RUTGERS
New Jersey Agricultural Experiment Station

Draft

Impervious Cover Reduction Action Plan for Hopewell Township, Cumberland County, New Jersey

Prepared for Hopewell Township by the Rutgers Cooperative Extension Water Resources Program

November 29, 2018

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Introduction

Located in Cumberland County, New Jersey, Hopewell Township covers approximately 30.9 square miles. Figures 1 and 2 illustrate that Hopewell Township is dominated by agricultural land uses. A total of 10.2% of the municipality's land use is classified as urban. Of the urban land in Hopewell Township, rural residential is the dominant land use (Figure 3).

The New Jersey Department of Environmental Protection's (NJDEP) 2012 land use/land cover geographical information system (GIS) data layer categorizes Hopewell 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 Hopewell Township. Based upon the 2012 NJDEP land use/land cover data, approximately 2.9% of Hopewell Township has impervious cover. This level of impervious cover suggests that the streams in Hopewell Township are sensitive supporting streams. [1]

Methodology

Hopewell Township contains portions of four subwatersheds (Figure 4). For this impervious cover reduction action plan, projects have been identified in each of these watersheds. Initially, aerial imagery was used to identify potential project sites that contain extensive impervious cover. Field visits were then conducted at each of these potential project sites to determine if a viable option exists to reduce impervious cover or to disconnect impervious surfaces from draining directly to the local waterway or storm sewer system. During the site visit, appropriate green infrastructure practices for the site were determined. Sites that already had stormwater management practices in place were not considered.

[1] 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.

