GREEN INFRASTRUCTURE FEASIBILITY STUDY

PERTH AMBOY

RUTGERS
New Jersey Agricultural Experiment Station

ACKNOWLEDGEMENTS

This document has been prepared by the Rutgers Cooperative Extension Water Resources Program with funding provided by Surdna Foundation and the New Jersey Agricultural Experiment Station. This work is intended to provide a feasibility assessment of the City of Perth Amboy with regard to the green infrastructure opportunities in the area.

RUTGERS
New Jersey Agricultural
Experiment Station

TABLE OF CONTENTS

INTRODUCTION

In 2014 the Surdna Foundation awarded funding to the Rutgers Cooperative Extension (RCE) Water Resources Program to help communities with combined sewer systems identify opportunities for implementing green infrastructure.

The RCE Water Resources Program is dedicated to leading the effort of managing these systems using green infrastructure to intercept stormwater runoff, reduce combined sewer overflows (CSOs), manage existing water infrastructure, and minimize frequent flooding events.

Perth Amboy 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, Perth Amboy 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 Perth Amboy to begin implementing green infrastructure practices and demonstrate to residents and local leaders the benefits and opportunities for better managing stormwater runoff.

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

PERTH AMBOY

The City of Perth Amboy is located in Middlesex County and covers an area of approximately six square miles. The City of Perth Amboy has a population of 51,982 according to the 2013 US Census data. The City is unique due to its location at the mouth of the Raritan Bay. With this, it is named “City by the Bay” with many waterfront opportunities as well as quality concerns. The City of Perth Amboy currently holds 16 combined sewer overflow points within its boundaries. Therefore, in the event of a heavy storm, much of the wastewater travels into the Raritan Bay untreated. However, by evaluating the city’s feasibility for green infrastructure, there are cost effective ways to begin to mitigate these issues and improve water quality in the Raritan Bay.

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

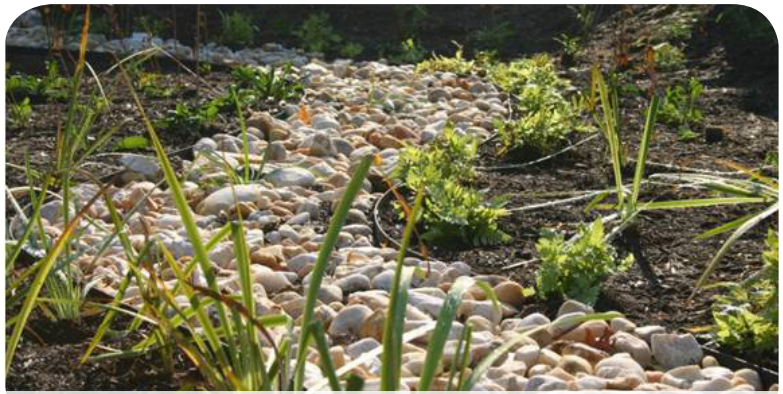

Purple Cone Flower


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.

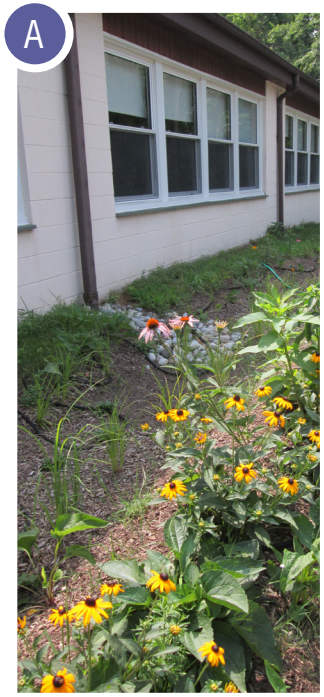
D ***IMPERVIOUS SURFACE:***

An impervious surface is one that water cannot penetrate.

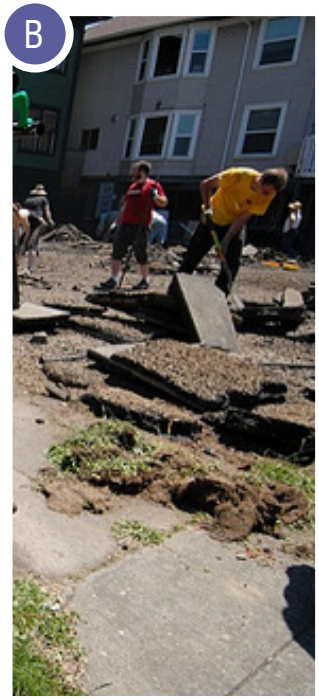
E ***RUNOFF:***

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

A



B



C

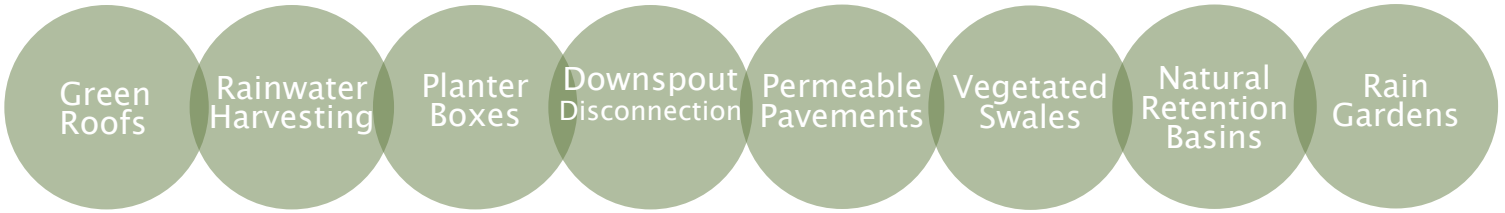

Rain Garden
Water Quality and Habitat
Enhancement Project
This garden is designed to intercept, treat, and infiltrate stormwater at the source, before it becomes runoff. The plants are native to the region and help retain pollutants that could otherwise harm nearby waterways.
Rain gardens are beautiful, low-maintenance, and inexpensive gardens that you can install at home.
www.water.rutgers.edu

D

E

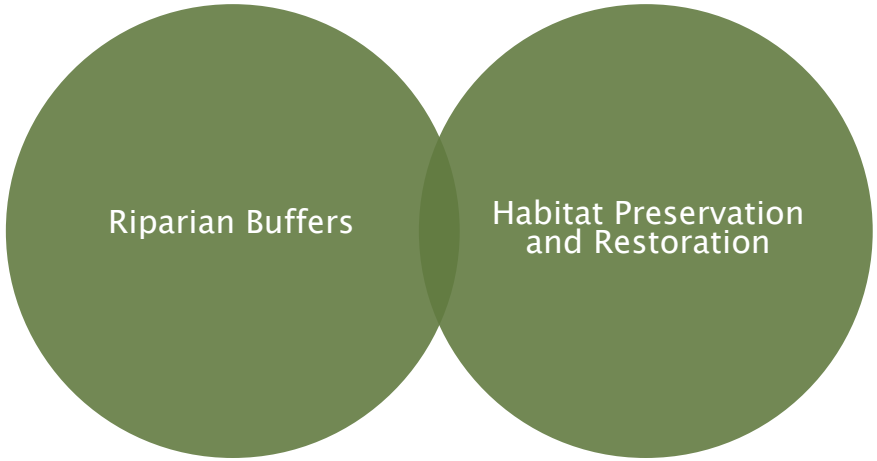
GREEN INFRASTRUCTURE STRATEGIES

SITE



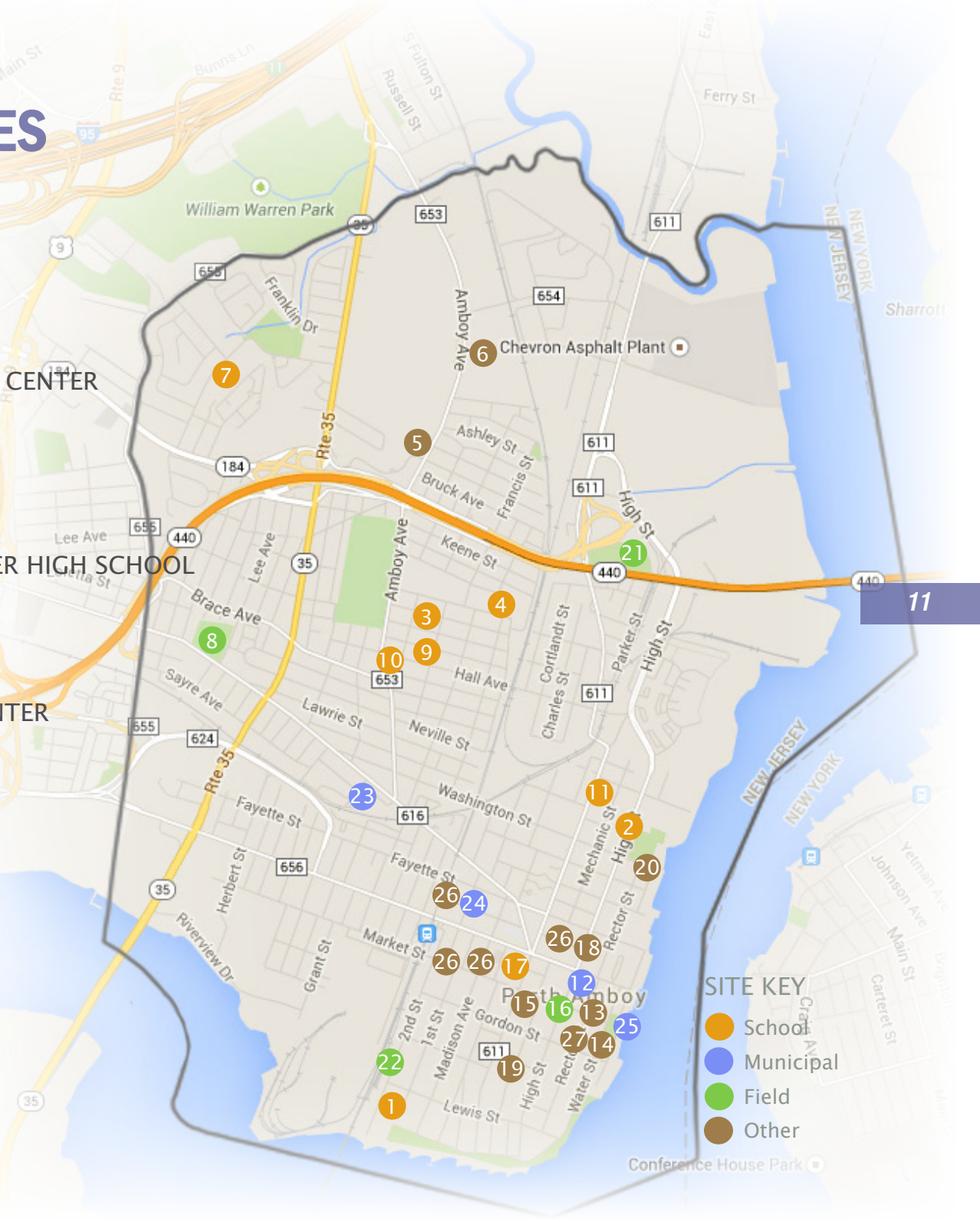
NEIGHBORHOOD

WATERSHED



POTENTIAL PROJECT SITES WITHIN STUDY AREA

1. ROBERT N. WILENTZ ELEMENTARY SCHOOL
2. PERTH AMBOY VOCATIONAL SCHOOL
3. ASSUMPTION CATHOLIC CHURCH/SCHOOL
4. PERTH AMBOY HIGH SCHOOL
5. EDMUND HMIELESKI JR. EARLY CHILDHOOD CENTER
6. PERTH AMBOY BUSINESS PARK
7. JAMES J. FLYNN ELEMENTARY
8. WASHINGTON PARK
9. SAMUEL E. SHULL MIDDLE SCHOOL
10. ACADEMY FOR URBAN LEADERSHIP CHARTER HIGH SCHOOL
11. ST. STEPHEN'S CAMPUS
12. PERTH AMBOY CITY HALL
13. HARBORVIEW CHILD CARE CENTER
14. SCIENCE OF SPIRITUALITY MEDITATION CENTER
15. FIRST BAPTIST CHURCH
16. TRAFFIC CIRCLE PARK
17. WILLIAM C. McGINNIS MIDDLE SCHOOL
18. SIMPSON UNITED METHODIST CHURCH
19. THE PROPRIETARY HOUSE
20. WASHINGTON STREET STREETSCAPE
21. RUDYK PARK
22. 2ND STREET REDEVELOPMENT
23. PUBLIC SAFTEY COMPLEX
24. PERTH AMBOY PUBLIC LIBRARY
25. PERTH AMBOY MARINA
26. PARKING UTILITY PARKING LOTS
27. ST. PETER'S EPISCOPAL CHURCH

