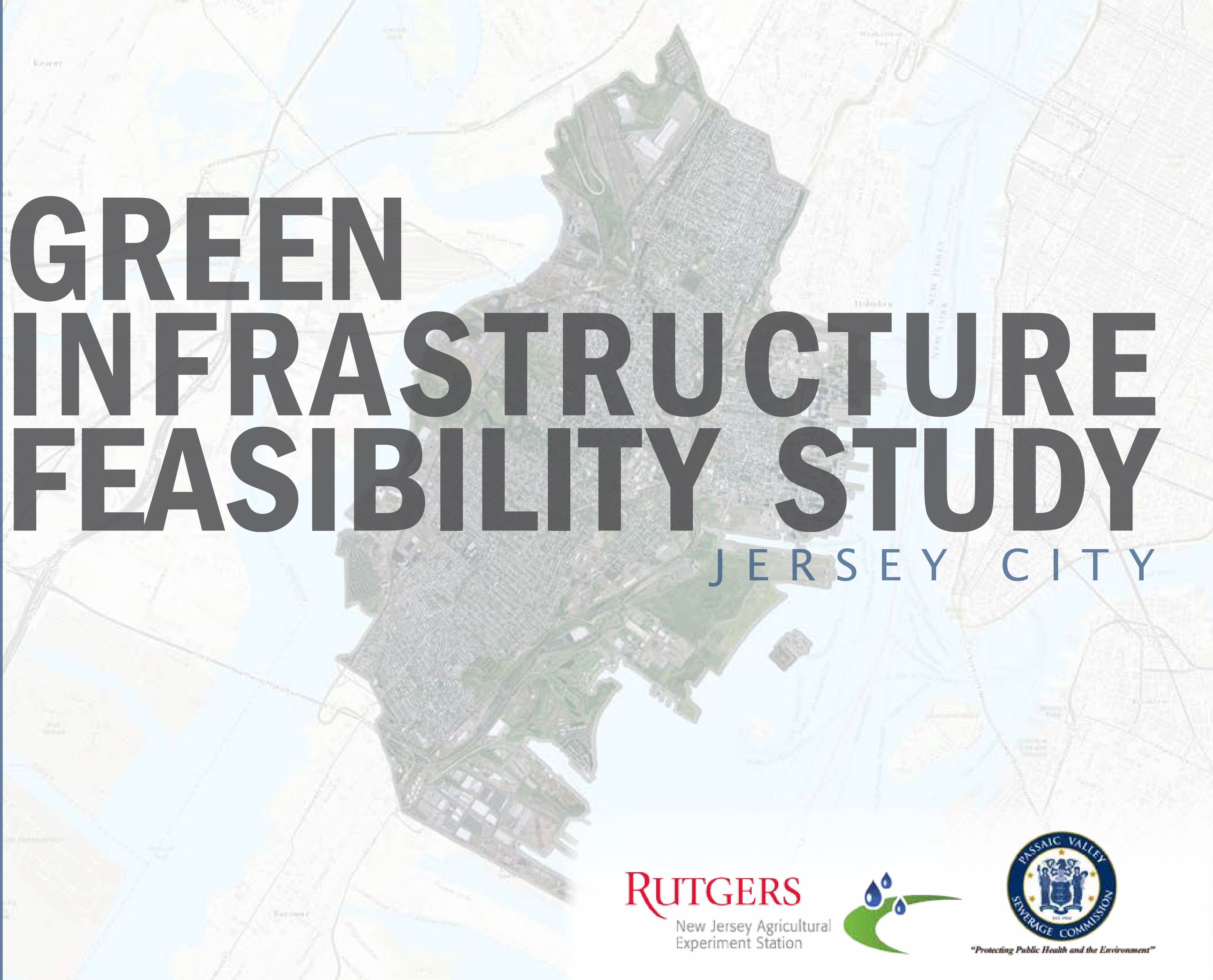
GREEN INFRASTRUCTURE FEASIBILITY STUDY

JERSEY CITY



RUTGERS
New Jersey Agricultural Experiment Station

PASSAIC VALLEY SEWERAGE COMMISSION
"Protecting Public Health and the Environment"

ACKNOWLEDGEMENTS

Designed to highlight green infrastructure opportunities within the City of Jersey City, this document has been prepared by the Rutgers Cooperative Extension Water Resources Program with funding and direction by the Passaic Valley Sewerage Commission and the New Jersey Agricultural Experiment Station.

We would like to thank the Passaic Valley Sewerage Commission, the New Jersey Agricultural Experiment Station, and the City of Jersey City for their input and support in creating this document.

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New Jersey Agricultural
Experiment Station

PASSAIC VALLEY SEWERAGE COMMISSION
"Protecting Public Health and the Environment"

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INTRODUCTION

In 2013, the Passaic Valley Sewerage Commission (PVSC) began a new initiative to assist the 48 municipalities within its jurisdiction to manage flooding and eliminate combined sewer overflows. With municipalities spread across five counties, PVSC is dedicated to leading efforts throughout the PVSC Sewerage District by using green infrastructure to intercept stormwater runoff, reduce combined sewer overflows (CSOs), manage existing water infrastructure, and minimize frequent flooding events. To help with this effort, PVSC has entered into a partnership with the Rutgers Cooperative Extension (RCE) Water Resources Program.

Jersey City is a community with a combined sewer system which carries both wastewater and stormwater in the same pipes. During heavy rain or snow melt, combined sewer systems often cannot manage all of the water and overflow, causing a combined sewer overflow (CSO) event. When overflows or CSO events occur, stormwater that has been mixed with untreated wastewater is discharged into local waterways, carrying with it many contaminants. By using cost-effective green infrastructure practices, Jersey City can begin to reduce the negative impacts of stormwater runoff and pressure on the local infrastructure, while also increasing resiliency to CSO events and protecting the health of our waterways.

This feasibility study is intended to be used as a guide for the community of Jersey City to begin implementing green infrastructure practices while demonstrating to residents and local leaders the benefits of and opportunities for better managing stormwater runoff.

Rutgers University professor, Tobiah Horton, reviews a rain garden design with a homeowner.

JERSEY CITY

Jersey City is located in Hudson County and covers approximately 21 square miles. The city has a population of 247,597 according to the 2010 US Census, making it the largest city in Hudson County and the second largest in the state. Having numerous distinct and culturally diverse neighborhoods, Jersey City is geographically divided into six wards. Each ward is represented on the city council. The city shares its northern border with the municipalities of Hoboken, North Bergen, Secaucus, and Union City, while it borders Bayonne to the south. It is bounded to the east by the Hudson River and to the west by the Hackensack River and Newark Bay, creating 11 miles of waterfront. With this, Jersey City has many waterfront opportunities as well as water quality concerns.

The city has a combined sewer system with a total of 21 CSO points. In the event of a heavy storm, wastewater travels untreated into the adjacent water bodies. By evaluating feasibility for green infrastructure, Jersey City can identify cost effective ways to help mitigate water quality and local flooding issues.

WHAT IS STORMWATER?

When rainfall hits the ground, it can soak into the ground or flow across the surface. When rainfall flows across a surface, it is called "stormwater" runoff. Pervious surfaces allow stormwater to readily soak into the soil and recharge groundwater. An impervious surface can be any material that has been placed over soil that prevents water from soaking into the ground. Impervious surfaces include paved roadways, parking lots, sidewalks, and rooftops. As impervious areas increase, so does the amount of stormwater runoff. New Jersey has many problems due to stormwater runoff from impervious surfaces, including:

- POLLUTION: According to the 2010 New Jersey Water Quality Assessment Report, 90% of the assessed waters in New Jersey are impaired. Urban-related stormwater runoff is listed as the most probable source of impairment (USEPA, 2013). As stormwater flows over the ground, it picks up pollutants, including animal waste, excess fertilizers, pesticides and other toxic substances. These pollutants are carried to waterways.
- FLOODING: Over the past decade, the state has seen an increase in flooding. Communities around the state have been affected by these floods. The amount of damage caused also has increased greatly with this trend, costing billions of dollars over this time span.
- EROSION: Increased stormwater runoff causes an increase in stream velocity. The increased velocity after storm events erodes stream banks and shorelines, degrading water quality. This erosion can damage local roads and bridges and cause harm to wildlife.

A local reservoir


Purple Coneflower


Pervious Pavers

To protect and repair our waterways, reduce flooding, and stop erosion, stormwater runoff has to be better managed. Impervious surfaces need to be disconnected with green infrastructure to prevent stormwater runoff from flowing directly into New Jersey's waterways. Disconnection redirects runoff from paving and rooftops to pervious areas in the landscape.

A community garden that harvests and recycles rainwater

Rain barrel workshop participants

A rain garden after planting

WHAT IS GREEN INFRASTRUCTURE?

Green infrastructure is an approach to stormwater management that is cost-effective, sustainable, and environmentally friendly. Green infrastructure projects capture, filter, absorb, and reuse stormwater to maintain or mimic natural systems and to treat runoff as a resource. As a general principle, green infrastructure practices use soil and vegetation to recycle stormwater runoff through infiltration and evapotranspiration. When used as components of a stormwater management system, green infrastructure practices such as bioretention, green roofs, porous pavement, rain gardens, and vegetated swales can produce a variety of environmental benefits. In addition to effectively retaining and infiltrating rainfall, these technologies can simultaneously help filter air pollutants, reduce energy demands, mitigate urban heat islands, and sequester carbon while also providing communities with aesthetic and natural resource benefits (USEPA, 2013).

GLOSSARY OF GREEN INFRASTRUCTURE TERMINOLOGY

A — ***DISCONNECTED:*** Disconnected refers to channeling water from gutters and pipes that collect runoff to somewhere other than a sewer drain where it can be filtered.

B — ***DEPAVING:*** Depaving is the process of removing hardscape such as asphalt or concrete.

C — ***INFILTRATION:*** Infiltration occurs when water on the ground's surface is absorbed into the soil below. Plants promote infiltration.

D — ***IMPERVIOUS SURFACE:*** An impervious surface is one that water cannot penetrate.

E — ***RUNOFF:*** Runoff is water from precipitation that flows across land and paved surfaces before entering local waterways or sewer systems.

A

B

C

D

E

GREEN INFRASTRUCTURE STRATEGIES

SITE

- Green Roofs
- Rainwater Harvesting
- Planter Boxes
- Downspout Disconnection
- Permeable Pavements
- Vegetated Swales
- Natural Retention Basins
- Rain Gardens

NEIGHBORHOOD

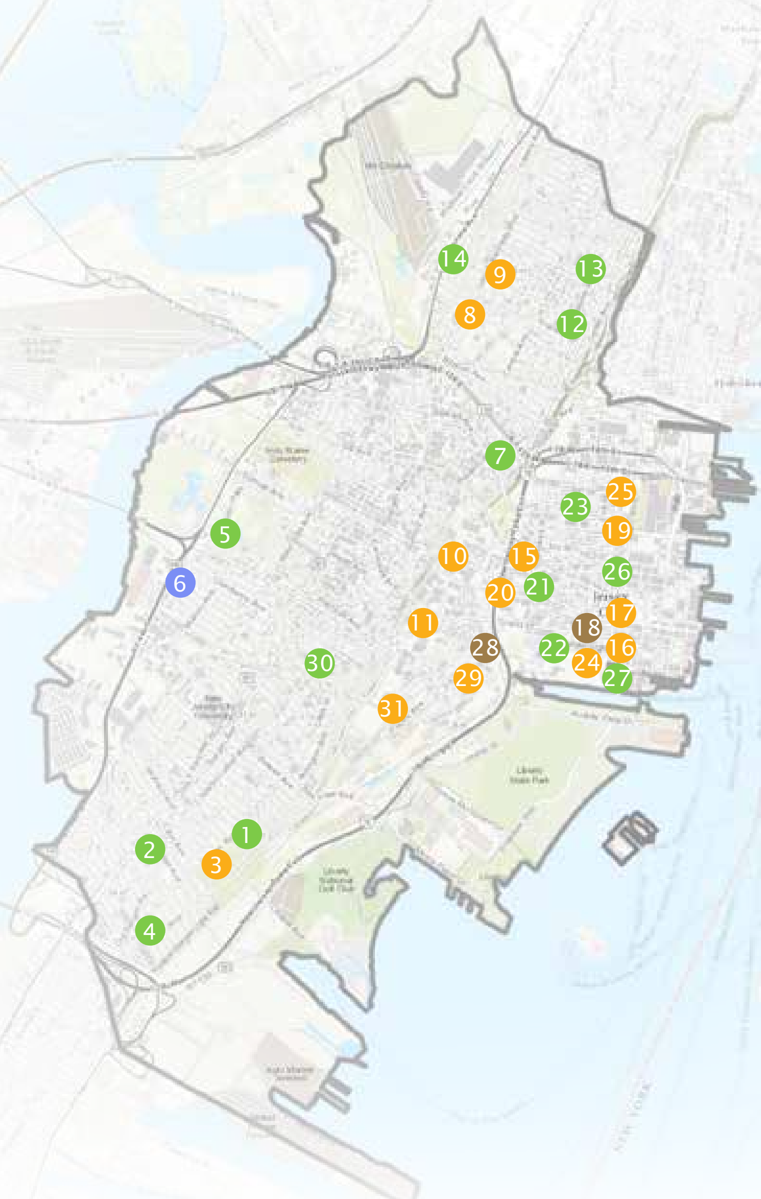
- Green Parking
- Pocket Wetlands
- Brownfield Redevelopment
- Trees and Urban Forestry
- Green Streets and Highways
- Infill and Redevelopment

