**Draft**

# Impervious Cover Reduction Action Plan for Buena Vista Township, Atlantic County, New Jersey

*Prepared for Buena Vista Township by the Rutgers Cooperative Extension Water Resources Program*

November 29, 2018

## Table of Contents

## Introduction

Located in Atlantic County, New Jersey, Buena Vista Township covers approximately 41.6 square miles. Figures 1 and 2 illustrate that Buena Vista Township is dominated by forest. A total of 14.8% of the municipality's land use is classified as urban. Of the urban land in Buena Vista 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 Buena Vista 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 Buena Vista Township. Based upon the 2012 NJDEP land use/land cover data, approximately 2.6% of Buena Vista Township has impervious cover. This level of impervious cover suggests that the streams in Buena Vista Township are sensitive streams. [1]

## Methodology

Buena Vista Township contains portions of eleven 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.

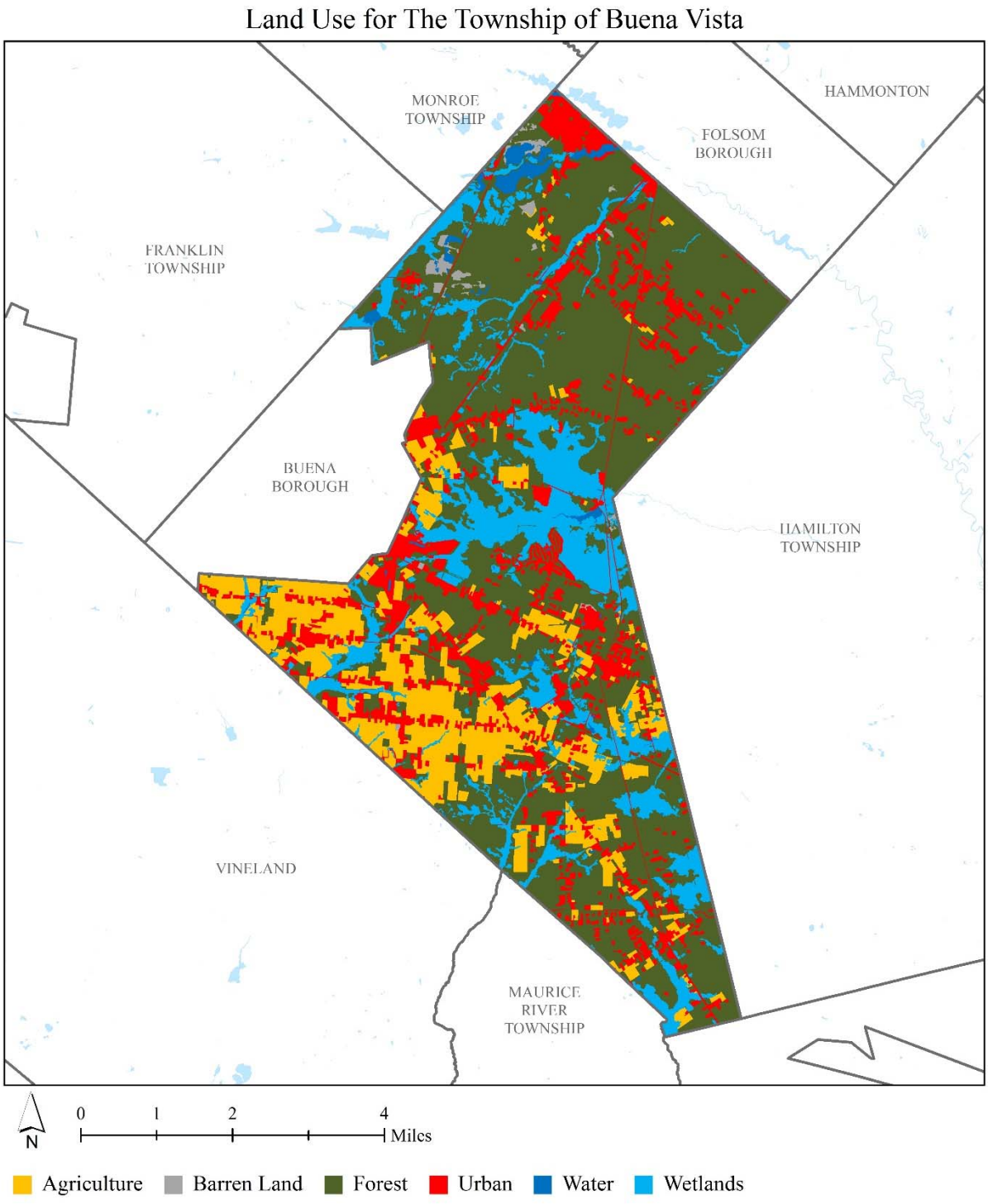



Figure 1: Map illustrating the land use in Buena Vista Township

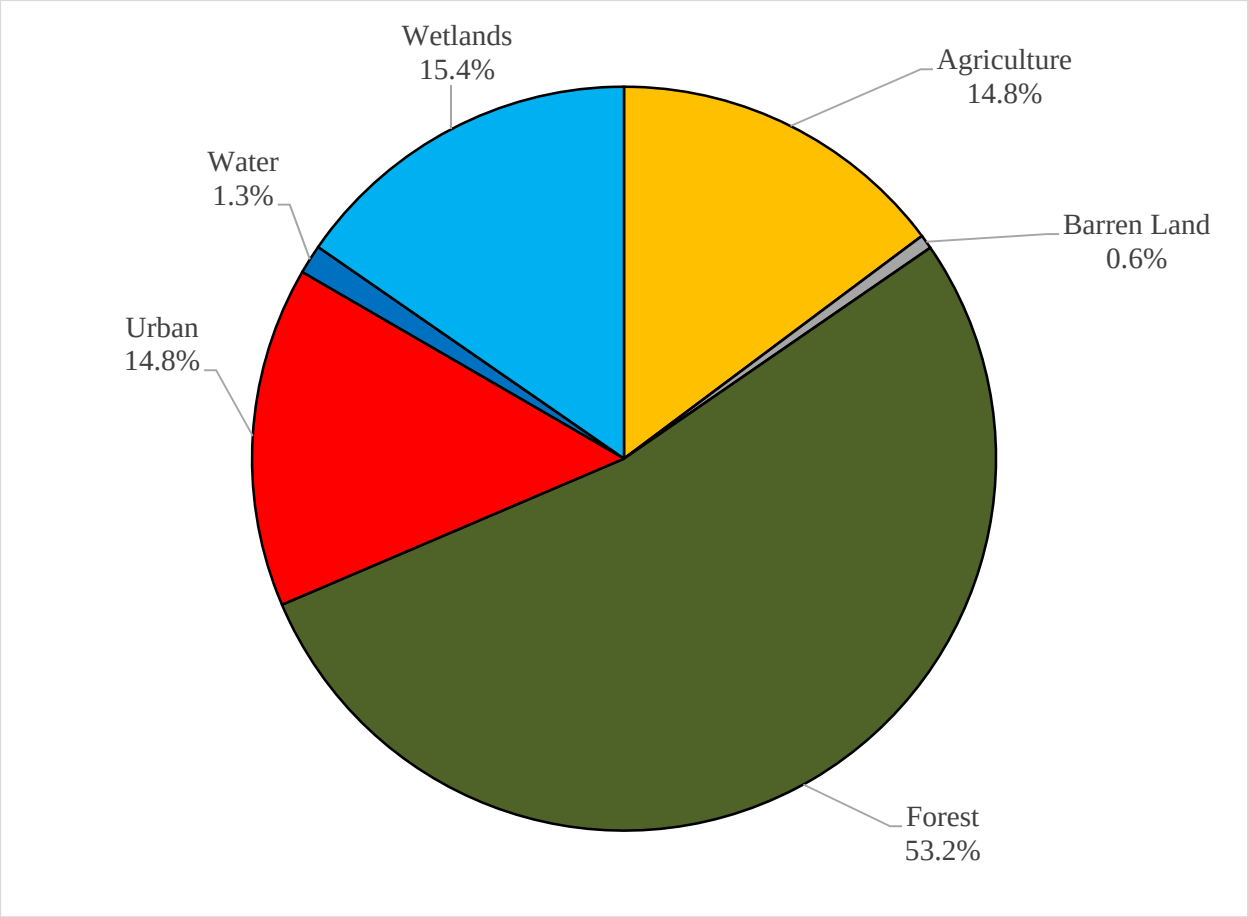



Figure 2: Pie chart illustrating the land use in Buena Vista Township

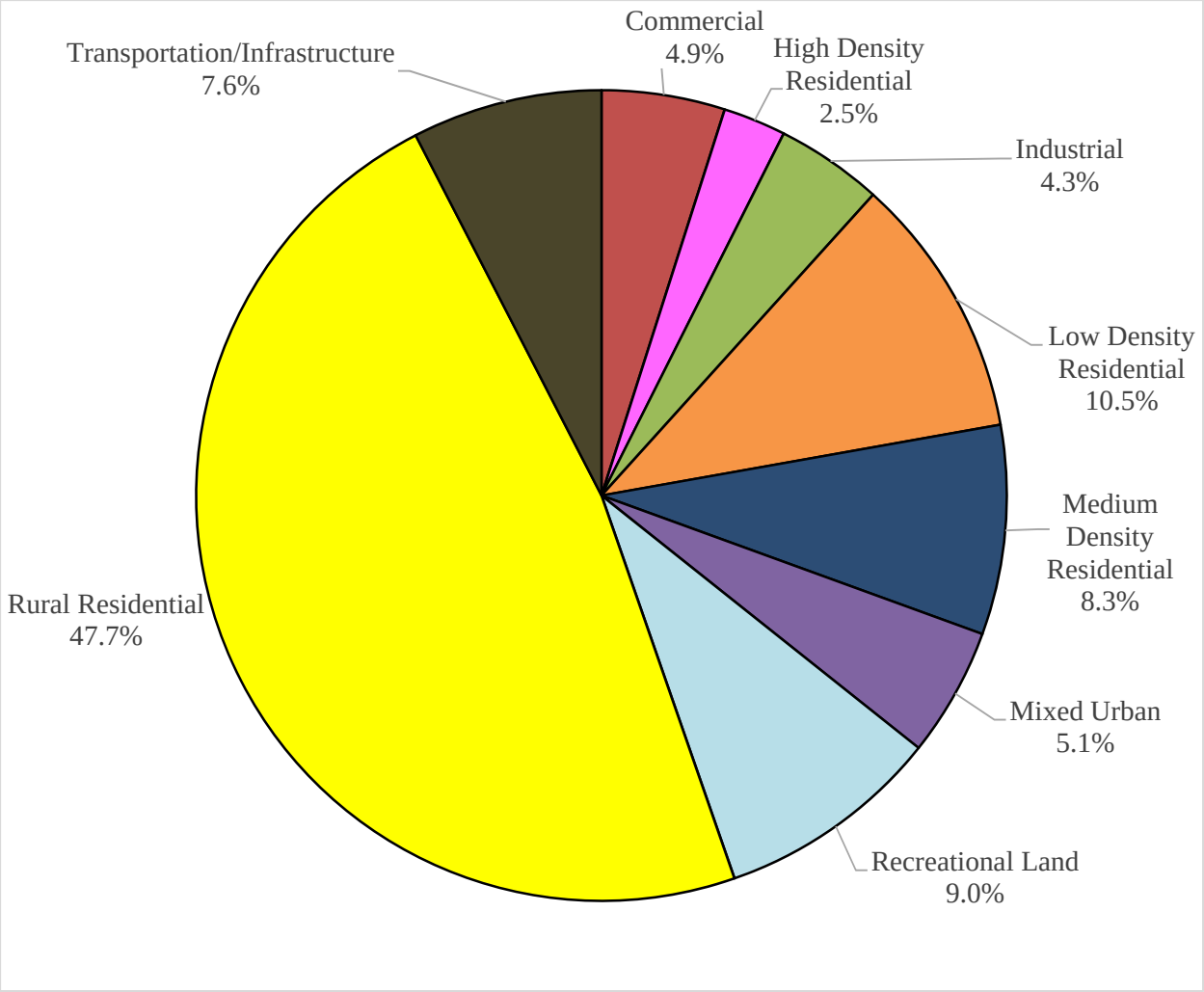



Figure 3: Pie chart illustrating the various types of urban land use in Buena Vista Township

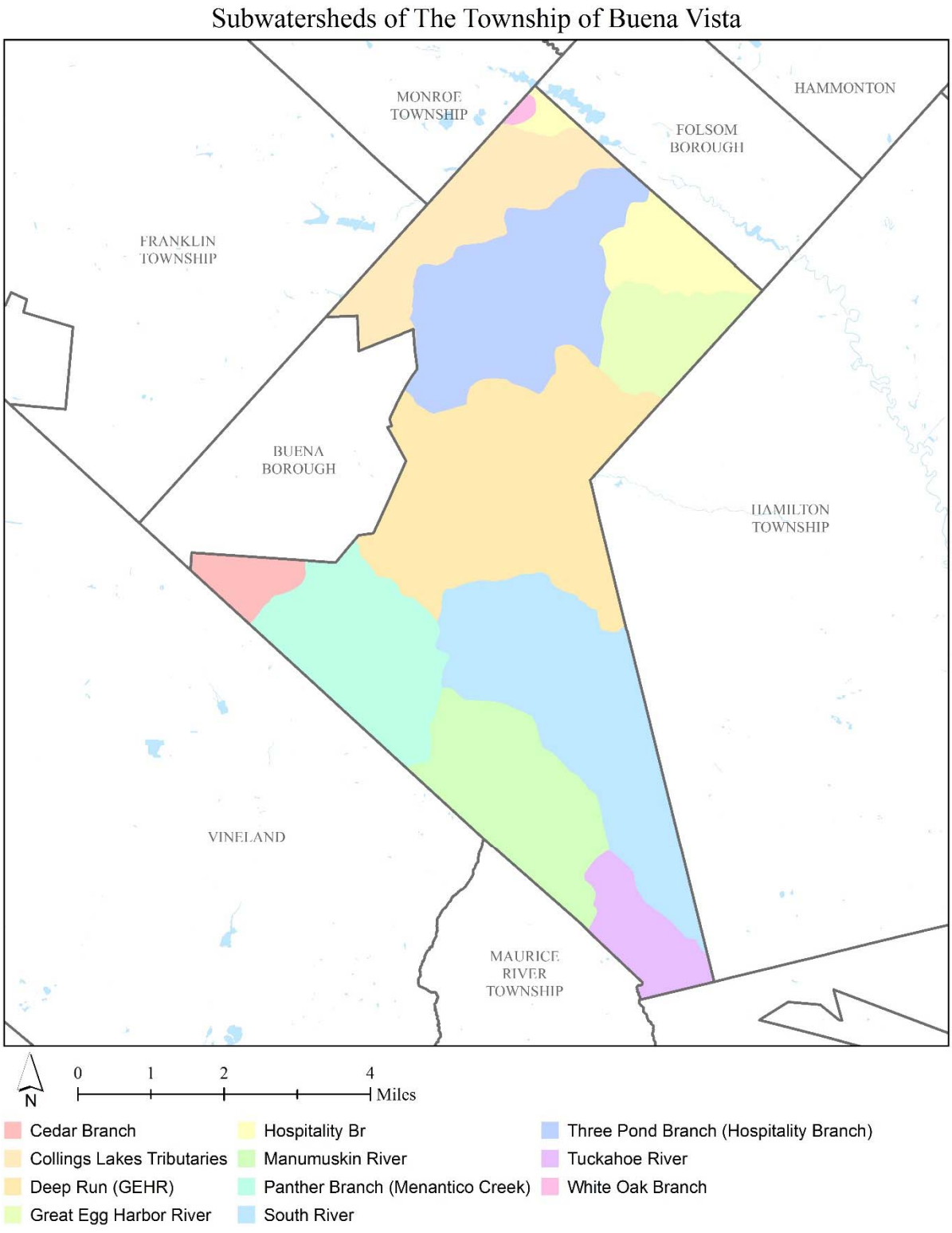



Figure 4: Map of the subwatersheds in Buena Vista Township

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 Buena Vista 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 Buena Vista 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*.

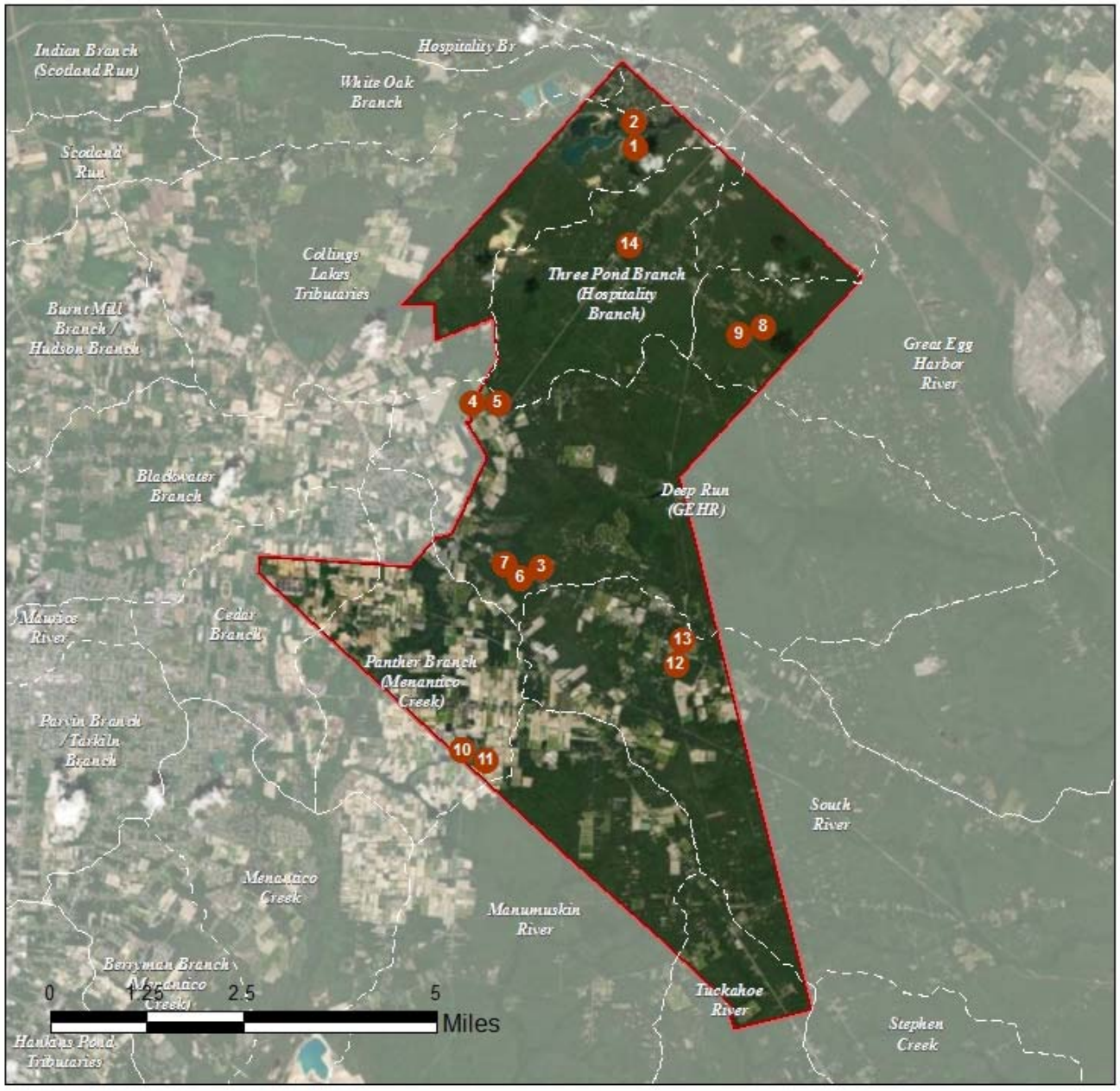
## Conclusion

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.

