RUTGERS
New Jersey Agricultural
Experiment Station

Impervious Cover Reduction Action Plan
for
Mount Olive Township, Morris County, New Jersey

Prepared for Mount Olive Township by the
Rutgers Cooperative Extension Water Resources Program

August 10, 2016

WILLIAM PENN
FOUNDATION

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Introduction

Located in Morris County in northern New Jersey, Mount Olive Township covers approximately 31.2 square miles. Figures 1 and 2 illustrate that Mount Olive Township is dominated by forest land uses. A total of 32.5% of the municipality's land use is classified as urban. Of the urban land in Mount Olive Township, low density residential is the dominant land use (Figure 3).

The New Jersey Department of Environmental Protection's (NJDEP) 2012 land use/land cover geographical information system (GIS) data layer categorizes Mount Olive 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 Mount Olive Township. Based upon the 2012 NJDEP land use/land cover data, approximately 10.0% of Mount Olive Township has impervious cover. This level of impervious cover suggests that the streams Mount Olive Township are likely sensitive streams.[1]

Methodology

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

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

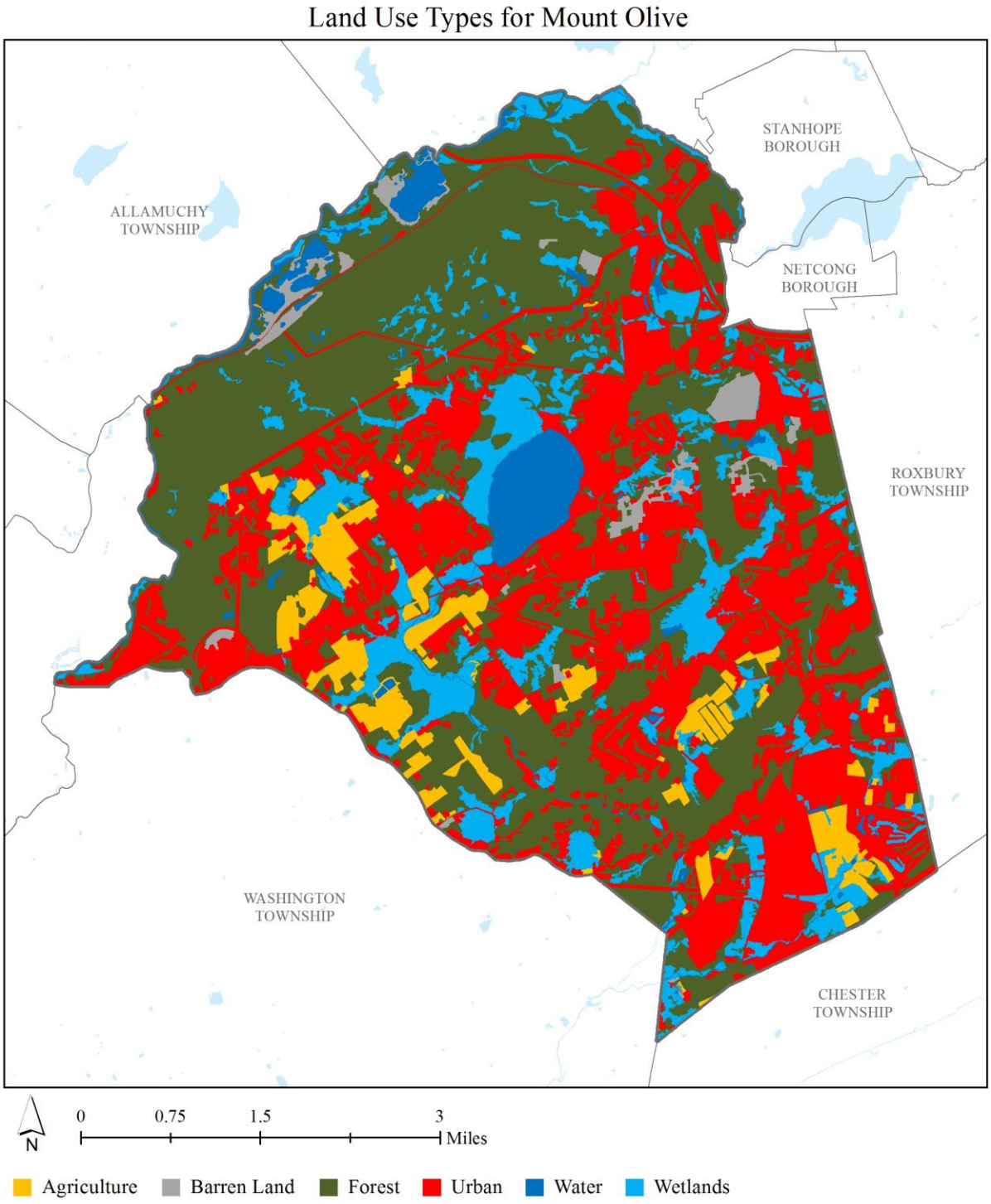


Figure 1: Map illustrating the land use in Mount Olive Township

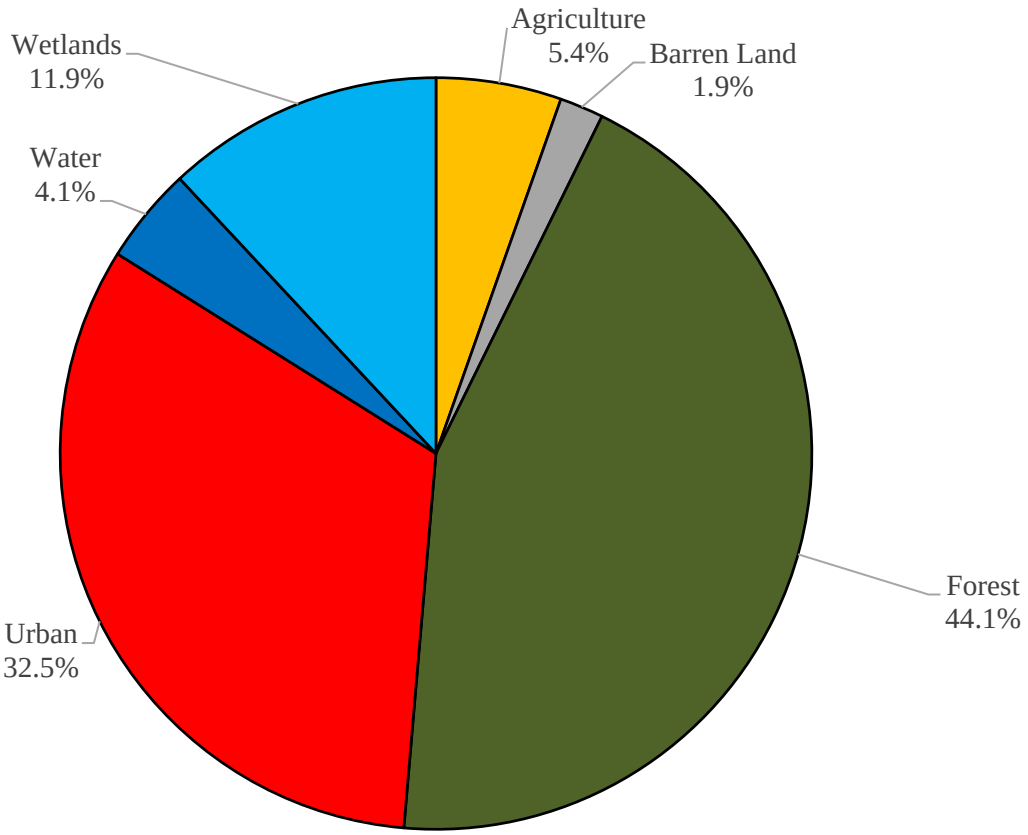


Figure 2: Pie chart illustrating the land use in Mount Olive Township

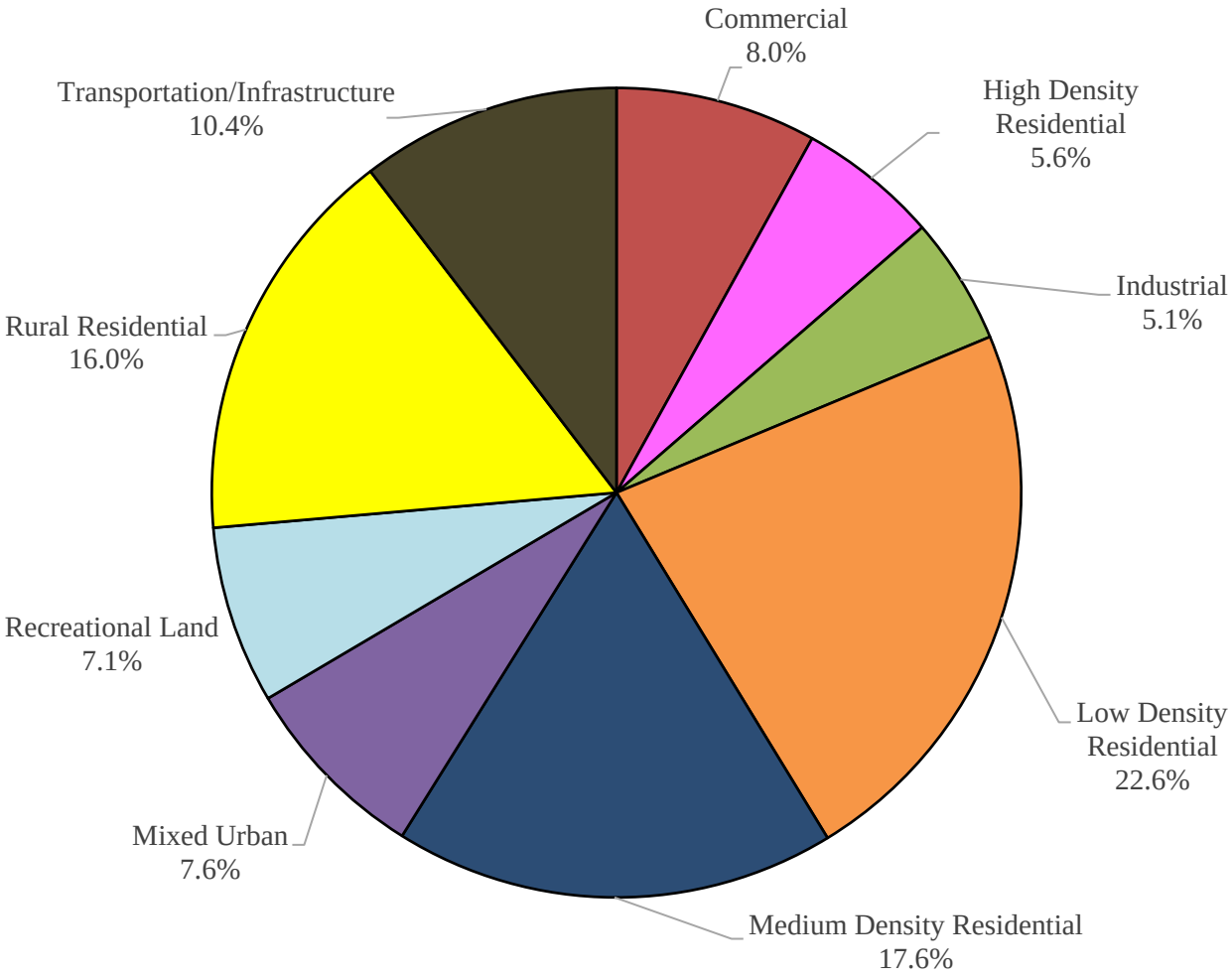


Figure 3: Pie chart illustrating the various types of urban land use in Mount Olive Township

