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NACWA February 2011 Winter Conference

General Session III: Making Wet Weather Solutions Affordable

New York City's Green Infrastructure Plan: A Cost-Effective Approach to CSO Control

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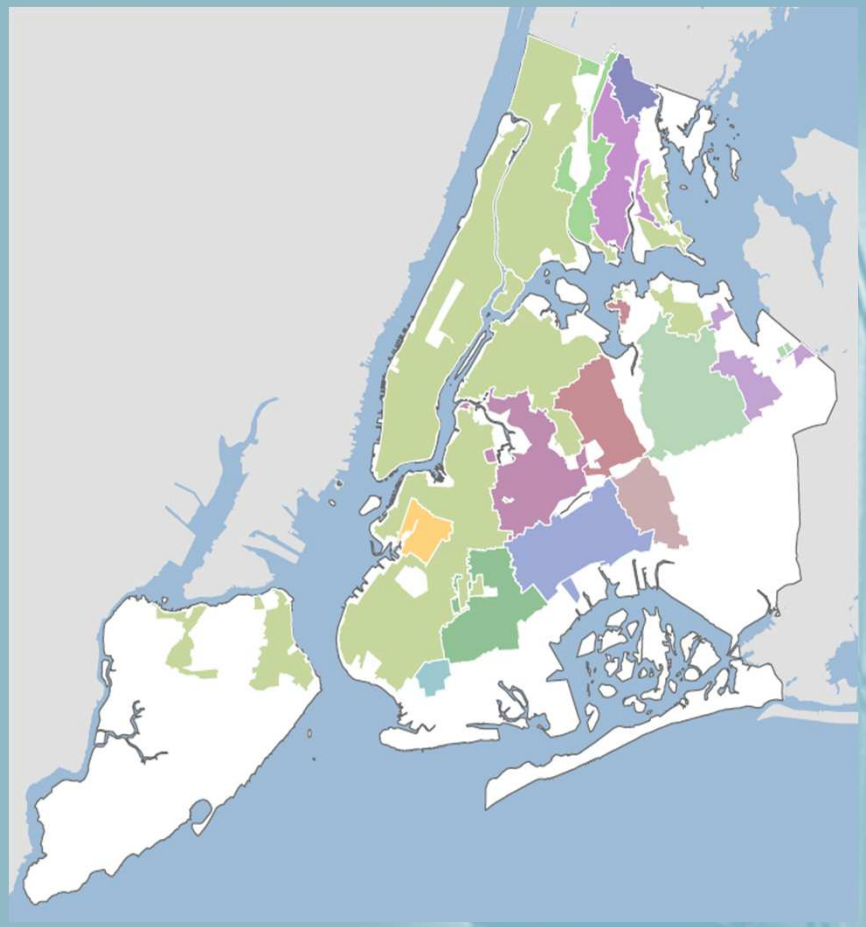
Background on New York City's Sewer System and Receiving Waters



- **Two-thirds of NYC** served by combined sewers
- **216,000 acres** of CSO drainage area
- **7,400 miles** of sewers
- **422 CSO outfalls**
- **27 billion gallons** of CSO per year

= does not meet water quality standards (pathogens/DO)

75% of Harbor meets pathogen standards for swimming

19% meets standards for boating, fishing

7% of our Harbor is made up of tributaries that do not meet secondary contact standards

System Investments Over the Last 10 Years

- $1.78 Billion in sewer system and WWTP upgrades since 2002, under administrative consent orders
- 17 capital projects
- Annual CSO volume reduction of over 5 billion gallons per year
- Project costs range from $0.03/gal to $1.99/gal

Financial Impact of Mandated Work

Four consecutive years of double digit rate increases, largely driven by mandates

- Ratio of the annual residential charges for water/wastewater to median household income is currently 1.63 %
- Varies by Borough: Manhattan 1.22%, Brooklyn 1.90%, Bronx 2.41%, Queens 1.49%, Staten Island 1.15%

