



# Using Green Infrastructure to Prevent Flooding from Intensified Storms in New Jersey and New York

Green Infrastructure Webcast Series

March 2, 2023

# Housekeeping

- This presentation is being recorded and will be made available via <https://www.epa.gov/green-infrastructure/green-infrastructure-webcast-series>
- All participants are muted to minimize background noise.
- Technical issues or questions?
  - Contact us via the Q&A Box.





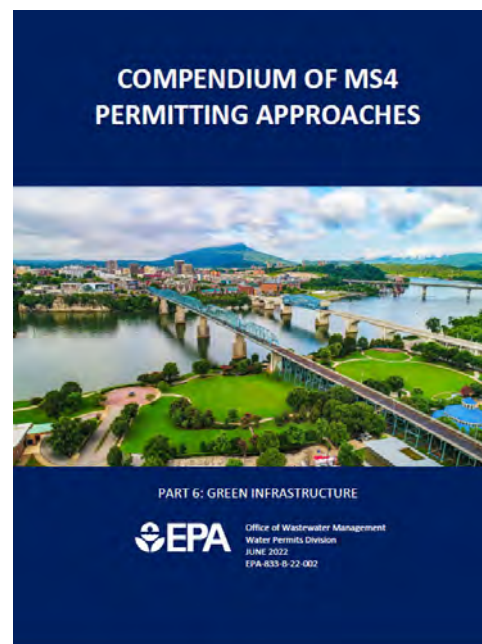
# EPA's Green Infrastructure Program

## Free Webcasts



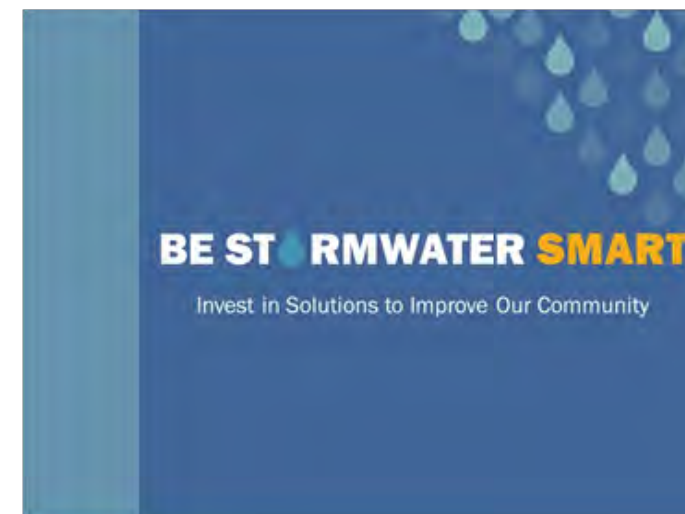
- [2022 O&M Series](#)
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# Today's Speakers:

**Dr. Pinar Balci**, Assistant Commissioner at NYC Department of Environmental Protection

- Cloudburst Management Program

**Dr. Chris Obropta**, Extension Specialist in Water Resources at Rutgers Cooperative Extension

- Watershed scale green infrastructure

**Lindsey Sigmund, PP, AICP**, Program Manager at NJ Future

- Green infrastructure tools and resources



**NYC**

Environmental  
Protection

**NYC**

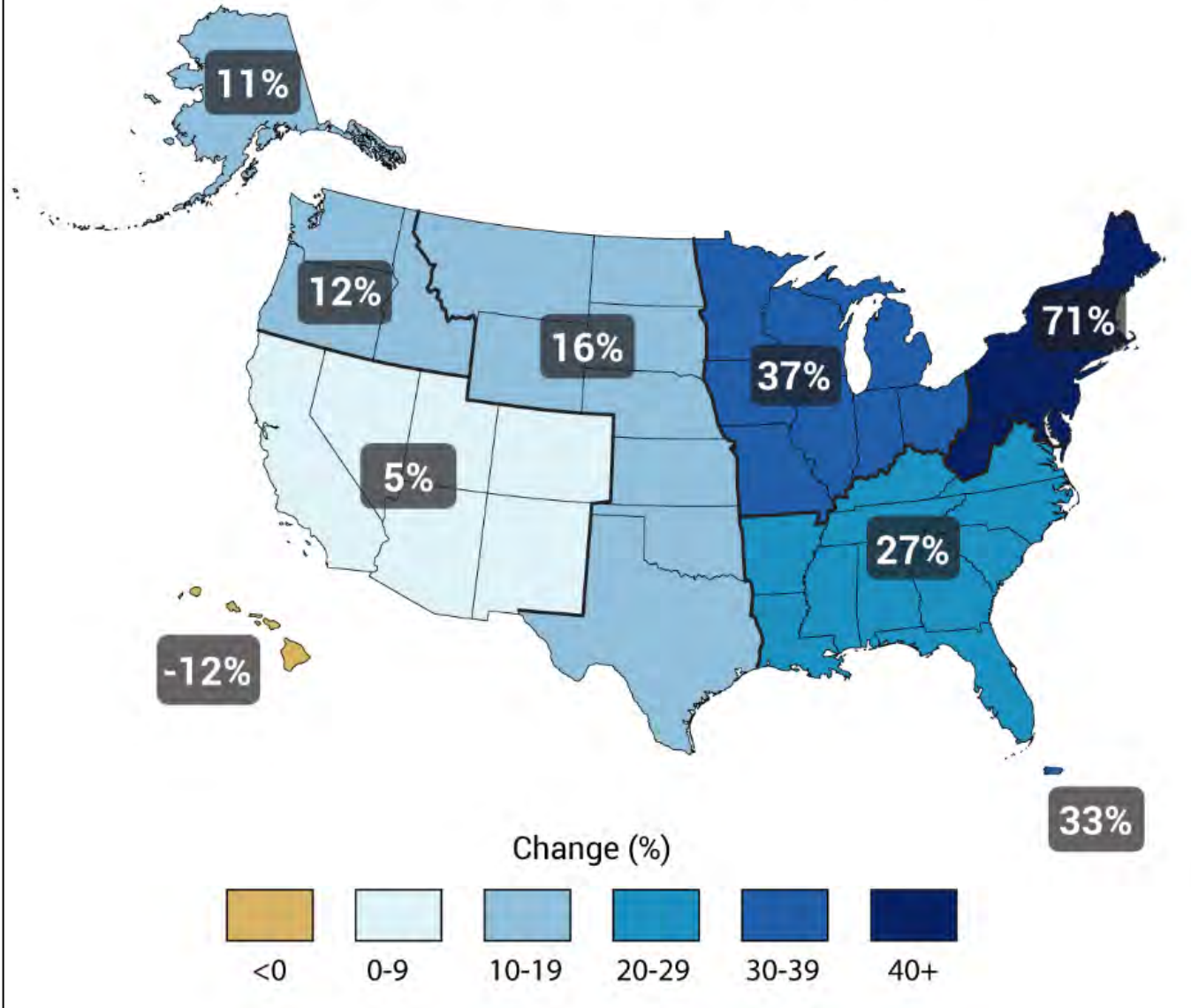
Mayor's Office of Climate &  
Environmental Justice

# Cloudburst Management in NYC

for Long-Term Resilience



## Observed Change in Very Heavy Precipitation



## Heavy Precipitation Trends (1958-2012)

The National Climate Assessment calculates a 71% increase in the annual amount of precipitation from heavy rain events\* from 1958 to 2012 in the Northeast.

\*The National Climate Assessment defines “heavy precipitation” as the top 1% of daily precipitation values

**Average precipitation is expected to increase by 4 to 11 percent by 2050 in NYC**

# Record Breaking Rains in 2021

## Tropical Storm Elsa: July 8-9

- Max 1-hr rainfall rate: 2.75 inch/hr

## Tropical Storm Henri: August 21-23

- Central Park reported 1.94 inch of rain

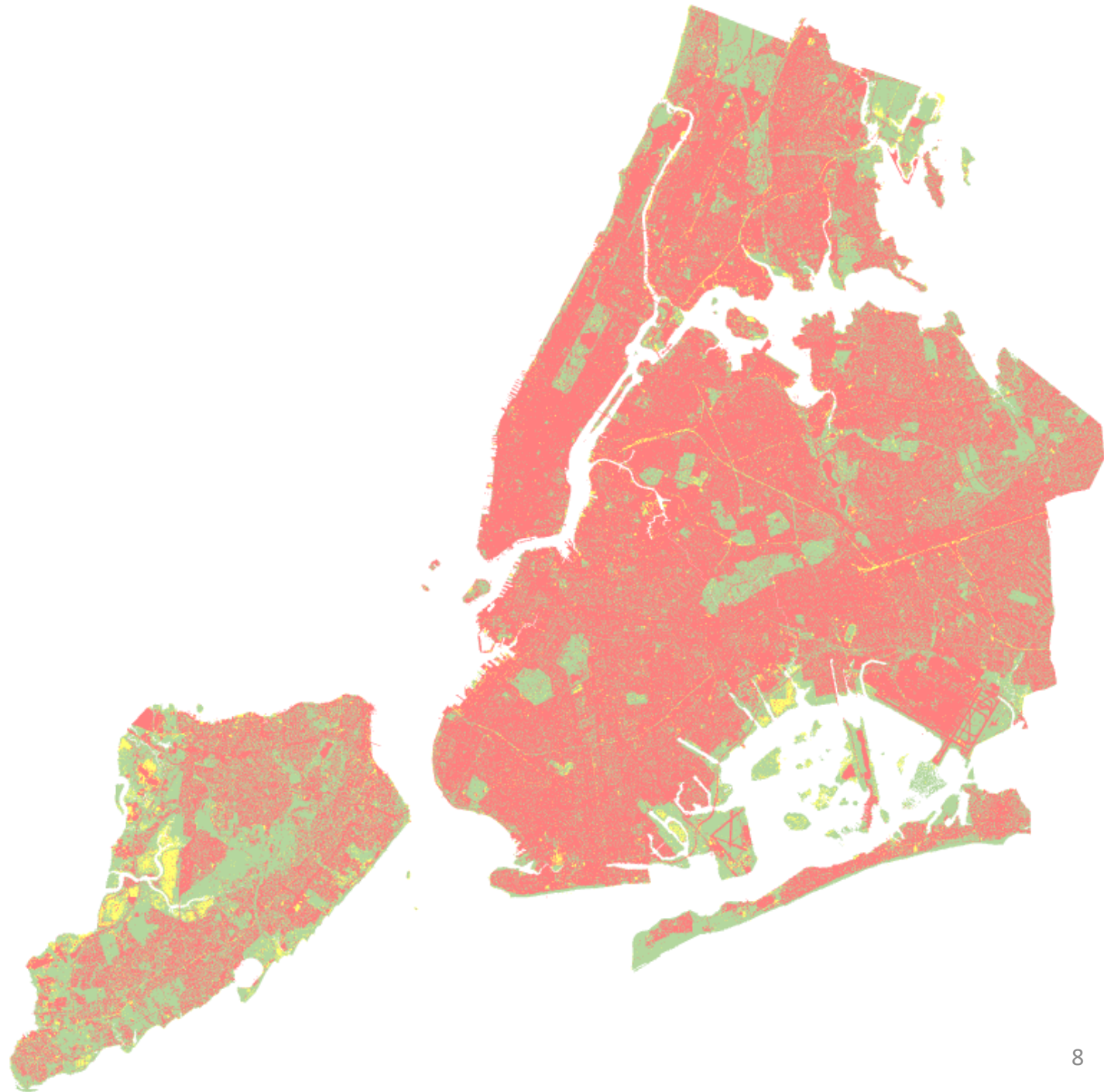
## Tropical Storm Ida: September 2

- The Central Park rain gauge set a new record for 1-hour rainfall with 3.15 inch



# Citywide Imperviousness

Brooklyn	72%
Bronx	63%
Manhattan	80%
Queens	66%
Staten Island	42%
Citywide	63%





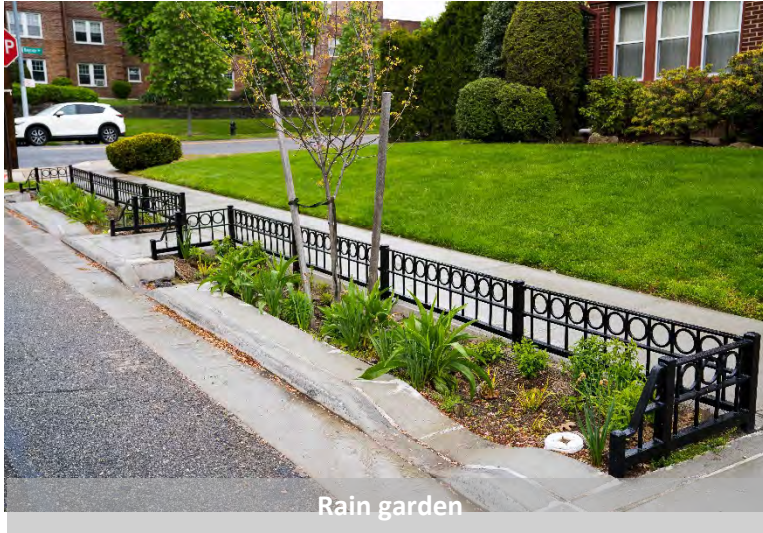
# NYC Green Infrastructure Program

## 2030 Goal

- 1.67 BGY CSO reduction

## 2021 Accomplishments

- 507 MGY CSO reduction
- 11,050 assets
- 1,504 greened acres



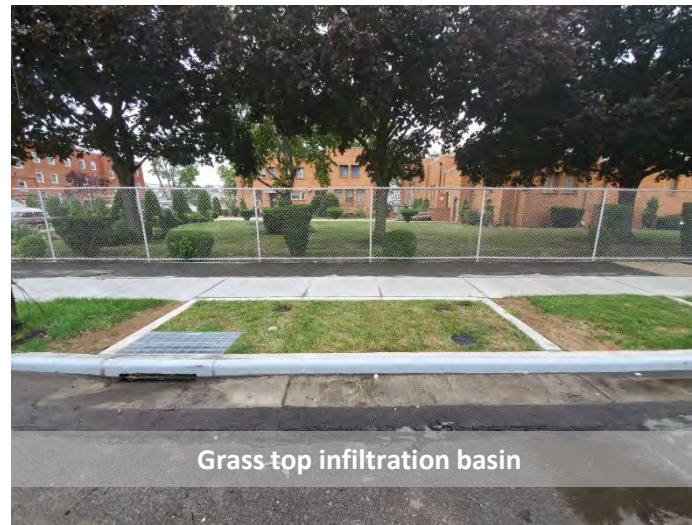
Rain garden



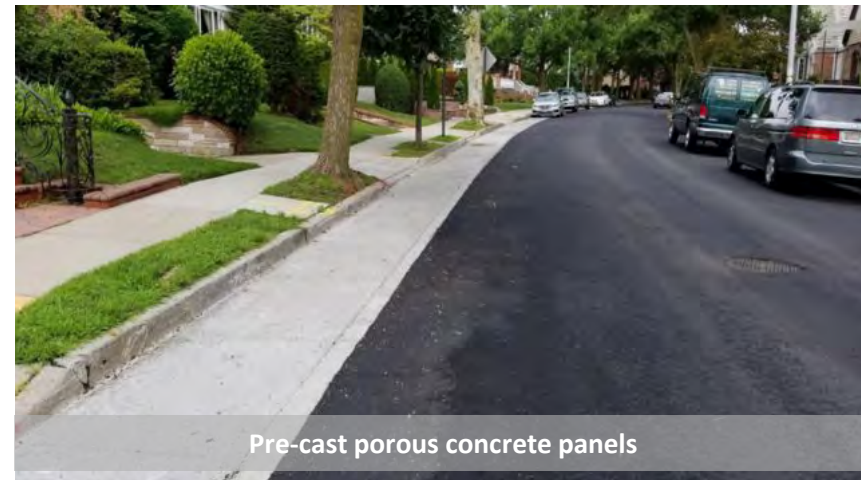
Rain garden with stormwater inlet



Concrete top infiltration basin



Grass top infiltration basin

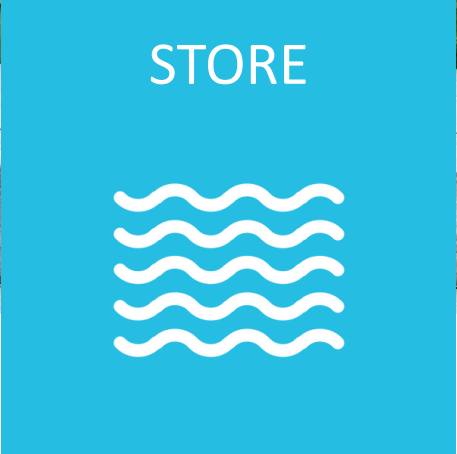


Pre-cast porous concrete panels

# Public Onsite Green Infrastructure

Project Status	Parks/ Playgrounds	Public Schools	NYCHA Housing	Other Public	Total
In Construction/ Constructed	40	40	13	8	101
In Design	101	53	20	3	177
Potential	97	28	27	7	159
<b>Total</b>	<b>238</b>	<b>121</b>	<b>60</b>	<b>18</b>	<b>437</b>





# What is Cloudburst Management?

Combination of grey infrastructure, like drainage pipes and underground tanks, and green infrastructure, like trees and rain gardens.

Targets larger volume storage, typically building for up to the future 10-yr (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.

# Cloudburst Framework

## 1. Physical Vulnerability

- Flooding hotspots, historically and in recent rainfall events
- Predicted modeled conditions using stormwater flood maps

## 2. Social Vulnerability (SVI Index)

- Considering social factors that may increase vulnerability to stormwater flooding

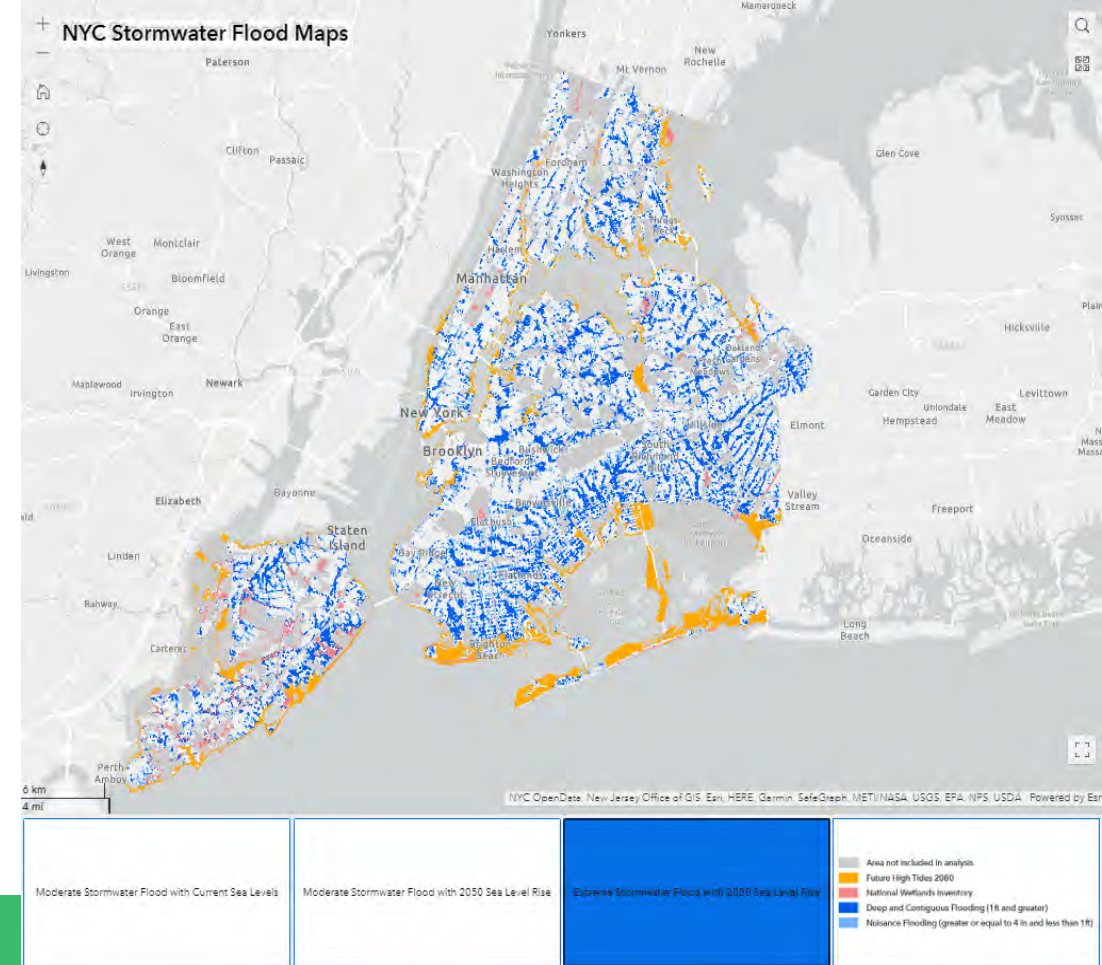
## 3. Operational Feasibility

- Understanding local conditions and opportunities by including locations prone to flooding, major investments in priority areas, current or planned projects in priority areas, existing partnerships, or other areas of interest

# Physical Vulnerabilities

## Objective

Identify flooding hot spots, balancing historic complaint data, modeled current and future precipitation scenarios and complaint/impact data from 2021 events.



