

# HYDROCAD CALCULATIONS

PRE DEV. & POST DEV. ANALYSIS

33 DUNSTER LANE

WINCHESTER, MA

Prepared for:

LUCAS SILVA

12 Kimball Dr.

Stoneham, MA

Prepared by:

H-Star Engineering

200 Greenville Road

New Ipswich, NH 03071

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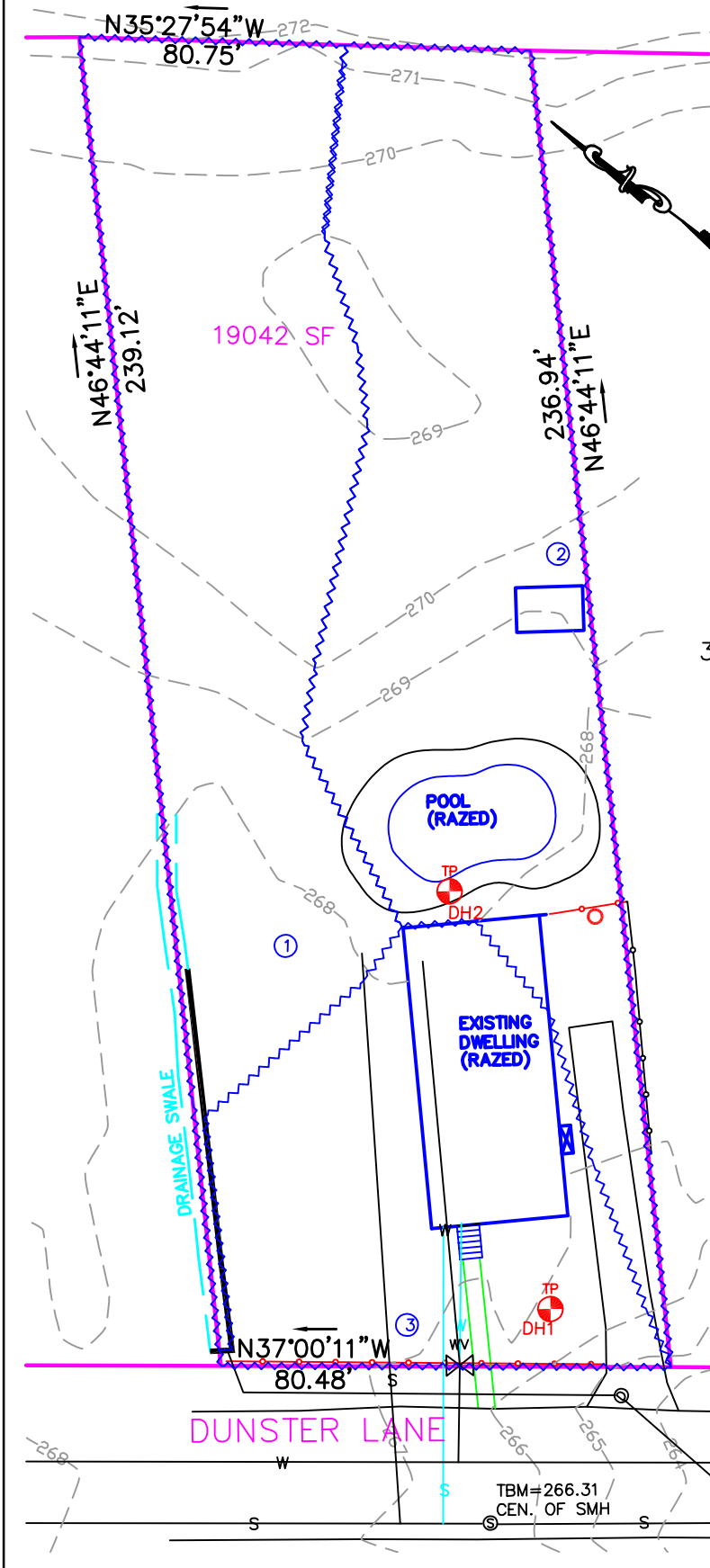
**DATE: 28 June 2021**



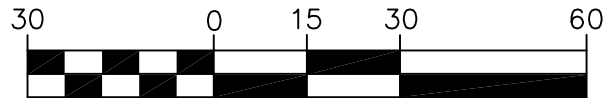
*Bernard H. Hamill*

Bernard H. Hamill, PE, RLS

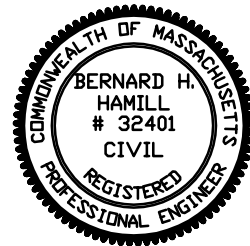
*PRE-DEVELOPMENT*  
*33 DUNSTER LANE*  
*WINCHESTER, MA*



GRAPHIC SCALE



( IN FEET )  
 1 inch = 30 ft.



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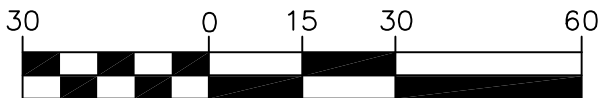
DATE: 28 JUNE 2021

