



Draft

**Impervious Cover Assessment
for
Green Brook Township, Somerset County, New Jersey**

*Prepared for Green Brook Township by the
Rutgers Cooperative Extension Water Resources Program*

February 4, 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

Green Brook Township Impervious Cover Analysis

Located in Somerset County in central New Jersey, Green Brook Township covers approximately 4.41 square miles east of Warren Township. Figures 3 and 4 illustrate that Green Brook Township is dominated by urban land uses. A total of 59.3% of the municipality's land use is classified as urban. Of the urban land in Green Brook Township, low density and medium density residential are the dominant land uses (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 streams 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 Green Brook Township 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 Green Brook Township. Based upon the 2007 NJDEP land use/land cover data, approximately 21.1% of Green Brook Township has impervious cover. This level of impervious cover suggests that the streams in Green Brook Township are likely impacted.

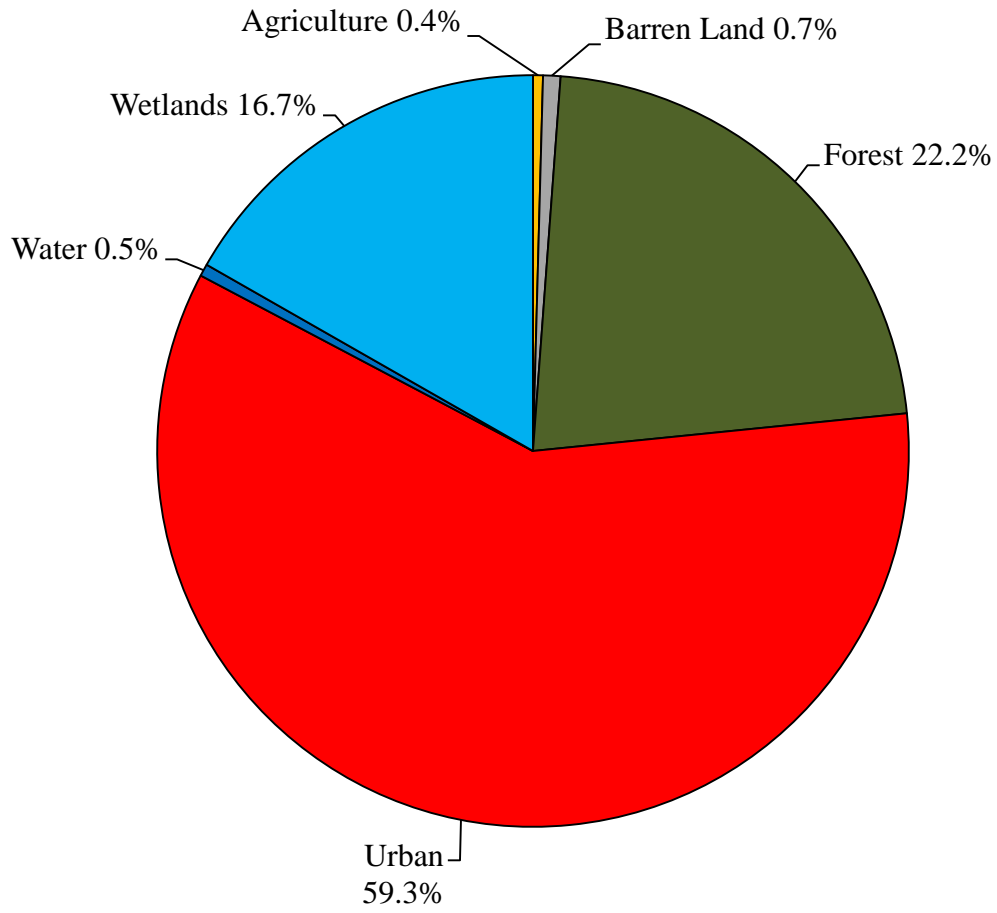


