



# **New Paltz Green Infrastructure Capital Improvements Feasibility Plan**

**December 2018**

Green Infrastructure  
Capital Improvements Feasibility Plan\*

Ulster County, New York

December 2018

Prepared For:

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List of Abbreviations:

B&L	Barton & Loguidice, D.P.C.
CDRPC	Capital District Regional Planning Commission
CSO	Combined Sewer Overflow
DEC	Department of Environmental Conservation
DPW	Department of Public Works
EFC	Environmental Facilities Corporation
EPA	Environmental Protection Agency
EPG	Engineering Planning Grant
FEMA	Federal Emergency Management Agency
GI	Green Infrastructure
GSM	Green Stormwater Management
HTFC	Housing Trust Fund Corporation
HUD	Housing and Urban Development
JDA	Job Development Authority
NYSDEC	New York State Department Environmental Conservation.
OCR	Office of Community Renewal
SEQR	State Environmental Quality Review
SSO	Sanitary Sewer Overflow
SWDM	Stormwater Management Design Manual
SWMP	Stormwater Management Program
SUNY	State University of New York
UDC	Urban Development Authority
USDA	US Department of Agriculture



## 1.0 INTRODUCTION AND PROJECT BACKGROUND

A planning grant awarded by the New York State Department of Environmental Conservation's (NYSDEC) Hudson River Estuary Program (HREP) has funded this project, which will assist the Village in moving forward with its desire to advance a Green Infrastructure (GI) program. This strategy has been developed to advance GI project readiness, for increased integration of gray and green infrastructure, based on a robust prioritization of projects. The project solutions focused on opportunities within the Village of New Paltz downtown/infill locations and more densely developed areas of the Town of New Paltz, with an aim to reduce localized flooding and potential storm sewer overflows (SSO) through implementation of GI. Furthermore, the project process aimed to increase local understanding of the benefits and opportunities associated with GI through public outreach, including a Public Workshop to build familiarity with, and broad support for, specific plans of action.

Stormwater from the Village of New Paltz and urbanized areas of the Town discharges to the Walkkill River. The Walkkill River has been the focus of water quality sampling and targeted clean-up initiatives by local organizations such as the Walkkill River Watershed Alliance and Riverkeeper. In 2017, NYSDEC's water chemistry sampling indicated that the Walkkill River is impaired for phosphorus, and this data resulted in updates to the Walkkill river's listing in the Priority Waterbodies List. This project supports local implementation of green infrastructure, which in turn improves the quality of stormwater at outfalls to the Walkkill River.

### 1.1 Project Scope

Barton and Loguidice, DPC, (B&L) was engaged to provide technical services for the various stages of the project, working closely with the established GI Steering Committee, which was comprised of community volunteers, in order develop a Strategy for capital improvements planning and to build local capacity around GI program implementation. The project was comprised of the following tasks:

1. Facilitate Project Committee Meetings (4 meetings)
2. Develop Scoring Criteria and Site Selection Matrix
3. Site Visits and Document Existing Site Conditions (15 sites)
4. Site Screening, Ranking and Selection of Priority Sites
5. Design Guidelines
6. Public Outreach Workshop
7. Feasibility Analysis (2 sites)
8. Develop Implementation Strategies

9. Finalize GI Capital Improvements Feasibility Plan

1.2 Project Goals and Objectives

The following project goals and objectives were developed in collaboration with the GI Steering Committee, and presented at the Public Workshop.

Goals

1. Leverage environmental protection, conserve and manage natural assets;
2. Advance community resiliency, defining vulnerabilities, improving local drainage and reducing sanitary sewer overflows (SSO);
3. Enhance quality of life through the sustainable utilization of GI, enhancing stormwater quality and increasing land value;
4. Support smart and sustainable development, highlighting local resources and plans;
5. Sustain infrastructure and align spending for long-term management to optimize community benefits;
6. Develop cooperation and capacity, identifying revenue sources and operational requirements, for effective implementation of GI; and
7. Identify opportunities to advance private and public-private GI projects and develop incentives to encourage GI.

Objectives

1. Public Outreach to increase knowledge of GI benefits and opportunities;
2. Engage Local Stakeholders and Elected Officials to increase cooperation, commitment and capacity;
3. Develop a robust approach to Site Prioritization for evidence based analysis and selection of preferred sites;
4. Prepare Stormwater Management Design Standards for up to 3 practice types;
5. Complete Feasibility Analysis (grant ready) for up to 3 sites; and
6. Finalize Capital Improvements Feasibility Plan and Map.

### 1.3 Stakeholder Engagement and Public Participation

A Public Participation Plan was developed to guide the stakeholder engagement and public participation process for the project. Refer Appendix A1.

The following meetings were held with the GI Steering Committee to discuss project development:

- February 7, 2018 – Committee Meeting 1, Project Kick-off, Suitability Screening
- March 21, 2018 – Committee Meeting 2, Priority Location Selection
- April 4, 2018 – Public Workshop, Presentation and Concept Development
- May 9, 2018 – Committee Meeting 3, Feasibility Analysis and Reporting

These meetings were conducted and publicized according to open meetings law. Refer to Appendix A2 for meeting minutes.



## 2.0 APPLICATION OF GREEN INFRASTRUCTURE

### 2.1 Existing Resources

At the regulatory level, the New York State Department of Environmental Conservation (NYSDEC) Stormwater Management Design Manual (NYS SMDM) requires elements of GI to be included in projects requiring coverage under the State Pollution Discharge Elimination System (SPDES) construction permit. As these trends gain momentum, it is important to pro-actively develop best management practices to guide the planning, design, implementation and maintenance of GI installations.

The following resources are fundamental to the design and maintenance of GI:

- Stormwater Management Design Manual, NYSDEC, January 2015
- Maintenance Guidance – Stormwater Management Practices, NYSDEC, March 2017
- Construction Stormwater Toolbox <https://www.dec.ny.gov/chemical/8694.html>

In addition to these NYSDEC resources, significant existing documentation exists from various publically accessible sources, such as the Environmental Protection Agency (EPA), regional municipalities, and industry leaders that describe GI practices and the ways it can be used to aid water quality, infrastructure, and environmental enhancement. The table in Appendix A3 presents a summary of existing resources, categorized based on related themes.

### 2.2 Benefits of Green Infrastructure

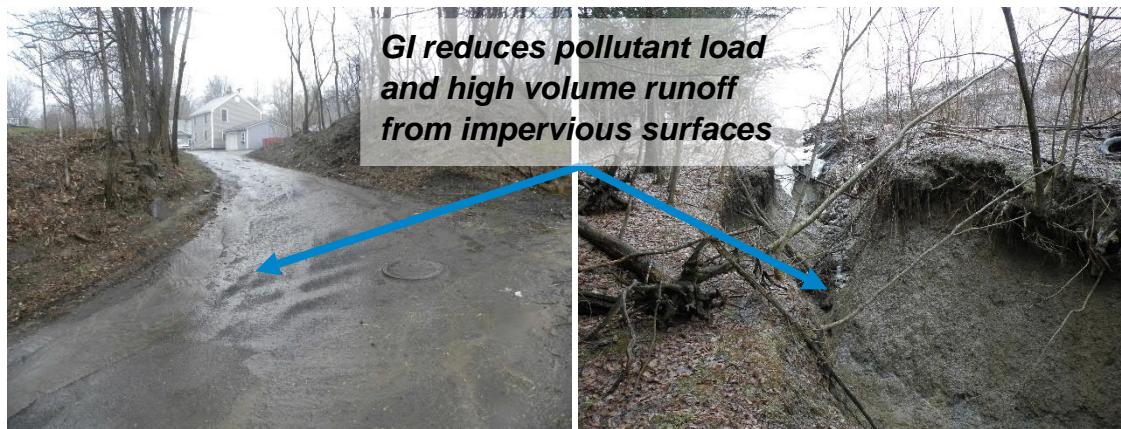
Green infrastructure (GI) is a design strategy that applies a natural systems approach to managing stormwater and creating healthier, more sustainable environments. There are compound benefits to utilizing this approach to stormwater management over traditional gray infrastructure, which relies traditionally on underground piped networks.

The primary benefit of GI, by design, is the direct environmental impact to improving the quality of receiving waterbodies. By increasing groundwater recharge and reducing peak flow velocity and volume to receiving waterways, the potential for scour/erosion and pollutant transfer (nutrients, sediment, hydrocarbons, etc.) is minimized. While GI is not a cure-all for flood risk reduction, it can help tremendously with urban drainage related flooding and small stream flash flooding, particularly in urban and suburban areas. This localized flood reduction also reduces the potential for SSO discharging to local waterways, as discussed in Section 2.3.

In addition to the improvement to local waterways realized through GI implementation, there are abundant well-documented environmental, social and economic impacts associated with the installation of GI within urban environments. Some of the more significant environmental benefits include the absorption of airborne particulates and reduction of surface air

temperatures (i.e., heat island effect), as well as increasing wildlife habitat and connectivity. There are evident social impacts, which include increased recreational opportunity, as well as community pride and improved aesthetic, both of which have been linked to crime reduction and increased community safety. Economic impacts have also been demonstrated as a result of GI implementation, such as reducing municipal water usage, providing green jobs, increasing nearby property values, and minimizing the cost associated with damage from localized flooding.

With increasing frequency, the Village and Town of New Paltz are considering GI technology for public stormwater management redevelopment projects across their respective jurisdictions. This strategy prioritizes initiatives and presents strategies to assist New Paltz in realizing the compound benefits of GI.



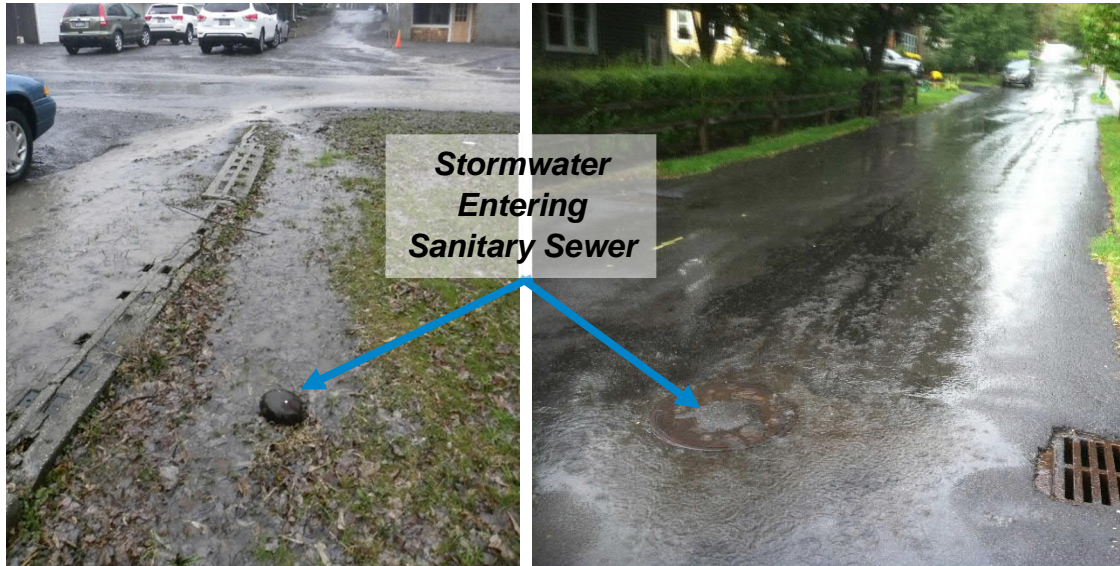
### 2.3 Green Infrastructure's role in SSO mitigation

As presented in Section 2.2, one of the many benefits of GI is the role it can play in advancing long-term flood control and improving sanitary sewer system capacity, thus reducing sanitary sewer overflow (SSO). Although the sanitary sewer in New Paltz is separate from the stormwater sewer network, there are still opportunities for stormwater to enter the sanitary system during heavy rainfall events, particularly in areas experiencing localized surface water ponding.

The main role of GI will be to improve drainage and promote infiltration along the entire stormwater network, and particularly upstream of areas experiencing localized flooding. The impact of GI implementation on SSO will depend on the primary cause of I/I upstream and downstream of a particular SSO location. The benefit is derived from improved drainage, often in conjunction with gray infrastructure improvements.

To fully understand the impact of GI on the system's capacity, management, operation and maintenance (CMOM), it is important to understand the location of inflow and infiltration (I/I)

within the system. Specific GI projects can then be designed to reduce surface water from entering the sanitary sewer system, by improving drainage to direct flows away from these areas. In addition to I/I along pipes, main points of entry for surface water entering a separate sanitary sewer include clean-out and vent stacks and manhole covers. Examples of gray infrastructure improvements that may be incorporated in conjunction with GI installation include fixing laterals and broken vent stacks or adding dishes to manholes.



The role of GI in reducing SSO was an important criteria in the prioritization of GI sites. Screening and ranking of GI sites was undertaken based on information that was provided by the Village Engineer, including condition of the existing sanitary sewer system, location of recently rehabilitated sewers and location of known SSOs. Analysis of the impact of GI on SSO for the purposes of prioritization was based on the condition of the existing sanitary sewer system downstream of each site location. (Refer Section 4.0, Suitability Screening).

When designing GI at the site level, it is important to consider the location and condition of the sanitary sewer, how and where surface water may enter the system and site specific drainage improvements to reduce I/I, along with any possible required gray infrastructure improvements.



### 3.0 GREEN STORMWATER MANAGEMENT DESIGN GUIDELINES

Green Stormwater Management (GSM) Guidelines have been developed as part of this project for selected GI types that are anticipated for integration with private development and in future public-sector GI projects. One of objectives of the GSM Guideline development is to provide direction and consistency for infill/redevelopment projects and to foster GI uptake for private development, which can be promoted through the site plan review process.

The types of GI technology vary, and applicability is depended on site specific factors and local preferences. Refer to Appendix A4 for description and example photos of the various GI types most applicable to urban retrofit practices.

Table 3-1: GI Practice Types

GI PRACTICES ELIGIBLE FOR GIGP FUNDING	ADDITIONAL GI PRACTICES FROM NYSDEC SWMDM
<ol style="list-style-type: none"> <li>1. Permeable pavement:                             <ol style="list-style-type: none"> <li>a. Porous asphalt</li> <li>b. Porous concrete</li> <li>c. Porous pavers</li> </ol> </li> <li>2. Bio retention:                             <ol style="list-style-type: none"> <li>a. Rain gardens</li> <li>b. Bioswales</li> </ol> </li> <li>3. Living roof / wall:                             <ol style="list-style-type: none"> <li>a. Green roof</li> <li>b. Green wall</li> </ol> </li> <li>4. SW trees:                             <ol style="list-style-type: none"> <li>a. SW street trees</li> <li>b. Urban forestry programs</li> </ol> </li> <li>5. Construction or restoration of:                             <ol style="list-style-type: none"> <li>a. Wetlands</li> <li>b. Floodplains</li> <li>c. Riparian buffers</li> </ol> </li> <li>6. Stream daylighting</li> <li>7. Downspout disconnection:                             <ol style="list-style-type: none"> <li>a. Stormwater Planters</li> </ol> </li> <li>8. SW harvesting and reuse (i.e. barrel / cistern project)</li> </ol>	<ol style="list-style-type: none"> <li>9. Stormwater Ponds                             <ol style="list-style-type: none"> <li>a. Micropool Extended Detention Pond</li> <li>b. Wet Pond</li> <li>c. Wet Extended Detention Pond</li> <li>d. Multiple Pond System</li> <li>e. Pocket Pond</li> </ol> </li> <li>10. Infiltration System                             <ol style="list-style-type: none"> <li>a. Trench</li> <li>b. Basin</li> <li>c. Dry well (downspout disconnection)</li> <li>d. Underground infiltration system</li> </ol> </li> <li>11. Filtering Systems                             <ol style="list-style-type: none"> <li>a. Surface Sand Filter</li> <li>b. Underground Sand Filter</li> <li>c. Perimeter Sand Filter</li> <li>d. Organic Filter</li> <li>e. Bio retention</li> </ol> </li> <li>12. Open Channel                             <ol style="list-style-type: none"> <li>a. Dry swale</li> <li>b. Wet swale</li> </ol> </li> </ol>

In order to select up to three practice types for the development of GSM Guidelines, the characteristics of the various GI types listed above were considered. Refer to the table in Appendix A4, developed to compare the benefits and disadvantages of various GI practice types, and assisting in the selection of three GI types most applicable to the downtown/urban environment for the development of GSM Guidelines.

In collaboration with the Steering Committee, the following three (3) GI types were selected, primarily based on their ability to remove target pollutants, high aesthetic value and suitability for small in-fill sites:

1. porous pavement;
2. tree planting; and
3. rain garden / road-side stormwater planter



*Stormwater Planters*



*Rain Gardens & Bio retention*

These stormwater management practice types are well suited to the street-scape environment and were adopted for the conceptual design of the preferred project sites, as presented in Section 5.0, Feasibility Analysis.

It should be noted that for porous pavement, the focus was not on poured and cured on-site media, like asphalt, concrete or rubber applications, due to perceived quality control issues during construction, which has been difficult to achieve in some applications. Rather, focus here is on modular/assembled systems (i.e., pavers and blocks) that are shipped and installed on prepared bases, often used in sidewalks, bike lanes, parking lots and driveways. There are many proprietary products available for local supply of porous pavers and blocks (e.g., Stormcrete, AOF Environmental Unilock, PaveDrain, etc.) which should be referenced prior to specifying sub-base materials for construction.

The GSM Guidelines for porous pavement, tree pits, raingardens and road-side stormwater planters are presented in Appendix A5.

## 4.0 SUITABILITY SCREENING

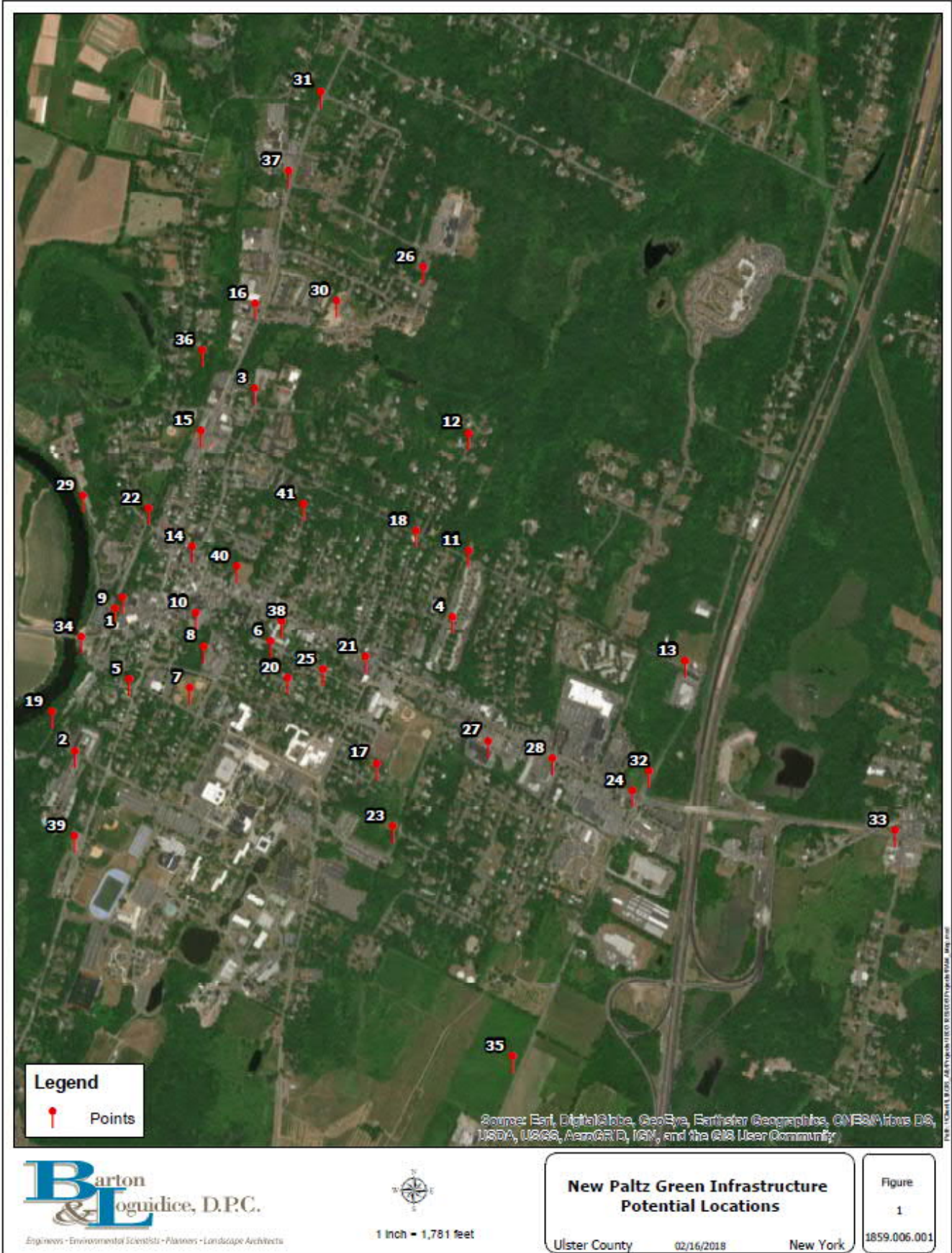
### 4.1 Preliminary Screening

Prior to B&L's involvement in the project, the Village Planner, in collaboration with the New Paltz GI Steering Committee, developed a Preliminary Inventory of 40 potential project sites, where drainage improvement opportunities were identified within the Village and urbanized areas of the Town. The Preliminary Inventory database and matrix was developed (using the software AccessDB), as a tool curated by the Village Planner, in conjunction with other staff and officials in the Village and Town, for use in evaluation of opportunities and constraints for each site, documenting methods for improved drainage, including with the use of GI. The location of the 41 potential GI project sites is shown on Figure 1.

The initial identification of locations with drainage improvement potential (quality and flow) was based on high level planning knowledge, but did not include a rigorous assessment of the limits of public streets and rights of ways. In developing the inventory, attention was given to municipal streets and parking areas, as major capital assets that are publicly controlled and maintained, and contain high levels of impervious surface and underutilized space.

The initial screening matrix was not developed to rank the sites according to which is best suited to, or would benefit most from GI. Instead, it was set up to weight criteria and rank sites, with the aim of selecting sites for feasibility analysis which are considered to be grant eligible and relatively easy to move forward to construction, following securing of funds. Although large impervious commercial centers have significant impervious area and contribute greatly to runoff within the urban center, they are privately owned and do not represent projects suitable for grant funding sought by the municipality. Although these sites ranked lower on the initial screening matrix, they are important sites for promoting the uptake of GI practices. Strategies for promoting GI uptake in private/commercial redevelopment projects are discussed in Section 6.4.





Site ID #	Name	Address
1	Core of Village	45 MAIN STREET
2	Southside Ave.	4 SOUTHSIDE AVENUE
3	Moriello Park	21 MULBERRY STREET
4	Colonial Drive	25 COLONIAL DRIVE
5	South Chestnut	18 WURTS AVENUE
6	West Center Street	148 MAIN STREET
7	Hasbrouck Park Locus	15 MOHONK AVENUE
8	Municipal Properties and Pit	25 PLATTEKILL AVENUE
9	Pencil Hill	43 MAIN STREET
10	Plattekill Ave. Parking Lot & Vicinity	15 PLATTEKILL AVENUE
11	HWD, Harrington & Colonial Drive Vicinity	81 H W DUBOIS DRIVE
12	Mill Brook Preserve - Gateway @ No. Manheim	66 MANHEIM BOULEVARD
13	Fire Station#2 (117 HWDDr and Adjacent Area	117 HENRY W DUBOIS DRIVE
14	Church & No. Front Streets Location	25 CHURCH STREET
15	Base of Henry W. D. Dr.	80 CHESTNUT STREET
16	No. Chestnut Complete Street Segment	135 CHESTNUT STREET
17	Hasbrouk Pl.	6 HASBROUCK PLACE
18	No. Manheim Blvd (Complete Green Street)	45 MANHEIM BOULEVARD
19	Plains Road	17 WATER STREET
20	South Oakwood Complete St.	19 OAKWOOD TERRACE
21	Dedrick's Plaza & Main Overlay	185 MAIN STREET
22	North Front Street	28 FRONT STREET
23	Cherry Hill	2 CICERO AVENUE
24	Empire Trail	270 PUTT CORNERS ROAD
25	Center Street	37 CENTER STREET
26	Eastern Sunset Ridge	40 SUNSET RIDGE
27	Rite Aid Plaza & Adjacent Private Lands	238 STATE HIGHWAY 299
28	Upper Main - incl. by Shoprite & NYSDEC	248 MAIN STREET
29	Wastewater Treatment Plant Driveway	65 HUGUENOT STREET
30	Cooper St. Vicinity	136 CHESTNUT STREET
31	Van Alst	185 CHESTNUT STREET
32	Trib. 13 Headwater by No. Putt	12 PUTT CORNERS ROAD
33	Ohioville Hamlet	11 OLD 299
34	Main, Water, & Huguenot Sts & WVRT Vicinity	1 WATER STREET
35	South Putt (GI as aid for future buildout)	47 PUTT CORNERS ROAD
36	Henry Ct.	6 HENRY COURT
37	Sunset Ridge	170 CHESTNUT STREET
38	Vicinity of 144-154 Main Street	154 MAIN STREET
39	Village Border by So. Chestnut	85 CHESTNUT STREET
40	115-125 Main Vicinity	115 MAIN STREET
41	Prospect	PROSPECT STREET

The Preliminary Inventory of potential project sites was screened based on the following initial criteria for the selection of the top 15 priority sites shown in Figure 2:

1. Ownership (public versus private);
2. Sanitary Sewer Overflow (SSO) benefit;
3. Context for Potential Improvement; and
4. Prioritization based on Village Planner, Engineer, DPW and Committee input

The Initial Screening Matrix in Appendix A6 presents the rankings for each of the 41 potential sites against the initial screening criteria. The sites with the highest ranking were selected as the top 15 priority sites to take to the 'next stage scoring' analysis.

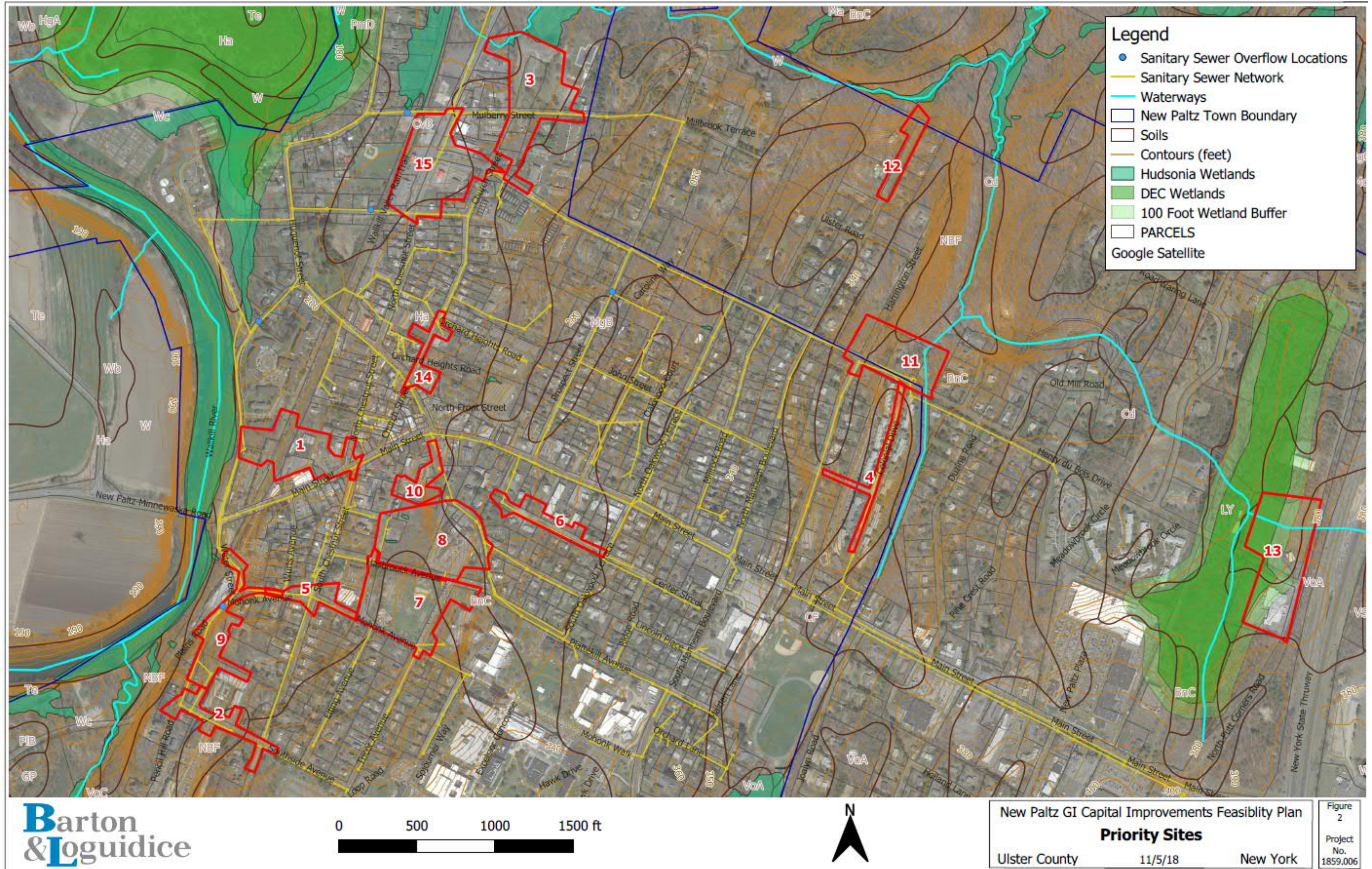
In addition to identifying 15 priority sites, the Initial Screening Matrix provides a critical tool in prioritizing and planning for GI projects as public capital improvements are planned, and as funding for GI projects is identified.

#### 4.2 Site Map of 15 Priority Sites

The top 15 priority sites identified in the Initial Screening were mapped in Figure 2 to identify important site information within the vicinity of each project, such as proximity to publicly owned park/recreational lands, open spaces and environmentally sensitive areas. Relevant natural and engineered features, such as waterways and wetlands, topography, sanitary sewers and location of SSO were also identified in Figure 2.

Additional maps were developed to assist in identifying other relevant environmental and culturally significant features, such as location of archeological sensitive areas, nationally registered historic buildings/districts and known remediation sites. These additional layers are shown on Figure 2 provided in Appendix A7.







#### 4.3 Site Reconnaissance for the Top 15 Priority Sites

The outcome of the Initial Screening Matrix was the selection of the top 15 priority locations that would receive further analysis and ranking in the Next Stage Scoring Matrix.

As part of site assessment and prioritization for these top 15 locations, site visits were conducted, including Village and Town staff and members of the GI Steering Committee. The Site Reconnaissance Document (refer Appendix A8) contains pictures, map excerpts and commentary on site characteristics and area features, based on observation during a tour of the priority sites on the March 9, 2018.

In addition to site observations, the Site Reconnaissance Document also contains the following information:

- input from the Village Planner in relation to physical and social characteristics (i.e. aesthetic/landscape value) and relevant historical or parallel projects; and
- input from the Village Engineer on the state of the sanitary sewer within the vicinity of each site, as it relates to the potential to impact sanitary sewer overflows (SSO).

This Site Reconnaissance Document was developed to assist in the selection of up to three locations that will receive detailed feasibility analysis as part of the next stage of the project (refer Section 5.0). Furthermore, the document acts as a resource for planning and concept design of future projects, as capital projects and planned redevelopment are initiated that would benefit from a GI component.

#### 4.4 Next Stage Scoring Matrix

The Table 4-1 “Next Stage” Scoring Matrix was developed to analyze the top 15 priority sites based on an expanded set of screening criteria in order to select up to three (3) preferred sites to take to the next phase of the project, Feasibility Analysis. The expanded screening selection criteria were developed in collaboration with the GI Steering Committee, and included:

Table 4-1: Next Stage Scoring Matrix Criteria

SOILS CHARACTERISTICS	REGULATORY CONSTRAINTS
1. Capacity to transmit water / permeability	11. SEQR Constraints (i.e. National Register Buildings, Archeological/ Environmental Sensitive Areas)
2. Drainage class / frequency and duration of wet periods	12. Potential for contaminated soils
3. Depth to water table	13. Proximity to drinking water wells
4. Pesticide and nutrient movement	<b>FEASIBILITY</b>
5. Hydrologic soil group	14. Ownership
<b>SMART GROWTH CRITERIA (I.E., SOCIAL, ECONOMIC, ENVIRONMENTAL IMPACT)</b>	15. Depth to restrictive layer (i.e. bedrock, clay pan)
6. High profile / visible site, educational opportunity	16. Design constraints (i.e., footprint, basement, topography, steep slopes)
7. Potential to improve existing drainage issues	<b>WATER QUALITY IMPROVEMENT POTENTIAL</b>
8. Sanitary Sewer Overflow (SSO) benefit	17. Pollutant Load, sediment, oils and metals
9. Natural resource restoration and proximity to waterways	18. Cumulative effects (i.e. potential for runoff reduction)
<b>AESTHETIC VALUE</b>	19. Catchment Area
10. Aesthetic value / opportunity to improve landscaping	

The Next Stage Scoring Matrix is presented in Appendix A9, with additional details of soils analysis presented in a separate table.

During the third GI Committee meeting on May 9, 2018, there was significant discussion in relation to which criteria were most important, particularly with consideration for the goals and objectives, as defined for this project. Table 4-2 is a sensitivity analysis was completed to understand the impact of nominating various weighting values to the screening criteria. Results of the sensitivity analysis are presented below in Table 4-2.

