



**Impervious Cover Reduction Action Plan  
for  
Woodstown Borough, Salem County, New Jersey**

*Prepared for Woodstown Borough by the  
Rutgers Cooperative Extension Water Resources Program*

April 30, 2015



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## **Introduction**

Located in Salem County, New Jersey, Woodstown Borough covers just over 1.5 square miles in southern New Jersey. Figures 1 and 2 illustrate that Woodstown Borough is dominated by urban land uses. A total of 66.1% of the municipality's land use is classified as urban. Of the urban land in Woodstown Borough, medium density residential is the dominant land use (Figure 3).

The New Jersey Department of Environmental Protection's (NJDEP) 2007 land use/land cover geographical information system (GIS) data layer categorizes Woodstown Borough 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 Woodstown Borough. Based upon the 2007 NJDEP land use/land cover data, approximately 20.7% of Woodstown Borough has impervious cover. This level of impervious cover suggests that the streams in Woodstown Borough are likely impacted.<sup>1</sup>

## **Methodology**

Woodstown Borough contains portions of two 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.

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<sup>1</sup> 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

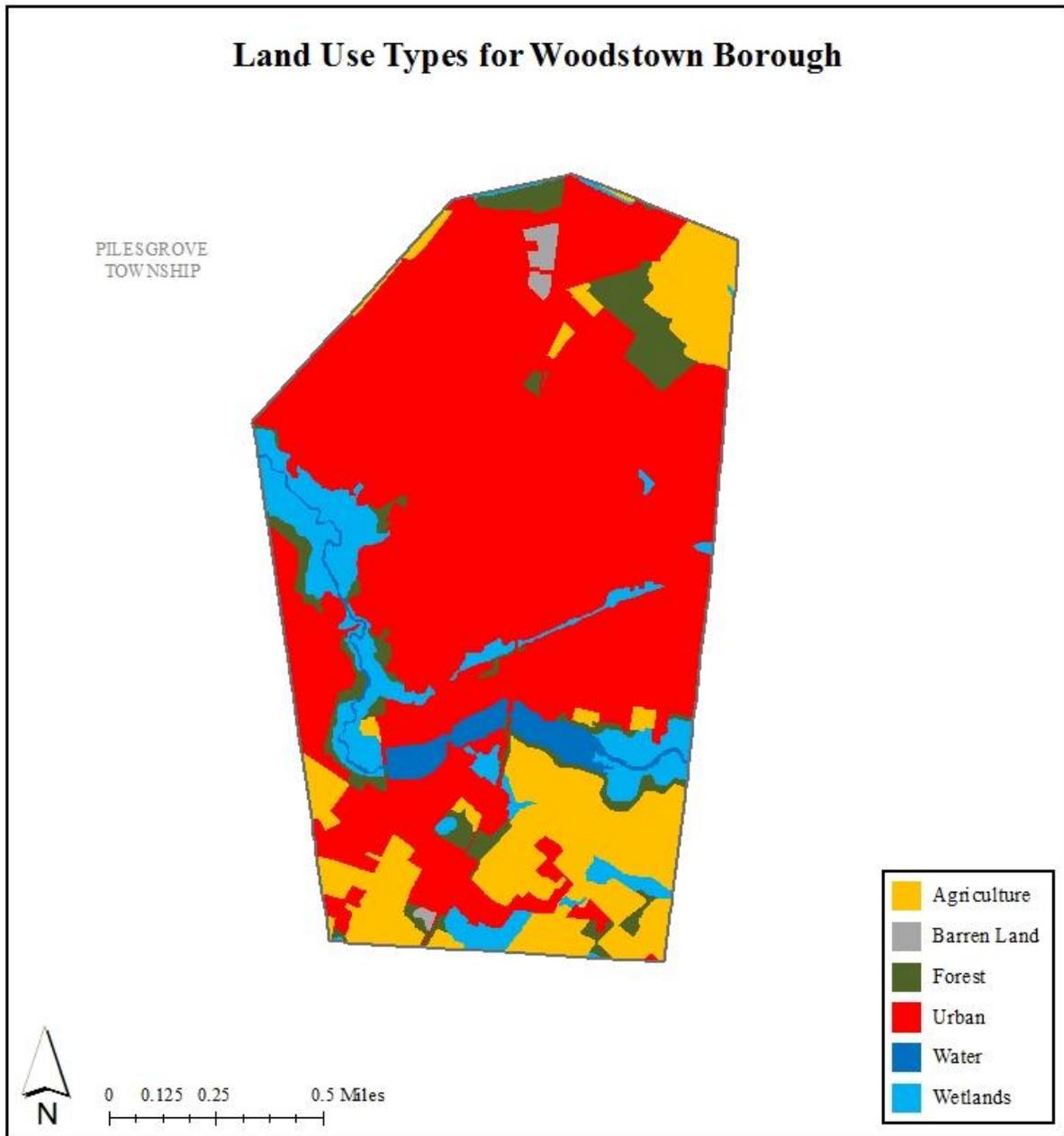


Figure 1: Map illustrating the land use in Woodstown Borough

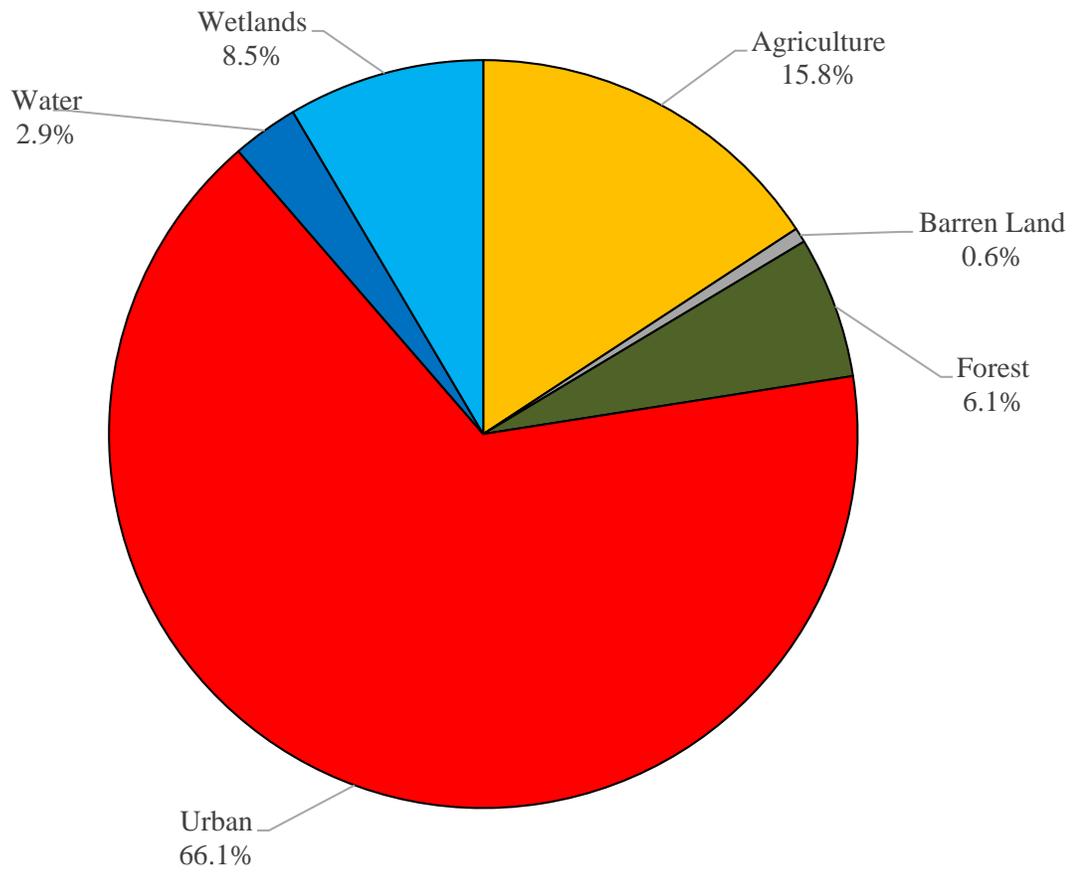


Figure 2: Pie chart illustrating the land use in Woodstown Borough

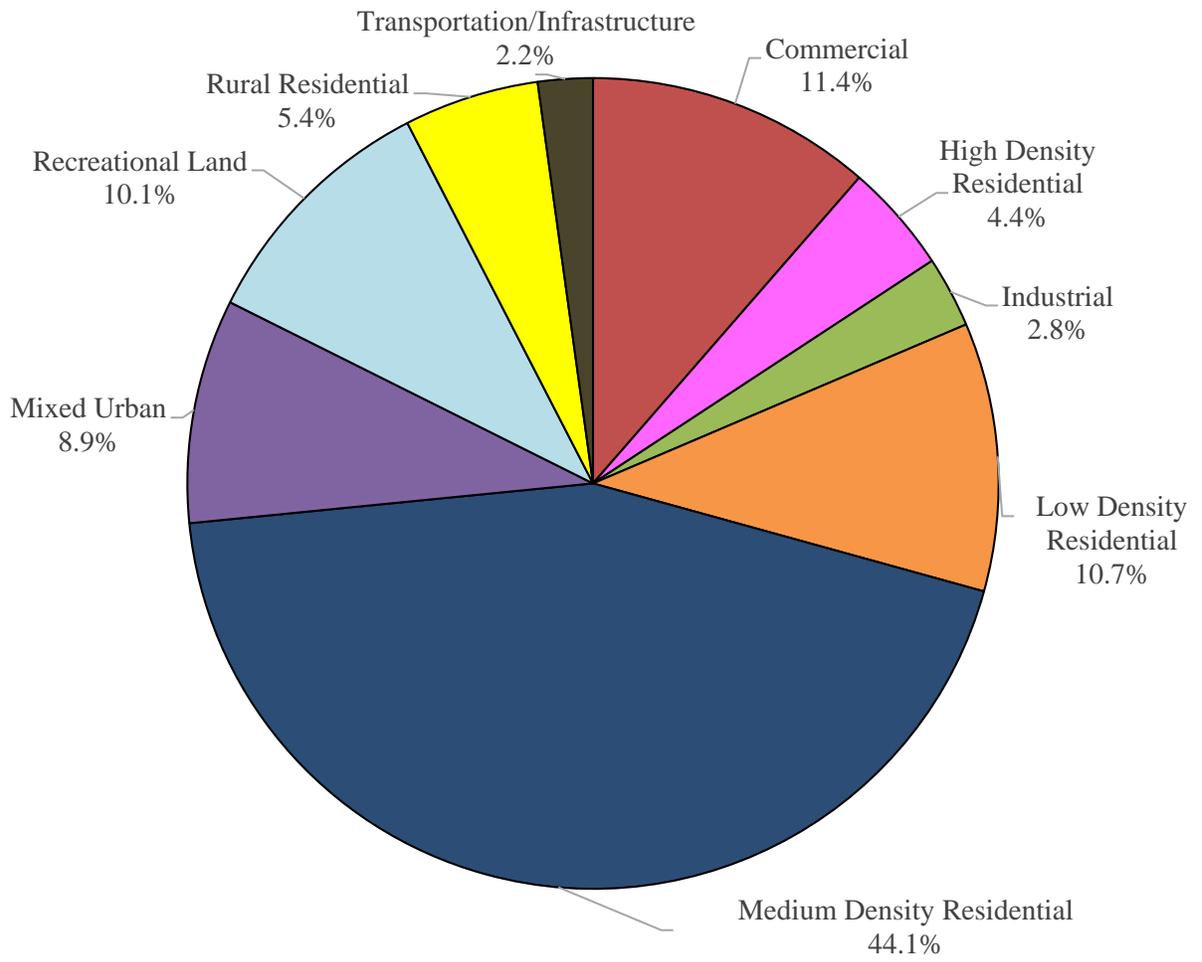


Figure 3: Pie chart illustrating the various types of urban land use in Woodstown Borough

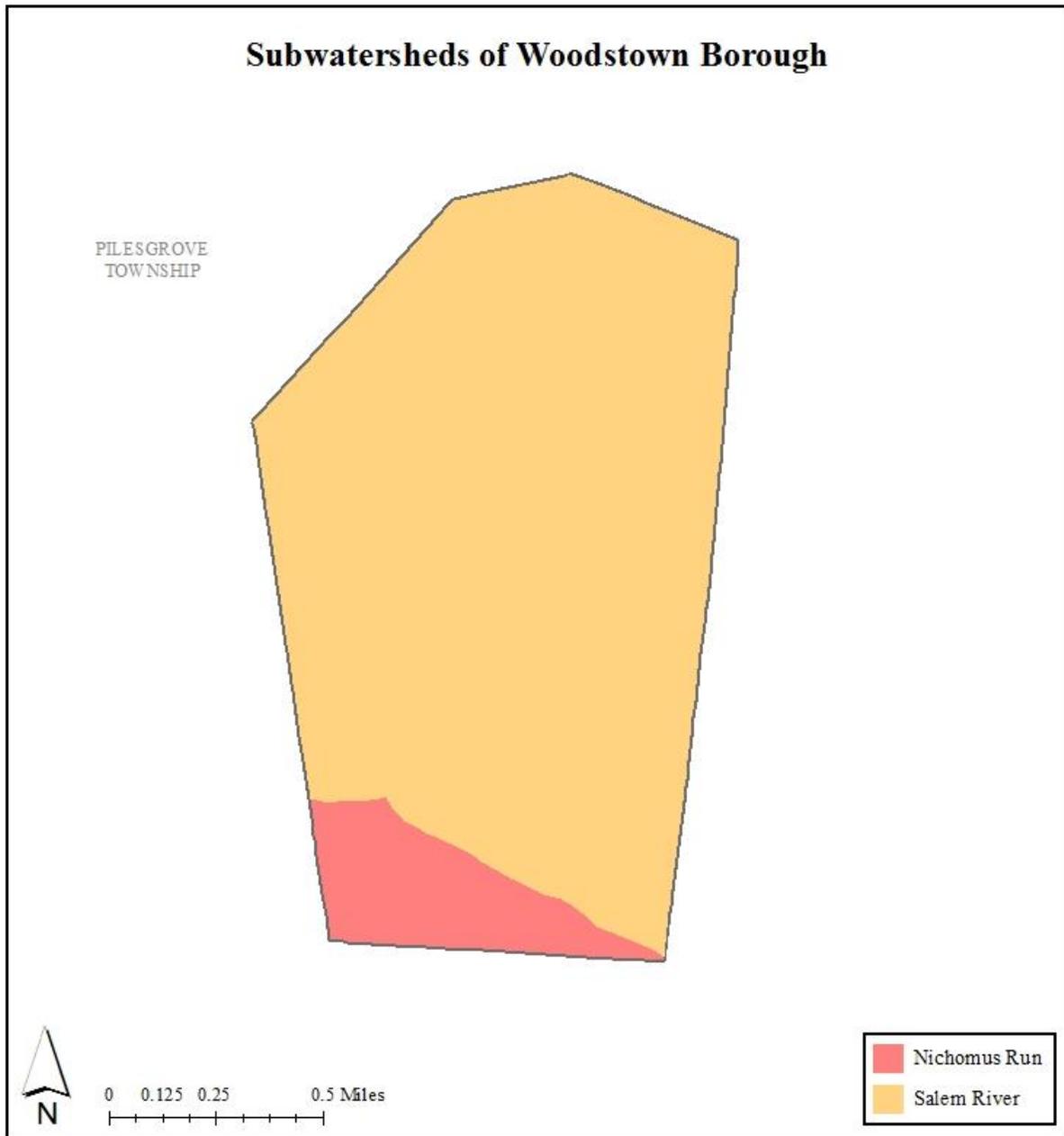


Figure 4: Map of the subwatersheds in Woodstown Borough

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 2007 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 Woodstown Borough 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<sup>2</sup>

<b>Land Cover</b>	<b>TP load (lbs/acre/yr)</b>	<b>TN load (lbs/acre/yr)</b>	<b>TSS load (lbs/acre/yr)</b>
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

