



Draft

**Impervious Cover Reduction Action Plan
for
Tinton Falls Borough, Monmouth County, New Jersey**

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

June 14, 2016

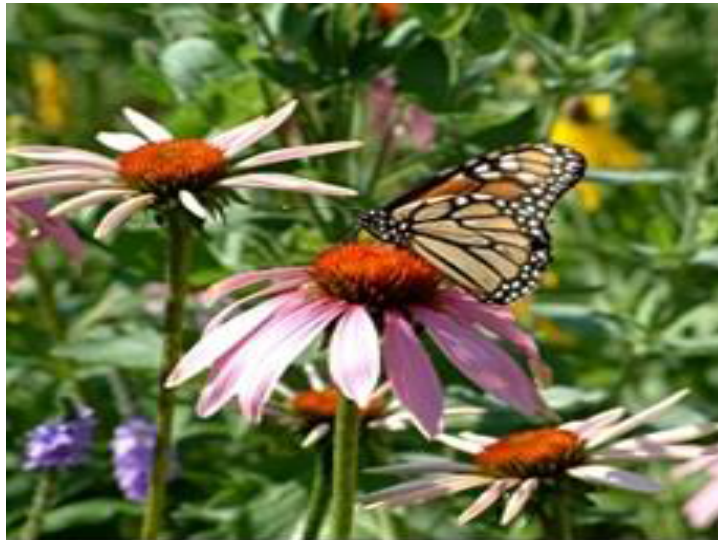


Table of Contents

Introduction	1
Methodology	1
Green Infrastructure Practices	8
Potential Project Sites	10
Conclusion	11

Attachment: Climate Resilient Green Infrastructure

- a. Green Infrastructure Sites
- b. Proposed Green Infrastructure Concepts
- c. Summary of Existing Conditions
- d. Summary of Proposed Green Infrastructure Practices

Introduction

Located in Monmouth County in central New Jersey, Tinton Falls Borough covers approximately 15.6 square miles. Figures 1 and 2 illustrate that Tinton Falls Borough is dominated by urban land use. A total of 46.4% of the municipality's land use is classified as urban. Of the urban land use in Tinton Falls Borough, low density residential is the dominant land use (Figure 3).

The New Jersey Department of Environmental Protection (NJDEP) 2007 land use/land cover geographical information system (GIS) data layer categorizes Tinton Falls 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 Tinton Falls Borough. Based upon the NJDEP 2007 land use/land cover data, approximately 16.8% of Tinton Falls Borough has impervious cover. This level of impervious cover suggests that the streams in Tinton Falls Borough are likely impacted streams.¹

Methodology

Tinton Falls Borough contains portions of seven 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

