

POST CONSTRUCTION AND STORMWATER MANAGEMENT REPORT

PROPOSED MIXED-USE BUILDING RENOVATION 501 Washington Lane, Jenkintown, Pennsylvania CED Project No. 22001641A

July 2022

Revised December 2022

Prepared for:

Chase Walnut Holdings II, LLC 1541 Ridge Avenue, Suite 1 Philadelphia, PA 19130



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Introduction

The subject site is an existing developed lot located at 501 Washington Lane, Jenkintown, Pennsylvania. The existing property contains a 4-story office building with associated parking lot. The proposed project is to renovate the existing building into a mixed-use development with residential units on floors 2-4 and commercial space on the ground floor. The project also includes site improvements related to the parking lot, landscape areas, and stormwater management.



Site Description

The existing site is an existing developed property consisting of a 4-story building, asphalt parking lot, and a small area of overgrown hedges. The site is surrounded by an alley to the North, an adjacent Glanzmann Subaru property to the East, Washington Lane to the south, and Cedar Street to the west. The location of the site is shown on the accompanying Land Development plans. No streams, lakes, ponds, wetlands, or other surface water features existing on-site or within the immediate vicinity of the subject site. The current property has no existing stormwater management features on-site. The site runoff is collected via roof drains and one (1) existing inlet on-site that connect to the existing public storm sewer system. The site drains from East to West.

Based on review of the Borough of Jenkintown Stormwater Management District Watershed Map the site falls in the B – Management District and drains to the Tookany Creek in the Tookany/Tacony-Frankford Watershed.

PAST USES OF THE SITE

After a review of the USGS website and other available information which includes historical aerial images we have identified that the site was previously a parking lot dating back to the 1940's. In the mid-to-late 1970's / early 1980's the property was developed as the 4-story office building that exists today. For the past 40 years the site has remained in this condition.

SOIL CLASSIFICATIONS & LIMITING ZONES (GEOLOGIC FORMATIONS/SOIL CONDITIONS)

<u>UgB – Urban Land:</u>

0 to 8% slopes, Runoff classification is medium Hydrologic Soil Group – Not Listed

Depth to bedrock: Not known.

Depth to water table: Not known.

<u>UugB – Urban Land-Udorthents, schist and gneiss complex:</u>

0 to 8% slopes, Runoff classification is medium Hydrologic Soil Group C

Depth to bedrock: Not known. 10-90 inches deep based on soil survey.

Depth to water table: Not known. 60 inches deep based on soil survey.



Geologic/Soil Conditions that affects suitability for building site:

During construction activities, the potential for pollution exists that is typical with construction activities. Such pollution could be associated with sediment transport from silt laden runoff.

Measures to avoid/minimize or mitigate sediment pollution:

To prevent silt laden runoff from being transported off-site, silt soxx, and temporary soil stockpiles, are proposed to prevent sediment transport. Inlet protection is also proposed on existing inlets within the vicinity of the subject site. These filters will minimize sediment from being transported into the existing stormwater infrastructure and conveyed downstream.

FLOOD PLAIN

Based on the flood insurance rate maps for this site location, this property is located in flood hazard zone x (areas of minimal flooding, no shading), and therefore, the site is not located within the floodplain.



Proposed Development

The proposed project is to renovate the existing building into a mixed-use development with residential units on floors 2-4 and commercial space on the ground floor. The project also includes site improvements related to the parking lot, landscape areas, and stormwater management.

A raingarden, green roof, and new landscaped areas are proposed to meet the township stormwater management requirements as indicated in the below summary:



Stormwater Management

The overall philosophy of the proposed stormwater management system is to mitigate impacts of the proposed development due to changes in stormwater runoff rate, quantity and quality. This study analyzes the runoff from the site for the pre-development and post-development conditions.

The Borough's stormwater ordinance includes requirements for stormwater designs as outlined below:

- **Groundwater Recharge** (154-50): Maximize groundwater recharge through infiltration
- Water Quality Requirements (154-51): Treatment of stormwater runoff
- Stream bank Erosion Requirements (Channel Protection) (154-51): Reduce Post 2-year to the Pre 1-year flow
- **Stormwater Peak Rate Control and Management Districts** (154-53): Control postdevelopment runoff rates to pre-development runoff rates in accordance with Table 154-53.
- Erosion Control (154-12): Refer to Erosion & Sediment Control Report

Below please find a summary of the stormwater requirements as follows:

A. Groundwater Recharge (154-50)

The proposed raingarden is designed to promote infiltration for collected stormwater from the development into the ground. The raingarden has stone and soil storage below surface level orifice of the outlet structure. An underdrain with low flow orifice is provided in the event infiltration is not feasible. However, the design intent is for the subsurface volume to recharge into the ground instead of flowing out of the underground basin. The recharge volume is calculated by multiplying 1" of rainfall over the new impervious surface within the limit of disturbance. Below please find a summary of the required and proposed groundwater recharge volume summary (Please refer to the Appendix for the calculations).:

Total	
Required Recharge Volume (8,100 SF):	675 Cu. Ft.
Provided Recharge Volume:	1,481 Cu. Ft.

INFILTRATION TESTING

Infiltration testing was performed and documented in the Report of Stormwater Infiltration Evaluation. From this, the two test results yielded rates of 0.75 and 2.25 inches per hour (in/hr). Tests were completed between elevations 276.70 and 277.00. Conservatively, a factor of safety of 2 has been applied to the field infiltration rates. Although Infiltration Test #IT-1 is outside the raingarden footprint, the infiltration rates have been averaged to a calculated rate of 0.75 in/hr. This rate has been utilized for the stormwater modeling.



B. Water Quality Requirements (154–51)

The proposed raingarden is designed to treat the captured stormwater from the development through filtration from the plants and soil before infiltrating into the ground or entering the public storm sewer. The raingarden has stone and soil storage below surface level orifice of the outlet structure. An underdrain with low flow orifice is provided in the event infiltration is not feasible. However, the design intent is for the subsurface volume to recharge into the ground instead of flowing out of the underground basin. The water quality volume is calculated by multiplying 1" of rainfall over the new impervious surface within the limit of disturbance. Below please find a summary of the required and proposed water quality volume summary (Please refer to the Appendix for the calculations).:

Iotal	
Required Water Quality Volume (8,100 SF):	675 Cu. Ft.
Provided Water Quality Volume:	1,481 Cu. Ft.

Additionally, the project proposes 750 SF of green roof on the existing roof. This will provide even more water quality improvements to the existing site.

C. Stream bank Erosion Requirements (Channel Protection) (154–52)

The proposed site improvements including raingarden and landscape areas reduce the postdevelopment 2-year flow to less than the pre-development 1-year flow. Summarized below (Please refer to the Appendix for the calculations):

Pre-Development 1-year Flow:	1.97 CFS
Post-Development 2-year Flow:	1.46 CFS

D. Stormwater Management Districts – Runoff Rate Requirements (154–53)

The site falls under the runoff rate requirements for B Management District as shown on the Borough of Jenkintown Stormwater Management District Watershed Map (See Appendix for Map). Requirements are listed below:

District	Design Storm Proposed Conditions		Design Storm Existing Conditions
В	100-Year 50-Year 25-Year 10-Year 5-Year 2-Year	Reduce To	100-Year 25-Year 10-Year 5-Year 2-Year 1-Year



The method used to calculate the runoff rate was the SCS method. Rainfall depths were taken from Chapter 154 Borough of Jenkintown Stormwater Management Ordinance. This Chapter references NOAA Precipitation Data (See Appendix for Downloaded Information). Time of concentration for drainage areas calculated to be less than 5 minutes utilize 5 minutes for these areas.

The site has been analyzed for on-site, disturbed areas only. Below please find a summary of the peak flow analysis:

Post-Dev.
+ On-Site Bypass Flows
1.18 cfs
1.46 cfs
2.37 cfs
2.93 cfs
3.58 cfs
4.25 cfs
5.49 cfs

Hydrograph Summary

Stormwater Management Ground Cover Analysis

The Stormwater Management Ground Cover analysis included within this report was prepared using the SCS Method for ground cover comparison.

SOILS HYDROLOGIC GROUP "C"

Impervious	CN 98
Green Roof	CN 86
Lawn	CN 77
Meadow	CN 71
Grass Pavers	CN 70

Additionally, the project proposes 750 SF of green roof on the existing roof. This will provide even more runoff rate reduction than is calculated from the model.

THERMAL IMPACT MITIGATION

The redevelopment of the subject site proposes a green roof, landscaping and a raingarden throughout the subject site. These vegetative improvements will provide the largest benefit to existing thermal impacts. The use of the landscaping and stormwater management systems will mitigate, to the maximum extent practicable, the thermal impacts associated with the proposed redevelopment of the subject site.



MINIMIZE SOIL COMPACTION

Adequate soil compaction is necessary for areas of buildings and paving areas that are being established. Where possible, and at the direction of the on-site geotechnical engineer, all landscaping areas and the raingarden are proposed to be graded with lightweight machinery in an effort to minimize soil compaction.

E. Stormsewer Conveyance

Since there is only one (1) storm pipe proposed on-site, the storm sewer conveyance was designed utilizing the post-development rates from the HydroCAD model. The 25-year storm event was analyzed out of the raingarden with the discharge pipe for adequate capacity. The proposed storm pipe was designed to meet the 25-year storm event.

F. Undisturbed Off-site Bypass Analysis

There is an area of undisturbed bypass that is being captured by the proposed raingarden. This area is being analyzed in the pre-development and post-development drainage areas to compare matching areas. The raingarden is able to manage this additional area and model shows that the 100-year storm event can pass the additional volume through the basin with adequate storage. The management of this off-site area provides additional stormwater improvements. See Appendix for Calculations.

Conclusion

The proposed redevelopment will decrease the peak rate of runoff from the subject site when compared to the pre-development conditions. In actuality, an even greater reduction will be observed as the proposed green roof is not included in the stormwater modeling within the post construction stormwater management report. Through the proposed stormwater management measures, the proposed development will improve the stormwater management conditions downstream of the subject site, which we believe meets the intent of *Chapter 154 Borough of Jenkintown Stormwater Management Ordinance*.



Appendix

Appendix A – Preparer Qualifications

Preparer Qualifications: The Post Construction Stormwater Management Plan and Narrative have been prepared by Rhett Chiliberti, P.E. who has been trained and has experience in post construction stormwater methods and design techniques applicable to the size and scope of project.



Appendix B – Maps

STORMWATER MANAGEMENT

154 Attachment 1

Borough of Jenkintown

Appendix A Stormwater Management District Watershed Map



154 Attachment 1:1

06 - 01 - 2011

Custom Soil Resource Report Soil Map



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MAP INFORMATION	The soil surveys that comprise your AOI were mapped at 1:12,000.	Warning: Soil Map may not be valid at this scale. Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.	Please rely on the bar scale on each map sheet for map measurements. Source of Map: Natural Resources Conservation Service Web Soil Survey URL:	Maps from the Web Soil Survey are based on the Web Mercator Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.	This product is generated from the USDA-NRCS certified data as of the version date(s) listed below. Soil Survey Area: Montgomery County, Pennsylvania Survey Area Data: Version 16, Sep 1, 2021	Soil map units are labeled (as space allows) for map scales 1:50,000 or larger. Date(s) aerial images were photographed: Jun 1, 2019—Aug 4,	The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.
MAP LEGEND	Area of Interest (AOI) Result Spoil Area Area of Interest (AOI) Area Area of Interest (AOI)	Soils Soil Map Unit Polygons A Very Stony Spot Soil Map Unit Lines Soil Map Unit Lines Soil Map Unit Points Special Point Features Blowout Soil Map Unit Points Mater Features Soil Map Unit Points Special Point Features Soil Map Unit Points Special Point Features Soil Map Unit Points Special Line Features Special Point Features Special Line Features Special Line Features Special Line Features Special Line Features Special Point Features Special Line Features Special Line Features Special Line Features Special Line Features Special Point Features Special Line Features Special Point Features Special Line Features Special Point Features<th> Borrow Pit Clay Spot Clay Spot Closed Depression Interstate Highways Gravel Pit US Routes </th><th> Gravely Spot Landfill Landfill Lava Flow Marsh or swamp Mine or Quarry </th><th> Miscellaneous Water Perennial Water Rock Outcrop Saline Spot </th><th> Sandy Spot Severely Eroded Spot Sinkhole </th><th>Sodic Spot</th>	 Borrow Pit Clay Spot Clay Spot Closed Depression Interstate Highways Gravel Pit US Routes 	 Gravely Spot Landfill Landfill Lava Flow Marsh or swamp Mine or Quarry 	 Miscellaneous Water Perennial Water Rock Outcrop Saline Spot 	 Sandy Spot Severely Eroded Spot Sinkhole 	Sodic Spot

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
UgB	Urban land, 0 to 8 percent slopes	0.5	70.6%
UugB	Urban land-Udorthents, schist and gneiss complex, 0 to 8 percent slopes	0.2	29.4%
Totals for Area of Interest		0.6	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the

development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Montgomery County, Pennsylvania

