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# STORMWATER POLLUTION PREVENTION PLAN

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## ***RESIDENTIAL DEVELOPMENT***

**1165 GREACEN POINT ROAD  
VILLAGE OF MAMARONECK, NEW YORK**

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JMC Project 18100

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## **APPENDIX DESCRIPTION**

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## **REFERENCED DRAWINGS FOR SWPPP DESIGN AND DETAILS**

### **JMC SITE PLANS**

<b><u>Dwg. No.</u></b>	<b><u>Title</u></b>	<b><u>Rev. No./Date</u></b>	
C-000	“Cover Sheet”	11	12/29/2020
C-010	“Existing Conditions Map”	11	12/29/2020
C-020	“Demolition & Tree Removal Plan”	11	12/29/2020
C-100	“Layout Plan”	11	12/29/2020
C-200	“Grading Plan”	3	12/29/2020
C-300	“Utilities Plan”	3	12/29/2020
C-400	“Erosion & Sediment Control Plan”	11	12/29/2020
C-900	“Construction Details”	11	12/29/2020
C-901	“Construction Details”	11	12/29/2020
C-902	“Construction Details”	6	12/29/2020
C-903	“Construction Details”	6	12/29/2020
L-100	“Landscaping & Wetland Mitigation Plan”	6	12/29/2020

## **I. INTRODUCTION**

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This Stormwater Pollution Prevention Plan has been prepared for the 1.09 acre site, located at 1165 Greacen Point Road in the Village of Mamaroneck, Westchester County, New York (hereinafter referred to as the "Site"). The site is bordered by the Delancey Cove to the northwest, Greacen Point Road to the southeast, and single-family homes to the southwest and northeast. The development has been designed in accordance with the following:

- Chapter 294 "Stormwater Management and Erosion and Sediment Control" of the Village of Mamaroneck Zoning Code

The project proposes the demolition of the existing single-family home and construction of a new single-family home with associated improvements including a detached garage, driveway / parking areas, landscaping improvements, deck and patio areas, an onsite wastewater treatment system, and stormwater management facilities.

## **II. STORMWATER MANAGEMENT PLANNING**

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A Stormwater Pollution Prevention Plan has been prepared for this project because it is a land development activity that involves:

- Disturbance of land greater than 1,000 square feet

The proposed stormwater facilities have been designed such that the quantity and quality of stormwater runoff during and after construction are not adversely altered or are enhanced when compared to pre-development conditions in the 25-year storm event.

### **The Six Step Process for Stormwater Site Planning and Practice Selection**

Stormwater management using green infrastructure is summarized in the six step process described below. The six step process was adhered to when developing this SWPPP.



Information is provided in this SWPPP which documents compliance with the required process as follows:

#### Step 1: Site Planning

Implement planning practices that protect natural resources and utilize the hydrology of the site. Strong consideration must be given to reducing impervious cover to aid in the preservation of natural resources including protecting natural areas, avoiding sensitive areas and minimizing grading and soil disturbance.

#### Step 2: Determine Water Quality Treatment Volume (WQv)

Determine the required WQv for the site based on the site layout, impervious areas and sub-catchments. This initial calculation of WQv will have to be revised after green infrastructure techniques are applied. The following method has been used to calculate the WQv.

- **90% Rule** - According to the New York State Stormwater Design Manual, Section 4.1, the water quality volume is determined from the 90% rule. The method is based on 90% of the average annual stormwater runoff volume which must be provided due to impervious surfaces. The Water Quality Volume (denoted as the WQv) is designed to improve water quality sizing to capture and treat 90% of the average annual stormwater runoff volume. The WQv is directly related to the amount of impervious cover created at a site. The average rainfall storm depth for 90% of storms in New York State in one year is used to calculate a volume of runoff. The rainfall depth depends on the location of the site within the state. From this depth of rainfall, the required water quality volume is calculated.

Proposed SMP's will effectively treat 100% of the 1-year storm for all new impervious areas which is above and beyond the water quality requirements for Redevelopment Projects.

### Step 3: Runoff Reduction Volumes (RRv) by Applying Green Infrastructure Techniques and Standard SMP's

RRv is not required for this project since it is a redevelopment; however, two Cisterns are proposed to collect rainwater for irrigation and will provide water quality and runoff reduction.

- **Rain Barrels and Cisterns**

- Underground storage tanks installed to collect stormwater runoff to be used for irrigation purposes the project will have an irrigation system for the lawn and landscaped areas.

The Minimum RRv capacity required must be provided by green infrastructure techniques to verify that the RRv requirement has been met. The RRv that is provided by the green infrastructure techniques can then be subtracted from the Total Required WQv that must be provided by the SMP's.

### Step 4: Determine the minimum RRv Required

The minimum RRv is calculated similar to the WQV. However, it is determined using only the new impervious cover and accounts for the hydrologic soil group present. In no case shall the runoff reduction achieved from the newly constructed impervious area be less than the minimum runoff reduction volume ( $RRv_{min}$ ).

### Step 5: Apply Standard Stormwater Management Practices to Address Remaining Water Quality Volume

Apply the standard SMP's to meet additional water quality volume requirements that cannot be addressed by applying the green infrastructure techniques. The standard SMP's with RRv capacity must be implemented to verify that the RRv requirement has been met.

## Step 6: Apply Volume and Peak Rate Control Practices to Meet Water Quantity Requirements

The Village of Mamaroneck requires that the Peak Rate from the 25 year storm event be mitigated under post-development conditions. This is accomplished by using practices such as infiltration basins, dry detention basins, etc. to meet water quantity requirements.

### **III. STUDY METHODOLOGY**

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Runoff rates were calculated based upon the standards set forth by the United States Department of Agriculture Natural Resources Conservation Service Technical Release 55, Urban Hydrology for Small Watersheds (TR-55), dated June 1986. The methodology set forth in TR-55 considers a multitude of characteristics for watershed areas including soil types, soil permeability, vegetative cover, time of concentration, topography, rainfall intensity, ponding areas, etc.

The 25-year storm recurrence intervals were reviewed in the design of the stormwater management facilities (see Appendix A for the Hydrologic Calculations).

Anticipated drainage conditions were analyzed taking into account the rate of runoff which will result from the construction of buildings, parking areas and other impervious surfaces associated with the site development.

#### Base Data and Design Criteria

For the stormwater management analysis, the following base information and methodology were used:

- I. The site drainage patterns and outfall facilities were reviewed by JMC personnel for the purpose of gathering background data and confirming existing mapping of the watershed areas.

2. An Existing Drainage Area Map was developed from the topographical survey. The drainage area map reflects the existing conditions within and around the project area.
3. A Proposed Drainage Area Map was developed from the proposed grading design superimposed over the topographical survey. The drainage area map reflects the proposed conditions within the project area and the existing conditions to remain in the surrounding area.
4. The United States Department of Agriculture (USDA) Web Soil Survey of the site available on its website at <http://websoilsurvey.nrcd.usda.gov>.
5. Soil Survey of Putnam and Westchester Counties, 1994.
6. The United States Department of Agriculture Natural Resources Conservation Service National Engineering Handbook, Section 4 - Hydrology", dated March 1985.
7. The United States Department of Agriculture Natural Resources Conservation Service Technical Report No. 55, Urban Hydrology for Small Watersheds (TR-55), dated June 1986.
8. United States Department of Commerce Weather Bureau Technical Release No. 40 Rainfall Frequency Atlas of the United States.
9. The time of concentration was calculated using the methods described in Chapter 3 of TR-55, Second Edition, June 1986. Manning's kinematics wave equation was used to determine the travel time of sheet flow. The 2-year 24 hour precipitation amount of 3.45 inches was used in the equation for all storm events. The travel time for shallow concentrated flow was computed using Figure 3-1 and Table 3-1 of TR-55. Manning's Equation was used to determine the travel time for channel reaches.
10. All hydrologic calculations were performed with the Bentley PondPack software package version 10.0.

11. The New York State Stormwater Management Design Manual, revised January 2015.
12. New York Standards and Specifications for Erosion and Sediment Control, November 2016.
13. The storm flows for the 25-year recurrence interval storms were analyzed for the total watershed areas. The Type III distribution design storm for a 24 hour duration was used and the mass rainfall for each design storm was taken from the Extreme Precipitation in New York & New England developed by the Natural Resource Conservation Service (NRCS) and the Northeast Regional Climate Center (NRCC) as follows:

24 Hour Rainfall Amounts

Design Storm Recurrence Interval	Inches of Rainfall
25 Year	6.41

#### **IV. EXISTING CONDITIONS**

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The existing conditions of the project site consists of a 2,000± S.F. single-family residence including a deck and porch, driveway and parking areas, areas of lawn, and a wetland in the rear of the property adjacent to Delancey Cove. After stormwater runoff exits the project site, it flows to Delancey Cove.

The following natural features, conservation areas, resource areas and drainage patterns of the project site have been identified and utilized to develop Drawing DA-I “Existing Drainage Area Map” which is included in Appendix G:

- Wetlands (jurisdictional, wetland of special concern)
- Waterways (major, perennial, intermittent, springs)
- Buffers (stream, wetland, forest, etc.)
- Floodplains

- Topography (contour lines, existing flow paths, steep slopes, etc.)
- Soil (hydrologic soil groups, highly erodible soils, etc.)

Based on the USDA Web soil survey, all on-site soils are poorly drained and belong to hydrological group D. The soil types, boundaries and drainage areas/designations are depicted on Drawing DA-I within Appendix G.

Two separate Design Lines (DL-1 through DL-2) were identified for comparing peak rates of runoff in existing and proposed conditions. Similarly, two separate drainage areas were identified in existing conditions based on the existing drainage divides at the site. The numbers included in the name of each drainage area correspond to the Design Point they drain towards.

The following is a description of each of the drainage areas analyzed in the existing conditions analysis:

Existing Drainage Area 1 (EDA-1) is 0.55 acres in size and is located on the northwestern portion of the site adjacent to the wetland area. This area consists of the existing single-family residence, driveway and parking areas, and areas of lawn. This drainage area drains overland to the wetland area, and ultimately to Delancey Cove.

The Curve Number (CN) and Time of Concentration (Tc) for this drainage area are 80 and 10.6 minutes, respectively. Refer to Drawing DA-I in Appendix G.

Existing Drainage Area 2 (EDA-2) is 0.18 acres in size and is located on the southeastern portion of the site adjacent to the wetland area. This area consists of the existing driveway and areas of lawn. This drainage area drains overland toward Greacon Point Road, and ultimately to Delancey Cove.

The Curve Number (CN) and Time of Concentration (Tc) for this drainage area are 78 and 6.7 minutes, respectively. Refer to Drawing DA-I in Appendix G.

The peak rates of runoff to the design points from the drainage areas for each storm are shown in the table below:

**Table I**  
**Summary of Peak Rates of Runoff in Existing Conditions**  
**(Cubic Feet per Second)**

<b>Storm Recurrence Interval</b>	<b>DL-1</b>	<b>DL-2</b>
25 year	2.11	0.69

## **V. PROPOSED CONDITIONS**

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The proposed improvements consist of the construction of a 2,637± S.F. single-family residence with associated improvements consisting of a detached garage, driveway / parking areas, landscaping improvements, deck and patio areas, an onsite wastewater treatment system, and stormwater management facilities.

The proposed drainage improvements include a variety of stormwater practices including an R-Tank subsurface detention facility and a rainwater cistern to water quality treatment and irrigation. After treatment for water quality and peak rate attenuation, stormwater discharges will utilize energy dissipating aprons which will drain to the existing wetland buffer and wetland. The vegetated practices and overland discharges provide multiple opportunities for water quality enhancement and infiltration in addition to the proposed stormwater management basins. These overland conveyances of stormwater runoff will result in additional infiltration not considered in the SWPPP's hydrologic model, resulting in a conservative analysis.

This section describes the design and analysis of the proposed conditions used to demonstrate that the SWPPP meets the requirements of the General Permit.

### **The Six Step Process For Stormwater Site Planning and Practice Selection**

#### **Step 1: Site Planning**

The following practices and site features were incorporated in the site design:

- Preserving hydrology - Maintaining drainage divides
- Wetlands and buffers – The site includes 0.37 acres of wetlands and 0.41 acres of wetland buffers. The project requires the disturbance of 0.30± acres of wetland buffer.
- Floodplain considerations - The site lies within the 100 year flood zone according to the National Flood Insurance Program Flood Insurance Rate Map (FIRM) No. 36119C0361F, effective date 09/28/2007.
- Waterways (major, perennial, intermittent, springs) – The location, setback, cross section, etc. of the existing waterway has been maintained.
- Topography (contour lines, existing flow paths, steep slopes, etc.) has been maintained or disturbed to the minimum extent practicable.
- Soil (hydrologic soil groups, highly erodible soils, etc.)

#### Step 2: Determine Water Quality Treatment Volume (WQv)

The following method has been used to calculate the WQv.

- **90% Rule** - According to the New York State Stormwater Design Manual, Section 4.1, the water quality volume is determined from the 90% rule. The method is based on 90% of the average annual stormwater runoff volume which must be provided due to impervious surfaces. The Water Quality Volume (denoted as the WQv) is designed to improve water quality sizing to capture and treat 90% of the average annual stormwater runoff volume. The WQv is directly related to the amount of impervious cover created at a site. The average rainfall storm depth for 90% of storms in New York State in one year is used to calculate a volume of runoff. The rainfall depth depends on the location of the site within the state. From this depth of rainfall, the required water quality volume is calculated.

Proposed SMP's will effectively treat 100% of the 1 year storm for all new impervious areas which is above and beyond the water quality requirements for Redevelopment Projects.



### Step 3: Runoff Reduction Volumes (RRv) by Applying Green Infrastructure Techniques and Standard SMP's

RRv is not required for this project since it is a redevelopment; however, two cisterns are proposed to collect rainwater for irrigation and will provide water quality and runoff reduction.

### Step 4: Determine the minimum RRv Required

RRv calculations have not been provided as runoff reduction is not required.

### Step 5: Apply Standard Stormwater Management Practices to Address Remaining Water Quality Volume

The entirety of the required Water Quality Volume has been met through the proposed rainwater cisterns. Please refer to the Water Quality Calculations in Appendix B.

### Step 6: Apply Volume and Peak Rate Control Practices to Meet Water Quantity Requirements

- R-Tank Subsurface Detention System

#### Description

A subsurface detention system is proposed to store and detain stormwater runoff from the proposed house and driveway. This system has been designed to attenuate the peak rate of runoff during a 25-year storm event.

All practices exceed the required elements of SMP criteria as outlined in Chapter 6 of the NYS Stormwater Management Design Manual. A summary of each category is provided below.

1. Feasibility – Stormwater practices are designed based upon unique physical environmental considerations noted in the NYS Stormwater Management Design Manual (NYSSMDM).
2. Conveyance – The design conveys runoff to the designed stormwater practice in a manner that is safe, minimizes erosion and disruption to natural drainage channel and promotes filtering and infiltration.
3. Pretreatment – All stormwater practices provide pretreatment as required in accordance with NYSSMDM design guidelines.
4. Treatment Geometry – The plan provides water quality treatment in accordance with NYSSMDM guidelines.
5. Maintenance – Maintenance for the environment practices has been provided and is detain the SWPPP Report as required. Maintenance access is provided in the design plans.

In order to determine the post-development rates of runoff generated on-site, the following drainage areas were analyzed in the post-development conditions. These areas are graphically depicted on Drawing DA-2 "Proposed Drainage Area Map" located in Appendix G.

Two separate Design Lines (DL-1 through DL-2) were identified for comparing peak rates of runoff in existing and proposed conditions. Similarly, three separate drainage areas were identified in proposed conditions based on the proposed drainage divides at the site. The numbers included in the name of each drainage area correspond to the Design Point they drain towards.

The following is a description of each of the drainage areas analyzed in the proposed conditions analysis:

Proposed Drainage Area 1A (PDA-1A) is 0.20 acres in size and is located in the center of the site and consists of the proposed single-family residence, detached garage, driveway and parking areas, front sidewalk, and lawn. This drainage area drains towards a series of drain inlets where

runoff is then conveyed to the rainwater cisterns, and then to the R-tank system for detention. After being detained, runoff is slowly released via an outlet control structure to a rip-rap apron, where it then flows overland to Delancey Cove.

The Curve Number (CN) and Time of Concentration (Tc) for this drainage area are 89 and 5.0 minutes, respectively.

Proposed Drainage Area 1B (PDA-1B) is 0.38 acres in size and is located on the northwestern portion of the site. This area consists of the backyard lawn areas which drain overland to the wetland and then to Delancey Cove.

The Curve Number (CN) and Time of Concentration (Tc) for this drainage area are 80 and 5.2 minutes, respectively.

Proposed Drainage Area 2 (PDA-2) is 0.15 acres in size and is located on the southeastern portion of the site. This area consists of the front yard and a portion of the proposed driveway. This drainage area drains overland toward Greacen Point Road and ultimately to Delancey Cove.

The Curve Number (CN) and Time of Concentration (Tc) for this drainage area are 82 and 5.0 minutes, respectively.

Refer to Drawing DA-2 in Appendix G.

The peak rates of runoff to the design point of each of the analyzed drainage areas for each storm are shown on the table below:

**Table 2**  
**Summary of Proposed Peak Rates of Runoff in Proposed Conditions**  
**(Cubic Feet per Second)**

<b>Storm Recurrence Interval</b>	<b>DL-1</b>	<b>DL-2</b>
25 year	1.89	0.66

The reductions in peak rates of runoff from proposed to existing conditions are shown on the table below:

**Table 3**  
**Percent Reductions in Peak Rates of Runoff (Existing vs. Proposed Conditions)**  
**(Cubic Feet per Second)**

<b>Design Point</b>	<b>Storm Recurrence Frequency (Years)</b>	<b>Existing Peak Runoff Rate (cfs)</b>	<b>Proposed Peak Runoff Rate (cfs)</b>	<b>Percent Reduction (%)</b>
1	25 year	2.11	1.89	10.4
2	25 year	0.69	0.66	4.3

As demonstrated in Table 4, the proposed stormwater improvements will result in reductions of peak rates of runoff for all design points analyzed.

## **VI. SOIL EROSION & SEDIMENT CONTROL**

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A potential impact of the proposed development on any soils or slopes will be that of erosion and transport of sediment during construction. An Erosion and Sediment Control Management Program will be established for the proposed development, beginning at the start of construction and continuing throughout its course, as outlined in the "New York State Standards and Specifications for Erosion and Sediment Control," November 2016. A continuing maintenance program will be implemented for the control of sediment transport and erosion control after construction and throughout the useful life of the project.

The Operator shall have a qualified professional conduct an assessment of the site prior to the commencement of construction and certify that the appropriate erosion and sediment controls, as shown on the Sediment & Erosion Control Plans, have been adequately installed to ensure overall preparedness of the site for the commencement of construction. In addition, the Operator shall have a qualified professional conduct one site inspection at least every seven calendar days and at least two site inspections every seven calendar days when greater than five acres of soil is disturbed at any one time.

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 of the contractors and subcontractors identified above sign a copy of the certification statement provided in Appendix D before they commence any construction activity.

#### Soil Description

As provided by the United States Department of Agriculture, Soil Conservation Service "Web Soil Survey," soil classifications which exist on the subject site are described below.

Soils are placed into four hydrologic groups: A, B, C, and D. In the definitions of the classes, infiltration rate is the rate at which water enters the soil at the surface and is controlled by the surface conditions. Transmission rate is the rate at which water moves in the soil and is controlled by soil properties. Definitions of the classes are as follows:

- A. (Low runoff potential). The soils have a high infiltration rate even when thoroughly wetted. They chiefly consist of deep, well drained to excessively drained sands or gravels. They have a high rate of water transmission.
- B. The soils have a moderate infiltration rate when thoroughly wetted. They chiefly are moderately deep to deep, moderately well drained to well drained soils that have moderately fine to moderately coarse textures. They have a moderate rate of water transmission.

- C. The soils have a slow infiltration rate when thoroughly wetted. They chiefly have a layer that impedes downward movement of water or have moderately fine to fine texture. They have a slow rate of water transmission.
- D. (High runoff potential). The soils have a very slow infiltration rate when thoroughly wetted. They chiefly consist of clay soils that have a high swelling potential, soils that have a permanent high-water table, soils that have a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. They have a very slow rate of water transmission.