## Results

The majority of flooding hotspots are in Queens, Staten Island, and Brooklyn, but impacts are seen across all 5 boroughs.

Identification of physically vulnerable areas across the five boroughs.

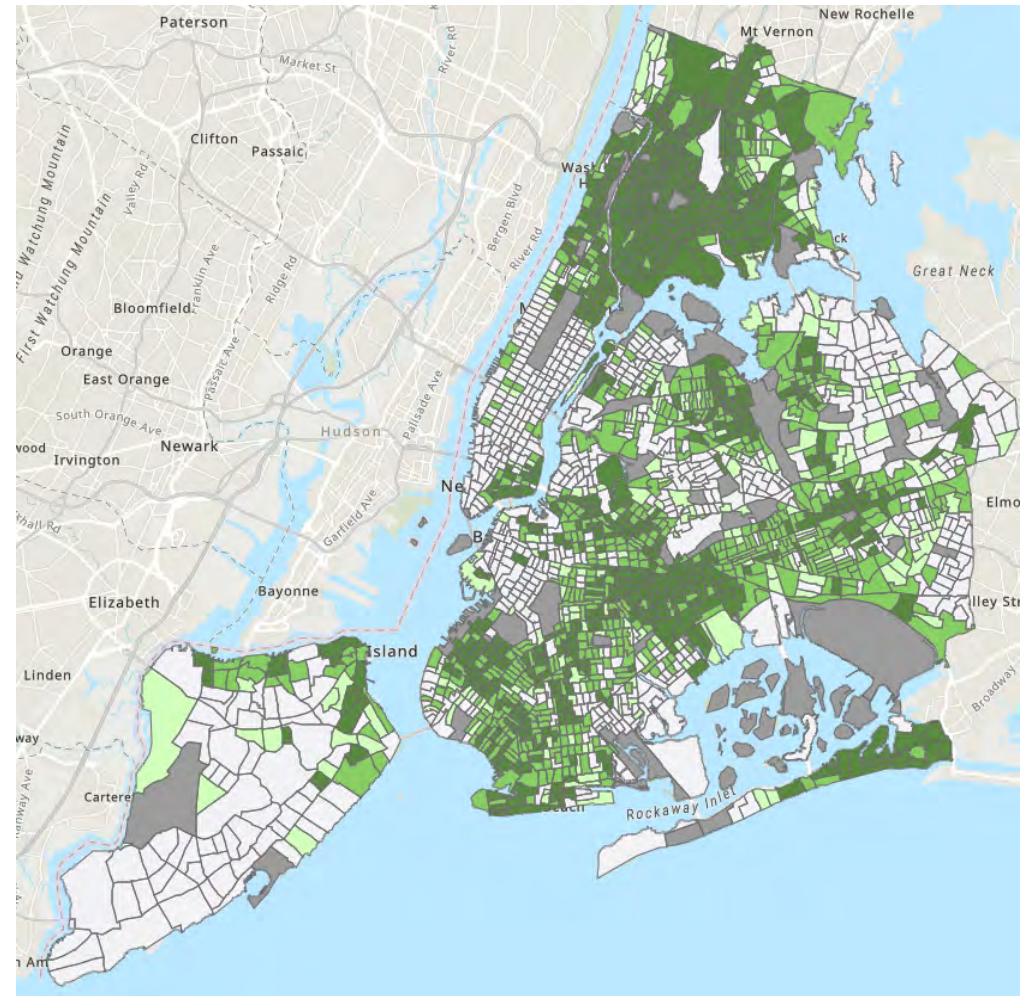
# Social Vulnerabilities

## Objective

Consider social factors that may increase vulnerability to stormwater flooding that will impact ability to prepare for floods.

## Results

Using the Social Vulnerability Index to identify vulnerable areas and prioritize for federal and state funding opportunities.



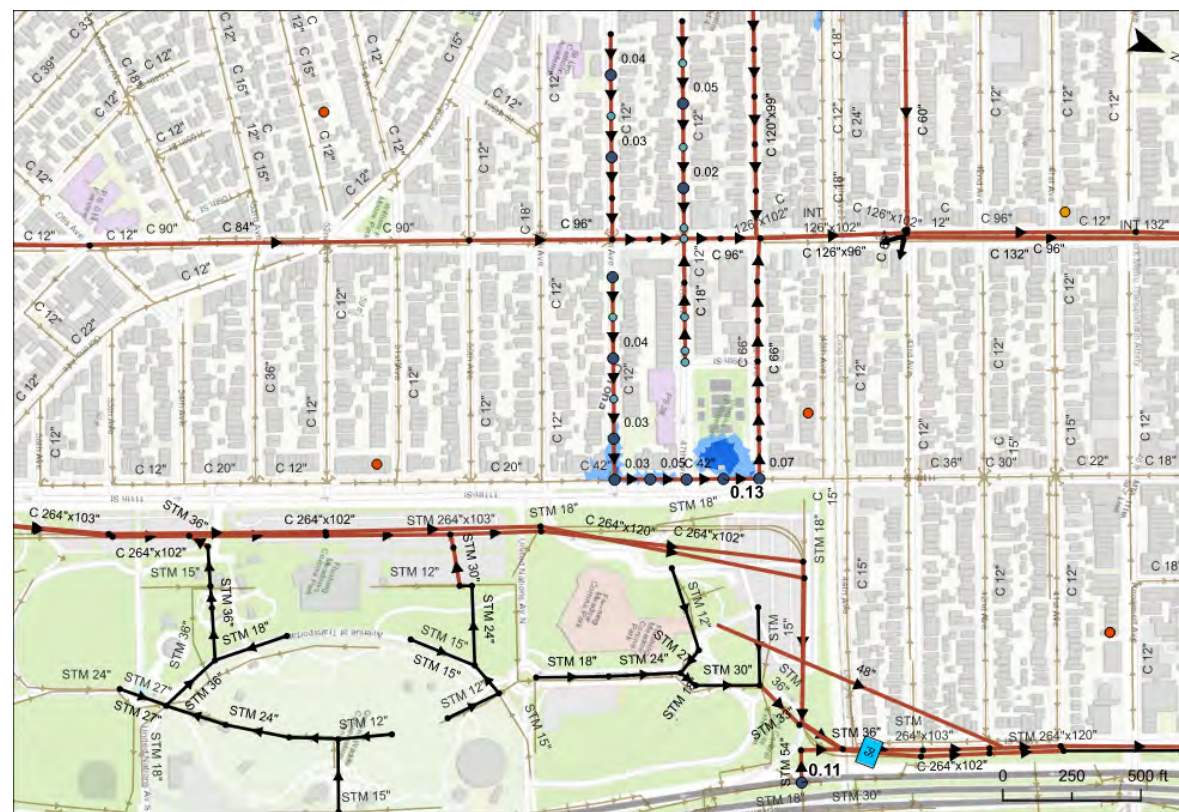
# Operational Feasibility

## Objective

Understanding immediate opportunities and agency feasibility for implementation

## Results

Submissions for agency synergistic opportunities across the 5 boroughs, particularly from NYCHA, Parks, and DOT



# Cloudburst Adaptation Toolbox

## Aggregated Asset Types

### ✓ Flow Diversion/ Conveyance

- Raised crosswalk
- Raised intersection
- Depressed gutters
- Supplemental street drainage

### ✓ ROW Storage

- Non-vegetated sidewalk storage
- Vegetated sidewalk storage
- Vegetated median lane
- Enhanced tree pits

### ✓ Offline Storage

- Surface storage
- Subsurface storage

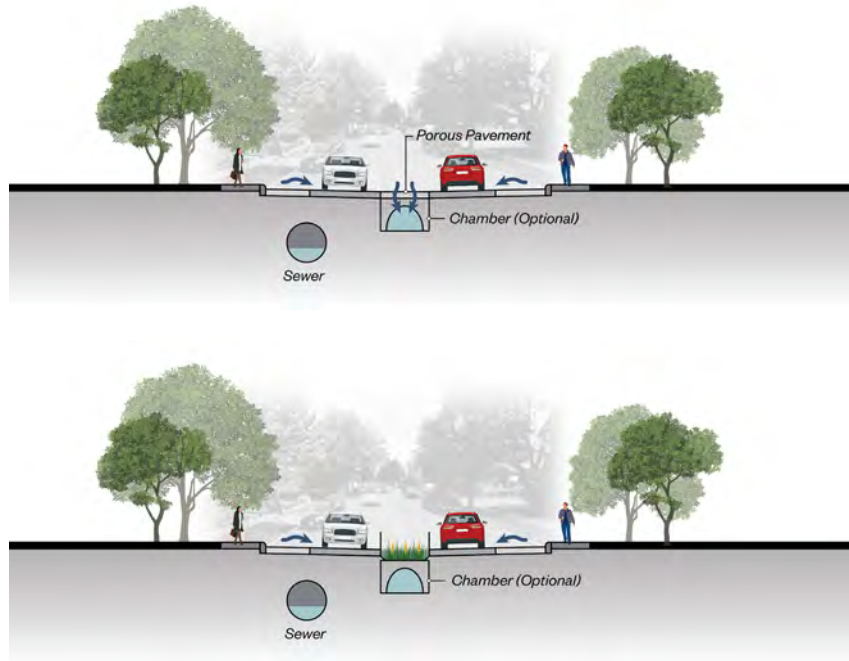
### ✓ Porous Pavement Storage

- Porous parking lane
- Porous pedestrian ramps
- Porous median
- Porous bike lane/greenway



# Median Storage

Provides temporary storage of stormwater during cloudburst events

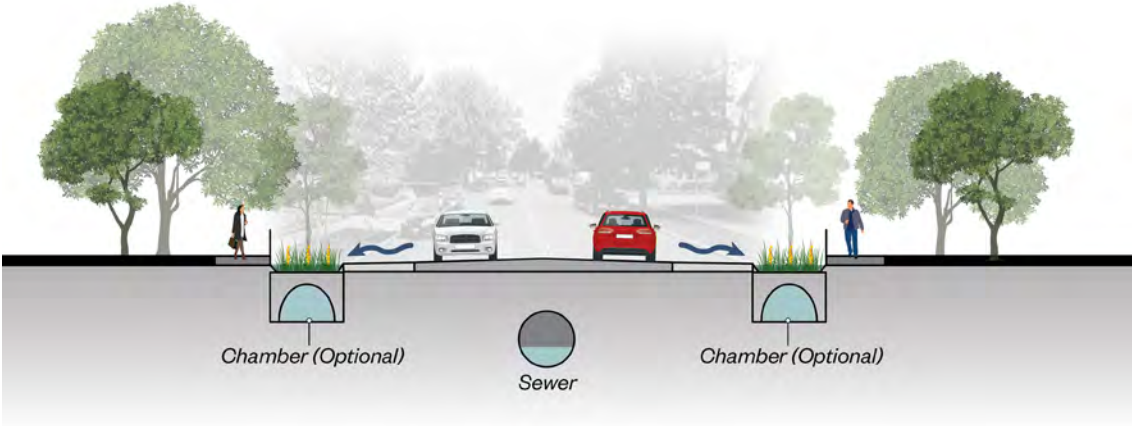


Beach 67<sup>th</sup> Street, Median GI – Post-Construction Renderings



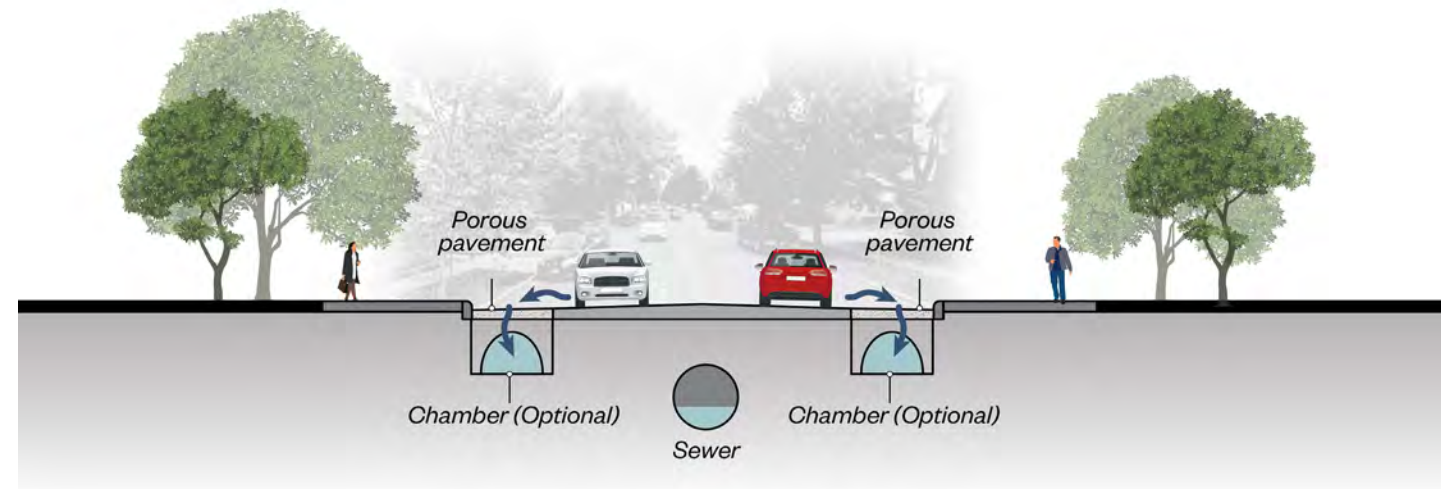
# Infiltration and Rain Gardens

Provides temporary storage of stormwater during cloudburst events



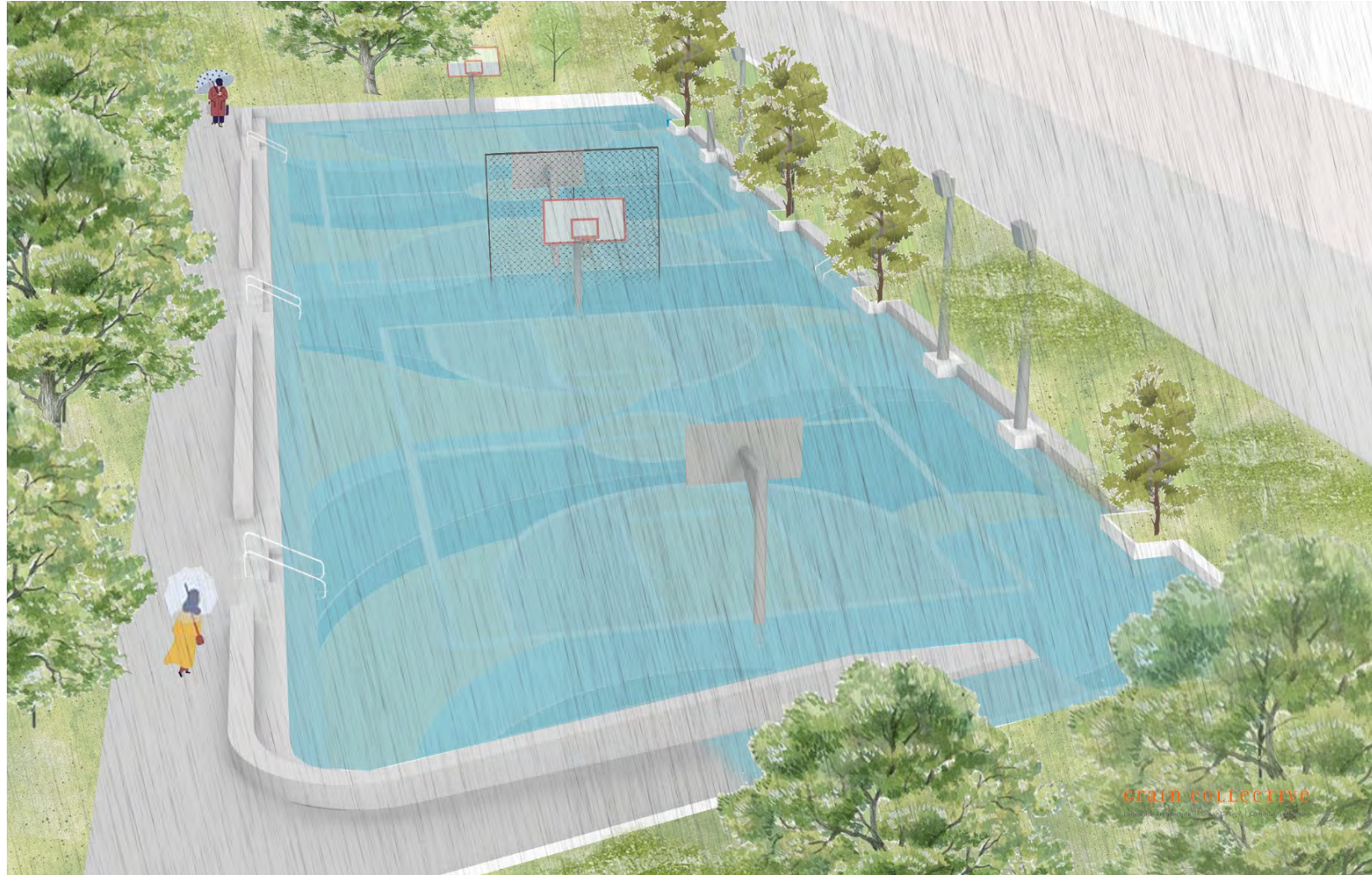
# Porous Pavement / Asphalt

Provides temporary storage of stormwater during cloudburst events



# Surface/ Subsurface Storage

Provides temporary storage of  
stormwater during cloudburst events



Rendering of Sunken Basketball Court at South Jamaica Houses

## 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 2.3 inches of rainfall per hour. Aside from flood mitigation, this pilot shows how cloudburst infrastructure can offer many co-benefits to communities.