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<sup>2</sup> 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<sup>3</sup>. A wide range of green infrastructure practices have been evaluated for the potential project sites in Woodstown Borough. 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.



<sup>3</sup> 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](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**

Attachment 1 contains information on potential project sites where green infrastructure practices could be installed. The recommended green infrastructure practice and the drainage area that the green infrastructure practice can treat are identified for each potential project site. For each practice, the recharge potential, TSS removal potential, maximum volume reduction potential per storm, and the peak reduction potential 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.<sup>4</sup>

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<sup>4</sup> 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**

## WOODSTOWN BOROUGH: GREEN INFRASTRUCTURE SITES



## Salem River Subwatershed

1. Asbury United Methodist Church
2. Catholic Community of the Holy Spirit
3. First Baptist Church
4. Friends Village at Woodstown
5. Heritage's Dairy Stores
6. Loyal Order of the Moose Lodge 932
7. Mary S. Shoemaker Elementary School
8. Railroad
9. Reliance Fire Company
10. Woodstown Friends Meeting Church
11. Woodstown High School
12. Woodstown-Pilesgrove Library
13. Woodstown Post Office
14. Woodstown Public Works Lot
15. Woodstown Square / Woodstown Family Center

## **b. Proposed Green Infrastructure Concepts**

# Asbury United Methodist Church

149 South Main Street, Woodstown, NJ 08098  
 Block 35, Lot 7  
 36,460 sq. ft.  
 Salem River Subwatershed



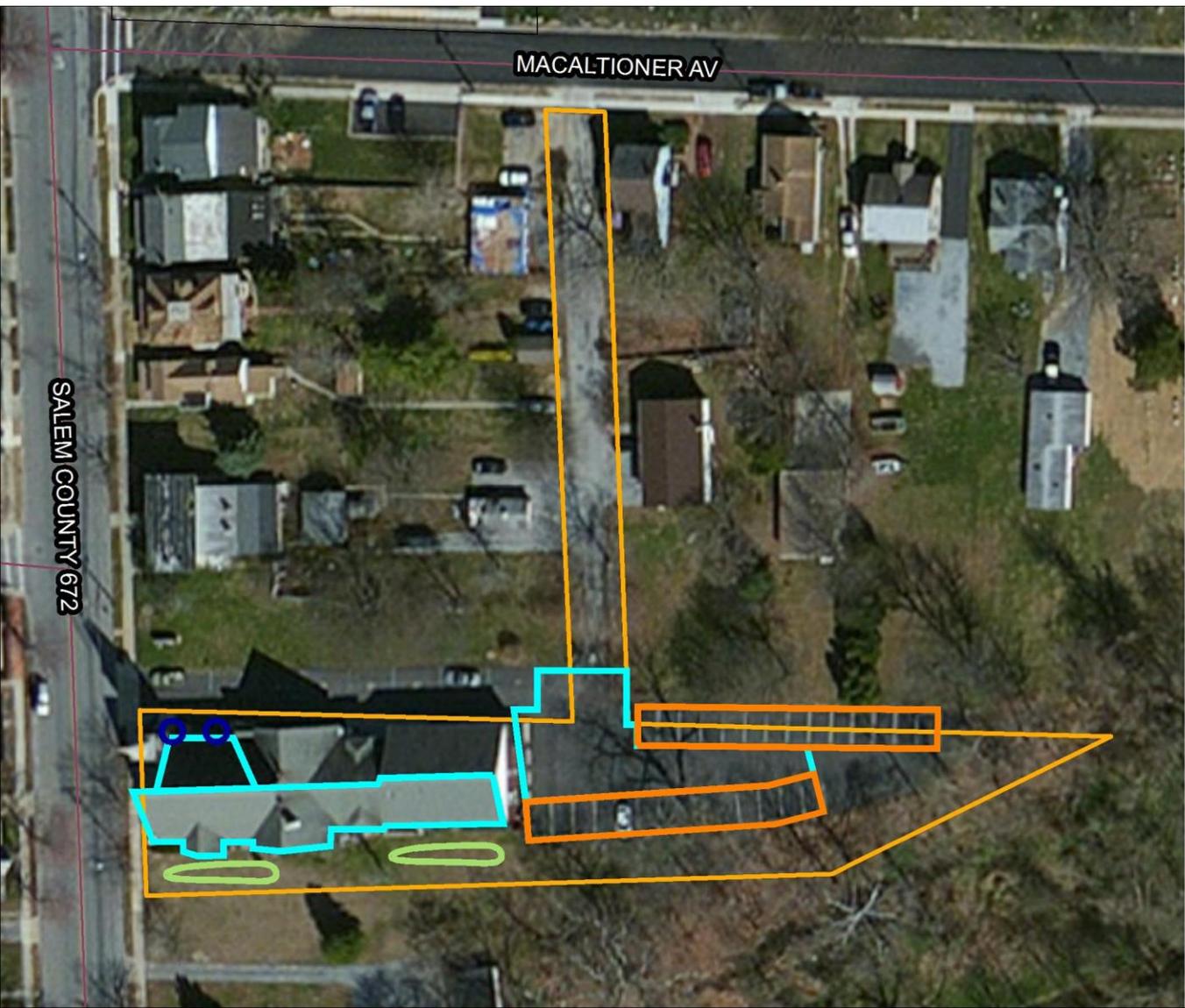
Sections of the parking lot can be repaved with pervious pavement. Downspout planter boxes could also be installed to reuse runoff. Bioretention systems could be installed on the south side of the church to capture, treat, and infiltrate roof runoff. A preliminary soil assessment for this site suggests that more soil testing would be required to determine the existing 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"
62	22,677	1.1	11.5	104.1	0.018	0.62

