Technical Memorandum

To: Peter DiSclafani, Supervisor – Town of Shandaken, NY

From: **SLR Engineering, Landscape Architecture, and Land Surveying, P.C.**
Adam Doan – Principal Water Resources Scientist
Ethan Ely, PE – Water Resources Engineer

Date: September 19, 2025

Project No. 143.14615.00039

RE: Pine Hill Community Center Stormwater Management Feasibility Study

Introduction

The hamlet of Pine Hill in the Town of Shandaken, New York, experiences frequent, localized flooding from stormwater runoff along Main Street. This flooding negatively impacts the residences and commercial areas. Stormwater runoff flows also cause erosion and subsequently transport eroded materials to Birch Creek and its tributaries, degrading water quality. The existing drainage infrastructure along Main Street has fallen into disrepair and is inadequate for managing runoff volumes.

The Town of Shandaken (Town) initiated a stormwater retrofit project to address these issues and in February 2017 retained SLR Engineering, Landscape Architecture, and Land Surveying, P.C. (SLR, formerly Milone & MacBroom, Inc.) to develop conceptual design plans for stormwater improvements. SLR met with Town leaders and community members and developed a set of conceptual plans for stormwater improvements (Attachment A). During the intervening time since the plans were completed, the Town has been investigating the possibility of utilizing various properties along Main Street for providing additional stormwater treatment. In September 2022, SLR, on behalf of the Town, evaluated the feasibility of implementing Stormwater Management Practices (SMPs) on the Town-owned firehouse property (265 Main Street). Due to various site constraints and the results of infiltration testing, a dry swale system was proposed as the most practical option for stormwater treatment at the property (Attachment B).

The Town is now looking to evaluate the feasibility of implementing stormwater detention and treatment at a site next to the Pine Hill Community Center. The Town hopes that the stormwater system at the Community Center will be part of the future drainage retrofit project along Main Street in Pine Hill. SLR was retained to conduct a feasibility study that included a field assessment, test pits, infiltration testing, and stormwater runoff analysis. The results of the tests and an evaluation of the proposed treatment site are described in this memorandum.

Field Assessment

On May 1, 2025, SLR performed a field assessment of the project area in Pine Hill. The primary objectives were to document the existing drainage infrastructure, evaluate the area available for SMP development, perform test pits, and conduct infiltration tests. A Trimble TDC650 GNSS handheld data collector, which uses cellular data for real-time kinematic (RTK) correction, was used during the site visit to geolocate drainage infrastructure and identify runoff flow paths. Horizontal and vertical positioning is based on the NAD83 New York (East) State Plane horizontal datum and NAVD88 vertical datum, respectively.

Site Description

Stormwater runoff in the hamlet of Pine Hill generally flows down Main Street from the intersection with Bonnie View Avenue and Pine Hill Road to the bridge over Birch Creek, with an

average gutter slope of approximately 4 percent. Stormwater runoff from the impervious surfaces south of Main Street flows northeast, concentrating along Main Street. The roadway generally contains the runoff, due to the paved curbs, until the water reaches the southeastern end of Main Street where the road flattens out. At the bottom of the hill, runoff ponds until it spills over the edge of the road and flows down into Birch Creek. During short, intense rainstorms, several buildings along Main Street are impacted by nuisance flooding as the drainage system is overwhelmed and surcharging water is directed towards the buildings.

The proposed stormwater treatment area is located in a small green space separating the Pine Hill Community Center parking lot from Main Street (Attachment C). The site is a rectangular, grass-covered area, approximately 90 feet long by 40 feet wide (Figure 1). Within the area, there are several small trees, an electrical box, and a Veterans Memorial with a small walkway leading to the memorial. Two curb stops and a spigot for the Town's drinking water system are located at the northeast corner of the site. The site slopes to the southeast, causing stormwater runoff to flow to the corner of the parking lot where there are two catch basins. The parking lot appears to be a combination of gravel and deteriorated asphalt pavement.

Figure 1: Proposed site for a stormwater treatment system in Pine Hill. Photo taken on May 1, 2025.

The existing stormwater drainage infrastructure along Main Street consists of seven catch basins, with four at the top of the hill near the intersection of Main Street, Bonnie View Avenue, and Pine Hill Road, and three at the bottom near the bridge over Birch Creek. Several of the catch basins are filled with sediment, limiting their capacity to convey stormwater. The two catch

basins located at the southeastern corner of the community center parking lot appear to connect to a segment of the drainage system that flows southeast parallel with Main Street, crossing behind and under several buildings. The discharge location for this segment of the drainage system was not identified. One of the pipes along this segment has reportedly collapsed or is clogged with debris, causing water to surcharge out of the ground behind the house at 285 Main Street. The water anecdotally flows year-round because the drainage system intercepts groundwater. During rainstorms, the community center parking lot and the house at 285 Main Street can become flooded because runoff cannot drain through the damaged drainage system.

Test Pits and Permeability Tests

In order to observe subsurface conditions and determine the suitability of existing soils to support the infiltration of stormwater, two test pits and field permeability tests were conducted with assistance from Shandaken's Highway Department (SHD). The test pits were excavated to a depth of 6.5 feet below ground level at the proposed stormwater treatment site. At each test pit, soil samples were collected to evaluate the soil composition and texture. Field permeability tests were performed according to New York State Department of Environmental Conservation guidelines (NYSDEC, 2024) at the base of each test pit.

To pre-saturate the soil for the tests, casings were installed and filled with water. Due to the high infiltration rates of the soil, the water rapidly drained out of the casings over several minutes. To ensure that saturated conditions were achieved, the Town Highway Department used a fire truck to pump a combined volume of approximately 350 gallons of water into the two casings until ponded water could be seen in the surrounding area of the pit. Once the soils were saturated, permeability tests were performed by filling the casings with water and monitoring the water level within the casings over a period of approximately 10 minutes, or until the water fully infiltrated. The permeability rate was considered stable when the change in water level over a period of 1 minute remained constant.

Results and Analysis

According to the Soil Survey Geographic Database (SSURGO) for Ulster County, the native soils underlying the project site consist of Valois very bouldery soils (soil symbol VAB), which are in hydrologic soil group B (i.e., soils with a moderately low runoff potential and saturated hydraulic conductivity between 0.57 to 1.42 inches per hour). The soil along the bottom of both pits was identified as a light brown, fine sandy loam with some gravel and cobbles. The upper layers of soil consisted of fill material, large stones, and the burnt remains of a building that was previously located at the site (Figure 2). The stacked stone foundation of the building extended up to 5 feet below the ground surface. During test pit excavation, neither groundwater nor bedrock were encountered.

The field permeability tests were repeated several times at each location (Table 1). The lowest permeability rates for Tests #1 and #2 were 22.5 inches per hour and 60 inches per hour, respectively. The results of the permeability testing indicate that the proposed site is favorable for the implementation of SMPs that promote infiltration. NYSDEC stormwater management guidelines advise that native soils must have a minimum infiltration rate of 0.5 inches per hour to be suitable for infiltration. With a minimum measured rate of 22.5 inches per hour, the native soil exceeds this requirement.

Table 1: Permeability Test Results

Trial Number	Permeability Test #1 (Inches/hour)	Permeability Test #2 (Inches/hour)
1	45.0	60.0
2	22.5	60.0
3	30.0	

Figure 2: Stone foundation, construction debris, and burnt rubble from former building in Test Pit #2.
Picture taken on May 1, 2025.

Stormwater Management Alternatives

Despite the presence of construction debris on the site, which would need to be managed during construction, the permeability testing indicates that the installation of an SMP is a viable option at the proposed site. However, several other factors should be considered in addition to the infiltration rate when evaluating the feasibility of SMPs, including the area available for the system, the existing topography of the site, and the composition of the drainage area to be treated. The proposed site for the SMP has a usable area of approximately 3,000 square feet

and is constrained by Main Street to the north, the community center parking lot to the south, the drinking water spigot and curb stops to the east, and the parking lot entrance to the west. The Veterans Memorial and associated walkway, a flagpole, electrical box, and several small shrubs are also located within the area and would need to be relocated in order to use the area for stormwater treatment.

Redirecting the parking lot runoff to the proposed SMP site would be challenging because the southern end of the parking lot is 1 to 3 feet lower than the ground surface of the proposed stormwater treatment area. Alternatively, a portion of the stormwater runoff that flows down Main Street could be redirected to the proposed SMP site by installing a stormwater collection system along the road, as proposed in the 2017 concept design plan (Attachment A).

