



Draft

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

*Prepared for Manville Borough by the
Rutgers Cooperative Extension Water Resources Program*

September 5, 2015



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Introduction

Located in Somerset County in central New Jersey, Manville Borough covers approximately 2.45 square miles south of Bridgewater Township. Figures 1 and 2 illustrate that Manville Borough is dominated by urban land uses. A total of 77.4% of the municipality's land use is classified as urban. Of the urban land in Manville Borough, medium density residential is the dominant land use (Figure 3).

The New Jersey Department of Environmental Protection's (NJDEP) 2007 land use/land cover geographical information system (GIS) data layer categorizes Manville Borough into many unique land use areas, assigning a percent impervious cover for each delineated area. These impervious cover values were used to estimate the impervious coverage for Manville Borough. Based upon the 2007 NJDEP land use/land cover data, approximately 34.0% of Manville Borough has impervious cover. This level of impervious cover suggests that the streams in Manville Borough are likely non-supporting streams.¹

Methodology

Manville Borough contains portions of three 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

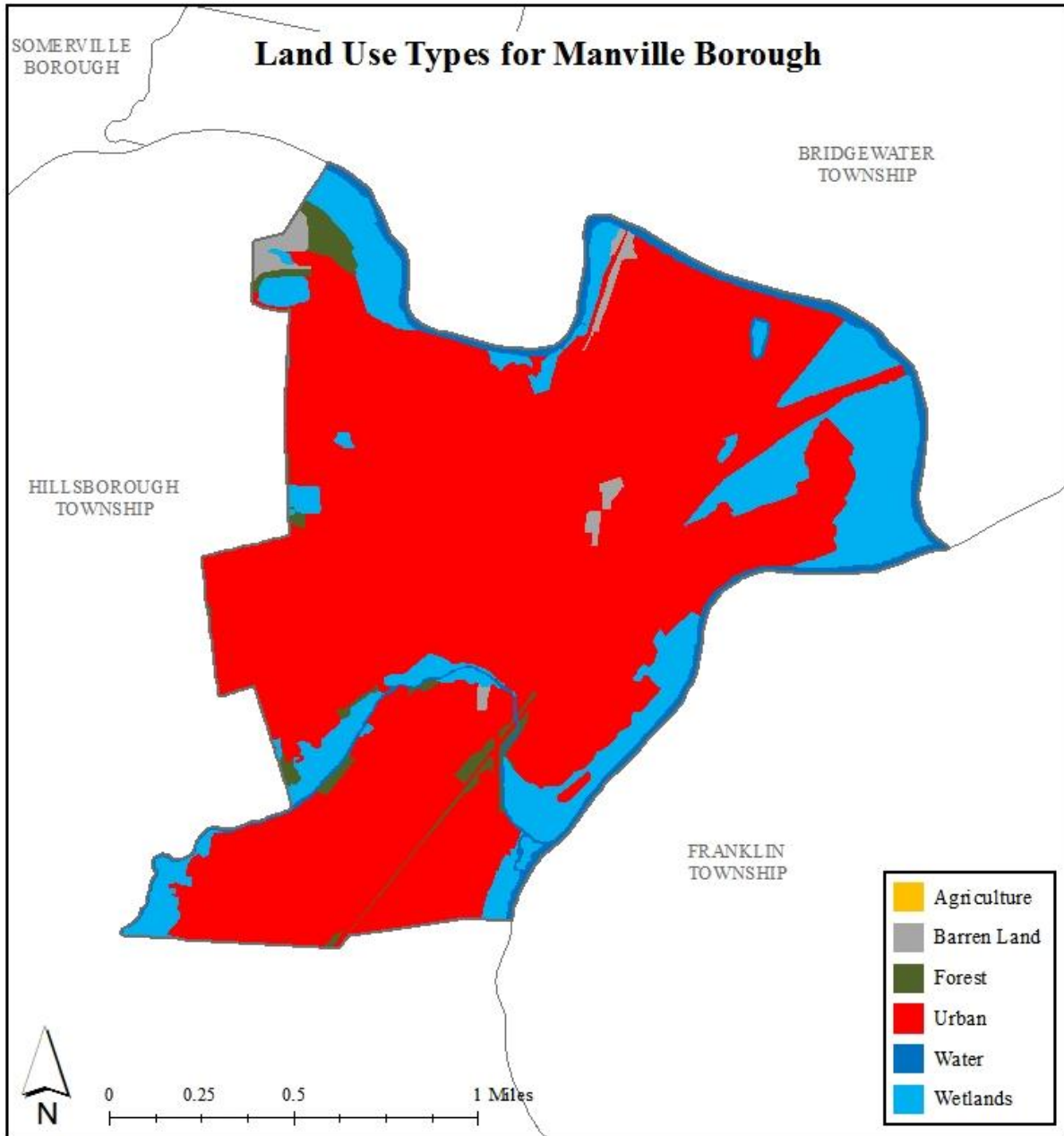


Figure 1: Map illustrating the land use in Manville Borough

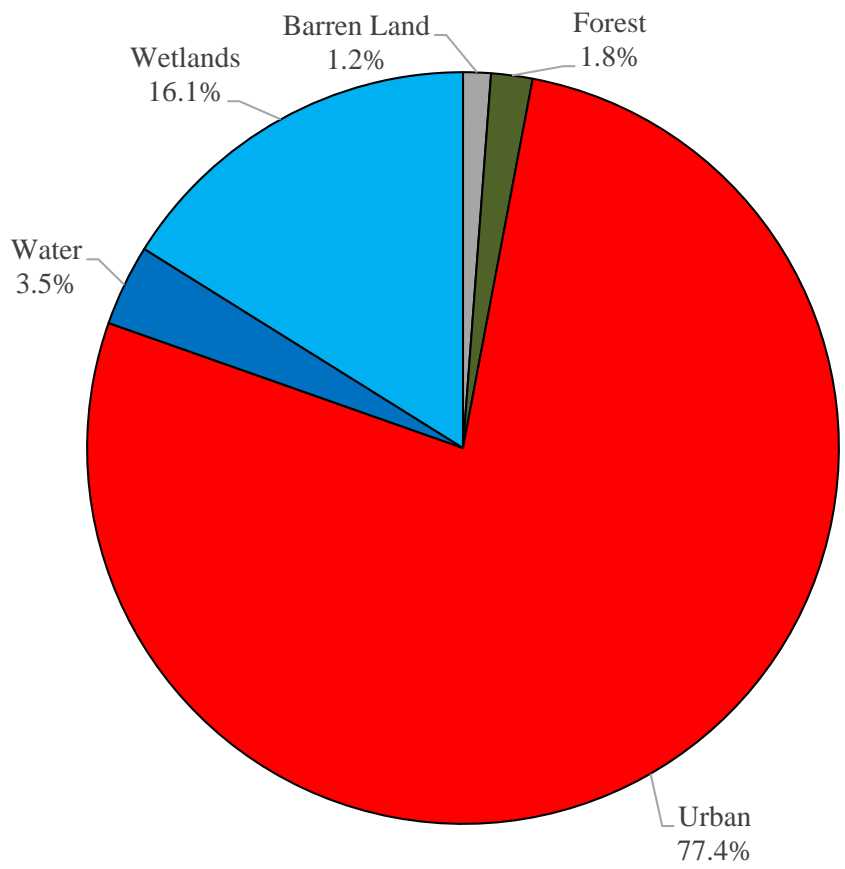


Figure 2: Pie chart illustrating the land use in Manville Borough

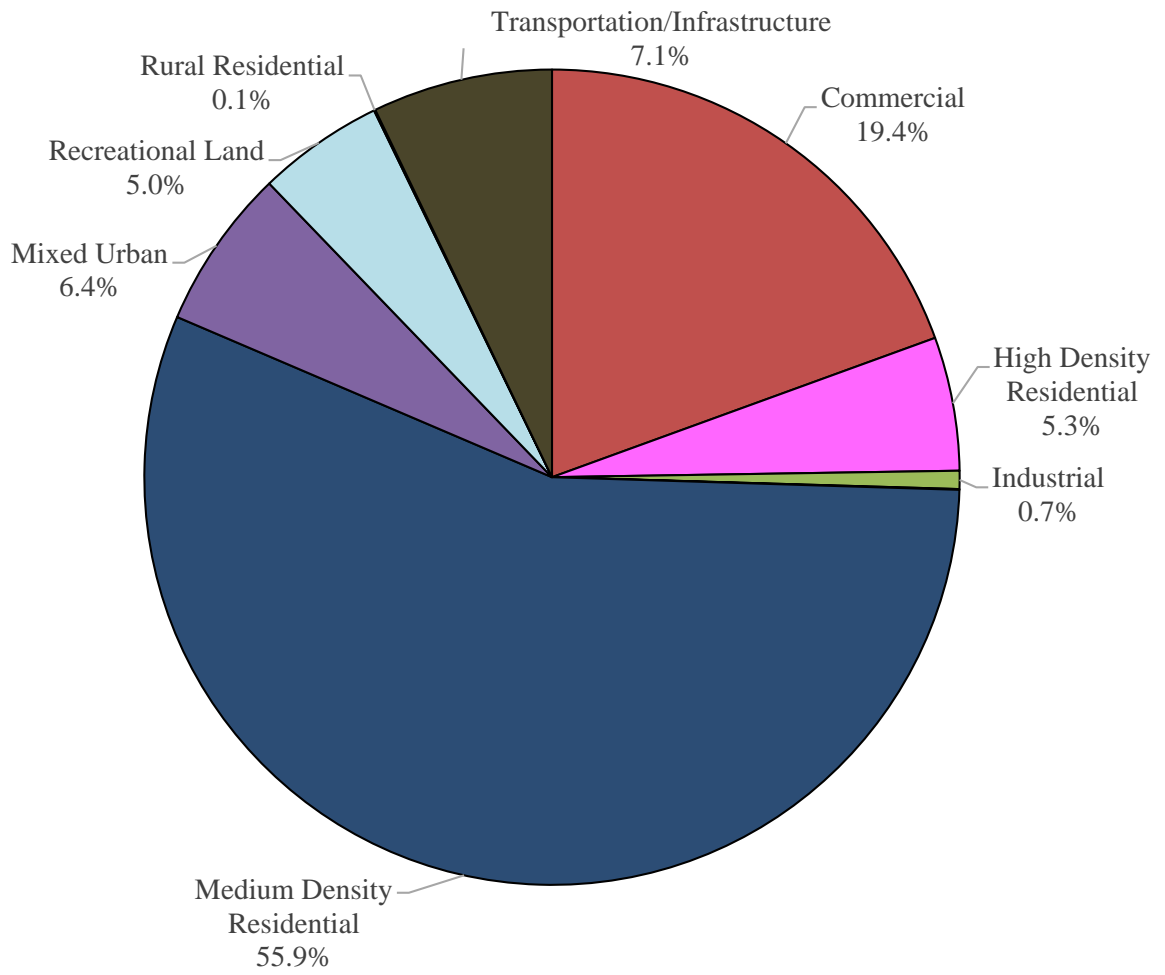


Figure 3: Pie chart illustrating the various types of urban land use in Manville Borough

