RUTGERS
New Jersey Agricultural
Experiment Station

**Draft**

# Impervious Cover Assessment
# for
# South Amboy, Middlesex County, New Jersey

*Prepared for South Amboy by the*
*Rutgers Cooperative Extension Water Resources Program*

February 2, 2015

## Introduction

Pervious and impervious are terms that are used to describe the ability or inability of water to flow through a surface. When rainfall hits a surface, it can soak into the surface or flow off the surface. Pervious surfaces are those which allow stormwater to readily soak into the soil and recharge groundwater. When rainfall drains from a surface, it is called "stormwater" runoff (Figure 1). 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 volume of stormwater runoff.

Figure 1: Stormwater draining from a parking lot

New Jersey has many problems due to stormwater runoff, including:

- Pollution: According to the 2010 New Jersey Water Quality Assessment Report, 90% of the assessed waters in New Jersey are impaired, with urban-related stormwater runoff 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 then able to enter 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 the velocity of flows in our waterways. 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.

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). To repair our waterways, reduce flooding, and stop erosion, stormwater runoff from impervious surfaces has to be better managed. 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.

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 principal, 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).

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

1. ***Eliminate surfaces that are not necessary.*** For example, a paved courtyard at a public school could be converted to a grassed area.

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 car ways could be converted to one-way car 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 (Figure 2).

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 may exist to reuse this captured water.

Figure 2: Rapid infiltration of water through porous pavement is demonstrated at the USEPA Edison New Jersey test site

**South Amboy Impervious Cover Analysis**

Located in Middlesex County in central New Jersey, South Amboy covers approximately 1.97 square miles. Figures 3 and 4 illustrate that South Amboy is dominated by urban land uses. A total of 59.6% of the municipality's land use is classified as urban. Of the urban land in South Amboy, high density residential is the dominant land use (Figure 5).

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.

The New Jersey Department of Environmental Protection's (NJDEP) 2007 land use/land cover geographical information system (GIS) data layer categorizes South Amboy into many unique land use areas, assigning a percent impervious cover for each delineated area. These impervious cover values were used to estimate the impervious coverage for South Amboy. Based upon the 2007 NJDEP land use/land cover data, approximately 34.7% of South Amboy has impervious cover. This level of impervious cover suggests that the streams in South Amboy are likely non-supporting streams.