PREPARED FOR:  
**LUCAS SILVA**  
 12 KIMBALL DRIVE  
 STONEHAM, MA 02180

PREPARED BY:  
**H-STAR ENGINEERING**  
 200 GREENVILLE ROAD  
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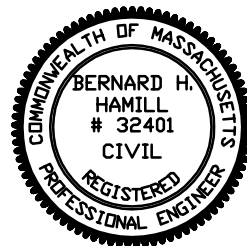
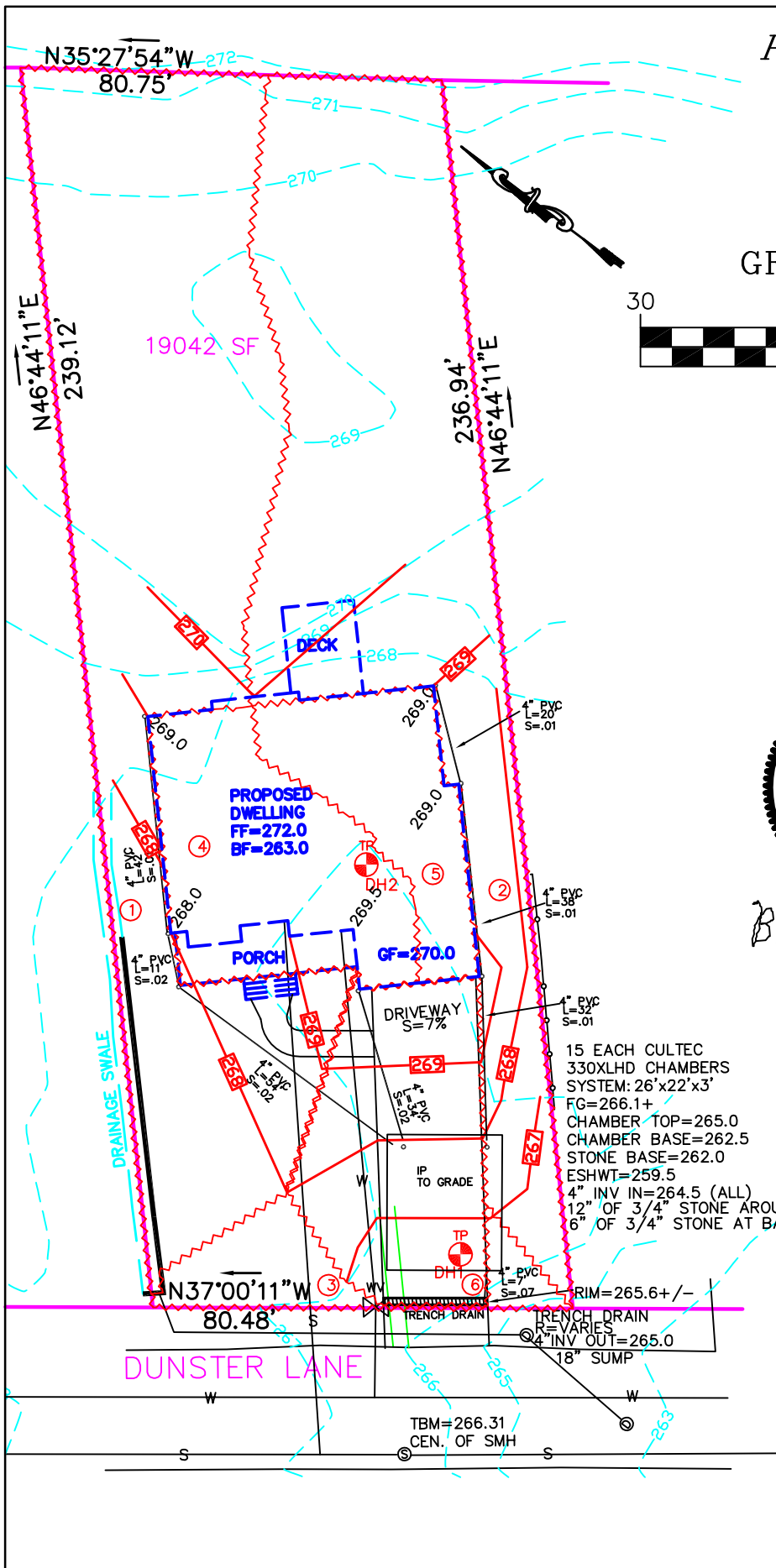
POST-DEVELOPMENT  
33 DUNSTER LANE  
WINCHESTER, MA

GRAPHIC SCALE



( IN FEET )

1 inch = 30 ft.



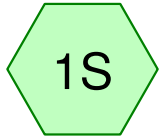
*Bernard H. Hamill*

15 EACH CULTEC  
330XLHD CHAMBERS  
SYSTEM: 26'x22'x3'  
FG=266.1+  
CHAMBER TOP=265.0  
CHAMBER BASE=262.5  
STONE BASE=262.0  
ESHWT=259.5  
4" INV IN=264.5 (ALL)  
12" OF 3/4" STONE AROUND SIDES  
6" OF 3/4" STONE AT BASE

DATE: 28 JUNE 2021

PREPARED FOR:  
**LUCAS SILVA**  
12 KIMBALL DRIVE  
STONEHAM, MA 02180

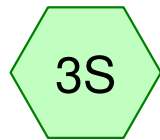
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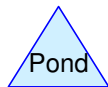
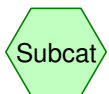
Flow to Swale



Flow to Right Side of Site



Flow to Dunster Lane



**33 Dunster, Winchester - PreDev**

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**Project Notes**

Rainfall events imported from "2 Nassau Winchester - PreDev.hcp"

### 33 Dunster, Winchester - PreDev

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#### Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.297	49	50-75% Grass cover, Fair, HSG A (1S, 2S)
0.073	49	>75% Grass cover, Good, HSG A (3S)
0.068	98	Bldg & Pave (1S, 2S, 3S)
<b>0.437</b>	<b>57</b>	<b>TOTAL AREA</b>

**Summary for Subcatchment 1S: Flow to Swale**

Includes left side of roof

Runoff = 0.00 cfs @ 13.84 hrs, Volume= 0.001 af, Depth> 0.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 year Rainfall=3.20"

Area (sf)	CN	Description
* 42	98	Bldg & Pave
* 6,900	49	50-75% Grass cover, Fair, HSG A
6,942	49	Weighted Average
6,900		99.39% Pervious Area
42		0.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	24	0.0800	0.10		<b>Sheet Flow, Overland Flow</b> Woods: Light underbrush n= 0.400 P2= 3.20"
12.6	105	0.0300	0.14		<b>Sheet Flow, Overland Flow</b> Grass: Dense n= 0.240 P2= 3.20"
0.3	100	0.0100	6.09	36.57	<b>Channel Flow, Swale</b> Area= 6.0 sf Perim= 7.0' r= 0.86' n= 0.022 Earth, clean & straight
16.8	229	Total			

**Summary for Subcatchment 2S: Flow to Right Side of Site**

Includes left side of roof

Runoff = 0.02 cfs @ 12.57 hrs, Volume= 0.004 af, Depth> 0.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 year Rainfall=3.20"

Area (sf)	CN	Description
* 6,016	49	50-75% Grass cover, Fair, HSG A
* 1,445	98	Bldg & Pave
7,461	58	Weighted Average
6,016		80.63% Pervious Area
1,445		19.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	24	0.0800	0.10		<b>Sheet Flow, Overland Flow</b> Woods: Light underbrush n= 0.400 P2= 3.20"
22.6	217	0.0300	0.16		<b>Sheet Flow, Overland Flow</b> Grass: Dense n= 0.240 P2= 3.20"
26.5	241	Total			

**Summary for Subcatchment 3S: Flow to Dunster Lane**

Runoff = 0.06 cfs @ 12.04 hrs, Volume= 0.004 af, Depth> 0.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 2 year Rainfall=3.20"

	Area (sf)	CN	Description
*	1,460	98	Bldg & Pave
*	3,179	49	>75% Grass cover, Good, HSG A
	4,639	64	Weighted Average
	3,179		68.53% Pervious Area
	1,460		31.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	19	0.3000	2.92		<b>Sheet Flow, Roof Flow</b> Smooth surfaces n= 0.011 P2= 3.20"
1.0	70	0.0300	1.21		<b>Shallow Concentrated Flow, Overland Flow</b> Short Grass Pasture Kv= 7.0 fps
1.1	89	Total			



