RUTGERS
New Jersey Agricultural
Experiment Station

Impervious Cover Reduction Action Plan
for
Lumberton Township, Burlington County, New Jersey

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

August 2022

ACKNOWLEDGEMENTS:

This document has been prepared by the Rutgers Cooperative Extension Water Resources Program, with funding and direction from the Pinelands Preservation Alliance and the New Jersey Agricultural Experiment Station, to highlight green infrastructure opportunities within Lumberton Township. We would like to thank the New Jersey Agricultural Experiment Station, Pinelands Preservation Alliance, and Lumberton Township for their input and support in creating this document.

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Introduction

Located in Burlington County, New Jersey, Lumberton Township covers approximately 13.01 square miles. Figures 1 and 2 illustrate that Lumberton Township is dominated by urban land use. A total of 40.4% of the municipality's land use is classified as urban. Of the urban land in Lumberton Township, rural residential is the dominant land use (Figure 3).

The New Jersey Department of Environmental Protection's (NJDEP) 2015 land use/land cover geographical information system (GIS) data layer categorizes Lumberton 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 Lumberton Township. Based upon the 2015 NJDEP land use/land cover data, approximately 15.9% of Lumberton Township has impervious cover. This level of impervious cover suggests that the waterways in Lumberton Township are likely impacted streams. [1]

Methodology

Lumberton Township contains portions of five subwatersheds (Figure 4). For this impervious cover reduction action plan (RAP), projects have been identified in two of the five subwatersheds. Aerial imagery initially was studied to identify potential project sites that contain extensive impervious cover. Field inspections were conducted to determine if viable options exist at the sites to reduce impervious cover or to disconnect impervious surfaces from draining directly to the local waterway or storm sewer system. During the field inspections, appropriate green infrastructure practices for the sites were recommended. Sites that already had green infrastructure stormwater management practices in place were not considered.

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[1] Schuler, T.R., L. Fraley-McNeal, and K. Cappiella. 2009. Is Impervious Cover Still Important? Review of Recent Research. *Journal of Hydrologic Engineering* 14 (4): 309-315.