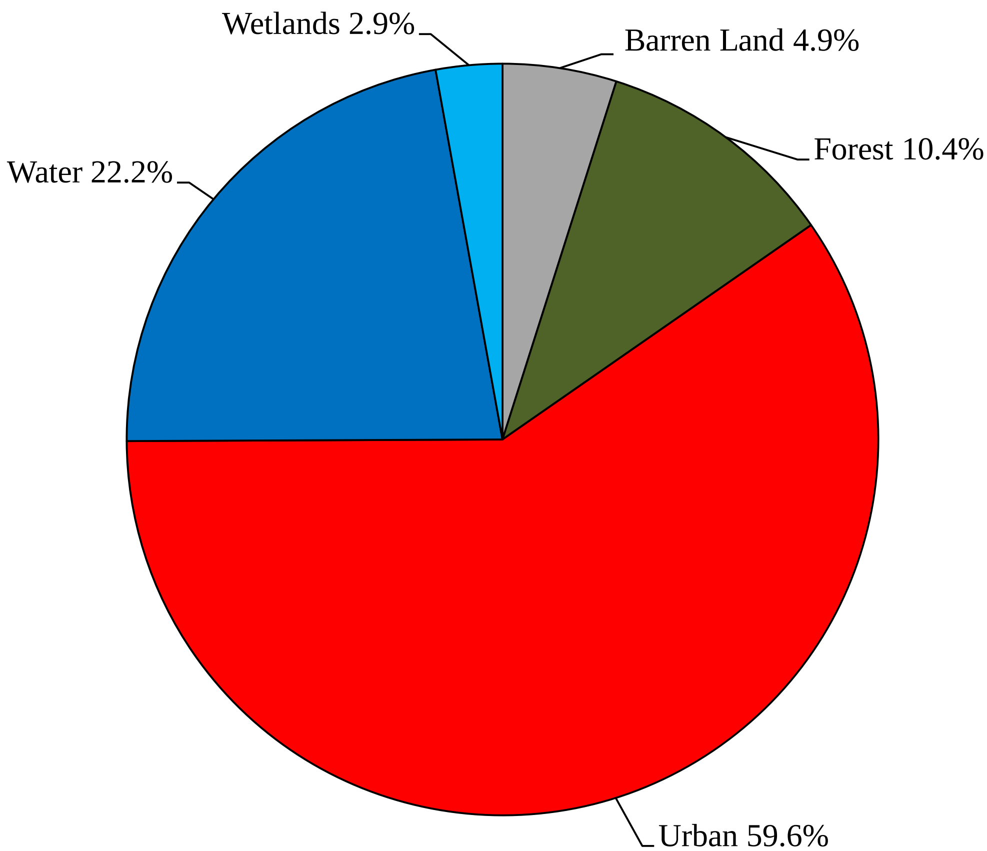



Figure 3: Pie chart illustrating the land use in South Amboy

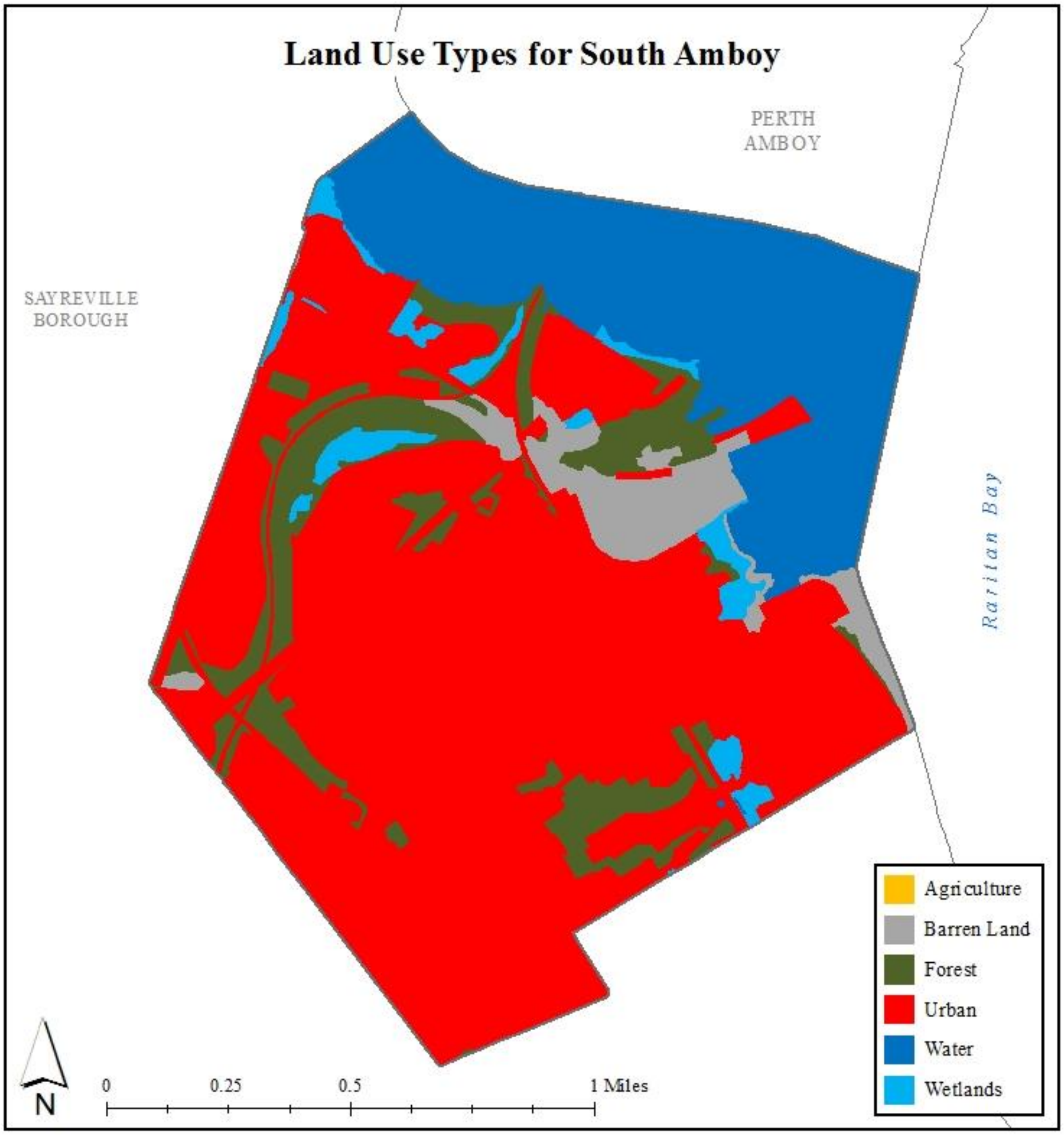



Figure 4: Map illustrating the land use in South Amboy

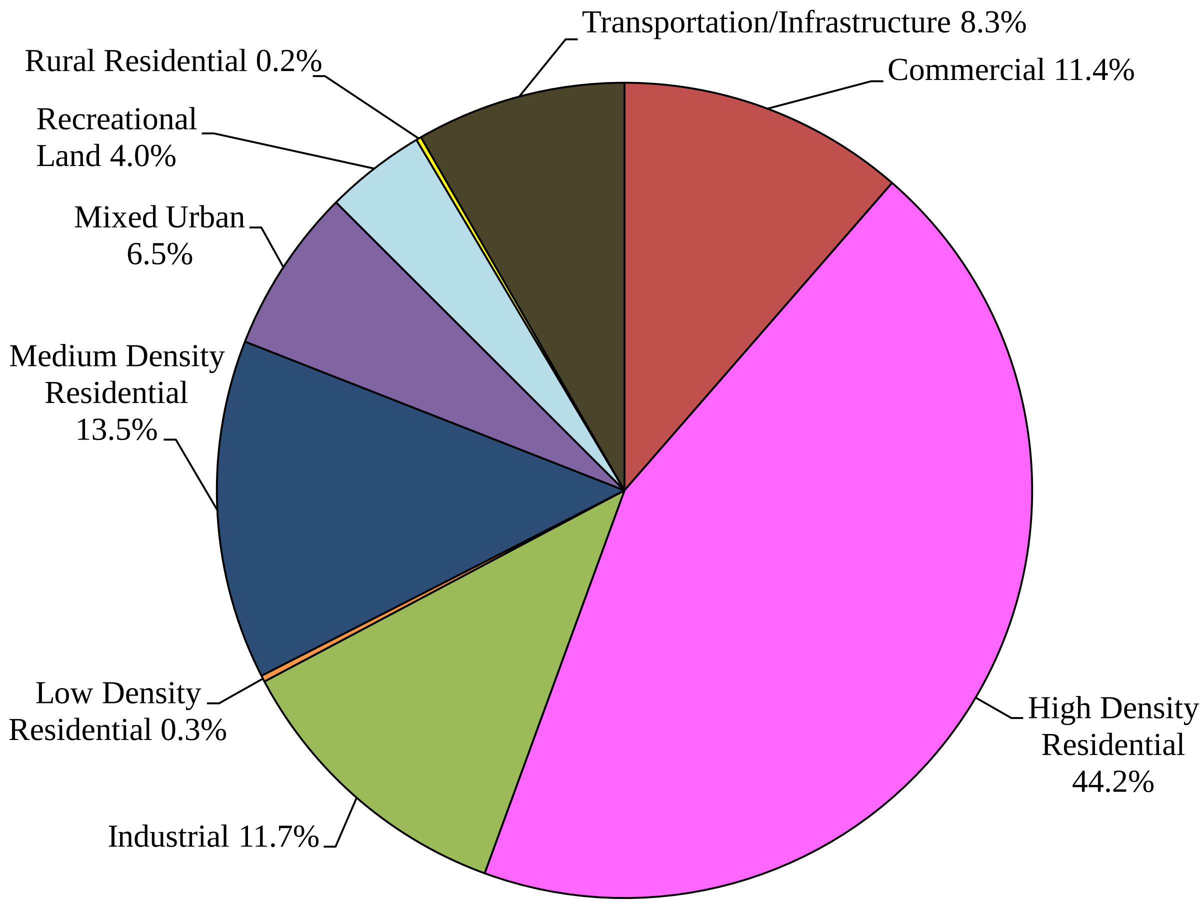



Figure 5:  Pie chart illustrating the various types of urban land use in South Amboy

Water resources are typically managed on a watershed/subwatershed basis; therefore an impervious cover analysis was performed for each Raritan River subwatershed within South Amboy (Table 1 and Figure 6). On a subwatershed basis, impervious cover ranges from 1.7% in the Raritan Bay subwatershed to 37.7% in the Cheesequake Creek/Whale Creek 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.

