RUTGERS
New Jersey Agricultural
Experiment Station

Impervious Cover Reduction Action Plan
for
Hampton Township, Sussex County, New Jersey

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

November 8, 2016

WILLIAM PENN
FOUNDATION

Table of Contents

Introduction

Located in Sussex County in northern New Jersey, Hampton Township covers approximately 25.5 square miles. Figures 1 and 2 illustrate that Hampton Township is dominated by forest land uses. A total of 16.0% of the municipality's land use is classified as urban. Of the urban land in Hampton Township, rural residential is the dominant land use (Figure 3).

The New Jersey Department of Environmental Protection's (NJDEP) 2012 land use/land cover geographical information system (GIS) data layer categorizes Hampton 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 Hampton Township. Based upon the 2012 NJDEP land use/land cover data, approximately 3.3% of Hampton Township has impervious cover. This level of impervious cover suggests that the streams Hampton Township are likely sensitive streams.[1]

Methodology

Hampton 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

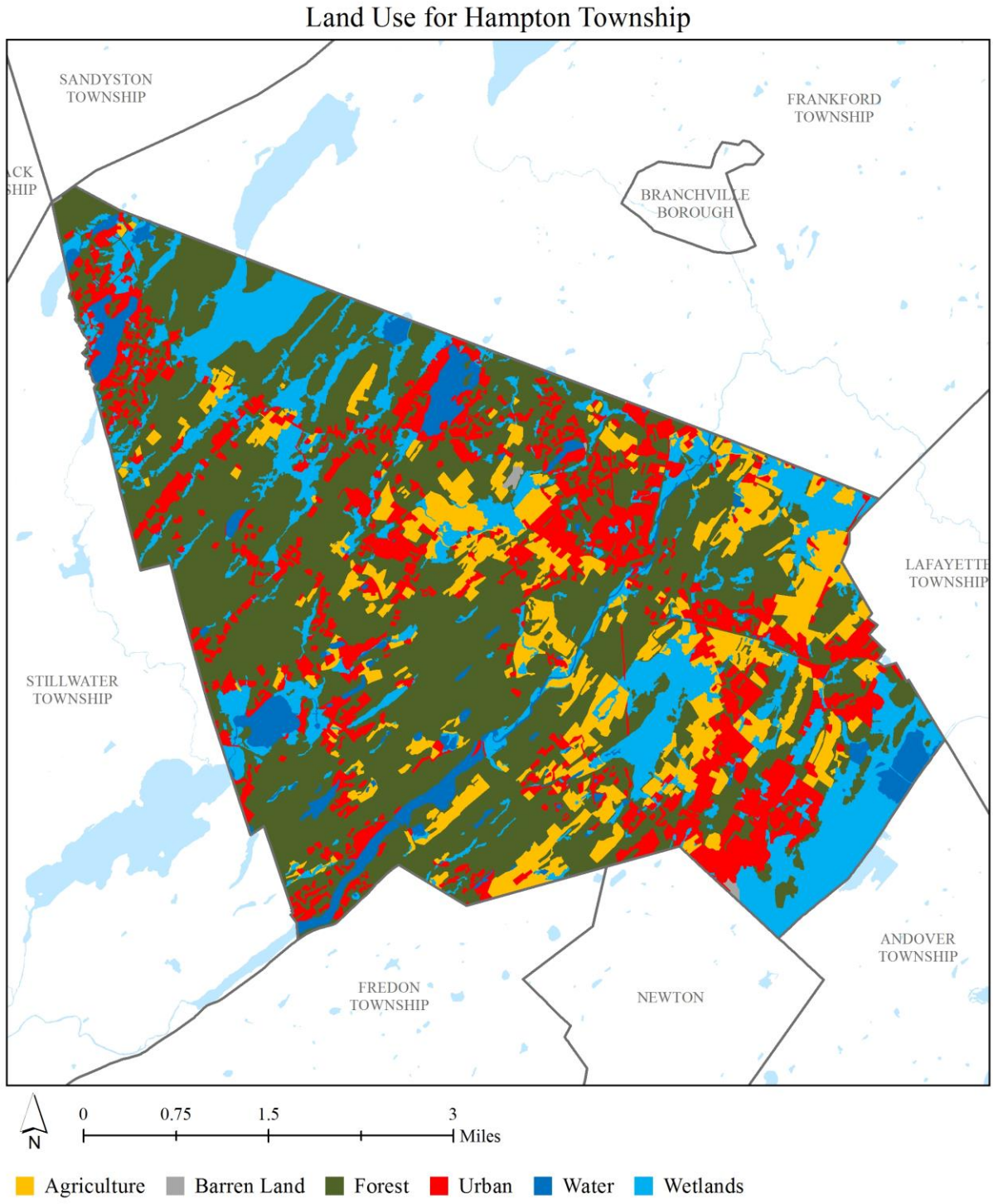


Figure 1: Map illustrating the land use in Hampton Township

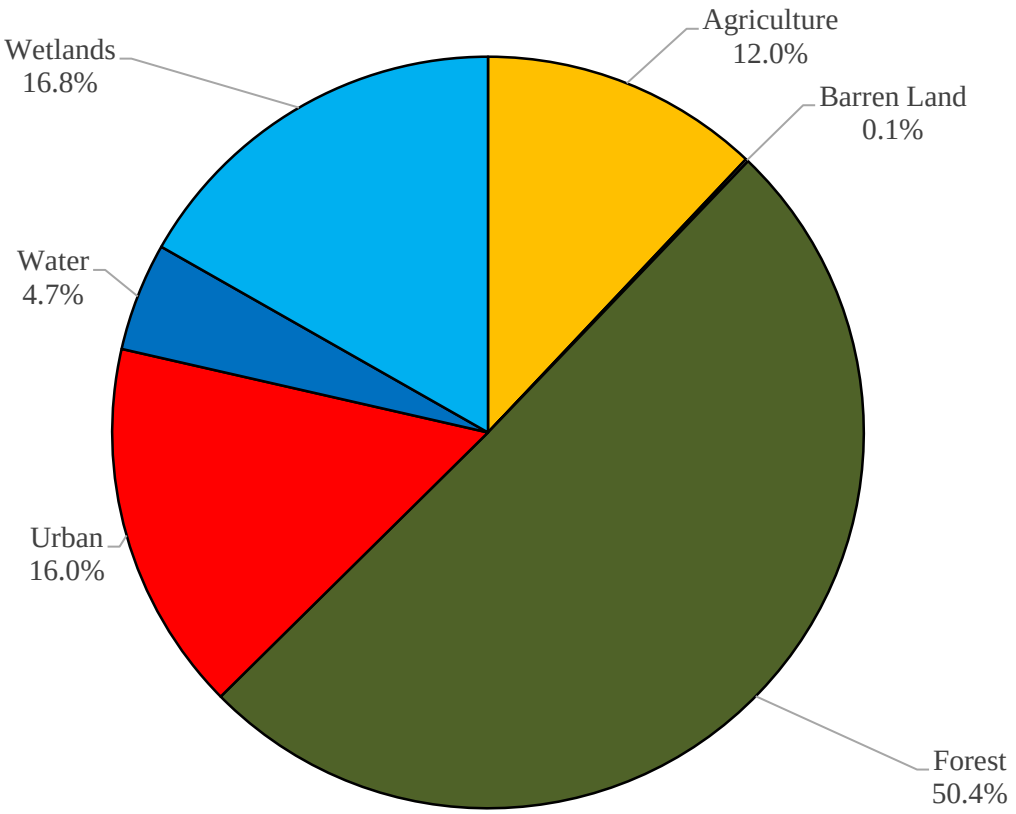


Figure 2: Pie chart illustrating the land use in Hampton Township

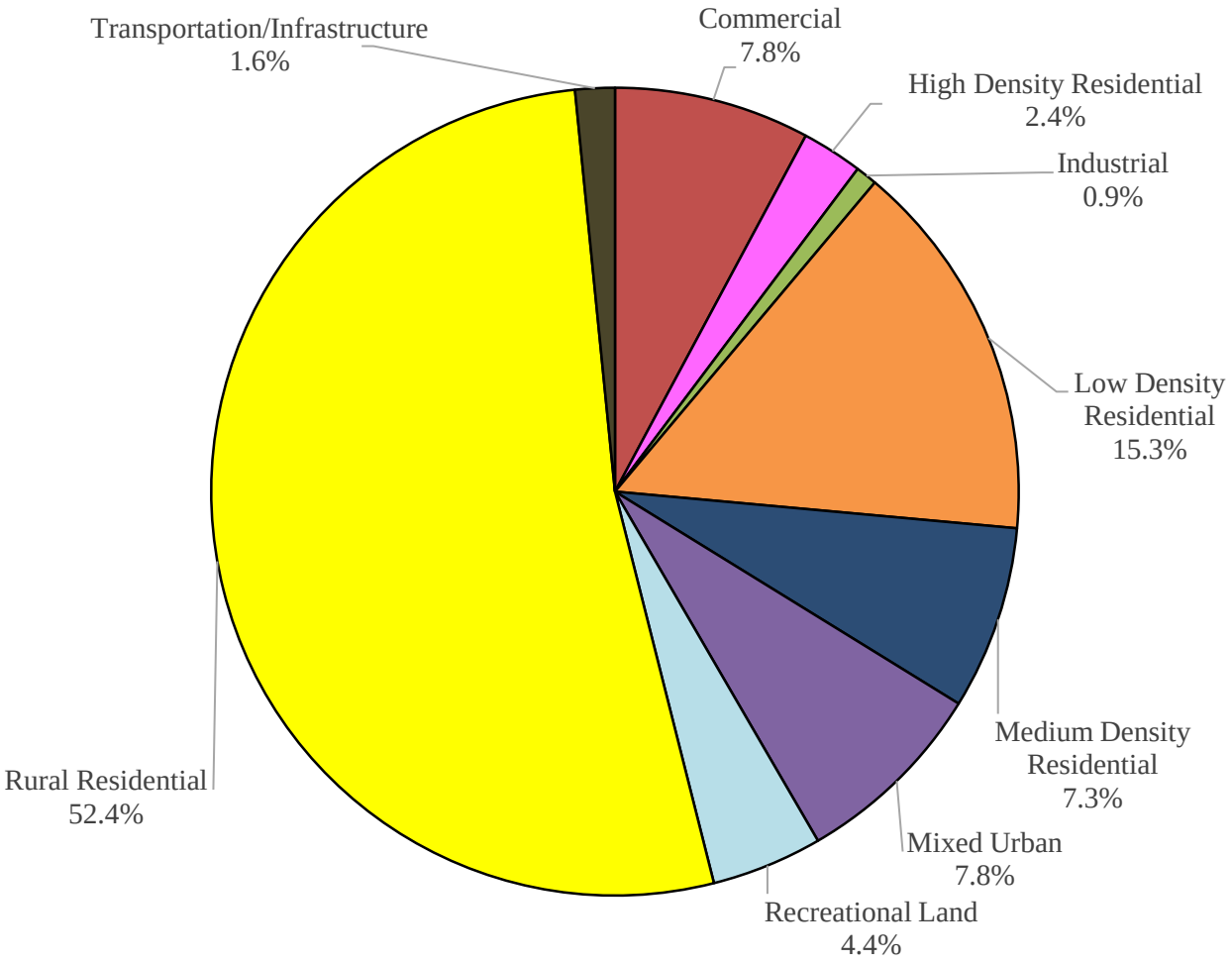


Figure 3: Pie chart illustrating the various types of urban land use in Hampton Township

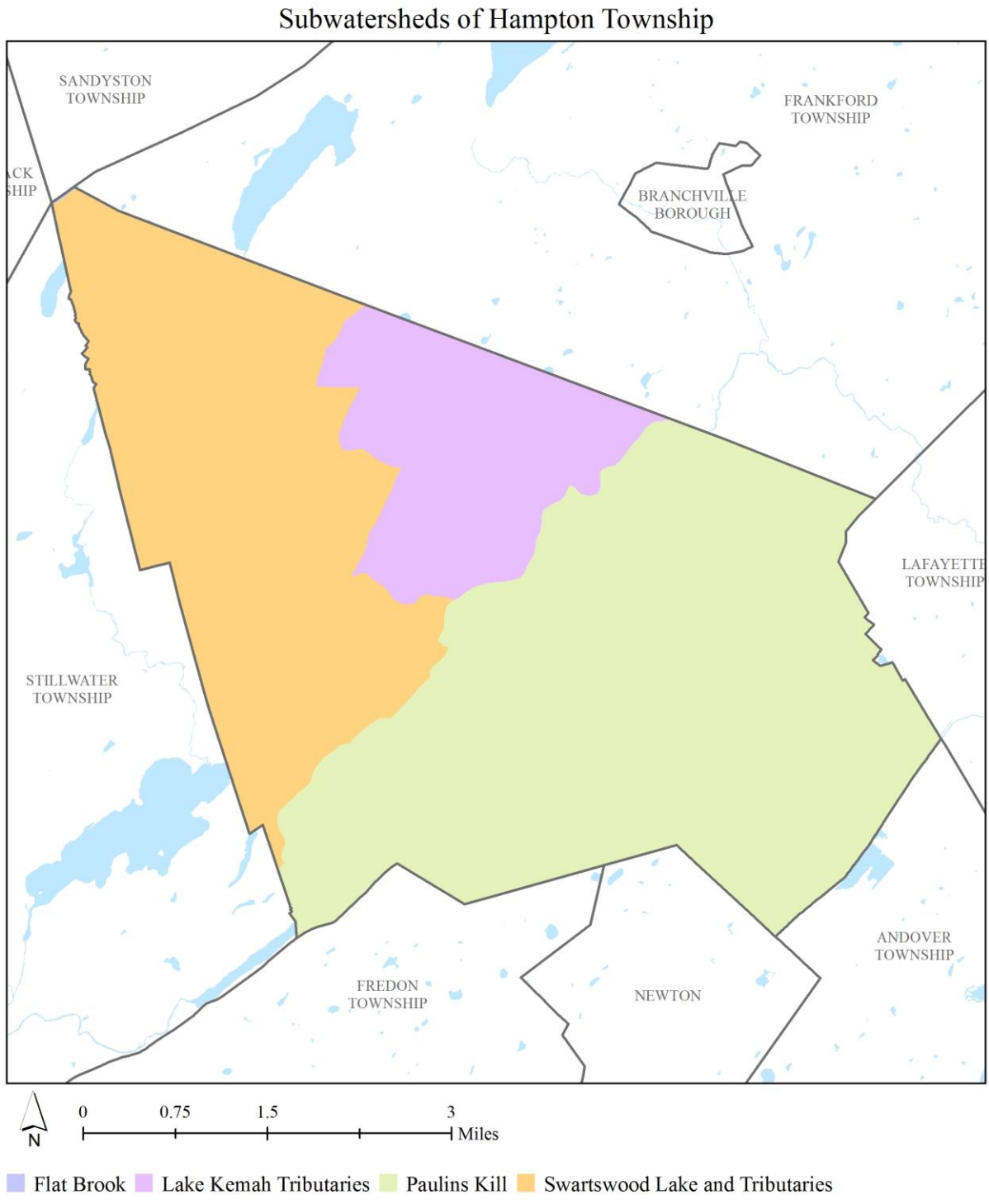


Figure 4: Map of the subwatersheds in Hampton Township

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 Hampton 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 Hampton 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*.