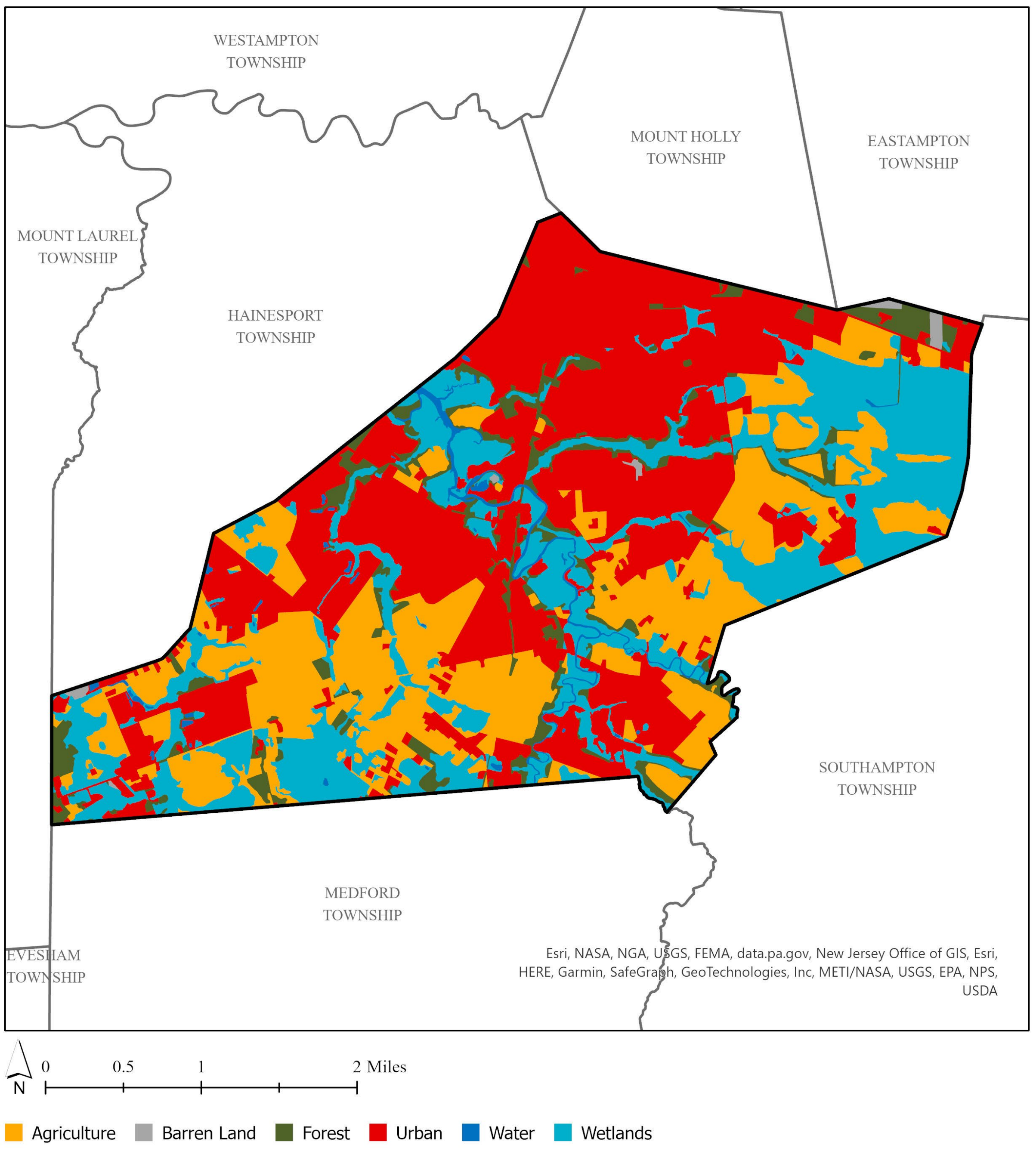


Figure 1: Map illustrating land use in Lumberton Township

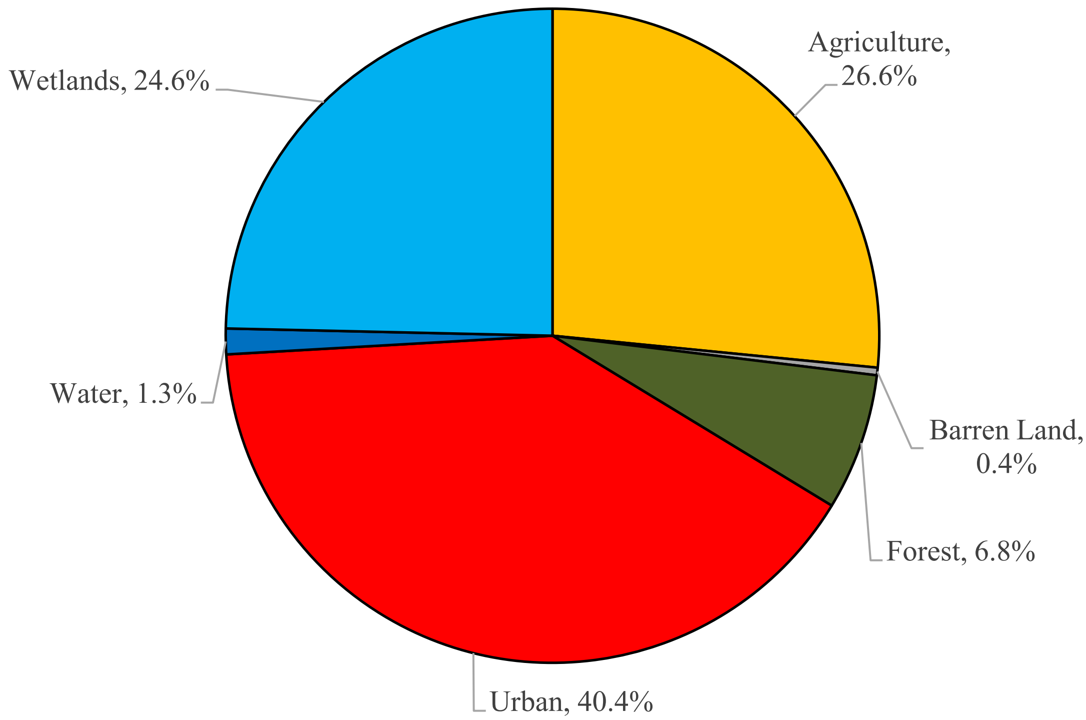


Figure 2: Pie chart illustrating the land use in Lumberton Township

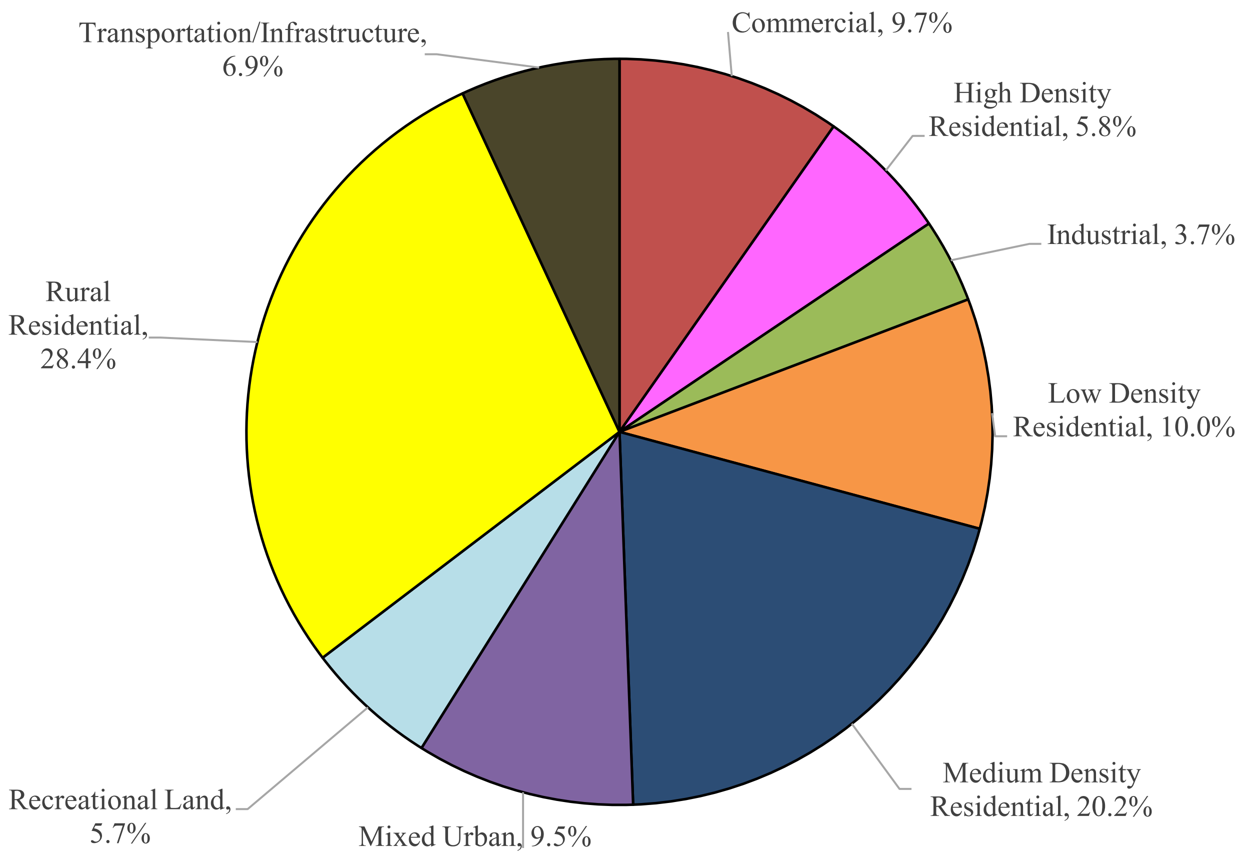


Figure 3: Pie chart illustrating the various types of urban land use in Lumberton Township

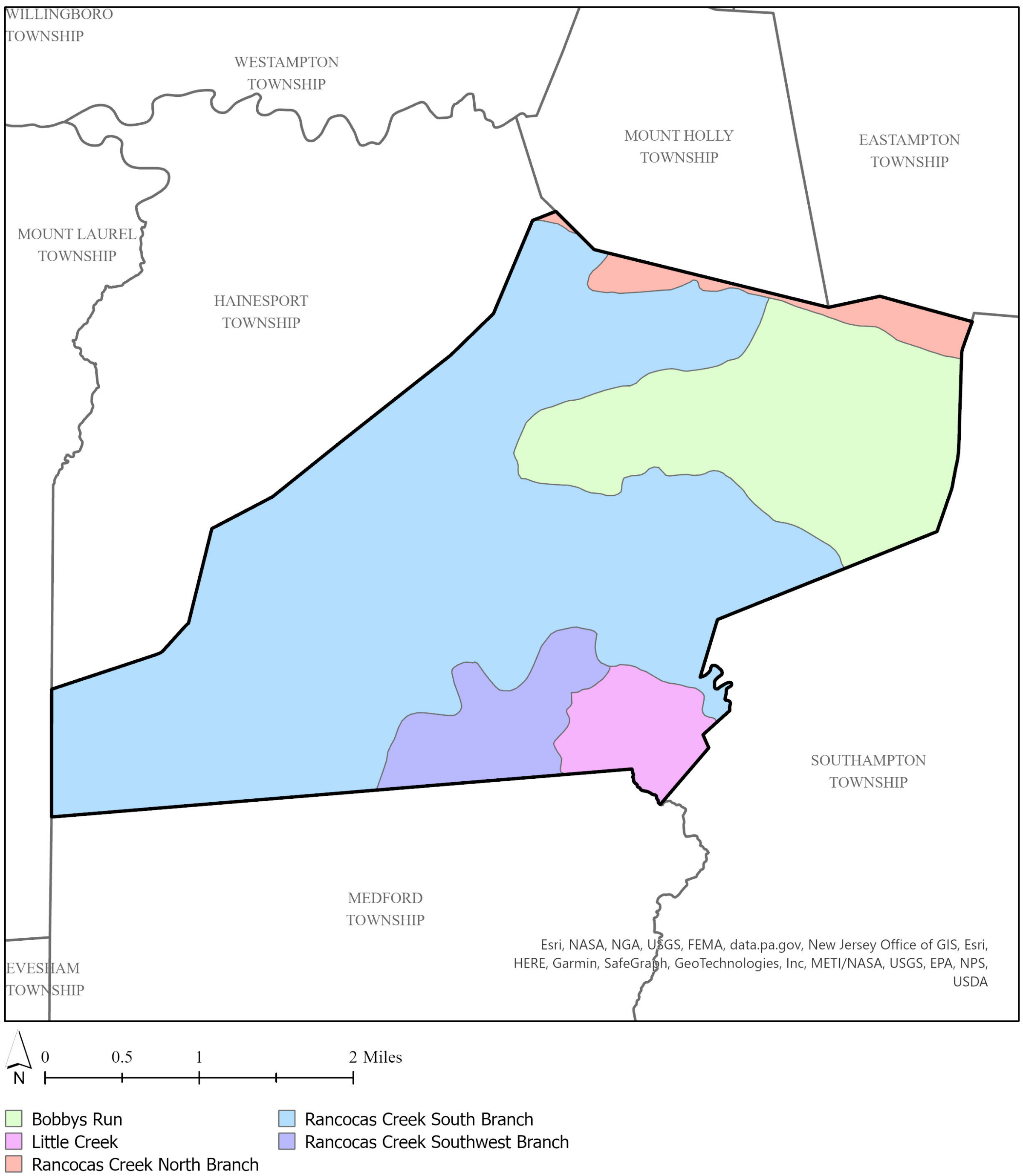


Figure 4: Map of the subwatersheds in Lumberton Township

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 2015 NJDEP land use/land cover database. For impervious areas, runoff volumes were determined for the New Jersey water quality design storm (1.25 inches of rain over two hours) and for the average annual rainfall total of 44 inches.

