Ad Hoc Combined Sewer System Plan Stakeholder Group
(CSS Stakeholder Group)

1101 Sister Cities, 301 King Street City Hall
Alexandria, VA 22314

Thursday, January 7, 2016

7:00 PM – 9:00 PM

<u>Agenda</u>

1) Welcome and Call to Order	7:00 – 7:05
a) Acceptance of Meeting #2 Summary	
2) Infrastructure Sizing Analysis	
a) Technical Presentation	7:05 – 7:35
b) Stakeholder Group Discussion	7:35 – 8:05
c) Public Comment	8:05 – 8:15
3) Green Infrastructure Strategy	
a) Technical Presentation	8:15 – 8:35
b) Stakeholder Group Discussion	8:35 – 8:55
c) Public Comment	8:55 – 9:00
4) Wrap up and Adjournment	9:00
a) Next Meeting February 4, 2016 7 pm – 9 pm Sister Cities Conference Room 1101	

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Alexandria, VA 22314
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Agenda

Discussion Questions

1. The City, and their consultant, have identified the minimum infrastructure sizing necessary to satisfy the regulatory requirements. We have presented the benefits, limitations, and costs associated with increasing the sizing of the infrastructure. Do the benefits justify the additional costs? What benefits and drawbacks are there from the community's perspective to these options?
2. What are your thoughts on the proposed Green Infrastructure Strategy? Do you have any other suggestions or recommendations?

City of Alexandria, Virginia

Long-Term Control Plan Update

CSS Stakeholder Group
Meeting #3
January 7, 2016

Department of Transportation and Environmental Services

ECO-CITY ALEXANDRIA

City of Alexandria, Virginia

PRESENTATION OUTLINE

- ❑ Infrastructure Sizing Analysis
- ❑ Green Infrastructure Strategy

Long Term Control Plan Update Overall Strategy

Short List of Strategies for Further Evaluation

Primary Strategies

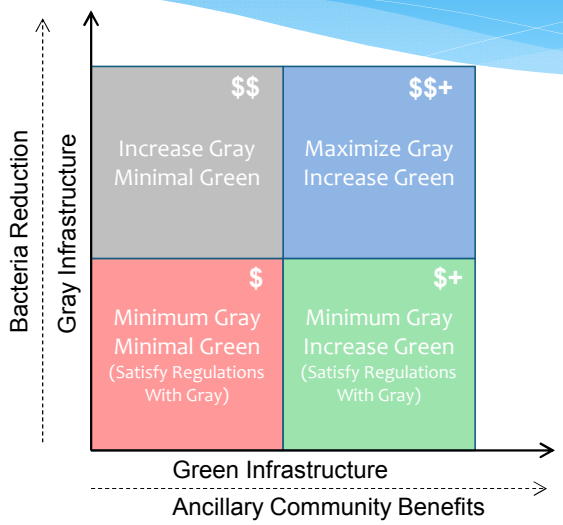
(will select one for final plan)

1. Separate storage tunnels (CSO 003/004 tunnel and CSO 002 tunnel)
2. Storage tunnel for Hooffs Run (CSO 003/004) and storage tank at Royal Street (CSO 002)
3. One storage tunnel for CSOs 002 (Royal Street), 003 and 004 (Hooffs Run)

Complementary Strategies

1. Green Infrastructure
2. Area Reduction Plan (Targeted Sewer Separation)
3. Other opportunities to be considered
   - Downspout disconnection
   - Low flow-fixture rebates

Requested Feedback



City of Alexandria, Virginia

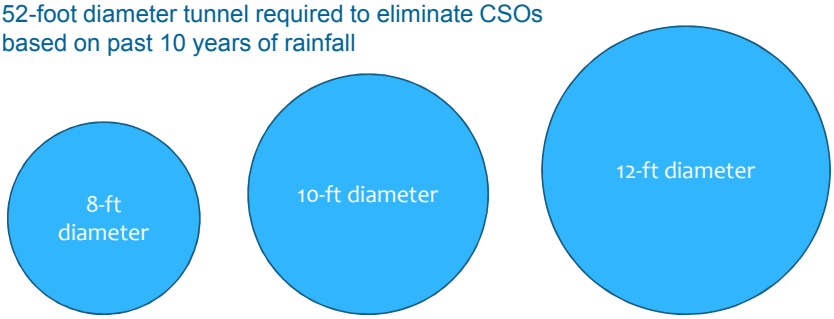
Infrastructure Sizing Analysis

Basis for Storage Tunnels/Tanks

- EPA's Combined Sewer Overflow Control Policy
  - Presumption approach for combined sewer overflows, requires one of the following:
    - An average of 4-6 overflow events per year
    - The capture of 85% of the combined sewage for treatment
    - The removal of the mass of pollutants equal to 85% capture
- City has established a minimum target of 4-6 overflows per year during the typical year (1984)
  - Other requirements of presumptive approach are also met

