GREEN INFRASTRUCTURE FEASIBILITY STUDY

JERSEY CITY

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

RUTGERS
New Jersey Agricultural Experiment Station

ACKNOWLEDGEMENTS

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

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

"Protecting Public Health and the Environment"

New Jersey Agricultural Experiment Station

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GLOSSARY OF GREEN INFRASTRUCTURE TERMINOLOGY

1 **BEST MANAGMENT PRACTICE (BMP)**

Activities or structural improvements that help reduce the quantity and improve the quality of stormwater runoff

2 **COMBINED SEWER OVERFLOW (CSO)**

During wet weather events, stormwater flows can exceed the capacity of the combined sewer system and/or the sewage treatment plant causing an overflow of a slurry of untreated wastewater and stormwater to local waterways.

3 **COMBINED SEWER SYSTEM (CSS)**

A wastewater collection system designed to carry sanitary sewage (consisting of domestic, commercial, and industrial wastewater) and stormwater (surface drainage from rainfall or snowmelt) in a single pipe to a treatment facility

4 **CONNECTED IMPERVIOUS SURFACE**

When stormwater runoff flows directly from an impervious surface to a local waterway or a sewer system, the impervious surface is considered "connected" or "directly connected."

5 **DISCONNECTED IMPERVIOUS SURFACE**

When stormwater runoff flows from an impervious surface onto a pervious surface or into a green infrastructure practice prior to entering a local waterway or a sewer system, the impervious surface is considered "disconnected."

6 **GREEN INFRASTRUCTURE PRACTICE**

A stormwater management practice that captures, filters, absorbs, and/or reuses stormwater to help restore the natural water cycle by reducing stormwater runoff, promoting infiltration, and/or enhancing evapotranspiration

7 **IMPERVIOUS COVER ASSESSMENT (ICA)**

Readily available land use/land cover data from the New Jersey geographic information system (GIS) database are used to determine the percentage of impervious cover in municipalities by subwatershed. The ICA includes calculations of stormwater runoff volumes associated with impervious surfaces.

8 **IMPERVIOUS COVER REDUCTION ACTION PLAN (RAP)**

A plan that identifies opportunities to retrofit specific sites with green infrastructure practices to reduce the impacts of stormwater runoff from impervious surfaces

9 **IMPERVIOUS SURFACE**

Any surface that has been covered with a layer of material so that it is highly resistant to infiltration by water (e.g., paved roadways, paved parking areas, and building roofs)

10 **LONG-TERM CONTROL PLAN (LTCP)**

A systemwide evaluation of the sewage infrastructure and the hydraulic relationship between sewers, precipitation, treatment capacity, and overflows; it identifies measures needed to eliminate or reduce the occurrence of CSOs

11 **LOW IMPACT DEVELOPMENT (LID)**

A land planning and engineering design approach that emphasizes conservation and use of on-site natural features to manage stormwater runoff and protect water quality

12 **MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4)**

A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains) that transports stormwater runoff to local waterways or stormwater facilities such as a detention basin

13 **NONPOINT SOURCE (NPS) POLLUTION**

"Nonpoint source pollution" is also called "people pollution." It is the pollution that comes from our everyday lives. It is the fertilizers that wash off farms and lawns. It is the pet waste that washes into streams. It is the sediment (or soil) that erodes from the land into local waterways. It is the oil and grease that comes from parking lots. Finally, it is the pollutants such as nitrogen, phosphorus, and heavy metals that settle out of the atmosphere onto roads and rooftops. When it rains, stormwater runoff carries nonpoint source pollution and may ultimately wash it into waterways.

14 **PERVIOUS SURFACE**

Any surface that allows water to pass through it (e.g., lawn area)

15 **STORMWATER RUNOFF**

The water from rain or melting snows that can become "runoff" flowing over the ground surface and returning to lakes and streams

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.

By using cost-effective green infrastructure practices, Jersey City can begin to reduce the negative impacts of stormwater runoff and decrease the pressure on local infrastructure and 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.

For Jersey City, potential green infrastructure projects have been identified. Each project has been classified as a mitigation opportunity for recharge potential, total suspended solids removal, and stormwater peak reduction. For each proposed green infrastructure practice, detailed green infrastructure information sheets provide an estimate of gallons of stormwater captured and treated per year. Additionally, concept designs for eleven of the potential green infrastructure projects have been developed. These concept designs provide an aerial photograph of the site and details of the proposed green infrastructure practices. Lastly, Appendix A of this document offers information about community engagement opportunities related to green infrastructure, while Appendix B provides maintenance guidelines for green infrastructure practices.

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

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).

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.

Stormwater catch basin

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.

WHY ARE IMPERVIOUS SURFACES IMPORTANT?

The primary cause of the pollution, flooding, and erosion problems is the quantity of impervious surfaces draining directly to local waterways. New Jersey is one of the most developed states in the country. Currently, the state has the highest percent of impervious cover in the country at 12.1% of its total area (Nowak & Greenfield, 2012). Many of these impervious surfaces are directly connected to local waterways (i.e., every drop of rain that lands on these impervious surfaces ends up in a local river, lake, or bay without any chance of being treated or soaking into the ground).

The literature suggests a link between impervious cover and stream ecosystem impairment starting at approximately 10% impervious surface cover (Schueler, 1994; Arnold and Gibbons, 1996; May et al., 1997). Impervious cover may be linked to the quality of lakes, reservoirs, estuaries, and aquifers (Caraco et al., 1998), and the amount of impervious cover in a watershed can be used to project the current and future quality of streams. Based on the scientific literature, Caraco et al. (1998) classified urbanizing streams into the following three categories: sensitive streams, impacted streams, and non-supporting streams. Sensitive steams typically have a watershed impervious surface cover from 0-10%. Impacted streams have a watershed impervious cover ranging from 11-25% and typically show clear signs of degradation from urbanization. Non-supporting streams have a watershed impervious cover of greater than 25%; at this high level of impervious cover, streams are simply conduits for stormwater flow and no longer support a diverse stream community.

JERSEY CITY

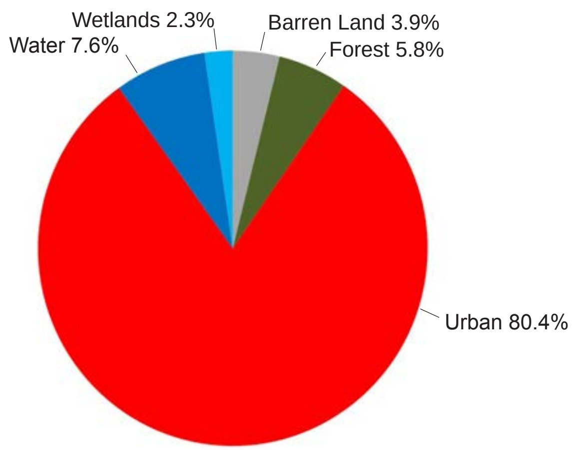
Jersey City is located in Hudson County and covers approximately 21 square miles. The city has a population of 247,597 according to the 2010 US Census, making it the largest city in Hudson County and the second largest in the state. Having numerous distinct and culturally diverse neighborhoods, Jersey 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.

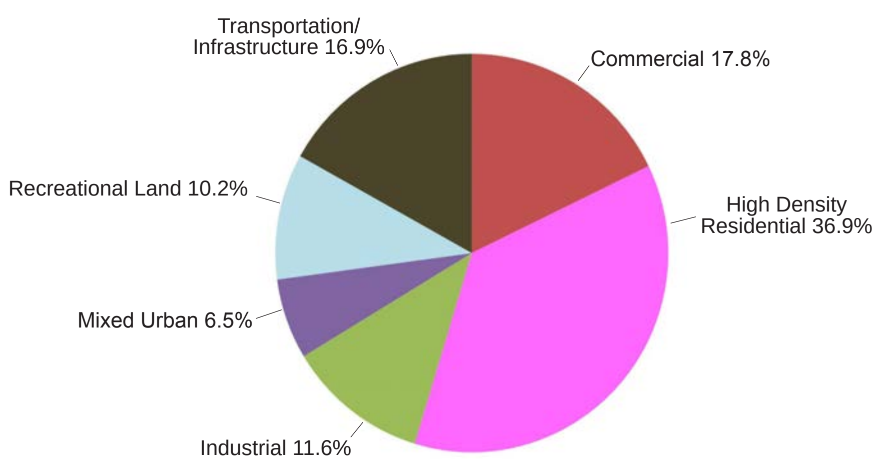
LAND USE IN JERSEY CITY

Jersey City is dominated by urban land uses. A total of 80.4% of the municipality's land use is classified as urban. Of the urban land in Jersey City, high density residential is the dominant land use. Urban land uses tend to have a high percentage of impervious surfaces.

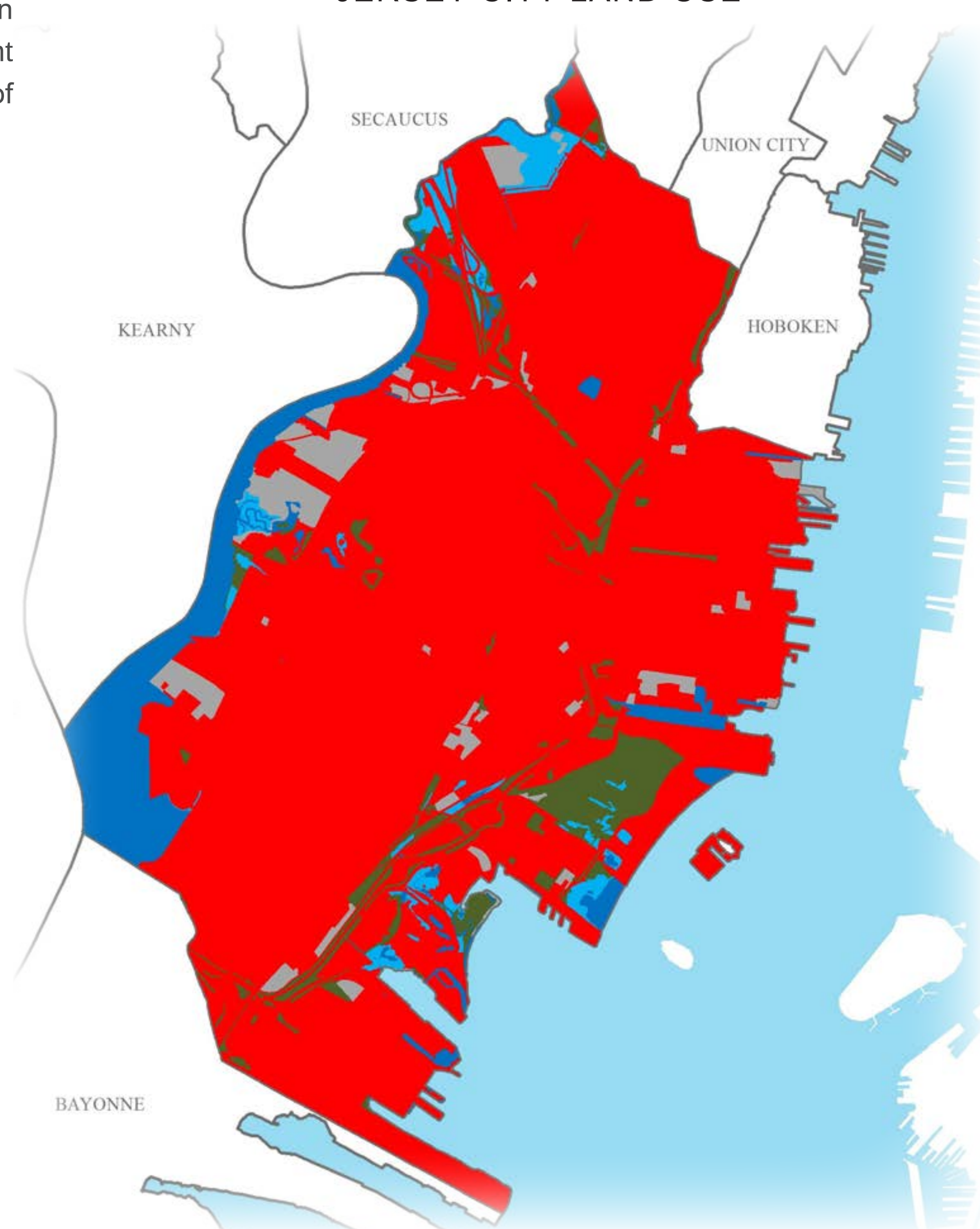
JERSEY CITY LAND USE



JERSEY CITY URBAN LAND USE



JERSEY CITY LAND USE



JERSEY CITY SUBWATERSHEDS

IMPERVIOUS COVER ANALYSIS

The first step to reducing the impacts from impervious surfaces is to conduct an impervious cover assessment. This assessment can be completed on different scales: individual lot, municipality, or watershed. Impervious surfaces need to be identified for stormwater management.

The New Jersey Department of Environmental Protection's (NJDEP) 2007 land use/land cover geographical information system (GIS) data layer categorizes Jersey City into many unique land use areas, assigning a percent impervious cover for each delineated area. These impervious cover values are used to estimate the impervious coverage for Jersey City. Based upon the 2007 NJDEP land use/land cover data, approximately 57.7% of Jersey City has impervious cover.

Water resources are typically managed on a watershed/subwatershed basis; therefore an impervious cover analysis has been performed for each subwatershed within Jersey City (Table 1). On a subwatershed basis, impervious cover ranges from 48.0% in the Upper New York Bay subwatershed to 70.4% in the Newark Bay subwatershed. Evaluating impervious cover on a subwatershed basis allows the municipality to focus impervious cover reduction or disconnection efforts in the subwatersheds where frequent flooding occurs.

Connected downspout

Reservoir

TABLE 1. IMPERVIOUS COVER ANALYSIS BY SUBWATERSHED FOR JERSEY CITY

Subwatershed	Total Area	Land Use Area	Water Area	Impervious Cover	
	(ac)	(ac)	(ac)	(ac)	(%)
Hackensack River	3,580.9	3,249.6	331.3	1,856.1	57.1%
Hudson River	2,851.8	2,792.7	59.1	1,864.9	66.8%
Newark Bay	718.2	419.7	298.5	295.3	70.4%
Upper New York Bay	3,002.1	2,919.3	82.9	1,400.7	48.0%
Total	10,153.1	9,381.3	771.8	5,417.0	57.7%

TABLE 2. STORMWATER RUNOFF VOLUMES FROM IMPERVIOUS SURFACES BY SUBWATERSHED IN JERSEY CITY

Subwatershed	Total Runoff Volume for the 1.25" NJ Water Quality Storm (Mgal)	Total Runoff Volume for the NJ Annual Rainfall of 44" (Mgal)	Total Runoff Volume for the 2-year Design Storm (3.3") (Mgal)	Total Runoff Volume for the 10-year Design Storm (5.0") (Mgal)	Total Runoff Volume for the 100 Year Design Storm(8.3") (Mgal)
Hackensack River	63.0	2,217.5	166.3	252.0	418.3
Hudson River	63.3	2,228.0	167.1	253.2	420.3
Newark Bay	10.0	352.8	26.5	40.1	66.6
Upper New York Bay	47.5	1,673.4	125.5	190.2	315.7
Total	183.9	6,471.7	485.4	735.4	1,220.8

In developed landscapes, stormwater runoff from parking lots, driveways, sidewalks, and rooftops flows to drainage pipes that feed the sewer system. The cumulative effect of these impervious surfaces and thousands of connected downspouts reduces the amount of water that can infiltrate into soils and greatly increases the volume and rate of runoff that flows to waterways.

Stormwater runoff volumes (specific to Jersey City, Hudson County) associated with impervious surfaces have been calculated for the following storms: the New Jersey water quality design storm of 1.25 inches of rain, an annual rainfall of 44 inches, the 2-year design storm (3.3 inches of rain), the 10-year design storm (5.0 inches of rain), and the 100-year design storm (8.3 inches of rain). These runoff volumes are summarized in Table 2. A substantial amount of rainwater drains from impervious surfaces in Jersey City. For example, if the stormwater runoff from one water quality storm (1.25 inches of rain) in the Hudson River subwatershed was harvested and purified, it could supply water to 578 homes for a year (assuming 300 gallons per day per home).

WHAT CAN WE DO ABOUT IMPERVIOUS SURFACES?

Once impervious surfaces have been identified, there are three steps to better manage these surfaces through green infrastructure practices.

1

Eliminate surfaces that are not necessary. One method to reduce impervious cover is to "depave." Depaving is the act of removing paved impervious surfaces and replacing them with pervious soil and vegetation that will allow for the infiltration of rainwater. Depaving leads to the recreation of natural areas that will help reduce flooding, increase wildlife habitat, and positively enhance water quality as well as beautify neighborhoods.

2

Reduce or convert impervious surfaces. There may be surfaces that are required to be hardened, such as roadways or parking lots, but could be made smaller and still be functional. A parking lot that has two-way cart ways could be converted to one-way cart ways. There also are permeable paving materials such as porous asphalt, pervious concrete, or permeable paving stones that could be substituted for impermeable paving materials.

3

Disconnect impervious surfaces from flowing directly to local waterways. There are many ways to capture, treat, and infiltrate stormwater runoff from impervious surfaces. Opportunities also exist to harvest rainwater for non-potable uses such as water gardens.


SMART
RAIN GARDEN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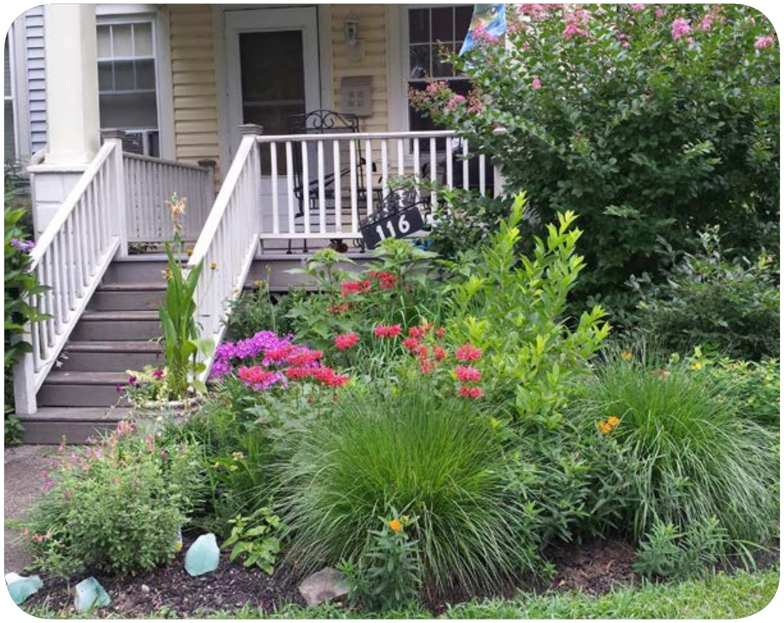
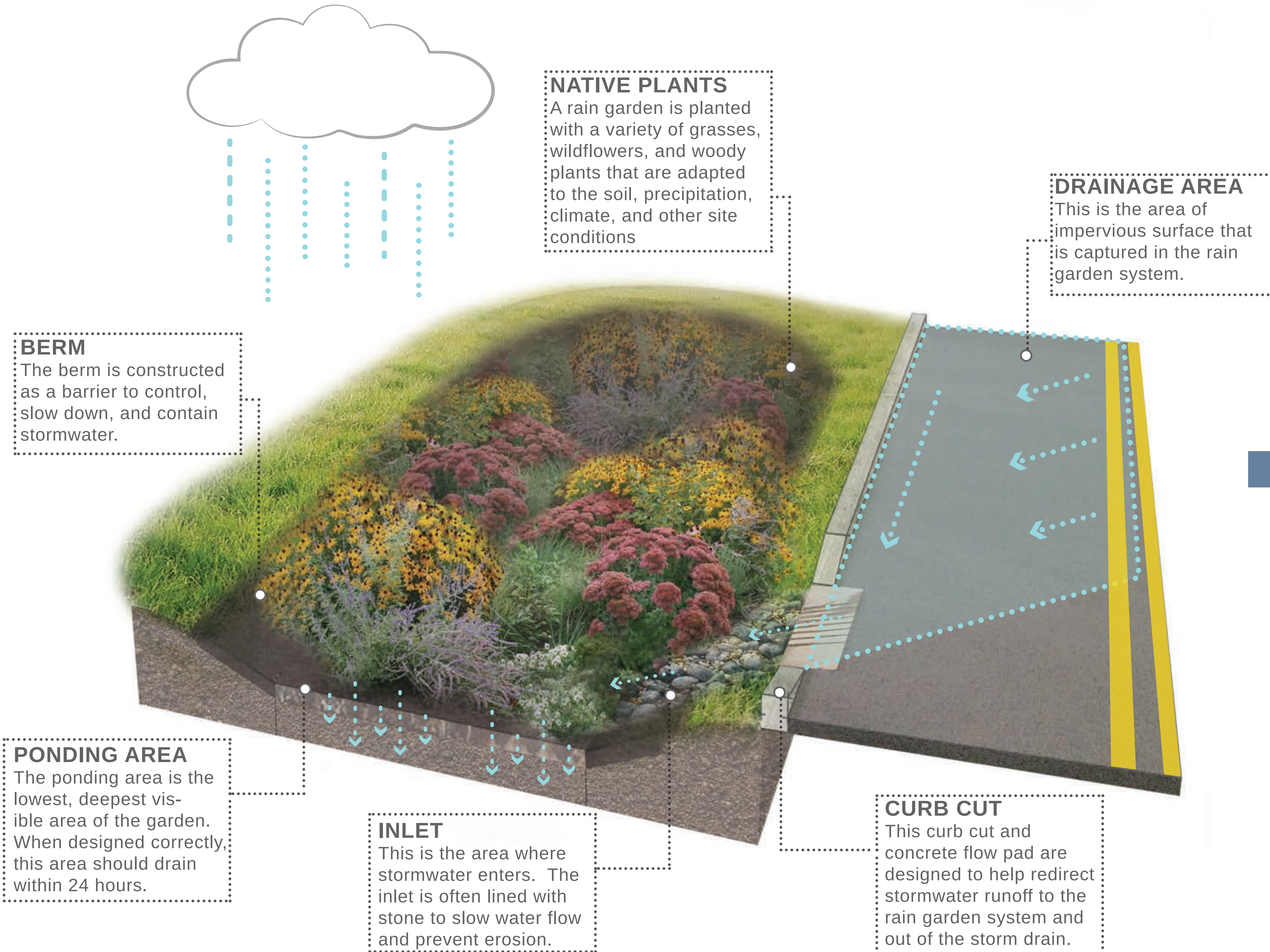
GREEN INFRASTRUCTURE PRACTICES

BIORETENTION SYSTEMS

A rain garden, or bioretention system, is a landscaped, shallow depression that captures, filters, and infiltrates stormwater runoff. The rain garden removes nonpoint source pollutants from stormwater runoff while recharging groundwater. A rain garden serves as a functional system to capture, filter, and infiltrate stormwater runoff at the source while being aesthetically pleasing. Rain gardens are an important tool for communities and neighborhoods to create diverse, attractive landscapes while protecting the health of the natural environment. Rain gardens can also be installed in areas that do not infiltrate by incorporating an underdrain system.