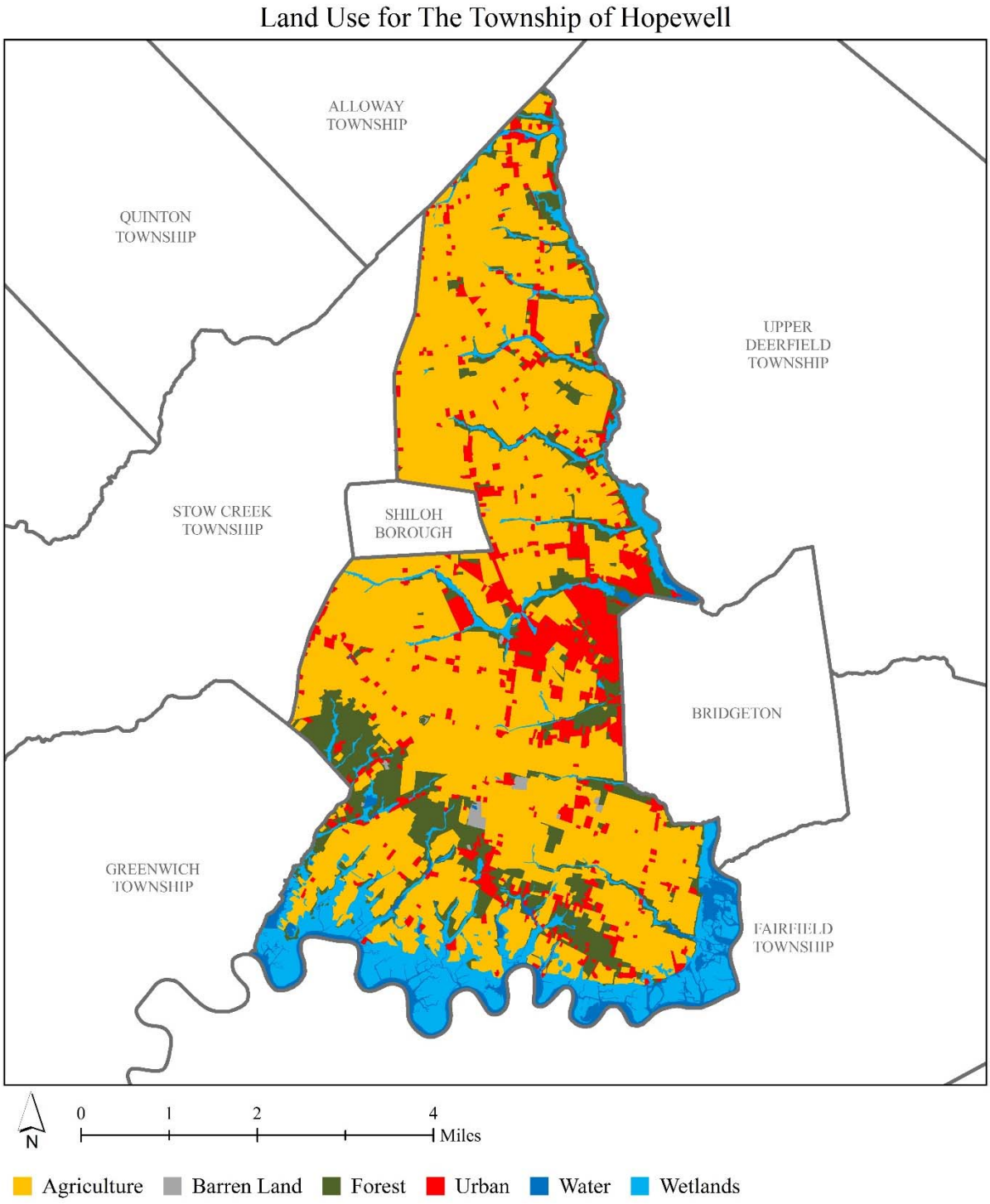


Figure 1: Map illustrating the land use in Hopewell Township

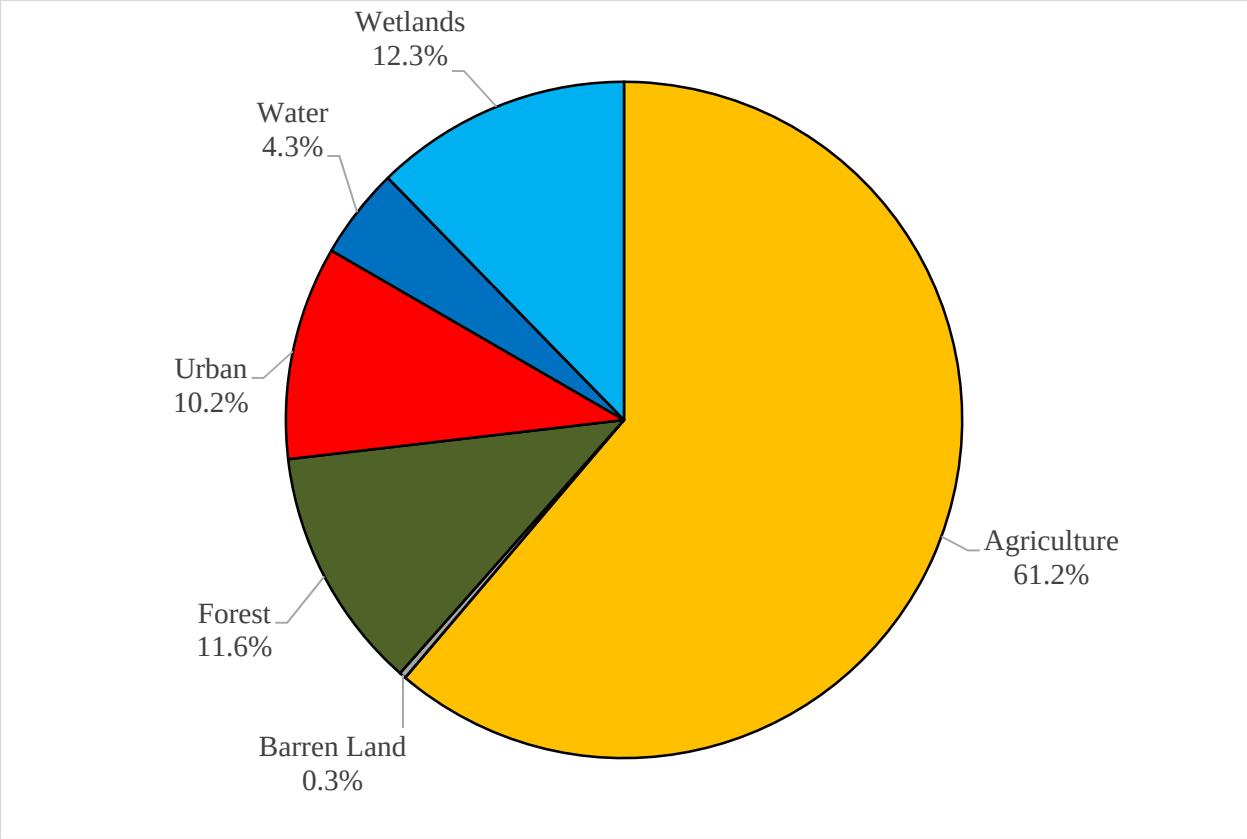


Figure 2: Pie chart illustrating the land use in Hopewell Township

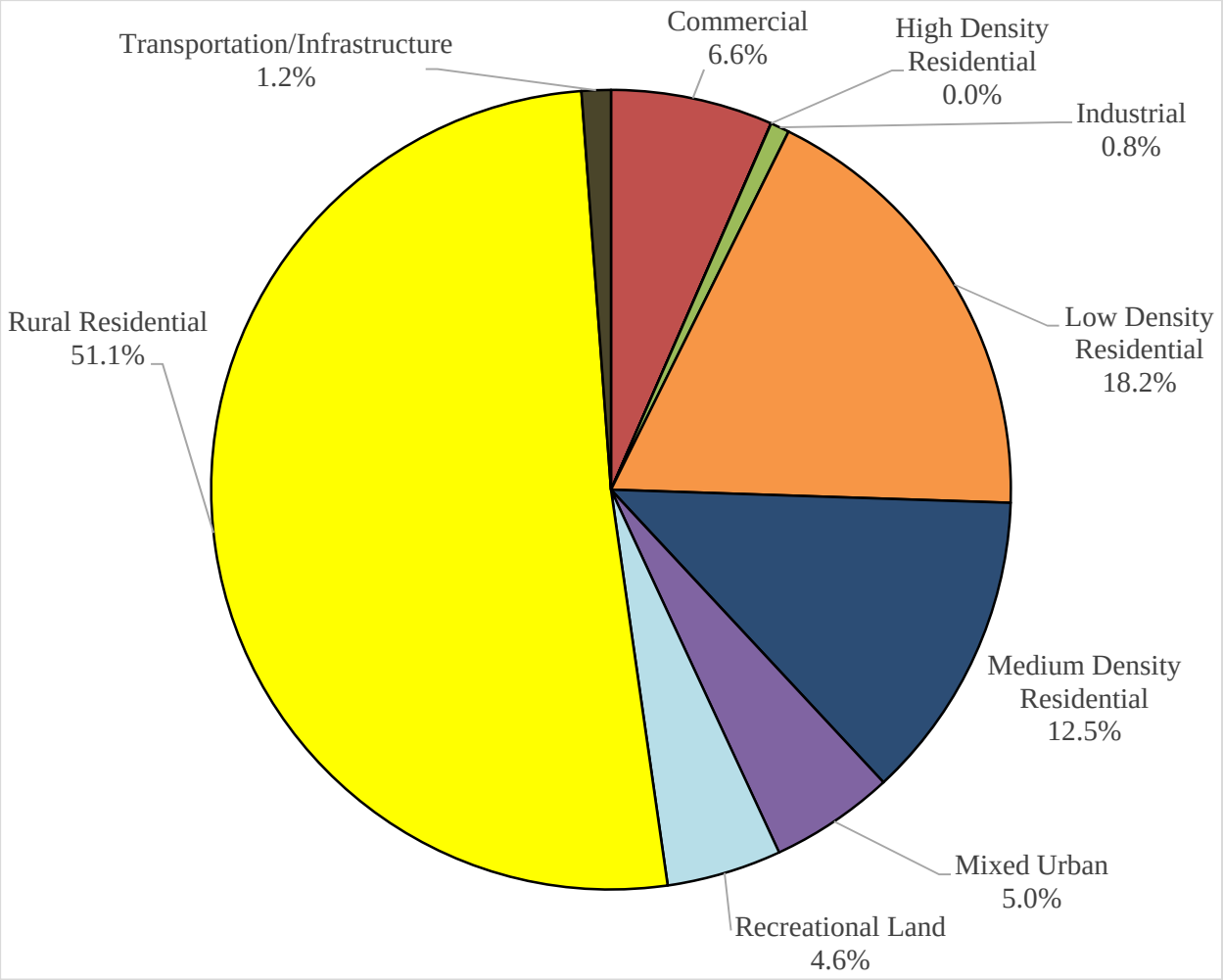


Figure 3: Pie chart illustrating the various types of urban land use in Hopewell Township

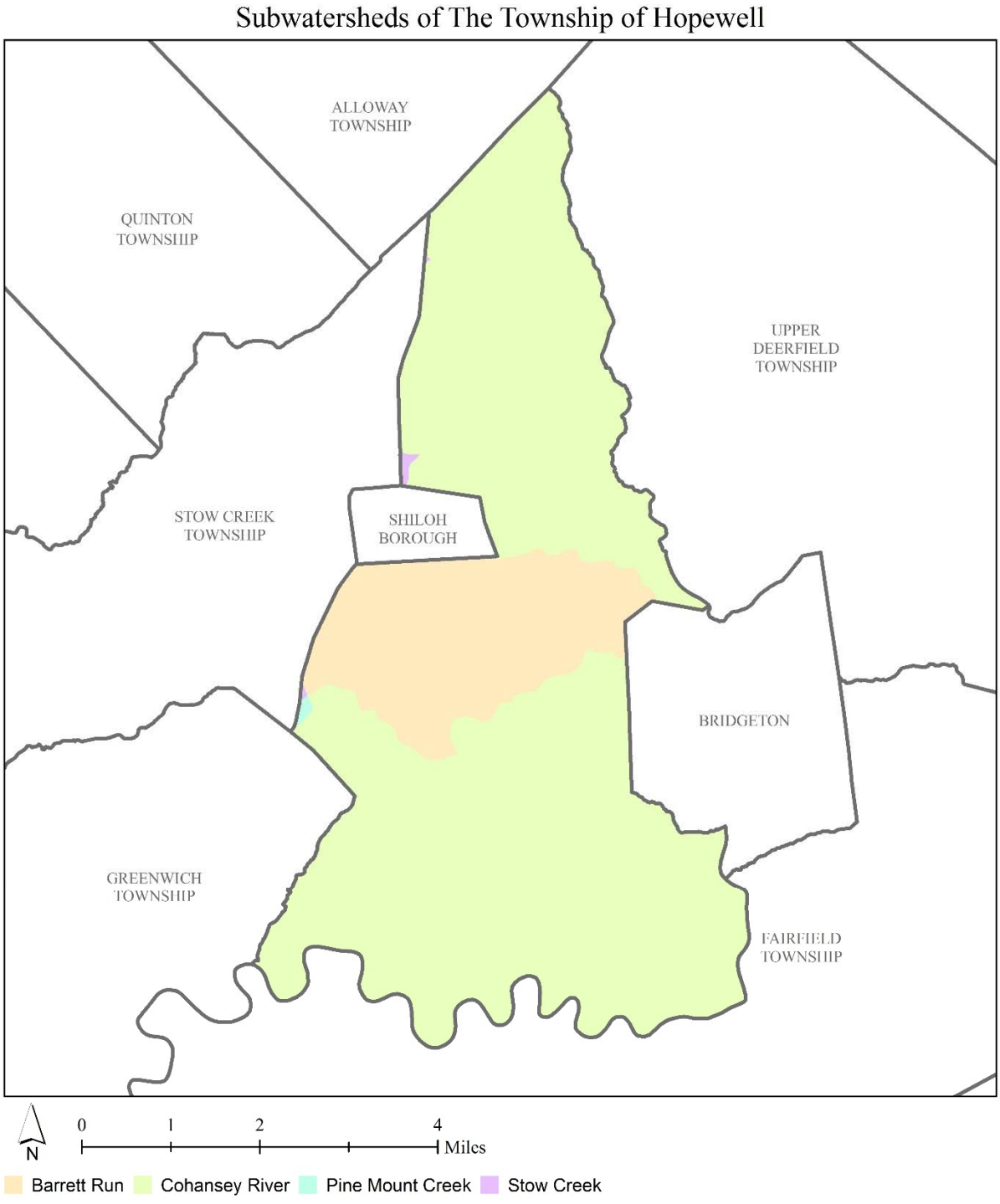


Figure 4: Map of the subwatersheds in Hopewell Township

For each potential project site, specific aerial loading coefficients for commercial land use were used to determine the annual runoff loads for total phosphorus (TP), total nitrogen (TN), and total suspended solids (TSS) from impervious surfaces (Table 1). These are the same aerial loading coefficients that NJDEP uses in developing total maximum daily loads (TMDLs) for impaired waterways of the state. The percentage of impervious cover for each site was extracted from the 2012 NJDEP land use/land cover database. For impervious areas, runoff volumes were determined for the water quality design storm (1.25 inches of rain over two-hours) and for the annual rainfall total of 44 inches.

