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# **Harnessing Nature for Stormwater Resiliency in NYC**

**25 March 2025**

**Melissa Enoch**

**Assistant Commissioner, Environmental Planning & Analysis**



# **NYC Department of Environmental Protection (DEP) is the largest combined water and wastewater utility in the United States.**

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## **WATER SUPPLY**

- Deliver 3.8 billion L of water to 9.6 million New Yorkers every day and maintain 11,000 km of water mains
- Protect approximately 5,000 square km of watershed, including 19 reservoirs and three controlled lakes



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## **WASTEWATER TREATMENT**

- Treat 5 billion L of wastewater each day
- Operate and maintain 14 plants, 96 pumping stations, and over 12,000 km of sewers



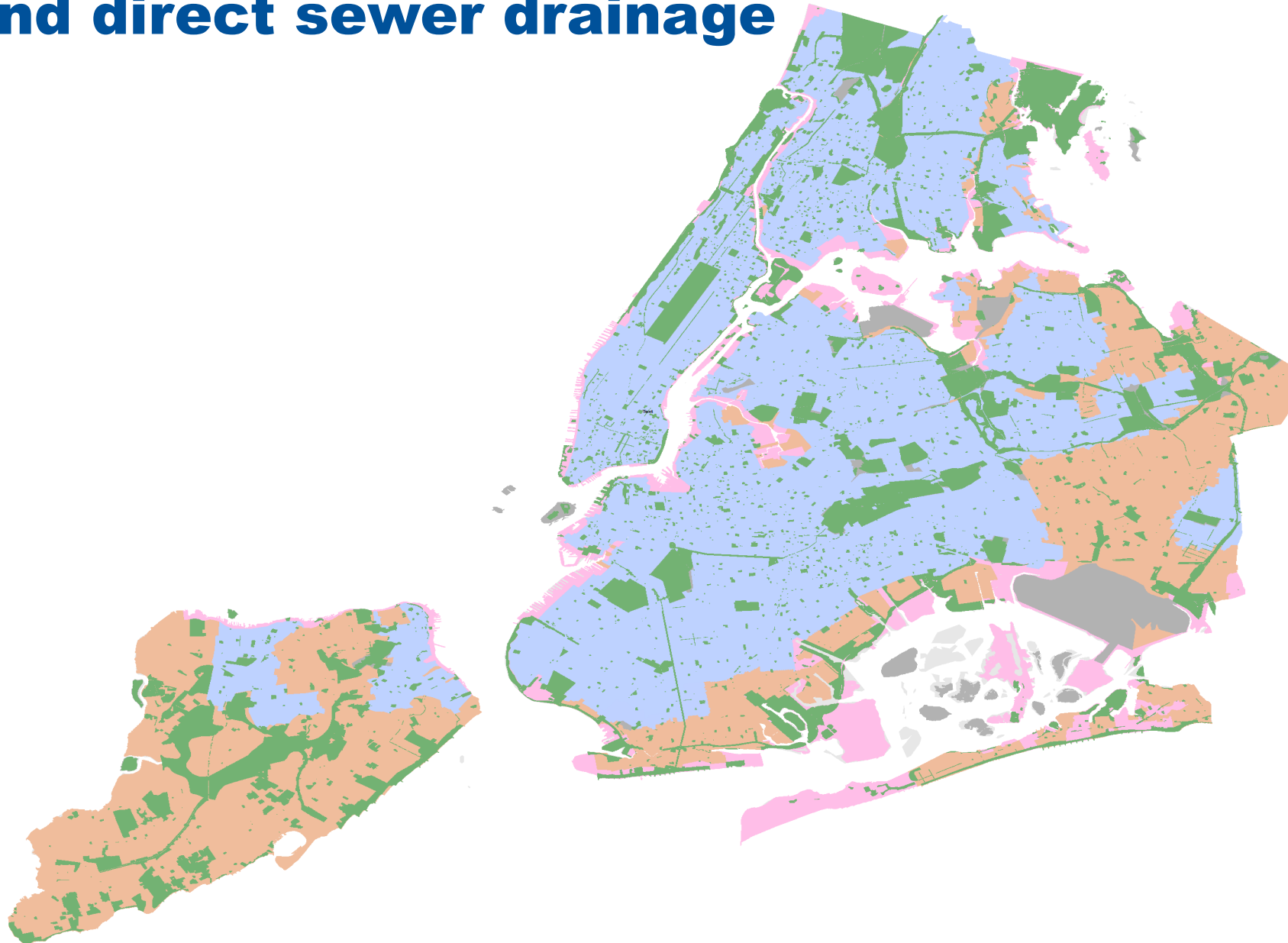
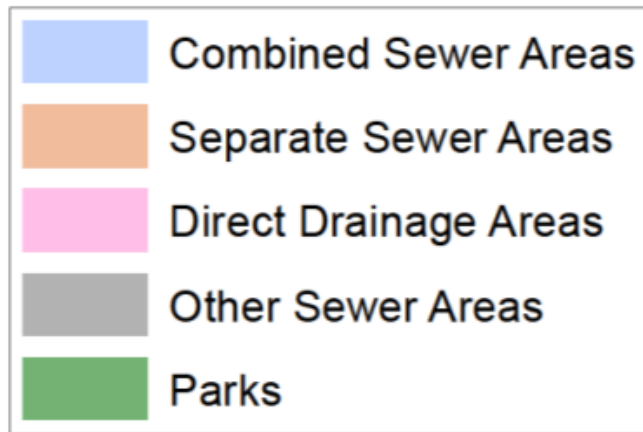
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## **AIR, NOISE, AND HAZARDOUS WASTE**

- Update and enforce the Air Code to reduce local emissions, and regulate hazardous waste and noise pollution