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 South Amboy, Middlesex County) associated with impervious surfaces were 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 (5.1 inches of rain), and the 100-year design storm (8.6 inches of rain). These runoff volumes are summarized in Table 2. A substantial amount of rainwater drains from impervious surfaces in South Amboy. For example, if the stormwater runoff from one water quality storm (1.25 inches of rain) in the Cheesequake Creek/Whale Creek subwatershed was harvested and purified, it could supply water to 74 homes for one year[1].

[1] Assuming 300 gallons per day per home

Table 1: Impervious cover analysis by subwatershed for South Amboy

| Subwatershed | Total Area | | Land Use Area | | Water Area | | Impervious Cover | | |
|---|---|---|---|---|---|---|---|---|---|
| | (ac) | ($mi^2$) | (ac) | ($mi^2$) | (ac) | ($mi^2$) | (ac) | ($mi^2$) | (%) |
| Cheesequake Creek/Whale Creek | 638.7 | 1.00 | 635.8 | 0.99 | 2.94 | 0.00 | 239.4 | 0.37 | 37.7% |
| Raritan Bay | 124.0 | 0.19 | 0.60 | 0.00 | 123.4 | 0.19 | 0.01 | 0.00 | 1.7% |
| Lower Raritan River | 501.1 | 0.78 | 346.7 | 0.54 | 154.5 | 0.24 | 101.7 | 0.16 | 29.3% |
| Total | 1,263.9 | 1.97 | 983.1 | 1.54 | 280.8 | 0.44 | 341.1 | 0.53 | 34.7% |

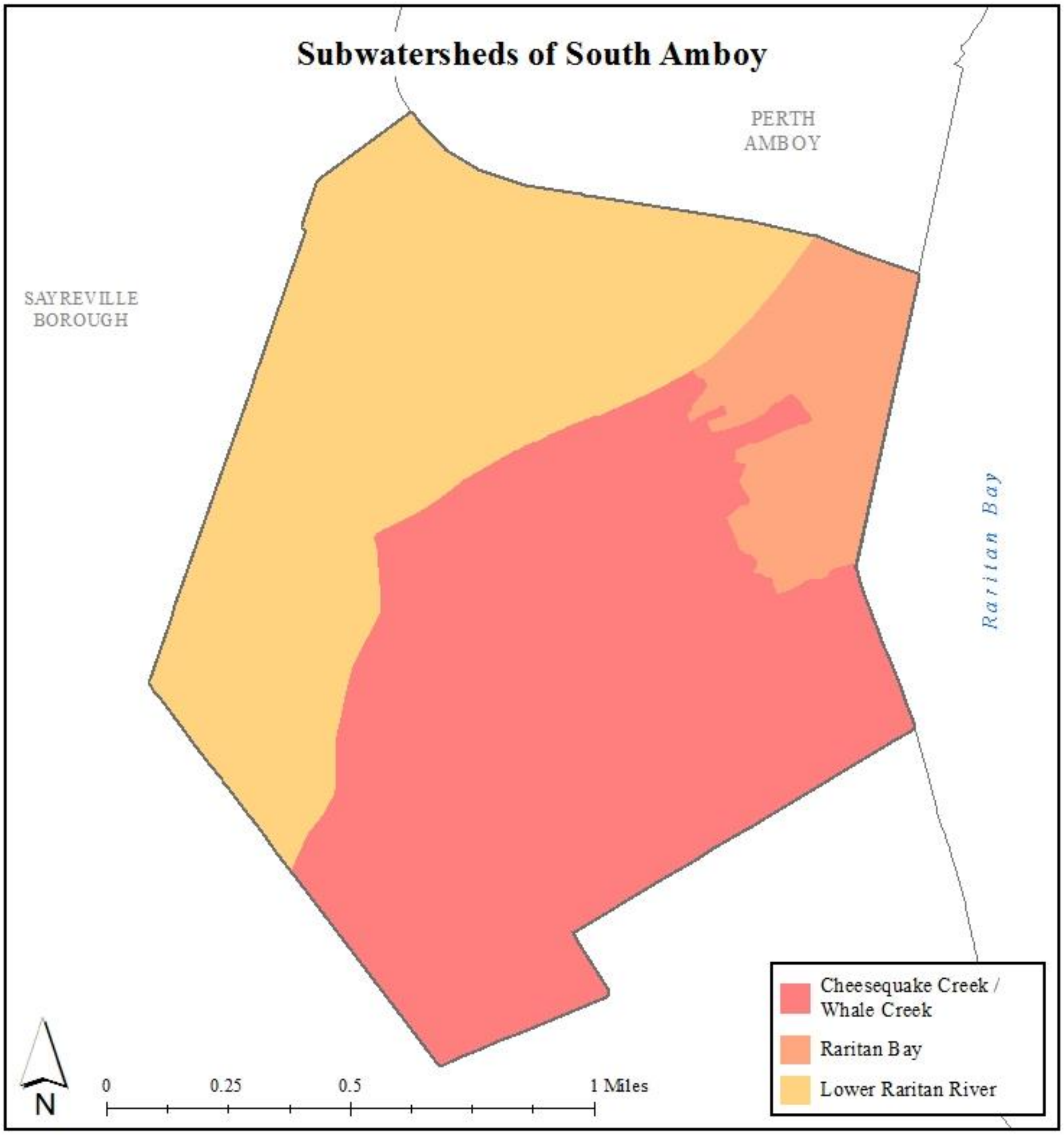



Figure 6: Map of the subwatersheds in South Amboy

Table 2: Stormwater runoff volumes from impervious surfaces by subwatershed in South Amboy

| **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 (5.1") (MGal)** | **Total Runoff Volume for the 100-Year Design Storm (8.6") (MGal)** |
|---|---|---|---|---|---|
| Cheesequake Creek/Whale Creek | 8.1 | 286.0 | 21.5 | 33.2 | 55.9 |
| Raritan Bay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Lower Raritan River | 3.5 | 121.5 | 9.1 | 14.1 | 23.8 |
| Total | 11.6 | 407.5 | 30.6 | 47.3 | 79.7 |

The next step is to set a reduction goal for impervious area in each subwatershed. Based upon the Rutgers Cooperative Extension (RCE) Water Resources Program's experience, a 10% reduction would be a reasonably achievable reduction for these subwatersheds in South Amboy. While it may be difficult to eliminate paved areas or replace paved areas with permeable pavement, it is relatively easy to identify impervious surfaces that can be disconnected using green infrastructure practices. For all practical purposes, disconnecting an impervious surface from a storm sewer system or a water body is an "impervious area reduction." The RCE Water Resources Program recommends that all green infrastructure practices that are installed to disconnect impervious surfaces should be designed for the 2-year design storm (3.3 inches of rain over 24-hours). Although this results in management practices that are slightly over-designed by NJDEP standards, which require systems to be designed for the New Jersey water quality storm (1.25 inches of rain over 2-hours), these systems will be able to handle the increase in storm intensities that are expected to occur due to climate change. By designing these management practices for the 2-year design storm, these practices will be able to manage 95% of the annual rainfall volume. The recommended annual reductions in runoff volumes are shown in Table 3.

