GREEN INFRASTRUCTURE FEASIBILITY STUDY

NEWARK

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 Newark, 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.

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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 across the five counties served by PVSC with managing flooding and eliminating combined sewer overflows. 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.

Newark 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, Newark can begin to reduce the negative impacts of stormwater runoff, reduce pressures on the local infrastructure, increase resiliency to CSO events, and protect the health of our waterways.

This feasibility study is intended to be used as a guide for the community of Newark to begin implementing green infrastructure practices and demonstrate 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.

Source: Newark Airport


Source: City Of Newark


Source: City-Data

NEWARK

Newark is located in Essex County and covers an area of approximately 26 square miles. The city has a population of 277,140 according to the 2010 US Census. At the east boundary of the city is the Passaic River, which runs southeast into the Newark Bay. The city has both a municipal separate storm sewer system (MS4) and a combined sewer system (CSO).

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

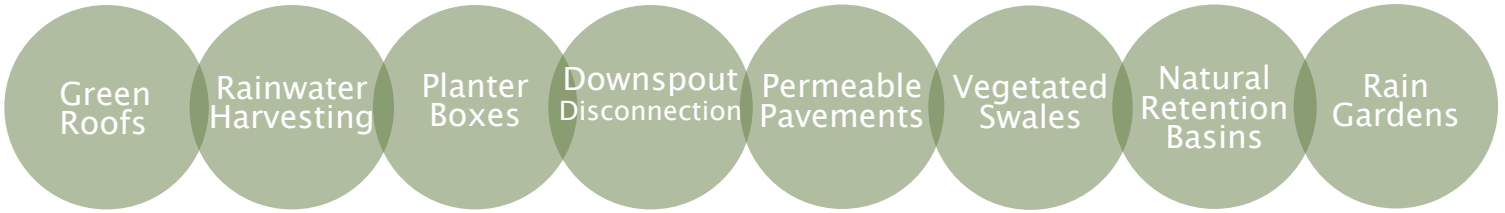

C
Rain Garden


D


E

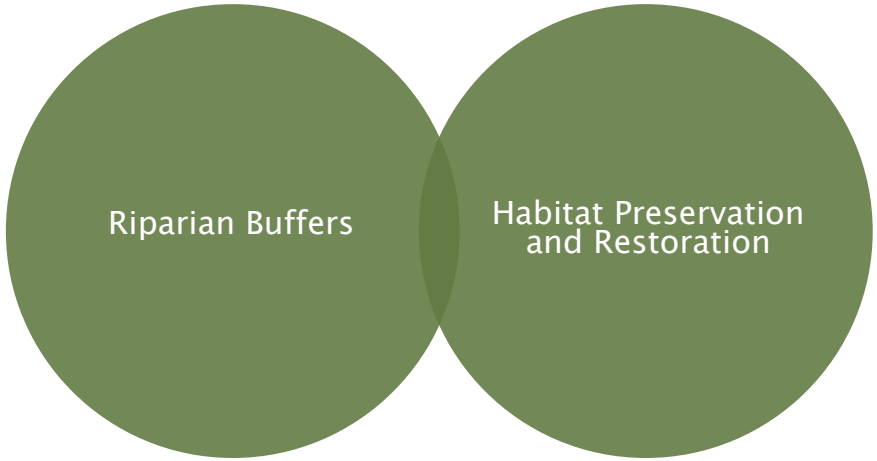
GREEN INFRASTRUCTURE STRATEGIES

SITE



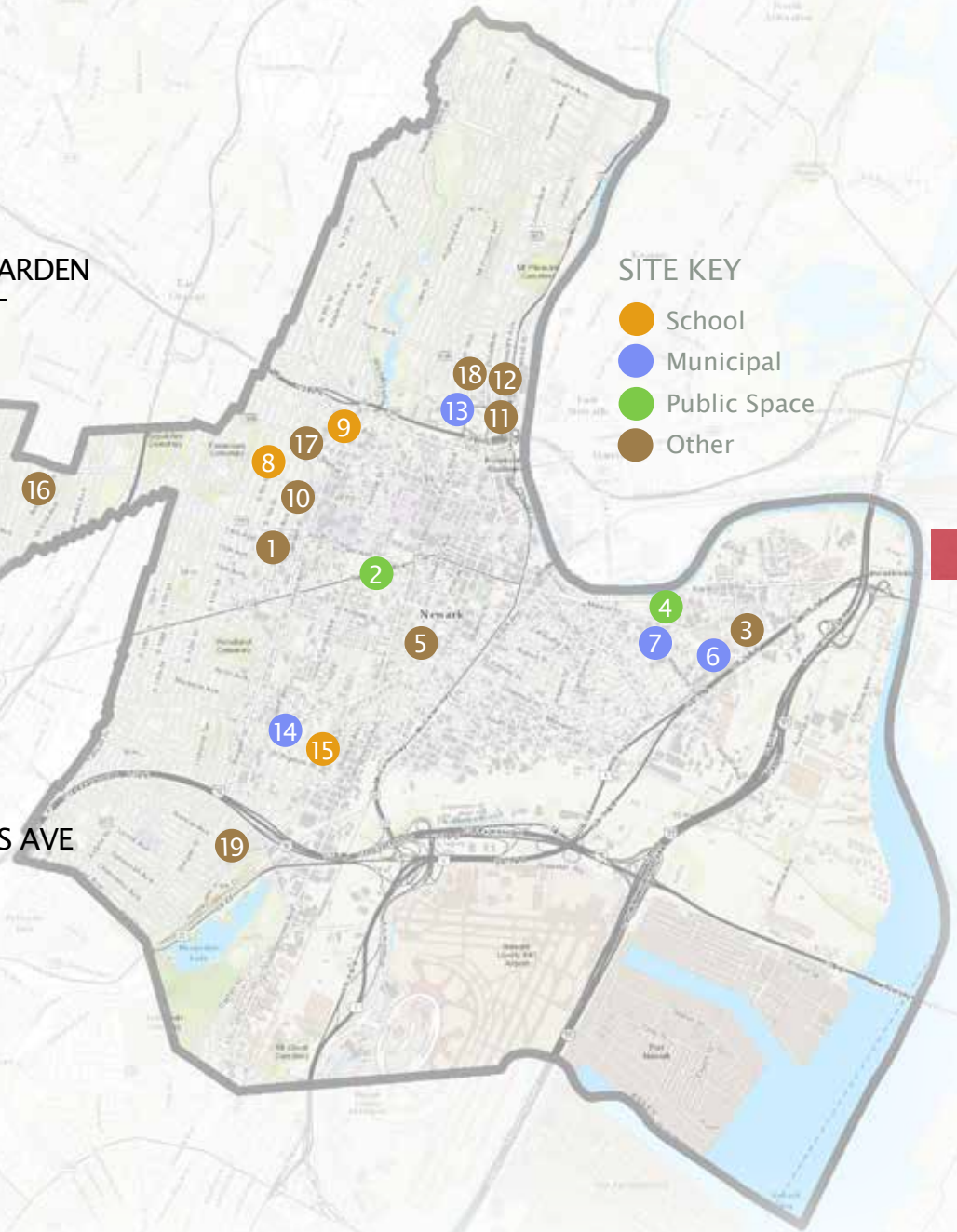
NEIGHBORHOOD

WATERSHED



POTENTIAL PROJECT SITES WITHIN STUDY AREA

1. COMMUNITY GARDEN – 293 SOUTH 7TH ST
2. GREATER NEWARK CONSERVANCY
3. RESIDENTIAL APARTMENTS
4. RIVERFRONT PARK
5. NEWARK SCIENCE AND SUSTAINABILITY COMMUNITY GARDEN
6. COMMERCIAL – RESIDENTIAL STREET – 198 CHRISTIE ST
7. COMMERCIAL – RESIDENTIAL STREET – 655 MARKET ST
8. NORTH STAR ACADEMY
9. SUSSEX AVENUE ELEMENTARY SCHOOL
10. VACANT LOT – 125 12TH AVE
11. GREATER NEWARK CHARTER SCHOOL COMMUNITY GARDEN
12. RESIDENTIAL AREA – 201–225 MT PLEASANT AVE
13. VACANT LOT – 87 DR MARTIN LUTHER KING JR BLVD
14. TRAFFIC TRIANGLE – 421 CLINTON AVE
15. MALCOM X SHABAZZ HIGH SCHOOL
16. UVSO COMMUNITY GARDEN
17. URBAN LEAGUE OF ESSEX COUNTY
18. GARDEN OF WORKER BEES – 179 BROADWAY
19. AL MAIDAH NATURAL COMMUNITY GARDEN– 45 LYONS AVE