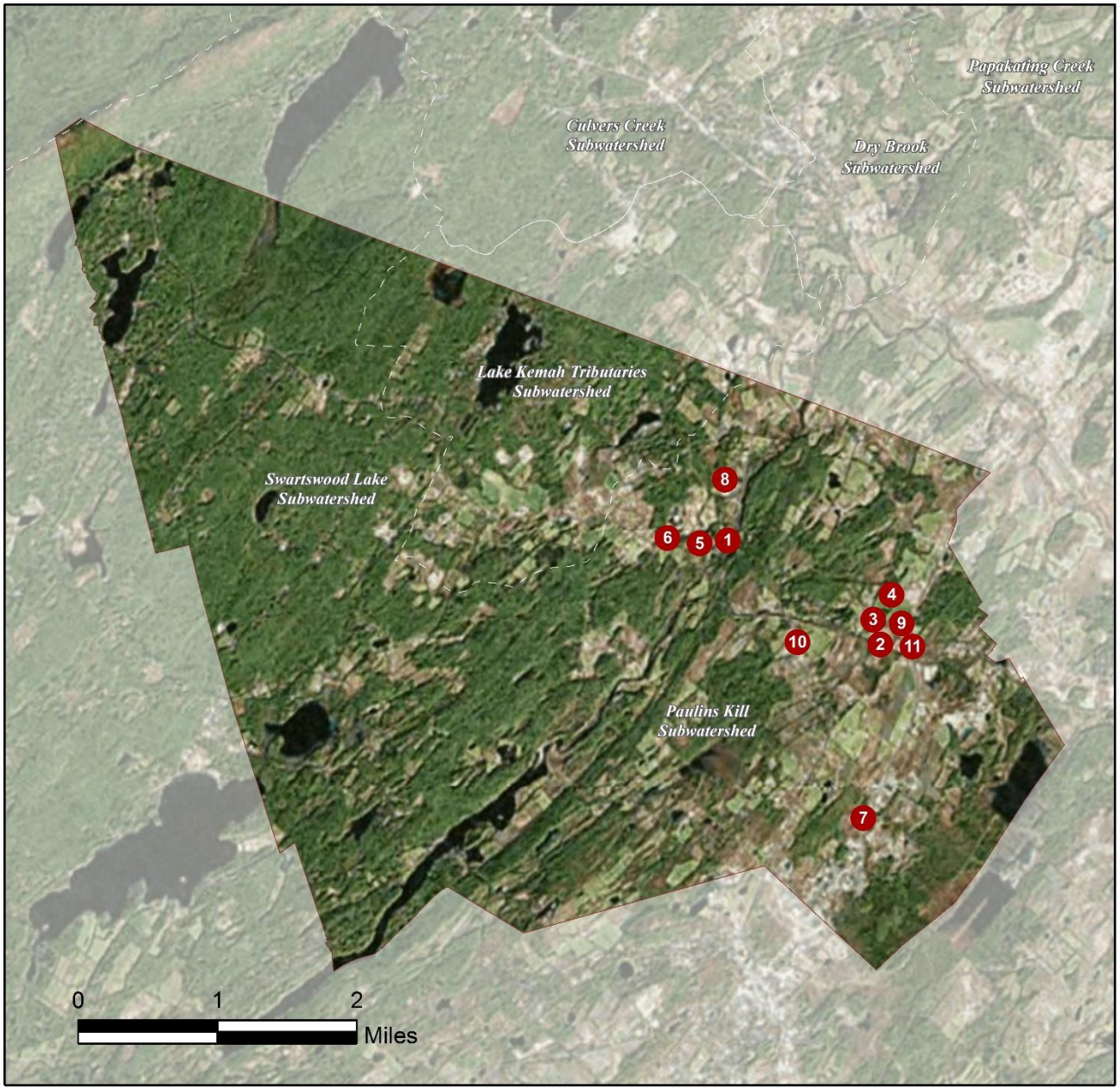
Conclusion

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

HAMPTON TOWNSHIP: GREEN INFRASTRUCTURE SITES



SITES WITHIN THE PAULINS KILL SUBWATERSHED:

1. Baleville Congregational Church
2. Brothers Sheet Metal, Inc.
3. Ephemeral Realty, LLC
4. Hampton Township Fire Department
5. Hampton Township Municipal Building
6. Kittatinny Regional High School
7. Lowe's
8. Marian Emmons McKeown School
9. Middleton & Company Insurance
10. Northwest Christian School
11. R & T Nautilus

b. Proposed Green Infrastructure Concepts

BALEVILLE CONGREGATIONAL CHURCH

Subwatershed: **Paulins Kill**

Site Area: **159,163 sq. ft.**

Address: **6 Church Road**
Newton, NJ 07860

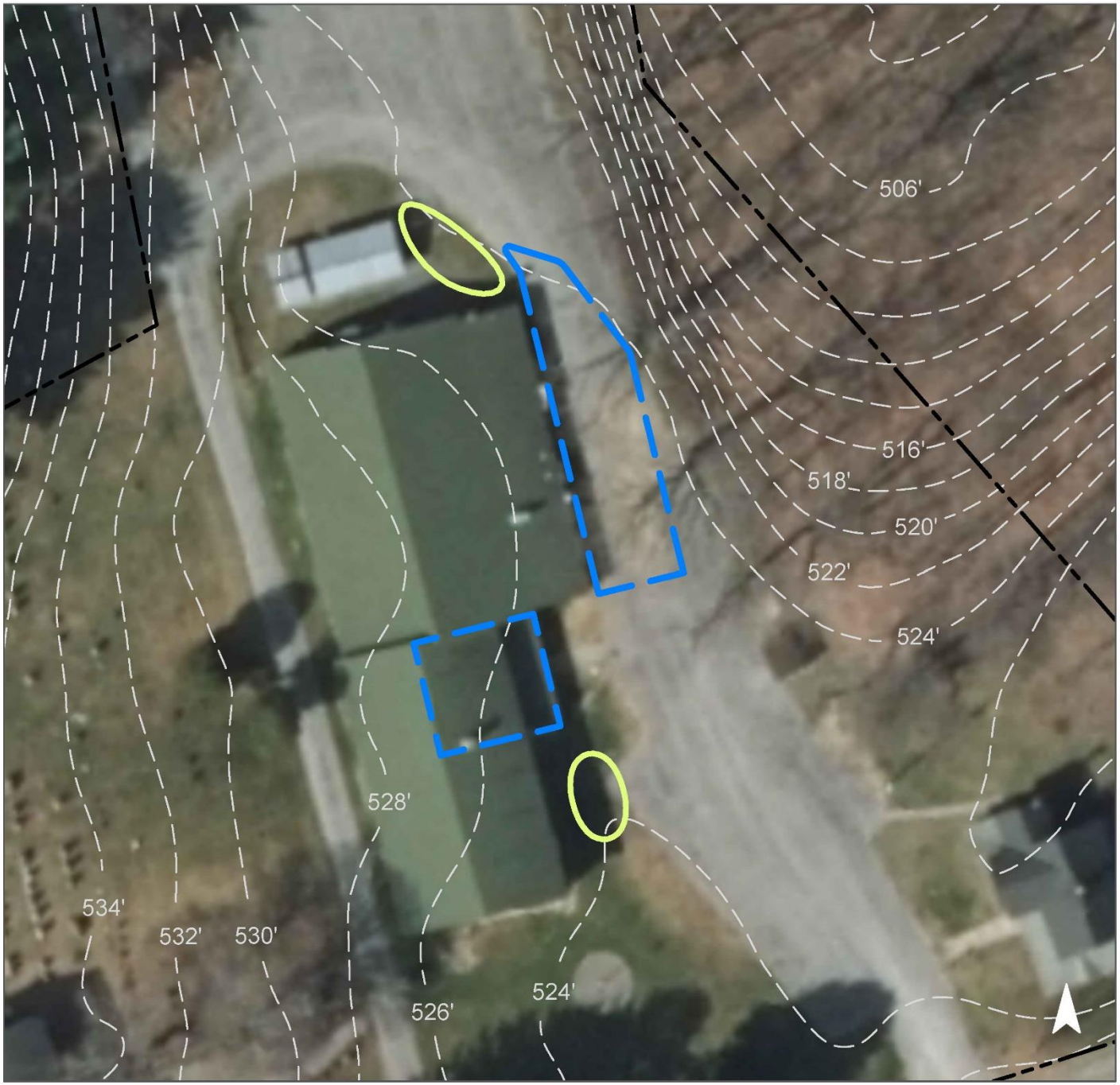
Block and Lot: **Block 2702 , Lot 8**

Installing a rain garden in front of the building can capture, treat, and infiltrate roof runoff. Another rain garden can be built to the north of the building to prevent erosion. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
13	20,912	1.0	10.6	96.0	0.016	0.57

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	0.074	12	5,281	0.20	570	$2,850

GREEN INFRASTRUCTURE RECOMMENDATIONS



Baleville Congregational Church

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

0 20' 40'

BROTHERS SHEET METAL, INC.