Preliminary soil assessments were conducted for each potential project site identified in Lumberton 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, allowing for the capture of 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, February 2004, Page 3-11.

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 principle, green infrastructure practices use soil and vegetation to recycle stormwater runoff through infiltration and evapotranspiration. When used as components of a stormwater management system, green infrastructure practices such as bioretention, green roofs, porous pavement, rain gardens, and vegetated swales can yield 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 Lumberton Township. The practices are discussed below.

Disconnected downspouts

This is often referred to as simple disconnection. A downspout is simply disconnected 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 are designed with an underlying stone layer to retain stormwater runoff and allow it to slowly seep into the ground.




3 United States Environmental Protection Agency (USEPA). 2015. Benefits of Green Infrastructure. http://www.epa.gov/greeninfrastructure/benefits-green-infrastructure

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.

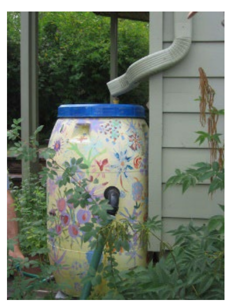
Downspout planter boxes

These are large wooden boxes that house a variety of water-retaining and/or filtering plants. When installed at the base of a downspout, water is captured by the plants which reduces stormwater runoff volume, provides a water source for the vegetation, and provides a small patch of habitat and food sources for birds and insects.

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. Bioswales are often designed for larger scale sites where water needs time to move and slowly infiltrate into the groundwater. Much like rain garden systems, bioswales can also be designed with an underdrain pipe that allows excess water to discharge to the nearest catch basin or existing stormwater system.

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. Tree filter boxes 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.

<u>Potential Project Sites</u>

Appendix A contains information on potential project sites where green infrastructure practices could be installed with a focus 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, recharge potential, TSS removal potential, maximum volume reduction potential per storm, peak reduction potential, and estimated project costs are provided. This information will be especially useful in instances where proposed development projects cannot satisfy the New Jersey stormwater management requirements (N.J.A.C. 7:8).

Conclusion

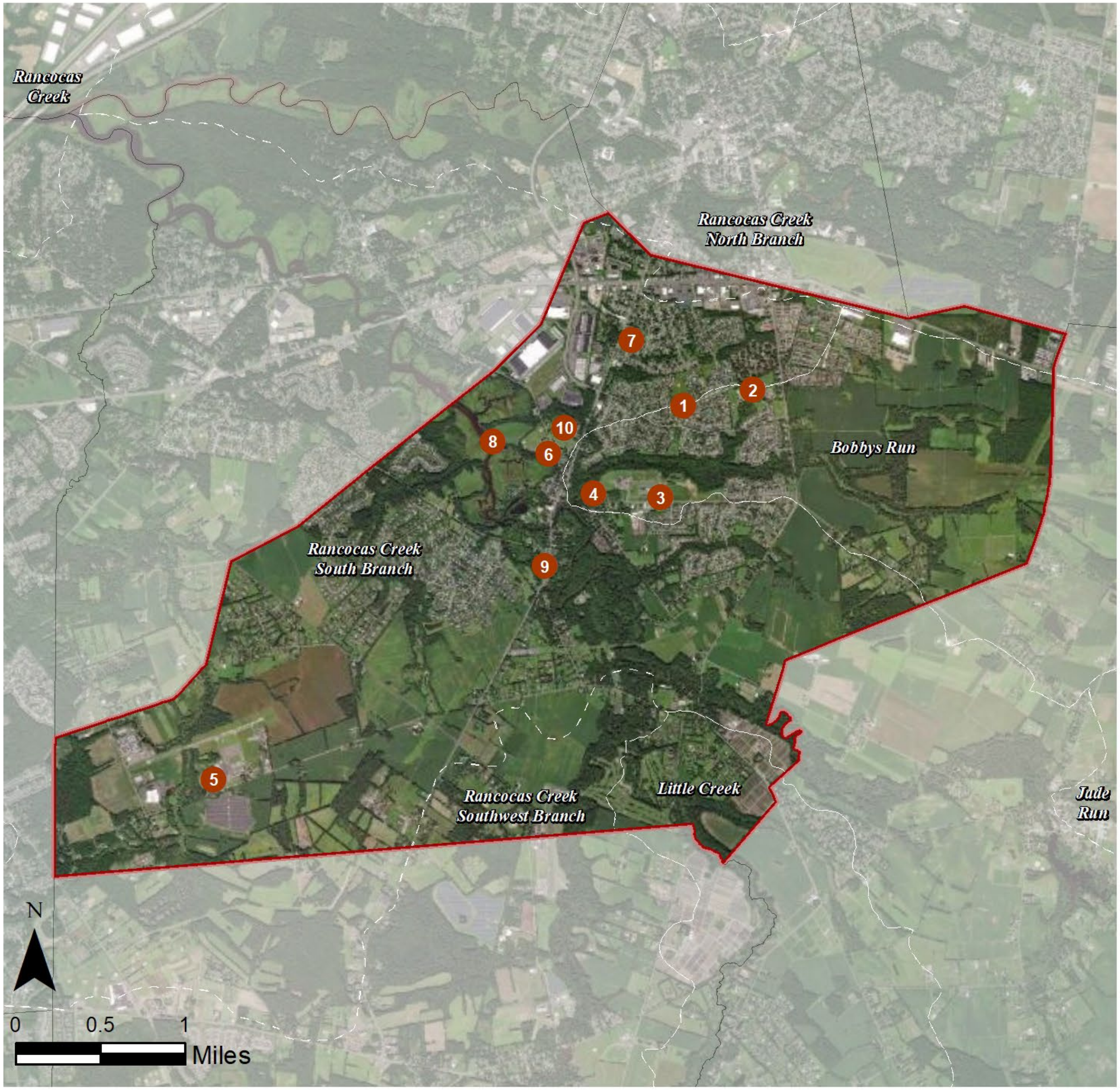
This impervious cover reduction action plan is meant to provide the municipality with a blueprint for implementing green infrastructure practices that will reduce the impact of stormwater runoff from impervious surfaces. These projects can be implemented through a wide variety of volunteer groups, such as Boy Scouts, Girl Scouts, Municipal Green Teams, corporate volunteerism, faith-based groups, school groups, watershed groups, and other active community organizations.

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 green infrastructure action plan into a stormwater mitigation plan and incorporate it into the municipal stormwater control ordinance.

Appendix A: Climate Resilient Green Infrastructure

a. Green Infrastructure Sites

LUMBERTON TOWNSHIP: GREEN INFRASTRUCTURE SITES



SITES WITHIN THE BOBBYS RUN SUBWATERSHED

1. Bryan Freeman Park
2. Lumberton Middle School
3. Lumberton Township Municipal Court
4. Lumberton United Methodist Church

SITES WITHIN THE RANCOCAS CREEK SOUTH BRANCH SUBWATERSHED

5. Air Victory Museum
6. Florence L. Walther Elementary School
7. Lighthouse Church
8. Lumberton Boat Ramp
9. St. Martin-in-the-Fields Episcopal Church
10. Village Green Park

b. Proposed Green Infrastructure Concepts

BRYAN FREEMAN PARK

Subwatershed: Bobbys Run

Site Area: 721,035 sq. ft.