Preliminary soil assessments were conducted for each potential project site identified in Hopewell Township using the United States Department of Agriculture Natural Resources Conservation Service Web Soil Survey, which utilizes regional and statewide soil data to predict soil types in an area. Several key soil parameters were examined (e.g., natural drainage class, saturated hydraulic conductivity of the most limiting soil layer (K_{sat}), depth to water table, and hydrologic soil group) to evaluate the suitability of each site's soil for green infrastructure practices. In cases where multiple soil types were encountered, the key soil parameters were examined for each soil type expected at a site.

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

Table 1: Aerial Loading Coefficients[2]

Land Cover	TP load (lbs/acre/yr)	TN load (lbs/acre/yr)	TSS load (lbs/acre/yr)
High, Medium Density Residential	1.4	15	140
Low Density, Rural Residential	0.6	5	100
Commercial	2.1	22	200
Industrial	1.5	16	200
Urban, Mixed Urban, Other Urban	1.0	10	120
Agriculture	1.3	10	300
Forest, Water, Wetlands	0.1	3	40
Barrenland/Transitional Area	0.5	5	60

[2] New Jersey Department of Environmental Protection (NJDEP), Stormwater Best Management Practice Manual, 2004.

Green Infrastructure Practices

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 practices 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[3]. A wide range of green infrastructure practices have been evaluated for the potential project sites in Hopewell Township. Each practice is discussed below.

Disconnected downspouts

This is often referred to as simple disconnection. A downspout is simply disconnected, prevented from draining directly to the roadway or storm sewer system, and directed to discharge water to a pervious area (i.e., lawn).

Pervious pavements

There are several types of permeable pavement systems including porous asphalt, pervious concrete, permeable pavers, and grass pavers. These surfaces are hard and support vehicle traffic but also allow water to infiltrate through the surface. They have an underlying stone layer to store stormwater runoff and allow it to slowly seep into the ground.

[3] 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

Bioretention systems/rain gardens

These are landscaped features that are designed to capture, treat, and infiltrate stormwater runoff. These systems can easily be incorporated into existing landscapes, improving aesthetics and creating wildlife habitat while managing stormwater runoff. Bioretention systems also can be used in soils that do not quickly infiltrate by incorporating an underdrain into the system.

Downspout planter boxes

These are wooden boxes with plants installed at the base of a downspout that provide an opportunity to beneficially reuse rooftop runoff.

Rainwater harvesting systems (cistern or rain barrel)

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

Bioswale

Bioswales are landscape features that convey stormwater from one location to another while removing pollutants and providing water an opportunity to infiltrate.

Stormwater planters

Stormwater planters are vegetated structures that are built into the sidewalk to intercept stormwater runoff from the roadway or sidewalk. Many of these planters are designed to allow the water to infiltrate into the ground while others are designed simply to filter the water and convey it back into the stormwater sewer system.

Tree filter boxes

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

Potential Project Sites

Appendix A contains information on potential project sites where green infrastructure practices could be installed as well as information on existing site conditions. The recommended green infrastructure practices and the drainage area that the green infrastructure practices can treat are identified for each potential project site. For each practice, the recharge potential, TSS removal potential, maximum volume reduction potential per storm, the peak reduction potential, and estimated costs are provided. This information is also provided so that proposed development projects that cannot satisfy the New Jersey stormwater management requirements for major development can use one of the identified projects to offset a stormwater management deficit. [4]

[4] New Jersey Administrative Code, N.J.A.C. 7:8, Stormwater Management, Statutory Authority: N.J.S.A. 12:5-3, 13:1D-1 et seq., 13:9A-1 et seq., 13:19-1 et seq., 40:55D-93 to 99, 58:4-1 et seq., 58:10A-1 et seq., 58:11A-1 et seq. and 58:16A-50 et seq., *Date last amended: April 19, 2010*.

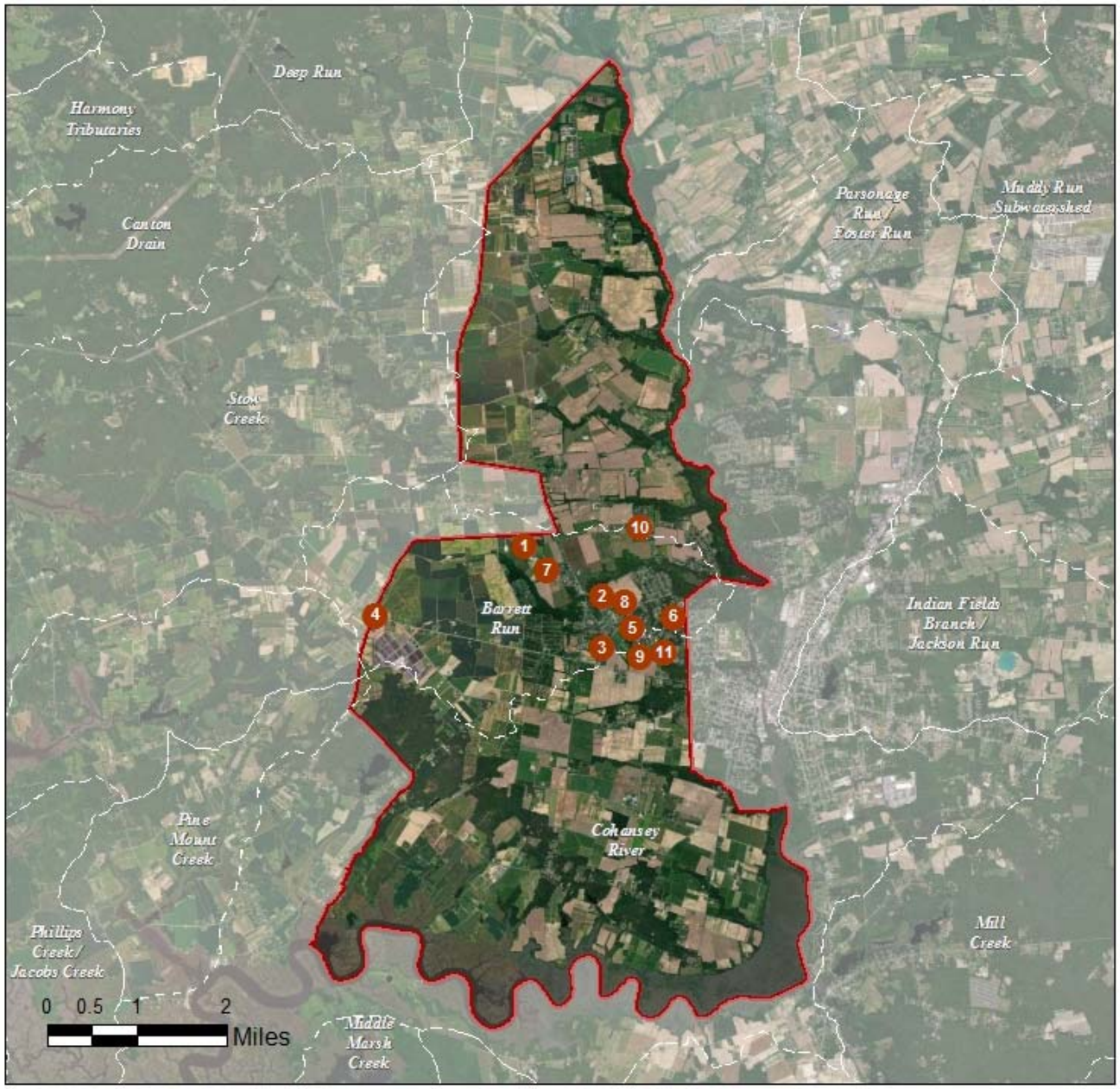
Conclusion

This impervious cover reduction action plan is meant to provide the municipality with a blueprint for implementing green infrastructure practices that will reduce the impact of stormwater runoff from impervious surfaces. These projects can be implemented by a wide variety of people such as boy scouts, girl scouts, school groups, faith-based groups, social groups, watershed groups, and other community groups.