Figure 3: Pie chart illustrating the land use in Green Brook Township

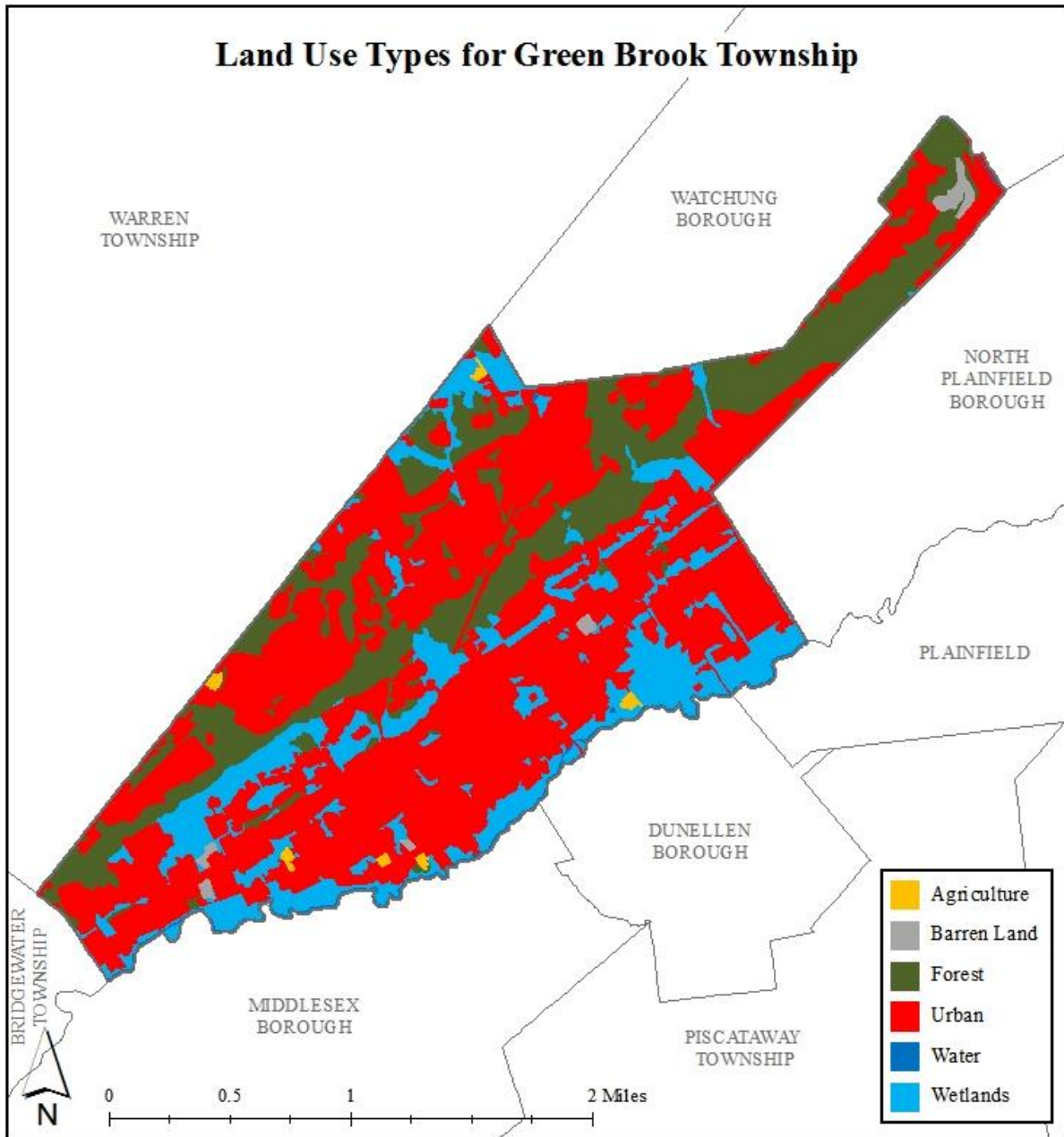


Figure 4: Map illustrating the land use in Green Brook Township

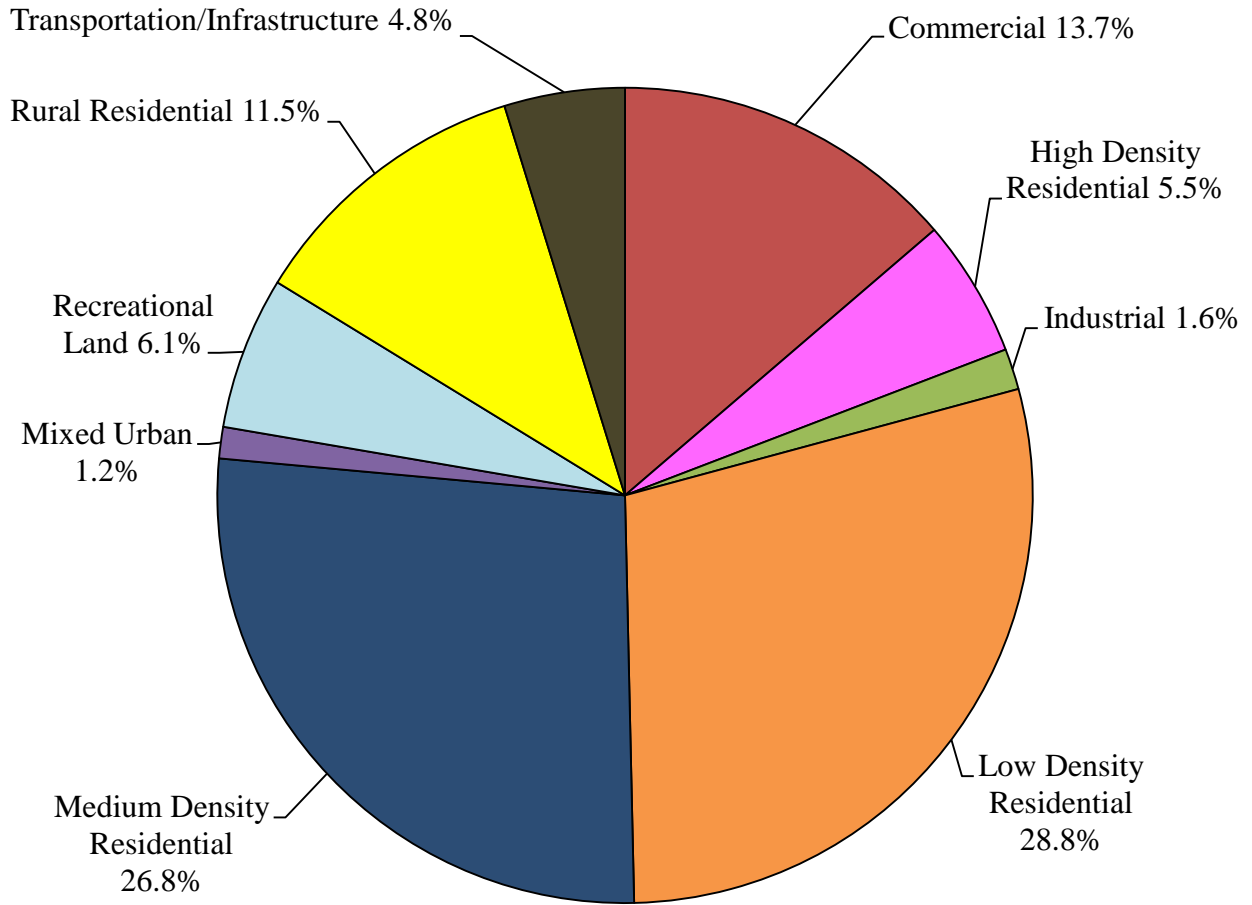


Figure 5: Pie chart illustrating the various types of urban land use in Green Brook Township

Water resources are typically managed on a watershed/subwatershed basis; therefore an impervious cover analysis was performed for each Raritan River subwatershed within Green Brook Township (Table 1 and Figure 6). On a subwatershed basis, impervious cover ranges from 11.5% in the Stony Brook subwatershed to 25.2% in the Green Brook 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 Green Brook Township, Somerset 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 (5.0 inches of rain), and the 100-year design storm (8.2 inches of rain). These runoff volumes are summarized in Table 2. A substantial amount of rainwater drains from impervious surfaces in Green Brook Township. For example, if the stormwater runoff from one water quality storm (1.25 inches of rain) in the Green Brook subwatershed was harvested and purified, it could supply water to 148 homes for one year¹.