Two viable SMP options for the project site are infiltration basins and underground infiltration systems. Infiltration basins are excavated dry ponds that temporarily store stormwater runoff, allowing the water to infiltrate into the ground. The systems are vegetated to help maintain infiltration rates, remove nutrients, capture carbon, treat contaminants, and prevent soil erosion. Infiltration practices, such as infiltration basins, are a simple, cost-effective method for stormwater management that will reduce stormwater runoff volumes and remove stormwater pollutants. Infiltration basins require moderate levels of maintenance, including removal of trash, debris, garbage, and accumulated sediment as well as vegetation management to maintain stormwater infiltration rates.

Underground infiltration systems are composed of buried pipes or proprietary vaults that temporarily store stormwater, allowing runoff to infiltrate into the surrounding native soils. While the infiltration basin is limited by the amount of open space available, the underground infiltration system could be extended below the community center parking lot and could therefore be designed to treat stormwater runoff from a larger drainage area. No parking spaces would be lost, and the Veterans Memorial could be reinstalled at its current location following construction. These systems are advantageous for space-limited urban environments but generally have high initial construction costs and higher maintenance requirements. Table 2 provides a list of advantages and disadvantages for the two SMPs.

Table 2: SMP Advantages and Disadvantages

SMP	Advantages	Disadvantages
Infiltration Basin	- Simple to design/construct - Reduces runoff volumes - High pollutant removal rates - Lower construction cost	- Size limited by available aboveground space - Need to relocate Veterans Memorial - Moderate maintenance requirements
Underground Infiltration System	- Reduces runoff volumes - High pollutant removal rates - Large runoff storage capacity - Size not limited by space constraints	- Higher construction cost - Moderate maintenance requirements - Accommodates Veterans Memorial

Recommendations

Based on the project goals, site constraints, and high permeability of the native soils, installation of an infiltration basin is recommended for the project site. With the available space, an infiltration basin would have the capacity to infiltrate 100 percent of the water quality volume (WQv) of 2,400 cubic feet of runoff from the 0.83-acre area that drains to Main Street upstream of the project site (Table 3). The drainage area consists of the upper portion of Main Street between the intersection with Bonnie View Avenue and the community center parking lot and some of the residential properties along the southern side of Main Street. According to the NYSDEC *Stormwater Management Design Manual* (2024), pretreatment should be provided for 50 percent of the WQv to remove sediment from the stormwater before it is infiltrated. Due to space constraints, pretreatment could be provided in the form of a hydrodynamic separator installed upstream of the infiltration basin along the stormwater collection system.

Table 3: Proposed SMP Design Variable

Design Variable	Value
Drainage Area	0.83 acres
Impervious Area	0.57 acres
Native Soil Infiltration Rate	22.5 inch/hour
WQv	2,400 cubic feet
Max System Depth	3 feet
Maximum System Storage Volume	4,280 cubic feet
% Removal – Total Suspended Solids*	>80%
% Removal – Total Phosphorous*	>40%

*Removal efficiencies reported in 2024 NYSDEC *Stormwater Manual*

An opinion of probable cost for the proposed SMP at the Pine Hill Community Center is provided in Table 4. The cost opinion is subject to the following assumptions:

- Cost opinion excludes costs associated with design, permitting, and bid assistance.
- Cost opinion excludes costs for stormwater collection system.
- Cost opinion assumes 2026 construction date.
- Fill material and buried rubble excavated from the site is not contaminated and can be reused as general fill or disposed of off site.

Table 4: Opinion of Probably Cost – Feasibility Level

COST OPINION - FEASIBILITY LEVEL
Pine Hill Stormwater Feasibility Study
Pine Hill, NY
July 28, 2025

Description	Amount ($)
MOBILIZATION/DEMOBILIZATION	$ 25,000
SEDIMENT AND EROSION CONTROL	$ 10,000
INFILTRATION BASIN	$ 41,000
HYDRODYNAMIC SEPARATOR	$ 32,000
RESTORATION	$ 5,000
DISPOSAL OF BURIED RUBBLE	$ 30,000
SUBTOTAL (ROUNDED)	**$ 143,000**
CONSTRUCTION CONTINGENCY (30%)	**$ 42,900**
TOTAL (ROUNDED)	**$ 190,000**

The proposed infiltration basin should be integrated into the conceptual design for stormwater improvements in Pine Hill initially develop by SLR in 2017. The attached plans (Attachment C) provide a proposed layout for the infiltration basin and show how the system could be integrated into the proposed stormwater collection system along Main Street. The two catch basins located at the southern edge of the Pine Hill Community Center parking lot should be replaced and connected to the Main Street stormwater collection system to help reduce flooding of the parking lot and nearby properties. The discharge location for the stormwater system would be located at the Main Street crossing over Birch Creek where the existing drainage system discharges into Birch Creek.

A dry swale could be incorporated into the stormwater system at the firehouse property, as recommended in the 2022 stormwater feasibility study, to provide additional stormwater treatment. Currently, the Town of Shandaken has not identified any other potential locations for implementation of stormwater treatment in Pine Hill. As is shown on the 2017 concept design plans, proprietary systems such as hydrodynamic separators should be incorporated into the stormwater collection system to provide additional treatment for stormwater not being conveyed to an SMP.

Next Steps

This analysis was completed as an initial phase to evaluate the feasibility of installing an SMP at the proposed site near the Pine Hill Community Center parking lot. The next phase of the project would entail updating the stormwater improvements concept design from 2017 to include the proposed infiltration basin and advancing the design. For the next phase, the following tasks will need to be completed:

- Soil testing to determine if the fill material at the proposed stormwater treatment site is contaminated
- Hydrologic and hydraulic modeling for the existing and proposed drainage systems
- Detailed survey of utilities and thorough review of Town records to evaluate potential conflicts between the proposed stormwater improvements and existing utilities

- Advancement of design, plans, and cost opinions through final design
- Development of design specifications
- Regulatory permitting
- Development of SMP maintenance guidelines

Attachments

Attachment A: Pine Hill Stormwater Improvements – Concept Design Plans (October 2017)

Attachment B: Pine Hill Stormwater Feasibility Study Memorandum (September 6, 2022)

Attachment C: Pine Hill Community Center Stormwater Management Feasibility Plans (September 2025)

Attachment D: Field Permeability Test Results

Attachment E: Stormwater Calculations

References

Stormwater Management Design Manual. July 31, 2024. New York State Department of Environmental Conservation (NYSDEC).

BMP Efficiency. Nonpoint Source Guidance and Technical Assistance. New York State Department of Environmental Conservation (NYSDEC). https://dec.ny.gov/environmental-protection/water/water-quality/nps-program/guidance-and-technical-assistance.