Tunnel Sizes (CSOs 002/003/004)

- 8-foot diameter tunnel meets the regulatory requirement of 4-6 overflows/year (typical year)
- 52-foot diameter tunnel required to eliminate CSOs based on past 10 years of rainfall

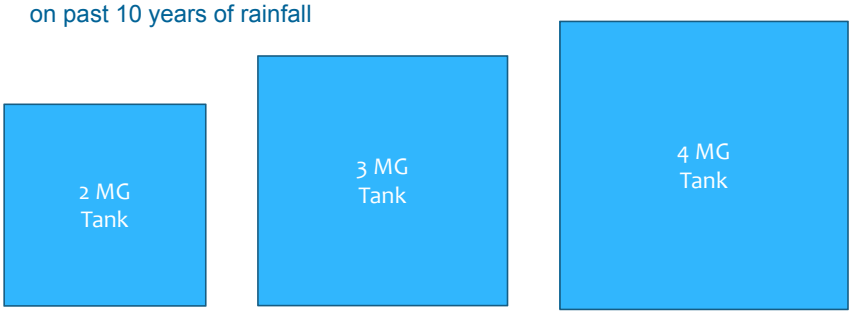


8-ft diameter	10-ft diameter	12-ft diameter
CSO-003/004 - 1 MG CSO-002 – 2 MG	CSO-003/004 – 1.6 MG CSO-002 – 3.2 MG	CSO-003/004 – 2.25 MG CSO-002 – 4.5 MG

MG = million gallon

Tank Sizes (CSO 002 Only)

- 2 MG tank meets the regulatory requirement of 4-6 overflows/year (typical year)
- 44 MG tank required to eliminate CSOs based on past 10 years of rainfall



105'Lx150'Wx25'D | 130'Lx130'Wx25'D | 150'Lx150'Wx25'D

MG = million gallon; L = Length, W = Width, D - Depth

Thoughts for Group to Consider

- What are the benefits of the larger infrastructure?
- What are the limitations of the larger infrastructure?
  - Are there diminishing returns?
- What are the costs?
- What else, outside the combined sewer area, is needed to meet the Hunting Creek Total Maximum Daily Load (TMDL)?

Why Go Larger?

- Reduce the number of overflows and total overflow volume in a typical year
- Reduce the number of overflows and total overflow volume during “wetter” years
- Accommodate uncertainty in future weather patterns

Scope of Evaluation

- Impacts on Overflows
  - # of Overflows
  - Volume
- Net Present Worth (NPW)
- Beach Advisory Criterion
  - 235 cfu/100mL
- Tunnel Sizes (CSOs-002 and 003/004)
  - 8-foot diameter
  - 10-foot diameter
  - 12-foot diameter
  - 52-foot diameter
- Tank Sizes (CSO-002 only)
  - 2 million gallons
  - 3 million gallons
  - 4 million gallons
  - 44 million gallons

1984 vs 2004-2013

1984

- Rainfall = 37.1”
- Wet Weather Events = 72
- Largest Event:
  - 2.53”
  - 33 hours
  - 1-year storm event

2004-2013

- Annual rainfall = 40.6” on average
- Wet Weather Events = 73 on average per year
- Largest Event:
  - 9.55”
  - 49 hours
  - 130-year storm event

National CSO Policy = 1984 Typical Year Recent Climate = 2004-2013 Years

- Determined 1984 was the *Typical Year* based on analysis of the last 40 years of rainfall data
- 2004-2013 selected to evaluate what the performance would have been if in place in recent years
  - 2004-2013 has a similar number of wet weather events (on average) compared to 1984, but includes extreme wet weather events:
    - 100-year+ events = 1 (130-year event)
    - 50-100 year events = 1 (67-year event)
    - 5-10 year events = 3

