CIVIL ENGINEERS • LAND SURVEYORS • ENVIRONMENTAL CONSULTANTS

FORESITE ENGINEERING

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STORMWATER MANAGEMENT PLAN REPORT

FOR

Construction of a Dwelling

LOT 2 HARVARD ROAD
Stow, Massachusetts

Assessors Map R-09 Parcel 38

October 28, 2022

Prepared for:
John Giordano
30 Heritage Lane
Stow, Massachusetts 01775

Prepared by:
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CONTENTS

I. Introduction

Lot 2 Harvard Road is an undeveloped 40,771 sq.ft. residential lot on the north side of Harvard Road between existing house numbers 137 Harvard Road and 153 Harvard Road, immediately south of Wedgewood Pines Golf Course, Hole 5 fairway. The site is wooded with areas of underbrush, surface stones and exposed rock. The development proposal for the site consists of construction of a single-family dwelling, driveway, sewage disposal system, and drainage improvements to mitigate storm water impacts from development. Drainage is currently southerly toward Harvard Road. The site drainage area in this analysis has been separated to distinguish that portion of the site that drains off site southwesterly directly to abutting property at 153 Harvard Road from that portion of the site that drains directly to Harvard Road to evaluate drainage impacts to these areas independently. Clearing, grading, construction and landscaping activities affect off-site drainage characteristics and require evaluation and mitigation for compliance with Stow Zoning Bylaw Section 3.8.1.9.

The extents of the lot have been established as the study area. The United States Natural Resources Conservation Service (NRCS) as Charlton-Hollis Rock Outcrop series, 15-25% slopes (103D). The unit consists of well drained Charlton soils, somewhat excessively drained Hollis soils, and rock outcroppings. Soil conditions were verified in the field with test holes conducted by a Massachusetts Licensed Soil Evaluator. Field investigations were conducted to confirm soil conditions and estimated seasonal high groundwater conditions on the site.

The development proposal involves site clearing, grading, and construction of a single-family dwelling and associated site improvements (sewage disposal system, driveway, roof runoff infiltration bed, installation of water supply well and other service utilities, and associated grading and landscaping). Development of the site results in disturbance of approximately 26,000 sq.ft. of site area. These alterations, unmitigated, would increase the rate and volume of runoff from the site to abutting property and to Harvard Road. To mitigate impacts of site alteration, a roof infiltration system is proposed to manage roof runoff and a rain garden/retention basin is proposed to further mitigate surface runoff from yard and driveway area. By limiting grade and surface cover changes of the site, drainage patterns are not substantially altered by development. Utilization of a subsurface infiltration for recharge of roof runoff takes advantage of the well-drained soils to reduce runoff and coupled with the rain garden retention area, act to effectively reduce runoff rates and volumes from development of the site.

Erosion and sediment from construction activities will be mitigated by installation of staked straw wattle erosion control along the down-gradient work limit for erosion control, and HDPE construction fencing

to demark the overall limit of proposed work. A stabilized stone construction entrance to prevent tracking of sediments onto Harvard Road during construction.

II. Methodology & References

Methodology:

SCS TR-55 & SCS TR-20 utilizing HydroCAD (v 8.0) software.

References:

A Guide to Hydrologic Analysis Using SCS Methods, Richard McCuen, copyright 1982, Prentice Hall, Inc.

Natural Resources Conservation Service (NRCS), Web Soil Survey

Soil Survey of Middlesex County, Massachusetts, published by NRCS

USGS Quadrangle Hudson, Massachusetts, 1987

Rawl (1982) Infiltration Rates

III. Results

The study area consists of the project site area. Though the entirety of the site ultimately drains to Harvard Road, the western portion drains off-site to abutting property at 153 Harvard Road (Sub 1S) prior to following the natural drainage pattern to Harvard Road, so therefore has been evaluated separately from that portion of the that drains directly to Harvard Road (Sub 2S).

Under proposed (post-development) conditions the same study area was broken down into subcatchment areas that drain to each of the off-site areas evaluated under pre-development conditions. Proposed roof area (Sub 3S) is separated into a separate subcatchment area that is directed to the modeled subsurface roof infiltration bed (Pond 10P) which has been sized to detain and infiltrate a substantial portion of post-development runoff. A portion of the yard and driveway area drainage is directed to an on-site rain garden/retention area (Pond 11P) at the driveway entrance to further control, slow the rate and reduce the volume of runoff to Harvard Road. Drainage to Harvard Road following these mitigating measures is represented in the calculations as Reach 51R. That portion of the site that drains toward 153 Harvard Road (Sub 1S) is not proposed to be altered by development activity, therefore no change to off-site drainage to this area from proposed construction activity will occur.

Table 1 below shows the key of each off-site area analyzed as referenced in the HydroCAD calculations in Appendix F, and also shows which pre-development areas are compared to which post-development areas for evaluation of the effectiveness of the storm water controls proposed.

TABLE 1

PRE-DEVELOPMENT & POST-DEVELOPMENT COMPARISON AREAS

DESCRIPTION	PRE	POST
OFF SITE WEST TO 153 HARVARD RD	**1S**	**1S**
OFF SITE SOUTH TO HARVARD RD	**2S**	**51R**

The off-site areas were analyzed for rate and volume of runoff under existing conditions for the 2-yr, 10-yr and 100-yr, 24-hr design storms and the results are shown in Table 2. Under post-development conditions increases in runoff from site development are controlled through implementation of the

stormwater Best Management Practices (BMP's). Comparison of the off-site rates and volumes of runoff under pre-development conditions to the off-site runoff to the same areas under post-development conditions illustrates the effectiveness of the proposed stormwater controls. The results in Table 2 show that off-site runoff rates and volumes are effectively reduced following development of the site by the proposed drainage improvements.

TABLE 2

PRE-DEVELOPMENT & POST-DEVELOPMENT RATES AND VOLUMES

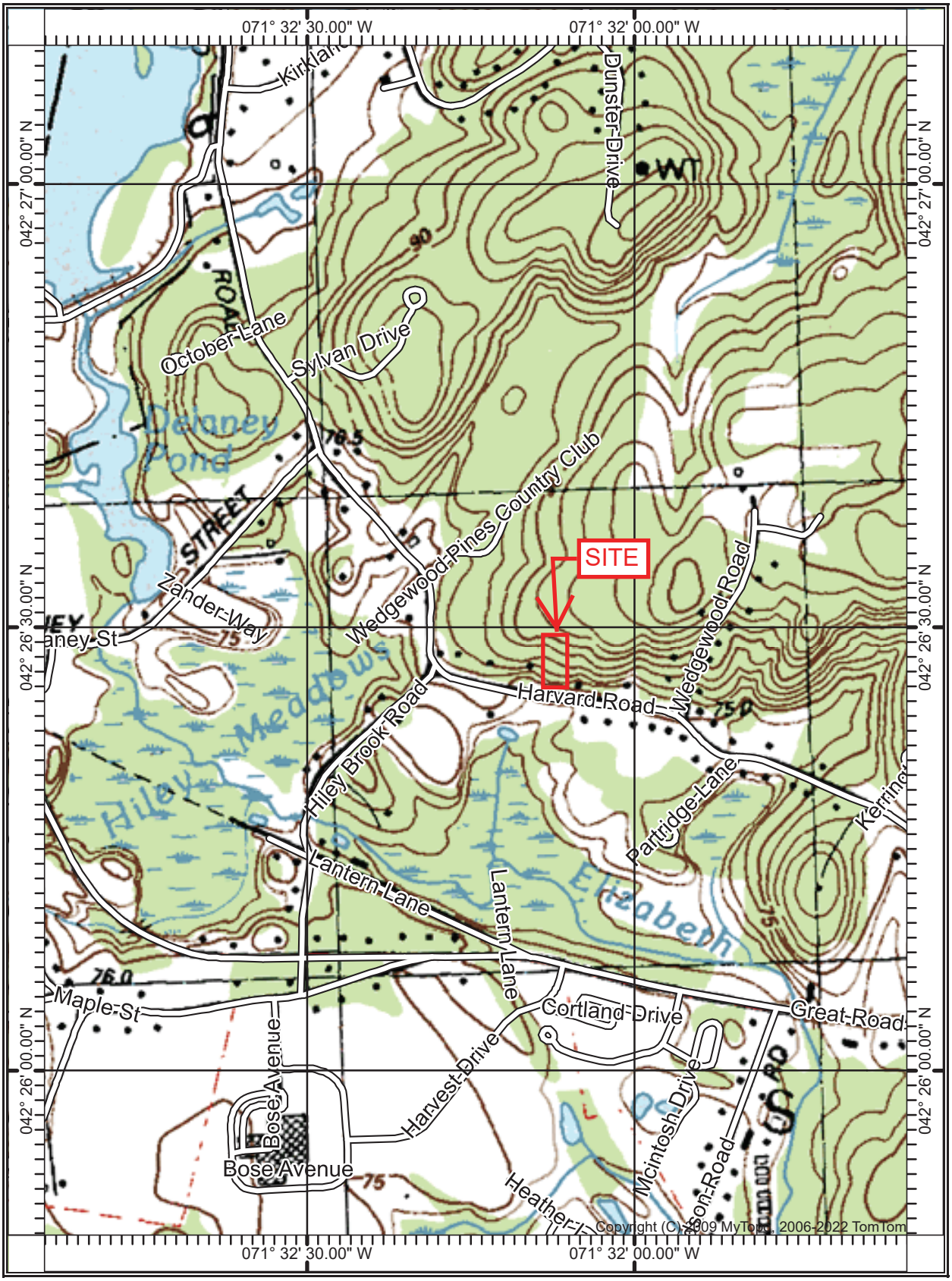
2-YR DESIGN STORM	**PRE-DEVELOPMENT**		**POST-DEVELOPMENT**	
	Q (cfs)	**V (cubic ft)**	**Q (cfs)**	**V (cubic ft)**
Off-site West (1S/1S)	0.12	451	0.12	451
Off-site South (2S/51R)	0.38	1,552	0.07	496

10-YR DESIGN STORM	**PRE-DEVELOPMENT**		**POST-DEVELOPMENT**	
	Q (cfs)	**V (cubic ft)**	**Q (cfs)**	**V (cubic ft)**
Off-site West (1S/1S)	0.30	1,031	0.30	1,031
Off-site South (2S/51R)	1.16	4,041	0.75	2,824

100-YR DESIGN STORM	**PRE-DEVELOPMENT**		**POST-DEVELOPMENT**	
	Q (cfs)	**V (cubic ft)**	**Q (cfs)**	**V (cubic ft)**
Off-site West (1S/1S)	0.80	2,719	0.80	2,719
Off-site South (2S/51R)	3.53	11,877	3.46	10,747

Conclusions

The calculations demonstrate that the proposed drainage mitigation at Lot 2 Harvard Road adequately controls both rate and volume of runoff from development of the lot for the design storms analyzed.



SCALE 1:12000

0 1000 2000 3000

FEET

Map Scale: 1:3,430 if printed on A landscape (11" x 8.5") sheet.