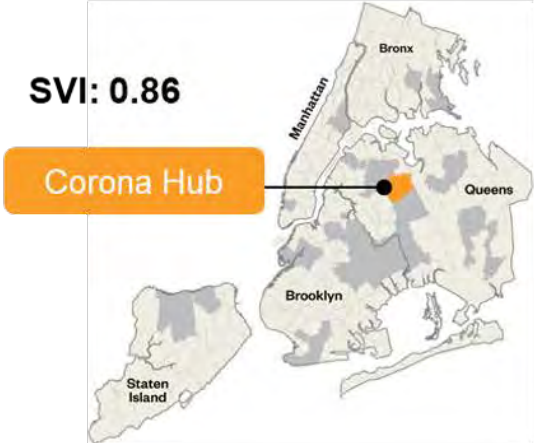
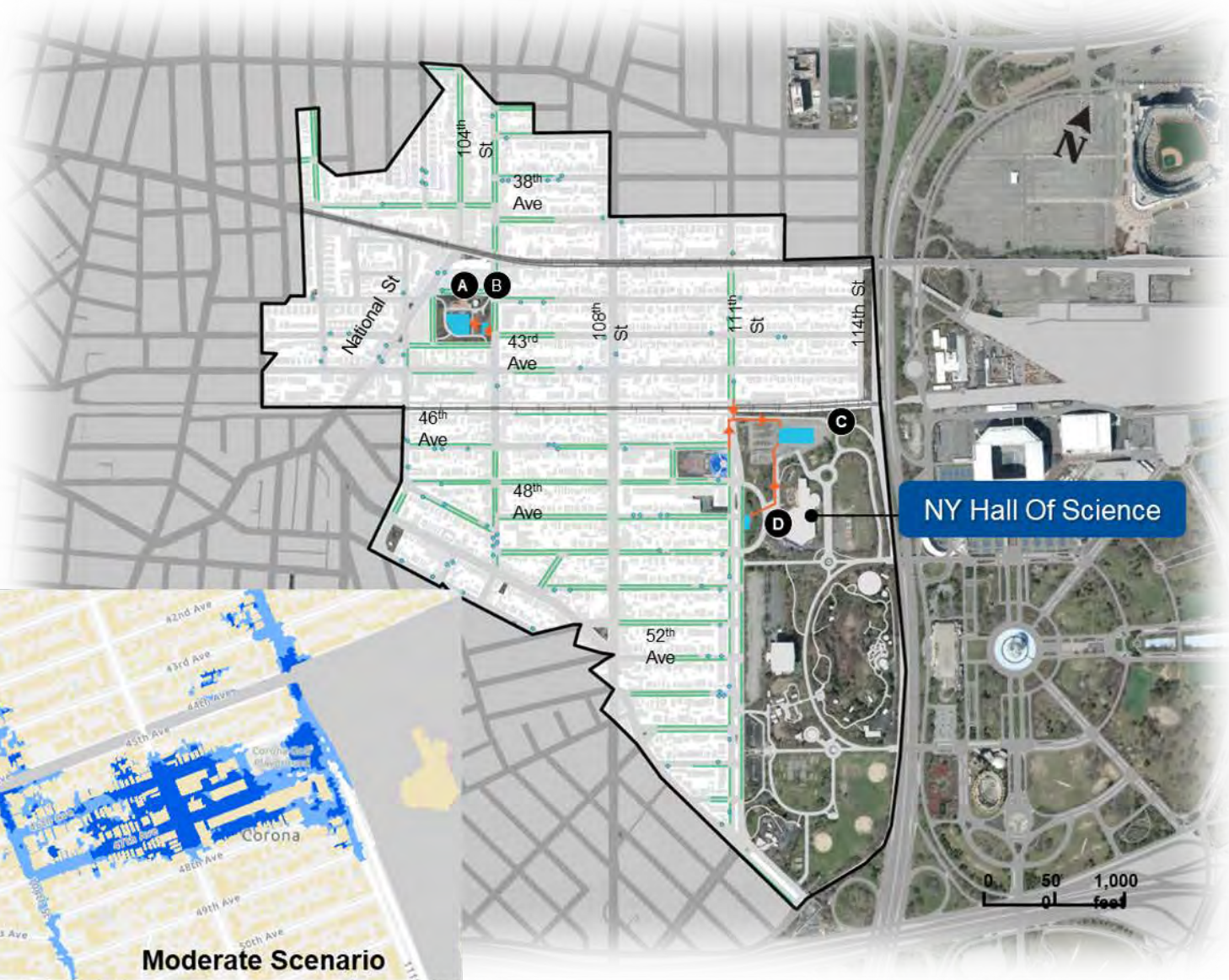
As of September 2022, this project has reached 100% design and is proceeding to construction.



# Case Study: Corona Cloudburst Hub



# Corona Cloudburst Hub

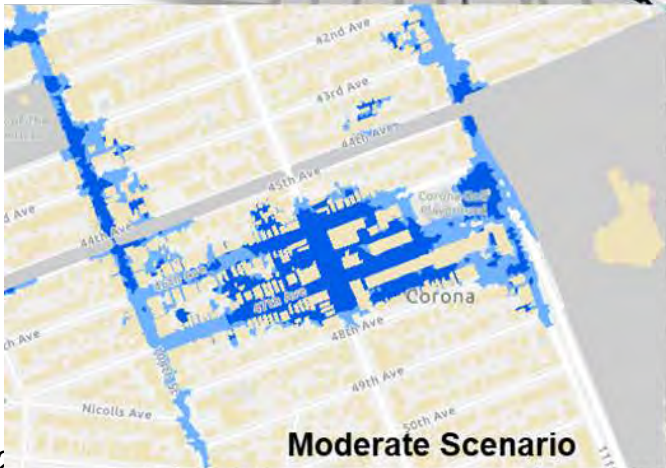


**LEGEND:**

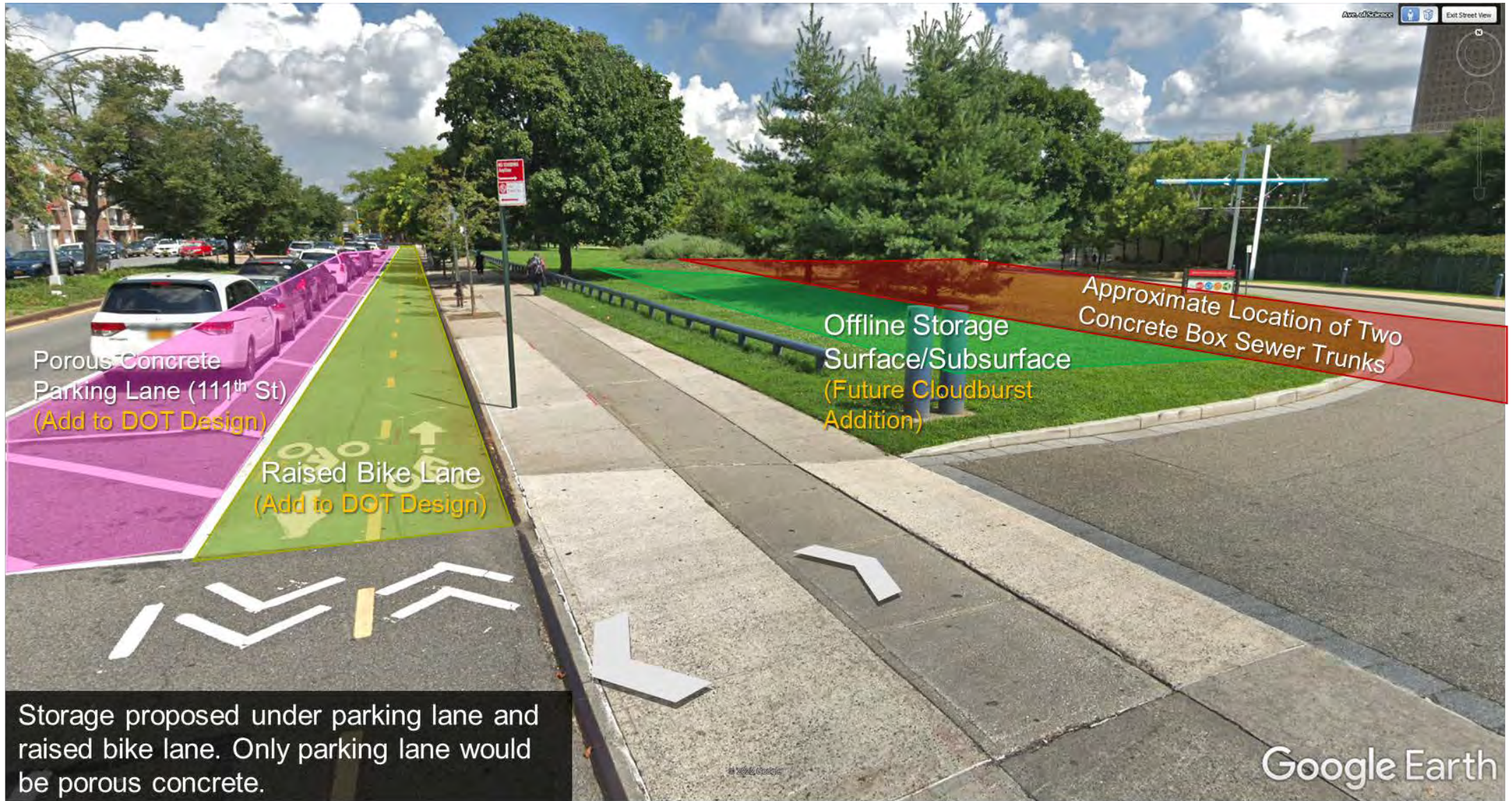
**SW Volume Managed: 3MG**

- Offline Storage
- Porous Concrete Parking Lane
- Existing / Planned Green Infrastructure
- Supplemental Street Drainage

- A Park of America's Field
- C NY Hall of Science Parking Lot
- B Park of America's Playground
- D NY Hall of Science Front Lawn



# 111<sup>th</sup> St and 49<sup>th</sup> Ave





# Corona Cloudburst Hub






# Parking Lot of New York Hall of Science





# Next Steps

- Announced 4 cloudburst hubs in January
  - Hubs announced in 2023:  
Corona, Kissena, Parkchester, East NY
  - Pilot projects: South Jamaica Houses, St. Albans, Clinton Houses (East Harlem)
- Total Funding: \$390M in City capital

SHARE

 Email

 Print

## Mayor Adams Announces Construction of new Cloudburst Resiliency Projects to Better Manage Intense Rainfall Events in Flood-Prone Neighborhoods

January 9, 2023

*\$390 Million Projects Will Develop Innovative Methods to Absorb, Store, and Transfer Stormwater Caused by Sudden, Heavy Downpours*

*City Announces Four New Cloudburst Sites in Corona, Kissena Park, Parkchester, and East New York*

**NEW YORK** – New York City Mayor Eric Adams today announced the expansion of the city’s [Cloudburst Program](#) — which constructs clustered stormwater management projects in flood-prone communities — to four new neighborhoods, a major milestone in the city’s continued resiliency efforts to better prepare for intense rainfall events, like Hurricane Ida in the past. 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.

“Four months ago, DEP Commissioner Aggarwala and I announced our plans for rainfall management, to protect our city and prevent future tragedies like what we saw during Hurricane Ida,” said **Mayor Adams**. “Today, we are pleased to announce a



**Environmental  
Protection**

**NYC** Mayor's Office of Climate &  
Environmental Justice

Website

[nyc.gov/dep/cloudburst](https://nyc.gov/dep/cloudburst)

Email Address

[onewater@dep.nyc.gov](mailto:onewater@dep.nyc.gov)

Thank you for  
your time!

# Corona Hub

Will be updated per final consensus on 111<sup>th</sup> Street configuration for parking and bike lanes

A Park of America’s Field (DPR)

C NY Hall of Science Parking Lot (DPR)

1 111<sup>th</sup> St Safety Improvements (DOT)

3 Park of the Americas Basketball Court Reconstruction (Parks)

B Park of America’s Playground (DPR)

D NY Hall of Science Lawn (DPR)

2 NY Hall of Science Flood Protection (DDC)

**Opportunistic Hub**

**Capital Project Synergies:**  
 111<sup>th</sup> St Safety Improvements  
 NY Hall of Science Flood Protection  
 Park of the Americas Basketball Court Reconstruction



Metric	Value
Modeled Flood Volume (MG)	1.0
Deep and Contiguous Flood Area (ac.)	0.3
Nuisance Flood Area (ac.)	1.5
Stormwater Volume Managed (MG)	3.0
Stormwater Volume Managed (\$/Gal)	19.4
Mean Social Vulnerability Index	0.86
Population Density (per square mile)	83,400
# of Critical Facilities within Hub	9



## Environmental

- Demonstrate commitment to sustainability and community
- Improve water quality and health of local waterways
- Enhance stormwater management on site
- Increase biodiversity with green projects



## Social

- Create customer interest and increase public safety
- Partner with the City in stormwater and resiliency initiatives
- Reduce ponding on paved surfaces used by customers and staff



## Economic

- Lower flood risk and liability
- Receive funding for parking lot resurfacing, tree plantings, or other site improvements
- Guard against future costs such as more restrictive stormwater regulations

Investments that work for you and the community!

- \$53M contract to target highly impervious lots >50,000 SF
- Awarded to 3<sup>rd</sup> party administrator to incentivize cost-effective aggregation of projects
- Pay-for-performance framework
  - \$250,000 per greened acre + bonus payments

**Goal: 200 Greened Acres in 5 years.**



## RESILIENT NYC PARTNERS

NYC provides the funding and the expertise, you provide the property.

Resilient NYC Partners is an NYC-funded program that helps you improve your property and NYC meet its resiliency goals. Property owners can use these funds for projects like:

- Building green roofs and rain gardens
- Fixing drainage issues and reducing ponding
- Resurfacing or replacing pavement
- Building subsurface stormwater storage

These projects can help to improve your community and promote your commitment to a resilient and sustainable NYC.

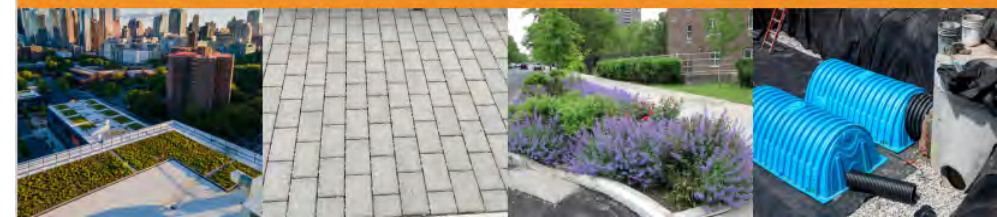
Partnering with us is easy!

We know construction can be a big undertaking. Our expert team has worked with property owners on similar projects. We know how to streamline the process and make it work for you, your residents, tenants, employees, and other property users.

- |  |   |
|--|---|
| <p><b>1 Assessment</b><br/>We will schedule a site visit with you to better understand your property to tailor a project that fits your needs.</p> | <p><b>3 Scheduling &amp; Approvals</b><br/>Once a project is agreed upon, we will work with you to make a construction plan and obtain permits.</p>             |
| <p><b>2 Planning &amp; Review</b><br/>We will develop detailed plans for your review. Together, we will refine and finalize your project.</p>      | <p><b>4 Construction</b><br/>Build it! Construction typically lasts 4-6 weeks. We will work with you to make sure everyone is safe and minimally disrupted.</p> |

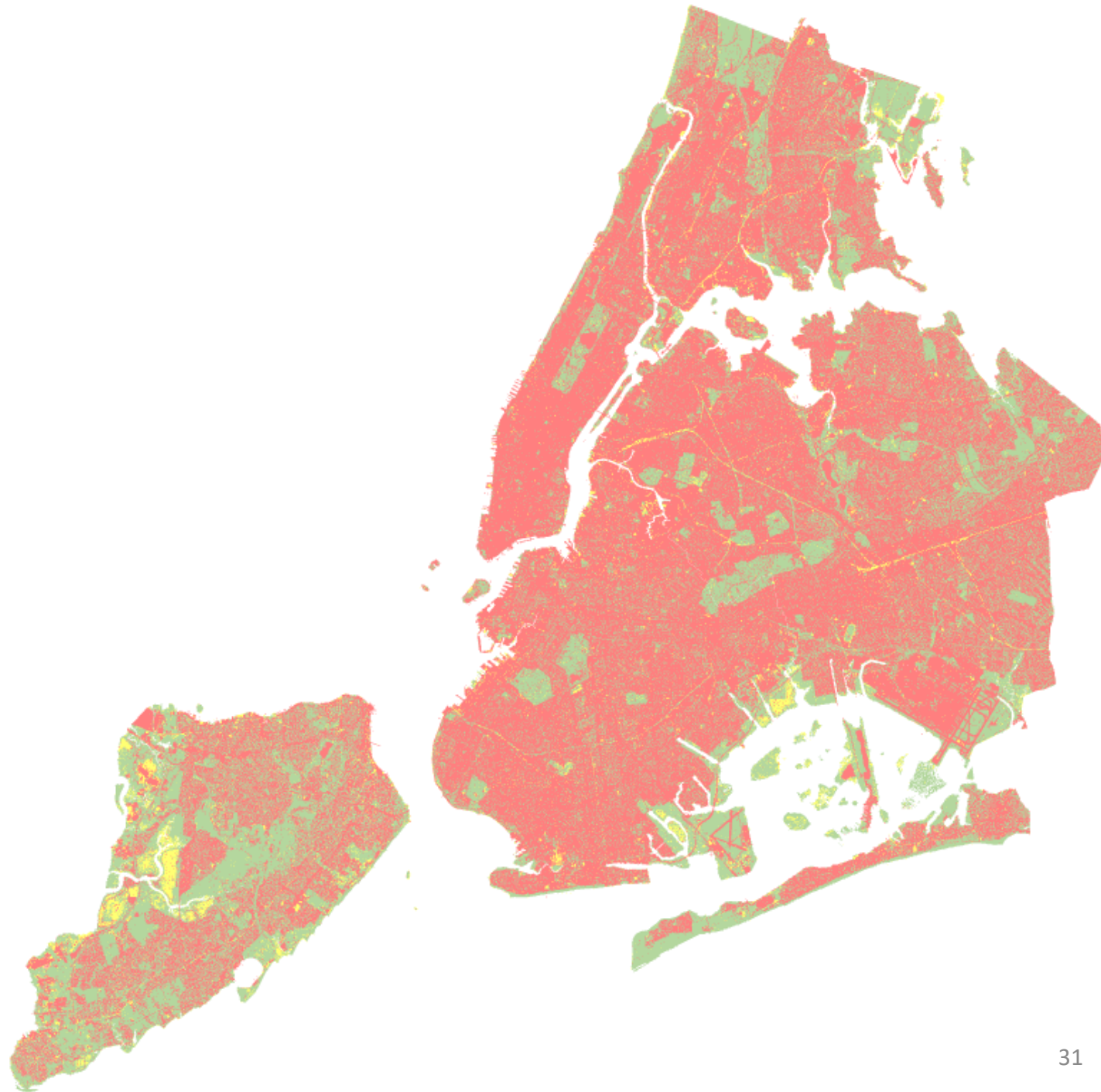
**Don't miss out on this opportunity—funds are limited!**

Contact our team at [info@resilientpartners.nyc](mailto:info@resilientpartners.nyc) to schedule a meeting or visit [resilientpartners.nyc](http://resilientpartners.nyc) for more information.



