RUTGERS
New Jersey Agricultural
Experiment Station

Impervious Cover Reduction Action Plan
for
Branchville Borough, Sussex County, New Jersey

Prepared for Branchville Borough by the
Rutgers Cooperative Extension Water Resources Program

August 10, 2016

WILLIAM PENN
FOUNDATION

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Introduction

Located in Sussex County in northern New Jersey, Branchville Borough covers approximately 0.59 square miles. Figures 1 and 2 illustrate that Branchville Borough is dominated by urban land uses. A total of 70.6% of the municipality's land use is classified as urban. Of the urban land in Branchville Borough, medium density 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 Branchville 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 Branchville Borough. Based upon the 2012 NJDEP land use/land cover data, approximately 21.6% of Branchville Borough has impervious cover. This level of impervious cover suggests that the streams in Branchville Borough are likely impacted streams. [1]

Methodology

Branchville Borough contains portions of two 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

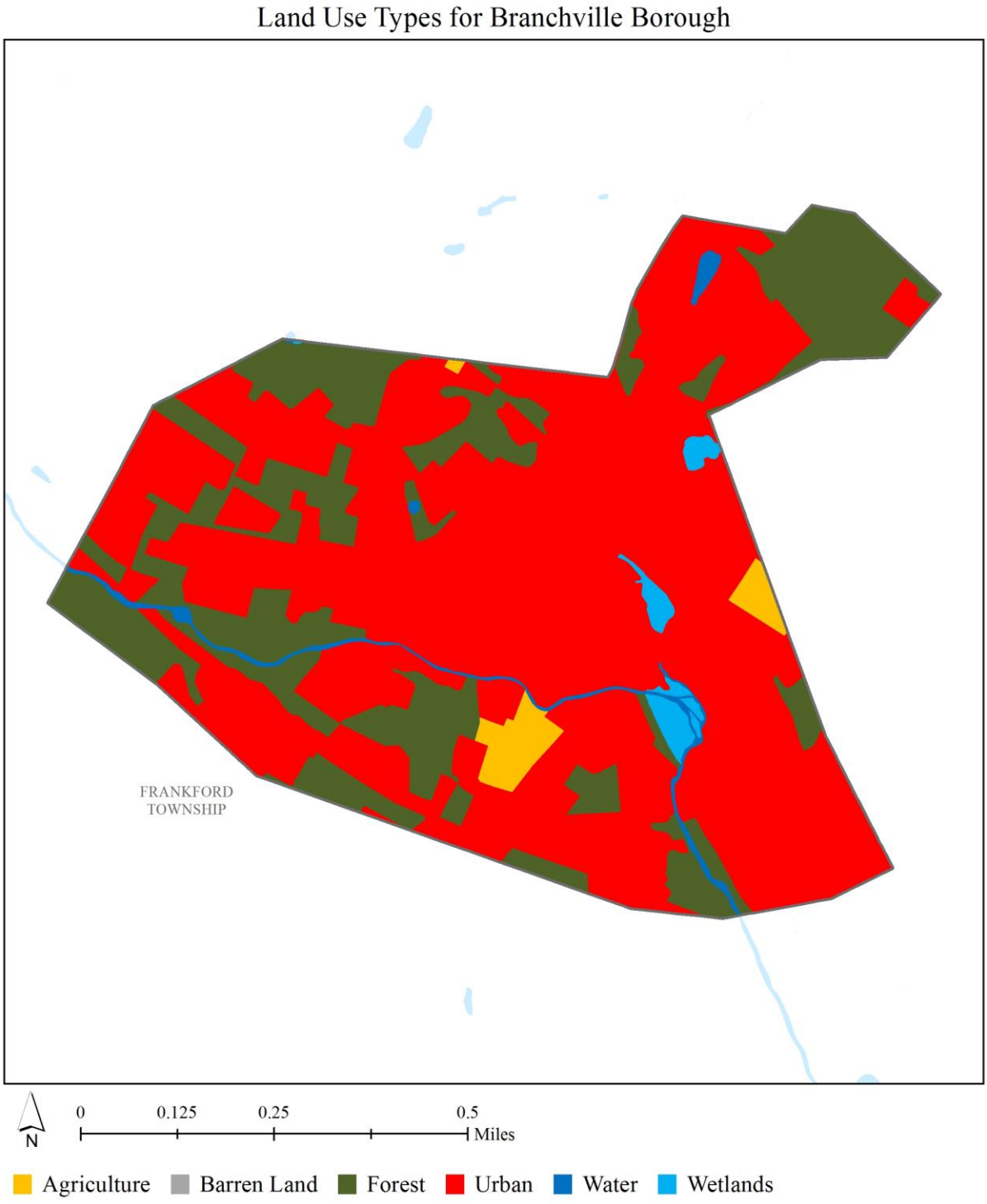


Figure 1: Map illustrating the land use in Branchville Borough

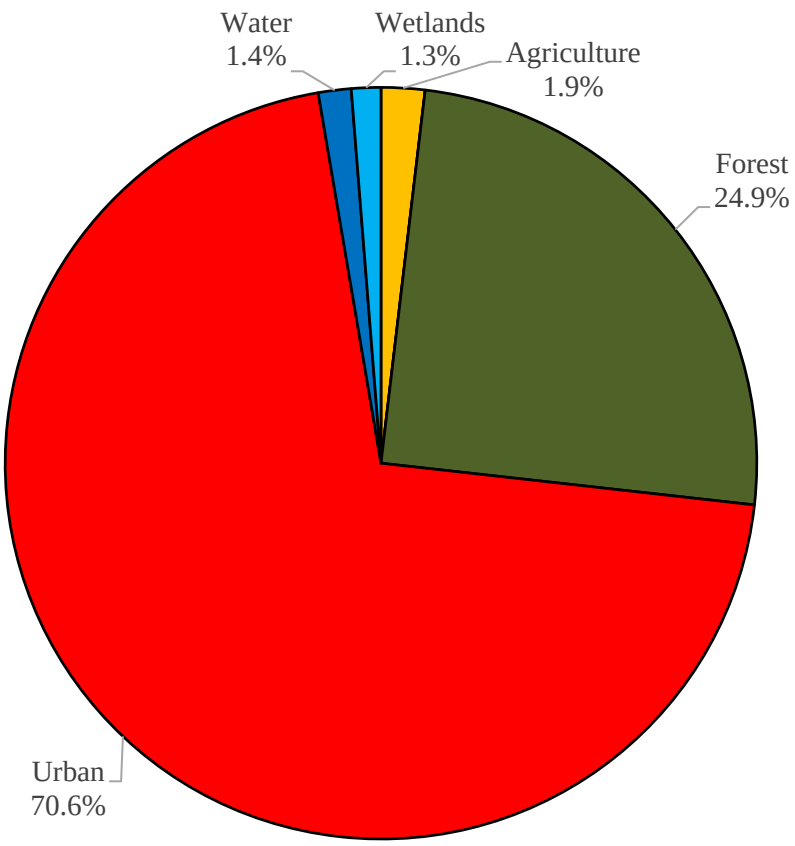


Figure 2: Pie chart illustrating the land use in Branchville Borough

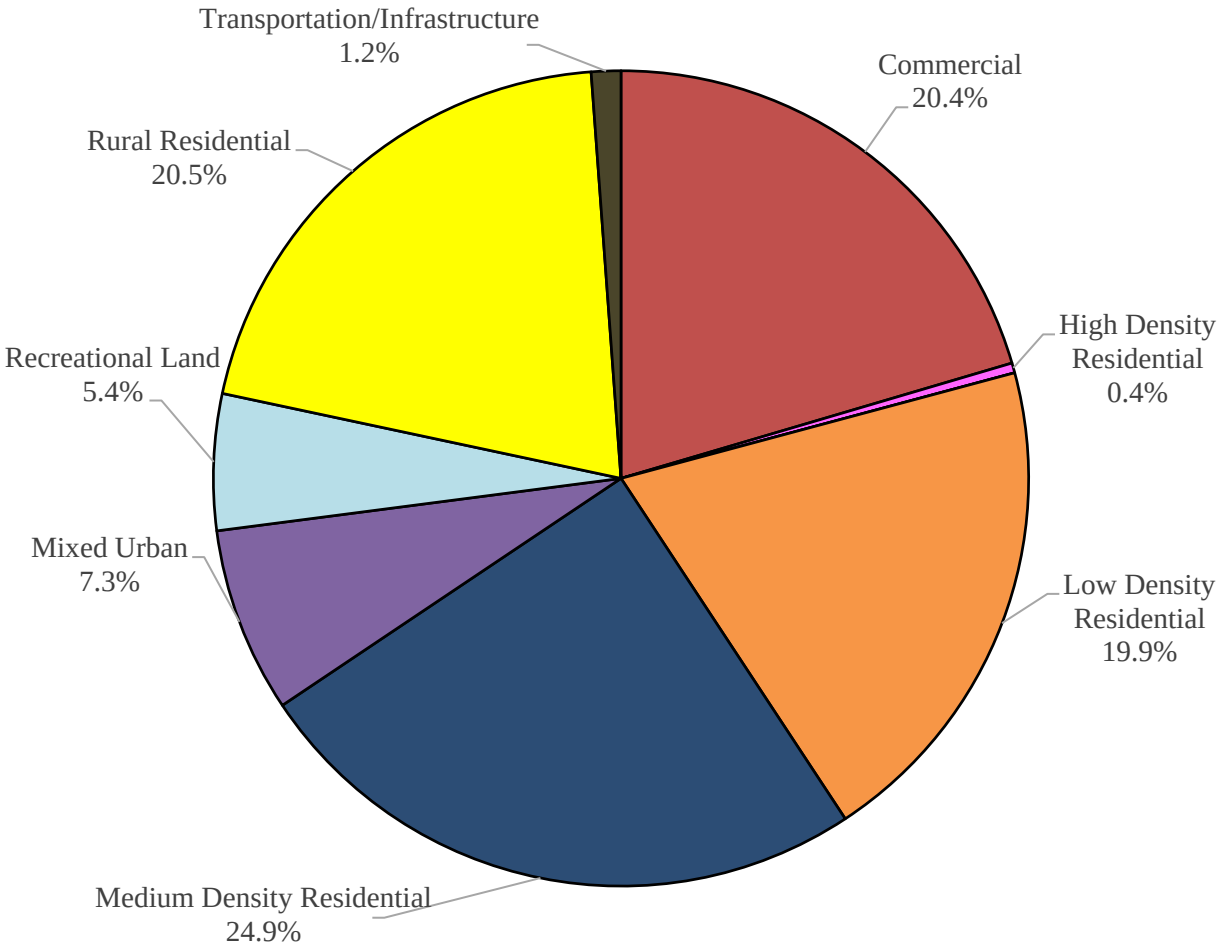


Figure 3: Pie chart illustrating the various types of urban land use in Branchville Borough

