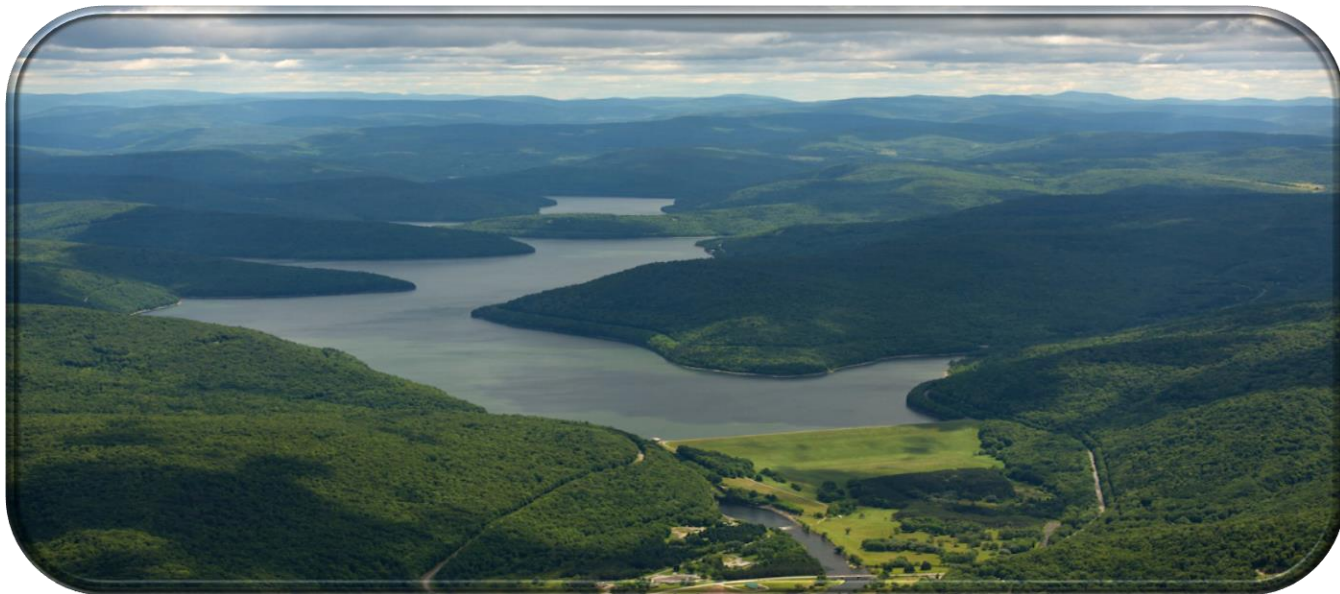


# Delaware Aqueduct Repair Update

October 12, 2021



**NYC**  
Environmental  
Protection

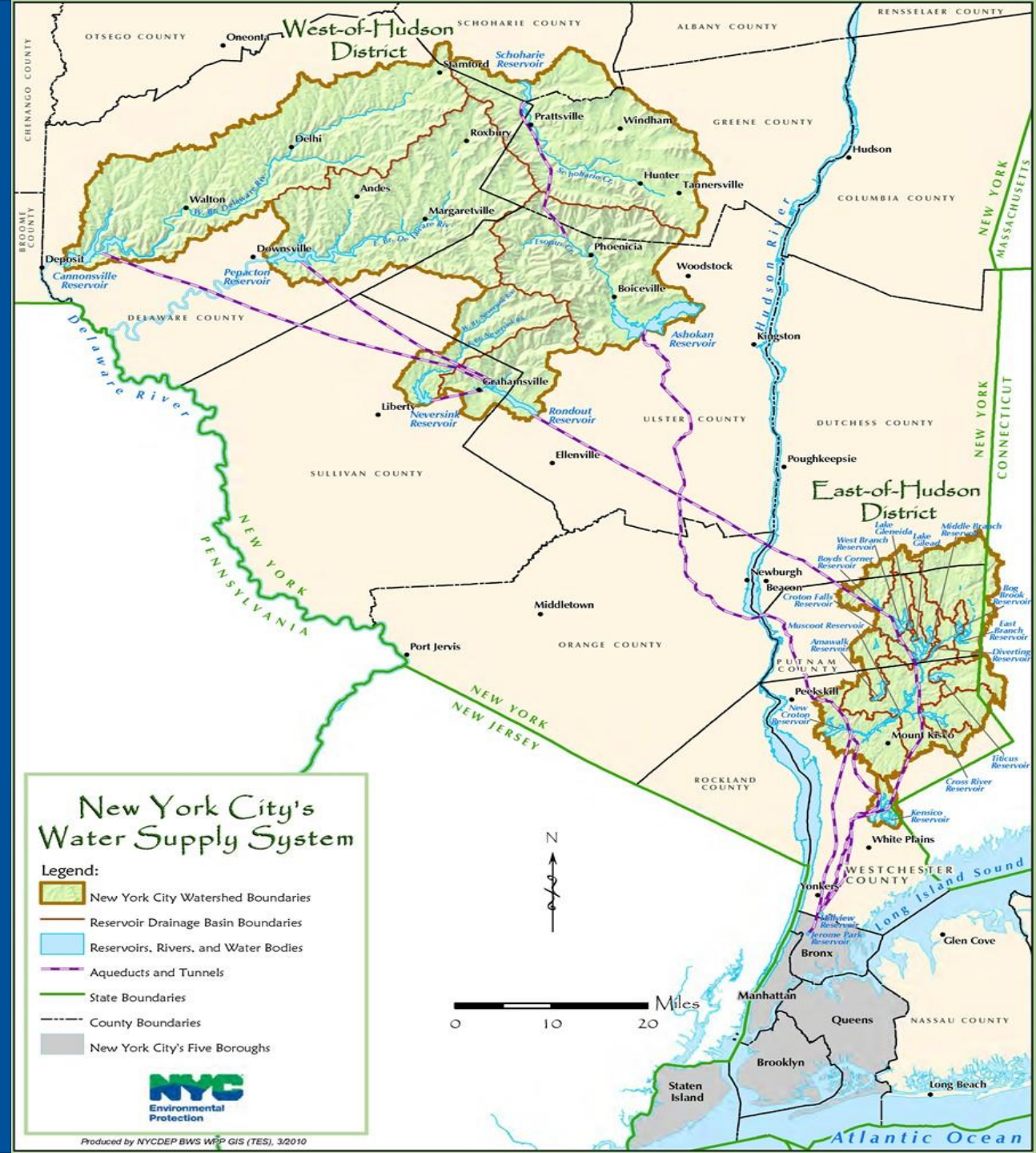
# Agenda

**Paul V. Rush, P.E.**  
BUREAU OF WATER SUPPLY

- System Overview
- Delaware Aqueduct
- History of the project
- Delaware operations during the shutdown
- Concerns
- Summary
- Questions

# System Overview

- Primarily a surface water supply
- 19 reservoirs & 3 controlled lakes
- System Capacity: 570 billion gallons
- Serves 9.8 million people Delivers approx. 1.1 billion gallons per day
- Source of water is a 2,000 square mile watershed in parts of 8 upstate counties



# Delaware Aqueduct

- 85 miles long from Rondout to Hillview Reservoir
- Longest tunnel in the world
- Conveys about 50-60 percent of NYC drinking water
- Put in service in 1944
- Last drained for inspection 1957-1958
- Critical system component
- Aqueduct consists of three segments
  - Rondout to West Branch (44 mi.)
  - West Branch to Kensico (27 mi.)
  - Kensico to Hillview (14 mi.)