¹ Assuming 300 gallons per day per home

Table 1: Impervious cover analysis by subwatershed for Green Brook Township

Subwatershed	Total Area		Land Use Area		Water Area		Impervious Cover		
	(ac)	(mi ²)	(ac)	(mi ²)	(ac)	(mi ²)	(ac)	(mi ²)	(%)
Green Brook	1,916.8	2.99	1,902.9	2.97	13.8	0.02	478.5	0.75	25.2%
Middle Brook	592.9	0.93	592.9	0.93	0.00	0.00	78.1	0.12	13.2%
Stony Brook	310.4	0.48	309.5	0.48	0.94	0.00	35.7	0.06	11.5%
Total	2,820.0	4.41	2,805.3	4.38	14.8	0.02	592.3	0.93	21.1%

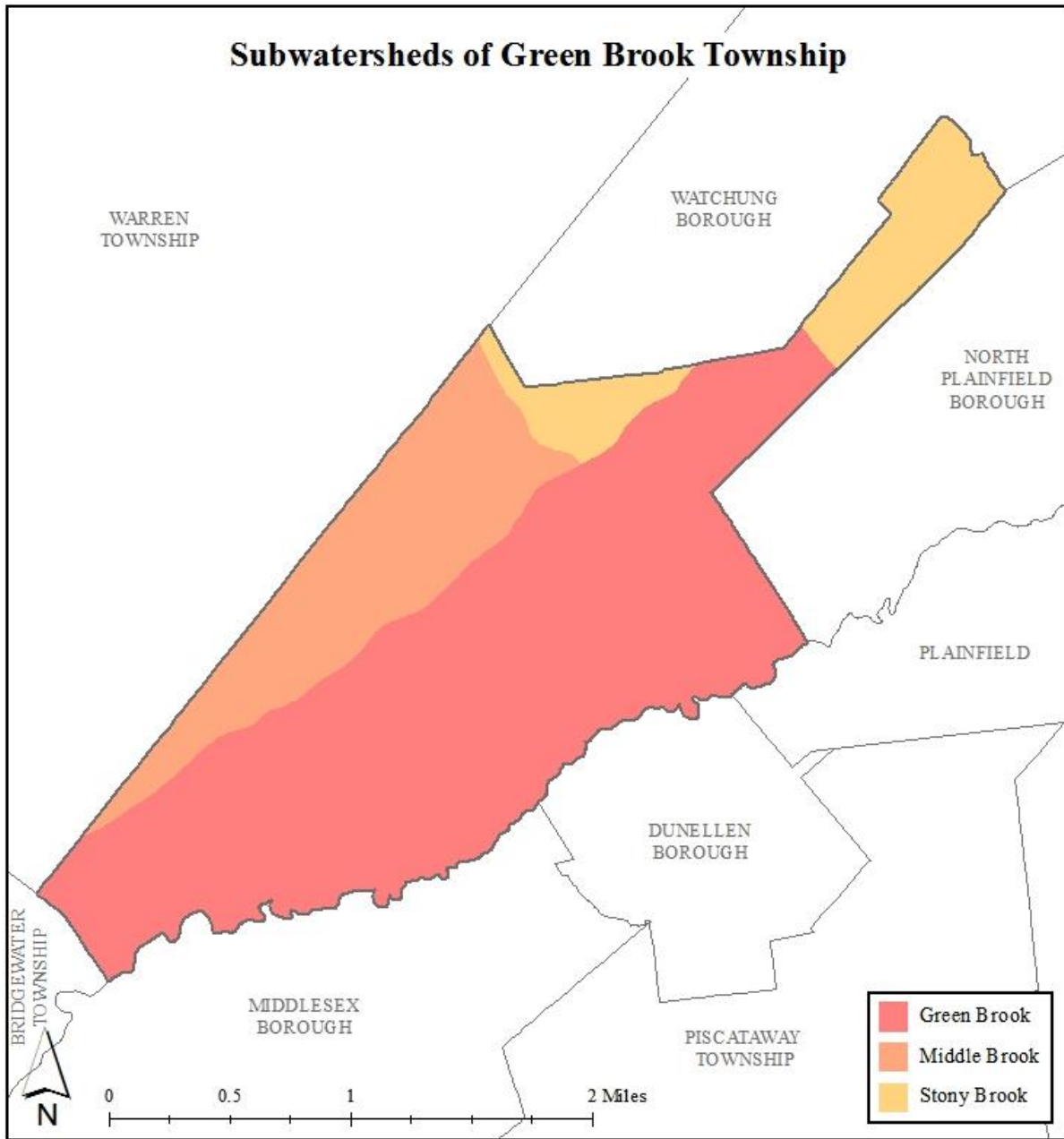


Figure 6: Map of the subwatersheds in Green Brook Township

Table 2: Stormwater runoff volumes from impervious surfaces by subwatershed in Green Brook Township

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 (8.2") (MGal)
Green Brook	16.2	571.7	42.9	65.0	106.5
Middle Brook	2.7	93.3	7.0	10.6	17.4
Stony Brook	1.2	42.6	3.2	4.8	7.9
Total	20.1	707.6	53.1	80.4	131.9

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 Green Brook Township. 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 Green Brook Township

Subwatershed	Recommended Impervious Area Reduction (10%) (ac)	Annual Runoff Volume Reduction ² (MGal)
Green Brook	47.9	54.3
Middle Brook	7.8	8.9
Stony Brook	3.6	4.0
Total	59.2	67.2

² Annual Runoff Volume Reduction =

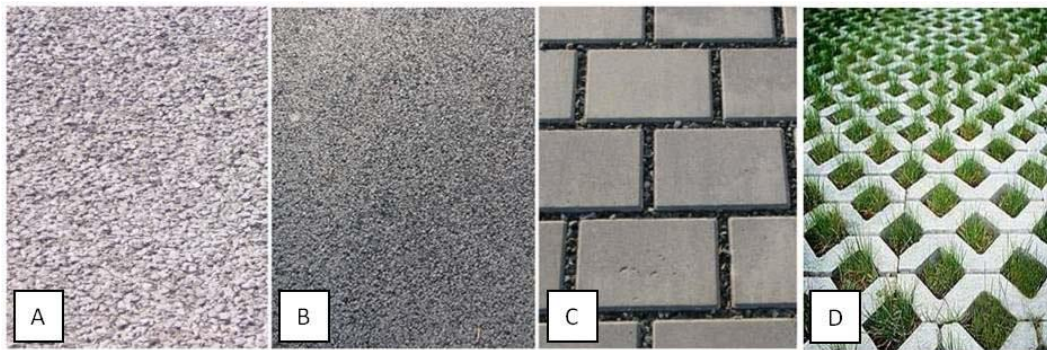
Acres of impervious cover x 43,560 ft²/ac x 44 in x (1 ft/12 in) x 0.95 x (7.48 gal/ft³) x (1 MGal/1,000,000 gal)

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 Green Brook Township

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 Green Brook Township, 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

Green Brook Township 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.