WATERSHED

- Riparian Buffers
- Habitat Preservation and Restoration

POTENTIAL PROJECT SITES WITHIN STUDY AREA

1 BAYSIDE PARK
2 COLUMBIA PARK
3 JERSEY CITY COMMUNITY CHARTER SCHOOL
4 GARFIELD-MERRITT COMMUNITY GARDEN
5 HUDSON COUNTY LINCOLN PARK MAINTENANCE BUILDING
6 JERSEY CITY MUNICIPAL UTILITIES AUTHORITY
7 OGDEN'S END COMMUNITY GARDEN
8 FRANKLIN WILLIAMS MIDDLE SCHOOL NO. 7
9 CONCORDIA/ST. JOSEPH'S SCHOOL FOR THE BLIND
10 WILLIAM DICKINSON HIGH SCHOOL
11 HUDSON COUNTY SCHOOL OF TECHNOLOGY
12 RIVERVIEW COMMUNITY GARDEN
13 RIVERVIEW PARK
14 CARLTON AVENUE STREETSCAPE
15 THE BRUNSWICK SCHOOL
16 CORNELIA BRADFORD SCHOOL NO. 16
17 ST JOSEPH'S HOME/YORK STREET PROJECT
18 OUR LADY OF CZESTOCHOWA CHURCH
19 ST. ANTHONY HIGH SCHOOL
20 DR. MICHAEL CONTI SCHOOL NO. 5
21 BRUNSWICK STREET COMMUNITY GARDEN
22 BRIGHT STREET COMMUNITY GARDEN
23 HAMILTON PARK
24 ST. PETERS PREPARATORY SCHOOL
25 M.E.T.S. CHARTER SCHOOL
26 MANILA AVENUE STREETSCAPE
27 SUSSEX STREETSCAPE
28 ST. BRIDGET'S CHURCH
29 JAMES FERRIS HIGH SCHOOL
30 ARLINGTON PARK
31 NEW JERSEY REGIONAL DAY SCHOOL



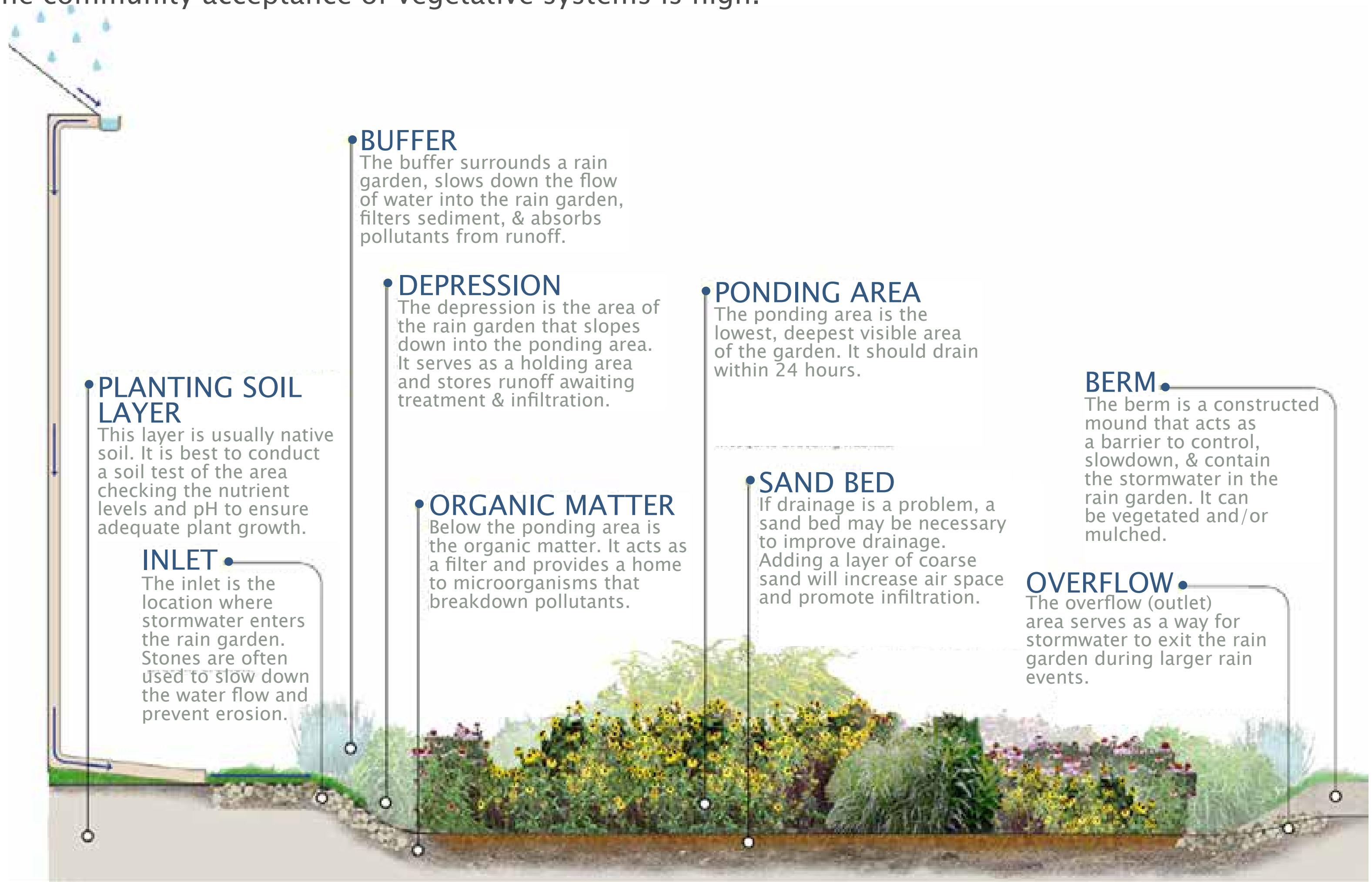
SITE KEY
School
Municipal
Public Space
Other


STATE OF
NEW JERSEY
DEPARTMENT OF
ENVIRONMENTAL
PROTECTION

GREEN INFRASTRUCTURE SYSTEMS

VEGETATED SYSTEMS

Vegetative systems primarily focus on reducing water quality impacts and less on reducing flooding. These systems are typically located close to the sources of runoff and can manage the smaller storms of several inches. The main treatment mechanisms are infiltration, filtration, and evapotranspiration. These systems do an excellent job at removing total suspended solids, nutrients and pathogens. Construction costs for vegetated systems are typically low to moderate when compared to other green infrastructure practices. Since these systems often can be incorporated into existing landscapes and enhance aesthetics, the community acceptance of vegetative systems is high.



RAIN GARDEN DIAGRAM

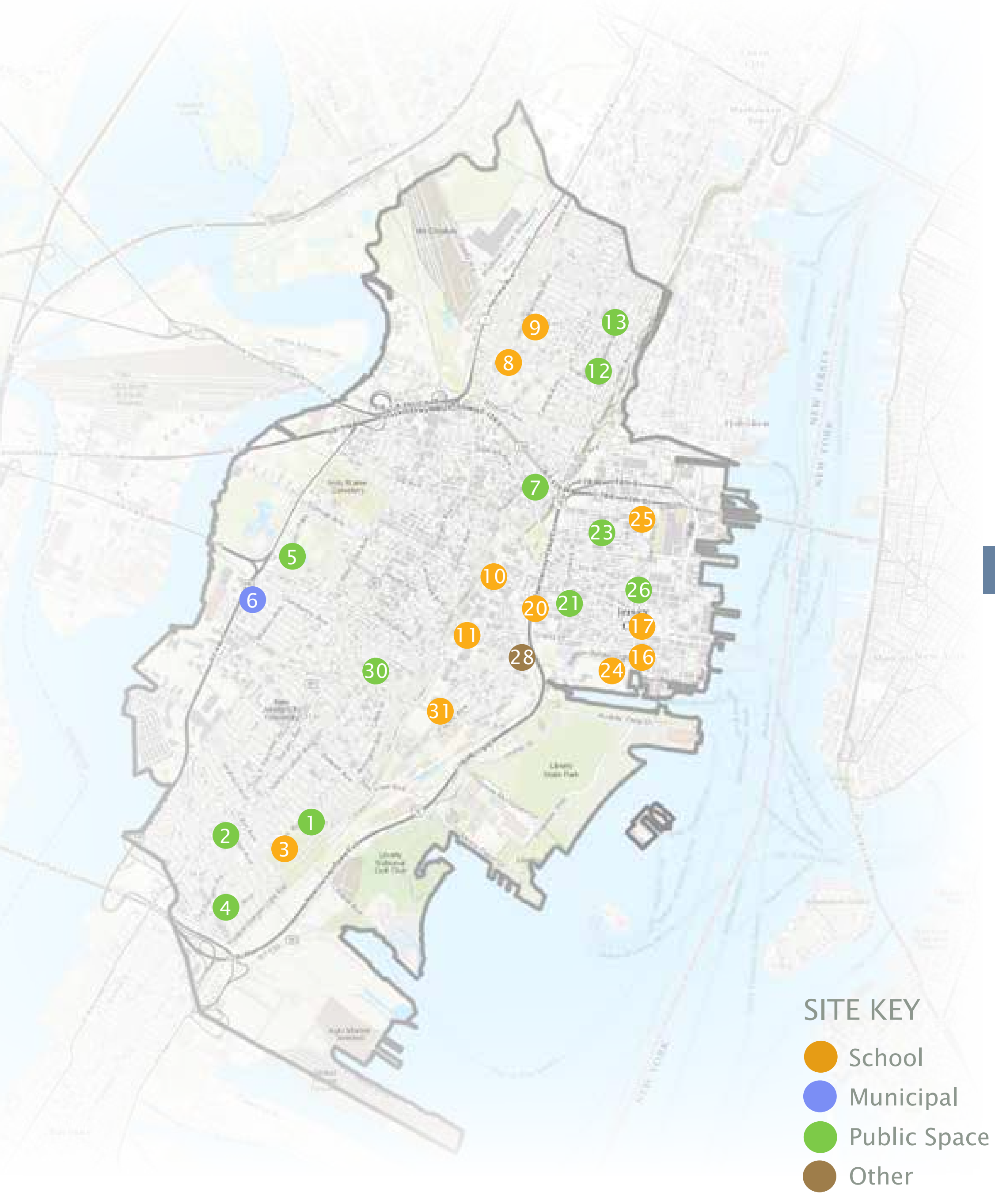
VEGETATED SYSTEM SUITABILITY

Rain gardens are shallow landscaped depressions designed to capture, treat, and infiltrate stormwater runoff. Rain gardens can be readily installed throughout a community to begin re-establishing the natural processes of the landscape. Rain gardens:

- Capture stormwater runoff, reducing soil erosion and sedimentation and the amount of water that flows to our streams and waterways during rain storms
- Protect water quality by filtering out and breaking down pollutants
- Infiltrate runoff and recharge groundwater supplies by providing base flow to nearby streams and waterways
- Enhance and increase green space and vegetated cover

Rain gardens are a simple way communities can begin to reduce stormwater runoff, manage flows to sewer systems, and protect water resources. Rain gardens can be placed in strategic locations to capture runoff from rooftops and paved areas, including:

- Homes
- Schools
- Churches
- Parking areas
- Community gardens



VEGETATED SYSTEM SUITABILITY: EXAMPLE PROJECT SITE

Several sidewalk paths in Riverview Park have depressed curb cuts adjacent to open lawn areas.

VEGETATED SYSTEM SUITABILITY: EXAMPLE PROJECT SITE

Rain gardens can be located adjacent to existing depressed curbing to capture stormwater runoff throughout the park.