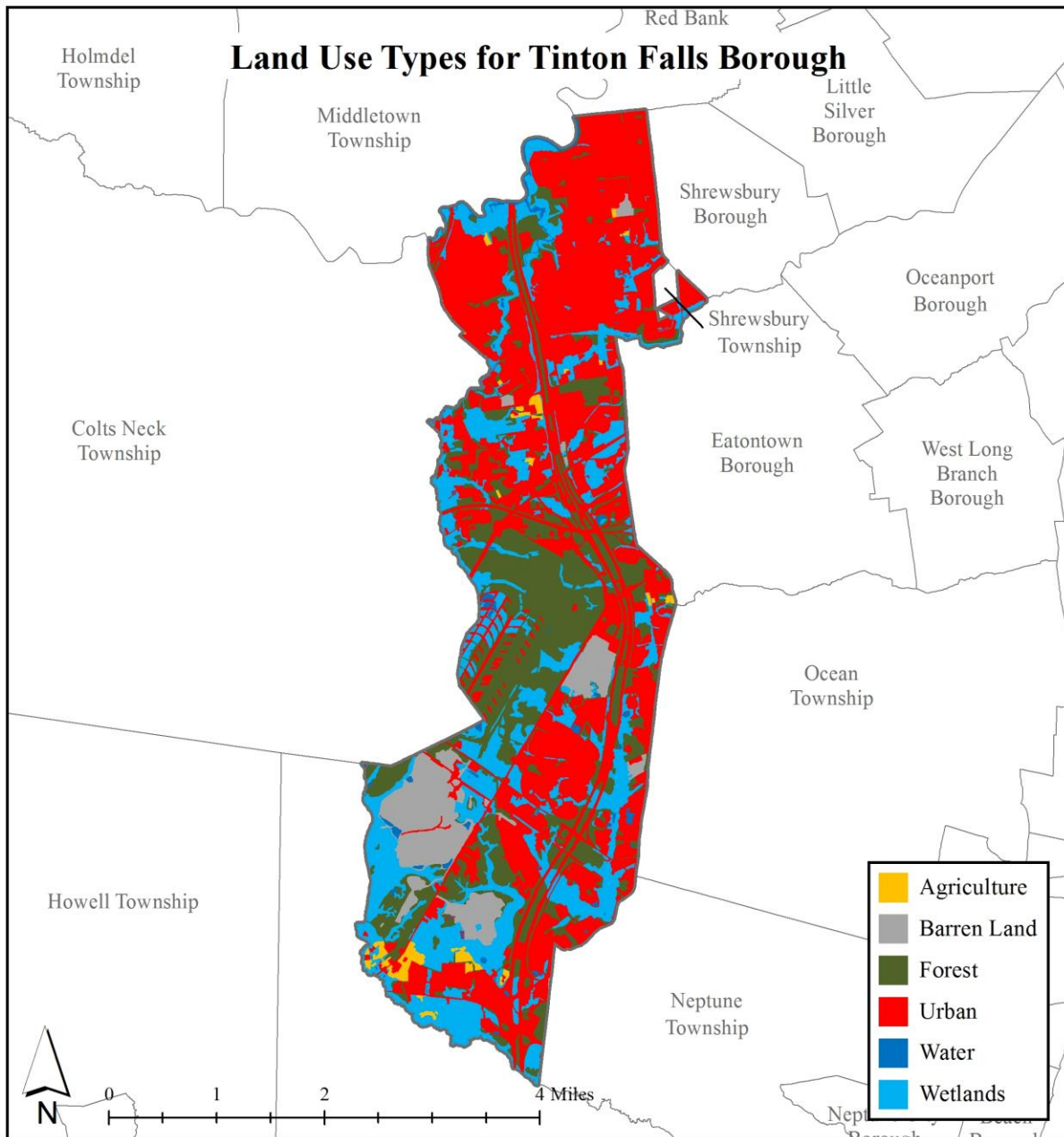


Figure 1: Map illustrating the land use in Tinton Falls Borough

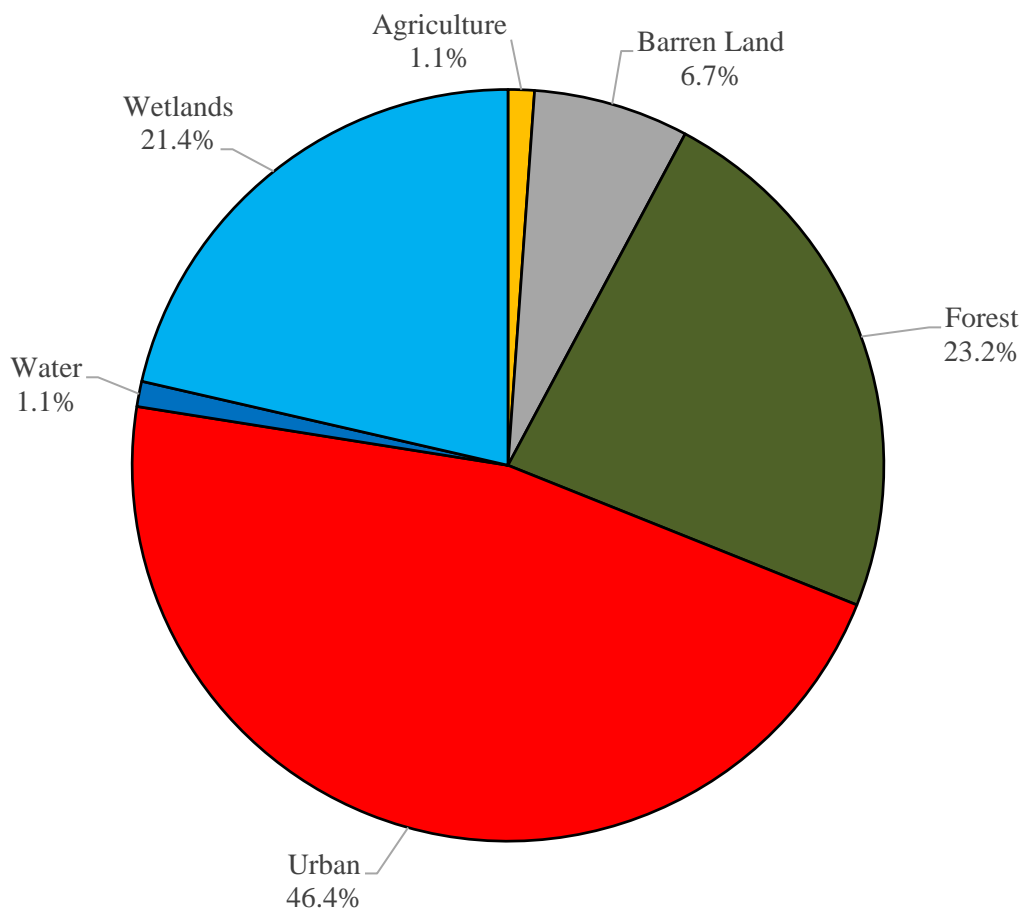


Figure 2: Pie chart illustrating the land use in Tinton Falls Borough

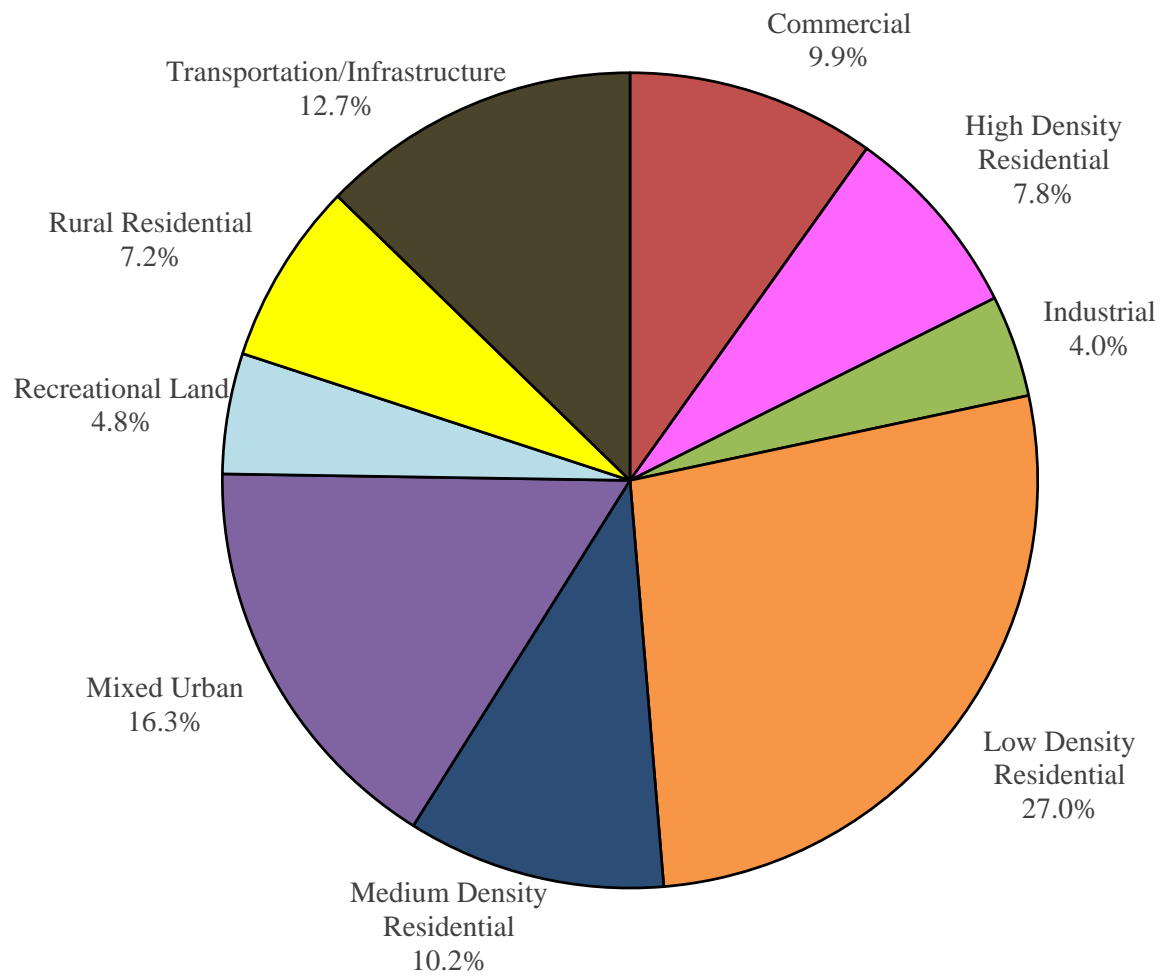


Figure 3: Pie chart illustrating the various types of urban land use in Tinton Falls Borough

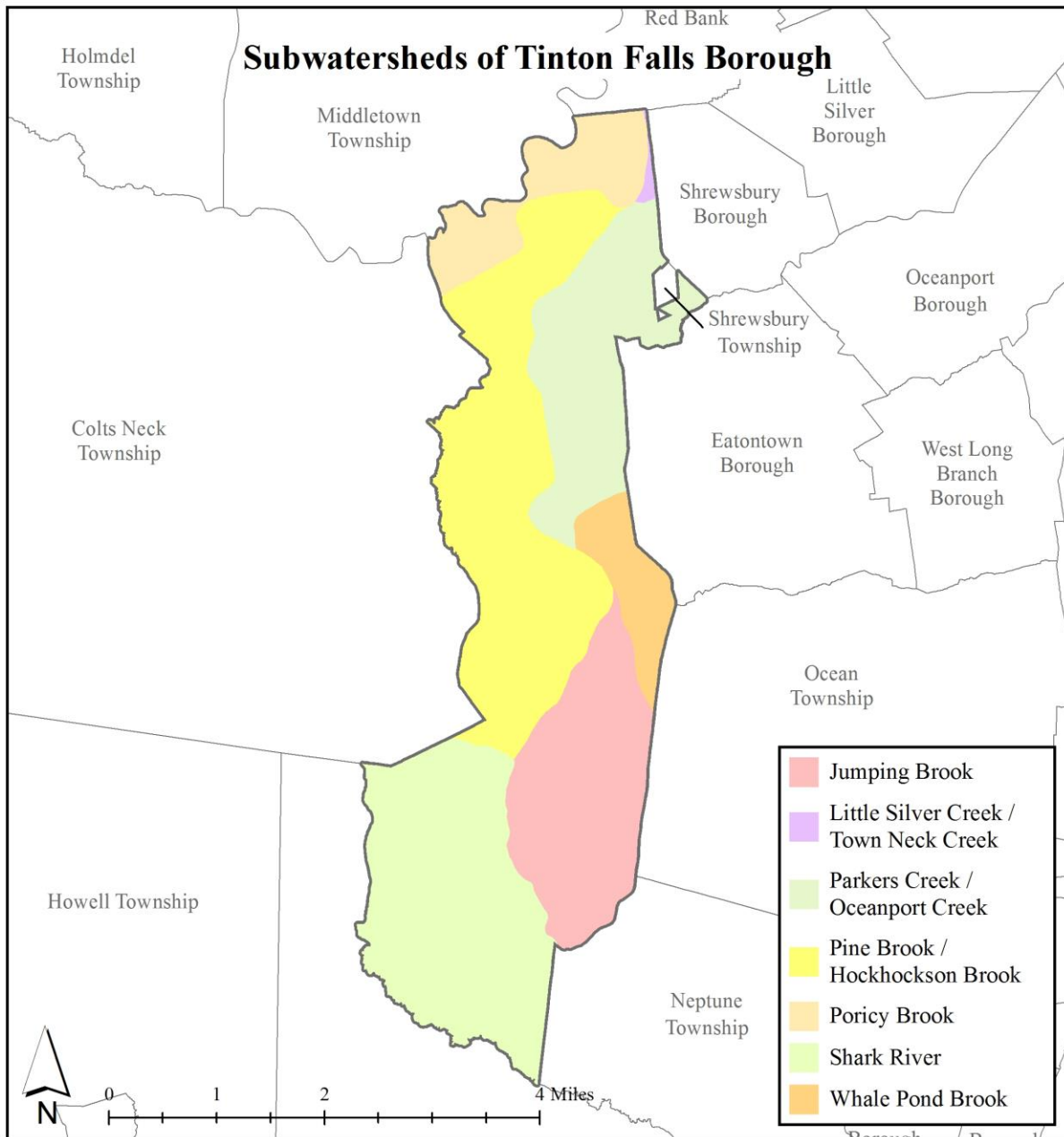


Figure 4: Map of the subwatersheds in Tinton Falls Borough

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 Tinton Falls 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 Tinton Falls 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.*

