PRIME AE™




Chesapeake Bay Large Scale Watershed Implementation Plans

NEWEA Watershed & Stormwater Conference

October 2014

Outline – Chesapeake Bay Large-Scale Watershed Implementation

- Chesapeake Bay and TMDL
- Impacts on Large Scale Watershed Imp Plans
- TMDL Driven Subwatershed Restoration Plans
- Management Approach
- Q&A

Chesapeake Bay

Largest Estuary in the US

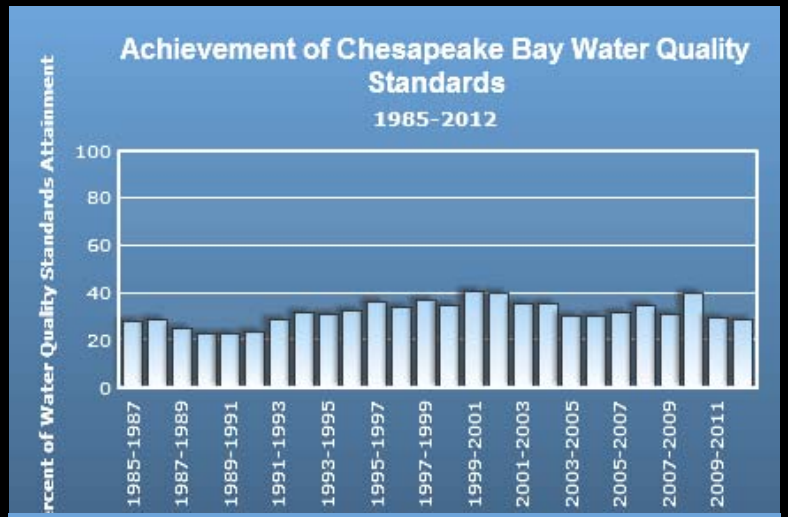
- Watershed reaches Six States
- 64,000 SQM watershed
- 30 x 200 Miles
- Bay and Tribs. 4500 SQM
- 12 Miles of Shoreline
- Two Major Ports

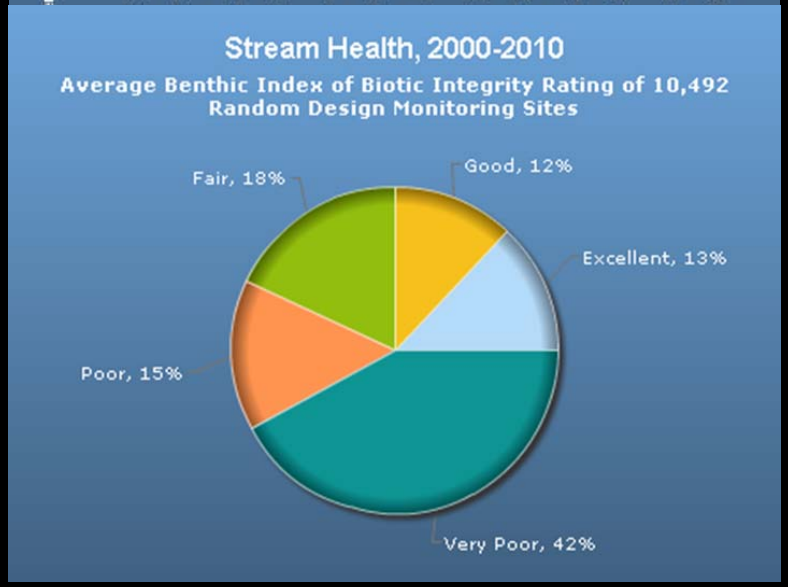
Why is the Chesapeake Bay Important to MD and VA

- 500M lbs. of Seafood Harvested in MD and VA each year
- $3.39 Billion in Sales
- $900M Income
- 34000 Local Jobs

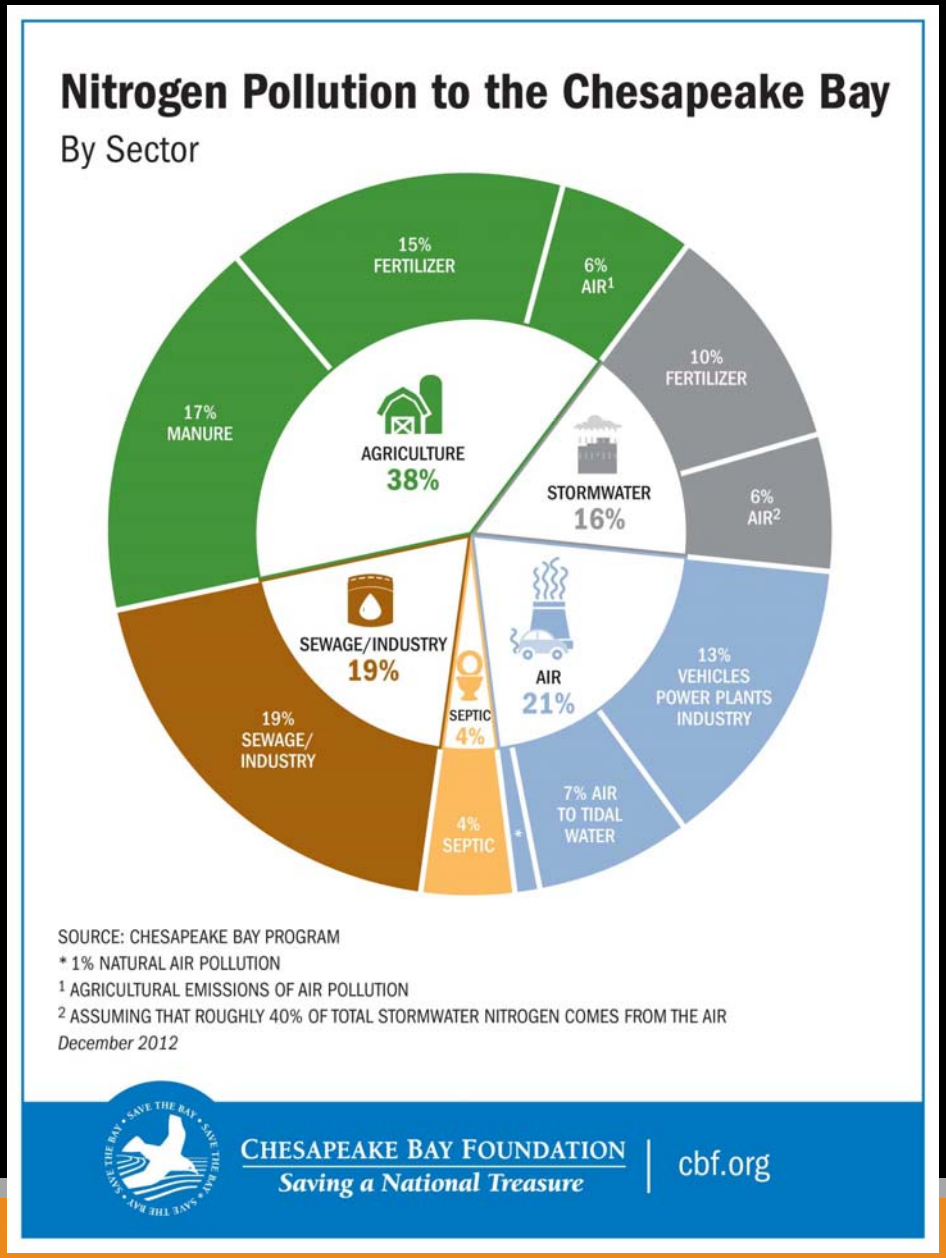
Health of the Chesapeake Bay

- Limited attainment of water quality standards
- Parameters:
  - Dissolved oxygen
  - Water clarity
  - Chlorophyll a.
- 57% of streams rated poor to very poor





