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Credit Valley Conservation – inspired by nature

Rising Tides: Navigating the Future of New York City's Water Resources

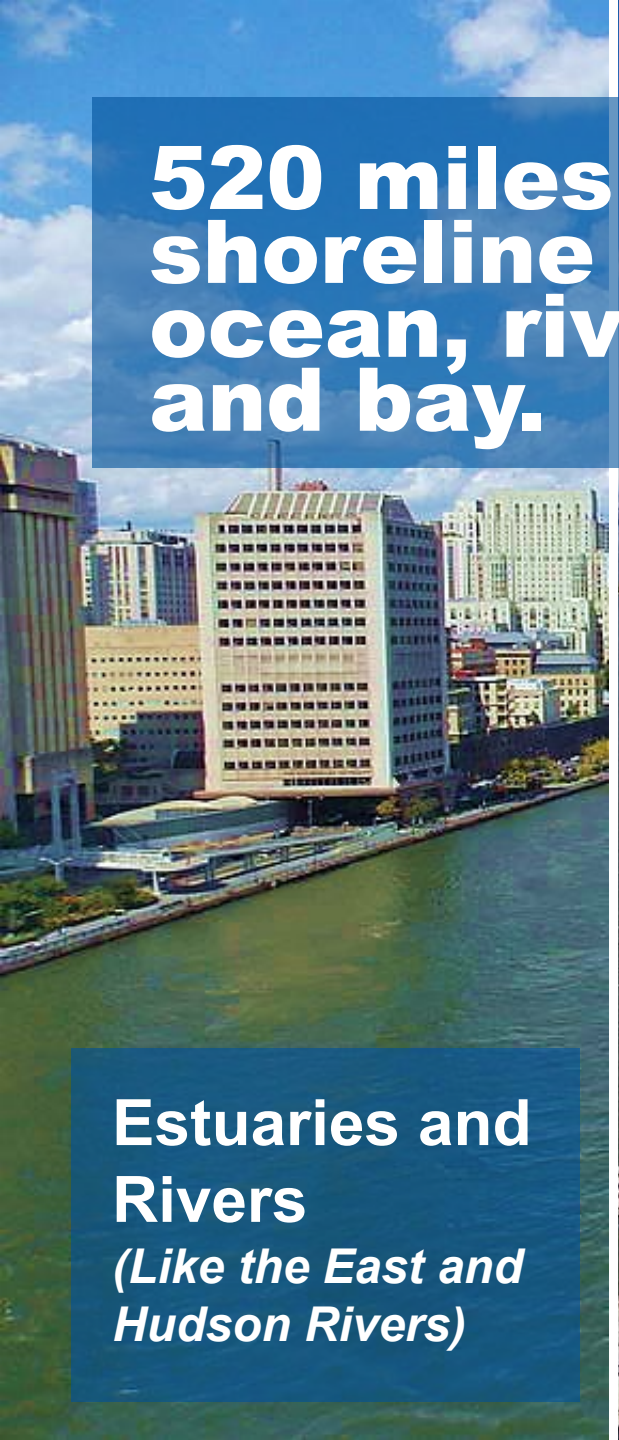
Source to Stream 2025

Laurian Farrell
Deputy Commissioner, Bureau of Coastal Resilience
Department of Environmental Protection, New York City
lafarrell@dep.nyc.gov

A Brief History

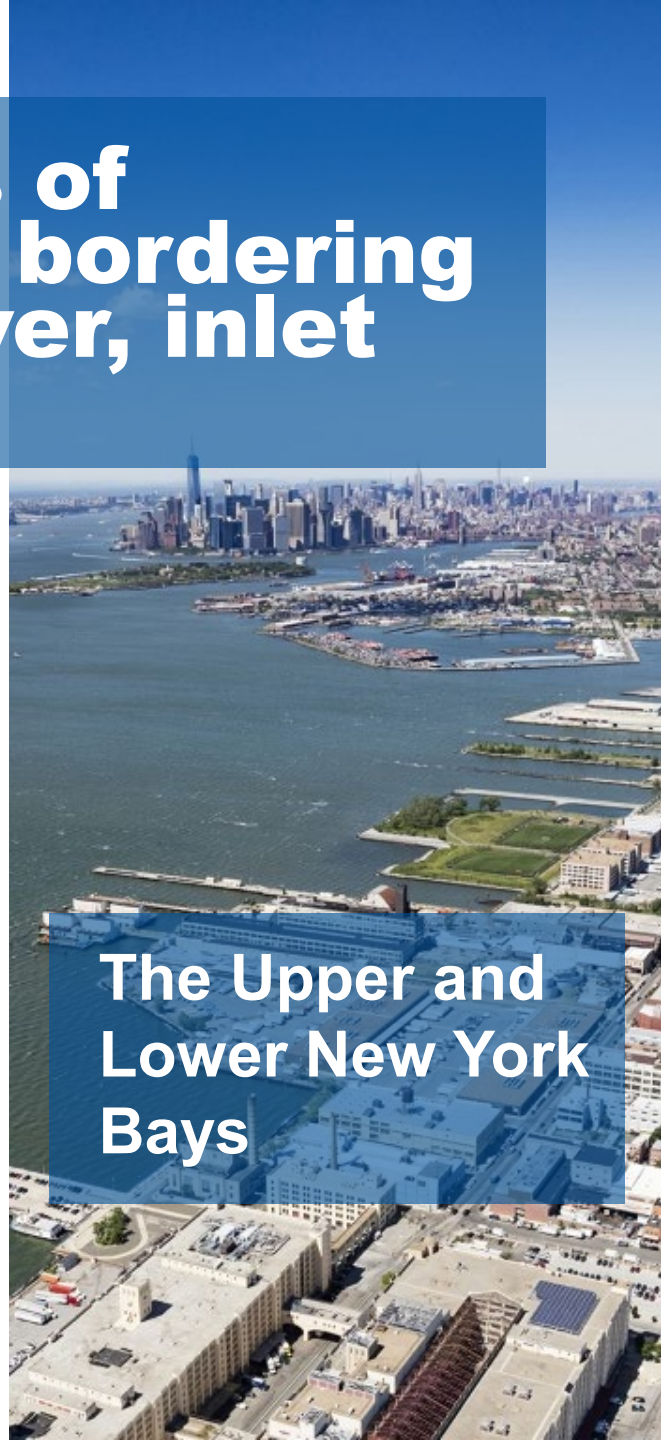
Shaped by water, New York's relationship with its waterways has changed fundamentally as it has grown

520 miles of shoreline bordering ocean, river, inlet and bay.



Estuaries and Rivers

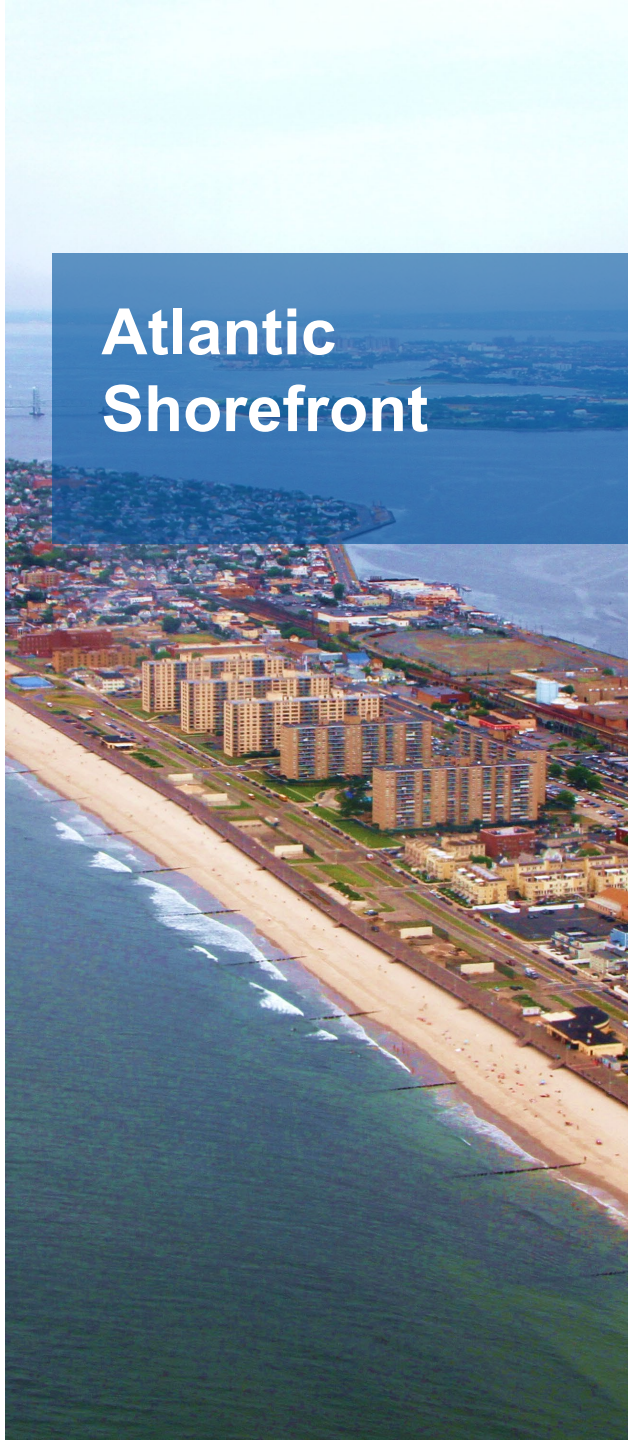
(Like the East and Hudson Rivers)