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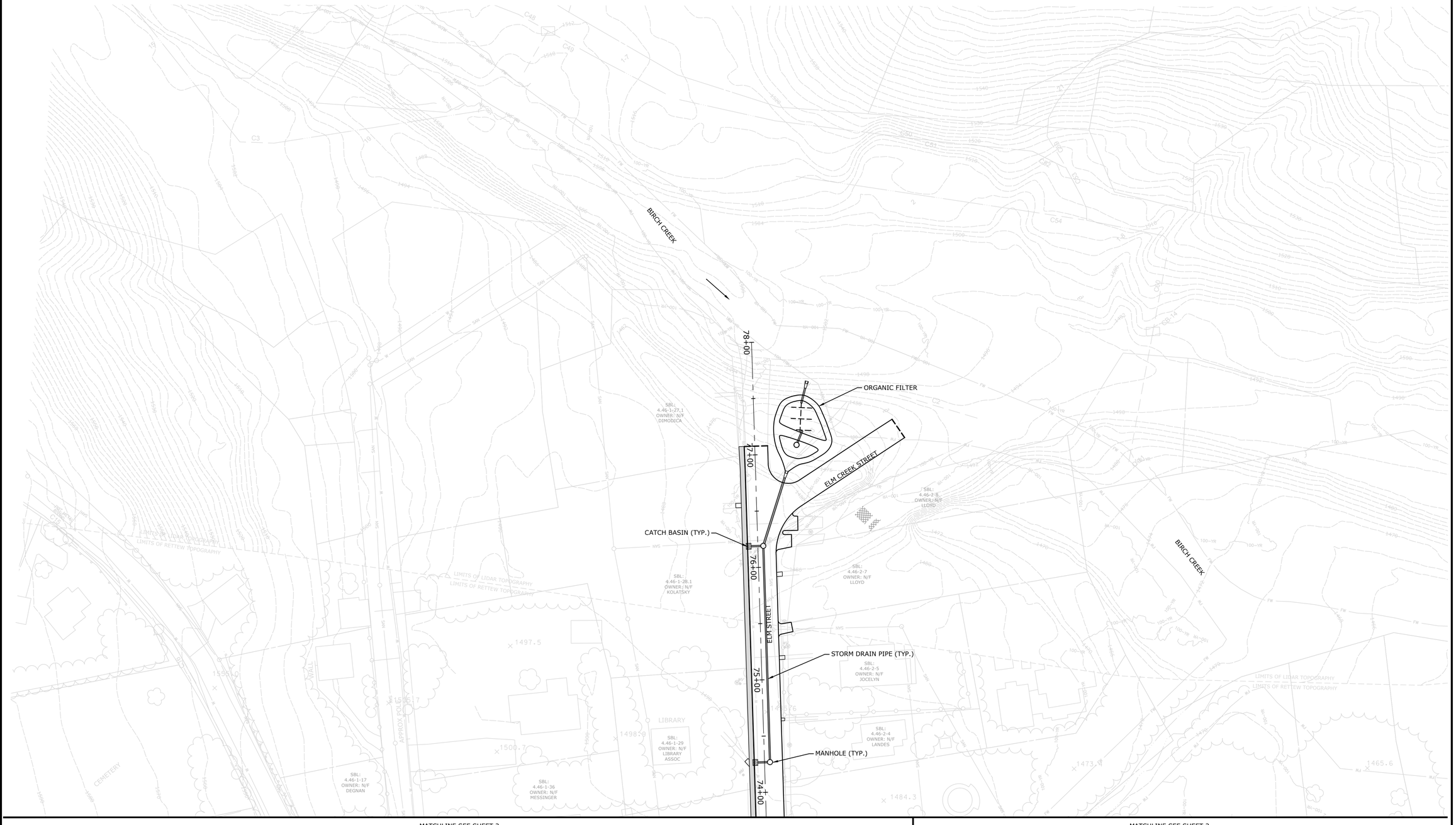
Attachment A: Pine Hill Stormwater Improvements – Concept Design Plans (October 2017)

Pine Hill Community Center Stormwater Management Feasibility Study

Town of Shandaken, NY

SLR Project No.: 143.14615.00039

September 19, 2025



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MATCHLINE SEE SHEET 3

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CONCEPT ROADWAY AND DRAINAGE PLAN

PINE HILL STORMWATER IMPROVEMENTS

MAIN STREET
SHANDAKEN, NEW YORK

JDM	JDM	GN
DESIGNED	DRAWN	CHECKED

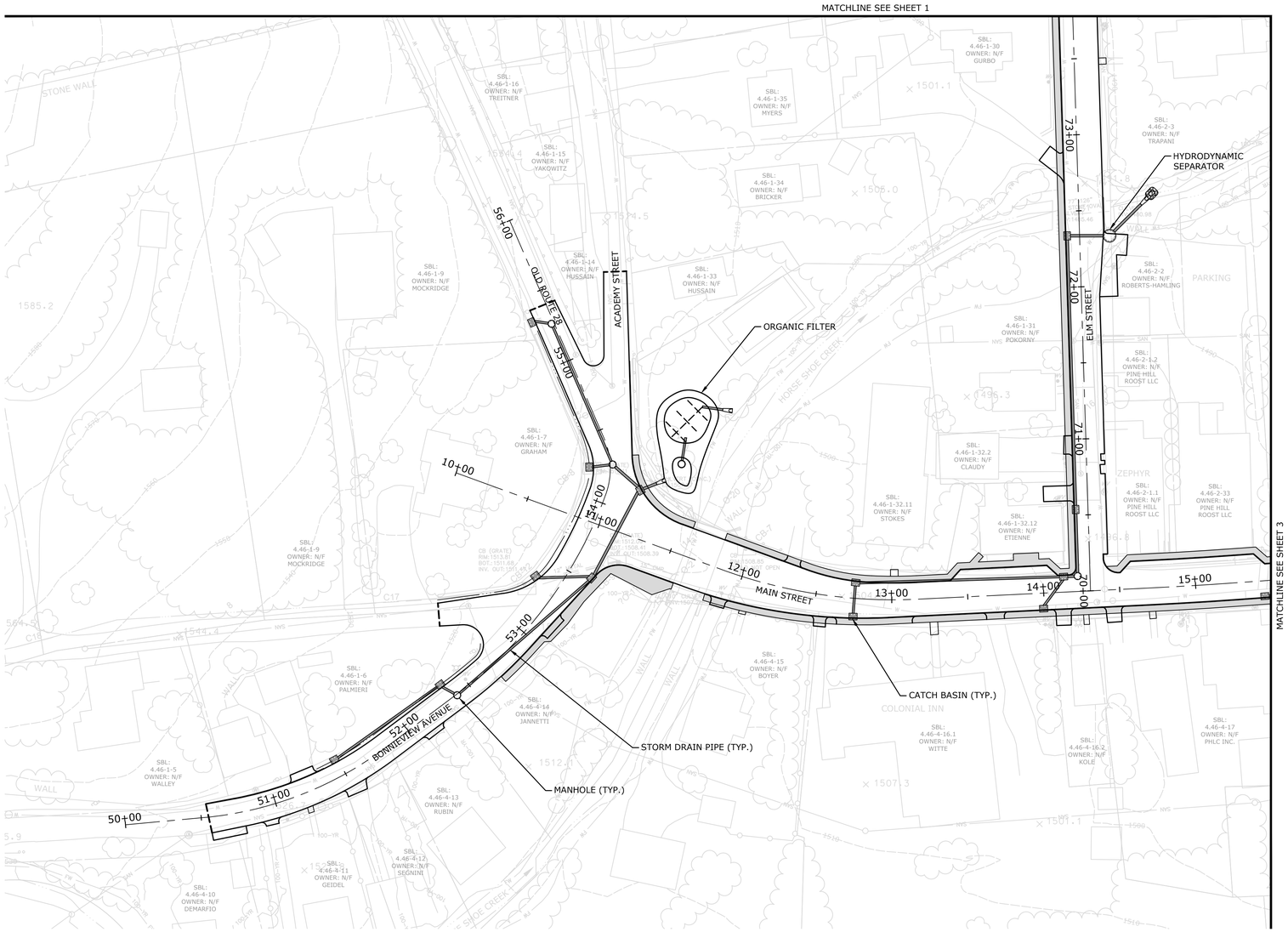
SCALE: 1"=40'

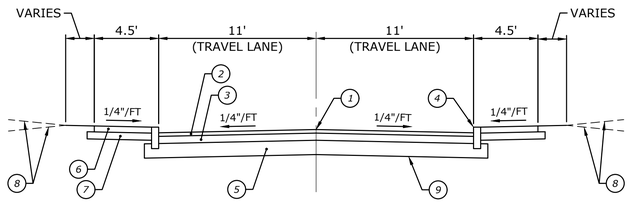
DATE: OCTOBER 2017

PROJECT NO.: 4615-20

SHEET NO.: 1 OF 5

SHEET NAME: PLN-1





TYPICAL SECTION - MAIN STREET

LEGEND

1. POINT OF APPLICATION OF GRADE
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3. 6" BITUMINOUS CONCRETE (BASE COURSE)
4. CONCRETE CURBING
5. 12" GRAVEL (SUBBASE COURSE)
6. 5"CONCRETE SIDEWALK
7. 6" GRAVEL (BASE COURSE)
8. EXISTING GRADE
9. FORMATION OF SUBGRADE

