STORMWATER POLLUTION PREVENTION PLAN & DRAINAGE ANALYSIS

Self Storage Addition
560 Fenimore Road
Mamaroneck - New York

February 8, 2018
Revised January 14, 2019

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CONTRACTOR and SUBCONTRACTOR CERTIFICATION STATEMENT

for the New York State Department of Environmental Conservation (DEC) State Pollutant Discharge Elimination System Permit for Stormwater Discharges from Construction Activity (GP-0-15-002)

As per *Part III.A.5* on page 19 of *GP-0-15-002* (effective January 29, 2015):

'Prior to the *commencement of construction activity*, the *owner or operator* must identify the contractor(s) and subcontractor(s) that will be responsible for installing, constructing, repairing, replacing, inspecting and maintaining the erosion and sediment control practices included in the SWPPP; and the contractor(s) and subcontractor(s) that will be responsible for constructing the post-construction stormwater management practices included in the SWPPP. The *owner or operator* shall have each of the contractors and subcontractors identify at least one person from their company that will be responsible for implementation of the SWPPP. This person shall be known as the *trained contractor*. The *owner or operator* shall ensure that at least one *trained contractor* is on site on a daily basis when soil disturbance activities are being performed.'

The *owner or operator* shall have each contractor and subcontractor involved in soil disturbance sign a copy of the following certification statement before they commence any *construction activity*:

416 Waverly Avenue	NYR __________	Village of Mamaroneck
Name of Construction Site	*DEC Permit ID*	*Municipality (MS4)*

"I hereby certify under penalty of law that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the qualified inspector during a site inspection. I also understand that the owner or operator must comply with the terms and conditions of the most current version of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I am aware that there are significant penalties for submitting false information, that I do not believe to be true, including the possibility of fine and imprisonment for knowing violations."

______________________	______________________
Responsible Corporate Officer/Partner Signature	Date
______________________	______________________
Name of above Signatory	Name of Company
______________________	______________________
Title of above Signatory	Mailing Address
______________________	______________________
Telephone of Company	City, State and Zip

Identify the specific elements of the SWPPP the contractor or subcontractor is responsible for:
The contractor shall be responsible for the installation and maintenance of all temporary and permanent erosion
and sediment control practices for the duration of construction activities.

'*TRAINED CONTRACTOR*' FOR THE CERTIFIED CONTRACTOR OR SUBCONTRACTOR

______________________	______________________	__________
Name of Trained Employee	*Title of Trained Employee*	*NYSDEC SWT #*

A copy of this signed contractor certification statement must be maintained at the SWPPP on site

2.) Narrative

STORMWATER POLLUTION PREVENTION PLAN
Self Storage Addition
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A. INTRODUCTION

This Stormwater Pollution Prevention Plan & Stormwater Analysis presents the proposed Best Management Practices (BMPs) to control erosion, sedimentation, and manage stormwater during the construction of a new four (4) story addition to an existing self storage building, and associated parking and landscaping, located at 560 Fenimore Road (SBL 8-25-70) in the Village of Mamaroneck, Westchester County, New York.

This Plan consists of this narrative and a plan set entitled: "Self Storage Building Addition, 560 Fenimore Road, Village of Mamaroneck, Westchester County, New York", all as prepared by Hudson Engineering and Consulting, P.C., Elmsford, New York, last revised January 14, 2019. The design is in accordance with the Village of Mamaroneck requirements. The plans have also been prepared to meet the requirements of the New York State Department of Environmental Conservation (NYSDEC), per the Village code.

B. METHODOLOGY

The stormwater analysis was developed utilizing the Soil Conservation Service (SCS) TR-20 methodologies (HydroCad®) to assist with the drainage analysis and design of the mitigating practice. The "Complex Number" (CN) value determination is based on soil type, vegetation and land use. *See Soil Map & Report contained herein.* The "Time of Concentration" (T_c) is determined by the time wise longest flow path within each watershed. The CN and T_c data is input into the computer model. This project involves modifications to an existing developed property; therefore, this will be classified as redevelopment per the NYSDEC Phase II regulations.

The pre-developed and post-developed impervious area coverage was calculated as follows:

Pre and Post Impervious Coverage	
Total Existing Impervious Area	41,390-square feet
Total Proposed Impervious Area	40,675-square feet
Total Decrease in Impervious Area	715-square feet
Percent Decrease	1.73%

Per Section 9.2.1, B-III of the NYSDEC Manual, 75% of the Water Quality Volume from the disturbed, impervious area, as well as any additional runoff from tributary areas that are undisturbed, can be treated with the use of Alternative Stormwater Management Practices (SMPs), as listed in Section 9.4 of the NYSDEC Stormwater Management Design Manual.

The stormwater management design is based on the NYSDEC "New York State Stormwater Management Design Manual", latest edition and "Controlling Urban Runoff: A practical Manual for Planning and Designing Urban BMP'S", by the Metropolitan Washington Council of Governments. Stormwater quality has been analyzed in accordance with the guidelines set forth in the New York State General Permit for Storm Water Discharge, GP-0-15-002.

C. LIST OF PERMITS

The following is a list of permits and approvals required for the project along with the status.

- Village of Mamaroneck – Building Permit – Pending
- Village of Mamaroneck – Zoning Board Approval – Pending
- Village of Mamaroneck – Planning Board Approval – Pending
- Harbor Coastal Zone Management Commission – Pending

D. PRE-DESIGN INVESTIGATIVE ANALYSIS

Due to the site's location partially within the 100-year flood limit line, it has been determined that percolation is not a viable option for stormwater on this site, and conventional stormwater management practices could not be utilized in the stormwater design (i.e. infiltration chambers, infiltration basins, etc.). Therefore, no deep hole testing or percolation testing was performed.

E. PRE-DEVELOPED CONDITION

In the pre-developed conditions, the proposed redevelopment project was modeled as six watersheds, Watershed 1A, 1B, 1C, 1D, 2 and 3. Watersheds 1A, 1B, 1C, 1D and 2 are all tributary to Design Point 1. Watershed 3 is tributary to DP-2. Each watershed was analyzed as follows:

Watershed 1A is comprised of 2,252 square feet, of which all is impervious in the form of a portion of the existing 2 story building and driveway surface. The watershed has a weighted complex number (CN) value of 98 and a calculated time of concentration (Tc) of 0.8 Minutes. Stormwater from this tributary area flows overland to an existing catch basin located in the center of the parking area. The runoff is then conveyed via pipe to an existing hydrodynamic separator and enters the village's drainage system at Design Point DP-1.

Watershed 1B is comprised of 5,979 square feet, of which 5,522 square feet is impervious in the form of a portion of the driveway and 457 square feet is pervious in the form of lawn and landscaping. The watershed has a weighted complex number (CN) value of 97 and a calculated time of concentration (Tc) of 1.1 Minutes. Stormwater from this tributary area flows overland to an existing catch basin located in the center of the parking area. The runoff is then conveyed via pipe to an existing hydrodynamic separator and enters the village's drainage system at Design Point DP-1.

Watershed 1C is comprised of 2,849 square feet, of which 2,119 square feet is impervious in the form of a portion of the driveway and 730 square feet is pervious in the form of lawn and landscaping. The watershed has a weighted complex number (CN) value of 93 and a calculated time of concentration (Tc) of 0.9 Minutes. Stormwater from this tributary area flows overland to an existing catch basin located adjacent to the Waverly Avenue right-of-way. The runoff is then conveyed via pipe to an existing hydrodynamic separator and enters the village's drainage system at Design Point DP-1.

Watershed 1D is comprised of 786 square feet, all of which is impervious in the form of a portion of an existing building. The watershed has a weighted complex number (CN) value of 98 and a calculated time of concentration (Tc) of 1.0 Minute (direct entry). Stormwater from this roof area is collected and conveyed via pipe to an existing catch basin (private) located within the village's Right of Way. The runoff then enters the village's drainage system at Design Point DP-1.

Watershed 2 is comprised of 10,733 square feet, of which 10,056 square feet is impervious in the form of the existing storage building and 677 square feet is pervious in the form of an existing stormwater planter. The watershed has a weighted complex number (CN) value of 97 and a calculated time of concentration (Tc) of 1.0 Minute (direct entry). The existing stormwater planter was sized to provide water quality treatment for the runoff from this watershed. The planter is designed with overflows to bypass larger storms. All runoff from the planter is conveyed via pipe the hydrodynamic separator and enters the village's drainage system at design point DP-1.

Watershed 3 is comprised of 21,557 square feet, of which 20,655 is impervious in the form of a portion of the driveway, and buildings and 902 square feet is pervious in the form of lawn and landscaping. The watershed has a weighted complex number (CN) value of 97 and a calculated time of concentration (Tc) of 1.4 Minutes. Stormwater from this tributary area flows overland from the center of the site in a northwesterly direction where it exits the site into the Fenimore Road right-of-way at Point C. The runoff flows overland (R1) to design point DP-1 where it enters the village's drainage system.

The rate off runoff at the design point are calculated as follows:

Pre-Developed Conditions			
Design Point	1-Year	10-Year	25-Year
	cfs	cfs	cfs
DP-1	0.89	3.02	3.81
DP-2	1.58	2.89	3.64

F. POST-DEVELOPED CONDITION

In the post-developed condition, the project site has been modeled as nine (9) watersheds, Watershed 1A, 1B, 1C, 1D, 1E, 2, 3, 3A and 3B. Watersheds 1A, 1B, 1C, 1D, 1E, and 2 are tributary to design point DP-1. Watersheds 3, 3A, and 3B are tributary to DP-2. Each watershed is analyzed as follows:

Watershed 1A is made up of the portion of the proposed parking area adjacent to the proposed building addition. This watershed contains 2,893-square feet of tributary area, all of which is impervious area in the form of the driveway. This watershed has a weighted complex number (CN) value of 98 and a calculated Time of Concentration (Tc) of 1.2 minutes. Stormwater from this area flows overland to an existing catch basin. From here the runoff is captured and conveyed to an existing hydrodynamic separator, where it meets with the runoff from Watersheds 1B, 1C, 1E and 2. The hydrodynamic separator is capable of treating the entire water quality volume from the tributary area. The treated runoff is then conveyed to an existing catch basin located at the corner of Waverly Avenue and Fenimore Road where it enters the village's drainage system at design point DP-1.

Watershed 1B is made up of the portion of the proposed parking area adjacent to the entrance to the existing storage building. This watershed contains 3,079-square feet of tributary area, which consists of 3,008-square feet of impervious area, with the remaining 71-square feet of area in the form of lawn and landscaping. This watershed has a weighted complex number (CN) value of 97 and a calculated Time of Concentration (Tc) of 0.8 minutes. Stormwater from this area flows overland to a relocated catch basin located adjacent to a proposed loading area. From here the runoff is captured and conveyed to an existing hydrodynamic separator, where it meets with the runoff from Watersheds 1A, 1C, 1E and 2. As previously mentioned, the hydrodynamic separator is capable of treating the entire water quality volume from the tributary area. The treated runoff is then conveyed to an existing catch basin located at the corner of Waverly Avenue and Fenimore Road where it enters the village's drainage system at design point DP-1.

Watershed 1C is made up of the portion of the proposed parking area adjacent to the existing stucco building to remain. This watershed contains 3,283-square feet of tributary area, which consists of 3,039-square feet of impervious area, with the remaining 244-square feet of area in the form of lawn and landscaping. This watershed has a weighted complex number (CN) value of 96 and a calculated Time of Concentration (Tc) of 0.9 minutes. Stormwater from this area flows overland to an existing catch basin located just upstream of the existing hydrodynamic separator. From here the runoff is captured and conveyed to the existing hydrodynamic separator, where it meets with the runoff from Watersheds 1A, 1B, 1E and 2. As previously mentioned, the hydrodynamic separator is capable of treating the entire water quality volume from the tributary area. The treated runoff is then conveyed to an existing catch basin located at the corner of Waverly Avenue and Fenimore Road where it enters the village's drainage system at design point DP-1.

Watershed 1D is comprised of 786 square feet, all of which is impervious in the form of a portion of an existing building. The watershed has a weighted complex number (CN) value of 98 and a calculated time of concentration (Tc) of 1.0 Minute (direct entry). Stormwater from this roof area is collected and conveyed via pipe to an existing catch basin (private) located within the village's ROW. The runoff then enters the village's drainage system at Design Point DP-1.

Watershed 1E is made up of the portion of the proposed parking area adjacent to the main driveway entrance. This watershed contains 1,428-square feet of tributary area, which consists of 1,402-square feet of impervious area, with the remaining 26-square feet of area in the form of lawn and landscaping. This watershed has a weighted complex number (CN) value of 98 and a calculated Time of Concentration (Tc) of 0.7 minutes. Stormwater from this area flows overland to a proposed trench drain located across the driveway entrance. From here the runoff is captured and conveyed to an existing hydrodynamic separator, where it meets with the runoff from Watersheds 1A, 1B, 1C and 2. As previously mentioned, the hydrodynamic separator is capable of treating the entire water quality volume from the tributary area. The treated runoff is then conveyed to an existing catch basin located at the corner of Waverly Avenue and Fenimore Road where it enters the village's drainage system at design point DP-1.

Watershed 2 is made up of the existing roof area and associated stormwater planter. This watershed contains 10,733-square feet of tributary area, which consists of 10,056-square feet of impervious area, with the remaining 677-square feet of area in the form of an existing stormwater planter. This watershed has a weighted complex number (CN) value of 97 and a direct entry Time of Concentration (Tc) of 1.0 minute. Stormwater from this area is collected via a series of roof drains and is conveyed directly to an existing stormwater planter located adjacent to the existing building. The stormwater planter is sized to treat the entire water quality volume from the watershed, as well as bypass storm events up to and including the 25-year storm. From here the treated runoff is conveyed to an existing hydrodynamic separator, where it meets with the runoff from Watersheds 1A, 1B, 1C and 1E. The treated runoff is then conveyed to an existing catch basin located at the corner of Waverly Avenue and Fenimore Road where it enters the village's drainage system at design point DP-1.

Watershed 3 is made up of portions of sidewalk and landscaped area encompass the perimeter of the property. This watershed contains 2,071 square feet of tributary area, consisting of 416 square feet of impervious area in the form of sidewalks, with the remaining 1,655 square feet pervious area. The watershed has a weighted complex number (CN) value of 79 and a calculated time of concentration (Tc) of 1.0 minute (direct entry). The runoff flows overland within the right-of-way to an existing catch basin where it enters the village's drainage system and is conveyed to the design point DP-2.

Watershed 3A is made up of the proposed roof area and associated stormwater planter. This watershed contains 14,755-square feet of tributary area, which consists of 14,082-square feet of impervious area, with the remaining 673-square feet of area in the form of a proposed stormwater planter. This watershed has a weighted complex number (CN) value of 97 and a direct entry Time of Concentration (Tc) of 1.0 minute. Stormwater from this area is collected via a series of roof drains and is conveyed directly to a proposed stormwater planter, which has been sized to treat the entire water quality volume from watersheds 3A and 3B, as well as bypass storm events up to and including the 25-year storm. The treated runoff is conveyed via pipe to design point DP-2 where it enters the village's drainage system.

Watershed 3B is made up of a portion of the driveway area, existing 2 story building and landscaped area located along Fenimore Road. This watershed contains 5,128-square feet of tributary area, which consists of 4,993-square feet of impervious area, with the remaining 135-square feet of area pervious in the form of lawn and landscaping. This watershed has a weighted complex number (CN) value of 97 and a Time of Concentration (Tc) of 1.0 minute. Stormwater from this area originates adjacent to the existing two-story building and flows in an easterly direction where it flows into the proposed stormwater planter. The stormwater planter has been sized to treat the entire water quality volume from watershed 3A and 3B, as well as bypass storm events up to and including the 25-year storm. The treated runoff is conveyed via pipe to design point DP-2 where it enters the village's drainage system.

The rate off runoff at the design point are calculated as follows:

Post-Developed Conditions			
Design Point	**1-Year**	**10-Year**	**25-Year**
	cfs	**cfs**	**Cfs**
DP-1	**0.89**	**2.98**	**3.75**

DP-2	1.48	2.85	3.62

G. SUMMARY OF FLOWS

Pre- and Post-Developed Conditions						
Design Point	**1-Year**		**10-Year**		**25-Year**	
	Pre-	**Post-**	**Pre-**	**Post-**	**Pre-**	**Post-**
DP-1	0.89	**0.89**	3.02	**2.98**	3.81	**3.75**
DP-2	1.58	**1.48**	2.89	**2.85**	3.64	**3.62**

Post-developed flows rates at each design point are equal to or less than those in the pre-developed conditions.

H. WATER QUALITY VOLUME

The Water Quality Volume (WQv) calculations were performed for the entire site as well as for the tributary areas to each water quality practice. The calculations are as follows:

ENTIRE SITE

P= 90% Rainfall 1.5 -inches

A_i = Impervious Area = 40,675 -square feet
A_i = 0.9338 -acres

A_t = Tributary Area = 44,156 -square feet
A_t = 1.0137 -acres

I = % Impervious = 92.12%

R_v= 0.05+0.009(I); where I = Percent Impervious written as a percent

R_v= 0.879 **(0.20 minimum)**
R_v= 0.879

$$WQ_v = \frac{(P \times R_v \times A_t)}{12} = 0.11138 \text{ acre-feet} = 4851.91 \text{ cubic feet}$$

Total Water Quality Volume: 4851.91 cubic feet

*Water Quality treatment provided: 100.04% (4,854.00 cubic feet)

Due to the configuration of the site, water quality treatment could not be provided for watershed 1D and Watershed 3. Watershed 1D consists of a portion of the existing building that will not be altered as a result of the improvements and watershed 3 consists of the small areas around the perimeter of the site that flow overland into the right-of-way.

To compensate for these two areas, additional treatment was provided for Watershed 1A, 1B, 1C, 1E, 2, 3A, and 3B. Since Watersheds 1A, 1B, 1C, 1E and 3A are more susceptible to pollutants as they are mostly made up of driving surfaces, the increase of treatable volume will have greater overall benefits than trying to capture the roof area.

WATERSHEDS 1A, 1B, 1C & 1E

P=	90%	Rainfall	1.5	-inches
A_i =	Impervious Area =		10,297	-square feet
		A_i =	0.2364	-acres
A_t =	Tributary Area =		10,638	-square feet
		A_t =	0.2442	-acres
I =	% Impervious =		96.79%	

R_v= 0.05+0.009(I); where I = Percent Impervious written as a percent

R_v= 0.921 **(0.20 minimum)**

R_v= 0.921

$$WQ_v = \frac{(P \times R_v \times A_t)}{12} = 0.02812 \text{ acre-feet} = 1224.90 \text{ cubic feet}$$

Rainfall = 1.73 -inches → 1263 cubic feet OKAY

The Water Quality Volume (WQv) from the proposed parking area comprises of approximately 26.03% of the overall WQv for the entire property. This volume is equal to a 1.73-inch, 24-hour storm event from tributary area, which produces a flow rate of approximately 0.45-cfs*. The entire volume is treated via an existing AquaSwirl AS-2 hydrodynamic device, which is capable of treating up to 1.10-cfs. The existing device is also capable of bypassing the 25-year storm event from the watershed. *Water Quality routing calculations are contained within Section 8 of this report. The AquaSwirl Sizing Chart is contained within Section 9 of this report.*

**Note, the existing hydrodynamic separator also receives flows from watershed 2. For the water quality storm event the peak flow is 0.03 cfs.*

WATERSHED 2

P=	90%	Rainfall	1.5	-inches
A_i =	Impervious Area =		10,086	-square feet
		A_i =	0.2315	-acres
A_t =	Tributary Area =		10,755	-square feet
		A_t =	0.2469	-acres
I =	% Impervious =		93.78%	

R_v= 0.05+0.009(I); where I = Percent Impervious written as a percent

R_v=	0.894	**(0.20 minimum)**
R_v=	0.894	

$$WQ_v = \frac{(P \times R_v \times A_t)}{12} = 0.02759 \text{ acre-feet} = 1201.89 \text{ cubic feet}$$

Rainfall = 1.73 -inches → 1259 cubic feet OKAY

The Water Quality Volume (WQv) from the existing roof area comprises of approximately 25.95% of the overall WQv for the entire property. This volume is equal to a 1.73-inch, 24-hour storm event. The entire volume is treated via an existing Stormwater Planter, which was previously approved by the Village and was designed to treat the entire WQV from this watershed. The existing planter is also capable of bypassing the 25-year storm event from the watershed without overflow. *Water Quality routing calculations are contained within Section 8 of this report.*

WATERSHED 3A & 3B

P=	90%	Rainfall	1.5	-inches
A_i =	Impervious Area =		19,075	-square feet
		A_i =	0.4379	-acres
A_t =	Tributary Area =		19,883	-square feet
		A_t =	0.4565	-acres
I =	% Impervious =		95.94%	

R_v= 0.05+0.009(I); where I = Percent Impervious written as a percent

R_v= 0.913 **(0.20 minimum)**

R_v= 0.913

$$WQ_v = \frac{(P \times R_v \times A_t)}{12} = 0.05212 \text{ acre-feet} = 2270.21 \text{ cubic feet}$$

Rainfall = 1.73 -inches → 2332 cubic feet OKAY

The Water Quality Volume (WQv) from the proposed roof area comprises of approximately 48.06% of the overall WQv for the entire property. This volume is equal to a 1.73-inch, 24 hour storm event over the tributary area. This volume is treated via a proposed Stormwater Planter with a Focal Point biofilter system. The proposed planter is also capable of bypassing the 25-year storm event from the watershed without overflow. The FocalPoint biofilter system is approved as a proprietary practice for redevelopment under the NYSDEC guidelines. Additional information for this practice has been provided in *Section 10* of this report. *Water Quality routing calculations are contained within Section 8 of this report.*

100% of the Water Quality Volume is treated with a combination of a proposed stormwater planter for all new roof area, an existing stormwater planter for the existing roof area, and an AquaSwirl AS-2 hydrodynamic device for the existing/revised parking area. All practices have also been sized to bypass the 25-year storm event. Each practice is an approved Alternate SMP, as outlined in Section 9.4 of the NYSDEC Stormwater Management Design Manual.

I. NYSDEC TABLE 3.1 DESIGN REGULATIONS:

Each mitigation practice is contained in Table 3.1 of the NYSDEC design regulations and is discussed below.

- Preservation of Undisturbed Areas: Permanent conservation easements of undisturbed areas are not proposed for this site
- Preservation of Buffers. See above.
- Reduction of Clearing and Grading: All construction is occurring in areas previously disturbed.
- Locating Development in Less Sensitive Areas: No development is planned within sensitive areas.
- Open Space Design: Not applicable to this application.
- Soil Restoration: As required, all disturbed soil areas will be "deep tilled" prior to the establishment of ground cover. Deep tilling restores the absorptive quality of the soil.
- Roadway Reduction: No roadways are being proposed as part of this application.
- Sidewalk Reduction: All sidewalks have been designed to the minimum extent possible per the Village of Mamaroneck requirements, in order meet the required pedestrian traffic on and off-site.
- Driveway Reduction: All driveways have been designed to the minimum extent possible to provide adequate access for the proposed use.
- Cul-de-sac Reduction: No Cul-de-sacs are being proposed as part of this application.
- Building Footprint Reduction: The proposed building footprint is considered the minimum footprint desired for this use.
- Parking Reduction: Parking for the proposed use has been provided to the maximum extent possible.
- Conservation of Natural Areas: Not applicable to this application.
- Sheet Flow to riparian buffers or filter strips: Not applicable to this application.
- Vegetated Open Swale: An "O-Type Swale" is not applicable to this site.
- Tree Planting/Tree Boxes: Landscaped Islands have been provided wherever possible.
- Disconnection of Rooftop Runoff: Not applicable to this application.
- Stream Daylighting for Redevelopment Projects: Not applicable to this application.
- Rain Gardens: Due to the location of the property within the existing 100-year flood zone, standard exfiltration practices were determined to be ineffective for this application.
- Green Roof: Green roof technology could be incorporated into the design if desired, however, the required water quality volume is already being

treated via existing and proposed stormwater planters and an existing hydrodynamic separator.

- Stormwater Planters: Stormwater Planters have been incorporated into the design to treat the runoff from both existing and proposed roof areas.
- Rain tank/Cistern: Rain tanks/Cisterns could be incorporated if desired.
- Porous Pavement: Porous Pavement could be incorporated into the design, however, due to the location of the property within the existing 100-year flood zone, standard exfiltration practices were determined to be ineffective for this application.

J. CONSTRUCTION PHASE

During the construction phase of the project, a sediment and erosion control plan shall be implemented in accordance with the New York State Department of Environmental Conservation's Best Management Practices (BMP). The primary goals of the sediment and erosion control plan are to prevent the tracking of dirt and mud onto adjacent roads, to prevent mud and silt from entering into existing and proposed drainage facilities, and to protect the receiving waters from contamination during the construction.

During construction, the party responsible for implementing the temporary (during construction) Stormwater Management facilities Maintenance Program will be the owner. Contact information will be filed with the Village.

A New York State Professional Engineer or Certified Professional In Erosion and Sediment Control (P.E. or CPESC) shall conduct an assessment of the site prior to the commencement of construction and certify in an inspection report that the appropriate erosion and sediment controls shown on the plan have been adequately installed and/or implemented to ensure overall preparedness of the site for construction. Following the commencement of construction, site inspections shall be conducted by the P.E. or CPESC at least every 7 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater.

During each inspection, the representative shall record the following:

1. On a site map, indicate the extent of all disturbed site areas and drainage pathways. Indicate site areas that are expected to undergo initial disturbance or significant site work within the next 14-day period;

2. Indicate on a site map all areas of the site that have undergone temporary or permanent stabilization;

3. Indicate all disturbed site areas that have not undergone active site work during the previous 14-day period;

4. Inspect all sediment control practices and record approximate degree of sediment accumulation as a percentage of the sediment storage volume;

5. Inspect all erosion and sediment control practices and record all maintenance requirements. Identify any evidence of rill or gully erosion occurring on slopes and any loss of stabilizing vegetation or seeding/mulching. Document any excessive deposition of sediment or ponding water along the barrier. Record the depth of sediment within containment structures and any erosion near outlet and overflow structures.

6. All identified deficiencies.

The construction manager shall maintain a record of all inspection reports in a site logbook. The site logbook shall be maintained on-site and be made available to the Village of Mamaroneck. A summary of the site inspection activities shall be posted on a monthly basis in a public accessible location at the site.

The projects anticipated start date is Spring 2019 and the anticipated completed date is spring 2020.

K. CONSTRUCTION SEQUENCING

The following erosion control schedule shall be utilized:

1. Install construction entrance to the development area.

2. Establish construction staging area.

3. Selective vegetation removal for silt fence installation.

4. Install silt fence down slope of all areas to be disturbed as shown on the plan.

5. Strip topsoil and stockpile at the locations specified on the plans (up gradient of erosion control measures). Temporarily stabilize topsoil stockpiles (hydroseed during May 1st through October 31st planting season or by covering with a tarpaulin(s) November 1st through April 30th. Install silt fence around toe of slope.

6. Demolish any existing site features and/or structures noted as being removed on the construction documents, and dispose of off-site.

7. Rough grade site.

8. Install additional silt fencing as necessary.

9. Rough grade parking lot and install trench drains and drain inlets, as well as all associated onsite piping.

10. Obtain street opening permit for drainage connection to existing catch basin in Fenimore Road, as well as proposed curb cut widenings.

11. Install drainage work tributary to existing municipal catch basin in Fenimore Road up to location of proposed stormwater planter.

12. Excavate and construct foundations for new building.

13. Construct stormwater planter adjacent to building addition.

14. Construct building. Install and connect all roof drain leaders to previously installed stormwater planter.

15. Install curbing, and sub-base courses. Fine grade and seed all disturbed areas. Spread salt hay over seeded areas.

16. Install bituminous concrete top course.

17. Clean pavement, drain lines, catch basins and pretreatment devices. Clean exfiltration/attenuation galleries.

18. Remove all temporary soil erosion and sediment control measures after the site is stabilized with vegetation.

* Soil erosion and sediment control maintenance must occur weekly and prior to and after every ½" or greater rainfall event.

L. EROSION AND SEDIMENT CONTROL COMPONENTS

The primary aim of the soil and sediment control measures is to reduce soil erosion from areas stripped of vegetation during and after construction and to prevent silt from reaching the off-site drainage structures and downstream properties. As outlined in the Construction Sequencing schedule, the Sediment and Erosion Control Components are an integral component of the construction sequencing and will be implemented to control sedimentation and re-establish vegetation as soon as practicable.

Planned erosion and sedimentation control practices during construction include the installation, inspection and maintenance of the inlet protection, soil stockpile areas, diversion swales, sediment traps and silt fencing. General land grading practices, including land stabilization and construction sequencing are also integrated into the Sediment and Erosion Control Plan. Dust control is not expected to be a problem due to the relatively limited area of exposure, the undisturbed perimeter of trees around the project area and the relatively short time of exposure. Should excessive dust be generated, it will be controlled by sprinkling.

All proposed soil erosion and sediment control practices have been designed in accordance with the following publications:

- New York State standards and Specifications for Urban Erosion and Sediment Control, latest edition.
- New York State General Permit for Stormwater Discharges, GP-0-15-002 (General permit).
- "Reducing the Impacts of Stormwater Runoff from New Development", as published by the New York State Department of Environmental Conservation (NYSDEC), second edition, April, 1993.

The proposed soil erosion and sediment control devices include the planned erosion control practices outlined below. Maintenance procedures for each erosion control practice have also been outlined below.

- **SILT FENCE**

  Silt fence (geo-textile filter cloth) shall be placed in locations depicted on the approved plans. The purpose of the silt fence is to reduce the velocity of sediment laden stormwater from small drainage areas and to intercept the transported sediment load. In general, silt fence shall be used at the toe of slopes or intermediately within slopes where obvious channel concentration of stormwater is not present.

  Maintenance

  Silt fencing shall be inspected at a minimum of once per week and prior to and within 48 hours following a rain event ½" or greater. Inspections shall include ensuring that the fence material is tightly secured to the woven wire and the wire is secured to the wood posts. In addition, overlapping filter fabric shall be secure and the fabric shall be maintained a minimum of six (6) inches below grade. In the event that any "bulges" develop in the fence, that section of fence shall be replaced within 48 hours with new fence section. Any sediment build-up against the fence shall be removed within 48 hours and deposited on-site a minimum of 100 feet outside of any wetland or watercourse.

- **INLET PROTECTION**

  After driveway catch basins and surface inlets have been installed, these drain inlets will receive stormwater from the driveway, Temporary Diversion Swales and surrounding overland watersheds. In order to protect the receiving waters from sedimentation, the contractor shall install ¾ inch stone aggregate around the perimeter of all catch basins and surface inlets as illustrated on the approved plans. This barrier will allow stormwater to be filtered prior to reaching the basin inlet grate.

Maintenance

The stone aggregate shall be inspected weekly prior to and within 48 hours following a rain event ½" or greater. Care shall be taken to ensure that all stone aggregate are properly located and secure and do not become displaced. The stone aggregate shall be inspected for accumulated sediments and any accumulated sediment shall be removed from the device and deposited not less than 100 feet from wetland or watercourse.