Address: 5 Westminster Drive
Lumberton, NJ 08048

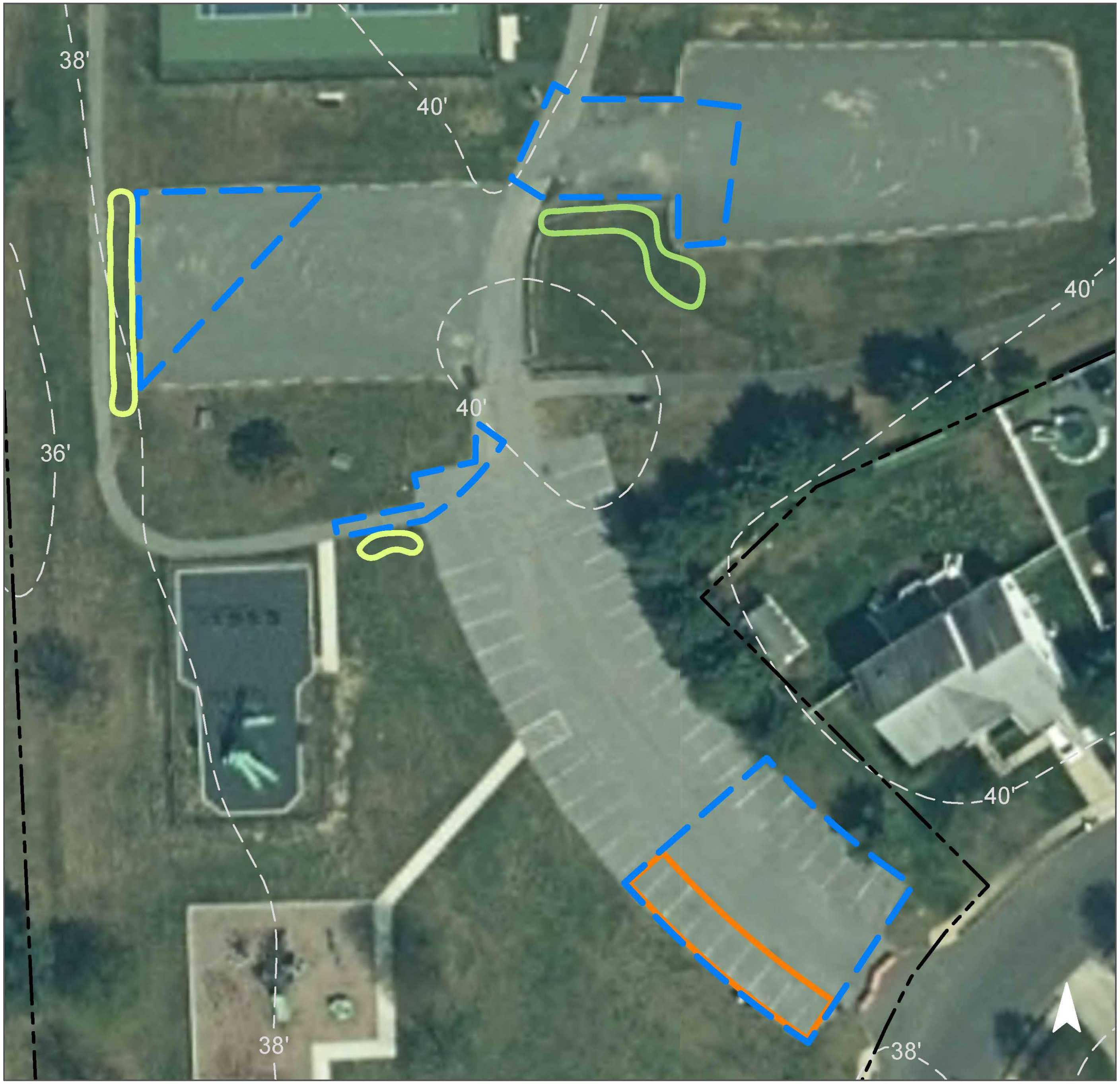
Block and Lot: Block 19.52, Lot 25

Parking spaces in the south parking lot can be converted to porous pavement to capture and infiltrate stormwater runoff from the parking lot. Rain gardens can be installed alongside the pavement to capture, treat, and infiltrate the stormwater runoff from the parking. A bioswale can be installed alongside the eastern parking lot to help move the stormwater off the parking 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"
25	106410	5.1	53.7	488.6	0.083	2.92

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	0.063	11	4700	0.18	605	$3,025
Bioswale	0.074	9	2,060	0.01	550	$2,750
Pervious pavement	0.116	19	8,620	0.32	1,245	$31,125

GREEN INFRASTRUCTURE RECOMMENDATIONS



Bryan Freeman Park

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

LUMBERTON MIDDLE SCHOOL

Subwatershed: Bobbys Run

Site Area: 1,531,565 sq. ft.

Address: 30 Dimsdale Drive
Lumberton, NJ 08048

Block and Lot: Block 19.56, Lot 3

Various rain gardens can be installed south of the building to capture, treat, and infiltrate the stormwater runoff from the rooftops. Patches of parking areas can be converted to pervious pavement to help infiltrate the stormwater from the parking lots. An existing concrete flow channel can be removed and replaced with a bioswale to help slow and detain the stormwater. 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"
3	419,975	20.2	212.1	1,928.3	0.327	11.52

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	0.172	29	12760	0.48	1,650	$8,250
Bioswale	0.051	6	1,380	0.01	370	$1,850
Pervious pavement	0.471	79	35,010	1.32	3,200	$80,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Lumberton Middle School

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

0 100' 200'

LUMBERTON TOWNSHIP MUNICIPAL COURT

Subwatershed: Bobbys Run

Site Area: 3,628,605 sq. ft.

Address: 35 Municipal Drive
Lumberton, NJ 08048

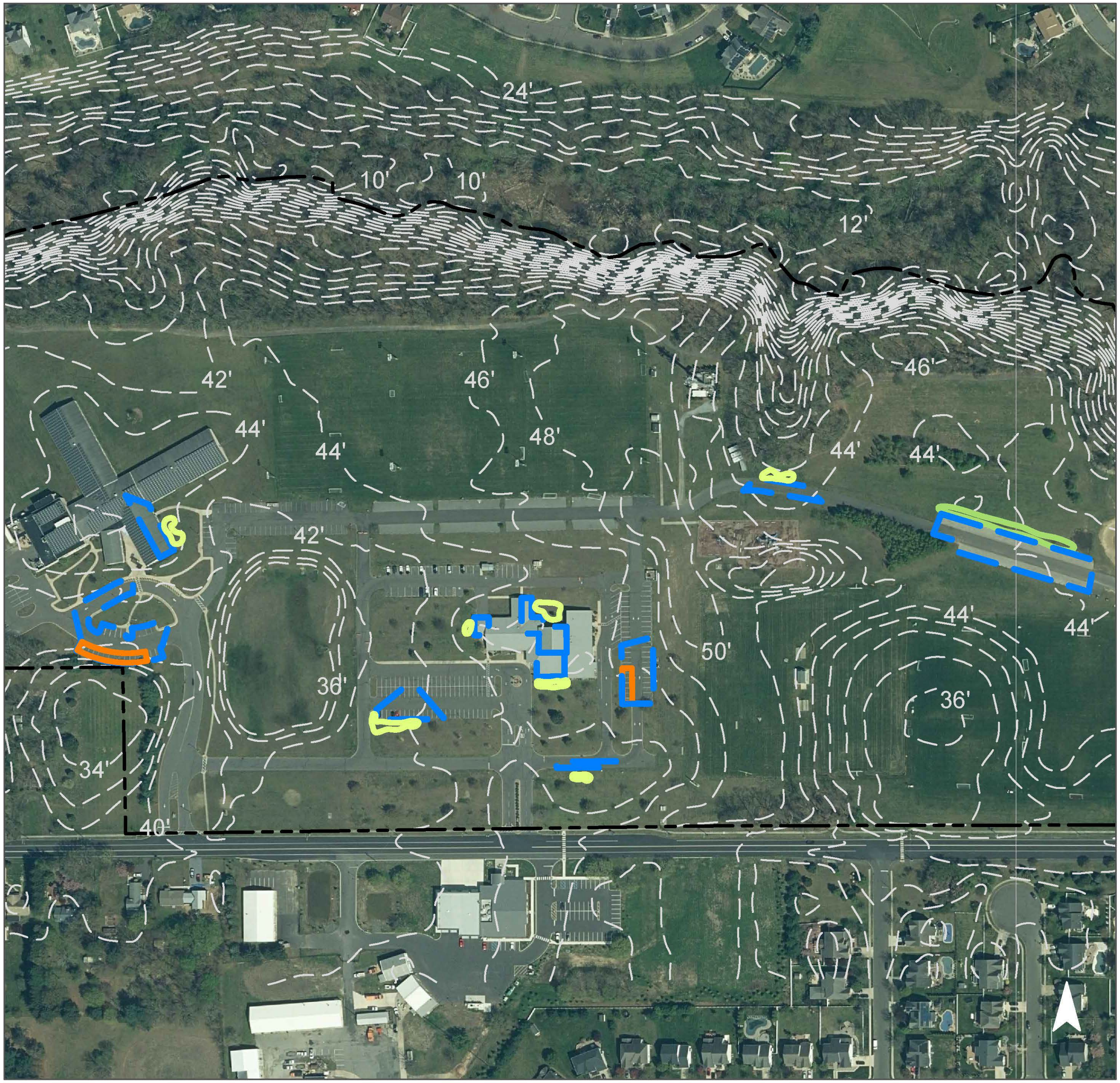
Block and Lot: Block 19, Lot 2.04 & 18.01