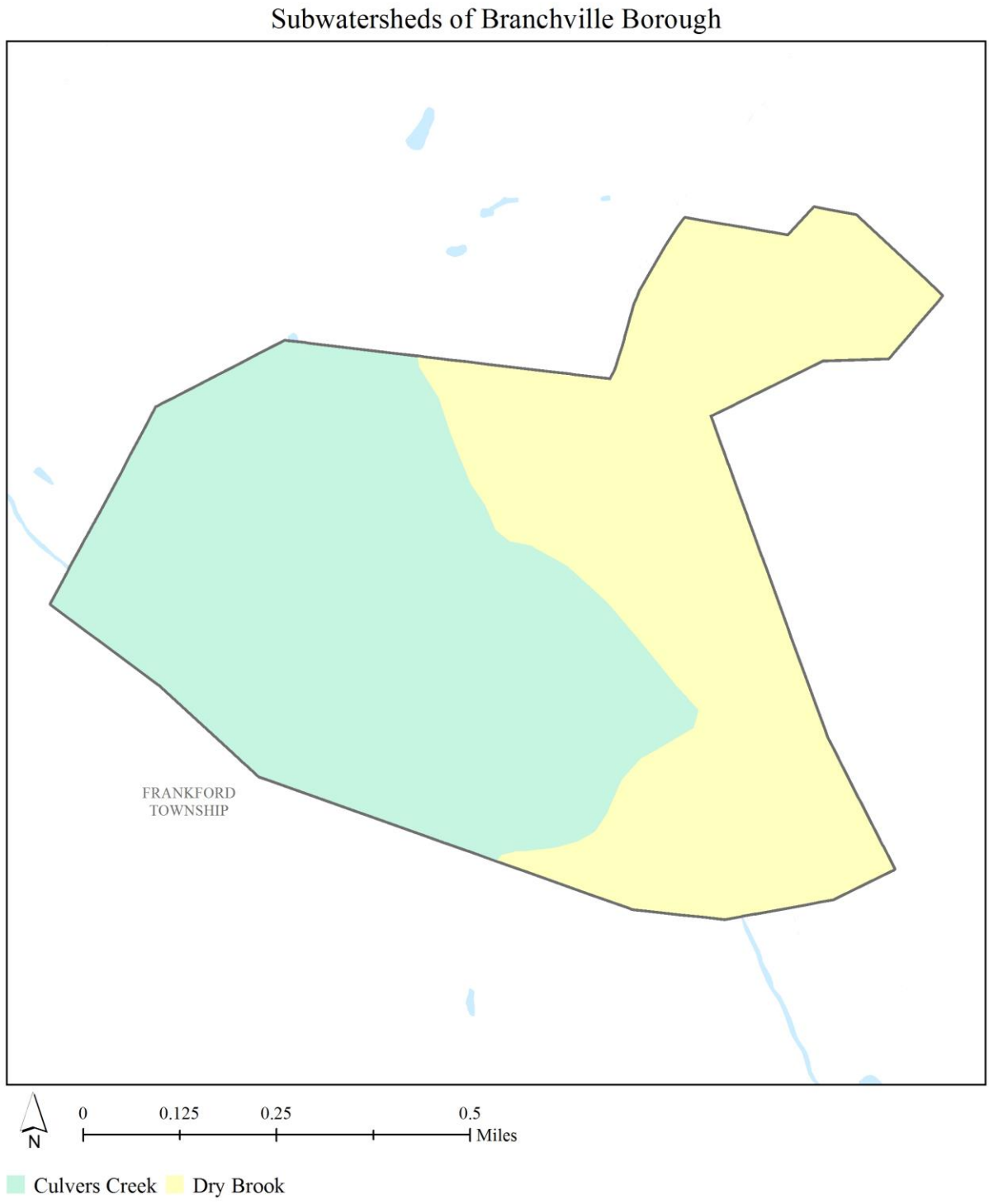


Figure 4: Map of the subwatersheds in Branchville Borough

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 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 Branchville 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 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 Branchville 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 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 practices 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

BRANCHVILLE BOROUGH: GREEN INFRASTRUCTURE SITES

SITES WITHIN THE CULVERS CREEK SUBWATERSHED:

1. 123 Auto Sales
2. Branchville Hose Company
3. Branchville Post Office
4. Castner Auction - Appraisal Services
5. First Presbyterian Church
6. Franklin Mutual Insurance
7. Montague Tool & Supply Company
8. Municipal Parking Lot
9. United Methodist Church
10. Wilco Air Conditioning Refrigeration & Heating
11. Wood Funeral Home

SITES WITHIN THE DRY BROOK SUBWATERSHED:

12. Branchville Borough Office
13. Branchville Borough Road Department
14. Branchville Country Vet Clinic
15. Lafayette Clay Works

b. Proposed Green Infrastructure Concepts

123 Auto Sales

Subwatershed: Culvers Creek

Site Area: 93,998 sq. ft.

Address: 3 Kemah Lake Road
Branchville, NJ 07826

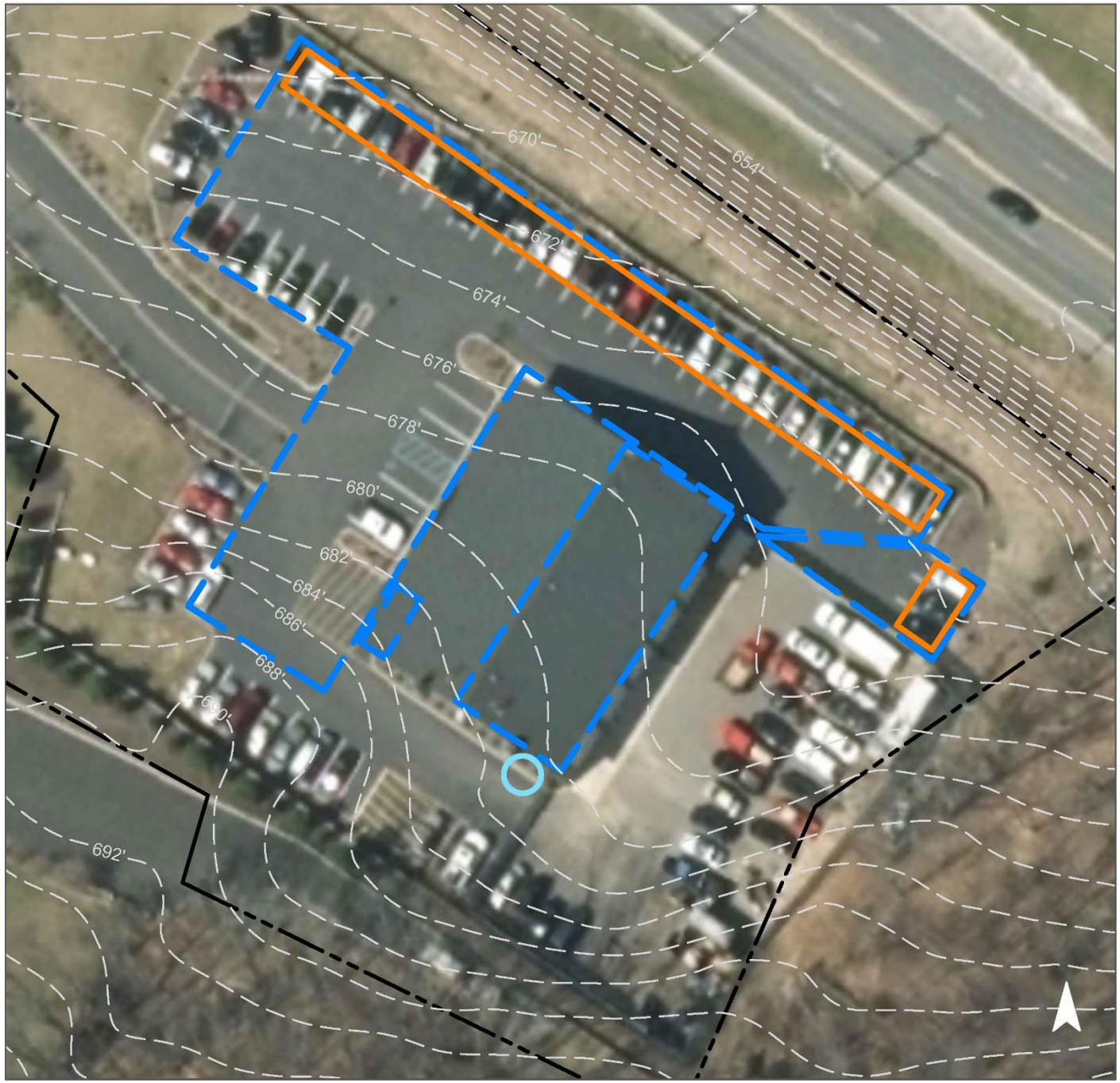
Block and Lot: Block 505, Lot 2

Stormwater is currently directed to the existing sewer system through connected downspouts. Parking spots can be replaced with porous asphalt to capture and infiltrate stormwater from the parking lot and roof. A cistern can be placed on the south corner of the building to capture roof runoff to be used for washing vehicles. 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"
63	58,737	2.8	29.7	269.7	0.046	1.61

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	0.757	127	55,721	2.02	5,190	$129,750
Rainwater harvesting	0.109	18	7,734	0.29	3,260 (gal)	$6,520

GREEN INFRASTRUCTURE RECOMMENDATIONS



123 Auto Sales

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

0 25' 50'

BRANCHVILLE HOSE COMPANY

Subwatershed: Culvers Creek

Site Area: 72,510 sq. ft.