Subwatershed: **Paulins Kill**

Site Area: **89,354 sq. ft.**

Address: **3 Camre Drive**
Newton, NJ 07860

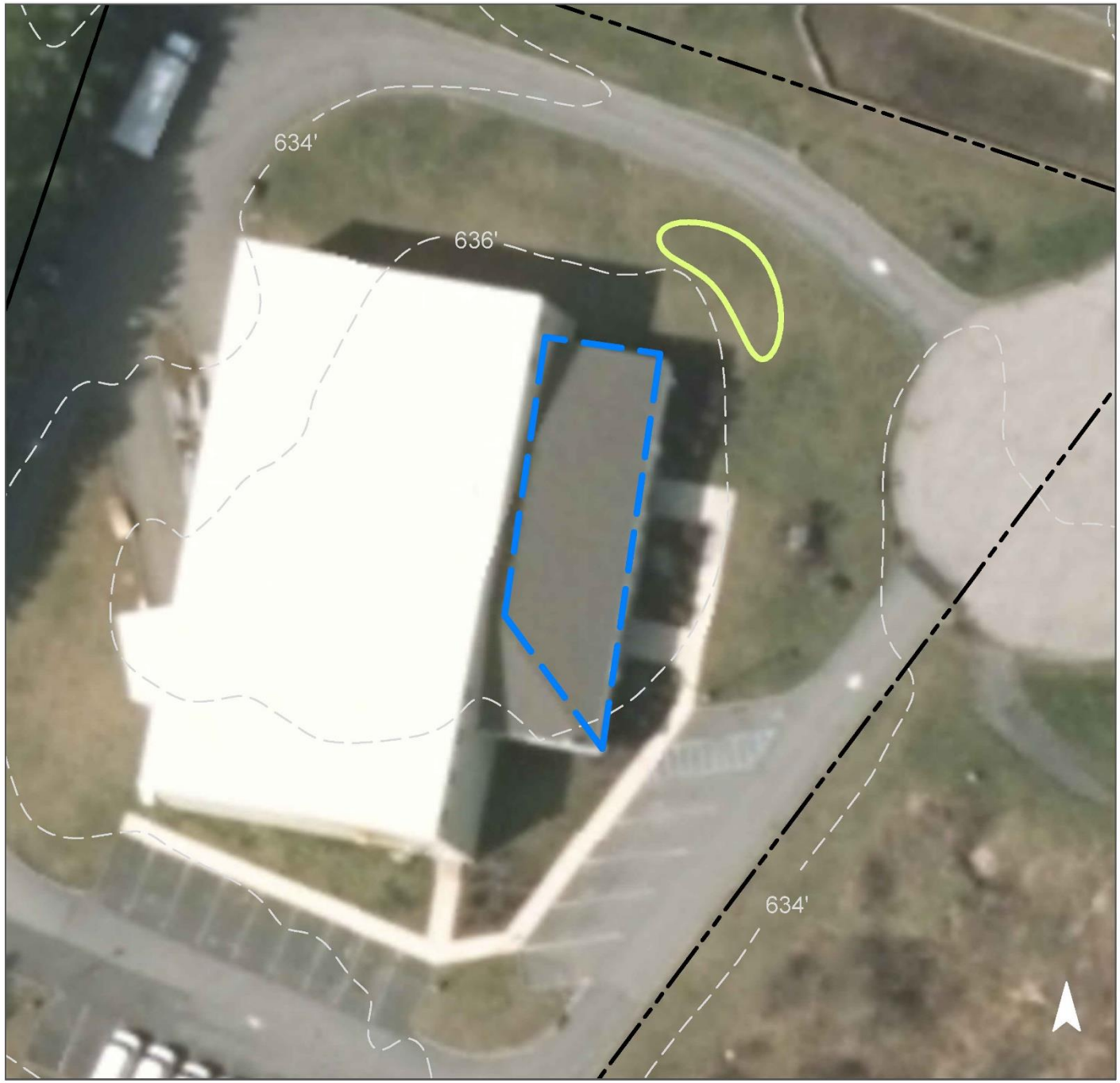
Block and Lot: **Block 3501 , Lot 82.03**

A rain garden can be built in the front of the building to 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"
61	54,394	2.6	27.5	249.7	0.042	1.49

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	0.071	12	5,012	0.19	545	$2,725

GREEN INFRASTRUCTURE RECOMMENDATIONS



Brothers Sheet Metal, Inc.

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

0 20' 40'

EPHEMERAL REALTY, LLC

Subwatershed: **Paulins Kill**

Site Area: **183,734 sq. ft.**

Address: **178 Halsey Road**
Newton, NJ 07860

Block and Lot: **Block 3501 , Lot 51**

Rainwater can be harvested by installing cisterns adjacent to the building. The water can then be used for watering gardens, washing vehicles, or for other non-potable uses. 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"
48	88,596	4.3	44.7	406.8	0.069	2.43

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Rainwater harvesting	0.251	42	17,915	0.67	10,000 (gal)	$20,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Ephemeral Realty, LLC

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

0 20' 40'

HAMPTON TOWNSHIP FIRE DEPARTMENT

Subwatershed: **Paulins Kill**

Site Area: **130,213 sq. ft.**

Address: **189 Halsey Road**
Newton, NJ 07860

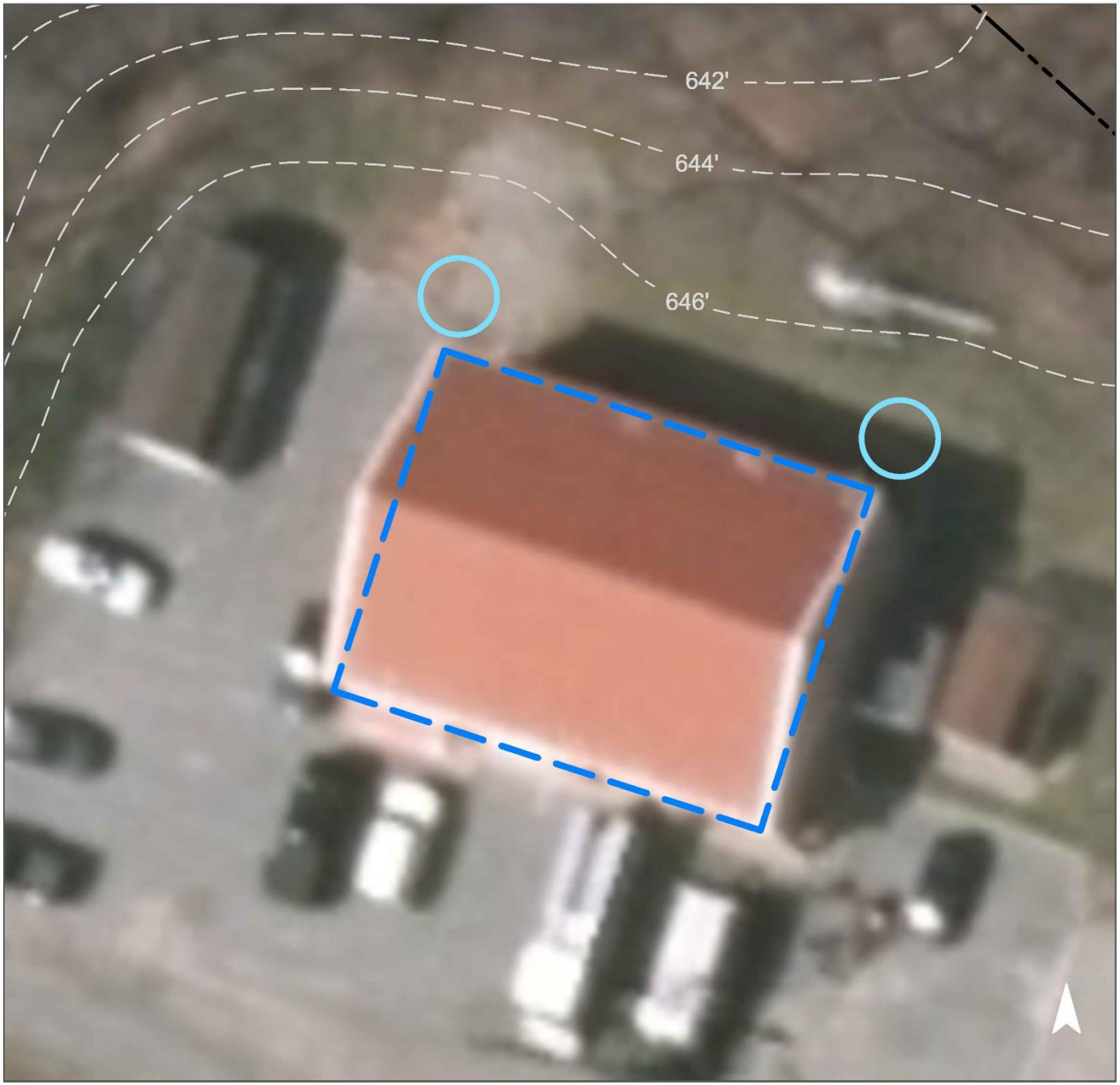
Block and Lot: **Block 3105 , Lot 23**

Rainwater can be harvested by installing cisterns in the back of the building. The water can then be used for watering gardens, washing vehicles, or for other non-potable uses. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
14	18,048	0.9	9.1	82.9	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
Rainwater harvesting	0.072	12	5,086	0.19	3,000 (gal)	$6,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Hampton Township Fire Department

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

0 10' 20'