N

0 50 100 200 300 Meters

0 150 300 600 900 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

Map Unit Legend

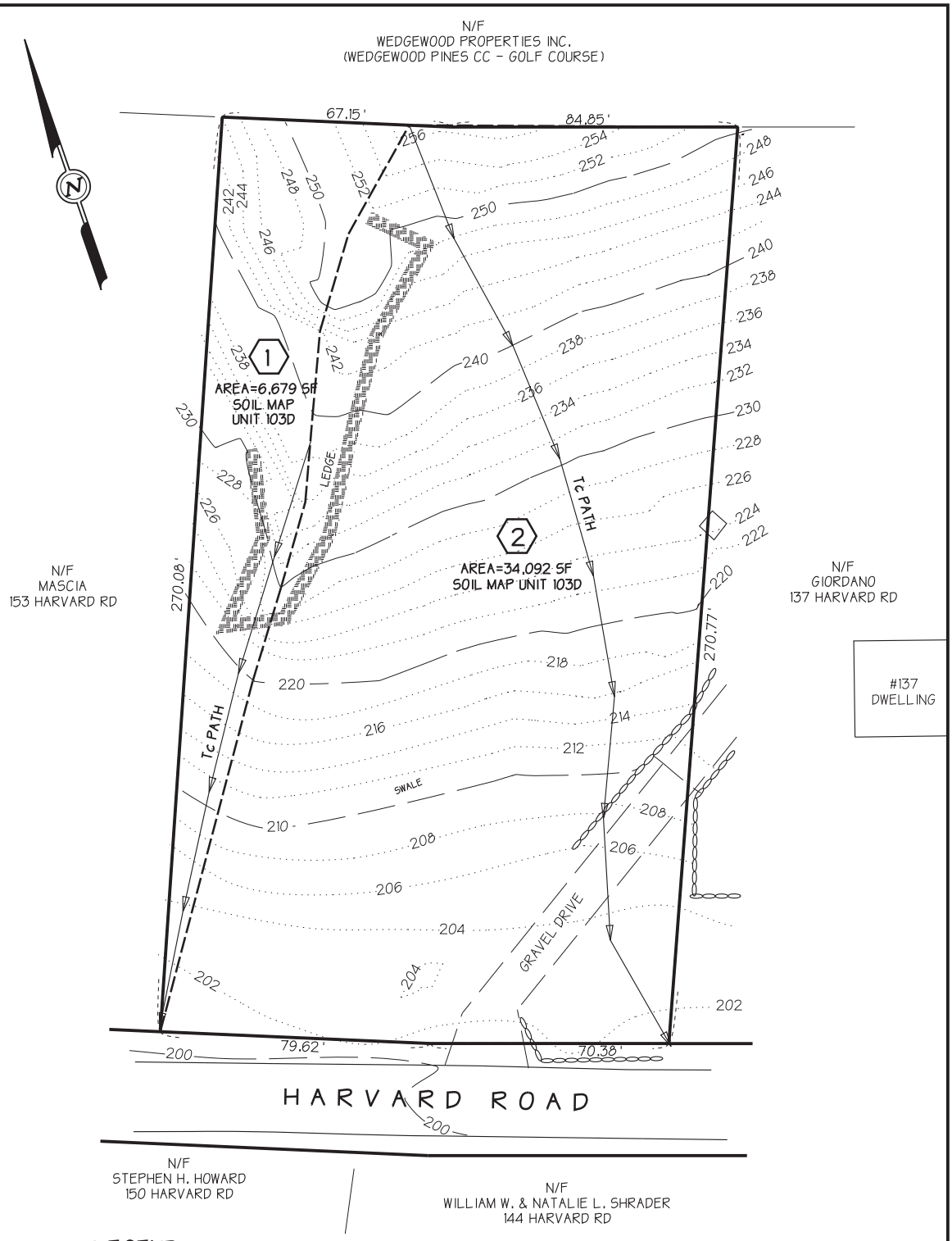
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
6A	Scarboro mucky fine sandy loam, 0 to 3 percent slopes	1.1	1.9%
51A	Swansea muck, 0 to 1 percent slopes	0.0	0.0%
73B	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	0.2	0.3%
103B	Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes	3.8	6.8%
103C	Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes	7.1	12.7%
103D	Charlton-Hollis-Rock outcrop complex, 15 to 25 percent slopes	17.3	30.9%
253B	Hinckley loamy sand, 3 to 8 percent slopes	5.9	10.5%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	12.0	21.5%
256B	Deerfield loamy fine sand, 3 to 8 percent slopes	3.5	6.2%
302C	Montauk fine sandy loam, 8 to 15 percent slopes, extremely stony	3.7	6.7%
312B	Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony	1.3	2.4%
Totals for Area of Interest		**55.8**	**100.0%**

Table D.13.1 Hydrologic Soil Properties Classified by Soil Texture*

Texture Class	Effective Water Capacity (C_w) (inch per inch)	Minimum Infiltration Rate (f) (inches per hour)	Hydrologic Soil Grouping
Sand	0.35	8.27	A
Loamy Sand	0.31	2.41	A
Sandy Loam	0.25	1.02	A
Loam	0.19	0.52	B
Silt Loam	0.17	0.27	B
Sandy Clay Loam	0.14	0.17	C
Clay Loam	0.14	0.09	D
Silty Clay Loam	0.11	0.06	D
Sandy Clay	0.09	0.05	D
Silty Clay	0.09	0.04	D
Clay	0.08	0.02	D

* Source: Rawls, Brakensiek and Saxton, 1982

Based on the soil textural classes and the corresponding minimum infiltration rates, a restriction is established to eliminate unsuitable soil conditions. Soil textures with minimum infiltration rates less than 0.52 inches per hour are not suitable for usage of infiltration practices. These include soils that have a 30 percent clay content, making these soils susceptible to frost heaving and structurally unstable, in addition to having a poor capacity to percolate runoff. Soil textures that are recommended for infiltration systems include those soils with infiltration rates of 0.52 inches per hour or greater, which include loam, sandy loam, loamy sand, and sand.



LEGEND

- (1) SUBCATCHMENT AREA LABEL (TYP.)
- SUBCATCHMENT AREA BOUNDARY
- TIME OF CONCENTRATION PATH*

*MIN. Tc OF 6 MIN. UTILIZED FOR DESIGN CALCULATIONS

NOTE: ALL SOILS IN THE STUDY AREA ARE CHARLTON-HOLLIS ROCK OUTCROP COMPLEX NRCS SOIL MAP UNIT 103D

0 30 60 90 FT
0 15 30 M

PRE-DEVELOPMENT DRAINAGE PLAN

LOT 2 HARVARD ROAD

STOW, MASSACHUSETTS

DATE: OCT. 28, 2022
SCALE: 1"=30'

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16 Gleasondale Road Suite 1-1
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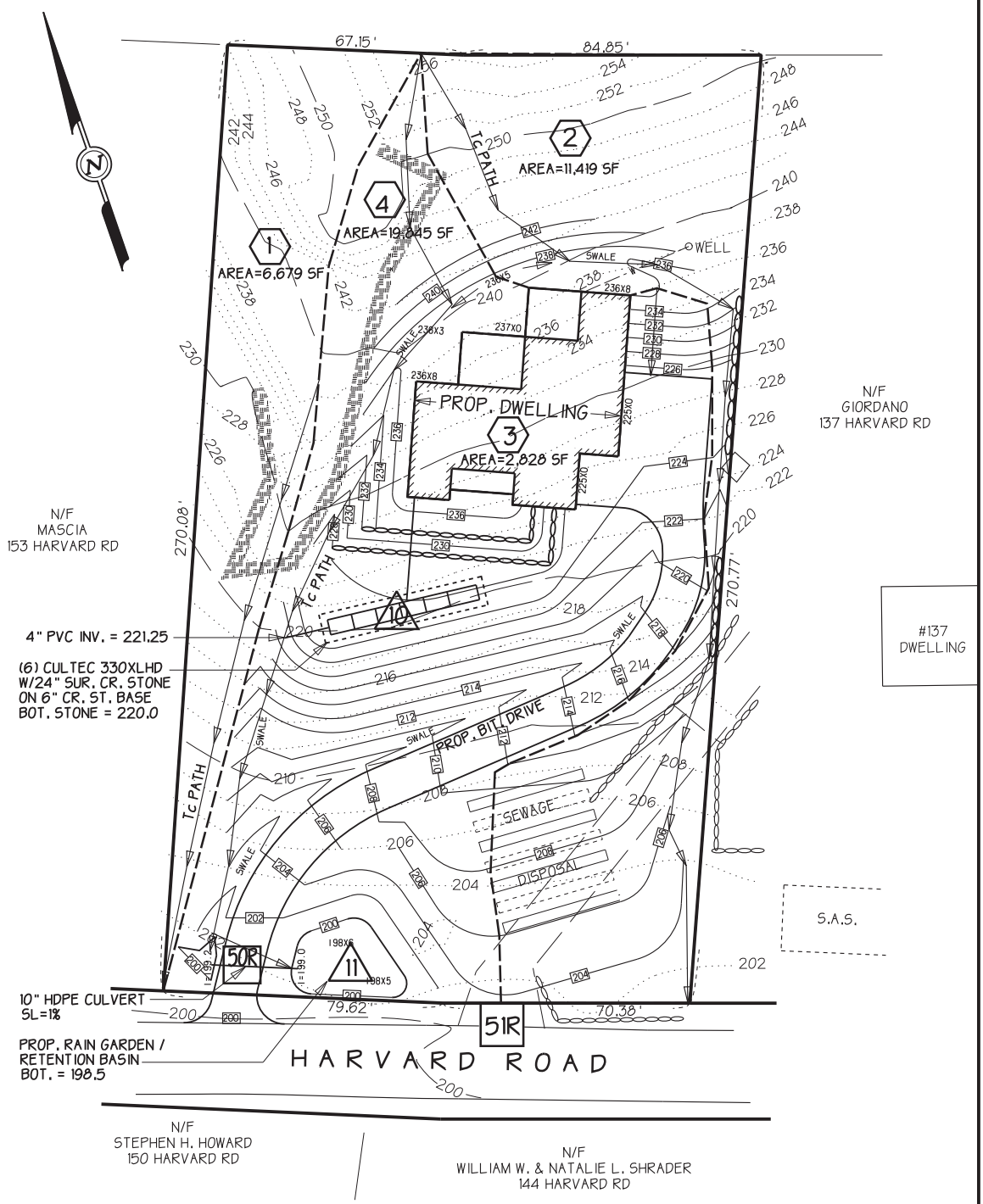

LEGEND

(1) SUBCATCHMENT AREA LABEL (TYP.)

SUBCATCHMENT AREA BOUNDARY

TIME OF CONCENTRATION PATH*

*MIN. Tc OF 6 MIN. UTILIZED FOR DESIGN CALCULATIONS

NOTE: ALL SOILS IN THE STUDY AREA ARE CHARLTON-HOLLIS ROCK OUTCROP COMPLEX NRCS SOIL MAP UNIT 103D

0 30 60 90 FT

0 15 30 M

POST-DEVELOPMENT DRAINAGE PLAN

LOT 2 HARVARD ROAD

STOW, MASSACHUSETTS

DATE: OCT. 28, 2022
SCALE: 1"=30'

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APPENDIX F

EROSION & SEDIMENTATION CONTROL PLAN REPORT

LOT 2 HARVARD ROAD, STOW

CONTENTS

1. Planned Erosion and Sedimentation Control Measures During Construction

12" Staked Straw Wattle Erosion Control Barrier

A 12" staked straw wattle erosion control barrier is proposed to be installed along the down-gradient limit of work. Additionally, 4-ft HDPE construction fencing is proposed around the up-gradient limit of work to limit site disturbance to establish a clear limit of work. The siltation barrier and construction fencing will be installed prior to the commencement of work. An additional supply of wattles or straw bales shall be stored on-site to replace and/or repair barriers damaged by and during construction activities and to reinforce problem areas. The erosion control barrier shall be inspected and maintained on a weekly basis during construction and repaired or replaced as necessary until final site stabilization has occurred.

