RUTGERS
New Jersey Agricultural
Experiment Station

Impervious Cover Assessment
for
The Town of Hammonton, Atlantic County, New Jersey

Prepared for the Town of Hammonton by the
Rutgers Cooperative Extension Water Resources Program

December 9, 2016

*Funding provided by: New Jersey Future, Geraldine R. Dodge Foundation and New Jersey Agricultural Experiment Station

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

The Town of Hammonton Impervious Cover Analysis

Located in Atlantic County in southern New Jersey, the Town of Hammonton covers approximately 41.3 square miles. Figures 3 and 4 illustrate that the Town of Hammonton is dominated by wetland land uses. A total of 19.1% of the municipality's land use is classified as urban. Of the urban land in the Town of Hammonton, rural 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 the Town of Hammonton 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 the Town of Hammonton. Based upon the 2007 NJDEP land use/land cover data, approximately 5.2% of the Town of Hammonton has impervious cover. This level of impervious cover suggests that the streams in the Town of Hammonton are likely sensitive streams.

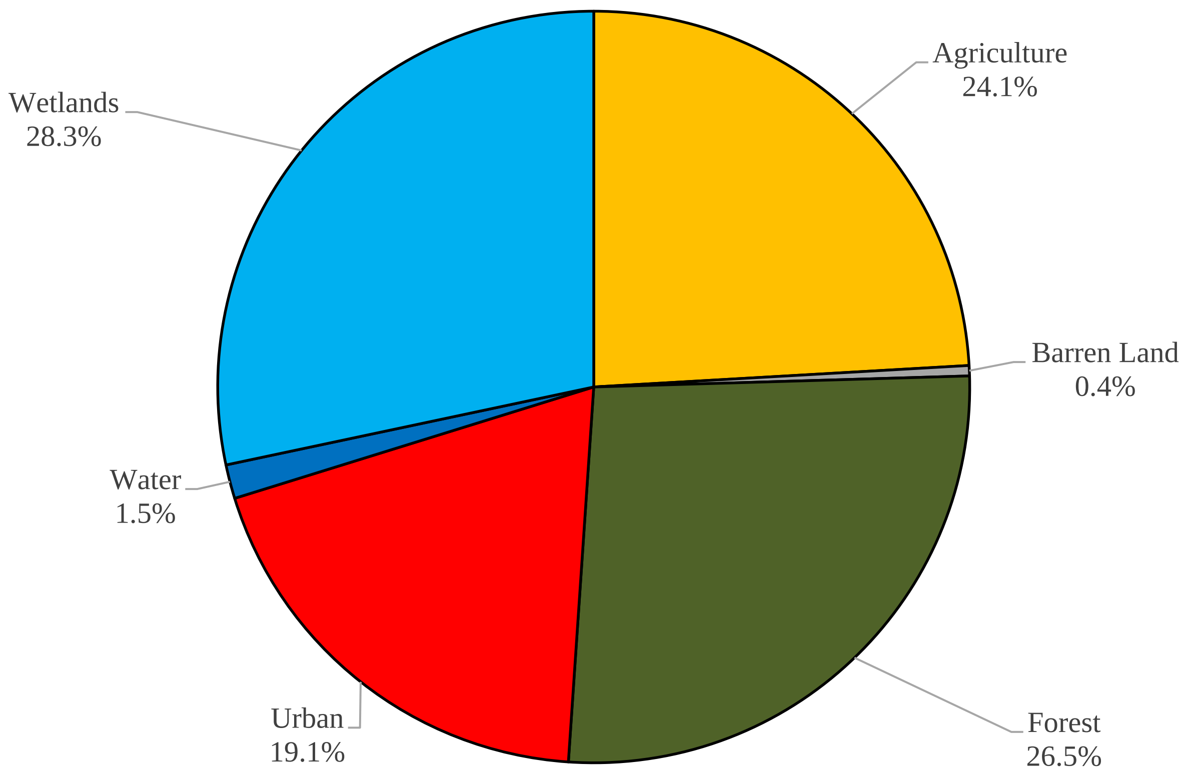


Figure 3: Pie chart illustrating the land use in the Town of Hammonton

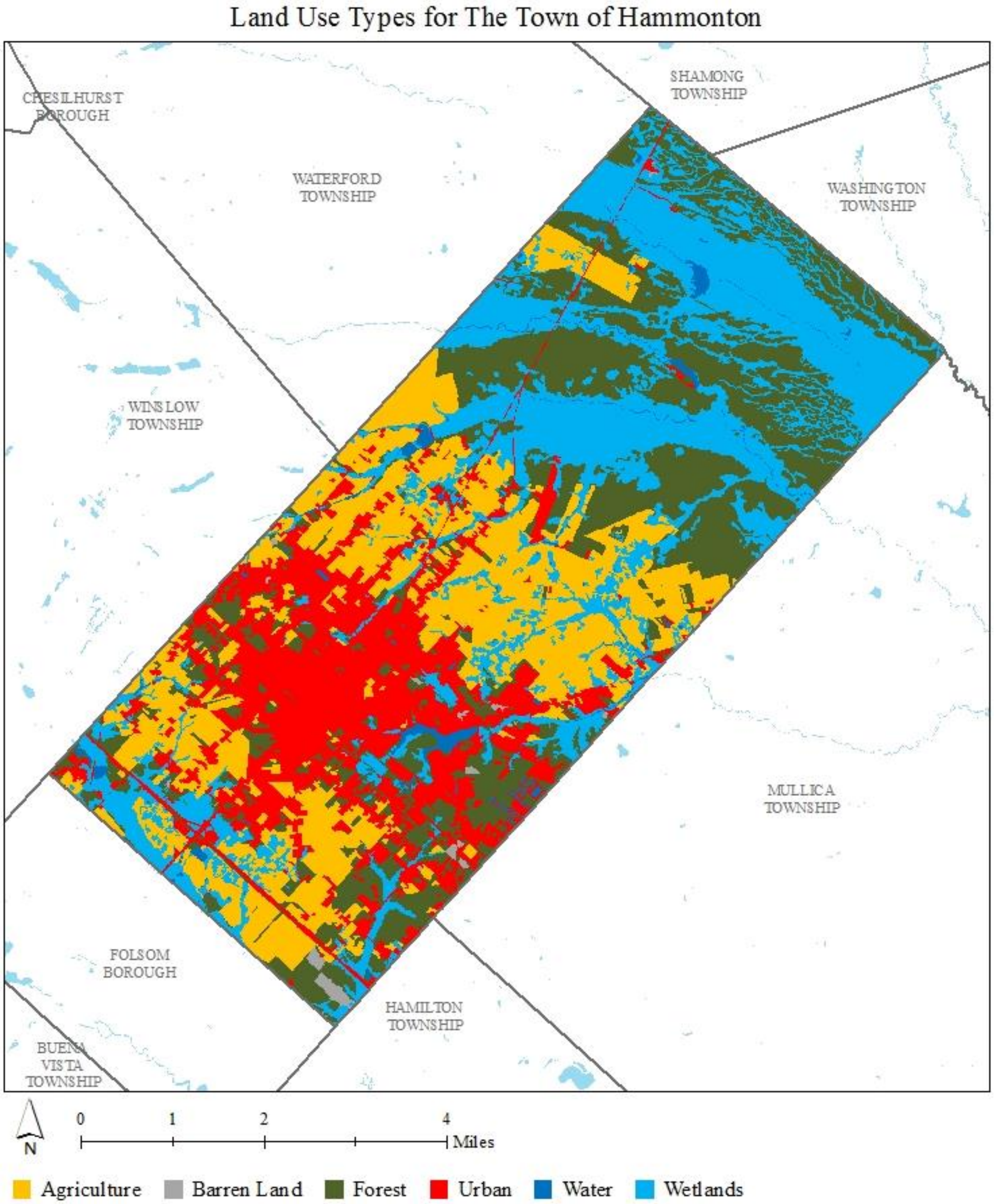


Figure 4: Map illustrating the land use in the Town of Hammonton

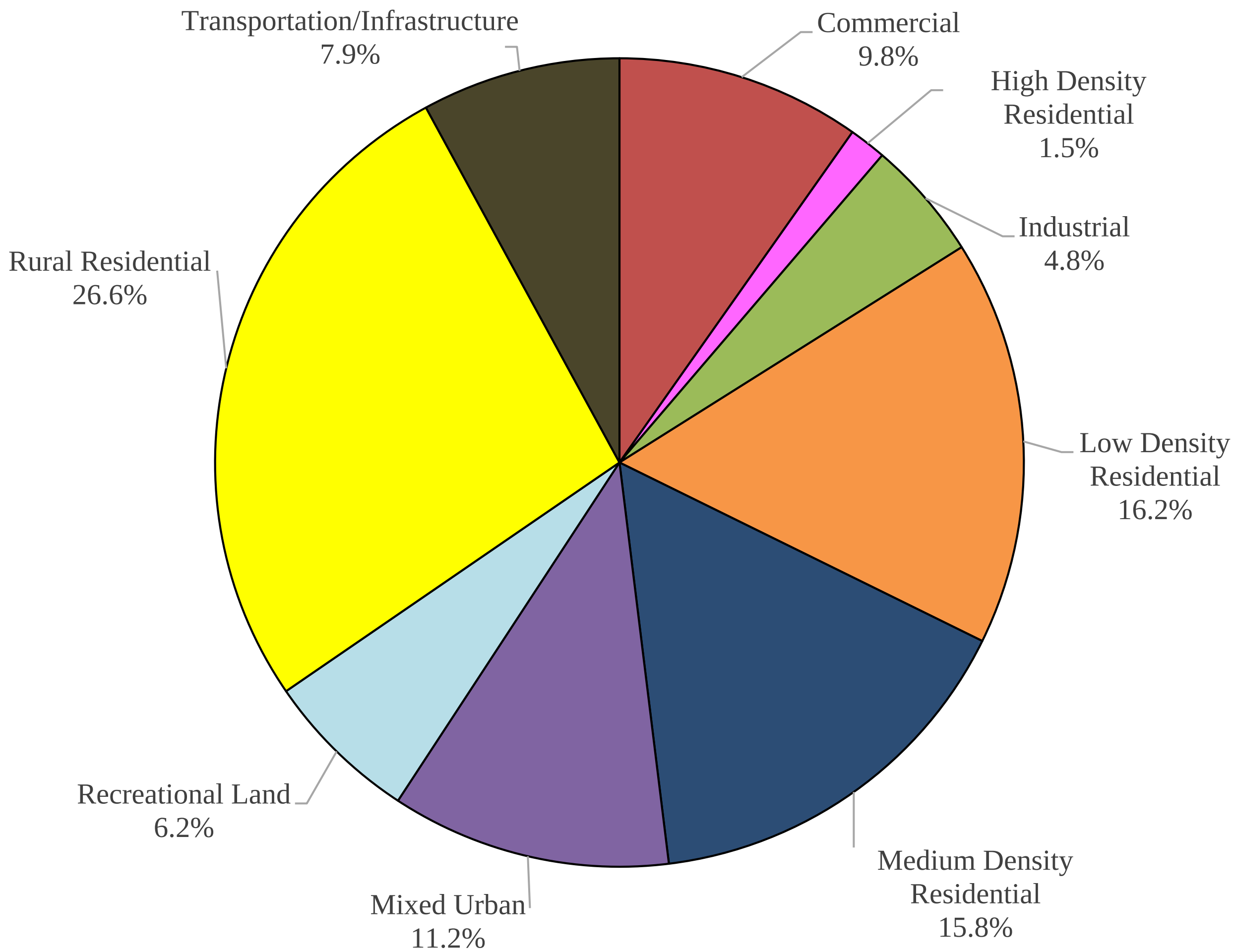


Figure 5: Pie chart illustrating the various types of urban land use in the Town of Hammonton