HAMPTON TOWNSHIP MUNICIPAL BUILDING

Subwatershed: **Paulins Kill**

Site Area: **766,642 sq. ft.**

Address: **1 Rumsey Way**
Newton, NJ 07860

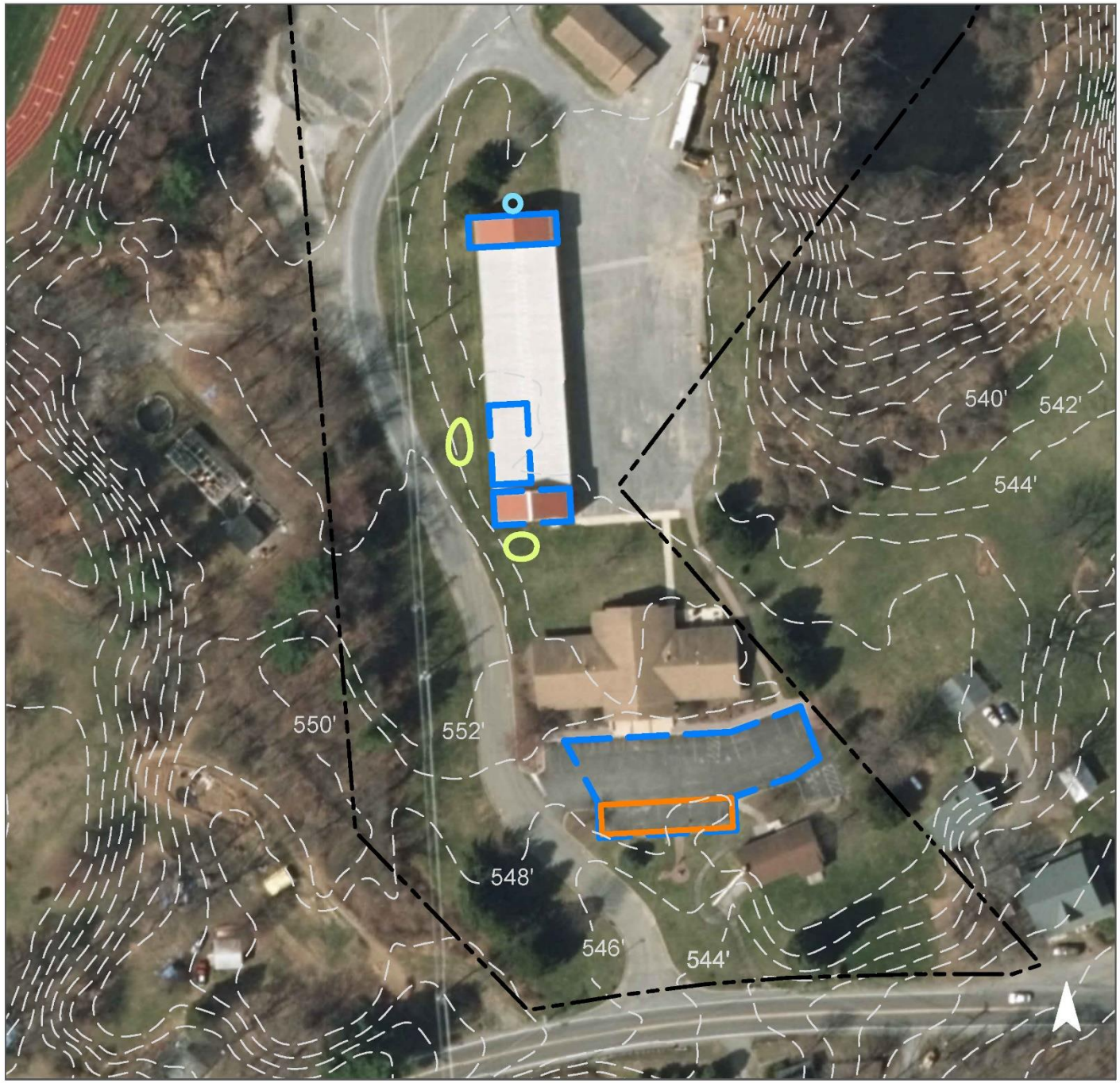
Block and Lot: **Block 2702 , Lot 4**

Two rain gardens can be built adjacent to the building in the middle to capture, treat, and infiltrate roof runoff. Another rain garden can be built at a picnic area to the north. A cistern can be installed to harvest rainwater from the northeastern corner of the building. Parking spots in front of the southern building can be replaced with porous asphalt to capture and 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"
11	87,229	4.2	44.1	400.5	0.068	2.39

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	0.133	22	12,252	0.46	1,325	$6,625
Pervious pavement	0.217	36	15,401	0.58	41,750	$41,750
Rainwater harvesting	0.030	5	2,109	0.08	1,000 (gal)	$2,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

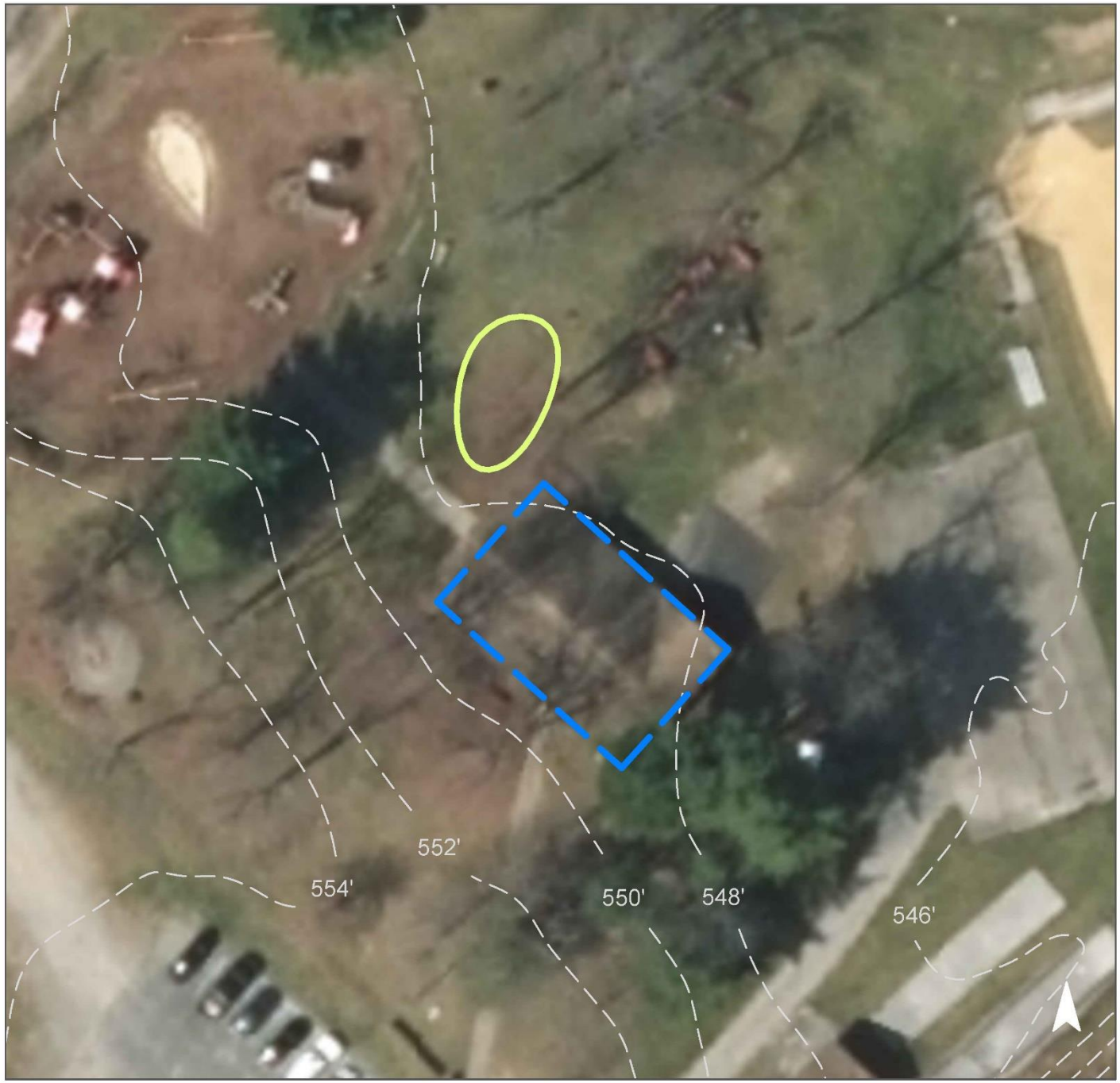


Hampton Township Municipal Building

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

0 50' 100'

GREEN INFRASTRUCTURE RECOMMENDATIONS



Hampton Township Municipal Building - Continued

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

0 20' 40'

KITTATINNY REGIONAL HIGH SCHOOL

Subwatershed: Paulins Kill

Site Area: 4,093,143 sq. ft.

