



# Setting Up Fast-Track Stormwater Retrofit Projects For Long Term Success

Presented By:

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Section



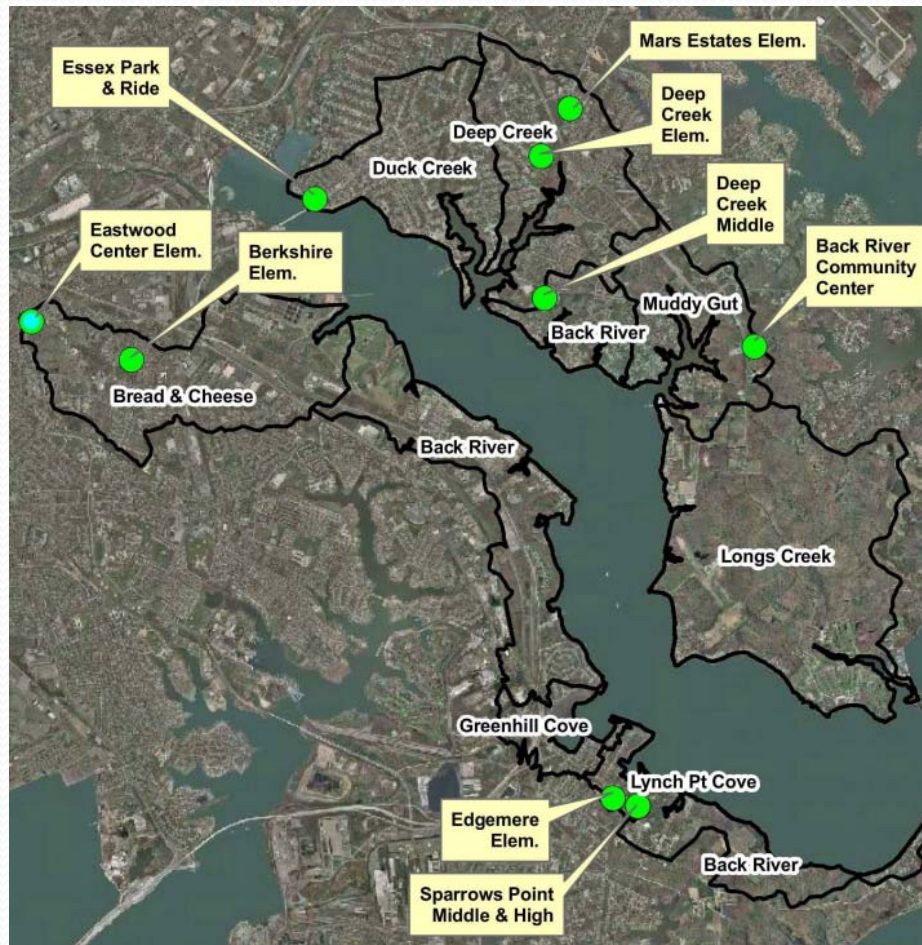
Baltimore County Watersheds





## Tidal Back River Greening Project

- Project Owner: Baltimore County Dept. of Environmental Protection & Sustainability
- Property Owners (9 Sites Total): Baltimore County Public Schools and Baltimore County Government
- Design Firm: Parsons Brinkerhoff
- Contractor: Angler Environmental



Tidal Back River Watershed and Project Sites





# Tidal Back River Greening Project

Design & CM Services: \$405,650  
Construction: \$1,604,694  
Total: \$2,010,344

Supplemental Funding Sources:  
Chesapeake Bay Trust  
Dept. of Natural Resources Trust  
Maryland Dept. of the Environment-MWQ Financing Administration