Water resources are typically managed on a watershed/subwatershed basis; therefore an impervious cover analysis was performed for each subwatershed within the Town of Hammonton (Table 1 and Figure 6). On a subwatershed basis, impervious cover ranges from 0.1% in the Mullica River subwatershed to 9.5% in the Hammonton 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 the Town of Hammonton, Atlantic 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 (5.2 inches of rain), and the 100-year design storm (8.9 inches of rain). These runoff volumes are summarized in Table 2. A substantial amount of rainwater drains from impervious surfaces in the Town of Hammonton. For example, if the stormwater runoff from one water quality storm (1.25 inches of rain) in the Great Swamp subwatershed was harvested and purified, it could supply water to 169 homes for one year[1].

[1] Assuming 300 gallons per day per home

Table 1: Impervious cover analysis by subwatershed for the Town of Hammonton

Subwatershed	Total Area		Land Use Area		Water Area		Impervious Cover		
	(ac)	(mi^2)	(ac)	(mi^2)	(ac)	(mi^2)	(ac)	(mi^2)	(%)
Albertson Brook / Gun Branch	2,358.4	3.69	2,314.9	3.62	43.5	0.07	10.1	0.02	0.4%
Great Egg Harbor River	5,947.5	9.29	5,886.9	9.20	60.5	0.09	340.9	0.53	5.8%
Great Swamp Branch	7,144.4	11.16	7,056.5	11.03	87.9	0.14	544.1	0.85	7.7%
Hammonton Creek	4,872.7	7.61	4,749.3	7.42	123.3	0.19	450.2	0.70	9.5%
Mullica River	5,998.5	9.37	5,927.9	9.26	70.7	0.11	8.2	0.01	0.1%
Sleeper Branch	117.4	0.18	117.4	0.18	0.0	0.00	2.8	0.004	2.4%
Total	26,438.8	41.31	26,052.9	40.71	386.0	0.60	1,356.4	2.12	5.2%