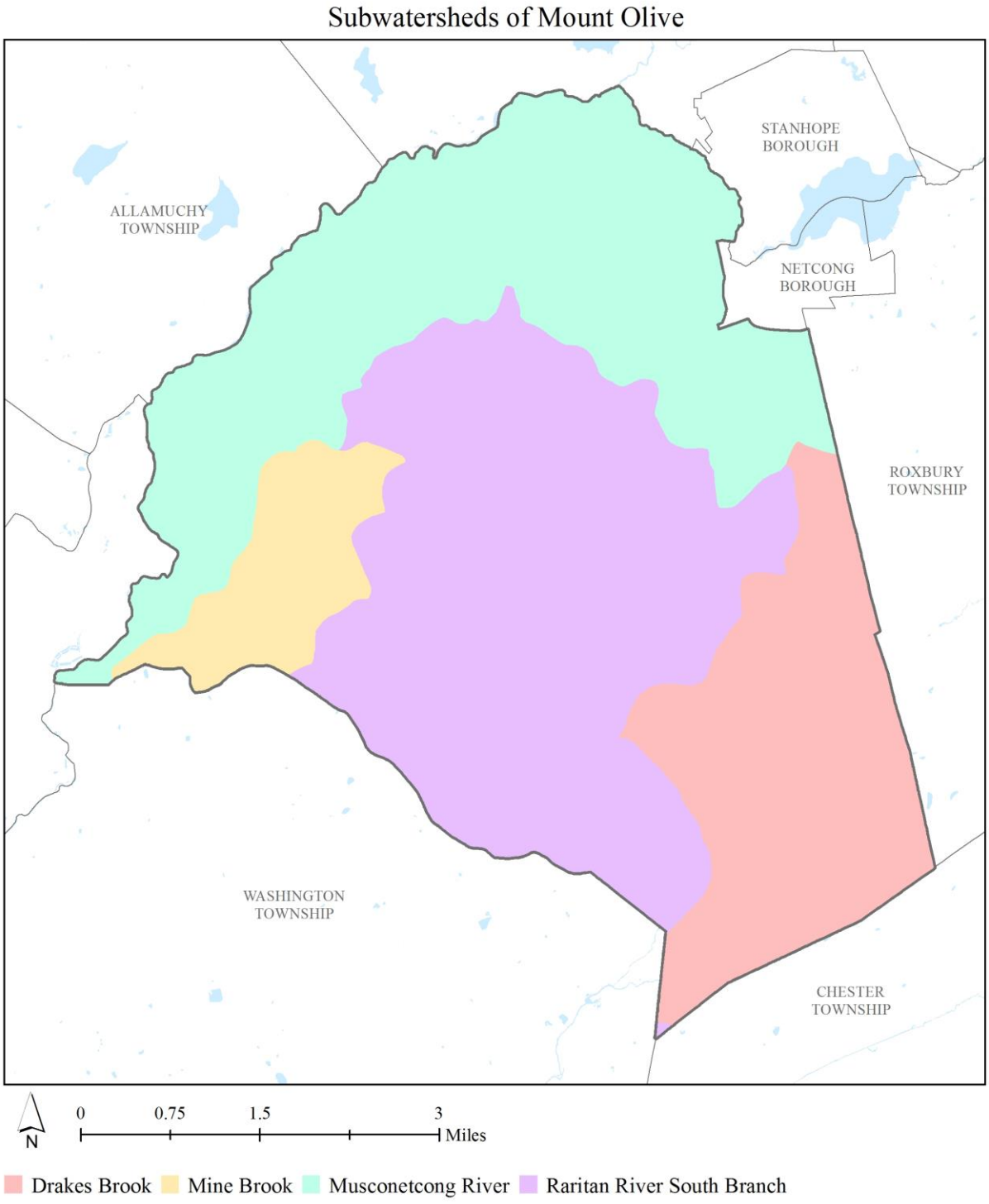


Figure 4: Map of the subwatersheds in Mount Olive Township

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

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

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

Table 1: Aerial Loading Coefficients[2]

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

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

Green Infrastructure Practices

Green infrastructure is an approach to stormwater management that is cost-effective, sustainable, and environmentally friendly. Green infrastructure projects capture, filter, absorb, and reuse stormwater to maintain or mimic natural systems and to treat runoff as a resource. As a general principal, green infrastructure practices use soil and vegetation to recycle stormwater runoff through infiltration and evapotranspiration. When used as components of a stormwater management system, green infrastructure practices such as bioretention, green roofs, porous pavement, rain gardens, and vegetated swales can produce a variety of environmental benefits. In addition to effectively retaining and infiltrating rainfall, these practices can simultaneously help filter air pollutants, reduce energy demands, mitigate urban heat islands, and sequester carbon while also providing communities with aesthetic and natural resource benefits[3]. A wide range of green infrastructure practices have been evaluated for the potential project sites in Mount Olive Township. Each practice is discussed below.

Disconnected downspouts

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

Pervious pavements

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




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

Bioretention systems/rain gardens

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

Downspout planter boxes

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

Rainwater harvesting systems (cistern or rain barrel)

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

Bioswale

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

Stormwater planters

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

Tree filter boxes

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

Potential Project Sites

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*.

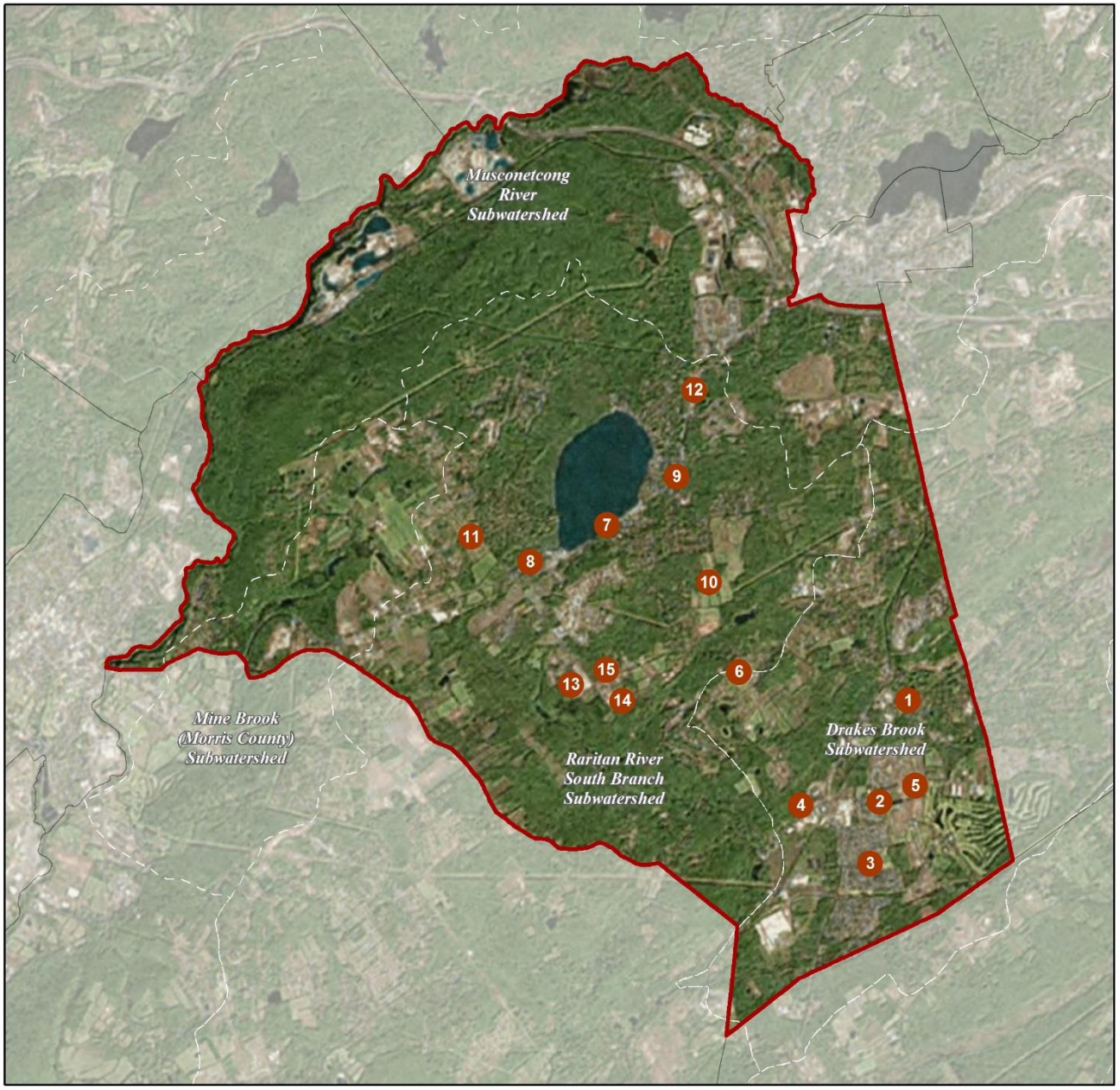
Conclusion

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.

a. Green Infrastructure Sites

MOUNT OLIVE TOWNSHIP: GREEN INFRASTRUCTURE SITES



SITES WITHIN THE DRAKES BROOK SUBWATERSHED:

1. Flanders Fire Company No. 1
2. Flanders Park
3. Mountain View Elementary School
4. New Beginnings Bible Church
5. Temple Hatikvah
6. Tinc Road Elementary School

SITES WITHIN THE RARITAN RIVER SOUTH BRANCH SUBWATERSHED:

7. Abiding Peace Lutheran Church
8. Budd Lake Fire Department
9. Budd Lake Post Office
10. Chester M. Stephens Elementary School
11. Christ Episcopal Church
12. Lakeview Medical
13. Mount Olive Middle School
14. Mount Olive Public Library
15. Mount Olive Public Works

b. Proposed Green Infrastructure Concepts

FLANDERS FIRE COMPANY NO.1

Subwatershed: Drakes Brook

Site Area: 48,177 sq. ft.

