

Delaware Aqueduct Repair: Other than the Bypass Tunnel

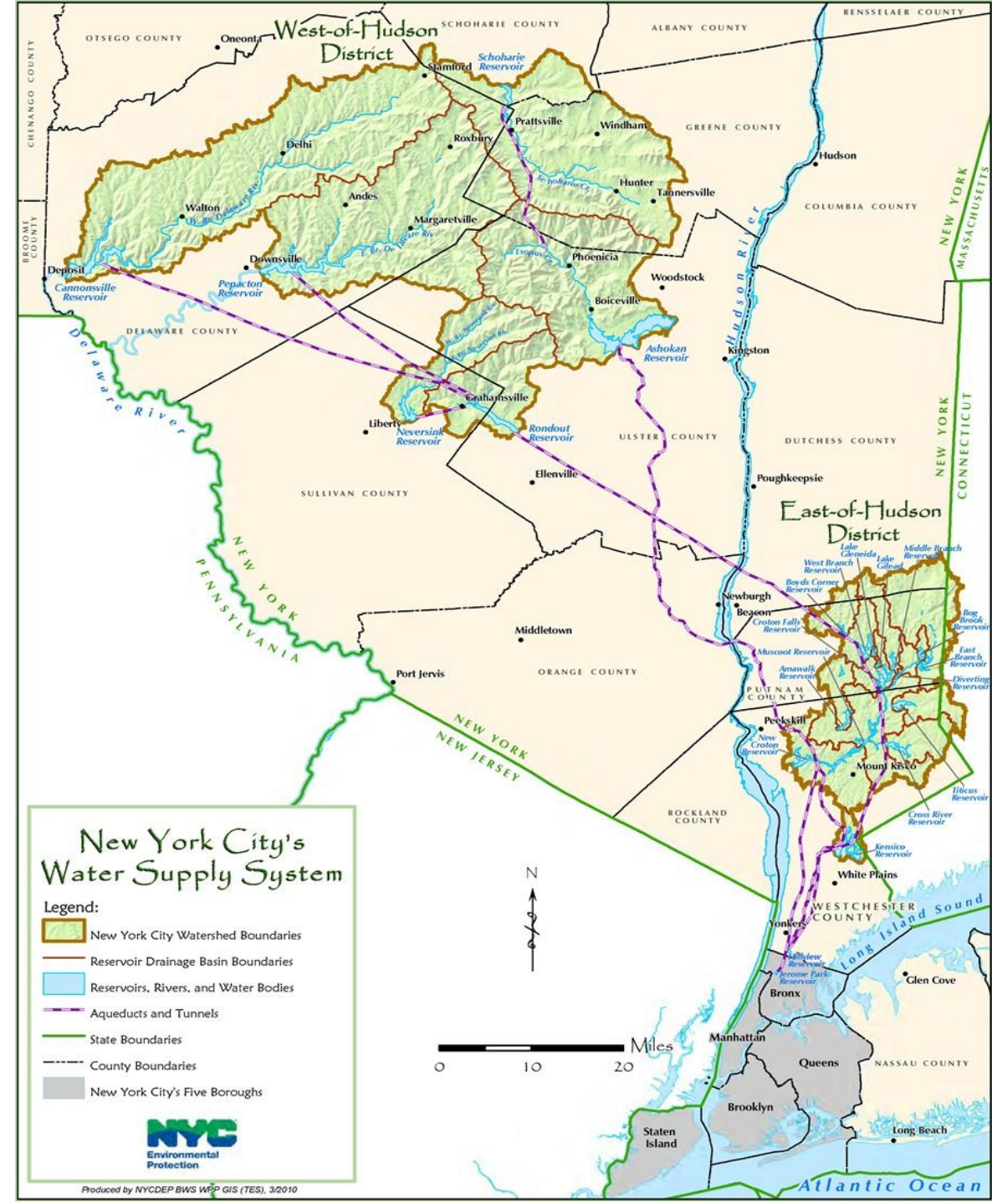
NYSSPE New York Chapter

February 16, 2022



NYC Water Supply Overview

- Surface water system
- 19 reservoirs + 3 lakes
- 570 billion gallons total reservoir storage capacity
- 9.8 million consumers (~1/2 New York State population)
- Watershed is 1,969 square miles in 8 upstate counties plus a small portion of CT
- Nation's largest municipal water supply
- 90% unfiltered



