RUTGERS
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Experiment Station

Draft

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

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

March 16, 2020

Highlands Council
New Jersey

ACKNOWLEDGEMENTS:

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

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Highlands Council
New Jersey

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Introduction

Located in Morris County, New Jersey, Randolph Township covers approximately 21.07 square miles. Figures 1 and 2 illustrate that Randolph Township is dominated by urban land use. A total of 51.3% of the municipality's land use is classified as urban. Of the urban land in Randolph Township, low density residential is the dominant land use (Figure 3).

The New Jersey Department of Environmental Protection's (NJDEP) 2015 land use/land cover geographical information system (GIS) data layer categorizes Randolph 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 Randolph Township. Based upon the 2015 NJDEP land use/land cover data, approximately 14.5% of Randolph Township has impervious cover. This level of impervious cover suggests that the streams in Randolph Township are likely impacted streams. [1]

Methodology

Randolph Township contains portions of seven subwatersheds (Figure 4). For this impervious cover reduction action plan, projects have been identified in six 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] Schuler, T.R., L. Fraley-McNeal, and K. Cappiella. 2009. Is Impervious Cover Still Important? Review of Recent Research. *Journal of Hydrologic Engineering* 14 (4): 309-315.

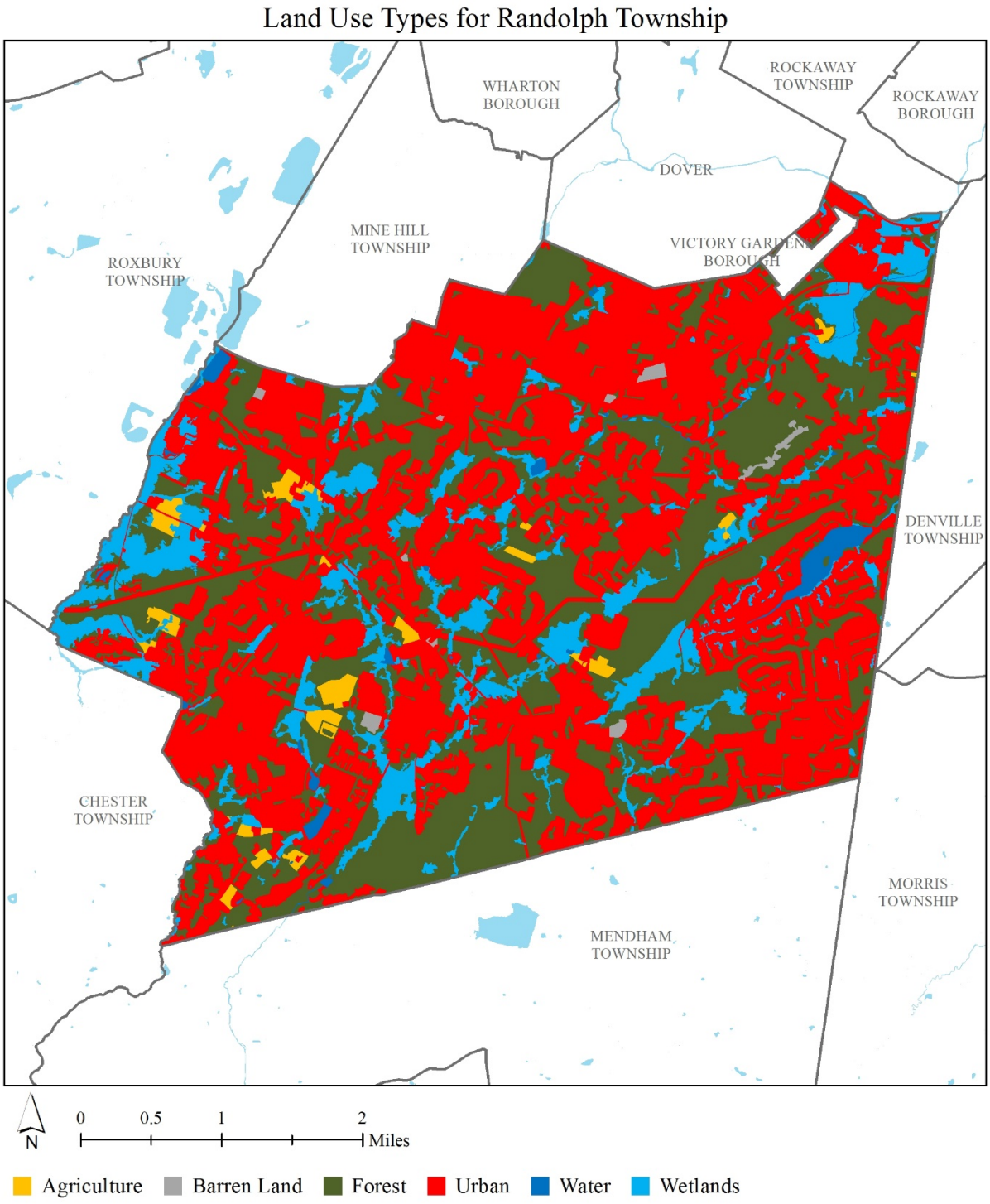


Figure 1: Map illustrating the land use in Randolph Township

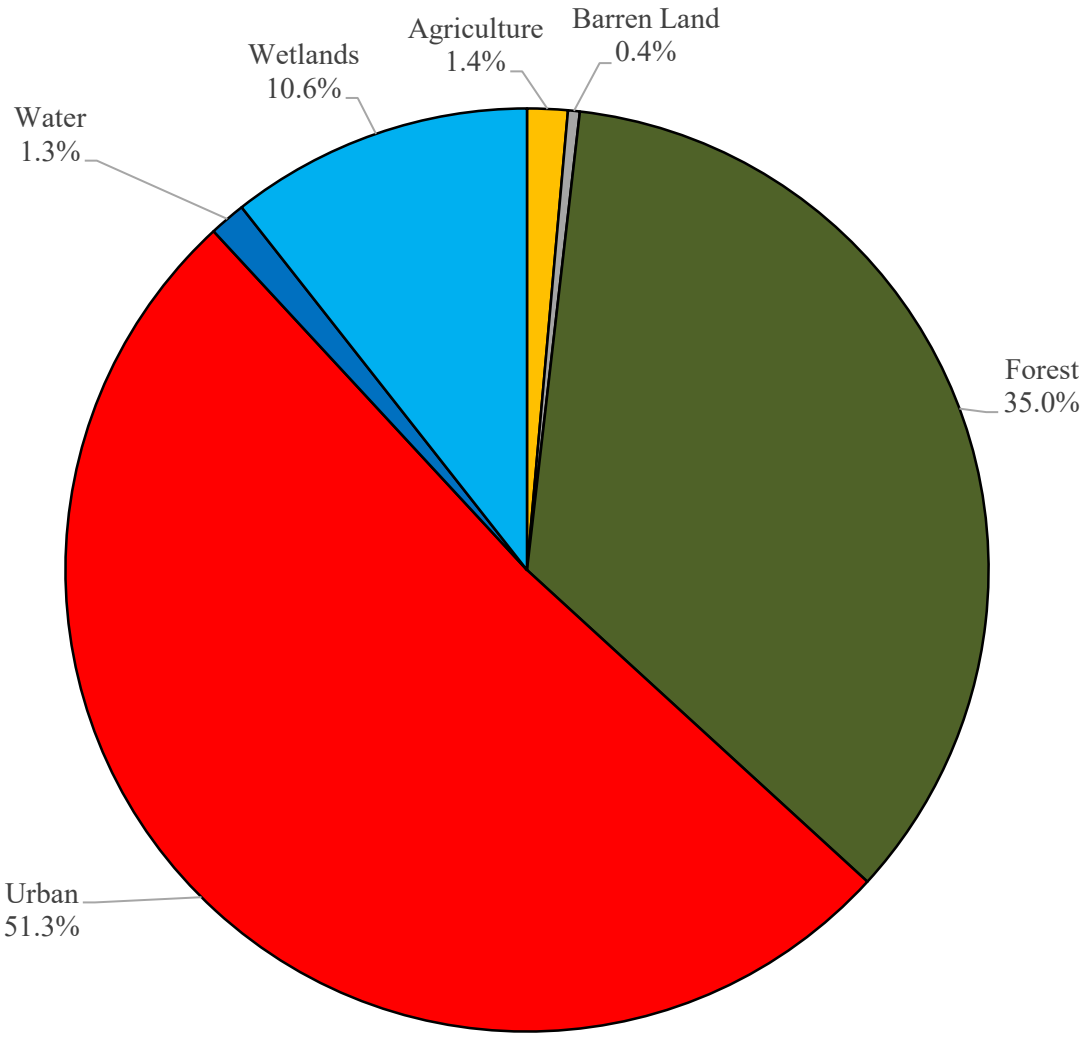


Figure 2: Pie chart illustrating the land use in Randolph Township

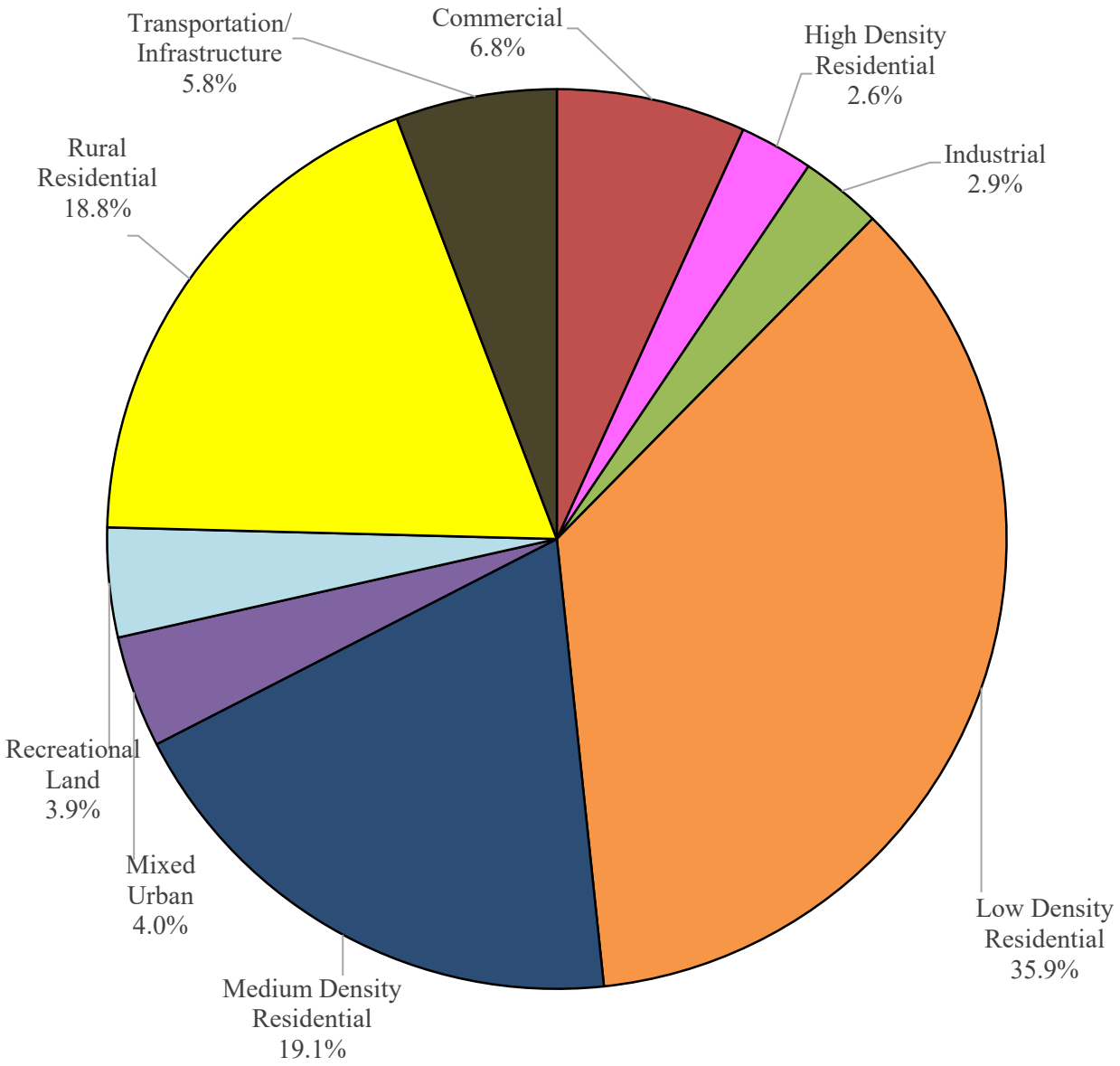


Figure 3: Pie chart illustrating the various types of urban land use in Randolph Township