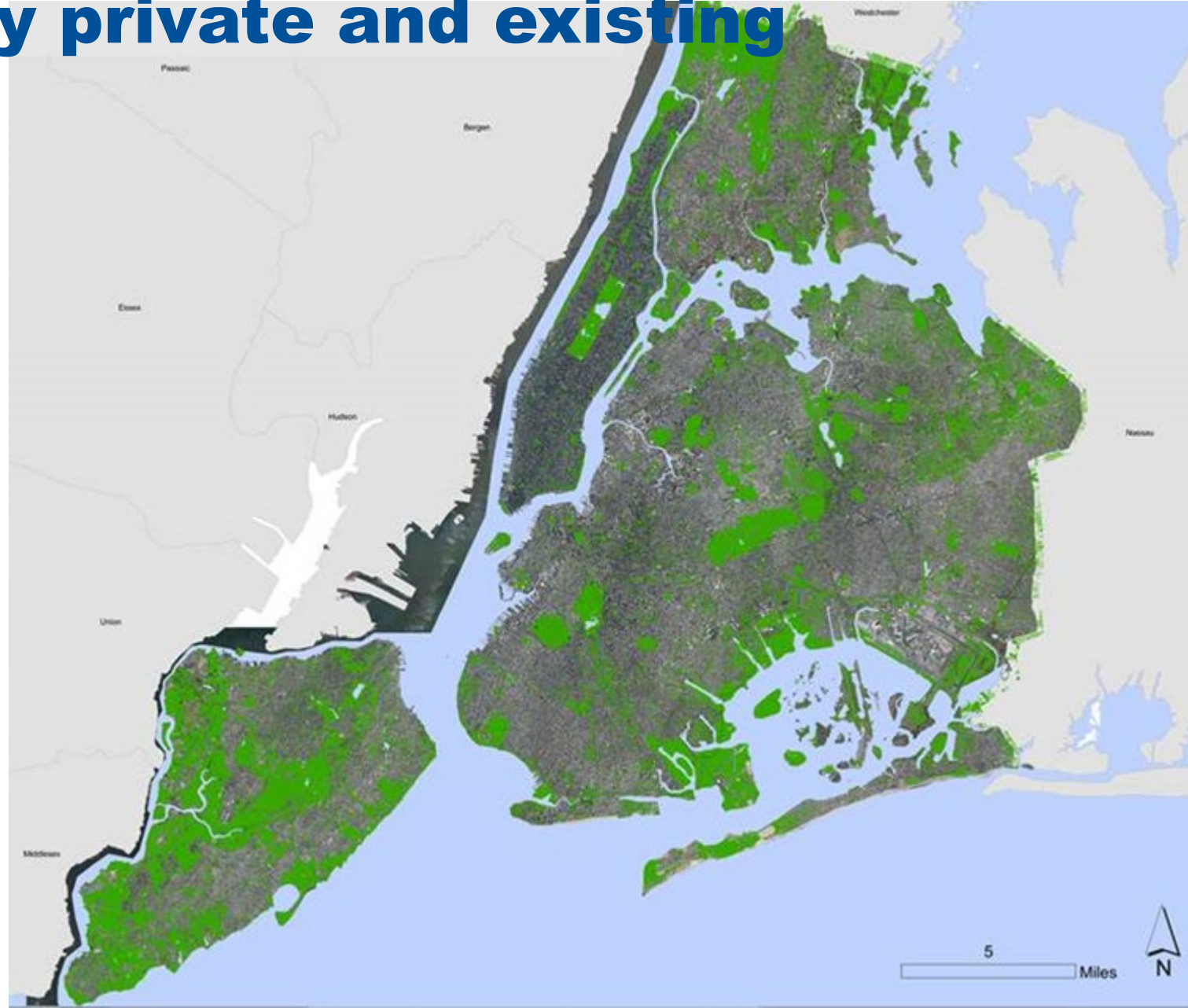


**NYC has a combination of combined (60%), separate (30%+) and direct sewer drainage networks.**





**NYC is roughly 72% impervious and a large portion of our land is held by private and existing development.**



# In NYC, we must prepare for the full range of climate threats.



## COASTAL STORMS

**+50%**  
increase in  
intense  
hurricanes  
by 2100

MORE FREQUENT,  
MORE DESTRUCTIVE  
HURRICANES



## SEA LEVEL RISE

Up to  
**.76 m**  
SLR by  
2050s

INCREASED  
TIDAL FLOODING +  
GROUNDWATER  
TABLE RISE



## PRECIPITATION

Up to  
**1.5x**  
rain days > 25mm  
by 2080s

FLOODING IN NON-  
COASTAL AREAS



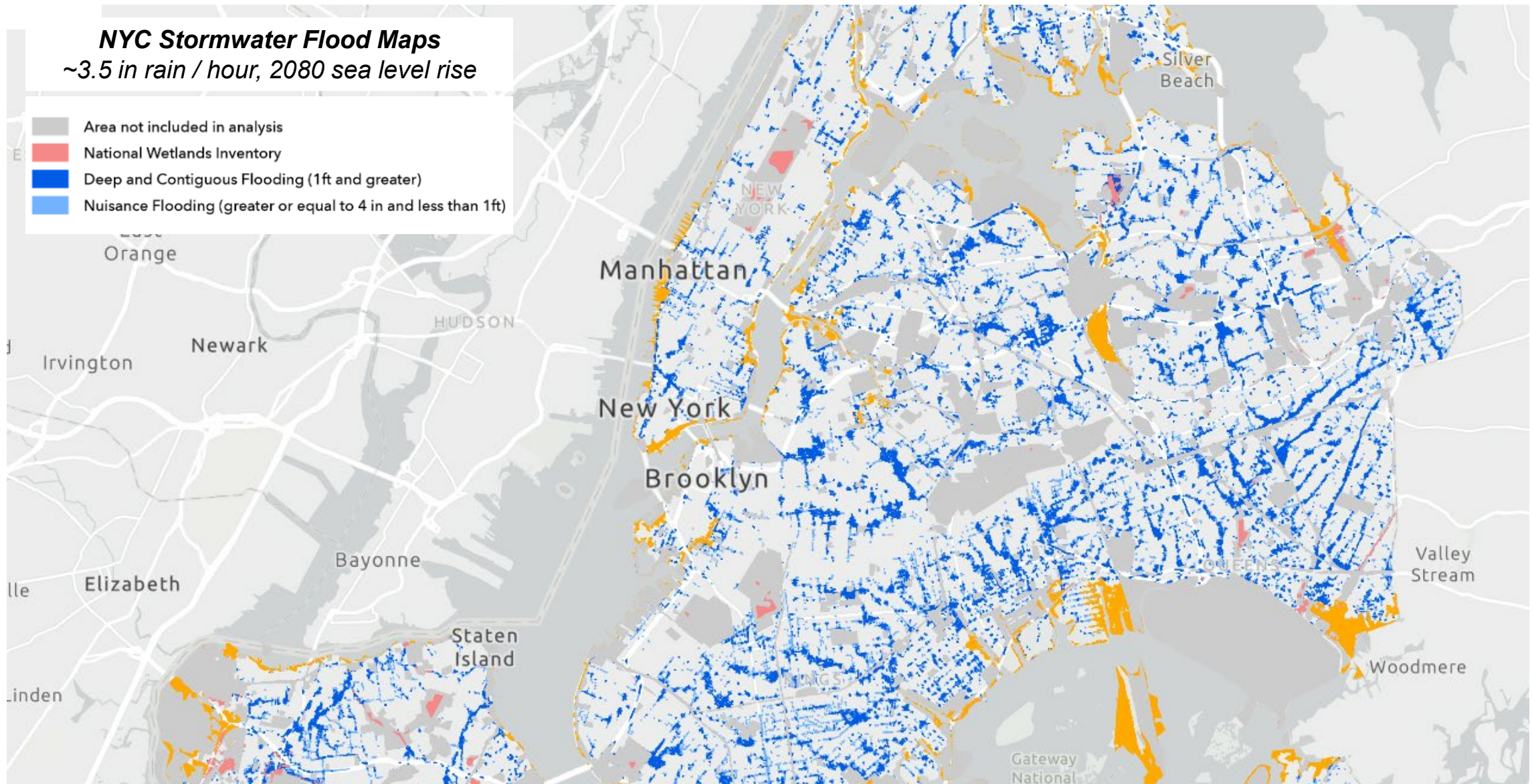
## TEMPERATURE

# of days  
above 32°C  
**TRIPLE**  
by 2050s

LONGER, MORE  
DANGEROUS HEAT  
WAVES



**We've been communicating stormwater flooding risk across a variety of climate driven precipitation scenarios starting in 2021, with more recent publication of existing conditions scenarios.**





# Also in 2021 . . . extreme rain events overwhelm our drainage system.

Photo Credit: Daily News



Tropical Storm Elsa: July 8-9

- Max 1-hr rainfall rate: 70 to 76 mm/hr

Tropical Storm Henri: August 21-23

- Central Park reported 113 mm of rain on Aug. 21 alone, with 49 mm falling between 10 to 11pm.

