District of Columbia Water and Sewer Authority
David L. Gadis, CEO and General Manager

Briefing on:

DC Clean Rivers Project:

Green Infrastructure Practicability Assessment Webinar

June 11, 2020

DCWATER.COM

Agenda

- Background
- Rock Creek Practicability Assessment
- Potomac Practicability Assessment
- Next Steps

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CLEAN RIVERS BACKGROUND

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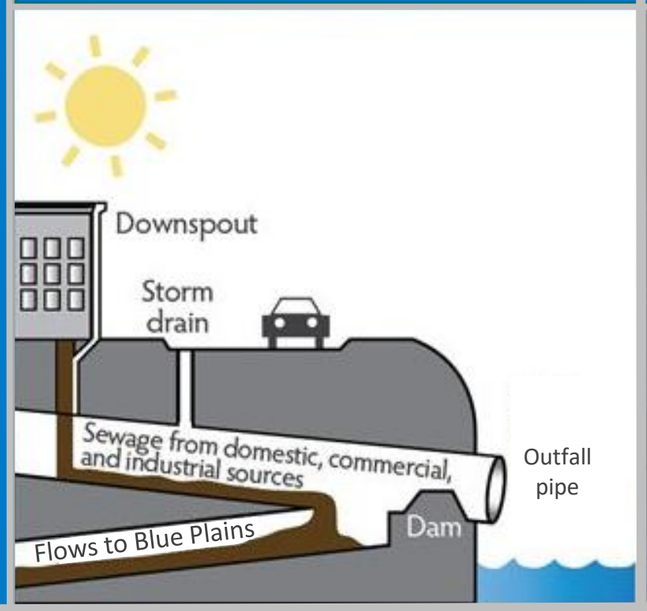
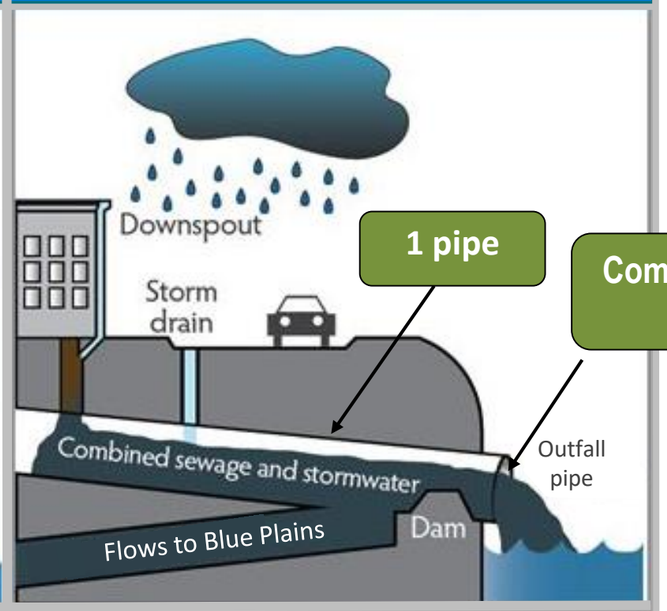
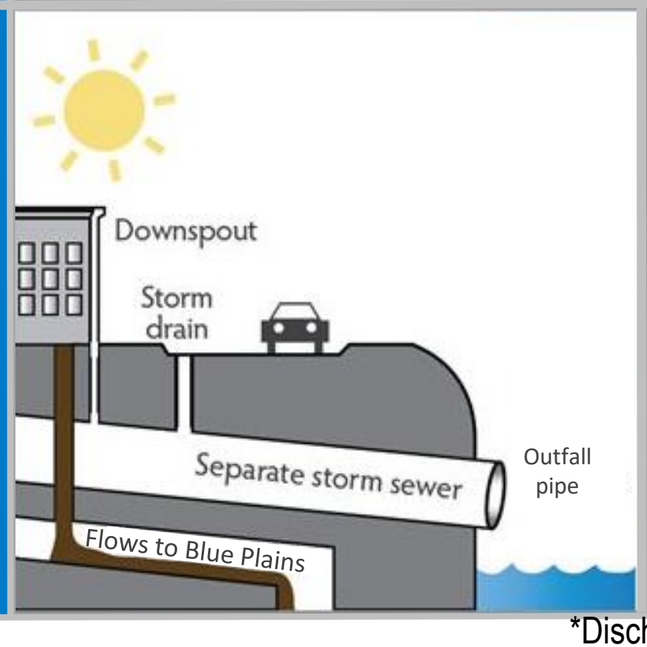
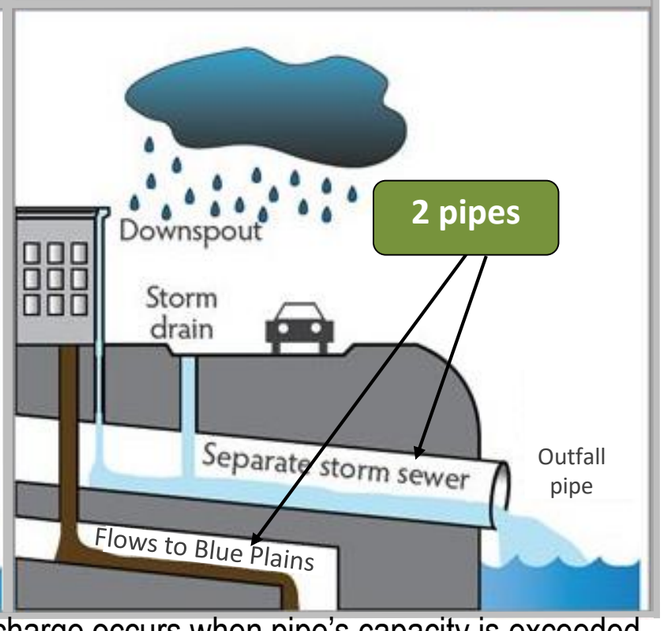
Sewer Systems in DC

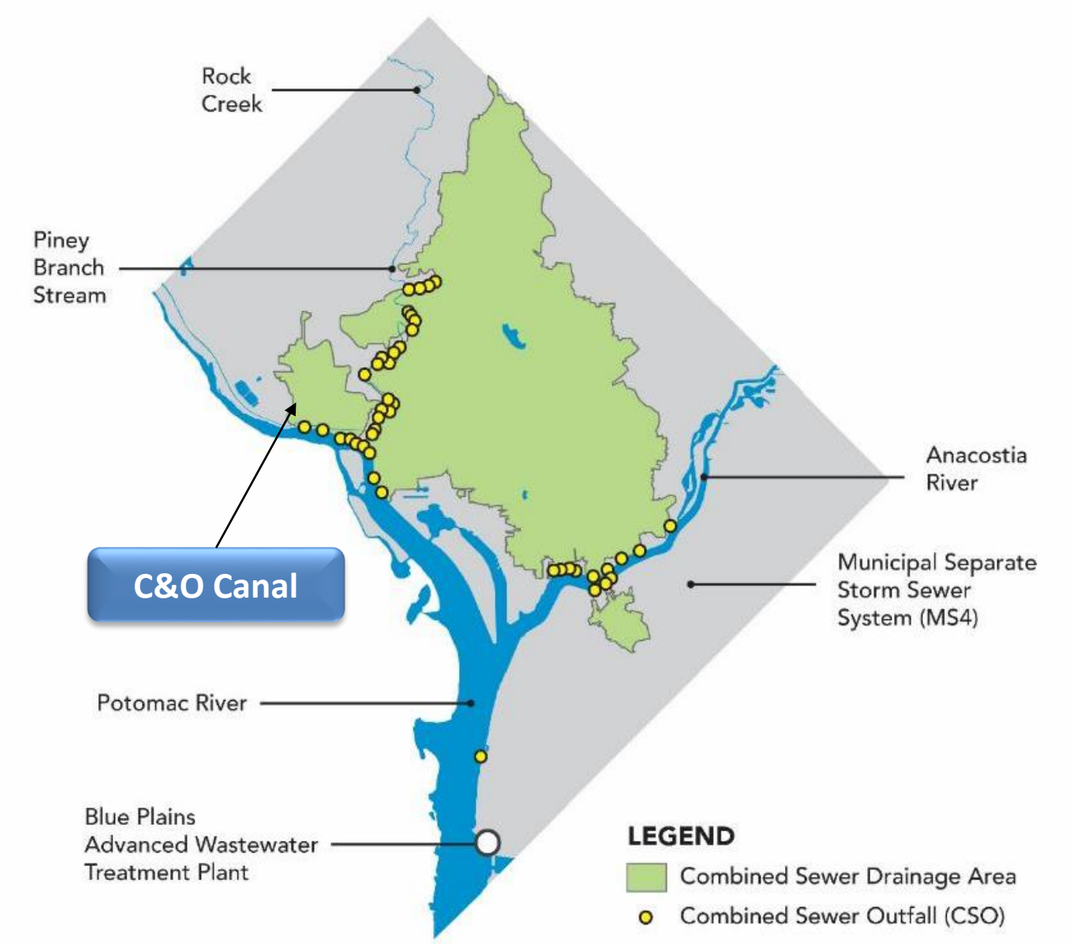
	Sunny Day	Rainy Day*
Combined Sewer System		
Separate Sewer System		