As previously mentioned, once impervious surfaces have been identified, the next steps for managing impervious surfaces are to 1) eliminate surfaces that are not necessary, 2) reduce or convert impervious surfaces to pervious surfaces, and 3) disconnect impervious surfaces from flowing directly to local waterways.

**Elimination of Impervious Surfaces**

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 re-creation of natural space that will help reduce flooding, increase wildlife habitat, and positively enhance water quality as well as beautify neighborhoods. Depaving also can bring communities together around a shared vision to work together to reconnect their neighborhood to the natural environment.

Table 3: Impervious cover reductions by subwatershed in South Amboy

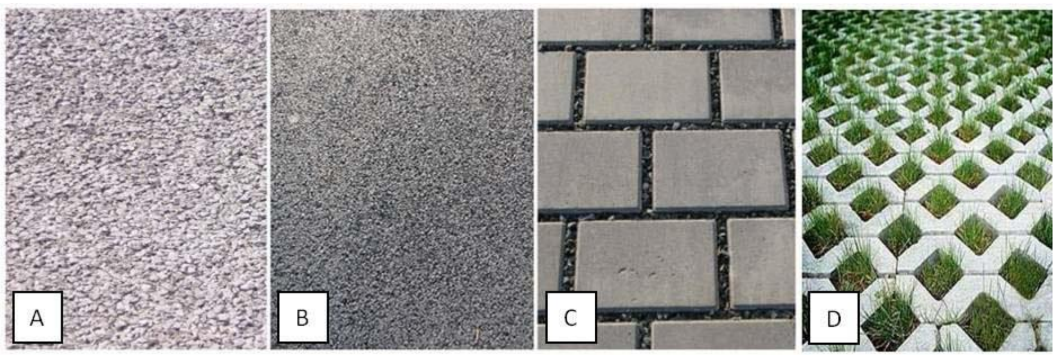
| Subwatershed | Recommended Impervious Area Reduction (10%) (ac) | Annual Runoff Volume Reduction [2] (MGal) |
|---|---|---|
| Cheesequake Creek/Whale Creek | 23.9 | 27.2 |
| Raritan Bay | 0.0 | 0.0 |
| Lower Raritan River | 10.2 | 11.5 |
| Total | 34.1 | 38.7 |

[2] Annual Runoff Volume Reduction =
Acres of impervious cover x 43,560 $ft^2$/ac x 44 in x (1 ft/12 in) x 0.95 x (7.48 gal/$ft^3$) x (1 MGal/1,000,000 gal)
All green infrastructure should be designed to capture the first 3.3 inches of rain from each storm. This would allow the green infrastructure to capture 95% of the annual rainfall of 44 inches.

**Pervious Pavement**

There are four different types of permeable pavement systems that are commonly being used throughout the country to reduce the environmental impacts from impervious surfaces. These surfaces include pervious concrete, porous asphalt, interlocking concrete pavers, and grid pavers.

> "*Permeable pavement is a stormwater drainage system that allows rainwater and runoff to move through the pavement's surface to a storage layer below, with the water eventually seeping into the underlying soil. Permeable pavement is beneficial to the environment because it can reduce stormwater volume, treat stormwater water quality, replenish the groundwater supply, and lower air temperatures on hot days (Rowe, 2012).*"




*Permeable surfaces: (A) pervious concrete, (B) porous asphalt, (C) interlocking concrete pavers, (D) grid pavers (Rowe, 2012)*

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.

**Impervious Cover Disconnection Practices**

By redirecting runoff from paving and rooftops to pervious areas in the landscape, the amount of directly connected impervious area in a drainage area can be greatly reduced. There are many cost-effective ways to disconnect impervious surfaces from local waterways.

- Simple Disconnection: This is the easiest and least costly method to reduce stormwater runoff for smaller storm events. Instead of piping rooftop runoff to the street where it enters the catch basin and is piped to the river, the rooftop runoff is released onto a grassed area to allow the water to be filtered by the grass and soak into the ground. A healthy lawn typically can absorb the first one to two inches of stormwater runoff from a rooftop. Simple disconnection also can be used to manage stormwater runoff from paved areas. Designing a parking lot or driveway to drain onto a grassed area, instead of the street, can dramatically reduce pollution and runoff volumes.

- Rain Gardens: Stormwater can be diverted into shallow landscaped depressed areas (i.e., rain gardens) where the vegetation filters the water, and it is allowed to soak into the ground. Rain gardens, also known as bioretention systems, come in all shapes and sizes and can be designed to disconnect a variety of impervious surfaces (Figure 7).

Figure 7: Rain garden outside the RCE of Gloucester County office which was designed to disconnect rooftop runoff from the local storm sewer system

- Rainwater Harvesting: Rainwater harvesting includes the use of rain barrels and cisterns (Figures 8a and 8b). These can be placed below downspouts to collect rooftop runoff. The collected water has a variety of uses including watering plants and washing cars. This practice also helps cut down on the use of potable water for nondrinking purposes. It is important to divert the overflow from the rainwater harvesting system to a pervious area.

Figure 8a: Rain barrel used to disconnect a downspout with the overflow going to a flower bed

Figure 8b: A 5,000 gallon cistern used to disconnect the rooftop of the Department of Public Works in Clark Township to harvest rainwater for nonprofit car wash events

## **Examples of Opportunities in South Amboy**

To address the impact of stormwater runoff from impervious surfaces, the next step is to identify opportunities in the municipality for eliminating, reducing, or disconnecting directly connected impervious surfaces. To accomplish this task, an impervious cover reduction action plan should be prepared. Aerial photographs are used to identify sites with impervious surfaces in the municipality that may be suitable for inclusion in the action plan. After sites are identified, site visits are conducted to photo-document all opportunities and evaluate the feasibility of eliminating, reducing or disconnecting directly connected impervious surfaces. A brief description of each site discussing the existing conditions and recommendations for treatment of the impervious surfaces is developed. After a number of sites have been selected for inclusion in the action plan, concept plans and detailed green infrastructure information sheets are prepared for a selection of representative sites.

