# Cloudburst Program Citywide Update

NYC Environmental Protection

# Agenda

- **Cloudburst Overview**
  - Refresher: What is Cloudburst Management?
  - Key Milestones to Date
- **Cloudburst Hubs**
  - Planning Study
  - Program Development & Funding
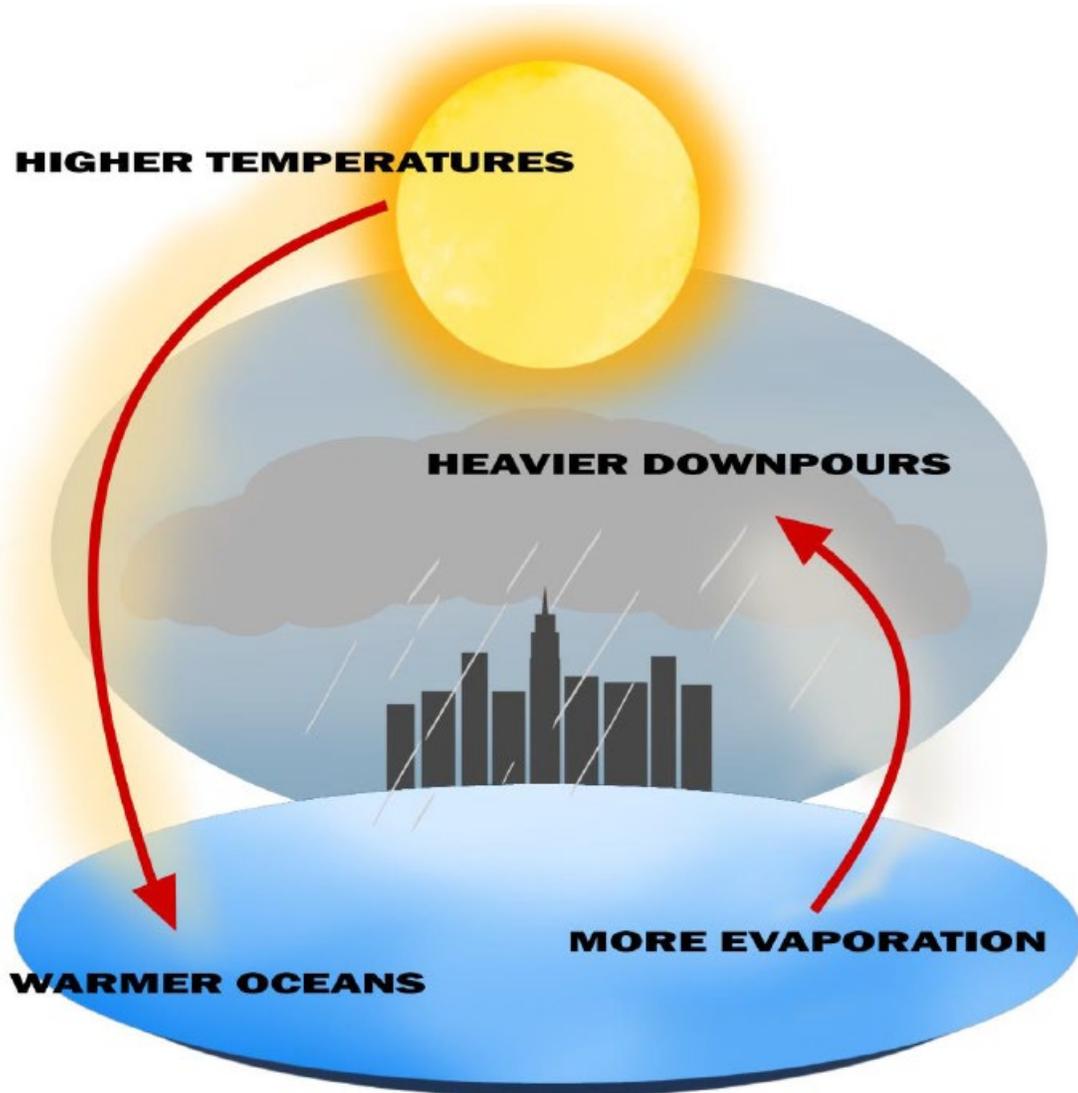  - Cloudburst Hubs in Design