CSO-003/004 Tunnel Comparison

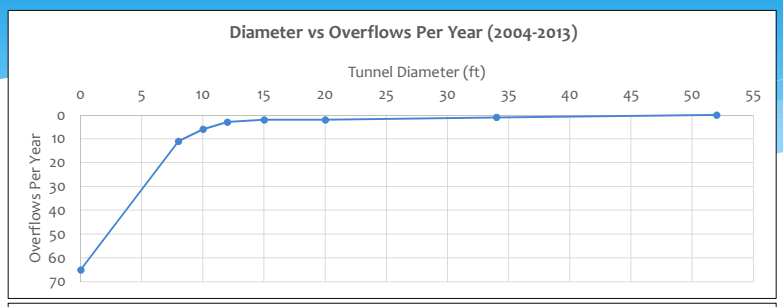
Tunnel Diameter	Typical Year (1984)[1]		Recent (2004-2013)[1]		NPW Cost ($M)
	Number of Overflows	Volume of Overflows (MG)	Number of Overflows per year	Volume of Overflows (MG)	
Current Conditions (no tunnel)	67	29.1	65	52.4	-
8-foot	5	2.9	11	27.1	$69-$103
10-foot	3	1.1	6	22.7	$77-$115
12-foot	0	0	3	19.8	$85-$127
52-foot[2]	0	0	0	0	$232-$348

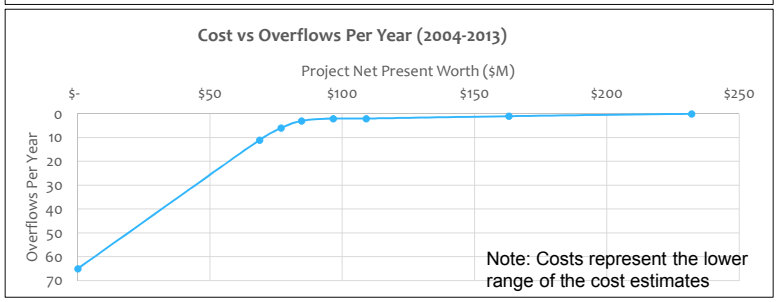
Notes:

1. Expected performance estimated for the years indicated. Actual overflows and volume will be more or less based on specific rainfall events each year.
2. For illustrative purposes only, not practical to construct.

MG = million gallons
$M = cost in millions

CSO-003/004 Tunnel





CSO-002 Tunnel Comparison

Tunnel Diameter	Typical Year (1984)[1]		Recent (2004-2013)[1]		Cost ($M)
	Number of Overflows	Volume of Overflows (MG)	Number of Overflows per year	Volume of Overflows (MG)	
Current Conditions (no tunnel)	48	35.8	50	67.6	-
8-foot	6	5.7	10	34.8	$59-$89
10-foot	2	2.8	7	26.0	$67-$100
12-foot	1	1.4	4	20.1	$80-$120
52-foot[2]	0	0	0	0	$280-$420

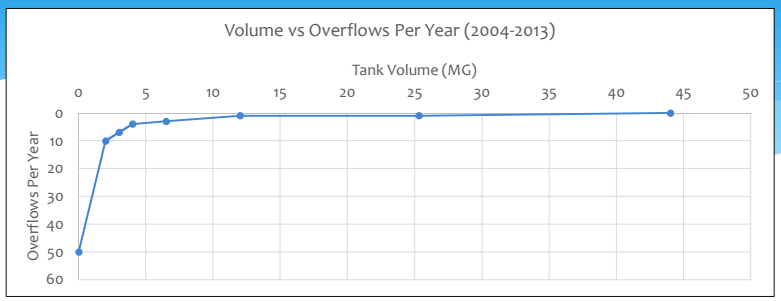
Notes:
1. Expected performance estimated for the years indicated. Actual overflows and volume will be more or less based on specific rainfall events each year.
2. For illustrative purposes only, not practical to construct.

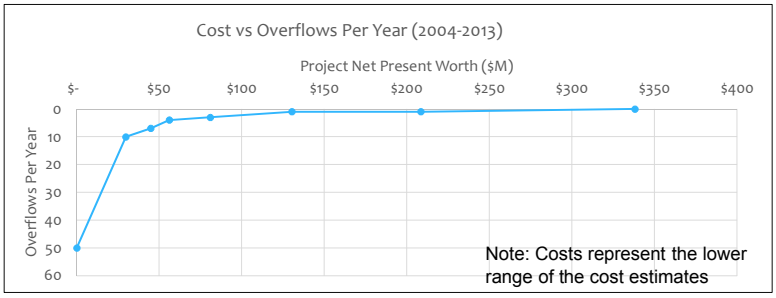
CSO-002 Tank Comparison

Tank Volume (MG)	Typical Year (1984)[1]		Recent (2004-2013)[1]		Cost ($M)
	Number of Overflows	Volume of Overflows (MG)	Number of Overflows per year	Volume of Overflows (MG)	
Current Conditions (no tank)	48	35.8	50	67.6	-
2.0	6	5.7	10	34.8	$30-$45
3.0	2	3.1	7	26.7	$45-$67
4.0	1	1.9	4	21.8	$56-$84
44.0[2]	0	0	0	0	$338-$507

Notes:
1. Expected performance estimated for the years indicated. Actual overflows and volume will be more or less based on specific rainfall events each year.
2. For illustrative purposes only, not practical to construct.

