# Healthier Waterways, Healthier Alexandria;
# Partnering with the Community for Project Success

AMERICAN ACADEMY OF ENVIRONMENTAL ENGINEERS & SCIENTISTS®

BLACK & VEATCH

**Thank you to our valued patron, Black & Veatch, for sponsoring this webinar and for their continued support of the Academy.**

Black & Veatch is an employee-owned global engineering, procurement, consulting and construction company with a more than 100-year track record of innovation in sustainable infrastructure. Since 1915, we have helped our clients improve the lives of people around the world by addressing the resilience and reliability of our most important infrastructure assets.

***Our webinar will begin in a few moments.***

Leadership and Excellence in Environmental Engineering and Science

# Healthier Waterways, Healthier Alexandria

## Partnering with the Community for Project Success

September 21, 2021

# Presentation Outline

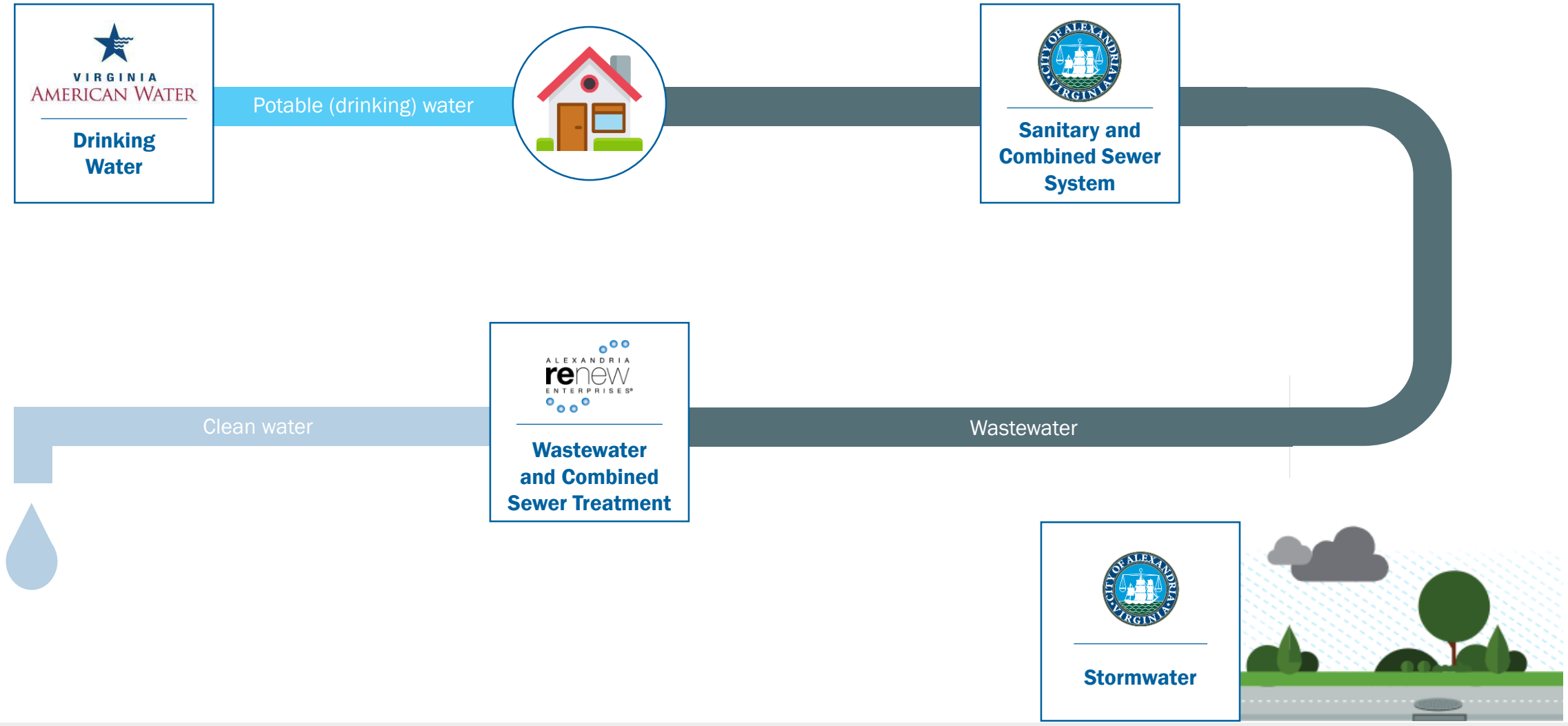
- AlexRenew Background
- AlexRenew's New Water Environment Mission
  RiverRenew
- RiverRenew Tunnel Project
  The largest infrastructure project in Alexandria's history
- Planning
  Leveraging Community Input to Select the Best Alternative for Alexandria
- Design
  Minimizing Community Impacts through the Selection and Siting of Facilities
- Construction
  Communicating Progress, Impacts, and Mitigation Approaches
- Education
  Growing the next generation of scientists, engineers, and mathematicians
- Takeaways

# AlexRenew Background


# Alexandria has an Educated and Engaged Citizenry

- Population of approximately 160,000
- 50% of residents with a bachelor's degree or higher
- 65 standing boards, commissions, and committees
- Governed by a City Council
- Centralized historic district (Old Town)

# How Water Works in Alexandria



# AlexRenew At-a-Glance

- Independent political subdivision created under the Virginia Water and Wastes Authorities Act in 1952
- Serves over 300,000 customers in Alexandria and Fairfax County
- Led by a five-member citizen Board of Directors
- Primarily funded through sewer fees
- Fairfax County pays AlexRenew for wholesale wastewater services for a portion of the County
- AlexRenew pays Arlington County to provide wastewater services for a small portion of Alexandria