## Plans Distribution and/or Coordination for Project Approval

Baltimore County Gov't	Baltimore Co. Public Schools	Maryland Dept. Transportation	Maryland Dept. of the Environment	Utility Companies	Community Input Groups
SWM Section	Engineering & Construction	Maryland Transit Admin.	Wetlands and Waterways Program	BGE	Back River Restoration Committee
Environmental Impact Review	Maintenance Grounds & Logistics	Maryland State Highway Admin.	Water Quality Finance Admin. Program	Other Utility Companies	Essex Renaissance Corporation
Sustainability (Forest Management)	Individual School Personnel (Principal's Office)		NOI Permit Process		Essex Middle River Civic Council
Dept. of Public Works					Baltimore Metropolitan Council
Property Management		*Additional Grant/Funding Sources	DNR-Critical Area Commission		Tree Planting Volunteer Groups?
Recreation & Parks					
Permits Approvals & Inspection					
County Exec's Office					





Sparrows Point Middle & High Schools-Facility 9.1





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Sparrows Point Middle & High Schools-Facility 9.1





Edgemere Elementary School-Facility 8.1





Edgemere Elementary School-Facility 8.1





Edgemere Elementary School-Facility 8.1





Edgemere Elementary School-Facility 8.1





Edgemere Elementary School-Facility 8.1





Berkshire Elementary School-Facility 2.1





Deep Creek Middle School-Facility 6.1





Deep Creek Middle School-Facility 6.1





Deep Creek Middle School-Facility 6.2





Deep Creek Middle School-Facility 6.2





Mars Estates Elementary School-Facility 4.1





Mars Estates Elementary School-Facility 4.1





Mars Estates Elementary School-Facility 4.1





Mars Estates Elementary School-Facility 4.1





Mars Estates Elementary School-Facility 4.1





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Mars Estates Elementary School-Facility 4.1





Essex Park & Ride-Facility 3.1





Essex Park & Ride-Facility 3.1





Essex Park & Ride-Facility 3.1





Essex Park & Ride-Facility 3.2





Essex Park & Ride-Facility 3.2





Essex Park & Ride-Facility 3.2





Essex Park & Ride-Tree Planting





Essex Park & Ride-Tree Planting





# Tidal Back River Greening Project

Design & CM Services: \$405,650  
Construction: \$1,604,694  
Total: \$2,010,344

On Time?  
Within Budget?





# Tidal Back River Greening Project

What about Condition and  
Function of BMPs *Presently?*





# Maintenance: Bioretention

## Schools & EPS Collaboration

- Baltimore County EPS
  - As-Built Inspections
  - Triennial Inspections
  - Structural Maintenance
- Baltimore County Public Schools
  - Vegetation Management
  - Surficial Filter Media





# Maintenance: Bioretention

## Vegetation Management

- Requirements
  - Healthy growth
  - Control invasives
  - Structures visible
  - Storage volume
  - Roots in underdrains
- Design for Maintenance
  - Easy-care plantings
  - Plant lists





Sparrows Point Middle & High Schools-Facility 9.1





Sparrows Point Middle & High Schools-Facility 9.1





Edgemere Elementary School-Facility 8.1





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Deep Creek Middle School-Facility 6.1





Deep Creek Middle School-Facility 6.1





Deep Creek Middle School-Facility 6.2





Deep Creek Middle School-Facility 6.2



# Benefits of Retrofits

## Design vs As Built

$$\Delta \text{ Performance} = f \left( \begin{array}{l} \Delta \text{ Pollution Accounting Practices,} \\ \Delta \text{ BMP size achieved in field} \end{array} \right)$$

- Pollution Accounting Practices:
  - Watershed Model
  - Chesapeake Bay Program Expert Panels
  - NPDES Permit Rules/Guidance
  - Geographic Specificity