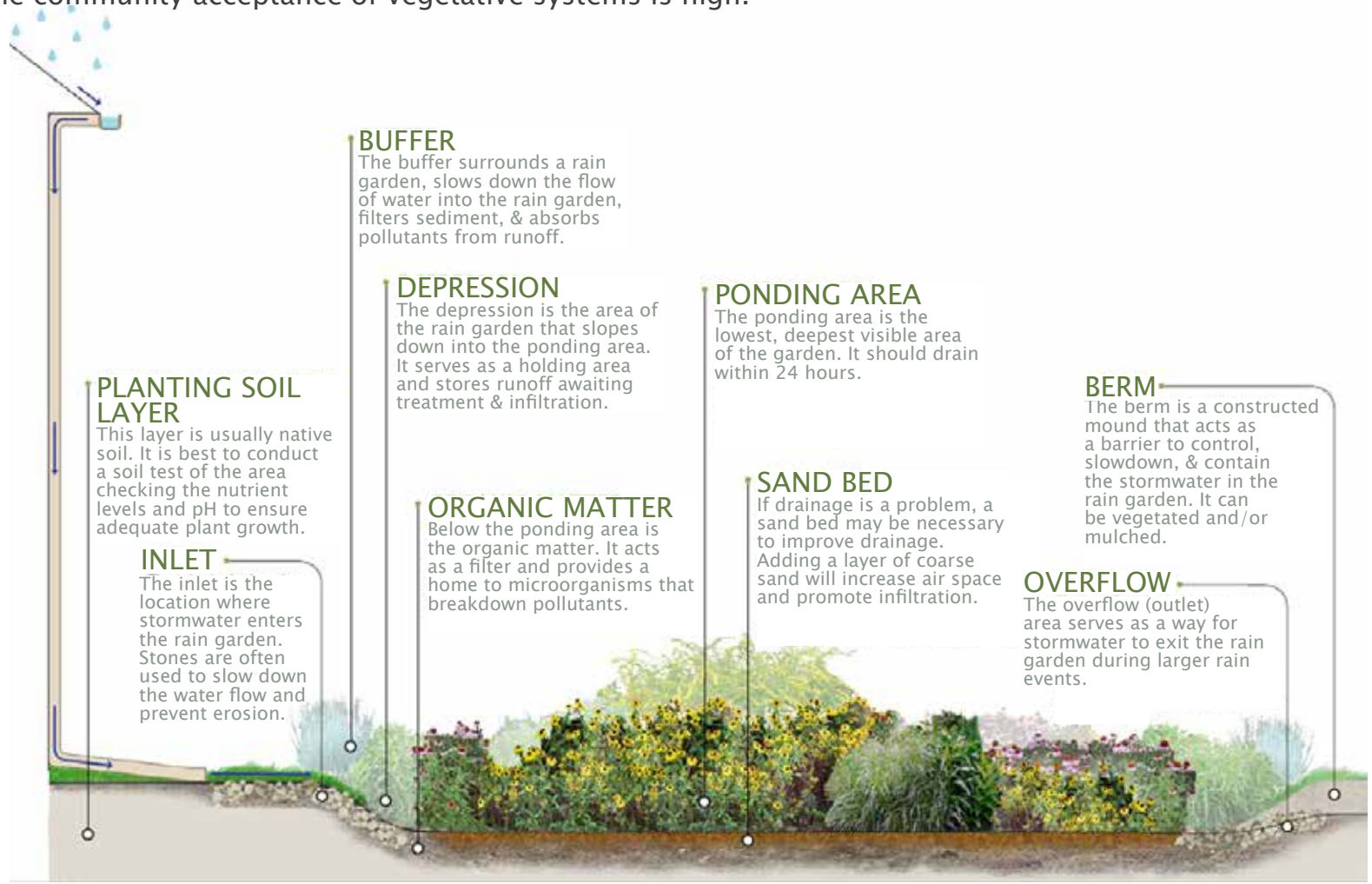



STATE OF
NEW JERSEY
DEPARTMENT OF
ENVIRONMENTAL
PROTECTION

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 in existing landscapes and enhance aesthetics, the community acceptance of vegetative systems is high.



RAIN GARDEN DIAGRAM

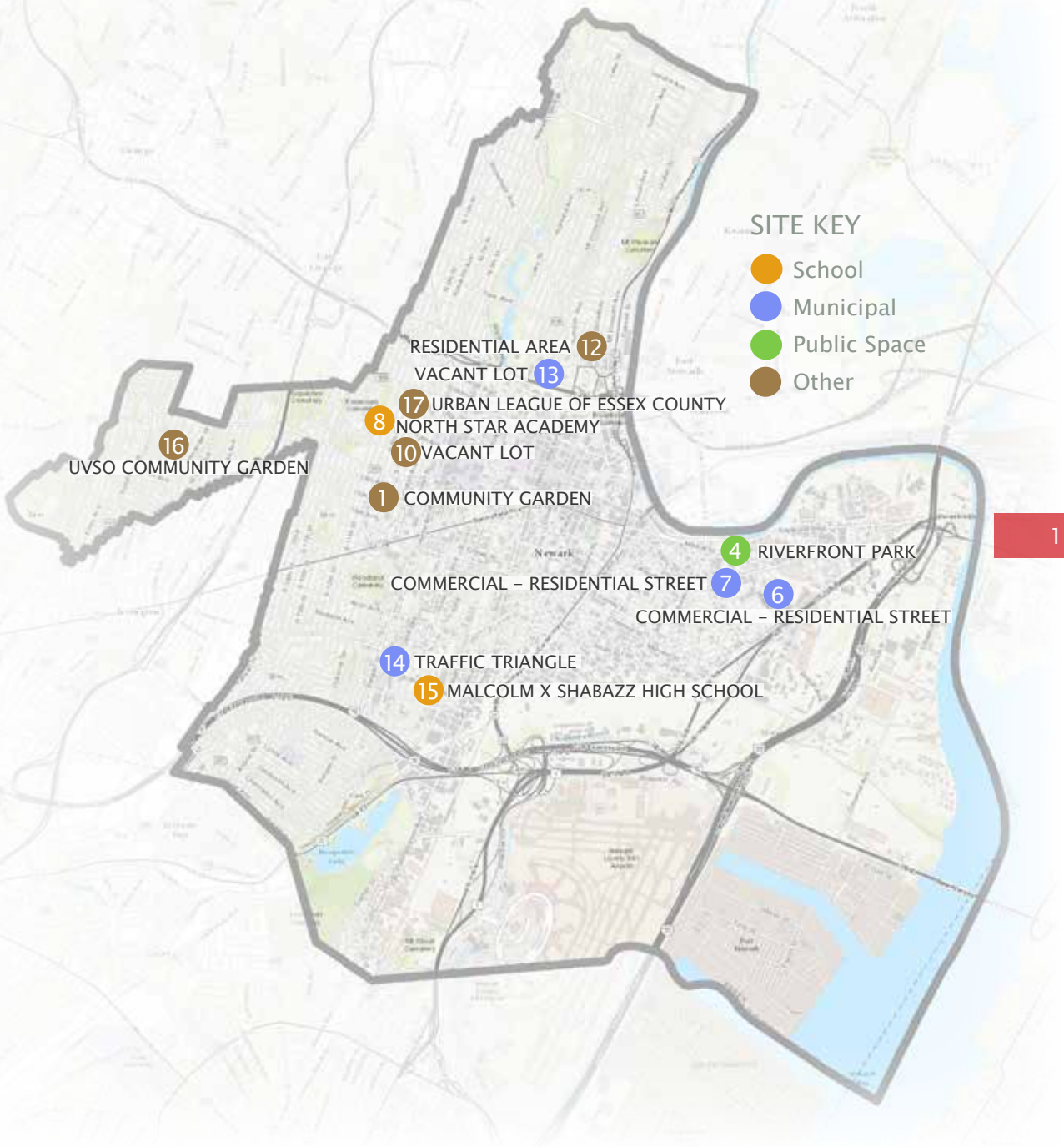
VEGETATED SYSTEM SUITABILITY

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 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

293 South 7th Street
Newark, NJ 07103

VEGETATED SYSTEM SUITABILITY: EXAMPLE PROJECT SITE



The site is Greater Newark Conservancy's Community Garden at 293 South 7th Street. On the north side of the garden, there are multiple downspouts around the building that discharge onto the lawn. Potentially a cistern can be connected to the building and installed in the garden to provide water to plants. A rain garden can be installed on the east side of the garden by disconnecting the front side of the building's downspout, which slopes toward the street.