Table 4-2: Next Stage Scoring Matrix Sensitivity Analysis

SENSITIVITY ANALYSIS TABLE						
	NO WEIGHTING	WEIGHTING A	WEIGHTING B	WEIGHTING C	WEIGHTING D	WEIGHTING E
Soils	1	.1	.05	.15	.05	.15
Smart Growth	1	.2	.05	.15	.25	.15
Aesthetic	1	.05	.05	.075	.05	.1
Regulatory	1	.05	.05	.075	.05	.1
Feasibility	1	.3	.4	.3	.35	.25
Water Quality	1	.3	.4	.25	.25	.25
Top 6 Sites	<ol style="list-style-type: none"> <li>Moriello Park/ Mullberry &amp; Church St. Vicinity</li> <li>Municipal Properties &amp; Pit</li> <li>Core of Village</li> <li>So. Chestnut/Mohonk Intersection</li> <li>Pencil Hill/Water St. Vicinity</li> <li>Southside Ave./ So. Chestnut St.</li> </ol>	<ol style="list-style-type: none"> <li>Moriello Park/ Mullberry &amp; Church St. Vicinity</li> <li>Municipal Properties &amp; Pit</li> <li>Southside Ave./ So. Chestnut St.</li> <li>Core of Village</li> <li>Hasbrouck Park Locus</li> <li>South Chestnut /Mohonk Intersection</li> </ol>	<ol style="list-style-type: none"> <li>Moriello Park/ Mullberry &amp; Church St. Vicinity</li> <li>Municipal Properties &amp; Pit</li> <li>Southside Ave./ So. Chestnut St.</li> <li>Hasbrouck Park Locus</li> <li>Core of Village</li> <li>South Chestnut/ Mohonk Intersection (tie for 6<sup>th</sup>)</li> <li>Plattekill Ave Parking Lot &amp; Vicinity (tie for 6<sup>th</sup>)</li> </ol>	<ol style="list-style-type: none"> <li>Moriello Park/ Mullberry &amp; Church St. Vicinity</li> <li>Municipal Properties &amp; Pit</li> <li>Southside Ave./ So. Chestnut St.</li> <li>Core of Village</li> <li>South Chestnut/ Mohonk Intersection</li> <li>Hasbrouck Park Locus</li> </ol>	<ol style="list-style-type: none"> <li>Moriello Park/ Mullberry &amp; Church St. Vicinity</li> <li>Municipal Properties &amp; Pit</li> <li>Southside Ave./ So. Chestnut St.</li> <li>Core of Village</li> <li>South Chestnut/ Mohonk Intersection</li> <li>Hasbrouck Park Locus</li> </ol>	<ol style="list-style-type: none"> <li>Moriello Park/ Mullberry &amp; Church St. Vicinity</li> <li>Municipal Properties &amp; Pit</li> <li>Southside Ave./ So. Chestnut St.</li> <li>Core of Village</li> <li>South Chestnut/ Mohonk Intersection</li> <li>Pencil Hill/Water St. Vicinity</li> </ol>

Note: Feasibility Analysis for sites shown in blue will be completed as part of a separate Engineering Planning Grant to be completed by the Village Engineer

The sensitivity analysis demonstrates that altering the weightings changes the ranking of the sites, but the same six (6) to eight (8) sites continue to make the 'Top 6' list. There was consensus among project stormwater professionals and the GI Steering Committee that Feasibility and Water Quality criteria should be weighted most heavily, followed by Soils and Smart Growth, and then Aesthetic and Regulatory. The values presented in column 'Weighting A' of the Sensitivity Analysis were considered to best reflect the preferred weighting based on project specific goals and objectives, and results in the following Top 6 list of project sites:

1. [Moriello Park / Mullberry & Church St. Vicinity \(Site 3\)](#)
2. Municipal Properties & Pit (Site 8)
3. Southside Ave. / So. Chestnut St. (Site 2)
4. Core of Village (Site 1)
5. [Hasbrouck Park \(Site 7\)](#)
6. South Chestnut / Mohonk Intersection (Site 5)

It should be noted that substantial changes to weighting can play a significant role in selecting preferred project sites for GI implementation. For example, if the "Potential to improve existing drainage issues" criteria was more heavily weighted, sites with existing localized flooding, such as West Center Street (Site 6) and Church & North Front Streets (Site 14) would rise to the top of the list. The Next Stage Screening Matrix provides a tool that the municipality can utilize for on-going GI Capital Planning, which can be adjusted to consider alternative weightings and rankings based on changing influences, such as municipal priorities or available funding criteria.

Feasibility Analysis for GI at the project sites highlighted in [blue text](#) above have been included within a NYSDEC Environmental Facilities Corporation (EFC) Engineering Planning Grant (EPG) obtained by the Village, and being completed as a separate parallel project by the Village Engineer. In addition to the Moriello Pool property and Hasbrouck Park properties, the scope of the EPG also includes feasibility analysis for the West Center Street (Site 6). The Village Engineer has confirmed that, scope of work for those sites will include property line and topographic surveys (and possibly soils borings and permeability testing) as required for preliminary engineering to explore feasibility and develop a specific scope for GI construction to reduce the impacts of stormwater discharges on the Village's sanitary sewer system in these locations. It should be noted that Phase I of the West Center Street project includes gray infrastructure improvements and has already commenced. The intent is for Phase II of this project to consider a cistern for reuse on Village owned land on West Center St, potentially for stormwater harvesting for reuse at the newly proposed join Village and Town Hall. Phase II may also incorporate GI at the Hasbrouck Park (Site 7) and could incorporate proposed improvements for Plattekill Ave (Site 8), as described in Section 5.0.

The Villages intent is to utilize the remaining funds in the EPG, along with the required local match, to move the planning of these three projects (Sites 3, 7 and 6) to a point where they can



be moved to final engineering design and construction to make one or all of these projects a reality. Therefore, to avoid duplication of efforts, Sites 3 and 7 were removed from the Top 6 list of preferred sites for the purposes of this study.

#### 4.5 Selection of Preferred Sites

Based on the sensitivity analysis, and with the exclusion of sites 3 and 7, as described in the previous section, the top 3 sites to be considered for Feasibility Analysis include:

1. Municipal Properties & Pit / Plattekill Ave (Site 8)
2. Southside Ave. / So. Chestnut St. (Site 2)
3. Core of Village (Site 1)

The list of three preferred sites was scrutinized, considering project readiness and complexity, with a desire to select at least one project that may be implemented within a shorter term, plus another one to two projects that may be considered longer-term.

There was discussion among the GI Steering Committee, Village staff and elected Officials as to whether to advance the 'Core of Village' site, bounded by North Chestnut and Main Streets and adjacent to the Rail Trail (Site 1), which ranked in the Top 3. A portion of the public property within this site is within a conservation easement on rail trail lands, while another portion is identified on rented space by the intersection where there was planning for an enhanced vest-pocket park. Village Officials confirmed that the time required to explore potential work on leased property would not fit with desired implementation timeline and that the preference is to focus instead on two preferred sites, Site 8 (Figure 3) and Site 2 (Figure 4).

It was noted the public part of the 'Pit' properties (Site 8, Figure 3) has various complexities, including ownership and potential redevelopment. The municipal parking lot and buildings are being considered for redevelopment in the short term which would limit the ability to construct GI on this site until it can be accomplished in conjunction with that re-design. Thus, the 'pit' and DPW and Village Hall parking area were removed from the Site 8 polygon, while the roadway section of the polygon was expanded to include the entire length of Plattekill Ave. This results in advancement of a smaller scale project, progressing the Village's vision for complete streets, while minimizing exposure to uncertainty associated with potential redevelopment. This project also supports the goal of providing feasibility analysis and readiness programming for an approach involving a highly visible prototypical but unique street treatment which can be replicated in other areas of New Paltz.

Although the Southside Ave. / So. Chestnut Street (Site 2, Figure 4) is less visible than the Site 8 location, it was determined to be an ideal candidate to compliment the Site 8 selection, as the wide street right-of-way and absence of design constraints provides an opportunity to move

quickly to install GI in this location. It was also noted that this street is slated for re-paving in the near future and opportunities exist to consider the impact of GI installation on capital planning for these improvement.

The final polygons for the two preferred sites for Feasibility Analysis are shown on the figures below for Site A, Plattekill Ave and Site B, Southside Ave.

Figure 3: Preferred Site A: Plattekill Ave

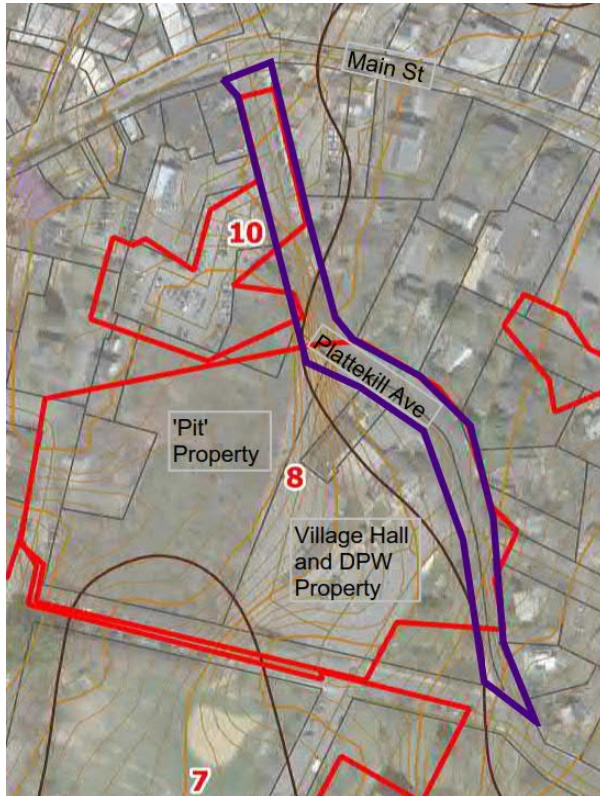


Figure 4: Preferred Site B: Southside Ave



## 5.0 FEASIBILITY ANALYSIS

### 5.1 Scope

The scope of the feasibility analysis is framed by the objective to evaluate the potential to incorporate GI, primarily on public lands, within the nominated polygons for each of the two preferred sites. The purpose of the Feasibility Analysis Report is to assess the suitability of installing GI at these targeted locations, as well as to prepare documentation that the community can use within applications for external funding assistance. The Feasibility Analysis Report completed for Preferred Sites A and B is included in Appendix A10.

### 5.2 Summary of Results

Both Preferred Sites A and B were found to have soils with satisfactory groundwater infiltration, with preliminary infiltration results that appear sufficient for GI practices without the addition of an underdrain system, and with suitable public land available and are recommended for implementing GI when funding becomes available.

Since the majority of both sites consist of concrete sidewalk and asphalt, stormwater currently moves quickly throughout the respective sites without soaking into the soil. Introduction of GI practices will reduce downstream flows by encouraging stormwater to infiltrate on the respective sites.

Sanitary sewers at Site A, along Plattekill Ave, are considered to be in good condition. The goal of SSO reduction will be achieved by preventing surface ponding and encouraging stormwater to infiltrate in this area, subsequently reducing flows to the storm sewer system as well as reducing flows directed to the 'Pit' and lower lying areas, such as along Hasbrouck Ave and South Chestnut Street, where inflow/infiltration is a known issue contributing to SSO.

Sanitary sewers at Site B, along Southside Ave, are also considered to be in good condition. The goal of SSO reduction will be achieved by preventing surface ponding and encouraging stormwater to infiltrate the ground, reducing flows to the storm sewer system upstream of a known SSO location near the intersection of Water Street and Mohonk Ave (Refer to Figure 2 for SSO locations).

### 5.3 Cost Estimate

The tables below shows planning level cost estimates for the installation of green infrastructure at Sites A and B based on the proposed practices presented on the Feasibility Analysis concept plans (refer Appendix A10).

Table 5-1: Estimated Cost of GI for Preferred Sites

SITE A								
GI PRACTICE	AREA (SQFT)	Unit Cost (\$/sq ft)	Subtotal estimated in 2018 dollars	Total cost estimate including contingency (25%)	Total cost estimate including contingency (25%) and engineering (25%)	Maintenance Unit Cost Range (\$/SF)	Typical Maintenance Unit Cost (\$/SF)	Estimated Annual Maintenance Cost
RAIN GARDEN / STORMWATER PLANTER	1,200	\$14	\$16,900	\$21,100	\$26,400	\$0.4 to \$4	\$0.90	\$1,100
PERMEABLE PAVER SIDEWALK / PARKING LANE / BIKE LANE	20,200	\$13	\$260,700	\$325,900	\$407,400	\$0.1 to \$0.3	\$0.15	\$3,000
Total Preliminary Project Cost Estimate					433,800			

SITE B								
GI PRACTICE	AREA (SQFT)	Unit Cost (\$/sq ft)	Subtotal estimated in 2018 dollars	Total cost estimate including contingency (25%)	Total cost estimate including contingency (25%) and engineering (25%)	Maintenance Unit Cost Range (\$/SF)	Typical Maintenance Unit Cost (\$/SF)	Estimated Annual Maintenance Cost
RAIN GARDEN	260	\$22	\$5,600	7,000	8,800	\$0.4 to \$4	\$0.90	\$200
PERMEABLE PAVER SIDEWALK / PARKING LANE / BIKE LANE	3,800	\$20	\$74,600	93,200	116,500	\$0.1 to \$0.3	\$0.15	\$600
Total Preliminary Project Cost Estimate					125,300			

## 6.0 IMPLEMENTATION STRATEGIES

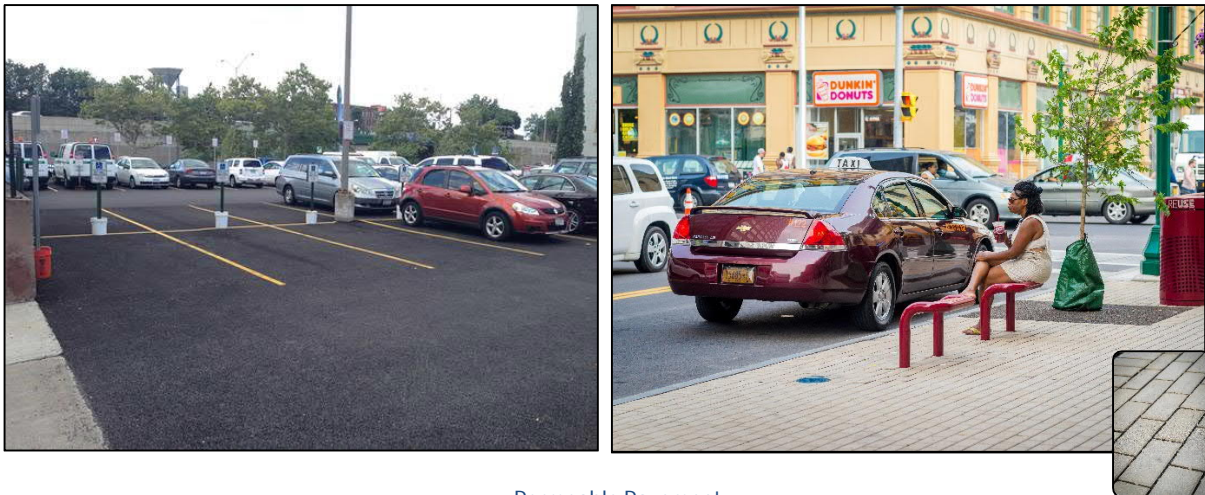
### 6.1 Land use considerations

GI is scalable, with a wide variety of practices available, along with a growing number of new practices and refinements. Every retrofit or redevelopment opportunity provides a chance to include GI practices.

Though every retrofit presents opportunities for GI, the types of opportunities will vary throughout the Village and Town of New Paltz. Existing land use and density of development will help to determine which GI practices are best suited to each retrofit and redevelopment project. In addition, the best options for GI will vary based on physical constraints of the site, including area, soil conditions, and slope.

Urban areas often have limited green space and, therefore, relatively small GI investments such as tree planting can have a positive impact.

Land uses that require dedicated parking provide an opportunity to redefine the standard parking lot, by incorporating bioretention, tree planting, or permeable paving to create a more aesthetically appealing pedestrian friendly lot while addressing stormwater issues. These may include commercial districts, industrial districts, and high density residential areas.



Permeable Pavement

Some project types, such as green roofs or stormwater planters, may make the most sense in dense urban areas with a large percentage of impermeable surface. These are more heavily constructed practices that are designed to make big impacts where space is limited.



Other projects such as stream buffer restoration may be more feasible in rural settings. Where natural systems are already in place it is cheapest and most effective to preserve these systems through conservation practices.



## 6.2 Maintenance Framework

Many GI practices can provide valuable services with relatively little maintenance. The key to low maintenance GI is considering maintenance during the planning and design phases. This can increase the effectiveness of GI maintenance, cut down on costs, and increase the lifespan of GI practices. All project elements, living and constructed, will require adequate maintenance over the long term.

Communities that are planning for GI implementation are encouraged to identify the potential GI strategies, the associated maintenance requirements, confirm the responsibilities for maintenance, and take action to fund a maintenance plan, so that long term GI benefits are realized. The following maintenance strategies are recommended:

- Incorporating a maintenance plan into design - This plan should detail which staff will be responsible for maintenance, what maintenance tasks need to be performed, and at what frequency. In addition, the cost for replacement of components of a GI practice should be included in the plan. A maintenance plan cuts down on surprises and reduces inefficiencies in project maintenance.
- Planning for a second planting - As part of the communities long term GI maintenance plan, long term care for the plantings needs to be considered. Three to five years after construction, when plants are established, there is an opportunity to do a second infill planting. This can fill in any open spaces, decreasing the need for weeding and improving the appearance of GI. A second planting will generally be

- much smaller in scale than the initial planting, and plants can be selected based on which plants are already thriving. Over the longer term, periodic replanting for dead or diseased plantings should be budgeted for.
- Staying organized - keeping track of GI projects - Keeping track of all the GI practices in a community and managing them together can reduce redundancies, making project maintenance more efficient. Using Geographic Information Systems (GIS) software is one way to track the location, health, and maintenance of GI practices. Additionally, a GIS or map record of GI projects can serve as a planning document and a demonstration of a community's commitment to GI and meeting stewardship goals. As MS4 communities, the Village and Town should already have an inventory of existing GI locations. Continuing and expanding these efforts to include potential GI projects, could have many benefits for the future of GI in the municipality.
  - Training maintenance staff - Planning for GI should also consider the training of staff to maintain GI practices. Without this, GI would be maintained by municipal staff with little or no training in GI care. Providing information about the purpose of GI, how it functions, and how to care for it, can increase staff buy-in and improve the effectiveness of maintenance.
  - Knowledgeable construction crew - Many of the techniques for installing GI are different than typical construction best practices for non GI projects. Ensuring practices are oversight and construction by experienced staff will improve the quality of GI which results in projects that are easier to maintain over time. There are certification programs for GI practices - hiring GI certified staff or certifying municipal staff is one way to increase the impact of GI and decrease long term costs. The National Ready Mixed Concrete Association is one of the many groups that provide GI certification programs.

### 6.3 Existing Municipal Resources

The NYSDEC Maintenance Guidance document (March 31, 2017) provides guidance on the required maintenance inspections and renewal activities for each stormwater management practice type. This document identifies Maintenance Inspection Hierarchy Levels 1, 2 and 3.

Level 1 maintenance inspections can be completed by property owners/managers and municipal maintenance staff (i.e., DPW or Highway Department staff) with limited training.

Level 2 maintenance inspections and responsibilities would fall to the Superintendent of Public Works in the Village or the Highway Superintendent in the Town. In addition to maintenance inspections, Level 2 maintenance includes minor renewal/repair work such as: Removal of

larger amounts of sediment; Structural damage repair; Minor regrading and scarification of soil surface to restore permeability.

Level 3 maintenance would require qualified professionals, and could be undertaken by the Village or Town Designated Engineer, or other qualified Consultant or Contractor, to address more complex maintenance issues such as the redesign or reconstruction of a failing system or the replacement of soil media.

The Maintenance Recurrence and Resources table (Refer to Appendix A11) was developed to demonstrate the anticipated maintenance activities for various GI practices and documents the Village and Town's in-house capacity to undertake these activities.

The gap analysis shows that both the Town and Village are well equipped to undertake the required maintenance for GI practices, with the exception of the following gaps:

- Weeding, replanting, mulching and soil additives – Gardening work is often undertaken by volunteer committees, such as the Town's Community Improvement Team (CIT). Municipal staff are not trained in plant differentiation and specifics of bio-retention vegetation.
- Sediment disposal – Municipal staff are not trained in relation to sediment sampling (if required) and proper disposal.
- Minor/major resetting of bio-retention (including pipes, underdrainage pipes, filter media and plants) – Resetting of stormwater GI filter media and infrastructure requires specialty contractors to meet specifications and infiltration rates.
- Pest control – Municipal staff are not trained or licensed for application of plant pest controls.
- Porous pavement – Rubber-tipped snow blades are not installed on municipal trucks. Purpose-built vacuum head is not currently available. Tubing connection to existing vacuum truck could be manually operated however may not be efficient.

## 6.4 Advancing GI on Private Property

### 6.4.1 Reduced area threshold for GI implementation

The NYSDEC SPDES General Permit for Construction Activity regulates GI and post-construction stormwater management practices for land development activities with greater than 1-acre of disturbance. However, to realize the benefits of GI within urbanized areas, where the majority of construction is infill/redevelopment with less than 1-acre disturbance, it is critical to incentivize GI for sites with less than 1-acre of disturbance.

It should be noted that there is a significant difference between the Village and Town stormwater management codes, in relation to implementation of GI for sites with less than 1-



acre, as presented in the following subsections. The Village has adopted a lower threshold for requiring post-construction stormwater management practices than the Town, which has adopted the 1-acre threshold per the NYSDEC guidelines.

#### Village Stormwater Management Local Law

Chapter 165, Storm Sewers and Stormwater Management was adopted by the Village of New Paltz in December of 2017 in accordance with the requirements for MS4 communities. The adopted law builds on the MS4 model local law and requires post-construction stormwater runoff control for land development activities where the amount of land disturbance is equal to or greater than 5,000 square feet and where the impervious cover created is 1,000 square feet or more, with the exception of new one- family or two-family residential development creating less than 1,750 square feet of impervious cover. Refer Village Code 165-29.A(2).

#### Town Stormwater Management Local Law

Chapter 116, Stormwater Management and Erosion and Sediment Control, was adopted by the Town of New Paltz in December of 2016 in accordance with the requirements for MS4 communities. The threshold adopted within the law is in line with the NYSDEC SPDES General Permit for Construction, requiring post-construction stormwater management practices for sites with land disturbance over 1-acre. Refer Town Code 116-7.B(2).

An amendment to the Town's Stormwater law may be considered to trigger implementation of GI for redevelopment projects at smaller commercial sites, such as those more frequently found within the urbanized areas of the Town (e.g. McDonalds, Dunkin Donuts, etc.).



*Aesthetically Pleasing Green Practices that Promote Infiltration, Detention and Uptake of Stormwater*

#### 6.4.2 Full review of Existing Stormwater Ordinance

In addition to reducing the disturbance area threshold, other amendments to the municipal stormwater local law may be considered to incentivize private uptake of GI practices. Examples of amendments include:

- Post development peak runoff not to exceed the existing peak runoff for the 10-year storm event;
- Properties one-quarter ( $\frac{1}{4}$ ) acre or smaller must either: detain the first one (1) inch of rainfall and direct 100% of the rooftop and 75% of surface stormwater flows to a tree well, drainage swale, raingarden, or underground cistern; or install a green or blue roof;
- Increase 25% water quality treatment for existing impervious on redevelopment sites;
- Prioritize stream day-lighting, where feasible;

- Adopt minimum 20-foot buffer from streams;
- Adopt wetlands local law within the Village (similar to the Town law)

The above list provides examples of adaptations to the model local law that have been adopted in municipalities within New York. A full review of the Village and Town Stormwater Management local laws to incentivize GI within private property is beyond the scope of this project.

#### 6.4.3 Constrained urban sites with less than 1 acre disturbance

Incentivizing GI within small urban parcels, where space is constrained, can be accomplished by implementing 'alternative' guidelines that do not meet the standards of the NYSDEC SWDM, but will nonetheless contribute to the municipality's goals of advancing community resiliency, improving local drainage and reducing sanitary sewer overflows (SSO).

In 2017, B&L assisted the NYSDEC and Capital District Regional Planning Commission (CDRPC) in reviewing the current NYSDEC SWDM for opportunities to expand upon current practices. Although the toolbox was developed for a group of six municipalities in the Capital Region and with an aim to reduce combined sewer overflow (CSO), it is publicly available and the techniques and methods described in the toolbox are applicable for the evaluation of GI practices in other municipalities to promote GI implementation within an urbanized setting.

The Toolkit emphasizes stormwater management through retention and infiltration with a focus on urban areas and small sites – specifically focusing on volume as its main objective. It can be referenced for sites that are not subject to the requirements of the NYSDEC SPDES General Permit for Construction Activity, being less than 1 acre in size, providing techniques for developers similar to the standards within the NYSDEC SWDM, but urban adaptable with relaxed limits to meet constraints often encountered in the in-fill/redevelopment projects. Example adaptations include such elements as:

- reduced pretreatment requirements
- reduced separation distance to groundwater
- increased maximum ponding depth

For further details, refer to the Toolkit at <http://cdrpc.org/programs/water-quality/green-infrastructure-toolkit>

#### 6.4.4 Planning Board Review

The adoption of GI for private development projects will be facilitated through the Planning Board review process, promoting private uptake of the SWD Guidelines and ensuring that the requirements of stormwater local laws are met. Engineering reviews should focus on identifying opportunities for stormwater management using GI techniques, appropriate to the constraints of a particular site. Training of Planning Board members is also important to increase awareness of, and exposure to, the various tools and resources available for adaptation of GI to private development sites.

#### 6.4.5 Leverage Municipal Policies

The municipality has various policies and ordinances that may be leveraged for the effective implementation of GI. Utilization of GI to enhance stormwater quality can be strengthened by reviewing and weaving GI into these varied municipal documents, which is further supported by developing enforcement, cooperation and capacity within all municipal departments and committees. Examples of these documents include: MS4 Stormwater Management Program (SWMP) Plan, Hazard Mitigation Plan, Complete Streets ordinance, municipal budgetary process, Wallkill River Watershed Alliance Action Plan, etc.

It should be noted that inclusion of GI elements within municipal policies and plans will also strengthen applications for funding of GI projects. For example Green Infrastructure must be specified within a municipality's Hazard Mitigation Plan in order to be eligible for funding through emerging collaborative EPA and FEMA funding programs.

## 7.0 FUNDING OPPORTUNITIES

The table below presents funding opportunities for green infrastructure projects at the federal, state and local levels. Demonstration of public and stakeholder engagement, such as the process undertaken throughout this project, is critical for project success and will strengthen the application. Additionally, leveraging relationships and partnerships with local organizations such as the Wallkill River Watershed Alliance, State University of New York (SUNY) or the NYS Water Research Institute at Cornell may also be beneficial for project development and securing of funding.

Stormwater from the Village of New Paltz and urbanized areas of the Town discharges to the Wallkill River. In July 2017, the Wallkill River was listed as impaired within the NYSDEC's Priority Waterbodies List. This classification may provide further support for funding of GI projects in New Paltz, increasing competitiveness for grant applications such as the WQIP.

If a project can demonstrate within the WQIP application that it would impact the pollutant for which it's impaired, the applicant will get a multiplier effect on points. The Wallkill River is now listed as impaired for phosphorus, with sources including agriculture, point sources, and urban/storm runoff. If a stormwater project can demonstrate a reduction in phosphorus (or sediment) or reduce SSO, it will score well for that particular grant.

*Table 7-1: Funding Sources*

NYS FUNDING (THROUGH THE CONSOLIDATED FUNDING APPLICATION)		
Grant Name	Funding Source	Relevant Project Types
Green Innovation Grant Program	NYS Environmental Facilities Corp. (Through CFA)	Permeable pavement bioretention systems, stormwater planters, green roofs, urban forestry riparian buffers, floodplain restoration, constructed wetlands, stream daylighting
Community Development Block Grants - Public Infrastructure	Office of Community Renewal (OCR) NYS Housing Trust Fund Corporation (HTFC) through CFA	Flood control, stormwater drainage Stormwater retrofit projects - low income populations
Local Waterfront Revitalization Program	NYS Dept. of State through CFA	Preparation or Implementation of a Local Waterfront Revitalization Program, Redeveloping hamlets, downtowns, urban waterfronts.
Climate Smart Communities Program	NYS Department of Environmental Conservation through CFA	Sustainability projects that support work of municipalities to address the impacts of climate change and preparedness for future extreme weather conditions
Empire State Development Grants - Infrastructure	NYS Urban Development Corporation (UDC) & NYS Job Development Authority (JDA) through CFA	GI practices as part of downtown/streetscape revitalization
New York Main Street Program	NYS Office of Community Renewal through CFA	GI practices as part of downtown/streetscape revitalization
Water Quality Improvement Program (WQIP)	NYS Department of Environmental Conservation (DEC)	Stormwater Retrofits, Green Infrastructure, Stream Stabilization/Restoration, and Other Non-point Source Best Management Practices (BMPs), Upgrade and replacement of road stream crossing structures (culverts and bridges), Rehabilitation of road stream crossings, Installation of fish ladders, Removal or breach of stream barriers, Stream daylighting
Urban and Community Forestry Program	NYS Department of Environmental Conservation (DEC)	Tree plantings on public property
Environmental Justice Community Impact Grant Program	NYS Department of Environmental Conservation (DEC)	GI practices combined with education, stewardship, or monitoring activities in areas with multiple environmental risks
Integrated Solutions Construction (ISC) Grant	NYS Environmental Facilities Corporation (EFC)	Incorporation of green infrastructure into existing base Clean Water State Revolving Fund (CWSRF) projects to improve water quality. Funding for up to 50% of the construction cost. Must remove SW from combined, sanitary or storm sewers and reduce at least 25% of the WQV.

FEDERAL FUNDING		
Grant Name	Funding Source	Relevant Project Types
Community Development Block Grant (CDBG) Entitlement Program	Department of Housing and Urban Development (HUD)	Public facilities and improvements, such as streets, sidewalks, sewers, water systems, community and senior citizen centers, recreational facilities, and greenways.
Section 108 Loan Guarantee Program	Department of Housing and Urban Development (HUD)	The Section 108 Loan Guarantee Program allows future CDBG allocations to be used to guarantee loans for neighborhood revitalization projects, including construction and installation of public facilities and infrastructure. Section 108-guaranteed projects can incorporate GI into their design and construction
National Urban and Community Forestry Program	US Department of Agriculture (USDA)	Urban forestry, tree planting
Pre-Disaster Mitigation Program	Federal Emergency Management Agency	Flood prevention through stormwater management
Clean Water State Revolving Fund (CWSRF)	US Environmental Protection Agency (EPA)	Wastewater treatment, green infrastructure stormwater management, non-point source pollution control, and watershed and estuary management.
Urban Waters Small Grants	US Environmental Protection Agency (EPA)	Urban Waters Small Grants seek to help restore and protect urban water quality and revitalize adjacent neighborhoods by engaging communities in activities that increase their connection to, understanding of, and stewardship of local urban waterways.
Wetland Program Development Grants	US Environmental Protection Agency (EPA)	Wetland creation and restoration, prevention and reduction of water pollution
Science to Achieve Results	US Environmental Protection Agency (EPA)	Stormwater Management Approaches Using Green Infrastructure, Monitoring and Evidence Based Design
PRIVATE FUNDING		
American ReLeaf Program	Private	Tree Planting
The Conservation Alliance Fund	Private	Land Use
Surdna Environment/Community Revitalization	Private	Community revitalization and environment



# **APPENDIX A1**

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## **PUBLIC PARTICIPATION PLAN**

# Village of New Paltz Green Infrastructure Capital Improvements Plan

## Public Participation Plan

April 2, 2018

*This document was prepared for the Village of New Paltz with funds provided through the 2015 Hudson River Estuary Grants for Stewardship Planning (Round 16).*

## Section 1: Introduction

The Village of New Paltz (Village) is developing a Green Infrastructure Capital Improvements Plan (Strategy) to advance comparative analysis and project readiness and construction for increased integration of green infrastructure. This project was funded by a Hudson River Estuary Grant for Stewardship Planning. One of the primary goals of this project is to ensure the long-term success of GI projects, focus on maintenance and quality redevelopment, with particular attention to GI solutions for downtown/infill locations.

A Steering Committee was set up in March 2017 to review areas within the Village and urbanized areas of the Town, and to develop information and documentation for preliminary site selection. The work completed by this Committee will be used as a starting point for implementing the project and developing the components of the Capital Improvements Feasibility Plan. This GI planning project includes three primary phases; 1) screening and priority site selection, 2) feasibility analysis (for three preferred sites), and 3) preparation of a Capital Improvements Feasibility Plan.

This project involves an effort to help provide information for community comprehensive planning and incorporating smart growth principles into land use plans and policies, providing for long-term sustainability, as well as providing for creating a framework for resource-efficient site design and construction, including by providing guidance to help advance adoption of sustainable or 'green' practices and policies for streets and parking lots (public and private), by advancing the Village's complete streets policy, as well as complementing preserved or high value natural resource and open space areas, including wetlands, while also helping advance a healthy urban tree canopy and high quality urban forestry policy. This project also aids Climate Smart Community (CSC) designation and achieving various CSC milestones.

The GI Strategy will be prepared by Barton and Loguidice, DPC, in collaboration with the project Steering Committee, Village staff and local stakeholders. Public participation is an important component in the strategy development and helps to ensure that the outcomes accurately reflect the community's needs and vision for GI implementation.

## Section 2: Purpose

The purpose of the Public Participation Plan (PPP) is to outline the procedures that will be used in the process to foster public participation, including open discussion, communication programs, information services and public meetings to ensure that there are opportunities for public engagement throughout the strategy development.

