RUTGERS
New Jersey Agricultural
Experiment Station

Draft

Impervious Cover Reduction Action Plan for Watchung Borough, Somerset County, New Jersey

Prepared for Watchung Borough by the
Rutgers Cooperative Extension Water Resources Program

September 30, 2015

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Introduction

Located in Somerset County in central New Jersey, Watchung Borough covers approximately 6.0 square miles. Figures 1 and 2 illustrate that Watchung Borough is dominated by urban land uses. A total of 62.6% of the municipality's land use is classified as urban. Of the urban land in Watchung Borough, rural 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 Watchung 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 Watchung Borough. Based upon the 2007 NJDEP land use/land cover data, approximately 16.7% of Watchung Borough has impervious cover. This level of impervious cover suggests that the streams in Watchung Borough are likely impacted. [1]

Methodology

Watchung 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.

[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

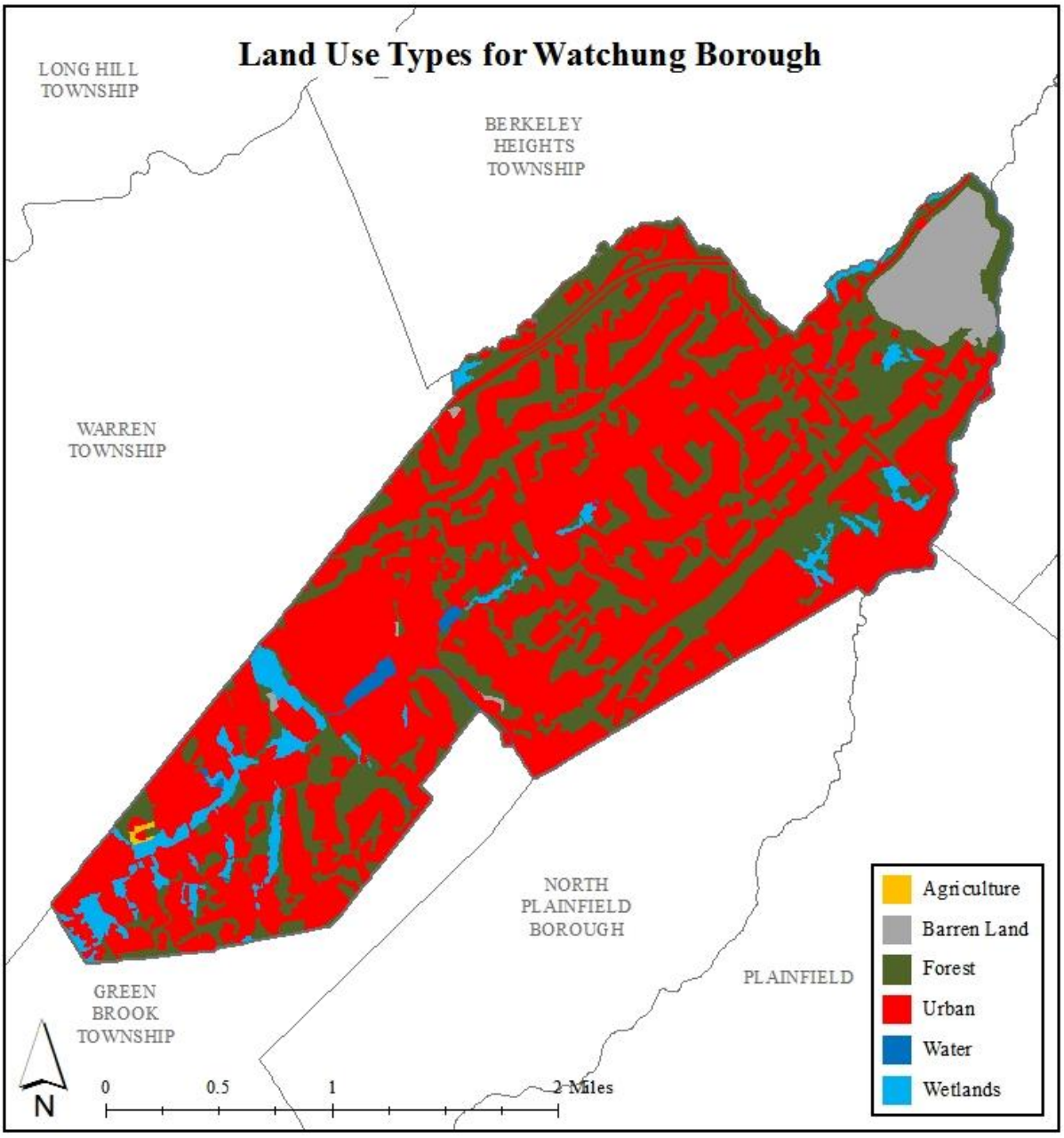


