SUSTAINABLE BIORETENTION MEDIA STUDY

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PROJECT BASIS

• Background
  • Bioretention Soil is 60-75% Sand
  • Source = “River” Sand
  • Sand cost = $8-12/ton
  • MSD Cost of Ash Disposal
• MSD Lemay WWTP incinerates biosolids, creates ash
  • “Ash” = Non-hazardous
    • Silica (sand), Aluminum (trace), Iron (trace)
    • Particle size: relatively small % fines
RESEARCH OBJECTIVE

• Could Lemay ash replace river sand in bioretention media?
  • Hydraulic Conductivity?
  • Export of Nutrients & Metals?
  • Plant Compatibility?
  • Permitting Requirements?
  • Lemay Modifications?
• This Project
  • Focus = Hydraulic Conductivity
<table>
<thead>
<tr>
<th>Set</th>
<th>Mixed Medium</th>
<th>Columns</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>75% Sand 25% Compost (Control)</td>
<td>1-3</td>
</tr>
<tr>
<td>B</td>
<td>75% Bottom Ash 25% Compost</td>
<td>4-6</td>
</tr>
<tr>
<td>C</td>
<td>50% Bottom Ash 50% Compost</td>
<td>7-9</td>
</tr>
<tr>
<td>D</td>
<td>75% Bottom Ash 25% Mulch Fines</td>
<td>10-12</td>
</tr>
<tr>
<td>E</td>
<td>50% Bottom Ash 50% Mulch Fines</td>
<td>13-15</td>
</tr>
</tbody>
</table>
METHODS (1 OF 3)

Column Fabrication
- PVC pipe
- window screen
- 6” pea gravel
- geotextile fabric
- 18” mixed medium
METHODS (2 OF 3)
METHODS (2 OF 3)
# RESULTS (1 OF 3)

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>1</td>
<td>54.91 ± 7.23</td>
<td>5.42 ± 0.58</td>
<td>6.94 ± 0.64</td>
<td>9.92 ± 1.53</td>
<td>27.74 ± 3.23</td>
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<tr>
<td>2</td>
<td>57.35 ± 7.23</td>
<td>4.55 ± 0.58</td>
<td>5.58 ± 0.64</td>
<td>6.82 ± 1.53</td>
<td>31.16 ± 3.23</td>
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<tr>
<td>3</td>
<td>51.99 ± 7.23</td>
<td>4.19 ± 0.58</td>
<td>6.23 ± 0.64</td>
<td>6.91 ± 1.53</td>
<td>31.83 ± 3.23</td>
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<td>4</td>
<td>40.97 ± 7.23</td>
<td>4.19 ± 0.58</td>
<td>5.61 ± 0.64</td>
<td>6.87 ± 1.53</td>
<td>24.87 ± 3.23</td>
</tr>
</tbody>
</table>
RESULTS

Hydraulic Conductivity vs. Test Number

- Set A
- Set B
- Set C
- Set D
- Set E

$k$(in/hr)

Test Number
RESULTS (3 OF 3)

Grain-size Distribution Curve
Average of Top, Middle, & Bottom 6" for Each Set

- Percent Passing
- Grain Diameter (in)

Sets:
- Set A
- Set B
- Set C
- Set D
- Set E

Legend:
- Silt & Clay
CONCLUSION & FUTURE WORK

• Hydraulic Conductivity
  • >1 in/hr (2 ft/day) met
  • Conclusion: ash mix could be acceptable
  • Most Promising Mix
    50% ash : 50 % mulch

• Future Research
  • Plant compatibility
  • Nutrient/metals export

http://www.mofga.org
QUESTIONS

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