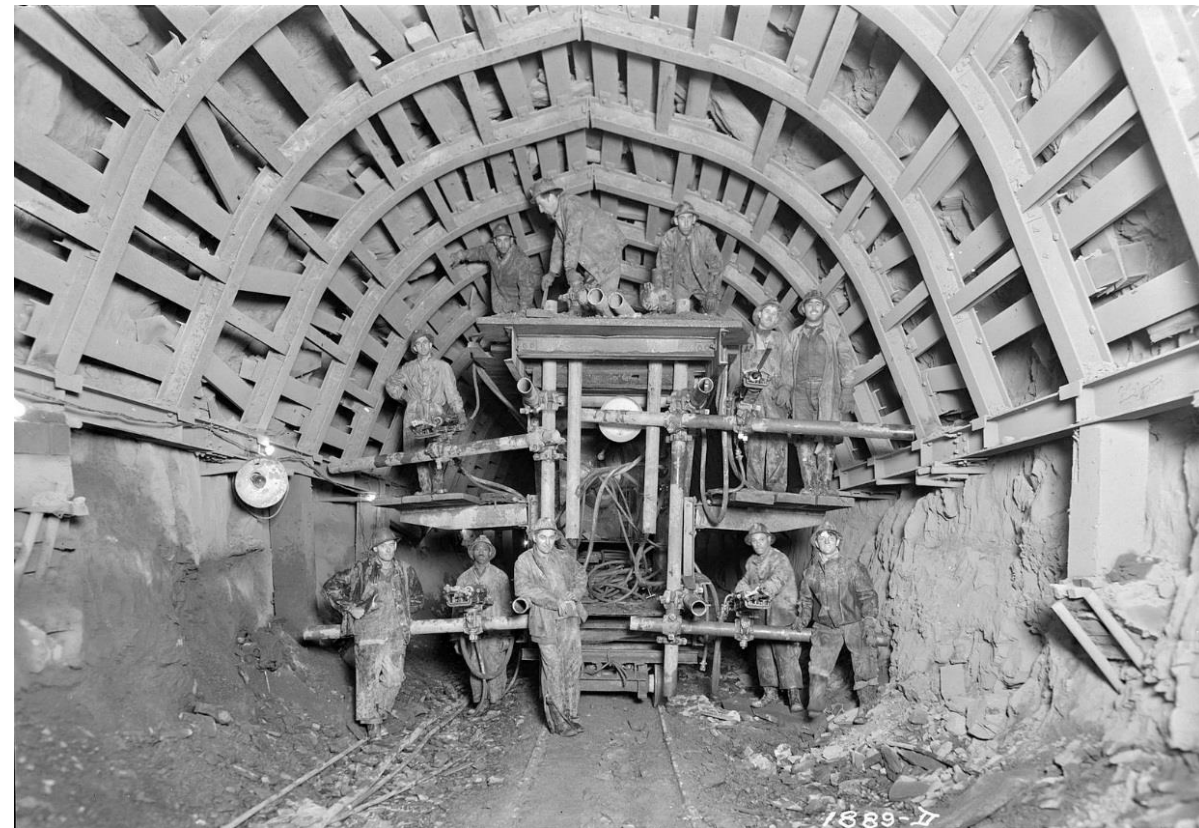


# Delaware Aqueduct



Workers in the Rondout-West  
Branch Tunnel

Workers on the drilling rig in the Rondout-  
West Branch Tunnel in Newburgh



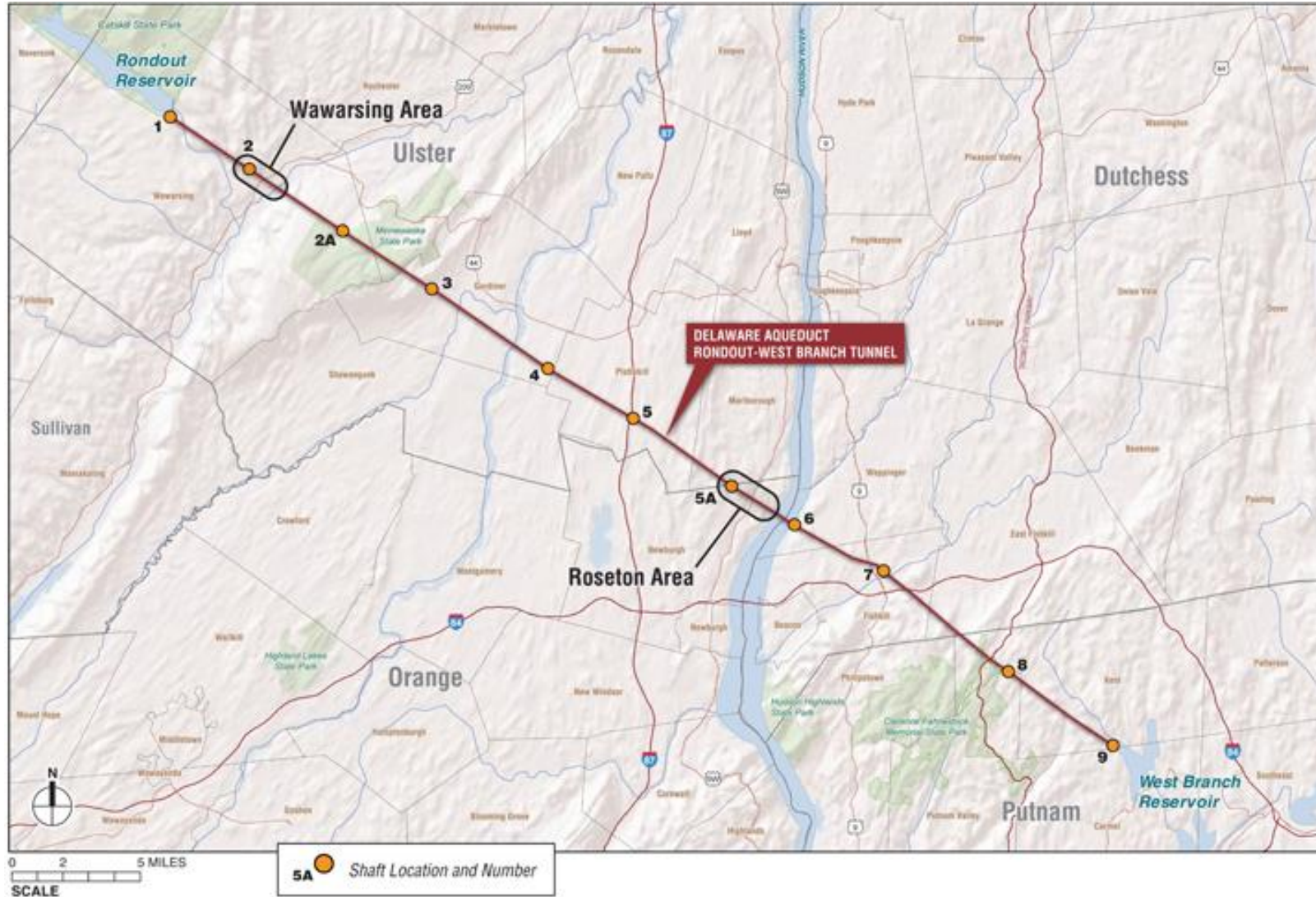
# Leak Discovery

- Leak identified in late 1990 at CHG&E Roseton generating station
- Leak identified in 1992 in Town of Wawarsing
- Total leakage rate estimated at approx. 20 MGD on typical day
- Approximately 95 percent is leaking from Newburgh section
- Difficult conditions encountered during construction – faulted limestone
- Steel lining installed through these sections to provide support for the tunnel