Figure 1: Map illustrating the land use in Watchung Borough

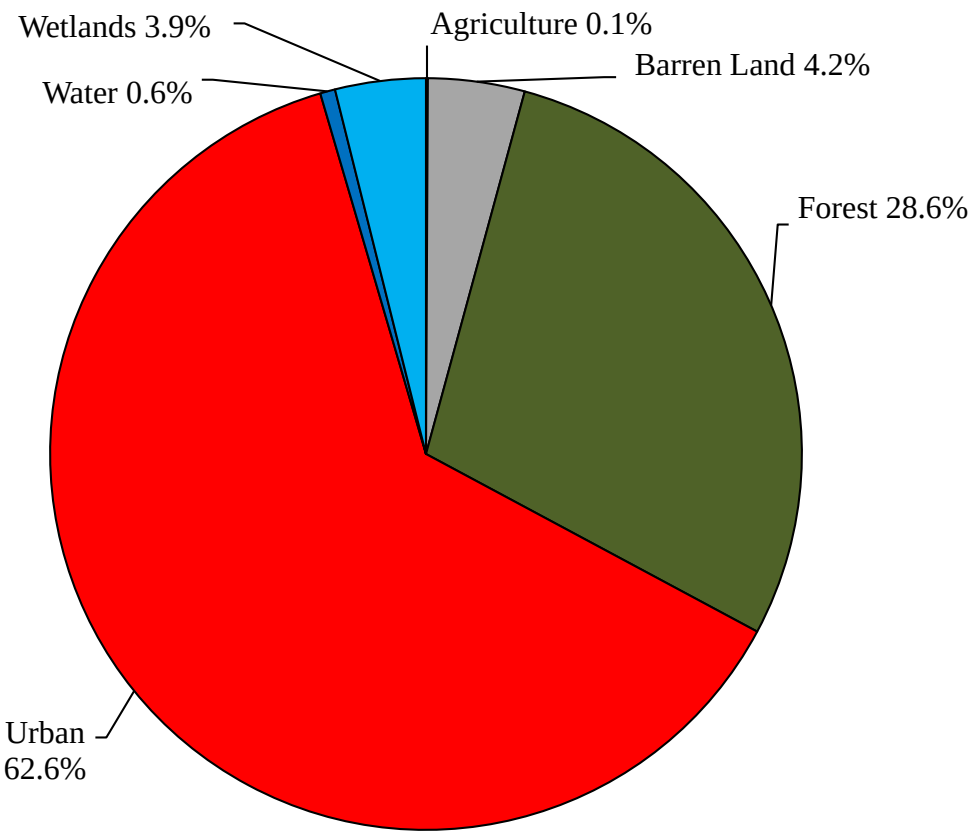


Figure 2: Pie chart illustrating the land use in Watchung Borough

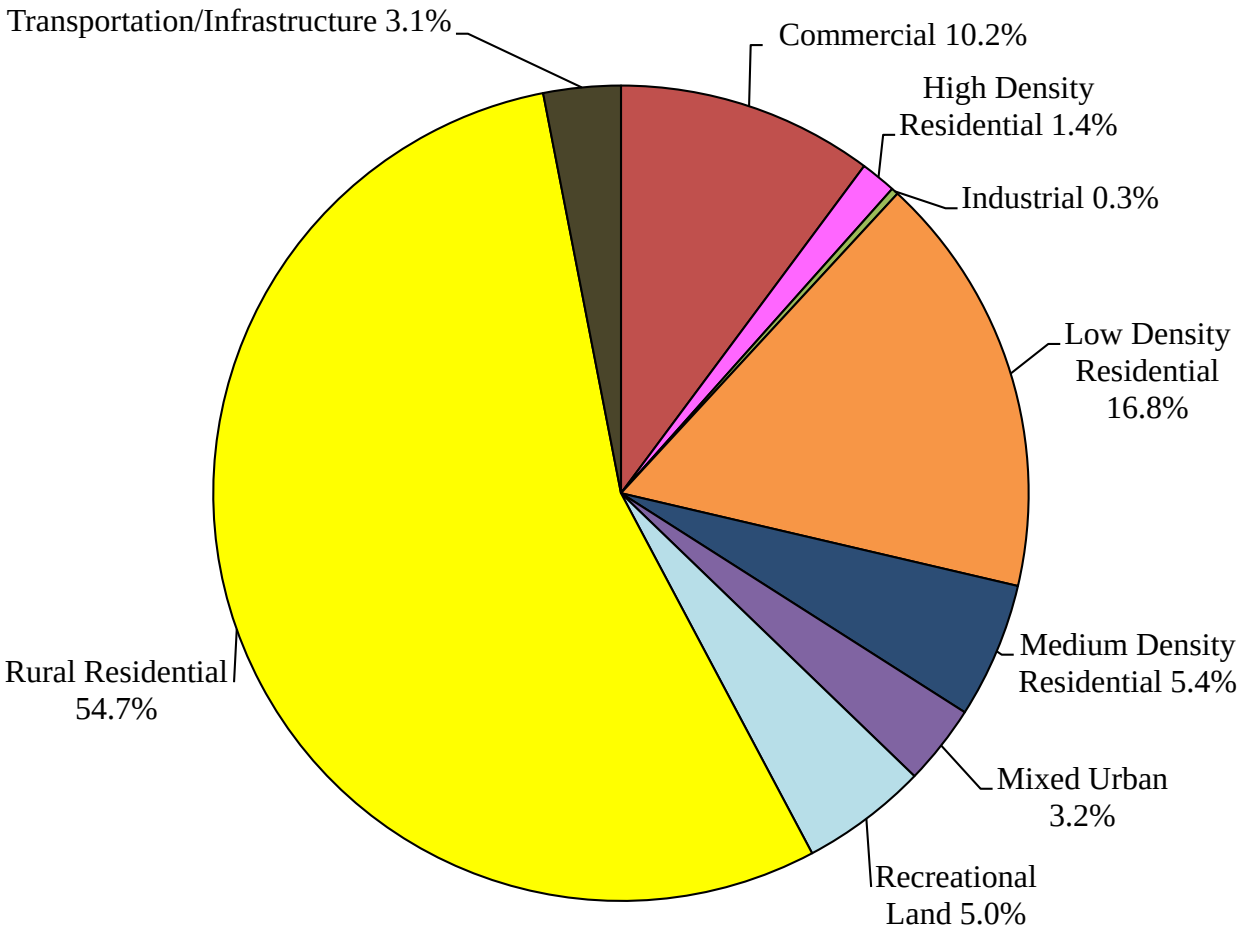


Figure 3: Pie chart illustrating the various types of urban land use in Watchung Borough

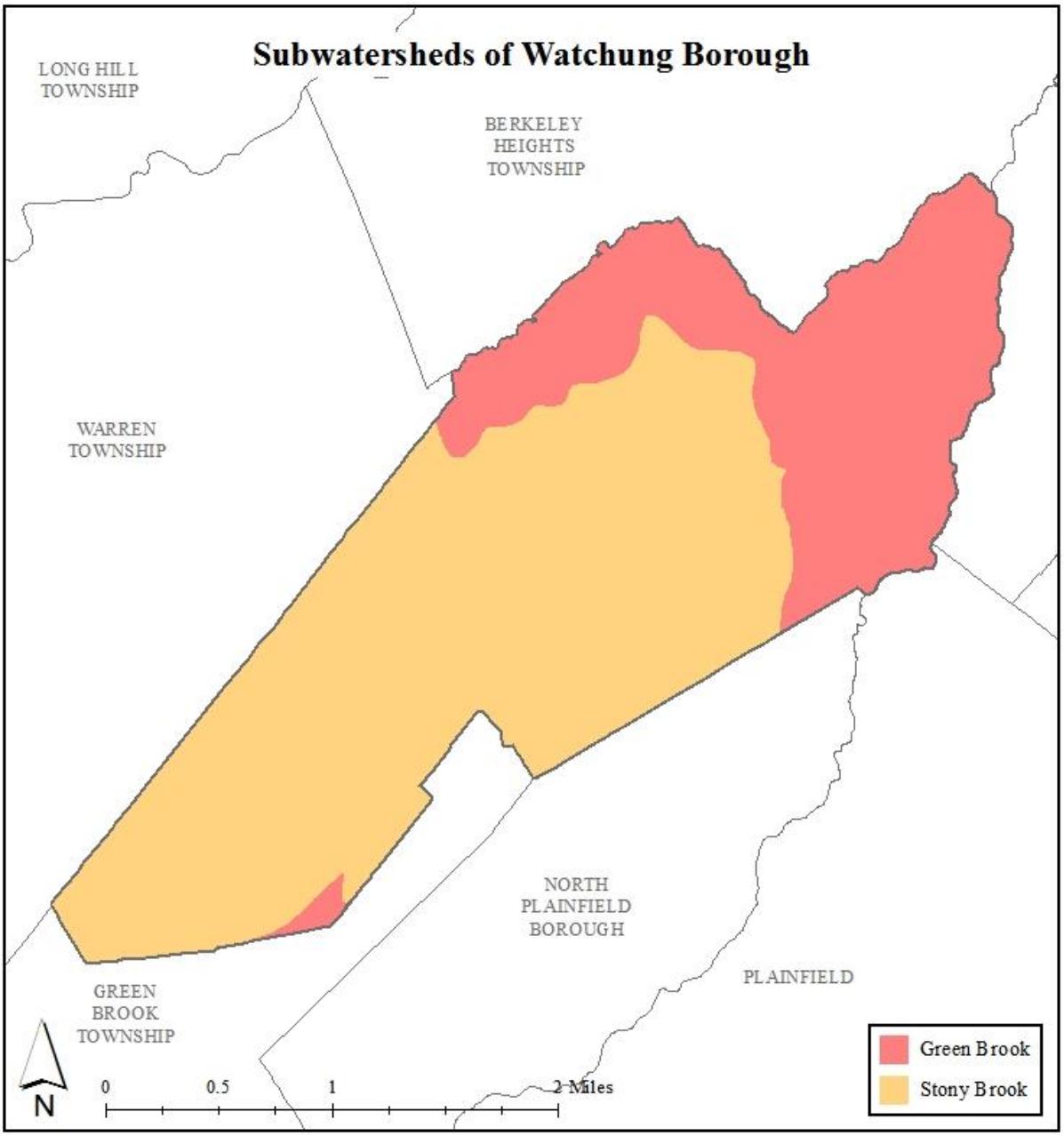


Figure 4: Map of the subwatersheds in Watchung Borough

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 Watchung 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[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 Watchung 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.




[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

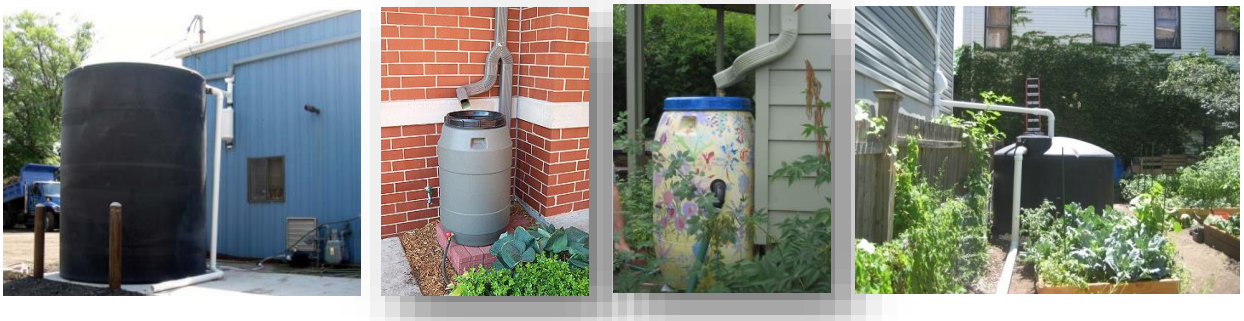
These are landscaped features that are designed to capture, treat, and infiltrate stormwater runoff. These systems can easily be incorporated into existing landscapes, improving aesthetics and creating a wildlife habitat while managing stormwater runoff. Bioretention systems also can be used in soils 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. [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.

ATTACHMENT: CLIMATE RESILIENT GREEN INFRASTRUCTURE

Contents:

a. Overview Map of the Project
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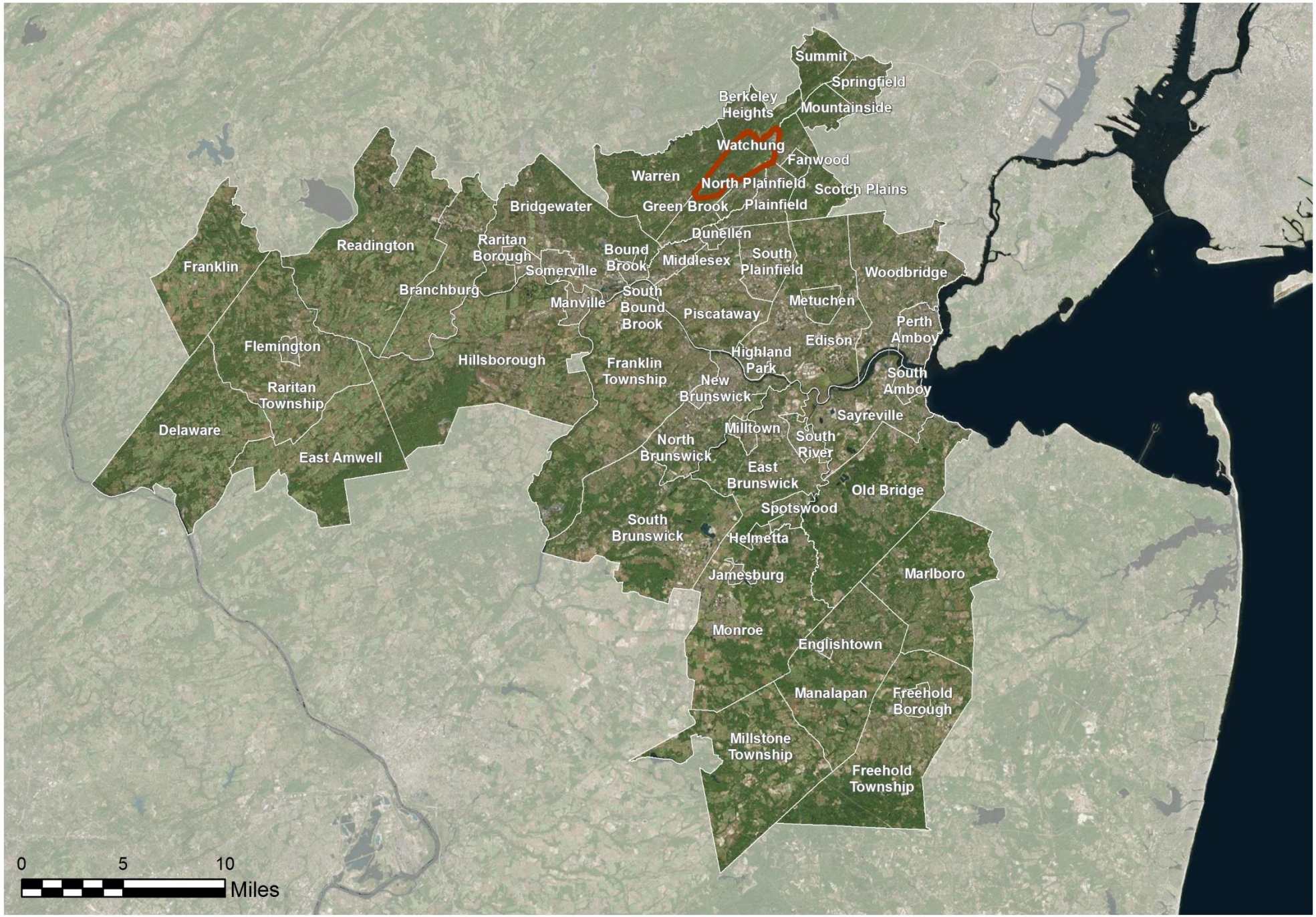
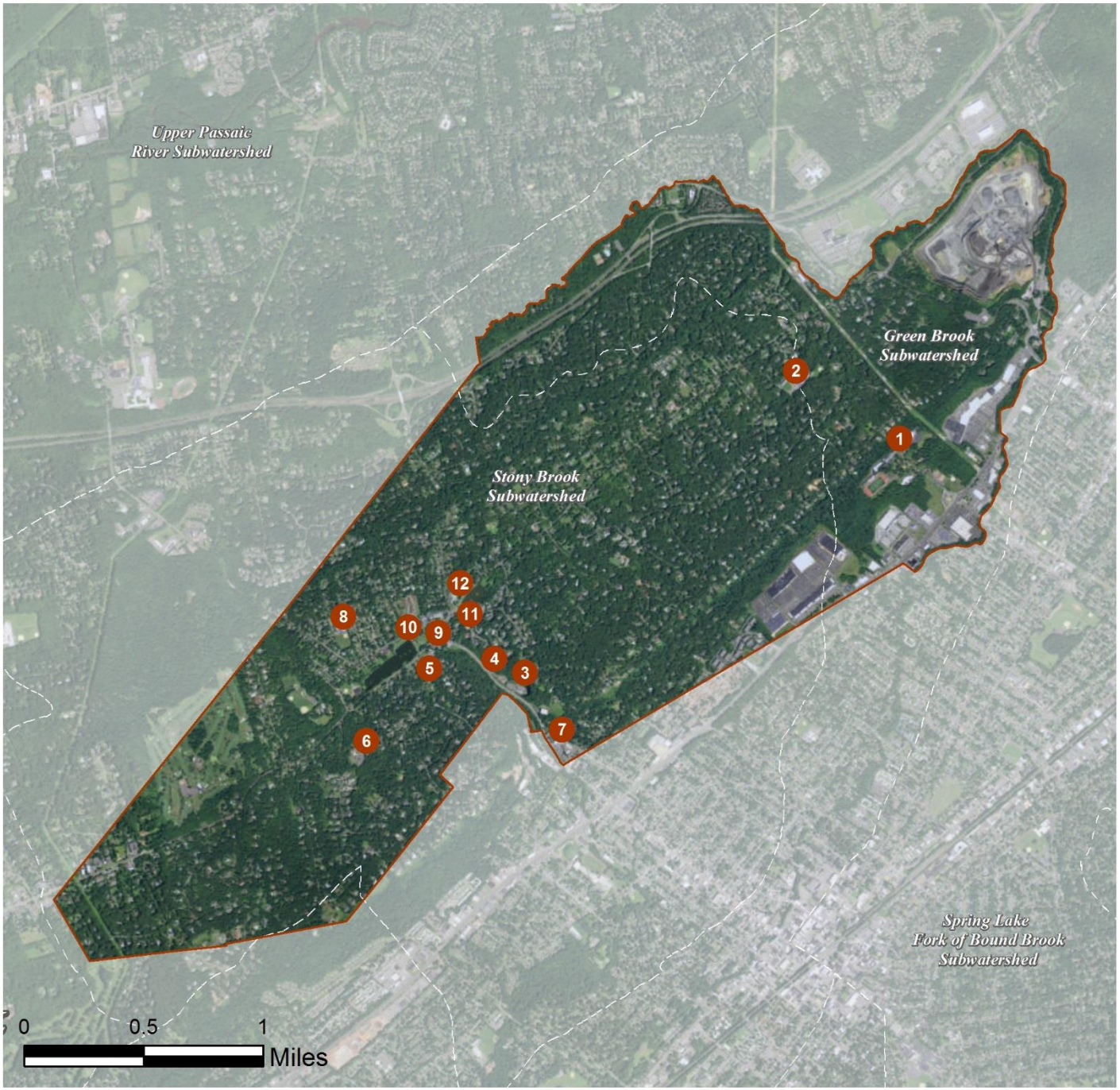
a. Overview Map of the Project

WATCHUNG: CLIMATE RESILIENT GREEN INFRASTRUCTURE FOR THE RARITAN BASIN



b. Green Infrastructure Sites

WATCHUNG: GREEN INFRASTRUCTURE SITES



SITES WITHIN THE GREEN BROOK SUBWATERSHED:

1. Mount Saint Mary Academy

SITES WITHIN THE STONY BROOK SUBWATERSHED:

2. Bayberry School
3. Borough of Watchung Police Department
4. Donald R Scott Public Works Center
5. Fire Department
6. St. Mary's Stony Hill Youth Group
7. US Post Office
8. Valley View School
9. Watchung Borough Administration
10. Watchung Lake Dev
11. Watchung Public Library
12. Wilson Memorial Church

c. Proposed Green Infrastructure Concepts

MOUNT SAINT MARY ACADEMY: GYMNASIUM

Subwatershed: **Green Brook**

Site Area: **2,505,968 sq. ft.**

Address: **1645 U.S. Highway 22**
Watchung, NJ 07069

Block and Lot: **Block 6402, Lot 5**

Rows of parking spaces and a picnic area next to the bus parking can be replaced with pervious pavement to infiltrate runoff. Rain gardens and bioswales can also capture, treat and infiltrate stormwater. A preliminary soil assessment suggests that more soil testing would be required before determining soil suitability for green infrastructure.

The tables below represent existing conditions and recommendations for all of Mount Saint Mary Academy.

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"
19	481,964	23.2	243.4	2,212.9	0.376	13.22

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	0.221	37	16,187	0.61	2,650	$13,250
Bioswales	0.037	6	2,708	0.10	380	$1,900
Pervious pavements	0.766	128	56,220	2.11	8,020	$200,500

GREEN INFRASTRUCTURE RECOMMENDATIONS

Mount Saint Mary Academy: Gymnasium

- pervious pavements
- bioretention / rain gardens
- bioswales
- drainage areas
- property line
- 2012 Aerial: NJOIT, OGIS

0 30' 60'

MOUNT SAINT MARY ACADEMY: PARKING LOT NEAR TRACK

Subwatershed: **Green Brook**

Site Area: **2,505,968 sq. ft.**

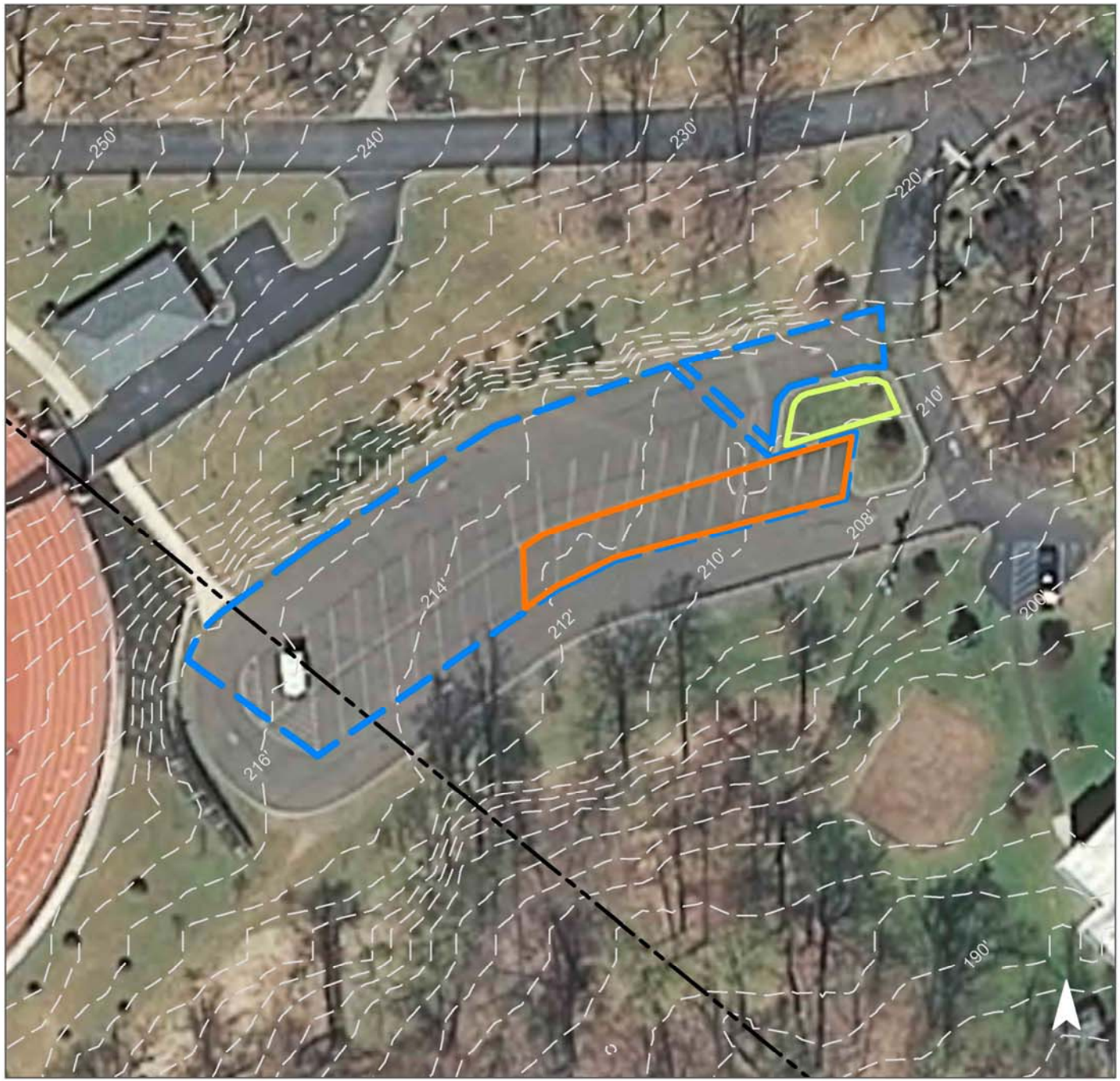
Address: **1645 U.S. Highway 22**
Watchung, NJ 07069