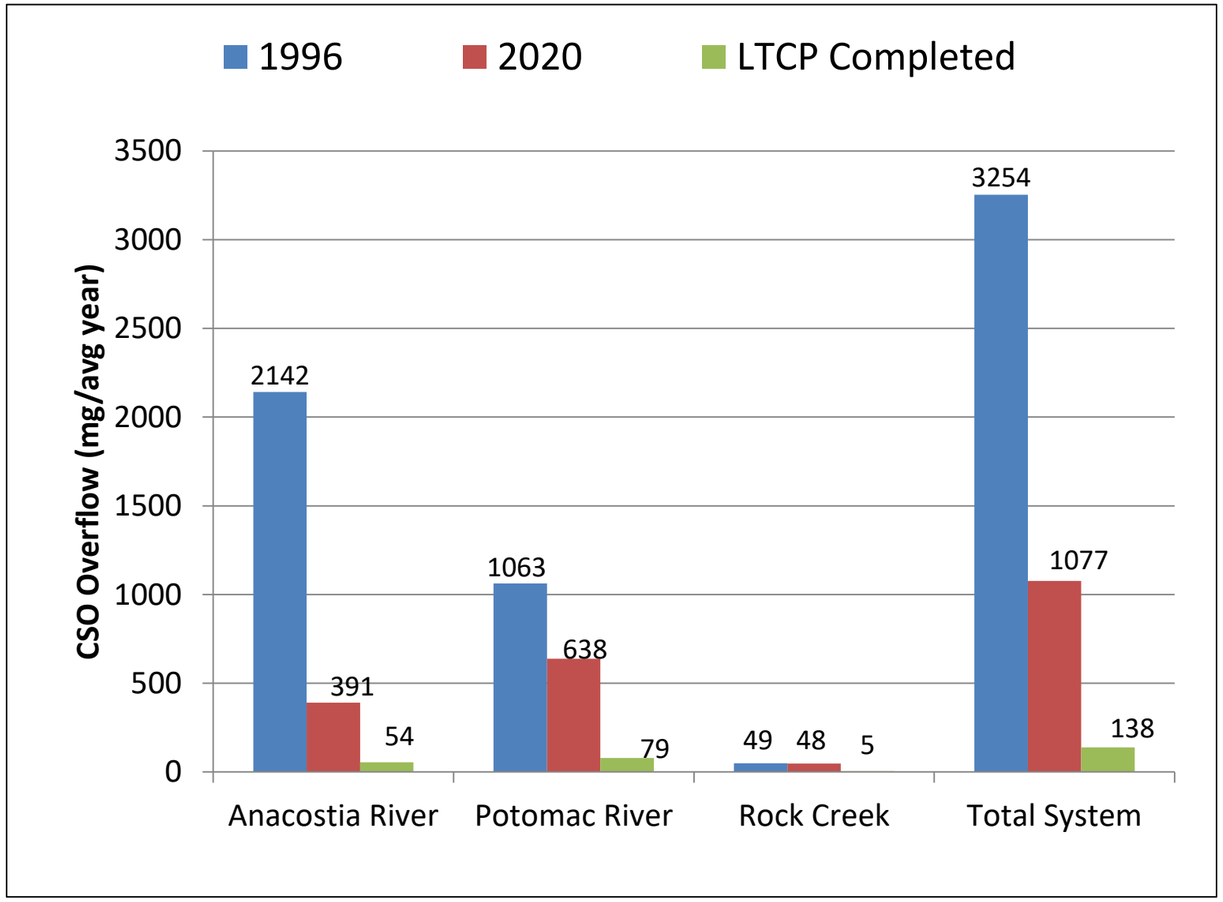
*Discharge occurs when pipe's capacity is exceeded

What is in a CSO?

- Human waste
- Gray water from:
  - Shower
  - Dishwasher
  - Kitchen
  - Laundry
  - Businesses
  - Etc.

Combined Sewer Locations





- Combined Sewer System covers 1/3 of the District (12,478 acres)
- 48 potentially active CSO outfalls
  - 15 to Anacostia
  - 10 to Potomac
  - 23 to Rock Creek