A soil's tendency to erode is also described in the USDA web soil survey. The ratings in this interpretation indicate the hazard of soil loss from unsurfaced areas. The ratings are based on soil erosion factor K, slope, and content of rock fragments. The hazard is described as "slight," "moderate," or "SEVERE." A rating of "slight" indicates that little or no erosion is likely; "moderate" indicates that some erosion is likely, that the temporarily unsurfaced / unstabilized during construction may require occasional maintenance, and that simple erosion-control measures are needed; and "SEVERE" indicates that significant erosion is expected, that the roads or trails require frequent maintenance, and that erosion-control measures are needed.

Per the Soil Survey, the following soils listed below are present at the site. Following this list is a detailed description of each soil type found on the property:

<u>SYM.</u>	<u>H.S.G.</u>	<u>DESCRIPTION</u>
UhB	D	Urban land-Charlton complex, 3 to 8 percent slopes
UwB	D	Urban land-Woodbridge complex, 3 to 8 percent slopes

UhB, Urban land-Charlton complex, 3 to 8 percent slopes

This unit consists of areas of Urban land and the very deep, well drained, and gently sloping Charlton soil. It is on ridges and hilltops that are underlain by folded bedrock. The parent material consists of coarse-loamy melt-out till derived from gneiss, granite, and/or schist. Depth

to the top of a seasonal high-water table is at a depth of more than 60 inches. Available water capacity is moderate.

Hydrologic group: D

Erosion Hazard Rating: Severe

#### UhB, Urban land-Woodbridge complex, 3 to 8 percent slopes

This unit consists of areas of Urban land and the gently sloping, very deep, moderately well drained Woodbridge soil. The parent material consists of coarse-loamy melt-out till derived from gneiss, granite, and/or schist. Depth to the top of a seasonal high-water table is at a depth of 1.5 feet. Available water capacity is moderate.

Hydrologic group: D

Erosion Hazard Rating: Severe

#### On-Site Pollution Prevention

There are temporary pollution prevention measures used to control litter and construction debris on site, such as:

- Silt Fence
- Inlet Protection

There will be inlet protection provided for all storm drains and inlets with the use of silt sack inlet protection inserts and stone & block drop inlet protection, which keep silt, sediment and construction litter and debris out of the on-site stormwater drainage system.

## Temporary Control Measures

Temporary control measures and facilities will include silt fences, construction ditches, stabilized construction access, temporary seeding, mulching and sediment traps with temporary riser and anti-vortex devices.

Throughout the construction of the proposed development, temporary control facilities will be implemented to control on-site erosion and sediment transfer. Construction ditches, if required, will be used to direct stormwater runoff to temporary sediment traps for settlement. The sediment traps will be constructed as part of this project will serve as temporary sediment basins to remove sediment and pollutants from the stormwater runoff produced during construction. Descriptions of the temporary sediment & erosion controls that will be used during the development of the site including silt fence, stabilized construction access, seeding, mulching and inlet protection are as follows:

1. Silt Fence is constructed using a geotextile fabric. The fence will be either 18 inches or 30 inches high. The height of the fence can be increased in the event of placing these devices on uncompacted fills or extremely loose undisturbed soils. The fences will not be placed in areas which receive concentrated flows such as ditches, swales and channels nor will the filter fabric material be placed across the entrance to pipes, culverts, spillway structures, sediment traps or basins.
2. Stabilized Construction Access consists of AASHTO No. 1 rock. The rock entrance will be a minimum of 50 feet in length by 24 feet in width by 8 inches in depth.
3. Seeding will be used to create a vegetative surface to stabilize disturbed earth until at least 80% of the disturbed area has a perennial vegetative cover. This amount is required to adequately function as a sediment and erosion control facility. Grass lining will also be used to line temporary channels and the surrounding disturbed areas.



4. Mulching is used as an anchor for seeding and disturbed areas to reduce soil loss due to storm events. These areas will be mulched with straw at a rate of 3 tons per acre such that the mulch forms a continuous blanket. Mulch must be placed after seeding or within 48 hours after seeding is completed.
5. Inlet Protection will be provided for all stormwater basins and inlets with the use of curb & gutter inlet protection and stone & block inlet protection structures, which will keep silt, sediment and construction debris out of the storm system. Existing structures within existing paved areas will be protected using “Silt Sacks” inside the structures.

The contractor shall be responsible for maintaining the temporary sediment and erosion control measures throughout construction. This maintenance will include, but not be limited to, the following tasks:

1. For dust control purposes, moisten all exposed graded areas with water at least twice a day in those areas where soil is exposed and cannot be planted with a temporary cover due to construction operations or the season (December through March).
2. Inspection of erosion and sediment control measures shall be performed at the end of each construction day and immediately following each rainfall event. All required repairs shall be immediately executed by the contractor.
3. Sediment deposits shall be removed when they reach approximately  $\frac{1}{3}$  the height of the silt fence. All such sediment shall be properly disposed of in fill areas on the site, as directed by the Owner’s Field Representative. Fill shall be protected following disposal with mulch, temporary and/or permanent vegetation and be completely circumscribed on the downhill side by silt fence.
4. Rake all exposed areas parallel to the slope during earthwork operations.

5. Following final grading, the disturbed area shall be stabilized with a permanent surface treatment (i.e. turf grass, pavement or sidewalk). During rough grading, areas which are not to be disturbed for fourteen or more days shall be stabilized with the temporary seed mixture, as defined on the plans. Seed all piles of dirt in exposed soil areas that will not receive a permanent surface treatment.

#### Concrete Material and Equipment Management

Concrete washouts shall be used to contain concrete and liquids when the chutes of concrete mixers and hoppers of concrete pumps are rinsed out after delivery. The washout facilities consolidate solid for easier disposal and prevent runoff of liquids. The wash water is alkaline and contains high levels of chromium, which can leach into the ground and contaminate groundwater. It can also migrate to a storm drain, which can increase the pH of area waters and harm aquatic life. Solids that are improperly disposed of can clog storm drain pipes and cause flooding. Installing concrete washout facilities not only prevents pollution but also is a matter of good housekeeping at your construction site.

Prefabricated concrete washout containers can be delivered to the site to provide maintenance and disposal of materials. Regular pick-ups of solid and liquid waste materials will be necessary. To prevent leaks on the job site, ensure that prefabricated washout containers are watertight. A self installed concrete washout facility can be utilized although they are much less reliable than prefabricated containers and are prone to leaks. There are many design options for the washout, but they are preferably built below-grade to prevent breaches and reduce the likelihood of runoff. Above-grade structures can also be used if they are sized and constructed correctly and are diligently maintained. One of the most common problems with self-installed concrete washout facilities is that they can leak or be breached as a result of constant use, therefore the contractor shall be sure to use quality materials and inspect the facilities on a daily basis.

Washouts must be sized to handle solids, wash water, and rainfall to prevent overflow.

Concrete Washout Systems, Inc. estimates that 7 gallons of wash water are used to wash one truck chute and 50 gallons are used to wash out the hopper of a concrete pump truck.

For larger sites, a below-grade washout should be at least 10 feet wide and sized to contain all liquid and solid waste expected to be generated in between cleanout periods. A minimum of 12-inches of freeboard must be provided. The pit must be lined with plastic sheeting of at least 10-mil thickness without holes or tears to prevent leaching of liquids into the ground. Concrete wash water should never be placed in a pit that is connected to the storm drain system or that drains to nearby waterways.

An above-grade washout can be constructed at least 10 feet wide by 10 feet long and sized to contain all liquid and solid waste expected to be generated in between cleanout periods. A minimum of 4-inches of freeboard must be provided. The washout structures can be constructed with staked straw bales or sandbags double-or triple lined with plastic sheeting of at least 10-mil thickness without holes or tears.

Concrete washout facilities shall not be located within 50 feet of storm drains, open ditches, or water bodies and should be placed in locations that allow for convenient access for concrete trucks. The contractor shall check all concrete washout facilities daily to determine if they have been filled to 75 percent capacity, which is when materials need to be removed. Both above-and below-ground self-installed washouts should be inspected daily to ensure that plastic linings are intact, and sidewalls have not been damaged by construction activities. Prefabricated washout containers should be inspected daily as well as to ensure the container is not leaking or nearing 75 percent capacity. Inspectors should also note whether the facilities are being used regularly. Additional signage for washouts may be needed in more convenient locations if concrete truck operators are not utilizing them.

The washout structures must be drained or covered prior to predicted rainstorms to prevent overflows. Hardened solids either whole or broken must be removed and then they may be reused onsite or hauled away for recycling.

Once materials are removed from the concrete washout, a new structure must be built or excavated, or if the previous structure is still intact, inspect it for signs of weakening or damage and make any necessary repairs. Line the structure with new plastic that is free of holes or tears and replace signage if necessary. It is very important that new plastic be used after every cleaning because pumps and concrete removal equipment can damage the existing liner.

### Construction Site Chemical Control

The purpose of this management measure is to prevent the generation of nonpoint source pollution from construction sites due to improper handling and usage of nutrients and toxic substances, and to prevent the movement of toxic substances from the construction site.

Many potential pollutants other than sediment are associated with construction activities. These pollutants include pesticides; fertilizers used for vegetative stabilization; petrochemicals; construction chemicals such as concrete products, sealers, and paints; wash water associated with these products; paper; wood; garbage; and sanitary waste.

Disposal of excess pesticides and pesticide-related wastes should conform to registered label directions for the disposal and storage of pesticides and pesticide containers set forth in applicable Federal, State and local regulations that govern their usage, handling, storage, and disposal.

Pesticides should be disposed of through either a licensed waste management firm or a treatment, storage and disposal (TSD) facility. Containers should be triple rinsed before disposal, and rinse waters should be reused as product.

Other practices include setting aside a locked storage area, tightly closing lids, storing in a cool, dry place, checking containers periodically for leaks or deterioration, maintaining a list of products in storage, using plastic sheeting to line the storage areas, and notifying neighboring property owners prior to spraying.

When storing petroleum products, follow these guidelines:

- Create a shelter around the area with cover and wind protection;
- Line the storage area with a double layer of plastic sheeting or similar material;
- Create an impervious berm around the perimeter with a capacity of 110 percent greater than that of the largest container;
- Clearly label all products;
- Keep tanks off the ground; and
- Keep lids securely fastened.

Post spill procedure information and have persons trained in spill handling on site or on call at all times. Materials for cleaning up spills should be kept on site and easily available. Spills should be cleaned up immediately and the contaminated material properly disposed of. Maintain and wash equipment and machinery in confined areas specifically designed to control runoff.

Thinners or solvents should not be discharged into sanitary or storm systems when cleaning machinery. Use alternative methods for cleaning larger equipment parts, such as high-pressure, high-temperature water washes, or steam cleaning. Equipment-washing detergents can be used, and wash water may be discharged into sanitary sewers if solids are removed from the solution first. (This practice should be verified with the local sewer authority.) Small parts can be cleaned with degreasing solvents, which can then be reused or recycled.

#### Solid Waste Management and Portable Sanitary Management

The purpose of this management measure is to prevent the potential for solid waste such as construction debris, trash, etc. from construction sites due to improper handling and storage. Debris and litter should be removed periodically from the BMP's and surrounding areas to prevent clogging of pipes and structures. All construction material shall be stored in designated staging areas. Roll-off containers shall be placed on site and all empty containers, construction debris and litter shall be placed in the containers.

Portable sanitary units may be utilized on-site or bathrooms will be provided within construction trailers. A sanitation removal company will be hired to pump/remove any sanitary waste. In the event that portable sanitary units are used and then cleaned after being emptied, the rinse water may not be disposed of to the storm drain system. It shall be contained for later disposal if it can't be disposed of on-site. Remove paper and trash before cleaning the portable sanitary units. The portable sanitary units shall be located away from the storm drain system if possible. Provide over head cover for wash areas if possible. Maintain spill response material and equipment on site to eliminate the potential for contaminants and wash water from entering the storm drain system.

#### Permanent Control Measures and Facilities for Long Term Protection

Towards the completion of construction, permanent sediment and erosion control measures will be developed for long term erosion protection. The following permanent control measures and facilities have been proposed to be implemented for the project:

1. Drain Inlets will be used to remove some of the coarse sand and grit sediment before entering the drainage system. Each catch basin will be constructed with an 18 inch deep sump.
2. Two 3,000 gallon Cisterns will be used to store and provide water quality treatment for the stormwater runoff on the site. Some sediment will be collected and trapped before water is discharged to the detention system and then to the rear of the property.
3. Rip-Rap Energy Dissipators At discharge points from the stormwater management system, rip-rap pads consisting of angular rocks will be placed to dissipate velocity and reduce the risk of erosion.
4. Seeding of at least 70% perennial vegetative cover will be used to produce a permanent uniform erosion resistant surface. The seeded areas will be mulched with straw at a rate of 2 tons per acre such that the mulch forms a continuous blanket.

## **Specifications for Soil Restoration**

Prior to the final stabilization of the disturbed areas, soil restoration will be required for all vegetated areas to recover the original properties and porosity of the soil. Soil Restoration Requirements are provided on Table 4 below:

**Table 4**

### **Soil Restoration Requirements**

<b>Type of Soil Disturbance</b>	<b>Soil Restoration Requirement</b>		<b>Comments/Examples</b>
No soil disturbance	Restoration not permitted		Preservation of Natural Features
Minimal soil disturbance	Restoration not required		Clearing and grubbing
Areas where topsoil is stripped only – no change in grade	HSG A&B	HSG C&D	Protect area from any ongoing construction activities
	apply 6 inches of topsoil	Aerate* and apply 6 inches of topsoil	
Areas of cut or fill	HSG A&B	HSG C&D	Clearing and grubbing
	Aerate and apply 6 inches of topsoil	Apply full Soil Restoration**	
Heavy traffic areas on site (especially) in a zone 5-25 feet around buildings but not within a 5 foot perimeter around foundation walls)	Apply full Soil Restoration (decompaction and compost enhancement)		
Areas where Runoff Reduction and/or Infiltration practices are applied	Restoration not required, but may be applied to enhance the reduction specified for appropriate practices.		Keep construction equipment from crossing these areas. To protect newly installed practice from any ongoing construction activities construct a single phase operation fence area.
Redevelopment projects	Soil Restoration is required on redevelopment projects in areas where existing impervious area will be converted to pervious area.		

\* Aeration includes the use of machines such as tractor-drawn implements with coulters making a narrow slit in the soil, a roller with many spikes making indentations in the soil, or prongs which function like a mini-subsoiler.

\*\* Per "Deep Ripping and De-compaction, DEC 2008."

During periods of relatively low to moderate subsoil moisture, the disturbed subsoils are returned to rough grade and the following full soil restoration steps applied:

1. Apply 3 inches of compost over subsoil.
2. Till compost into subsoil to a depth of at least 12 inches using a cat-mounted ripper, tractor-mounted disc, or tiller, mixing, and circulating air and compost into subsoils.
3. Rock-pick until uplifted stone/rock materials of four inches and larger size are cleaned off the site.

### **Specifications for Final Stabilization of Graded Areas**

Final stabilization of graded areas consists of the placement of topsoil and installation of landscaping (unless the area is to be paved, or a building is to be constructed in the location). Topsoil is to be spread as soon as grading operations are completed. Topsoil is to be placed to a minimum depth of six inches on all embankments, planting areas and seeding/sod areas. The subgrade is to be scarified to a depth of two inches to provide a bond of the topsoil with the subsoil. Topsoil is to be raked to an even surface and cleared of all debris, roots, stones and other unsatisfactory material.

Planting operations shall be conducted under favorable weather conditions as follows:

- Permanent Lawns - April 15 (provided soil is frost-free and not excessively moist) to May 15; August 15 to October 15.



- Temporary Lawn Seeding - if outside of the time periods noted above, the areas shall be seeded immediately on completion of topsoil operations with annual ryegrass (Italian rye) at a rate of six pounds per 1,000 square feet. Temporary lawn installation is permitted provided the soil is frost-free and not excessively moist. The permanent lawn is to be installed the next planting season.

On slopes with a grade of 3 horizontal to 1 vertical or greater, and in swales, a geotextile netting or mat shall be installed for stabilization purposes as shown on the Plans. Seeded areas are to be mulched with straw or hay at an application rate of 70-90 pounds per 1,000 s.f. Straw or hay mulch must be spread uniformly and anchored immediately after spreading to prevent wind blowing. Mulches must be inspected periodically and in particular after rainstorms to check for erosion. If erosion is observed, additional mulch must be applied. Netting shall be inspected after rainstorms for dislocation or failure; any damage shall be repaired immediately.

All denuded surfaces which will be exposed for a period of over two months or more shall be temporarily hydroseeded with (a) perennial ryegrass at a rate of 40 lbs per acre (1.0 lb per 1000 square feet ); (b) Certified "Aroostook" winter rye (cereal rye) @ 100 lb per acre (2.5 lb/1000 s.f.) to be used in the months of October and November.

Permanent turfgrass cover is to consist of a seed mixture as follows:

(a) Sunny sites

Kentucky Bluegrass	2.0-2.6 pounds/1000 square feet
Perennial Ryegrass	0.6-0.7 pounds/1000 square feet
Fine Fescue	0.4-0.6 pounds/1000 square feet

(b) Shady sites

Kentucky Bluegrass	0.8-1.0 pounds/1000 square feet
Perennial Ryegrass	0.6-0.7 pounds/1000 square feet

Fine Fescue

2.6-3.3 pounds/1000 square feet

All plant materials shall comply with the standards of the American Association Of Nurserymen with respect to height and caliper as described in its publication American Standard for Nursery Stock, latest edition.

## **VII. CONSTRUCTION PHASE AND POST-CONSTRUCTION MAINTENANCE**

During the construction phase and following construction of the project, a number of maintenance measures will be taken with respect to the site maintenance. Measures to be taken included the following:

### **I. During Construction**

A comprehensive sediment and erosion control plan will be in place during the construction period. Maintenance measures for sediment and erosion controls will include:

A qualified professional acceptable to the municipality will be hired by the owner or operator to monitor the installation and maintenance of the sediment and erosion control plans. The qualified professional shall report directly to the Engineering Consultant and shall be responsible for ensuring compliance with the design of the sediment and erosion control plans.

The qualified professional so hired will inspect all sediment and erosion control measures at least every seven calendar days. In the event that there has been a variance with the design of the sediment and erosion control measures so that the ability of the measures to adequately perform the intended function is lessened or compromised and/or the facilities are not adequately maintained, the qualified professional shall be required to report such variance to the Engineering Consultant within 48 hours and shall be empowered to order immediate repairs to the sediment and erosion control measures.

The qualified professional will also be responsible for observing the adequacy of the vegetation growth (trees, shrubs, groundcovers and turfgrasses) in newly graded areas and for ordering additional plantings in the event that the established plant materials do not adequately protect the ground surface from erosion.

## **2. Following Construction**

Site maintenance activities on the property will include:

- Grounds maintenance, including mowing of lawns;
- Planting of trees, shrubs and groundcovers; pruning of trees and shrubs;
- Maintenance of stormwater management area;

Mr. William Fedyna will be responsible for the long-term operation and maintenance of the permanent stormwater management practices. The permanent stormwater management practices shall be maintained in accordance with the Maintenance Inspection Checklists provided in Appendix C.

## **VIII. CONCLUSION**

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This Stormwater Pollution Prevention Plan has been prepared to describe the project's pre and post-development stormwater management improvements and its sediment and erosion control improvements to be utilized during construction. The proposed permanent improvements and the interim improvements to be utilized during construction have been designed in accordance with the requirements of the:

- Chapter 294 "Stormwater Management and Erosion and Sediment Control" of the Village of Mamaroneck Zoning Code

The project employs a variety of practices to enhance stormwater quality and reduce peak rates of runoff associated with the proposed improvements. These measures include two rainwater cisterns and a proposed subsurface detention system.

Based on the foregoing, it is our professional opinion that the proposed improvements will provide water quantity and quality enhancements which exceed the above mentioned requirements and are not anticipated to have any adverse impacts to the site or any surrounding areas.