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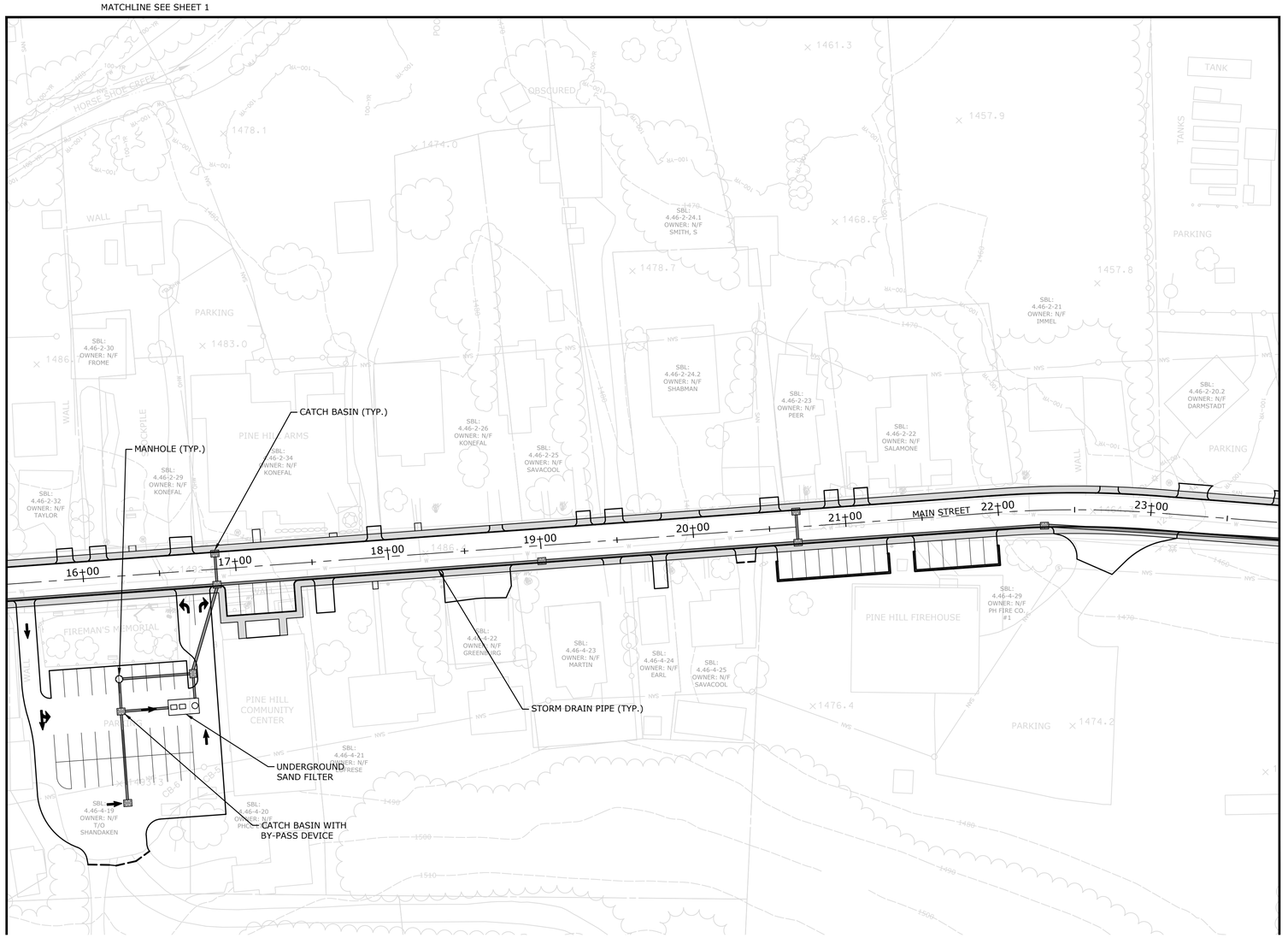
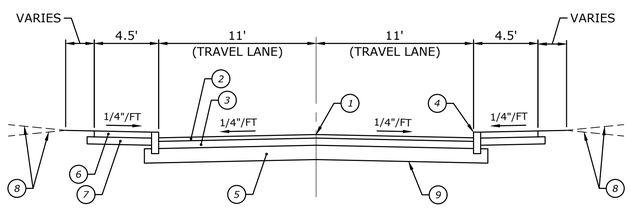
PROJECT NO.: 4615-20

SHEET NO.: 2 OF 5

SHEET NAME: PLN-2





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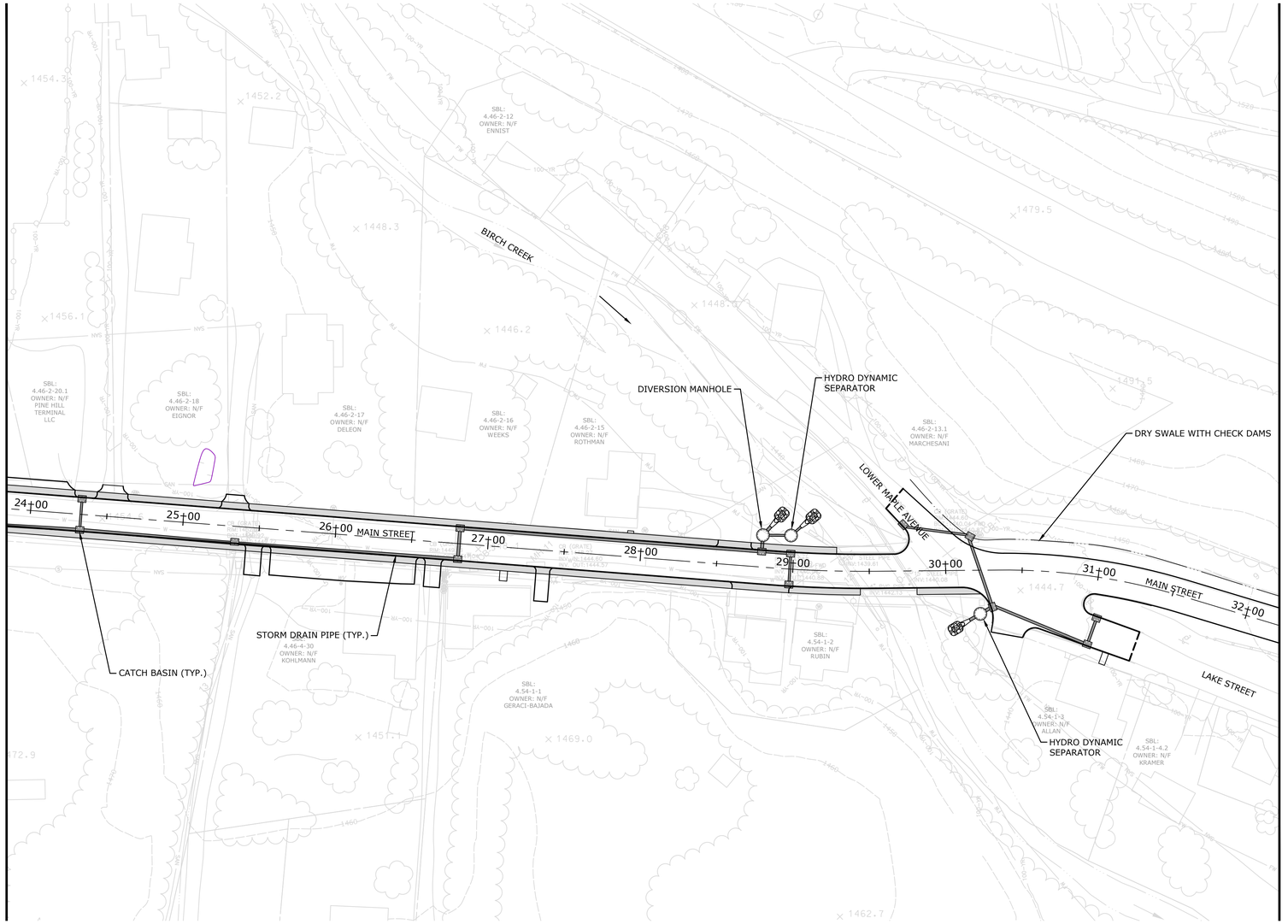