Tropical Depression Ida: September 2

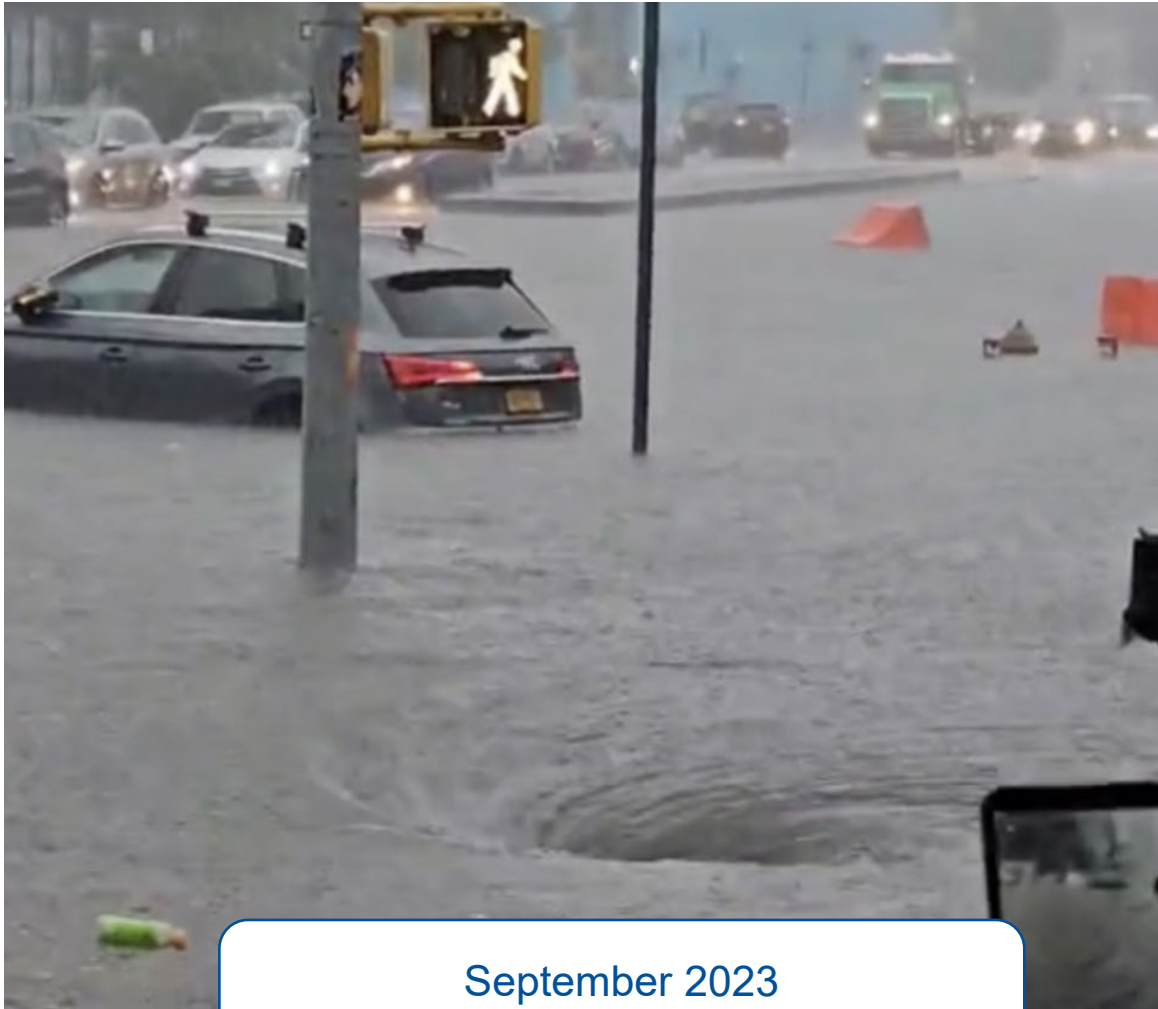
- The Central Park rain gauge set a new record for 1-hour rainfall with 80 mm (previously 49 mm from Tropical Storm Henri)

Photo Credit: CNN





# Extreme storms that have occurred in past few years have far exceeded 5 to 10 Year Design Storm intensities



September 2023  
2.7 in/hr Rainfall Intensity



Hurricane Ida in 2021  
3.33 in/hr Rainfall Intensity

# **We need to shift our approach to Water**



**We have limited the ability of natural systems to manage heavy rainfall**



**Spaces that have been designed to keep water out must transform to integrate water**



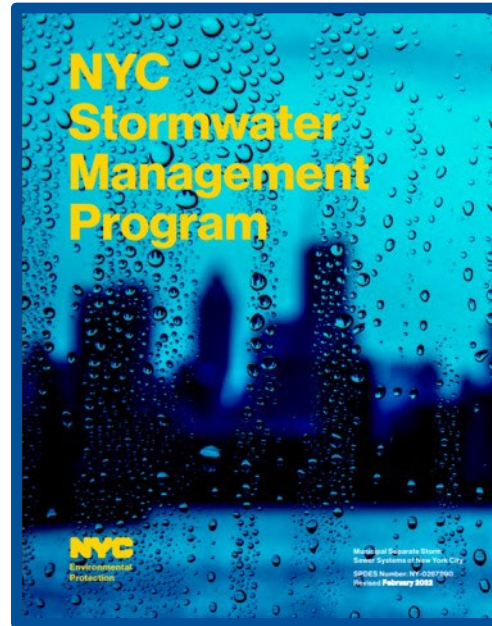
**Natural and engineered systems must work together more seamlessly**



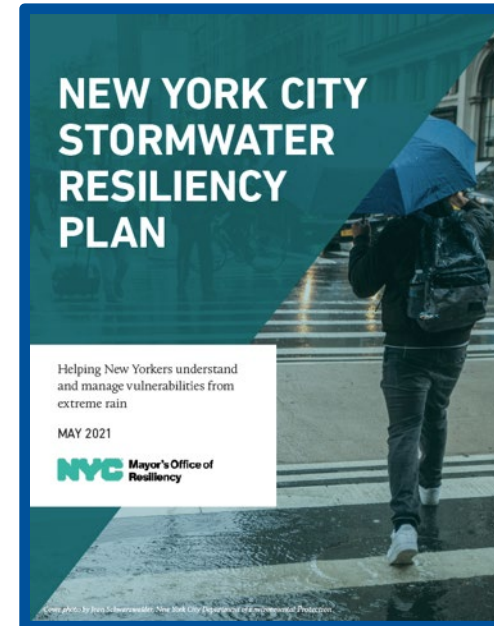
# The way we think about grey and green systems is evolving.



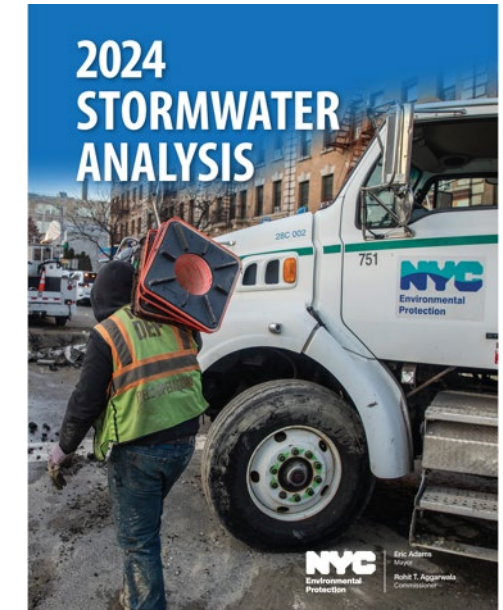
Green where grey isn't feasible



Green for water quality



We need more focused stormwater infrastructure



We need to increase our level of service and layer our stormwater infrastructure strategies, and this is going to be costly.



# The City has a **toolkit** for managing stormwater

DEP is using a multi-layered approach that strategically uses grey infrastructure, green infrastructure, and other solutions.