**Summary for Subcatchment 1S: Flow to Swale**

Includes left side of roof

Runoff = 0.05 cfs @ 12.38 hrs, Volume= 0.007 af, Depth> 0.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 year Rainfall=4.90"

Area (sf)	CN	Description
* 42	98	Bldg & Pave
* 6,900	49	50-75% Grass cover, Fair, HSG A
6,942	49	Weighted Average
6,900		99.39% Pervious Area
42		0.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	24	0.0800	0.10		<b>Sheet Flow, Overland Flow</b> Woods: Light underbrush n= 0.400 P2= 3.20"
12.6	105	0.0300	0.14		<b>Sheet Flow, Overland Flow</b> Grass: Dense n= 0.240 P2= 3.20"
0.3	100	0.0100	6.09	36.57	<b>Channel Flow, Swale</b> Area= 6.0 sf Perim= 7.0' r= 0.86' n= 0.022 Earth, clean & straight
16.8	229	Total			

**Summary for Subcatchment 2S: Flow to Right Side of Site**

Includes left side of roof

Runoff = 0.11 cfs @ 12.43 hrs, Volume= 0.014 af, Depth> 0.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 year Rainfall=4.90"

Area (sf)	CN	Description
* 6,016	49	50-75% Grass cover, Fair, HSG A
* 1,445	98	Bldg & Pave
7,461	58	Weighted Average
6,016		80.63% Pervious Area
1,445		19.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	24	0.0800	0.10		<b>Sheet Flow, Overland Flow</b> Woods: Light underbrush n= 0.400 P2= 3.20"
22.6	217	0.0300	0.16		<b>Sheet Flow, Overland Flow</b> Grass: Dense n= 0.240 P2= 3.20"
26.5	241	Total			

**33 Dunster, Winchester - PreDev**

Type III 24-hr 10 year Rainfall=4.90"

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**Summary for Subcatchment 3S: Flow to Dunster Lane**

Runoff = 0.20 cfs @ 12.03 hrs, Volume= 0.012 af, Depth&gt; 1.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 year Rainfall=4.90"

	Area (sf)	CN	Description
*	1,460	98	Bldg & Pave
*	3,179	49	>75% Grass cover, Good, HSG A
	4,639	64	Weighted Average
	3,179		68.53% Pervious Area
	1,460		31.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	19	0.3000	2.92		<b>Sheet Flow, Roof Flow</b> Smooth surfaces n= 0.011 P2= 3.20"
1.0	70	0.0300	1.21		<b>Shallow Concentrated Flow, Overland Flow</b> Short Grass Pasture Kv= 7.0 fps
1.1	89	Total			

**Summary for Subcatchment 1S: Flow to Swale**

Includes left side of roof

Runoff = 0.12 cfs @ 12.29 hrs, Volume= 0.014 af, Depth> 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 year Rainfall=6.20"

Area (sf)	CN	Description
* 42	98	Bldg & Pave
* 6,900	49	50-75% Grass cover, Fair, HSG A
6,942	49	Weighted Average
6,900		99.39% Pervious Area
42		0.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	24	0.0800	0.10		<b>Sheet Flow, Overland Flow</b> Woods: Light underbrush n= 0.400 P2= 3.20"
12.6	105	0.0300	0.14		<b>Sheet Flow, Overland Flow</b> Grass: Dense n= 0.240 P2= 3.20"
0.3	100	0.0100	6.09	36.57	<b>Channel Flow, Swale</b> Area= 6.0 sf Perim= 7.0' r= 0.86' n= 0.022 Earth, clean & straight
16.8	229	Total			

**Summary for Subcatchment 2S: Flow to Right Side of Site**

Includes left side of roof

Runoff = 0.21 cfs @ 12.41 hrs, Volume= 0.024 af, Depth> 1.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 year Rainfall=6.20"

Area (sf)	CN	Description
* 6,016	49	50-75% Grass cover, Fair, HSG A
* 1,445	98	Bldg & Pave
7,461	58	Weighted Average
6,016		80.63% Pervious Area
1,445		19.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	24	0.0800	0.10		<b>Sheet Flow, Overland Flow</b> Woods: Light underbrush n= 0.400 P2= 3.20"
22.6	217	0.0300	0.16		<b>Sheet Flow, Overland Flow</b> Grass: Dense n= 0.240 P2= 3.20"
26.5	241	Total			

**Summary for Subcatchment 3S: Flow to Dunster Lane**

Runoff = 0.32 cfs @ 12.02 hrs, Volume= 0.020 af, Depth> 2.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 25 year Rainfall=6.20"

	Area (sf)	CN	Description
*	1,460	98	Bldg & Pave
*	3,179	49	>75% Grass cover, Good, HSG A
	4,639	64	Weighted Average
	3,179		68.53% Pervious Area
	1,460		31.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	19	0.3000	2.92		<b>Sheet Flow, Roof Flow</b> Smooth surfaces n= 0.011 P2= 3.20"
1.0	70	0.0300	1.21		<b>Shallow Concentrated Flow, Overland Flow</b> Short Grass Pasture Kv= 7.0 fps
1.1	89	Total			

**Summary for Subcatchment 1S: Flow to Swale**

Includes left side of roof

Runoff = 0.34 cfs @ 12.26 hrs, Volume= 0.032 af, Depth> 2.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 year Rainfall=8.90"

Area (sf)	CN	Description
* 42	98	Bldg & Pave
* 6,900	49	50-75% Grass cover, Fair, HSG A
6,942	49	Weighted Average
6,900		99.39% Pervious Area
42		0.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	24	0.0800	0.10		<b>Sheet Flow, Overland Flow</b> Woods: Light underbrush n= 0.400 P2= 3.20"
12.6	105	0.0300	0.14		<b>Sheet Flow, Overland Flow</b> Grass: Dense n= 0.240 P2= 3.20"
0.3	100	0.0100	6.09	36.57	<b>Channel Flow, Swale</b> Area= 6.0 sf Perim= 7.0' r= 0.86' n= 0.022 Earth, clean & straight
16.8	229	Total			

**Summary for Subcatchment 2S: Flow to Right Side of Site**

Includes left side of roof

Runoff = 0.44 cfs @ 12.38 hrs, Volume= 0.049 af, Depth> 3.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 year Rainfall=8.90"

Area (sf)	CN	Description
* 6,016	49	50-75% Grass cover, Fair, HSG A
* 1,445	98	Bldg & Pave
7,461	58	Weighted Average
6,016		80.63% Pervious Area
1,445		19.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	24	0.0800	0.10		<b>Sheet Flow, Overland Flow</b> Woods: Light underbrush n= 0.400 P2= 3.20"
22.6	217	0.0300	0.16		<b>Sheet Flow, Overland Flow</b> Grass: Dense n= 0.240 P2= 3.20"
26.5	241	Total			

