Feasibility Analysis for Green Stormwater Infrastructure in Washington, D.C.

DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING

RetCredit1

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Problem Definition

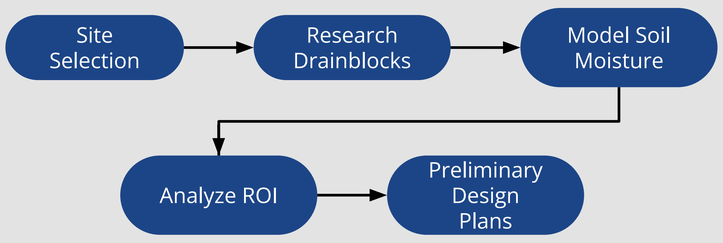
Washington, D.C. operates a Stormwater Retention Credit (SRC) market that incentivizes GSI on private property to help manage runoff and protect local waterways. Green Mechanics works within this market to implement sustainable stormwater projects on behalf of clients, making stormwater management accessible and profitable for site owners. Drainblocks, a porous basalt material developed and tested in Europe, may offer a space-efficient, high-performance addition to bioretention systems in D.C., though it is not yet approved by the Department of Energy and Environment (DOEE).

The goals of this project are to **explore and enhance current GSI practices** to further mitigate the impacts of runoff from urban development.

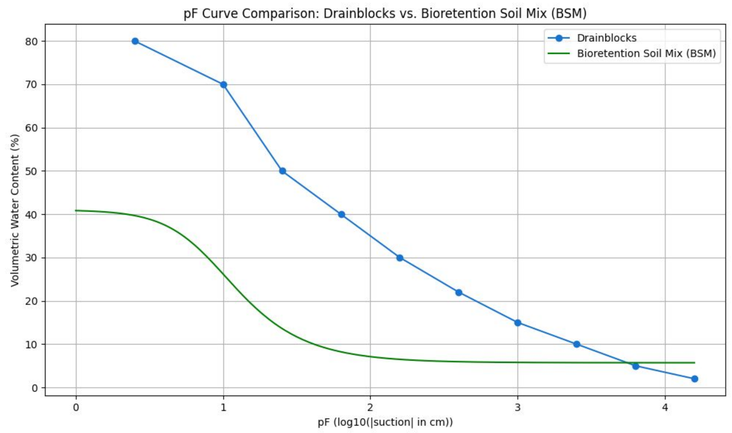
Criteria	Site A James Creek Marina	Site B Emmanuel Baptist Church	Site C East Market	Site D Allen Chapel Hill
Impervious Acre Size				
0 - 0.49 acres will receive 1 point				
0.5 - 0.99 acres will receive 2 points	3	3	1	3
1.0+ acres will receive 3 points				
Hydrologic Soil Designation				
D soil type will receive 1 point				
B-C soil type will receive 2 points	1	1	2	1
A soil type will receive 3 points				
Likelihood of Obtaining a Letter of Engagement				
least likely will receive 1 point				
moderate likelihood will receive 3 points	1	3	5	3
most likely will receive 5 points				
Total Product Score:	**5**	**7**	**8**	**7**

Site Feasibility Matrix

Design Approach



Preliminary Site Design for East Market



pF Curves for Drainblocks and Bioretention Soil Mix

Bioretention Soil Moisture Data		
Criteria	**Facility 1: Business School West Bioretention**	**Facility 2: Business School East Bioretention**
Soil Moisture Average (%)	15	13.4
Soil Moisture Standard Deviation (%)	3.47	3.15
pF Average	1.36	1.46
pF Standard Deviation	0.14	0.22
Confidence Interval	1.22 to 1.50	1.24 to 1.68

Calculated Bioretention Soil Moisture Data

Final Design

The final design features:

- **882 square-foot bioretention facility**
  - With surface ponding, filter media, and gravel layers
- **Storage volume of 1,518 cubic feet**
  - Exceeding the required retention volume of 1,336 cubic feet
- **3-meter trench drain**
  - To route parking lot runoff to the bioretention facility

Drainblocks, initially considered, will be omitted from the final design due to their lower return on investment.

Using the DOEE calculator, this project will be eligible to receive:

- **6,813 SRCs annually**
- 81,756 SRCs over the 12 year investment period
- 204,390 SRCs over the 30 year BMP lifecycle

	Return on Investment GSI Matrix		
	Basic Bioretention Facility	**Bioretention Facility with Trench Drain**	**Bioretention Facility with Drainblocks**
Total Over Investment Period	48%	89%	62%
Total Over BMP Life	45%	70%	58%

Green Stormwater Infrastructure Comparison Matrix

Conclusion

- pF curve analysis shows that Drainblocks **retain significantly more water** at the same matric potential
- **ROI with Drainblocks is less than** a bioretention facility without Drainblocks for this site
  - More area allows for bigger bioretention
  - Drainblocks better suited for urban site with limited space
- Beneficial to establish a **breakeven point** at which Drainblocks' benefit outweighs the cost for a certain site area

Drainblocks could be practical in urban GSI development where creativity must be employed to maximize the storage potential of smaller spaces.

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