History of NYC Water Supply

Croton System

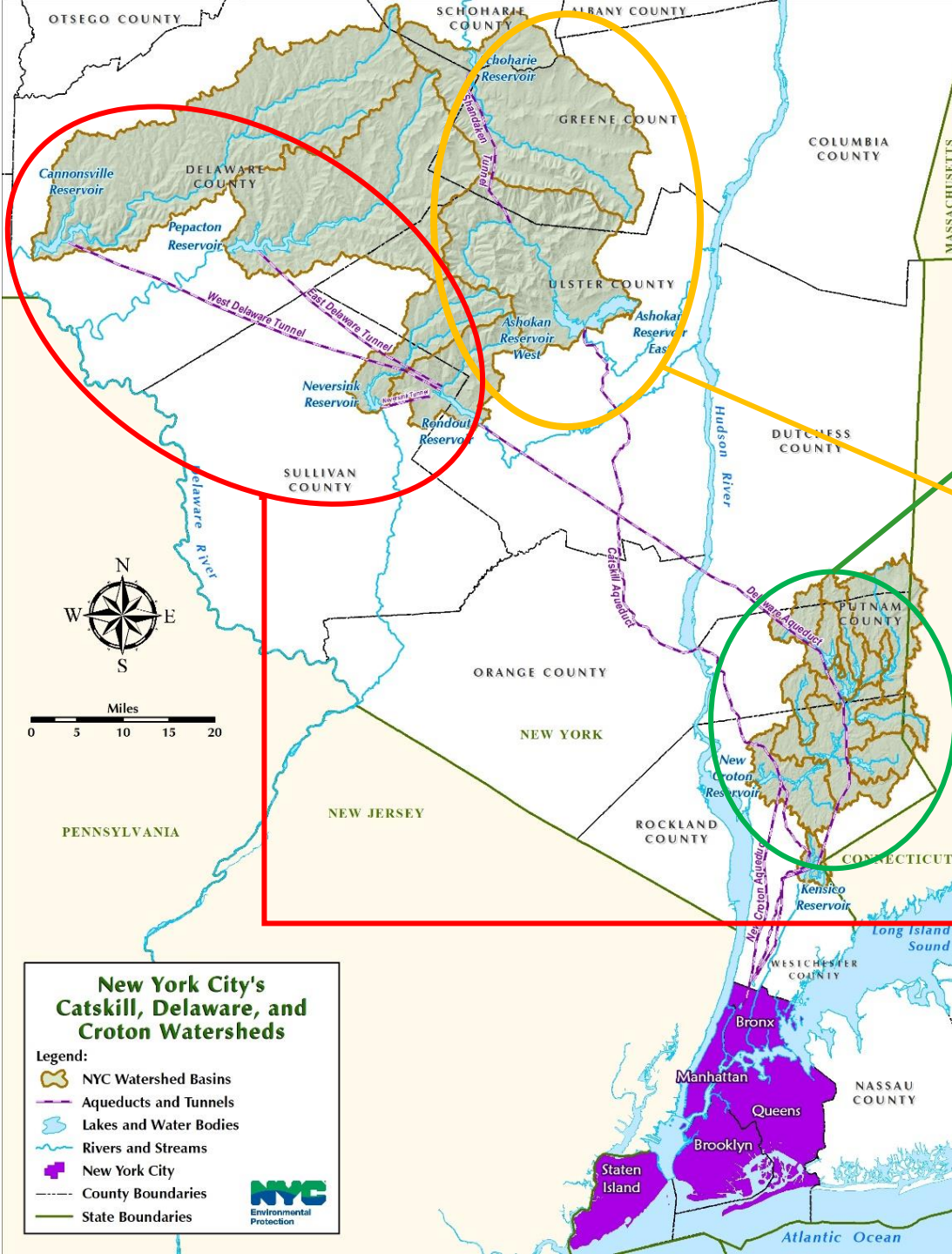
- Built 1830s – 1910s, activated 1842
- Filtered supply
- 10 percent of NYC water