The Upper and Lower New York Bays

Tidal Wetlands

(Much of which have been built over)

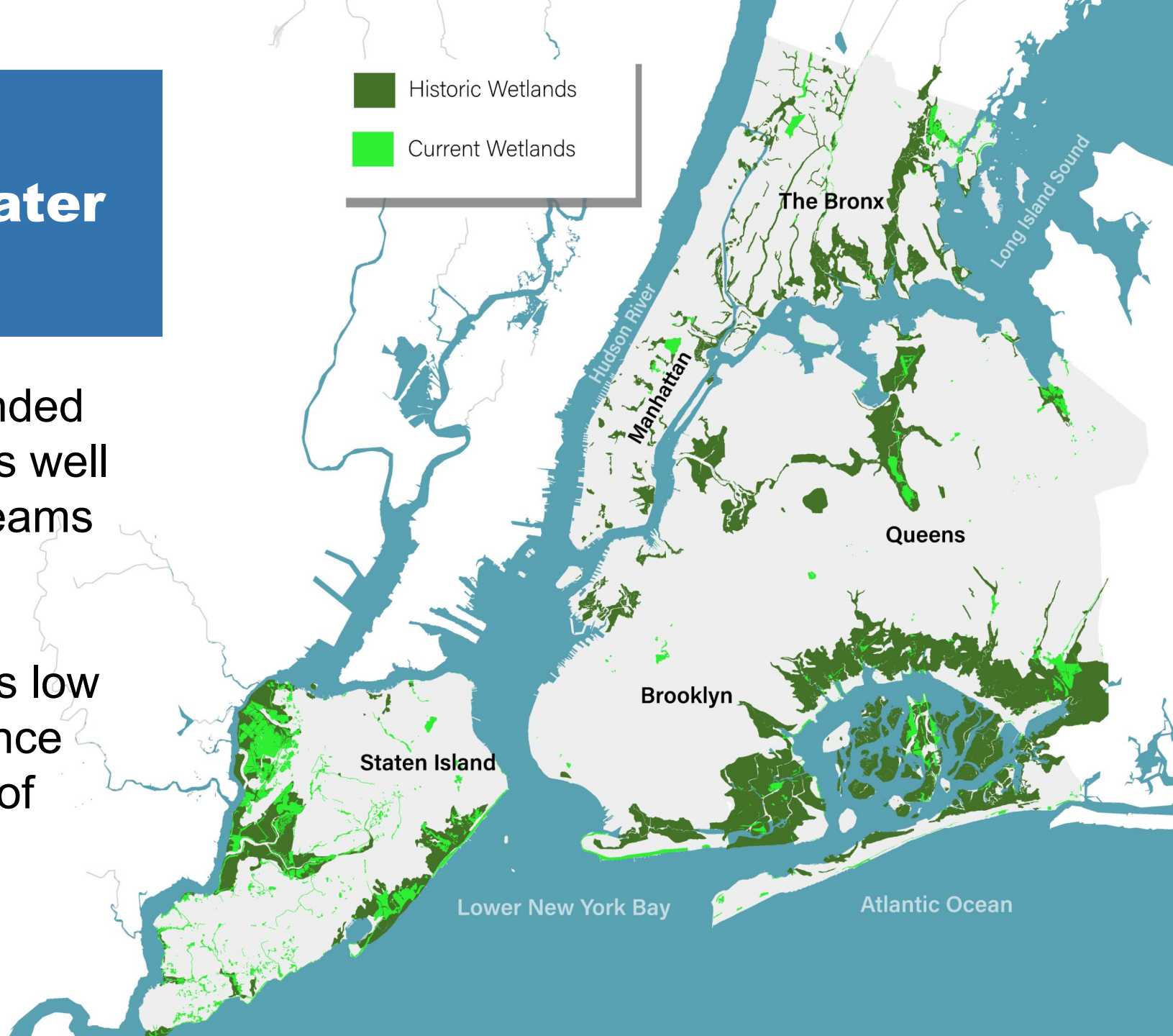


Atlantic Shorefront

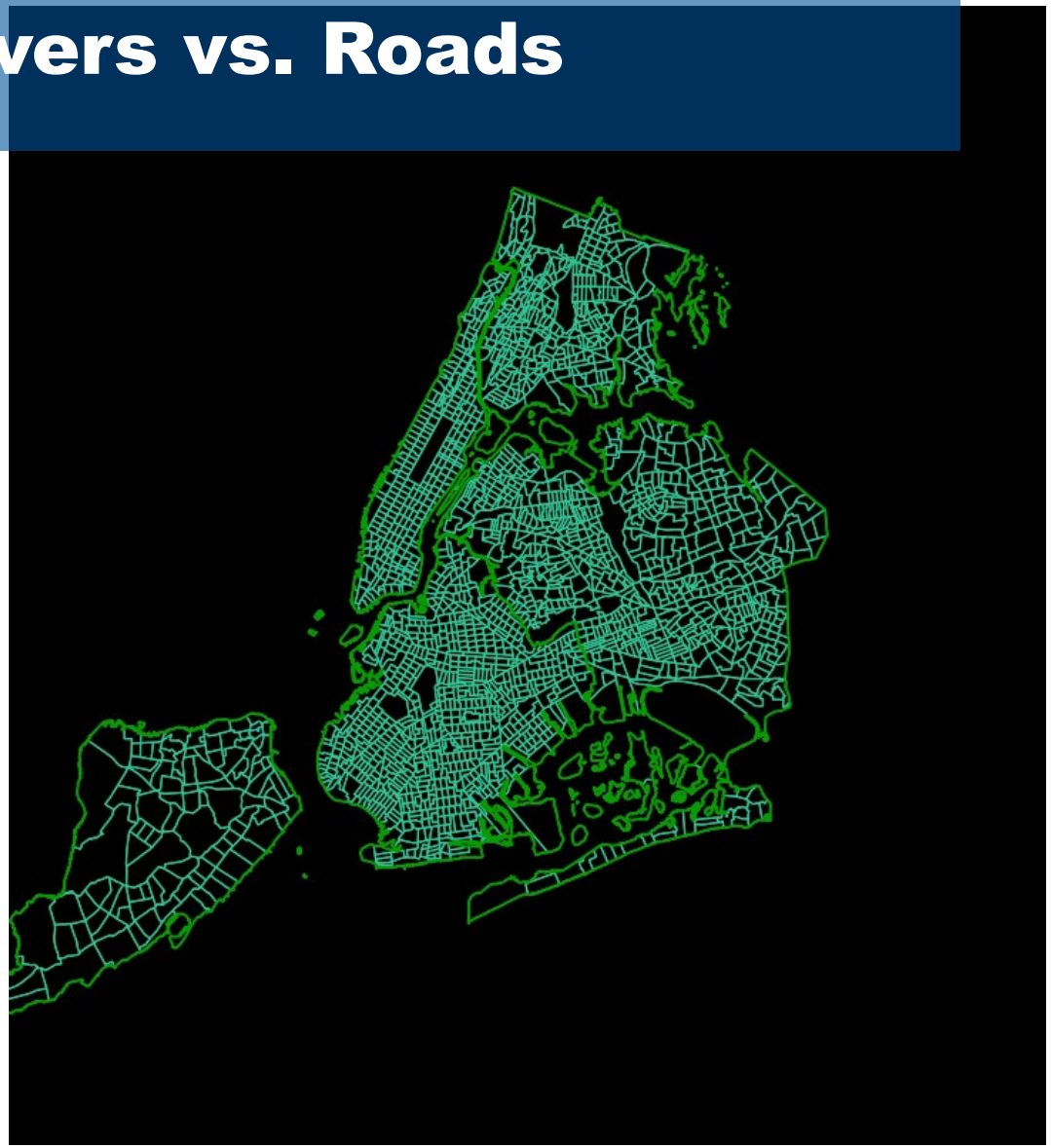
A City Defined by Water

Over time, the city has expanded and hardened its shoreline as well as drained and built over streams and wetlands.