# Primary Areas of Concern

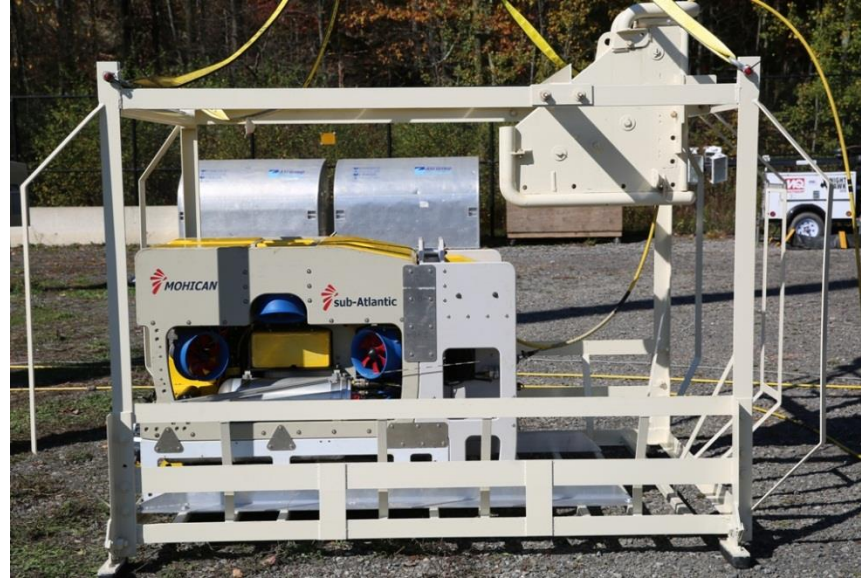




# Leak Investigation



Top: ROV used in 2015 to investigate locations in Wawarsing



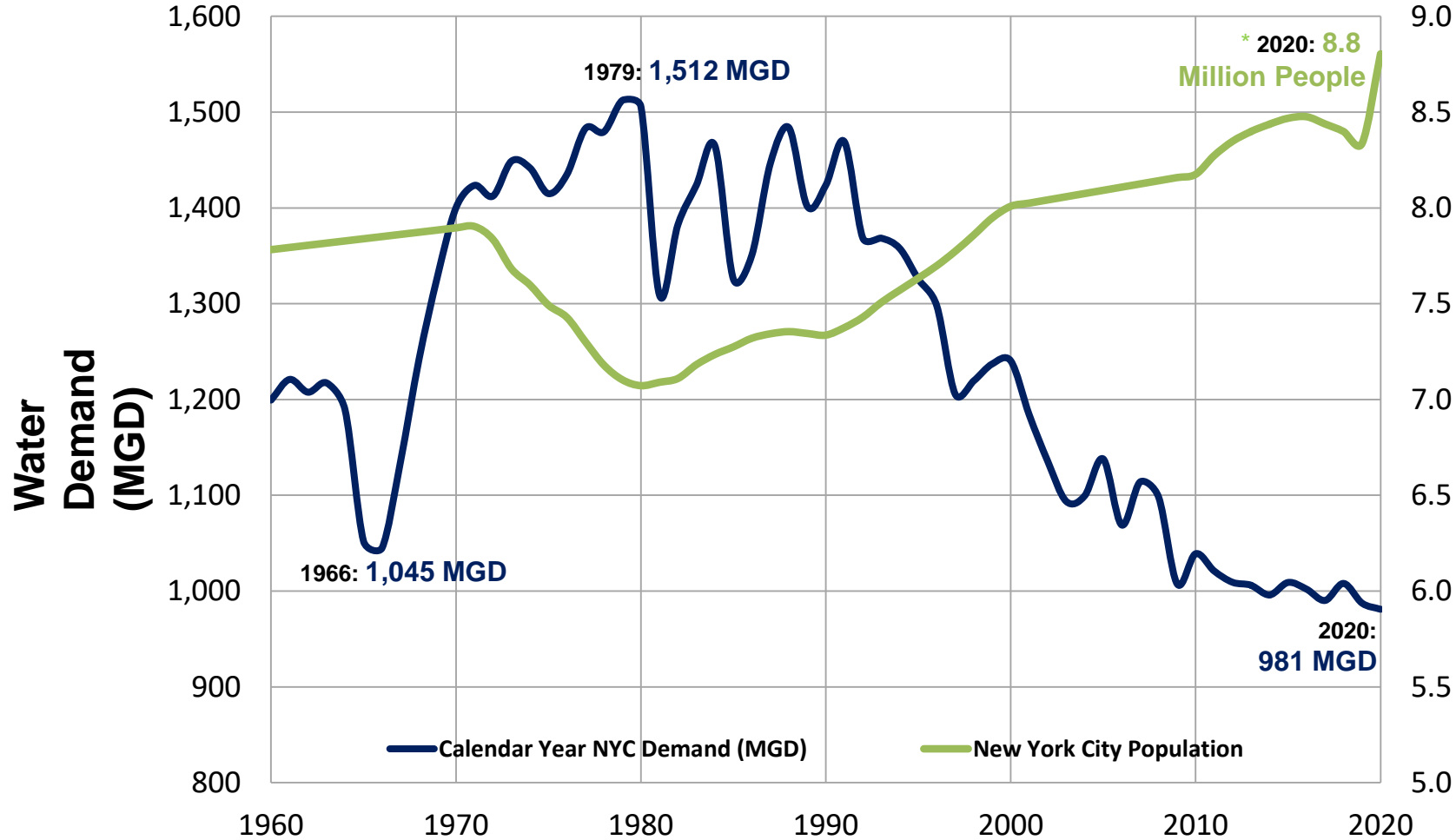
Bottom: AUV used in 2004, 2009, 2014 to investigate the Rondout-West Branch segment