## **Section 3: Stakeholders**

A goal of early project meetings was to identify stakeholders, those who are interested and/or impacted by the process and outcomes of this project. This plan references both project stakeholders, who will be directly contacted for contribution to the project, as well as local stakeholders, comprised of interested members of the community who will attend meetings and/or workshops following public notices or press releases.

The process will seek to actively identify and involve project stakeholders in recognizing issues, opportunities and assets as well as articulating the resources and information that may be required to improve GI project readiness. In addition to the steering committee, project stakeholders will include the Village Board, Village DPW, Walkkill Watershed Alliance, and Village Planning Board. Public outreach will also aim to involve the Village Environmental Conservation Board, Shade Tree Commissioners, ZBA, and Town Planning and Environmental Boards.

The Campus Sustainability Coordinator at SUNY-New Paltz may be contacted to identify potential additional stakeholders (e.g. Professors, Environmental Task Force, Benjamin Center, Sustainability Committee). This offers a way to bolster engagement and extension between local government and educators.

Local developers may be engaged at appropriate points of the project to gain their perspective on related issues such as level of training, magnitude of impact, available equipment, readiness to implement, etc. Key infill property owners, i.e. neighborhoods with known drainage challenges, may also be engaged as appropriate for discussion of issues and site identification.

It is a goal of this project to educate the general public, with an aim to increase community awareness, and in turn increasing the number of local stakeholders during the process. In addition to improving outcomes and awareness for this project, public education and involvement is a requirement of the State Pollution Discharge Elimination System permit program for Municipal Separate Storm Sewers (MS4). Communication with, and involvement of, the broader community in this GI planning project contributes to the Village of New Paltz' MS4 Stormwater Management Program to achieve Minimum Control Measure (MCM) 1, 'Public education & outreach' and MCM 2, 'Public Involvement / participation'.

## **Section 3: Guidelines for Participation**

In order to foster public participation throughout the process, the Village will follow these guidelines:

- All project meetings will be publicized in advance, and open to the public.
- Village staff will prepare and disseminate documents to the public regarding the strategy development. The Village's website will be used when possible.
- The Village formed an ad-hoc Steering Committee to provide guidance throughout the process. The group is comprised of local stakeholders from the Village and Town. Members are expected to be liaisons for their fellow residents and business owners.
- A scope of work includes up to three Steering Committee meetings and one community meeting.
- Public comments will be welcomed throughout the process.

## Section 4: Public Outreach Meeting

The Village Planner will coordinate with the Steering Committee and other stakeholders to hold the Public Outreach Meeting.

B&L, in collaboration with the Village Planner and Steering Committee, will hold a community workshop to present project development including the Initial Site Screening, Scoring Matrix and framework for analysis of GI feasibility.

The purpose of this meeting is twofold, taking advantage of the opportunity to educate the interested public and project stakeholders on the benefits and opportunities of GI implementation, while getting feedback and buy-in for project specifics, deliverables and frameworks. Target audiences, besides staff, elected officials, and municipal volunteers, would be land owners and development professionals, membership of the Wallkill River Watershed Alliance, and the SUNY-NP community.

It is assumed that meeting coordination and publicity will be undertaken by Village staff and/or Committee members. Information about the Public Outreach Meeting will be posted by Village staff to the Village website, and flyers will be distributed by Committee volunteers. Committee members will document and summarize public input, to be collated and submitted to B&L for inclusion with the meeting summary. The public meeting may take the format of small group discussions including designated members of the Committee within each group to take notes and provide feedback.

The Public Outreach Workshop will include a presentation followed by opportunity for public participation. Topics to be included in the Agenda may include:

- Explanation of what is GI
- Benefits of GI, including GI's role in Sanitary Sewer Overflow (SSO) mitigation
- Opportunities and Constraints for GI implementation in New Paltz
- Importance of capital planning
- Site screening and criteria
- Scoring matrix and selection of Priority Sites
- Framework for feasibility analysis of GI
- Implementation strategies and incentivizing private projects
- Funding opportunities

### Additional Information:

- Village staff and/or Steering Committee members will coordinate invitation of project stakeholders to the Public Outreach Workshop, posting notices of the meeting at Village Hall, on the Village web page, on social media and through email contacts.
- It has been requested, if possible, to video record the meeting.
- Village staff and/or Steering Committee members will provide relevant project stakeholder contacts and will coordinate the collection of information, as required, outside of the public workshop
- It is anticipated that the Community Workshop will take place in early April 2018.
- Village will assist with arranging location and announcements / advertisements for meetings.
- Updates and documents will be provided for public review on the Village's web site, as deemed necessary by the Steering Committee.

## Section 5: Other

- Steering group meetings are planned periodically during the course of this project which is currently anticipated to last through July 2018. As these meetings are scheduled, there will be efforts to publicize these by posting meeting agendas on the bulletin boards outside of the Village Clerk's office as well as within the foyer outside of the Building Department.
- Persons interested in green infrastructure, analysis within this project, and its proposed strategies may provide comments to the Village in writing. These will be considered in the course of project development. In addition to providing written comments to the Village Clerk, interested persons may also contact Municipal Planner, David Gilmour, AICP, at [planning@villageofnewpaltz.org](mailto:planning@villageofnewpaltz.org) or (845) 255-5758.
- A presentation on the project to the joint elected boards of the Village and the Town is currently planned in July, 2018.

# **APPENDIX A2**

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## **COMMITTEE MEETING MINUTES AND CORRESPONDENCE**



**Green Infrastructure Capital Improvement Feasibility Plan Project**  
**Steering Group Meeting Notes**  
**Wednesday March 21, 2018 6:00 to 8:00 p.m.**

*Attending - Rebecca Minas, PE, and Nadine Medina, PE, Barton & Loguidice; David Gilmour, AICP, Municipal Planner, George Profous (from 6:20); Emily Vail, Hudson River Estuary Program. Mr. Bergstein and Mr. Nitza indicated prior obligations from attending in-person.*

Populating GI Sites Preliminary Reconnaissance document. A 38 page document containing pictures, map excerpts, and commentary on site features, initially developed by Barton & Loguidice, based on the recent tour of 15 sites was distributed and is available for editing/additions by the group. This a tool that will be used to help with the rating of 15 sites. Ms. Minas said the timeline for its development is not critical. The next meeting of the steering group is proposed for on or around Wednesday, April 18 (participants should ID to Gilmour whether they're available for a GI meeting starting at say, 5:00). Ms. Minas would like to use this document in selection of three locations that will be provided detailed feasibility analysis. It would be developed as content provided in the back of the GI plan.

Ms. Vail noted there would be a benefit of including information on streams - such as when these are proximate to each of the 15 sites, as well as characteristics of these streams. An example of one is a stream that runs along Hasbrouck Avenue. There was also discussion about Tributary 13 and ones underground in urbanized areas, that essentially become part of the stormwater management system. One such one is underground in the vicinity of Colonial Drive.

Gilmour asked if this 'stream' information' should go within an established category in the document, or a new one. Ms Vail said urban streams are often neglected/ not thought of, so calling attention to them can be helpful. Gilmour noted there is data from Hudsonia, from a decade ago, characterizing Village streams and wetlands - a GIS shapefile of this data can be provided to consultant (Gilmour will be out of office the following week - it will be supplied after that). There was discussion of whether wetlands are regulated in the Village (they are not). Gilmour identified there is a stream setback standard in zoning. There was discussion on the way wetlands are delineated and regulated in Town. There was discourse on possible limitations of Hudsonia data. As for including information on streams within the Reconnaissance document, Gilmour suggested that other environmental conditions, like characterization of nearby open space, is not easily captured/ positioned within the existing categories, so a new category will be added 'Area Natural Resource Features'. Information on streams near sites can be encapsulated in it.

It was noted Village maps of storm-sewersheds and MS4 inflow and outflow points are being migrated from paper maps into an electronic database. Mr. Gilmour indicated the quality of information needs improvement (QA/QC). The digital database for these probably will not be available in an acceptable digital form coincident with this project.

Mr. Gilmour will spend more time checking for information to migrate into the document from the Access database, including checking for pictures, to see if these can be included in the Reconnaissance document. He will also add more observations on locations. Rich Ruth, PE, Brinnier & Larios, will be supplied it for input. The consultants would like more photos of sites. Ms. Vail has photos of the Walkkill. She also has other local pictures to provide, such as one from Water Street vicinity. For the current Reconnaissance screening document, Gilmour will provide information in coming days. It will be supplied to Brinnier & Larios for input as well.

Turning to the upcoming major public meeting, the GI community workshop scheduled for April 4, in discussing its goals, Ms. Minas said one is education. Ms. Minas and Ms. Vail discussed how much detail to go into regarding GI. Discussion occurred within the context of the draft meeting agenda Ms. Minas provided. It is hoped there can be attendance by key stakeholders, like planning board members.

Ms. Medina indicated she would like to know how much community buy-in there will be around GI. This is insight that can be gained from the meeting. Input on respective sites will be used in screenings. They would like a sense of what the community does and does not support.

Gilmour asked whether Barton & Loguidice obtained sewer line data that they requested directly from Brinnier & Larios, or information requested on conditions of sanitary sewers (including on I&I) at locations and within sub-areas around where GI screenings are occurring. Ms. Minas indicated while they communicated, this information was not received yet, and Mr. Ruth said this would take some time to compile. There will be a reiterated request involving Ms. Minas and Mr. Gilmour. Gilmour noted that the preferred route is for engineers to talk/ coordinate, yet, there are some public documents that could be tracked-down, like CMOM, if- that can help.

Gilmour asked if polygons around potential sites, drafted prior to the consultant's commencement of work, may be adjusted by Barton & Loguidice as they provide site analysis - yes, this is possible. This would probably be the case for the three selected to received detailed feasibility analysis. It is not known by Ms. Minas how readily their GIS technician can manipulate the shape files presented by the Village.

There will be poster boards. In discussing poster boards development, Gilmour indicated a preference for three quality ones rather than four. This can aid incidental costs management within the project.

Project examples and types of GI can be presented in meeting materials. Ms. Minas queried about using SUNY case examples and materials. Ms. Vail cited an example of construction occurring at SUNY where there was physical work / alteration of topography and land cover close to streams in order to install GI. It is not an ideal development scenario when a natural buffer is lost.

Mr. Profous suggested when examples of GI on SUNY-NP are used, there should be consideration to present these as examples of how GI might be mirrored in other locations, with

discussion/ exploration of potential for similar types of be replicated in the village. This provides a way to give examples of GI being instituted locally, which people can relate to and learn about. But it does not require holding-up these SUNY cases as models. There is a green infrastructure tour that has been done on campus, so there could be awareness made to expose people to the GI on campus, such using this tour tool. Ms. Vail will share the report from NYS Water Resources Institute. It covers the campus project that facilitated a large chunk of the GI installation at campus (and assisted stream daylighting by Peace Park).

It was noted there is desire for pictures for applications like stormwater planters. For the presentation, there is an example of a green roof recently approved for siting within the 12 Main Street live theater site plan application. Gilmour (has since confirmed affirmative) checked that it is acceptable for diagrams and specifications for this green roof to be used in Powerpoints, etc. Also, Alfandre Architecture will also be contacted for whether they would allow the consultants to share information on the rainwater cistern installed at their upper Main Street property. (Editor note - response also affirmative for this).

It was discussed that for a project like the recent installation of a cistern on-site at the new Science Center on SUNY campus, it would be beneficial to understand the design objectives of that facility. With background info, it is more readily possible to discuss what characteristics of it may be worthy of mimicking in the Village. Likewise, it would be good to know about characteristics of the underground storage developed under the Main Street parking lot at the Middle School as part School building rehabilitation.

It is an option whether Ms. Vail will speak at the Workshop, she is open to that, if desired.

Discussing education goals, the project can provide exposure to multiple components of GI as well as insights as to how to structure cooperation and collaboration among multiple parties in achieving prevalent GI and sustaining it. There consultants can help achieve buy-in about the attributes and benefits about GI. Education about GI can help information factors in selecting the appropriate type of GI in different situations. For instance, there was discussion about context by Colonial Drive, where it would be beneficial to understand ground-water levels and soil characteristics, as this can influence technology selection, such as ones involving tree plantings, and based on the degree that species may be hydrotrophic, and there should be consideration of root characteristics with different potential species. Mr. Profous was encouraged to add this type of context into the discussion document.

Mr. Profous supposed there are not area-level (regional) models of the net amount of flows impact that can be targeted for alteration within stormwater and sewer systems. So, this project aims to contribute to flows diversions and stormwater management enhancements in a more qualitative fashion. The project can explore, on a case-basis, when there might be designs attempted to aid temporary storage of stormwater flows and attenuating very high-peaked flow curves, like exist when there are high rates of impervious cover in a location or corresponding watershed. It was noted in some nations or places, where there is more highly-advanced stormwater management, there is a relatively high level of water quality treatment, built into the

systems and technology, and practices like GI, are used to aid remediation of contaminants in flows.

The point was made that this project can provide insight into the benefit of integrating grey and green infrastructure. There was discussion that stakeholders can be educated to the many different forms of funding leverage that exist in addition to GIGP, including the Integrated Facilities funding available from NYS Environmental Facilities Corporation (EFC). This funding source provides a grant for the portion of green infrastructure incorporated into a primarily grey project, incentivizing the integrated-type of approach this project is exploring and advocating for. There was consensus within the group that there can be research into the types of projects that have been funded, where these are, what types of technology have been used, goals and objectives of these, and whether the program criteria remains the same as when they were awarded funds. Barton & Loguidice can assist this research as project progresses.

But discussing relationship between this project and potential assistance with aiding sewer operations and assisting SSO mitigation, Ms. Minas noted that I&I is a complex issue. There should be awareness of limits as to how much in-ground GI installations can aid minimization of I&I. If there is lots of I&I, if the issue is with groundwater entering the sanitary system through infiltration, GI alone will not be likely to solve problems. This project should not form unrealistic expectations about the extent GI can aid I&I minimization. GI and grey infrastructure can be structured to complement one another and to reduce surface water from getting into the sanitary sewer system. Barton & Loguidice can look at how to deal with reductions in surface flows to help mitigate I&I. For instance, there can be examination of ponding by sanitary sewer manholes by potential GI sites. Brinnier & Larios can gather and provide information on context and sewer conditions around potential GI sites to aid sites analysis.

There was discussion of the mix of Barton & Loguidice staff who will participate in the meeting. One planner identified at proposal-stage left their employ. They have another individual, Mr. Marshal who will participate. Gilmour suggested that is up to the consultant - but there is scheduled to be a presentation to the joint elected boards at the final stage of the project, so it is important to also have B&L resources available for explaining the project and implementation at that point as well.

Mr. Gilmour encouraged discussion of how to leverage outside funding to help achieve and implement locally important projects at the meeting. Ms. Minas said the funding dialogue may be put aside for greater emphasis in later stages of the project. Rather, the focus would be on applications of GI and the opportunities and constraints in siting it. Ms. Minas said there should be some awareness of the potential of GI in the community, desire for using it. She anticipates some familiarity among and experience among stakeholders within this community with GI and implementing GI, so there will be focus on building more capacity around GI, so as to complement these strengths.

The meeting should be used to help people in attendance understand ways they can help advance utilization of GI and bring awareness about what they can do with information they

receive at the community workshop. It is noted participants can be informed of ways they can be involved with various local boards, committees and commissions, as well as with nonprofits like Walkkill River Watershed Alliance. Local groups like them or New Paltz Climate Action can be invited to display materials and sign-up sheets. The project will not study need for downspout disconnections, but there can be awareness stimulated of the benefits of rain barrels and cisterns, and promotion of people using these, plus awareness around regular ongoing opportunities, such as from Ulster County Resource Recovery Agency, which annually holds a sale of rain barrels (confirmation can occur that this sale will happen this spring).

Databases and inventories of stormwater management and GI opportunities, such as will be contained in the plan, can be presented as living documents, available for ongoing use and refinement by entities like DPW, the planning, zoning and environmental boards. This way, on a case-by-case basis, and according to needs, and as aligned opportunities present themselves in the future, it might be possible to incrementally and cumulatively implement more GI.

It was noted in regard to making the case for GI, there should be presentation of the bigger picture and the substantial costs of continuing on with business as usual. This project embodies one where there is an effort to be proactive in terms of costs avoidance, including for the high costs of operating old/ underperforming sewer lines and the cost of water unnecessarily being processed at the WWTP. Plus there are associated costs of maintaining regulatory compliance.

The powerpoint presentation will be targeted for 30 minutes. Ms. Minas said implementation strategies will not be a focus - that content will come later.

Turning to how group public input and table-level discussions will occur and be structured after the powerpoint presentations, Mr. Gilmour felt public workshop meeting content and time does need to be reserved to explore and address potential for GI sitings in parklands to be a potential issue of 'alienation' of such parkland properties. As background, it was noted that Mr. Gilmour and Ms. Minas previously discussed a notion that there may be a need to address a potential concern that GI deployed in public parklands would need to be documented through evidence and formal criteria why, when is GI sensitively and carefully sited in parks, it is not a potential alienation of such parklands. Since that discussion, Gilmour consulted NY State Parks regional staff, who opined within the last week that in most instances siting GI in parklands is not likely to raise an alienation concern. Ms. Vail agreed with this notion. There is report she saw, that was widely distributed within professional networks, which specifically addressed use of GI in parks and encouraged it. Ms. Vail will find and circulate this report. Hasbrouck Park was discussed as an example. Moreover, it was noted that there were previously grey drainage system improvements to the park and these were not alienation. There was consensus GI can enhance the appearance of parks, like complimentary landscaping, and often its deployment can be structured to be cheaper than just grey infrastructure alone.

The structure of the group discussions may occur in a way that locations and areas can be delved into, so there may be input gathered on perceptions about the specific opportunities and constraints associated with GI at and around various spots. If there are not enough people

attending to allow people to elect the table they will go to which will cover a place they are familiar with, such as by where they live or work, then the structure may be for people to go from one table to another in sequence. This will depend on the number of attendees.

There can be brief (consensus emphasis) report-outs by groups. Gilmour should help summarize by identifying next steps within the project, retiring ways for people to be involved, and the relationships to various BCCs. He should identify the timeline and projects thresholds. This can also identify that citizens can have a chance to review various recommended strategies, and approximately when these will be available and ways (including channels by which) to provide feedback on them.

In discussing potential meeting handouts, there was a text-based inventory list of types of GI previously supplied by Barton & Loguidice, but it is only text. Rather than using this, which has potential to be technical and without too much specifics, Ms. Vail advocated for using a 2-page color handout on GI that is available on the EFC - GIGP web page.

Also, in terms of location maps/ graphics that Barton & Loguidice uses, there is a soil horizon shown with a blue line. Since this can be incorrectly construed as a water resource or watershed boundary, Ms. Minas said this will be changed to a different color, such as brown.

The meeting occurred from 6:05 to 8:00 p.m.

Respectfully submitted,

David Gilmour, AICP, Village Planner

Version: march 28, 2018 0900

**MEETING SUMMARY**  
**NEW PALTZ GREEN INFRASTRUCTURE (GI) CAPITAL IMPROVEMENTS FEASIBILITY PLAN**  
**PROJECT STEERING COMMITTEE WEDNESDAY, MAY 2, 2018, 5PM VILLAGE HALL**  
**Version: 5/9/18**

*Attending: Rebecca Minas, PE, and Nadine Medina, PE, Barton & Loguidice; David Gilmour, AICP, Municipal Planner; Ted Nitza, P.E.; George Profous; Emily Vail, Hudson River Estuary Program. Mr. Bettez indicated attendance was not possible.*

**Materials distributed:**

- Agenda
- 15 Potential GI Sites Reconnaissance Doc. (w DPW/ Engineer's comments)
- Draft Next Stage Scoring Matrix
- Comparison GI Practice Types
- Draft Implementation Strategies
- Natural Resources map
- New Paltz GI Map
- Schedule revised May 2018
- April 4 Meeting Summary

**Review of Meetings / Notes** - The April 4, 2018 Community Workshop Meeting Summary developed and distributed by Mr. Gilmour was accepted by unanimous consent. Likewise, the summary from the March 21, 2018 Steering Group meeting (distributed 3/28/18) prior to April 4 Workshop was approved by consent.

There was discussion that the Workshop was well attended. Participants were engaged and asked quality questions and gave substantial feedback.

**Evaluation, Ranking & Selection of Up to Three Sites to Receive Feasibility Analysis** - Ms. Minas met with DPW Director Terwilliger and Village engineering consultant, Richard Ruth, PE, to review 15 sites and obtain feedback, including on characteristics of sanitary sewers by locations. Electronic information on sewer lines was provided to Barton & Loguidice. The group's reconnaissance document summarizes the March 9, 2018 site visits and commentary by DPW/ Brinier & Larios Engineers. It likely will be a plan appendix. It does not contain public input obtained from the 4/4/18 workshop.

The group reviewed the revised four-page draft screening matrix sensitivity analysis results with summary table. It includes sets of criteria with descriptions of criterion and weightings ascribed subsets, with overall rankings by Barton & Loguidice. Three locations receiving analysis by a different Village Engineer per an Engineering Planning Grant project are provided unique call-outs.

The objective is to select up to three sites for which detailed feasibility analysis will be performed. With a water quality goal for the project, there was discussion about

moving some criteria out of the 'smart growth' subset, and weighting those removed ones higher, and many smart growth criteria lower, but in a way that still provides high emphasis on high-profile/ visible sites.

One option could be to attempt to define feasibility and advance readiness for one project that may be able to be implemented within a shorter term, plus another that may be longer-term. It was noted the public part of the 'Pit' properties has various complexities. Alternatively, there was a continuing line of discussion around pros and cons of action to combine that location with the Plattekill Avenue lot. One notion could be to promote formation of an enhanced stormwater system 'skeleton' or framework on them. There was discussion of uncertainties, complexities and risks involved in an approach using one or both of these. Mr. Gilmour suggested there are sub-parts of these locations. It was asked if it may be possible to advance small project somewhere here, even if there is uncertainty on bigger picture.

All present are interested in selecting sites to get a GI improvement, or GI improvements done. Mr. Profous discussed conditions in and by Church & North Front Streets Location, contemplating its relative ripeness. He provided comments on other sites, with similar discussion for Base of Henry W. Dubois Drive site.

Mr. Gilmour indicated that annual announcements for some types of grants were made. He is evaluating opportunities to apply for implementation funding, including WQIP of NYSDEC.

There is support for providing feasibility analysis and readiness programming for a type of approach involving a prototypical but unique street treatment. It can aid advancement of complete streets.

There was discussion whether to advance 'Core of Village' site (bounded by North Chestnut & Main Streets & Rail Trail), which ranks high. Gilmour IDs that public property in this polygon is on rail trail plus rented space by the intersection where there was planning for an enhanced vest-pocket park. There is a conservation easement on rail trail lands. There have been musings in the community whether it may be desirable for public lands to be used for enhancing/ managing up-gradient flows. Regarding this location, Gilmour notes in northeast part of polygon, plus extending beyond it, by rail trail, there's an 1890's era stone wall, including west of Academy Street terminus. Water accumulates in a depression west of stone wall and east of rail trail. He doesn't suppose it could be readily possible to enhance treatment and storage in this area where water already ponds while enhancing trail environment landscaping and ambiance.

The GI Plan will provide treatment to ID substantial analysis and vetting around the 15 sites, describing factors considered, including alternative GI implementation practices. There can be commentary on which ones rank well within the 15. This way it will ID ones that may be ripe for future planning/ implementation, even if they did not proceed to feasibility analysis in this Project or the EPG Project. Consensus is the



group will not seek to advance high-ranking Core of Village site if the property by the intersection is seen as unlikely to be accessible for GI development. (*Editor Note – it was subsequently confirmed it would take time to explore potential to work on leased property and this would not fit with Project timeline*).

Planner is surprised how three sites being analyzed in EPG stacked-up. There was a question on aesthetics variable application against Hasbrouck Park. He has other questions on scoring for that site. He notes EPG order is different, with West Center first, then Hasbrouck. This may be driven by unique emphasis within EPG Project.

For Southside Ave./ So. Chestnut Street site, it was surprising to consultant this one scored high. Mr. Nitza felt there is not much in the way at this location.

There was extensive discussion about location and surroundings where Village Hall/ DPW/ Town Court are at, Plattekill lot, streets, area drainage, and other factors.

Group discussed synthesis on soils by Barton & Loguidice.

There is agreement that when locations are selected to receive feasibility analysis, it is acceptable to re-arrange polygons for these locations.

There will be alterations to information discussed at this meeting with redistribution to the group. Participants are asked to provide feedback/comments via e-mail within one week (*see further Editor Note below*).

**Selection of Three GI Practice Types to Address in Plan** – Selected practices (1pp handout) are: Porous Pavement; Raingarden; and Street Trees - Tree Pit. For porous pavement, focus will be less on poured and cured on-site media, like asphalt, concrete or rubber applications, because these are, in their current practices, often found to be difficult to consistently achieve quality control during construction (and operating performance). Rather, focus here is on various modular/ assembled systems like types of pavers, large blocks that are shipped and installed on prepared bases, etc. There are many proprietary brands. Often these are used in sidewalks, parking edges, driveways.

There was consensus that no matter what locations are chosen and what three types are drilled-down on, the process of installing GI would aesthetically improve locations.

- Visibility of sites will help prompt upkeep and maintenance
- Per Ms. Medina, some poured technologies are shown to have 5% failure rates
- Kingston has grit and garbage getting into some of its GI
- Prefabricated techniques may require less pre-treatment before receiving runoff
- Gilmour supported the selections, but did ask if substituting Bioretention may be a technology that can also provide some storage/ underdrain to aid peak flow management in urbanized sewersheds and establish prototypical street treatment

**Other Assorted Business** –

The group touched on the one-page implementation strategies handout –

- Asked about plan audience, strategy can ID ways to foster capacity and support for GI implementation among electeds, DPW and Planning Boards
- Gilmour suggests forming guiding principles for use of GI on public properties;
- Budgetary process and Stormwater Management Program (SWMPs) are policy in addition to ‘master plans’.
- Gilmour encourages weaving GI into other plans, like of Wallkill River Watershed Alliance, such as if there is a 9-point plan, sub-watershed plans
- There should be care to have well-tailored incentives
- Stream daylighting can be encouraged

Ms. Minas will be out of office in part of July and desires to confirm date of meeting with Village and Town Boards soon.

***Editor note*** – After meeting the matrix was modified and discussed by the group, with process advanced to select sites to provide with feasibility analysis. Ms. Minas:

- Added a ratio for each set of criteria so each is given a value out of 1 (i.e., 1 representing the highest ranking that a site could achieve for a given criteria set). This ensures that each criteria set is valued equally in the overall ranking, prior to the weightings being added
- Removed ‘aesthetic’ from Smart Growth criteria and gave it a lower ranking than the others, leaving SSO and natural resources criteria in smart growth because they’re still suited to this category and equally as important as the others in it (i.e. visibility and drainage issues)
- Notes that altering weightings changes ranking of the sites slightly, but the same 6 to 8 sites continue to make the Top 6. As there was agreement to provide heavier weighting on Water Quality and Feasibility Criteria, Ms. Minas suggested information in the report should be provided with a weighting (there was a consensus of the group to provide a weighting). If we exclude ‘core of the village’ site and EGP sites, that leaves the following 3 winners for all weighted scenarios:
  1. Site 8 - Municipal Properties & Pit
  2. Site 2 - Southside Ave./ So. Chestnut St.
  3. Site 5 - So. Chestnut/ Mohonk Intersection
- Believes there is merit in swapping out Site 5 for Site 10 (Plattekill & Vicinity) in the interest of combining Sites 8 and 10, as discussed at the May 4 meeting. This may also prove beneficial to allow a focus on a particular area and not spread resources too thin.
- At point of meeting follow-up, had not had chance to do QA/QC and format data distributed, instead getting it out to group in the interest of getting feedback and making final selections.

**Respectfully submitted, David Gilmour, AICP**

*This Project is supported by the Hudson River Estuary Program of the New York State Department of Environmental Conservation (NYSDEC). Project funding was provided from the Environmental Protection Fund as administered by the NYSDEC.*

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The objective is to select up to three sites for which detailed feasibility analysis will be performed. With a water quality goal for the project, there was discussion about

moving some criteria out of the 'smart growth' subset, and weighting those removed ones higher, and many smart growth criteria lower, but in a way that still provides high emphasis on high-profile/ visible sites.

One option could be to attempt to define feasibility and advance readiness for one project that may be able to be implemented within a shorter term, plus another that may be longer-term. It was noted the public part of the 'Pit' properties has various complexities. Alternatively, there was a continuing line of discussion around pros and cons of action to combine that location with the Plattekill Avenue lot. One notion could be to promote formation of an enhanced stormwater system 'skeleton' or framework on them. There was discussion of uncertainties, complexities and risks involved in an approach using one or both of these. Mr. Gilmour suggested there are sub-parts of these locations. It was asked if it may be possible to advance small project somewhere here, even if there is uncertainty on bigger picture.

All present are interested in selecting sites to get a GI improvement, or GI improvements done. Mr. Profous discussed conditions in and by Church & North Front Streets Location, contemplating its relative ripeness. He provided comments on other sites, with similar discussion for Base of Henry W. Dubois Drive site.

Mr. Gilmour indicated that annual announcements for some types of grants were made. He is evaluating opportunities to apply for implementation funding, including WQIP of NYSDEC.

There is support for providing feasibility analysis and readiness programming for a type of approach involving a prototypical but unique street treatment. It can aid advancement of complete streets.

There was discussion whether to advance 'Core of Village' site (bounded by North Chestnut & Main Streets & Rail Trail), which ranks high. Gilmour IDs that public property in this polygon is on rail trail plus rented space by the intersection where there was planning for an enhanced vest-pocket park. There is a conservation easement on rail trail lands. There have been musings in the community whether it may be desirable for public lands to be used for enhancing/ managing up-gradient flows. Regarding this location, Gilmour notes in northeast part of polygon, plus extending beyond it, by rail trail, there's an 1890's era stone wall, including west of Academy Street terminus. Water accumulates in a depression west of stone wall and east of rail trail. He doesn't suppose it could be readily possible to enhance treatment and storage in this area where water already ponds while enhancing trail environment landscaping and ambiance.

The GI Plan will provide treatment to ID substantial analysis and vetting around the 15 sites, describing factors considered, including alternative GI implementation practices. There can be commentary on which ones rank well within the 15. This way it will ID ones that may be ripe for future planning/ implementation, even if they did not proceed to feasibility analysis in this Project or the EPG Project. Consensus is the

group will not seek to advance high-ranking Core of Village site if the property by the intersection is seen as unlikely to be accessible for GI development. (*Editor Note – it was subsequently confirmed it would take time to explore potential to work on leased property and this would not fit with Project timeline*).

Planner is surprised how three sites being analyzed in EPG stacked-up. There was a question on aesthetics variable application against Hasbrouck Park. He has other questions on scoring for that site. He notes EPG order is different, with West Center first, then Hasbrouck. This may be driven by unique emphasis within EPG Project.

For Southside Ave./ So. Chestnut Street site, it was surprising to consultant this one scored high. Mr. Nitza felt there is not much in the way at this location.

There was extensive discussion about location and surroundings where Village Hall/ DPW/ Town Court are at, Plattekill lot, streets, area drainage, and other factors.

Group discussed synthesis on soils by Barton & Loguidice.

There is agreement that when locations are selected to receive feasibility analysis, it is acceptable to re-arrange polygons for these locations.

There will be alterations to information discussed at this meeting with redistribution to the group. Participants are asked to provide feedback/comments via e-mail within one week (*see further Editor Note below*).

**Selection of Three GI Practice Types to Address in Plan** – Selected practices (1pp handout) are: Porous Pavement; Raingarden; and Street Trees - Tree Pit. For porous pavement, focus will be less on poured and cured on-site media, like asphalt, concrete or rubber applications, because these are, in their current practices, often found to be difficult to consistently achieve quality control during construction (and operating performance). Rather, focus here is on various modular/ assembled systems like types of pavers, large blocks that are shipped and installed on prepared bases, etc. There are many proprietary brands. Often these are used in sidewalks, parking edges, driveways.

There was consensus that no matter what locations are chosen and what three types are drilled-down on, the process of installing GI would aesthetically improve locations.

- Visibility of sites will help prompt upkeep and maintenance
- Per Ms. Medina, some poured technologies are shown to have 5% failure rates
- Kingston has grit and garbage getting into some of its GI
- Prefabricated techniques may require less pre-treatment before receiving runoff
- Gilmour supported the selections, but did ask if substituting Bioretention may be a technology that can also provide some storage/ underdrain to aid peak flow management in urbanized sewersheds and establish prototypical street treatment

**Other Assorted Business** –

The group touched on the one-page implementation strategies handout –

- Asked about plan audience, strategy can ID ways to foster capacity and support for GI implementation among electeds, DPW and Planning Boards
- Gilmour suggests forming guiding principles for use of GI on public properties;
- Budgetary process and Stormwater Management Program (SWMPs) are policy in addition to ‘master plans’.
- Gilmour encourages weaving GI into other plans, like of Wallkill River Watershed Alliance, such as if there is a 9-point plan, sub-watershed plans
- There should be care to have well-tailored incentives
- Stream daylighting can be encouraged

Ms. Minas will be out of office in part of July and desires to confirm date of meeting with Village and Town Boards soon.