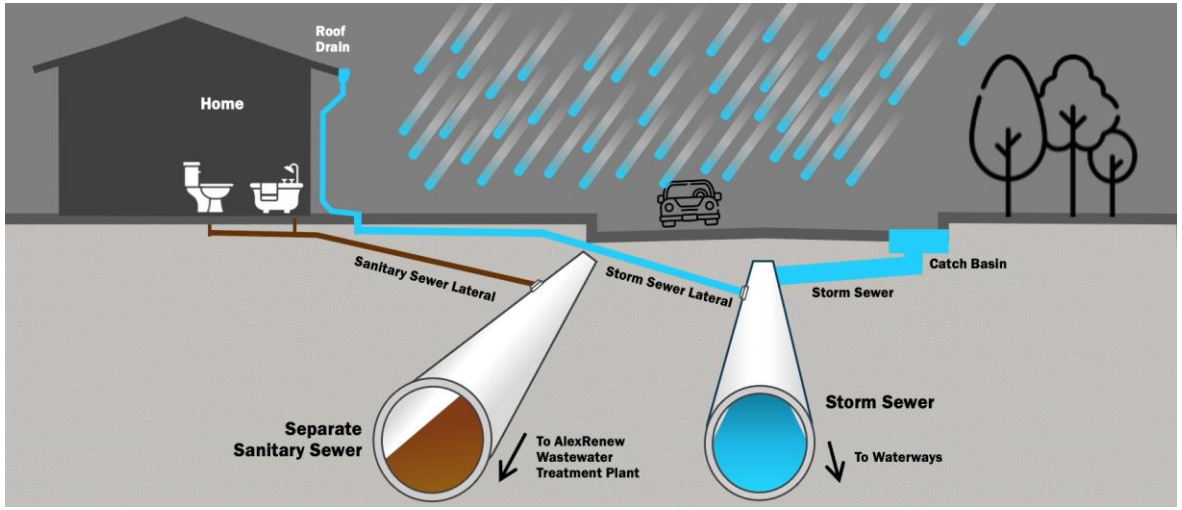
**4** pumping stations

**4** combined sewer outfalls

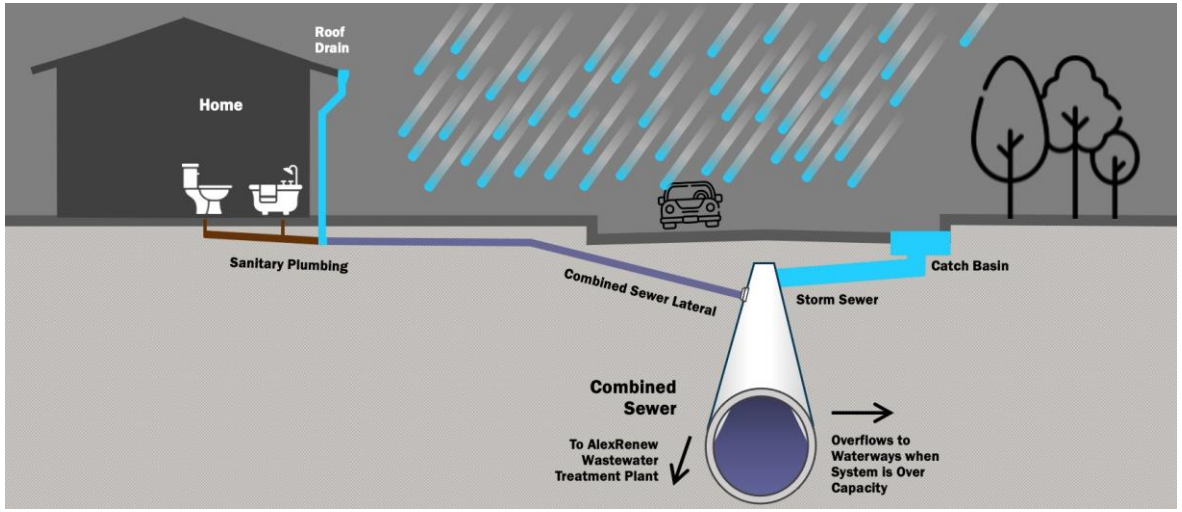
**20** miles of sewer interceptors

**38** million gallons of wastewater treated daily

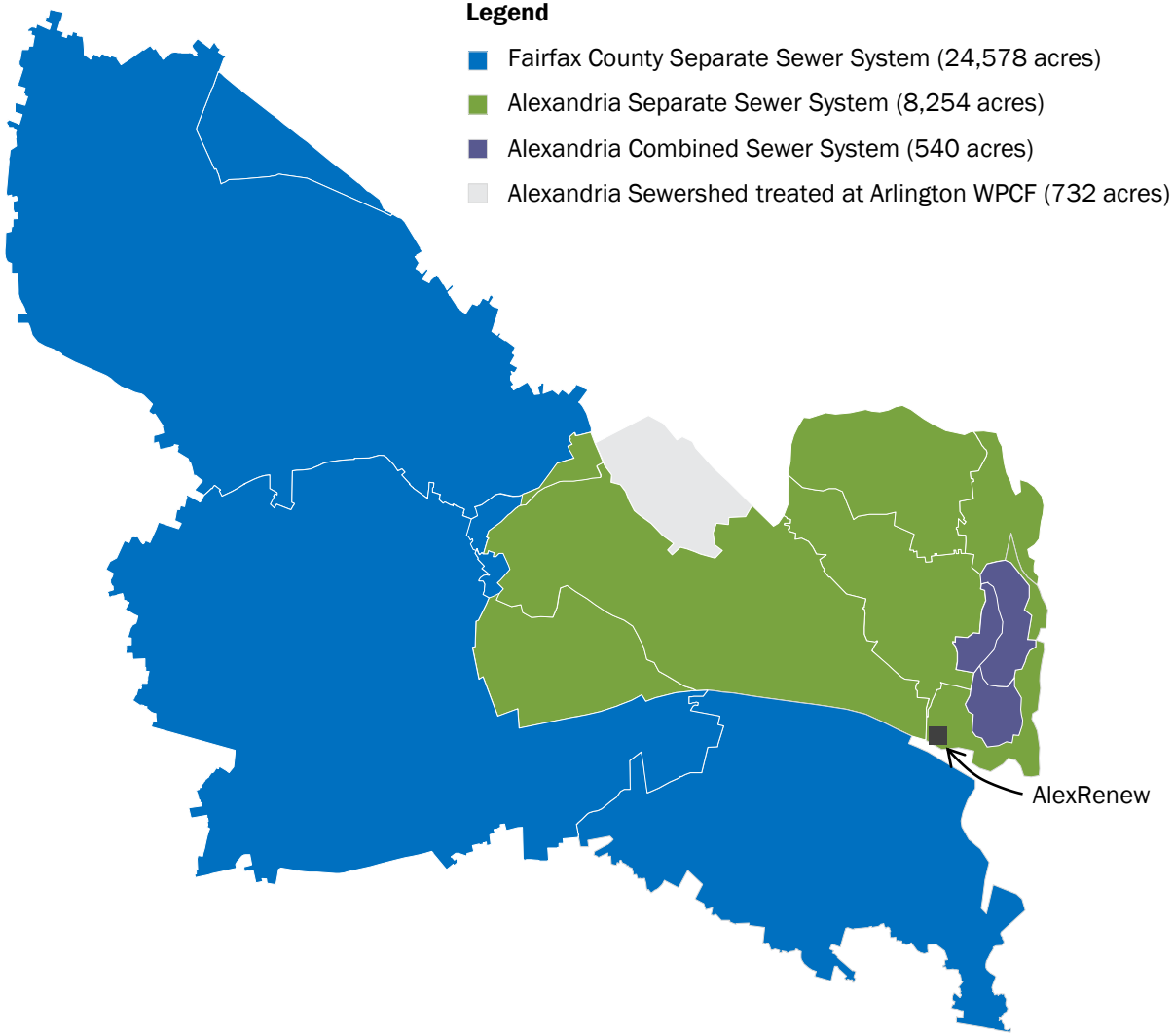
# AlexRenew Serves both Separate and Combined Sewer Systems




Separate Sanitary Sewer System




Combined Sewer System



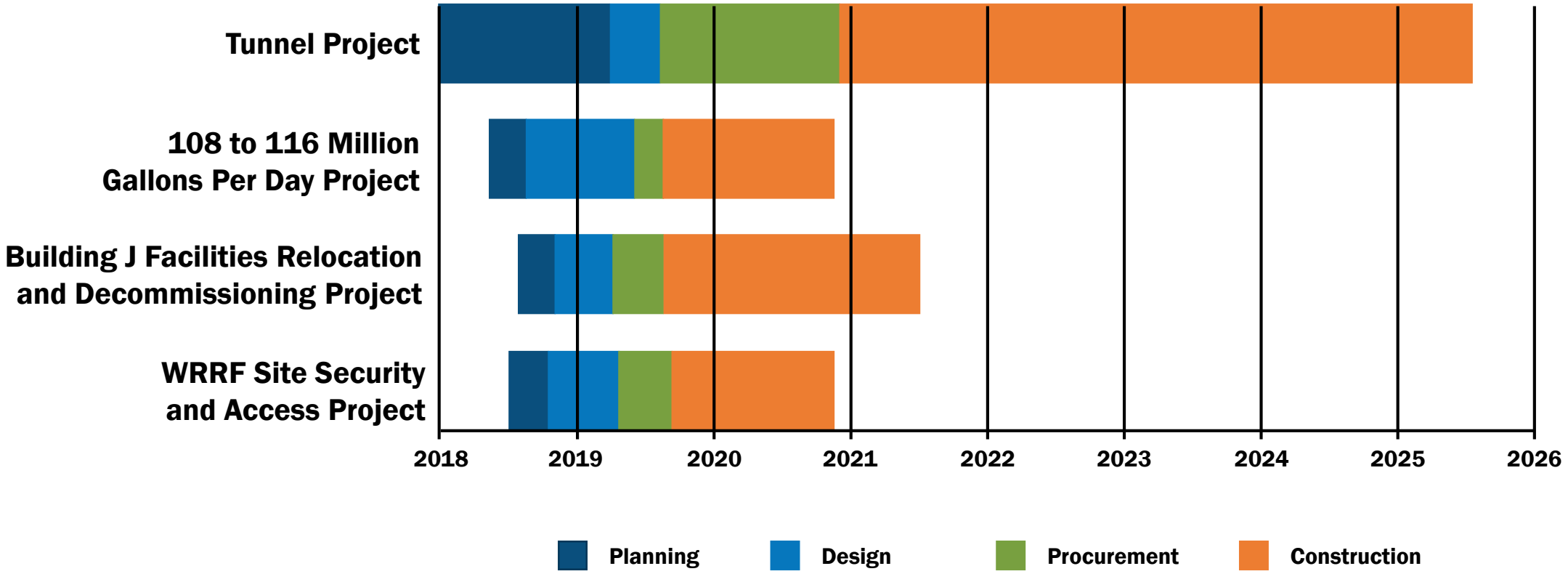
# AlexRenew's New Water Environment Mission

## RiverRenew

# AlexRenew's New Water Environment Initiative: RiverRenew

- 2017 law enacted by Virginia General Assembly
  - Required City of Alexandria to plan, design, and construct a solution to bring four existing combined sewer outfalls into Federal and State compliance
  - Required completion by July 1, 2025
- In July 2018, the City of Alexandria transferred the four existing outfalls and RiverRenew ownership to AlexRenew

# The 2017 CSO Law Imposed One of the Most Aggressive Schedules of its Kind in the United States



# RiverRenew will Meet Strict Control Requirements Established by Total Maximum Daily Loads and EPA's CSO Control Policy

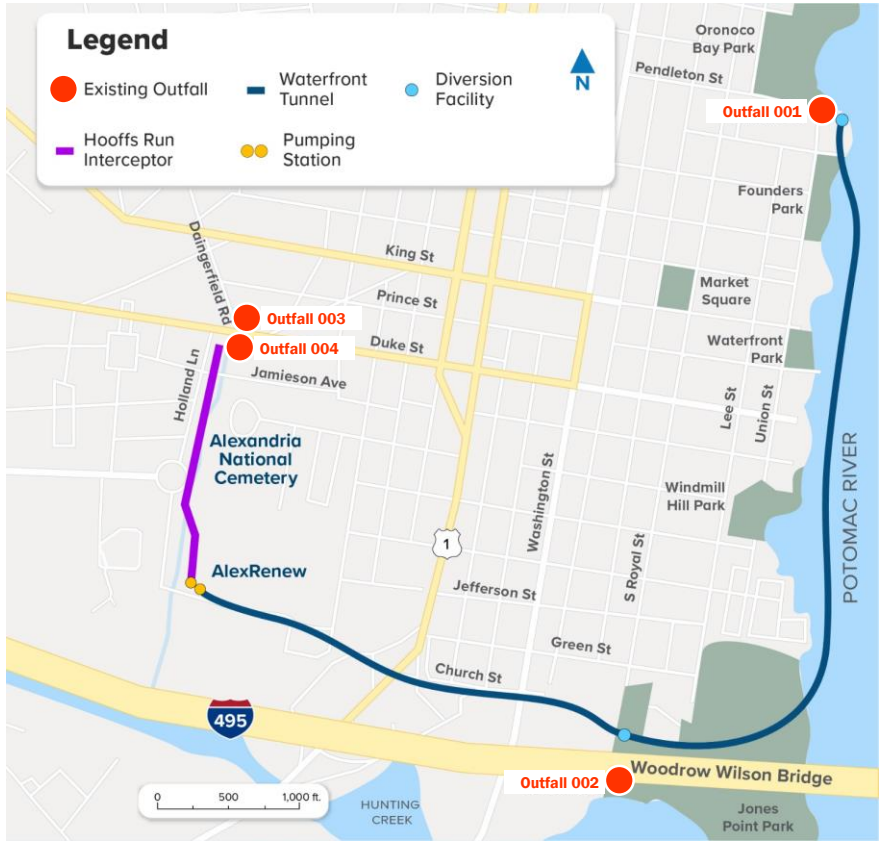
| Combined Sewer Outfall | Control Requirement | Before RiverRenew* | | After RiverRenew* | |
|---|---|---|---|---|---|
| | | Overflow Volume (million gallons) | Overflow Events | Overflow Volume (million gallons) | Overflow Events |
| 001 | EPA Presumption Approach, 4-6 OF/yr | 63 | 37 | 9 | <4 |
| 002 | TMDL, 80% Reduction | 38 | 46 | 5.5 | 2 |
| 003 | TMDL, 99% Reduction | 31 | 70 | 0.7 | 2 |
| 004 | TMDL, 99% Reduction | 8 | 44 | 1.5 | <1 |
| System-wide Percent Capture | | **70 percent** | | **98 percent** | |