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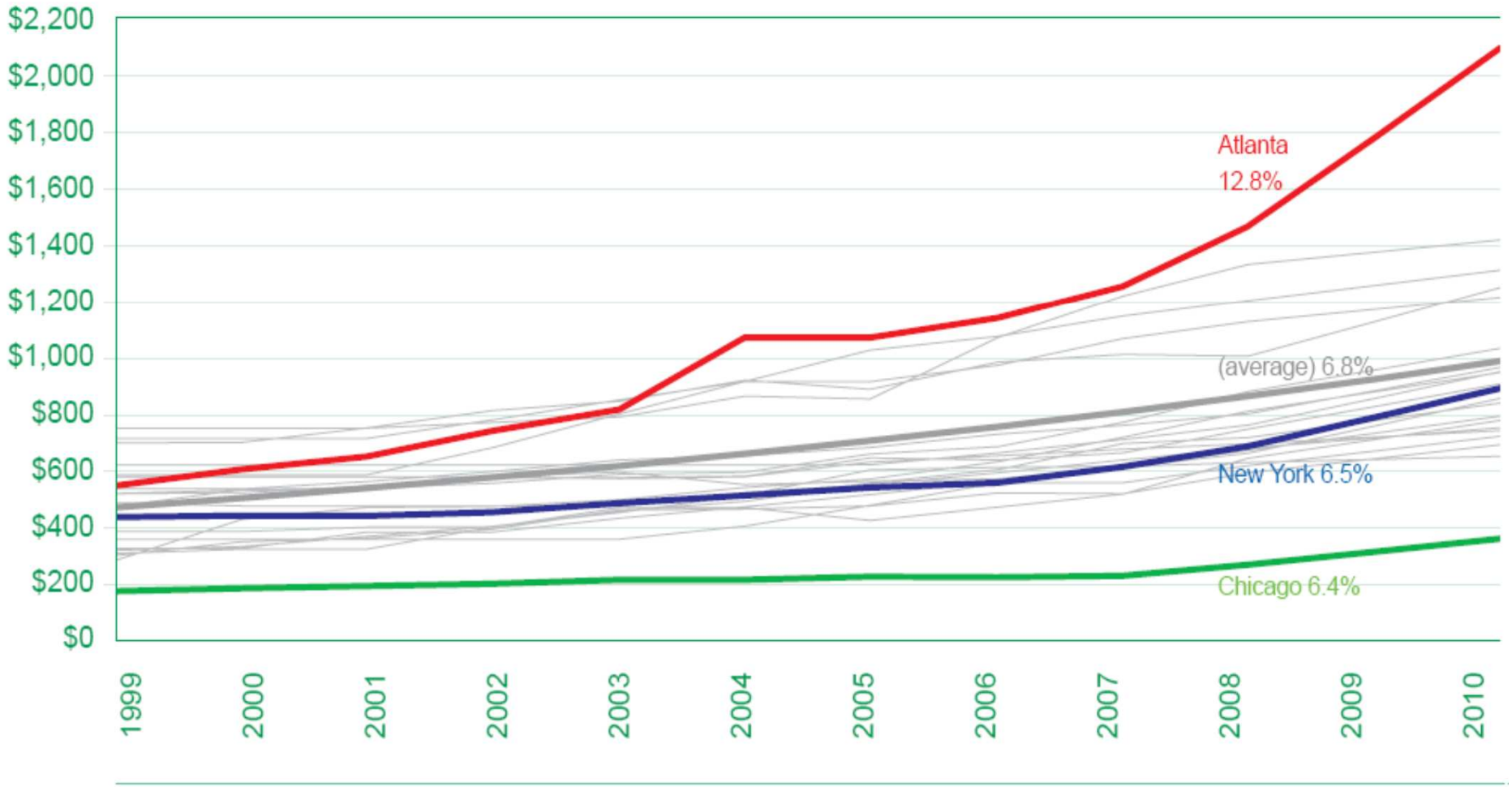
Rate Increase of Various Cities Over Time



Percentages indicate average annual increases from 1999 through 2010

Future Mandates

- Total cost of all projects included in DEP's Facility Plans is $6.8 Billion
- Projects developed in Facility Plans include costly tanks, tunnels and WWTP wet weather expansions

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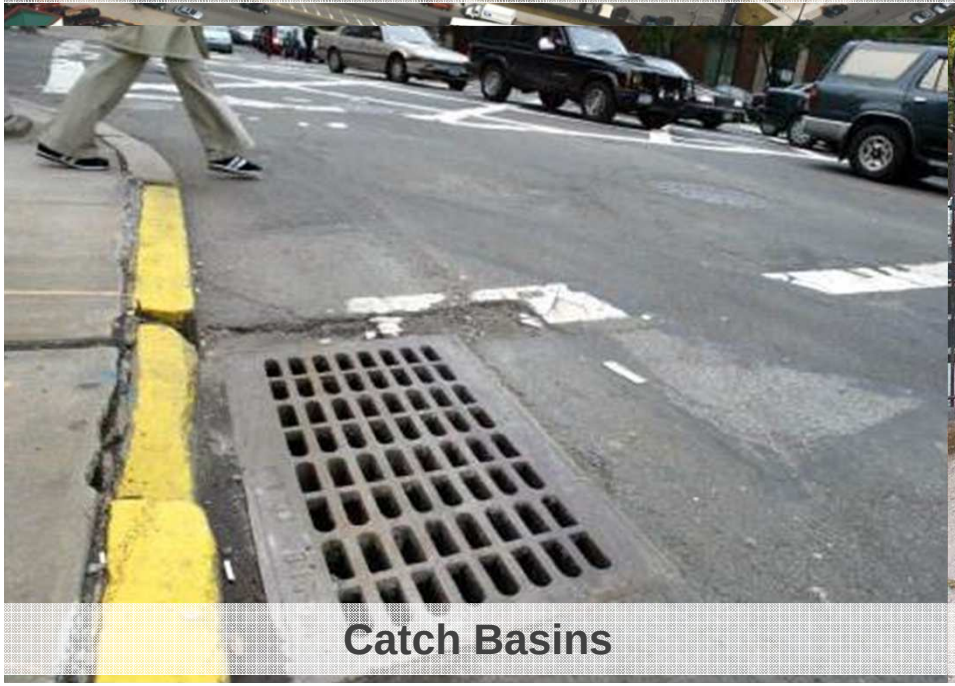
The Green Infrastructure Alternative