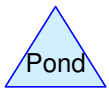
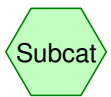
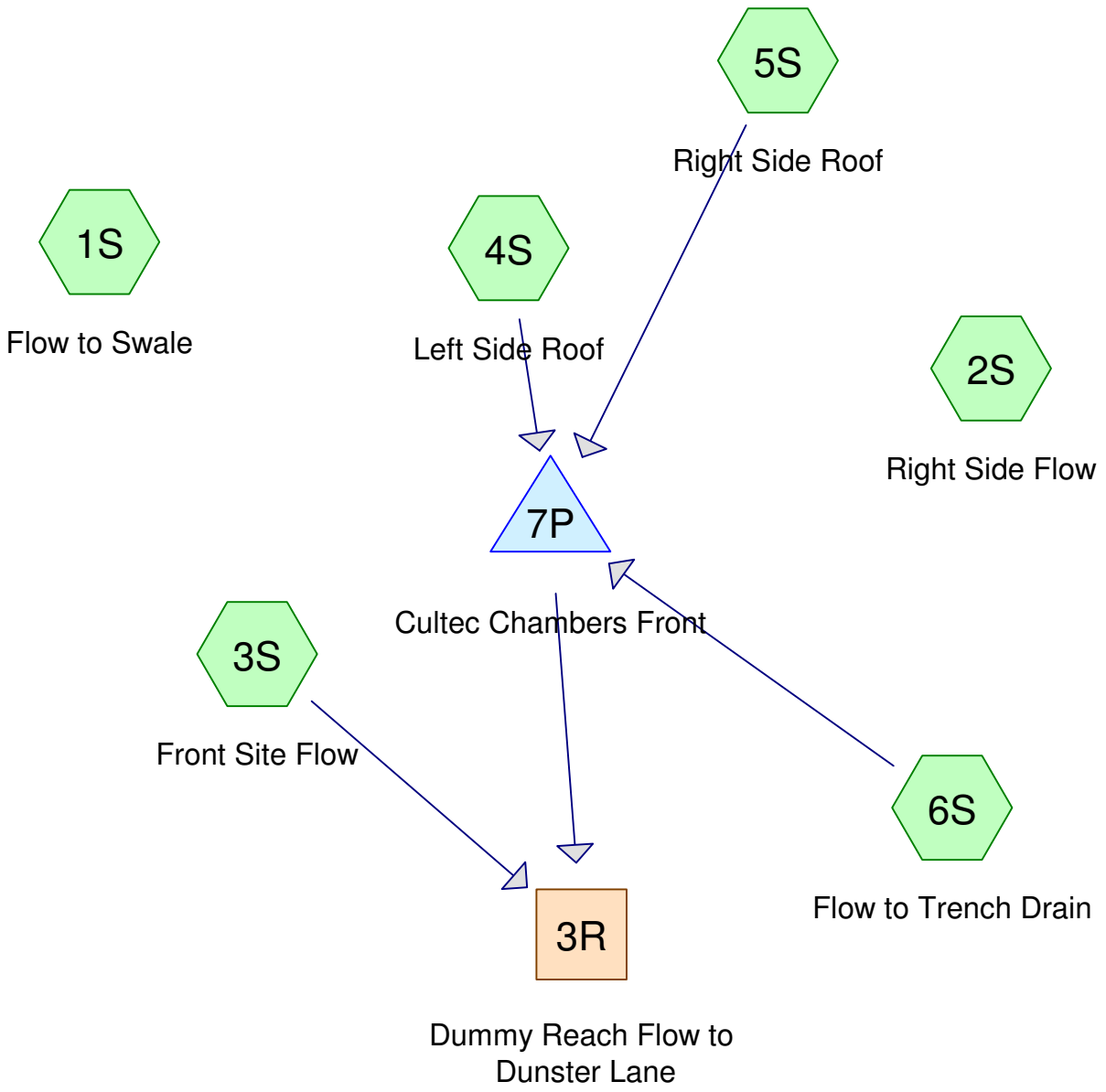
**Summary for Subcatchment 3S: Flow to Dunster Lane**

Runoff = 0.62 cfs @ 12.02 hrs, Volume= 0.037 af, Depth> 4.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 100 year Rainfall=8.90"

	Area (sf)	CN	Description
*	1,460	98	Bldg & Pave
*	3,179	49	>75% Grass cover, Good, HSG A
	4,639	64	Weighted Average
	3,179		68.53% Pervious Area
	1,460		31.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	19	0.3000	2.92		<b>Sheet Flow, Roof Flow</b> Smooth surfaces n= 0.011 P2= 3.20"
1.0	70	0.0300	1.21		<b>Shallow Concentrated Flow, Overland Flow</b> Short Grass Pasture Kv= 7.0 fps
1.1	89	Total			



**Routing Diagram for 33 Dunster, Winchester -PostDev R1**  
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**Project Notes**

Rainfall events imported from "2 Nassau Winchester - PreDev.hcp"



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#### Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.334	45	50-75% Grass cover, Fair, HSG A (1S, 2S, 3S, 6S)
0.103	98	Bldg & Pave (1S, 2S, 3S, 4S, 5S, 6S)
<b>0.437</b>	<b>57</b>	<b>TOTAL AREA</b>

**Summary for Subcatchment 1S: Flow to Swale**

Includes left side of roof

Runoff = 0.00 cfs @ 15.25 hrs, Volume= 0.001 af, Depth> 0.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2 year Rainfall=3.20"

Area (sf)	CN	Description
* 7,079	45	50-75% Grass cover, Fair, HSG A
* 152	98	Bldg & Pave
7,231	46	Weighted Average
7,079		97.90% Pervious Area
152		2.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	24	0.0800	0.10		<b>Sheet Flow, Overland Flow</b> Woods: Light underbrush n= 0.400 P2= 3.20"
12.6	105	0.0300	0.14		<b>Sheet Flow, Overland Flow</b> Grass: Dense n= 0.240 P2= 3.20"
0.3	100	0.0100	6.09	36.57	<b>Channel Flow, Swale</b> Area= 6.0 sf Perim= 7.0' r= 0.86' n= 0.022 Earth, clean & straight
16.8	229	Total			

**Summary for Subcatchment 2S: Right Side Flow**

Includes left side of roof

Runoff = 0.00 cfs @ 15.69 hrs, Volume= 0.001 af, Depth> 0.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2 year Rainfall=3.20"

Area (sf)	CN	Description
* 6,134	45	50-75% Grass cover, Fair, HSG A
* 15	98	Bldg & Pave
6,149	45	Weighted Average
6,134		99.76% Pervious Area
15		0.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	24	0.0800	0.10		<b>Sheet Flow, Overland Flow</b> Woods: Light underbrush n= 0.400 P2= 3.20"
22.6	217	0.0300	0.16		<b>Sheet Flow, Overland Flow</b> Grass: Dense n= 0.240 P2= 3.20"
26.5	241	Total			