## ***APPENDIX A***

# ***HYDROLOGIC CALCULATIONS***

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Project Summary

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Title	Residential Development
Engineer	JMC Planning Engineering Landscape Architecture & Land Surveying, PLLC
Company	
Date	12/29/2020

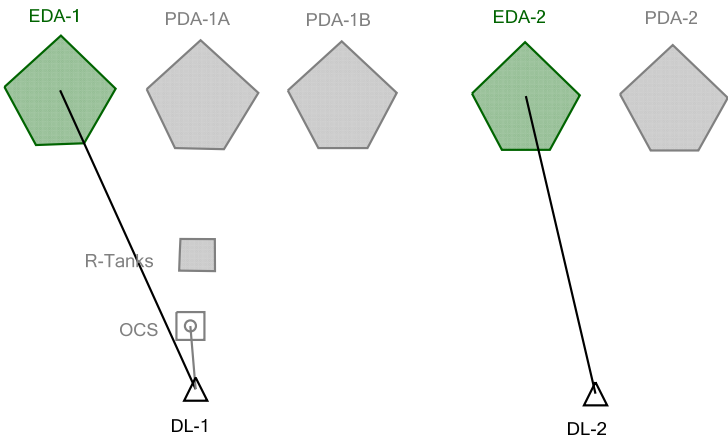
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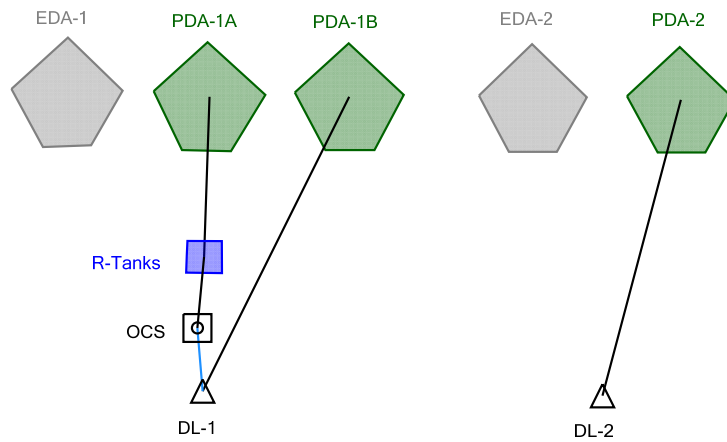
Notes

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Scenario: Pre-Development 1 Year



## Scenario: Post-Development 1 Year





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## Subsection: Master Network Summary

### Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft <sup>3</sup> )	Time to Peak (hours)	Peak Flow (ft <sup>3</sup> /s)
EDA-1	Pre-Development 25 Year	25	8,294.000	12.150	2.11
EDA-2	Pre-Development 25 Year	25	2,512.000	12.100	0.69
PDA-1A	Post-Development 25 Year	25	3,720.000	12.100	0.99
PDA-2	Post-Development 25 Year	25	2,357.000	12.100	0.66
PDA-1B	Post-Development 25 Year	25	5,696.000	12.100	1.60

### Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft <sup>3</sup> )	Time to Peak (hours)	Peak Flow (ft <sup>3</sup> /s)
DL-1	Post-Development 25 Year	25	9,398.000	12.100	1.89
DL-1	Pre-Development 25 Year	25	8,294.000	12.150	2.11
DL-2	Post-Development 25 Year	25	2,357.000	12.100	0.66
DL-2	Pre-Development 25 Year	25	2,512.000	12.100	0.69

### Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft <sup>3</sup> )	Time to Peak (hours)	Peak Flow (ft <sup>3</sup> /s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft <sup>3</sup> )
R-Tanks (IN)	Post-Development 25 Year	25	3,720.000	12.100	0.99	(N/A)	(N/A)
R-Tanks (OUT)	Post-Development 25 Year	25	3,702.000	12.200	0.73	9.62	876.000

Subsection: Time-Depth Curve  
 Label: Time-Depth - 1  
 Scenario: Post-Development 25 Year

Return Event: 25 years  
 Storm Event: 25 Year

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Time-Depth Curve: 25 Year

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Label	25 Year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	25 years

---

**CUMULATIVE RAINFALL (in)**  
**Output Time Increment = 0.100 hours**  
**Time on left represents time for first value in each row.**

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.1	0.1
1.000	0.1	0.1	0.1	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.2
2.500	0.2	0.2	0.2	0.2	0.2
3.000	0.2	0.2	0.2	0.2	0.2
3.500	0.2	0.2	0.3	0.3	0.3
4.000	0.3	0.3	0.3	0.3	0.3
4.500	0.3	0.3	0.3	0.3	0.4
5.000	0.4	0.4	0.4	0.4	0.4
5.500	0.4	0.4	0.4	0.4	0.5
6.000	0.5	0.5	0.5	0.5	0.5
6.500	0.5	0.5	0.5	0.6	0.6
7.000	0.6	0.6	0.6	0.6	0.6
7.500	0.7	0.7	0.7	0.7	0.7
8.000	0.7	0.7	0.8	0.8	0.8
8.500	0.8	0.8	0.9	0.9	0.9
9.000	0.9	1.0	1.0	1.0	1.0
9.500	1.1	1.1	1.1	1.2	1.2
10.000	1.2	1.2	1.3	1.3	1.3
10.500	1.4	1.4	1.5	1.5	1.6
11.000	1.6	1.7	1.7	1.8	1.8
11.500	1.9	2.0	2.2	2.4	2.7
12.000	3.2	3.7	4.0	4.2	4.4
12.500	4.5	4.6	4.6	4.7	4.8
13.000	4.8	4.9	4.9	4.9	5.0
13.500	5.0	5.1	5.1	5.1	5.2
14.000	5.2	5.2	5.3	5.3	5.3
14.500	5.3	5.4	5.4	5.4	5.5
15.000	5.5	5.5	5.5	5.5	5.6
15.500	5.6	5.6	5.6	5.6	5.7
16.000	5.7	5.7	5.7	5.7	5.7
16.500	5.8	5.8	5.8	5.8	5.8
17.000	5.8	5.8	5.9	5.9	5.9

Subsection: Time-Depth Curve  
 Label: Time-Depth - 1  
 Scenario: Post-Development 25 Year

Return Event: 25 years  
 Storm Event: 25 Year

**CUMULATIVE RAINFALL (in)**  
**Output Time Increment = 0.100 hours**  
**Time on left represents time for first value in each row.**

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	5.9	5.9	5.9	5.9	5.9
18.000	5.9	6.0	6.0	6.0	6.0
18.500	6.0	6.0	6.0	6.0	6.0
19.000	6.0	6.1	6.1	6.1	6.1
19.500	6.1	6.1	6.1	6.1	6.1
20.000	6.1	6.1	6.2	6.2	6.2
20.500	6.2	6.2	6.2	6.2	6.2
21.000	6.2	6.2	6.2	6.2	6.2
21.500	6.3	6.3	6.3	6.3	6.3
22.000	6.3	6.3	6.3	6.3	6.3
22.500	6.3	6.3	6.3	6.3	6.3
23.000	6.4	6.4	6.4	6.4	6.4
23.500	6.4	6.4	6.4	6.4	6.4
24.000	6.4	(N/A)	(N/A)	(N/A)	(N/A)

Subsection: Time-Depth Curve  
 Label: Time-Depth - 1  
 Scenario: Pre-Development 25 Year

Return Event: 25 years  
 Storm Event: 25 Year

Time-Depth Curve: 25 Year

Label	25 Year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	25 years

**CUMULATIVE RAINFALL (in)**

**Output Time Increment = 0.100 hours**

**Time on left represents time for first value in each row.**

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.1	0.1
1.000	0.1	0.1	0.1	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.2
2.500	0.2	0.2	0.2	0.2	0.2
3.000	0.2	0.2	0.2	0.2	0.2
3.500	0.2	0.2	0.3	0.3	0.3
4.000	0.3	0.3	0.3	0.3	0.3
4.500	0.3	0.3	0.3	0.3	0.4
5.000	0.4	0.4	0.4	0.4	0.4
5.500	0.4	0.4	0.4	0.4	0.5
6.000	0.5	0.5	0.5	0.5	0.5
6.500	0.5	0.5	0.5	0.6	0.6
7.000	0.6	0.6	0.6	0.6	0.6
7.500	0.7	0.7	0.7	0.7	0.7
8.000	0.7	0.7	0.8	0.8	0.8
8.500	0.8	0.8	0.9	0.9	0.9
9.000	0.9	1.0	1.0	1.0	1.0
9.500	1.1	1.1	1.1	1.2	1.2
10.000	1.2	1.2	1.3	1.3	1.3
10.500	1.4	1.4	1.5	1.5	1.6
11.000	1.6	1.7	1.7	1.8	1.8
11.500	1.9	2.0	2.2	2.4	2.7
12.000	3.2	3.7	4.0	4.2	4.4
12.500	4.5	4.6	4.6	4.7	4.8
13.000	4.8	4.9	4.9	4.9	5.0
13.500	5.0	5.1	5.1	5.1	5.2
14.000	5.2	5.2	5.3	5.3	5.3
14.500	5.3	5.4	5.4	5.4	5.5
15.000	5.5	5.5	5.5	5.5	5.6
15.500	5.6	5.6	5.6	5.6	5.7
16.000	5.7	5.7	5.7	5.7	5.7
16.500	5.8	5.8	5.8	5.8	5.8
17.000	5.8	5.8	5.9	5.9	5.9

Subsection: Time-Depth Curve  
 Label: Time-Depth - 1  
 Scenario: Pre-Development 25 Year

Return Event: 25 years  
 Storm Event: 25 Year

**CUMULATIVE RAINFALL (in)**  
**Output Time Increment = 0.100 hours**  
**Time on left represents time for first value in each row.**

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	5.9	5.9	5.9	5.9	5.9
18.000	5.9	6.0	6.0	6.0	6.0
18.500	6.0	6.0	6.0	6.0	6.0
19.000	6.0	6.1	6.1	6.1	6.1
19.500	6.1	6.1	6.1	6.1	6.1
20.000	6.1	6.1	6.2	6.2	6.2
20.500	6.2	6.2	6.2	6.2	6.2
21.000	6.2	6.2	6.2	6.2	6.2
21.500	6.3	6.3	6.3	6.3	6.3
22.000	6.3	6.3	6.3	6.3	6.3
22.500	6.3	6.3	6.3	6.3	6.3
23.000	6.4	6.4	6.4	6.4	6.4
23.500	6.4	6.4	6.4	6.4	6.4
24.000	6.4	(N/A)	(N/A)	(N/A)	(N/A)

Subsection: Time of Concentration Calculations

Label: EDA-1

Scenario: Pre-Development 25 Year

Return Event: 25 years

Storm Event: 25 Year

Time of Concentration Results

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Segment #1: TR-55 Sheet Flow

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Hydraulic Length	72.00 ft
Manning's n	0.400
Slope	0.056 ft/ft
2 Year 24 Hour Depth	3.5 in
Average Velocity	0.11 ft/s
Segment Time of Concentration	0.176 hours

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Time of Concentration (Composite)

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Time of Concentration (Composite)	0.176 hours
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Subsection: Time of Concentration Calculations

Label: EDA-1

Scenario: Pre-Development 25 Year

Return Event: 25 years

Storm Event: 25 Year

**==== SCS Channel Flow**

$$T_c = \frac{R}{Q_a / W_p}$$
$$V = \frac{(1.49 * (R^{2/3}) * (S_f^{0.5}))}{n}$$

Where:

$(L_f / V) / 3600$

R= Hydraulic radius  
Aq= Flow area, square feet  
Wp= Wetted perimeter, feet  
V= Velocity, ft/sec  
Sf= Slope, ft/ft  
n= Manning's n  
Tc= Time of concentration, hours  
Lf= Flow length, feet

Subsection: Time of Concentration Calculations

Label: EDA-2

Scenario: Pre-Development 25 Year

Return Event: 25 years

Storm Event: 25 Year

Time of Concentration Results

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Segment #1: TR-55 Sheet Flow

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Hydraulic Length	53.00 ft
Manning's n	0.400
Slope	0.094 ft/ft
2 Year 24 Hour Depth	3.5 in
Average Velocity	0.13 ft/s
Segment Time of Concentration	0.112 hours

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Time of Concentration (Composite)

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Time of Concentration (Composite)	0.112 hours
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Subsection: Time of Concentration Calculations

Label: EDA-2

Scenario: Pre-Development 25 Year

Return Event: 25 years

Storm Event: 25 Year

**==== SCS Channel Flow**

$$T_c = \frac{R}{Q_a / W_p}$$
$$V = \frac{(1.49 * (R^{2/3}) * (S_f^{0.5}))}{n}$$

Where:

$(L_f / V) / 3600$

R= Hydraulic radius  
Aq= Flow area, square feet  
Wp= Wetted perimeter, feet  
V= Velocity, ft/sec  
Sf= Slope, ft/ft  
n= Manning's n  
Tc= Time of concentration, hours  
Lf= Flow length, feet

Subsection: Time of Concentration Calculations

Label: PDA-1A

Scenario: Post-Development 25 Year

Return Event: 25 years

Storm Event: 25 Year

Time of Concentration Results

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Segment #1: User Defined Tc

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Time of Concentration	0.083 hours
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Time of Concentration (Composite)

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Time of Concentration (Composite)	0.083 hours
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Subsection: Time of Concentration Calculations  
Label: PDA-1A  
Scenario: Post-Development 25 Year

Return Event: 25 years  
Storm Event: 25 Year

**==== User Defined**

Tc = Value entered by user  
Where: Tc= Time of concentration, hours

Subsection: Time of Concentration Calculations

Label: PDA-1B

Scenario: Post-Development 25 Year

Return Event: 25 years

Storm Event: 25 Year

Time of Concentration Results

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Segment #1: TR-55 Sheet Flow

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Hydraulic Length	72.00 ft
Manning's n	0.150
Slope	0.046 ft/ft
2 Year 24 Hour Depth	3.5 in
Average Velocity	0.23 ft/s
Segment Time of Concentration	0.087 hours

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Time of Concentration (Composite)

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Time of Concentration (Composite)	0.087 hours
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Subsection: Time of Concentration Calculations

Label: PDA-1B

Scenario: Post-Development 25 Year

Return Event: 25 years

Storm Event: 25 Year

**==== SCS Channel Flow**

$$T_c = \frac{R}{Q_a / W_p}$$
$$V = \frac{(1.49 * (R^{2/3}) * (S_f^{0.5}))}{n}$$

Where:

$(L_f / V) / 3600$

R= Hydraulic radius  
Aq= Flow area, square feet  
Wp= Wetted perimeter, feet  
V= Velocity, ft/sec  
Sf= Slope, ft/ft  
n= Manning's n  
Tc= Time of concentration, hours  
Lf= Flow length, feet

Subsection: Time of Concentration Calculations

Label: PDA-2

Scenario: Post-Development 25 Year

Return Event: 25 years

Storm Event: 25 Year

Time of Concentration Results

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Segment #1: TR-55 Sheet Flow

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Hydraulic Length	42.00 ft
Manning's n	0.150
Slope	0.065 ft/ft
2 Year 24 Hour Depth	3.5 in
Average Velocity	0.24 ft/s
Segment Time of Concentration	0.049 hours

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Time of Concentration (Composite)

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Time of Concentration (Composite)	0.083 hours
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Subsection: Time of Concentration Calculations

Label: PDA-2

Scenario: Post-Development 25 Year

Return Event: 25 years

Storm Event: 25 Year

**==== SCS Channel Flow**

$$T_c = \frac{R}{Q_a / W_p}$$
$$V = \frac{(1.49 * (R^{2/3}) * (S_f^{0.5}))}{n}$$

Where:

$(L_f / V) / 3600$

R= Hydraulic radius  
Aq= Flow area, square feet  
Wp= Wetted perimeter, feet  
V= Velocity, ft/sec  
Sf= Slope, ft/ft  
n= Manning's n  
Tc= Time of concentration, hours  
Lf= Flow length, feet

Subsection: Runoff CN-Area  
 Label: EDA-1  
 Scenario: Pre-Development 25 Year

Return Event: 25 years  
 Storm Event: 25 Year

### Runoff Curve Number Data

Soil/Surface Description	CN	Area (ft <sup>2</sup> )	C (%)	UC (%)	Adjusted CN
Impervious Areas - Paved parking lots, roofs, driveways, Streets and roads - Soil D	98.000	2,816.364	0.0	0.0	98.000
Pasture, grassland, or range - good - Soil D	80.000	7,220.639	0.0	0.0	80.000
Woods - good - Soil D	77.000	13,971.697	0.0	0.0	77.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	24,008.700	(N/A)	(N/A)	80.366

Subsection: Runoff CN-Area  
 Label: EDA-2  
 Scenario: Pre-Development 25 Year

Return Event: 25 years  
 Storm Event: 25 Year

### Runoff Curve Number Data

Soil/Surface Description	CN	Area (ft²)	C (%)	UC (%)	Adjusted CN
Impervious Areas - Paved parking lots, roofs, driveways, Streets and roads - Soil D	98.000	332.527	0.0	0.0	98.000
Pasture, grassland, or range - good - Soil D	80.000	1,167.020	0.0	0.0	80.000
Woods - good - Soil D	77.000	6,150.852	0.0	0.0	77.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	7,650.400	(N/A)	(N/A)	78.370

Subsection: Runoff CN-Area  
 Label: PDA-1A  
 Scenario: Post-Development 25 Year

Return Event: 25 years  
 Storm Event: 25 Year

### Runoff Curve Number Data

Soil/Surface Description	CN	Area (ft <sup>2</sup> )	C (%)	UC (%)	Adjusted CN
Impervious Areas - Paved parking lots, roofs, driveways, Streets and roads - Soil D	98.000	4,406.125	0.0	0.0	98.000
Pasture, grassland, or range - good - Soil D	80.000	4,296.180	0.0	0.0	80.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	8,702.305	(N/A)	(N/A)	89.114

Subsection: Runoff CN-Area  
 Label: PDA-1B  
 Scenario: Post-Development 25 Year

Return Event: 25 years  
 Storm Event: 25 Year

### Runoff Curve Number Data

Soil/Surface Description	CN	Area (ft <sup>2</sup> )	C (%)	UC (%)	Adjusted CN
Pasture, grassland, or range - good - Soil D	80.000	16,473.360	0.0	0.0	80.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	16,473.360	(N/A)	(N/A)	80.000

Subsection: Runoff CN-Area  
 Label: PDA-2  
 Scenario: Post-Development 25 Year

Return Event: 25 years  
 Storm Event: 25 Year

### Runoff Curve Number Data

Soil/Surface Description	CN	Area (ft <sup>2</sup> )	C (%)	UC (%)	Adjusted CN
Pasture, grassland, or range - good - Soil D	80.000	5,737.065	0.0	0.0	80.000
Impervious Areas - Paved parking lots, roofs, driveways, Streets and roads - Soil D	98.000	515.525	0.0	0.0	98.000
GrassPave	88.000	230.000	0.0	0.0	88.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	6,482.590	(N/A)	(N/A)	81.715

Subsection: Unit Hydrograph (Hydrograph Table)  
 Label: EDA-1  
 Scenario: Pre-Development 25 Year

Return Event: 25 years  
 Storm Event: 25 Year

Storm Event	25 Year
Return Event	25 years
Duration	24.000 hours
Depth	6.4 in
Time of Concentration (Composite)	0.176 hours
Area (User Defined)	24,008.700 ft <sup>2</sup>

### HYDROGRAPH ORDINATES (ft<sup>3</sup>/s)

Output Time Increment = 0.050 hours

Time on left represents time for first value in each row.