Paerdegat Detention Facility

Staten Island Bluebelt



Catch Basins

Enhanced Tree Pit

Dense, Efficient Settlement is Impervious

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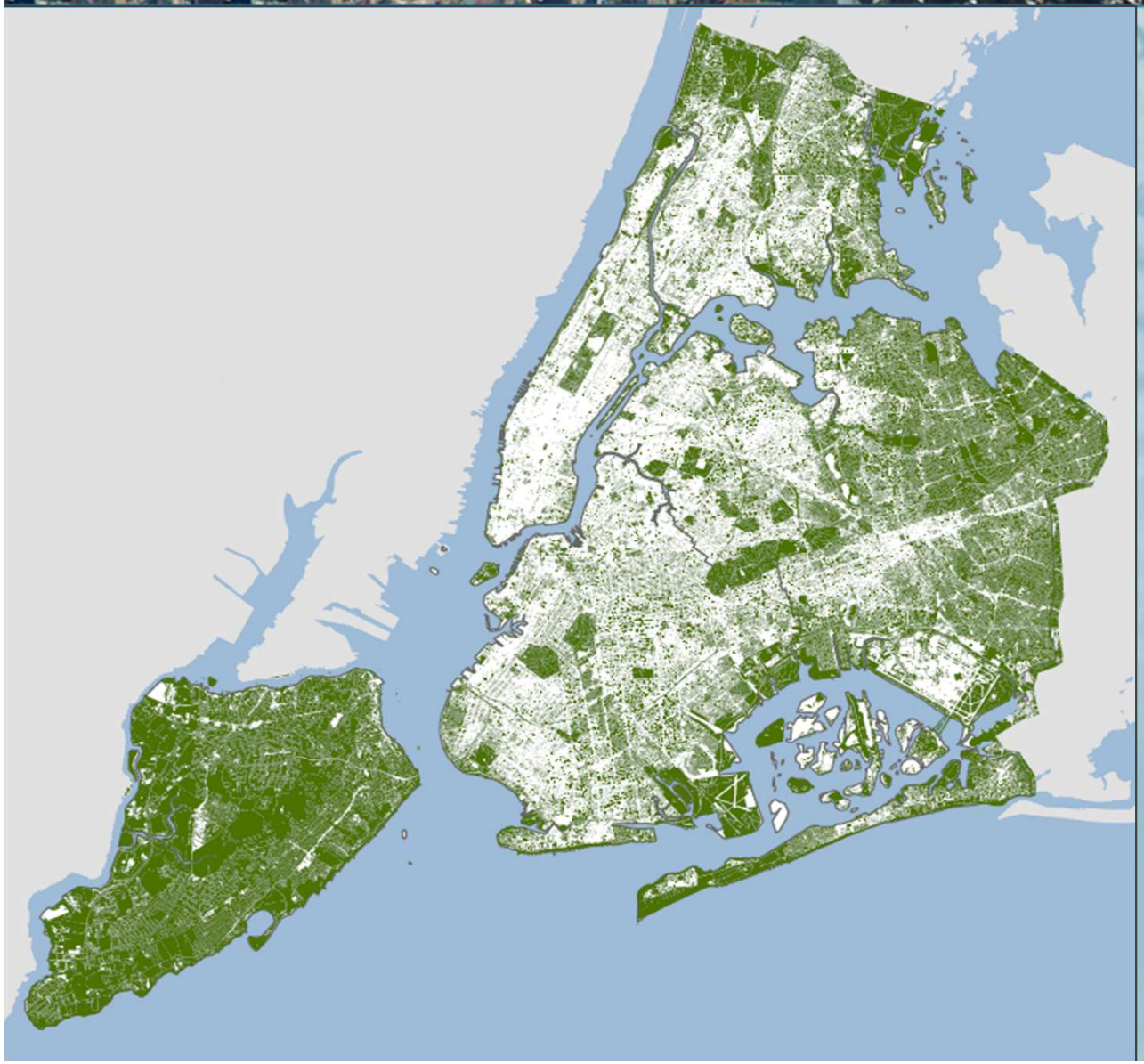