96% reduction system wide
98% reduction on Anacostia River

CSOs and Surface Flooding

CSO Discharge to Anacostia River

Photo source unknown

Rhode Island & T St NW

Photo courtesy of: Greg Roberts

Rhode Island & 1st St NW

Trash in Anacostia River

Photo courtesy of myfox.com

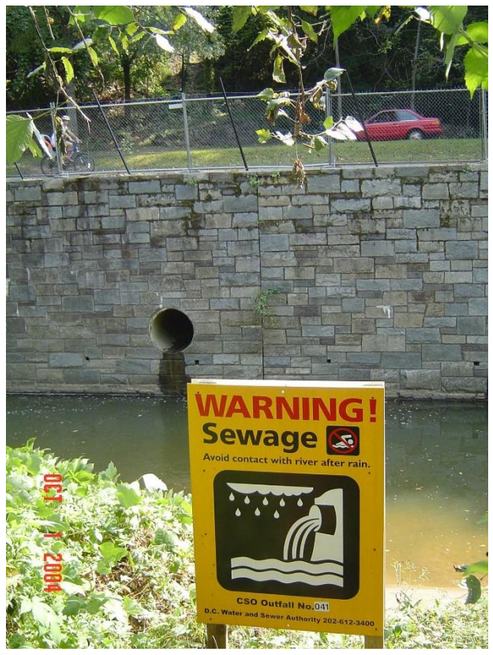
Rhode Island & T St NW

Photo source unknown

Rhode Island Between 1st & 2nd St NW

Photo courtesy of huffintonpost.com

Piney Branch CSO Discharging



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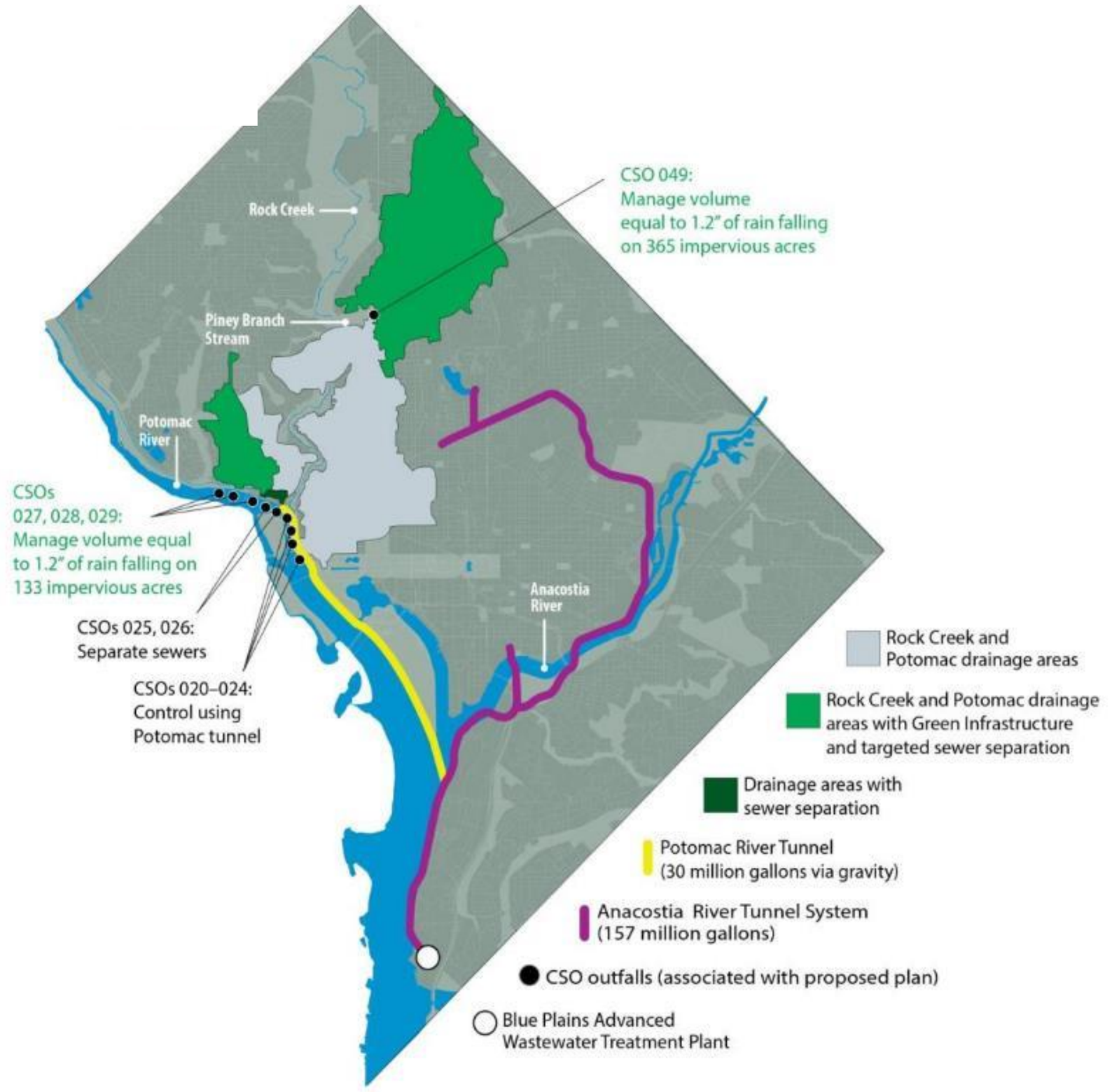
CSO 049 Overflowing

1st & V St NW

Clean River Project

- **Clean Rivers Project: $2.7 Billion**
- **Nitrogen Removal: $950 Million**
- **Total > $ 3.5 Billion**



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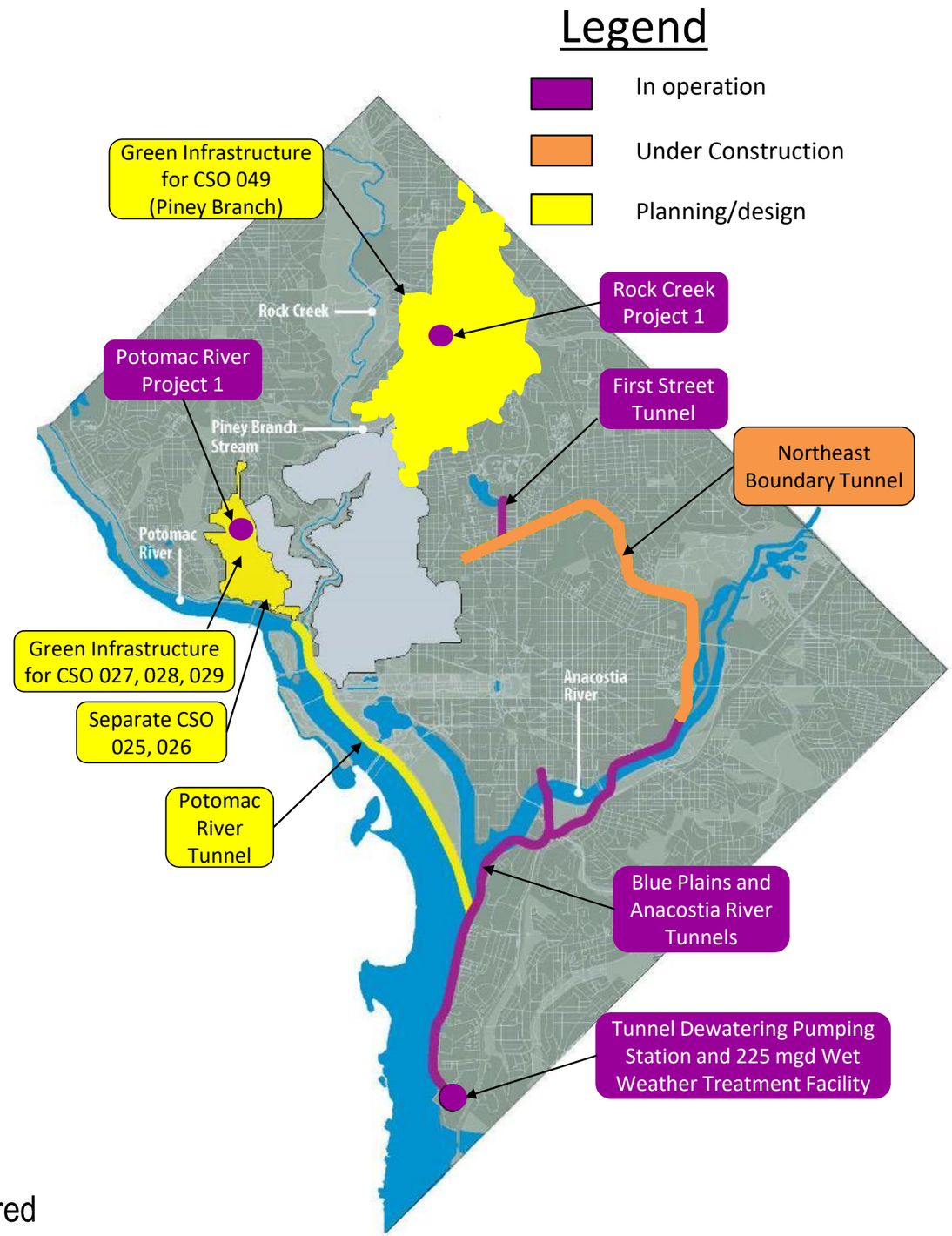
Program Status

No.	Month	Rainfall, DCA Gauge (in)	Volume Captured by Tunnel (MG)	Measured Overflow (MG)	% captured	Solids Removed (tons)
1	March 20 -31, 2018	1.48	20	0	100%	8
2	April 2018	3.59	249	10	96%	
3	May 2018	8.73	860	13	98%	72
4	June 2018	5.21	265	47	85%	55
5	July 2018	9.73	679	260	72%	10
6	August 2018	5.19	334	14	96%	226
7	September 2018	9.73	784	116	87%	94
8	October 2018	3.06	164	0	100%	151
9	November 2018	7.57	777	5	99%	89
10	December 2018	5.82	468	100	82%	165
11	January 2019	3.30	259	0	100%	99
12	February 2019	3.52	74	0	100%	191
13	March 2019	4.00	337	46	88%	48
14	April 2019	2.24	77	0.1	100%	384
15	May 2019	4.97	311	1	100%	357
16	June 2019	4.27	134	0.1	100%	268
17	July 2019	6.49	339	77	81%	139
18	August 2019	1.99	186	22	89%	165
19	September 2019	0.25	19	0	100%	78
20	October 2019	6.66	450	18	96%	67
21	November 2019	1.37	55	0	100%	131
22	December 2019	2.80	80	0	100%	227
23	January 2020	2.79	150	0	100%	120
24	February 2020	3.21	143	0.6	100%	159
25	March 2020	2.31	38	0	100%	238
26	April 2020	6.30	338	127	73%	139
27	May 2020 (DRAFT)	2.49	169	0	100%	191
28	June 2020 (DRAFT, thru 6/8)	1.92	187	0	100%	TBD
	Total	**120.99**	**7943**	**859**	**90%**	**3871**