Time (hours)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)
6.650	0.00	0.00	0.00	0.00	0.00
6.900	0.00	0.00	0.00	0.00	0.00
7.150	0.00	0.01	0.01	0.01	0.01
7.400	0.01	0.01	0.01	0.01	0.01
7.650	0.01	0.01	0.01	0.01	0.01
7.900	0.01	0.01	0.01	0.01	0.01
8.150	0.02	0.02	0.02	0.02	0.02
8.400	0.02	0.02	0.02	0.02	0.02
8.650	0.02	0.03	0.03	0.03	0.03
8.900	0.03	0.03	0.03	0.03	0.04
9.150	0.04	0.04	0.04	0.04	0.04
9.400	0.04	0.05	0.05	0.05	0.05
9.650	0.05	0.05	0.06	0.06	0.06
9.900	0.06	0.06	0.06	0.07	0.07
10.150	0.07	0.07	0.08	0.08	0.08
10.400	0.08	0.09	0.09	0.09	0.10
10.650	0.10	0.10	0.11	0.11	0.11
10.900	0.12	0.12	0.12	0.13	0.13
11.150	0.14	0.15	0.16	0.17	0.18
11.400	0.19	0.20	0.22	0.23	0.27
11.650	0.32	0.40	0.49	0.60	0.71
11.900	0.83	1.02	1.39	1.77	2.04
12.150	2.11	1.91	1.60	1.35	1.17
12.400	1.01	0.87	0.73	0.61	0.51
12.650	0.43	0.38	0.35	0.33	0.31
12.900	0.29	0.28	0.26	0.25	0.24
13.150	0.23	0.22	0.22	0.21	0.21
13.400	0.21	0.20	0.20	0.20	0.19
13.650	0.19	0.19	0.18	0.18	0.17
13.900	0.17	0.17	0.16	0.16	0.16
14.150	0.15	0.15	0.15	0.15	0.15
14.400	0.14	0.14	0.14	0.14	0.14
14.650	0.14	0.13	0.13	0.13	0.13
14.900	0.13	0.13	0.12	0.12	0.12

Subsection: Unit Hydrograph (Hydrograph Table)  
 Label: EDA-1  
 Scenario: Pre-Development 25 Year

Return Event: 25 years  
 Storm Event: 25 Year

**HYDROGRAPH ORDINATES (ft<sup>3</sup>/s)**  
**Output Time Increment = 0.050 hours**  
**Time on left represents time for first value in each row.**

Time (hours)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)
15.150	0.12	0.12	0.11	0.11	0.11
15.400	0.11	0.11	0.11	0.10	0.10
15.650	0.10	0.10	0.10	0.10	0.09
15.900	0.09	0.09	0.09	0.09	0.08
16.150	0.08	0.08	0.08	0.08	0.08
16.400	0.08	0.08	0.08	0.08	0.08
16.650	0.07	0.07	0.07	0.07	0.07
16.900	0.07	0.07	0.07	0.07	0.07
17.150	0.07	0.07	0.07	0.06	0.06
17.400	0.06	0.06	0.06	0.06	0.06
17.650	0.06	0.06	0.06	0.06	0.06
17.900	0.06	0.05	0.05	0.05	0.05
18.150	0.05	0.05	0.05	0.05	0.05
18.400	0.05	0.05	0.05	0.05	0.05
18.650	0.05	0.05	0.05	0.05	0.05
18.900	0.05	0.05	0.05	0.05	0.05
19.150	0.05	0.05	0.05	0.05	0.05
19.400	0.05	0.05	0.04	0.04	0.04
19.650	0.04	0.04	0.04	0.04	0.04
19.900	0.04	0.04	0.04	0.04	0.04
20.150	0.04	0.04	0.04	0.04	0.04
20.400	0.04	0.04	0.04	0.04	0.04
20.650	0.04	0.04	0.04	0.04	0.04
20.900	0.04	0.04	0.04	0.04	0.04
21.150	0.04	0.04	0.04	0.04	0.04
21.400	0.04	0.04	0.04	0.04	0.04
21.650	0.04	0.04	0.04	0.04	0.04
21.900	0.04	0.04	0.04	0.04	0.03
22.150	0.03	0.03	0.03	0.03	0.03
22.400	0.03	0.03	0.03	0.03	0.03
22.650	0.03	0.03	0.03	0.03	0.03
22.900	0.03	0.03	0.03	0.03	0.03
23.150	0.03	0.03	0.03	0.03	0.03
23.400	0.03	0.03	0.03	0.03	0.03
23.650	0.03	0.03	0.03	0.03	0.03
23.900	0.03	0.03	0.03	(N/A)	(N/A)



Subsection: Unit Hydrograph (Hydrograph Table)  
 Label: EDA-2  
 Scenario: Pre-Development 25 Year

Return Event: 25 years  
 Storm Event: 25 Year

Storm Event	25 Year
Return Event	25 years
Duration	24.000 hours
Depth	6.4 in
Time of Concentration (Composite)	0.112 hours
Area (User Defined)	7,650.400 ft <sup>2</sup>

### HYDROGRAPH ORDINATES (ft<sup>3</sup>/s)

Output Time Increment = 0.050 hours

Time on left represents time for first value in each row.

Time (hours)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)
7.400	0.00	0.00	0.00	0.00	0.00
7.650	0.00	0.00	0.00	0.00	0.00
7.900	0.00	0.00	0.00	0.00	0.00
8.150	0.00	0.00	0.00	0.00	0.00
8.400	0.00	0.00	0.01	0.01	0.01
8.650	0.01	0.01	0.01	0.01	0.01
8.900	0.01	0.01	0.01	0.01	0.01
9.150	0.01	0.01	0.01	0.01	0.01
9.400	0.01	0.01	0.01	0.01	0.01
9.650	0.01	0.01	0.02	0.02	0.02
9.900	0.02	0.02	0.02	0.02	0.02
10.150	0.02	0.02	0.02	0.02	0.02
10.400	0.02	0.03	0.03	0.03	0.03
10.650	0.03	0.03	0.03	0.03	0.03
10.900	0.03	0.04	0.04	0.04	0.04
11.150	0.04	0.05	0.05	0.05	0.06
11.400	0.06	0.06	0.07	0.08	0.09
11.650	0.11	0.14	0.17	0.21	0.24
11.900	0.29	0.38	0.55	0.64	0.69
12.150	0.64	0.49	0.40	0.35	0.31
12.400	0.26	0.22	0.18	0.15	0.13
12.650	0.11	0.10	0.10	0.09	0.09
12.900	0.09	0.08	0.08	0.07	0.07
13.150	0.07	0.07	0.07	0.07	0.06
13.400	0.06	0.06	0.06	0.06	0.06
13.650	0.06	0.06	0.06	0.05	0.05
13.900	0.05	0.05	0.05	0.05	0.05
14.150	0.05	0.05	0.05	0.05	0.04
14.400	0.04	0.04	0.04	0.04	0.04
14.650	0.04	0.04	0.04	0.04	0.04
14.900	0.04	0.04	0.04	0.04	0.04
15.150	0.04	0.04	0.04	0.03	0.03
15.400	0.03	0.03	0.03	0.03	0.03
15.650	0.03	0.03	0.03	0.03	0.03

Subsection: Unit Hydrograph (Hydrograph Table)  
 Label: EDA-2  
 Scenario: Pre-Development 25 Year

Return Event: 25 years  
 Storm Event: 25 Year

**HYDROGRAPH ORDINATES (ft<sup>3</sup>/s)**  
**Output Time Increment = 0.050 hours**  
**Time on left represents time for first value in each row.**

Time (hours)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)
15.900	0.03	0.03	0.03	0.03	0.03
16.150	0.03	0.03	0.03	0.02	0.02
16.400	0.02	0.02	0.02	0.02	0.02
16.650	0.02	0.02	0.02	0.02	0.02
16.900	0.02	0.02	0.02	0.02	0.02
17.150	0.02	0.02	0.02	0.02	0.02
17.400	0.02	0.02	0.02	0.02	0.02
17.650	0.02	0.02	0.02	0.02	0.02
17.900	0.02	0.02	0.02	0.02	0.02
18.150	0.02	0.02	0.02	0.02	0.02
18.400	0.02	0.02	0.02	0.02	0.02
18.650	0.02	0.02	0.02	0.01	0.01
18.900	0.01	0.01	0.01	0.01	0.01
19.150	0.01	0.01	0.01	0.01	0.01
19.400	0.01	0.01	0.01	0.01	0.01
19.650	0.01	0.01	0.01	0.01	0.01
19.900	0.01	0.01	0.01	0.01	0.01
20.150	0.01	0.01	0.01	0.01	0.01
20.400	0.01	0.01	0.01	0.01	0.01
20.650	0.01	0.01	0.01	0.01	0.01
20.900	0.01	0.01	0.01	0.01	0.01
21.150	0.01	0.01	0.01	0.01	0.01
21.400	0.01	0.01	0.01	0.01	0.01
21.650	0.01	0.01	0.01	0.01	0.01
21.900	0.01	0.01	0.01	0.01	0.01
22.150	0.01	0.01	0.01	0.01	0.01
22.400	0.01	0.01	0.01	0.01	0.01
22.650	0.01	0.01	0.01	0.01	0.01
22.900	0.01	0.01	0.01	0.01	0.01
23.150	0.01	0.01	0.01	0.01	0.01
23.400	0.01	0.01	0.01	0.01	0.01
23.650	0.01	0.01	0.01	0.01	0.01
23.900	0.01	0.01	0.01	(N/A)	(N/A)

Subsection: Unit Hydrograph (Hydrograph Table)  
 Label: PDA-1A  
 Scenario: Post-Development 25 Year

Return Event: 25 years  
 Storm Event: 25 Year

Storm Event	25 Year
Return Event	25 years
Duration	24.000 hours
Depth	6.4 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	8,702.305 ft <sup>2</sup>

### HYDROGRAPH ORDINATES (ft<sup>3</sup>/s)

Output Time Increment = 0.050 hours

Time on left represents time for first value in each row.

Time (hours)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)
4.200	0.00	0.00	0.00	0.00	0.00
4.450	0.00	0.00	0.00	0.00	0.00
4.700	0.00	0.00	0.00	0.00	0.00
4.950	0.00	0.00	0.00	0.00	0.00
5.200	0.00	0.00	0.00	0.00	0.00
5.450	0.00	0.00	0.00	0.00	0.00
5.700	0.00	0.00	0.00	0.01	0.01
5.950	0.01	0.01	0.01	0.01	0.01
6.200	0.01	0.01	0.01	0.01	0.01
6.450	0.01	0.01	0.01	0.01	0.01
6.700	0.01	0.01	0.01	0.01	0.01
6.950	0.01	0.01	0.01	0.01	0.01
7.200	0.01	0.01	0.01	0.01	0.01
7.450	0.01	0.01	0.01	0.01	0.01
7.700	0.01	0.01	0.01	0.01	0.02
7.950	0.02	0.02	0.02	0.02	0.02
8.200	0.02	0.02	0.02	0.02	0.02
8.450	0.02	0.02	0.02	0.02	0.02
8.700	0.02	0.02	0.02	0.03	0.03
8.950	0.03	0.03	0.03	0.03	0.03
9.200	0.03	0.03	0.03	0.03	0.03
9.450	0.03	0.03	0.04	0.04	0.04
9.700	0.04	0.04	0.04	0.04	0.04
9.950	0.04	0.04	0.04	0.04	0.05
10.200	0.05	0.05	0.05	0.05	0.05
10.450	0.05	0.06	0.06	0.06	0.06
10.700	0.06	0.06	0.06	0.07	0.07
10.950	0.07	0.07	0.07	0.08	0.08
11.200	0.09	0.09	0.10	0.10	0.11
11.450	0.11	0.12	0.14	0.17	0.21
11.700	0.26	0.31	0.36	0.41	0.47
11.950	0.66	0.90	0.97	0.99	0.82
12.200	0.59	0.49	0.43	0.38	0.32
12.450	0.27	0.22	0.18	0.15	0.14

Subsection: Unit Hydrograph (Hydrograph Table)  
 Label: PDA-1A  
 Scenario: Post-Development 25 Year

Return Event: 25 years  
 Storm Event: 25 Year

**HYDROGRAPH ORDINATES (ft<sup>3</sup>/s)**  
**Output Time Increment = 0.050 hours**  
**Time on left represents time for first value in each row.**

Time (hours)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)
12.700	0.13	0.13	0.12	0.11	0.11
12.950	0.10	0.10	0.09	0.09	0.09
13.200	0.09	0.08	0.08	0.08	0.08
13.450	0.08	0.08	0.08	0.07	0.07
13.700	0.07	0.07	0.07	0.07	0.07
13.950	0.06	0.06	0.06	0.06	0.06
14.200	0.06	0.06	0.06	0.06	0.06
14.450	0.06	0.05	0.05	0.05	0.05
14.700	0.05	0.05	0.05	0.05	0.05
14.950	0.05	0.05	0.05	0.05	0.05
15.200	0.04	0.04	0.04	0.04	0.04
15.450	0.04	0.04	0.04	0.04	0.04
15.700	0.04	0.04	0.04	0.04	0.03
15.950	0.03	0.03	0.03	0.03	0.03
16.200	0.03	0.03	0.03	0.03	0.03
16.450	0.03	0.03	0.03	0.03	0.03
16.700	0.03	0.03	0.03	0.03	0.03
16.950	0.03	0.03	0.03	0.03	0.03
17.200	0.03	0.03	0.02	0.02	0.02
17.450	0.02	0.02	0.02	0.02	0.02
17.700	0.02	0.02	0.02	0.02	0.02
17.950	0.02	0.02	0.02	0.02	0.02
18.200	0.02	0.02	0.02	0.02	0.02
18.450	0.02	0.02	0.02	0.02	0.02
18.700	0.02	0.02	0.02	0.02	0.02
18.950	0.02	0.02	0.02	0.02	0.02
19.200	0.02	0.02	0.02	0.02	0.02
19.450	0.02	0.02	0.02	0.02	0.02
19.700	0.02	0.02	0.02	0.02	0.02
19.950	0.02	0.02	0.02	0.02	0.02
20.200	0.02	0.02	0.02	0.02	0.02
20.450	0.02	0.02	0.02	0.02	0.02
20.700	0.02	0.02	0.02	0.02	0.02
20.950	0.02	0.02	0.01	0.01	0.01
21.200	0.01	0.01	0.01	0.01	0.01
21.450	0.01	0.01	0.01	0.01	0.01
21.700	0.01	0.01	0.01	0.01	0.01
21.950	0.01	0.01	0.01	0.01	0.01
22.200	0.01	0.01	0.01	0.01	0.01
22.450	0.01	0.01	0.01	0.01	0.01
22.700	0.01	0.01	0.01	0.01	0.01
22.950	0.01	0.01	0.01	0.01	0.01
23.200	0.01	0.01	0.01	0.01	0.01

Subsection: Unit Hydrograph (Hydrograph Table)  
Label: PDA-1A  
Scenario: Post-Development 25 Year

Return Event: 25 years  
Storm Event: 25 Year

**HYDROGRAPH ORDINATES (ft<sup>3</sup>/s)**

**Output Time Increment = 0.050 hours**

**Time on left represents time for first value in each row.**

Time (hours)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)
23.450	0.01	0.01	0.01	0.01	0.01
23.700	0.01	0.01	0.01	0.01	0.01
23.950	0.01	0.01	(N/A)	(N/A)	(N/A)

Subsection: Unit Hydrograph (Hydrograph Table)  
 Label: PDA-1B  
 Scenario: Post-Development 25 Year

Return Event: 25 years  
 Storm Event: 25 Year

Storm Event	25 Year
Return Event	25 years
Duration	24.000 hours
Depth	6.4 in
Time of Concentration (Composite)	0.087 hours
Area (User Defined)	16,473.360 ft <sup>2</sup>

### HYDROGRAPH ORDINATES (ft<sup>3</sup>/s)

Output Time Increment = 0.050 hours

Time on left represents time for first value in each row.

Time (hours)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)
6.650	0.00	0.00	0.00	0.00	0.00
6.900	0.00	0.00	0.00	0.00	0.00
7.150	0.00	0.00	0.00	0.00	0.00
7.400	0.01	0.01	0.01	0.01	0.01
7.650	0.01	0.01	0.01	0.01	0.01
7.900	0.01	0.01	0.01	0.01	0.01
8.150	0.01	0.01	0.01	0.01	0.01
8.400	0.01	0.02	0.02	0.02	0.02
8.650	0.02	0.02	0.02	0.02	0.02
8.900	0.02	0.02	0.02	0.02	0.03
9.150	0.03	0.03	0.03	0.03	0.03
9.400	0.03	0.03	0.03	0.03	0.04
9.650	0.04	0.04	0.04	0.04	0.04
9.900	0.04	0.04	0.05	0.05	0.05
10.150	0.05	0.05	0.05	0.06	0.06
10.400	0.06	0.06	0.06	0.07	0.07
10.650	0.07	0.07	0.08	0.08	0.08
10.900	0.08	0.09	0.09	0.09	0.10
11.150	0.10	0.11	0.12	0.13	0.13
11.400	0.14	0.15	0.16	0.19	0.23
11.650	0.29	0.36	0.43	0.52	0.60
11.900	0.69	0.99	1.38	1.53	1.60
12.150	1.36	0.99	0.83	0.73	0.64
12.400	0.55	0.46	0.37	0.31	0.26
12.650	0.24	0.22	0.21	0.21	0.20
12.900	0.19	0.18	0.17	0.16	0.15
13.150	0.15	0.15	0.15	0.14	0.14
13.400	0.14	0.14	0.13	0.13	0.13
13.650	0.13	0.12	0.12	0.12	0.12
13.900	0.11	0.11	0.11	0.11	0.10
14.150	0.10	0.10	0.10	0.10	0.10
14.400	0.10	0.10	0.10	0.09	0.09
14.650	0.09	0.09	0.09	0.09	0.09
14.900	0.09	0.08	0.08	0.08	0.08

Subsection: Unit Hydrograph (Hydrograph Table)  
 Label: PDA-1B  
 Scenario: Post-Development 25 Year

Return Event: 25 years  
 Storm Event: 25 Year

**HYDROGRAPH ORDINATES (ft<sup>3</sup>/s)**  
**Output Time Increment = 0.050 hours**  
**Time on left represents time for first value in each row.**

Time (hours)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)
15.150	0.08	0.08	0.08	0.08	0.07
15.400	0.07	0.07	0.07	0.07	0.07
15.650	0.07	0.07	0.06	0.06	0.06
15.900	0.06	0.06	0.06	0.06	0.06
16.150	0.06	0.06	0.05	0.05	0.05
16.400	0.05	0.05	0.05	0.05	0.05
16.650	0.05	0.05	0.05	0.05	0.05
16.900	0.05	0.05	0.05	0.05	0.05
17.150	0.05	0.04	0.04	0.04	0.04
17.400	0.04	0.04	0.04	0.04	0.04
17.650	0.04	0.04	0.04	0.04	0.04
17.900	0.04	0.04	0.04	0.04	0.04
18.150	0.03	0.03	0.03	0.03	0.03
18.400	0.03	0.03	0.03	0.03	0.03
18.650	0.03	0.03	0.03	0.03	0.03
18.900	0.03	0.03	0.03	0.03	0.03
19.150	0.03	0.03	0.03	0.03	0.03
19.400	0.03	0.03	0.03	0.03	0.03
19.650	0.03	0.03	0.03	0.03	0.03
19.900	0.03	0.03	0.03	0.03	0.03
20.150	0.03	0.03	0.03	0.03	0.03
20.400	0.03	0.03	0.03	0.03	0.03
20.650	0.03	0.03	0.03	0.03	0.03
20.900	0.03	0.03	0.03	0.03	0.03
21.150	0.03	0.03	0.03	0.03	0.03
21.400	0.03	0.03	0.03	0.03	0.03
21.650	0.02	0.02	0.02	0.02	0.02
21.900	0.02	0.02	0.02	0.02	0.02
22.150	0.02	0.02	0.02	0.02	0.02
22.400	0.02	0.02	0.02	0.02	0.02
22.650	0.02	0.02	0.02	0.02	0.02
22.900	0.02	0.02	0.02	0.02	0.02
23.150	0.02	0.02	0.02	0.02	0.02
23.400	0.02	0.02	0.02	0.02	0.02
23.650	0.02	0.02	0.02	0.02	0.02
23.900	0.02	0.02	0.02	(N/A)	(N/A)

Subsection: Unit Hydrograph (Hydrograph Table)  
 Label: PDA-2  
 Scenario: Post-Development 25 Year

Return Event: 25 years  
 Storm Event: 25 Year

Storm Event	25 Year
Return Event	25 years
Duration	24.000 hours
Depth	6.4 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	6,482.590 ft <sup>2</sup>

### HYDROGRAPH ORDINATES (ft<sup>3</sup>/s)

Output Time Increment = 0.050 hours

Time on left represents time for first value in each row.