Bay Pollution Contributing Sectors



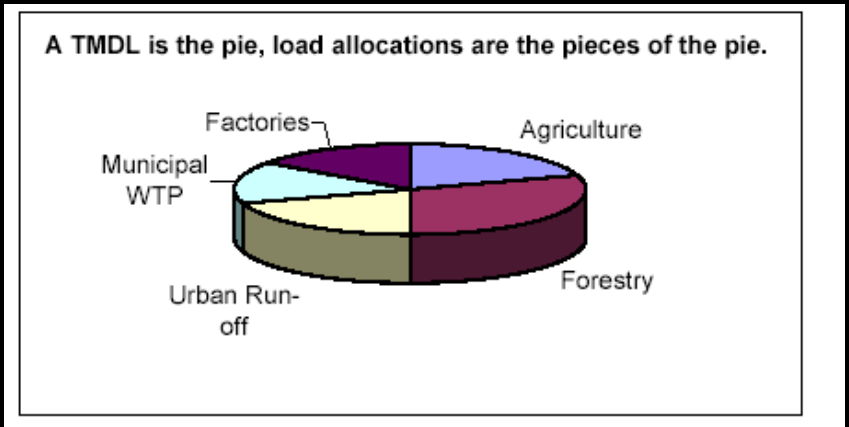
Chesapeake Bay TMDL

Chesapeake Bay TMDL

- Chesapeake Bay Foundation Law Suit
- 2010 Settlement USEPA agreed to set rigorous goals for the amount of nutrients and sediment that can enter the Bay

What is a TMDL?

- Maximum amount of a pollutant that a body of water can receive while still meeting water quality standards



- TMDL = WLA + LA + MOS

Where:

- WLA = Point Source Wasteload Allocations
- LA = Nonpoint Load Allocations
- MOS = Margin of Safety

PRIME AE™

USEPA Chesapeake Bay TMDL Model

- Simulates scenarios, pollution loads and flow
- Predicts how various changes or pollution-reduction actions could affect the Bay ecosystem
- Withstood legal challenges so far

TMDL Pollutant Reduction Allocations

- Numerical reduction goals on the amount of nutrients and sediment
- Watershed Implementation Plans (WIP) by State and Counties
- Milestone and accountability framework

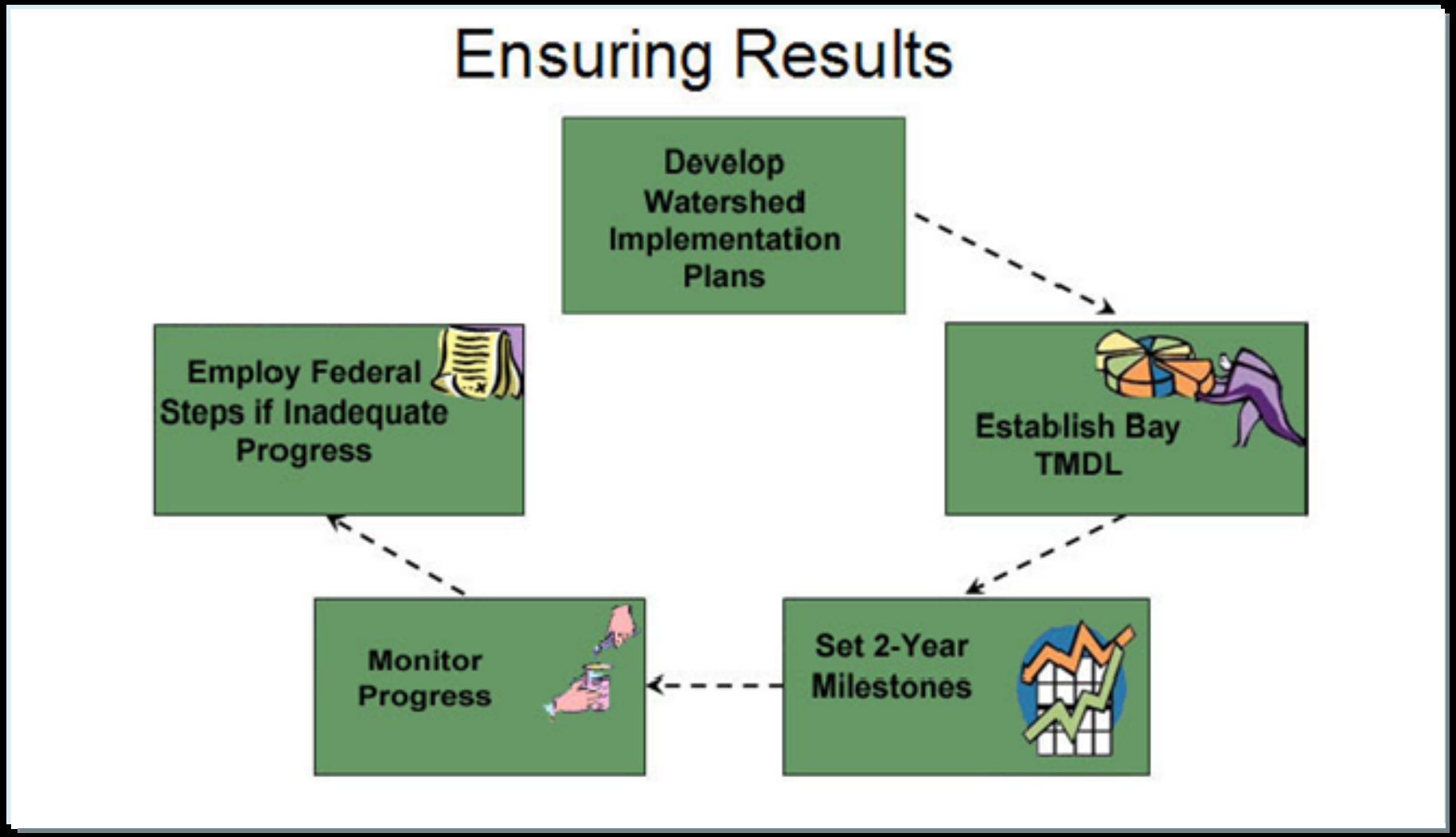
	Nitrogen	Phosphorus	Sediment
Delaware	13.1%	12.3%	5.1%
District of Columbia	12.8%	21.9%	16%
Virginia	13%	21.5%	29.6%
West Virginia	NNI	NNI	NNI
Maryland	**24.2%**	**28.2%**	**29.3%**
Pennsylvania	41.1%	44.8%	50.4%

9.48 M lbs/yr. → 7.55 M lbs/yr.

0.7 M lbs./yr. → 0.5 M lbs/yr.

PRIME AE™

Tracking and Reporting Milestone



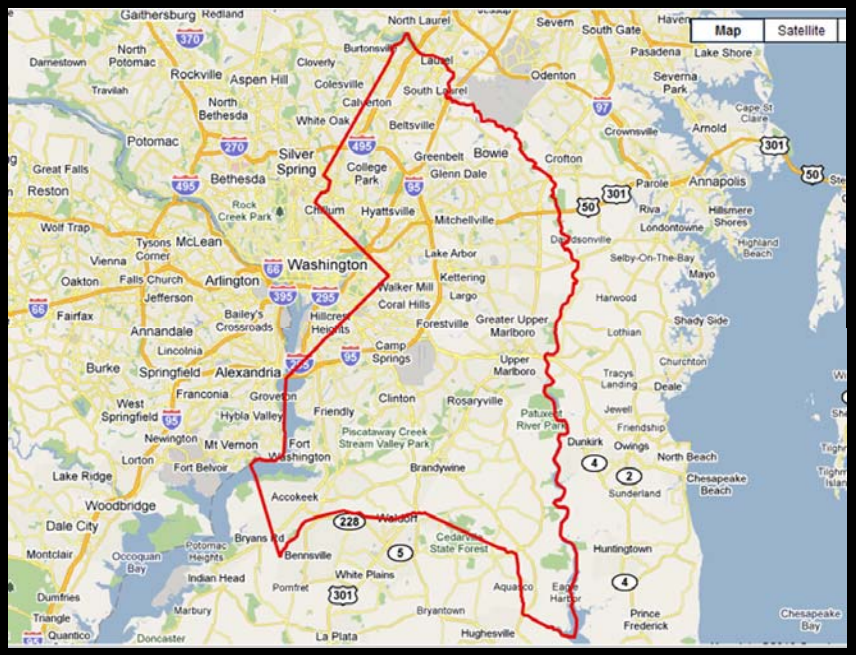
Impact of Large Scale WIP

New MS4/ NPDES and TMDL Regulatory Requirements

- MS4 NPDES Phase I Stormwater Permits - Retrofit of 30% of untreated impervious surface by 2017
- County-wide Load Reductions Restoration Plans
  - Structural &
  - Non Structural BMPs
- Tracking & Reporting Requirements