Address: 77 Halsey Road
Newton, NJ 07860

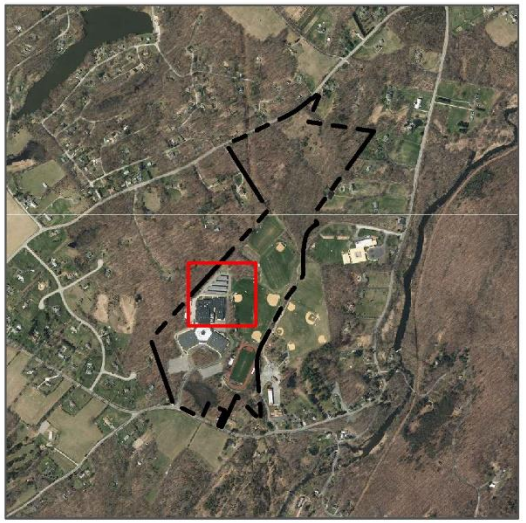
Block and Lot: Block 2702 , Lot 16.03

Two rain gardens can be built in the back of the main building to capture, treat, and infiltrate roof runoff. Parking spots to the east of the solar farm can be replaced with pervious pavement to capture and 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"
15	618,000	29.8	312.1	2,837.5	0.482	16.95

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	0.310	52	22,036	0.83	2,385	$11,925
Pervious pavement	0.528	88	37,460	1.41	4,050	$101,250

GREEN INFRASTRUCTURE RECOMMENDATIONS



Kittatinny Regional High School

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

0 50' 100'

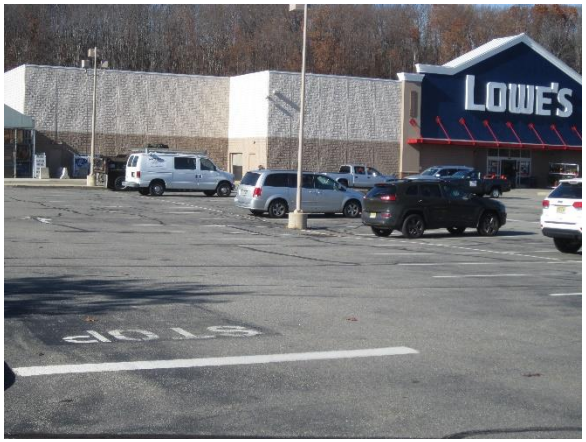
LOWE'S

Subwatershed: **Paulins Kill**

Site Area: **2,348,226 sq. ft.**

Address: **39 Hampton House Road**
Newton, NJ 07860

Block and Lot: **Block 3501 , Lot 37**

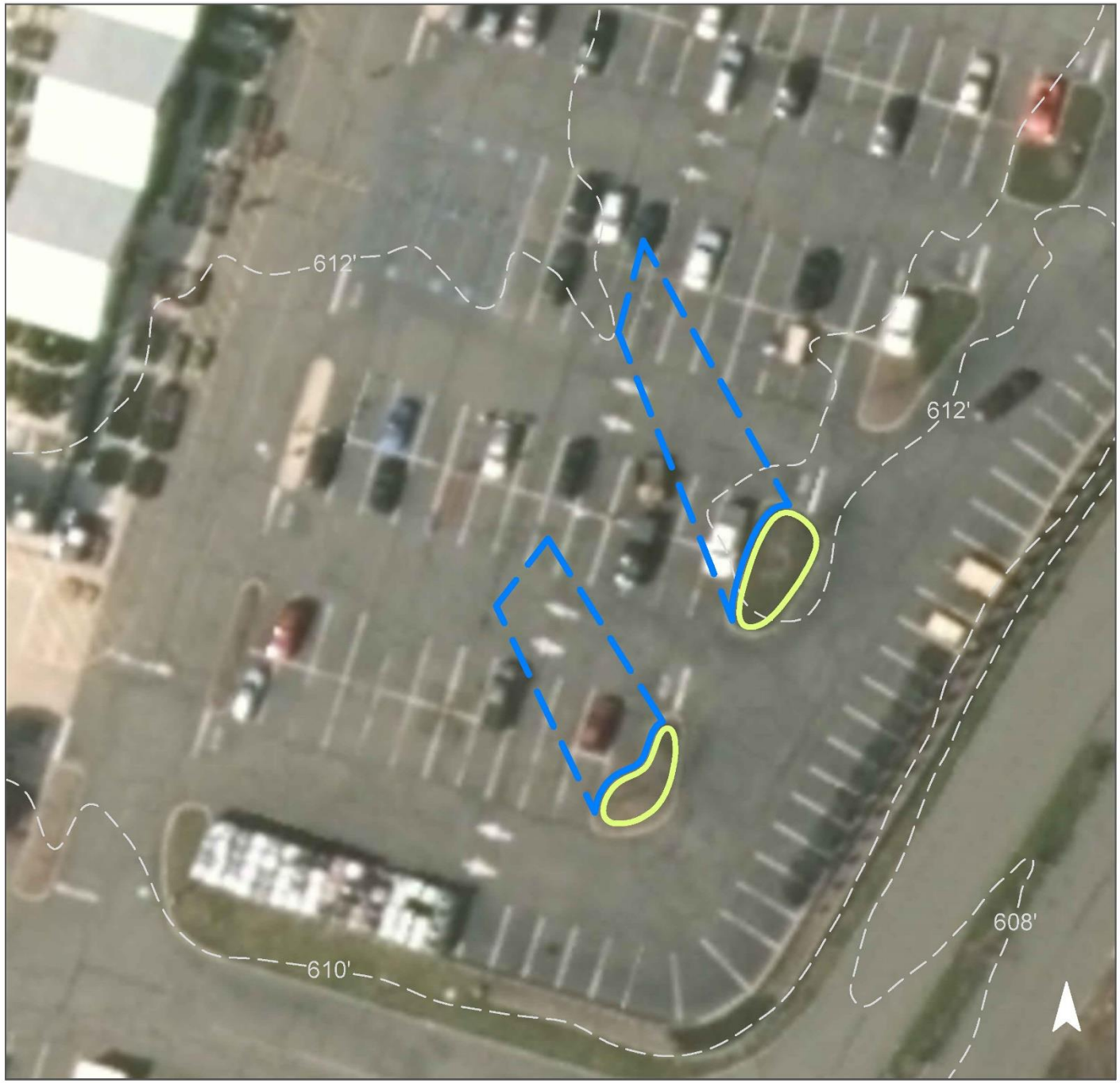


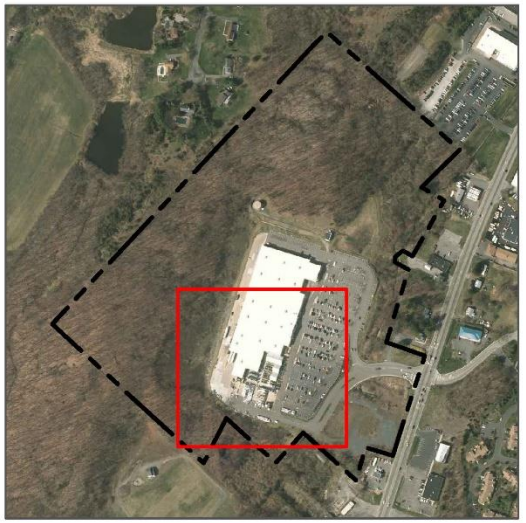
Installing rain gardens in the parking islands will capture, treat, and infiltrate parking lot runoff. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.

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"
25	582,106	28.1	294.0	2,672.7	0.454	15.97

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	0.077	13	5,490	0.21	595	$2,975

GREEN INFRASTRUCTURE RECOMMENDATIONS





Lowe's

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

0 20' 40'

MARIAN EMMONS MCKEOWN SCHOOL

Subwatershed: **Paulins Kill**

Site Area: **786,679 sq. ft.**

Address: **1 School Road**
Newton, NJ 07860

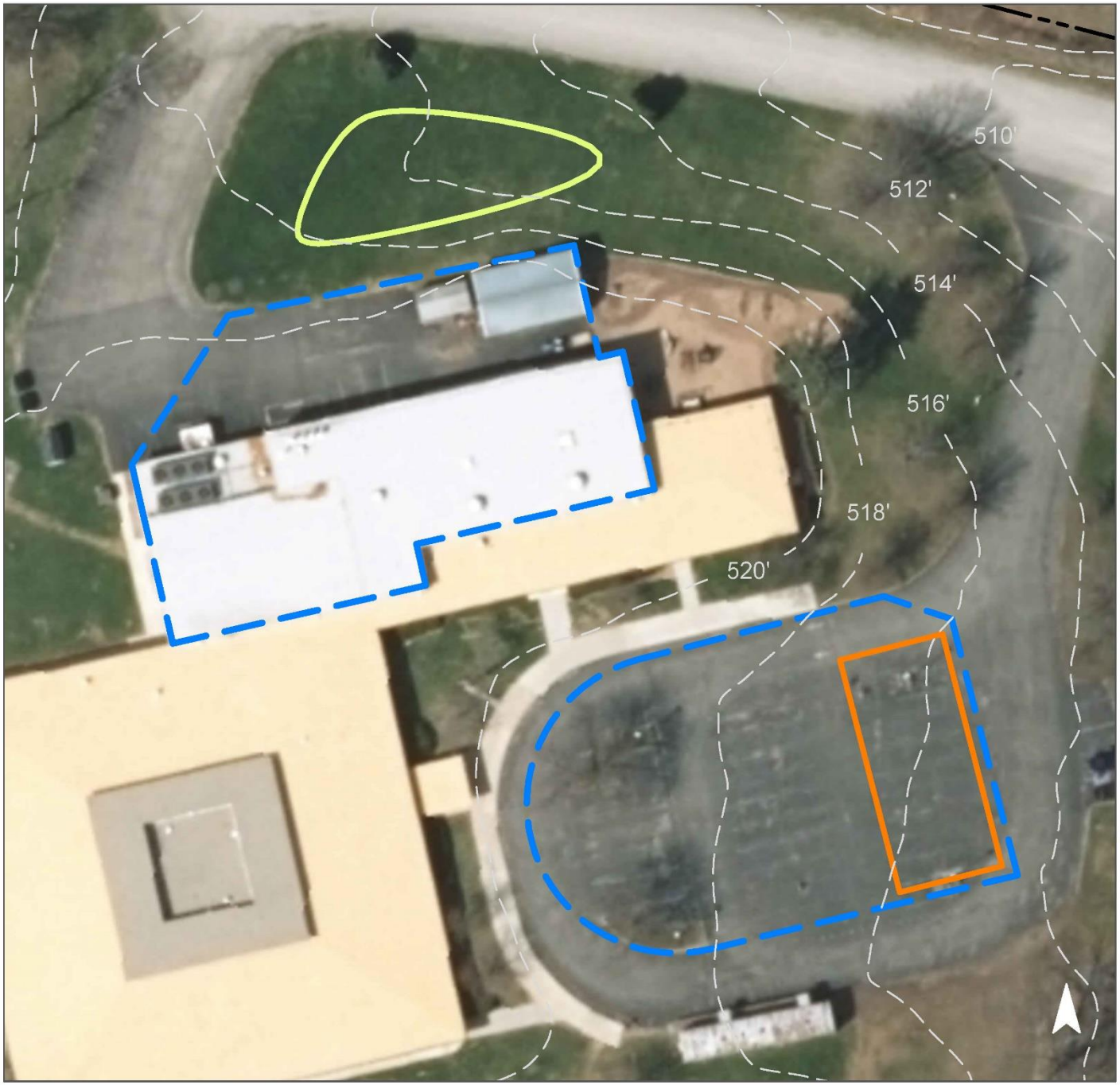
Block and Lot: **Block 2702 , Lot 16.01**