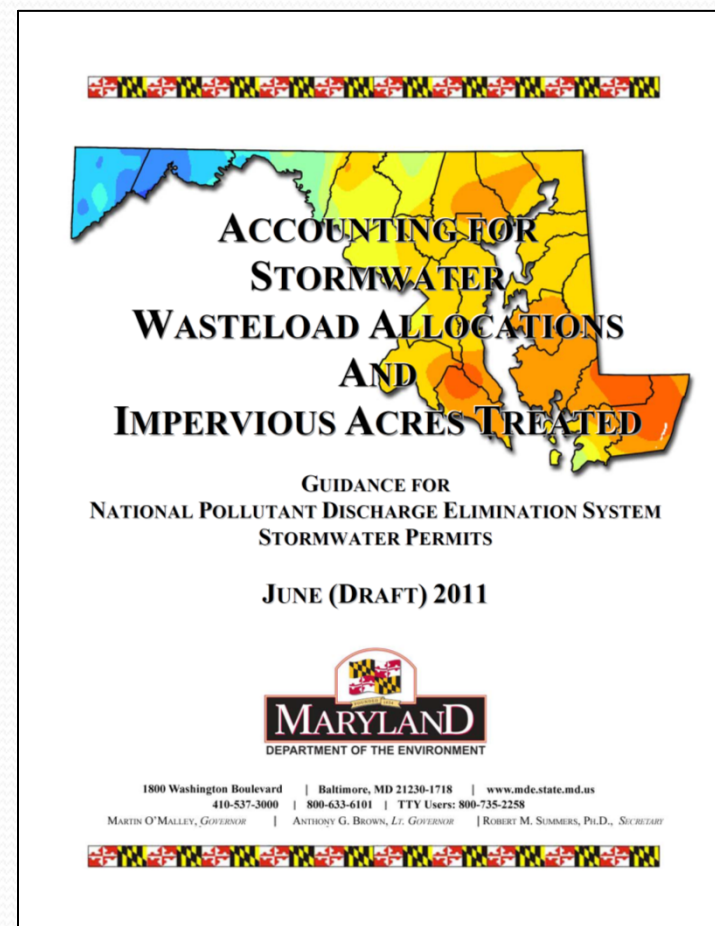
# Bioretention: Designed vs As Built

## 2011 MDE Guidance

### Efficiency Fixed per Category

**Table 4.** Structural BMP Retrofit Matrix

BMP Practice	TN	TP	TSS
<b>CBP Structural BMPs</b>			
Dry Detention Ponds	5%	10%	10%
⋮	⋮	⋮	⋮
<b>ESD to the MEP from the <i>Manual</i></b>			
Green Roofs	50%	60%	90%
Permeable Pavements	50%	60%	90%
⋮	⋮	⋮	⋮
<b>Micro-Bioretention</b>	<b>50%</b>	<b>60%</b>	<b>90%</b>





# Bioretention: Designed vs As Built

## 2014 MDE Guidance

### Efficiency Varies by Volume & Regulations

- ESD to the MEP: development

$$Q = \left( \frac{P_{design}}{P_E} \right) \times 2.5 \text{ inches}$$

Q = runoff depth treated per impervious acre (inches)

$P_{design}$  = the rainfall treated by stormwater management practices (inches)

$P_E$  = the rainfall target used to size ESD practices

- RR/ST curves: restoration & older development

$$Q = \frac{(12 \times EP)}{IA}$$

Q = runoff depth treated per impervious acre (inches)

EP = state-specific engineering parameter (acre-feet); either ESD<sub>v</sub> or WQ<sub>v</sub>

IA = impervious area (acres)

### Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated

Guidance for  
National Pollutant Discharge Elimination  
System Stormwater Permits