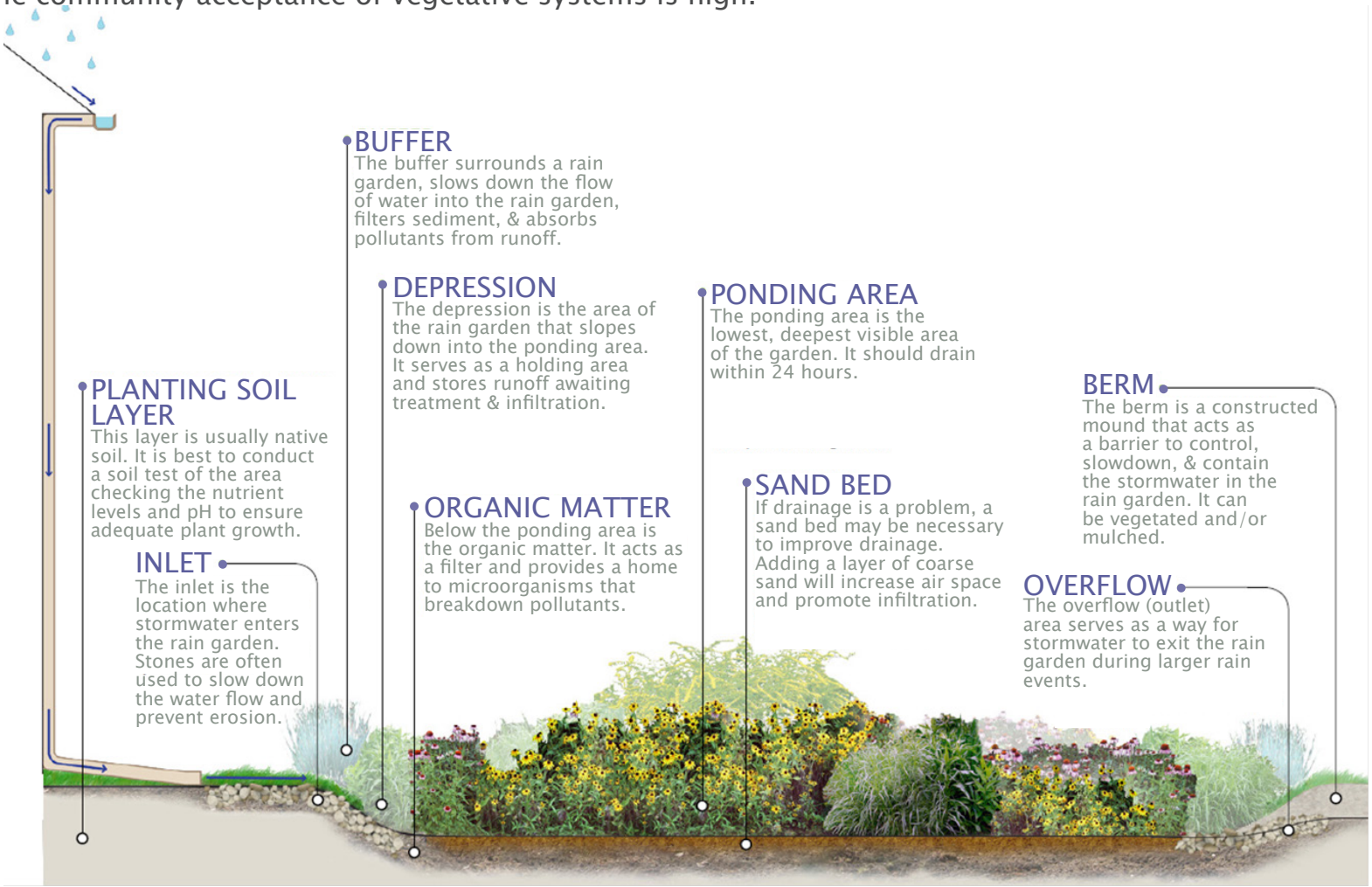



STATE OF
NEW JERSEY
DEPARTMENT OF
ENVIRONMENTAL
PROTECTION

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

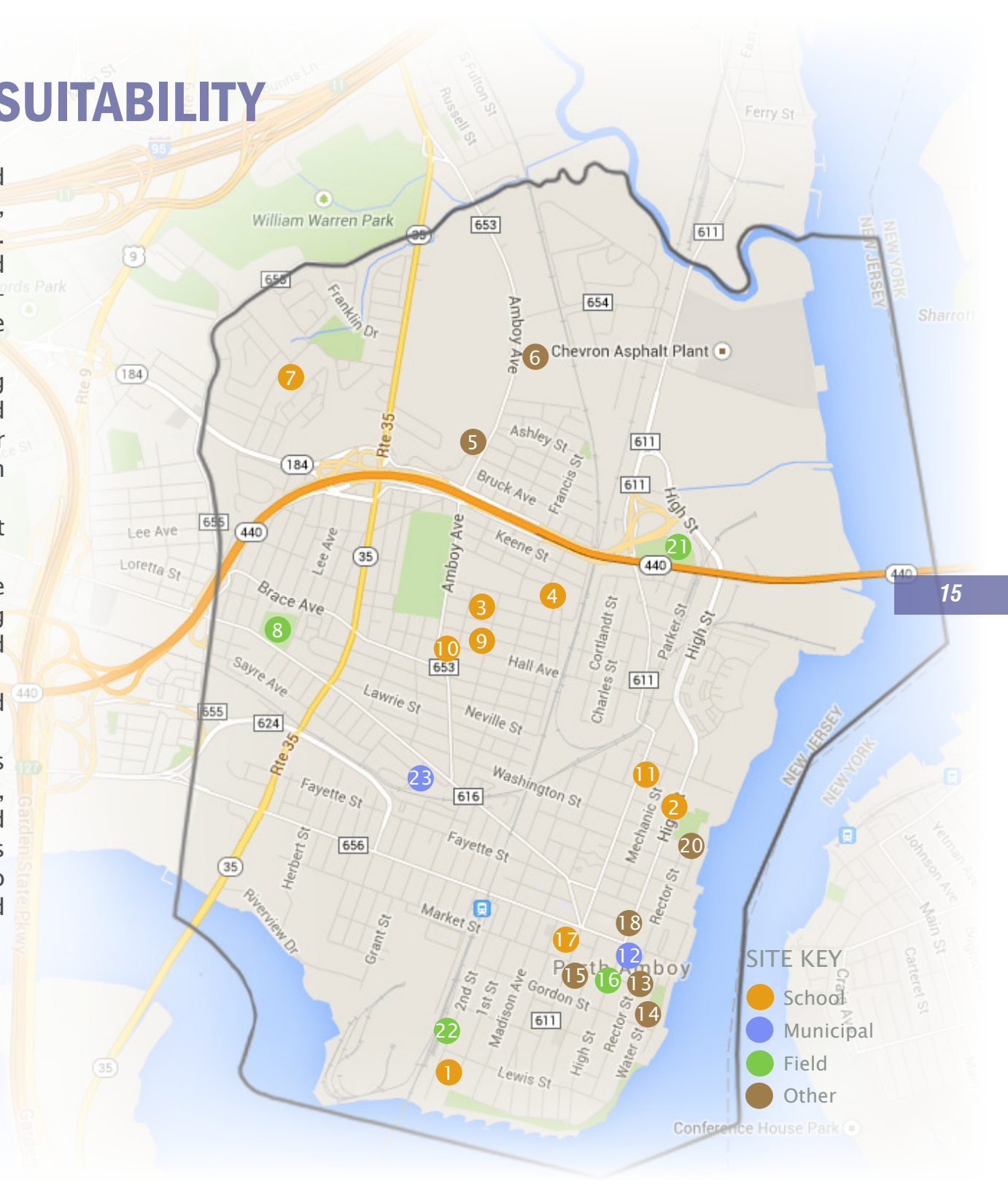
VEGETATED SYSTEM SUITABILITY

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

VEGETATED SYSTEM SUITABILITY: EXAMPLE PROJECT SITE

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.

INLET
Rainwater collected in gutters is released into the barrel here

OVERFLOW OUTLET
Releases water when the rain barrel reaches capacity

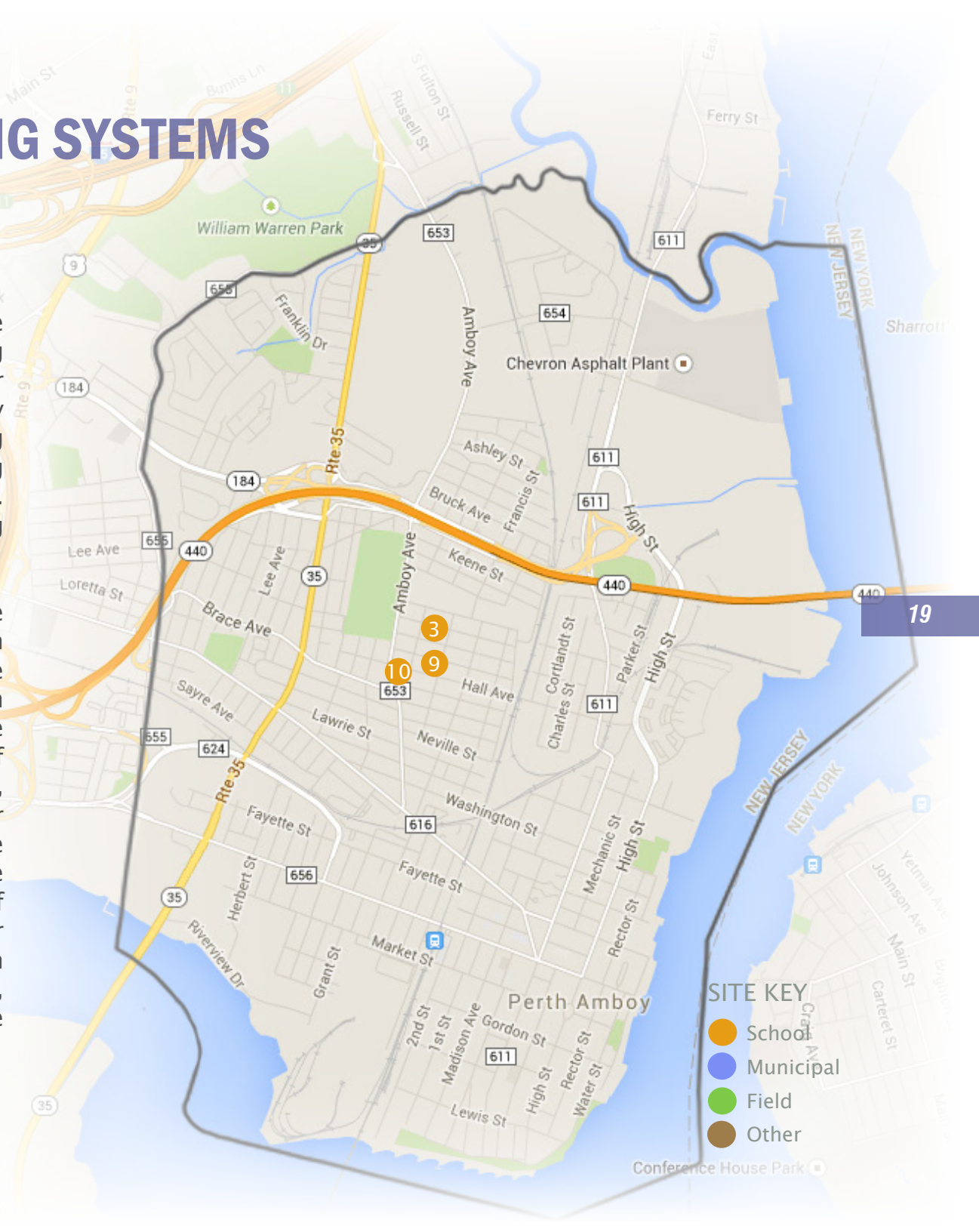
SPIGOT
Valve that opens and closes barrel's water flow