# Cloudburst Overview

# The Problem

**Climate change is causing more localized flooding across NYC.**

# Our Changing Climate



HIGHER TEMPERATURES

HEAVIER DOWNPOURS
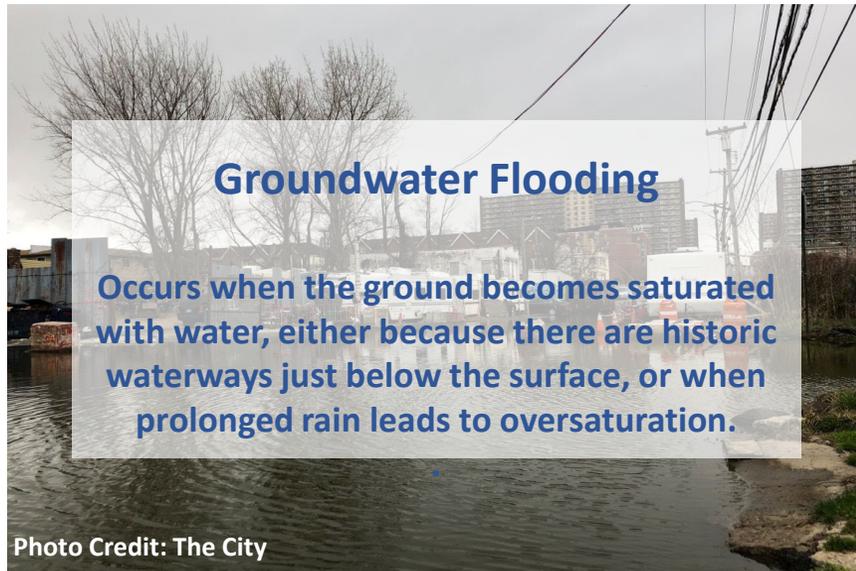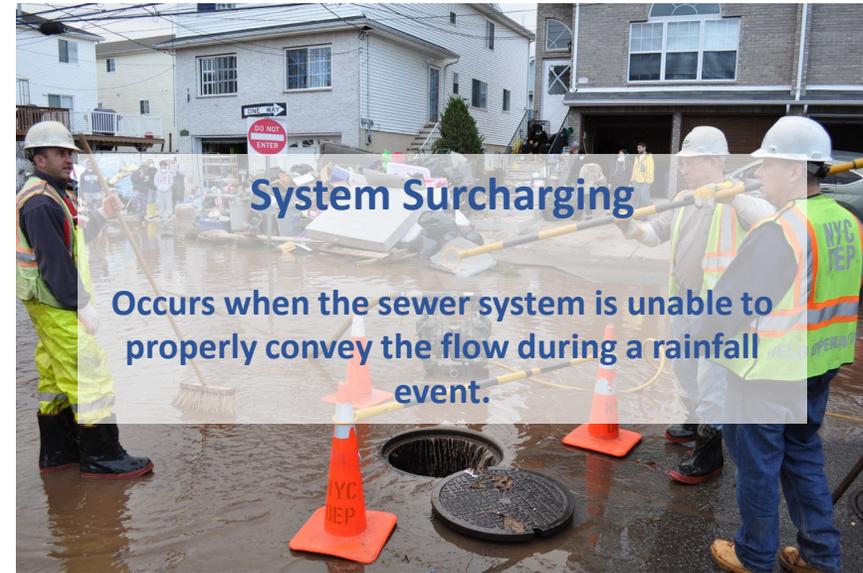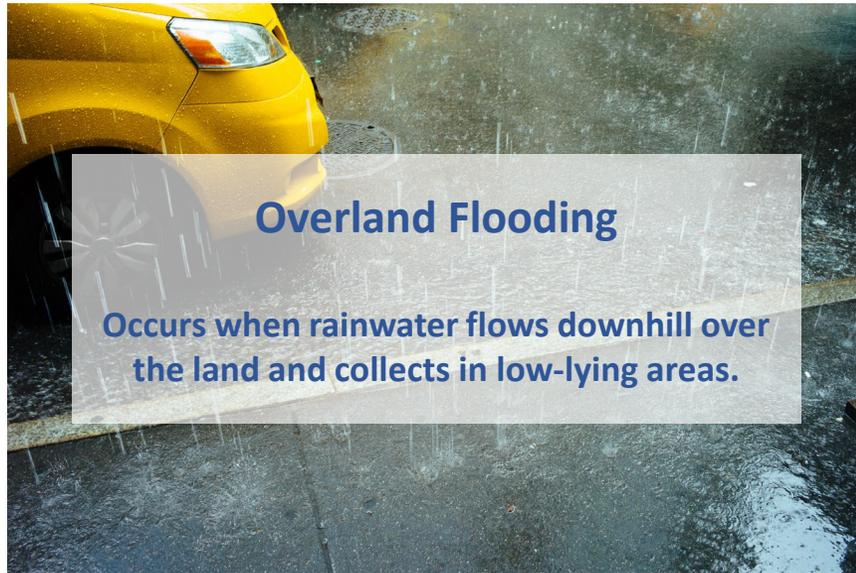
MORE EVAPORATION

WARMER OCEANS

Sudden, powerful storms are bringing more **intense rainfall** to New York City.

- August 2021 (Henri) – 1.94 inches in an hour
- September 2021 (Ida) – 3.15 inches in an hour
- September 29, 2023 – 2.5 inches in an hour

In 2023, NYC experienced **rain every 3 days.**

NOAA (National Oceanic and Atmospheric Administration) has **reclassified NYC a "humid subtropical" climate.**

# There are several different types of flooding that New Yorkers may experience, either combined or in isolation during a flooding event.

## Overland Flooding

Occurs when rainwater flows downhill over the land and collects in low-lying areas.

## System Surcharging

Occurs when the sewer system is unable to properly convey the flow during a rainfall event.

## Groundwater Flooding

Occurs when the ground becomes saturated with water, either because there are historic waterways just below the surface, or when prolonged rain leads to oversaturation.

Photo Credit: The City

## Coastal Flooding

Occurs when rising tides or storm surges push ocean water over the coastline.
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Photo Credit: NY Daily News

# 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, pollute New York's waterways, and in extreme examples even cause loss of life.

# The City has a **toolkit** to combat flooding

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

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

# Sewers: 1ˢᵗ Line of Defense

- **Sewers** work in every rainstorm and protect fully against 98% of rain events.

- The sewer network is generally built to handle 1.5 to 1.75 inches of rain per hour.

- During rainstorms, the system can get overwhelmed when the amount of water produced by the storm is greater than the capacity of pipes.