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	0.103	17	7,577	0.25	990	\$4,950
Pervious pavement	0.325	54	23,831	0.79	1,950	\$48,750
Planter boxes	0.006	1	441	0.01	60	\$300

# Asbury United Methodist Church

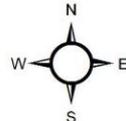
149 South Main Street, Woodstown, NJ 08098  
Block 35, Lot 7  
36,460 sq. ft.  
Salem River Subwatershed



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- Parcel boundary
- Drainage area
- Green infrastructure practices**
  - Bioretention system
  - Pervious pavement
  - Planter box



# Catholic Community of the Holy Spirit

2 Lamplighter Drive, Woodstown, 08098  
 Block 15, Lot 30  
 540,403 sq. ft.  
 Salem River Subwatershed



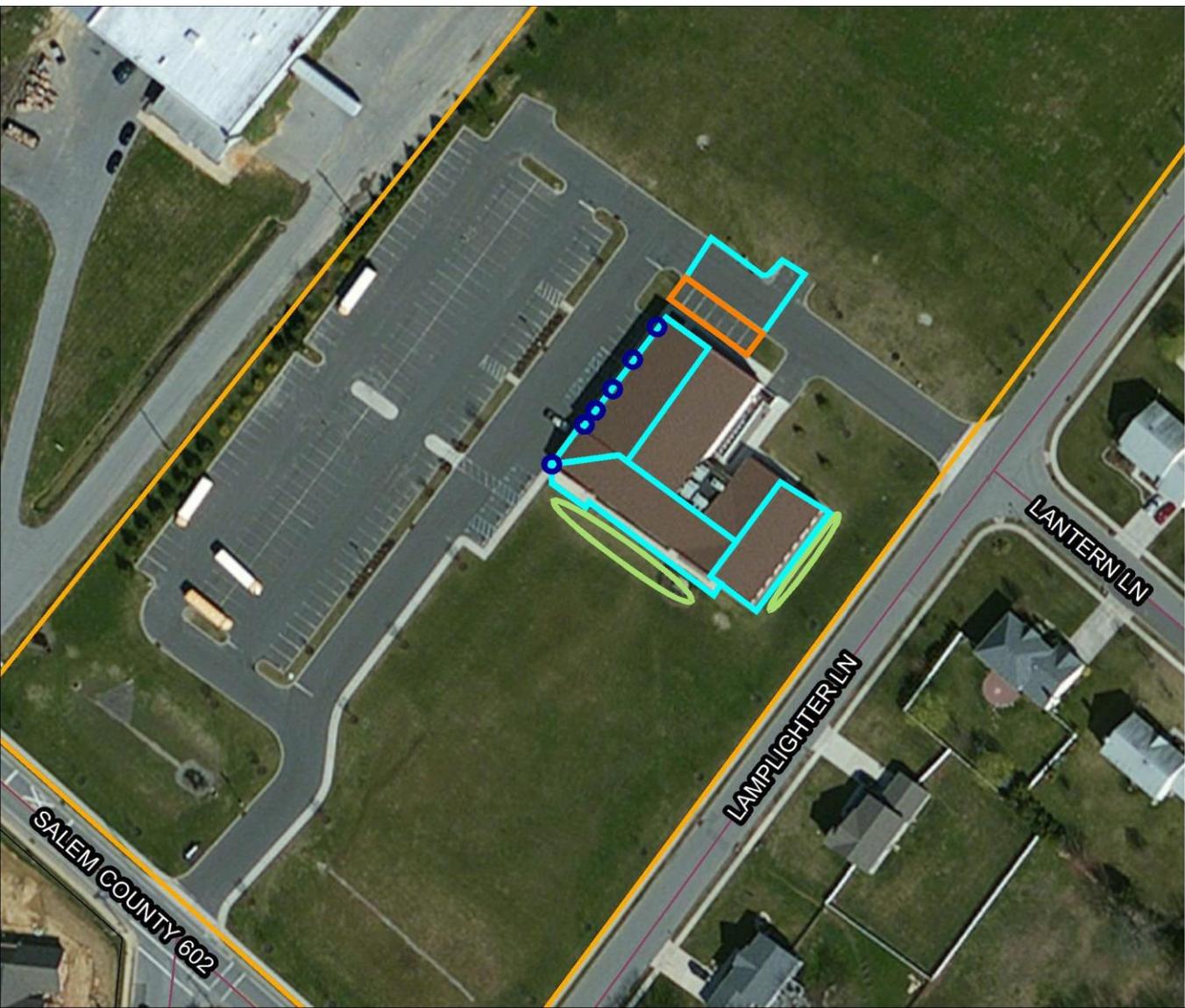
Runoff from the southernmost roofs of the building could be routed to bioretention systems. Downspouts could be fitted to downspout planter boxes. Multiple parking spaces could be repaved with pervious pavement. A preliminary soil assessment for this site suggests that the site's existing soils have 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"
28	151,127	7.3	76.3	693.9	0.118	4.14

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	0.197	35	15,431	0.51	1,890	\$9,450
Pervious pavement	0.090	15	6,590	0.22	540	\$13,500
Planter boxes	0.018	3	1,316	0.04	170	\$850

# Catholic Community of the Holy Spirit

2 Lamplighter Drive, Woodstown, 08098  
Block 15, Lot 30  
540,403 sq. ft.  
Salem River Subwatershed



-  Parcel boundary
-  Drainage area
- Green infrastructure practices**
-  Bioretention system
-  Pervious pavement
-  Planter box



# First Baptist Church

117 South Main Street, Woodstown, NJ 08098  
 Block 34, Lot 5  
 58,067 sq. ft.  
 Salem River Subwatershed

The parking lot's runoff can be captured by repaving parking spots with pervious pavement. A bioretention system can be installed west of the driveway to treat runoff from the pavement. A downspout planter box could be installed at the northeast corner of the church to reuse runoff. A preliminary soil assessment for this site suggests that the site's existing soils have suitable drainage characteristics for green infrastructure.