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

INLET
Rainwater collected in gutters is released into the barrel here

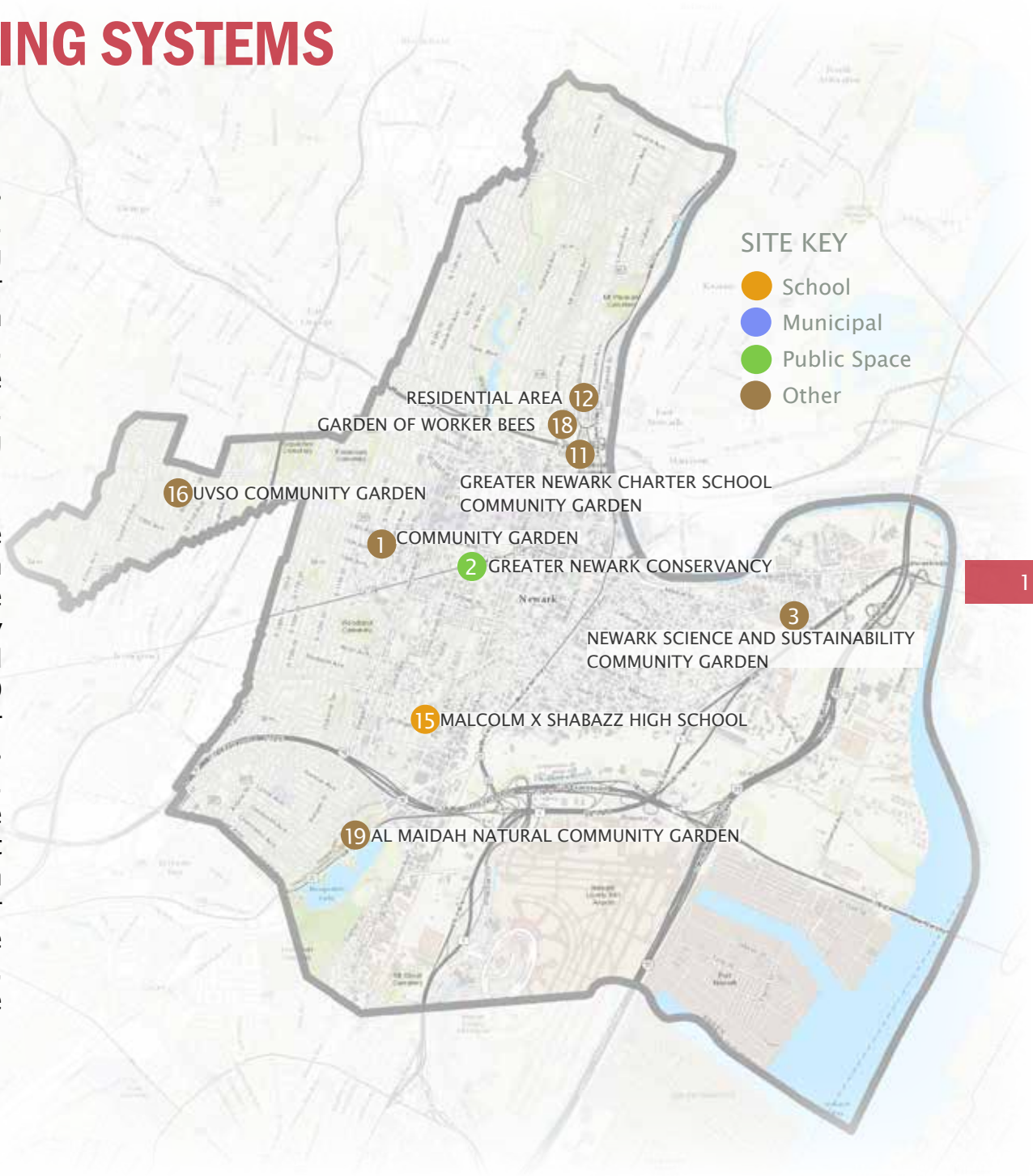
OVERFLOW OUTLET
Releases water when the rain barrel reaches capacity

SPIGOT
Valve that opens and closes barrel's water flow

RAINWATER HARVESTING SYSTEMS SUITABILITY

Typical rainwater harvesting systems can store up to 5,000 gallons of water. Harvesting during rainy months in spring and summer provides a source of water during hot, 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 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

32 Prince Street
Newark, NJ 07103

RAINWATER HARVESTING SYSTEM SUITABILITY: EXAMPLE PROJECT SITE



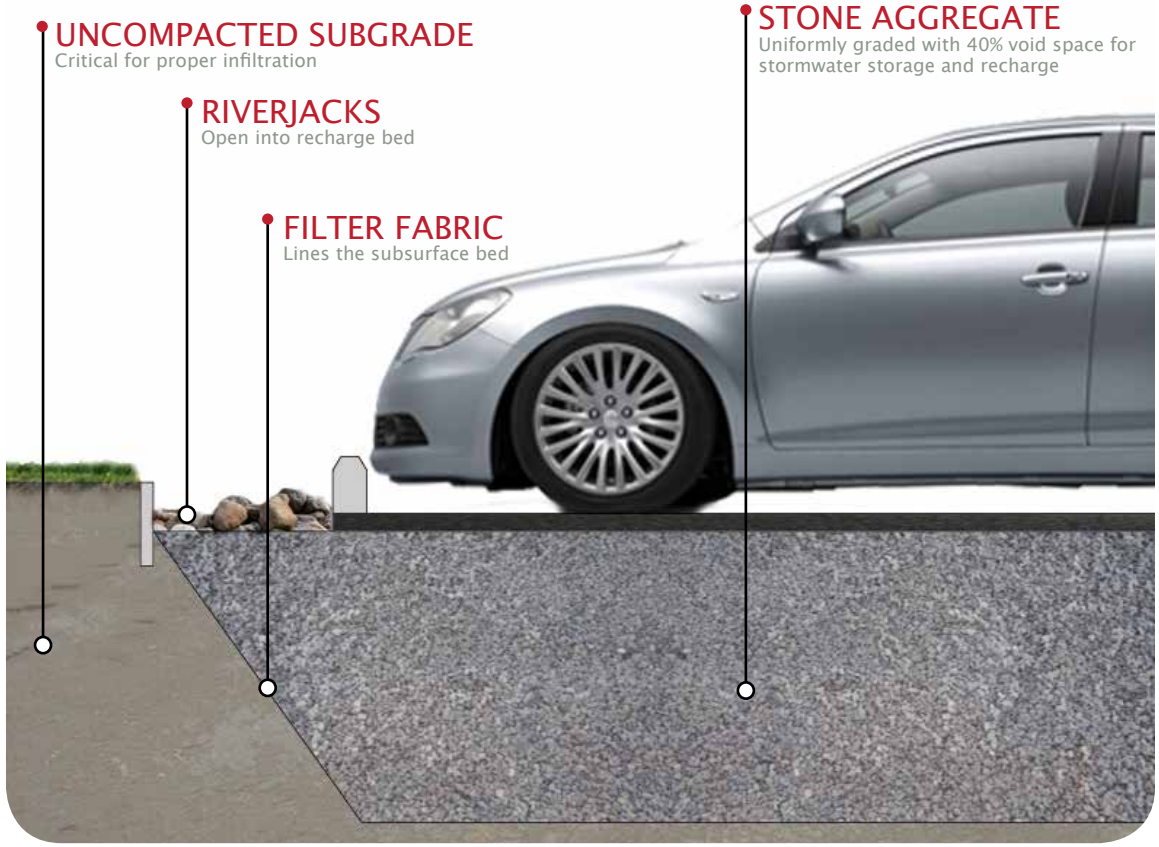
The site is Greater Newark Conservancy at 32 Prince Street. On the west site of the building there are ponding areas and erosion in an existing gated area. The downspout is currently connected to a series of rain barrels unable to withhold the amount of stormwater from the drainage area. The downspout can be disconnected and directed into a larger rain harvesting system to infiltrate runoff from the building's roof. The overflow can be directed into existing drainage to the pond on the west side of the building.