**33 Dunster, Winchester -PostDev R1**

Type III 24-hr 2 year Rainfall=3.20"

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**Summary for Subcatchment 3S: Front Site Flow**

Runoff = 0.00 cfs @ 15.11 hrs, Volume= 0.000 af, Depth&gt; 0.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2 year Rainfall=3.20"

Area (sf)	CN	Description
* 13	98	Bldg & Pave
* 717	45	50-75% Grass cover, Fair, HSG A
730	46	Weighted Average
717		98.22% Pervious Area
13		1.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	80	0.0400	0.15		<b>Sheet Flow, Overland Flow</b> Grass: Dense n= 0.240 P2= 3.20"

**Summary for Subcatchment 4S: Left Side Roof**

Runoff = 0.14 cfs @ 12.07 hrs, Volume= 0.011 af, Depth&gt; 2.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2 year Rainfall=3.20"

Area (sf)	CN	Description
* 1,884	98	Bldg & Pave
1,884		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	23	0.3000	3.03		<b>Sheet Flow, Roof</b> Smooth surfaces n= 0.011 P2= 3.20"
0.4	97	0.0200	4.01	0.35	<b>Pipe Channel, 4" Pipe</b> 4.0" Round Area= 0.1 sf Perim= 1.0' r= 0.08' n= 0.010 PVC, smooth interior
0.5	120	Total, Increased to minimum Tc = 5.0 min			

**Summary for Subcatchment 5S: Right Side Roof**

Runoff = 0.08 cfs @ 12.07 hrs, Volume= 0.006 af, Depth&gt; 2.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2 year Rainfall=3.20"

**33 Dunster, Winchester -PostDev R1**

Type III 24-hr 2 year Rainfall=3.20"

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Area (sf)	CN	Description
* 1,145	98	Bldg & Pave
1,145		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	33	0.3000	3.26		<b>Sheet Flow, Roof</b> Smooth surfaces n= 0.011 P2= 3.20"
0.4	90	0.0200	4.01	0.35	<b>Pipe Channel, 4" Pipe</b> 4.0" Round Area= 0.1 sf Perim= 1.0' r= 0.08' n= 0.010 PVC, smooth interior
0.6	123	Total, Increased to minimum Tc = 5.0 min			

**Summary for Subcatchment 6S: Flow to Trench Drain**

Runoff = 0.08 cfs @ 12.08 hrs, Volume= 0.005 af, Depth> 1.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2 year Rainfall=3.20"

Area (sf)	CN	Description
* 1,276	98	Bldg & Pave
* 627	45	50-75% Grass cover, Fair, HSG A
1,903	81	Weighted Average
627		32.95% Pervious Area
1,276		67.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	69	0.0700	2.11		<b>Sheet Flow, Driveway Flow</b> Smooth surfaces n= 0.011 P2= 3.20"
0.5	69	Total, Increased to minimum Tc = 5.0 min			

**Summary for Reach 3R: Dummy Reach Flow to Dunster Lane**

Inflow Area = 0.130 ac, 76.26% Impervious, Inflow Depth > 0.01" for 2 year event  
 Inflow = 0.00 cfs @ 15.11 hrs, Volume= 0.000 af  
 Outflow = 0.00 cfs @ 15.11 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

**Summary for Pond 7P: Cultec Chambers Front**

Inflow Area = 0.113 ac, 87.29% Impervious, Inflow Depth > 2.39" for 2 year event  
 Inflow = 0.30 cfs @ 12.07 hrs, Volume= 0.023 af  
 Outflow = 0.05 cfs @ 12.54 hrs, Volume= 0.022 af, Atten= 84%, Lag= 28.1 min  
 Discarded = 0.05 cfs @ 12.54 hrs, Volume= 0.022 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 6

**33 Dunster, Winchester -PostDev R1**

Type III 24-hr 2 year Rainfall=3.20"

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Peak Elev= 263.31' @ 12.54 hrs Surf.Area= 572 sf Storage= 300 cf

Plug-Flow detention time= 46.9 min calculated for 0.022 af (100% of inflow)  
Center-of-Mass det. time= 45.7 min ( 820.4 - 774.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	262.00'	364 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) 1,725 cf Overall - 816 cf Embedded = 909 cf x 40.0% Voids
#2	263.50'	816 cf	<b>Cultec R-330XLHD</b> x 15 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 3 rows
		1,179 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
262.00	572	0	0
262.50	572	286	286
265.00	572	1,430	1,716
265.01	1	3	1,719
270.00	1	5	1,724
271.00	1	1	1,725

Device	Routing	Invert	Outlet Devices
#1	Discarded	262.00'	<b>2.410 in/hr Exfiltration over Surface area</b> Conductivity to Groundwater Elevation = 259.50'
#2	Primary	270.00'	<b>4.0" Vert. Orifice/Grate X 3.00</b> C= 0.600
#3	Primary	265.60'	<b>2.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)

**Discarded OutFlow** Max=0.05 cfs @ 12.54 hrs HW=263.31' (Free Discharge)  
 ↳1=Exfiltration ( Controls 0.05 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=262.00' TW=265.00' (Fixed TW Elev= 265.00')  
 ↳2=Orifice/Grate ( Controls 0.00 cfs)  
 ↳3=Sharp-Crested Rectangular Weir ( Controls 0.00 cfs)

**Summary for Subcatchment 1S: Flow to Swale**

Includes left side of roof

Runoff = 0.03 cfs @ 12.46 hrs, Volume= 0.006 af, Depth> 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10 year Rainfall=4.90"

Area (sf)	CN	Description
* 7,079	45	50-75% Grass cover, Fair, HSG A
* 152	98	Bldg & Pave
7,231	46	Weighted Average
7,079		97.90% Pervious Area
152		2.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	24	0.0800	0.10		<b>Sheet Flow, Overland Flow</b> Woods: Light underbrush n= 0.400 P2= 3.20"
12.6	105	0.0300	0.14		<b>Sheet Flow, Overland Flow</b> Grass: Dense n= 0.240 P2= 3.20"
0.3	100	0.0100	6.09	36.57	<b>Channel Flow, Swale</b> Area= 6.0 sf Perim= 7.0' r= 0.86' n= 0.022 Earth, clean & straight
16.8	229	Total			

**Summary for Subcatchment 2S: Right Side Flow**

Includes left side of roof

Runoff = 0.02 cfs @ 12.63 hrs, Volume= 0.005 af, Depth> 0.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10 year Rainfall=4.90"