**Performance based on 2000-2016 climate period*

# RiverRenew Tunnel Project

## The largest infrastructure project in Alexandria's history

# RiverRenew At-a-Glance




**Tunnel Project**

Construction of tunnel to capture and transport CSOs

Dec 2020 – July 2025

**Ongoing**

$454.4M*

## Wastewater Projects to Pave the Way for the Tunnel Project


Increase of primary pumping capacity to 116 MGD

Aug 2019 – Dec 2020

**Complete**

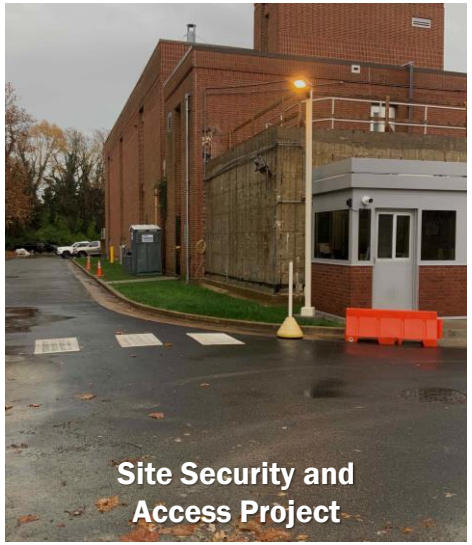
$5.0M*


Relocation of building uses and building demolition

Jul 2019 – Jun 2021

**Complete**

$19.4M*




Upgrades to existing access and security systems

Aug 2019 – Dec 2020

**Complete**

$1.5M*

*Denotes construction cost

# RiverRenew Tunnel Project At-a-Glance

## Components:

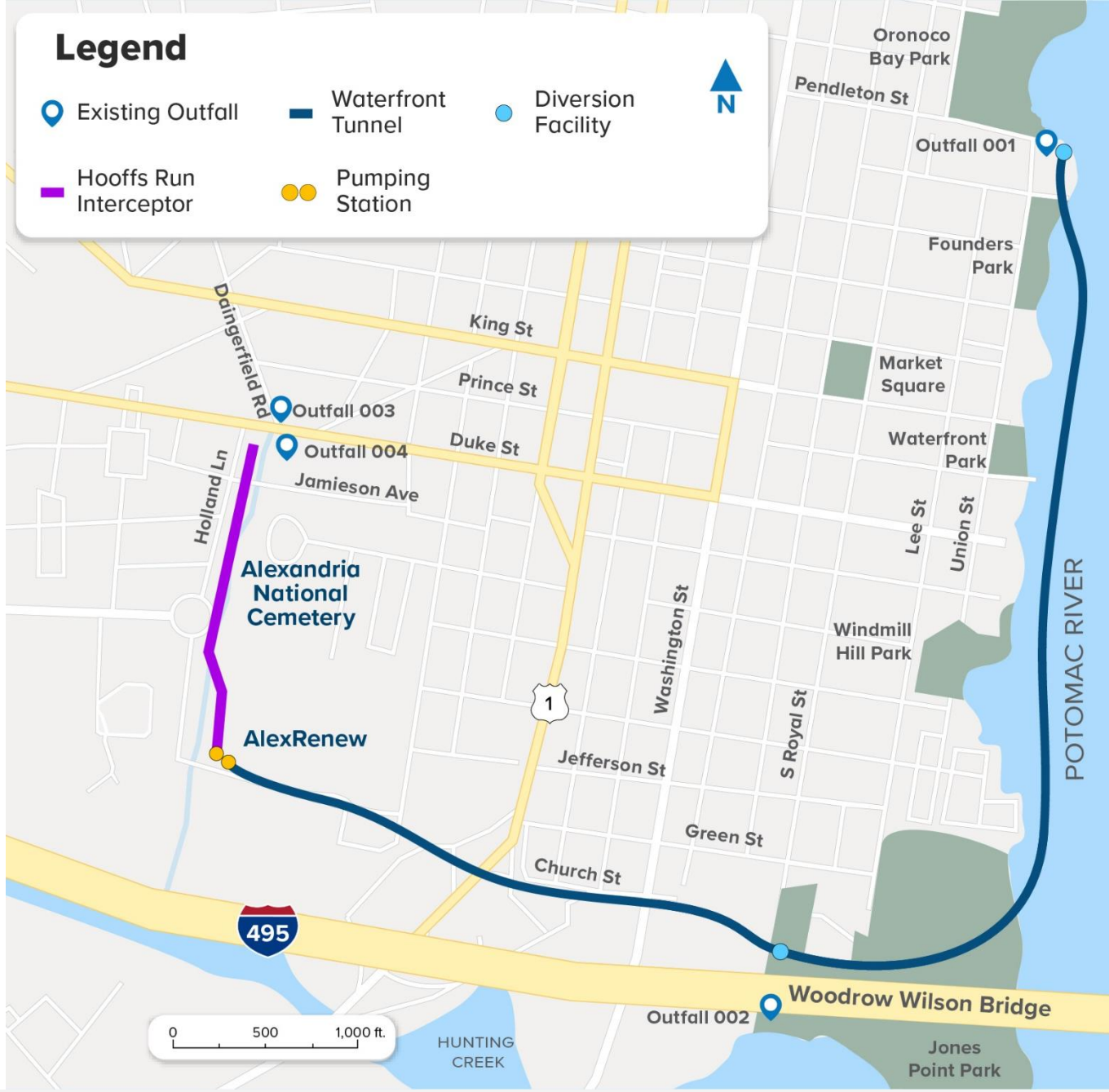
- Two-mile-long, 12-foot-wide **Waterfront Tunnel** approximately 100 feet below ground
- **Diversion facilities** to direct combined sewage into the tunnel system
- Half-mile-long, six-foot-wide **Hooffs Run Interceptor**
- **Pumping stations** housed in two large shafts
- Superstructure to house pumping station equipment