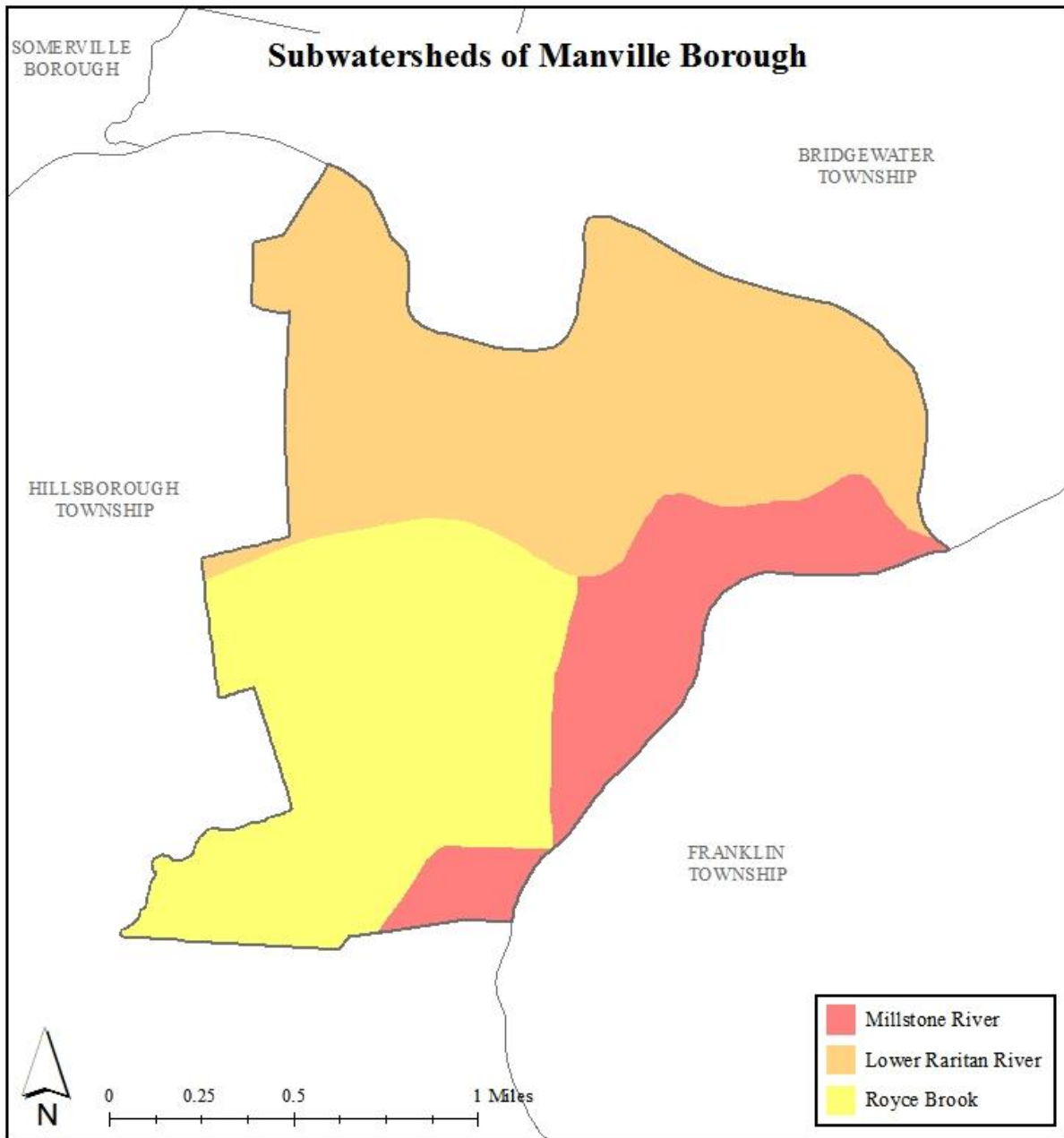


Figure 4: Map of the subwatersheds in Manville Borough

For each potential project site, specific aerial loading coefficients for commercial land use were used to determine the annual runoff loads for total phosphorus (TP), total nitrogen (TN), and total suspended solids (TSS) from impervious surfaces (Table 1). These are the same aerial loading coefficients that NJDEP uses in developing total maximum daily loads (TMDLs) for impaired waterways of the state. The percentage of impervious cover for each site was extracted from the 2007 NJDEP land use/land cover database. For impervious areas, runoff volumes were determined for the water quality design storm (1.25 inches of rain over two-hours) and for the annual rainfall total of 44 inches.

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

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

Table 1: Aerial Loading Coefficients²

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 benefits³. A wide range of green infrastructure practices have been evaluated for the potential project sites in Manville Borough. Each practice is discussed below.

Disconnected downspouts

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



Pervious pavements

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



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

Bioretention systems/rain gardens

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



Downspout planter boxes

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



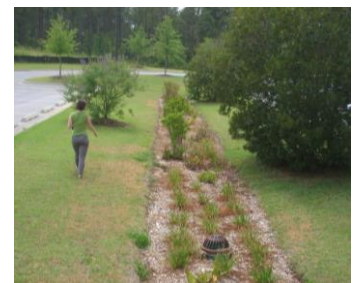
Rainwater harvesting systems (cistern or rain barrel)

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



Bioswale

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



Stormwater planters

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



Tree filter boxes

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



Potential Project Sites

Attachment 1 contains information on potential project sites where green infrastructure practices could be installed. The recommended green infrastructure practice and the drainage area that the green infrastructure practice can treat are identified for each potential project site. For each practice, the recharge potential, TSS removal potential, maximum volume reduction potential per storm, and the peak reduction potential are provided. This information is also provided so that proposed development projects that cannot satisfy the New Jersey stormwater management requirements for major development can use one of the identified projects to offset a stormwater management deficit.⁴

⁴ New Jersey Administrative Code, N.J.A.C. 7:8, Stormwater Management, Statutory Authority: N.J.S.A. 12:5-3, 13:1D-1 et seq., 13:9A-1 et seq., 13:19-1 et seq., 40:55D-93 to 99, 58:4-1 et seq., 58:10A-1 et seq., 58:11A-1 et seq. and 58:16A-50 et seq., *Date last amended: April 19, 2010.*

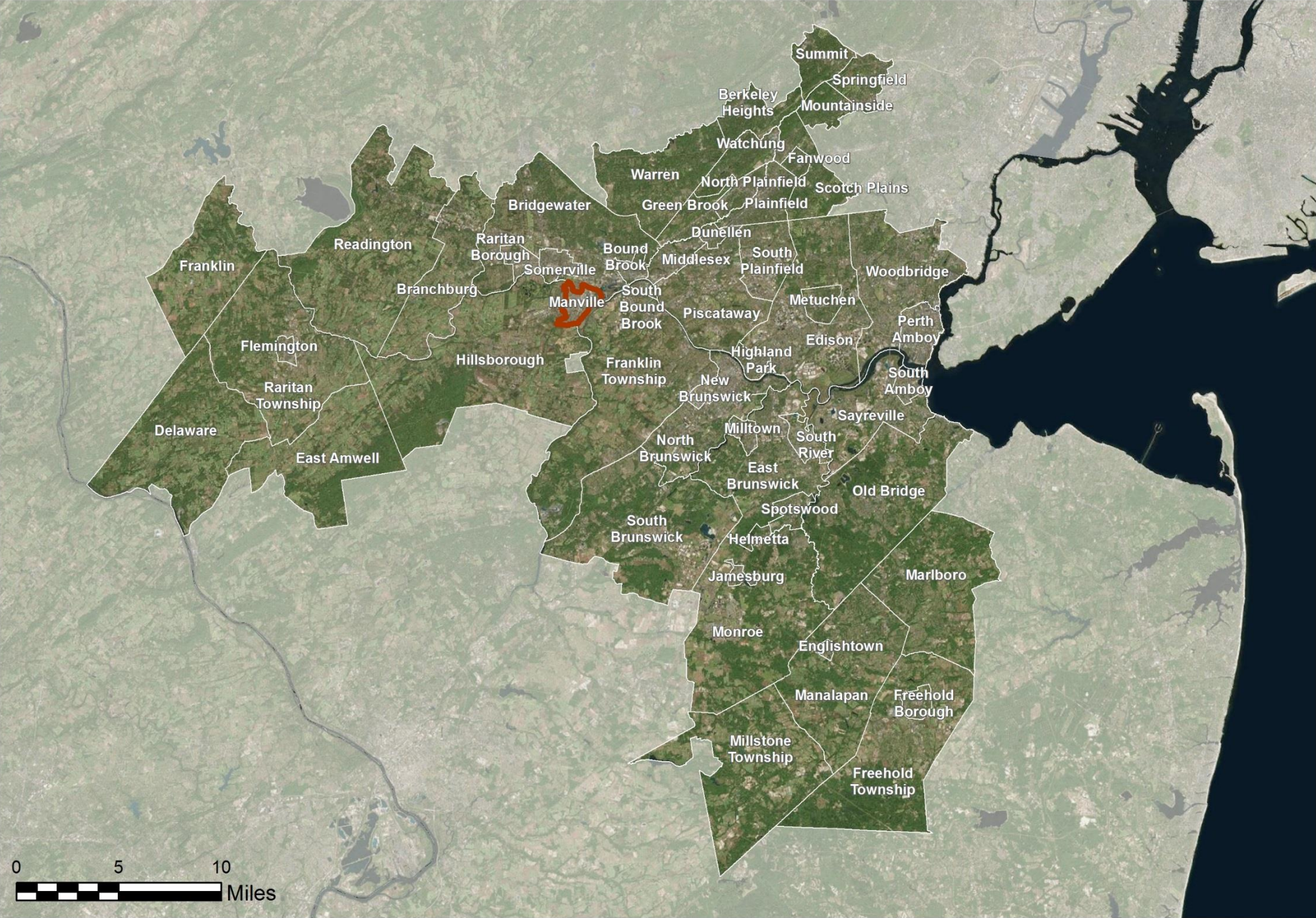
Conclusion

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

Additionally, development projects that are in need of providing off-site compensation for stormwater impacts can use the projects in this plan as a starting point. The municipality can quickly convert this impervious cover reduction action plan into a stormwater mitigation plan and incorporate it into the municipal stormwater control ordinance.

a. Overview Map of the Project

MANVILLE: CLIMATE RESILIENT GREEN INFRASTRUCTURE FOR THE RARITAN BASIN



b. Green Infrastructure Sites

MANVILLE: GREEN INFRASTRUCTURE SITES



SITES WITHIN THE LOWER RARITAN RIVER SUBWATERSHED:

1. Borough of Manville Municipal Complex
2. Christ the King School
3. Manville High & Alexander Batcho Intermediate
4. North End Volunteer Fire Company #3
5. Roosevelt School
6. US Post Office

SITES WITHIN THE ROYCE BROOK SUBWATERSHED:

7. Camplain Volunteer Fire Company # 2
8. Dukes Memorial Park
9. Emmanuel Baptist Church
10. Faith in Action Church
11. Holy Ghost Carpatho-Russian Church
12. Manville Fire Company #1
13. Manville Public Library
14. Sacred Heart Roman Catholic Church
15. Sacred Heart Roman Catholic Parish Office
16. Saints Peter and Paul Orthodox Church
17. The Arc of Somerset County
18. Weston Elementary School

c. Proposed Green Infrastructure Concepts

BOROUGH OF MANVILLE MUNICIPAL COMPLEX



Subwatershed: Lower Raritan River

Site Area: 44,855 sq. ft.