## a. Green Infrastructure Sites

## BUENA VISTA TOWNSHIP: GREEN INFRASTRUCTURE SITES




SITES WITHIN THE COLLINGS LAKES SUBWATERSHED

1. Collings Lakes Elementary School
2. Collings Lakes Fire Department

SITES WITHIN THE DEEP RUN SUBWATERSHED

3. Buena Post Office
4. Buena Regional High School
5. Buena Regional Middle School
6. Buena Vista Township Court Clerk
7. John C. Milanesi Elementary School

SITES WITHIN THE GREAT EGG HARBOR RIVER SUBWATERSHED

8. Bethel Holy Temple Church of God in Christ
9. First Union Baptist Church

SITES WITHIN THE PANTHER BRANCH (MENANTICO CREEK) SUBWATERSHED

10. St. Mary's Church
11. St. Mary's Regional School

SITES WITHIN THE SOUTH RIVER SUBWATERSHED

12. Richland Fire Company
13. The Ukrainian House of Gospel

SITES WITHIN THE THREE POND BRANCH (HOSPITAL BRANCH) SUBWATERSHED

14. Newtonville Volunteer Fire Department

# b. Proposed Green Infrastructure Concepts

# Collings Lakes Elementary School

**Subwatershed:** Collings Lakes

**Site Area:** 886,257 sq. ft.

**Address:** 620 Cains Mill Road
Williamstown, NJ 0894

**Block and Lot:** Block 502, Lot 5

A rain garden can be installed west of the main entrance of the school to capture, treat, and infiltrate 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" |
| 12 | 102,806 | 5.0 | 51.9 | 472.0 | 0.080 | 2.82 |

| 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 | 0.125 | 21 | 9,180 | 0.34 | 1,200 | $6,000 |

# GREEN INFRASTRUCTURE RECOMMENDATIONS


## Collings Lakes Elementary School

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

0 30' 60'

# Collings Lakes Fire Department

**Subwatershed:** Collings Lakes

**Site Area:** 24,707 sq. ft.

**Address:** 600 Cains Mill Road
Williamstown, NJ 08094

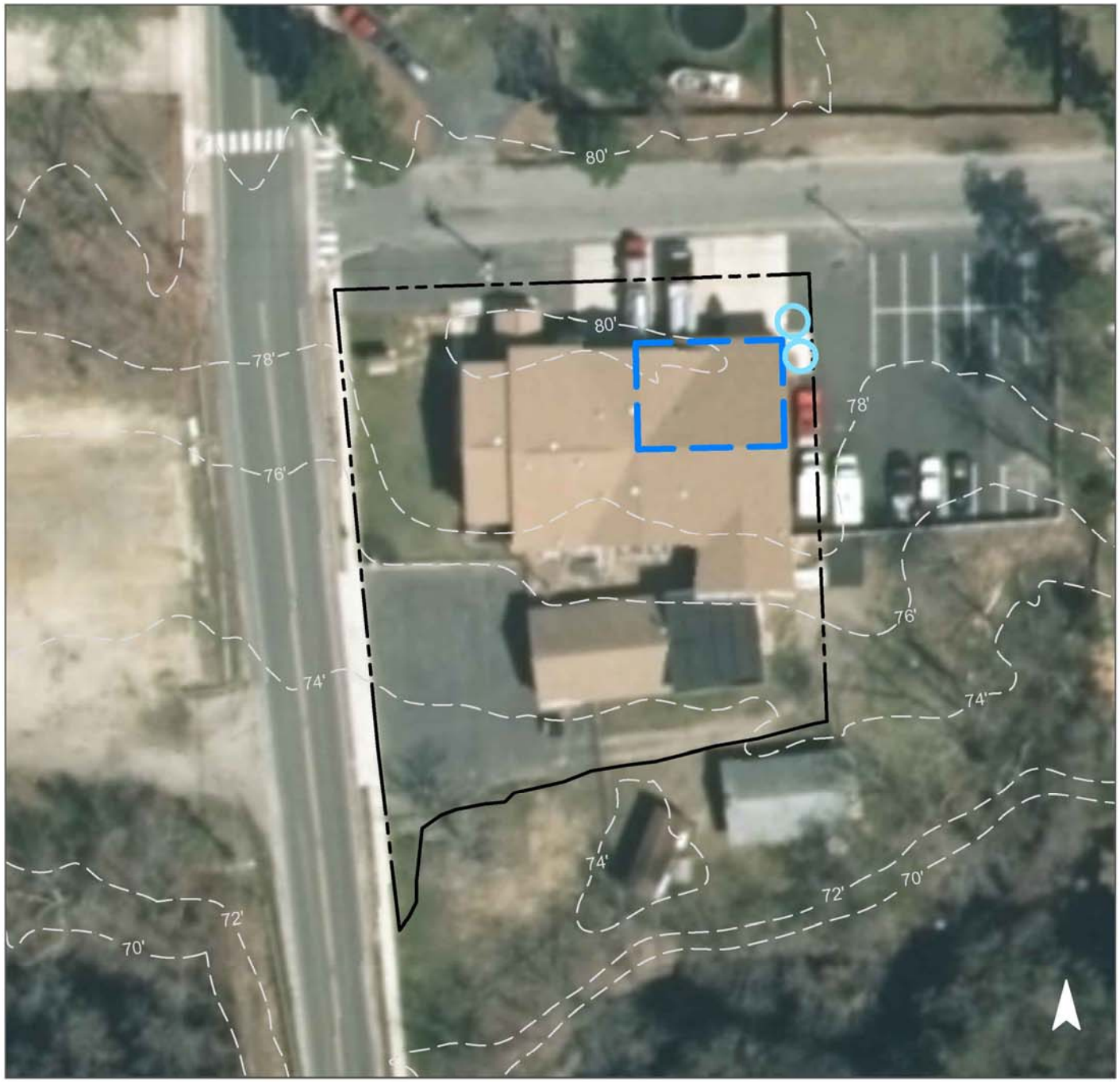
**Block and Lot:** Block 401, Lots 1, 2


Cisterns can be placed in the northeast corner of the building to collect rooftop runoff and 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" |
| 50 | 12,353 | 0.6 | 6.2 | 56.7 | 0.010 | 0.34 |

| 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 |
|---|---|---|---|---|---|---|
| Rainwater harvesting | 0.044 | 7 | 1,310 | 0.05 | 1,310 (gal) | $2,620 |

# GREEN INFRASTRUCTURE RECOMMENDATIONS




**Collings Lakes Fire Department**

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

0 25' 50'

# Buena Post Office

**Subwatershed:** Deep Run

**Site Area:** 76,549 sq. ft.

**Address:** 896 Harding Highway
Buena, NJ 08310

**Block and Lot:** Block 5301, Lot 3


A rain garden can be installed on the northwest side of the building to capture, treat, and infiltrate rooftop runoff. The row of parking spaces closest to the building can be replaced with pervious pavement 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" |
| 16 | 12,266 | 0.6 | 6.2 | 56.3 | 0.010 | 0.34 |

| 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 system | 0.027 | 5 | 2,020 | 0.08 | 265 | $1,325 |
| Pervious pavement | 0.180 | 30 | 13,210 | 0.50 | 1,240 | $31,000 |

# GREEN INFRASTRUCTURE RECOMMENDATIONS


## Buena Post Office

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

0 20' 40'

# Buena Regional High School

**Subwatershed:** Deep Run

**Site Area:** 1,973,569 sq. ft.

**Address:** 125 Weymouth Road
Buena, NJ 08310

**Block and Lot:** n/a


A rain garden can be installed at the corner of one section of parking lot to capture, treat, and infiltrate the associated stormwater runoff. The most southern row of parking spaces can be replaced with pervious pavement 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" |
| 23 | 446,627 | 21.5 | 225.6 | 2,050.6 | 0.348 | 12.25 |

| 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 | 0.193 | 32 | 14,140 | 0.53 | 1,1850 | $9,250 |
| Pervious pavement | 2.591 | 434 | 190,140 | 7.15 | 17,760 | $444,000 |

# GREEN INFRASTRUCTURE RECOMMENDATIONS


## Buena Regional High School

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

0 100' 200'