## Construction Cost:

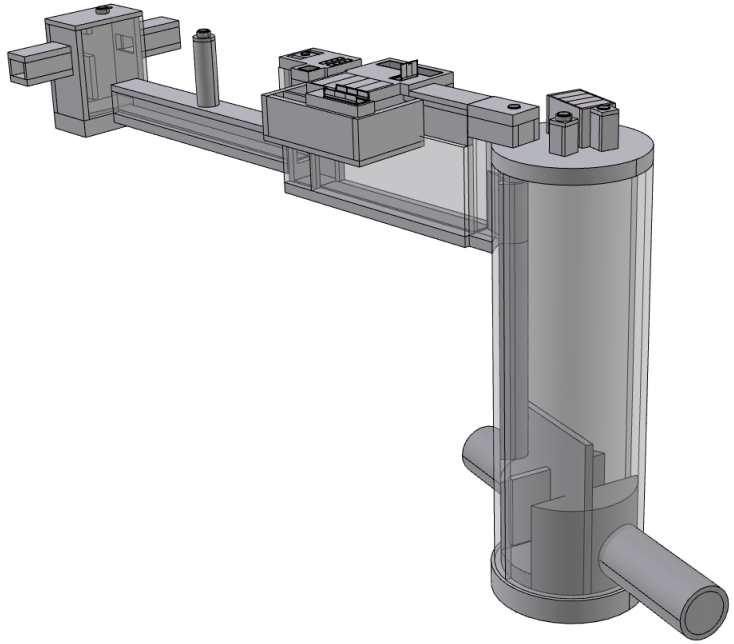
- $454.4 million

## Tunnel Project Schedule:

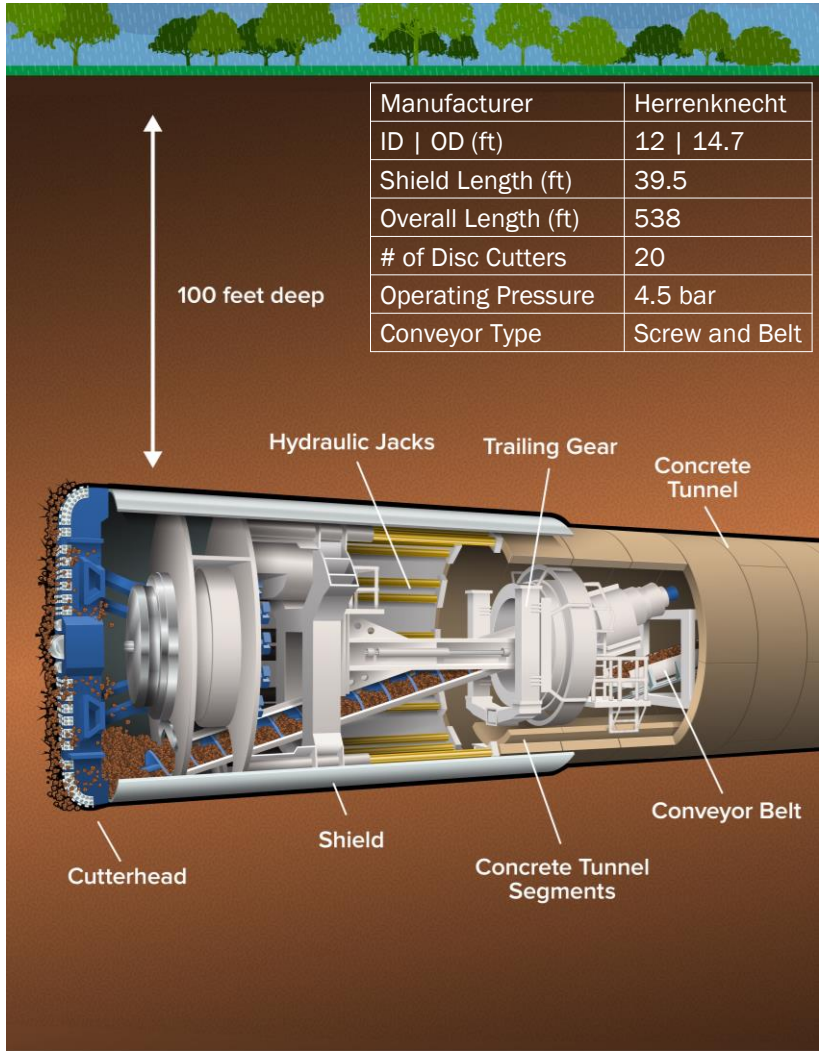
- December 2020 – July 2025



# Major RiverRenew Tunnel Project Components

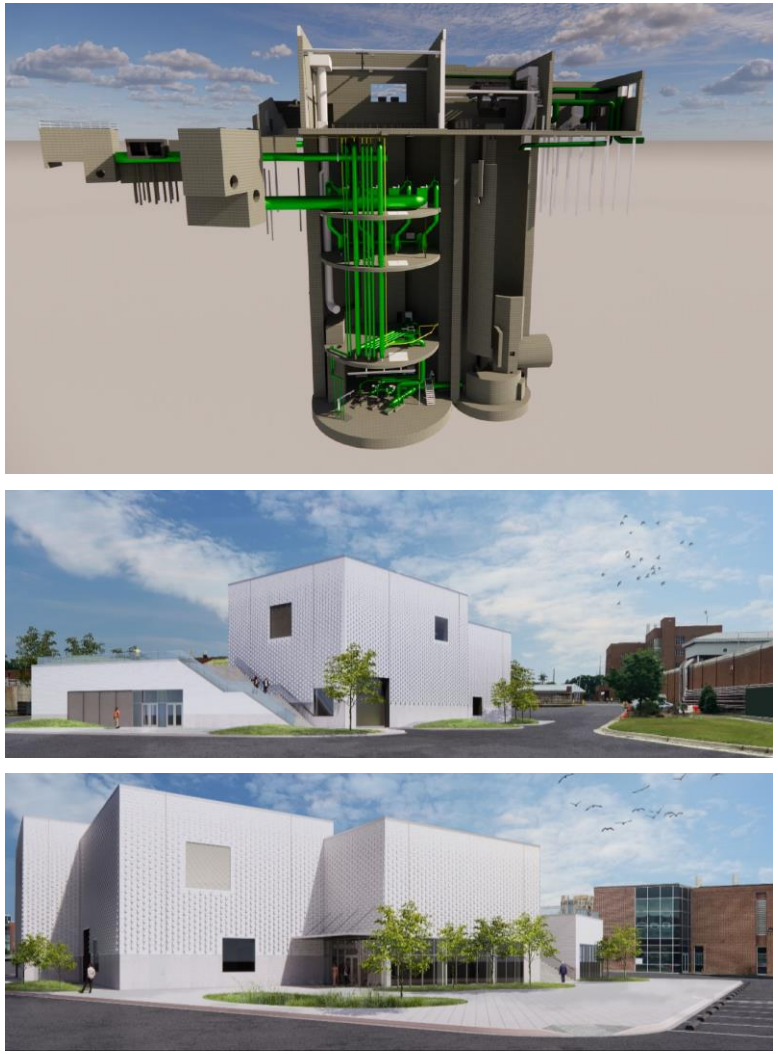


**Diversion Facilities**



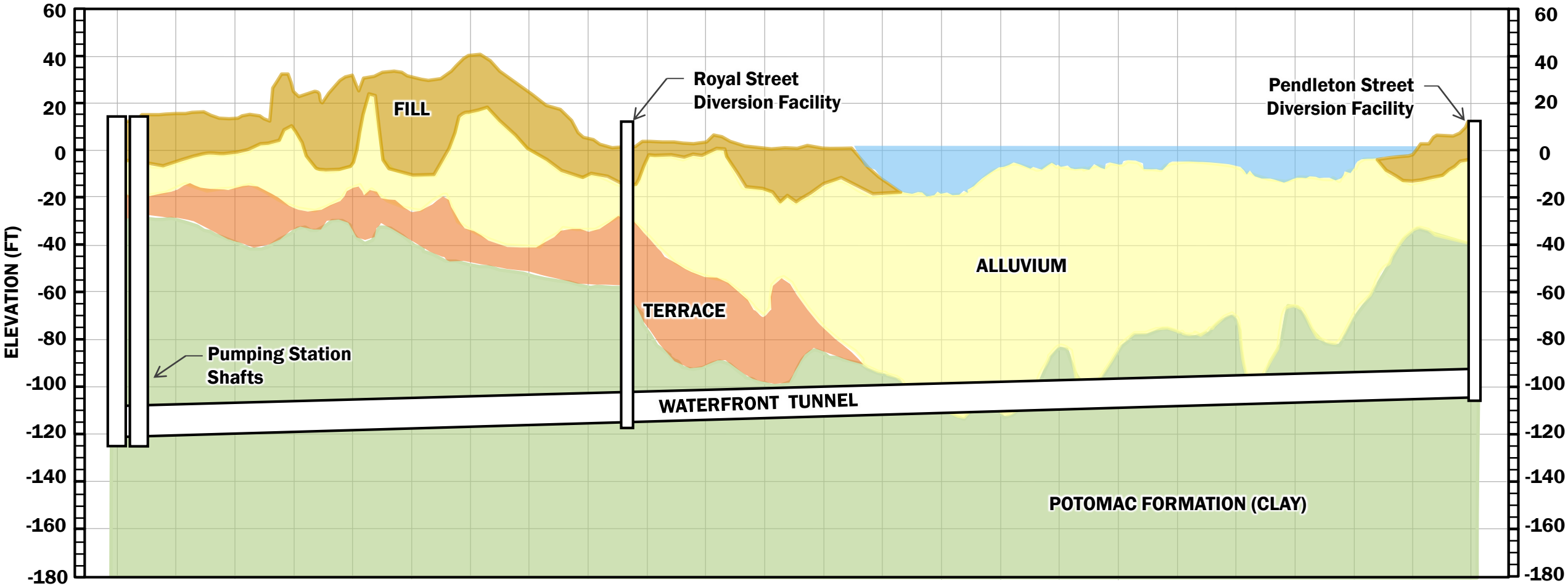

| | |
|---|---|
| Manufacturer | Herrenknecht |
| ID \| OD (ft) | 12 \| 14.7 |
| Shield Length (ft) | 39.5 |
| Overall Length (ft) | 538 |
| # of Disc Cutters | 20 |
| Operating Pressure | 4.5 bar |
| Conveyor Type | Screw and Belt |

**Waterfront Tunnel constructed using Earth Pressure Balance Tunnel Boring Machine**

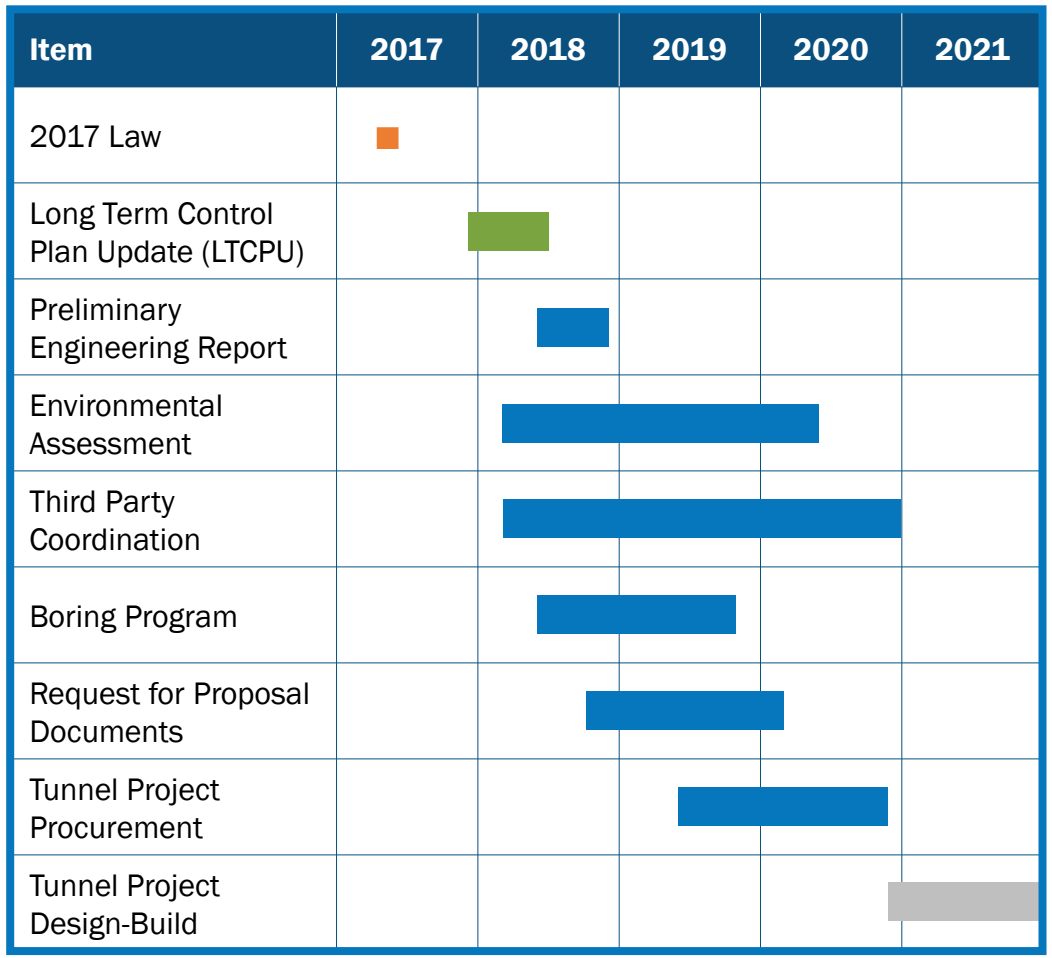


**20 mgd and 130 mgd Pumping Stations**

# The Geologic Profile for the Waterfront Tunnel was Developed from Nearly 100 Borings and Over 2,000 Soil Samples



# Community Feedback has been Vital in Shaping RiverRenew




**Major Outcomes of the 2017-18 PLANNING Stakeholder Advisory Group:**

- **Recommended Option B+** Unified Tunnel
- Challenged team to reduce **overflow volume** at Outfall 001
- Noted Alexandria's historic character and requested the team to consider potential **impacts to historic structures**