Parking spots to the east of the building can be replaced with porous asphalt to capture and infiltrate stormwater. Installing a rain garden in the back 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"
22	173,439	8.4	87.6	796.3	0.135	4.76

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	0.530	89	37,624	1.42	4,070	$20,350
Pervious pavement	0.509	85	36,143	1.36	3,910	$97,750

GREEN INFRASTRUCTURE RECOMMENDATIONS



Marian Emmons McKeown School

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

0 30' 60'

MIDDLETON & COMPANY INSURANCE

Subwatershed: **Paulins Kill**

Site Area: **108,625 sq. ft.**

Address: **186 Halsey Road**
Newton, NJ 07860

Block and Lot: **Block 3501 , Lot 83**

A rain garden can be built adjacent to the building to capture, treat, and infiltrate roof runoff. 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"
17	18,252	0.9	9.2	83.8	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	0.038	6	2,663	0.10	290	$1,450

GREEN INFRASTRUCTURE RECOMMENDATIONS

Middleton &Company Insurance

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

0 10' 20'

NORTHWEST CHRISTIAN SCHOOL

Subwatershed: Paulins Kill

Site Area: 580,750 sq. ft.

Address: 92 County Road 519
Newton, NJ 07860

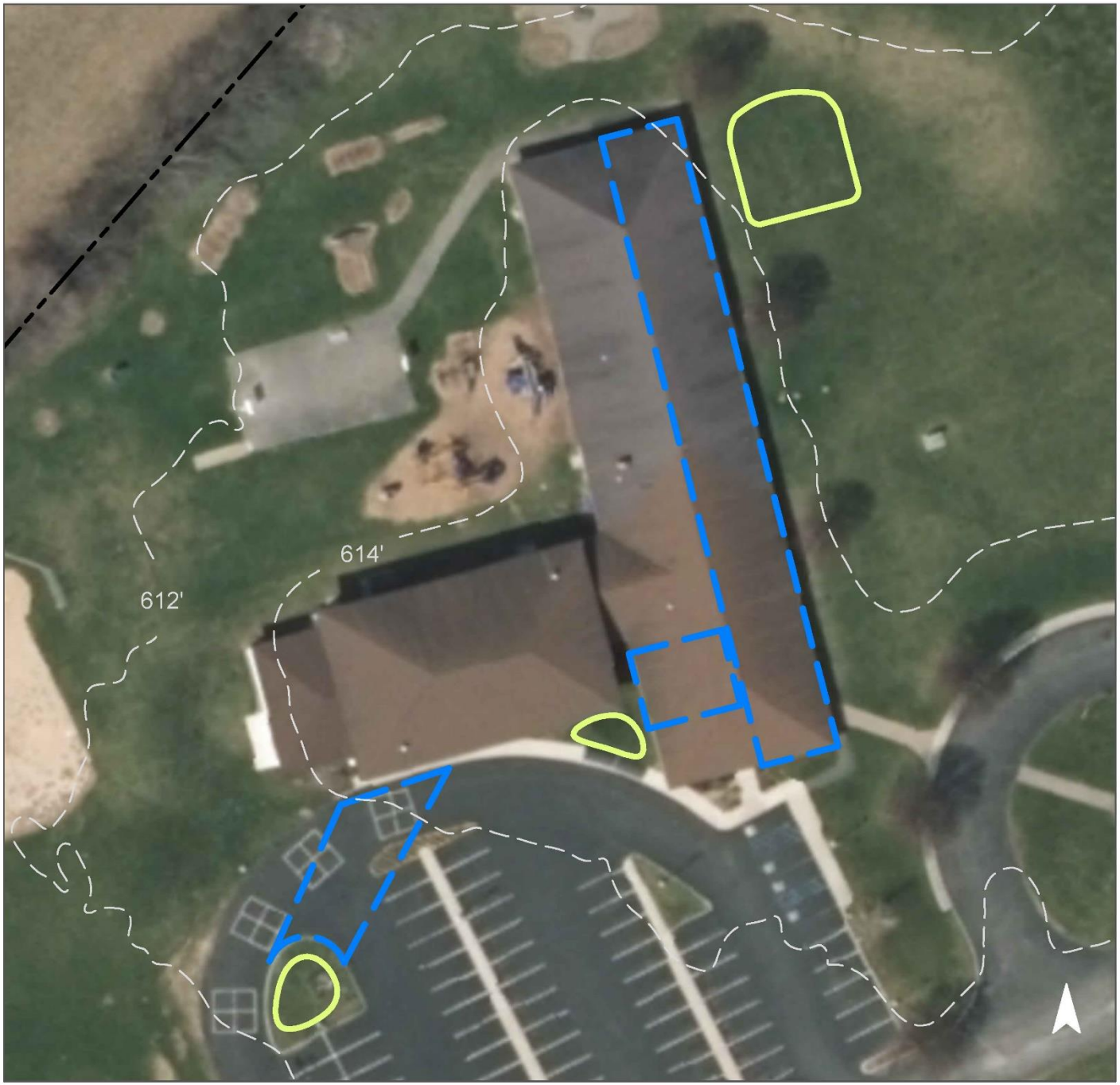
Block and Lot: Block 3202 , Lot 24

Installing rain gardens adjacent to the building and in the parking island 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"
21	122,310	5.9	61.8	561.6	0.095	3.35

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	0.286	48	20,331	0.77	2,740	$13,700

GREEN INFRASTRUCTURE RECOMMENDATIONS



Northwest Christian School

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

0 30' 60'