August 2014

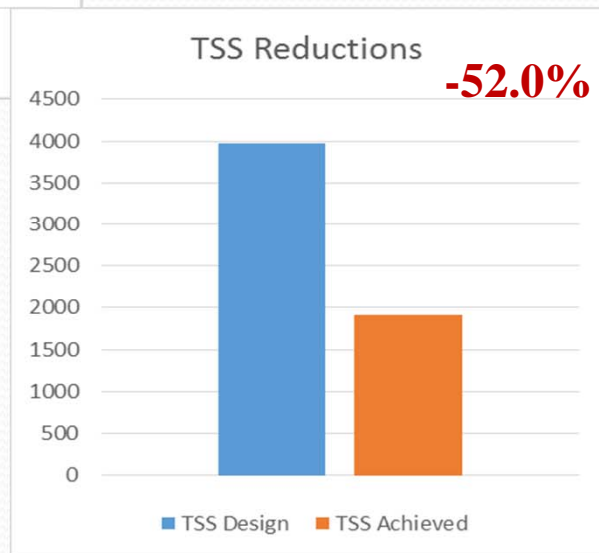
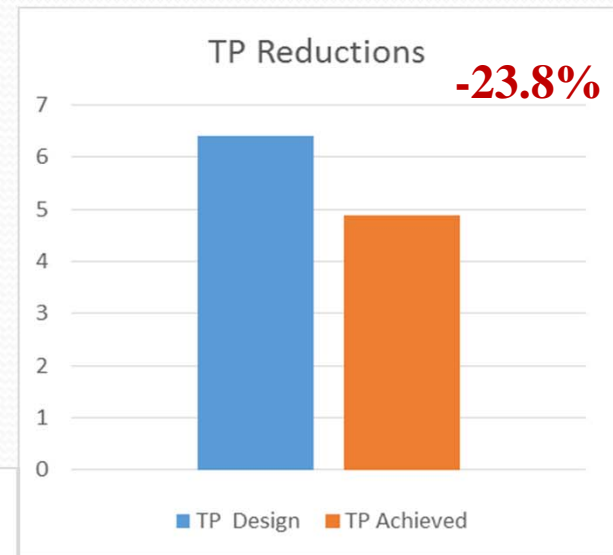
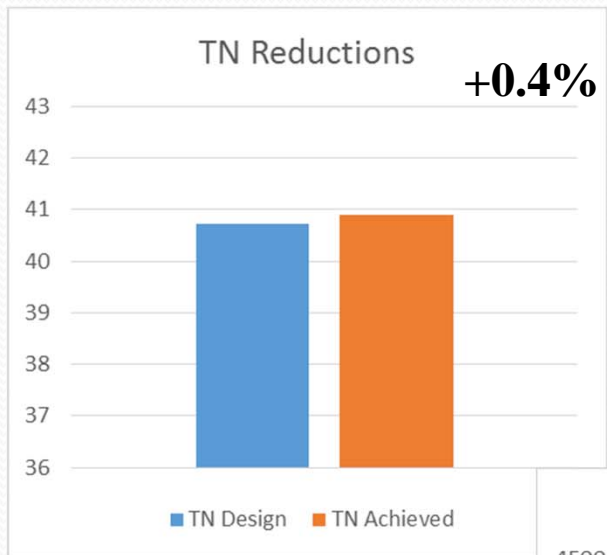


Department of the Environment

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Martin O'Malley, Governor | Anthony G. Brown, Lt. Governor | Robert M. Summers, Ph.D., Secretary