Area (sf)	CN	Description
* 6,134	45	50-75% Grass cover, Fair, HSG A
* 15	98	Bldg & Pave
6,149	45	Weighted Average
6,134		99.76% Pervious Area
15		0.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	24	0.0800	0.10		<b>Sheet Flow, Overland Flow</b> Woods: Light underbrush n= 0.400 P2= 3.20"
22.6	217	0.0300	0.16		<b>Sheet Flow, Overland Flow</b> Grass: Dense n= 0.240 P2= 3.20"
26.5	241	Total			

**33 Dunster, Winchester -PostDev R1**

Type III 24-hr 10 year Rainfall=4.90"

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**Summary for Subcatchment 3S: Front Site Flow**

Runoff = 0.00 cfs @ 12.33 hrs, Volume= 0.001 af, Depth&gt; 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10 year Rainfall=4.90"

Area (sf)	CN	Description
* 13	98	Bldg & Pave
* 717	45	50-75% Grass cover, Fair, HSG A
730	46	Weighted Average
717		98.22% Pervious Area
13		1.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	80	0.0400	0.15		<b>Sheet Flow, Overland Flow</b> Grass: Dense n= 0.240 P2= 3.20"

**Summary for Subcatchment 4S: Left Side Roof**

Runoff = 0.21 cfs @ 12.07 hrs, Volume= 0.017 af, Depth&gt; 4.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10 year Rainfall=4.90"

Area (sf)	CN	Description
* 1,884	98	Bldg & Pave
1,884		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	23	0.3000	3.03		<b>Sheet Flow, Roof</b> Smooth surfaces n= 0.011 P2= 3.20"
0.4	97	0.0200	4.01	0.35	<b>Pipe Channel, 4" Pipe</b> 4.0" Round Area= 0.1 sf Perim= 1.0' r= 0.08' n= 0.010 PVC, smooth interior
0.5	120	Total, Increased to minimum Tc = 5.0 min			

**Summary for Subcatchment 5S: Right Side Roof**

Runoff = 0.13 cfs @ 12.07 hrs, Volume= 0.010 af, Depth&gt; 4.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10 year Rainfall=4.90"

**33 Dunster, Winchester -PostDev R1**

Type III 24-hr 10 year Rainfall=4.90"

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Area (sf)	CN	Description
* 1,145	98	Bldg & Pave
1,145		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	33	0.3000	3.26		<b>Sheet Flow, Roof</b> Smooth surfaces n= 0.011 P2= 3.20"
0.4	90	0.0200	4.01	0.35	<b>Pipe Channel, 4" Pipe</b> 4.0" Round Area= 0.1 sf Perim= 1.0' r= 0.08' n= 0.010 PVC, smooth interior
0.6	123	Total, Increased to minimum Tc = 5.0 min			

**Summary for Subcatchment 6S: Flow to Trench Drain**

Runoff = 0.15 cfs @ 12.07 hrs, Volume= 0.011 af, Depth> 2.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10 year Rainfall=4.90"

Area (sf)	CN	Description
* 1,276	98	Bldg & Pave
* 627	45	50-75% Grass cover, Fair, HSG A
1,903	81	Weighted Average
627		32.95% Pervious Area
1,276		67.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	69	0.0700	2.11		<b>Sheet Flow, Driveway Flow</b> Smooth surfaces n= 0.011 P2= 3.20"
0.5	69	Total, Increased to minimum Tc = 5.0 min			

**Summary for Reach 3R: Dummy Reach Flow to Dunster Lane**

Inflow Area = 0.130 ac, 76.26% Impervious, Inflow Depth > 0.06" for 10 year event

Inflow = 0.00 cfs @ 12.33 hrs, Volume= 0.001 af

Outflow = 0.00 cfs @ 12.33 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

**Summary for Pond 7P: Cultec Chambers Front**

Inflow Area = 0.113 ac, 87.29% Impervious, Inflow Depth > 3.98" for 10 year event

Inflow = 0.50 cfs @ 12.07 hrs, Volume= 0.038 af

Outflow = 0.06 cfs @ 12.67 hrs, Volume= 0.037 af, Atten= 89%, Lag= 36.1 min

Discarded = 0.06 cfs @ 12.67 hrs, Volume= 0.037 af

Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 6



**33 Dunster, Winchester -PostDev R1**

Type III 24-hr 10 year Rainfall=4.90"

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Peak Elev= 263.99' @ 12.67 hrs Surf.Area= 572 sf Storage= 580 cf

Plug-Flow detention time= 82.4 min calculated for 0.037 af (100% of inflow)  
Center-of-Mass det. time= 81.2 min ( 848.2 - 767.0 )

Volume	Invert	Avail.Storage	Storage Description
#1	262.00'	364 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) 1,725 cf Overall - 816 cf Embedded = 909 cf x 40.0% Voids
#2	263.50'	816 cf	<b>Cultec R-330XLHD</b> x 15 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 3 rows
		1,179 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
262.00	572	0	0
262.50	572	286	286
265.00	572	1,430	1,716
265.01	1	3	1,719
270.00	1	5	1,724
271.00	1	1	1,725

Device	Routing	Invert	Outlet Devices
#1	Discarded	262.00'	<b>2.410 in/hr Exfiltration over Surface area</b> Conductivity to Groundwater Elevation = 259.50'
#2	Primary	270.00'	<b>4.0" Vert. Orifice/Grate X 3.00</b> C= 0.600
#3	Primary	265.60'	<b>2.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)

**Discarded OutFlow** Max=0.06 cfs @ 12.67 hrs HW=263.99' (Free Discharge)  
 ↖1=Exfiltration ( Controls 0.06 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=262.00' TW=265.00' (Fixed TW Elev= 265.00')  
 ↖2=Orifice/Grate ( Controls 0.00 cfs)  
 ↖3=Sharp-Crested Rectangular Weir ( Controls 0.00 cfs)

**33 Dunster, Winchester -PostDev R1**

Type III 24-hr 25 year Rainfall=6.20"

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**Summary for Subcatchment 1S: Flow to Swale**

Includes left side of roof

Runoff = 0.09 cfs @ 12.31 hrs, Volume= 0.013 af, Depth&gt; 0.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25 year Rainfall=6.20"

Area (sf)	CN	Description
* 7,079	45	50-75% Grass cover, Fair, HSG A
* 152	98	Bldg & Pave
7,231	46	Weighted Average
7,079		97.90% Pervious Area
152		2.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	24	0.0800	0.10		<b>Sheet Flow, Overland Flow</b> Woods: Light underbrush n= 0.400 P2= 3.20"
12.6	105	0.0300	0.14		<b>Sheet Flow, Overland Flow</b> Grass: Dense n= 0.240 P2= 3.20"
0.3	100	0.0100	6.09	36.57	<b>Channel Flow, Swale</b> Area= 6.0 sf Perim= 7.0' r= 0.86' n= 0.022 Earth, clean & straight
16.8	229	Total			