Address: 27 Main Street
Mount Olive, NJ 07828

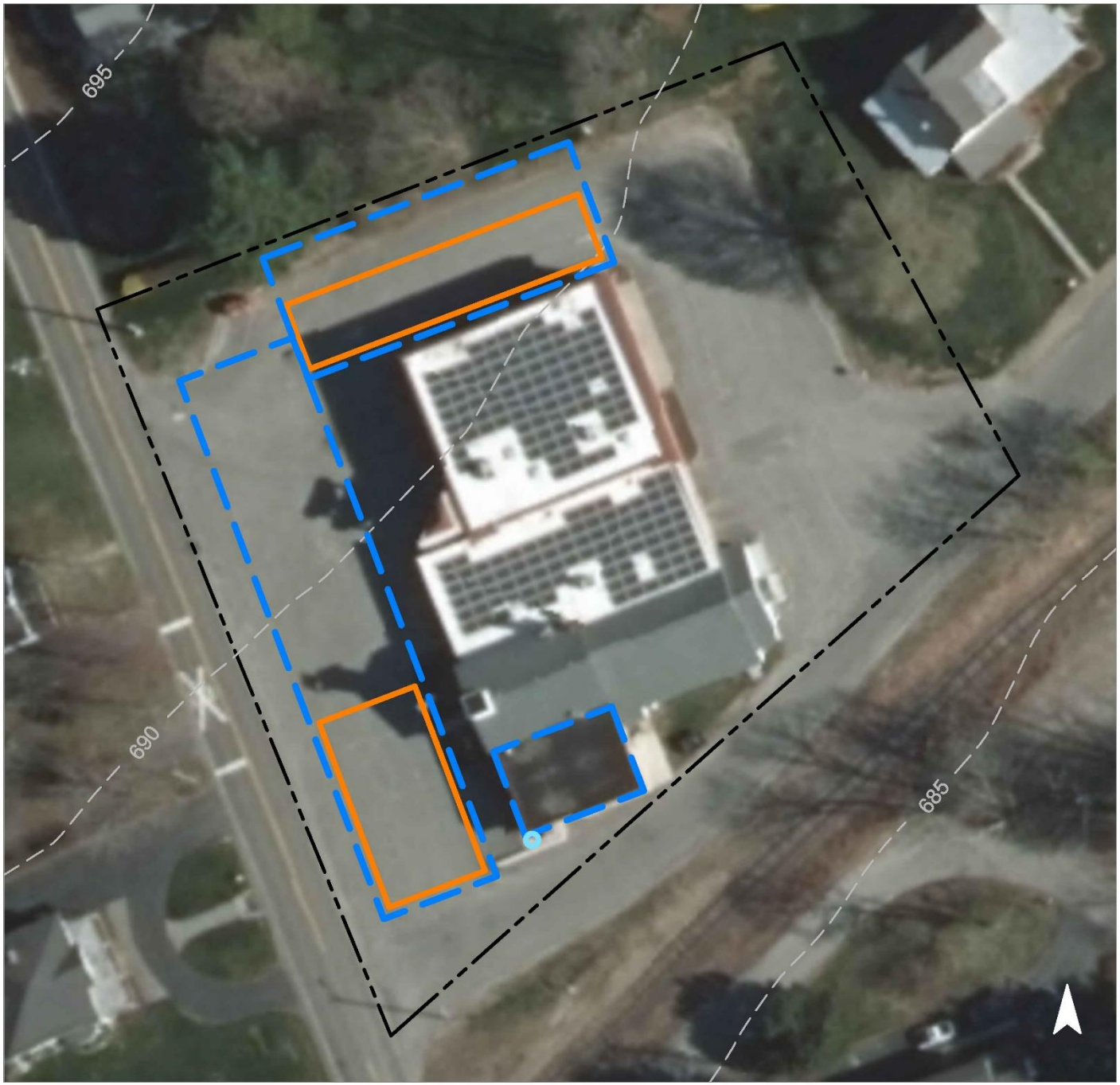
Block and Lot: Block 5500, Lot 10, 11

Parking spaces on the north side and west side of the building can be replaced with porous asphalt to infiltrate stormwater. Rainwater can be harvested by installing a cistern at the southwest corner of the building and be used for washing trucks. 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"
84	40,360	1.9	20.4	185.3	0.031	1.11

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	0.313	52	4,400	1.62	5,680	$142,000
Rainwater harvesting	0.032	5	1,000	0.09	1,000 (gal)	$2,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Flanders Fire Company No.1

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

0 25' 50'

FLANDERS PARK

Subwatershed: Drakes Brook

Site Area: 838,388 sq. ft.

Address: Allyson Road
Mount Olive, NJ 07828

Block and Lot: Block 6000, Lot 12

Parking spaces and the basketball court can be replaced with porous asphalt to infiltrate stormwater. 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"
8	65,592	3.2	33.1	301.2	0.051	1.80

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	0.908	152	70,955	2.66	19,000	$475,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Flanders Park

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

0 50' 100'

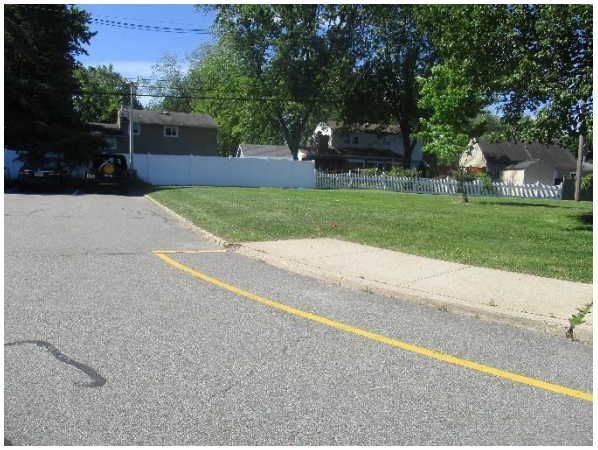
MOUNTAIN VIEW ELEMENTARY SCHOOL

Subwatershed: Raritan River South Branch

Site Area: 860,860 sq. ft.

Address: 118 Clover Hill Drive
Mount Olive, NJ 07828

Block and Lot: Block 6208, Lot 24



A rain garden adjacent to the parking lot can capture, treat, and infiltrate stormwater runoff. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
26	222,800	10.7	112.5	1,023.0	0.174	6.11

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	0.306	51	23,936	0.90	3,000	$15,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Mountain View Elementary School

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

0 50' 100'

NEW BEGINNINGS BIBLE CHURCH

Subwatershed: Drakes Brook

Site Area: 138,673 sq. ft.

Address: 104 Bartley Flanders Road
Mount Olive, NJ 07828

Block and Lot: Block 5300, Lot 31

Parking spaces northwest of the building can be replaced with porous asphalt to infiltrate stormwater from the roof and 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"
30	41,622	2.0	21.0	191.1	0.032	1.14

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
Pervious pavement	0.172	29	13,442	0.50	1,730	$43,250

GREEN INFRASTRUCTURE RECOMMENDATIONS

New Beginnings Bible Church

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

0 20' 40'

TEMPLE HATIKVAH

Subwatershed: Drakes Brook

Site Area: 102,086 sq. ft.