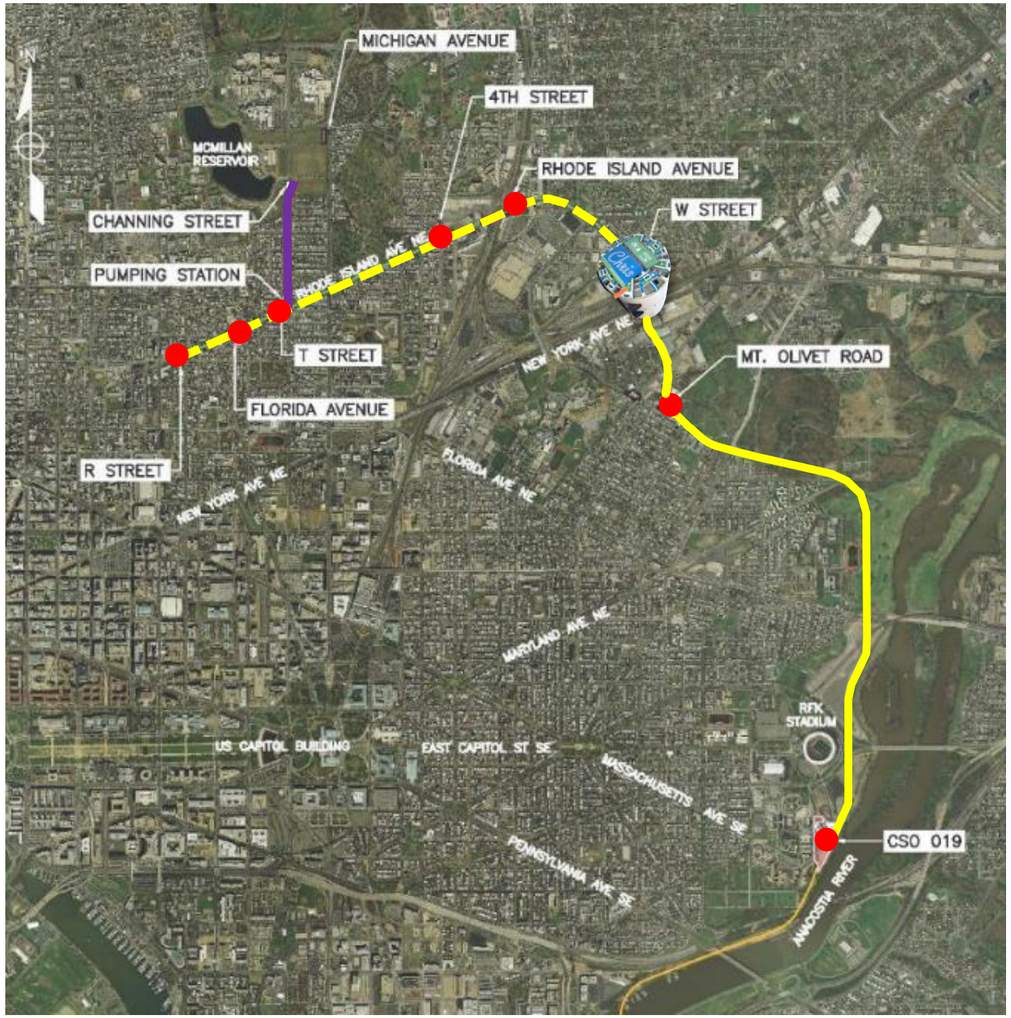


- Over **7.9 billion gallons** captured to date
- Over **3,800 tons** of trash, debris, and other solids captured
- Exceeding predicted capture rate (>80%)
- First year in operation (2018) was the wettest year on record for DC

Northeast Boundary Tunnel (under construction)

- 23 foot diameter tunnel, 27,000 feet long
- 7 shafts, 5 diversion chambers
- Construction value: $580 M
- Place in operation: 2023

W Street Shaft Break-in, 4/15/20



Adds 90 million gallons to existing 100 million gallons of Anacostia Tunnel

GREEN INFRASTRUCTURE PRACTICABILITY ASSESSMENT

Green Roof at Fort Reno Reservoir

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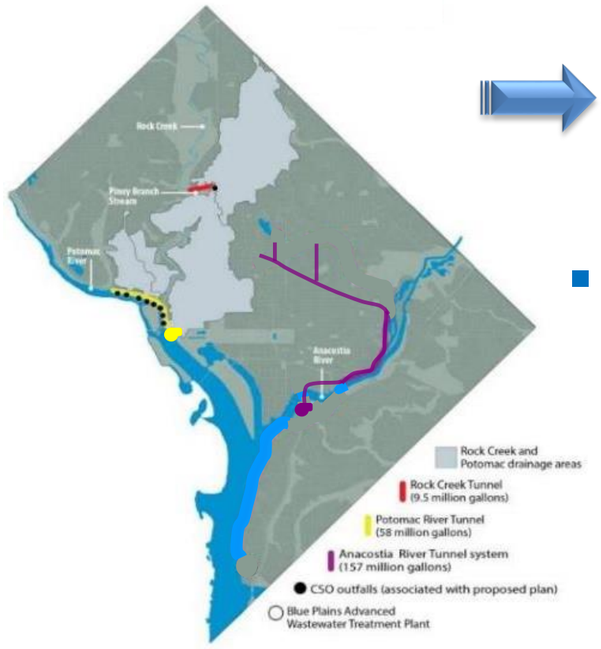
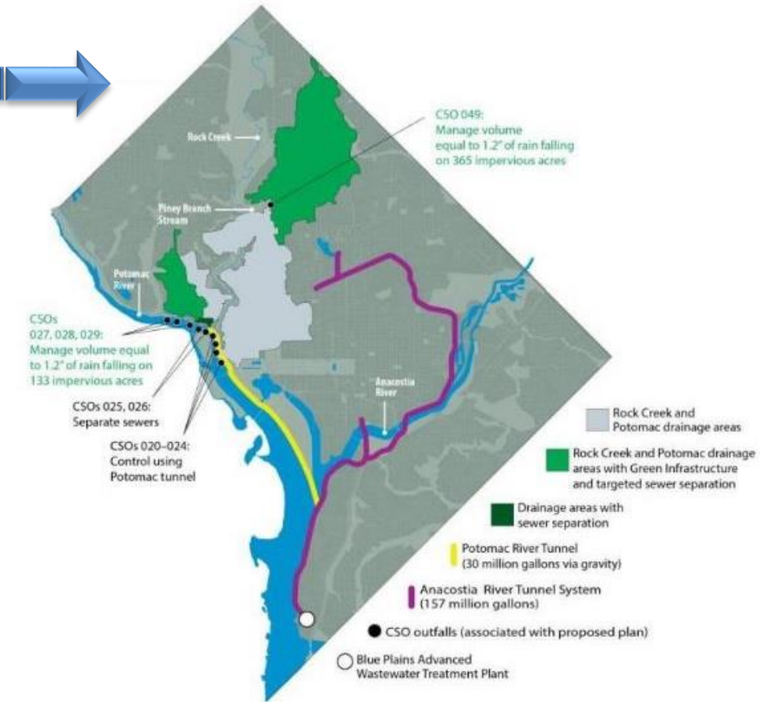
Consent Decree Change for Green Infrastructure



Consent Decree modification entered in Federal Court January 14, 2016

- Rationale:
  - Test GI on large scale
  - GI offers Triple Bottom Line benefits:
    - Economic
    - Environmental
    - Social
  - National Green Infrastructure Certification Program for local jobs
  - Gravity tunnel eliminates deep tunnel pumping station



One of the highest CSO reductions in the country:

Condition	Anacostia River	Potomac River	Rock Creek	Total
Overflow Volume (mg/avg year)				
1996 – DC Water Formed	2,142	1,063	49	3,254
LTCP Complete	54	79	5	138
% reduction	**98%**	**93%**	**90%**	**96%**
CSO Frequency (#/avg yr)				
1996 – DC Water Formed	82	74	30	82
LTCP Complete	2	4	1 / 4[1]	4

Note 1: One overflow at Piney Branch, 4 overflows at other Rock Creek CSOs

DOEE and EPA determined that LTCP meets District Water Quality Standards, subject to post construction monitoring