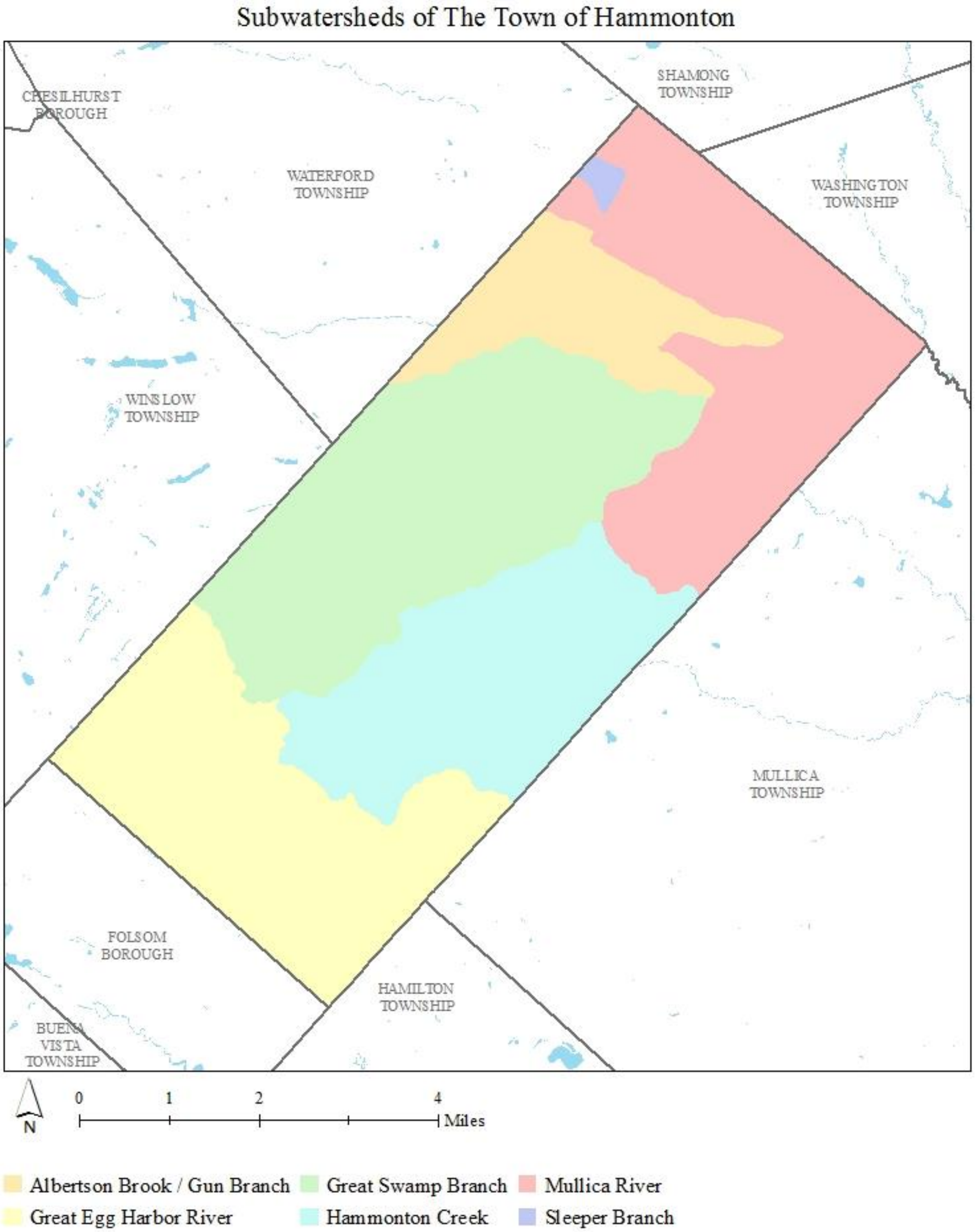


Figure 6: Map of the subwatersheds in the Town of Hammonton

Table 2: Stormwater runoff volumes from impervious surfaces by subwatershed in the Town of Hammonton

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 (5.2") (Mgal)**	**Total Runoff Volume for the 100-Year Design Storm (8.9") (Mgal)**
Albertson Brook / Gun Branch	0.3	12.1	0.9	1.4	2.4
Great Egg Harbor River	11.6	407.3	30.5	48.1	82.4
Great Swamp Branch	18.5	650.0	48.8	76.8	131.5
Hammonton Creek	15.3	537.9	40.3	63.6	108.8
Mullica River	0.3	9.8	0.7	1.2	2.0
Sleeper Branch	0.1	3.3	0.3	0.4	0.7
Total	46.0	1,620.5	121.5	191.5	327.8

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 the Town of Hammonton. 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 the Town of Hammonton

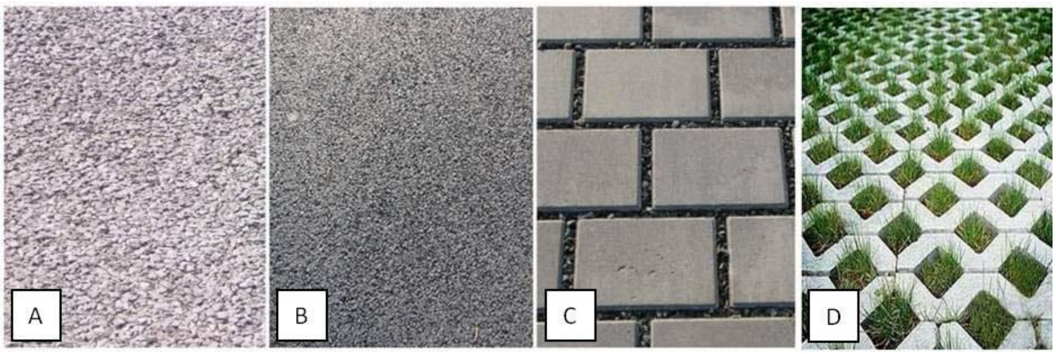
Subwatershed	**Recommended Impervious Area Reduction (10%) (ac)**	**Annual Runoff Volume Reduction[2] (Mgal)**
Albertson Brook / Gun Branch	1.0	1.1
Great Egg Harbor River	34.1	38.7
Great Swamp Branch	54.4	61.8
Hammonton Creek	45.0	51.1
Mullica River	0.8	0.9
Sleeper Branch	0.3	0.3
Total	135.6	153.9

[2] Annual Runoff Volume Reduction =
Acres of IC 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 BMPs should be designed to capture the first 3.3 inches of rain from each storm. This would allow the BMP 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 the Town of Hammonton

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 the Town of Hammonton, 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

The Town of Hammonton 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

Arnold, C.L. Jr. and C.J. Gibbons. 1996. Impervious Surface Coverage The Emergence of a Key Environmental Indicator. *Journal of the American Planning Association* 62(2): 243-258.

Caraco, D., R. Claytor, P. Hinkle, H. Kwon, T. Schueler, C. Swann, S. Vysotsky, and J. Zielinski. 1998. Rapid Watershed Planning Handbook. A Comprehensive Guide for Managing Urbanizing Watersheds. Prepared by Center For Watershed Protection, Ellicott City, MD. Prepared for U.S. Environmental Protection Agency, Office of Wetlands, Oceans and Watersheds and Region V. October 1998.

May, C.W., R.R. Horner, J.R. Karr, B.W. Mar, E.G. Welch. 1997. Effects of Urbanization on Small Streams in the Puget Sound Lowland Ecoregion. *Watershed Protection Techniques* 2(4): 483-493.

Nowak, D. J., and E. J. Greenfield, 2012. Trees and Impervious Cover in the United States. *Landscape and Urban Planning* 107 (2012): 21-30.
http://www.nrs.fs.fed.us/pubs/jrnl/2012/nrs_2012_nowak_002.pdf

Rowe, A., 2012. Green Infrastructure Practices: An Introduction to Permeable Pavement. Rutgers NJAES Cooperative Extension, FS1177, pp. 4.
http://njaes.rutgers.edu/pubs/publication.asp?pid=FS1177

Schueler, T. 1994. The Importance of Imperviousness. *Watershed Protection Techniques*1(3): 100-111.

United States Environmental Protection Agency (USEPA), 2013. Watershed Assessment, Tracking, and Environmental Results, New Jersey Water Quality Assessment Report.
http://ofmpub.epa.gov/waters10/attains_state.control?p_state=NJ