72 % of NYC is covered by impermeable surfaces

= Impermeable surfaces

= Permeable surfaces

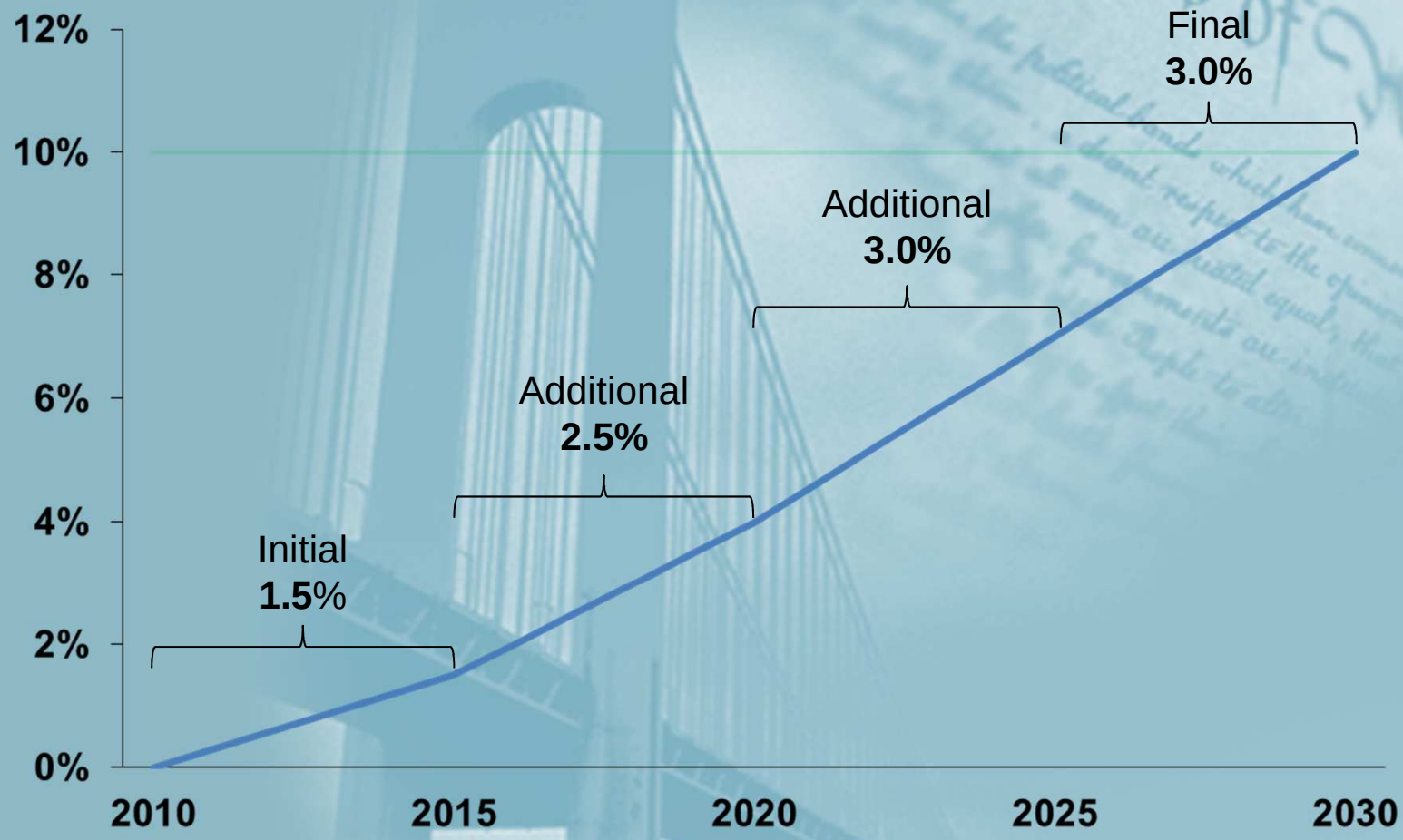
NYC Green Infrastructure Plan

- Issued in September 2010
- Hybrid grey-green approach
- Overall cost of CSO reductions in the plan is $0.45/gal

A Balanced, Hybrid Approach

- Build cost-effective grey infrastructure
- Optimize the existing wastewater system
- Control runoff from 10% of impervious surfaces through green infrastructure and other source controls
- Institutionalize adaptive management, model impacts, measure CSOs, and monitor water quality
- Sustain stakeholder engagement

Green Infrastructure Phased Implementation Timeline



Opportunities for Green Infrastructure

Land Use	% of Combined Sewer Watershed
New development and redevelopment	5.0%
Streets and sidewalks	26.6%
Multi-family residential complexes	3.4%
Parking lots	0.5%
Parks	11.6%
Schools	1.9%
Vacant lots	1.9%
Other public properties	1.1%

- Targeted land uses representing 52% of our watersheds
- Expect that capture goal of 10% will be met by:
  - 1/3 New development standards
  - 1/3 Right-of-way projects
  - 1/3 Public facilities, parks, and other existing development

Target Areas

- Combined sewer areas
- Areas that maximize stormwater capture
- Areas where we can reduce flooding and sewer backups
- Areas of high visibility
- Areas that can provide open space
- Areas able to construct high-level storm sewers

Green Infrastructure Task Force

Mission

- Identify cost-effective opportunities in planned capital projects (e.g., road and sidewalk reconstruction)
- Build green infrastructure

Members

- Led by Mayor's Office and DEP
- Over 10 City agencies
- Task Force will also seek to partner with the MTA, Port Authority, and other non-city capital agencies