R & T NAUTILUS

Subwatershed: **Paulins Kill**

Site Area: **131,298 sq. ft.**

Address: **190 Halsey Road**
Newton, NJ 07860

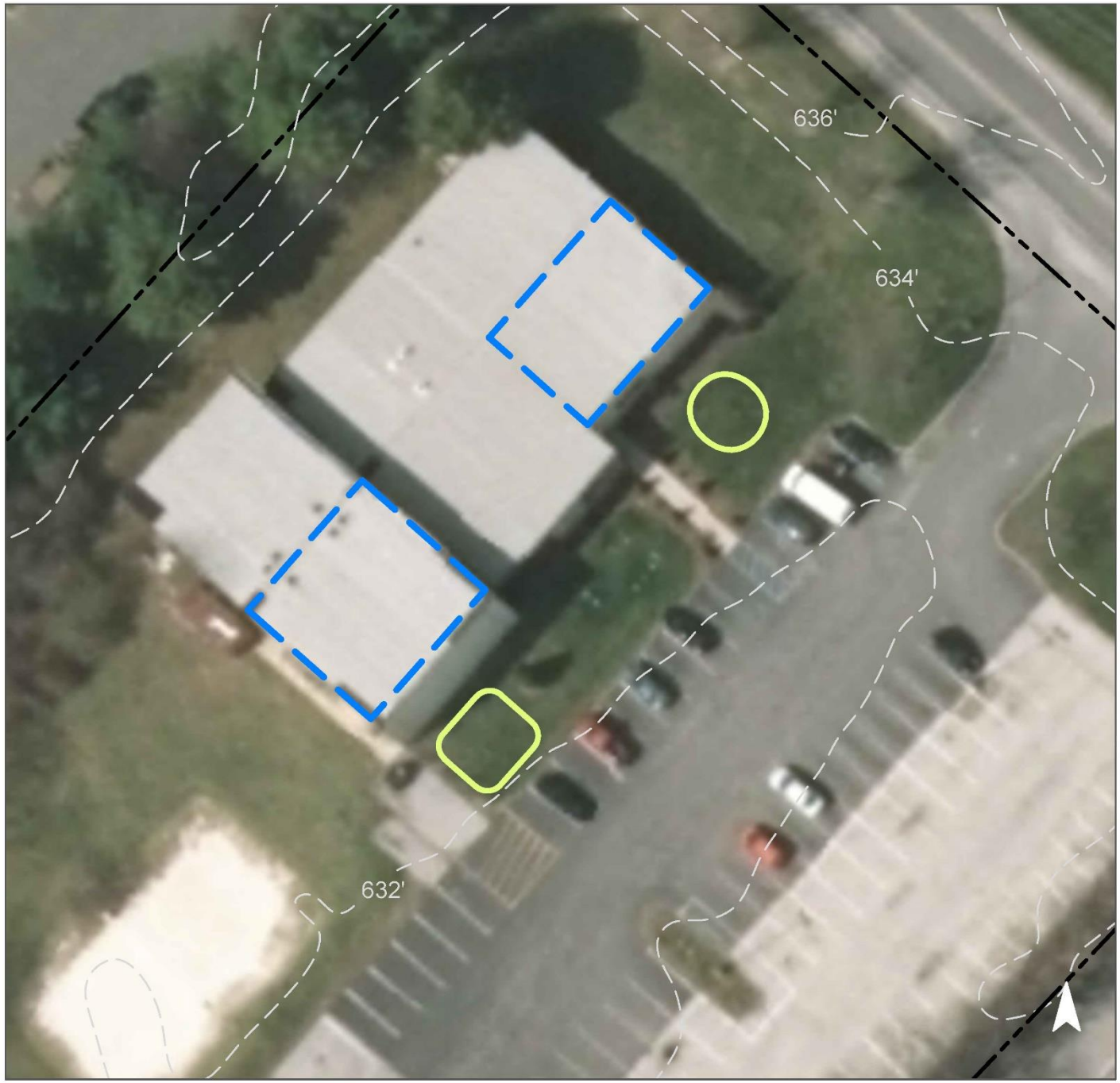
Block and Lot: **Block 3501 , Lot 2**

Installing rain gardens adjacent to the building can capture, treat, and infiltrate roof runoff. 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"
39	51,787	2.5	26.2	237.8	0.040	1.42

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	6,657	0.25	720	$3,600

GREEN INFRASTRUCTURE RECOMMENDATIONS



R&T Nautilus

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

0 20' 40'

c. Summary of Existing Conditions

Summary of Existing 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)
PAULINS KILL SUBWATERSHED	**215.29**	**9,377,828**			**88.5**	**926.8**	**8,425.5**		**42.13**	**1,835,074**	**1.430**	**50.33**
Baleville Congregational Church												
Total Site Info	3.65	159,163	2702	8	1.0	10.6	96.0	13	0.48	20,912	0.016	0.57
Brothers Sheet Metal, Inc.												
Total Site Info	2.05	89,354	3501	82.03	2.6	27.5	249.7	61	1.25	54,394	0.042	1.49
Ephemeral Realty, LLC												
Total Site Info	4.22	183,734	3501	51	4.3	44.7	406.8	48	2.03	88,596	0.069	2.43
Hampton Township Fire Department												
Total Site Info	2.99	130,213	3105	23	0.9	9.1	82.9	14	0.41	18,048	0.014	0.49
Hampton Township Municipal Building												
Total Site Info	17.60	766,642	2702	4	4.2	44.1	400.5	11	2.00	87,229	0.068	2.39
Kittatinny Regional High School												
Total Site Info	93.97	4,093,143	2702	16.03	29.8	312.1	2,837.5	15	14.19	618,000	0.482	16.95
Lowe's												
Total Site Info	53.91	2,348,226	3501	37	28.1	294.0	2,672.7	25	13.36	582,106	0.454	15.97
Marian Emmons McKeown School												
Total Site Info	18.06	786,679	2702	16.01	8.4	87.6	796.3	22	3.98	173,439	0.135	4.76
Middleton & Company Insurance												
Total Site Info	2.49	108,625	3501	83	0.9	9.2	83.8	17	0.42	18,252	0.014	0.50
Northwest Christian School												
Total Site Info	13.33	580,750	3202	24	5.9	61.8	561.6	21	2.81	122,310	0.095	3.35
R & T Nautilus												
Total Site Info	3.01	131,298	3501	2	2.5	26.2	237.8	39	1.19	51,787	0.040	1.42

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 %
	PAULINS KILL SUBWATERSHED	**123,545**	**2.84**	**3.219**	**539**	**231,341**	**8.72**	**36,870**			**$334,950**	**6.7%**
1	**Baleville Congregational Church**											
	Bioretention systems	2,855	0.07	0.074	12	5,281	0.20	570	5	SF	$2,850	13.7%
	Total Site Info	**2,855**	**0.07**	**0.074**	**12**	**5,281**	**0.20**	**570**			**$2,850**	**13.7%**
2	**Brothers Sheet Metal, Inc.**											
	Bioretention system	2,710	0.06	0.071	12	5,012	0.19	545	5	SF	$2,725	5.0%
	Total Site Info	**2,710**	**0.06**	**0.071**	**12**	**5,012**	**0.19**	**545**			**$2,725**	**5.0%**
3	**Ephemeral Realty, LLC**											
	Rainwater harvesting	9,620	0.22	0.251	42	17,795	0.67	10,000	2	gal	$20,000	10.9%
	Total Site Info	**9,620**	**0.22**	**0.251**	**42**	**17,795**	**0.67**	**10,000**			**$20,000**	**10.9%**
4	**Hampton Township Fire Department**											
	Rainwater harvesting	2,750	0.06	0.072	12	5,086	0.19	3,000	2	gal	$6,000	15.2%
	Total Site Info	**2,750**	**0.06**	**0.072**	**12**	**5,086**	**0.19**	**3,000**			**$6,000**	**15.2%**
5	**Hampton Township Municipal Building**											
	Bioretention systems	5,100	0.12	0.133	22	12,252	0.46	1,325	5	SF	$6,625	5.8%
	Pervious pavement	8,325	0.19	0.217	36	15,401	0.58	1,670	25	SF	$41,750	9.5%
	Rainwater harvesting	1,140	0.03	0.030	5	2,109	0.08	1,000	2	gal	$2,000	1.3%
	Total Site Info	**14,565**	**0.33**	**0.379**	**64**	**29,763**	**1.12**	**3,995**			**$50,375**	**16.7%**
6	**Kittatinny Regional High School**											
	Bioretention systems	11,915	0.27	0.310	52	22,036	0.83	2,385	5	SF	$11,925	1.9%
	Pervious pavement	20,250	0.46	0.528	88	37,460	1.41	4,050	25	SF	$101,250	3.3%
	Total Site Info	**32,165**	**0.74**	**0.838**	**140**	**59,496**	**2.24**	**6,435**			**$113,175**	**5.2%**
7	**Lowe's**											
	Bioretention systems	2,970	0.07	0.077	13	5,490	0.21	595	5	SF	$2,975	0.5%
	Total Site Info	**2,970**	**0.07**	**0.077**	**13**	**5,490**	**0.21**	**595**			**$2,975**	**0.5%**

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	**Marian Emmons McKeown School**											
	Bioretention system	20,340	0.47	0.530	89	37,624	1.42	4,070	5	SF	$20,350	11.7%
	Pervious pavement	19,540	0.45	0.509	85	36,143	1.36	3,910	25	SF	$97,750	11.3%
	Total Site Info	**39,880**	**0.92**	**1.039**	**174**	**73,768**	**2.78**	**7,980**			**$118,100**	**23.0%**
9	**Middleton & Company Insurance**											
	Bioretention system	1,440	0.03	0.038	6	2,663	0.10	290	5	SF	$1,450	7.9%
	Total Site Info	**1,440**	**0.03**	**0.038**	**6**	**2,663**	**0.10**	**290**			**$1,450**	**7.9%**
10	**Northwest Christian School**											
	Bioretention systems	10,990	0.25	0.286	48	20,331	0.77	2,740	5	SF	$13,700	9.0%
	Total Site Info	**10,990**	**0.25**	**0.286**	**48**	**20,331**	**0.77**	**2,740**			**$13,700**	**9.0%**
11	**R & T Nautilus**											
	Bioretention systems	3,600	0.08	0.094	16	6,657	0.25	720	5	SF	$3,600	7.0%
	Total Site Info	**3,600**	**0.08**	**0.094**	**16**	**6,657**	**0.25**	**720**			**$3,600**	**7.0%**