Address: 58 Pleasant Hill Road
Mount Olive, NJ 07828

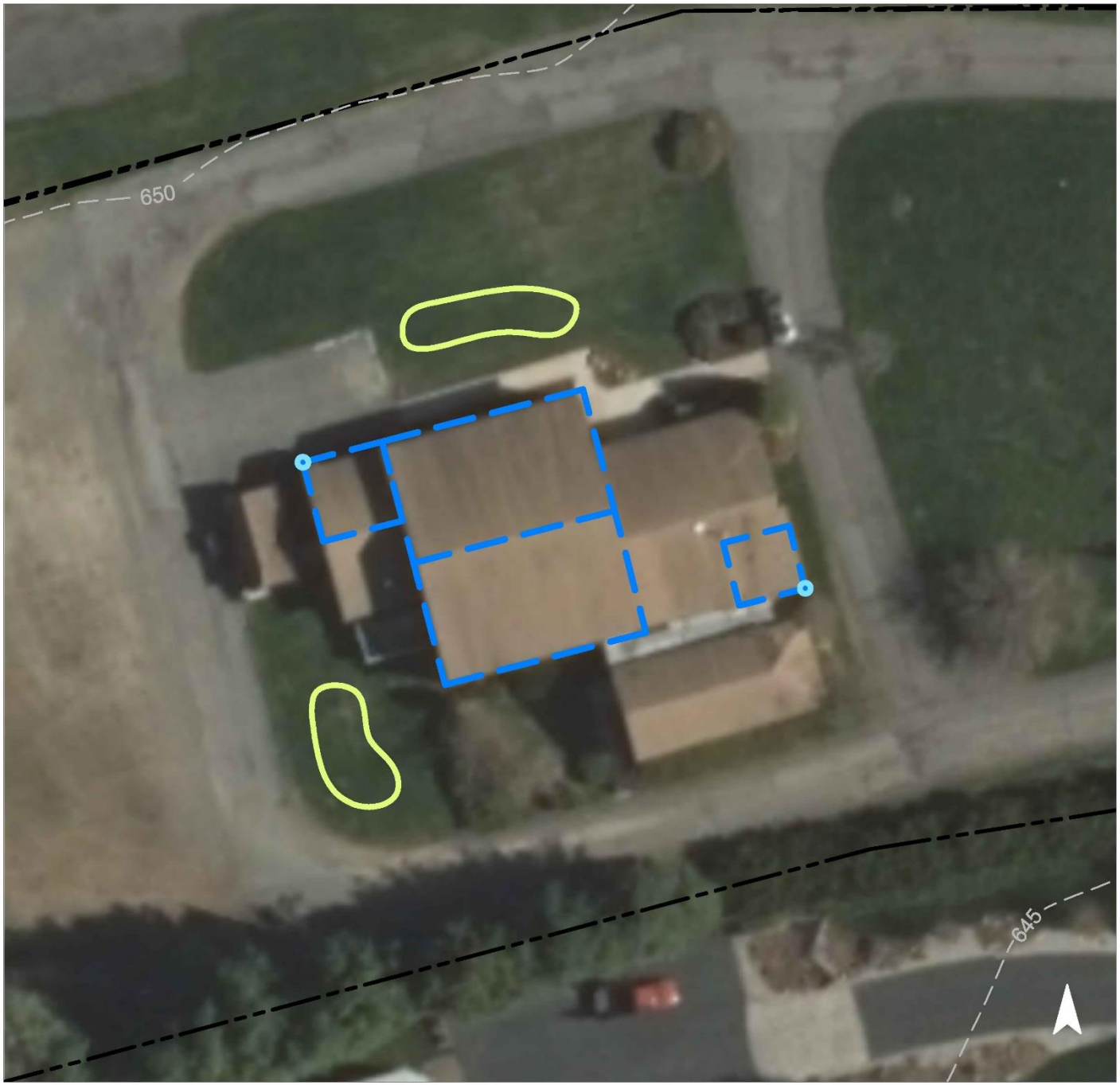
Block and Lot: Block 600, Lot 11

Rain gardens north and southwest of the building can capture, treat, and infiltrate roof runoff. Rainwater can be harvested by installing a cistern at the southwest corner of the building to reuse for watering existing vegetation. 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"
34	34,696	1.7	17.5	159.3	0.027	0.95

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.093	16	7,248	0.27	890	$4,450
Rainwater harvesting	0.021	3	600	0.06	600 (gal)	$1,200

GREEN INFRASTRUCTURE RECOMMENDATIONS



Temple Hatikvah

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

0 20' 40'

TINC ROAD ELEMENTARY SCHOOL

Subwatershed: Drakes Brook

Site Area: 1,306,368 sq. ft.

Address: 24 Tinc Road
Mount Olive, NJ 07828

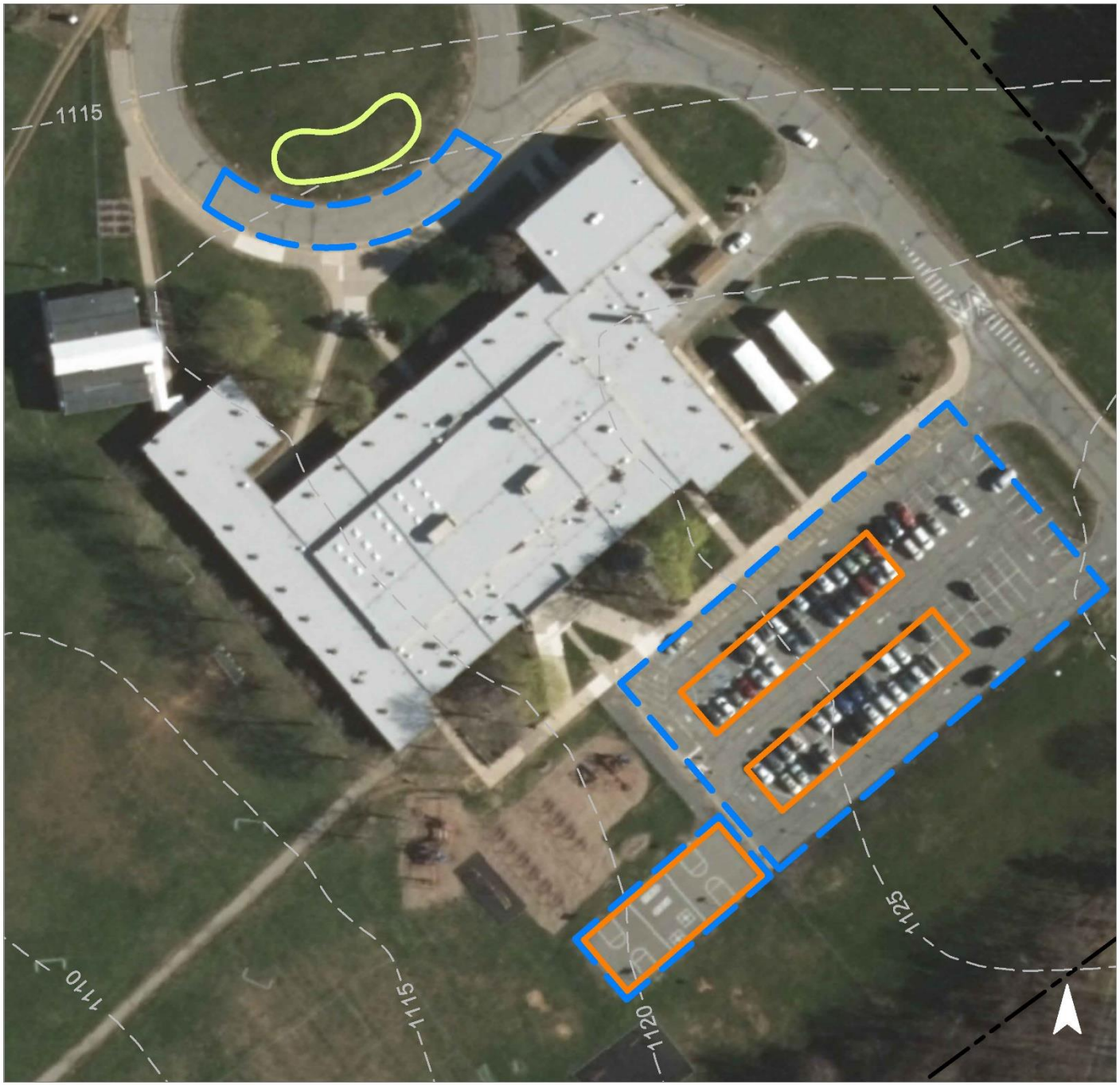
Block and Lot: Block 7100, Lot 67

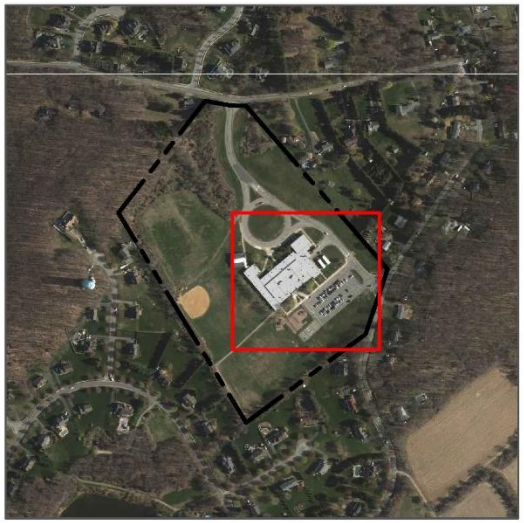
The basketball court and parking spaces in the lot south of the building can be replaced with porous asphalt to infiltrate stormwater. A rain garden north of the building can capture, treat, and infiltrate roof runoff. A preliminary soil assessment suggests that the soils have suitable drainage characteristics 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"
18	233,791	11.3	118.1	1,073.4	0.182	6.41

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	0.146	24	11,400	0.43	3,070	$15,350
Pervious pavement	1.303	218	101,803	3.82	16,600	$415,000

GREEN INFRASTRUCTURE RECOMMENDATIONS





Tinc Road Elementary School

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

0 50' 100'

ABIDING PEACE LUTHERAN CHURCH

Subwatershed: Raritan River South Branch

Site Area: 125,077 sq. ft.