- **SOIL/SHOT ROCK STOCKPILING**

All soil and shot rock stripped from the construction area during grubbing and mass grading shall be stockpiled in locations approved by the Town/Village's representative, but in no case shall they be placed within 100' of a wetland or watercourse. The stockpiled soils shall be re-used during finish-grading to provide a suitable growing medium for plant establishment. Soil stockpiles shall be protected from erosion by vegetating the stockpile with rapidly – germinating grass seed or covering the stockpile with tarpaulin and surrounding it with either silt fence.

Maintenance

Sediment controls (silt fence) surrounding the stockpiles shall be inspected according to the recommended maintenance outline above. All stockpiles shall be inspected for signs of erosion or problems with seed establishment weekly and prior to and within 48 hours following a rain event ½" or greater.

- **GENERAL LAND GRADING**

The intent of the Erosion & Sediment Control Plan is to control disturbed areas such that soils are protected from erosion by temporary methods and, ultimately, by permanent vegetation. Where practicable, all cut and fill slopes shall be kept to a maximum slope of 2:1. In the event that a slope must exceed a 2:1 slope, it will be stabilized with stone riprap. On fill slopes, all material will be placed in layers not to exceed 12 inches in depth and adequately compacted. Where practicable, diversion swales shall be constructed on the top of all fill embankments to divert any overland flows away from the fill slopes.

- **SURFACE STABILIZATION**

All disturbed will be protected from erosion with the use of vegetative measures (i.e., grass seed mix, sod) hydromulch netting or hay. When activities temporarily cease during construction, soil stockpiles and exposed soil should be stabilized by seed, mulch or other appropriate measures as soon as possible, but in no case more than 14 days after construction activity has ceased. All seeded areas will be re-seeded areas as necessary and mulch according to the site plan to maintain a vigorous, dense vegetative cover,

Erosion control barriers consisting of silt fencing shall be placed around exposed areas during construction. Where exposed areas are immediately uphill from a wetland or watercourse, the erosion control barrier will consist of double rows of silt fencing. Any areas stripped of vegetation during construction will be vegetated and/or mulch as soon as possible, but in no case more than 14 days to prevent erosion of the exposed soils. And topsoil removed during construction will be temporarily stockpiled for future use in grading and landscaping.

As mentioned above, temporary vegetation will be established to protect exposed soil areas during construction. If growing conditions are not suitable for the temporary vegetation, mulch will be used to the satisfaction of the Commissioner of Public Works. Materials that may be used for mulching include straw, hay, salt hay, wood fiber, synthetic soil stabilizers, mulch netting, sod or hydromulch. In site areas where significant erosion potential exists (steep slopes) and where specifically directed by the Town/Village's representative, Curlex Excelsior erosion control blankets (manufactured by American Excelsior, or approved equal) shall be installed. A permanent vegetative cover will be established upon completion of construction of those areas that have been brought to finish-grade and to remain undisturbed.

- **DEWATERING**

Prevent surface water and subsurface or ground water from flowing into excavations and trenches. Pump out any accumulated water.

Do not allow water to accumulate in excavations or trenches. Remove water from all excavations immediately to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to the stability of subgrades and foundations. Furnish and maintain pumps, sumps, suction and discharge piping systems, and other system components necessary to convey the water away from the Site.

Convey water removed from excavations, and rain water, to collecting or run-off area. Cut and maintain temporary drainage ditches and provide other necessary diversions outside excavation limits for each structure. Do not use trench excavations as temporary drainage ditches.

Provide temporary controls to restrict the velocity of discharged water as necessary to prevent erosion and siltation of receiving areas.

M. CONSTRUCTION PRACTICES TO MINIMIZE STORMWATER CONTAMINATION

General:

Adequate measures shall be taken to minimize contaminant particles arising from the discharge of solid materials, including building materials, grading operations, and the reclamation and placement of pavement, during project construction, including but not limited to:

- Building materials, garbage, and debris shall be cleaned up daily and deposited into dumpsters, which will be periodically removed from the site and appropriately disposed of. All dumpsters and containers left on-site shall be covered and surrounded with silt fence in order to prevent contaminants from leaving the site. Silt fencing shall be inspected on a weekly basis.

- Dump trucks hauling material from the construction site will be covered with a tarpaulin.

- The paved street adjacent to the site entrance will be swept daily to remove excess mud, dirt, or rock tracked from the site.

- Petroleum products will be stored in tightly sealed containers that are clearly labeled.

- All vehicles on site will be monitored for leaks and receive regular preventive maintenance to reduce the chance of leakage.

- All spills will be cleaned up immediately upon discovery. Spills large enough to reach the storm system will be reported to the National Response Center at 1-800-424-8802.

- Materials and equipment necessary for spill cleanup will be kept in the temporary material storage trailer onsite. Equipment will include, but not be limited to, brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sand, saw dust, and plastic and metal trash containers.

- All paint containers and curing compounds will be tightly sealed and stored when not required for use. Excess paint will not be discharged to the storm system, but will be properly disposed according to the manufacturer’s instructions.

- Sanitary waste will be collected from portable units a minimum of two times a week to avoid overfilling. All sanitary waste units shall be surrounded by silt fence to prevent contaminants from leaving the site. Silt fencing shall be inspected on a weekly basis.

- Any asphalt substances used on-site will be applied according to the manufacturer's recommendation.

- Fertilizers will be stored in a covered shed and partially used bags will be transferred to a sealable bin to avoid spills and will be applied only in the minimum amounts recommended by the manufacturer and worked into the soil to limit exposure to stormwater.

- No disturbed area shall be left un-stabilized for longer than 14 days during the growing season.

- When erosion is likely to be a problem, grubbing operations shall be scheduled and performed such that grading operations and permanent erosion control features can follow within 24 hours thereafter.

- As work progresses, patch seeding shall be done as required on areas previously treated to maintain or establish protective cover.

- Drainage pipes and swales/ditches shall generally be constructed in a sequence from outlet to inlet in order to stabilize outlet areas and ditches before water is directed to the new installation or any portion thereof, unless conditions unique to the location warrant an alternative method.

Spill Control & Spill Response:

- For all hazardous materials stored on site, the manufacturer's recommended methods for spill clean up will be clearly posted. Site personnel will be made aware of the procedures, and the locations of the information and cleanup supplies.
- Appropriate cleanup materials and equipment will be maintained by the Contractor in the materials storage area on-site. As appropriate, equipment and materials may include items such as booms, dust pans, mops, rags, gloves, goggles, kitty litter, sand, sawdust, and plastic and metal trash containers specifically for clean up purposes.
- All spills will be cleaned immediately after discovery and the materials disposed of properly.
- The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with a hazardous substance.
- After a spill, a report will be prepared describing the spill, what caused it, and the cleanup measures taken. The spill prevention plan will be adjusted to include measures to prevent this type of spill from reoccurring, as well as clean up instructions in the event of reoccurrences.
- The Contractor's site superintendent, responsible for day-to-day operations, will be the spill prevention and cleanup coordinator. The Contractor is responsible for ensuring that the site superintendent has had

appropriate training for hazardous materials handling, spill management, and cleanup.

- The Contractor's site superintendent will be notified immediately when a spill or the threat of a spill is observed. The superintendent will assess the situation and determine the appropriate response.
- If spills represent an imminent threat of escaping erosion and sediment controls and entering receiving waters, personnel will be directed to respond immediately to contain the release and notify the superintendent after the situation has been stabilized.
- Spill kits containing appropriate materials and equipment for spill response and cleanup will be maintained by the Contractor at the site.
- If oil sheen is observed on surface water, action will be taken immediately to remove the material causing the sheen. The Contractor will use appropriate materials to contain and absorb the spill. The source of the oil sheen will also be identified and removed or repaired as necessary to prevent further releases.
- If a spill occurs the superintendent or the superintendent's designee will be responsible for completing the spill reporting form and for reporting the spill to the contacts listed below.
- Personnel with primary responsibility for spill response and clean up will receive training by the Contractor's site superintendent or designee. The training must include identifying the location of the spill kits and other spill response equipment and the use of spill response materials.
- Spill response equipment will be inspected and maintained as necessary to replace any materials used in spill response activities.

Spill Control Notification:

- A reportable spill is a quantity of five (5) gallons or more or any spill of oil which: (1) violates water quality standards, (2) produces a "sheen" on a surface water, or (3) causes a sludge or emulsion. This spill must be reported immediately to the agencies listed below.

- Any spill of oil or hazardous substance to waters of the state must be reported immediately by telephone to the following agencies:

  - 911 – Police, Fire and EMS
  - Village of Mamaroneck Engineering Department
    169 Mount Pleasant Avenue

Phone: (914) 777-7731

- Mamaroneck Fire Department
  123 Mamaroneck Avenue
  Phone: (914) 825-8777

- NYS Department of Environmental Conservation (NYSDEC)
  Spill Reporting Hotline
  (1800) 457–7362

- National Response Center: (1800) 424-8802

- Local Emergency Planning Committee (LEPC)
  Westchester County Office of Emergency Management
  200 Bradhurst Avenue
  Hawthorne, NY 10532
  (914) 864–5450

- Westchester County Department of Health (WCDOH)
  Spill Reporting Hotline
  (914) 813-5000

- U.S. Environmental Protection Agency (USEPA)
  EPCRA Information Hotline
  1(800) 535–0202

- U.S. Department of Labor and Occupational Safety and Health Administration (OSHA)
  Tarrytown, NY
  (914) 524–7510

N. STORMWATER MANAGEMENT FACILITIES MAINTENANCE PROGRAM

The following maintenance plan has been developed to maintain the proper function of all drainage and erosion and sediment control facilities:

- <u>Erosion & Sediment Control Maintenance:</u>

  During the construction of the project, the site erosion and sediment control measures as well as basin embankments and outlet structures will be inspected by the project superintendent once a week and/or within 24 hours following a rainstorm ½” or greater. Any repairs required shall be performed in a timely manner. All sediment removal and/or repairs will be followed within 24 hours by re-vegetation. Remove sediment and correct erosion by re-seed eroded areas and gullies within 7 days.

- <u>General Stormwater Facilities Maintenance (Storm Sewer, Catch Basins/Drain Inlets, Manholes, Pre-treatment Device and Subsurface Infiltration System)</u>

All stormwater facilities shall be inspected immediately after completion of construction, and then monthly for the first three (3) months following the completion of the Project. Within the first three (3) months, inspections shall immediately be performed following a large storm event (i.e. producing 1/2" (one-half inch) of rain or greater. Thereafter, these facilities shall be inspected as described as follows. Upon inspection, facilities shall be immediately maintained and/or cleaned as may be required. Any site areas exhibiting soil erosion of any kind shall be immediately restored and stabilized with vegetation, mulch or stone, depending on the area to be stabilized.

Upon each inspection, all visible debris including, but not limited to, twigs, leaf and forest litter shall be removed from the swales, overflow discharge points and frames and grates of drainage structures.

- Sumps − Catch Basin/Drain Inlets and Drain Manholes

  All catch basin/drain inlets and drain manholes with sumps have been designed to trap sediment prior to its transport to the infiltration practice and, ultimately, downstream. These sumps will require periodic inspection and maintenance to ensure that adequate depth is maintained within the sumps.

  All sumps shall be inspected once per month for the first three (3) months (after drainage system has been put into service). Thereafter, all sumps shall be inspected every four (4) months. The Owner, or their duly authorized representative, shall take measurements of the sump depth.

  If sediment has accumulated to 1/2 (one-half) the depth of the sump, all sediment shall be removed from the sump. Sediments can be removed with hand-labor or with a vacuum truck.

  The use of road salt shall be minimized for maintenance of roadway and driveway areas.

- Hydrodynamic Separator:

  The hydrodynamic separator (Aquaswirl unit) shall be inspected every six (6) months (Spring and Fall) for excess sediment accumulation. During dry weather conditions, accumulated sediments shall be vacuumed out when sediment has reached 1/2 (one-half) the capacity of the isolated sump, or when an appreciable level of hydrocarbons and trash has accumulated, whichever occurs first.

  Upon completion of construction, the Aquaswirl Unit should be inspected quarterly during the first year in order to develop an appropriate schedule of maintenance. When the sediment pile is within 30 to 36 inches of the water surface, the system should be maintained. A vacuum truck shall be used to remove the accumulated sediment and debris. Refer to manufacturer's literature for detailed maintenance instructions.

- Stormwater Planter:

  The stormwater planters shall be inspected twice within the first six (6) months, and after each storm event greater than 0.5-inches (Spring and Fall) for excess sediment accumulation and for surface ponding. After the first year, the planter shall be inspected every four (4) months and after storm events greater than the 1-year storm.

  During dry weather conditions, all accumulated sediment shall be removed from the planter, and the existing topsoil shall be retiled to promote exfiltration of the stormwater thought the practice.

  Routine maintenance activities shall be performed weekly, and shall include running and replacing dead or dying vegetation, plant thinning, and erosion repair.

- FocalPoint Biofilter System:

  The Focalpoint Biofilter System shall be inspected twice within the first six (6) months, and after each storm event greater than 1.0-inches (Spring and Fall) for excess sediment accumulation and for surface ponding. After the first year, the planter shall be inspected every six (6) months and after storm events greater than the 1-year storm.

  During dry weather conditions, all accumulated sediment shall be removed from the planter, and the existing topsoil shall be retiled to promote exfiltration of the stormwater thought the practice.

  Routine maintenance activities shall be performed weekly and shall include running and replacing dead or dying vegetation, plant thinning, and erosion repair.

  All maintenance shall be completed in accordance with the manufacturer's guidelines outlined in the Operations & Maintenance manual located in *Section 8* of this report.

O. CONCLUSION:

The stormwater management plan proposed meets and exceeds all the requirements set forth by the Village of Mamaroneck and the New York State Department of Environmental Conservation (NYSDEC) for redevelopment projects. Design modification requirements that may occur during the approval process, will be performed and submitted for review to the Village of Mamaroneck.

3.) Extreme
Precipitation Table

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Smoothing	Yes
State	New York
Location	
Longitude	73.743 degrees West
Latitude	40.950 degrees North
Elevation	0 feet
Date/Time	Fri, 19 Jan 2018 11:31:10 -0500

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.34	0.51	0.64	0.84	1.05	1.31	**1yr**	0.90	1.23	1.50	1.86	2.31	2.86	3.22	**1yr**	2.53	3.10	3.58	4.31	4.94	**1yr**
2yr	0.41	0.63	0.78	1.02	1.28	1.59	**2yr**	1.11	1.50	1.83	2.26	2.80	3.45	3.87	**2yr**	3.05	3.72	4.27	5.07	5.75	**2yr**
5yr	0.47	0.74	0.92	1.24	1.58	2.00	**5yr**	1.37	1.85	2.31	2.86	3.52	4.31	4.89	**5yr**	3.82	4.70	5.45	6.38	7.13	**5yr**
10yr	0.53	0.84	1.06	1.43	1.86	2.37	**10yr**	1.61	2.18	2.75	3.41	4.19	5.11	5.84	**10yr**	4.53	5.62	6.56	7.59	8.38	**10yr**
25yr	0.62	0.98	1.25	1.73	2.31	2.97	**25yr**	1.99	2.69	3.45	4.30	5.28	6.41	7.40	**25yr**	5.67	7.11	8.37	9.56	10.39	**25yr**
50yr	0.70	1.13	1.45	2.02	2.72	3.53	**50yr**	2.35	3.17	4.11	5.11	6.27	7.60	8.85	**50yr**	6.73	8.51	10.08	11.38	12.23	**50yr**
100yr	0.80	1.29	1.66	2.36	3.21	4.19	**100yr**	2.77	3.73	4.89	6.09	7.46	9.02	10.58	**100yr**	7.99	10.18	12.13	13.55	14.41	**100yr**
200yr	0.91	1.48	1.91	2.75	3.79	4.98	**200yr**	3.27	4.40	5.82	7.26	8.88	10.72	12.66	**200yr**	9.48	12.18	14.62	16.13	16.97	**200yr**
500yr	1.09	1.79	2.33	3.38	4.73	6.24	**500yr**	4.08	5.48	7.32	9.14	11.18	13.47	16.06	**500yr**	11.92	15.45	18.71	20.33	21.08	**500yr**

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.25	0.39	0.47	0.63	0.78	0.88	**1yr**	0.67	0.86	1.27	1.54	1.96	2.58	2.97	**1yr**	2.29	2.86	3.31	3.97	4.58	**1yr**
2yr	0.39	0.61	0.75	1.01	1.25	1.50	**2yr**	1.08	1.47	1.71	2.19	2.73	3.35	3.76	**2yr**	2.97	3.61	4.14	4.93	5.61	**2yr**
5yr	0.44	0.68	0.84	1.16	1.47	1.79	**5yr**	1.27	1.75	2.02	2.57	3.20	4.03	4.54	**5yr**	3.56	4.37	5.06	5.95	6.70	**5yr**
10yr	0.49	0.75	0.93	1.31	1.69	2.04	**10yr**	1.46	1.99	2.29	2.91	3.58	4.62	5.21	**10yr**	4.09	5.01	5.90	6.82	7.63	**10yr**
25yr	0.56	0.85	1.06	1.52	1.99	2.42	**25yr**	1.72	2.36	2.71	3.42	4.15	5.53	6.22	**25yr**	4.90	5.98	7.22	8.17	9.07	**25yr**
50yr	0.62	0.94	1.17	1.69	2.27	2.73	**50yr**	1.96	2.67	3.09	3.89	4.59	6.32	7.11	**50yr**	5.60	6.83	8.44	9.34	10.35	**50yr**
100yr	0.69	1.05	1.31	1.90	2.60	3.09	**100yr**	2.24	3.02	3.54	4.43	5.12	7.23	8.11	**100yr**	6.40	7.80	9.85	10.69	11.80	**100yr**
200yr	0.78	1.17	1.48	2.15	3.00	3.52	**200yr**	2.59	3.44	4.06	5.05	5.68	8.27	9.27	**200yr**	7.32	8.91	11.52	12.23	13.47	**200yr**
500yr	0.91	1.36	1.75	2.54	3.62	4.22	**500yr**	3.12	4.12	4.88	6.08	8.37	9.87	11.05	**500yr**	8.73	10.63	14.20	14.60	16.05	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.37	0.58	0.71	0.95	1.17	1.38	**1yr**	1.01	1.35	1.63	2.14	2.61	3.13	3.48	**1yr**	2.77	3.35	3.85	4.63	5.26	**1yr**
2yr	0.42	0.65	0.80	1.08	1.33	1.63	**2yr**	1.15	1.59	1.90	2.38	3.01	3.55	4.03	**2yr**	3.15	3.87	4.40	5.25	5.93	**2yr**
5yr	0.51	0.78	0.97	1.33	1.70	1.99	**5yr**	1.46	1.95	2.32	3.03	3.75	4.61	5.23	**5yr**	4.08	5.03	5.85	6.83	7.56	**5yr**
10yr	0.60	0.92	1.14	1.59	2.05	2.38	**10yr**	1.77	2.33	2.81	3.67	4.53	5.63	6.42	**10yr**	4.98	6.17	7.25	8.37	9.12	**10yr**
25yr	0.74	1.12	1.40	2.00	2.63	3.01	**25yr**	2.27	2.94	3.64	4.74	5.83	7.31	8.41	**25yr**	6.47	8.09	9.64	10.99	11.68	**25yr**
50yr	0.86	1.32	1.64	2.35	3.17	3.61	**50yr**	2.73	3.52	4.42	5.76	7.06	8.95	10.32	**50yr**	7.92	9.92	11.95	13.50	14.09	**50yr**
100yr	1.02	1.54	1.93	2.79	3.82	4.31	**100yr**	3.30	4.21	5.36	7.00	8.55	10.93	12.68	**100yr**	9.68	12.20	14.82	16.57	17.01	**100yr**
200yr	1.20	1.80	2.29	3.31	4.62	5.16	**200yr**	3.98	5.04	6.49	8.49	10.36	13.35	15.61	**200yr**	11.82	15.01	18.37	20.38	20.52	**200yr**
500yr	1.50	2.23	2.87	4.16	5.92	6.52	**500yr**	5.11	6.37	8.38	10.97	13.30	17.43	20.55	**500yr**	15.42	19.76	24.41	26.80	26.31	**500yr**

Powered by ACIS
Northeast Regional Climate Center

4.) Soils Maps & Soils Data

Soil Map—Westchester County, New York
(416 Waverly Avenue)

Map Scale: 1:838 if printed on A size (8.5" x 11") sheet.

N

Meters: 0 5 10 20 30

Feet: 0 30 60 120 180

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features

- Gully
- Short Steep Slope
- Other

Political Features

- Cities

Water Features

- Oceans
- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:838 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 18N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Westchester County, New York
Survey Area Data: Version 4, Dec 14, 2006

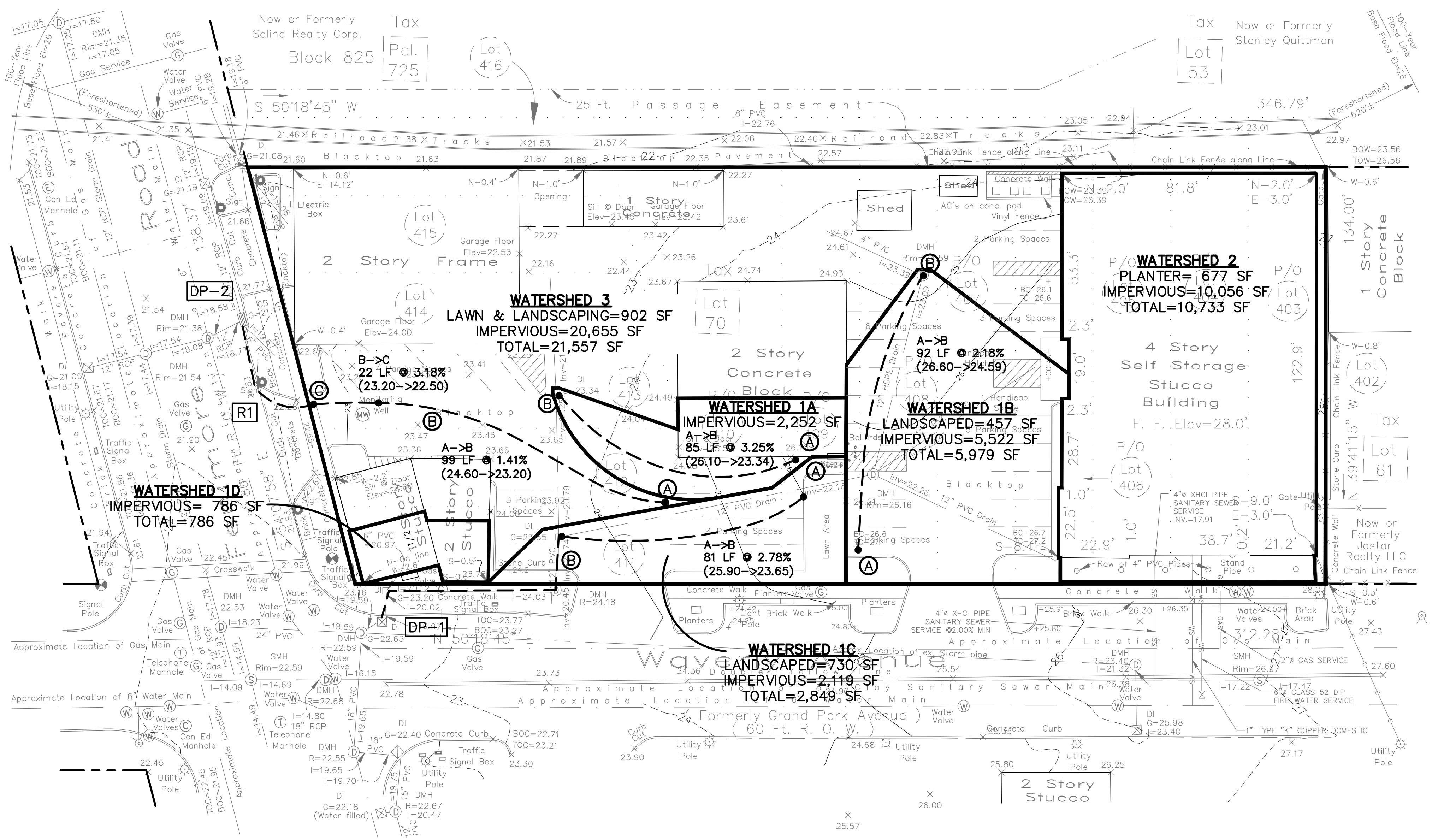
Date(s) aerial images were photographed: 7/31/2006

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Westchester County, New York (NY119)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
Uf	Urban land	1.3	100.0%
Totals for Area of Interest		**1.3**	**100.0%**

5.) Watershed Maps



GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

ANY ALTERATIONS OR REVISIONS OF THESE PLANS, UNLESS DONE BY OR UNDER THE DIRECTION OF THE NYS LICENSED AND REGISTERED ENGINEER THAT PREPARED THEM, IS A VIOLATION OF THE NYS EDUCATION LAW.

No.	Description	Date
1.	REVISED PER TOWN COMMENTS	1-14-19

Revisions

THIS PLAN NOT VALID FOR CONSTRUCTION WITHOUT ENGINEERS SEAL & SIGNATURE

PROJECT:

SELF STORAGE BUILDING ADDITION
560 FENIMORE ROAD
VILLAGE OF MAMARONECK
WESTCHESTER COUNTY – NEW YORK

WATERSHED MAP – EXISTING

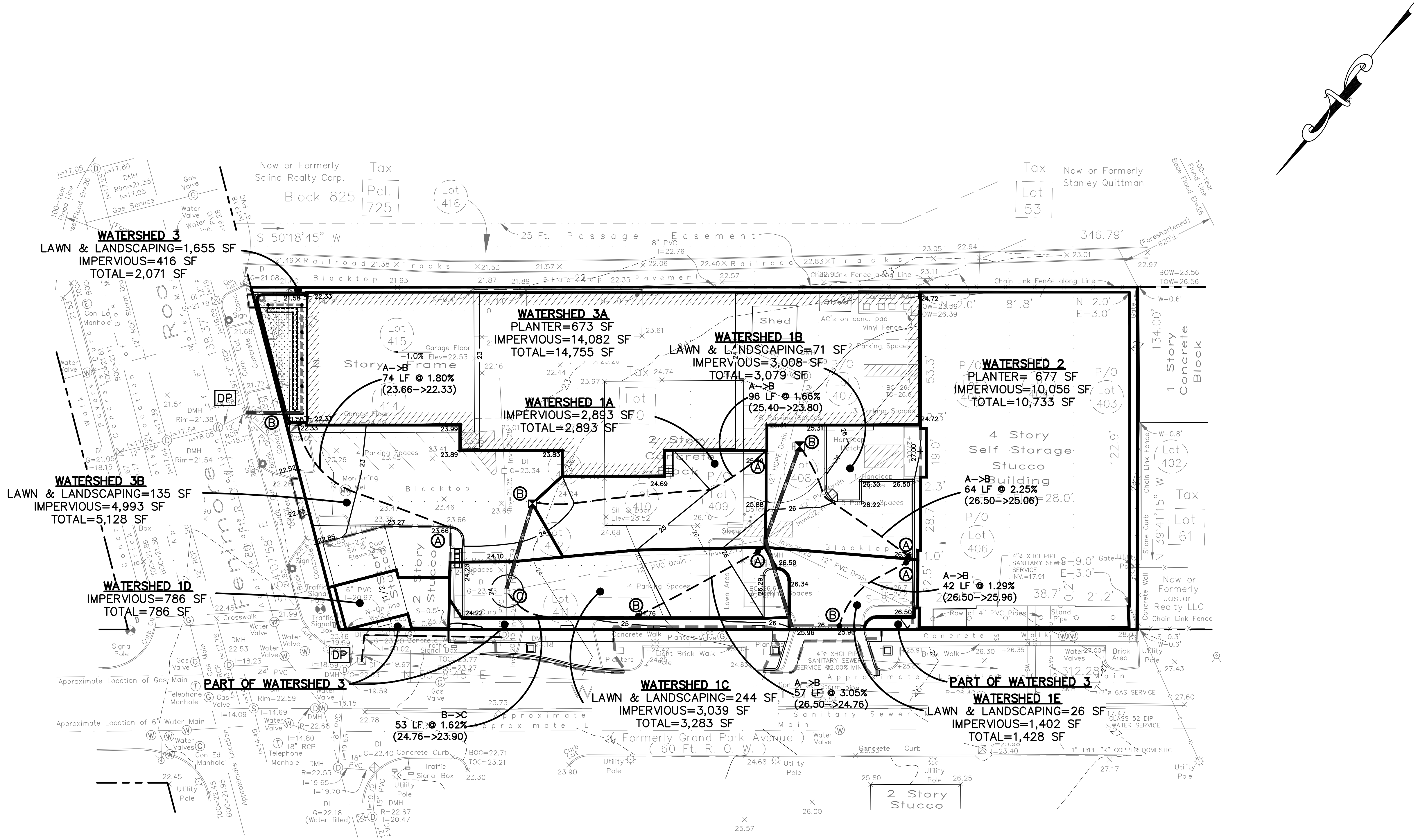
HEC

HUDSON ENGINEERING & CONSULTING, P.C.
45 Knollwood Road – Suite 201
Elmsford, New York 10523
T: 914-909-0420
F: 914-560-2086

Date:	2/8/18	Sheet: 1 / 2
Scale:	1" = 20'	
Designed By:	D.C.	
Checked By:	M.S.	

Sheet No.

WS-E



GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

ANY ALTERATIONS OR REVISIONS OF THESE PLANS, UNLESS DONE BY OR UNDER THE DIRECTION OF THE NYS LICENSED AND REGISTERED ENGINEER THAT PREPARED THEM, IS A VIOLATION OF THE NYS EDUCATION LAW.