For South Amboy, three sites have been included in this assessment. Examples of concept plans and detailed green infrastructure information sheets are provided in Appendix A. The detailed green infrastructure information sheets describe existing conditions and issues, proposed solutions, anticipated benefits, possible funding sources, potential partners and stakeholders, and estimated costs. Additionally, each project has been classified as a mitigation opportunity for recharge potential, total suspended solids removal, and stormwater peak reduction. Finally, these detailed green infrastructure information sheets provide an estimate of gallons of stormwater captured and treated per year by each proposed green infrastructure practice. The concept plans provide an aerial photograph of the site and details of the proposed green infrastructure practices.

## **Conclusions**

South Amboy can reduce flooding and improve its waterways by better managing stormwater runoff from impervious surfaces. This impervious cover assessment is the first step toward better managing stormwater runoff. The next step is to develop an action plan to eliminate, reduce, or disconnect impervious surfaces where possible and practical. Many of the highly effective disconnection practices are inexpensive. The entire community can be engaged in implementing these disconnection practices.

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# Appendix A

## Examples of Impervious Cover Reduction Action Plan Projects

## Concept Plans and Detailed Green Infrastructure Information Sheets

# South Amboy
# Impervious Cover Assessment
## *Metropolitan Surgical Institute, 540 Bordentown Avenue*

Rutgers New Jersey Agricultural Experiment Station

**PROJECT LOCATION:**


**SITE PLAN:**

N


A

B

1 **CURB CUTS:** Curb cuts could be installed to allow the flow of runoff into the existing vegetated island.

2 **POROUS PAVEMENT:** Porous pavement promotes groundwater recharge and filters stormwater.

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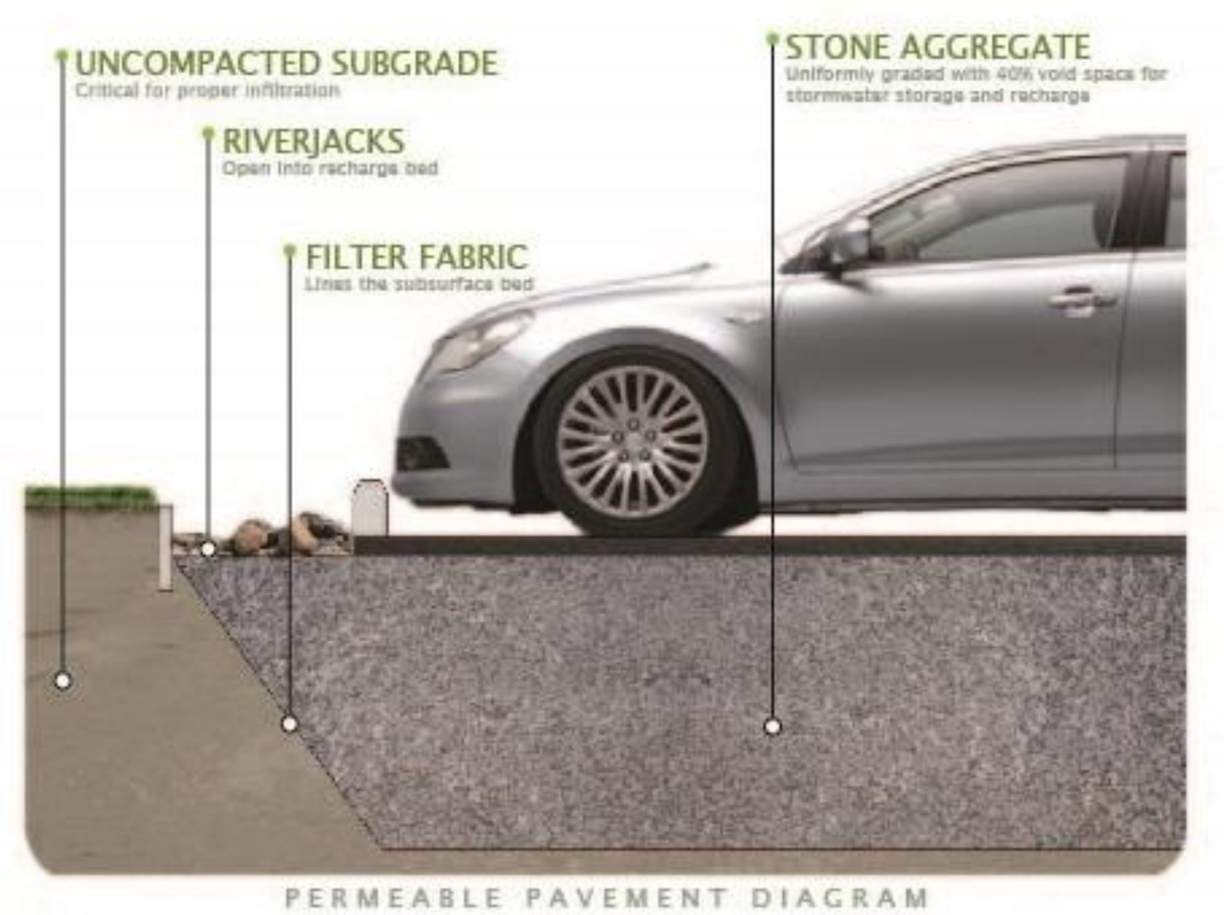
## 1 CURB CUT

## 2 POROUS PAVEMENT



| | |
|---|---|
| **Location:**<br>540 Bordentown Avenue<br>South Amboy, NJ 08879 | **Municipality:**<br>South Amboy<br><br>**Subwatershed:**<br>Cheesequake Creek |
| **Green Infrastructure Description:**<br>bioretention system<br>porous pavement<br>curb cuts | **Targeted Pollutants:**<br>total nitrogen (TN), total phosphorous (TP), and total suspended solids (TSS) in surface runoff |
| **Mitigation Opportunities:**<br>recharge potential: yes<br>stormwater peak reduction potential: yes<br>total suspended solids removal potential: yes | **Stormwater Captured and Treated Per Year:**<br>porous pavement #1: 103,650 gal.<br>porous pavement #2: 87,940 gal. |

**Existing Conditions and Issues:**

The Metropolitan Surgical Institute is located at the corner of Bordentown Avenue and Route 35. Throughout the parking lot, sediment is building up alongside of the curbs. Sediment build-up and vegetation overgrowth is occurring in front of the catch basins. One of the corners near Catherine Street is in poor condition. The parking spots near this area are eroded due to excessive sediment and pooling. In the middle of the parking lot there is an island that has a lot of sediment and overgrowth along the curb and inlet. A few of the parking spots are eroded and are in bad condition.