- Just like we don't design roads for Memorial Day Weekend traffic, we don't design sewers to handle hurricane-level water.
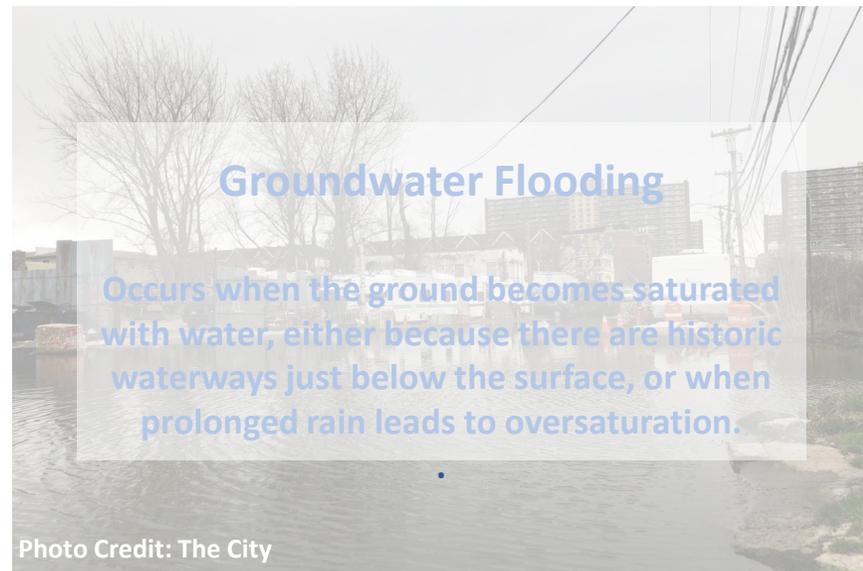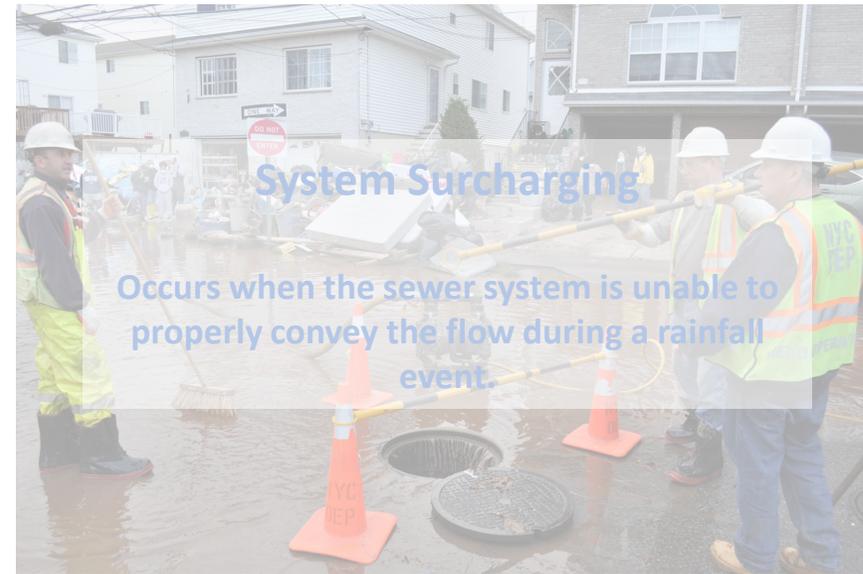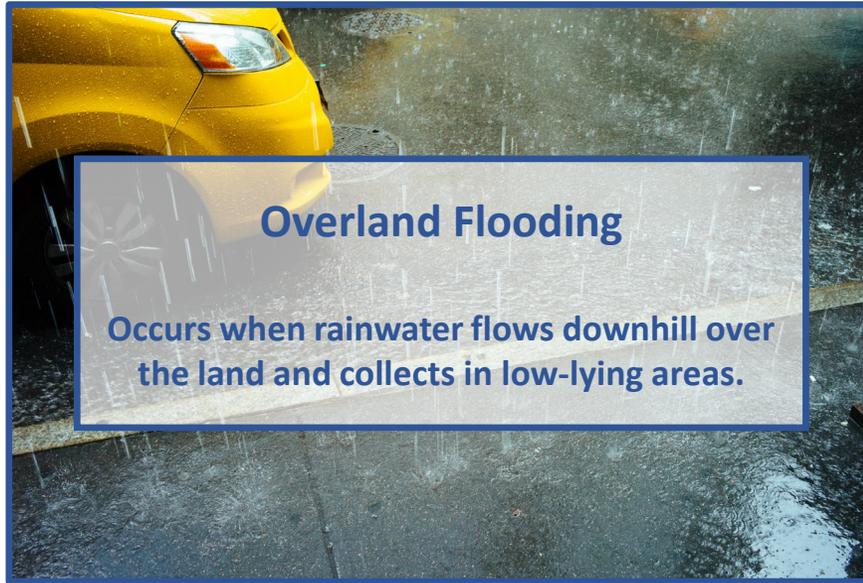
# Depending on the underlying cause of flooding, DEP can use a variety of strategies to provide flooding relief.

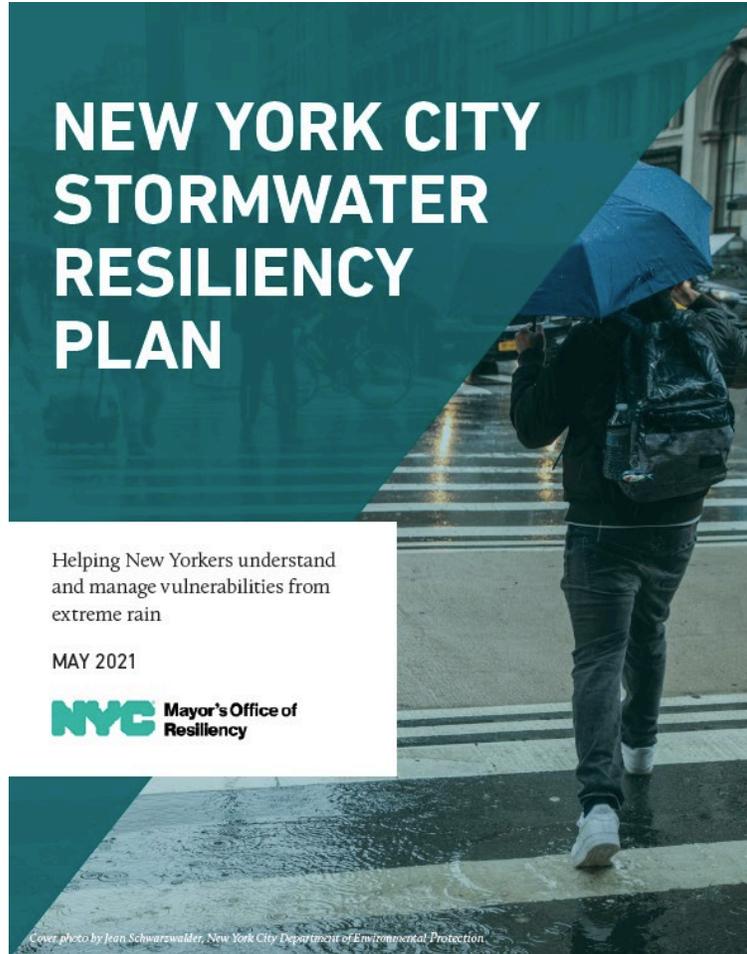| Type of Flooding | Examples of Potential Solutions | |
| --- | --- | --- |
| | Green/Blue | Grey |
| Overland flooding | Green infrastructure* and cloudburst management | High level storm sewers Underground storage tanks |
| System surcharging | Bluebelts | Large sewer expansion and system redesign |
| Groundwater flooding | n/a | Waterproof properties |
| Coastal flooding | Wetland restoration | Flood walls, pumping stations |

*Green infrastructure includes practices such as porous pavement, rain gardens and other systems that retain or detain stormwater where it falls or nearby