Additionally, development projects that are in need of providing off-site compensation for stormwater impacts can use the projects in this plan as a starting point. The municipality can quickly convert this impervious cover reduction action plan into a stormwater mitigation plan and incorporate it into the municipal stormwater control ordinance.

a. Green Infrastructure Sites

HOPEWELL TOWNSHIP: GREEN INFRASTRUCTURE SITES



SITES WITHIN THE BARRETT RUN SUBWATERSHED

1. By Our Hand Gift Shop
2. Cumberland County Insurance Group
3. First Church of the Nazarene
4. Hopewell-Stow Creek Fire Company
5. Hopewell Township Municipal Building
6. New Hope Presbyterian Church
7. South Jersey Water Conditioning Service
8. West Park Methodist Church

SITES WITHIN THE COHANSEY RIVER SUBWATERSHED

9. Cumberland County Elections
10. Hopewell Crest Elementary School
11. Hopewell Veterinary Clinic

b. Proposed Green Infrastructure Concepts

BY OUR HAND GIFT SHOP

Subwatershed: **Barrett Run**

Site Area: **187,133 sq. ft.**

Address: **780 Shiloh Pike**
Bridgeton, NJ 08302

Block and Lot: **Block 39, Lot 4**

A rain garden can be installed in the turfgrass area on the west side of the building to capture, treat, and infiltrate stormwater runoff from the roof. The downspout at the southeast corner of the building can be connected to a downspout planter box to allow rooftop runoff to be filtered and reused. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
13	24,302	1.2	12.3	111.6	0.019	0.67

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.072	12	5,260	0.20	690	$3,450
Planter box	n/a	1	n/a	n/a	1 (box)	$1,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

By Our Hand Gift Shop

- bioretention system
- planter box
- drainage area
- property line
- 2015 Aerial: NJOIT, OGIS

0 X' X'

CUMBERLAND COUNTY INSURANCE GROUP

Subwatershed: **Barrett Run**

Site Area: **442,147 sq. ft.**

Address: **633 Shiloh Pike**
Bridgeton, NJ 08302

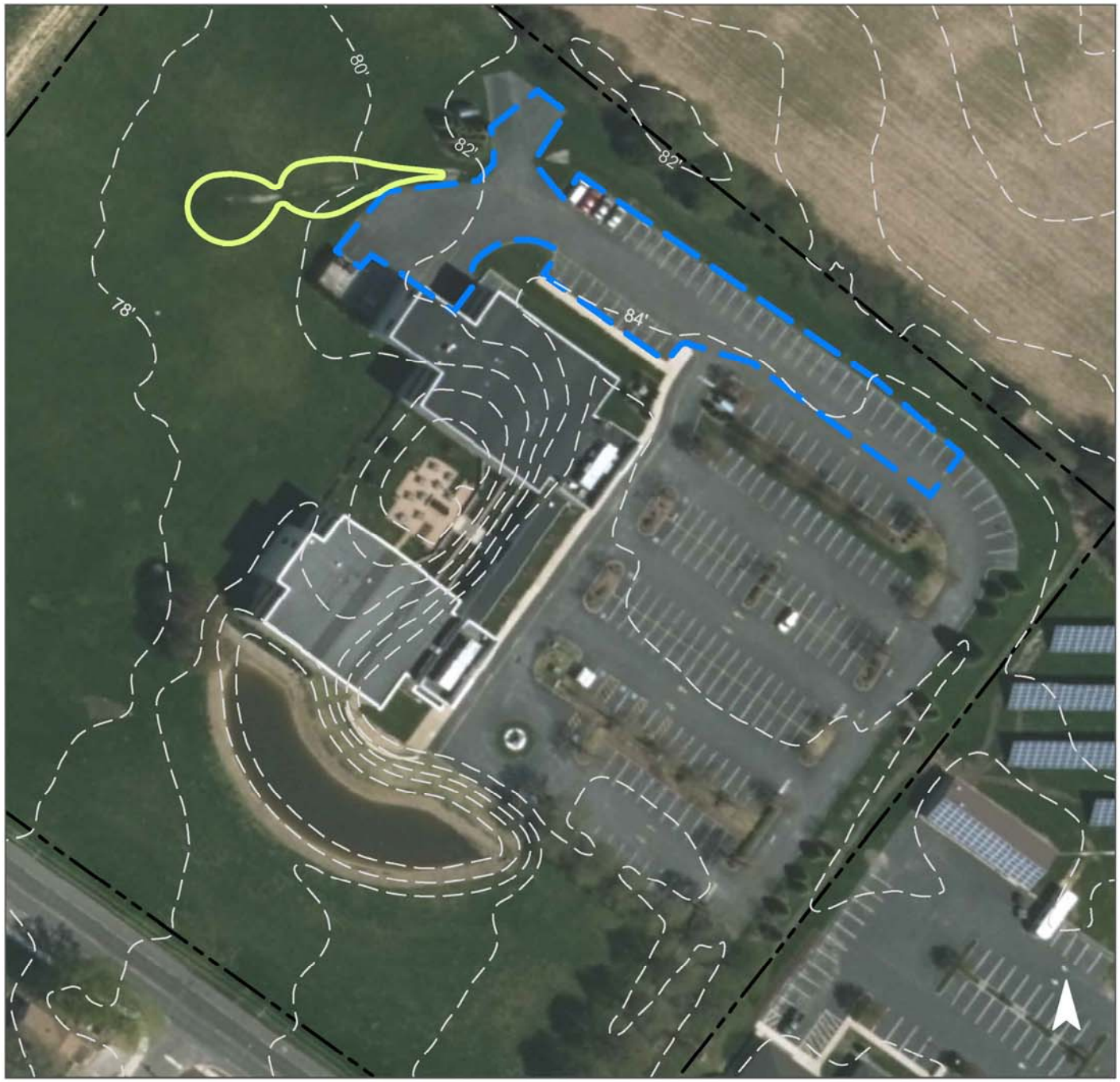
Block and Lot: **Block 35.09, Lot 12.01**

A rain garden can be installed on the west side of the property to capture, treat, and infiltrate stormwater runoff from the parking lot and to enhance a currently existing drainage area. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
33	144,120	6.9	72.8	661.7	0.112	3.95

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.619	104	45,400	1.71	4,375	$21,875

GREEN INFRASTRUCTURE RECOMMENDATIONS



Cumberland County Insurance Group

- bioretention system
- drainage area
- property line
- 2015 Aerial: NJOIT, OGIS

0 X' X'

FIRST CHURCH OF THE NAZARENE

Subwatershed: Barrett Run

Site Area: 103,777 sq. ft.