Address: 1 Railroad Avenue
Branchville, NJ 07826

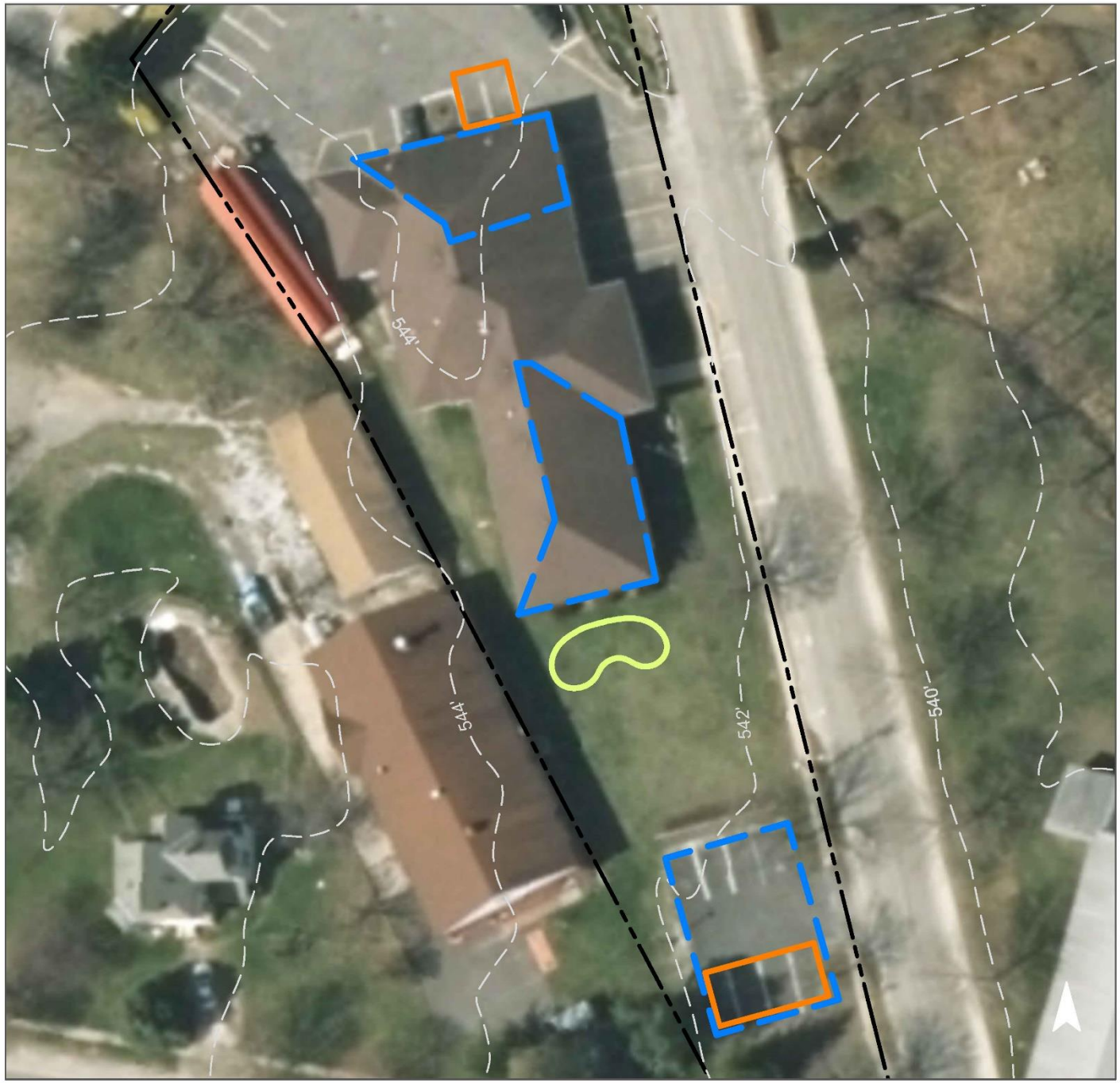
Block and Lot: Block 202, Lot 37

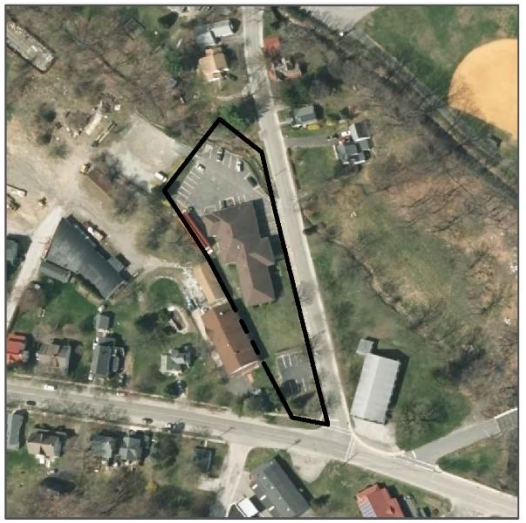
Stormwater is currently directed to an existing catch basin and the local sewer system. Parking spots in both the south and the north parking lot can be replaced with porous asphalt to capture and infiltrate stormwater. A rain garden adjacent to the building can capture, treat, and infiltrate roof runoff. 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"
69	33,349	1.6	16.8	153.1	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
Bioretention system	0.057	10	4,062	0.15	550	$2,750
Pervious pavement	0.116	19	9,410	0.35	1,000	$25,000

GREEN INFRASTRUCTURE RECOMMENDATIONS





Branchville Hose Company

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

0 25' 50'

BRANCHVILLE POST OFFICE

Subwatershed: Culvers Creek

Site Area: 27,906 sq. ft.

Address: 1 Broad Street
Branchville, NJ 07826

Block and Lot: Block 202, Lot 19,20

Stormwater is currently directed to an existing catch basin. Parking spots in the rear parking lot 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	23,720	1.1	12.0	108.9	0.018	0.65

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	0.338	57	23,988	0.90	2,315	$57,875

GREEN INFRASTRUCTURE RECOMMENDATIONS

Branchville Post Office

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

0 25' 50'

CASTNER AUCTION-APPRAISAL SERVICES

Subwatershed: Culvers Creek

Site Area: 6,969 sq. ft.

Address: 6 Wantage Avenue
Branchville, NJ 07826

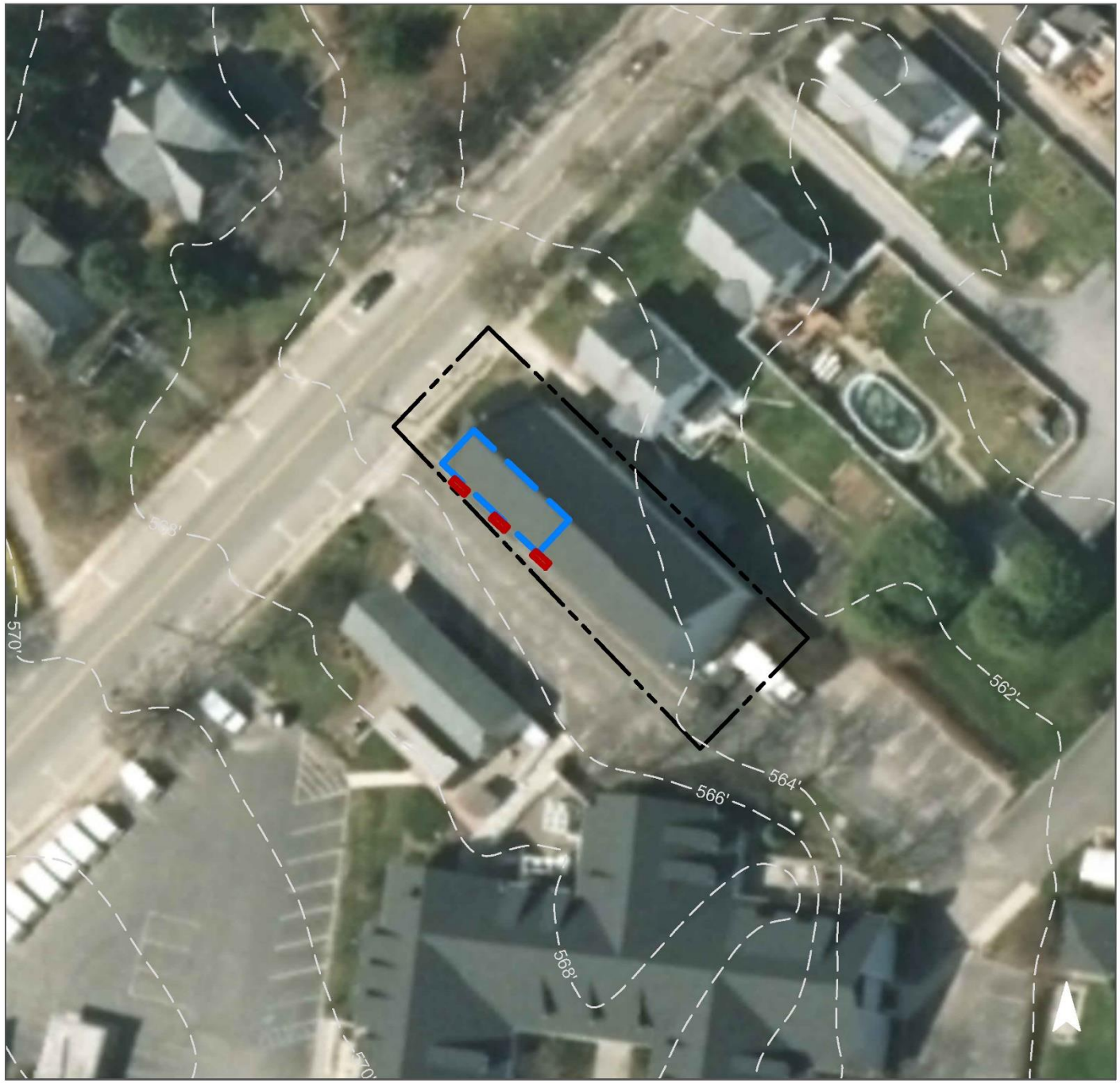
Block and Lot: Block 202, Lot 17

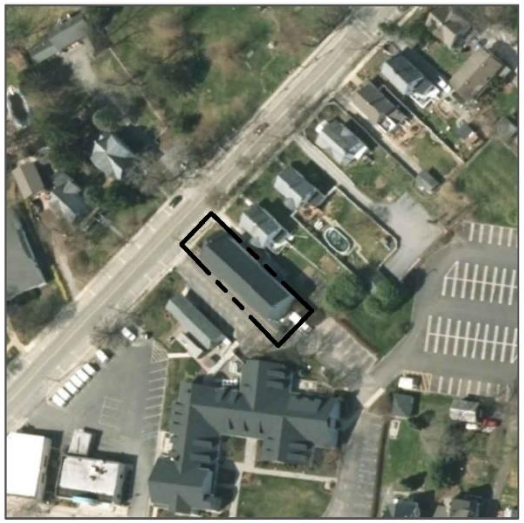
Stormwater currently drains toward the rear of the building. Three downspout planter boxes adjacent to the building can capture, treat, and infiltrate roof runoff. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

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"
85	5,923	0.3	3.0	27.2	0.005	0.16

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	0.017	2	n/a	n/a	36	$36,000

GREEN INFRASTRUCTURE RECOMMENDATIONS





Castner Auction-Appraisal Services

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

0 25' 50'

FIRST PRESBYTERIAN CHURCH

Subwatershed: Culvers Creek

Site Area: 34,192 sq. ft.