# Citywide Imperviousness

Brooklyn	72%
Bronx	63%
Manhattan	80%
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Staten Island	42%
Citywide	63%



# Managing Flooding by Coupling Green Infrastructure with Gray Infrastructure on a Watershed Scale



**RUTGERS**  
New Jersey Agricultural  
Experiment Station



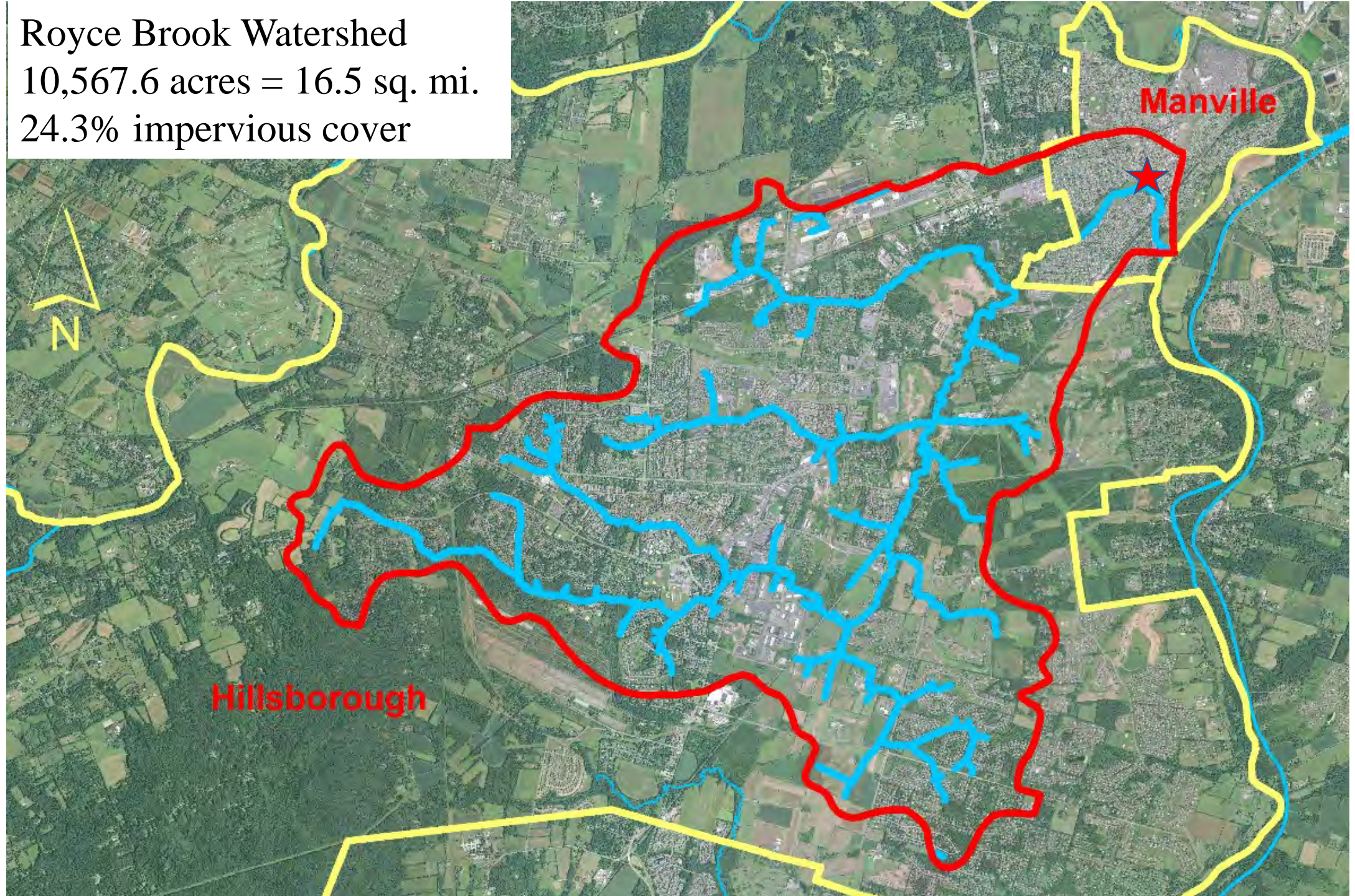
*Christopher C. Obropta, Ph.D., P.E.*  
*Extension Specialist in Water Resources*  
[obropta@envsci.rutgers.edu](mailto:obropta@envsci.rutgers.edu)



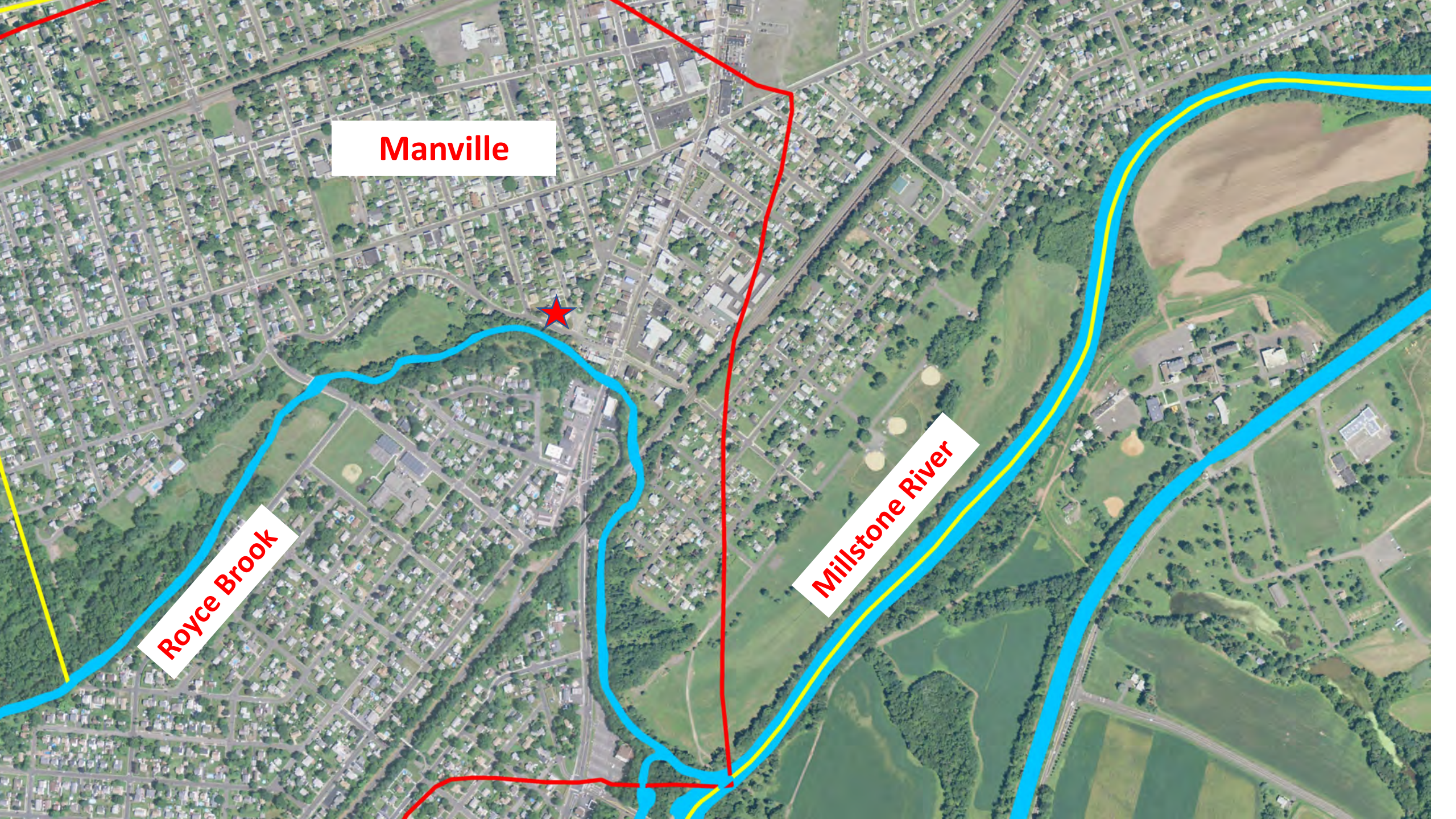
The death toll in New Jersey from Ida was 30 people; two of those victims were Hillsborough residents. The storm dumped **10 inches of rain in Hillsborough in a matter of hours**, and caused \$95 billion in damages statewide to homes, businesses, and infrastructure.



Royce Brook Watershed  
10,567.6 acres = 16.5 sq. mi.  
24.3% impervious cover







**Manville**

**Royce Brook**

**Millstone River**





Holy Ghost  
Catholic Church

ROOSEVELT AVE

ROOSEVELT AVE

© 2022 Google



# **Project Goal is to Reduce Flooding in Hillsborough and Manville (supported by NFWF Coastal Resiliency Fund)**

- Design stormwater management systems that will manage the 100-year storm from existing development
- Prioritize nature-based solutions; nature-based solutions are sustainable planning, design, environmental management, and engineering practices that weave natural features or processes into the built environment to promote adaptation and resilience
- Design retrofits to manage the increase in rainfall due to climate change for sites that already have stormwater management



<b>Condition (100-yr Design Storm)</b>	<b>24-hour rainfall total (in)</b>
2000 Rainfall Total	8.21
2020 Rainfall Total	8.95
2100 Rainfall Total	12.15

# Types of Nature-Based Solutions (FEMA, 2021)

- **WATERSHED OR LANDSCAPE SCALE:** Interconnected systems of natural areas and open space. These are large-scale practices that require long-term planning and coordination.
- **NEIGHBORHOOD OR SITE SCALE:** Distributed stormwater management practices that manage rainwater where it falls. These practices can often be built into a site, corridor, or neighborhood without requiring additional space.
- **COASTAL AREAS:** Nature-based solutions that stabilize the shoreline, reducing erosion and buffering the coast from storm impacts. While many watershed and neighborhood-scale solutions work in coastal areas, these systems are designed to support coastal resilience.

# WATERSHED SCALE

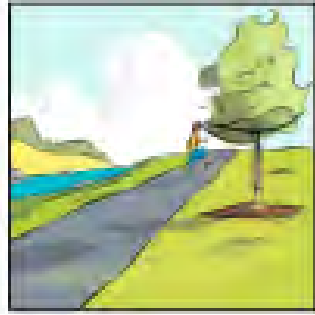
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## LAND CONSERVATION

Land conservation is one way of preserving interconnected systems of open space that sustain healthy communities.

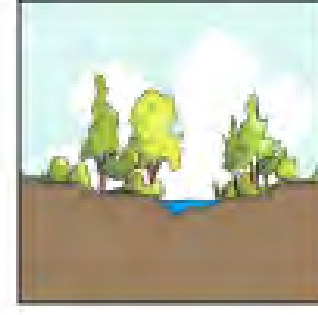
Land conservation projects begin by prioritizing areas of land for acquisition. Land or conservation easements can be bought or acquired through donation.



## GREENWAYS

Greenways are corridors of protected open space managed for both conservation and recreation.

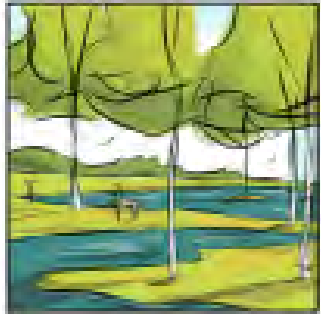
Greenways often follow rivers or other natural features. They link habitats and provide networks of open space for people to explore and enjoy.



## FLOODPLAIN RESTORATION

Undisturbed floodplains help keep waterways healthy by storing floodwaters, reducing erosion, filtering water pollution, and providing habitat.

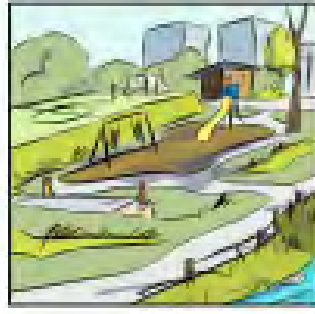
Floodplain restoration rebuilds some of these natural functions by reconnecting the floodplain to its waterway.



## WETLAND RESTORATION AND PROTECTION

Restoring and protecting wetlands can improve water quality and reduce flooding. Healthy wetlands filter, absorb, and slow runoff.

Wetlands also sustain healthy ecosystems by recharging groundwater and providing habitat for fish and wildlife.



## STORMWATER PARKS

Stormwater parks are recreational spaces that are designed to flood during extreme events and to withstand flooding.

By storing and treating floodwaters, stormwater parks can reduce flooding elsewhere and improve water quality.

# NEIGHBORHOOD OR SITE SCALE

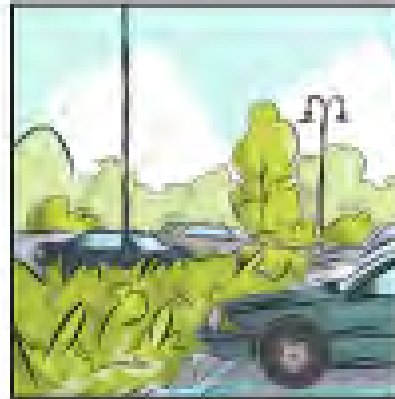
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## RAIN GARDENS

A rain garden is a shallow, vegetated basin that collects and absorbs runoff from rooftops, sidewalks, and streets.

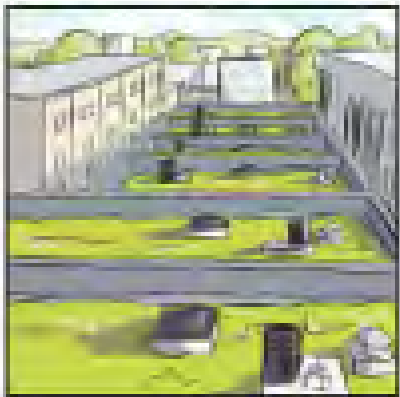
Rain gardens can be added around homes and businesses to reduce and treat stormwater runoff.



## VEGETATED SWALES

A vegetated swale is a channel holding plants or mulch that treats and absorbs stormwater as it flows down a slope.

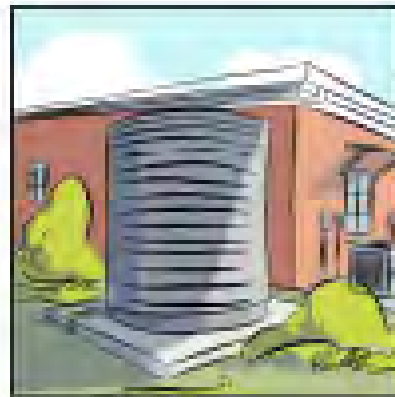
Vegetated swales can be placed along streets and in parking lots to soak up and treat their runoff, improving water quality.



## GREEN ROOFS

A green roof is fitted with a planting medium and vegetation. A green roof reduces runoff by soaking up rainfall. It can also reduce energy costs for cooling the building.

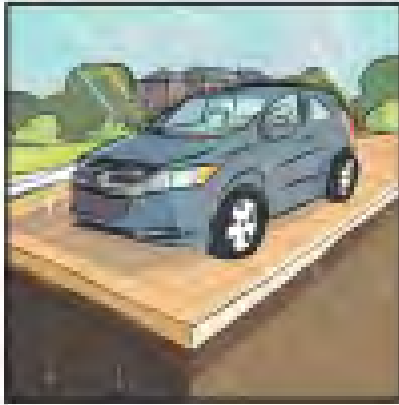
Extensive green roofs, which have deeper soil, are more common on commercial buildings. Intensive green roofs, which have shallower soil, are more common on residential buildings.



## RAINWATER HARVESTING

Rainwater harvesting systems collect and store rainfall for later use. They slow runoff and can reduce the demand for potable water.

Rainwater systems include rain barrels that store tens of gallons and rainwater cisterns that store hundreds or thousands of gallons.



### PERMEABLE PAVEMENT

Permeable pavements allow more rainfall to soak into the ground. Common types include pervious concrete, porous asphalt, and interlocking pavers.

Permeable pavements are most commonly used for parking lots and roadway shoulders.



### TREE CANOPY

Tree canopy can reduce stormwater runoff by catching rainfall on branches and leaves and increasing evapotranspiration. By keeping neighborhoods cooler in the summer, tree canopy can also reduce the "urban heat island effect."

Because of trees' many benefits, many cities have set urban tree canopy goals.



### TREE TRENCHES

A stormwater tree trench is a row of trees planted in an underground infiltration structure made to store and filter stormwater.

Tree trenches can be added to streets and parking lots with limited space to manage stormwater.