Catskill System

- Built 1907-1927, activated 1915
- 40 percent of NYC water

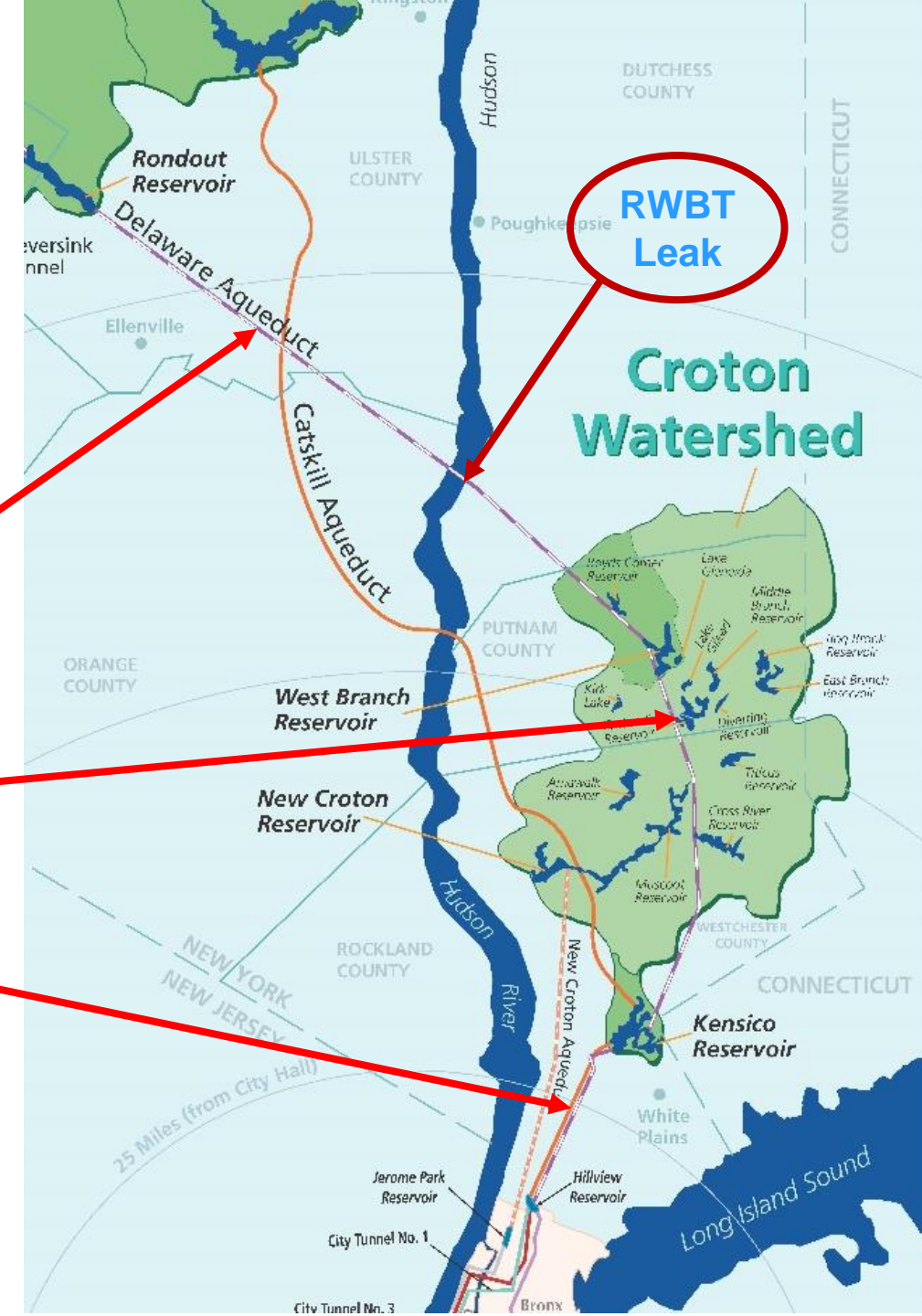
Delaware System

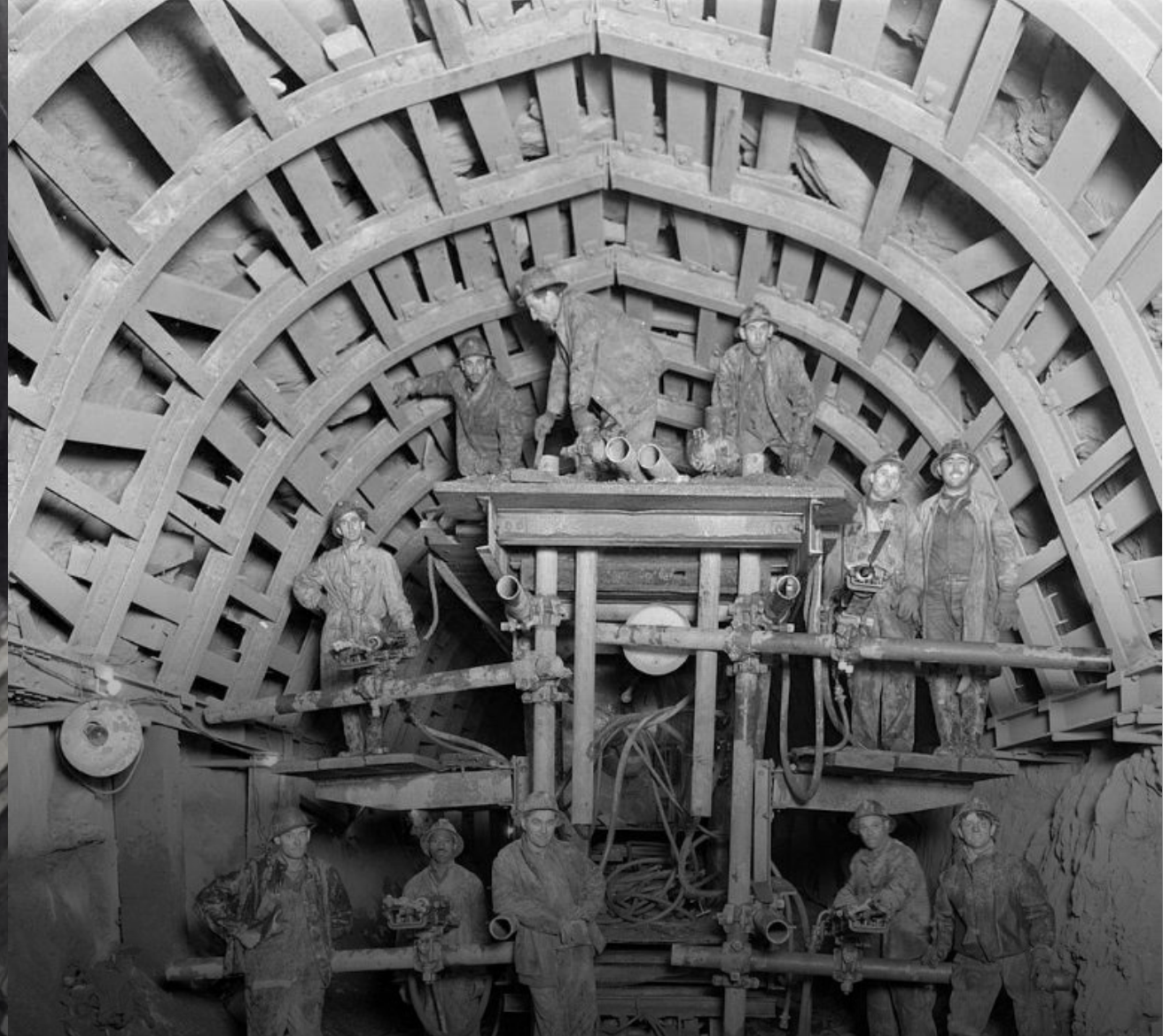
- Built 1930s-1960s, activated 1944
- 50 percent of NYC water



