,600 gpm) of Tributary Peak Runoff Rate Managed
- 1.4 cfs (~630 gpm) of Peak System Discharge

- 83% Reduction in Peak Discharge Rate (Design Storm)
DPS Regional Stormwater Basin Analysis and Flood Control Bank
Columbus, Ohio
Lessons Learned

Retrofitting Existing Basins
• Low-hanging fruit
• Potential for expansion
• No right of way issues

New Regional Basins
• Lifecycle Cost Analysis
• $ per cfs stored

Interagency Coordination
• Partnership with Parks
• Regional WQ benefits
• Flood Reduction Strategies
In many cases, a typical project process requires that our engineers work with multiple disciplines to design and develop our implemented projects. The advantages of having these services in-house is that the professionals involved work together, generating and sharing ideas on a daily basis, providing seamless project delivery.
Discussion

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