**Summary for Subcatchment 2S: Right Side Flow**

Includes left side of roof

Runoff = 0.06 cfs @ 12.51 hrs, Volume= 0.010 af, Depth&gt; 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25 year Rainfall=6.20"

Area (sf)	CN	Description
* 6,134	45	50-75% Grass cover, Fair, HSG A
* 15	98	Bldg & Pave
6,149	45	Weighted Average
6,134		99.76% Pervious Area
15		0.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	24	0.0800	0.10		<b>Sheet Flow, Overland Flow</b> Woods: Light underbrush n= 0.400 P2= 3.20"
22.6	217	0.0300	0.16		<b>Sheet Flow, Overland Flow</b> Grass: Dense n= 0.240 P2= 3.20"
26.5	241	Total			

**33 Dunster, Winchester -PostDev R1**

Type III 24-hr 25 year Rainfall=6.20"

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**Summary for Subcatchment 3S: Front Site Flow**

Runoff = 0.01 cfs @ 12.16 hrs, Volume= 0.001 af, Depth&gt; 0.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25 year Rainfall=6.20"

Area (sf)	CN	Description
* 13	98	Bldg & Pave
* 717	45	50-75% Grass cover, Fair, HSG A
730	46	Weighted Average
717		98.22% Pervious Area
13		1.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	80	0.0400	0.15		<b>Sheet Flow, Overland Flow</b> Grass: Dense n= 0.240 P2= 3.20"

**Summary for Subcatchment 4S: Left Side Roof**

Runoff = 0.27 cfs @ 12.07 hrs, Volume= 0.021 af, Depth&gt; 5.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25 year Rainfall=6.20"

Area (sf)	CN	Description
* 1,884	98	Bldg & Pave
1,884		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	23	0.3000	3.03		<b>Sheet Flow, Roof</b> Smooth surfaces n= 0.011 P2= 3.20"
0.4	97	0.0200	4.01	0.35	<b>Pipe Channel, 4" Pipe</b> 4.0" Round Area= 0.1 sf Perim= 1.0' r= 0.08' n= 0.010 PVC, smooth interior
0.5	120	Total, Increased to minimum Tc = 5.0 min			

**Summary for Subcatchment 5S: Right Side Roof**

Runoff = 0.17 cfs @ 12.07 hrs, Volume= 0.013 af, Depth&gt; 5.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25 year Rainfall=6.20"

**33 Dunster, Winchester -PostDev R1**

Type III 24-hr 25 year Rainfall=6.20"

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Area (sf)	CN	Description
* 1,145	98	Bldg & Pave
1,145		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	33	0.3000	3.26		<b>Sheet Flow, Roof</b> Smooth surfaces n= 0.011 P2= 3.20"
0.4	90	0.0200	4.01	0.35	<b>Pipe Channel, 4" Pipe</b> 4.0" Round Area= 0.1 sf Perim= 1.0' r= 0.08' n= 0.010 PVC, smooth interior
0.6	123	Total, Increased to minimum Tc = 5.0 min			

**Summary for Subcatchment 6S: Flow to Trench Drain**

Runoff = 0.21 cfs @ 12.07 hrs, Volume= 0.015 af, Depth> 4.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25 year Rainfall=6.20"

Area (sf)	CN	Description
* 1,276	98	Bldg & Pave
* 627	45	50-75% Grass cover, Fair, HSG A
1,903	81	Weighted Average
627		32.95% Pervious Area
1,276		67.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	69	0.0700	2.11		<b>Sheet Flow, Driveway Flow</b> Smooth surfaces n= 0.011 P2= 3.20"
0.5	69	Total, Increased to minimum Tc = 5.0 min			

**Summary for Reach 3R: Dummy Reach Flow to Dunster Lane**

Inflow Area = 0.130 ac, 76.26% Impervious, Inflow Depth > 0.12" for 25 year event

Inflow = 0.01 cfs @ 12.16 hrs, Volume= 0.001 af

Outflow = 0.01 cfs @ 12.16 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

**Summary for Pond 7P: Cultec Chambers Front**

Inflow Area = 0.113 ac, 87.29% Impervious, Inflow Depth > 5.23" for 25 year event

Inflow = 0.65 cfs @ 12.07 hrs, Volume= 0.049 af

Outflow = 0.06 cfs @ 12.84 hrs, Volume= 0.049 af, Atten= 90%, Lag= 45.9 min

Discarded = 0.06 cfs @ 12.84 hrs, Volume= 0.049 af

Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 6

**33 Dunster, Winchester -PostDev R1**

Type III 24-hr 25 year Rainfall=6.20"

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Peak Elev= 264.50' @ 12.84 hrs Surf.Area= 572 sf Storage= 822 cf

Plug-Flow detention time= 111.2 min calculated for 0.049 af (100% of inflow)

Center-of-Mass det. time= 110.1 min ( 873.0 - 762.9 )

Volume	Invert	Avail.Storage	Storage Description
#1	262.00'	364 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) 1,725 cf Overall - 816 cf Embedded = 909 cf x 40.0% Voids
#2	263.50'	816 cf	<b>Cultec R-330XLHD</b> x 15 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 3 rows
		1,179 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
262.00	572	0	0
262.50	572	286	286
265.00	572	1,430	1,716
265.01	1	3	1,719
270.00	1	5	1,724
271.00	1	1	1,725

Device	Routing	Invert	Outlet Devices
#1	Discarded	262.00'	<b>2.410 in/hr Exfiltration over Surface area</b> Conductivity to Groundwater Elevation = 259.50'
#2	Primary	270.00'	<b>4.0" Vert. Orifice/Grate X 3.00</b> C= 0.600
#3	Primary	265.60'	<b>2.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)

**Discarded OutFlow** Max=0.06 cfs @ 12.84 hrs HW=264.50' (Free Discharge)

↑1=Exfiltration ( Controls 0.06 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=262.00' TW=265.00' (Fixed TW Elev= 265.00')

↑2=Orifice/Grate ( Controls 0.00 cfs)

↑3=Sharp-Crested Rectangular Weir ( Controls 0.00 cfs)

**Summary for Subcatchment 1S: Flow to Swale**

Includes left side of roof

Runoff = 0.29 cfs @ 12.26 hrs, Volume= 0.032 af, Depth> 2.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100 year Rainfall=8.90"