- ✓ Grey Infrastructure
- ✓ Green Infrastructure
- ✓ Blue Infrastructure
- ✓ Regulation
- ✓ Real-time Monitoring

# **Our Green Infrastructure Program was created to reduce CSOs.**



**City Sidewalks**



**City Streets**



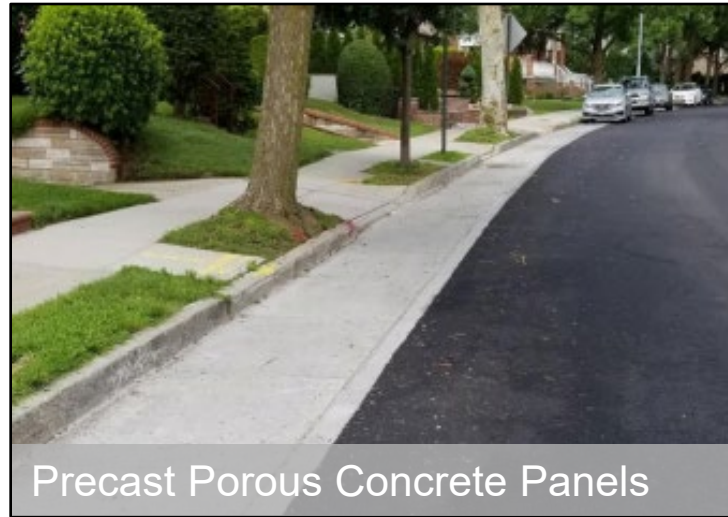
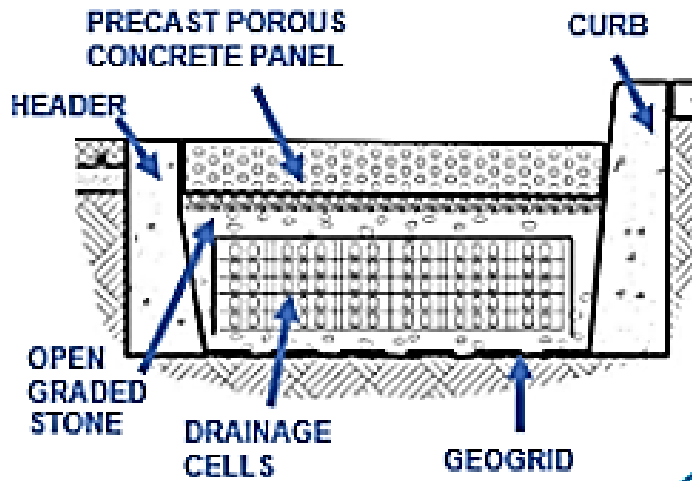
**Grant Program for Private Property Owners**



**Public Property Retrofits**



# Traditional green infrastructure in NYC



Precast Porous Concrete Panels



Precast Porous Concrete Panels



Grass Top Infiltration Basin



Concrete Top Infiltration Basin



Rain Garden

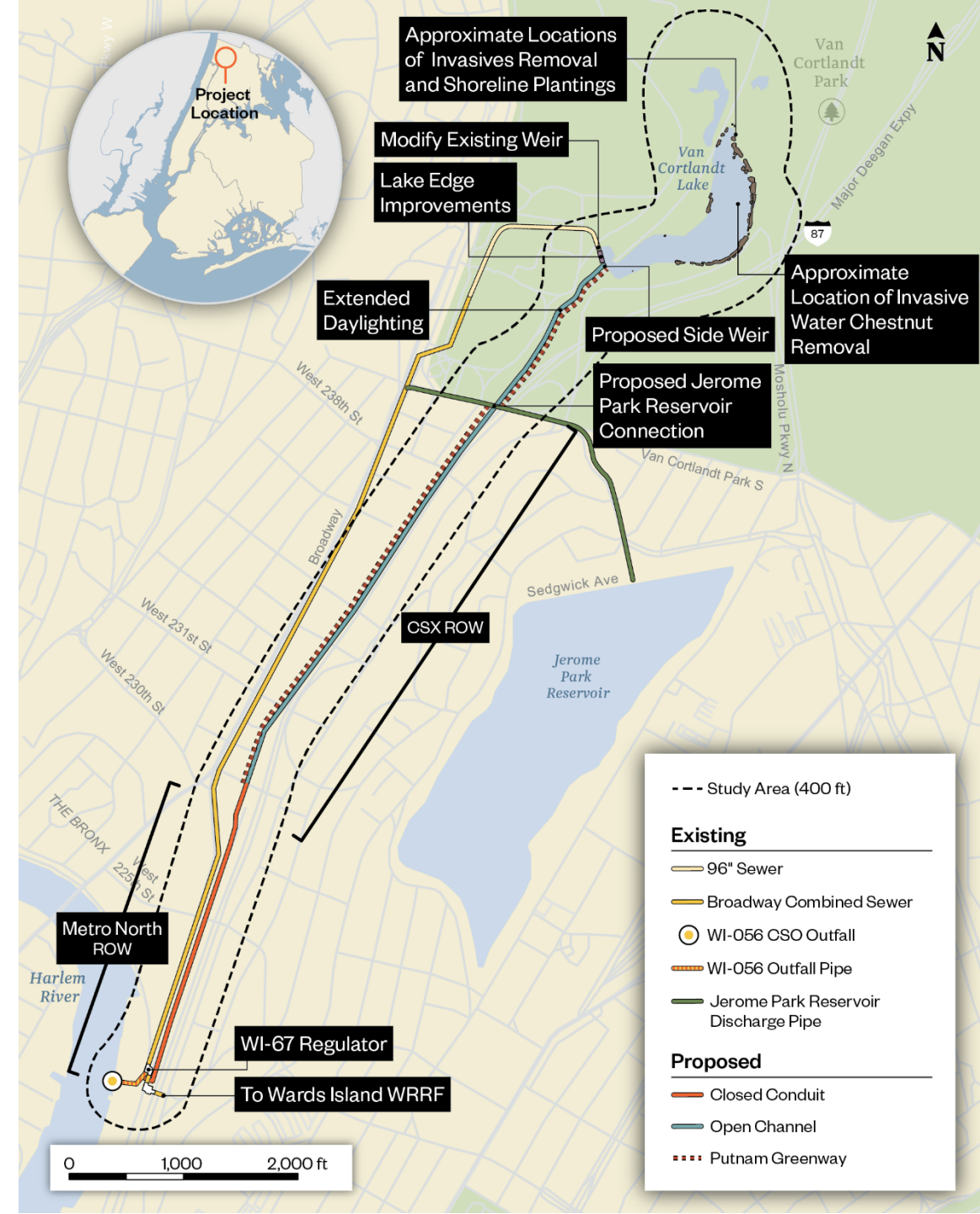


# Evolution of NYC green infrastructure



# Our largest green CSO reduction project also serves as an opportunity to restore a natural waterway.

- **Tibbetts Brook Daylighting:**
  - The proposed open channel would sit above the sewer crossings and be designed for a **baseflow of 7 cfs** and a **maximum wet weather flow of 38 cfs**.
  - Greenway paths would run parallel to the open channel.





**We have a rich history of wetland creation and restoration and now we're looking to leverage this work for water quality.**





# CLOUDBURST RESILIENCY PLANNING STUDY

## EXECUTIVE SUMMARY



# Cloudburst Study

In 2017 DEP published the Cloudburst Resiliency Planning Study based on Copenhagen's Cloudburst Management. The conceptual plan focused on Southeast Queens and featured potential solutions to manage stormwater for both everyday and extreme rain events, leveraging stormwater features to enhance outdoor spaces and neighborhood connectivity .