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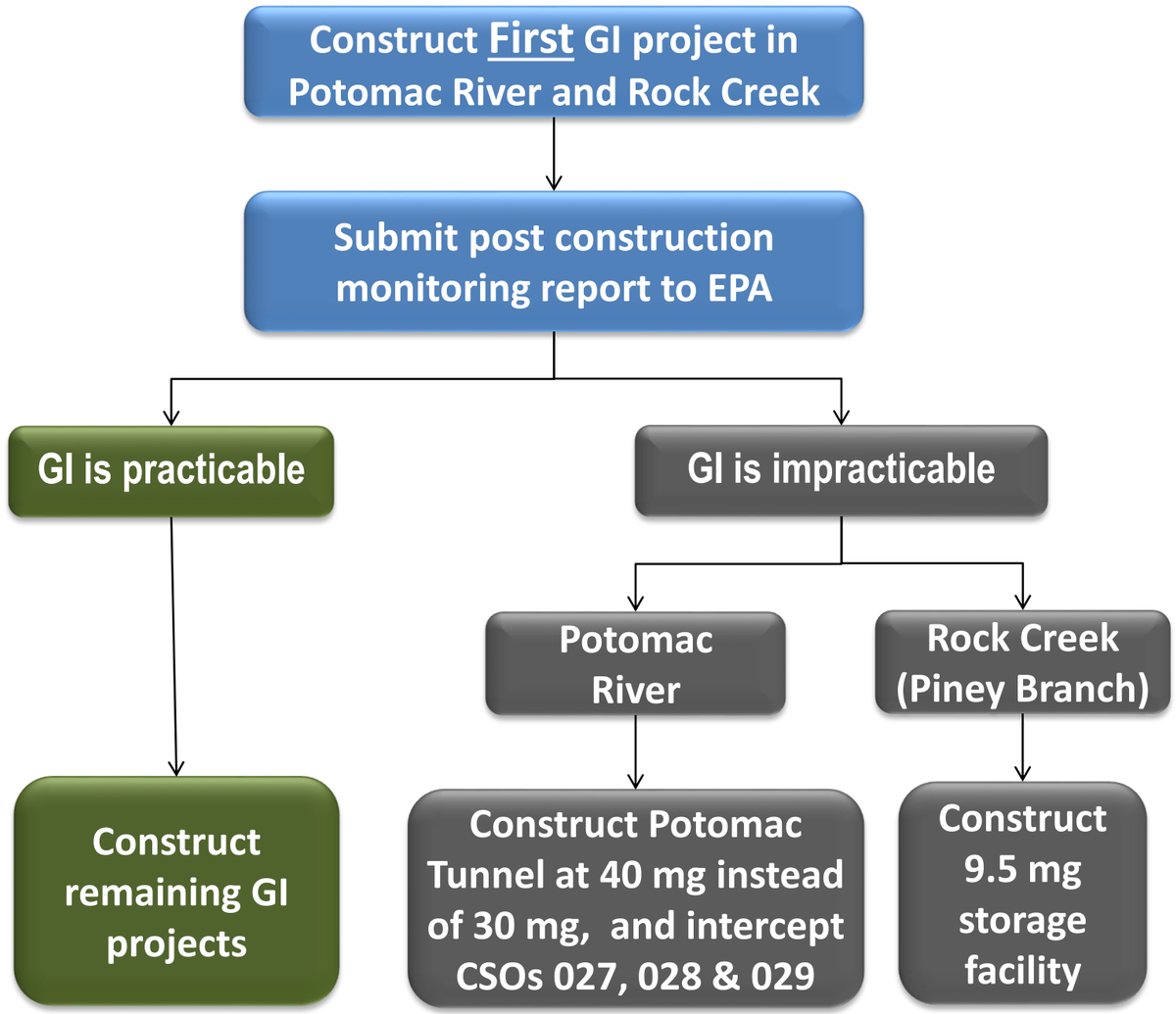
GI Practicability Assessment

<u>Rationale:</u> GI not constructed on a large scale with high CSO reduction, documented case histories with cost and performance not available, need time to learn

Project	Impervious Acres Managed @ 1.2”	Place in Operation Deadline
Potomac River Project 1	44	2019
Practicability assessment – due Aug. 17, 2020		
Potomac River Project 2	46	2024
Potomac River Project 3	43	2027
Subtotal	**133**	
Rock Creek Project 1	20	2019
Practicability assessment – due Jun. 15, 2020		
Rock Creek Project 2	75	2024
Rock Creek Project 3	90	2027
Rock Creek Project 4	90	2029
Rock Creek Project 5	90	2030
Subtotal	**365**	
Grand Total	**498**	



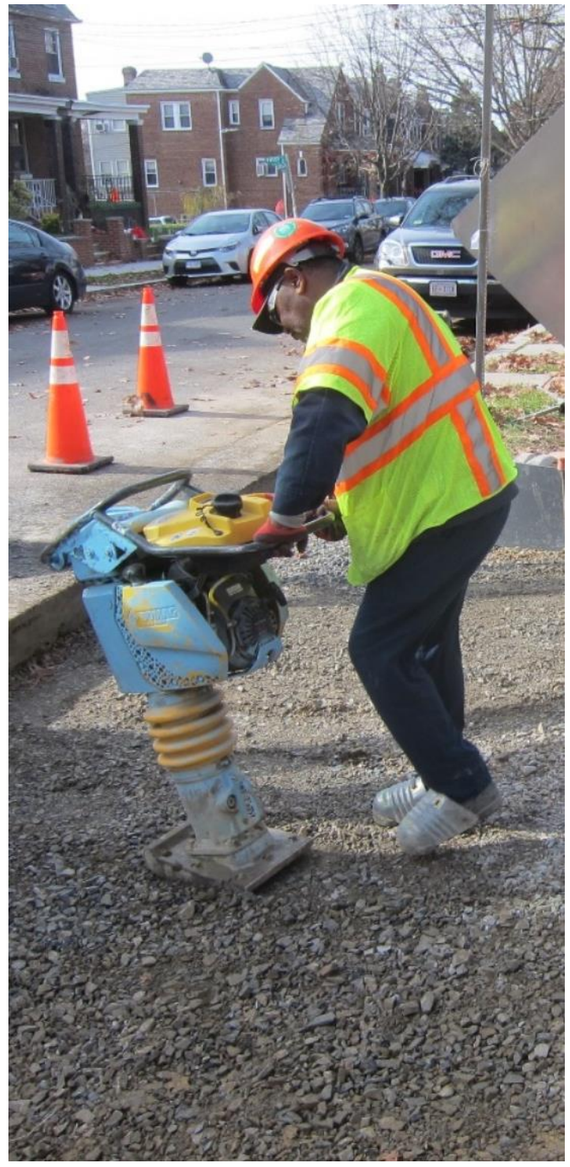
Other Considerations

- Decree requires practicability determination to consider "*constructability, operability, efficacy, public acceptability and cost per impervious acre treated*"

- EPA has 180 days to approve or disapprove DC Water's practicability determination

- DC Water can take credit for other acres controlled pursuant to District's Stormwater regulations provided "DC Water, the District or a private party has assumed operation and maintenance responsibilities in a legally binding document or as part of its statutory or regulatory authority"

- Regardless of the Determination decision, DC Water required to operate and maintain the GI Project 1 sites



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DC Water has Spared no Effort to Make GI Successful

More than **$80 M and several hundred thousand person-hours** have been spent on GI

- Potomac River Project A
- Rock Creek Project A
- Alleypalooza Partnership with DDOT
- Downspout Disconnection
- DC Water Design Challenge
- Utility Protection Guidelines
- DC Water Green Infrastructure Construction Standards
- DDOT Green Infrastructure Standards
- National Green Infrastructure Certification Program
- Seed money to fund WEF, UDC to train new workers
- Blanket permit Negotiated with DOEE and DDOT
- Standard Designs for Alley Porous Pavement and Bioretention
- Extensive pre and post construction modeling and monitoring
- GI Parks Project
- GI Project Planning and Education with DC Schools & Georgetown University