# Buena Regional Middle School

**Subwatershed:** Deep Run

**Site Area:** 1,428,945 sq. ft.

**Address:** 175 Weymouth Road
Buena, NJ 08310

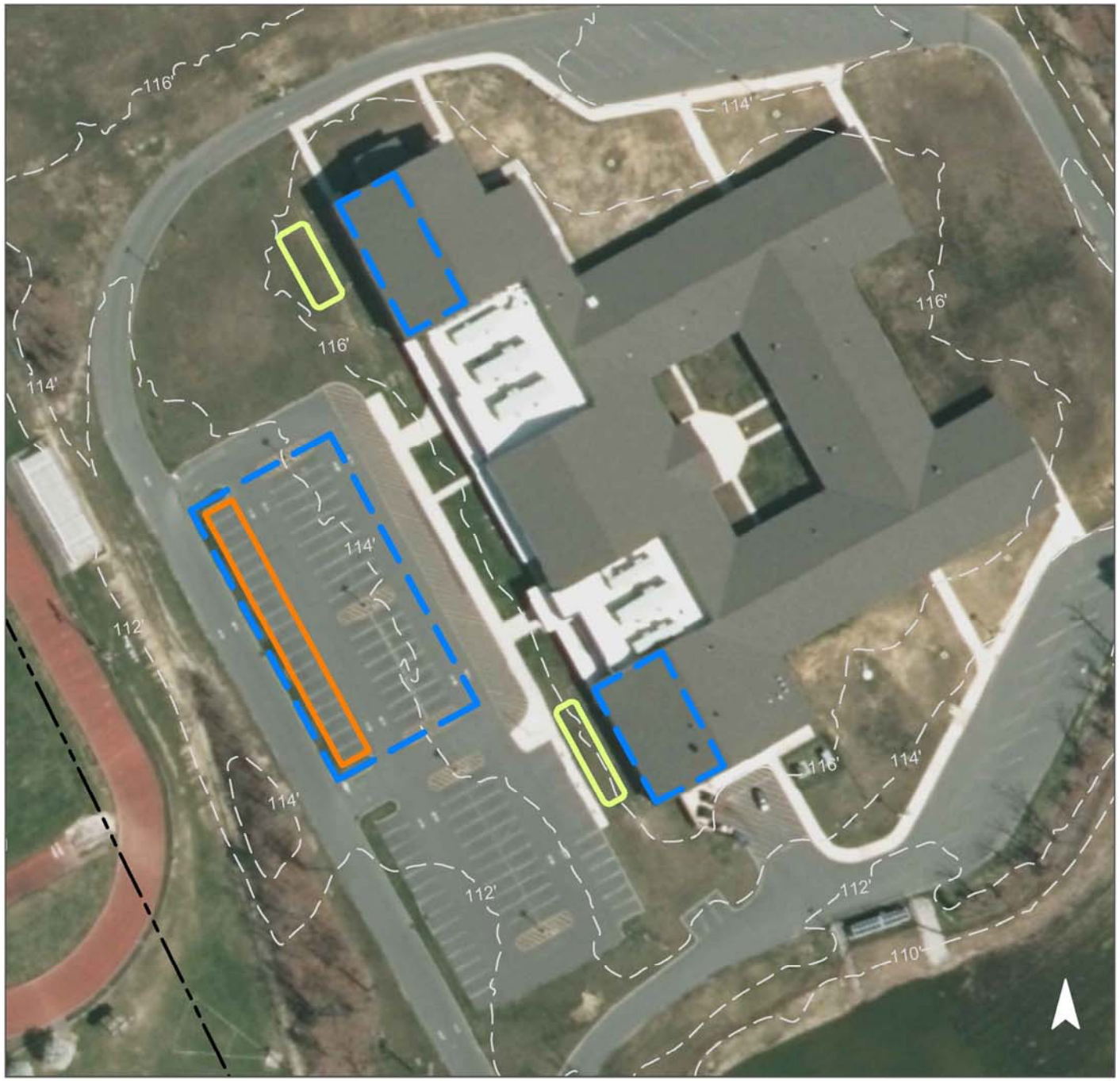
**Block and Lot:** n/a

One rain garden can be installed north of the main entrance of the school as well as one south of the entrance to capture, treat, and infiltrate rooftop runoff. The row of parking spaces on the northwest side of the building can be replaced with pervious pavement 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" |
| 18 | 246,916 | 11.9 | 124.7 | 1,133.7 | 0.192 | 6.77 |

| Recommended Green Infrastructure Practices | Recharge Potential (Mgal/yr) | TSS Removal Potential (lbs/yr) | Maximum Volume Reduction Potential (gal/storm) | Peak Discharge Reduction Potential (cu. ft./second) | Estimated Size (sq. ft.) | Estimated Cost |
|---|---|---|---|---|---|---|
| Bioretention systems | 0.218 | 36 | 16,020 | 0.60 | 2,095 | $10,475 |
| Pervious pavement | 0.547 | 92 | 40,150 | 1.51 | 3,750 | $93,750 |

# GREEN INFRASTRUCTURE RECOMMENDATIONS




**Buena Regional Middle School**

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

0 50' 100'

# Buena Vista Township Court Clerk

**Subwatershed:** Deep Run

**Site Area:** 168,656 sq. ft.

**Address:** 890 Harding Highway
Buena, NJ 08310

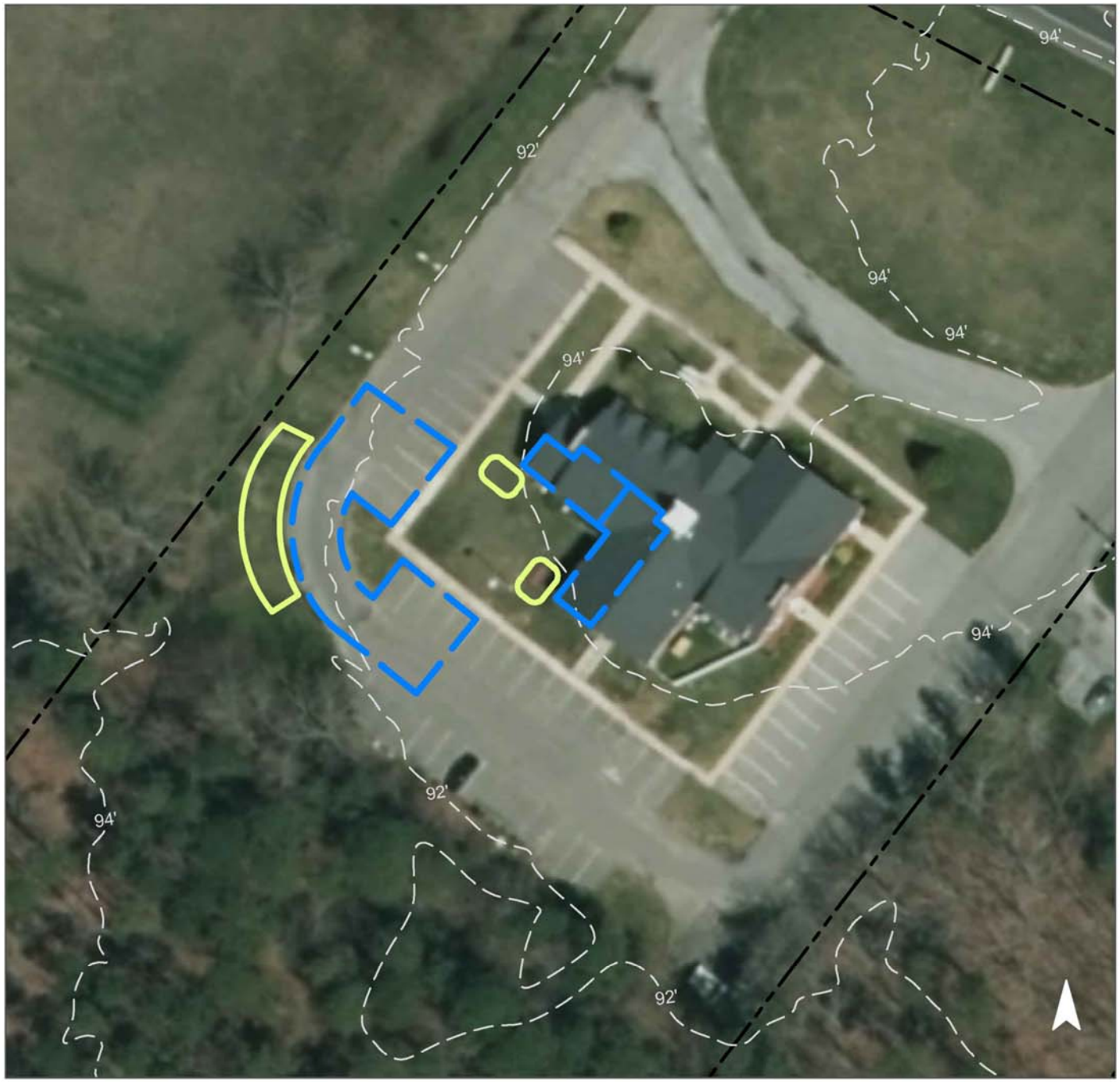
**Block and Lot:** Block 5301, Lot 2

Two rain gardens can be installed at the two southwest facing sides of the building to capture, treat, and infiltrate rooftop runoff. Another rain garden can be placed adjacent to the rounded corner driveway west of the building to capture, treat, and infiltrate runoff from the impervious parking lot. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

| Impervious Cover | | Existing Loads from Impervious Cover (lbs/yr) | | | Runoff Volume from Impervious Cover (Mgal) | |
|---|---|---|---|---|---|---|
| % | sq. ft. | TP | TN | TSS | For the 1.25" Water Quality Storm | For an Annual Rainfall of 44" |
| 30 | 51,412 | 2.5 | 26.0 | 236.1 | 0.040 | 1.41 |

| Recommended Green Infrastructure Practices | Recharge Potential (Mgal/yr) | TSS Removal Potential (lbs/yr) | Maximum Volume Reduction Potential (gal/storm) | Peak Discharge Reduction Potential (cu. ft./second) | Estimated Size (sq. ft.) | Estimated Cost |
|---|---|---|---|---|---|---|
| Bioretention systems | 0.144 | 24 | 10,550 | 0.40 | 1,380 | $6,900 |