# Elements of Cloudburst Projects

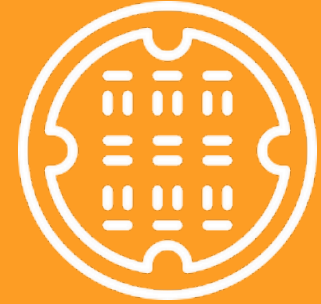
ABSORB



STORE



TRANSFER







## South Jamaica Houses

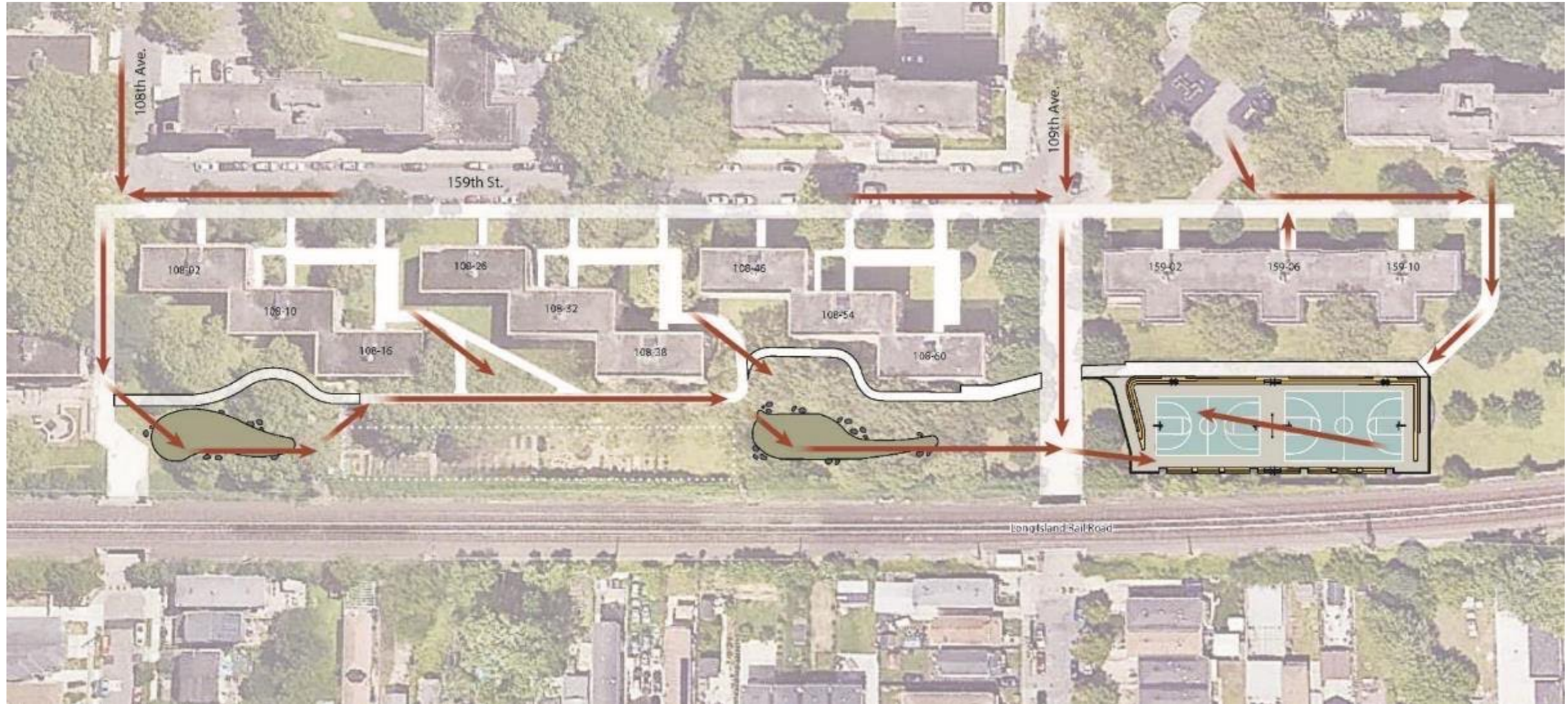
South Jamaica Houses includes 8 city blocks in South Jamaica, Queens and is home to around 2,600 residents. South Jamaica Houses were chosen to provide relief upstream to allow for more flow to enter the sewer system downstream and reduce flooding.

This project will maximize storm water capture for up to 58 mm of rainfall per hour. Aside from flood mitigation, this pilot shows how cloudburst infrastructure can offer many co-benefits to communities.

This project has reached 100% design and is currently in construction.



# South Jamaica Houses will be NYC's first cloudburst project





# South Jamaica Houses Construction

February 2025





# Expanding the cloudburst program

- **Cloudburst Hubs** are identified at the sub-catchment scale, which are hydraulically connected areas based on the sewer network, that can:
  - Include infiltration, storage, and conveyance to reduce the flood depths of hotspots,
  - Connect onsite with right-of-way strategies, including diverting street runoff, and
  - Be a combination of green-grey strategies