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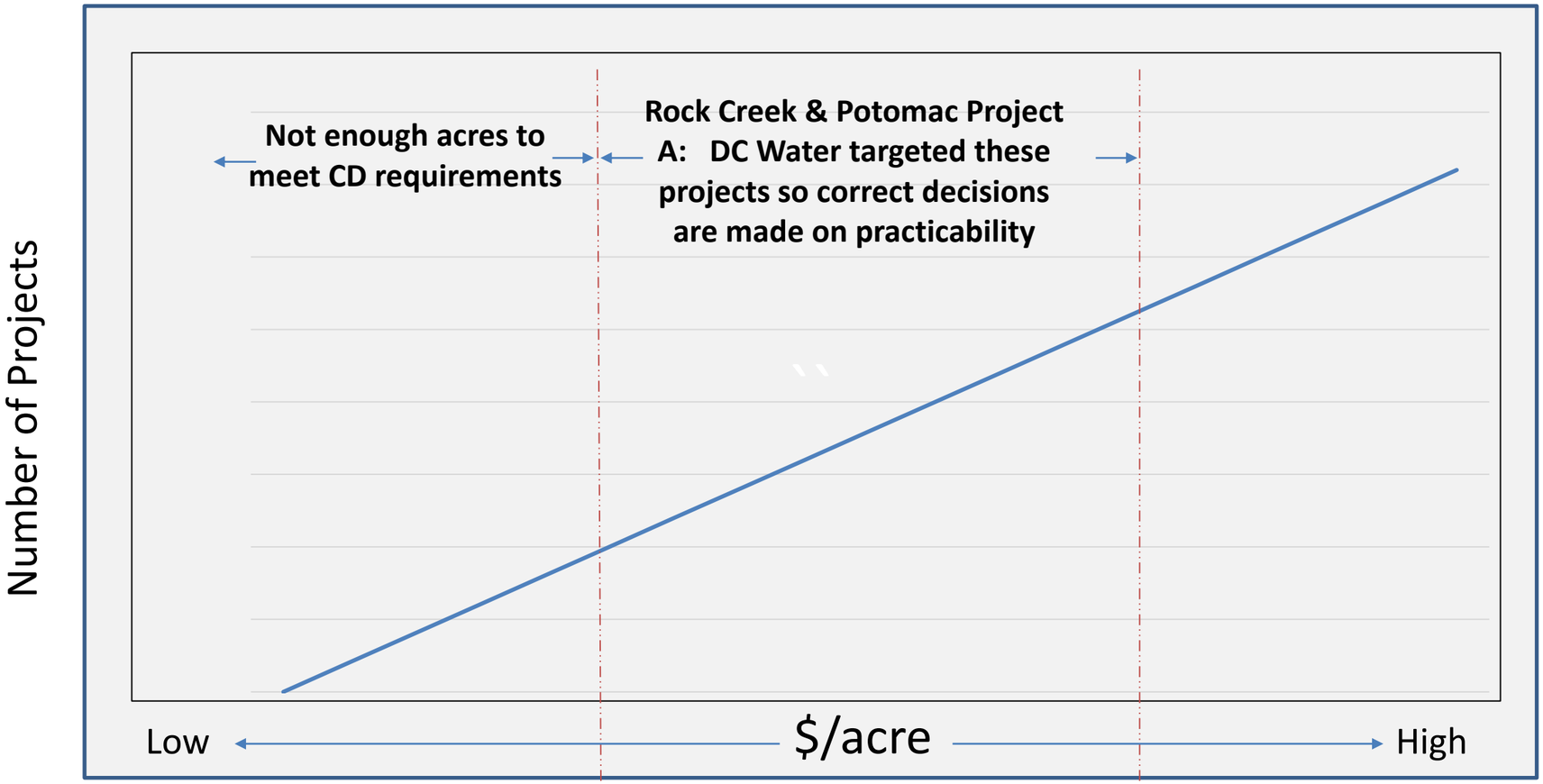
GI Projects – Parks

Green Infrastructure Cost Ranges



Targeted:

- "Low hanging fruit"
- Construct as part of a District Project

Adapted to Public Space:

- Adjust practices to space available
- Representative of typical city blocks

Retrofit Public Space

- Change public space
- Utility Relocation

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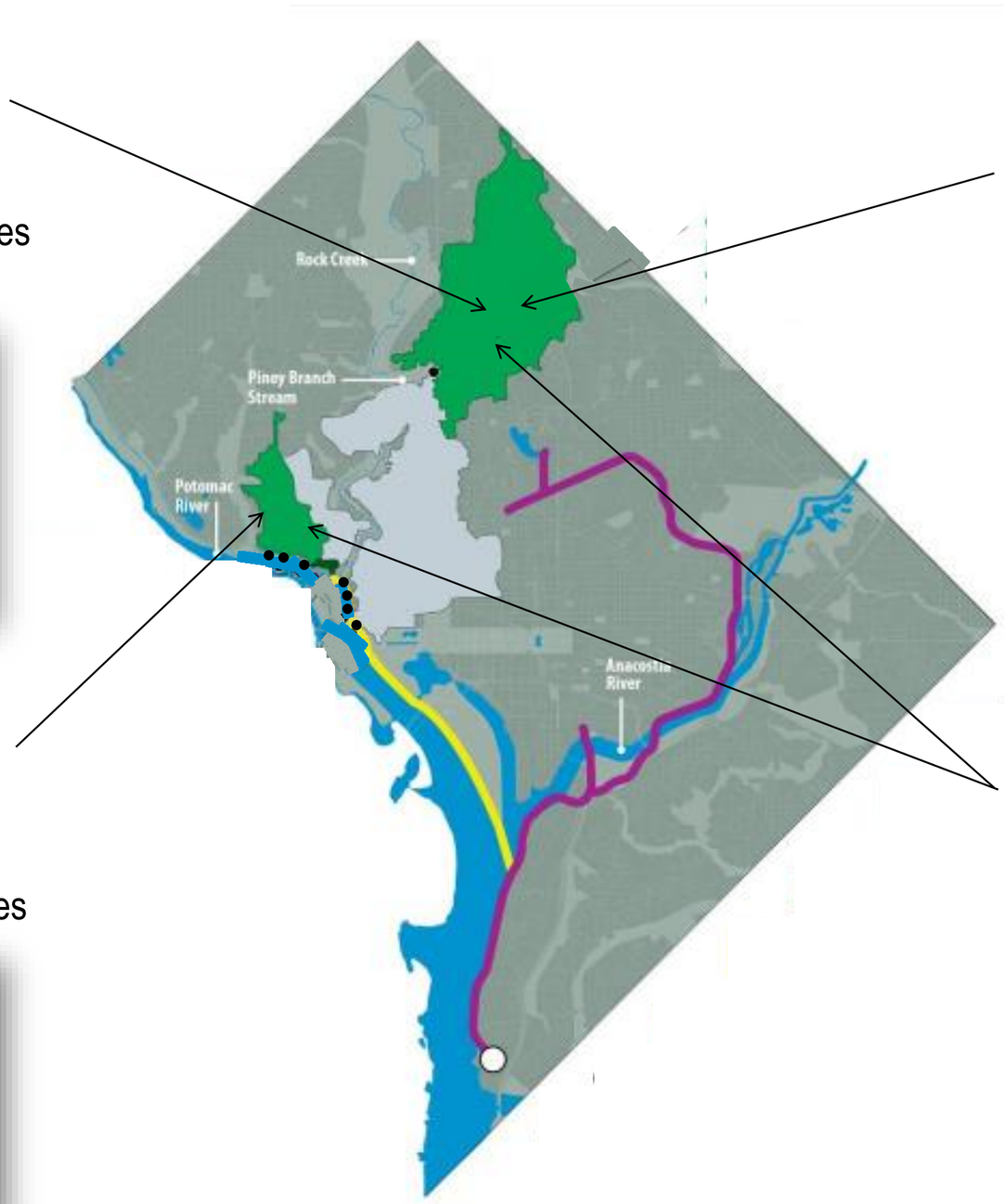
Adaptive Management Approach: Projects Used to Assess Practicability

Rock Creek Project A

- 22 acres constructed and operated for a year
- 38 bioretention facilities
- 39 porous pavement facilities
- 2 other facilities

Potomac River Project A

- 8 acres constructed and operated for a year
- 5 bioretention facilities
- 38 porous pavement facilities



Alleypalooza Partnership w/DDOT

- Partnership to incorporate green alleys in Alleypalooza work
- 7 alleys managing 3 acres of runoff