Time (hours)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)
6.450	0.00	0.00	0.00	0.00	0.00
6.700	0.00	0.00	0.00	0.00	0.00
6.950	0.00	0.00	0.00	0.00	0.00
7.200	0.00	0.00	0.00	0.00	0.00
7.450	0.00	0.00	0.00	0.00	0.00
7.700	0.00	0.00	0.00	0.00	0.00
7.950	0.01	0.01	0.01	0.01	0.01
8.200	0.01	0.01	0.01	0.01	0.01
8.450	0.01	0.01	0.01	0.01	0.01
8.700	0.01	0.01	0.01	0.01	0.01
8.950	0.01	0.01	0.01	0.01	0.01
9.200	0.01	0.01	0.01	0.01	0.01
9.450	0.02	0.02	0.02	0.02	0.02
9.700	0.02	0.02	0.02	0.02	0.02
9.950	0.02	0.02	0.02	0.02	0.02
10.200	0.02	0.02	0.03	0.03	0.03
10.450	0.03	0.03	0.03	0.03	0.03
10.700	0.03	0.03	0.03	0.04	0.04
10.950	0.04	0.04	0.04	0.04	0.05
11.200	0.05	0.05	0.05	0.06	0.06
11.450	0.07	0.07	0.08	0.10	0.12
11.700	0.15	0.19	0.22	0.25	0.29
11.950	0.42	0.58	0.63	0.66	0.55
12.200	0.40	0.33	0.29	0.26	0.22
12.450	0.19	0.15	0.12	0.10	0.10
12.700	0.09	0.09	0.08	0.08	0.08
12.950	0.07	0.07	0.06	0.06	0.06
13.200	0.06	0.06	0.06	0.06	0.06
13.450	0.05	0.05	0.05	0.05	0.05
13.700	0.05	0.05	0.05	0.05	0.05
13.950	0.04	0.04	0.04	0.04	0.04
14.200	0.04	0.04	0.04	0.04	0.04
14.450	0.04	0.04	0.04	0.04	0.04
14.700	0.04	0.04	0.04	0.03	0.03



Subsection: Unit Hydrograph (Hydrograph Table)  
 Label: PDA-2  
 Scenario: Post-Development 25 Year

Return Event: 25 years  
 Storm Event: 25 Year

**HYDROGRAPH ORDINATES (ft<sup>3</sup>/s)**  
**Output Time Increment = 0.050 hours**  
**Time on left represents time for first value in each row.**

Time (hours)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)
14.950	0.03	0.03	0.03	0.03	0.03
15.200	0.03	0.03	0.03	0.03	0.03
15.450	0.03	0.03	0.03	0.03	0.03
15.700	0.03	0.03	0.03	0.02	0.02
15.950	0.02	0.02	0.02	0.02	0.02
16.200	0.02	0.02	0.02	0.02	0.02
16.450	0.02	0.02	0.02	0.02	0.02
16.700	0.02	0.02	0.02	0.02	0.02
16.950	0.02	0.02	0.02	0.02	0.02
17.200	0.02	0.02	0.02	0.02	0.02
17.450	0.02	0.02	0.02	0.02	0.02
17.700	0.02	0.02	0.02	0.02	0.01
17.950	0.01	0.01	0.01	0.01	0.01
18.200	0.01	0.01	0.01	0.01	0.01
18.450	0.01	0.01	0.01	0.01	0.01
18.700	0.01	0.01	0.01	0.01	0.01
18.950	0.01	0.01	0.01	0.01	0.01
19.200	0.01	0.01	0.01	0.01	0.01
19.450	0.01	0.01	0.01	0.01	0.01
19.700	0.01	0.01	0.01	0.01	0.01
19.950	0.01	0.01	0.01	0.01	0.01
20.200	0.01	0.01	0.01	0.01	0.01
20.450	0.01	0.01	0.01	0.01	0.01
20.700	0.01	0.01	0.01	0.01	0.01
20.950	0.01	0.01	0.01	0.01	0.01
21.200	0.01	0.01	0.01	0.01	0.01
21.450	0.01	0.01	0.01	0.01	0.01
21.700	0.01	0.01	0.01	0.01	0.01
21.950	0.01	0.01	0.01	0.01	0.01
22.200	0.01	0.01	0.01	0.01	0.01
22.450	0.01	0.01	0.01	0.01	0.01
22.700	0.01	0.01	0.01	0.01	0.01
22.950	0.01	0.01	0.01	0.01	0.01
23.200	0.01	0.01	0.01	0.01	0.01
23.450	0.01	0.01	0.01	0.01	0.01
23.700	0.01	0.01	0.01	0.01	0.01
23.950	0.01	0.01	(N/A)	(N/A)	(N/A)

Subsection: Addition Summary

Label: DL-1

Scenario: Post-Development 25 Year

Return Event: 25 years

Storm Event: 25 Year

**Summary for Hydrograph Addition at 'DL-1'**

Upstream Link	Upstream Node
<Catchment to Outflow Node>	PDA-1B
	R-Tanks

**Node Inflows**

Inflow Type	Element	Volume (ft <sup>3</sup> )	Time to Peak (hours)	Flow (Peak) (ft <sup>3</sup> /s)
Flow (From)	PDA-1B	5,696.144	12.100	1.60
Flow (From)		3,701.511	12.200	0.73
Flow (In)	DL-1	9,397.656	12.100	1.89

Subsection: Addition Summary

Label: DL-1

Scenario: Pre-Development 25 Year

Return Event: 25 years

Storm Event: 25 Year

**Summary for Hydrograph Addition at 'DL-1'**

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EDA-1

**Node Inflows**

Inflow Type	Element	Volume (ft <sup>3</sup> )	Time to Peak (hours)	Flow (Peak) (ft <sup>3</sup> /s)
Flow (From)	EDA-1	8,294.216	12.150	2.11
Flow (In)	DL-1	8,294.216	12.150	2.11

Subsection: Addition Summary

Label: DL-2

Scenario: Post-Development 25 Year

Return Event: 25 years

Storm Event: 25 Year

### Summary for Hydrograph Addition at 'DL-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	PDA-2

### Node Inflows

Inflow Type	Element	Volume (ft <sup>3</sup> )	Time to Peak (hours)	Flow (Peak) (ft <sup>3</sup> /s)
Flow (From)	PDA-2	2,356.599	12.100	0.66
Flow (In)	DL-2	2,356.599	12.100	0.66

Subsection: Addition Summary

Label: DL-2

Scenario: Pre-Development 25 Year

Return Event: 25 years

Storm Event: 25 Year

**Summary for Hydrograph Addition at 'DL-2'**

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EDA-2

**Node Inflows**

Inflow Type	Element	Volume (ft <sup>3</sup> )	Time to Peak (hours)	Flow (Peak) (ft <sup>3</sup> /s)
Flow (From)	EDA-2	2,511.605	12.100	0.69
Flow (In)	DL-2	2,511.605	12.100	0.69

Subsection: Outlet Input Data  
 Label: OCS  
 Scenario: Post-Development 25 Year

Return Event: 25 years  
 Storm Event: 25 Year

Requested Pond Water Surface Elevations	
Minimum (Headwater)	7.50 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	9.75 ft

### Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice - 1	Forward	Culvert - Out	7.50	9.75
Rectangular Weir	Weir - 1	Forward	Culvert - Out	9.55	9.75
Culvert-Circular	Culvert - Out	Forward	TW	7.50	9.75
Tailwater Settings	Tailwater			(N/A)	(N/A)

Subsection: Outlet Input Data  
Label: OCS  
Scenario: Post-Development 25 Year

Return Event: 25 years  
Storm Event: 25 Year

Structure ID: Orifice - 1	
Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	7.50 ft
Orifice Diameter	3.0 in
Orifice Coefficient	0.600
Structure ID: Weir - 1	
Structure Type: Rectangular Weir	
Number of Openings	1
Elevation	9.55 ft
Weir Length	4.00 ft
Weir Coefficient	3.33 (ft <sup>0.5</sup> )/s
Structure ID: Culvert - Out	
Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	12.0 in
Length	37.00 ft
Length (Computed Barrel)	37.00 ft
Slope (Computed)	0.007 ft/ft
Outlet Control Data	
Manning's n	0.013
Ke	0.200
Kb	0.031
Kr	0.000
Convergence Tolerance	0.00 ft
Inlet Control Data	
Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317
Y	0.6900
T1 ratio (HW/D)	1.092
T2 ratio (HW/D)	1.194
Slope Correction Factor	-0.500

Subsection: Outlet Input Data  
Label: OCS  
Scenario: Post-Development 25 Year

Return Event: 25 years  
Storm Event: 25 Year

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Use unsubmerged inlet control 0 equation below T1 elevation.

Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control, interpolate between flows at T1 & T2...

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T1 Elevation	8.59 ft	T1 Flow	2.75 ft <sup>3</sup> /s
T2 Elevation	8.69 ft	T2 Flow	3.14 ft <sup>3</sup> /s

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Subsection: Outlet Input Data  
Label: OCS  
Scenario: Post-Development 25 Year

Return Event: 25 years  
Storm Event: 25 Year

Structure ID: TW	
Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall
Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft <sup>3</sup> /s
Flow Tolerance (Maximum)	10.000 ft <sup>3</sup> /s

Subsection: Composite Rating Curve  
 Label: OCS  
 Scenario: Post-Development 25 Year

Return Event: 25 years  
 Storm Event: 25 Year

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft <sup>3</sup> /s)	Tailwater Elevation (ft)	Convergence Error (ft)
7.50	0.00	(N/A)	0.00
8.00	0.13	(N/A)	0.00
8.50	0.20	(N/A)	0.00
9.00	0.26	(N/A)	0.00
9.50	0.31	(N/A)	0.00
9.55	0.31	(N/A)	0.00
9.75	1.48	(N/A)	0.00

Contributing Structures

(no Q: Orifice - 1,Weir -  
 1,Culvert - Out)  
 Orifice - 1,Culvert - Out  
 (no Q: Weir - 1)  
 Orifice - 1,Culvert - Out  
 (no Q: Weir - 1)  
 Orifice - 1,Culvert - Out  
 (no Q: Weir - 1)  
 Orifice - 1,Culvert - Out  
 (no Q: Weir - 1)  
 Orifice - 1,Culvert - Out  
 (no Q: Weir - 1)  
 Orifice - 1,Weir -  
 1,Culvert - Out

Subsection: Elevation-Volume-Flow Table (Pond)  
 Label: R-Tanks  
 Scenario: Post-Development 25 Year

Return Event: 25 years  
 Storm Event: 25 Year

Infiltration	
Infiltration Method (Computed)	No Infiltration
Initial Conditions	
Elevation (Water Surface, Initial)	7.50 ft
Volume (Initial)	0.000 ft <sup>3</sup>
Flow (Initial Outlet)	0.00 ft <sup>3</sup> /s
Flow (Initial Infiltration)	0.00 ft <sup>3</sup> /s
Flow (Initial, Total)	0.00 ft <sup>3</sup> /s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft <sup>3</sup> /s)	Storage (ft <sup>3</sup> )	Area (ft <sup>2</sup> )	Infiltration (ft <sup>3</sup> /s)	Flow (Total) (ft <sup>3</sup> /s)	2S/t + O (ft <sup>3</sup> /s)
7.50	0.00	0.000	0.000	0.00	0.00	0.00
8.00	0.13	206.492	0.000	0.00	0.13	2.42
8.50	0.20	412.984	0.000	0.00	0.20	4.79
9.00	0.26	619.476	0.000	0.00	0.26	7.14
9.50	0.31	825.968	0.000	0.00	0.31	9.48
9.55	0.31	846.617	0.000	0.00	0.31	9.72
9.75	1.48	929.214	0.000	0.00	1.48	11.80

Subsection: Pond Routed Hydrograph (total out)  
 Label: R-Tanks (OUT)  
 Scenario: Post-Development 25 Year

Return Event: 25 years  
 Storm Event: 25 Year

Peak Discharge	0.73 ft <sup>3</sup> /s
Time to Peak	12.200 hours
Hydrograph Volume	3,700.398 ft <sup>3</sup>

**HYDROGRAPH ORDINATES (ft<sup>3</sup>/s)**  
**Output Time Increment = 0.050 hours**

**Time on left represents time for first value in each row.**

Time (hours)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)
4.550	0.00	0.00	0.00	0.00	0.00
4.800	0.00	0.00	0.00	0.00	0.00
5.050	0.00	0.00	0.00	0.00	0.00
5.300	0.00	0.00	0.00	0.00	0.00
5.550	0.00	0.00	0.00	0.00	0.00
5.800	0.00	0.00	0.00	0.00	0.00
6.050	0.00	0.00	0.00	0.00	0.01
6.300	0.01	0.01	0.01	0.01	0.01
6.550	0.01	0.01	0.01	0.01	0.01
6.800	0.01	0.01	0.01	0.01	0.01
7.050	0.01	0.01	0.01	0.01	0.01
7.300	0.01	0.01	0.01	0.01	0.01
7.550	0.01	0.01	0.01	0.01	0.01
7.800	0.01	0.01	0.01	0.01	0.01
8.050	0.01	0.01	0.01	0.01	0.01
8.300	0.02	0.02	0.02	0.02	0.02
8.550	0.02	0.02	0.02	0.02	0.02
8.800	0.02	0.02	0.02	0.02	0.02
9.050	0.02	0.02	0.02	0.02	0.03
9.300	0.03	0.03	0.03	0.03	0.03
9.550	0.03	0.03	0.03	0.03	0.03
9.800	0.03	0.03	0.03	0.03	0.04
10.050	0.04	0.04	0.04	0.04	0.04
10.300	0.04	0.04	0.04	0.04	0.05
10.550	0.05	0.05	0.05	0.05	0.05
10.800	0.05	0.05	0.06	0.06	0.06
11.050	0.06	0.06	0.06	0.07	0.07
11.300	0.07	0.07	0.08	0.08	0.08
11.550	0.09	0.10	0.11	0.12	0.13
11.800	0.15	0.16	0.18	0.20	0.23
12.050	0.26	0.29	0.48	0.73	0.52
12.300	0.46	0.40	0.34	0.31	0.31
12.550	0.30	0.30	0.29	0.28	0.28
12.800	0.27	0.27	0.26	0.25	0.25
13.050	0.24	0.23	0.22	0.22	0.21
13.300	0.21	0.20	0.19	0.18	0.18
13.550	0.17	0.16	0.16	0.15	0.15
13.800	0.14	0.14	0.13	0.13	0.12
14.050	0.12	0.11	0.11	0.10	0.10

Subsection: Pond Routed Hydrograph (total out)  
 Label: R-Tanks (OUT)  
 Scenario: Post-Development 25 Year

Return Event: 25 years  
 Storm Event: 25 Year

### HYDROGRAPH ORDINATES (ft<sup>3</sup>/s)

Output Time Increment = 0.050 hours

Time on left represents time for first value in each row.

Time (hours)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)	Flow (ft <sup>3</sup> /s)
14.300	0.09	0.09	0.09	0.08	0.08
14.550	0.08	0.07	0.07	0.07	0.07
14.800	0.07	0.06	0.06	0.06	0.06
15.050	0.06	0.06	0.06	0.06	0.05
15.300	0.05	0.05	0.05	0.05	0.05
15.550	0.05	0.05	0.05	0.05	0.04
15.800	0.04	0.04	0.04	0.04	0.04
16.050	0.04	0.04	0.04	0.04	0.04
16.300	0.04	0.04	0.04	0.03	0.03
16.550	0.03	0.03	0.03	0.03	0.03
16.800	0.03	0.03	0.03	0.03	0.03
17.050	0.03	0.03	0.03	0.03	0.03
17.300	0.03	0.03	0.03	0.03	0.03
17.550	0.03	0.03	0.03	0.03	0.02
17.800	0.02	0.02	0.02	0.02	0.02
18.050	0.02	0.02	0.02	0.02	0.02
18.300	0.02	0.02	0.02	0.02	0.02
18.550	0.02	0.02	0.02	0.02	0.02
18.800	0.02	0.02	0.02	0.02	0.02
19.050	0.02	0.02	0.02	0.02	0.02
19.300	0.02	0.02	0.02	0.02	0.02
19.550	0.02	0.02	0.02	0.02	0.02
19.800	0.02	0.02	0.02	0.02	0.02
20.050	0.02	0.02	0.02	0.02	0.02
20.300	0.02	0.02	0.02	0.02	0.02
20.550	0.02	0.02	0.02	0.02	0.02
20.800	0.02	0.02	0.02	0.02	0.02
21.050	0.02	0.02	0.02	0.02	0.02
21.300	0.02	0.02	0.02	0.01	0.01
21.550	0.01	0.01	0.01	0.01	0.01
21.800	0.01	0.01	0.01	0.01	0.01
22.050	0.01	0.01	0.01	0.01	0.01
22.300	0.01	0.01	0.01	0.01	0.01
22.550	0.01	0.01	0.01	0.01	0.01
22.800	0.01	0.01	0.01	0.01	0.01
23.050	0.01	0.01	0.01	0.01	0.01
23.300	0.01	0.01	0.01	0.01	0.01
23.550	0.01	0.01	0.01	0.01	0.01
23.800	0.01	0.01	0.01	0.01	0.01

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## ***APPENDIX B***

### ***NYSDEC STORMWATER SIZING CALCULATIONS***



# CISTERN WORKSHEET

JMC Project: **18100**Design Point: **DL-1**

## RAINWATER HARVESTING TANK CALCULATIONS

Drainage Area: PDA-1A

Site Data for Drainage Area to be Treated by Practice			
DESCRIPTION	SYMBOL	VALUE	UNITS
Design Storm [90% Rainfall Event Number]	P	1.5	In
Impervious Area	I	0.10	Ac
Area	A	0.20	Ac
Percent Impervious	%I	50.63	%
Runoff Coefficient [ $0.05 + 0.009 \times \%I$ ]	$R_v$	0.51	CF
<b>TOTAL VOLUME Required</b> [ $WQ_v = (P \times R_v \times A) / 12$ ]	$WQ_v$	<b>550</b>	CF

Minimum Cistern Size			
DESCRIPTION	SYMBOL	VALUE	UNITS
Water Quality Volume	$WQ_v$	550	CF
Conversion Factor (7.5 gals/cf)		7.50	Gals/CF
<b>Required Cistern Volume</b> Vol = ( $WQ_v \times 7.5$ )	Vol	<b>4,126</b>	Gals

Proposed Cistern Size			
DESCRIPTION	SYMBOL	VALUE	UNITS
Provided Cistern Volume (Per Cistern)	-	5,000	Gal
<b>Provided Cistern Volume</b>	<b>PVol</b>	<b>5,000</b>	<b>Gal</b>

## ***APPENDIX C***

# ***TEMPORARY EROSION AND SEDIMENT CONTROL & PERMANENT STORMWATER PRACTICE INSPECTION CHECKLIST***

**Temporary Erosion and Sediment Control Inspection and Maintenance Checklist**

<b>Erosion and Sediment Control Measure</b>	<b>Inspection/Maintenance Intervals</b>	<b>Inspection/Maintenance Requirements</b>
Stabilized Construction Entrance	Daily	<ul style="list-style-type: none"><li>• Periodic top dressing with additional aggregate as required</li><li>• Clean sediment in public right-of-ways immediately</li></ul>
Silt Fence	Weekly + After Each Rain	<ul style="list-style-type: none"><li>• Remove &amp; redistribute sediment when bulges develop in the silt fence.</li></ul>
Inlet Protection	Weekly + After Each Rain	<ul style="list-style-type: none"><li>• Remove sediment as necessary and replace filter fabric, crushed stone etc.</li><li>• Any broken and damaged components should be replaced.</li><li>• Check all materials for proper anchorage and secure as necessary.</li></ul>

**Permanent Stormwater Management Practice Inspection and Maintenance Checklist**

<b>Stormwater Management Practice</b>	<b>Inspection/Maintenance Intervals</b>	<b>Inspection/Maintenance Requirements</b>
Rip-Rap Apron/Energy Dissipator and Check Dams	Annually + After Major Storms	<ul style="list-style-type: none"><li>• Check for evidence of flows going around the structure.</li><li>• Check for evidence at downstream toe and repair as needed.</li><li>• Clean sediment and install additional aggregate as necessary.</li></ul>
Drain Inlets	Monthly	<ul style="list-style-type: none"><li>• Check for blockage and/or erosion at top of each inlet. Repair/remove as necessary.</li><li>• Check for sediment and debris collected within sumps and clean out as necessary.</li></ul>
Subsurface Stormwater Management Detention Facility	Annually + After Major Storms	<ul style="list-style-type: none"><li>• Check level of sediment and debris accumulated within the system.</li><li>• Check structural integrity of the system pipes, structures, etc. for cracking, bulging or deterioration. Repair/remove as necessary.</li><li>• Confirm all inlets and outlet structures/pipes are operating properly.</li></ul>

**Permanent Stormwater Management Practice Inspection and Maintenance Checklist**

Stormwater Management Practice	Inspection/Maintenance Intervals	Inspection/Maintenance Requirements
Rain Garden	Early Spring (before new growth is 3 inches high)	<ul style="list-style-type: none"> <li>• Cut and remove dead stalks and seed heads remaining from previous season.</li> <li>• Remove sticks and debris.</li> <li>• Prune shrubs if necessary.</li> <li>• Divide and move perennials if they are too crowded.</li> <li>• Replenish mulch layer to maintain a 3 inch layer of shredded bark.</li> </ul>
	Late Spring and Summer	<ul style="list-style-type: none"> <li>• Remove weeds.</li> <li>• Water as needed during periods of drought.</li> </ul>
	Fall	<ul style="list-style-type: none"> <li>• Remove weeds and diseased plants</li> <li>• Remove excess leaves.</li> <li>• If Fall is dry, continue to water trees and shrubs until the ground begins to freeze (later October). These woody plants need moisture entering winter to ensure survival.</li> </ul>