No.	Description	Date
1.	REVISED PER TOWN COMMENTS	1-14-19

Revisions

THIS PLAN NOT VALID FOR CONSTRUCTION WITHOUT ENGINEERS SEAL & SIGNATURE

PROJECT:

SELF STORAGE BUILDING ADDITION
560 FENIMORE ROAD
VILLAGE OF MAMARONECK
WESTCHESTER COUNTY – NEW YORK

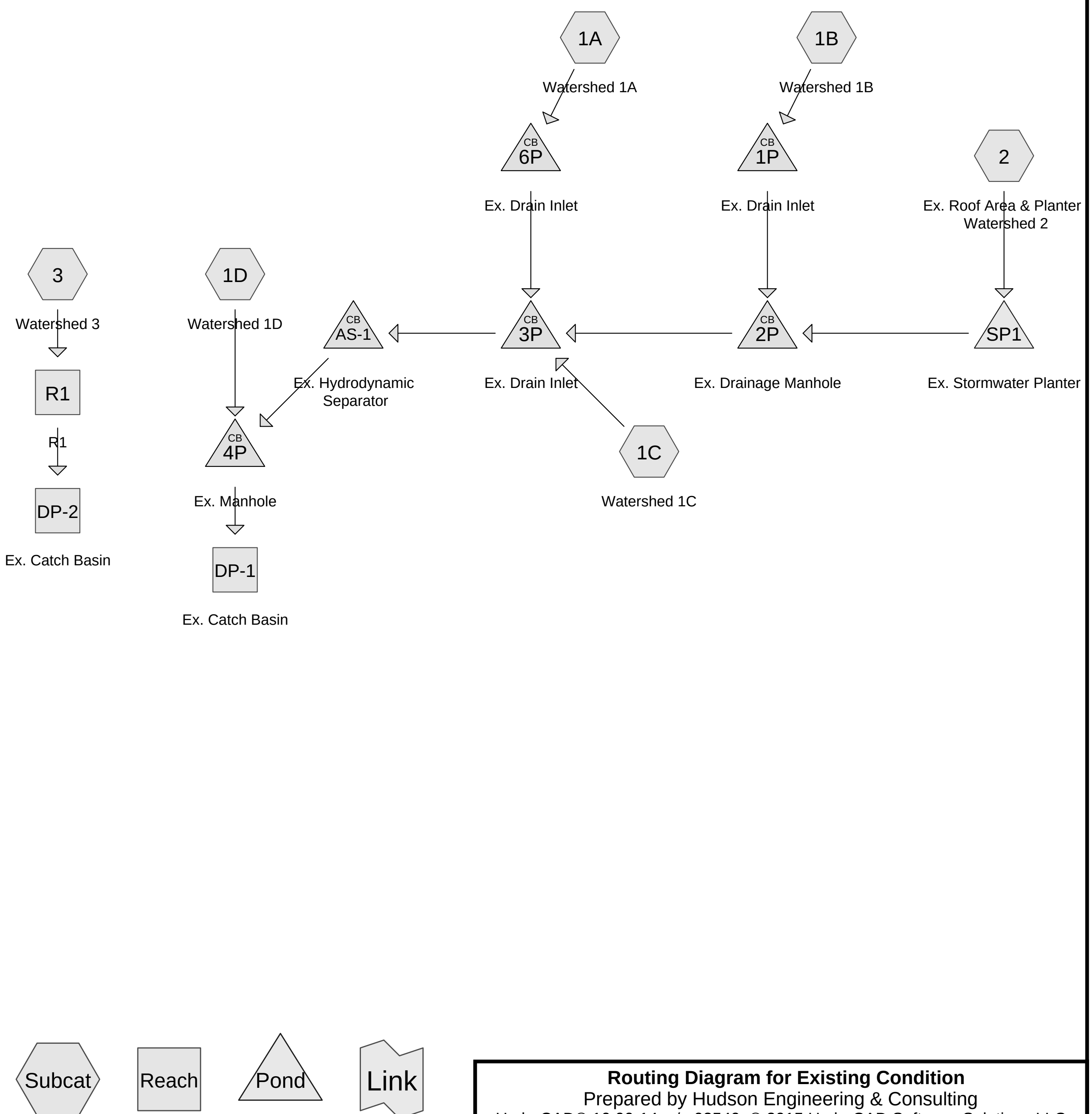
WATERSHED MAP – PROPOSED

HEC

HUDSON ENGINEERING & CONSULTING, P.C.
45 Knollwood Road – Suite 201
Elmsford, New York 10523
T: 914-909-0420
F: 914-560-2086

Date:	2/8/18
Scale:	1" = 20'
Designed By:	D.C.
Checked By:	M.S.
Sheet:	2 / 2
Sheet No.	WS-P

6.) Pre-Developed Analysis of the 1-, 10-, and 25-year Extreme Storm Events



Routing Diagram for Existing Condition
Prepared by Hudson Engineering & Consulting
HydroCAD® 10.00-14 s/n 02549 © 2015 HydroCAD Software Solutions LLC

Summary for Subcatchment 1A: Watershed 1A

Runoff = 0.17 cfs @ 12.01 hrs, Volume= 493 cf, Depth= 2.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.86"

	Area (sf)	CN	Description
*	2,252	98	Parking Lot & part of building
	2,252		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	85	0.0325	1.68		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 1B: Watershed 1B

Runoff = 0.44 cfs @ 12.02 hrs, Volume= 1,255 cf, Depth= 2.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.86"

	Area (sf)	CN	Description
	457	79	50-75% Grass cover, Fair, HSG C
*	5,522	98	Parking Lot
	5,979	97	Weighted Average
	457		7.64% Pervious Area
	5,522		92.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	92	0.0218	1.45		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 1C: Watershed 1C

Runoff = 0.19 cfs @ 12.01 hrs, Volume= 503 cf, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.86"

	Area (sf)	CN	Description
	730	79	50-75% Grass cover, Fair, HSG C
*	2,119	98	Parking Lot
	2,849	93	Weighted Average
	730		25.62% Pervious Area
	2,119		74.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	81	0.0277	1.56		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 1D: Watershed 1D

Runoff = 0.06 cfs @ 12.01 hrs, Volume= 172 cf, Depth= 2.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.86"

	Area (sf)	CN	Description
*	786	98	
	786		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0					**Direct Entry,**

Summary for Subcatchment 2: Ex. Roof Area & Planter Watershed 2

Runoff = 0.80 cfs @ 12.01 hrs, Volume= 2,254 cf, Depth= 2.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.86"

	Area (sf)	CN	Description
*	10,056	98	Roof
*	677	79	Planter
	10,733	97	Weighted Average
	677		6.31% Pervious Area
	10,056		93.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0					**Direct Entry,**

Summary for Subcatchment 3: Watershed 3

Runoff = 1.58 cfs @ 12.02 hrs, Volume= 4,526 cf, Depth= 2.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.86"

	Area (sf)	CN	Description
	902	79	50-75% Grass cover, Fair, HSG C
*	20,655	98	Parking Lot & Buildings
	21,557	97	Weighted Average
	902		4.18% Pervious Area
	20,655		95.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	99	0.0141	1.24		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"
0.1	22	0.0318	3.62		**Shallow Concentrated Flow, B->C** Paved Kv= 20.3 fps
1.4	121	Total			

Summary for Reach DP-1: Ex. Catch Basin

Inflow Area = 22,599 sf, 91.75% Impervious, Inflow Depth = 2.48" for 1-Year event
Inflow = 0.89 cfs @ 12.01 hrs, Volume= 4,678 cf
Outflow = 0.89 cfs @ 12.01 hrs, Volume= 4,678 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: Ex. Catch Basin

Inflow Area = 21,557 sf, 95.82% Impervious, Inflow Depth = 2.52" for 1-Year event
Inflow = 1.58 cfs @ 12.02 hrs, Volume= 4,526 cf
Outflow = 1.58 cfs @ 12.02 hrs, Volume= 4,526 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

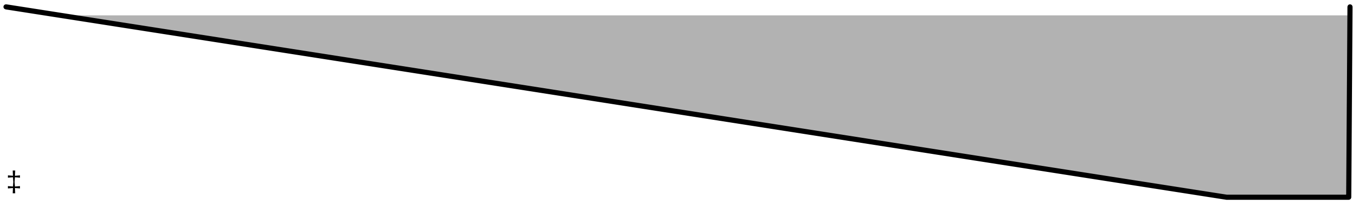
Summary for Reach R1: R1

Inflow Area = 21,557 sf, 95.82% Impervious, Inflow Depth = 2.52" for 1-Year event
Inflow = 1.58 cfs @ 12.02 hrs, Volume= 4,526 cf
Outflow = 1.58 cfs @ 12.02 hrs, Volume= 4,526 cf, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.86 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.01 fps, Avg. Travel Time= 0.7 min

Peak Storage= 23 cf @ 12.02 hrs
Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 0.10' Flow Area= 0.6 sf, Capacity= 1.77 cfs

1.00' x 0.10' deep channel, n= 0.013 Asphalt, smooth
Side Slope Z-value= 100.0 0.1 '/' Top Width= 11.01'
Length= 41.0' Slope= 0.0324 '/'
Inlet Invert= 22.50', Outlet Invert= 21.17'



‡

Summary for Pond 1P: Ex. Drain Inlet

Inflow Area = 5,979 sf, 92.36% Impervious, Inflow Depth = 2.52" for 1-Year event
Inflow = 0.44 cfs @ 12.02 hrs, Volume= 1,255 cf
Outflow = 0.44 cfs @ 12.02 hrs, Volume= 1,255 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.44 cfs @ 12.02 hrs, Volume= 1,255 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 23.47' @ 12.02 hrs
Flood Elev= 24.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	23.09'	**12.0" Round 12" HDPE** L= 65.3' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 23.09' / 22.26' S= 0.0127 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.44 cfs @ 12.02 hrs HW=23.46' TW=22.55' (Dynamic Tailwater)
└─**1=12" HDPE** (Inlet Controls 0.44 cfs @ 1.64 fps)

Summary for Pond 2P: Ex. Drainage Manhole

Inflow Area = 16,712 sf, 93.21% Impervious, Inflow Depth = 2.52" for 1-Year event
Inflow = 0.47 cfs @ 12.02 hrs, Volume= 3,509 cf
Outflow = 0.47 cfs @ 12.02 hrs, Volume= 3,509 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.47 cfs @ 12.02 hrs, Volume= 3,509 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 22.55' @ 12.02 hrs
Flood Elev= 26.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	22.16'	**12.0" Round 12" PVC** L= 101.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 22.16' / 20.74' S= 0.0140 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.47 cfs @ 12.02 hrs HW=22.55' TW=21.27' (Dynamic Tailwater)
└─**1=12" PVC** (Inlet Controls 0.47 cfs @ 1.67 fps)

Summary for Pond 3P: Ex. Drain Inlet

Inflow Area = 21,813 sf, 91.45% Impervious, Inflow Depth = 2.48" for 1-Year event
Inflow = 0.84 cfs @ 12.01 hrs, Volume= 4,506 cf
Outflow = 0.84 cfs @ 12.01 hrs, Volume= 4,506 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.84 cfs @ 12.01 hrs, Volume= 4,506 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 21.27' @ 12.01 hrs
Flood Elev= 23.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.74'	**12.0" Round 12" PVC** L= 14.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.74' / 20.45' S= 0.0207 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.83 cfs @ 12.01 hrs HW=21.27' TW=20.97' (Dynamic Tailwater)
↑—**1=12" PVC** (Inlet Controls 0.83 cfs @ 1.96 fps)

Summary for Pond 4P: Ex. Manhole

Inflow Area = 22,599 sf, 91.75% Impervious, Inflow Depth = 2.48" for 1-Year event
Inflow = 0.89 cfs @ 12.01 hrs, Volume= 4,678 cf
Outflow = 0.89 cfs @ 12.01 hrs, Volume= 4,678 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.89 cfs @ 12.01 hrs, Volume= 4,678 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 20.59' @ 12.01 hrs
Flood Elev= 24.12'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.02'	**15.0" Round Ex. 15" HDPE** L= 8.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.02' / 19.97' S= 0.0063 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.89 cfs @ 12.01 hrs HW=20.59' TW=0.00' (Dynamic Tailwater)
↑—**1=Ex. 15" HDPE** (Barrel Controls 0.89 cfs @ 2.39 fps)

Summary for Pond 6P: Ex. Drain Inlet

Inflow Area = 2,252 sf,100.00% Impervious, Inflow Depth = 2.63" for 1-Year event
Inflow = 0.17 cfs @ 12.01 hrs, Volume= 493 cf
Outflow = 0.17 cfs @ 12.01 hrs, Volume= 493 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.17 cfs @ 12.01 hrs, Volume= 493 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 21.49' @ 12.02 hrs
Flood Elev= 23.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	21.25'	**12.0" Round 12" PVC** L= 45.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 21.25' / 20.79' S= 0.0102 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.17 cfs @ 12.01 hrs HW=21.49' TW=21.27' (Dynamic Tailwater)
└─**1=12" PVC** (Outlet Controls 0.17 cfs @ 1.76 fps)

Summary for Pond AS-1: Ex. Hydrodynamic Separator

Inflow Area =	21,813 sf, 91.45% Impervious,	Inflow Depth = 2.48" for 1-Year event	
Inflow =	0.84 cfs @ 12.01 hrs,	Volume=	4,506 cf
Outflow =	0.84 cfs @ 12.01 hrs,	Volume=	4,506 cf, Atten= 0%, Lag= 0.0 min
Primary =	0.84 cfs @ 12.01 hrs,	Volume=	4,506 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 20.97' @ 12.02 hrs
Flood Elev= 24.12'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.45'	**15.0" Round Ex. 15" RCP** L= 54.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.45' / 20.12' S= 0.0061 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.82 cfs @ 12.01 hrs HW=20.97' TW=20.59' (Dynamic Tailwater)
└─**1=Ex. 15" RCP** (Outlet Controls 0.82 cfs @ 2.50 fps)

Summary for Pond SP1: Ex. Stormwater Planter

Inflow Area =	10,733 sf, 93.69% Impervious,	Inflow Depth = 2.52" for 1-Year event	
Inflow =	0.80 cfs @ 12.01 hrs,	Volume=	2,254 cf
Outflow =	0.20 cfs @ 12.33 hrs,	Volume=	2,254 cf, Atten= 75%, Lag= 18.7 min
Primary =	0.20 cfs @ 12.33 hrs,	Volume=	2,254 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 27.77' @ 12.33 hrs Surf.Area= 677 sf Storage= 861 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 209.2 min (973.5 - 764.3)

Volume	Invert	Avail.Storage	Storage Description
#1	26.50'	1,016 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
26.50	677	0	0
28.00	677	1,016	1,016

Device	Routing	Invert	Outlet Devices
#1	Primary	23.50'	**12.0" Round Culvert** L= 64.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 23.50' / 21.33' S= 0.0339 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	27.75'	**6.0" Horiz. Orifice/Grate X 10.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	26.50'	**2.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.20 cfs @ 12.33 hrs HW=27.77' TW=22.47' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.20 cfs of 5.80 cfs potential flow)
  ├─**2=Orifice/Grate** (Weir Controls 0.17 cfs @ 0.48 fps)
  └─**3=Exfiltration** (Exfiltration Controls 0.03 cfs)

Summary for Subcatchment 1A: Watershed 1A

Runoff = 0.31 cfs @ 12.01 hrs, Volume= 914 cf, Depth= 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.11"

	Area (sf)	CN	Description
*	2,252	98	Parking Lot & part of building
	2,252		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	85	0.0325	1.68		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 1B: Watershed 1B

Runoff = 0.81 cfs @ 12.02 hrs, Volume= 2,370 cf, Depth= 4.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.11"

	Area (sf)	CN	Description
	457	79	50-75% Grass cover, Fair, HSG C
*	5,522	98	Parking Lot
	5,979	97	Weighted Average
	457		7.64% Pervious Area
	5,522		92.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	92	0.0218	1.45		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 1C: Watershed 1C

Runoff = 0.37 cfs @ 12.01 hrs, Volume= 1,022 cf, Depth= 4.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.11"

	Area (sf)	CN	Description
	730	79	50-75% Grass cover, Fair, HSG C
*	2,119	98	Parking Lot
	2,849	93	Weighted Average
	730		25.62% Pervious Area
	2,119		74.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	81	0.0277	1.56		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 1D: Watershed 1D

Runoff = 0.11 cfs @ 12.01 hrs, Volume= 319 cf, Depth= 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.11"

	Area (sf)	CN	Description
*	786	98	
	786		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0					**Direct Entry,**

Summary for Subcatchment 2: Ex. Roof Area & Planter Watershed 2

Runoff = 1.46 cfs @ 12.01 hrs, Volume= 4,254 cf, Depth= 4.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.11"

	Area (sf)	CN	Description
*	10,056	98	Roof
*	677	79	Planter
	10,733	97	Weighted Average
	677		6.31% Pervious Area
	10,056		93.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0					**Direct Entry,**

Summary for Subcatchment 3: Watershed 3

Runoff = 2.90 cfs @ 12.02 hrs, Volume= 8,545 cf, Depth= 4.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.11"

	Area (sf)	CN	Description
	902	79	50-75% Grass cover, Fair, HSG C
*	20,655	98	Parking Lot & Buildings
	21,557	97	Weighted Average
	902		4.18% Pervious Area
	20,655		95.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	99	0.0141	1.24		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"
0.1	22	0.0318	3.62		**Shallow Concentrated Flow, B->C** Paved Kv= 20.3 fps
1.4	121	Total			

Summary for Reach DP-1: Ex. Catch Basin

Inflow Area = 22,599 sf, 91.75% Impervious, Inflow Depth = 4.72" for 10-Year event
Inflow = 3.02 cfs @ 12.02 hrs, Volume= 8,881 cf
Outflow = 3.02 cfs @ 12.02 hrs, Volume= 8,881 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: Ex. Catch Basin

Inflow Area = 21,557 sf, 95.82% Impervious, Inflow Depth = 4.76" for 10-Year event
Inflow = 2.89 cfs @ 12.02 hrs, Volume= 8,545 cf
Outflow = 2.89 cfs @ 12.02 hrs, Volume= 8,545 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Reach R1: R1

Inflow Area = 21,557 sf, 95.82% Impervious, Inflow Depth = 4.76" for 10-Year event
Inflow = 2.90 cfs @ 12.02 hrs, Volume= 8,545 cf
Outflow = 2.89 cfs @ 12.02 hrs, Volume= 8,545 cf, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.26 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.20 fps, Avg. Travel Time= 0.6 min

Peak Storage= 36 cf @ 12.02 hrs
Average Depth at Peak Storage= 0.13'
Bank-Full Depth= 0.10' Flow Area= 0.6 sf, Capacity= 1.77 cfs

1.00' x 0.10' deep channel, n= 0.013 Asphalt, smooth
Side Slope Z-value= 100.0 0.1 '/' Top Width= 11.01'
Length= 41.0' Slope= 0.0324 '/'
Inlet Invert= 22.50', Outlet Invert= 21.17'

‡

Summary for Pond 1P: Ex. Drain Inlet

Inflow Area = 5,979 sf, 92.36% Impervious, Inflow Depth = 4.76" for 10-Year event
Inflow = 0.81 cfs @ 12.02 hrs, Volume= 2,370 cf
Outflow = 0.81 cfs @ 12.02 hrs, Volume= 2,370 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.81 cfs @ 12.02 hrs, Volume= 2,370 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 23.65' @ 12.02 hrs
Flood Elev= 24.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	23.09'	**12.0" Round 12" HDPE** L= 65.3' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 23.09' / 22.26' S= 0.0127 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.77 cfs @ 12.02 hrs HW=23.64' TW=23.21' (Dynamic Tailwater)
└─**1=12" HDPE** (Outlet Controls 0.77 cfs @ 2.52 fps)

Summary for Pond 2P: Ex. Drainage Manhole

Inflow Area = 16,712 sf, 93.21% Impervious, Inflow Depth = 4.76" for 10-Year event
Inflow = 2.24 cfs @ 12.02 hrs, Volume= 6,625 cf
Outflow = 2.24 cfs @ 12.02 hrs, Volume= 6,625 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.24 cfs @ 12.02 hrs, Volume= 6,625 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 23.22' @ 12.02 hrs
Flood Elev= 26.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	22.16'	**12.0" Round 12" PVC** L= 101.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 22.16' / 20.74' S= 0.0140 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.24 cfs @ 12.02 hrs HW=23.22' TW=22.54' (Dynamic Tailwater)
└─**1=12" PVC** (Inlet Controls 2.24 cfs @ 2.85 fps)

Summary for Pond 3P: Ex. Drain Inlet

Inflow Area = 21,813 sf, 91.45% Impervious, Inflow Depth = 4.71" for 10-Year event
Inflow = 2.91 cfs @ 12.02 hrs, Volume= 8,562 cf
Outflow = 2.91 cfs @ 12.02 hrs, Volume= 8,562 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.91 cfs @ 12.02 hrs, Volume= 8,562 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 22.55' @ 12.02 hrs
Flood Elev= 23.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.74'	**12.0" Round 12" PVC** L= 14.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.74' / 20.45' S= 0.0207 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.85 cfs @ 12.02 hrs HW=22.53' TW=21.62' (Dynamic Tailwater)
└─**1=12" PVC** (Inlet Controls 2.85 cfs @ 3.63 fps)

Summary for Pond 4P: Ex. Manhole

Inflow Area = 22,599 sf, 91.75% Impervious, Inflow Depth = 4.72" for 10-Year event
Inflow = 3.02 cfs @ 12.02 hrs, Volume= 8,881 cf
Outflow = 3.02 cfs @ 12.02 hrs, Volume= 8,881 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.02 cfs @ 12.02 hrs, Volume= 8,881 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 21.19' @ 12.02 hrs
Flood Elev= 24.12'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.02'	**15.0" Round Ex. 15" HDPE** L= 8.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.02' / 19.97' S= 0.0063 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=3.01 cfs @ 12.02 hrs HW=21.19' TW=0.00' (Dynamic Tailwater)
└─**1=Ex. 15" HDPE** (Barrel Controls 3.01 cfs @ 3.28 fps)

Summary for Pond 6P: Ex. Drain Inlet

Inflow Area = 2,252 sf,100.00% Impervious, Inflow Depth = 4.87" for 10-Year event
Inflow = 0.31 cfs @ 12.01 hrs, Volume= 914 cf
Outflow = 0.31 cfs @ 12.01 hrs, Volume= 914 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.31 cfs @ 12.01 hrs, Volume= 914 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 22.55' @ 12.03 hrs
Flood Elev= 23.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	21.25'	**12.0" Round 12" PVC** L= 45.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 21.25' / 20.79' S= 0.0102 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.01 hrs HW=22.34' TW=22.47' (Dynamic Tailwater)
└─**1=12" PVC** (Controls 0.00 cfs)

Summary for Pond AS-1: Ex. Hydrodynamic Separator

Inflow Area = 21,813 sf, 91.45% Impervious, Inflow Depth = 4.71" for 10-Year event
Inflow = 2.91 cfs @ 12.02 hrs, Volume= 8,562 cf
Outflow = 2.91 cfs @ 12.02 hrs, Volume= 8,562 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.91 cfs @ 12.02 hrs, Volume= 8,562 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 21.63' @ 12.02 hrs
Flood Elev= 24.12'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.45'	**15.0" Round Ex. 15" RCP** L= 54.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.45' / 20.12' S= 0.0061 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.85 cfs @ 12.02 hrs HW=21.62' TW=21.19' (Dynamic Tailwater)
└─**1=Ex. 15" RCP** (Outlet Controls 2.85 cfs @ 3.10 fps)

Summary for Pond SP1: Ex. Stormwater Planter

Inflow Area = 10,733 sf, 93.69% Impervious, Inflow Depth = 4.76" for 10-Year event
Inflow = 1.46 cfs @ 12.01 hrs, Volume= 4,254 cf
Outflow = 1.43 cfs @ 12.02 hrs, Volume= 4,255 cf, Atten= 2%, Lag= 0.5 min
Primary = 1.43 cfs @ 12.02 hrs, Volume= 4,255 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 27.84' @ 12.02 hrs Surf.Area= 677 sf Storage= 908 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 150.0 min (900.7 - 750.7)

Volume	Invert	Avail.Storage	Storage Description
#1	26.50'	1,016 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
26.50	677	0	0
28.00	677	1,016	1,016

Device	Routing	Invert	Outlet Devices
#1	Primary	23.50'	**12.0" Round Culvert** L= 64.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 23.50' / 21.33' S= 0.0339 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	27.75'	**6.0" Horiz. Orifice/Grate X 10.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	26.50'	**2.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=1.43 cfs @ 12.02 hrs HW=27.84' TW=23.22' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.43 cfs of 5.85 cfs potential flow)
  ├─**2=Orifice/Grate** (Weir Controls 1.40 cfs @ 0.98 fps)
  └─**3=Exfiltration** (Exfiltration Controls 0.03 cfs)

Summary for Subcatchment 1A: Watershed 1A

Runoff = 0.39 cfs @ 12.01 hrs, Volume= 1,158 cf, Depth= 6.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.41"

	Area (sf)	CN	Description
*	2,252	98	Parking Lot & part of building
	2,252		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	85	0.0325	1.68		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 1B: Watershed 1B

Runoff = 1.02 cfs @ 12.02 hrs, Volume= 3,016 cf, Depth= 6.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.41"

	Area (sf)	CN	Description
	457	79	50-75% Grass cover, Fair, HSG C
*	5,522	98	Parking Lot
	5,979	97	Weighted Average
	457		7.64% Pervious Area
	5,522		92.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	92	0.0218	1.45		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 1C: Watershed 1C

Runoff = 0.47 cfs @ 12.01 hrs, Volume= 1,327 cf, Depth= 5.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.41"

	Area (sf)	CN	Description
	730	79	50-75% Grass cover, Fair, HSG C
*	2,119	98	Parking Lot
	2,849	93	Weighted Average
	730		25.62% Pervious Area
	2,119		74.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	81	0.0277	1.56		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 1D: Watershed 1D

Runoff = 0.14 cfs @ 12.01 hrs, Volume= 404 cf, Depth= 6.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.41"

	Area (sf)	CN	Description
*	786	98	
	786		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0					**Direct Entry,**

Summary for Subcatchment 2: Ex. Roof Area & Planter Watershed 2

Runoff = 1.84 cfs @ 12.01 hrs, Volume= 5,414 cf, Depth= 6.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.41"

	Area (sf)	CN	Description
*	10,056	98	Roof
*	677	79	Planter
	10,733	97	Weighted Average
	677		6.31% Pervious Area
	10,056		93.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0					**Direct Entry,**

Summary for Subcatchment 3: Watershed 3

Runoff = 3.65 cfs @ 12.02 hrs, Volume= 10,874 cf, Depth= 6.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.41"

	Area (sf)	CN	Description
	902	79	50-75% Grass cover, Fair, HSG C
*	20,655	98	Parking Lot & Buildings
	21,557	97	Weighted Average
	902		4.18% Pervious Area
	20,655		95.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	99	0.0141	1.24		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"
0.1	22	0.0318	3.62		**Shallow Concentrated Flow, B->C** Paved Kv= 20.3 fps
1.4	121	Total			

Summary for Reach DP-1: Ex. Catch Basin

Inflow Area = 22,599 sf, 91.75% Impervious, Inflow Depth = 6.01" for 25-Year event
Inflow = 3.81 cfs @ 12.02 hrs, Volume= 11,319 cf
Outflow = 3.81 cfs @ 12.02 hrs, Volume= 11,319 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: Ex. Catch Basin

Inflow Area = 21,557 sf, 95.82% Impervious, Inflow Depth = 6.05" for 25-Year event
Inflow = 3.64 cfs @ 12.02 hrs, Volume= 10,874 cf
Outflow = 3.64 cfs @ 12.02 hrs, Volume= 10,874 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Reach R1: R1

Inflow Area = 21,557 sf, 95.82% Impervious, Inflow Depth = 6.05" for 25-Year event
Inflow = 3.65 cfs @ 12.02 hrs, Volume= 10,874 cf
Outflow = 3.64 cfs @ 12.02 hrs, Volume= 10,874 cf, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.38 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.28 fps, Avg. Travel Time= 0.5 min

Peak Storage= 44 cf @ 12.02 hrs
Average Depth at Peak Storage= 0.14'
Bank-Full Depth= 0.10' Flow Area= 0.6 sf, Capacity= 1.77 cfs

1.00' x 0.10' deep channel, n= 0.013 Asphalt, smooth
Side Slope Z-value= 100.0 0.1 '/' Top Width= 11.01'
Length= 41.0' Slope= 0.0324 '/'
Inlet Invert= 22.50', Outlet Invert= 21.17'

‡

Summary for Pond 1P: Ex. Drain Inlet

Inflow Area = 5,979 sf, 92.36% Impervious, Inflow Depth = 6.05" for 25-Year event
Inflow = 1.02 cfs @ 12.02 hrs, Volume= 3,016 cf
Outflow = 1.02 cfs @ 12.02 hrs, Volume= 3,016 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.02 cfs @ 12.02 hrs, Volume= 3,016 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 24.38' @ 12.04 hrs
Flood Elev= 24.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	23.09'	**12.0" Round 12" HDPE** L= 65.3' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 23.09' / 22.26' S= 0.0127 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.02 hrs HW=23.93' TW=24.04' (Dynamic Tailwater)
└─**1=12" HDPE** (Controls 0.00 cfs)

Summary for Pond 2P: Ex. Drainage Manhole

Inflow Area = 16,712 sf, 93.21% Impervious, Inflow Depth = 6.05" for 25-Year event
Inflow = 2.82 cfs @ 12.02 hrs, Volume= 8,430 cf
Outflow = 2.82 cfs @ 12.02 hrs, Volume= 8,430 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.82 cfs @ 12.02 hrs, Volume= 8,430 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 24.29' @ 12.03 hrs
Flood Elev= 26.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	22.16'	**12.0" Round 12" PVC** L= 101.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 22.16' / 20.74' S= 0.0140 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.53 cfs @ 12.02 hrs HW=24.16' TW=23.44' (Dynamic Tailwater)
└─**1=12" PVC** (Inlet Controls 2.53 cfs @ 3.22 fps)

Summary for Pond 3P: Ex. Drain Inlet

Inflow Area = 21,813 sf, 91.45% Impervious, Inflow Depth = 6.00" for 25-Year event
Inflow = 3.68 cfs @ 12.02 hrs, Volume= 10,915 cf
Outflow = 3.68 cfs @ 12.02 hrs, Volume= 10,915 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.68 cfs @ 12.02 hrs, Volume= 10,915 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 23.45' @ 12.02 hrs
Flood Elev= 23.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.74'	**12.0" Round 12" PVC** L= 14.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.74' / 20.45' S= 0.0207 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.56 cfs @ 12.02 hrs HW=23.40' TW=21.98' (Dynamic Tailwater)
↑—**1=12" PVC** (Inlet Controls 3.56 cfs @ 4.53 fps)

Summary for Pond 4P: Ex. Manhole

Inflow Area = 22,599 sf, 91.75% Impervious, Inflow Depth = 6.01" for 25-Year event
Inflow = 3.81 cfs @ 12.02 hrs, Volume= 11,319 cf
Outflow = 3.81 cfs @ 12.02 hrs, Volume= 11,319 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.81 cfs @ 12.02 hrs, Volume= 11,319 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 21.39' @ 12.02 hrs
Flood Elev= 24.12'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.02'	**15.0" Round Ex. 15" HDPE** L= 8.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.02' / 19.97' S= 0.0063 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=3.80 cfs @ 12.02 hrs HW=21.39' TW=0.00' (Dynamic Tailwater)
↑—**1=Ex. 15" HDPE** (Barrel Controls 3.80 cfs @ 3.52 fps)

Summary for Pond 6P: Ex. Drain Inlet

Inflow Area = 2,252 sf,100.00% Impervious, Inflow Depth = 6.17" for 25-Year event
Inflow = 0.39 cfs @ 12.01 hrs, Volume= 1,158 cf
Outflow = 0.39 cfs @ 12.01 hrs, Volume= 1,158 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.39 cfs @ 12.01 hrs, Volume= 1,158 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 23.47' @ 12.03 hrs
Flood Elev= 23.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	21.25'	**12.0" Round 12" PVC** L= 45.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 21.25' / 20.79' S= 0.0102 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.01 hrs HW=23.04' TW=23.29' (Dynamic Tailwater)
└─**1=12" PVC** (Controls 0.00 cfs)