The Delaware Aqueduct

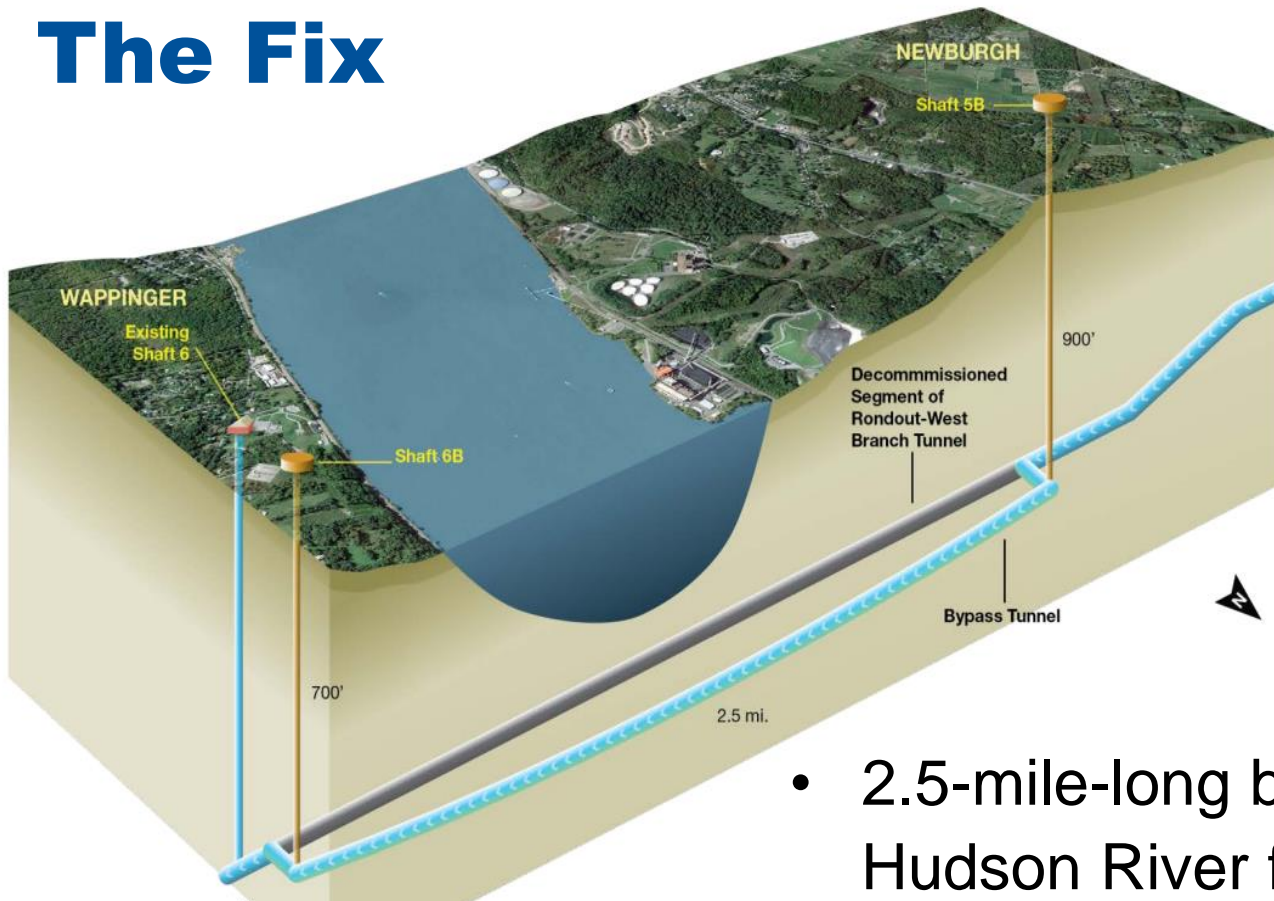
- 85 miles long
- Longest continuous tunnel in the world
- Conveys half of NYC drinking water
- Last drained for human inspection 1957-1958
- Aqueduct consists of three segments
 - Rondout → West Branch (44 mi.)
 - West Branch → Kensico (27 mi.)
 - Kensico → Hillview (14 mi.)





RWBT Construction 1941

The Fix



- 2.5-mile-long bypass tunnel 600 feet below the Hudson River from Newburgh to Wappinger.
- 14-foot finished diameter tunnel with inch-thick steel liner now completed.
- To be connected to original RWBT from Oct 2022 through Spring 2023.