**Proposed Solution(s):**

In the area that there is sediment buildup along the curbs, curb cuts can be implemented to redirect the runoff from going directly into the inlet. A few parking spots near the Catherine Street entrance can be replaced with porous pavement to reduce this sediment buildup further and prevent flooding. The clogged inlet structure near Catherine Street should have the excessive sediment removed. Another few parking spots near middle island by the Bordentown Avenue entrance can also be replaced with porous pavement. Curb cuts could also be installed along this island to redirect the runoff onto the island and away from the inlet. This will prevent nonpoint source pollution such as sediments, nutrients, oil and grease from going directly into the stream.

**Anticipated Benefits:**

The addition of curb cuts will allow water and the sediment being carried with it to enter the islands. This will reduce the amount of water and sediment entering the inlets. Making a few parking spaces porous will intercept some of the water before it reaches the catch basin and allow it to infiltrate into the ground. The porous pavement systems are estimated to achieve a 95% pollutant load reduction for TN, TP, and TSS. Removing the sediment clogging the inlet structure will allow it to drain the water correctly from the parking and reduce the flooding.

**Possible Funding Sources:**

mitigation funds from local developers
NJDEP grant programs

| |
|---|
| grants from foundations |
| **Partners/Stakeholders:**<br>City of South Amboy<br>local community groups (Boy Scouts, Girl Scouts, etc.)<br>NY/NJ Baykeeper<br>Raritan Riverkeeper<br>Rutgers Cooperative Extension |
| **Estimated Cost:**<br>The porous pavement #1 would cover approximately 600 square feet and have a three foot stone reservoir under the surface. At $30 per square foot, the cost of the porous pavement system would be $18,000. Porous pavement #2 would cover approximately 600 square feet and have a two foot stone reservoir under the surface. At $20 per square foot, the cost of the porous pavement would be $12,000. The total cost of the project would be approximately $30,000. |

South Amboy
Impervious Cover Assessment

*South Amboy City Hall and Police Department,140 North Broadway Street*

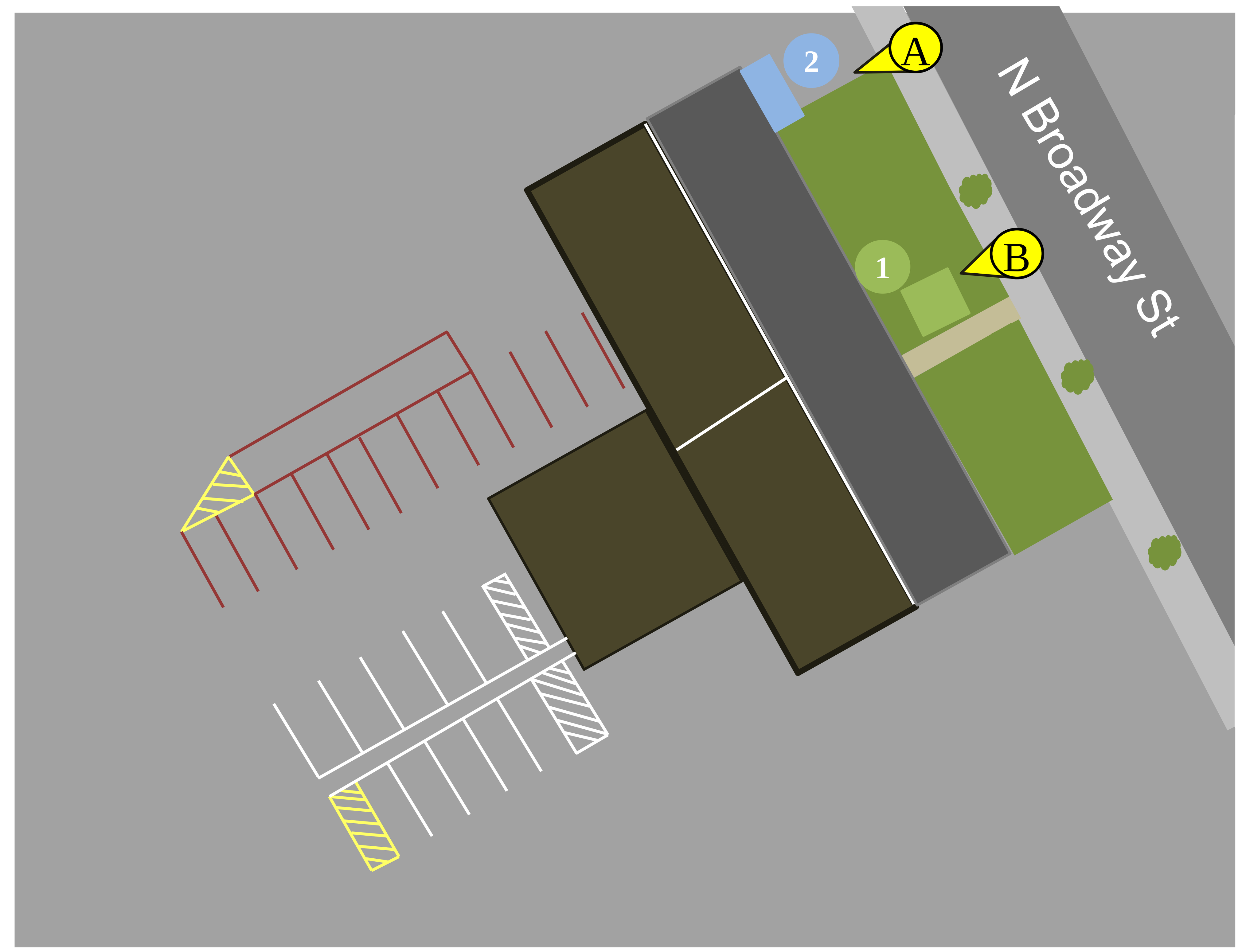
A

B

**PROJECT LOCATION:**


**SITE PLAN:**

N




1 **BIORETENTION SYSTEM:** A rain garden can be installed near the flag pole to capture rooftop runoff by disconnecting the nearby downspout and directing it into the rain garden. A rain garden is used to reduce sediment and nutrient loading to the local waterway.