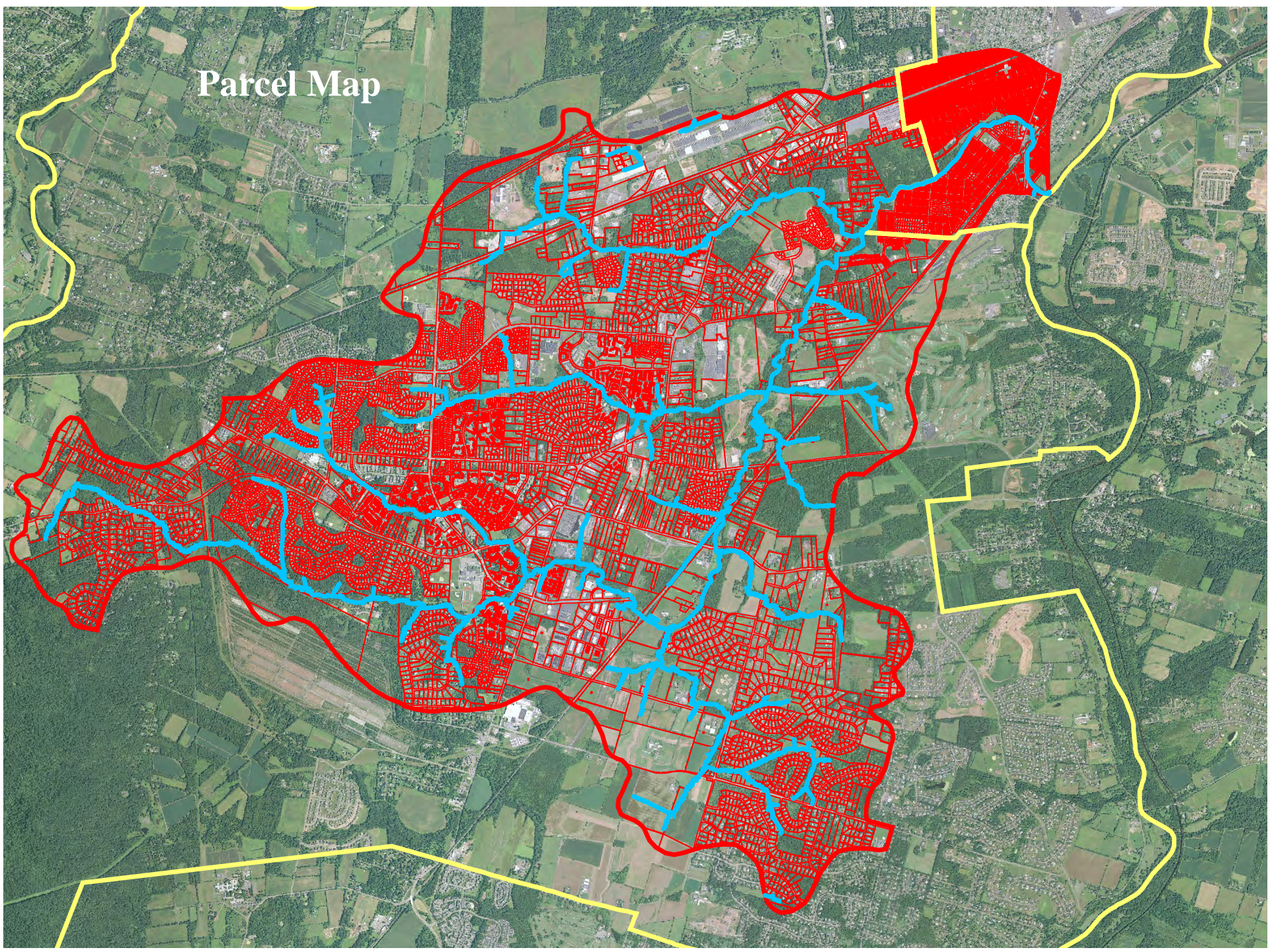


### GREEN STREETS

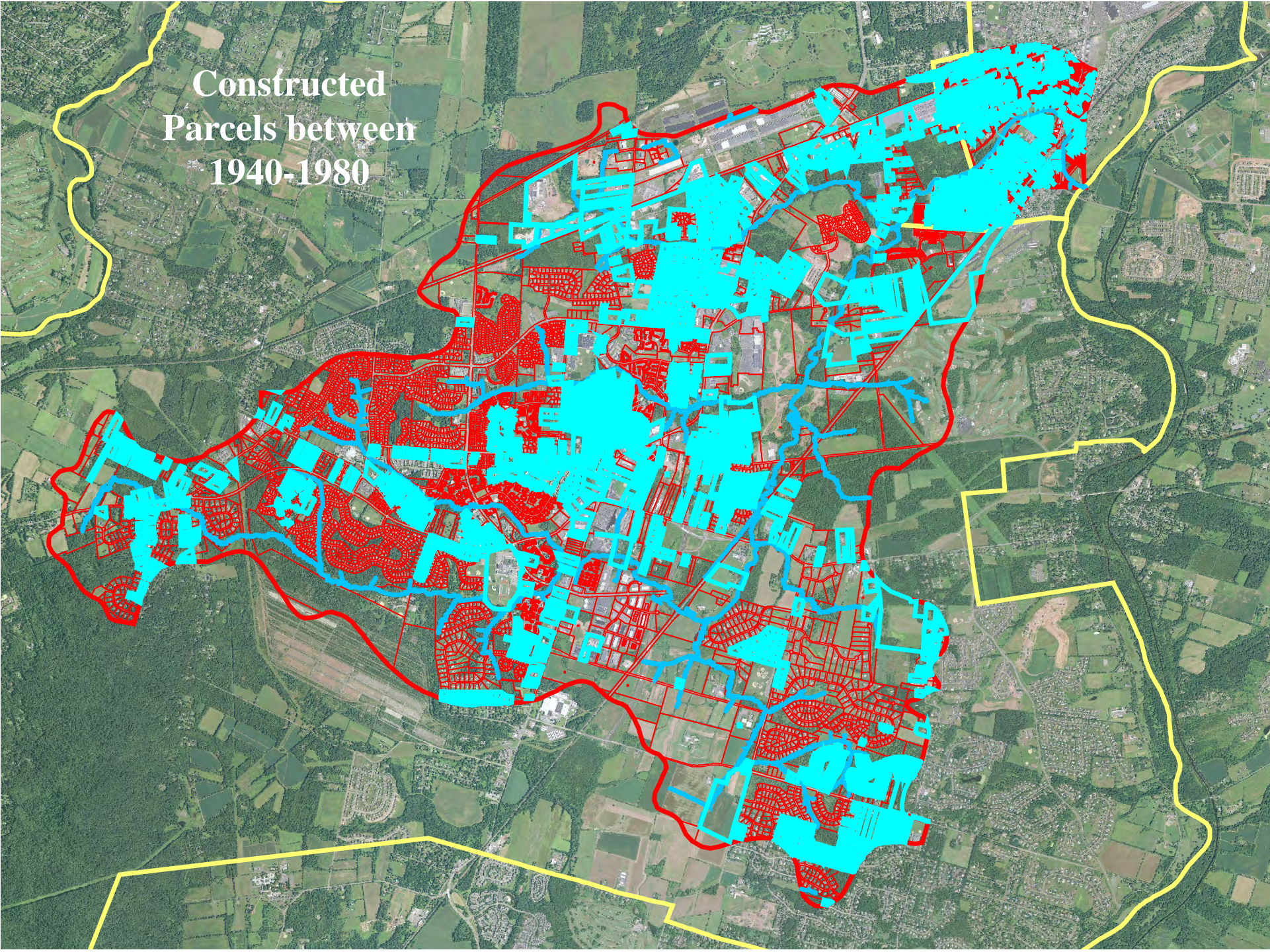
Green streets use a suite of green infrastructure practices to manage stormwater runoff and improve water quality.

Adding green infrastructure features to a street corridor can also contribute to a safer and more attractive environment for walking and biking.

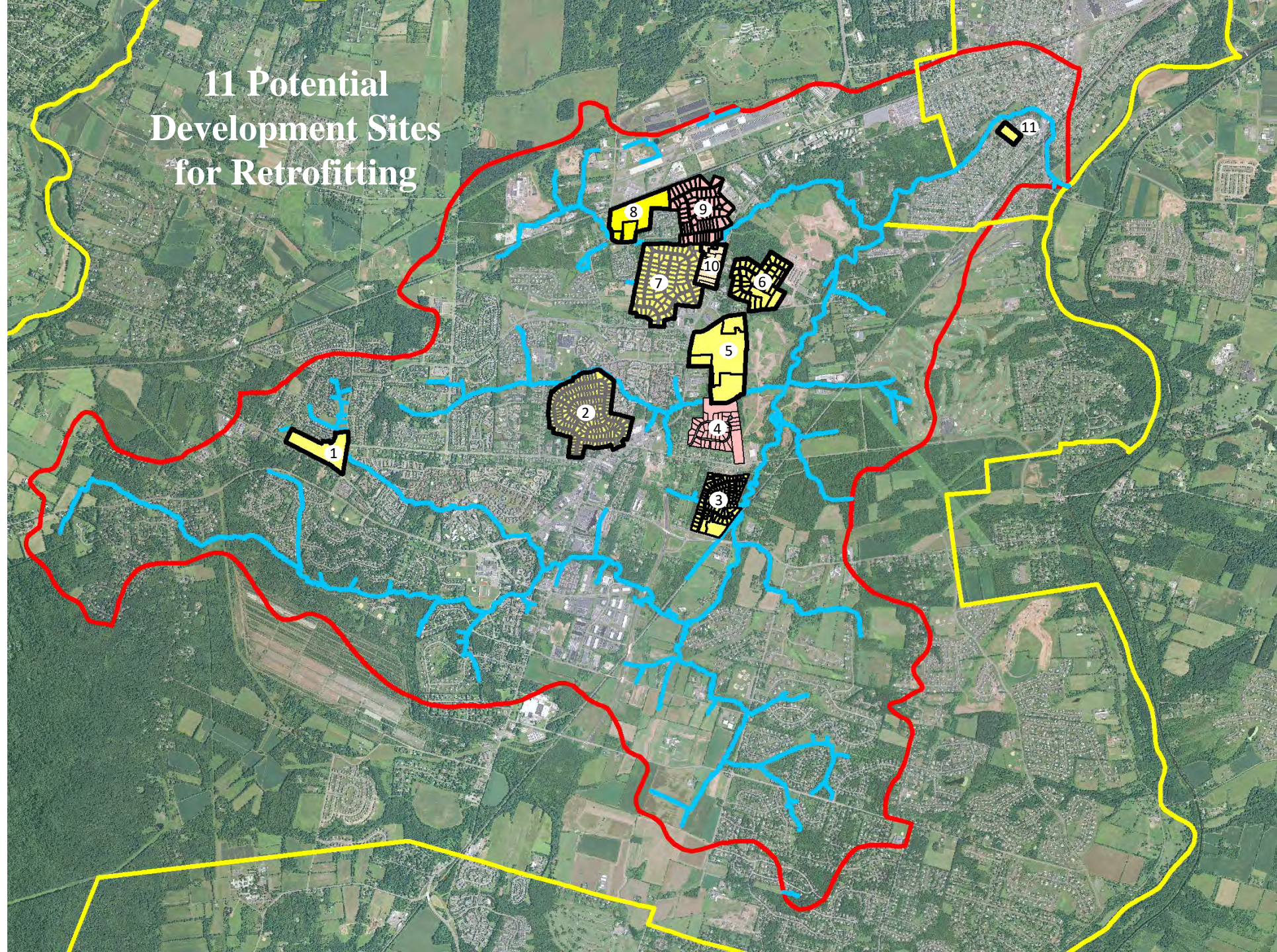
# Parcel Map



Constructed  
Parcels between  
1940-1980



# 11 Potential Development Sites for Retrofitting





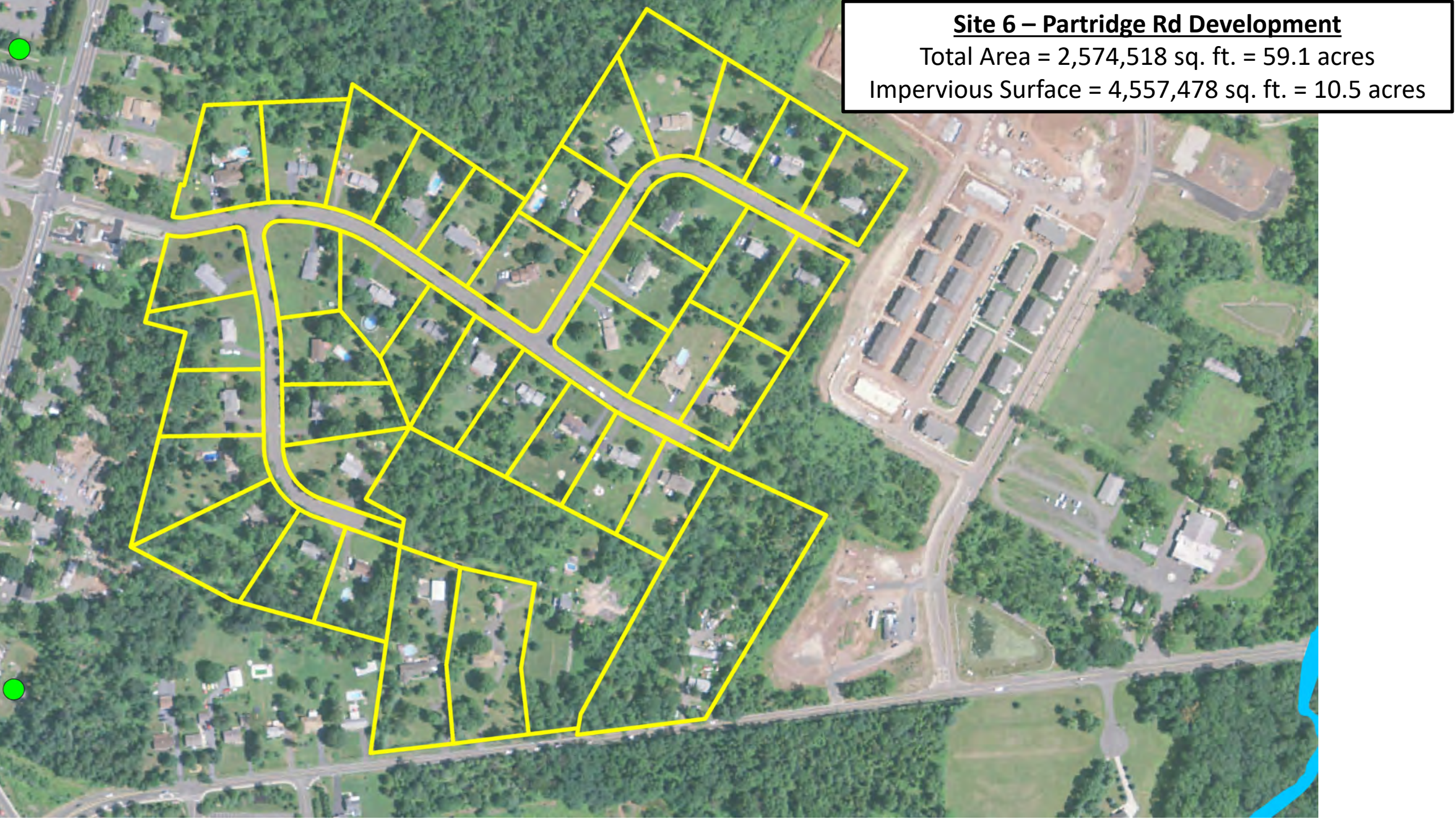
# 11 Potential Development Sites for Retrofitting

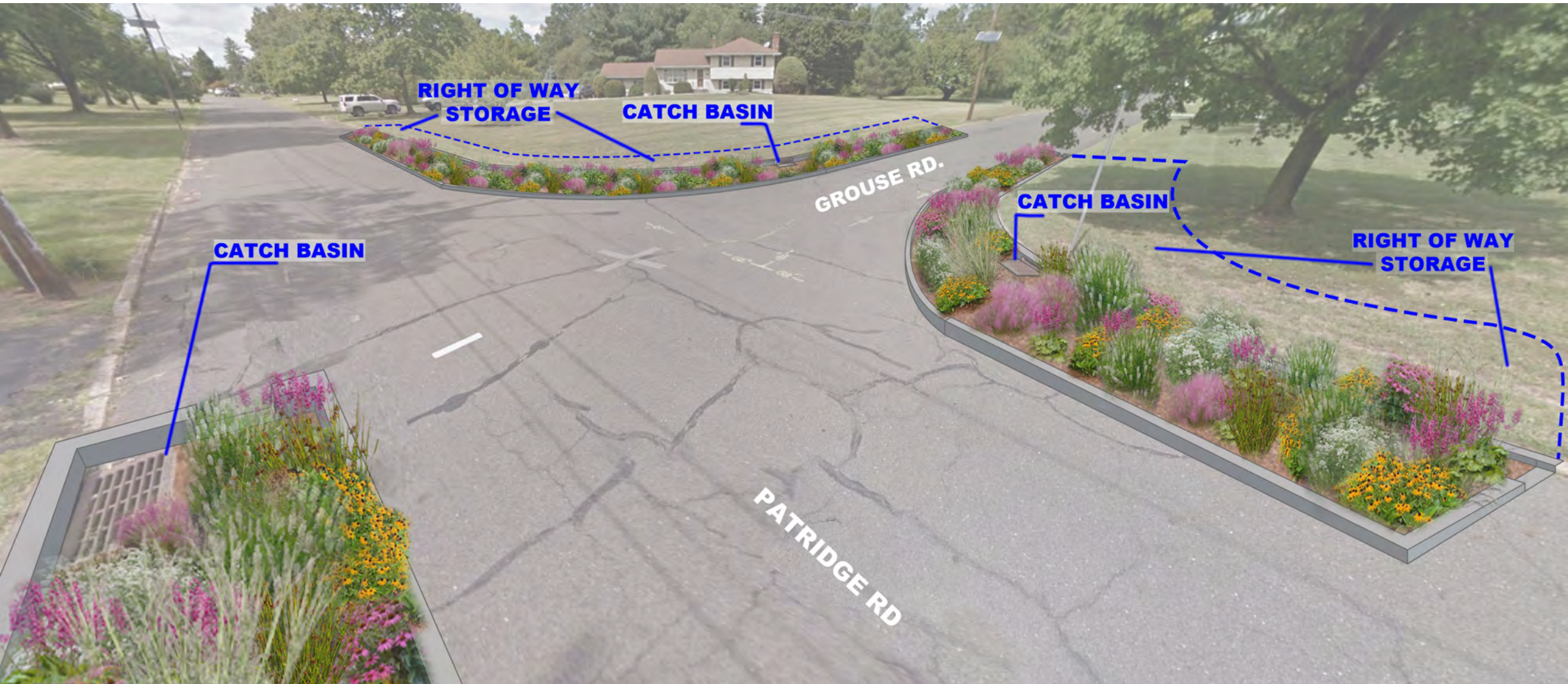
- 673.4 acres = 1.05 sq. mi.
- Six residential developments
- Three commercial sites (one with some stormwater management)
- One municipal site
- One public school
- Possible solutions
  - Constructed wetlands
  - Bioretention
  - Permeable pavement
  - Roadside rain gardens
  - Homeowner rain gardens

**Site 6 – Partridge Rd Development**

Total Area = 2,574,518 sq. ft. = 59.1 acres

Impervious Surface = 4,557,478 sq. ft. = 10.5 acres





**RIGHT OF WAY STORAGE**

**CATCH BASIN**

**GROUSE RD.**

**CATCH BASIN**

**RIGHT OF WAY STORAGE**

**CATCH BASIN**

**PATRIDGE RD**

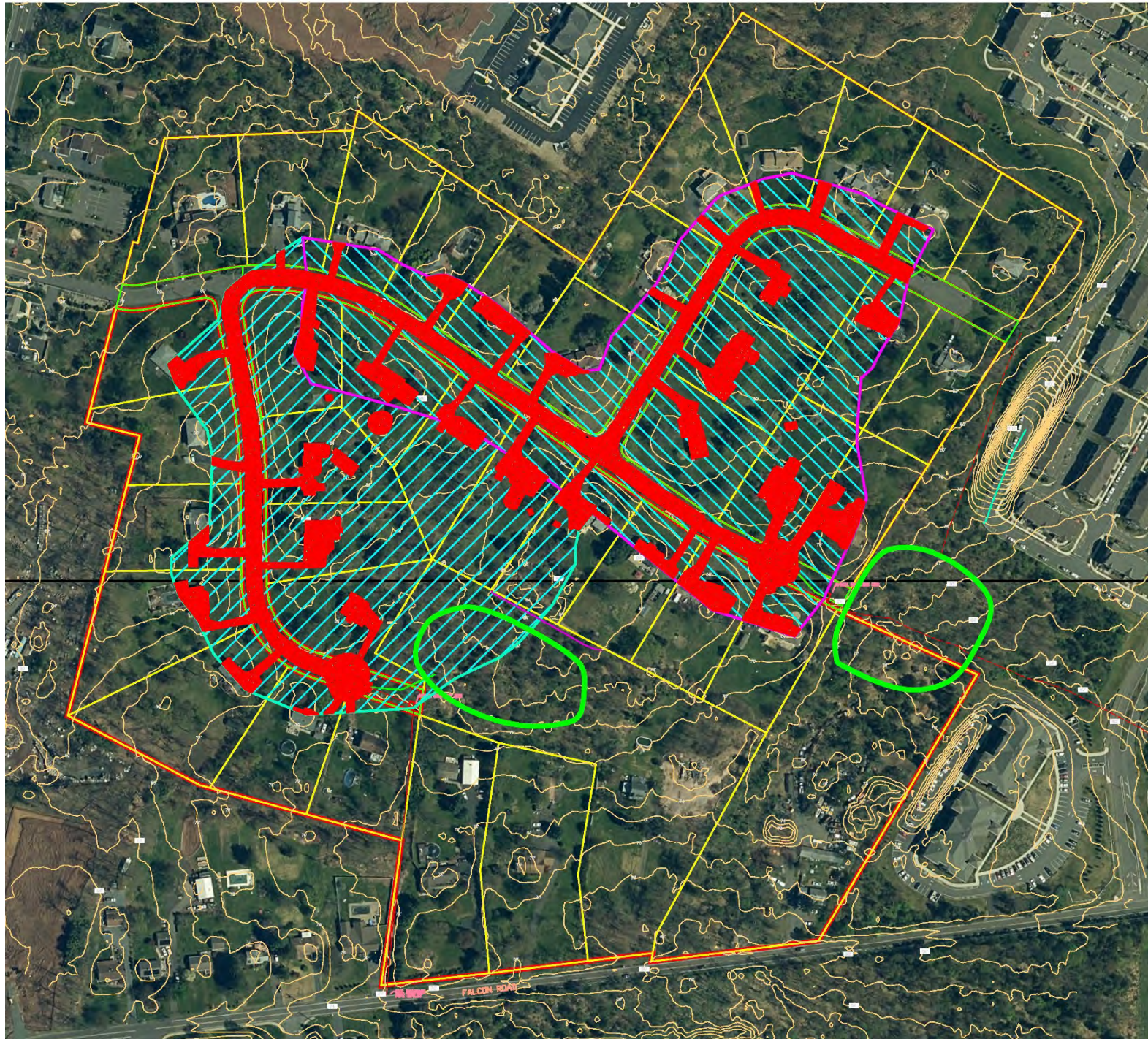


**CATCH BASIN**

**RIGHT OF WAY  
STORAGE**

**CATCH BASIN**

**PATRIDGE RD  
CUL DE SAC**



Two bioretention systems can capture 40.3% of the drainage area including 51.4% of the impervious cover.