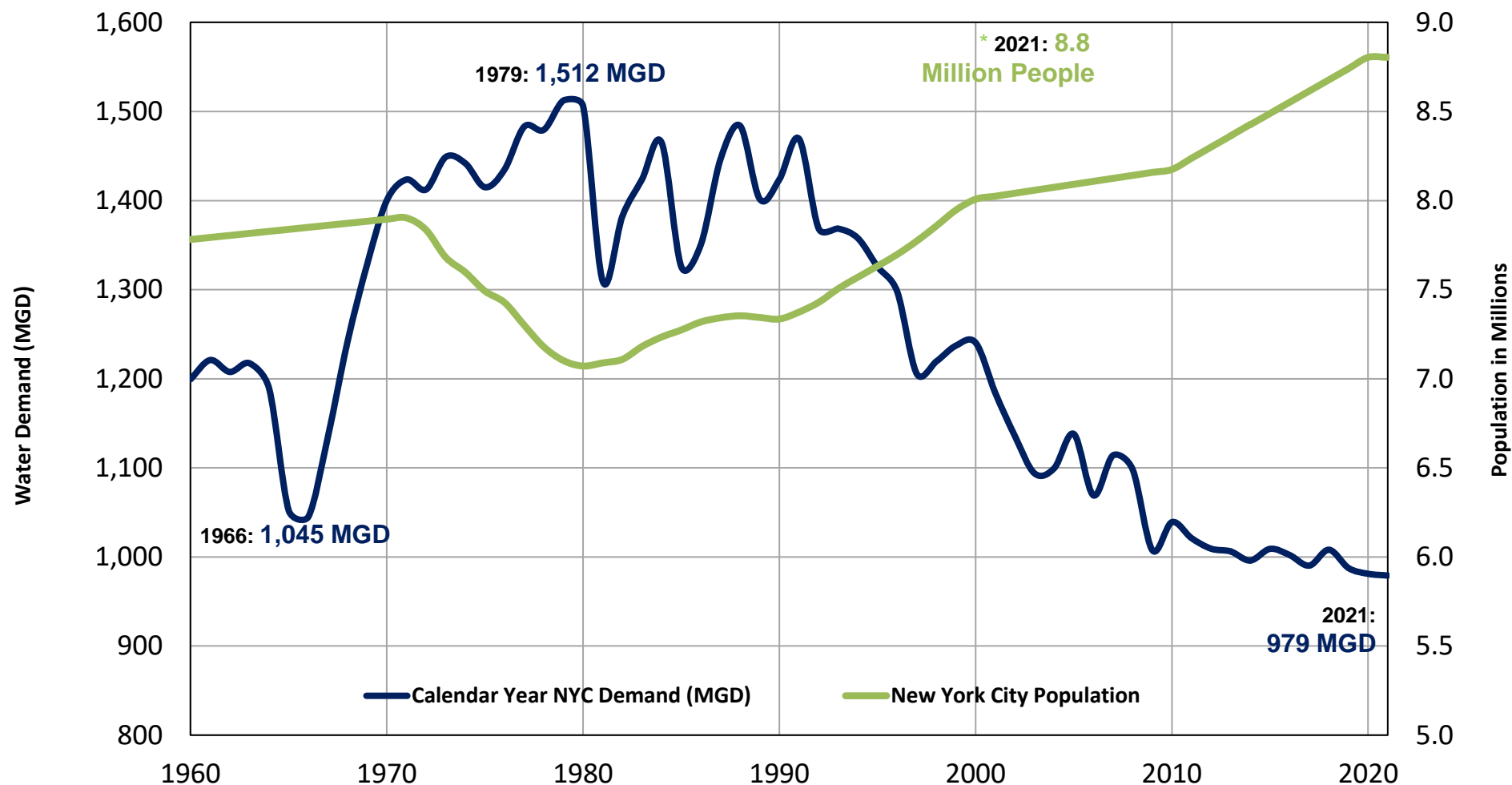


How Much Water Will Be Available During the RWBT Shutdown?

Schoharie	590 MGD
Ashokan	
New Croton	250 MGD
Cross River	180 MGD
Croton Falls	

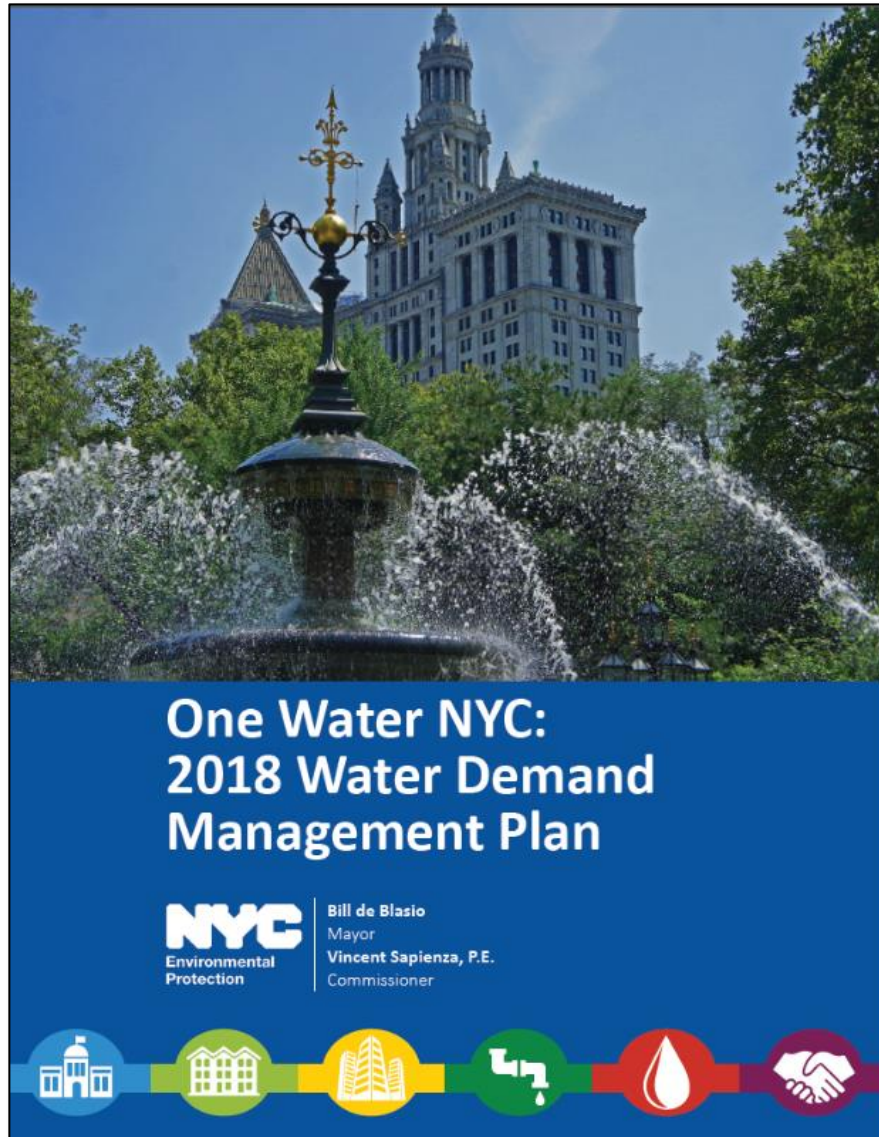
In City Water Demand

Since 2009, average daily demand has been below the 1960s drought-of-record (1,045 MGD), even as population increases. 2021 demand was lower than in at least the last 60 years.



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

DEP's Water Demand Management Program



Municipal: Retrofit and replace water fixtures in public facilities



Residential: Replace inefficient fixtures in multi-family buildings



Non-Residential: Create voluntary conservation programs and provide cost sharing incentives



System Optimization: Continue leak detection, pressure management, and metering



Shortage Management: Revise Water Shortage Emergency Rules



Wholesale Customers: Develop demand management plans for largest wholesale customers

Wholesale Customer Demand Management

Goal: 5% reduced demand for each participating Utility Partner, based on their 2013 demand

Utility Partners

1. Village of Ossining
2. Village of Scarsdale
3. Village of Tarrytown
4. Westchester Joint Water Works
5. City of White Plains
6. City of Yonkers
7. Town of Greenburgh