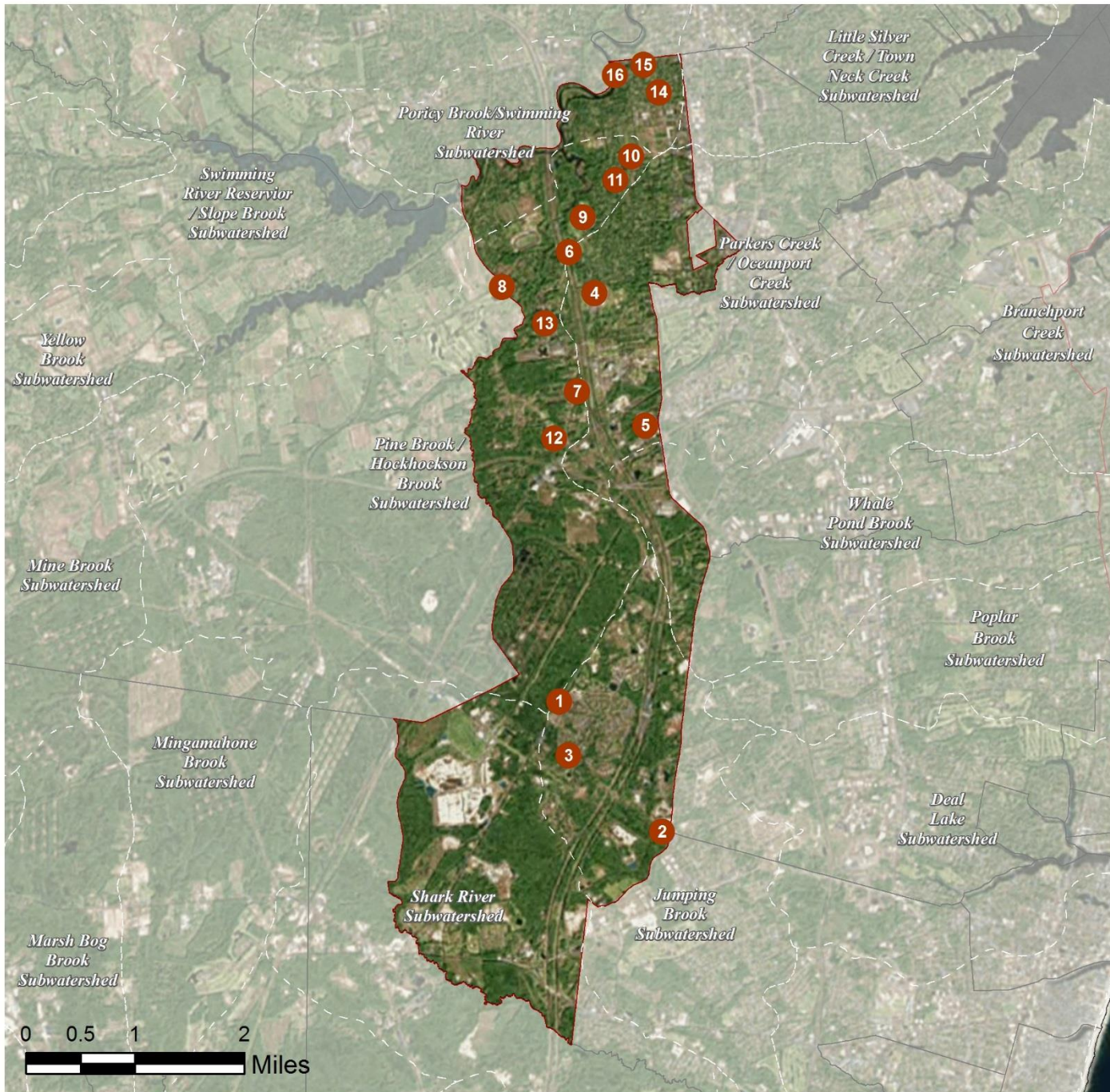
Conclusion

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. Green Infrastructure Sites

TINTON FALLS BOROUGH: GREEN INFRASTRUCTURE SITES



SITES WITHIN THE JUMPING BROOK SUBWATERSHED:

1. Bongarzone Funeral Home
2. Glad Tidings Assembly of God
3. Wayside Fire Company

SITES WITHIN THE PARKERS CREEK/OCEANPORT CREEK SUBWATERSHED:

4. Monmouth Regional High School
5. Park Church
6. Winding Brook School

SITES WITHIN THE PAPINE BROOK/HOCKHOCKSON BROOK SUBWATERSHED:

7. Grace Christian Church
8. Luther Memorial Evangelical Church
9. Mahala F. Atchison School
10. Monmouth Church of Christ
11. Monmouth Reform Temple
12. Pine Brook Fire Co. Inc
13. Tinton Falls Middle School

SITES WITHIN THE PORICY BROOK/SWIMMING RIVER SUBWATERSHED:

14. Emmanuel Baptist Church
15. Northside Engine Company
16. Oakwood School

b. Proposed Green Infrastructure Concepts

BONGARZONE FUNERAL HOME



Subwatershed: Jumping Brook
Site Area: 156,569 sq. ft.
Address: 2400 Shafto Road
Tinton Falls, NJ 07712
Block and Lot: Block 124, Lot 28

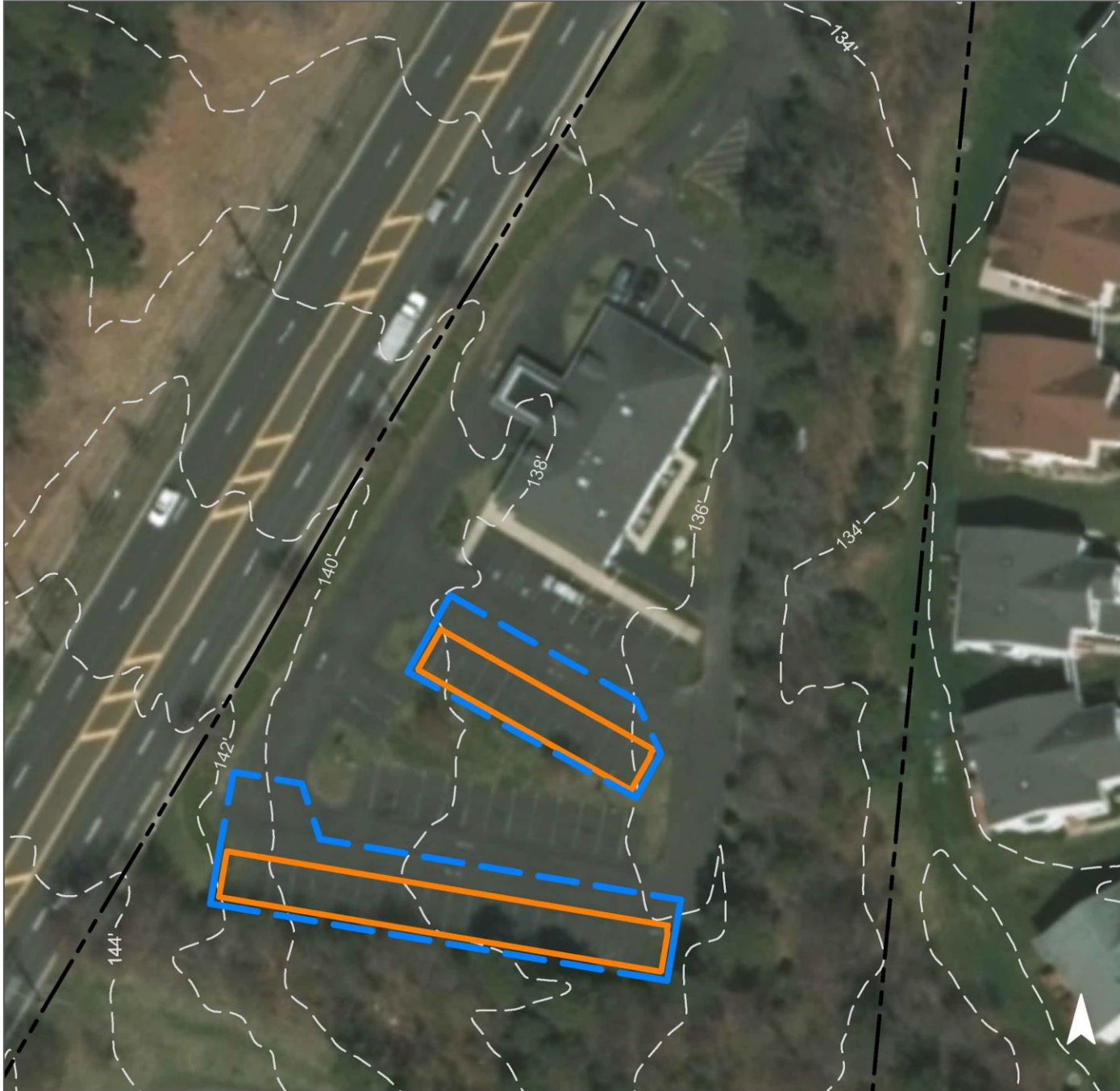


Parking spots along the south end of the site can be replaced with pervious pavement to capture and infiltrate stormwater runoff from the parking lot. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.





Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
49	76,536	3.7	38.7	351.4	0.060	2.10

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	0.250	42	6193	0.64	4,830	\$120,750

GREEN INFRASTRUCTURE RECOMMENDATIONS



Bongarzone Funeral Home

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



GLAD TIDINGS ASSEMBLY OF GOD



Subwatershed: Jumping Brook
Site Area: 262,811 sq. ft.
Address: 4012 Asbury Ave
Tinton Falls, NJ 07753
Block and Lot: Block 128.03, Lot 28.03



Parking spaces east of the church can be replaced with pervious pavement to capture and infiltrate parking lot runoff. A rain garden can also be implemented near the front of the building by redirecting downspouts to capture 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"
28	72,755	3.5	36.7	334.0	0.057	2.00

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.052	9	1,287	0.13	420	\$2,100
Pervious pavements	0.177	30	4,383	0.45	3,380	\$84,500

GREEN INFRASTRUCTURE RECOMMENDATIONS



Glad Tidings Assembly of God

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



WAYSIDE FIRE COMPANY



Subwatershed: Jumping Brook

Site Area: 228,528 sq. ft.

Address: 2 Volunteer Way
Tinton Falls, NJ 07753

Block and Lot: Block 124.13, Lot 1



Bioretention systems can be built at the front of the building to capture, treat, and infiltrate rooftop runoff. Parking spaces on the east end of the parking can be replaced with pervious pavement to capture runoff from the parking lot. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.





Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
33	74,617	3.6	37.7	342.6	0.058	2.05

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	0.152	26	3,777	0.39	1,220	\$6,100
Pervious pavements	0.327	55	8,086	0.83	3,710	\$92,750

GREEN INFRASTRUCTURE RECOMMENDATIONS



Wayside Fire Company

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



MONMOUTH REGIONAL HIGH SCHOOL



Subwatershed: Parkers Creek

Site Area: 2,715,760 sq. ft.

Address: Norman J. Field Way
Tinton Falls, NJ 07724

Block and Lot: Block 5, Lot 5, 10

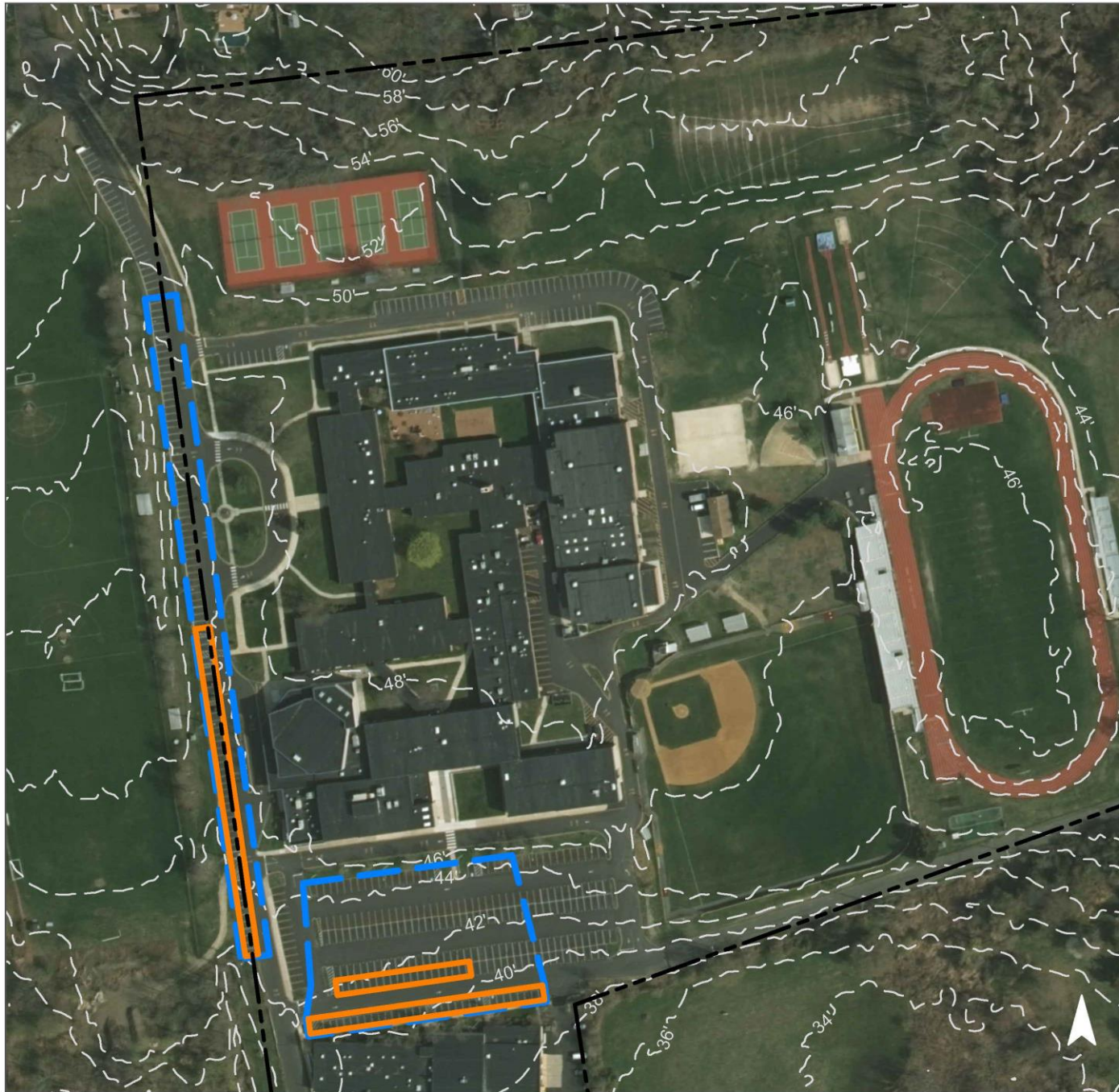


Parking spaces along the west driveway and in the south parking lot can be replaced with porous asphalt to capture and infiltrate runoff. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.





Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
25	670,364	32.3	338.6	3077.9	0.522	18.39

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Pervious pavements	2.141	358	58,322	6.01	16,665	\$416,625

GREEN INFRASTRUCTURE RECOMMENDATIONS



Monmouth Regional High School

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



PARK CHURCH



Subwatershed: Parkers Creek

Site Area: 81,615 sq. ft.

Address: 31 Park Road
Tinton Falls, NJ 07724

Block and Lot: Block 114, Lot 24.01



Parking spaces along the north west end of the parking lot can be replaced with pervious pavement to capture and infiltrate stormwater runoff. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.





Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
77	62,665	3.0	31.6	287.7	0.049	1.72

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	0.317	53	7,854	0.81	3,630	\$90,750

GREEN INFRASTRUCTURE RECOMMENDATIONS



Park Church

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



WINDING BROOK SCHOOL



Subwatershed: Parkers Creek
Site Area: 67,218 sq. ft.
Address: 1044 Sycamore Ave
Tinton Falls, NJ 07724
Block and Lot: Block 51, Lot 1



Parking spaces in the parking lot can be replaced with pervious pavement to capture runoff from the parking lot. Additional runoff can be captured by redirecting downspouts to flow into the pervious pavement. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.





Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
25	16,805	0.8	8.5	77.2	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 pavements	0.131	22	3,254	0.34	2,000	\$50,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Winding Brook School

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



GRACE CHRISTIAN CHURCH



Subwatershed: Pine Brook
Site Area: 143,158 sq. ft.
Address: 1961 Wayside Road,
Tinton Falls, NJ 07724
Block and Lot: Block 97, Lot 45