Address: 305 US-46
Mount Olive, NJ 07828

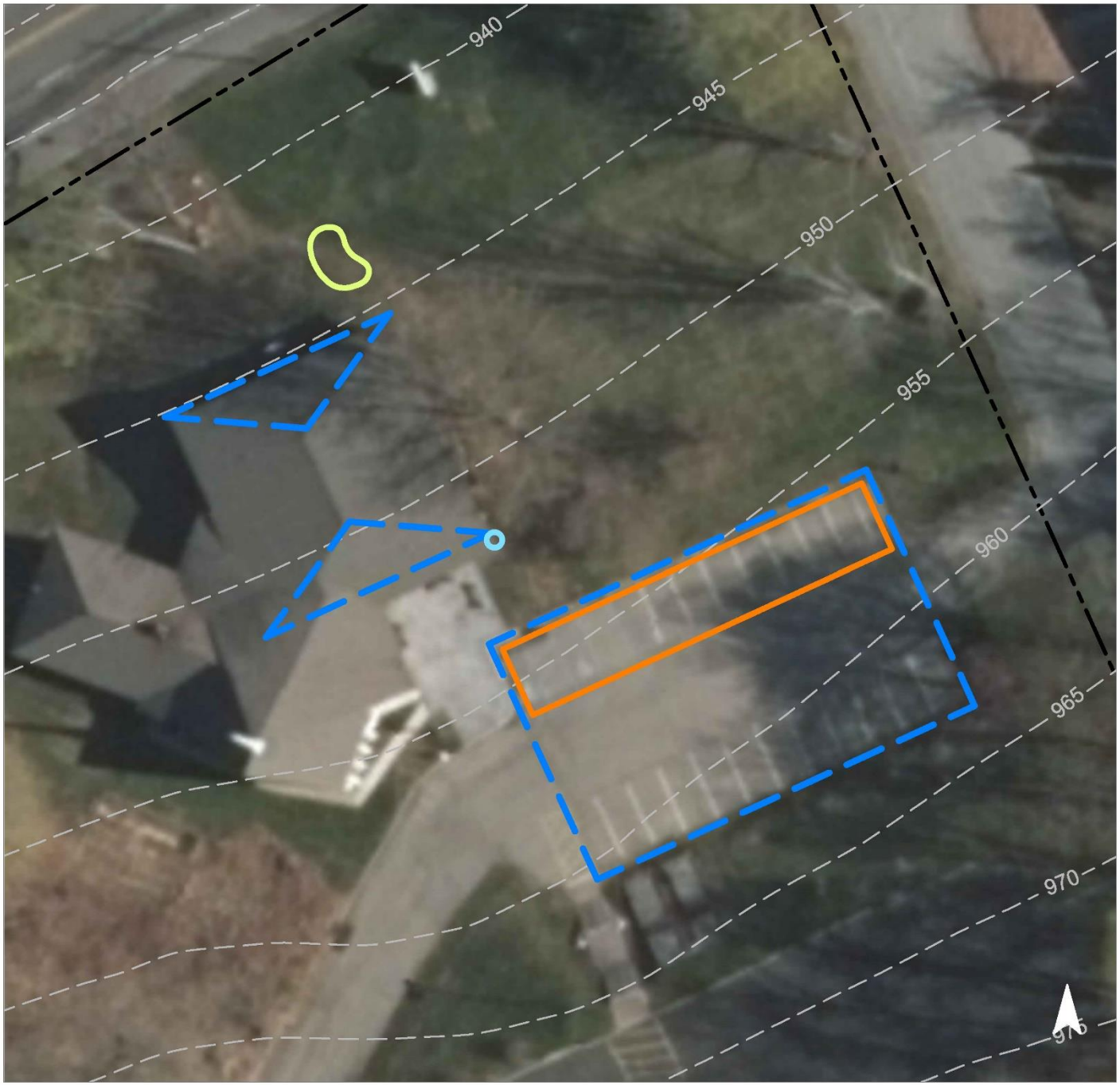
Block and Lot: Block 3400, Lot 12

Parking spaces southeast of the building can be replaced with porous asphalt to infiltrate stormwater. A rain garden north of the building can be used to capture, treat, and infiltrate roof runoff. Rainwater can be harvested by installing a cistern at the southwest corner of the building to reuse for watering existing vegetation. 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"
43	53,300	2.6	26.9	244.7	0.042	1.46

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	0.015	3	1,204	0.05	150	$750
Pervious pavement	0.192	32	15,005	0.56	1,970	$49,250
Rainwater harvesting	0.015	3	1,204	0.05	460 (gal)	$920

GREEN INFRASTRUCTURE RECOMMENDATIONS



Abiding Peace Lutheran Church

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

0 20' 40'

BUDD LAKE FIRE DEPARTMENT

Subwatershed: Raritan River South Branch

Site Area: 241,964 sq. ft.

Address: 378 US-46
Mount Olive, NJ 07828

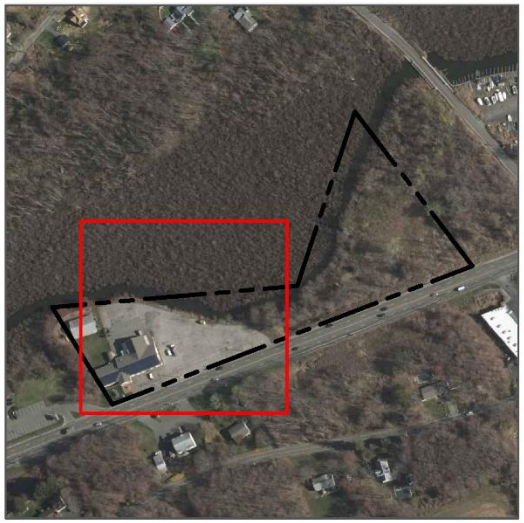
Block and Lot: Block 2300, Lot 9

Parking spaces north and east of the building can be replaced with porous asphalt to infiltrate stormwater. Rainwater can be harvested by installing a cistern at the northeast corner of the building for washing trucks. 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"
29	69,445	3.3	35.1	318.8	0.054	1.90

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 pavement	0.519	87	34,206	1.28	7,200	$180,000
Rainwater harvesting	0.036	6	1,100	0.11	1,100 (gal)	$2,200

GREEN INFRASTRUCTURE RECOMMENDATIONS



Budd Lake Fire Department

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

0 30' 60'

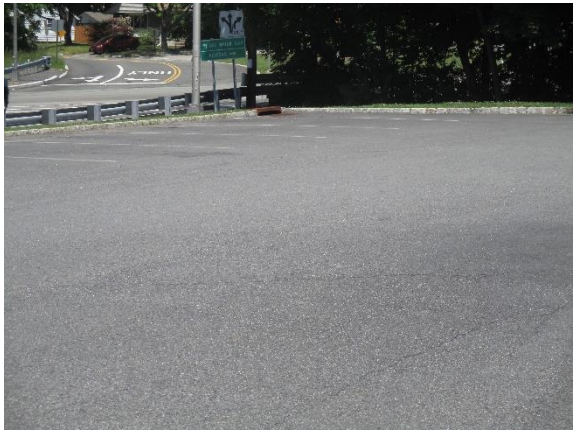
BUDD LAKE POST OFFICE

Subwatershed: Raritan River South Branch

Site Area: 85,582 sq. ft.

Address: 1 Mount Olive Road #102
Budd Lake, NJ 07828

Block and Lot: Block 4400, Lot 51

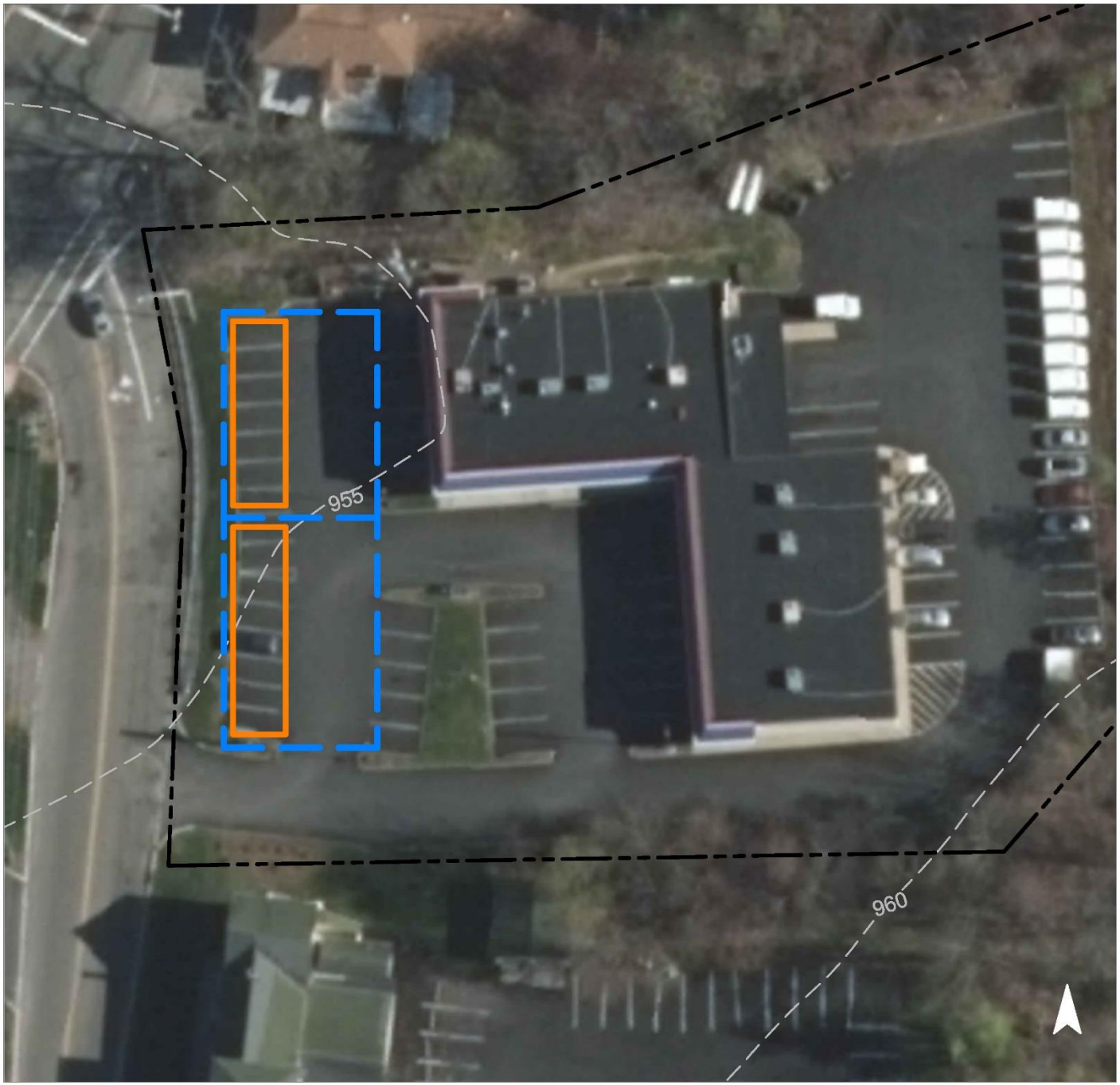


Parking spaces west of the building can be replaced with porous asphalt to infiltrate stormwater. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.

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"
49	41,794	2.0	21.1	191.9	0.033	1.15

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	0.187	31	14,579	0.55	2,210	$55,250

GREEN INFRASTRUCTURE RECOMMENDATIONS



Budd Lake Post Office

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

0 25' 50'

CHESTER M. STEPHENS ELEMENTARY SCHOOL

Subwatershed: Raritan River South Branch

Site Area: 1,012,922 sq. ft.