References

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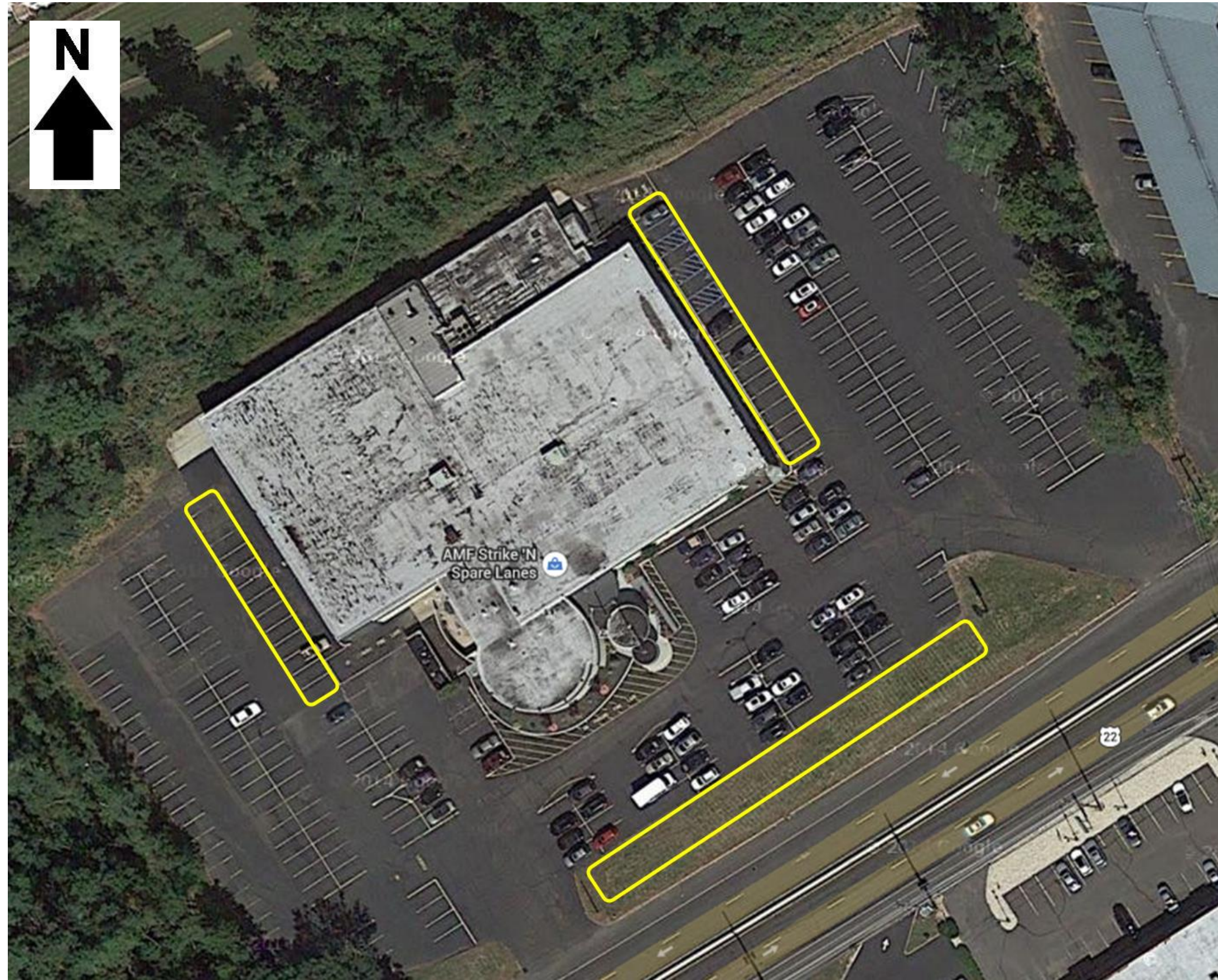
Appendix A

Examples of Impervious Cover Reduction Action Plan Projects Concept Plans and Detailed Green Infrastructure Information Sheets

Green Brook Township Impervious Cover Assessment

AMF Strike 'N Spare Lanes, 380 U.S. 22

PROJECT LOCATION:



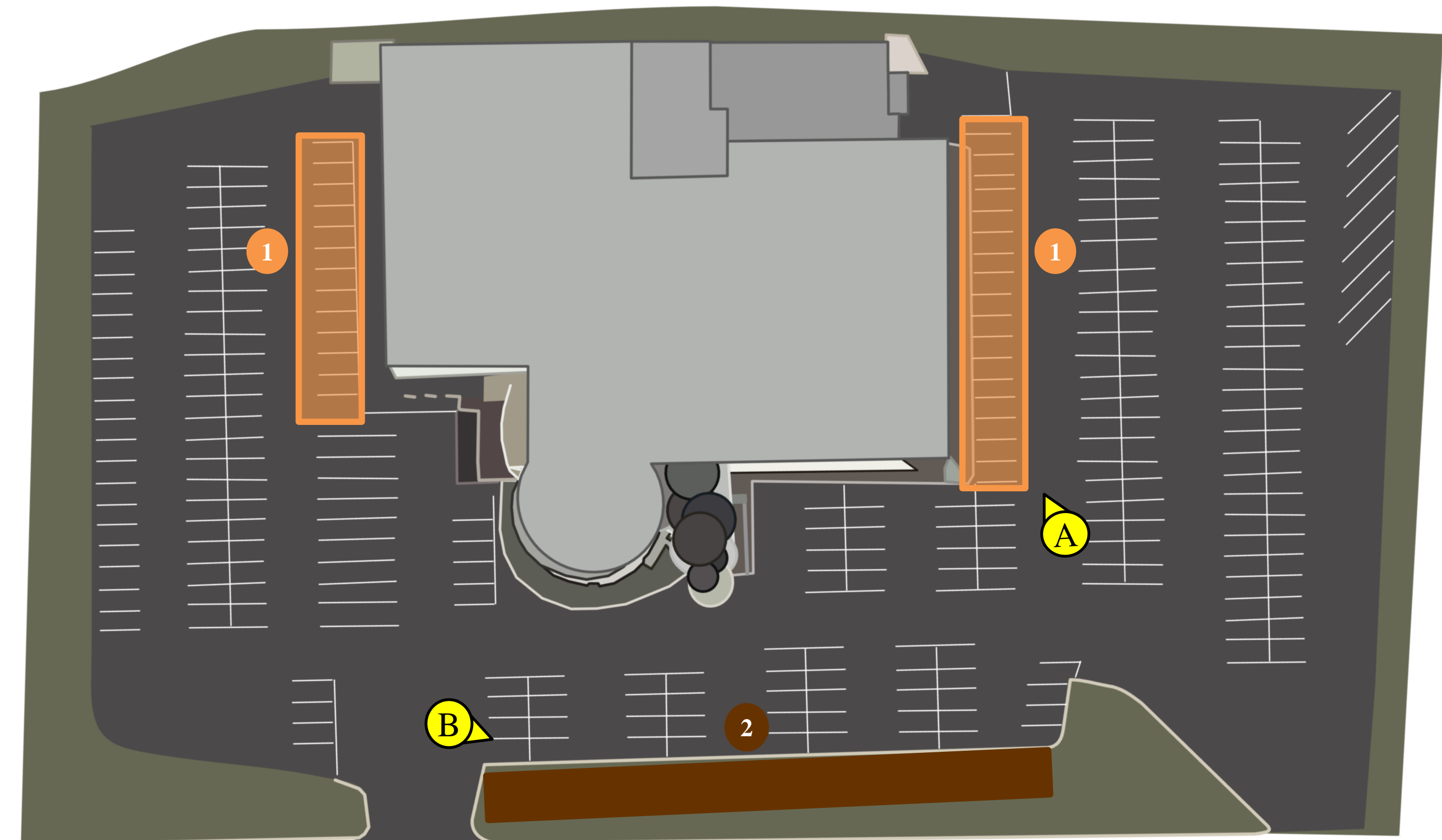
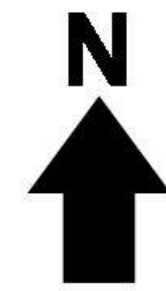
A