Block and Lot: **Block 6402, Lot 5**

Runoff from the parking lot currently drains toward the road. Parking spaces can be replaced with porous asphalt to capture and infiltrate stormwater. A rain garden can also capture, treat and infiltrate runoff on the site. A preliminary soil assessment suggests that more soil testing would be required before determining soil suitability for green infrastructure.

Please refer to the previous page for site and green infrastructure calculations for the Mount Saint Mary Academy.

GREEN INFRASTRUCTURE RECOMMENDATIONS



Mount Saint Mary Academy: Parking Lot

- pervious pavements
- bioretention / rain gardens
- drainage areas
- property line
- 2012 Aerial: NJOIT, OGIS

0 25' 50'

BAYBERRY SCHOOL

Subwatershed: **Stony Brook**

Site Area: **614,599 sq. ft.**

Address: **113 Bayberry Lane**
Watchung, NJ 07069

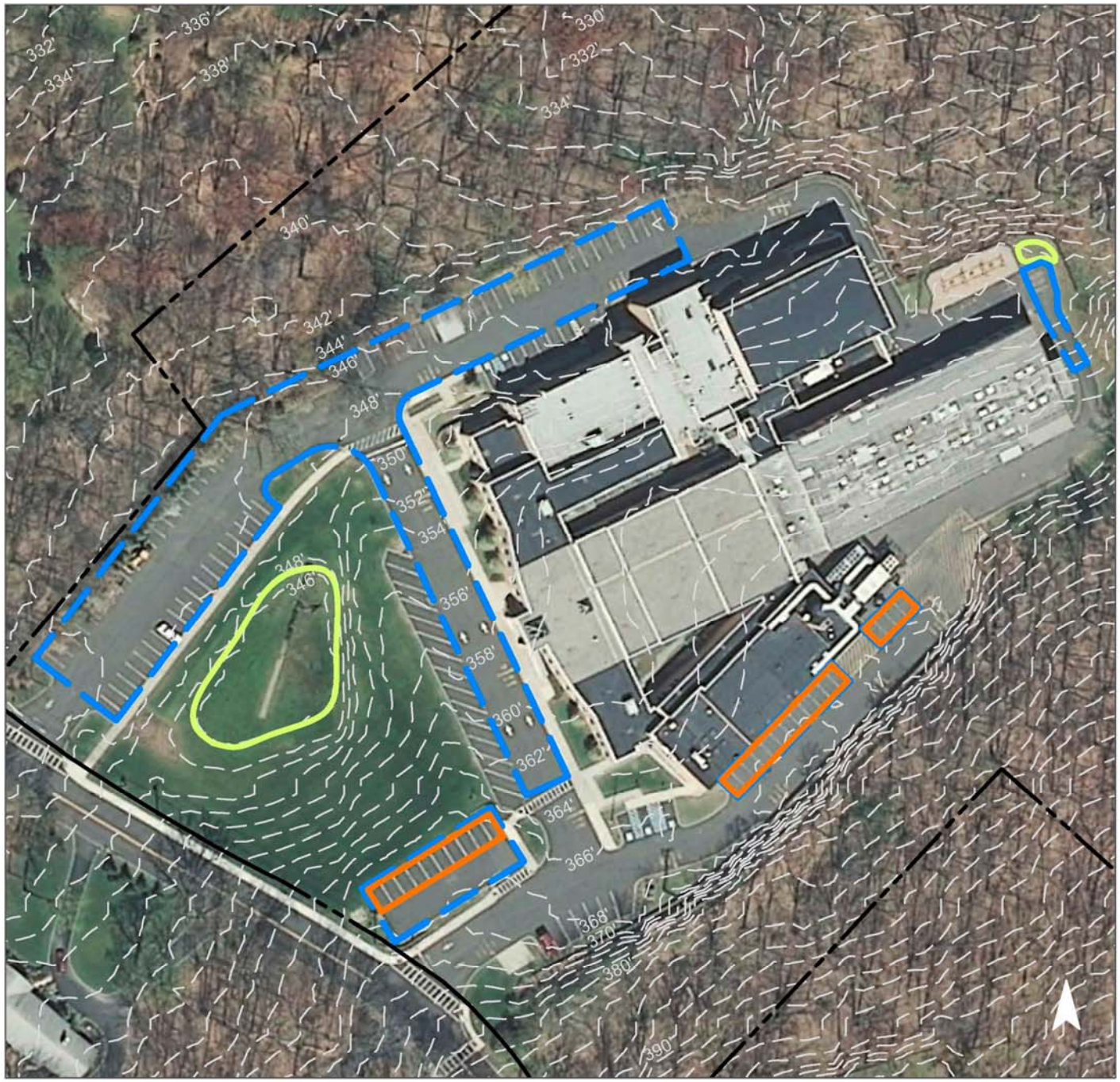
Block and Lot: **Block 6909, Lot 7**

Stormwater is currently directed into a detention basin. The detention basin can be converted into a bioretention system to promote groundwater recharge and TSS removal. A smaller bioretention system can also be implemented in the northeast to capture, treat and infiltrate runoff. Additionally, parking spots can be replaced with porous asphalt to capture and infiltrate stormwater. A preliminary soil assessment suggests that more soil testing would be required before determining soil 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"
28	173,767	8.4	87.8	797.8	0.135	4.77

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	0.929	156	68,173	2.56	7,715	$38,575
Pervious pavements	0.203	34	14,915	0.56	3,680	$92,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Bayberry School

- pervious pavements
- bioretention / rain gardens
- drainage areas
- property line
- 2012 Aerial: NJOIT, OGIS

0 50' 100'