**Major Outcomes of 2019-20 DESIGN Stakeholder Advisory Group:**

- Promoted **Community Listening Sessions**
- Gave feedback on **tunnel routes** and **facility locations**
- Reviewed **procurement** criteria
- Reviewed the development of **Request for Proposal Documents**
- Supported development and approval of **Special Use Permits**
- Served as liaisons to community while AlexRenew completed **site investigation program**

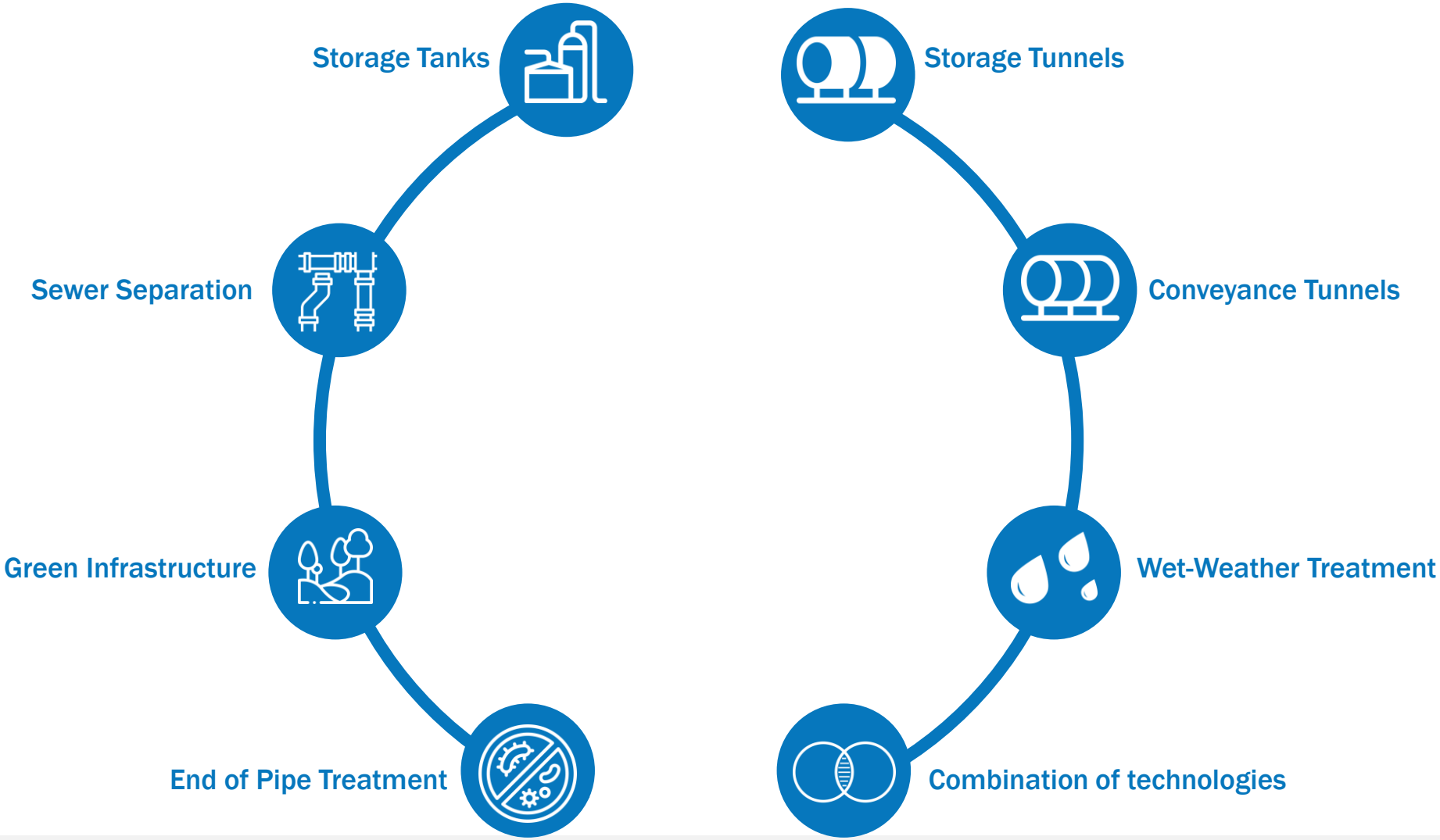
**2021-22 CONSTRUCTION Stakeholder Advisory Group:**

- Review and monitor construction progress
- Communicate progress to the community by leveraging existing networks
- Identify concerns and receive input from the public
- Provide recommendations regarding mitigation of construction impacts

# Planning

## Leveraging Community Input to Select the Best Alternative for Alexandria

# AlexRenew Evaluated an Array of Technologies to Achieve CSO Reduction Goals



# Tunnels or Tanks: Weighing the Best Alternative for Alexandria

## Life Cycle Costs
Minimize impacts to rate payers

## O&M Complexity and Reliability
Maximize reliability of meeting permits

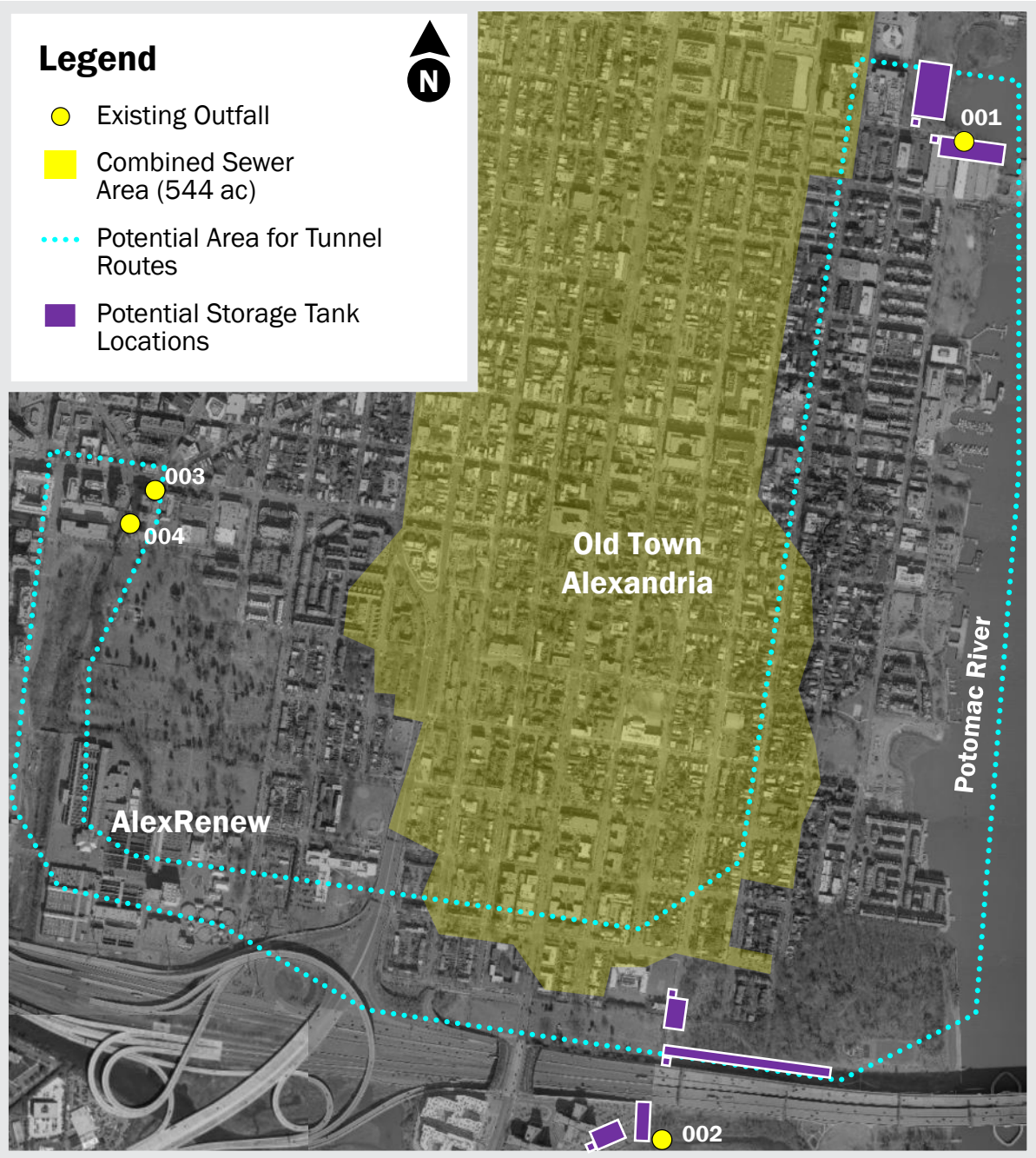
## Adaptability
Maximize ability to meet changing regulatory and climate conditions