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

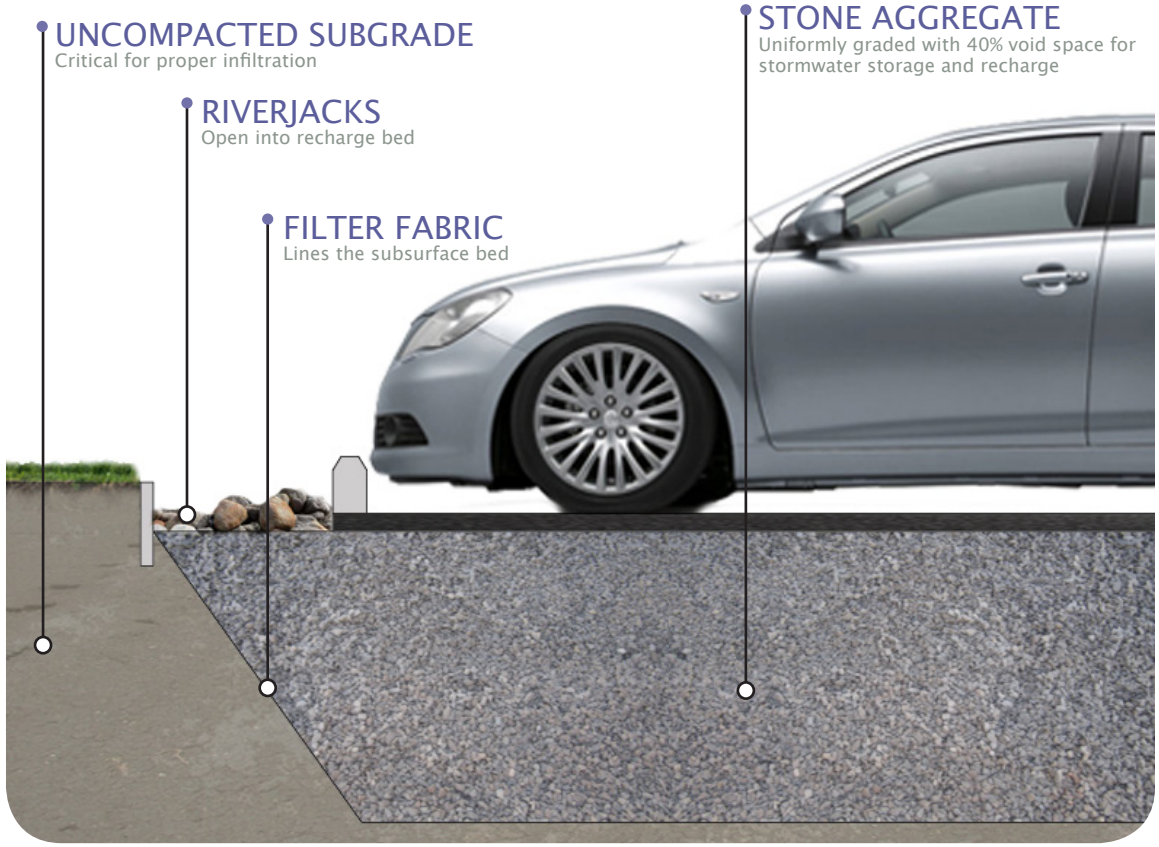
RAINWATER HARVESTING SYSTEM SUITABILITY: EXAMPLE PROJECT SITE

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

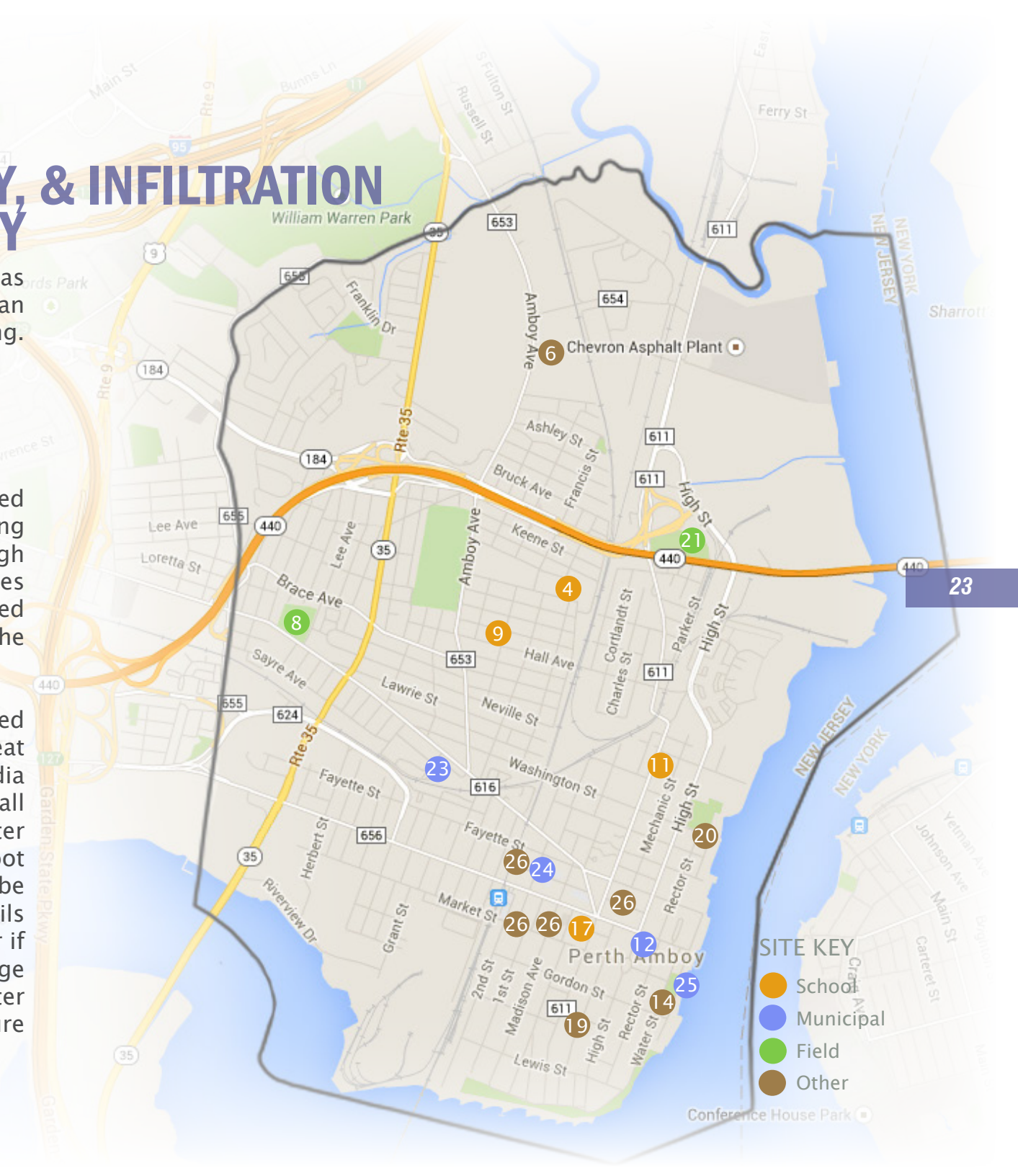
STORAGE, QUANTITY, & INFILTRATION SYSTEM SUITABILITY

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

PERTH AMBOY CITY HALL

260 High Street,
Perth Amboy NJ 08861

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

POROUS ASPHALT

GRAVEL BASE


New Jersey TREE FOUNDATION
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), 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 PERTH AMBOY'S GREEN INFRASTRUCTURE SYSTEMS

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

2. RAINWATER HARVESTING
   - Rain Barrels
   - Cisterns

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 no water can enter and freeze within the barrel
- Weekly check: Check for leaks, clogs and other 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 and make any necessary replacements; inspect cistern cover, screen, overflow pipe, sediment trap and other accessories and make 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

ROBERT N. WILENTZ ELEMENTARY SCHOOL

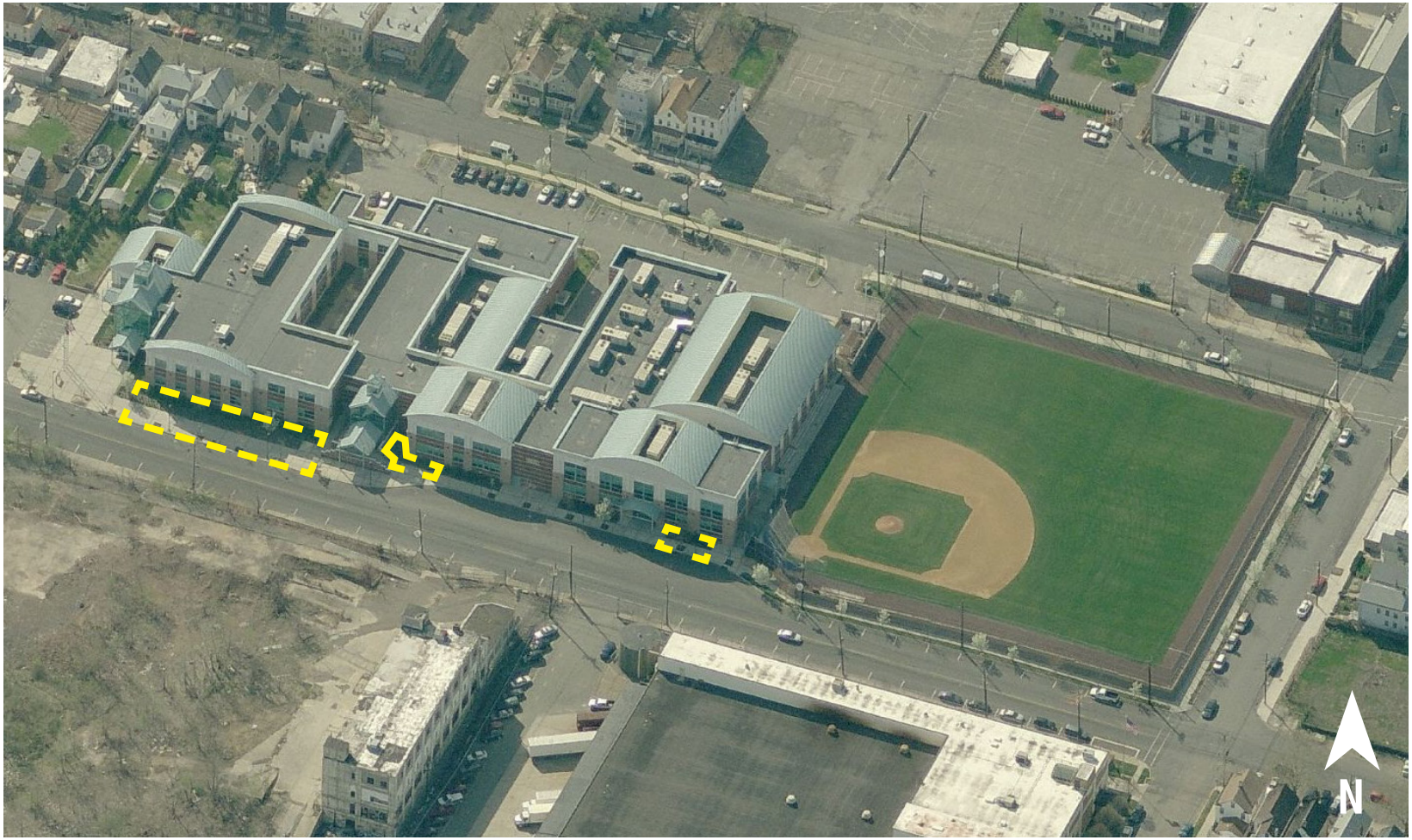
51 1st Street,
Perth Amboy NJ 08861



This site is located at the end of 1st Street. Overall the site slopes from the street to the property's catch basins. To treat this runoff, the site would benefit from a series of rain gardens along the 1st Street entrance. In addition, the southern most edge of the school located on the 2nd Street entrance could benefit from a rain garden to help mitigate the existing erosion occuring from stormwater runoff.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

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


N



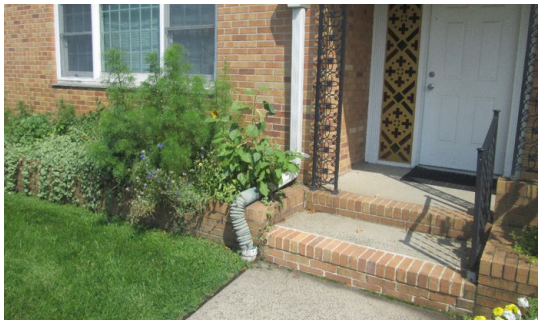
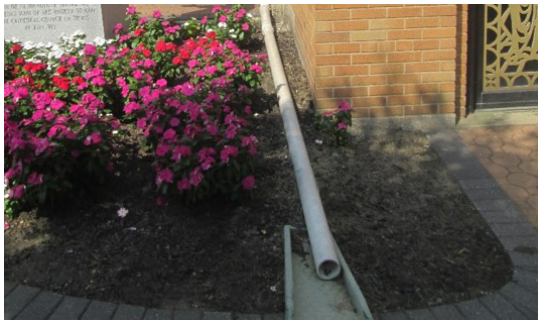
This school is located on High Street between Buckingham Avenue and Washington Street. The majority of site's stormwater runoff comes from the roof and is piped directly to the nearby street. Because of the nearby waterfront, it is critical to treat the water before allowing it to flow into the catch basins. By disconnecting the school's downspouts to flow into rain gardens and stormwater planters, some water will be able to infiltrate into the ground. In addition to the stormwater benefits, these plantings will add aesthetic value to the school's landscape.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