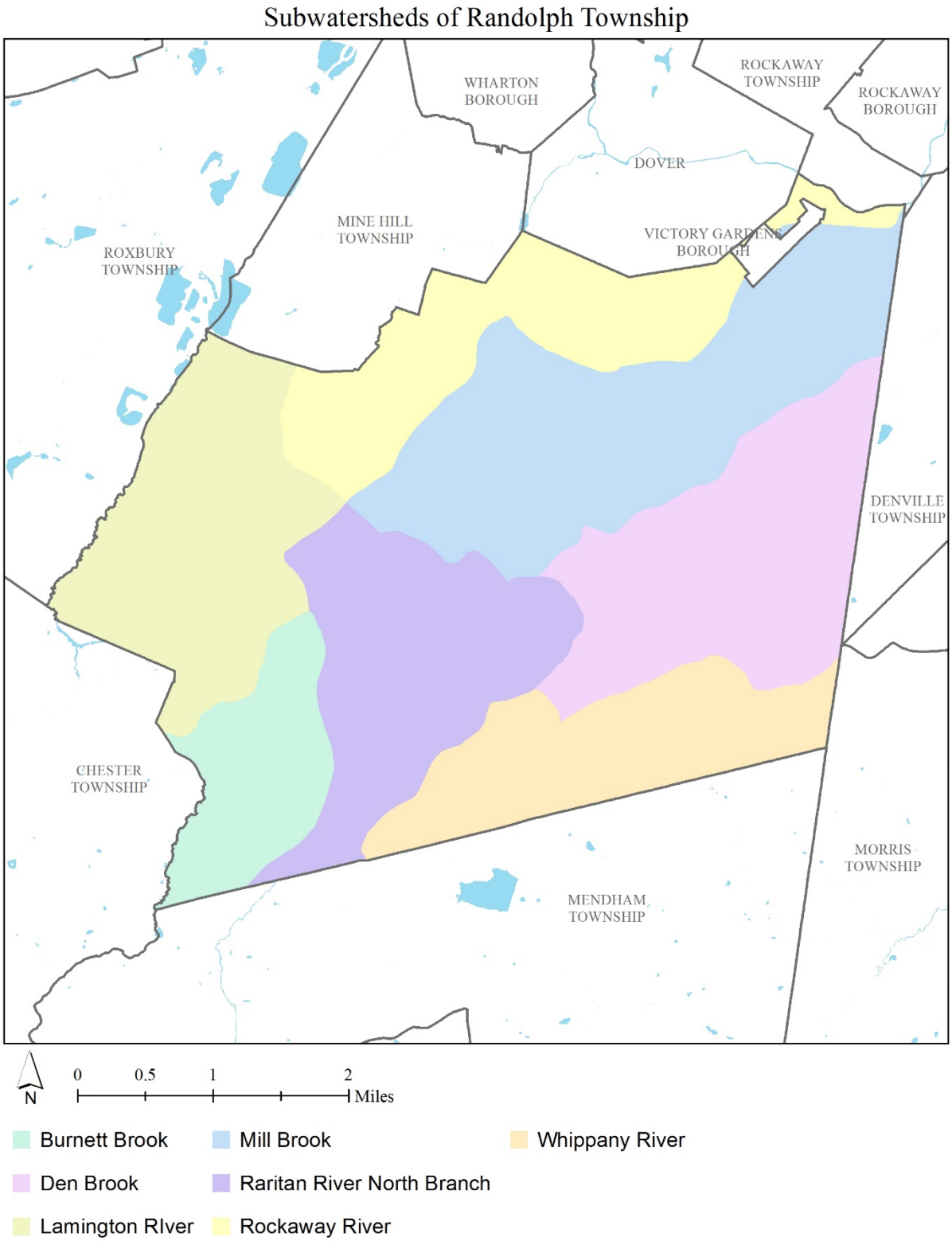


Figure 4: Map of the subwatersheds in Randolph Township

For each potential project site, specific aerial loading coefficients for commercial land use were used to determine the annual runoff loads for total phosphorus (TP), total nitrogen (TN), and total suspended solids (TSS) from impervious surfaces (Table 1). These are the same aerial loading coefficients that NJDEP uses in developing total maximum daily loads (TMDLs) for impaired waterways of the state. The percentage of impervious cover for each site was extracted from the 2015 NJDEP land use/land cover database. For impervious areas, runoff volumes were determined for the 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 Randolph 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 principle, green infrastructure practices use soil and vegetation to recycle stormwater runoff through infiltration and evapotranspiration. When used as components of a stormwater management system, green infrastructure practices such as bioretention, green roofs, porous pavement, rain gardens, and vegetated swales can 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 Randolph 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.

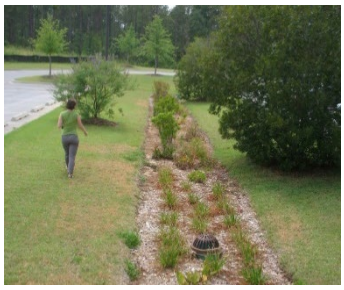
Downspout planter boxes

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

Appendix A contains information on potential project sites where green infrastructure practices could be installed as well as information on existing site conditions. The recommended green infrastructure practices and the drainage area that the green infrastructure practices can treat are identified for each potential project site. For each practice, the recharge potential, TSS removal potential, maximum volume reduction potential per storm, the peak reduction potential, and estimated costs 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

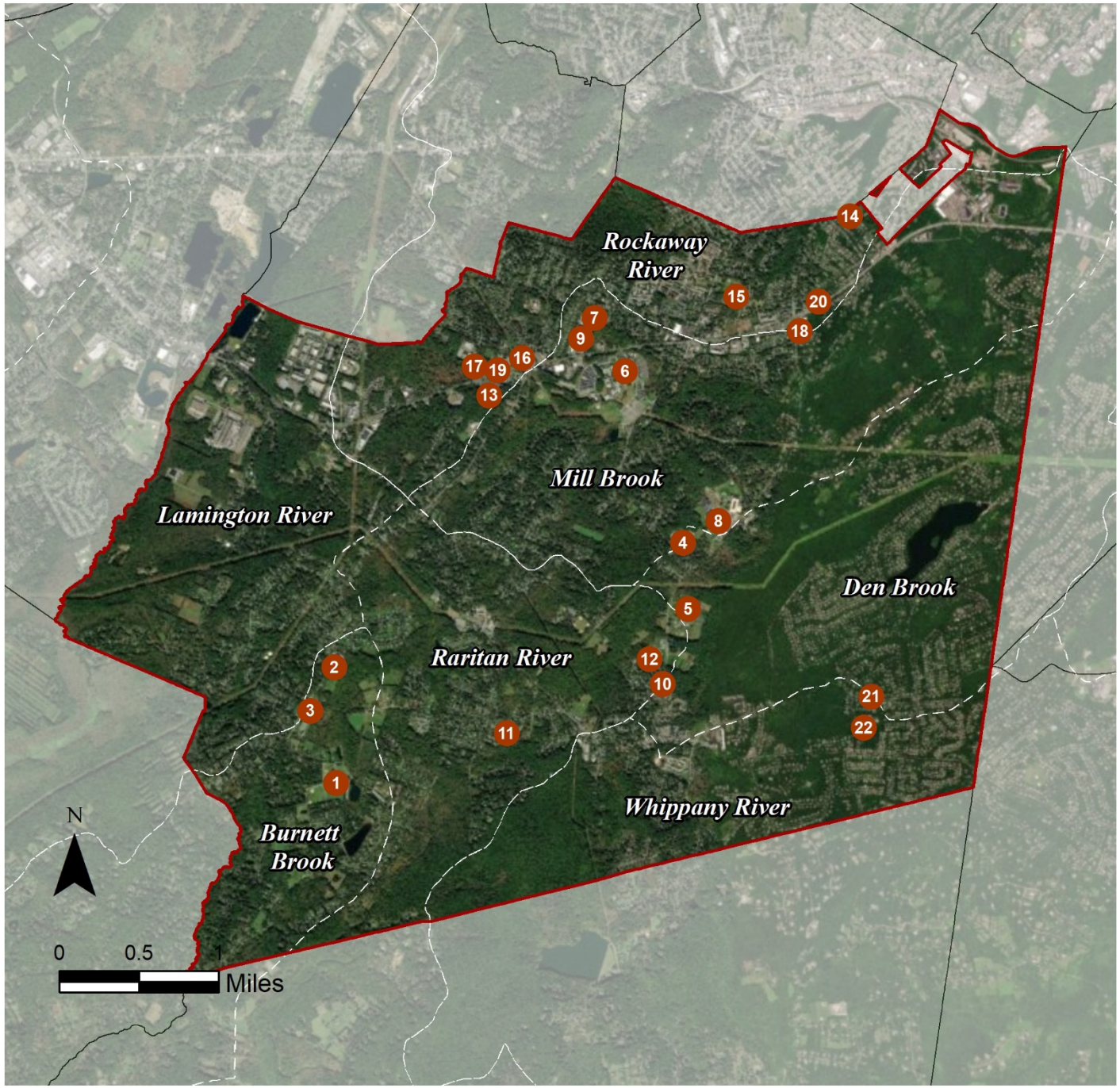
This impervious cover reduction action plan is meant to provide the municipality with a blueprint for implementing green infrastructure practices that will reduce the impact of stormwater runoff from impervious surfaces. These projects can be implemented by a wide variety of people such as boy scouts, 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.

Appendix A: Climate Resilient Green Infrastructure

a. Green Infrastructure Sites

RANDOLPH TOWNSHIP: GREEN INFRASTRUCTURE SITES



SITES WITHIN THE BURNETT BROOK SUBWATERSHED

1. Heistein Park
2. Ironia Elementary School
3. Randolph Township Fire Department Company #4

SITES WITHIN THE DEN BROOK SUBWATERSHED

4. Center Grove Elementary School
5. Freedom Park

SITES WITHIN THE MILL BROOK SUBWATERSHED

6. County College of Morris
7. Iglesia Alianza
8. Randolph High School
9. The Connect Church: Randolph

SITES WITHIN THE RARITAN RIVER SUBWATERSHED

10. Randolph Township Fire Department Company #3
11. Randolph Township Library & Community Center
12. Resurrection Parish

SITES WITHIN THE ROCKAWAY RIVER SUBWATERSHED

13. Bible Church International
14. Christadelphian Chapel
15. Fernbrook Elementary School
16. Grace Church Bethlehem Campus
17. Mar Thoma Church of New Jersey
18. Millbrook United Methodist Church
19. Randolph Rescue Squad
20. Randolph Township Fire Department Company #2

SITES WITHIN THE WHIPPANY RIVER SUBWATERSHED

21. Randolph Township Fire Department Company #5
22. Shongum Elementary School

b. Proposed Green Infrastructure Concepts

HEISTEIN PARK

Subwatershed: Burnett Brook

Site Area: 1,849,597 sq. ft.

Address: Heistein Park Road
Randolph, NJ 07869

Block and Lot: Block 51 | Lot 7,30

A bioretention system can be installed in the parking lot bump out to treat the parking lot drainage area. Pervious pavement can be installed in the east and west strips of the parking lot to manage additional runoff from the parking lot. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
9	174,724	8.4	88.2	802.2	0.136	4.79

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	0.078	13	6,110	0.23	750	$3,750
Pervious pavement	1.091	183	85,230	3.20	7,520	$188,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Heistein Park

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

0 75' 150'

IRONIA ELEMENTARY SCHOOL

Subwatershed: Burnett Brook

Site Area: 653,414 sq. ft.

Address: 303 Dover Chester Road
Randolph, NJ 07869

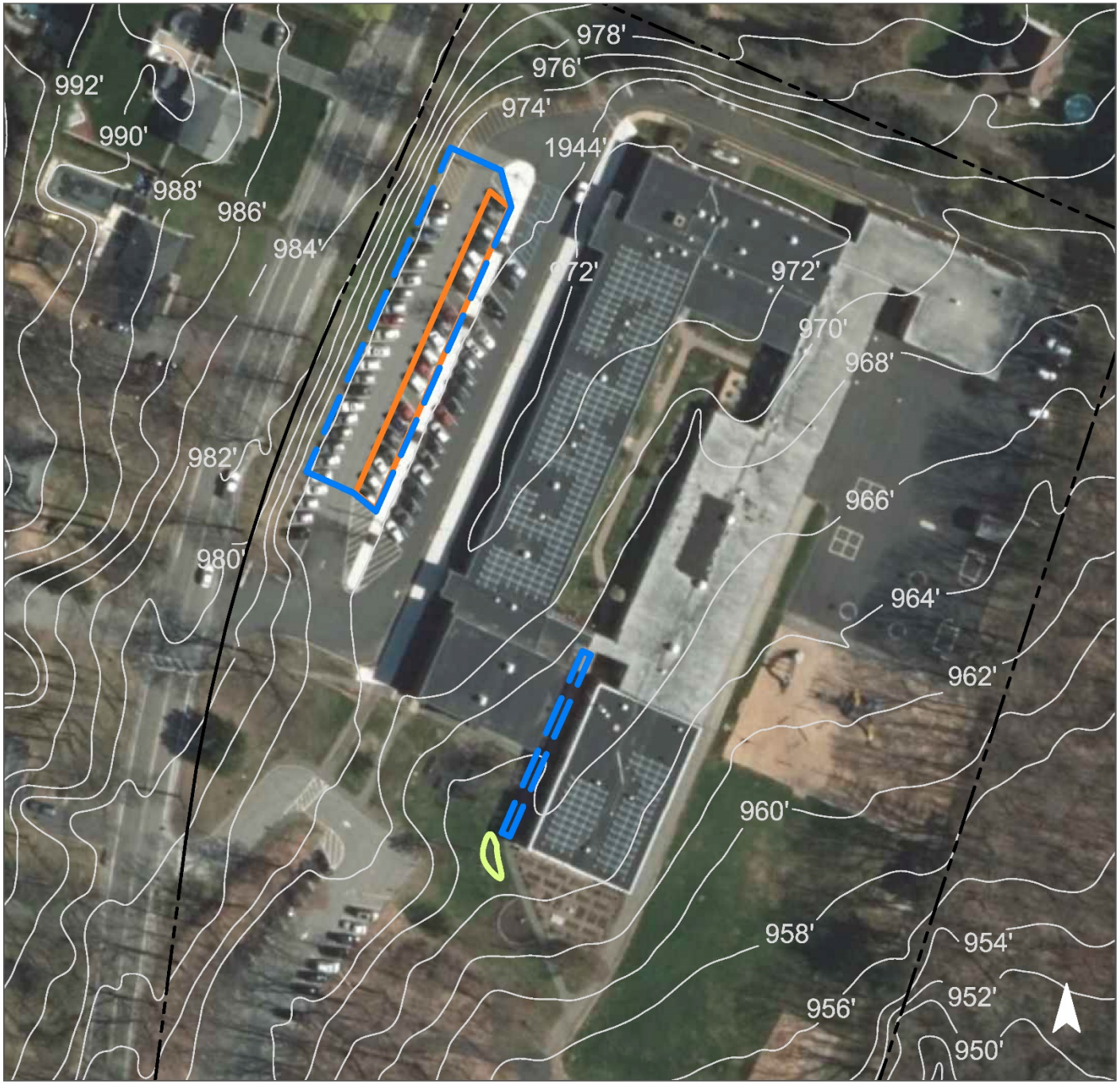
Block and Lot: Block 48 | Lot 5

A bioretention system can be created at the south end the building to capture, treat, and infiltrate the building's stormwater runoff. Pervious pavement can be installed in a strip of parking spaces to treat 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"
38	247,317	11.9	124.9	1,135.5	0.193	6.78

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	0.020	3	1,590	0.06	200	$1,000
Pervious pavement	0.312	52	24,350	0.92	3,925	$98,125

GREEN INFRASTRUCTURE RECOMMENDATIONS



Ironia Elementary School

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

0 50' 100'

RANDOLPH TOWNSHIP FIRE DEPARTMENT COMPANY #4

Subwatershed: Burnett Brook

Site Area: 100,313 sq. ft.