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

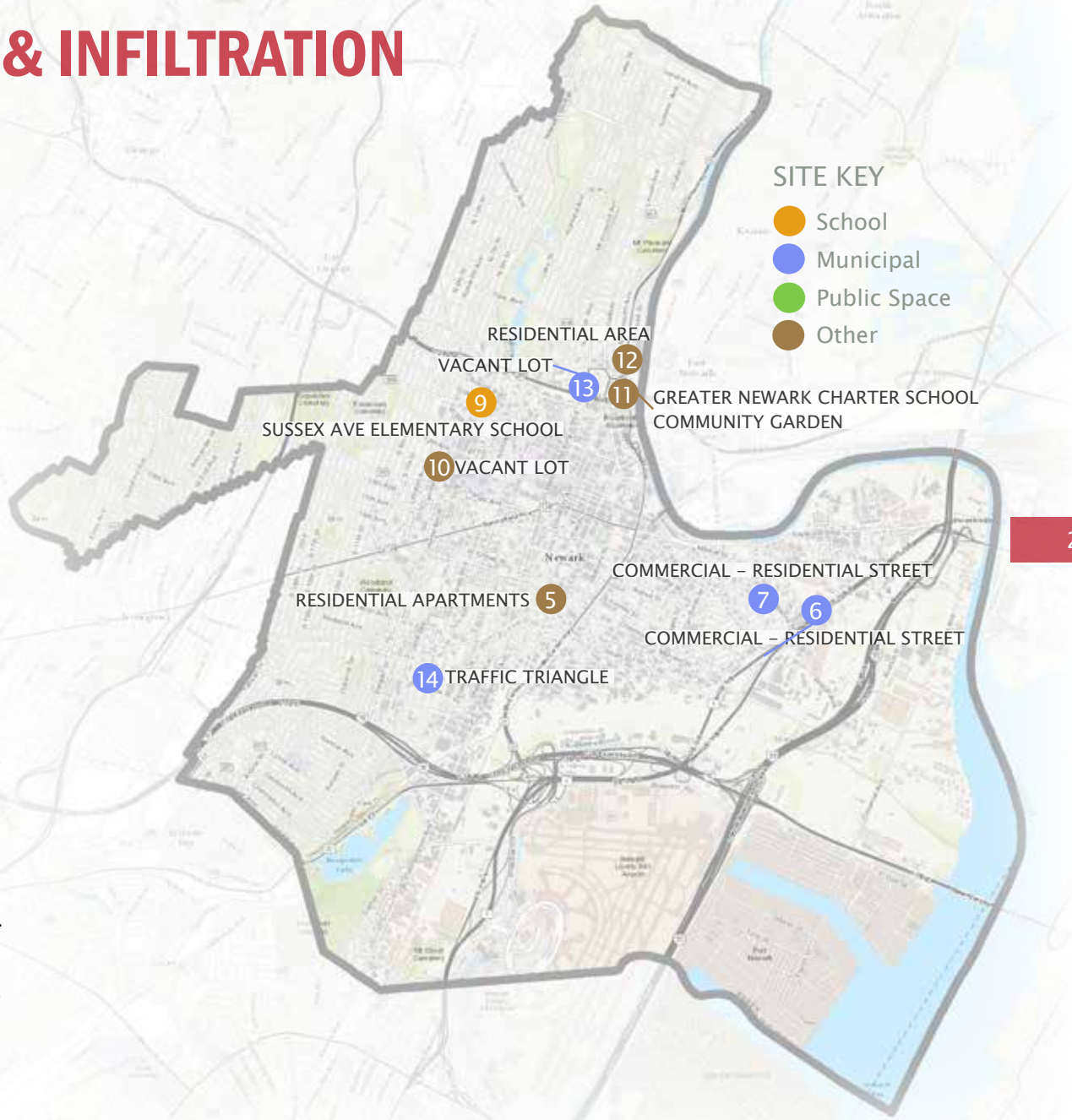
Pervious paving systems are paved areas that produce less stormwater runoff than areas paved with conventional paving. These systems include:

- Permeable pavers
- Porous asphalt
- Pervious concrete

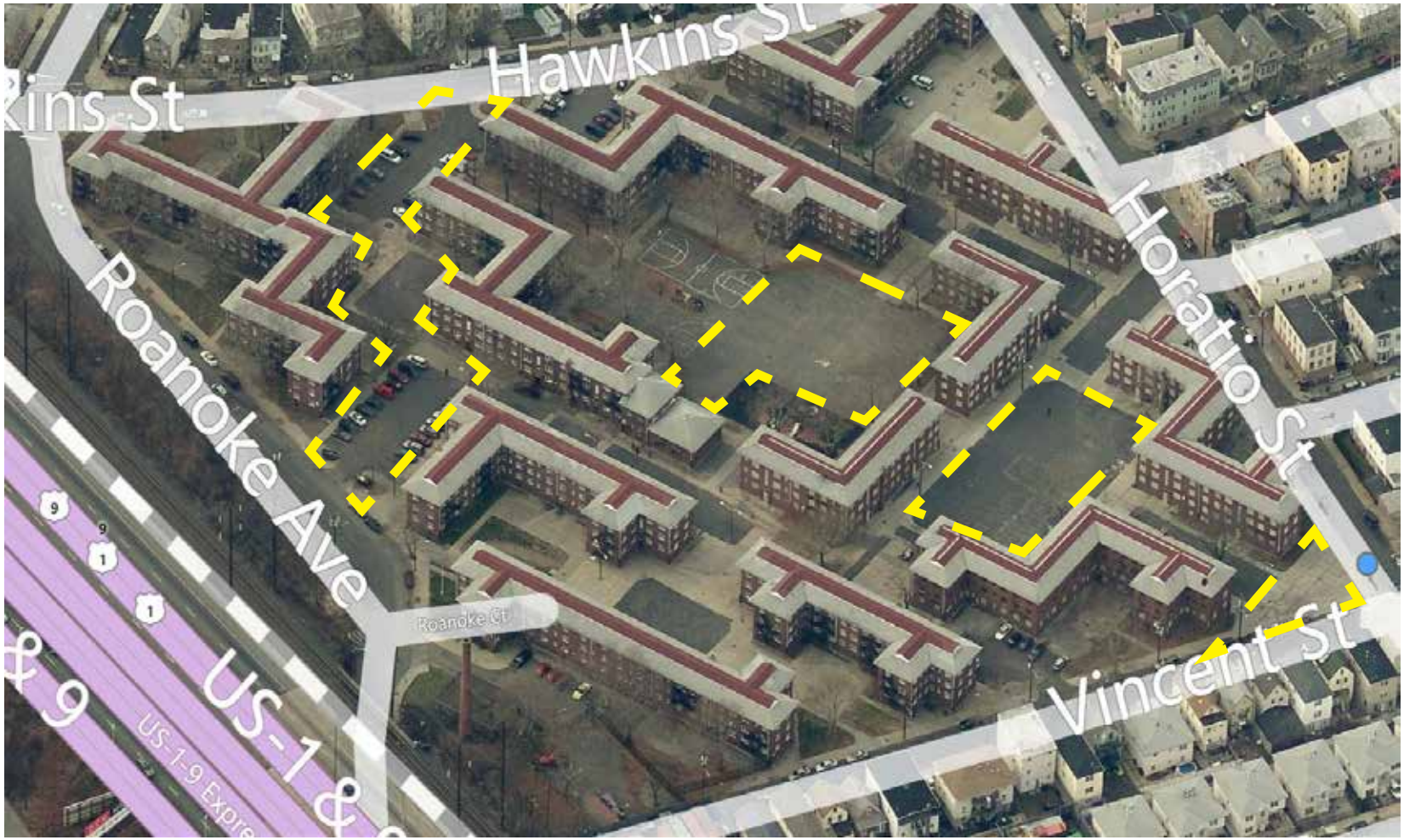
The paving material is placed over a bed of uniformly graded stone. The paving materials allow water to pass through and then infiltrate into the pore spaces of the underlying stone bed. The stored runoff then infiltrates over time into the uncompacted subgrade soils.

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



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



The site is the residential apartment buildings sitting between Horatio Street and Vincent Street. Horatio Street drains to low points on Vincent Street where six catch basins are located. A streetscape to incorporate tree plantings and pervious pavement will disconnect stormwater runoff before entering the catch basins located along the intersection of Horatio Street and Vincent Street.


TREE
PLANTING

COMMUNITY ENGAGEMENT & EDUCATION

BUILD-A-RAIN BARREL WORKSHOP

With the Build-a-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 rain water 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 drains from hard surfaces like rooftops, driveways, roadways, parking lots, and compacted lawns, it carries pollution to our local waterways. Harvesting the rain water 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), 21st 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