Prince George's County, MD

- Area: 500 SQ. Miles
- Population: 900K
- Major Watersheds:
  - Potomac
  - Anacostia River Trib.



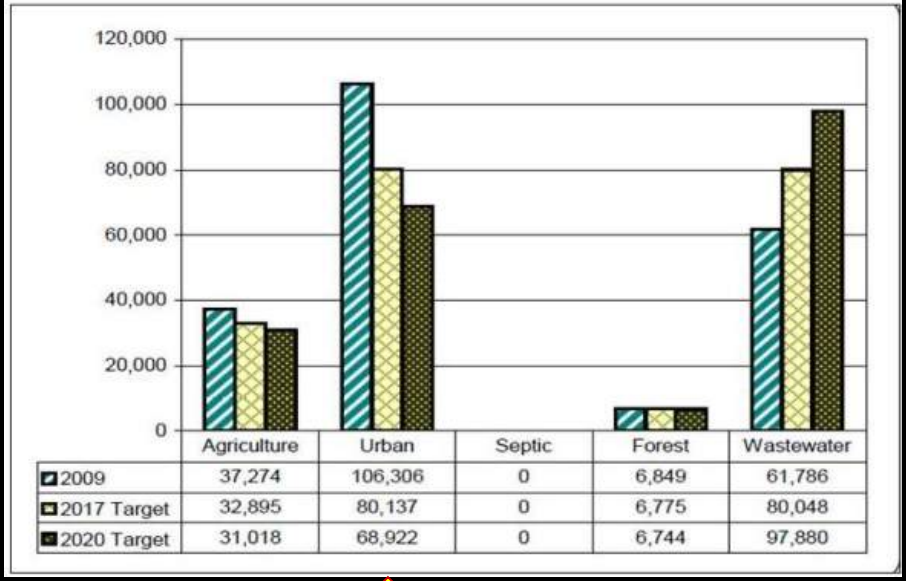
PRINCE GEORGE'S COUNTY MARYLAND
SEMPER EADEM

PRIME AE™

Prince George's County's TMDL Implementation Plan

- Achieve 70% load reductions by 2017; 100% by 2025.
- Retrofit 7,109 acres of untreated impervious area
- Implementation Challenges
  - Program Cost
  - Implementation Capacity
  - Permitting

Figure 4: Prince George's County Phase II
Total Phosphorus 2017 and Final Target Loads by Sector



	Agriculture	Urban	Septic	Forest	Wastewater
2009	37,274	106,306	0	6,849	61,786
2017 Target	32,895	80,137	0	6,775	80,048
2020 Target	31,018	68,922	0	6,744	97,880

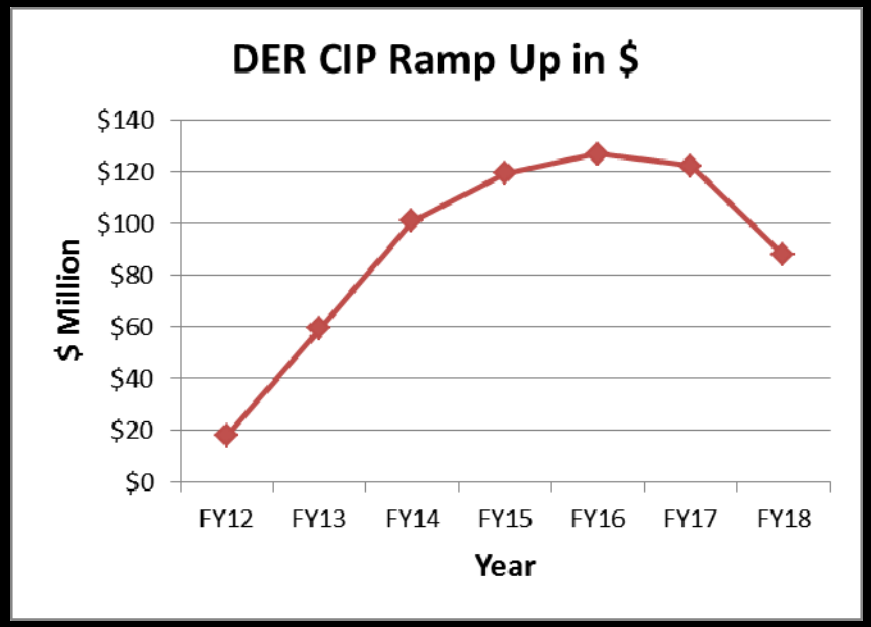
PRIME AE™

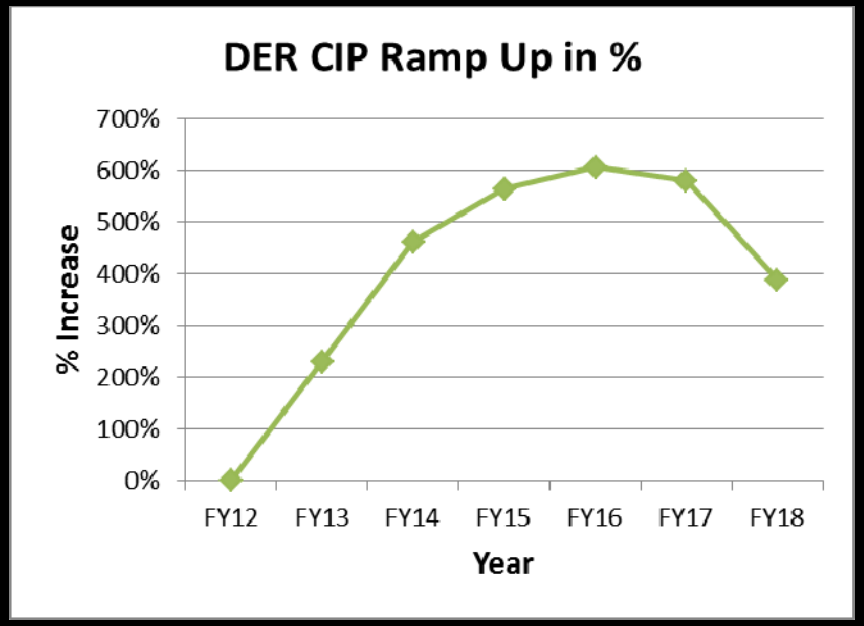
Prince George's County, MD WIP

BMP Type	Impervious area (acres)	Estimated pervious area (acres)	Cost per Imp acre ($/acre)	Estimated cost
County				
Bioretention area	305	1,728	$100,000	$30,500,000
Filtering practices	379	2,148	$100,000	$37,900,000
Infiltration practices	1,124	6,369	$100,000	$112,400,000
Filtration ponds	725	4,108	$35,000	$25,375,000
Wetland restoration	251	199	$82,669	$20,750,000
Stream restoration	645	3,655	$55,764	$35,968,000
Forest buffer	484	939	$11,763	$5,693,273
Pond retrofit	1,222	3,477	$15,712	$19,200,000
Urban nutrient management	1,000	11,108	Minimal	$100,000
Impervious disconnect	975	0	$30,000	$29,235,000
Sum for County	**7,109**	**33,732**	**$44,610**	**$317,121,273**
Target (30% Untreated Impervious Areas)	**7,109**			