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

ASSUMPTION CATHOLIC CHURCH/SCHOOL

376 Meredith Street,
Perth Amboy NJ 08861


This site is located on Meredith Street. Currently the church roof captures stormwater in traditional downspouts that are connected to the ground through a pipe or directed across impervious surfaces. To help decrease the amount of water entering the CSO system, the site would benefit from rain gardens and stormwater planters to help capture the water on-site, encouraging its infiltration. In addition, the church could implement a rainwater harvesting system (e.g., rain barrels or cisterns) to capture rainwater for future use.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

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

PERTH AMBOY HIGH SCHOOL

300 Eagle Avenue,
Perth Amboy NJ 08861



This school is located on Eagle Avenue and Francis Street. Currently this school provides for the majority of Perth Amboy's high school student population. The site experiences poor drainage and ponding in areas along the lawn. By creating rain garden plantings in areas around the school, stormwater has the ability to infiltrate into the ground. Aside from the lawn area around the school, much of the parking area experiences flooding or ponding in areas along the edges. By providing pervious pavement or pervious parking areas, water can infiltrate, and ponding will be reduced.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

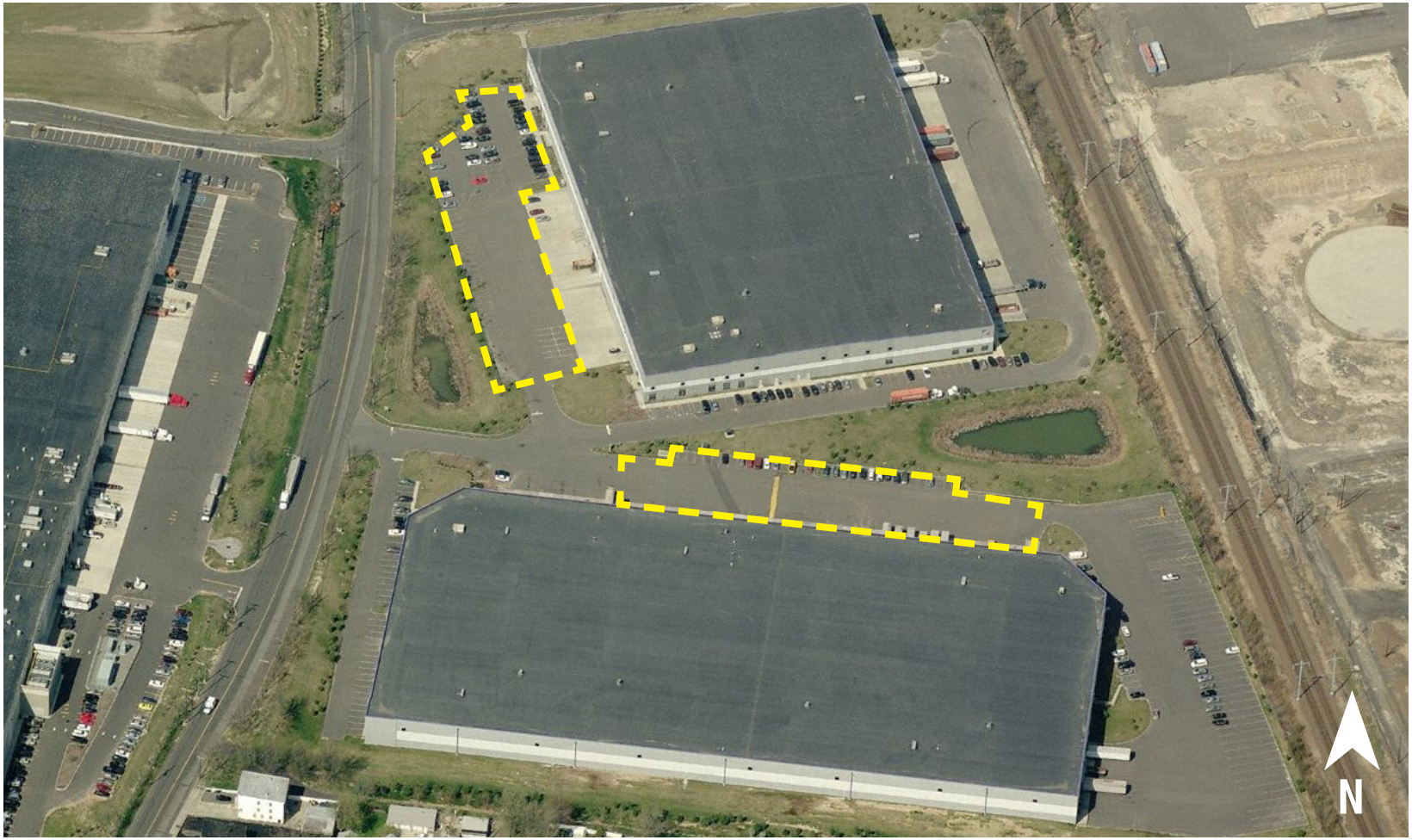
- [x] rain gardens
- [ ] curb cuts
- [ ] stormwater planters
- [ ] rain barrels
- [ ] buffers
- [ ] cisterns
- [x] pervious pavement
- [ ] bioswales
- [ ] depaving


N

The Edmund Hmieleski Early Childhood Center is located on Amboy Avenue. The site is occupied by the building and large depressed lawn areas which collect all runoff in a series of catch basins. Currently stormwater from the building and park area flows toward these catch basins with little to no treatment. By installing rain gardens around these basins, in place of the existing lawn, the runoff will infiltrate and provide water to the plant life.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

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

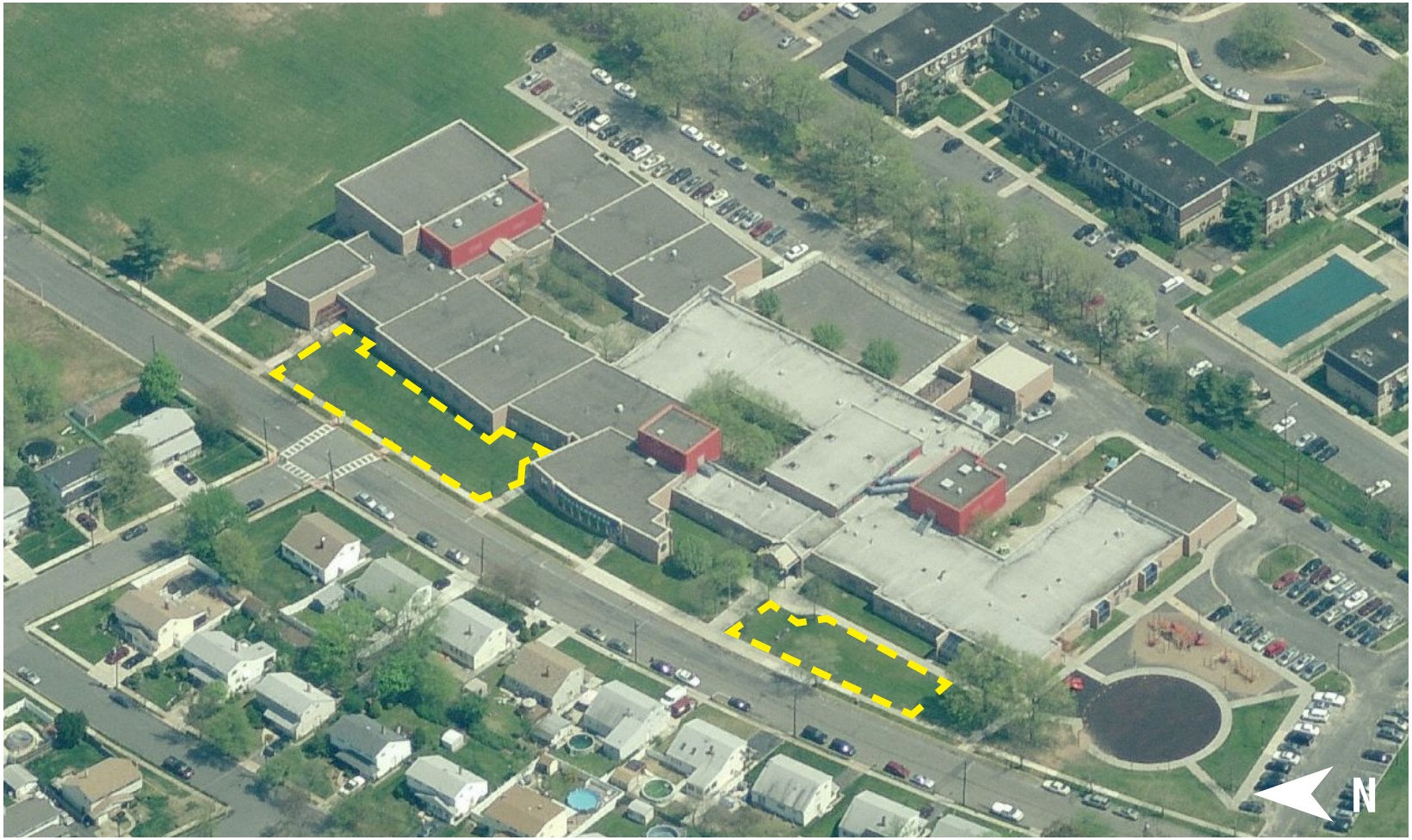

N



This site is located on Amboy Avenue. The site uses traditional catch basins to capture its parking lot runoff. However, with nearby existing swales, the site could benefit from creating curb cuts that direct stormwater into the swales or additional rain garden plantings. In addition, the current state of the asphalt has deteriorated enough to justify its replacement. The site could benefit from porous asphalt as it will promote water infiltration and reduce puddling.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

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


N



James J. Flynn Elementary School is located on Chamberlain Avenue on a large piece of land. The site mostly consists of lawn areas that are depressed to direct stormwater towards their central catch basins. To add aesthetic interest and promote stormwater infiltration, planting rain gardens around these catch basins would be very beneficial to the school's landscape. In addition, providing complementary lessons or student programs can provide students with a knowledge of the importance of green infrastructure.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

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

WASHINGTON PARK

Weirup Street,
Perth Amboy NJ 08861



This site is located on Weirup Street in Perth Amboy. It is a park used for its recreational fields and play area. Currently the park suffers from constant flooding in the play area near the picnic tables. This area would greatly benefit from the installation of porous asphalt to reduce flooding and increase infiltration.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

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

SAMUEL E. SHULL MIDDLE SCHOOL

380 Hall Avenue,
Perth Amboy NJ 08861



Samuel E. Shull Middle School is located on Hall Avenue in the middle of urban Perth Amboy. Currently the students have little to no green outdoor space to play, and there is little stormwater management in practice. By depaving the under-utilized parking area on the southern edge of the building, the space can provide a play area for the students. In addition, the area can manage stormwater through harvesting and infiltration systems. By planting rain gardens and installing porous asphalt, the area will allow stormwater to infiltrate as opposed to just flow to the nearest catch basin. In addition, providing stormwater harvesting systems (e.g., cisterns or rain barrels) can provide water for future gardens or other landscape plants.