BOROUGH OF WATCHUNG POLICE DEPARTMENT

Subwatershed: **Stony Brook**

Site Area: **280,504 sq. ft.**

Address: **840 Somerset Street #1**
Watchung, NJ 07069

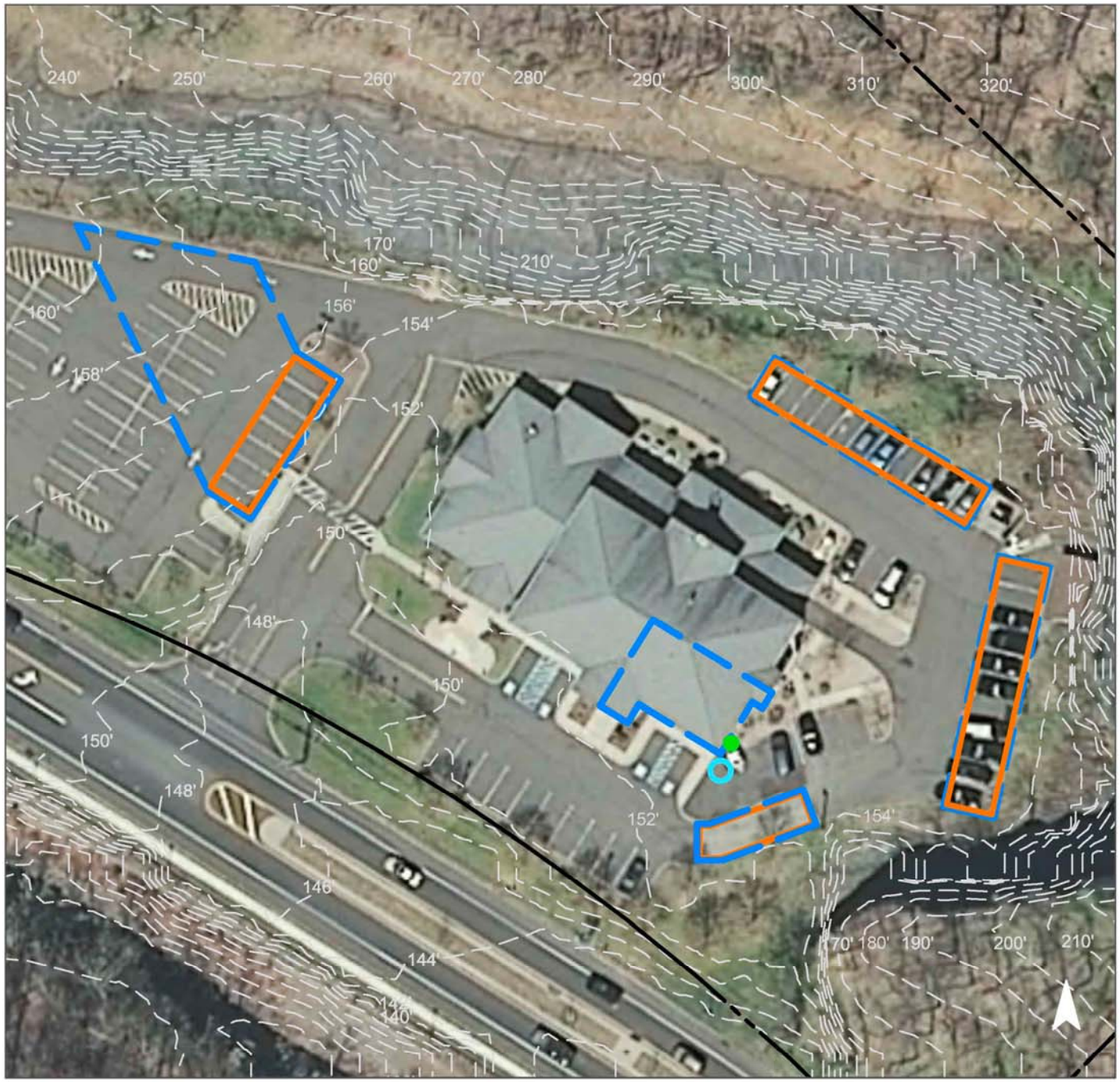
Block and Lot: **Block 4501, Lot 1.08**

Parking spots can be replaced with porous asphalt to capture and infiltrate stormwater. Downspouts can be redirected into a cistern on the southeast side of the building to harvest rain water. A preliminary soil assessment suggests that more soil testing would be required before determining soil 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"
37	104,725	5.0	52.9	480.8	0.082	2.87

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 pavements	0.254	42	18,618	0.70	5,485	$137,125
Rainwater harvesting systems	0.045	7	1,500	0.12	1500 (gal)	$3,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Borough of Watchung Police Department

- disconnected downspouts
- pervious pavements
- rainwater harvesting
- drainage areas
- property line
- 2012 Aerial: NJOIT, OGIS

0 30' 60'

DONALD R. SCOTT PUBLIC WORKS CENTER

Subwatershed: **Stony Brook**

Site Area: **111,746 sq. ft.**

Address: **880 Somerset Street**
Watchung, NJ 07069

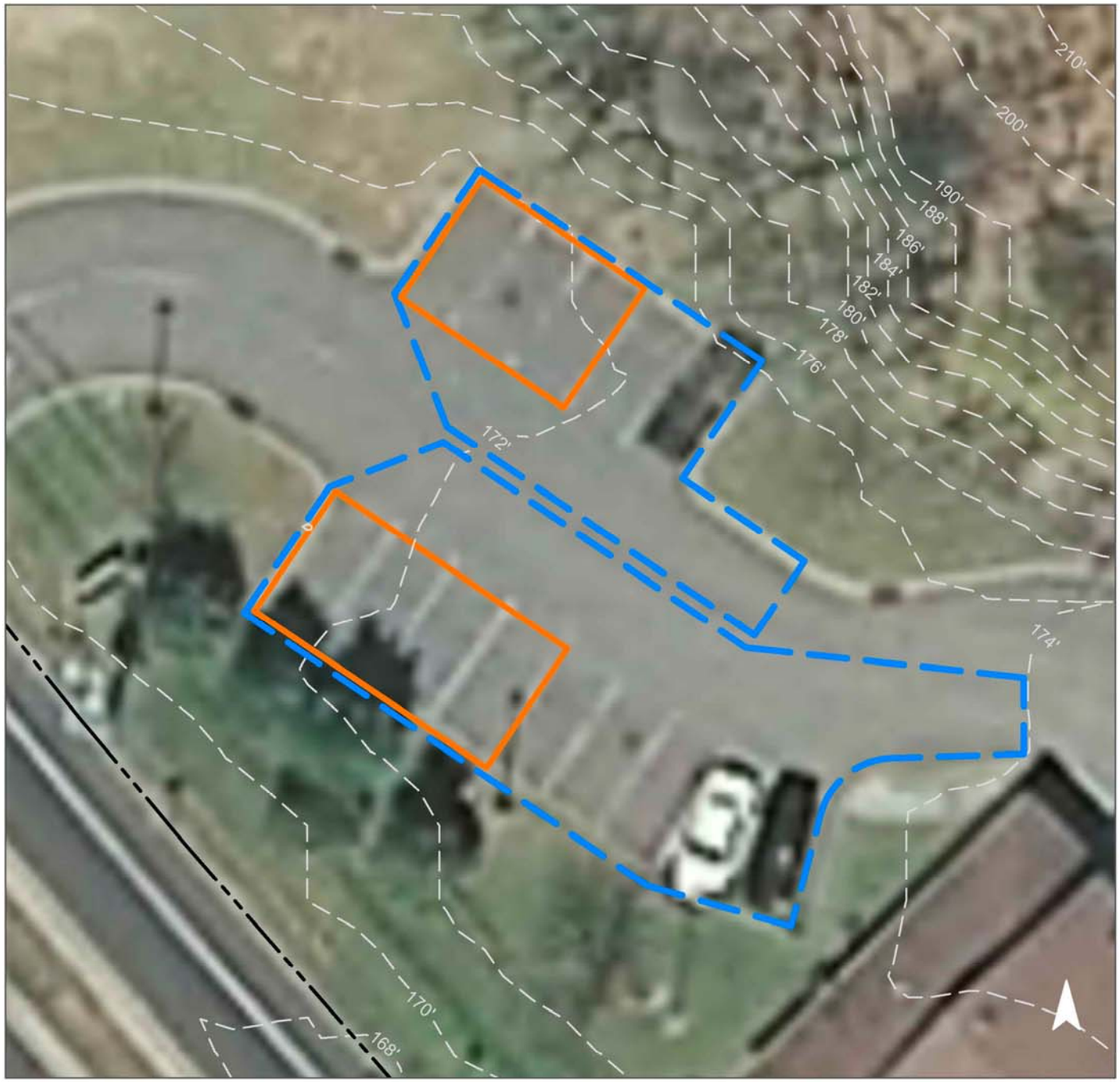
Block and Lot: **Block 4501, Lot 1.07**

Parking spots west of the building can be replaced with porous asphalt to capture and infiltrate stormwater. A preliminary soil assessment suggests that more soil testing would be required before determining soil 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"
28	30,736	1.5	15.5	141.1	0.024	0.84

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 pavements	0.114	19	8,385	0.32	1,185	$29,625

GREEN INFRASTRUCTURE RECOMMENDATIONS



Donald R. Scott Public Works Center

- pervious pavements
- drainage areas
- property line
- 2012 Aerial: NJOIT, OGIS

0 10' 20'