***Editor note*** – *After meeting the matrix was modified and discussed by the group, with process advanced to select sites to provide with feasibility analysis. Ms. Minas:*

- *Added a ratio for each set of criteria so each is given a value out of 1 (i.e., 1 representing the highest ranking that a site could achieve for a given criteria set). This ensures that each criteria set is valued equally in the overall ranking, prior to the weightings being added*
- *Removed ‘aesthetic’ from Smart Growth criteria and gave it a lower ranking than the others, leaving SSO and natural resources criteria in smart growth because they’re still suited to this category and equally as important as the others in it (i.e. visibility and drainage issues)*
- *Notes that altering weightings changes ranking of the sites slightly, but the same 6 to 8 sites continue to make the Top 6. As there was agreement to provide heavier weighting on Water Quality and Feasibility Criteria, Ms. Minas suggested information in the report should be provided with a weighting (there was a consensus of the group to provide a weighting). If we exclude ‘core of the village’ site and EGP sites, that leaves the following 3 winners for all weighted scenarios:*
  1. *Site 8 - Municipal Properties & Pit*
  2. *Site 2 - Southside Ave./ So. Chestnut St.*
  3. *Site 5 - So. Chestnut/ Mohonk Intersection*
- *Believes there is merit in swapping out Site 5 for Site 10 (Plattekill & Vicinity) in the interest of combining Sites 8 and 10, as discussed at the May 4 meeting. This may also prove beneficial to allow a focus on a particular area and not spread resources too thin.*
- *At point of meeting follow-up, had not had chance to do QA/QC and format data distributed, instead getting it out to group in the interest of getting feedback and making final selections.*

**Respectfully submitted, David Gilmour, AICP**

*This Project is supported by the Hudson River Estuary Program of the New York State Department of Environmental Conservation (NYSDEC). Project funding was provided from the Environmental Protection Fund as administered by the NYSDEC.*

# **APPENDIX A3**

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## **EXISTING RESOURCES**



## MAINTENANCE CONSIDERATIONS

### STANDARD DESIGN AND SIZING REQUIREMENTS

Reference Documents	Agency	Website
1. New York State Stormwater Management Design Manual	Department of Environmental Conservation	<a href="http://www.dec.ny.gov/chemical/29072.html">http://www.dec.ny.gov/chemical/29072.html</a>
2. EPA Green Infrastructure Municipal Handbook	Environmental Protection Agency	<a href="https://www.epa.gov/green-infrastructure/green-infrastructure-municipal-handbook">https://www.epa.gov/green-infrastructure/green-infrastructure-municipal-handbook</a>
3. CDRPC Green Infrastructure Toolkit	CDRPC and NYS DEC	<a href="http://cdrpc.org/programs/water-quality/green-infrastructure-toolkit">http://cdrpc.org/programs/water-quality/green-infrastructure-toolkit</a>
4. Green Infrastructure Retrofit Manual	City of Rochester and Monroe County	<a href="http://www.cityofrochester.gov/giretrofitmanual.aspx">http://www.cityofrochester.gov/giretrofitmanual.aspx</a>

### COLD CLIMATE CONSIDERATIONS

Reference Documents	Agency	Website
5. Stormwater BMP Design Supplement for Cold Climates	Environmental Protection Agency	<a href="https://vermont4evolution.files.wordpress.com/2011/12/ulm-elc_coldclimates.pdf">https://vermont4evolution.files.wordpress.com/2011/12/ulm-elc_coldclimates.pdf</a>
6. UNH Stormwater Center	University of New Hampshire	<a href="http://www.unh.edu/unhsc/">http://www.unh.edu/unhsc/</a>

### PLANT SELECTION FACTORS

Reference Documents	Agency	Website
7. USDA Hardiness Zone Map	United States Department of Agriculture	<a href="http://planthardiness.ars.usda.gov/PHZMWeb">http://planthardiness.ars.usda.gov/PHZMWeb</a>

### GENERAL MAINTENANCE

Reference Documents	Agency	Website
8. Certifications for Green Infrastructure Professionals	Harvard Law School.	<a href="http://environment.law.harvard.edu/wp-content/uploads/2015/08/certifications-green-infrastructure-professionals.pdf">http://environment.law.harvard.edu/wp-content/uploads/2015/08/certifications-green-infrastructure-professionals.pdf</a>
9. Maintenance Guidance for Stormwater Management Practices	Department of Environmental Conservation	<a href="http://www.dec.ny.gov/docs/water_pdf/smpmaintguidraft.pdf">http://www.dec.ny.gov/docs/water_pdf/smpmaintguidraft.pdf</a>
10. Save the Rain Program Green Infrastructure Maintenance Manual	Save the Rain, Onondaga County, New York	<a href="http://savetherain.us/wp-content/uploads/2012/03/MaintenanceBinder_Rev-april2013.pdf">http://savetherain.us/wp-content/uploads/2012/03/MaintenanceBinder_Rev-april2013.pdf</a>
11. The Importance of Operation and Maintenance for the Long-Term Success of Green Infrastructure	Environmental Protection Agency	<a href="https://www.epa.gov/sites/production/files/2015-04/documents/green_infrastructure-om_report.pdf">https://www.epa.gov/sites/production/files/2015-04/documents/green_infrastructure-om_report.pdf</a>

MAINTENANCE CONSIDERATIONS (CONTINUED)

RETROFIT CONSIDERATIONS

Reference Documents	Agency	Website
12. Low Impact Development- Retrofit Guidance	Credit Valley Conservation.	<a href="http://www.creditvalley.ca/low-impact-development/low-impacy-development-support/stormwater-management-lid-guidance-documents">http://www.creditvalley.ca/low-impact-development/low-impacy-development-support/stormwater-management-lid-guidance-documents</a>
13. Stormwater Retrofit Guidance Manual	Philadelphia Water	<a href="http://www.phila.gov/water/PDF/SWRetroManual.pdf">http://www.phila.gov/water/PDF/SWRetroManual.pdf</a>
14. Stormwater Retrofit Project Design Manual.	East of Hudson Watershed Corporation.	<a href="http://eohwc.org/wp-content/uploads/2013/05/EOHWC-SRPDesignManual-rev1.pdf">http://eohwc.org/wp-content/uploads/2013/05/EOHWC-SRPDesignManual-rev1.pdf</a>
15. Urban Stormwater Retrofit Practices	Center for Watershed Protection.	<a href="http://www.staunton.va.us/directory/departments-h-z/planning-inspections/images%20and%20files/Urban%20retro-fit%20sotrm%20water.pdf">http://www.staunton.va.us/directory/departments-h-z/planning-inspections/images%20and%20files/Urban%20retro-fit%20sotrm%20water.pdf</a>

PLANTING GUIDANCE

Reference Documents	Agency	Website
16. Cornell Woody Plants Database.	Cornell University	<a href="http://woodyplants.cals.cornell.edu/home">http://woodyplants.cals.cornell.edu/home</a>
17. New York State Native Plant Database.	Ladybird Johnson National Wildflower Center	<a href="http://www.wildflower.org/collections/">http://www.wildflower.org/collections/</a>
18. Plantfinder.	Chicago Botanic Garden	<a href="http://www.chicagobotanic.org/plantcollections#plantfinder">http://www.chicagobotanic.org/plantcollections#plantfinder</a>
19. Green Infrastructure Planning Design Guidelines.	Genesee/Finger Lakes Regional Planning Council.	<a href="http://www.gflrpc.org/uploads/5/0/4/0/50406319/piplanningdesignguidelines.pdf">http://www.gflrpc.org/uploads/5/0/4/0/50406319/piplanningdesignguidelines.pdf</a>
20. Chesapeake Stormwater Network.		<a href="http://chesapeakestormwater.net/category/publications">http://chesapeakestormwater.net/category/publications</a>
21. City of Philadelphia Green Streets Design Manual.	Mayor's Office of Transportation and Utilities.	<a href="http://www.phillywatersheds.org/img/GSDM_FINAL_20140211.pdf">http://www.phillywatersheds.org/img/GSDM_FINAL_20140211.pdf</a>

MAINTENANCE CONSIDERATIONS (CONTINUED)

REFERENCE GUIDES FROM OTHER COMMUNITIES

Reference Documents	Agency	Website
22. City of Portland OR. Green Streets Program.		<a href="http://www.portlandoregon.gov/bes/34602">http://www.portlandoregon.gov/bes/34602</a>
23. City of Newburgh Green Infrastructure Guide.		<a href="http://www.law.pace.edu/sites/default/files/LULC/CAC%20Green%20Infrastructure%20Guide.pdf">http://www.law.pace.edu/sites/default/files/LULC/CAC%20Green%20Infrastructure%20Guide.pdf</a>
24. Green Infrastructure Maintenance Manual Development Process Plan.	City of Philadelphia	<a href="http://phillywatershed.org/ltcpu/Green%20Infrastructure%20Maintenance%20Manual%20Development%20Process%20Plan.pdf">http://phillywatershed.org/ltcpu/Green%20Infrastructure%20Maintenance%20Manual%20Development%20Process%20Plan.pdf</a>
25. NYC Sustainable Urban Site Design Manual.		<a href="http://www.nyc.gov/html/ddc/downloads/pdf/ddc_sdsitedesignmanual.pdf">http://www.nyc.gov/html/ddc/downloads/pdf/ddc_sdsitedesignmanual.pdf</a>
26. San Mateo County Sustainable Green Streets and Parking Lots Design Guidebook.		<a href="http://chesapeakestormwater.net/wp-content/uploads/downloads/2012/03/Dan-Mateo-Green-Streets.pdf">http://chesapeakestormwater.net/wp-content/uploads/downloads/2012/03/Dan-Mateo-Green-Streets.pdf</a>
27. The Chicago Green Alley Handbook.	Chicago DOT	<a href="http://www.cityofchicago.org/content/dam/city/depts/cdot/Green_Alley_Handbook_2010.pdf">http://www.cityofchicago.org/content/dam/city/depts/cdot/Green_Alley_Handbook_2010.pdf</a>
28. University of New Hampshire Stormwater Maintenance Documents.		<a href="http://www.unh.edu/unhsc">http://www.unh.edu/unhsc</a>

OTHER REFERENCES

Reference Documents	Agency	Website
29. Greening CSO Plans.	Environmental Protection Agency	<a href="https://www.epa.gov/sites/production/files/2015-10/documents/greening_cso_plans_0.pdf">https://www.epa.gov/sites/production/files/2015-10/documents/greening_cso_plans_0.pdf</a>
30. I-Tree.	US Forest Service	<a href="http://www.itresstools.org/">http://www.itresstools.org/</a>
31. Immerse Yourself in a Forest for Better Health.	Department of Environmental Conservation	<a href="http://www.dec.ny.gov/lands/60720.html">http://www.dec.ny.gov/lands/60720.html</a>
32. The Economic Benefits of Green Infrastructure	Environmental Protection Agency	<a href="https://www.epa.gov/green-infrastructure/economic-benefits-green-infrastructure-case-study-lancaster-pa">https://www.epa.gov/green-infrastructure/economic-benefits-green-infrastructure-case-study-lancaster-pa</a>

# **APPENDIX A4**

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**GI TYPES, DESCRIPTIONS, EXAMPLE PHOTOS AND  
COMPARISON**



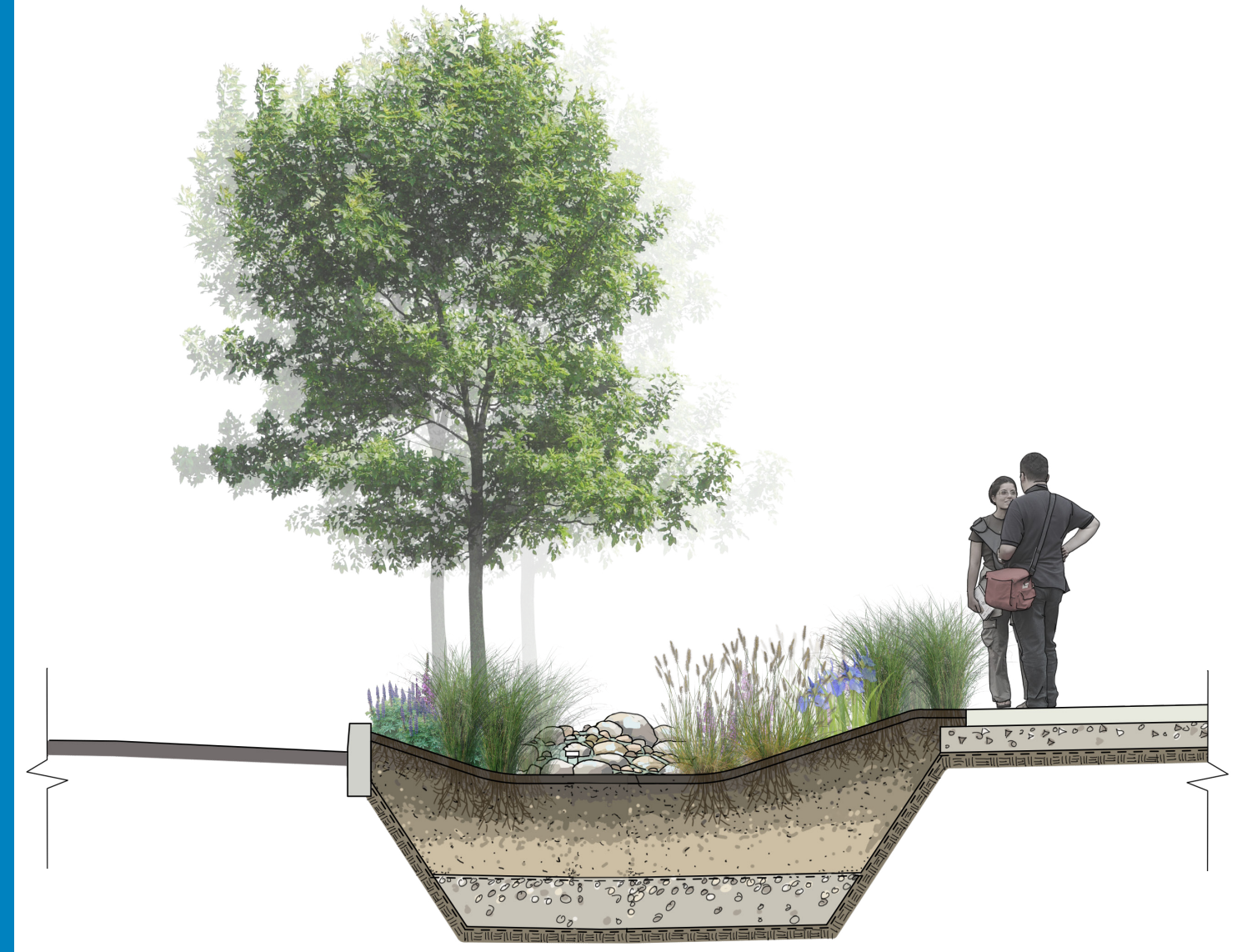
# Green Infrastructure

Sustainable by Design



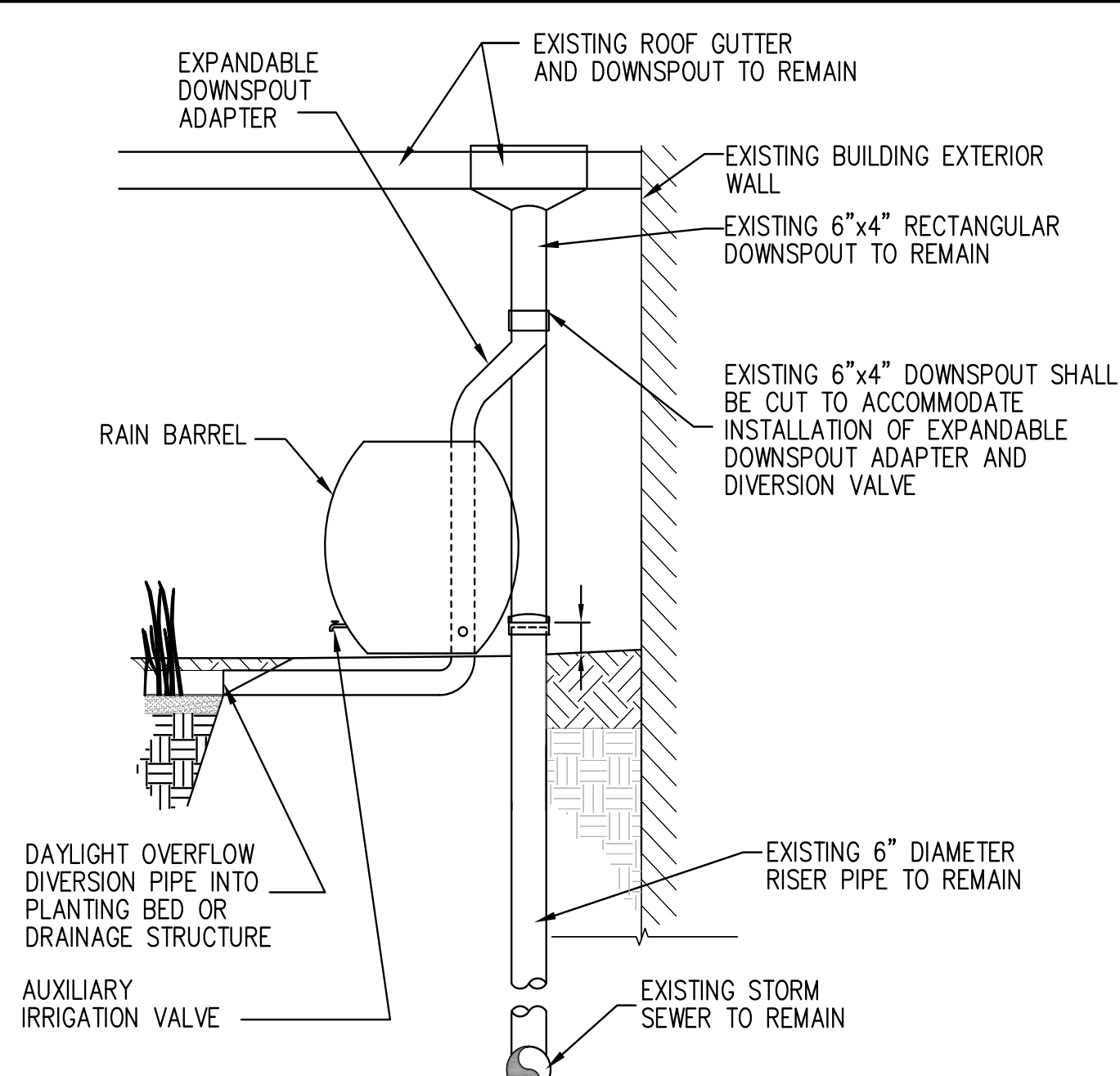
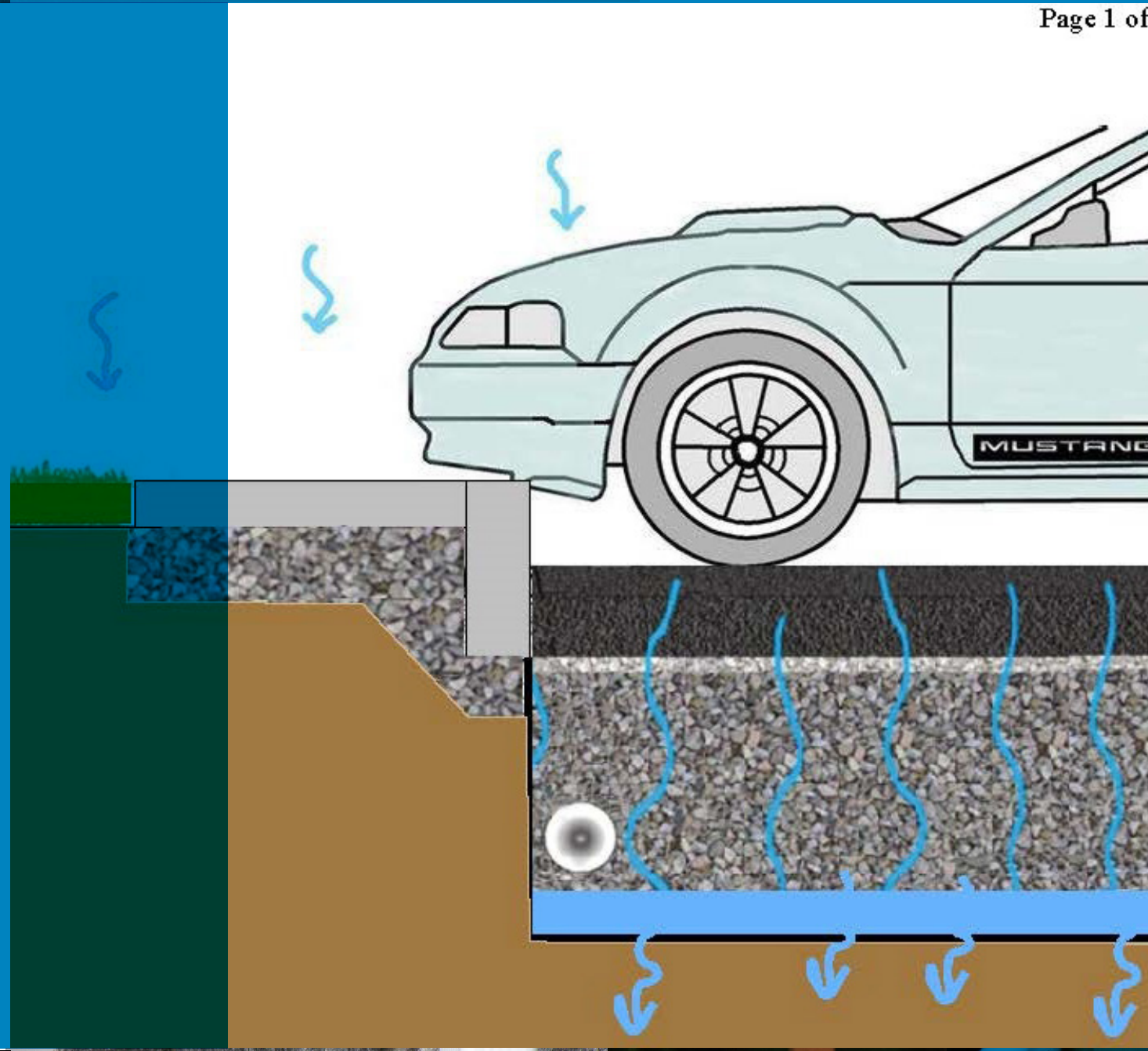
## Bio-Retention

These multi-functional green spaces filter and manage stormwater runoff while providing benefits including effective breakdown and removal/ immobilization of pollutants, increased infiltration time, increased wildlife habitat and biodiversity, and decreased reliance on existing stormwater infrastructure and treatment facilities.



## Permeable Pavements & Sidewalks

Designed to infiltrate rainfall through the pavement surface, thereby reducing stormwater runoff quantities.



## Rain Barrels

Rain barrels capture and collect storm water runoff from roof surfaces decreasing overall storm water quantity and providing water for irrigation.



## Vegetated Swale & Rain Garden

The linear vegetated swale collects stormwater runoff, increasing filtration and managing runoff. The rain garden incorporates native plantings, and provides benefits including effective breakdown of pollutants, increased infiltration time, increased wildlife habitat and biodiversity, and decreased reliance on existing stormwater infrastructure and treatment facilities.





# Green Infrastructure

Sustainable by Design



## Tree Plantings & Tree Pits

Maintaining or planting trees within impervious areas will reduce stormwater runoff and increase nutrient uptake. In addition to their use for stormwater management within an urban environments, tree plantings also provide bank stabilization, conservation areas and erosion and sediment control within pervious environments.



## Stormwater Planters

Small landscaped areas, often within planter boxes, designed as infiltration or filtering practices and using soil infiltration and biogeochemical processes for improved water quality and runoff reduction. Stormwater Planters are often used for conveyance of roof-top runoff when disconnecting downspouts from the traditional stormwater sewer system.



## Green Roof

Conventional roof is modified or created with a layer of vegetation and soil allowing evaporation and evapotranspiration processes to reduce the quantity of runoff discharging from the roof. These systems also reduces Urban Heat Island Effect and reduces building heating/cooling demand.

# Barton & Loguidice



## Comparison of GI Practice Types – Draft for discussion and selection of 3 GI types for development of Design Guidelines

Type	Design considerations*	Maintenance	Benefits / Disadvantages	Nutrient Removal	Sediment Removal	Metals Removal	Pathogen Removal
Porous pavement	Infiltration > 0.5-2"/ hr; > 3' from bottom trench to GW;	Moderate/High; may require vac truck for annual cleaning	Runoff reduction	Good	Fair	Good	Good
Dry swale / bioswale (O-1)	Check dams required for slopes > 2%; > 2' from bottom filter to GW	Low; sediment removal, mow/maintain for 4 to 6" vegetation	Long lengths required; High pre-treatment required, may not suit smaller infill sites;	Fair/Good	Pre-treatment	Good	Poor
Bioretention (F-5) (greater depth and pre-treatment and engineered soils) /	> 2' from bottom filter to GW	Moderate; clean out pre-treatment device, silt/sediment removal from filter bed when accumulation exceeds 1", mulch/weed/replant garden bed	High pre-treatment required, may not suit smaller infill sites; High aesthetic value;	Good	Pre-treatment	Good	Fair
Raingarden (R) (shallower depth, in-site soils and no pre-treatment)	> 2' from bottom filter to GW	Moderate; silt/sediment removal from filter bed when accumulation exceeds 1", mulch/weed/replant garden bed	Good bang for buck; High aesthetic value, suitable for small in-fill sites	Good	Good	Good	Fair
Infiltration Trench (I-1)	Infiltration > 0.5-2"/hr; > 3' from bottom trench to GW;	Moderate; clean out pre-treatment device (sed basin, sump pit, grass channel, plunge pool)	Low aesthetic value	Good	Pre-treatment	Good	Good
Street Trees –Tree Pit	Utilities locations ; May be infiltration or with underdrain	Low; remove grate and sediment as required	Higher visibility than tree planting; High aesthetic value; Benefit from connection to existing separate storm drain	Fair/Good	Good (Pit)	Good	Good/Fair
Street Trees – Tree Planting	Utilities locations		High aesthetic value	Fair/Good	Fair (Planting)	Good	Good/Fair
Stormwater Planters	May be infiltration or filter practice with underdrain	Moderate; Mulch and weed garden bed and replant damaged/dead plants		Good	Good	Good	Good/Fair
Underground Infiltration Practice	Considered to be an Underground Injection Well regulated by EPA; greater depth of practice required	Low; remove sediment as required	No visibility / aesthetic value High capital cost Higher depth of practice required	Good	Good	Good	Good

\*Note: Winter treatment considered to be minimal with all practices. Underdrain can be added to practices for improved functioning in winter

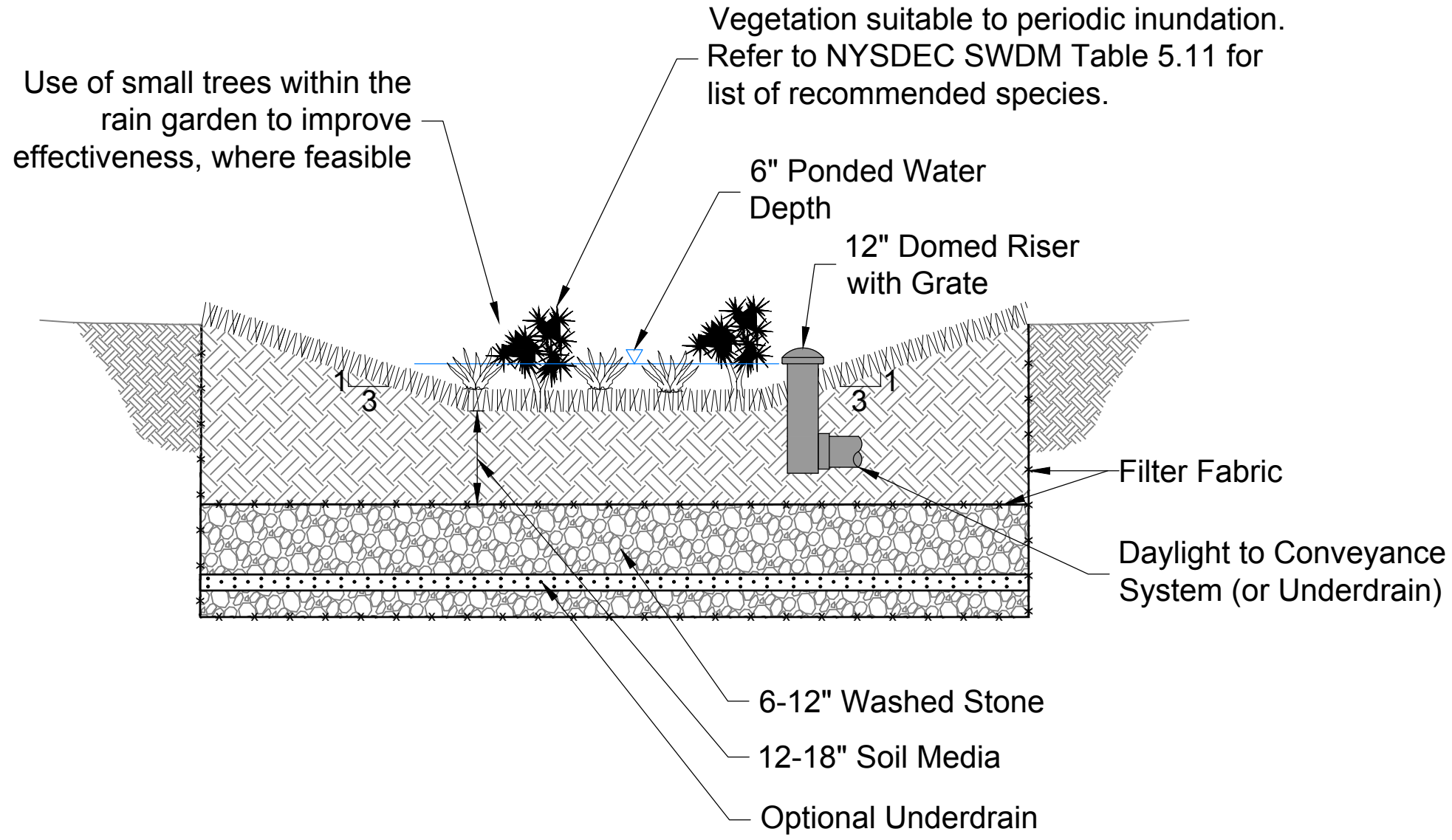


# **APPENDIX A5**

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## **GREEN STORMWATER MANAGEMENT GUIDELINES**

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PROJECT: New Paltz Green Infrastructure      DATE:      DECEMBER 2018

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SUBJECT: SITE DETAILS      JOB NO.: 11948      PAGE: C4

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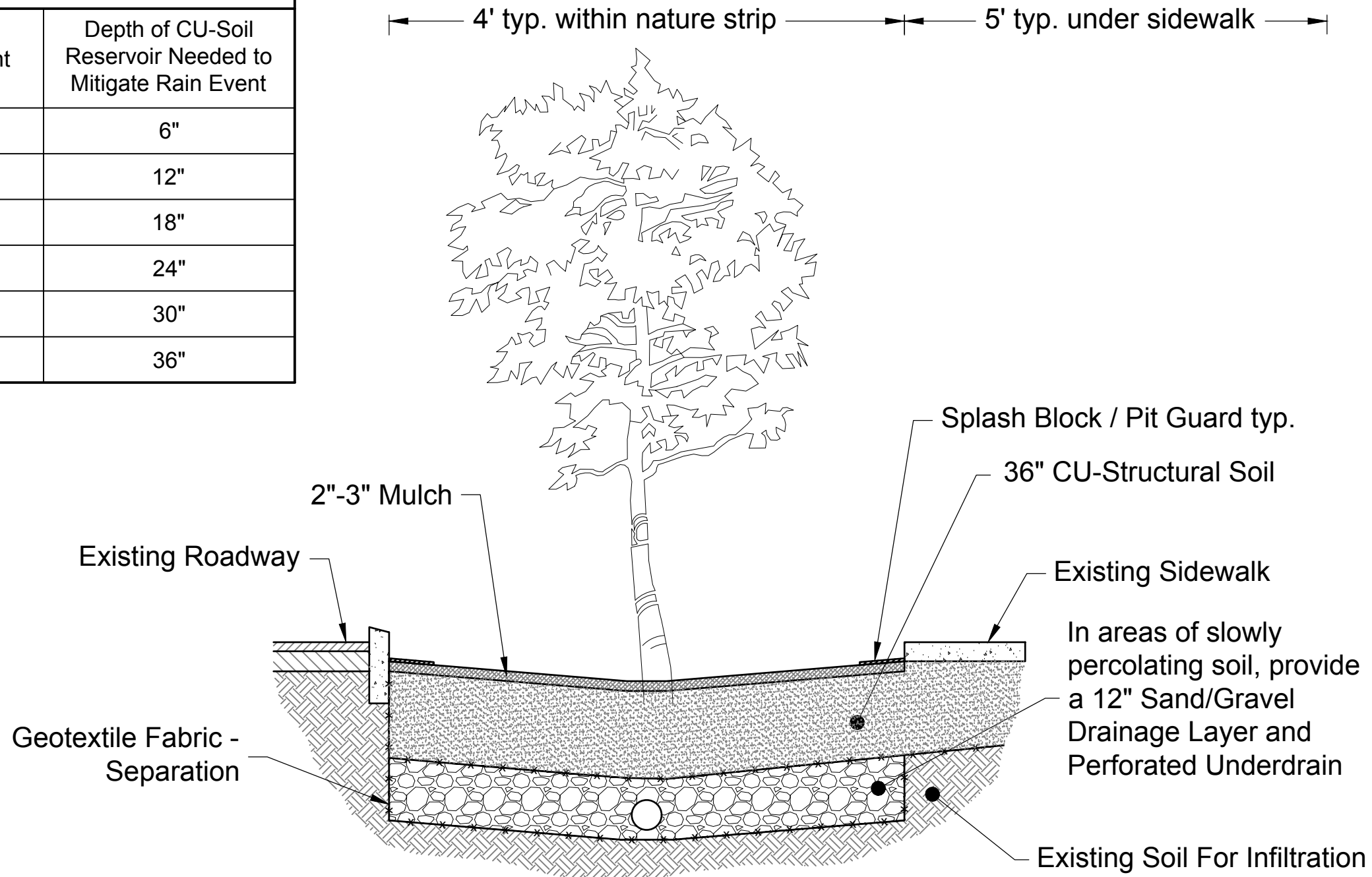
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1	<b>RAIN GARDEN TYPICAL DETAIL</b>
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CU-Structural Soil	
Size of Rain Event	Depth of CU-Soil Reservoir Needed to Mitigate Rain Event
1.56"	6"
3.12"	12"
4.68"	18"
6.25"	24"
7.8"	30"
9.36"	36"