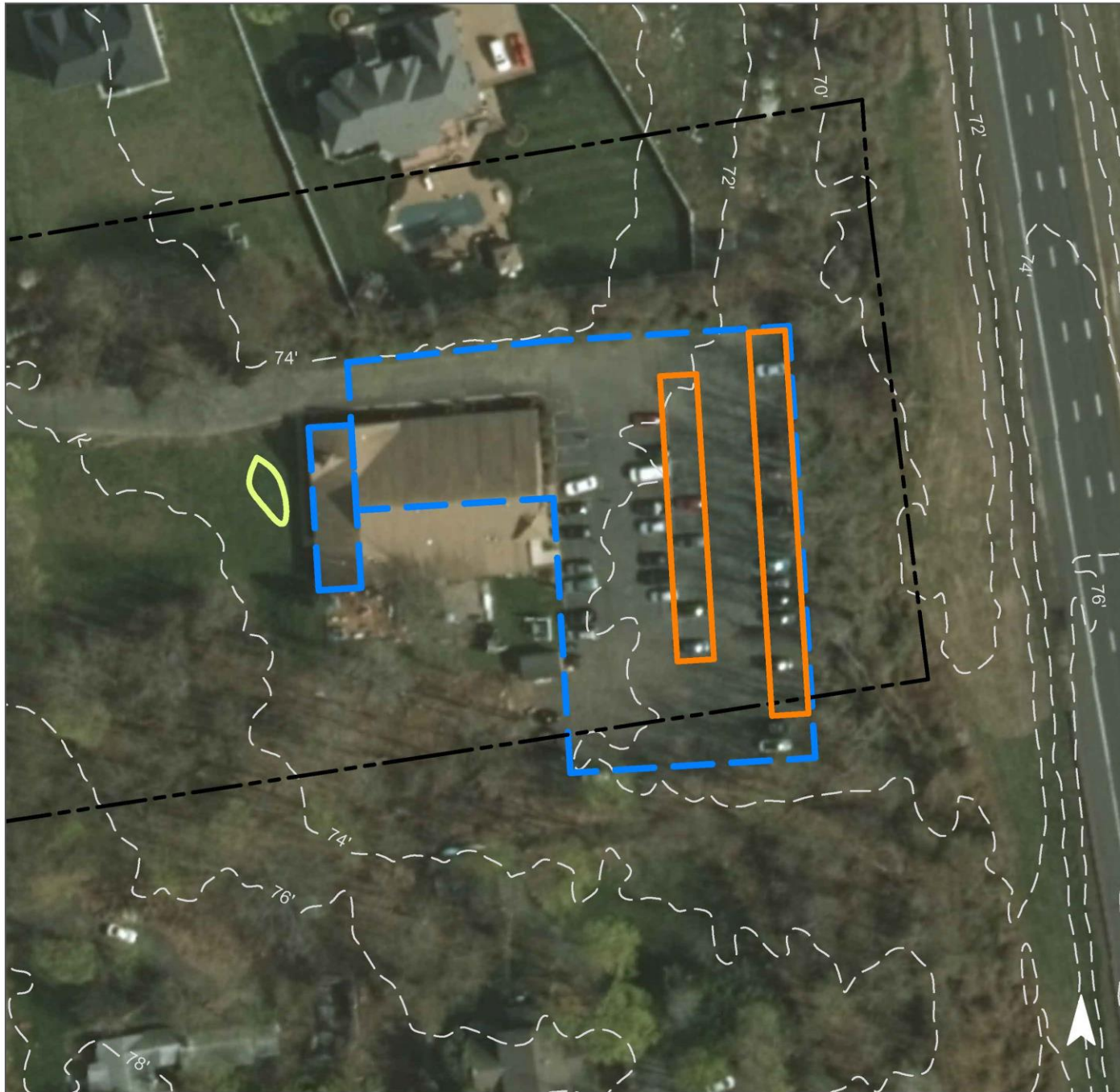


A rain garden can be placed at the front of the church to capture runoff from the rooftop. Parking spaces at the rear of the church can be replaced with pervious pavement to infiltrate runoff from the parking lot and rooftop runoff already being directed to the driveway. A preliminary soil assessment 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"
27	38,327	1.8	19.4	176.0	0.030	1.05

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	0.048	8	1,189	0.12	385	\$1,925
Pervious pavements	0.928	155	22,956	2.37	6,570	\$164,250

GREEN INFRASTRUCTURE RECOMMENDATIONS



Grace Christian Church

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



LUTHER MEMORIAL EVANGELICAL CHURCH



Subwatershed: Pine Brook
Site Area: 196,871 sq. ft.
Address: 818 Tinton Ave
Tinton Falls, NJ 07724
Block and Lot: Block 68.02, Lot 19,20



Parking spaces at the south end of the parking lot can be replaced with pervious pavement to capture, treat, and infiltrate runoff from the parking lot. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.





Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
39	77,453	3.7	39.1	355.6	0.060	2.12

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
Pervious pavements	0.745	125	18,431	1.90	7,430	\$185,750

GREEN INFRASTRUCTURE RECOMMENDATIONS



Luther Memorial Evangelical Church

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



MAHALA F. ATCHISON SCHOOL



Subwatershed: Pine Brook
Site Area: 1,335,541 sq. ft.
Address: 961 Sycamore Ave
Tinton Falls, NJ, 07724
Block and Lot: Block 44, Lot 1,2



Parking spaces in the north parking lot can be replaced with pervious pavement to infiltrate parking lot runoff. The tennis court can be repaved with pervious pavement to capture and infiltrate additional 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"
19	259,249	12.5	130.9	1,190.3	0.202	7.11

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Pervious pavements	1.150	192	28,454	2.93	20,900	\$522,500

GREEN INFRASTRUCTURE RECOMMENDATIONS



Mahala F. Atchison School

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



MONMOUTH CHURCH OF CHRIST



Subwatershed: Pine Brook
Site Area: 317,962 sq. ft.
Address: 312 Hance Ave
Tinton Falls, NJ 07724
Block and Lot: Block 37, Lot 13



A rain garden can be implemented in the northeast region with curb cuts can be built to capture, treat, and infiltrate parking lot runoff. Two concrete sidewalks to the east of the church can be made pervious to capture and infiltrate runoff. A strip of pervious asphalt can also be implemented in the north strip of parking spaces to capture additional 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"
32	102,059	4.9	51.5	468.6	0.080	2.80

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.188	31	4,645	0.48	1,500	\$7,500
Pervious pavement	0.507	85	12,544	1.29	4,825	\$120,625

GREEN INFRASTRUCTURE RECOMMENDATIONS



Monmouth Church of Christ

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



MONMOUTH REFORM TEMPLE



Subwatershed: Pine Brook
Site Area: 263,655 sq. ft.
Address: 332 Hance Ave
Tinton Falls, NJ 07724
Block and Lot: Block 37, Lot 4



Parking spaces in the rear parking lot can be replaced with pervious pavement to infiltrate runoff from the parking lot . A rain garden can be installed on the south face to capture, treat, and infiltrate roof runoff from the temple rooftop by disconnecting downspouts. Another rain garden be can be implemented at the northeast by capturing runoff from the driveway with a curb cut or trench drain. 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"
36	95,764	4.6	48.4	439.7	0.075	2.63

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
Bioretention systems	0.137	23	3,388	0.35	1,325	\$6,625
Pervious pavements	0.166	28	4,121	0.42	2,800	\$70,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Monmouth Reform Temple

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



PINE BROOK FIRE CO. INC



Subwatershed: Pine Brook
Site Area: 52,118 sq. ft.
Address: 70 Hamilton Road
Tinton Falls, NJ 07724
Block and Lot: Block 94, Lot 1.01



Parking spaces on the north side of the site can be replaced with porous asphalt to capture and infiltrate stormwater runoff from the parking area. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.





Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
59	30,801	1.5	15.6	141.4	0.024	0.84

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Pervious pavements	0.152	25	3,762	2,200	\$55,000	

GREEN INFRASTRUCTURE RECOMMENDATIONS



Pine Brook Fire Co. Inc

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



TINTON FALLS MIDDLE SCHOOL



Subwatershed: Pine Brook
Site Area: 729,830 sq. ft.
Address: 674 Tinton Ave
Tinton Falls, NJ 07724
Block and Lot: Block 74, Lot 10