Address: 325 North Main Street
Manville, NJ 08835

Block and Lot: Block 17, Lot 11-20,
29-38

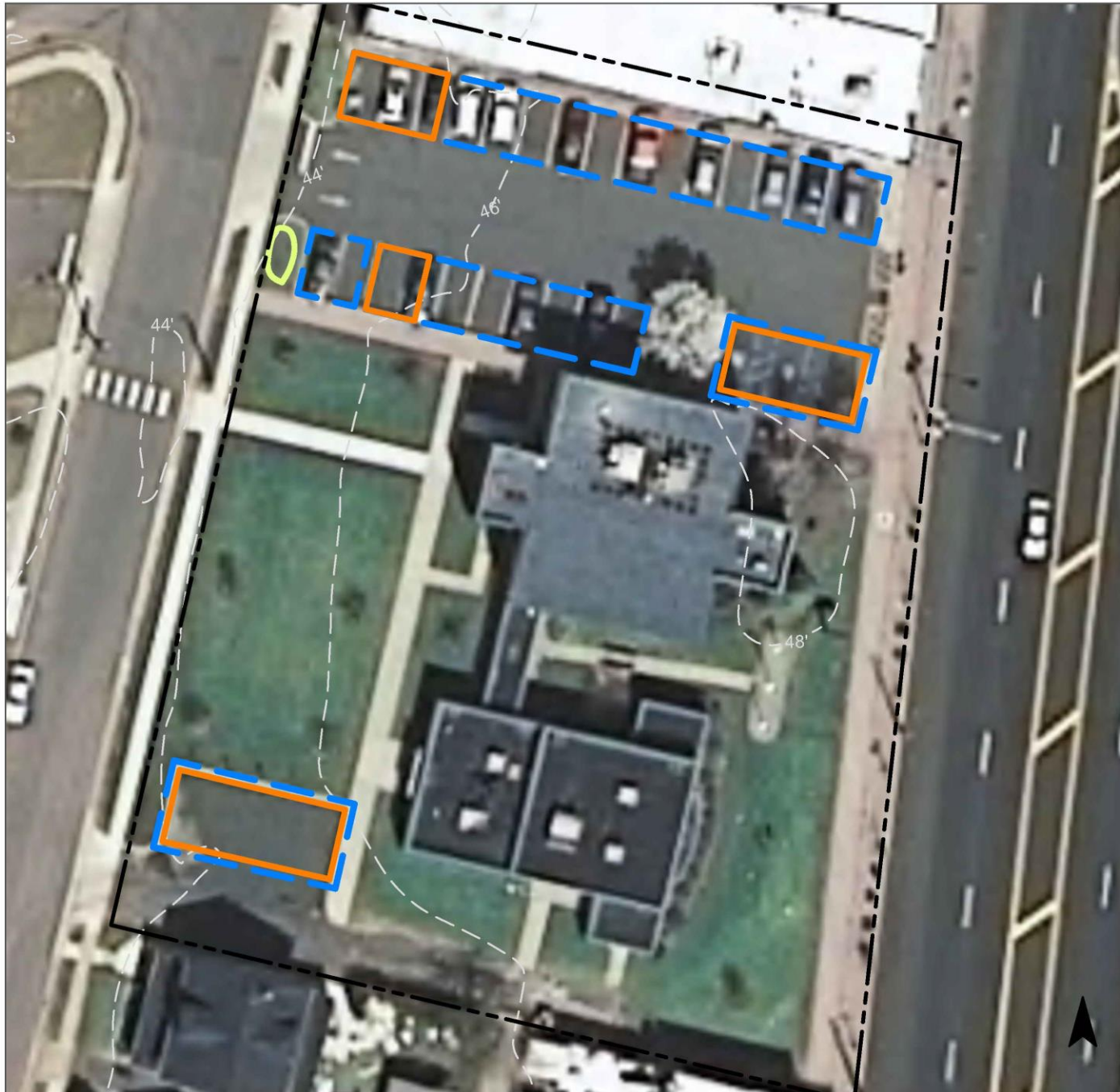


The building has an internal drainage system. Stormwater runoff can be reduced by installing a rain garden and replacing parking spots with porous asphalt. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.





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"
80	35,882	1.7	18.1	164.7	0.028	0.98

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	0.008	1	554	0.02	72	\$360
Pervious pavements	0.132	22	9,672	0.36	2,557	\$63,925

GREEN INFRASTRUCTURE RECOMMENDATIONS



Borough of Manville Municipal Complex

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



CHRIST THE KING SCHOOL



Subwatershed: Lower Raritan River

Site Area: 229,130 sq. ft.

Address: 99 North 13th Avenue
Manville, NJ 08835

Block and Lot: Block 42.01, Lot 1.01



Stormwater is currently being directed to storm drains. Parking spots on both side of the building can be replaced with porous asphalt to capture and infiltrate stormwater. Rain gardens adjacent to the building can capture, treat, and infiltrate roof runoff. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
59	135,116	6.5	68.2	620.4	0.105	1.01

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.279	47	20,450	0.77	2,970	\$14,850
Pervious pavements	1.007	169	73,872	2.78	14,250	\$356,250

GREEN INFRASTRUCTURE RECOMMENDATIONS



Christ the King School

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



MANVILLE HIGH SCHOOL & ALEXANDER BATCHO INTERMEDIATE



Subwatershed: Lower Raritan River

Site Area: 1,164,090 sq. ft.

Address: 410 Brooks Boulevard and
100 North 13th Avenue
Manville, NJ 08835

Block and Lot: Block 39.01, Lot 1.01

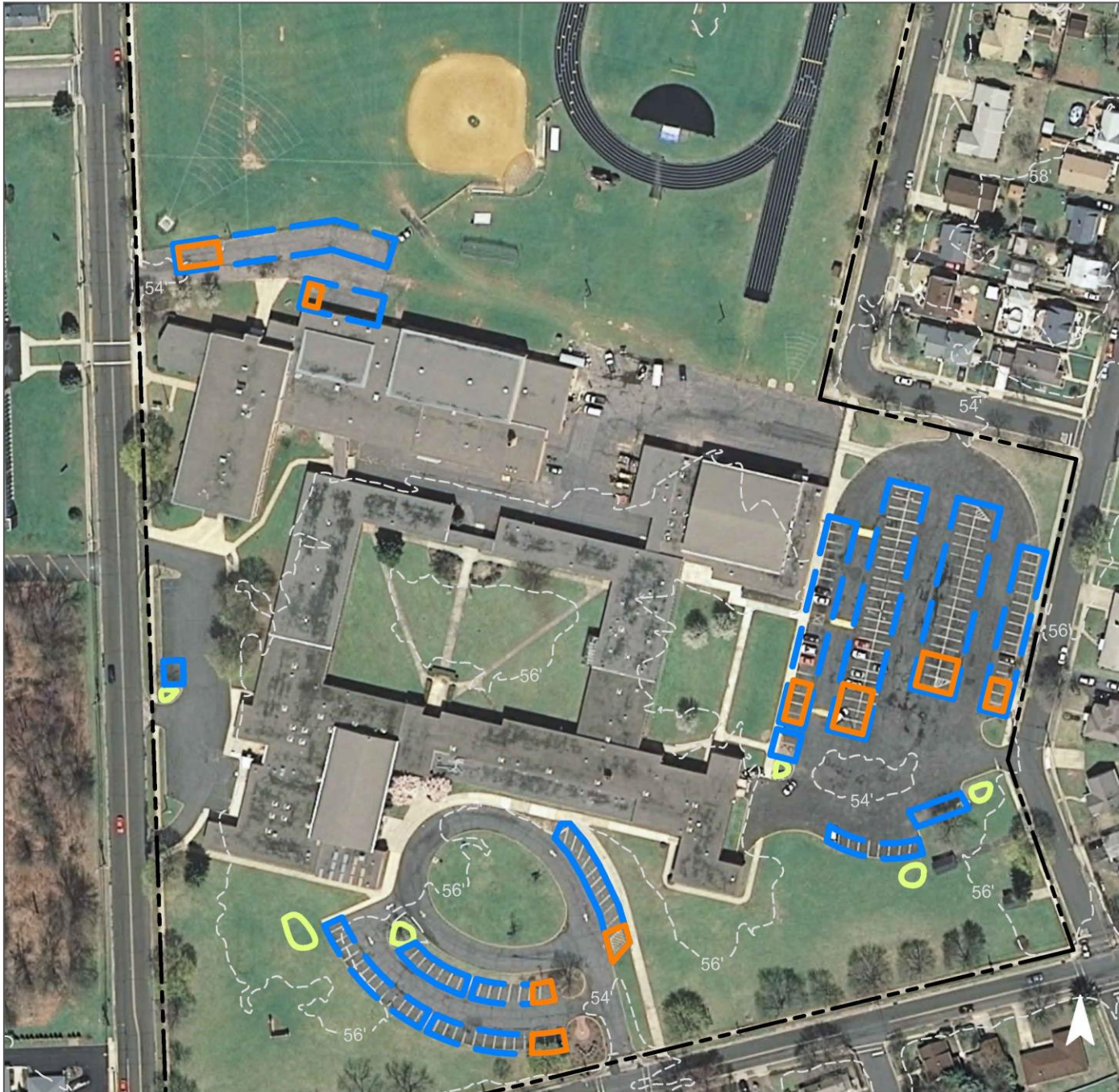


Both buildings have internal drainage systems. Parking spots around both buildings can be replaced with porous asphalt to capture and infiltrate stormwater. Rain gardens adjacent to the building can capture, infiltrate, and treat roof runoff. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.






Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
36	418,733	20.2	211.5	1,922.6	0.326	11.48

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	0.186	31	13,629	0.51	1,782	\$8,910
Pervious pavements	1.102	184	80,866	3.04	6,146	\$153,650

GREEN INFRASTRUCTURE RECOMMENDATIONS



**Manville High School &
Alexander Batcho
Intermediate**

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



NORTH END VOLUNTEER FIRE COMPANY #3



Subwatershed: Lower Raritan River

Site Area: 20,763 sq. ft.