Address: 99 Sunset Drive
Mount Olive, NJ 07828

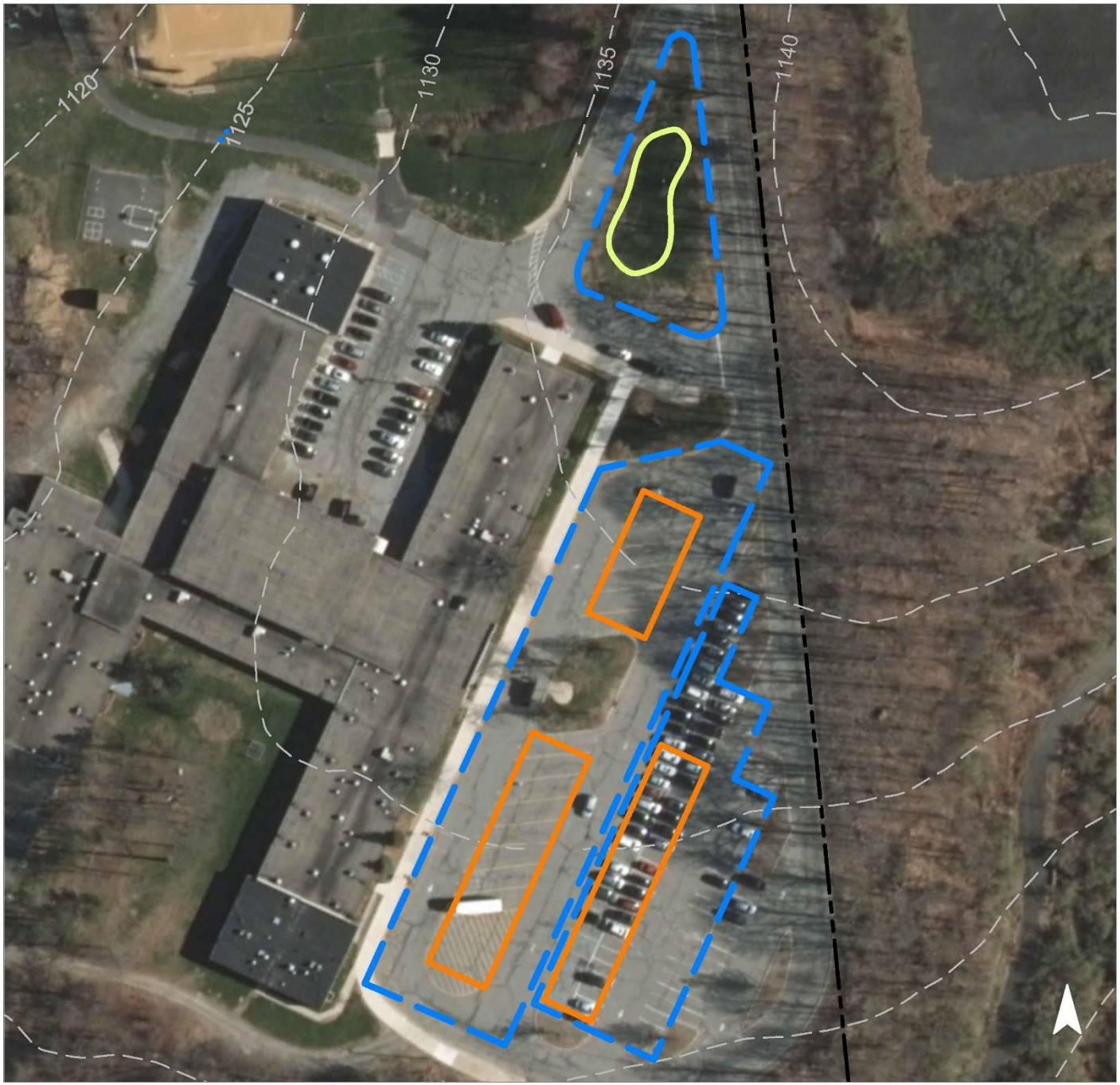
Block and Lot: Block 7600, Lot 70

A rain garden in the grass median can capture, treat, and infiltrate stormwater runoff from the adjacent roadway. 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"
27	276,516	13.3	139.7	1,269.6	0.215	7.58

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	0.096	16	7,495	0.28	1,500	$7,500
Pervious pavement	0.843	141	65,891	2.47	15,425	$385,625

GREEN INFRASTRUCTURE RECOMMENDATIONS



Chester M. Stephens Elementary School

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

0 50' 100'

CHRIST EPISCOPAL CHURCH

Subwatershed: Raritan River South Branch

Site Area: 175,024 sq. ft.

Address: 369 Sand Shore Road
Mount Olive, NJ 07828

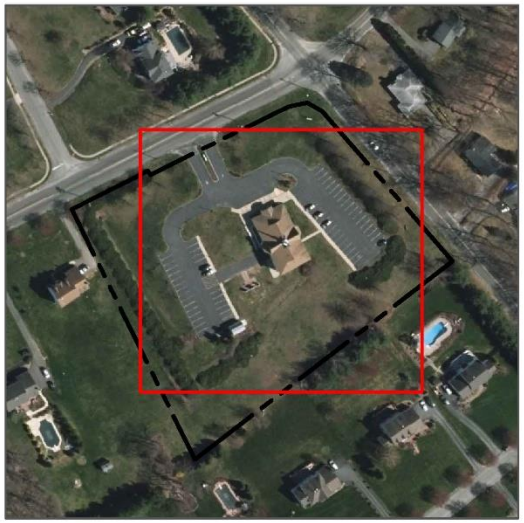
Block and Lot: Block 8200, Lot 19

Parking spaces on the east and west sides of the building can be replaced with porous asphalt to infiltrate 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"
32	56,866	2.7	28.7	261.1	0.044	1.56

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	0.524	88	40,946	1.53	5,365	$134,125

GREEN INFRASTRUCTURE RECOMMENDATIONS



Christ Episcopal Church

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

0 30' 60'

LAKEVIEW MEDICAL

Subwatershed: Raritan River South Branch

Site Area: 53,840 sq. ft.

Address: 125 US-46 #4
Mount Olive, NJ 07828

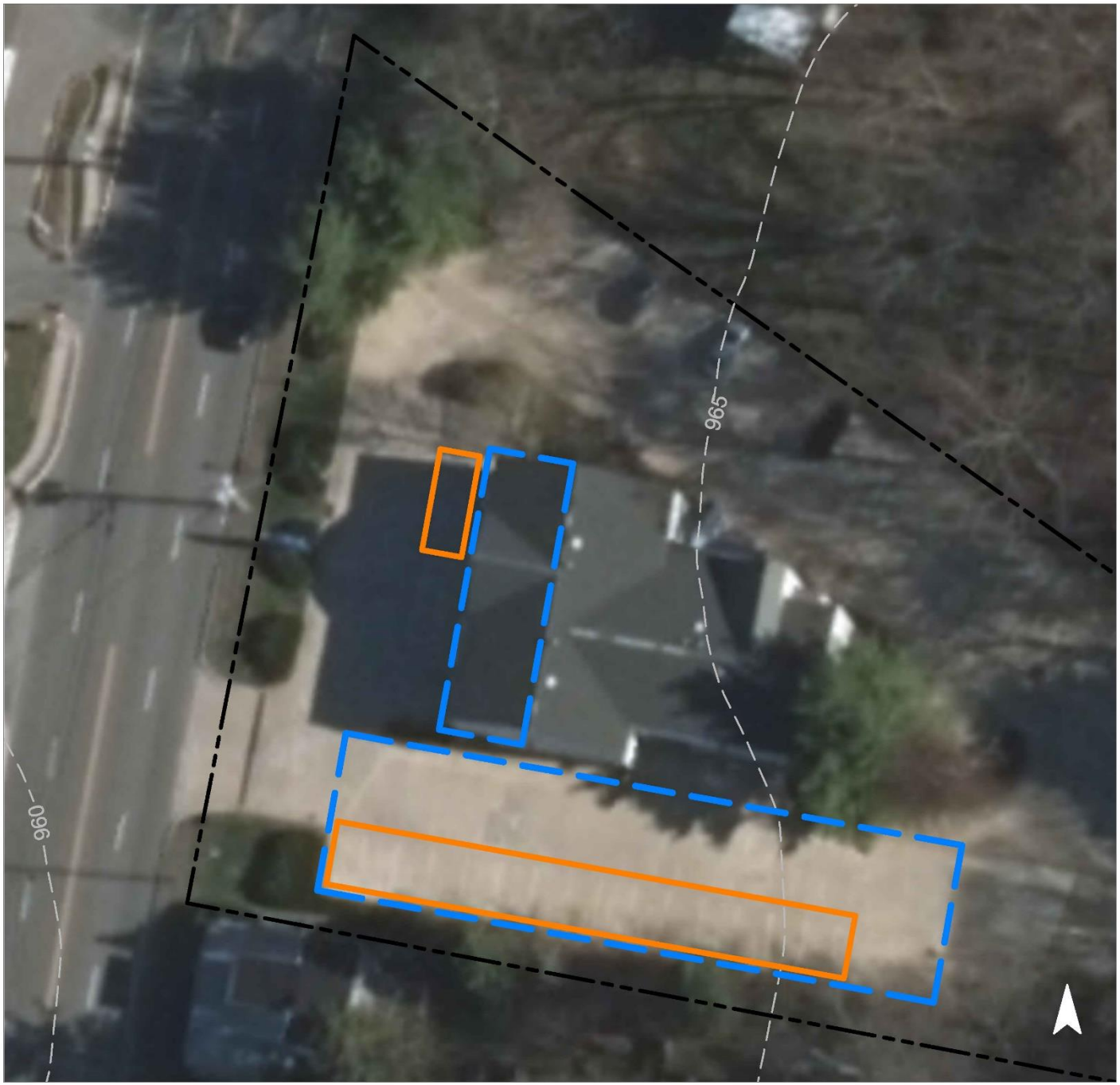
Block and Lot: Block 4100, Lot 66, 67, 68

Parking spaces west of the building can be replaced with porous asphalt to infiltrate 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"
68	36,514	1.8	18.4	167.7	0.028	1.00

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	0.178	30	13,928	0.52	2,290	$57,250

GREEN INFRASTRUCTURE RECOMMENDATIONS



Lakeview Medical

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

0 20' 40'

MOUNT OLIVE MIDDLE SCHOOL

Subwatershed: Raritan River South Branch

Site Area: 1,095,113 sq. ft.