Address: 331 Dover Chester Road
Randolph, NJ 07869

Block and Lot: Block 49 | Lot 2.02

A bioretention system can be installed in the east and south turfgrass areas to capture, treat, and infiltrate the runoff from the parking area. Additionally, a cistern can be installed on the northeast corner of the building to capture the rooftop drainage area that can be reused to wash the fire trucks and water the existing landscaping. 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"
67	67,102	3.2	33.9	308.1	0.052	1.84

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
Bioretention systems	0.231	39	18,060	0.68	2,220	$55,500
Rainwater harvesting	0.066	11	2,000	0.07	2,000 (gal)	$4,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Randolph Township Fire Department Company #4

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

0 30' 60'

CENTER GROVE ELEMENTARY SCHOOL

Subwatershed: Den Brook

Site Area: 886,920 sq. ft.

Address: 25 Schoolhouse Road
Randolph, NJ 07869

Block and Lot: Block 116 | Lot 34

Pervious pavement can be installed in parking spaces throughout the site to capture and infiltrate stormwater runoff from the parking lot and adjacent rooftops. A rain garden can be installed in the area to the south of the building to capture additional stormwater from the rooftop by redirecting downspouts into it. 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	302,005	14.6	152.5	1,386.6	0.235	8.28

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
Bioretention system	0.092	15	7,210	0.27	885	$22,125
Pervious pavement	0.996	167	77,850	2.93	1,980	$49,500

GREEN INFRASTRUCTURE RECOMMENDATIONS

Center Grove Elementary School

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

0 50' 100'

FREEDOM PARK

Subwatershed: Den Brook

Site Area: 4,398,539 sq. ft.

Address: 630 Millbrook Avenue
Randolph, NJ 07869

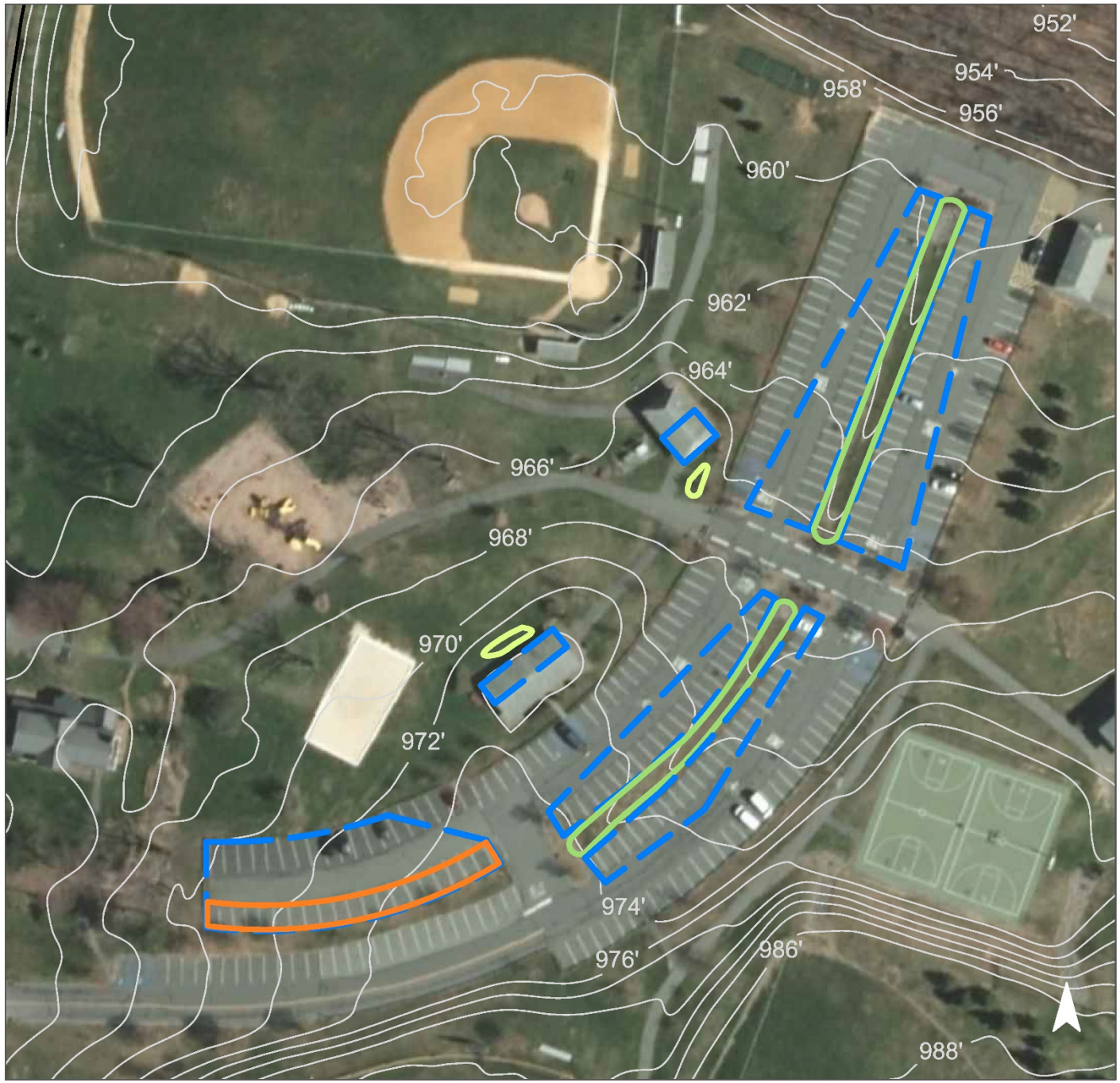
Block and Lot: Block 119 | Lot 15. 01, 115.02, 101.01, 116.01

Bioretention systems can be installed near the park buildings to manage their rooftop areas. The existing swales in the center of the parking lot can be retrofitted with bioswales to enhance infiltration and slow down the stormwater runoff from the parking lot area. Pervious pavement can be installed in the northwest corner of the parking lot to capture additional stormwater 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"
8	348,578	16.8	176.0	1,600.4	0.272	9.56

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
Bioretention systems	0.039	7	3,080	0.12	380	$1,900
Bioswales	0.305	73	21,880	0.35	5,850	$146,250
Pervious pavement	0.266	44	20,770	0.78	3,530	$88,250

GREEN INFRASTRUCTURE RECOMMENDATIONS



Freedom Park

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

0 50' 100'

COUNTY COLLEGE OF MORRIS

Subwatershed: Mill Brook

Site Area: 9,259,582 sq. ft.

Address: 214 Center Grove Road
Randolph, NJ 07869

Block and Lot: Block 81 | Lot 1

A bioretention system can be installed at the east end of the parking lot adjacent to Henderson Hall to treat the parking lot's drainage area. Pervious pavement can be installed in parking spaces throughout the campus to manage the large amount of stormwater runoff generated by the parking lot areas. 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	2,484,265	119.8	1254.7	11,406.2	1.936	68.14

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.417	70	32,580	1.22	4,000	$20,000
Pervious pavement	8.189	1,371	639,940	24.05	60,800	$1,520,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

County College of Morris

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

0 150' 300'

IGLESIA ALIANZA

Subwatershed: Mill Brook

Site Area: 93,605 sq. ft.

Address: 12 Emery Avenue
Randolph, NJ 07869

Block and Lot: Block 73, Lot 58, 59

Parking spaces at the southeast end of the parking lot can be converted to pervious pavement to capture and infiltrate stormwater from the parking lot. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
53	49,950	2.4	25.2	229.3	0.039	1.37

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	0.263	44	20,530	0.77	1,800	$45,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Iglesia Alianza

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

0 25' 50'

RANDOLPH HIGH SCHOOL

Subwatershed: Mill Brook

Site Area: 1,241,714 sq. ft.

Address: 511 Millbrook Avenue
Randolph, NJ 07869

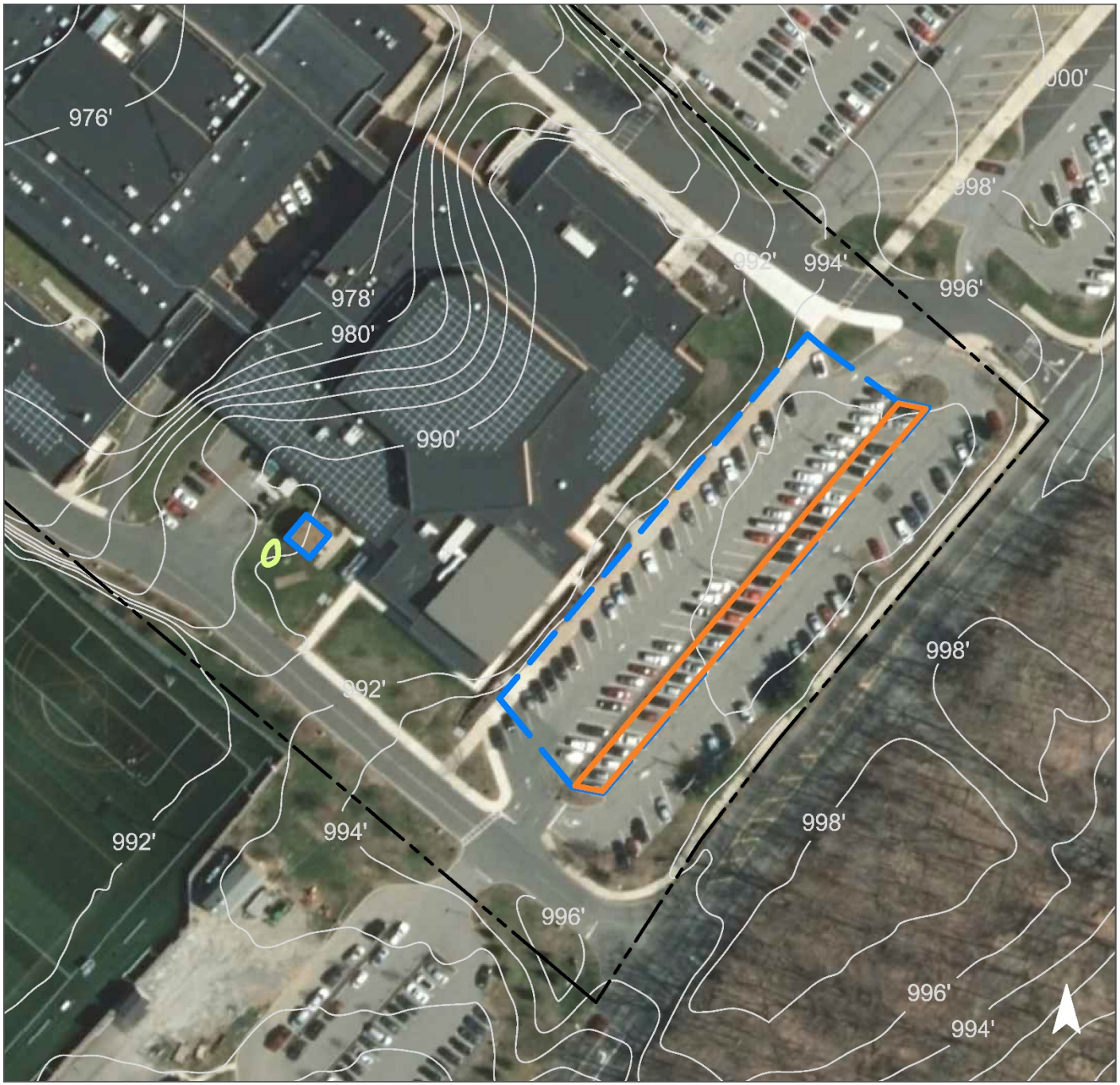
Block and Lot: Block 116 | Lot 30

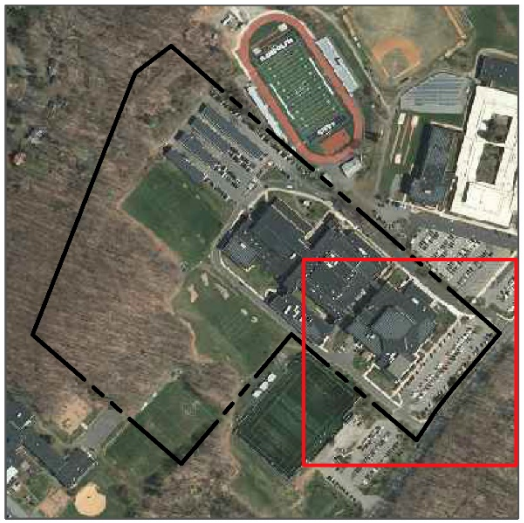
Parking spaces in the parking lot to the southeast of the building can be converted to pervious pavement to capture and infiltrate stormwater runoff from the parking lot. Additional parking spaces throughout the site could be retrofitted as well. A small bioretention system can be installed adjacent to the shed to manage the rooftop 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"
47	584,321	28.2	295.1	2,682.8	0.455	16.03

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.010	2	820	0.03	100	$500
Pervious pavement	0.771	129	60,270	2.26	5,940	$148,500

GREEN INFRASTRUCTURE RECOMMENDATIONS





Randolph High School

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

0 50' 100'

THE CONNECT CHURCH: RANDOLPH

Subwatershed: Mill Brook

Site Area: 75,871 sq. ft.