RAINWATER HARVESTING SYSTEMS

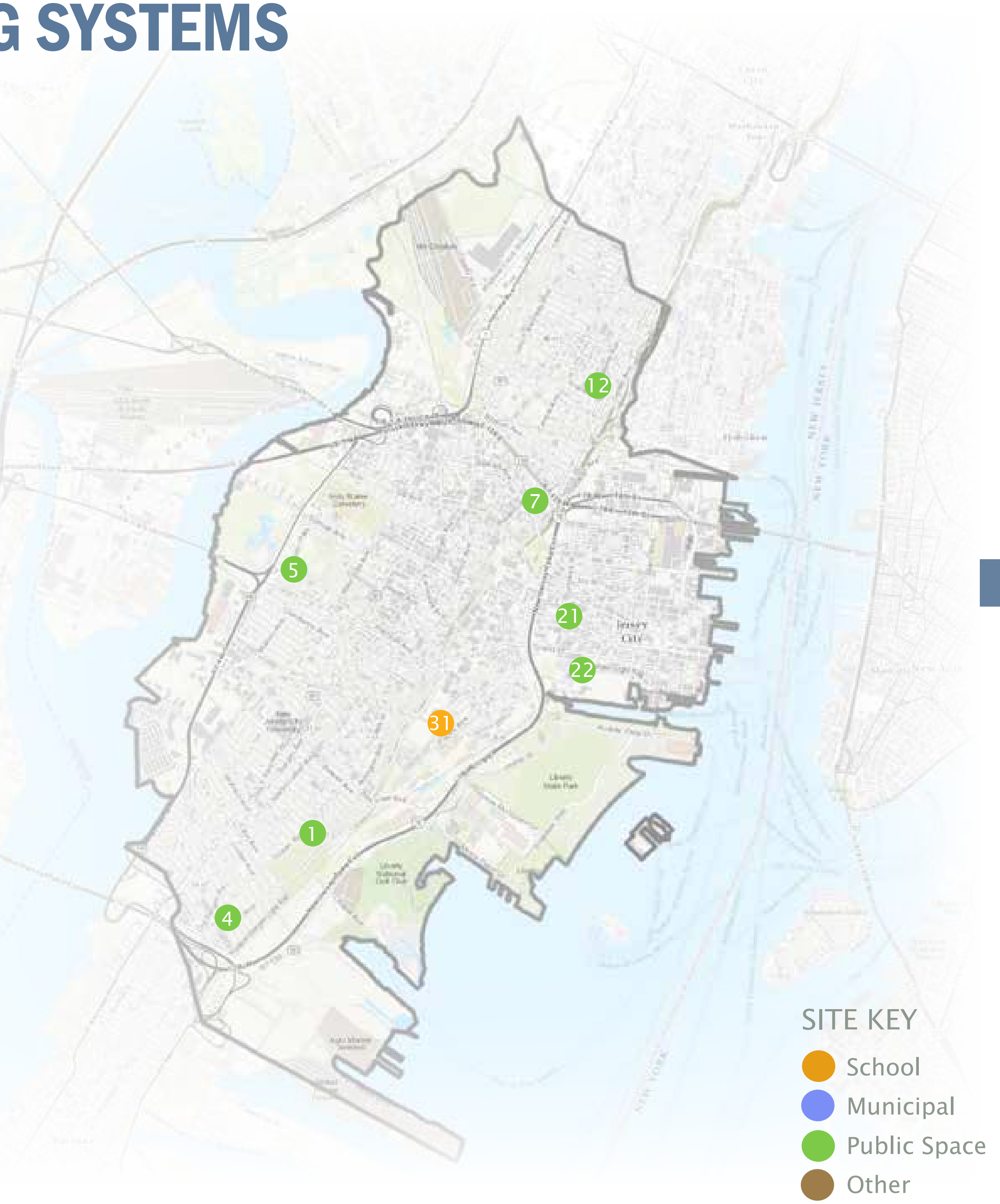
Rainwater harvesting systems focus on the conservation, capture, storage and reuse of rainwater. These systems are located close to residential and commercial buildings. Construction costs are low to moderate, depending on the size of the system, compared to other green infrastructure practices. Since these systems can be easily incorporated into the built landscape, the community acceptance of rainwater harvesting systems is moderate to high. Rainwater harvesting systems include rain barrels and cisterns.

RAIN BARREL DIAGRAM

RAINWATER HARVESTING SYSTEMS SUITABILITY

Typical rainwater harvesting systems can store up to 5,000 gallons of water. Harvesting during the rainy months of spring and summer provides a source of water during hot and dry periods between rain storms. Instead of using potable water, residents can save money using the rainwater stored in a rain barrel or cistern. This also reduces the demand on drinking water supplies and related infrastructure.

Rain barrels and cisterns are an effective rainwater harvesting tool and can be an important element in a community-wide green infrastructure program. For every inch of rain that falls on an eight hundred square foot roof (20' x 40'), nearly 500 gallons of water can be collected. Over an entire year, water draining from this rooftop will total over 20,000 gallons. This sustainable practice reduces the impact a building has on the environment by harvesting stormwater runoff from rooftops and decreasing flow to sewer systems. Rain barrels and cisterns provide an alternative source of water for gardens, lawns, and landscaping by reducing the use of potable water supplies.



RAINWATER HARVESTING SYSTEM SUITABILITY: EXAMPLE PROJECT SITE

Roof runoff is internally piped into the ground where it connects to the sewer system.

RAINWATER HARVESTING SYSTEM SUITABILITY: EXAMPLE PROJECT SITE

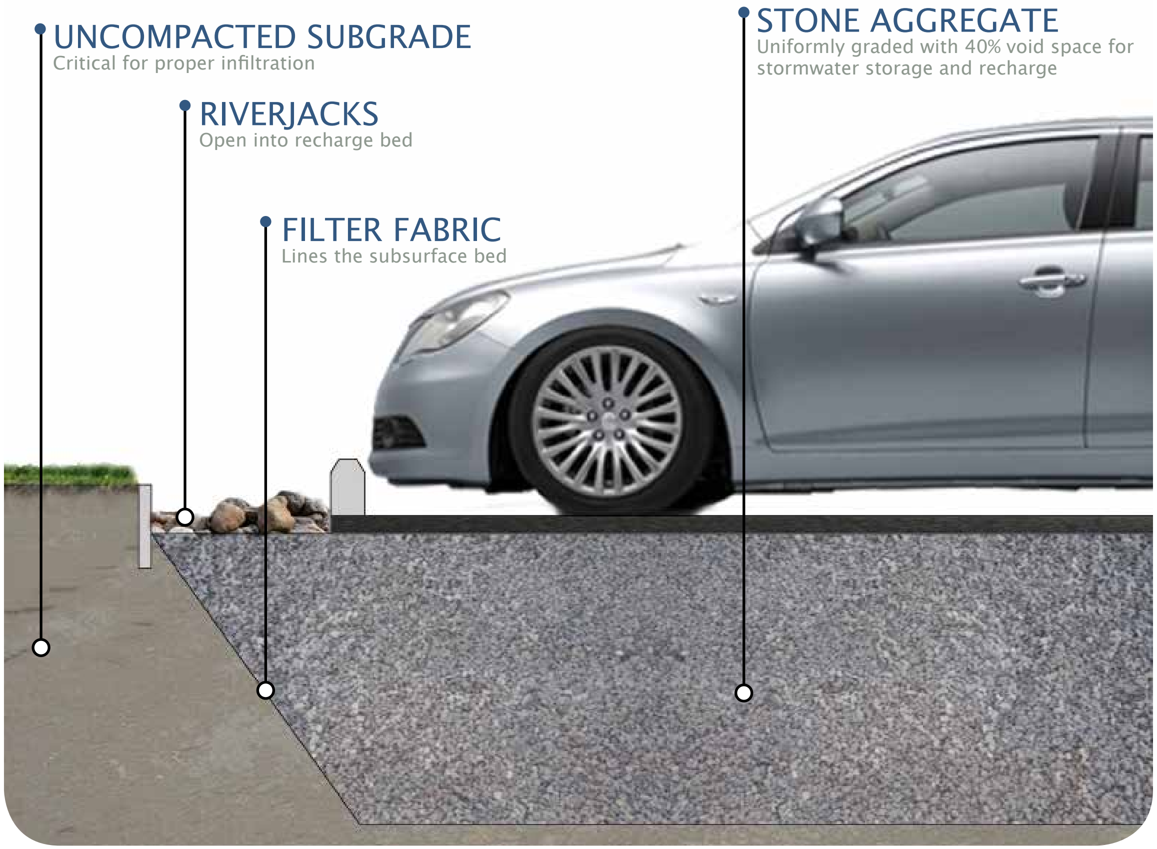
Downspouts can be disconnected, and rainwater could be harvested in a cistern and used to provide water for the community garden.

STORAGE, QUANTITY, & INFILTRATION SYSTEMS

Storage, quantity, and infiltration systems primarily focus on storage. These systems are typically located close to runoff sources within residential, commercial, and industrial landscapes. The main treatment mechanism is reducing peak flows of stormwater by storing it before it becomes runoff. Construction costs for storage, quantity, and infiltration are moderate to high when compared to other green infrastructure practices because they require more space and infrastructure and are more laborious to install. Since these systems can be seamlessly incorporated into the built environment and can manage a large quantity of water, the community acceptance of storage, quantity, and infiltration systems is high.

PERMEABLE PAVEMENT

- Underlying stone reservoir
- Porous asphalt and pervious concrete are manufactured without “fine” materials to allow infiltration
- Grass pavers are concrete interlocking blocks with open areas to allow grass to grow
- Ideal application for porous pavement is to treat a low traffic or overflow parking area



PERMEABLE PAVEMENT DIAGRAM

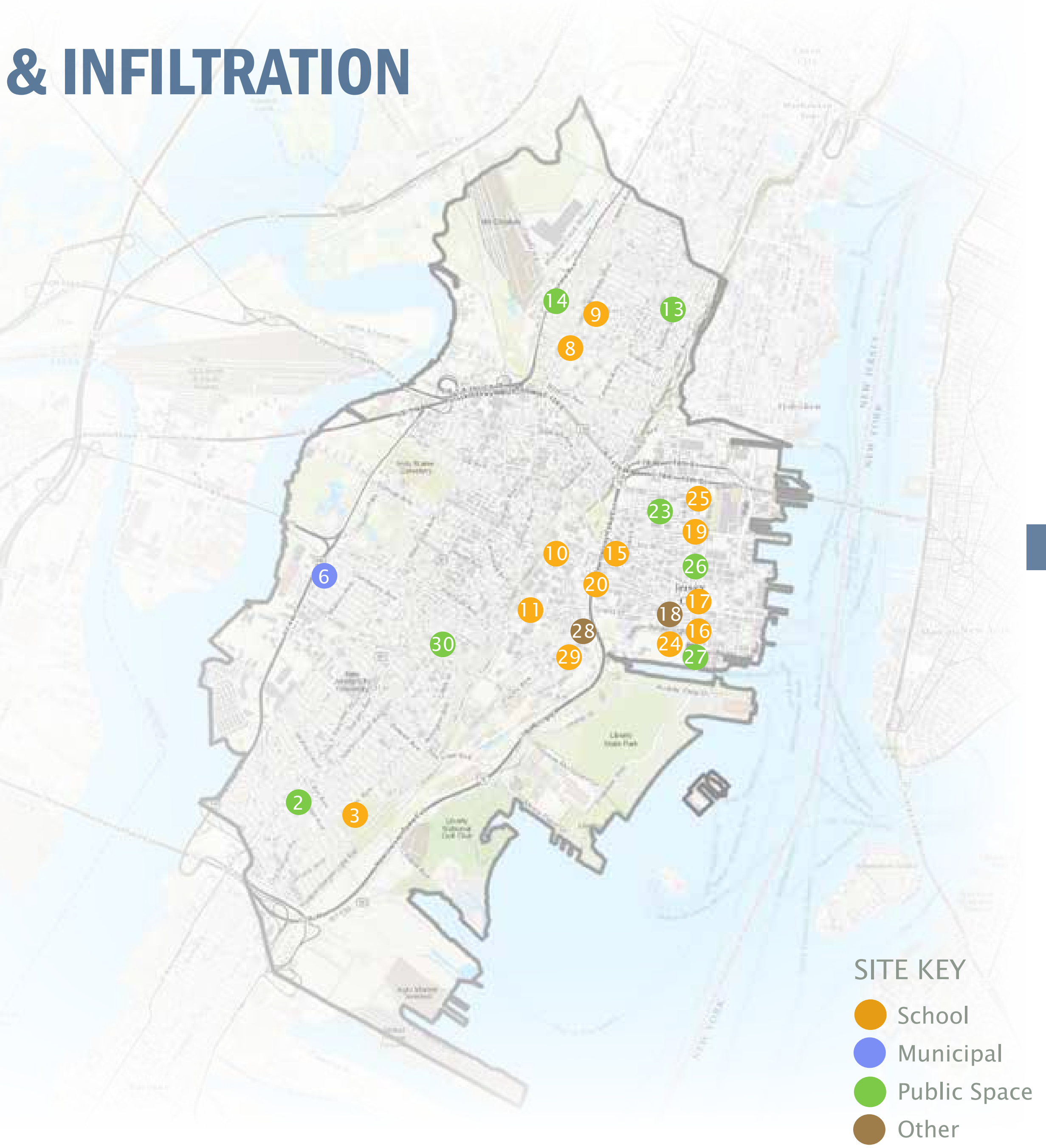
STORAGE, QUANTITY, & INFILTRATION SYSTEM SUITABILITY

Pervious paving systems are paved areas that produce less stormwater runoff than areas paved with conventional paving. These systems include:

- Permeable pavers
- Porous asphalt
- Pervious concrete

The paving material is placed over a bed of uniformly graded stone. The paving materials allow water to pass through and then infiltrate into the pore spaces of the underlying stone bed. The stored runoff then infiltrates over time into the uncompacted subgrade soils.