SUBSURFACE  
STORAGE



POROUS CONCRETE  
PARKING LANE

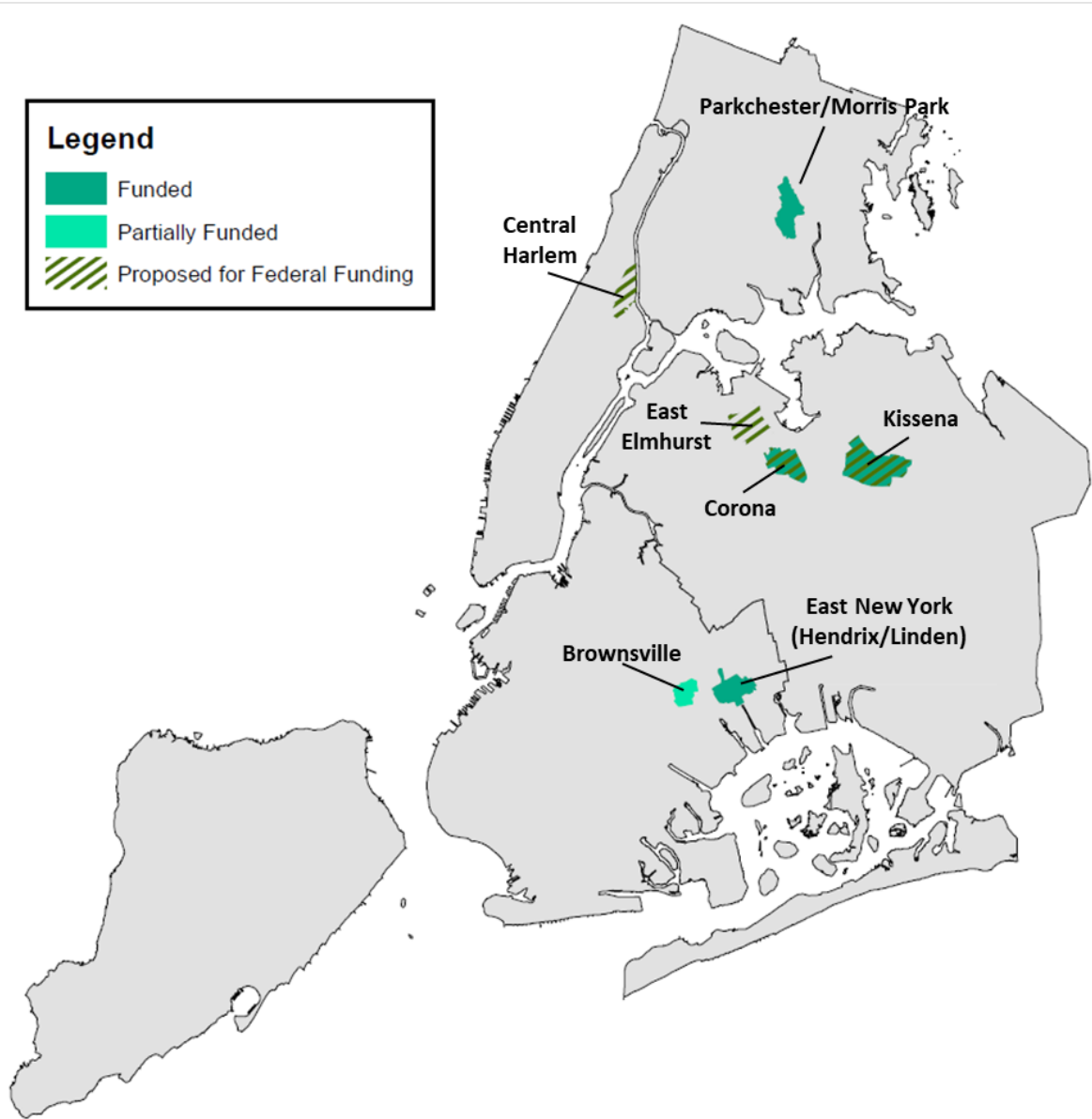
SUBSURFACE STORAGE

POROUS  
PAVEMENT  
SYSTEM

POROUS  
PAVEMENT  
SYSTEM



# Cloudburst Hub Implementation



**\$390M**

**City Funding Allocated**

**\$40M**

**DEP Design Contracts Registered  
for 4 initial hubs**

**\$224M**

**Additional Federal Funding Requested  
by DEP**



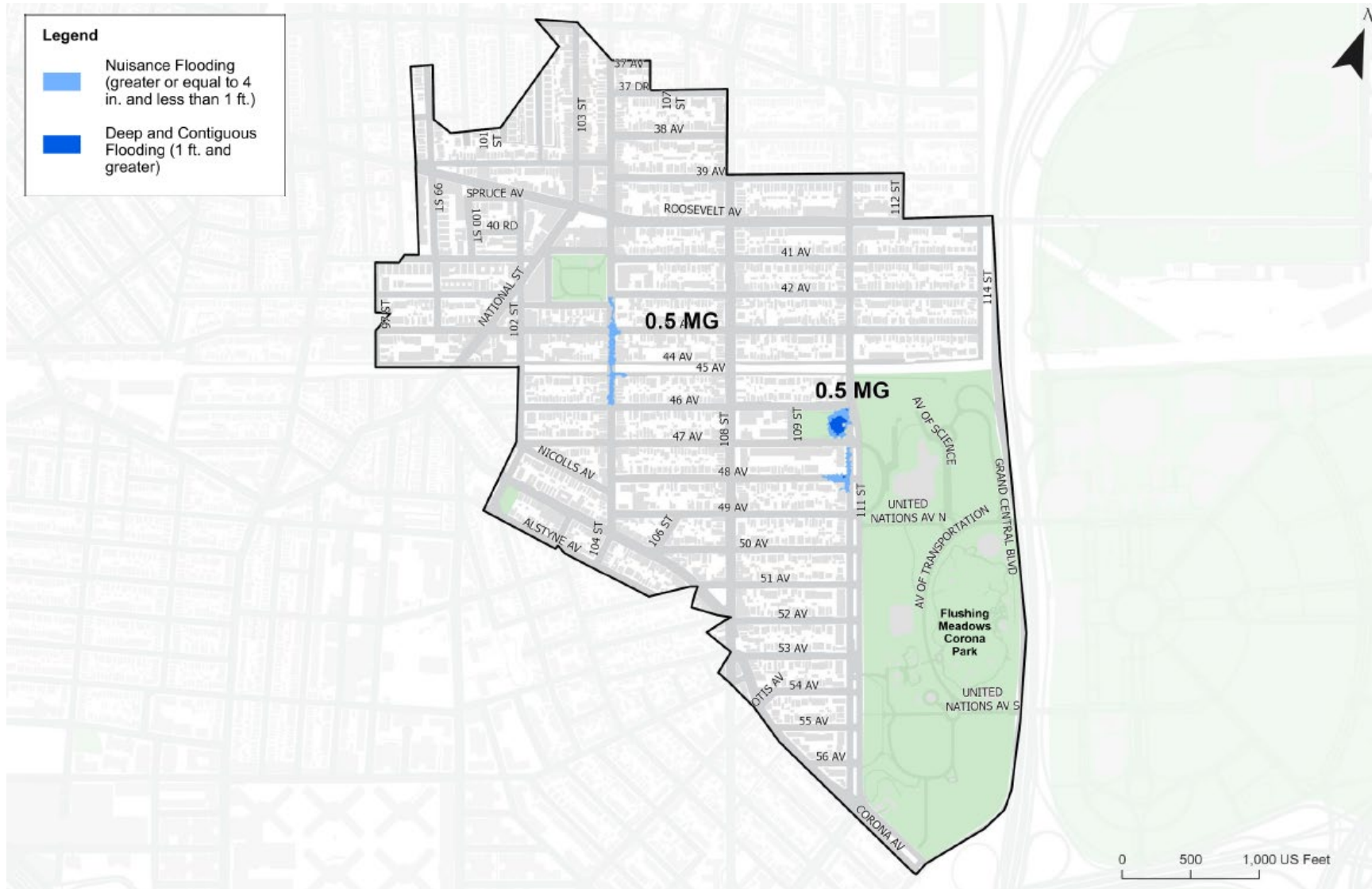
# Location + Context





# Corona Cloudburst Hub

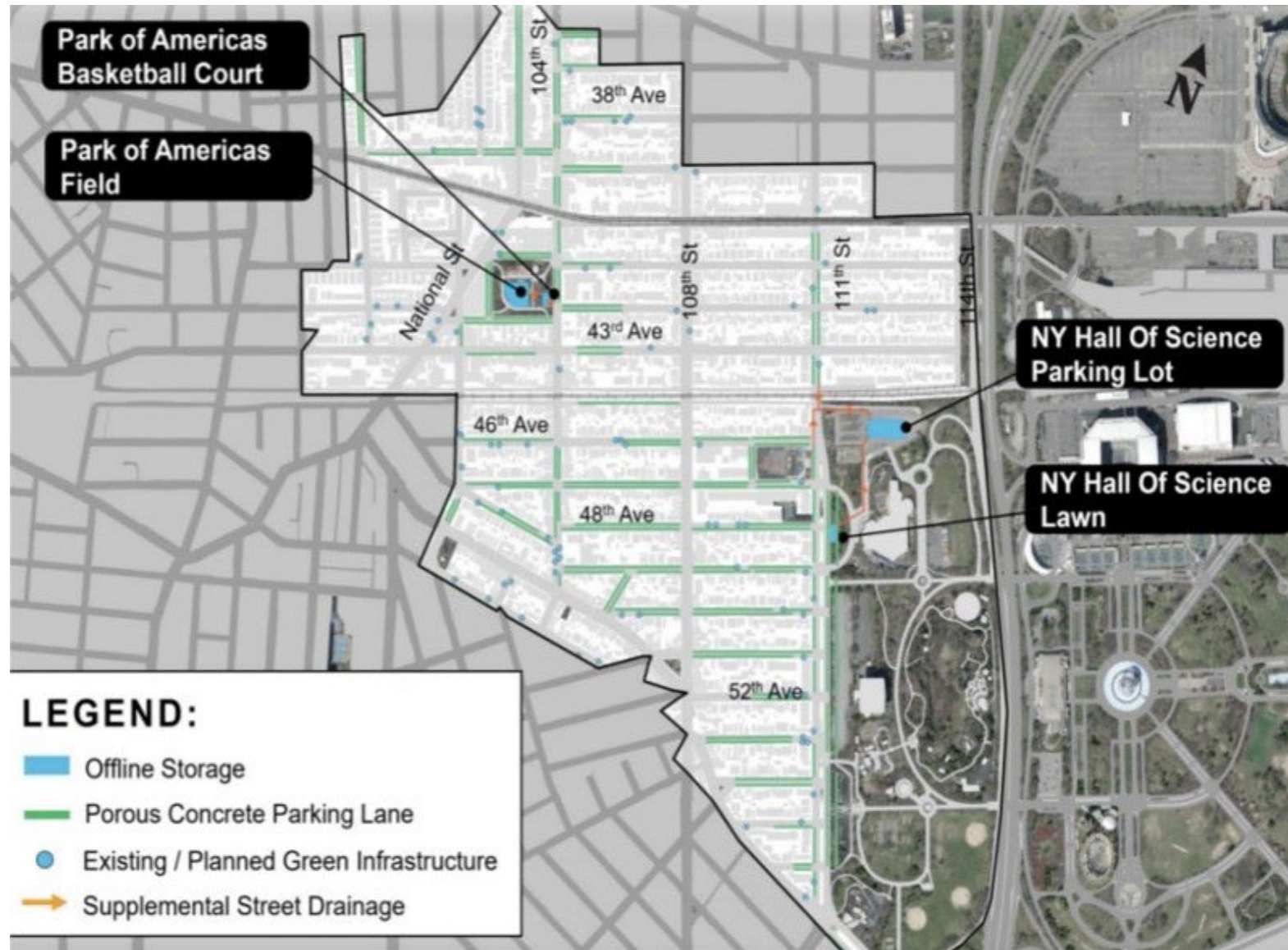
## Flooding



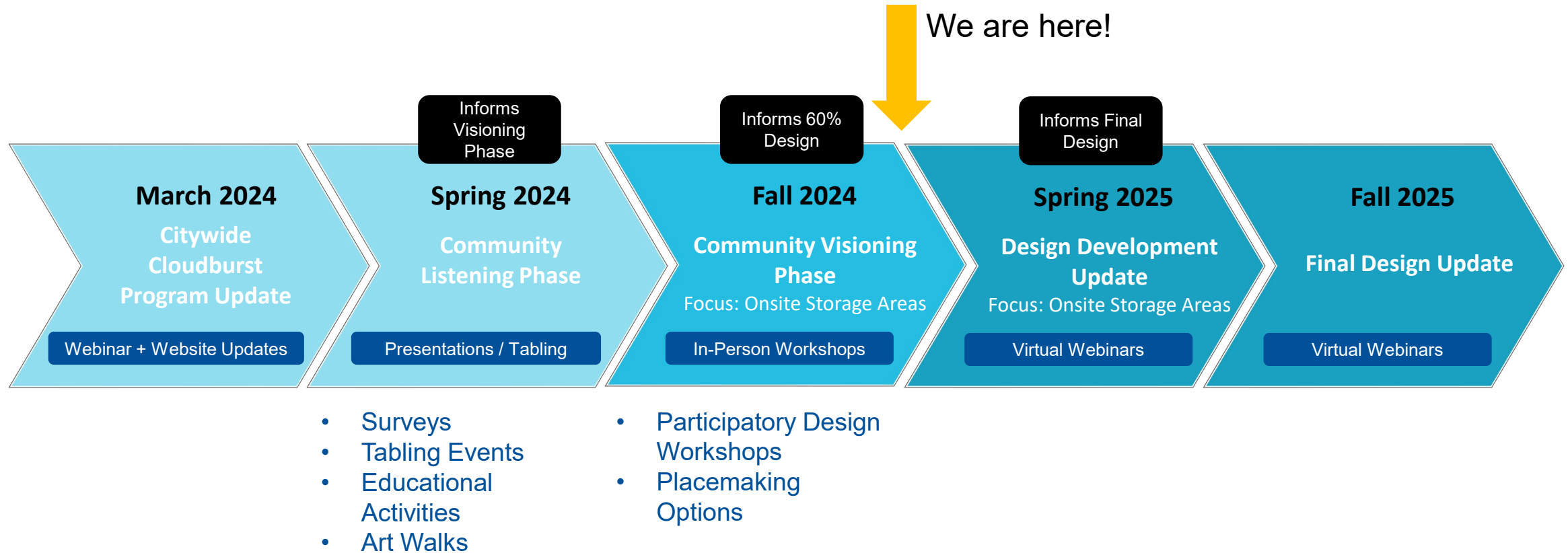


# Corona Cloudburst Hub

Boundary + Stormwater Management Interventions



# Engagement & Equity: Cloudburst Hub Outreach Process





# Public Engagement: Listening Phase





CORONACLOUDBURSTIVISIONINGWORKSHOPJULY19, 2022

# Engagement Materials

## LISTENING PHASE

### NYC DEP Cloudburst Hub

**What is a Cloudburst?**

A cloudburst is a sudden, heavy downpour where a lot of rain falls in a short amount of time. Cloudbursts can cause flooding, damage property, disrupt critical infrastructure, and pollute New York's rivers and harbor.

**What is a Cloudburst Project?**

DEP will be constructing and installing a number of stormwater management tools that will be able to store and slowly release stormwater after a cloudburst. Cloudburst projects will use:

- Grey infrastructure, like sewer pipes and underground storage tanks.
- Green infrastructure, like trees and rain gardens.

Cloudburst management can minimize flooding and increase capacity in our sewer system. These projects may also feature public open space and special community amenities.

Corona, Queens



**Help us design community spaces this Spring!**

As a community member, your voice is integral to our Cloudburst design planning process, and we would love to hear from you and your neighbors as we start the planning process for these sites this spring.

To be involved, please visit our Newsletter landing page here: [nyc.gov/site/departments/newsletter](https://nyc.gov/site/departments/newsletter)

On this website, you will be able to sign up for notifications and updates about upcoming workshops and events at your local Cloudburst project.