*Many factors influence which type of solution is appropriate.*

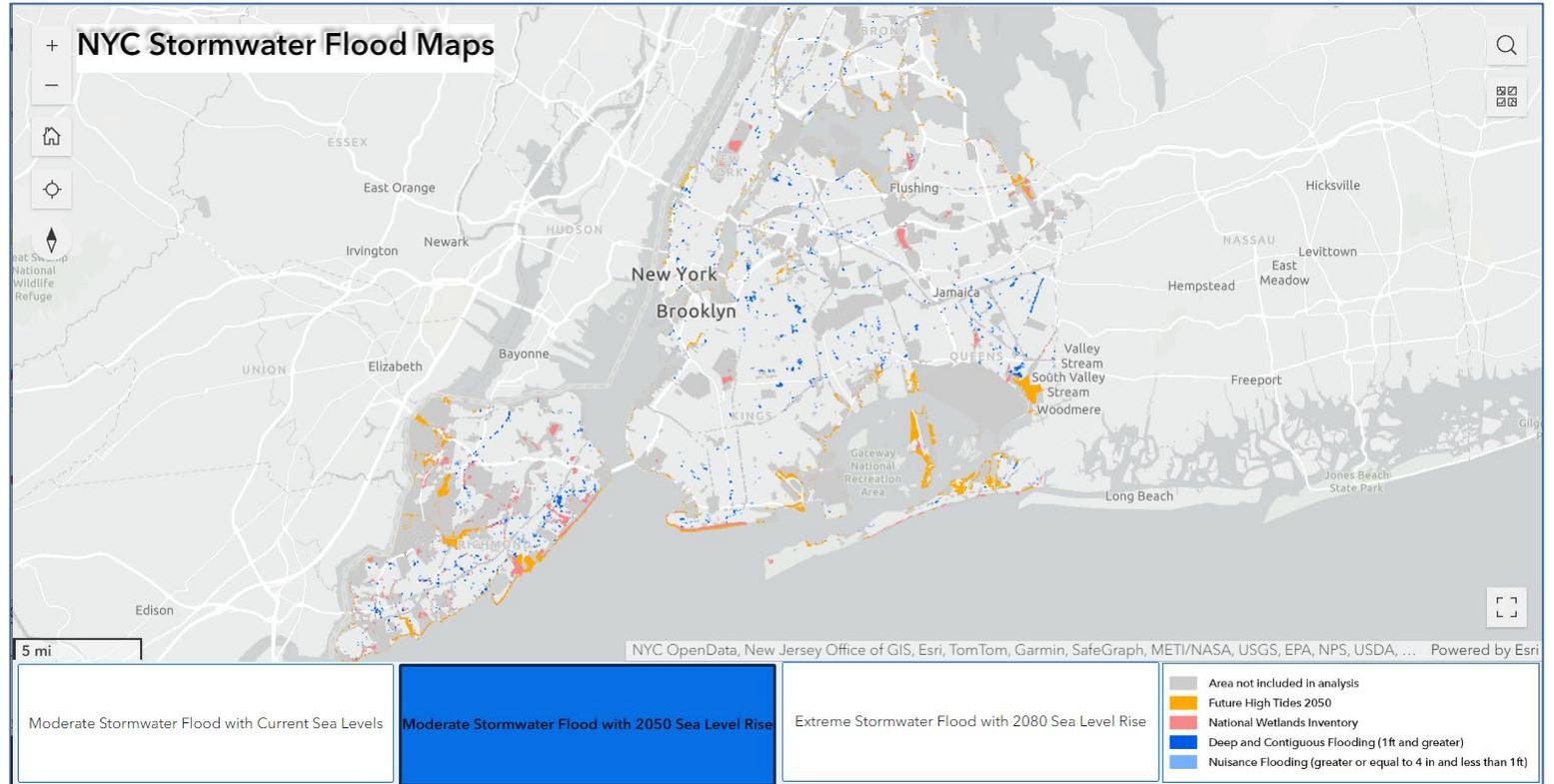# Cloudburst Management is primarily suited to address overland flooding.

### Overland Flooding

Occurs when rainwater flows downhill over the land and collects in low-lying areas.

### System Surcharging

Occurs when the sewer system is unable to properly convey the flow during a rainfall event.

### Groundwater Flooding

Occurs when the ground becomes saturated with water, either because there are historic waterways just below the surface, or when prolonged rain leads to oversaturation.

Photo Credit: The City

### Coastal Flooding

Occurs when rising tides or storm surges push ocean water over the coastline.

Photo Credit: NY Daily News

# NYC Citywide Stormwater Flood Maps



Moderate Stormwater Flood with 2050 Seal Level Rise
(2.1 in/hr + 2.5 ft of SLR)