Address: 169 North 8th Avenue
Manville, NJ 08835

Block and Lot: Block 52, Lot 21-28

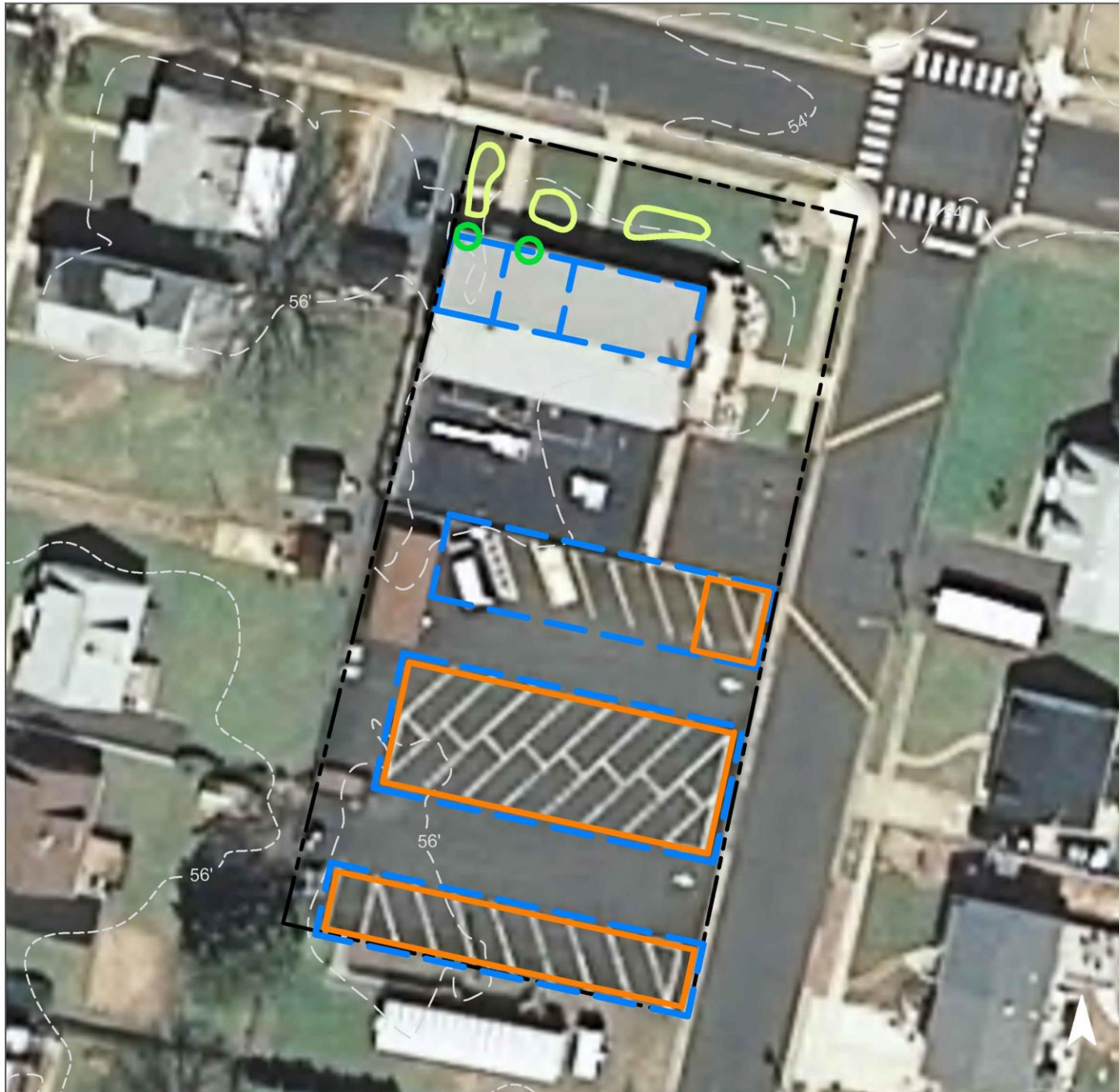


The parking lot is pitched towards the road. Rain gardens adjacent to the building can capture, treat, and infiltrate roof runoff. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.







Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
80	16,611	0.8	8.4	76.3	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
Bioretention systems	0.035	6	2,551	0.10	334	\$1,670
Pervious pavements	0.151	25	11,078	0.42	4,442	\$111,050

GREEN INFRASTRUCTURE RECOMMENDATIONS



North End Fire Company #3

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



ROOSEVELT SCHOOL



Subwatershed: Lower Raritan River

Site Area: 97,714 sq. ft.

Address: 410 Brooks Boulevard
Manville, NJ 08835

Block and Lot: Block 58, Lot 1-45



The building has internal downspouts. 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"
80	78,172	3.8	39.5	358.9	0.061	2.14

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Pervious pavements	0.397	66	29,097	1.09	6,155	\$153,875

GREEN INFRASTRUCTURE RECOMMENDATIONS



Roosevelt School

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



US POST OFFICE



Subwatershed: Lower Raritan River

Site Area: 32,241 sq. ft.

Address: 101 Brooks Boulevard
Manville, NJ 08835

Block and Lot: Block 82, Lot 42.02

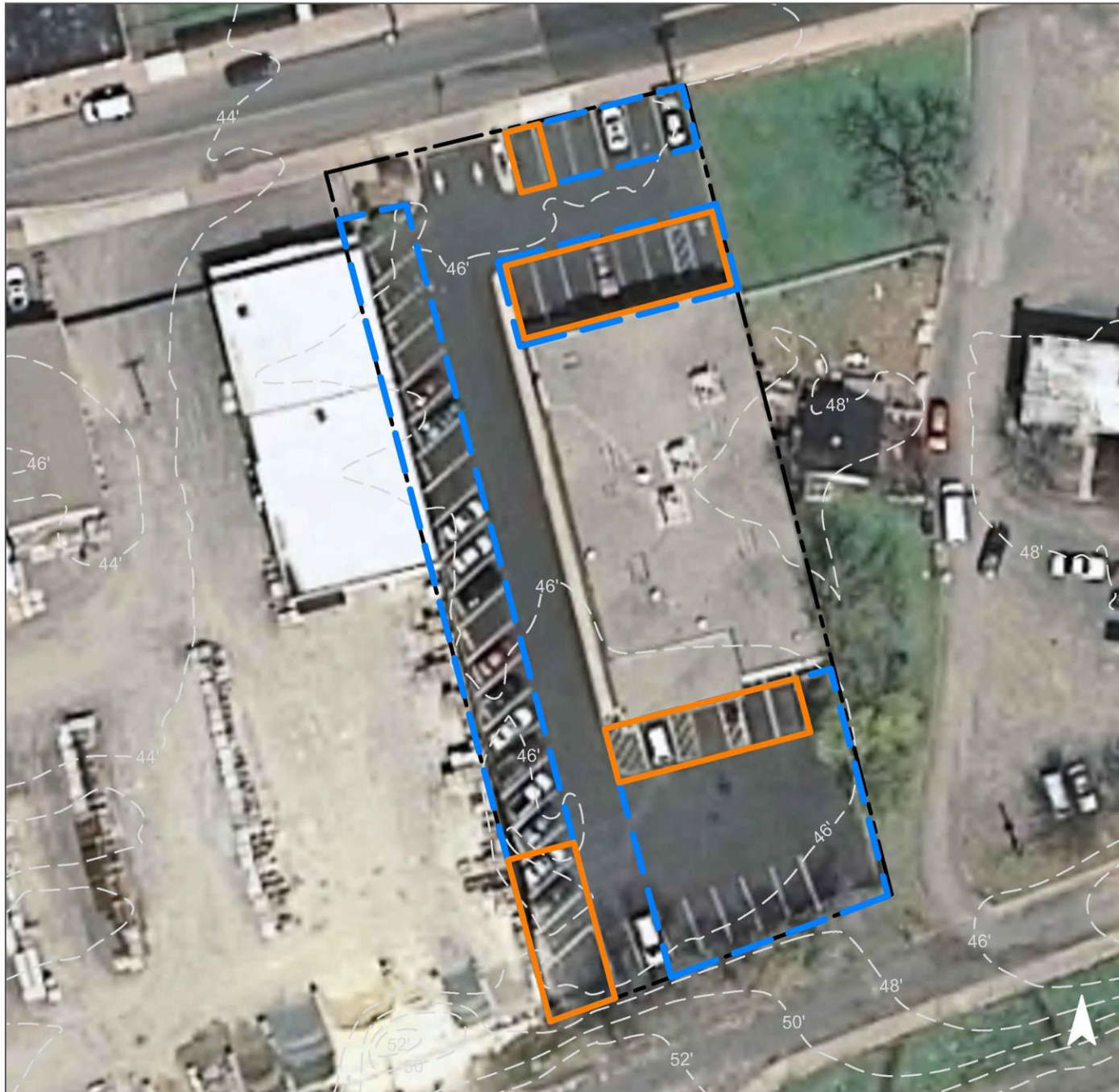


The parking lot is in poor condition and the building has internal drainage. Some of the parking spots around the building can be replaced with porous asphalt to capture and infiltrate stormwater. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.





Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
85	27,405	85	13.8	125.8	0.023	0.82

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
Pervious pavements	0.310	52	22,769	0.86	4,267	\$106,675

GREEN INFRASTRUCTURE RECOMMENDATIONS



US Post Office

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



CAMPLAIN VOLUNTEER FIRE COMPANY #2



Subwatershed: Royce Brook

Site Area: 50,842 sq. ft.

Address: 13 South 13th Avenue
Manville, NJ 08835

Block and Lot: Block 99, Lot 1-20,
21.01, 21.02, 22-25

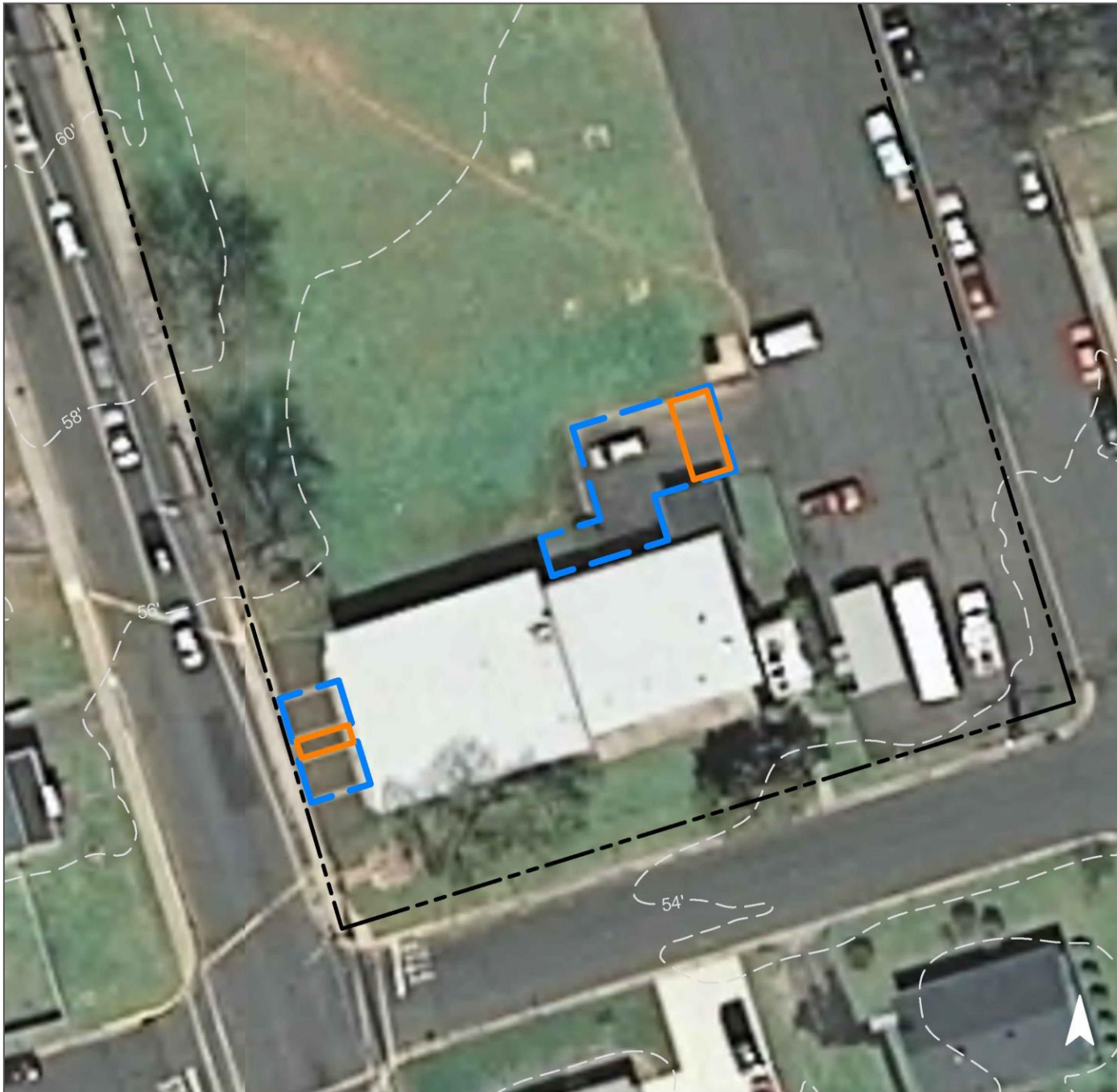


Parking spots behind the building can be replaced with porous asphalt to capture and infiltrate stormwater. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.





Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
45	22,880	1.1	11.6	105.1	0.018	0.63

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Pervious pavements	0.040	7	2,940	0.11	275	\$6,875

GREEN INFRASTRUCTURE RECOMMENDATIONS



**Camplain Vol. Fire
Co. #2**

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



DUKES MEMORIAL PARK



Subwatershed: Royce Brook

Site Area: 35,517 sq. ft.