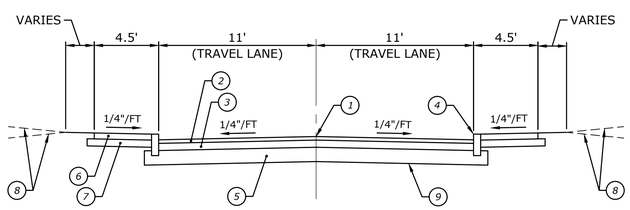

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9. FORMATION OF SUBGRADE

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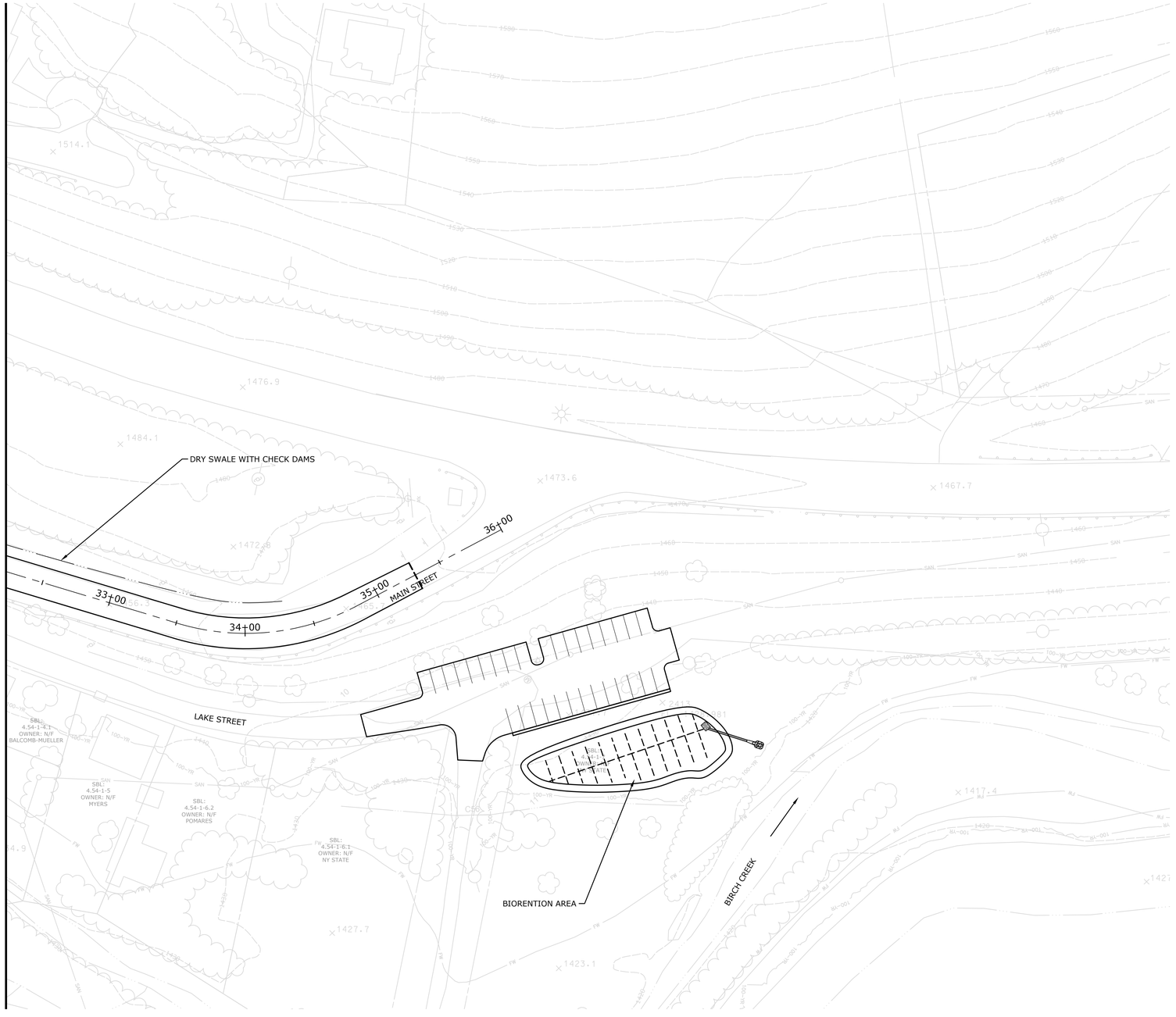

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OCTOBER 2017
DATE

4615-20
PROJECT NO.

5 OF 5
SHEET NO.

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SHEET NAME

Attachment B: Pine Hill Stormwater Feasibility Study Memorandum (September 6, 2022)

Pine Hill Community Center Stormwater Management Feasibility Study

Town of Shandaken, NY

SLR Project No.: 143.14615.00039

September 19, 2025

Memorandum

To: Peter DiSclafani, Supervisor – Town of Shandaken

From: Ethan Ely, Water Resource Engineer – SLR Engineering, Landscape Architecture, and Land Surveying, P.C.

Date: September 6, 2022

Subject: Pine Hill Stormwater Feasibility Study
SLR #142.14615.00031

The Town of Shandaken has retained SLR Engineering, Landscape Architecture, and Land Surveying, P.C. (SLR) to evaluate the feasibility of implementing stormwater treatment on the town-owned firehouse property in the hamlet of Pine Hill. The hamlet hopes to install a stormwater treatment system at the property as part of a larger stormwater retrofit project to address localized flooding caused by stormwater runoff along Main Street. As part of this feasibility study, SLR, in collaboration with Shandaken's Public Works Department, excavated a test pit at the proposed site of the stormwater system and conducted an infiltration test. The results of the test and an evaluation of the proposed treatment site along with recommendations for various stormwater treatment options are described in this memorandum.

Site Description

The proposed stormwater treatment site is approximately 150 feet long by 20 feet wide and is located along the side of Main Street at the southeast corner of the Pine Hill firehouse property (see attached site map). The available area for the system is limited by the sidewalk along Main Street, a fire hydrant, and the sanitary sewer main that runs through the firehouse property parallel to Main Street. Under existing conditions, the site is grassed and slopes from northwest to southeast at a gradient of approximately 5 percent. According to the Soil Survey Geographic Database (SSURGO) for Ulster County, the native soils underlying the project site consist of Valois very bouldery soils (soil symbol VAB), which are in hydrologic soil group B (i.e., soils that have a moderately low runoff potential and saturated hydraulic conductivity between 0.57 to 1.42 inches per hour).

Infiltration Test

An infiltration test was conducted in July 2022 to determine the infiltration rates of the native soils at the site. To perform the test, a trench was excavated within the area of the proposed stormwater system and a 30-inch-long, 4-inch-diameter section of polyvinyl chloride (PVC) pipe was installed according to the guidelines provided in Appendix D of the *New York State Stormwater Management Design Manual*

(NYSDEC, 2015). The observed soils within the trench consisted of a mixture of sand and gravel with some larger stones. The base of the casing was set at an elevation of approximately 1,451.5 feet (NAVD88), which was estimated to be 24 inches below the bottom of a hypothetical stormwater system, assuming that the system is approximately 36 inches deep. After a presoak period in which the casing was filled with water and allowed to drain for 24 hours, the infiltration testing was performed.

According to New York State Department of Environmental Conservation guidelines, the infiltration rate should be calculated from the change in water level within the casing over a period of 1 hour, after the casing is initially filled with 24 inches of water (i.e., a volume of 1.31 gallons). However, due to the high infiltration rates of the native soils, the casing could not be filled during the tests. Alternatively, for each test, 3.5 to 4.0 gallons of water was added to the casing and the initial water level was measured. The infiltration rate was then calculated from the amount of time for the casing to drain entirely. The final infiltration rate of 28.3 inches per hour was determined based on the last of five consecutive measurements.

Results and Recommendations

The results of the infiltration testing indicate that the proposed site is favorable for the implementation of stormwater management practices (SMPs) that promote infiltration. NYSDEC stormwater management guidelines advise that native soils must have a minimum infiltration rate of 0.5 inches per hour to be suitable for infiltration. With a measured rate of over 28 inches per hour, the native soils significantly exceed this requirement. Based on these initial results, installation of an SMP is a viable option at the proposed site and could provide water quality treatment and runoff volume reduction through infiltration.

There are several other factors to consider in addition to the infiltration rate when evaluating the feasibility of SMPs, including the area available for the system, the existing topography of the site, and the composition of the drainage area to be treated. The existing site has a total usable area of approximately 3,000 square feet and is constrained by the sanitary sewer main on one side and the roadway on the other. Due to space limitation, a stormwater system could only realistically treat the runoff from the firehouse property. Stormwater runoff flows along Main Street are significantly greater than what a system constructed within the available space could manage.

The existing topography of the site is also a significant limitation because most SMPs are constructed with a flat base in order to allow for even ponding and filtration. Stormwater ponds and filtration systems would not be advantageous for the proposed site as the land slopes steeply toward the road and to the southeast along the road. Regrading the site to a flatter slope would reduce the usable treatment area significantly.

Based on the site constraints, a dry swale is the most practical option for the firehouse property. Dry swales are turf-lined, open channel systems that allow for infiltration and provide natural treatment of stormwater runoff. With a maximum bottom width of 8 feet, the system would fit within the narrow area between the roadway and the sewer main. Dry swales are also one of the few SMP options that are sloped

and would therefore work well for the existing topography of the site. The primary limitation for a dry swale system would be the minimum channel length required to treat the water quality volume (WQv). With a length of 150 feet, a dry swale system would only be able to treat a portion of the runoff from the firehouse property. In order to effectively treat runoff across the entire property, the dry swale system could be installed in combination with a series of stormwater rain gardens along the perimeter of the firehouse building to collect and treat rooftop runoff.