Stabilized Crushed Stone Construction Entrance

A stabilized 2-3" washed crushed stone construction entrance shall be installed at the construction entrance from Harvard Road at the start of construction and maintained until all construction is complete and disturbed surfaces have been stabilized with vegetation or other final stabilizing cover. Crushed stone shall be removed if/when voids become filled with sediment and/or when tracking of silt or soil onto the public way is observed.

Surface Stabilization

The surface of all disturbed areas shall be stabilized during and after construction. Temporary measures shall be taken during construction to prevent erosion and siltation. All disturbed slopes will be stabilized with a permanent vegetative cover. Some or all of the following measures may be utilized on this project as conditions may warrant.

a. Temporary Seeding
b. Temporary Mulching
c. Permanent Seeding
d. Placement of Sod
e. Hydroseeding
f. Placement of Hay
g. Placement of Jute Netting

2. Long-Term Inspection and Maintenance Measures After Construction

Stormwater Management System Owners & Party Responsible for Maintenance:

John Giordano
30 Heritage Lane
Stow, MA 01775
Phone (978) 375-3336

Erosion Control

Eroded sediments can adversely affect the performance of the stormwater management system. Eroding or barren areas should be re-vegetated immediately with permanent stabilizing cover or temporary measures (wood chips, bark mulch, etc.) if not to be permanently stabilized immediately.

Debris and Litter Removal

Trash may collect in the BMP's, potentially causing clogging of the facilities. All debris and litter shall be collected and stored in designated refuse receptacles until it can be removed from the site for proper disposal. The site shall be inspected for debris and litter weekly during construction, and after each substantial storm event that occurs during construction.

3. Illicit Discharge Compliance Statement

(1) Prohibition of Illicit Discharges.

(a) Prohibition. No person shall throw, drain, discharge, cause to be discharged, or allow others under their control to discharge into the storm sewer system or watercourse any materials other than stormwater, including but not limited to pollutants or waters containing pollutants.

(b) Exemptions. The following non-stormwater discharges are excluded from (a) above:

(1) waterline flushing or other potable water sources;

(2) landscape irrigation or lawn watering;

(3) diverted, natural riparian habitat and/or wetland flows;

(4) rising ground water, ground water infiltration to storm drains, and/or uncontaminated pumped groundwater;

(5)foundation or footing drains (not including active ground water dewatering systems) and crawl space pumps;

(6) air conditioning condensation;

(7) springs;

(8) other water sources determined by the Massachusetts Department of Environmental Protection, in writing, as not containing pollutants that cause or contribute to waterway degradation, including but not limited to a violation of applicable water quality standards and/or degradation of the biotic integrity of surface water bodies and their floodplains.

Drywell Operation & Maintenance Plan

The property owner of record shall be responsible for the design, performance, operation, and maintenance of the drywell system proposed for this site. Drywells that cease to drain in a 48-hour period due to clogging shall be replaced by the owner.

Drywell Inspection

Drywell inspections are to be performed annually by the owner or whenever ponding is still evident 48 hours after a storm. The inspection procedure should include visual inspection of roof gutter for accumulation of debris and removal of the inspection port cover and inspection of the interior of the system. Inspections shall be documented with a written report and kept on file by the drywell facility owner. Annual inspection reports should also be sent to the Weston Stormwater Engineer.

Should inspection reveal that the system is no longer effective and cannot be returned to effective use, a new system should be installed. Drywell maintenance should occur when inspection shows:

- Drainage time has increased beyond 48 hours
- A non-stormwater discharge has entered the system
- Upon change of ownership of the system

Drywell Maintenance

Drywell maintenance may include, but is not limited to;

- Removal of sediment, trash, and debris from the system
- Purging of accumulated silt out of the aggregate fill by jetting, surging, or pumping
- Clearing gutters of accumulated debris

CULTEC Recharger® 330XLHD Stormwater Chamber

The Recharger® 330XLHD is a 30.5" (775 mm) tall, high capacity chamber. Typically when using this model, fewer chambers are required resulting in less labor and a smaller installation area. The Recharger® 330XLHD has the side portal internal manifold feature. HVLV® FC-24 Feed Connectors are inserted into the side portals to create the internal manifold.

Size (L x W x H)	8.5' x 52" x 30.5"
	2.59 m x 1321 mm x 775 mm
Installed Length	7'
	2.13 m
Length Adjustment per Run	1.50'
	0.46 m
Chamber Storage	7.46 ft^3/ft
	0.69 m^3/m
	52.21 ft^3/unit
	1.48 m^3/unit
Min. Installed Storage	11.32 ft^3/ft
	1.05 m^3/m
	79.26 ft^3/unit
	2.24 m^3/unit
Min. Area Required	33.83 ft^2
	3.14 m^2
Chamber Weight	73.0 lbs
	33.11 kg
Shipping	30 chambers/skid
	2,335 lbs/skid
	10 skids/48' flatbed
Min. Center-to-Center Spacing	4.83'
	1.47 m
Max. Allowable Cover	12'
	3.66 m
Max. Inlet Opening in End Wall	24" HDPE, PVC
	600 mm HDPE, PVC
Max. Allowable O.D. in Side Portal	10" HDPE, 12" PVC
	250 mm HDPE, 300 mm PVC
Compatible Feed Connector	HVLV FC-24 Feed Connector

Calculations are based on installed chamber length.
All above values are nominal.
Min. installed storage includes 6" (152 mm) stone base, 6" (152 mm) stone above crown of chamber and typical stone surround at 58" (1473 mm) center-to-center spacing.

	Stone Foundation Depth		
	6"	12"	18"
	152 mm	305 mm	457 mm
Chamber and Stone Storage Per Chamber	79.26 ft^3	86.03 ft^3	92.79 ft^3
	2.24 m^3	2.44 m^3	2.63 m^3
Min. Effective Depth	3.54'	4.04'	4.54'
	1.08 m	1.23 m	1.38 m
Stone Required Per Chamber	2.50 yd^3	3.13 yd^3	3.76 yd^3
	1.91 m^3	2.39 m^3	2.87 m^3

Calculations are based on installed chamber length.
Includes 6" (305 mm) stone above crown of chamber and typical stone surround at 58"(1473 mm) center-to-center spacing and stone foundation as listed in table.
Stone void calculated at 40%.

Recharger® 330XLHD Bare Chamber Storage Volumes

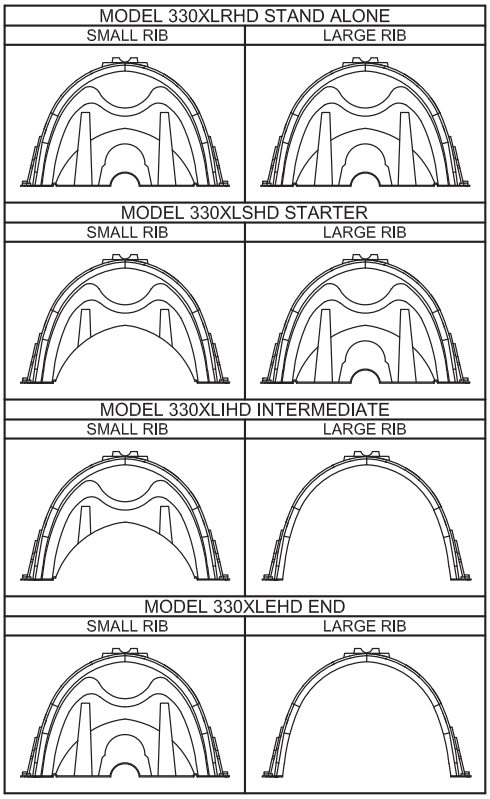
Elevation		Incremental Storage Volume				Cumulative Storage	
in.	mm	ft^3/ft	m^3/m	ft^3	m^3	ft^3	m^3
30.5	775	0.000	0.000	0.000	0.000	52.213	1.479
30	762	0.019	0.002	0.133	0.004	52.213	1.479
29	737	0.051	0.005	0.357	0.010	52.080	1.475
28	711	0.084	0.008	0.588	0.017	51.723	1.465
27	686	0.124	0.012	0.868	0.025	51.135	1.448
26	660	0.150	0.014	1.05	0.030	50.267	1.424
25	635	0.173	0.016	1.211	0.034	49.217	1.394
24	609	0.191	0.018	1.337	0.038	48.006	1.360
23	584	0.207	0.019	1.449	0.041	46.669	1.322
22	559	0.221	0.021	1.547	0.044	45.220	1.281
21	533	0.233	0.022	1.631	0.046	43.673	1.237
20	508	0.244	0.023	1.708	0.048	42.042	1.191
19	483	0.254	0.024	1.778	0.050	40.334	1.142
18	457	0.264	0.025	1.848	0.052	38.556	1.092
17	432	0.271	0.025	1.897	0.054	36.708	1.040
16	406	0.283	0.026	1.981	0.056	34.811	0.986
15	381	0.294	0.027	2.058	0.058	32.830	0.930
14	356	0.296	0.027	2.072	0.059	30.772	0.871
13	330	0.299	0.028	2.093	0.059	28.700	0.813
12	305	0.301	0.028	2.107	0.060	26.607	0.754
11	279	0.303	0.028	2.121	0.060	24.500	0.694
10	254	0.304	0.028	2.128	0.060	22.379	0.634
9	229	0.306	0.028	2.142	0.061	20.251	0.574
8	203	0.313	0.029	2.191	0.062	18.109	0.513
7	178	0.321	0.030	2.247	0.064	15.918	0.451
6	152	0.322	0.030	2.254	0.064	13.671	0.387
5	127	0.323	0.030	2.261	0.064	11.417	0.323
4	102	0.324	0.030	2.268	0.064	9.156	0.259
3	76	0.325	0.030	2.275	0.064	6.888	0.195
2	51	0.327	0.030	2.289	0.065	4.613	0.131
1	25	0.332	0.031	2.324	0.066	2.324	0.066
Total		7.459	0.693	52.213	1.479	52.213	1.479

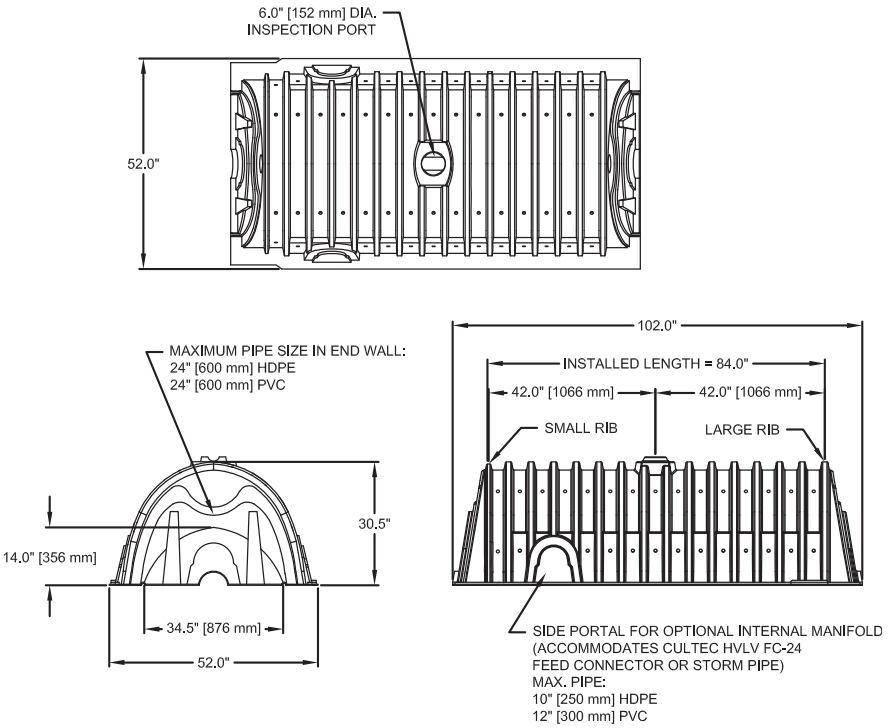
Calculations are based on installed chamber length.