# What is Cloudburst Management?

Cloudburst Management is a way of absorbing, storing, and transferring stormwater to minimize flooding from heavy rain events. Cloudburst Management uses a combination of grey infrastructure, like drainage pipes and underground tanks, and green infrastructure, like trees and rain gardens. These projects consider larger volume storage, typically building for up to 2.3 inches/hour and provide CSO reduction benefits as well as stormwater resilience.
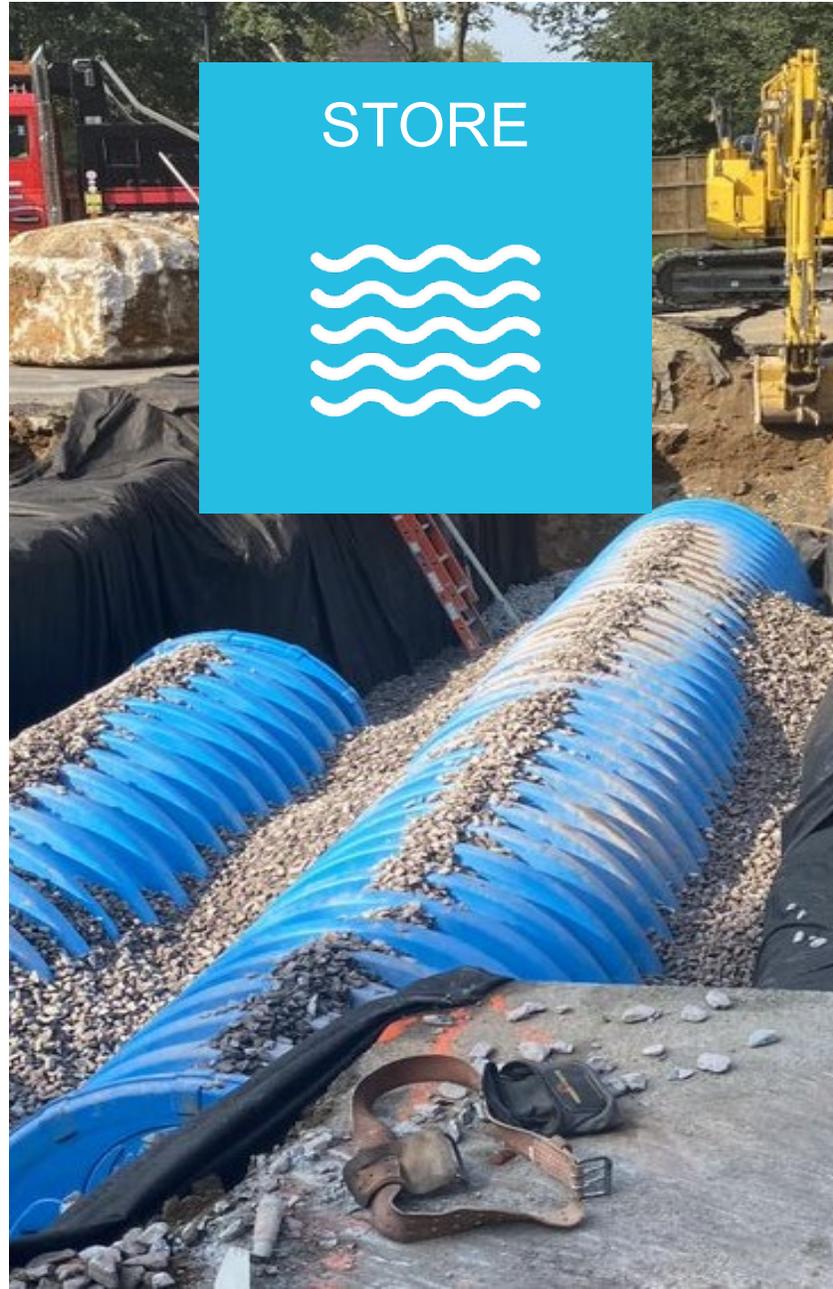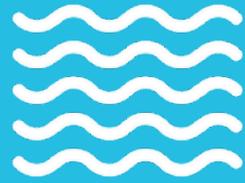
During heavy rain events, Cloudburst Management can minimize damage to property and infrastructure by reducing pressure on the sewer system.
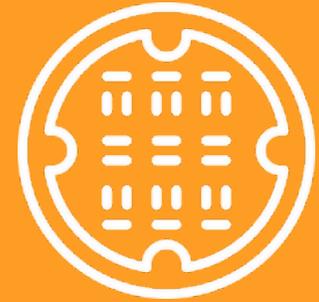
# Elements of Cloudburst Projects