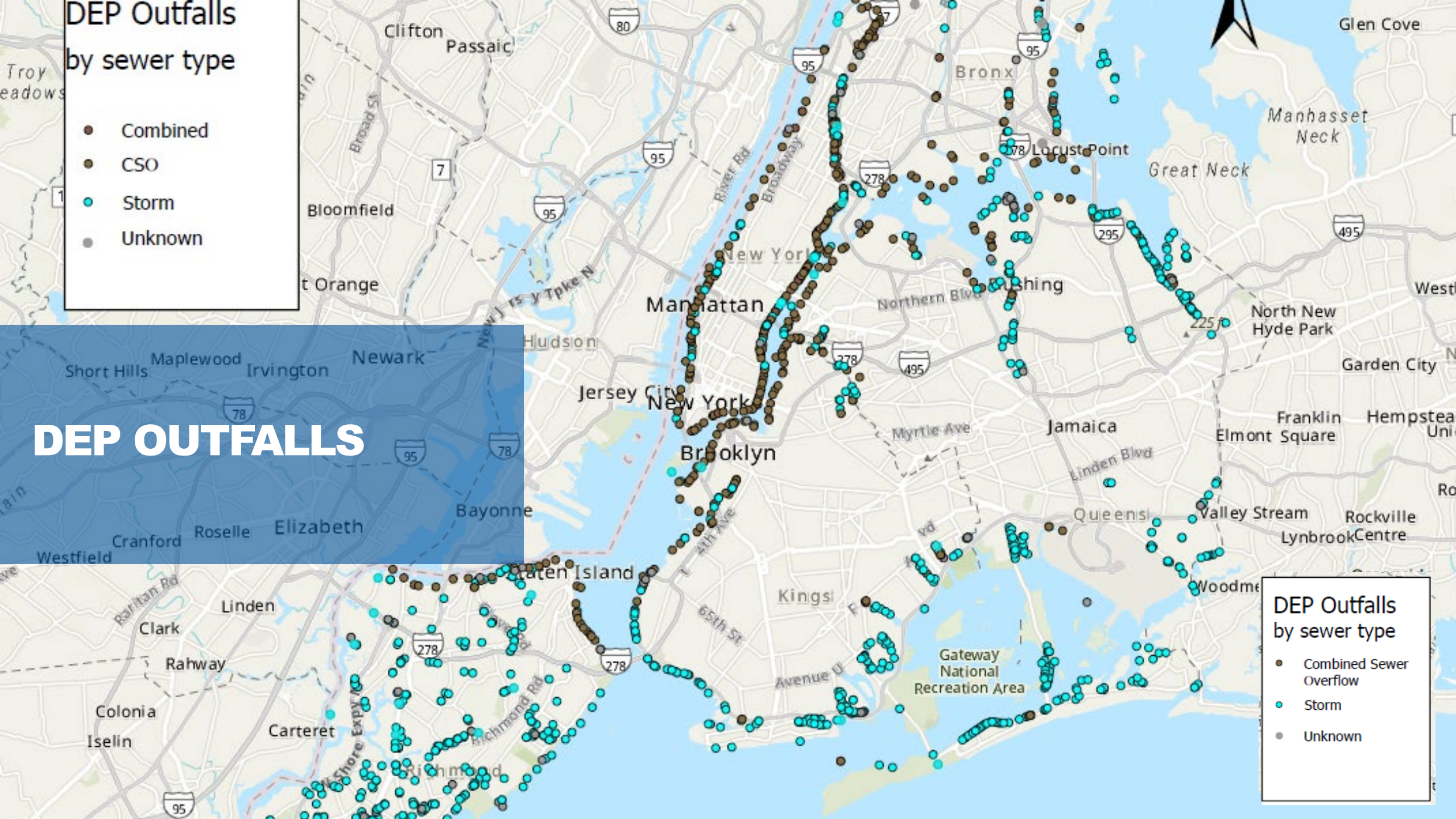
Much of the flooding the city's low lying neighborhoods experience today matches the locations of former wetlands.



Rivers vs. Roads



Credit: Steve Shikaze, 2025
@steveshik


DEP Outfalls
by sewer type
Combined
CSO
Storm
Unknown
DEP OUTFALLS
DEP Outfalls
by sewer type
Combined Sewer Overflow
Storm
Unknown
Clifton
Passaic
Bloomfield
Orange
Maplewood
Short Hills
Irvington
Newark
Hudson
Jersey City
New York
Manhattan
Brooklyn
Bronx
Glen Cove
Manhasset Neck
Great Neck
Locust Point
North New Hyde Park
Garden City
Jamaica
Elmont
Franklin Square
Valley Stream
Lynbrook
Rockville Centre
Queens
Kings
Staten Island
Bayonne
Elizabeth
Roselle
Cranford
Westfield
Linden
Clark
Rahway
Colonia
Iselin
Carteret
Richmond
Gateway National Recreation Area
Broadway
River Rd
Northern Blvd
Myrtle Ave
Linden Blvd
Avenue U
65th St
4th Ave
Richmond Rd
Raritan Rd
Broad St
New Jersey Tpke N
Shore Expy
95
78
278
495
295
225
80
7

Mid-1800s to 1950s – A city defined by its working waterfront

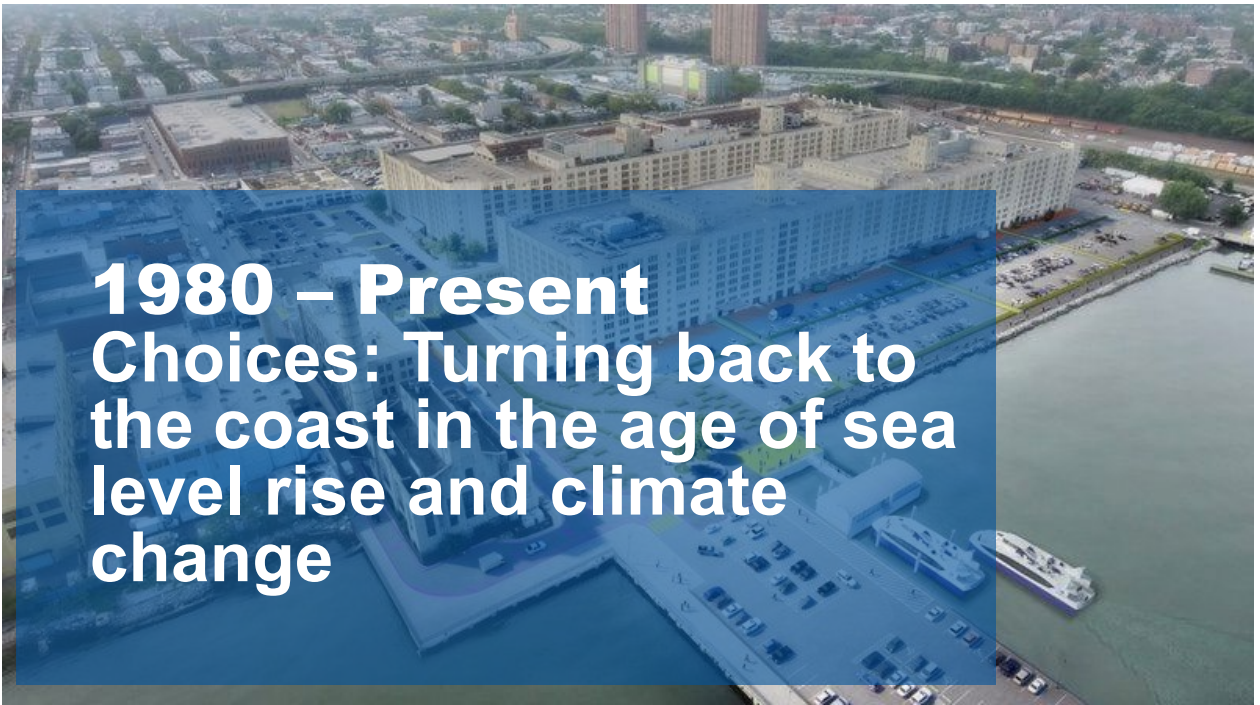
iew South of the 11th St
eadhouse, Manhattan

West Side Highway During Removal - 1983

Dumbo

Greenwich Village Pier

1950 – 1980 Industry largely abandons the waterfront



1980 – Present
Choices: Turning back to the coast in the age of sea level rise and climate change

The Plans:

- Past
- Present
- Future

NYC Environmental Protection

Illustration by: Jenni Sparks

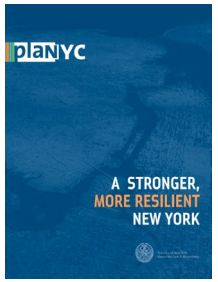
Planning: BCR will build upon planning initiatives to create a Comprehensive Coastal Resilience Plan

The Bureau of Coastal Resilience is a 2023 PlaNYC Commitment

BCR builds upon almost 20 years of Mayor's Office planning

2007

2013



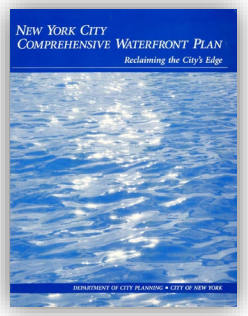
2015

2021

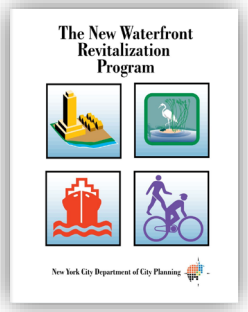
2023

BCR builds upon over 3 decades of Federal & State legislation + city-wide discussion, planning and inter-agency cooperation