Rain gardens can be implemented throughout communitites to begin the process of re-establishing the natural function of the land. Rain gardens offer one of the quickest and easiest methods to reduce runoff and help protect our water resources. Beyond the aesthetic and ecological benefits, rain gardens encourage environmental stewardship and community pride.

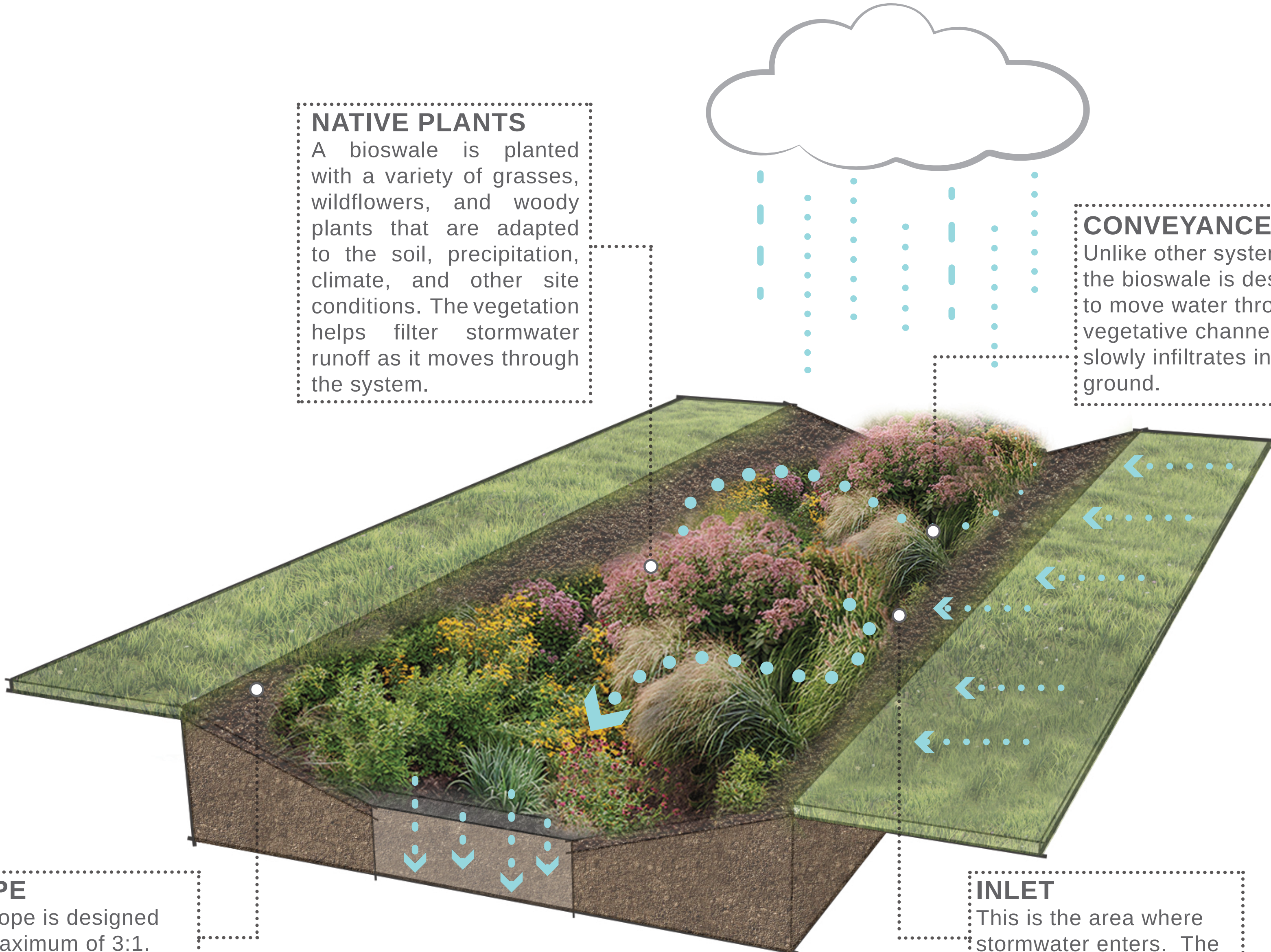



NATIVE PLANTS
A rain garden is planted with a variety of grasses, wildflowers, and woody plants that are adapted to the soil, precipitation, climate, and other site conditions
DRAINAGE AREA
This is the area of impervious surface that is captured in the rain garden system.
BERM
The berm is constructed as a barrier to control, slow down, and contain stormwater.
PONDING AREA
The ponding area is the lowest, deepest visible area of the garden. When designed correctly, this area should drain within 24 hours.
INLET
This is the area where stormwater enters. The inlet is often lined with stone to slow water flow and prevent erosion.
CURB CUT
This curb cut and concrete flow pad are designed to help redirect stormwater runoff to the rain garden system and out of the storm drain.

BIOSWALES

Bioswales are landscape features that convey stormwater from one location to another while removing pollutants and allowing water to infiltrate. Bioswales are often designed for larger scale sites where water needs time to move and slowly infiltrate into the groundwater.

Much like the rain garden systems, bioswales can also be designed with an underdrain pipe that allows excess water to discharge to the nearest catch basin or existing stormwater system.



NATIVE PLANTS

A bioswale is planted with a variety of grasses, wildflowers, and woody plants that are adapted to the soil, precipitation, climate, and other site conditions. The vegetation helps filter stormwater runoff as it moves through the system.

CONVEYANCE

Unlike other systems, the bioswale is designed to move water through a vegetative channel as it slowly infiltrates into the ground.

SLOPE

The slope is designed at a maximum of 3:1. These slopes often require erosion control blankets for stabilization.

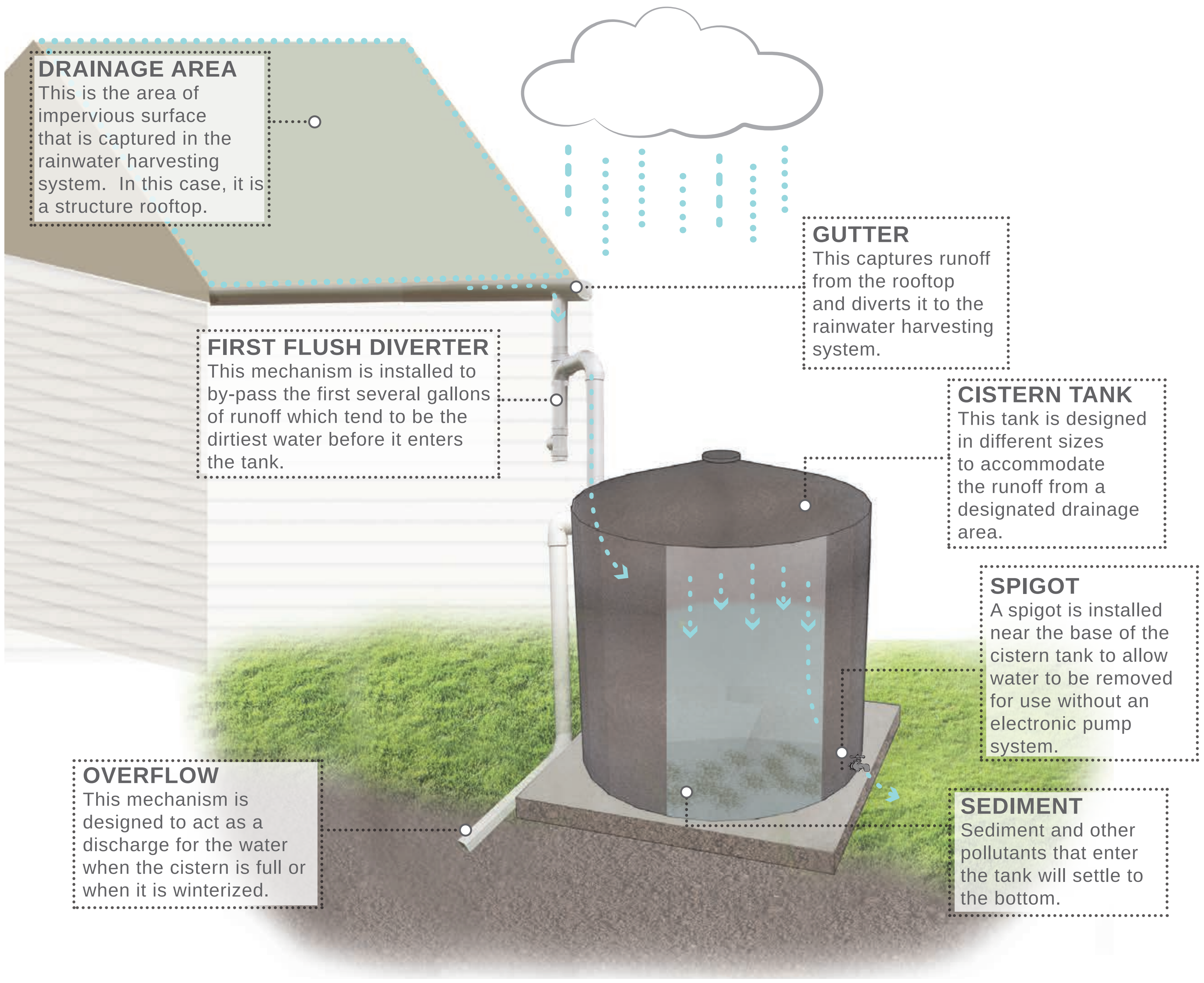
INLET

This is the area where stormwater enters. The inlet is often lined with stone to slow water flow and prevent erosion.

RAINWATER HARVESTING SYSTEMS

These systems capture rainwater, mainly from rooftops, in cisterns or rain barrels. The water can then be used for watering gardens, washing vehicles, or for other non-potable uses.

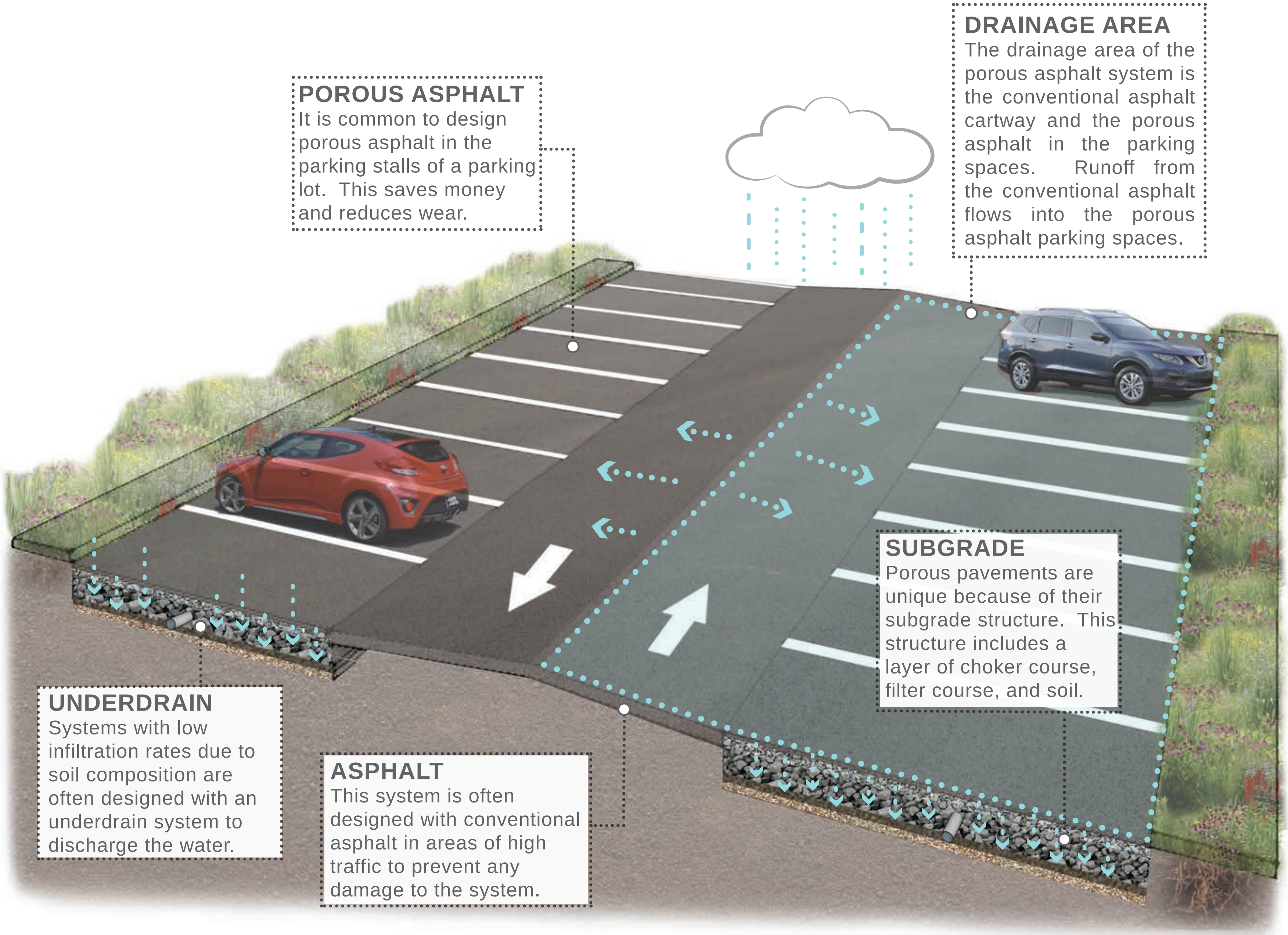
Rainwater harvesting systems come in all shapes and sizes. These systems are good for harvesting rainwater in the spring, summer, and fall but must be winterized during the colder months. Cisterns are winterized, and then their water source is redirected from the cistern back to the original discharge area.


DRAINAGE AREA
This is the area of impervious surface that is captured in the rainwater harvesting system. In this case, it is a structure rooftop.
GUTTER
This captures runoff from the rooftop and diverts it to the rainwater harvesting system.
FIRST FLUSH DIVERTER
This mechanism is installed to by-pass the first several gallons of runoff which tend to be the dirtiest water before it enters the tank.
CISTERN TANK
This tank is designed in different sizes to accommodate the runoff from a designated drainage area.
SPIGOT
A spigot is installed near the base of the cistern tank to allow water to be removed for use without an electronic pump system.
OVERFLOW
This mechanism is designed to act as a discharge for the water when the cistern is full or when it is winterized.
SEDIMENT
Sediment and other pollutants that enter the tank will settle to the bottom.

PERMEABLE PAVEMENTS

These surfaces include pervious concrete, porous asphalt, interlocking concrete pavers, and grid pavers. Pervious concrete and porous asphalt are the most common of the permeable surfaces. They are similar to regular concrete and asphalt but without the fine materials. This allows water to quickly pass through the material into an underlying layered system of stone that holds the water, allowing it to infiltrate into the underlying uncompacted soil. They have an underlying stone layer to store stormwater runoff and allow it to slowly seep into the ground.

By installing an underdrain system, these systems can be used in areas where infiltration is limited. The permeable pavement system will still filter pollutants and provide storage but will not infiltrate the runoff.

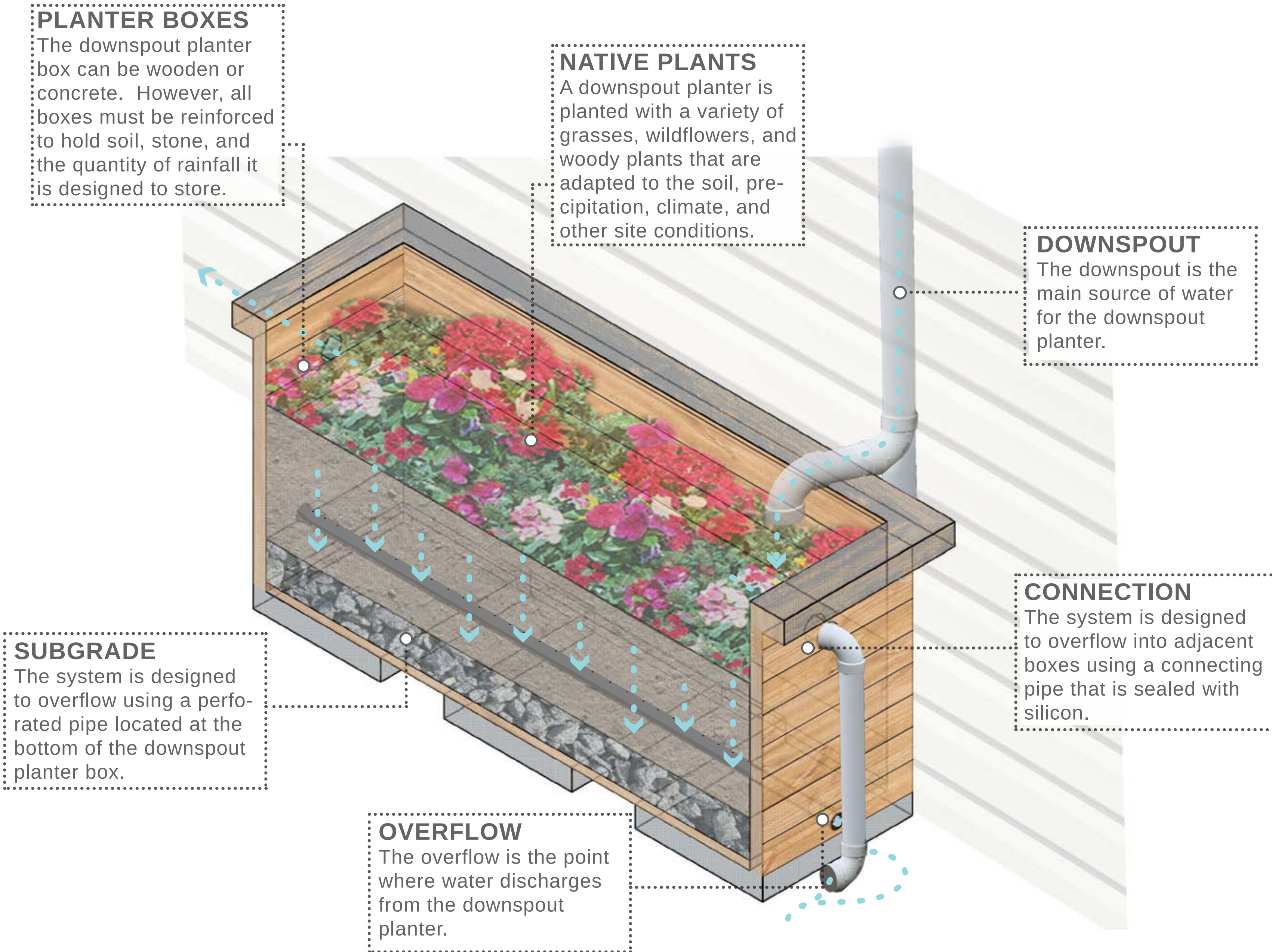


POROUS ASPHALT
It is common to design porous asphalt in the parking stalls of a parking lot. This saves money and reduces wear.
DRAINAGE AREA
The drainage area of the porous asphalt system is the conventional asphalt cartway and the porous asphalt in the parking spaces. Runoff from the conventional asphalt flows into the porous asphalt parking spaces.
SUBGRADE
Porous pavements are unique because of their subgrade structure. This structure includes a layer of choker course, filter course, and soil.
UNDERDRAIN
Systems with low infiltration rates due to soil composition are often designed with an underdrain system to discharge the water.
ASPHALT
This system is often designed with conventional asphalt in areas of high traffic to prevent any damage to the system.

DOWNSPOUT PLANTER BOXES

Downspout planter boxes are wooden or concrete boxes with plants installed at the base of the downspout that provide an opportunity to beneficially reuse rooftop runoff. Although small, these systems have some capacity to store rooftop runoff during rainfall events and release it slowly back into the storm sewer system through an overflow.

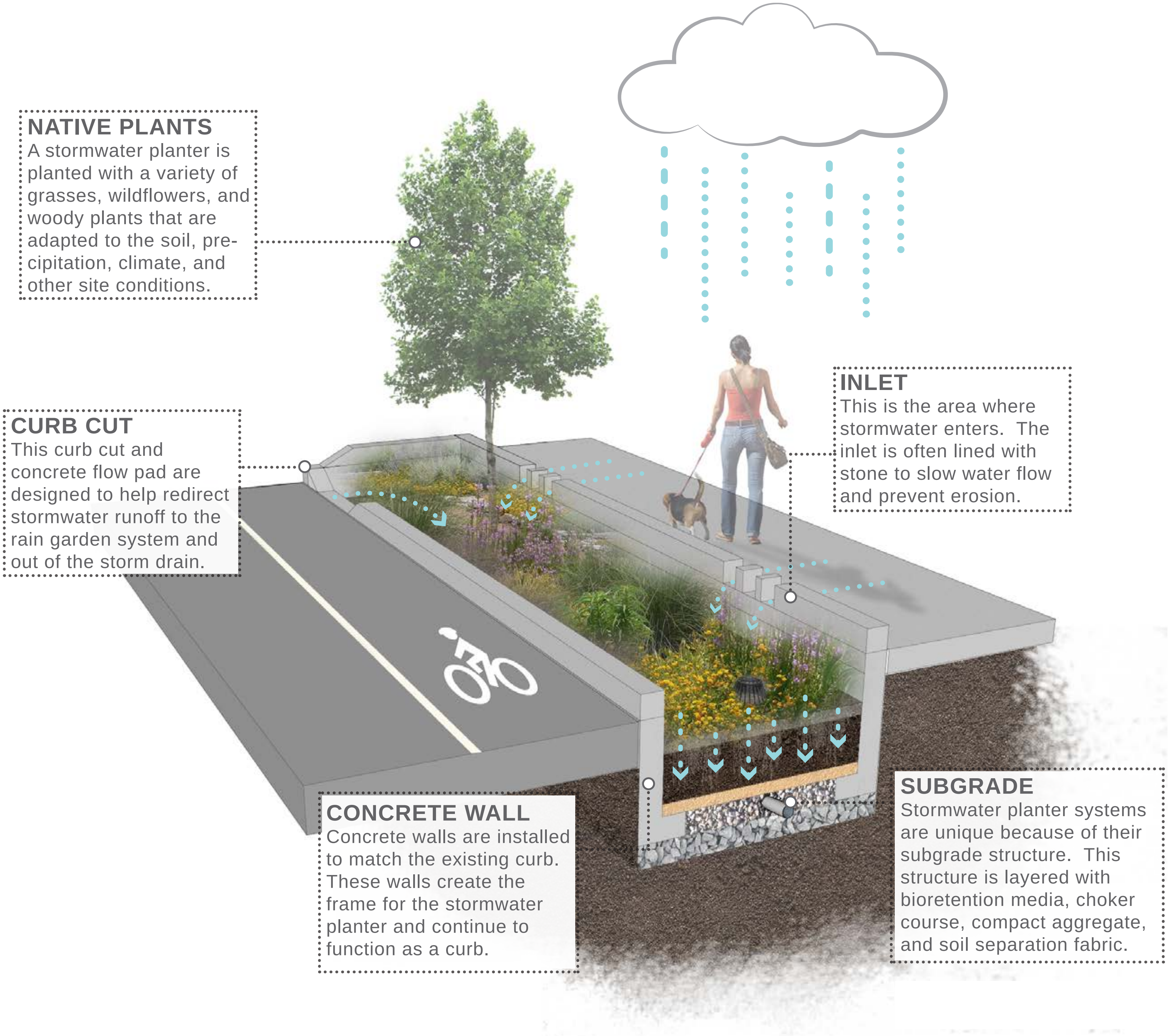
Most often, downspout planter boxes are a reliable green infrastructure practice used to provide some rainfall storage and aesthetic value for property.