There is also the opportunity to sign up for more than one DEP Cloudburst project if you wish to receive regular updates and notifications at all of our sites as well as DEP's brand new Stormwater newsletter to learn more about flooding and the many citywide initiatives currently underway to address it.


Please feel free to send this information along to fellow community members because we want as much participation as possible!

Corona, Queens



### NYC DEP Cloudburst Hub

**Corona Cloudburst Hub**



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Cloudburst investments aim to protect the Corona neighborhood from flooding during heavy storm events. These projects include porous parking lots and on-site storages at the Park of Americas field and basketball court and the New York Hall of Science lawn and parking lot.

Corona, Queens





### NYC DEP Cloudburst Hub




**KEY**

- Building / Edificio
- Parking Lot / Estacionamiento
- Parks / Parques
- Subway Route / Ruta del Metro
- Long Island Rail Road / Línea del Ferrocarril de Long Island
- 100-year Stormwater Flood event / Inundación de agua aluvional de 100 años de la década de 2050
- 100-year Stormwater Flood event / Inundación de agua aluvional de 100 años de la década de 2050

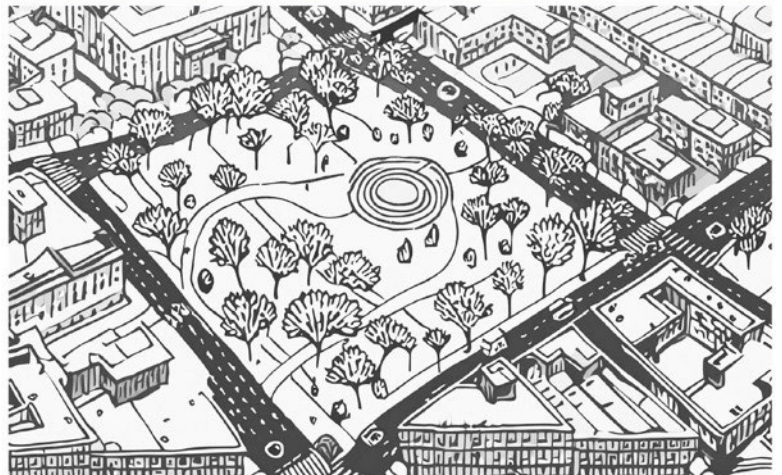
The map shows flooding from cloudburst events, or extreme stormwater flooding. This cloudburst project is focused on flooding from the "2050's 10-year stormwater flood event."

El mapa muestra inundaciones por tormentas o inundaciones extremas por aguas pluviales. Este proyecto de tormentas se centra en las inundaciones provocadas por el "evento de inundación de aguas pluviales de 10 años de 2050".

Corona, Queens

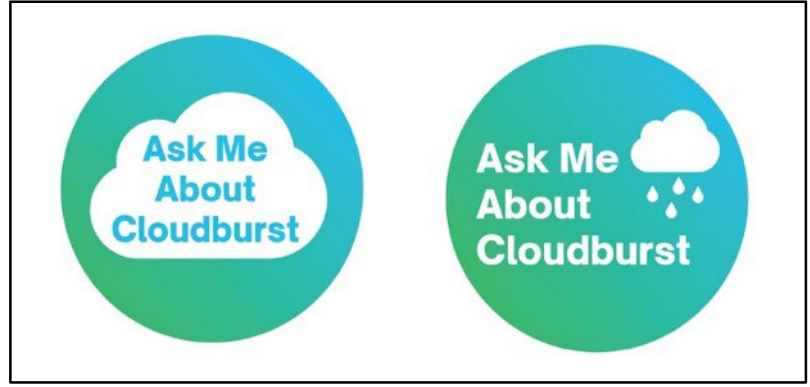


### Cloudburst Hub | Corona, Queens



When the ground is grassy, it's called **PERMEABLE**. That means rain can soak into the ground. When the ground is paved or there are buildings, it's called **IMPERMEABLE**. That means rain has to flow along the pavement until it reaches a drain going into the sewer. Can you spot the permeable and impermeable areas in this picture? Try filling them in with different colors!