Address: 212-220 South Main Street
Manville, NJ 08835

Block and Lot: Block 153, Lot 3



Stormwater is currently directed to an existing detention basin. Parking spots near Rosalie Avenue can be converted to porous asphalt to capture 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"
84	29,747	1.4	15.0	136.6	0.023	0.82

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
Pervious pavements	0.479	80	35,178	1.32	2,019	\$50,475

GREEN INFRASTRUCTURE RECOMMENDATIONS



Dukes Memorial Park

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



EMMANUEL BAPTIST CHURCH



Subwatershed: Royce Brook
Site Area: 17,571 sq. ft.
Address: 34 South 3rd Avenue
Manville, NJ 08835
Block and Lot: Block 86, Lot 14-22

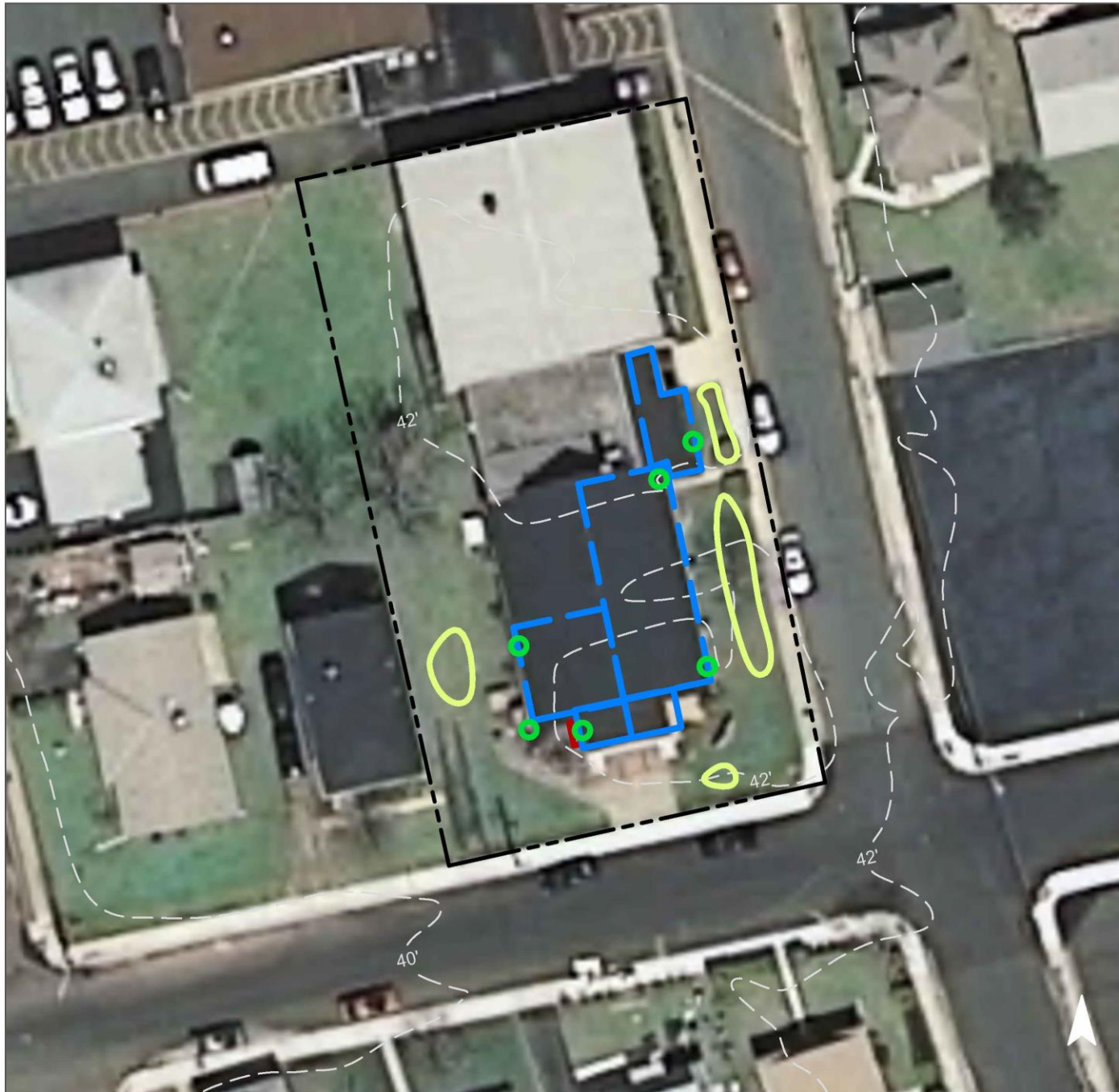


Bioretention systems can be installed to capture, treat, and infiltrate rooftop runoff. Downspout planter boxes can be constructed around the perimeter of the mobile classrooms to allow roof runoff to be reused. A preliminary soil assessment suggests that soils have suitable drainage characteristics for green infrastructure.







Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
76	13,297	0.6	6.7	61.1	0.010	0.36

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	0.062	10	4,533	0.17	593	\$2,965
Downspout planter boxes	0.006	1	n/a	n/a	12	\$1,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Emmanuel Baptist Church

-  disconnected downspouts
-  bioretention / rain gardens
-  downspout planter boxes
-  drainage areas
-  property line
-  2012 Aerial: NJOIT, OGIS



FAITH IN ACTION CHURCH



Subwatershed: Royce Brook

Site Area: 5,048 sq. ft.

Address: 234 South Main Street
Manville, NJ 08835

Block and Lot: Block 116, Lot 15-17

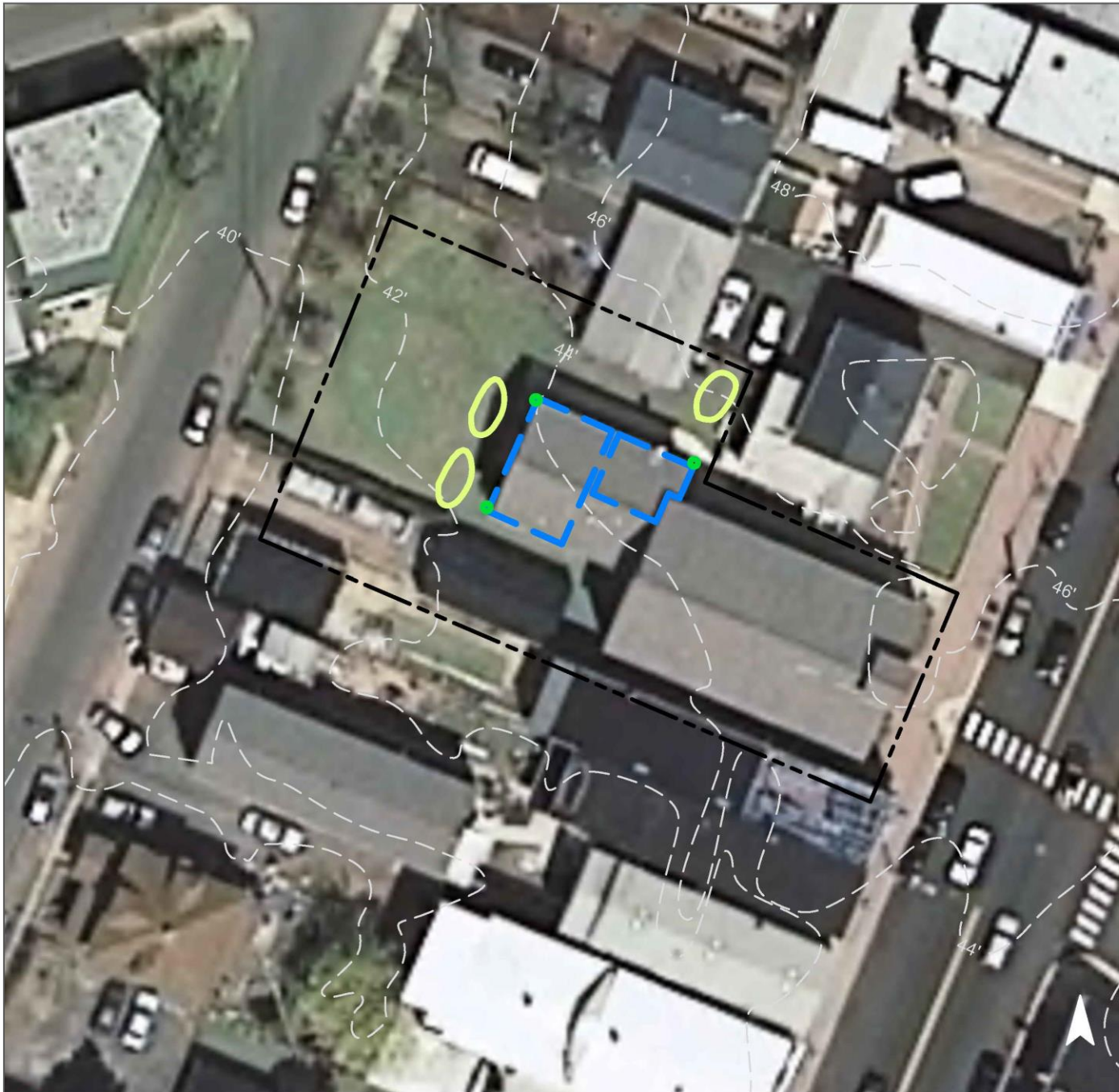


There is an open field behind the building where downspouts can be disconnected and directed into a rain garden to capture, treat, and infiltrate runoff. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.






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"
85	4,291	0.2	2.2	19.7	0.003	0.12

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	0.026	4	1,945	0.07	254	\$1,270

GREEN INFRASTRUCTURE RECOMMENDATIONS



Faith in Action Church

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



HOLY GHOST CARPATHO-RUSSIAN CHURCH



Subwatershed: Royce Brook

Site Area: 26,935 sq. ft.

Address: 258 South 6th Avenue
Manville, NJ 08835

Block and Lot: Block 146, Lot 33-43



Rain gardens adjacent to the building can capture, treat, and infiltrate roof runoff. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.






Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
64	12,635	0.6	6.4	58.0	0.010	0.35

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.040	7	2,902	0.11	380	\$1,900

GREEN INFRASTRUCTURE RECOMMENDATIONS



**Holy Ghost
Carpatho-Russian
Church**

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



MANVILLE FIRE COMPANY #1



Subwatershed: Royce Brook

Site Area: 19,798 sq. ft.

Address: 20 South 3rd Avenue
Manville, NJ 08835

Block and Lot: Block 86, Lot 9-13, 32-36



Pervious pavement can replace existing parking spaces to infiltrate runoff and serve as overflow for planter boxes. In addition, a cistern can capture rooftop runoff and be used to wash service vehicles. 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"
81	16,000	0.8	8.1	73.5	0.012	0.44

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
Downspout planter boxes	0.017	3	n/a	n/a	36	\$3,000
Rainwater harvesting systems	0.021	3	750	0.06	750 gal.	\$1,500
Pervious pavements	0.074	12	5,423	0.20	2,480	\$62,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Manville Fire Co. #1

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



MANVILLE PUBLIC LIBRARY



Subwatershed: Royce Brook

Site Area: 63,699 sq. ft.