PLANTER BOXES
The downspout planter box can be wooden or concrete. However, all boxes must be reinforced to hold soil, stone, and the quantity of rainfall it is designed to store.
NATIVE PLANTS
A downspout planter is planted with a variety of grasses, wildflowers, and woody plants that are adapted to the soil, pre-cipitation, climate, and other site conditions.
DOWNSPOUT
The downspout is the main source of water for the downspout planter.
CONNECTION
The system is designed to overflow into adjacent boxes using a connecting pipe that is sealed with silicon.
SUBGRADE
The system is designed to overflow using a perfo-rated pipe located at the bottom of the downspout planter box.
OVERFLOW
The overflow is the point where water discharges from the downspout planter.

STORMWATER PLANTERS

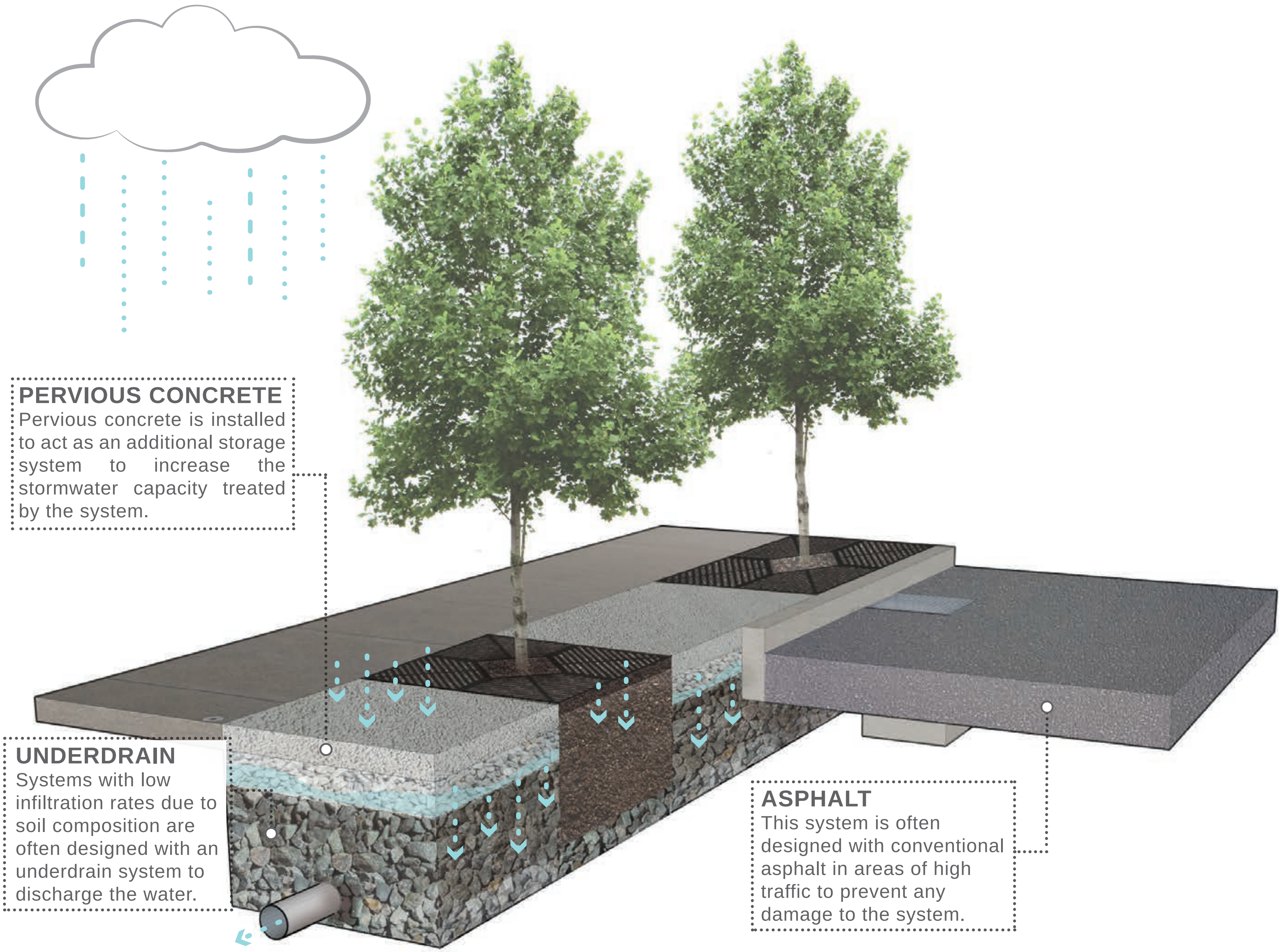
Stormwater planters are vegetated structures that are built into the sidewalk to intercept stormwater runoff from the roadway or sidewalk. Stormwater planters, like rain gardens, are a type of bioretention system. This means many of these planters are designed to allow the water to infiltrate into the ground. However, some are designed simply to filter the water and convey it back into the storm sewer system via an underdrain system.


NATIVE PLANTS
A stormwater planter is planted with a variety of grasses, wildflowers, and woody plants that are adapted to the soil, precipitation, climate, and other site conditions.
CURB CUT
This curb cut and concrete flow pad are designed to help redirect stormwater runoff to the rain garden system and out of the storm drain.
INLET
This is the area where stormwater enters. The inlet is often lined with stone to slow water flow and prevent erosion.
CONCRETE WALL
Concrete walls are installed to match the existing curb. These walls create the frame for the stormwater planter and continue to function as a curb.
SUBGRADE
Stormwater planter systems are unique because of their subgrade structure. This structure is layered with bioretention media, choker course, compact aggregate, and soil separation fabric.

TREE FILTER BOXES

Tree filter boxes can be pre-manufactured concrete boxes or enhanced tree pits that contain a special soil mix and are planted with a tree or shrub. They filter stormwater runoff but provide little storage capacity. They are typically designed to quickly filter stormwater and then discharge it to the local storm sewer system.

Often tree filter boxes are incorporated into streetscape systems that include an underlying stormwater system which connects several boxes (as shown on the next page). This is also coupled with pervious concrete to increase the storage capacity for rainwater into the system.


PERVIOUS CONCRETE
Pervious concrete is installed to act as an additional storage system to increase the stormwater capacity treated by the system.
UNDERDRAIN
Systems with low infiltration rates due to soil composition are often designed with an underdrain system to discharge the water.
ASPHALT
This system is often designed with conventional asphalt in areas of high traffic to prevent any damage to the system.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GREEN INFRASTRUCTURE IN JERSEY CITY

SITE SELECTION & METHODOLOGY

TABLE 1. AERIAL LOADING COEFFICIENTS

Land Cover	Total Phosphorus (lbs/acre/yr)	Total Nitrogen (lbs/acre/yr)	Total Suspended Solids (lbs/acre/yr)
High, Medium Density Residential	1.4	15	140
Low Density, Rural Residential	0.6	5	100
Commercial	2.1	22	200
Industrial	1.5	16	200
Urban, Mixed Urban, Other Urban	1.0	10	120
Agriculture	1.3	10	300
Forest, Water, Wetlands	0.1	3	40

A collection of sites have been identified in Jersey City based on site visibility, feasibility, cost-effectiveness, and potential partnerships. The RCE Water Resources Program uses a "look here first" method to identify the most accessible and visible sites. These sites include: schools, churches, libraries, municipal buildings, public works, firehouses, post offices, social clubs such as the Elks or Moose lodge, and parks/recreational fields. These sites often have large amounts of impervious cover and typically are relatively easy to engage in implementing green infrastructure practices. Sites are selected based on their feasibility or the ability to get the project in the ground. This criteria is based on property ownership and ability to do maintanence. In addition, potential partnerships related to the site help in making a project feasible.

Initially, aerial imagery was used to identify potential project sites that contain extensive impervious cover. Field visits were then conducted at each of these potential project sites to determine if a viable option exists to reduce impervious cover or to disconnect impervious surfaces from draining directly to the local waterway or storm sewer system. During the site visit, appropriate green infrastructure practices for the site were determined.

For each potential project site, specific aerial loading coefficients for commercial land use were used to determine the annual runoff loads for total phosphorus (TP), total nitrogen (TN), and total suspended solids (TSS) from impervious surfaces (Table 1). These are the same aerial loading coefficients that NJDEP uses to develop total maximum daily loads (TMDLs) for impaired waterways of the state. The percentage of impervious cover for each site was extracted from the 2007 NJDEP land use/land cover database.

For impervious areas, runoff volumes were determined for the water quality design storm (1.25 inches of rain over two-hours) and for the annual rainfall total of 44 inches.

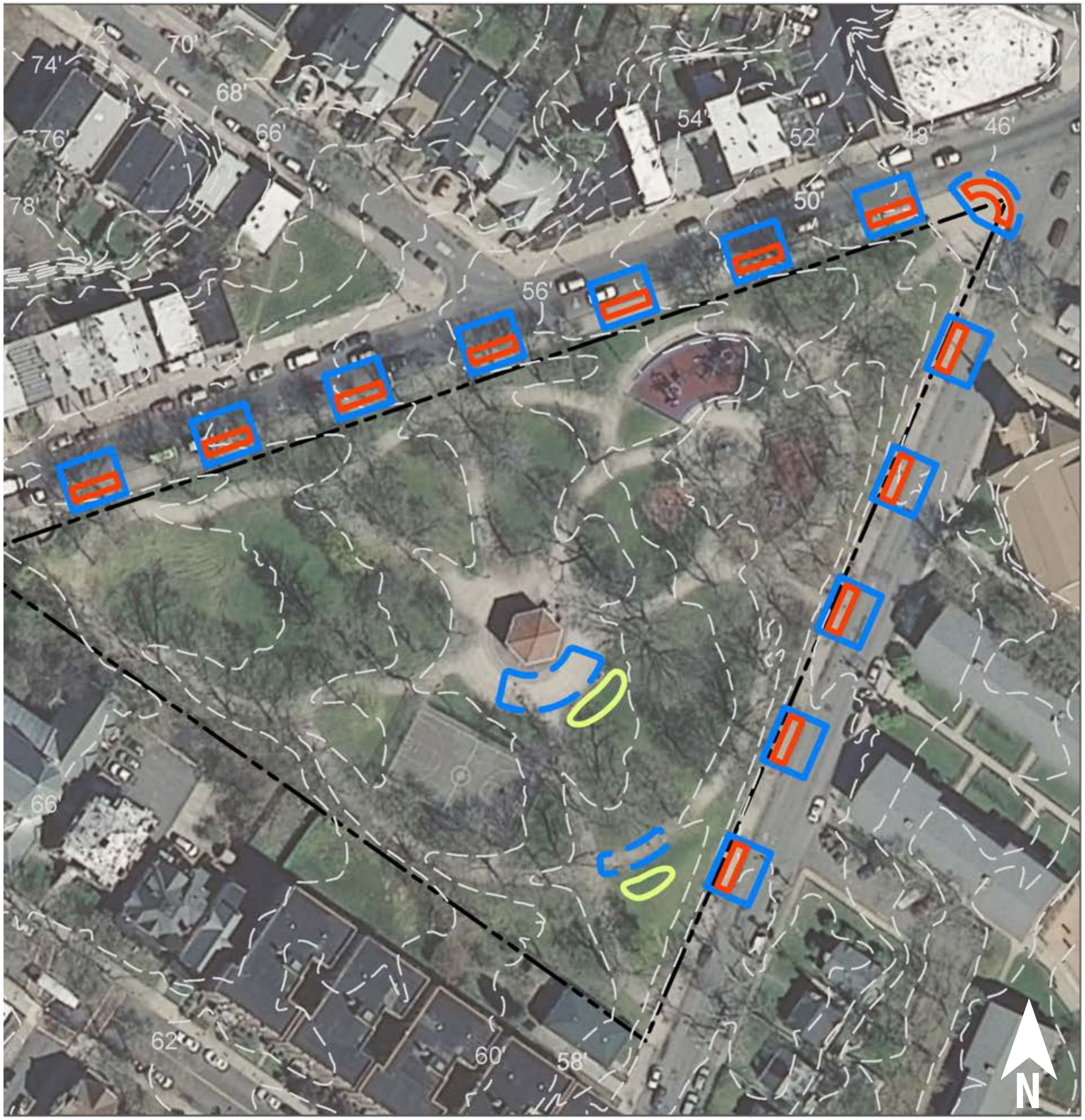
Preliminary soil assessments were conducted for each potential project site identified in Jersey City using the United States Department of Agriculture Natural Resources Conservation Service Web Soil Survey, which utilizes regional and statewide soil data to predict soil types in an area.

For each potential project site, drainage areas were determined for each of the green infrastructure practices proposed at the site. These green infrastructure practices were designed to manage the 2-year design storm, enabling these practices to capture 95% of the annual rainfall. Runoff volumes were calculated for each proposed green infrastructure practice. The reduction in TSS loading was calculated for each drainage area for each proposed green infrastructure practice using the aerial loading coefficients in Table 1. The maximum volume reduction in stormwater runoff for each green infrastructure practice for a storm was determined by calculating the volume of runoff captured from the 2-year design storm. For each green infrastructure practice, peak discharge reduction potential was determined through hydrologic modeling in HydroCAD. For each green infrastructure practice, a cost estimate is provided. These costs are based upon the square footage of the green infrastructure practice and the real cost of green infrastructure practice implementation in New Jersey.

POTENTIAL PROJECT SITES
WITHIN STUDY AREA

Site	Name	Address	Page #
1	Arlington Park	752 Grand Street, Jersey City, NJ 07304, Ward F	40
2	Bayside Park	1 Bayside Park Drive, Jersey City, NJ 07305, Ward A	42
3	Bright Street Community Garden *	54 Bright Street, Jersey City, NJ 07302, Ward E	44
4	Brunswick Street Community Garden	170 Brunswick Street, Jersey City, NJ 07302, Ward E	48
5	Carlton Avenue Streetscape	1-200 Carlton Avenue, Jersey City, NJ 07306, Ward D	50
6	Columbia Park	145 Old Bergen Road, Jersey City, NJ 07305, Ward A	52
7	Concordia/St. Joseph's School For The Blind	761 Summit Avenue, Jersey City, NJ 07307, Ward C	54
8	Cornelia Bradford School No. 16	96 Sussex Street, Jersey City, NJ 07302, Ward E	56
9	Dr. Michael Conti School No. 5	182 Merseles Street, Jersey City, NJ 07302, Ward E	58
10	Ezra L. Nolan Middle School *	88 Gates Avenue, Jersey City, NJ 07305, Ward A	60
11	Franklin Williams Middle School No. 7	212 Laidlaw Avenue, Jersey City, NJ 07307, Ward C	64
12	Garfield-Merritt Community Garden	81 Garfield Avenue, Jersey City, NJ 07305, Ward A	66
13	Greenway Path *	Bartholdi Avenue & Sullivan Drive, Jersey City, NJ 07305, Ward A	68
14	Hamilton Park	262 8th Street, Jersey City, NJ 07302, Ward E	72
15	Hudson County Lincoln Park Maintenance Building	1 Lincoln Park, Jersey City, NJ 07306, Ward B	74
16	Hudson County School Of Technology	525 Montgomery Street, Jersey City, NJ 07302, Ward C	76
17	James Ferris High School	35 Colgate Street, Jersey City, NJ 07302, Ward F	78
18	Jersey City Community Charter School	128 Danforth Avenue, Jersey City, NJ 07305, Ward A	80
19	Jersey City Municipal Utilities Authority	555 Route 440, Jersey City, NJ 07304, Ward B	82
20	Jersey City Parking Lot *	Central Avenue & Hutton Street, Jersey City, NJ 07307, Ward D	84
21	Jotham Wakeman Elementary School *	100 St. Paul's Avenue, Jersey City, NJ 07306, Ward C	88
22	M.E.T.S. Charter School	180 9th Street, Jersey City, NJ 07302, Ward E	92
23	Manila Avenue Streetscape	400-500 Manila Avenue, Jersey City, NJ 07302, Ward E	94
24	New Jersey Regional Day School	425 Johnston Avenue, Jersey City, NJ 07304, Ward F	96
25	NJ Turnpike Underpass *	Merseles Street & C. C. Drive, Jersey City, NJ 07302, Ward F	98
26	Ogden's End Community Garden *	100 Ogden Avenue, Jersey City, NJ 07307, Ward C	102
27	Our Lady Of Czestochowa Church	248 Marin Boulevard, Jersey City, NJ 07302, Ward E	106
28	Public School No.8 *	96 Franklin Street, Jersey City, NJ 07307, Ward D	108
29	Riverview Community Garden	285 Ogden Avenue, Jersey City, NJ 07307, Ward D	112
30	Riverview Park *	1 Bowers Street, Jersey City, NJ 07307, Ward D	114
31	St Joseph's Home/York Street Project	81 York Street, Jersey City, NJ 07302, Ward E	120
32	St. Anthony High School	175 8th Street, Jersey City, NJ 07302, Ward E	122
33	St. Bridget's Church	372 Montgomery Street, Jersey City, NJ 07302, Ward E	124
34	St. Peters Preparatory School	144 Grand Street, Jersey City, NJ 07302, Ward E	126
35	Sussex Streetscape	100-200 Sussex Street, Jersey City, NJ 07302, Ward E	128
36	The Brunswick School	189 Brunswick Street, Jersey City, NJ 07302, Ward E	130
37	Vacant Lot *	Hopkins Avenue & Bevan Street, Jersey City, NJ 07306, Ward C	132
38	West Side Avenue Light Rail *	West Side Avenue & Claremont Avenue, Jersey City, NJ 07305, Ward B	136
39	William Dickinson High School	2 Palisade Avenue, Jersey City, NJ 07306, Ward C	140

* Contains a concept design



bioretention systems

stormwater planters

drainage area

property line

2012 Aerial: NJOIT, OGIS

0' 50' 100'

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 stormwater planters in the wide sidewalks. Rain gardens could manage stormwater on the site in open lawn areas throughout the park.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
21.2	32,192	1.6	16.3	147.8	0.025	0.88

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.053	9	16,149	0.61	850	$4,250
Stormwater planters	0.361	60	26,606	1.00	3,200	$320,000

bioretention system

rainwater harvesting

stormwater planters

drainage area

property line

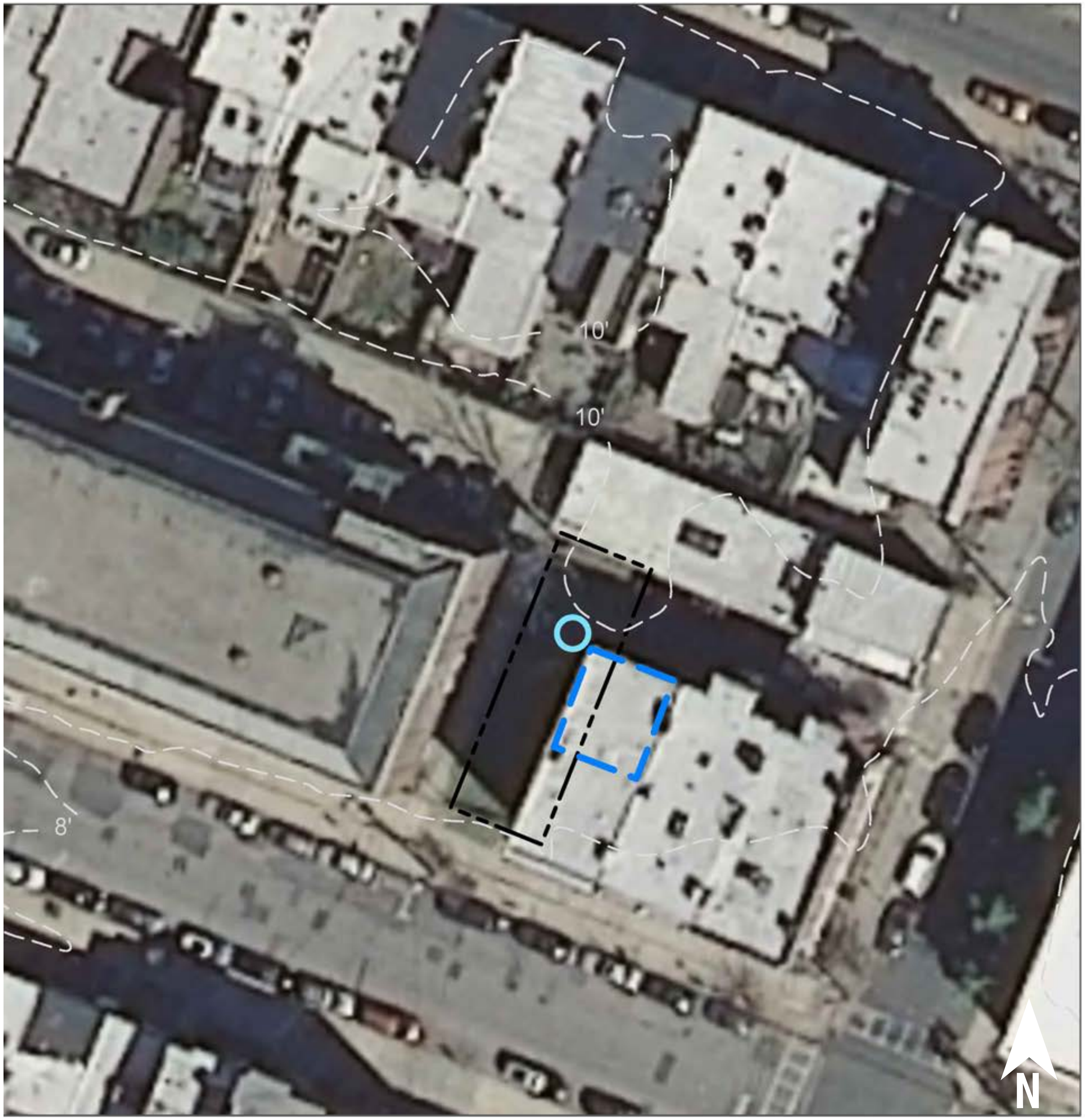
2012 Aerial: NJOIT, OGIS

0' 10' 20'

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

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
18.9	71,456	3.4	36.1	328.1	0.056	1.96

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.045	8	3,299	0.12	550	$2,750
Rainwater harvesting	0.025	4	1,840	0.07	2,000	$4,000
Stormwater planters	0.015	2	1,077	0.04	140	$14,000



- rainwater harvesting
- drainage area
- property line
- 2012 Aerial: NJOIT, OGIS

0' 20' 40'

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.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
55.0	1,031	0.0	0.5	4.7	0.001	0.03

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Rainwater harvesting	0.016	3	1,152	0.04	1,000	$2,000