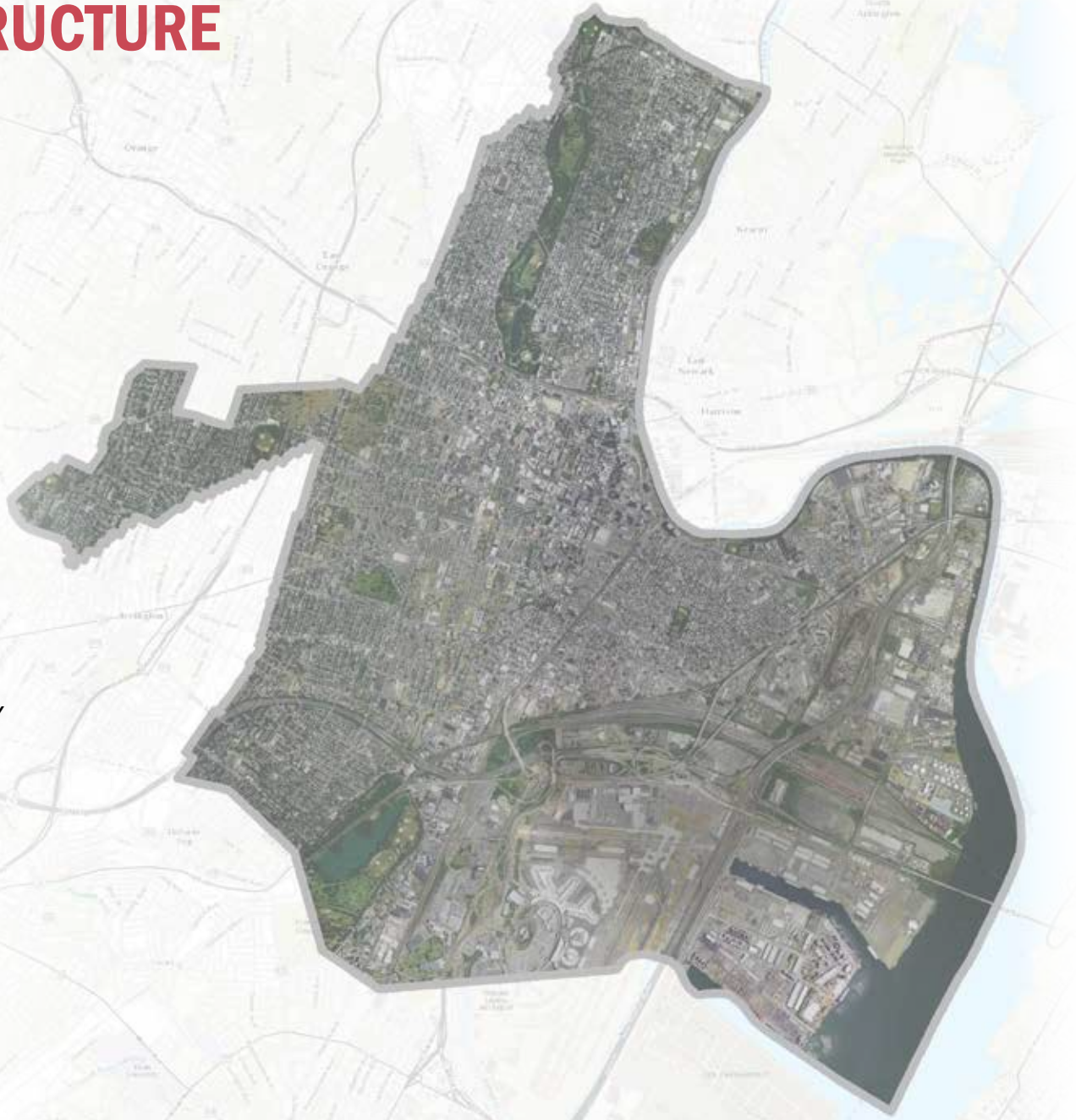
MAINTAINING NEWARK'S GREEN INFRASTRUCTURE SYSTEMS

1. VEGETATED SYSTEMS
   - Rain Gardens
   - Stormwater Planters
   - Bioswales

2. RAINWATER HARVESTING
   - Rain Barrels
   - Cisterns

3. STORAGE, QUANTITY, AND INFILTRATION
   - Pervious Pavements

4. COMBINATION OF STRATEGY TYPES



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

671 Raymond Boulevard
Newark, NJ 07105



The site is the Riverfront Park that sits between Raymond Boulevard and the Passaic River. Linear bioswales can redirect stormwater directly upstream from a combined sewer overflow (CSO) outfall at the west end of the park.

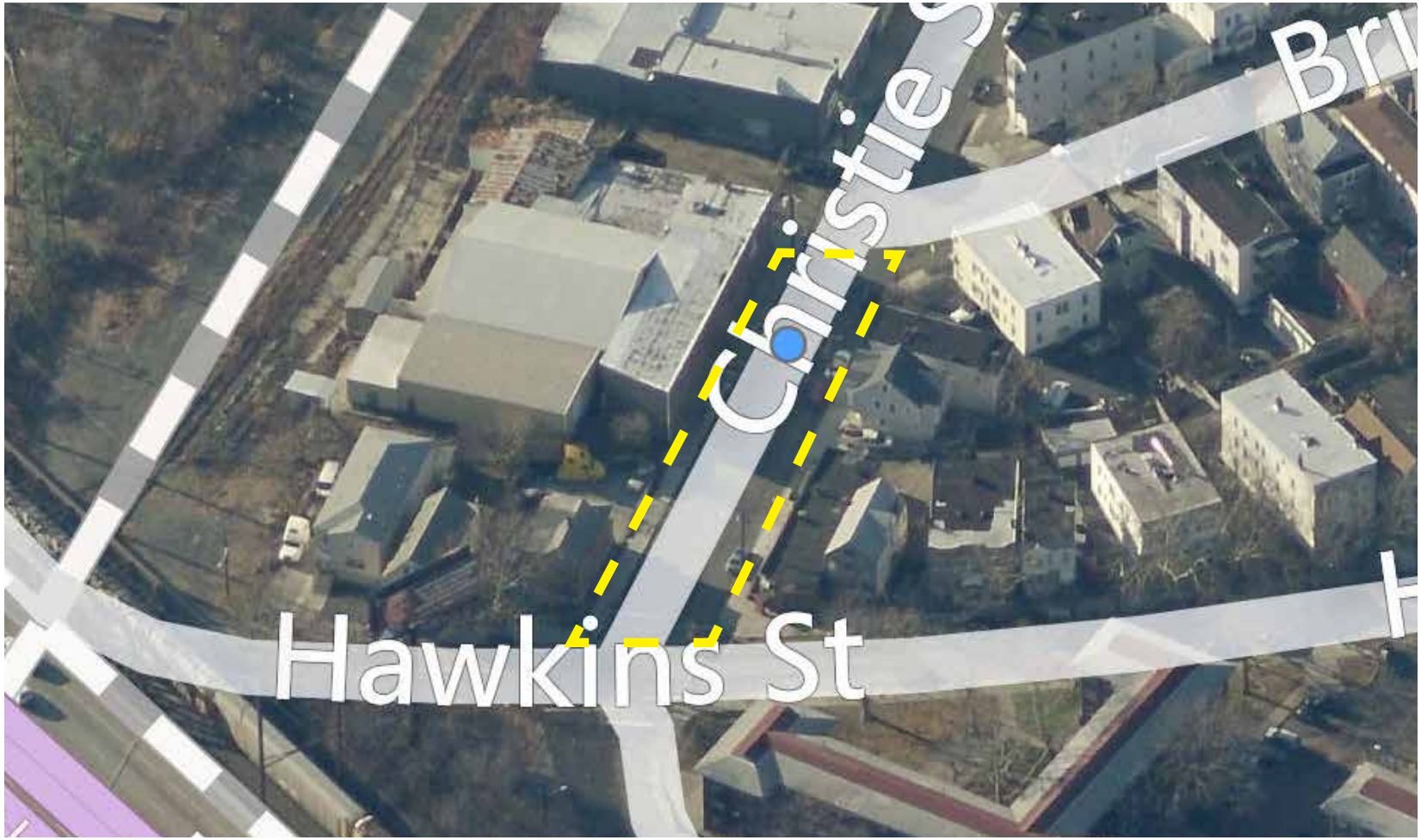
SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- ☐ rain gardens
- ☐ curb cuts
- ☐ stormwater planters
- ☐ rain barrels
- ☐ buffers
- ☐ cisterns
- ☐ pervious pavement
- ☑ bioswales
- ☐ depaving

The site is the Newark Science and Sustainability, Inc. community garden located at 483 Washington Street. On the north side of the building, garden beds have been implemented with limited access to water. On the corner of the west side of the building, a downspout is directly connected to the sewer system. A cistern can be connected to the building and installed in the garden to provide water to the plants.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- ☐ rain gardens
- ☐ rain barrels
- ☐ pervious pavement
- ☐ curb cuts
- ☐ buffers
- ☐ bioswales
- ☐ stormwater planters
- ☑ cisterns
- ☐ depaving


Christie St
Hawkins St

The site is located at the intersection of Christie Street and Brill Street. Brill Street has a large skewed intersection that is a prime location for bump outs, and Christie Street has an overly-wide sidewalk. Downspouts from a warehouse along Christie Street can be redirected into stormwater planters, curb cuts, and pervious pavement. Rain garden bump-outs can also be placed along fire hydrants on Christie, Brill and Hawkins Streets.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [x] rain gardens
- [x] curb cuts
- [x] stormwater planters
- [ ] rain barrels
- [ ] buffers
- [ ] cisterns
- [x] pervious pavement
- [ ] bioswales
- [ ] depaving