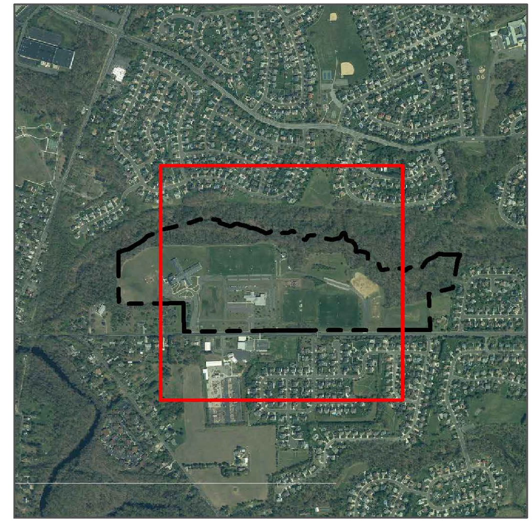
Rain gardens can be installed around the site in turfgrass areas where the stormwater runoff already drains to from the parking lots or near buildings using downspouts to capture the rooftop stormwater runoff. Parking spaces in the area can have the lowest points replaced with pervious pavement to promote infiltration. A bioswale can be installed north of the eastern roadway to help prevent erosion in the 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"
12	445,265	21.5	224.9	2,044.4	0.347	12.21

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	0.569	95	42,280	1.59	5,460	$27,300
Bioswale	0.489	59	36,320	0.01	18,755	$93,775
Pervious pavement	0.714	119	53,050	1.99	5,560	$139,000

GREEN INFRASTRUCTURE RECOMMENDATIONS





Lumberton Township Municipal Court

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

0 150' 300'

LUMBERTON UNITED METHODIST CHURCH

Subwatershed: Bobbys Run

Site Area: 303,785 sq. ft.

Address: 5 Municipal Drive
Lumberton, NJ 08048

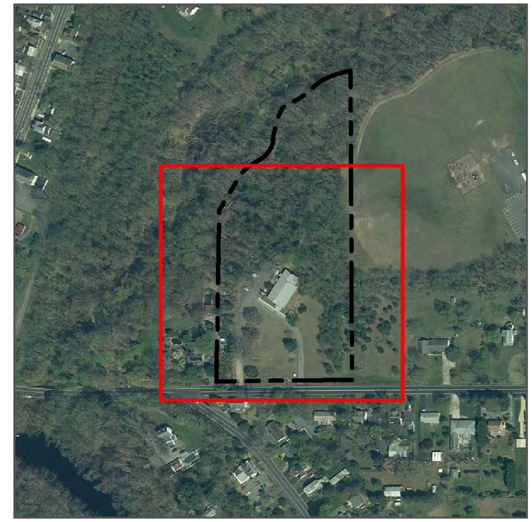
Block and Lot: Block 19, Lot 2.02

A rain garden can be installed south of the building to capture, treat, and infiltrate the stormwater from three of the downspouts. A bioswale can be installed near the right of way on the street to help prevent erosion of the pavement edge of the street. 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"
14	43,955	2.1	22.2	201.8	0.034	1.21

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	0.064	11	4,790	0.18	620	$3,100
Bioswale	0.061	7	3,800	0.01	1,015	$5,075

GREEN INFRASTRUCTURE RECOMMENDATIONS



Lumberton United Methodist Church

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

0 30' 60'

AIR VICTORY MUSEUM

Subwatershed: Rancocas Creek South Branch

Site Area: 16,365,520 sq. ft.