Address: 6 Emery Avenue
Randolph, NJ 07869

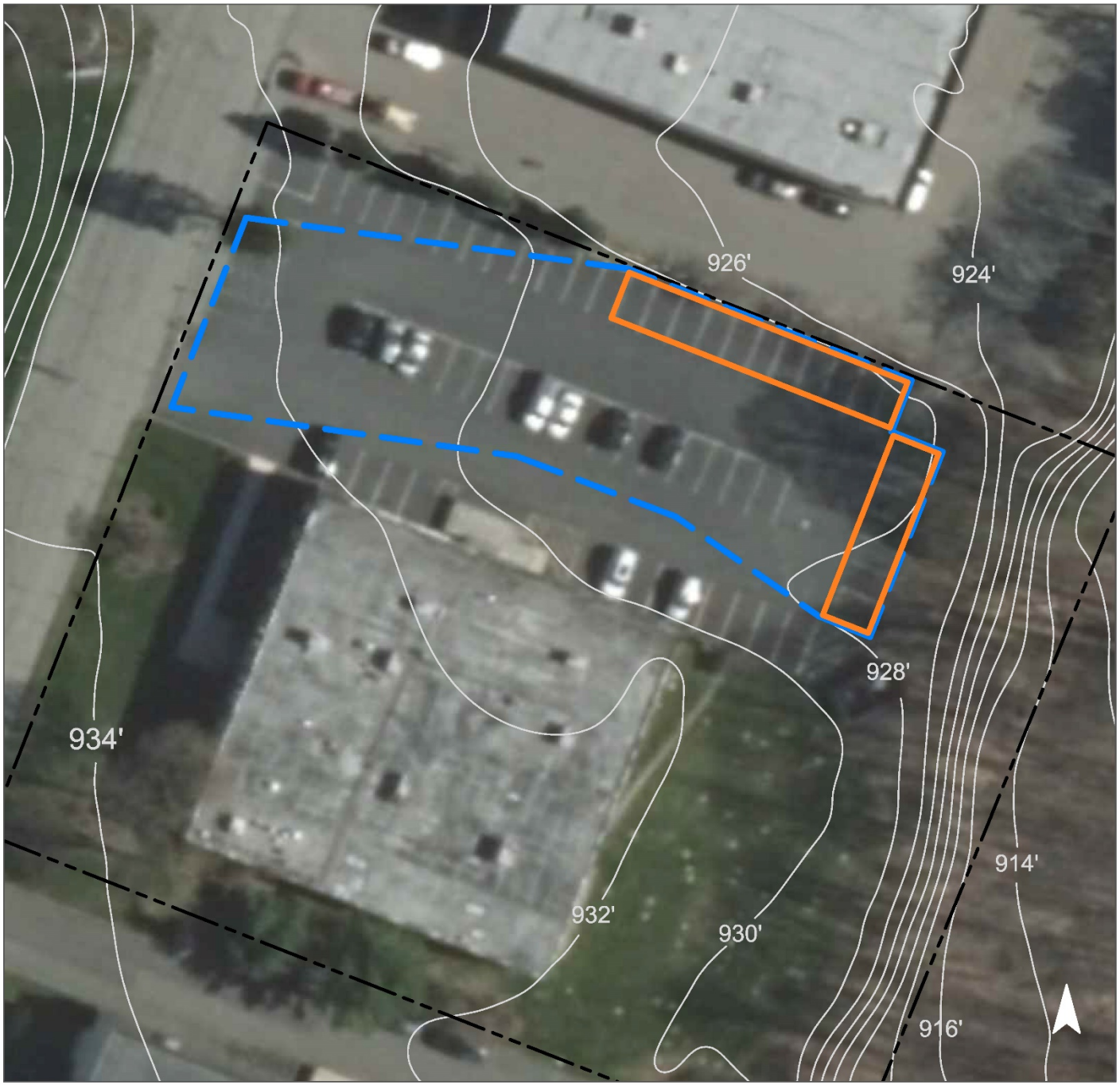
Block and Lot: Block 73 | Lot 56

Pervious pavement can be installed in the northeast portion of the parking lot to capture and infiltrate stormwater runoff from the parking area. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
62	47,152	2.3	23.8	216.5	0.037	1.29

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	0.550	92	42,970	1.61	2,970	$74,250

GREEN INFRASTRUCTURE RECOMMENDATIONS



The Connect Church: Randolph

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

0 25' 50'

RANDOLPH TOWNSHIP FIRE DEPARTMENT COMPANY #3

Subwatershed: Raritan River

Site Area: 199,614 sq. ft.

Address: 670 Millbrook Avenue
Randolph, NJ 07869

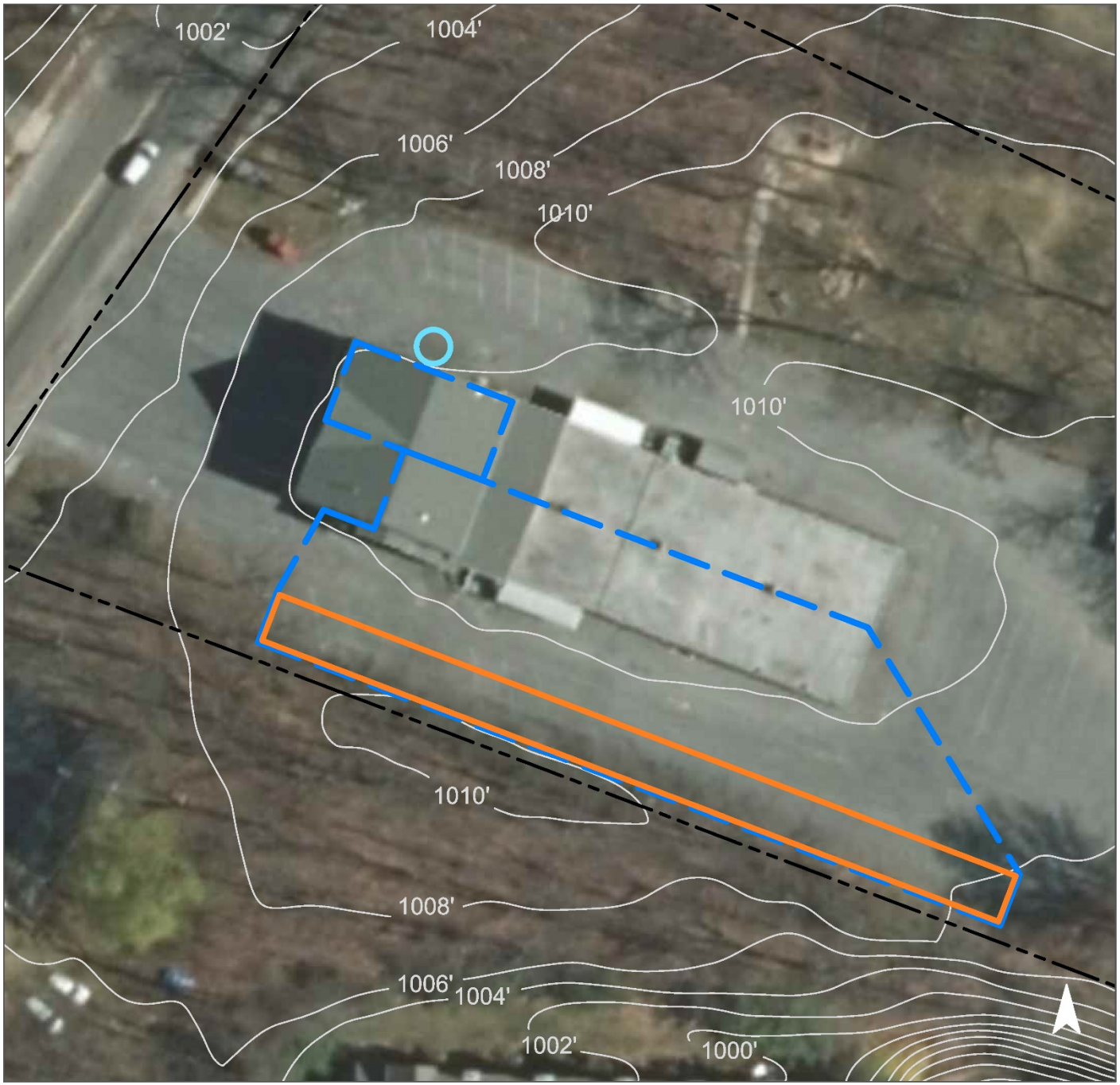
Block and Lot: Block 119 | Lot 114.01

Parking spaces along the south end of the building near multiple disconnected downspouts can be converted to pervious pavement to capture and infiltrate stormwater runoff from the parking lot and rooftop areas. A cistern can be installed on the north side of the building near a disconnected downspout to capture rainwater that can 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"
35	70,861	3.4	35.8	325.3	0.055	1.94

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 pavement	0.438	73	34,210	1.29	4,680	$117,000
Rainwater harvesting	0.039	7	1,200	0.05	1,200 (gal)	$2,400

GREEN INFRASTRUCTURE RECOMMENDATIONS



Randolph Township Fire Department Company #3

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

0 25' 50'

RANDOLPH TOWNSHIP LIBRARY & COMMUNITY CENTER

Subwatershed: Raritan River

Site Area: 431,087 sq. ft.

Address: 30 Calais Road
Randolph, NJ 07869

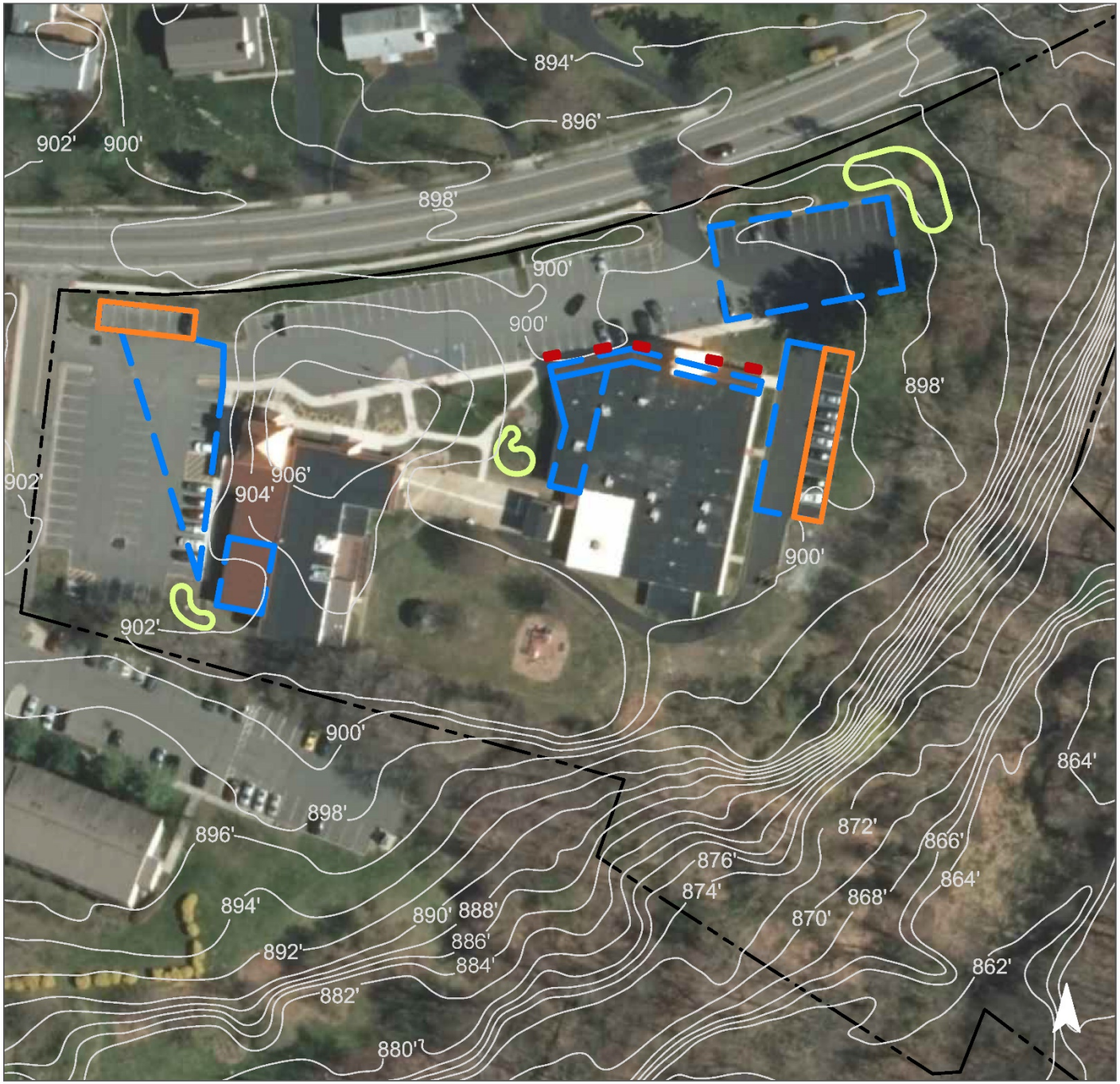
Block and Lot: Block 93 | Lot 3

Five downspout planter boxes can be installed on the north end of the library to filter the rooftop drainage area and beautify the area. Pervious pavement can be installed in the parking areas to capture and infiltrate stormwater runoff from the parking lot. Bioretention systems can be installed to manage areas from the rooftop by redirecting downspouts and from the parking lot by creating curb cuts. 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"
28	121,846	5.9	61.5	559.4	0.095	3.34

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	0.269	45	21,030	0.79	2,590	$12,950
Planter boxes	0.028	5	n/a	n/a	5 (boxes)	$5,000
Pervious pavement	0.327	55	25,580	0.96	2,450	$61,250

GREEN INFRASTRUCTURE RECOMMENDATIONS



Randolph Township Library & Community Center

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

0 50' 100'

RESURRECTION PARISH

Subwatershed: Raritan River

Site Area: 347,087 sq. ft.

Address: 651 Millbrook Avenue
Randolph, NJ 07869

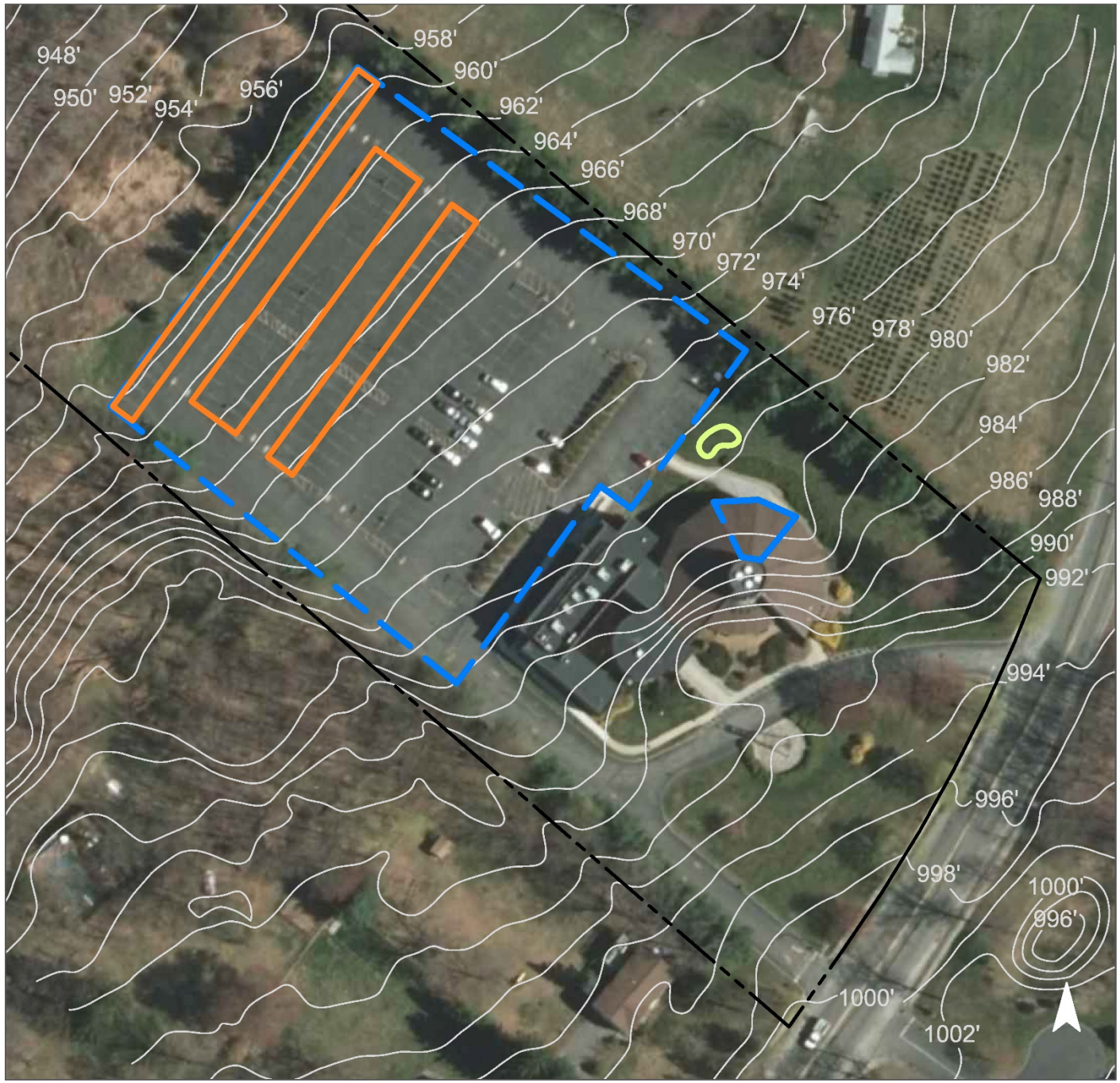
Block and Lot: Block 82 | Lot 40

A rain garden can be installed on the north side of the building near the connected downspouts. The connected downspouts can be disconnected and led into the rain garden to capture, treat, and infiltrate stormwater runoff from the roof. The parking spaces in the parking lot can be retrofitted into pervious pavement to capture a large volume of stormwater running off from the parking lot during storm events. 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"
35	120,730	5.8	61.0	554.3	0.094	3.31