Area (sf)	CN	Description
* 7,079	45	50-75% Grass cover, Fair, HSG A
* 152	98	Bldg & Pave
7,231	46	Weighted Average
7,079		97.90% Pervious Area
152		2.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	24	0.0800	0.10		<b>Sheet Flow, Overland Flow</b> Woods: Light underbrush n= 0.400 P2= 3.20"
12.6	105	0.0300	0.14		<b>Sheet Flow, Overland Flow</b> Grass: Dense n= 0.240 P2= 3.20"
0.3	100	0.0100	6.09	36.57	<b>Channel Flow, Swale</b> Area= 6.0 sf Perim= 7.0' r= 0.86' n= 0.022 Earth, clean & straight
16.8	229	Total			

**Summary for Subcatchment 2S: Right Side Flow**

Includes left side of roof

Runoff = 0.20 cfs @ 12.42 hrs, Volume= 0.026 af, Depth> 2.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100 year Rainfall=8.90"

Area (sf)	CN	Description
* 6,134	45	50-75% Grass cover, Fair, HSG A
* 15	98	Bldg & Pave
6,149	45	Weighted Average
6,134		99.76% Pervious Area
15		0.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	24	0.0800	0.10		<b>Sheet Flow, Overland Flow</b> Woods: Light underbrush n= 0.400 P2= 3.20"
22.6	217	0.0300	0.16		<b>Sheet Flow, Overland Flow</b> Grass: Dense n= 0.240 P2= 3.20"
26.5	241	Total			

**33 Dunster, Winchester -PostDev R1**

Type III 24-hr 100 year Rainfall=8.90"

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**Summary for Subcatchment 3S: Front Site Flow**

Runoff = 0.04 cfs @ 12.14 hrs, Volume= 0.003 af, Depth&gt; 2.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100 year Rainfall=8.90"

Area (sf)	CN	Description
* 13	98	Bldg & Pave
* 717	45	50-75% Grass cover, Fair, HSG A
730	46	Weighted Average
717		98.22% Pervious Area
13		1.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	80	0.0400	0.15		<b>Sheet Flow, Overland Flow</b> Grass: Dense n= 0.240 P2= 3.20"

**Summary for Subcatchment 4S: Left Side Roof**

Runoff = 0.39 cfs @ 12.07 hrs, Volume= 0.031 af, Depth&gt; 8.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100 year Rainfall=8.90"

Area (sf)	CN	Description
* 1,884	98	Bldg & Pave
1,884		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	23	0.3000	3.03		<b>Sheet Flow, Roof</b> Smooth surfaces n= 0.011 P2= 3.20"
0.4	97	0.0200	4.01	0.35	<b>Pipe Channel, 4" Pipe</b> 4.0" Round Area= 0.1 sf Perim= 1.0' r= 0.08' n= 0.010 PVC, smooth interior
0.5	120	Total, Increased to minimum Tc = 5.0 min			

**Summary for Subcatchment 5S: Right Side Roof**

Runoff = 0.24 cfs @ 12.07 hrs, Volume= 0.019 af, Depth&gt; 8.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100 year Rainfall=8.90"

**33 Dunster, Winchester -PostDev R1**

Type III 24-hr 100 year Rainfall=8.90"

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Area (sf)	CN	Description
* 1,145	98	Bldg & Pave
1,145		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	33	0.3000	3.26		<b>Sheet Flow, Roof</b> Smooth surfaces n= 0.011 P2= 3.20"
0.4	90	0.0200	4.01	0.35	<b>Pipe Channel, 4" Pipe</b> 4.0" Round Area= 0.1 sf Perim= 1.0' r= 0.08' n= 0.010 PVC, smooth interior
0.6	123	Total, Increased to minimum Tc = 5.0 min			

**Summary for Subcatchment 6S: Flow to Trench Drain**

Runoff = 0.34 cfs @ 12.07 hrs, Volume= 0.024 af, Depth> 6.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100 year Rainfall=8.90"

Area (sf)	CN	Description
* 1,276	98	Bldg & Pave
* 627	45	50-75% Grass cover, Fair, HSG A
1,903	81	Weighted Average
627		32.95% Pervious Area
1,276		67.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	69	0.0700	2.11		<b>Sheet Flow, Driveway Flow</b> Smooth surfaces n= 0.011 P2= 3.20"
0.5	69	Total, Increased to minimum Tc = 5.0 min			

**Summary for Reach 3R: Dummy Reach Flow to Dunster Lane**

Inflow Area = 0.130 ac, 76.26% Impervious, Inflow Depth > 0.77" for 100 year event  
 Inflow = 0.30 cfs @ 12.31 hrs, Volume= 0.008 af  
 Outflow = 0.30 cfs @ 12.31 hrs, Volume= 0.008 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

**Summary for Pond 7P: Cultec Chambers Front**

Inflow Area = 0.113 ac, 87.29% Impervious, Inflow Depth > 7.86" for 100 year event  
 Inflow = 0.97 cfs @ 12.07 hrs, Volume= 0.074 af  
 Outflow = 0.35 cfs @ 12.31 hrs, Volume= 0.074 af, Atten= 64%, Lag= 14.2 min  
 Discarded = 0.08 cfs @ 12.31 hrs, Volume= 0.069 af  
 Primary = 0.27 cfs @ 12.31 hrs, Volume= 0.005 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 6



**33 Dunster, Winchester -PostDev R1**

Type III 24-hr 100 year Rainfall=8.90"

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Peak Elev= 265.72' @ 12.31 hrs Surf.Area= 1 sf Storage= 1,164 cf

Plug-Flow detention time= 136.7 min calculated for 0.074 af (100% of inflow)

Center-of-Mass det. time= 135.4 min ( 892.3 - 756.9 )

Volume	Invert	Avail.Storage	Storage Description
#1	262.00'	364 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) 1,725 cf Overall - 816 cf Embedded = 909 cf x 40.0% Voids
#2	263.50'	816 cf	<b>Cultec R-330XLHD</b> x 15 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 3 rows
		1,179 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
262.00	572	0	0
262.50	572	286	286
265.00	572	1,430	1,716
265.01	1	3	1,719
270.00	1	5	1,724
271.00	1	1	1,725

Device	Routing	Invert	Outlet Devices
#1	Discarded	262.00'	<b>2.410 in/hr Exfiltration over Surface area</b> Conductivity to Groundwater Elevation = 259.50'
#2	Primary	270.00'	<b>4.0" Vert. Orifice/Grate X 3.00</b> C= 0.600
#3	Primary	265.60'	<b>2.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)

**Discarded OutFlow** Max=0.08 cfs @ 12.31 hrs HW=265.72' (Free Discharge)

↑1=Exfiltration ( Controls 0.08 cfs)

**Primary OutFlow** Max=0.26 cfs @ 12.31 hrs HW=265.72' TW=265.00' (Fixed TW Elev= 265.00')

↑2=Orifice/Grate ( Controls 0.00 cfs)

↑3=Sharp-Crested Rectangular Weir (Weir Controls 0.26 cfs @ 1.13 fps)