The owner/operator responsible for inspection and maintenance as outlined above:

Mr. William Fedyna  
219 W 81<sup>st</sup> Street, Apt. 9D  
New York, NY 10024  
Phone: (646) 321-2081

## ***APPENDIX D***

### ***CONTRACTOR'S CERTIFICATION***



Site Planning  
Civil Engineering  
Landscape Architecture  
Land Surveying  
Transportation Engineering

Environmental Studies  
Entitlements  
Construction Services  
3D Visualization  
Laser Scanning

JMC Project 18100  
Residential Development  
1165 Greacen Point Road  
Village of Mamaroneck, NY

### CONTRACTOR'S CERTIFICATION

"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"

Company Name: \_\_\_\_\_

Address: \_\_\_\_\_

Telephone Number: \_\_\_\_\_

Name and Title: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Permit Identification No.: \_\_\_\_\_

Name and Title of Trained Contractor: \_\_\_\_\_

Elements of the SWPPP Contractor is responsible for: \_\_\_\_\_

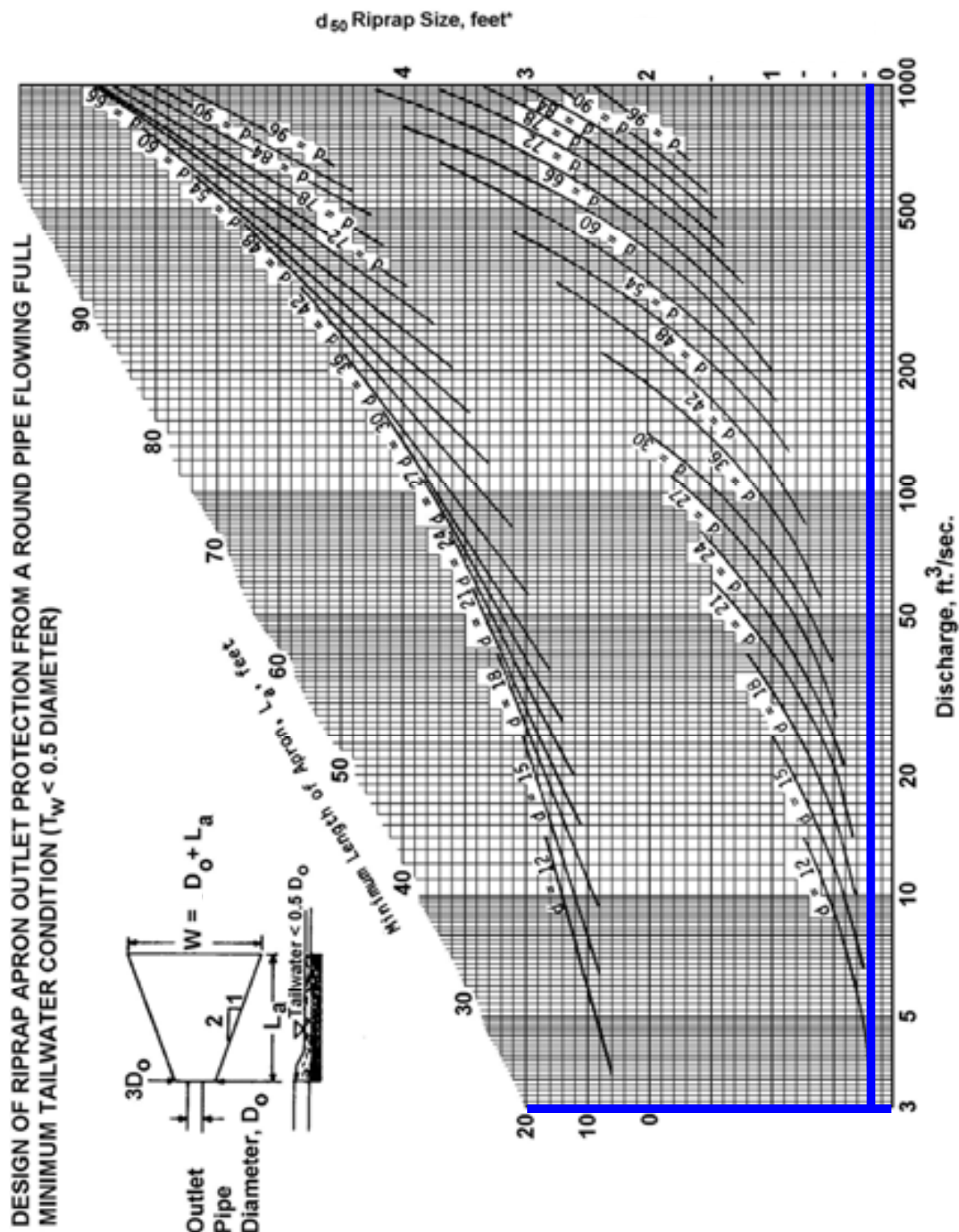
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## ***APPENDIX E***

### ***STONE OUTLET PROTECTION DESIGN CALCULATIONS***

**Figure 3.16**  
**Outlet Protection Design—Minimum Tailwater Condition Chart**  
 (Design of Outlet Protection from a Round Pipe Flowing Full,  
 Minimum Tailwater Condition:  $T_w < 0.5D_o$ ) (USDA - NRCS)



\* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase  $d_{50}$  stone size and/or provide velocity reduction device.

PIPE DIAMETER: 12"

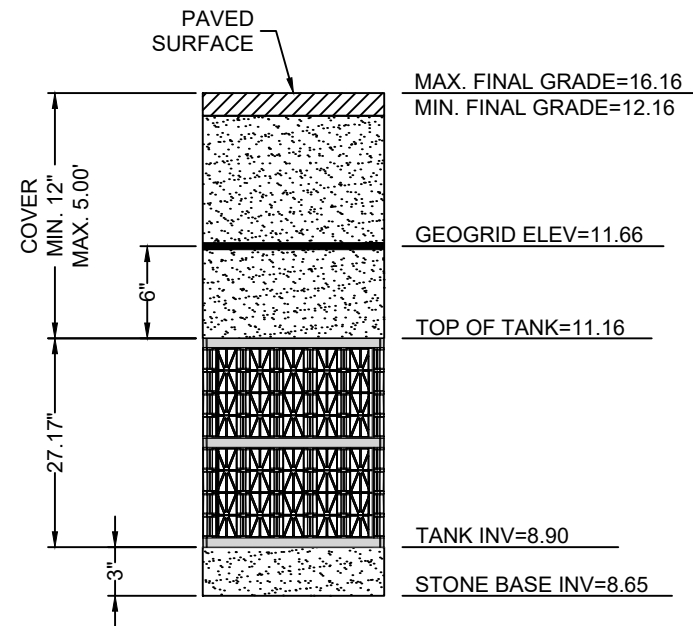
DISCHARGE RATE: 1.89 cfs

$d_{50}$  RIP RAP SIZE: 3"

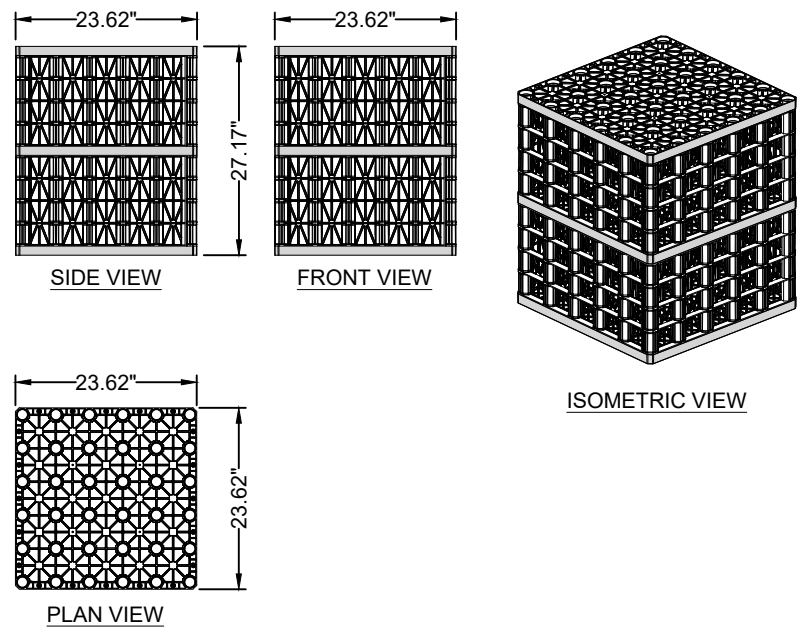
La MINIMUM LENGTH OF APRON: 6'

## ***APPENDIX F***

### ***R-TANK DETAILS AND SPECIFICATIONS***



DOUBLE R-TANK<sup>UD</sup> - ELEVATION



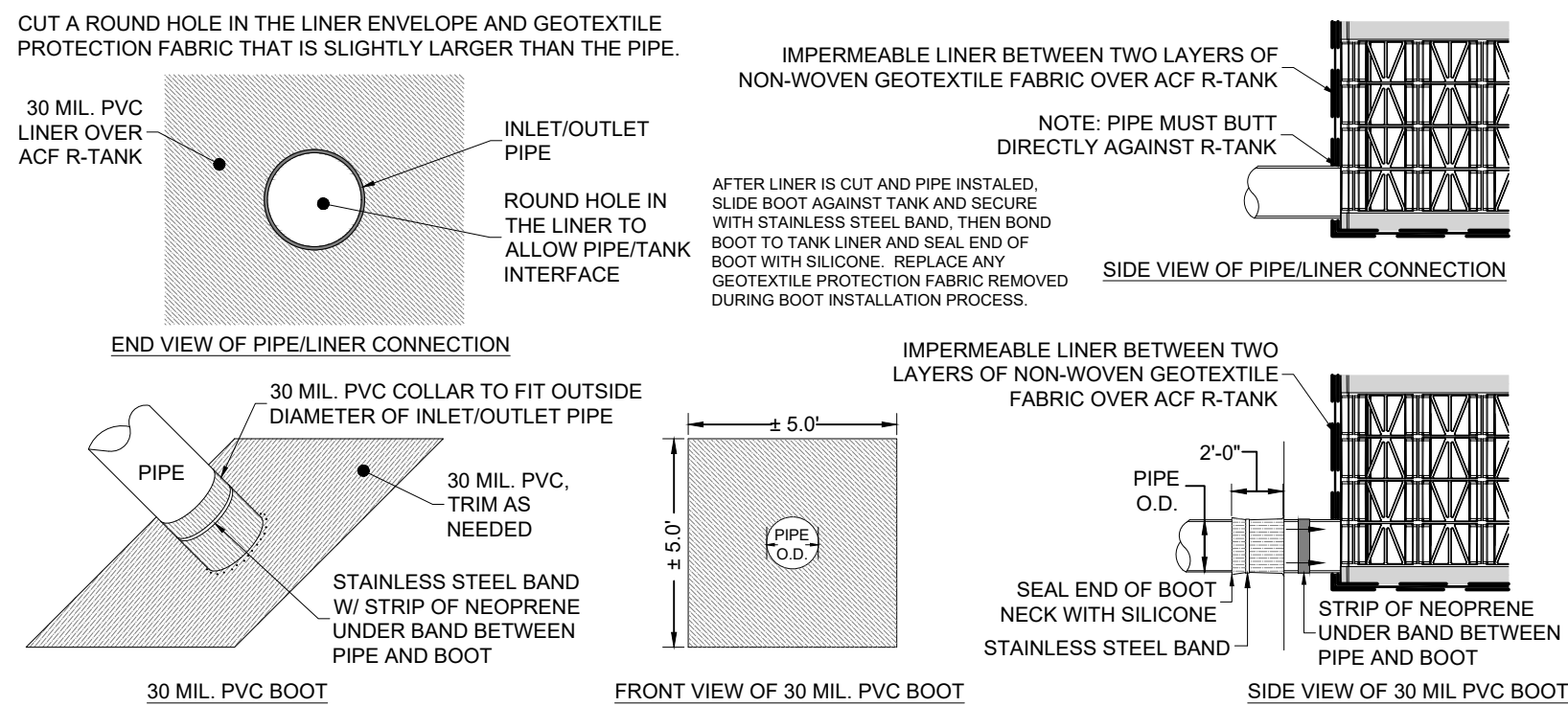
MODULE DATA

**GEOMETRY:**  
LENGTH = 23.62 IN. (600 MM)  
WIDTH = 23.62 IN. (600 MM)  
HEIGHT = 27.17 IN. (690 MM)  
TANK VOLUME = 8.77 CF  
STORAGE VOLUME = 8.33 CF  
VOID INTERNAL VOLUME: 95%  
VOID SURFACE AREA: 90%

**LOAD RATING:**  
134.2 PSI, (MODULE ONLY)  
HS20, (WITH ACF COVER SYSTEM)

**MATERIAL:**  
100% RECYCLED POLYPROPYLENE

DOUBLE R-TANK<sup>UD</sup> - MODULE DETAIL



R-TANK<sup>HD</sup> TYPICAL TANK INLET/OUTLET W/ 30 MIL PVC PIPE BOOT DETAIL

R-TANK<sup>UD</sup> QUANTITIES

R-TANK <sup>UD</sup> MODULE TYPE	DOUBLE
# OF DOUBLE R-TANKS	204
R-TANK STORAGE VOLUME	1,700 CF
STONE BED FOOTPRINT	1,035 SF
STONE QUANTITY	68 CY
30 MIL. PVC LINER TANK WRAP	2,118 SF (235 SY)
8 OZ. NON-WOVEN GEOTEXTILE LINER PROTECTION	4,236 SF (471 SY)
ACF BX-12 GEOGRID	1680 SF (187 SY)
10" MAINTENANCE PORTS	1
6" PIPE BOOTS	2
NOTE: STONE QUANTITY INCLUDES 6" OF COVER AND 3" OF BASE.	
NOTE: GEOTEXTILE / LINER QUANTITIES INCLUDE A 15% WASTE FACTOR.	



ENGINEER OF  
RECORD TO  
REVIEW, APPROVE  
AND ENDORSE  
FINAL SITE  
SPECIFIC DESIGN.

FOR ADDITIONAL INFORMATION PLEASE CONTACT:  
ACF ENVIRONMENTAL 1-800-448-3636  
www.acfenvironmental.com



R-TANK<sup>UD</sup> SYSTEM DETAILS  
RESIDENTIAL DEVELOPMENT  
MAMARONECK, NY  
SITE DESIGNATION: UGDS  
ACF ENVIRONMENTAL, 1-800-448-3636, www.acfenvironmental.com

DRAWN BY

JPS

DATE

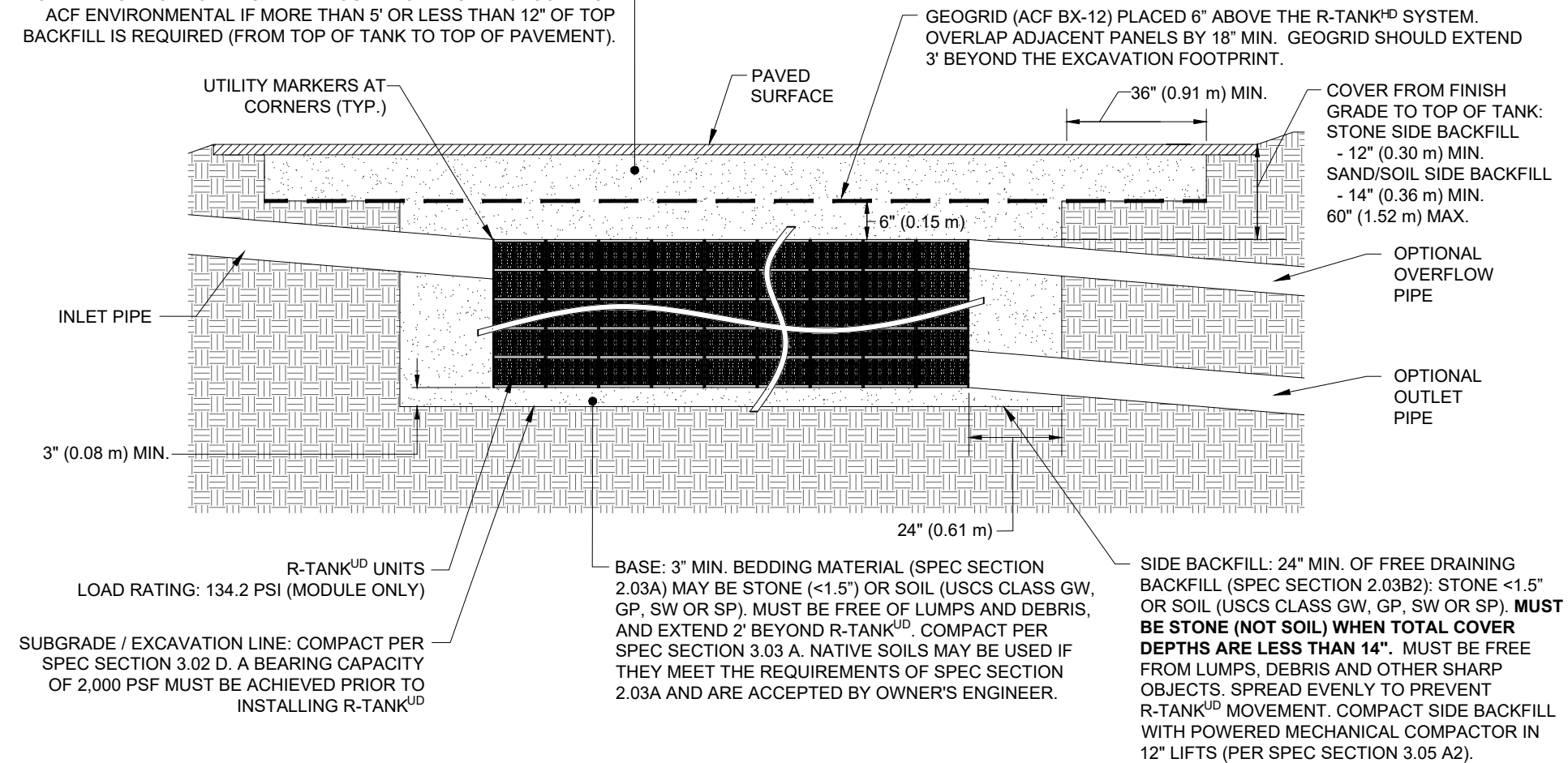
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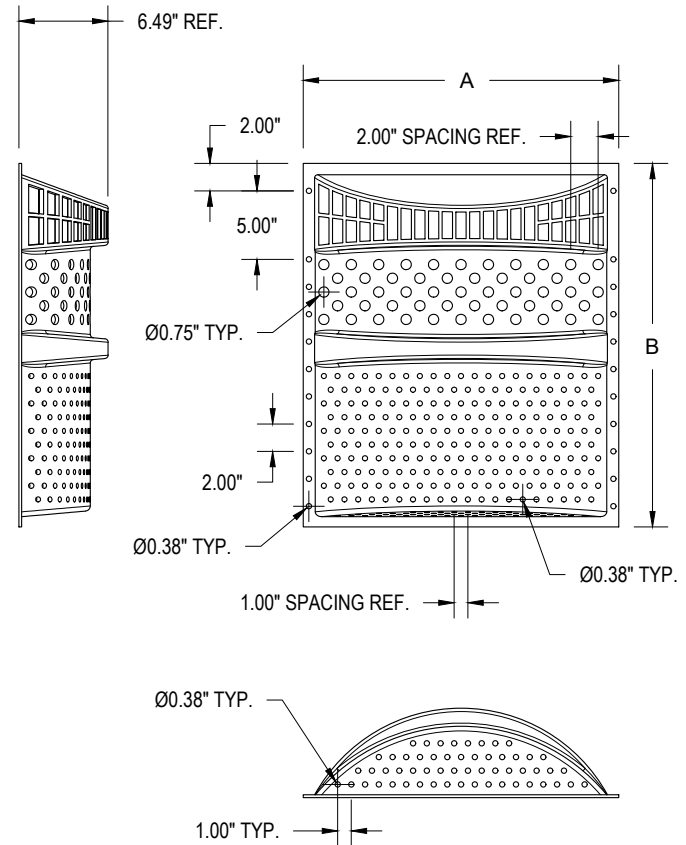


TOTAL COVER: 12"(STONE)/14"(SAND/SOIL) MINIMUM AND 60" MAXIMUM. FIRST 12" (OR FROM TOP OF MODULE TO BOTTOM OF PAVEMENT SECTION WHEN MINIMUM COVER CONDITIONS APPLY) MUST BE FREE DRAINING BACKFILL (SPEC SECTION 2.03B2): STONE <1.5" OR SOIL (USCS CLASS GW, GP, SW OR SP). ADDITIONAL FILL MAY BE STRUCTURAL FILL (SPEC SECTION 2.03C): STONE OR SOIL (USCS CLASS SM, SP, SW, GM, GP OR GW) WITH MAX CLAY CONTENT<10%, MAX 25% PASSING NO. 200 SIEVE, AND MAX PLASTICITY INDEX OF 4. A MIN. 12" COVER MUST BE MAINTAINED BETWEEN BACKFILL EQUIPMENT AND THE TOP OF THE R-TANK™ SYSTEM AT ALL TIMES. TOTAL HEIGHT OF TOP BACKFILL SHOULD NOT EXCEED 5'. CONTACT ACF ENVIRONMENTAL IF MORE THAN 5' OR LESS THAN 12" OF TOP BACKFILL IS REQUIRED (FROM TOP OF TANK TO TOP OF PAVEMENT).