PROJECT: New Paltz Green Infrastructure      DATE: DECEMBER 2018  
 DWG BY: MCF      CHK BY: THF  
 SUBJECT: SITE DETAILS      JOB NO.: 11948      PAGE: C5  
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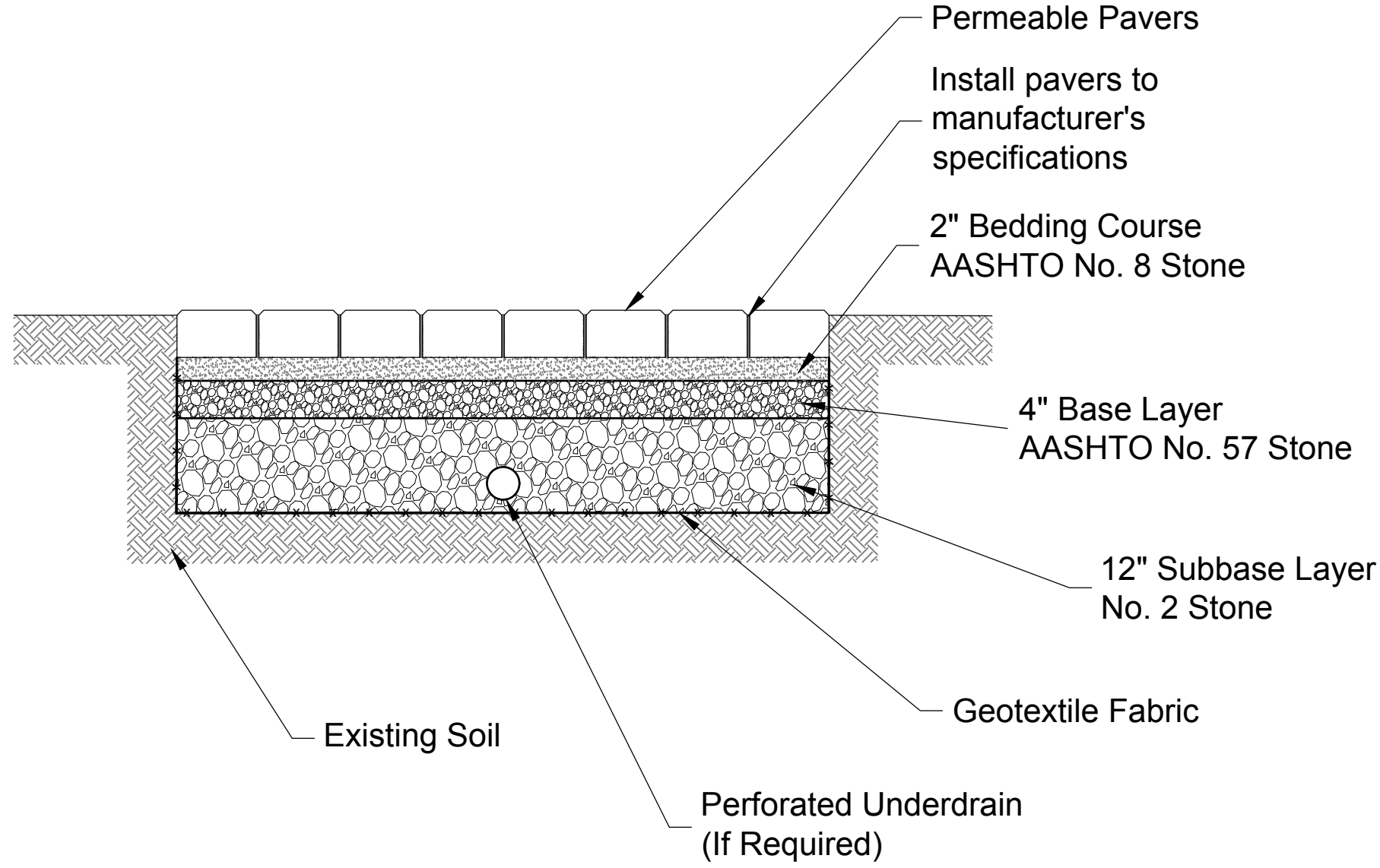
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1	<b>TREE BOX TYPICAL DETAIL</b>
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PROJECT: New Paltz Green Infrastructure

DATE: DECEMBER 2018

SUBJECT: SITE DETAILS

DWG BY: MCF CHK BY: THF

JOB NO.: 11948 PAGE: C6

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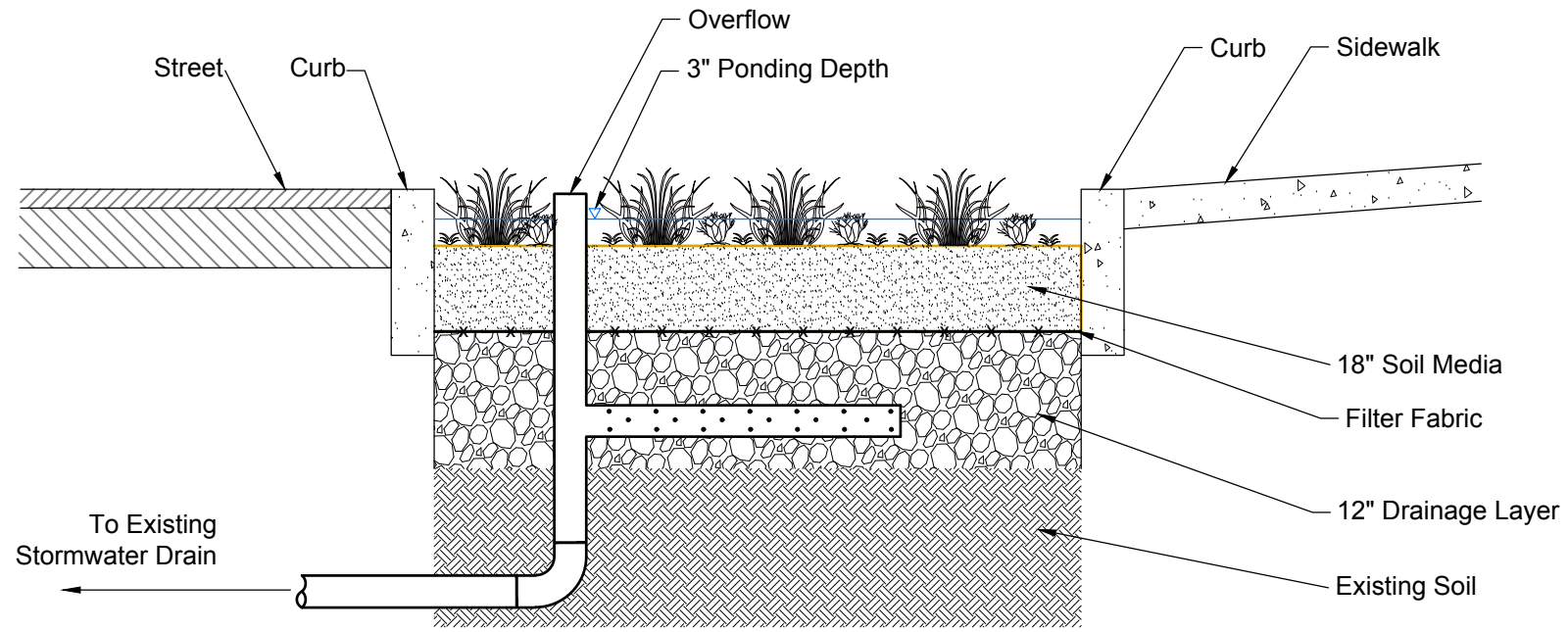
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PERMEABLE PAVEMENT TYPICAL DETAIL

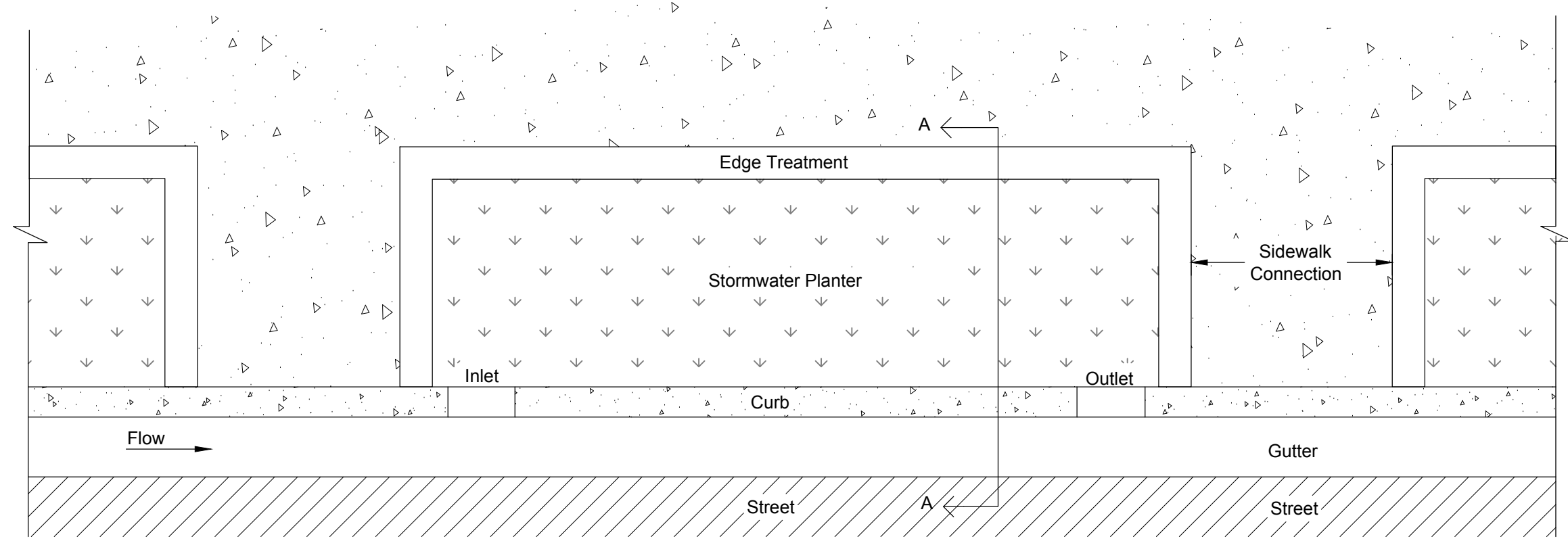
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**SECTION A - A**



**PLAN VIEW**

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1	<b>STORMWATER PLANTER - ADJACENT TO STREET TYPICAL DETAIL</b>
REF:	SCALE: N.T.S.

# **APPENDIX A6**

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## **INITIAL SCREENING MATRIX**

**New Paltz Green Infrastructure Capital Improvement Feasibility Plan - Initial Site Screening Matrix**

Mapped Site ID#	Site Location Name	Planner / DPW / Engineer / Committee Average Approval Rating	Majority Ownership			SSO Benefit			Context for Potential Improvement *			Initial Site Screening	Top 15 Sites
			Public	Private	Unknown / Mixed / Non-profit	Yes	No	Unknown	Yes	No	Unknown		
1	Core of Village	3.00	3			3			3			12.0	Top 15
2	Southside Ave./ So. Chestnut St.	3.00	3			3			3			12.0	Top 15
3	Moriello Park/ Mullberry & Church St. Vicinity	3.00	3			3			3			12.0	Top 15
4	Colonial Drive	3.00	3			3			3			12.0	Top 15
5	So. Chestnut/Mohonk Intersection	2.67	3			3			3			11.7	Top 15
6	West Center St.	2.33	3			3			3			11.3	Top 15
7	Hasbrouck Park Locus	3.00	3			3			3			12.0	Top 15
8	Municipal Properties & Pit	3.00	3					2	3			11.0	Top 15
9	Pencil Hill/Water St. Vicinity	2.67			2	3			3			10.7	Top 15
10	Plattekill Ave Parking Lot & Vicinity	2.67	3					2	3			10.7	Top 15
11	HWD, Harrington & Colonial Drive Vicinity	2.67		1		3			3			9.7	Top 15
12	Mill Brook Preserve-Gateway @No. Manheim	2.67	3				1		3			9.7	Top 15
13	Fire Station#2 (117 HWDDr) & Adjacent Area	2.33			2		1		3			8.3	Top 15
14	Church and No. Front Streets Location	2.33	3				1				2	8.3	Top 15
15	Base of Henry W. D. Dr	3.00		1		3					2	9.0	Top 15
16	No. Chestnut Complete Street Segment	2.33		1				2	3			8.3	
17	Hasbrouk Pl./ Middle School Vicinity	1.00	3					2			2	8.0	
18	No. Manheim Blvd (Complete Green Street)	1.00	3					2			2	8.0	
19	Plains Road/ Sojourner Park Property	1.00	3					2			2	8.0	
20	South Oakwood Complete St.	1.67	3				1				2	7.7	
21	Dedrick's Plaza & Main Overlay	2.33		1				2			2	7.3	
22	North Front St. & WVRT	2.33		1				2			2	7.3	
23	Cherry Hill/ Cicero Ave/ So. Joalyn	1.00			2			2			2	7.0	
24	Empire Trail/Rte 299	1.00	3				1				2	7.0	
25	Center St.	1.00	3				1				2	7.0	
26	Eastern Sunset Ridge/MBP Gateway/Duzine School	1.00	3				1				2	7.0	
27	Wastewater Treatment Plant Driveway	1.33	3				1				1	6.3	
28	Cooper St. Vicinity	1.00		1				2			2	6.0	
29	Van Alst / Hummel Rd./NYSRte3 2 Streets Grid	1.00			2		1				2	6.0	
30	Rite Aid Plaza & Adjacent Private Lands	1.67		1			1				2	5.7	
31	Upper Main - incl. by Shoprite & NYSDEC	1.67		1			1				2	5.7	
32	Trib. 13 Headwater by No. Putt	1.67		1			1				2	5.7	
33	Ohioville Hamlet	1.67		1			1				2	5.7	
34	Main, Water, & Huguenot Sts & WVRT Vicinity	1.33			2		1				2	6.3	
35	South Putt (GI as aid for future buildout)	1.00		1			1				2	5.0	
36	Henry Ct./ WVRT Vicinity	1.00		1			1				2	5.0	
37	Sunset Ridge/ No. Chestnut (NYS Rte 32 No)	1.00		1			1				2	5.0	
38	Vicinity of 144-154 Main St.	1.33		1			1			1		4.3	
39	Village Border by So. Chestnut/ VFW	1.00		1			1			1		4.0	
40	Porspect Stret by Slate & HWD **												

Project removed from top 15 due to limited potential due to current property owner  
 Sites to be investigated as part of the Village of New Paltz Engineering Planning Grant CFA # 63415  
 Potential to combine S1 & T1 for design based on proximity.  
 Potential to combined I1 & J1 for design based on proximity.  
 Considers anecdotal and qualitatively based factors such as land use, soil characteristics, land cover, planned project/redevelopment, location within water shed, uniform drainage, amount impervious, opportunity to reduce impervious, potential for 'inline' treatment, etc.  
 Information for ranking to be added by Village Planner

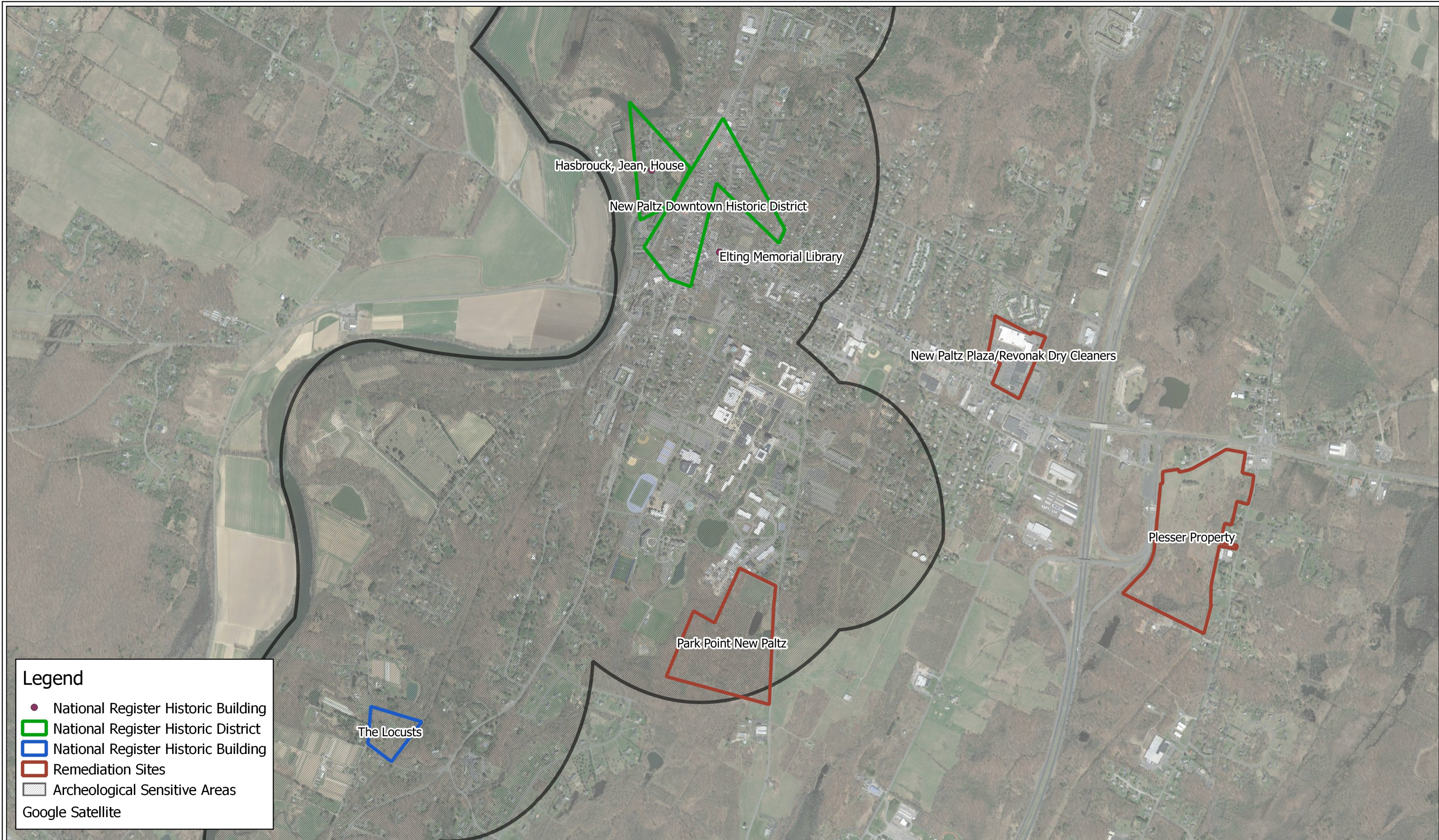


# **APPENDIX A7**

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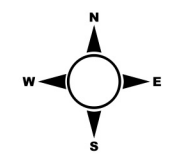
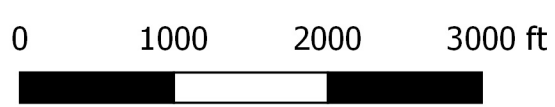
## **NATURAL RESOURCES MAP**





**Legend**

- National Register Historic Building
- ▭ National Register Historic District
- ▭ National Register Historic Building
- ▭ Remediation Sites
- ▨ Archeological Sensitive Areas
- Google Satellite





# **APPENDIX 8**

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**SITE RECONNAISSANCE DOCUMENT (SITE PHOTOS  
AND DETAILS FOR 15 PREFERRED SITES)**

**Mapped Site ID#: 1; Site Identifier: D.1 - Site Location: Core of Village (Post Office, Mobile Station and Municipal Parking Lot)**

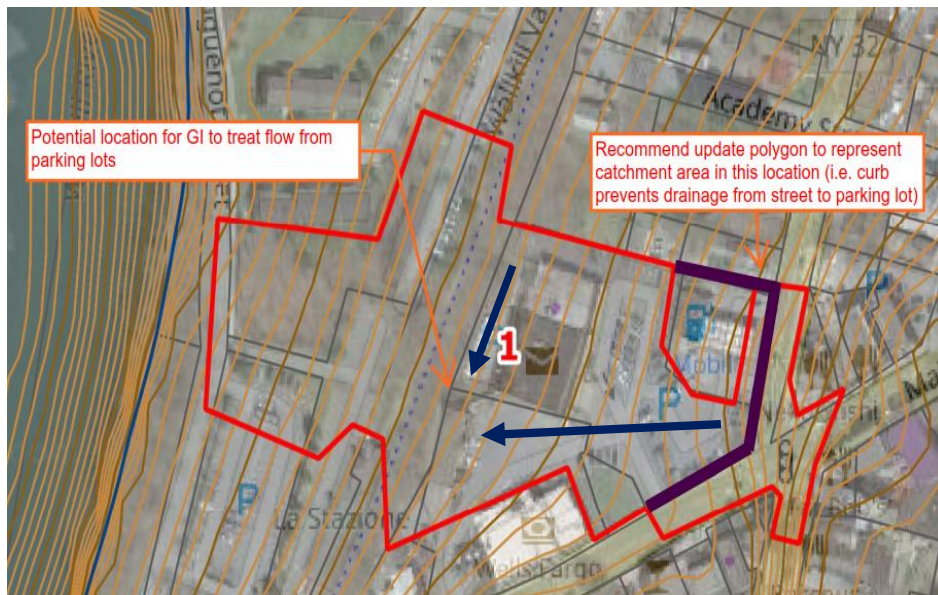
**Photos:**







## Site Polygon and SW Catchment Area



### Social characteristics (i.e. educational opportunity, visibility, high profile, aesthetic/landscape value, etc.)

- Highly visible and busy location with potential GI location adjacent to rail trail, opportunity for kiosk/educational material for locals/tourists travelling on rail trail (very busy intersection and core place in the Village, although lacking unique identify in the asphalt parking lots)
- Jibes with 'Feedback Project' underwriting by SUNY Grant, implemented by SUNY-NP Professors Franck, et al, circa 2016/2017
- Location has views of scenic ridge – seems like GI can complement site/ surroundings
- Private land uses (covering a lot of this polygon) are oriented to parking areas and streets, not Rail Trail - there is some, limited, opportunity to orient private land use more to public (Village) rail trail public property.

### Physical characteristics and design constraints (i.e., available footprint, building location / basement, topography, slope, erosion, etc.)

- Entire lot draining to outfall at back of property. Potential to also include smaller lower parking lot in behind of post office.
- Vest pocket park maintained by garden club
- Multiple private ownership of impervious lot area; Portion of parking lot rented by Village; represents potential for public/private partnership
- Infill opportunity at property/ adjacent
- Significant slopes, ultimately draining to river

### Stormwater management (i.e., pollutant load, potential for run-on, potential for storage, % impervious, etc.)

- "Hotspot" for pollutants (i.e. vehicle parking/loading areas, gas station), large commercial site almost 100% impervious, single point for inflow to GI potentially within 60' ROW of the rail trail
- There is a (private) outfall south west of rear of post office parking area – could be improved upon and integrated with open drainage an landscaping at edge of rail trail
- Rail trail public space is downgradient of most of site and receives its drainage – there is swale along east side.
- Complex, aged adjacent storm sewer system in street (lower Main St. is operated by Village)
- Drainage flows towards south side of Town & County property

- Apparently minimal run-on

Typology (i.e. complete streets, type of suitable GI, grant eligible, replicable, etc.)

- Previous 'notional' design completed but may be weak on SW aspects; Village Engineer to obtain copy, if available
- Major bicycle/tourism "node"

Sanitary sewer system (i.e. known SSO locations, state of repair of sanitary sewer and known I/I, etc.)

- No known SSO at this location. Site is upstream from existing SSO location #3
- Site served by sanitary sewer laterals. General note: sewer laterals on private property may be issue still on private property
- Sanitary sewer in N. Chestnut Street currently being replaced under CDBG Contract.
- Reoccurring ponding during storm events on the westerly side of NYS Highway Route 32 in the area south of North Front Street. This creates inflow into sanitary manholes in close proximity of the ponding, however ponding within roadway generally beyond boundary of the site polygon.

Area Natural Resource Features

- There are no mapped wetland pockets or streams in this vicinity.
- There is open space on rail trail

Other notes (i.e. 'bang-for-buck', cumulative impacts, known regulatory constraints: SHPO, SEQR, land use, brownfield, etc.)

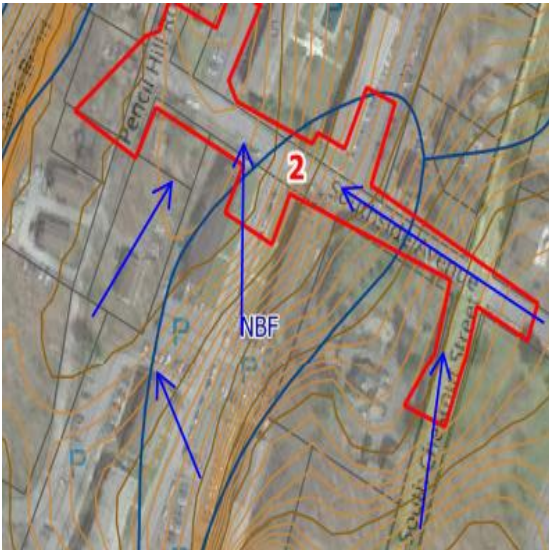
- Gas station may be considered 'brownfield' or potential contaminated site

**Mapped Site ID#: 2; Site Identifier: G.1 - Site Location: South Side Ave / South Chestnut St**

**Photos:**



## Site Polygon and SW Catchment Area



Social characteristics (i.e. educational opportunity, visibility, high profile, aesthetic/landscape value, etc.)

- Relatively dense student housing with associated foot traffic

Physical characteristics and design constraints (i.e., available footprint, building location / basement, topography, slope, erosion, etc.)

- Wide street with potential for GI. However, eastern side is steeper compared with further west.
- Steep slopes at east end of site

Stormwater management (i.e., pollutant load, potential for run-on, potential for storage, % impervious, etc.)

- SW drainage needs attention, significant sediment load, potentially significant catchment area with run-on from extensive parking areas to the south and east
- High sediment loading

Typology (i.e. complete streets, type of suitable GI, grant eligible, replicable, etc.)

- Replicable complete street project; wide street with existing sidewalk

Sanitary sewer system (i.e. known SSO locations, state of repair of sanitary sewer and known I/I, etc.)

- Not within vicinity of known SSO Locations.
- No known specific I/I locations
- Slip lined sanitary sewer circa 95
- Replaced 90' storm sewer in circa 02
- Upstream from historic SSO location #5

Area Natural Resource Features

- There are not identified streams or wetlands in polygon; however, at toe of hill, below NYS Rte. 208 South, there are known issues of waters in basements at private properties
- On north side of streets there are typically flows in CBs (and further south, off-site, there is an open and identified stream running along east side of Pencil Hill Road



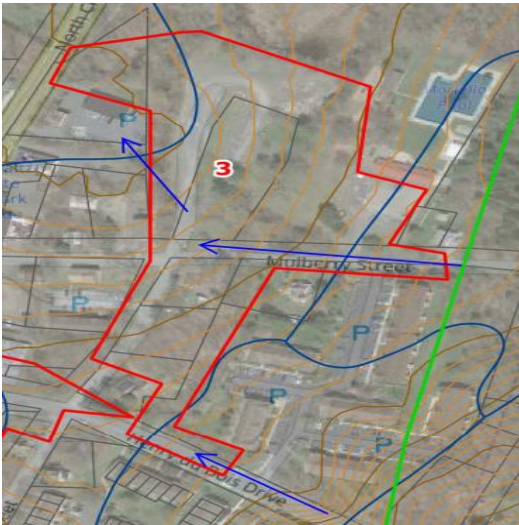
Other notes (i.e. 'bang-for-buck', cumul impacts, known regulatory constraints: SHPO, SEQR, land use, brownfield, etc.)

**Mapped Site ID#: 3; Site Identifier: A.I.1 - Site Location: Moriello Park / Mulberry & Church St Vicinity**

**Photos:**



## Site Polygon and SW Catchment Area



Social characteristics (i.e. educational opportunity, visibility, high profile, aesthetic/landscape value, etc.)

- Public park - High visibility, including municipal pool parking lot
- Opportunity for parks & nature community stewardship – location has been assessed for eel migration barriers
- Emerging recreation hub in area (Empire State Trail; with potential for connectivity with Mill Brook Preserve)

Physical characteristics and design constraints (i.e., available footprint, building location / basement, topography, slope, erosion, etc.)

- Village/Town joint property; Town operated and maintained
- Gravel parking lot
- Slopes to a wet area
- There was formerly a community pool with impoundment – comprehensive plan promotes its possible redevelopment (not all of it is within the drawn polygon)

Stormwater management (i.e., pollutant load, potential for run-on, potential for storage, % impervious, etc.)

- Adjacent to wetland/stream. Previous sampling found e-coli at location near bridge (adjacent to Stewarts)
- Potential for site run-on from Mulberry Square development
- Approximately 100% impervious, with the exception being gravel (assumed compacted)
- Site currently included in the EPG program for stormwater flow reduction and treatment and rehabilitation of stormwater system.

Typology (i.e. complete streets, type of suitable GI, grant eligible, replicable, etc.)

- Potential to increase stream buffer
- Reconstruct or restore wetland/ pond (habitat enhancement demonstration?)
- Rain garden (by pool?)
- Bio-swale
- Tree planting

Sanitary sewer system (i.e. known SSO locations, state of repair of sanitary sewer and known I/I, etc.)

- No known SSO Locations in vicinity; Upstream from historic SSO location #1

- Within vicinity of leaking sewer along Mulberry St, however primarily groundwater entering sanitary;
- No known location of surface water entering sanitary sewer in this location

#### Area Natural Resource Features

- Tributary 13 (Mill Brook) runs through USF&W / local wetland where community pool was
- Two stream branches enter property along Mulberry – the one with larger flow is just east of Church St (from Mulberry Square where is an identified local stream per Hudsonia (2006))
- After the two branches join, they flow in culvert under driveway entrance along western property line before entering Trib 13.

Other notes (i.e. 'bang-for-buck', cumulative impacts, known regulatory constraints: SHPO, SEQR, land use, brownfield, etc.)

- Feasibility Assessment being undertaken for this site under separate EPG (to be completed by 2020)
- Site being explored for potential drinking water sourcing
- Need to define future service need for current timber pedestrian bridge (should it connect vehicles to Veteran's Drive?) and fund its now needed replacement

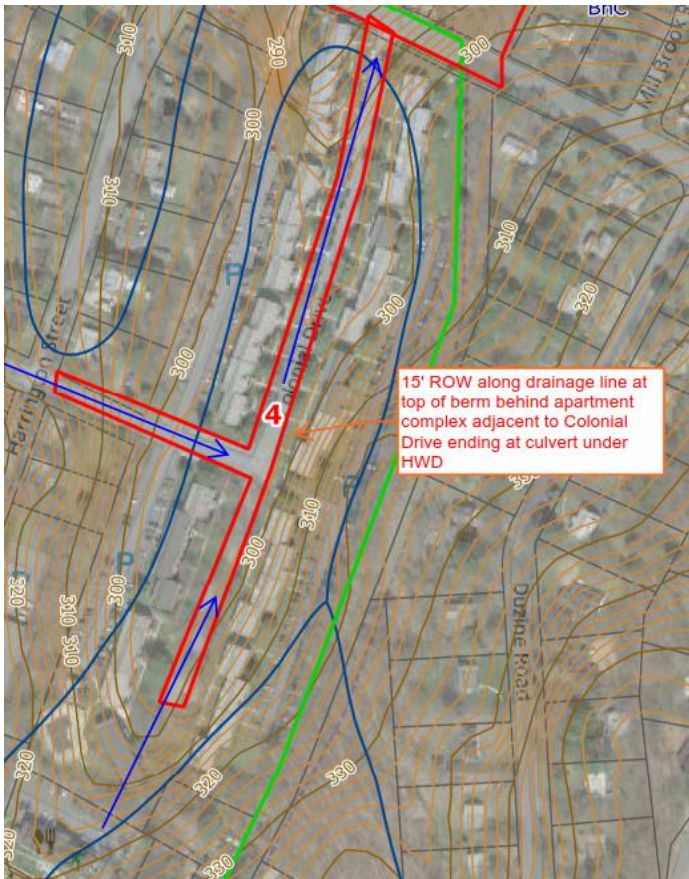
**Mapped Site ID#: 4; Site Identifier: T.1 - Site Location: Colonial Drive**

**Photos:**





## Site Polygon and SW Catchment Area



Social characteristics (i.e. educational opportunity, visibility, high profile, aesthetic/landscape value, etc.)

- Relatively dense residential apartment complex area – constructed 1960s

Physical characteristics and design constraints (i.e., available footprint, building location / basement, topography, slope, erosion, etc.)

- Depth to groundwater seems to be roughly 3-3.5 feet, per anecdote (influences role/ type/ approach to tree plantings)
- Narrow roadway with parking on either side of two-way travel lane; wide nature strip between sidewalk and roadway with mature White Pines
- Apartments in most of the complex's first floor are below ground and regularly get flooded with several inches of water and have moisture issues - during hurricanes, 4 years or so ago, some had several feet.
- Site located at low point (note: may be combined with site 11)

Stormwater management (i.e., pollutant load, potential for run-on, potential for storage, % impervious, etc.)