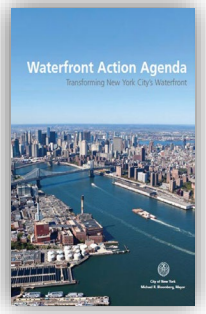
1992



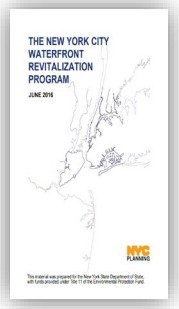
2002



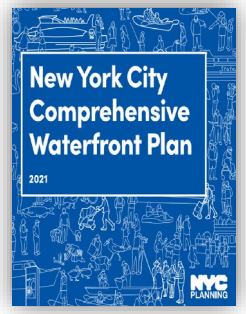
2011



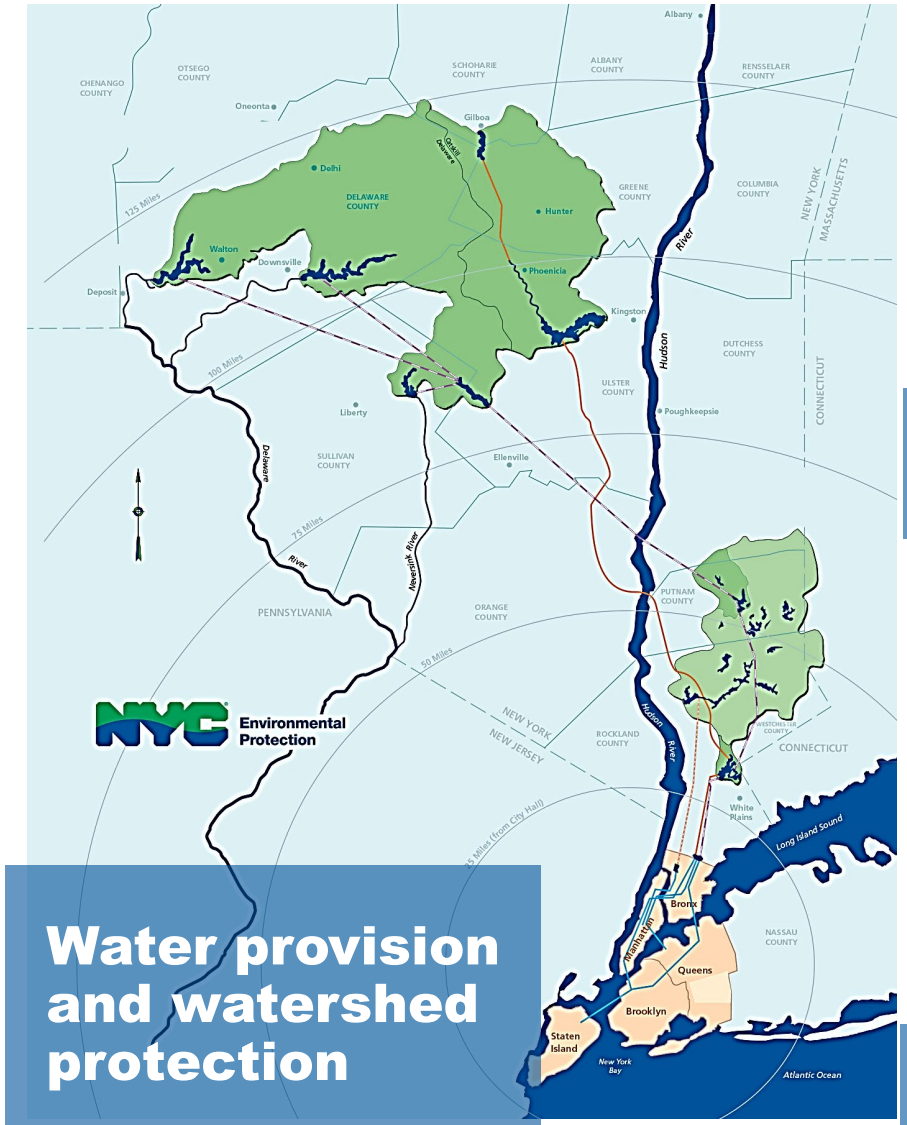
2016



2021



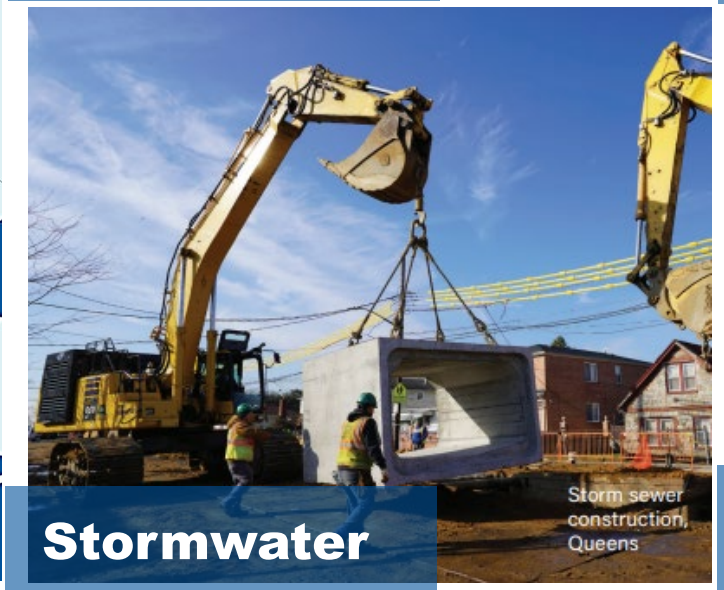
DEP's Role



Water provision and watershed protection

Wastewater Treatment

Since 2023 – Coastal Resilience



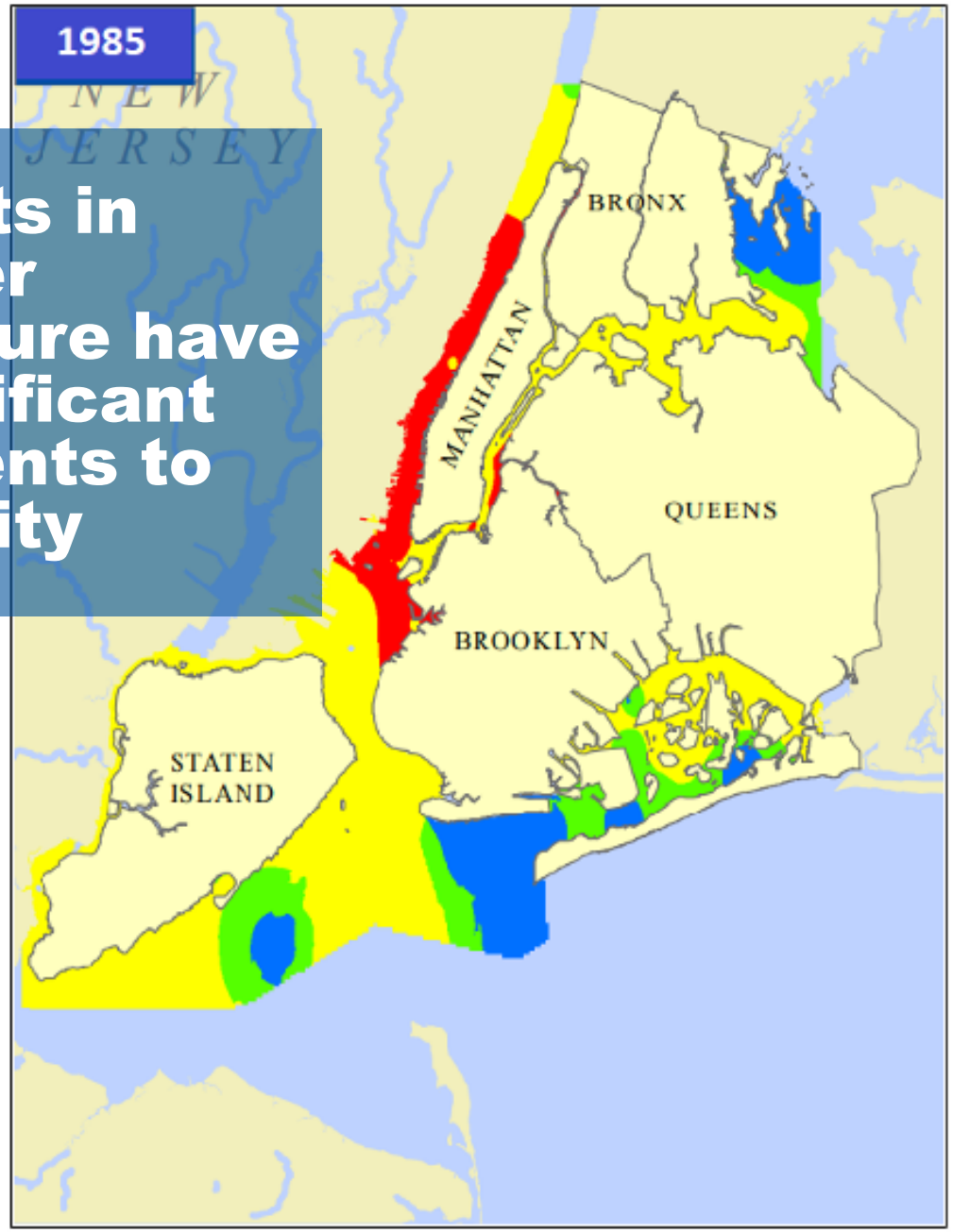
Storm sewer construction, Queens

Stormwater

Green infrastructure medians, Queens

Green Infrastructure

Investments in wastewater infrastructure have led to significant improvements to water quality




floodgen
NYPD
1.3 million
New York City residents live within or directly adjacent to the floodplain. Flood damage is extensive, expensive, and oftentimes predictable.
Sources: Rebuild by Design. AP Photo.
BetaNYC