Stormwater planters are small, contained vegetated systems that collect and treat stormwater using a prepared soil media and mulch. These systems serve as small bioretention facilities filtering stormwater through layers of mulch, soil, and plant root systems. Treated stormwater can then be infiltrated into existing surrounding soils as groundwater (infiltration planter), or if infiltration is not appropriate, drainage pipes can discharge filtered stormwater into traditional storm sewer infrastructure (flow-through planter).



STORAGE, QUANTITY, & INFILTRATION SYSTEM SUITABILITY: EXAMPLE PROJECT SITE

Stormwater runoff from tennis courts and surrounding lawn areas have degraded the sidewalk over time.

STORAGE, QUANTITY, & INFILTRATION SYSTEM SUITABILITY: EXAMPLE PROJECT SITE

The addition of porous asphalt or pervious concrete paths would store and infiltrate stormwater runoff. Native plantings around lawn areas would prevent additional slope erosion.


TREE
PLANTING

COMMUNITY ENGAGEMENT & EDUCATION

BUILD A RAIN BARREL WORKSHOP

With the Build a Rain Barrel Workshop, community members participate in a short presentation on stormwater management and water conservation and then learn how to build their own rain barrel. Workshop participants work with trained experts to convert 55 gallon plastic food-grade drums into rain barrels. They are quickly able to take an active role in recycling rainwater by installing a rain barrel at their house! Harvesting rainwater has many benefits including saving water, saving money, and preventing basement flooding. By collecting rainwater, homeowners are helping to reduce flooding and pollution in local waterways. When rainwater flows across hard surfaces like rooftops, driveways, roadways, parking lots, and compacted lawns, it carries pollution to our local waterways. Harvesting the rainwater in a rain barrel is just one of the ways homeowners can reduce the amount of rainwater draining from their property and help reduce neighborhood flooding problems.

STORMWATER MANAGEMENT IN YOUR SCHOOLYARD

The *Stormwater Management in Your Schoolyard* program provides educational lectures, hands-on activities, and community-level outreach for students on the topics of water quality issues and stormwater management practices such as rain gardens and rain barrels. Program objectives include the exploration of various aspects of the natural environment on school grounds, the detailed documentation of findings related to these explorations, and the communication of these findings to the school community. As part of this program, several New Jersey State Core Curriculum Content Standards for science (5.1, 5.3, and 5.4), twenty-first century life and careers (9.1, 9.3, and 9.4), and social studies (6.3) are addressed. Every school is unique in its need for stormwater management, so each school's *Stormwater Management in Your Schoolyard* program can be delivered in a variety of ways. This program can be tailored for grades K-8 or 9-12 and can be offered to meet a variety of schedules.

MAINTENANCE PROCEDURES

MAINTAINING JERSEY CITY'S GREEN INFRASTRUCTURE SYSTEMS

1. VEGETATED SYSTEMS
    - Rain Garden
    - Stormwater Planter
    - Bioswale

2. RAINWATER HARVESTING
    - Rain Barrel
    - Cistern

3. STORAGE, QUANTITY, AND INFILTRATION
    - Porous Asphalt & Concrete
    - Underground Detention

VEGETATED SYSTEM MAINTENANCE

RAIN GARDEN:

Weekly

- Water
- Weed
- Inspect for invasive plants, plant health, excessive sediment, and movement of sediment within the rain garden
- Observe the rain garden during rain events and note any successes (Example of success: stormwater runoff picks up oil and grease from the parking lot, flows through a curb cut, and into a rain garden; the rain garden traps the nonpoint source pollutants before they reach the nearby waterway)

Annually

- Mulch in the spring to retain a 3-inch mulch layer in the garden
- Prune during dormant season to improve plant health
- Remove sediment
- Plant
- Test the soil (every 3 years)
- Harvest plants to use in other parts of the landscape
- Clean debris from gutters connected to rain garden
- Replace materials (such as river rock and landscape fabric) where needed

STORMWATER PLANTER

- Very similar maintenance regime to rain gardens

BIOSWALE

- Very similar maintenance regime to rain gardens

RAINWATER HARVESTING SYSTEM MAINTENANCE

RAIN BARREL:

- Keep screen on top and a garden hose attached to the overflow to prevent mosquitoes; change screen every two years
- Remove debris from screen after storms
- Disconnect the barrel in winter; store inside or outside with a cover
- Clean out with long brush and water/dilute bleach solution (~3%)

CISTERN:

- In the fall, prepare your cistern for the winter by diverting flow so that no water can enter and freeze within the tank
- Weekly check: Check for leaks, clogs, obstructions, holes, and vent openings where animals, insects, and rodents may enter; repair leaks with sealant; drain the first flush diverter/ roof washer after every rainfall event
- Monthly check: Check roof and roof catchments to make sure no debris is entering the gutter and downspout directed into the cistern; keep the roof, gutters, and leader inlets clear of leaves; inspect the first flush filter and all of its attachments, making any necessary replacements; inspect cistern cover, screen, overflow pipe, sediment trap, and other accessories while making any necessary replacements

STORAGE, QUANTITY, & INFILTRATION SYSTEM MAINTENANCE

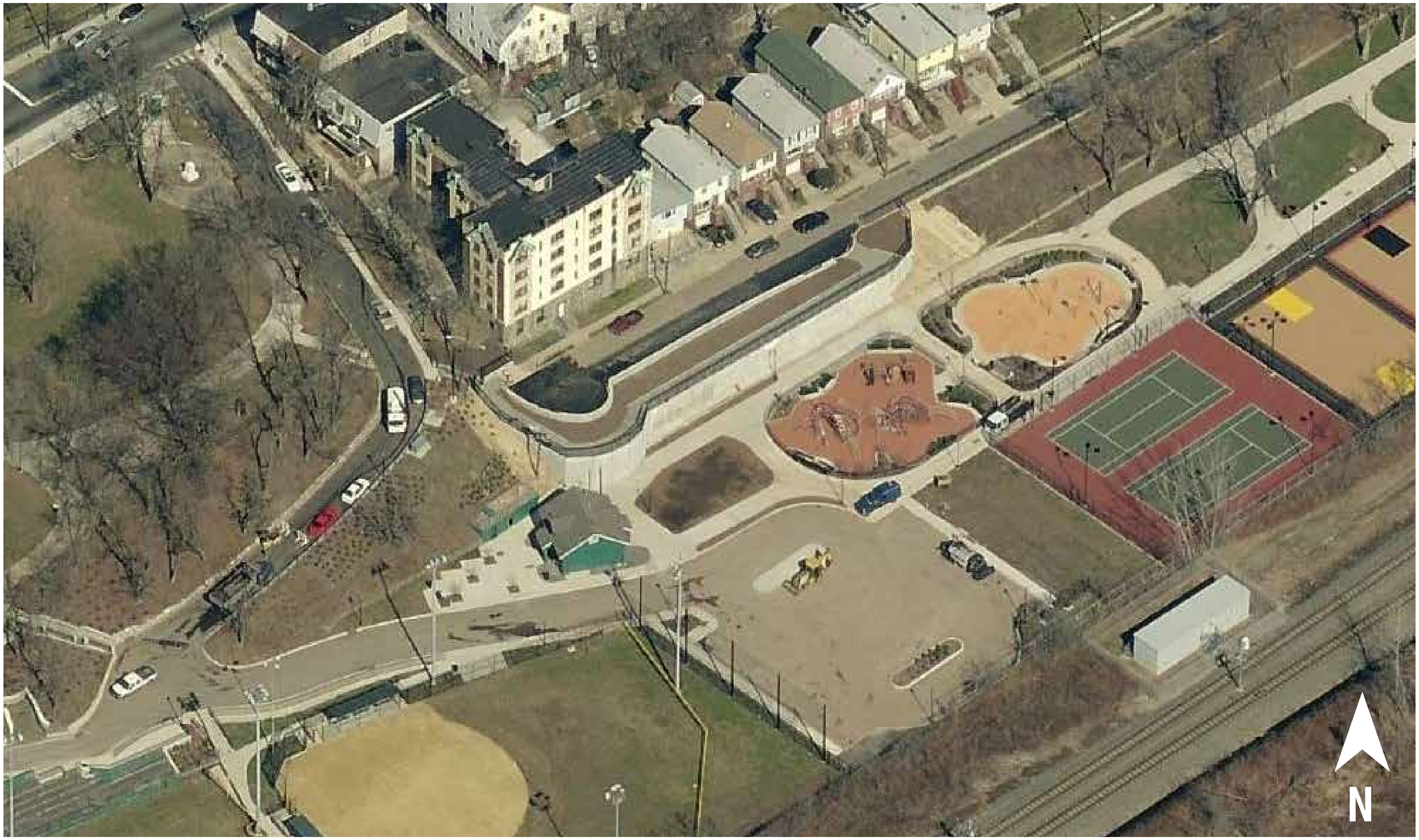
POROUS ASPHALT & CONCRETE:

- Materials cost is ~20-25% more than traditional asphalt or concrete
- Long-term maintenance is required by routine quarterly vacuum sweeping
- Sweeping cost may be off-set by reduced deicing costs
- Asphalt repairs can be made with standard asphalt not to exceed 10% of surface area
- Concrete repairs can be made with standard concrete not to exceed 10% of the surface area

UNDERGROUND DETENTION:

- Periodic inspections of the inlet and outlet areas to ensure correct operation of system
- Clean materials trapped on grates protecting catch basins and inlet area monthly
- Primary maintenance concerns are removal of floatables that become trapped and removal of accumulating sediments within the system; this should be done at least on an annual basis
- Proprietary traps and filters associated with stormwater storage units should be maintained as recommended by the manufacturer
- Any structural repairs required to inlet and outlet areas should be addressed in a timely manner on an as needed basis
- Local authorities may require annual inspection or require that they carry out inspections and maintenance

POTENTIAL PROJECT SITES



BAYSIDE PARK

1 Bayside Park Drive
Jersey City, NJ 07305, Ward A



Bayside Park is a recently constructed large city park with recreational facilities and open lawn space. Several parking and sidewalk areas could be retrofitted with stormwater planters or permeable pavement to manage stormwater. A storage building on site can harvest stormwater for maintainance or watering from the rooftop in a cistern. Steeply sloped sidewalk and lawn areas can be retrofitted with rain gardens or bioswales to intercept run off and prevent erosion and sedimentation.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [x] rain gardens
- [ ] rain barrels
- [x] pervious pavement
- [x] tree pits
- [ ] buffers
- [x] bioswales
- [x] stormwater planters
- [x] cisterns
- [ ] depaving

BAYSIDE PARK

1 Bayside Park Drive
Jersey City, NJ 07305, Ward A

COLUMBIA PARK

145 Old Bergen Road
Jersey City, NJ 07305, Ward A



Columbia Park is a block-long city park with ample open lawn and sections of degraded sidewalk. Stormwater runoff from the nearby streets could be managed by the installation of tree pits and stormwater planters in the perimeter sidewalk. Demonstration rain gardens, buffers, or bioswales could manage runoff on site.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [x] rain gardens
- [ ] rain barrels
- [ ] pervious pavement
- [x] tree pits
- [x] buffers
- [x] bioswales
- [x] stormwater planters
- [ ] cisterns
- [ ] depaving

COLUMBIA PARK

145 Old Bergen Road
Jersey City, NJ 07305, Ward A


N

The Jersey City Community Charter School, at the corner of Danforth and Ocean Avenues, has a sidewalk and parking lot in fair condition. Stormwater runoff could be managed on site through permeable pavements, tree pits, and stormwater planters around the perimeter.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [ ] rain gardens
- [x] tree pits
- [x] stormwater planters
- [ ] rain barrels
- [ ] buffers
- [ ] cisterns
- [x] pervious pavement
- [ ] bioswales
- [ ] depaving

JERSEY CITY COMMUNITY CHARTER SCHOOL

128 Danforth Avenue
Jersey City, NJ 07305, Ward A


N

Garfield-Merritt Community Garden is part of the Jersey City "Adopt-a-Lot" Program. Rainwater harvesting systems (cistern) connected to the downspouts of the northern adjacent buildings could be used to provide water to the garden. A stormwater planter and curb cuts along Merritt Street could intercept stormwater roadway runoff and the garden/sidewalk. A rain garden situated at the base of the slope near the northeastern side of the lot could intercept slope runoff and stormwater from the adjacent downspouts.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [x] rain gardens
- [ ] tree pits
- [x] stormwater planters
- [x] rain barrels
- [ ] buffers
- [x] cisterns
- [ ] pervious pavement
- [ ] bioswales
- [ ] depaving