Address: 102 South 11th Avenue
Manville, NJ 08835

Block and Lot: Block 104, Lot 1-16,
55-70

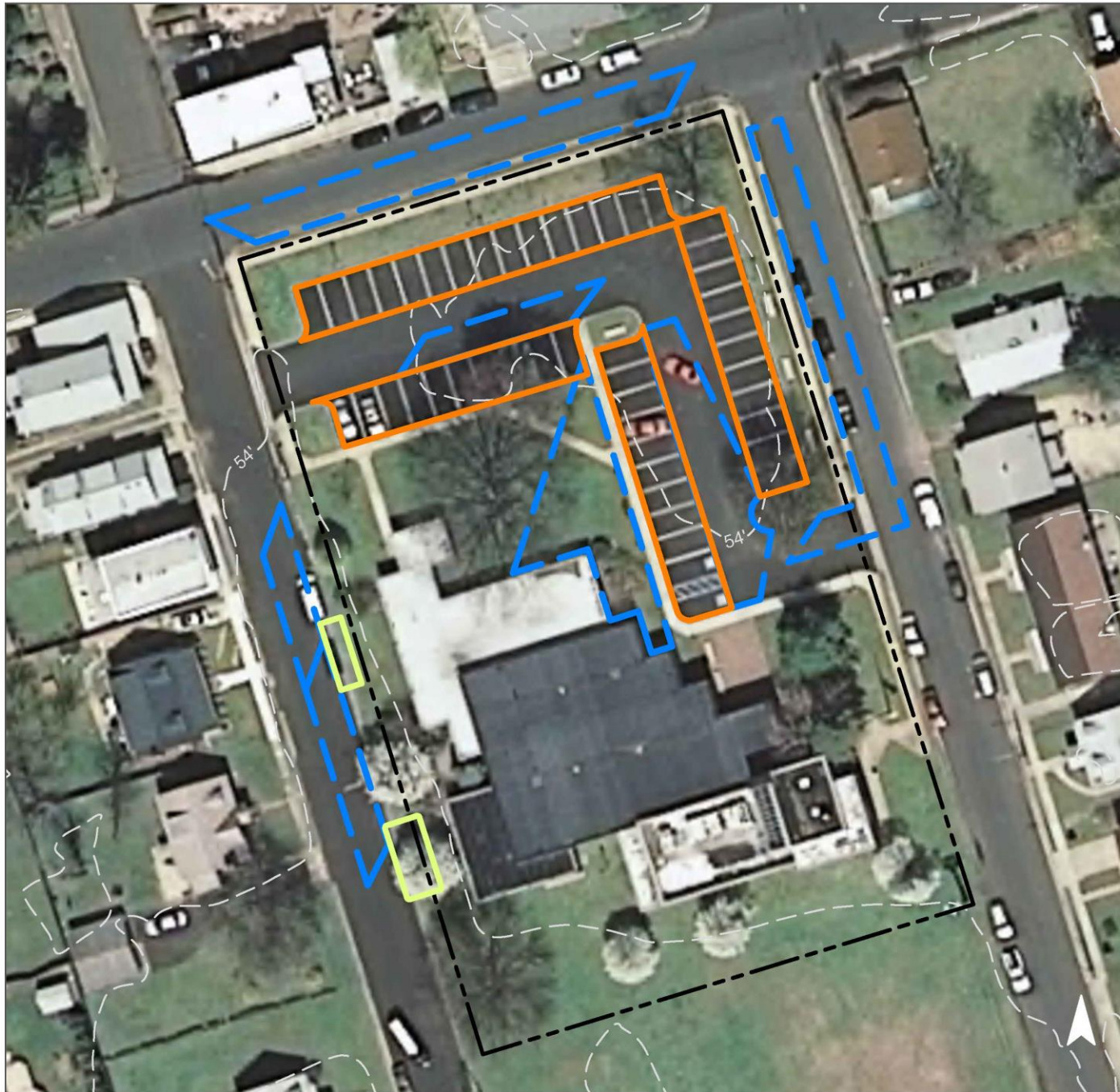


The building has internal drainage. Parking spaces can be replaced with porous asphalt to capture and infiltrate stormwater. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.





Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
75	48,062	2.3	24.3	220.7	0.037	1.32

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Pervious pavements	0.347	58	25,425	0.96	9,375	\$234,375
Bioretention systems	0.046	8	3,344	0.13	790	\$3,950

GREEN INFRASTRUCTURE RECOMMENDATIONS



Manville Public Library

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



SACRED HEART ROMAN CATHOLIC CHURCH



Subwatershed: Royce Brook
Site Area: 34,276 sq. ft.
Address: 98 South 2nd Avenue
Manville, NJ 08835
Block and Lot: Block 113, Lot 7-22

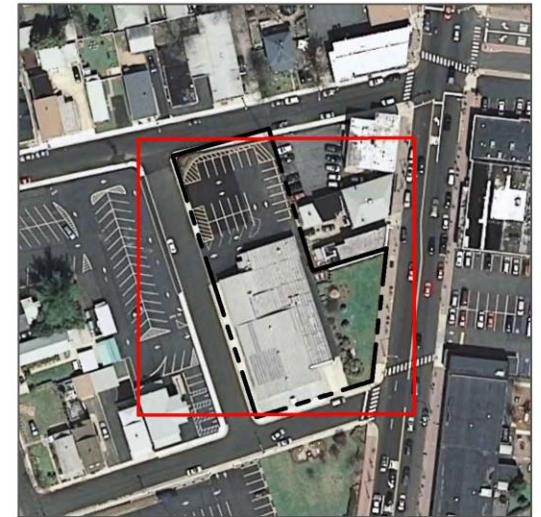


Parking spaces can be replaced with porous asphalt to capture and infiltrate stormwater. Planter boxes along the sidewalk can be set up to reuse roof runoff. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.








Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
85	29,135	1.4	14.7	133.8	0.029	1.01

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Downspout planter boxes	0.034	6	n/a	n/a	72	\$6,000
Pervious pavements	0.258	43	18,969	0.71	2,520	\$63,000
Rainwater harvesting systems	0.003	0	100	0.01	100 gal.	\$200

GREEN INFRASTRUCTURE RECOMMENDATIONS



Sacred Heart Roman Catholic Church

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



SACRED HEART ROMAN CATHOLIC PARISH OFFICE



Subwatershed: Royce Brook

Site Area: 40,450 sq. ft.

Address: 98 South 2nd Avenue
Manville, NJ 08835

Block and Lot: Block 112, Lot 1-15

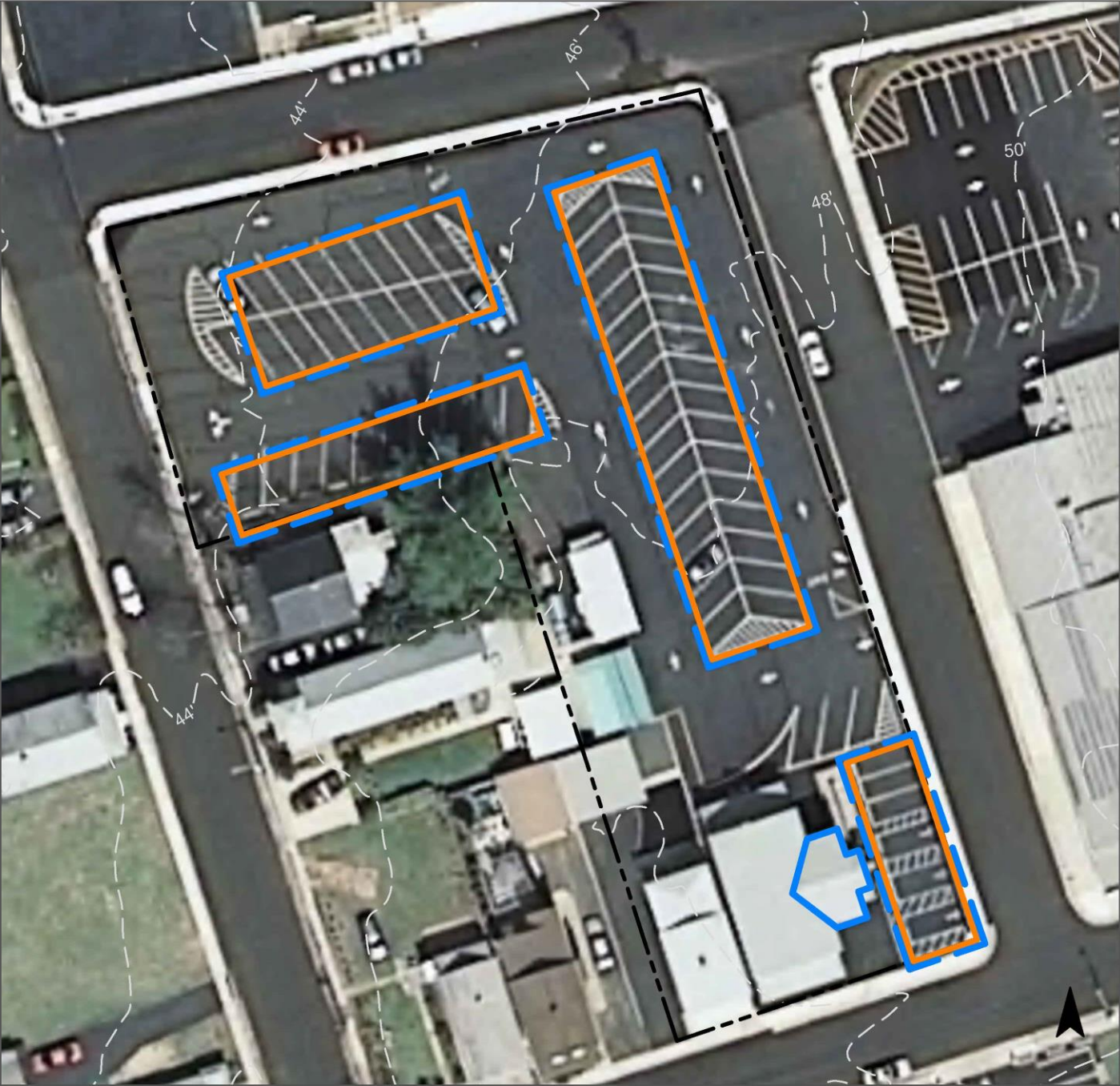


The pavement is currently in poor condition. Parking spaces can be replaced with porous asphalt to infiltrate runoff. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.