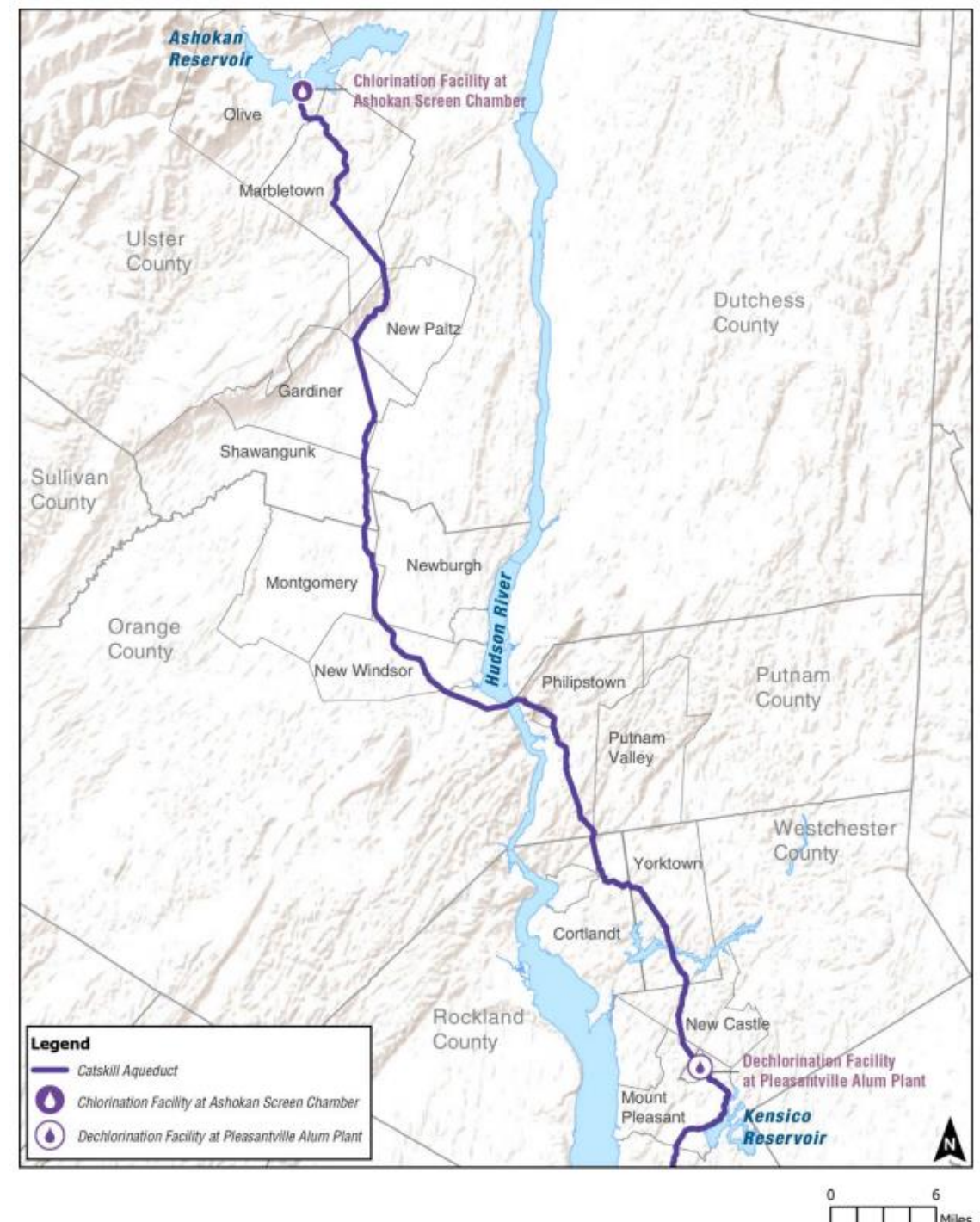
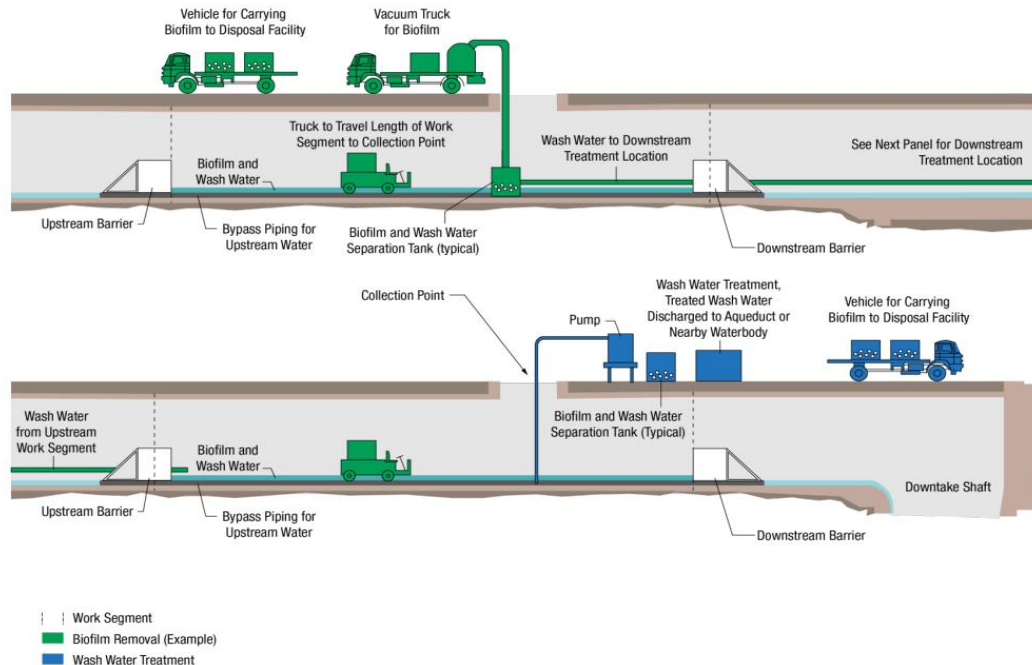


Participant Strategies and Savings Goals

<div>Strategy</div> <div>Utility Partner</div>	Annual AWWA M36 Water Audit	Water Loss Control: Leak Detection and Repairs	Water Loss Control: Service Line Leak Repairs	Automated Metering Infrastructure, with Monthly Billing and/or Customer Leak Alerts	Residential Indoor Fixture Replacement Program
Ossining	✓	✓			✓
Scarsdale	✓	✓		✓	
Tarrytown	✓	✓			
WJWW	✓	✓		✓	
White Plains	✓	✓	✓		
Yonkers	✓	✓		✓	
Greenburgh	✓	✓		✓	✓

CAT-RR Project

- Restore Catskill Aqueduct capacity: original 660 MGD, current 590 MGD.
- Four 10-week shutdowns to make repairs and remove biofilm (2018, 19, 20, 21).
- Biofilm is a filamentous bacteria attached to iron and manganese that creates friction, slowing down the flow.