2 **RAINWATER HARVESTING SYSTEM:** Rainwater can be harvested from the roof of the building and stored in a slim line cistern. The water can be used to water the existing landscape, the bioretention system or wash the police vehicles.

## 1 BIORETENTION SYSTEMS

## 2 RAINWATER HARVESTING SYSTEM

| **Location:**<br>140 N. Broadway Street<br>South Amboy, NJ 08879 | **Municipality:**<br>South Amboy<br><br>**Subwatershed:**<br>Cheesequake Creek |
|---|---|
| **Green Infrastructure Description:**<br>rain water harvesting system<br>simple disconnection<br>bioretention system | **Targeted Pollutants:**<br>total nitrogen (TN), total phosphorous (TP), and total suspended solids (TSS) in surface runoff |
| **Mitigation Opportunities:**<br>recharge potential: yes<br>stormwater peak reduction potential: yes<br>TSS removal potential: yes | **Stormwater Captured and Treated Per Year:**<br>rain water harvesting system: 12,157 gal.<br>bioretention system: 10,422 gal. |

**Existing Conditions and Issues:**
There is a connected downspout on the front side of the building closest to the South Amboy Municipal Court. There are three connected downspouts that line the main entrance of the police department, and there are areas of turf grass in front of them. One area has a flag pole, and the other has a light in the ground. At the southernmost part of the front of the building, there is a planter bed with connected downspouts that may be connected to combined sewer systems that can pollute local waterways and cause flooding.

**Proposed Solution(s):**
On the front of the building closest to the South Amboy Police stairwell, three of the connected downspouts can be disconnected, and the runoff from the rooftop can flow into a rainwater harvesting system that can be used to water the existing landscape, the newly constructed bioretention system, or be used to wash police vehicles. The connected downspout by the main entrance to City Hall could be disconnected, and a bioretention system could be installed. The bioretention systems will capture, treat, and infiltrate stormwater runoff from the rooftop.

**Anticipated Benefits:**
Since the bioretention system would be designed to capture, treat, and infiltrate the entire 2-year design storm (3.3 inches of rain over 24 hours), these systems are estimated to achieve a 95% pollutant load reduction for TN, TP, and TSS. A bioretention system would also provide ancillary benefits such as enhanced wildlife habitat and aesthetic appeal. Since the rainwater harvesting system would be designed to capture the first 1.25 inches of rain, it would reduce the pollutant loading by 90% during the periods it is operational (i.e., it would not be used in the winter when there is chance of freezing).

**Possible Funding Sources:**
mitigation funds from local developers
NJDEP grant programs like 319(h)

**Partners/Stakeholders:**

| |
|---|
| South Amboy residents and parishioners<br>local community groups (Boy Scouts, Girl Scouts, etc.)<br>American Littoral Society<br>Rutgers Cooperative Extension |
| **Estimated Cost:**<br>The cistern would need to be approximately 1,000 gallons and would cost approximately $2,000 to purchase and install. The bioretention system would need to be approximately 100 square feet. At $5 per square foot, the bioretention system would cost approximately $500. The total cost of this project is approximately $2,500. |

South Amboy
Impervious Cover Assessment
*Sacred Heart Elementary School, 517 Augusta Street*

**PROJECT LOCATION:**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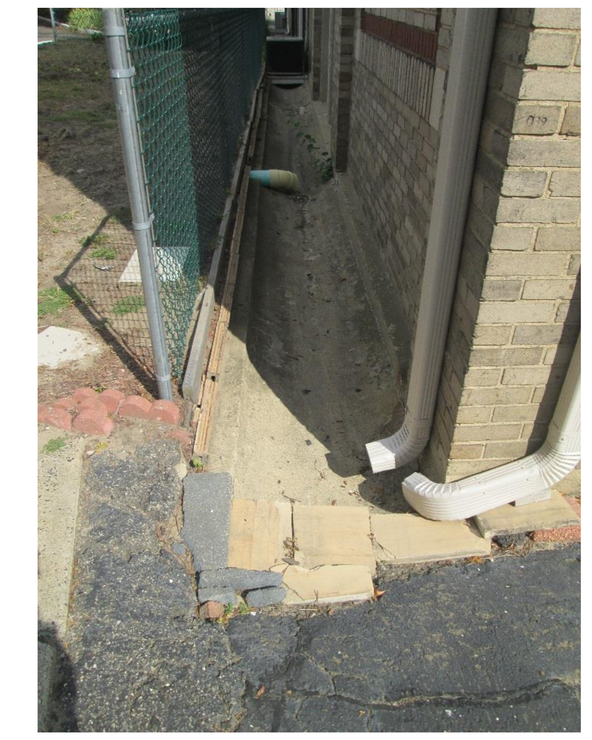

**SITE PLAN:**


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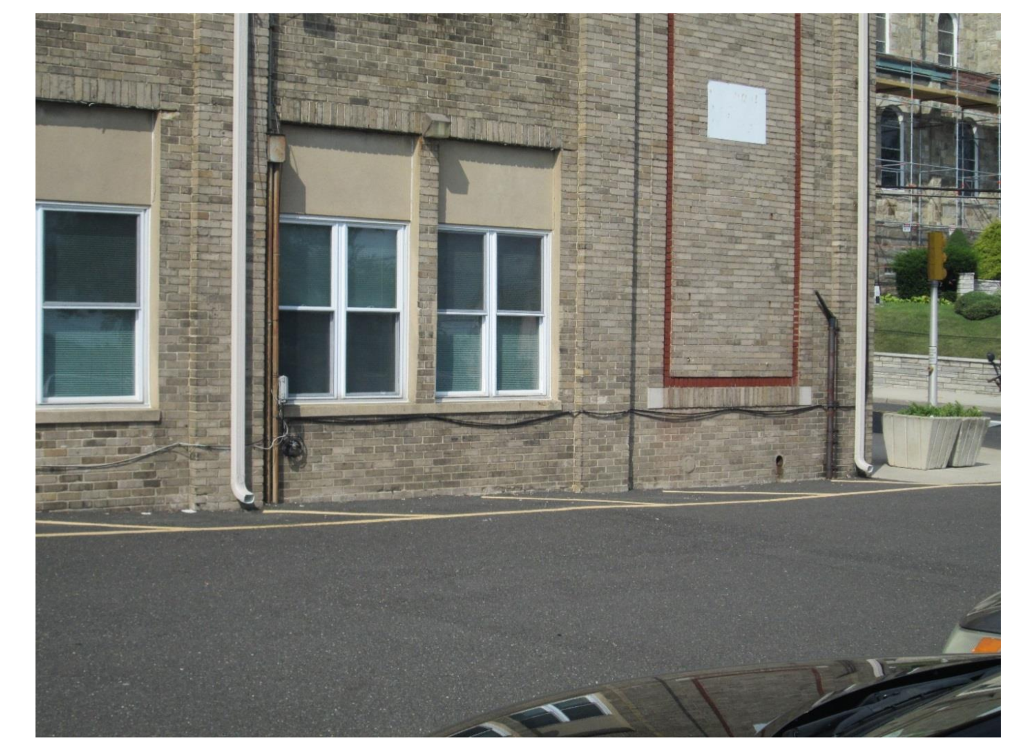