The site is a commercial – residential area along Market Street. The area is largely commercial and has a wide sidewalk suitable for implementation of a streetscape. The intersection of Market Street and Read Street is a low point. A streetscape to incorporate tree plantings, rain gardens, and pervious pavement will disconnect stormwater runoff.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

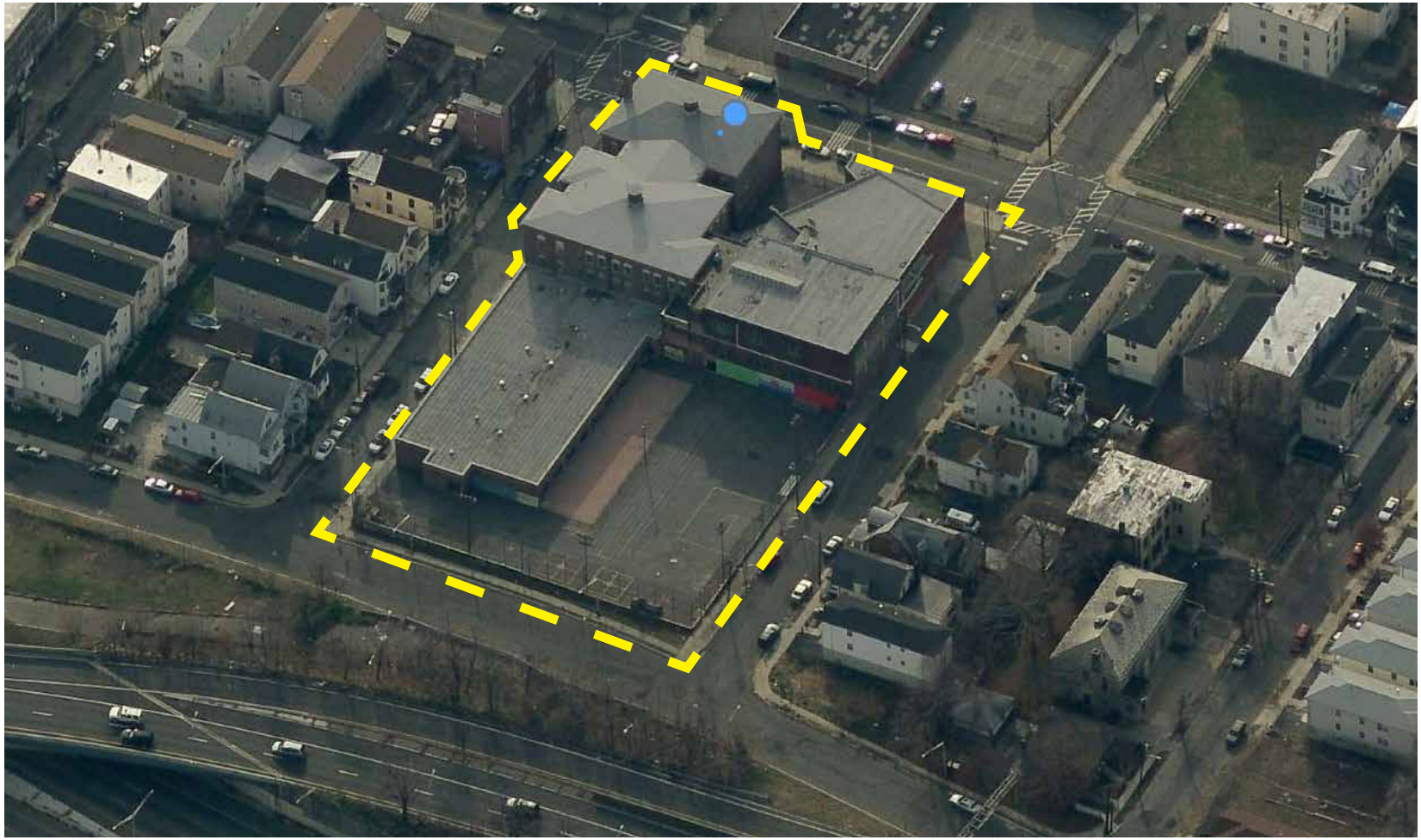
- [x] rain gardens
- [ ] curb cuts
- [x] stormwater planters
- [ ] rain barrels
- [ ] buffers
- [ ] cisterns
- [x] pervious pavement
- [ ] bioswales
- [ ] depaving



The site is the North Star Academy located at 108 South 9th Street. The City of Newark owns a vacant parcel to the south of the school, and a community garden is located on the north side of the school. Both of these adjacent sites are at a lower elevation than the school property. Rain gardens can be used to intercept the runoff from North Star Academy. Enhanced tree pits can also be implemented to detain stormwater runoff from the school site.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [x] rain gardens
- [ ] curb cuts
- [x] stormwater planters
- [ ] rain barrels
- [ ] buffers
- [ ] cisterns
- [ ] pervious pavement
- [ ] bioswales
- [ ] depaving





The site is the Sussex Avenue Elementary School located at 307 Sussex Avenue. The main parking lot slopes northeast towards Gould Place. Large downspouts sit along the school on Gould Place. Stormwater can be intercepted from the downspouts and redirected to areas that contain pervious pavement or to stormwater planters.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

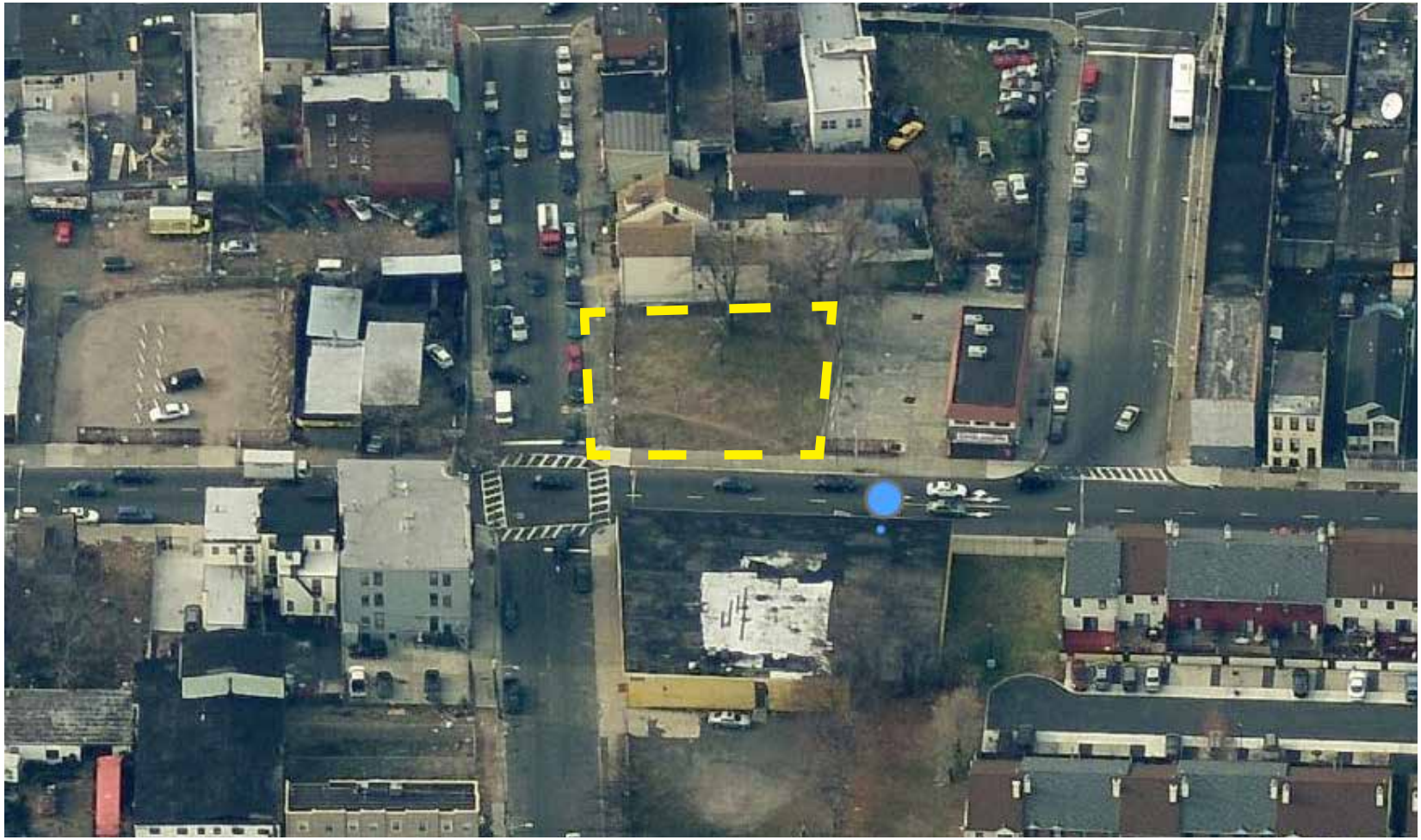
- ☐ rain gardens
- ☐ rain barrels
- ☑ pervious pavement
- ☐ curb cuts
- ☐ buffers
- ☐ bioswales
- ☑ stormwater planters
- ☐ cisterns
- ☐ depaving