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"
80	32,424	1.6	16.4	148.9	0.025	1.15

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Pervious pavements	0.339	57	24,804	0.93	12,450	\$311,250

GREEN INFRASTRUCTURE RECOMMENDATIONS



Sacred Heart Roman Catholic Parish Office

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



SAINTS PETER AND PAUL ORTHODOX CHURCH



Subwatershed: Royce Brook
Site Area: 18,418 sq. ft.
Address: 605 Washington Avenue
Manville, NJ 08835
Block and Lot: Block 108, Lot 5

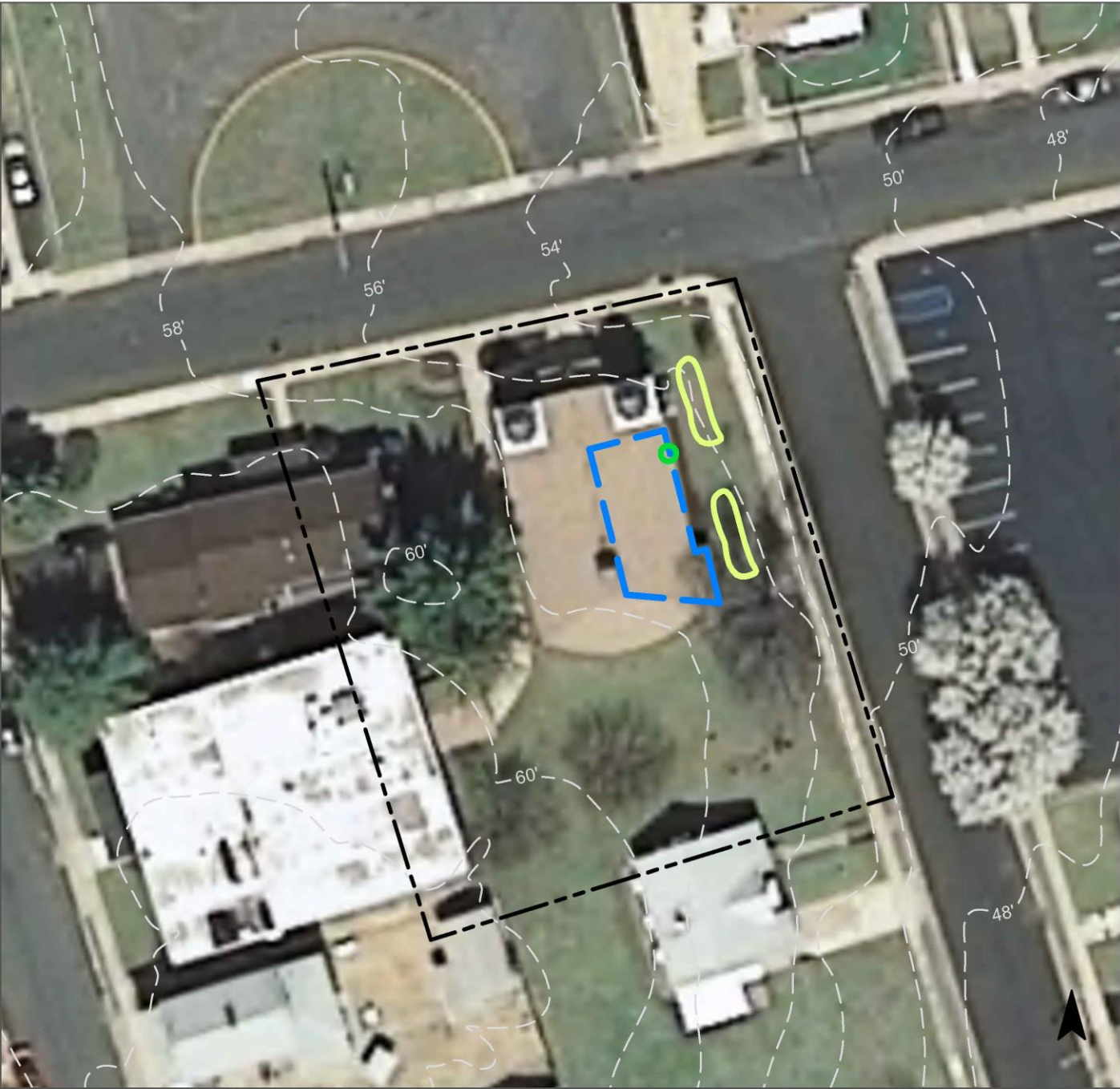


Rain gardens adjacent to the building can capture, treat, and infiltrate roof runoff. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.





Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
61	11,233	0.5	5.7	51.6	0.009	0.31

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 systems	0.023	4	1,698	0.06	223	\$1,115

GREEN INFRASTRUCTURE RECOMMENDATIONS



**Saints Peter and Paul
Orthodox Church**

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



THE ARC OF SOMERSET COUNTY



Subwatershed: Royce Brook

Site Area: 45,955 sq. ft.

Address: 141 South Main Street
Manville, NJ 08835

Block and Lot: Block 310, Lot 6

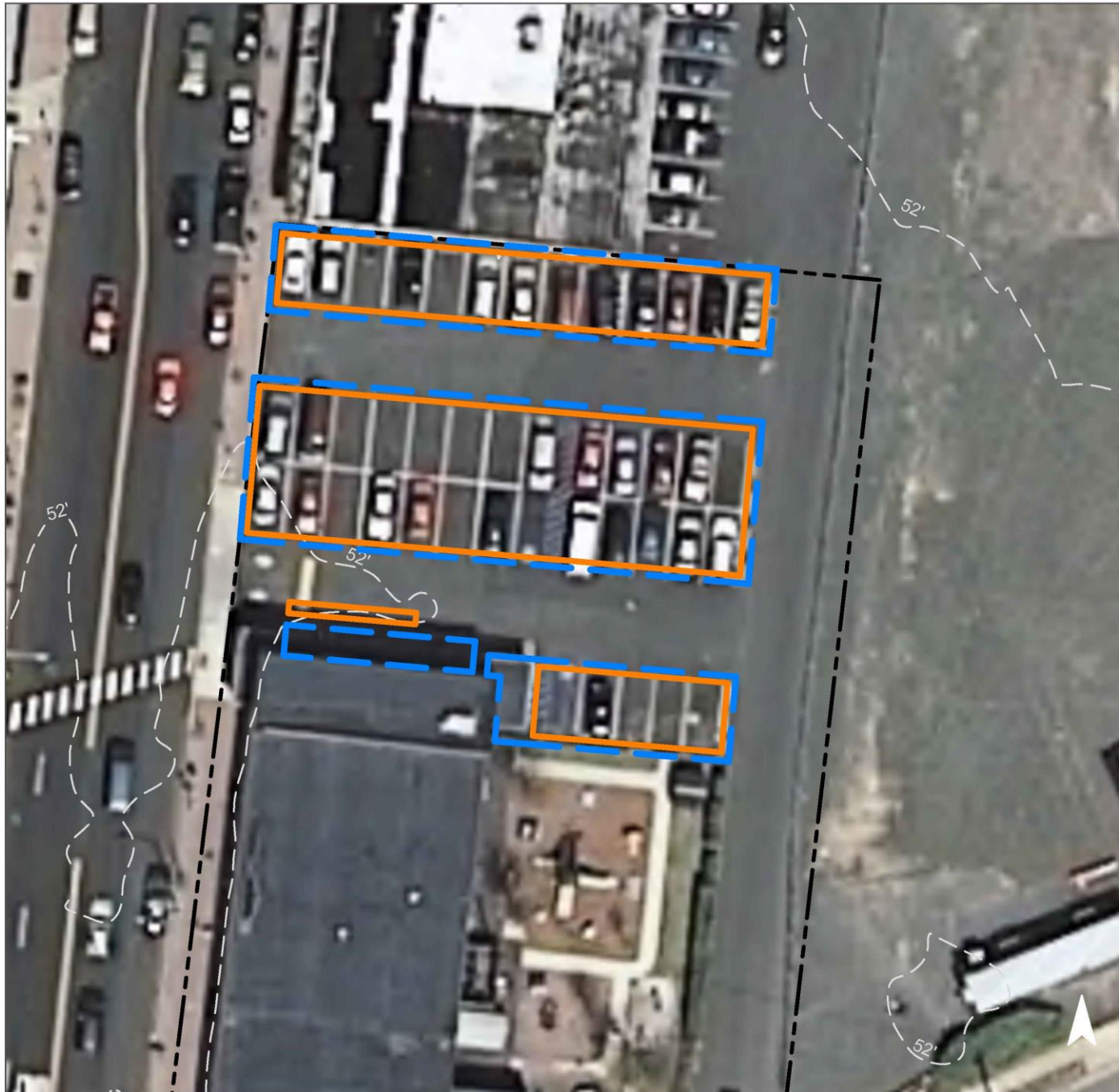


Speed bumps in the parking lot are currently in poor condition. When the parking lot is repaved, it would be ideal to pitch the lot towards the field along East Camplain Road, so that rain gardens can capture, treat, and infiltrate runoff. Parking spaces can be replaced with porous asphalt to infiltrate stormwater. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.





Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
91	41,951	2.0	21.2	192.6	0.033	1.15

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Pervious pavements	0.227	38	16,636	0.63	8,110	\$202,750

GREEN INFRASTRUCTURE RECOMMENDATIONS



The Arc of Somerset County

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



WESTON ELEMENTARY SCHOOL



Subwatershed: Royce Brook

Site Area: 278,826 sq. ft.

Address: 600 Newark Avenue
Manville, NJ 08835

Block and Lot: Block 204.01, Lot 1.01

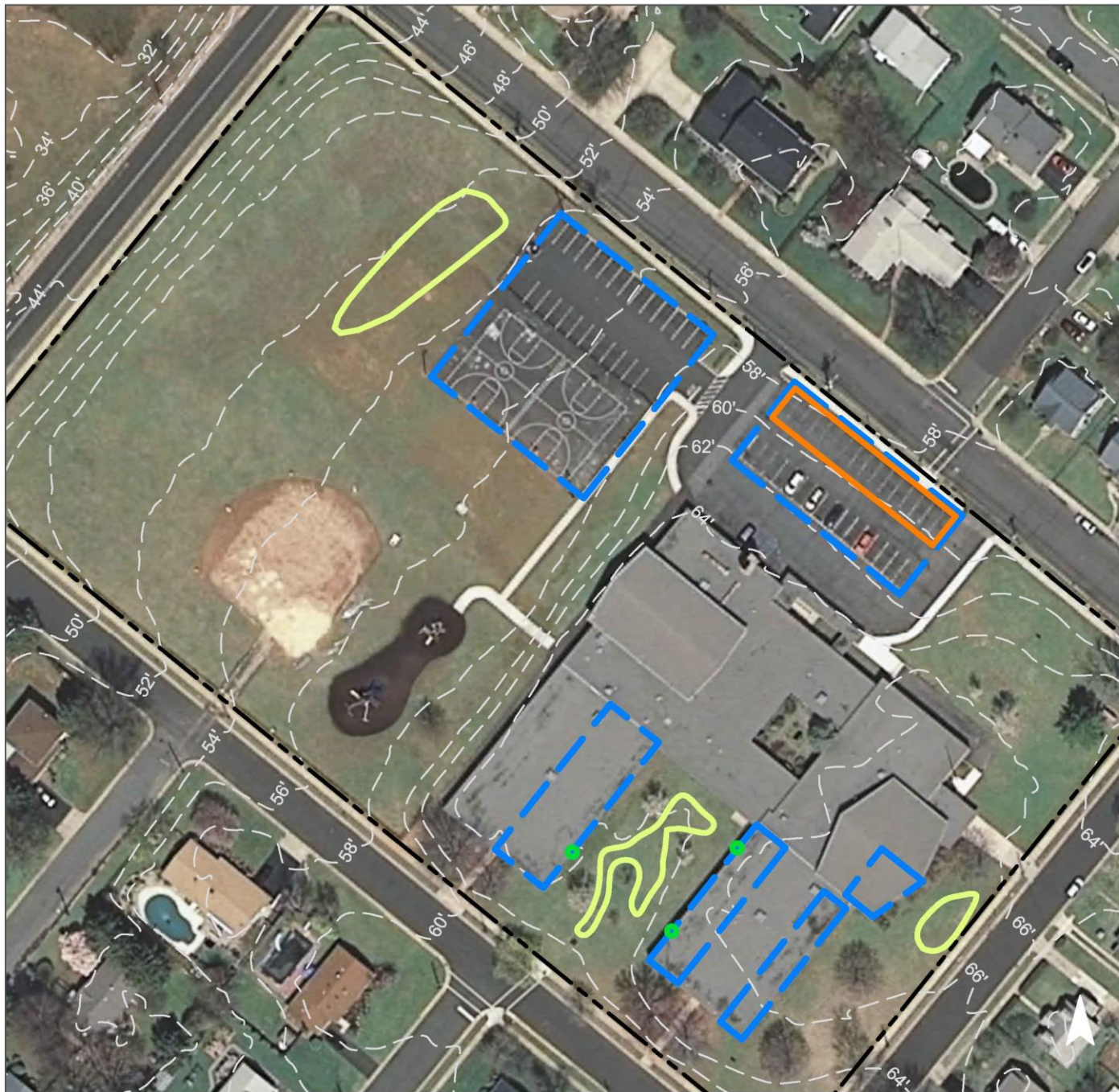


One parking lot currently has solar panels installed. A row of parking spaces can be replaced with porous asphalt to infiltrate stormwater. Several rain gardens can be installed to capture, treat, and infiltrate roof and parking lot runoff. A preliminary soil assessment suggests that the soils have suitable 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"
39	108,279	5.2	54.7	497.1	0.084	2.97