FIRE DEPARTMENT

Subwatershed: **Stony Brook**

Site Area: **49,766 sq. ft.**

Address: **57 Mountain Boulevard**
Watchung, NJ 07069

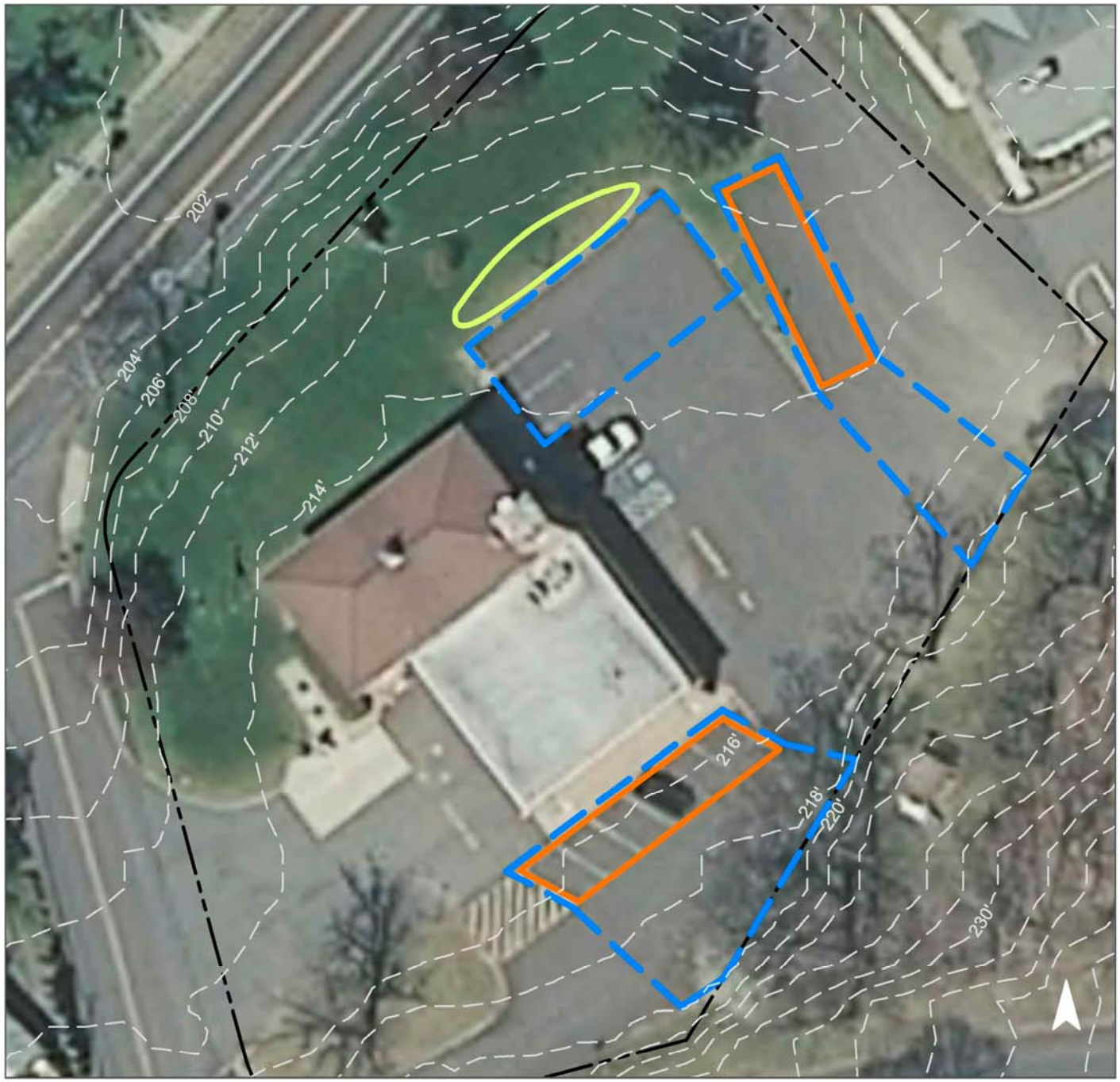
Block and Lot: **Block 1604, Lot 14**

Parking spots south of the building can be replaced with porous asphalt to capture and infiltrate stormwater. A wide drive way east of the building can be de-paved or converted into pervious pavement. Additionally, a rain garden can be installed beside the parking lot to capture, treat and infiltrate runoff. A preliminary soil assessment suggests that 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	37,325	1.8	18.9	171.4	0.029	1.02

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	0.056	9	4,084	0.15	540	$2,700
Pervious pavements	0.147	25	10,794	0.41	2,115	$52,875

GREEN INFRASTRUCTURE RECOMMENDATIONS



Fire Department

- disconnected downspouts
- pervious pavements
- bioretention / rain gardens
- drainage areas
- property line
- 2012 Aerial: NJOIT, OGIS

0 20' 40'

SAINT MARY'S STONY HILL YOUTH GROUP

Subwatershed: **Stony Brook**

Site Area: **1,072,613 sq. ft.**

Address: **225 Mountain Boulevard**
Watchung, NJ 07069

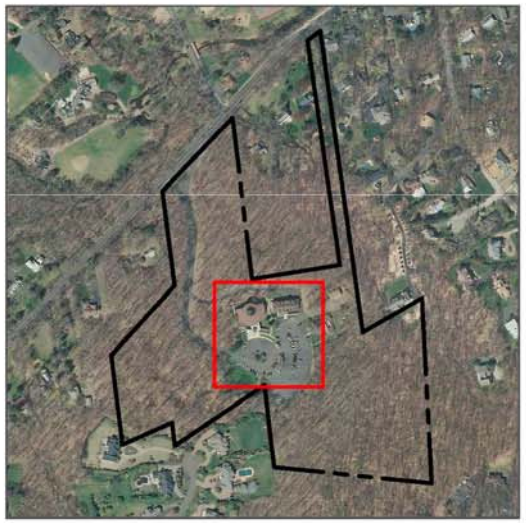
Block and Lot: **Block 1201, Lot 7**

Parking spots south of the building can be replaced with porous asphalt to capture and infiltrate stormwater. Several opportunities exist to disconnect downspouts into rain barrels, planting beds, or rain gardens. Rain gardens can also be installed to capture parking lot runoff. A preliminary soil assessment suggests that more soil testing would be required before determining soil 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"
17	182,793	8.8	92.3	839.3	0.142	5.01

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	0.094	16	6,920	0.26	940	$4,700
Pervious pavements	0.076	13	5,543	0.21	1,040	$26,000
Rainwater harvesting systems	0.001	0	55	0.00	55 (gal)	$250

GREEN INFRASTRUCTURE RECOMMENDATIONS



St. Mary's Stony Hill Youth Group

- disconnected downspouts
- pervious pavements
- bioretention / rain gardens
- rainwater harvesting
- drainage areas
- property line
- 2012 Aerial: NJOIT, OGIS

0 30' 60'

US POST OFFICE

Subwatershed: **Stony Brook**

Site Area: **37,922 sq. ft.**

Address: **475 Watchung Avenue**
Watchung, NJ 07069

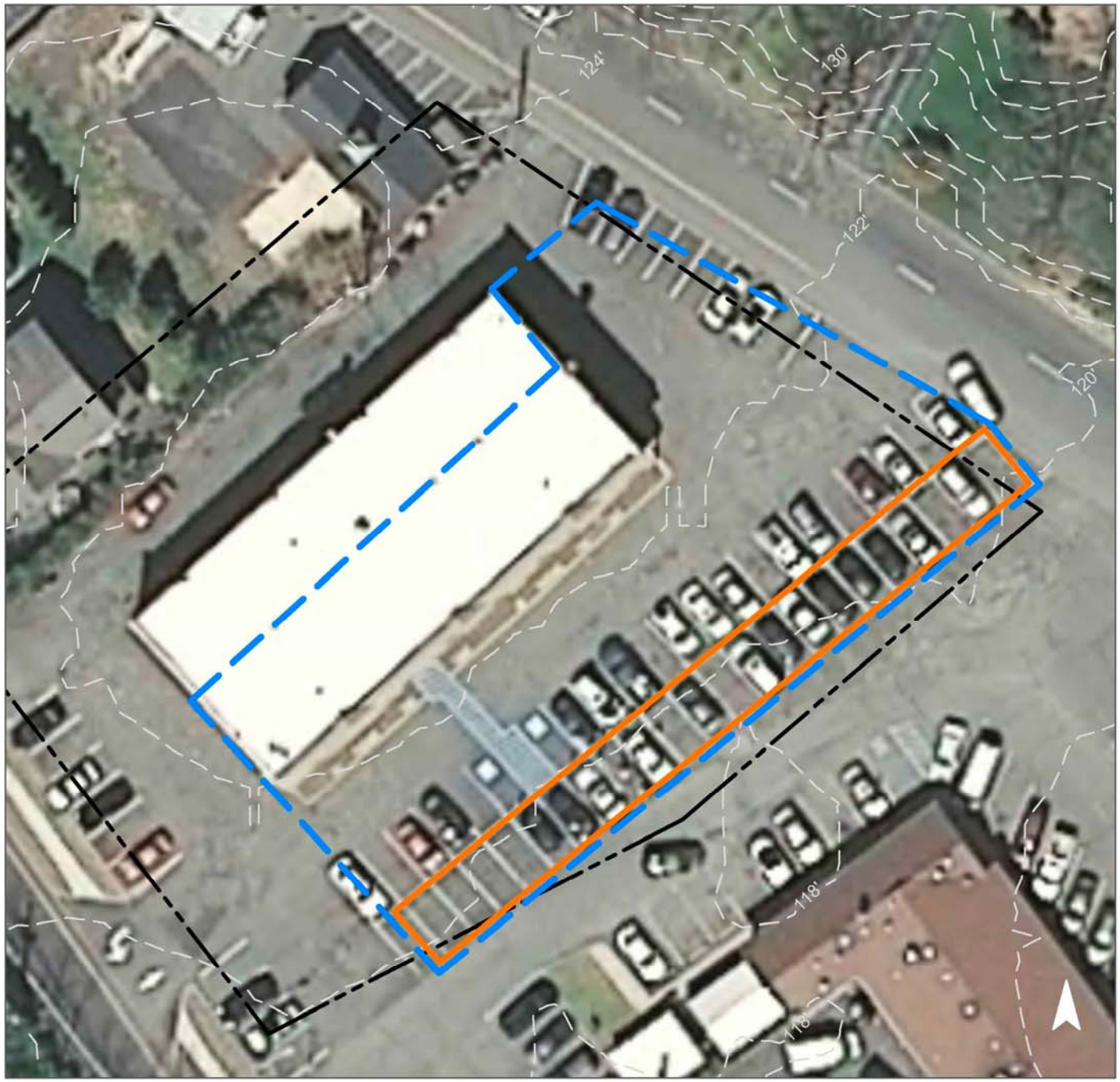
Block and Lot: **Block 4701, Lot 5**

Parking spots south of the building can be replaced with porous asphalt to capture and infiltrate stormwater. A preliminary soil assessment suggests that more soil testing would be required before determining soil 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"
90	34,130	1.6	17.2	156.7	0.027	0.94

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 pavements	0.538	90	39,494	1.48	3,645	$91,125

GREEN INFRASTRUCTURE RECOMMENDATIONS



US Post Office

- pervious pavements
- drainage areas
- property line
- 2012 Aerial: NJOIT, OGIS

0 20' 40'

VALLEY VIEW SCHOOL

Subwatershed: **Stony Brook**

Site Area: **245,131 sq. ft.**

Address: **50 Valleyview Road**
Watchung, NJ 07069

Block and Lot: **Block 3101, Lot 6**

Parking spots and a basketball court can be replaced with pervious pavement to capture and infiltrate stormwater. Pedestrian walkways around the school can be replaced with pervious concrete to capture stormwater as well. A preliminary soil assessment suggests that more soil testing would be required before determining soil 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	105,765	5.1	53.4	485.6	0.082	2.90

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 pavements	0.559	94	40,990	1.54	7,040	$176,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Valley View School

- disconnected downspouts
- pervious pavements
- drainage areas
- property line
- 2012 Aerial: NJOIT, OGIS

0 30' 60'