GARFIELD-MERRITT COMMUNITY GARDEN

81 Garfield Avenue
Jersey City, NJ 07305, Ward A

1 Lincoln Park
Jersey City, NJ 07306, Ward B



The site includes several Hudson County maintenance buildings located in the 273 acre Lincoln Park. Downspouts around the building perimeter could be disconnected into demonstration rain gardens in surrounding lawn areas. Downspouts can also be disconnected to harvest rainwater in a cistern or rain barrel. The harvested water can be used to wash county vehicles or irrigate landscaping.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [x] rain gardens
- [ ] tree pits
- [ ] stormwater planters
- [x] rain barrels
- [ ] buffers
- [x] cisterns
- [ ] pervious pavement
- [ ] bioswales
- [ ] depaving

JERSEY CITY MUNICIPAL UTILITIES AUTORITY

555 Route 440
Jersey City, NJ 07304, Ward B



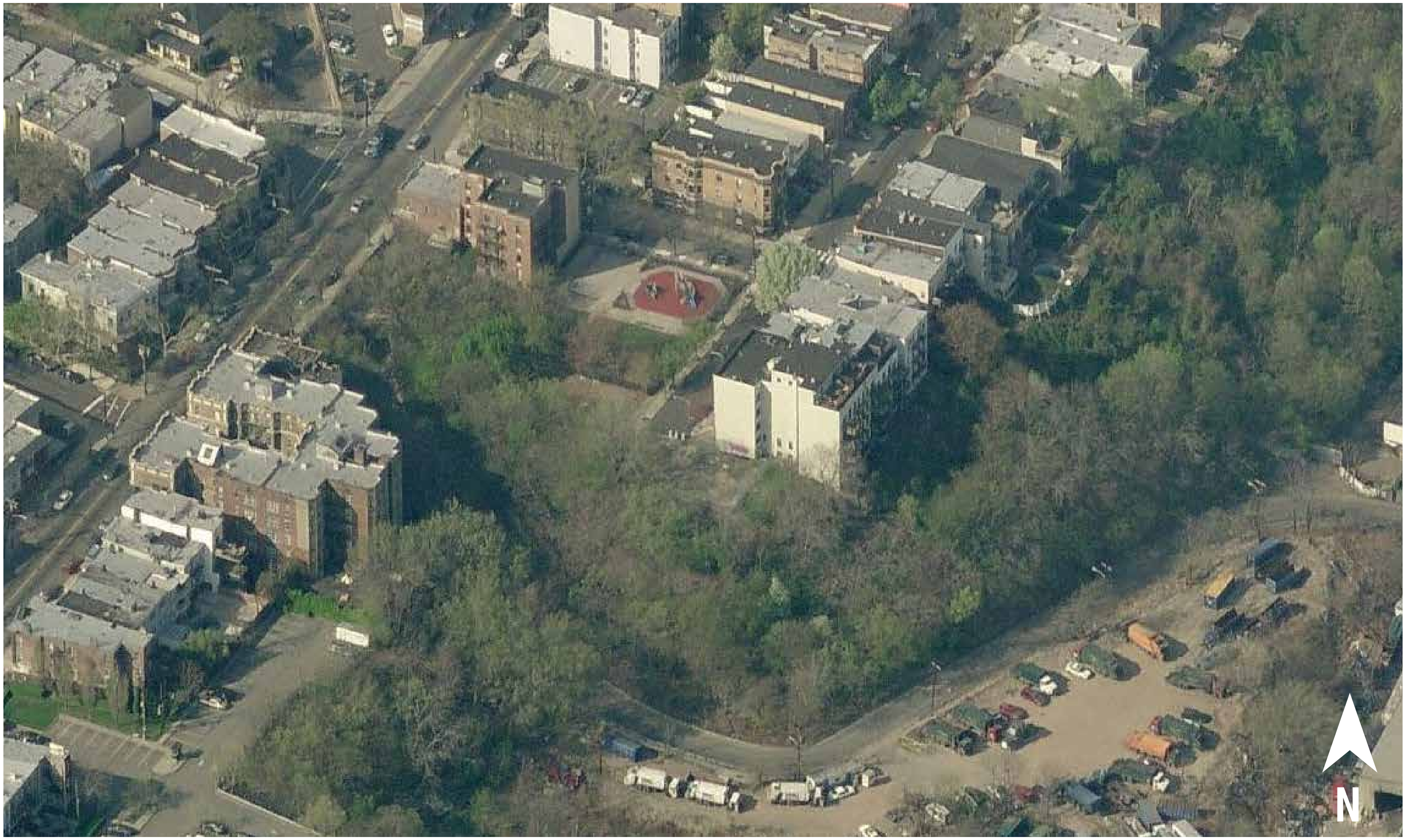
The Jersey City Municipal Utilities Authority facility is adjacent to the Hackensack River and State Highway 440. Parking for visitors is on the east side of the complex and is surrounded by turf grass lawn, which both show evidence of poor drainage. Runoff from the parking areas and lawn can be captured by permeable pavement or bioswales, and presented as a demonstration rain garden project.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [x] rain gardens
- [ ] rain barrels
- [x] pervious pavement
- [ ] tree pits
- [ ] buffers
- [x] bioswales
- [ ] stormwater planters
- [ ] cisterns
- [ ] depaving

JERSEY CITY MUNICIPAL UTILITIES AUTORITY

555 Route 440
Jersey City, NJ 07304, Ward B



OGDEN'S END COMMUNITY GARDEN

102 Ogden Avenue
Jersey City, NJ 07307, Ward C



Ogden's End Community Garden is located at the terminus of Ogden Avenue and receives stormwater runoff from the street. A combination of tree pits and rain gardens can manage excess stormwater on site. Rain water can be harvested in cisterns or rain barrels from the rooftop of an adjacent building through downspouts.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [x] rain gardens
- [x] tree pits
- [ ] stormwater planters
- [x] rain barrels
- [ ] buffers
- [x] cisterns
- [ ] pervious pavement
- [ ] bioswales
- [ ] depaving

OGDEN'S END COMMUNITY GARDEN

102 Ogden Avenue
Jersey City, NJ 07307, Ward C

FRANKLIN WILLIAMS MIDDLE SCHOOL NO. 7

212 Laidlaw Avenue
Jersey City, NJ 07307, Ward C

Franklin Williams School is a public school building with a pickup/drop-off zone along Laidlaw Avenue. Runoff along this street flows to the east towards Summit Avenue. The concrete and asphalt sidewalks and island can be retrofitted to intercept runoff through rain gardens, permeable pavement, tree pits, and stormwater planters.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [x] rain gardens
- [ ] rain barrels
- [x] pervious pavement
- [x] tree pits
- [ ] buffers
- [ ] bioswales
- [x] stormwater planters
- [ ] cisterns
- [ ] depaving

FRANKLIN WILLIAMS MIDDLE SCHOOL NO. 7

212 Laidlaw Avenue
Jersey City, NJ 07307, Ward C

CONCORDIA/ST. JOSEPH'S SCHOOL FOR THE BLIND

761 Summit Avenue
Jersey City, NJ 07307, Ward C

Concordia Learning Center/St. Joseph's School for the Blind has downspouts that discharge onto the adjacent lawn and Summit Avenue. These downspouts can be rerouted and diverted into a rain garden located in the lawn. Parking spaces and islands can manage stormwater through permeable pavement and rain gardens.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [x] rain gardens
- [ ] tree pits
- [ ] stormwater planters
- [ ] rain barrels
- [ ] buffers
- [ ] cisterns
- [x] pervious pavement
- [ ] bioswales
- [ ] depaving

WILLIAM DICKINSON HIGH SCHOOL

2 Palisade Avenue
Jersey City, NJ 07306, Ward C



William Dickinson High School grounds are situated on a terraced hill above the surrounding grade. Runoff from the terraces is discharged along Palisade Avenue. Rain gardens or bioswales in the terraces can intercept stormwater runoff. Parking areas can manage stormwater on site with the addition of permeable pavement.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [x] rain gardens
- [ ] rain barrels
- [x] pervious pavement
- [ ] tree pits
- [ ] buffers
- [x] bioswales
- [ ] stormwater planters
- [ ] cisterns
- [ ] depaving

WILLIAM DICKINSON HIGH SCHOOL

2 Palisade Avenue
Jersey City, NJ 07306, Ward C

HUDSON COUNTY SCHOOL OF TECHNOLOGY

525 Montgomery Street
Jersey City, NJ 07302, Ward C



The Hudson County School of Technology building has internally fed rooftop drainage and impervious parking surfaces. A single downspout adjacent to the entrance on Montgomery Street can be diverted into a rain garden. Parking surfaces and islands can be potential demonstration sites of permeable paving and bioswales.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [x] rain gardens
- [ ] tree pits
- [ ] stormwater planters
- [ ] rain barrels
- [ ] buffers
- [ ] cisterns
- [x] pervious pavement
- [x] bioswales
- [ ] depaving

RIVERVIEW COMMUNITY GARDEN

285 Ogden Avenue
Jersey City, NJ 07307, Ward D

Riverview Community Garden is adjacent to Riverview Park along Ogden Avenue. The garden could harvest water in cisterns or rain barrels for gardening purposes like irrigation or cleaning. Downspouts from neighboring rooftops could be disconnected from the storm sewer system and diverted into the cistern or rain barrel. A rain garden could capture the overflow stormwater from the harvesting system.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [x] rain gardens
- [x] rain barrels
- [ ] pervious pavement
- [ ] tree pits
- [ ] buffers
- [ ] bioswales
- [ ] stormwater planters
- [x] cisterns
- [ ] depaving

RIVERVIEW PARK

1 Bowers Street
Jersey City, NJ 07307, Ward D



Riverview Park is a two block-wide city park on Palisade Avenue that is host to a regular farmer's market and a permenant community garden, in addition to ample lawn space and tennis courts. Partially situated on a steep slope overlooking a rocky cliff, the park deals with issues of erosion and sedimentation. Stormwater runoff could be managed on site with the addition of rain gardens, tree pits, or stormwater planters adjacent to open lawn areas. A bioswale and permeable pavement would aid in managing runoff in the areas of steep slopes.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [x] rain gardens
- [x] tree pits
- [x] stormwater planters
- [ ] rain barrels
- [ ] buffers
- [ ] cisterns
- [x] pervious pavement
- [x] bioswales
- [ ] depaving

RIVERVIEW PARK

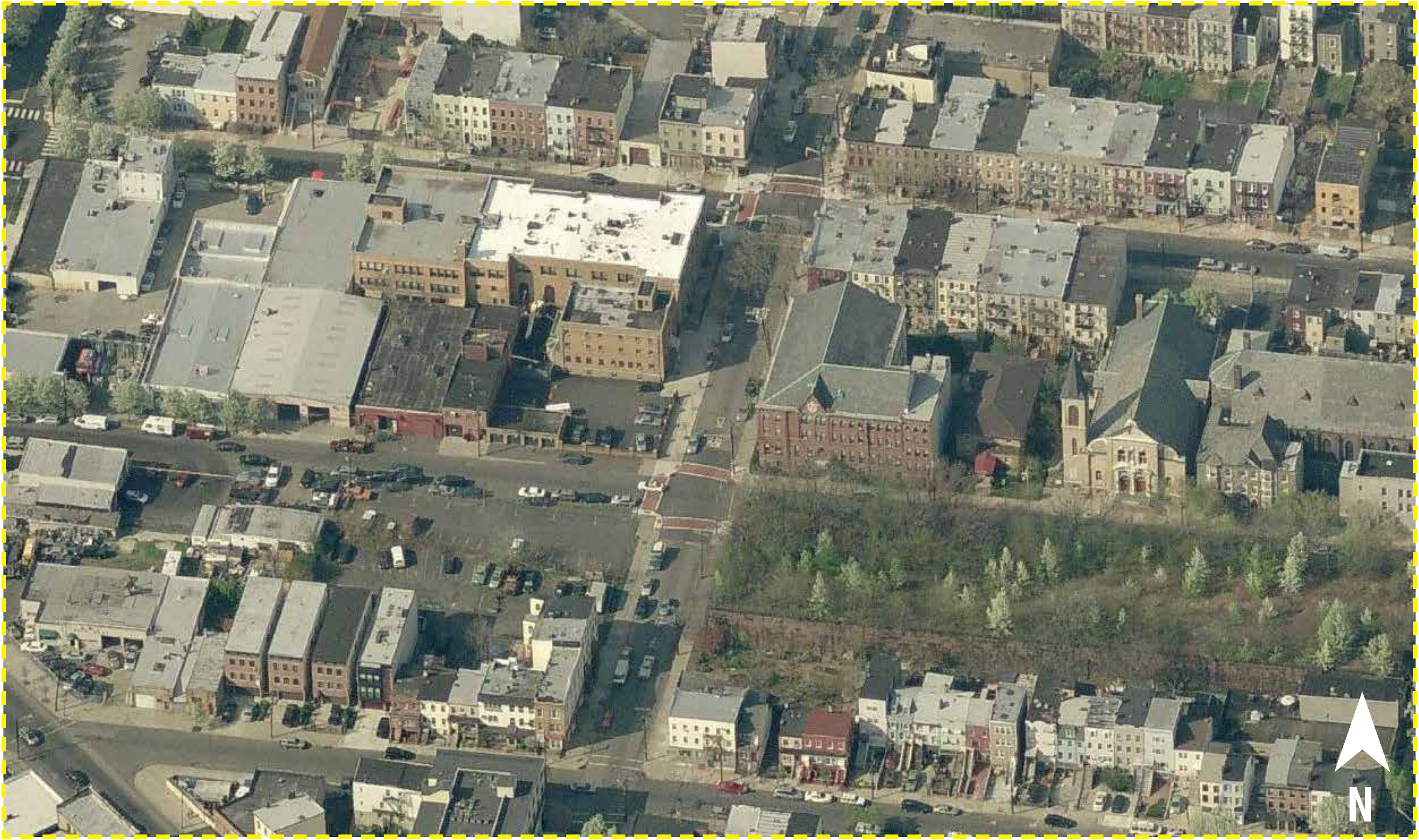
1 Bowers Street
Jersey City, NJ 07307, Ward D