# Pollutant Removals: Bioretention





## Tree Planting: Designed vs As Built

# 2016 Baltimore County Method

### Reductions vary by location:

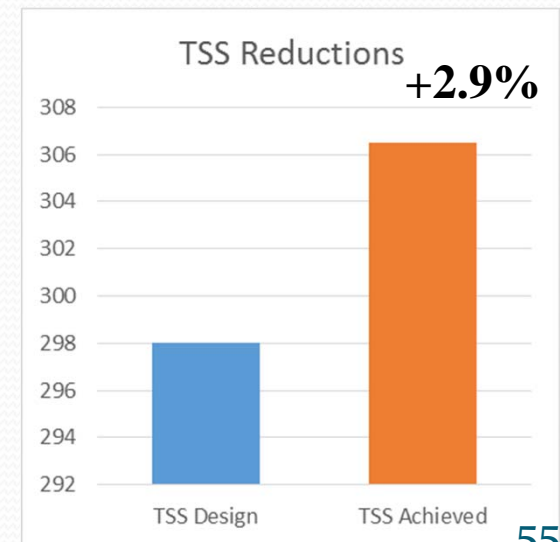
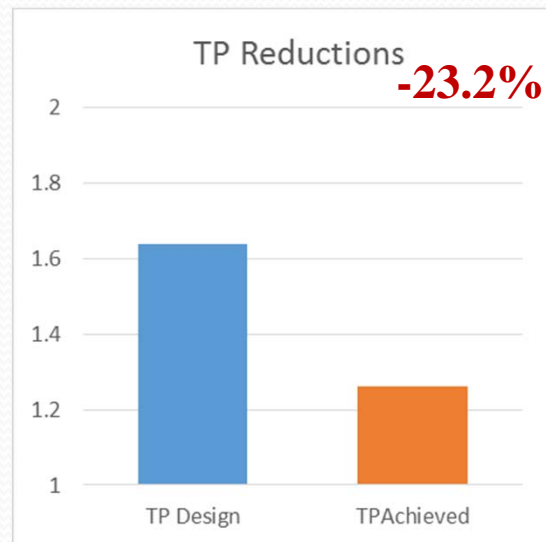
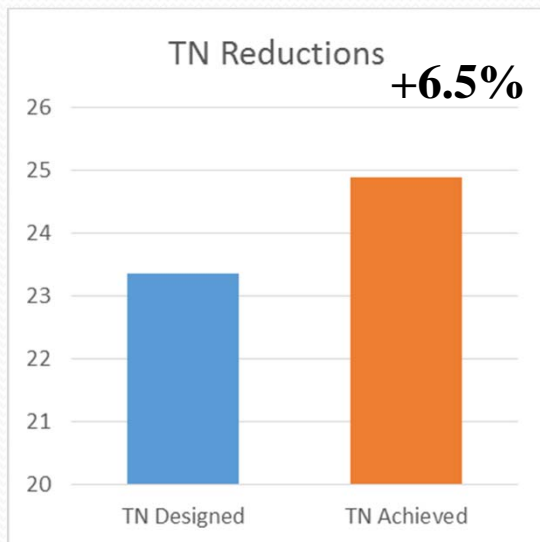
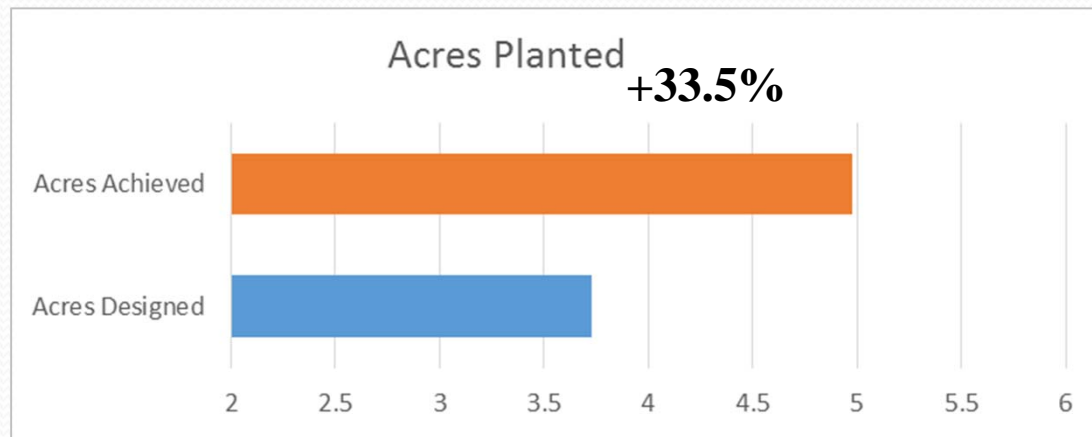
- Land-River Segment
- Riparian or Upland

### **Pollution Reduction Per Acre of Reforestation**

<b>Method</b>	<b>TN</b>	<b>TP</b>	<b>TSS</b>
MDE 2011	6.27	0.44	80.00
County, Back River, Upland	4.86	0.24	52.19
County, Back River, Riparian	8.24	0.40	168.66



# Pollutant Removals: Tree Plantings





# QUESTIONS?