UgB—Urban land, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2dtyq Elevation: 800 to 1,500 feet Mean annual precipitation: 36 to 46 inches Mean annual air temperature: 41 to 62 degrees F Frost-free period: 130 to 170 days Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 90 percent *Minor components:* 10 percent *Estimates are based on observations, descriptions, and transects of the mapunit.*

Description of Urban Land

Setting

Parent material: Pavement, buildings and other artifically covered areas human transported material

Interpretive groups

Land capability classification (irrigated): None specified Land capability classification (nonirrigated): 8s Hydric soil rating: No

Minor Components

Udorthents, unstable fill

Percent of map unit: 10 percent Down-slope shape: Linear Across-slope shape: Linear Hydric soil rating: No

UugB—Urban land-Udorthents, schist and gneiss complex, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2dtz7 Elevation: 200 to 2,000 feet Mean annual precipitation: 35 to 55 inches Mean annual air temperature: 45 to 61 degrees F Frost-free period: 110 to 235 days Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 80 percent

Udorthents, schist and gneiss, and similar soils: 15 percent *Minor components:* 5 percent *Estimates are based on observations, descriptions, and transects of the mapunit.*

Description of Urban Land

Setting

Landform: Hills Landform position (two-dimensional): Summit, shoulder, backslope Landform position (three-dimensional): Interfluve, nose slope, side slope Down-slope shape: Convex, linear Across-slope shape: Linear, convex Parent material: Pavement, buildings and other artifically covered areas

Typical profile

C - 0 to 6 inches: variable

Properties and qualities

Slope: 0 to 8 percent Depth to restrictive feature: 10 to 99 inches to lithic bedrock Available water supply, 0 to 60 inches: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified Land capability classification (nonirrigated): 8s Hydric soil rating: No

Description of Udorthents, Schist And Gneiss

Setting

Landform: Hills Landform position (two-dimensional): Summit, shoulder, backslope Landform position (three-dimensional): Interfluve, nose slope, side slope Down-slope shape: Convex, linear Across-slope shape: Linear, convex Parent material: Graded areas of schist and/or gneiss

Typical profile

Ap - 0 to 6 inches: loam C - 6 to 40 inches: silty clay loam R - 40 to 60 inches: bedrock

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 20 to 70 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 60 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified Land capability classification (nonirrigated): 7s Hydrologic Soil Group: C

Hydric soil rating: No

Minor Components

Glenelg

Percent of map unit: 1 percent Landform: Hillslopes Landform position (two-dimensional): Summit, shoulder, backslope Landform position (three-dimensional): Interfluve, nose slope, side slope Down-slope shape: Convex, linear Across-slope shape: Linear, convex Hydric soil rating: No

Baile

Percent of map unit: 1 percent Landform: Depressions Landform position (two-dimensional): Footslope Landform position (three-dimensional): Base slope Down-slope shape: Concave, linear Across-slope shape: Concave, linear Hydric soil rating: Yes

Edgemont

Percent of map unit: 1 percent Landform: Ridges Landform position (two-dimensional): Summit Landform position (three-dimensional): Mountaintop Down-slope shape: Convex, linear Across-slope shape: Linear, convex Hydric soil rating: No

Gladstone

Percent of map unit: 1 percent Landform: Hillslopes Landform position (two-dimensional): Summit, shoulder Landform position (three-dimensional): Nose slope, side slope Down-slope shape: Convex, linear Across-slope shape: Linear, convex Hydric soil rating: No

Glenville

Percent of map unit: 1 percent Landform: Hillslopes Landform position (two-dimensional): Backslope, footslope Landform position (three-dimensional): Head slope, side slope Down-slope shape: Concave, linear Across-slope shape: Linear, concave Hydric soil rating: No



Appendix C – Stormwater Analysis

Project Name: Proposed Building Renovation

 Project #:
 22001641A

 Prepared by:
 EHD

 Date:
 7/8/2022

 Revised:
 11/29/2022

PRE-DEVELOPMENT DRAINAGE AREA CALCULATIONSDrainage AreaSFAcrePre-Dev Impervious DA21,4750.49Pre-Dev Green DA4700.01Total Pre-Dev DA21,9450.50

POST-DEVELOPMENT DRAINAGE AREA CALCULATIONS			
Drainage Area	SF	Acre	
Post-Dev Impervious DA #1 to RG	7,154	0.16	
Post-Dev Green DA #1 to RG	1,135	0.03	
Post-Dev Grass Pavers DA #1 to RG	153	0.00	
Post-Dev Impervious DA (Bypass)	12,158	0.28	
Post-Dev Green Area (Bypass)	595	0.01	
Post-Dev Green Roof Area (Bypass)	750	0.02	
Total Post-Dev DA (On-Site)	21,945	0.50	

Hydraulic Soil Group: C	
<u>Curve Numbers (CN)</u>	
Impervious =	98
Green Roof=	86
Green(Lawn) =	77
Meadow =	71
Grass Pavers=	70

PRE-DEVELOPMENT TC PATH CALCULATION

📆 E	Edit S	ubcat 10S -	220621_2	2001641A-Pre-Post - Raingarden2	×
C	Gener	al Area	TC N	lotes	
[Line	Tc (minutes	Method	Description	<u>~</u>
	1	1.2	Sheet	Sheet Flow	
	2	0.2	Shallow	Shallow Concentrated Flow	
	3				
	4				
	5				
	6				
	7				
	8				×
		Total Tc: 1.4	(minu	<u>E</u> dit Tc	
				Import Tc values automatical	У
		ОК	Cance	l Apply <u>H</u> elp	

THEREFORE, SINCE THE CALCULATED TIME OF CONCENTRATION IS LESS THAN 5 MINUTES. UTILIZE 5 MINUTES FOR MODELING CALCULATIONS

221129_22001641A-Pre-Post - Raingarden2-with inf-Larger Ryp	e II 24-hr 1 Rair	nfall=2.74"
Prepared by Maser Consulting PA	Printed	12/2/2022
HydroCAD® 10.00-25 s/n 11761 © 2019 HydroCAD Software Solutions LLC		Page 1

Subcatchment10S: Pre-Dev Impervious Runoff Area=21,475 sf 100.00% Impervious Runoff Depth=2.51" Tc=5.0 min CN=0/98 Runoff=1.96 cfs 0.103 af

Subcatchment13S: Pre-Dev Green Area Runoff

Runoff Area=470 sf 0.00% Impervious Runoff Depth=0.62" Tc=5.0 min CN=71/0 Runoff=0.01 cfs 0.001 af

Link 11L: Pre-Dev POI#1

Inflow=1.97 cfs 0.104 af Primary=1.97 cfs 0.104 af

Total Runoff Area = 0.504 ac Runoff Volume = 0.104 af Average Runoff Depth = 2.47" 2.14% Pervious = 0.011 ac 97.86% Impervious = 0.493 ac

221129_22001641A-Pre-Post - Raingarden2-with inf-Larger Ry	/pe II 24-hr 2 Rair	nfall=3.30"
Prepared by Maser Consulting PA	Printed	12/2/2022
HydroCAD® 10.00-25 s/n 11761 © 2019 HydroCAD Software Solutions LLC		Page 2

Subcatchment10S: Pre-Dev Impervious Runoff Area=21,475 sf 100.00% Impervious Runoff Depth=3.07" Tc=5.0 min CN=0/98 Runoff=2.38 cfs 0.126 af

Subcatchment13S: Pre-Dev Green Area

Runoff Area=470 sf 0.00% Impervious Runoff Depth=0.94" Tc=5.0 min CN=71/0 Runoff=0.02 cfs 0.001 af

Link 11L: Pre-Dev POI#1

Inflow=2.39 cfs 0.127 af Primary=2.39 cfs 0.127 af

Total Runoff Area = 0.504 ac Runoff Volume = 0.127 af Average Runoff Depth = 3.02" 2.14% Pervious = 0.011 ac 97.86% Impervious = 0.493 ac

221129_22001641A-Pre-Post - Raingarden2-with inf-Larger	R ype II 24-hr 5 Rainfall=4.17"
Prepared by Maser Consulting PA	Printed 12/2/2022
HydroCAD® 10.00-25 s/n 11761 © 2019 HydroCAD Software Solutions LLC	Page 3

Subcatchment10S: Pre-Dev Impervious Runoff Area=21,475 sf 100.00% Impervious Runoff Depth=3.93" Tc=5.0 min CN=0/98 Runoff=3.01 cfs 0.162 af

Subcatchment13S: Pre-Dev Green Area

Runoff Area=470 sf 0.00% Impervious Runoff Depth=1.51" Tc=5.0 min CN=71/0 Runoff=0.03 cfs 0.001 af

Link 11L: Pre-Dev POI#1

Inflow=3.04 cfs 0.163 af Primary=3.04 cfs 0.163 af

Total Runoff Area = 0.504 ac Runoff Volume = 0.163 af Average Runoff Depth = 3.88" 2.14% Pervious = 0.011 ac 97.86% Impervious = 0.493 ac

221129_22001641A-Pre-Post - Raingarden2-with inf-LargerType II 24-hr	10 Rair	nfall=4.90"
Prepared by Maser Consulting PA	Printed	12/2/2022
HydroCAD® 10.00-25 s/n 11761 © 2019 HydroCAD Software Solutions LLC		Page 4

Subcatchment10S: Pre-Dev Impervious Runoff Area=21,475 sf 100.00% Impervious Runoff Depth=4.66" Tc=5.0 min CN=0/98 Runoff=3.55 cfs 0.192 af

Subcatchment13S: Pre-Dev Green Area

Runoff Area=470 sf 0.00% Impervious Runoff Depth=2.04" Tc=5.0 min CN=71/0 Runoff=0.04 cfs 0.002 af

Link 11L: Pre-Dev POI#1

Inflow=3.59 cfs 0.193 af Primary=3.59 cfs 0.193 af

Total Runoff Area = 0.504 ac Runoff Volume = 0.193 af Average Runoff Depth = 4.61" 2.14% Pervious = 0.011 ac 97.86% Impervious = 0.493 ac

221129_22001641A-Pre-Post - Raingarden2-with inf-LargerType II 24-hr	25 Raiı	nfall=5.97"
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Subcatchment10S: Pre-Dev Impervious Runoff Area=21,475 sf 100.00% Impervious Runoff Depth=5.73" Tc=5.0 min CN=0/98 Runoff=4.33 cfs 0.235 af

Subcatchment13S: Pre-Dev Green Area

Runoff Area=470 sf 0.00% Impervious Runoff Depth=2.87" Tc=5.0 min CN=71/0 Runoff=0.06 cfs 0.003 af

Link 11L: Pre-Dev POI#1

Inflow=4.39 cfs 0.238 af Primary=4.39 cfs 0.238 af

Total Runoff Area = 0.504 ac Runoff Volume = 0.238 af Average Runoff Depth = 5.67" 2.14% Pervious = 0.011 ac 97.86% Impervious = 0.493 ac

221129_22001641A-Pre-Post - Raingarden2-with inf-LargerType II 24-hr	50 Rair	nfall=6.87"
Prepared by Maser Consulting PA	Printed	12/2/2022
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Subcatchment10S: Pre-Dev Impervious Runoff Area=21,475 sf 100.00% Impervious Runoff Depth=6.63" Tc=5.0 min CN=0/98 Runoff=4.99 cfs 0.272 af

Subcatchment13S: Pre-Dev Green Area

Runoff Area=470 sf 0.00% Impervious Runoff Depth=3.61" Tc=5.0 min CN=71/0 Runoff=0.07 cfs 0.003 af

Link 11L: Pre-Dev POI#1

Inflow=5.06 cfs 0.276 af Primary=5.06 cfs 0.276 af

Total Runoff Area = 0.504 ac Runoff Volume = 0.276 af Average Runoff Depth = 6.57" 2.14% Pervious = 0.011 ac 97.86% Impervious = 0.493 ac

221129_22001641A-Pre-Post - Raingarden2-with inf-LargeType II 24-hr	100 Raiı	nfall=7.86"
Prepared by Maser Consulting PA	Printed	12/2/2022
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Subcatchment10S: Pre-Dev Impervious Runoff Area=21,475 sf 100.00% Impervious Runoff Depth=7.62" Tc=5.0 min CN=0/98 Runoff=5.71 cfs 0.313 af

Subcatchment13S: Pre-Dev Green Area

Runoff Area=470 sf 0.00% Impervious Runoff Depth=4.46" Tc=5.0 min CN=71/0 Runoff=0.09 cfs 0.004 af

Link 11L: Pre-Dev POI#1

Inflow=5.80 cfs 0.317 af Primary=5.80 cfs 0.317 af

Total Runoff Area = 0.504 ac Runoff Volume = 0.317 af Average Runoff Depth = 7.55" 2.14% Pervious = 0.011 ac 97.86% Impervious = 0.493 ac



Summary for Subcatchment 10S: Pre-Dev Impervious

Runoff = 1.96 cfs @ 11.96 hrs, Volume= 0.103 af, Depth= 2.51"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 1 Rainfall=2.74"



Summary for Subcatchment 13S: Pre-Dev Green Area

Runoff = 0.01 cfs @ 11.97 hrs, Volume= 0.001 af, Depth= 0.62"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 1 Rainfall=2.74"