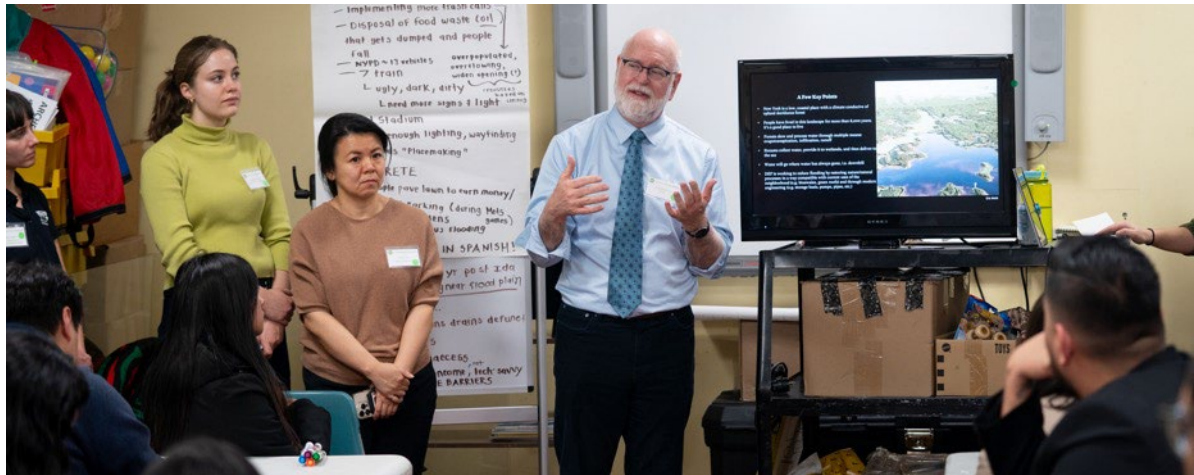
NYC  
Environmental Protection



The Listening Phase utilized a variety of engagement materials in both Spanish and English: postcards, informational board, laminated map, 3D-printed sensory models, porous concrete sample, coloring pages, and “Ask Me About Cloudburst” stickers.



# Community Resilience Workshop





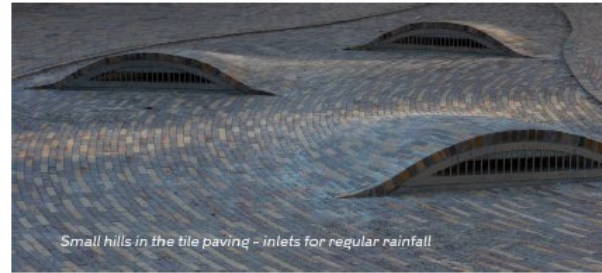
# We strive to establish value through placemaking

Where we have the opportunity, we hope to enhance Cloudburst designs to include placemaking that will communicate:

- Why we experience flooding - hydrologic history and NYC realities of “living with water” now and into the future
- The benefits of invisible infrastructure
- Providing interim flood mitigation and community benefits while DEP longer term planning is underway
- Long-term engagement with communities



Edgewater Park in Minneapolis is designed to be sustainable, with prairie grass and native plants chosen for their low maintenance and their ability to capture storm-water. The pervious concrete fits right in. It's stained blue in places to mimic the paths of the nearby Mississippi and Minnesota rivers. Photo courtesy of Cemstone.



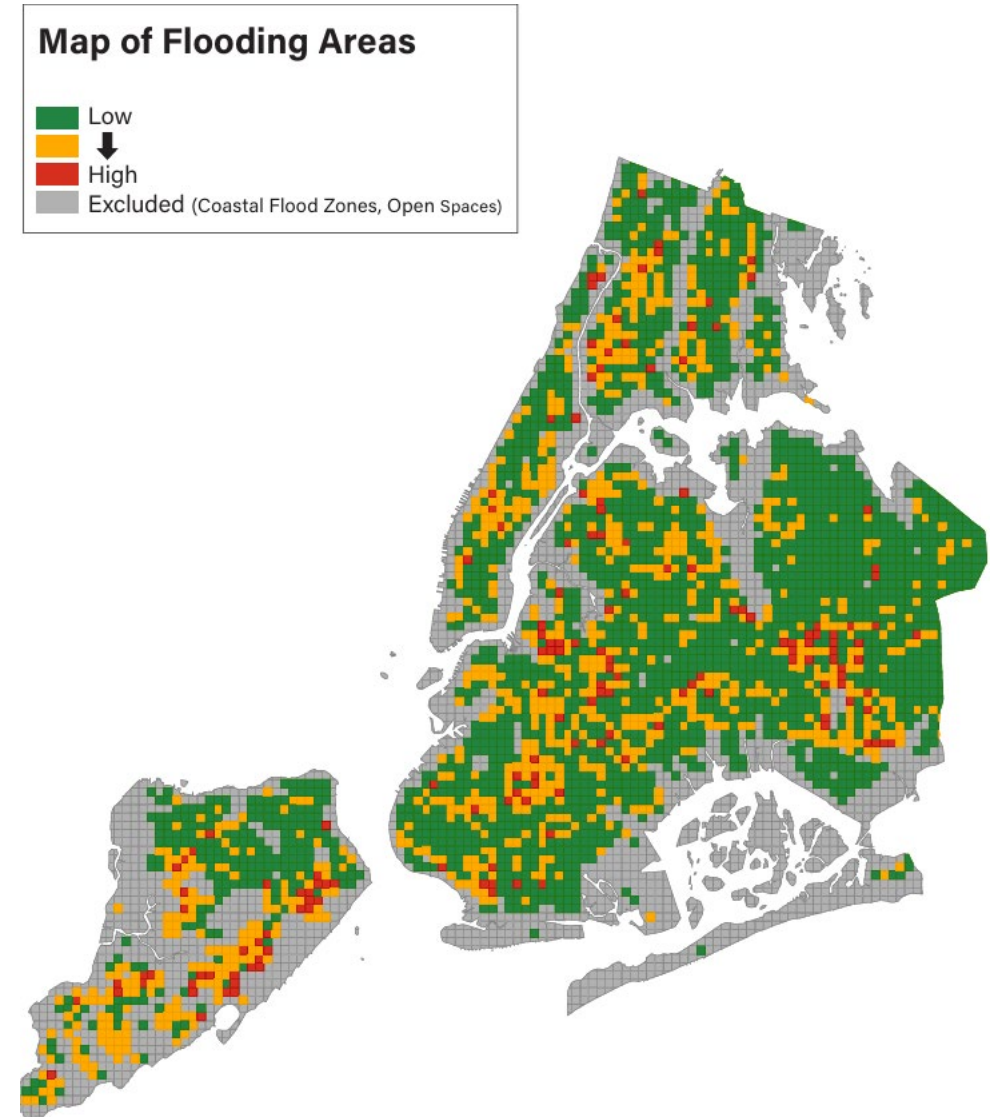
Small hills in the tile paving - inlets for regular rainfall





# What's next in NYC for stormwater resiliency

- Launching a “Stormwater Dashboard” and continuing community resilience conversations
- Complete build-out of trunk main network analyses and initiate “Smart Sewer” studies
- Recalibrate our stormwater resiliency models with new surface and in-sewer flow data
- Finalize stormwater “Level of Service” to address climate change – will likely need to consider allowance for some street flooding (<4in) and land acquisition to balance costs and risks
- Continue advancing Cloudburst Hubs
- Initiate about new grey, green, blue projects in priority areas



**Thank you!**





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