- NOTES:
1. FOR COMPLETE MODULE DATA, SEE APPROPRIATE R-TANK<sup>UD</sup> MODULE SHEET .
  2. INSTALLATIONS PER THIS DETAIL MEET GUIDELINES OF HL-93 LOADING PER THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, CUSTOMARY U.S. UNITS, 7TH EDITION, 2014 WITH 2015 AND 2016 INTERIM REVISIONS.
  3. PRE-TREATMENT STRUCTURES NOT SHOWN.
  4. FOR INFILTRATION APPLICATIONS, GEOTEXTILE ENVELOPING R-TANK SHALL BE ACF M200 (PER SPEC SECTION 2.02A) AND BASE SHALL BE 4" MIN. UNCOMPACTED FREE DRAINING BACKFILL (SPEC SECTION 2.03A) TO PROVIDE A LEVEL BASE. SURFACE MUST BE SMOOTH, FREE OF LUMPS OR DEBRIS, AND EXTEND 2' BEYOND R-TANK<sup>UD</sup> FOOTPRINT.



R-TANK<sup>UD</sup> & H-20 LOADS - SECTION VIEW



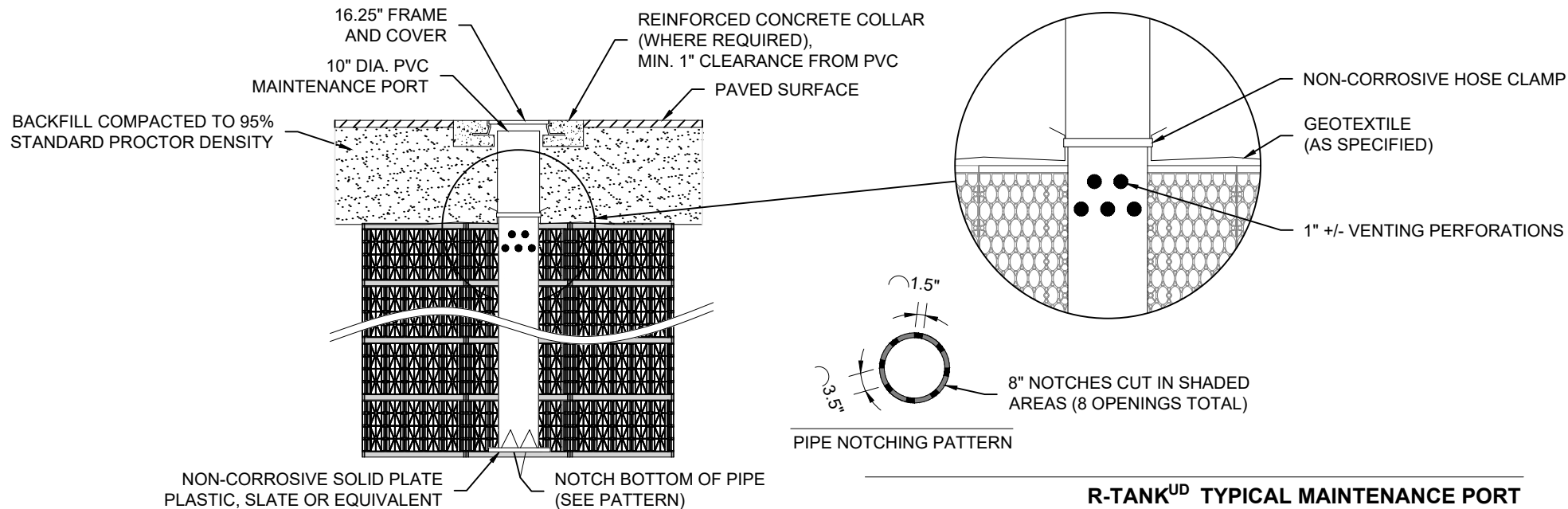
SIZE	A	B
23" x 24"	23"	26.51"
28" x 30"	28"	33.15"
34" x 36"	34"	38.69"

±0.25" TOLERANCE ON DIMENSIONS

TRASHGUARD PLUS PRETREATMENT DETAIL

NOTES

1. THIS PORT IS USED TO PUMP WATER INTO THE SYSTEM AND RE-SUSPEND ACCUMULATED SEDIMENT SO THAT IT MAY BE PUMPED OUT.
2. MINIMUM REQUIRED MAINTENANCE INCLUDES A QUARTERLY INSPECTION DURING THE FIRST YEAR OF OPERATION AND A YEARLY INSPECTION THEREAFTER. FLUSH AS NEEDED.
3. SEE TRAFFIC LOADING DETAIL FOR MINIMUM & MAXIMUM COVER REQUIREMENTS.
4. IF MAINTENANCE PORT IS LOCATED IN A NON-TRAFFIC AREA, A PLASTIC CAP CAN BE USED IN LEU OF A FRAME AND COVER WITH CONCRETE COLLAR.



R-TANK<sup>UD</sup> TYPICAL MAINTENANCE PORT



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AND ENDORSE  
FINAL SITE  
SPECIFIC DESIGN.

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www.acfenvironmental.com



R-TANK<sup>UD</sup> SYSTEM DETAILS  
RESIDENTIAL DEVELOPMENT  
MAMARONECK, NY  
SITE DESIGNATION: UGDS

ACF ENVIRONMENTAL, 1-800-448-3636, www.acfenvironmental.com

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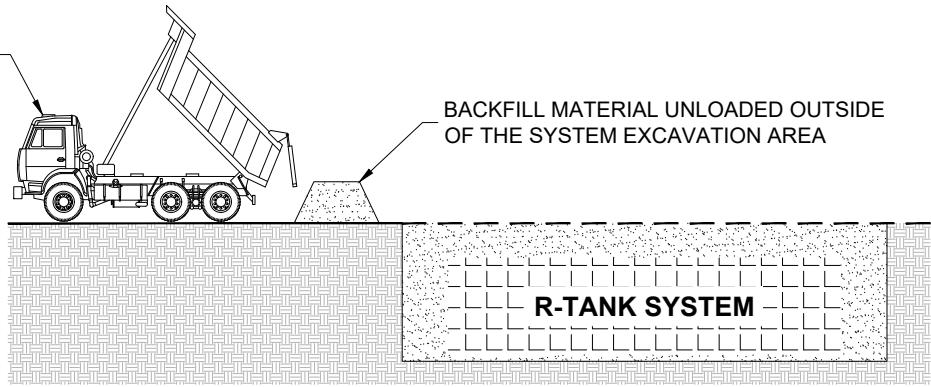
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08/25/20

SHEET NO.

DUMP TRUCKS AND PANS SHALL NOT OPERATE OVER THE SYSTEM EXCAVATION AREA



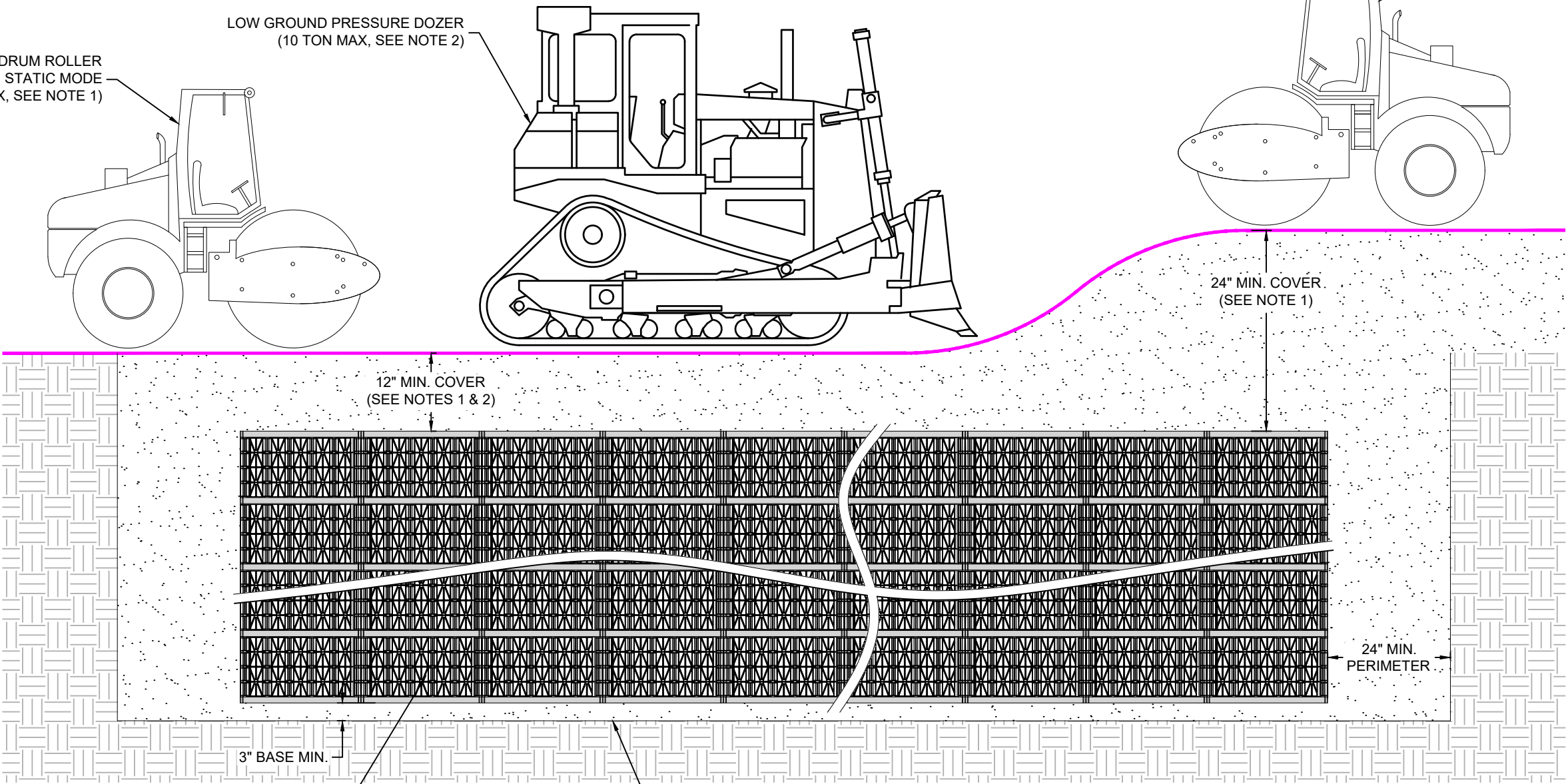
DUMP TRUCK DETAIL (SEE NOTE 3)

- NOTES:
1. FOLLOWING PLACEMENT OF SIDE BACKFILL, A UNIFORM 12" LIFT OF THE FREELY DRAINING MATERIAL (SPEC SECTION 2.03 B) SHALL BE PLACED OVER THE R-TANK AND LIGHTLY COMPACTED USING A WALK-BEHIND TRENCH ROLLER. ALTERNATELY, A ROLLER (MAXIMUM GROSS VEHICLE WEIGHT OF 6 TONS) MAY BE USED. ROLLER MUST REMAIN IN STATIC MODE UNTIL A MINIMUM OF 24" OF COVER HAS BEEN PLACED OVER THE MODULES. SHEEP FOOT ROLLERS SHOULD NOT BE USED. **SPEC SECTION 3.05 A**
  2. ONLY LOW PRESSURE TIRE OR TRACK VEHICLES (LESS THAN 7 PSI AND OPERATING WEIGHT OF LESS THAN 20,000 LBS) SHALL BE OPERATED OVER THE R-TANK SYSTEM DURING CONSTRUCTION. **SPEC SECTION 3.05 B**
  3. DUMP TRUCKS AND PANS SHALL NOT BE OPERATED WITHIN THE R-TANK SYSTEM AT ANY TIME. WHERE NECESSARY, THE HEAVY EQUIPMENT SHOULD UNLOAD IN AN AREA ADJACENT TO THE R-TANK SYSTEM AND THE MATERIAL SHOULD BE MOVED OVER THE SYSTEM WITH TRACKED EQUIPMENT. **SPEC SECTION 3.05 B**
  4. ENSURE THAT ALL UNRELATED CONSTRUCTION TRAFFIC IS KEPT AWAY FROM THE LIMITS OF EXCAVATION RELATED LOADING SHOULD BE ALLOWED OVER THE R-TANK SYSTEM UNTIL THE FINAL DESIGN SECTION HAS BEEN CONSTRUCTED (INCLUDING PAVEMENT). **SPEC SECTION 3.05 C**
  5. SEE R-TANK INSTALLATION GUIDE OR CONTACT YOUR LOCAL ACF REPRESENTATIVE FOR ADDITIONAL INFORMATION.

SMOOTH DRUM ROLLER  
STATIC MODE  
(6 TON MAX, SEE NOTE 1)

LOW GROUND PRESSURE DOZER  
(10 TON MAX, SEE NOTE 2)

SMOOTH DRUM ROLLER  
VIBRATORY MODE  
(6 TON MAX, SEE NOTE 1)



ENGINEER OF  
RECORD TO  
REVIEW, APPROVE  
AND ENDORSE  
FINAL SITE  
SPECIFIC DESIGN.

FOR ADDITIONAL INFORMATION PLEASE CONTACT:  
ACF ENVIRONMENTAL 1-800-448-3636  
www.acfenvironmental.com



R-TANK<sup>UD</sup> CONSTRUCTION EQUIPMENT COVER DETAIL  
RESIDENTIAL DEVELOPMENT  
MAMARONECK, NY  
SITE DESIGNATION: UGDS  
ACF ENVIRONMENTAL, 1-800-448-3636, www.acfenvironmental.com

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DATE

08/25/20

SHEET NO.



R-TANK SPECIFICATION

PART 1 - GENERAL

- 1.01

Related Documents

A. Drawings, technical specification and general provisions of the Contract as modified herein apply to this section.
- 1.02

Description of Work Included

A. Provide excavation and base preparation per geotechnical engineer's recommendations and/or as shown on the design drawings, to provide adequate support for project design loads and safety from excavation sidewall collapse. Excavations shall be in accordance with the owner's and OSHA requirements.

B. Provide and install R-Tank<sup>LD</sup>, R-Tank<sup>HD</sup>, R-Tank<sup>SD</sup>, or R-Tank<sup>UD</sup> system (hereafter called R-Tank) and all related products including fill materials, geotextiles, geogrids, inlet and outlet pipe with connections per the manufacturer's installation guidelines provided in this section.

C. Provide and construct the cover of the R-Tank system including; stone backfill, structural fill cover, and pavement section as specified.

D. Protect R-Tank system from construction traffic after installation until completion of all construction activity in the installation area.
- 1.03

Quality Control

A. All materials shall be manufactured in ISO certified facilities.

B. Installation Contractor shall demonstrate the following experience:

1.

A minimum of three R-Tank or equivalent projects completed within 2 years; and,

2.

A minimum of 25,000 cubic feet of storage volume completed within 2 years.

3.

Contractor experience requirement may be waived if the manufacturer's representative provides on-site training and review during construction.

C. Installation Personnel: Performed only by skilled workers with satisfactory record of performance on bulk earthworks, pipe, chamber, or pond/landfill construction projects of comparable size and quality.

D. Contractor must have manufacturer's representative available for site review if requested by Owner.
- 1.04

Submittals

A. Submit proposed R-Tank layout drawings. Drawings shall include typical section details as well as the required base elevation of stone and tanks, minimum cover requirements and tank configuration.

B. Submit manufacturer's product data, including compressive strength and unit weight.

C. Submit manufacturer's installation instructions.

D. Submit R-Tank sample for review. Reviewed and accepted samples will be returned to the Contractor.

E. Submit material certificates for geotextile, geogrid, base course and backfill materials.

F. Submit required experience and personnel requirements as specified in Section 1.03.

G. Any proposed equal alternative product substitution to this specification must be submitted for review and approved prior to bid opening. Review package should include third party reviewed performance data that meets or exceeds criteria in Table 2.01 B.
- 1.05

Delivery, Storage, and Handling

A. Protect R-Tank and other materials from damage during delivery, and store UV sensitive materials under tarp to protect from sunlight when time from delivery to installation exceeds two weeks. Storage of materials should be on smooth surfaces, free from dirt, mud and debris.

B. Handling is to be performed with equipment appropriate to the materials and site conditions, and may include hand, handcart, forklifts, extension lifts, etc.

C. Cold weather:

1.

Care must be taken when handling plastics when air temperature is 40 degrees or below as plastic becomes brittle.

2.

Do not use frozen materials or materials mixed or coated with ice or frost.

3.

Do not build on frozen ground or wet, saturated or muddy subgrade.
- 1.06

Preinstallation Conference.

A. Prior to the start of the installation, a preinstallation conference shall occur with the representatives from the design team, the general contractor, the excavation contractor, the R-Tank installation contractor, and the manufacturer's representative.
- 1.07

Project Conditions

A. Coordinate installation for the R-Tank system with other on-site activities to eliminate all non-installation related construction traffic over the completed R-Tank system. No loads heavier than the design loads shall be allowed over the system, and in no case shall loads higher than a standard AASHTO HS20 (or HS25, depending on design criteria) load be allowed on the system at any time.

B. Protect adjacent work from damage during R-Tank system installation.

C. All pre-treatment systems to remove debris and heavy sediments must be in place and functional prior to operation of the R-Tank system. Additional pretreatment measures may be needed if unit is operational during construction due to increased sediment loads.

D. Contractor is responsible for any damage to the system during construction.

PART 2 - PRODUCTS

- 2.01

R-Tank Units

A. R-Tank - Injection molded plastic tank plates assembled to form a 95% void modular structure of predesigned height (custom for each project).

B. R-Tank units shall meet the following Physical & Chemical Characteristics:

PROPERTY	DESCRIPTION	R-Tank <sup>LD</sup> VALUE	R-Tank <sup>HD</sup> VALUE	R-Tank <sup>SD</sup> VALUE	R-Tank <sup>UD</sup> VALUE
Void Area	Volume available for water storage	95%	95%	95%	95%
Surface Void Area	Percentage of exterior available for infiltration	90%	90%	90%	90%
Compressive Strength	ASTM D 2412 /ASTM F 2418	30.0 psi	33.4 psi	42.9 psi	134.2 psi
HS-20 Minimum Cover	Cover required to support HS-20 loads	N/A	20"	18"	12" (STONE BACKFILL)
HS-25 Minimum Cover	Cover required to support HS-25 loads	N/A	24"	19"	15" (STONE BACKFILL)
Maximum Cover	Maximum allowable cover depth	3 feet	<7 feet	<10 feet	5 feet
Unit Weight	Weight of plastic per cubic foot of tank	3.29 lbs / cf	3.62 lbs/cf	3.96 lbs / cf	4.33 lbs / cf
Rib Thickness	Thickness of load-bearing members	0.18 inches	0.18 inches	0.18 inches	N/A
Service Temperature	Safe temperature range for use	-14 – 167° F	-14 – 167° F	-14 – 167° F	-14 – 167° F

- C.

Supplier: ACF Environmental 2831 Cardwell Road Richmond, VA 23234  
(T): 800-448-3636; (F): 804-743-7779 www.acfenvironmental.com

- 2.02

Geosynthetics

A. Geotextile. A geotextile envelope is required to prevent backfill material from entering the R-Tank modules.

1.

Standard Application: The standard geotextile shall be an 8 oz per square yard nonwoven geotextile (ACF N080 or equivalent).

2.

Infiltration Applications: When water must infiltrate/exfiltrate through the geotextile as a function of the system design, a woven monofilament (ACF M200 or equivalent) shall be used.