Address: 3 Wantage Avenue
Branchville, NJ 07826

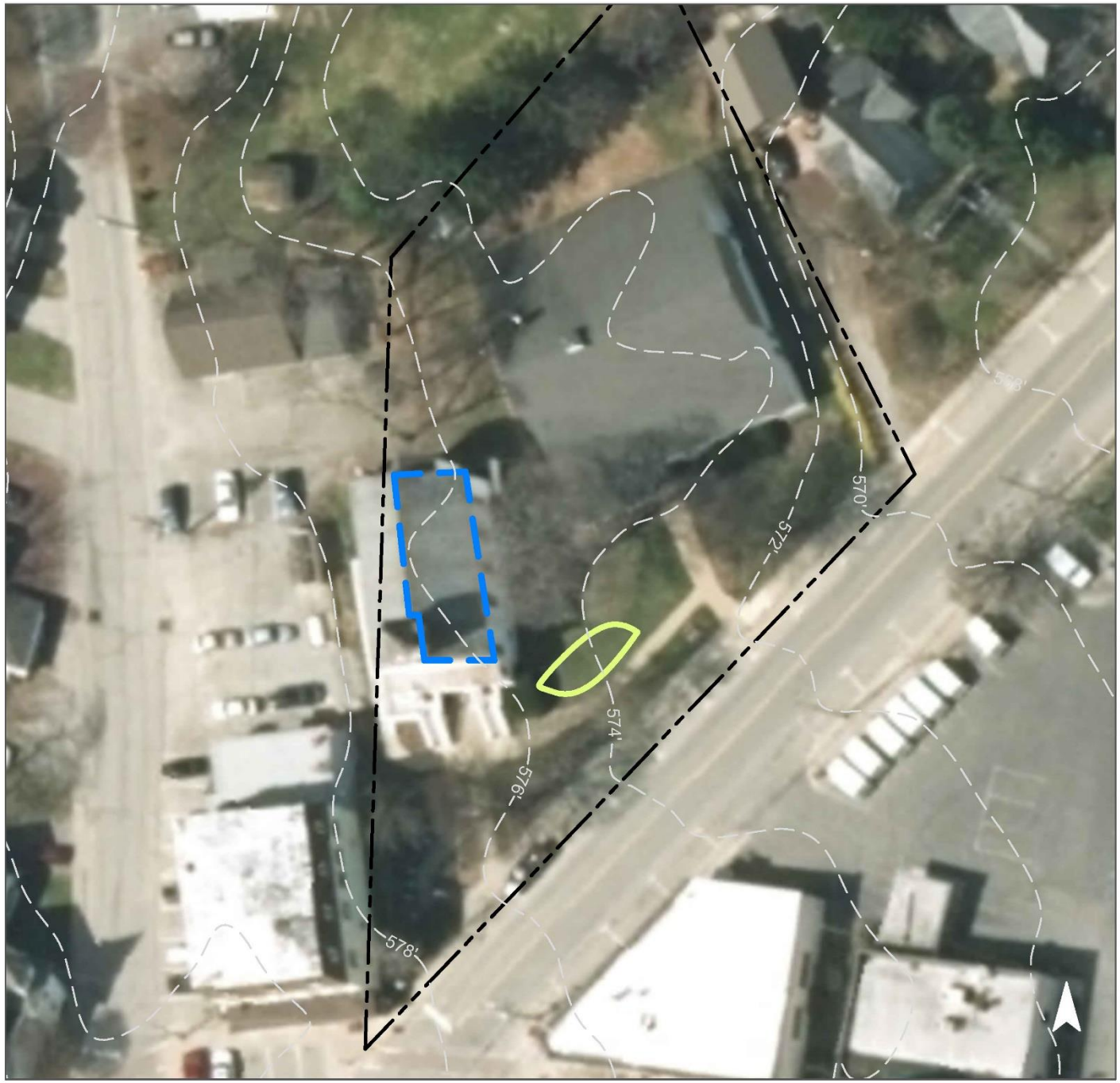
Block and Lot: Block 203, Lot 13,14,15

Stormwater is currently directed across the church's lawn causing erosion issues. A rain garden adjacent to the building on that lawn 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"
74	25,365	1.2	12.8	116.5	0.020	0.70

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	0.038	6	2,730	0.10	370	$9,250

GREEN INFRASTRUCTURE RECOMMENDATIONS



First Presbyterian Church

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

0 25' 50'

FRANKLIN MUTUAL INSURANCE

Subwatershed: Culvers Creek

Site Area: 134,648 sq. ft.

Address: 5 Broad Street
Branchville, NJ 07826

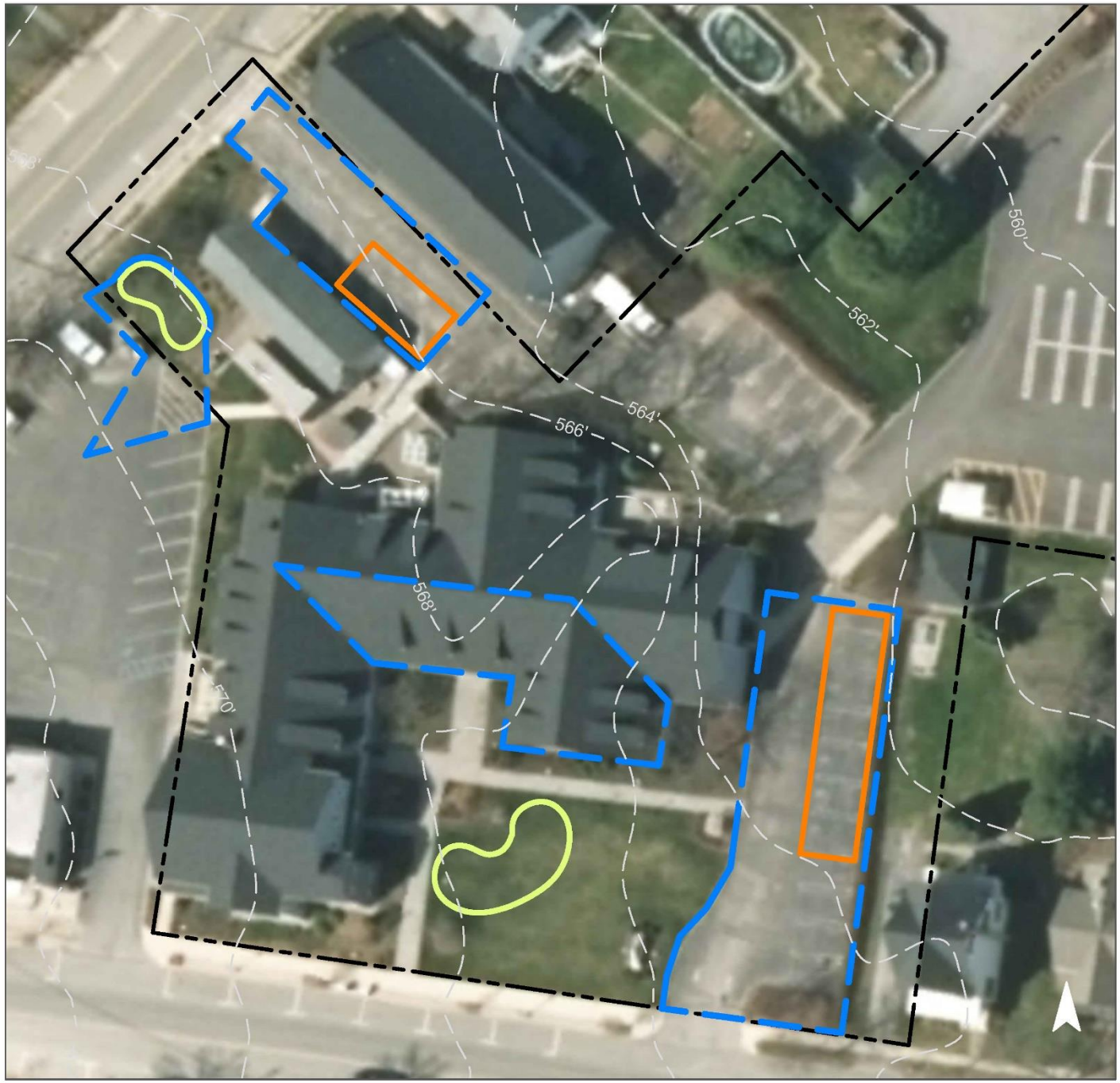
Block and Lot: Block 202, Lot 18,21,23

Stormwater is currently directed to the local sewer system through connected downspouts or existing catch basins. Parking spots on the east side of the building can be replaced with porous asphalt to capture and infiltrate stormwater. Rain gardens on the front lawn of the building can capture, treat, and infiltrate roof runoff. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
71	95,089	4.6	48.0	436.6	0.074	2.61

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	0.139	23	9,881	0.37	1,335	$6,675
Pervious pavement	0.291	49	20,316	0.78	1,995	$49,578

GREEN INFRASTRUCTURE RECOMMENDATIONS



Franklin Mutual Insurance

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

0 25' 50'

MONTAGUE TOOL & SUPPLY COMPANY

Subwatershed: Culvers Creek

Site Area: 177,110 sq. ft.