Summary for Pond AS-1: Ex. Hydrodynamic Separator

Inflow Area = 21,813 sf, 91.45% Impervious, Inflow Depth = 6.00" for 25-Year event
Inflow = 3.68 cfs @ 12.02 hrs, Volume= 10,915 cf
Outflow = 3.68 cfs @ 12.02 hrs, Volume= 10,915 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.68 cfs @ 12.02 hrs, Volume= 10,915 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 22.00' @ 12.02 hrs
Flood Elev= 24.12'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.45'	**15.0" Round Ex. 15" RCP** L= 54.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.45' / 20.12' S= 0.0061 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=3.60 cfs @ 12.02 hrs HW=21.98' TW=21.39' (Dynamic Tailwater)
└─**1=Ex. 15" RCP** (Inlet Controls 3.60 cfs @ 2.93 fps)

Summary for Pond SP1: Ex. Stormwater Planter

Inflow Area = 10,733 sf, 93.69% Impervious, Inflow Depth = 6.05" for 25-Year event
Inflow = 1.84 cfs @ 12.01 hrs, Volume= 5,414 cf
Outflow = 1.81 cfs @ 12.02 hrs, Volume= 5,414 cf, Atten= 1%, Lag= 0.5 min
Primary = 1.81 cfs @ 12.02 hrs, Volume= 5,414 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 27.86' @ 12.02 hrs Surf.Area= 677 sf Storage= 918 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 133.3 min (879.6 - 746.3)

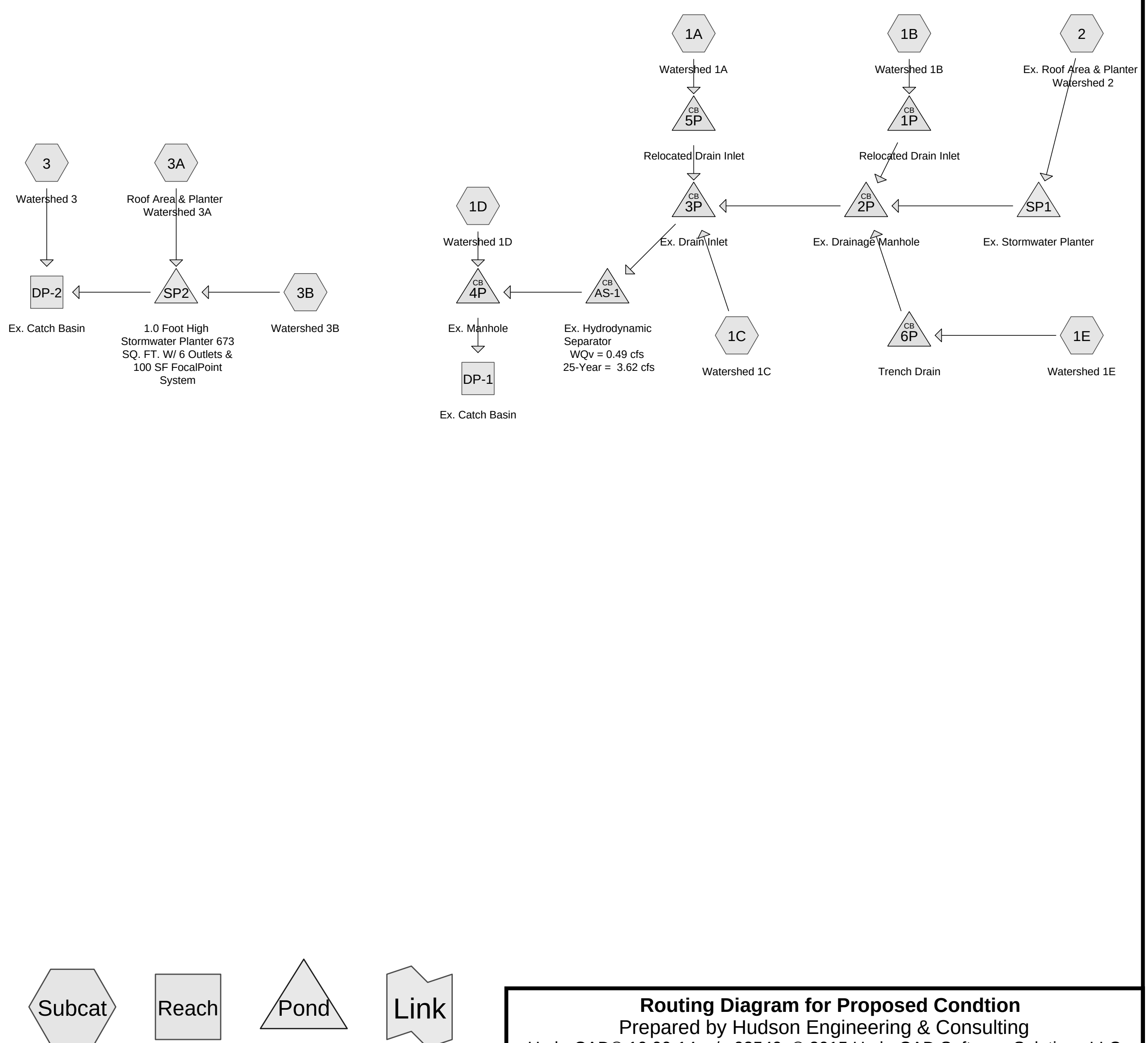
Volume	Invert	Avail.Storage	Storage Description
#1	26.50'	1,016 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
26.50	677	0	0
28.00	677	1,016	1,016

Device	Routing	Invert	Outlet Devices
#1	Primary	23.50'	**12.0" Round Culvert** L= 64.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 23.50' / 21.33' S= 0.0339 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	27.75'	**6.0" Horiz. Orifice/Grate X 10.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	26.50'	**2.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=1.80 cfs @ 12.02 hrs HW=27.86' TW=24.19' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.80 cfs of 5.72 cfs potential flow)
  ├─**2=Orifice/Grate** (Weir Controls 1.77 cfs @ 1.06 fps)
  └─**3=Exfiltration** (Exfiltration Controls 0.03 cfs)

7.) Post-Developed Analysis of the 1-, 10-, and 25-year Extreme Storm Events



Routing Diagram for Proposed Condtion

Prepared by Hudson Engineering & Consulting

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Summary for Subcatchment 1A: Watershed 1A

Runoff = 0.22 cfs @ 12.02 hrs, Volume= 634 cf, Depth= 2.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.86"

	Area (sf)	CN	Description
*	2,893	98	Parking Lot
	2,893		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	96	0.0166	1.31		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 1B: Watershed 1B

Runoff = 0.23 cfs @ 12.01 hrs, Volume= 646 cf, Depth= 2.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.86"

	Area (sf)	CN	Description
	71	74	>75% Grass cover, Good, HSG C
*	3,008	98	Parking Lot
	3,079	97	Weighted Average
	71		2.31% Pervious Area
	3,008		97.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	64	0.0225	1.37		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 1C: Watershed 1C

Runoff = 0.24 cfs @ 12.01 hrs, Volume= 661 cf, Depth= 2.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.86"

	Area (sf)	CN	Description
	244	74	>75% Grass cover, Good, HSG C
*	3,039	98	Parking Lot
	3,283	96	Weighted Average
	244		7.43% Pervious Area
	3,039		92.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	57	0.0305	1.51		**Sheet Flow, A->B** Smooth surfaces n= 0.011 P2= 3.45"
0.3	53	0.0162	2.58		**Shallow Concentrated Flow, B->C** Paved Kv= 20.3 fps
0.9	110	Total			

Summary for Subcatchment 1D: Watershed 1D

Runoff = 0.06 cfs @ 12.01 hrs, Volume= 172 cf, Depth= 2.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.86"

	Area (sf)	CN	Description
*	786	98	building
	786		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0					**Direct Entry,**

Summary for Subcatchment 1E: Watershed 1E

Runoff = 0.11 cfs @ 12.01 hrs, Volume= 313 cf, Depth= 2.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.86"

	Area (sf)	CN	Description
	26	74	>75% Grass cover, Good, HSG C
*	1,402	98	Parking Lot
	1,428	98	Weighted Average
	26		1.82% Pervious Area
	1,402		98.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	42	0.0129	1.01		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 2: Ex. Roof Area & Planter Watershed 2

Runoff = 0.80 cfs @ 12.01 hrs, Volume= 2,254 cf, Depth= 2.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.86"

	Area (sf)	CN	Description
*	10,056	98	Roof
*	677	79	Planter
	10,733	97	Weighted Average
	677		6.31% Pervious Area
	10,056		93.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0					**Direct Entry,**

Summary for Subcatchment 3: Watershed 3

Runoff = 0.07 cfs @ 12.02 hrs, Volume= 188 cf, Depth= 1.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.86"

	Area (sf)	CN	Description
	1,655	74	>75% Grass cover, Good, HSG C
*	416	98	Sidewalks
	2,071	79	Weighted Average
	1,655		79.91% Pervious Area
	416		20.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0					**Direct Entry,**

Summary for Subcatchment 3A: Roof Area & Planter Watershed 3A

Runoff = 1.10 cfs @ 12.01 hrs, Volume= 3,098 cf, Depth= 2.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.86"

	Area (sf)	CN	Description
*	14,082	98	Roof
*	673	79	Planter
	14,755	97	Weighted Average
	673		4.56% Pervious Area
	14,082		95.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0					**Direct Entry,**

Summary for Subcatchment 3B: Watershed 3B

Runoff = 0.38 cfs @ 12.01 hrs, Volume= 1,077 cf, Depth= 2.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.86"

	Area (sf)	CN	Description
	135	74	>75% Grass cover, Good, HSG C
*	4,993	98	Parking Lot & portion of ex. building
	5,128	97	Weighted Average
	135		2.63% Pervious Area
	4,993		97.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	74	0.0180	1.29		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Reach DP-1: Ex. Catch Basin

Inflow Area = 22,202 sf, 95.41% Impervious, Inflow Depth = 2.53" for 1-Year event
Inflow = 0.89 cfs @ 12.01 hrs, Volume= 4,680 cf
Outflow = 0.89 cfs @ 12.01 hrs, Volume= 4,680 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3

Summary for Reach DP-2: Ex. Catch Basin

Inflow Area = 21,954 sf, 88.78% Impervious, Inflow Depth = 2.39" for 1-Year event
Inflow = 1.48 cfs @ 12.03 hrs, Volume= 4,365 cf
Outflow = 1.48 cfs @ 12.03 hrs, Volume= 4,365 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3

Summary for Pond 1P: Relocated Drain Inlet

Inflow Area = 3,079 sf, 97.69% Impervious, Inflow Depth = 2.52" for 1-Year event
Inflow = 0.23 cfs @ 12.01 hrs, Volume= 646 cf
Outflow = 0.23 cfs @ 12.01 hrs, Volume= 646 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.23 cfs @ 12.01 hrs, Volume= 646 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 23.02' @ 12.01 hrs
Flood Elev= 25.05'

Device	Routing	Invert	Outlet Devices
#1	Primary	22.75'	**12.0" Round 12" HDPE** L= 35.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 22.75' / 22.26' S= 0.0140 '/' Cc= 0.900

n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.23 cfs @ 12.01 hrs HW=23.01' TW=22.50' (Dynamic Tailwater)
↑—**1=12" HDPE** (Inlet Controls 0.23 cfs @ 1.38 fps)

Summary for Pond 2P: Ex. Drainage Manhole

Inflow Area =	15,240 sf,	94.92% Impervious,	Inflow Depth = 2.53"	for 1-Year event
Inflow =	0.37 cfs @	12.01 hrs, Volume=	3,213 cf	
Outflow =	0.37 cfs @	12.01 hrs, Volume=	3,213 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.37 cfs @	12.01 hrs, Volume=	3,213 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 22.50' @ 12.01 hrs
Flood Elev= 26.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	22.16'	**12.0" Round 12" PVC** L= 101.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 22.16' / 20.74' S= 0.0140 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.37 cfs @ 12.01 hrs HW=22.50' TW=21.39' (Dynamic Tailwater)
↑—**1=12" PVC** (Inlet Controls 0.37 cfs @ 1.57 fps)

Summary for Pond 3P: Ex. Drain Inlet

Inflow Area =	21,416 sf,	95.25% Impervious,	Inflow Depth = 2.53"	for 1-Year event
Inflow =	0.83 cfs @	12.01 hrs, Volume=	4,508 cf	
Outflow =	0.83 cfs @	12.01 hrs, Volume=	4,508 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.83 cfs @	12.01 hrs, Volume=	4,508 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 21.39' @ 12.01 hrs
Flood Elev= 23.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.74'	**12.0" Round 12" PVC** L= 14.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.74' / 20.45' S= 0.0207 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.82 cfs @ 12.01 hrs HW=21.39' TW=21.22' (Dynamic Tailwater)
↑—**1=12" PVC** (Inlet Controls 0.82 cfs @ 1.53 fps)

Summary for Pond 4P: Ex. Manhole

Inflow Area = 22,202 sf, 95.41% Impervious, Inflow Depth = 2.53" for 1-Year event
Inflow = 0.89 cfs @ 12.01 hrs, Volume= 4,680 cf
Outflow = 0.89 cfs @ 12.01 hrs, Volume= 4,680 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.89 cfs @ 12.01 hrs, Volume= 4,680 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 20.59' @ 12.01 hrs
Flood Elev= 24.12'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.02'	**15.0" Round Ex. 15" HDPE** L= 8.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.02' / 19.97' S= 0.0063 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.88 cfs @ 12.01 hrs HW=20.59' TW=0.00' (Dynamic Tailwater)
└─**1=Ex. 15" HDPE** (Barrel Controls 0.88 cfs @ 2.39 fps)

Summary for Pond 5P: Relocated Drain Inlet

Inflow Area = 2,893 sf,100.00% Impervious, Inflow Depth = 2.63" for 1-Year event
Inflow = 0.22 cfs @ 12.02 hrs, Volume= 634 cf
Outflow = 0.22 cfs @ 12.02 hrs, Volume= 634 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.22 cfs @ 12.02 hrs, Volume= 634 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 21.53' @ 12.02 hrs
Flood Elev= 23.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	21.20'	**12.0" Round 12" HDPE** L= 34.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 21.20' / 20.79' S= 0.0121 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.22 cfs @ 12.02 hrs HW=21.52' TW=21.38' (Dynamic Tailwater)
└─**1=12" HDPE** (Outlet Controls 0.22 cfs @ 1.47 fps)

Summary for Pond 6P: Trench Drain

Inflow Area = 1,428 sf, 98.18% Impervious, Inflow Depth = 2.63" for 1-Year event
Inflow = 0.11 cfs @ 12.01 hrs, Volume= 313 cf
Outflow = 0.11 cfs @ 12.01 hrs, Volume= 313 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.11 cfs @ 12.01 hrs, Volume= 313 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 23.53' @ 12.01 hrs
Flood Elev= 25.96'

Device	Routing	Invert	Outlet Devices
#1	Primary	23.35'	**12.0" Round 12" HDPE** L= 34.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 23.35' / 22.26' S= 0.0321 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.11 cfs @ 12.01 hrs HW=23.53' TW=22.50' (Dynamic Tailwater)
└─**1=12" HDPE** (Inlet Controls 0.11 cfs @ 1.14 fps)

Summary for Pond AS-1: Ex. Hydrodynamic Separator WQv = 0.49 cfs 25-Year = 3.62 cfs

Inflow Area = 21,416 sf, 95.25% Impervious, Inflow Depth = 2.53" for 1-Year event
Inflow = 0.83 cfs @ 12.01 hrs, Volume= 4,508 cf
Outflow = 0.83 cfs @ 12.01 hrs, Volume= 4,508 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.83 cfs @ 12.01 hrs, Volume= 4,508 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 21.23' @ 12.01 hrs
Flood Elev= 24.12'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.74'	**15.0" Round Ex. 15" RCP** L= 52.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.74' / 20.12' S= 0.0119 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf

Primary OutFlow Max=0.82 cfs @ 12.01 hrs HW=21.22' TW=20.59' (Dynamic Tailwater)
└─**1=Ex. 15" RCP** (Inlet Controls 0.82 cfs @ 1.87 fps)

Summary for Pond SP1: Ex. Stormwater Planter

Inflow Area = 10,733 sf, 93.69% Impervious, Inflow Depth = 2.52" for 1-Year event
Inflow = 0.80 cfs @ 12.01 hrs, Volume= 2,254 cf
Outflow = 0.21 cfs @ 12.31 hrs, Volume= 2,254 cf, Atten= 74%, Lag= 17.7 min
Primary = 0.21 cfs @ 12.31 hrs, Volume= 2,254 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 27.77' @ 12.31 hrs Surf.Area= 669 sf Storage= 852 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 208.0 min (972.3 - 764.3)

Volume	Invert	Avail.Storage	Storage Description
#1	26.50'	1,004 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
26.50	669	0	0
28.00	669	1,004	1,004

Device	Routing	Invert	Outlet Devices
#1	Primary	23.50'	**12.0" Round Culvert** L= 64.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 23.50' / 22.26' S= 0.0194 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	27.75'	**6.0" Horiz. Orifice/Grate X 10.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	26.50'	**2.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.21 cfs @ 12.31 hrs HW=27.77' TW=22.46' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.21 cfs of 5.80 cfs potential flow)
  ├─**2=Orifice/Grate** (Weir Controls 0.18 cfs @ 0.50 fps)
  └─**3=Exfiltration** (Exfiltration Controls 0.03 cfs)

mmary for Pond SP2: 1.0 Foot High Stormwater Planter 673 SQ. FT. W/ 6 Outlets & 100 SF FocalPoint Sy

Inflow Area = 19,883 sf, 95.94% Impervious, Inflow Depth = 2.52" for 1-Year event
Inflow = 1.48 cfs @ 12.01 hrs, Volume= 4,175 cf
Outflow = 1.41 cfs @ 12.03 hrs, Volume= 4,177 cf, Atten= 4%, Lag= 0.9 min
Primary = 1.41 cfs @ 12.03 hrs, Volume= 4,177 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 22.17' @ 12.03 hrs Surf.Area= 100 sf Storage= 445 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 6.3 min (770.6 - 764.3)

Volume	Invert	Avail.Storage	Storage Description
#1	19.33'	45 cf	**2.00'W x 50.00'L x 2.25'H FocalPoint** 225 cf Overall x 20.0% Voids
#2	21.58'	505 cf	**Stormwater Planter (Prismatic)**Listed below (Recalc) -Impervious
		550 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
21.58	673	0	0
22.08	673	337	337
22.33	673	168	505

Device	Routing	Invert	Outlet Devices
#1	Primary	19.00'	**12.0" Round Culvert** L= 19.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 19.00' / 18.77' S= 0.0121 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	19.33'	**100.000 in/hr Exfiltration over Surface area**
#3	Device 1	22.08'	**8.0" Horiz. Orifice/Grate X 6.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.41 cfs @ 12.03 hrs HW=22.17' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.41 cfs of 4.88 cfs potential flow)
  ├─**2=Exfiltration** (Exfiltration Controls 0.23 cfs)
  └─**3=Orifice/Grate** (Weir Controls 1.18 cfs @ 1.00 fps)

Summary for Subcatchment 1A: Watershed 1A

Runoff = 0.39 cfs @ 12.02 hrs, Volume= 1,175 cf, Depth= 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.11"

	Area (sf)	CN	Description
*	2,893	98	Parking Lot
	2,893		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	96	0.0166	1.31		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 1B: Watershed 1B

Runoff = 0.42 cfs @ 12.01 hrs, Volume= 1,220 cf, Depth= 4.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.11"

	Area (sf)	CN	Description
	71	74	>75% Grass cover, Good, HSG C
*	3,008	98	Parking Lot
	3,079	97	Weighted Average
	71		2.31% Pervious Area
	3,008		97.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	64	0.0225	1.37		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 1C: Watershed 1C

Runoff = 0.44 cfs @ 12.01 hrs, Volume= 1,270 cf, Depth= 4.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.11"

	Area (sf)	CN	Description
	244	74	>75% Grass cover, Good, HSG C
*	3,039	98	Parking Lot
	3,283	96	Weighted Average
	244		7.43% Pervious Area
	3,039		92.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	57	0.0305	1.51		**Sheet Flow, A->B** Smooth surfaces n= 0.011 P2= 3.45"
0.3	53	0.0162	2.58		**Shallow Concentrated Flow, B->C** Paved Kv= 20.3 fps
0.9	110	Total			

Summary for Subcatchment 1D: Watershed 1D

Runoff = 0.11 cfs @ 12.01 hrs, Volume= 319 cf, Depth= 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.11"

	Area (sf)	CN	Description
*	786	98	building
	786		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0					**Direct Entry,**

Summary for Subcatchment 1E: Watershed 1E

Runoff = 0.20 cfs @ 12.01 hrs, Volume= 580 cf, Depth= 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.11"

	Area (sf)	CN	Description
	26	74	>75% Grass cover, Good, HSG C
*	1,402	98	Parking Lot
	1,428	98	Weighted Average
	26		1.82% Pervious Area
	1,402		98.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	42	0.0129	1.01		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 2: Ex. Roof Area & Planter Watershed 2

Runoff = 1.46 cfs @ 12.01 hrs, Volume= 4,254 cf, Depth= 4.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.11"

	Area (sf)	CN	Description
*	10,056	98	Roof
*	677	79	Planter
	10,733	97	Weighted Average
	677		6.31% Pervious Area
	10,056		93.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0					**Direct Entry,**

Summary for Subcatchment 3: Watershed 3

Runoff = 0.19 cfs @ 12.02 hrs, Volume= 500 cf, Depth= 2.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.11"

	Area (sf)	CN	Description
	1,655	74	>75% Grass cover, Good, HSG C
*	416	98	Sidewalks
	2,071	79	Weighted Average
	1,655		79.91% Pervious Area
	416		20.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0					**Direct Entry,**

Summary for Subcatchment 3A: Roof Area & Planter Watershed 3A

Runoff = 2.01 cfs @ 12.01 hrs, Volume= 5,849 cf, Depth= 4.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.11"

	Area (sf)	CN	Description
*	14,082	98	Roof
*	673	79	Planter
	14,755	97	Weighted Average
	673		4.56% Pervious Area
	14,082		95.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0					**Direct Entry,**

Summary for Subcatchment 3B: Watershed 3B

Runoff = 0.70 cfs @ 12.01 hrs, Volume= 2,033 cf, Depth= 4.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.11"

	Area (sf)	CN	Description
	135	74	>75% Grass cover, Good, HSG C
*	4,993	98	Parking Lot & portion of ex. building
	5,128	97	Weighted Average
	135		2.63% Pervious Area
	4,993		97.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	74	0.0180	1.29		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Reach DP-1: Ex. Catch Basin

Inflow Area = 22,202 sf, 95.41% Impervious, Inflow Depth = 4.77" for 10-Year event
Inflow = 2.98 cfs @ 12.02 hrs, Volume= 8,819 cf
Outflow = 2.98 cfs @ 12.02 hrs, Volume= 8,819 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3

Summary for Reach DP-2: Ex. Catch Basin

Inflow Area = 21,954 sf, 88.78% Impervious, Inflow Depth = 4.58" for 10-Year event
Inflow = 2.85 cfs @ 12.02 hrs, Volume= 8,383 cf
Outflow = 2.85 cfs @ 12.02 hrs, Volume= 8,383 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3

Summary for Pond 1P: Relocated Drain Inlet

Inflow Area = 3,079 sf, 97.69% Impervious, Inflow Depth = 4.76" for 10-Year event
Inflow = 0.42 cfs @ 12.01 hrs, Volume= 1,220 cf
Outflow = 0.42 cfs @ 12.01 hrs, Volume= 1,220 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.42 cfs @ 12.01 hrs, Volume= 1,220 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 23.28' @ 12.02 hrs
Flood Elev= 25.05'

Device	Routing	Invert	Outlet Devices
#1	Primary	22.75'	**12.0" Round 12" HDPE** L= 35.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 22.75' / 22.26' S= 0.0140 '/' Cc= 0.900

n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.39 cfs @ 12.01 hrs HW=23.27' TW=23.17' (Dynamic Tailwater)
↑—**1=12" HDPE** (Outlet Controls 0.39 cfs @ 1.39 fps)

Summary for Pond 2P: Ex. Drainage Manhole

Inflow Area = 15,240 sf, 94.92% Impervious, Inflow Depth = 4.77" for 10-Year event
Inflow = 2.04 cfs @ 12.02 hrs, Volume= 6,055 cf
Outflow = 2.04 cfs @ 12.02 hrs, Volume= 6,055 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.04 cfs @ 12.02 hrs, Volume= 6,055 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 23.19' @ 12.02 hrs
Flood Elev= 26.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	22.16'	**12.0" Round 12" PVC** L= 101.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 22.16' / 20.74' S= 0.0140 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.03 cfs @ 12.02 hrs HW=23.18' TW=22.67' (Dynamic Tailwater)
↑—**1=12" PVC** (Outlet Controls 2.03 cfs @ 3.14 fps)

Summary for Pond 3P: Ex. Drain Inlet

Inflow Area = 21,416 sf, 95.25% Impervious, Inflow Depth = 4.76" for 10-Year event
Inflow = 2.87 cfs @ 12.02 hrs, Volume= 8,500 cf
Outflow = 2.87 cfs @ 12.02 hrs, Volume= 8,500 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.87 cfs @ 12.02 hrs, Volume= 8,500 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 22.67' @ 12.02 hrs
Flood Elev= 23.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.74'	**12.0" Round 12" PVC** L= 14.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.74' / 20.45' S= 0.0207 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.86 cfs @ 12.02 hrs HW=22.66' TW=21.75' (Dynamic Tailwater)
↑—**1=12" PVC** (Inlet Controls 2.86 cfs @ 3.64 fps)

Summary for Pond 4P: Ex. Manhole

Inflow Area = 22,202 sf, 95.41% Impervious, Inflow Depth = 4.77" for 10-Year event
Inflow = 2.98 cfs @ 12.02 hrs, Volume= 8,819 cf
Outflow = 2.98 cfs @ 12.02 hrs, Volume= 8,819 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.98 cfs @ 12.02 hrs, Volume= 8,819 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 21.18' @ 12.02 hrs
Flood Elev= 24.12'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.02'	**15.0" Round Ex. 15" HDPE** L= 8.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.02' / 19.97' S= 0.0063 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.96 cfs @ 12.02 hrs HW=21.18' TW=0.00' (Dynamic Tailwater)
└**1=Ex. 15" HDPE** (Barrel Controls 2.96 cfs @ 3.26 fps)

Summary for Pond 5P: Relocated Drain Inlet

Inflow Area = 2,893 sf,100.00% Impervious, Inflow Depth = 4.87" for 10-Year event
Inflow = 0.39 cfs @ 12.02 hrs, Volume= 1,175 cf
Outflow = 0.39 cfs @ 12.02 hrs, Volume= 1,175 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.39 cfs @ 12.02 hrs, Volume= 1,175 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 22.69' @ 12.02 hrs
Flood Elev= 23.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	21.20'	**12.0" Round 12" HDPE** L= 34.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 21.20' / 20.79' S= 0.0121 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.39 cfs @ 12.02 hrs HW=22.68' TW=22.66' (Dynamic Tailwater)
└**1=12" HDPE** (Inlet Controls 0.39 cfs @ 0.50 fps)

Summary for Pond 6P: Trench Drain

Inflow Area = 1,428 sf, 98.18% Impervious, Inflow Depth = 4.87" for 10-Year event
Inflow = 0.20 cfs @ 12.01 hrs, Volume= 580 cf
Outflow = 0.20 cfs @ 12.01 hrs, Volume= 580 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.20 cfs @ 12.01 hrs, Volume= 580 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 23.59' @ 12.01 hrs
Flood Elev= 25.96'

Device	Routing	Invert	Outlet Devices
#1	Primary	23.35'	**12.0" Round 12" HDPE** L= 34.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 23.35' / 22.26' S= 0.0321 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.20 cfs @ 12.01 hrs HW=23.59' TW=23.16' (Dynamic Tailwater)
└─**1=12" HDPE** (Inlet Controls 0.20 cfs @ 1.33 fps)

Summary for Pond AS-1: Ex. Hydrodynamic Separator WQv = 0.49 cfs 25-Year = 3.62 cfs

Inflow Area = 21,416 sf, 95.25% Impervious, Inflow Depth = 4.76" for 10-Year event
Inflow = 2.87 cfs @ 12.02 hrs, Volume= 8,500 cf
Outflow = 2.87 cfs @ 12.02 hrs, Volume= 8,500 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.87 cfs @ 12.02 hrs, Volume= 8,500 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 21.75' @ 12.02 hrs
Flood Elev= 24.12'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.74'	**15.0" Round Ex. 15" RCP** L= 52.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.74' / 20.12' S= 0.0119 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf

Primary OutFlow Max=2.86 cfs @ 12.02 hrs HW=21.75' TW=21.18' (Dynamic Tailwater)
└─**1=Ex. 15" RCP** (Inlet Controls 2.86 cfs @ 2.70 fps)

Summary for Pond SP1: Ex. Stormwater Planter

Inflow Area = 10,733 sf, 93.69% Impervious, Inflow Depth = 4.76" for 10-Year event
Inflow = 1.46 cfs @ 12.01 hrs, Volume= 4,254 cf
Outflow = 1.43 cfs @ 12.02 hrs, Volume= 4,255 cf, Atten= 2%, Lag= 0.5 min
Primary = 1.43 cfs @ 12.02 hrs, Volume= 4,255 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 27.84' @ 12.02 hrs Surf.Area= 669 sf Storage= 897 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 149.2 min (899.8 - 750.7)

Volume	Invert	Avail.Storage	Storage Description
#1	26.50'	1,004 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
26.50	669	0	0
28.00	669	1,004	1,004

Device	Routing	Invert	Outlet Devices
#1	Primary	23.50'	**12.0" Round Culvert** L= 64.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 23.50' / 22.26' S= 0.0194 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	27.75'	**6.0" Horiz. Orifice/Grate X 10.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	26.50'	**2.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=1.43 cfs @ 12.02 hrs HW=27.84' TW=23.17' (Dynamic Tailwater)
└**1=Culvert** (Passes 1.43 cfs of 5.85 cfs potential flow)
  ├**2=Orifice/Grate** (Weir Controls 1.40 cfs @ 0.98 fps)
  └**3=Exfiltration** (Exfiltration Controls 0.03 cfs)

mmary for Pond SP2: 1.0 Foot High Stormwater Planter 673 SQ. FT. W/ 6 Outlets & 100 SF FocalPoint Sy

Inflow Area = 19,883 sf, 95.94% Impervious, Inflow Depth = 4.76" for 10-Year event
Inflow = 2.70 cfs @ 12.01 hrs, Volume= 7,881 cf
Outflow = 2.66 cfs @ 12.02 hrs, Volume= 7,883 cf, Atten= 2%, Lag= 0.5 min
Primary = 2.66 cfs @ 12.02 hrs, Volume= 7,883 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 22.23' @ 12.02 hrs Surf.Area= 100 sf Storage= 484 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 5.7 min (756.4 - 750.7)

Volume	Invert	Avail.Storage	Storage Description
#1	19.33'	45 cf	**2.00'W x 50.00'L x 2.25'H FocalPoint** 225 cf Overall x 20.0% Voids
#2	21.58'	505 cf	**Stormwater Planter (Prismatic)**Listed below (Recalc) -Impervious
		550 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
21.58	673	0	0
22.08	673	337	337
22.33	673	168	505