Appendix A

Examples of Impervious Cover Reduction Action Plan Projects

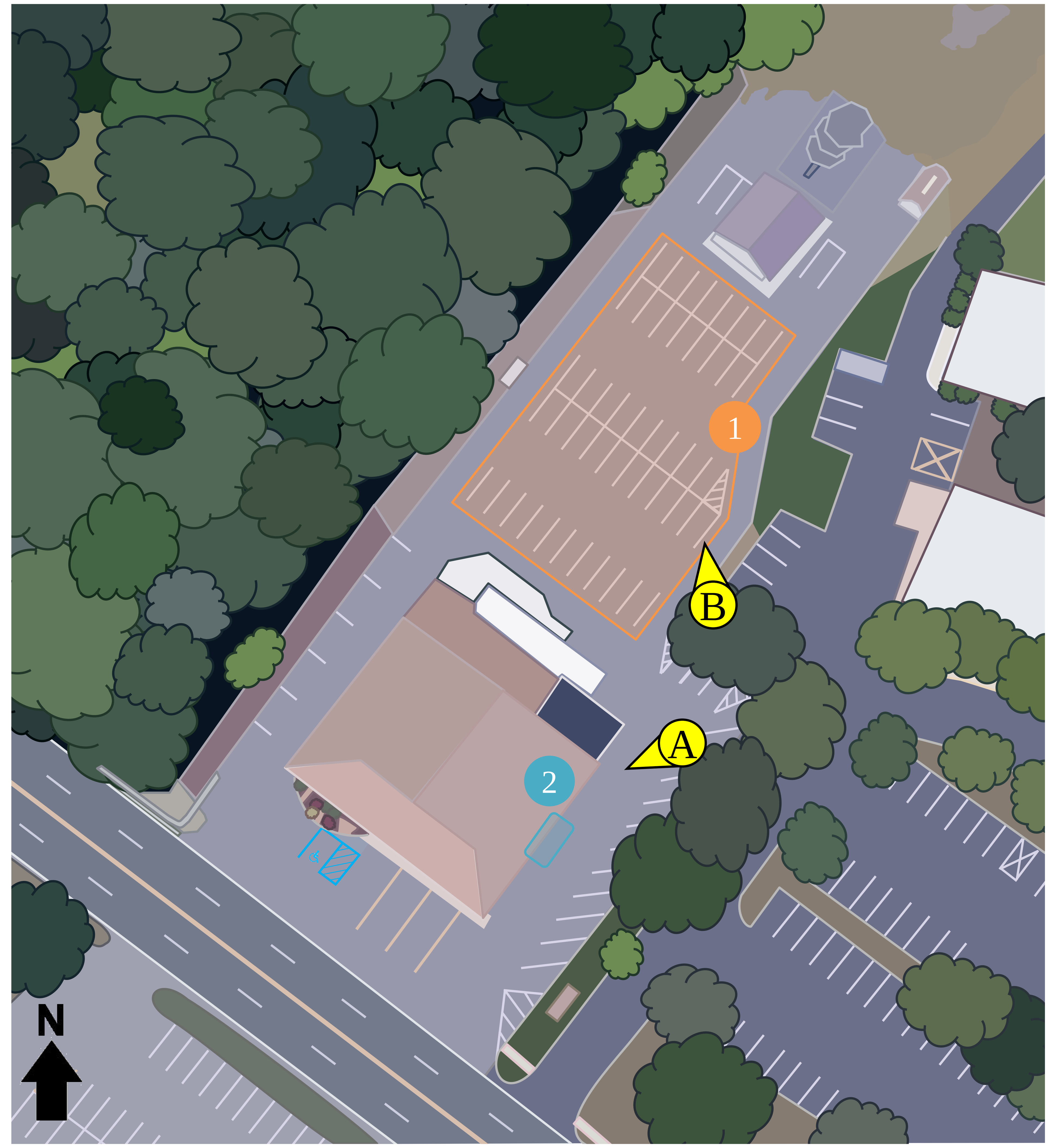
Concept Plans and Detailed Green Infrastructure Information Sheets

Town of Hammonton
Impervious Cover Assessment

Hammonton Volunteer Fire Company No. 2,
51 North White Horse Pike

PROJECT LOCATION:

SITE PLAN:



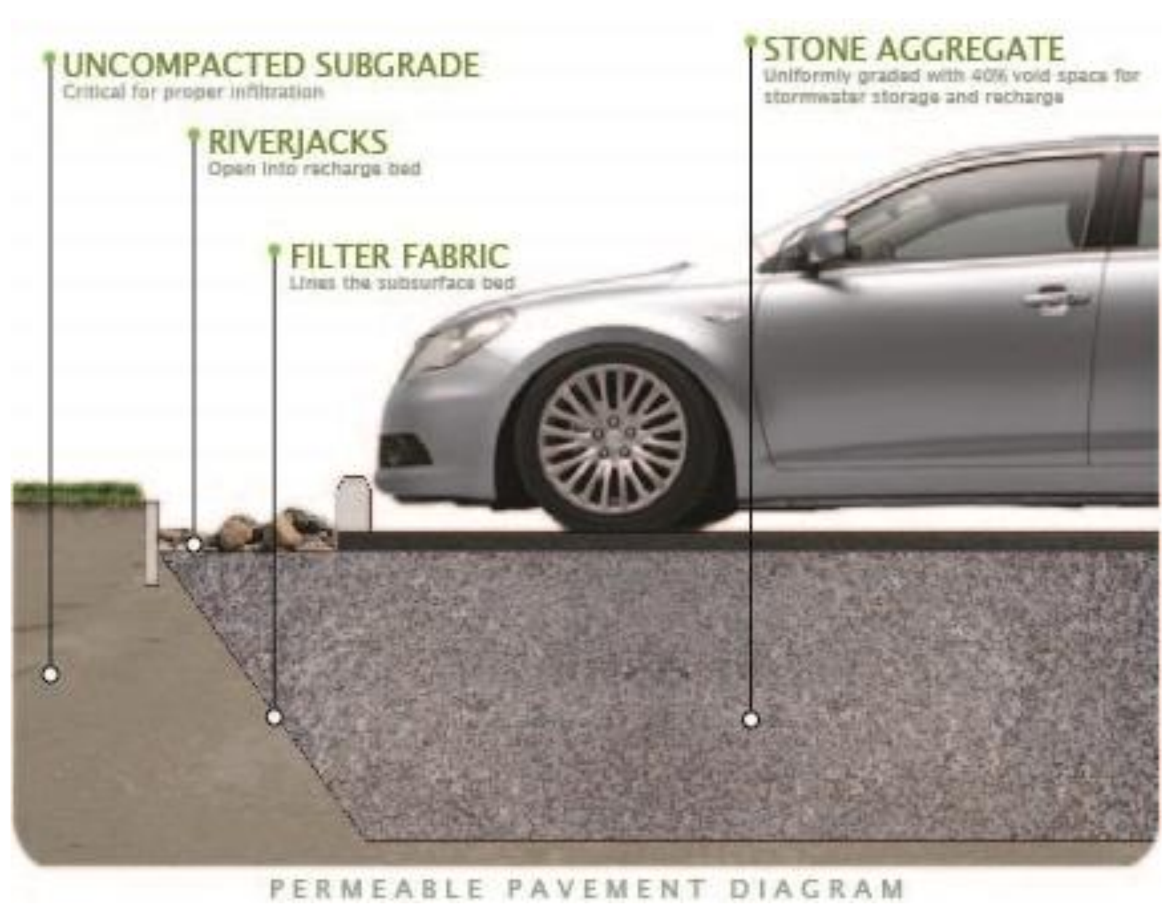
A

B

1 **POROUS PAVEMENT:** Portions of the northern parking lots in the parking spaces can be retrofitted to porous pavement to allow some of the runoff to infiltrate.

2 **RAINWATER HARVESTING SYSTEM:** Rainwater can be harvested from the downspouts on the south east side of the building and stored in a cistern. The water can be used to wash the firehouse vehicles.

1 POROUS PAVEMENT



2 RAINWATER HARVESTING SYSTEM

Hammonton Volunteer Fire Company No. 2
Green Infrastructure Information Sheet

Location: 51 North White Horse Pike Hammonton, NJ 08037	**Municipality:** Town of Hammonton **Subwatershed:** Great Swamp Branch
Green Infrastructure Description: disconnecting downspouts porous pavement rain harvesting system (rain barrel/cistern)	**Targeted Pollutants:** total nitrogen (TN), total phosphorus (TP), total suspended solids (TSS) in surface runoff
Mitigation Opportunities: recharge potential: yes stormwater peak reduction potential: yes total suspended solids removal potential: yes	**Stormwater Captured and Treated Per Year:** cistern: 46,280 gal. porous pavement: 331,950 gal.

Existing Conditions and Issues:
Stormwater, as well as water containing cleaning chemicals and gasoline from cars, flows freely into the adjacent brook. The remainder of the stormwater runoff flows into the street, where it does not get an opportunity to infiltrate into soil.

Proposed Solution(s):
Porous asphalt can be installed in the back parking area of the firehouse to absorb and treat rainwater, removing pollutants before infiltrating into the ground. A cistern can be installed on the south east side of the firehouse to harvest stormwater.