Address: 42 Broad Street
Branchville, NJ 07826

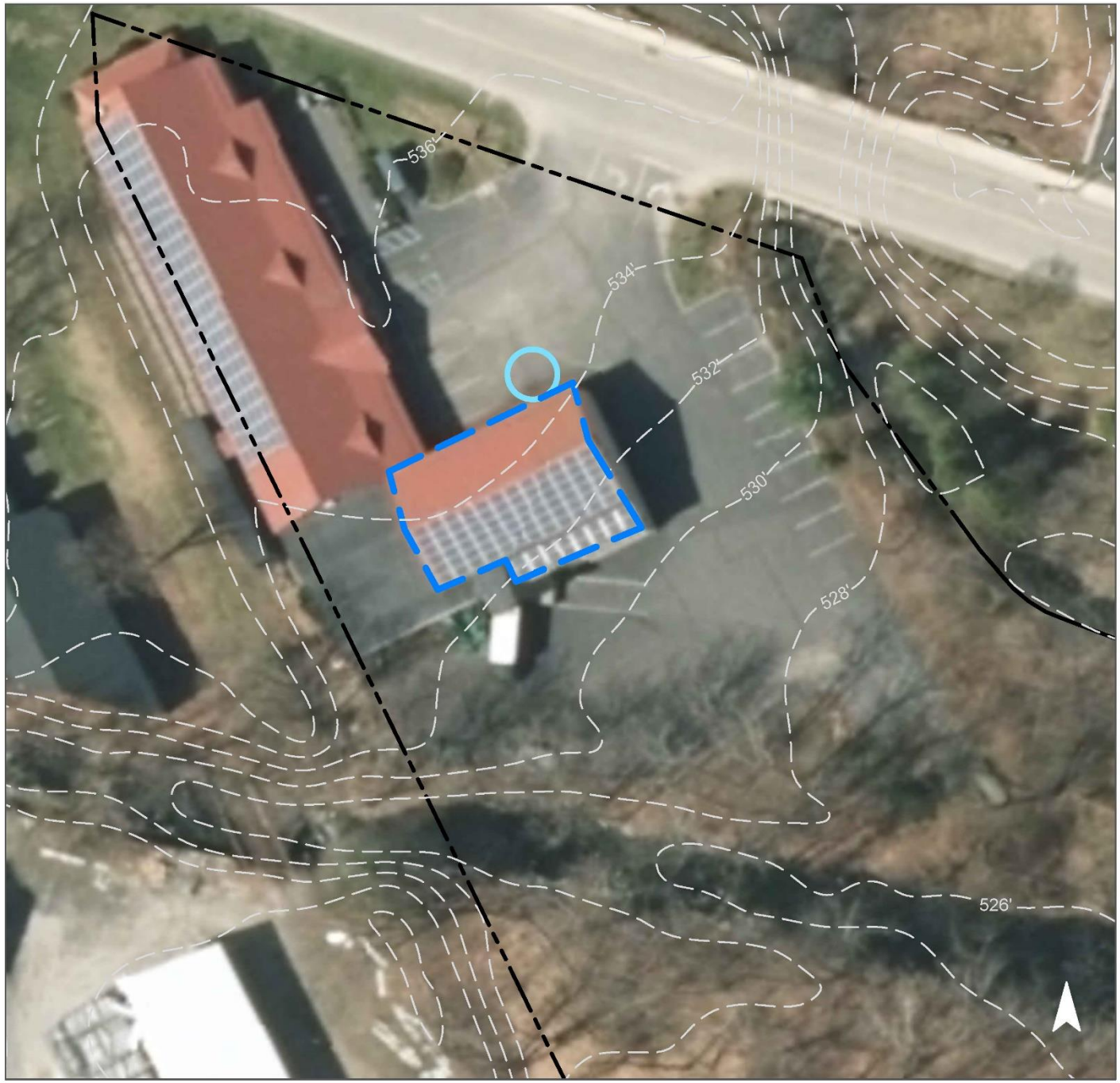
Block and Lot: Block 705, Lot 18

Stormwater is currently directed to the local sewer system by connected downspouts. A cistern can be installed on the south building to capture roof runoff. The water can then be used for 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"
19	34,455	1.7	17.4	158.2	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
Rainwater harvesting	0.085	14	6,014	0.23	2,500 (gal)	$5,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Montague Tool & Supply Company

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

0 25' 50'

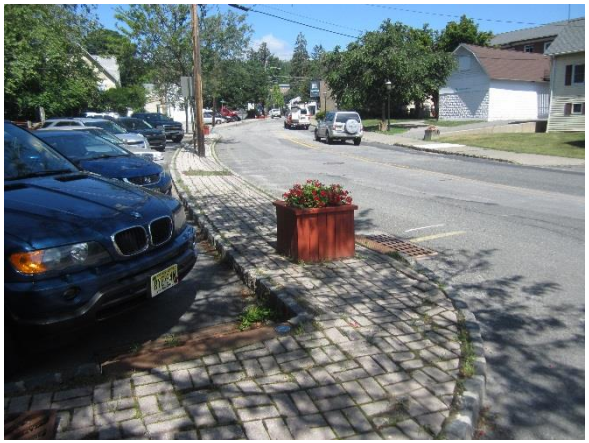
MUNICIPAL PARKING LOT

Subwatershed: Culvers Creek

Site Area: 10,657 sq. ft.

Address: 4 Mill Street
Branchville, NJ 07826

Block and Lot: Block 504, Lot 22



Stormwater is currently directed to an existing catch basin. Parking spots on the north side of the lot 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"
60	6,349	0.03	3.2	29.2	0.005	0.17

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	0.071	12	4,436	0.17	1,800	$45,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Municipal Parking Lot

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

0 25' 50'

UNITED METHODIST CHURCH

Subwatershed: Culvers Creek

Site Area: 15,820 sq. ft.

Address: 8 Broad Street
Branchville, NJ 07826

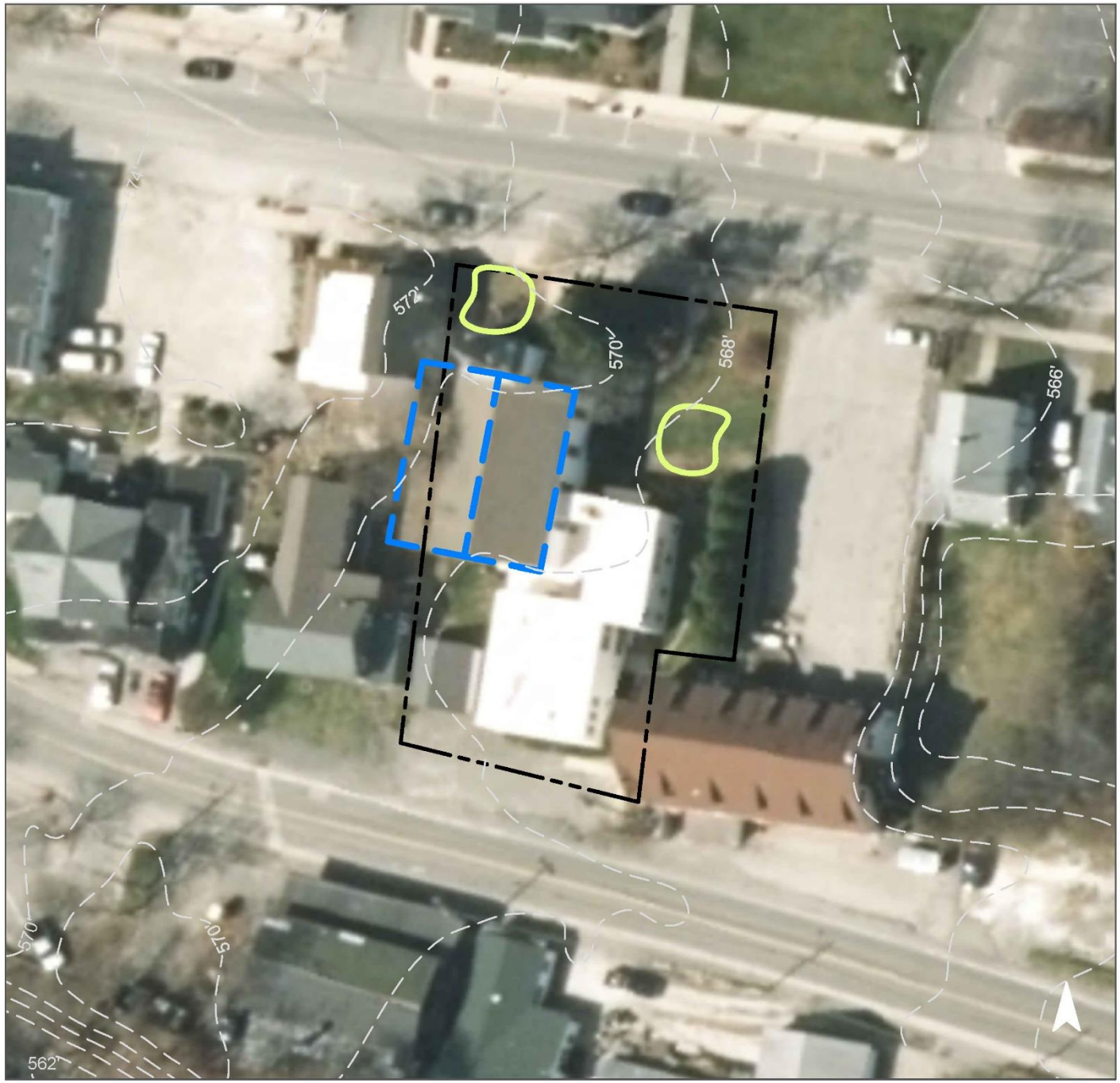
Block and Lot: Block 502, Lot 12

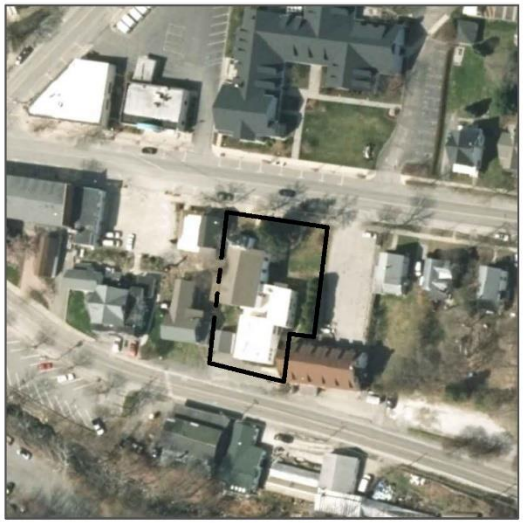
Stormwater is currently directed to the west side of the building where it is the cause of erosion issues. Rain gardens adjacent to the building can capture, treat, and infiltrate roof runoff. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

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"
75	11,865	0.6	6.0	54.5	0.009	0.33

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	0.078	13	5,550	0.18	750	$3,750

GREEN INFRASTRUCTURE RECOMMENDATIONS





United Methodist Church

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

0 25' 50'

WILCO AIR CONDITIONING REFRIGERATION & HEATING

Subwatershed: Culvers Creek

Site Area: 68,671 sq. ft.