CURRENT CONDITION

CONCEPT DESIGN

rainwater harvesting

stormwater planters

drainage area

property line

2012 Aerial: NJOIT, OGIS

0' 20' 40'



The Brunswick Street Community Garden is part of the Jersey City “Adopt-a-Lot” Program. A rainwater harvesting system 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 stormwater planters to intercept stormwater runoff.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
65.0	2,907	0.1	1.5	13.3	0.002	0.08

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size	Estimated Cost
Rainwater harvesting	0.033	5	2,416	0.09	2,000	$4,000
Stormwater planters	0.009	1	636	0.02	85	$8,500

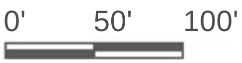
permeable pavement

tree filter boxes

drainage area

property line

2012 Aerial: NJOIT, OGIS



Carlton Avenue is a steep sloped residential street with wide sidewalks and paved medians. Stormwater runoff can be intercepted with tree filter boxes and permeable paving.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
53.6	72,171	3.5	36.5	331.4	0.056	1.98

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Permeable pavement	0.531	89	39,105	1.47	6,060	$151,500
Tree filter boxes	0.370	62	27,235	1.02	3,720	$372,000

bioretention system

stormwater planters

tree filter boxes

drainage area

property line

2012 Aerial: NJOIT, OGIS

0' 100' 200'

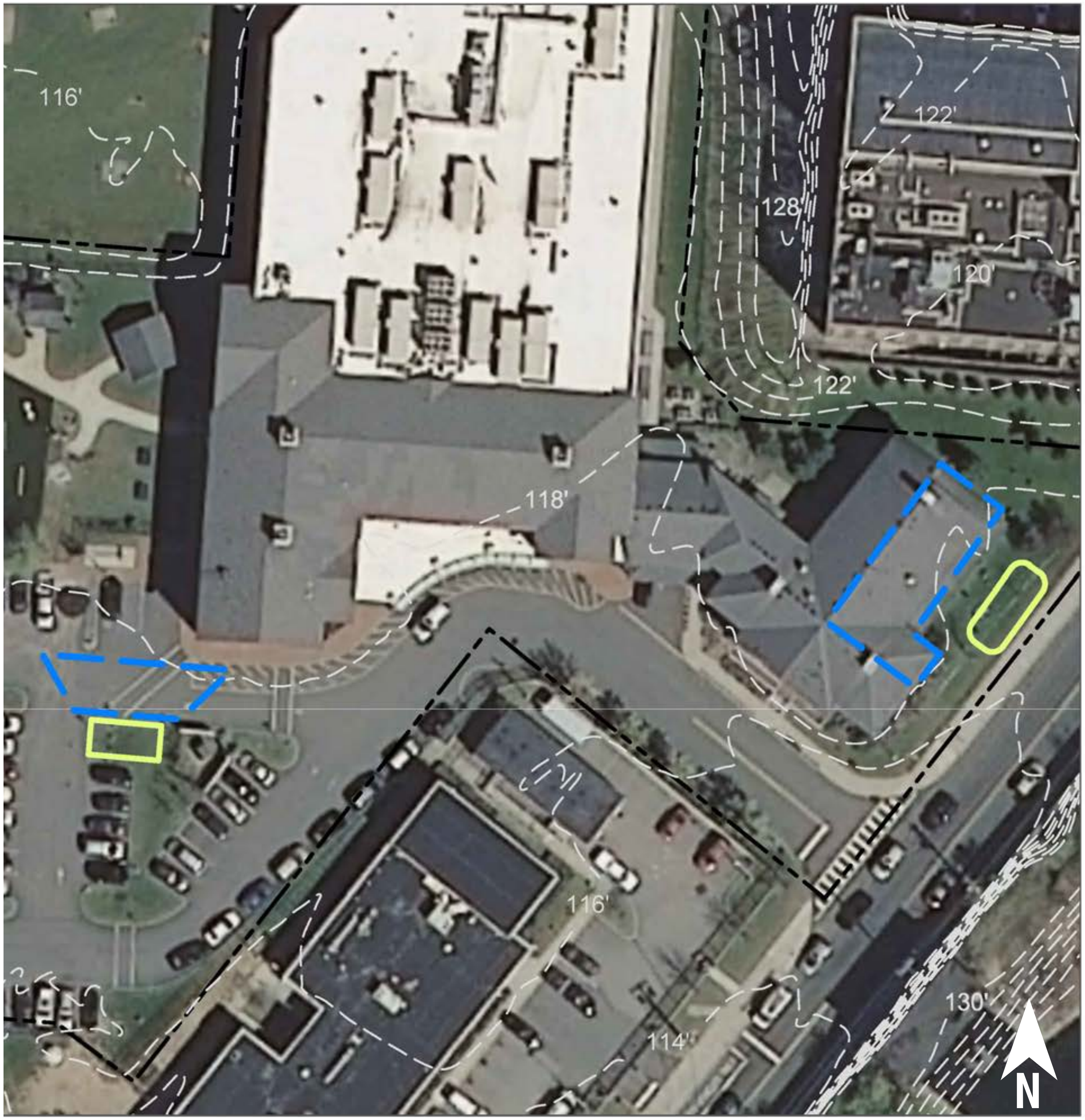
COLUMBIA PARK

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 filter boxes and stormwater planters in the perimeter sidewalk. A demonstration bioretention system could manage runoff on the site.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
15.0	30,390	1.5	15.3	139.5	0.024	0.83

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.075	13	5,543	0.21	1,629	$8,145
Stormwater planters	0.181	30	13,314	0.50	1,220	$122,000
Tree filter boxes	0.609	102	44,828	1.68	4,710	$471,000



bioretention systems

drainage area

property line

2012 Aerial: NJOIT, OGIS

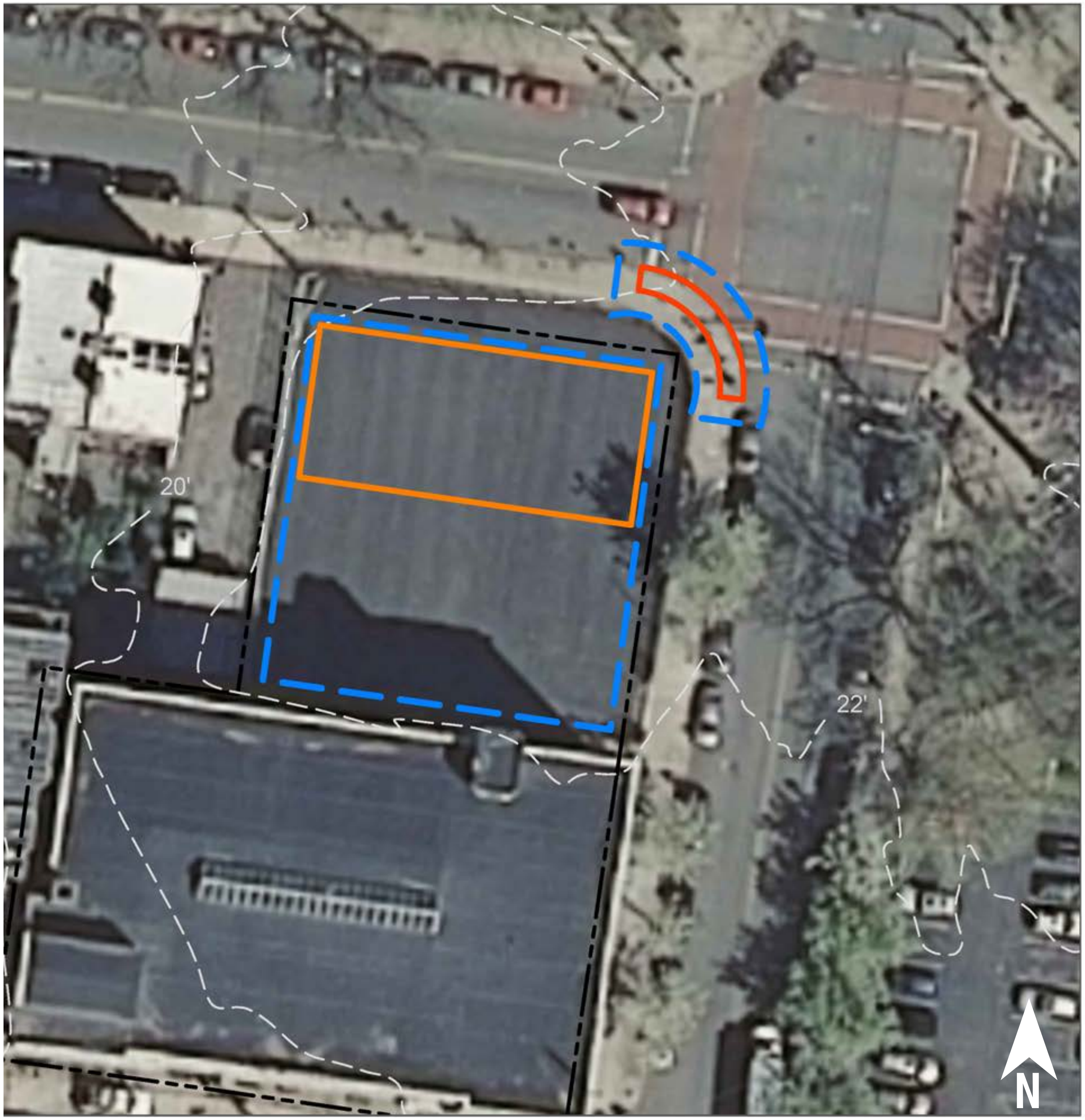
0' 30' 60'



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.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
69.3	87,545	4.2	44.2	402.0	0.068	2.40

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.092	15	6,792	0.26	870	$4,350



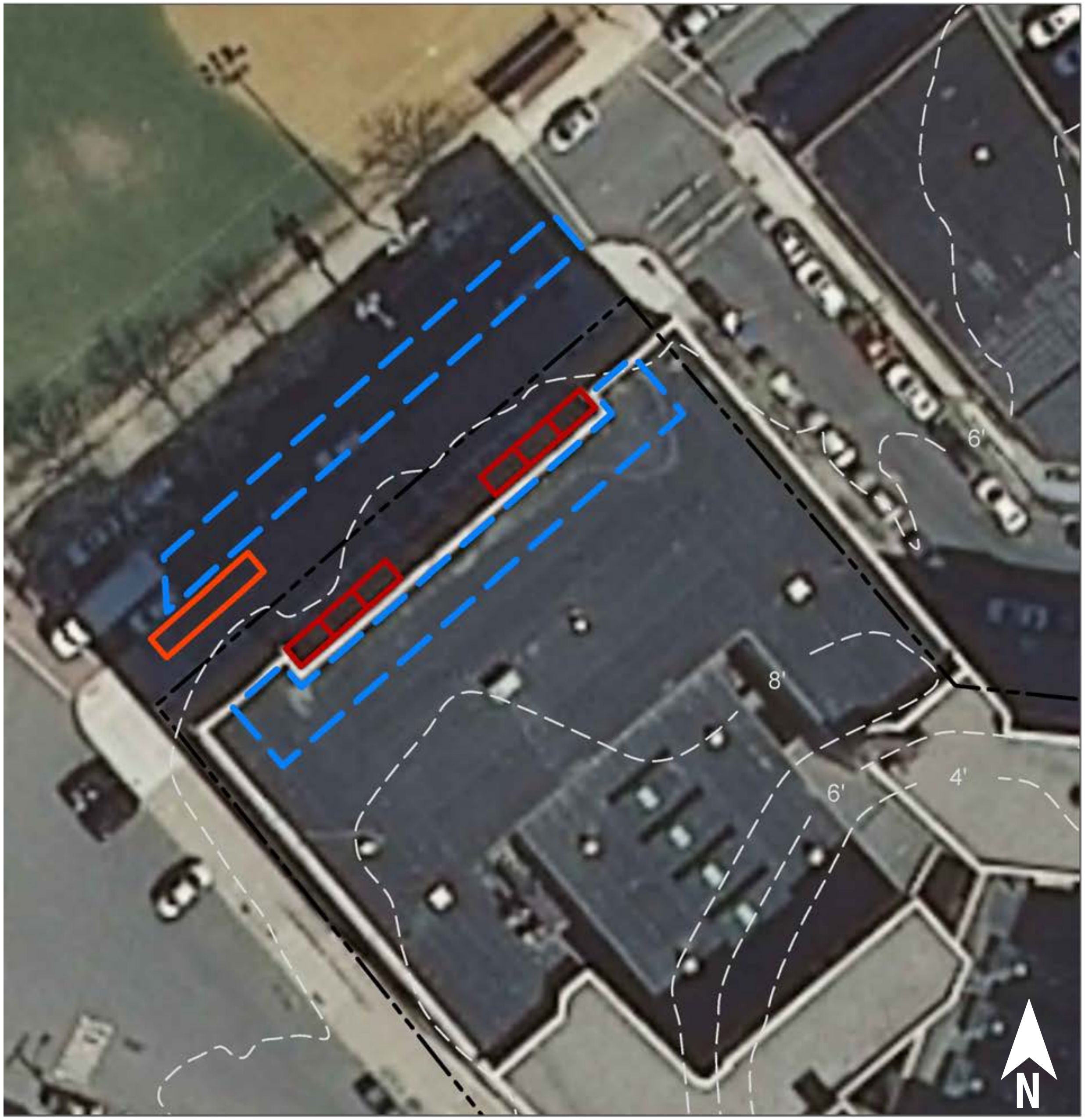
permeable pavement
stormwater planters
drainage area
property line
2012 Aerial: NJOIT, OGIS

0' 20' 40'

The Bradford School building is adjacent to a paved asphalt schoolyard. There is evidence of poor stormwater drainage on the site 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 stormwater planters at each of the sidewalk corners to intercept stormwater runoff and provide traffic calming.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
94.2	23,541	1.1	11.9	108.1	0.018	0.65

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Permeable pavement	0.218	37	16,052	0.60	3,360	$84,000
Stormwater planters	0.026	4	1,877	0.07	255	$25,500



planter boxes

stormwater planters

drainage area

property line

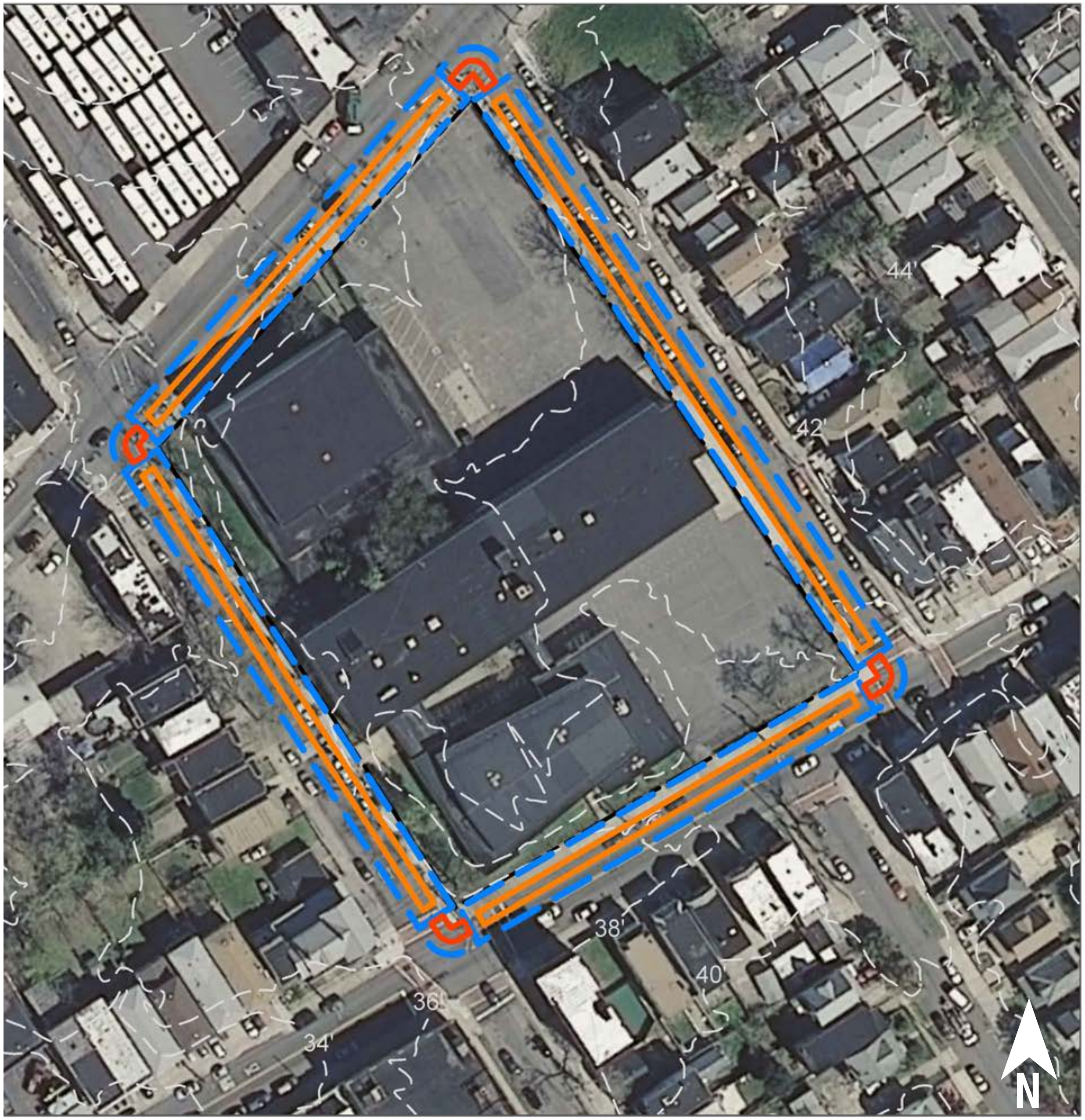
2012 Aerial: NJOIT, OGIS

0' 20' 40'

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

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
90.0	43,537	2.1	22.0	199.9	0.034	1.19

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Planter boxes	0.034	5	n/a	n/a	72	$72,000
Stormwater planters	0.039	7	2,865	0.11	210	$21,000



permeable pavement

stormwater planters

drainage area

property line

2012 Aerial: NJOIT, OGIS

0' 50' 100'

Stormwater runoff is draining to the east corner of the site. Stormwater planter bumpouts and permeable pavement can be installed adjacent to the site. This will capture, treat, and infiltrate stormwater runoff while helping to provide a safer pedestrian environment.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
95.0	109,837	5.3	55.5	504.3	0.086	3.01

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Permeable pavement	0.907	152	66,789	2.51	11,410	$285,250
Stormwater planters	0.078	13	5,775	0.22	930	$93,000

CURRENT CONDITION

CONCEPT DESIGN

permeable pavement

stormwater planters

drainage area

property line

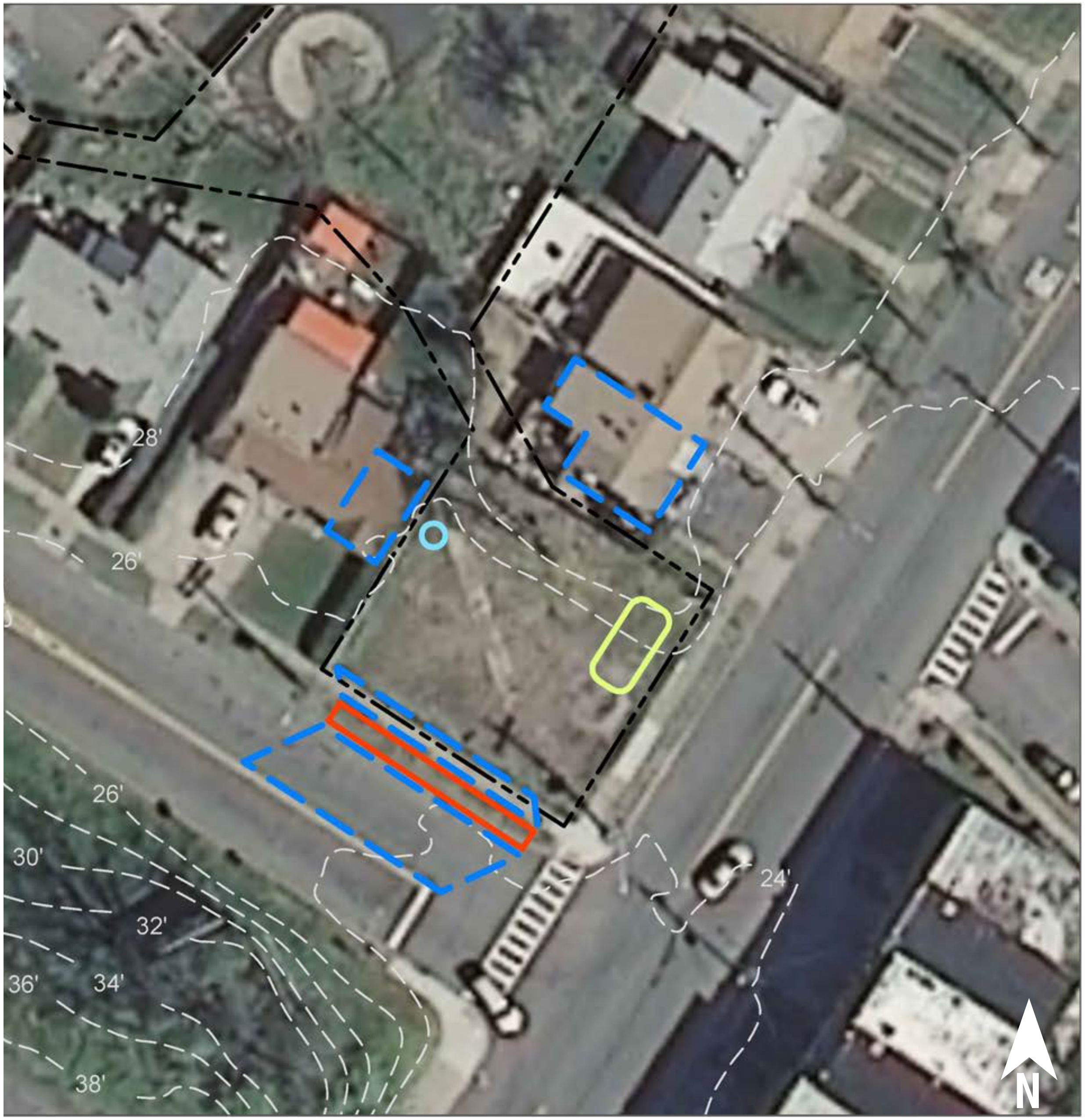
2012 Aerial: NJOIT, OGIS

0' 30' 60'

Franklin Williams School is a public school building with a pick up/drop-off zone along Laidlaw Avenue. Runoff along this street flows to the east towards Summit Avenue. The sidewalks and island can be retrofitted to intercept runoff through permeable pavements and stormwater planters.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
62.5	215,786	10.4	109.0	990.8	0.168	5.92

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Permeable pavement	0.259	43	19,067	0.72	4,640	$116,000
Stormwater planters	0.185	31	13,636	0.51	1,980	$198,000



bioretention system
rainwater harvesting
stormwater planters
drainage area
property line
2012 Aerial: NJOIT, OGIS