WATCHUNG BOROUGH ADMINISTRATION

Subwatershed: **Stony Brook**

Site Area: **70,046 sq. ft.**

Address: **15 Mountain Boulevard**
Watchung, NJ 07069

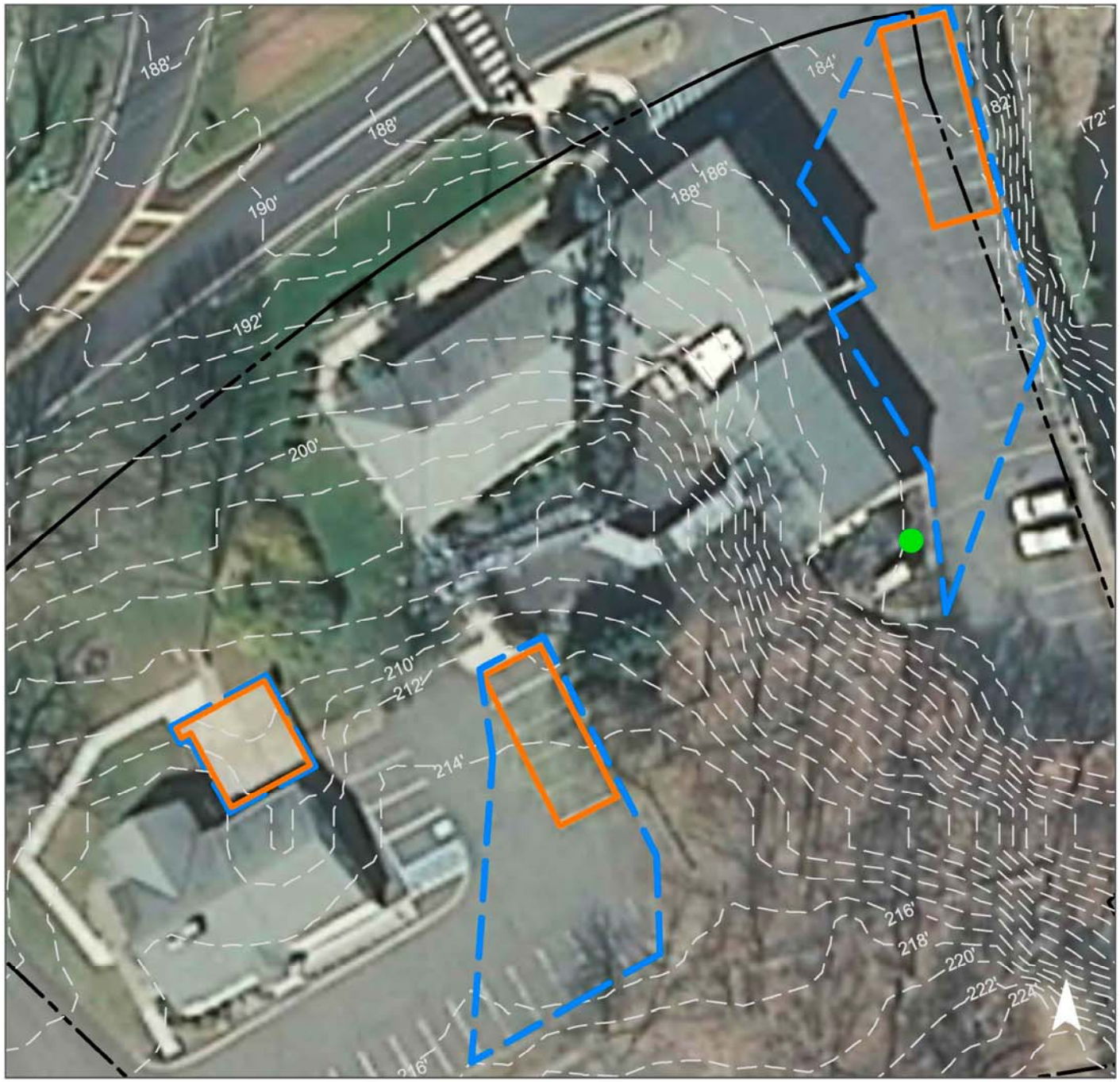
Block and Lot: **Block 1604, Lot 15.01**

Stormwater is currently directed to existing rain barrels and catch basins throughout the site. The paved picnic area beside the building can be replaced with permeable pavers to capture and infiltrate stormwater. Parking spaces can be replaced with porous asphalt to capture and infiltrate runoff as well. A preliminary soil assessment suggests that 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"
67	46,720	2.3	23.6	214.5	0.036	1.28

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 pavements	0.238	40	17,481	0.66	2,280	$57,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Watchung Boro Administration

- disconnected downspouts
- pervious pavements
- drainage areas
- property line
- 2012 Aerial: NJOIT, OGIS

0 20' 40'

WATCHUNG LAKE DEV

Subwatershed: **Stony Brook**

Site Area: **854,826 sq. ft.**

Address: **Watchung, NJ 07069**

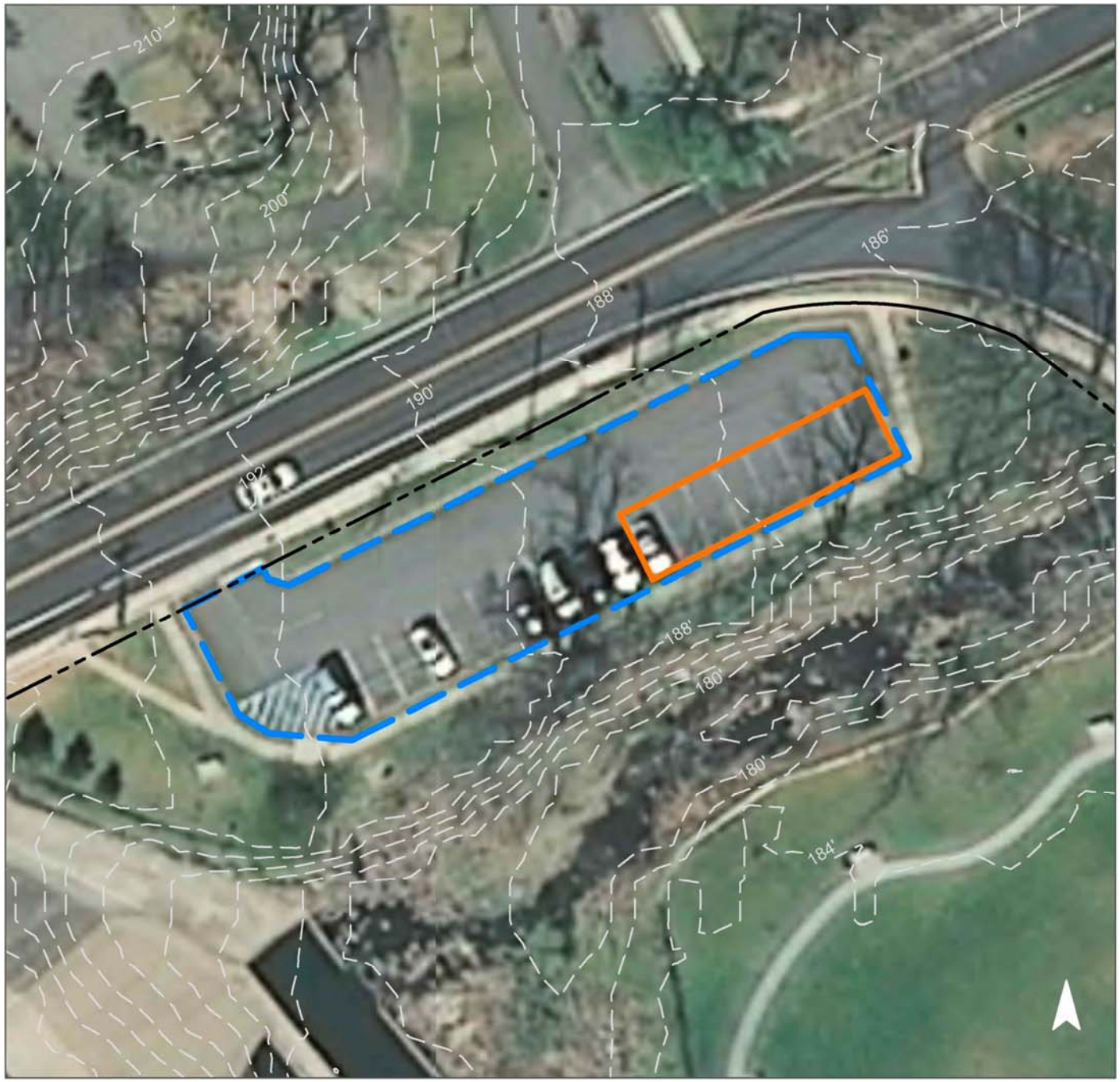
Block and Lot: **Block 2401, Lot 1.01**

Parking spots by the lake can be replaced with porous asphalt to capture and infiltrate stormwater. A preliminary soil assessment suggests that more soil testing would be required before determining soil 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"
6	47,638	2.3	24.1	218.7	0.037	1.31

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 pavements	0.198	33	14,564	0.55	1,375	$34,375

GREEN INFRASTRUCTURE RECOMMENDATIONS



Watchung Lake Dev

- pervious pavements
- drainage areas
- property line
- 2012 Aerial: NJOIT, OGIS

0 20' 40'

WATCHUNG PUBLIC LIBRARY

Subwatershed: **Stony Brook**

Site Area: **61,575 sq. ft.**

Address: **12 Stirling Road**
Watchung, NJ 07069

Block and Lot: **Block 4401, Lot 7**

Stormwater is currently directed into existing rain barrels and catch basins. Parking spots and sidewalks south of the building can be replaced with pervious pavement to capture and infiltrate stormwater. The private parking area west of the building can also be replaced with permeable pavers to capture and infiltrate roof runoff. A preliminary soil assessment suggests that 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	46,181	2.2	23.3	212.0	0.036	1.27

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
Pervious pavements	0.233	39	17,107	0.64	3,345	$83,625