Address: 160 Wolfe Road
Mount Olive, NJ 07828

Block and Lot: Block 8101, Lot 22

Parking spaces by the north building can be replaced with porous asphalt to infiltrate stormwater. A rain garden south of the building can capture, treat, and infiltrate runoff from the parking lot. 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"
46	506,237	24.4	255.7	2,324.3	0.394	13.88

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	0.179	30	13,973	0.52	1,715	$8,575
Pervious pavement	0.246	41	19,231	0.72	1,687	$42,175

GREEN INFRASTRUCTURE RECOMMENDATIONS

Mount Olive Middle School

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

0 50' 100'

MOUNT OLIVE PUBLIC LIBRARY

Subwatershed: Raritan River South Branch

Site Area: 955,850 sq. ft.

Address: 202 Flanders-Drakestown Road
Mount Olive, NJ 07828

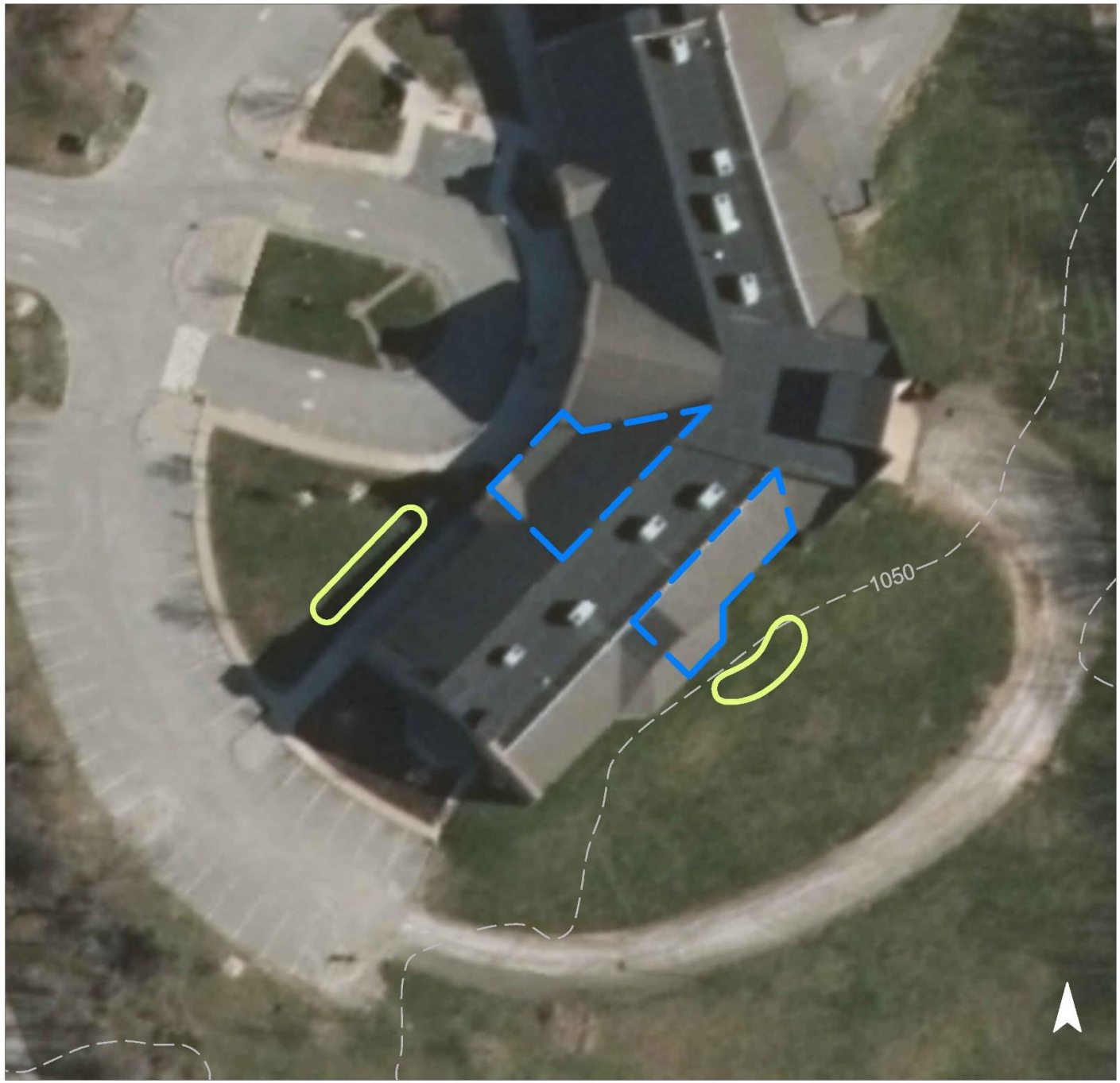
Block and Lot: Block 7900, Lot 3.01

Rain gardens adjacent to the building can capture, treat, and infiltrate roof runoff. 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"
10	93,770	4.5	47.4	430.5	0.073	2.57

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	0.075	12	8,146	0.31	820	$4,100

GREEN INFRASTRUCTURE RECOMMENDATIONS



Mount Olive Public Library

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

0 25' 50'

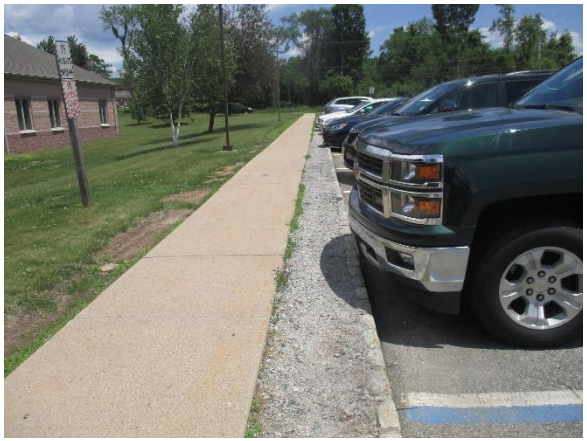
MOUNT OLIVE PUBLIC WORKS

Subwatershed: Raritan River South Branch

Site Area: 955,850 sq. ft.

Address: 202 Flanders-Drakestown Road
Mount Olive, NJ 07828

Block and Lot: Block 7900, Lot 3.01

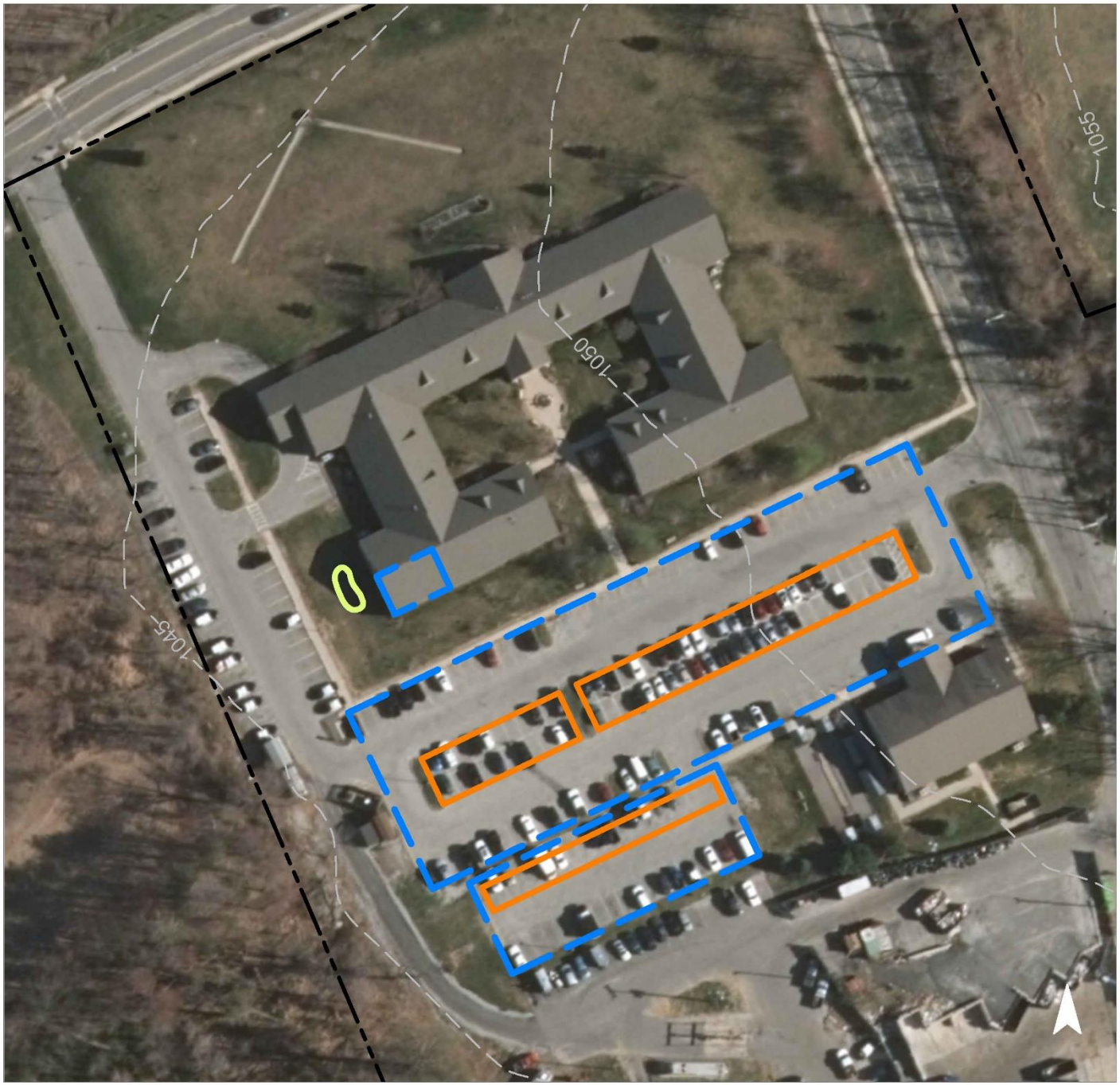


A rain garden adjacent to the building can capture, treat, and infiltrate roof runoff. Parking spots in the lot to the west of the public works building can be replaced with porous asphalt to infiltrate stormwater. A preliminary soil assessment suggests that the soils have suitable drainage characteristics 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"
10	93,770	4.5	47.4	430.5	0.073	2.57