Visit http://cultec.com/downloads/
for Product Downloads and CAD details.

For more information, contact CULTEC at (203) 775-4416 or visit www.cultec.com.

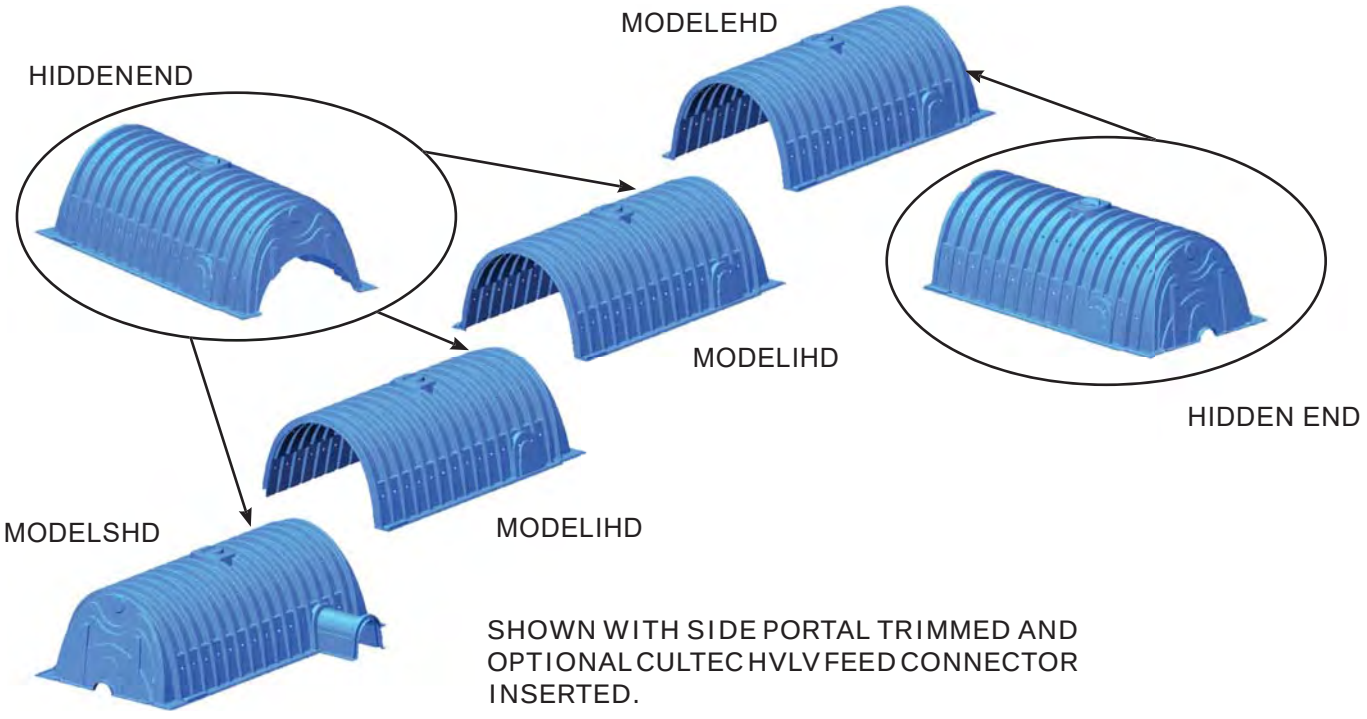
Three View Drawing





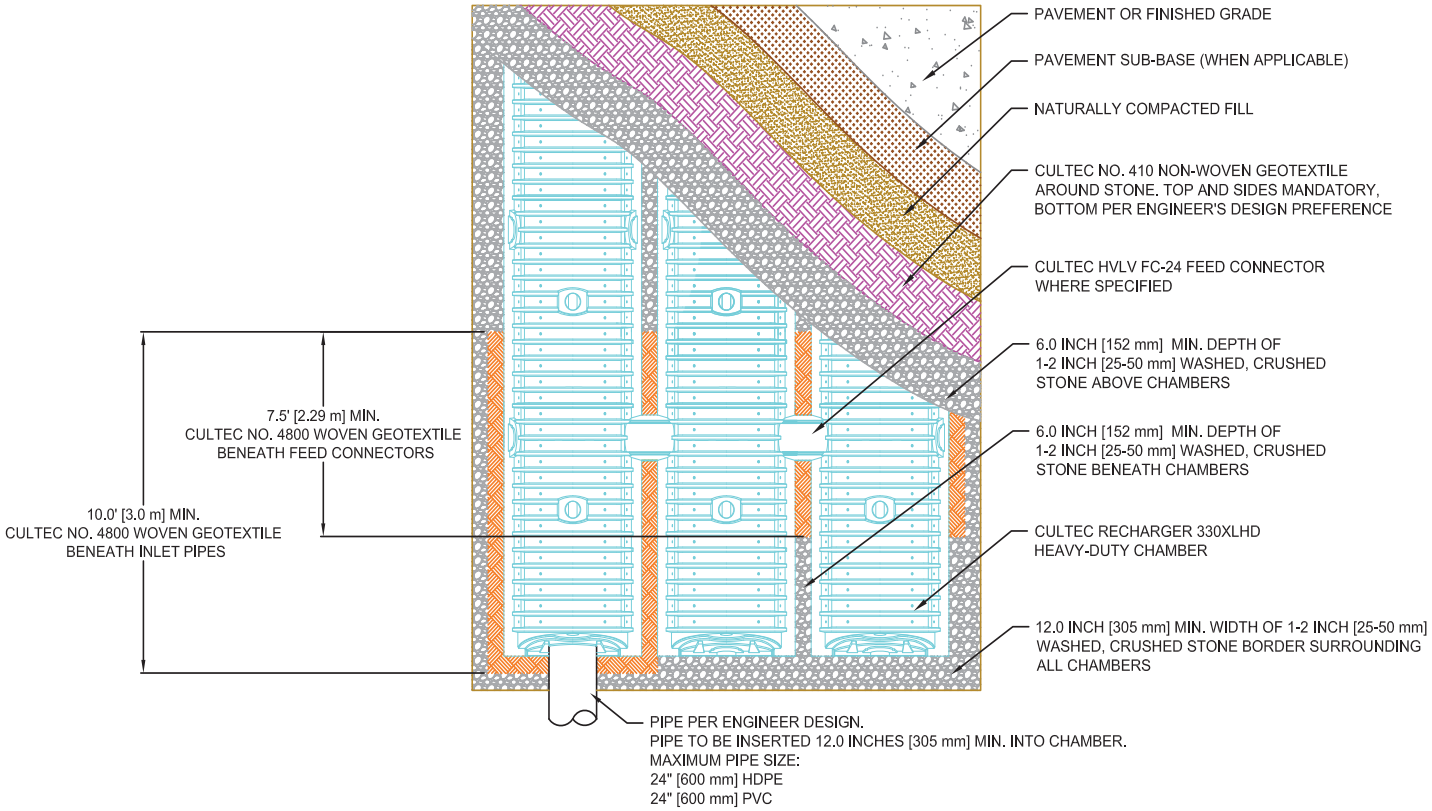
CULTEC RECHARGER 330XLHD CHAMBER STORAGE = 7.459 CF/FT [0.693 m³/m]
INSTALLED LENGTH ADJUSTMENT = 1.5' [0.46 m]
SIDE PORTAL ACCEPTS CULTEC HVLV FC-24 FEED CONNECTOR

Typical Interlock Installation

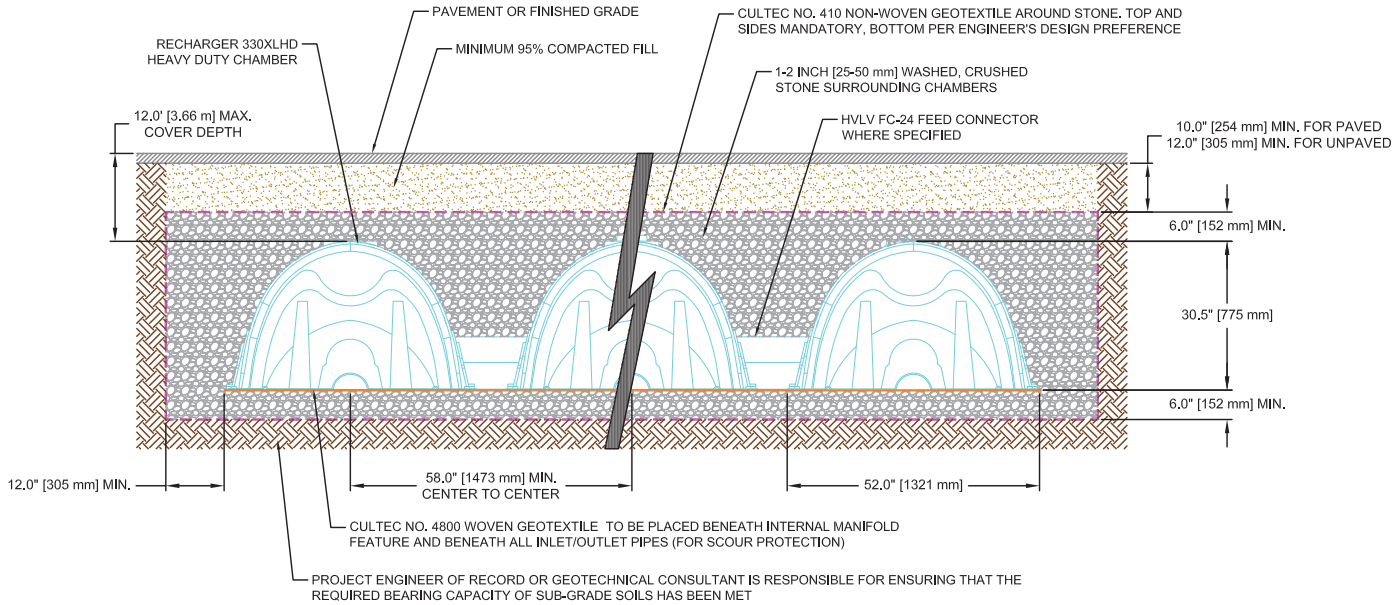


SHOWN WITH SIDE PORTAL TRIMMED AND OPTIONAL CULTEC HVLV FEED CONNECTOR INSERTED.

Plan View Drawing



Typical Cross Section for Traffic Application



CULTEC Recharger® 330XLHD Specifications

GENERAL

CULTEC Recharger® 330XLHD chambers are designed for underground stormwater management. The chambers may be used for retention, recharging, detention or controlling the flow of on-site stormwater runoff.