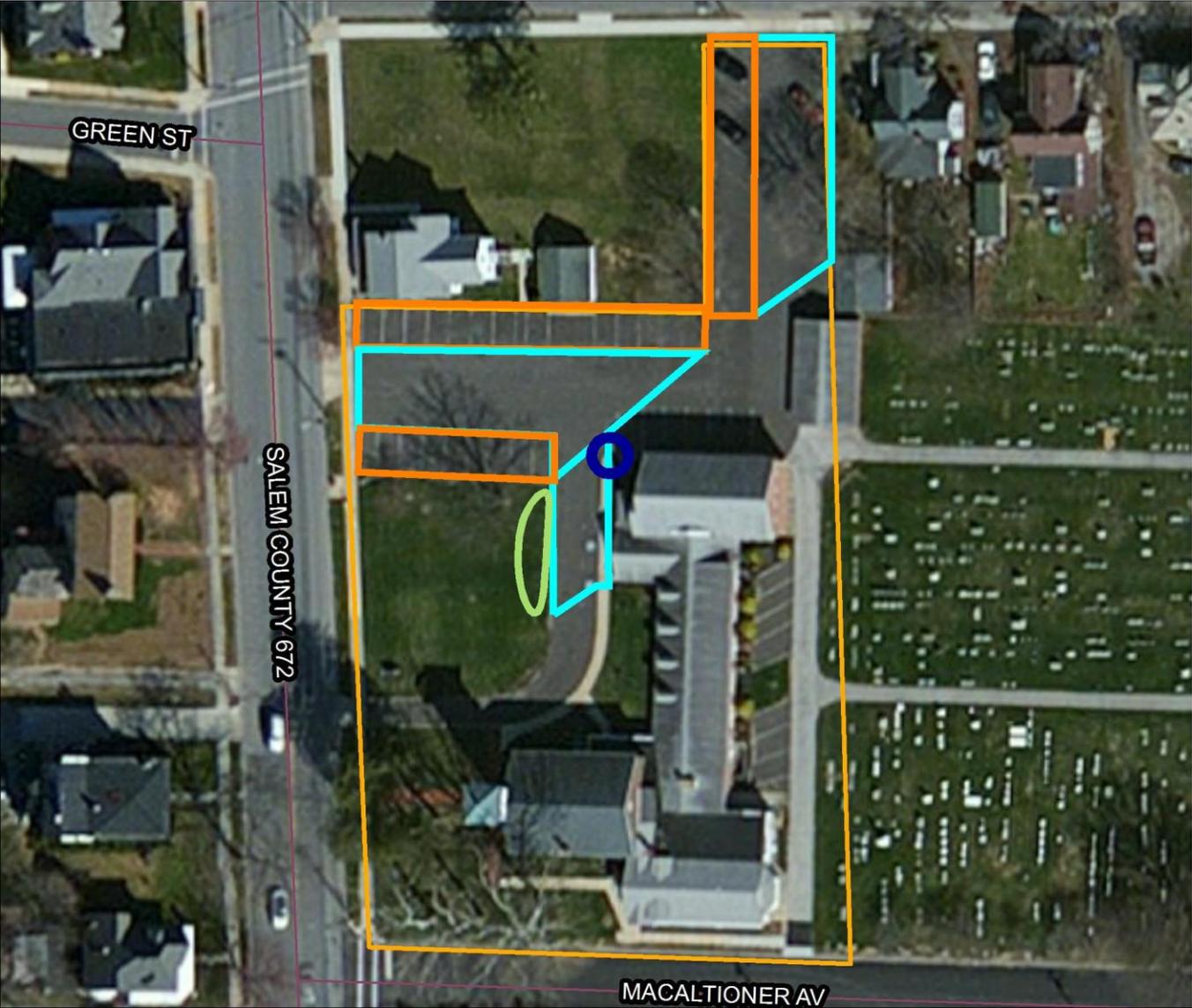


Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
57	33,368	1.6	16.9	153.2	0.026	0.92

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 system	0.034	6	2,461	0.08	320	\$1,600
Pervious pavement	0.348	58	25,529	0.85	2,090	\$52,250
Planter box	0.003	1	209	0.01	30	\$150

# First Baptist Church

117 South Main Street, Woodstown, NJ 08098  
Block 34, Lot 5  
58,067 sq. ft.  
Salem River Subwatershed



-  Parcel boundary
-  Drainage area
- Green infrastructure practices**
-  Bioretention system
-  Pervious pavement
-  Planter box



# Friends Village at Woodstown

Friends Drive, Woodstown, NJ 08098  
 Block 27, Lot 64  
 Block 36, Lot 8 (Pilesgrove, NJ)  
 1,132,498 sq. ft. (All parcels)  
 Salem River Subwatershed

Each building's runoff can be conveyed through disconnected downspouts to bioretention systems. Parking spaces can be repaved with pervious pavement to capture runoff. A preliminary soil assessment for this site suggests that the site's existing soils have suitable drainage characteristics for green infrastructure.

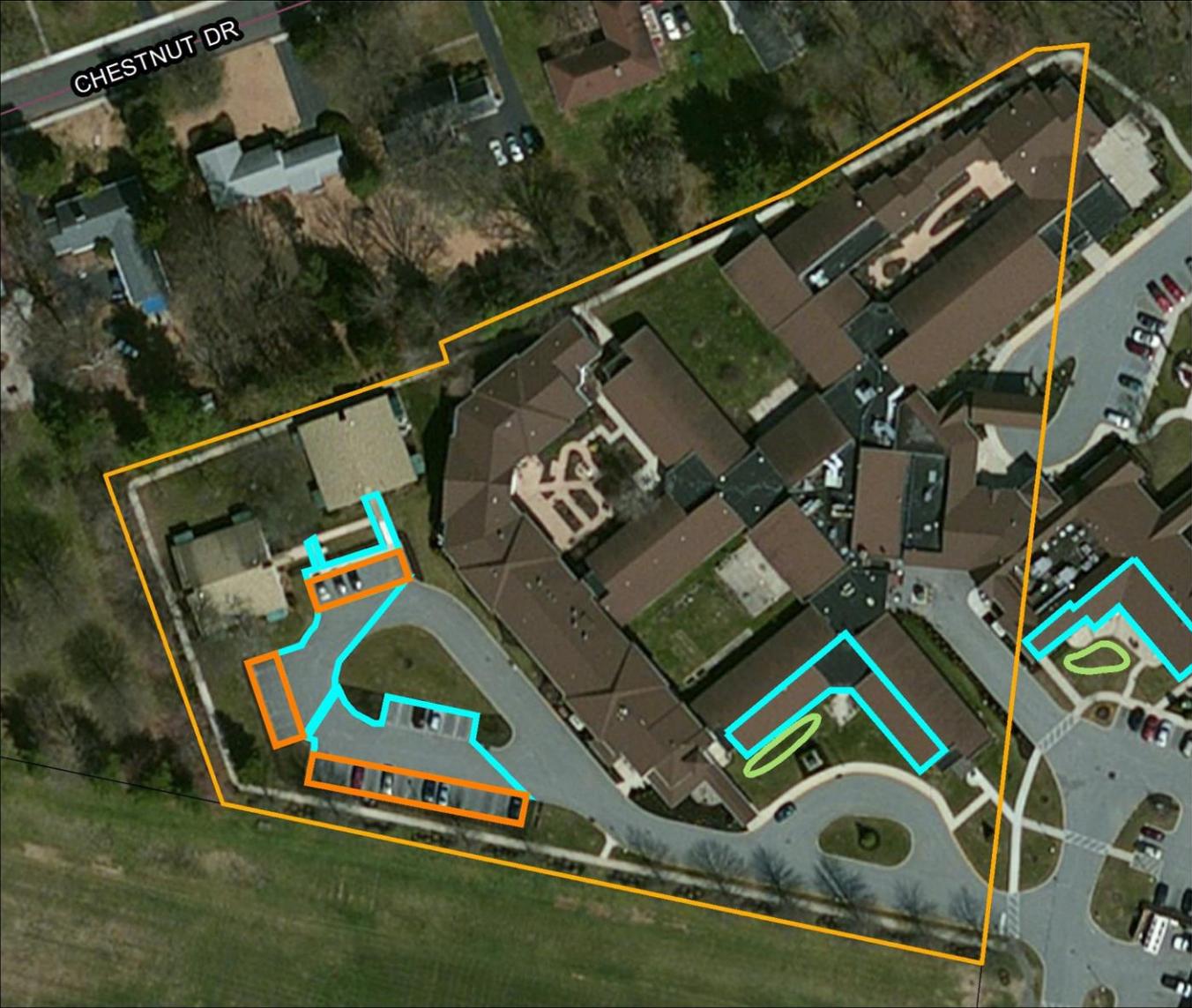


Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
47	534,697	25.8	270.0	2,455.0	0.417	14.66

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	0.161	27	11,781	0.39	1,540	\$7,700
Pervious pavement	0.305	51	22,343	0.75	1,830	\$45,750

# Friends Village at Woodstown

Friends Drive, Woodstown, NJ 08098  
Block 27, Lot 64  
Block 36, Lot 8  
1,132,498 sq. ft.  
Salem River Subwatershed



-  Parcel boundary
-  Drainage area
- Green infrastructure practices**
-  Bioretention system
-  Pervious pavement



# Heritage's Dairy Stores

199 East Avenue, Woodstown, NJ 08098  
 Block 15.02, Lot 33  
 42,352 sq. ft.  
 Salem River Subwatershed

Runoff from the building's rooftop could be routed to a bioretention system on its eastern side. The parking spaces in the lot can be repaved with pervious pavement. A preliminary soil assessment for this site suggests that more soil testing would be required to determine the existing 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"
43	18,210	0.9	9.2	83.6	0.014	0.50

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	0.080	13	3,411	0.20	2,310	\$11,550
Pervious pavement	0.241	40	17,660	0.59	480	\$12,000

# Heritage's Dairy Stores

199 East Avenue, Woodstown, NJ 08098  
Block 15.02, Lot 33  
42,352 sq. ft.  
Salem River Subwatershed



-  Parcel boundary
-  Drainage area
- Green infrastructure practices**
-  Bioretention system
-  Pervious pavement



# Loyal Order of the Moose Lodge 932

13 Bypass Road, Woodstown, NJ 08098  
 Block 14.01, Lot 3  
 82,459 sq. ft.  
 Salem River Subwatershed

The entire front roof and parking lot can be discharged to bioretention systems. The roof of the pavilion could be routed to a rainwater harvesting system. A preliminary soil assessment for this site suggests that the site's existing 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"
65	53,554	2.6	27.1	245.9	0.042	1.47

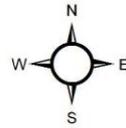
Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.429	72	31,431	1.05	4,120	\$20,600
Rainwater harvesting	0.015	3	2,311	0.08	5,000 (gal)	\$10,000

# Loyal Order of the Moose Lodge 932

13 Bypass Road, Woodstown, NJ 08098  
Block 14.01, Lot 3  
82,459 sq. ft.  
Salem River Subwatershed



- Parcel boundary
- Drainage area
- Green infrastructure practices**
- Bioretention system
- Rainwater harvesting



# Mary S. Shoemaker Elementary School

201 East Millbrooke Avenue, Woodstown, NJ 08098  
 Block 27, Lot 65  
 177,287 sq. ft.  
 Salem River Subwatershed

Two sections of parking spaces and a basketball court can be replaced with pervious pavement. Bioretention systems could be used to manage runoff from the school's roof and parking lots. A preliminary soil assessment for this site suggests that the site's existing soils have suitable drainage characteristics for green infrastructure.