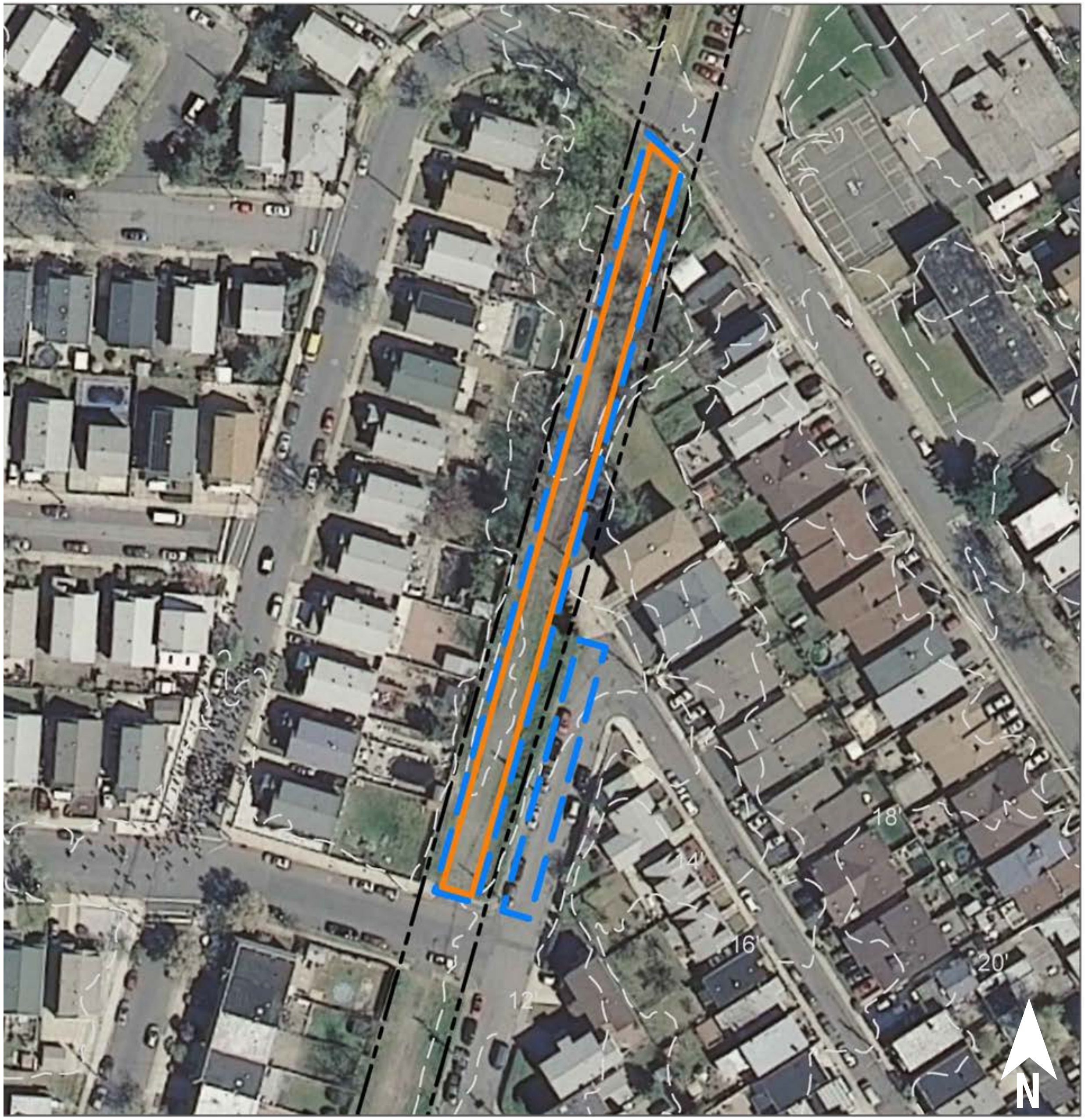
0' 20' 40'

Garfield–Merritt Community Garden is part of the Jersey City "Adopt-a-Lot" Program. Rainwater harvesting systems 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 roadway runoff. 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.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
70.0	18,256	0.9	9.2	83.8	0.014	0.50

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.023	4	1,705	0.06	260	$1,300
Rainwater harvesting	0.009	2	688	0.03	500	$1,000
Stormwater planters	0.038	6	2,798	0.11	320	$32,000



permeable pavement

drainage area

property line

2012 Aerial: NJOIT, OGIS

0' 50' 100'

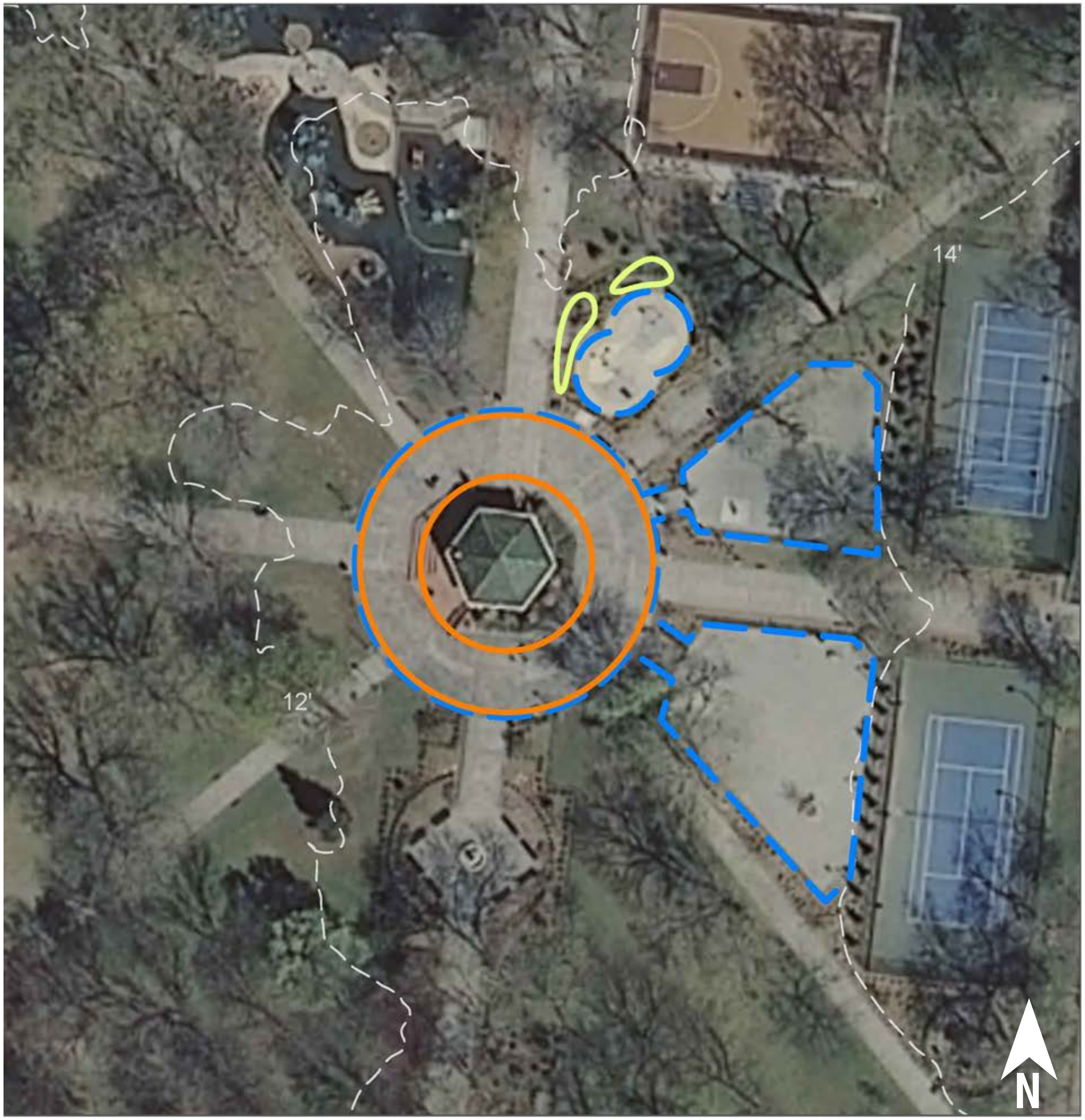
This site is the location of a future greenway path. This path will serve as a passive recreational space for the adjacent community. It can be constructed using permeable pavement to capture and infiltrate stormwater runoff.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
45.8	90,453	4.4	45.7	415.3	0.070	2.48

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Permeable pavement	0.436	73	32,089	1.21	9,450	$236,250

CURRENT CONDITION

CONCEPT DESIGN



permeable pavement
bioretention systems
drainage area
property line
2012 Aerial: NJOIT, OGIS

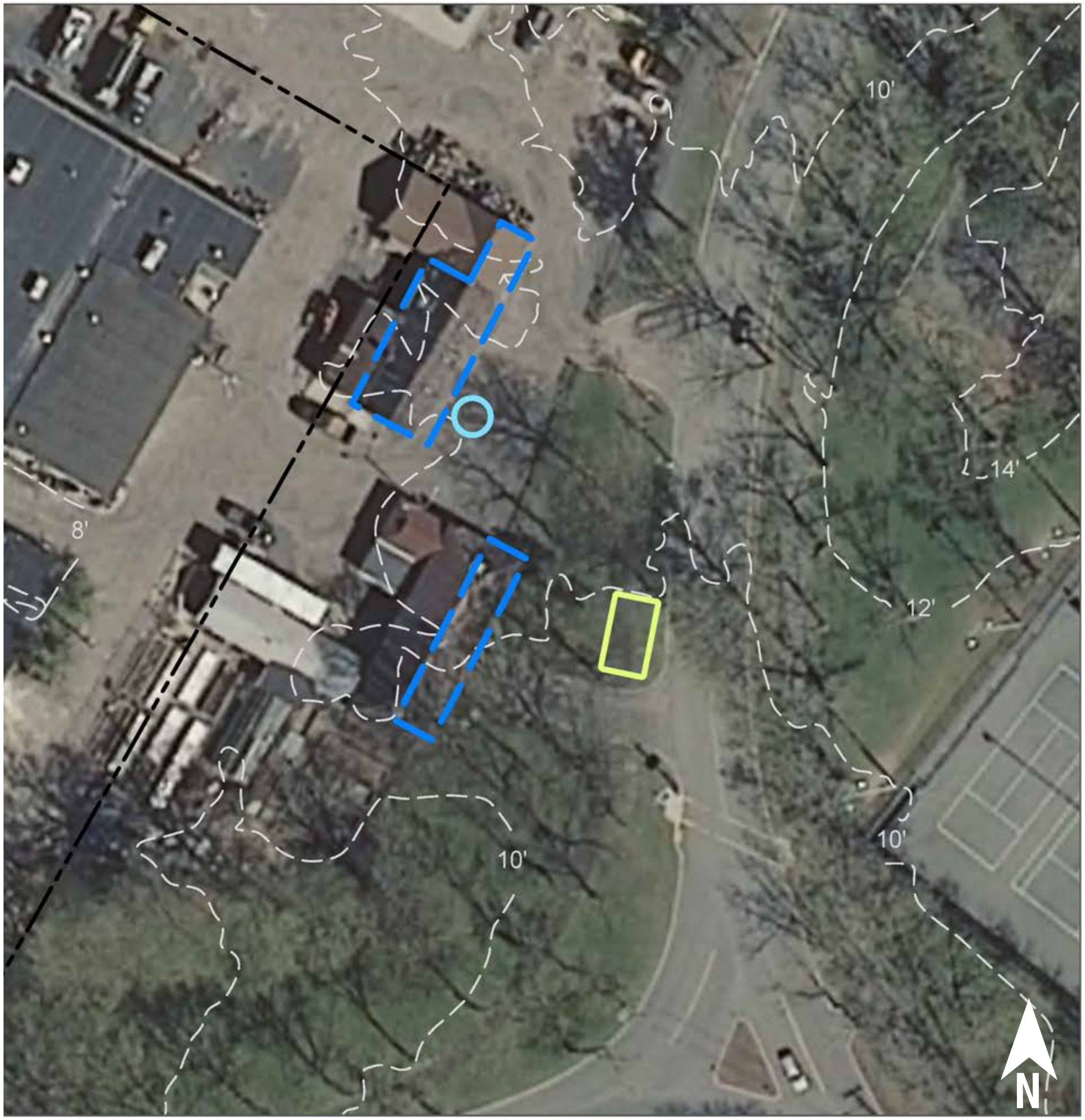
0' 30' 60'

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 permeable paving.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
25.0	58,899	2.8	29.7	270.4	0.046	1.62

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size	Estimated Cost
Bioretention systems	0.035	6	2,611	0.10	415	$2,075
Permeable pavement	0.537	90	39,509	1.49	6,590	$164,750



bioretention system
rainwater harvesting
drainage area
property line
2012 Aerial: NJOIT, OGIS

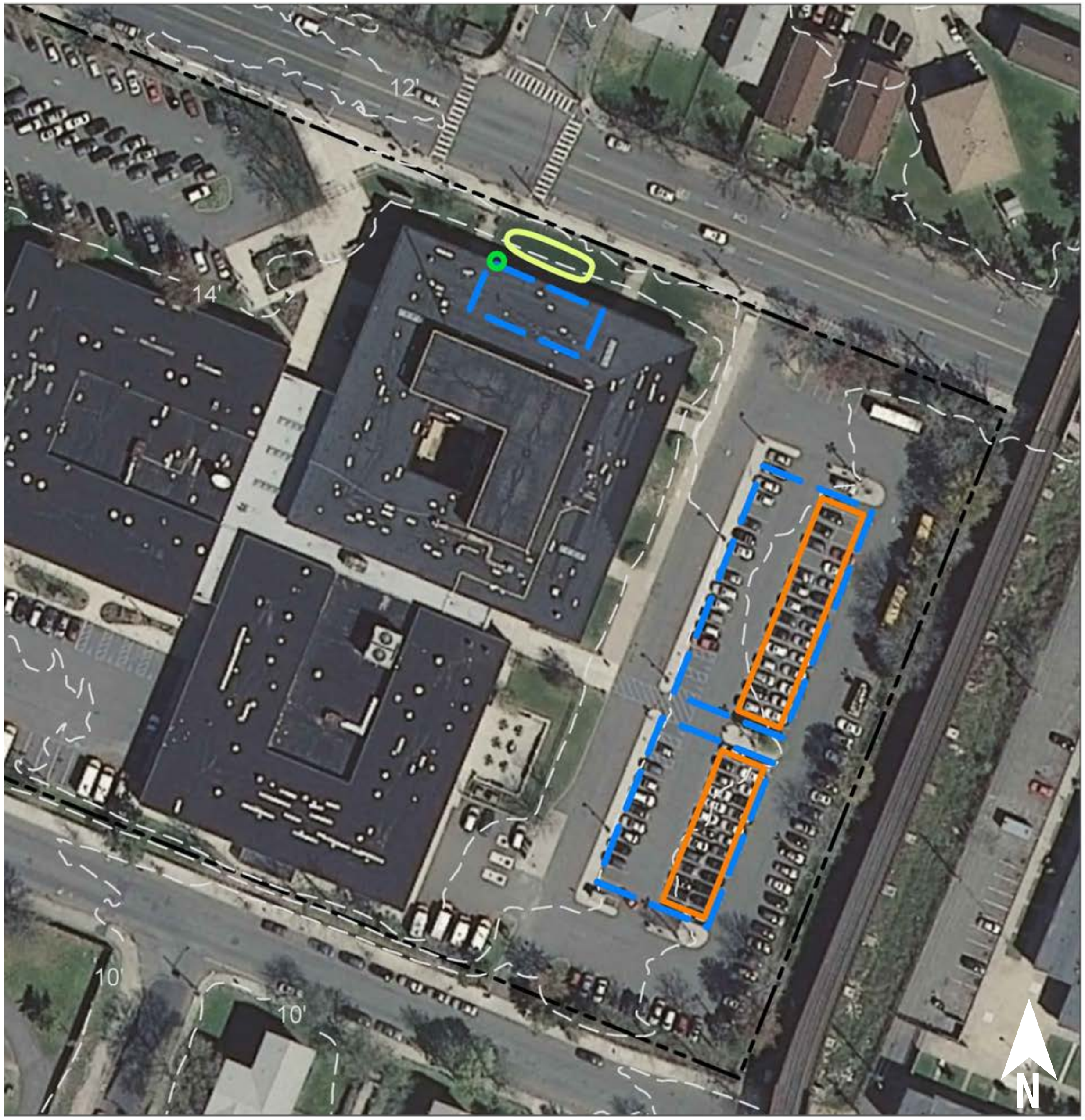
0' 30' 60'



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.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
21.6	1,046,155	50.4	528.4	4,803.3	0.815	28.69

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.032	5	2,379	0.09	490	$2,450
Rainwater harvesting	0.064	11	4,727	0.18	4,000	$8,000



disconnection

permeable pavement

bioretention system

drainage area

property line

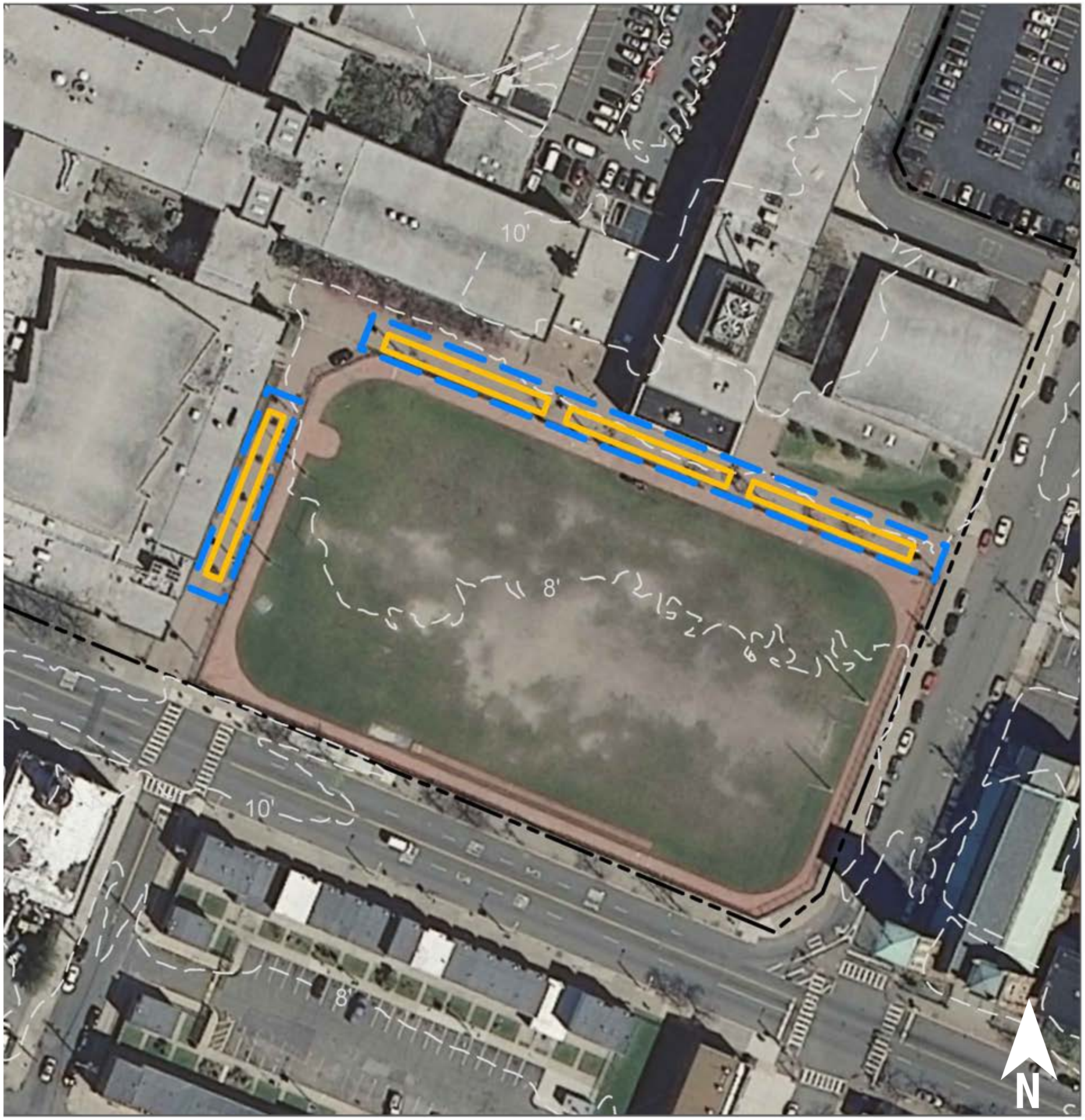
2012 Aerial: NJOIT, OGIS

0' 50' 100'

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.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
84.9	285,100	13.7	144.0	1,309.0	0.222	7.82

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.068	11	4,989	0.19	780	$3,900
Disconnection	-	-	-	-	-	$250
Permeable pavement	0.529	89	38,978	1.46	8,070	$201,750



tree filter boxes

drainage area

property line

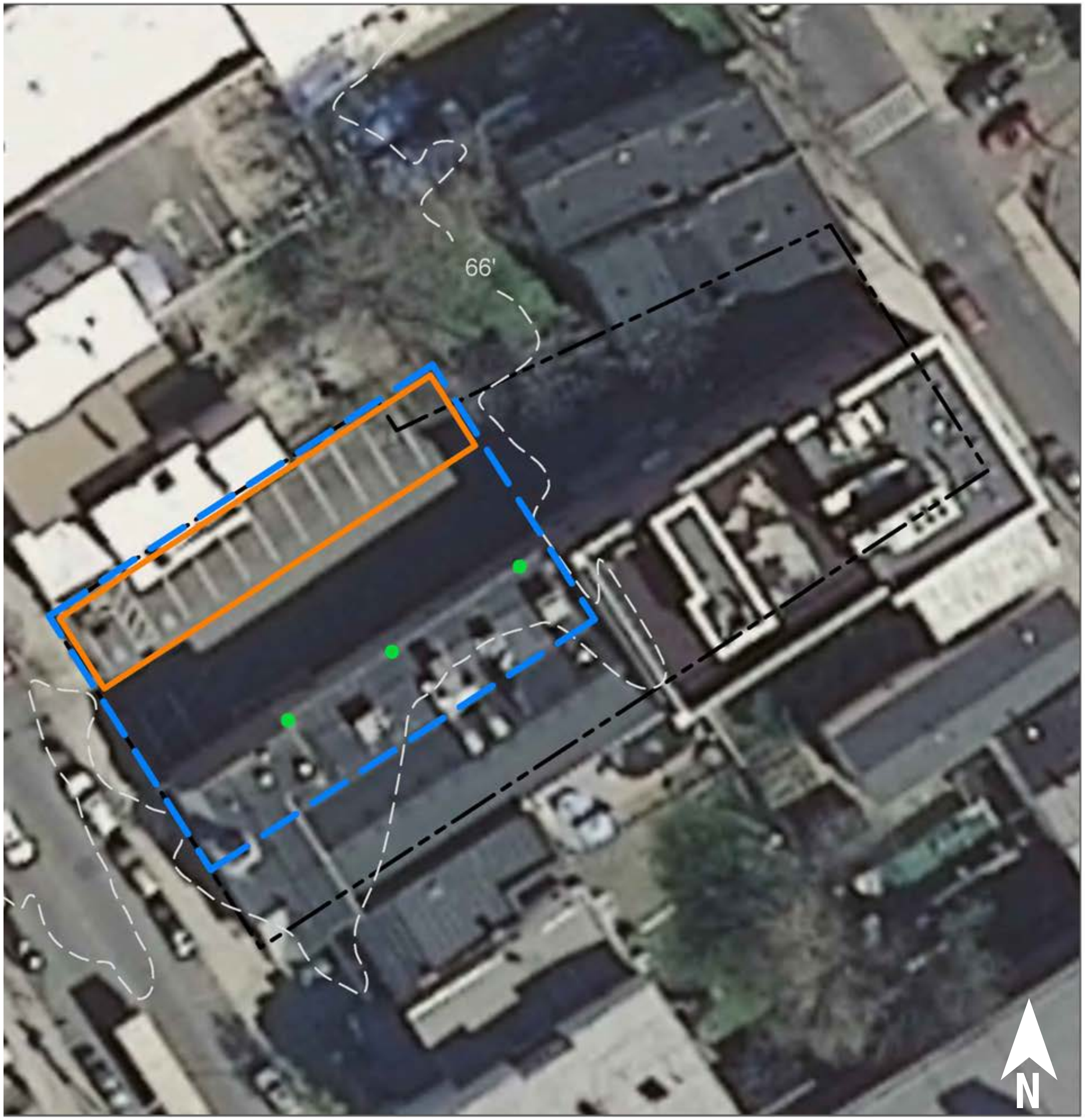
2012 Aerial: NJOIT, OGIS

0' 50' 100'