PRIME AE™

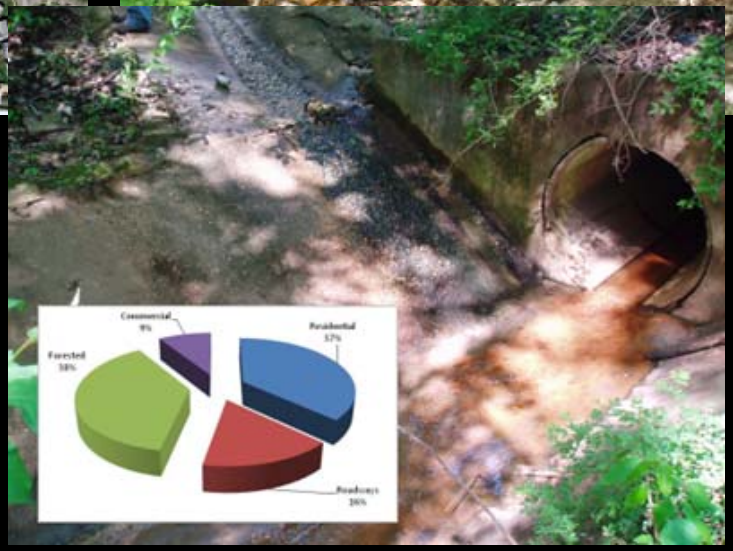
CIP Build Up, Prince George's County, MD





Subwatershed Restoration Plans

Subwatershed Restoration Plans, Anacostia River



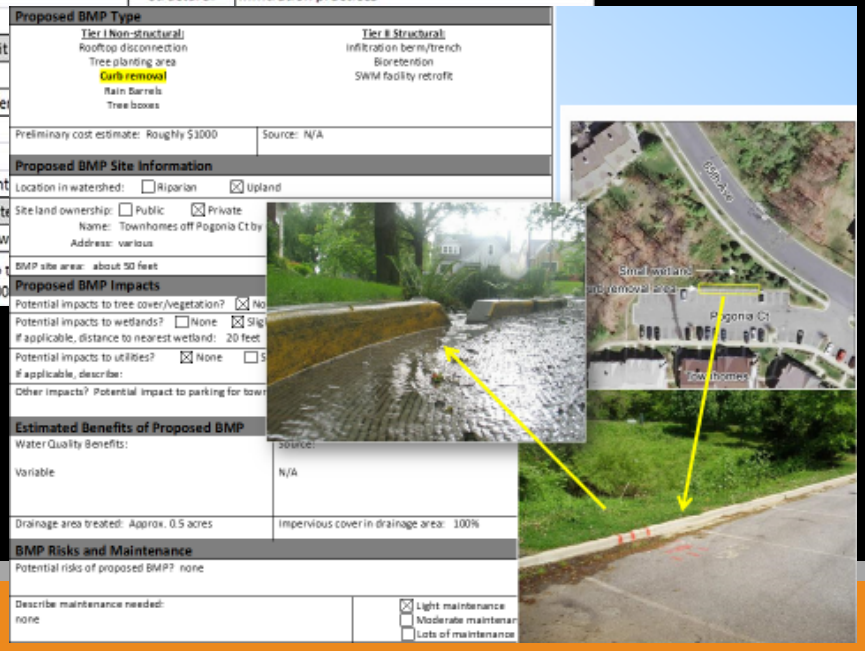
PRINCE GEORGE'S COUNTY MARYLAND

PRIME AE™

Beaverdam Creek, Anacostia River

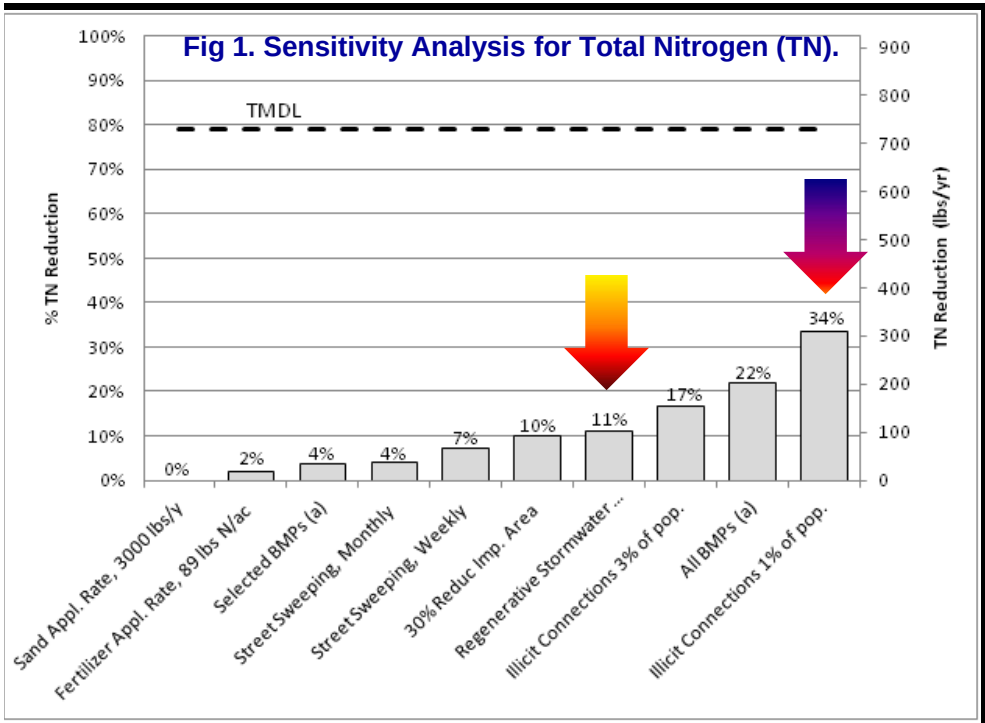
BMP #	Description	Type	Modeled As
CI-1	Tree planting area	Non-structural	Increase in forested area
64S-1	Rooftop disconnection	Non-structural	Rooftop disconnection
	Rain barrels	Non-structural	Rain tanks & cisterns
CA-4	Trash removal	Non-structural	Not modeled
CCX-2	Curb removal	Non-structural	sheetflow to open space
	Tree boxes	Non-structural	Other[1]
CCX-3	Trash removal	Non-structural	Not modeled
CCX-4	Rooftop disconnection	Non-structural	Rooftop disconnection
	Rain barrels	Non-structural	Rain tanks & cisterns
CCX-5	Tree planting area	Non-structural	Increase in forested area
TH-1	Curb removal	Non-structural	sheetflow to open space
TH-2	Curb removal	Non-structural	sheetflow to open space
	Tree boxes	Non-structural	Other[1]
US-1	Rooftop disconnection	Non-structural	Rooftop disconnection
	Rain barrels	Non-structural	Rain tanks & cisterns
US-2	Tree planting area	Non-structural	Increase in forested area
	Curb & gutter removal	Non-structural	Sheetflow to open space
BK-1	Tree planting area	Non-structural	Increase in forested area
BK-2	Flow diversion	Non-structural	Not modeled
BK-3	Bioretention	Structural	Bioretention
ER-1	Bioretention	Structural	Bioretention
CCX-1	Bioretention	Structural	Bioretention
CC-1	Infiltration trench	Structural	Infiltration practices
	Bioretention		
US-3	SWM facility retrofit		
II-1	Bioretention		
TH-3	Infiltration berm/tre		
CA-1	Tree boxes		
	Infiltration trench		
	Permeable pavement		
CA-2	Energy dissipator/st		
CA-3	Regenerative stormw		