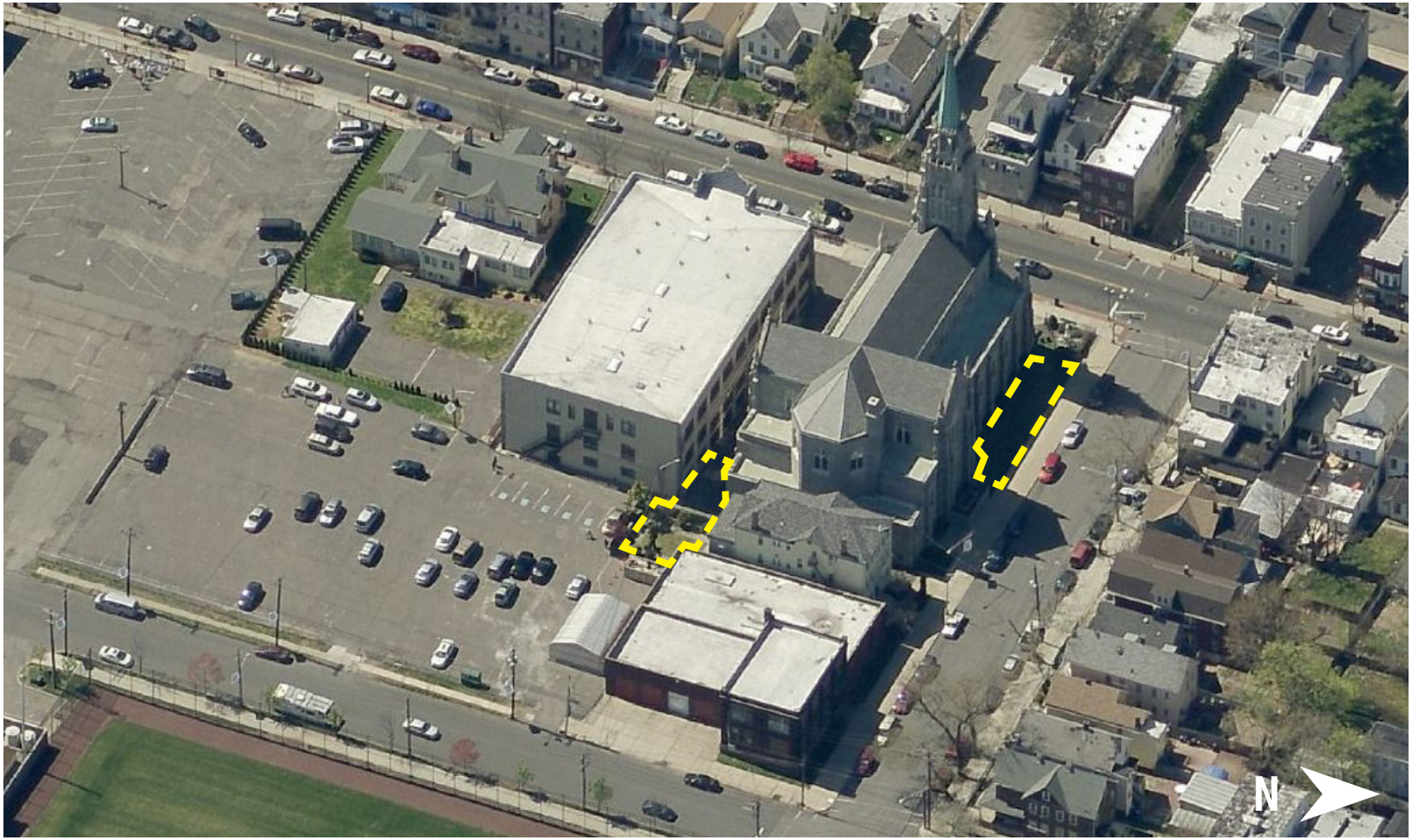
SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

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

The Academy for Urban Leadership Charter High School is located on Amboy Avenue near the edge of Perth Amboy. Currently the site uses traditional downspouts draining into the ground to manage stormwater. However, there are opportunities on the site for disconnecting downspouts into rain garden areas or cistern harvesting systems. In addition to small implementation projects, the paved area between the buildings could be depaved into an outdoor green space for students that manages stormwater through other planted systems.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

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


N



St. Stephens is a site located in a very impervious area of Perth Amboy near State Street. Currently the site manages stormwater through traditional downspouts connected to the ground. This site could benefit from disconnecting downspouts to flow into rain garden plantings along the northern edge of the building. In addition, replacing traditional asphalt with pervious pavement would decrease the quantity of runoff in the CSO system.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

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

PERTH AMBOY CITY HALL

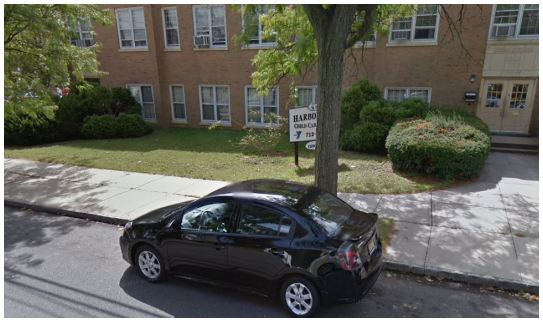
260 High Street,
Perth Amboy NJ 08861

Perth Amboy City Hall is located on High Street near the Perth Amboy waterfront area. Currently, much like the rest of the city, the site manages stormwater through a traditional connected downspout system. These pipes take stormwater off the roof and pipe it to the ground into a large system. To intercept that system and treat water on-site, these traditional downspouts can be disconnected to flow into stormwater planters or over pervious pavers. At City Hall these systems can benefit the site by adding aesthetic value and capturing stormwater runoff.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

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


N



This site is located on Market Street across from the City Hall of Perth Amboy. Currently the site serves a child care center and uses traditional downspouts to manage stormwater. By disconnecting the building's downspouts and installing rain garden plantings, stormwater can infiltrate and recharge the groundwater. In addition to providing stormwater benefits, the gardens can provide aesthetic value and educational benefits to the site.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

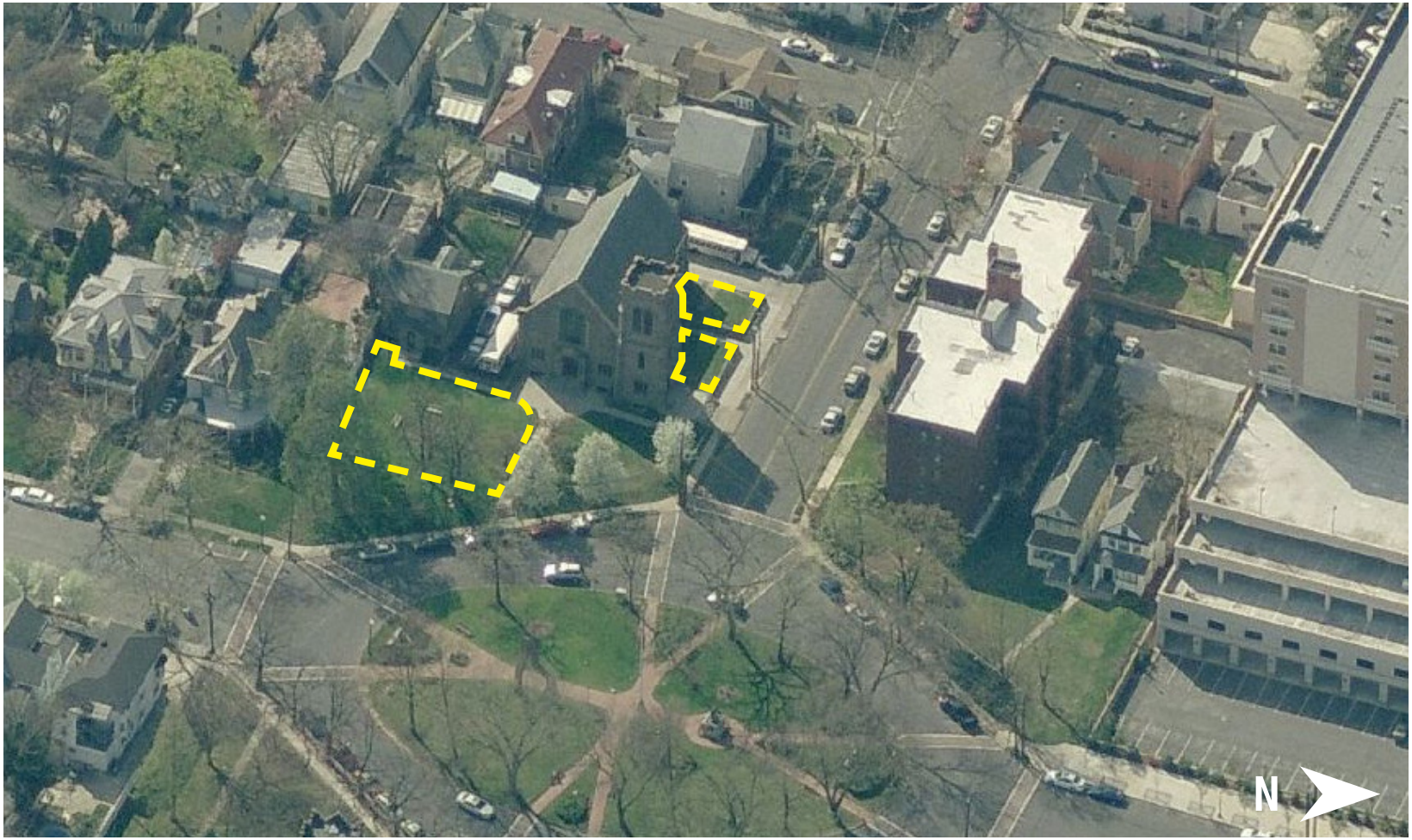
- [x] rain gardens
- [ ] curb cuts
- [ ] stormwater planters
- [ ] rain barrels
- [ ] buffers
- [ ] cisterns
- [ ] pervious pavement
- [ ] bioswales
- [ ] depaving


N

The Science of Spirituality Meditation Center is located on the corner of Market Street and Water Street. The site drains toward the street where stormwater flows into the nearest catch basin. By installing rain garden plantings and pervious pavement, stormwater runoff can be reduced. Both systems can promote infiltration and stormwater treatment prior to flowing into waterways.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

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

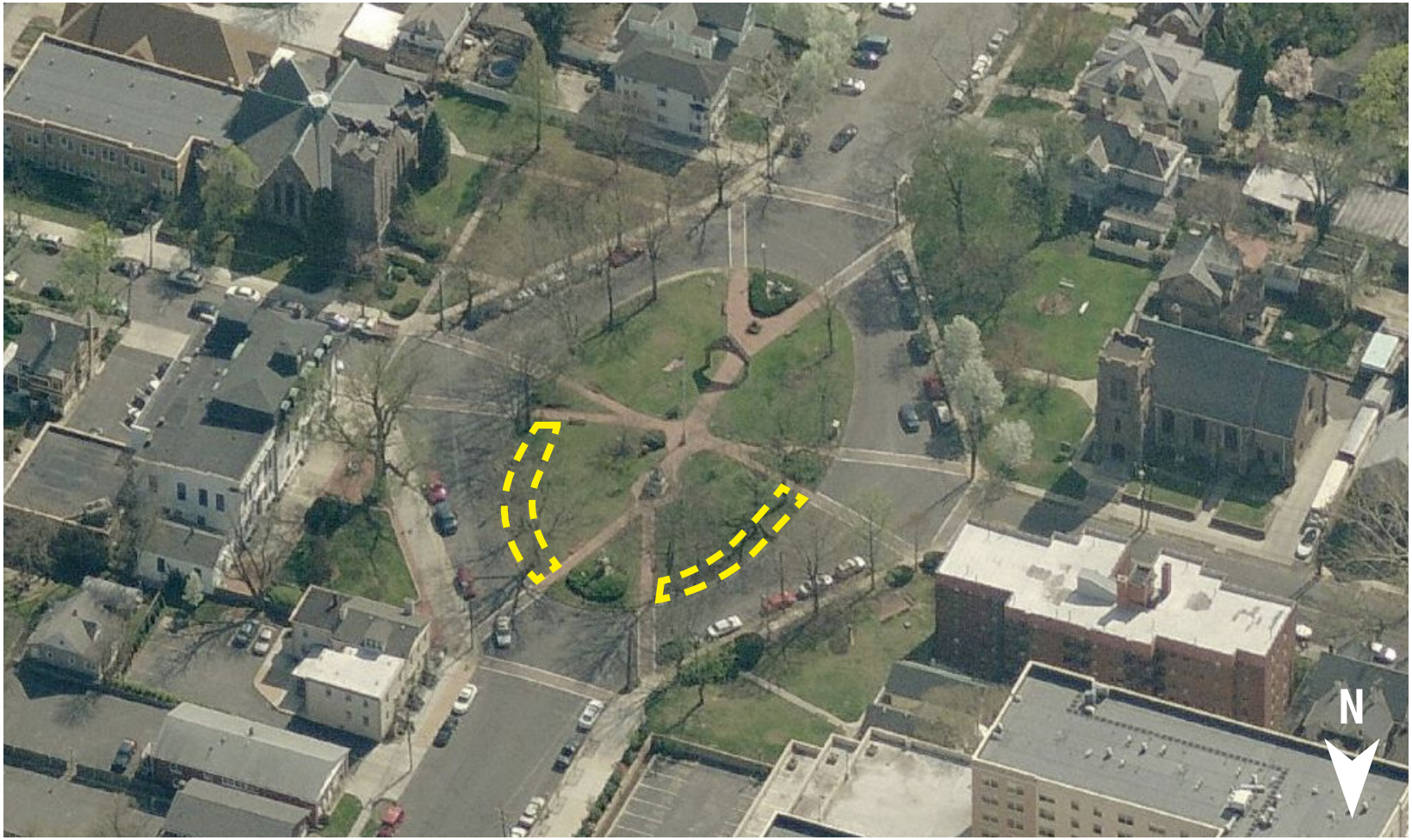

N



This site is located on the corner of Market Street and High Street in Perth Amboy. The site slopes toward the road on either side of the street corner. Currently the site uses downspouts to manage stormwater collected on the roof. Each downspout is connected to a larger piping system in the ground. These downspouts can be disconnected to flow into stormwater planters or rain gardens to help increase infiltration and decrease runoff.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