Address: 350 West Park Drive
Bridgeton, NJ 08302

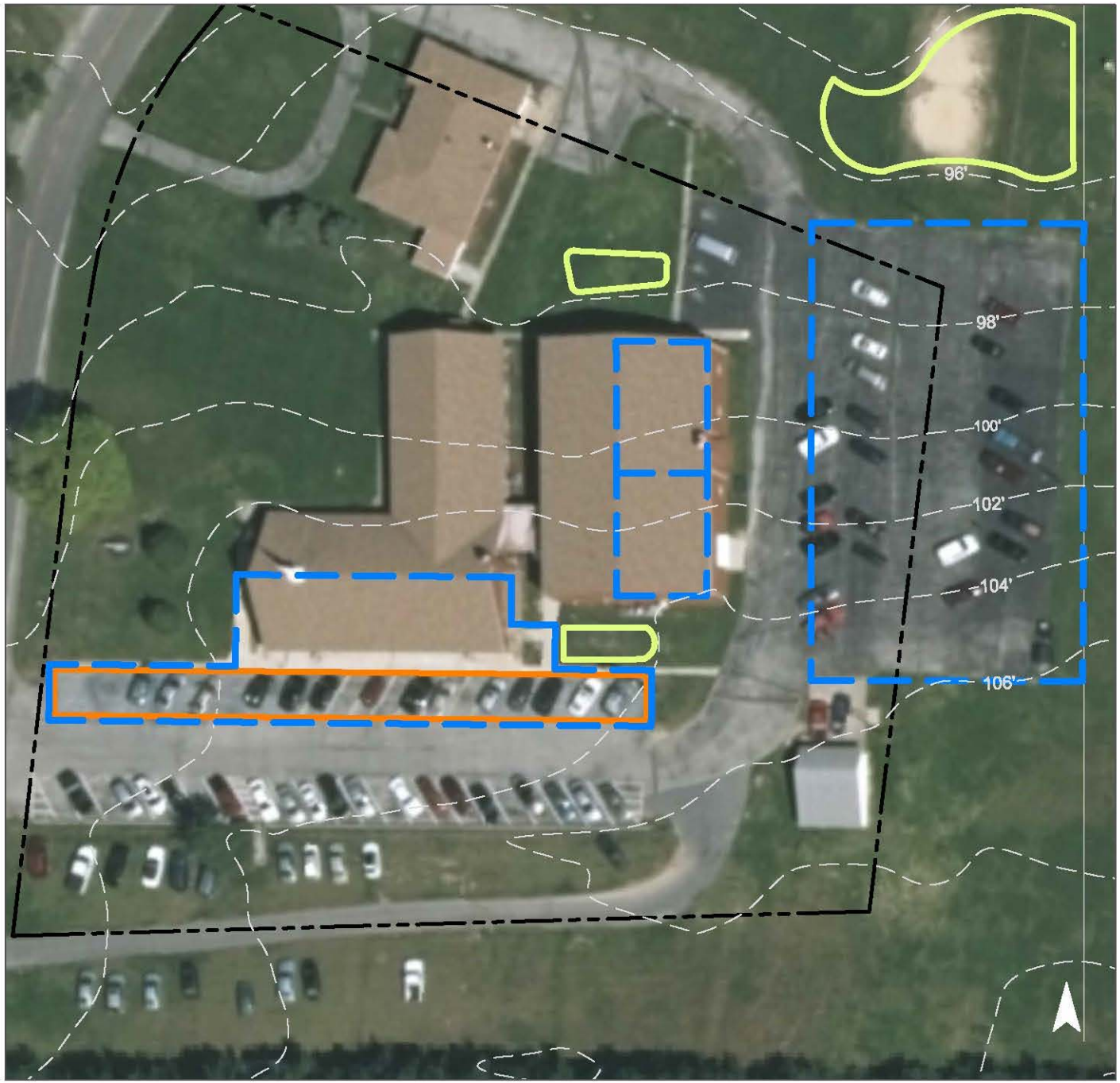
Block and Lot: Block 54, Lot 4.01

A section of parking spaces can be replaced with pervious pavement to capture and infiltrate stormwater runoff from the parking lot. Rain gardens can be installed in the turfgrass around the property to capture, treat, and infiltrate stormwater runoff from the roof of the building and the parking lot. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
57	59,082	2.8	29.8	271.3	0.046	1.62

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.561	94	41,140	1.55	5,400	$27,000
Pervious pavement	0.245	41	18,010	0.68	4,200	$105,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



First Church of the Nazarene

- bioretention system
- pervious pavement
- drainage area
- property line
- 2015 Aerial: NJOIT, OGIS

0 30' 60'

HOPEWELL-STOW CREEK FIRE COMPANY

Subwatershed: **Barrett Run**

Site Area: **48,954 sq. ft.**

Address: **753 Roadstown Road**
Bridgeton, NJ 08302

Block and Lot: **Block 65, Lot 25**

Downspouts along the building can lead to cisterns. Collected stormwater from the cisterns can be used to wash emergency vehicles or for other non-potable purposes. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
45	21,892	1.1	11.1	100.5	0.017	0.60

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Rainwater harvesting	0.078	13	3,000	0.11	3,000 (gal)	$6,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Hopewell-Stow Creek Fire Company

- rainwater harvesting
- drainage area
- property line
- 2015 Aerial: NJOIT, OGIS

0 15' 30'

HOPEWELL TOWNSHIP MUNICIPAL BUILDING

Subwatershed: **Barrett Run**

Site Area: **55,431 sq. ft.**

Address: **590 Shiloh Pike**
Bridgeton, NJ 08302

Block and Lot: **Block 54, Lot 2**

A rain garden at the east side of the building can capture, treat, and infiltrate rooftop runoff. A strip of parking spaces on the west side of the parking lot can be replaced with pervious pavement to capture and infiltrate stormwater runoff from the parking lot. The downspout at the northwest corner of the small building on the south side of the parking lot can lead to a cistern. The captured water can be used to wash vehicles and water existing landscaping. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
85	47,116	2.3	23.8	216.3	0.037	1.29

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.082	14	6,020	0.23	790	$4,000
Pervious pavement	0.245	41	18,010	0.68	2,840	$71,100
Rainwater harvesting	0.023	4	680	0.02	680 (gal)	$1,360

GREEN INFRASTRUCTURE RECOMMENDATIONS

Hopewell Township Municipal Building

- bioretention system
- pervious pavement
- rainwater harvesting
- drainage area
- property line
- 2015 Aerial: NJOIT, OGIS

0 25' 50'

NEW HOPE PRESBYTERIAN CHURCH

Subwatershed: **Barrett Run**

Site Area: **130,304 sq. ft.**

Address: **65 Hitchner Avenue**
Bridgeton, NJ 08302

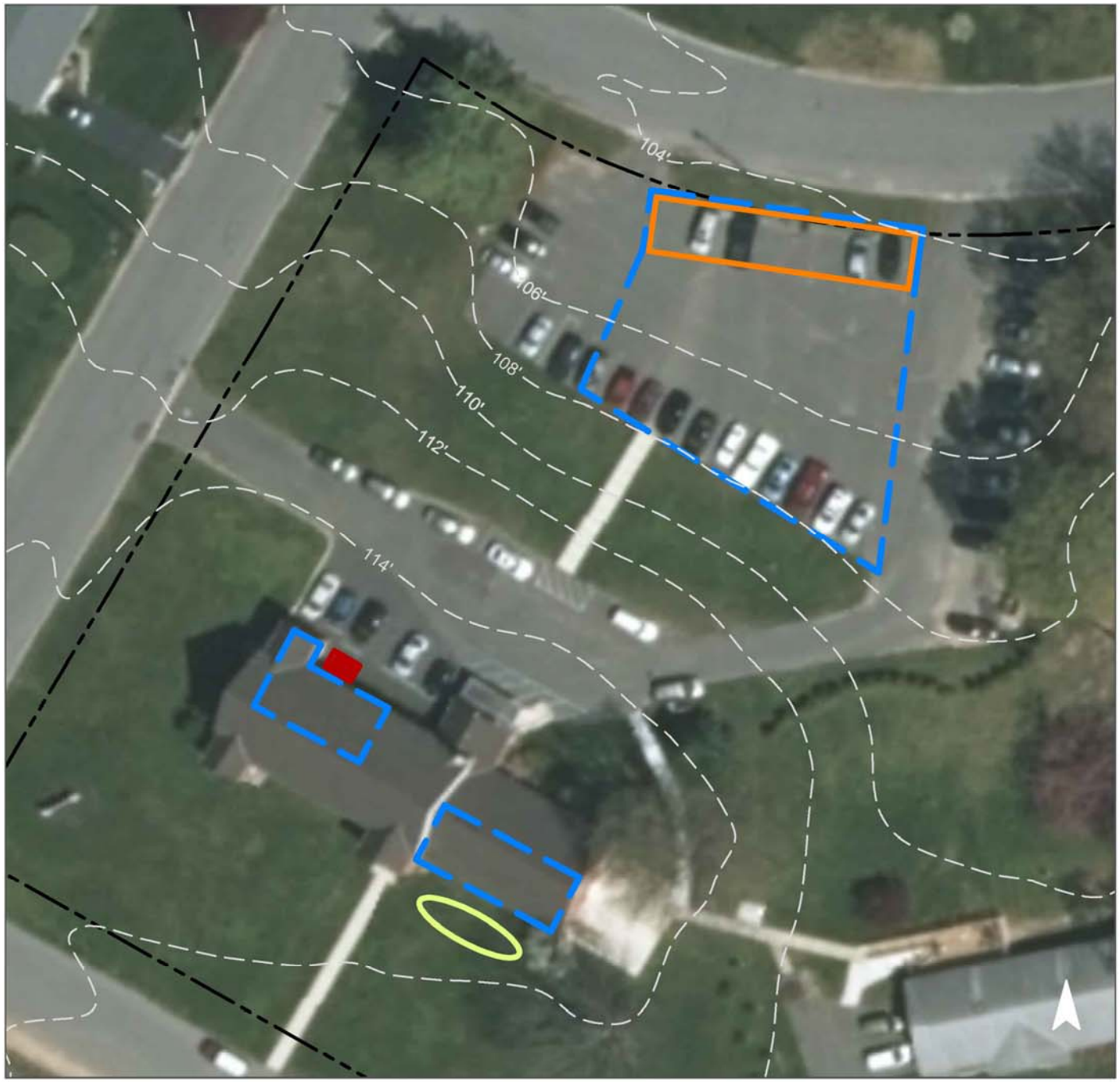
Block and Lot: **Block 45, Lot 8**

A rain garden can be installed in the turfgrass area at the southeast corner of the building to capture, treat, and infiltrate stormwater runoff from the roof. A section of parking spaces in the north parking lot can be replaced with pervious pavement to capture and infiltrate stormwater runoff from the parking lot. The downspout at the northwest corner of the building can be led to a downspout planter box to allow rooftop runoff to be filtered and reused. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
40	52,122	2.5	26.3	239.3	0.041	1.43