Address: 68 Stacy Haines Road
Lumberton, NJ 08048

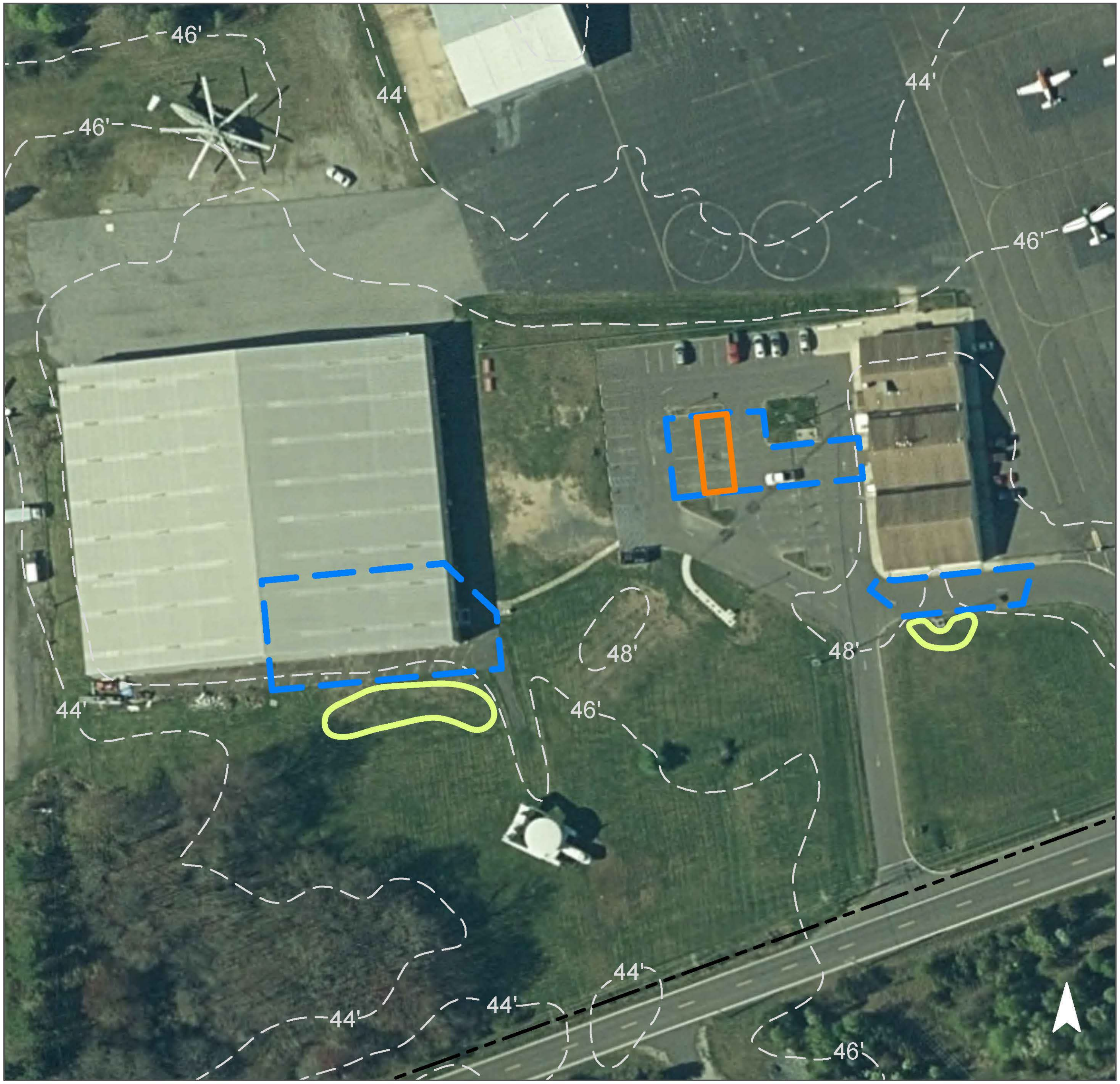
Block and Lot: Block 36, Lot 14

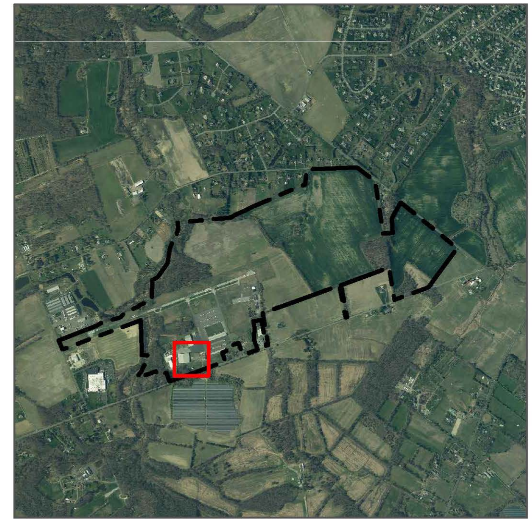
Rain gardens can be installed south of the building and pavement sections to capture, treat, and infiltrate the stormwater runoff from the buildings and roadways. The center of the parking lot can be converted to pervious pavement to promote stormwater infiltration. A preliminary soil assessment suggests 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"
9	1,431,825	69.0	723.1	6,574.0	1.116	39.27

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	0.329	55	24,450	0.92	3,160	$15,800
Pervious pavement	0.127	21	9,470	0.36	1,040	$26,000

GREEN INFRASTRUCTURE RECOMMENDATIONS





Air Victory Museum

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

0 50' 100'

FLORENCE L. WALTHER ELEMENTARY SCHOOL

Subwatershed: Rancocas Creek South Branch

Site Area: 715,450 sq. ft.

Address: 56 Chestnut Street
Lumberton, NJ 08048

Block and Lot: Blocks 26; 4.01
Lots 4; 9 &10

Various rain gardens can be placed around the building and off the roadways in low lying areas to help capture, treat, and infiltrate the stormwater runoff from the rooftops and paved areas. Parking spots in the southern parking lot can be converted to pervious pavement to infiltrate the stormwater runoff from the parking lot. A cistern can be installed south of the building nearby the existing planting beds for stormwater reuse. 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"
24	171,605	8.3	86.7	787.9	0.134	4.71

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	0.634	106	47,120	1.77	6,080	$30,400
Pervious pavement	0.166	28	12,330	0.46	1,200	$30,000
Rainwater harvesting	0.023	4	750	0.03	750 (gal)	$1,500

GREEN INFRASTRUCTURE RECOMMENDATIONS

Florence L. Walther Elementary School

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

0 50' 100'

LIGHTHOUSE CHURCH

Subwatershed: Rancocas Creek South Branch

Site Area: 306,485 sq. ft.

Address: 716 Main Street
Lumberton, NJ 08048

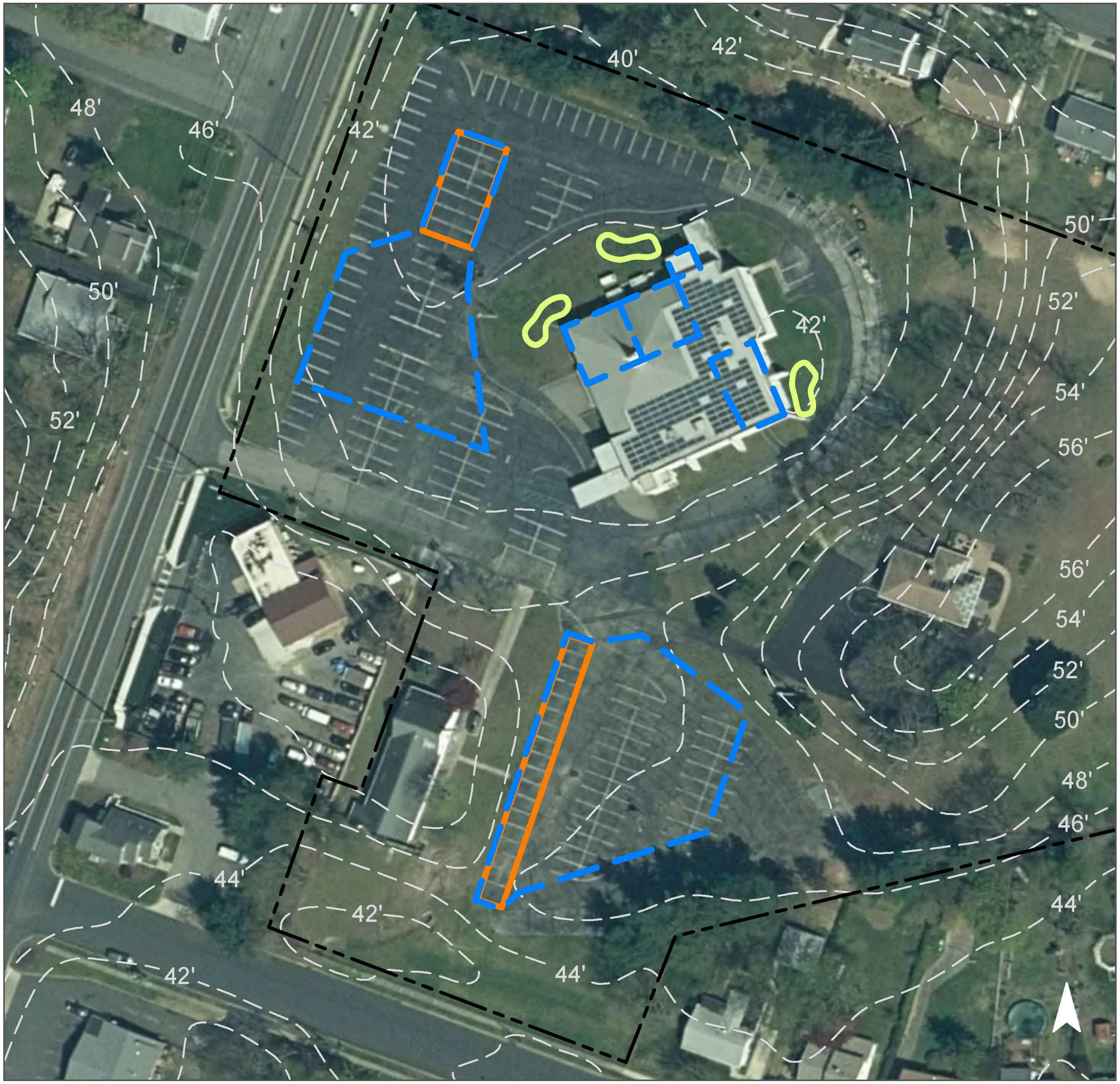
Block and Lot: Block 19.08, Lots 43 &44

Rain gardens can be placed around the building to capture, treat, and infiltrate the stormwater runoff from the building rooftop. Sections of parking spaces can be converted to pervious pavement to capture the 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"
74	226,655	10.9	114.5	1,040.7	0.177	6.22

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	0.130	22	9,670	0.36	1,250	$6,250
Pervious pavement	0.874	146	64,930	2.44	5,850	$146,250

GREEN INFRASTRUCTURE RECOMMENDATIONS



Lighthouse Church

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

0 100' 200'

LUMBERTON BOAT RAMP

Subwatershed: Rancocas Creek South Branch

Site Area: 1,479,480 sq. ft.