[1] Tree boxes were built into t
Stormwater Center (UNH, 200

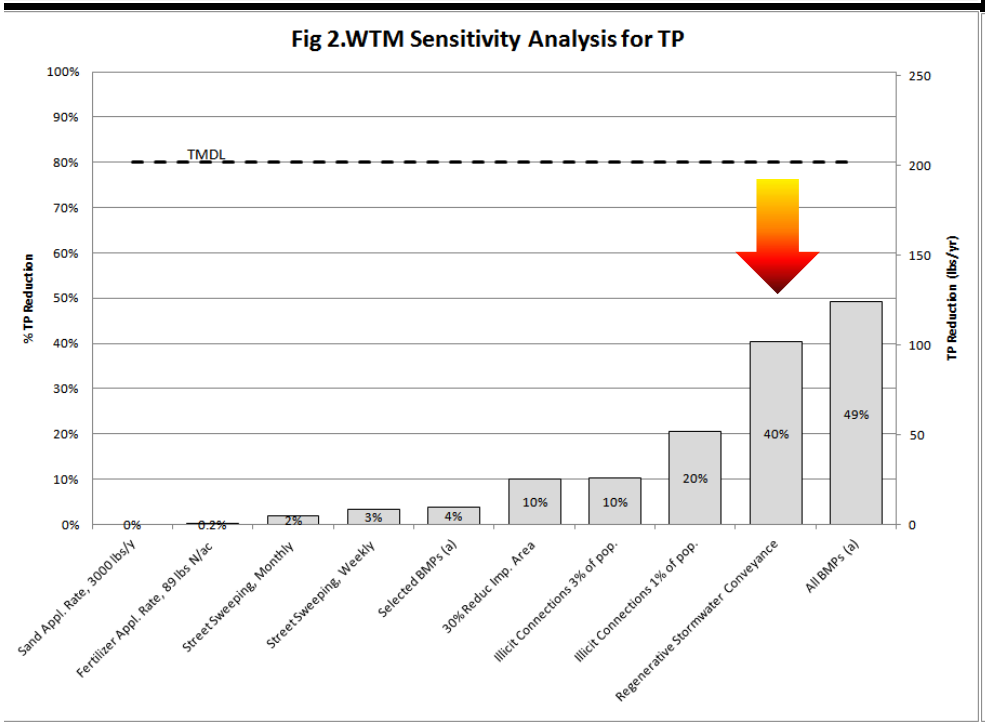


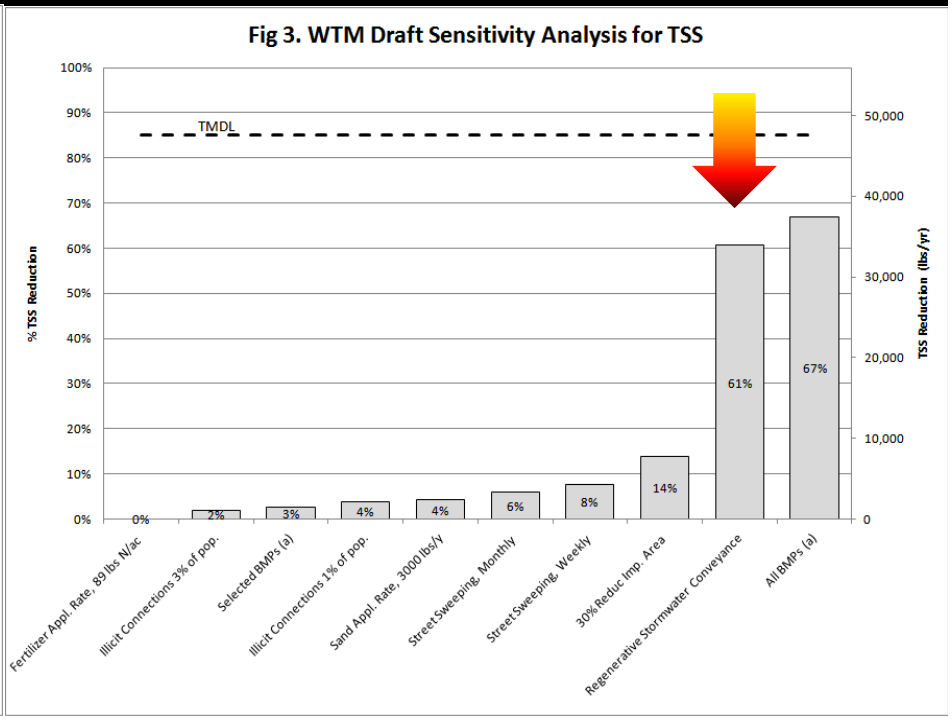
- BMP Inventory Criteria:
  - BMP Opportunity Sites
  - Right-of-Way/Ownership
  - Construction Access
  - Drainage Area
  - Outfalls