GREEN INFRASTRUCTURE RECOMMENDATIONS

Watchung Public Library

- disconnected downspouts
- pervious pavements
- drainage areas
- property line
- 2012 Aerial: NJOIT, OGIS

0 20' 40'

WILSON MEMORIAL CHURCH

Subwatershed: **Stony Brook**

Site Area: **72,866 sq. ft.**

Address: **7 Valley Road**
Watchung, NJ 07069

Block and Lot: **Block 4301, Lot 1**

Parking spaces can be replaced with porous asphalt to capture and infiltrate stormwater. Sidewalks can be replaced with pervious pavement to capture stormwater as well. Rain gardens can capture, treat and infiltrate runoff from the roof. A preliminary soil assessment suggests that 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	54,650	2.6	27.6	250.9	0.043	1.50

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 systems	0.071	12	5,243	0.20	700	$3,500
Pervious pavements	0.082	14	6,051	0.23	1,500	$37,500

GREEN INFRASTRUCTURE RECOMMENDATIONS

Wilson Memorial Church

- disconnected downspouts
- pervious pavements
- bioretention / rain gardens
- drainage areas
- property line
- 2012 Aerial: NJOIT, OGIS

0 25' 50'

d. Summary of Existing Conditions

Summary of Existing Site Conditions

Subwatershed/Site Name/Total Site Info/GI Practice	Area (ac)	Area (SF)	Block	Lot	Existing Annual Loads TP (lb/yr)	Existing Annual Loads TN (lb/yr)	Existing Annual Loads TSS (lb/yr)	I.C. %	I.C. Area (ac)	I.C. Area (SF)	Runoff Volumes from I.C. Water Quality Storm (1.25" over 2-hours) (Mgal)	Runoff Volumes from I.C. Annual (Mgal)
GREEN BROOK SUBWATERSHED	**57.53**	**2,505,968**			**23.2**	**243.4**	**2,212.9**		**11.06**	**481,964**	**0.376**	**13.22**
Mount Saint Mary Academy												
Total Site Info	57.53	2,505,968	6402	5	23.2	243.4	2,212.9	19	11.06	481,964	0.376	13.22
STONY BROOK SUBWATERSHED	**79.70**	**3,471,594**			**41.7**	**436.6**	**3,968.9**		**19.84**	**864,429**	**0.674**	**23.71**
Bayberry School												
Total Site Info	14.11	614,599	6909	7	8.4	87.8	797.8	28	3.99	173,767	0.135	4.77
Borough of Watchung Police Department												
Total Site Info	6.44	280,504	4501	1.08	5.0	52.9	480.8	37	2.40	104,725	0.082	2.87
Donald R. Scott Public Works Center												
Total Site Info	2.57	111,746	4501	1.07	1.5	15.5	141.1	28	0.71	30,736	0.024	0.84
Fire Department												
Total Site Info	1.14	49,766	1604	14	1.8	18.9	171.4	75	0.86	37,325	0.029	1.02
Saint Mary's Stony Hill Youth Group												
Total Site Info	24.62	1,072,613	1201	7	8.8	92.3	839.3	17	4.20	182,793	0.142	5.01
US Post Office												
Total Site Info	0.87	37,922	4701	5	1.6	17.2	156.7	90	0.78	34,130	0.027	0.94
Valley View School												
Total Site Info	5.63	245,131	3101	6	5.1	53.4	485.6	43	2.43	105,765	0.082	2.90
Watchung Boro Administration												
Total Site Info	1.61	70,046	1604	15.01	2.3	23.6	214.5	67	1.07	46,720	0.036	1.28
Watchung Lake Dev												
Total Site Info	19.62	854,826	2401	1.01	2.3	24.1	218.7	6	1.09	47,638	0.037	1.31
Watchung Public Library												
Total Site Info	1.41	61,575	4401	7	2.2	23.3	212.0	75	1.06	46,181	0.036	1.27

Summary of Existing Site Conditions

Subwatershed/Site Name/Total Site Info/GI Practice	Area (ac)	Area (SF)	Block	Lot	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)
Wilson Memorial Church												
Total Site Info	1.67	72,866	4301	1	2.6	27.6	250.9	75	1.25	54,650	0.043	1.50

e. Summary of Proposed Green Infrastructure Practices

Summary of Propsed 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 (SF)	Unit Cost ($)	Unit	Total Cost ($)	I.C. Treated %
		Area (SF)	Area (ac)									
	GREEN BROOK SUBWATERSHED	**39,288**	**0.90**	**1.024**	**171**	**75,115**	**2.82**	**11,050**			**$215,650**	**8.2%**
1	**Mount Saint Mary Academy**											
	Bioretention systems/rain gardens	8,466	0.19	0.221	37	16,187	0.61	2,650	5	SF	$13,250	1.8%
	Bioswales	1,416	0.03	0.037	6	2,708	0.10	380	5	SF	$1,900	0.3%
	Pervious pavements	29,406	0.68	0.766	128	56,220	2.11	8,020	25	SF	$200,500	6.1%
	Total Site Info	**39,288**	**0.90**	**1.024**	**171**	**75,115**	**2.82**	**11,050**			**$215,650**	**8.2%**
	STONY BROOK SUBWATERSHED	**147,366**	**3.38**	**3.840**	**643**	**279,917**	**10.59**	**44,140**			**$869,975**	**17.0%**
2	**Bayberry School**											
	Bioretention systems/rain gardens	35,660	0.82	0.929	156	68,173	2.56	7,715	5	SF	$38,575	20.5%
	Pervious pavements	7,800	0.18	0.203	34	14,915	0.56	3,680	25	SF	$92,000	4.5%
	Total Site Info	**43,460**	**1.00**	**1.132**	**190**	**83,088**	**3.12**	**11,395**			**$130,575**	**25.0%**
3	**Borough of Watchung Police Department**											
	Pervious pavements	9,737	0.22	0.254	42	18,618	0.70	5,485	25	SF	$137,125	9.3%
	Rainwater harvesting systems	1,718	0.04	0.045	7	1,500	0.12	1,500	2	GAL.	$3,000	1.6%
	Total Site Info	**11,455**	**0.26**	**0.298**	**50**	**20,118**	**0.82**	**6,985**			**$140,125**	**10.9%**
4	**Donald R. Scott Public Works Center**											
	Pervious pavements	4,387	0.10	0.114	19	8,385	0.32	1,185	25	SF	$29,625	14.3%
	Total Site Info	**4,387**	**0.10**	**0.114**	**19**	**8,385**	**0.32**	**1,185**			**$29,625**	**14.3%**
5	**Fire Department**											
	Bioretention systems/rain gardens	2,136	0.05	0.056	9	4,084	0.15	540	5	SF	$2,700	5.7%
	Pervious pavements	5,646	0.13	0.147	25	10,794	0.41	2,115	25	SF	$52,875	15.1%
	Total Site Info	**7,781**	**0.18**	**0.203**	**34**	**14,878**	**0.56**	**2,655**			**$55,575**	**20.8%**
6	**Saint Mary's Stony Hill Youth Group**											
	Bioretention systems/rain gardens	3,620	0.08	0.094	16	6,920	0.26	940	5	SF	$4,700	2.0%
	Pervious pavements	2,900	0.07	0.076	13	5,543	0.21	1,040	25	SF	$26,000	1.6%
	Rainwater harvesting systems	53	0.00	0.001	0	55	0.00	55	1	BARREL	$250	0.0%
	Total Site Info	**6,573**	**0.15**	**0.171**	**29**	**12,518**	**0.47**	**2,035**			**$30,950**	**3.6%**

Summary of Propsed 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 (SF)	Unit Cost ($)	Unit	Total Cost ($)	I.C. Treated %
		Area (SF)	Area (ac)									
7	**US Post Office**											
	Pervious pavements	20,656	0.47	0.538	90	39,494	1.48	3,645	25	SF	$91,125	60.5%
	Total Site Info	**20,656**	**0.47**	**0.538**	**90**	**39,494**	**1.48**	**3,645**			**$91,125**	**60.5%**
8	**Valley View School**											
	Pervious pavements	21,441	0.49	0.559	94	40,990	1.54	7,040	25	SF	$176,000	20.3%
	Total Site Info	**21,441**	**0.49**	**0.559**	**94**	**40,990**	**1.54**	**7,040**			**$176,000**	**20.3%**
9	**Watchung Borough Administration**											
	Pervious pavements	9,143	0.21	0.238	40	17,481	0.66	2,280	25	SF	$57,000	19.6%
	Total Site Info	**9,143**	**0.21**	**0.238**	**40**	**17,481**	**0.66**	**2,280**			**$57,000**	**19.6%**
10	**Watchung Lake Dev**											
	Pervious pavements	7,618	0.17	0.198	33	14,564	0.55	1,375	25	SF	$34,375	16.0%
	Total Site Info	**7,618**	**0.17**	**0.198**	**33**	**14,564**	**0.55**	**1,375**			**$34,375**	**16.0%**
11	**Watchung Public Library**											
	Pervious pavements	8,947	0.21	0.233	39	17,107	0.64	3,345	25	SF	$83,625	19.4%
	Total Site Info	**8,947**	**0.21**	**0.233**	**39**	**17,107**	**0.64**	**3,345**			**$83,625**	**19.4%**
12	**Wilson Memorial Church**											
	Bioretention systems/rain gardens	2,741	0.06	0.071	12	5,243	0.20	700	5	SF	$3,500	5.0%
	Pervious pavements	3,165	0.07	0.082	14	6,051	0.23	1,500	25	SF	$37,500	5.8%
	Total Site Info	**5,906**	**0.14**	**0.154**	**26**	**11,294**	**0.43**	**2,200**			**$41,000**	**10.8%**