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 tree filter boxes.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
66.3	300,268	14.5	151.7	1,378.6	0.234	8.24

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Tree filter boxes	0.316	53	23,285	0.88	4,430	$443,000



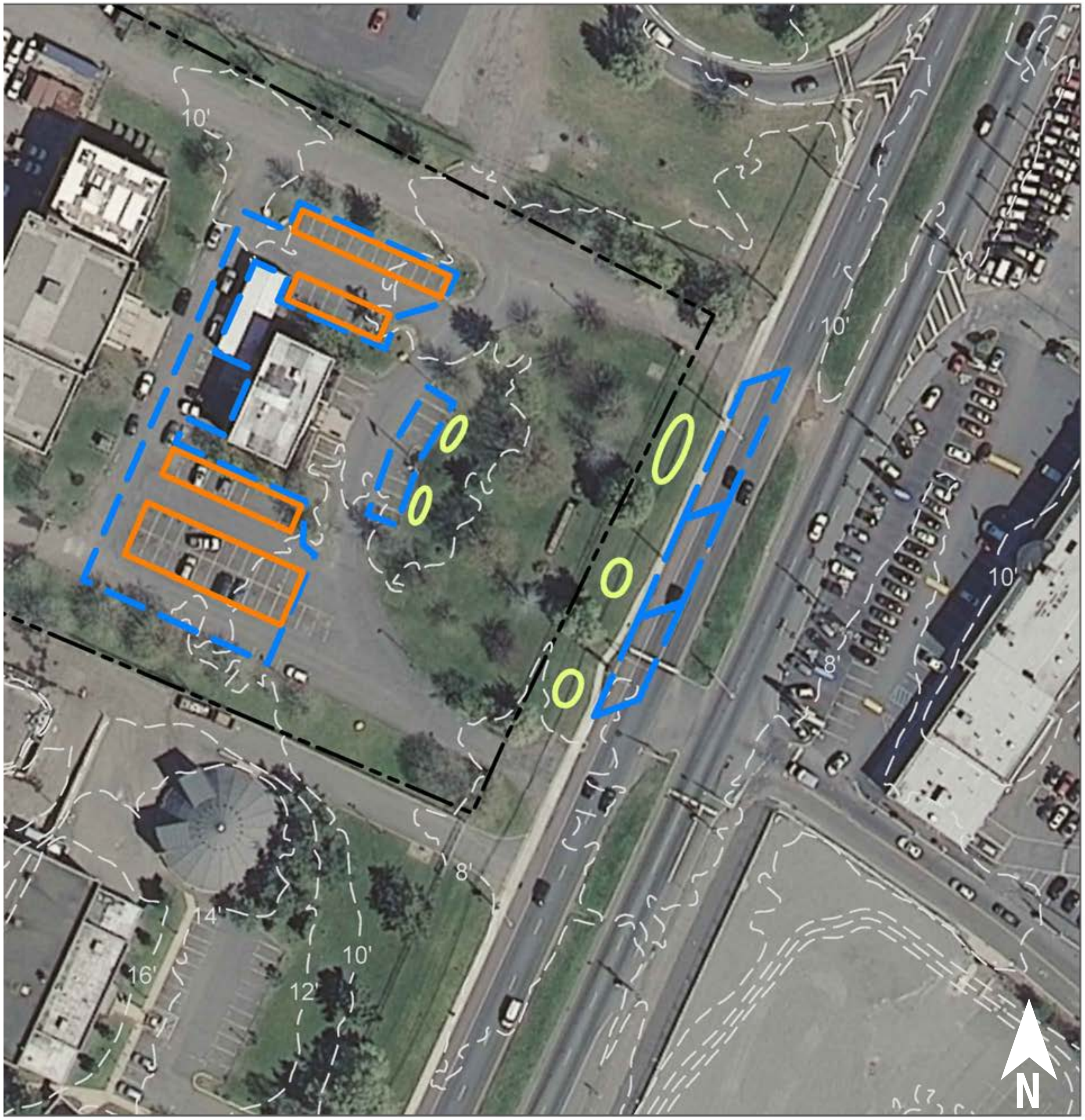
- disconnection
- permeable pavement
- drainage area
- property line
- 2012 Aerial: NJOIT, OGIS



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 the site through permeable pavements around the perimeter.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
90.0	18,092	0.9	9.1	83.1	0.014	0.50

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Disconnection	-	-	-	-	-	$750
Permeable pavement	0.234	39	17,219	0.65	2,400	$60,000



permeable pavement

bioretention systems

drainage area

property line

2012 Aerial: NJOIT, OGIS

0' 50' 100'

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 site can be captured by permeable pavement or bioretention systems.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
27.9	221,952	10.7	112.1	1,019.1	0.173	6.09

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.179	30	13,105	0.50	2,110	$10,550
Permeable pavement	0.607	102	44,656	1.68	8,260	$206,500

permeable pavement
drainage area
property line
2012 Aerial: NJOIT, OGIS

0' 20' 40'

Central Avenue & Hutton Street
Jersey City, NJ 07307, Ward D

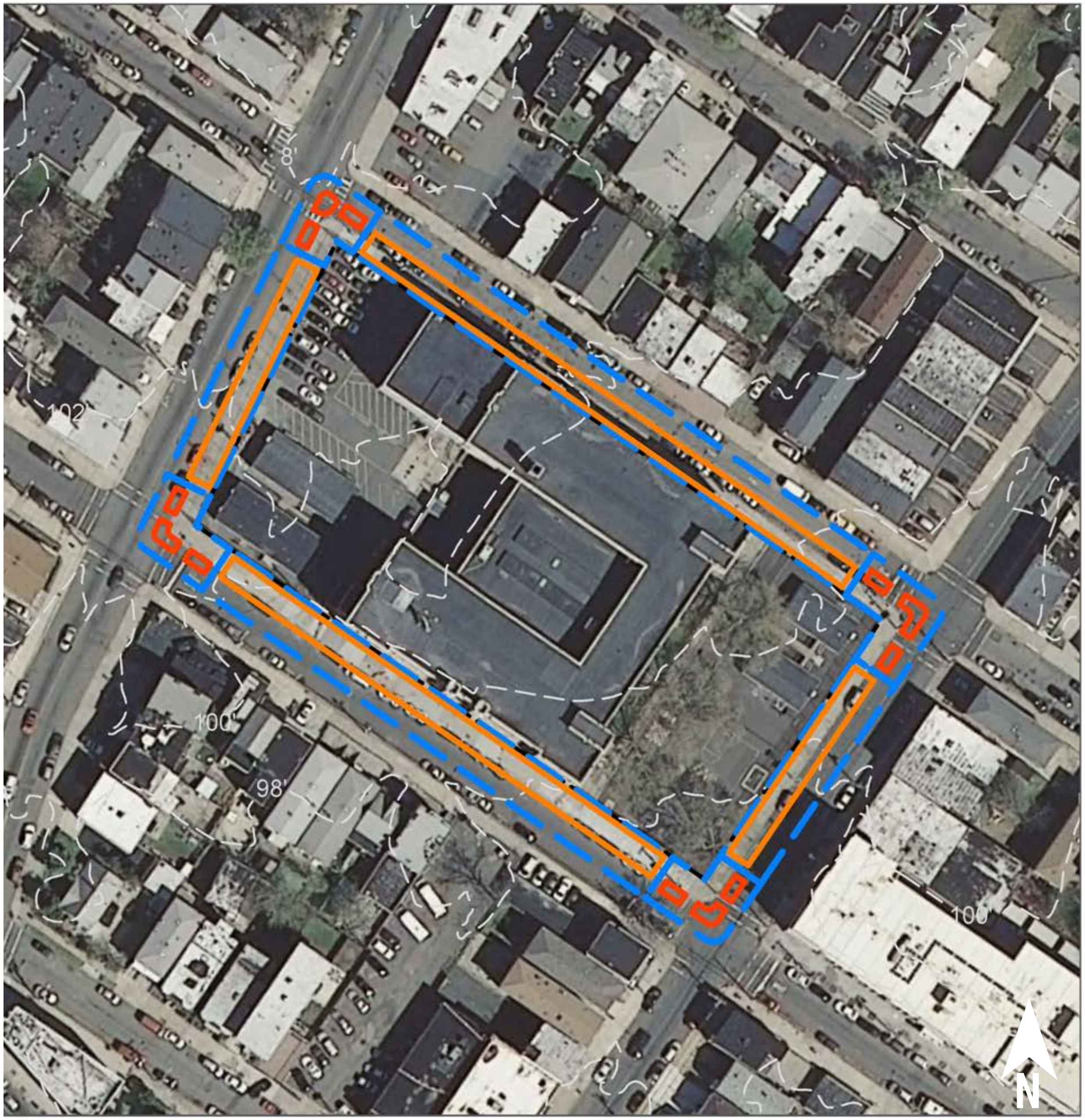
This site is a Jersey City public parking lot. Stormwater drains off of the site towards Central Avenue. Parking spaces in the lot can be retrofitted with porous asphalt to capture and infiltrate stormwater runoff. This will help decrease localized flooding.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
89.3	21,251	1.0	10.7	97.6	0.017	0.58

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Permeable pavement	0.485	81	35,672	1.34	5,440	$136,000

CURRENT CONDITION

CONCEPT DESIGN


8'
102'
100'
98'
100'
N
0' 50' 100'

permeable pavement
stormwater planters
drainage area
property line
2012 Aerial: NJOIT, OGIS

Stormwater runoff is draining from north to south across the site. Stormwater planters and permeable pavement can be installed adjacent to the site to capture, treat, and infiltrate stormwater runoff and promote a safer pedestrian environment.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
100.0	81,858	3.9	41.3	375.8	0.064	2.25

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Permeable pavement	0.848	142	62,436	2.35	15,055	$376,375
Stormwater planters	0.243	41	17,885	0.67	1,515	$151,500

CURRENT CONDITION

CONCEPT DESIGN

permeable pavement

stormwater planters

drainage area

property line

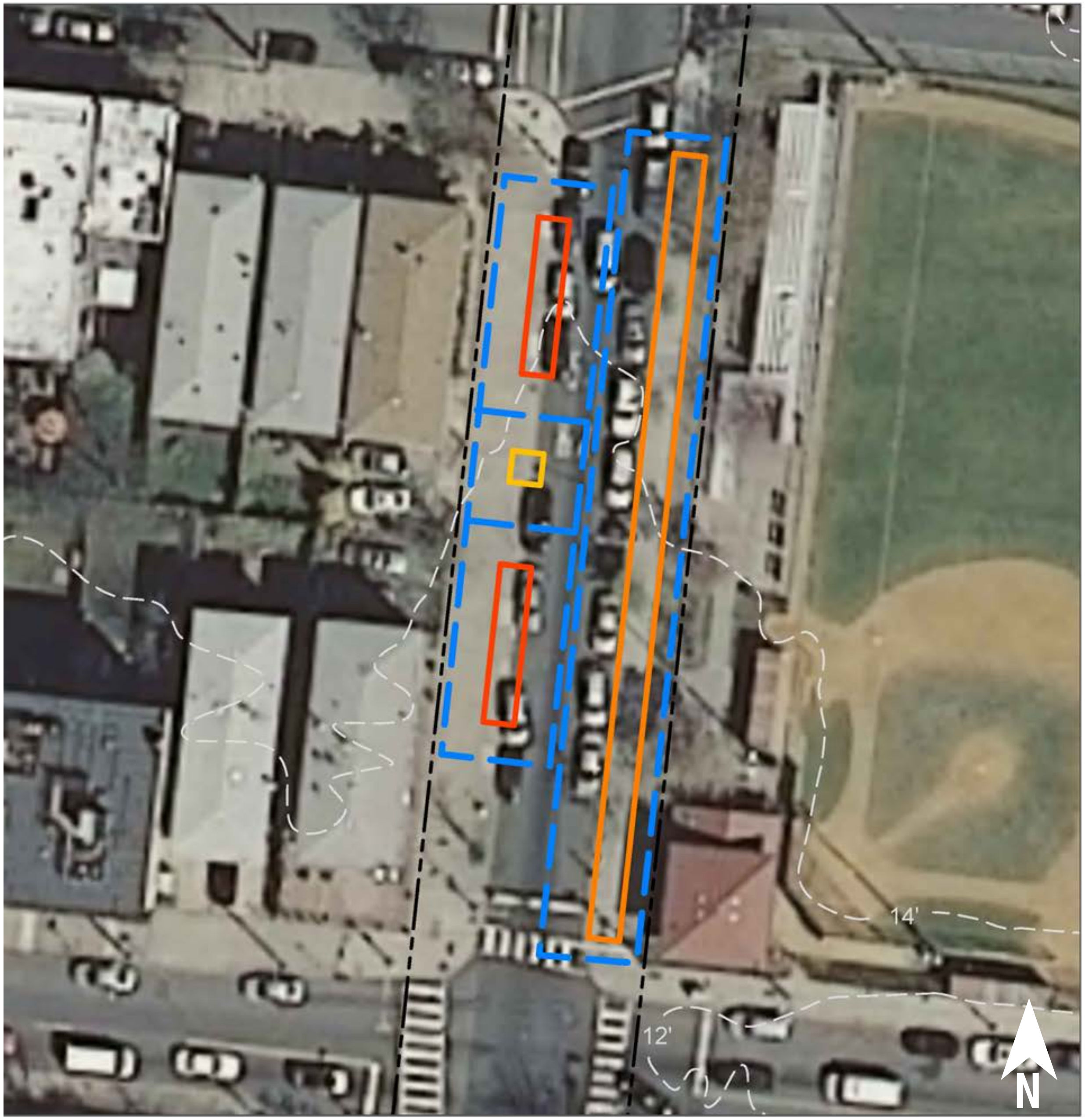
2012 Aerial: NJOIT, OGIS

0' 30' 60'

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

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
85.0	58,271	2.8	29.4	267.5	0.045	1.60

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Permeable pavement	0.163	27	12,005	0.45	2,610	$65,250
Stormwater planters	0.211	35	15,514	0.58	1,560	$156,000



permeable pavement

stormwater planters

tree filter boxes

drainage area

property line

2012 Aerial: NJOIT, OGIS

0' 20' 40'

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

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
65.1	79,648	3.8	40.2	365.7	0.062	2.18

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Permeable pavement	0.137	23	10,091	0.38	1,600	$40,000
Stormwater Planters	0.089	15	6,523	0.25	640	$64,000
Tree filter boxes	0.019	3	1,384	0.05	64	$6,400

disconnection

permeable pavement

bioretention systems

drainage area

property line

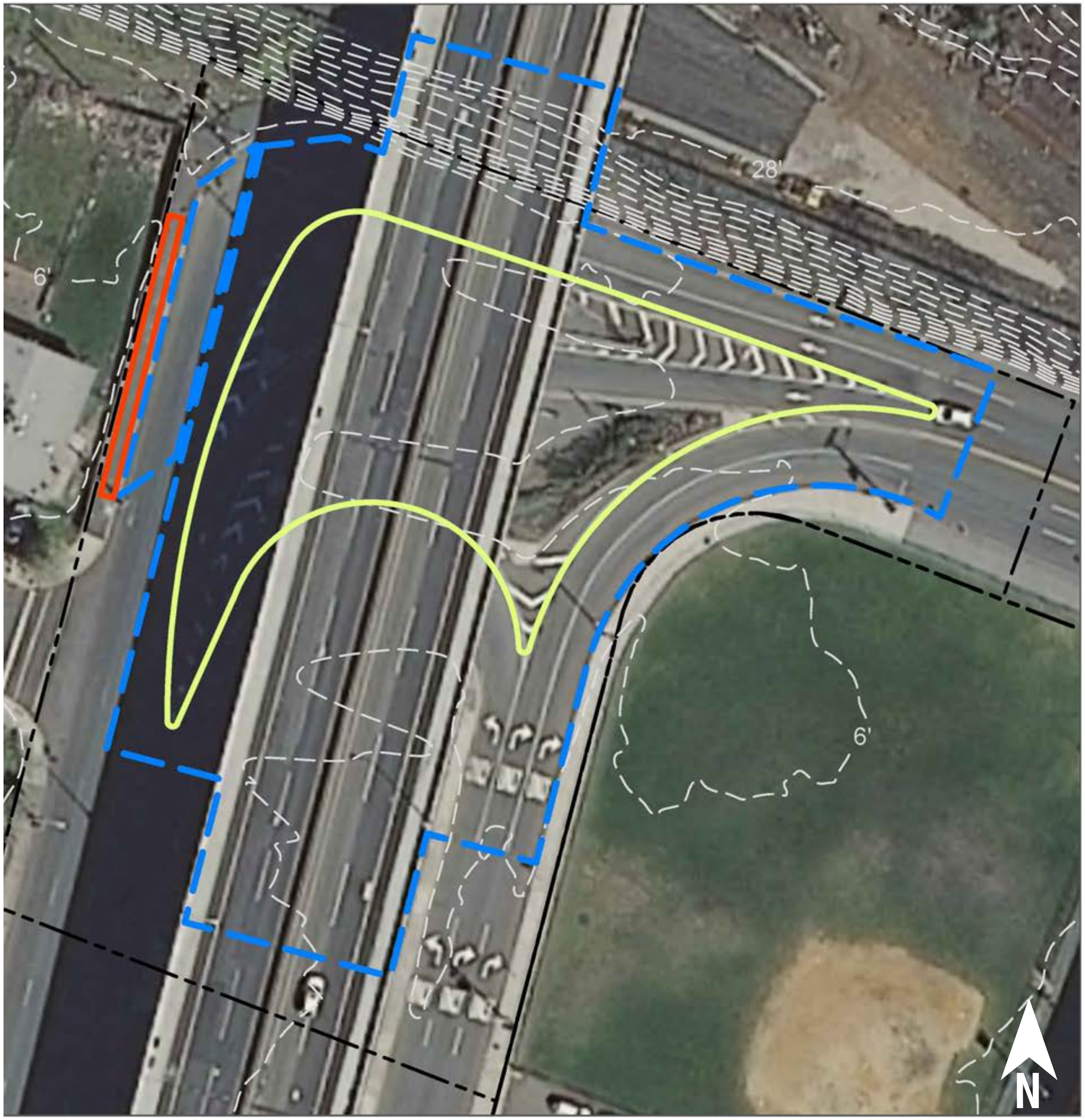
2012 Aerial: NJOIT, OGIS

0' 50' 100'

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 building. Parking areas could manage stormwater runoff through the addition of permeable pavement.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
60.5	120,726	5.8	61.0	554.3	0.094	3.31

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.245	41	18,072	0.68	2,390	$11,950
Disconnection	-	-	-	-	-	$1,250
Permeable pavement	0.499	84	36,749	1.38	4,500	$112,500



bioretention systems
stormwater planters
drainage area
property line
2012 Aerial: NJOIT, OGIS

0' 30' 60'

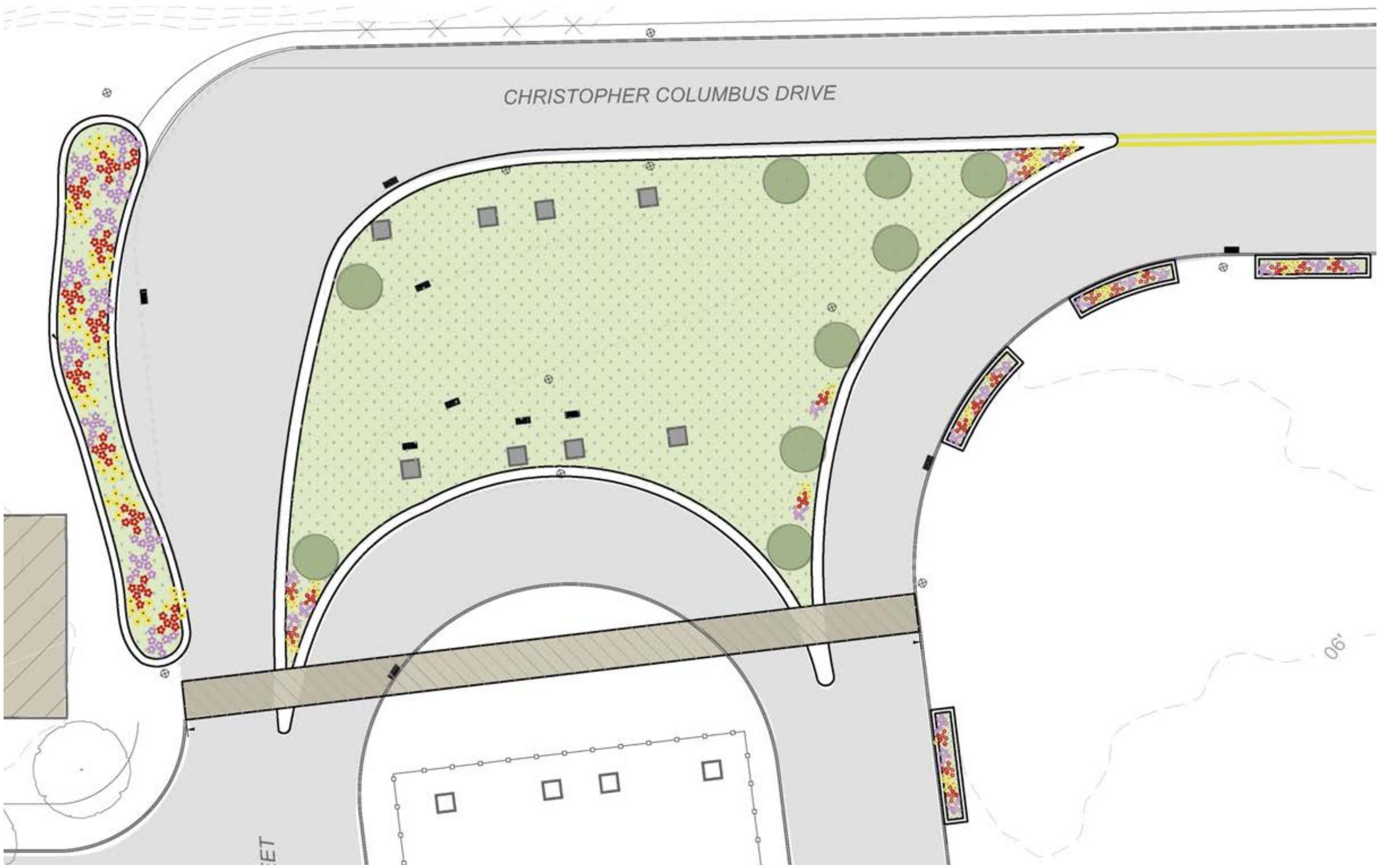
Stormwater is draining from I-78 via disconnected downspouts to the corner of Merseles Street & C. C. Drive. Stormwater planters and bioretention systems can be installed to capture, treat, and infiltrate stormwater runoff. These practices will help reduce localized flooding.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
95.5	77,914	3.8	39.4	357.7	0.061	2.14