Chlor and De-Chlor

- To maintain the Catskill Aqueduct's restored capacity following biofilm removal, chlorine-based chemicals will be added Ashokan Screen Chamber.
- Sodium bisulfite will subsequently be dosed at a new dechlorination facility at Pleasantville Alum Plant, to remove chlorine residual prior to discharge into Kensico Reservoir.
- The Pleasantville Alum Plant was originally constructed (1917) to feed alum to Catskill water during episodic turbidity events. In recent years, we've simply addressed episodic turbidity events by reducing flows from Ashokan Reservoir. We don't have that option during the RWBT shutdown, so upgrades were made to the Alum systems.



CAT-213E Ashokan Chlorination – chlorine dioxide generators inside the Ashokan Chemical Treatment Facility



Pleasantville Alum and De-chlor Plant

Croton Water Filtration Plant (CWFP) in Bronx

- NYC's only filtered water
- Plant went on-line in 2015, with capacity of up to 290 MGD
- Improvements have since been added to improve taste characteristics: GAC
- The plant isn't always operated, because it's our most expensive water, particularly when pumping to high-service areas
- During the RWBT shutdown, we need to run CWFP at a minimum of 250 MGD.



Monitoring Ground Settlement and Upstate Wells

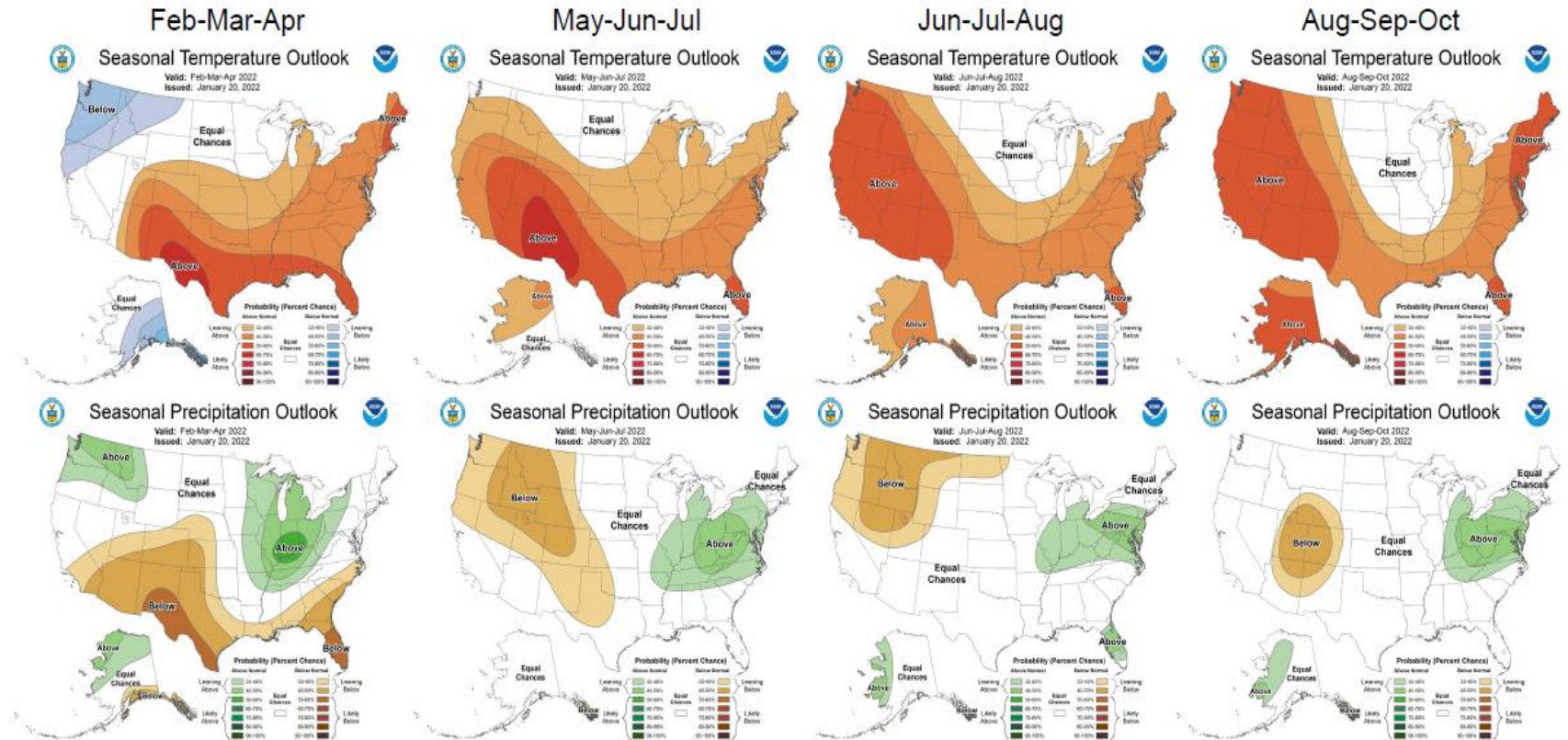
- When the leaking section of RWBT is pumped out, the level of groundwater that the leak was feeding will lower.
- That may cause ground settlement, effecting buildings and the CSX rail line.
- Drinking water well levels might also drop.
- Pre-shutdowns surveys continue being done.
- Monitoring will be done throughout construction and afterward.



