DC CLEAN RIVERS PROJECT
CONSENT DECREE EVOLUTION

CWEA Collection Systems Committee
Spring Seminar

May 24, 2018
Brandon Flora
Greeley and Hansen
Agenda

- Background
- Project Evolution
  - LTCP Base Plan
  - Total Nitrogen/Wet Weather Modifications
  - Summer 2012 Bloomingdale Flooding Response
  - Green Infrastructure
- Wrap-up and Current Status
- Questions
BACKGROUND
Background
DC Water Overview

- Provides
  - Drinking water distribution
  - Wastewater collection and treatment
  - Stormwater collection and conveyance
- Treats wastewater for a population of 2.1 million
  - District of Columbia
  - Montgomery & Prince George’s Counties, MD
  - Fairfax & Loudoun Counties, VA
- Operates the world’s largest advanced wastewater treatment plant
- Serves a regional area of approximately 725 mi²
Background
DC Water Service Area
Control combined sewer overflows to the:
- Potomac River
- Anacostia River
- Rock Creek

Relieve flooding in the Northeast Boundary Area

Implemented under a Federal Consent Decree among:
- US Environmental Protection Agency (US EPA)
- US Department of Justice (US DOJ)
- District of Columbia
- DC Water

Fully in operation by 2030
- Major intermediate milestones in 2018 and 2025
Background
Magnitude of the Challenge

<table>
<thead>
<tr>
<th></th>
<th>1996</th>
<th>2017</th>
<th>2018</th>
<th>LTCP Completed</th>
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<tbody>
<tr>
<td>Anacostia River</td>
<td>2142</td>
<td>1282</td>
<td>391</td>
<td>54</td>
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<tr>
<td>Potomac River</td>
<td>366</td>
<td>1063</td>
<td>638</td>
<td>79</td>
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<td>Rock Creek</td>
<td>494</td>
<td>48</td>
<td>48</td>
<td>5</td>
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<td>Total System</td>
<td>3254</td>
<td>1968</td>
<td>1077</td>
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**CSO Overflow (mg/avg year)**

- Anacostia River
- Potomac River
- Rock Creek
- Total System

**Legend**
- Blue: 1996
- Red: 2017
- Green: 2018
- Purple: LTCP Completed

*Background Image: Flooding at 1st and V Streets NW, Flooding at 1st and Rhode Island Ave NW*
PROJECT EVOLUTION
Project Evolution
Program History

1998 - LTCP Started
2002 - Final LTCP
2003 - LTCP Meets WQS (EPA/DC) Signed
2005 - Consent Decree
2007 - New Nitrogen Limits Require Changing LTCP
2011 - DC Water Evaluates GI for Potomac River and Rock Creek
2012 - Mayor's Task Force

January 14, 2016 – Consent Decree Modification Entered in Federal Court
Project Evolution
Program History

1. Original LTCP
2. TN/WW Plan
3. Bloomingdale Flooding
4. Green Infrastructure

Base Plan

Challenge:
New effluent limit in NPDES permit for Blue Plains due to Chesapeake Bay TMDL

Challenge:
Flooding demands urgent action for an undersized sewer that’s existed for 135+ years

Challenge:
Modify Consent Decree to incorporate Green Infrastructure

- 30 mg with GI
- 40 mg without GI

- 365 imp ac managed by GI

- 225 mgd Tunnel Dewatering PS
- 225 mgd Enhanced Clarification Facility
- Mining Site for 12’ tunnels
- Mining Site for 23’ tunnel
- Blue Plains Tunnel

- 126 mg
- 58 mg
- 9.5 mg
- 157 mg

126 MG Anacostia River Tunnel System
  - Dewatered to existing system via deep pumping station near Poplar Point
  - Smaller diameter branch tunnels for flood relief in Northeast Boundary

58 MG Potomac River Runnel
  - Dewatered to existing system via deep pumping station near Lincoln Memorial

9.5 MG Piney Branch Tunnel
  - Dewatered to existing system via gravity
Before 2007
- No permit limit - effluent goal of 8.4672 million lbs/yr or 7.5 mg/L

2007 NPDES Permit Modification
- Nitrogen limit of 4.689 million lbs or 4.2 mg/L (reduction of 44%)
Project Evolution
Nitrogen Removal Alternatives

**Conventional Approach**
- Blue Plains 370 mgd annual avg
  - 1076 mgd
- 740 mgd Peak = 2.0
  - Complete Treatment ENR
  - Outfall 002
- 336 mgd
  - Excess Flow Treatment, Plain Settling, Add 4 Primary Tanks
  - Outfall 001

**Selected Approach**
- Blue Plains 370 mgd annual avg
  - 1076 mgd
- 555 mgd Peak = 1.5
  - Complete Treatment ENR
  - Outfall 002
- 521 mgd
  - Enhanced Clarification (improved effluent to lower pollutant loads)
  - Outfall 001
- 31 mg of storage
- 225 mgd

**Total Cost to DC Water**
- $1,600 M

**Additional Cost to CSO Program**
- $0

Significant Savings by Integrating Nitrogen Removal Goals into CSO Program

Total Additional Cost to CSO Program
- $800 M
- $239 M
Before 2007 Nitrogen Permit Limits

- Blue Plains WWTP
- Anacostia Tunnel System (126 mg)
- Anacostia Tunnel Dewatering Pumping Station

After 2007 Nitrogen Permit Limits

- Blue Plains WWTP
- Anacostia Tunnel System (157 mg)
- Anacostia Tunnel Dewatering Pumping Station
- 30 mg Blue Plains Tunnel added
- 225 mgd Wet Weather Treatment Facility
- Tunnel Pumping Station at Blue Plains
- Easily expandable to 500 mgd
## Project Evolution
### 2012 Bloomingdale Flooding