470 71 Meadow 470 71 100.00% Pervious Area Tc Length (feet) Slope (ft/ft) Velocity (ft/sec) Capacity (cfs) Description 5.0 Direct Entry, Direct Entry Subcatchment 13S: Pre-Dev Green Area Hydrograph Outline of the second se		Ar	rea (sf)	CN	Descriptio	n	
470 71 100.00% Pervious Area Tc Length (feet) Slope (tf/ft) Velocity (ff/sec) Capacity (cfs) Description 5.0 Direct Entry, Direct Entry Subcatchment 13S: Pre-Dev Green Area Hydrograph Out of the second sec			470	71	Meadow		
Tc Length (feet) Slope (ft/ft) Velocity (ft/sec) Description (cfs) 5.0 Direct Entry, Direct Entry Subcatchment 13S: Pre-Dev Green Area Hydrograph 0.013 0.01 cfs Type II 24-hr 0.011 0.01 cfs Type II 24-hr 0.011 0.01 cfs Type II 24-hr 0.012 0.01 cfs Type II 24-hr 0.013 0.01 cfs Type II 24-hr 0.014 0.01 cfs Type II 24-hr 0.015 Type II 24-hr Trype II 24-hr 0.001 Freedom Colspan= Colspa= Colspan= Colspa= Colspan= Colspan= Colsp			470	71	100.00%	Pervious Are	ea
5.0 Direct Entry, Direct Entry Subcatchment 13S: Pre-Dev Green Area Hydrograph	(r	Tc nin)	Length (feet)	Slop (ft/t	be Velocity ft) (ft/sec	/ Capacity) (cfs)	Description
Subcatchment 13S: Pre-Dev Green Area Hydrograph 0.013 0.012 0.011 0.009 0.009 0.009 0.007 0		5.0				· · · ·	Direct Entry, Direct Entry
Mydrograph 0.013 0.01 cfs 0.011 0.01 cfs 0.011 Type II 24-hr 0.011 1 Rainfall=2.74" 0.009 Runoff Area=470 sf 0.007 Runoff Depth=0.62" 0.006 Tc=5.0 min 0.005 CN=71/0 0.004 CN=71/0					Subc	atchment	13S: Pre-Dev Green Area
0.013 0.012 0.01 cfs 0.011 0.01 cfs 0.011 0.01 0.011 0.01 0.011 0.01 0.011 0.01 0.011 0.01 0.011 0.01 0.011 0.01 0.011 0.01 0.009 0.009 0.009 0.008 0.009 0.008 0.007 0.006 0.007 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.006 0.003 0.003 0.003 0.003						Hydro	ograph
0.011 0.01 Type II 24-hr 0.01 1 Rainfall=2.74" 0.009 0.009 0.008 Runoff Area=470 sf 0.007 Runoff Volume=0.001 af 0.006 Runoff Depth=0.62" 0.006 Tc=5.0 min 0.005 0.004 0.003 0.003 0.003 0.003		0.013 0.013 0.012			+ - + - + - + - + - + - + - + - + - + -		
0.01 0.01 0.009 0.009 0.009 0.009 0.008 0.008 0.007 0.007 0.007 0.007 0.007 0.007 0.006 0.006 0.006 0.006 0.005 0.005 0.005 0.005 0.005 0.004 0.004 0.004 0.003 0.003 0.003 0.003 0.004 0.004 0.004 0.004 0.003 0.003 0.003 0.004 0.004 0.004 0.004 0.004 0.004 0.003 0.00		0.011 0.011		· -¦¦			Type H-24-hr -
0.009 0.009 Runoff Area=470 sf 0.008 0.008 Runoff Volume=0.001 af 0.007 0.006 Runoff Depth=0.62" 0.006 0.005 Tc=5.0 min 0.005 0.004 CN=71/0 0.004 0.004 CN=71/0 0.003 0.002 0.002		0.01					
0.009 0.008 Runoff Area=470 sf 0.008 0.007 0.007 0.007 0.006 Runoff Depth=0.62" 0.006 0.005 0.005 0.004 CN=71/0 0.003 0.003 0.002 0.002		0.009)				
0.008 0.008 Runoff Volume=0.001 af 0.007 0.007 Runoff Depth=0.62" 0.006 0.006 Tc=5.0 min 0.005 0.005 CN=71/0 0.004 0.004 CN=71/0 0.004 0.003 0.002		0.009			$-\frac{1}{1}-\frac{1}{1}-\frac{1}{1}-\frac{1}{1}-\frac{1}{1}-$	$\frac{l}{l} = \frac{l}{l} = \frac{l}{l} = \frac{l}{l} = \frac{l}{l} = \frac{l}{l} = \frac{l}{l} = \frac{l}{l}$	
(€ 0.007 0.007 0.006 0.006 0.006 0.005 0.005 0.005 0.005 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.003 0.003 0.002		0.008	} ⊢ - - }		- + - + - + - +		
B 0.007 0.006 0.006 0.005 0.005 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.004 0.005 0.004 0.004 0.005 0.004 0.005 0.004	(s	0.007			- + - + - + - + -		
0.006 0.005 0.005 0.004 0.004 0.004 0.004 0.003 0.003 0.003 0.003 0.002	5	0.007		-ii		;-;-;-;-;-;-;-;-;-;-;-;-;-;-;-;-;-;-;-	Runoff Depth=0.62"
" 0.005	<u>0</u>	0.006			$-\frac{1}{1}-\frac{1}{1}-\frac{1}{1}-\frac{1}{1}-\frac{1}{1}-$		
$\begin{array}{c} 0.005 \\ 0.004 \\ 0.004 \\ 0.003 \\ 0.003 \\ 0.003 \\ 0.002 \\ 0.002 \\ 0.002 \\ 0.002 \\ 0.002 \\ 0.002 \\ 0.002 \\ 0.003 \\ 0.002 \\$		0.005		· _	$\begin{array}{c} - \bot - \bot - \bot - \bot - \bot - \\ 1 & 1 & 1 & 1 \end{array}$		
		0.005					CN=71/0
		0.004			- + - + - + - + -		
		0.003		· -¦¦	$-\frac{1}{1}-\frac{1}{1}-\frac{1}{1}-\frac{1}{1}-\frac{1}{1}-\frac{1}{1}$		
		0.003			- + - + - + - + -		+ - + - + - + - + - + - +
		0.002		-	- + - + - + - + -		
		0.001					
		0.001			+ + - + - + - + -		+ - + - + - + - +
		0.000		-i-i-			

Summary for Link 11L: Pre-Dev POI#1

Inflow Ar	ea =	0.504 ac, 97.86% Impervious, Inflov	w Depth = 2.47"	for 1 event
Inflow	=	1.97 cfs @ 11.96 hrs, Volume=	0.104 af	
Primary	=	1.97 cfs @ 11.96 hrs, Volume=	0.104 af, Atte	en= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 11L: Pre-Dev POI#1



Summary for Subcatchment 10S: Pre-Dev Impervious

Runoff = 2.38 cfs @ 11.96 hrs, Volume= 0.126 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 2 Rainfall=3.30"



Summary for Subcatchment 13S: Pre-Dev Green Area

Runoff = 0.02 cfs @ 11.97 hrs, Volume= 0.001 af, Depth= 0.94"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 2 Rainfall=3.30"


Summary for Link 11L: Pre-Dev POI#1

Inflow /	Area =	0.504 ac,	97.86% Impervious,	Inflow Depth = 3.	02" for 2 event
Inflow	=	2.39 cfs @	2 11.96 hrs, Volume	e 0.127 af	
Primar	y =	2.39 cfs @) 11.96 hrs, Volume	e 0.127 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 11L: Pre-Dev POI#1



Summary for Subcatchment 10S: Pre-Dev Impervious

Runoff = 3.01 cfs @ 11.96 hrs, Volume= 0.162 af, Depth= 3.93"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 5 Rainfall=4.17"



Summary for Subcatchment 13S: Pre-Dev Green Area

Runoff = 0.03 cfs @ 11.97 hrs, Volume= 0.001 af, Depth= 1.51"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 5 Rainfall=4.17"

	Ar	ea (sf)	CN	Description		
*		470	71	Meadow		
		470	71	100.00% P	ervious Are	a
(n	Tc nin)	Length (feet)	Slope (ft/ft	e Velocity) (ft/sec)	Capacity (cfs)	Description
	5.0		-			Direct Entry, Direct Entry
				Subca	tchment	13S: Pre-Dev Green Area
					Hydro	ograph
	0.032			∑fs		
	0.03					Type II 24-hr
	0.026					5 Rainfall=4.17"
	0.024			$-\frac{1}{1} - \frac{1}{1} - \frac{1}{1} - \frac{1}{1} - \frac{1}{1} - \frac{1}{1} - \frac{1}{1}$		Pupoff Area=170 sf
	0.022			· + - + - + - + - + ·		
(st	0.02			$\frac{1}{1} = \frac{1}{1} = \frac{1}{1} = \frac{1}{1} = \frac{1}{1} = \frac{1}{1}$		
) 20	0.018					Runoff Depth=1.51"
Ę	0.014			$\cdot \frac{1}{1} - \frac{1}{1}$		Tc=5.0 min
	0.012					CN=71/0
	0.01					
	0.008					
	0.006					
	0.004				 -	
	0				· · · · · ·	
		0 2 4 6	8 10 12	14 16 18 20 22	24 26 28 30 32 T	2 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 Time (hours)

Summary for Link 11L: Pre-Dev POI#1

Inflow A	Area =	0.504 ac, 97.86% Impervious, Inflo	ow Depth = 3.88"	for 5 event
Inflow	=	3.04 cfs @ 11.96 hrs, Volume=	0.163 af	
Primary	y =	3.04 cfs @ 11.96 hrs, Volume=	0.163 af, Atte	en= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 11L: Pre-Dev POI#1



Summary for Subcatchment 10S: Pre-Dev Impervious

Runoff = 3.55 cfs @ 11.96 hrs, Volume= 0.192 af, Depth= 4.66"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 10 Rainfall=4.90"



Summary for Subcatchment 13S: Pre-Dev Green Area

Runoff = 0.04 cfs @ 11.96 hrs, Volume= 0.002 af, Depth= 2.04"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 10 Rainfall=4.90"



Summary for Link 11L: Pre-Dev POI#1

Inflow /	Area =	0.504 ac, 9	7.86% Impervious,	Inflow Depth = 4.6	61" for 10 event
Inflow	=	3.59 cfs @	11.96 hrs, Volume	= 0.193 af	
Primar	y =	3.59 cfs @	11.96 hrs, Volume	= 0.193 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 11L: Pre-Dev POI#1



Summary for Subcatchment 10S: Pre-Dev Impervious

Runoff = 4.33 cfs @ 11.96 hrs, Volume= 0.235 af, Depth= 5.73"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 25 Rainfall=5.97"



Summary for Subcatchment 13S: Pre-Dev Green Area

Runoff = 0.06 cfs @ 11.96 hrs, Volume= 0.003 af, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 25 Rainfall=5.97"



Summary for Link 11L: Pre-Dev POI#1

Inflow /	Area =	0.504 ac, 9	97.86% Impervious,	Inflow Depth = 5.6	67" for 25 event
Inflow	=	4.39 cfs @	11.96 hrs, Volume	= 0.238 af	
Primar	y =	4.39 cfs @	11.96 hrs, Volume	= 0.238 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 11L: Pre-Dev POI#1



Summary for Subcatchment 10S: Pre-Dev Impervious

Runoff = 4.99 cfs @ 11.96 hrs, Volume= 0.272 af, Depth= 6.63"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 50 Rainfall=6.87"



Summary for Subcatchment 13S: Pre-Dev Green Area

Runoff = 0.07 cfs @ 11.96 hrs, Volume= 0.003 af, Depth= 3.61"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 50 Rainfall=6.87"

AI	rea (st)	<u>CN</u> L	Description			
	470	71 N	leadow			
	470	71 1	00.00% P	ervious Are	a	
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description	
5.0					Direct Entry, Direct Entry	
			Subca	tchment	13S: Pre-Dev Green Area	
				Hydro	ograph	
0.08 0.075			+ = + = + = + = + = + = + - + = + = + = + = +			- Runoff
0.07						
0.065						
0.06					50 Rainfall=6.87"	
0.055	j		$\frac{1}{1} - \frac{1}{1} - \frac{1}{1} - \frac{1}{1} - \frac{1}{1} - \frac{1}{1} - \frac{1}{1} - \frac{1}{1}$		Runoff Area=470 sf	
0.05					Runoff Volume=0.003 af	
5 0.045		-,, _	1 - T - T - T - F - F - F - F - F - F - F	- - - -	Runoff Depth=3.61"	
0.035		 -		 - - - -		
0.03		 -			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
0.025		-ii				
0.02		 -!!				
0.015	5-	-i	, , , , , , , , , , , , , , , , , , , ,			
0.01		_!!				
0.005			 			
0.500 r						
C C	0 2 4 6	8 10 12 1	4 16 18 20 22	24 26 28 30 32	2 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72	2