CHAMBER PARAMETERS

1. The chambers shall be manufactured in the U.S.A. by CULTEC, Inc. of Brookfield, CT (cultec.com, 203-775-4416).
2. The chamber shall be vacuum thermoformed of polyethylene with a black interior and blue exterior.
3. The chamber shall be arched in shape.
4. The chamber shall be open-bottomed.
5. The chamber shall be joined using an interlocking overlapping rib method. Connections must be fully shouldered overlapping ribs, having no separate couplings or separate end walls.
6. The nominal chamber dimensions of the CULTEC Recharger® 330XLHD shall be 30.5 inches (775 mm) tall, 52 inches (1321 mm) wide and 8.5 feet (2.59 m) long. The installed length of a joined Recharger® 330XLHD shall be 7 feet (2.13 m).
7. Maximum inlet opening on the chamber end wall is 24 inches (600 mm) HDPE, PVC.
8. The chamber shall have two side portals to accept CULTEC HVLV® FC-24 Feed Connectors to create an internal manifold. Maximum allowable O.D. in the side portal is 10 inches (250 mm) HDPE and 12 inches (300 mm) PVC.
9. The nominal chamber dimensions of the CULTEC HVLV® FC-24 Feed Connector shall be 12 inches (305 mm) tall, 16 inches (406 mm) wide and 24.2 inches (614 mm) long.
10. The nominal storage volume of the Recharger® 330XLHD chamber shall be 7.459 ft^3 / ft (0.693 m^3 / m) - without stone. The nominal storage volume of a single Recharger® 330XLRHD Stand Alone unit shall be 63.40 ft^3 (1.80 m^3) - without stone. The nominal storage volume of a joined Recharger® 330XLIHD Intermediate unit shall be 52.213 ft^3 (1.478 m^3) - without stone. The nominal storage volume of the length adjustment amount per run shall be 11.19 ft^3 (1.04 m^3) - without stone.
11. The nominal storage volume of the HVLV® FC-24 Feed Connector shall be 0.913 ft^3 / ft (0.026 m^3 / m) - without stone.
12. The Recharger® 330XLHD chamber shall have fifty-six discharge holes bored into the sidewalls of the unit's core to promote lateral conveyance of water.
13. The Recharger® 330XLHD chamber shall have 16 corrugations.
14. The end wall of the chamber, when present, shall be an integral part of the continuously formed unit. Separate end plates cannot be used with this unit.
15. The Recharger® 330XLRHD Stand Alone unit must be formed as a whole chamber having two fully formed integral end walls and having no separate end plates or separate end walls.
16. The Recharger® 330XLSHD Starter unit must be formed as a whole chamber having one fully formed integral end wall and one partially formed integral end wall with a lower transfer opening of 14 inches (356 mm) high x 34.5 inches (876 mm) wide.
17. The Recharger® 330XLIHD Intermediate unit must be formed as a whole chamber having one fully open end wall and one partially formed integral end wall with a lower transfer opening of 14 inches (356 mm) high x 34.5 inches (876 mm) wide.
18. The Recharger® 330XLEHD End unit must be formed as a whole chamber having one fully formed integral end wall and one fully open end wall and having no separate end plates or end walls.
19. The HVLV® FC-24 Feed Connector must be formed as a whole chamber having two open end walls and having no separate end plates or separate end walls. The unit shall fit into the side portals of the Recharger® 330XLHD and act as cross feed connections.
20. Chambers must have horizontal stiffening flex reduction steps between the ribs.
21. The chamber shall have a raised integral cap at the top of the arch in the center of each unit to be used as an optional inspection port or clean-out.
22. The units may be trimmed to custom lengths by cutting back to any corrugation on the large rib end.
23. The chamber shall be manufactured in an ISO 9001:2015 certified facility.
24. The chamber shall be designed and manufactured to meet the material and structural requirements of IAPMO PS 63-2019, including resistance to AASHTO H-10 and H-20 highway live loads, when installed in accordance with CULTEC's installation instructions.
25. The chamber shall be designed and manufactured in accordance with the specifications of NSAI Irish Agrement Board Certificate for Cultec Attenuation and Infiltration.
26. Maximum allowable cover over the top of the chamber shall be 12' (3.66 m).
27. The chamber shall be designed to withstand traffic loads when installed according to CULTEC's recommended installation instructions.

RETENTION BASIN INSPECTION & MAINTENANCE PLAN

RETENTION POND INFORMATION

Retention ponds are designed to settle out sediment and associated pollutants to improve water quality. Retention ponds also provide rate and flood control prior to discharging into the storm drain system of a receiving waterway.

RETENTION POND INSPECTION/MAINTENANCE

The CURRENT OWNER or their designee is responsible for completing inspections and conducting maintenance.

WHEN WILL THE RETENTION POND BE INSPECTED AND MAINTAINED?

At a minimum, Retention ponds must be inspected once per year. Additional inspections are recommended during or after rain events. Personnel should be aware of the maintenance plan. It is recommended to consult with the designer and builder to understand the inspection and maintenance needs.

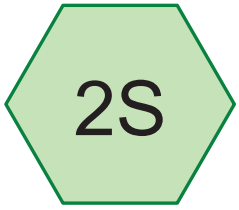
INSPECTION & MAINTENANCE CHECKLIST (to be completed once/year):

	Visually inspect for sediment and debris accumulation within the pond and pre- treatment (e.g. sumps, forebay) areas annually.
	Clean pond if sediment/debris accumulates taking up 50% of the storage capacity or the pond is negatively affecting downstream waterways or properties.
	Detailed inspection of sediment accumulation (sediment survey) every 5-7 years.
	Inspect drainage area for erosion and possible illicit discharges.
	Repair clogging or erosion at the inlets, outlets, and overflow.
	Perform any mowing or weed control needed. Identify pond bank erosion and repair as needed.

Appendix H

HydroCAD Output

OFF SITE WEST



SOUTH TO HARVARD RD

Subcat Reach Pond Link

Routing Diagram for 2152_PRE-DEVELOPMENT
Prepared by FORESITE ENGINEERING, Printed 11/4/2022

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-YR	NRCC 24-hr	D	Default	24.00	1	3.09	2
2	10-YR	NRCC 24-hr	D	Default	24.00	1	4.65	2
3	100-YR	NRCC 24-hr	D	Default	24.00	1	8.36	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
19,729	67	Brush, Poor, HSG B (2S)
1,000	98	Paved parking, HSG B (2S)
2,551	98	Unconnected pavement, HSG B (1S)
13,363	60	Woods, Fair, HSG B (2S)
4,128	55	Woods, Good, HSG B (1S)
40,771	**66**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
40,771	HSG B	1S, 2S
0	HSG C	
0	HSG D	
0	Other	
40,771		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subca Numb
0	19,729	0	0	0	19,729	Brush, Poor	
0	1,000	0	0	0	1,000	Paved parking	
0	2,551	0	0	0	2,551	Unconnected pavement	
0	13,363	0	0	0	13,363	Woods, Fair	
0	4,128	0	0	0	4,128	Woods, Good	
0	**40,771**	**0**	**0**	**0**	**40,771**	**TOTAL AREA**	

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: OFF SITE WEST Runoff Area=6,679 sf 38.19% Impervious Runoff Depth>0.81"
Flow Length=125' Tc=6.3 min CN=71 Runoff=0.12 cfs 451 cf

Subcatchment 2S: SOUTH TO HARVARD RD Runoff Area=34,092 sf 2.93% Impervious Runoff Depth>0.55"
Flow Length=200' Slope=0.2000 '/' Tc=6.0 min CN=65 Runoff=0.38 cfs 1,552 cf

Total Runoff Area = 40,771 sf Runoff Volume = 2,004 cf Average Runoff Depth = 0.59"
91.29% Pervious = 37,220 sf 8.71% Impervious = 3,551 sf

Summary for Subcatchment 1S: OFF SITE WEST

Runoff = 0.12 cfs @ 12.14 hrs, Volume= 451 cf, Depth> 0.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-YR Rainfall=3.09"

Area (sf)	CN	Description
2,551	98	Unconnected pavement, HSG B
4,128	55	Woods, Good, HSG B
6,679	71	Weighted Average
4,128		61.81% Pervious Area
2,551		38.19% Impervious Area
2,551		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	25	0.1500	0.07		**Sheet Flow, Overland** Woods: Dense underbrush n= 0.800 P2= 3.09"
0.7	100	0.2000	2.24		**Shallow Concentrated Flow, Overland** Woodland Kv= 5.0 fps
6.3	125	Total			

Summary for Subcatchment 2S: SOUTH TO HARVARD RD

Runoff = 0.38 cfs @ 12.14 hrs, Volume= 1,552 cf, Depth> 0.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-YR Rainfall=3.09"

Area (sf)	CN	Description
1,000	98	Paved parking, HSG B
13,363	60	Woods, Fair, HSG B
19,729	67	Brush, Poor, HSG B
34,092	65	Weighted Average
33,092		97.07% Pervious Area
1,000		2.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	25	0.2000	0.36		**Sheet Flow, SHEET FLOW** Range n= 0.130 P2= 3.09"
1.3	175	0.2000	2.24		**Shallow Concentrated Flow, SH CONC. FLOW** Woodland Kv= 5.0 fps
2.5	200	Total, Increased to minimum Tc = 6.0 min			

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: OFF SITE WEST Runoff Area=6,679 sf 38.19% Impervious Runoff Depth>1.85"
Flow Length=125' Tc=6.3 min CN=71 Runoff=0.30 cfs 1,031 cf

Subcatchment 2S: SOUTH TO HARVARD RD Runoff Area=34,092 sf 2.93% Impervious Runoff Depth>1.42"
Flow Length=200' Slope=0.2000 '/' Tc=6.0 min CN=65 Runoff=1.16 cfs 4,041 cf

Total Runoff Area = 40,771 sf Runoff Volume = 5,072 cf Average Runoff Depth = 1.49"
91.29% Pervious = 37,220 sf 8.71% Impervious = 3,551 sf

Summary for Subcatchment 1S: OFF SITE WEST

Runoff = 0.30 cfs @ 12.14 hrs, Volume= 1,031 cf, Depth> 1.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-YR Rainfall=4.65"

Area (sf)	CN	Description
2,551	98	Unconnected pavement, HSG B
4,128	55	Woods, Good, HSG B
6,679	71	Weighted Average
4,128		61.81% Pervious Area
2,551		38.19% Impervious Area
2,551		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	25	0.1500	0.07		**Sheet Flow, Overland** Woods: Dense underbrush n= 0.800 P2= 3.09"
0.7	100	0.2000	2.24		**Shallow Concentrated Flow, Overland** Woodland Kv= 5.0 fps
6.3	125	Total			

Summary for Subcatchment 2S: SOUTH TO HARVARD RD

Runoff = 1.16 cfs @ 12.14 hrs, Volume= 4,041 cf, Depth> 1.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-YR Rainfall=4.65"

Area (sf)	CN	Description
1,000	98	Paved parking, HSG B
13,363	60	Woods, Fair, HSG B
19,729	67	Brush, Poor, HSG B
34,092	65	Weighted Average
33,092		97.07% Pervious Area
1,000		2.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	25	0.2000	0.36		**Sheet Flow, SHEET FLOW** Range n= 0.130 P2= 3.09"
1.3	175	0.2000	2.24		**Shallow Concentrated Flow, SH CONC. FLOW** Woodland Kv= 5.0 fps
2.5	200	Total, Increased to minimum Tc = 6.0 min			