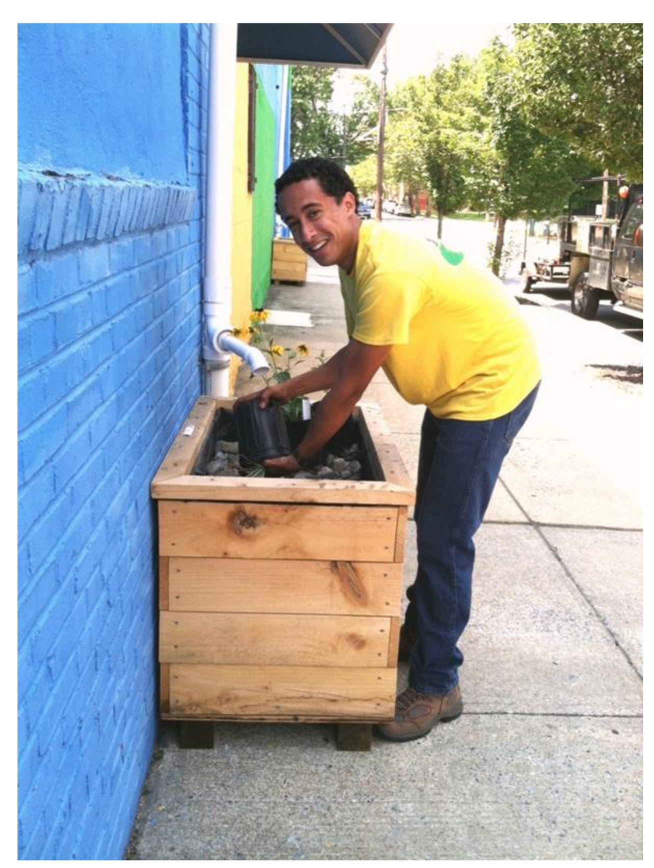
1 **BIORETENTION SYSTEM:** A bioretention system can be used to capture rooftop runoff that is currently going into a concrete trench on the southwest side of the school. This system would help reduce sediment and nutrient loading to the local waterway and increase groundwater recharge.

2 **DOWNSPOUT PLANTER BOXES:** A downspout planter box can be installed off the east side of the building to collect water from the nearby downspout. Planter boxes reduce runoff and allow water to slowly infiltrate while being treated for pollutants.

**EDUCATIONAL PROGRAM:** The RCE Water Resources Program's *Stormwater Management in Your Schoolyard* program can be delivered at Robert N. Wilentz Elementary School to educate the students about stormwater management and engage them in designing and building the bioretention systems.

## 1 BIORETENTION SYSTEMS

## 2 DOWNSPOUT PLANTER BOX



## EDUCATIONAL PROGRAM

# Sacred Heart Elementary School
# Green Infrastructure Information Sheet

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| **Location:**<br>517 Augusta Street<br>South Amboy, NJ 08879 | **Municipality:**<br>South Amboy<br><br>**Subwatershed:**<br>Cheesequake Creek |
| **Green Infrastructure Description:**<br>bioretention system<br>youth education program<br>downspout planter boxes | **Targeted Pollutants:**<br>total nitrogen (TN), total phosphorous (TP), and total suspended solids (TSS) in surface runoff |
| **Mitigation Opportunities:**<br>recharge potential: yes<br>stormwater peak reduction potential: yes<br>TSS removal potential: yes | **Stormwater Captured and Treated Per Year:**<br>bioretention system: 59,930 gal.<br>downspout planter boxes: 2,800 gal. |

**Existing Conditions and Issues:**

Sacred Heart Elementary School is located on Augusta Street. There are disconnected downspouts that line the wall of the school and carry runoff directly onto the parking lot causing erosion and flooding. Runoff is carrying nonpoint source pollution, such as sediments, nutrients, oil, and grease to local waterways. In the back of the school, there is a trench between the building and a patch of grassy dirt that carries runoff with nonpoint source pollution directly onto a driveway and then to catch basins that carry runoff to local waterways. The pavement around the school appears to be in good condition.

**Proposed Solution(s):**

Downspout planter boxes could be installed along the east side of the building to capture roof runoff with the disconnected downspouts and treat it before it flows directly onto the parking lot. The runoff flowing into the trench off the southwest side of the school could be redirected to allow the water to flow into the proposed bioretention system. The bioretention system will capture, treat and infiltrate the runoff carried by the trench.

**Anticipated Benefits:**

Since the bioretention system would be designed to capture, treat, and infiltrate the entire 2-year design storm (3.3 inches of rain over 24 hours), this system is estimated to achieve a 95% pollutant load reduction for TN, TP, and TSS. This bioretention system would provide additional benefits such as aesthetic appeal and enhance wildlife habitat. Rutgers Cooperative Extension could additionally present the *Stormwater Management in Your Schoolyard* program to students and include them in bioretention system planting efforts to enhance the program. This may also be used as a demonstration project for the South Amboy Department of Public Works staff to launch educational programming. A bioretention system would also raise awareness about the importance of stormwater management to students. The downspout planter boxes would work the same way as the bioretention systems by capturing and infiltrating stormwater runoff.

**Possible Funding Sources:**
mitigation funds from local developers
NJDEP grant programs like 319(h)

**Partners/Stakeholders:**
South Amboy residents and parishioners
local community groups (Boy Scouts, Girl Scouts, etc.)
students and parents
American Littoral Society
Rutgers Cooperative Extension

**Estimated Cost:**
Two 6′ x 6′ downspout planter boxes are needed. The estimated cost for the downspout planter boxes is $600. The bioretention system would need to be approximately 580 square feet. At $5 per square foot, the estimated cost of the bioretention system is $2,900. The total cost of the project would be approximately $3,500.