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	1.544	258	113,629	4.27	21,680	$108,400
Stormwater planters	0.055	9	4,069	0.15	570	$57,000

CURRENT CONDITION

CONCEPT DESIGN



rainwater harvesting

tree filter boxes

drainage area

property line

2012 Aerial: NJOIT, OGIS

0' 20' 40'

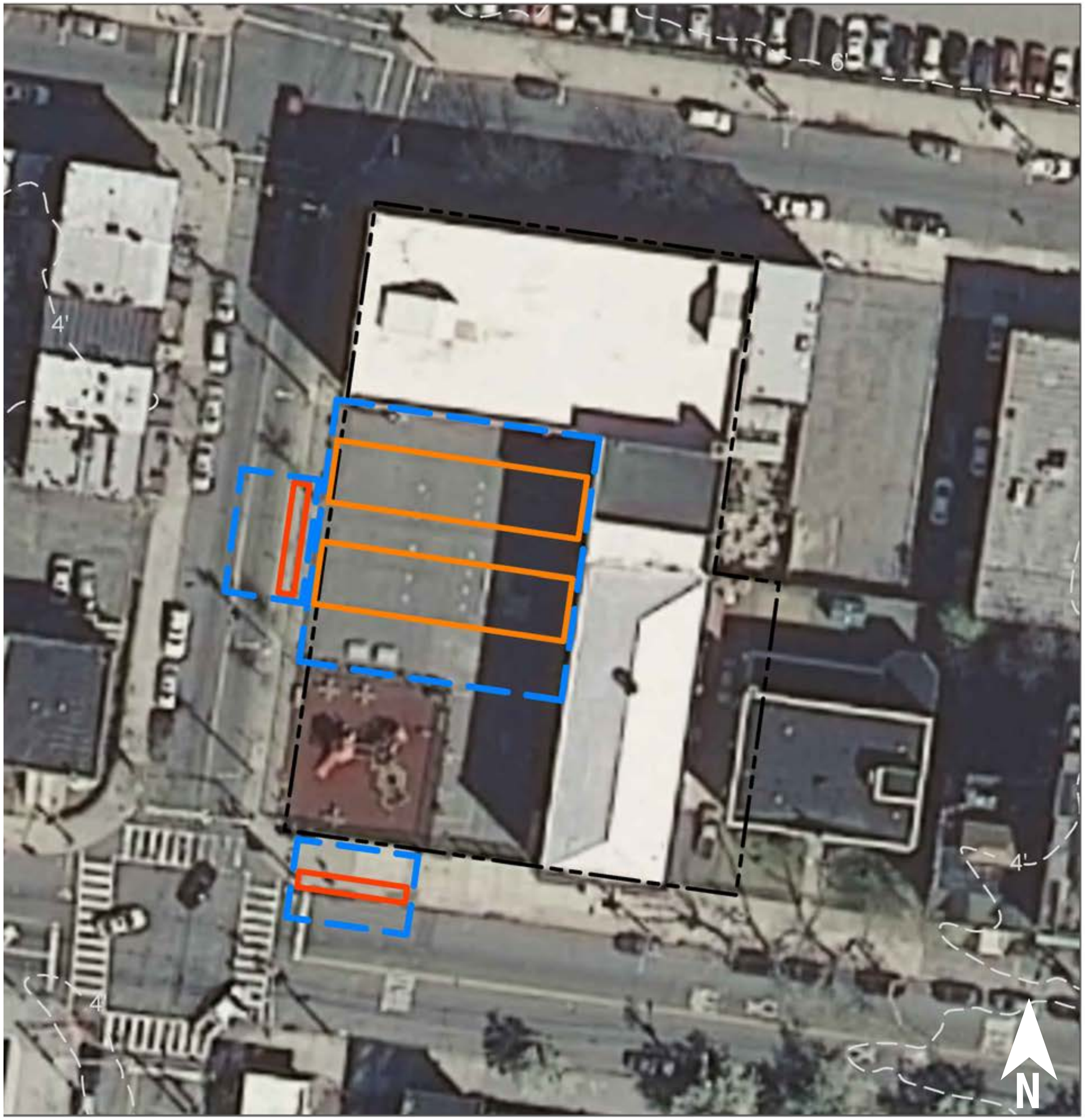
Ogden's End Community Garden is located at the terminus of Ogden Avenue and receives stormwater runoff from the street. Tree filter boxes can manage excess stormwater on the site. Rainwater can be harvested in cisterns or rain barrels from the rooftop of an adjacent building through downspouts.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
12.3	4,464	0.2	2.3	20.5	0.003	0.12

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Rainwater harvesting	0.034	6	2,483	0.09	2,000	$4,000
Tree filter boxes	0.033	5	2,416	0.09	130	$13,000

CURRENT CONDITION

CONCEPT DESIGN



permeable pavement

stormwater planters

drainage area

property line

2012 Aerial: NJOIT, OGIS

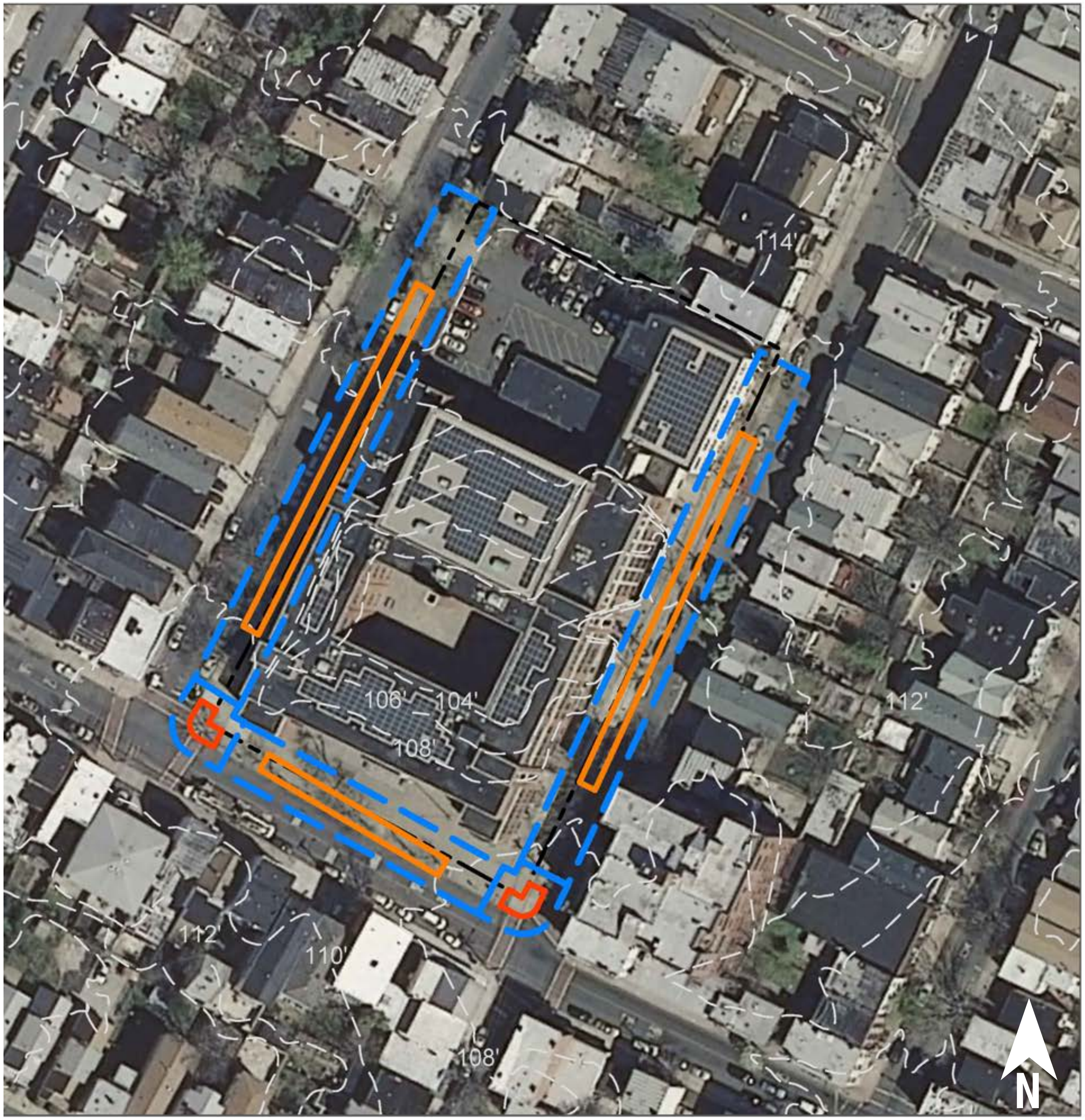
0' 25' 50'



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. Stormwater runoff can be diverted into permeable paving and stormwater planters.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
94.9	25,739	1.2	13.0	118.2	0.020	0.71

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size	Estimated Cost
Permeable pavement	0.185	31	13,636	0.51	3,205	$80,125
Stormwater planters	0.051	9	3,740	0.14	350	$35,000



permeable pavement
stormwater planters
drainage area
property line
2012 Aerial: NJOIT, OGIS

0' 50' 100'

PUBLIC SCHOOL NO.8

96 Franklin Street
Jersey City, NJ 07307, Ward D



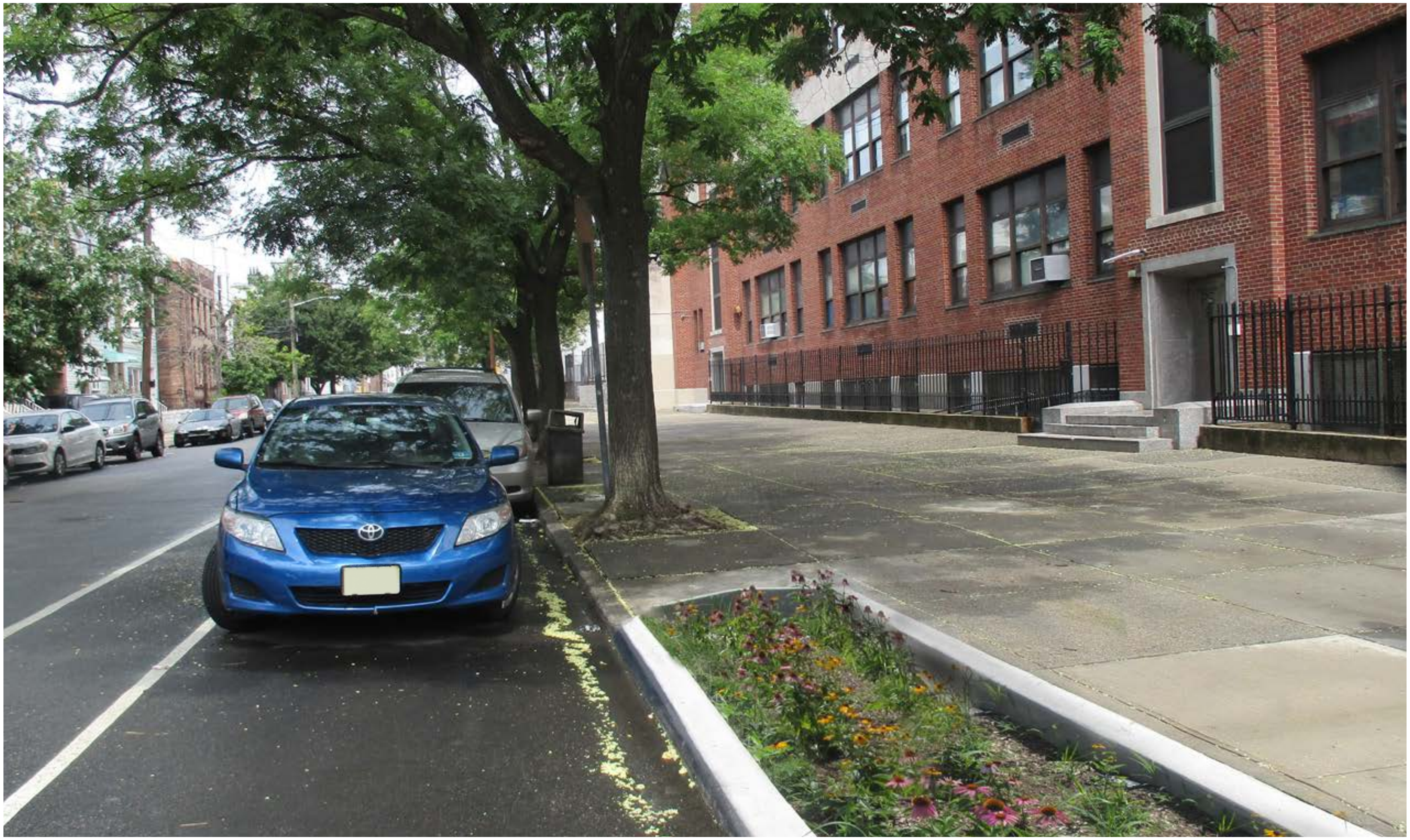
Stormwater runoff is draining from north to south across the site. Stormwater planter bumpouts can be installed to capture, treat, and infiltrate stormwater runoff. Parking spaces in the adjacent lot can be converted to porous asphalt to capture and infiltrate stormwater runoff.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
99.9	84,214	4.1	42.5	386.7	0.066	2.31

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Permeable pavement	0.796	133	58,576	2.20	7,000	$175,000
Stormwater planters	0.087	15	6,388	0.24	680	$68,000

CURRENT CONDITION

CONCEPT DESIGN



disconnection

bioretention system

rainwater harvesting

drainage area

property line

2012 Aerial: NJOIT, OGIS

0' 20' 40'



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.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
63.8	4,699	0.2	2.4	21.6	0.004	0.13

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.019	3	1,384	0.05	180	$900
Disconnection	-	-	-	-	-	$250
Rainwater harvesting	0.021	3	1,533	0.06	2,000	$4,000

permeable pavement

bioretention systems

drainage area

property line

2012 Aerial: NJOIT, OGIS

0' 50' 100'



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 the site with the addition of rain gardens adjacent to open lawn areas. Permeable pavement would aid in managing runoff in the areas of steep slopes.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
13.0	29,318	1.4	14.8	134.6	0.023	0.22

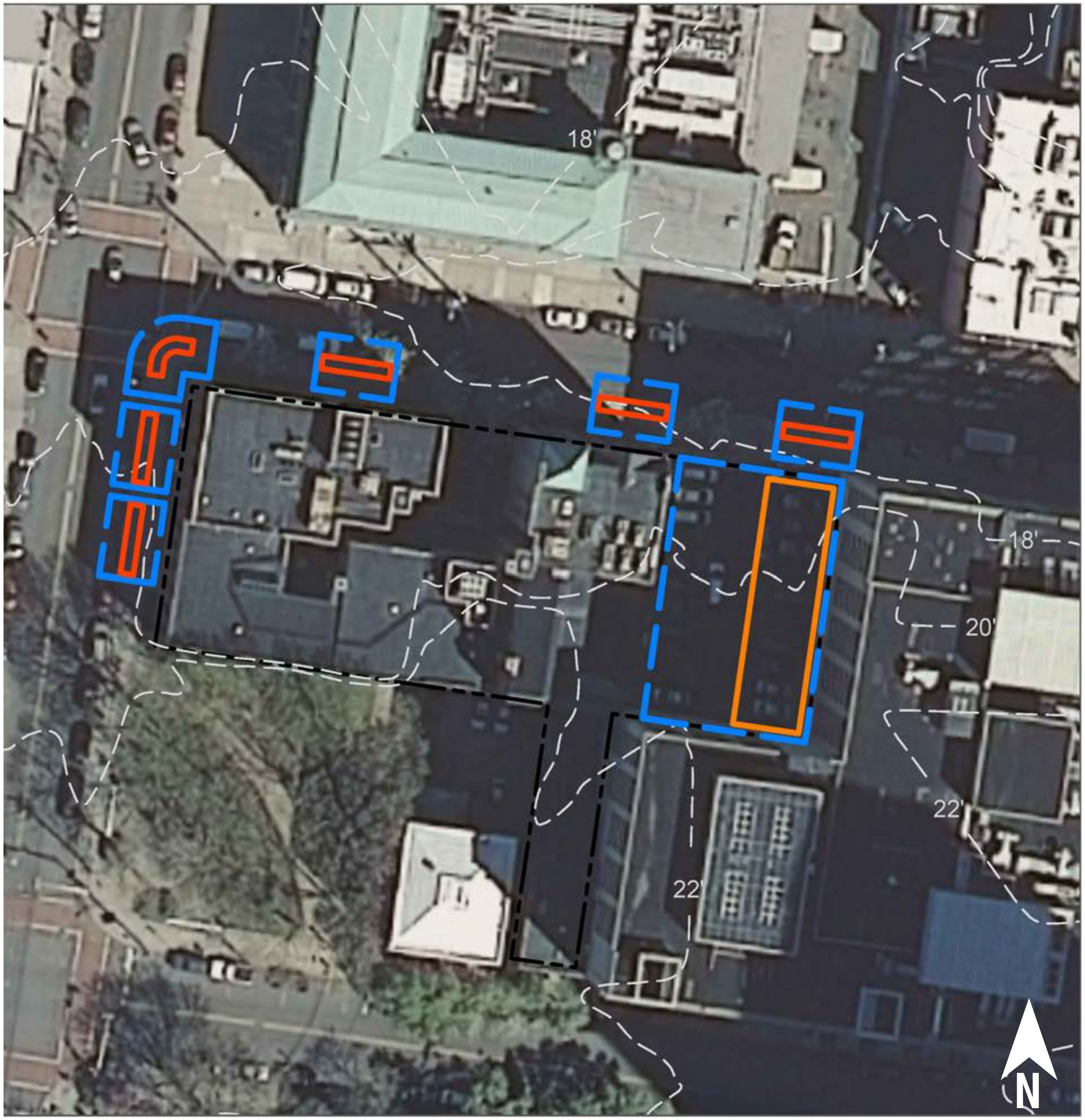
Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.096	16	7,099	0.27	1,020	$5,100
Permeable pavement	0.547	92	40,280	1.51	10,800	$270,000

CURRENT CONDITION

CONCEPT DESIGN

CURRENT CONDITION

CONCEPT DESIGN



permeable pavement
stormwater planters
drainage area
property line
2012 Aerial: NJOIT, OGIS

0' 30' 60'

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 stormwater planters at each of the sidewalk corners to intercept stormwater runoff and provide traffic calming.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
93.3	25,816	1.2	13.0	118.5	0.020	0.71

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Permeable pavement	0.164	27	12,080	0.45	2,400	$60,000
Stormwater planters	0.104	17	7,652	0.29	770	$77,000

permeable pavement

drainage area

property line

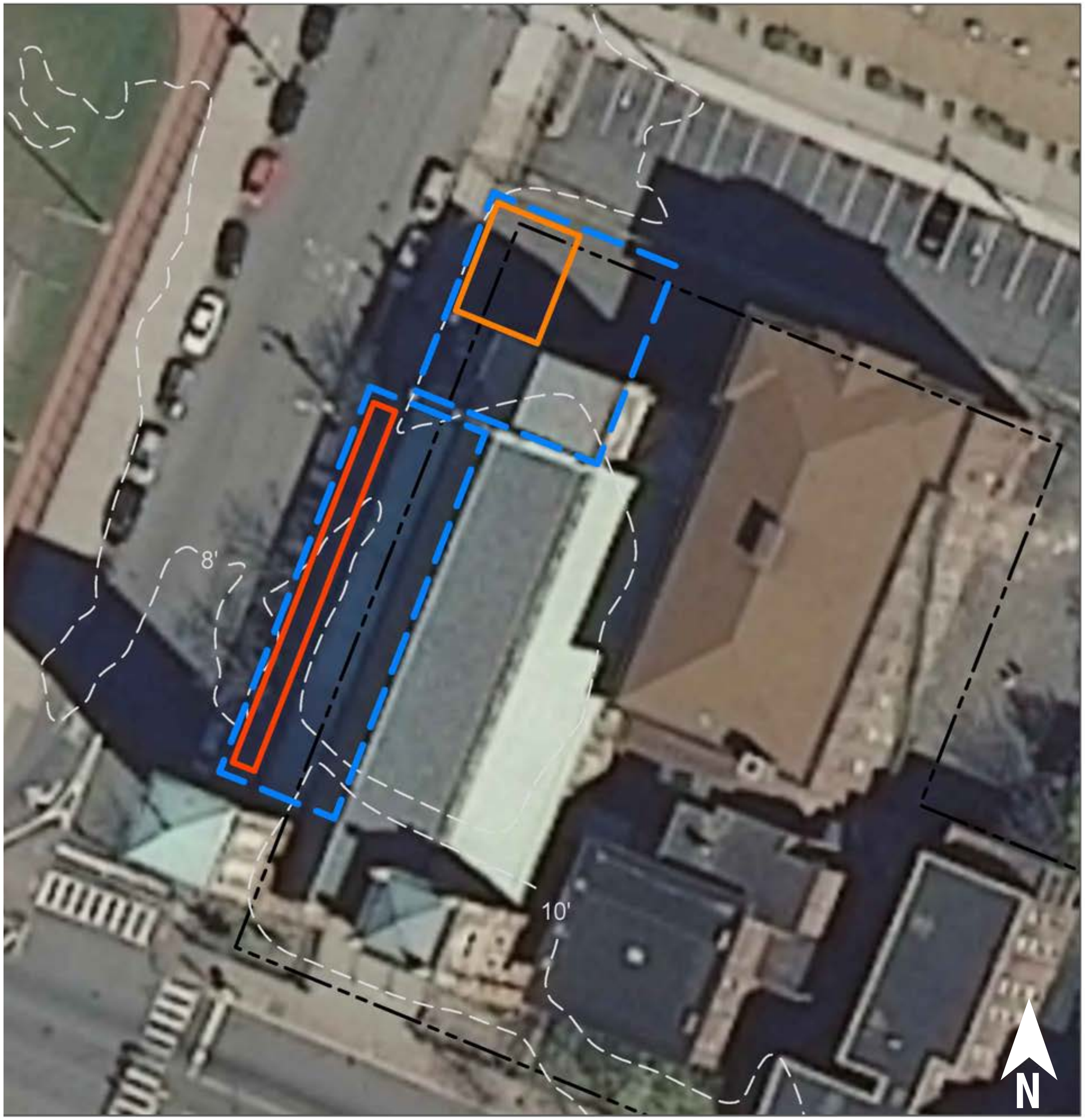
2012 Aerial: NJOIT, OGIS

0' 20' 40'