The site is a vacant lot located at 125 12th Avenue. The site offers a good pitch in the northeasterly direction across the site. Fairmount Avenue drains to a catch basin on the corner adjacent to the vacant lot. Drainage from Fairmount Avenue can be redirected onto the site. The existing section of sidewalk is degraded and offers an opportunity to implement pervious pavement or rain garden bump outs.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [x] rain gardens
- [ ] rain barrels
- [x] pervious pavement
- [x] curb cuts
- [ ] buffers
- [ ] bioswales
- [x] stormwater planters
- [ ] cisterns
- [ ] depaving





The site is the Greater Newark Charter School's community garden located at 262 Broad Street. This site has a cistern that can be connected to the residential building located on the west side of the garden. The sidewalk is in poor condition and can be replaced with pervious pavement to reduce stormwater runoff from flowing across the sidewalk.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- ☐ rain gardens
- ☐ rain barrels
- ☑ pervious pavement
- ☐ curb cuts
- ☐ buffers
- ☐ bioswales
- ☐ stormwater planters
- ☑ cisterns
- ☐ depaving

RESIDENTIAL AREA

201-225 Mt Pleasant Avenue
Newark, NJ 07104



The site is a residential area that stretches along Mt. Pleasant Avenue between Gouverneur Street and Clark Street. The block slopes to the south towards Clark Street. Strategies to consider should include disconnecting accessible downspouts to stormwater planters or rain barrels pending on the residents need for water. Pervious pavement can be considered along the sidewalk, driveway aprons, in the right of way, as well as on private property.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- ☐ rain gardens
- ☐ curb cuts
- ☑ stormwater planters
- ☑ rain barrels
- ☐ buffers
- ☐ cisterns
- ☑ pervious pavement
- ☐ bioswales
- ☐ depaving

DR. MARTIN LUTHOR KING JR BLVD AND VACANT LOT

87 Dr. Martin Luther King Jr. Boulevard
Newark, NJ 07104



The site is along Dr. Martin Luther King Jr. Boulevard between Crane Street and 7th Avenue. A vacant lot is stretched along the site located at 87 Dr. Martin Luther King Jr. Boulevard. This street is overly wide and could benefit from a streetscape for calming the traffic near the Coretta Scott King Playground and neighboring school.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- ☐ rain gardens
- ☑ curb cuts
- ☑ stormwater planters
- ☐ rain barrels
- ☐ buffers
- ☐ cisterns
- ☑ pervious pavement
- ☐ bioswales
- ☐ depaving

TRAFFIC TRIANGLE

421 Clinton Avenue
Newark, NJ 07108



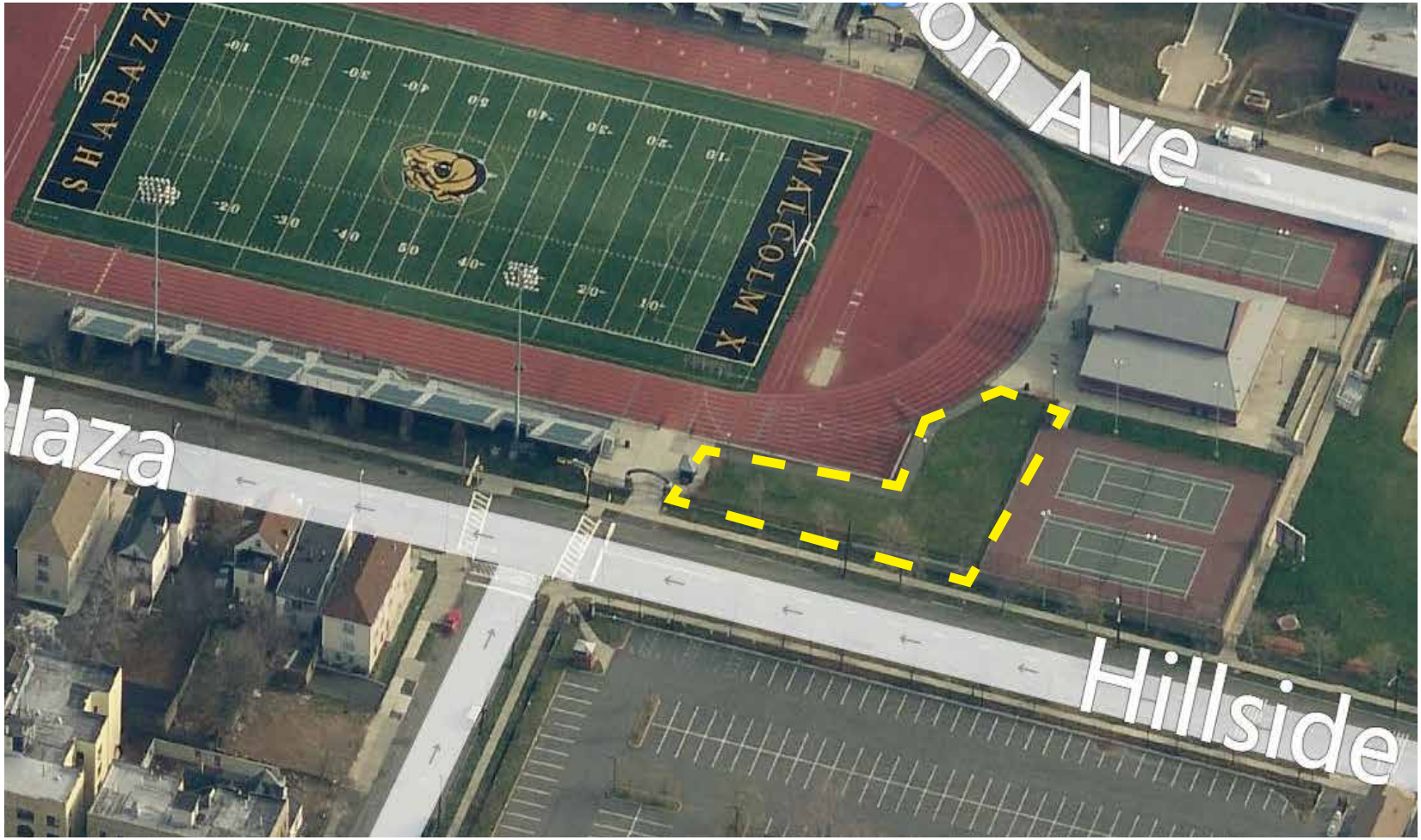
The site is a traffic triangle between Clinton and Badger Avenue located at 421 Clinton Avenue. There is an opportunity to divert stormwater runoff to a rain garden within the traffic triangle. A large portion of existing pavement can be replaced with stormwater planters and pervious pavement.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [x] rain gardens
- [x] curb cuts
- [x] stormwater planters
- [ ] rain barrels
- [ ] buffers
- [ ] cisterns
- [x] pervious pavement
- [ ] bioswales
- [ ] depaving

