BLUE PLAINS TUNNEL
DC CLEAN RIVERS PROJECT

Tunnel Achievement Awards Banquet
10th Annual Breakthroughs in Tunneling Short Course

August 15, 2017

Carlton M. Ray
Director, DC Clean Rivers Project, DC Water
Agenda

- DC Water
- DC Clean Rivers Background
- Anacostia River Tunnel System
- Blue Plains Tunnel
- Procurement
- Lessons Learned
- Questions
Who We Are
DC Water (District of Columbia Water and Sewer Authority)

- Provides
  - Drinking water distribution for DC
  - 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, Maryland
  - Fairfax & Loudoun Counties, Virginia

- Operates the world’s largest Advanced Wastewater Treatment Plant
  - Average daily capacity, 370 mgd
  - Peak daily capacity, 1 billion+ gallons

- Serves a regional area of approximately 725 Square Miles
Who We Serve
Blue Plains Service Area

- Provides
  - Drinking water distribution for DC
  - 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, Maryland
  - Fairfax & Loudoun Counties, Virginia

- Operates the world’s largest Advanced Wastewater Treatment Plant
  - Average daily capacity, 370 mgd
  - Peak daily capacity, 1 billion+ gallons

- Serves a regional area of approximately 725 Square Miles
DC Clean Rivers Background
Magnitude of the Challenge

► Combined Sewer Overflows

CSO Discharge to Anacostia River

Trash in Anacostia River

On average, 2.1 billion gallons of untreated sewage and stormwater runoff (combined sewage) are discharged to the Anacostia River per year.

► Chronic Sewer Flooding

- Flooding on Mt. Olivet Rd NE
- Flooding on Rhode Island Ave NE
- Flooding on Rhode Island Ave NW
- Flooding on Flagler Pl NW
- Flooding at 1st and V Streets NW
- Flooding at 1st and Rhode Island Ave NW
- Flooding at Shaw metro
- Flooding at 1st and P Streets NW

| Current chance of flood occurring in any given year | 50% (2-year storm) |
| Chance of flood after Northeast Boundary Tunnel | 7% (15-year storm) |
Clean Rivers Background

Plan

- 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

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 NE Boundary |
| Approx 1 million lbs/yr nitrogen reduction predicted |
Clean Rivers Background
21st Century Sewer System

STORM DRAIN
DOMESTIC, COMMERCIAL, AND INDUSTRIAL SEWAGE
EXISTING INTERCEPTOR (~20 FEET DEEP)
DIVERSION FACILITY
23-FOOT DIAMETER TUNNEL (~100 FEET DEEP)

OUTFALL PIPE
98% REDUCTION OF CSO'S

DAM
APPROACH CHANNEL
DROP SHAFT
ADIT
TUNNEL STORAGE AND FLOW BY GRAVITY TO BLUE PLAINS (157 million gallons)
Clean Rivers Background

Benefits

CSO Reduction to Anacostia River

96% Reduction Overall, 98% on Anacostia River

Flood Mitigation in Northeast Boundary

Nitrogen Removal for Chesapeake Bay

Effluent TN Discharged in million pounds/year

Chesapeake Bay Agreement Goal
8.5 million pounds/year

New NPDES Permit Limit
4.4 million pounds per year

Rhode Island Metro
### Anacostia River Tunnel System Snapshot

<table>
<thead>
<tr>
<th>Project</th>
<th>Diameter</th>
<th>Length</th>
<th>Start</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue Plains Tunnel ($319M)</td>
<td>23</td>
<td>24,207</td>
<td>5/2011</td>
<td>8/2015</td>
</tr>
<tr>
<td>Anacostia River Tunnel ($254M)</td>
<td>23</td>
<td>12,484</td>
<td>6/2013</td>
<td>12/2017</td>
</tr>
<tr>
<td>Northeast Boundary Tunnel ($580M)</td>
<td>23</td>
<td>27,000</td>
<td>9/2017</td>
<td>5/2023</td>
</tr>
<tr>
<td>First Street Tunnel ($158M)</td>
<td>20</td>
<td>2,700</td>
<td>10/2013</td>
<td>10/2016</td>
</tr>
</tbody>
</table>

Various other contracts to connect to tunnel system

More than $1.8 B in Contracts have been let for the Anacostia River Projects
Anacostia River Tunnel System
Tunnel Profile

- Pumping station and wet weather treatment facility at Blue Plains
- Minimum Grade = 0.1%
- Depth determined by going under the following facilities:
  - Bridges
  - Structures
  - Utilities
- Working depth limited to 3 bars of water
BLUE PLAINS TUNNEL
Blue Plains Tunnel

What is it?
- Key component of Clean Rivers Project
- Key component of TN/Wet Weather Plan
- First major tunnel in program
- Significant suburban cost contribution