Device	Routing	Invert	Outlet Devices
#1	Primary	19.00'	**12.0" Round Culvert** L= 19.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 19.00' / 18.77' S= 0.0121 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	19.33'	**100.000 in/hr Exfiltration over Surface area**
#3	Device 1	22.08'	**8.0" Horiz. Orifice/Grate X 6.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.65 cfs @ 12.02 hrs HW=22.23' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 2.65 cfs of 4.93 cfs potential flow)
  ├**2=Exfiltration** (Exfiltration Controls 0.23 cfs)
  └**3=Orifice/Grate** (Weir Controls 2.42 cfs @ 1.27 fps)

Summary for Subcatchment 1A: Watershed 1A

Runoff = 0.49 cfs @ 12.02 hrs, Volume= 1,488 cf, Depth= 6.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.41"

	Area (sf)	CN	Description
*	2,893	98	Parking Lot
	2,893		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	96	0.0166	1.31		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 1B: Watershed 1B

Runoff = 0.53 cfs @ 12.01 hrs, Volume= 1,553 cf, Depth= 6.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.41"

	Area (sf)	CN	Description
	71	74	>75% Grass cover, Good, HSG C
*	3,008	98	Parking Lot
	3,079	97	Weighted Average
	71		2.31% Pervious Area
	3,008		97.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	64	0.0225	1.37		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 1C: Watershed 1C

Runoff = 0.56 cfs @ 12.01 hrs, Volume= 1,624 cf, Depth= 5.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.41"

	Area (sf)	CN	Description
	244	74	>75% Grass cover, Good, HSG C
*	3,039	98	Parking Lot
	3,283	96	Weighted Average
	244		7.43% Pervious Area
	3,039		92.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	57	0.0305	1.51		**Sheet Flow, A->B** Smooth surfaces n= 0.011 P2= 3.45"
0.3	53	0.0162	2.58		**Shallow Concentrated Flow, B->C** Paved Kv= 20.3 fps
0.9	110	Total			

Summary for Subcatchment 1D: Watershed 1D

Runoff = 0.14 cfs @ 12.01 hrs, Volume= 404 cf, Depth= 6.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.41"

	Area (sf)	CN	Description
*	786	98	building
	786		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0					**Direct Entry,**

Summary for Subcatchment 1E: Watershed 1E

Runoff = 0.25 cfs @ 12.01 hrs, Volume= 734 cf, Depth= 6.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.41"

	Area (sf)	CN	Description
	26	74	>75% Grass cover, Good, HSG C
*	1,402	98	Parking Lot
	1,428	98	Weighted Average
	26		1.82% Pervious Area
	1,402		98.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	42	0.0129	1.01		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 2: Ex. Roof Area & Planter Watershed 2

Runoff = 1.84 cfs @ 12.01 hrs, Volume= 5,414 cf, Depth= 6.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.41"

	Area (sf)	CN	Description
*	10,056	98	Roof
*	677	79	Planter
	10,733	97	Weighted Average
	677		6.31% Pervious Area
	10,056		93.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0					**Direct Entry,**

Summary for Subcatchment 3: Watershed 3

Runoff = 0.27 cfs @ 12.02 hrs, Volume= 699 cf, Depth= 4.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.41"

	Area (sf)	CN	Description
	1,655	74	>75% Grass cover, Good, HSG C
*	416	98	Sidewalks
	2,071	79	Weighted Average
	1,655		79.91% Pervious Area
	416		20.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0					**Direct Entry,**

Summary for Subcatchment 3A: Roof Area & Planter Watershed 3A

Runoff = 2.53 cfs @ 12.01 hrs, Volume= 7,443 cf, Depth= 6.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.41"

	Area (sf)	CN	Description
*	14,082	98	Roof
*	673	79	Planter
	14,755	97	Weighted Average
	673		4.56% Pervious Area
	14,082		95.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0					**Direct Entry,**

Summary for Subcatchment 3B: Watershed 3B

Runoff = 0.88 cfs @ 12.01 hrs, Volume= 2,587 cf, Depth= 6.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.41"

	Area (sf)	CN	Description
	135	74	>75% Grass cover, Good, HSG C
*	4,993	98	Parking Lot & portion of ex. building
	5,128	97	Weighted Average
	135		2.63% Pervious Area
	4,993		97.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	74	0.0180	1.29		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Reach DP-1: Ex. Catch Basin

Inflow Area = 22,202 sf, 95.41% Impervious, Inflow Depth = 6.06" for 25-Year event
Inflow = 3.75 cfs @ 12.02 hrs, Volume= 11,218 cf
Outflow = 3.75 cfs @ 12.02 hrs, Volume= 11,218 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3

Summary for Reach DP-2: Ex. Catch Basin

Inflow Area = 21,954 sf, 88.78% Impervious, Inflow Depth = 5.86" for 25-Year event
Inflow = 3.62 cfs @ 12.02 hrs, Volume= 10,730 cf
Outflow = 3.62 cfs @ 12.02 hrs, Volume= 10,730 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3

Summary for Pond 1P: Relocated Drain Inlet

Inflow Area = 3,079 sf, 97.69% Impervious, Inflow Depth = 6.05" for 25-Year event
Inflow = 0.53 cfs @ 12.01 hrs, Volume= 1,553 cf
Outflow = 0.53 cfs @ 12.01 hrs, Volume= 1,553 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.53 cfs @ 12.01 hrs, Volume= 1,553 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 24.20' @ 12.02 hrs
Flood Elev= 25.05'

Device	Routing	Invert	Outlet Devices
#1	Primary	22.75'	**12.0" Round 12" HDPE** L= 35.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 22.75' / 22.26' S= 0.0140 '/' Cc= 0.900

n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.01 hrs HW=24.09' TW=24.11' (Dynamic Tailwater)
↑—**1=12" HDPE** (Controls 0.00 cfs)

Summary for Pond 2P: Ex. Drainage Manhole

Inflow Area = 15,240 sf, 94.92% Impervious, Inflow Depth = 6.06" for 25-Year event
Inflow = 2.57 cfs @ 12.02 hrs, Volume= 7,702 cf
Outflow = 2.57 cfs @ 12.02 hrs, Volume= 7,702 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.57 cfs @ 12.02 hrs, Volume= 7,702 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 24.18' @ 12.02 hrs
Flood Elev= 26.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	22.16'	**12.0" Round 12" PVC** L= 101.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 22.16' / 20.74' S= 0.0140 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.55 cfs @ 12.02 hrs HW=24.16' TW=23.44' (Dynamic Tailwater)
↑—**1=12" PVC** (Inlet Controls 2.55 cfs @ 3.24 fps)

Summary for Pond 3P: Ex. Drain Inlet

Inflow Area = 21,416 sf, 95.25% Impervious, Inflow Depth = 6.06" for 25-Year event
Inflow = 3.62 cfs @ 12.02 hrs, Volume= 10,814 cf
Outflow = 3.62 cfs @ 12.02 hrs, Volume= 10,814 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.62 cfs @ 12.02 hrs, Volume= 10,814 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 23.45' @ 12.02 hrs
Flood Elev= 23.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.74'	**12.0" Round 12" PVC** L= 14.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.74' / 20.45' S= 0.0207 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.60 cfs @ 12.02 hrs HW=23.43' TW=21.97' (Dynamic Tailwater)
↑—**1=12" PVC** (Inlet Controls 3.60 cfs @ 4.59 fps)

Summary for Pond 4P: Ex. Manhole

Inflow Area = 22,202 sf, 95.41% Impervious, Inflow Depth = 6.06" for 25-Year event
Inflow = 3.75 cfs @ 12.02 hrs, Volume= 11,218 cf
Outflow = 3.75 cfs @ 12.02 hrs, Volume= 11,218 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.75 cfs @ 12.02 hrs, Volume= 11,218 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 21.38' @ 12.02 hrs
Flood Elev= 24.12'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.02'	**15.0" Round Ex. 15" HDPE** L= 8.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.02' / 19.97' S= 0.0063 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=3.74 cfs @ 12.02 hrs HW=21.37' TW=0.00' (Dynamic Tailwater)
↑—**1=Ex. 15" HDPE** (Barrel Controls 3.74 cfs @ 3.50 fps)

Summary for Pond 5P: Relocated Drain Inlet

Inflow Area = 2,893 sf,100.00% Impervious, Inflow Depth = 6.17" for 25-Year event
Inflow = 0.49 cfs @ 12.02 hrs, Volume= 1,488 cf
Outflow = 0.49 cfs @ 12.02 hrs, Volume= 1,488 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.49 cfs @ 12.02 hrs, Volume= 1,488 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 23.47' @ 12.02 hrs
Flood Elev= 23.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	21.20'	**12.0" Round 12" HDPE** L= 34.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 21.20' / 20.79' S= 0.0121 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.39 cfs @ 12.02 hrs HW=23.45' TW=23.43' (Dynamic Tailwater)
↑—**1=12" HDPE** (Inlet Controls 0.39 cfs @ 0.49 fps)

Summary for Pond 6P: Trench Drain

Inflow Area = 1,428 sf, 98.18% Impervious, Inflow Depth = 6.17" for 25-Year event
Inflow = 0.25 cfs @ 12.01 hrs, Volume= 734 cf
Outflow = 0.25 cfs @ 12.01 hrs, Volume= 734 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.25 cfs @ 12.01 hrs, Volume= 734 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 24.18' @ 12.02 hrs
Flood Elev= 25.96'

Device	Routing	Invert	Outlet Devices
#1	Primary	23.35'	**12.0" Round 12" HDPE** L= 34.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 23.35' / 22.26' S= 0.0321 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.01 hrs HW=24.05' TW=24.10' (Dynamic Tailwater)
└─**1=12" HDPE** (Controls 0.00 cfs)

Summary for Pond AS-1: Ex. Hydrodynamic Separator WQv = 0.49 cfs 25-Year = 3.62 cfs

Inflow Area = 21,416 sf, 95.25% Impervious, Inflow Depth = 6.06" for 25-Year event
Inflow = 3.62 cfs @ 12.02 hrs, Volume= 10,814 cf
Outflow = 3.62 cfs @ 12.02 hrs, Volume= 10,814 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.62 cfs @ 12.02 hrs, Volume= 10,814 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 21.98' @ 12.02 hrs
Flood Elev= 24.12'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.74'	**15.0" Round Ex. 15" RCP** L= 52.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.74' / 20.12' S= 0.0119 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf

Primary OutFlow Max=3.60 cfs @ 12.02 hrs HW=21.97' TW=21.37' (Dynamic Tailwater)
└─**1=Ex. 15" RCP** (Inlet Controls 3.60 cfs @ 2.94 fps)

Summary for Pond SP1: Ex. Stormwater Planter

Inflow Area = 10,733 sf, 93.69% Impervious, Inflow Depth = 6.05" for 25-Year event
Inflow = 1.84 cfs @ 12.01 hrs, Volume= 5,414 cf
Outflow = 1.81 cfs @ 12.02 hrs, Volume= 5,414 cf, Atten= 1%, Lag= 0.5 min
Primary = 1.81 cfs @ 12.02 hrs, Volume= 5,414 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 27.86' @ 12.02 hrs Surf.Area= 669 sf Storage= 907 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 132.6 min (878.9 - 746.3)

Volume	Invert	Avail.Storage	Storage Description
#1	26.50'	1,004 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
26.50	669	0	0
28.00	669	1,004	1,004

Device	Routing	Invert	Outlet Devices
#1	Primary	23.50'	**12.0" Round Culvert** L= 64.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 23.50' / 22.26' S= 0.0194 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	27.75'	**6.0" Horiz. Orifice/Grate X 10.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	26.50'	**2.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=1.80 cfs @ 12.02 hrs HW=27.86' TW=24.14' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.80 cfs of 5.75 cfs potential flow)
  ├─**2=Orifice/Grate** (Weir Controls 1.77 cfs @ 1.06 fps)
  └─**3=Exfiltration** (Exfiltration Controls 0.03 cfs)

mmary for Pond SP2: 1.0 Foot High Stormwater Planter 673 SQ. FT. W/ 6 Outlets & 100 SF FocalPoint Sy

Inflow Area = 19,883 sf, 95.94% Impervious, Inflow Depth = 6.05" for 25-Year event
Inflow = 3.40 cfs @ 12.01 hrs, Volume= 10,030 cf
Outflow = 3.36 cfs @ 12.02 hrs, Volume= 10,031 cf, Atten= 1%, Lag= 0.4 min
Primary = 3.36 cfs @ 12.02 hrs, Volume= 10,031 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 22.26' @ 12.02 hrs Surf.Area= 100 sf Storage= 502 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 5.8 min (752.1 - 746.3)

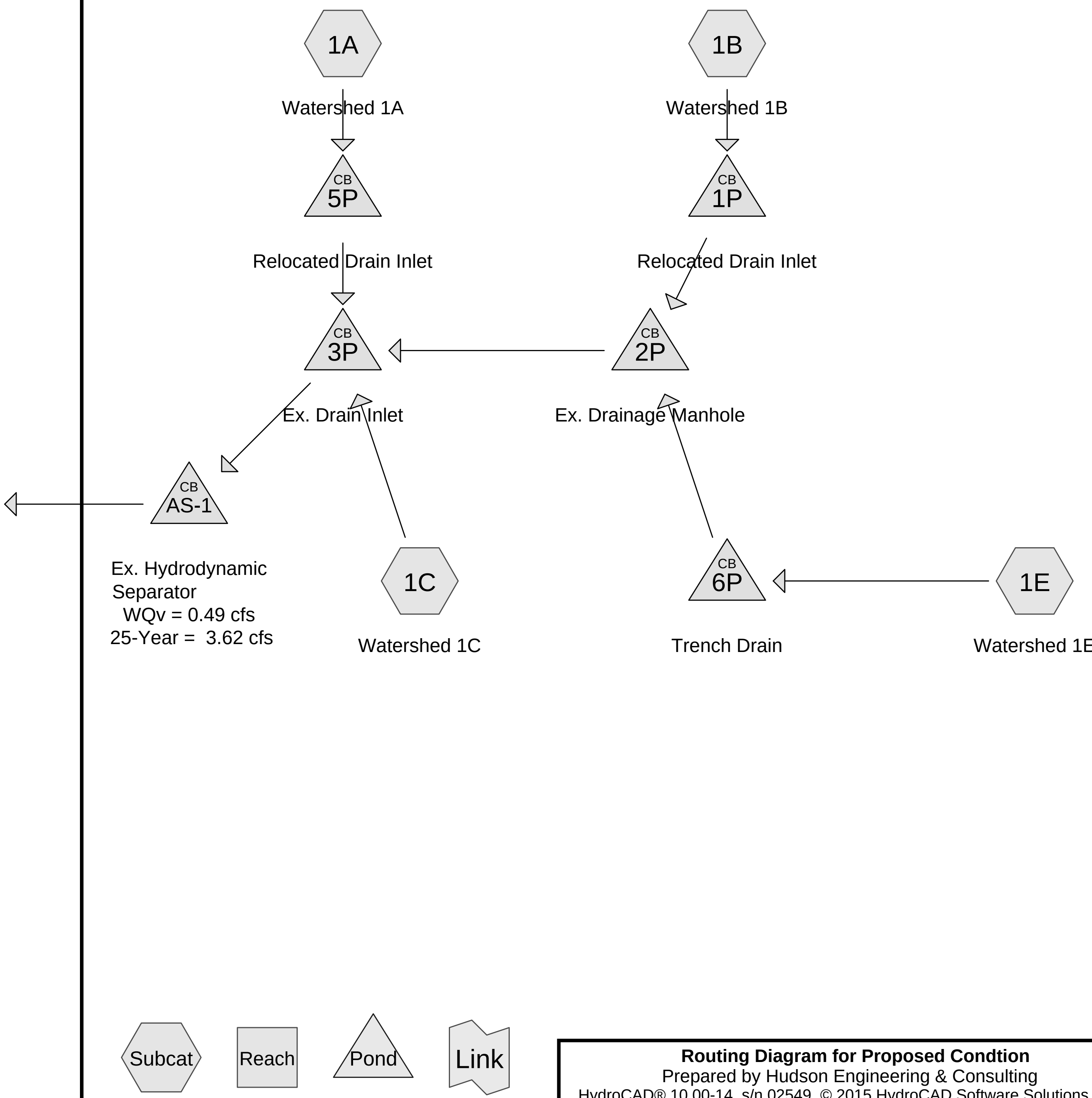
Volume	Invert	Avail.Storage	Storage Description
#1	19.33'	45 cf	**2.00'W x 50.00'L x 2.25'H FocalPoint** 225 cf Overall x 20.0% Voids
#2	21.58'	505 cf	**Stormwater Planter (Prismatic)**Listed below (Recalc) -Impervious
		550 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
21.58	673	0	0
22.08	673	337	337
22.33	673	168	505

Device	Routing	Invert	Outlet Devices
#1	Primary	19.00'	**12.0" Round Culvert** L= 19.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 19.00' / 18.77' S= 0.0121 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	19.33'	**100.000 in/hr Exfiltration over Surface area**
#3	Device 1	22.08'	**8.0" Horiz. Orifice/Grate X 6.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.35 cfs @ 12.02 hrs HW=22.26' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 3.35 cfs of 4.96 cfs potential flow)
  ├─**2=Exfiltration** (Exfiltration Controls 0.23 cfs)
  └─**3=Orifice/Grate** (Weir Controls 3.11 cfs @ 1.38 fps)

8). Water Quality Calculations



Routing Diagram for Proposed Condtion
Prepared by Hudson Engineering & Consulting

Summary for Subcatchment 1A: Watershed 1A

Runoff = 0.13 cfs @ 12.02 hrs, Volume= 363 cf, Depth= 1.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.73"

	Area (sf)	CN	Description
*	2,893	98	Parking Lot
	2,893		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	96	0.0166	1.31		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 1B: Watershed 1B

Runoff = 0.13 cfs @ 12.01 hrs, Volume= 361 cf, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.73"

	Area (sf)	CN	Description
	71	74	>75% Grass cover, Good, HSG C
*	3,008	98	Parking Lot
	3,079	97	Weighted Average
	71		2.31% Pervious Area
	3,008		97.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	64	0.0225	1.37		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 1C: Watershed 1C

Runoff = 0.13 cfs @ 12.01 hrs, Volume= 360 cf, Depth= 1.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.73"

	Area (sf)	CN	Description
	244	74	>75% Grass cover, Good, HSG C
*	3,039	98	Parking Lot
	3,283	96	Weighted Average
	244		7.43% Pervious Area
	3,039		92.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	57	0.0305	1.51		**Sheet Flow, A->B** Smooth surfaces n= 0.011 P2= 3.45"
0.3	53	0.0162	2.58		**Shallow Concentrated Flow, B->C** Paved Kv= 20.3 fps
0.9	110	Total			

Summary for Subcatchment 1E: Watershed 1E

Runoff = 0.06 cfs @ 12.01 hrs, Volume= 179 cf, Depth= 1.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.73"

	Area (sf)	CN	Description
	26	74	>75% Grass cover, Good, HSG C
*	1,402	98	Parking Lot
	1,428	98	Weighted Average
	26		1.82% Pervious Area
	1,402		98.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	42	0.0129	1.01		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Pond 1P: Relocated Drain Inlet

Inflow Area = 3,079 sf, 97.69% Impervious, Inflow Depth = 1.41" for WQv event
Inflow = 0.13 cfs @ 12.01 hrs, Volume= 361 cf
Outflow = 0.13 cfs @ 12.01 hrs, Volume= 361 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.13 cfs @ 12.01 hrs, Volume= 361 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 22.95' @ 12.01 hrs
Flood Elev= 25.05'

Device	Routing	Invert	Outlet Devices
#1	Primary	22.75'	**12.0" Round 12" HDPE** L= 35.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 22.75' / 22.26' S= 0.0140 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.13 cfs @ 12.01 hrs HW=22.95' TW=22.40' (Dynamic Tailwater)
↑—**1=12" HDPE** (Inlet Controls 0.13 cfs @ 1.20 fps)

Summary for Pond 2P: Ex. Drainage Manhole

Inflow Area = 4,507 sf, 97.85% Impervious, Inflow Depth = 1.44" for WQv event
Inflow = 0.20 cfs @ 12.01 hrs, Volume= 540 cf
Outflow = 0.20 cfs @ 12.01 hrs, Volume= 540 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.20 cfs @ 12.01 hrs, Volume= 540 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 22.40' @ 12.01 hrs
Flood Elev= 26.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	22.16'	**12.0" Round 12" PVC** L= 101.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 22.16' / 20.74' S= 0.0140 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.20 cfs @ 12.01 hrs HW=22.40' TW=21.21' (Dynamic Tailwater)
↑—**1=12" PVC** (Inlet Controls 0.20 cfs @ 1.33 fps)

Summary for Pond 3P: Ex. Drain Inlet

Inflow Area = 10,683 sf, 96.81% Impervious, Inflow Depth = 1.42" for WQv event
Inflow = 0.46 cfs @ 12.01 hrs, Volume= 1,263 cf
Outflow = 0.46 cfs @ 12.01 hrs, Volume= 1,263 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.46 cfs @ 12.01 hrs, Volume= 1,263 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 21.21' @ 12.01 hrs
Flood Elev= 23.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.74'	**12.0" Round 12" PVC** L= 14.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.74' / 20.45' S= 0.0207 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.46 cfs @ 12.01 hrs HW=21.21' TW=21.09' (Dynamic Tailwater)
↑—**1=12" PVC** (Outlet Controls 0.46 cfs @ 1.84 fps)

Summary for Pond 5P: Relocated Drain Inlet

Inflow Area = 2,893 sf,100.00% Impervious, Inflow Depth = 1.51" for WQv event
Inflow = 0.13 cfs @ 12.02 hrs, Volume= 363 cf
Outflow = 0.13 cfs @ 12.02 hrs, Volume= 363 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.13 cfs @ 12.02 hrs, Volume= 363 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 21.42' @ 12.02 hrs
Flood Elev= 23.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	21.20'	**12.0" Round 12" HDPE** L= 34.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 21.20' / 20.79' S= 0.0121 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.13 cfs @ 12.02 hrs HW=21.42' TW=21.21' (Dynamic Tailwater)
↑—**1=12" HDPE** (Outlet Controls 0.13 cfs @ 1.55 fps)

Summary for Pond 6P: Trench Drain

Inflow Area = 1,428 sf, 98.18% Impervious, Inflow Depth = 1.51" for WQv event
Inflow = 0.06 cfs @ 12.01 hrs, Volume= 179 cf
Outflow = 0.06 cfs @ 12.01 hrs, Volume= 179 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.06 cfs @ 12.01 hrs, Volume= 179 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 23.49' @ 12.01 hrs
Flood Elev= 25.96'

Device	Routing	Invert	Outlet Devices
#1	Primary	23.35'	**12.0" Round 12" HDPE** L= 34.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 23.35' / 22.26' S= 0.0321 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.06 cfs @ 12.01 hrs HW=23.49' TW=22.40' (Dynamic Tailwater)
↑—**1=12" HDPE** (Inlet Controls 0.06 cfs @ 0.99 fps)

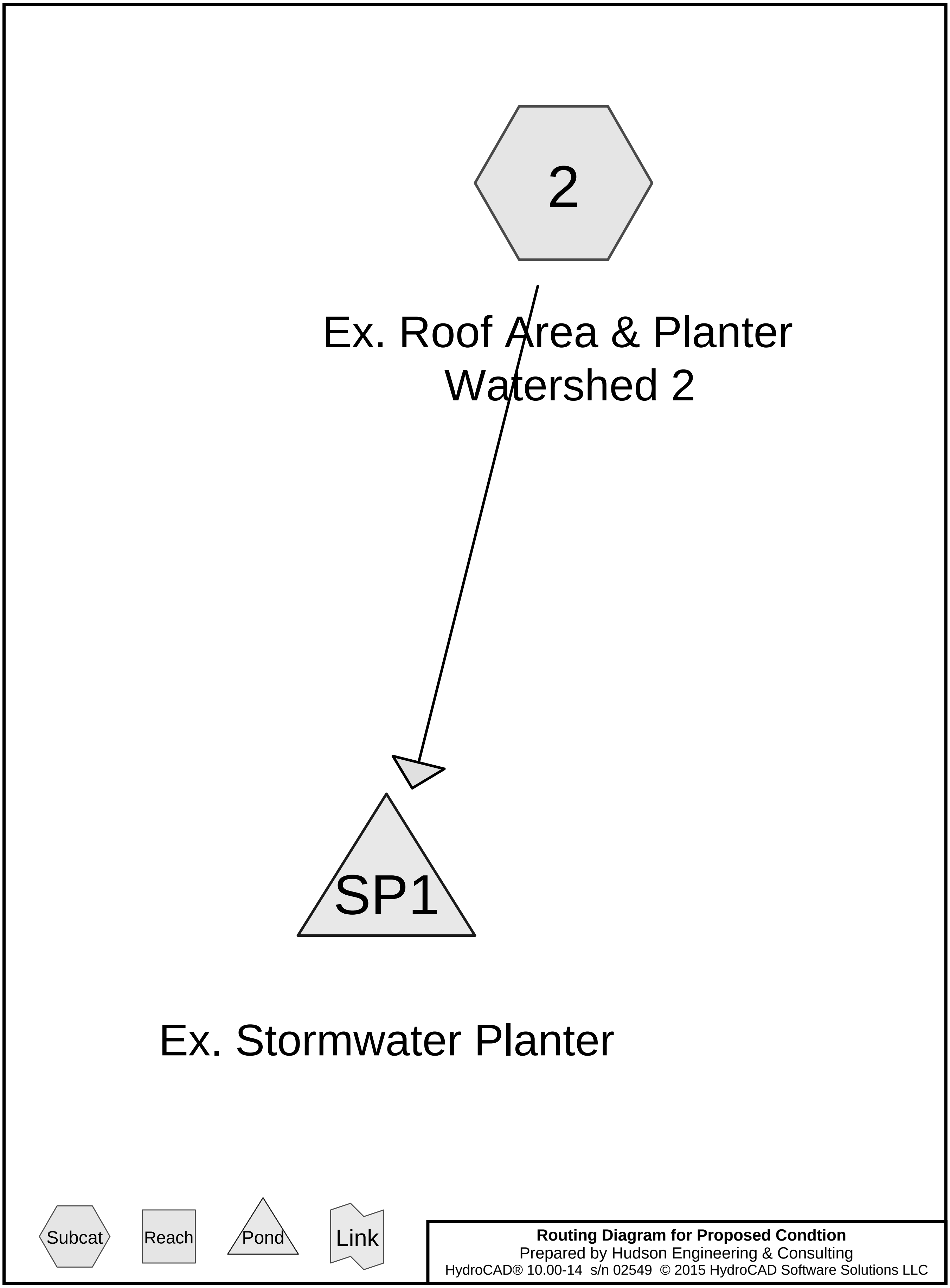
Summary for Pond AS-1: Ex. Hydrodynamic Separator WQv = 0.49 cfs 25-Year = 3.62 cfs

Inflow Area = 10,683 sf, 96.81% Impervious, Inflow Depth = 1.42" for WQv event
Inflow = 0.46 cfs @ 12.01 hrs, Volume= 1,263 cf
Outflow = 0.46 cfs @ 12.01 hrs, Volume= 1,263 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.46 cfs @ 12.01 hrs, Volume= 1,263 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 21.10' @ 12.01 hrs
Flood Elev= 24.12'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.74'	**15.0" Round Ex. 15" RCP** L= 52.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.74' / 20.12' S= 0.0119 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf

Primary OutFlow Max=0.46 cfs @ 12.01 hrs HW=21.09' TW=20.43' (Dynamic Tailwater)
↑—**1=Ex. 15" RCP** (Inlet Controls 0.46 cfs @ 1.60 fps)


2
Ex. Roof Area & Planter
Watershed 2
SP1
Ex. Stormwater Planter
Subcat
Reach
Pond
Link
Routing Diagram for Proposed Condtion
Prepared by Hudson Engineering & Consulting
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Summary for Subcatchment 2: Ex. Roof Area & Planter Watershed 2

Runoff = 0.46 cfs @ 12.01 hrs, Volume= 1,259 cf, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.73"

	Area (sf)	CN	Description
*	10,056	98	Roof
*	677	79	Planter
	10,733	97	Weighted Average
	677		6.31% Pervious Area
	10,056		93.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0					**Direct Entry,**

Summary for Pond SP1: Ex. Stormwater Planter

Inflow Area = 10,733 sf, 93.69% Impervious, Inflow Depth = 1.41" for WQv event
Inflow = 0.46 cfs @ 12.01 hrs, Volume= 1,259 cf
Outflow = 0.03 cfs @ 11.57 hrs, Volume= 1,259 cf, Atten= 93%, Lag= 0.0 min
Primary = 0.03 cfs @ 11.57 hrs, Volume= 1,259 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 27.22' @ 12.99 hrs Surf.Area= 669 sf Storage= 482 cf

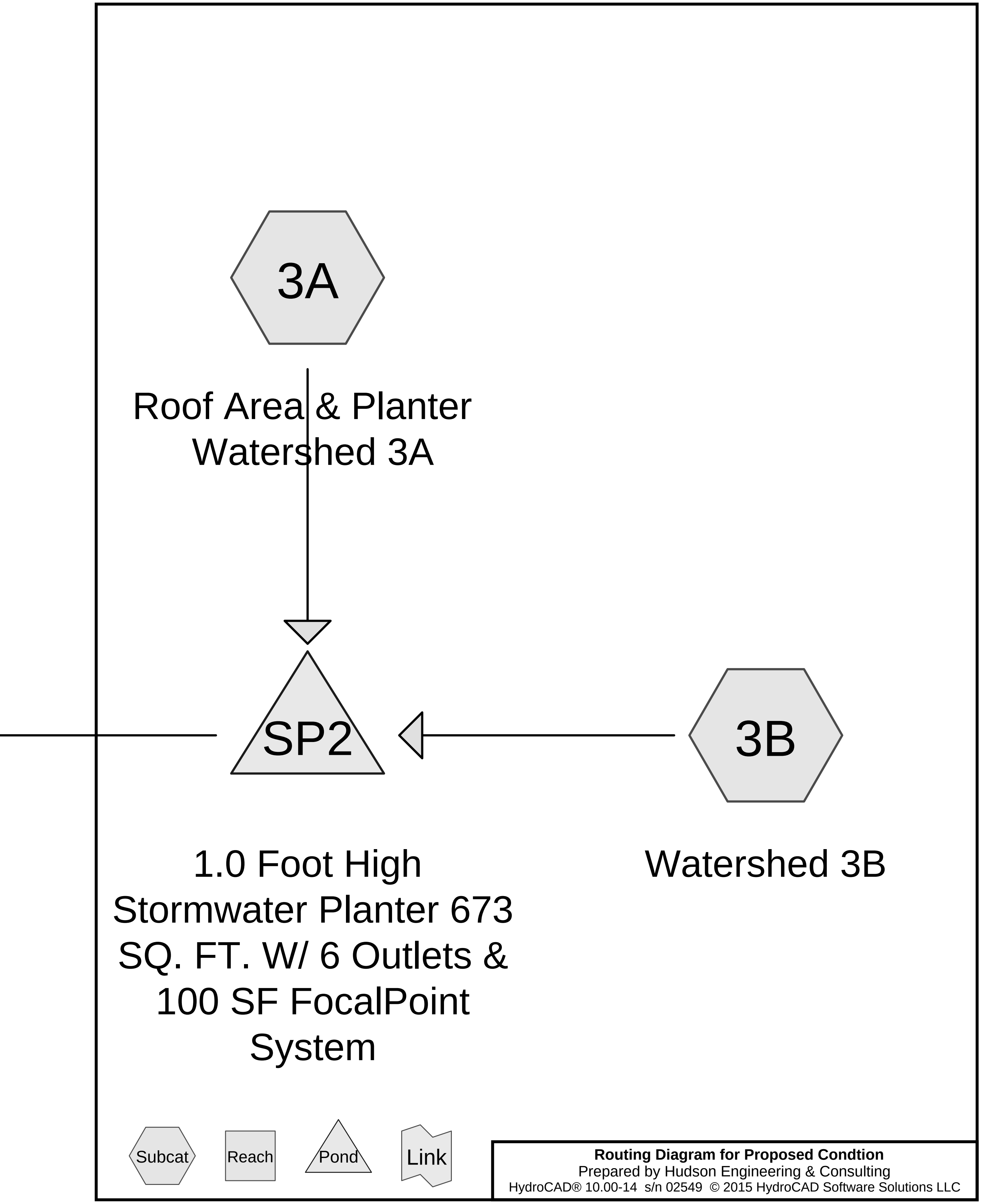
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 120.3 min (899.3 - 778.9)