# Challenge-1 Meeting Demand

- Water demand has declined more than **30%** since the early 1990s – despite increasing population
- Since 2009, water usage has been below the 1960s drought-of-record
- Daily demand peaked in 1979 at over 1.5 billion gallons (per capita of 213 gallons)

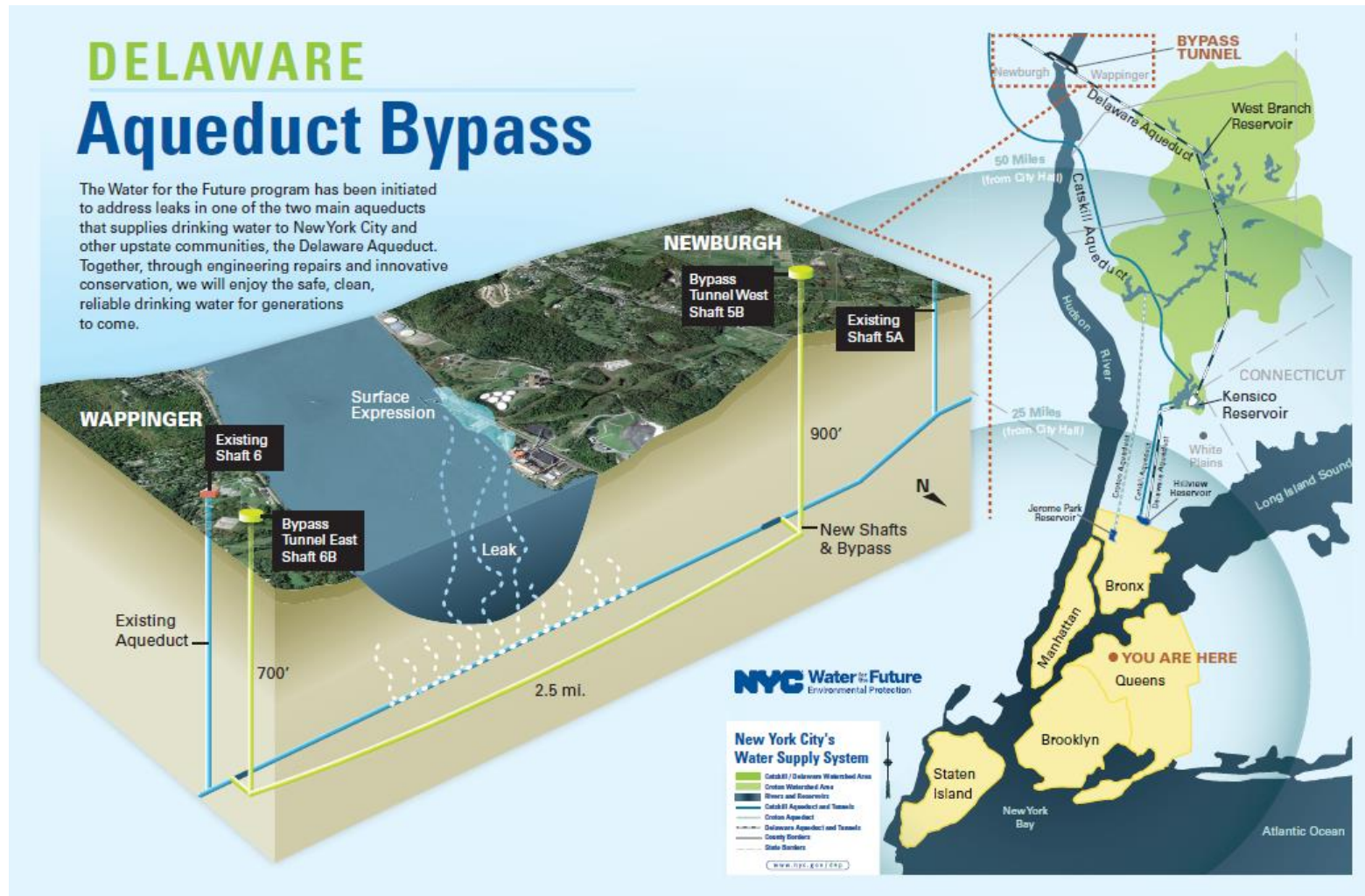


Average Daily Demand (MGD)
2011: 1,021
2012: 1,009
2013: 1,006
2014: 996
2015: 1,009
2016: 1,002
2017: 990
2018: 1,008
2019: 987
<b>2020: 981</b>

Per Capita Demand (GPD)
2011: 123
2012: 121
2013: 120
2014: 118
2015: 119
2016: 118
2017: 117
2018: 120
2019: 118
<b>2020: 111</b>

\* Official 2020 US Census and New York City Department of City Planning Estimate

# Challenge -2 Fixing the Tunnel





- Shafts completed in 2017 → roughly 845 feet at Newburgh, 675 feet at Wappinger
- Bell-out chamber (40 X 40 X 100) completed at bottom of Shaft 5B
- Tunnel boring machine completed excavation of the tunnel on Aug. 13, 2019
- Pulverized rock brought to surface and managed in Newburgh
- Steel liners installed and final concrete lining for the bypass tunnel finished in March 2021
- Shutdown for connection still planned for 2022-2023

## Status of Current Work



# Bureau of Water Supply

The mission of the Bureau of Water Supply is to reliably deliver a sufficient quantity of high quality drinking water to protect public health and quality of life of the City of New York.





# Water Supply Operations

- Essential Tasks