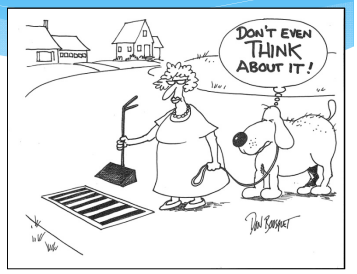
CSO-002 Tank





Other Controls Required to Meet Water Quality Standards

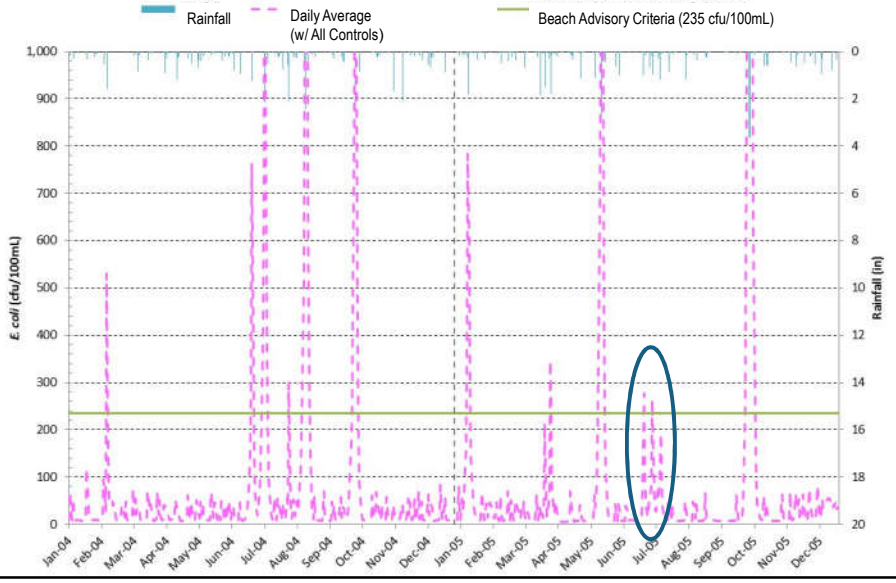
- In addition to CSO controls, the Hunting Creek TMDL calls for…
  - Removal of 85-98% of the stormwater load (technology unknown)
  - Removal of 100% of the human and septic load
  - Removal of 50% of the wildlife load



Recreational Evaluation

- In order to evaluate additional water quality benefits of additional combined sewer controls, the Beach Advisory Level of 235 CFU/100ml was used:
  - Does not represent a water quality standard, but represents the potential recreational benefit
  - This is a number that can be used to advise people of increased risk at a heavily-used beach. We do not have any such beaches.
  - Evaluated by determining how many "beach advisory days" eliminated with larger tanks/tunnels, if we had beaches.

Daily Beach Advisory Level Exceeded 12 times over the 2 years



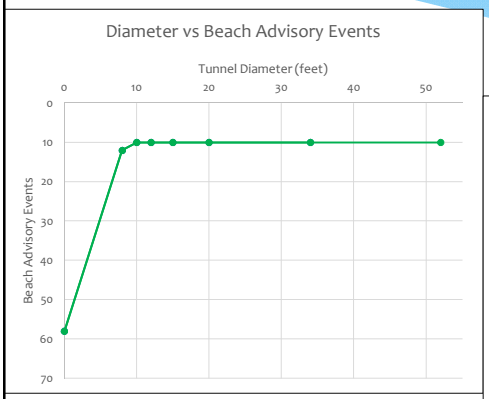
Beach Advisory

003/004 Tunnel Diameter	Beach Advisory Events (2004-2005)	002 Tank (MG)	Beach Advisory Events (2004-2005)
Current Conditions (no tunnel)	58*	Current Conditions (no tank)	58*
8-foot	12	2.0	12
10-foot	10	3.0	10
12-foot	10	4.0	10
52-foot	10	44.0	10

Note: Expected performance estimated for the years indicated. Actual performance may be more or less based on specific rainfall events each year.