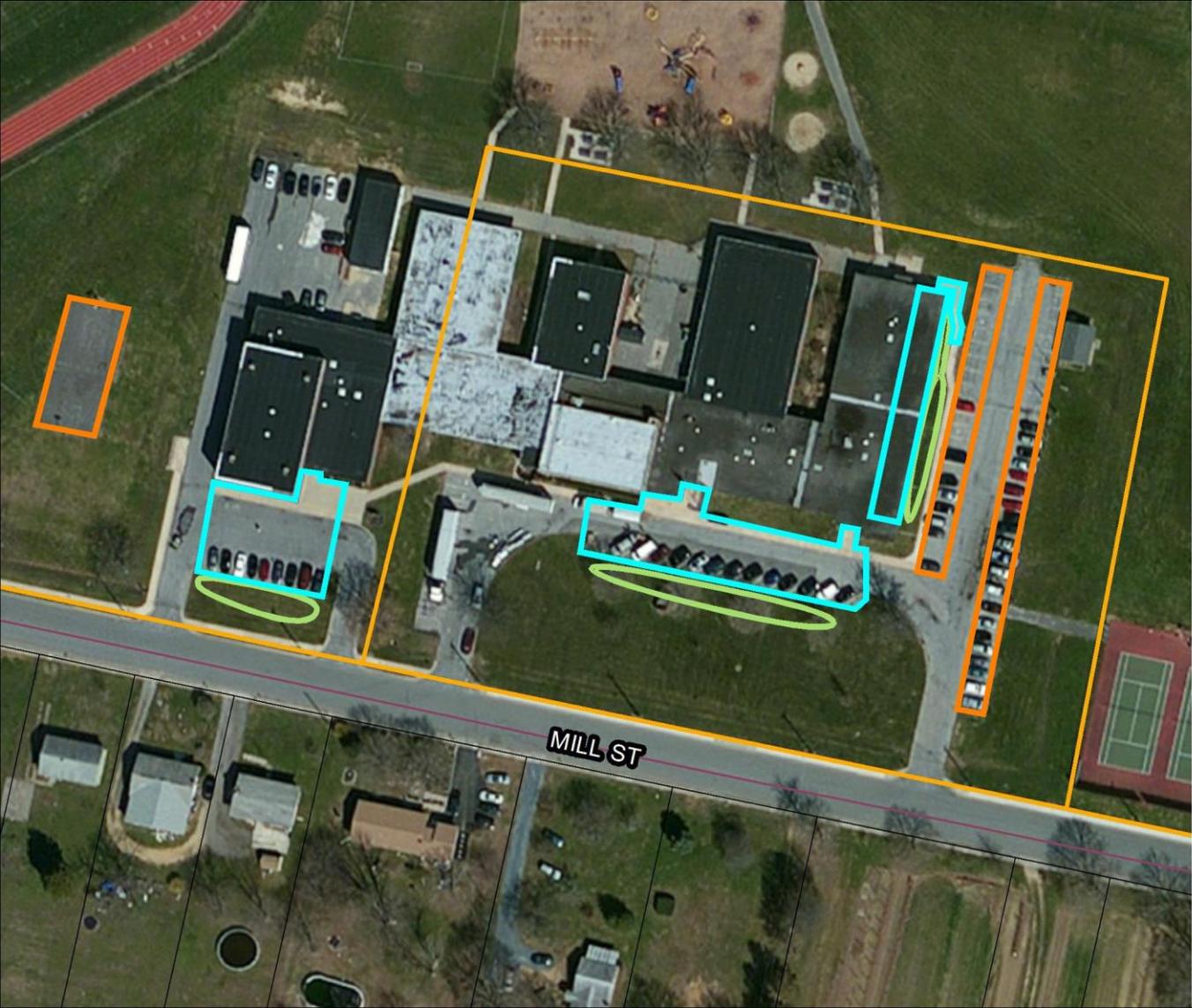


Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
56	99,564	4.8	50.3	457.1	0.078	2.73

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	0.465	78	34,049	1.14	4,460	\$22,300
Pervious pavement	0.335	56	24,519	0.82	2,000	\$50,000

# Mary S. Shoemaker Elementary School

201 East Millbrooke Avenue, Woodstown, NJ 08098  
Block 27, Lot 65  
177,287 sq. ft.  
Salem River Subwatershed



-  Parcel boundary
-  Drainage area
- Green infrastructure practices**
-  Bioretention system
-  Pervious pavement



# Railroad

West Wilson Avenue, Woodstown, NJ 08098  
 Block 500, Lot 5  
 22,534 sq. ft.  
 Salem River Subwatershed

Stormwater runoff from the road can be treated with a series of bioretention systems installed alongside the train tracks. A preliminary soil assessment for this site suggests that the site's existing 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"
16	3,642	0.2	1.8	16.7	0.003	0.10

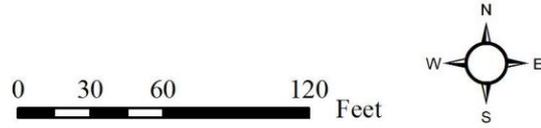
Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.090	15	6,605	0.22	865	\$4,325

# Railroad

West Wilson Avenue, Woodstown, NJ 08098  
Block 500, Lot 5  
22,534 sq. ft.  
Salem River Subwatershed



-  Parcel boundary
-  Drainage area
- Green infrastructure practices**
-  Bioretention system



# Reliance Fire Company

25 Broad Street, Woodstown, NJ 08098  
 Block 24, Lot 21  
 28,386 sq. ft.  
 Salem River Subwatershed



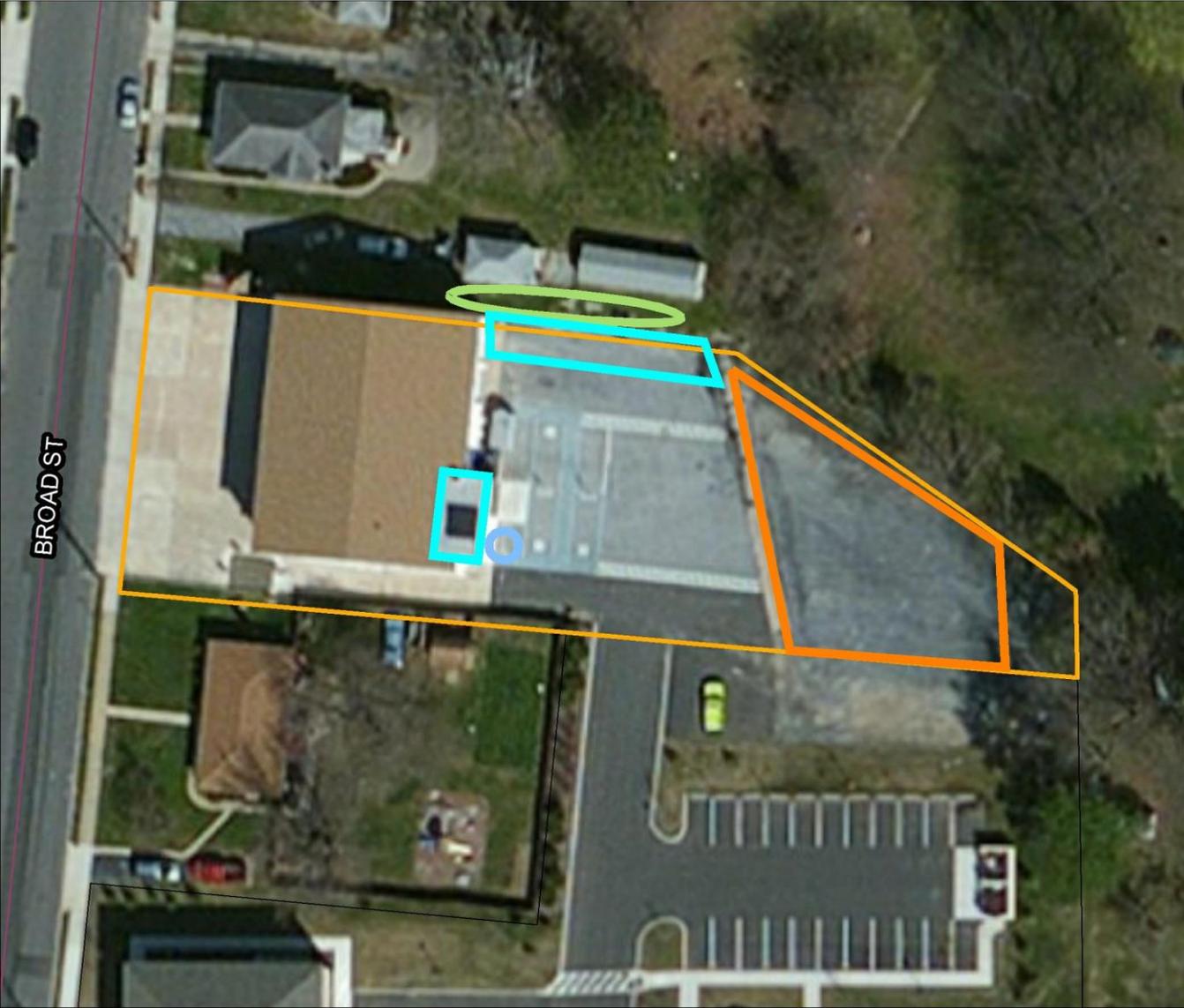
The roof's runoff could be stored in a rainwater harvesting system to be used for washing trucks. A bioretention system could be installed to manage runoff from the northern lot. The eastern portion of the lot could be replaced with grass pavers. A preliminary soil assessment for this site suggests that the site's existing 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"
75	21,256	1.0	10.7	97.6	0.017	0.58

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	1,892	0.06	250	\$1,250
Pervious pavement	0.011	2	838	0.03	70	\$1,750
Rainwater harvesting	0.064	11	9,933	0.33	5,000 (gal)	\$10,000

# Reliance Fire Company

25 Broad Street, Woodstown, NJ 08098  
Block 24, Lot 21  
28,386 sq. ft.  
Salem River Subwatershed



-  Parcel boundary
-  Drainage area
- Green infrastructure practices**
-  Bioretention system
-  Pervious pavement
-  Rainwater harvesting