ABSORB
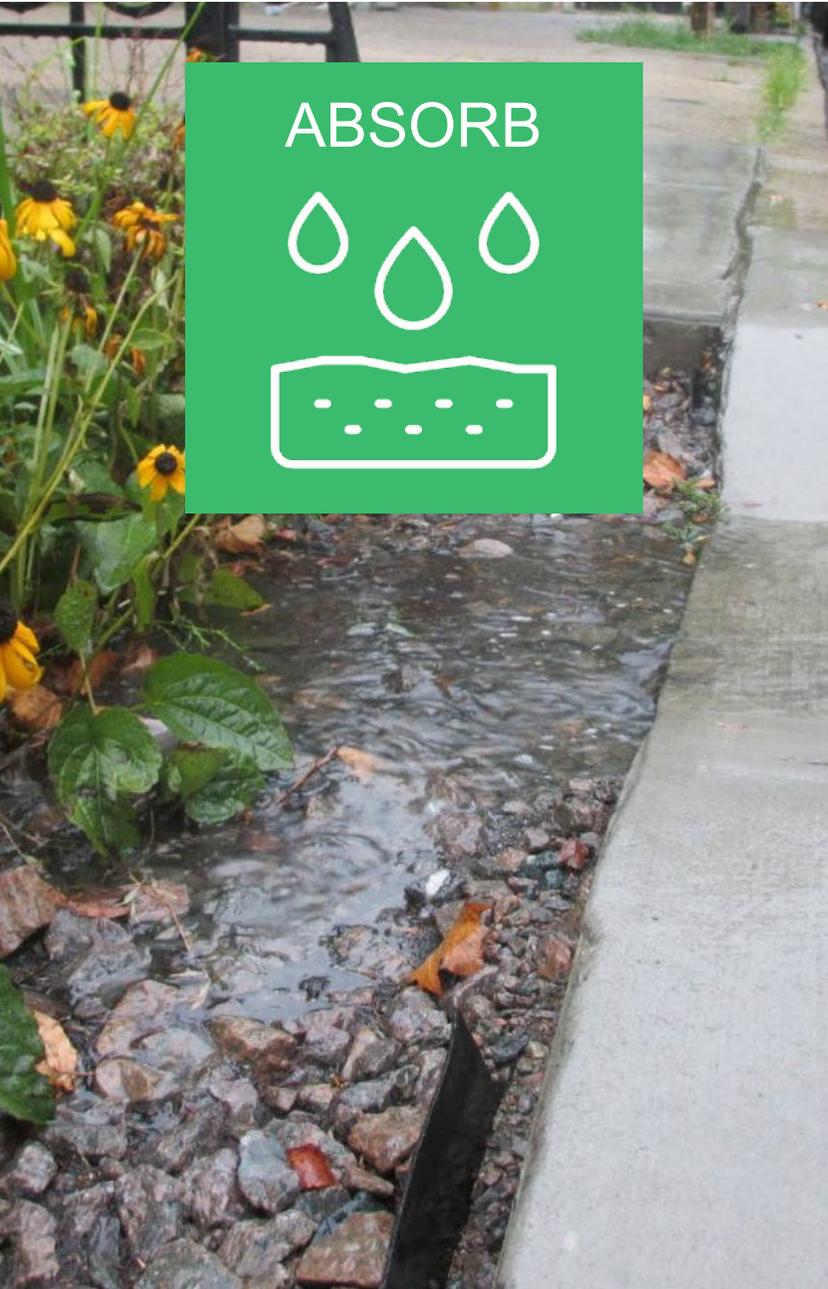
STORE

TRANSFER

# Key Milestones to Date

**January 2017**
Cloudburst Resiliency Planning Study

**May 2021 – December 2021**
NYC Stormwater Resiliency Plan & Commitment to Cloudburst Hub Implementation

**September 2022**
Cloudburst Management for NYC Long Term Resilience Presentation

**January 2023**
Mayoral Announcement of Initial Cloudburst Hubs

**Submitted FY22 Applications for FEMA Funding**

**Winter 2023 – Fall 2023**
Design Contract Procurement

**Fall 2023**
Cloudburst Design Team Selection & Contract Kickoff

**Submitted FY23 Applications for FEMA Funding**

**March 2024**
Citywide Cloudburst Update

# Cloudburst Hubs

# Cloudburst Program & Agency Partners

## Sister City Partnership



## Cloudburst Planning Study



CLOUDBURST RESILIENCY PLANNING STUDY
EXECUTIVE SUMMARY

## Cloudburst Pilot Projects



## Cloudburst Hubs



NEW YORK CITY DOT
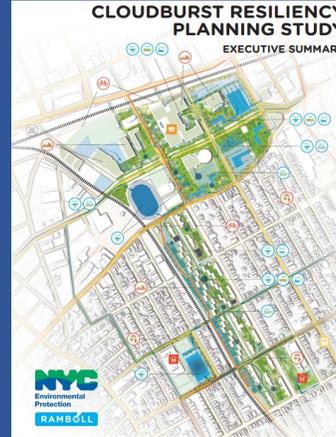
NYC Parks

NYC DDC Department of Design and Construction

NEW YORK CITY HOUSING AUTHORITY

NYC Emergency Management

NYC Mayor's Office of Climate & Environmental Justice

# What is a cloudburst hub?

- Flood hotspots were identified and clustered into Cloudburst Hubs

- 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
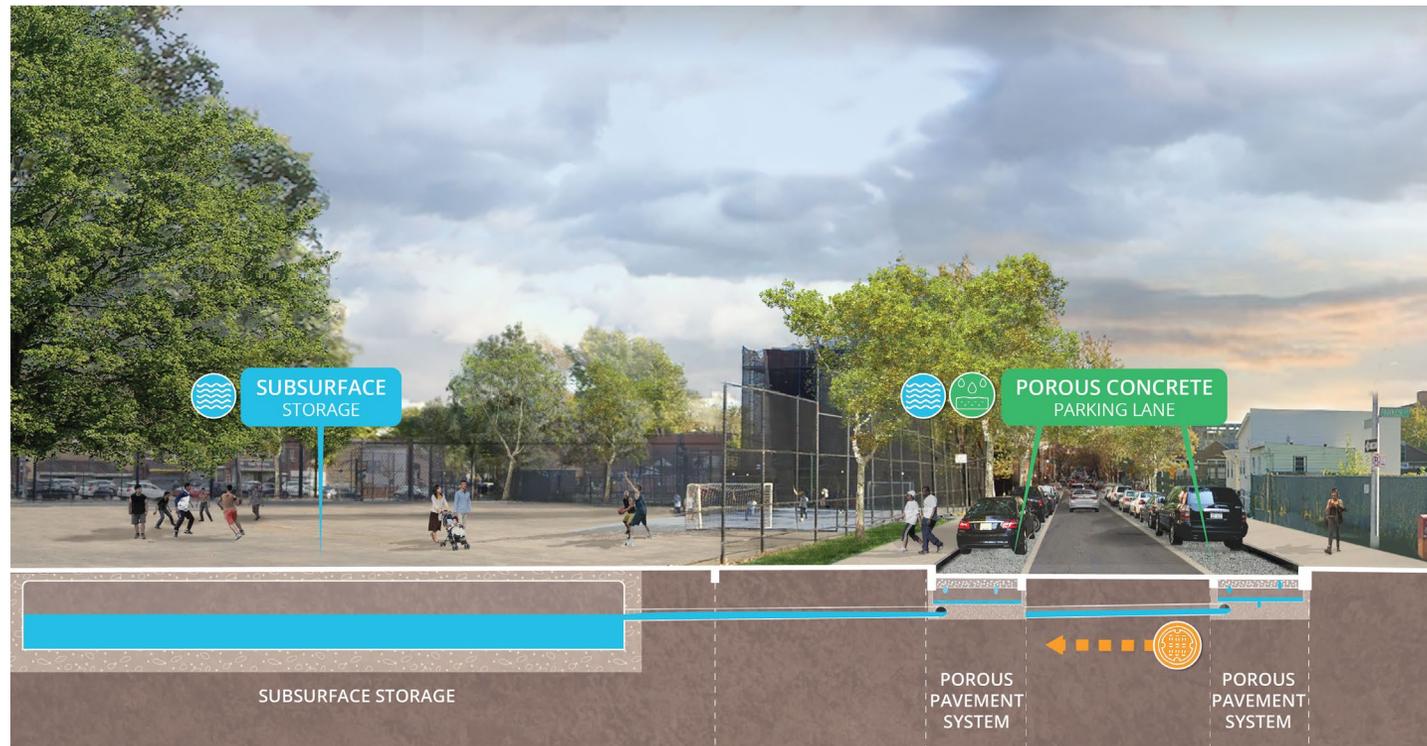
# Cloudburst Adaptation Toolbox
## Aggregated Asset Types

✓ **Flow Diversion/ Conveyance**
- Depressed Gutter
- Supplemental Street Drainage

✓ **Onsite Storage**
- Vegetated Surface Retention with Subsurface Storage
- Non-vegetated Surface Retention with Subsurface Storage
- Subsurface Storage

✓ **Right of Way Storage**
- Vegetated Sidewalk Storage
- Non-vegetated Sidewalk Storage
- Vegetated Median Storage

✓ **Porous Pavement Storage**
- Precast Porous Concrete Panel Parking Lane
- One-Way Porous Asphalt Bike Lane
- Two-Way Porous Asphalt Bike Lane
- Porous Asphalt Median

# How did we choose our sites?

**Determine Cause of Flooding at Hotspots**

1. Review existing drainage infrastructure

2. Assess how water flows through the sewers and over land

**Identify Cloudburst Management Opportunities**

3. Review future planned infrastructure

4. Identify and assess feasibility of interventions

**Estimate Benefits of Interventions**

5. Stormwater volume managed

6. Community benefits

# Planning Process

## Desktop Analysis

Complete desktop review to assess physical and socioeconomic vulnerability and identify planning areas.