Summary for Link 11L: Pre-Dev POI#1

Inflow A	Area =	0.504 ac, 9	7.86% Impervious,	Inflow Depth = 6.	57" for 50 event
Inflow	=	5.06 cfs @	11.96 hrs, Volume	= 0.276 af	
Primary	y =	5.06 cfs @	11.96 hrs, Volume	= 0.276 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 11L: Pre-Dev POI#1



Summary for Subcatchment 10S: Pre-Dev Impervious

Runoff = 5.71 cfs @ 11.96 hrs, Volume= 0.313 af, Depth= 7.62"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 100 Rainfall=7.86"



Time (hours)

Summary for Subcatchment 13S: Pre-Dev Green Area

Runoff = 0.09 cfs @ 11.96 hrs, Volume= 0.004 af, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 100 Rainfall=7.86"

A	rea (sf)	CN I	Description		
	470	71 I	Neadow		
	470	71 <i>*</i>	100.00% P	ervious Are	ea
Tc (min)	Length	Slope	Velocity	Capacity	Description
5.0	(1001)	(1010)	(1000)	(010)	Direct Entry, Direct Entry
			Subaa	tohmont	12St Bro Doy Croop Aroo
			Subca	lchment	135: Pre-Dev Green Area
	4		· · · · ·		yiani
0.09	5	0.09 cf	s i i i i		
0.0	9				
0.08	5				Type II 24-hr
0.0	8				
0.07	7				
0.06	5				Runoff Area=470 sf
0.0	6				Pupoff Volumo-0.004 of
£ 0.05	5				
≥ 0.0 ≥ 0.0	5				
ନ୍ଥି 0.04	5				Tc=5.0 min
0.0	4			- i i i i	
0.03	5		+ - + - + - + - + I I I I I I		- + - + - + - + - + - + - + - + - + - +
0.0	3		+-+-+-+-+		
0.02			+ - + - + - + - +		
0.0					
0.01					
0.00	5				

Summary for Link 11L: Pre-Dev POI#1

Inflow A	Area =	0.504 ac, 9	7.86% Impervious,	Inflow Depth = 7.8	55" for 100 event
Inflow	=	5.80 cfs @	11.96 hrs, Volume	= 0.317 af	
Primary	y =	5.80 cfs @	11.96 hrs, Volume	= 0.317 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 11L: Pre-Dev POI#1



Project Name: Proposed Building Renovation

 Project #:
 22001641A

 Prepared by:
 EHD

 Date:
 7/8/2022

 Revised:
 11/29/2022

PRE-DEVELOPMENT DRAINAGE AREA CALCULATIONSDrainage AreaSFAcrePre-Dev Impervious DA21,4750.49Pre-Dev Green DA4700.01Total Pre-Dev DA21,9450.50

POST-DEVELOPMENT DRAINAGE AREA CALCULATIONS				
Drainage Area	SF	Acre		
Post-Dev Impervious DA #1 to RG	7,154	0.16		
Post-Dev Green DA #1 to RG	1,135	0.03		
Post-Dev Grass Pavers DA #1 to RG	153	0.00		
Post-Dev Impervious DA (Bypass)	12,158	0.28		
Post-Dev Green Area (Bypass)	595	0.01		
Post-Dev Green Roof Area (Bypass)	750	0.02		
Total Post-Dev DA (On-Site)	21,945	0.50		

Hydraulic Soil Group:	C		
Curve Numbers	<u>Curve Numbers (CN)</u>		
Impervious =	98		
Green Roof=	86		
Green(Lawn) =	77		
Meadow =	71		
Grass Pavers=	70		

221129_22001641A-Pre-Post - Raingarden2-with inf-Larger Rype II 24-hr 1	1 Rair	nfall=2.74'
Prepared by Maser Consulting PA Pri	inted	12/2/2022
HydroCAD® 10.00-25 s/n 11761 © 2019 HydroCAD Software Solutions LLC		Page 1
		-

Subcatchment6S: Post D)ev #1 -	Runoff Are	ea=7,154 sf Tc=5.	100.0 .0 min	0% Imperv CN=0/98	/ious Runo	Runoff De off=0.65 cfs	pth=2.51" 5 0.034 af
Subcatchment12S: Post	Dev #1 - Green Ar	ea Runoff /	Area=1,288 Tc=5.	sf 0.0 .0 min	0% Imperv CN=76/0	/ious Runo	Runoff De ff=0.05 cfs	pth=0.84" 5_0.002 af
Subcatchment14S: Post	Dev Bypass #2 -	Runoff /	Area=1,345 Tc=5.	sf 0.0 .0 min	0% Imperv CN=82/0	/ious Runo	Runoff De off=0.07 cfs	pth=1.18" 6 0.003 af
Subcatchment15S: Post	Dev Bypass#1 - F	Runoff Area	a=12,158 sf Tc=5.	100.0 .0 min	0% Imperv CN=0/98	/ious Runo	Runoff De off=1.11 cfs	pth=2.51" 6 0.058 af
Pond 8P: Raingarden#1	Discarded=0.03 cfs	Peak E 0.034 af	Elev=280.81 Primary=0.	l' Stora 06 cfs	age=720 cf 0.002 af	inflo [®] Outflo	w=0.70 cfs w=0.10 cfs	0.036 af 0.036 af
Link 7L: Post-Dev POI#1						Inflo Prima	w=1.18 cfs ry=1.18 cfs	s 0.064 af s 0.064 af

Total Runoff Area = 0.504 ac Runoff Volume = 0.098 af Average Runoff Depth = 2.33" 12.00% Pervious = 0.060 ac 88.00% Impervious = 0.443 ac

221129_22001641A-Pre-Post - Raingarden2-with inf-Larger Ry	pe II 24-hr 2 Raii	nfall=3.30"
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Subcatchment6S: Post D	Dev #1 -	Runoff Ar	ea=7,154	sf 100	0.00% Im	pervious	Runoff De	pth=3.07"
			IC	=5.0 mi	n CN=0	/98 Rur	off=0.79 cfs	6 0.042 af
Subcatchment12S: Post	Dev #1 - Green A	r ea Runoff	Area=1,2	88 sf (0.00% Im	pervious	Runoff De	pth=1.22"
			To	=5.0 mi	n CN=7	'6/0 Rur	off=0.07 cfs	0.003 af
Subcatchment14S: Post	Dev Bypass #2 -	Runoff	Area=1,3	45 sf (0.00% Im	pervious	Runoff De	pth=1.62"
			To	=5.0 mi	n CN=8	2/0 Rur	off=0.09 cfs	6 0.004 af
Subcatchment15S: Post	Dev Bypass #1 -	Runoff Are	a=12,158	sf 100	0.00% Im	pervious	Runoff De	pth=3.07"
			To	=5.0 mi	n CN=0	/98 Rur	off=1.34 cfs	0.071 af
Pond 8P: Raingarden#1		Peak	Elev=281	.25' Sto	orage=80)3 cf Infl	ow=0.86 cfs	0.045 af
-	Discarded=0.03 cfs	0.037 af	Primary	=0.35 cf	fs 0.008	af Outfl	ow=0.38 cfs	0.045 af
Link 7L: Post-Dev POI#1						Inf	low=1.46 cfs	s 0.083 af
						Prim	ary=1.46 cfs	s 0.083 af

Total Runoff Area = 0.504 ac Runoff Volume = 0.120 af Average Runoff Depth = 2.87" 12.00% Pervious = 0.060 ac 88.00% Impervious = 0.443 ac

221129_22001641A-Pre-Post - Raingarden2-with inf-Larger	R ype II 24-hr 5 Rair	nfall=4.17"
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Subcatchment6S: Post D)ev #1 -	Runoff Are	ea=7,154 sf Tc=5	100.0 .0 min	0% Imperv CN=0/98	vious Runo	Runoff Dep ff=1.00 cfs	oth=3.93" 0.054 af
Subcatchment12S: Post	Dev #1 - Green Ar	ea Runoff /	Area=1,288 Tc=5	sf 0.0 .0 min	0% Imperv CN=76/0	vious Runo	Runoff Dep ff=0.10 cfs	oth=1.87" 0.005 af
Subcatchment14S: Post	Dev Bypass #2 -	Runoff	Area=1,345 Tc=5	sf 0.0 .0 min	0% Imperv CN=82/0	vious Runo	Runoff Dep ff=0.13 cfs	oth=2.35" 0.006 af
Subcatchment15S: Post	Dev Bypass#1 - F	Runoff Area	a=12,158 sf Tc=5	100.0 .0 min	0% Imperv CN=0/98	vious Runo	Runoff Dep ff=1.71 cfs	oth=3.93" 0.092 af
Pond 8P: Raingarden#1	Discarded=0.04 cfs	Peak B 0.041 af	Elev=281.63 Primary=0.	3' Stora 69 cfs	age=919 cf 0.017 af	Inflo Outflov	w=1.11 cfs w=0.72 cfs	0.058 af 0.058 af
Link 7L: Post-Dev POI#1						Inflo Prima	w=2.37 cfs ry=2.37 cfs	0.115 af 0.115 af

Total Runoff Area = 0.504 ac Runoff Volume = 0.156 af Average Runoff Depth = 3.72" 12.00% Pervious = 0.060 ac 88.00% Impervious = 0.443 ac

221129_22001641A-Pre-Post - Raingarden2-with inf-LargerType II 24-hr	[.] 10 Raiı	nfall=4.90"
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Subcatchment6S: Post D)ev #1 -	Runoff Are	ea=7,154 sf Tc=5	100.0 0 min	0% Imper\ 0% CN=0/98	/ious Runo	Runoff De ff=1.18 cfs	pth=4.66" 0.064 af
Subcatchment12S: Post	Dev #1 - Green Ar	ea Runoff	Area=1,288 Tc=5	sf 0.0 .0 min	0% Imper\ CN=76/0	/ious Runo	Runoff De ff=0.13 cfs	pth=2.45" 0.006 af
Subcatchment14S: Post	Dev Bypass#2 -	Runoff	Area=1,345 Tc=5	sf 0.0 .0 min	0% Imper\ CN=82/0	/ious Runo	Runoff De ff=0.17 cfs	pth=2.99" 0.008 af
Subcatchment15S: Post	Dev Bypass#1 - F	Runoff Area	a=12,158 sf Tc=5	100.0 .0 min	0% Imper\ CN=0/98	/ious Runo	Runoff De ff=2.01 cfs	pth=4.66" 0.108 af
Pond 8P: Raingarden#1	Discarded=0.04 cfs	Peak El 0.045 af	ev=281.87' Primary=0	Storag .84 cfs	e=1,019 cf 0.025 af	Inflov Outflov	w=1.32 cfs v=0.88 cfs	0.070 af 0.070 af
Link 7L: Post-Dev POI#1						Inflo Primai	w=2.93 cfs ry=2.93 cfs	6 0.141 af 6 0.141 af

Total Runoff Area = 0.504 ac Runoff Volume = 0.186 af Average Runoff Depth = 4.43" 12.00% Pervious = 0.060 ac 88.00% Impervious = 0.443 ac

221129_22001641A-Pre-Post - Raingarden2-with inf-LargerType II 24-hr	25 Rair	nfall=5.97"
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Subcatchment6S: Post D)ev #1 -	Runoff Ar	ea=7,154 st Tc=5	f 100.0 5.0 min	0% Imperv CN=0/98	vious I Runof	Runoff Dep ff=1.44 cfs	oth=5.73" 0.078 af
Subcatchment12S: Post	Dev #1 - Green Ai	r ea Runoff	Area=1,288 Tc=5	3 sf 0.0 5.0 min	0% Imperv CN=76/0	vious I Runof	Runoff Dep ff=0.18 cfs	oth=3.35" 0.008 af
Subcatchment14S: Post	Dev Bypass #2 -	Runoff	Area=1,345 Tc=5	5 sf 0.0 5.0 min	0% Imperv CN=82/0	vious I Runof	Runoff Der ff=0.22 cfs	oth=3.96" 0.010 af
Subcatchment15S: Post	Dev Bypass#1 - ∣	Runoff Are	a=12,158 st Tc=5	f 100.0 5.0 min	0% Imperv CN=0/98	vious I Runof	Runoff Der ff=2.45 cfs	oth=5.73" 0.133 af
Pond 8P: Raingarden#1	Discarded=0.04 cfs	Peak El s 0.049 af	ev=282.17' Primary=1	Storag .00 cfs	e=1,169 cf 0.038 af	Inflov Outflow	v=1.62 cfs v=1.03 cfs	0.087 af 0.087 af
Link 7L: Post-Dev POI#1						Inflov Primar	w=3.58 cfs y=3.58 cfs	0.182 af 0.182 af

Total Runoff Area = 0.504 ac Runoff Volume = 0.230 af Average Runoff Depth = 5.48" 12.00% Pervious = 0.060 ac 88.00% Impervious = 0.443 ac