Capacities
- 23’ inside dia, 24,207 feet long
- 5 shafts – 50’ to 132’ Inside diameter
- 75 million gallons storage

Design-Builder
- Traylor-Skanska-JayDee (Designer CH2M)
- $330 million contract amount, $319 M final amount
- Award: May 2011
- Substantial completion: Dec 2015

23 feet in diameter
24,207 feet long
05/2011 to 08/2015
Traylor-Skanska-JayDee
Blue Plains Tunnel

Tunnel Boring Machine
- Best day: 150 feet
- Best Week: 631 feet
- Average: 57 ft/day (excludes zero days)
- 726 calendar days
- Bolted and gasketed concrete steel fiber reinforced segments
- EPBM - Herrenknect

MBE/WBE
- Design MBE/WBE = 46%/5% (goal= 28%/4%)
- Construction MBE/WBE = 38%/3% (goal= 32%/6%)
- Total payments to MBE/WBE more than $110 M

Local Resident Hiring
- 591 cumulative employees on project
- 239 from DC and user jurisdictions
- 40 new hires sourced from Dept. of Employment Services (DOES)
Blue Plains Tunnel Innovations

- First design-build project for DC Water
- 100 yr design life → 100 yr Green Century bond
- Proprietary collaboration procurement process
- Protected 100 year old sewers from shaft excavation with unintrusive soil mix columns
- Slurry wall containment wall replaces jet grouting for watertight TBM launch
- Circular deaeration at intermediate shafts eliminated separate drop shafts and deaeration tunnels
- Binocular shaft at Blue Plains eliminated connecting tunnel between shafts

![Circular Deaeration Shaft](image)

![“Binocular” Shaft](image)
Blue Plains Tunnel
Safety

- Completed more than 1.6 million person-hours without a lost time accident
- Maintained a recordable incident rate (RIR) well below the Bureau of Labor Statistics (BLS) national average for heavy civil construction:
  - TSJD: 1.82
  - BLS national average: 3.0
Historical Delivery Methods

- DC Water has typically used traditional Design-Bid-Build (DBB) delivery process

- For LTCP projects, DC Water considered alternative project delivery methods, recognizing:
  - Tunneling projects differ from typical DC Water CIP
  - Early contractor involvement can reduce risks
  - Consent Decree schedule was a big driver
Project Delivery
Rationale for Design-Build

- Benefits from early contractor involvement:
  - Opportunity to reduce uncertainties between parties (mutual risk reduction)
  - Contractor design decisions
  - Facilitates discussing issues in a confidential setting pre-bid
  - Enhances alternative technical approaches
  - Schedule compression and flexibility
- Need for price certainty
- Price competition
- Sensitive to marketplace’s concerns on risk allocation and procurement confidentiality
- Consent Decree
Design-Build Procurement Process

- **Industry Outreach**: Generate Project Interest, Update on Project Progress
- **RFQ**: Request Qualifications Statements
- **Shortlist**: Evaluate SOQ and Shortlist up to 4 Teams
- **Collaboration**
  - Confidential Meetings
  - Review Technical Approach
- **Technical and Cost Proposals**: Teams Provide Technical Approach to Build Project
- **Evaluation**
  - Review and Score Technical Proposals
- **Interviews**
  - Conduct Interviews with Shortlisted Teams
- **Selection**
  - Review Final Scoring
  - Open Price Proposals
  - Select Based on Best Value
- **Clarifications and Debrief**
  - Contract Clarifications
  - Incorporate Components of Technical Proposals
  - Hold Debrief Meetings with Unsuccessful Teams
  - Provide Stipend to Unsuccessful Teams

**Best Value**

- Technical Proposal Evaluation Factors (35% of score)
  - Project Management and Organization
  - Design and Construction Plan
  - M/WBE Business Development Plan, Local Hiring Initiative and Subcontracting Plan
- Price Proposal (65% of score)
- Selection on price and technical proposal = best value

**TIMEFRAME**

- 1 month before RFQ
- 6 month process
- 1 month before RFP Issued
- 8 to 9 months
- 2 months
- 1 to 2 weeks
- 1 month

---

Claro: 21
LESSONS LEARNED
Lessons Learned

- Become owner of choice
  - Be fair, listen to contractors concerns, pay on time, fairly adjudicate claims
- Design-builder participation during collaboration extremely valuable
- Select key topics for collaboration and conduct substantive discussions on construction approaches
  - e.g. TBM selection, shaft construction techniques, dewatering, maintenance of traffic
- Clarifications phase is valuable in reaching a final contract
- Challenges bring up opportunities to make broader changes that benefit the entire program
- Remain focused on your overall vision and goals – keep these in mind when approaching problems

Blue Plains Tunnel was an excellent project, built on time, under budget, safely and with high quality
A Drop’s Life
Questions

Carlton M. Ray

e-mail: CARLTON.RAY@DCWATER.COM

phone: 202-787-4469