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



TRAFFIC CIRCLE AT HIGH STREET AND MARKET STREET

Intersection of High St. & Market St.,
Perth Amboy NJ 08861



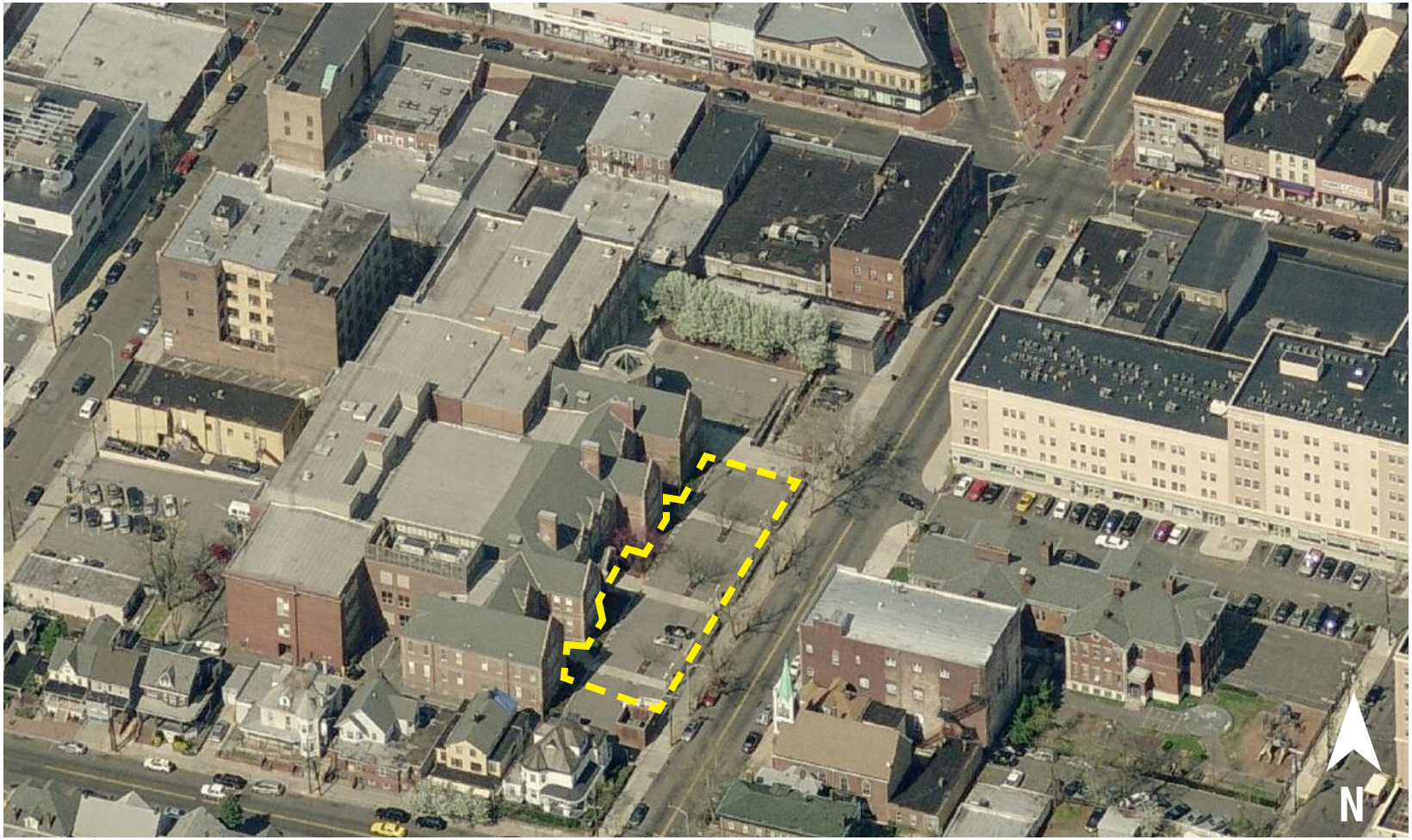
This site is located at the intersection of High Street and Market Street in the center of Perth Amboy. The area is designed as a park space for visitors to sit or stroll safely through the large intersection. Because of the site's elevation an slope, most of the stormwater on this site, as well as the road, flows to one catch basin on the southern edge of High Street. By installing bioswales along the edges of the park, stormwater can be collected from both the site and the roadway. This will help to redirect the water from the catch basin, lowering the overall volume in the combined sewer system.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

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

TRAFFIC CIRCLE AT HIGH STREET AND MARKET STREET

Intersection of High St. & Market St.,
Perth Amboy NJ 08861



WILLIAM C. MCGINNIS MIDDLE SCHOOL

271 State Street,
Perth Amboy NJ 08861



This site is located on State Street in Perth Amboy. Currently the site provides no green space and manages stormwater through traditional downspout systems. This site could benefit from a large scale depaving project that allows for additional green space to be added and downspout disconnection. To help capture the stormwater from the disconnected downspouts, the site could use infiltration or vegetative systems such as pervious pavement and rain gardens.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

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

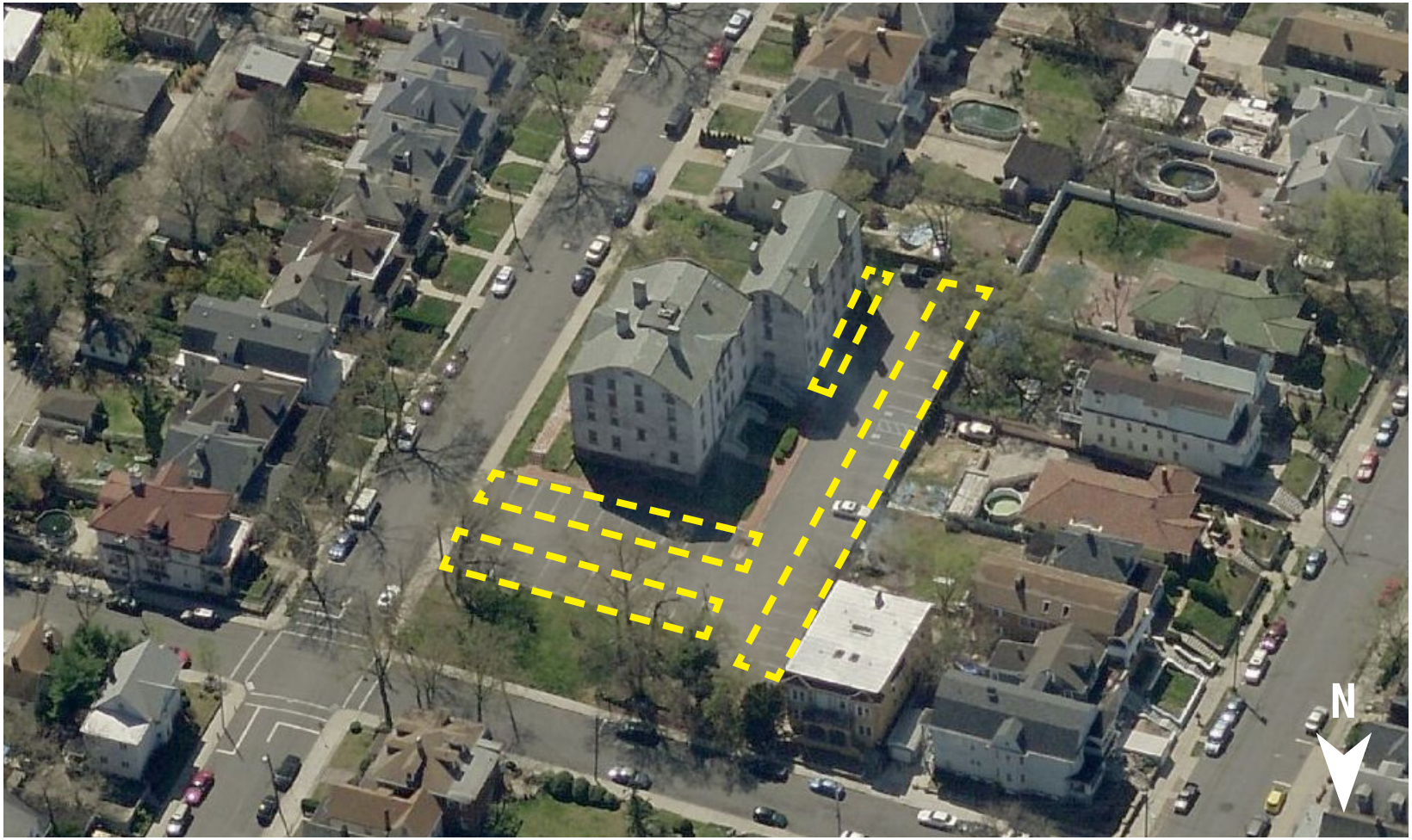

N



The Simpson United Methodist Church is located on the corner of High Street and Jefferson Street. The site slopes toward the north facade. Currently the site has no visible stormwater management strategy. By implementing rain garden plantings and curb cuts along the western facade of the church, the area can capture stormwater from both the building and the adjacent road. In addition, the southern facade could benefit from a small depaving project or stormwater planters.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

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


N

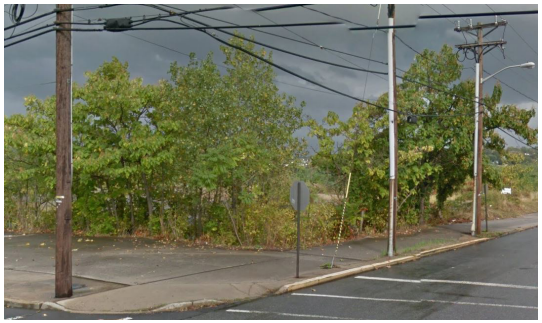
The Proprietary House is a historic landmark in the City of Perth Amboy. Currently the site uses a traditional downspout system to manage stormwater. However, by disconnecting those downspouts and replacing the parking lot with pervious pavement, stormwater can be managed without compromising the historical integrity of the site.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

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

WASHINGTON STREET STREETSCAPE

High Street & Washington Street,
Perth Amboy NJ 08861



The Washington Street streetscape is located adjacent to the old Rosegarten Tract. Currently the streetscape is in poor condition, allowing stormwater to flow along the edge of the roadway. However, with future design plans for a restored park, the streetscape could benefit from stormwater management. Implementing curb cuts, bioswales, and pervious pavement could help mitigate any stormwater from the road as well as help redirect it to the adjacent parkland. This will not only provide aesthetic value but much needed stormwater mitigation in an area so close to the waterfront.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