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: OFF SITE WEST Runoff Area=6,679 sf 38.19% Impervious Runoff Depth>4.89"
Flow Length=125' Tc=6.3 min CN=71 Runoff=0.80 cfs 2,719 cf

Subcatchment 2S: SOUTH TO HARVARD RD Runoff Area=34,092 sf 2.93% Impervious Runoff Depth>4.18"
Flow Length=200' Slope=0.2000 '/' Tc=6.0 min CN=65 Runoff=3.53 cfs 11,877 cf

Total Runoff Area = 40,771 sf Runoff Volume = 14,596 cf Average Runoff Depth = 4.30"
91.29% Pervious = 37,220 sf 8.71% Impervious = 3,551 sf

Summary for Subcatchment 1S: OFF SITE WEST

Runoff = 0.80 cfs @ 12.13 hrs, Volume= 2,719 cf, Depth> 4.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-YR Rainfall=8.36"

Area (sf)	CN	Description
2,551	98	Unconnected pavement, HSG B
4,128	55	Woods, Good, HSG B
6,679	71	Weighted Average
4,128		61.81% Pervious Area
2,551		38.19% Impervious Area
2,551		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	25	0.1500	0.07		**Sheet Flow, Overland** Woods: Dense underbrush n= 0.800 P2= 3.09"
0.7	100	0.2000	2.24		**Shallow Concentrated Flow, Overland** Woodland Kv= 5.0 fps
6.3	125	Total			

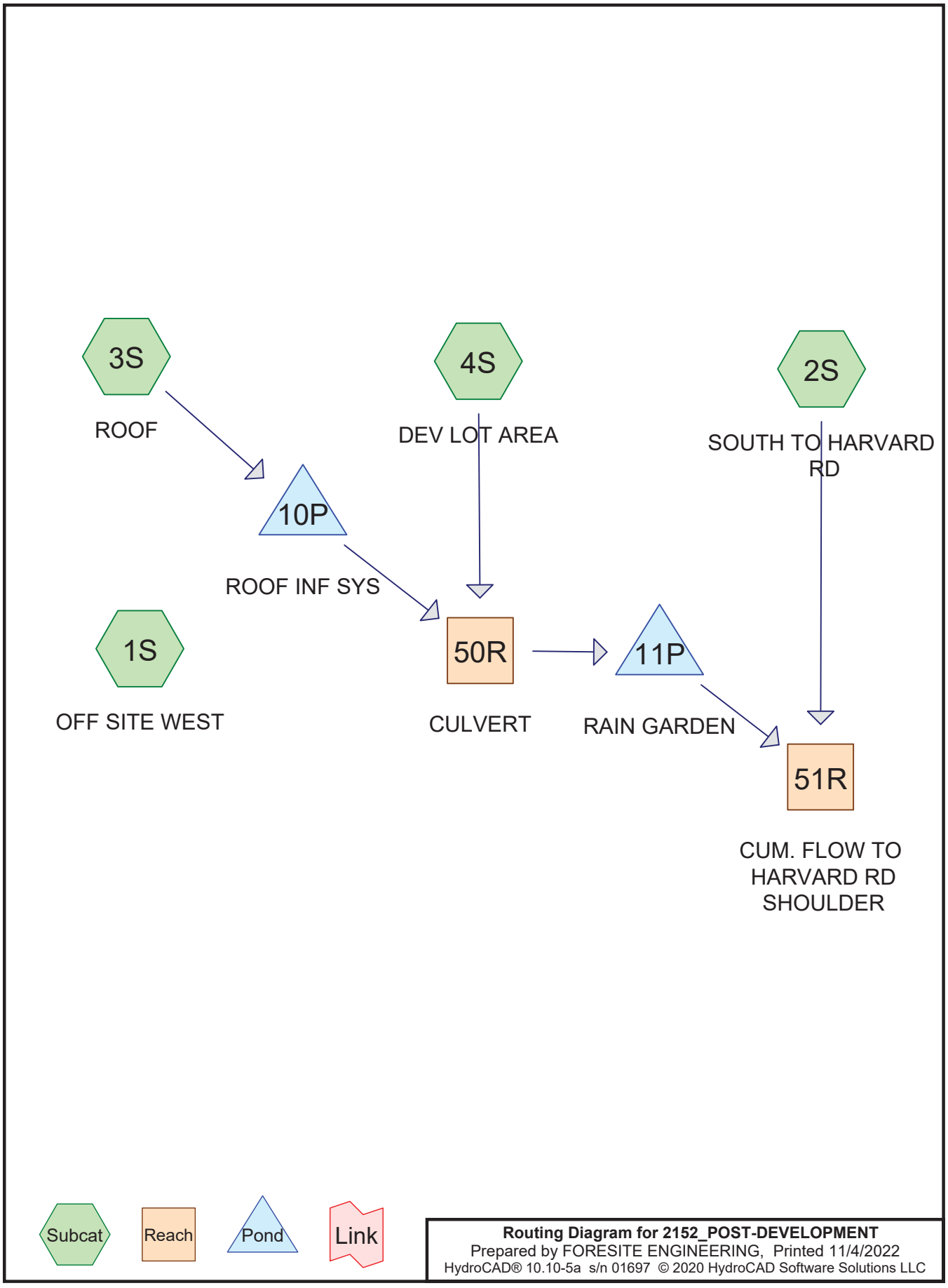
Summary for Subcatchment 2S: SOUTH TO HARVARD RD

Runoff = 3.53 cfs @ 12.13 hrs, Volume= 11,877 cf, Depth> 4.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-YR Rainfall=8.36"

Area (sf)	CN	Description
1,000	98	Paved parking, HSG B
13,363	60	Woods, Fair, HSG B
19,729	67	Brush, Poor, HSG B
34,092	65	Weighted Average
33,092		97.07% Pervious Area
1,000		2.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	25	0.2000	0.36		**Sheet Flow, SHEET FLOW** Range n= 0.130 P2= 3.09"
1.3	175	0.2000	2.24		**Shallow Concentrated Flow, SH CONC. FLOW** Woodland Kv= 5.0 fps
2.5	200	Total, Increased to minimum Tc = 6.0 min			



Routing Diagram for 2152_POST-DEVELOPMENT
Prepared by FORESITE ENGINEERING, Printed 11/4/2022
HydroCAD® 10.10-5a s/n 01697 © 2020 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-YR	NRCC 24-hr	D	Default	24.00	1	3.09	2
2	10-YR	NRCC 24-hr	D	Default	24.00	1	4.65	2
3	100-YR	NRCC 24-hr	D	Default	24.00	1	8.36	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
19,502	61	>75% Grass cover, Good, HSG B (2S, 4S)
3,580	98	Paved parking, HSG B (4S)
2,828	98	Roofs, HSG B (3S)
2,551	98	Unconnected pavement, HSG B (1S)
4,895	60	Woods, Fair, HSG B (2S)
4,128	55	Woods, Good, HSG B (1S)
3,287	58	Woods/grass comb., Good, HSG B (4S)
40,771	**68**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
40,771	HSG B	1S, 2S, 3S, 4S
0	HSG C	
0	HSG D	
0	Other	
40,771		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
0	19,502	0	0	0	19,502	>75% Grass cover, Good	
0	3,580	0	0	0	3,580	Paved parking	
0	2,828	0	0	0	2,828	Roofs	
0	2,551	0	0	0	2,551	Unconnected pavement	
0	4,895	0	0	0	4,895	Woods, Fair	
0	4,128	0	0	0	4,128	Woods, Good	
0	3,287	0	0	0	3,287	Woods/grass comb., Good	
0	**40,771**	**0**	**0**	**0**	**40,771**	**TOTAL AREA**	

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: OFF SITE WEST Runoff Area=6,679 sf 38.19% Impervious Runoff Depth>0.81"
Flow Length=125' Tc=6.3 min CN=71 Runoff=0.12 cfs 451 cf

Subcatchment 2S: SOUTH TO HARVARD RD Runoff Area=11,419 sf 0.00% Impervious Runoff Depth>0.40"
Flow Length=200' Tc=6.0 min CN=61 Runoff=0.07 cfs 379 cf

Subcatchment 3S: ROOF Runoff Area=2,828 sf 100.00% Impervious Runoff Depth>2.85"
Flow Length=25' Slope=0.5000 '/' Tc=6.0 min CN=98 Runoff=0.17 cfs 673 cf

Subcatchment 4S: DEV LOT AREA Runoff Area=19,845 sf 18.04% Impervious Runoff Depth>0.63"
Flow Length=275' Tc=6.0 min CN=67 Runoff=0.27 cfs 1,040 cf

Reach 50R: CULVERT Avg. Flow Depth=0.17' Max Vel=3.28 fps Inflow=0.27 cfs 1,040 cf
10.0" Round Pipe n=0.010 L=25.0' S=0.0100 '/' Capacity=2.85 cfs Outflow=0.27 cfs 1,039 cf

Reach 51R: CUM. FLOW TO HARVARD RD SHOULDER Inflow=0.07 cfs 496 cf
Outflow=0.07 cfs 496 cf

Pond 10P: ROOF INF SYS Peak Elev=221.61' Storage=365 cf Inflow=0.17 cfs 673 cf
Discarded=0.00 cfs 336 cf Primary=0.00 cfs 0 cf Outflow=0.00 cfs 336 cf

Pond 11P: RAIN GARDEN Peak Elev=199.90' Storage=591 cf Inflow=0.27 cfs 1,039 cf
Discarded=0.01 cfs 332 cf Primary=0.01 cfs 116 cf Outflow=0.02 cfs 449 cf

Total Runoff Area = 40,771 sf Runoff Volume = 2,543 cf Average Runoff Depth = 0.75"
78.03% Pervious = 31,812 sf 21.97% Impervious = 8,959 sf

Summary for Subcatchment 1S: OFF SITE WEST

Runoff = 0.12 cfs @ 12.14 hrs, Volume= 451 cf, Depth> 0.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-YR Rainfall=3.09"

Area (sf)	CN	Description
2,551	98	Unconnected pavement, HSG B
4,128	55	Woods, Good, HSG B
6,679	71	Weighted Average
4,128		61.81% Pervious Area
2,551		38.19% Impervious Area
2,551		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	25	0.1500	0.07		**Sheet Flow, Overland** Woods: Dense underbrush n= 0.800 P2= 3.09"
0.7	100	0.2000	2.24		**Shallow Concentrated Flow, Overland** Woodland Kv= 5.0 fps
6.3	125	Total			

Summary for Subcatchment 2S: SOUTH TO HARVARD RD

Runoff = 0.07 cfs @ 12.15 hrs, Volume= 379 cf, Depth> 0.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-YR Rainfall=3.09"

Area (sf)	CN	Description
4,895	60	Woods, Fair, HSG B
6,524	61	>75% Grass cover, Good, HSG B
11,419	61	Weighted Average
11,419		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	25	0.2000	0.36		**Sheet Flow, SHEET FLOW** Range n= 0.130 P2= 3.09"
1.2	175	0.2500	2.50		**Shallow Concentrated Flow, SH CONC. FLOW** Woodland Kv= 5.0 fps
2.4	200	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 3S: ROOF