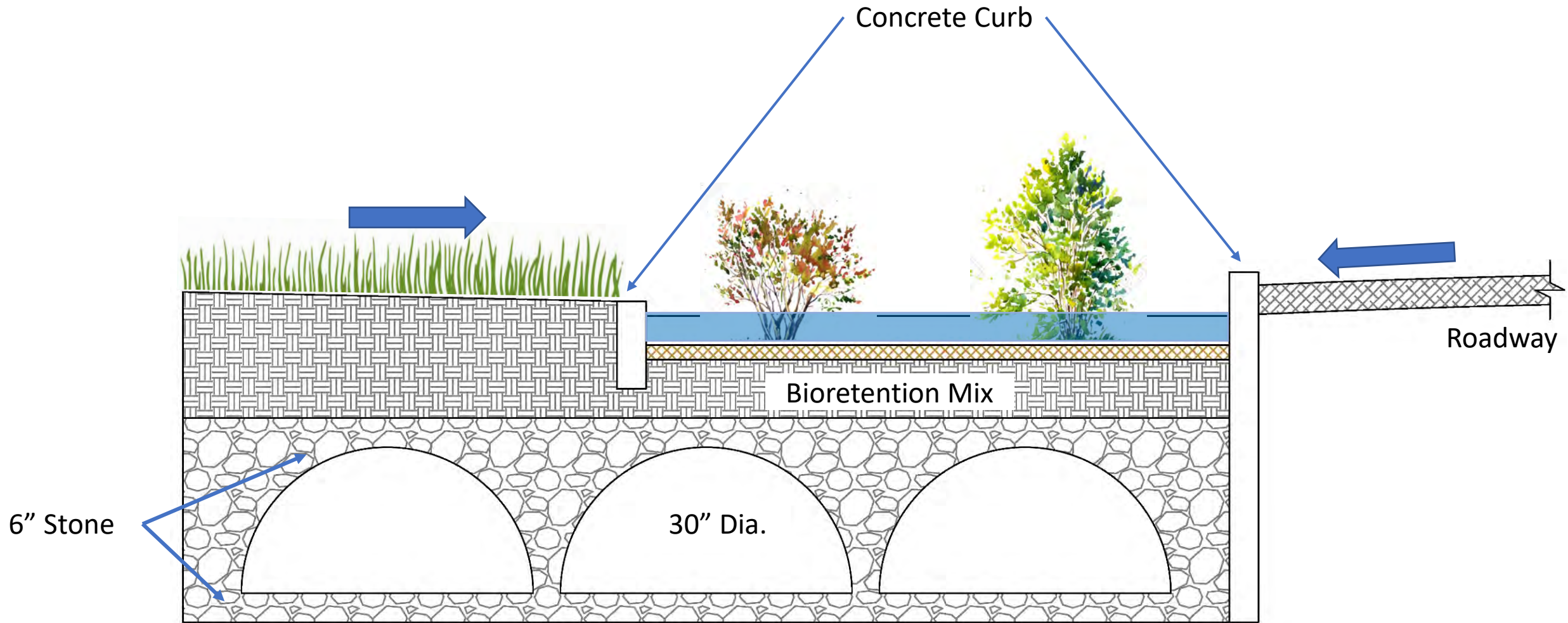
23 Bioswales = 47,375 cu. ft. storage

**Bioswales capture and treat runoff for first 2" of rainfall**

Basin 1 =  
233,464 cu. ft. storage

Basin 2 =  
266,220 cu. ft. storage

Total Storage =  
547,059 cu. ft.



# Preliminary Design Results

100-year Storm	Rainfall (in)	Volume (cu. Ft.)	Volume Managed (%)
2000	8.21	510,868	107.1%
2020	8.95	572,362	95.6%
2100	12.15	839,248	65.2%



# HILLSBOROUGH PLAZA

## GREEN INFRASTRUCTURE IMPLEMENTATION PROJECT

### 256 US-206, HILLSBOROUGH CITY]

### SOMERSET COUNTY, NEW JERSEY

#### PROJECT DESCRIPTION:

GREEN INFRASTRUCTURE DEMONSTRATION PROJECT WILL BE INSTALLED IN 256 US-206 PLAZA.

1. ISLANDS OF PARKING LOT WILL BE DE-PAVED AND RE-INSTALLED TO BE RAIN GARDENS, TO CAPTURE, INFILTRATE THE STORMWATER RUNOFF FROM THE ROAD.
2. RAIN GARDENS WILL BE INSTALLED ON THE GRASS AREA AROUND THE PLAZA, TO CAPTURE, INFILTRATE THE STORMWATER RUNOFF FROM THE ROAD.
3. PARKING LOT AT THE SOUTH SIDE OF PLANET FITNESS WILL BE REPLACED WITH PERVIOUS CONCRETE TO CAPTURE THE STORMWATER RUNOFF FROM THE ROAD AND THE ROOF.
4. UNDERGROUND STORAGE TANK WILL BE INSTALLED UNDER THE PARKING LOT TO INCREASE THE CAPACITY OF GREEN INFRASTRUCTURES.

THE PROJECT WILL SERVE AS A DEMONSTRATION FOR CITIZEN TO LEARN ABOUT SUSTAINABLE STORMWATER MANAGEMENT AND LOCAL POLLINATOR ECOLOGY.

#### LIST OF DRAWINGS:

SHEET NAME	TITLE
COVER	COVER SHEET
P-1	EXISTING CONDITIONS AND DEMOLITION PLAN
P-2	PROPOSED SITE PLAN
DT-1	DETAILS
DT-2	DETAILS 2
DT-3	DETAILS 3
DT-4	DETAILS 4

#### GENERAL NOTES:

1. SURVEY CONDUCTED BY RUTGERS COOPERATIVE EXTENSION WATER RESOURCES PROGRAM. ALL ELEVATIONS ARE RELATIVE TO THE 100.00' BENCHMARK POINT. (OR ELEVATION DATA OBTAINED FROM [INSERT DATA SOURCE HERE, TYP NOAA DIGITAL COASTAL LIDAR]. ELEVATION ARE HEIGHT ABOVE MEAN SEA LEVEL SET BY NAVD 1988).
2. EXISTING SOILS ARE PENN SILT LOAM WHICH ARE CLASSIFIED AS HYDROLOGIC SOIL GROUP C WHICH HAVE LOW INFILTRATION RATES BASED ON THE NRCS WEB SOIL SURVEY ([websoilsurvey.sc.egov.usda.gov](http://websoilsurvey.sc.egov.usda.gov)).
3. ANY OVERHEAD AND UNDERGROUND UTILITIES SHOWN ARE FROM FIELD OBSERVATIONS AND ARE NOT A COMPLETE REPRESENTATION. A UTILITY MARKOUT NEEDS TO BE CONDUCTED PRIOR TO MOBILIZATION BY THOSE RESPONSIBLE FOR EXCAVATION. NJ ONE CALL: 811 OR 800-272-1000

#### LOCATION MAP (N.T.S):



#### LEGEND:

	EXISTING DRAINAGE AREA
	EDGE OF PAVEMENT
	EXISTING CENTERLINE
	EXISTING TREELINE
	EXISTING TREE/SHRUB
	EXISTING BUILDING
	EXISTING LIGHT POLE
	AREA TO BE DEPAVED
	PROPOSED GREEN INFRASTRUCTURE
	PROPOSED POROUS ASPHALT
	PROPOSED TOP OF BERM

PLAN REVISIONS		
REV. DATE	REV. SUMMARY	REV. SHEETS

CHRISTOPHER C. OBROPTA, Ph.D., P.E.  
 PROFESSOR & V.P. ENGINEER - N.J. LICENSE # 37332  
 DATE: 2/20/2024  
 APPROVED FOR: [Signature]  
 PROJECT: [Signature]

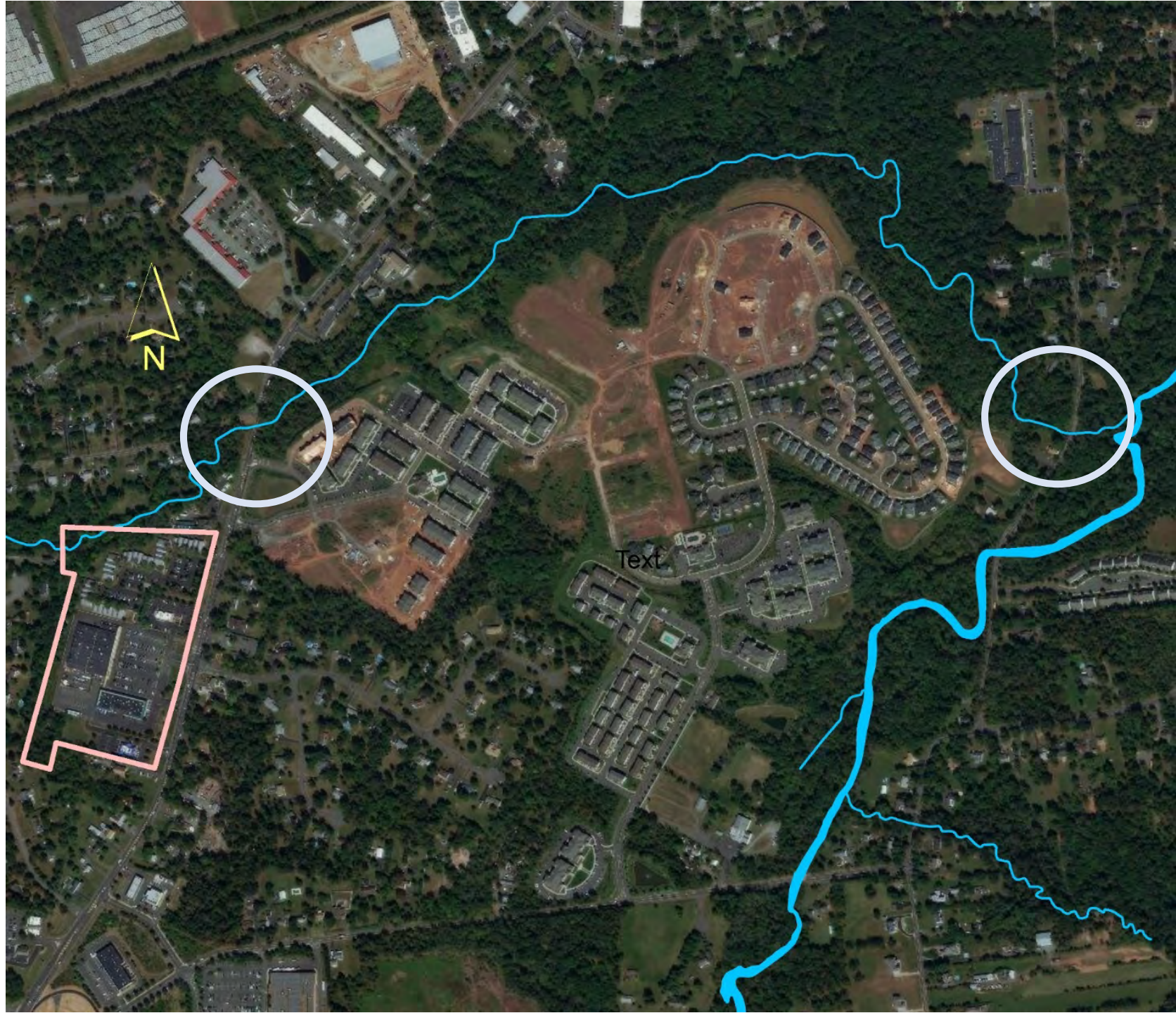
DESCRIPTION: [Blank]  
 DATE: [Blank]  
 No.: [Blank]  
**DRAFT**

HILLSBOROUGH PLAZA  
 GREEN INFRASTRUCTURE IMPLEMENTATION PROJECT  
 256 US-126, HILLSBOROUGH CITY,  
 SOMERSET COUNTY, NJ  
 COVER SHEET