221129_22001641A-Pre-Post - Raingarden2-with inf-LargerType // 24-hr	50 Raiı	nfall=6.87"
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Subcatchment6S: Post D)ev #1 -	Runoff Are	ea=7,154 sf Tc=5.	100.0 0 min	0% Imperv CN=0/98	vious Runo	Runoff De ff=1.66 cfs	oth=6.63" 0.091 af
Subcatchment12S: Post	Dev #1 - Green Ar	ea Runoff /	Area=1,288 Tc=5.	sf 0.0 0 min	0% Imperv CN=76/0	rious Runo	Runoff De ff=0.22 cfs	oth=4.14" 0.010 af
Subcatchment14S: Post	Dev Bypass#2 -	Runoff /	Area=1,345 Tc=5.	sf 0.0 0 min	0% Imperv CN=82/0	rious Runo	Runoff De ff=0.26 cfs	oth=4.79" 0.012 af
Subcatchment15S: Post	Dev Bypass#1 - F	Runoff Area	a=12,158 sf Tc=5.	100.0 0 min	0% Imperv CN=0/98	rious Runo	Runoff De ff=2.82 cfs	oth=6.63" 0.154 af
Pond 8P: Raingarden#1	Discarded=0.04 cfs	Peak Ele 0.052 af	ev=282.30' Primary=1.	Storag 54 cfs	e=1,245 cf 0.049 af (Inflov Outflov	w=1.88 cfs w=1.58 cfs	0.101 af 0.101 af
Link 7L: Post-Dev POI#1						Inflo [.] Primai	w=4.25 cfs ry=4.25 cfs	0.216 af 0.216 af

Total Runoff Area = 0.504 ac Runoff Volume = 0.268 af Average Runoff Depth = 6.37" 12.00% Pervious = 0.060 ac 88.00% Impervious = 0.443 ac

221129_22001641A-Pre-Post - Raingarden2-with inf-LargeType II 24-hr	100 Raiı	nfall=7.86"
Prepared by Maser Consulting PA	Printed	12/2/2022
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Subcatchment6S: Post D)ev #1 -	Runoff Are	ea=7,154 sf Tc=5	f 100.0 5.0 min	0% Imper CN=0/98	/ious Runo	Runoff De ff=1.90 cf	epth=7.62" s_0.104 af
Subcatchment12S: Post	Dev #1 - Green Ard	ea Runoff .	Area=1,288 Tc=5	8 sf 0.0 5.0 min	0% Imper\ CN=76/0	/ious Runo	Runoff De ff=0.27 cf	epth=5.03" s_0.012 af
Subcatchment14S: Post	Dev Bypass#2 -	Runoff .	Area=1,345 Tc=5	5 sf 0.0 5.0 min	0% Imper\ CN=82/0	/ious Runo	Runoff De ff=0.31 cf	epth=5.73" s_0.015 af
Subcatchment15S: Post	Dev Bypass#1 - F	Runoff Area	a=12,158 sf Tc=5	f 100.0 5.0 min	0% Imper CN=0/98	/ious Runo	Runoff De ff=3.23 cf	epth=7.62" s_0.177 af
Pond 8P: Raingarden#1	Discarded=0.04 cfs	Peak Ele 0.055 af	ev=282.33' Primary=2	Storag .03 cfs	e=1,265 cf 0.062 af	i Inflov Outflov	w=2.17 cfs w=2.08 cfs	s 0.117 af s 0.117 af
Link 7L: Post-Dev POI#1						Inflo Prima	w=5.49 cf ry=5.49 cf	s 0.254 af s 0.254 af

Total Runoff Area = 0.504 ac Runoff Volume = 0.309 af Average Runoff Depth = 7.35" 12.00% Pervious = 0.060 ac 88.00% Impervious = 0.443 ac



Summary for Subcatchment 6S: Post Dev #1 - Impervious Area

Runoff = 0.65 cfs @ 11.96 hrs, Volume= 0.034 af, Depth= 2.51"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 1 Rainfall=2.74"

	A	rea (sf)	CN	Description		
*		7,154	98	Impervious		
		7,154	98	100.00% Im	npervious A	Area
	Tc (min)	Length	Slop	e Velocity	Capacity	Description
	<u>(11111)</u> 5.0	(ieel)	וויוו	(1/3ec)	(013)	Direct Entry,

Subcatchment 6S: Post Dev #1 - Impervious Area



Summary for Subcatchment 12S: Post Dev #1 - Green Area

Runoff = 0.05 cfs @ 11.97 hrs, Volume= 0.002 af, Depth= 0.84"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 1 Rainfall=2.74"

	Area (sf)	CN	Description		
*	1,135	77	Ground Lar	ldscape	
*	153	70	Grass Pave	ers	
	1,288	76	Weighted A	verage	
	1,288	76	100.00% Pe	ervious Are	ea
T (min	c Length	Slop	e Velocity	Capacity	Description
		(101	(1/360)	(013)	
5.	U				Direct Entry,

Subcatchment 12S: Post Dev #1 - Green Area



Summary for Subcatchment 14S: Post Dev Bypass #2 - Green Area

Runoff = 0.07 cfs @ 11.96 hrs, Volume= 0.003 af, Depth= 1.18"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 1 Rainfall=2.74"

	Area (sf)	CN	Description		
*	595	77	Ground Lar	ndscape	
*	750	86	Green Roof	-	
	1,345	82	Weighted A	verage	
	1,345	82	100.00% Pe	ervious Are	ea
То	: Length	Slop	e Velocity	Capacity	Description
(min) (feet)	(ft/f	t) (ft/sec)	(cfs)	
5.0)				Direct Entry,

Subcatchment 14S: Post Dev Bypass #2 - Green Area



Summary for Subcatchment 15S: Post Dev Bypass #1 - Impervious Area

Runoff = 1.11 cfs @ 11.96 hrs, Volume= 0.058 af, Depth= 2.51"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 1 Rainfall=2.74"



Summary for Pond 8P: Raingarden #1

Inflow Area	ı =	0.194 ac, 8	4.74% Imp	ervious, Inflow	Depth = 2.2	6" for 1 even	ent
Inflow	=	0.70 cfs @	11.96 hrs,	Volume=	0.036 af		
Outflow	=	0.10 cfs @	12.16 hrs,	Volume=	0.036 af,	Atten= 86%,	Lag= 12.4 min
Discarded	=	0.03 cfs @	12.16 hrs,	Volume=	0.034 af		
Primary	=	0.06 cfs @	12.16 hrs,	Volume=	0.002 af		

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2 Peak Elev= 280.81' @ 12.16 hrs Surf.Area= 1,510 sf Storage= 720 cf

Plug-Flow detention time= 259.1 min calculated for 0.036 af (100% of inflow) Center-of-Mass det. time= 259.1 min (1,020.2 - 761.1)

Volume	Invert	Avail.Storage	Storage Description
#1	277.00'	412 cf	Stone Storage (Conic)Listed below (Recalc)
			1,032 cf Overall - 3 cf Embedded = 1,029 cf x 40.0% Voids
#2	277.00'	3 cf	4.0" Round Pipe Storage Inside #1
			L= 33.0'
#3	278.51'	274 cf	Soil Storage (Conic)Listed below (Recalc)
			1,369 cf Overall x 20.0% Voids
#4	280.50'	687 cf	Surface Storage (Conic)Listed below (Recalc)
		1,375 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft <u>)</u>
277.00	688	0	0	688
278.50	688	1,032	1,032	827
Elevation	Surf.Area	Inc.Store	Cum.Store	Wet.Area
(feet)	(sq-ft)	(cubic-feet)	(cubic-feet)	(sq-ft)
278.51	688	0	0	688
280.50	688	1,369	1,369	873
Elevation	Surf.Area	Inc.Store	Cum.Store	Wet.Area
(feet)	(sq-ft)	(cubic-feet)	(cubic-feet)	(sq-ft)
280.50	73	0	0	73
281.00	181	61	61	183
282.00	503	329	390	511
282.50	688	297	687	701

Device	Routing	Invert	Outlet Devices
#1	Primary	276.74'	12.0" Round Culvert
	-		L= 77.0' CPP, end-section conforming to fill, Ke= 0.500
			Inlet / Outlet Invert= 276.74' / 275.20' S= 0.0200 '/' Cc= 0.900
			n= 0.012 Steel, smooth, Flow Area= 0.79 sf
#2	Device 1	280.60'	2.5" W x 11.5" H Vert. Surface Orifice C= 0.600
#3	Device 1	282.25'	27.0" x 48.0" Horiz. Grate C= 0.600
			Limited to weir flow at low heads
#4	Discarded	277.00'	0.750 in/hr Exfiltration over Wetted area

Discarded OutFlow Max=0.03 cfs @ 12.16 hrs HW=280.81' (Free Discharge) **4=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.06 cfs @ 12.16 hrs HW=280.81' (Free Discharge) 1=Culvert (Passes 0.06 cfs of 7.14 cfs potential flow) 2=Surface Orifice (Orifice Controls 0.06 cfs @ 1.46 fps)

-3=Grate (Controls 0.00 cfs)





Summary for Link 7L: Post-Dev POI#1

Inflow A	rea =	0.504 ac, 8	88.00% Impervious,	Inflow Depth = 1.5	52" for 1 event
Inflow	=	1.18 cfs @	11.96 hrs, Volume	= 0.064 af	
Primary	=	1.18 cfs @	11.96 hrs, Volume	= 0.064 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 7L: Post-Dev POI#1



Summary for Subcatchment 6S: Post Dev #1 - Impervious Area

Runoff = 0.79 cfs @ 11.96 hrs, Volume= 0.042 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 2 Rainfall=3.30"

	A	rea (sf)	CN	Description		
*		7,154	98	Impervious		
		7,154	98	100.00% In	npervious A	Area
	Tc (min)	Length (feet)	Slop (ft/ft	e Velocity (ft/sec)	Capacity (cfs)	Description
	5.0			, , , , ,		Direct Entry,

Subcatchment 6S: Post Dev #1 - Impervious Area



Summary for Subcatchment 12S: Post Dev #1 - Green Area

Runoff = 0.07 cfs @ 11.97 hrs, Volume= 0.003 af, Depth= 1.22"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 2 Rainfall=3.30"

	Area (sf)	CN	Description		
*	1,135	77	Ground Lar	ndscape	
*	153	70	Grass Pave	ers	
	1,288	76	Weighted A	verage	
	1,288	76	100.00% Pe	ervious Are	ea
To (min)	Length	Slop	e Velocity	Capacity	Description
		ועו	(10300)	(013)	
5.0)				Direct Entry,

Subcatchment 12S: Post Dev #1 - Green Area



Summary for Subcatchment 14S: Post Dev Bypass #2 - Green Area

Runoff = 0.09 cfs @ 11.96 hrs, Volume= 0.004 af, Depth= 1.62"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 2 Rainfall=3.30"

	Area (sf)	CN	Description		
*	595	77	Ground Lan	ndscape	
*	750	86	Green Roof		
	1,345	82	Weighted A	verage	
	1,345	82	100.00% Pe	ervious Are	ea
(r	Tc Length nin) (feet)	Slop (ft/f	e Velocity t) (ft/sec)	Capacity (cfs)	Description
	5.0				Direct Entry,
	-	Su	bcatchme	nt 14S: P _{Hydro}	Post Dev Bypass #2 - Green Area
	0.1		·	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	
	0.095				
	0.09				Type II 24-hr
	0.08				2 Rainfall=3.30"
				$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Runoff Area=1,345 sf
fs)	0.065			+ - + - + - - + - + - + - + - - 	Runoff Volume=0.004 af
j S	0.055			T - T - T - I - I	. – – – – – – – – – – – – – – – – – – –



Summary for Subcatchment 15S: Post Dev Bypass #1 - Impervious Area

Runoff = 1.34 cfs @ 11.96 hrs, Volume= 0.071 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 2 Rainfall=3.30"


Summary for Pond 8P: Raingarden #1

Inflow Area	ı =	0.194 ac, 8	4.74% Imp	ervious,	Inflow Depth =	2.79"	for 2 eve	ent
Inflow	=	0.86 cfs @	11.96 hrs,	Volume=	= 0.045	af		
Outflow	=	0.38 cfs @	12.05 hrs,	Volume=	= 0.045	af, Atte	en= 55%,	Lag= 5.5 min
Discarded	=	0.03 cfs @	12.05 hrs,	Volume=	= 0.037	af		-
Primary	=	0.35 cfs @	12.05 hrs,	Volume=	= 0.008	af		

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2 Peak Elev= 281.25' @ 12.05 hrs Surf.Area= 1,622 sf Storage= 803 cf

Plug-Flow detention time= 230.8 min calculated for 0.045 af (100% of inflow) Center-of-Mass det. time= 230.8 min (988.3 - 757.5)

Volume	Invert	Avail.Storage	Storage Description
#1	277.00'	412 cf	Stone Storage (Conic)Listed below (Recalc)
			1,032 cf Overall - 3 cf Embedded = 1,029 cf x 40.0% Voids
#2	277.00'	3 cf	4.0" Round Pipe Storage Inside #1
			L= 33.0'
#3	278.51'	274 cf	Soil Storage (Conic)Listed below (Recalc)
			1,369 cf Overall x 20.0% Voids
#4	280.50'	687 cf	Surface Storage (Conic)Listed below (Recalc)
		1,375 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft <u>)</u>
277.00	688	0	0	688
278.50	688	1,032	1,032	827
Elevation	Surf.Area	Inc.Store	Cum.Store	Wet.Area
(feet)	(sq-ft)	(cubic-feet)	(cubic-feet)	(sq-ft)
278.51	688	0	0	688
280.50	688	1,369	1,369	873
Elevation	Surf.Area	Inc.Store	Cum.Store	Wet.Area
(feet)	(sq-ft)	(cubic-feet)	(cubic-feet)	(sq-ft)
280.50	73	0	0	73
281.00	181	61	61	183
282.00	503	329	390	511
282.50	688	297	687	701