B



SITE PLAN:

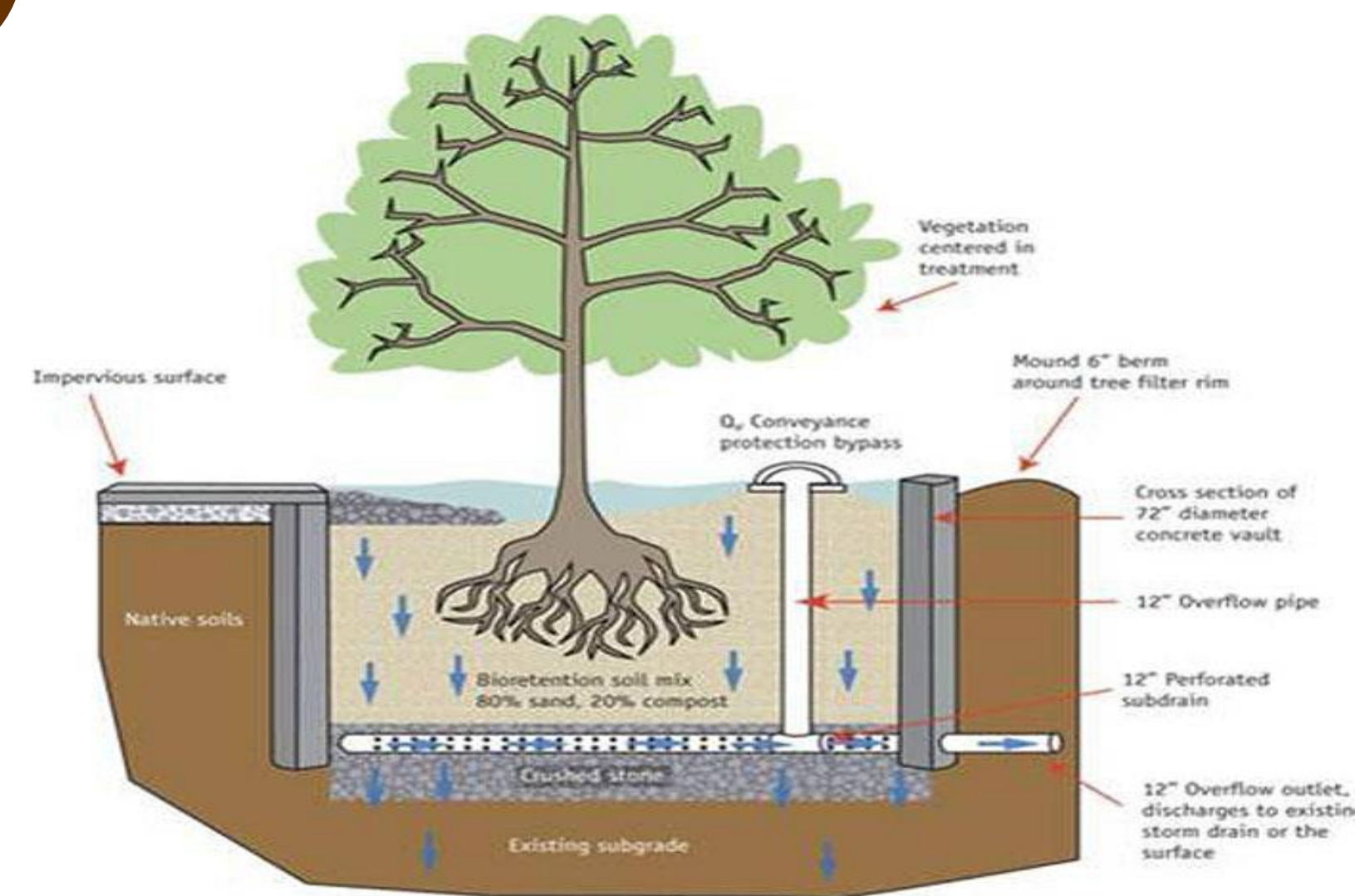


- 1 POROUS PAVEMENT:** A section of porous pavement can be installed along the eastern and western edges of the building in the parking lot to promote groundwater recharge and filter stormwater runoff.
- 2 TREE FILTER BOXES:** Tree filter boxes can be installed at the southern edge of the parking lot. The tree filter boxes will treat stormwater prior to discharge to the storm sewer system.