# GREEN INFRASTRUCTURE RECOMMENDATIONS




**Buena Vista Township Court Clerk**

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

0 30' 60'

# John C. Milanesi Elementary School

**Subwatershed:** Deep Run

**Site Area:** 1,030,509 sq. ft.

**Address:** 880 Harding Highway
Buena, NJ 08310

**Block and Lot:** Block 5301, Lot 1

A rain garden can be installed at the northwestern corner of the school to capture, treat, and infiltrate 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" |
| 13 | 134,852 | 6.5 | 68.1 | 619.2 | 0.105 | 3.70 |

| 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 | 0.099 | 17 | 7,290 | 0.27 | 955 | $4,775 |

# GREEN INFRASTRUCTURE RECOMMENDATIONS


**John C. Milanesi Elementary School**

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

0 30' 60'

# Bethel Holy Temple Church of God in Christ

**Subwatershed:** Great Egg Harbor River

**Site Area:** 43,831 sq. ft.

**Address:** 533 8th Street
Newtonville, NJ 08346

**Block and Lot:** Block 1601, Lot 20

The southern half of parking spaces northeast of the building can be replaced with pervious pavement 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" |
| 38 | 16,691 | 0.8 | 8.4 | 76.6 | 0.013 | 0.46 |

| Recommended Green Infrastructure Practices | Recharge Potential (Mgal/yr) | TSS Removal Potential (lbs/yr) | Maximum Volume Reduction Potential (gal/storm) | Peak Discharge Reduction Potential (cu. ft./second) | Estimated Size (sq. ft.) | Estimated Cost |
|---|---|---|---|---|---|---|
| Pervious pavement | 0.075 | 13 | 5,510 | 0.21 | 515 | $12,875 |

# GREEN INFRASTRUCTURE RECOMMENDATIONS


**Bethel Holy Temple Church of God in Christ**

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

0 25' 50'

# First Union Baptist Church

**Subwatershed:** Great Egg Harbor River

**Site Area:** 20,429 sq. ft.

**Address:** 854 Jackson Road
Newtonville, NJ 08346

**Block and Lot:** Block 2001, Lot 10

Downspout planter boxes can be constructed along the northwest and southeast sides of the building to allow roof runoff to be reused. 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" |
| 75 | 15,322 | 0.7 | 7.7 | 70.3 | 0.012 | 0.42 |

| 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 |
|---|---|---|---|---|---|---|
| Planter boxes | n/a | 5 | n/a | n/a | 7 (boxes) | $7,000 |

# GREEN INFRASTRUCTURE RECOMMENDATIONS


**First Union Baptist Church**

- planter box
- drainage area
- property line
- 2015 Aerial: NJOIT, OGIS

0 20' 40'

# St. Mary's Church

**Subwatershed:** **Panther Branch**

**Site Area:** **186,573 sq. ft.**

**Address:** **735 Union Road**
**Vineland, NJ 08360**

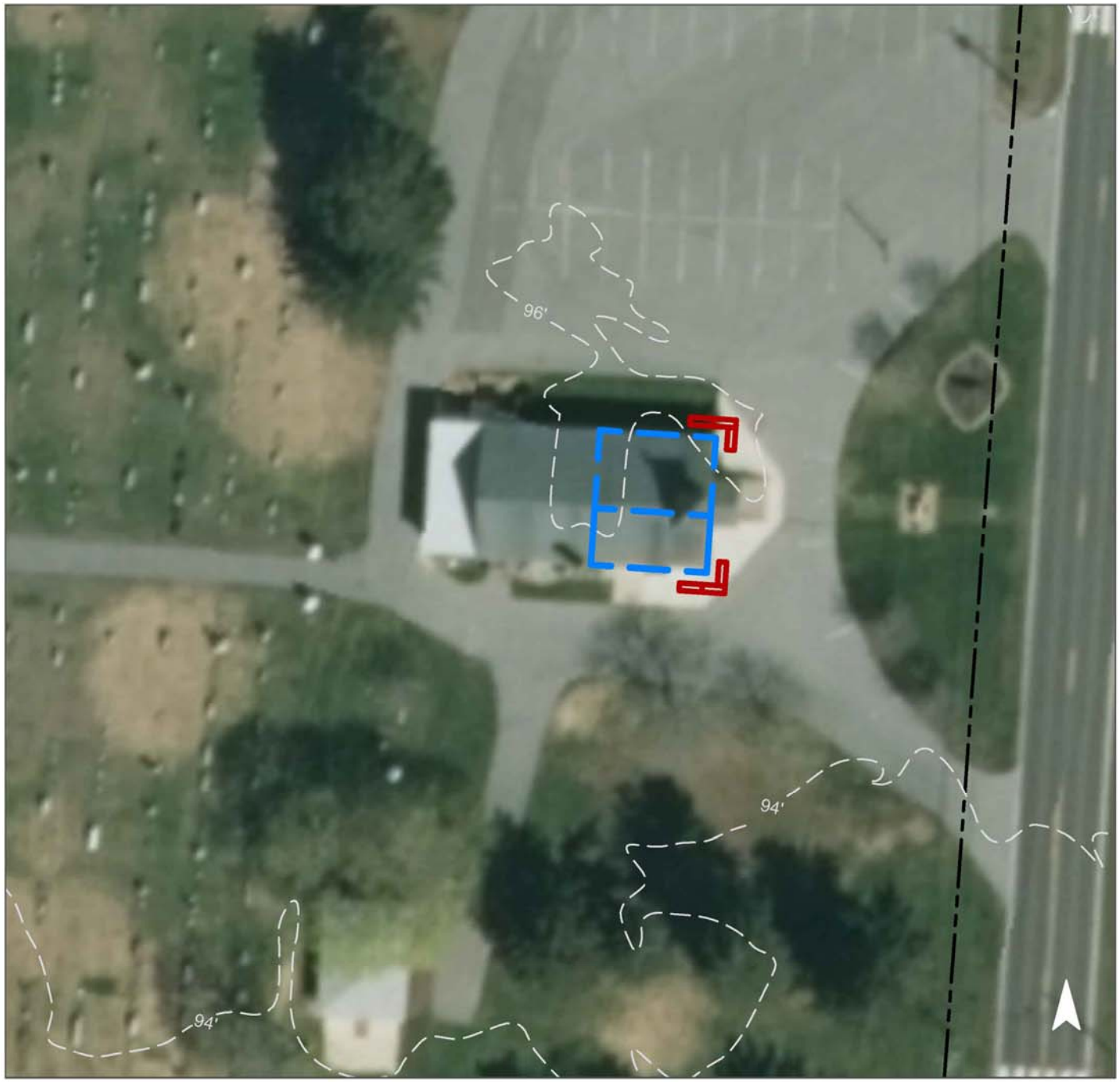
**Block and Lot:** **Block 7702, Lot 9**


Downspout planter boxes can be constructed along the two corners on either side of the entrance of the building to allow roof runoff to be reused. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

| Impervious Cover | | Existing Loads from Impervious Cover (lbs/yr) | | | Runoff Volume from Impervious Cover (Mgal) | |
|---|---|---|---|---|---|---|
| % | sq. ft. | TP | TN | TSS | For the 1.25" Water Quality Storm | For an Annual Rainfall of 44" |
| 18 | 34,389 | 1.7 | 17.4 | 157.9 | 0.027 | 0.94 |

| Recommended Green Infrastructure Practices | Recharge Potential (Mgal/yr) | TSS Removal Potential (lbs/yr) | Maximum Volume Reduction Potential (gal/storm) | Peak Discharge Reduction Potential (cu. ft./second) | Estimated Size (sq. ft.) | Estimated Cost |
|---|---|---|---|---|---|---|
| Planter boxes | n/a | 4 | n/a | n/a | 6 (boxes) | $6,000 |

# GREEN INFRASTRUCTURE RECOMMENDATIONS




**St. Mary's Church**

- planter box
- drainage area
- property line
- 2015 Aerial: NJOIT, OGIS

0 20' 40'