# Woodstown Friends Meeting Church

104 North Main Street, Woodstown, NJ 08098  
 Block 2, Lot 24  
 150,469 sq. ft.  
 Salem River Subwatershed

The pavement is in poor condition. The parking spaces in the lot could be repaved with pervious pavement to manage the lot's runoff. A preliminary soil assessment for this site suggests that the site's existing 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"
29	43,101	2.1	21.8	197.9	0.034	1.18

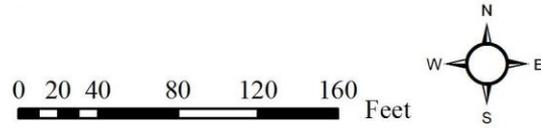
Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Pervious pavement	0.482	81	35,343	1.18	2,890	\$72,250

# Woodstown Friends Meeting Church

104 North Main Street, Woodstown, NJ 08098  
Block 2, Lot 24  
150,469 sq. ft.  
Salem River Subwatershed



-  Parcel boundary
-  Drainage area
- Green infrastructure practices**
-  Pervious pavement



# Woodstown High School

140 East Avenue, Woodstown, NJ 08098  
 Block 27, Lot 22  
 1,871,330 sq. ft.  
 Salem River Subwatershed

Stormwater from the southern roof can be conveyed to a terraced bioretention system. Sections of pervious pavement and a bioretention system could prevent runoff from flowing directly to the river. A preliminary soil assessment for this site suggests that more soil testing would be required to determine the existing 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"
20	365,410	17.6	184.6	1,677.7	0.285	10.02

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	0.518	87	37,983	1.27	4,970	\$24,850
Pervious pavement	0.641	107	46,959	1.57	3,840	\$96,000

# Woodstown High School

140 East Avenue, Woodstown, NJ 08098  
Block 27, Lot 22  
1,871,330 sq. ft.  
Salem River Subwatershed



-  Parcel boundary
-  Drainage area
- Green infrastructure practices**
-  Bioretention system
-  Pervious pavement



# Woodstown-Pilesgrove Library

14 School Lane, Woodstown, NJ 08098  
 Block 24, Lot 6  
 20,063 sq. ft.  
 Salem River Subwatershed

At this site, bioretention systems can be installed along the western and eastern sides of the building to treat runoff. A preliminary soil assessment for this site suggests that the site's existing soils have suitable drainage characteristics for green infrastructure.

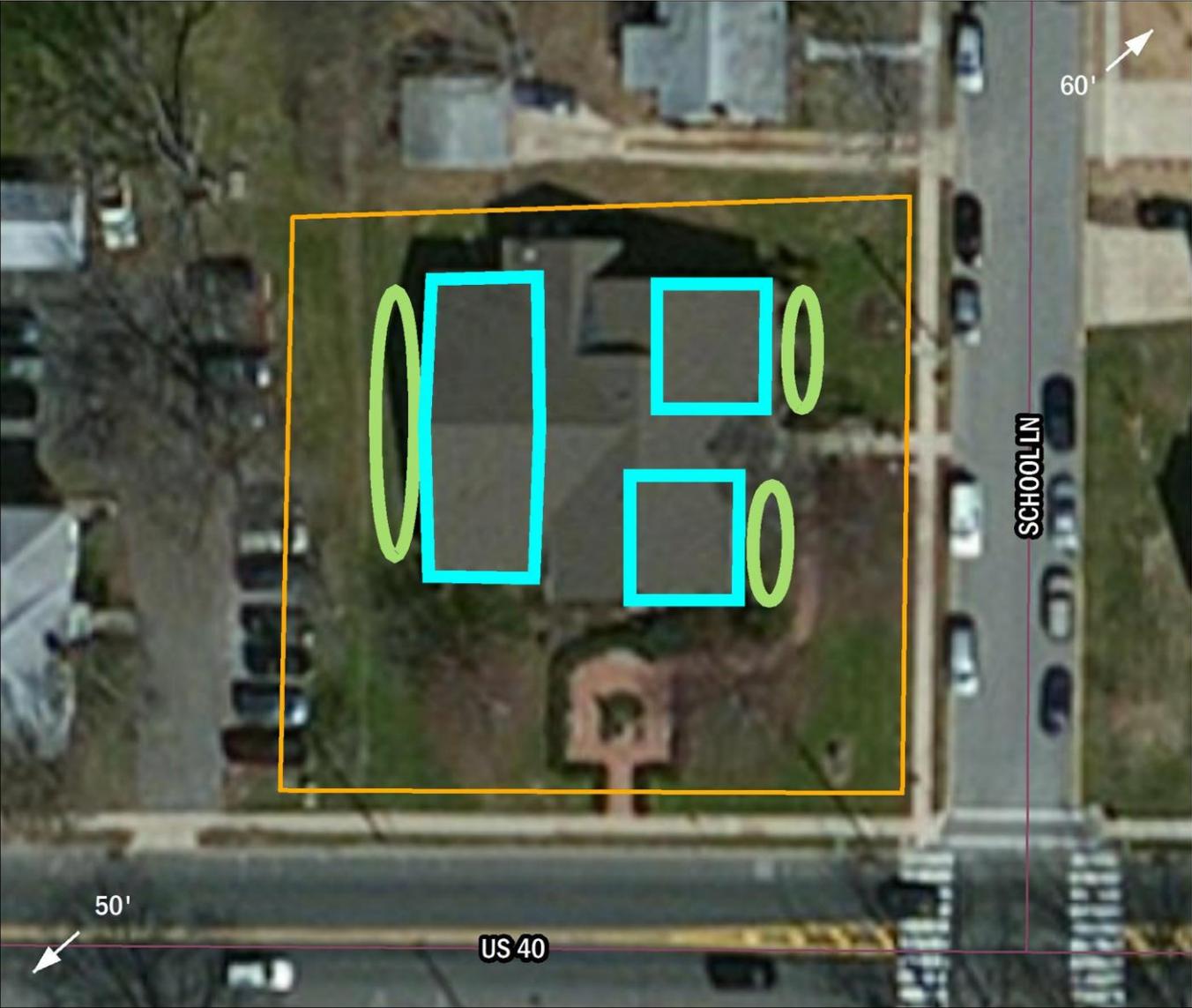


Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
25	5,017	0.2	2.5	23.0	0.004	0.14

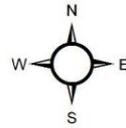
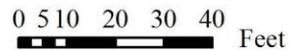
Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.086	14	6,328	0.21	830	\$4,150

# Woodstown-Pilesgrove Library

14 School Lane, Woodstown, NJ 08098  
Block 24, Lot 6  
20,063 sq. ft.  
Salem River Subwatershed



-  Parcel boundary
-  Drainage area
- Green infrastructure practices**
-  Bioretention system



# Woodstown Post Office

35 East Avenue, Woodstown, NJ 08098  
 Block 22, Lot 8  
 23,997 sq. ft.  
 Salem River Subwatershed

Portions of the building's roof and parking lot can be directed to pervious pavement. Runoff from the western driveway can be captured in a bioretention system. A preliminary soil assessment for this site suggests that the site's existing 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"
75	17,998	0.9	9.1	82.6	0.014	0.49

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	0.035	6	2,558	0.09	340	\$1,700
Pervious pavement	0.069	12	5,064	0.17	410	\$10,250

# Woodstown Post Office

35 East Avenue, Woodstown, NJ 08098  
Block 22, Lot 8  
23,997 sq. ft.  
Salem River Subwatershed



-  Parcel boundary
-  Drainage area
- Green infrastructure practices**
-  Bioretention system
-  Pervious pavement



# Woodstown Public Works Lot

25 West Avenue, Woodstown, NJ 08098  
 Block 21, Lot 26  
 34,623 sq. ft.  
 Salem River Subwatershed

At this site, there are many opportunities to disconnect the parking lot from draining directly to the storm sewer system by installing sections of pervious pavement. A preliminary soil assessment for this site suggests that the site's existing soils have suitable drainage characteristics for green infrastructure.