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.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
95.0	52,596	2.5	26.6	241.5	0.041	1.44

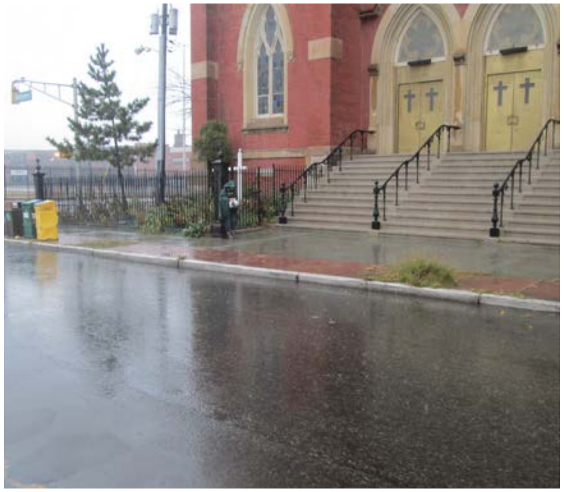
Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Permeable pavement	0.465	78	34,199	1.29	4,450	$111,250



stormwater planters
permeable pavement
drainage area
property line
2012 Aerial: NJOIT, OGIS

0' 20' 40'

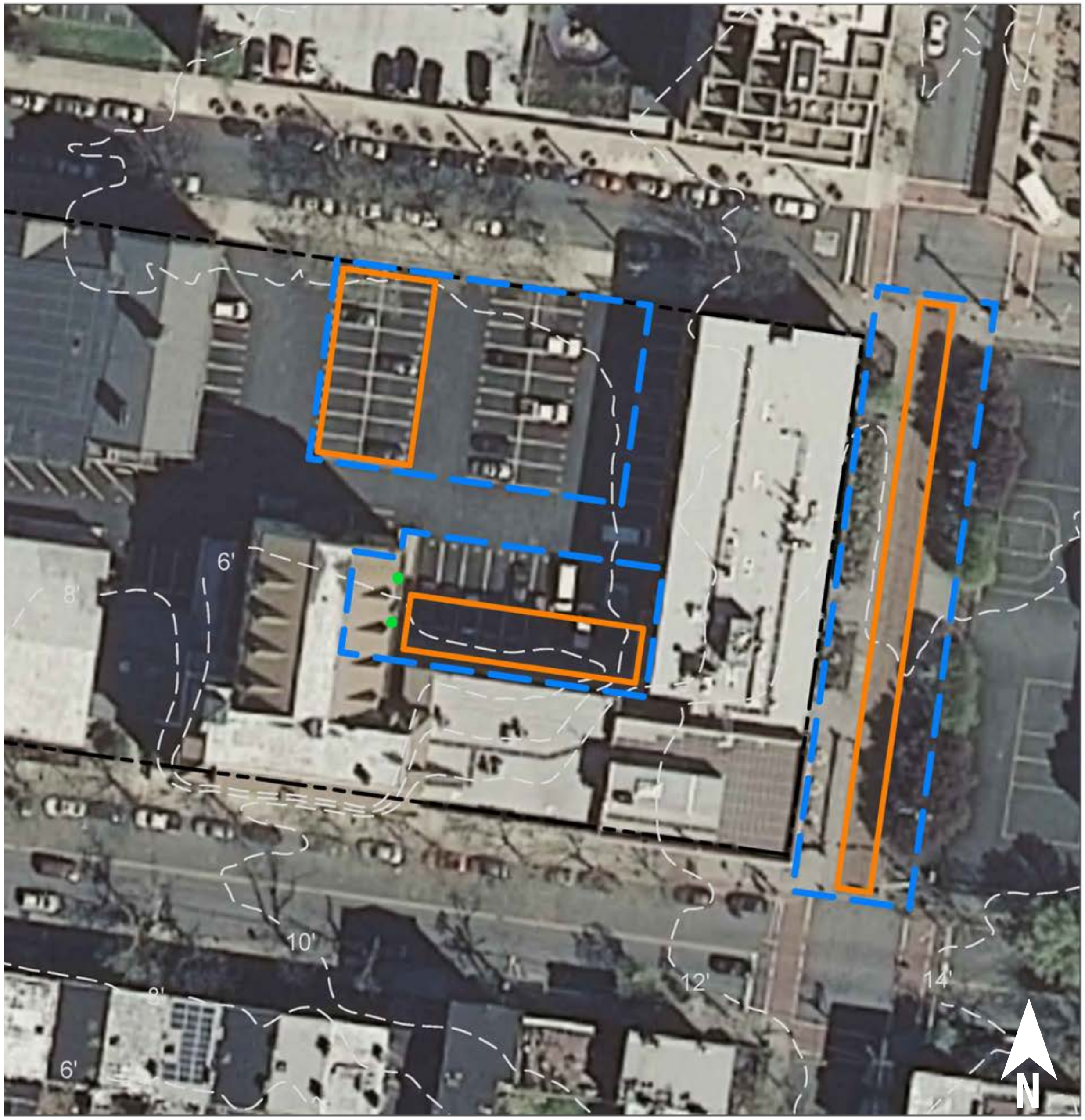
372 Montgomery Street
Jersey City, NJ 07302, Ward E



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.

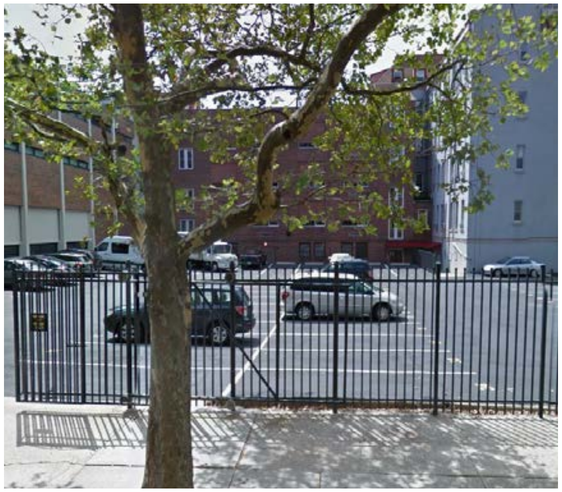
Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
94.1	34,871	1.7	17.6	160.1	0.027	0.96

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Permeable pavement	0.071	12	5,199	0.20	660	$16,500
Stormwater planters	0.087	15	6,388	0.24	590	$59,000



- disconnection
- permeable pavement
- drainage area
- property line
- 2012 Aerial: NJOIT, OGIS

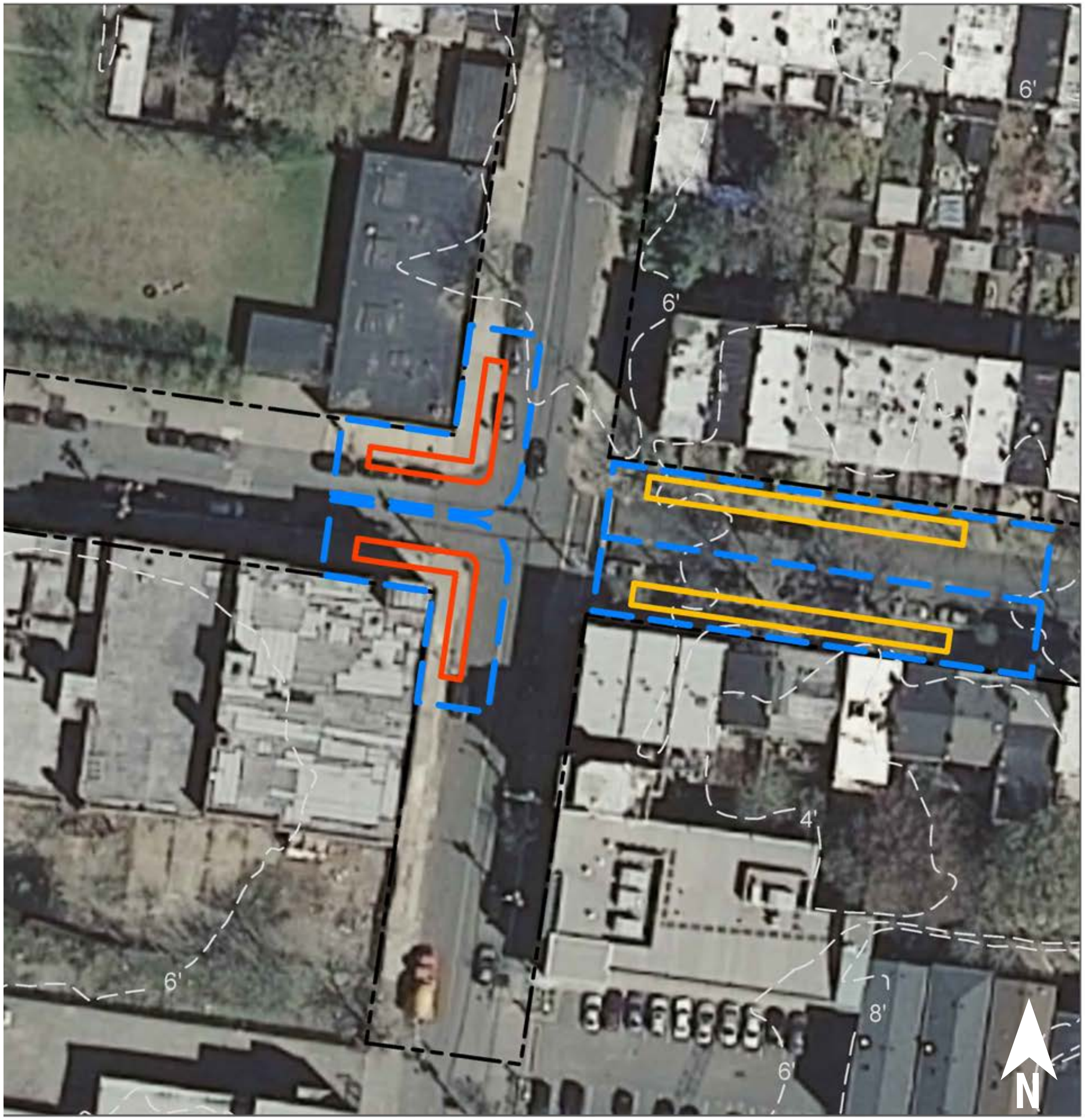
0' 30' 60'



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

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
95.0	75,988	3.7	38.4	348.9	0.059	2.08

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Disconnection	-	-	-	-	-	$500
Permeable pavement	0.664	111	48,889	1.84	7,300	$182,500



stormwater planters

tree filter boxes

drainage area

property line

2012 Aerial: NJOIT, OGIS

0' 30' 60'

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 filter boxes and stormwater planters.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
70.0	42,463	2.0	21.4	195.0	0.033	1.16

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Stormwater planters	0.164	27	12,043	0.45	1,310	$131,000
Tree filter boxes	0.251	42	18,461	0.69	1,970	$197,000

permeable pavement

drainage area

property line

2012 Aerial: NJOIT, OGIS

0' 20' 40'

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.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
95.0	28,792	1.4	14.5	132.2	0.022	0.79

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Permeable pavement	0.082	14	6,014	0.23	1,120	$28,000

permeable pavement

stormwater planters

drainage area

property line

2012 Aerial: NJOIT, OGIS

0' 20' 40'

Hopkins Avenue & Bevan Street
Jersey City, NJ 07306, Ward C

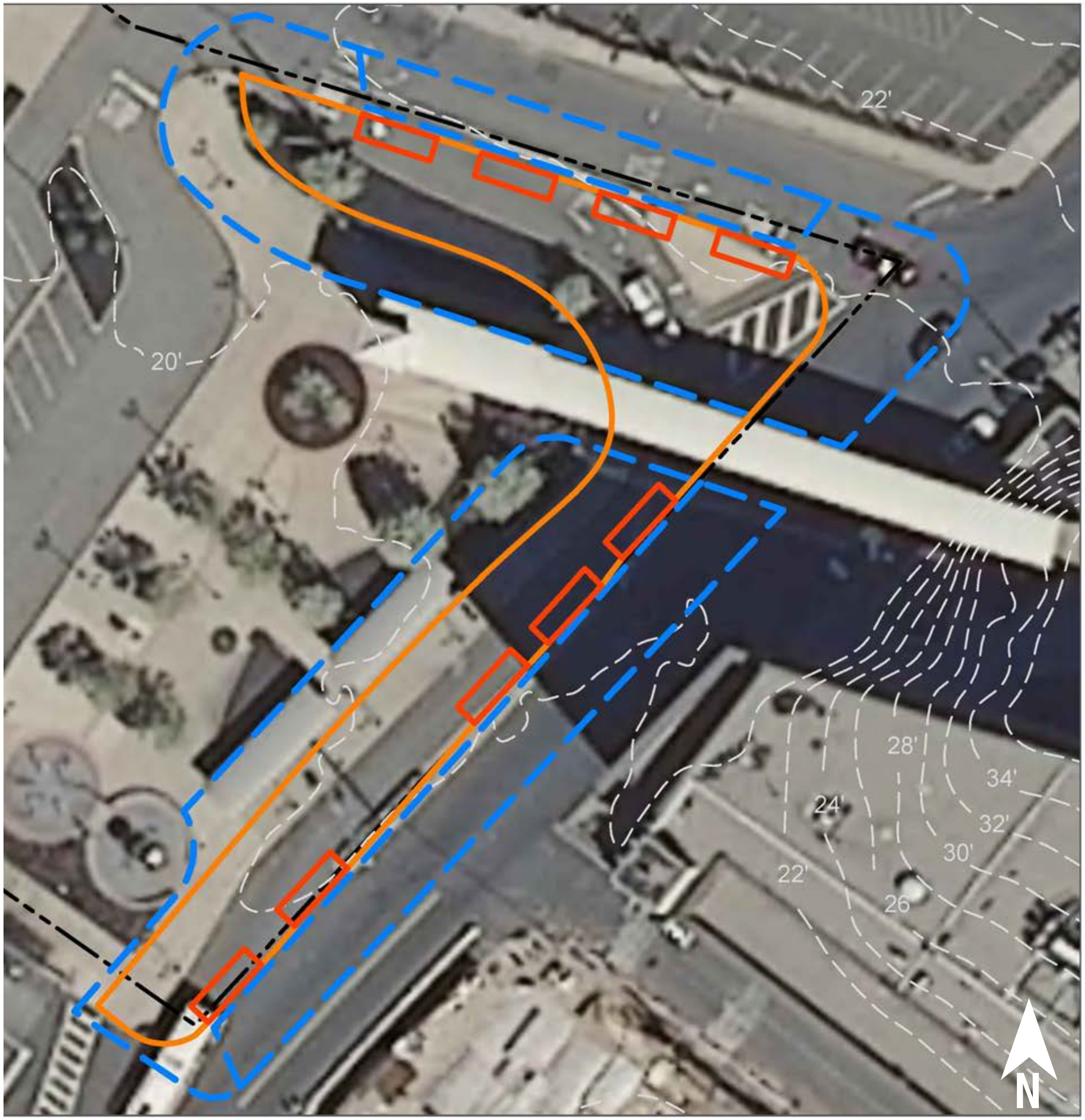
Stormwater runoff drains to the site from the east and west. Stormwater planters and permeable pavement can be installed on this site to capture, treat, and infiltrate stormwater runoff. A park can be developed to provide a safe outdoor space for the community.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
21.8	5,000	0.2	2.5	23.0	0.004	0.14

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Permeable pavement	3.103	519	228,439	8.59	4,040	$101,000
Stormwater planters	0.128	21	9,395	0.35	970	$97,000

CURRENT CONDITION

CONCEPT DESIGN



permeable pavement
stormwater planters
drainage area
property line
2012 Aerial: NJOIT, OGIS

0' 20' 40'

Stormwater runoff is draining toward the site from the north and south. Stormwater planter bumpouts and permeable pavement can be installed at this site in order to capture, treat, and infiltrate stormwater runoff. This will reduce flooding and create a pedestrian friendly environment.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
93.8	330,783	15.9	167.1	1,518.7	0.258	9.07

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Permeable pavement	0.452	76	33,241	1.25	9,000	$225,000
Stormwater planters	0.133	22	9,761	0.37	1,080	$108,000

CURRENT CONDITION

CONCEPT DESIGN

permeable pavement

bioretention systems

drainage area

property line

2012 Aerial: NJOIT, OGIS

0' 30' 60'



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 in the terraces can intercept stormwater runoff. Parking areas can manage stormwater on the site with the addition of permeable pavement.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	From the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
52.5	228,405	11.0	115.4	1,048.7	0.178	6.26

Recommended Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.192	32	14,100	0.53	2,640	$13,200
Permeable pavement	0.416	70	30,653	1.15	3,350	$83,750


New Jersey TREE FOUNDATION
TREE PLANTING

APPENDIX A:
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 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.




APPENDIX B: MAINTENANCE PROCEDURES

MAINTAINING JERSEY CITY'S GREEN INFRASTRUCTURE SYSTEMS

1. Rain Garden
   Stormwater Planter
   Tree Filter Box

2. Rain Barrel
   Cistern

3. Porous Asphalt
   Underground Detention

RAIN GARDEN / STORMWATER PLANTER / TREE FILTER BOX

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

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

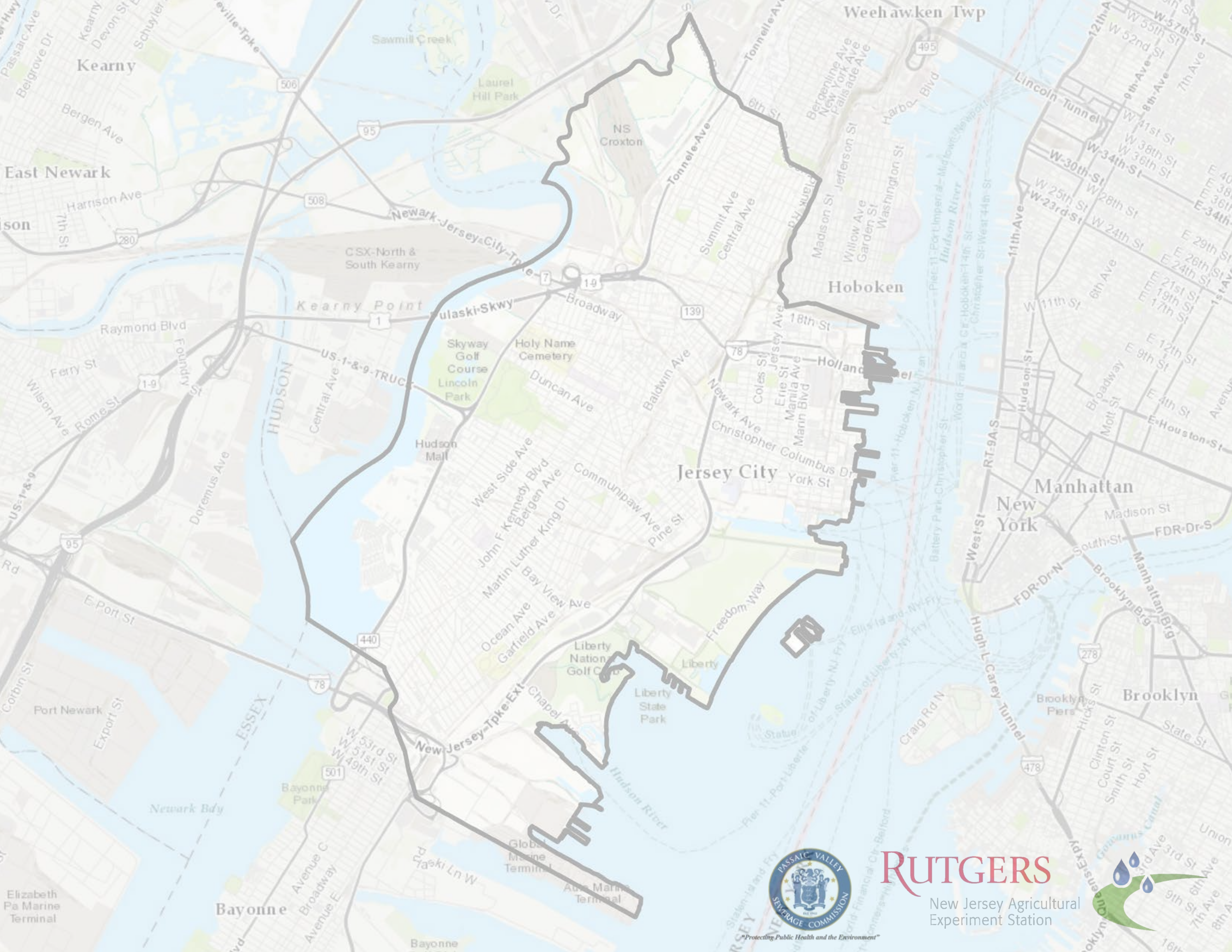
- In the fall prepare your cistern for the winter by diverting flow so no water can enter and freeze within the barrel
- Weekly check: Check for leaks, clogs and other obstructions, holes and vent openings where animals, insects, and rodents may enter; repair leaks with sealant; drain the first flush 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

POROUS ASPHALT

- Materials cost is ~20-25% more than traditional asphalt
- 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


Weehawken Twp
Kearny
East Newark
Sawmill Creek
Laurel Hill Park
NS Croxton
CSX-North & South Kearny
Kearny Point
Newark-Jersey City Tpke
Pulaski Skwy
Broadway
Tonnele Ave
Summit Ave
Central Ave
Hoboken
18th St
Holland Tunnel
Skyway Golf Course
Holy Name Cemetery
Lincoln Park
Duncan Ave
Baldwin Ave
Newark Ave
Christopher Columbus Dr
Hudson Mall
West Side Ave
John F Kennedy Blvd
Bergen Ave
Martin Luther King Dr
Communipaw Ave
Pine St
Jersey City
York St
Bay View Ave
Ocean Ave
Garfield Ave
Freedom Way
Liberty National Golf Club
Liberty State Park
New Jersey Tpke Ext
Chapel Ave
Hudson River
Newark Bay
Port Newark
Bayonne Park
Bayonne
Global Marine Terminal
Auto Marine Terminal
Elizabeth Pa Marine Terminal
HUDSON
ESSEX
Raymond Blvd
Harrison Ave
Bergen Ave
Doremus Ave
Central Ave
E Port St
Manhattan
New York
Brooklyn
Lincoln Tunnel
Hugh L Carey Tunnel
FDR Dr
Brooklyn Brg
Manhattan Brg
Brooklyn Piers
Holland Tunnel
RUTGERS
New Jersey Agricultural Experiment Station
PASSAIC VALLEY SEWERAGE COMMISSION
"Protecting Public Health and the Environment"