Anticipated Benefits:
Porous pavement allows stormwater to penetrate though to soil layers which will promote groundwater recharge as well as intercept and filter stormwater runoff. The porous pavement system will achieve the same level of pollutant load reduction for TN, TP and TSS as the bioretention system.
Rain barrels and cisterns can harvest stormwater which can be used for watering plants, or other purposes which cuts back on use of potable water for nondrinking purposes. 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
Town of Hammonton
local social and community groups

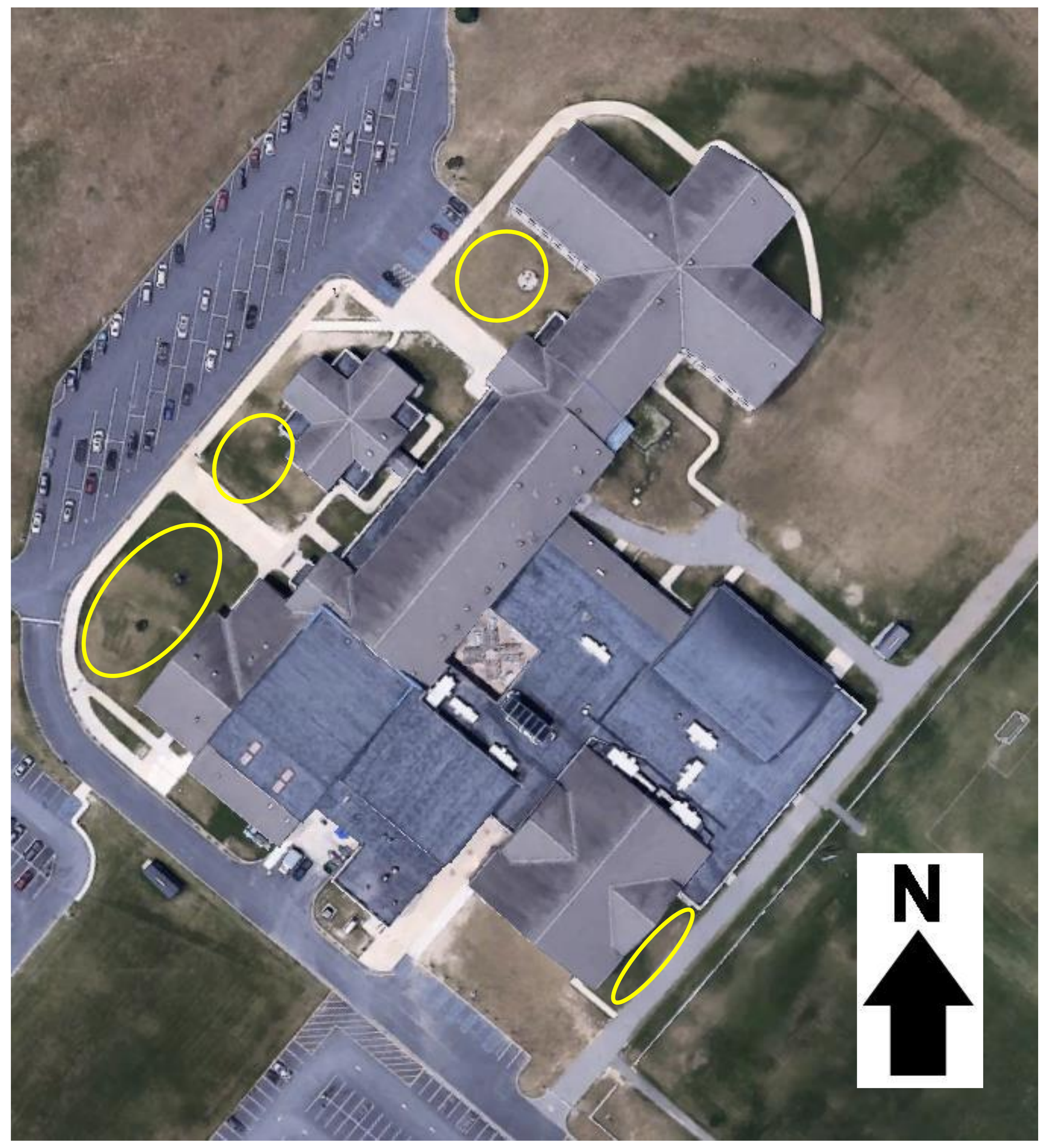
Partners/Stakeholders:
Town of Hammonton
Hammonton Volunteer Fire Co. No. 2
local community groups
Rutgers Cooperative Extension

Estimated Cost:

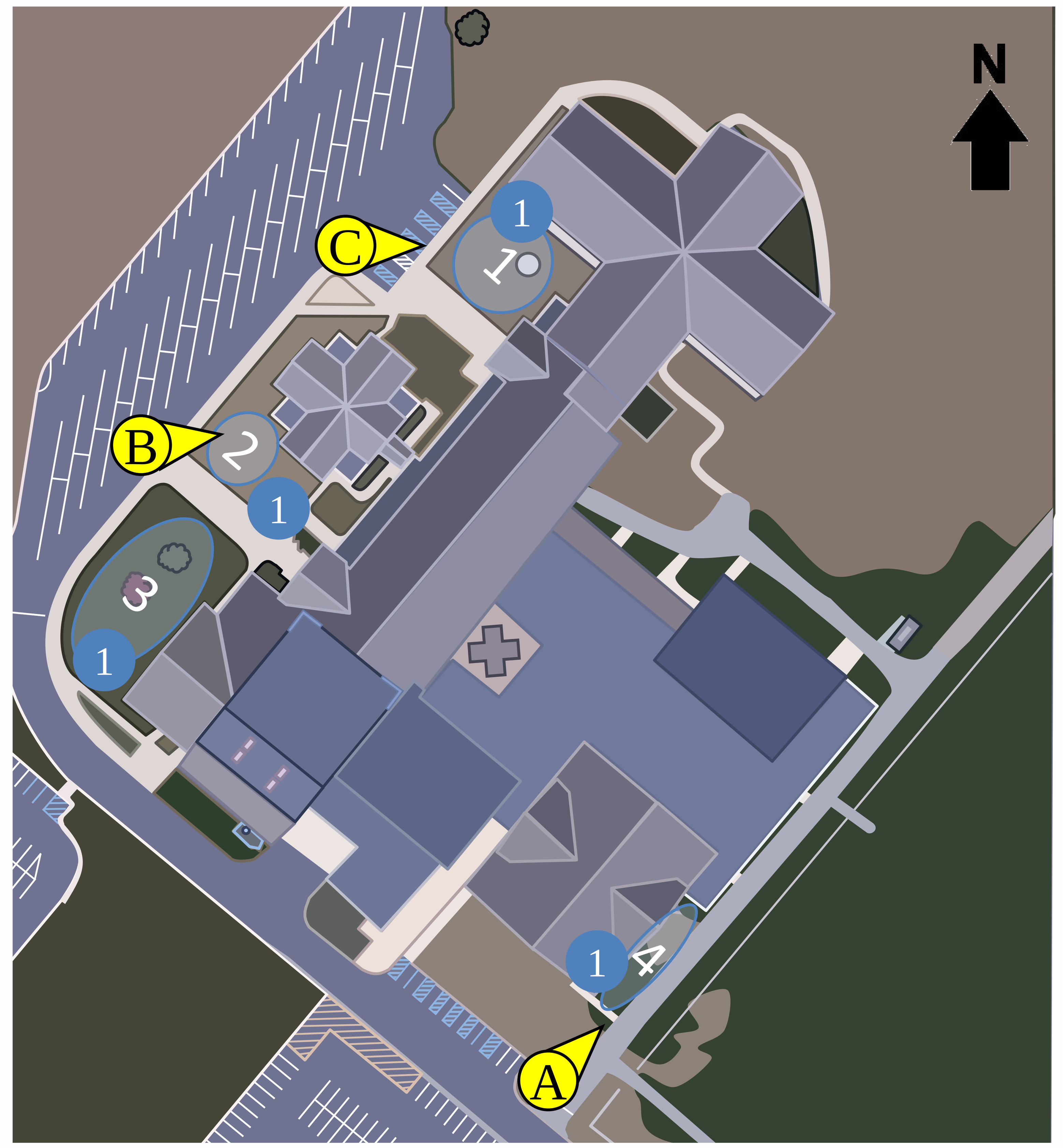
The porous asphalt section would cover 2,275 square feet and have a two foot stone reservoir under the surface. At approximately $25 per square foot, the cost of the porous asphalt system would be $56,875.
The cistern would be 3,000 gallons and cost approximately $6,000 to purchase and install.
The total cost of the project will thus be approximately $62,875.