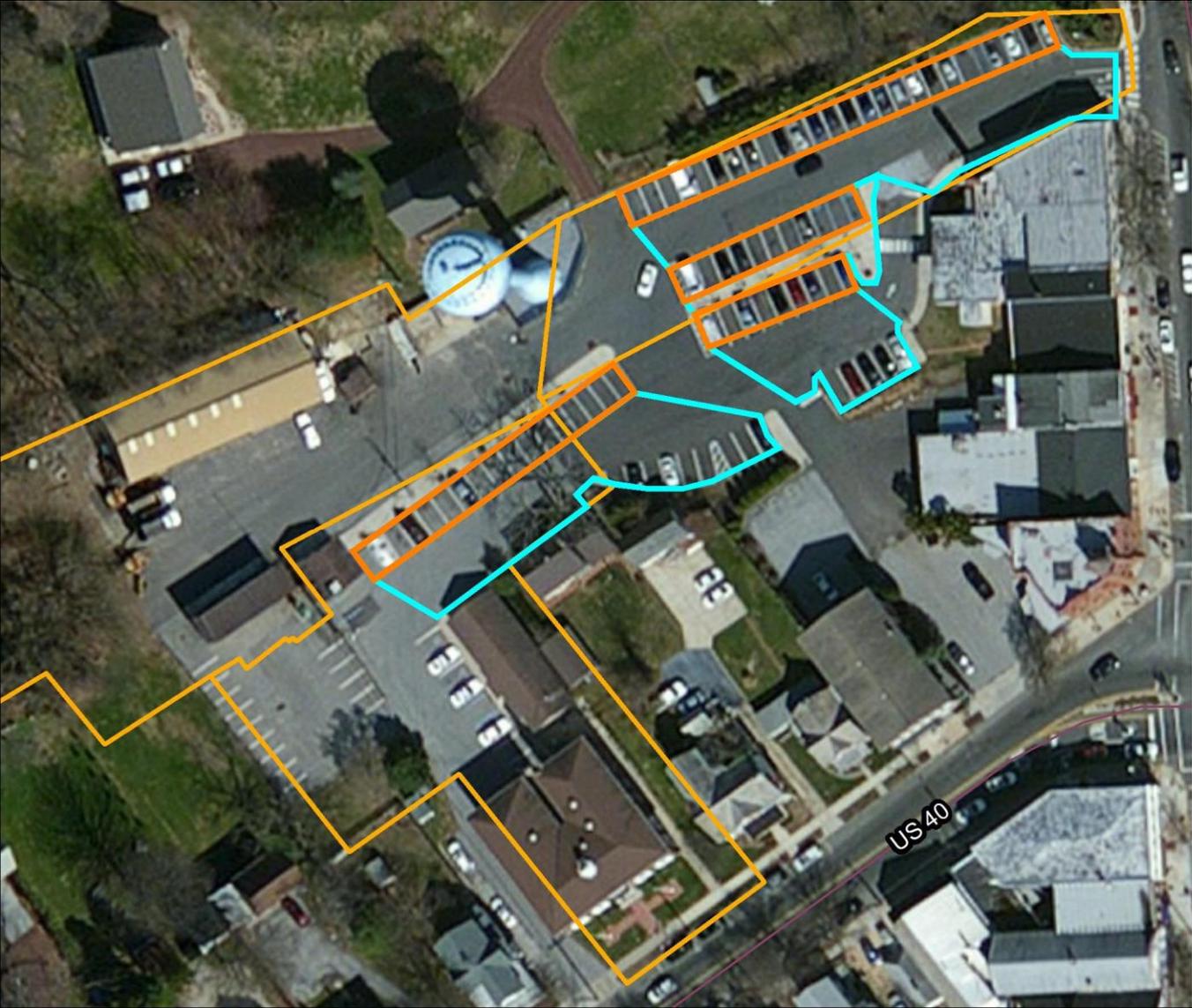


Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
75	25,909	1.2	13.1	119.0	0.020	0.71

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
Pervious pavement	0.513	86	37,565	1.25	4,690	\$117,250

# Woodstown Public Works Lot

25 West Avenue, Woodstown, NJ 08098  
Block 21, Lot 26  
34,623 sq. ft.  
Salem River Subwatershed



-  Parcel boundary
-  Drainage area
- Green infrastructure practices**
-  Pervious pavement



# Woodstown Square / Woodstown Family Center

125 East Avenue, Woodstown, NJ 08098  
 Block 24, Lot 2  
 102,907 sq. ft.  
 Salem River Subwatershed

Multiple parking sections could be replaced with pervious pavement, which would enhance groundwater recharge and reduce pollutant loads to the storm sewers. A preliminary soil assessment for this site suggests that the site's existing soils have suitable drainage characteristics for green infrastructure.

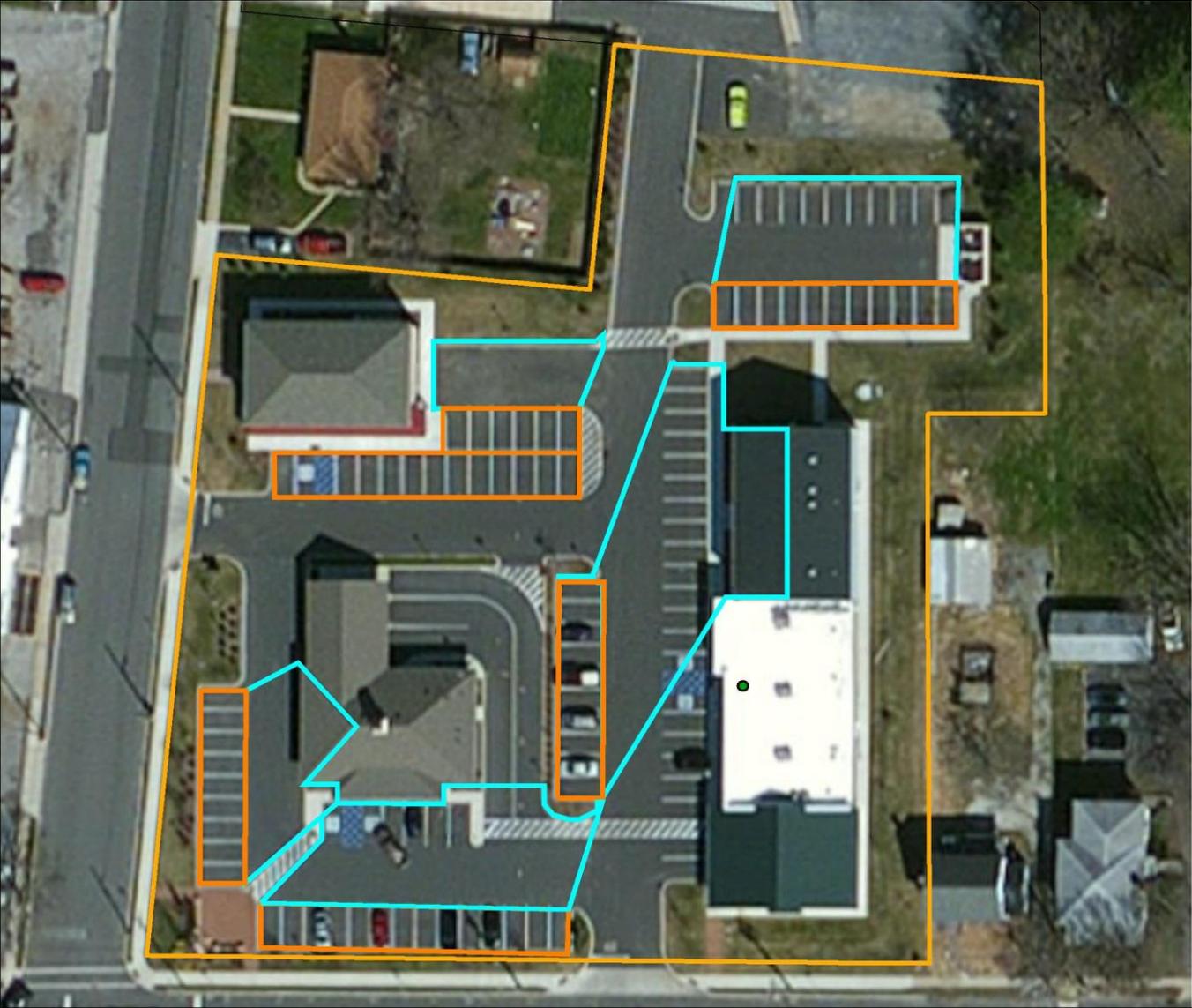


Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
64	65,921	3.2	33.3	302.7	0.051	1.81

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
Pervious pavement	0.795	133	58,299	1.94	4,770	\$119,250

# Woodstown Square / Woodstown Family Center

125 East Avenue, Woodstown, NJ 08098  
Block 24, Lot 2  
102,907 sq. ft.  
Salem River Subwatershed



-  Parcel boundary
-  Drainage area
- Green infrastructure practices**
-  Pervious pavement



**c. Summary of Existing Conditions**

**Summary of Existing Site Conditions**

Watershed/Site Name/Total Site Info/GI Practice	Area (ac)	Area (SF)	Lot	Block	Existing Annual Loads			I.C. %	I.C. Area (ac)	I.C. Area (SF)	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)
					<b>SALEM RIVER SUBWATERSHED</b>	<b>99.26</b>	<b>4,323,835</b>					
<b>Asbury United Methodist Church</b>												
<b>Total Site Info</b>	0.84	36,460	7	35	1.1	11.5	104.1	62	0.52	22,677	0.018	0.62
<b>Catholic Community of the Holy Spirit</b>												
<b>Total Site Info</b>	12.41	540,403	30	15	7.3	76.3	693.9	28	3.47	151,127	0.118	4.14
<b>First Baptist Church</b>												
<b>Total Site Info</b>	1.33	58,067	5	34	1.6	16.9	153.2	57	0.77	33,368	0.026	0.92
<b>Friends Village at Woodstown</b>												
<b>Total Site Info</b>	26.00	1,132,498	64; 8	27; 36	25.8	270.0	2,455.0	47	12.27	534,697	0.417	14.66
<b>Heritage's Dairy Stores</b>												
<b>Total Site Info</b>	0.97	42,352	33	15.02	0.9	9.2	83.6	43	0.42	18,210	0.014	0.50
<b>Loyal Order of the Moose Lodge 932</b>												
<b>Total Site Info</b>	1.89	82,459	3	14.01	2.6	27.0	245.9	65	1.23	53,554	0.042	1.47
<b>Mary S. Shoemaker Elementary School</b>												
<b>Total Site Info</b>	4.07	177,287	65	27	4.8	50.3	457.1	56	2.29	99,564	0.078	2.73
<b>Railroad (along W. Wilson Ave)</b>												
<b>Total Site Info</b>	0.52	22,534	5	500	0.2	1.8	16.7	16	0.08	3,642	0.003	0.10
<b>Reliance Fire Company</b>												
<b>Total Site Info</b>	0.65	28,386	21	24	1.0	10.7	97.6	75	0.49	21,256	0.017	0.58
<b>Woodstown Friends Meeting Church</b>												
<b>Total Site Info</b>	3.45	150,469	24	2	2.1	21.8	197.9	29	0.99	43,101	0.034	1.18
<b>Woodstown High School</b>												
<b>Total Site Info</b>	42.96	1,871,330	22	27	17.6	184.6	1,677.7	20	8.39	365,410	0.285	10.02
<b>Woodstown-Pilesgrove Library</b>												
<b>Total Site Info</b>	0.46	20,063	6	24	0.2	2.5	23.0	25	0.12	5,017	0.004	0.14