Infiltration trenches and subsurface systems were also evaluated for the project site. However, an infiltration trench would require a pretreatment system, such as a settling chamber, sized to contain 100 percent of the WQv. Due to area constraints, the combined volume of an infiltration trench and pretreatment system would only be large enough to treat a small portion of the total runoff volume from the firehouse property. Subsurface systems, such as sand filters, would also be an unrealistic treatment option due to area constraints and cost. These systems are usually designed for highly impervious, urban areas where infiltration is not an option. A sand filter system would also be significantly more expensive to construct and would have more maintenance requirements than aboveground systems.

Attachments: Project Site Map
Dry Swale Diagram – *New York State Stormwater Management Design Manual* – Chapter 6

References

New York State Department of Environmental Conservation (NYSDEC). January 2015. *New York State Stormwater Management Design Manual*.

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Document Path: Q:\Projects\v4615-31 Pine Hill Stormwater Feasibility\GIS\ArcGIS Pro\Pine_Hill_Stormwater\Pine_Hill_Stormwater.aprx

Main St

Firehouse Property

1450
1455
1460
1465
1470
1475
1480
1485
1490
1495
1500
1510
1515

NYS ITS GIS Program Office

Legend

- Sewer Manholes
- Infiltration Testing Location
- Sanitary Sewer
- Propose Stormwater System
- Approximate Property Boundaries
- LiDAR-Based Contours (5ft)
- LiDAR-Based Contours (1ft)

PROJECT SITE MAP

PINE HILL STORMWATER FEASIBILITY STUDY

HAMLET OF PINE HILL, SHANDAKEN, NY

0 40 80

Feet

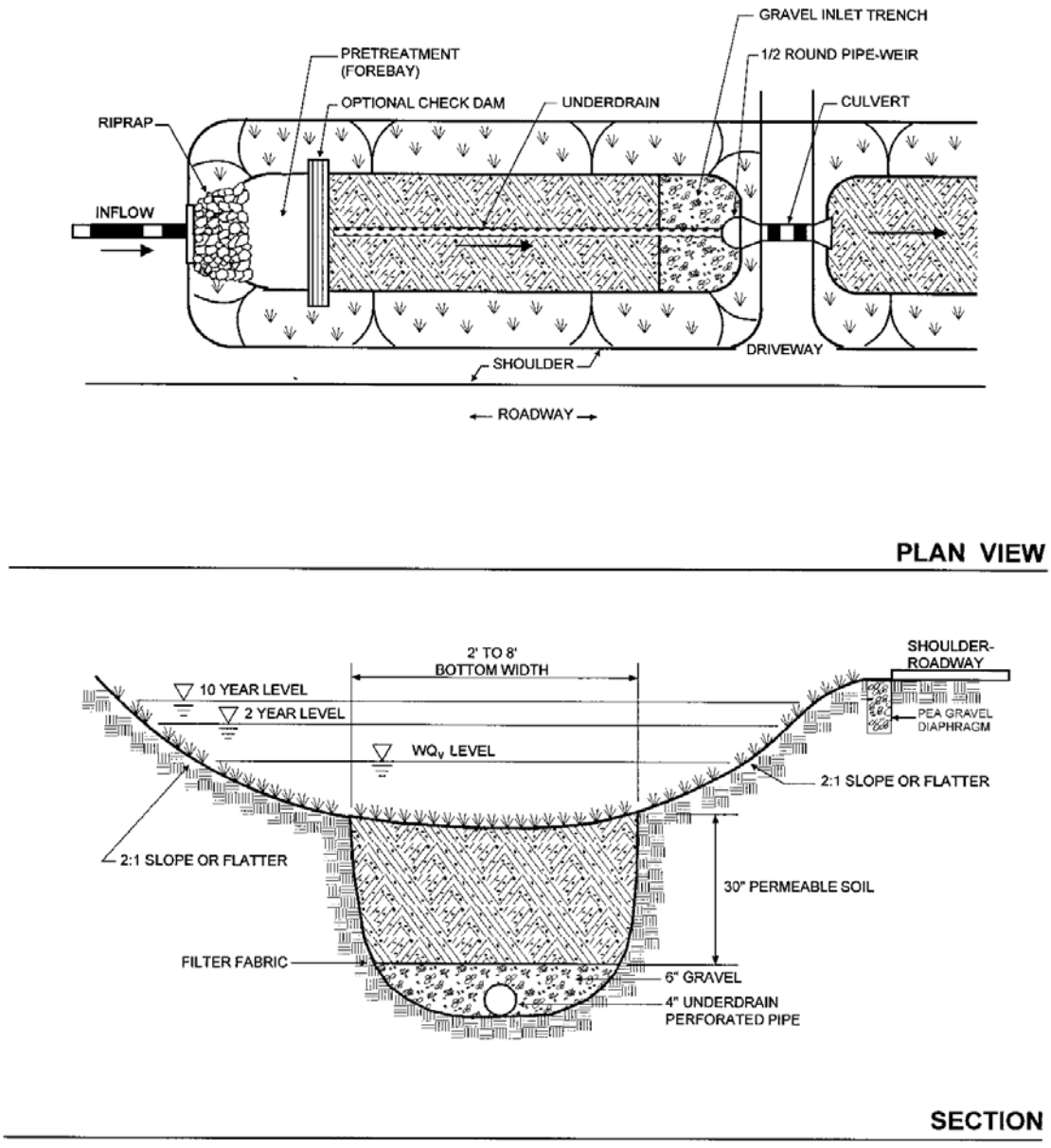
1 inch = 40 feet

N

SLR

231 MAIN STREET
SUITE 102
NEW PALTZ, NY 12561
845.633.8153

Figure 6.20 Dry Swale (O-1)



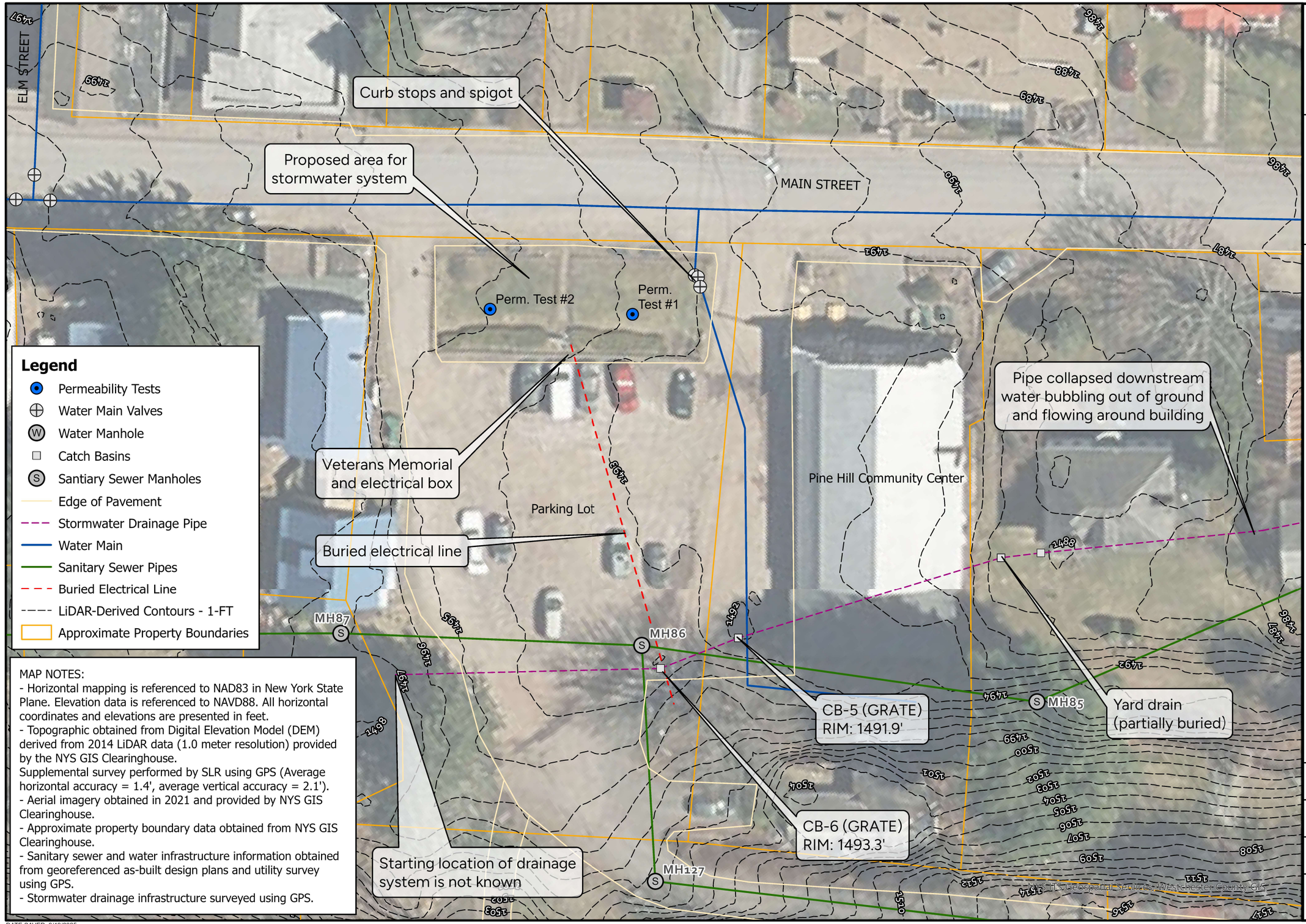
Attachment C: Pine Hill Community Center Stormwater Management Feasibility Plans (September 2025)