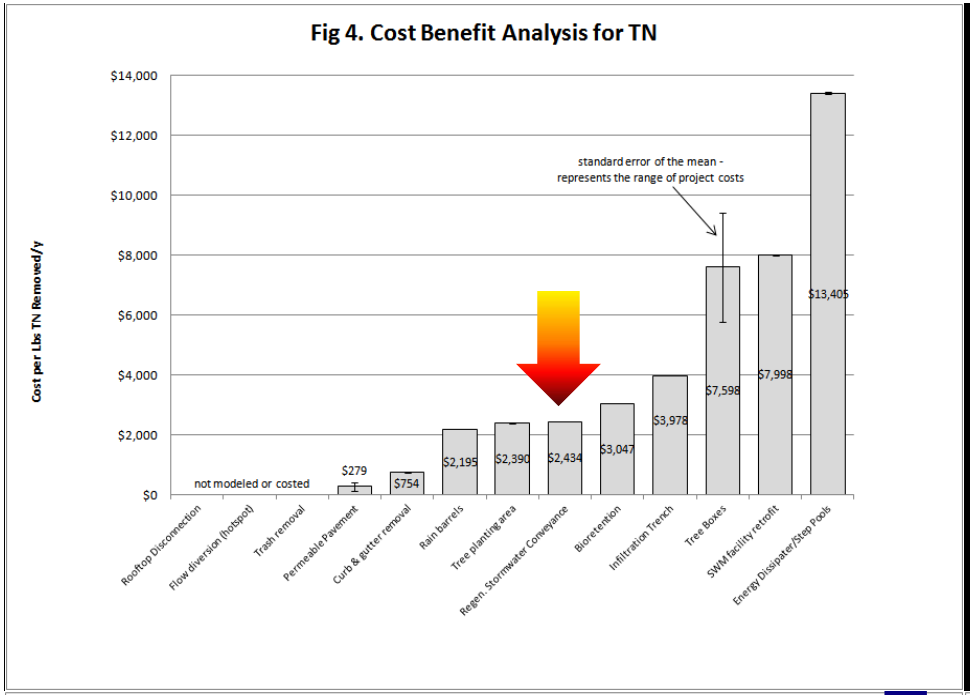
PRIME AE™



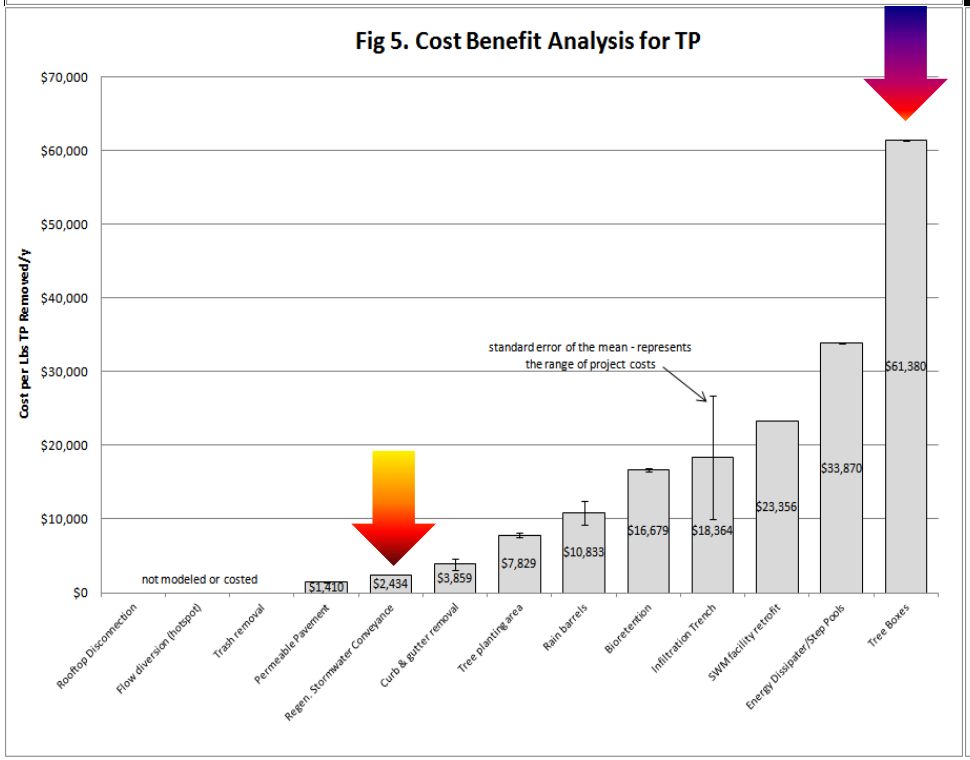
- Ranking Factors:
  - Type of BMP
  - Pollutant Addressed
  - Pollutants Reduced
  - Impervious Area Treated
  - Cost