Town of Hammonton
Impervious Cover Assessment
Hammonton High School, 566 Old Forks Road

PROJECT LOCATION:



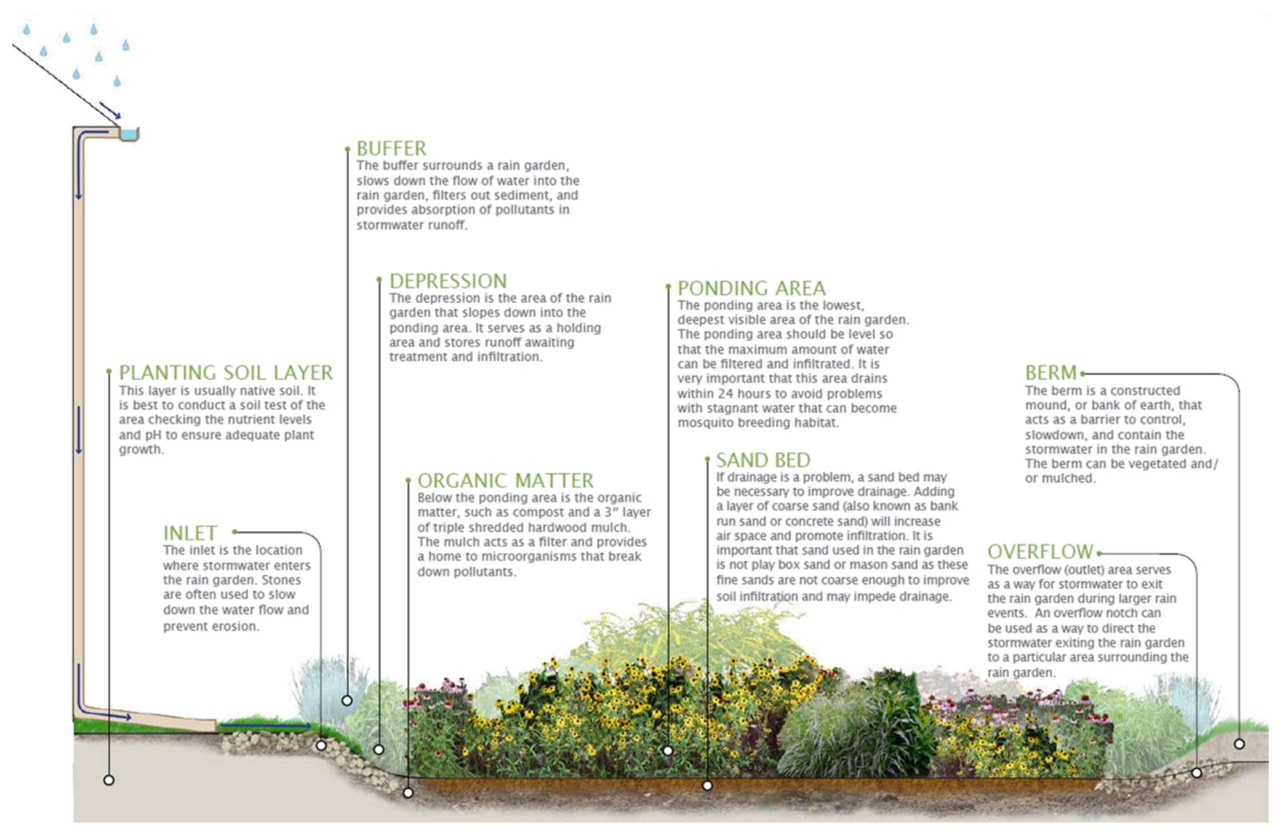
SITE PLAN:



1 **BIORETENTION SYSTEMS:** Rain gardens will be used to reduce sediment and nutrient loading to the local waterway and increase groundwater recharge. This site has multiple area where downspouts can be redirected and rain gardens implemented, such as the northern area near the flagpole, the areas in front of the entrance, and the southern area beside the handicap parking.

2 **EDUCATIONAL PROGRAM:** The RCE Water Resources Program, *Stormwater Management in Your Schoolyard*, can be delivered at the high school to educate the students about stormwater management and engage them in designing and building the bioretention systems.

1 BIORETENTION SYSTEMS



2 EDUCATIONAL PROGRAM

RUTGERS
New Jersey Agricultural Experiment Station

Hammonton High School
Green Infrastructure Information Sheet

Location: 566 Old Forks Road Hammonton, NJ 08037	**Municipality:** Town of Hammonton **Subwatershed:** Great Swamp Branch
Green Infrastructure Description: bioretention system (rain garden) disconnecting downspouts youth education program	**Targeted Pollutants:** total nitrogen (TN), total phosphorus (TP), total suspended solids (TSS) in surface runoff
Mitigation Opportunities: recharge potential: yes stormwater peak reduction potential: yes total suspended solids removal potential: yes	**Stormwater Captured and Treated Per Year:** bioretention system #1: 225,120 gal. bioretention system #2: 51,850 gal. bioretention system #3: 186,430 gal. bioretention system #4: 182,910 gal.

Existing Conditions and Issues:
During rainstorms, stormwater runoff from the roof primarily flows down disconnected downspouts into grassed areas. The parking lot runoff flows either toward the roadway or nearby catch basins where it discharges into the storm sewer system being untreated for pollutants and unable to infiltrate.

Proposed Solution(s):
Several rain gardens adjacent to the building will reduce flooding risk by capturing stormwater before is able to flow past the grassed area. The captured water will infiltrate into soil, promoting groundwater recharge while also filtering out pollutants.

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 and aesthetic appeal to the local residents of Hammonton.

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 Hammonton's Public Works staff to launch educational programming.

Possible Funding Sources:
mitigation funds from local developers
NJDEP grant programs
Town of Hammonton
Local social and community groups

Partners/Stakeholders:
Town of Hammonton
Hammonton High School
local community groups
students and parents
Rutgers Cooperative Extension

Estimated Cost:

Rain gardens are approximately $5 per square foot.
Rain garden #1 would need to be approximately 2,160 square feet and the estimated cost is $10,800.
Rain garden #2 would need to be approximately 500 square feet and the estimated cost is $2,500.
Rain garden #3 would need to be approximately 1,790 square feet and the estimated cost is $8,950.
Rain garden #4 would need to be approximately 1,977 square feet and the estimated cost is $8,750.
The total cost of the project will thus be approximately $31,000.

Town of Hammonton
Impervious Cover Assessment
St. Joseph Church, 226 French Street