12 years after Sandy NYC is at an **inflection point**

Super-storm Sandy hits NYC: the numbers

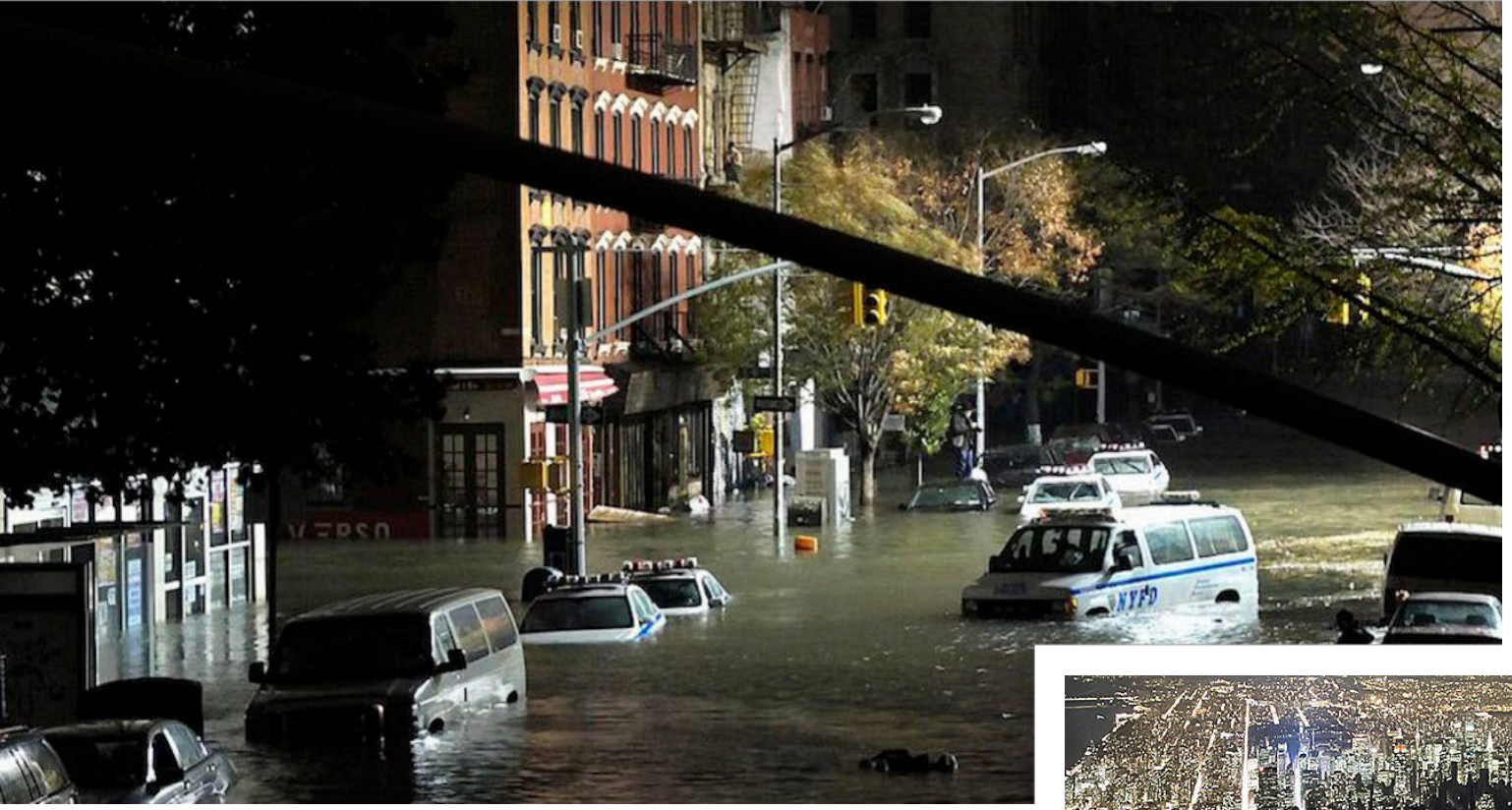
80mph (129km/h)
Winds caused by storm

13.7ft (4.15m)
Height of record tidal surge to hit Manhattan

375,000
New Yorkers ordered to evacuate the city

600,000
Households without power in and around the city

$10bn-$20bn (£6.2bn-£12.4bn)
Estimated cost of the storm


NYPD

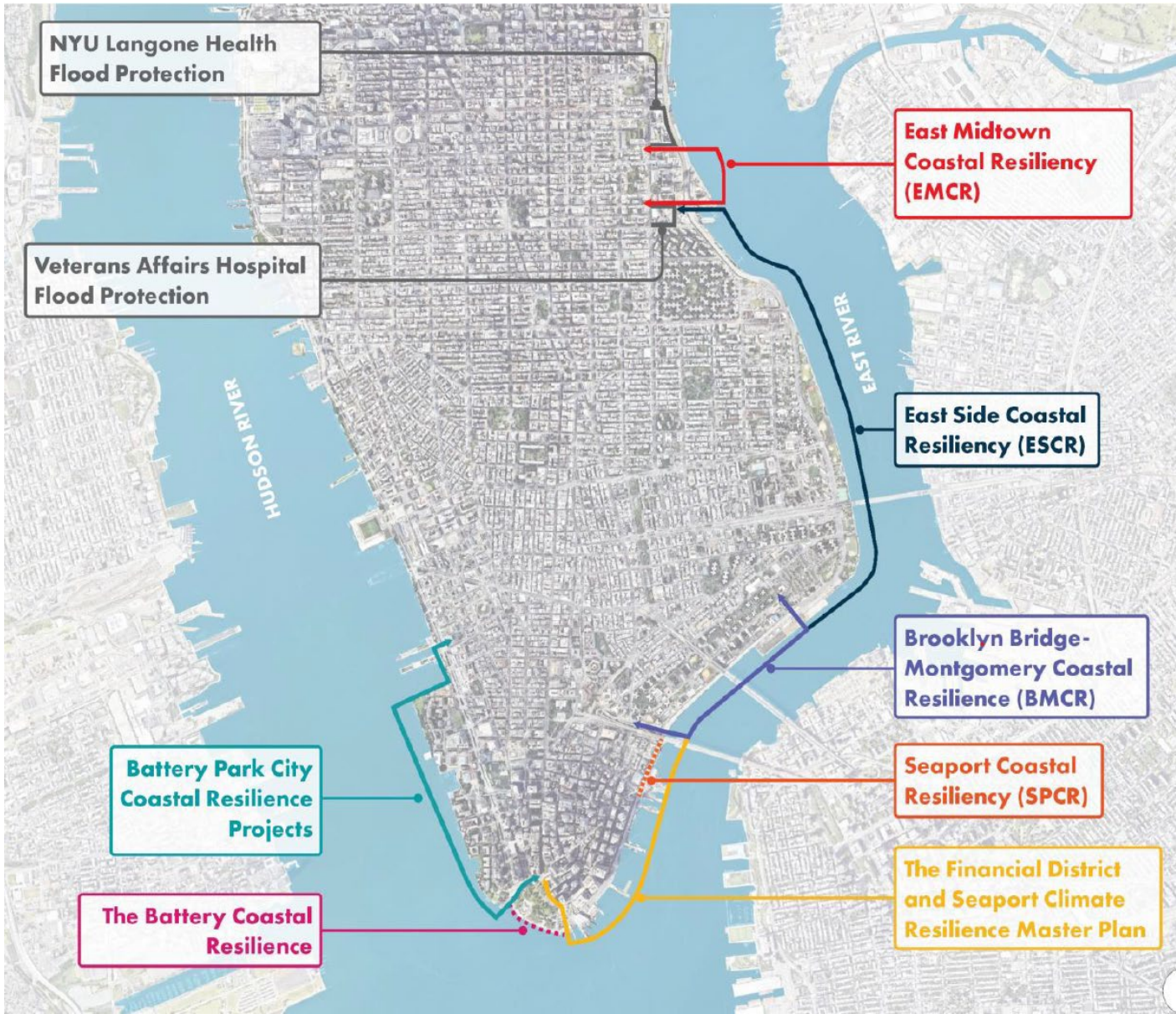
Post-Sandy: how far have we come?

Photo: DEP

$15 Billion in funding post Tropical Storm Sandy

City-led Projects

- **Red Hook $192M - $73M City Capital**
- **ESCR $1.45B - $1.112B City Capital**
- **BMCR $350M - $178M City Capital**
- **Seaport Coastal Resiliency $228.8M - $170M City Capital**
- **The Battery Coastal Resiliency - $200M**
- **Battery Park City Authority Coastal Resilience - $852M** (BPCA bond financing)
- **Raised Shorelines - $179M - $47M City Capital**