SHEET NAME  
**COVER**





Text



**Hillsborough Plaza**  
**256 Route 206**  
**Hillsborough, New Jersey**



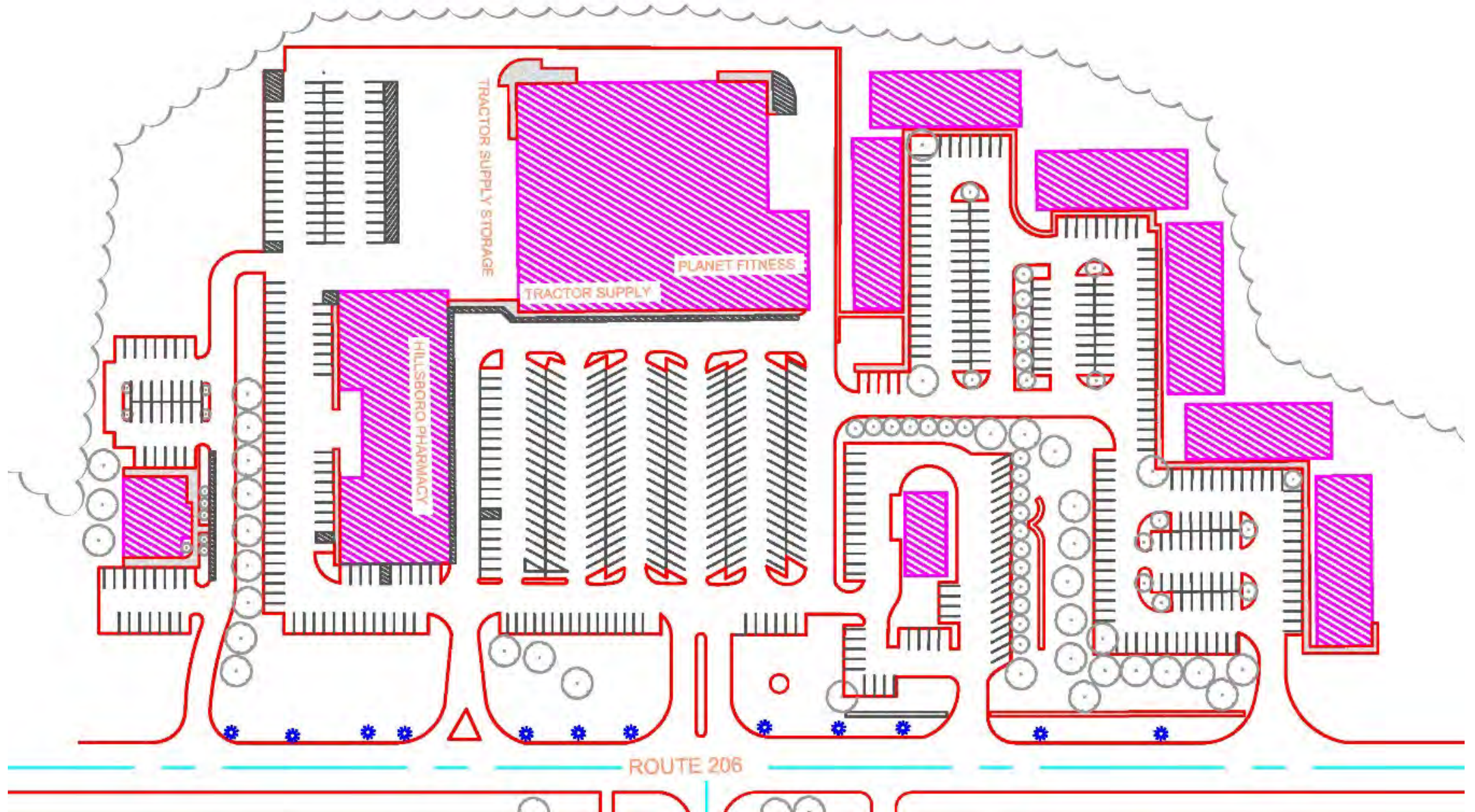
Google



Google



EXISTING TREE LINE

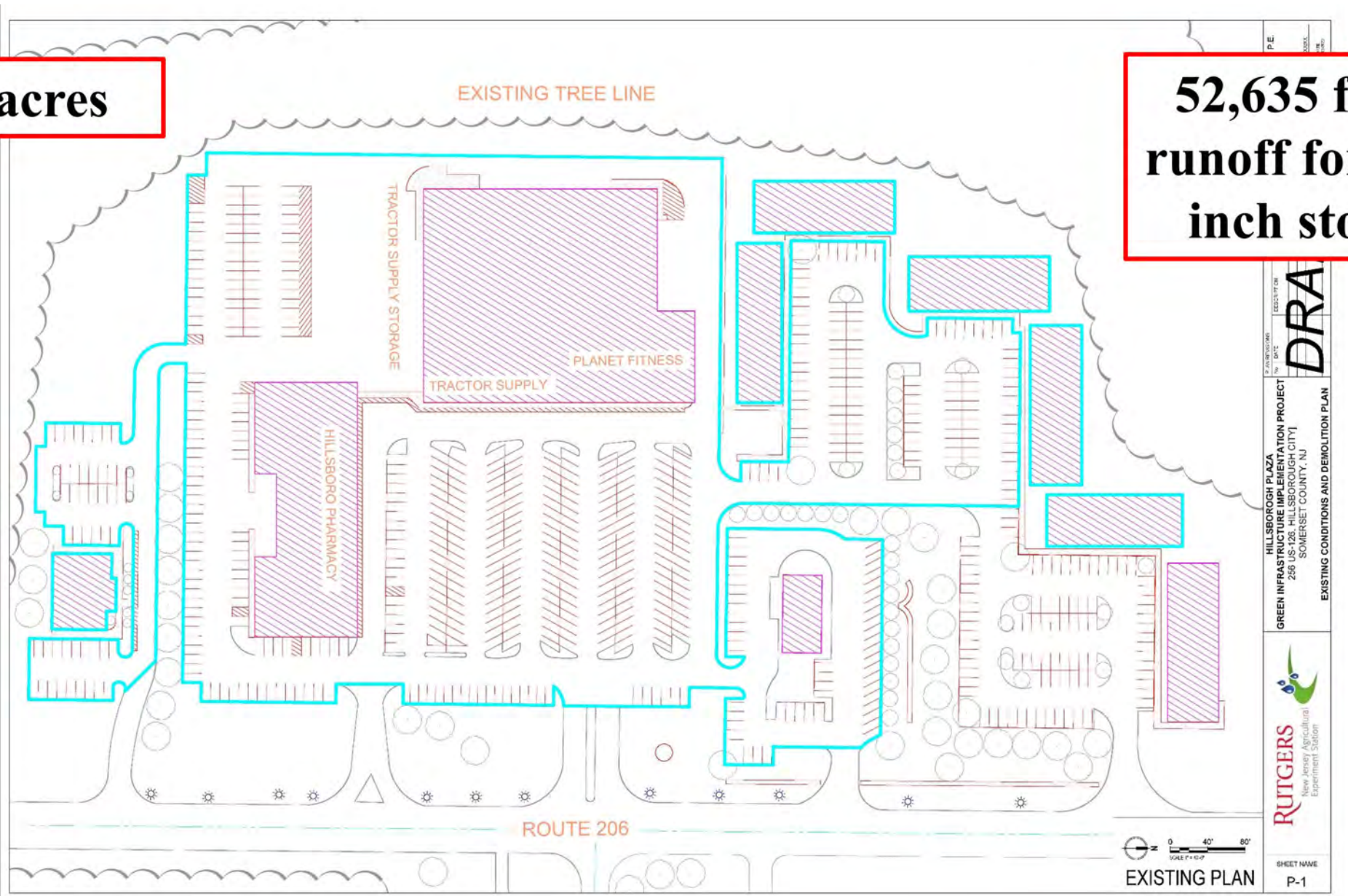




# Water Quality Storm Analysis (1.25 inches)

**11.6 acres**

**52,635 ft<sup>3</sup> of runoff for 1.25 inch storm**



**DRA**

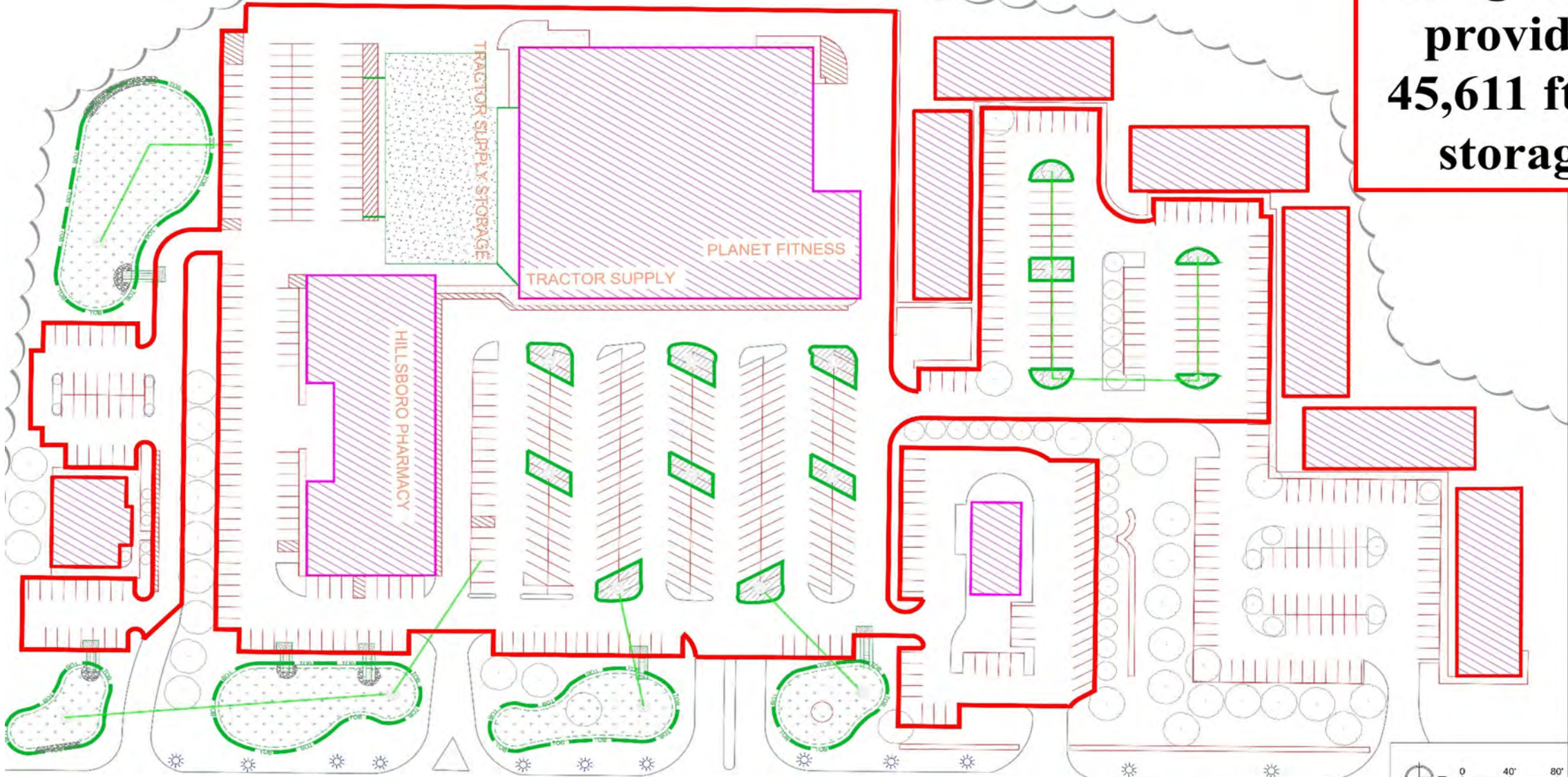
HILLSBOROUGH PLAZA  
GREEN INFRASTRUCTURE IMPLEMENTATION PROJECT  
256 US-126, HILLSBOROUGH CITY  
SOMERSET COUNTY, NJ



SHEET NAME  
**P-1**

EXISTING TREE LINE

**1.23 acres of  
rain gardens  
provides  
45,611 ft<sup>3</sup> of  
storage**



ROUTE 206

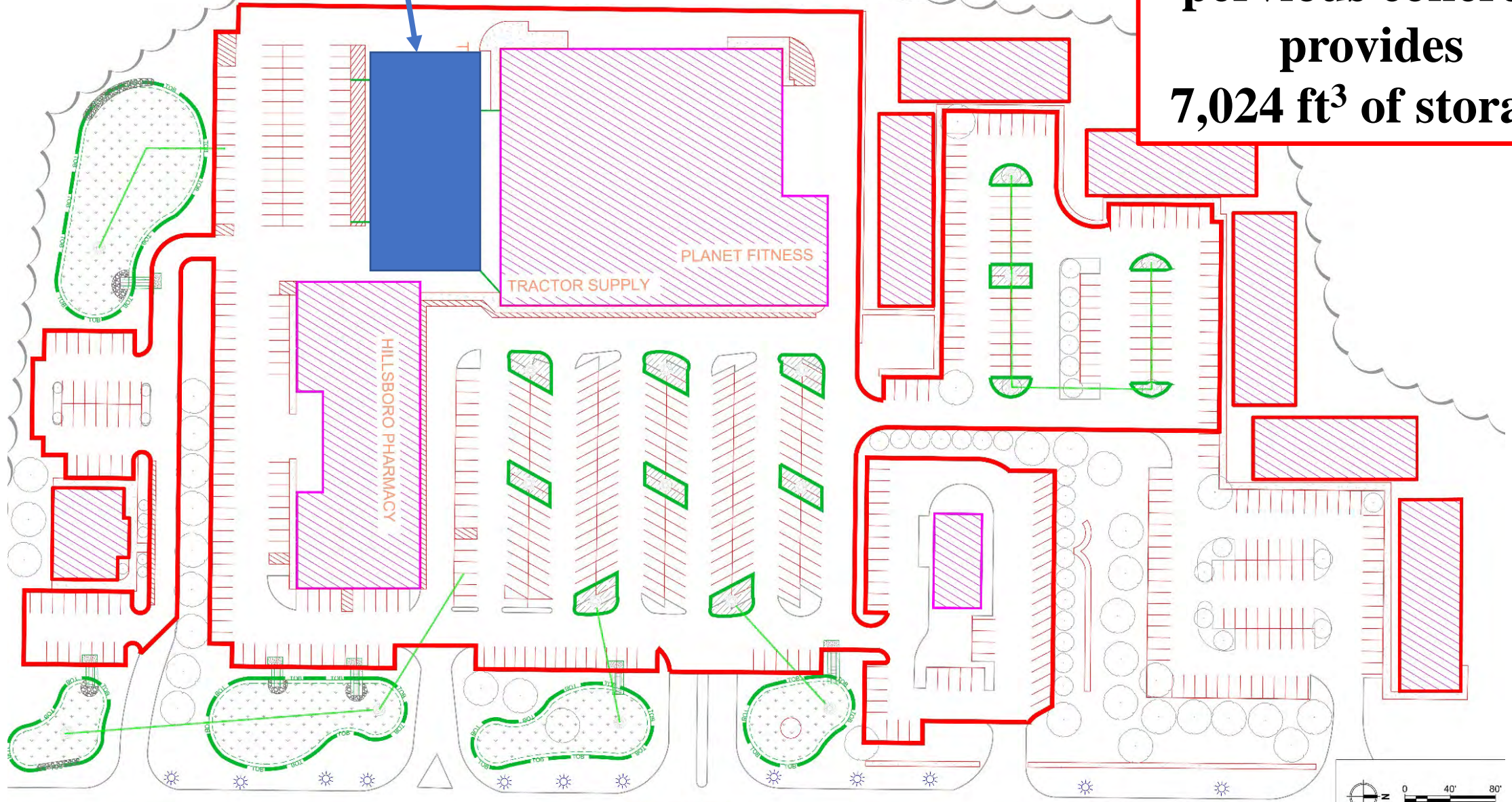


SITE PLAN

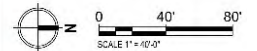
Pervious Concrete

EXISTING TREE LINE

**17,560 ft<sup>2</sup> of  
pervious concrete  
provides  
7,024 ft<sup>3</sup> of storage**



ROUTE 206

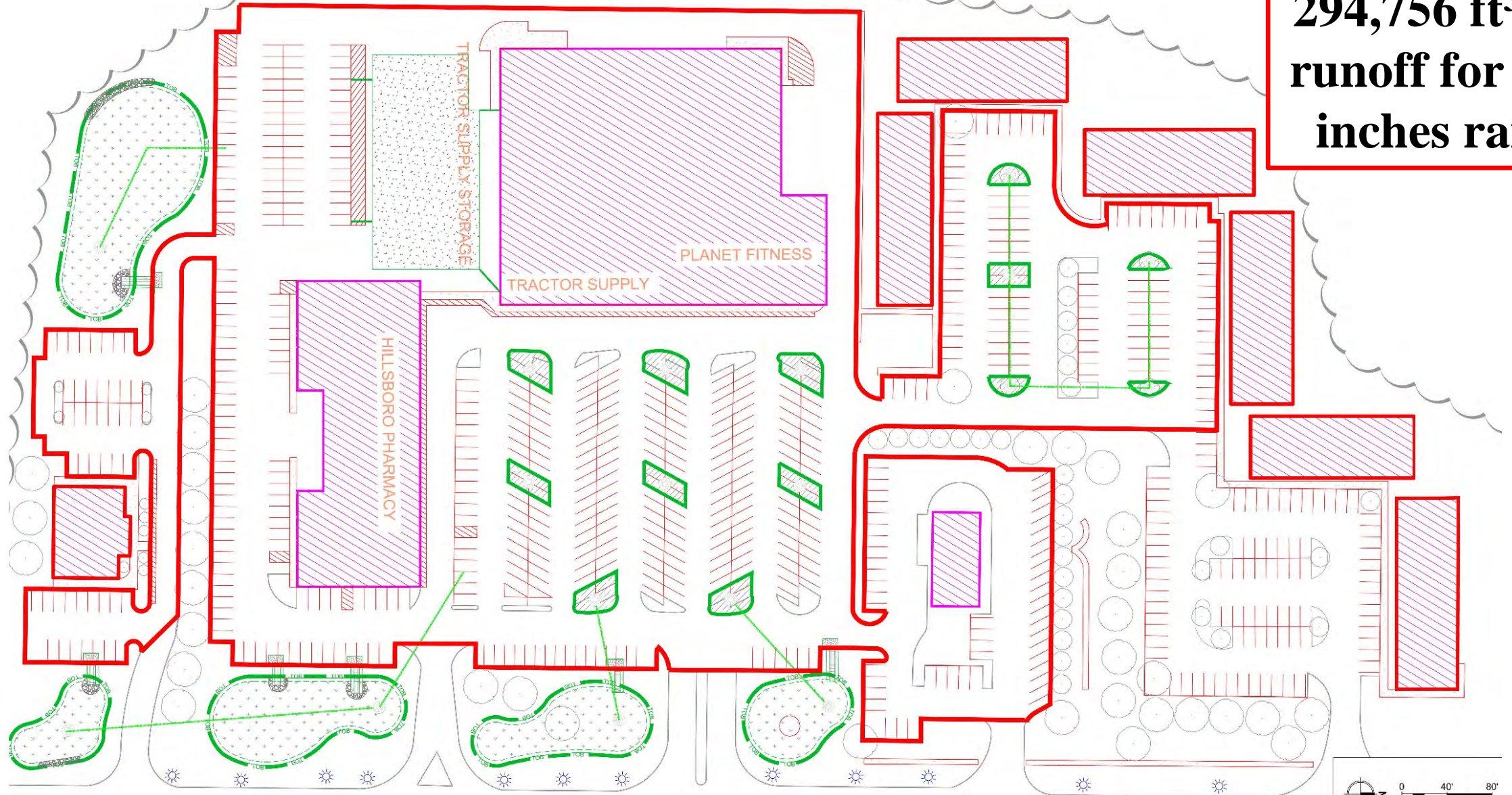


SITE PLAN

# 100-Year Storm Analysis 8.25 inches

11.6 acres

294,756 ft<sup>3</sup> of runoff for 7.0 inches rain



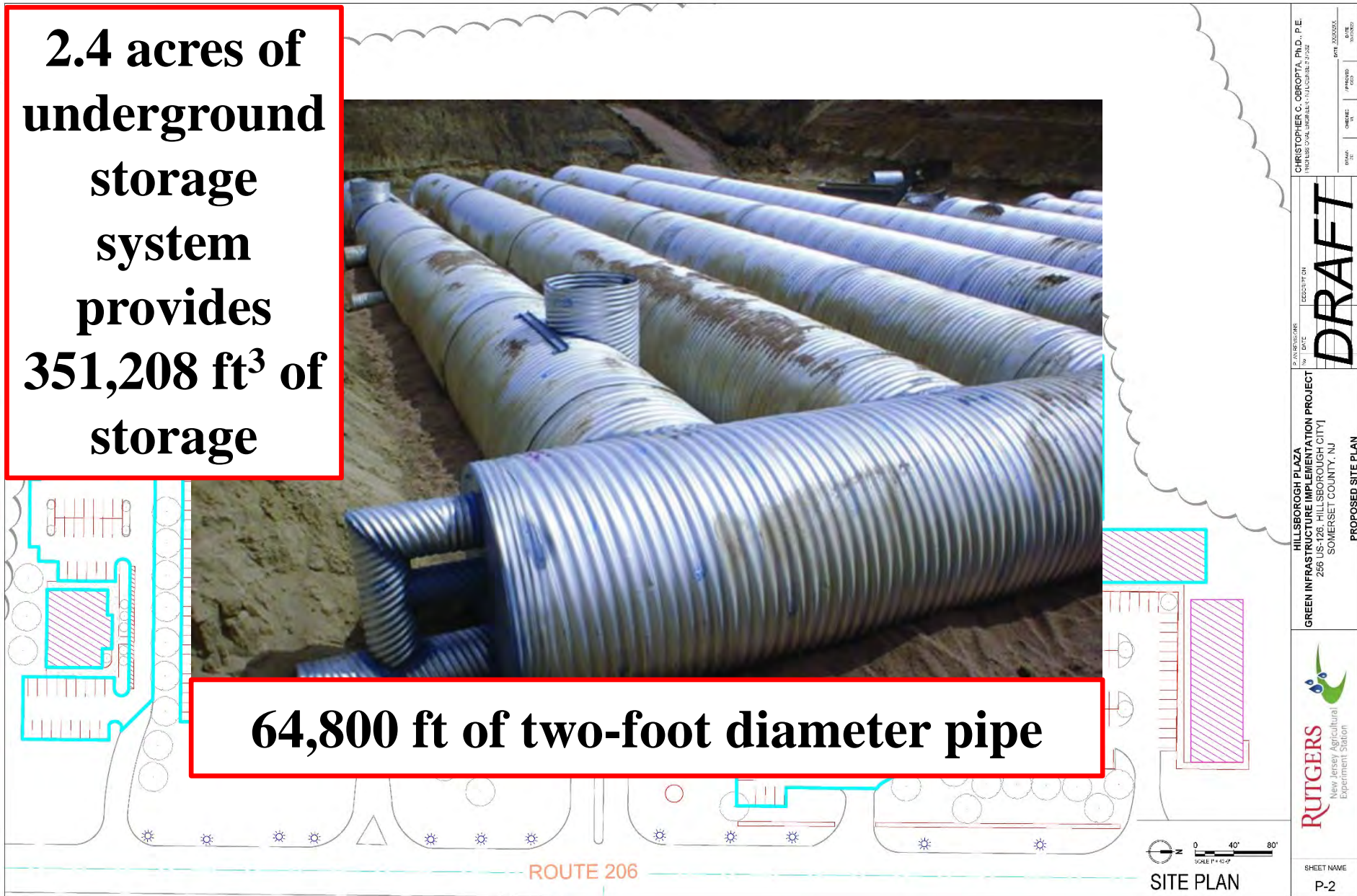
ROUTE 206

0 40' 80'  
SCALE 1" = 40.0'

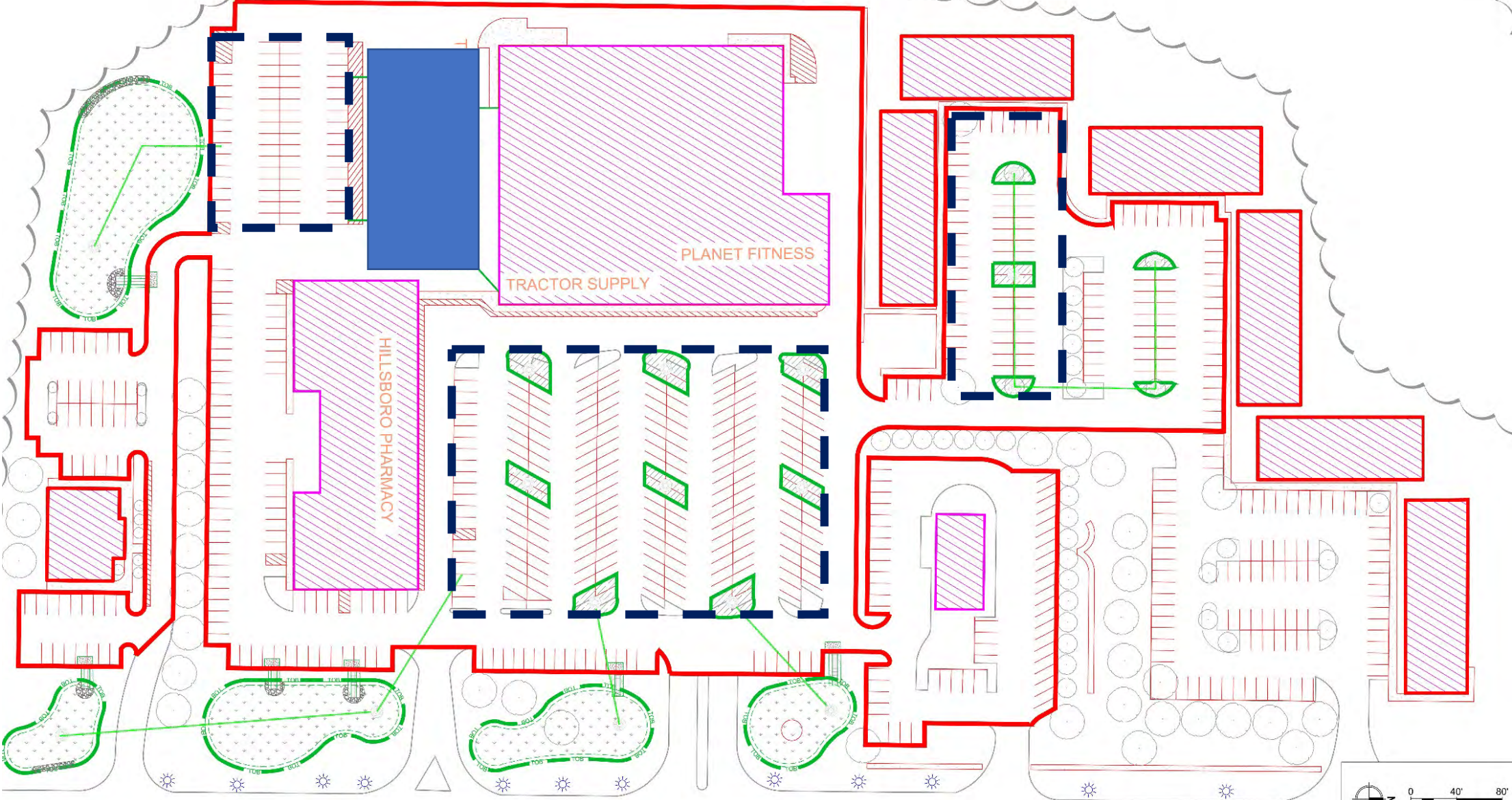
SITE PLAN

**2.4 acres of  
underground  
storage  
system  
provides  
351,208 ft<sup>3</sup> of  
storage**

**64,800 ft of two-foot diameter pipe**



# Green and Gray Infrastructure Practices



ROUTE 206

0 40' 80'  
SCALE 1" = 40'-0"

SITE PLAN

# Questions?

1. How long do we hold the larger storms before we can safely release the stormwater?
2. Can we link the release with downstream elevations?
3. What is the cost?