Runoff = 0.17 cfs @ 12.13 hrs, Volume= 673 cf, Depth> 2.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-YR Rainfall=3.09"

Area (sf)	CN	Description
2,828	98	Roofs, HSG B
2,828		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	25	0.5000	3.71		**Sheet Flow, SHEET FLOW** Smooth surfaces n= 0.011 P2= 3.09"
0.1	25	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 4S: DEV LOT AREA

Runoff = 0.27 cfs @ 12.14 hrs, Volume= 1,040 cf, Depth> 0.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-YR Rainfall=3.09"

Area (sf)	CN	Description
3,287	58	Woods/grass comb., Good, HSG B
3,580	98	Paved parking, HSG B
12,978	61	>75% Grass cover, Good, HSG B
19,845	67	Weighted Average
16,265		81.96% Pervious Area
3,580		18.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	25	0.1500	0.13		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 3.09"
0.4	50	0.2000	2.24		**Shallow Concentrated Flow, SH CONC WOODS** Woodland Kv= 5.0 fps
1.1	200	0.2000	3.13		**Shallow Concentrated Flow, SH CONC LAWN** Short Grass Pasture Kv= 7.0 fps
4.7	275	Total, Increased to minimum Tc = 6.0 min			

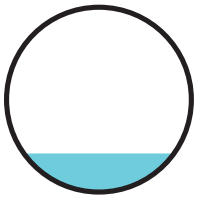
Summary for Reach 50R: CULVERT

Inflow Area = 22,673 sf, 28.26% Impervious, Inflow Depth > 0.55" for 2-YR event
Inflow = 0.27 cfs @ 12.14 hrs, Volume= 1,040 cf
Outflow = 0.27 cfs @ 12.15 hrs, Volume= 1,039 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.28 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.47 fps, Avg. Travel Time= 0.3 min

Peak Storage= 2 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.17' , Surface Width= 0.68'
Bank-Full Depth= 0.83' Flow Area= 0.5 sf, Capacity= 2.85 cfs

10.0" Round Pipe
n= 0.010
Length= 25.0' Slope= 0.0100 '/'
Inlet Invert= 199.20', Outlet Invert= 198.95'



Summary for Reach 51R: CUM. FLOW TO HARVARD RD SHOULDER

Inflow Area = 34,092 sf, 18.80% Impervious, Inflow Depth > 0.17" for 2-YR event
Inflow = 0.07 cfs @ 12.15 hrs, Volume= 496 cf
Outflow = 0.07 cfs @ 12.15 hrs, Volume= 496 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond 10P: ROOF INF SYS

Inflow Area = 2,828 sf,100.00% Impervious, Inflow Depth > 2.85" for 2-YR event
Inflow = 0.17 cfs @ 12.13 hrs, Volume= 673 cf
Outflow = 0.00 cfs @ 7.90 hrs, Volume= 336 cf, Atten= 97%, Lag= 0.0 min
Discarded = 0.00 cfs @ 7.90 hrs, Volume= 336 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 221.61' @ 17.34 hrs Surf.Area= 396 sf Storage= 365 cf

Plug-Flow detention time= 245.0 min calculated for 336 cf (50% of inflow)
Center-of-Mass det. time= 85.9 min (846.5 - 760.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	220.00'	431 cf	**8.33'W x 47.50'L x 3.54'H Field A** 1,402 cf Overall - 324 cf Embedded = 1,078 cf x 40.0% Voids
#2A	220.50'	324 cf	**Cultec R-330XLHD** x 6 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 1 rows
		755 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	220.00'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	222.50'	**4.0" Round Culvert**
			L= 25.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 222.50' / 221.25' S= 0.0500 '/' Cc= 0.900
			n= 0.010 PVC, smooth interior, Flow Area= 0.09 sf

Discarded OutFlow Max=0.00 cfs @ 7.90 hrs HW=220.04' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=220.00' (Free Discharge)
2=Culvert (Controls 0.00 cfs)

Summary for Pond 11P: RAIN GARDEN

Inflow Area = 22,673 sf, 28.26% Impervious, Inflow Depth > 0.55" for 2-YR event
Inflow = 0.27 cfs @ 12.15 hrs, Volume= 1,039 cf
Outflow = 0.02 cfs @ 16.96 hrs, Volume= 449 cf, Atten= 94%, Lag= 288.8 min
Discarded = 0.01 cfs @ 16.96 hrs, Volume= 332 cf
Primary = 0.01 cfs @ 16.96 hrs, Volume= 116 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 199.90' @ 16.96 hrs Surf.Area= 659 sf Storage= 591 cf

Plug-Flow detention time= 368.5 min calculated for 448 cf (43% of inflow)
Center-of-Mass det. time= 186.3 min (1,114.8 - 928.5)

Volume	Invert	Avail.Storage	Storage Description
#1	198.50'	658 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
198.50	0	0	0
199.00	420	105	105
200.00	685	553	658

Device	Routing	Invert	Outlet Devices
#1	Discarded	198.50'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	199.90'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.01 cfs @ 16.96 hrs HW=199.90' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 16.96 hrs HW=199.90' (Free Discharge)
2=Broad-Crested Rectangular Weir (Weir Controls 0.00 cfs @ 0.10 fps)

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: OFF SITE WEST Runoff Area=6,679 sf 38.19% Impervious Runoff Depth>1.85"
Flow Length=125' Tc=6.3 min CN=71 Runoff=0.30 cfs 1,031 cf

Subcatchment 2S: SOUTH TO HARVARD RD Runoff Area=11,419 sf 0.00% Impervious Runoff Depth>1.16"
Flow Length=200' Tc=6.0 min CN=61 Runoff=0.30 cfs 1,105 cf

Subcatchment 3S: ROOF Runoff Area=2,828 sf 100.00% Impervious Runoff Depth>4.41"
Flow Length=25' Slope=0.5000 '/' Tc=6.0 min CN=98 Runoff=0.26 cfs 1,039 cf

Subcatchment 4S: DEV LOT AREA Runoff Area=19,845 sf 18.04% Impervious Runoff Depth>1.56"
Flow Length=275' Tc=6.0 min CN=67 Runoff=0.75 cfs 2,581 cf

Reach 50R: CULVERT Avg. Flow Depth=0.29' Max Vel=4.39 fps Inflow=0.75 cfs 2,675 cf
10.0" Round Pipe n=0.010 L=25.0' S=0.0100 '/' Capacity=2.85 cfs Outflow=0.75 cfs 2,675 cf

Reach 51R: CUM. FLOW TO HARVARD RD SHOULDER Inflow=0.75 cfs 2,824 cf
Outflow=0.75 cfs 2,824 cf

Pond 10P: ROOF INF SYS Peak Elev=222.56' Storage=587 cf Inflow=0.26 cfs 1,039 cf
Discarded=0.00 cfs 370 cf Primary=0.01 cfs 94 cf Outflow=0.01 cfs 465 cf

Pond 11P: RAIN GARDEN Peak Elev=199.96' Storage=629 cf Inflow=0.75 cfs 2,675 cf
Discarded=0.01 cfs 363 cf Primary=0.55 cfs 1,719 cf Outflow=0.56 cfs 2,083 cf

Total Runoff Area = 40,771 sf Runoff Volume = 5,756 cf Average Runoff Depth = 1.69"
78.03% Pervious = 31,812 sf 21.97% Impervious = 8,959 sf

Summary for Subcatchment 1S: OFF SITE WEST

Runoff = 0.30 cfs @ 12.14 hrs, Volume= 1,031 cf, Depth> 1.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-YR Rainfall=4.65"

Area (sf)	CN	Description
2,551	98	Unconnected pavement, HSG B
4,128	55	Woods, Good, HSG B
6,679	71	Weighted Average
4,128		61.81% Pervious Area
2,551		38.19% Impervious Area
2,551		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	25	0.1500	0.07		**Sheet Flow, Overland** Woods: Dense underbrush n= 0.800 P2= 3.09"
0.7	100	0.2000	2.24		**Shallow Concentrated Flow, Overland** Woodland Kv= 5.0 fps
6.3	125	Total			

Summary for Subcatchment 2S: SOUTH TO HARVARD RD

Runoff = 0.30 cfs @ 12.14 hrs, Volume= 1,105 cf, Depth> 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-YR Rainfall=4.65"

Area (sf)	CN	Description
4,895	60	Woods, Fair, HSG B
6,524	61	>75% Grass cover, Good, HSG B
11,419	61	Weighted Average
11,419		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	25	0.2000	0.36		**Sheet Flow, SHEET FLOW** Range n= 0.130 P2= 3.09"
1.2	175	0.2500	2.50		**Shallow Concentrated Flow, SH CONC. FLOW** Woodland Kv= 5.0 fps
2.4	200	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 3S: ROOF

Runoff = 0.26 cfs @ 12.13 hrs, Volume= 1,039 cf, Depth> 4.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-YR Rainfall=4.65"

Area (sf)	CN	Description
2,828	98	Roofs, HSG B
2,828		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	25	0.5000	3.71		**Sheet Flow, SHEET FLOW** Smooth surfaces n= 0.011 P2= 3.09"
0.1	25	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 4S: DEV LOT AREA

Runoff = 0.75 cfs @ 12.14 hrs, Volume= 2,581 cf, Depth> 1.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-YR Rainfall=4.65"

Area (sf)	CN	Description
3,287	58	Woods/grass comb., Good, HSG B
3,580	98	Paved parking, HSG B
12,978	61	>75% Grass cover, Good, HSG B
19,845	67	Weighted Average
16,265		81.96% Pervious Area
3,580		18.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	25	0.1500	0.13		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 3.09"
0.4	50	0.2000	2.24		**Shallow Concentrated Flow, SH CONC WOODS** Woodland Kv= 5.0 fps
1.1	200	0.2000	3.13		**Shallow Concentrated Flow, SH CONC LAWN** Short Grass Pasture Kv= 7.0 fps
4.7	275	Total, Increased to minimum Tc = 6.0 min			

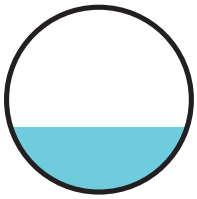
Summary for Reach 50R: CULVERT

Inflow Area = 22,673 sf, 28.26% Impervious, Inflow Depth > 1.42" for 10-YR event
Inflow = 0.75 cfs @ 12.14 hrs, Volume= 2,675 cf
Outflow = 0.75 cfs @ 12.14 hrs, Volume= 2,675 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.39 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.83 fps, Avg. Travel Time= 0.2 min

Peak Storage= 4 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.29' , Surface Width= 0.80'
Bank-Full Depth= 0.83' Flow Area= 0.5 sf, Capacity= 2.85 cfs

10.0" Round Pipe
n= 0.010
Length= 25.0' Slope= 0.0100 '/'
Inlet Invert= 199.20', Outlet Invert= 198.95'



Summary for Reach 51R: CUM. FLOW TO HARVARD RD SHOULDER

Inflow Area = 34,092 sf, 18.80% Impervious, Inflow Depth > 0.99" for 10-YR event
Inflow = 0.75 cfs @ 12.21 hrs, Volume= 2,824 cf
Outflow = 0.75 cfs @ 12.21 hrs, Volume= 2,824 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond 10P: ROOF INF SYS