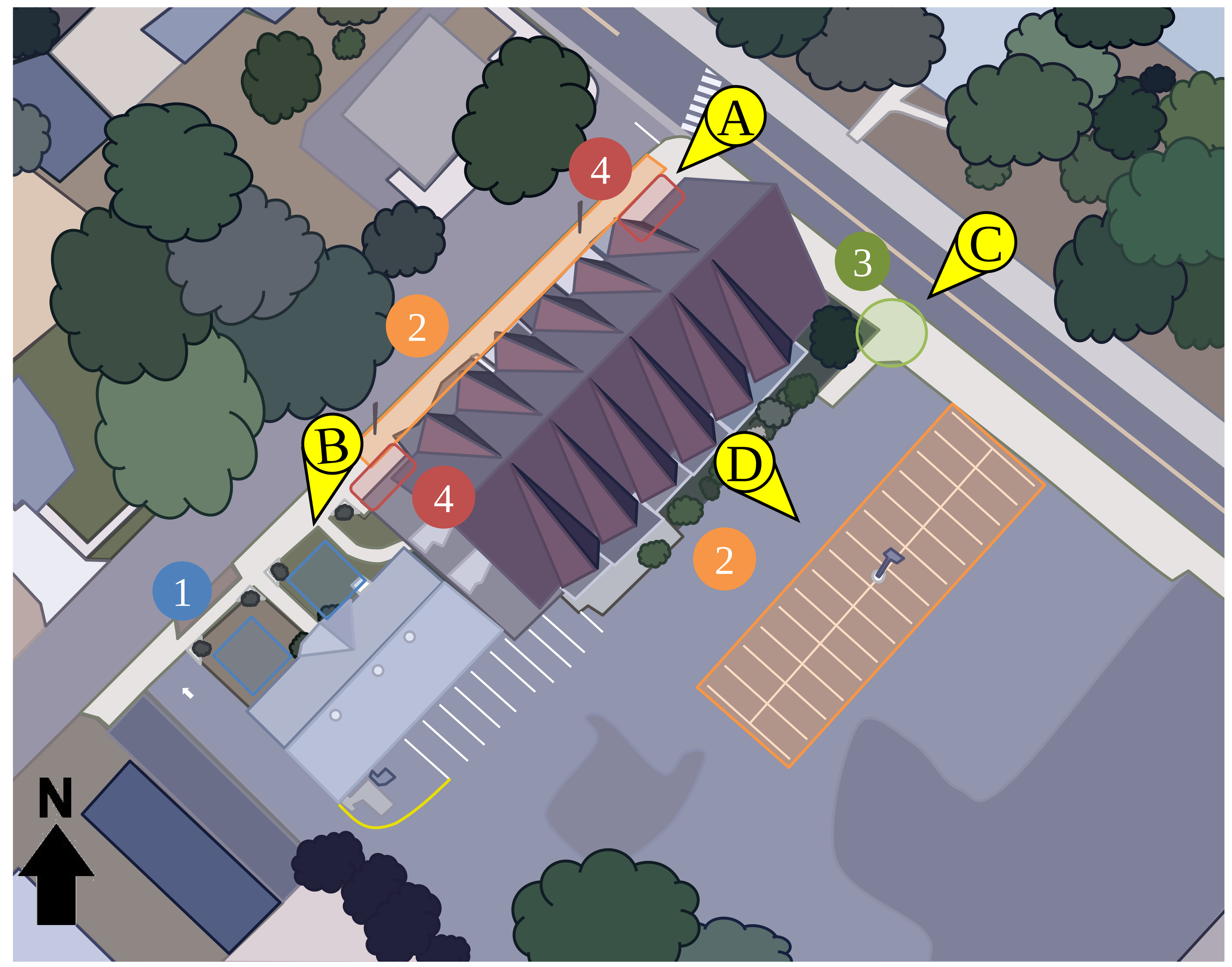
RUTGERS
New Jersey Agricultural Experiment Station

PROJECT LOCATION:

A

B

SITE PLAN:



C

D

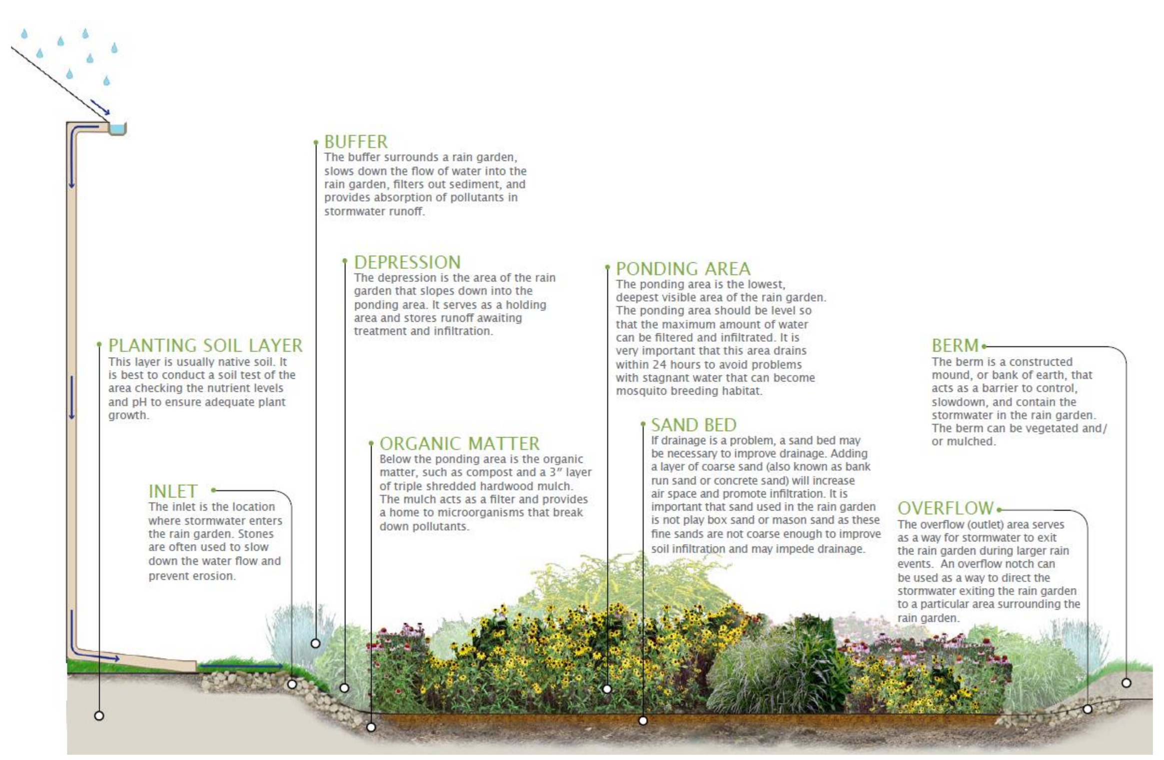
1 **BIORETENTION SYSTEM:** Rain gardens can reduce sediment and nutrient loading to the local waterway and increase groundwater recharge. The front lawn of the southernmost building can be retrofitted with a rain garden that can collect the runoff from the downspouts coming off the building.

2 **POROUS PAVEMENT:** Portions of the western sidewalk and the main parking lot can be retrofitted to porous pavement to allow some of the runoff to infiltrate.

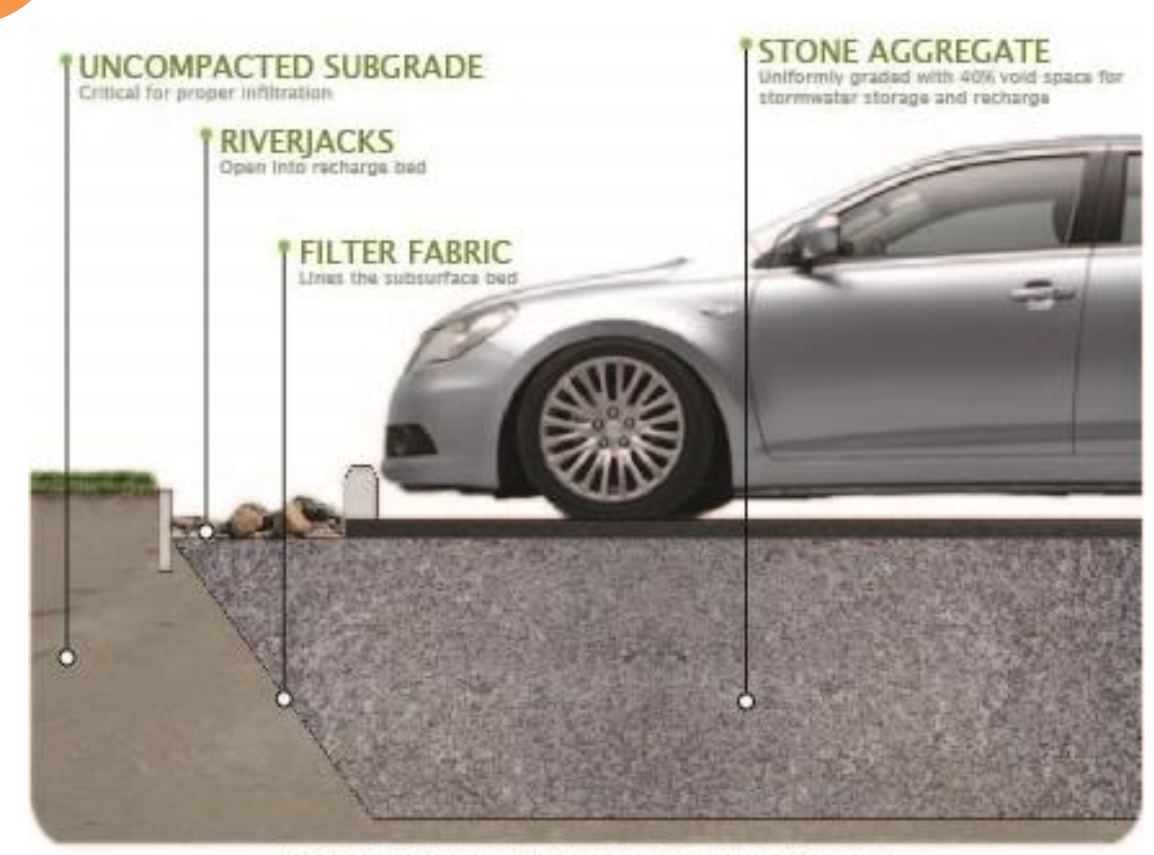
3 **TREE FILTER BOX:** A section of sidewalk north east of the church can be retrofitted with a pre-manufactured concrete box that contains a special soil mix and a tree or shrub. These boxes are designed to quickly filter stormwater, then discharge it to the local sewer system.