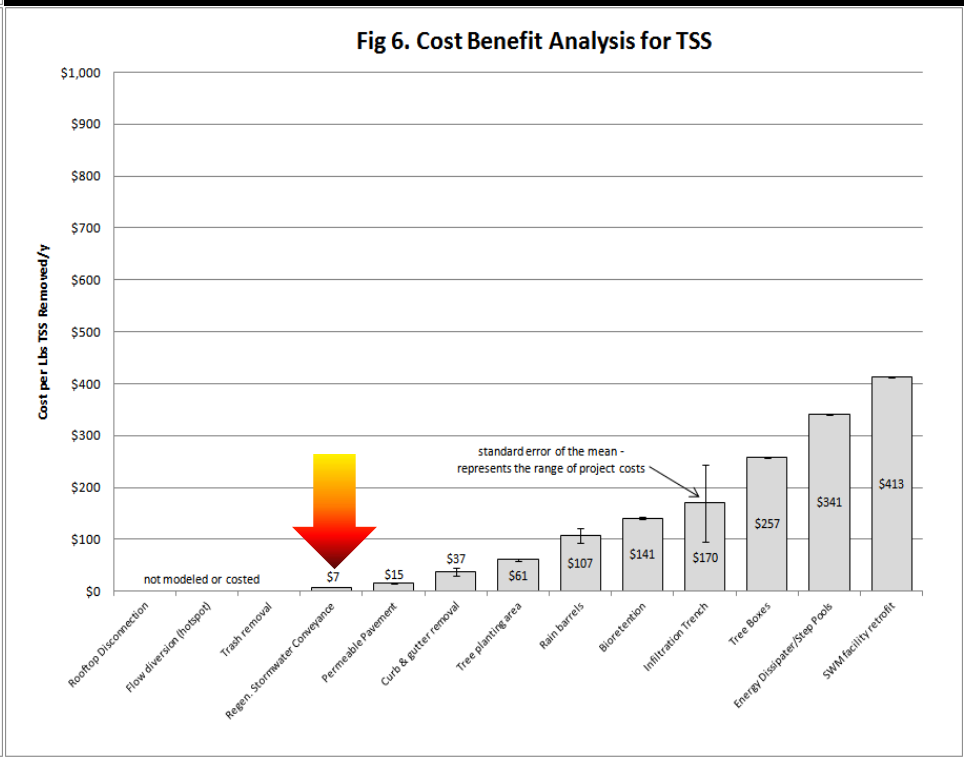




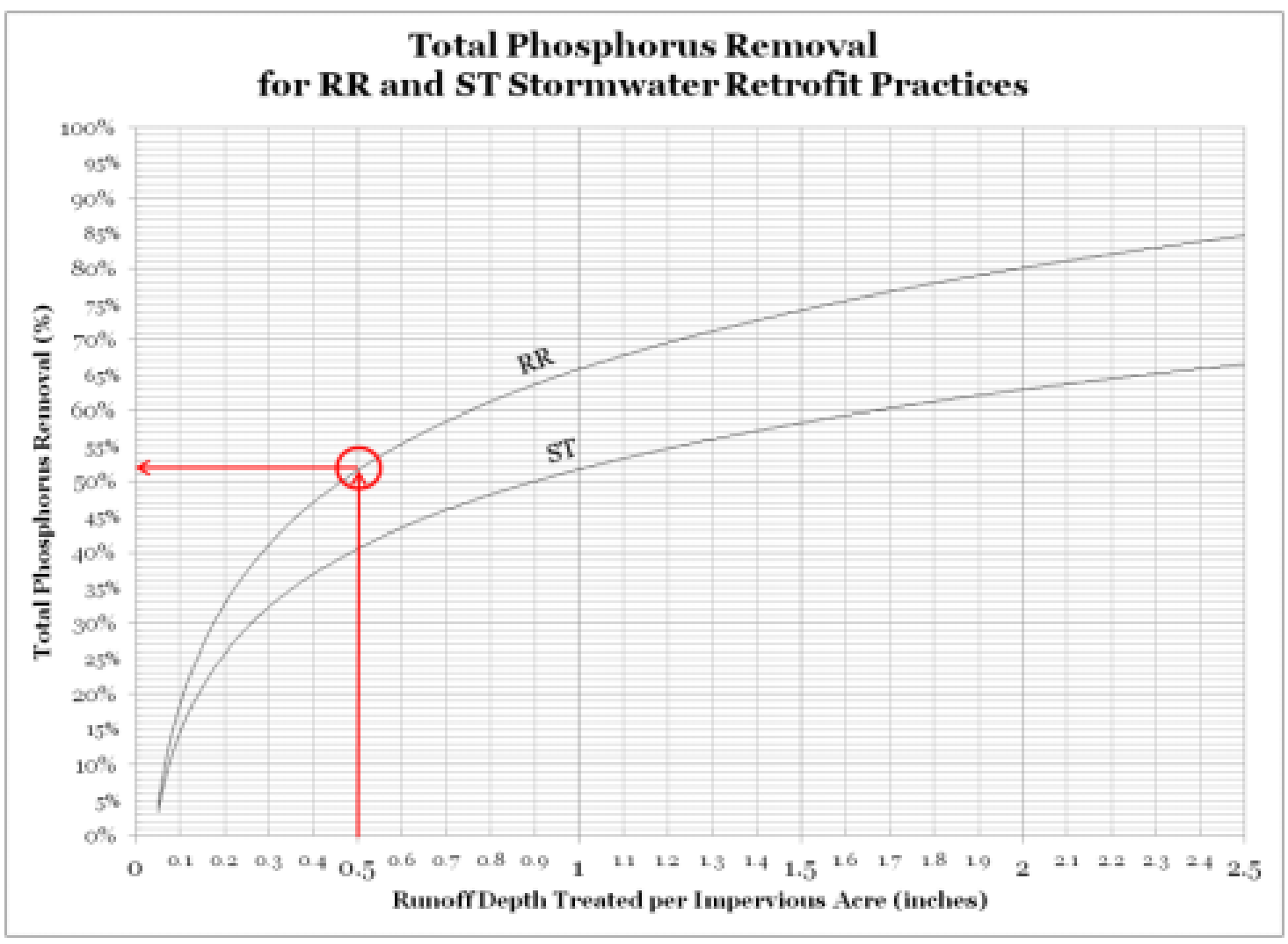


- Benefit/Cost Analysis
- Site Conditions
- Type of Pollutants





BMP Efficiency



Source: http://www.chesapeakebay.net/groups/group/urban_stormwater_workgroup

BMP Effectiveness

	TSS	TKN	Nitrate	TP	Total Zinc	Fecal Coliform
Sand Filters:						
Austin Sand Filter	High	Medium	Low	Medium	Medium	**Medium**
Delaware Sand Filter	High	Medium	Low	Medium	High	**High**
Extended Detention Basin	Medium	Low	Low	Medium	High	**Low**
Wet Basin	High	Low	Medium	Low	High	**High**
Infiltration Basin	High	High	High	High	High	**High**
Infiltration Trenches	High	High	High	High	High	**High**
Vegetated Swales	Low	Medium	Low	Low	High	**Low**
Vegetated Buffer Strips	**Medium**	**Low**	**Low**	**Low**	**High**	**Varied**

Source: BMPs for TMDL, Abbasi & Koskelo, NCHRP 2012

PRIME AE™

Maryland BMP Cost Data

BMP Type	Lo	Hi	Lo	Hi
	x 1000 per Imp Ac		per gallon	
Traditional	$ 15	$ 70	$ 0.55	$ 2.58
ESD	$ 50	$ 300	$ 1.84	$ 11.04

Source: Cost of Stormwater Management Practices
In Maryland Counties, MD Dept. of Environment (King and Hagan, 2011)

PRIME AE™

Management Approach

County Wide TMDL Implementation Plans

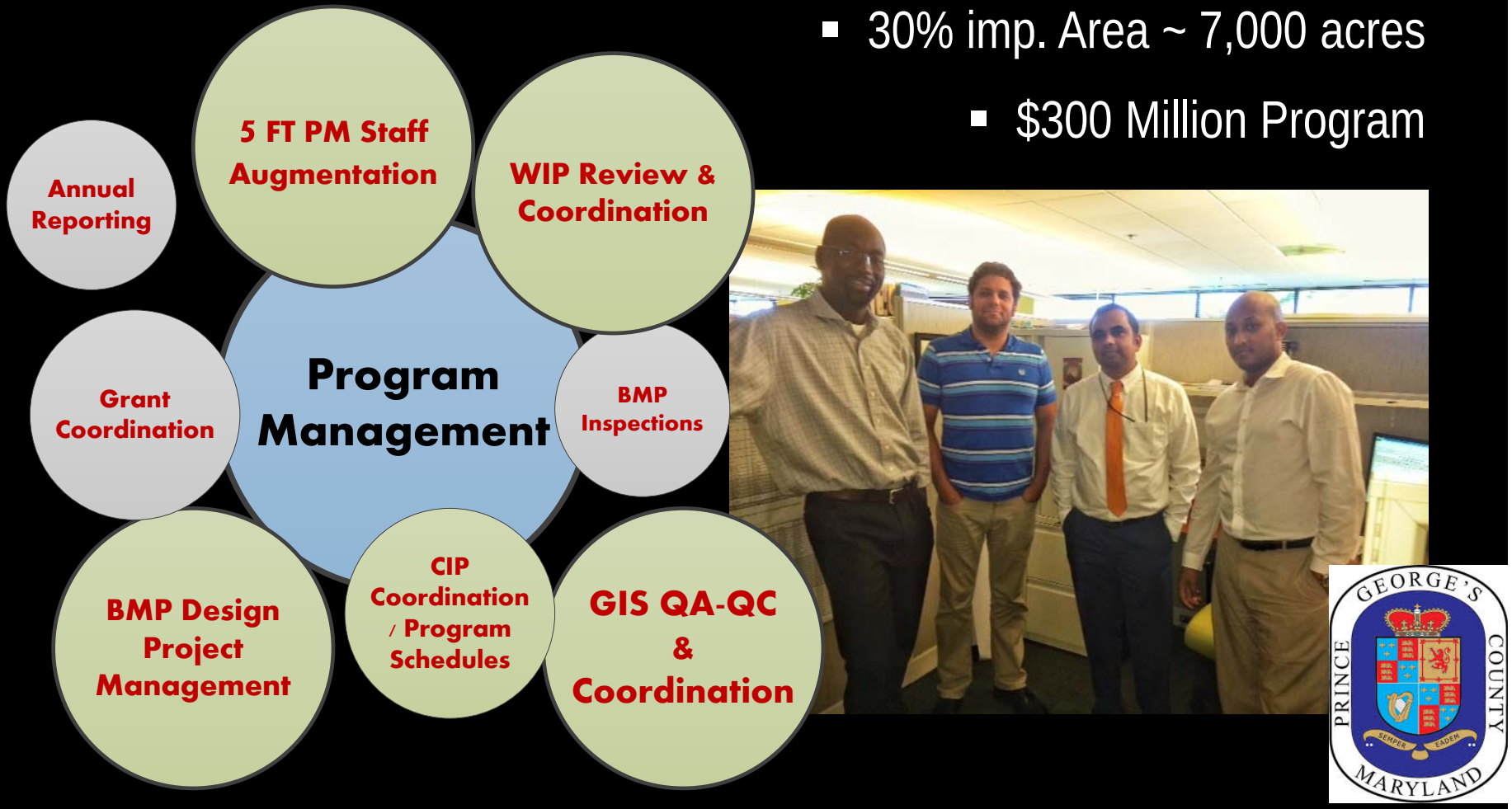
PROJECT: Frederick County, MD MS4 NPDES Program Support

- MS4 Permit Requirements
  - Watershed Assessment Plans
  - TMDL Implementation Plans
  - CIP Planning and Prioritization
  - GIS Data Management
  - BMP Optimization
  - Milestone Schedules

Large Scale Watershed Implementation

PROJECT: Dept. of Environment, Prince George's County, MD

- 30% imp. Area ~ 7,000 acres
- $300 Million Program



PRINCE GEORGE'S COUNTY MARYLAND

PRIME AE™

Large Scale Watershed Implementation

PROJECT: Stakeholder Partnerships, Prince George's County, MD

Planning

- Desktop Analysis
- Site Selection
- Stakeholders
- Prioritization
- Concept Plans