- Physical Vulnerability
- Social Vulnerability
- Operational Feasibility
- Capital Project Synergies
- Cost

## Feasibility Studies

Quantify opportunities to reduce and transfer stormwater from flooded areas, conduct field assessments, and analyze below ground conditions.
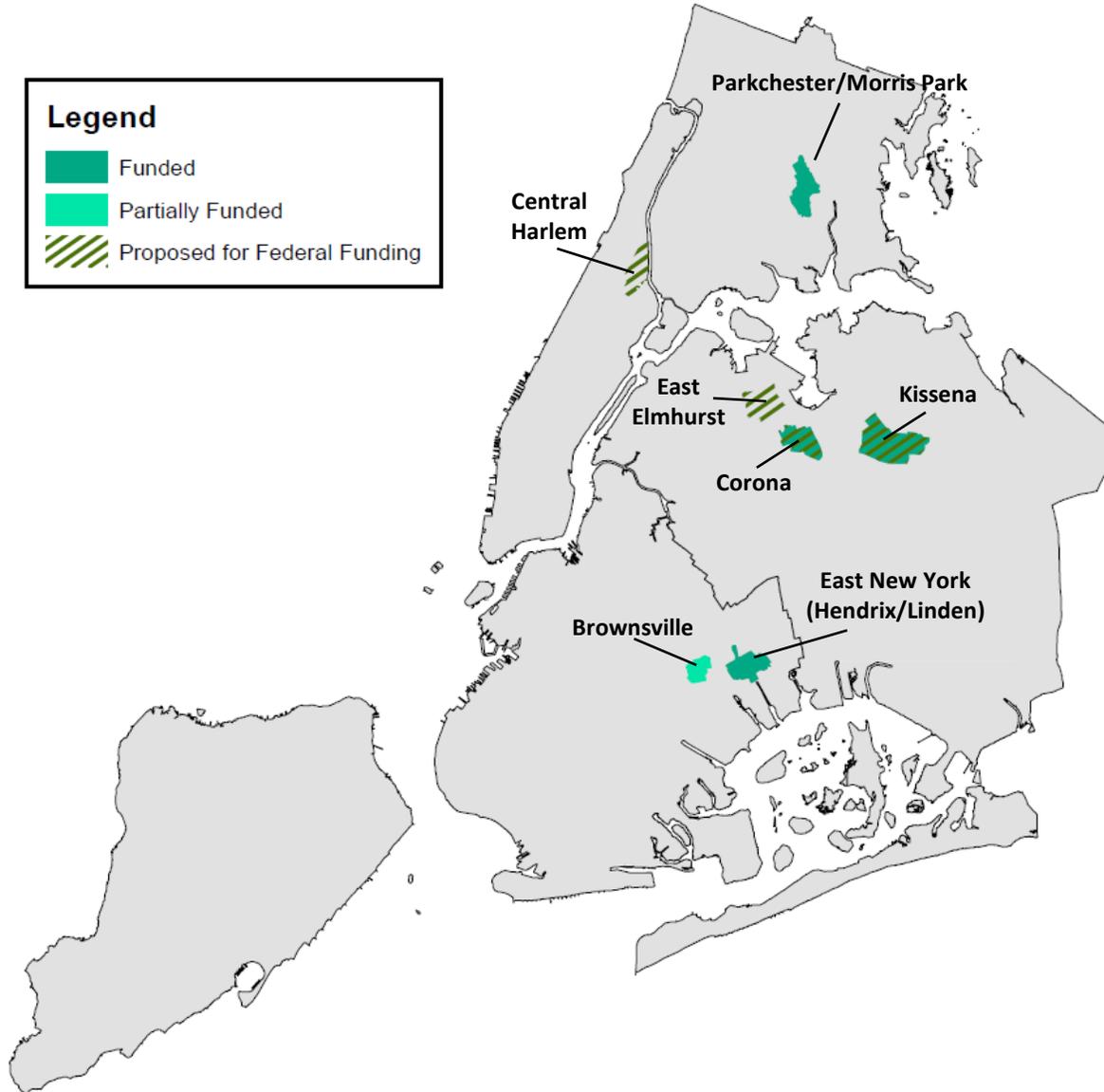
## Conceptual Designs for Cloudburst Hubs

Initiate site-specific analysis and conceptual designs for Cloudburst Hubs, identifying costs and benefits of potential solutions.

## Design and Construction of Cloudburst Hubs

Begin implementation of Cloudburst Hubs utilizing allocated funding and seeking external funding opportunities.

# Program Development & Funding Update



Legend
- Funded
- Partially Funded
- Proposed for Federal Funding

Parkchester/Morris Park

Central Harlem

East Elmhurst

Kissena

Corona

East New York (Hendrix/Linden)