Device	Routing	Invert	Outlet Devices
#1	Primary	276.74'	12.0" Round Culvert
	,		L= 77.0' CPP, end-section conforming to fill, Ke= 0.500
			Inlet / Outlet Invert= 276.74' / 275.20' S= 0.0200 '/' Cc= 0.900
			n= 0.012 Steel, smooth, Flow Area= 0.79 sf
#2	Device 1	280.60'	2.5" W x 11.5" H Vert. Surface Orifice C= 0.600
#3	Device 1	282.25'	27.0" x 48.0" Horiz. Grate C= 0.600
			Limited to weir flow at low heads
#4	Discarded	277.00'	0.750 in/hr Exfiltration over Wetted area

Discarded OutFlow Max=0.03 cfs @ 12.05 hrs HW=281.25' (Free Discharge) **4=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.35 cfs @ 12.05 hrs HW=281.25' (Free Discharge) 1=Culvert (Passes 0.35 cfs of 7.51 cfs potential flow) 2=Surface Orifice (Orifice Controls 0.35 cfs @ 2.59 fps)

-3=Grate (Controls 0.00 cfs)



Pond 8P: Raingarden #1

Summary for Link 7L: Post-Dev POI#1

Inflow A	Area =	0.504 ac, 8	38.00% Impervious,	Inflow Depth = 1.9	98" for 2 event
Inflow	=	1.46 cfs @	11.99 hrs, Volume	= 0.083 af	
Primary	y =	1.46 cfs @	11.99 hrs, Volume	= 0.083 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 7L: Post-Dev POI#1



Summary for Subcatchment 6S: Post Dev #1 - Impervious Area

Runoff = 1.00 cfs @ 11.96 hrs, Volume= 0.054 af, Depth= 3.93"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 5 Rainfall=4.17"



Summary for Subcatchment 12S: Post Dev #1 - Green Area

Runoff = 0.10 cfs @ 11.96 hrs, Volume= 0.005 af, Depth= 1.87"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 5 Rainfall=4.17"

	Area (sf)	CN	Description						
*	1,135	77	Ground Lar	ldscape					
*	153	70	Grass Pave	ers					
	1,288	76	Weighted A	/eighted Average					
	1,288	76	100.00% Pe	100.00% Pervious Area					
Т	c Length	Slop	e Velocity	Capacity	Description				
(mir	n) (feet)	(ft/f	t) (ft/sec)	(cfs)					
5.	.0				Direct Entry,				

Subcatchment 12S: Post Dev #1 - Green Area



Summary for Subcatchment 14S: Post Dev Bypass #2 - Green Area

Runoff = 0.13 cfs @ 11.96 hrs, Volume= 0.006 af, Depth= 2.35"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 5 Rainfall=4.17"



0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 Time (hours)

Summary for Subcatchment 15S: Post Dev Bypass #1 - Impervious Area

Runoff = 1.71 cfs @ 11.96 hrs, Volume= 0.092 af, Depth= 3.93"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 5 Rainfall=4.17"



Summary for Pond 8P: Raingarden #1

Inflow Area	=	0.194 ac, 8	4.74% Imp	ervious,	Inflow I	Depth =	3.6	2" for	5 eve	ent	
Inflow	=	1.11 cfs @	11.96 hrs,	Volume	=	0.058	af				
Outflow	=	0.72 cfs @	12.02 hrs,	Volume	=	0.058	af,	Atten=	35%,	Lag= 3.9) min
Discarded	=	0.04 cfs @	12.02 hrs,	Volume	=	0.041	af				
Primary	=	0.69 cfs @	12.02 hrs,	Volume	=	0.017	af				

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2 Peak Elev= 281.63' @ 12.02 hrs Surf.Area= 1,742 sf Storage= 919 cf

Plug-Flow detention time= 201.2 min calculated for 0.058 af (100% of inflow) Center-of-Mass det. time= 201.2 min (954.5 - 753.4)

Volume	Invert	Avail.Storage	Storage Description
#1	277.00'	412 cf	Stone Storage (Conic)Listed below (Recalc)
			1,032 cf Overall - 3 cf Embedded = 1,029 cf x 40.0% Voids
#2	277.00'	3 cf	4.0" Round Pipe Storage Inside #1
			L= 33.0'
#3	278.51'	274 cf	Soil Storage (Conic)Listed below (Recalc)
			1,369 cf Overall x 20.0% Voids
#4	280.50'	687 cf	Surface Storage (Conic)Listed below (Recalc)
		1,375 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft <u>)</u>
277.00	688	0	0	688
278.50	688	1,032	1,032	827
Elevation	Surf.Area	Inc.Store	Cum.Store	Wet.Area
(feet)	(sq-ft)	(cubic-feet)	(cubic-feet)	(sq-ft)
278.51	688	0	0	688
280.50	688	1,369	1,369	873
Elevation	Surf.Area	Inc.Store	Cum.Store	Wet.Area
(feet)	(sq-ft)	(cubic-feet)	(cubic-feet)	(sq-ft)
280.50	73	0	0	73
281.00	181	61	61	183
282.00	503	329	390	511
282.50	688	297	687	701

Device	Routing	Invert	Outlet Devices
#1	Primary	276.74'	12.0" Round Culvert
	-		L= 77.0' CPP, end-section conforming to fill, Ke= 0.500
			Inlet / Outlet Invert= 276.74' / 275.20' S= 0.0200 '/' Cc= 0.900
			n= 0.012 Steel, smooth, Flow Area= 0.79 sf
#2	Device 1	280.60'	2.5" W x 11.5" H Vert. Surface Orifice C= 0.600
#3	Device 1	282.25'	27.0" x 48.0" Horiz. Grate C= 0.600
			Limited to weir flow at low heads
#4	Discarded	277.00'	0.750 in/hr Exfiltration over Wetted area

Discarded OutFlow Max=0.04 cfs @ 12.02 hrs HW=281.63' (Free Discharge) **4=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.69 cfs @ 12.02 hrs HW=281.63' (Free Discharge) 1=Culvert (Passes 0.69 cfs of 7.79 cfs potential flow) 2=Surface Orifice (Orifice Controls 0.69 cfs @ 3.44 fps)

-3=Grate (Controls 0.00 cfs)



Pond 8P: Raingarden #1

Summary for Link 7L: Post-Dev POI#1

Inflow A	Area =	0.504 ac, 88.00% Impervious, Infle	ow Depth = 2.73"	for 5 event
Inflow	=	2.37 cfs @ 11.97 hrs, Volume=	0.115 af	
Primary	y =	2.37 cfs @ 11.97 hrs, Volume=	0.115 af, Atte	en= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 7L: Post-Dev POI#1



Summary for Subcatchment 6S: Post Dev #1 - Impervious Area

Runoff = 1.18 cfs @ 11.96 hrs, Volume= 0.064 af, Depth= 4.66"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 10 Rainfall=4.90"



Summary for Subcatchment 12S: Post Dev #1 - Green Area

Runoff = 0.13 cfs @ 11.96 hrs, Volume= 0.006 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 10 Rainfall=4.90"

	Area (sf)	CN	Description						
*	1,135	77	Ground Lar	Idscape					
*	153	70	Grass Pave	rs					
	1,288	76	Weighted A	Weighted Average					
	1,288	76	100.00% Pe	100.00% Pervious Area					
T (min	c Length) (feet)	Slop (ft/f	e Velocity t) (ft/sec)	Capacity (cfs)	Description				
5.	0			\$ 1	Direct Entry,				

Subcatchment 12S: Post Dev #1 - Green Area



Summary for Subcatchment 14S: Post Dev Bypass #2 - Green Area

Runoff = 0.17 cfs @ 11.96 hrs, Volume= 0.008 af, Depth= 2.99"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 10 Rainfall=4.90"



Time (hours)

Summary for Subcatchment 15S: Post Dev Bypass #1 - Impervious Area

Runoff = 2.01 cfs @ 11.96 hrs, Volume= 0.108 af, Depth= 4.66"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 10 Rainfall=4.90"



Summary for Pond 8P: Raingarden #1

Inflow Area	=	0.194 ac, 8	4.74% Impe	ervious, l	Inflow Dep	oth =	4.33"	for 10	event	
Inflow	=	1.32 cfs @	11.96 hrs,	Volume=	: 0).070 a	af			
Outflow	=	0.88 cfs @	12.02 hrs,	Volume=	: 0).070 a	af, Atte	en= 33%	6, Lag=3	3.8 min
Discarded	=	0.04 cfs @	12.02 hrs,	Volume=	: 0).045 a	af		•	
Primary	=	0.84 cfs @	12.02 hrs,	Volume=	: 0).025 a	af			

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2 Peak Elev= 281.87' @ 12.02 hrs Surf.Area= 1,830 sf Storage= 1,019 cf

Plug-Flow detention time= 183.7 min calculated for 0.070 af (100% of inflow) Center-of-Mass det. time= 183.7 min (934.5 - 750.8)

Volume	Invert	Avail.Storage	Storage Description
#1	277.00'	412 cf	Stone Storage (Conic)Listed below (Recalc)
			1,032 cf Overall - 3 cf Embedded = 1,029 cf x 40.0% Voids
#2	277.00'	3 cf	4.0" Round Pipe Storage Inside #1
			L= 33.0'
#3	278.51'	274 cf	Soil Storage (Conic)Listed below (Recalc)
			1,369 cf Overall x 20.0% Voids
#4	280.50'	687 cf	Surface Storage (Conic)Listed below (Recalc)
		1,375 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft <u>)</u>
277.00	688	0	0	688
278.50	688	1,032	1,032	827
Elevation	Surf.Area	Inc.Store	Cum.Store	Wet.Area
(feet)	(sq-ft)	(cubic-feet)	(cubic-feet)	(sq-ft)
278.51	688	0	0	688
280.50	688	1,369	1,369	873
Elevation	Surf.Area	Inc.Store	Cum.Store	Wet.Area
(feet)	(sq-ft)	(cubic-feet)	(cubic-feet)	(sq-ft)
280.50	73	0	0	73
281.00	181	61	61	183
282.00	503	329	390	511
282.50	688	297	687	701

Device	Routing	Invert	Outlet Devices
#1	Primary	276.74'	12.0" Round Culvert
	-		L= 77.0' CPP, end-section conforming to fill, Ke= 0.500
			Inlet / Outlet Invert= 276.74' / 275.20' S= 0.0200 '/' Cc= 0.900
			n= 0.012 Steel, smooth, Flow Area= 0.79 sf
#2	Device 1	280.60'	2.5" W x 11.5" H Vert. Surface Orifice C= 0.600
#3	Device 1	282.25'	27.0" x 48.0" Horiz. Grate C= 0.600
			Limited to weir flow at low heads
#4	Discarded	277.00'	0.750 in/hr Exfiltration over Wetted area

Discarded OutFlow Max=0.04 cfs @ 12.02 hrs HW=281.87' (Free Discharge) **4=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.84 cfs @ 12.02 hrs HW=281.87' (Free Discharge) 1=Culvert (Passes 0.84 cfs of 7.96 cfs potential flow) 2=Surface Orifice (Orifice Controls 0.84 cfs @ 4.22 fps)

-3=Grate (Controls 0.00 cfs)

Pond 8P: Raingarden #1



Summary for Link 7L: Post-Dev POI#1

Inflow /	Area =	0.504 ac, 8	88.00% Impervious,	Inflow Depth = 3.3	37" for 10 event
Inflow	=	2.93 cfs @	11.96 hrs, Volume	= 0.141 af	
Primar	y =	2.93 cfs @	11.96 hrs, Volume	= 0.141 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 7L: Post-Dev POI#1



Summary for Subcatchment 6S: Post Dev #1 - Impervious Area

Runoff = 1.44 cfs @ 11.96 hrs, Volume= 0.078 af, Depth= 5.73"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 25 Rainfall=5.97"



Summary for Subcatchment 12S: Post Dev #1 - Green Area

Runoff = 0.18 cfs @ 11.96 hrs, Volume= 0.008 af, Depth= 3.35"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 25 Rainfall=5.97"

	Area (sf)	CN	Description				
*	1,135	77	Ground Lar	ndscape			
*	153	70	Grass Pave	ers			
	1,288	76	Weighted A	verage			
	1,288	76	100.00% Pervious Area				
Т	c Length	Slop	e Velocity	Capacity	Description		
(mir	n) (feet)	(ft/f	t) (ft/sec)	(cfs)			
5.	0				Direct Entry,		