# St. Mary's Regional School

**Subwatershed:** Panther Branch

**Site Area:** 529,653 sq. ft.

**Address:** 735 Union Road
Vineland, NJ 08360

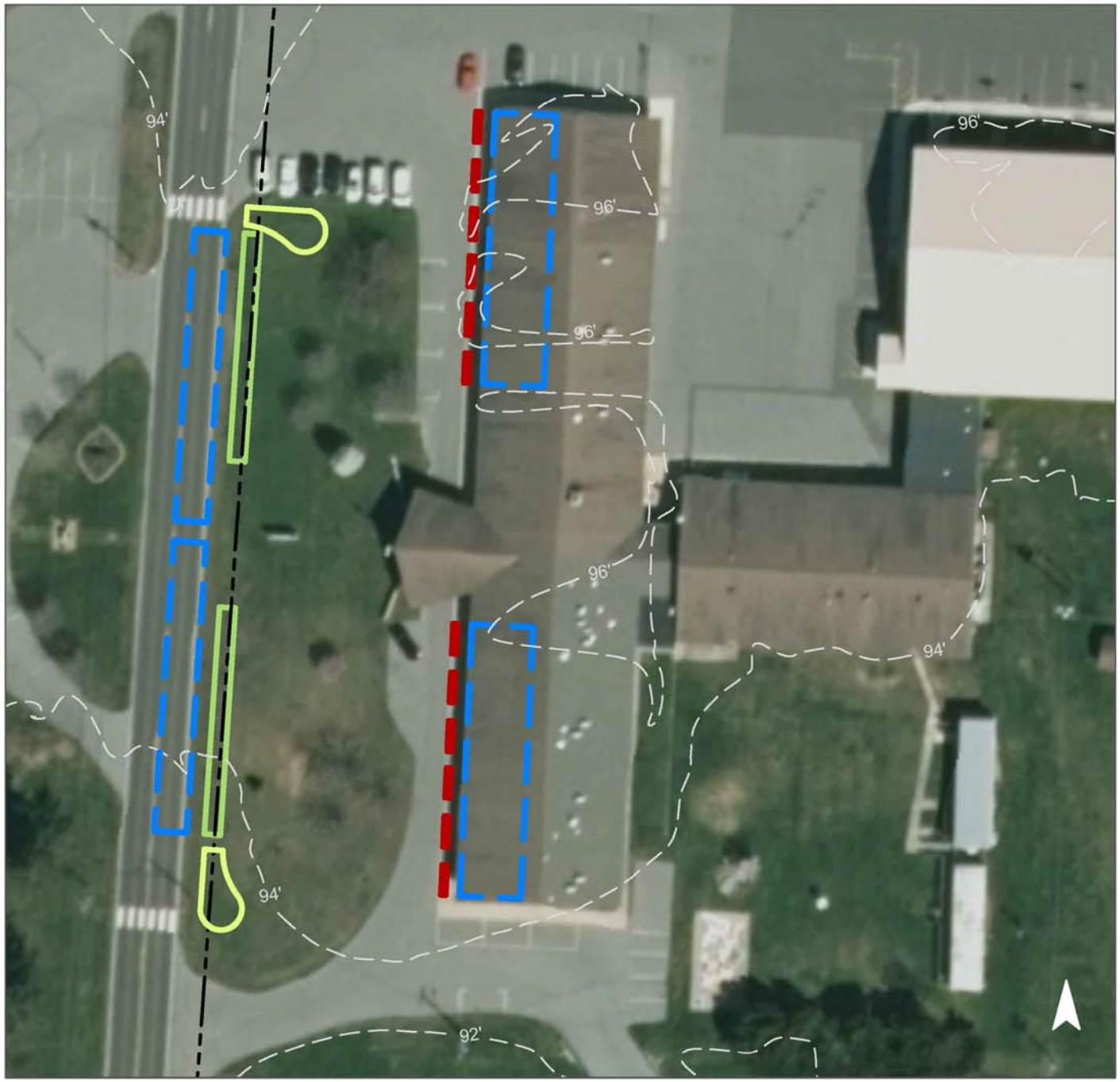
**Block and Lot:** Block 6902, Lot 32


Downspout planter boxes can be installed along the front entrance of the building to allow roof runoff to be reused. Two bioswales leading to rain gardens can be placed in the turfgrass area west of the building adjacent to the road to convey stormwater from the street while removing pollutants and allowing infiltration. 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" |
| 20 | 118,883 | 5.7 | 60.0 | 545.8 | 0.093 | 3.26 |

| 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 | 0.076 | 13 | 5,540 | 0.21 | 730 | $3,650 |
| Bioswales | n/a | 20 | n/a | n/a | 1,130 | $5,650 |
| Planter boxes | n/a | 19 | n/a | n/a | 24 (boxes) | $24,000 |

# GREEN INFRASTRUCTURE RECOMMENDATIONS




## St. Mary's Regional School

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

0 30' 60'

# Richland Fire Company

**Subwatershed:** South River

**Site Area:** 144,978 sq. ft.

**Address:** 876 Main Avenue
Buena, NJ 08310

**Block and Lot:** Block 4529, Lot 4


Two rain gardens can be installed at the two north corners of the building to capture, treat, and infiltrate rooftop runoff. The southernmost row of parking spaces 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" |
| 22 | 31,228 | 1.5 | 15.8 | 143.4 | 0.024 | 0.86 |

| 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 | 0.035 | 6 | 2,580 | 0.10 | 340 | $1,700 |
| Pervious pavement | 0.327 | 55 | 24,000 | 0.90 | 1,825 | $45,625 |

# GREEN INFRASTRUCTURE RECOMMENDATIONS


## Richland Fire Company

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

0 30' 60'

# The Ukrainian House of Gospel

**Subwatershed:** South River

**Site Area:** 46,324 sq. ft.

**Address:** 204 Sewell Avenue
Richland, NJ 08350

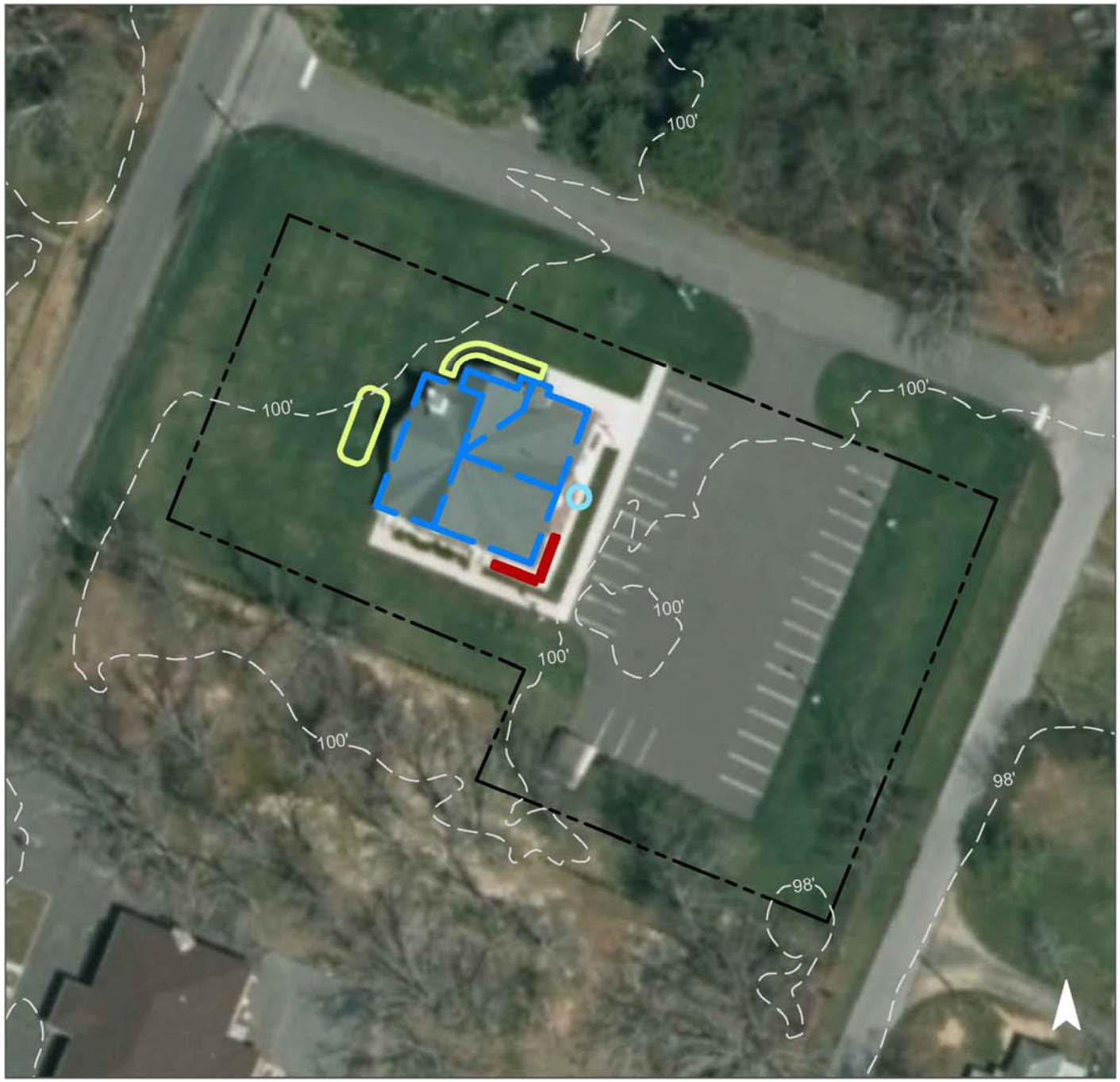
**Block and Lot:** Block 4521, Lot 1

A rain garden can be installed along the north side of the building as well as another along the west of the building to capture, treat, and infiltrate rooftop runoff. Downspout planter boxes can be constructed around the southern corner of the building to allow roof runoff to be reused. A rainwater harvesting system can be placed on the east side of the building to collect rooftop runoff and be used for watering gardens, washing vehicles, or for other non-potable uses. 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" |
| 29 | 13,511 | 0.7 | 6.8 | 62.0 | 0.011 | 0.37 |

| 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 |
|---|---|---|---|---|---|---|
| Bioretention systems | 0.045 | 8 | 3,340 | 0.13 | 545 | $2,725 |
| Planter boxes | n/a | 5 | n/a | n/a | 6 (boxes) | $6,000 |
| Rainwater harvesting | 0.027 | 5 | 820 | 0.03 | 820 (gal) | $1,640 |