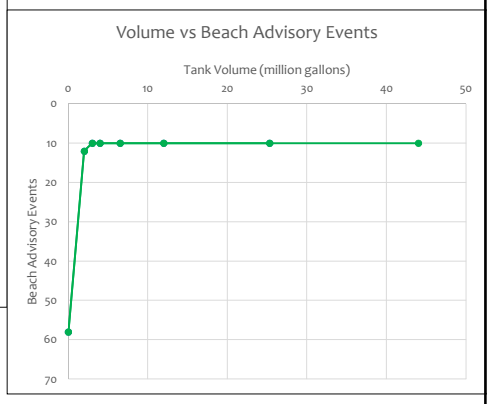
* This number represents the number of events upstream of the CSOs without any controls (i.e., stormwater, wildlife, human).

Water Recreational Benefits



CSO-003/004 Tunnel

CSO-002 Tank



Conclusions

- All sizing alternatives meet the regulatory requirements
- Bigger gray infrastructure will:
  - Reduce the number of overflows and total overflow volume
  - Accommodate uncertainty of future weather patterns
  - Provide little discernable water quality benefit
  - Cost more to construct, operate, and maintain
  - Increase disruption during construction
- Bigger gray infrastructure will not:
  - Address the other sources of bacteria (e.g. stormwater, wildlife, pets)
  - Provide other ancillary benefits

Questions for Stakeholder Group

The City, and their consultant, have identified the minimum infrastructure sizing necessary to satisfy the regulatory requirements. We have presented the benefits, limitations, and costs associated with increasing the sizing of the infrastructure. Do the benefits justify the additional costs? What benefits and drawbacks are there from the community's perspective to these options?

City of Alexandria, Virginia

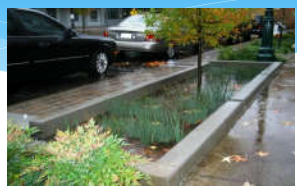
Green Infrastructure Strategy

Long Term Control Plan Update Overall Strategy

Examples of Green Infrastructure

Bioswales

Rain Gardens



Planter Boxes

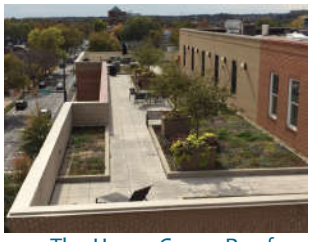
Permeable Pavement

Rainwater Harvesting

Downspout Disconnects

Green Infrastructure: Benefits and Limitations

- Benefits:
  - Mimics natural systems
    - Reduces stormwater runoff volume, peak flows, and pollutants
    - Improves water quality and reduced nutrient loads discharged to the Chesapeake Bay
  - Community benefits:
    - Green spaces
    - Improves aesthetics
    - Increases property values
    - Reduces heat island effect
  - Environmental education
- Limitations:
  - Limited bacteria and stormwater volume reduction



The Henry Green Roof

Combined Sewer Systems Green Infrastructure Benchmarking

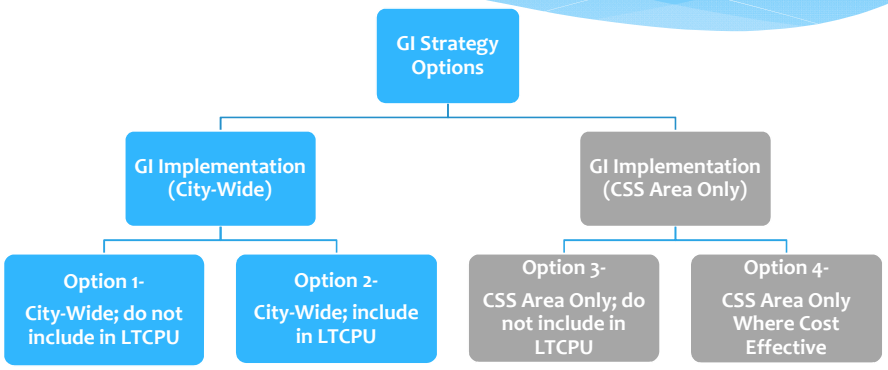
Location	Green Investment	
	Proposed Cost ($)	% of Total Investment
DC Water	$100-$200 million	4%-8% $2.6 billion
Richmond, VA	$0*	0%* $850 million
Lynchburg, VA	$0*	0%* $340 million
Kansas City (WSD)	$3.7 million	1%-2% $2.3 billion
Cleveland (NEORSD)	$42 million	1%-2% $3 billion
Louisville (MSD)	$47 million	17% $377 million
New York (DEP)	$1.5 billion	22% $6.8 billion
Philadelphia (PWD)	$1 billion	63% $1.6 billion

* Green Infrastructure was evaluated but not included as a commitment in the long term control plan to meet the combined sewer overflow control goals; however, green infrastructure may be considered where appropriate and applicable to provide additional benefits.