Address: 15 Mill Street
Branchville, NJ 07826

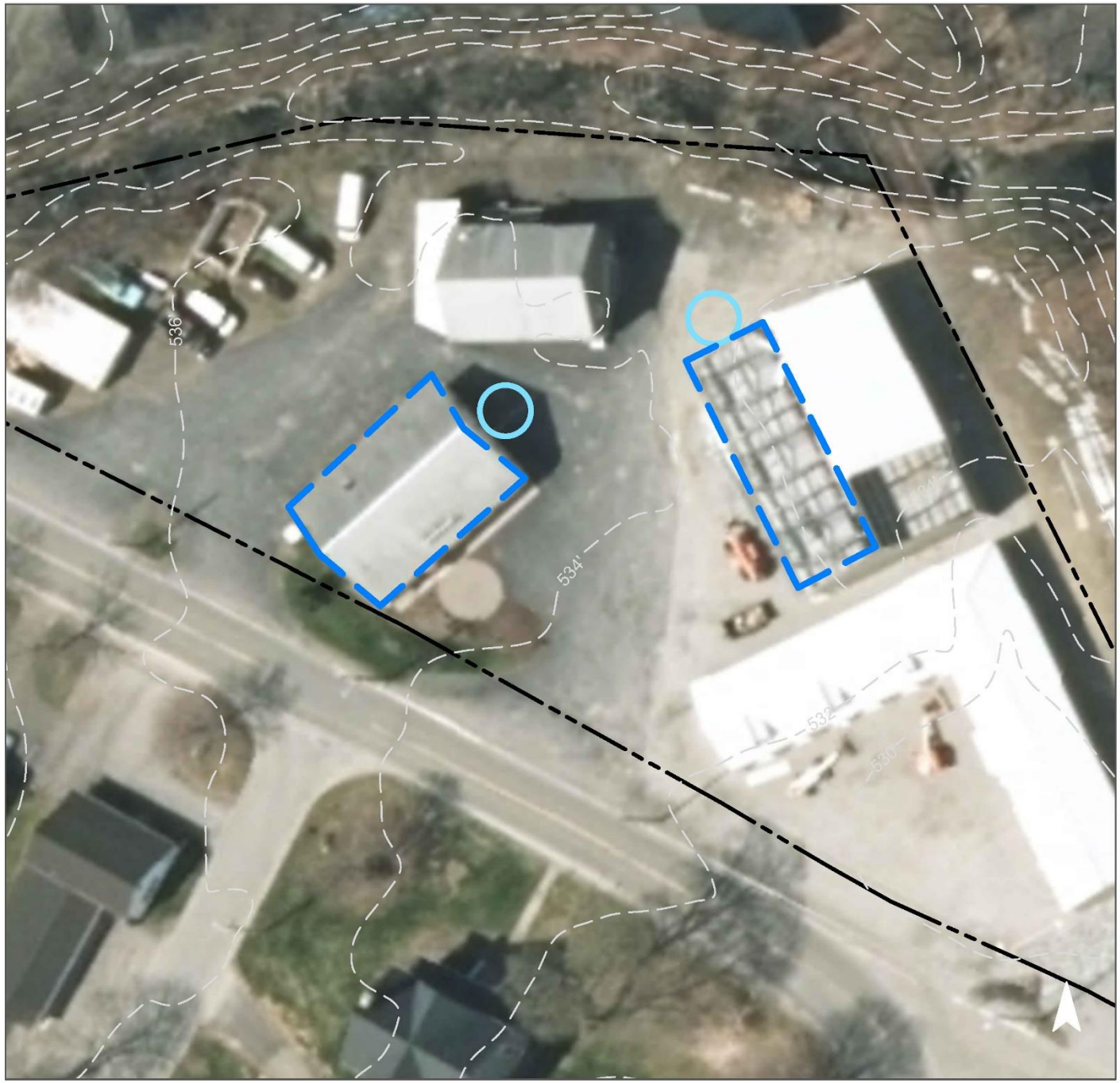
Block and Lot: Block 705, Lot 22

Stormwater is currently directed to the local sewer system by connected downspouts. Cisterns placed adjacent to the northwest building and the main building can capture roof runoff. The water can then be used for watering an existing garden on the property, washing vehicles, or 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"
81	55,897	2.7	28.2	256.6	0.044	1.53

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	0.135	23	9,582	0.36	4,035 (gal)	$8,070

GREEN INFRASTRUCTURE RECOMMENDATIONS



Wilco Air Conditioning Refrigeration & Heating

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

0 25' 50'

WOOD FUNERAL HOME

Subwatershed: Culvers Creek

Site Area: 46,478 sq. ft.

Address: 16 Main Street
Branchville, NJ 07826

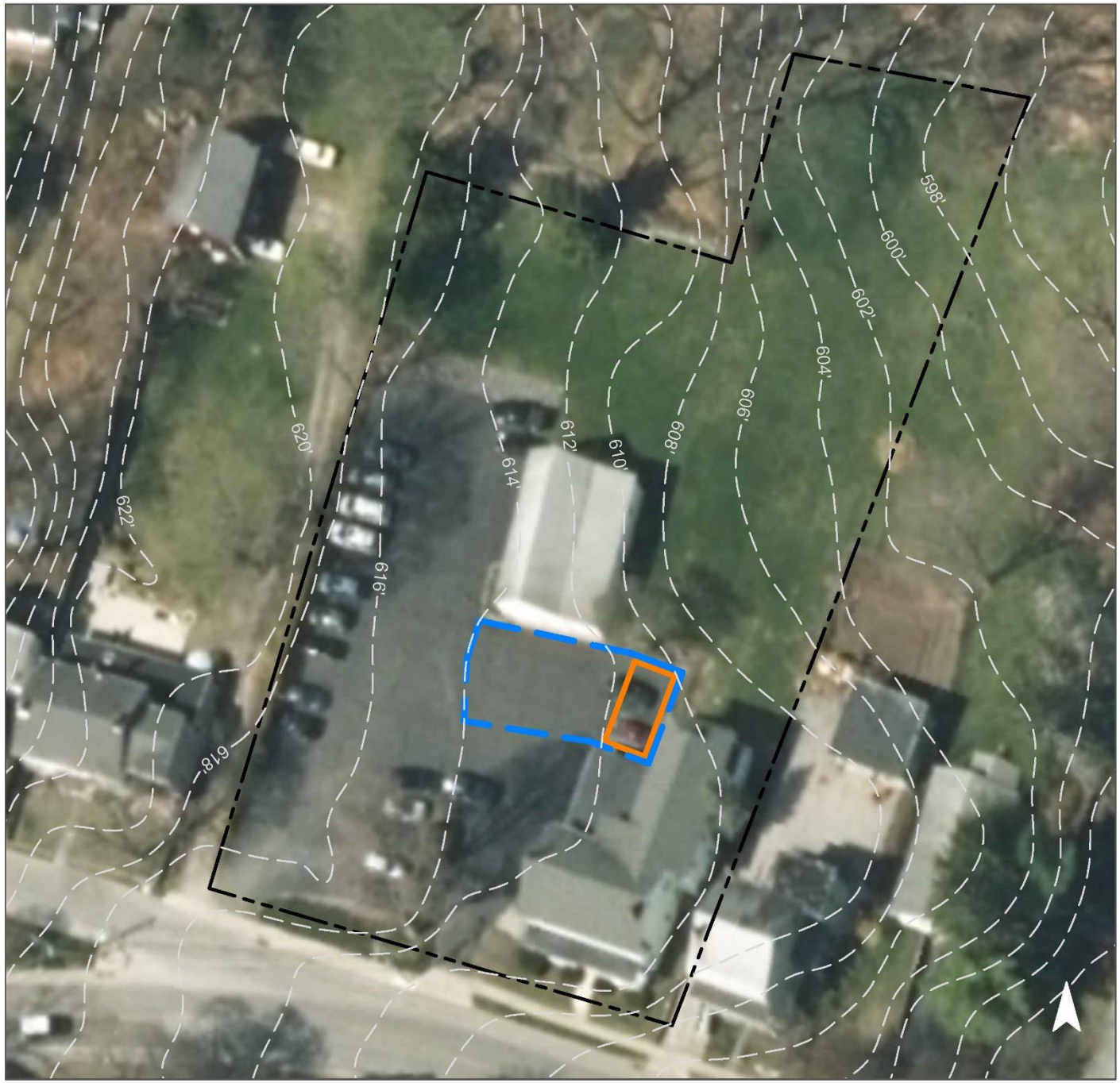
Block and Lot: Block 301, Lot 24

Stormwater currently flows across the parking lot. Parking spots adjacent to the south 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"
44	20,672	1.0	10.4	94.9	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 pavement	0.057	10	4,039	0.15	390	$9,750

GREEN INFRASTRUCTURE RECOMMENDATIONS



Wood Funeral Home

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

0 25' 50'

BRANCHVILLE BOROUGH OFFICE

Subwatershed: Dry Brook

Site Area: 106,329 sq. ft.

Address: 34 Wantage Avenue
Branchville, NJ 07826

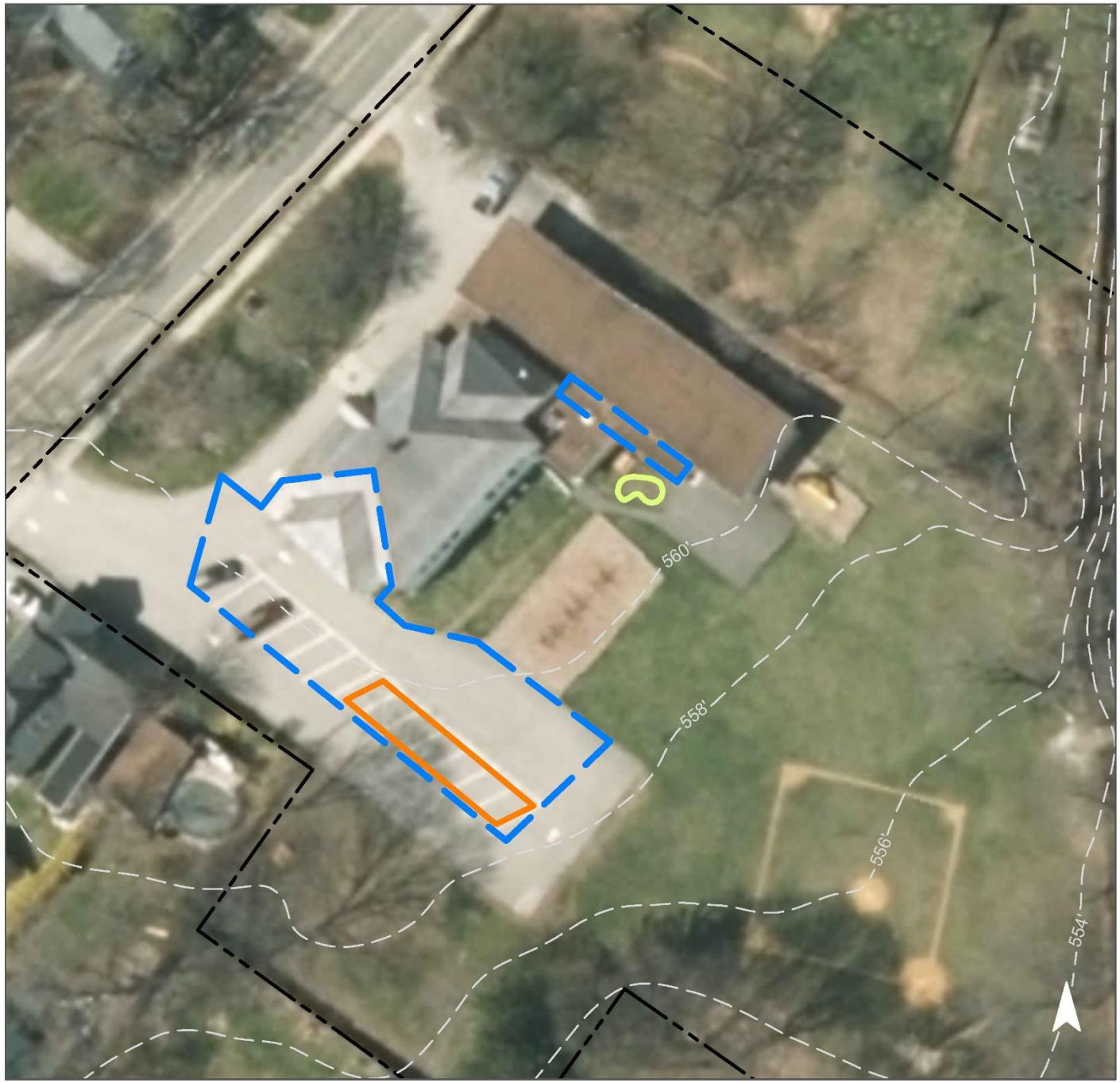
Block and Lot: Block 201, Lot 12

Stormwater is currently directed to an existing detention basin. Parking spots on the southwest side of the building can be replaced with porous asphalt to capture and infiltrate stormwater. A rain garden 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"
34	36,365	1.8	18.4	167.0	0.028	1.00

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	0.009	2	666	0.03	90	$450
Pervious pavement	0.165	28	11,706	0.44	1,130	$28,250

GREEN INFRASTRUCTURE RECOMMENDATIONS



Branchville Borough Office

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

0 25' 50'

BRANCHVILLE BOROUGH ROAD DEPARTMENT

Subwatershed: Dry Brook

Site Area: 88,172 sq. ft.