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.026	4	1,910	0.07	250	$1,250
Pervious pavement	0.292	49	21,420	0.80	1,550	$38,750
Planter box	n/a	3	n/a	n/a	4 (boxes)	$4,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



New Hope Presbyterian Church

- bioretention system
- pervious pavement
- planter box
- drainage area
- property line
- 2015 Aerial: NJOIT, OGIS

0 25' 50'

SOUTH JERSEY WATER CONDITIONING SERVICE

Subwatershed: **Barrett Run**

Site Area: **148,346 sq. ft.**

Address: **760 Shiloh Pike**
Bridgeton, NJ 08302

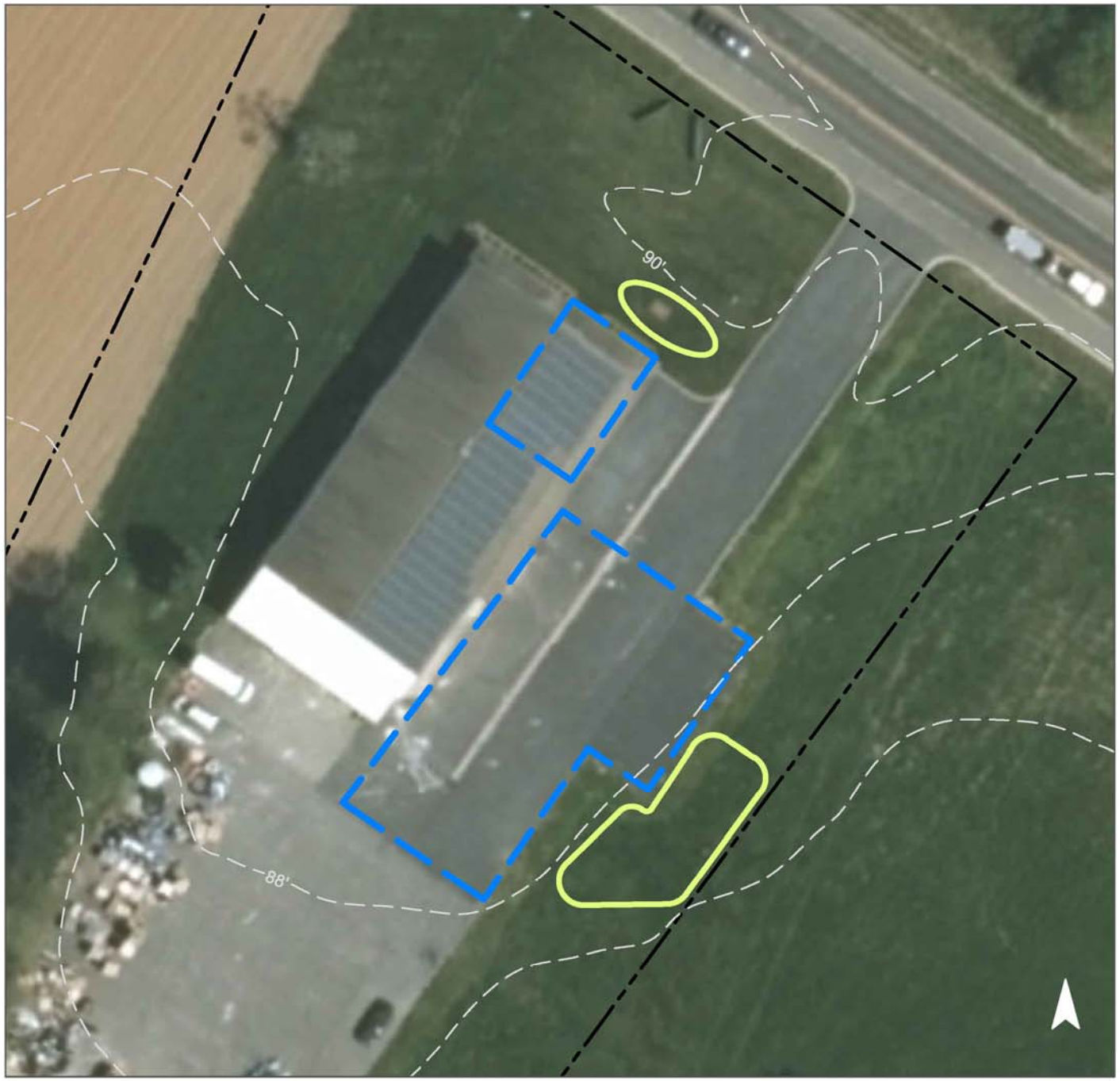
Block and Lot: **Block 63, Lot 3.01**

A rain garden can be installed in the turfgrass on the west side of the driveway to capture, treat, and infiltrate stormwater runoff from the parking lot. Another rain garden can be installed in the turfgrass at the northeast corner of the building to capture, treat, and infiltrate stormwater runoff from the building. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
30	43,800	2.1	22.1	201.1	0.034	1.20

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.246	41	18,060	0.68	2,370	$11,850

GREEN INFRASTRUCTURE RECOMMENDATIONS



South Jersey Water Conditioning Service

- bioretention system
- drainage area
- property line
- 2015 Aerial: NJOIT, OGIS

0 25' 50'