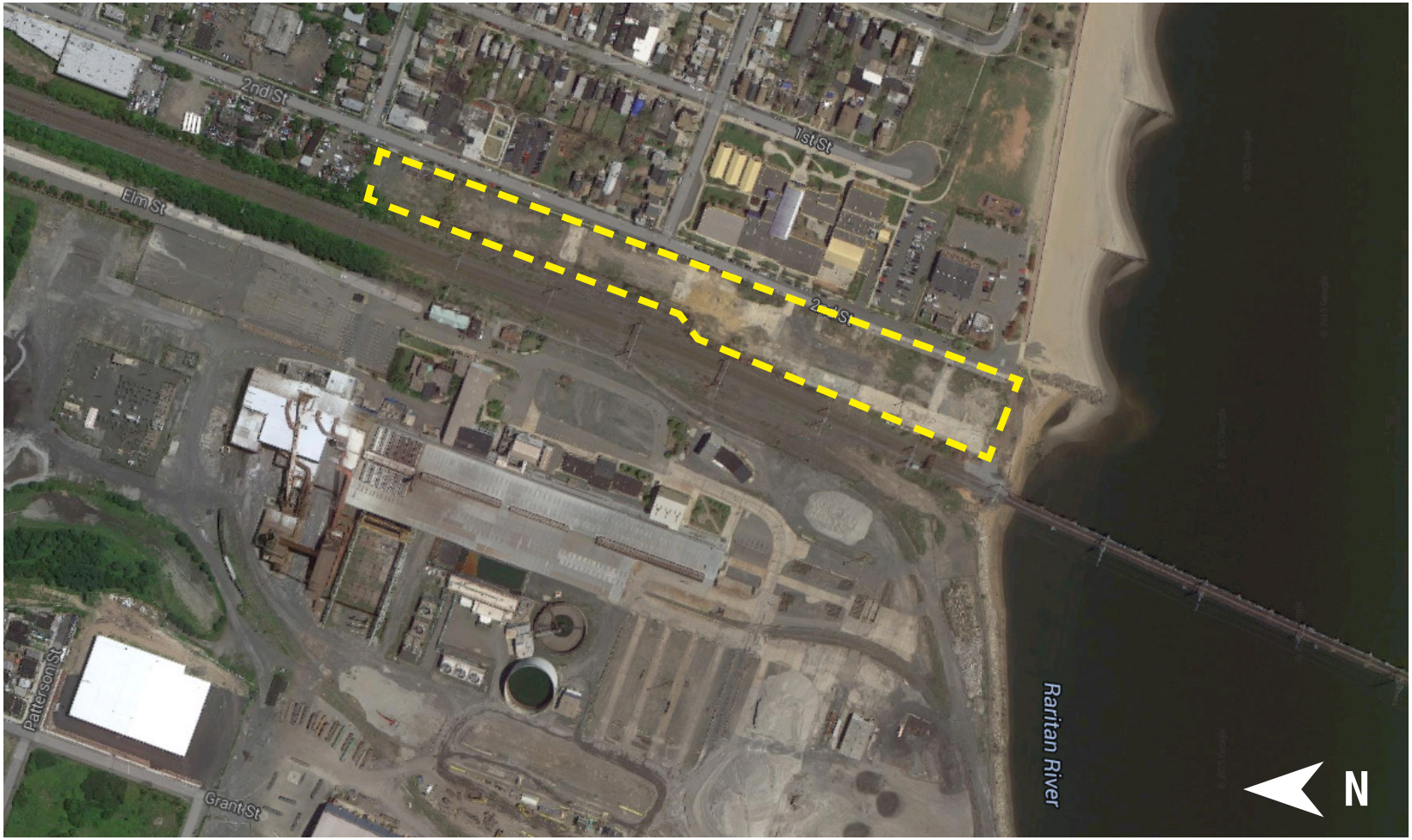
- ☐ rain gardens
- ☑ curb cuts
- ☐ stormwater planters
- ☐ rain barrels
- ☐ buffers
- ☐ cisterns
- ☑ pervious pavement
- ☑ bioswales
- ☐ depaving


N

This site is located at the end of Valley Place underneath the Outerbridge Crossing. The site is currently used for its recreational fields with a small dwelling with public restrooms. Overall, this site could benefit from a series of small implementation projects. Providing curb cuts and rain gardens in the area around the public restrooms will allow roof runoff to be captured. In addition, resurfacing degraded pavement and the basketball courts with pervious pavement will encourage stormwater infiltration in those areas.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

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

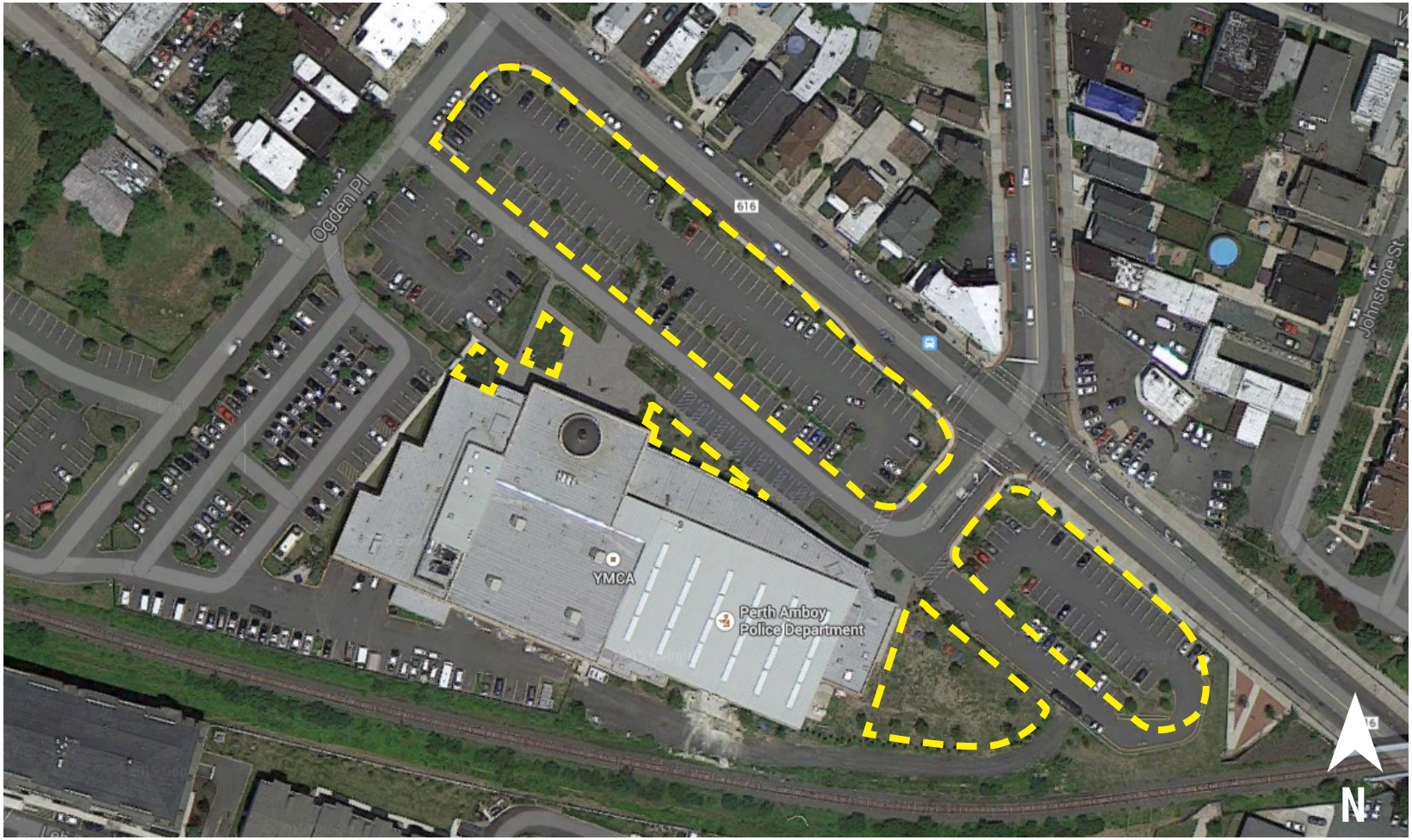

2nd St
1st St
Elm St
Patterson St
Grant St
Raritan River
N



This site is located on western edge of Perth Amboy. At the end of 2nd street, the strip of undeveloped land sits across the street from the Robert N. Wilentz Elementary School. Currently, the property is being conceptualized into a park by the Rutgers University Center for Urban Sustainability. The plan using passive program and stormwater management to develop the park design. The site could benefit from raingardens and bioswales to help collect stormwater runoff from the adjacent roadway, future park pathways, and right-of-way.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

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



PUBLIC SAFETY COMPLEX

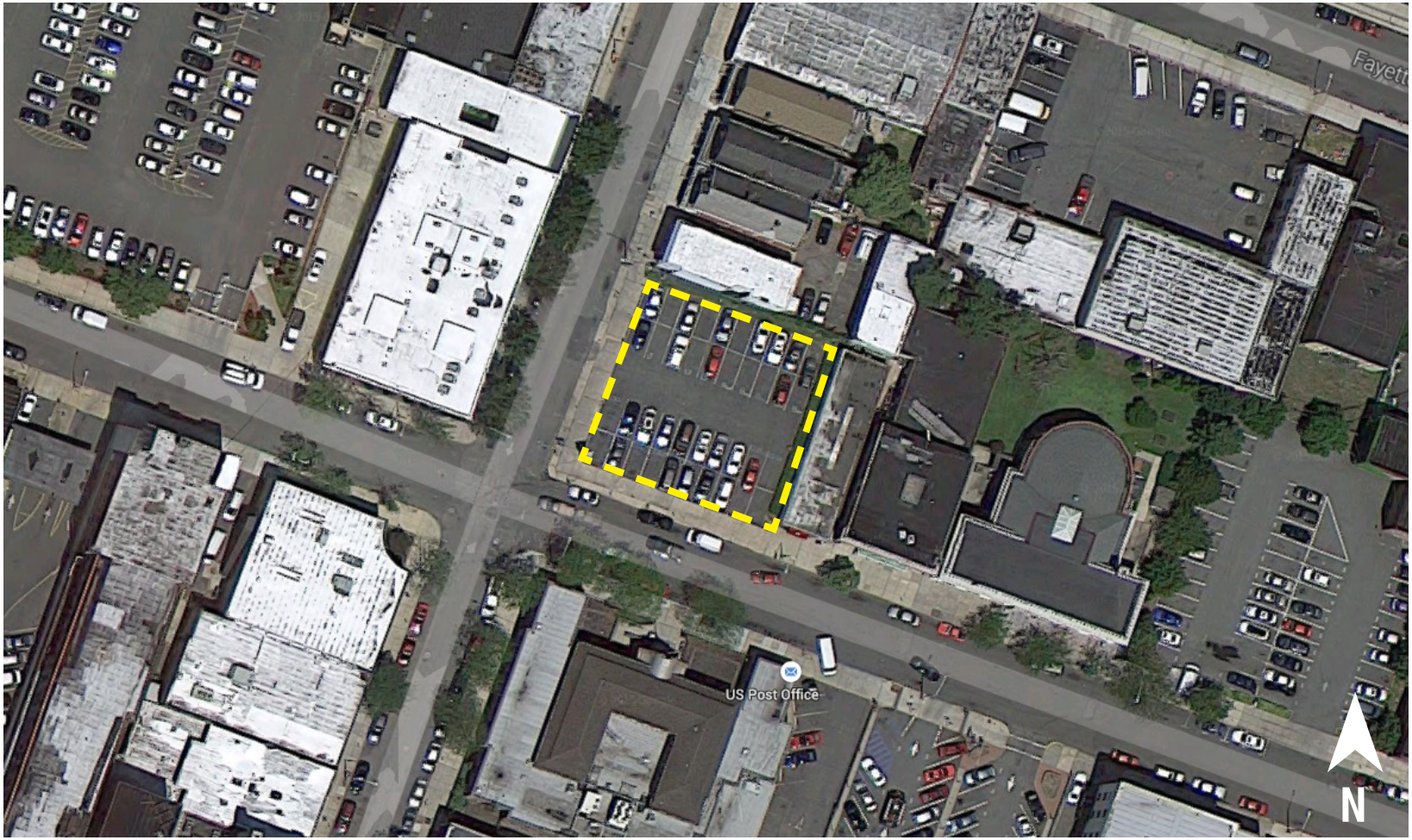
365 New Brunswick Avenue,
Perth Amboy NJ 08861



This site is located on New Brunswick Avenue as a new development built to serve as the Perth Amboy Police headquarters. Currently the site sits at the intersection of the New Brunswick Avenue and the old historic rainline in Perth Amboy. With the site surrounded by parking areas and excess lawn area there are many opportunities for green infrastructure. Although fairly new today, in the future the site would benefit from porous asphalt parking lots. In addition, the site would benefit from raingardens to add both a stormwater and aesthetic value. Given the size of the structure, the site could also benefit from a cistern to harvest rainwater and use it to wash the police vehicles