Address: 6 New Street
Branchville, NJ 07826

Block and Lot: Block 204, Lot 8

Stormwater is currently draining from the impervious surfaces of the property. A rain garden placed near an existing trench adjacent to the building can capture, treat, and infiltrate roof and impervious surface runoff. A cistern can be added to the smaller building to collect runoff for washing 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"
19	16,870	0.8	8.5	77.5	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 system	0.281	47	19,957	0.75	3,375	$16,875
Rainwater harvesting	0.042	7	3,014	0.11	1,300 (gal)	$2,600

GREEN INFRASTRUCTURE RECOMMENDATIONS

Branchville Borough Road Department

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

0 25' 50'

BRANCHVILLE COUNTRY VET CLINIC

Subwatershed: Dry Brook

Site Area: 19,520 sq. ft.

Address: 12 Maple Avenue
Branchville, NJ 07826

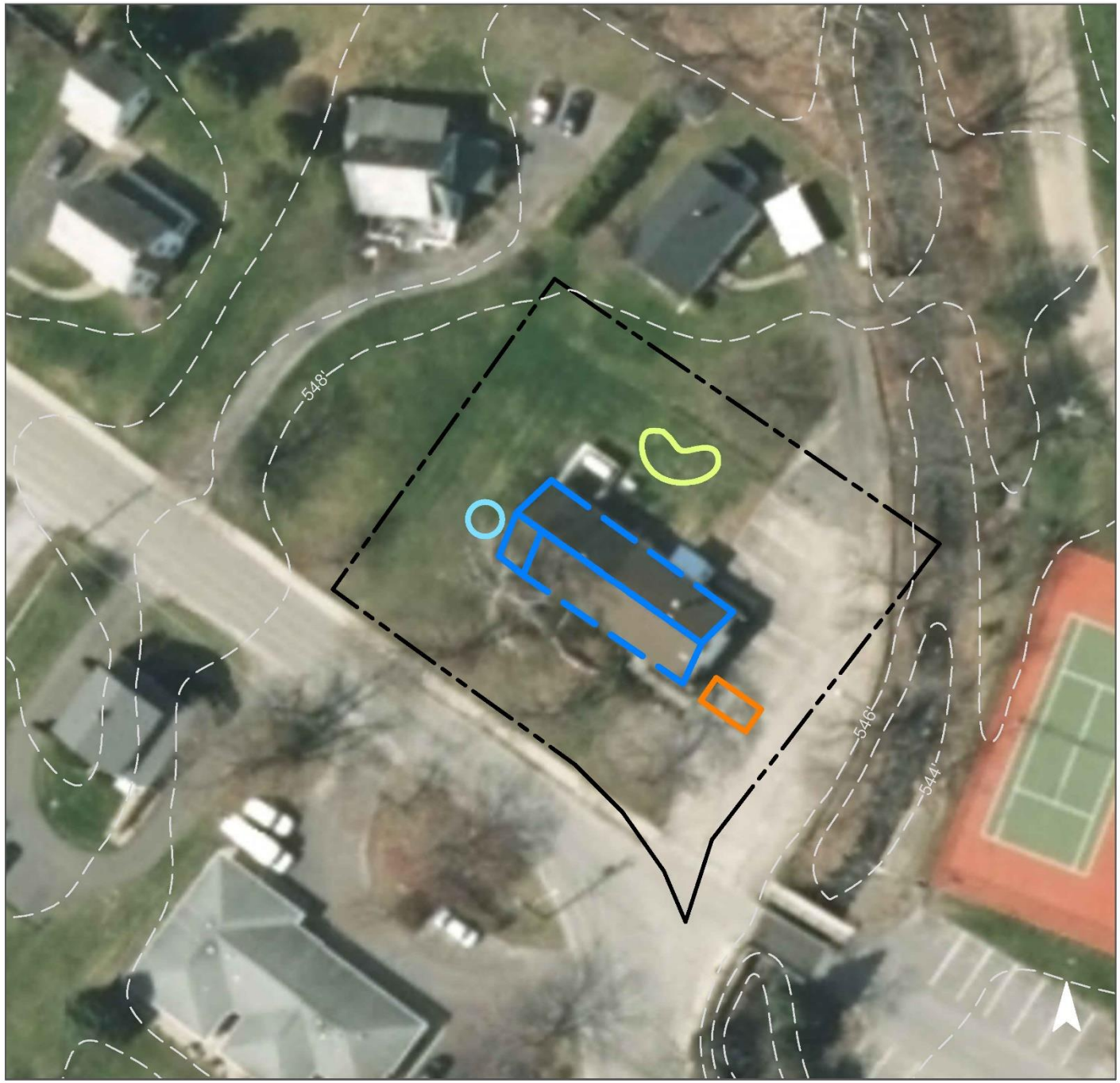
Block and Lot: Block 201, Lot 20

Stormwater is currently directed to drain from the parking lot towards Dry Brook. Parking spots adjacent to the building can be replaced with porous asphalt to capture and infiltrate stormwater. A rain garden in the yard placed away from the septic tank can capture, treat, and infiltrate roof runoff. A cistern placed at the north end of the property can capture roof runoff and be used to water the existing landscaping. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
37	7,240	0.3	3.7	33.2	0.006	0.20

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	0.029	5	2,027	0.08	275	$1,375
Pervious pavement	0.024	4	1,750	0.07	160	$4,000
Rainwater harvesting	0.004	1	277	0.01	120 (gal)	$240

GREEN INFRASTRUCTURE RECOMMENDATIONS



Branchville Country Vet Clinic

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

0 25' 50'

LAFAYETTE CLAY WORKS

Subwatershed: Dry Brook

Site Area: 87,263 sq. ft.

Address: 22 Wantage Avenue
Branchville, NJ 07826

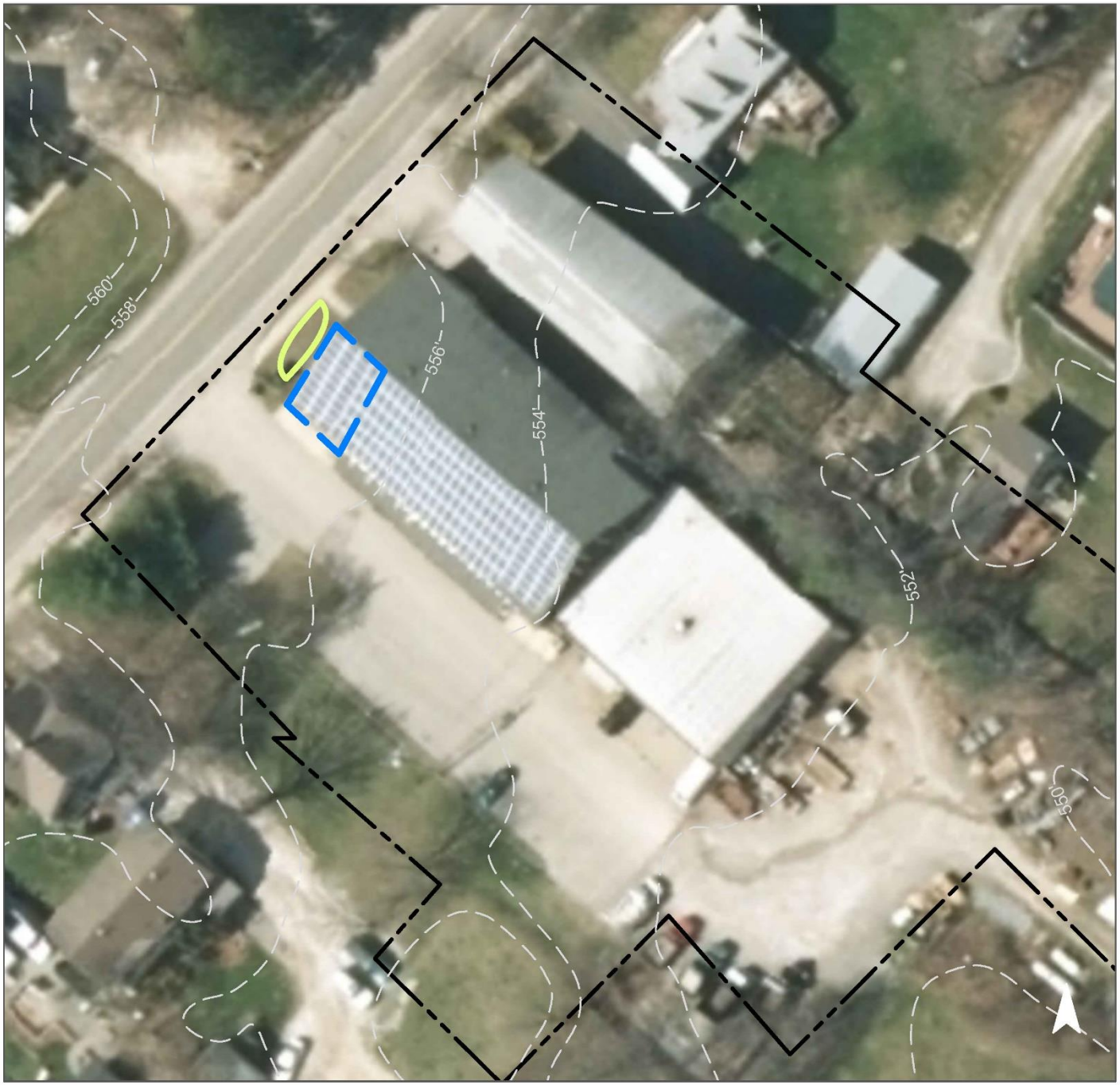
Block and Lot: Block 202, Lot 9

Stormwater is directed to the ground by disconnected downspouts. A rain garden 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"
62	53,841	2.6	27.2	247.2	0.042	1.48