WEST PARK METHODIST CHURCH

Subwatershed: **Barrett Run**

Site Area: **260,320 sq. ft.**

Address: **625 Shiloh Pike**
Bridgeton, NJ 08302

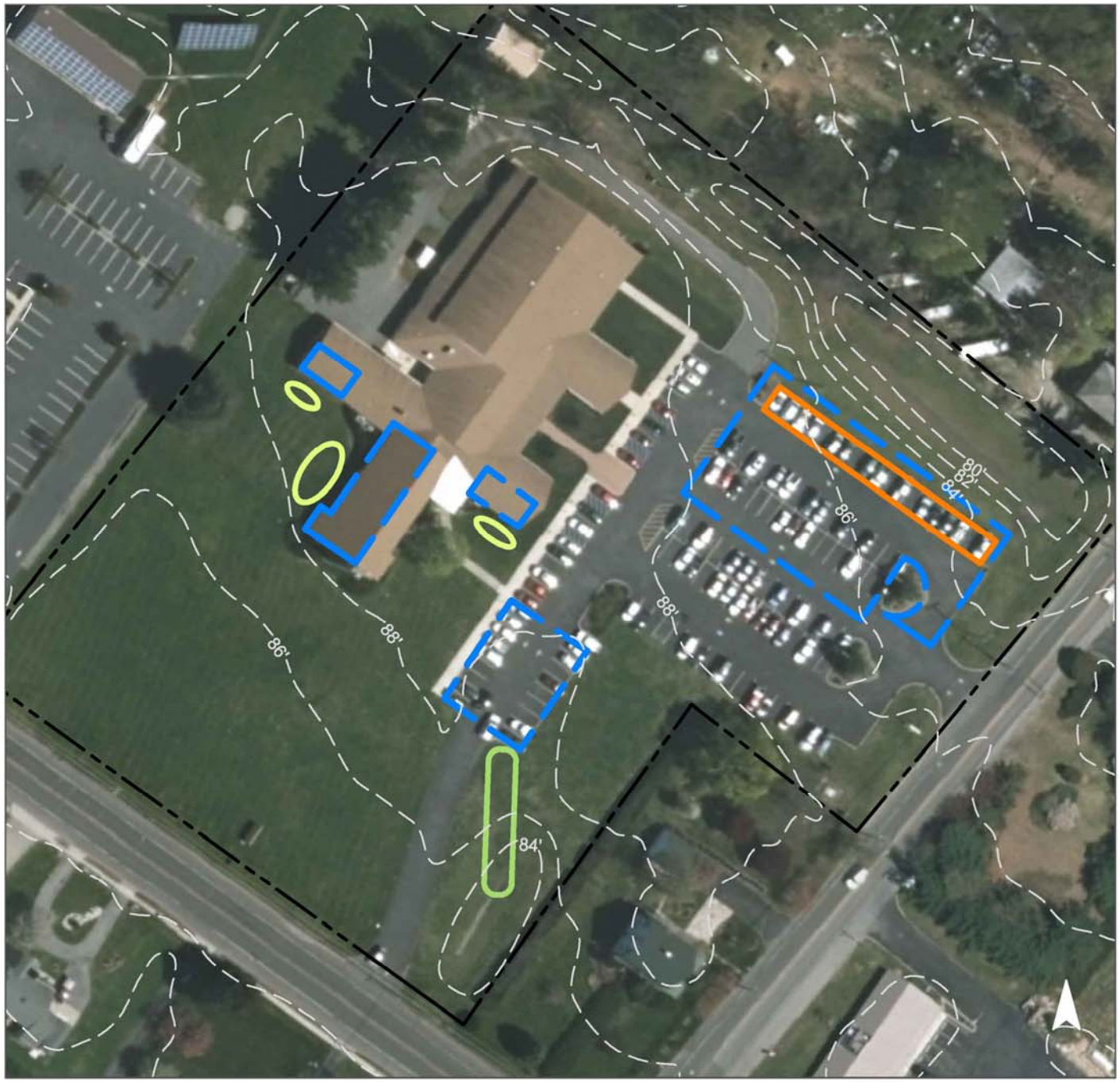
Block and Lot: **Block 35.09, Lot 14**

Two rain gardens can be installed in the turfgrass area near downspouts at the southwest corner of the building. Another rain garden can be installed at the downspout at the southeast corner of the building. A bioswale can be installed at the south part of the parking lot. A section of parking spaces on the north side of the parking lot can be replaced with pervious pavement to capture and infiltrate stormwater runoff from the parking lot. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
42	108,893	5.2	55.0	500.0	0.085	2.99

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.115	19	8,450	0.32	1,105	$5,525
Bioswale	0.122	20	8,950	0.34	1,170	$5,850
Pervious pavement	0.460	77	33,740	1.27	3,150	$78,750

GREEN INFRASTRUCTURE RECOMMENDATIONS



West Park Methodist Church

- bioretention system
- bioswale
- pervious pavement
- drainage area
- property line
- 2015 Aerial: NJOIT, OGIS

0 50' 100'

CUMBERLAND COUNTY ELECTIONS

Subwatershed: Cohansey River

Site Area: 71,103 sq. ft.

Address: 555 Shiloh Pike
Bridgeton, NJ 08302

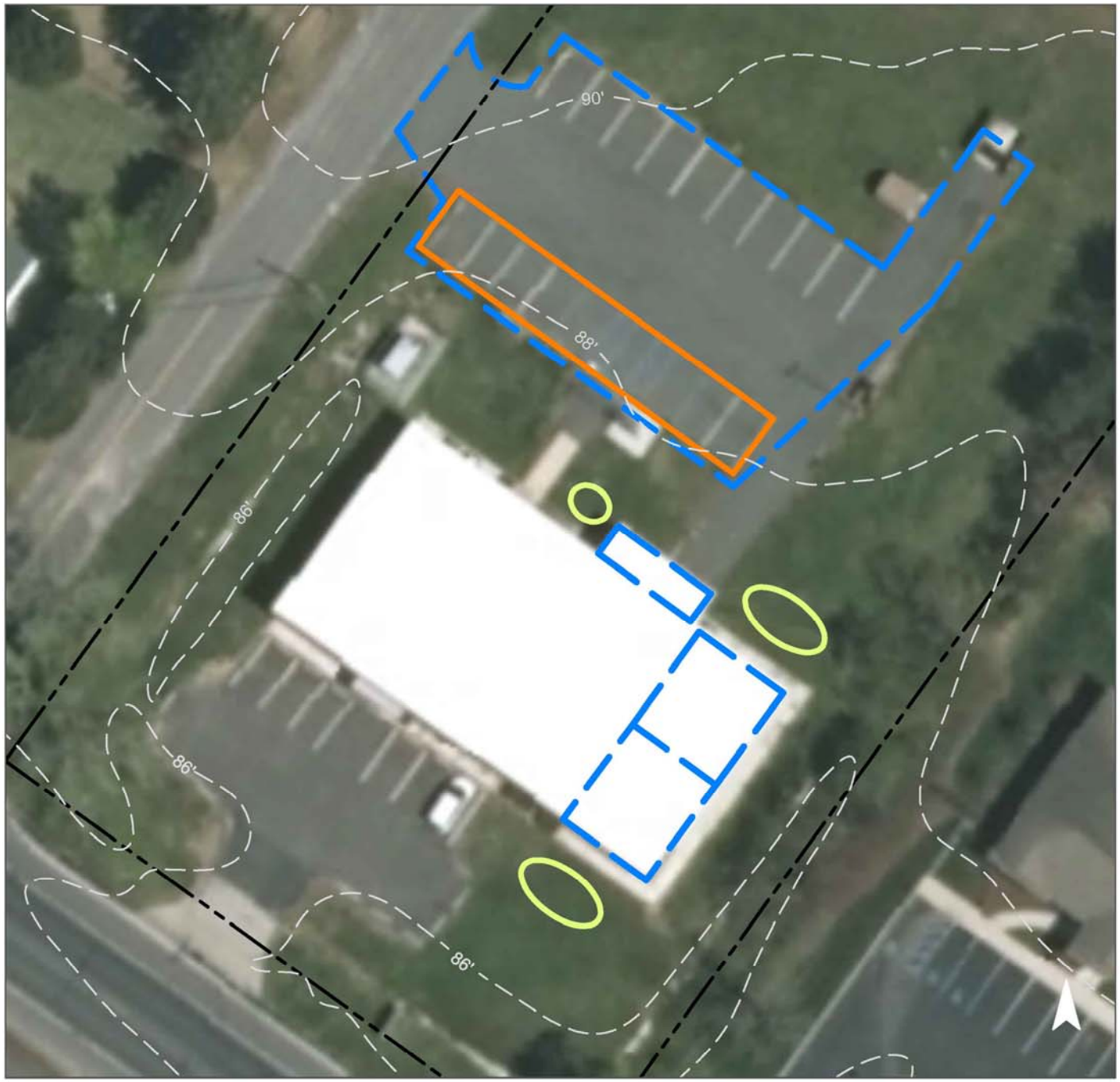
Block and Lot: Block 50, Lot 53

A rain garden can be installed in the turfgrass area on the north and south sides of the building to capture, treat, and infiltrate stormwater runoff from the roof. A rain garden can be installed in the depressed channel at the northeast corner of the building to help direct and filter stormwater runoff away from the building. A strip of parking spaces on the north side of the building can be replaced with pervious pavement to capture and infiltrate stormwater runoff from the parking lot. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
38	27,210	1.3	13.7	124.9	0.021	0.75

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.051	9	3,770	0.14	500	$2,500
Pervious pavement	0.268	45	19,690	0.74	1,840	$46,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Cumberland County Elections

- bioretention system
- pervious pavement
- drainage area
- property line
- 2015 Aerial: NJOIT, OGIS

0 20' 40'

HOPEWELL CREST ELEMENTARY SCHOOL

Subwatershed: Cohansey River

Site Area: 575,878 sq. ft.

Address: 122 Sewall Road
Bridgeton, NJ 08302

Block and Lot: Block 35, Lot 2

A rain garden can be installed on the west side of the parking lot on the west side of the property to capture, treat, and infiltrate stormwater runoff from the parking lot. A section of parking spaces in the east parking lot can be replaced with pervious pavement to capture and infiltrate stormwater runoff from the parking lot. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
41	237,361	11.4	119.9	1,089.8	0.185	6.51

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.253	42	18,580	0.70	2,430	$12,150
Pervious pavement	0.295	49	21,620	0.81	2,020	$50,500

GREEN INFRASTRUCTURE RECOMMENDATIONS

Hopewell Crest Elementary School

- bioretention system
- pervious pavement
- drainage area
- property line
- 2015 Aerial: NJOIT, OGIS

0 100' 200'

HOPEWELL VETERINARY CLINIC

Subwatershed: Cohansey River

Site Area: 65,967 sq. ft.