Subcatchment 12S: Post Dev #1 - Green Area



Summary for Subcatchment 14S: Post Dev Bypass #2 - Green Area

Runoff = 0.22 cfs @ 11.96 hrs, Volume= 0.010 af, Depth= 3.96"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 25 Rainfall=5.97"

	Area (sf)	CN	Description					
*	595	77	Ground Lar	ldscape				
*	750	86	Green Roof					
	1,345	82	Weighted Average					
	1,345	82	100.00% Pe	100.00% Pervious Area				
Т	c Length	Slop	e Velocity	Capacity	Description			
(mir	n) (feet)	(ft/f	t) (ft/sec)	(cfs)				
5.	0				Direct Entry,			

Subcatchment 14S: Post Dev Bypass #2 - Green Area



Summary for Subcatchment 15S: Post Dev Bypass #1 - Impervious Area

Runoff = 2.45 cfs @ 11.96 hrs, Volume= 0.133 af, Depth= 5.73"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 25 Rainfall=5.97"



Summary for Pond 8P: Raingarden #1

Inflow Area	ı =	0.194 ac, 8	4.74% Imp	ervious,	Inflow	Depth =	5.37	7" for	25 ev	vent	
Inflow	=	1.62 cfs @	11.96 hrs,	Volume	=	0.087	af				
Outflow	=	1.03 cfs @	12.02 hrs,	Volume	=	0.087	af, /	Atten=	36%,	Lag= 4.1	min
Discarded	=	0.04 cfs @	12.02 hrs,	Volume	=	0.049	af			-	
Primary	=	1.00 cfs @	12.02 hrs,	Volume	=	0.038	af				

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2 Peak Elev= 282.17' @ 12.02 hrs Surf.Area= 1,938 sf Storage= 1,169 cf

Plug-Flow detention time= 164.3 min calculated for 0.087 af (100% of inflow) Center-of-Mass det. time= 164.3 min (912.1 - 747.8)

Volume	Invert	Avail.Storage	Storage Description
#1	277.00'	412 cf	Stone Storage (Conic)Listed below (Recalc)
			1,032 cf Overall - 3 cf Embedded = 1,029 cf x 40.0% Voids
#2	277.00'	3 cf	4.0" Round Pipe Storage Inside #1
			L= 33.0'
#3	278.51'	274 cf	Soil Storage (Conic)Listed below (Recalc)
			1,369 cf Overall x 20.0% Voids
#4	280.50'	687 cf	Surface Storage (Conic)Listed below (Recalc)
		1,375 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft <u>)</u>
277.00	688	0	0	688
278.50	688	1,032	1,032	827
Elevation	Surf.Area	Inc.Store	Cum.Store	Wet.Area
(feet)	(sq-ft)	(cubic-feet)	(cubic-feet)	(sq-ft)
278.51	688	0	0	688
280.50	688	1,369	1,369	873
Elevation	Surf.Area	Inc.Store	Cum.Store	Wet.Area
(feet)	(sq-ft)	(cubic-feet)	(cubic-feet)	(sq-ft)
280.50	73	0	0	73
281.00	181	61	61	183
282.00	503	329	390	511
282.50	688	297	687	701

Device	Routing	Invert	Outlet Devices
#1	Primary	276.74'	12.0" Round Culvert
	-		L= 77.0' CPP, end-section conforming to fill, Ke= 0.500
			Inlet / Outlet Invert= 276.74' / 275.20' S= 0.0200 '/' Cc= 0.900
			n= 0.012 Steel, smooth, Flow Area= 0.79 sf
#2	Device 1	280.60'	2.5" W x 11.5" H Vert. Surface Orifice C= 0.600
#3	Device 1	282.25'	27.0" x 48.0" Horiz. Grate C= 0.600
			Limited to weir flow at low heads
#4	Discarded	277.00'	0.750 in/hr Exfiltration over Wetted area

Discarded OutFlow Max=0.04 cfs @ 12.02 hrs HW=282.17' (Free Discharge) **4=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.99 cfs @ 12.02 hrs HW=282.17' (Free Discharge) 1=Culvert (Passes 0.99 cfs of 8.16 cfs potential flow) 2=Surface Orifice (Orifice Controls 0.99 cfs @ 4.98 fps)

-3=Grate (Controls 0.00 cfs)

Pond 8P: Raingarden #1



Summary for Link 7L: Post-Dev POI#1

Inflow /	Area =	0.504 ac,	88.00% Impervious,	Inflow Depth = 4.3	33" for 25 event
Inflow	=	3.58 cfs @) 11.96 hrs, Volume	= 0.182 af	
Primar	y =	3.58 cfs @) 11.96 hrs, Volume	= 0.182 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 7L: Post-Dev POI#1



Summary for Subcatchment 6S: Post Dev #1 - Impervious Area

Runoff = 1.66 cfs @ 11.96 hrs, Volume= 0.091 af, Depth= 6.63"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 50 Rainfall=6.87"



Summary for Subcatchment 12S: Post Dev #1 - Green Area

Runoff = 0.22 cfs @ 11.96 hrs, Volume= 0.010 af, Depth= 4.14"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 50 Rainfall=6.87"

	Area (sf)	CN	Description		
*	1,135	77	Ground Lar	Idscape	
*	153	70	Grass Pave	ers	
	1,288	76	Weighted A	verage	
	1,288	76	100.00% Pe	ervious Are	ea
T (miı	c Length n) (feet)	Slop (ft/f	e Velocity t) (ft/sec)	Capacity (cfs)	Description
5	.0				Direct Entry,

Subcatchment 12S: Post Dev #1 - Green Area



Summary for Subcatchment 14S: Post Dev Bypass #2 - Green Area

Runoff = 0.26 cfs @ 11.96 hrs, Volume= 0.012 af, Depth= 4.79"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 50 Rainfall=6.87"

Area (st	f) CN	Description							
* 59	5 77	Ground Lar	ndscape						
<u>* 75</u>	0 86	Green Root	-						
1,34	5 82	Weighted A	verage						
1,34	5 82	100.00% Pe	ervious Are	a					
Tc Leng (min) (fee	ıth Sloj et) (ft/	pe Velocity ft) (ft/sec)	Capacity (cfs)	Description					
5.0				Direct Entry,					
Subcatchment 14S: Post Dev Bypass #2 - Green Area									
0.28 0.28 0.26 cfs 0.									
0 24	i i i -		· · · · · · · · · · · · · · · · · · ·	Type II 24-hr					



Summary for Subcatchment 15S: Post Dev Bypass #1 - Impervious Area

Runoff = 2.82 cfs @ 11.96 hrs, Volume= 0.154 af, Depth= 6.63"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 50 Rainfall=6.87"



Summary for Pond 8P: Raingarden #1

Inflow Area	ı =	0.194 ac, 8	4.74% Imp	ervious,	Inflow I	Depth =	6.2	5" for	50 ev	vent	
Inflow	=	1.88 cfs @	11.96 hrs,	Volume	=	0.101	af				
Outflow	=	1.58 cfs @	12.00 hrs,	Volume	=	0.101	af, <i>i</i>	Atten=	16%,	Lag= 2.0	6 min
Discarded	=	0.04 cfs @	12.00 hrs,	Volume	=	0.052	af			-	
Primary	=	1.54 cfs @	12.00 hrs,	Volume	=	0.049	af				

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2 Peak Elev= 282.30' @ 12.00 hrs Surf.Area= 1,986 sf Storage= 1,245 cf

Plug-Flow detention time= 153.1 min calculated for 0.101 af (100% of inflow) Center-of-Mass det. time= 153.0 min (898.8 - 745.8)

Volume	Invert	Avail.Storage	Storage Description
#1	277.00'	412 cf	Stone Storage (Conic)Listed below (Recalc)
			1,032 cf Overall - 3 cf Embedded = 1,029 cf x 40.0% Voids
#2	277.00'	3 cf	4.0" Round Pipe Storage Inside #1
			L= 33.0'
#3	278.51'	274 cf	Soil Storage (Conic)Listed below (Recalc)
			1,369 cf Overall x 20.0% Voids
#4	280.50'	687 cf	Surface Storage (Conic)Listed below (Recalc)
		1,375 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft <u>)</u>
277.00	688	0	0	688
278.50	688	1,032	1,032	827
Elevation	Surf.Area	Inc.Store	Cum.Store	Wet.Area
(feet)	(sq-ft)	(cubic-feet)	(cubic-feet)	(sq-ft)
278.51	688	0	0	688
280.50	688	1,369	1,369	873
Elevation	Surf.Area	Inc.Store	Cum.Store	Wet.Area
(feet)	(sq-ft)	(cubic-feet)	(cubic-feet)	(sq-ft)
280.50	73	0	0	73
281.00	181	61	61	183
282.00	503	329	390	511
282.50	688	297	687	701

Device	Routing	Invert	Outlet Devices
#1	Primary	276.74'	12.0" Round Culvert
	-		L= 77.0' CPP, end-section conforming to fill, Ke= 0.500
			Inlet / Outlet Invert= 276.74' / 275.20' S= 0.0200 '/' Cc= 0.900
			n= 0.012 Steel, smooth, Flow Area= 0.79 sf
#2	Device 1	280.60'	2.5" W x 11.5" H Vert. Surface Orifice C= 0.600
#3	Device 1	282.25'	27.0" x 48.0" Horiz. Grate C= 0.600
			Limited to weir flow at low heads
#4	Discarded	277.00'	0.750 in/hr Exfiltration over Wetted area

Discarded OutFlow Max=0.04 cfs @ 12.00 hrs HW=282.30' (Free Discharge) **4=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=1.49 cfs @ 12.00 hrs HW=282.30' (Free Discharge) 1=Culvert (Passes 1.49 cfs of 8.25 cfs potential flow) -2=Surface Orifice (Orifice Controls 1.05 cfs @ 5.28 fps) 2=Create (Main Controls 0.44 cfs @ 0.72 fps)

-3=Grate (Weir Controls 0.44 cfs @ 0.72 fps)



Pond 8P: Raingarden #1

Summary for Link 7L: Post-Dev POI#1

Inflow A	Area =	0.504 ac, 8	88.00% Impervious,	Inflow Depth = 5.1	14" for 50 event
Inflow	=	4.25 cfs @	11.99 hrs, Volume	= 0.216 af	
Primar	y =	4.25 cfs @	11.99 hrs, Volume	e= 0.216 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 7L: Post-Dev POI#1



Summary for Subcatchment 6S: Post Dev #1 - Impervious Area

Runoff = 1.90 cfs @ 11.96 hrs, Volume= 0.104 af, Depth= 7.62"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 100 Rainfall=7.86"



Summary for Subcatchment 12S: Post Dev #1 - Green Area

Runoff = 0.27 cfs @ 11.96 hrs, Volume= 0.012 af, Depth= 5.03"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 100 Rainfall=7.86"

	Area (sf)	CN	Description		
*	1,135	77	Ground Lar	ldscape	
*	153	70	Grass Pave	ers	
	1,288	76	Weighted A	verage	
	1,288	76	100.00% Pe	ervious Are	ea
Т	c Length	Slop	e Velocity	Capacity	Description
(mir	n) (feet)	(ft/f	t) (ft/sec)	(cfs)	
5.	.0				Direct Entry,

Subcatchment 12S: Post Dev #1 - Green Area



Summary for Subcatchment 14S: Post Dev Bypass #2 - Green Area

Runoff = 0.31 cfs @ 11.96 hrs, Volume= 0.015 af, Depth= 5.73"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 100 Rainfall=7.86"

	Area (sf)	CN	Description		
*	595	77	Ground Lar	Idscape	
*	750	86	Green Roof		
	1,345	82	Weighted A	verage	
	1,345	82	100.00% Pe	ervious Are	ea
- (mi	Гс Length n) (feet)	Slop (ft/f	e Velocity t) (ft/sec)	Capacity (cfs)	Description
5	.0				Direct Entry,
- (mi 5	1,345 Tc Length <u>n) (feet)</u> .0	82 Slop (ft/f	100.00% Pe be Velocity t) (ft/sec)	Capacity (cfs)	Description Direct Entry,

Subcatchment 14S: Post Dev Bypass #2 - Green Area



Summary for Subcatchment 15S: Post Dev Bypass #1 - Impervious Area

Runoff = 3.23 cfs @ 11.96 hrs, Volume= 0.177 af, Depth= 7.62"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type II 24-hr 100 Rainfall=7.86"



Summary for Pond 8P: Raingarden #1

Inflow Area	ı =	0.194 ac, 8	4.74% Impe	ervious, In	flow Depth =	7.23"	for 100) event
Inflow	=	2.17 cfs @	11.96 hrs,	Volume=	0.117	af		
Outflow	=	2.08 cfs @	11.98 hrs,	Volume=	0.117	af, Att	en= 4%,	Lag= 1.3 min
Discarded	=	0.04 cfs @	11.98 hrs,	Volume=	0.055	af		-
Primary	=	2.03 cfs @	11.98 hrs,	Volume=	0.062	af		

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2 Peak Elev= 282.33' @ 11.98 hrs Surf.Area= 1,999 sf Storage= 1,265 cf