## Schedule
Minimize schedule and third party risk

## Community Acceptance
Minimize community disruptions

Tunnels: **4.1**

Tanks: **1.7**

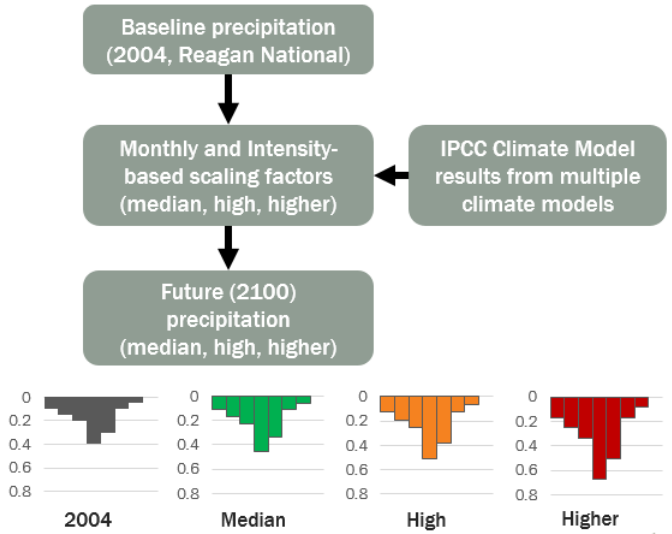


# AlexRenew's Water Resource Recovery Facility is Central to Achieving CSO Goals

# Ensuring RiverRenew is Adaptable and Resilient

## Future climate precipitation projection generated to evaluate performance of Option B due to potential climate change

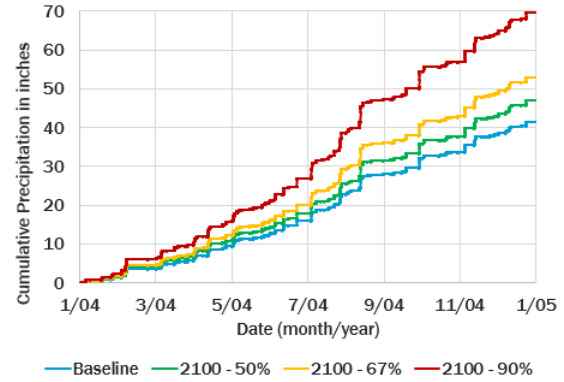
- **"Baseline" Year 2004** used for actual historical precipitation
- **Future climate for 2100** from IPCC climate model outputs using highest greenhouse gas emissions (RCP 8.5)
- **Baseline precipitation scaled** to create an estimated future climate precipitation
- **Range of projections reflects uncertainty**
  - Median (50th percentile of climate model results)
  - High (67th percentile of climate model results)
  - Higher (90th percentile of climate model results)



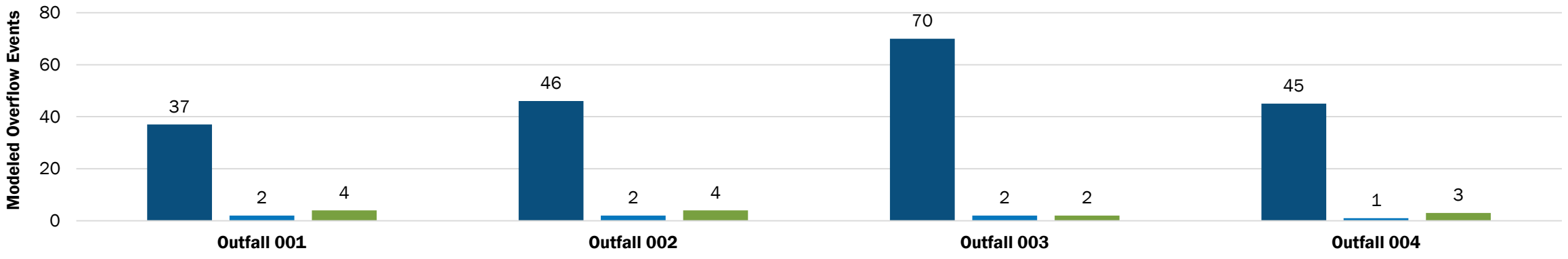



## Estimated future climate precipitation for year 2100

| Annual Results | Baseline | Median (50%) | High (67%) | Higher (90%) |
|---|---|---|---|---|
| Total precipitation (inches) | 41.3 | 47.0 | 53.0 | 69.5 |
| Added precipitation (inches, over baseline) | - | 5.7 | 11.7 | 28.2 |
| Percent increase | - | 14% | 28% | 68% |





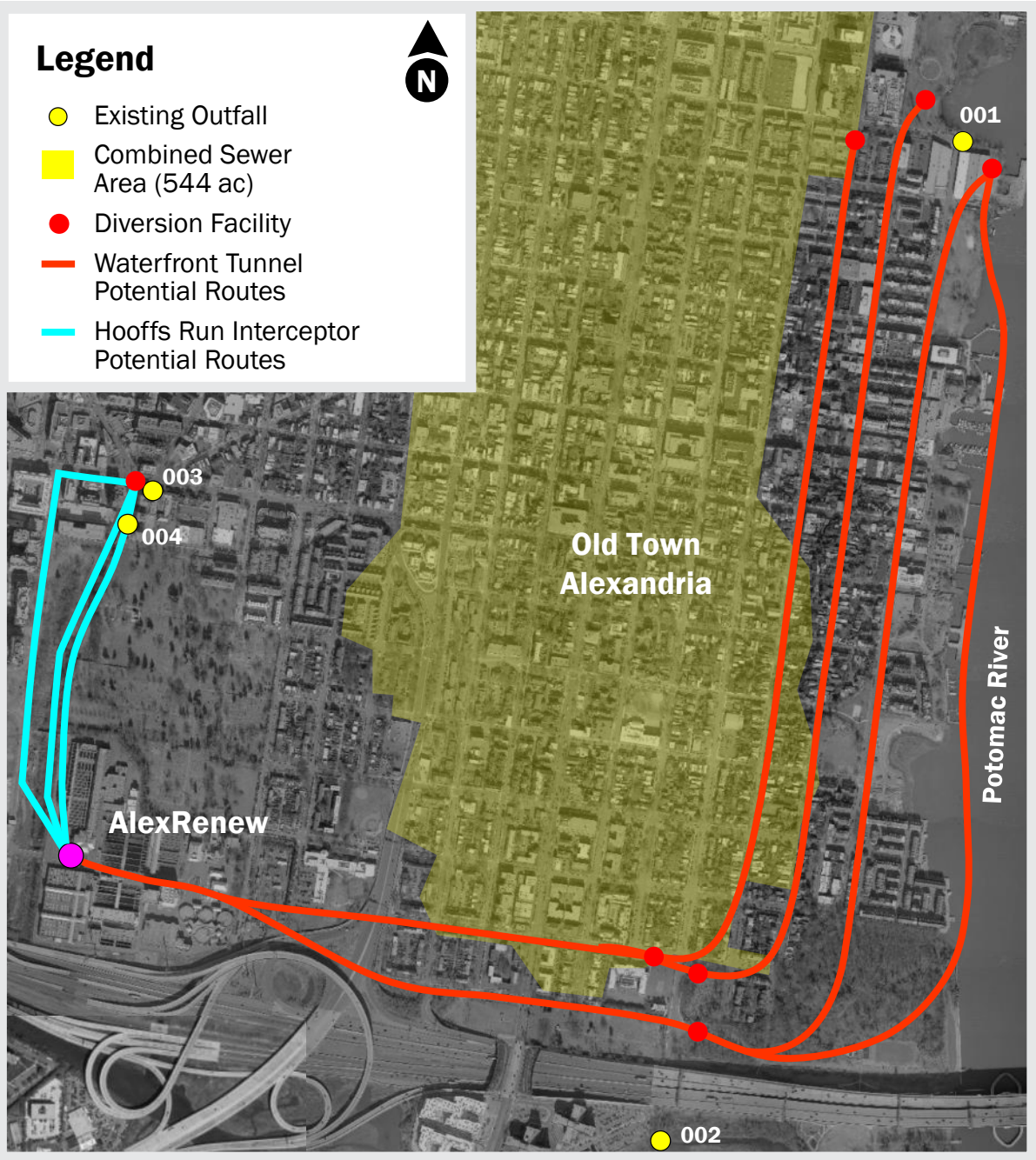
# Design

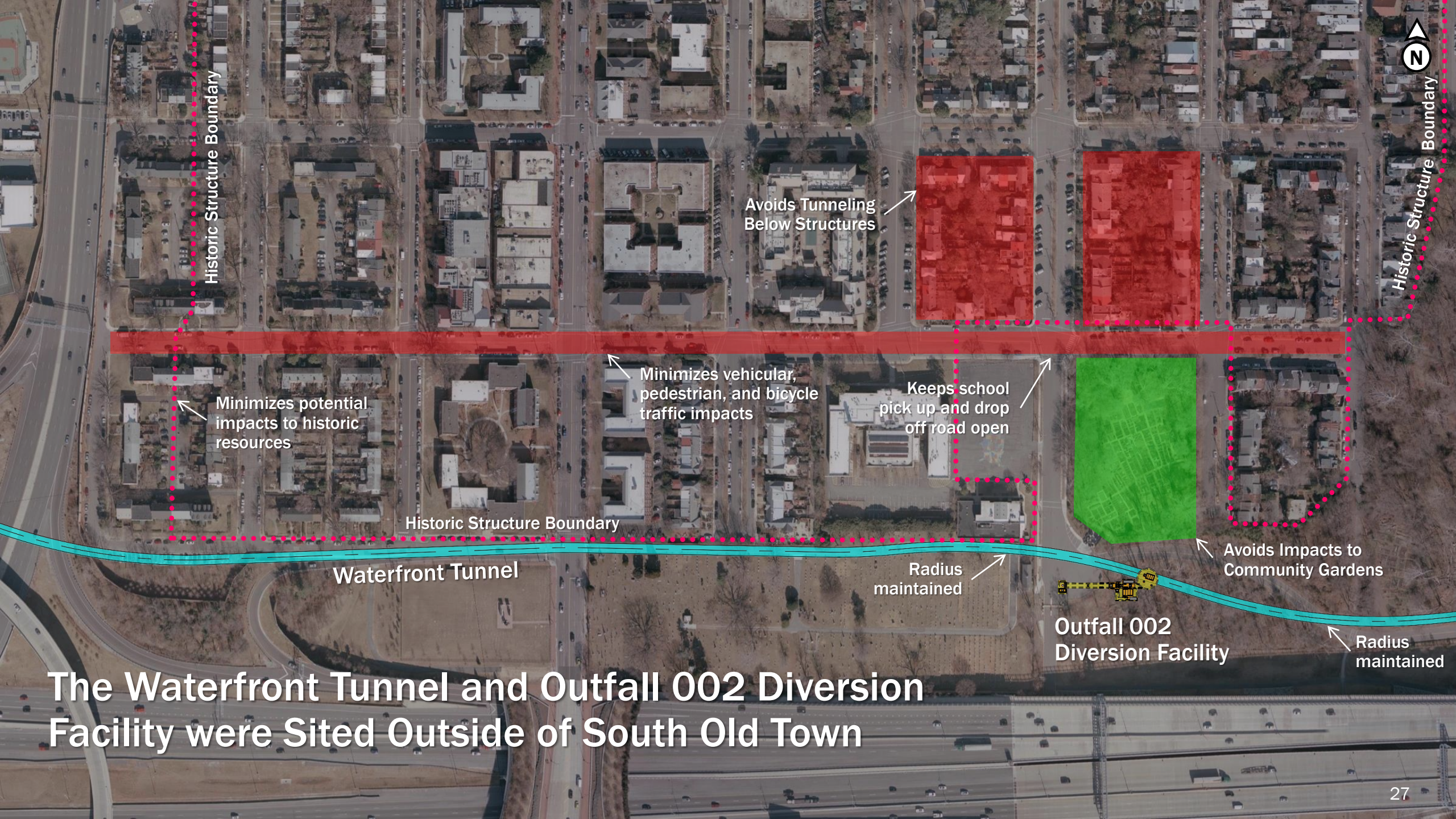
## Minimizing Community Impacts through the Selection and Siting of Facilities