Pine Hill Community Center Stormwater Management Feasibility Study

Town of Shandaken, NY

SLR Project No.: 143.14615.00039

September 19, 2025



Legend

- Permeability Tests
- Water Main Valves
- Water Manhole
- Catch Basins
- Santiary Sewer Manholes
- Edge of Pavement
- Stormwater Drainage Pipe
- Water Main
- Sanitary Sewer Pipes
- Buried Electrical Line
- LiDAR-Derived Contours - 1-FT
- Approximate Property Boundaries

MAP NOTES:
- Horizontal mapping is referenced to NAD83 in New York State Plane. Elevation data is referenced to NAVD88. All horizontal coordinates and elevations are presented in feet.
- Topographic obtained from Digital Elevation Model (DEM) derived from 2014 LiDAR data (1.0 meter resolution) provided by the NYS GIS Clearinghouse.
Supplemental survey performed by SLR using GPS (Average horizontal accuracy = 1.4', average vertical accuracy = 2.1').
- Aerial imagery obtained in 2021 and provided by NYS GIS Clearinghouse.
- Approximate property boundary data obtained from NYS GIS Clearinghouse.
- Sanitary sewer and water infrastructure information obtained from georeferenced as-built design plans and utility survey using GPS.
- Stormwater drainage infrastructure surveyed using GPS.