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
Bioretention system	0.033	6	2,590	0.10	320	$1,600
Pervious pavement	2.210	370	172,740	6.49	16,430	$410,750

GREEN INFRASTRUCTURE RECOMMENDATIONS



Resurrection Parish

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

0 50' 100'

BIBLE CHURCH INTERNATIONAL

Subwatershed: Rockaway River

Site Area: 336,955 sq. ft.

Address: 791 NJ Route 10
Randolph, NJ 07869

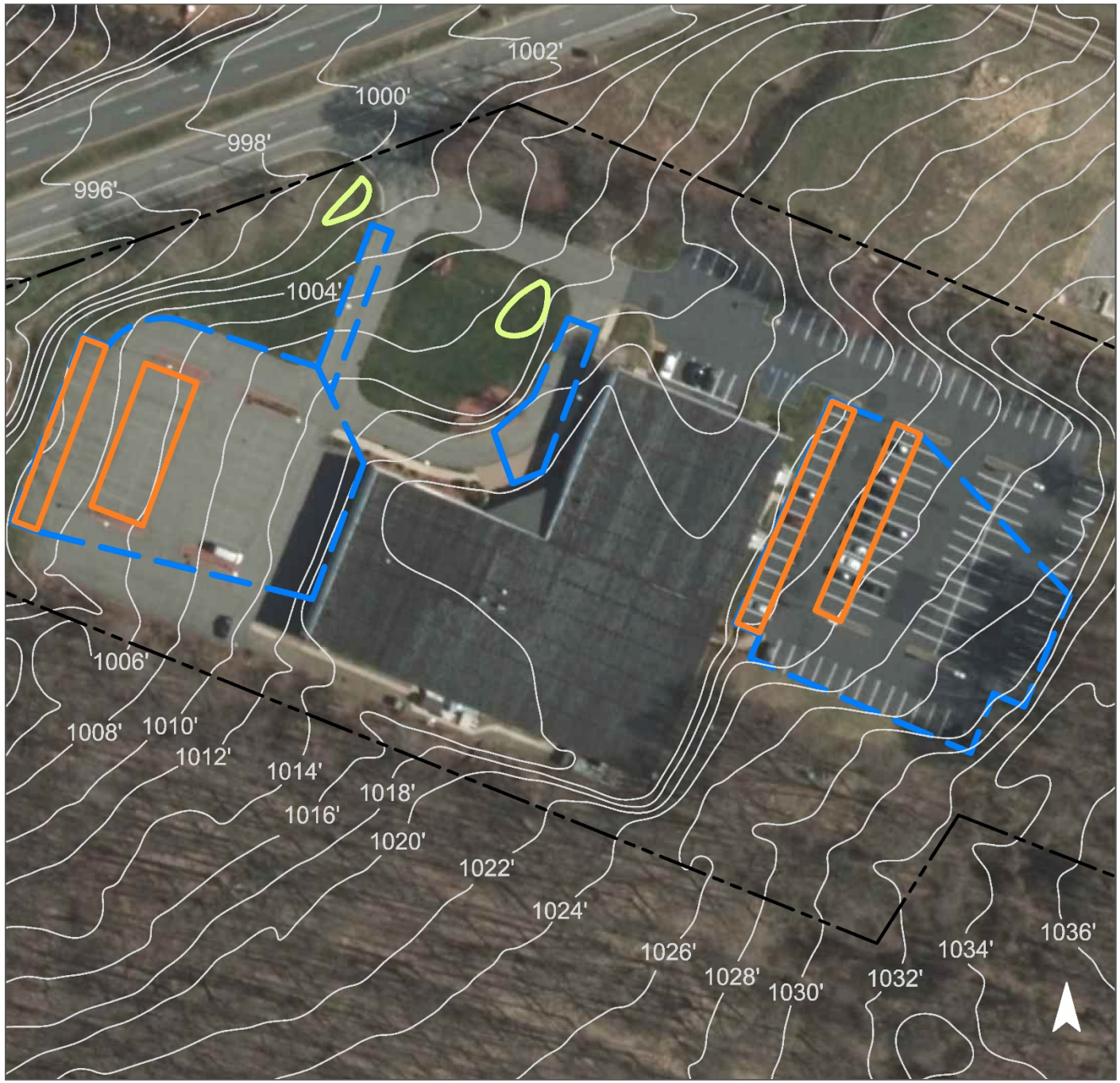
Block and Lot: Block 44 | Lot 13.01

Pervious pavement can be installed in both parking lots to capture and infiltrate stormwater runoff from the parking lot. Bioretention systems can be installed in the turfgrass areas by using curb cuts to direct water from the pavement into them. 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"
50	167,782	8.1	84.7	770.3	0.131	4.60

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	0.112	19	8,750	0.33	1,075	$5,375
Pervious pavement	0.327	55	25,580	0.96	2,500	$62,500

GREEN INFRASTRUCTURE RECOMMENDATIONS



Bible Church International

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

0 50' 100'

CHRISTADELPHIAN CHAPEL

Subwatershed: Rockaway River

Site Area: 130,981 sq. ft.

Address: 322 South Morris Street
Randolph, NJ 07869

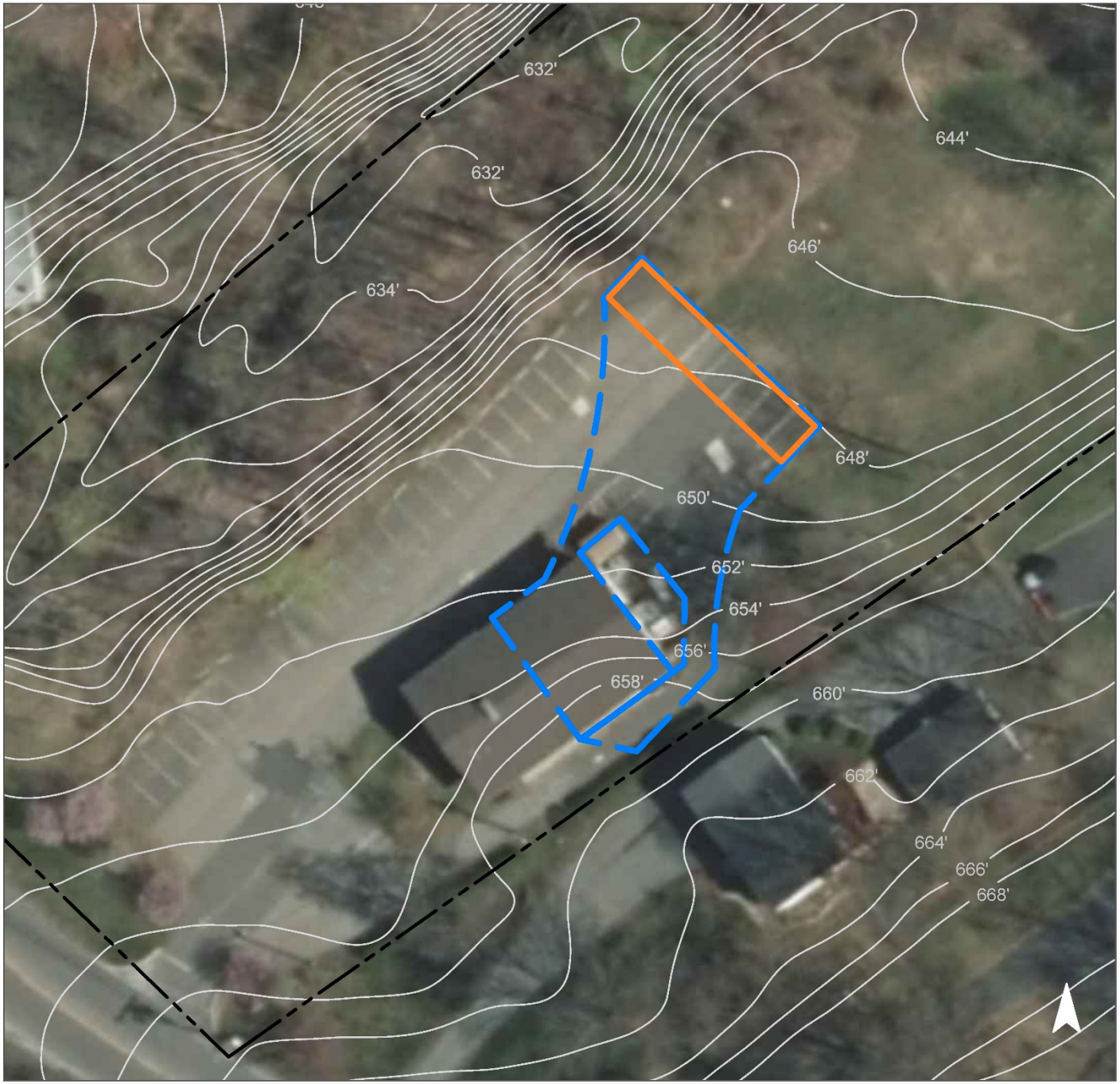
Block and Lot: Block 180 | Lot 1

Parking spaces in the parking lot to the northeast of the building can be converted to pervious pavement to capture and infiltrate stormwater 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"
19	24,620	1.2	12.4	113.0	0.019	0.68

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	0.210	35	16,420	0.62	1,440	$36,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Christadelphian Chapel

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

0 25' 50'

FERNBROOK ELEMENTARY SCHOOL

Subwatershed: Rockaway River

Site Area: 741,661 sq. ft.

Address: 206 Quaker Church Road
Randolph, NJ 07869

Block and Lot: Block 110 | Lot 11

A bioretention system can be installed to the south of the building near the playground to capture, treat, and infiltrate rooftop runoff. A second rain garden can be installed in the low area at the end of the parking lot to better manage the stormwater runoff generated by 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"
32	234,813	11.3	118.6	1,078.1	0.183	6.44

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.129	22	10,050	0.38	1,235	$6,175

GREEN INFRASTRUCTURE RECOMMENDATIONS

Fernbrook Elementary School

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

0 50' 100'

GRACE CHURCH BETHLEHEM CAMPUS

Subwatershed: Rockaway River

Site Area: 442,120 sq. ft.

Address: 758 Route 10 West
Randolph, NJ 07869

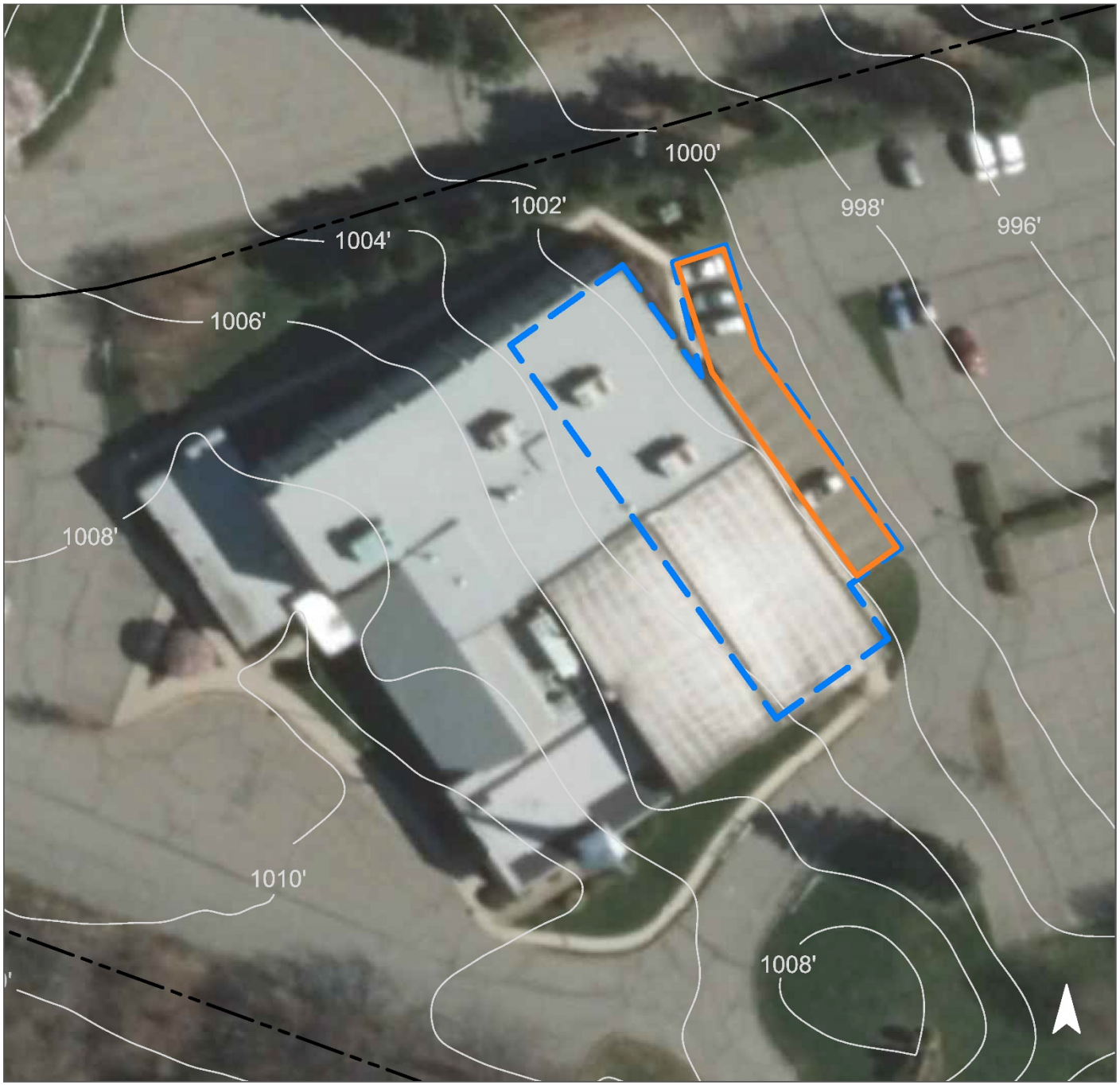
Block and Lot: Block 42 | Lot 97,98,99

Pervious pavement can be installed on a strip of parking spaces north of the building near connected downspouts. Parking spaces can be replaced with pervious pavement to capture and infiltrate stormwater. The downspouts can be disconnected and redirected into the pervious pavement to capture additional 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	139,728	6.7	70.6	641.5	0.109	3.83

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	0.238	40	18,630	0.70	2,130	$53,250

GREEN INFRASTRUCTURE RECOMMENDATIONS



Grace Church Bethlehem Campus

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

0 25' 50'

MAR THOMA CHURCH OF NEW JERSEY

Subwatershed: Rockaway River

Site Area: 70,616 sq. ft.