B. Geogrid. For installations subject to traffic loads and/or when required by project plans, install geogrid (ACF BX12 or equivalent) to reinforce backfill above the R-Tank system. Geogrid is not always required for R-Tank<sup>UD</sup> installations, and is often not required for non-traffic load applications.
- 2.03

Backfill & Cover Materials

A. Bedding Materials: Stone (angular and smaller than 1.5" in diameter) or soil (GW, GP, SW, or SP as classified by the Unified Soil Classification System) shall be used below the R-Tank system (3" minimum). Material must be free from lumps, debris, and any sharp objects that could cut the geotextile. Material shall be within 3 percent of the optimum moisture content as determined by ASTM D698 at the time of installation. For infiltration applications bedding material shall be free draining.

B. Side and Top Backfill: Free draining material shall be used adjacent to (24" minimum) and above (for the first 12") the R-Tank system. Material must be free from lumps, debris and any sharp objects that could cut the geotextile. Material shall be within 3 percent of the optimum moisture content as determined by ASTM D698 at the time of installation.

1.

For LD, HD, and SD modules, backfill materials shall be free draining stone (angular and smaller than 1.5" in diameter) or soil (GW, GP, SW, or SP as classified by the Unified Soil Classification System).

2.

For UD modules in traffic loaded (HS-20) applications with less than 14" of top cover, side backfill materials shall be free draining stone (angular and smaller than 1.5" in diameter). The use of soil backfill on the sides of the UD module is not permitted unless the modules are installed outside of traffic areas or with cover depths of > 14". Top backfill material may be stone or soil as noted above (Section 2.03 B 1).

C. Additional Cover Materials: Structural Fill shall consist of granular materials meeting the gradational requirements of SM, SP, SW, GM, GP or GW as classified by the Unified Soil Classification System. Structural fill shall have a maximum of 25 percent passing the No. 200 sieve, shall have a maximum clay content of 10 percent and a maximum Plasticity Index of 4. Material shall be within 3 percent of the optimum moisture content as determined by ASTM D698 at the time of installation.

2.04

Other Materials

Utility Marker: Install metallic tape at corners of R-Tank system to mark the area for future utility detection.

PART 3 - EXECUTION

3.01

Assembly of R-Tank Units

A. Assembly of modules shall be performed in accordance with the R-Tank Installation Manual, Section 2.

3.02

Layout and Excavation

A. Installer shall stake out, excavate, and prepare the subgrade area to the required plan grades and dimensions, ensuring that the excavation is at least 2 feet greater than R-Tank dimensions in each direction allowing for installation of geotextile filter fabric, R-Tank modules, and free draining backfill materials.

B. All excavations must be prepared with OSHA approved excavated sides and sufficient working space.

C. Protect partially completed installation against damage from other construction traffic by establishing a perimeter with high visibility construction tape, fencing, barricades, or other means until construction is complete.

D. Base of the excavation shall be uniform, level, and free of lumps or debris and soft or yielding subgrade areas. A minimum 2,000 pounds per square foot bearing capacity is required.

1.

Standard Applications: Compact subgrade to a minimum of 95% of Standard Proctor (ASTM D698) density or as required by the Owner's engineer.

2.

Infiltration Applications: Subgrade shall be prepared in accordance with the contract documents. Compaction of subgrade should not be performed in infiltration applications.

E. Unsuitable Soils or Conditions: All questions about the base of the excavation shall be directed to the owner's engineer, who will approve the subgrade conditions prior to placement of stone. The owner's engineer shall determine the required bearing capacity of the R-Tank subgrade; however in no case shall a bearing capacity of less than 2,000 pounds per square foot be provided.

1.

If unsuitable soils are encountered at the subgrade, or if the subgrade is pumping or appears excessively soft, repair the area in accordance with contract documents and/or as directed by the owner's engineer.

2.

If indications of the water table are observed during excavation, the engineer shall be contacted to provide recommendations.

3.

Do not start installation of the R-Tank system until unsatisfactory subgrade conditions are corrected and the subgrade conditions are accepted by the owner's engineer.

3.03

Preparation of Base

A. Place a thin layer (3" unless otherwise specified) of bedding material (Section 2.03 A), over the subgrade to establish a level working platform for the R-Tank modules. Level to within 1/2" (+/- 1/4") or as shown on the plans. Native subgrade soils or other materials may be used if determined to meet the requirements of 2.03 A and are accepted by the owner's engineer.

1.

Standard Applications: Static roll or otherwise compact bedding materials until they are firm and unyielding.

2.

Infiltration Applications: Bedding materials shall be prepared in accordance with the contract documents.

B. Outline the footprint of the R-Tank system on the excavation floor using spray paint or chalk line to ensure a 2' perimeter is available around the R-Tank system for proper installation and compaction of backfill.

3.04

Installation of the R-Tanks

A. Where a geotextile wrap is specified on the stone base, cut strips to length and install in excavation, removing wrinkles so material lays flat. Overlap geotextile a minimum 12" or as recommended by manufacturer.

B. Where an impervious liner (for containment) is specified, install the liner per manufacturer's recommendations and the contract documents. The R-Tank units shall be separated from impervious liner by a non-woven geotextile fabric installed accordance with Section 3.04A.

C. Install R-Tank modules by placing side by side, in accordance with the design drawings. No lateral connections are required. It is advisable to use a string line to form square corners and straight edges along the perimeter of the R-Tank system. The modules are to be oriented as per the design drawing with required depth as shown on plans..

1.

For LD, HD, and SD installations, the large side plate of the tank should be placed on the perimeter of the system. This will typically require that the two ends of the tank area will have a row of tanks placed perpendicular to all other tanks. If this is not shown in the construction drawings, it is a simple field adjustment that will have minimal effect on the overall system footprint. Refer to R-Tank Installation Guide for more details

2.

For UD installations, there is no perpendicular end row required.

D. Wrap the R-Tank top and sides in specified geotextile. Cut strips of geotextile so that it will cover the sides and top, encapsulating the entire system to prevent backfill entry into the system. Overlap geotextile 12" or as recommended by manufacturer. Take great care to avoid damage to geotextile (and, if specified, impervious liner) during placement.

E. Identify locations of inlet, outlet and any other penetrations of the geotextile (and optional liner). These connections should be installed flush (buted up to the R-Tank) and the geotextile fabric shall be cut to enable hydraulic continuity between the connections and the R-Tank units. These connections shall be secured using pipe boots with stainless steel pipe clamps. Support pipe in trenches during backfill operations to prevent pipe from settling and damaging the geotextile, impervious liner (if specified) or pipe. Connecting pipes at 90 degree angles facilitates construction, unless otherwise specified. Ensure end of pipe is installed snug against R-Tank system.

F. Install Inspection and Maintenance Ports in locations noted on plans. At a minimum one maintenance port shall be installed within 10' of each inlet & outlet connection, and with a maximum spacing of one maintenance port for every 2,500 square feet. Install all ports as noted in the R-Tank Installation Guide.

G. If required, install ventilation pipes and vents as specified on drawings to provide ventilation for proper hydraulic performance. The number of pipes and vents will depend on the size of the system. Vents are often installed using a 90 degree elbow with PVC pipe into a landscaped area with "U" bend or venting bollard to inhibit the ingress of debris. A ground level concrete or steel cover can be used.

3.05

Backfilling of the R-Tank Units

A. Backfill and fill with recommended materials as follows:

1.

Place freely draining backfill materials (Section 2.03 B) around the perimeter in lifts with a maximum thickness of 12". Each lift shall be placed around the entire perimeter such that each lift is no more than 24" higher than the side backfill along any other location on the perimeter of the R-Tank system. No fill shall be placed over top of tanks until the side backfill has been completed.

2.

Each lift shall be compacted at the specified moisture content to a minimum of 95% of the Standard Proctor Density until no further densification is observed (for self-compacting stone materials). The side lifts must be compacted with walk behind compaction equipment. Even when "self-compacting" backfill materials are selected, a walk behind vibratory compactor must be used.

3.

Take care to ensure that the compaction process does not allow the machinery to come into contact with the modules due to the potential for damage to the geotextile and R-Tank units.

4.

No compaction equipment is permissible to operate directly on the R-Tank modules.

5.

Top Backfill:

a.

Typical Applications: Install a 12" (or as shown on plans) lift of freely draining material (Section 2.03 B) over the R-Tank Units, maintaining 12" between equipment tracks and R-Tank System.

b.

Shallow Applications (< 18" total cover): Install top backfill in accordance with plans. Lightly compacted using a walk-behind trench roller. Alternately, a roller (maximum gross vehicle weight of 6 tons) may be used. Roller must remain in static mode until a minimum of 24" of cover has been placed over the modules. Sheep foot rollers should not be used.

6.

If required, install a geogrid as shown on plans. Geogrid shall extend a minimum of 3 feet beyond the limits of the excavation wall.

7.

Following placement and compaction of the initial cover, subsequent lifts of structural fill (Section 2.03 C) shall be placed at the specified moisture content and compacted to a minimum of 95% of the Standard Proctor Density and shall cover the entire footprint of the R-Tank system. During placement of fill above the system, unless otherwise specified, a uniform elevation of fill shall be maintained to within 12" across the footprint of the R-Tank system. Do not exceed maximum cover depths listed in Table 2.01 B.

8.

Place additional layers of geotextile and/or geogrid at elevations as specified in the design details. Each layer of geosynthetic reinforcement placed above the R-Tank system shall extend a minimum of 3 feet beyond the limits of the excavation wall.

B. Only low pressure tire or track vehicles shall be operated over the R-Tank system during construction. No machinery should drive on top of the tank until a minimum of 18" of backfill and compaction is achieved. Dump Trucks and Pans shall not be operated within the R-Tank system footprint at any time. Where necessary the heavy equipment should unload in an area adjacent to the R-Tank system and the material should be moved over the system with tracked equipment.

C. Ensure that all unrelated construction traffic is kept away from the limits of excavation until the project is complete and final surface materials are in place. No non-installation related loading should be allowed over the R-Tank system until the final design section has been constructed (including pavement).

D. Place surfacing materials, such as groundcovers (no large trees), or paving materials over the structure with care to avoid displacement of cover fill and damage to surrounding areas.

E. Backfill depth over R-Tank system must be within the limitations shown in the table in Section 2.01 B. If the total backfill depth does not comply with this table, contact engineer or manufacturer's representative for assistance.

PART 4 - USING THE SYSTEM

4.01

Maintenance Requirements

A. A routine maintenance effort is required to ensure proper performance of the R-Tank system. The Maintenance program should be focused on pretreatment systems. Ensuring these structures are clean and functioning properly will reduce the risk of contamination of the R-Tank system and stormwater released from the site. Pre-treatment systems shall be inspected yearly, or as directed by the regulatory agency and by the manufacturer (for proprietary systems). Maintain as needed using acceptable practices or following manufacturer's guidelines (for proprietary systems).

B. Inspection and/or Maintenance Ports in the R-Tank system will need to be inspected for accumulation of sediments at least quarterly through the first year of operation and at least yearly thereafter. This is done by removing the cap of the port and using a measuring device long enough to reach the bottom of the R-Tank system and stiff enough to push through the loose sediments, allowing a depth measurement.

C. If sediment has accumulated to the level noted in the R-Tank Maintenance Guide or above a level acceptable to the Owner's engineer, the R-Tank system should be flushed. A flushing event consists of pumping water into the Maintenance Port and/or adjacent structure, allowing the turbulent flows through the R-Tank system to re-suspend the fine sediments. If multiple Maintenance Ports have been installed, water should be pumped into each port to maximize flushing efficiency. Sediment-laden water can be filtered through a Dirtbag or approved equivalent if permitted by the locality.

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R-TANK SPECIFICATION  
RESIDENTIAL DEVELOPMENT  
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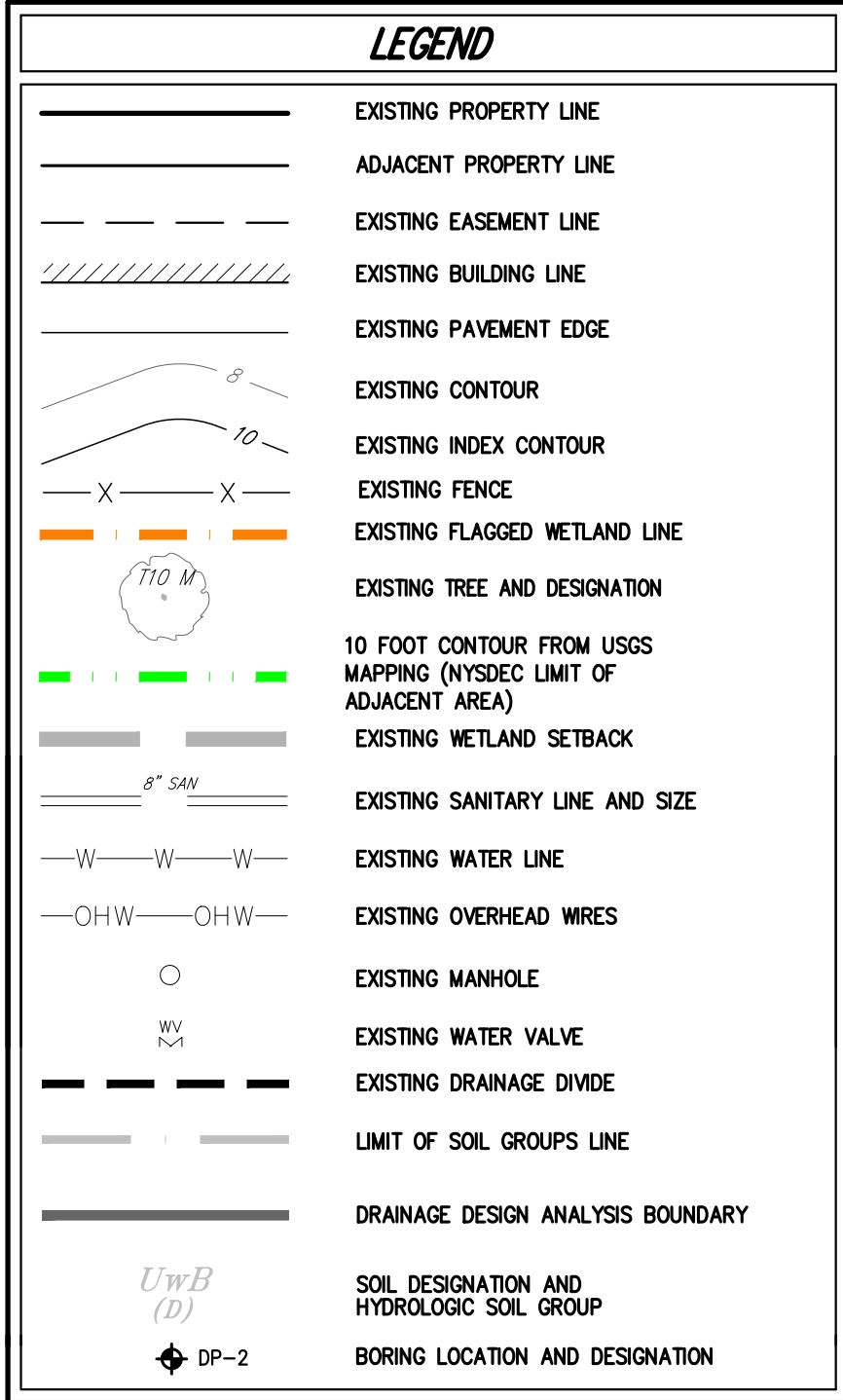
SHEET NO.

6 of 6

## ***APPENDIX G***

### ***DRAWINGS***





1. EXISTING CONDITIONS DEPICTED ON THIS PLAN HAVE BEEN TAKEN FROM SURVEY PREPARED BY SPINELLI SURVEYING, DATED 02/22/2018, LAST REVISED 04/23/2020.
2. WETLANDS FLAGGED BY ECOLOGICAL SOLUTIONS L.L.C.
3. THE MEAN LOW WATER BOUNDARY IS BEYOND DRAWING LIMITS TOWARD THE DELANCY COVE CHANNEL.
4. MEAN HIGH WATER: 3.39'  
MEAN HIGHER HIGH WATER: 3.75'  
MEAN LOW WATER: -3.90  
MEAN LOWER LOW WATER: -4.14

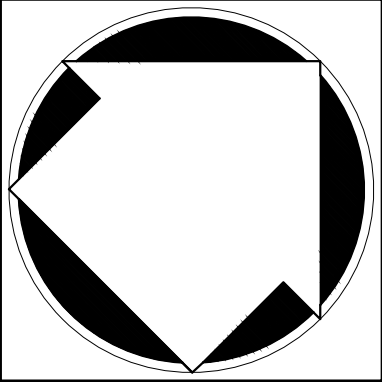
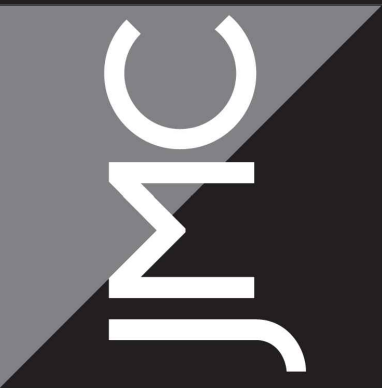
SOIL TYPE TABLE		
DESIGNATION	HYDROLOGIC GROUP	DESCRIPTION
UhB	D	URBAN LAND-CHARLTON COMPLEX, 3 TO 8 PERCENT SLOPES
UwB	D	URBAN LAND-WOODBRIDGE COMPLEX, 3 TO 8 PERCENT SLOPES

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[illegible]

APPLICANT/OWNER: <b>MR. WILLIAM FEDYNA &amp; ELISABETH FEDYNA</b> 219 W 81ST STREET, APT. 9D NEW YORK, NY, 10024	ARCHITECT: <b>ARCHI—TECTONICS</b> 111 JOHN ST. #700 NEW YORK, NY 10038
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**JMC Planning, Engineering, Landscape  
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**JMC Site Development Consultants, LLC**  
John Meyer Consulting, Inc.  
220 BEDFORD ROAD • ARMONK, NY 10504  
voice 914.273.5225 • fax 914.273.2102  
[www.jmcpllc.com](http://www.jmcpllc.com)



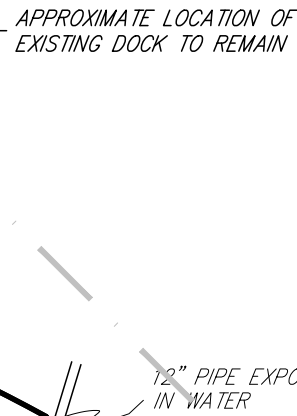
# EXISTING DRAINAGE AREA MAP

RESIDENTIAL DEVELOPMENT  
1165 GREACEN POINT ROAD  
MAMARONECK, NY, 10543

DA-1



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NOTES.

1. EXISTING CONDITIONS DEPICTED ON THIS PLAN HAVE BEEN TAKEN FROM SURVEY PREPARED BY SPINELLI SURVEYING, DATED 02/22/2018, LAST REVISED 04/23/2020.
2. ALL STORMWATER MANAGEMENT PRACTICES SHALL REMAIN UNDISTURBED AND BE PROTECTED FROM HEAVY MACHINERY DURING CONSTRUCTION, HOWEVER DURING CONSTRUCTION OF THE PRACTICE THE CONTRACTOR SHALL MINIMIZE AND AVOID HEAVY MACHINERY TRAFFIC TO THE MAXIMUM EXTENT PRACTICABLE. THERE SHALL BE NO STORAGE OF MATERIALS WITHIN AREAS TO BE USED FOR STORMWATER MANAGEMENT PRACTICES. THE CONTRACTOR SHALL INSTALL CONSTRUCTION FENCE AROUND THE PRACTICE TO DISCOURAGE VEHICLE TRAFFIC.

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Drawn:	<b>RAR</b>	Approved:	<b>JAR</b>
Scale:	<b>1" = 20'</b>		
Date:	<b>06/08/2020</b>		
Project No:	<b>18100</b>		
<b>8100-DRAINAGE-2a</b>	PDA	EDA.scr	
Drawing No:			
<b>DA-2</b>			

# PROPOSED DRAINAGE AREA MAP

RESIDENTIAL DEVELOPMENT  
1165 GREACEN POINT ROAD  
MAMARONECK, NY, 10543

APPLICANT/OWNER: MR. WILLIAM FEDYNA & ELISABETH FEDYNA  
219 W 81ST STREET, APT. 9D  
NEW YORK, NY, 10024

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ARCHITECT: ARCHI—TECTONICS  
111 JOHN ST. #700  
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