Plug-Flow detention time= 144.4 min calculated for 0.117 af (100% of inflow) Center-of-Mass det. time= 144.4 min (888.4 - 744.0)

Volume	Invert	Avail.Storage	Storage Description
#1	277.00'	412 cf	Stone Storage (Conic)Listed below (Recalc)
			1,032 cf Overall - 3 cf Embedded = 1,029 cf x 40.0% Voids
#2	277.00'	3 cf	4.0" Round Pipe Storage Inside #1
			L= 33.0'
#3	278.51'	274 cf	Soil Storage (Conic)Listed below (Recalc)
			1,369 cf Overall x 20.0% Voids
#4	280.50'	687 cf	Surface Storage (Conic)Listed below (Recalc)
		1,375 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft <u>)</u>
277.00	688	0	0	688
278.50	688	1,032	1,032	827
Elevation	Surf.Area	Inc.Store	Cum.Store	Wet.Area
(feet)	(sq-ft)	(cubic-feet)	(cubic-feet)	(sq-ft)
278.51	688	0	0	688
280.50	688	1,369	1,369	873
Elevation	Surf.Area	Inc.Store	Cum.Store	Wet.Area
(feet)	(sq-ft)	(cubic-feet)	(cubic-feet)	(sq-ft)
280.50	73	0	0	73
281.00	181	61	61	183
282.00	503	329	390	511
282.50	688	297	687	701

Device	Routing	Invert	Outlet Devices
#1	Primary	276.74'	12.0" Round Culvert
	2		L= 77.0' CPP, end-section conforming to fill, Ke= 0.500
			Inlet / Outlet Invert= 276.74' / 275.20' S= 0.0200 '/' Cc= 0.900
			n= 0.012 Steel, smooth, Flow Area= 0.79 sf
#2	Device 1	280.60'	2.5" W x 11.5" H Vert. Surface Orifice C= 0.600
#3	Device 1	282.25'	27.0" x 48.0" Horiz. Grate C= 0.600
			Limited to weir flow at low heads
#4	Discarded	277.00'	0.750 in/hr Exfiltration over Wetted area
Discarded OutFlow Max=0.04 cfs @ 11.98 hrs HW=282.33' (Free Discharge) **4=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=2.02 cfs @ 11.98 hrs HW=282.33' (Free Discharge) 1=Culvert (Passes 2.02 cfs of 8.27 cfs potential flow) 2=Surface Orifice (Orifice Controls 1.07 cfs @ 5.35 fps)

-3=Grate (Weir Controls 0.95 cfs @ 0.93 fps)



Pond 8P: Raingarden #1

Summary for Link 7L: Post-Dev POI#1

Inflow /	Area =	0.504 ac,	88.00% Impervious,	Inflow Depth = 6.	05" for 100 event
Inflow	=	5.49 cfs @	11.97 hrs, Volume	= 0.254 af	
Primar	y =	5.49 cfs @	11.97 hrs, Volume	= 0.254 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 7L: Post-Dev POI#1



INFILTRATION BASIN DRAIN TIME ANALYSIS - Raingarden

DARCEY'S LAW: Q = KIA

Q =	the rate of infiltration in cubic feet per second						
K =	the hydraulic conductivity of the soil in feet per second						
=	the hydraulic gradient (see Hydraulic Gradient Calculations)						
A =	the area of infiltration in square feet						
BASIN:							
K =	0.75	in./hr. =	0.00001736 fps				
=	1.08	ft.					
A =	688	sq. ft.					
Q =	0.01	cfs					
	4 000	0					
Volume 2 year storm =	1,960	cu. π.					
Drain time =	152,645	sec. =	42.4 hrs				

Hydraulic Gradient Calculations 0.5 in./hr. (From Geotechnical Report) Infiltration rate with Factor of Safety Applied=0.25 in/hr

BASIN:

d=	5.00	ft.
D ₁ =	5.00	ft.
D ₂ =	5.75	ft.
D _{avg} =	5.38	ft.
I=	1.08	ft.

INPUT VALUES		
Basin Bottom Elevation	280.5	
Limiting Elevation	275.5	
Water Surface in Basin	281.25	
K (infiltration Rate)	0.75	in./hr
Area	688	
Volume 2 year storm	1,960	



NOAA Atlas 14, Volume 2, Version 3 Location name: Jenkintown, Pennsylvania, USA* Latitude: 40.0924°, Longitude: -75.1262° Elevation: 284.36 ft** * source: ESRI Maps ** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) ¹										
Duration	Average recurrence interval (years)									
Duration	1	2	5	10	25	50	100	200	500	1000
5-min	0.345 (0.315-0.379)	0.412 (0.376-0.452)	0.486 (0.442-0.533)	0.540 (0.490-0.592)	0.605 (0.546-0.662)	0.651 (0.585-0.713)	0.696 (0.623-0.764)	0.736 (0.655-0.812)	0.786 (0.693-0.872)	0.823 (0.720-0.918)
10-min	0.552 (0.504-0.606)	0.659 (0.601-0.723)	0.779 (0.708-0.854)	0.864 (0.784-0.947)	0.964 (0.871-1.06)	1.04 (0.931-1.14)	1.11 (0.989-1.22)	1.17 (1.04-1.29)	1.24 (1.10-1.38)	1.30 (1.13-1.45)
15-min	0.690 (0.629-0.757)	0.828 (0.755-0.909)	0.985 (0.896-1.08)	1.09 (0.992-1.20)	1.22 (1.10-1.34)	1.31 (1.18-1.44)	1.40 (1.25-1.54)	1.47 (1.31-1.63)	1.57 (1.38-1.74)	1.63 (1.42-1.81)
30-min	0.946 (0.863-1.04)	1.14 (1.04-1.25)	1.40 (1.27-1.53)	1.58 (1.44-1.74)	1.81 (1.64-1.98)	1.98 (1.78-2.17)	2.14 (1.92-2.35)	2.29 (2.04-2.53)	2.49 (2.19-2.76)	2.64 (2.30-2.94)
60-min	1.18 (1.08-1.29)	1.44 (1.31-1.58)	1.80 (1.63-1.97)	2.06 (1.87-2.26)	2.41 (2.18-2.64)	2.68 (2.41-2.94)	2.95 (2.64-3.24)	3.22 (2.86-3.55)	3.57 (3.15-3.96)	3.85 (3.36-4.29)
2-hr	1.42 (1.29-1.56)	1.72 (1.57-1.90)	2.16 (1.96-2.38)	2.50 (2.26-2.75)	2.96 (2.65-3.24)	3.32 (2.96-3.64)	3.68 (3.26-4.05)	4.05 (3.57-4.46)	4.56 (3.96-5.05)	4.95 (4.26-5.51)
3-hr	1.55 (1.41-1.72)	1.89 (1.71-2.08)	2.37 (2.15-2.62)	2.75 (2.48-3.03)	3.27 (2.93-3.60)	3.67 (3.28-4.05)	4.10 (3.64-4.53)	4.54 (3.98-5.02)	5.13 (4.45-5.71)	5.61 (4.80-6.27)
6-hr	1.95 (1.77-2.15)	2.36 (2.14-2.61)	2.95 (2.68-3.26)	3.44 (3.10-3.79)	4.12 (3.69-4.54)	4.69 (4.17-5.17)	5.29 (4.66-5.84)	5.93 (5.17-6.55)	6.84 (5.85-7.62)	7.59 (6.39-8.49)
12-hr	2.37 (2.17-2.62)	2.86 (2.62-3.17)	3.61 (3.30-3.99)	4.24 (3.85-4.68)	5.17 (4.64-5.69)	5.96 (5.30-6.56)	6.82 (5.98-7.53)	7.77 (6.71-8.62)	9.17 (7.74-10.2)	10.4 (8.58-11.6)
24-hr	2.74 (2.53-2.97)	3.30 (3.05-3.59)	4.17 (3.85-4.53)	4.90 (4.51-5.31)	5.97 (5.46-6.45)	6.87 (6.25-7.43)	7.86 (7.10-8.49)	8.94 (8.00-9.65)	10.5 (9.30-11.4)	11.9 (10.4-12.9)
2-day	3.15 (2.90-3.43)	3.81 (3.50-4.14)	4.82 (4.43-5.24)	5.65 (5.18-6.13)	6.84 (6.25-7.42)	7.84 (7.12-8.50)	8.92 (8.05-9.66)	10.1 (9.02-10.9)	11.8 (10.4-12.8)	13.2 (11.5-14.3)
3-day	3.33 (3.08-3.62)	4.02 (3.72-4.37)	5.06 (4.67-5.50)	5.92 (5.45-6.41)	7.14 (6.54-7.72)	8.15 (7.44-8.82)	9.24 (8.38-9.99)	10.4 (9.37-11.3)	12.1 (10.8-13.1)	13.5 (11.9-14.6)
4-day	3.52 (3.26-3.81)	4.24 (3.93-4.59)	5.31 (4.92-5.75)	6.19 (5.72-6.69)	7.43 (6.84-8.03)	8.46 (7.76-9.14)	9.56 (8.72-10.3)	10.7 (9.73-11.6)	12.4 (11.1-13.4)	13.8 (12.3-14.9)
7-day	4.11 (3.83-4.43)	4.93 (4.59-5.32)	6.10 (5.68-6.59)	7.07 (6.57-7.63)	8.46 (7.82-9.12)	9.61 (8.86-10.3)	10.8 (9.92-11.7)	12.1 (11.1-13.1)	14.0 (12.6-15.1)	15.5 (13.9-16.8)
10-day	4.67 (4.38-5.01)	5.59 (5.23-5.99)	6.82 (6.37-7.32)	7.82 (7.29-8.38)	9.22 (8.56-9.87)	10.3 (9.58-11.1)	11.5 (10.6-12.3)	12.7 (11.7-13.6)	14.5 (13.2-15.5)	15.9 (14.3-17.1)
20-day	6.32 (5.97-6.71)	7.50 (7.09-7.96)	8.96 (8.46-9.51)	10.1 (9.53-10.7)	11.7 (11.0-12.4)	12.9 (12.1-13.7)	14.1 (13.2-15.0)	15.4 (14.3-16.3)	17.1 (15.8-18.1)	18.4 (16.9-19.5)
30-day	7.87 (7.47-8.28)	9.28 (8.80-9.77)	10.8 (10.3-11.4)	12.1 (11.4-12.7)	13.6 (12.9-14.4)	14.9 (14.0-15.6)	16.1 (15.1-16.9)	17.2 (16.2-18.2)	18.8 (17.5-19.8)	19.9 (18.5-21.1)
45-day	10.0 (9.55-10.5)	11.8 (11.2-12.4)	13.6 (12.9-14.2)	14.9 (14.2-15.6)	16.6 (15.8-17.4)	17.9 (17.0-18.7)	19.1 (18.1-20.0)	20.2 (19.1-21.2)	21.6 (20.4-22.8)	22.7 (21.3-23.9)
60-day	12.0 (11.5-12.6)	14.1 (13.4-14.7)	16.1 (15.3-16.8)	17.5 (16.7-18.4)	19.4 (18.5-20.3)	20.8 (19.8-21.8)	22.0 (20.9-23.1)	23.2 (22.0-24.3)	24.7 (23.4-25.9)	25.7 (24.3-27.0)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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GROUNDWATER RECHARGE CALCULATION

Inflow Area = 0.194 ac, 84.74% Impervious, Inflow Depth = 2.26" for 1 event Inflow = 0.70 cfs @ 11.96 hrs, Volume= 0.036 af Outflow = 0.10 cfs @ 12.16 hrs, Volume= 0.036 af, Atten= 86%, Lag= 12.4 min Discarded = 0.03 cfs @ 12.16 hrs, Volume= 0.034 af VOLUME INFILTRATED = 1,481 CF Primary 0.06 cfs @ 12.16 hrs, Volume= 0.002 af =

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2 Peak Elev= 280.81' @ 12.16 hrs Surf.Area= 1,510 sf Storage= 720 cf

Plug-Flow detention time= 259.1 min calculated for 0.036 af (100% of inflow) Center-of-Mass det. time= 259.1 min (1,020.2 - 761.1)

GROUNDWATER RECHARGE & WATER QUALITY CALCULATION:

PROPOSED ON-SITE IMPERVIOUS AREA (WITHIN LIMIT OF DISTURBANCE) = 8,100 SF

VOLUME INFILTRATED (1-YEAR STORM) = 1,481 CF

REQUIRED RE & WQ = 8,100 SF X 1"/12" = 675 CF

PROVIDED = 1,481 CF > 675 CF (REQUIRED)



Appendix D – Pipe Capacity Analysis

CAPACITY CALCULATIONS

12" HDPE Capacity (OCS #1 TO EX. INL.)					
MANNING'S FORMULA					
(CIRCULAR PIPES)					
Ν	0.012		(2		
D	12	in.			
А	0.785398	ft ²			
R	0.25	ft			
S	0.02	ft/ft			
Q=	5.47314	ft³/s			

NL.) OCS #1 Flow Calculation

Q= **1** cfs (25 YR FLOW FROM HYDROCAD MODEL)



Appendix E – Pre-Development and Post-Development Drainage Area Maps

Refer to Accompanying Design Development Plans



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