CSX rail line in Roseton

Monitoring Long-Range Forecasts

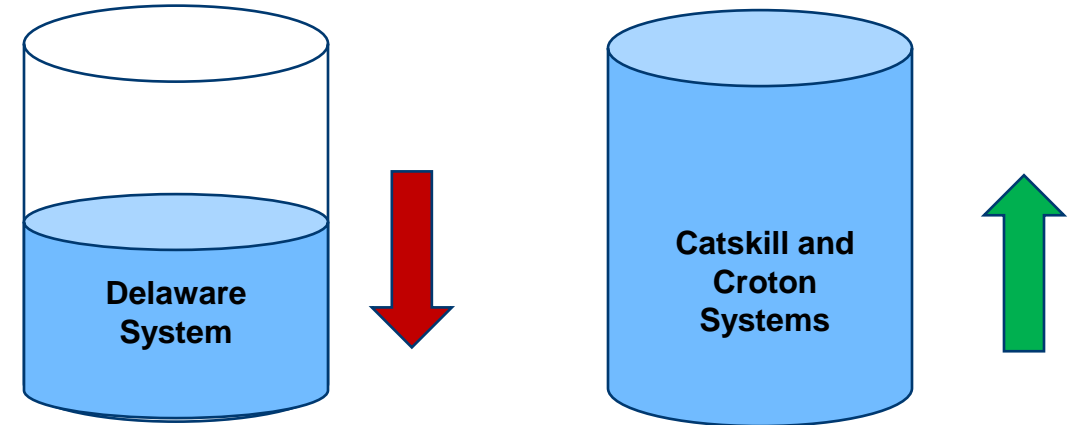
- Drought and/or high-water use during a hot summer could postpone the RWBT shutdown
- We'll closely monitor weather trends through October



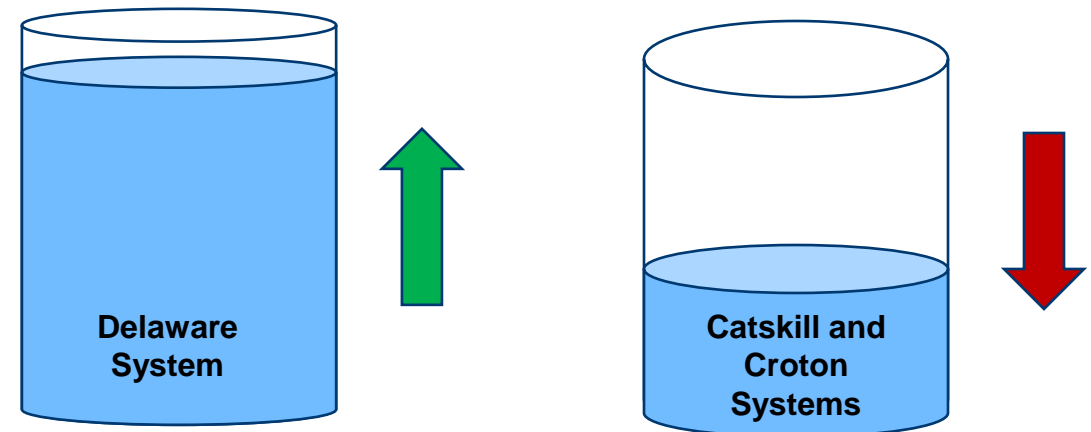
Delaware System operations during shutdown

- Usually strive for balance across the three systems
- Preferential use of Delaware System water before the shutdown
 - Draw down the reservoirs to reduce the likelihood they will pass water through spillways
 - Allow Catskill and Croton to stay relatively full
 - Still making downstream releases in accordance with decree and agreements
- Exclusive use of Catskill and Croton water during the shutdown
 - Will draw down those two systems substantially
 - Delaware will begin to refill
- System will be operated after the shutdown to regain “balance”

Before the shutdown, Summer 2022



During the shutdown, starting Oct 2022



Cat/Del Inter-Connection at Shaft 4 (CDIC4)



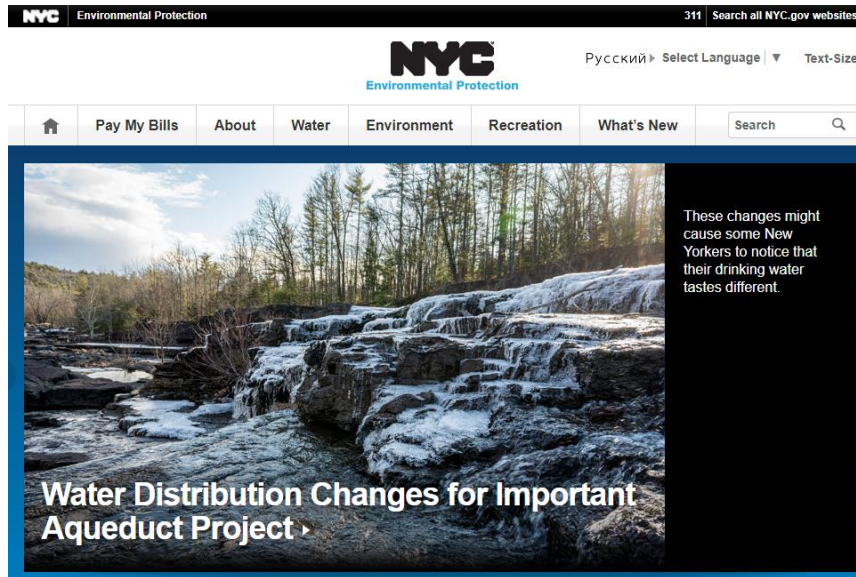
- Completed in 2016
- Allows Delaware water to go into the Catskill Aqueduct
- Helps to accelerate draw down of Rondout Reservoir prior to the RWBT shutdown
- Allows a rapid rebalancing of the system after the bypass tunnel goes into operation



Summary

- This project has been more than 20 years in conception, assessment, design and construction
- Largest and most complex repair project in the history of the NYC's water supply
- If all goes well through October, shutdown will commence, and be completed in Spring 2023

For more information...



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Questions and discussion...