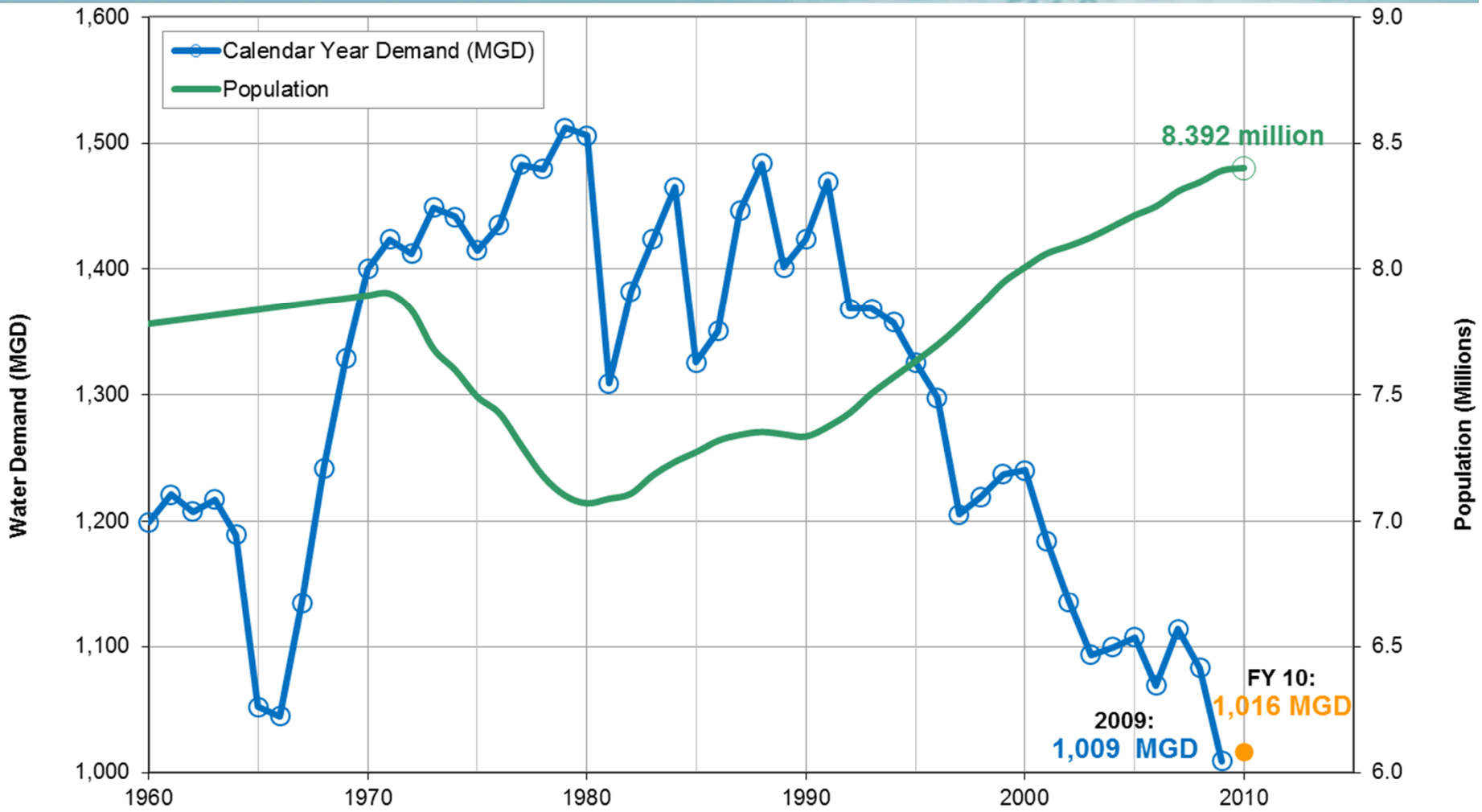
Tasks

- Review capital projects for green infrastructure potential
- Choose investments based on water quality impact
- Standard specifications and designs
- Design and project support
- Develop and administer grant program
- Watershed-level planning

Performance standard to slow down the release of runoff from new development and redevelopment (0.25 cfs / acre)

	Scenario 1		Scenario 2		Scenario 3		Scenario 4	
Building Type	**Low-Density Residential**		**Office Building Medium-Density Residential**		**Office Building Medium-Density Residential**		**Big Box Retail**	
Lot Size	5,000		10,000		20,000		43,560	
Zoning	R4		R6A/C4-2A		R6A/C4-2A		C8-1	
FAR	0.9		3		3		1	
Building Footprint, sq ft	1,500		6		12		21,780	
Development Size, sq ft	4,500		30		60		43,560	
Runoff Coefficient	0.7	0.9	0.7	0.9	0.7	0.9	0.7	0.9
Proposed Rule Compliance Cost (thousands)	$20-26	$23-27	$35-37	$43-47	$59-80	$71-97	$98-127	$106-167
Increment of Proposed Rule (thousands)	$3-9	$4-9	$15-17	$15-19	$32-53	$32-58	$44-73	$31-93
Proposed Rule Total Development Cost	**1.1-1.4%**	**1.3-1.5%**	**0.3%**	**0.4%**	**0.3%**	**0.3-0.4%**	**0.6-0.7%**	**0.6-1.0%**

Maintain Declining Water Use



Green Infrastructure Costs

- Cost per gallon ranges from $0.03 to $1.60
- Eliminate the most costly tanks and tunnels, which cost $1.75/gallon
- Credit other types of CSO reductions
  - Count reductions attributable to system optimization, interceptor rehabilitation, tide gate rehabilitation & reduced flows