N

Carlton Avenue is a steep sloped residential street with wide sidewalks and paved medians. Stormwater runoff can be intercepted with tree pits, stormwater planters, and permeable paving.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [ ] rain gardens
- [ ] rain barrels
- [x] pervious pavement
- [x] tree pits
- [ ] buffers
- [ ] bioswales
- [x] stormwater planters
- [ ] cisterns
- [ ] depaving



THE BRUNSWICK SCHOOL

189 Brunswick Street
Jersey City, NJ 07302, Ward E



The Brunswick School has an asphalt parking lot in fair condition and rooftop downspouts that currently are directed into the underground storm sewer. These downspouts can be disconnected and the parking area can be replaced with permeable pavement to reduce stormwater runoff.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [ ] rain gardens
- [ ] tree pits
- [ ] stormwater planters
- [ ] rain barrels
- [ ] buffers
- [ ] cisterns
- [x] pervious pavement
- [ ] bioswales
- [ ] depaving

THE BRUNSWICK SCHOOL

189 Brunswick Street
Jersey City, NJ 07302, Ward E

CORNELIA BRADFORD SCHOOL NO. 16

96 Sussex Street
Jersey City, NJ 07302, Ward E

The Bradford School building is adjacent to a paved asphalt schoolyard. There is evidence of poor stormwater drainage onsite and deteriorated sidewalks around the school. Permeable pavement can be used to intercept stormwater runoff. The adjacent city park and intersection can be redesigned with tree pits and stormwater planters at each of the sidewalk corners to intercept stormwater runoff and provide traffic calming.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [ ] rain gardens
- [x] tree pits
- [x] stormwater planters
- [ ] rain barrels
- [ ] buffers
- [ ] cisterns
- [x] pervious pavement
- [x] bioswales
- [ ] depaving

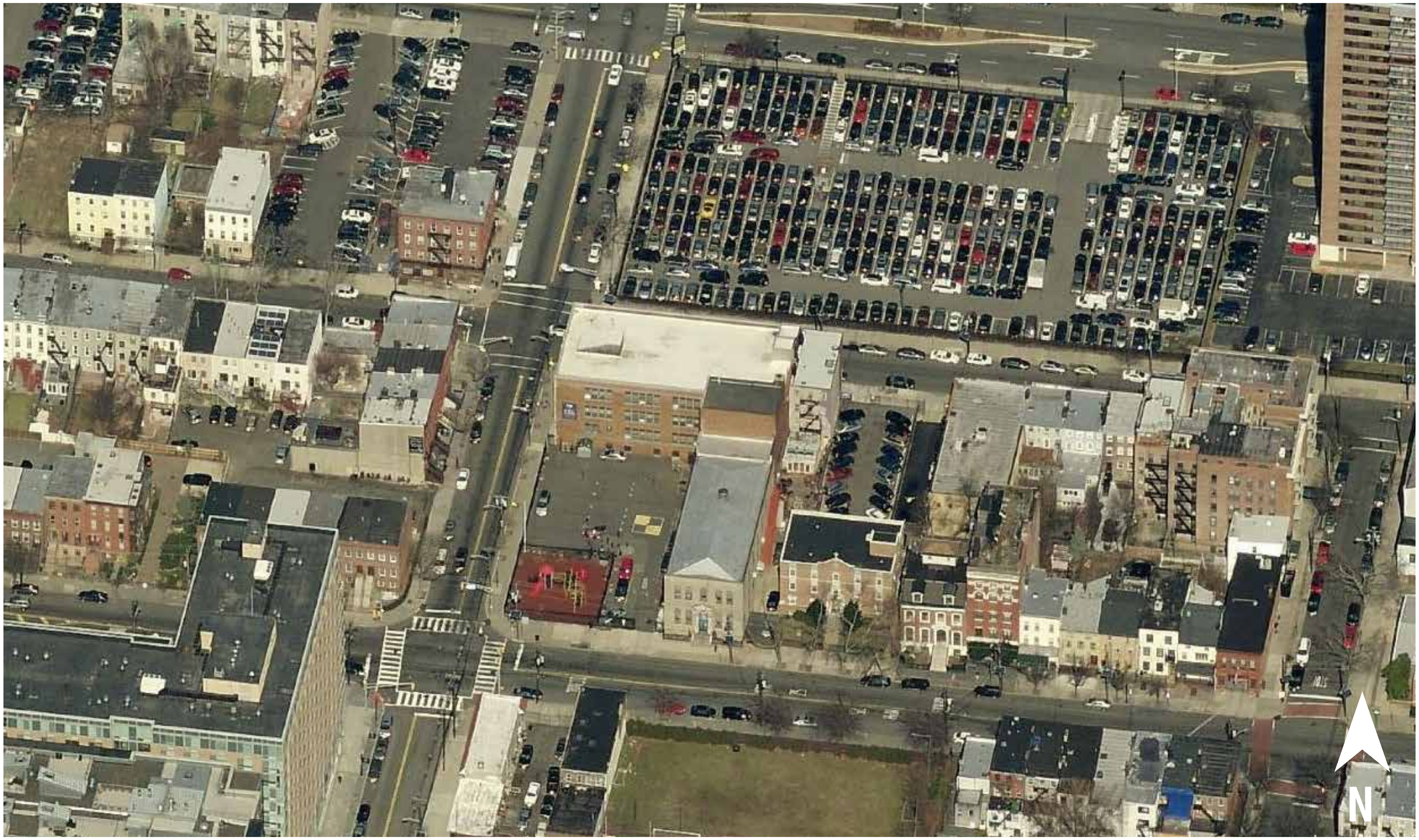

N

The St. Joseph's Home/York Street Project building is adjacent to a public park and busy intersection. Permeable pavement can be used to intercept stormwater runoff. The adjacent city park and intersection can be redesigned with tree pits and stormwater planters at each of the sidewalk corners to intercept stormwater runoff and provide traffic calming.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- ☐ rain gardens
- ☑ tree pits
- ☑ stormwater planters
- ☐ rain barrels
- ☐ buffers
- ☐ cisterns
- ☑ pervious pavement
- ☐ bioswales
- ☐ depaving



OUR LADY OF CZESTOCHOWA CHURCH

248 Marin Boulevard
Jersey City, NJ 07302, Ward E

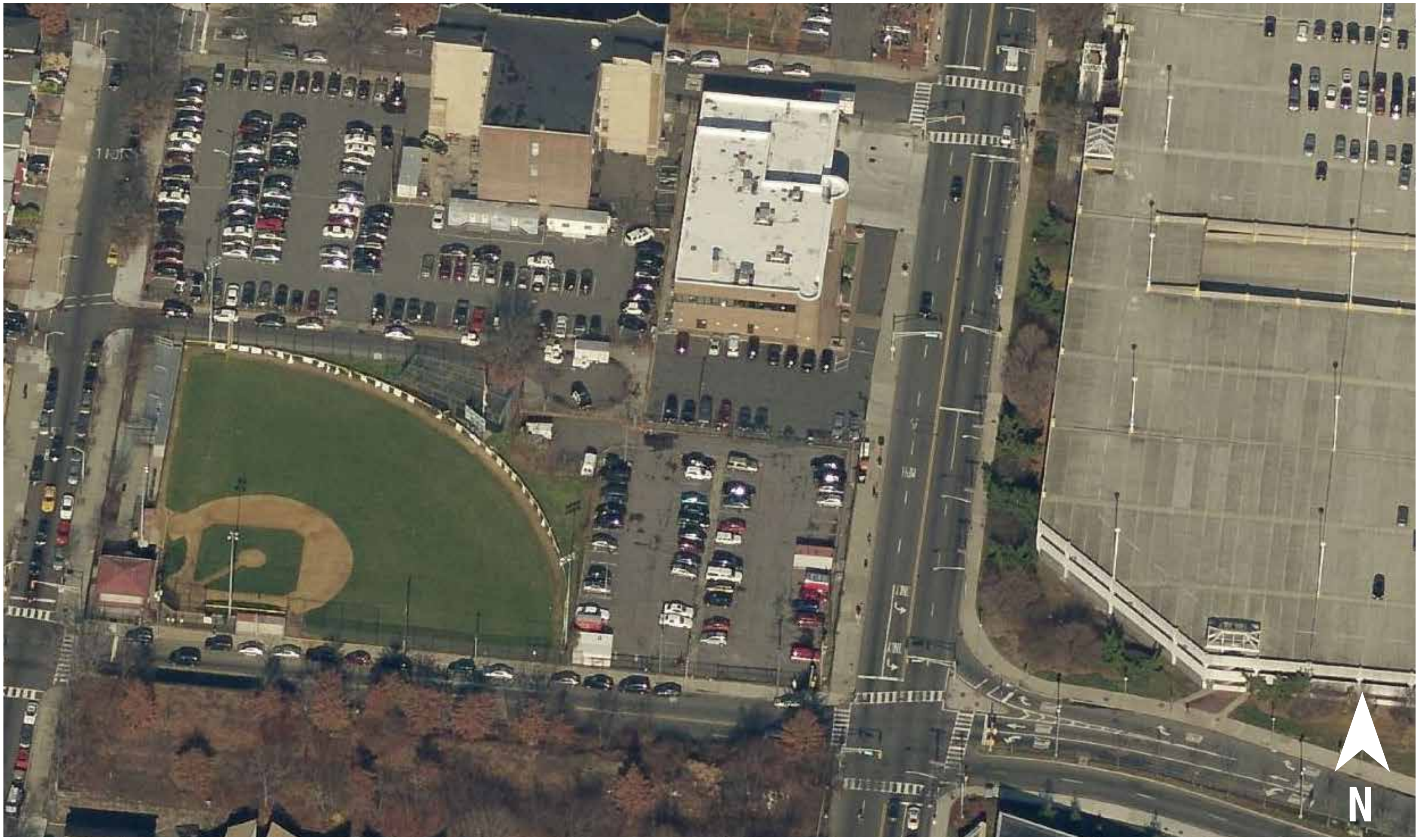
Our Lady of Czestochowa is a private school complex along Sussex Street. Stormwater runoff from the roof of one building discharges onto the driveway and sidewalk. This downspout can be diverted into a rain garden in the lawn area along Sussex Street.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [x] rain gardens
- [ ] rain barrels
- [ ] pervious pavement
- [ ] tree pits
- [ ] buffers
- [ ] bioswales
- [ ] stormwater planters
- [ ] cisterns
- [ ] depaving

OUR LADY OF CZESTOCHOWA CHURCH

248 Marin Boulevard
Jersey City, NJ 07302, Ward E



ST. ANTHONY HIGH SCHOOL

175 8th Street
Jersey City, NJ 07302, Ward E



St. Anthony High School has downspouts that discharge onto impermeable asphalt and concrete surfaces. These downspouts can be rerouted, and these surfaces can be replaced with permeable pavement.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [ ] rain gardens
- [ ] rain barrels
- [x] pervious pavement
- [ ] tree pits
- [ ] buffers
- [ ] bioswales
- [ ] stormwater planters
- [ ] cisterns
- [ ] depaving

175 8th Street
Jersey City, NJ 07302, Ward E

DR. MICHAEL CONTI SCHOOL NO. 5

182 Merseles Street
Jersey City, NJ 07302, Ward E



Public School No. 5 has internally-fed drainage that can be diverted into demonstration stormwater planters. Stormwater runoff from the street can be managed in tree pits.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [ ] rain gardens
- [x] tree pits
- [x] stormwater planters
- [ ] rain barrels
- [ ] buffers
- [ ] cisterns
- [ ] pervious pavement
- [ ] bioswales
- [ ] depaving