What We Heard!

- General Consensus:
  - Implement green infrastructure citywide, don't limit it to the combined sewer area
  - Focus on meeting the regulatory requirements with gray infrastructure
  - Spend dollars cost-effectively
- Other Feedback:
  - Consider incentivizing the private sector to install green infrastructure
  - Green infrastructure should not compromise the historic fabric of the City
  - Green component in combined sewer area, including more street trees

Green Infrastructure Strategy Options



CSS – Combined Sewer System
GI – Green Infrastructure
LTCPU – Long Term Control Plan Update

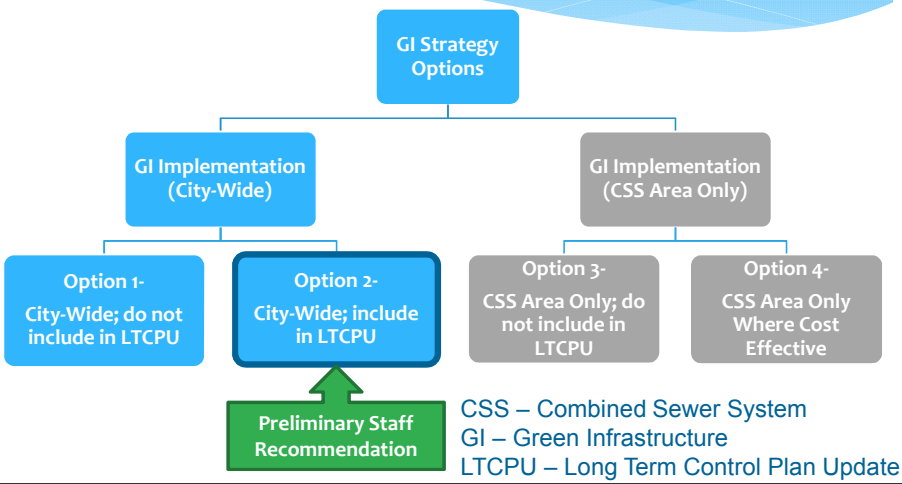
Green Infrastructure Strategy – Option 1

- Option 1 - Citywide; do not include in Long Term Control Plan Update
  - Provides flexibility to install citywide and maximize green infrastructure benefits while still exploring options within the combined sewer area
  - City will continue stormwater (MS4) program
  - Similar to Richmond and Lynchburg Long Term Control Plans

Green Infrastructure Strategy – Option 2

* Option 2 – Citywide; include in Long Term Control Plan Update
  - Provides flexibility to install citywide and maximize green infrastructure benefits while exploring options within the combined sewer area as well
  - Includes commitment to a green infrastructure implementation target(s) tied to the 5-year combined sewer permit cycles
  - Periodic assessment of the effectiveness of green infrastructure

Green Infrastructure Strategy Options



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Green Infrastructure Strategy Preliminary Recommendation

- Continue to implement existing green infrastructure pilot permit for current permit cycle (2013-2018)
- For next permit cycle (2018-2023), expand upon existing green infrastructure program by
  - Add funding in 10-year Capital Improvement Program and implement variety of green infrastructure practices
  - Evaluate incentive programs for private property
  - Evaluate increasing number of trees including street trees in combined sewer area
- Assess effectiveness of different practices compared to cost of implementation and neighborhood impacts
- Based on assessment, consider establishing program and target goals for future permit cycles

Green Infrastructure Target Goals

- Target goals to potentially be established following implementation and assessment period
  - Implementation and assessment through next 5-year permit cycle (2018-2023)
- Target goals could be established based on a number of factors
  - Specific $ amount or % of overall Long Term Control Plan Program for green infrastructure
  - Stormwater volume reduction target
  - Impervious area (acres) treated by green infrastructure
  - Number of trees planted

Questions for Stakeholder Group

What are your thoughts on the proposed Green Infrastructure Strategy? Do you have any other suggestions or recommendations?