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	0.029	5	8,146	0.31	295	$1,475
Pervious pavement	0.404	68	31,603	1.18	4,510	$112,750

GREEN INFRASTRUCTURE RECOMMENDATIONS



Mount Olive Public Works

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

0 50' 100'

c. 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)
DRAKES BROOK SUBWATERSHED	**75.63**	**3,294,552**			**30.8**	**322.7**	**2,933.2**		**14.67**	**638,862**	**0.498**	**17.52**
Flanders Fire Company No. 1												
Total Site Info	1.11	48,177	5500	10, 11	1.9	20.4	185.3	84	0.93	40,360	0.031	1.11
Flanders Park												
Total Site Info	19.25	838,388	6000	12	3.2	33.1	301.2	8	1.51	65,592	0.051	1.80
Mountain View Elementary School												
Total Site Info	19.76	860,860	7600	70	10.7	112.5	1,023.0	26	5.11	222,800	0.174	6.11
New Beginnings Bible Church												
Total Site Info	3.18	138,673	5300	31	2.0	21.0	191.1	30	0.96	41,622	0.032	1.14
Temple Hatikvah												
Total Site Info	2.34	102,086	600	11	1.7	17.5	159.3	34	0.80	34,696	0.027	0.95
Tinc Road Elementary School												
Total Site Info	29.99	1,306,368	7100	67	11.3	118.1	1,073.4	18	5.37	233,791	0.182	6.41
RARITAN RIVER SOUTH BRANCH SUBWATERSHED	**85.98**	**3,745,371**			**54.7**	**573.0**	**5,208.6**		**26.04**	**1,134,442**	**0.884**	**31.11**
Abiding Peace Lutheran Church												
Total Site Info	2.87	125,077	3400	12	2.6	26.9	244.7	43	1.22	53,300	0.042	1.46
Budd Lake Fire Department												
Total Site Info	5.55	241,964	2300	9	3.3	35.1	318.8	29	1.59	69,445	0.054	1.90
Budd Lake Post Office												
Total Site Info	1.96	85,582	4400	51	2.0	21.1	191.9	49	0.96	41,794	0.033	1.15
Chester M. Stephens Elementary School												
Total Site Info	23.25	1,012,922	7600	70	13.3	139.7	1,269.6	27	6.35	276,516	0.215	7.58
Christ Episcopal Church												
Total Site Info	4.02	175,024	8200	19	2.7	28.7	261.1	32	1.31	56,866	0.044	1.56

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)
Lakeview Medical												
Total Site Info	1.24	53,840	4100	66, 67, 68	1.8	18.4	167.7	68	0.84	36,514	0.028	1.00
Mount Olive Middle School												
Total Site Info	25.14	1,095,113	8101	22	24.4	255.7	2,324.3	46	11.62	506,237	0.394	13.88
Mount Olive Public Library and Public Works												
Total Site Info	21.94	955,850	7900	3.01	4.5	47.4	430.5	10	2.15	93,770	0.073	2.57

d. Summary of Proposed Green Infrastructure Practices

Summary of Proposed Green Infrastructure Practices

	Subwatershed/Site Name/Total Site Info/GI Practice	Potential Management Area Area (SF)	Potential Management Area Area (ac)	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Max Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cfs)	Size of BMP (SF)	Unit Cost ($)	Unit	Total Cost ($)	I.C. Treated %
	DRAKES BROOK SUBWATERSHED	**126,385**	**2.90**	**3.293**	**551**	**234,784**	**10.35**	**51,570**			**$1,113,250**	**3.8%**
1	**Flanders Fire Company No. 1**											
	Pervious pavement	12,000	0.28	0.313	52	4,400	1.62	5,680	25	SF	$142,000	29.7%
	Rainwater harvesting	1,220	0.03	0.032	5	1,000	0.09	1,000	2	gal	$2,000	3.0%
	Total Site Info	**13,220**	**0.30**	**0.344**	**58**	**5,400**	**1.71**	**6,680**			**$144,000**	**32.8%**
2	**Flanders Park**											
	Pervious pavement	34,850	0.80	0.908	152	70,955	2.66	19,000	25	SF	$475,000	53.1%
	Total Site Info	**34,850**	**0.80**	**0.908**	**152**	**70,955**	**2.66**	**19,000**			**$475,000**	**53.1%**
3	**Mountain View Elementary School**											
	Bioretention system	11,755	0.27	0.306	51	23,936	0.90	3,000	5	SF	$15,000	5.3%
	Total Site Info	**11,755**	**0.27**	**0.306**	**51**	**23,936**	**0.90**	**3,000**			**$15,000**	**5.3%**
4	**New Beginnings Bible Church**											
	Pervious pavement	6,600	0.15	0.172	29	13,442	0.50	1,730	25	SF	$43,250	15.9%
	Total Site Info	**6,600**	**0.15**	**0.172**	**29**	**13,442**	**0.50**	**1,730**			**$43,250**	**15.9%**
5	**Temple Hatikvah**											
	Bioretention systems	3,560	0.08	0.093	16	7,248	0.27	890	5	SF	$4,450	10.3%
	Rainwater harvesting	800	0.02	0.021	3	600	0.06	600	2	gal	$1,200	2.3%
	Total Site Info	**4,360**	**0.10**	**0.114**	**19**	**7,848**	**0.33**	**1,490**			**$5,650**	**12.6%**
6	**Tinc Road Elementary School**											
	Bioretention system	5,600	0.13	0.146	24	11,400	0.43	3,070	5	SF	$15,350	2.4%
	Pervious pavement	50,000	1.15	1.303	218	101,803	3.82	16,600	25	SF	$415,000	21.4%
	Total Site Info	**55,600**	**1.28**	**1.449**	**243**	**113,203**	**4.25**	**19,670**			**$430,350**	**23.8%**
	RARITAN RIVER SOUTH BRANCH SUBWATERSHED	**135,776**	**3.12**	**3.538**	**592**	**276,657**	**10.44**	**46,697**			**$1,041,945**	**3.6%**
7	**Abiding Peace Lutheran Church**											
	Bioretention system	590	0.01	0.015	3	1,204	0.05	150	5	SF	$750	1.1%
	Pervious pavement	7,370	0.17	0.192	32	15,005	0.56	1,970	25	SF	$49,250	13.8%
	Rainwater harvesting	590	0.01	0.015	3	1,204	0.05	460	2	gal	$920	1.1%
	Total Site Info	**8,550**	**0.20**	**0.223**	**37**	**17,413**	**0.66**	**2,580**			**$50,920**	**14.9%**

Summary of Proposed Green Infrastructure Practices

	Subwatershed/Site Name/Total Site Info/GI Practice	Potential Management Area Area (SF)	Potential Management Area Area (ac)	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Max Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cfs)	Size of BMP (SF)	Unit Cost ($)	Unit	Total Cost ($)	I.C. Treated %
8	**Budd Lake Fire Department**											
	Pervious pavement	19,900	0.46	0.519	87	34,206	1.28	7,200	25	SF	$180,000	28.7%
	Rainwater harvesting	1,380	0.03	0.036	6	1,100	0.11	1,100	2	gal	$2,200	2.0%
	Total Site Info	**21,280**	**0.49**	**0.554**	**93**	**35,306**	**1.39**	**8,300**			**$182,200**	**30.6%**
9	**Budd Lake Post Office**											
	Pervious pavement	7,160	0.16	0.187	31	14,579	0.55	2,210	25	SF	$55,250	17.1%
	Total Site Info	**7,160**	**0.16**	**0.187**	**31**	**14,579**	**0.55**	**2,210**			**$55,250**	**17.1%**
10	**Chester M. Stephens Elementary School**											
	Bioretention system	3,680	0.08	0.096	16	7,495	0.28	1,500	5	SF	$7,500	1.3%
	Pervious pavement	32,360	0.74	0.843	141	65,891	2.47	15,425	25	SF	$385,625	11.7%
	Total Site Info	**36,040**	**0.83**	**0.939**	**157**	**73,386**	**2.75**	**16,925**			**$393,125**	**13.0%**
11	**Christ Episcopal Church**											
	Pervious pavement	20,110	0.46	0.524	88	40,946	1.53	5,365	25	SF	$134,125	35.4%
	Total Site Info	**20,110**	**0.46**	**0.524**	**88**	**40,946**	**1.53**	**5,365**			**$134,125**	**35.4%**
12	**Lakeview Medical**											
	Pervious pavement	6,840	0.16	0.178	30	13,928	0.52	2,290	25	SF	$57,250	18.7%
	Total Site Info	**6,840**	**0.16**	**0.178**	**30**	**13,928**	**0.52**	**2,290**			**$57,250**	**18.7%**
13	**Mount Olive Middle School**											
	Bioretention system	6,861	0.16	0.179	30	13,973	0.52	1,715	5	SF	$8,575	1.4%
	Pervious pavement	9,445	0.22	0.246	41	19,231	0.72	1,687	25	SF	$42,175	1.9%
	Total Site Info	**16,306**	**0.37**	**0.425**	**71**	**33,204**	**1.24**	**3,402**			**$50,750**	**3.2%**
14	**Mount Olive Public Library**											
	Bioretention systems	2,860	0.07	0.075	12	8,146	0.31	820	5	SF	$4,100	3.1%
	Total Site Info	**2,860**	**0.07**	**0.075**	**12**	**8,146**	**0.31**	**820**			**$4,100**	**3.1%**
15	**Mount Olive Public Works**											
	Bioretention system	1,110	0.03	0.029	5	8,146	0.31	295	5	SF	$1,475	1.2%
	Pervious pavement	15,520	0.36	0.404	68	31,603	1.18	4,510	25	SF	$112,750	16.6%
	Total Site Info	**16,630**	**0.38**	**0.433**	**73**	**39,749**	**1.49**	**4,805**			**$114,225**	**17.7%**