- Buried stream in this location; piped underneath roadway
- Pollutant load from typical residential street plus potential for run-on from unknown pollutant load for properties fronting Main Street
- Presumed relatively poor quality stormwater management system
- Water from parking lots from both sides of complex are uphill and flow into units which are lower elevation per topography - perhaps something could be done in diverting flow to swales away from buildings, but this would involve private lands.



- Stream to east in Town has overflowed its western edge impacting downhill/ parking lots
- 100% impervious (note combined with site 11)
- Major stormwater collection point (note combined with site 11)

Typology (i.e. complete streets, type of suitable GI, grant eligible, replicable, etc.)

- Potential for curb cuts and increased infiltration / techniques to take advantage of existing or planted tree root system. Would require confirmation of water/nutrient uptake of species – most of existing trees are mature White Pines. Vegetation considered by one participant to have only minor impacts, quite secondary to understanding where below ground infrastructure lies

Sanitary sewer system (i.e. known SSO locations, state of repair of sanitary sewer and known I/I, etc.)

- No known SSO within vicinity. No known I/I locations.
- Previous SSO in this location due to pump station malfunction and grease build-up not I/I.
- I/I issues coming in from Town sanitary sewers along Main Street at unknown locations.

Area Natural Resource Features

- A DEC Class C stream is shown on NYSDEC Environmental Resource Mapper which is not visible above ground. It flows along entire length of Colonial Drive (southern private segment as well as public segment). It emanates south of Main St./ NYS Rte. 299 (this is not shown on Hudsonia 2006)
- There is perennial stream (also not on Hudsonia) flowing along eastern property line / Municipal border, situated in Town, emanating from Duzine Road vicinity and south of there

Other notes (i.e. 'bang-for-buck', cumulative impacts, known regulatory constraints: SHPO, SEQR, land use, brownfield, etc.)

- Recently there were two heating oil spills at a non-residential land use within the Town. This contamination got into Tributary 13. It is unclear if the flow impacted the stream under Colonial, or just the stream to east in Town.

**Mapped Site ID#: 5; Site Identifier: A.O.1 - Site Location: South Chestnut / Mohonk Intersection**

**Photos:**



## Site Polygon and SW Catchment Area



Social characteristics (i.e. educational opportunity, visibility, high profile, aesthetic/landscape value, etc.)

- Some visibility, primarily for student foot traffic from campus to residential area to west
- Appearance of being a “lost space”

Physical characteristics and design constraints (i.e., available footprint, building location / basement, topography, slope, erosion, etc.)

- Recent reconstruction of turning lane to sidewalk with median may provide opportunity to incorporate GI however cost benefit of reconstruction may be prohibitive
- Portions of the site were once filled in to create a more narrow street
- This area links to the waterfront
- Sidewalk needed on Mohonk – opportunity for capital project sequencing (and urban tree canopy enhancement)
- Area subterranean drainage needs improvement – was subject of BridgeNY funding application

Stormwater management (i.e., pollutant load, potential for run-on, potential for storage, % impervious, etc.)

- Typical pollutant load from primary road within Village core
- Potential “subterranean drainage”
- Area was previously (2016) part of Bridge NY (culvert) grant application (unsuccessful)

Typology (i.e. complete streets, type of suitable GI, grant eligible, replicable, etc.)

- Complete streets, bioretention within median

Sanitary sewer system (i.e. known SSO locations, state of repair of sanitary sewer and known I/I, etc.)

- No known SSO Locations within vicinity. u/s historic SSO location #5
- Recent sewer upgrades completed and modification to intersection. NYSDOT adding new catch-basin this summer to address stormwater issues (i.e. standing water on the east side of road)
- within vicinity of leaking sanitary sewer, however no known surface water entering system and DOT upgrades to address existing ponding issues

Area Natural Resource Features

- While not on Hudsonia Map, there is 'urban' stream that is above ground and open, such as mid-block between Tricor and Elting, that goes underground by Mohonk and does not remerge as open stream until the major outfall just west of Wurts Avenue.

Other notes (i.e. 'bang-for-buck', cumulative impacts, known regulatory constraints: SHPO, SEQR, land use, brownfield, etc.)

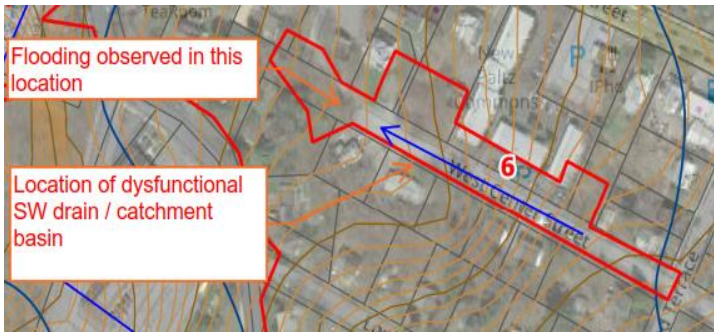


**Mapped Site ID#: 6; Site Identifier: N.1 - Site Location: West Center Street (Site being review with EPG)**

**Photos:**



## Site Polygon and SW Catchment Area



Social characteristics (i.e. educational opportunity, visibility, high profile, aesthetic/landscape value, etc.)

- Major need for drainage system improvements
- High levels of pedestrian activity associated with students / employees at SUNY-NP
- Residential street, primarily SFD rented for student housing

Physical characteristics and design constraints (i.e., available footprint, building location / basement, topography, slope, erosion, etc.)

- Wide roadway

Stormwater management (i.e., pollutant load, potential for run-on, potential for storage, % impervious, etc.)

- Flooding and severe drainage issues, altered upstream hydrology exacerbating issues
- Blocked/dysfunctional stormwater drain at bottom end of West Center Street

Typology (i.e. complete streets, type of suitable GI, grant eligible, replicable, etc.)

- GI improvements along with gray infrastructure improvements required

Sanitary sewer system (i.e. known SSO locations, state of repair of sanitary sewer and known I/I, etc.)

- Site contains deteriorated storm sewer system (i.e., collapsed/blocked) that routinely causes inflow from stormwater ponding on MH and into the sanitary sewer system. EPG program will rehabilitate storm sewer system
- Lines in good condition but surface water is entering from ponding on MH
- u/s from existing SSO location #3

Area Natural Resource Features

- Tricky drainage in terms of where is divide for flows that goes northwest (may be some unmapped wetlands on private property that could be enhanced in order to derive storage)

Other notes (i.e. 'bang-for-buck', cumulative impacts, known regulatory constraints: SHPO, SEQR, land use, brownfield, etc.)

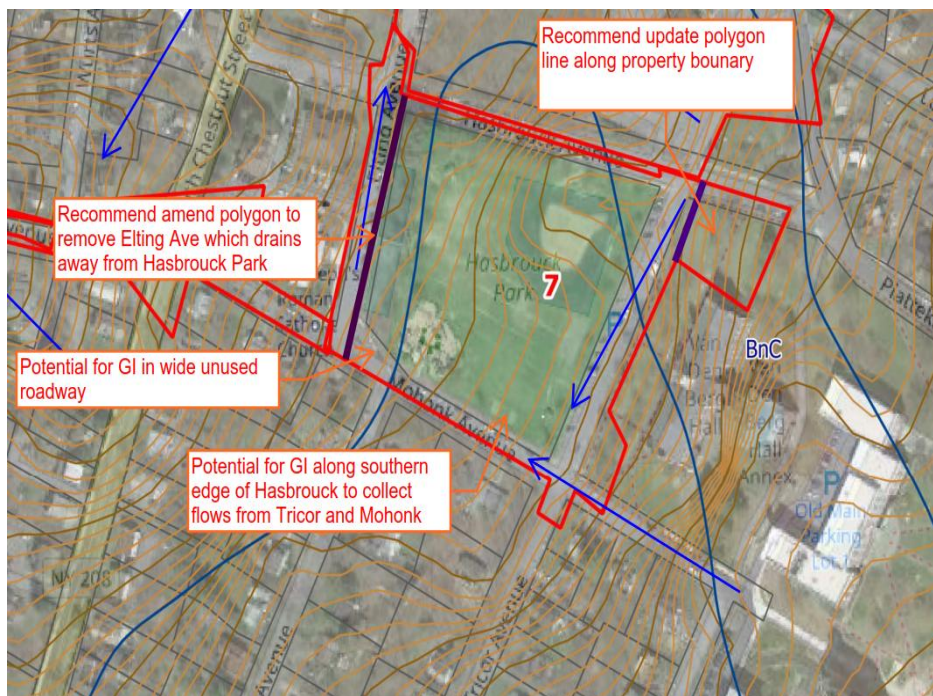
- Some undeveloped private land adjacent to street
- Feasibility Assessment being undertaken for this site under separate EPG (to be completed by 2020)



**Photos:**



**Site Polygon and SW Catchment Area**



**Social characteristics** (i.e. educational opportunity, visibility, high profile, aesthetic/landscape value, etc.)

- Highly visible area in main municipal park; educational opportunities

**Physical characteristics and design constraints** (i.e., available footprint, building location / basement, topography, slope, erosion, etc.)

- Location is upstream of areas identified for underground conveyance system improvements that were previously part of BridgeNy funding apps

- Consider update to Polygon to remove area of SUNY campus from polygon

Stormwater management (i.e., pollutant load, potential for run-on, potential for storage, % impervious, etc.)

- Piped stream from parcel near corner Elting & Mohonk under roadway
- Tile drainage added to park around 2011/12; has reduced drainage issues; Tile drain captures flow from u/s roads and discharges to system near corner of Hasbrouck . Potential for GI at this discharge location to treat/reduce flows.
- Pollutant load typical from local roads

Typology (i.e. complete streets, type of suitable GI, grant eligible, replicable, etc.)

- Various complete streets types - Area of 'lost space' within curved roadway of Mohonk Ave to Elting Ave
- SW trees and bioretention to improve appearance of park and edges

Sanitary sewer system (i.e. known SSO locations, state of repair of sanitary sewer and known I/I, etc.)

- Within vicinity of leaking sanitary sewer (primarily groundwater entering sanitary sewer) on Hasbrouck; no known location of surface water entering sanitary sewer
- Upper portion (east of Route 208) of Mohonk Avenue recently received CIPP remediation under CDBG project in 2016
- In EPG program for feasibility to include rain garden for site. To reduce SW flows in down gradient system and sewer system which has I/I in areas d/s of the park.

Area Natural Resource Features

- Dedicated open space
- Some urban stream (unmapped) such as SW

Other notes (i.e. 'bang-for-buck', cumulative impacts, known regulatory constraints: SHPO, SEQR, land use, brownfield, etc.)

- Potential for argument of 'alienation' of parkland needs to be considered (i.e. use of parkland for uses other than recreation)
- Feasibility Assessment being undertaken for this site under separate EPG (to be completed by 2020)

**Mapped Site ID#: 8; Site Identifier: I.1 - Site Location: Municipal Properties and Pit**

**Photos:**

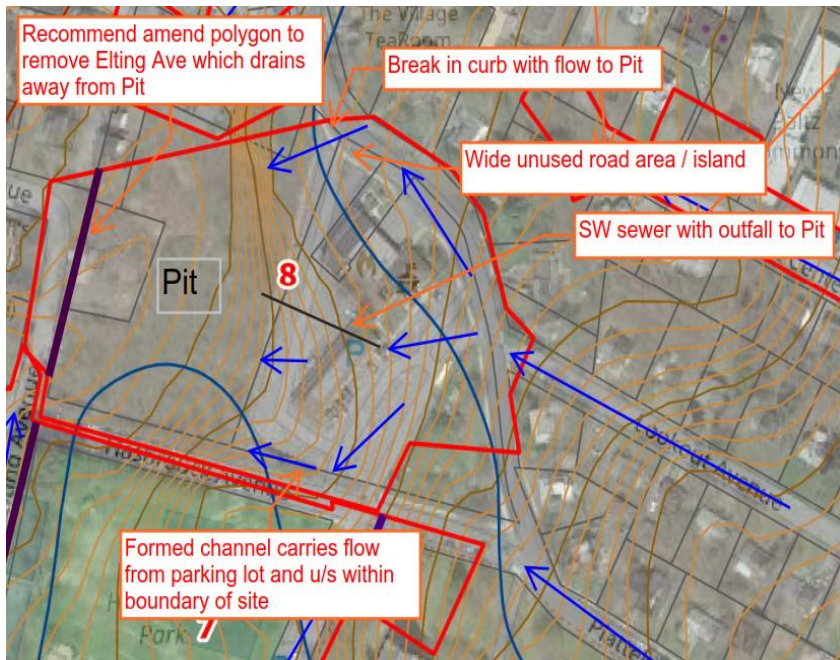








Site Polygon and SW Catchment Area



Social characteristics (i.e. educational opportunity, visibility, high profile, aesthetic/landscape value, etc.)

- Great infill location that is underutilized real estate on filled land in the heart of the community

- Municipal properties & pit location represents ideal sites for a GI pilot. This is a highly visible area that is transited by many SUNY students and village/town residents. We discussed a potential partnership with SUNY that could involve some students in the environmental program in establishing a demonstration project in the area between the fire house and SUNY.
- Consultants indicated that a project at this site would demonstrate the village/town's commitment to stormwater management and by involving SUNY, would be a very positive measure supporting our MS4 stormwater management efforts.
- Parking area behind muni buildings was observed as a short-cut for students walking from campus to Main St;
- Potential to partner with SUNY for education and contribution to MS4 for public education via kiosk/signage;
- High visibility
- Plattekill Ave. is major bike-ped connecting corridor that needs physical improvements and that links SUNY-NP and Main Street environments

Physical characteristics and design constraints (i.e., available footprint, building location / basement, topography, slope, erosion, etc.)

- Multiple sub-sheds on and by location
- No basement
- Village property involves filled land
- Complex grey infrastructure needs improvement
- Wet ("mucky") in pit area
- Potential redevelopment site, however Village DPW/Engineer anticipate footprint of building to remain unchanged.

Stormwater management (i.e., pollutant load, potential for run-on, potential for storage, % impervious, etc.)

- Entire area drains to 'Pit'; front parking area via SW drain and back parking area via overland flow
- Large impervious area and hotspot with vehicle parking and municipal garage, large rooftop area
- 100% impervious, high pollutant load, high potential for run-on
- Old corrugated metal SW pipe noted by Village Engineer
- Stormwater discharged into uniform outfall (pipe) at 'pit'

Typology (i.e. complete streets, type of suitable GI, grant eligible, replicable, etc.)

- Opportunity for multiple potential types
- Significant 'wasted space' within parking area for reconfiguration without losing parking spaces
- Parking area could present shared use opportunities if reconfigured (stormwater management + parking)

Sanitary sewer system (i.e. known SSO locations, state of repair of sanitary sewer and known I/I, etc.)

- No known SSO Locations within vicinity.
- Plattekill Avenue Sewer recently replaced under CDBG project which eliminated major source of stormwater inflow and infiltration
- Within vicinity of leaking sanitary sewer (primarily groundwater entering sanitary sewer) on Hasbrouck; however no known location of surface water entering sanitary sewer

Area Natural Resource Features

- There is a Hudsonia mapped stream by Hasbrouck
- There is Hudsonia wetland and stream at pit



- There seems to be urban underground flow bisecting village property

Other notes (i.e. 'bang-for-buck', cumulative impacts, known regulatory constraints: SHPO, SEQR, land use, brownfield, etc.)

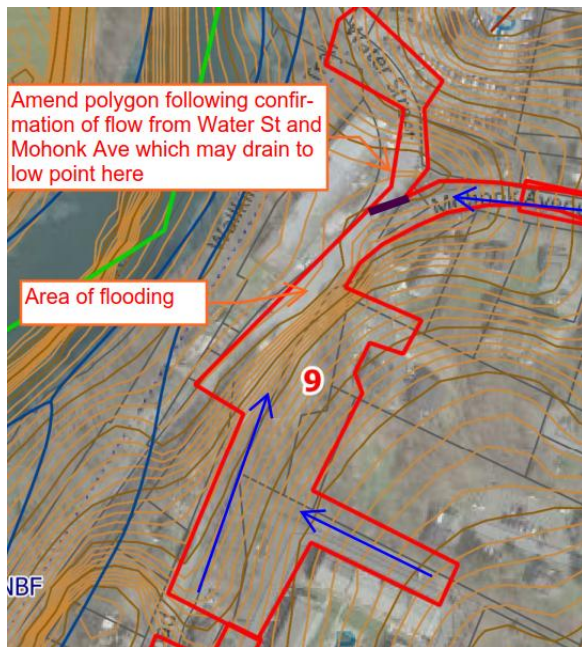
- Potential redevelopment of site with joint redevelopment or following co-location of Town/Village spaces
- Current development plan for the 'Pit' includes relatively dense development with boutique hotel and shops
- Potential method to address requirements of new SPDES permit for municipal DPW facility
- Open spill number with DEC. Contact Ed Moore or Michelle Tipple (lead geologist) for details.
-

**Mapped Site ID#: 9; Site Identifier: E.1 - Site Location: Pencil Hill / Water St Vicinity**

**Photos:**



## Site Polygon and SW Catchment Area



- Low lying area where complicated drainage flows converge. The upgradient area includes Pit environs

Social characteristics (i.e. educational opportunity, visibility, high profile, aesthetic/landscape value, etc.)

- Some residential density nearby. Location by waterfront and rail trail and SUNY proximity means already evident foot traffic may grow
- Site is mix of public/private

Physical characteristics and design constraints (i.e., available footprint, building location / basement, topography, slope, erosion, etc.)

- Large unused space within intersection;
- Steep slope

Stormwater management (i.e., pollutant load, potential for run-on, potential for storage, % impervious, etc.)

- 2 Mohonk Ave is source of drainage issues in this area; significant flooding near intersection of Mohonk Ave and Water St
- Muddy waters flow down Pencil Hill Rd
- High potential for creating positive stormwater impacts (pollutant load, runoff, etc)
- Water seeps out of hill (i.e., under housing project); often during winter (i.e. frozen/ice areas)

Typology (i.e. complete streets, type of suitable GI, grant eligible, replicable, etc.)

- Potential to increase stream buffer on private property
- Awkward traffic pattern requires site specific solution (i.e. not highly replicable)

Sanitary sewer system (i.e. known SSO locations, state of repair of sanitary sewer and known I/I, etc.)

- Area is lowest portion of sanitary sewer system and contains one of main SSO manholes (intersection of Pencil Hill and Water Street), SSO location #5

- No known areas for I/I. Sewer was replaced in late 1990s from Pencil Hill Road to Huguenot Street with new sanitary siphons and gravity sewer.

Area Natural Resource Features

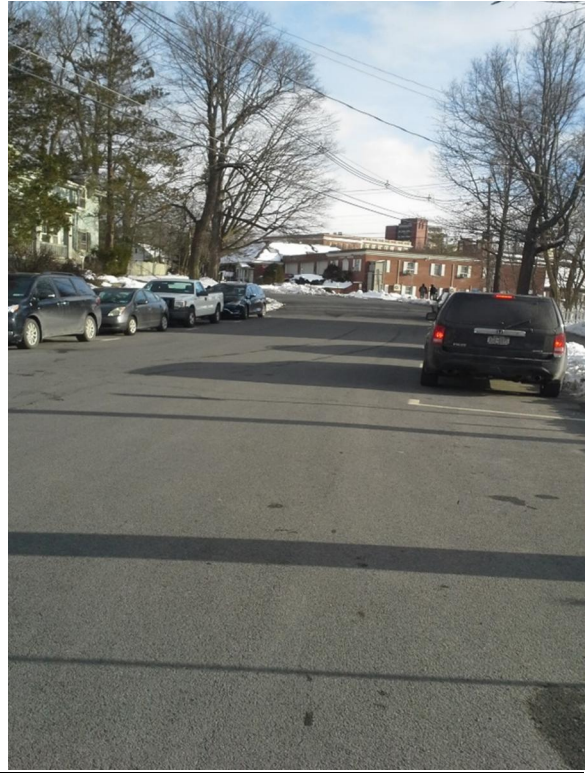
- There is Hudsonia mapped stream along Pencil Hill road
- Area has some floodplain – establishing compensatory storage could aid area development

Other notes (i.e. 'bang-for-buck', cumulative impacts, known regulatory constraints: SHPO, SEQ, land use, brownfield, etc.)

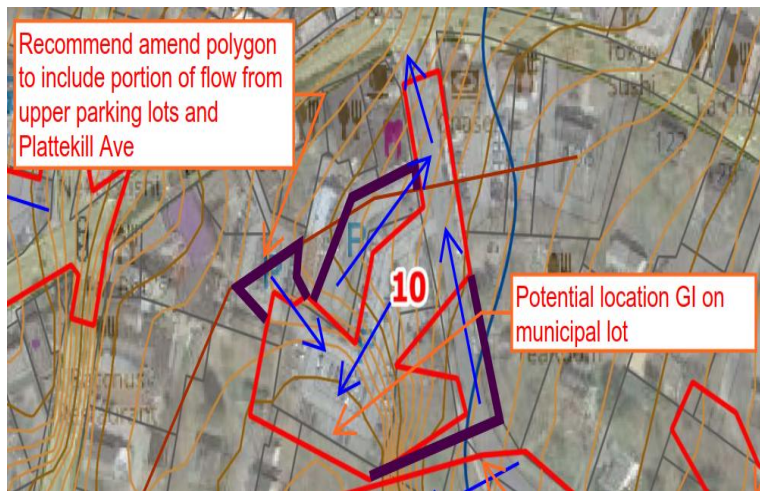


**Mapped Site ID#: 10; Site Identifier: J.1 - Site Location: Plattekill Ave Parking Lot and Vicinity**

**Photos:**



## Site Polygon and SW Catchment Area



Social characteristics (i.e. educational opportunity, visibility, high profile, aesthetic/landscape value, etc.)

- Busy urbanized area of Village core. Potential location of GI at back of municipal lot but not highly visible.
- If there is intensification of land use or capital programming, such as to repave, GI can be included in parking lot surface and there could be consideration of using complimentary GI treatments
- If this is to remain land use inefficient surface parking, consider innovation potential, such as by constructing and providing on-site stormwater services for existing and future private adjacent land uses and infill, either or both storage and treatment

Physical characteristics and design constraints (i.e., available footprint, building location / basement, topography, slope, erosion, etc.)

- Potential location of GI on municipal grassed area adjacent to lot may be particularly beneficial if Pit site redeveloped in this area
- Some southeastern Plattekill Avenue flows go here
- Opportunities for public/private partnership

Stormwater management (i.e., pollutant load, potential for run-on, potential for storage, % impervious, etc.)

- Upper tier of parking area flows to Plattekill and toward Main St
- Lower tier of parking and portion of parking for Main St shops flows to back of municipal lot (i.e. drains to 'pit' property)
- Significant area of impervious within 2.5 parking lots

Typology (i.e. complete streets, type of suitable GI, grant eligible, replicable, etc.)

- Two-way traffic with parking on one side may provide space on Plattekill reconfiguration / complete streets

Sanitary sewer system (i.e. known SSO locations, state of repair of sanitary sewer and known I/I, etc.)

- No known SSO Locations within vicinity.
- Plattekill Avenue Sewer recently replaced under CDBG project. Area is adjacent to the vacant lot known as the Pit which may provide possibilities for stormwater treatment/management during potential future development.



- Portion of site directed toward the pit and ultimately toward vicinity of leaking sanitary sewer (primarily groundwater entering sanitary sewer); no known location of surface water entering sanitary sewer
- Remaining portion directed toward vicinity with new sanitary on Plattekill

Area Natural Resource Features

- There is wetland (mapped Hudsonia) to south

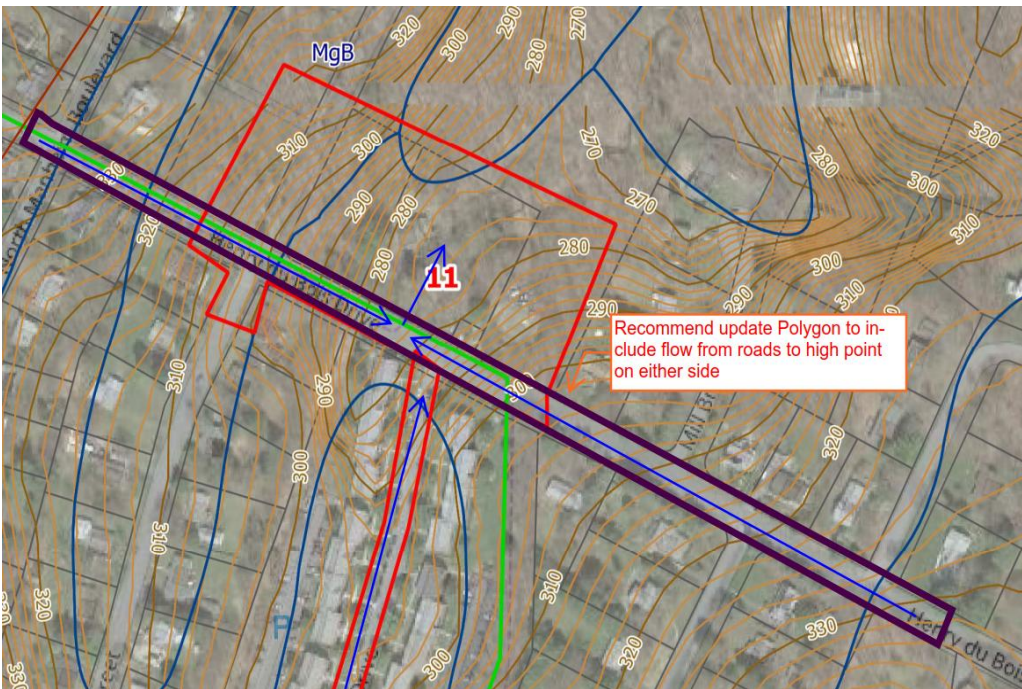
Other notes (i.e. 'bang-for-buck', cumulative impacts, known regulatory constraints: SHPO, SEQR, land use, brownfield, etc.)

**Mapped Site ID#: 11; Site Identifier: S.1 - Site Location: HWD, Harrington & Colonial Drive Vicinity**

**Photos:**



**Site Polygon and SW Catchment Area**



Social characteristics (i.e. educational opportunity, visibility, high profile, aesthetic/landscape value, etc.)

- Stream corridor at this location goes towards/ into Mill Brook Preserve – opportunity to engage community on its stewardship and restoration, but this needs owner support/ involvement
- Possibility for public-private partnership to upgrade/ restore outfall & stream at north edge of Henry W. DuBois Drive and possibly apply wetland restoration, stream buffer, and stormwater GI systems that could accommodate flows from public streets in addition to whatever capacity is planned for future potential infill development around this location
- Somewhat visible with relatively high foot traffic on secondary road

Physical characteristics and design constraints (i.e., available footprint, building location / basement, topography, slope, erosion, etc.)

- Steep slopes on roadway
- Site located at low stormwater collection point (note: may be combined with Site 4)

Stormwater management (i.e., pollutant load, potential for run-on, potential for storage, % impervious, etc.)

- Typical pollutant load from heavily trafficked secondary road, runoff limited to impervious area of road
- 100% impervious (note: may be combined with Site 4)
- Major stormwater collection point (note: may be combined with Site 4)
- Town replaced storm sewers near Colonial Drive that were causing issue previously; discharge location adjacent to existing pump station

Typology (i.e. complete streets, type of suitable GI, grant eligible, replicable, etc.)

- Stormwater ponds (beyond road by pump station, etc.)
- Infiltration basins or sinuous bio-swales (beyond road by pump station, etc, including if polygon enhanced to include more of Town deeded ROW)
- Potential for complete street, road width limited to ROW which is expected to be clear

Sanitary sewer system (i.e. known SSO locations, state of repair of sanitary sewer and known I/I, etc.)

- No known SSO Locations within vicinity. No known specific I/I locations.

Area Natural Resource Features

Other notes (i.e. 'bang-for-buck', cumulative impacts, known regulatory constraints: SHPO, SEQR, land use, brownfield, etc.)

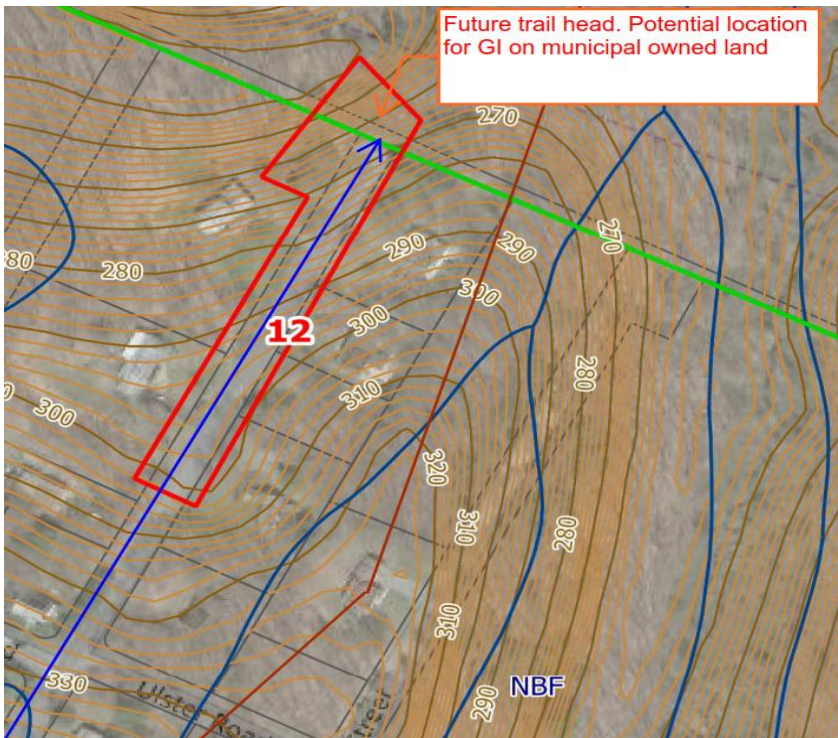
- Potential to leverage GI funding for important community project for 'complete street' on secondary road with relatively high bike/pedestrian traffic



**Photos:**



**Site Polygon and SW Catchment Area**



Social characteristics (i.e. educational opportunity, visibility, high profile, aesthetic/landscape value, etc.)

- Educational opportunity for kiosk/signage at planned future trail head
- Currently low visibility, but intended to become a bicycle corridor to potential future trail head

Physical characteristics and design constraints (i.e., available footprint, building location / basement, topography, slope, erosion, etc.)

- Significant natural buffer and forest exists between tributary 13 and edge of pavement. Cost-benefit of GI in this location may be limited
- Site slopes toward trail head

Stormwater management (i.e., pollutant load, potential for run-on, potential for storage, % impervious, etc.)

- Pollutant load from typical quiet residential dead end street
- No public sewers in area – presumably organic septic material does not get into overland stormwater flows
- 100% impervious from roadway

Typology (i.e. complete streets, type of suitable GI, grant eligible, replicable, etc.)

- Potential for grass lined channel or swale adjacent to roadway

Sanitary sewer system (i.e. known SSO locations, state of repair of sanitary sewer and known I/I, etc.)

- No sanitary sewer in this location.

Area Natural Resource Features

Other notes (i.e. 'bang-for-buck', cumulative impacts, known regulatory constraints: SHPO, SEQR, land use, brownfield, etc.)

- Noted that there was no flow from the outfall during site visit and that the site was a low “bang for the buck”

**Mapped Site ID#: 13; Site Identifier: U.1 - Site Location: Fire Station #2 (117 HWD) and vicinity**

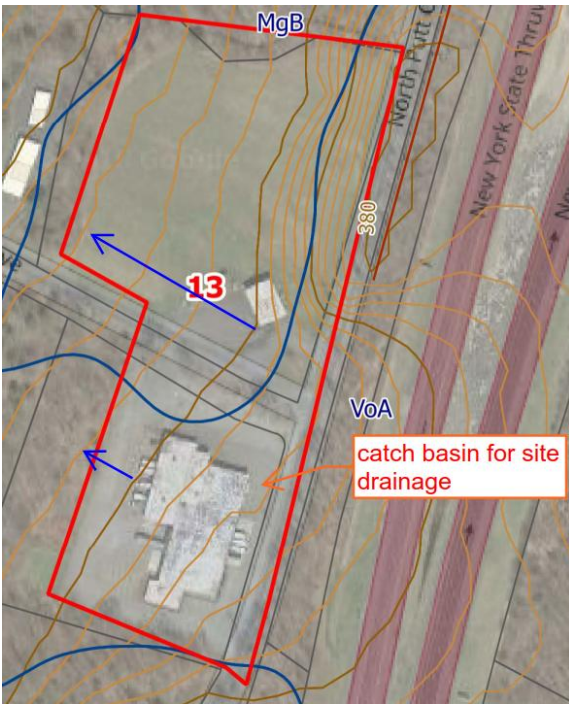
**Photos:**







Site Polygon and SW Catchment Area



Social characteristics (i.e. educational opportunity, visibility, high profile, aesthetic/landscape value, etc.)

- Limited visibility in area currently in terms of minimal pedestrian traffic. Some bike traffic to be increased with EST planned along HWD.
- The public property is being upgraded with a new station
- There should be thought how to transform No. Putt right of way and edge of right of way to achieve traffic calming and intermodal design, including separated multi-use trail with GI integration in and by this.

Physical characteristics and design constraints (i.e., available footprint, building location / basement, topography, slope, erosion, etc.)

- Top of watershed. Downstream there are high pathogen levels, Planner does not know if there is high pathogen rates at this location that is not overlain by sanitary sewer service
- Planned redevelopment of fire station site will trigger 1 acre threshold for DEC SPDES permit requiring GI at this site
- Minimal grade change across site
- There should be thought on what are typical groundwater levels around location

Stormwater management (i.e., pollutant load, potential for run-on, potential for storage, % impervious, etc.)