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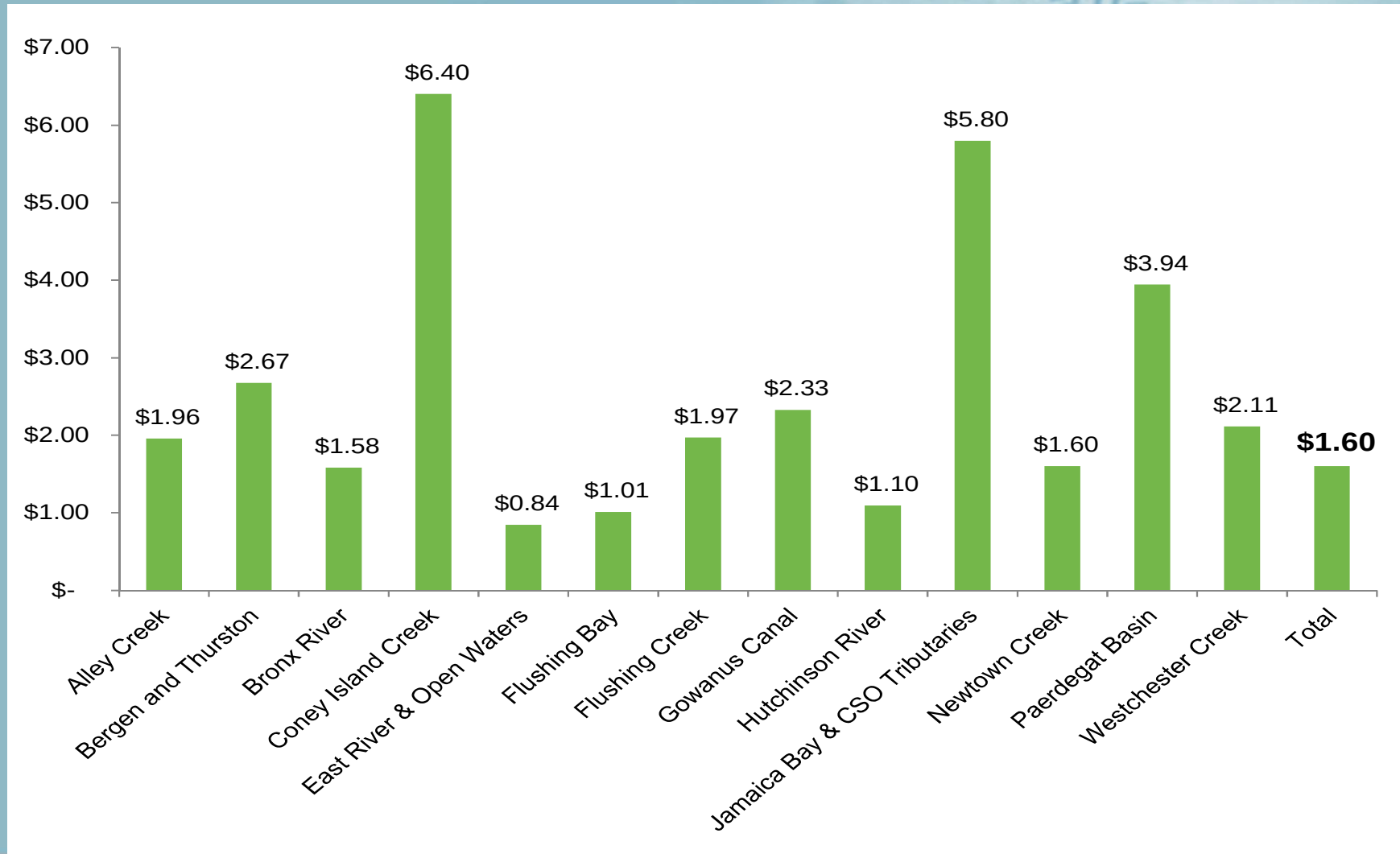