Mayor's Office of Climate & Environmental Justice

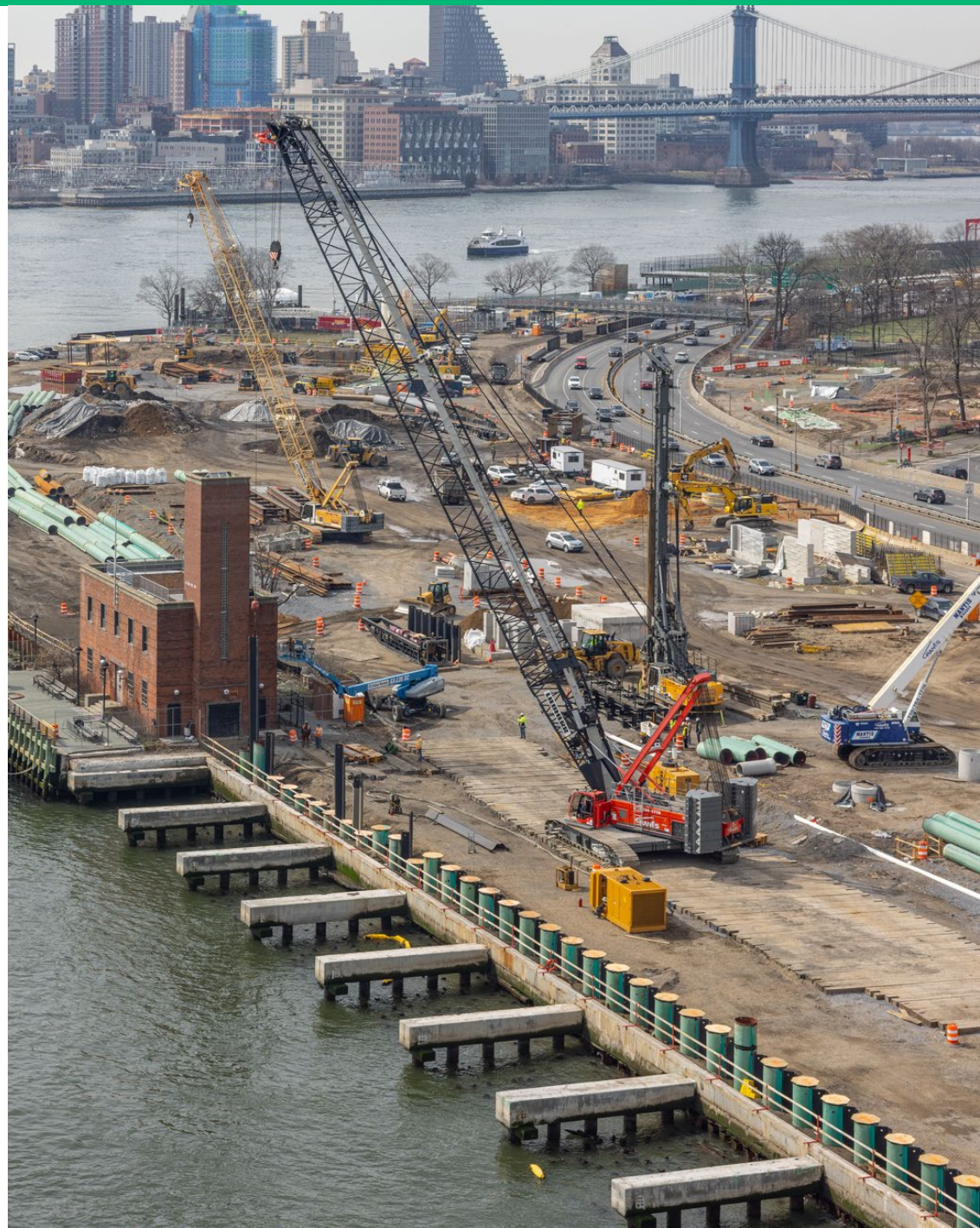
Source: *EDC*
$ updated 04/24

City-led Projects

- **Red Hook - $192M** ($80M FEMA HMGP, $10M Ida CDBG-DR, **$73M City Capital**, $29M pending)
- **ESCR - $1.45B** ($338M Sandy CDBG-DR, **$1.112B** City Capital)
- **BMCR - $522M** ($172M Sandy CDBG-NDR, **$350M** City Capital)
- **Seaport Coastal Resiliency – $228.8M** (**$170M City Capital**, $8.8M Howard Hughes Corporation, $50M FEMA BRIC)
- **The Battery Coastal Resiliency - $200M** (City Capital)
- **Battery Park City Authority Coastal Resilience - $852M** (BPCA bond financing)
- **Raised Shorelines - $179M** ($4M Sandy CDBG-DR, **$47M City Capital**, $54M FEMA HMGP for Coney Island Creek (CIC); $8M CDBG-DR, $70M City Capital for the other four projects)

USACE-led Projects

- **Staten Island - $615M** ($400M USACE, $150M NYS, **$65M City Capital**) **Has increased to estimated $2.34B** + $100M for DEP additional work + TDB City additional work.
- **Rockaways Atlantic Shorefront - $600M** (100% USACE) + **$4M City Capital** for NYC Parks additional work
- **Rockaways Jamaica Bay - $253M** (100% USACE) + TBD City additional work



NYC Mayor's Office of Climate & Environmental Justice

Source: *EDC*

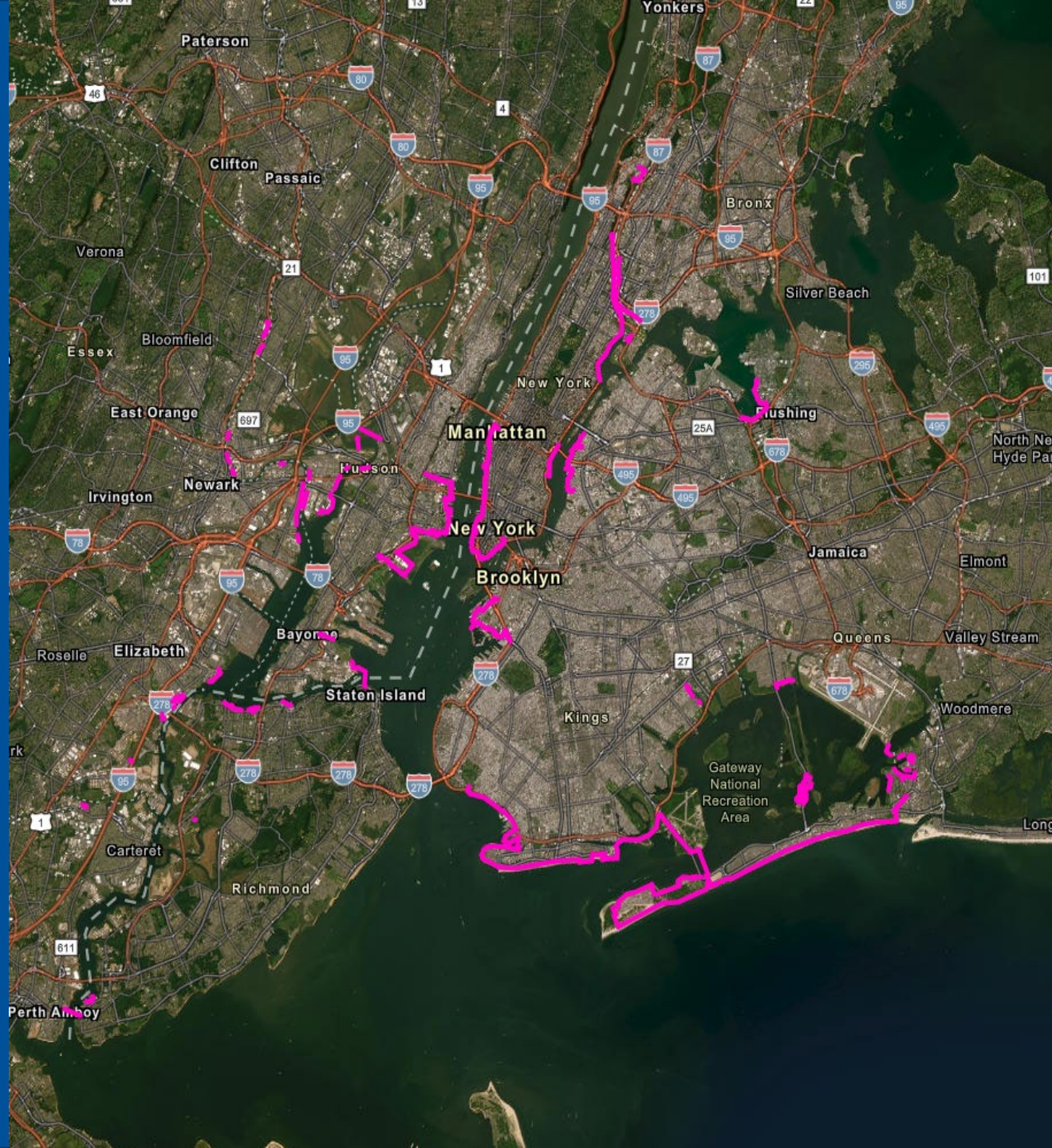
U.S. Army Corps of Engineers

HATS

NY/NJ Harbor and Tributaries Study, $19.4M

- Regional coastal protection plan
- In partnership with NYS and NJ
- $52B estimated cost to implement projects

NYC Environmental Protection



So what? How many more people are safe now?

What is the state of our infrastructure?

What have we learned?

NYC Environmental Protection


In 2150 what will our relationship be with the coast?

Equity

BCR's Mandate:

Sea Level Rise

Tidal Flooding

Storm Surge

NYC Environmental Protection

Source: www.climate.gov

Photo: Hamilton, March 2024

Source: www.nbcnews.com

Bureau of Coastal Resilience

Vision: Promote healthy and safe coastal communities where people, businesses and the environment thrive.

Mandate: Sea Level Rise Tidal Flooding Coastal Storm Surge

Threats:

- ✓ **+25%** increase in annual rainfall by 2100
- ✓ Up to **5.5 ft** sea level rise by 2100
- ✓ **+50%** increase in intense hurricanes by 2100
- ✓ A storm the creates **8ft surge risk today** is exacerbated by sea level rise and will produce **9ft surge risk in the 2100**
- ✓ Sections of the city's coastline will experience daily tidal flooding on Sunny Days

Coastal Resilience Team

- Strategy & Planning
- Regulations
- Government Affairs
- Design
- Construction
- Operations & Maintenance
- Emergency Management
- Community Groups
- Advocates
- Utilities
- Private Sector
- Academics

How will existing infrastructure function as sea level rises and rainfall intensifies?