1 POROUS PAVEMENT



2 TREE FILTER BOXES



AMF Strike 'N Spare Lanes
Green Infrastructure Information Sheet

<p>Location: 380 U.S. 22 Green Brook, NJ 08812</p>	<p>Municipality: Green Brook Township</p>
<p>Green Infrastructure Description: porous pavement tree filter box</p>	<p>Subwatershed: Green Brook</p>
<p>Mitigation Opportunities: recharge potential: yes stormwater peak reduction potential: yes TSS removal potential: yes</p>	<p>Targeted Pollutants: total nitrogen (TN), total phosphorous (TP), and total suspended solids (TSS) in surface runoff</p> <p>Stormwater Captured and Treated Per Year: porous pavement #1: 284,524 gal. porous pavement #2: 268,474 gal. three tree filter boxes: 755,605 gal.</p>
<p>Existing Conditions and Issues: This site contains several impervious surfaces including driveways, a parking lot, and a bowling alley. These impervious surfaces are directly connected to a storm sewer system. The site's impervious surfaces produce stormwater runoff during rain events. The parking lot is sloped to the southeast towards Route 22 and is generally in poor condition. A 13,000 square foot strip of grass separates the parking lot from Route 22. There are three downspouts on each of the western and eastern sides of the building that bring water from the internal drainage system into the parking lot.</p>	
<p>Proposed Solution(s): Two areas of the parking lot could be repaved with porous pavement to manage the stormwater from the building's internal drainage system and the surrounding areas. The porous pavement area #1 would be on the eastern side of the building. The porous pavement area #2 would be on the western side of the building. Approximately 29,000 square feet of the parking lot's drainage area could be managed using three tree filter boxes along the grass strip at the southeastern edge of the parking lot. The tree filter boxes would capture, treat, and infiltrate the stormwater runoff, thereby reducing localized flooding and improving water quality.</p>	
<p>Anticipated Benefits: Porous pavement allows stormwater to penetrate through to soil layers which will promote groundwater recharge as well as intercept and filter stormwater runoff. These systems are expected to achieve a 95% pollutant load reduction for TN, TP, and TSS. Tree filter boxes can capture, treat, and infiltrate the entire 2-year design storm (3.3 inches of rain over 24 hours) and treat individual drainage areas as large as 10,000 square feet. These systems are estimated to achieve a 95% pollutant load reduction for TN, TP, and TSS. They also enhance aesthetic appeal while reducing localized flooding.</p>	

AMF Strike 'N Spare Lanes
Green Infrastructure Information Sheet

Possible Funding Sources:

mitigation funds from local developers
NJDEP grant programs
Green Brook Township
AMF Strike 'N Spare Lanes
local social and community groups

Partners/Stakeholders:

Green Brook Township
AMF Strike 'N Spare Lanes
local social and community groups
local residents
Rutgers Cooperative Extension

Estimated Cost:

Porous pavement area #1 would cover approximately 2,600 square feet and have a 1.5 feet deep stone reservoir under the surface. At \$22.50 per square foot, the cost of this system would be \$58,500. Porous pavement area #2 would cover approximately 1,840 square feet and have a 2 feet deep stone reservoir under the surface. At \$25 per square foot, the cost of this system would be \$46,000. Three 6'x6' tree filter boxes would cost \$7,500 each. These three systems would cost \$22,500 in total. The total cost of the project will be approximately \$127,000.

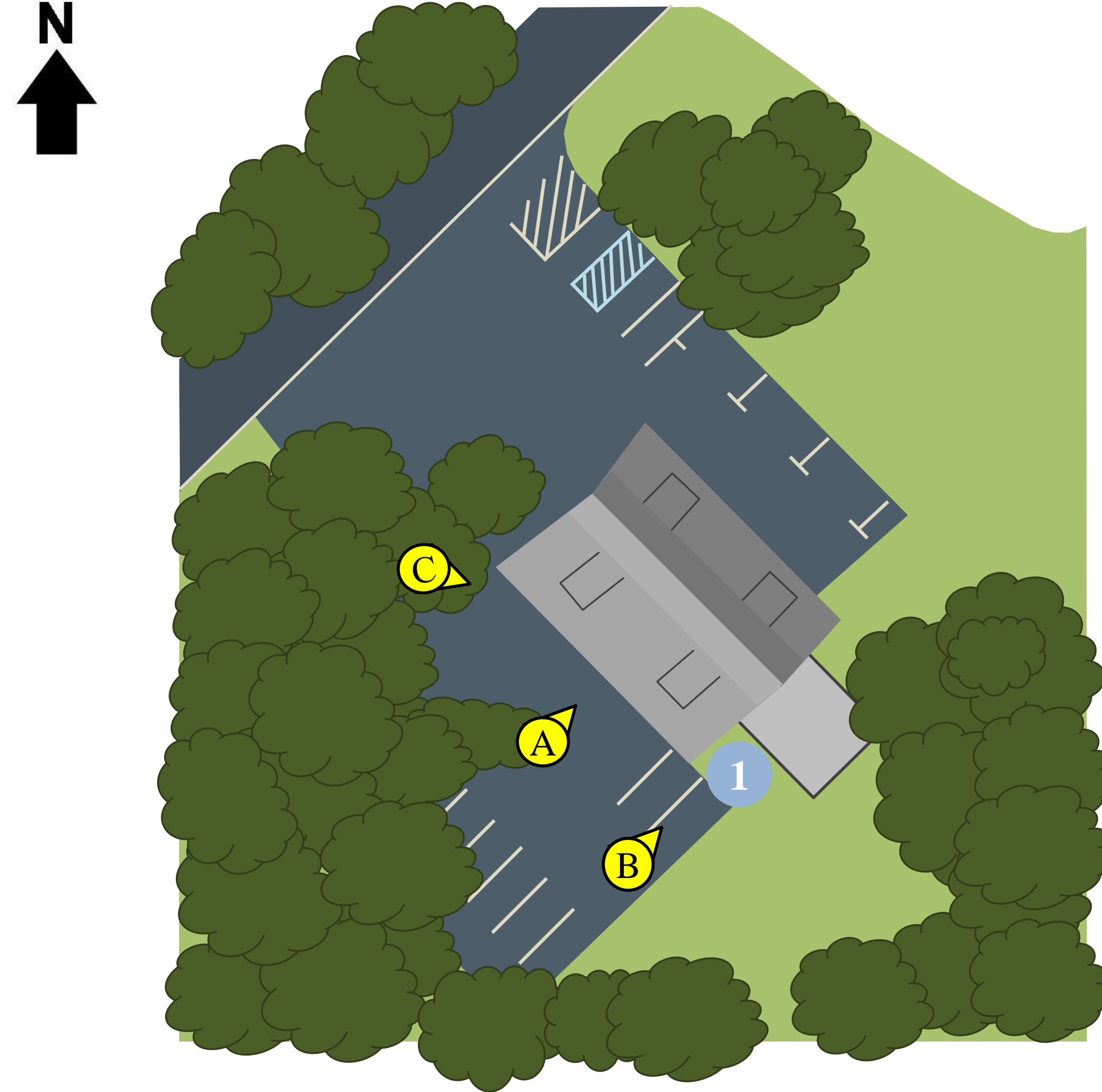
Green Brook Township Impervious Cover Assessment

Green Brook Fire & EMS House 2, 26 Rock Road West

PROJECT LOCATION:



SITE PLAN:



1 RAINWATER HARVESTING SYSTEM: Rainwater can be harvested from the roof of the building and stored in a cistern. This water can be used to wash fire trucks.