# AlexRenew Sought Input on Tunnel Routes and Diversion Facility Locations through a Series of Community Listening Sessions

# Spaghetti Map of Potential Tunnel Routes and Diversion Facility Locations

- Minimize proximity to **existing structures**
- Avoid tunneling **below structures**
- Construct tunnel from AlexRenew
- Locate **Outfall 002 Diversion Facility** as far south as possible
- Stay within **Potomac Formation**
- Keep Pressure **below 3-Bar**
- Avoid piles and foundations
- Maintain tunnel curves at or above **1,200-feet**
- Consider depths for **pumping**

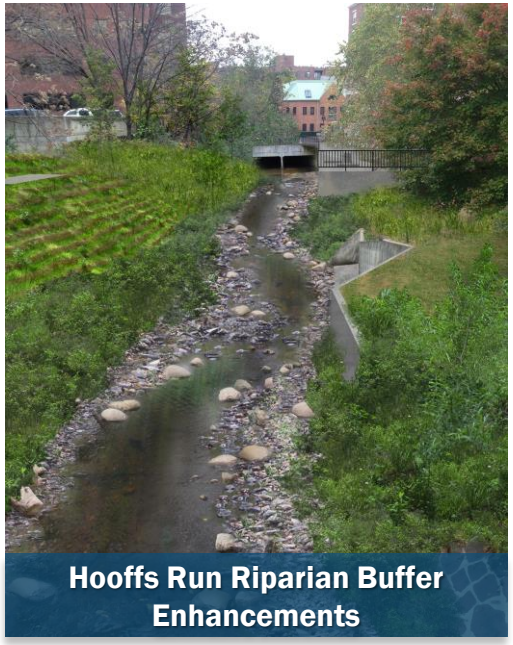





# The Waterfront Tunnel and Outfall 002 Diversion Facility were Sited Outside of South Old Town

# The Multiple Civic and Environmental Benefits at the Restored Sites Helps the Community See and Understand their Water Infrastructure Investment