- Meet the supply needs of New York City
- Meet all reservoir release & diversion requirements
- Maintain system to ensure a dependable supply



- Objectives

- Divert the best quality water available
- Maintain balanced system
- Provide downstream habitat and flood mitigation benefits w/o water supply impact



# Water Supply Augmentation

- Catskill System – > 600 MGD
- Cross River and Croton Falls pumping stations – 240 MGD
- Croton System – 290 MGD





# Delaware Reservoir Operations

- Extensive modeling and analysis conducted
- System wide refill Spring of 2022
- Delaware System water favored for diversions to lower reservoirs ahead of shutdown
  - Keeping Catskill and Croton Systems as full as possible
- Releases will continue to be made throughout the shutdown and the goal is to maintain the CSSO



# Concerns

- Concerns we've heard:
  - Reservoirs being too full during the shutdown
  - Installing siphons at PCN
- ❑ Extensive planning and public process
- ❑ 20 years in the making
- ❑ Use state of the art models
- ❑ We don't have a crystal ball to predict the weather



WAISGLASS/COULTHART

*“...And this is our corporate planning group.”*



# Summary

- NYC's Water Supply benefits from wise investments in infrastructure
- We must:
  - Maintain a state of good repair
  - Stay on top of current research and regulatory trends to understand potential future challenges
  - Ensure system wide flexibility



# Questions