Volume	Invert	Avail.Storage	Storage Description
#1	26.50'	1,004 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
26.50	669	0	0
28.00	669	1,004	1,004

Device	Routing	Invert	Outlet Devices
#1	Primary	23.50'	**12.0" Round Culvert** L= 64.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 23.50' / 22.26' S= 0.0194 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	27.75'	**6.0" Horiz. Orifice/Grate X 10.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	26.50'	**2.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.03 cfs @ 11.57 hrs HW=26.52' (Free Discharge)
└─**1=Culvert** (Passes 0.03 cfs of 4.74 cfs potential flow)
  ├─**2=Orifice/Grate** (Controls 0.00 cfs)
  └─**3=Exfiltration** (Exfiltration Controls 0.03 cfs)


3A
Roof Area & Planter Watershed 3A
SP2
3B
1.0 Foot High Stormwater Planter 673 SQ. FT. W/ 6 Outlets & 100 SF FocalPoint System
Watershed 3B
Subcat
Reach
Pond
Link
Routing Diagram for Proposed Condtion
Prepared by Hudson Engineering & Consulting
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Summary for Subcatchment 3A: Roof Area & Planter Watershed 3A

Runoff = 0.63 cfs @ 12.01 hrs, Volume= 1,730 cf, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.73"

	Area (sf)	CN	Description
*	14,082	98	Roof
*	673	79	Planter
	14,755	97	Weighted Average
	673		4.56% Pervious Area
	14,082		95.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0					**Direct Entry,**

Summary for Subcatchment 3B: Watershed 3B

Runoff = 0.22 cfs @ 12.01 hrs, Volume= 601 cf, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.73"

	Area (sf)	CN	Description
	135	74	>75% Grass cover, Good, HSG C
*	4,993	98	Parking Lot & portion of ex. building
	5,128	97	Weighted Average
	135		2.63% Pervious Area
	4,993		97.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	74	0.0180	1.29		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

mmary for Pond SP2: 1.0 Foot High Stormwater Planter 673 SQ. FT. W/ 6 Outlets & 100 SF FocalPoint Sy

Inflow Area = 19,883 sf, 95.94% Impervious, Inflow Depth = 1.41" for WQv event
Inflow = 0.85 cfs @ 12.01 hrs, Volume= 2,332 cf
Outflow = 0.23 cfs @ 11.78 hrs, Volume= 2,334 cf, Atten= 73%, Lag= 0.0 min
Primary = 0.23 cfs @ 11.78 hrs, Volume= 2,334 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 22.03' @ 12.30 hrs Surf.Area= 100 sf Storage= 347 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 6.4 min (785.4 - 778.9)

Volume	Invert	Avail.Storage	Storage Description
#1	19.33'	45 cf	**2.00'W x 50.00'L x 2.25'H FocalPoint** 225 cf Overall x 20.0% Voids
#2	21.58'	505 cf	**Stormwater Planter (Prismatic)**Listed below (Recalc) -Impervious
		550 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
21.58	673	0	0
22.08	673	337	337
22.33	673	168	505

Device	Routing	Invert	Outlet Devices
#1	Primary	19.00'	**12.0" Round Culvert** L= 19.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 19.00' / 18.77' S= 0.0121 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	19.33'	**100.000 in/hr Exfiltration over Surface area**
#3	Device 1	22.08'	**8.0" Horiz. Orifice/Grate X 6.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.23 cfs @ 11.78 hrs HW=19.37' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.23 cfs of 0.42 cfs potential flow)
  ├─**2=Exfiltration** (Exfiltration Controls 0.23 cfs)
  └─**3=Orifice/Grate** (Controls 0.00 cfs)

9.) AquaSwirl Sizing Chart & Spec Sheet

Aqua-Swirl®
Stormwater Treatment System

Inspection and Maintenance Manual

AquaShield™, Inc.
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AquaShield™, Inc
Stormwater Treatment Solutions

The highest priority of AquaShield™, Inc. (AquaShield™) is to protect waterways by providing stormwater treatment solutions to businesses across the world. These solutions have a reliable foundation based on over 20 years of water treatment experience.

Local regulators, engineers, and contractors have praised the AquaShield™ systems for their simple design and ease of installation. All the systems are fabricated from high performance, durable and lightweight materials. Contractors prefer the quick and simple installation of our structures that saves them money.

The patented line of AquaShield™ stormwater treatment products that provide high levels of stormwater treatment include the following:

- **Aqua-Swirl® Stormwater Treatment System:** hydrodynamic separator, which provides a highly effective means for the removal of sediment, floating debris and free-oil.
- **Aqua-Filter™ Stormwater Filtration System:** treatment train stormwater filtration system capable of removing gross contaminants, fine sediments, waterborne hydrocarbons, heavy metals and total phosphorous.

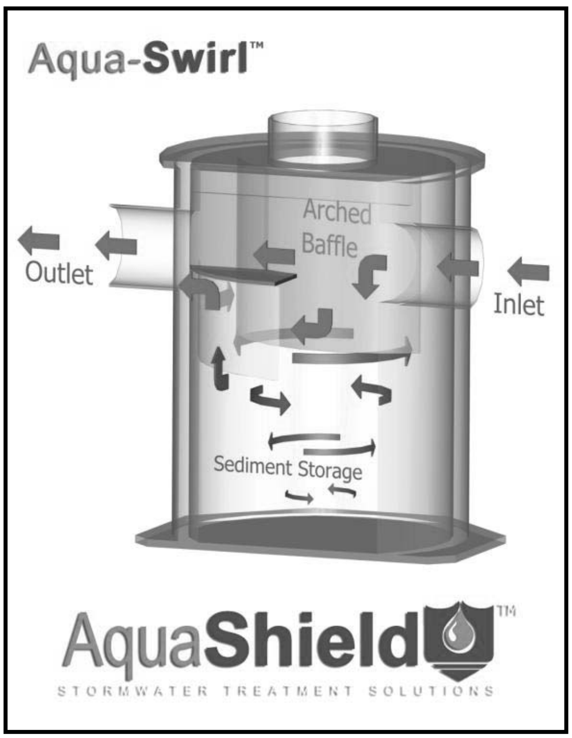
Aqua-Swirl® Stormwater Treatment System

Aqua-Filter™ Stormwater Filtration System

Aqua-Swirl® Stormwater Treatment System

The patented Aqua-Swirl® Stormwater Treatment System is a single chamber hydrodynamic separator which provides a highly effective means for the removal of sediment, free oil, and floating debris. Both treatment and storage are accomplished in the swirl chamber without the use of multiple or "blind" chambers. Independent laboratory and field performance verifications have shown that the Aqua-Swirl® achieves over 80% suspended solids removal efficiency on a net annual basis.

The Aqua-Swirl® is most commonly installed in an "off-line" configuration. Or, depending on local regulations, an "in-line" (on-line) conveyance flow diversion (CFD) system can be used. The CFD model allows simple installation by connecting directly to the existing storm conveyance pipe thereby providing full treatment of the "first flush," while the peak design storm is diverted and channeled through the main conveyance pipe.



The patented Aqua-Swirl® Stormwater Treatment System provides a highly effective means for the removal of sediment, floating debris, and free oil. Swirl technology, or vortex separation, is a proven form of treatment utilized in the stormwater industry to accelerate gravitational separation.

Floatable debris in the Aqua-Swirl®

Each Aqua-Swirl® is constructed of high performance, lightweight and durable materials including polymer coated steel (PCS), high density polyethylene (HDPE), or fiberglass reinforced polymer (FRP). These materials eliminate the need for heavy lifting equipment during installation.

System Operation

The treatment operation begins when stormwater enters the Aqua-Swirl® through a tangential inlet pipe that produces a circular (or vortex) flow pattern that causes contaminates to settle to the base of the unit. Since stormwater flow is intermittent by nature, the Aqua-Swirl® retains water between storm events providing both dynamic and quiescent settling of solids. The dynamic settling occurs during each storm event while the quiescent settling takes place between successive storms. A combination of gravitational and hydrodynamic drag forces encourages the solids to drop out of the flow and migrate to the center of the chamber where velocities are the lowest.

The treated flow then exits the Aqua-Swirl® behind the arched outer baffle. The top of the baffle is sealed across the treatment channel, thereby eliminating floatable pollutants from escaping the system. A vent pipe is extended up the riser to expose the backside of the baffle to atmospheric conditions, preventing a siphon from forming at the bottom of the baffle.

Custom Applications

The Aqua-Swirl® system can be modified to fit a variety of purposes in the field, and the angles for inlet and outlet lines can be modified to fit most applications. The photo below demonstrates the flexibility of Aqua-Swirl® installations using a “twin” configuration in order to double the water quality treatment capacity. Two Aqua-Swirl® units were placed side by side in order to treat a high volume of water while occupying a small amount of space.

Custom designed AS-9 Twin Aqua-Swirl®

Retrofit Applications

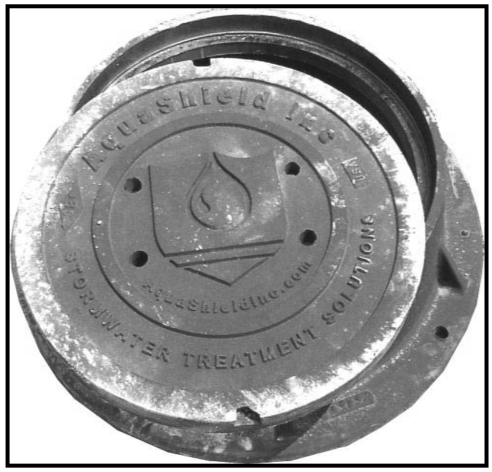
The Aqua-Swirl® system is designed so that it can easily be used for retrofit applications. With the invert of the inlet and outlet pipe at the same elevation, the Aqua-Swirl® can easily be connected directly to the existing storm conveyance drainage system. Furthermore, because of the lightweight nature and small footprint of the Aqua-Swirl®, existing infrastructure utilities (i.e., wires, poles, trees) would be unaffected by installation.

AquaShield™ Product System Maintenance

The long term performance of any stormwater treatment structure, including manufactured or land based systems, depends on a consistent maintenance plan. Inspection and maintenance functions are simple and easy for the AquaShield™ Stormwater Treatment Systems allowing all inspections to be performed from the surface.

It is important that a routine inspection and maintenance program be established for each unit based on: (a) the volume or load of the contaminants of concern, (b) the frequency of releases of contaminants at the facility or location, and (c) the nature of the area being drained.

In order to ensure that our systems are being maintained properly, AquaShield™ offers a maintenance solution to all of our customers. We will arrange to have maintenance performed.



Inspection

All AquaShield™ products can be inspected from the surface, eliminating the need to enter the systems to determine when cleanout should be performed. In most cases, AquaShield™ recommends a quarterly inspection for the first year of operation to develop an appropriate schedule of maintenance. Based on experience of the system's first year in operation, we recommend that the inspection schedule be revised to reflect the site-specific conditions encountered. Typically, the inspection schedule for subsequent years is reduced to semi-annual inspection.

Aqua-Swirl® Maintenance

The Aqua-Swirl® has been designed to minimize and simplify the inspection and maintenance process. The single chamber system can be inspected and maintained entirely from the surface thereby eliminating the need for confined space entry. Furthermore, the entire structure (specifically, the floor) is accessible for visual inspection from the surface. There are no areas of the structure that are blocked from visual inspection or periodic cleaning. Inspection of any free-floating oil and floatable debris can be directly observed and maintained through the manhole access provided directly over the swirl chamber.

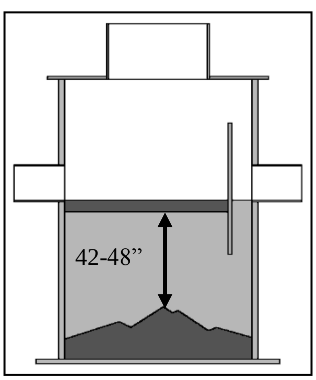
Aqua-Swirl® Inspection Procedure

To inspect the Aqua-Swirl®, a hook is needed to remove the manhole cover. AquaShield™ provides a customized manhole cover with our distinctive logo to make it easy for maintenance crews to locate the system in the field. We also provide a permanent metal information plate affixed inside the access riser which provides our contact information, the Aqua-Swirl® model size, and serial number.

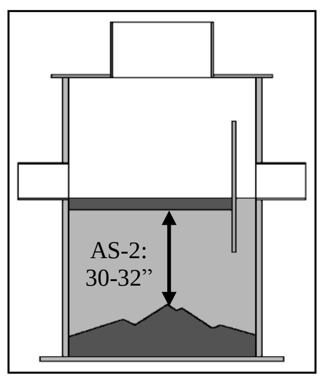
The only tools needed to inspect the Aqua-Swirl® system are a flashlight and a measuring device such as a stadia rod or pole. Given the easy and direct accessibility provided, floating oil and debris can be observed directly from the surface. Sediment depths can easily be determined by lowering a measuring device to the top of the sediment pile and to the surface of the water.

Sediment inspection using a stadia rod in a single chamber

The maintenance trigger for Aqua-Swirl® Models AS-3 through AS-13 occurs when the sediment pile is within 42 to 48 inches of the standing water surface. For the Aqua-Swirl® Model AS-2, maintenance is needed when the top of the sediment pile is measured to be 30 to 32 inches below the standing water surface.



Maintenance trigger for Aqua-Swirl® Models AS-3 through AS-13 occurs when sediment pile is 42-48 inches below water surface.



Maintenance trigger for Aqua-Swirl® Model AS-2 occurs when sediment pile is 30 to 32 inches below water surface.

It should be noted that in order to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the *top* of the sediment pile. Keep in mind that the finer sediment at the top of the pile may offer less resistance to the measuring device than the larger particles which typically occur deeper within the sediment pile.

The Aqua-Swirl® design allows for the sediment to accumulate in a semi-conical fashion as illustrated above. That is, the depth to sediment as measured below the water surface may be less in the center of the swirl chamber; and likewise, may be greater at the edges of the swirl chamber.

Aqua-Swirl® Cleanout Procedure

Cleaning the Aqua-Swirl® is simple and quick. Free-floating oil and floatable debris can be observed and removed directly through the 30-inch service access riser provided. A vacuum truck is typically used to remove the accumulated sediment and debris. An advantage of the Aqua-Swirl® design is that the entire sediment storage area can be reached with a vacuum hose from the surface (reaching all the sides). Since there are no multiple or limited (hidden or "blind") chambers in the Aqua-Swirl®, there are no restrictions to impede on-site maintenance tasks.

Disposal of Recovered Materials

Disposal of recovered material is typically handled in the same fashion as catch basin cleanouts. AquaShield™ recommends that all maintenance activities be performed in accordance with appropriate health and safety practices for the tasks and equipment being used.

AquaShield™ also recommends that all materials removed from the Aqua-Swirl® and any external structures (e.g, bypass features) be handled and disposed in full accordance with any applicable local and state requirements.

Vacuum truck quickly cleans the Aqua-Swirl®
from a single chamber

Aqua-Swirl® Inspection and Maintenance Work Sheets on following pages

Aqua-Swirl® Inspection and Maintenance Manual
Work Sheets

SITE and OWNER INFORMATION

Site Name: ______________________________

Site Location: ______________________________

Date: ____________________ Time: ____________________

Inspector Name: ______________________________

Inspector Company: ____________________ Phone #: ____________________

Owner Name: ______________________________

Owner Address: ______________________________

Owner Phone #: ____________________ Emergency Phone #: ____________________

INSPECTIONS

I. Floatable Debris and Oil

1. Remove manhole lid to expose liquid surface of the Aqua-Swirl®.
2. Remove floatable debris with basket or net if any present.
3. If oil is present, measure its depth. Clean liquids from system if one half (½) inch or more oil is present.

   Note: Water in Aqua-Swirl® can appear black and similar to oil due to the dark body of the surrounding structure. Oil may appear darker than water in the system and is usually accompanied by oil stained debris (e.g. Styrofoam, etc.). The depth of oil can be measured with an oil/water interface probe, a stadia rod with water finding paste, a coliwasa, or collect a representative sample with a jar attached to a rod.

II. Sediment Accumulation

1. Lower measuring device (e.g. stadia rod) into swirl chamber through service access provided until top of sediment pile is reached.
2. Record distance to top of sediment pile from top of standing water: ____________ inches
3. For Aqua-Swirl® Models AS-3 through AS-13, schedule cleaning if value in Step #2 is 48 to 42 inches or less.
4. For Aqua-Swirl® Model AS-2, schedule cleaning if value in Step #2 is 32 to 30 inches or less.

III. Diversion Structures (External Bypass Features)

If a diversion (external bypass) configuration is present, it should be inspected as follows:

1. Inspect weir or other bypass feature for structural decay or damage. Weirs are more susceptible to damage than off-set piping and should be checked to confirm that they are not crumbling (concrete or brick) or decaying (steel).
2. Inspect diversion structure and bypass piping for signs of structural damage or blockage from debris or sediment accumulation.
3. When feasible, measure elevations on diversion weir or piping to ensure it is consistent with site plan designs.
4. Inspect downstream (convergence) structure(s) for sign of blockage or structural failure as noted above.

CLEANING

Schedule cleaning with local vactor company or AquaShield™ to remove sediment, oil and other floatable pollutants. The captured material generally does not require special treatment or handling for disposal. Site-specific conditions or the presence of known contaminants may necessitate that appropriate actions be taken to clean and dispose of materials captured and retained by the Aqua-Swirl®. All cleaning activities should be performed in accordance with property health and safety procedures.

AquaShield™ always recommends that all materials removed from the Aqua-Swirl® during the maintenance process be handled and disposed in accordance with local and state environmental or other regulatory requirements.

MAINTENANCE SCHEDULE

I. During Construction

Inspect the Aqua-Swirl® every three (3) months and clean the system as needed. The Aqua-Swirl® should be inspected and cleaned at the end of construction regardless of whether it has reached its maintenance trigger.

II. First Year Post-Construction

Inspect the Aqua-Swirl® every three (3) months and clean the system as needed.

Inspect and clean the system once annually regardless of whether it has reached its sediment or floatable pollutant storage capacity.

III. Second and Subsequent Years Post-Construction

If the Aqua-Swirl® did not reach full sediment or floatable pollutant capacity in the First Year Post-Construction period, the system can be inspected and cleaned once annually.

If the Aqua-Swirl® reached full sediment or floatable pollutant capacity in less than 12 months in the First Year Post-Construction period, the system should be inspected once every six (6) months and cleaned as needed. The Aqua-Swirl® should be cleaned annually regardless of whether it reaches its sediment or floatable pollutant capacity.

IV. Bypass Structures

Bypass structures should be inspected whenever the Aqua-Swirl® is inspected. Maintenance should be performed on bypass structures as needed.

MAINTENANCE COMPANY INFORMATION

Company Name: ____

Street Address: ____

City: ______________________ State/Prov.:________ Zip/Postal Code: __________

Contact: ______________________________ Title: _____________

Office Phone: ______________________ Cell Phone: _________________

ACTIVITY LOG

Date of Cleaning: __________________ (Next inspection should be 3 months from this data for first year).

Time of Cleaning: Start: __________________ End: __________________

Date of Next Inspection: ______________

Floatable debris present: Yes No

Notes: ____

____

____

Oil present: Yes No Oil depth (inches): ______________________

Measurement method and notes: ______________________________

____

____

STRUCTURAL CONDITIONS and OBSERVATIONS

Structural damage: Yes No Where: ______________________________

Structural wear: Yes No Where: ______________________________

Odors present: Yes No Describe: ______________________________

Clogging: Yes No Describe: ______________________________

Other Observations: ______________________________

____

____

NOTES

Additional Comments and/or Actions To Be Taken	Time Frame

ATTACHMENTS

- Attach site plan showing Aqua-Swirl® location.
- Attach detail drawing showing Aqua-Swirl® dimensions and model number.
- If a diversion configuration is used, attach details showing basic design and elevations (where feasible).

Aqua-Swirl®

TABULAR MAINTENANCE SCHEDULE

Date Construction Started: ______________________________

Date Construction Ended: ______________________________

During Construction

	Month											
Activity	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Inspect and Clean as needed			X			X			X			X
Inspect Bypass and maintain as needed			X			X			X			X
Clean System*												X*

* The Aqua-Swirl® should be cleaned **once a year** regardless of whether it has reached full pollutant storage capacity. In addition, the system should be cleaned at the **end of construction** regardless of whether it has reach full pollutant storage capacity.

First Year Post-Construction

	Month											
Activity	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Inspect and Clean as needed			X			X			X			X
Inspect Bypass and maintain as needed			X			X			X			X
Clean System*												X*

* The Aqua-Swirl® should be cleaned **once a year** regardless of whether it has reached full pollutant storage capacity.

Second and Subsequent Years Post-Construction

	Month											
Activity	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Inspect and Clean as needed												X*
Inspect Bypass, maintain as needed												X*
Clean System*												X*

* If the Aqua-Swirl® did **not** reach full sediment or floatable pollutant capacity in the First Year Post-Construction period, the system can be inspected and cleaned once annually.

If the Aqua-Swirl® **reached** full sediment or floatable pollutant capacity in less than 12 months in the First Year Post-Construction period, the system should be inspected once every six (6) months or more frequently if past history warrants, and cleaned as needed. The Aqua-Swirl® should be cleaned annually regardless of whether it reaches its full sediment or floatable pollutant capacity.

Aqua-Swirl™ Sizing Chart *(English)*

Aqua-Swirl™ Model	Swirl Chamber Diameter (ft.)	Maximum Stub-Out Pipe Outer Diameter (in.)		Water Quality Treatment Flow[2] (cfs)	Oil/Debris Storage Capacity (gal)	Sediment Storage Capacity (ft^3)
		On/Offline	CFD[1]			
AS-2	2.50	8	12	1.1	37	10
AS-3	3.25	10	16	1.8	110	20
AS-4	4.25	12	18	3.2	190	32
AS-5	5.00	12	24	4.4	270	45
AS-6	6.00	14	30	6.3	390	65
AS-7	7.00	16	36	8.6	540	90
AS-8	8.00	18	42	11.2	710	115
AS-9	9.00	20	48	14.2	910	145
AS-10	10.0	22	54	17.5	1130	180
AS-12	12.0	24	48	25.2	1698	270
AS-XX	Custom	--	--	>26	--	--

***Higher water quality treatment flow rates can be designed with multiple swirls.**

1) *The **Aqua-Swirl™ Conveyance Flow Diversion (CFD)** provides full treatment of the "first flush," while the peak design storm is diverted and channeled through the main conveyance pipe. Please refer to your local representative for more information.*

2) *Many regulatory agencies are establishing "water quality treatment flow rates" for their areas based on the initial movement of pollutants into the storm drainage system. The treatment flow rate of the Aqua-Swirl™ system is engineered to meet or exceed the local water quality treatment criteria. This **"water quality treatment flow rate"** typically represents approximately 90% to 95% of the total annual runoff volume.*

The design and orientation of the Aqua-Filter™ generally entails some degree of customization. For assistance in design and specific sizing using historical rainfall data, please refer to an AquaShield™ representative or visit our website at www.AquaShieldInc.com. CAD details and specifications are available upon request.

10.) FocalPoint Biofilter System

Designing with FocalPoint in New York

Utilizing a High Performance Modular Biofiltration System for New Development, Redevelopment and Retrofit Projects

The New York State Department of Environmental Conservation (NYS DEC) has approved the FocalPoint (High Performance Modular Biofiltration System) as a proprietary stormwater management practice for use on New Development, Redevelopment and Retrofit Projects.

SYSTEM OVERVIEW:

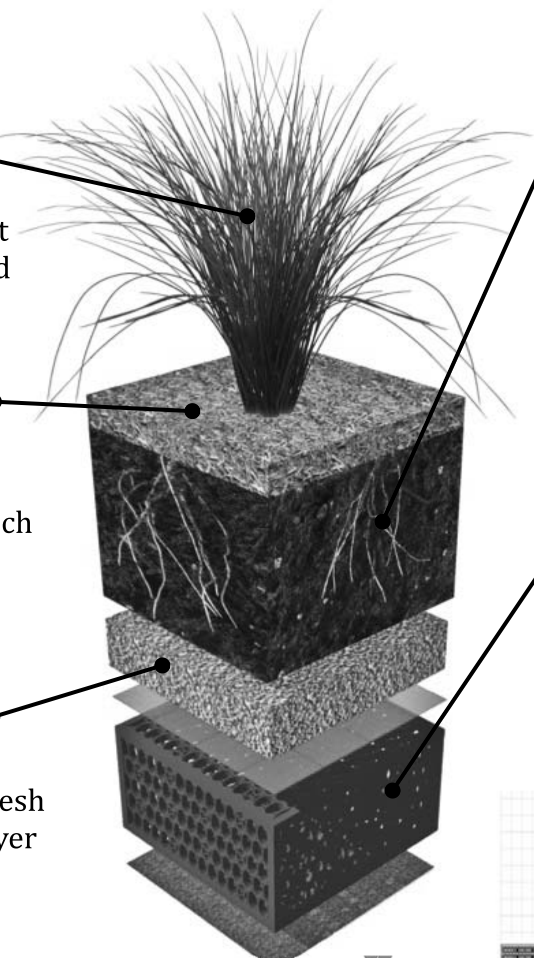
The FocalPoint is an ultra-efficient, modular biofiltration system that treats and drains large volumes of stormwater runoff in a small footprint to meet post construction stormwater treatment requirements. The system can be installed along the edge of a roadway behind curb line, in landscaped stormwater basins and be incorporated into an urban green infrastructure streetscape. As an innovative micro-scale practice, the FocalPoint overcomes many of the inherent challenges with traditional micro-bioretention and other similar BMPs – improving media quality control, reduction in space needed and reduced maintenance footprint, and elimination of clog-prone geotextiles.

SYSTEM COMPONENTS:

Vegetated System:
Plants process pollutants removed from run-off and root system maintains drainage and aeration of media.

3" Layer of Shredded Hardwood Mulch:
Pre-treatment mechanism. Removal and Replacement of Mulch Represents the Bulk of System Maintenance!

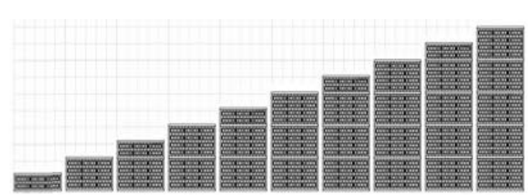
6" Bridging Stone & Separation Layer:
Clog-Proof Clean Stone & Micro-Mesh Replace Traditional Geotextile Layer
No geotextile = no clogging



18" High Performance Media:
Flows at 100" Per Hour / 200 ft per day
Resistant to Clogging

3rd Party Field and Lab Test Verified for 91% TSS, 66% P and 48% N

High Performance Underdrain:
9.45" Modular Tank, or "Flat Pipe" w/95% Open Surface Collects Water Efficiently. Expand into Modular Tanks for Larger Storage Needs.

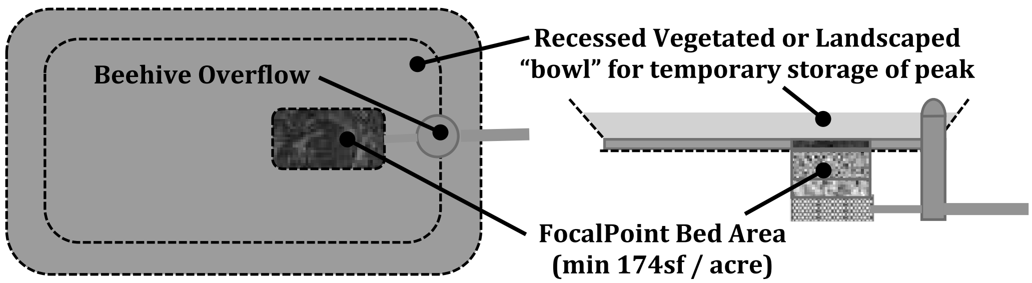


FocalPoint
BIOFILTRATION SYSTEMS

SIZING SUMMARY:

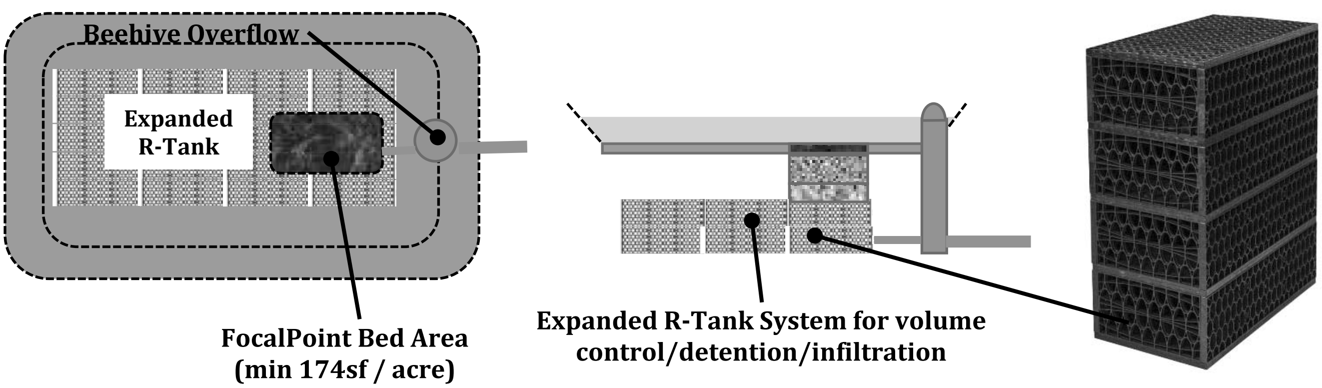
Water Quality (WQ) Treatment Only projects:

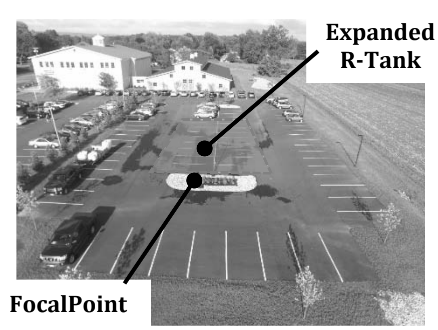
- The surface area of the FocalPoint media bed must be a minimum of **174 square feet per 1 acre of impervious area**
- The system must also be modelled in HydroCAD (or similar TR-55 modelling software) to demonstrate that the entire volume of a Type II or Type III (depending on region) 24 hr storm is treated prior to activation of the bypass/overflow (typically set at 6-12" above the mulch surface). Note: a 1.20 to 1.50 inch rainfall event typically generates 1.0 inches of runoff depending on watershed characteristics



Managing Larger Storms (with expanded infiltration or detention):

The R-Tank modular underdrain at the bottom of the FocalPoint gives the designer the opportunity to satisfy both WQv, Channel Protection, Recharge and Detention for controlled release of major storm events all within one system. The R-Tank can be expanded both vertically and horizontally to meet the volume/storage goals to ensure runoff is not only treated by the FocalPoint but also achieves post development peak flowrate control. The benefit to designers is that the R-Tank portion of the system can be built under parking areas (H-20, HS-25 load rated) to improve site surface utilization.