BRUNSWICK STREET COMMUNITY GARDEN

170 Brunswick Street
Jersey City, NJ 07302, Ward E

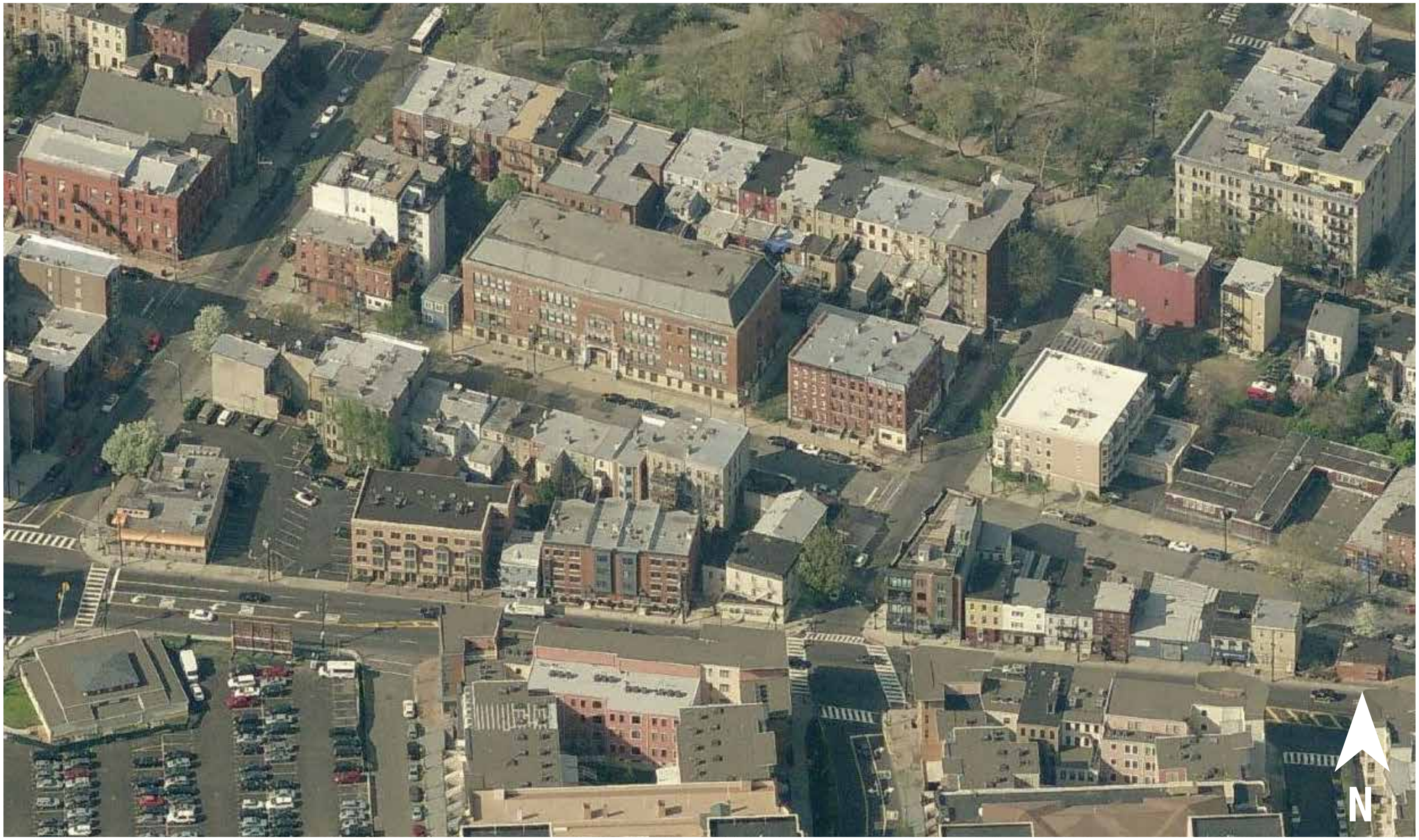
The Brunswick Street Community Garden is part of the Jersey City "Adopt-a-Lot" Program. A rainwater harvesting system (cistern) connected to the downspouts of southern adjacent buildings could be used to provide water to the garden. Planting beds near the entrance of the site can be converted into a vegetated filter strip (or bioswale) to intercept stormwater runoff. A rain garden near the lowest elevation of the site could alternatively capture runoff.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [x] rain gardens
- [ ] tree pits
- [ ] stormwater planters
- [ ] rain barrels
- [ ] buffers
- [x] cisterns
- [ ] pervious pavement
- [x] bioswales
- [ ] depaving

BRUNSWICK STREET COMMUNITY GARDEN

170 Brunswick Street
Jersey City, NJ 07302, Ward E



BRIGHT STREET COMMUNITY GARDEN

54 Bright Street
Jersey City, NJ 07302, Ward E

The Bright Street Community Garden is situated between a residential and a public school building. Although downspouts are not visible, the internal drainage piping of the school could potentially be connected to a rainwater harvesting system for garden use.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

☐ rain gardens	☐ tree pits	☐ stormwater planters
☑ rain barrels	☐ buffers	☑ cisterns
☐ pervious pavement	☐ bioswales	☐ depaving

BRIGHT STREET COMMUNITY GARDEN

54 Bright Street
Jersey City, NJ 07302, Ward E

HAMILTON PARK

262 8th Street
Jersey City, NJ 07302, Ward E



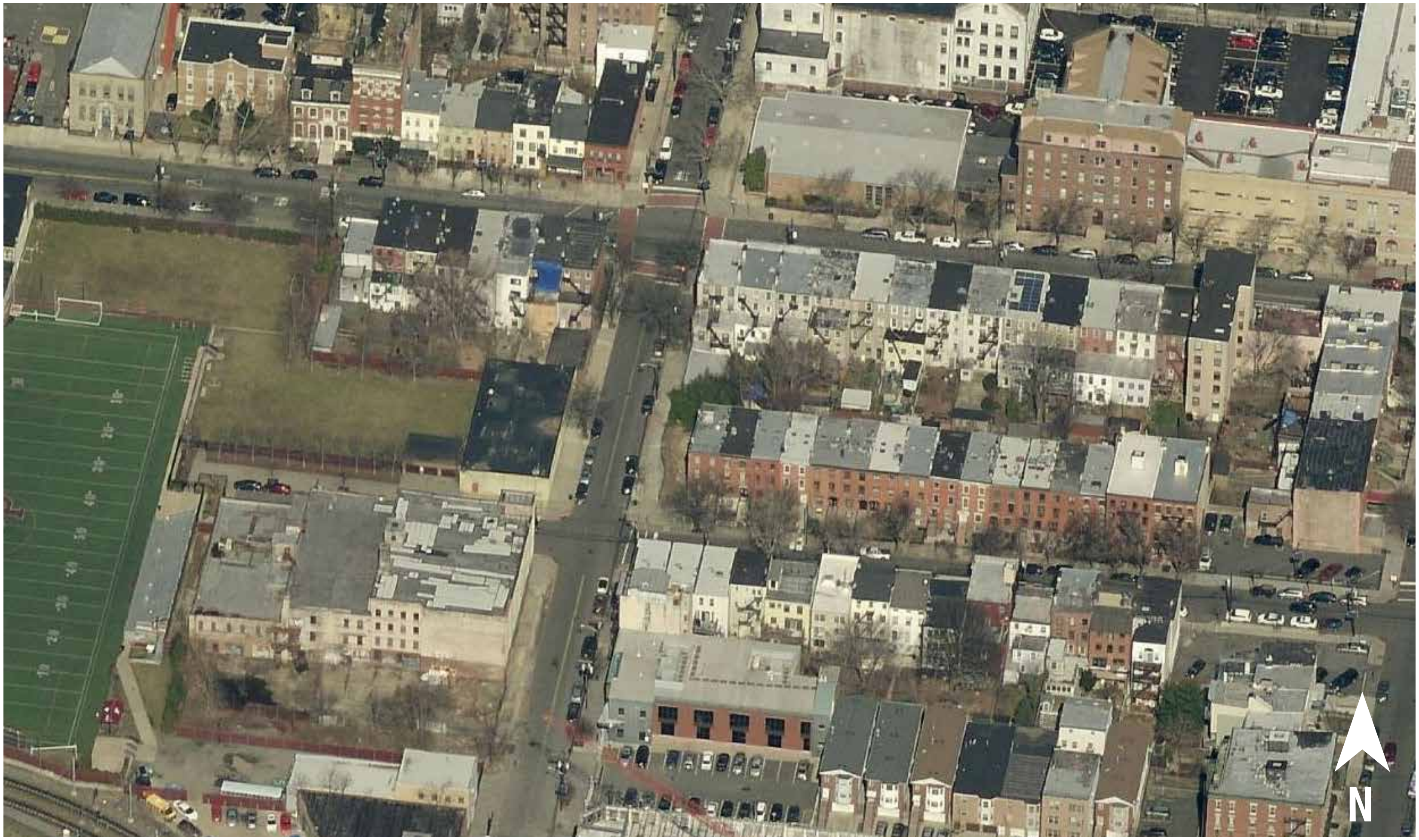
Hamilton Park is a city park that shows signs of drainage issues in the northeast corner and near the dog parks. Drainage could be improved with rain gardens. The central gazebo structure has existing piping that can be diverted to stormwater planters or permeable paving.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [x] rain gardens
- [ ] tree pits
- [x] stormwater planters
- [ ] rain barrels
- [ ] buffers
- [ ] cisterns
- [x] pervious pavement
- [ ] bioswales
- [ ] depaving

HAMILTON PARK

262 8th Street
Jersey City, NJ 07302, Ward E



ST. PETERS PREPARATORY SCHOOL

144 Grand Street
Jersey City, NJ 07302, Ward E



St. Peter's Preparatory School campus has downspouts that can be disconnected to discharge onto permeable paving and stormwater planters. Warren Street is a vehicular street converted into a pedestrian plaza and can be considered for permeable paving alternatives.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [ ] rain gardens
- [ ] tree pits
- [x] stormwater planters
- [ ] rain barrels
- [ ] buffers
- [ ] cisterns
- [x] pervious pavement
- [ ] bioswales
- [ ] depaving

M.E.T.S. CHARTER SCHOOL

180 9th Street
Jersey City, NJ 07302, Ward E

M.E.T.S. Charter School is a school building with a pickup/drop-off zone on 9th Street. Runoff along this street flows to the east towards Marin Boulevard. The concrete and asphalt sidewalks and islands can be retrofitted to intercept runoff through permeable pavement, tree pits, and stormwater planters.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [ ] rain gardens
- [ ] rain barrels
- [x] pervious pavement
- [x] tree pits
- [ ] buffers
- [ ] bioswales
- [x] stormwater planters
- [ ] cisterns
- [ ] depaving