Downspout Disconnection

- 6,471 homes visited, 293 homes participated
- 1.2 acres managed

Rock Creek Qualitative Assessment of GI

Criteria	Assessment	Basis
Constructability	Good	• Projects are constructible with normal construction practices
Public Acceptance	Good	• Survey conducted of homes in project area • Survey results: 64% of residents would like more GI in their neighborhood
Efficacy	Good	• Can be designed and constructed to perform as predicted • Lessons learned can be applied going forward
Operability	Moderate	• Maintenance is simple, but is essential to assure performance • If not maintained adequately, performance can suffer
Cost Effectiveness • Targeted GI	Good	• Cost can be competitive with gray
Cost Effectiveness • Retrofit Public Space	Negative	• Costs much higher than gray
Other – Triple Bottom Line and Economic Benefits	Good	• Community and economic benefits substantially higher with Green Infrastructure
Other – Protection of future infrastructure (GI MOU)	Moderate	• Agreement with District not reached on GI MOU

Rock Creek Quantitative Assessment of Alternatives

Alt.	Description		Capital Cost ($M)	O&M Cost ($M/yr)	NPV 30 years ($M)	% Over Low
1	All Gray (9.5 mg storage)		$ 185	$ 0.28	$ 211	**+2%**
2	All Green (365 ac of GI) • 27.4 ac Project 1 • 266.6 new ac • 71 ac DC Stormwater Regs 365 ac total		$ 206	$ 4.3	$ 401	**+94%**
3	Hybrid (9.5 mg) • 92 ac of GI (27 ac Project 1 + 65 new ac, including downspout disconnect • Gray storage • BMPs per DC Stormwater Regs	3.0 mg 4.2 mg 2.3 mg	$ 133	$ 1.5	$ 207	**0%**
		Total 9.5 mg				

Recommended

Hybrid alternative achieves:

- **Same level of control as LTCP**
- **Equivalent total storage volume (9.5 mg) with green + gray together**

Recommendation:

- **Most cost effective approach**
- **Provides CSO performance certainty**
- **Maintains DC Water stature being green leader utility**
- **Submit practicability proposing hybrid approach**

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Rock Creek: Predicted CSO Performance

CSO Performance at Piney Branch (CSO 049):

Parameter	Before LTCP	LTCP
No. Overflows (#/average year)	25	1
Overflow Volume (million gallons/average year)	39.7	1.4
% Reduction from Before LTCP	--	96%

- Proposed plan provides **same performance as LTCP**
- Same performance that was determined to meet water quality standards by DOEE and EPA

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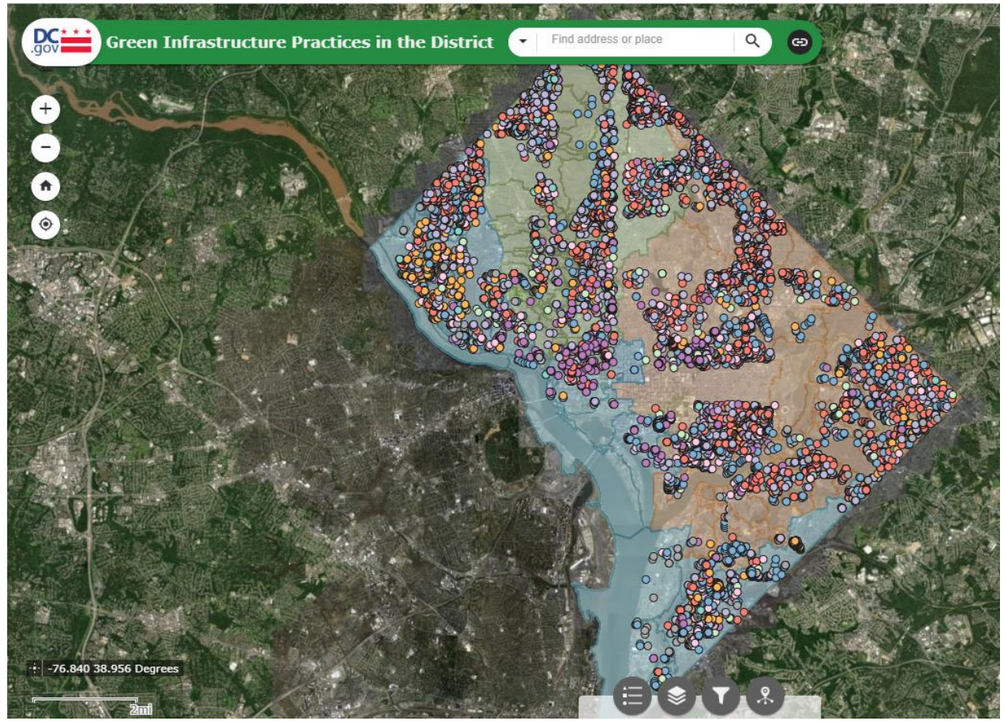
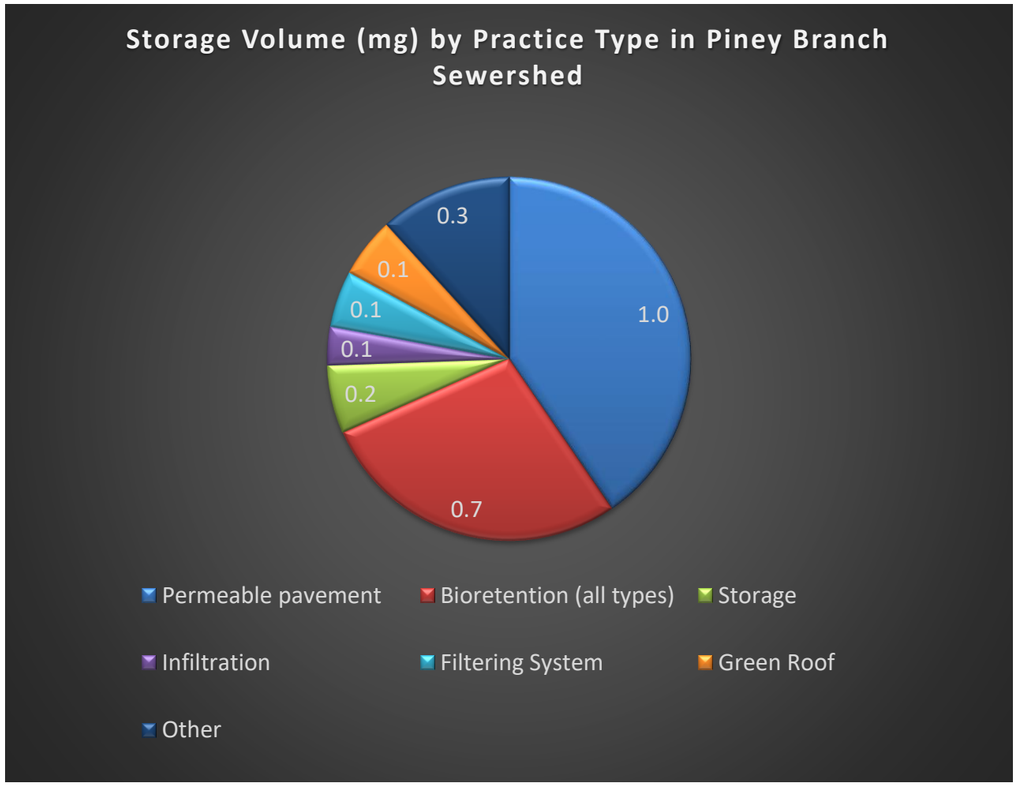
GI Constructed per District's Stormwater Regulations

- Decree language: *"DC Water can take credit for other acres controlled pursuant to District's Stormwater regulations provided "DC Water, the District or a private party has assumed operation and maintenance responsibilities in a legally binding document or as part of its statutory or regulatory authority"*