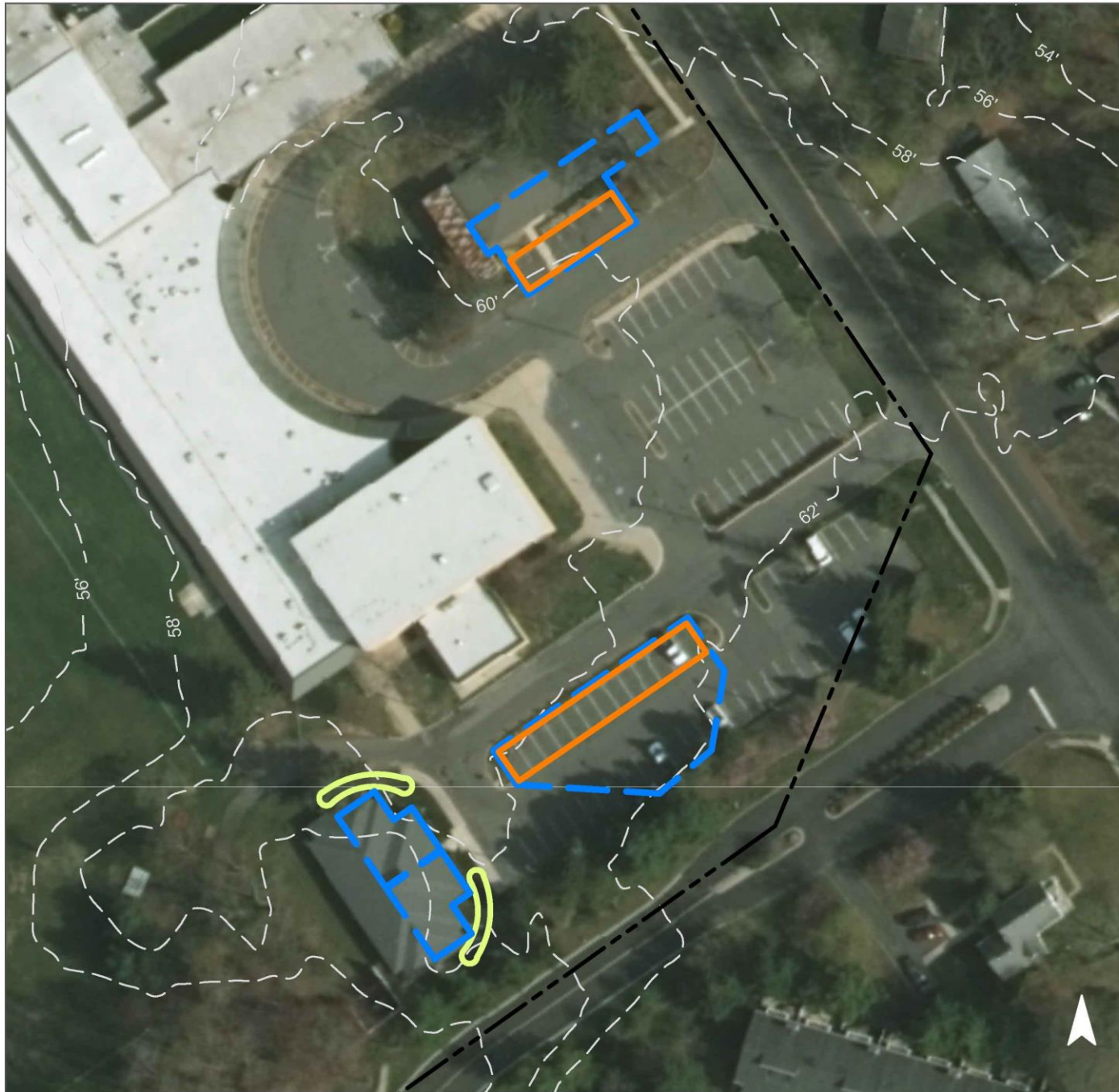


Parking spaces at the south end of the parking lot can be replaced with pervious pavement to infiltrate runoff. Additional spaces adjacent to the library can be replaced to capture runoff from the building's rooftop. Two bioretention system can be installed near the small building to the southwest to 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"
31	229,213	11.1	115.8	1052.4	0.179	6.29

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.069	11	1,698	0.18	685	\$3,425
Pervious pavements	0.262	44	6,478	0.67	3,285	\$82,125

GREEN INFRASTRUCTURE RECOMMENDATIONS



**Tinton Falls
Middle School**

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



EMMANUEL BAPTIST CHURCH



Subwatershed: Poricy Brook
Site Area: 28,800 sq. ft.
Address: 61 Cherry St
Tinton Falls, NJ 07724
Block and Lot: Block 12.02, Lot 41,43,45

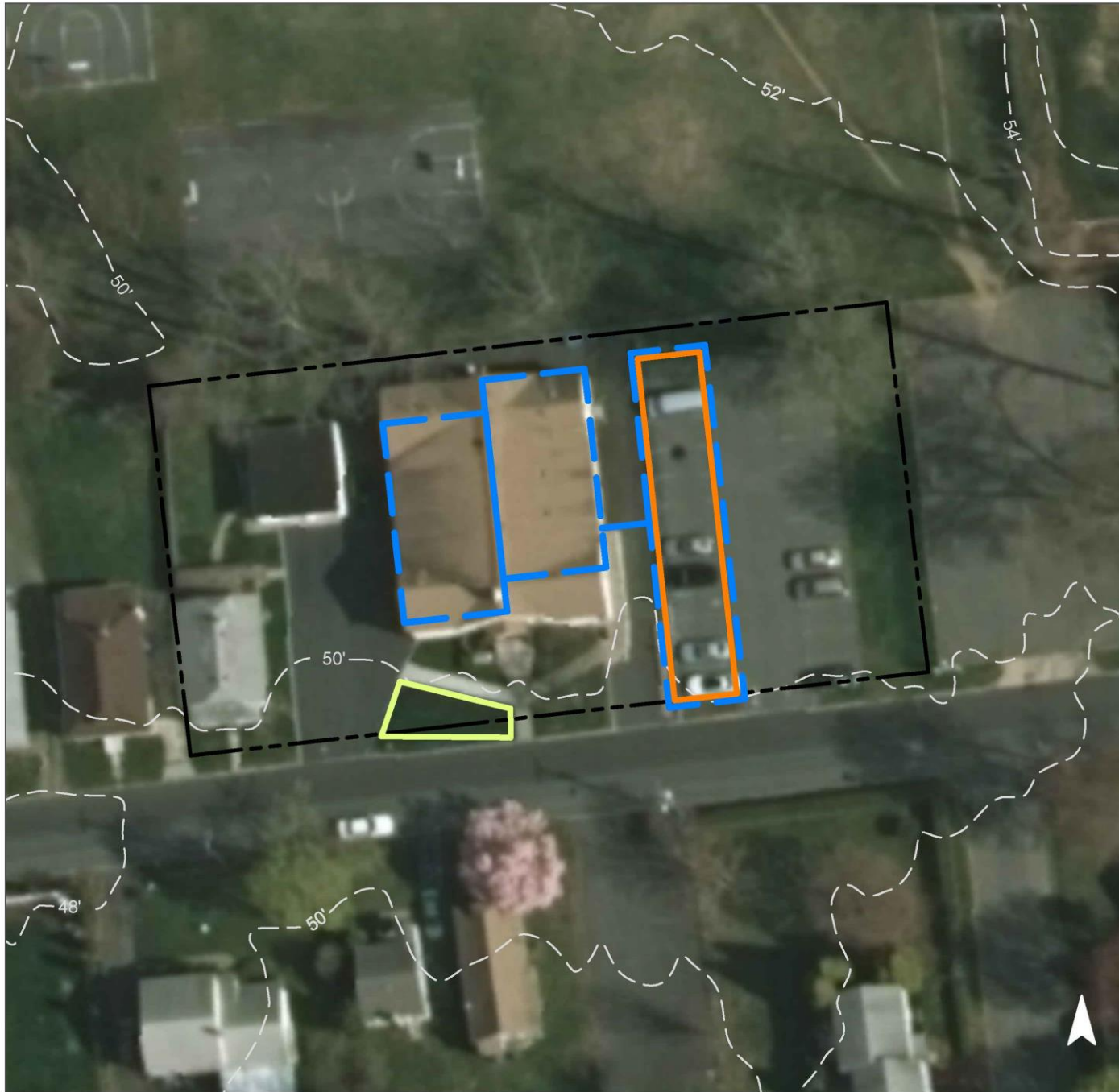


Parking spots on the east side of the building can be replaced with pervious pavement to capture and infiltrate parking lot runoff, and additional runoff can potentially be captured by redirecting downspouts from the building. A bioretention system can be installed in front of the building with a trench drain to capture the rooftop runoff. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.






Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
73	21,001	1.0	10.6	96.4	0.016	0.58

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.056	9	1,391	0.14	535	\$2,675
Pervious pavements	0.129	22	3,194	0.33	2,235	\$55,875

GREEN INFRASTRUCTURE RECOMMENDATIONS



Emmanuel Baptist Church

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



NORTHSIDE ENGINE COMPANY



Subwatershed: Poricy Brook
Site Area: 37,760 sq. ft.
Address: 35 Springdale Ave
Tinton Falls NJ 07724
Block and Lot: Block 6.01, Lot 4