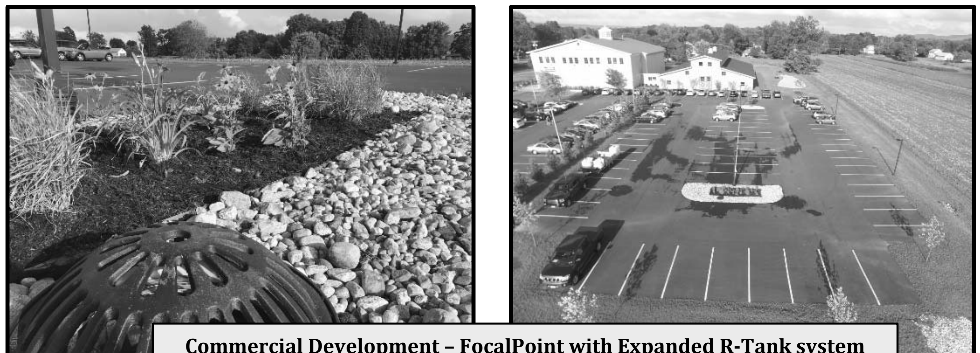
FocalPoint
BIOFILTRATION SYSTEMS

Site Development Project Examples:

Housing Development – FocalPoint with Expanded R-Tank system (Portland, ME)

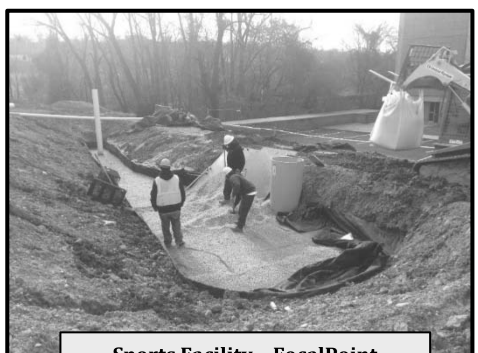
Grant Funded WQ Project – FocalPoint (Ogunquit, ME)

Site Development Project – FocalPoint (Portland, ME)

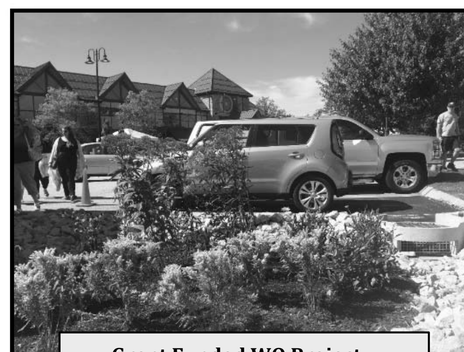


Commercial Development – FocalPoint with Expanded R-Tank system (Hadley, MA)

Urban Streetscape Project FocalPoint



Sports Facility – FocalPoint (Washington D.C.)



Grant Funded WQ Project – FocalPoint (Kittery, ME)

Urban Streetscape Installation FocalPoint

Premixed, certified FocalPoint Materials/Components

Site Development Project – FocalPoint with Expanded R-Tank – Newington NH

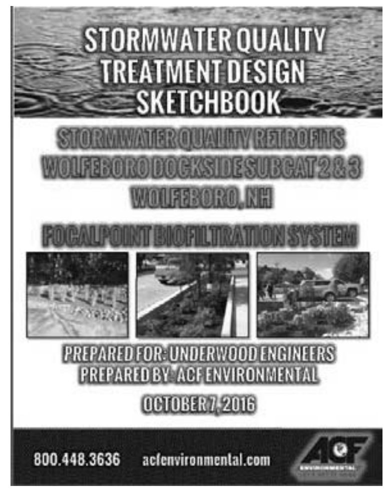
ACCESSORY ITEMS TO CONSIDER:

Rain Guardian Turret/Foxhole Curbline precast pretreatment unit for collection of sediment and energy dissipation.



ACF Beehive Overflow Filter
Domed riser with geotextile insert for collection of gross solids during major storm events.


DESIGN SUPPORT:



ACF and Fabco's in house engineering support team provide site specific technical support to engineers, designers, landscape architects and contractors. ACF realizes that engineers today are working on several projects at one time and are always working against low engineering design budgets. The intent of our technical support is to not only provide you with product information but to work alongside you and develop solutions to your site development design challenges.

We offer site specific design computations and conceptual layout support at no charge which we typically bind up with all relevant attachments in a design "Sketchbook" - a helpful tool that ultimately brings value and saves you time and associated cost as you work through incorporating this innovative solution into your design plans.

CONTACT ACF ENVIRONMENTAL:

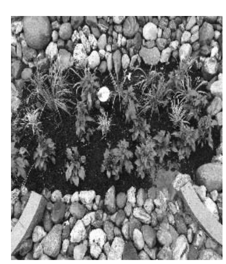
Bill Stoecker bill@energysmartsolutionsinc.com

BMP Specialist - Fabco Industries *(800) 559 2450*

Robert J Woodman – P.E., C.P.E.S.C rwoodman@acfenv.com

Senior Stormwater Engineer – ACF Environmental




ENVIRONMENTAL
LET'S GET IT DONE

FocalPoint

BIOFILTRATION SYSTEMS

HIGH PERFORMANCE MODULAR BIOFILTRATION SYSTEM (HPMBS)

Operations & Maintenance

ACF ENVIRONMENTAL

Customer Focused, Environmentally Committed

GENERAL DESCRIPTION

The following general specifications describe the general operations and maintenance requirements for the FocalPoint® High Performance Modular Biofiltration System (HPMBS). The system utilizes physical, chemical and biological mechanisms of a soil, plant and microbe complex to remove pollutants typically found in urban stormwater runoff. The treatment system is a fully equipped, modular, constructed in place system designed to treat contaminated runoff.

Stormwater enters the FocalPoint® HPMBS, is filtered by the High Flow Biofiltration Media and passes through to the underdrain/storage system where the treated water is detained, retained or infiltrated to sub-soils, prior to discharge to the storm sewer system of any remaining flow.

Higher flows bypass the FocalPoint® HPMBS via a downstream inlet or other overflow conveyance. Maintenance is a simple, inexpensive and safe operation that does not require confined space entry, pumping or vacuum equipment, or specialized tools. Properly trained landscape personnel can effectively maintain FocalPoint® HPMBS by following instructions in this manual.

BASIC OPERATIONS

FocalPoint® is a modular, high performance biofiltration system that often works in tandem with other integrated management practices (IMP). Contaminated stormwater runoff enters the biofiltration bed through a conveyance swale, planter box, or directly through a curb cut or false inlet. Energy is dissipated by a rock or vegetative dissipation device and is absorbed by a 3-inch layer of aged, double shredded hardwood mulch, with fines removed, (when specified) on the surface of the biofiltration media.

As the water passes through the mulch layer, most of the larger sediment particles and heavy metals are removed through sedimentation and chemical reactions with the organic material in the mulch. Water passes through the biofiltration media where the finer particles are removed and numerous chemical reactions take place to immobilize and capture pollutants in the soil media.

The cleansed water passes into the underdrain/storage system and remaining flows are directed to a storm sewer system or other appropriate discharge point. Once the pollutants are in the soil, bacteria begin to break down and metabolize the materials and the plants begin to uptake and metabolize the pollutants. Some pollutants such as heavy metals, which are chemically bound to organic particles in the mulch, are released over time as the organic matter decomposes to release the metals to the feeder roots of the plants and the cells of the bacteria in the soil where they remain and are recycled. Other pollutants such as phosphorus are chemically bound to the soil particles and released slowly back to the plants and bacteria and used in their metabolic processes. Nitrogen goes through a variety of very complex biochemical processes where it can ultimately end up in the plant/bacteria biomass, turned to nitrogen gas or dissolves back into the water column as nitrates depending on soil temperature, pH and the availability of oxygen. The pollutants ultimately are retained in the mulch, soil and biomass with some passing out of the system into the air or back into the water.

DESIGN AND INSTALLATION

Each project presents different scopes for the use of FocalPoint® HPMBS. To ensure the safe and specified function of this stormwater BMP, Convergent Water Technologies and/or its Value Added Resellers (VAR) review each application before supply. Information and design assistance is available to the design engineer during the planning process. Correct FocalPoint® sizing is essential to optimum performance. The engineer shall submit calculations for approval by the local jurisdiction when required. The contractor and/or VAR is responsible for the correct installation of FocalPoint® HPMBS units as described in approved plans. A comprehensive installation manual is available at www.convergentwater.com.

MAINTENANCE

Why Maintain?

All stormwater treatment systems require maintenance for effective operation. This necessity is often incorporated in your property's permitting process as a legally binding BMP maintenance agreement. Other reasons for maintenance include:

- Avoid legal challenges from your jurisdiction's maintenance enforcement program.
- Prolong the lifespan of your FocalPoint® HPMBS.
- Avoid costly repairs.
- Help reduce pollutant loads leaving your property.

Simple maintenance of the FocalPoint® HPMBS is required to continue effective pollutant removal from stormwater runoff before any discharge into downstream waters. This procedure will also extend the longevity of the living biofiltration system. The unit will recycle and accumulate pollutants within the biomass, but may also subjected to other materials entering the surface of the system. This may include trash, silt and leaves etc. which will be contained above the mulch and/or biofiltration media layer. Too much silt may inhibit the FocalPoint's® HPMBS flow rate, which is a primary reason for system maintenance. Removal of accumulated silt/sediment and/or replacement of the mulch layer (when specified), is an important activity that prevents over accumulation of such silt/sediment.

When to Maintain?

Convergent Water Technologies and/or its VAR includes a 1-year maintenance plan with each system purchased. Annual included maintenance consists of two (2) scheduled maintenance visits. Additional maintenance may be necessary depending on sediment and trash loading (by Owner or at additional cost). The start of the maintenance plan begins when the system is activated for full operation. Full operation is defined as when the site is appropriately stabilized, the unit is installed and activated (by VAR), i.e., when mulch (if specified) and plantings are added.

Activation should be avoided until the site is fully stabilized (full landscaping, grass cover, final paving and street sweeping completed). Maintenance visits are scheduled seasonally; the spring visit aims to clean up after winter loads including salts and sands. The fall visit helps the system by removing excessive leaf litter.

A first inspection to determine if maintenance is necessary should be performed at least twice annually after storm events of greater than (1) one inch total depth (subject to regional climate). Please refer to the maintenance checklist for specific conditions that indicate if maintenance is necessary.

It has been found that in regions which receive between 30-50 inches of annual rainfall, (2) two visits are generally required. Regions with less rainfall often only require (1) one visit per annum. Varying land uses can affect maintenance frequency.

Some sites may be subjected to extreme sediment or trash loads, requiring more frequent maintenance visits. This is the reason for detailed notes of maintenance actions per unit, helping the VAR/Maintenance contractor and Owner predict future maintenance frequencies, reflecting individual site conditions.

Owners must promptly notify the VAR/Maintenance contractor of any damage to the plant(s), which constitute(s) an integral part of the biofiltration technology. Owners should also advise other landscape or maintenance contractors to leave all maintenance of the FocalPoint® HPMBS to the VAR/Maintenance contractor (i.e. no pruning or fertilizing).

EXCLUSION OF SERVICES

It is the responsibility of the owner to provide adequate irrigation when necessary to the plant(s) in the FocalPoint® HPMBS.

Clean up due to major contamination such as oils, chemicals, toxic spills, etc. will result in additional costs and are not covered under the VAR/Maintenance contractor maintenance contract. Should a major contamination event occur, the Owner must block off the outlet pipe of the FocalPoint® (where the cleaned runoff drains to, such as drop-inlet) and block off the point where water enters of the FocalPoint® HPMBS. The VAR/Maintenance contractor should be informed immediately.

MAINTENANCE VISIT SUMMARY

Each maintenance visit consists of the following simple tasks (detailed instructions below).

1. Inspection of FocalPoint® HPMBS and surrounding area

2. Removal of debris, trash and mulch

3. Mulch replacement

4. Plant health evaluation (including measurements) and pruning or replacement as necessary

5. Clean area around FocalPoint® HPMBS

6. Complete paperwork, including date stamped photos of the tasks listed above.

MAINTENANCE TOOLS, SAFETY EQUIPMENT AND SUPPLIES

Ideal tools include: camera, bucket, shovel, broom, pruners, hoe/rake, and tape measure. Appropriate Personal Protective Equipment (PPE) should be used in accordance with local or company procedures. This may include impervious gloves where the type of trash is unknown, high visibility clothing and barricades when working in close proximity to traffic and also safety hats and shoes.

Inspection of FocalPoint® HPMBS and surrounding area

Record individual unit before maintenance with photograph (numbered). Record on Maintenance Report (see example in this document) the following:

- Standing Water — yes | no
- Is Bypass Inlet Clear? — yes | no
- Damage to HPMBS System — yes | no
- to Overflow conveyance — yes | no

Removal of Silt / Sediment / Clay

Dig out silt (if any) and mulch and remove trash & foreign items.

- Silt / Clay Found? — yes | no
- Cups / Bags Found? — yes | no
- Leaves? — yes | no
- Volume of material removed ________ (volume or weight)

Removal of debris, trash and mulch

After removal of mulch and debris, measure distance from the top of the FocalPoint® HPMBS engineered media soil to the flow line elevation of the adjacent overflow conveyance. If this distance is greater than that specified on the plans (typ. 6” - 12”), add media (not top soil or other) to recharge to the distance specified.

- Distance to media surface to flow line of overflow conveyance (inches) ____________
- # of Buckets of Media Added _________

Mulch Replacement

Most maintenance visits require only replacement mulch (if utilized) which must be, aged, double shredded hardwood mulch with fines removed. For smaller projects, one cubic foot of mulch will cover four square feet of biofiltration bed, and for larger projects, one cubic yard of mulch will cover 108 square feet of biofiltration bed. Some visits may require additional FocalPoint® HPMBS engineered soil media available from the VAR/Contractor.

- Add double shredded, aged hardwood mulch which has been screened to remove fines, evenly across the entire biofiltration media bed to a depth of 3”.
- Clean accumulated sediment from energy dissipation system at the inlet to the FocalPoint® HPMBS to allow for entry of trash during a storm event.

Plant health evaluation and pruning or replacement as necessary

Examine the plant’s health and replace if dead or dying.
Prune as necessary to encourage growth in the correct directions

- Height above Grate (feet) _______
- Width at Widest point (feet) _______
- Health — alive | dead
- Damage to Plant — yes | no

Clean area around FocalPoint® HPMBS

- Clean area around unit and remove all refuse to be disposed of appropriately.

Complete paperwork

- Deliver Maintenance Report and photographs as appropriate.
- Some jurisdictions may require submission of maintenance reports in accordance with approvals.
- It is the responsibility of the Owner to comply with local regulations.

FocalPoint Warranty

Seller warrants goods sold hereunder against defects in materials and workmanship only, for a period of (1) year from date the Seller activates the system into service. Seller makes no other warranties, express or implied.

Seller's liability hereunder shall be conditioned upon the Buyer's installation, maintenance, and service of the goods in strict compliance with the written instructions and specifications provided by the Seller. Any deviation from Seller's instructions and specifications or any abuse or neglect shall void warranties.

In the event of any claim upon Seller's warranty, the burden shall be upon the Buyer to prove strict compliance with all instructions and specifications provided by the Seller.

Seller's liability hereunder shall be limited only to the cost or replacement of the goods. Buyer agrees that Seller shall not be liable for any consequential losses arising from the purchase, installation, and/or use of the goods.

Maintenance Checklist

Element	Problem	What To Check	Should Exist	Action
Inlet	Excessive sediment or trash accumulation	Accumulation of sediment or trash impair free flow of water into FocalPoint	Inlet free of obstructions allowing free flow into FocalPoint System	Sediments or trash should be removed
Mulch Cover	Trash and floatable debris accumulation	Excessive trash or debris accumulation.	Minimal trash or other debris on mulch cover	Trash and debris should be removed and mulch cover raked level. Ensure that bark nugget
Mulch Cover	Ponding of water on mulch cover	Ponding in unit could be indicative of clogging due to excessive fine sediment accumulation or spill of petroleum oils	Stormwater should drain freely and evenly over mulch cover.	Contact VAR for advice.
Plants	Plants not growing, or in poor condition	Soil/mulch too wet, evidence of spill. Pest infestation. Vandalism to plants.	Plants should be healthy and pest free.	Contact VAR for advice.
Plants	Plant growth excessive	Plants should be appropriate to the species and location of FocalPoint		Trim/prune plants in accordance with typical landscaping and

R TANK

STORMWATER DETENTION SYSTEM®

LD HD SD UD XD

ACF ENVIRONMENTAL

LET'S GET IT DONE®

More Stormwater Less Space

STORMWATER MANAGEMENT

Is your stormwater detention system taking up too much space? Bring it down to size with the R-Tank System, the most efficient and versatile underground stormwater storage system available today. Whether you need to reduce your system footprint to resolve a utility conflict or free up space for a future expansion, R-Tank will give you the smallest footprint, provide more options for vehicular loading and cover depths, and deliver more installation versatility than any other system around.

The R-Tank System includes five different module configurations, providing system height options from 2” to over 7’ tall. And it delivers support for HS-20 and HS-25 traffic with cover depths from 6” all the way up to over 16’. Whether you’re designing a project at the beach with minimal depth over the water table, or a deep system in the hills, R-Tank has you covered.

With an unlimited array of system footprints and configurations, R-Tank solves tough stormwater problems by perfectly adapting to the needs of your site. Give R-Tank a shot on your next project, and prepare to be impressed.

BENEFITS

High Capacity
- 95% void internal area

Strength
- Easily supports traffic loading from parking lots and roads
- Module options for HS-20 and HS-25 rating with cover depths from 6 inches to 16 feet

Design & Construction Versatility
- Combine modules into any shape to efficiently use space
- Vary height from 2 inches to 7 feet

Increased Infiltration and Exfiltration
- Outer shell is 90% open
- Increases groundwater recharge, reducing post-construction discharge volumes

Easy to Transport
- Can be supplied unassembled for reduced delivery costs

Lightweight and Quick to Install
- Installed by hand; no cranes required
- Reduces site access delays

Recycled Content
- Manufactured with recycled polypropylene

R-TANK LD®

- Light Duty module (30 psi)
- Ideal for applications in green space
- Not rated for vehicular traffic
- 12” Minimum cover, 36” maximum cover
- Four internal plates

R-TANK HD®

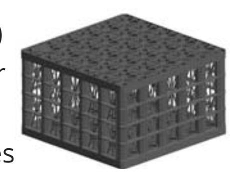
- Heavy Duty module (33.4 psi)
- Standard module for HS-20 traffic applications
- 20” Minimum cover, 84” Maximum cover
- Five internal plates

R-TANK SD®

- Super Duty module (42.9 psi)
- Higher safety factors for shallow traffic applications and deeper cover
- 18” Minimum cover, 120” Maximum cover
- Five internal plates

R-TANK UD

- Ultra Duty module (134.2 psi)
- Traffic loads with 12” of cover
- Available from 14” – 66” tall
- Ideal for high water table sites

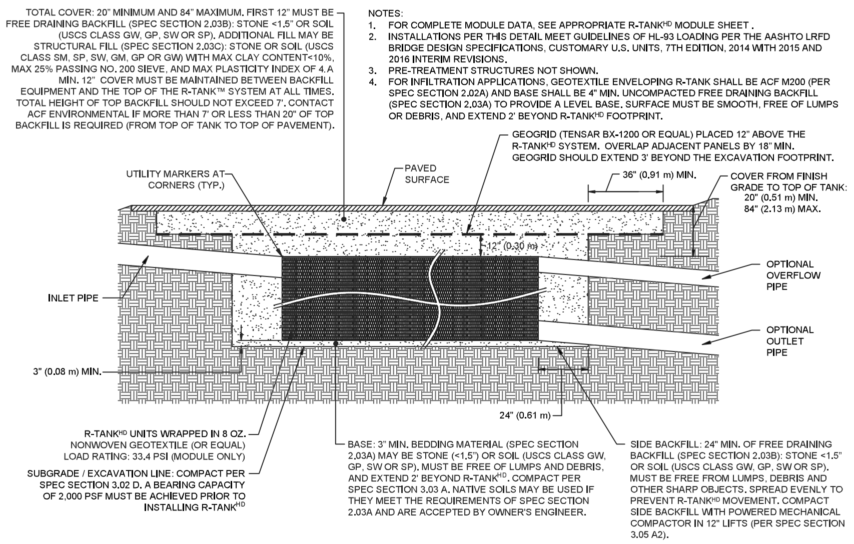


R-TANK XD®

- Extreme Duty module (320 psi)
- Traffic loads with 6” cover
- 16.5’ maximum cover
- Available from 2” - 10’ tall
- 90% void

Many factors will influence the design of the R-Tank® system. While this list is not intended to be all-inclusive, several design considerations are worth highlighting:

1. **PRE-TREATMENT**
2. **BACKFILL MATERIALS**
3. **RUNOFF REDUCTION**
4. **WATER TABLE**
5. **CONSTRUCTION LOADS**
6. **LATERAL LOADS**
7. **R-TANK® MODULES**
8. **LOAD MODELING**



1. PRE-TREATMENT

Removing pollutants from runoff before they enter an underground detention system is the only smart way to design & build a system. The best way to do that is with the Trash Guard Plus® (see page 6), but many other ways exist. Be sure the system you select will remove:

- Heavy Sediments
- Gross Pollutants (trash)
- Biodegradable Debris

2. BACKFILL MATERIALS

Backfill materials should be stone (smaller than 1.5” in diameter) or soil (GW, GP SW or SP as classified by the Unified Soil Classification System). Material must be free from lumps, debris and any sharp objects that could cut the geotextile. See the R-Tank® narrative specification section 2.03 for additional information.

3. RUNOFF REDUCTION

Most designs incorporate an outlet to drain the system at a controlled rate and/or an overflow to prevent flooding in extreme events. But be sure to take advantage of any infiltration you can achieve on the site. Consider raising the invert of your outlet or creating a sump to capture and infiltrate the water quality volume whenever possible.

4. WATER TABLE

While installing the R-Tank® below the water table is manageable, designers must be able to create a stable base and account for the system’s ability to drain this water out or limit its ability to enter the system. If a liner is used to prevent ground water from entering the system, measures must be taken to prevent the system from floating.

5. CONSTRUCTION LOADS

Construction loads are often the heaviest loads the system will see throughout its life. Care must be taken during backfilling and compaction using the proper equipment (see specification section 3.05), and post-installation construction traffic should be routed around the system (Installation Guide step 12).

6. LATERAL LOADS

As systems get deeper, the loads acting on the sides of the tank increase. While vertical loads often control the design, be sure to consider lateral loading, as well.

7. R-TANK MODULES

Be sure to select the right module for your application. See the information on page 3 for more details on which module is the best fit. Also refer to the specifications for each module on the back of this brochure, or call us for assistance.

8. LOAD MODELING

A safety factor of 1.75 or higher is required when designing an R-Tank System using the AASHTO LRFD Bridge Design Specifications. Be sure to run your own loading model with all requirements specific to your site. Several example models can be found in our Tech Note on loading capabilities, and minimum cover requirements for various loads can be found in the spec on the back of this brochure.

LOW IMPACT DESIGN AND GREEN INFRASTRUCTURE

As much of the nation's Gray Infrastructure continues to decay, new concepts for a better way to rebuild it are emerging through Green Infrastructure (GI) and Low Impact Development (LID). This type of reconstruction moves beyond traditional systems that do ONE THING very well to systems that accomplish MULTIPLE objectives simultaneously. ACF has several technologies that dovetail with the goals of LID and GI that can play a significant role in the redevelopment process.

SPACE EFFICIENT SUBSURFACE STORAGE

R-TANK®

Pipe and stone are used in traditional systems to move and store runoff.
R-Tank does the same job, but with several additional benefits.

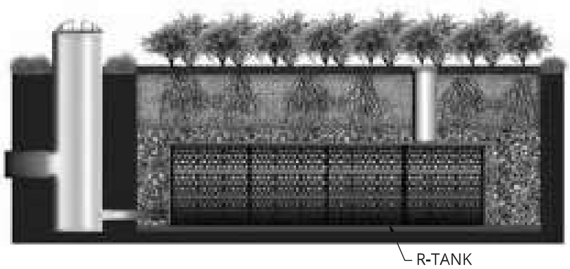
- Stores and moves runoff
- Open system encourages infiltration
- Stores 138% more water than stone
- Easily handles traffic loads beneath sidewalks and streets
- Ships flat to reduce site disturbance
- Moves water slowly, increasing time of concentration
- Fully accessible for maintenance
- Maximizes storage potential of GI practices like bioretention, street tree pits, etc.

VEGETATED/ BIOLOGICAL TREATMENT SYSTEM

FOCALPOINT

Traditional landscaping adds aesthetic value to projects, but has more potential. Many developers turn to bioretention, but are forced to surrender massive land areas and dedicate significant future funds to maintenance. FocalPoint reduces the space requirements and maintenance costs of bioretention by up to 90% while providing all the water purification benefits.

- Adds aesthetic value to properties
- Cleans runoff to improve water quality
- Reduces space requirements and maintenance costs of traditional bioretention systems
- Encourages infiltration to reduce volume of water discharged
- Pair with R-Tank® to maximize water storage and transport

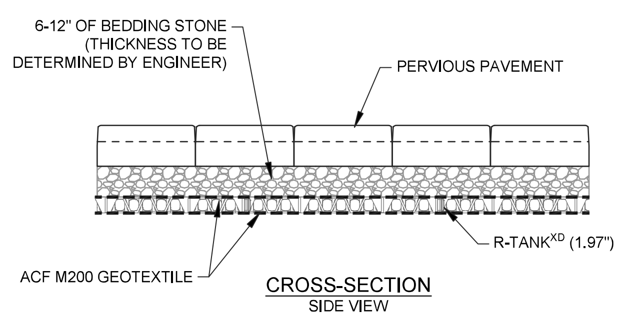


RUNOFF REDUCTION TECHNIQUES

PERMEABLE PAVEMENTS

Traditional pavements move vehicles efficiently, but are easily damaged by stormwater. ACF specializes in pervious pavements that handle traffic easily while providing surface infiltration rates 10 times higher than traditional pervious pavements. High surface infiltration rates reduce the expense of long-term maintenance and the headaches that go with it.

- Handles all vehicular loads
- Drains ten times faster than competing pervious pavements
- Reduces long-term maintenance costs
- Encourages infiltration
- Pair with R-Tank® to maximize water storage and transport



MAINTENANCE

Designing an R-Tank System with longevity and maintenance in mind is a simple three-step process:

1. PREVENT

Keep debris and sediment out of the system by pre-treating runoff with the Trash Guard Plus® unit (see below). For a more centralized approach, you could consider having the R-Tank units penetrate the connecting structure, which allows the use of the R-Tank® as its own trash screen. This works best with a structure that includes a sump (see drawing to right).

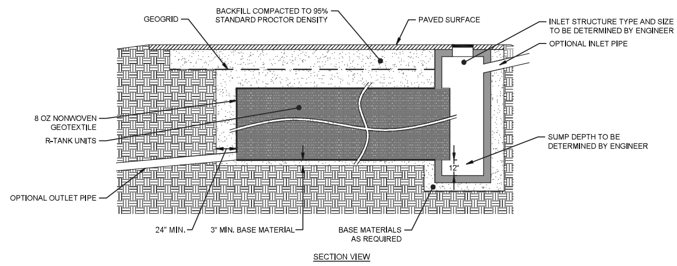
2. ISOLATE

Trap solid pollutants inside the maintenance row (see drawing to right) where they can be easily removed, using the Maintenance Modules (available in LD, HD, and UD only). These modules are wrapped in geotextile to retain solids and are fully accessible by conventional jet-vac systems to remove captured pollutants.

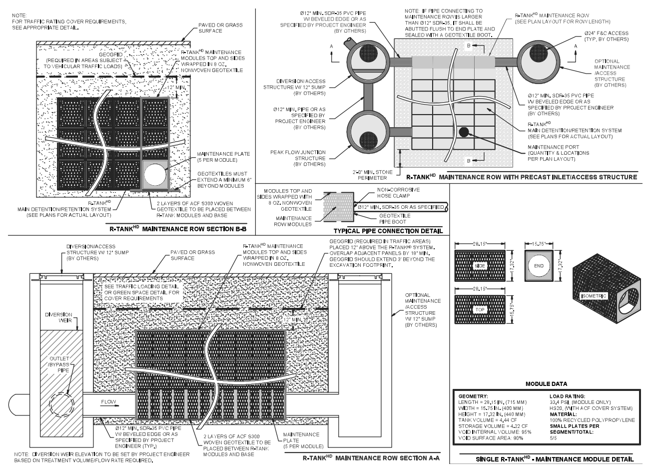
3. PROTECT

Ensure a long system life by including maintenance ports to remove any pollutants that evade the pre-treatment system and maintenance row. Maintenance ports should be specified within 10’ of inlet and outlet connections, and roughly 50’ on center (see detail on page 7).

INLET CONNECTION



MAINTENANCE ROW



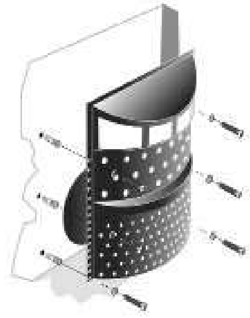
MAINTENANCE PREVENTION

TRASH GUARD PLUS ®

Trash Guard Plus® is a patented stormwater pretreatment device that captures debris, sediment and floatables. Easy to install and maintain, it is a fraction of the cost of other pretreatment devices.

