Green Infrastructure Installation Techniques

Ann Arbor Waste Water Treatment Plant
Agenda

- Overview of Ann Arbor WWTP Facilities Renovations Project (FRP) Improvements
- Local Stormwater Management Standards and Site Objectives
- Stormwater Management Plan – Green Infrastructure
- Green Infrastructure Design Adjustments
- Construction of Green Infrastructure Adjustments
- Pilot Testing of Proposed Improvements
- Installation of Improvements
- Review of Green Infrastructure Performance
FRP Improvements were focused on the West Plant, built in the 1930s

Some plant equipment and systems had exceeded their useful life

Total site drainage area = 28 acres

Work required compliance with current stormwater management regulations

FRP Construction began in 2012 and substantially complete in 2017
Ann Arbor WWTP FRP Improvements

- Construct Two New 5 MGD West Plant Treatment Trains
- New influent flow splitter
- New plant wide electrical distribution system
- New emergency electrical generators
- New Administration Building
- Replace East Plant Aeration Blowers
- Miscellaneous East Plant Improvement
Stormwater Management Standards/Requirements

- Minimum 0.5 inches of runoff be treated using water quality features
- Detention storage be provided to limit discharges from the 100-year storm to 0.15 cfs/acre
- Interior conveyance pipes provide capacity for the 10-year storm
- Interior surface flooding does not adversely impact the site for the 100-year storm
Site Objectives

• Meet regulatory compliance in a manner that will ensure sustainable operation of the treatment facilities

• Maintain available land for current/future wastewater treatment operations while maximizing use of land for stormwater facilities.
Stormwater Management Plan - Green Infrastructure
# Stormwater Management Plan - Green Infrastructure

- 5 Rain Gardens
- 3 Zero Net Runoff Areas
- 13 Grass Swales
- 5 Roadway/Parking Lot Porous Pavement Installations

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Pre-Construction Area, Acres</th>
<th>Post-Construction Area, Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grass</td>
<td>10.47</td>
<td>6.38</td>
</tr>
<tr>
<td>Open Process</td>
<td>9.45</td>
<td>9.34</td>
</tr>
<tr>
<td>Zero-Net Runoff Areas</td>
<td>0</td>
<td>1.56</td>
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<tr>
<td>Grass Swales</td>
<td>0</td>
<td>0.07</td>
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<tr>
<td>Porous Pavement</td>
<td>0</td>
<td>0.55</td>
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<tr>
<td>Rain Garden</td>
<td>0</td>
<td>2.16</td>
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<tr>
<td>Road</td>
<td>5.35</td>
<td>5.32</td>
</tr>
<tr>
<td>Roof</td>
<td>2.68</td>
<td>2.62</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>28</strong></td>
<td><strong>28</strong></td>
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<tr>
<td><strong>Impervious area roof and road</strong></td>
<td><strong>8.03</strong></td>
<td><strong>7.94</strong></td>
</tr>
</tbody>
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GI Installation Techniques

Challenges and Solutions

• GI Design Adjustments
• Construction of GI Adjustments
• Pilot Testing of Proposed GI Improvements
• Installation of GI Improvements
• Review of GI Performance
GI Design Adjustments

• Accommodate Changes to Land Use
• Flexibility on the number and location of green infrastructure installations
• Revise GI design based on changes to soil properties from construction activities that negatively impact the infiltration potential of GI.
• Evaluate modifications for compliance with stormwater treatment and detention storage requirements
Construction of Green Infrastructure Adjustments

- Improve infiltration potential at poorly draining GI installations
  - Underdrains: Small diameter perforated pipe installed below GI feature to collect and convey filtered stormwater runoff to the existing stormwater pipe network
  - Dry wells: vertical gravel filled columns to promote infiltration
- Avoid compaction of soils during GI construction activities
- Intercept the fine sediment with straw waddle or other until vegetation is established.
Pilot Testing of Proposed GI Improvements

• Installed dry well and underdrain pilot systems at a variety of locations to evaluate efficacy

• Adjust the design of improvements based on the performance of the pilot installations.
  • Underdrains were the selected solution based on performance
Installation of Improvements

- Construction oversight of GI improvements to ensure compliance with specifications
  - Successful construction of the underdrain system at the GI locations was completed in 2017
Review of GI Performance

- Record duration of stormwater ponding following wet-weather events
  - Not to exceed 24-48 hours
- Observe the establishment of vegetation within the GI installations
  - Perform maintenance as required: watering, weeding, pruning, etc.
Review of GI Performance

Before Underdrain Installation

After Underdrain Installation
Review of GI Performance

Before Underdrain Installation

After Underdrain Installation
Conclusions

- Installation of Green Infrastructure as a stormwater management tool requires site specific design.
- Green Infrastructure needs to be flexible and adjust to changes in site design, land use, soil conditions, etc.
- The success of Green Infrastructure depends upon continued review of system performance in response to changing environmental conditions such as increased sediment loading and changes in vegetation.

**Green infrastructure is a viable stormwater management tool that can be implemented at a variety of locations and site conditions.**
Acknowledgements

Thank you to the Team that made this project possible.