Address: 790 NJ Route 10
Randolph, NJ 07869

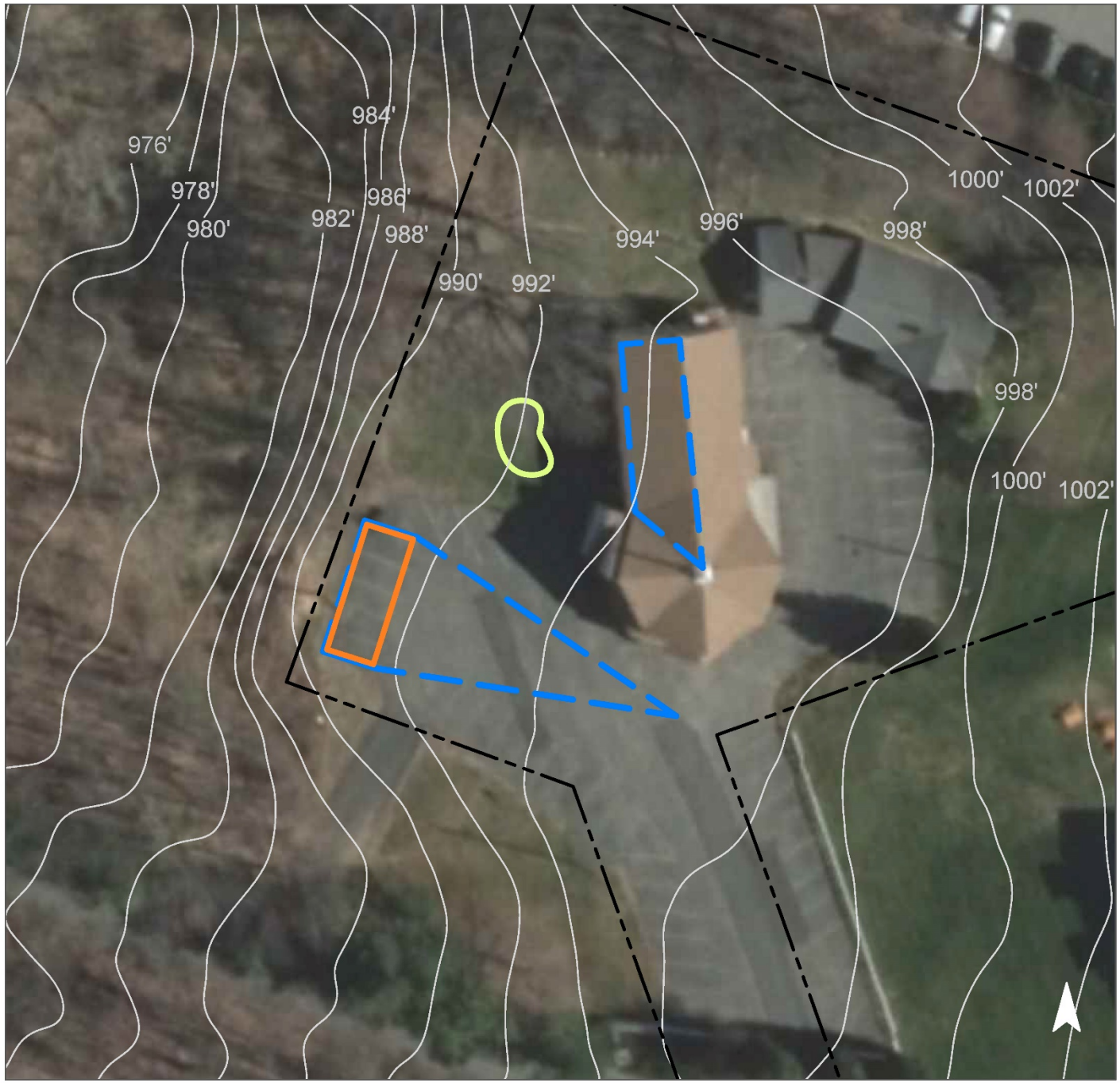
Block and Lot: Block 42 | Lot 109

Parking spaces in the parking lot to the southwest of the building can be converted to pervious pavement to capture and infiltrate stormwater runoff from the parking lot. A rain garden can be installed in the turfgrass area west of the building to capture, treat, and infiltrate stormwater runoff from the roof. 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"
67	47,055	2.3	23.8	216.0	0.037	1.29

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	0.033	6	2,620	0.10	300	$1,500
Pervious pavement	0.078	13	6,110	0.23	810	$20,250

GREEN INFRASTRUCTURE RECOMMENDATIONS



Mar Thoma Church of New Jersey

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

0 25' 50'

MILLBROOK UNITED METHODIST CHURCH

Subwatershed: Rockaway River

Site Area: 269,443 sq. ft.

Address: 246 Millbrook Avenue
Randolph, NJ 07869

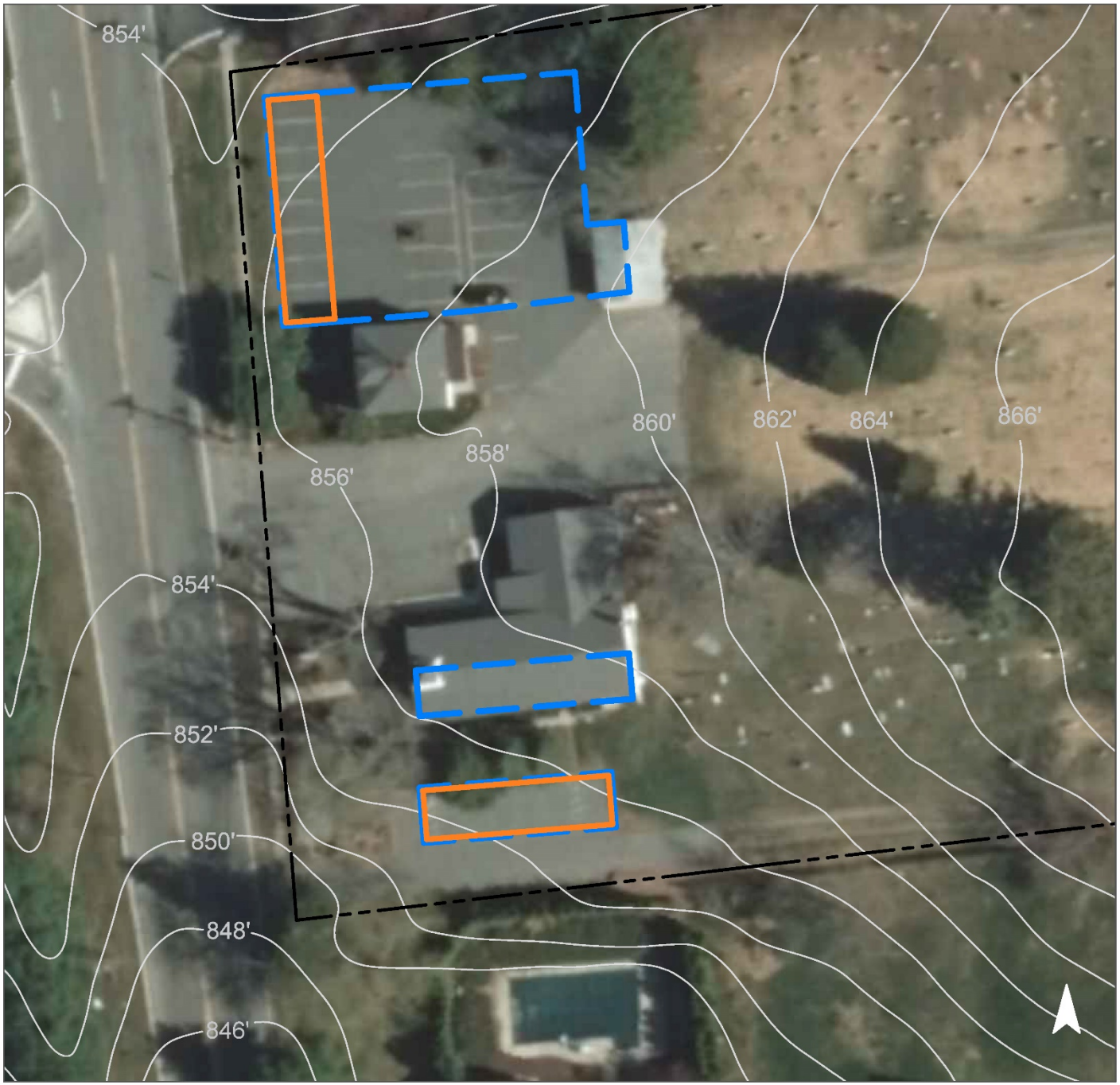
Block and Lot: Block 145 | Lot 3, 58

Pervious pavement can be installed south of the building near two disconnected downspouts to capture and infiltrate stormwater runoff from the parking lot and building. Parking spaces in the north parking lot can also be retrofitted with pervious pavement. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
12	32,099	1.5	16.2	147.4	0.025	0.88

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
Pervious pavement	0.254	43	19,840	0.75	2,485	$62,125

GREEN INFRASTRUCTURE RECOMMENDATIONS



Millbrook United Methodist Church

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

0 25' 50'

RANDOLPH RESCUE SQUAD

Subwatershed: Rockaway River

Site Area: 65,621 sq. ft.

Address: 780 NJ Route 10
Randolph, NJ 07869

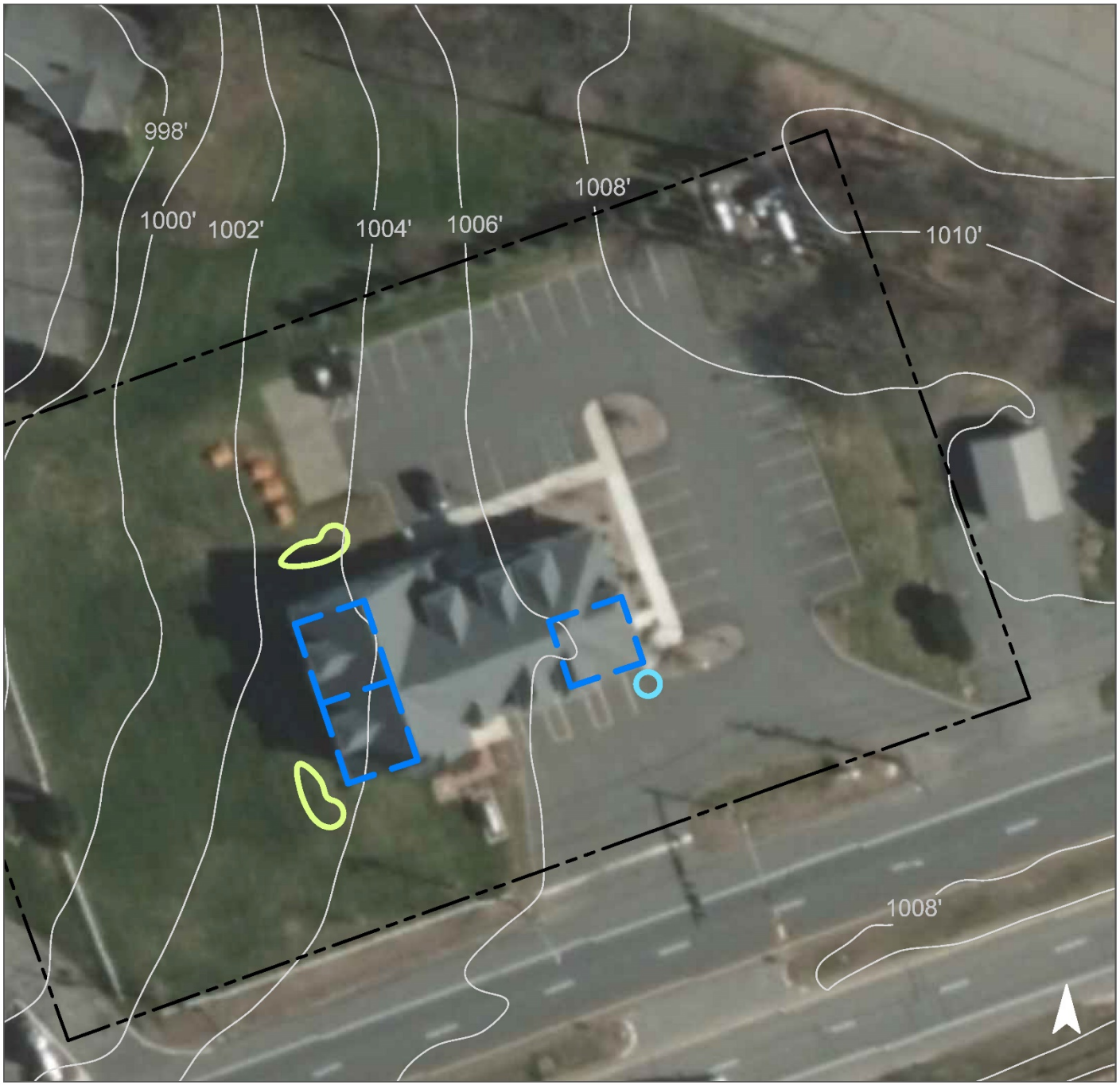
Block and Lot: Block 42 | Lot 107, 108

Rain gardens can be installed on the north and west side of the building to capture, treat, and infiltrate rooftop runoff. A cistern can be installed south of the building to 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"
68	44,459	2.1	22.5	204.1	0.035	1.22

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	0.034	6	2,690	0.10	330	$1,650
Rainwater harvesting	0.076	13	2,300	0.09	2,300 (gal)	$4,600

GREEN INFRASTRUCTURE RECOMMENDATIONS



Randolph Rescue Squad

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

0 25' 50'

RANDOLPH TOWNSHIP FIRE DEPARTMENT COMPANY #2

Subwatershed: Rockaway River

Site Area: 94,287 sq. ft.