4 **PLANTER BOX:** One or more planter boxes could be installed at the northwest face of the building to collect water from the nearby downspout. Planter boxes reduce runoff and allow water slowly infiltrate while being treated for pollutants.

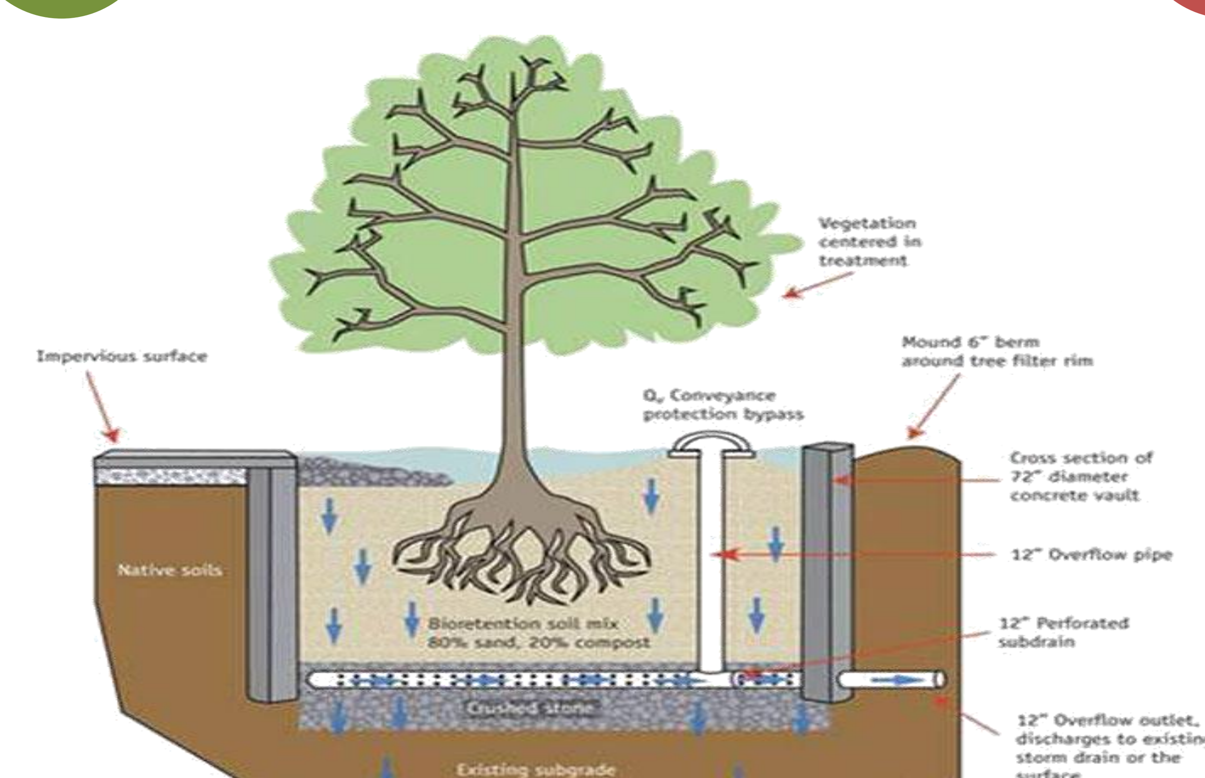
1 BIORETENTION SYSTEM



2 POROUS PAVEMENT



3 TREE FILTER BOX



4 DOWNSPOUT PLANTER BOX

St. Joseph Church
Green Infrastructure Information Sheet

Location: 226 French Street Hammonton, NJ 08037	**Municipality:** Town of Hammonton **Subwatershed:** Great Swamp Branch
Green Infrastructure Description: bioretention system (rain garden) porous pavement tree filter box downspout planter boxes	**Targeted Pollutants:** total nitrogen (TN), total phosphorus (TP), total suspended solids (TSS) in surface runoff
Mitigation Opportunities: recharge potential: yes stormwater peak reduction potential: yes total suspended solids removal potential: yes	**Stormwater Captured and Treated Per Year:** bioretention system #1: 16,285 gal. bioretention system #2: 16,285 gal. pervious pavement #1: 165,710 gal. pervious pavement #2: 268,240 gal. tree filter box: 260,550 gal. downspout planter boxes: 2,800 gal.

Existing Conditions and Issues:
Stormwater runoff from the southeast face of the building's roof flows down disconnected downspouts to the pavement where dysfunctional catch basins cause water to pool. The northwest face runoff flows down disconnected downspouts onto the sidewalk and roadway. Runoff from the parking lot flows toward the surrounding roadways into catch basins instead of infiltrating into the ground.

Proposed Solution(s):
Downspout planters can catch and filter the rainwater on the northwest side of the building while adding aesthetic benefits. The sidewalk can be redone with porous pavement to catch discharge from the planters and catch additional runoff from the rooftop. In the parking lot, porous asphalt can capture much of the stormwater runoff and allow in it into the ground. A tree filter box can be implemented in the sidewalk near the roadway to filter runoff from the street of pollutants before discharging to existing stormwater. Two rain gardens can be implemented in the grassed areas in front of the southern building.

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 and aesthetic appeal to the local residents of Hammonton.
Porous pavement allows stormwater to penetrate though to soil layers which will promote groundwater recharge as well as intercept and filter stormwater runoff. The porous pavement system will achieve the same level of pollutant load reduction for TN, TP and TSS as the bioretention system.
Planter boxes and tree filter boxes will take in runoff from downspouts and roadway respectively and achieve similar reductions in TN, TP, and TSS as the bioretention systems.

Possible Funding Sources:
mitigation funds from local developers
NJDEP grant programs
Town of Hammonton
local social and community groups

Partners/Stakeholders: Town of Hammonton St. Joseph Church, St. Anthony of Padua local community groups residents and parishioners Rutgers Cooperative Extension
Estimated Cost: Rain garden #1 and #2 would need to be approximately 160 square feet each. At $5 per square foot, the estimated cost is $800 each or $1,600 total. Porous pavement #1 would need to be approximately 1,650 square feet. At $5 per square foot, the estimated cost is $41,250. Porous pavement section #2 would need to be approximately 2,470 square feet. At $5 per square foot, the estimated cost is $61,750. The estimated cost of each planter box is $300 for a total cost of $600. The estimated cost of the tree filter box is $7,500. The total cost of the project will thus be approximately $112,700.