# GREEN INFRASTRUCTURE RECOMMENDATIONS




## The Ukrainian House of Gospel

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

0 30' 60'

# Newtonville Volunteer Fire Department

**Subwatershed:** Three Pond Branch

**Site Area:** 748,468 sq. ft.

**Address:** 835 Route 54
Williamstown, NJ 08346

**Block and Lot:** Block 1808, Lot 20

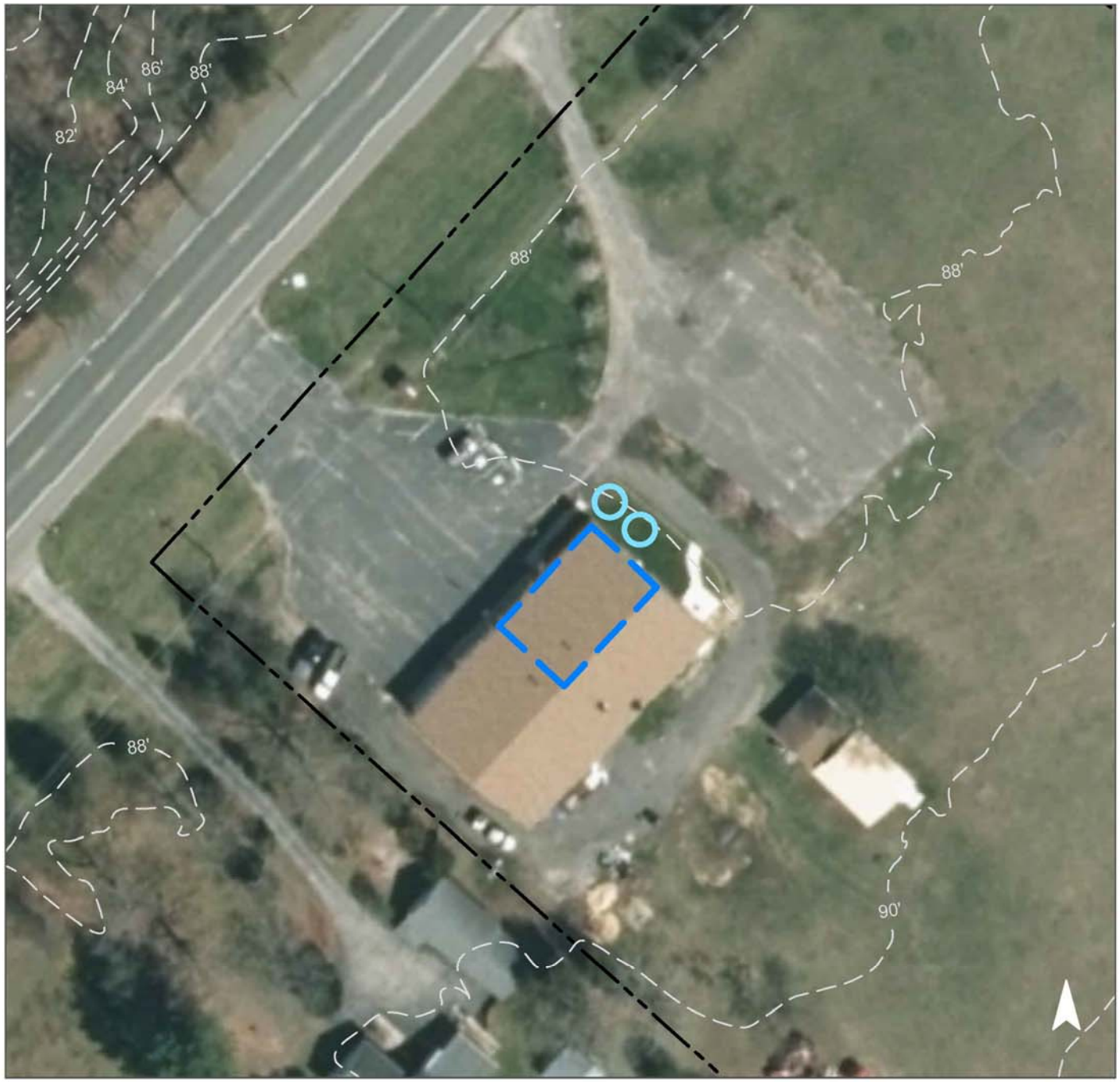


Cisterns can be placed in the north corner of the building to collect rooftop runoff and be used for watering gardens, washing vehicles, or for other non-potable uses. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

| 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" |
| 4 | 33,072 | 1.6 | 16.7 | 151.8 | 0.026 | 0.91 |

| 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 | 0.049 | 8 | 1,460 | 0.06 | 1,460 (gal) | $2,920 |

# GREEN INFRASTRUCTURE RECOMMENDATIONS




**Newtonville Volunteer Fire Department**

- rainwater harvesting
- 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) | | | Runoff Volumes from I.C. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | TP (lb/yr) | TN (lb/yr) | TSS (lb/yr) | Water Quality Storm (1.25" over 2-hours) (Mgal) | Annual (Mgal) |
| | **COLLINGS LAKES SUBWATERSHED** | **20.91** | **910,964** | | | | **2.64** | **115,160** | **5.6** | **58.2** | **528.7** | **0.090** | **3.16** |
| 1 | **Collings Lake Elementary School** | | | | | | | | | | | | |
| | **Total Site Info** | 20.35 | 886,257 | 502 | 5 | 12 | 2.36 | 102,806 | 5.0 | 51.9 | 472.0 | 0.080 | 2.82 |
| 2 | **Collings Lakes Fire Department** | | | | | | | | | | | | |
| | **Total Site Info** | 0.57 | 24,707 | 401 | 1,2 | 50 | 0.28 | 12,353 | 0.6 | 6.2 | 56.7 | 0.010 | 0.34 |
| | **DEEP RUN SUBWATERSHED** | **107.40** | **4,678,229** | | | | **20.48** | **892,073** | **43.0** | **450.5** | **4,095.8** | **0.695** | **24.47** |
| 3 | **Buena Post Office** | | | | | | | | | | | | |
| | **Total Site Info** | 1.76 | 76,549 | 5301 | 3 | 16 | 0.28 | 12,266 | 0.6 | 6.2 | 56.3 | 0.010 | 0.34 |
| 4 | **Buena Regional High School** | | | | | | | | | | | | |
| | **Total Site Info** | 45.31 | 1,973,569 | | | 23 | 10.25 | 446,627 | 21.5 | 225.6 | 2,050.6 | 0.348 | 12.25 |
| 5 | **Buena Regional Middle School** | | | | | | | | | | | | |
| | **Total Site Info** | 32.80 | 1,428,945 | | | 17 | 5.67 | 246,916 | 11.9 | 124.7 | 1,133.7 | 0.192 | 6.77 |
| 6 | **Buena Vista Township Court Clerk** | | | | | | | | | | | | |
| | **Total Site Info** | 3.87 | 168,656 | 5301 | 2 | 30 | 1.18 | 51,412 | 2.5 | 26.0 | 236.1 | 0.040 | 1.41 |
| 7 | **John C. Milanesi Elementary School** | | | | | | | | | | | | |
| | **Total Site Info** | 23.66 | 1,030,509 | 5301 | 1 | 13 | 3.10 | 134,852 | 6.5 | 68.1 | 619.2 | 0.105 | 3.70 |
| | **GREAT EGG HARBOR RIVER SUBWATERSHED** | **1.48** | **64,261** | | | | **0.73** | **32,013** | **1.5** | **16.2** | **147.0** | **0.025** | **0.88** |
| 8 | **Bethel Holy Temple Church of God in Christ** | | | | | | | | | | | | |
| | **Total Site Info** | 1.01 | 43,831 | 1601 | 20 | 38 | 0.38 | 16,691 | 0.8 | 8.4 | 76.6 | 0.013 | 0.46 |
| 9 | **First Union Baptist Church** | | | | | | | | | | | | |
| | **Total Site Info** | 0.47 | 20,429 | 2001 | 10 | 75 | 0.35 | 15,322 | 0.7 | 7.7 | 70.3 | 0.012 | 0.42 |