TRAFFIC TRIANGLE

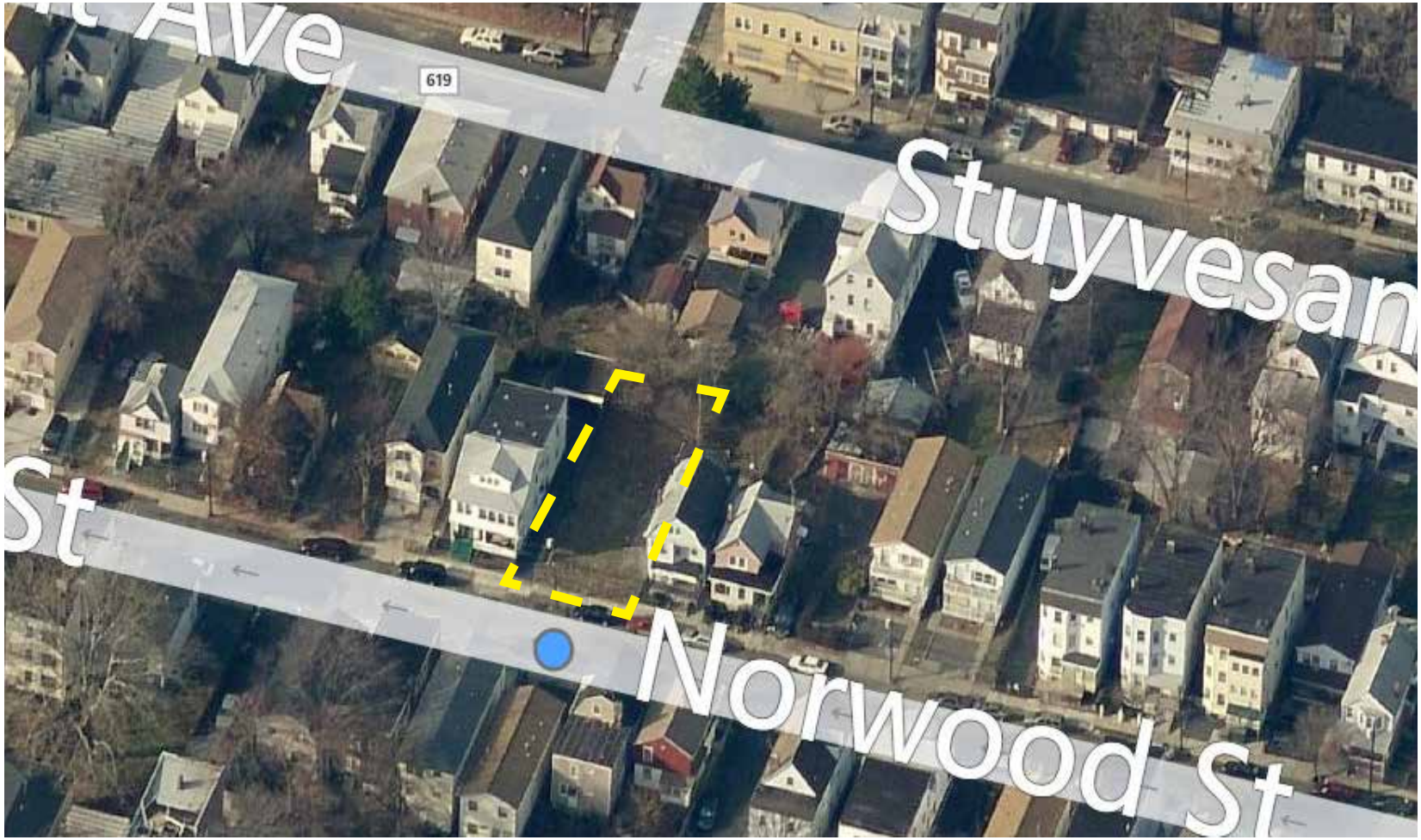
421 Clinton Avenue
Newark, NJ 07108


SHABAZZ
MALCOLM X
on Ave
laza
Hillside

The site is Malcom X Shabazz High School located at 80 Johnson Avenue. The high school garden club will be implementing raised garden beds on the southwest side of the football field. An athletic shed sits on the site near the area of the garden beds. There is an opportunity to install a cistern to collect stormwater runoff from the shed to provide water for the garden. A rain garden can be placed to capture overflow near a catch basin sitting on the south end of the athletic shed.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [x] rain gardens
- [ ] curb cuts
- [ ] stormwater planters
- [ ] rain barrels
- [ ] buffers
- [x] cisterns
- [ ] pervious pavement
- [ ] bioswales
- [ ] depaving

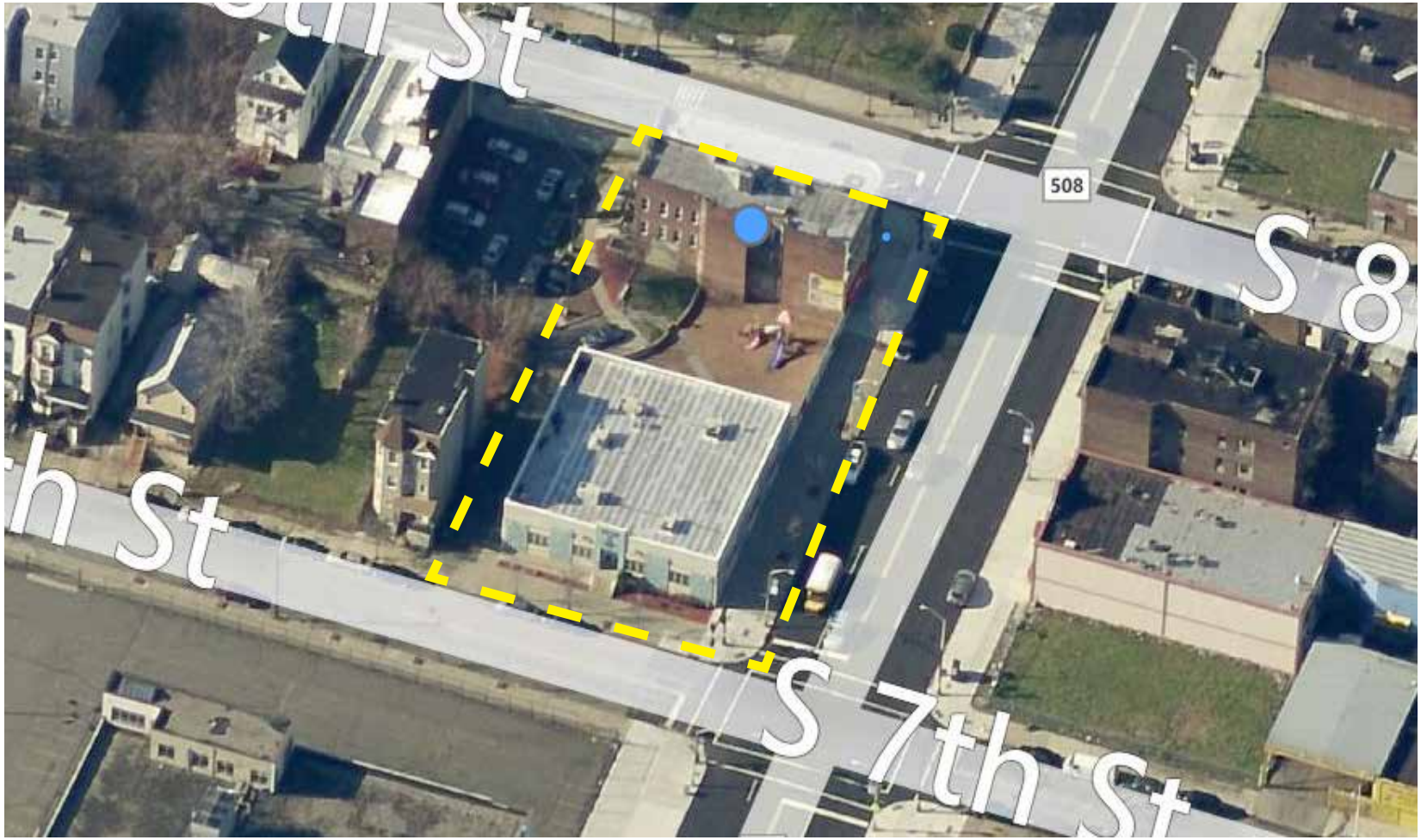

Ave
619
Stuyvesan
St
Norwood St



The site is the Unified Vailsburg Services Organization's community garden located at 69 Norwood Street. There is an opportunity to install a cistern or rain barrels to collect stormwater runoff from the north side of the building to water the garden beds.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- [x] rain gardens
- [ ] curb cuts
- [ ] stormwater planters
- [x] rain barrels
- [ ] buffers
- [x] cisterns
- [ ] pervious pavement
- [ ] bioswales
- [ ] depaving



508 Central Avenue
Newark, NJ 07107



The site is the Urban League of Essex County located at 508 Central Avenue. The west side of the building has several external downspouts that can be disconnected into stormwater planters.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- ☐ rain gardens
- ☐ curb cuts
- ☑ stormwater planters
- ☐ rain barrels
- ☐ buffers
- ☐ cisterns
- ☐ pervious pavement
- ☐ bioswales
- ☐ depaving

GARDEN OF WORKER BEES

179 Broadway
Newark, NJ 07104


The site is the Garden of Worker Bees located at 179 Broadway. The neighboring building has several external downspouts that can be disconnected into a rainwater harvesting system and can provide a source of water for the community garden.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- ☐ rain gardens
- ☐ curb cuts
- ☐ stormwater planters
- ☐ rain barrels
- ☐ buffers
- ☑ cisterns
- ☐ pervious pavement
- ☐ bioswales
- ☐ depaving


Lyons Ave
602



The site is a community garden located at 45 Lyons Avenue. The neighboring building to the north of the site has external downspouts that can be disconnected into a rainwater harvesting system and can provide a source of water for the community garden.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

- ☐ rain gardens
- ☐ rain barrels
- ☐ pervious pavement
- ☐ curb cuts
- ☐ buffers
- ☐ bioswales
- ☐ stormwater planters
- ☑ cisterns
- ☐ depaving

RUTGERS
New Jersey Agricultural
Experiment Station

PASSAIC VALLEY SEWERAGE COMMISSION

"Protecting Public Health and the Environment"