Address: 72 Chestnut Street
Lumberton, NJ 08048

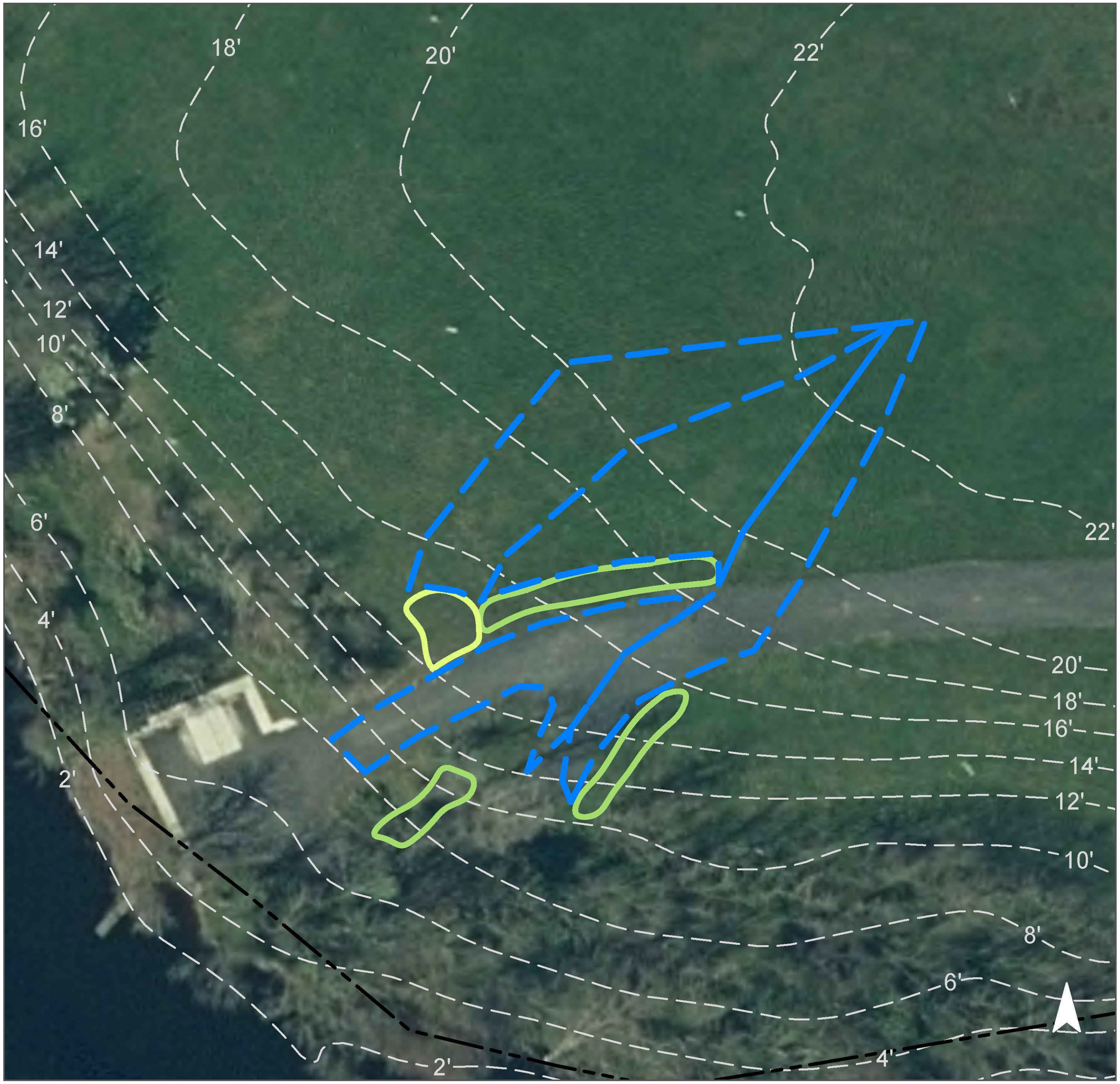
Block and Lot: Block 26, Lot 3.02

Bioswales can be placed around the roadway to help reduce the existing erosion next to the roadway. At the end of the north bioswale a rain garden can be installed to help promote infiltration of the stormwater prior to entering the existing catch basin. A major portion of the stormwater runoff comes from the capped field which acts as an impervious surface. 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"
1	15,890	0.8	8.0	73.0	0.012	0.44

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	0.557	7	3,080	0.35	575	$2,875
Bioswales	0.035	5	3,080	0.01	1,255	$6,275

GREEN INFRASTRUCTURE RECOMMENDATIONS



Lumberton Boat Ramp

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

0 20' 40'

ST. MARTIN-IN-THE-FIELDS EPISCOPAL CHURCH

Subwatershed: Rancocas Creek South Branch

Site Area: 249,410 sq. ft.

Address: 489 Main Street
Lumberton, NJ 08048

Block and Lot: Block 29, Lots 11-14

A rain garden can be installed south of the building to capture, treat, and infiltrate the stormwater from the rooftop. The parking spaces in the north section of the parking lot can be converted to pervious pavement to allow the stormwater runoff from the parking lot to infiltrate. A cistern can be installed east of the building to allow for non-potable stormwater reuse from the rooftop. 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"
18	45,590	2.2	23.0	209.3	0.036	1.25

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	0.010	2	730	0.03	95	$475
Pervious pavement	0.188	32	14,000	0.53	1,700	$42,500
Rainwater harvesting	0.008	1	250	0.01	250 (gal)	$500

GREEN INFRASTRUCTURE RECOMMENDATIONS

St. Martin-in-the-Fields Episcopal Church

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

0 20' 40'

VILLAGE GREEN PARK

Subwatershed: Rancocas Creek South Branch

Site Area: 1,228,785 sq. ft.

Address: 75 Chestnut Street
Lumberton, NJ 08048

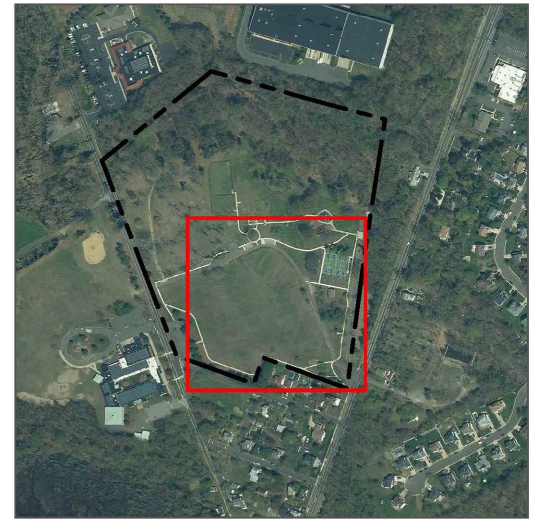
Block and Lot: Block 25.01, Lot 1

Rain gardens can be installed nearby the sidewalk and building to capture, treat, and infiltrate the stormwater runoff from those areas. A bioswale can be installed in the existing drainage ditch to help promote stormwater infiltration. The parking spaces to the north of the park can be converted to pervious pavement to allow for stormwater infiltration. 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"
3	33,190	1.6	16.8	152.4	0.026	0.91

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	0.037	6	2,740	0.10	355	$1,775
Bioswale	0.023	3	1,710	0.01	755	$3,775
Pervious pavement	0.106	18	7,880	0.30	1,735	$43,375