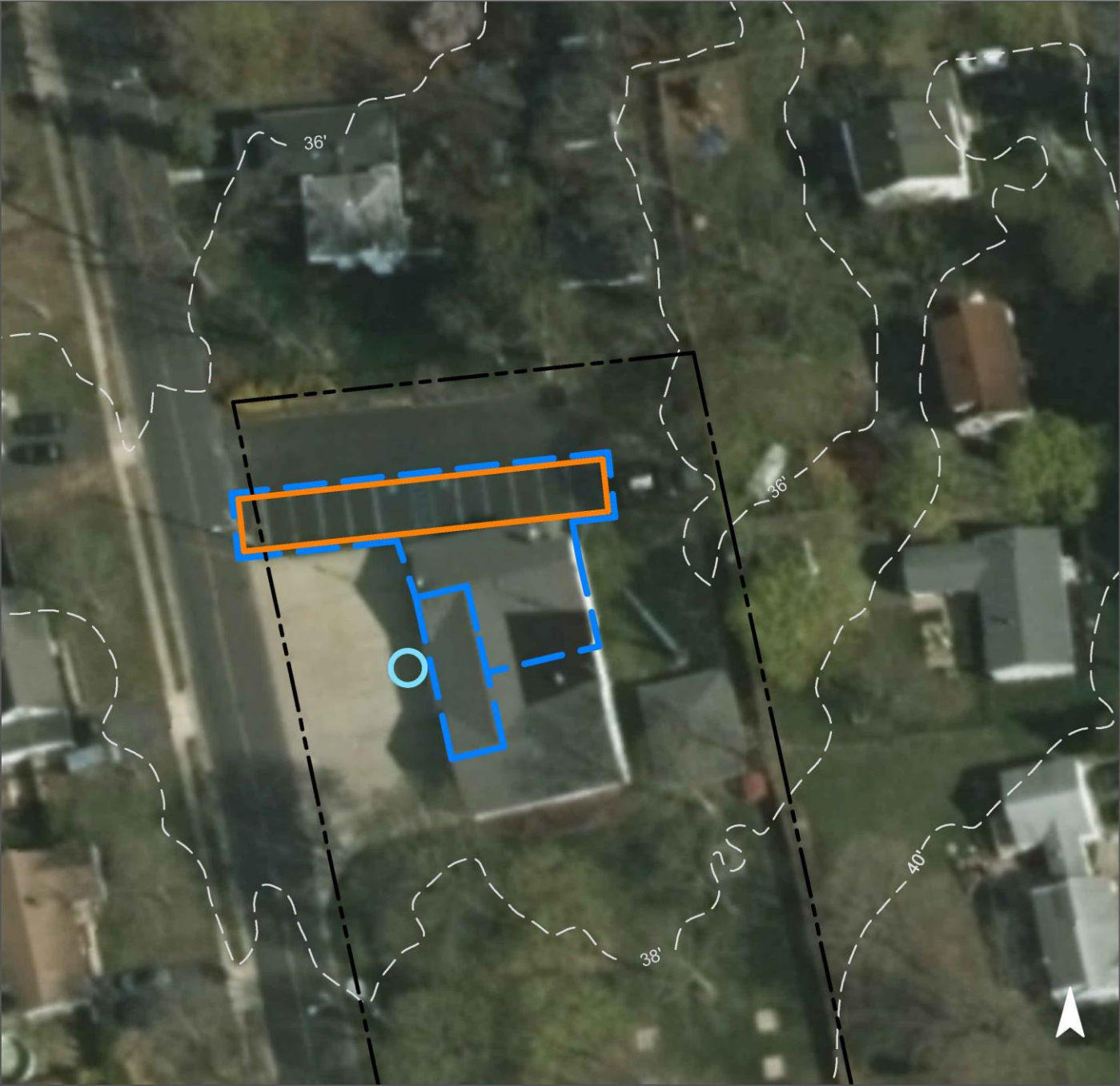


Parking spots on the north side of the building can be replaced with pervious pavement to capture and infiltrate stormwater runoff from the parking lot, and additional runoff can be captured by redirecting downspouts from the roof into them. A rain water harvesting system can be installed in the front of the building to capture runoff from the roof. This water could be used to wash the fire trucks. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.






Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
55	20,721	1.0	10.5	95.1	0.016	0.57

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Pervious pavements	0.119	20	2,947	0.30	2,045	\$51,125
Rainwater harvesting system	0.024	4	598	0.06	600 (gal)	\$1,200

GREEN INFRASTRUCTURE RECOMMENDATIONS



Northside Engine Company

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



OAKWOOD SCHOOL



Subwatershed: Poricy Brook

Site Area: 162,398 sq. ft.

Address: 62 Hance Avenue
Tinton Falls, NJ 07724

Block and Lot: Block 31.01, Lot 2,3

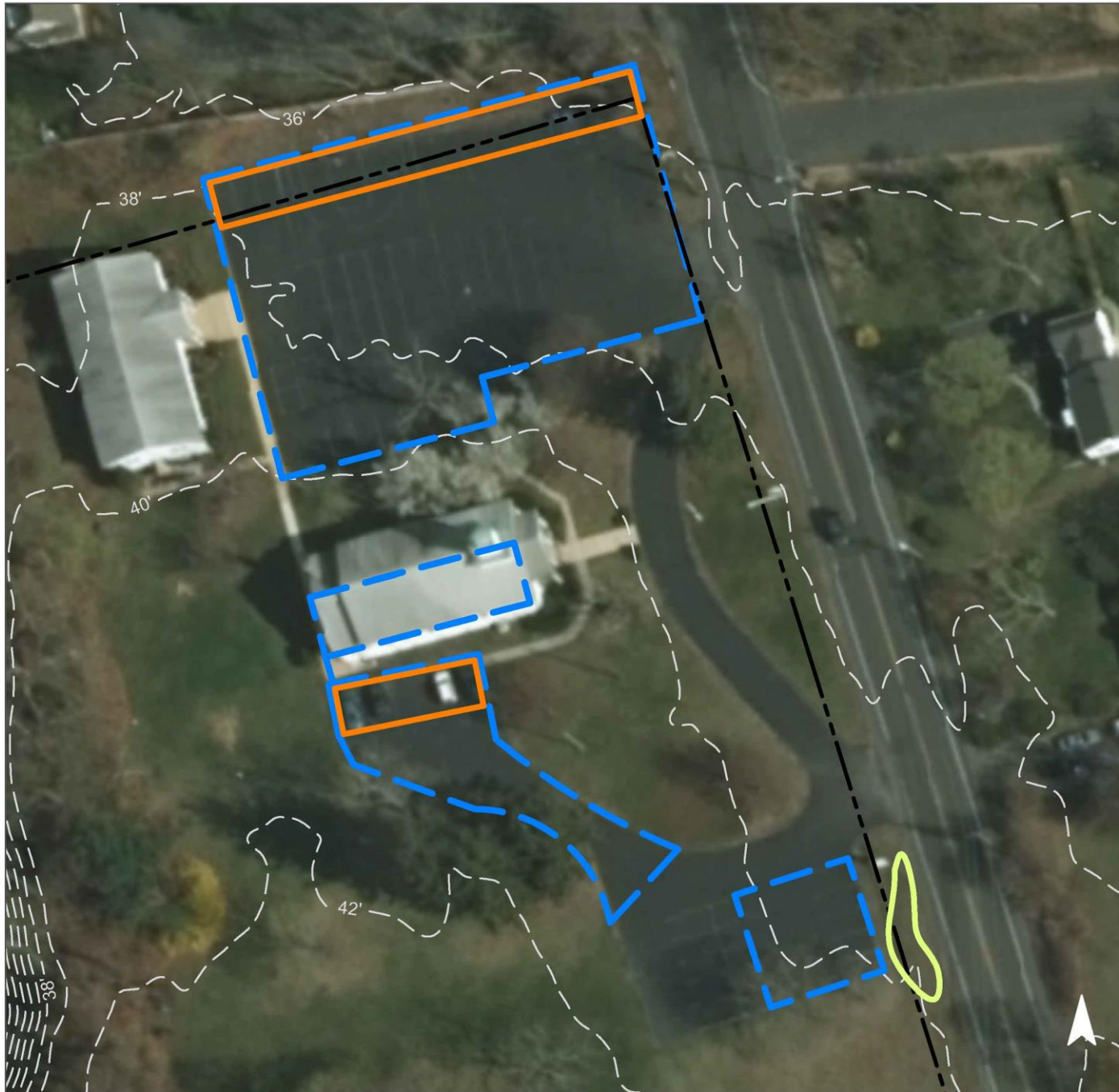


Parking spaces in the north parking lot area can be replaced with pervious pavement to infiltrate parking lot runoff. Additional spaces just south of the church can be replaced to capture runoff from the driveway and the rooftop. A rain garden can be installed at the southeast end of the site to capture, treat, and infiltrate more 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"
21	34,909	1.7	17.6	160.3	0.027	0.96

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	0.055	9	920	0.09	535	\$2,675
Pervious pavements	0.633	106	15,671	1.62	4,050	\$101,250

GREEN INFRASTRUCTURE RECOMMENDATIONS



Oakwood School

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



c. Summary of Existing Conditions

Summary of Existing Site Conditions

Subwatershed/Site Name/Total Site Info/GI Practice	Area (ac)	Area (SF)	Block	Lot	Existing Annual Loads			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)
JUMPING BROOK SUBWATERSHED	14.87	647,908			10.8	113.1	1,028.0		5.14	223,908	0.174	6.14
Bongarzone Funeral Home												
Total Site Info	3.59	156,569	124	28	3.7	38.7	351.4	49	1.76	76,536	0.060	2.10
Glad Tidings Assembly of God												
Total Site Info	6.03	262,811	128.03	28.03	3.5	36.7	334.0	28	1.67	72,755	0.057	2.00
Wayside Fire Company												
Total Site Info	5.25	228,528	124.13	1	3.6	37.7	342.6	33	1.71	74,617	0.058	2.05
PARKERS CREEK / OCEANPORT CREEK SUBWATERSHED	65.76	2,864,593			36.1	378.7	3,442.8		17.21	749,834	0.584	20.57
Monmouth Regional High School												
Total Site Info	62.35	2,715,760	54	5, 10	32.3	338.6	3,077.9	25	15.39	670,364	0.522	18.39
Park Church												
Total Site Info	1.87	81,615	114	24.01	3.0	31.6	287.7	77	1.44	62,665	0.049	1.72
Winding Brook School												
Total Site Info	1.54	67,218	51	1	0.8	8.5	77.2	25	0.39	16,805	0.013	0.46
PINE BROOK / HOCKHOCKSON BROOK SUBWATERSHED	69.77	3,039,135			40.2	420.6	3,824.0		19.12	832,865	0.649	22.84
Grace Christian Church												
Total Site Info	3.29	143,158	97	45	1.8	19.4	176.0	27	0.88	38,327	0.030	1.05
Luther Memorial Evangelical Church												
Total Site Info	4.52	196,871	68.02	19, 20	3.7	39.1	355.6	39	1.78	77,453	0.060	2.12
Mahala F. Atchison School												
Total Site Info	30.66	1,335,541	44	1, 2	12.5	130.9	1,190.3	19	5.95	259,249	0.202	7.11
Monmouth Church of Christ												
Total Site Info	7.30	317,962	37	13	4.9	51.5	468.6	32	2.34	102,059	0.080	2.80