## 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. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | TP (lb/yr) | TN (lb/yr) | TSS (lb/yr) | Water Quality Storm (1.25" over 2-hours) (Mgal) | Annual (Mgal) |
| | **PANTHER BRANCH SUBWATERSHED** | **17.89** | **779,227** | | | | **3.52** | **153,272** | **7.4** | **77.4** | **703.7** | **0.119** | **4.20** |
| 10 | **St. Mary's Church** | | | | | | | | | | | | |
| | **Total Site Info** | 4.28 | 186,573 | 7702 | 9 | 18 | 0.79 | 34,389 | 1.7 | 17.4 | 157.9 | 0.027 | 0.94 |
| 11 | **St. Mary's Regional School** | | | | | | | | | | | | |
| | **Total Site Info** | 13.61 | 592,653 | 6902 | 32 | 20 | 2.73 | 118,883 | 5.7 | 60.0 | 545.8 | 0.093 | 3.26 |
| | **SOUTH RIVER SUBWATERSHED** | **4.39** | **191,302** | | | | **1.03** | **44,738** | **2.2** | **22.6** | **205.4** | **0.035** | **1.23** |
| 12 | **Richland Fire Company** | | | | | | | | | | | | |
| | **Total Site Info** | 3.33 | 144,978 | 4529 | 4 | 22 | 0.72 | 31,228 | 1.5 | 15.8 | 143.4 | 0.024 | 0.86 |
| 13 | **The Ukrainian House of Gospel** | | | | | | | | | | | | |
| | **Total Site Info** | 1.06 | 46,324 | 4521 | 1 | 29 | 0.31 | 13,511 | 0.7 | 6.8 | 62.0 | 0.011 | 0.37 |
| | **THREE POND BRANCH SUBWATERSHED** | **17.18** | **748,468** | | | | **0.76** | **33,072** | **1.6** | **16.7** | **151.8** | **0.026** | **0.91** |
| 14 | **Newtonville Volunteer Fire Department** | | | | | | | | | | | | |
| | **Total Site Info** | 17.18 | 748,468 | 1808 | 20 | 4 | 0.76 | 33,072 | 1.6 | 16.7 | 151.8 | 0.026 | 0.91 |

# 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 | Unit Cost ($/unit) | Unit | Total Cost ($) | I.C. Treated % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **COLLINGS LAKES SUBWATERSHED** | **6,480** | **0.15** | **0.169** | **28** | **10,490** | **0.39** | | | | **$8,620** | **5.6%** |
| 1 | **Collings Lakes Elementary School** | | | | | | | | | | | |
| | Bioretention system | 4,800 | 0.11 | 0.125 | 21 | 9,180 | 0.34 | 1,200 | $5 | SF | $6,000 | 4.7% |
| | **Total Site Info** | **4,800** | **0.11** | **0.125** | **21** | **9,180** | **0.34** | | | | **$6,000** | **4.7%** |
| 2 | **Collings Lakes Fire Department** | | | | | | | | | | | |
| | Rainwater harvesting | 1,680 | 0.04 | 0.044 | 7 | 1,310 | 0.05 | 1,310 | $2 | gal | $2,620 | 13.6% |
| | **Total Site Info** | **1,680** | **0.04** | **0.044** | **7** | **1,310** | **0.05** | | | | **$2,620** | **13.6%** |
| | **DEEP RUN SUBWATERSHED** | **153,530** | **3.52** | **4.000** | **670** | **293,520** | **11.04** | | | | **$601,475** | **17.2%** |
| 3 | **Buena Post Office** | | | | | | | | | | | |
| | Bioretention system | 1,055 | 0.02 | 0.027 | 5 | 2,020 | 0.08 | 265 | $5 | SF | $1,325 | 8.6% |
| | Pervious pavement | 6,910 | 0.16 | 0.180 | 30 | 13,210 | 0.50 | 1,240 | $25 | SF | $31,000 | 56.3% |
| | **Total Site Info** | **7,965** | **0.18** | **0.208** | **35** | **15,230** | **0.58** | | | | **$32,325** | **64.9%** |
| 4 | **Buena Regional High School** | | | | | | | | | | | |
| | Bioretention system | 7,400 | 0.17 | 0.193 | 32 | 14,140 | 0.53 | 1,850 | $5 | SF | $9,250 | 1.7% |
| | Pervious pavement | 99,455 | 2.28 | 2.591 | 434 | 190,140 | 7.15 | 17,760 | $25 | SF | $444,000 | 22.3% |
| | **Total Site Info** | **106,855** | **2.45** | **2.784** | **466** | **204,280** | **7.68** | | | | **$453,250** | **23.9%** |
| 5 | **Buena Regional Middle School** | | | | | | | | | | | |
| | Bioretention systems | 8,380 | 0.19 | 0.218 | 37 | 16,020 | 0.60 | 2,095 | $5 | SF | $10,475 | 3.4% |
| | Pervious pavement | 21,000 | 0.48 | 0.547 | 92 | 40,150 | 1.51 | 3,750 | $25 | SF | $93,750 | 8.5% |
| | **Total Site Info** | **29,380** | **0.67** | **0.766** | **128** | **56,170** | **2.11** | | | | **$104,225** | **11.9%** |
| 6 | **Buena Vista Township Court Clerk** | | | | | | | | | | | |
| | Bioretention systems | 5,520 | 0.13 | 0.144 | 24 | 10,550 | 0.40 | 1,380 | $5 | SF | $6,900 | 10.7% |
| | **Total Site Info** | **5,520** | **0.13** | **0.144** | **24** | **10,550** | **0.40** | | | | **$6,900** | **10.7%** |
| 7 | **John C. Milanesi Elementary School** | | | | | | | | | | | |
| | Bioretention system | 3,810 | 0.09 | 0.099 | 17 | 7,290 | 0.27 | 955 | $5 | SF | $4,775 | 2.8% |
| | **Total Site Info** | **3,810** | **0.09** | **0.099** | **17** | **7,290** | **0.27** | | | | **$4,775** | **2.8%** |

## 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 | Unit Cost ($/unit) | Unit | Total Cost ($) | I.C. Treated % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **GREAT EGG HARBOR RIVER SUBWATERSHED** | **4,330** | **0.10** | **0.075** | **18** | **5,510** | **0.21** | | | | **$19,875** | **13.5%** |
| 8 | **Bethel Holy Temple Church of God in Christ** | | | | | | | | | | | |
| | Pervious pavement | 2,885 | 0.07 | 0.075 | 13 | 5,510 | 0.21 | 515 | $25 | SF | $12,875 | 17.3% |
| | **Total Site Info** | **2,885** | **0.07** | **0.075** | **13** | **5,510** | **0.21** | | | | **$12,875** | **17.3%** |
| 9 | **First Union Baptist Church** | | | | | | | | | | | |
| | Planter boxes | 1,445 | 0.03 | n/a | 5 | n/a | n/a | 7 | $1,000 | box | $7,000 | 9.4% |
| | **Total Site Info** | **1,445** | **0.03** | **n/a** | **5** | **n/a** | **n/a** | | | | **$7,000** | **9.4%** |
| | **PANTHER BRANCH (MENANTICO CREEK) SUBWATERSHED** | **13,645** | **0.31** | **0.193** | **55** | **5,540** | **0.21** | | | | **$39,300** | **8.9%** |
| 10 | **St. Mary's Church** | | | | | | | | | | | |
| | Planter boxes | 1,085 | 0.02 | n/a | 4 | n/a | n/a | 6 | $1,000 | box | $6,000 | 3.2% |
| | **Total Site Info** | **1,085** | **0.02** | **n/a** | **4** | **n/a** | **n/a** | | | | **$6,000** | **3.2%** |
| 11 | **St. Mary's Regional School** | | | | | | | | | | | |
| | Bioretention systems | 2,900 | 0.07 | 0.076 | 13 | 5,540 | 0.21 | 730 | $5 | SF | $3,650 | 2.4% |
| | Bioswales | 4,500 | 0.10 | 0.117 | 20 | n/a | n/a | 1,130 | $5 | SF | $5,650 | 3.8% |
| | Planter boxes | 5,160 | 0.12 | n/a | 19 | n/a | n/a | 24 | $1,000 | box | $24,000 | 4.3% |
| | **Total Site Info** | **12,560** | **0.29** | **0.193** | **51** | **5,540** | **0.21** | | | | **$33,300** | **10.6%** |
| | **SOUTH RIVER SUBWATERSHED** | **17,945** | **0.41** | **0.435** | **77** | **30,740** | **1.16** | | | | **$57,690** | **40.1%** |
| 12 | **Richland Fire Company** | | | | | | | | | | | |
| | Bioretention systems | 1,350 | 0.03 | 0.035 | 6 | 2,580 | 0.10 | 340 | $5 | SF | $1,700 | 4.3% |
| | Pervious pavement | 12,550 | 0.29 | 0.327 | 55 | 24,000 | 0.90 | 1,825 | $25 | SF | $45,625 | 40.2% |
| | **Total Site Info** | **13,900** | **0.32** | **0.362** | **61** | **26,580** | **1.00** | | | | **$47,325** | **44.5%** |
| 13 | **The Ukrainian House of Gospel** | | | | | | | | | | | |
| | Bioretention systems | 1,745 | 0.04 | 0.045 | 8 | 3,340 | 0.13 | 545 | $5 | SF | $2,725 | 12.9% |
| | Planter boxes | 1,250 | 0.03 | n/a | 5 | n/a | n/a | 6 | $1,000 | box | $6,000 | 9.3% |
| | Rainwater harvesting | 1,050 | 0.02 | 0.027 | 5 | 820 | 0.03 | 820 | $2 | gal | $1,640 | 7.8% |
| | **Total Site Info** | **4,045** | **0.09** | **0.073** | **17** | **4,160** | **0.16** | | | | **$10,365** | **29.9%** |

**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) | | | | | | | | | |
| **THREE POND BRANCH (HOSPITAL BRANCH) SUBWATERSHED** | **1,875** | **0.04** | **0.049** | **8** | **1,460** | **0.06** | | | | **$2,920** | **5.7%** |
| 14 **Newtonville Volunteer Fire Department** | | | | | | | | | | | |
| Rainwater harvesting | 1,875 | 0.04 | 0.049 | 8 | 1,460 | 0.06 | 1,460 | $2 | gal | $2,920 | 5.7% |
| **Total Site Info** | **1,875** | **0.04** | **0.049** | **8** | **1,460** | **0.06** | | | | **$2,920** | **5.7%** |