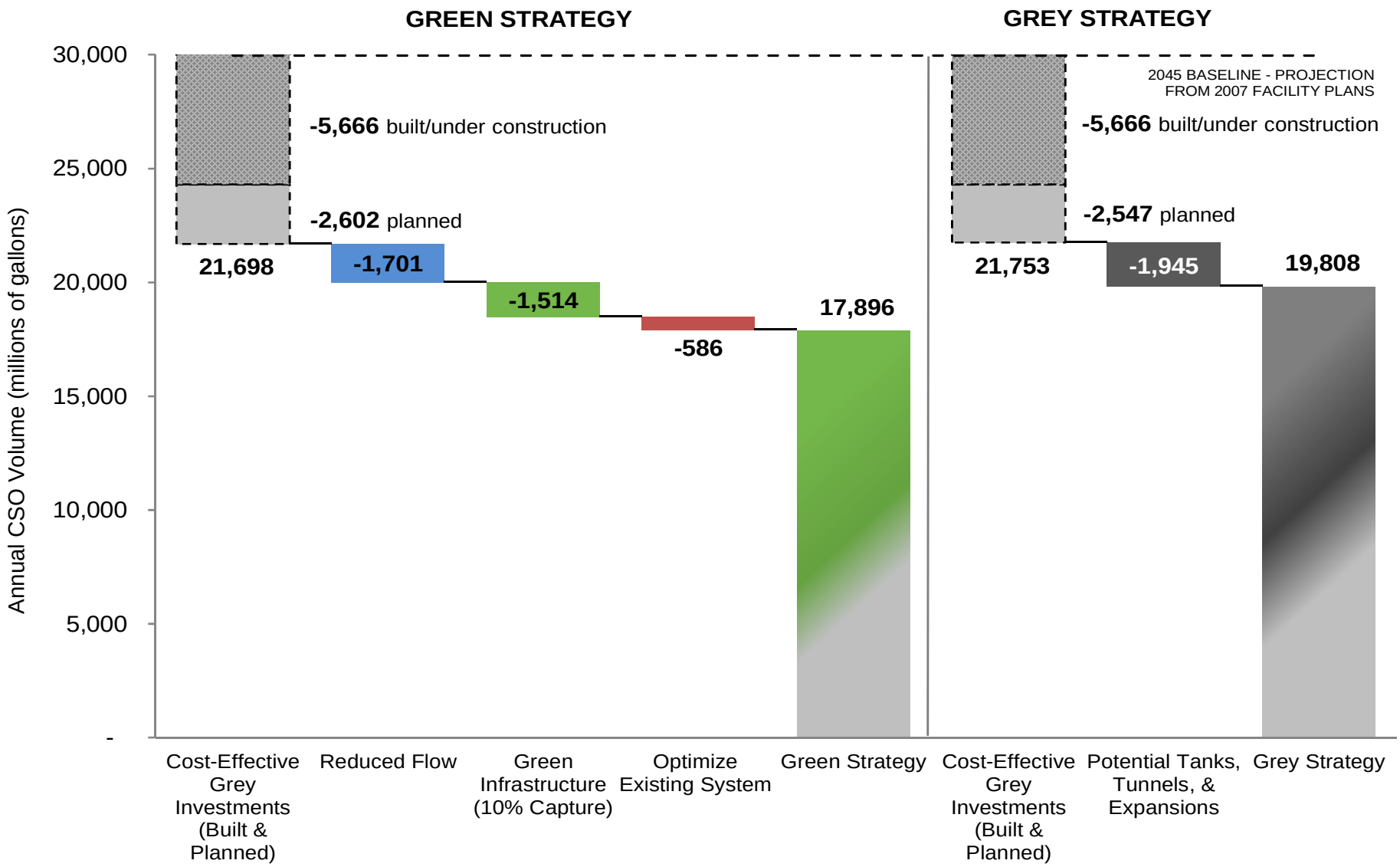
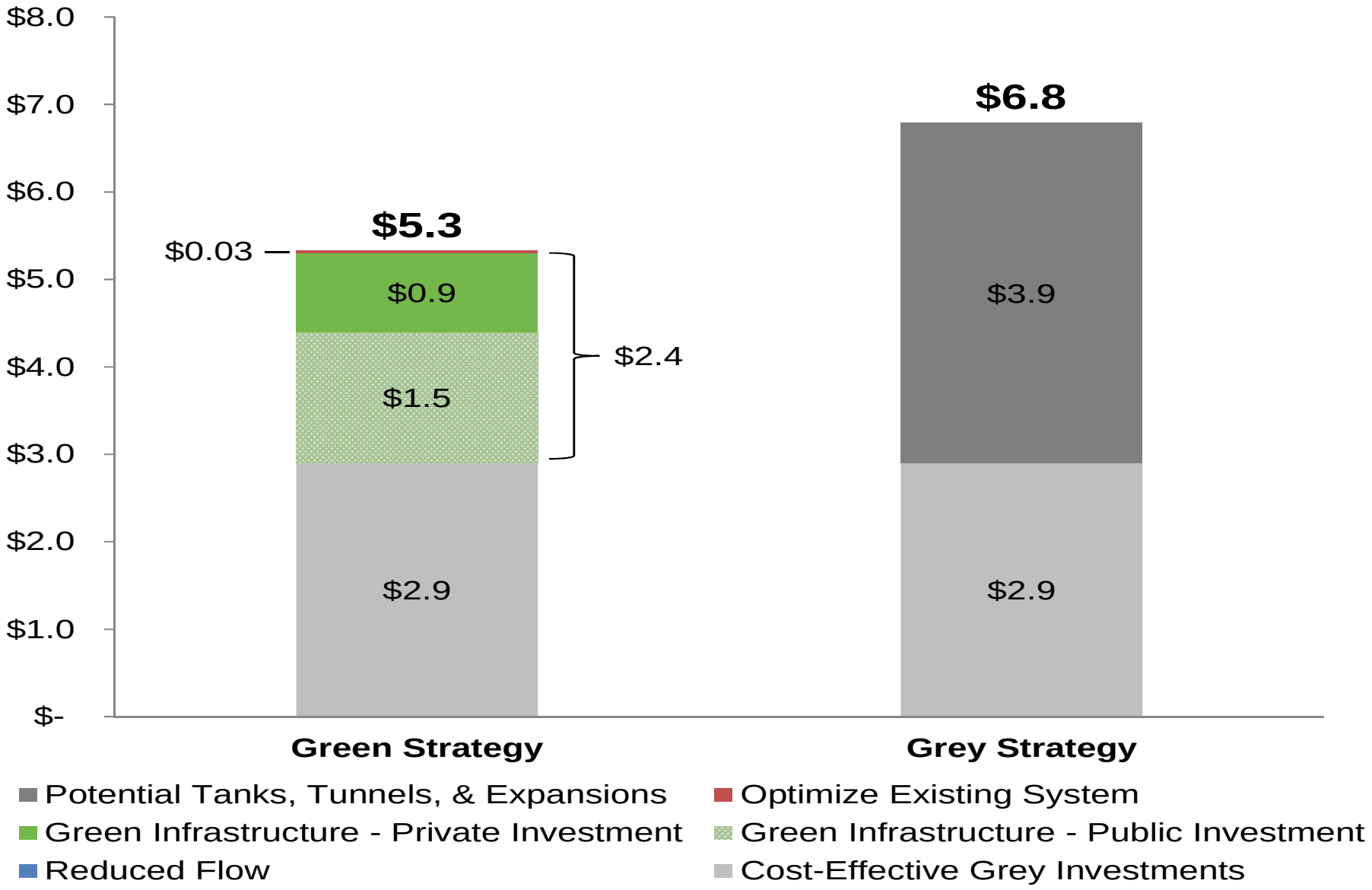
Green Infrastructure Costs