Address: 340 NJ Route 10
Randolph, NJ 07869

Block and Lot: Block 137, Lot 6, 7, 8

Pervious pavement can be installed in the parking spaces north of the building to capture and infiltrate stormwater runoff from the parking lot. A cistern can be installed north of the building near a downspout. The water from the cistern 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"
61	57,966	2.8	29.3	266.1	0.045	1.59

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	0.384	64	30,000	1.13	2,710	$67,750
Rainwater harvesting	0.061	10	2,300	0.09	2,300 (gal)	$4,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Randolph Township Fire Department Company #2

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

0 25' 50'

RANDOLPH TOWNSHIP FIRE DEPARTMENT COMPANY #5

Subwatershed: Whippany River

Site Area: 20,984 sq. ft.

Address: 118 West Hanover Avenue
Randolph, NJ 07869

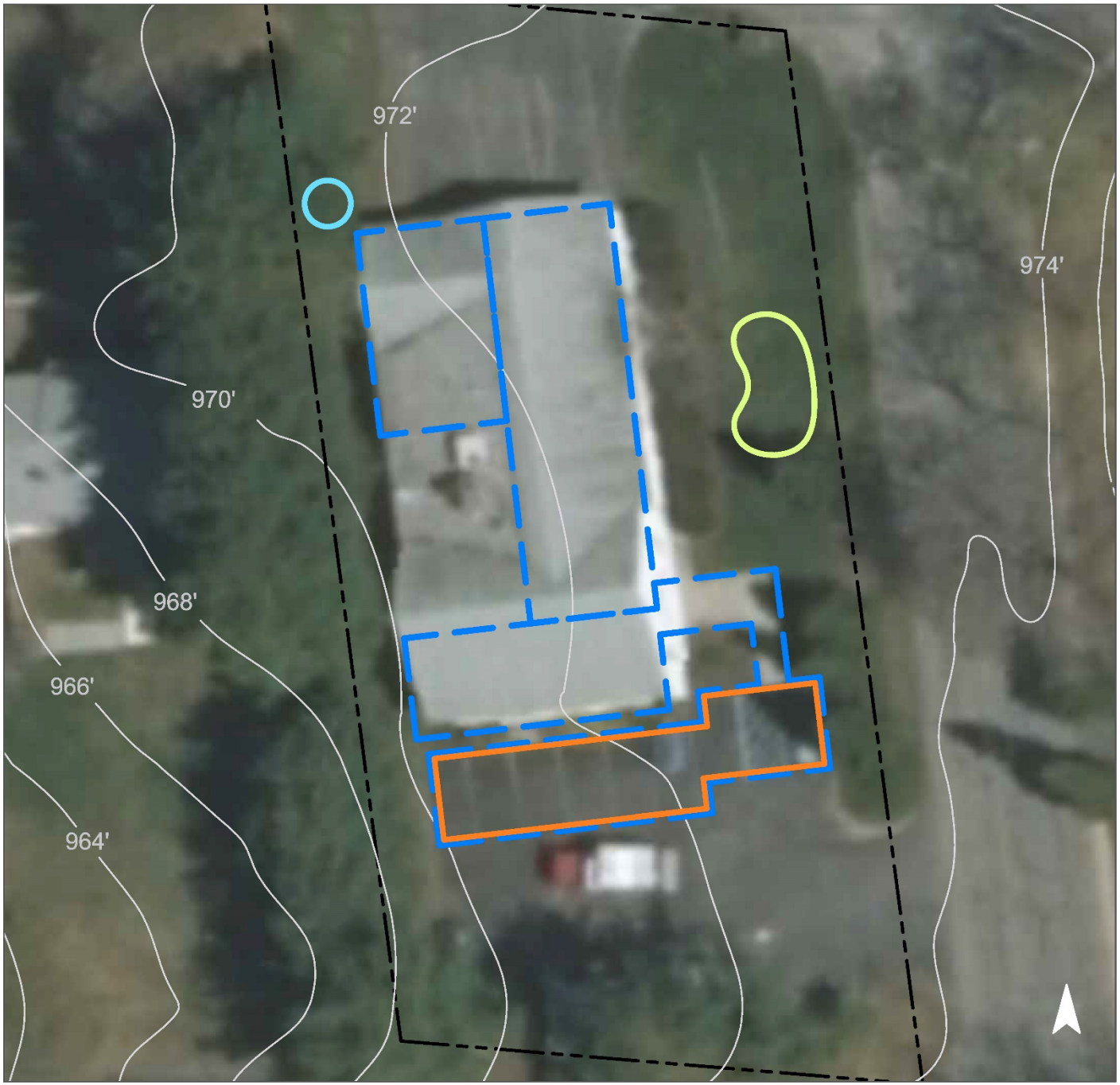
Block and Lot: Block 167 | Lot 1

Pervious pavement can be installed in parking spaces along the south side of the building to capture and infiltrate stormwater from the adjacent paved areas and rooftop. A rain garden can be installed to the east of the building near a disconnected downspout to capture, treat, and infiltrate stormwater runoff. A cistern can be installed on the north side of the building to capture stormwater and reuse it 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"
33	6,928	0.3	3.5	31.8	0.005	0.19

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	0.052	9	4,070	0.15	500	$2,500
Pervious pavement	0.071	12	5,540	0.21	1,400	$35,000
Rainwater harvesting	0.026	4	800	0.03	800 (gal)	$1,600

GREEN INFRASTRUCTURE RECOMMENDATIONS



Randolph Township Fire Department Company #5

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

0 15' 30'

SHONGUM ELEMENTARY SCHOOL

Subwatershed: Whippany River

Site Area: 675,450 sq. ft.

Address: 9 Arrow Place
Randolph, NJ 07869

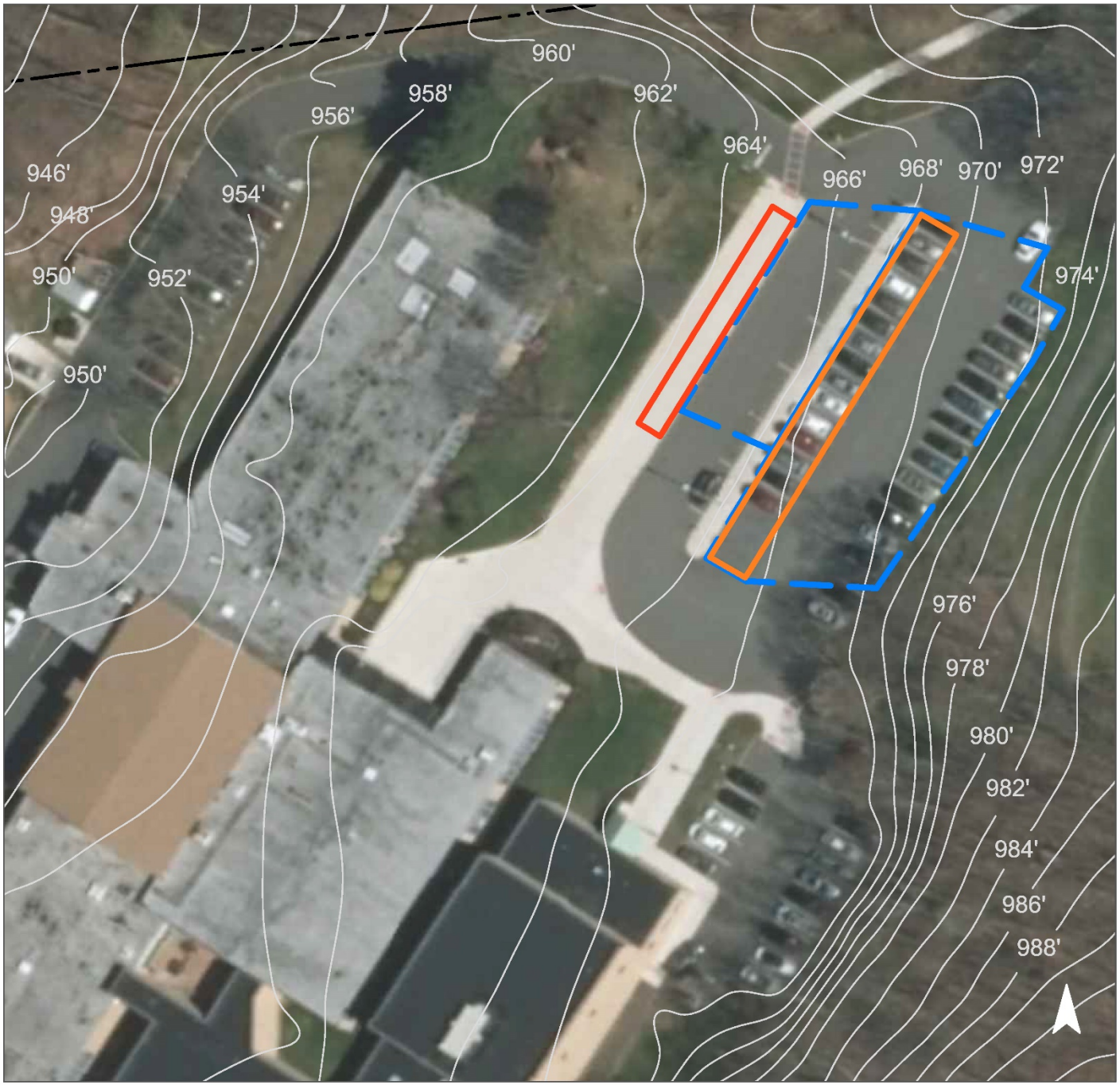
Block and Lot: Block 168 | Lot 58

Pervious pavement can be installed in the center parking spaces to capture and infiltrate stormwater runoff from the parking lot. A stormwater planter can be installed by depaving a portion of the wide sidewalk. A curb cut can be used to intercept stormwater runoff from the parking lot. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
26	173,966	8.4	87.9	798.7	0.136	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
Pervious pavement	0.267	45	20,830	0.78	2,890	$5,780
Stormwater planter	0.104	17	8,150	0.31	1,000	$5,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Shongum Elementary School

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

0 30' 60'

c. Summary of Existing Conditions

Summary of Existing Conditions

	Subwatershed/Site Name/Total Site Info/GI Practice	Area (ac)	Area (SF)	Block	Lot	I.C. %	I.C. Area (ac)	I.C. Area (SF)	Existing Annual Loads (Commercial) TP (lb/yr)	TN (lb/yr)	TSS (lb/yr)	Runoff Volumes from I.C. Water Quality Storm (1.25" over 2-hours) (cu.ft.)	Runoff Volumes from I.C. Annual (cu.ft.)	Runoff Volumes from I.C. Water Quality Storm (1.25" over 2-hours) (Mgal)	Runoff Volumes from I.C. Annual (Mgal)
	BURNETT BROOK SITES	**59.99**	**2,613,324**				**11.23**	**489,143**	**23.6**	**247.0**	**2,245.8**	**50,952**	**1,793,525**	**0.381**	**13.42**
1	**Heistein Park**														
	Total Site Info	42.69	1,859,597	51	7, 30	9	4.01	174,724	8.4	88.2	802.2	18,200	640,655	0.136	4.79
2	**Ironia Elementary School**														
	Total Site Info	15.00	653,414	48	5	38	5.68	247,317	11.9	124.9	1,135.5	25,762	906,828	0.193	6.78
3	**Randolph Township Fire Department Company #4**														
	Total Site Info	2.30	100,313	49	2.02	67	1.54	67,102	3.2	33.9	308.1	6,990	246,042	0.052	1.84
	DEN BROOK SITES	**121.13**	**5,276,459**				**14.94**	**650,582**	**31.4**	**328.6**	**2,987.1**	**67,769**	**2,385,469**	**0.507**	**17.84**
4	**Center Grove Elementary School**														
	Total Site Info	20.36	886,920	116	34	34	6.93	302,005	14.6	152.5	1,386.6	31,459	1,107,350	0.235	8.28
5	**Freedom Park**														
	Total Site Info	100.77	4,389,539	119	15.01, 101.01, 115.02, 116.01	8	8.00	348,578	16.8	176.0	1,600.4	36,310	1,278,119	0.272	9.56
	MILL BROOK SITES	**244.97**	**10,670,773**				**72.67**	**3,165,689**	**152.6**	**1598.8**	**14,534.8**	**329,759**	**11,607,526**	**2.467**	**86.82**
6	**County College of Morris**														
	Total Site Info	212.57	9,259,582	81	1	27	57.03	2,484,265	119.8	1254.7	11,406.2	258,778	9,108,973	1.936	68.14
7	**Iglesia Alianza**														
	Total Site Info	2.15	93,605	73	58, 59	53	1.15	49,950	2.4	25.2	229.3	5,203	183,151	0.039	1.37
8	**Randolph High School**														
	Total Site Info	28.51	1,241,714	116	30	47	13.41	584,321	28.2	295.1	2,682.8	60,867	2,142,509	0.455	16.03
9	**The Connect Church: Randolph**														
	Total Site Info	1.74	75,871	73	56	62	1.08	47,152	2.3	23.8	216.5	4,912	172,892	0.037	1.29
	RARITAN RIVER SITES	**22.46**	**978,259**				**7.20**	**313,436**	**15.1**	**158.3**	**1,439.1**	**32,650**	**1,149,267**	**0.244**	**8.60**
10	**Randolph Township Fire Department Company #3**														
	Total Site Info	4.58	199,614	119	114.01	35	1.63	70,861	3.4	35.8	325.3	7,381	259,822	0.055	1.94
11	**Randolph Township Library & Community Center**														
	Pervious pavement	9.90	431,087	93	3	28	2.80	121,846	5.9	61.5	559.4	12,692	446,767	0.095	3.34
12	**Resurrection Parish**														
	Total Site Info	7.98	347,557	82	40	35	2.77	120,730	5.8	61.0	554.3	12,576	442,678	0.094	3.31
	ROCKAWAY RIVER SITES	**49.40**	**2,151,682**				**17.18**	**748,521**	**36.1**	**378.0**	**3,436.7**	**77,971**	**2,744,578**	**0.583**	**20.53**
13	**Bible Church International**														
	Total Site Info	7.74	336,955	44	13.01	50	3.85	167,782	8.1	84.7	770.3	17,477	615,199	0.131	4.60
14	**Christadelphian Chapel**														
	Total Site Info	3.01	130,981	180	1	19	0.57	24,620	1.2	12.4	113.0	2,565	90,274	0.019	0.68
15	**Fernbrook Elementary School**														
	Total Site Info	17.03	741,661	110	11	32	5.39	234,813	11.3	118.6	1,078.1	24,460	860,983	0.183	6.44