Photos: DEP

East Side Coastal Resilience

1st set of flood gates to be completed in 2024

NYC Environmental Protection

Emergency Response:
BCR to deploy coastal flood protection

The same waterfront that the community enjoys when weather is good…

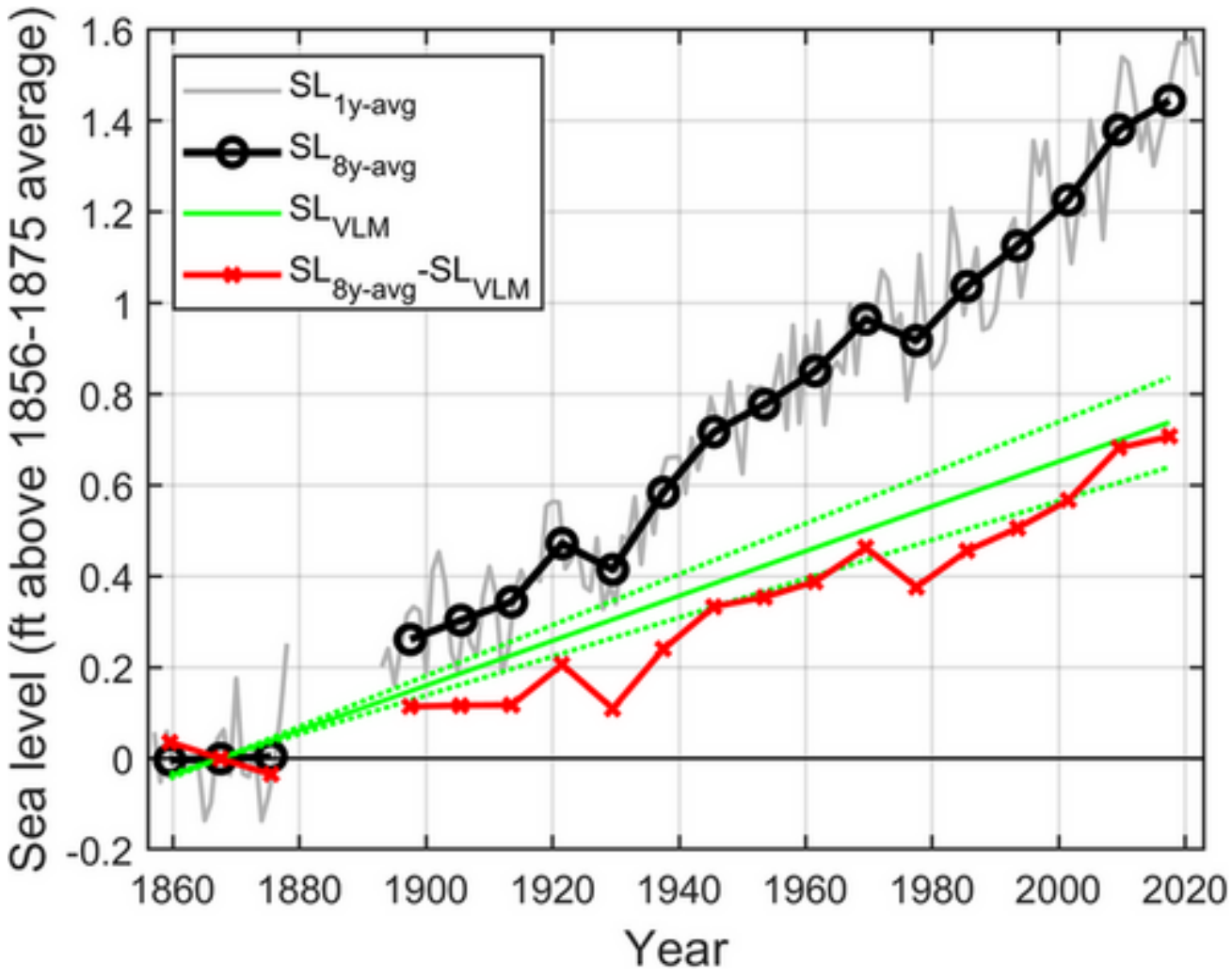
…transforms into critical flood protection during major flooding events.

BCR's Structure:

- Strategic Planning
- Engineering & Project Management
- Operations

NYC Environmental Protection

Our Challenge



Per the New York Panel on Climate Change (NPCC):

- In the New York Area, sea levels have risen by over a foot since 1900.
- Sea level will rise **more quickly** in New York than the global mean rate – creating greater impetus for adaptation.
- Compounded impacts of the SLR, Storm Surge, and more frequent heavy rainfall events pose a significant hazard.

What Choices will we make?

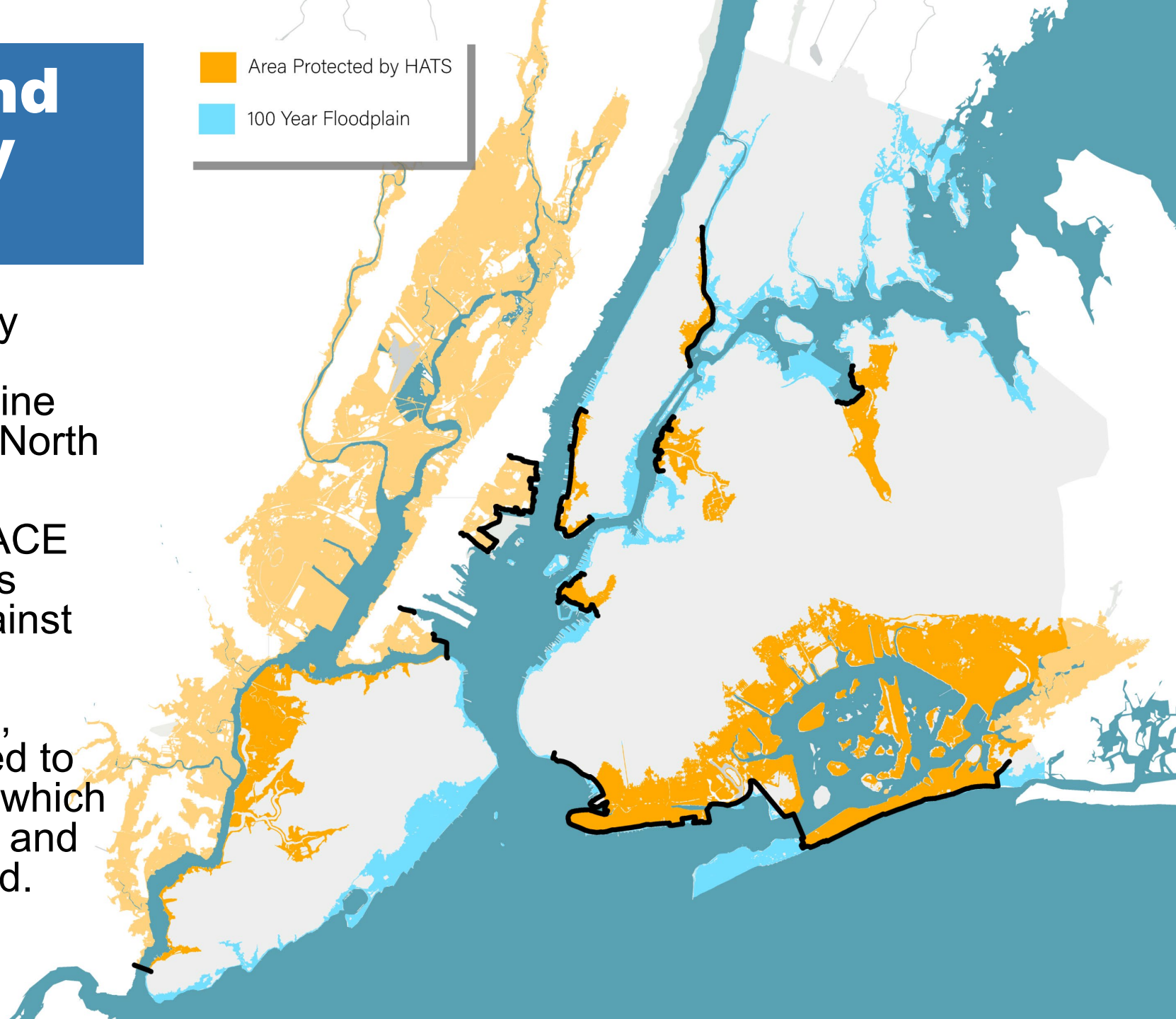
- Holistic, forward thinking and equitable
- Provide leadership and promote collaboration
- Living with Water & One Water approach
- Maintenance and operations of coastal flood control assets
- Innovative funding, finance & enabling legislation

NYNJ Harbors and Tributaries Study (HATS)

Beginning in 2016, the US Army Corps of Engineers (USACE) identified New York as one of nine high flood-risk areas along the North Atlantic Coast.

The HATS process led the USACE to develop a series of proposals designed to protect the city against storm surge events.