<table>
<thead>
<tr>
<th>Date</th>
<th>Duration</th>
<th>Rainfall (inches)</th>
<th>NOAA Point Precipitation Frequency (Nearly)</th>
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<tr>
<td>7/10/2012</td>
<td>1-hour</td>
<td>1.96</td>
<td>10-year storm</td>
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<td>7/18/2012</td>
<td>30-minute</td>
<td>1.35</td>
<td>5-year storm</td>
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<td>7/19/2012</td>
<td>15-min</td>
<td>0.94</td>
<td>5-year storm</td>
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<tr>
<td>9/2/2012</td>
<td>2-hour</td>
<td>2.78</td>
<td>10-year storm</td>
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Storm Intensity Map Courtesy of: Washington Post
Project Evolution
2012 Bloomingdale Flooding

Photo source unknown
1st St NW

Photo source unknown
Rhode Island & T St NW

Photo courtesy of: Greg Roberts
Rhode Island & 1st St NW

Photo source unknown
Rhode Island Metro

Photo courtesy of myfox.com
Rhode Island & T St NW

Photo source unknown
Flagler St NW

Photo source unknown
Rhode Island Between 1st & 2nd St NW

Photo source unknown

Photo courtesy of huffingtonpost.com

1st & V St NW
Project Evolution
2012 Bloomingdale Flooding

- Over 200 property owners affected
- Flood clean-up costs ranged from $3,000 to $18,000 per household
- Major concerns regarding public health and safety
Project Evolution
Response to Bloomingdale Flooding

4 storms caused major flooding: July 10, 18, 19 and Sept 2, 2012

Mayor formed Task Force in Aug 2012

Task Force report delivered end of Dec 2012

Over 25 Recommendations:

- Public Outreach
- Regulatory
- Code Changes
- Operations & Maintenance

Engineering Measures
- McMillan Stormwater Storage
- First Street Tunnel
- Northeast Boundary Tunnel
Project Evolution
Engineering Measures to Mitigate Bloomingdale Flooding

MCMILLAN STORMWATER STORAGE & IRVING ST GREEN INFRASTRUCTURE
4 million gallons
(Spring 2014)

FIRST STREET TUNNEL
8 million gallons
(Spring 2016)

NORTHEAST BOUNDARY TUNNEL
Gravity System to Blue Plains
2023
Project Evolution
Project Changes for Bloomingdale Flood Mitigation

Before Bloomingdale Flooding

- 12' dia. tunnel
- Complete by 2025
- Mining Site for 12' tunnels
- Blue Plains WWTP

After Bloomingdale Flooding

- First Street Tunnel
  - Accelerated and Built with Dewatering Pumping Station (Complete by 2016)
  - Complete by 2023
- Realigned Single 23' dia. Northeast Boundary Tunnel
- 23' dia. tunnel
- Blue Plains WWTP
Project Evolution
Green Infrastructure

Anacostia River Projects
- DC Water is implementing tunnels
- Most severely impacted by CSOs
- GI will provide additional control

Potomac & Rock Creek Projects
- Schedule allowed for evaluation of new approaches

Green  Gray  Hybrid
Project Evolution
Benefits of Green Infrastructure

- Added environmental, social and economic benefits
  - Heat island reduction
  - Improved air quality
  - Enhanced aesthetics
  - Opportunity for local, green jobs
- Supports Sustainable DC Plan

![Graph showing predicted CSO overflow volume comparison between Existing Plan and Recommended Plan. CSO reduction begins in 2017 and continues throughout the program. CSO reduction occurs in 2025.]
Full GI build-out pending practicability determination based on first project in each sewershed
WRAP-UP AND CURRENT STATUS
Wrap-Up and Current Status Overview

<table>
<thead>
<tr>
<th>Tunnel System</th>
<th>Status</th>
<th>Operation Date</th>
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<tbody>
<tr>
<td>First Street Tunnel</td>
<td>In Operation</td>
<td>2016</td>
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<tr>
<td>Anacostia River Tunnel</td>
<td>In Operation</td>
<td>2018</td>
</tr>
<tr>
<td>Northeast Boundary Tunnel</td>
<td>Construction</td>
<td>2023</td>
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<tr>
<td>Potomac River Tunnel</td>
<td>Planning</td>
<td>2030</td>
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DC CLEAN RIVERS PROJECT AND NITROGEN REMOVAL PROGRAMS

- DC Clean Rivers Project: $2.7 Billion
- Nitrogen Removal: $950 Million
- Total > $ 3.5 Billion
- 25 yr implementation (2005 – 2030)
- 96% reduction in CSOs & flood relief in Northeast Boundary
- Approx 1 million lbs/yr nitrogen reduction predicted
Wrap-Up and Current Status
Major Benefits of Project Changes

- Significantly more economical approach to meeting Blue Plains nitrogen limits
- Accelerated flooding relief for Bloomingdale
- Triple-bottom line benefits of Green Infrastructure
- Interconnected tunnel system operates entirely by gravity
  - Single dewatering pumping station at Blue Plains
  - Interconnection provides better control for localized storms
  - System provides operational redundancy for existing pumping stations
  - Allows for elimination of inflatable dams
Wrap-Up and Current Status
Anacostia River Tunnel in Operation

- Anacostia system was placed into operation March 20, 2018
- April 16 rain event
  - 2 inches of rain in 3 hours (2- to 5-year storm)
  - Tunnel filled to capacity
  - Tunnel captured 180 MG of combined sewage
- May 13-19 rain events
  - ~6” of rain over 7 days
  - Tunnel captured 650 MG of combined sewage
  - Tunnel did not overflow
  - Smaller overflows from existing CSOs (greatly reduced by tunnel)