- Impervious area to increase with planned redevelopment for fire station / emergency shelter expansion
- Bakery impervious area drains toward wetland area to back; vegetative buffer between private parcel and municipal owned wetland area

Typology (i.e. complete streets, type of suitable GI, grant eligible, replicable, etc.)

- Large site for development without space constraints
- Is there potential for compensatory upland storage
- Could there be constructed wetlands around north and west edges

Sanitary sewer system (i.e. known SSO locations, state of repair of sanitary sewer and known I/I, etc.)

- N/A, no sanitary sewer in this vicinity

Area Natural Resource Features

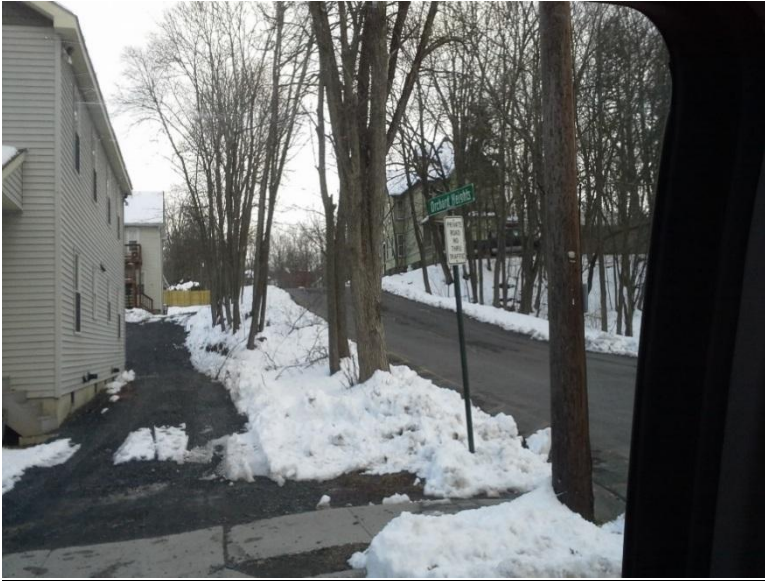
- Per NYSDEC Environmental Resource Mapper, there is a regulated State wetland underlying this site: Wetland (& buffer) ID: CD-39, Wetland Class: 3, 27.6 acres
- Also per ERM – there are two NYSDEC inventoried streams segments (Class C) at location

Other notes (i.e. ‘bang-for-buck’, cumulative impacts, known regulatory constraints: SHPO, SEQR, land use, brownfield, etc.)

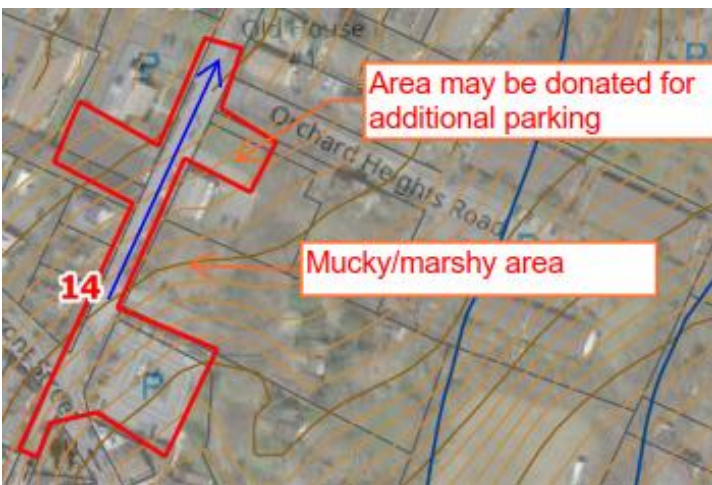
- Redevelopment planned within next 1 to 2 years for new fire station. Site work being completed by DASNY engineers.

**Mapped Site ID#: 14; Site Identifier: A.K.1 - Site Location: Church and North Front Streets location**

**Photos:**



Site Polygon and SW Catchment Area





Social characteristics (i.e. educational opportunity, visibility, high profile, aesthetic/landscape value, etc.)

- Civic and pedestrian-centered area
- Educational opportunity in Library parking lot and by its edge (there is NYS ROW)
- Known drainage challenges in area centered on Church – it carries downstream including impacting North Chestnut St vicinity
- Library parking lot is highly visible
- Located in dense infill area

Physical characteristics and design constraints (i.e., available footprint, building location / basement, topography, slope, erosion, etc.)

- Limited space available on road with two-way traffic and parking on both sides
- Basements in residential properties set-back from property line

Stormwater management (i.e., pollutant load, potential for run-on, potential for storage, % impervious, etc.)

- Pollutant load typical for busy secondary road
- It is not known how is Library drainage managed/ directed
- Noted as being regularly wet/mucky

Typology (i.e. complete streets, type of suitable GI, grant eligible, replicable, etc.)

- Potential for complete streets within typical narrow urbanized Village roadway
- Potential Library parking area and/or street demo with interactive / engagement potential
- Potential for pond within area noted as ‘area may be donated for parking’
- Tree plantings/ SW trees

Sanitary sewer system (i.e. known SSO locations, state of repair of sanitary sewer and known I/I, etc.)

- No known SSO Locations within vicinity. u/s from existing SSO location #3
- u/s from North Chestnut where there is surface water entering sanitary sewer however new sewer scheduled for this location in summer 2018
- No known I/I issues on Church St

Area Natural Resource Features

- This is an urbanized area that does not show any mapped wetlands or streams. Upgradient there is only a small wetland mapped – it seems there is perennial stream open and flowing by Prospect and Main and pocket and isolated wetlands around this location. This points to complicated grey systems and stormwater drainage sheds and it points to a need for better understanding of surface drainage flows in vicinity.

Other notes (i.e. ‘bang-for-buck’, cumulative impacts, known regulatory constraints: SHPO, SEQR, land use, brownfield, etc.)

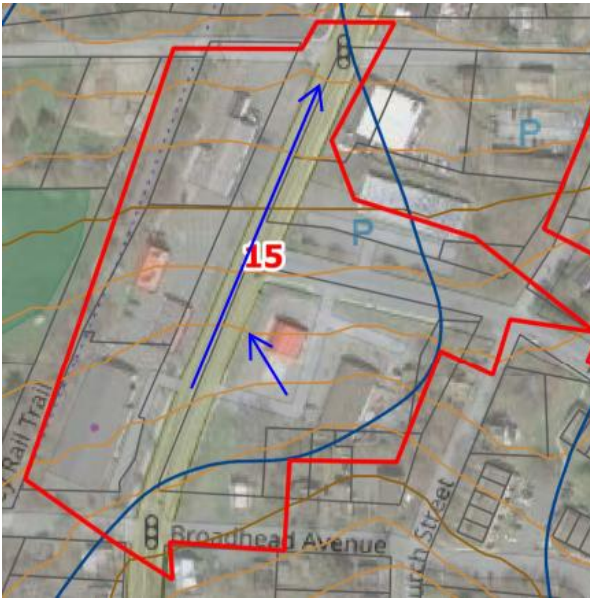
- Drainage problems at properties in area, downstream development, and success with past and future infill can be aided with improvements here, which points to potential upside benefits.

**Mapped Site ID#: 15; Site Identifier: A.1 - Site Location: Base of HWD Drive**

**Photos:**



## Site Polygon and SW Catchment Area



Social characteristics (i.e. educational opportunity, visibility, high profile, aesthetic/landscape value, etc.)

- Main entry/exit road to New Paltz from north
- Need to have excellent community character enhancement on this major street edge to National Register Listed historic resources on and by Huguenot St.
- High visibility
- Private with the exception of ROW

Physical characteristics and design constraints (i.e., available footprint, building location / basement, topography, slope, erosion, etc.)

- Rt 32 State Highway; potential for high profile NYSDOT complete streets project (i.e. bury power lines, widen roadway, add GI, etc.)
- High pollutant load potential
- High potential for 'brownfield', contaminated site area within proximity to gas station

Stormwater management (i.e., pollutant load, potential for run-on, potential for storage, % impervious, etc.)

- Large impervious private lot (gas station) for potential future redevelopment
- Some stormwater flows go west toward mid-block (by former NAPA store)

Typology (i.e. complete streets, type of suitable GI, grant eligible, replicable, etc.)

- Complete street, porous pavement within private lots
- Wetlands creation / compensatory storage (but public controlled space is limited)
- Promote quality improvements – filtering or treatment?
- SW trees on upper Broadhead?

Sanitary sewer system (i.e. known SSO locations, state of repair of sanitary sewer and known I/I, etc.)

- No known SSO at location. However within vicinity and u/s of historic SSO #1



- No known specific I/I locations. HWD Drive from Prospect to Church to Broadhead replaced under CDBG project. Only a small section of sewer runs from HWD Drive to Mulberry Street.
- Within vicinity of leaking sewer on Mulberry Street, however primarily groundwater entering; No known locations where surface water is entering sanitary sewer

Area Natural Resource Features –

- It should be check whether there was ever remediation or may be active reported release at gas filling station
- There is an urban stream northwest (at rail trail).
- This is an urbanized area that does not show mapped wetlands or streams, including upgradient west of HWDD, but there are some drainage challenges in that upstream area. It seems there is need to better facilitate flows through this area.

Other notes (i.e. 'bang-for-buck', cumulative impacts, known regulatory constraints: SHPO, SEQR, land use, brownfield, etc.)

# **APPENDIX 9**

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## **NEXT STAGE SCORING MATRIX**

		Soils Characteristics							
Map Site ID#	Site Location Name	1) Capacity to transmit water / permeability (3=best; used value of most prevalent characteristic)	2) Drainage class / Frequency & duration of wet periods (4=best; used value of most prevalent characteristic)	3) Depth to water table (5=best, used value of most prevalent characteristic)	4) Pesticide and nutrient movement (2 = least/somewhat limited; 1 = most limited)	5) Hydrologic Soil Group (4=best)	SUM of Soils Characteristics	Ratio to max score of 18	Weighting of Soils Characteristics
3	Moriello Park/ Mullberry & Church St. Vicinity	3	3	4	2	3	15	0.83	0.1
8	Municipal Properties & Pit	3	3	4	2	3	15	0.83	0.1
2	Southside Ave./ So. Chestnut St.	2	3	4	2	3	14	0.78	0.1
1	Core of Village	3	3	4	2	3	15	0.83	0.1
7	Hasbrouck Park Locus	2	3	3	2	3	13	0.72	0.1
5	So. Chestnut/Mohonk Intersection	3	3	3	2	3	14	0.78	0.1
6	West Center St.	2	4	3	2	2	13	0.72	0.1
9	Pencil Hill/Water St. Vicinity	3	3	4	2	3	15	0.83	0.1
15	Base of Henry W. D. Dr	2	1	1	1	2	7	0.39	0.1
10	Plattekill Ave Parking Lot & Vicinity	3	3	4	2	3	15	0.83	0.1
14	Church and No. Front Streets Location	3	3	4	2	3	15	0.83	0.1
4	Colonial Drive	2	4	4	2	3	15	0.83	0.1
12	Mill Brook Preserve-Gateway @No. Manheim	2	3	3	2	2	12	0.67	0.1
13	Fire Station#2 (117 HWDDr) & Adjacent Area	1	1	1	2	1	6	0.33	0.1
11	HWD, Harrington & Colonial Drive Vicinity	2	4	3	2	2	13	0.72	0.1

34 Sites to be investigated as part of the Village of New Paltz Engineering Planning Grant CFA # 63415

19 Potential to combine S1 & T1 for design based on proximity.

10 Potential to combined I1 & J1 for design based on proximity.



		Smart Growth Characteristics						
Map Site ID#	Site Location Name	6) High profile / visible site, educational opportunity (3=high profile; lots of foot traffic, 2=visible, 1=least visible)	7) Potential to improve existing drainage issues (3 = significant opportunity, 1 = no existing drainage issues)	8) Sanitary Sewer Overflow (SSO) benefit (4 = significant potential to benefit, 1 = no potential to benefit)	9) Natural resource restoration opportunities and proximity to waterways/wetlands (3 = high, mapped WL/waterway on-site, 1 = no mapped WL / streams in vicinity)	SUM of Smart Growth Characteristics	Ration to max score of 13	Weighting of Smart Growth Characteristics
3	Moriello Park/ Mullberry & Church St. Vicinty	3	2	2	3	13	1.00	0.2
8	Municipal Properties & Pit	3	2	2	3	13	1.00	0.2
2	Southside Ave./ So. Chestnut St.	2	3	2	2	11	0.85	0.2
1	Core of Village	3	2	3	1	12	0.92	0.2
7	Hasbrouck Park Locus	3	2	3	2	11	0.85	0.2
5	So. Chestnut/Mohonk Intersection	2	2	2	1	10	0.77	0.2
6	West Center St.	2	3	4	1	11	0.85	0.2
9	Pencil Hill/Water St. Vicinity	2	3	2	2	12	0.92	0.2
15	Base of Henry W. D. Dr	3	1	2	1	10	0.77	0.2
10	Plattekill Ave Parking Lot & Vicinity	1	1	1	2	6	0.46	0.2
14	Church and No. Front Streets Location	3	3	2	1	10	0.77	0.2
4	Colonial Drive	2	3	1	3	10	0.77	0.2
12	Mill Brook Preserve-Gateway @No. Manheim	2	1	1	2	7	0.54	0.2
13	Fire Station#2 (117 HWDDr) & Adjacent Area	1	1	1	3	7	0.54	0.2
11	HWD, Harrington & Colonial Drive Vicinity	2	1	1	3	8	0.62	0.2

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10 Potential to combined I1 & J1 for design based on proximity.

		<b>Aesthetic Value</b>			
<b>Map Site ID#</b>	<b>Site Location Name</b>	10) Aesthetic value / opportunity to improve landscaping (3 = high, needs significant improvement, 1 = minimal, does not require significant improvement)	<b>SUM of Aesthetic Value Characteristics</b>	<b>Out of 3 max score</b>	<b>Weighting of Aesthetic Value Characteristics</b>
3	Moriello Park/ Mullberry & Church St. Vicinity	3	3	1.00	0.05
8	Municipal Properties & Pit	3	3	1.00	0.05
2	Southside Ave./ So. Chestnut St.	2	2	0.67	0.05
1	Core of Village	3	3	1.00	0.05
7	Hasbrouck Park Locus	1	1	0.33	0.05
5	So. Chestnut/Mohonk Intersection	3	3	1.00	0.05
6	West Center St.	1	1	0.33	0.05
9	Pencil Hill/Water St. Vicinity	3	3	1.00	0.05
15	Base of Henry W. D. Dr	3	3	1.00	0.05
10	Plattekill Ave Parking Lot & Vicinity	1	1	0.33	0.05
14	Church and No. Front Streets Location	1	1	0.33	0.05
4	Colonial Drive	1	1	0.33	0.05
12	Mill Brook Preserve-Gateway @No. Manheim	1	1	0.33	0.05
13	Fire Station#2 (117 HWDDr) & Adjacent Area	1	1	0.33	0.05
11	HWD, Harrington & Colonial Drive Vicinity	1	1	0.33	0.05

**34** Sites to be investigated as part of the Village of New Paltz Engineering Planning Grant CFA # 63415

**19** Potential to combine S1 & T1 for design based on proximity.

**10** Potential to combined I1 & J1 for design based on proximity.

		Regulatory constraints					
Map Site ID#	Site Location Name	11) SEQR Constraints, i.e., within area of National Register Buildings Listing or Archeological Sensitive Area, Sensitive Enviro Area (2 = no likely impact, 1 = likely to be impacted)	12) Potential for contaminated soils (3 = low potential, 2 = significant potential, 1 = known contaminated site)	13) Proximity to drinking water wells (2 = within municiple water district, 1 = within proximity of area with residential wells)	SUM of Regulatory Characteristics	Ratio to max score of 7	Weighting of Regulatory Characteristics
3	Moriello Park/ Mullberry & Church St. Vicinty	1	3	2	6	0.86	0.05
8	Municipal Properties & Pit	1	1	2	4	0.57	0.05
2	Southside Ave./ So. Chestnut St.	1	3	2	6	0.86	0.05
1	Core of Village	1	2	2	5	0.71	0.05
7	Hasbrouck Park Locus	1	3	2	6	0.86	0.05
5	So. Chestnut/Mohonk Intersection	1	3	2	6	0.86	0.05
6	West Center St.	1	3	2	6	0.86	0.05
9	Pencil Hill/Water St. Vicinity	1	3	2	6	0.86	0.05
15	Base of Henry W. D. Dr	1	2	2	5	0.71	0.05
10	Plattekill Ave Parking Lot & Vicinity	1	3	2	6	0.86	0.05
14	Church and No. Front Streets Location	1	3	2	6	0.86	0.05
4	Colonial Drive	2	3	2	7	1.00	0.05
12	Mill Brook Preserve-Gateway @No. Manheim	2	3	1	6	0.86	0.05
13	Fire Station#2 (117 HWDDr) & Adjacent Area	2	3	1	6	0.86	0.05
11	HWD, Harrington & Colonial Drive Vicinity	2	3	1	6	0.86	0.05

34 Sites to be investigated as part of the Village of New Paltz Engineering Planning Grant CFA # 63415

19 Potential to combine S1 & T1 for design based on proximity.

10 Potential to combined I1 & J1 for design based on proximity.



		Feasibility						
Map Site ID#	Site Location Name	14) Ownership (3 = public, 2 = mixed, 1 = private)	15) Depth to restrictive layer (e.g. bedrock, clay pan) (3= best; greatest depth to restrictive layer)	16) Significant design constraints? (footprint, basement, topography, steep slope) (3 = minimally constrained, 2 = somewhat constrained, 1 = highly constrained)	Note major design constraint(s)	SUM of Feasibility Characteristics	Ratio to max score of 9	Weighting of Feasibility Characteristics
3	Moriello Park/ Mullberry & Church St. Vicinity	3	3	3		9	1.00	0.3
8	Municipal Properties & Pit	3	3	3		9	1.00	0.3
2	Southside Ave./ So. Chestnut St.	3	3	3		9	1.00	0.3
1	Core of Village	2	3	1	multiple private owners	6	0.67	0.3
7	Hasbrouck Park Locus	3	2	3		8	0.89	0.3
5	So. Chestnut/Mohonk Intersection	3	3	3		9	1.00	0.3
6	West Center St.	3	2	3		8	0.89	0.3
9	Pencil Hill/Water St. Vicinity	2	3	1	topography / steep slopes	6	0.67	0.3
15	Base of Henry W. D. Dr	1	3	1	DOT ROW along Rt 32	5	0.56	0.3
10	Plattekill Ave Parking Lot & Vicinity	3	3	2	2-way traffic with parking on one side; some steep slopes	8	0.89	0.3
14	Church and No. Front Streets Location	3	3	1	narrow street with parking both sides, 'wet' basements	7	0.78	0.3
4	Colonial Drive	2	3	1	Flooding basements, u/g stream	6	0.67	0.3
12	Mill Brook Preserve-Gateway @No. Manheim	3	2	3		8	0.89	0.3
13	Fire Station#2 (117 HWDDr) & Adjacent Area	2	1	3		6	0.67	0.3
11	HWD, Harrington & Colonial Drive Vicinity	1	1	1	potential encroachments in ROW; steep slopes	3	0.33	0.3

34 Sites to be investigated as part of the Village of New Paltz Engineering Planning Grant CFA # 63415

19 Potential to combine S1 & T1 for design based on proximity.

10 Potential to combined I1 & J1 for design based on proximity.

		Water Quality Improvement Potential						Ranking Summary		
Map Site ID#	Site Location Name	17) Pollutant Load, sediment, oils and metals (3 = high; intensive parking/loading, 2 = medium; busy road/parking/bare soil, 1 = low; quiet road/greenspace)	18) Cummulative Effects, i.e., high impervious, 'run-on' potential, potential for runoff reduction (3 = high, 1 = low)	19) Catchment area (3 = large, 2 = medium, 1 = small)	SUM of Water Quality Characteristics	Ratio to max score of 9	Weighting of Water Quality Characteristics	Weighted Total	Ranking	Top 3
3	<a href="#">Moriello Park/ Mullberry &amp; Church St. Vicinity</a>	2	3	3	8	0.89	0.3	0.94	1	Top 3
8	Municipal Properties & Pit	3	3	2	8	0.89	0.3	0.93	2	Top 3
2	Southside Ave./ So. Chestnut St.	2	2	3	7	0.78	0.3	0.86	3	Top 3
1	Core of Village	3	3	2	8	0.89	0.3	0.82	4	Top 6
7	<a href="#">Hasbrouck Park Locus</a>	2	3	2	7	0.78	0.3	0.80	5	Top 6
5	So. Chestnut/Mohonk Intersection	2	2	1	5	0.56	0.3	0.79	6	Top 6
6	<a href="#">West Center St.</a>	2	2	2	6	0.67	0.3	0.77	7	
9	Pencil Hill/Water St. Vicinity	2	1	3	6	0.67	0.3	0.76	8	
15	Base of Henry W. D. Dr	3	3	3	9	1.00	0.3	0.75	9	
10	Plattekill Ave Parking Lot & Vicinity	3	3	1	7	0.78	0.3	0.74	10	
14	Church and No. Front Streets Location	2	2	2	6	0.67	0.3	0.73	11	
4	<a href="#">Colonial Drive</a>	2	2	2	6	0.67	0.3	0.70	12	
12	Mill Brook Preserve-Gateway @No. Manheim	1	1	1	3	0.33	0.3	0.60	13	
13	Fire Station#2 (117 HWDDr) & Adjacent Area	2	2	1	5	0.56	0.3	0.57	14	
11	<a href="#">HWD, Harrington &amp; Colonial Drive Vicinity</a>	2	1	2	5	0.56	0.3	0.52	15	

**34** Sites to be investigated as part of the Village of New Paltz Engineering Planning Grant CFA # 63415

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**10** Potential to combined I1 & J1 for design based on proximity.

# **APPENDIX A10**

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## **FEASIBILITY ANALYSIS REPORT**



# Green Infrastructure Feasibility Study

**Village of New Paltz  
Plattekill Avenue & Southside Avenue  
New Paltz, New York**



Prepared for:

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Ryan Biggs | Clark Davis Project 11948  
December 2018

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## **I. EXECUTIVE SUMMARY**

The Village of New Paltz Green Infrastructure Capital Improvement Feasibility Plan consists of implementing Green Infrastructure in the Village of New Paltz, as well as urbanized areas of the Town of New Paltz, to enhance storm water flows, environmental water quality and overall community development. As part of this project, engineering feasibility analysis was completed for two selected site locations. The potential Green Infrastructure that will be incorporated into these target sites include: Permeable pavement; stormwater tree boxes/tree planting; and bioretention, e.g. rain gardens and stormwater planters. Bioretention and trees would be installed at strategic locations on site to capture street runoff from existing intersections and sloped topography. Permeable pavement could be used in bicycle lanes and parking lanes, and on sidewalks. The Green Infrastructure will reduce the quantity and improve the quality of runoff from the area and also provide groundwater recharge through infiltration. There are two sites discussed.

This project was funded by the Hudson River Estuary Program stewardship grant.

## **II. PROJECT OBJECTIVES**

The Village of New Paltz contains urbanized areas east of the Wallkill River that flood after heavy precipitation. Sections of these streets are frequently covered in standing water due to ineffective storm water conveyance and storage infrastructure.

One of the primary objectives of this project was to advance community resiliency, define vulnerabilities, improve local drainage, and reduce sanitary sewer overflows (SSOs) to the Wallkill River. The process of site selection was also based on goals related to improving water quality and having demonstration projects for the municipalities.

Green Infrastructure practices are proposed, such as rain gardens and porous pavement, which will prevent stormwater ponding and subsequent storm flow intrusions into sanitary sewers, further reducing SSOs. Additionally, the incorporated Green Infrastructure will improve downstream water quality, reducing erosion and sediment build-up in downstream waterways.



### III. EXISTING CONDITIONS

**a) Project Location – Site A – Plattekill Avenue**

Site A is located on Plattekill Ave in New Paltz, NY. The work will take place within maintenance strips and village property bordering Plattekill Ave and ranging from the intersections at Plattekill Ave / Main Street and Plattekill Ave / Hasbrouck Ave. Green Infrastructure will be introduced at specific locations along the street taking into account: topography; area and site characteristics, such as land ownership, property configuration and relationship of location to sanitary sewer and storm water infrastructure. See Figure 1 below.

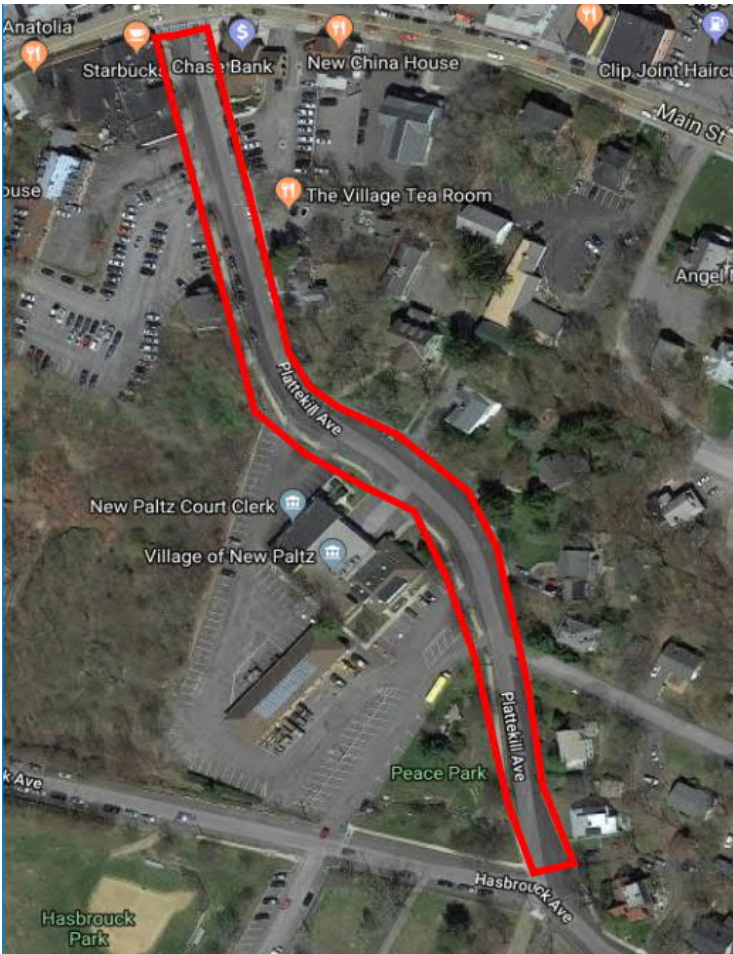


Figure 1 – Site Location Map – Site A – Plattekill Avenue

**b) Current Land Use**

The current land within the right-of-way is primarily a local two-lane road bordered by five foot sidewalks with a narrow maintenance strip. There are curbed islands belonging to the Village Hall and New Paltz Firehouse.

**c) USDA Soil Classification/Bedrock Depth**

The site consists of two main soil types. 70% of the soil on site is classified as Bath – Nassau complex (BnC), 8 to 25 percent slopes. Bath is part of Hydrologic Soil Group C and Nassau is within Hydrologic Soil Group D. The depth to bedrock for Bath is 40 to 80 inches, while the depth to bedrock for Nassau is 10 to 20 inches. The site also contains 30% of Hamlin silt loam (Ha), 0 to 3 percent slopes, Hydrologic Soil Group B. The depth to bedrock for Ha is more than 80 inches. The soils map is shown in the Figure 2.



Figure 2 – USDA Soils Map – Site A – Plattekill Avenue

#### **d) *Site Topography***

The topography of the project site is dominated by a gradually sloped, winding asphalt road. Toward the north end of the site, the landscape changes to flat ground. Located along either side of the road is raised curbing as well as sidewalks.

#### **e) *Stormwater Flowpath***

There are currently six stormwater structures within the scope of the project site. At the intersection of Plattekill and Hasbrouck, there is a drainage structure on the east side of the street that accommodates flow from the upper section of Hasbrouck Ave. Flows arriving at this catch basin are intercepted prior to entering the target Plattekill Ave project site. Moving north along Plattekill Ave, there is a catch basin located on the east side of the street, past the intersection with Lookout Ave, and then two catch basins staggered on the east and west sides of the street near the entrance to the Court House parking lot. These two catch basins take runoff from the Lookout Ave, Plattekill Ave, and from overland flow from residential properties on the east side of Plattekill, which is currently exacerbated by failing stormwater infrastructure on West Center Street. During and following heavy rainfall, stormwater overflows the two main catch basins towards an asphalt driveway apron just north of the Court House property, on the west side of the street. There is evidence of washout in this area which is impacting the existing sidewalk. The water then flows into a moderately wooded area (the Pit property), and proceeds to seek lower levels, where it floods the yards of surrounding property. Flows to the north of the Pit property continue along Plattekill Ave toward a catch basin located at the corner of Main St.

Since most of the site is asphalt, the water moves quickly without soaking into the soil.

#### **f) *Depth to Water Table***

The depth to water table for Bath – Nassau complex is 24 to 37 inches for Bath and more than 80 inches for Nassau. As for Hamlin silt loam, the depth to water table is approximately 36 to 72 inches. During percolation tests, no mottling or evidence of ground water was found to a depth of 12 inches.

#### **g) *Nearest Receiving Waterbody***

The nearest major receiving water body is the Wallkill River. Although there is a minor stream (approximately 150 feet long) that is day-lighted and travels through the Peace Park, located at the corner of Plattekill Ave and Hasbrouck Ave, runoff from Plattekill Ave north of the Peace Park does not directly flow to this stream.



### ***h) Other Site Considerations***

The project area is a two-lane street with existing sidewalk along both sides and has potential for Green Infrastructure. The New Paltz Village Court House and Firehouse are located along Plattekill Ave, providing municipal land that can be remodeled as Green Infrastructure. Plattekill Ave is a winding road with a gradual slope starting at the intersection of Plattekill Ave / Hasbrouck Ave all the way down to Main Street. Before reaching Main Street, parking on either side of the site is formal and efficiently used. Asphalt surface conditions end to end of the street shows little wear with minimal cracking. The site experiences moderate vehicle traffic and foot traffic. A goal of the Village is to develop a “Complete Street” which is designed and operated to enable safe access for all users, including pedestrians, bicyclists, motorists and transit riders of all ages and abilities. The curb line could be moved in some wider areas to make room for Green Infrastructure.

### ***i) Boring Logs, Infiltration Tests, other Subsurface Investigations***

Three percolation tests, approximately 12” deep, were performed on June 28<sup>th</sup>, 2018. The approximate locations are noted by the solid red circles on Figure 3. The first test yielded an average of 47.9 inch/Hr drop, the second had a result of 33.5 inch/Hr and the final site test generated a 104.9 inch/Hr drop. The soil profile for the first test hole was 7” of Topsoil and grass roots followed by 5” of sandy gravel. Test hole #2 contained 4” of topsoil at the surface with 8” of light brown, silty sand below. As for test hole #3, the soil was made up of 7” of topsoil and 5” of stony gravel below grade. Additional soil testing is required during project design phase, but the preliminary infiltration results appear sufficient for green infrastructure without the addition of an underdrain system.



Figure 3 – Infiltration Testing Location Plan – Site A – Plattekill Avenue

***j) Project Location – Site B – Southside Avenue***

Site B is located on Southside Ave in New Paltz, NY. The work will take place within the right-of-way along Southside Ave ranging from the intersections at Southside Ave / Pencil Hill Rd and Southside Ave / S Chestnut St. Green Infrastructure will be introduced at specific locations along the street taking into account: topography; area and site characteristics, such as land ownership, property configuration and relationship of location to sanitary sewer and storm water infrastructure. See Figure 4.

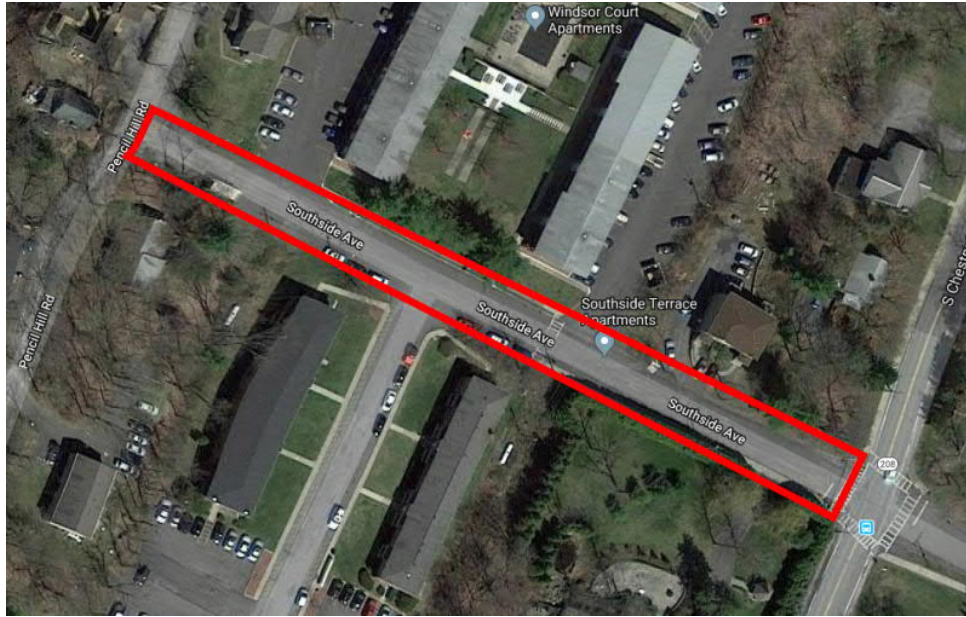


Figure 4 – Site Location Map – Site B – Southside Avenue

### ***k) Current Land Use***

On the north side of the local road, the current municipal land is primarily a three foot maintenance strip and five foot sidewalk. Toward each end of the road, the north side contains driveway and parking lot entrances to private property. There is no street parking on the north side. The south side of the road is mainly asphalt for parking toward the west end and encompasses a sloped sidewalk at the east end.