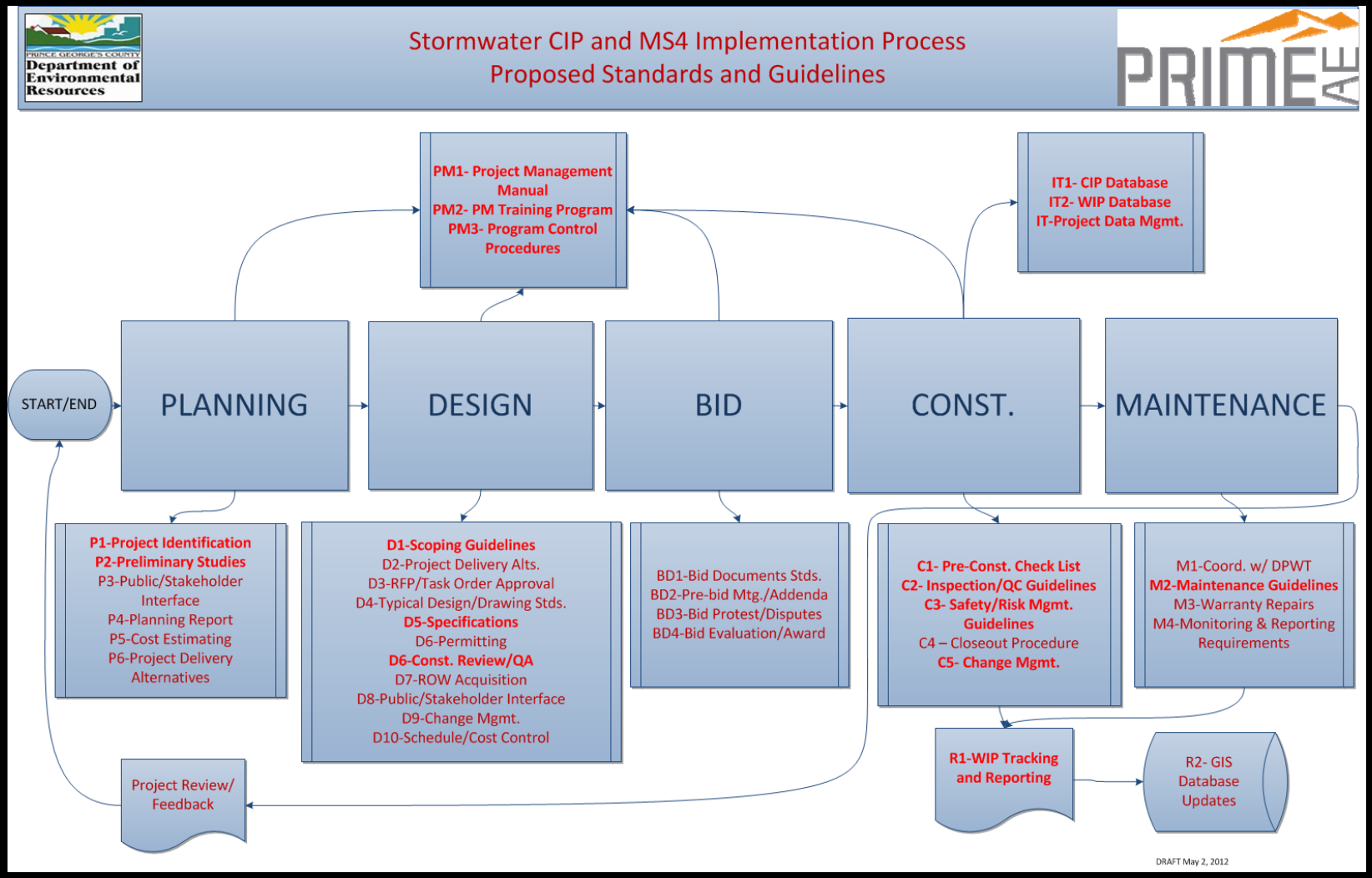
Design

- Consultant Coordination
- Technical Review
- Cost Control
- Schedule
- Permits
- Document Control
- QA/QC

Const.

- Construction Mgmt.
- Maintenance Issues
- As-Built Records

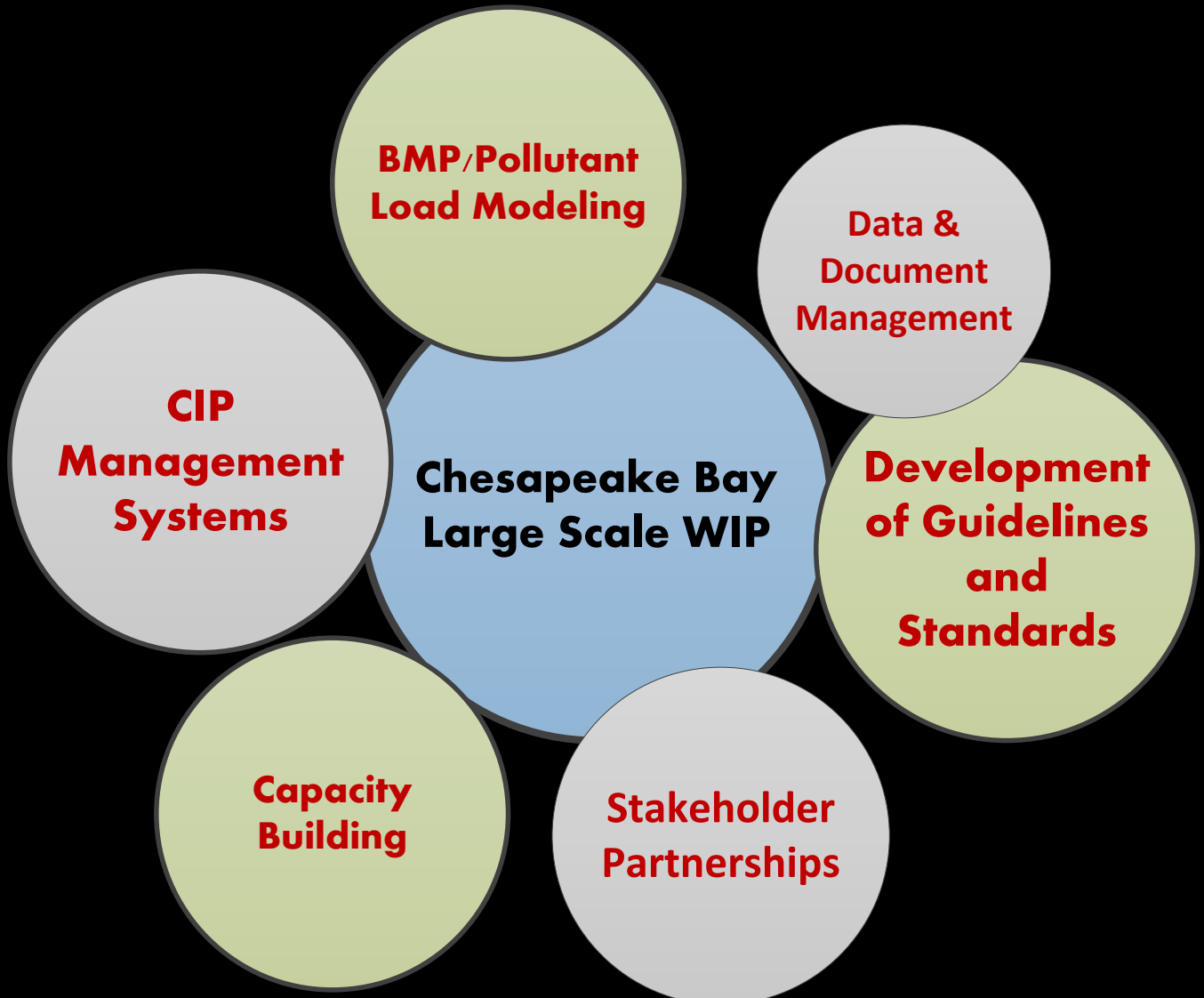
Project Management Standards and Guidelines



PRIME AE™

Summary

Large Scale Watershed Implementation



PRIME AE™

Large Scale Watershed Implementation

- BMP Body of Knowledge
- Pollutant Modeling Tools
- GIS Data Management
- On Site PM Staff Augmentation
- Development of PM SOPs
- CIP Budget Forecasting
- Document Management
- Performance Tracking and Reporting

Summary

- MS4 NPDES Permits changing from voluntary approaches to specific numerical WLA targets
- Watershed implementation plan milestones
- Significant infrastructure expansion of storm water assets
- Paradigm shift in how jurisdictions develop, build and maintain storm water assets
- Innovation in technology and management approaches

Q&A

S. Ali Abbasi

VP, Water Resources
PRIME AE Group, Inc.
aabbasi@primeeng.com
443-280-1351