Summary of Existing Conditions

	Subwatershed/Site Name/Total Site Info/GI Practice	Area (ac)	Area (SF)	Block	Lot	I.C. %	I.C. Area (ac)	I.C. Area (SF)	Existing Annual Loads (Commercial)			Runoff Volumes from I.C.		Runoff Volumes from I.C.	
									TP (lb/yr)	TN (lb/yr)	TSS (lb/yr)	Water Quality Storm (1.25" over 2-hours) (cu.ft.)	Annual (cu.ft.)	Water Quality Storm (1.25" over 2-hours) (Mgal)	Annual (Mgal)
16	**Grace Church Bethlehem Campus**														
	Total Site Info	10.15	442,120	42	97, 98, 99	32	3.21	139,728	6.7	70.6	641.5	14,555	512,335	0.109	3.83
17	**Mar Thoma Church of New Jersey**														
	Total Site Info	1.62	70,616	42	109	67	1.08	47,055	2.3	23.8	216.0	4,902	172,533	0.037	1.29
18	**Millbrook United Methodist Church**														
	Total Site Info	6.19	269,443	145	3, 58	12	0.74	32,099	1.5	16.2	147.4	3,344	117,696	0.025	0.88
19	**Randolph Rescue Squad**														
	Total Site Info	1.51	65,621	42	107, 108	68	1.02	44,459	2.1	22.5	204.1	4,631	163,017	0.035	1.22
20	**Randolph Township Fire Department Company #2**														
	Total Site Info	2.16	94,287	137	6, 7, 8	61	1.33	57,966	2.8	29.3	266.1	6,038	212,541	0.045	1.59
	WHIPPANY RIVER SITES	**15.99**	**696,434**				**4.15**	**180,893**	**8.7**	**91.4**	**830.5**	**18,843**	**663,276**	**0.141**	**4.96**
21	**Randolph Township Fire Department Company #5**														
	Total Site Info	0.48	20,984	167	1	33	0.16	6,928	0.3	3.5	31.8	722	25,401	0.005	0.19
22	**Shongum Elementary School**														
	Total Site Info	15.51	675,450	168	58	26	3.99	173,966	8.4	87.9	798.7	18,121	637,875	0.136	4.77

d. Summary of Proposed Green Infrastructure Practices

Summary of Proposed Green Infrastructure Practices

	Subwatershed/Site Name/Total Site Info/GI Practice	Potential Management Area		Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Max Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cfs)	Size of BMP	Unit Cost ($/unit)	Unit	Total Cost ($)	I.C. Treated %
		Area (SF)	Area (ac)									
	BURNETT BROOK SITES	**68,990**	**1.58**	**1.798**	**301**	**137,340**	**5.16**				**$350,375**	**14.1%**
1	**Heistein Park**											
	Bioretention system	3,000	0.07	0.078	13	6,110	0.23	750	$5	SF	$3,750	1.7%
	Pervious pavement	41,860	0.96	1.091	183	85,230	3.20	7,520	$25	SF	$188,000	24.0%
	Total Site Info	**44,860**	**1.03**	**1.169**	**196**	**91,340**	**3.43**				**$191,750**	**25.7%**
2	**Ironia Elementary School**											
	Bioretention system	780	0.02	0.020	3	1,590	0.06	200	$5	SF	$1,000	0.3%
	Pervious pavement	11,960	0.27	0.312	52	24,350	0.92	3,925	$25	SF	$98,125	4.8%
	Total Site Info	**12,740**	**0.29**	**0.332**	**56**	**25,940**	**0.98**				**$99,125**	**5.2%**
3	**Randolph Township Fire Department Company #4**											
	Bioretention systems	8,870	0.20	0.231	39	18,060	0.68	2,220	$25	SF	$55,500	13.2%
	Rainwater harvesting	2,520	0.06	0.066	11	2,000	0.07	2,000	$2	gal	$4,000	3.8%
	Total Site Info	**11,390**	**0.26**	**0.297**	**50**	**20,060**	**0.75**				**$59,500**	**17.0%**
	DEN BROOK SITES	**76,890**	**1.77**	**1.699**	**306**	**130,790**	**4.45**				**$308,025**	**11.8%**
4	**Center Grove Elementary School**											
	Bioretention system	3,540	0.08	0.092	15	7,210	0.27	885	$25	SF	$22,125	1.2%
	Pervious pavement	38,235	0.88	0.996	167	77,850	2.93	1,980	$25	SF	$49,500	12.7%
	Total Site Info	**41,775**	**0.96**	**1.088**	**182**	**85,060**	**3.20**				**$71,625**	**13.8%**
5	**Freedom Park**											
	Bioretention systems	1,515	0.03	0.039	7	3,080	0.12	380	$5	SF	$1,900	0.4%
	Bioswales	23,400	0.54	0.305	73	21,880	0.35	5,850	$25	SF	$146,250	6.7%
	Pervious pavement	10,200	0.23	0.266	44	20,770	0.78	3,530	$25	SF	$88,250	2.9%
	Total Site Info	**35,115**	**0.81**	**0.610**	**124**	**45,730**	**1.25**				**$236,400**	**10.1%**
	MILL BROOK SITES	**391,480**	**8.99**	**10.200**	**1,708**	**797,110**	**29.94**				**$1,808,250**	**12.4%**
6	**County College of Morris**											
	Bioretention system	16,000	0.37	0.417	70	32,580	1.22	4,000	$5	SF	$20,000	0.6%
	Pervious pavement	314,300	7.22	8.189	1,371	639,940	24.05	60,800	$25	SF	$1,520,000	12.7%
	Total Site Info	**330,300**	**7.58**	**8.606**	**1,441**	**672,520**	**25.27**				**$1,540,000**	**13.3%**
7	**Iglesia Alianza**											
	Pervious pavement	10,080	0.23	0.263	44	20,530	0.77	1,800	$25	SF	$45,000	20.2%
	Total Site Info	**10,080**	**0.23**	**0.263**	**44**	**20,530**	**0.77**				**$45,000**	**20.2%**
8	**Randolph High School**											
	Bioretention system	400	0.01	0.010	2	820	0.03	100	$5	SF	$500	0.1%
	Pervious pavement	29,600	0.68	0.771	129	60,270	2.26	5,940	$25	SF	$148,500	5.1%

Summary of Proposed Green Infrastructure Practices

	Subwatershed/Site Name/Total Site Info/GI Practice	Potential Management Area		Recharge Potential	TSS Removal Potential	Max Volume Reduction Potential	Peak Discharge Reduction Potential	Size of BMP	Unit Cost	Unit	Total Cost	I.C. Treated
		Area (SF)	Area (ac)	(Mgal/yr)	(lbs/yr)	(gal/storm)	(cfs)		($/unit)		($)	%
	Total Site Info	**30,000**	**0.69**	**0.782**	**131**	**61,090**	**2.29**				**$149,000**	**5.1%**
9	**The Connect Church: Randolph**											
	Pervious pavement	21,100	0.48	0.550	92	42,970	1.61	2,970	$25	SF	$74,250	44.7%
	Total Site Info	**21,100**	**0.48**	**0.550**	**92**	**42,970**	**1.61**				**$74,250**	**44.7%**
	RARITAN RIVER SITES	**128,375**	**2.95**	**3.345**	**560**	**257,350**	**9.68**				**$610,950**	**41.0%**
10	**Randolph Township Fire Department Company #3**											
	Pervious pavement	16,800	0.39	0.438	73	34,210	1.29	4,680	$25	SF	$117,000	23.7%
	Rainwater harvesting	1,500	0.03	0.039	7	1,200	0.05	1,200	$2	gal	$2,400	2.1%
	Total Site Info	**18,300**	**0.42**	**0.477**	**80**	**35,410**	**1.34**				**$119,400**	**25.8%**
11	**Randolph Township Library & Community Center**											
	Bioretention systems	10,330	0.24	0.269	45	21,030	0.79	2,590	$5	SF	$12,950	8.5%
	Planter boxes	1,075	0.02	0.028	5	n/a	n/a	5	$1,000	SF	$5,000	0.9%
	Pervious pavement	12,565	0.29	0.327	55	25,580	0.96	2,450	$25	SF	$61,250	10.3%
		23,970	**0.55**	**0.625**	**105**	**46,610**	**1.75**				**$79,200**	**19.7%**
12	**Resurrection Parish**											
	Bioretention system	1,270	0.03	0.033	6	2,590	0.10	320	$5	SF	$1,600	1.1%
	Pervious pavement	84,835	1.95	2.210	370	172,740	6.49	16,430	$25	SF	$410,750	70.3%
	Total Site Info	**86,105**	**1.98**	**2.243**	**376**	**175,330**	**6.59**				**$412,350**	**71.3%**
	ROCKAWAY RIVER SITES	**74,950**	**1.71**	**1.938**	**324**	**145,290**	**5.48**				**$325,175**	**10.0%**
13	**Bible Church International**											
	Bioretention systems	4,300	0.10	0.112	19	8,750	0.33	1,075	$5	SF	$5,375	2.6%
	Pervious pavement	12,565	0.29	0.327	55	25,580	0.96	2,500	$25	SF	$62,500	7.5%
	Total Site Info	**16,865**	**0.39**	**0.439**	**74**	**34,330**	**1.29**				**$67,875**	**10.1%**
14	**Christadelphian Chapel**											
	Pervious pavement	8,065	0.19	0.210	35	16,420	0.62	1,440	$25	SF	$36,000	32.8%
	Total Site Info	**8,065**	**0.19**	**0.210**	**35**	**16,420**	**0.62**				**$36,000**	**32.8%**
15	**Fernbrook Elementary School**											
	Bioretention systems	4,935	0.11	0.129	22	10,050	0.38	1,235	$5	SF	$6,175	2.1%
	Total Site Info	**4,935**	**0.11**	**0.129**	**22**	**10,050**	**0.38**				**$6,175**	**2.1%**
16	**Grace Church Bethlehem Campus**											
	Pervious pavement	9,150	0.21	0.238	40	18,630	0.70	2,130	$25	SF	$53,250	6.5%
	Total Site Info	**9,150**	**0.21**	**0.238**	**40**	**18,630**	**0.70**				**$53,250**	**6.5%**
17	**Mar Thoma Church of New Jersey**											
	Bioretention system	1,285	0.03	0.033	6	2,620	0.10	300	$5	SF	$1,500	2.7%

Summary of Proposed Green Infrastructure Practices

	Subwatershed/Site Name/Total Site Info/GI Practice	Potential Management Area		Recharge Potential	TSS Removal Potential	Max Volume Reduction Potential	Peak Discharge Reduction Potential	Size of BMP	Unit Cost	Unit	Total Cost	I.C. Treated
		Area (SF)	Area (ac)	(Mgal/yr)	(lbs/yr)	(gal/storm)	(cfs)		($/unit)		($)	%
	Pervious pavement	3,000	0.07	0.078	13	6,110	0.23	810	$25	SF	$20,250	6.4%
	Total Site Info	**4,285**	**0.10**	**0.112**	**19**	**8,730**	**0.33**				**$21,750**	**9.1%**
18	**Millbrook United Methodist Church**											
	Pervious pavement	9,745	0.22	0.254	43	19,840	0.75	2,485	$25	SF	$62,125	30.4%
	Total Site Info	**9,745**	**0.22**	**0.254**	**43**	**19,840**	**0.75**				**$62,125**	**30.4%**
19	**Randolph Rescue Squad**											
	Bioretention systems	1,320	0.03	0.034	6	2,690	0.10	330	$5	SF	$1,650	3.0%
	Rainwater harvesting	2,925	0.07	0.076	13	2,300	0.09	2,300	$2	gal	$4,600	6.6%
	Total Site Info	**4,245**	**0.10**	**0.111**	**19**	**4,990**	**0.19**				**$6,250**	**9.5%**
20	**Randolph Township Fire Department Company #2**											
	Pervious pavement	14,735	0.34	0.384	64	30,000	1.13	2,710	$25	SF	$67,750	25.4%
	Rainwater harvesting	2,925	0.05	0.061	10	2,300	0.09	2,300	$2	gal	$4,000	10.5%
	Total Site Info	**17,660**	**0.39**	**0.445**	**74**	**32,300**	**1.22**				**$71,750**	**35.9%**
	WHIPPANY RIVER SITES	**19,950**	**0.46**	**0.520**	**87**	**39,390**	**1.48**				**$49,880**	**11.0%**
21	**Randolph Township Fire Department Company #5**											
	Bioretention system	2,000	0.05	0.052	9	4,070	0.15	500	$5	SF	$2,500	28.9%
	Pervious pavement	2,720	0.06	0.071	12	5,540	0.21	1,400	$25	SF	$35,000	39.3%
	Rainwater harvesting	1,000	0.02	0.026	4	800	0.03	800	$2	gal	$1,600	14.4%
	Total Site Info	**5,720**	**0.13**	**0.149**	**25**	**10,410**	**0.39**				**$39,100**	**82.6%**
22	**Shongum Elementary School**											
	Pervious pavement	10,230	0.23	0.267	45	20,830	0.78	2,890	$2	gal	$5,780	5.9%
	Stormwater planter	4,000	0.09	0.104	17	8,150	0.31	1,000	$5	SF	$5,000	2.3%
	Total Site Info	**14,230**	**0.33**	**0.371**	**62**	**28,980**	**1.09**				**$10,780**	**8.2%**