1 RAINWATER HARVESTING SYSTEM



A



B



C



Green Brook Fire & EMS House 2
Green Infrastructure Information Sheet

<p>Location: 26 Rock Road West Green Brook, NJ 08812</p>	<p>Municipality: Green Brook Township</p>
<p>Green Infrastructure Description: rainwater harvesting system (cistern)</p>	<p>Subwatershed: Green Brook</p>
<p>Mitigation Opportunities: recharge potential: yes stormwater peak reduction potential: yes TSS removal potential: yes</p>	<p>Targeted Pollutants: total nitrogen (TN), total phosphorous (TP), and total suspended solids (TSS) in surface runoff</p>
<p>Existing Conditions and Issues: This site contains several impervious surfaces including driveways, a parking lot, and a firehouse. The site's impervious surfaces produce stormwater runoff during rain events. The parking lot slopes to the southeast. All of the firehouse downspouts discharge onto the parking lot.</p>	<p>Stormwater Captured and Treated Per Year: cistern: 35,792 gal.</p>
<p>Proposed Solution(s): A 2,500 gallon cistern could be connected to the firehouse. All runoff from the building will be redirected to the cistern. The cistern would be located along the southwestern side of the building.</p>	
<p>Anticipated Benefits: A rainwater harvesting system collects rainwater from the roof of the building and stores it in a cistern, which can be used for watering plants and washing the fire trucks.</p>	
<p>Possible Funding Sources: mitigation funds from local developers NJDEP grant programs Green Brook Township Green Brook Fire & EMS local social and community groups</p>	
<p>Partners/Stakeholders: Green Brook Township Green Brook Fire & EMS Rutgers Cooperative Extension</p>	

Green Brook Fire & EMS House 2
Green Infrastructure Information Sheet

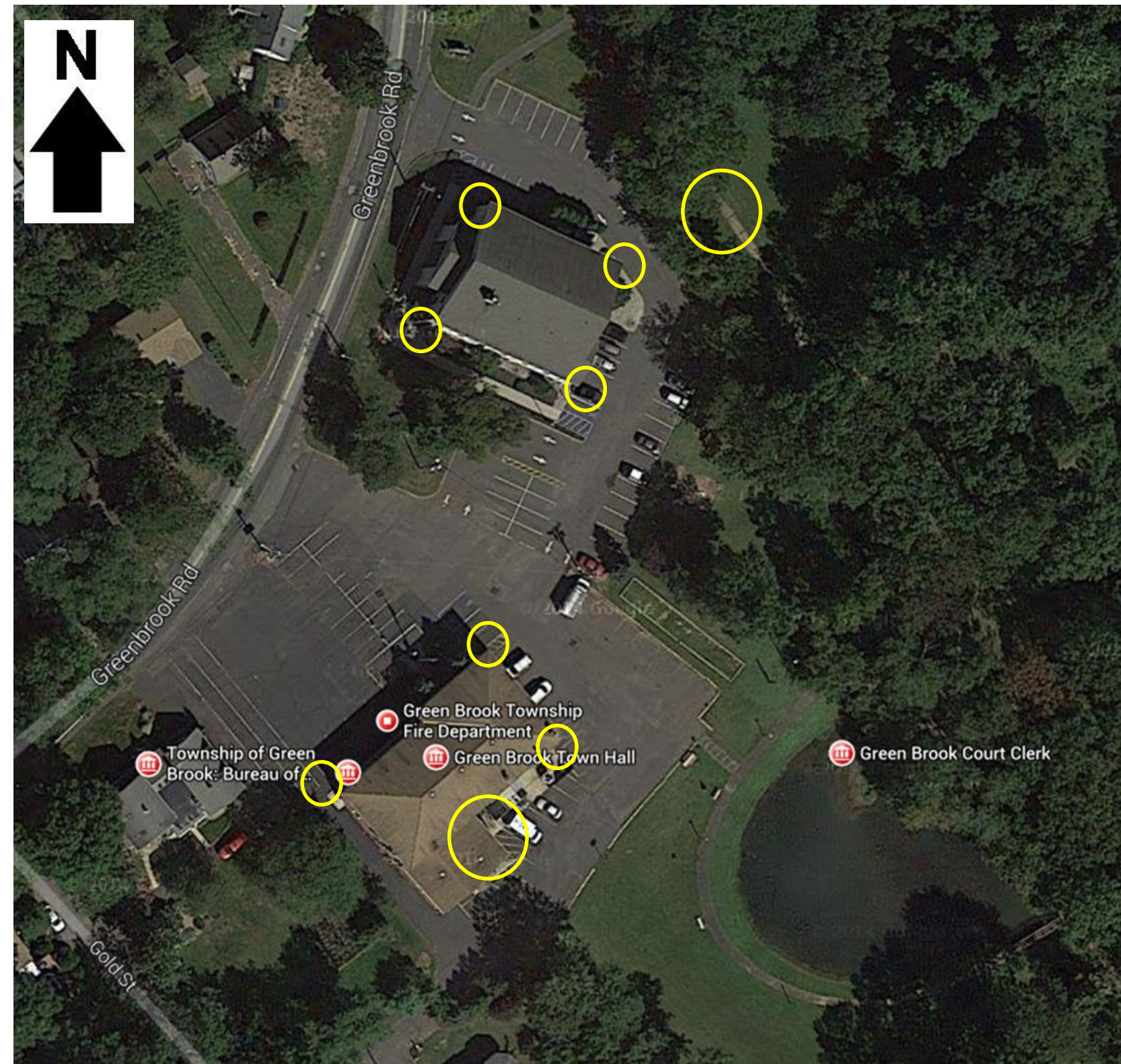
Estimated Cost:

The cistern would be 2,500 gallons and cost approximately \$5,000 to purchase and install.

Green Brook Township Impervious Cover Assessment

Green Brook Municipal Complex, 111 Green Brook Road

PROJECT LOCATION:



A



B



SITE PLAN:



- 1 RAINWATER HARVESTING SYSTEM:** A cistern can help capture the stormwater that drains from the building's rooftop. Connecting the Town Hall's downspouts to a cistern will allow the stormwater to be collected and used for truck washing and plant watering.
- 2 BIORETENTION SYSTEM:** A bioretention system can be used to reduce sediment and nutrient loading to the local waterway and increase groundwater recharge.
- 3 DOWNSPOUT PLANTER BOX:** A downspout planter box could be installed at several locations around the buildings to collect water from the nearby downspouts. Downspout planter boxes reduce runoff and allow water to slowly infiltrate while being treated for pollutants.