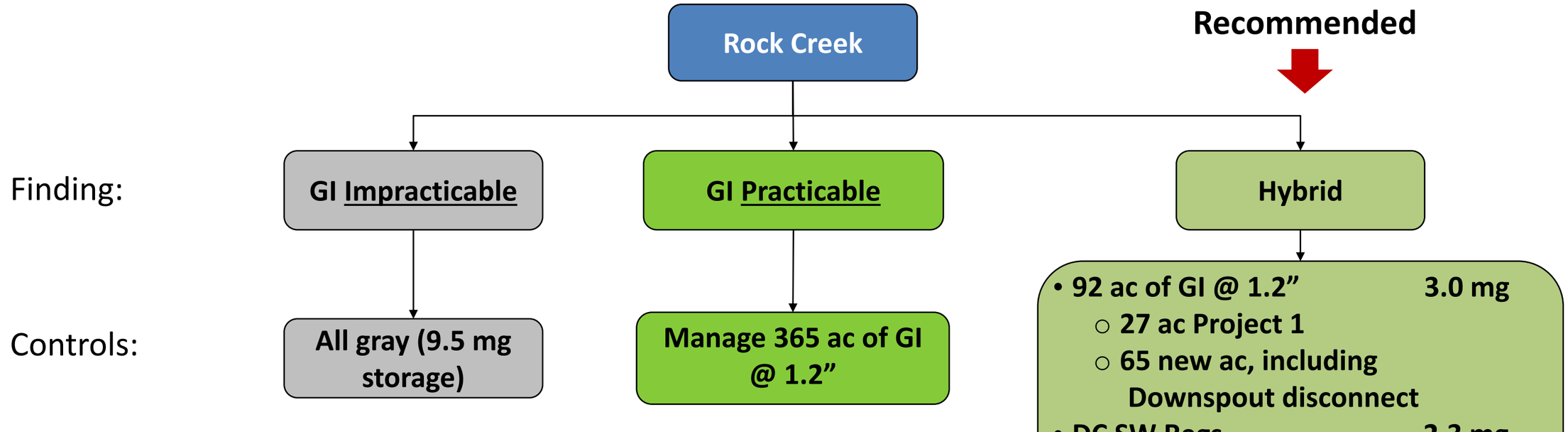
- District reports covenants in place after 1999 that convey with property
  - Obligation to keep and maintain practices

Period	# Practices	Storage Vol. (mg)
After 2002 (after LTCP monitoring)	244	2.32



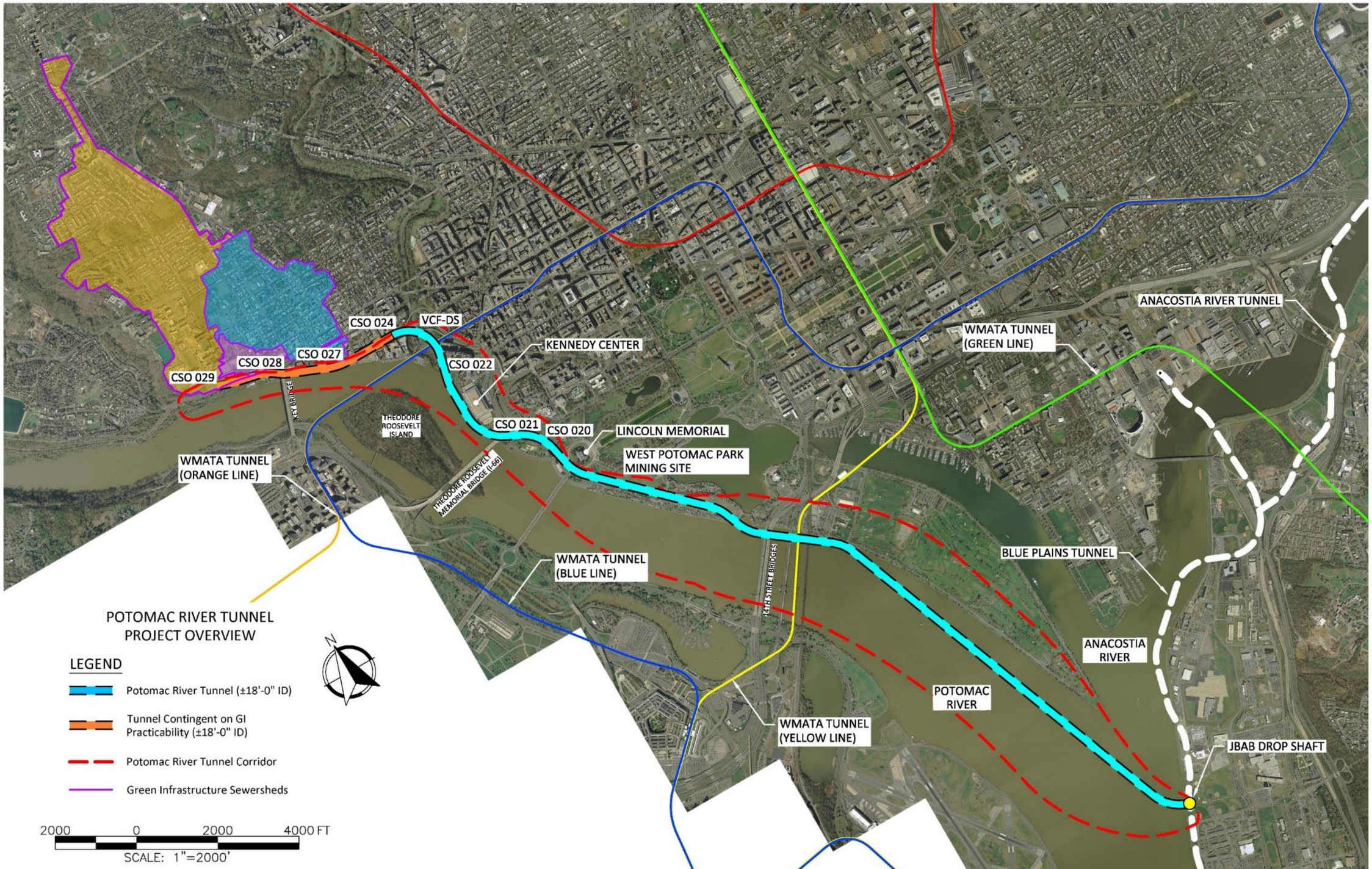


Recommended Approach for Rock Creek



Degree of CSO Control:	Same as LTCP	Same as LTCP	Same as LTCP
Technologies:	Same as LTCP	Same as LTCP	Same as LTCP
Schedule:	Same as 2016 Amended Decree, by 3/23/2030	Same as 2016 Amended Decree, by 3/23/2030	Same as 2016 Amended Decree, by 3/23/2030

Potomac GI Area Addresses Three CSO areas: CSO 027, 028 and 029



Potomac Qualitative Assessment of GI

Criteria	Assessment	Basis
Constructability	Negative	• Limited space in Georgetown area • GI not constructible in CSO 027 and 028
Public Acceptance	Negative	• Objections in Historic District, significant opposition from Commission of Fine Arts, Old Georgetown Board, National Capital Planning Commission, DC State Historic Preservation Office, Advisory Neighborhood Commission and residents
Efficacy	Good	• Can be designed and constructed to perform as predicted
Operability	Moderate	• Maintenance is simple, but is essential to assure performance • If not maintained inadequately, performance can suffer
Cost Effectiveness	Negative	• Extremely high costs to construct green infrastructure in historic District
Other – Triple Bottom Line and Economic Benefits	Negative	• Due to lack of space, most GI would be porous pavement (not green) with little triple bottom line benefit
Other – Protection of future infrastructure (GI MOU)	Moderate	• Agreement with District not reached on GI MOU

Potomac Hybrid Quantitative Assessment of Alternatives

Alt.	Description	Capital Cost ($M)	O&M Cost ($M/yr)	NPV 30 years ($M)	% Over Low
1	Extend Potomac Tunnel from CSO 027/028 to CSO 029	$ 28	$ 0.07	$ 31	**0%**
2	• Potomac Tunnel stops at CSO 028 • Green Infrastructure for CSO 029	$ 25	$0.50	$ 49	**+58%**

Recommended

Potomac Conclusion:

- GI is not practicable in CSO 027 and 028 due to historic district and community concerns
- In CSO 029, GI is approximately equivalent on a capital cost basis, but is 58% more expensive on a NPV basis
- GI constructed in CSO 029 is mostly alleys – minimal green expression and minimal triple bottom line community benefits
- **Recommendation: submit practicability stating GI is *impracticable* on Potomac**

Next Steps

- Rock Creek Practicability Report to be submitted by June 15, 2020
- EPA has 180 days to approve/disapprove
- Report will be available after June 15 on DC Water's website: https://www.dcwater.com/green-infrastructure
- Questions? E-mail us at cleanriversgi@dcwater.com