N

0 15 30
Feet

SLR
231 MAIN STREET
SUITE 102
NEW PALTZ, NY 12561
845.633.8153

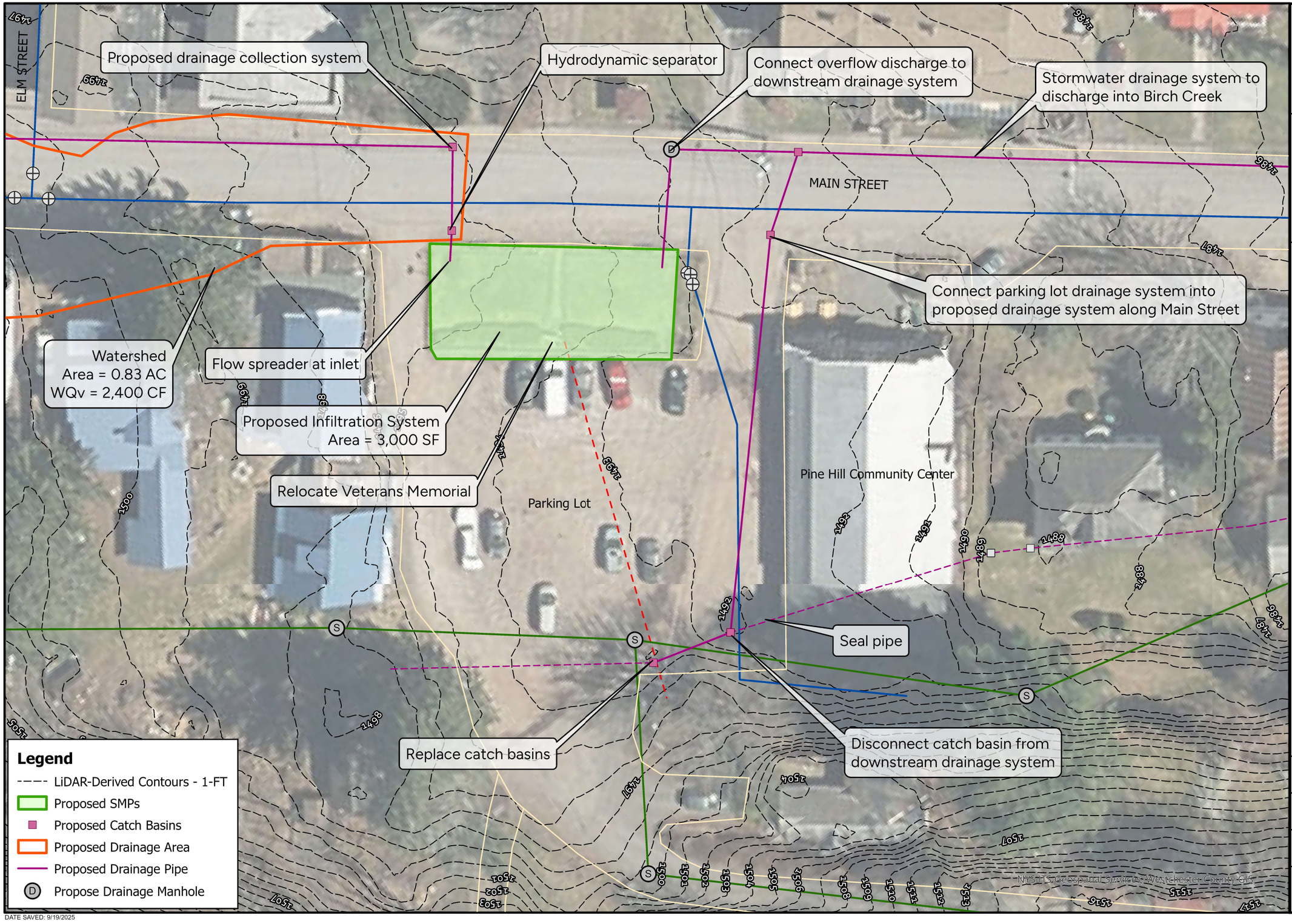
EXISTING CONDITIONS PLAN

STORMWATER MANAGEMENT FEASIBILITY STUDY
PINE HILL COMMUNITY CENTER
TOWN OF SHANDAKEN

MAIN STREET
PINE HILL, NY

SCALE	1 IN = 30 FT
DATE	9/19/2025
PROJECT NO.	14615.00039
	EX-1

DATE SAVED: 9/19/2025



N

0 15 30

Feet

SLR
231 MAIN STREET
SUITE 102
NEW PALTZ, NY 12561
845.633.8153

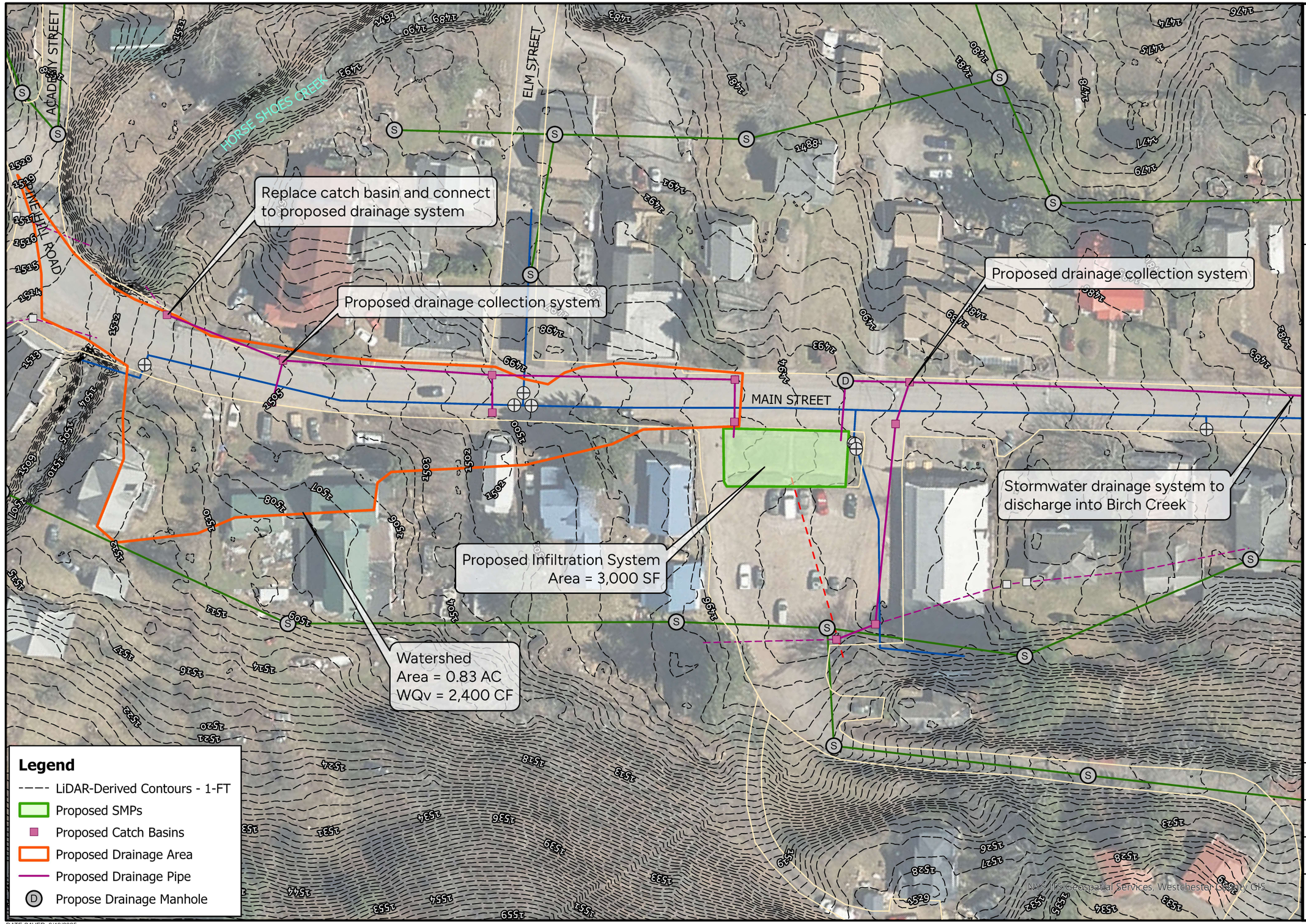
SITE PLAN - PROPOSED CONDITIONS

STORMWATER MANAGEMENT FEASIBILITY STUDY
PINE HILL COMMUNITY CENTER
TOWN OF SHANDAKEN

MAIN STREET
PINE HILL, NY

SCALE	1 IN = 30 FT
DATE	9/19/2025
PROJECT NO.	14615.00039
	SP-1

DATE SAVED: 9/19/2025



0 30 60
Feet

SLR
231 MAIN STREET
SUITE 102
NEW PALTZ, NY 12561
845.633.8153

SITE PLAN - DRAINAGE AREA

STORMWATER MANAGEMENT FEASIBILITY STUDY
PINE HILL COMMUNITY CENTER
TOWN OF SHANDAKEN

MAIN STREET
PINE HILL, NY

SCALE	1 IN = 60 FT
DATE	9/19/2025
PROJECT NO.	14615.00039
	SP-2

DATE SAVED: 9/19/2025

Attachment D: Field Permeability Test Results

Pine Hill Community Center Stormwater Management Feasibility Study

Town of Shandaken, NY

SLR Project No.: 143.14615.00039

September 19, 2025

Attachment B - Permeability Testing Results

Test Pit #1 - Based Elevation = 1,488.8 feet NAVD88			
Test1			
Depth from Top of Pipe (in)	**Time (min)**	**Δ WSE (in)**	**Infiltration Rate (in/hr)**
16	0.0	-	-
22	1.0	6	360
25	2.0	3	180
27	3.0	2	120
28	4.3	1	45
29.5	6.0	1.5	54
Test2			
Depth from Top of Pipe (in)	**Time (min)**	**Δ WSE (in)**	**Infiltration Rate (in/hr)**
17	0.0	-	-
23	1.0	6	360
25	2.3	2	90
26	3.0	1	90
27.5	4.0	1.5	90
28	5.3	0.5	22.5
28.5	6.0	0.5	45
Test3			
Depth from Top of Pipe (in)	**Time (min)**	**Δ WSE (in)**	**Infiltration Rate (in/hr)**
15	0.0	-	-
20	1.1	5	269
23	2.0	3	204
25	3.0	2	120
27	4.0	2	120
28	5.0	1	60
28.5	6.0	0.5	30
29.5	7.5	1	40

Test Pit #2 - Based Elevation = 1,488.9 feet NAVD88			
Test1			
Depth from Top of Pipe (in)	**Time (min)**	**Δ WSE (in)**	**Infiltration Rate (in/hr)**
15.5	0.0	-	-
19.5	1.0	4	240
21.5	2.0	2	120
23	3.0	1.5	90
24	4.0	1	60
25	5.0	1	60
26.5	6.0	1.5	90
27.5	7.0	1	60
29	8.3	1.5	67.5
Test2			
Depth from Top of Pipe (in)	**Time (min)**	**Δ WSE (in)**	**Infiltration Rate (in/hr)**
15.5	0.0	-	-
19.5	1.0	4	240
21	2.0	1.5	90
23	3.0	2	120
24.25	4.0	1.25	75
26	5.5	1.75	70
28	7.0	2	80
29	8.0	1	60

Notes:
Three soil samples collected
Soil consists of several feel of fill over fine sand loam with some gravel and cobbles

Test Pit/Infiltration Test #1
Maximum depth of test pit = 7.0'
Digging uncovered stacked stone foundation of old building
Lots of stone in excavation
Soils appear to be composed primarily of fill
Sandy-gravel with some river cobble at bottom of hole
No groundwater encountered
Base of casing installed at 1488.78' (NAVD88)
Ground surface elevation = 1494.88' (NAVD88)

Test Pit/Infiltration Test #2
First 24" - 36" of pit consists of stacked stone foundation and burnt remains of building (lot of metal, stone, and debris)
Maximum depth of test pit = 7.0'
Bottom 48" - 60" of hole are mix of sand and gravel with some cobbles
No groundwater encountered
Base of casing installed at 1488.9' (NAVD88)
Ground surface elevation = 1493.9' (NAVD88)

Attachment E: Stormwater Calculations

Pine Hill Community Center Stormwater Management Feasibility Study

Town of Shandaken, NY

SLR Project No.: 143.14615.00039

September 19, 2025

Pine Hill Community Center

Stormwater Management Feasibility Study

September 2025

Variable	Sub1
P (in)	1.2
I (%)	69
Rv	0.67
A (ac)	0.83
WQv (ac-ft)	0.06
WQv (cf)	2400

Cover	Area (sf)	Area (ac)
Grass	11283	0.26
Impervious	24672	0.57
Total =	35955	0.83

$$WQv = \frac{P \cdot R_v \cdot A}{12}$$

Where:

WQ_v = water quality volume (in acre-feet)

P = 90% Rainfall Event Number (see **Figure 4.1**)

R_v = 0.05 + 0.009(I), where I is percent impervious cover

A = contributing area (acres)

Pine Hill Community Center
Stormwater Management Feasibility Study
September 2025

Variable	Infiltration basin	
Top Length (ft)	38	
Top Width (ft)	80	
Bottom Length (ft)	20	
Bottom Width (ft)	62	
Max Depth (ft)	3	
Side Slope (H:1V)	3	
WQV Depth (ft)	2	
Top Area (sf)	3040	
Bottom Area (sf)	1240	<== Provided bottom area
Storage Volume (cf)	4280	
% of WQv Stored	178%	

WQv (sf)	2400	
db (ft)	2	
Ab (ft)	1200	<== Required bottom area

Hydrodynamic Separator Used for Pre-Treatment

Design I-2: calculate the minimum bottom area of an infiltration basin using the following equation:

$$A_b = \frac{WQ_V}{d_b}$$

Where:

A_b = Bottom area of the infiltration basin (sf)

WQ_V = Water Quality Volume (cf)

d_b = Depth of basin (ft) (measured from bottom to first outlet)