Oronoco Bay Promenade at Outfall 001



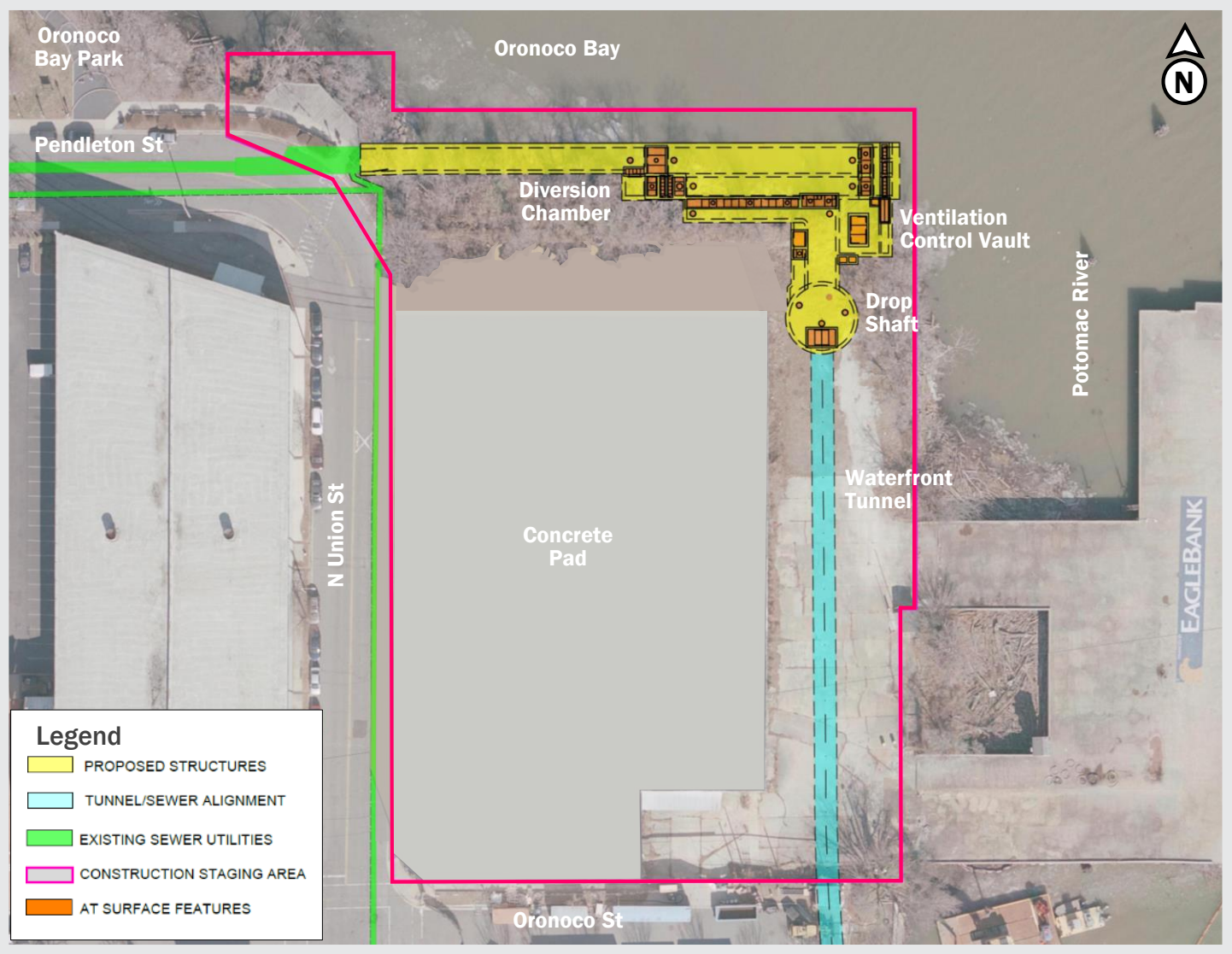
Hooffs Run Riparian Buffer Enhancements


Jones Point Park Native Plantings

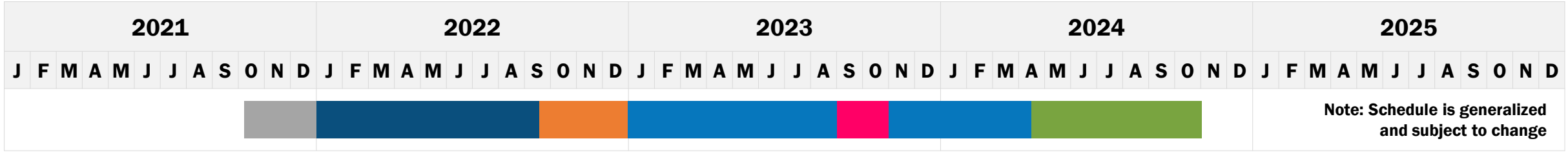
# Construction

## Communicating Progress, Impacts, and Mitigation Approaches

# Proposed Pendleton Street Diversion Facility



# Pendleton Street Diversion Facility Schedule





**Site Preparation**

**Support of Excavation**

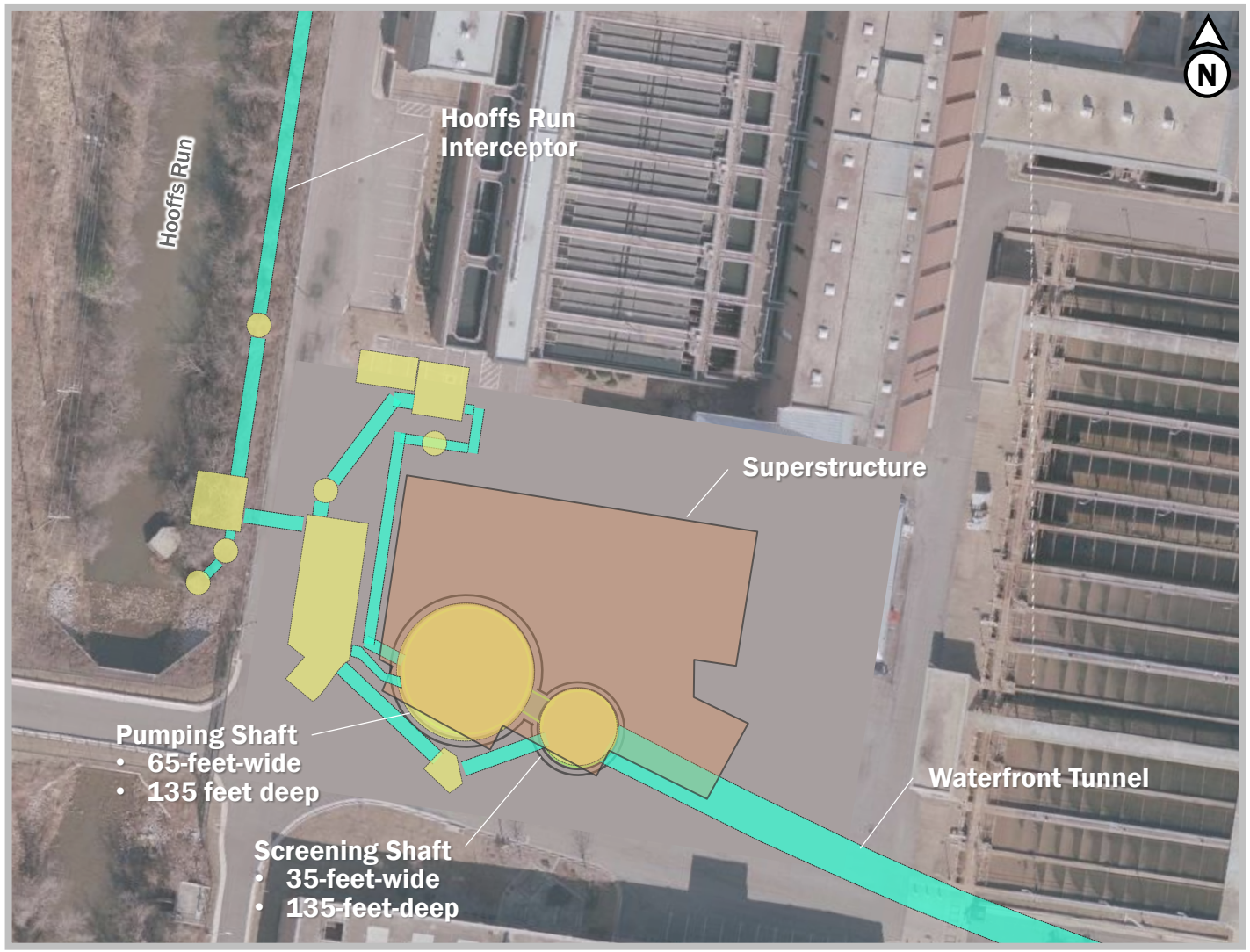
**Excavation**

**Permanent Structures**

**Tunnel Boring Machine Arrival and Removal**

**Restoration**

# Proposed Tunnel Project Facilities to be Constructed at AlexRenew



# AlexRenew Spent the Last Two Years Preparing its Wastewater Plant to Support Tunnel Construction

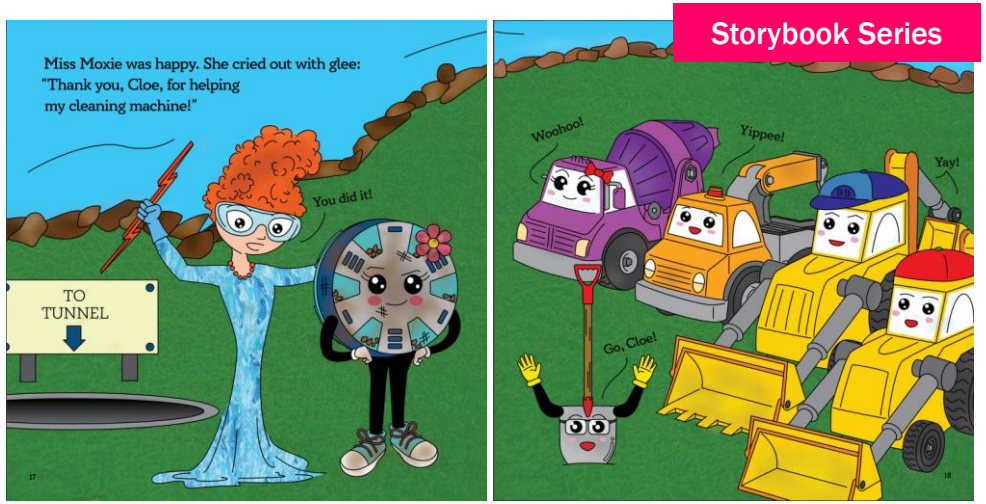
# Renderings of Pumping Station Superstructure

# Education

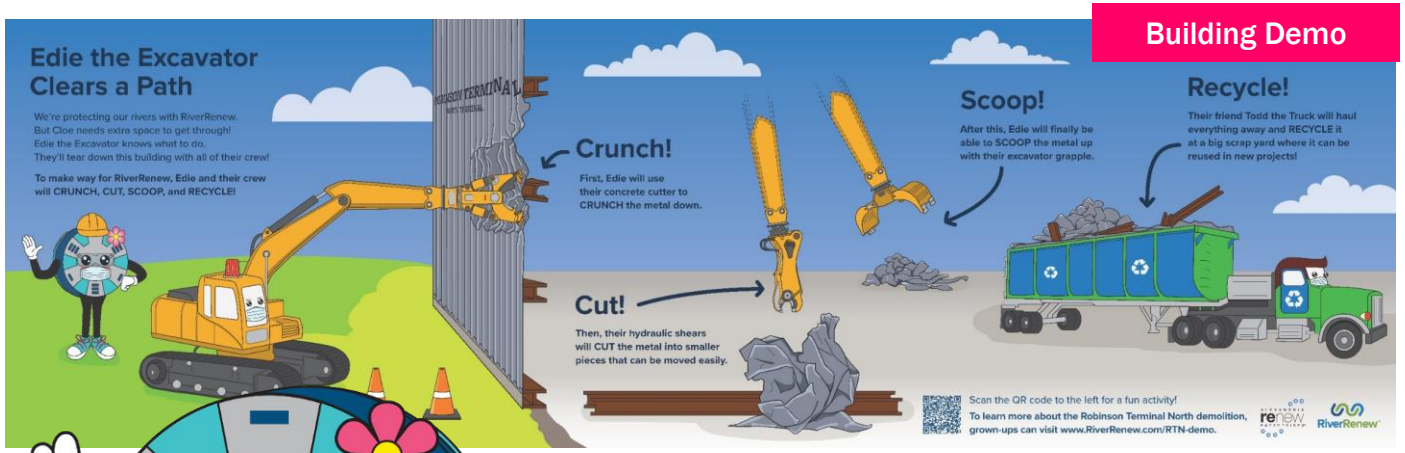
## Growing the next generation of scientists, engineers, and mathematicians

# Cloe's Corner on RiverRenew.com

Storybook Series

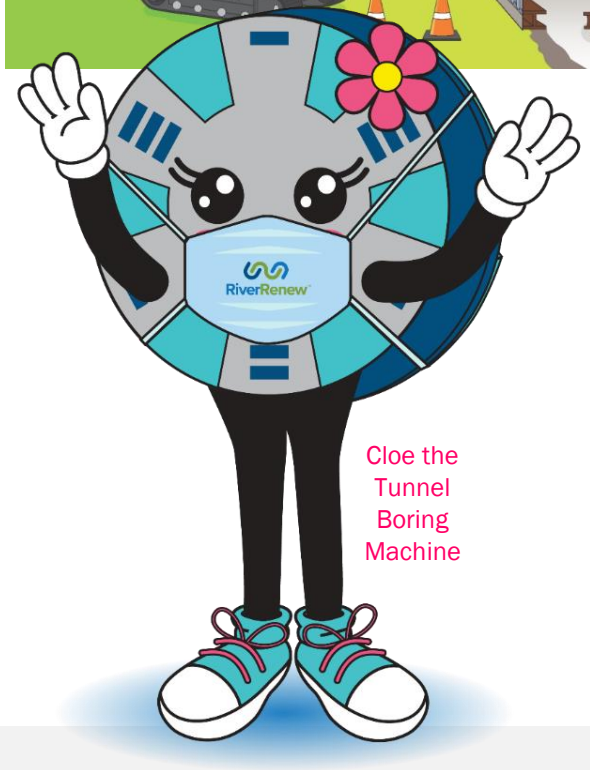



Building Demo

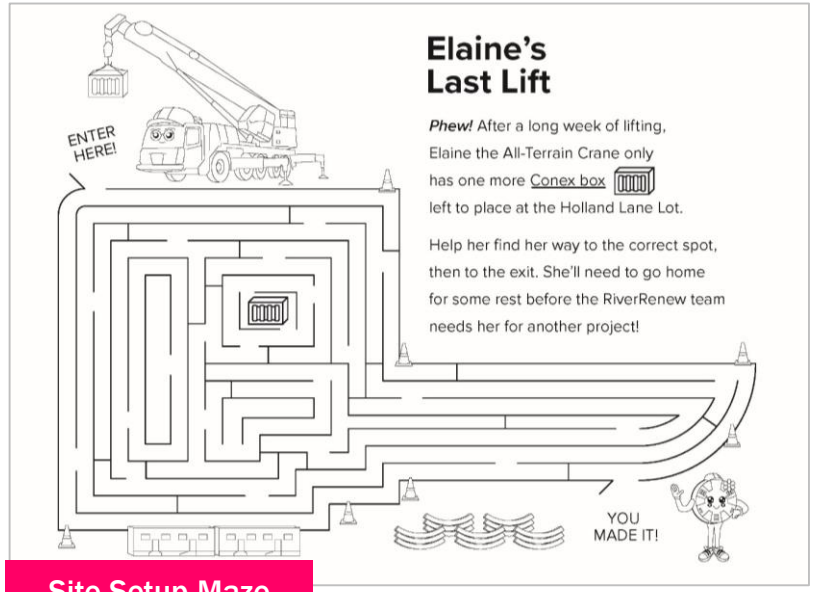




TBM Naming




Cloe the Tunnel Boring Machine




Site Setup Maze

# Takeaways

- Public works projects benefit the public
- Planning and design cannot be done in a vacuum – public input is crucial
- Technical solutions need to be designed to the environment
- Projects like RiverRenew provide STEM benefits
- Good engineering requires listening

ALEXANDRIA renew ENTERPRISES®

1800 Limerick Street
Alexandria, Virginia 22314
(703) 721-3500
alexrenew.com

# Healthier Waterways, Healthier Alexandria; Partnering with the Community for Project Success

AMERICAN ACADEMY OF ENVIRONMENTAL ENGINEERS & SCIENTISTS®

**Thank you for attending our webinar today. And thank you again to our sponsor, Black & Veatch.**

**Want to watch again?**
A recording of today's event will be available on our website tomorrow.

**Not an AAEES member yet?**
To determine which type of AAEES membership is the best fit for you, please go to AAEES.org or email Marisa Waterman at mwaterman@aaees.org

**Need a Certificate?**
You will be emailed a PDH Certificate for attending this webinar within two weeks.

**Want more?**
Our next webinar will be on October 6, 2021. A sign-up page will display when this event is over.

**Questions?**
Email Marisa Waterman at mwaterman@aaees.org with any questions you may have.

Leadership and Excellence in Environmental Engineering and Science