Brownsville

**$390M**

**City Funding Allocated**

**$40M**

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

**$224M**

**Additional Federal Funding Requested by DEP**

# 4 Initial Hub Locations
## Fully Funded & In Design

1. Corona - Queens

2. Kissena - Queens

3. East New York (Hendrix/Linden) - Brooklyn

4. Parkchester/Morris Park - Bronx
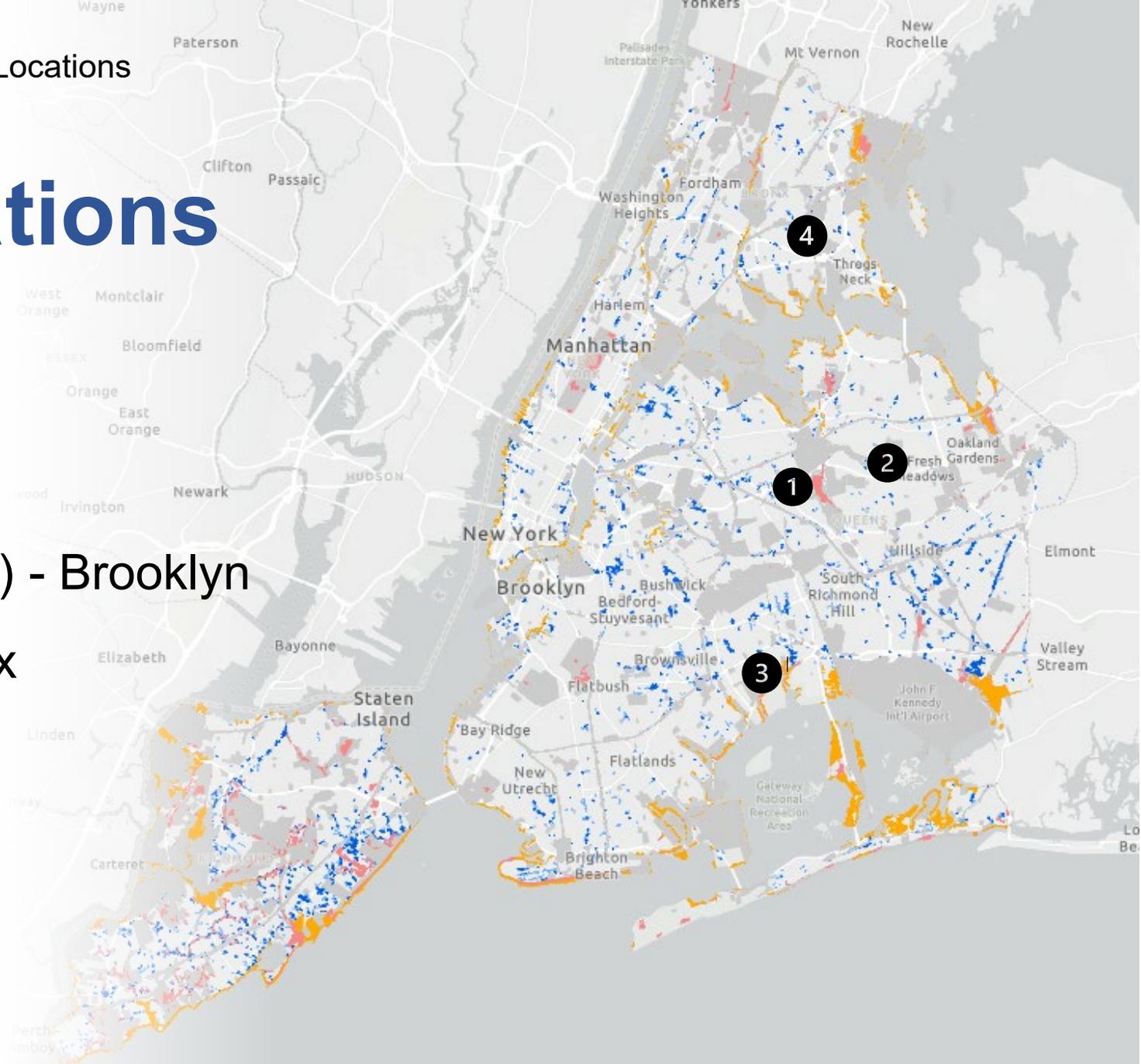
# Anticipated Design and Construction Timeline



**Early 2023 – Late 2025**
**Design**

**Late 2025 – Late 2026**
**Procurement**

**Late 2026 – Early 2028**
**Construction**

# Gathering input during design phase



**Early 2023 – Late 2025**
Design

**Late 2025 – Late 2026**
Procurement

**Late 2026 – Early 2028**
Construction

# Cloudburst Outreach Goals

**01** Inform communities about ongoing cloudburst projects and provide opportunities for their input throughout the design process.

**02** Educate communities about the type of flooding cloudburst projects will address and communicate residual risks.

**03** Establish foundational relationships with communities to ensure successful community engagement for cloudburst projects that can be built upon for planned long-term infrastructure improvement projects.

# Anticipated Outreach Timeline / Milestones

**Feb/March 2024**
**Initial Outreach to Community Boards + Stakeholder Groups**

Establish Community Contacts

**March 2024**
**Citywide Cloudburst Program Update**

Webinar + Website Updates

Informs Schematic Design

**Spring 2024**
**Community Listening Phase**

In-Person Meetings/Site Walks

Informs 30% Design

**Summer/Fall 2024**
**Community Visioning Phase**
Focus: Onsite Storage Areas

In-Person Workshops

**Preliminary Design Presentation (Virtual)**
*Winter 2025*

**Final Design Presentation**
*Summer 2025*

# Listening Phase

**To communicate:**

- Basics on what Cloudburst is and does
- Types of flooding and additional risk mitigation measures
- Additional benefits of Cloudburst strategies

**To learn:**

- Community's lived experience with flooding
- Community's basic understanding of flooding issues and causes
- Local knowledge that can strengthen projects

# How can you get involved?

- If you live or work within one of the cloudburst hubs, sign up for your hub's mailing list through the link below

  - https://nyc.gov/dep/newsletters

- You can also sign up for the new NYC Water newsletter by selecting "DEP Stormwater" from this link

- Educate your community about flooding and the many citywide initiatives currently underway to address it
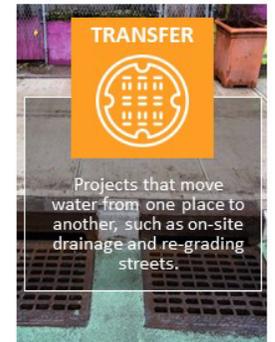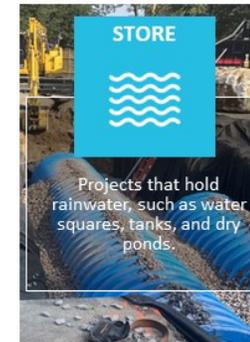


## Cloudburst Planning in NYC

### 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.

### Cloudburst Management
Cloudburst Management is a way of **absorbing**, **storing**, and **transferring** stormwater to minimize flooding from heavy rain events. Cloudburst Management uses a combination of grey infrastructure, like drainage pipes and underground tanks, and green infrastructure, like trees and rain gardens. During heavy rain events, Cloudburst Management can minimize damage to property and infrastructure by reducing pressure on the sewer system.

**ABSORB**
Projects that allow for surface water to enter the soil or ground, including green infrastructure, like porous pavement and rain gardens.

**STORE**
Projects that hold rainwater, such as water squares, tanks, and dry ponds.

**TRANSFER**
Projects that move water from one place to another, such as on-site drainage and re-grading streets.

### Cloudburst Planning
In January 2023, the Mayor announced an expansion of the city's cloudburst program to four new sites as part of ongoing resiliency efforts to better prepare for intense rain events. Supported with nearly $400 million in capital funds, these specially designed, built, and engineered infrastructure projects will protect residents and property in Corona and Kissena Park, Queens, Parkchester, Bronx, and East New York, Brooklyn from future extreme weather brought about by climate change.

### Learn more about Cloudburst!
To learn more about the planning process and ways to get involved, go to our website by scanning the QR code or contact us at the email below.

**NYC Environmental Protection**

Email    communityaffairs@dep.nyc.gov
Website    nyc.gov/dep/cloudburst
Report flooding related issues by calling 311