### ***l) USDA Soil Classification/Bedrock Depth***

The site consists of three main soil types. 20% of the soil on site is classified as Bath – Nassau complex (BnC), 8 to 25 percent slopes. Bath is part of Hydrologic Soil Group C and Nassau is within Hydrologic Soil Group D. The depth to lithic bedrock for Bath is 40 to 80 inches, while the depth to bedrock for Nassau is 10 to 20 inches. The site also contains 40% of Hamlin silt loam (Ha), 0 to 3 percent slopes, Hydrologic Soil Group B. The depth to bedrock for Ha is more than 80 inches. Nassau-Bath-Rock outcrop complex (NBF) makes up 40% of the soil on site: Nassau with a 25 to 65 percent slope and both Bath and Rock outcrop with a 25 to 45 percent slope. Hydrologic Soil Groups for NBF include Group D for Nassau, Group C for Bath and no group rating for Rock outcrop. The depth to bedrock for Nassau, Bath, and Rock outcrop are 10 to 20 inches, 40 to 80 inches and 0 inches respectively. Rock outcrop was not visible at the surface, nor was it encountered within test holes.





Figure 5 – USDA Soils Map – Site B – Southside Avenue

### ***m) Site Topography***

The project site is very flat on the western half and transitions into moderately sloped profile on the opposite end. Either side of the road has various sections where there is raised curbing and sidewalk.

### ***n) Stormwater Flowpath***

There are currently multiple stormwater structures on the project site: A total of six catch basins were located. At the peak of the east end of Southside Ave there is a drainage structure that collects water from the intersection of Southside Ave / S Chestnut St. In the vicinity where the slope of the street turns flat, there are three catch basins that collect the runoff coming down the street. After investigating the catch basins, it has been determined that two out of the three catch basins have been silted in and need attention. The site is moderately sloped on the east half of Southside Ave and turns into generally flat terrain at the opposite end. In addition to runoff flowing down the street, the roof leaders from the surrounding buildings discharge onto the ground. Stormwater has trouble leaving the site and often sits in large puddles for extended periods of time, flooding bordering areas of private property as well as the street. There is severe damage to the roadway caused by stormwater runoff, including potholes (which have been patched with stone) and severe cracking.

***o) Depth to Water Table***

The depth to water table for Bath – Nassau complex and Nassau-Bath-Rock outcrop complex is 24 to 37 inches for Bath and more than 80 inches for Nassau. As for Hamlin silt loam, the depth to water table is approximately 36 to 72 inches. During percolation tests, no mottling or evidence of ground water was found to a depth of 15 inches.

***p) Nearest Receiving Waterbody***

The nearest receiving water body is the Walkkill River.

***q) Other Site Considerations***

The project area is a two-lane street with segments of existing sidewalk and has potential for Green Infrastructure. A narrow maintenance strip and curbing edges the north side of the street with the possibility of being widened. The site receives a small amount of through traffic. The current street parking on the south side of the site is informal, but used effectively. Southside Ave borders relatively dense student housing with associated parking lot entrances and foot traffic. Asphalt conditions along the entirety of the street include low severity longitudinal cracking with some patching, as well as medium severity alligator cracking toward the north end of the site.

***r) Boring Logs, Infiltration Tests, other Subsurface Investigations***

Three percolation tests, varying in depth from 11” to 15”, were performed on June 28<sup>th</sup>, 2018. The approximate locations are noted by the red circles on Figure 6. The first test yielded an average of 11.3 inch/Hr drop, the second had a result of 16.9 inch/Hr and the final site test generated a 7.4 inch/Hr drop. The soil profile for the first test hole was 2” of Topsoil followed by 13” of sandy gravel with some silt. Test hole #2 contained 6” of topsoil at the surface with 6” of light brown sandy gravel with petrified tree remnants below. As for test hole #3, the soil was made up of 3” of topsoil and 8” of dark brown gravel with some clay below grade. Additional soil testing is required as part of the project design phase, but the preliminary infiltration results appear sufficient for green infrastructure without the addition of an underdrain system.

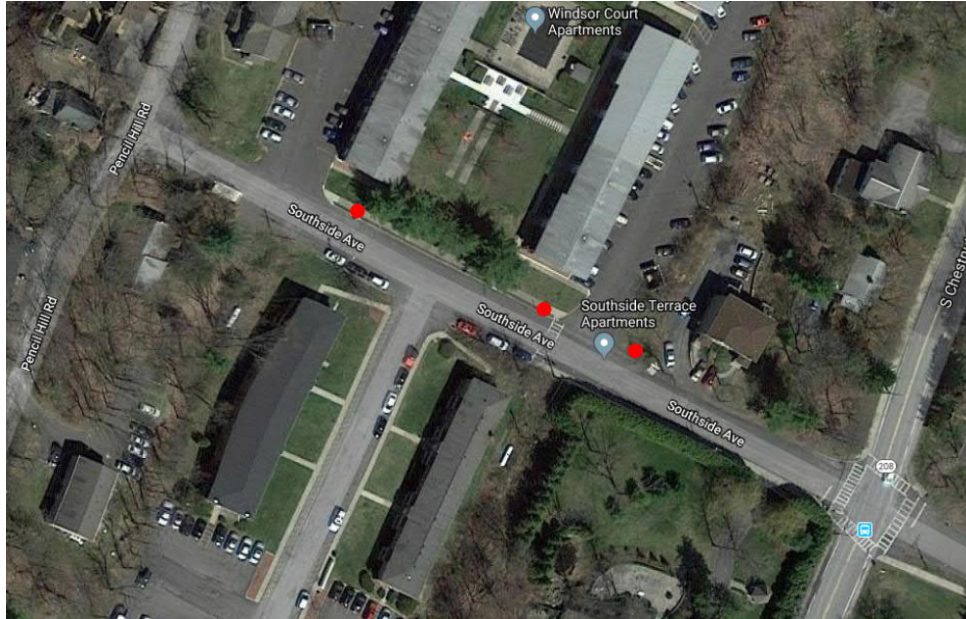


Figure 6 – Infiltration Testing Location Plan – Site B – Southside

## IV. PROJECT DESCRIPTION

### a) ***Recommended Green Infrastructure Practices - Plattekill***

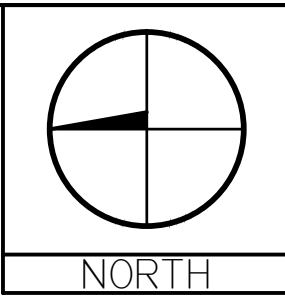
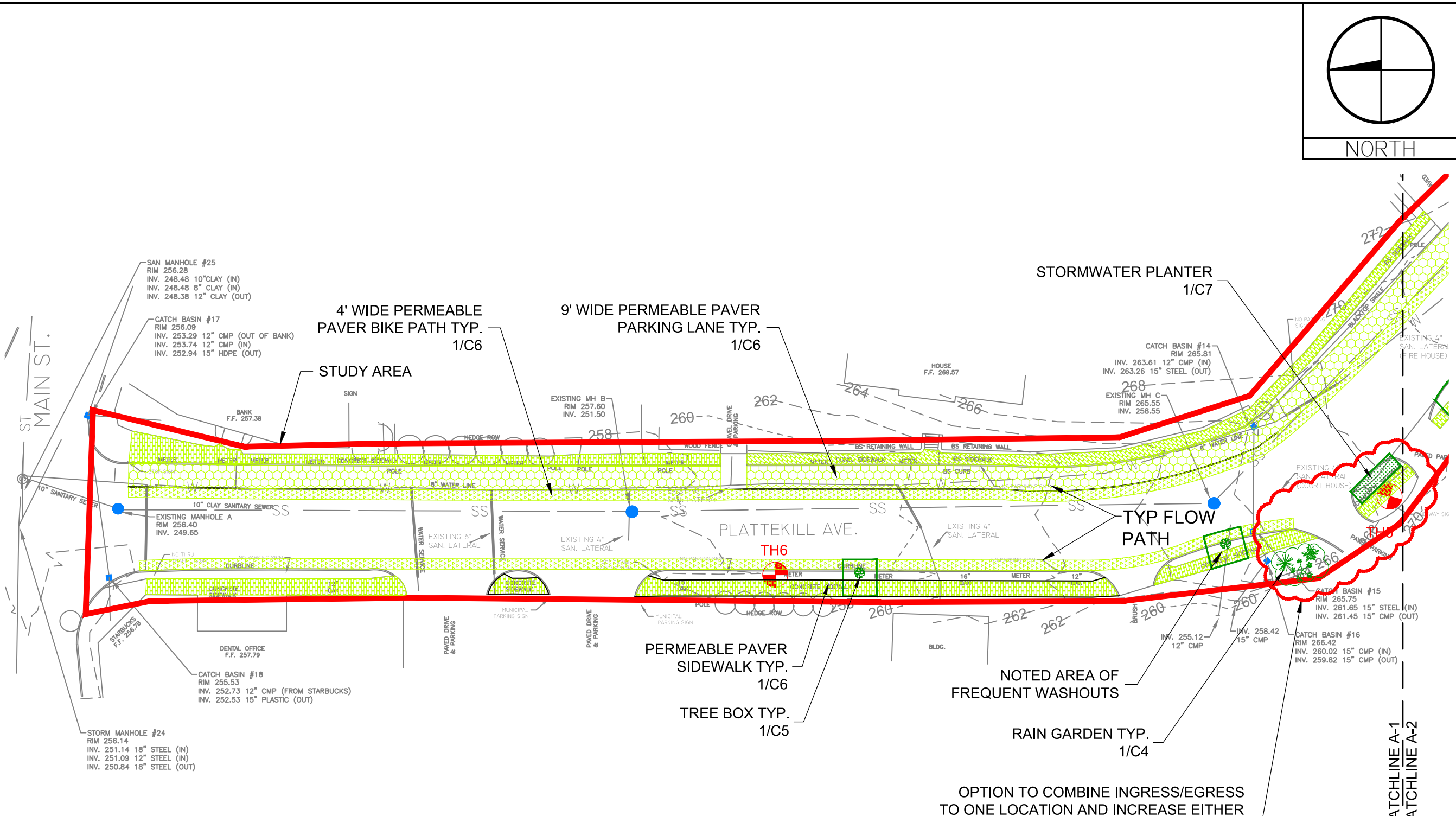
We recommend converting the scoped portion of Plattekill Ave into a Complete Street that includes: narrower travel lanes, bike lanes, sidewalks and curb extensions. The bike lane could be constructed from porous pavement, designed to infiltrate rainfall through the surface and reduce stormwater runoff. The potential bike lane would run along one side of Plattekill Ave, within the restricted project boundaries. Eliminating parking on the north side of the street and shrinking vehicle travel lanes would accommodate for wider maintenance strips. Widening municipal land along the roadway and taking advantage of curbed islands would allow the Village to incorporate bioretention methods into the site. Bioretention techniques such as raingardens and stormwater planters would be installed in Village owned land bordering the New Paltz Town Hall and Firehouse. At specific locations along the street, tree boxes / tree plantings would be installed for stormwater management in the area as well. Incorporating these Green Infrastructure techniques into the site would decrease stormwater quantity, controlling stormwater flow/runoff on Plattekill Ave and the surrounding area. See drawings C1 & C2 for recommended practices and locations.



***b) Recommended Green Infrastructure Practices – Southside***

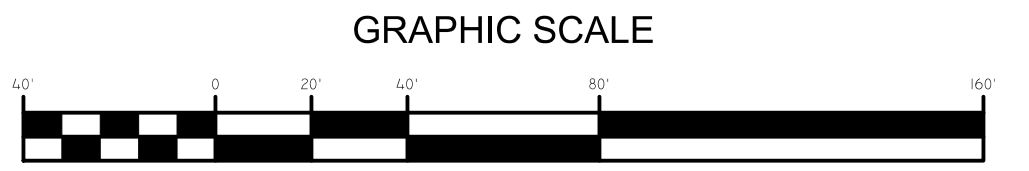
We recommend narrowing the street at strategic sections to allow for a wider maintenance strip between the curb and sidewalk on the north side of the street. Once complete, bioretention methods and tree boxes/plantings would be ideal to install along the project site, with the primary target being the north side of the site. Bioretention methods would be used in the right-of-way on the sloped east end of site, in addition to the flat portion. Tree planting and bioretention techniques would reduce stormwater flows and runoff volumes. These systems would also aid existing catch basins in collecting excess runoff. Lower flow rates would prevent the flooding of surrounding areas as well as the overflow and clogging of existing drainage structures at the low point of the site. Depending on the limitations of the site, porous concrete, or permeable pavers for sidewalk replacement is recommended. See drawing C3 for recommended practices and locations.

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**LEGEND:**

	RAIN GARDEN		TREE BOX
	PERMEABLE PAVER SIDEWALK		STORMWATER PLANTER
	PERMEABLE PAVER PARKING LANE		EXISTING CATCH BASIN
	PERMEABLE PAVER BIKE LANE		EXISTING MANHOLE
	TEST HOLE		STUDY AREA



PROJECT: New Paltz Green Infrastructure  
 DATE: DECEMBER 2018  
 DWG BY: SMK  
 CHK BY: THF  
 JOB NO.: 11948  
 PAGE: C1

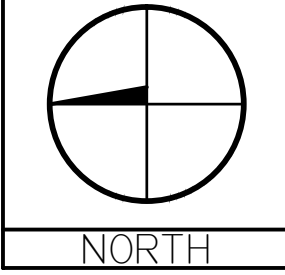
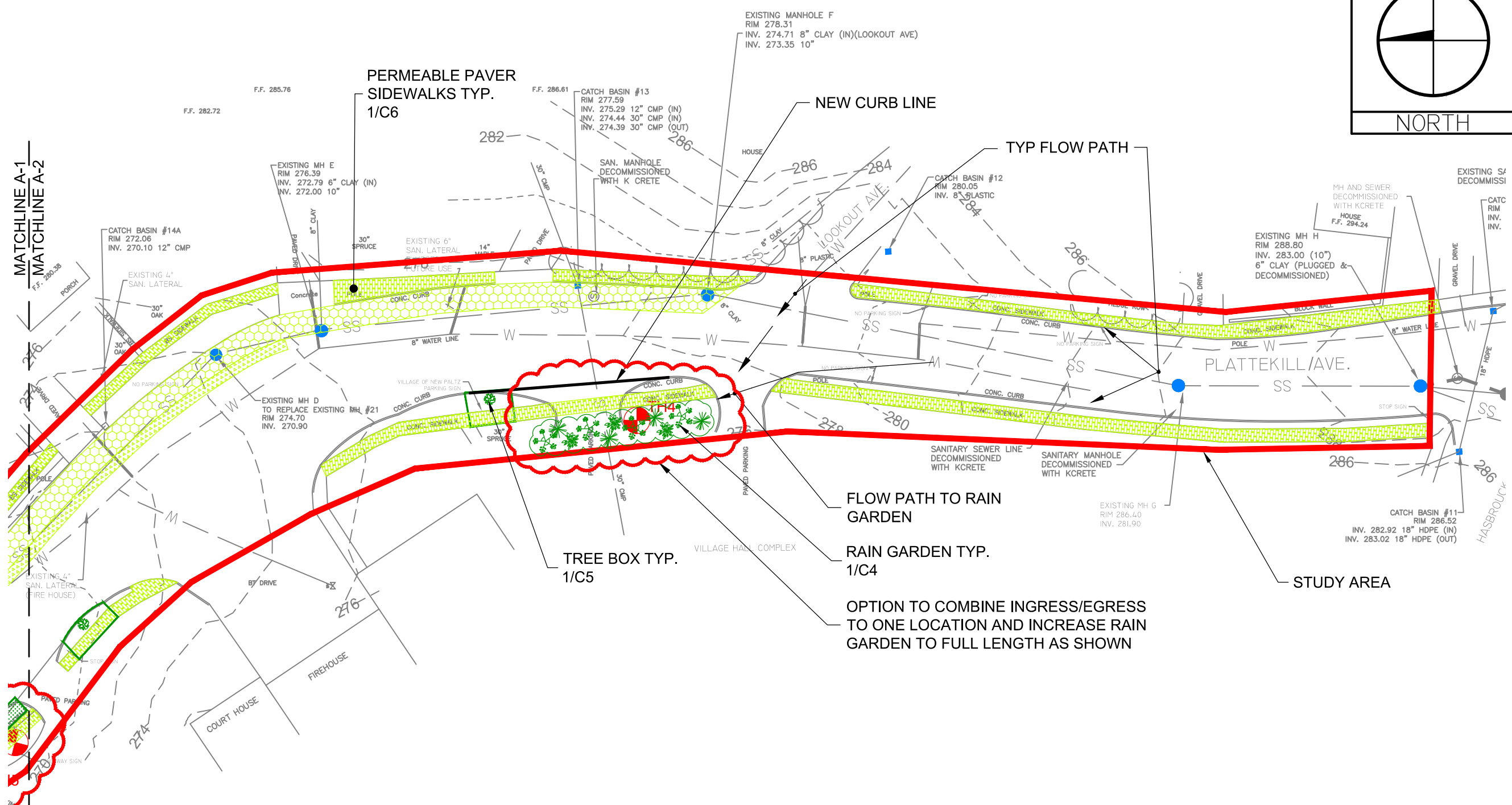
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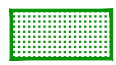






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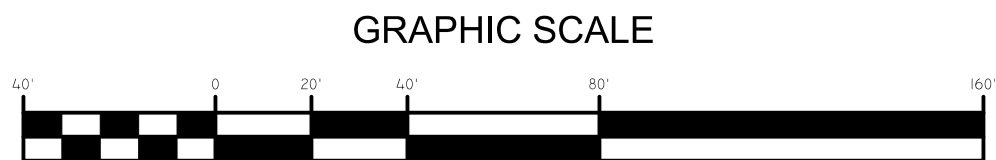
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**LEGEND:**

	RAIN GARDEN		TREE BOX
	PERMEABLE PAVER SIDEWALK		STORMWATER PLANTER
	PERMEABLE PAVER PARKING LANE		EXISTING CATCH BASIN
	PERMEABLE PAVER BIKE LANE		EXISTING MANHOLE
	TEST HOLE		STUDY AREA



PROJECT: New Paltz Green Infrastructure  
 DATE: DECEMBER 2018  
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 PAGE: C2  
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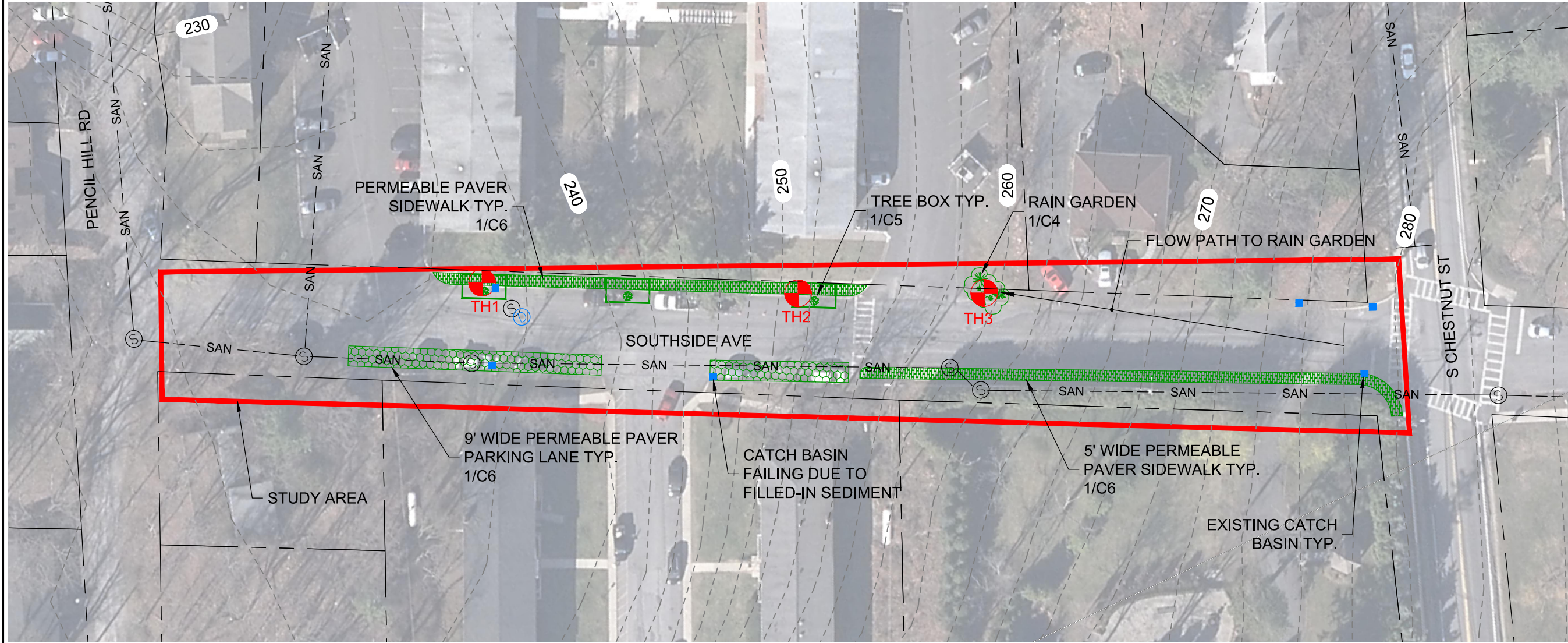
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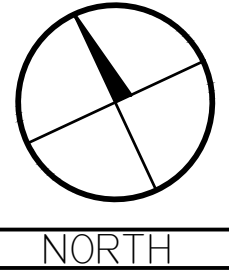


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**LEGEND:**

	RAIN GARDEN		TEST HOLE
	STORMWATER PLANTER		EXISTING SANITARY MANHOLE
	TREE BOX		EXISTING STORM MANHOLE
	PERMEABLE PAVER SIDEWALK		EXISTING CATCH BASIN
	PERMEABLE PAVER PARKING LANE		EXISTING SANITARY PIPE
			PROPERTY LINE
			STUDY AREA



PROJECT: New Paltz Green Infrastructure      DATE: DECEMBER 2018  
 DWG BY: SMK    CHK BY: THF  
 JOB NO.: 11948    PAGE: C3

SUBJECT: SITE B - SOUTHSIDE AVE  
 SITE LAYOUT

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# **APPENDIX A11**

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## **MAINTENANCE RECURRENCE AND RESOURCES**

**DRAFT - GREEN INFRASTRUCTURE ASSET TYPE AND MAINTENANCE ACTIVITY**

<b>SEDIMENTATION POND</b>	<b>Recommended Recurrence</b>	<b>Trained staff available within Village DPW?</b>	<b>Needed equipment available within Village DPW?</b>	<b>Trained staff available within Town Hwy Dept?</b>	<b>Needed equipment available within Town Hwy Dept?</b>
<b>Establishment Maintenance (first 1 to 3 years until plants well established)</b>					
Activities as per routine	Monthly	Y	Y	Y	Y
Watering (littoral vegetation)	As required (weather dependent)	Y	Y	Y	Y
<b>Routine - Aesthetic</b>					
Litter removal Weeding	3 monthly (location dependent)	Y N (weeding undertaken by volunteer committee)	Y Y	Y N (weeding undertaken by volunteer committee)	Y Y
<b>Routine - Functional</b>					
Visual inspections	6 monthly	Y	Y	Y	Y
Remove and replace diseased/dead vegetation		Y	Y	N	Y
Litter/organics/debris removal		Y	Y	Y	Y
Remove sediment build up at inlet		Y	Y	Y	Y (borrow Village vacuum)
<b>Renewal</b>					
Sediment removal - excavate and transport (asset can be dewatered)	3 to 5 yrs	Y	Y	Y	Y
Sediment removal - pump, dry and transport (asset cannot be dewatered)		Y	Y	Y	Y
Sediment disposal - low level contamination (if classified) - dry waste		N (training required for sampling and determining contamination)	Y	N (training required for sampling and determining contamination)	Y
Sediment disposal - low level contamination (if classified) - liquid waste		N (training required for sampling and determining contamination)	Y	N (training required for sampling and determining contamination)	Y
<b>Renewal - Damage</b>					
Vandalism and miscellaneous	As required	Y	Y	Y	Y
Flood damage		Y	Y	Y	Y
Removal debris (e.g. dumping rubbish,		Y	Y	Y	Y
Removal inlet/outlet blockages		Y	Y	Y	Y
Erosion / re-leveling / earthworks		Y	Y	Y	Y
<b>Renewal - Horticultural</b>					
Replanting terrestrial vegetation	As required	N	Y	N	Y
<b>Decommissioning</b>					
Removal, waste disposal and landscaping	As required, assume 50 years for life cycle costing	Y	Y (permitted trucks to haul dry waste to UCRRRA)	Y	Y (permitted trucks to haul dry waste to UCRRRA)
<b>Other</b>					
Civil maintenance and parts replacement	As required	Y	Y	Y	Y



**DRAFT - GREEN INFRASTRUCTURE ASSET TYPE AND MAINTENANCE ACTIVITY**

<b>BIORETENTION BASIN / ONSTREET RAINGARDEN</b>	<b>Recurrence</b>	<b>Trained staff available within Village DPW?</b>	<b>Needed equipment available within Village DPW?</b>	<b>Trained staff available within Town Hwy Dept?</b>	<b>Needed equipment available within Town Hwy Dept?</b>
<b>Establishment Maintenance (as per routine plus following activities)</b>					
Activities as per routine	Monthly	Y	Y	Y	Y
Watering	As required (weather dependent)	Y	Y	Y	Y
<b>Routine - Aesthetic</b>		Y	Y	Y	Y
Litter removal Weeding	3 monthly (location dependent)	N (weeding undertaken by volunteer committee)	Y	N (weeding undertaken by volunteer committee)	Y
<b>Routine - Functional</b>					
Visual inspections		Y	Y	Y	Y
Maintaining plant density / replanting		Y	Y	N	Y
Weeding and removal diseased/dead vegetation	6 monthly	Y	Y	N	Y
Litter/organics/debris removal		Y	Y	Y	Y
Remove sediment build up at inlet		Y	Y	Y	Y (borrow Village vacuum)
<b>Renewal - Filter</b>					
Sediment removal and disposal – low level contaminated (if classified)	3 to 5 yrs	N (training required for sampling and determining contamination)	Y	N (training required for sampling and determining contamination)	Y
Resetting- minor (replace top 100mm filter media and plants)	As required, assume 10 to 15 yrs	N	N (specialty contractor required)	N	N (specialty contractor required)
Resetting- major (including pipes, underdrainage pipes, filter media and plants)	As required (due to poor quality construct or subsequent damage)	N	N (specialty contractor required)	N	N (specialty contractor required)
Filter rehabilitation – Infill of holes / scour /	As required, assume 5 yrs	Y	Y	Y	Y
<b>Renewal - Damage</b>					
Vandalism and miscellaneous					
Removal blockages	As required	Y	Y	Y	Y
Erosion / releveling / earthworks					
<b>Renewal - Horticultural</b>					
Replanting – expect 5% per year		N	Y	N	Y
Pruning	Annual	Y	Y	Y	Y
Mulching		Y	Y	N	Y
Soil additives and amendment		N	Y	N	Y
Pest control	As required	N	N (no license for pesticide)	N	N (no license for pesticide)
Watering	As required (in drought conditions)	Y	Y	Y	Y
<b>Decommissioning</b>					

**DRAFT - GREEN INFRASTRUCTURE ASSET TYPE AND MAINTENANCE ACTIVITY**

<b>BIORETENTION BASIN / ONSTREET RAINGARDEN</b>	<b>Recurrence</b>	<b>Trained staff available within Village DPW?</b>	<b>Needed equipment available within Village DPW?</b>	<b>Trained staff available within Town Hwy Dept?</b>	<b>Needed equipment available within Town Hwy Dept?</b>
Removal, waste disposal and landscaping	As required, assume 25 to 50 yrs for life cycle costing	Y	Y (permitted trucks to haul dry waste to UCRRA)	Y	Y (permitted trucks to haul dry waste to UCRRA)
<b>Monitoring / Auditing</b>					
Infiltration test					
Observation after storm event	6 monthly	Y	Y	Y	Y
<b>Other</b>					
Civil maintenance and parts replacement	As required	Y	Y	Y	Y
Traffic management (TM)	As required for maintenance activities	Y	Y	Y	Y

**DRAFT - GREEN INFRASTRUCTURE ASSET TYPE AND MAINTENANCE ACTIVITY**

<b>TREE PIT</b>	<b>Recurrence</b>	<b>Trained staff available within Village DPW?</b>	<b>Needed equipment available within Village DPW?</b>	<b>Trained staff available within Town Hwy Dept?</b>	<b>Needed equipment available within Town Hwy Dept?</b>
<b>Establishment Maintenance (as per routine plus</b>					
Activities as per routine	Monthly	Y	Y	Y	Y
Watering	As required (weather dependent)	Y	Y	Y	Y
<b>Routine - Aesthetic</b>					
Litter removal Weeding	3 monthly (location dependent)	Y Y	Y Y	Y Y	Y Y
<b>Routine - Functional</b>					
Visual inspections Weeding, pruning and removal diseased/dead vegetation Litter/organics/debris removal Sediment removal from inlets	6 monthly	Y Y Y Y	Y Y Y Y	Y Y Y Y	Y Y Y Y (borrow Village vacuum truck)
<b>Renewal - Damage</b>					
Vandalism and miscellaneous (eg. traffic)	As required	Y	Y	Y	Y
Removal blockages		Y	Y	Y	Y
<b>Renewal - Horticultural</b>					
Reset replace tree / filter media / cover	As required, assume 10 yrs	Y (with spec)	Y	Y (with spec)	Y
Soil additives and amendment	As required	N	Y	N	Y
Pest control		N	N (no license for pesticide use)	N	N (no license for pesticide use)
Watering		Y	Y	Y	Y
<b>Decommissioning</b>					
Removal, waste disposal and landscaping	As required, assume 50 yrs for life cycle costing	Y	Y (permitted trucks to haul dry waste to UCRRA)	Y	Y (permitted trucks to haul dry waste UCRRA)
<b>Monitoring / Auditing</b>					
Infiltration test	6 monthly	Y	Y	Y	Y
Observation after storm event		Y	Y	Y	Y
<b>Other</b>					
Civil maintenance and parts replacement	As required	Y	Y	Y	Y
Traffic management (TM)	As required for maintenance activities	Y	Y	Y	Y



**DRAFT - GREEN INFRASTRUCTURE ASSET TYPE AND MAINTENANCE ACTIVITY**

<b>POROUS PAVEMENT</b>	<b>Recurrence</b>	<b>Trained staff available within Village DPW?</b>	<b>Needed equipment available within Village DPW?</b>	<b>Trained staff available within Town Hwy Dept?</b>	<b>Needed equipment available within Town Hwy Dept?</b>
<b>Routine</b>					
Inspection	Annual	Y	Y	Y	Y
Snow removal	As required (Only salt to be used for winter maintenance. No sand to be used.)	N	N (Carbide tip blades used. No rubber tipped blade available on existing trucks)	N	N (Carbide tip blades used. No rubber tipped blade available on existing trucks)
Litter/organics/debris removal	Annual (with routine street sweeping)	Y	Y	Y	Y
<b>Renewal</b>					
Vacuum removal sediment	As required, assume every 2 years	N	N (tube connection to existing vac truck could be used with operator but not efficient)	N	N (could borrow Village vac truck with similar issues)
Replacement	As required (due to poor quality construct or subsequent damage)	Y	Y	Y	Y
<b>Decommissioning</b>					
Removal, disposal and retrofit/landscape	As required, assume 25 yrs for life cycle costing	Y	Y	Y	Y
<b>Other</b>					
Civil maintenance and parts replacement	As required	Y	Y	Y	Y
Traffic management	As required for maintenance activities	Y	Y	Y	Y

**DRAFT - GREEN INFRASTRUCTURE ASSET TYPE AND MAINTENANCE ACTIVITY**

<b>GRASSED SWALE</b>	<b>Recurrence</b>	<b>Trained staff available within Village DPW?</b>	<b>Needed equipment available within Village DPW?</b>	<b>Trained staff available within Town Hwy Dept?</b>	<b>Needed equipment available within Town Hwy Dept?</b>
<b>Establishment Maintenance (First 1 to 3 years until plants well established)</b>					
Activities as per routine	Monthly	Y	Y	Y	Y
Watering	As required (weather dependent)	Y	Y	Y	Y
<b>Routine - Aesthetic</b>					
Litter removal	3 monthly (location dependent)	Y	Y	Y	Y
<b>Routine Maintenance- Functional</b>					
Visual inspections	6 monthly	Y	Y	Y	Y
Maintaining plant density / re-seeding		Y	Y	Y	Y
Litter/organics/debris removal		Y	Y	Y	Y
Mowing		Y	Y	Y	Y
Remove blockages at inlet/outlet		Y	Y	Y	Y
Remove blockages at inlet/outlet					
<b>Renewal - Drainage</b>					
Sediment removal and disposal – low level contaminated (if classified)	3 to 5 yrs		Y	N (training required for sampling and determining contamination)	Y
<b>Renewal - Damage</b>					
Vandalism and miscellaneous (eg. dumping, traffic, etc.))	As required	Y	Y	Y	Y
Repair profile from scour/erosion		Y	Y	Y	Y
<b>Renewal - Horticultural</b>					
Resetting – replanting / turfing	As required, assume 10 to 15 yrs	Y	Y	Y	Y
Watering	As required, drought conditions	Y	Y	Y	Y
<b>Decommissioning</b>					
Removal, waste disposal and landscaping	As required, assume 50 yrs for	Y	Y	Y	Y
<b>Other</b>					
Civil maintenance and parts replacement	As required	Y	Y	Y	Y
Traffic management for repair work	As required for maintenance activities	Y	Y	Y	Y