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

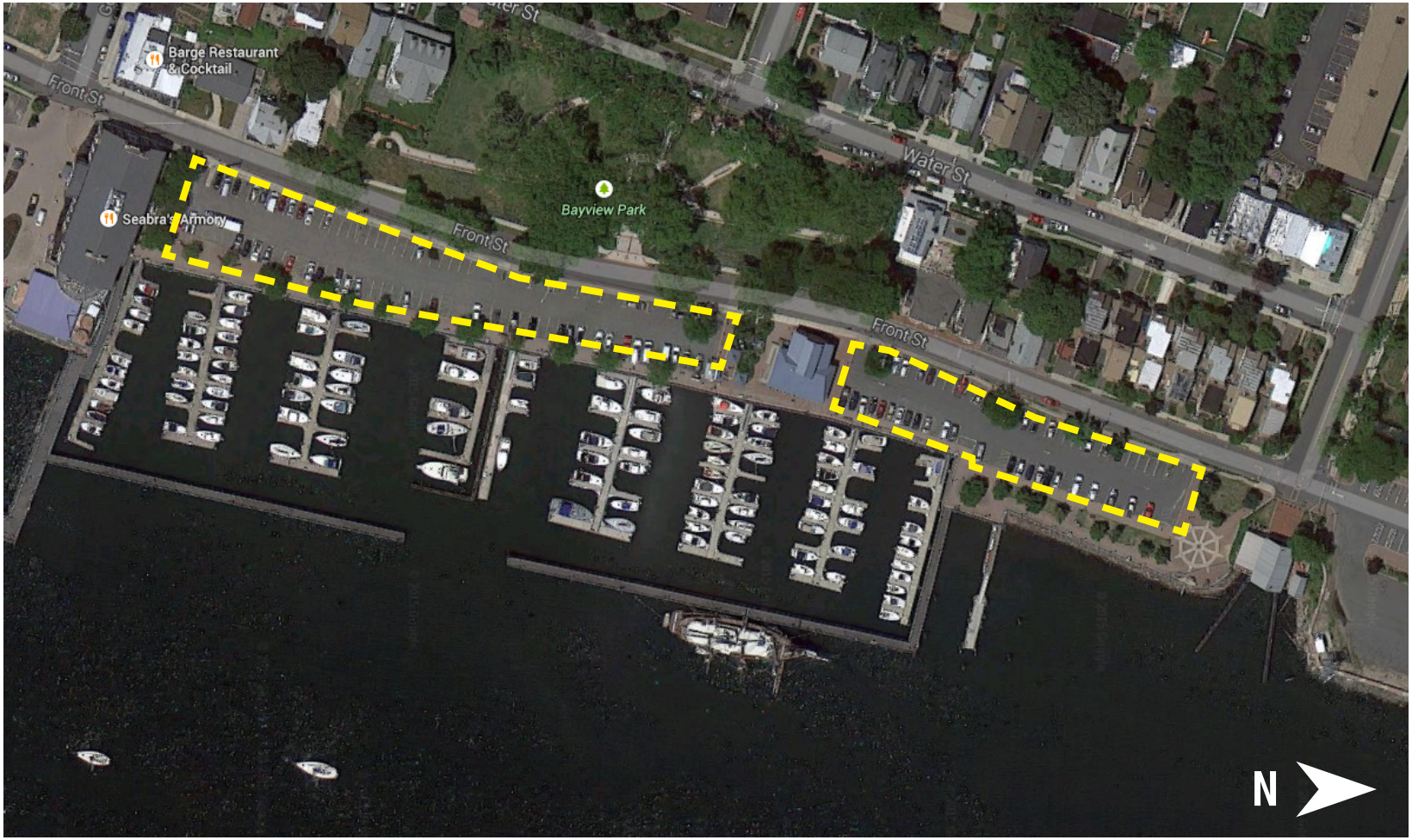
- [x] rain gardens
- [x] curb cuts
- [ ] stormwater planters
- [ ] rain barrels
- [ ] buffers
- [x] cisterns
- [x] pervious pavement
- [ ] bioswales
- [ ] depaving


US Post Office
N

This site ie located at the corner of Maple Street and Jefferson Street adjacent to the public library building. The parking lot serves as free parking for those visiting the Perth Amboy Public Library. Currently, the site accomodates for no stormwater, and all of the runoff flows to the nearby catch basin. To intercept that process, the site would benefit from porous aphsault.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

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



PERTH AMBOY MARINA PARKING LOT

260 Front Street,
Perth Amboy NJ 08861



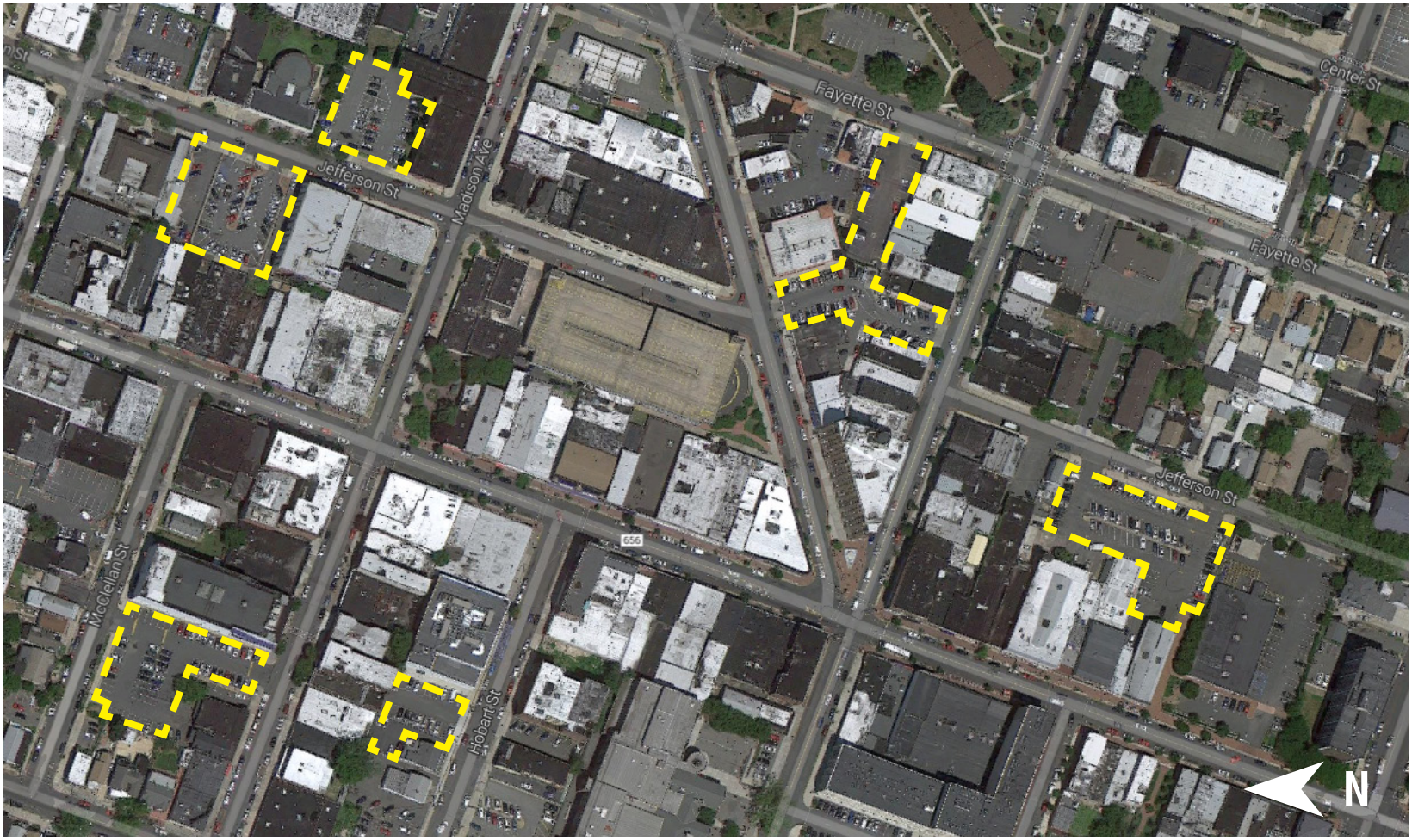
This site is located on Front Street adjacent to the Perth Amboy Marina. Due to its direct connection to the Raritan river it is imperative that runoff be captured and treated site prior to entering the waterway. The site could benefit from porous pavement and bioswales to help capture both the runoff from the roadway and the parking area itself.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

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

PERTH AMBOY MARINA PARKING LOT

260 Front Street,
Perth Amboy NJ 08861



PARKING UTILITY PARKING LOTS

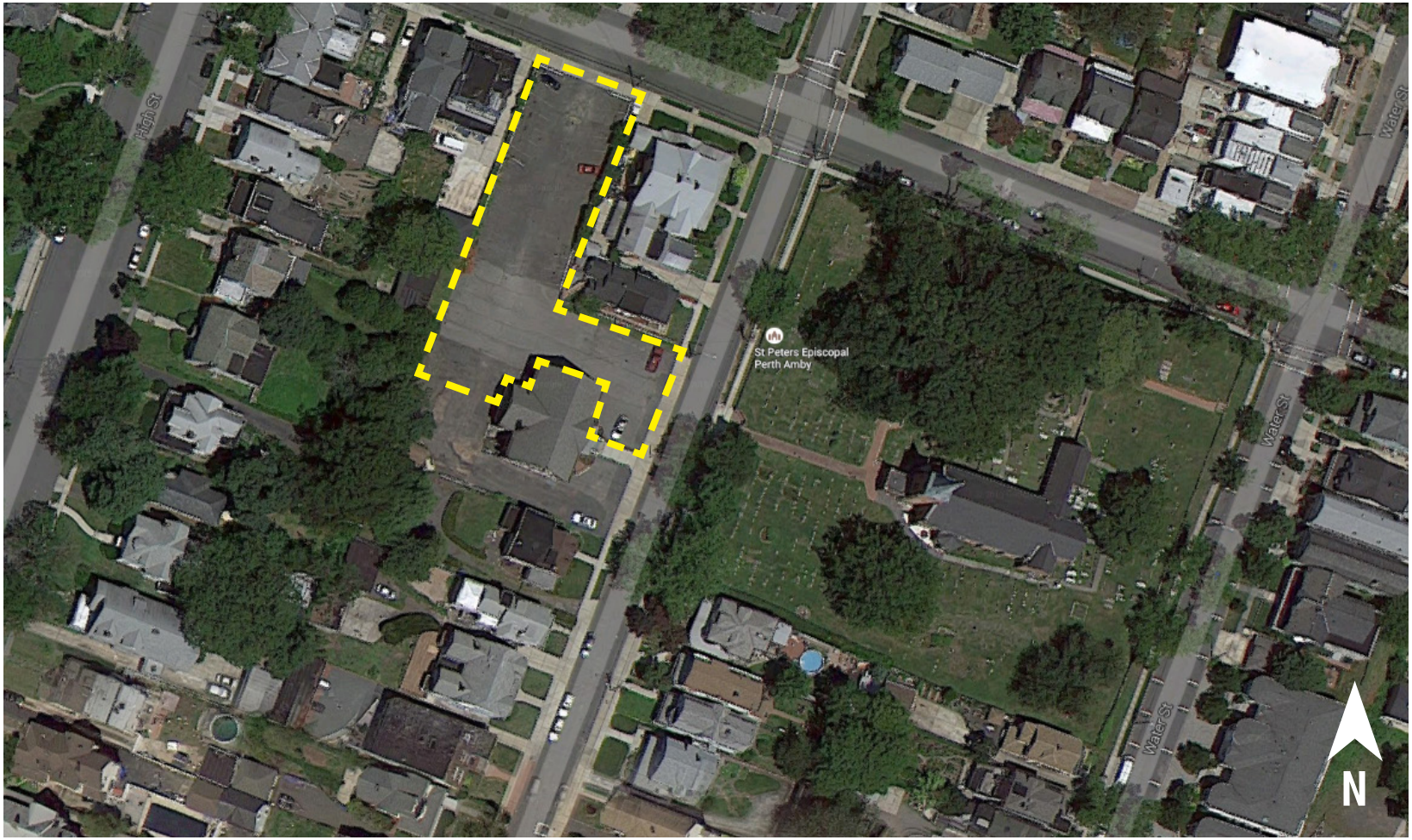


The following sites are designated municipal parking lots. They serve as great opportunites for porous asphalt to capture both stormwater runoff and rainwater that falls during the storm.

Lot A	185 Jefferson Street
Lot B	196 Jefferson Street
Lot C	103 Jefferson Street
Lot 4	Hobart Street
RDH Lot	269 Madison Avenue
Lot 9	New Brunswick Avenue & State Street
Train Station Lot	Smith Street

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

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



ST. PETER'S EPISCOPAL CHURCH



The St. Peter's Episcopal Church is located on Rector Street at the corner of Rector Street and Gordon Street. The current parking area is located across the street. The condition of the lot is poor and would benefit from the installation of porous asphalt. The site could benefit from porous pavement to help capture both the runoff from the roadway and the parking area itself.

SUITABLE GREEN INFRASTRUCTURE STRATEGIES:

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

RUTGERS
New Jersey Agricultural Experiment Station