



Gray Complements Green

Gray + Green Treatment Train Design:

- Targets Multiple Urban Pollutants
- Reduces Maintenance Costs
- Extends Useful Life of Green Infrastructure
- Minimizes Urban Blight
- Enhances Quality of Urban Life

Gene LaManna
Terre Hill Stormwater Systems

Typical Urban Rain Garden Retrofit Bump Out



Street View of Urban Trash in Gutter and Rain Garden



Ponding of Water at Entry to Rain Garden



Trash Entering Rain Garden or Causing Back Up



Curb Check Dam Causing Urban Trash Eyesore



Oil and Grease entering Rain Garden Without Pretreatment



No Pretreatment Device for these Gross Pollutants



Trash will be Deposited in Rain Garden from Cars and Pedestrians



Urban Landscape without Pretreatment



**Terre Urban Protector Pretreatment for Rain Garden
Staten Island, NY**



**Terre Urban Protector Pretreatment
Prevents Constant Urban Eyesore
Maintain 2' x 4' Area
Extends Useful Life of Rain Garden**



**Terre Urban Protector after Maintenance
1 Man Hour for Maintenance**



**Urban Landscape with Terre Urban Protector
Pretreatment Reduces Maintenance
Pretreatment Eliminates Urban Trash Eyesore
Pretreatment Enhances Quality of Urban Living**



Urban Landscape with Terre Urban Protector



Terre Tree Filter



Terre Tree Filter Structure



Terre Tree Filter Benefits

Reduce Volume and Rate from small, frequently occurring storms

Increases Infiltration and Groundwater recharge

Treatment to remove:

TSS 85%

TP 75%

TN 70%

Metals 82%

Cost Effective:

Purchase: \$5,000

Install: \$1,000

Maintenance: \$ 500/year

**Reducing Stormwater Costs Through Low
Impact Development Strategies and Practices**

EPA Document 841-F-07-006
December 2007

EPA:

Rate of land development is twice the rate of Population Growth.

2000 -2025: 68 million acres will be developed.

LID is a stormwater management set of practices designed to reduce runoff and pollutant loadings as close to its source as possible.

A set or system of small scale practices, usually natural systems, linked together on site, to obtain the desired results.

EPA LID Goals

Environmental Benefits:

- Pollution Abatement
- Protection of Water Resources
- Ground Water Recharge
- Water Quality Improvements
- Reduced Treatment Costs
- Reduced Incidence of CSOs
- Aquatic Habitat Improvements

EPA LID Goals
Land Value and Quality of Life Benefits:
Reduced downstream flooding
Reduced Property Damage
Enhanced Real Estate Values
Increased Property Tax Revenues
Improve Developer Lot Yield
Aesthetic Value
Enhance Public Spaces
Enhance Quality of Life
Increase Public Participation

EPA LID Construction Cost Considerations
LID techniques might not always be less costly than gray infrastructure:
costs of plant material
Site preparation
soil amendments
underdrains
connections to municipal stormwater systems
increased project management

EPA LID Maintenance Cost Considerations:
Maintenance costs for retention basins and constructed wetlands were estimated at 3 to 6 percent of construction costs.
Maintenance costs for swales and bioretention practices were estimated to be 5 to 7 percent of construction costs.
Wetland and pond maintenance requires heavy equipment to remove accumulated sediment, oils, trash, and vegetation.