M.E.T.S. CHARTER SCHOOL

180 9th Street
Jersey City, NJ 07302, Ward E

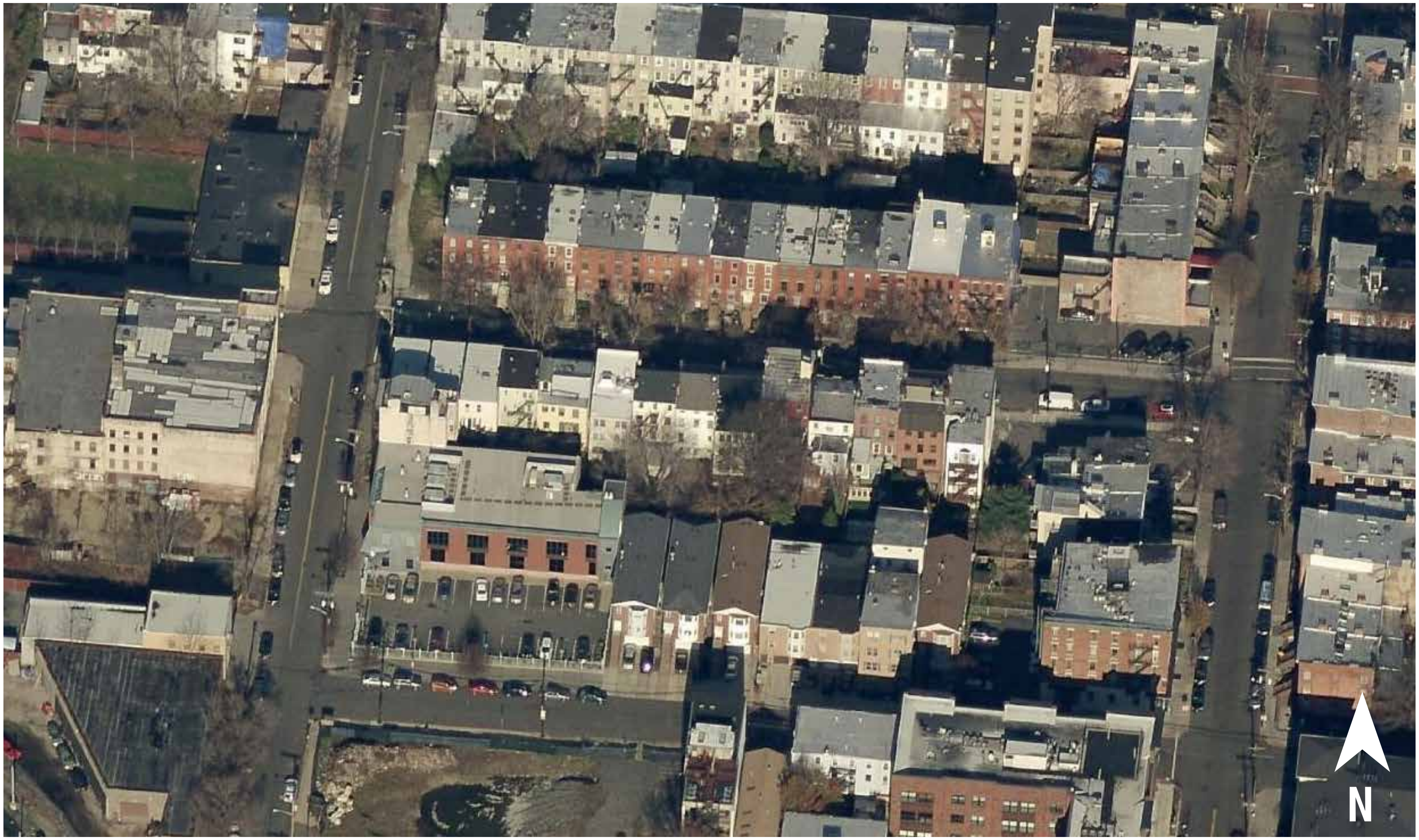

N



Manila Avenue is a one-way residential street with wide sidewalks and an absence of overhead utilities. Stormwater runoff can be intercepted with tree pits, stormwater planters, and permeable paving.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [ ] rain gardens
- [x] tree pits
- [x] stormwater planters
- [ ] rain barrels
- [ ] buffers
- [ ] cisterns
- [x] pervious pavement
- [ ] bioswales
- [ ] depaving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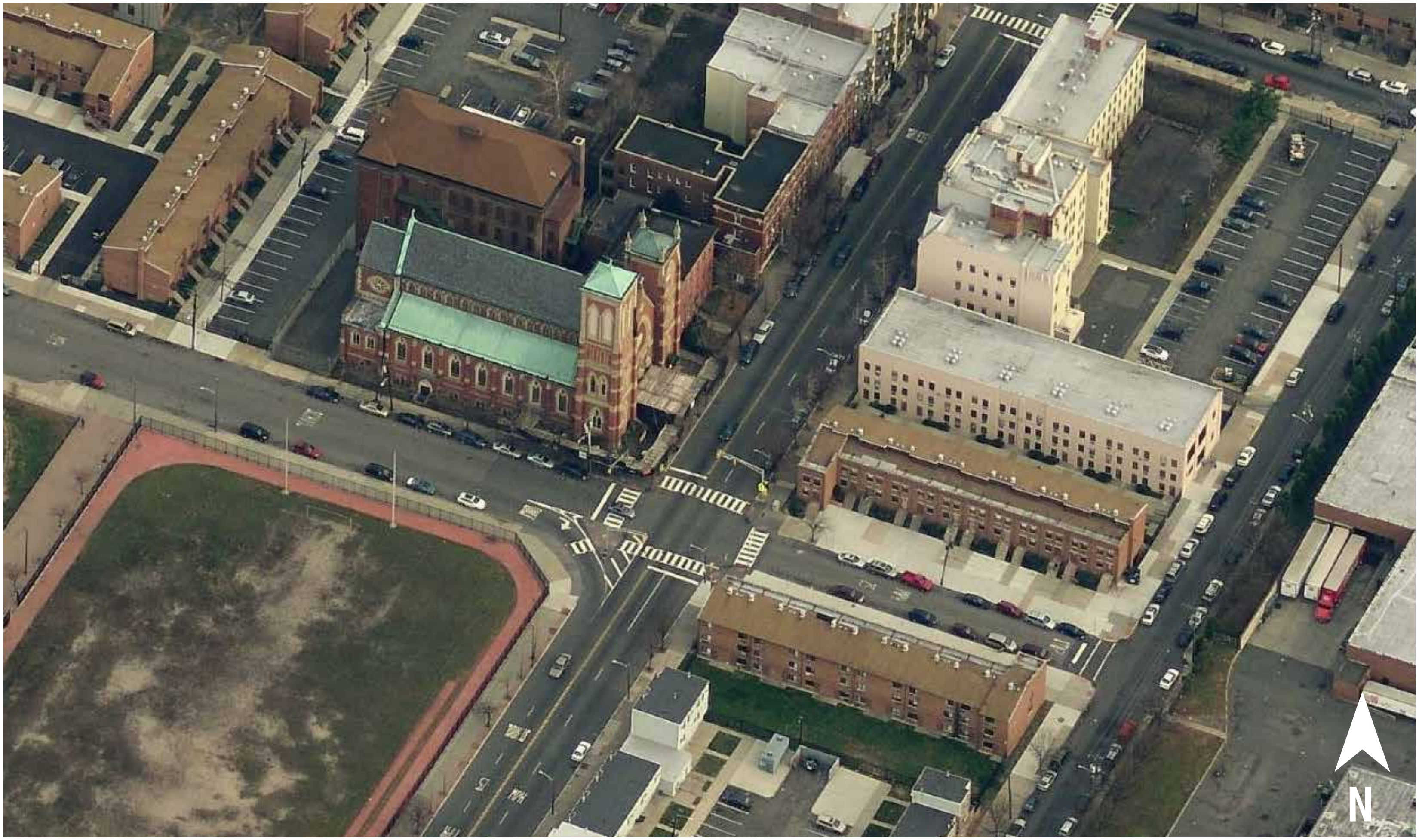
Westbound Sussex Street dead-ends in a residential neighborhood at the St. Peter's school athletic field complex. Significant flooding was noted at the intersection of Sussex Street and Van Vorst Street. Stormwater runoff can be intercepted and stored through tree pits and stormwater planters.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [ ] rain gardens
- [x] tree pits
- [x] stormwater planters
- [ ] rain barrels
- [ ] buffers
- [ ] cisterns
- [ ] pervious pavement
- [ ] bioswales
- [ ] depaving



ST. BRIDGET'S CHURCH

372 Montgomery Street
Jersey City, NJ 07302, Ward E



St. Bridget's Church has downspouts that discharge onto the adjacent lawn and sidewalk along Brunswick and Montgomery Streets. These downspouts can be rerouted and diverted into permeable pavement or stormwater planters.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- ☐ rain gardens
- ☐ rain barrels
- ☑ pervious pavement
- ☐ tree pits
- ☐ buffers
- ☐ bioswales
- ☑ stormwater planters
- ☐ cisterns
- ☐ depaving

ST. BRIDGET'S CHURCH

372 Montgomery Street
Jersey City, NJ 07302, Ward E

JAMES FERRIS HIGH SCHOOL

35 Colgate Street
Jersey City, NJ 07302, Ward F

James Ferris High School campus has wide sidewalks and two limited vehicular access roads. Parking surfaces and pedestrian paths can be potential demonstration sites of permeable paving and stormwater planters.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [ ] rain gardens
- [ ] tree pits
- [x] stormwater planters
- [ ] rain barrels
- [ ] buffers
- [ ] cisterns
- [x] pervious pavement
- [ ] bioswales
- [ ] depaving

ARLINGTON PARK

752 Grand Street
Jersey City, NJ 07304, Ward F

Arlington Park is a triangular city park at the junction of Grand Street and Arlington Avenue. Stormwater runoff from the adjacent streets can be managed in tree pits and stormwater planters in the wide sidewalks. Rain gardens could manage stormwater on the site in open lawn areas throughout the park.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [x] rain gardens
- [x] tree pits
- [x] stormwater planters
- [ ] rain barrels
- [ ] buffers
- [ ] cisterns
- [ ] pervious pavement
- [ ] bioswales
- [ ] depaving

ARLINGTON PARK

752 Grand Street
Jersey City, NJ 07304, Ward F

NEW JERSEY REGIONAL DAY SCHOOL

425 Johnston Avenue
Jersey City, NJ 07304, Ward F

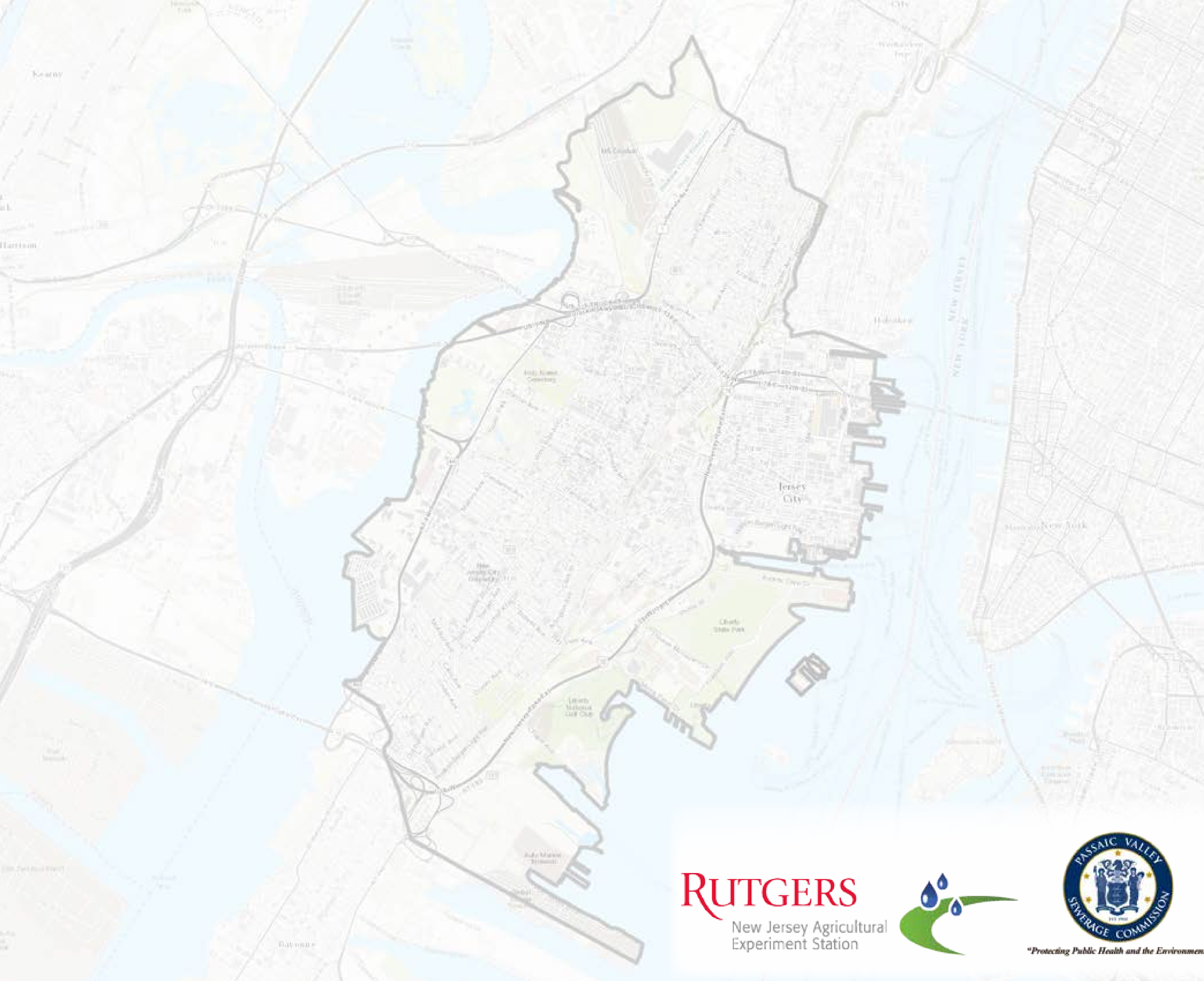
New Jersey Regional Day School is a public school campus with ample open lawn and parking areas. Downspouts can be diverted to demonstration rain gardens in lawn areas adjacent to the buildings. Rainwater can be harvested in rain barrels or cisterns for irrigation or garden use. Parking areas could manage stormwater runoff through the addition of permeable pavement.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [x] rain gardens
- [x] rain barrels
- [x] pervious pavement
- [ ] tree pits
- [ ] buffers
- [ ] bioswales
- [ ] stormwater planters
- [x] cisterns
- [ ] depaving

NEW JERSEY REGIONAL DAY SCHOOL

425 Johnston Avenue
Jersey City, NJ 07304, Ward F



RUTGERS
New Jersey Agricultural Experiment Station

PASSAIC VALLEY SEWERAGE COMMISSION

"Protecting Public Health and the Environment"