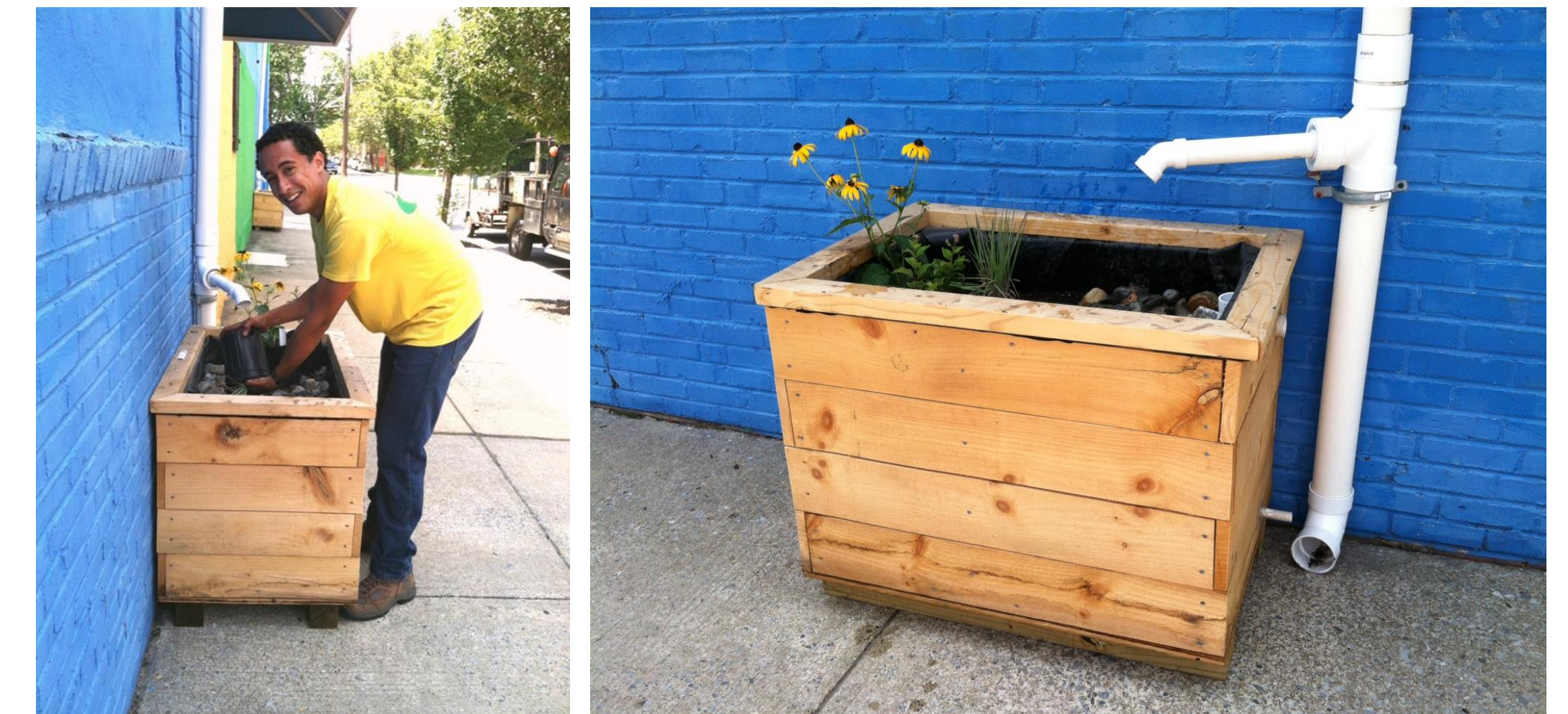
1 RAINWATER HARVESTING SYSTEM



2 BIORETENTION SYSTEM



3 DOWNSPOUT PLANTER BOX



Green Brook Municipal Complex
Green Infrastructure Information Sheet

<p>Location: 111 Greenbrook Road Green Brook, NJ 08812</p>	<p>Municipality: Green Brook Township</p>
<p>Green Infrastructure Description: bioretention system (rain garden) downspout planter box rainwater harvesting system (cistern)</p>	<p>Subwatershed: Green Brook</p>
<p>Mitigation Opportunities: recharge potential: yes stormwater peak reduction potential: yes TSS removal potential: yes</p>	<p>Targeted Pollutants: total nitrogen (TN), total phosphorous (TP), and total suspended solids (TSS) in surface runoff</p> <p>Stormwater Captured and Treated Per Year: bioretention system: 46,900 gal. cistern: 34,558 gal. each downspout planter box: 1,400 gal. all downspout planters: 9,800 gal.</p>
<p>Existing Conditions and Issues: This site contains several impervious surfaces including driveways, walkways, parking areas, a firehouse, and a municipal building. There is a tributary of the Green Brook near this site, which receives stormwater runoff from this site. The site's impervious surfaces produce stormwater runoff during rain events. The municipal building, the town hall, and the fire department have connected downspouts. A gully leading to a tributary of the Green Brook was observed near the entrance to Maurice Miller Park. The gully is eroded. The parking area throughout the site is in fair condition and generally flows to the north and slightly east.</p>	
<p>Proposed Solution(s): One bioretention system could be installed in the grass near the Maurice Miller Park sign next to the Municipal Building. A 3,000 gallon cistern could be connected to the southeastern roof of the fire department building and placed in the yellow marked paved space alongside the building. This system would effectively manage all the stormwater runoff for the entire southeastern face of the building. One downspout would be routed to this system, but it would treat a 2,800 square foot area. At least seven downspouts could be redirected into downspout planter boxes.</p>	
<p>Anticipated Benefits: Since the bioretention systems 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. A rainwater harvesting system will harvest rainwater from the roof of the fire department and store it in a cistern, which can be used for watering plants and washing the fire truck(s). Downspout planter boxes would harvest runoff from the roofs of the buildings to water plants.</p>	

Green Brook Municipal Complex
Green Infrastructure Information Sheet

Possible Funding Sources:

mitigation funds from local developers
NJDEP grant programs
Green Brook Township
Green Brook Township Municipal, Fire, and Police Departments
local social and community groups

Partners/Stakeholders:

Green Brook Township
Green Brook Township Municipal, Fire, and Police Departments
local social and community groups
local residents
Rutgers Cooperative Extension

Estimated Cost:

The bioretention system would need to be approximately 450 square feet. At \$5 per square foot, the estimated cost of this bioretention system is \$2,250. The cistern would be 2,000 gallons and cost approximately \$4,000 to purchase and install. Each downspout planter box would cost approximately \$300 to purchase and install. Seven downspout planter boxes have been proposed for this site. The total cost of the proposed downspout planter boxes is \$2,100. The total cost of the project will be approximately \$8,350.