*Christopher C. Obropta, Ph.D., P.E.*  
*Extension Specialist in Water Resources*  
[obropta@envsci.rutgers.edu](mailto:obropta@envsci.rutgers.edu)





# Take Action With These Stormwater Resources

Using Green Infrastructure to Prevent Flooding

Tools to Help Municipalities Weather the Storm

March 2, 2023

**Lindsey Sigmund, PP, AICP**  
Program Manager  
New Jersey Future







## Agenda

- **Background**
- **Green Infrastructure Municipal Toolkit**
- **Stormwater Utility Resource Center**
- **Questions**



## Agenda

- **Background**
- Green Infrastructure Municipal Toolkit
- Stormwater Utility Resource Center
- Questions



**NEW JERSEY**  
**FUTURE**





NEW JERSEY  
FUTURE

New Jersey  
Builders Association



## Agenda

- Background
- **Green Infrastructure Municipal Toolkit**
- Stormwater Utility Resource Center
- Questions



# NEW JERSEY GREEN INFRASTRUCTURE MUNICIPAL TOOLKIT



FROM STORMWATER  
TO CLEAN WATER

PREVENT  
POLLUTION

REDUCE  
FLOODING

IMPROVE YOUR  
COMMUNITY

INTRODUCING YOUR ONLINE, ONE-STOP  
GREEN INFRASTRUCTURE RESOURCE

**[GIToolkit.NJFuture.org](https://gitoolkit.njfuture.org)**





**Check out our Green Infrastructure  
Toolkit!**







# Benefits of Green Infrastructure



### Economic

- **Reduced construction costs** and long-term cost savings for public and private development by reducing the quantity of pavement, curbs and gutters
- Less damage and lower cost impacts from localized flooding
- Higher property values through improved community aesthetics

[Read More](#)



### Environmental

- Keeps polluted water out of creeks, lakes, and rivers; improves water quality by filtering pollutants
- Increases groundwater and aquifer recharge
- Improves air quality through reduction in greenhouse gases

[Read More](#)



### Community/Public Health

- Meets the public's growing demand for sustainable communities
- Cooler air: reduced urban heat island effect through evaporation and tree canopy cover
- Dedicated open space provides opportunities for passive and active recreation

[Read More](#)



# What Can You Do?

## Plan

Whether your town is starting from scratch or looking to move to the next level with green infrastructure, smart planning is a must. Chart your course with guidance and tools found here.

[Learn More >](#)

## Implement

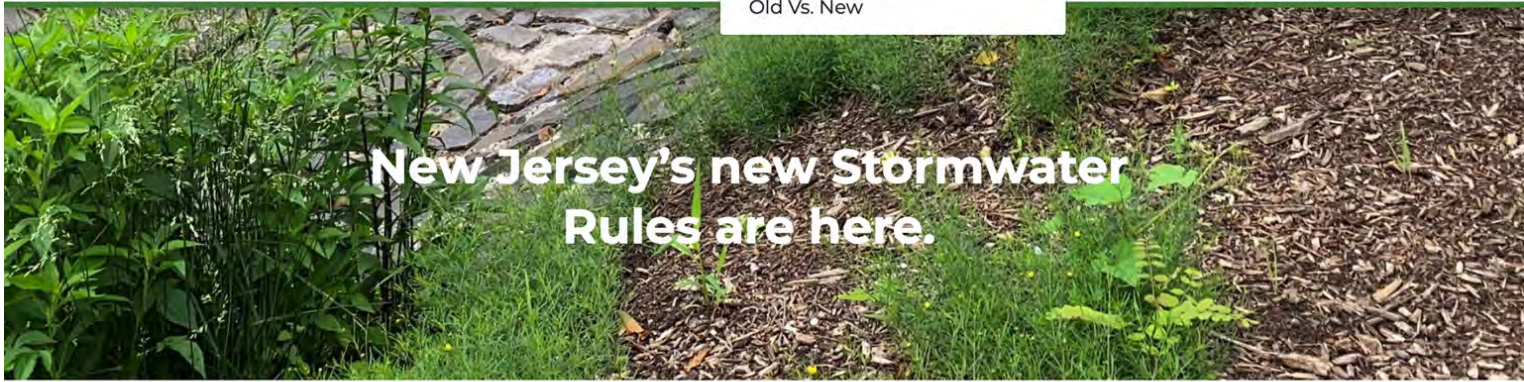
Green infrastructure isn't rocket science, but proper design, construction and maintenance – all essential to long-term success – requires a different approach. This section of the toolkit provides the tools needed and practical applications of implementing green infrastructure within your municipality.

[Learn More >](#)

## Sustain

Like all infrastructure, green infrastructure requires monitoring and maintenance in order to function properly over the long term. This section of the toolkit will provide operations, maintenance, and monitoring guidance, as well as ways to alert and engage your community about the benefits of green infrastructure.

[Learn More >](#)



**Green Infrastructure is now a requirement. What do municipalities need to know about NJ's amended stormwater rules?**



**Enhanced Model  
Stormwater Ordinance**

# Enhanced Model Stormwater Ordinance

The background image shows a city street that is completely flooded with water. In the distance, a large steel truss bridge spans across the street. The water is dark and reflects the surrounding environment. There are some trees and buildings visible on the sides of the street, but they are somewhat obscured by the water and the overall hazy atmosphere.

- **Redefine the threshold for “major development.”**
- **Add a definition and requirements for “minor development.”**
- **Require stormwater management on redevelopment projects, not just new development.**
- **Require infiltration of a specific volume of stormwater onsite.**
- **Reduce “maximum contributory drainage areas.”**



# Funding

There are many programs and opportunities listed below, ranging from \$10,000 to \$5 million, that can help fund green infrastructure projects. Sorting by project type, funding type or eligible activities will narrow your search and make it easier to see and digest what's available.

**Project Type/Phase:** All Types ▾  
All Types  
Construction  
Planning  
Design  
Maintenance  
Other  
Implementation

**Funding Type:** All Types ▾

**Eligible Activities:** All Activities ▾

Showing **49** results

**U** **Environmental Protection Agency** **Project Type:** Construction  
**U** **Small Grants** **Funding Type:** Federal

**Fu** \_\_\_\_\_,000.

**Eligible Applicant and Activities**  
Eligible applicants include: Local & state governments, higher education institutions, public or private organization acting in

**Website:**  
<https://www.epa.gov/urbanwaters/urban-waters-small-grants>



# Funding

There are many programs and opportunities listed below, ranging from \$10,000 to \$5 million, that can help fund green infrastructure projects. Sorting by project type, funding type or eligible activities will narrow your search and make it easier to see and digest what's available.

**Project Type/Phase:** All Types ▾

**Funding Type:** All Types ▾

- All Types
- Federal
- State
- Private

**Eligible Activities:** All Activities ▾

Showing **49** results

**United States Environmental Protection Agency**

**Urban Waters Small Grants**

**Funding Amount:** Up to \$60,000.

**Eligible Applicant and Activities**  
Eligible applicants include: Local & state governments, higher education institutions, public or private organization acting in

**Project Type:** Construction  
**Funding Type:** Federal

**Website:**  
<https://www.epa.gov/urbanwaters/urban-waters-small-grants>



# Funding

There are many programs and opportunities listed below, ranging from \$10,000 to \$5 million, that can help fund green infrastructure projects. Sorting by project type, funding type or eligible activities will narrow your search and make it easier to see and digest what's available.

<b>Project Type/Phase:</b> <a href="#">All Types</a> ▾	<b>Funding Type:</b> <a href="#">All Types</a> ▾	<b>Eligible Activities:</b> <a href="#">All Activities</a> ▾ <ul style="list-style-type: none"><li>All Activities</li><li>Bicycle and Pedestrian Projects</li><li>Capacity Building</li><li>Capital Needs</li><li>Coastal resiliency</li><li>Community Priorities</li><li>Conservation</li><li>Construction</li><li>Education</li></ul>
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<b>United States Environmental Protection Agency</b> <b>Urban Waters Small Grants</b> <b>Funding Amount:</b> Up to \$60,000. <b>Eligible Applicant and Activities</b> Eligible applicants include: Local & state governments, higher education institutions, public or private organization acting in	<b>Website:</b> <a href="https://www.epa.gov/urbanwaters/urban-waters-small-grants">https://www.epa.gov/urbanwaters/urban-waters-small-grants</a>
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NEW JERSEY  
GREEN INFRASTRUCTURE  
MUNICIPAL TOOLKIT

Home ▾ NJ Stormwater Rules ▾ Plan ▾ Implement ▾ Sustain ▾ Resources

About Stay Informed

Let us know how to reach you with new information and updates.  
All feedback welcome!

## Contact Us

**New Jersey Future**  
16 W. Lafayette St.  
Trenton, NJ 08608

[njfuture@njfuture.org](mailto:njfuture@njfuture.org)  
(609) 393-0008

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Full Name

Title

Title

Affiliation

Affiliation Name

\* Email Address

Email Address

Phone Number

Phone Number

Ideas or Feedback

Your Message Here...



## Agenda

- Background
- Green Infrastructure Municipal Toolkit
- **Stormwater Utility Resource Center**
- Questions



- [Home](#)
- [About](#)
- [Why Stormwater Matters](#) ▾
- [Why a Stormwater Utility?](#) ▾
- [Establish a Stormwater Utility](#) ▾
- [Stay Informed](#)
- [Resources](#)



Protect Public Health.  
Safeguard Your Community.  
Rest Easier When It Rains.



Why Stormwater Matters  
[Learn More >](#)



Why a Stormwater Utility?  
[Learn More >](#)



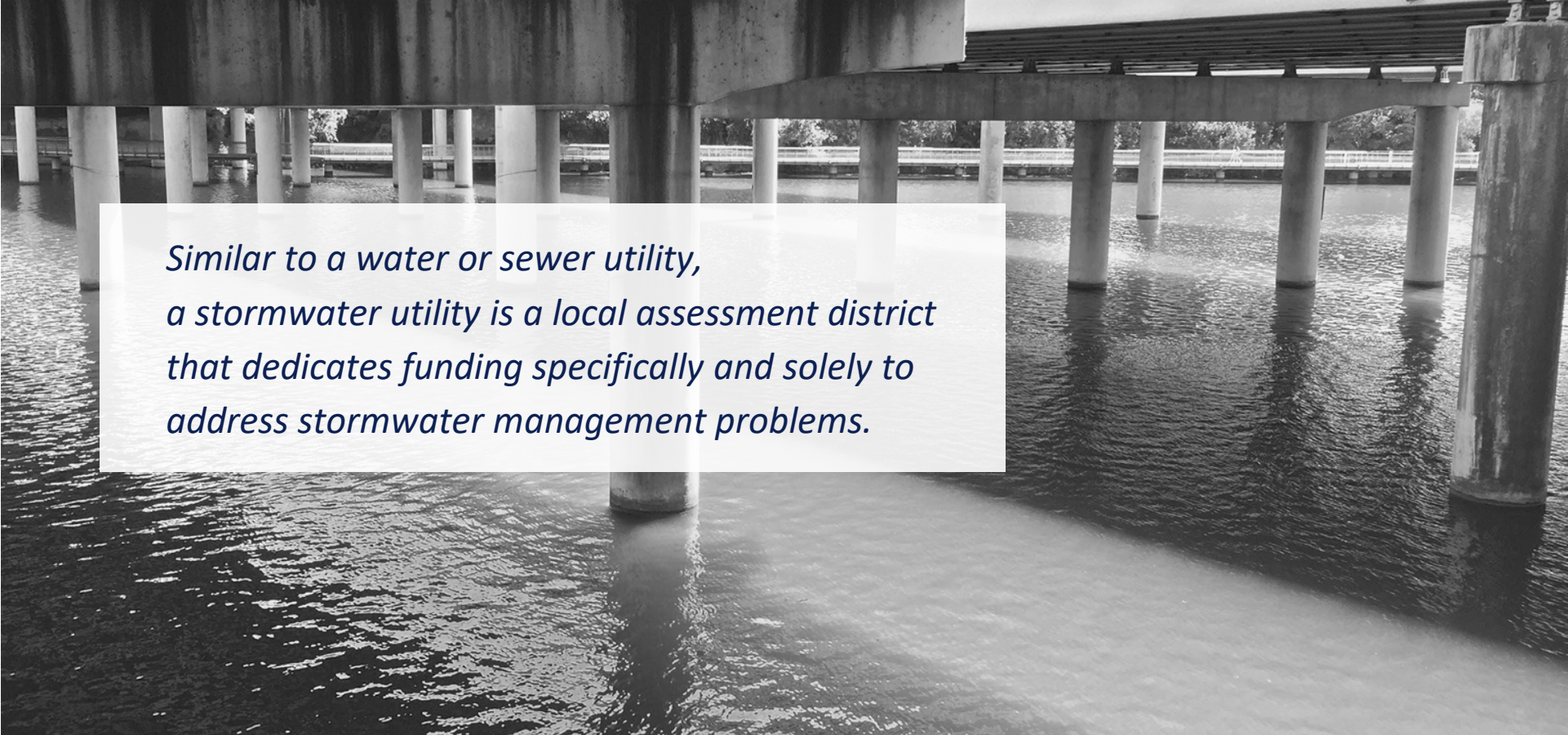
Establish a Stormwater Utility  
[Learn More >](#)



NEW JERSEY  
**STORMWATER  
UTILITY**  
RESOURCE CENTER

# What is a Stormwater Utility?

*Similar to a water or sewer utility, a stormwater utility is a local assessment district that dedicates funding specifically and solely to address stormwater management problems.*





## What is the purpose of the resource center?



To provide municipal and county officials and utilities with the tools to help them determine if a stormwater utility is right for their community.



## What is the purpose of the resource center?



To provide municipal and county officials and utilities with the tools to help them determine if a stormwater utility is right for their community.



To educate the public on stormwater utility basics.



## What is the purpose of the resource center?



To provide municipal and county officials and utilities with the tools to help them determine if a stormwater utility is right for their community.



To educate the public on stormwater utility basics.



To provide an ongoing repository for the latest information on stormwater utilities.

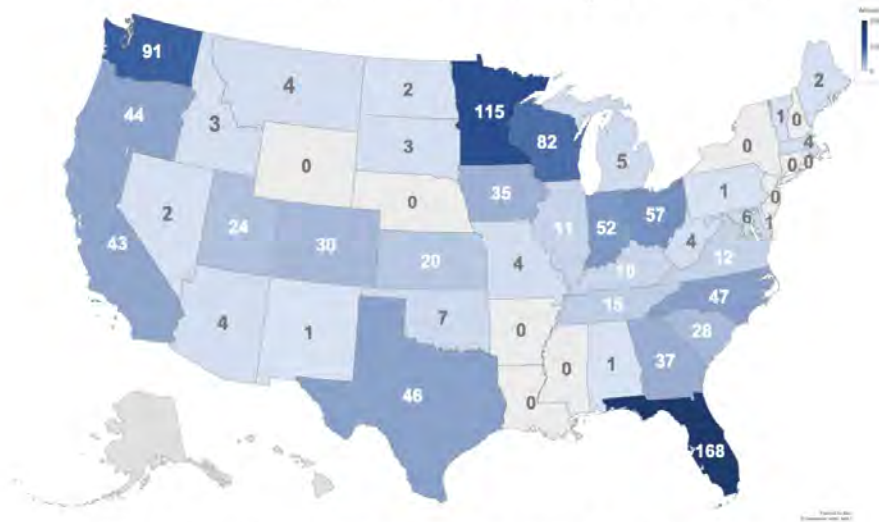


# Clean Stormwater & Flood Reduction Act

- New Jersey's law allows, but does not require, local governments to establish stormwater utilities.
- If established, stormwater utilities must collect fees based on the amount of stormwater a property generates.
- Utilities can be established by municipalities, counties, groups of municipalities, and sewerage and improvement authorities.
- Funds generated from the fees are dedicated solely to stormwater management and cannot be used for any other purposes.



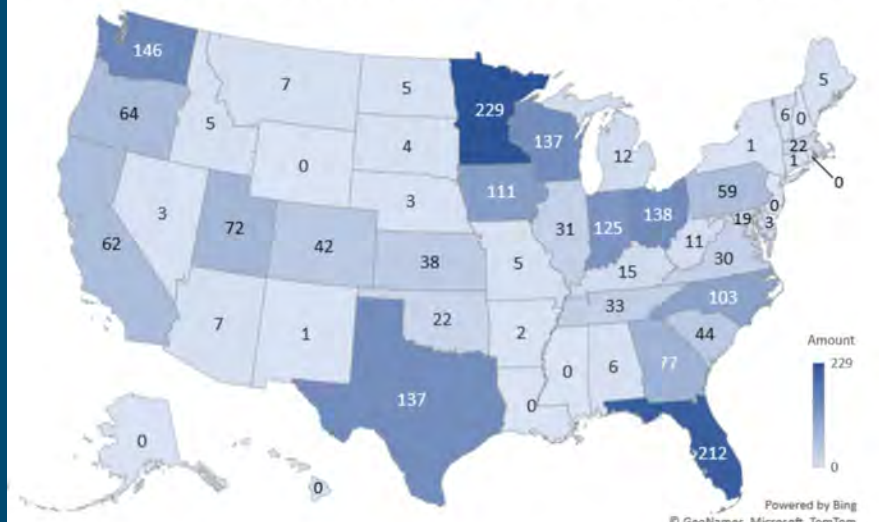
### Number of Stormwater Utilities by State 2009



As of 2009, 1,022 stormwater utilities had formed in the United States.

(Source: Western Kentucky University 2009 Stormwater Utility Survey)

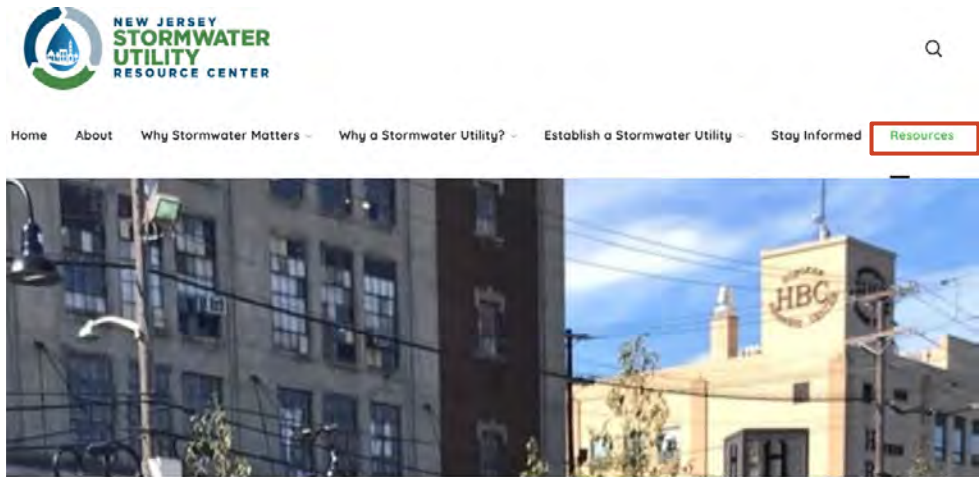
### Number of Stormwater Utilities by State 2022



As of 2022, 2,055 stormwater utilities had formed in the United States.

(Source: Western Kentucky University 2022 Stormwater Utility Survey)





## Stormwater Resources for Your Community

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### Overviews

- 🌱 [New Jersey Future - Stormwater Utilities at a Glance](#)
- 🌱 [New Jersey Future - Stormwater Utilities Fact Sheet](#)
- 🌱 [New Jersey Future - Stormwater Utilities Steps For Local Implementation](#)
- 🌱 [2018 Stormwater Utility Survey, Black & Veatch Management Consulting, LLC](#)
- 🌱 [New Jersey Department of Environmental Protection \(NJDEP\) Stormwater Utilities Guidance](#)
- 🌱 [Western Kentucky University 2019 Stormwater Utilities Survey](#)

# Resources

- [Overviews](#)
- [Legal](#)
- [Financial](#)
- [Public Outreach](#)
- [Case Studies](#)
- [Mapping/Impervious Cover](#)
- [Climate/Flooding](#)
- [Water Environment Federation \(WEF\) Tables](#)



NEW JERSEY  
**DEVELOPERS**  
Green Infrastructure  
GUIDE 2.0



Architect: Marchetto Higgins Stieve  
Photographer: Don Pearse



**THANK YOU!**

**Lindsey Sigmund**

Program Manager

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