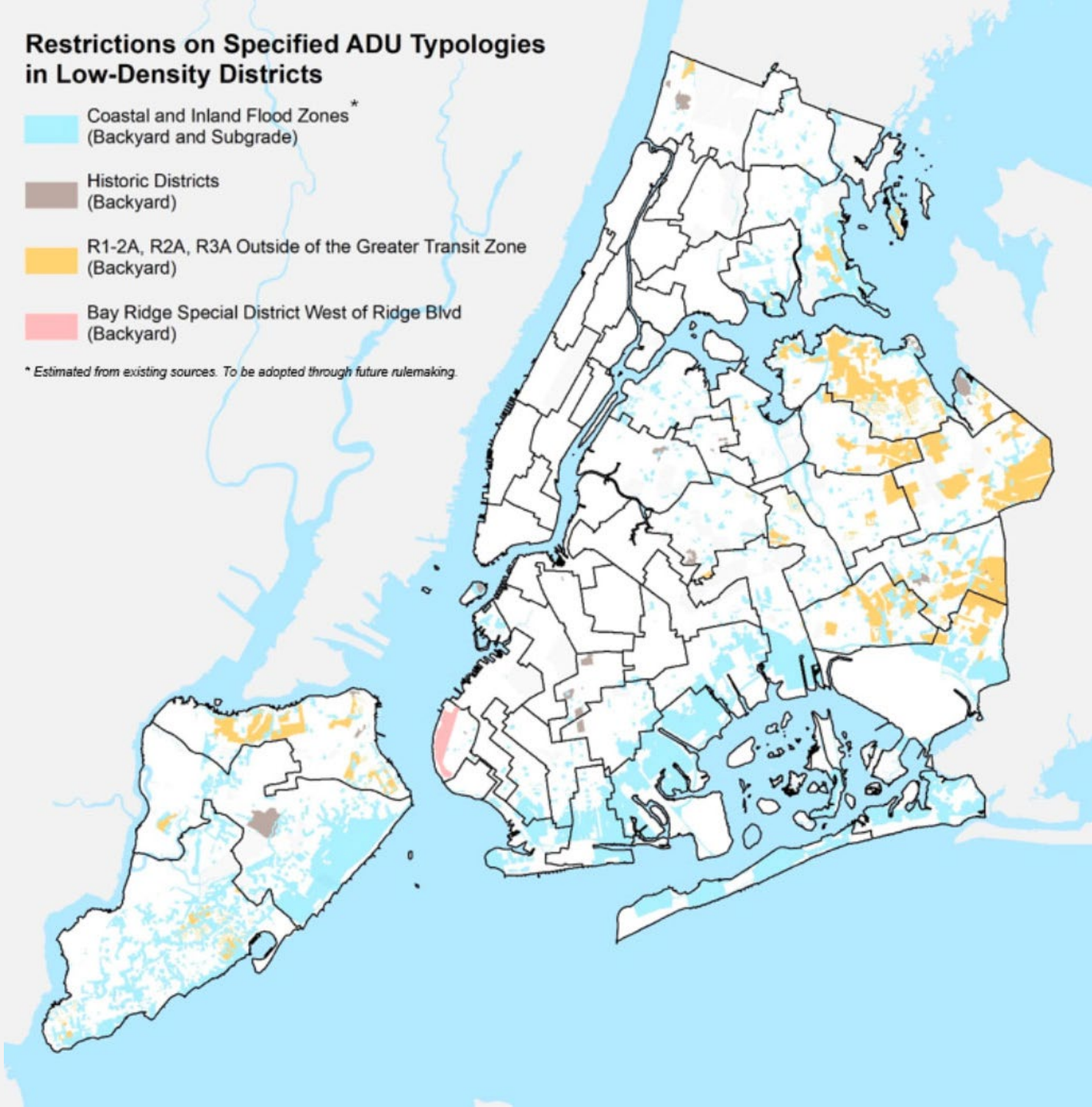
Multiple rounds of engagement, review, and EIS reports have led to the selection of Alternative 3B, which proposes a series of floodwalls and storm surge barriers, to proceed.



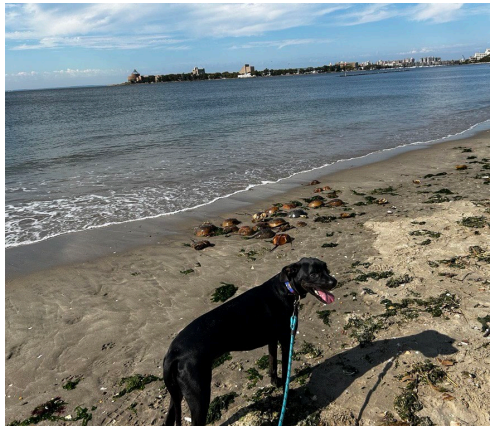
City of Yes

2024 “City of Yes” zoning reform measure to allow “a little more housing in every neighborhood”

- Required thoughtful consideration of coastal risk – **exempting coastal neighborhoods from new ADU construction.**
- Future planning will increasingly need to weigh coastal resilience considerations when developing the floodplain .



Adaptive Leadership



Thank you!
Questions?

lafarrell@dep.nyc.gov

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Future Climate Conditions

Sections of the city's coastline will experience **DAILY** tidal flooding on **Sunny Days**

A storm the creates **8ft surge risk today** is exacerbated by sea level rise and will produce **9ft surge risk in the 2100**

TIDAL FLOODING

+25%
increase in annual rainfall by 2100

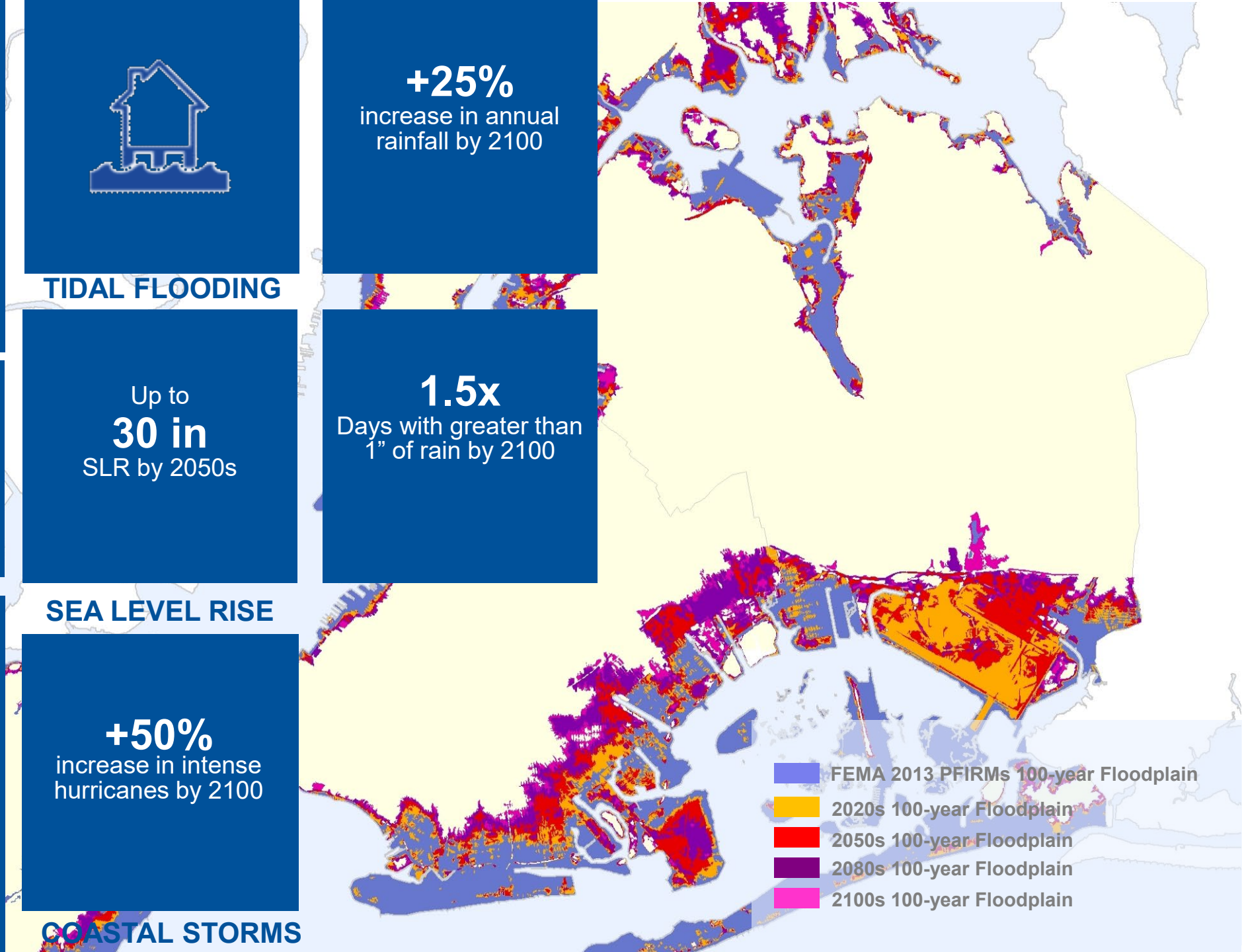
SEA LEVEL RISE

Up to
30 in
SLR by 2050s

1.5x
Days with greater than 1" of rain by 2100

COASTAL STORMS

+50%
increase in intense hurricanes by 2100



Future People Conditions

 # residents in FEMA flood insurance rate map area

DOUBLES from 400,000 in 2013 to 800,000 in 2050

 # buildings in FEMA flood insurance rate map area **increase by 65%** from 71,500 in 2013 to 118,000 in 2050

275 NYCHA buildings located in 100 year floodplain increasing to **921** projected in 2100

 # NYCHA buildings experiencing monthly tidal flooding increasing from **2** in the 2020's to **29** in the 2080's