Inflow Area = 2,828 sf,100.00% Impervious, Inflow Depth > 4.41" for 10-YR event
Inflow = 0.26 cfs @ 12.13 hrs, Volume= 1,039 cf
Outflow = 0.01 cfs @ 14.28 hrs, Volume= 465 cf, Atten= 95%, Lag= 129.2 min
Discarded = 0.00 cfs @ 4.95 hrs, Volume= 370 cf
Primary = 0.01 cfs @ 14.28 hrs, Volume= 94 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 222.56' @ 14.28 hrs Surf.Area= 396 sf Storage= 587 cf

Plug-Flow detention time= 256.4 min calculated for 464 cf (45% of inflow)
Center-of-Mass det. time= 76.9 min (828.1 - 751.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	220.00'	431 cf	**8.33'W x 47.50'L x 3.54'H Field A** 1,402 cf Overall - 324 cf Embedded = 1,078 cf x 40.0% Voids
#2A	220.50'	324 cf	**Cultec R-330XLHD** x 6 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 1 rows
		755 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	220.00'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	222.50'	**4.0" Round Culvert** L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 222.50' / 221.25' S= 0.0500 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.09 sf

Discarded OutFlow Max=0.00 cfs @ 4.95 hrs HW=220.04' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.01 cfs @ 14.28 hrs HW=222.56' (Free Discharge)
└**2=Culvert** (Inlet Controls 0.01 cfs @ 0.82 fps)

Summary for Pond 11P: RAIN GARDEN

Inflow Area = 22,673 sf, 28.26% Impervious, Inflow Depth > 1.42" for 10-YR event
Inflow = 0.75 cfs @ 12.14 hrs, Volume= 2,675 cf
Outflow = 0.56 cfs @ 12.22 hrs, Volume= 2,083 cf, Atten= 25%, Lag= 4.7 min
Discarded = 0.01 cfs @ 12.22 hrs, Volume= 363 cf
Primary = 0.55 cfs @ 12.22 hrs, Volume= 1,719 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 199.96' @ 12.22 hrs Surf.Area= 674 sf Storage= 629 cf

Plug-Flow detention time= 148.5 min calculated for 2,083 cf (78% of inflow)
Center-of-Mass det. time= 52.4 min (946.3 - 893.9)

Volume	Invert	Avail.Storage	Storage Description
#1	198.50'	658 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
198.50	0	0	0
199.00	420	105	105
200.00	685	553	658

Device	Routing	Invert	Outlet Devices
#1	Discarded	198.50'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	199.90'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.01 cfs @ 12.22 hrs HW=199.94' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.48 cfs @ 12.22 hrs HW=199.95' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 0.48 cfs @ 0.53 fps)

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: OFF SITE WEST Runoff Area=6,679 sf 38.19% Impervious Runoff Depth>4.89"
Flow Length=125' Tc=6.3 min CN=71 Runoff=0.80 cfs 2,719 cf

Subcatchment 2S: SOUTH TO HARVARD RD Runoff Area=11,419 sf 0.00% Impervious Runoff Depth>3.72"
Flow Length=200' Tc=6.0 min CN=61 Runoff=1.05 cfs 3,535 cf

Subcatchment 3S: ROOF Runoff Area=2,828 sf 100.00% Impervious Runoff Depth>8.11"
Flow Length=25' Slope=0.5000 '/' Tc=6.0 min CN=98 Runoff=0.48 cfs 1,912 cf

Subcatchment 4S: DEV LOT AREA Runoff Area=19,845 sf 18.04% Impervious Runoff Depth>4.41"
Flow Length=275' Tc=6.0 min CN=67 Runoff=2.17 cfs 7,301 cf

Reach 50R: CULVERT Avg. Flow Depth=0.60' Max Vel=5.87 fps Inflow=2.46 cfs 8,238 cf
10.0" Round Pipe n=0.010 L=25.0' S=0.0100 '/' Capacity=2.85 cfs Outflow=2.46 cfs 8,237 cf

Reach 51R: CUM. FLOW TO HARVARD RD SHOULDER Inflow=3.46 cfs 10,747 cf
Outflow=3.46 cfs 10,747 cf

Pond 10P: ROOF INF SYS Peak Elev=223.27' Storage=713 cf Inflow=0.48 cfs 1,912 cf
Discarded=0.00 cfs 394 cf Primary=0.33 cfs 937 cf Outflow=0.33 cfs 1,330 cf

Pond 11P: RAIN GARDEN Peak Elev=200.03' Storage=658 cf Inflow=2.46 cfs 8,237 cf
Discarded=0.01 cfs 429 cf Primary=2.41 cfs 7,212 cf Outflow=2.42 cfs 7,641 cf

Total Runoff Area = 40,771 sf Runoff Volume = 15,467 cf Average Runoff Depth = 4.55"
78.03% Pervious = 31,812 sf 21.97% Impervious = 8,959 sf

Summary for Subcatchment 1S: OFF SITE WEST

Runoff = 0.80 cfs @ 12.13 hrs, Volume= 2,719 cf, Depth> 4.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-YR Rainfall=8.36"

Area (sf)	CN	Description
2,551	98	Unconnected pavement, HSG B
4,128	55	Woods, Good, HSG B
6,679	71	Weighted Average
4,128		61.81% Pervious Area
2,551		38.19% Impervious Area
2,551		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	25	0.1500	0.07		**Sheet Flow, Overland** Woods: Dense underbrush n= 0.800 P2= 3.09"
0.7	100	0.2000	2.24		**Shallow Concentrated Flow, Overland** Woodland Kv= 5.0 fps
6.3	125	Total			

Summary for Subcatchment 2S: SOUTH TO HARVARD RD

Runoff = 1.05 cfs @ 12.13 hrs, Volume= 3,535 cf, Depth> 3.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-YR Rainfall=8.36"

Area (sf)	CN	Description
4,895	60	Woods, Fair, HSG B
6,524	61	>75% Grass cover, Good, HSG B
11,419	61	Weighted Average
11,419		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	25	0.2000	0.36		**Sheet Flow, SHEET FLOW** Range n= 0.130 P2= 3.09"
1.2	175	0.2500	2.50		**Shallow Concentrated Flow, SH CONC. FLOW** Woodland Kv= 5.0 fps
2.4	200	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 3S: ROOF

Runoff = 0.48 cfs @ 12.13 hrs, Volume= 1,912 cf, Depth> 8.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-YR Rainfall=8.36"

Area (sf)	CN	Description
2,828	98	Roofs, HSG B
2,828		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	25	0.5000	3.71		**Sheet Flow, SHEET FLOW** Smooth surfaces n= 0.011 P2= 3.09"
0.1	25	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 4S: DEV LOT AREA

Runoff = 2.17 cfs @ 12.13 hrs, Volume= 7,301 cf, Depth> 4.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-YR Rainfall=8.36"

Area (sf)	CN	Description
3,287	58	Woods/grass comb., Good, HSG B
3,580	98	Paved parking, HSG B
12,978	61	>75% Grass cover, Good, HSG B
19,845	67	Weighted Average
16,265		81.96% Pervious Area
3,580		18.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	25	0.1500	0.13		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 3.09"
0.4	50	0.2000	2.24		**Shallow Concentrated Flow, SH CONC WOODS** Woodland Kv= 5.0 fps
1.1	200	0.2000	3.13		**Shallow Concentrated Flow, SH CONC LAWN** Short Grass Pasture Kv= 7.0 fps
4.7	275	Total, Increased to minimum Tc = 6.0 min			

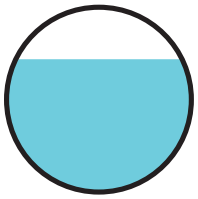
Summary for Reach 50R: CULVERT

Inflow Area = 22,673 sf, 28.26% Impervious, Inflow Depth > 4.36" for 100-YR event
Inflow = 2.46 cfs @ 12.13 hrs, Volume= 8,238 cf
Outflow = 2.46 cfs @ 12.14 hrs, Volume= 8,237 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.87 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.30 fps, Avg. Travel Time= 0.2 min

Peak Storage= 10 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.60' , Surface Width= 0.75'
Bank-Full Depth= 0.83' Flow Area= 0.5 sf, Capacity= 2.85 cfs

10.0" Round Pipe
n= 0.010
Length= 25.0' Slope= 0.0100 '/'
Inlet Invert= 199.20', Outlet Invert= 198.95'



Summary for Reach 51R: CUM. FLOW TO HARVARD RD SHOULDER

Inflow Area = 34,092 sf, 18.80% Impervious, Inflow Depth > 3.78" for 100-YR event
Inflow = 3.46 cfs @ 12.13 hrs, Volume= 10,747 cf
Outflow = 3.46 cfs @ 12.13 hrs, Volume= 10,747 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond 10P: ROOF INF SYS

Inflow Area = 2,828 sf,100.00% Impervious, Inflow Depth > 8.11" for 100-YR event
Inflow = 0.48 cfs @ 12.13 hrs, Volume= 1,912 cf
Outflow = 0.33 cfs @ 12.20 hrs, Volume= 1,330 cf, Atten= 30%, Lag= 4.3 min
Discarded = 0.00 cfs @ 1.70 hrs, Volume= 394 cf
Primary = 0.33 cfs @ 12.20 hrs, Volume= 937 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 223.27' @ 12.20 hrs Surf.Area= 396 sf Storage= 713 cf

Plug-Flow detention time= 197.6 min calculated for 1,330 cf (70% of inflow)
Center-of-Mass det. time= 75.9 min (817.3 - 741.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	220.00'	431 cf	**8.33'W x 47.50'L x 3.54'H Field A** 1,402 cf Overall - 324 cf Embedded = 1,078 cf x 40.0% Voids
#2A	220.50'	324 cf	**Cultec R-330XLHD** x 6 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 1 rows
		755 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	220.00'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	222.50'	**4.0" Round Culvert**
			L= 25.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 222.50' / 221.25' S= 0.0500 '/' Cc= 0.900
			n= 0.010 PVC, smooth interior, Flow Area= 0.09 sf

Discarded OutFlow Max=0.00 cfs @ 1.70 hrs HW=220.04' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.33 cfs @ 12.20 hrs HW=223.27' (Free Discharge)
2=Culvert (Inlet Controls 0.33 cfs @ 3.74 fps)

Summary for Pond 11P: RAIN GARDEN

Inflow Area = 22,673 sf, 28.26% Impervious, Inflow Depth > 4.36" for 100-YR event
Inflow = 2.46 cfs @ 12.14 hrs, Volume= 8,237 cf
Outflow = 2.42 cfs @ 12.13 hrs, Volume= 7,641 cf, Atten= 2%, Lag= 0.0 min
Discarded = 0.01 cfs @ 12.10 hrs, Volume= 429 cf
Primary = 2.41 cfs @ 12.13 hrs, Volume= 7,212 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 200.03' @ 12.13 hrs Surf.Area= 685 sf Storage= 658 cf

Plug-Flow detention time= 57.0 min calculated for 7,625 cf (93% of inflow)
Center-of-Mass det. time= 18.7 min (870.0 - 851.3)

Volume	Invert	Avail.Storage	Storage Description
#1	198.50'	658 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
198.50	0	0	0
199.00	420	105	105
200.00	685	553	658

Device	Routing	Invert	Outlet Devices
#1	Discarded	198.50'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	199.90'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.01 cfs @ 12.10 hrs HW=200.03' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=2.34 cfs @ 12.13 hrs HW=200.03' (Free Discharge)
2=Broad-Crested Rectangular Weir (Weir Controls 2.34 cfs @ 0.90 fps)