Benefits of Trash Guard Plus®

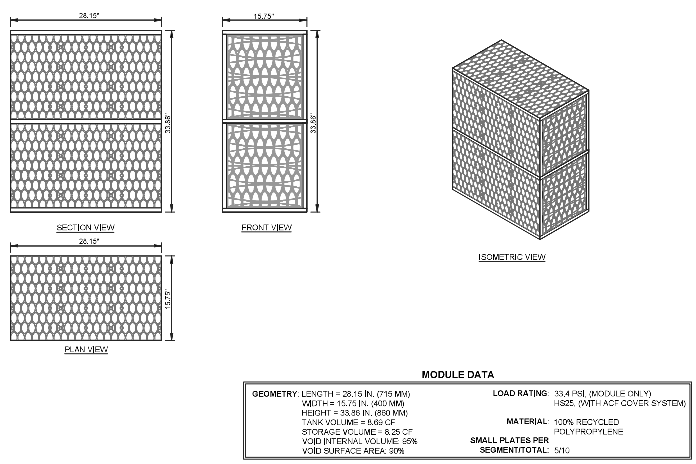
- Simple retrofit to existing catch basins
- Installs without heavy equipment
- Quick and easy assembly
- Adjusts to irregular catch basin bottoms and/or walls
- Eliminates eyesore stormwater trash at public parks, beaches, and waterways
- Removes harmful nutrients and regulated metals



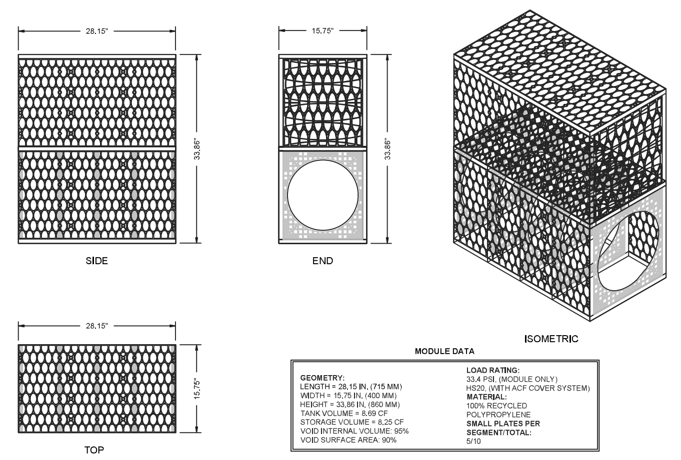
TYPICAL DESIGN

CAD DRAWINGS

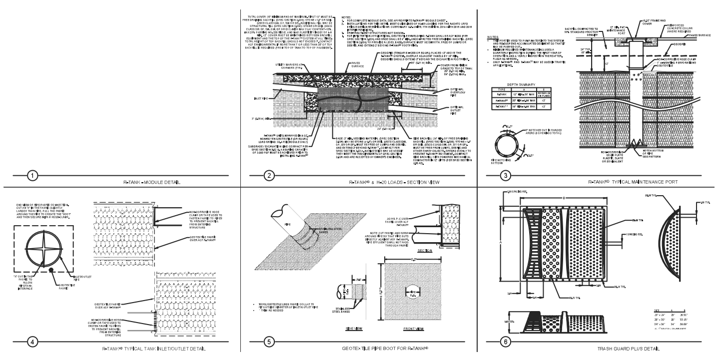
Module Drawing - Double



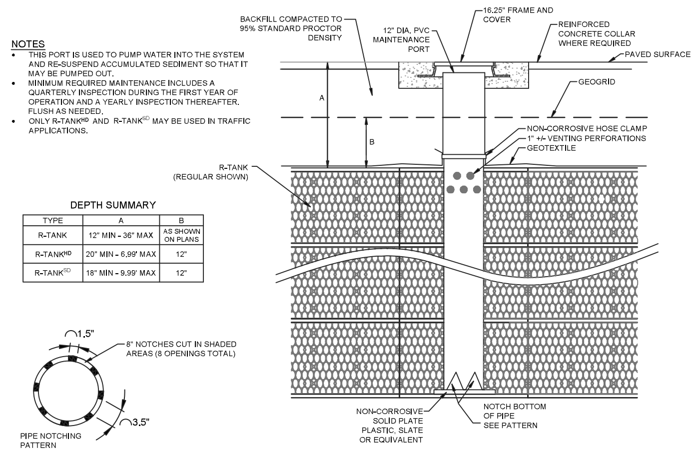
Maintenance Module - Double



Composite Details



Maintenance Port



Selecting the Right R-Tank Module

Cover Depth* (Inches)	Module: LD	HD	SD	UD	XD
Minimum 6"	Green Space - No Traffic	Green Space - No Traffic	Green Space - No Traffic	Green Space - No Traffic	HS-20
12"	Green Space - No Traffic	Green Space - No Traffic	Green Space - No Traffic	HS-20**	HS-20
14"	Green Space - No Traffic	Green Space - No Traffic	Green Space - No Traffic	HS-20	HS-20
18"	Green Space - No Traffic	Green Space - No Traffic	HS-20	HS-20	HS-20
20"	Green Space - No Traffic	HS-20	HS-20	HS-20	HS-20
24"	Green Space - No Traffic	HS-20	HS-20	HS-20	HS-20
36"	Green Space - No Traffic	HS-20	HS-20	HS-20	HS-20
48"	-	HS-20	HS-20	HS-20	HS-20
60"	-	HS-20	HS-20	HS-20	HS-20
72"	-	HS-20	HS-20	-	HS-20
84"	-	-	HS-20	-	HS-20
120"	-	-	HS-20	-	HS-20
160"	-	-	-	-	HS-20
Maximum 200"	-	-	-	-	HS-20

HS-20 designation based on AASHTO LRFD Bridge Design Specification for Single Lane Traffic

* *Cover depth is measured from the top of the module to the finished grade or top of pavement.*

** *The UD module requires STONE backfill (not soils) on the sides at this depth.*

R-TANK LD / R-TANK HD

Dimensions & Capacity

Module (Segments)	Width (inch)	Length (inch)	Height (in/ft)	Volume (cf)	Capacity (cf)	Weight* (lbs)
Mini	15.75	28.15	9.45"/0.79'	2.42	2.30	10.1/10.9
Single(1)	15.75	28.15	17.32"/1.44'	4.44	4.22	15.7/17.3
Single + Mini(1.5)	15.75	28.15	25.98"/2.17'	6.67	6.33	23.6/25.9
Double (2)	15.75	28.15	33.86"/2.82'	8.69	8.25	29.1/32.3
Double + Mini(2.5)	15.75	28.15	42.52"/3.54'	10.91	10.36	37.0/41.0
Triple (3)	15.75	28.15	50.39"/4.20'	12.93	12.28	42.5/47.4
Triple + Mini(3.5)	15.75	28.15	59.06"/4.92'	15.15	14.39	50.4/56.0
Quad(4)	15.75	28.15	66.93"/5.58'	17.17	16.31	55.9/62.4
Quad + Mini(4.5)	15.75	28.15	75.59"/6.30'	19.39	18.42	63.8/71.0
Pent(5)	15.75	28.15	83.46"/6.96'	21.41	20.34	69.3/77.4

*Weights shown are for LD/HD modules.

R-TANK SD

Dimensions & Capacity

Module (Segments)	Width (inch)	Length (inch)	Height (in/ft)	Volume (cf)	Capacity (cf)	Weight (lbs)
Single (1)	15.75	28.15	9.45"/0.79'	2.42	2.30	10.95
Double (2)	15.75	28.15	18.12"/1.51'	4.64	4.41	19.58
Triple (3)	15.75	28.15	26.79"/2.23'	6.86	6.52	28.21
Quad (4)	15.75	28.15	35.46"/2.96'	9.08	8.63	36.84
Pent (5)	15.75	28.15	44.13"/3.68'	11.30	10.74	45.47
Hex (6)	15.75	28.15	52.80"/4.40'	13.52	12.84	54.10
Septa (7)	15.75	28.15	61.47"/5.12'	15.74	14.95	62.73
Octo (8)	15.75	28.15	70.14"/5.85'	17.96	17.06	71.36
Nono (9)	15.75	28.15	78.81"/6.57'	20.18	19.17	79.99
Decka (10)	15.75	28.15	87.48"/7.29'	22.40	21.28	88.62

R-TANK UD

Dimensions & Capacity

Module (Segments)	Width (inch)	Length (inch)	Height (in/ft)	Volume (cf)	Capacity (cf)	Weight (lbs)
Single (1)	23.62	23.62	14.17"/1.18'	4.57	4.35	21.2
Double (2)	23.62	23.62	27.17"/2.26'	8.77	8.33	39.0
Triple (3)	23.62	23.62	40.16"/ 3.35'	12.97	12.32	56.8
Quad (4)	23.62	23.62	53.15"/4.43'	17.16	16.30	74.6
Pent (5)	23.62	23.62	66.14"/5.5'	21.35	20.29	92.4

R-TANK XD

Dimensions & Capacity

Module (Segments)	Width (inch)	Length (inch)	Height (inch)	Volume (cf)	Capacity (cf)	Weight (lbs)
Single (1)	19.68	23.62	1.97	0.53	0.48	4
Double (2)	19.68	23.62	3.94	1.06	0.95	8
Triple (3)	19.68	23.62	5.91	1.59	1.43	12
Quad (4)	19.68	23.62	7.87	2.12	1.91	16
Pent (5)	19.68	23.62	9.84	2.65	2.38	20

Note: XD modules may be stacked up to 10' tall (60 layers).

Specifications

Item	Description	LD	HD	SD	UD	XD
Void Area	Volume available for water storage	95%	95%	95%	95%	90%
Surface Area Void	% of exterior available for infiltration	90%	90%	90%	90%	90%
Compressive Strength	ASTM D2412 / ASTM F2418	30.0 psi	33.4	42.9 psi	134.2 psi	240.2 psi
Unit Weight	Weight of plastic/cubic foot of tank	3.29 lbs/cf	3.62 lbs/cf	3.96 lbs/cf	4.33 lbs/cf	7.55 lbs/cf
Rib Thickness	Thickness of load-bearing members	0.18 inches	0.18 inches	0.18 inches	-	-
Service Temperature	Safe temperature range for use	-14 - 167° F	-14 - 167° F	-14 - 167° F	-14 - 167° F	-14 - 167° F
Recycled Content	Use of recycle polypropylene	100%	100%	100%	100%	100%
Minimum Cover	Cover required for HS-20 loading	Not Traffic Rated	20"	18"	12"-14"	6"
Minimum Cover	Cover required for HS-25 loading	Not Traffic Rated	24"	18"	15"-17"	6"
Maximum Cover	Maximum allowable cover depth	3.0'	6.99'	9.99'	5.0'	16.7'

3 2018

FOCALPOINT

HIGH PERFORMANCE MODULAR BIOFILTRATION SYSTEM

NYS DEC DESIGN WORKSHEET/CHECKLIST

The New York State Department of Environmental Conservation (NYS DEC) has approved the FocalPoint (High Performance Modular Biofiltration System) as a proprietary stormwater management practice for use on New Development, Redevelopment and Retrofit Projects.

1. **FocalPoint Bed Area (min 174 square feet per acre of impervious area (e.g. 0.2 acres = 35 sf))**

- Tributary Impervious area = 0.44 ac. (A)
- Tributary Pervious area = 0.018 ac. (B)
- Min FocalPoint bed area req'd = (((A) x 1.0) + ((B) x 0.4)) * 174 = 77.8 sf.
- FocalPoint Bed Area provided * = 100 sf.
- Dimensions of Proposed FocalPoint = 2 ft x 50 ft

* see criteria 2. to determine if minimum size is appropriate.

2. **A Type II 24hr rainfall event that generates the WQ volume shall be modelled to demonstrate the entire storm volume is treated prior to activation of the overflow (typically set at 6-12" above the mulch) (Note: a 1.2 to 1.3" rainfall event usually generates 1 inch of runoff)** contact ACF for a sample HydroCAD node.

- Water Quality Volume Goal (WQv) = 2332 cubic feet
- Type II 24hr Rainfall Depth to generate WQv = 1.73 inches
- Temporary storage depth provided = 6" inches (typ 6" to 12")
- Temporary storage volume provided at above depth = 336.5 cubic feet.
- Peak ponding depth from Type II 24hr storm event = 5.5" inches

3. **Size Harco Domed Overflow Riser**

- Domed Overflow Riser:
  - Rim Elev of Overflow Riser: = ______ (typ 6-12" above mulch surface)
  - Overflow Riser Diameter = ______ (12, 15, 18, 24 or 30" dia)
  - 6" invert in Elev from FocalPoint = ______ (typ 3 ft below mulch surface)
  - ___" invert out Elev = ______
- Or other (spillway/weir etc) ☐

4. **RRv, Channel Protection and Flood Control/Peak flow attenuation of major storms**

- The treated flow and bypass flow can be routed to a detention system either an open pond, or a subsurface system such as an expanded R-Tank system (contact ACF for additional information on designing expanded R-Tank systems)

5. **The Design shall be reviewed by the manufacturer's representative prior to submission and installation will be overseen by the manufacturer's representative.**

- The Design has been reviewed by ACF Environmental ☐
- Engineer will coordinate installation inspection with ACF ☐

11.) Stormwater Management Construction Checklists

APPENDIX H

STATE POLLUTANT DISCHARGE ELIMINATION SYSTEM FOR CONSTRUCTION ACTIVITIES

CONSTRUCTION SITE LOG BOOK

Table of Contents

Properly completing forms such as those contained in Appendix H meet the inspection requirement of NYS-DEC SPDES GP for Construction Activities. Completed forms shall be kept on site at all times and made available to authorities upon request.

I. PRE-CONSTRUCTION MEETING DOCUMENTS

Project Name ____

Permit No. ______________________ **Date of Authorization** ____________

Name of Operator ____

Prime Contractor ____

a. Preamble to Site Assessment and Inspections

The Following Information To Be Read By All Person's Involved in The Construction of Stormwater Related Activities:

The Operator agrees to have a qualified professional[1] conduct an assessment of the site prior to the commencement of construction[2] and certify in this inspection report that the appropriate erosion and sediment controls described in the SWPPP have been adequately installed or implemented to ensure overall preparedness of the site for the commencement of construction.

Prior to the commencement of construction, the Operator shall certify in this site logbook that the SWPPP has been prepared in accordance with the State's standards and meets all Federal, State and local erosion and sediment control requirements.

When construction starts, site inspections shall be conducted by the qualified professional at least every 7 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater (Construction Duration Inspections). The Operator shall maintain a record of all inspection reports in this site logbook. The site logbook shall be maintained on site and be made available to the permitting authorities upon request. The Operator shall post at the site, in a publicly accessible location, a summary of the site inspection activities on a monthly basis (Monthly Summary Report).

The operator shall also prepare a written summary of compliance with this general permit at a minimum frequency of every three months (Operator's Compliance Response Form), while coverage exists. The summary should address the status of achieving each component of the SWPPP.

Prior to filing the Notice of Termination or the end of permit term, the Operator shall have a qualified professional perform a final site inspection. The qualified professional shall certify that the site has undergone final stabilization[3] using either vegetative or structural stabilization methods and that all temporary erosion and sediment controls (such as silt fencing) not needed for long-term erosion control have been removed. In addition, the Operator must identify and certify that all permanent structures described in the SWPPP have been constructed and provide the owner(s) with an operation and maintenance plan that ensures the structure(s) continuously functions as designed.

1 "Qualified Professional means a person knowledgeable in the principles and practice of erosion and sediment controls, such as a Certified Professional in Erosion and Sediment Control (CPESC), soil scientist, licensed engineer or someone working under the direction and supervision of a licensed engineer (person must have experience in the principles and practices of erosion and sediment control).

2 "Commencement of construction" means the initial removal of vegetation and disturbance of soils associated with clearing, grading or excavating activities or other construction activities.

3 "Final stabilization" means that all soil-disturbing activities at the site have been completed and a uniform, perennial vegetative cover with a density of eighty (80) percent has been established or equivalent stabilization measures (such as the use of mulches or geotextiles) have been employed on all unpaved areas and areas not covered by permanent structures.

b. Operators Certification

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. Further, I hereby certify that the SWPPP meets all Federal, State, and local erosion and sediment control requirements. I am aware that false statements made herein are punishable as a class A misdemeanor pursuant to Section 210.45 of the Penal Law.

Name (please print): ______________________________

Title ______________________________ **Date:** ______________

Address: ______________________________

Phone: ______________ **Email:** ______________________________

Signature: ______________________________

c. Qualified Professional's Credentials & Certification

"I hereby certify that I meet the criteria set forth in the General Permit to conduct site inspections for this project and that the appropriate erosion and sediment controls described in the SWPPP and as described in the following Pre-construction Site Assessment Checklist have been adequately installed or implemented, ensuring the overall preparedness of this site for the commencement of construction."

Name (please print): ______________________________

Title ______________________________ **Date:** ______________

Address: ______________________________

Phone: ______________ **Email:** ______________________________

Signature: ______________________________

d. Pre-construction Site Assessment Checklist
(NOTE: Provide comments below as necessary)

1. Notice of Intent, SWPPP, and Contractors Certification:

Yes No NA

[ ] [ ] [ ] Has a Notice of Intent been filed with the NYS Department of Conservation?
[ ] [ ] [ ] Is the SWPPP on-site? Where?________________________________
[ ] [ ] [ ] Is the Plan current? What is the latest revision date?______________
[ ] [ ] [ ] Is a copy of the NOI (with brief description) onsite? Where?______________
[ ] [ ] [ ] Have all contractors involved with stormwater related activities signed a contractor's certification?

2. Resource Protection

Yes No NA

[ ] [ ] [ ] Are construction limits clearly flagged or fenced?
[ ] [ ] [ ] Important trees and associated rooting zones, on-site septic system absorption fields, existing vegetated areas suitable for filter strips, especially in perimeter areas, have been flagged for protection.
[ ] [ ] [ ] Creek crossings installed prior to land-disturbing activity, including clearing and blasting.

3. Surface Water Protection

Yes No NA

[ ] [ ] [ ] Clean stormwater runoff has been diverted from areas to be disturbed.
[ ] [ ] [ ] Bodies of water located either on site or in the vicinity of the site have been identified and protected.
[ ] [ ] [ ] Appropriate practices to protect on-site or downstream surface water are installed.
[ ] [ ] [ ] Are clearing and grading operations divided into areas <5 acres?

4. Stabilized Construction Entrance

Yes No NA

[ ] [ ] [ ] A temporary construction entrance to capture mud and debris from construction vehicles before they enter the public highway has been installed.
[ ] [ ] [ ] Other access areas (entrances, construction routes, equipment parking areas) are stabilized immediately as work takes place with gravel or other cover.
[ ] [ ] [ ] Sediment tracked onto public streets is removed or cleaned on a regular basis.

5. Perimeter Sediment Controls

Yes No NA

[ ] [ ] [ ] Silt fence material and installation comply with the standard drawing and specifications.
[ ] [ ] [ ] Silt fences are installed at appropriate spacing intervals
[ ] [ ] [ ] Sediment/detention basin was installed as first land disturbing activity.
[ ] [ ] [ ] Sediment traps and barriers are installed.

6. Pollution Prevention for Waste and Hazardous Materials

Yes No NA

[ ] [ ] [ ] The Operator or designated representative has been assigned to implement the spill prevention avoidance and response plan.
[ ] [ ] [ ] The plan is contained in the SWPPP on page ______
[ ] [ ] [ ] Appropriate materials to control spills are onsite. Where? __________________

II. CONSTRUCTION DURATION INSPECTIONS

a. Directions:
Inspection Forms will be filled out during the entire construction phase of the project.
Required Elements:

(1) On a site map, indicate the extent of all disturbed site areas and drainage pathways. Indicate site areas that are expected to undergo initial disturbance or significant site work within the next 14-day period;

(2) Indicate on a site map all areas of the site that have undergone temporary or permanent stabilization;

(3) Indicate all disturbed site areas that have not undergone active site work during the previous 14-day period;

(4) Inspect all sediment control practices and record the approximate degree of sediment accumulation as a percentage of sediment storage volume (for example, 10 percent, 20 percent, 50 percent);

(5) Inspect all erosion and sediment control practices and record all maintenance requirements such as verifying the integrity of barrier or diversion systems (earthen berms or silt fencing) and containment systems (sediment basins and sediment traps). Identify any evidence of rill or gully erosion occurring on slopes and any loss of stabilizing vegetation or seeding/mulching. Document any excessive deposition of sediment or ponding water along barrier or diversion systems. Record the depth of sediment within containment structures, any erosion near outlet and overflow structures, and verify the ability of rock filters around perforated riser pipes to pass water; and

(6) Immediately report to the Operator any deficiencies that are identified with the implementation of the SWPPP.

SITE PLAN/SKETCH

______________________________________ ______________________________________

Inspector (print name) **Date of Inspection**

______________________________________ ______________________________________

Qualified Professional (print name) **Qualified Professional Signature**

The above signed acknowledges that, to the best of his/her knowledge, all information provided on the forms is accurate and complete.

Maintaining Water Quality

Yes No NA
[ ] [ ] [ ] Is there an increase in turbidity causing a substantial visible contrast to natural conditions?
[ ] [ ] [ ] Is there residue from oil and floating substances, visible oil film, or globules or grease?
[ ] [ ] [ ] All disturbance is within the limits of the approved plans.
[ ] [ ] [ ] Have receiving lake/bay, stream, and/or wetland been impacted by silt from project?

Housekeeping

1. General Site Conditions
Yes No NA
[ ] [ ] [ ] Is construction site litter and debris appropriately managed?
[ ] [ ] [ ] Are facilities and equipment necessary for implementation of erosion and sediment control in working order and/or properly maintained?
[ ] [ ] [ ] Is construction impacting the adjacent property?
[ ] [ ] [ ] Is dust adequately controlled?

2. Temporary Stream Crossing
Yes No NA
[ ] [ ] [ ] Maximum diameter pipes necessary to span creek without dredging are installed.
[ ] [ ] [ ] Installed non-woven geotextile fabric beneath approaches.
[ ] [ ] [ ] Is fill composed of aggregate (no earth or soil)?
[ ] [ ] [ ] Rock on approaches is clean enough to remove mud from vehicles & prevent sediment from entering stream during high flow.

Runoff Control Practices

1. Excavation Dewatering
Yes No NA
[ ] [ ] [ ] Upstream and downstream berms (sandbags, inflatable dams, etc.) are installed per plan.
[ ] [ ] [ ] Clean water from upstream pool is being pumped to the downstream pool.
[ ] [ ] [ ] Sediment laden water from work area is being discharged to a silt-trapping device.
[ ] [ ] [ ] Constructed upstream berm with one-foot minimum freeboard.

2. Level Spreader
Yes No NA
[ ] [ ] [ ] Installed per plan.
[ ] [ ] [ ] Constructed on undisturbed soil, not on fill, receiving only clear, non-sediment laden flow.
[ ] [ ] [ ] Flow sheets out of level spreader without erosion on downstream edge.

3. Interceptor Dikes and Swales
Yes No NA
[ ] [ ] [ ] Installed per plan with minimum side slopes 2H:1V or flatter.
[ ] [ ] [ ] Stabilized by geotextile fabric, seed, or mulch with no erosion occurring.
[ ] [ ] [ ] Sediment-laden runoff directed to sediment trapping structure

Runoff Control Practices (continued)

4. Stone Check Dam

Yes No NA

[ ] [ ] [ ] Is channel stable? (flow is not eroding soil underneath or around the structure).
[ ] [ ] [ ] Check is in good condition (rocks in place and no permanent pools behind the structure).
[ ] [ ] [ ] Has accumulated sediment been removed?.

5. Rock Outlet Protection

Yes No NA

[ ] [ ] [ ] Installed per plan.
[ ] [ ] [ ] Installed concurrently with pipe installation.

Soil Stabilization

1. Topsoil and Spoil Stockpiles

Yes No NA

[ ] [ ] [ ] Stockpiles are stabilized with vegetation and/or mulch.
[ ] [ ] [ ] Sediment control is installed at the toe of the slope.

2. Revegetation

Yes No NA

[ ] [ ] [ ] Temporary seedings and mulch have been applied to idle areas.
[ ] [ ] [ ] 4 inches minimum of topsoil has been applied under permanent seedings

Sediment Control Practices

1. Stabilized Construction Entrance

Yes No NA

[ ] [ ] [ ] Stone is clean enough to effectively remove mud from vehicles.
[ ] [ ] [ ] Installed per standards and specifications?
[ ] [ ] [ ] Does all traffic use the stabilized entrance to enter and leave site?
[ ] [ ] [ ] Is adequate drainage provided to prevent ponding at entrance?

2. Silt Fence

Yes No NA

[ ] [ ] [ ] Installed on Contour, 10 feet from toe of slope (not across conveyance channels).
[ ] [ ] [ ] Joints constructed by wrapping the two ends together for continuous support.
[ ] [ ] [ ] Fabric buried 6 inches minimum.
[ ] [ ] [ ] Posts are stable, fabric is tight and without rips or frayed areas.
Sediment accumulation is ___% of design capacity.

Sediment Control Practices (continued)

3. Storm Drain Inlet Protection (Use for Stone & Block; Filter Fabric; Curb; or, Excavated practices)
Yes No NA
[ ] [ ] [ ] Installed concrete blocks lengthwise so open ends face outward, not upward.
[ ] [ ] [ ] Placed wire screen between No. 3 crushed stone and concrete blocks.
[ ] [ ] [ ] Drainage area is 1acre or less.
[ ] [ ] [ ] Excavated area is 900 cubic feet.
[ ] [ ] [ ] Excavated side slopes should be 2:1.
[ ] [ ] [ ] 2" x 4" frame is constructed and structurally sound.
[ ] [ ] [ ] Posts 3-foot maximum spacing between posts.
[ ] [ ] [ ] Fabric is embedded 1 to 1.5 feet below ground and secured to frame/posts with staples at max 8-inch spacing.
[ ] [ ] [ ] Posts are stable, fabric is tight and without rips or frayed areas.
Sediment accumulation ___% of design capacity.

4. Temporary Sediment Trap
Yes No NA
[ ] [ ] [ ] Outlet structure is constructed per the approved plan or drawing.
[ ] [ ] [ ] Geotextile fabric has been placed beneath rock fill.
Sediment accumulation is ___% of design capacity.

5. Temporary Sediment Basin
Yes No NA
[ ] [ ] [ ] Basin and outlet structure constructed per the approved plan.
[ ] [ ] [ ] Basin side slopes are stabilized with seed/mulch.
[ ] [ ] [ ] Drainage structure flushed and basin surface restored upon removal of sediment basin facility.
Sediment accumulation is ___% of design capacity.

Note: Not all erosion and sediment control practices are included in this listing. Add additional pages to this list as required by site specific design.
Construction inspection checklists for post-development stormwater management practices can be found in Appendix F of the New York Stormwater Management Design Manual.

CONSTRUCTION DURATION INSPECTIONS

b. Modifications to the SWPPP (To be completed as described below)

The Operator shall amend the SWPPP whenever:

1. There is a significant change in design, construction, operation, or maintenance which may have a significant effect on the potential for the discharge of pollutants to the waters of the United States and which has not otherwise been addressed in the SWPPP; or
2. The SWPPP proves to be ineffective in:
   a. Eliminating or significantly minimizing pollutants from sources identified in the SWPPP and as required by this permit; or
   b. Achieving the general objectives of controlling pollutants in stormwater discharges from permitted construction activity; and
3. Additionally, the SWPPP shall be amended to identify any new contractor or subcontractor that will implement any measure of the SWPPP.

Modification & Reason:

III. Monthly Summary of Site Inspection Activities

Name of Permitted Facility:	Today's Date:	Reporting Month:
Location:	Permit Identification #:	
Name and Telephone Number of Site Inspector:		

Date of Inspection	Regular / Rainfall based Inspection	Name of Inspector	Items of Concern

Owner/Operator Certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that false statements made herein are punishable as a class A misdemeanor pursuant to Section 210.45 of the Penal Law."

Signature of Permittee or Duly Authorized Representative

Name of Permittee or Duly Authorized Representative

Date

Duly authorized representatives <u>must</u> have written authorization, submitted to DEC, to sign any permit documents.

NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity
Permit Number GP-02-01
Monthly Summary of Site Inspection Activities

Name of Permitted Facility:	**Permit Identification #:**	
Location:	**Today's Date:**	**Reporting Month:**
Name and Telephone Number of Site Inspector:	**Name and Telephone Number of Site Inspector:**	

Permit Reference; Part III.D.3.b (page 15):

"The operator shall post at the site, in a publicly-accessible location, a summary of the site inspection activities on a monthly basis."

Date of Inspection	Type of Inspection and 24 hr Rainfall	Name of Qualified Professional conducting Site Inspections	Major items of concern related to compliance of the SWPPP with all conditions of the general permit	Date Corrected

Owner/Operator Certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that false statements made herein are punishable as a class A misdemeanor pursuant to Section 210.45 of the Penal Law."

_______________________________ Signature of Permittee or Duly Authorized Representative

_______________________________ Name of Permittee or Duly Authorized Representative

__________ Date

Duly authorized representatives of the Permittee (Owner/Operator) must have written authorization, submitted to DEC, to sign any permit documents.

Inspection and Maintenance Checklist
Catch Basins, Manholes, and Inlets

Date: ______________________

Type of Inspection: Storm ☐ Weekly ☐ Monthly ☐ Annual ☐

Site: ______________________ Inspector(s): ______________________

Description or location of Project: ______________________

Defect	Conditions when Maintenance is Needed	Maintenance (1 or 2)*	Comments
General			
Trash and Debris	Trash and debris which are located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%.		
	Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe.		
	Trash or debris in any inlet or outlet pipe blocking more then 1/3 of its height.		
	Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).		
Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.		
Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider then ¼ inch.		
	Frame not sitting flush on top slab, i.e., separation of more than ¾ inch of the frame from the top slab. Frame not securely attached.		

*Maintenance: Enter 1 if maintenance is needed. Enter 2 if maintenance was preformed same day.

Defect	Conditions when Maintenance is Needed	Maintenance (1 or 2)*	Comments
Fractures or Cracks in Basin Walls/Bottom	Maintenance person judges that structure is unsound.		
	Grout fillet has separated or cracked wider then ½ inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.		
Settlement/Misalignment	If failure of basin has created a safety, function, or design problem.		
Vegetation	Vegetation growing across and blocking more than 10% of the basin opening.		
	Vegetation growing in inlet/outlet pipe joints that is more than 6 inches tall and less than 6 inches apart.		
Contamination and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants.		
Catch Basin Cover			
Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.		
Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than ½ inch of thread.		
Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is keep cover from sealing off access to maintenance).		
Ladder			
Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.		
Metal Grates (If Applicable)			
Grate opening Unsafe	Grate with opening wider than 7/8 inch.		
Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.		
Damaged or Missing	Grate missing or broken member(s) of the grate.		

*Maintenance: Enter 1 if maintenance is needed. Enter 2 if maintenance was preformed same day.

Inspection and Maintenance Checklist
Conveyance Systems (Pipes & Ditches)

Date: ______________________________

Type of Inspection: Storm ☐ Weekly ☐ Monthly ☐ Annual ☐

Site: ______________________________ Inspector(s): ______________________________

Defect	Conditions When Maintenance is Needed	Maintenance (1 or 2)*	Comments
Pipes			
Sediment & Debris	Accumulated Sediment that exceeds 20% of the diameter of the pipe.		
Vegetation	Vegetation that reduces free movement of water through pipes		
Damaged Pipe	Protective coating is damaged; rust is causing more than 50% deterioration to any part of pipe.		
	Any dent that decreases the cross section area of pipe by more than 20% or puncture that impacts performance.		
Open Ditches			
Trash and Debris	Trash and debris > 5 cf/1000 sf (one standard size garbage can) Visual evidence of dumping		
Sediment	Accumulated sediment that exceeds 20% of the design depth.		
Vegetation	Vegetation that reduces free movement of water through ditches.		
Erosion Damage to Slopes and Channel Bottom	Eroded damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion.		
Rock Lining Out of Place or Missing (If Applicable)	Maintenance person can see native soil beneath the rock lining.		

*Maintenance: Enter 1 if maintenance is needed. Enter 2 if maintenance was preformed same day.