GREEN INFRASTRUCTURE RECOMMENDATIONS



Village Green Park

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

0 50' 100'

c. 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) TP (lb/yr)	TN (lb/yr)	TSS (lb/yr)	Runoff Volumes from I.C. Water Quality Storm (1.25" over 2-hours) (cu.ft.)	Annual (cu.ft.)	Runoff Volumes from I.C. Water Quality Storm (1.25" over 2-hours) (Mgal)	Annual (Mgal)
	Bobby's Run Subwatershed Sites	**135.01**	**5,881,090**				**22.31**	**971,650**	**46.8**	**490.7**	**4461.2**	**101,214**	**3,562,717**	**0.757**	**26.65**
1	**Bryan Freeman Park**														
	Total Site Info	**16.55**	**720,920**	**19.52**	**25**	**15**	**2.44**	**106,410**	**5.1**	**53.7**	**488.6**	**11,084**	**390,170**	**0.083**	**2.92**
2	**Lumberton Middle School**														
	Total Site Info	**35.16**	**1,531,565**	**19.56**	**3**	**27**	**9.64**	**419,975**	**20.2**	**212.1**	**1928.3**	**43,747**	**1,539,908**	**0.327**	**11.52**
3	**Lumberton Township Municipal Court**														
	Total Site Info	**83.30**	**3,628,605**	**19**	**2.04 & 18.01**	**12**	**10.22**	**445,265**	**21.5**	**224.9**	**2044.4**	**46,382**	**1,632,638**	**0.347**	**12.21**
4	**Lumberton United Methodist Church**														
	Total Site Info	**6.97**	**303,785**	**19**	**2.02**	**14**	**1.01**	**43,955**	**2.1**	**22.2**	**201.8**	**4,579**	**161,168**	**0.034**	**1.21**
	Rancocas Creek South Branch Subwatershed Sites	**433.13**	**18,866,935**				**42.38**	**1,845,975**	**89.0**	**932.3**	**8475.6**	**192,289**	**6,768,575**	**1.438**	**50.63**
5	**Air Victory Museum**														
	Total Site Info	**375.70**	**16,365,520**	**36**	**14**	**9**	**32.87**	**1,431,825**	**69.0**	**723.1**	**6574.0**	**149,148**	**5,250,025**	**1.116**	**39.27**
6	**Florence L. Walther Elementary School**														
	Total Site Info	**16.42**	**715,450**	**26; 4.01**	**4; 9&10**	**24**	**3.94**	**171,605**	**8.3**	**86.7**	**787.9**	**17,876**	**629,218**	**0.134**	**4.71**
7	**Lighthouse Church**														
	Total Site Info	**7.04**	**306,485**	**19,08**	**43, 44**	**74**	**5.20**	**226,655**	**10.9**	**114.5**	**1040.7**	**23,610**	**831,068**	**0.177**	**6.22**
8	**Lumberton Boat Ramp**														
	Total Site Info	**33.96**	**1,479,480**	**26**	**3.02**	**1**	**0.36**	**15,890**	**0.8**	**8.0**	**73.0**	**1,655**	**58,263**	**0.012**	**0.44**
9	**St. Martin-in-the-Fields Episcopal Church**														
	Total Site Info	**5.73**	**249,410**	**29**	**11 - 14**	**18**	**1.05**	**45,590**	**2.2**	**23.0**	**209.3**	**4,749**	**167,163**	**0.036**	**1.25**
10	**Village Green Park**														
	Total Site Info	**28.21**	**1,228,785**	**25.01**	**1**	**3**	**0.76**	**33,190**	**1.6**	**16.8**	**152.4**	**3,457**	**121,697**	**0.026**	**0.91**

d. Summary of Proposed Green Infrastructure Practices

Summary of Proposed Green Infrastructure Practices

	Subwatershed/Site Name/Total Site Info/GI Practice	Potential Management Area		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 %
		Area (SF)	Area (ac)									
	Bobby's Run Subwatershed Sites	**104,325**	**2.39**	**2.718**	**426**	**196,180**	**5.91**				**$387,075**	**11%**
1	**Bryan Freeman Park**											
	Bioretention systems	2,425	0.06	0.063	11	4,700	0.18	605	5	SF	$3,025	2%
	Bioswale	2,830	0.06	0.074	9	2,060	0.01	550	5	SF	$2,750	3%
	Pervious pavement	4,455	0.10	0.116	19	8,620	0.32	1,245	25	SF	$31,125	4%
	Total Site Info	**9,710**	**0.22**	**0.253**	**39**	**15,380**	**0.51**				**$36,900**	**9%**
2	**Lumberton Middle School**											
	Bioretention systems	6,590	0.15	0.172	29	12,760	0.48	1,650	5	SF	$8,250	2%
	Bioswale	1,970	0.05	0.051	6	1,380	0.01	370	5	SF	$1,850	0%
	Pervious pavement	18,075	0.41	0.471	79	35,010	1.32	3,200	25	SF	$80,000	4%
	Total Site Info	**26,635**	**0.61**	**0.694**	**114**	**49,150**	**1.81**				**$90,100**	**6%**
3	**Lumberton Township Municipal Court**											
	Bioretention systems	21,835	0.50	0.569	95	42,280	1.59	5,460	5	SF	$27,300	5%
	Bioswale	18,755	0.43	0.489	59	36,320	0.01	18,755	5	SF	$93,775	4%
	Pervious pavement	27,390	0.63	0.714	119	53,050	1.99	5,560	25	SF	$139,000	6%
	Total Site Info	**67,980**	**1.56**	**1.771**	**273**	**131,650**	**3.59**				**$260,075**	**15%**
4	**Lumberton United Methodist Church**											
	Bioretention system	2,475	0.06	0.064	11	4,790	0.18	620	5	SF	$3,100	6%
	Bioswale	2,345	0.05	0.061	7	3,800	0.01	1,015	5	SF	$5,075	5%
	Total Site Info	**4,820**	**0.11**	**0.126**	**18**	**8,590**	**0.19**				**$8,175**	**11%**
	Rancocas Creek South Branch Subwatershed Sites	**90,815**	**2.08**	**2.875**	**394**	**174,880**	**6.70**	**0**			**$265,350**	**5%**
5	**Air Victory Museum**											
	Bioretention systems	12,625	0.29	0.329	55	24,450	0.92	3,160	5	SF	$15,800	1%
	Pervious pavement	4,890	0.11	0.127	21	9,470	0.36	1,040	25	SF	$26,000	0%
	Total Site Info	**17,515**	**0.40**	**0.456**	**76**	**33,920**	**1.28**				**$41,800**	**1%**
6	**Florence L. Walther Elementary School**											
	Bioretention systems	24,330	0.56	0.634	106	47,120	1.77	6,080	5	SF	$30,400	14%
	Pervious pavement	6,370	0.15	0.166	28	12,330	0.46	1,200	25	SF	$30,000	4%
	Rainwater harvesting	900	0.02	0.023	4	750	0.03	750	2	gal	$1,500	1%
	Total Site Info	**31,600**	**0.73**	**0.823**	**138**	**60,200**	**2.26**				**$61,900**	**18%**

Summary of Proposed Green Infrastructure Practices

	Subwatershed/Site Name/Total Site Info/GI Practice	Potential Management Area		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 %
		Area (SF)	Area (ac)									
7	**Lighthouse Church**											
	Bioretention systems	4,995	0.11	0.130	22	9,670	0.36	1,250	5	SF	$6,250	2%
	Pervious pavement	33,525	0.77	0.874	146	64,930	2.44	5,850	25	SF	$146,250	15%
	Total Site Info	**38,520**	**0.88**	**1.004**	**168**	**74,600**	**2.80**				**$152,500**	**17%**
8	**Lumberton Boat Ramp**											
	Bioretention system	1,590	0.04	0.557	7	3,080	0.35	575	5	SF	$2,875	10%
	Bioswales	1,590	0.04	0.035	5	3,080	0.01	1,255	5	SF	$6,275	10%
	Total Site Info	**3,180**	**0.07**	**0.591**	**12**	**6,160**	**0.36**				**$9,150**	**20%**
9	**St. Martin-in-the-Fields Episcopal Church**											
	Bioretention system	380	0.01	0.010	2	730	0.03	95	5	SF	$475	1%
	Pervious pavement	7,230	0.17	0.188	32	14,000	0.53	1,700	25	SF	$42,500	16%
	Rainwater harvesting	290	0.01	0.008	1	250	0.01	250	2	gal	$500	1%
	Total Site Info	**7,900**	**0.18**	**0.206**	**34**	**14,980**	**0.57**				**$43,475**	**17%**
10	**Village Green Park**											
	Bioretention systems	1,415	0.03	0.037	6	2,740	0.10	355	5	SF	$1,775	4%
	Bioswale	880	0.02	0.023	3	1,710	0.01	755	5	SF	$3,775	3%
	Pervious pavement	4,070	0.09	0.106	18	7,880	0.30	1,735	25	SF	$43,375	12%
	Total Site Info	**6,365**	**0.15**	**0.166**	**27**	**12,330**	**0.41**				**$48,925**	**19%**