Address: 540 Shiloh Pike
Bridgeton, NJ 08302

Block and Lot: Block 52, Lot 8.01

A rain garden can be installed in the turfgrass area on the south side of the building to capture, treat, and infiltrate stormwater runoff from the roof. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
26	17,318	0.8	8.7	79.5	0.013	0.47

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.008	1	550	0.02	75	$375

GREEN INFRASTRUCTURE RECOMMENDATIONS

Hopewell Veterinary Clinic

- bioretention system
- drainage area
- property line
- 2015 Aerial: NJOIT, OGIS

0 15' 30'

c. Summary of Existing Conditions

Summary of Existing Conditions

	Subwatershed/Site Name/Total Site Info/GI Practice	Area (ac)	Area (SF)	Block	Lot	I.C. %	I.C. Area (ac)	I.C. Area (SF)	Existing Annual Loads (Commercial)			Runoff Volumes from I.C.	
									TP (lb/yr)	TN (lb/yr)	TSS (lb/yr)	Water Quality Storm (1.25" over 2-hours) (Mgal)	Annual (Mgal)
	BARRETT RUN SUBWATERSHED	**31.60**	**1,376,413**				**11.51**	**501,325**	**24.2**	**253.2**	**2,301.8**	**0.391**	**13.75**
1	**By Our Hand Gift Shop**												
	Total Site Info	4.30	187,133	39	4	13	0.56	24,302	1.2	12.3	111.6	0.019	0.67
2	**Cumberland County Insurance Group**												
	Total Site Info	10.15	442,147	35.09	12.01	33	3.31	144,120	6.9	72.8	661.7	0.112	3.95
3	**First Church of the Nazarene**												
	Total Site Info	2.38	103,777	54	4.01	57	1.36	59,082	2.8	29.8	271.3	0.046	1.62
4	**Hopewell-Stow Creek Fire Company**												
	Total Site Info	1.12	48,954	65	25	45	0.50	21,892	1.1	11.1	100.5	0.017	0.60
5	**Hopewell Township Municipal Building**												
	Total Site Info	1.27	55,431	54	2	85	1.08	47,116	2.3	23.8	216.3	0.037	1.29
6	**New Hope Presbyterian Church**												
	Total Site Info	2.99	130,304	45	8	40	1.20	52,122	2.5	26.3	239.3	0.041	1.43
7	**South Jersey Water Conditioning Service**												
	Total Site Info	3.41	148,346	63	3.01	30	1.01	43,800	2.1	22.1	201.1	0.034	1.20
8	**West Park Methodist Church**												
	Total Site Info	5.98	260,320	35.09	14	42	2.50	108,893	5.2	55.0	500.0	0.085	2.99
	COHANSEY RIVER SUBWATERSHED	**16.37**	**712,948**				**6.47**	**281,889**	**13.6**	**142.4**	**1,294.3**	**0.220**	**7.73**
9	**Cumberland County Elections**												
	Total Site Info	1.63	71,103	50	53	38	0.62	27,210	1.3	13.7	124.9	0.021	0.75
10	**Hopewell Crest Elementary School**												
	Total Site Info	13.22	575,878	35	2	41	5.45	237,361	11.4	119.9	1,089.8	0.185	6.51

Summary of Existing Conditions

	Subwatershed/Site Name/Total Site Info/GI Practice	Area (ac)	Area (SF)	Block	Lot	I.C. %	I.C. Area (ac)	I.C. Area (SF)	Existing Annual Loads (Commercial)			Runoff Volumes from I.C.	
									TP (lb/yr)	TN (lb/yr)	TSS (lb/yr)	Water Quality Storm (1.25" over 2-hours) (Mgal)	Annual (Mgal)
11	**Hopewell Veterinary Clinic**												
	Total Site Info	1.51	65,967	52	8.01	26	0.40	17,318	0.8	8.7	79.5	0.013	0.47

d. Summary of Proposed Green Infrastructure Practices

Summary of Proposed Green Infrastructure Practices

	Subwatershed/Site Name/Total Site Info/GI Practice	Potential Management Area Area (SF)	Potential Management Area Area (ac)	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Max Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cfs)	Size of BMP	Unit Cost ($/unit)	Unit	Total Cost ($)	I.C. Treated %
	BARRETT RUN SUBWATERSHED	**98,690**	**2.27**	**2.54**	**430**	**182,890**	**6.88**				**$355,660**	**19.7%**
1	**By Our Hand Gift Shop**											
	Bioretention system	2,750	0.06	0.072	12	5,260	0.20	690	$5	SF	$3,450	11.3%
	Planter box	215	0.00	n/a	1	n/a	n/a	1	$1,000	box	$1,000	0.9%
	Total Site Info	**2,965**	**0.07**	**0.072**	**13**	**5,260**	**0.20**				**$4,450**	**12.2%**
2	**Cumberland County Insurance Group**											
	Bioretention system	23,750	0.55	0.619	104	45,400	1.71	4,375	$5	SF	$21,875	16.5%
	Total Site Info	**23,750**	**0.55**	**0.619**	**104**	**45,400**	**1.71**				**$21,875**	**16.5%**
3	**First Church of the Nazarene**											
	Bioretention systems	21,520	0.49	0.561	94	41,140	1.55	5,400	$5	SF	$27,000	36.4%
	Pervious pavement	9,420	0.22	0.245	41	18,010	0.68	4,200	$25	SF	$105,000	15.9%
	Total Site Info	**9,420**	**0.22**	**0.245**	**41**	**18,010**	**0.68**				**$105,000**	**15.9%**
4	**Hopewell-Stow Creek Fire Company**											
	Rainwater harvesting	3,000	0.07	0.078	13	3,000	0.11	3,000	$2	gal	$6,000	13.7%
	Total Site Info	**3,000**	**0.07**	**0.078**	**13**	**3,000**	**0.11**				**$6,000**	**13.7%**
5	**Hopewell Township Municipal Building**											
	Bioretention system	3,150	0.07	0.082	14	6,020	0.23	790	$5	SF	$3,950	6.7%
	Pervious pavement	9,420	0.22	0.245	41	18,010	0.68	2,840	$25	SF	$71,000	20.0%
	Rainwater harvesting	875	0.02	0.023	4	680	0.02	680	$2	gal	$1,360	1.9%
	Total Site Info	**10,295**	**0.24**	**0.268**	**45**	**18,690**	**0.70**				**$72,360**	**21.9%**
6	**New Hope Presbyterian Church**											
	Bioretention system	1,000	0.02	0.026	4	1,910	0.07	250	$5	SF	$1,250	1.9%
	Pervious pavement	11,200	0.26	0.292	49	21,420	0.80	1,550	$25	SF	$38,750	21.5%
	Planter box	860	0.02	n/a	3	n/a	n/a	4	$1,000	box	$4,000	1.6%
	Total Site Info	**13,060**	**0.30**	**0.318**	**56**	**23,330**	**0.87**				**$44,000**	**25.1%**
7	**South Jersey Water Conditioning Service**											
	Bioretention systems	9,450	0.22	0.246	41	18,060	0.68	2,370	$5	SF	$11,850	21.6%
	Total Site Info	**9,450**	**0.22**	**0.246**	**41**	**18,060**	**0.68**				**$11,850**	**21.6%**

Summary of Proposed Green Infrastructure Practices

	Subwatershed/Site Name/Total Site Info/GI Practice	Potential Management Area Area (SF)	Potential Management Area Area (ac)	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Max Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cfs)	Size of BMP	Unit Cost ($/unit)	Unit	Total Cost ($)	I.C. Treated %
8	**West Park Methodist Church**											
	Bioretention systems	4,420	0.10	0.115	19	8,450	0.32	1,105	$5	SF	$5,525	4.1%
	Bioswale	4,680	0.11	0.122	20	8,950	0.34	1,170	$5	SF	$5,850	4.3%
	Pervious pavement	17,650	0.41	0.460	77	33,740	1.27	3,150	$25	SF	$78,750	16.2%
	Total Site Info	**26,750**	**0.61**	**0.697**	**117**	**51,140**	**1.93**				**$90,125**	**24.6%**
	COHANSEY RIVER SUBWATERSHED	**33,590**	**0.77**	**0.875**	**146.5**	**64,210**	**2.41**				**$111,525**	**11.9%**
9	**Cumberland County Elections**											
	Bioretention systems	1,970	0.05	0.051	9	3,770	0.14	500	$5	SF	$2,500	7.2%
	Pervious pavement	10,300	0.24	0.268	45	19,690	0.74	1,840	$25	SF	$46,000	37.9%
	Total Site Info	**12,270**	**0.28**	**0.320**	**54**	**23,460**	**0.88**				**$48,500**	**45.1%**
10	**Hopewell Crest Elementary School**											
	Bioretention system	9,720	0.22	0.253	42	18,580	0.70	2,430	$5	SF	$12,150	4.1%
	Pervious pavement	11,310	0.26	0.295	49	21,620	0.81	2,020	$25	SF	$50,500	4.8%
	Total Site Info	**21,030**	**0.48**	**0.548**	**92**	**40,200**	**1.51**				**$62,650**	**8.9%**
11	**Hopewell Veterinary Clinic**											
	Bioretention system	290	0.01	0.008	1	550	0.02	75	$5	SF	$375	1.7%
	Total Site Info	**290**	**0.01**	**0.008**	**1**	**550**	**0.02**				**$375**	**1.7%**