Summary of Existing Site Conditions

Subwatershed/Site Name/Total Site Info/GI Practice	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)
Monmouth Reform Temple Total Site Info	6.05	263,655	37	4	4.6	48.4	439.7	36	2.20	95,764	0.075	2.63
Pine Brook Fire Co. Inc Total Site Info	1.20	52,118	94	1.01	1.5	15.6	141.4	59	0.71	30,801	0.024	0.84
Tinton Falls Middle School Total Site Info	16.75	729,830	74	10	11.1	115.8	1,052.4	31	5.26	229,213	0.179	6.29
PORICY BROOK / SWIMMING RIVER SUBWATERSHED	5.26	228,958			3.7	38.7	351.8		1.76	76,631	0.060	2.10
Emmanuel Baptist Church Total Site Info	0.66	28,800	12.02	41, 43, 45	1.0	10.6	96.4	73	0.48	21,001	0.016	0.58
Northside Engine Company Total Site Info	0.87	37,760	6.01	4	1.0	10.5	95.1	55	0.48	20,721	0.016	0.57
Oakwood School Total Site Info	3.73	162,398	31.01	2, 3	1.7	17.6	160.3	21	0.80	34,909	0.027	0.96

d. Summary of Proposed Green Infrastructure Practices

Summary of Proposed Green Infrastructure Practices

Subwatershed/Site Name/Total Site Info/GI Practice	Potential Management Area		Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Max Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cfs)	Size of BMP (SF)	Unit Cost (\$)	Unit	Total Cost (\$)	I.C. Treated %
	Area (SF)	Area (ac)									
JUMPING BROOK SUBWATERSHED	36,790	0.84	0.959	160	23,727	2.44	13,590			\$306,200	16.4%
1 Bongarzone Funeral Home											
Pervious pavements	9,600	0.22	0.250	42	6,193	0.64	4,830	25	SF	\$120,750	12.5%
Total Site Info	9,600	0.22	0.250	42	6,193	0.64	4,830			\$120,750	12.5%
2 Glad Tidings Assembly of God											
Bioretention systems/rain gardens	2,000	0.05	0.052	9	1,287	0.13	420	5	SF	\$2,100	2.7%
Pervious pavements	6,800	0.16	0.177	30	4,383	0.45	3,380	25	SF	\$84,500	9.3%
Total Site Info	8,800	0.20	0.229	38	5,670	0.58	3,830			\$86,600	12.1%
3 Wayside Fire Company											
Bioretention systems/rain gardens	5,850	0.13	0.152	26	3,777	0.39	1,220	5	SF	\$6,100	7.8%
Pervious pavements	12,540	0.29	0.327	55	8,086	0.83	3,710	25	SF	\$92,750	16.8%
Total Site Info	18,390	0.42	0.479	80	11,863	1.22	4,930			\$98,850	24.6%
PARKERS CREEK / OCEANPORT CREEK SUBWATERSHED	99,405	2.28	2.590	434	69,429	7.16	22,295			\$557,375	13.3%
4 Monmouth Regional High School											
Pervious pavements	82,185	1.89	2.141	358	58,322	6.01	16,665	25	SF	\$416,625	12.3%
Total Site Info	82,185	1.89	2.141	358	58,322	6.01	16,665			\$416,625	12.3%
5 Park Church											
Pervious pavements	12,180	0.28	0.317	53	7,854	0.81	3,630	25	SF	\$90,750	19.4%
Total Site Info	12,180	0.28	0.317	53	7,854	0.81	3,630			\$90,750	19.4%
6 Winding Brook School											
Pervious pavements	5,040	0.12	0.131	22	3,254	0.34	2,000	25	SF	\$50,000	30.0%
Total Site Info	5,040	0.12	0.131	22	3,254	0.34	2,000			\$50,000	30.0%

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)									
PINE BROOK / HOCKHOCKSON BROOK SUBWATERSHED	161,720	3.71	4.350	728	107,667	11.10	51,905			\$1,219,725	19.4%
7 Grace Christian Church											
Bioretention systems/rain gardens	1,850	0.04	0.048	8	1,189	0.12	385	5	SF	\$1,925	4.8%
Pervious pavements	35,600	0.82	0.928	155	22,956	2.37	6,570	25	SF	\$164,250	92.9%
Total Site Info	37,450	0.86	0.976	163	24,145	2.49	6,955			\$166,175	97.7%
8 Luther Memorial Evangelical Church											
Pervious pavements	28,580	0.66	0.745	125	18,431	1.90	7,430	25	SF	\$185,750	36.9%
Total Site Info	28,580	0.66	0.745	125	18,431	1.90	7,430			\$185,750	36.9%
9 Mahala F. Atchison School											
Pervious pavements	44,125	1.01	1.150	192	28,454	2.93	20,900	25	SF	\$522,500	17.0%
Total Site Info	44,125	1.01	1.150	192	28,454	2.93	20,900			\$522,500	17.0%
10 Monmouth Church of Christ											
Bioretention systems/rain gardens	7,200	0.17	0.188	31	4,645	0.48	1,500	5	SF	\$7,500	7.1%
Pervious pavements	19,450	0.45	0.507	85	12,544	1.29	4,825	25	SF	\$120,625	19.1%
Total Site Info	26,650	0.61	0.694	116	17,189	1.77	6,325			\$128,125	26.1%
11 Monmouth Reform Temple											
Bioretention systems/rain gardens	5,250	0.12	0.137	23	3,388	0.35	1,325	5	SF	\$6,625	5.5%
Pervious pavements	6,390	0.15	0.166	28	4,121	0.42	2,800	25	SF	\$70,000	6.7%
Total Site Info	6,390	0.15	0.303	51	7,510	0.77	4,125			\$76,625	12.2%
12 Pine Brook Fire Co. Inc											
Pervious pavements	5,840	0.13	0.152	25	3,762	0.39	2,200	25	SF	\$55,000	19.0%
Total Site Info	5,840	0.13	0.152	25	3,762	0.39	2,200			\$55,000	19.0%
13 Tinton Falls Middle School											
Bioretention systems/rain gardens	2,635	0.06	0.069	11	1,698	0.18	685	5	SF	\$3,425	1.1%
Pervious pavements	10,050	0.23	0.262	44	6,478	0.67	3,285	25	SF	\$82,125	4.4%
Total Site Info	12,685	0.29	0.331	55	8,176	0.85	3,970			\$85,550	5.5%

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)									
PORICY BROOK / SWIMMING RIVER SUBWATERSHED	39,015	0.90	1.017	170	24,721	2.54	10,000			\$214,800	50.9%
14 Emmanuel Baptist Church											
Bioretention systems/rain gardens	2,155	0.05	0.056	9	1,391	0.14	535	5	SF	\$2,675	10.3%
Pervious pavements	4,950	0.11	0.129	22	3,194	0.33	2,235	25	SF	\$55,875	23.6%
Total Site Info	7,105	0.16	0.185	31	4,585	0.47	2,770			\$58,550	33.8%
15 Northside Engine Company											
Pervious pavements	4,575	0.11	0.119	20	2,947	0.30	2,045	25	SF	\$51,125	22.1%
Rainwater harvesting systems	925	0.02	0.024	4	598	0.06	600	2	gal	\$1,200	4.5%
Total Site Info	5,500	0.13	0.143	24	3,546	0.36	2,645			\$52,325	26.5%
16 Oakwood School											
Bioretention systems/rain gardens	2,110	0.05	0.055	9	920	0.09	535	5	SF	\$2,675	6.0%
Pervious pavements	24,300	0.56	0.633	106	15,671	1.62	4,050	25	SF	\$101,250	69.6%
Total Site Info	26,410	0.61	0.688	115	16,591	1.71	4,585			\$103,925	75.7%