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.756	126	55,442	2.08	6,965	\$34,825
Pervious pavements	0.236	39	17,294	0.65	3,200	\$80,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Weston Elementary School

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



d. Summary of Existing Conditions

Summary of Existing Site Conditions

Subwatershed/Site Name/Total Site Info	Area (ac)	Area (SF)	Block	Lot	Existing Annual Loads			I.C. %	I.C. Area (ac)	I.C. Area (SF)	Runoff Volumes from I.C.	
					TP (lb/yr)	TN (lb/yr)	TSS (lb/yr)				Water Quality Storm (1.25" over 2-hours) (Mgal)	Annual (Mgal)
					LOWER RARITAN RIVER SUBWATERSHED	36.47	1,588,793					
Borough of Manville Municipal Complex Total Site Info	1.03	44,855	17	11	1.7	18.1	164.7	80	0.82	35,882	0.028	0.98
Christ the King School Total Site Info	5.26	229,130	42.01	1.01	6.5	68.2	620.4	59	3.10	135,116	0.105	3.71
Manville High School & Alexander Batcho Intermediate Total Site Info	26.72	1,164,090	39.01	1.01	20.2	211.5	1,922.6	36	9.61	418,733	0.326	11.48
North End Volunteer Fire Company #3 Total Site Info	0.48	20,763	52	21	0.8	8.4	76.3	80	0.38	16,611	0.013	0.46
Roosevelt School Total Site Info	2.24	97,714	58	1 - 45	3.8	39.5	358.9	80	1.79	78,172	0.061	2.14
US Post Office Total Site Info	0.74	32,241	82	42.02	1.3	13.8	125.8	85	0.63	27,405	0.021	0.75
ROYCE BROOK SUBWATERSHED	14.63	637,335			17.8	186.8	1,698.5		8.49	369,934	0.288	10.15
Camplain Volunteer Fire Company #2 Total Site Info	1.17	50,842	99	1 - 25	1.1	11.6	105.1	45	0.53	22,880	0.018	0.63
Dukes Memorial Park Total Site Info	0.82	35,517	153	3	1.4	15.0	136.6	84	0.68	29,747	0.023	0.82
Emmanuel Baptist Church Total Site Info	0.40	17,571	86	14 - 22	0.6	6.7	61.1	76	0.31	13,297	0.010	0.36
Faith In Action Church Total Site Info	0.12	5,048	116	15 - 17	0.2	2.2	19.7	85	0.10	4,291	0.003	0.12

Summary of Existing Site Conditions

Subwatershed/Site Name/Total Site Info	Area (ac)	Area (SF)	Block	Lot	Existing Annual Loads			I.C. %	I.C. Area (ac)	I.C. Area (SF)	Runoff Volumes from I.C.	
					TP (lb/yr)	TN (lb/yr)	TSS (lb/yr)				Water Quality Storm (1.25" over 2-hours) (Mgal)	Annual (Mgal)
Holy Ghost Carpatho-Russian Church Total Site Info	0.62	26,935	146	33 - 43	0.6	6.4	58.0	47	0.29	12,635	0.010	0.35
Manville Fire Company #1 Total Site Info	0.45	19,798	86	9 - 13	0.8	8.1	73.5	81	0.37	16,000	0.012	0.44
Manville Public Library Total Site Info	1.46	63,699	104	1 - 16	2.3	24.3	220.7	75	1.10	48,062	0.037	1.32
Sacred Heart Roman Catholic Church Total Site Info	0.79	34,276	113	7 - 22	1.4	14.7	133.8	85	0.67	29,135	0.023	0.80
Sacred Heart Roman Catholic Parish Office Total Site Info	0.93	40,450	112	1 - 15	1.6	16.4	148.9	80	0.74	32,424	0.025	0.89
Saints Peter and Paul Orthodox Church Total Site Info	0.42	18,418	108	5	0.5	5.7	51.6	61	0.26	11,233	0.009	0.31
The Arc of Somerset County Total Site Info	1.05	45,955	310	6	2.0	21.2	192.6	91	0.96	41,951	0.033	1.15
Weston Elementary School Total Site Info	6.40	278,826	204.01	1.01	5.2	54.7	497.1	39	2.49	108,279	0.084	2.97

e. 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 (SF)	Unit Cost (\$)	Unit	Total Cost (\$)	I.C. Treated %
	Area (SF)	Area (ac)									
LOWER RARITAN RIVER SUBWATERSHED	138,366	3.18	3.605	604	264,538	9.95	42,975			\$971,215	19.4%
1 Borough of Manville Municipal Complex											
Bioretention systems/rain gardens	288	0.01	0.008	1	554	0.02	72	5	SF	\$360	0.8%
Pervious pavements	5,058	0.12	0.132	22	9,672	0.36	2,557	25	SF	\$63,925	14.1%
Total Site Info	5,346	0.12	0.139	23	10,226	0.38	2,629			\$64,285	14.9%
2 Christ the King School											
Bioretention systems/rain gardens	10,695	0.25	0.279	47	20,450	0.77	2,970	5	SF	\$14,850	7.9%
Pervious pavements	38,641	0.89	1.007	169	73,872	2.78	14,250	25	SF	\$356,250	28.6%
Total Site Info	49,336	1.13	1.285	215	94,322	3.55	17,220			\$371,100	36.5%
Manville High School & Alexander Batcho											
3 Intermediate											
Bioretention systems/rain gardens	7,128	0.16	0.186	31	13,629	0.51	1,782	5	SF	\$8,910	1.7%
Pervious pavements	42,299	0.97	1.102	184	80,866	3.04	6,146	25	SF	\$153,650	10.1%
Total Site Info	49,427	1.13	1.288	216	94,495	3.55	7,928			\$162,560	11.8%
4 North End Volunteer Fire Company #3											
Bioretention systems/rain gardens	1,333	0.03	0.035	6	2,551	0.10	334	5	SF	\$1,670	8.0%
Pervious pavements	5,793	0.13	0.151	25	11,078	0.42	4,442	25	SF	\$111,050	34.9%
Total Site Info	7,126	0.16	0.186	31	13,629	0.52	4,776			\$112,720	42.9%
5 Roosevelt School											
Pervious pavements	15,221	0.35	0.397	66	29,097	1.09	6,155	25	SF	\$153,875	19.5%
Total Site Info	15,221	0.35	0.397	66	29,097	1.09	6,155			\$153,875	19.5%
6 US Post Office											
Pervious pavements	11,910	0.27	0.310	52	22,769	0.86	4,267	25	SF	\$106,675	43.5%
Total Site Info	11,910	0.27	0.310	52	22,769	0.86	4,267			\$106,675	43.5%
ROYCE BROOK SUBWATERSHED	116,349	2.67	3.032	507	217,383	8.20	50,604			\$1,068,450	31.5%
7 Camplain Volunteer Fire Company #2											
Pervious pavements	1,538	0.04	0.040	7	2,940	0.11	275	25	SF	\$6,875	6.7%
Total Site Info	1,538	0.04	0.040	7	2,940	0.11	275			\$6,875	6.7%

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 (SF)	Unit Cost (\$)	Unit	Total Cost (\$)	I.C. Treated %
	Area (SF)	Area (ac)									
8 Dukes Memorial Park											
Pervious pavements	18,400	0.42	0.479	80	35,178	1.32	2,019	25	SF	\$50,475	61.9%
Total Site Info	18,400	0.42	0.479	80	35,178	1.32	2,019			\$50,475	61.9%
9 Emmanuel Baptist Church											
Bioretention systems/rain gardens	2,371	0.05	0.062	10	4,533	0.17	593	5	SF	\$2,965	17.8%
Downspout planter boxes	215	0.00	0.006	1	n/a	n/a	12	1,000	box	\$1,000	1.6%
Total Site Info	2,586	0.06	0.067	11	4,533	0.17	605			\$3,965	19.4%
10 Faith In Action Church											
Bioretention systems/rain gardens	1,016	0.02	0.026	4	1,945	0.07	254	5	SF	\$1,270	23.7%
Total Site Info	1,016	0.02	0.026	4	1,945	0.07	254			\$1,270	23.7%
11 Holy Ghost Carpatho-Russian Church											
Bioretention systems/rain gardens	1,519	0.03	0.040	7	2,902	0.11	380	5	SF	\$1,900	12.0%
Total Site Info	1,519	0.03	0.040	7	2,902	0.11	380			\$1,900	12.0%
12 Manville Fire Company #1											
Downspout planter boxes	645	0.01	0.017	3	n/a	n/a	36	1,000	box	\$3,000	4.0%
Rainwater harvesting systems	800	0.02	0.021	3	750	0.06	750	2	gal.	\$1,500	5.0%
Pervious pavements	2,835	0.07	0.074	12	5,423	0.20	2,480	25	SF	\$62,000	17.7%
Total Site Info	4,280	0.10	0.112	19	6,173	0.26	3,266			\$66,500	26.8%
13 Manville Public Library											
Pervious pavements	13,300	0.31	0.347	58	25,425	0.96	9,375	25	SF	\$234,375	27.7%
Bioretention systems/rain gardens	1,750	0.04	0.046	8	3,344	0.13	790	5	SF	\$3,950	3.6%
Total Site Info	15,050	0.35	0.392	66	28,769	1.09	10,165			\$238,325	31.3%
14 Sacred Heart Roman Catholic Church											
Downspout planter boxes	1,290	0.03	0.034	6	n/a	n/a	72	1,000	box	\$6,000	4.4%
Pervious pavements	9,921	0.23	0.258	43	18,969	0.71	2,520	25	SF	\$63,000	34.1%
Rainwater harvesting systems	112	0.00	0.003	0	100	0.01	100	2	gal.	\$200	0.4%
Total Site Info	11,323	0.26	0.295	49	19,069	0.72	2,692			\$69,200	38.9%
15 Sacred Heart Roman Catholic Parish Office											
Pervious pavements	13,000	0.30	0.339	57	24,804	0.93	12,450	25	SF	\$311,250	40.1%
Total Site Info	13,000	0.30	0.339	57	24,804	0.93	12,450			\$311,250	40.1%

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 (SF)	Unit Cost (\$)	Unit	Total Cost (\$)	I.C. Treated %
	Area (SF)	Area (ac)									
16 Saints Peter and Paul Orthodox Church											
Bioretention systems/rain gardens	890	0.02	0.023	4	1,698	0.06	223	5	SF	\$1,115	7.9%
Total Site Info	890	0.02	0.023	4	1,698	0.06	223			\$1,115	7.9%
17 The Arc of Somerset County											
Pervious pavements	8,700	0.20	0.227	38	16,636	0.63	8,110	25	SF	\$202,750	20.7%
Total Site Info	8,700	0.20	0.227	38	16,636	0.63	8,110			\$202,750	20.7%
18 Weston Elementary School											
Bioretention systems/rain gardens	29,000	0.67	0.756	126	55,442	2.08	6,965	5	SF	\$34,825	26.8%
Pervious pavements	9,047	0.21	0.236	39	17,294	0.65	3,200	25	SF	\$80,000	8.4%
Total Site Info	38,047	0.87	0.991	166	72,736	2.73	10,165			\$114,825	35.1%