The Hybrid Approach Performs Better



The Hybrid Approach Costs Less



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Additional Benefits of Green Infrastructure Approach

A Portfolio of Approaches Manages Risks

Grey Strategy

- Large, expensive projects
- Economies of scale
- Proven performance
- Exposure to equipment failures, energy markets
- Long design and construction time
- End of pipe technology bears brunt of higher rainfall from climate change

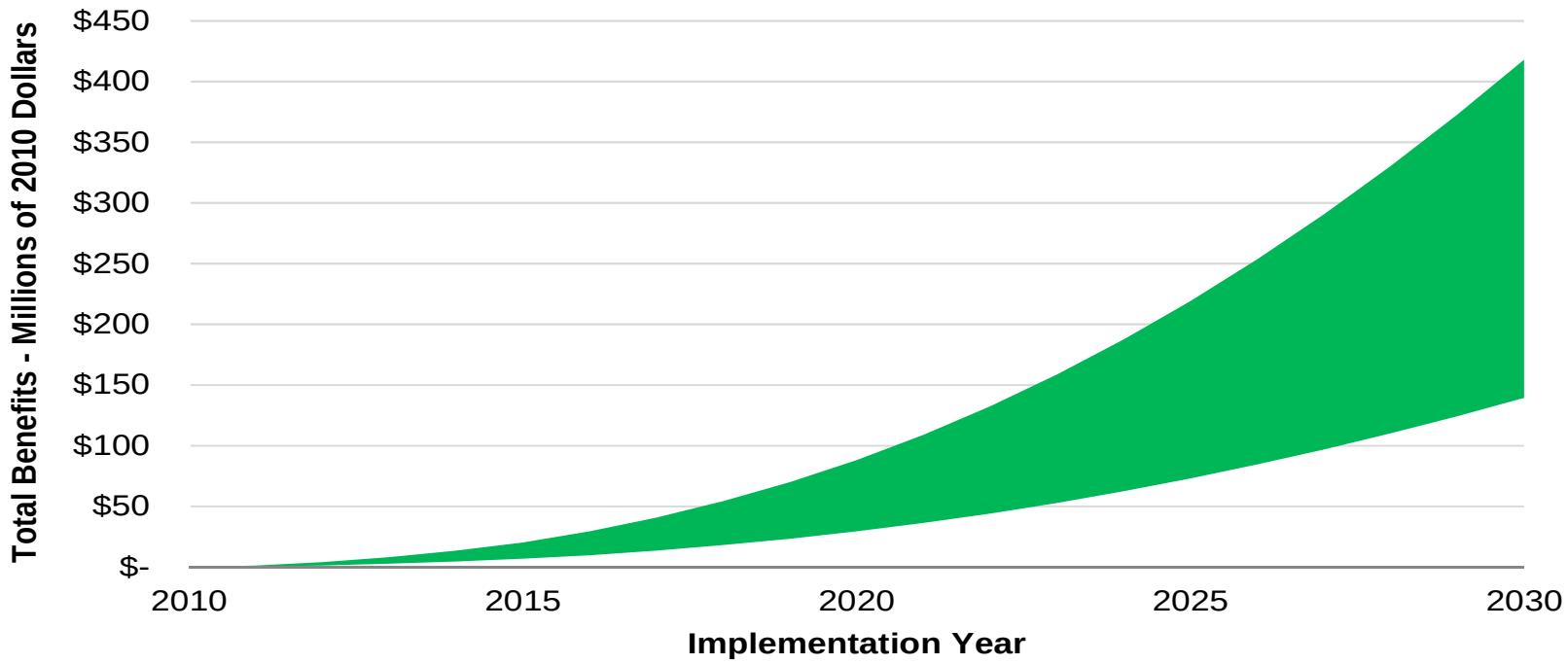
Green Strategy

- Smaller, inexpensive projects
- Network requires numerous projects
- Proven on demonstration level
- Low energy inputs reduce exposure to market fluctuations
- Shorter design and construction time
- Resilient to impacts of climate change
- Allows for adaptation and flexibility

Positive Co-Benefits of Green Infrastructure

Annual benefits of green infrastructure per acre	
Reduced energy demand:	$5,513
Reduced carbon dioxide:	$117
Improved air quality:	$759
Increased property value:	$4,725

Acres of planted green infrastructure in 2030	
25% planted green infrastructure	1,085 acres
75% planted green infrastructure	3,255 acres



Green Infrastructure Challenges

- Renegotiation of current CSO consent order
- Integration with Long Term Control Plans
- Metrics to measure success
- Adaptive management mechanisms
- Pilot testing and lag time to realize benefits
- Partnership model

Green Infrastructure Opportunities

- Broader support for clean water programs
- Broader support for infrastructure investments
- Ongoing public engagement in implementation
- Partnership model

Questions?

The NYC Green Infrastructure Plan can be viewed at and downloaded from DEP's website:

nyc.gov/dep/greeninfrastructure

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