**Summary of Existing Site Conditions**

Watershed/Site Name/Total Site Info/GI Practice	Area (ac)	Area (SF)	Lot	Block	Existing Annual Loads			I.C. %	I.C. Area (ac)	I.C. Area (SF)	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)
					<b>Woodstown Post Office</b>							
<b>Total Site Info</b>	0.55	23,997	8	22	0.9	9.1	82.6	75	0.41	17,998	0.014	0.49
<b>Woodstown Public Works Lot</b>												
<b>Total Site Info</b>	0.79	34,623	26	21	1.2	13.1	119.0	75	0.59	25,909	0.020	0.71
<b>Woodstown Square / Woodstown Family Center</b>												
<b>Total Site Info</b>	2.36	102,907	2	24	3.2	33.3	302.7	64	1.51	65,921	0.051	1.81

#### **d. Summary of Proposed Green Infrastructure Practices**

**Summary of Proposed Green Infrastructure Practices**

Watershed/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 (SF)	Unit Cost (\$)	Unit	Total Cost (\$)	I.C. Treated %
	Area (SF)	Area (ac)									
<b>SALEM RIVER SUBWATERSHED</b>	<b>252,270</b>	<b>5.79</b>	<b>6.485</b>	<b>1,086</b>	<b>480,256</b>	<b>16.10</b>	<b>58,705</b>			<b>\$774,725</b>	<b>17.3%</b>
<b>1 Asbury United Methodist Church</b>											
Bioretention systems	3,970	0.09	0.103	17	7,577	0.25	990	5	SF	\$4,950	17.5%
Pervious pavement	12,480	0.29	0.325	54	23,831	0.79	1,950	25	SF	\$48,750	55.0%
Planter boxes	230	0.01	0.006	1	441	0.01	60	5	SF	\$300	1.0%
<b>Total Site Info</b>	<b>16,680</b>	<b>0.38</b>	<b>0.435</b>	<b>73</b>	<b>31,849</b>	<b>1.05</b>	<b>3,000</b>			<b>\$54,000</b>	<b>73.6%</b>
<b>2 Catholic Community of the Holy Spirit</b>											
Bioretention systems	7,570	0.17	0.197	33	15,431	0.51	1,890	5	SF	\$9,450	5.0%
Pervious pavement	3,450	0.08	0.090	15	6,590	0.22	540	25	SF	\$13,500	2.3%
Planter boxes	690	0.02	0.018	3	1,316	0.04	170	5	SF	\$850	0.5%
<b>Total Site Info</b>	<b>11,710</b>	<b>0.27</b>	<b>0.305</b>	<b>51</b>	<b>23,337</b>	<b>0.77</b>	<b>2,600</b>			<b>\$23,800</b>	<b>7.7%</b>
<b>3 First Baptist Church</b>											
Bioretention system	1,290	0.03	0.034	6	2,461	0.08	320	5	SF	\$1,600	3.9%
Pervious pavement	13,370	0.31	0.348	58	25,529	0.85	2,090	25	SF	\$52,250	40.1%
Planter box	115	0.00	0.003	1	209	0.01	30	5	SF	\$150	0.3%
<b>Total Site Info</b>	<b>14,775</b>	<b>0.34</b>	<b>0.385</b>	<b>64</b>	<b>28,199</b>	<b>0.94</b>	<b>2,440</b>			<b>\$54,000</b>	<b>44.3%</b>
<b>4 Friends Village at Woodstown</b>											
Bioretention systems	6,170	0.14	0.161	27	11,781	0.39	1,540	5	SF	\$7,700	1.2%
Pervious pavement	11,700	0.27	0.305	51	22,343	0.75	1,830	25	SF	\$45,750	2.2%
<b>Total Site Info</b>	<b>17,870</b>	<b>0.41</b>	<b>0.466</b>	<b>78</b>	<b>34,124</b>	<b>1.14</b>	<b>3,370</b>			<b>\$53,450</b>	<b>3.3%</b>
<b>5 Heritage's Dairy Stores</b>											
Bioretention system	9,250	0.21	0.241	40	17,660	0.59	2,310	5	SF	\$11,550	50.8%
Pervious pavement	3,060	0.07	0.080	13	3,411	0.20	480	25	SF	\$12,000	16.8%
<b>Total Site Info</b>	<b>12,310</b>	<b>0.28</b>	<b>0.321</b>	<b>54</b>	<b>21,071</b>	<b>0.79</b>	<b>2,790</b>			<b>\$23,550</b>	<b>67.6%</b>
<b>6 Loyal Order of the Moose Lodge 932</b>											
Bioretention systems	16,460	0.38	0.429	72	31,431	1.05	4,120	5	SF	\$20,600	30.7%
Rainwater harvesting	1,210	0.03	0.015	3	2,311	0.08	5,000	2	gal	\$10,000	2.3%
<b>Total Site Info</b>	<b>17,670</b>	<b>0.41</b>	<b>0.444</b>	<b>74</b>	<b>33,742</b>	<b>1.13</b>	<b>9,120</b>			<b>\$30,600</b>	<b>33.0%</b>

**Summary of Proposed Green Infrastructure Practices**

Watershed/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 (SF)	Unit Cost (\$)	Unit	Total Cost (\$)	I.C. Treated %
	Area (SF)	Area (ac)									
<b>7 Mary S. Shoemaker Elementary School</b>											
Bioretention systems	17,830	0.41	0.465	78	34,049	1.14	4,460	5	SF	\$22,300	17.9%
Pervious pavement	12,840	0.29	0.335	56	24,519	0.82	2,000	25	SF	\$50,000	12.9%
<b>Total Site Info</b>	<b>30,670</b>	<b>0.70</b>	<b>0.799</b>	<b>134</b>	<b>58,568</b>	<b>1.96</b>	<b>6,460</b>			<b>\$72,300</b>	<b>30.8%</b>
<b>8 Railroad (along W. Wilson Ave)</b>											
Bioretention systems	3,460	0.08	0.090	15	6,605	0.22	865	5	SF	\$4,325	95.0%
<b>Total Site Info</b>	<b>3,460</b>	<b>0.08</b>	<b>0.090</b>	<b>15</b>	<b>6,605</b>	<b>0.22</b>	<b>865</b>			<b>\$4,325</b>	<b>95.0%</b>
<b>9 Reliance Fire Company</b>											
Bioretention system	990	0.02	0.026	4	1,892	0.06	250	5	SF	\$1,250	4.7%
Pervious pavement	440	0.01	0.011	2	838	0.03	70	25	SF	\$1,750	2.1%
Rainwater harvesting	5,200	0.12	0.064	11	9,933	0.33	5,000	2	gal	\$10,000	24.5%
<b>Total Site Info</b>	<b>6,630</b>	<b>0.15</b>	<b>0.101</b>	<b>17</b>	<b>12,663</b>	<b>0.42</b>	<b>5,320</b>			<b>\$13,000</b>	<b>31.2%</b>
<b>10 Woodstown Friends Meeting Church</b>											
Pervious pavement	18,510	0.42	0.482	81	35,343	1.18	2,890	25	SF	\$72,250	42.9%
<b>Total Site Info</b>	<b>18,510</b>	<b>0.42</b>	<b>0.482</b>	<b>81</b>	<b>35,343</b>	<b>1.18</b>	<b>2,890</b>			<b>\$72,250</b>	<b>42.9%</b>
<b>11 Woodstown High School</b>											
Bioretention systems	19,890	0.46	0.518	87	37,983	1.27	4,970	5	SF	\$24,850	5.4%
Pervious pavement	24,590	0.56	0.641	107	46,959	1.57	3,840	25	SF	\$96,000	6.7%
<b>Total Site Info</b>	<b>44,480</b>	<b>1.02</b>	<b>1.159</b>	<b>194</b>	<b>84,942</b>	<b>2.84</b>	<b>8,810</b>			<b>\$120,850</b>	<b>12.2%</b>
<b>12 Woodstown-Piles Grove Library</b>											
Bioretention systems	3,315	0.08	0.086	14	6,328	0.21	830	5	SF	\$4,150	66.1%
<b>Total Site Info</b>	<b>3,315</b>	<b>0.08</b>	<b>0.086</b>	<b>14</b>	<b>6,328</b>	<b>0.21</b>	<b>830</b>			<b>\$4,150</b>	<b>66.1%</b>
<b>13 Woodstown Post Office</b>											
Bioretention system	1,340	0.03	0.035	6	2,558	0.09	340	5	SF	\$1,700	7.4%
Pervious pavement	2,650	0.06	0.069	12	5,064	0.17	410	25	SF	\$10,250	14.7%
<b>Total Site Info</b>	<b>3,990</b>	<b>0.09</b>	<b>0.104</b>	<b>17</b>	<b>7,622</b>	<b>0.26</b>	<b>750</b>			<b>\$11,950</b>	<b>22.2%</b>
<b>14 Woodstown Public Works Lot</b>											
Pervious pavement	19,670	0.45	0.513	86	37,565	1.25	4,690	25	SF	\$117,250	75.9%
<b>Total Site Info</b>	<b>19,670</b>	<b>0.45</b>	<b>0.513</b>	<b>86</b>	<b>37,565</b>	<b>1.25</b>	<b>4,690</b>			<b>\$117,250</b>	<b>75.9%</b>

**Summary of Proposed Green Infrastructure Practices**

Watershed/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 (SF)	Unit Cost (\$)	Unit	Total Cost (\$)	I.C. Treated %
	Area (SF)	Area (ac)									

**15 Woodstown Square / Woodstown Family Center**

Pervious pavement	30,530	0.70	0.795	133	58,299	1.94	4,770	25	SF	\$119,250	46.3%
<b>Total Site Info</b>	<b>30,530</b>	<b>0.70</b>	<b>0.795</b>	<b>133</b>	<b>58,299</b>	<b>1.94</b>	<b>4,770</b>			<b>\$119,250</b>	<b>46.3%</b>