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 system	0.017	3	1,182	0.04	160	$800

GREEN INFRASTRUCTURE RECOMMENDATIONS



Lafayette Clay Works

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

0 25' 50'

c. Summary of Existing Conditions

Summary of Existing Conditions

Subwatershed/Site Name/Total Site Info/GI Practice	Area (ac)	Area (SF)	Block	Lot	Existing Annual Loads TP (lb/yr)	Existing Annual Loads TN (lb/yr)	Existing Annual Loads TSS (lb/yr)	I.C. %	I.C. Area (ac)	I.C. Area (SF)	Runoff Volumes from I.C. Water Quality Storm (1.25" over 2-hours) (Mgal)	Runoff Volumes from I.C. Annual (Mgal)
CULVERS CREEK SUBWATERSHED	**15.26**	**664,848**			**17.9**	**187.6**	**1,705.3**		**8.53**	**371,421**	**0.289**	**10.19**
123 Auto Sales												
Total Site Info	2.16	93,998	505	2	2.8	29.7	269.7	62	1.35	58,737	0.046	1.61
Branchville Hose Company												
Total Site Info	1.11	48,399	202	37	1.6	16.8	153.1	69	0.77	33,349	0.026	0.91
Branchville Post Office												
Total Site Info	0.64	27,906	202	19,20	1.1	12.0	108.9	85	0.54	23,720	0.018	0.65
Castner Auction-Appraisal Services												
Total Site Info	0.16	6,969	202	17	0.3	3.0	27.2	85	0.14	5,923	0.005	0.16
First Presbyterian Church												
Total Site Info	0.78	34,192	203	13,14,15	1.2	12.8	116.5	74	0.58	25,365	0.020	0.70
Franklin Mutual Insurance												
Total Site Info	3.09	134,648	202	18,21,23	4.6	48.0	436.6	71	2.18	95,089	0.074	2.61
Montague Tool & Supply Company												
Total Site Info	4.07	177,110	705	18	1.7	17.4	158.2	19	0.79	34,455	0.027	0.94
Municipal Parking lot												
Total Site Info	0.24	10,657	504	22	0.3	3.2	29.2	60	0.15	6,349	0.005	0.17
United Methodist Church												
Total Site Info	0.36	15,820	502	12	0.6	6.0	54.5	75	0.27	11,865	0.009	0.33
Wilco Air Conditioning Refrigeration & Heating												
Total Site Info	1.58	68,671	705	22	2.7	28.2	256.6	81	1.28	55,897	0.044	1.53
Wood Funeral Home												
Total Site Info	1.07	46,478	301	24	1.0	10.4	94.9	44	0.47	20,672	0.016	0.57

Summary of Existing Conditions

Subwatershed/Site Name/Total Site Info/GI Practice	Area (ac)	Area (SF)	Block	Lot	Existing Annual Loads TP (lb/yr)	Existing Annual Loads TN (lb/yr)	Existing Annual Loads TSS (lb/yr)	I.C. %	I.C. Area (ac)	I.C. Area (SF)	Runoff Volumes from I.C. Water Quality Storm (1.25" over 2-hours) (Mgal)	Runoff Volumes from I.C. Annual (Mgal)
DRY BROOK SUBWATERSHED	**6.92**	**301,283**			**5.5**	**57.7**	**524.9**		**2.62**	**114,316**	**0.089**	**3.14**
Branchville Borough Office												
Total Site Info	2.44	106,328	201	12	1.8	18.4	167.0	34	0.83	36,365	0.028	1.00
Branchville Borough Road Department												
Total Site Info	2.02	88,172	204	8	0.8	8.5	77.5	19	0.39	16,870	0.013	0.46
Branchville Country Vet Clinic												
Total Site Info	0.45	19,520	201	20	0.3	3.7	33.2	37	0.17	7,240	0.006	0.20
Lafayette Clay Works												
Total Site Info	2.00	87,263	202	9	2.6	27.2	247.2	62	1.24	53,841	0.042	1.48

d. Summary of Proposed Green Infrastructure Practices

Summary of Proposed Green Infrastructure Practices

	Subwatershed/Site Name/Total Site Info/GI Practice	Potential Management Area Area (SF)	Potential Management Area Area (ac)	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Max Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cfs)	Size of BMP (SF)	Unit Cost ($)	Unit	Total Cost ($)	I.C. Treated %
	CULVERS CREEK SUBWATERSHED	**87,830**	**2.02**	**2.288**	**383**	**161,463**	**6.05**	**25,526**			**$395,265**	**23.6%**
1	**123 Auto Sales**											
	Pervious pavement	29,040	0.67	0.757	127	53,721	2.02	5,190	25	SF	$129,750	49.4%
	Rainwater harvesting	4,180	0.10	0.109	18	7,734	0.29	3,260	2	gal	$6,520	7.1%
	Total Site Info	**33,220**	**0.76**	**0.866**	**145**	**61,456**	**2.31**	**8,450**			**$136,270**	**56.6%**
2	**Branchville Hose Company**											
	Bioretention system	2,195	0.05	0.057	10	4,062	0.15	550	5	SF	$2,750	6.6%
	Pervious pavement	4,465	0.10	0.116	19	9,410	0.35	1,000	25	SF	$25,000	13.4%
	Total Site Info	**6,660**	**0.15**	**0.174**	**29**	**13,471**	**0.50**	**1,550**			**$27,750**	**20.0%**
3	**Branchville Post Office**											
	Pervious pavement	12,970	0.30	0.338	57	23,988	0.90	2,315	25	SF	$57,875	54.7%
	Total Site Info	**12,970**	**0.30**	**0.338**	**57**	**23,988**	**0.90**	**2,315**			**$57,875**	**54.7%**
4	**Castner Auction-Appraisal Services**											
	Planter boxes	645	0.01	0.017	2	n/a	n/a	36	1,000	SF	$36,000	10.9%
	Total Site Info	**645**	**0.01**	**0.017**	**2**	n/a	n/a	**36**			**$36,000**	**10.9%**
5	**First Presbyterian Church**											
	Biorention system	1,475	0.03	0.038	6	2,730	0.10	370	25	SF	$9,250	5.8%
	Total Site Info	**1,475**	**0.03**	**0.038**	**6**	**2,730**	**0.10**	**370**			**$9,250**	**5.8%**
6	**Franklin Mutual Insurance**											
	Bioretention systems	5,340	0.12	0.139	23	9,881	0.37	1,335	5	SF	$6,675	5.6%
	Pervious pavement	11,165	0.26	0.291	49	20,316	0.78	1,995	25	SF	$49,875	11.7%
	Total Site Info	**16,505**	**0.38**	**0.430**	**72**	**30,197**	**1.15**	**3,330**			**$56,550**	**17.4%**
7	**Montague Tool & Supply Company**											
	Rainwater harvesting	3,250	0.07	0.085	14	6,014	0.23	2,500	2	gal	$5,000	9.4%
	Total Site Info	**3,250**	**0.07**	**0.085**	**14**	**6,014**	**0.23**	**2,500**			**$5,000**	**9.4%**
8	**Municipal Parking lot**											
	Pervious pavement	2,740	0.06	0.071	12	4,436	0.17	1,800	25	SF	$45,000	43.2%
	Total Site Info	**2,740**	**0.06**	**0.071**	**12**	**4,436**	**0.17**	**1,800**			**$45,000**	**43.2%**

Summary of Proposed Green Infrastructure Practices

	Subwatershed/Site Name/Total Site Info/GI Practice	Potential Management Area Area (SF)	Potential Management Area Area (ac)	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Max Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cfs)	Size of BMP (SF)	Unit Cost ($)	Unit	Total Cost ($)	I.C. Treated %
9	**United Methodist Church**											
	Bioretention systems	3,000	0.07	0.078	13	5,550	0.18	750	5	SF	$3,750	25.3%
	Total Site Info	**3,000**	**0.07**	**0.078**	**13**	**5,550**	**0.18**	**750**			**$3,750**	**25.3%**
10	**Wilco Air Conditioning Refrigeration & Heating**											
	Rainwater harvesting	5,180	0.12	0.135	23	9,582	0.36	4,035	2	gal	$8,070	9.3%
	Total Site Info	**5,180**	**0.12**	**0.135**	**23**	**9,582**	**0.36**	**4,035**			**$8,070**	**9.3%**
11	**Wood Funeral Home**											
	Pervious pavement	2,185	0.05	0.057	10	4,039	0.15	390	25	SF	$9,750	10.6%
	Total Site Info	**2,185**	**0.05**	**0.057**	**10**	**4,039**	**0.15**	**390**			**$9,750**	**10.6%**
	DRY BROOK SUBWATERSHED	**21,903**	**0.50**	**0.571**	**96**	**40,579**	**1.53**	**6,610**			**$54,590**	**19.2%**
12	**Branchville Borough Office**											
	Bioretention system	360	0.01	0.009	2	666	0.03	90	5	SF	$450	1.0%
	Pervious pavement	6,328	0.15	0.165	28	11,706	0.44	1,130	25	SF	$28,250	17.4%
	Total Site Info	**6,688**	**0.15**	**0.174**	**29**	**12,372**	**0.47**	**1,220**			**$28,700**	**18.4%**
13	**Branchville Borough Road Department**											
	Bioretention system	10,790	0.25	0.281	47	19,957	0.75	3,375	5	SF	$16,875	64.0%
	Rainwater harvesting	1,630	0.04	0.042	7	3,014	0.11	1,300	2	gal	$2,600	9.7%
	Total Site Info	**12,420**	**0.29**	**0.324**	**54**	**22,971**	**0.86**	**4,675**			**$19,475**	**73.6%**
14	**Branchville Country Vet Clinic**											
	Bioretention system	1,095	0.03	0.029	5	2,027	0.08	275	5	SF	$1,375	15.1%
	Pervious pavement	910	0.02	0.024	4	1,750	0.07	160	25	SF	$4,000	12.6%
	Rainwater harvesting	150	0.00	0.004	1	277	0.01	120	2	gal	$240	2.1%
	Total Site Info	**2,155**	**0.05**	**0.056**	**9**	**4,054**	**0.16**	**555**			**$5,615**	**29.8%**
15	**Lafayette Clay Works**											
	Bioretention system	640	0.01	0.017	3	1,182	0.04	160	5	SF	$800	1.2%
	Total Site Info	**640**	**0.01**	**0.017**	**3**	**1,182**	**0.04**	**160**			**$800**	**1.2%**