BEALS + THOMAS
BEALS AND THOMAS, INC.
Reservoir Corporate Center
144 Turnpike Road
Southborough, MA 01772-2104

CALCULATION SUMMARY

T 508.366.0560
F 508.366.4391
www.bealsandthomas.com
Regional Office: Plymouth, MA

JOB NO./LOCATION:
3077.03
Douglas, Sutton, Uxbridge, MA

CLIENT/PROJECT:
Scannell Properties
Blackstone Logistics Center

SUBJECT/TITLE:
Post-Development Hydrologic Calculations

OBJECTIVE OF CALCULATION:
- To determine the post-development peak runoff rates for the site for the 2-, 10-, and 100-year storm events.

CALCULATION METHOD(S):
- CN and Tc determined based on TR-55 methodology.
- Runoff rates and volumes were computed using HydroCAD version 10.00.

ASSUMPTIONS:
- Hydrologic group of on-site soils was determined based on the United States Department of Agriculture, NRCS Soil Survey information.
- Per TR-55, a minimum time of concentration of 6 minutes was used.
- Surface cover types and watershed boundaries have been estimated based upon B+T Topographic Plan information.
- The area of analysis is limited to the area affected by the proposed development.

SOURCES OF DATA/EQUATIONS:
- Post-Development Conditions Hydrologic Areas Map prepared by Beals and Thomas, Inc., plan no. 307703P006E-002.
- TR-55 Urban Hydrology for Small Watersheds, SCS, 1986.
- Storm data for rainfall sourced from Northeast Regional Climate Center for site area. See attached data table.
- NRCS Soil Survey for Middlesex County downloaded from Web Soil Survey 2.0 on 3/9/2020.
- Beals and Thomas, Inc. Topographic Plan, B+T plan numbers 307704B005A and 307703B003D.
- Beals and Thomas, Inc. Design Plan, B+T plan number 307703D008H.
- Massachusetts DEP Stormwater Handbook, February 2008.

COMMONWEALTH OF MASSACHUSETTS
Daniel M. Feeney
CIVIL ENGINEER
NO. 41422
REGISTERED PROFESSIONAL ENGINEER

11/3/2021

REV	CALC. BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
0	M. Bruckman	1/14/2021	J. Murphy	1/14/2021	D. Feeney	1/14/2021
1	M. Bruckman	3/18/2021	J. Murphy	3/31/2021	D. Feeney	4/1/2021
2	J. Murphy	11/02/2021	D. M. Feeney	11/3/2021	D. M. Feeney	11/3/2021

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CONCLUSIONS:

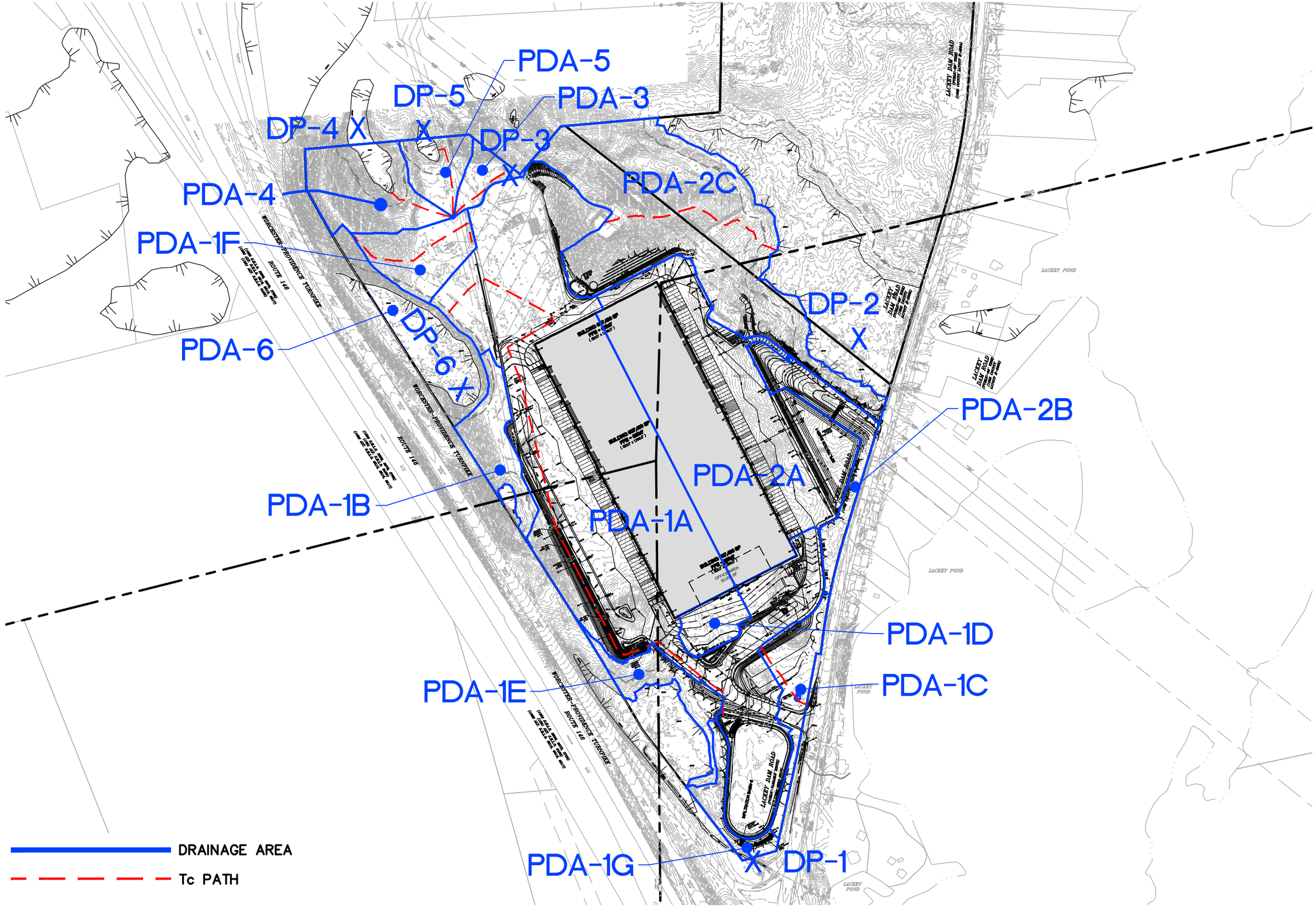
Post-Development Peak Runoff Rates:

Storm Event	Design Point DP-1	PDA-1E Wetland A	Design Point DP-2	Design Point DP-3	Design Point DP-4	Design Point DP-5	Design Point DP-6	Design Point DP-7
	Peak Flow (cfs)	Peak Flow (cfs)	Peak Flow (cfs)	Peak Flow (cfs)	Peak Flow (cfs)	Peak Flow (cfs)	Peak Flow (cfs)	Peak Flow (cfs)
2-yr	0.01	0.00	0.01	0.00	0.00	0.00	0.87	0.00
10-yr	0.11	0.01	0.36	0.05	0.03	0.04	3.58	0.00
100-yr	15.11	0.63	18.39	1.09	2.31	1.58	12.34	0.00

Note: DP-7 represents an existing on-site depression that will be filled in to construct the proposed project.

- Peak flow rates have been mitigated in the proposed condition.

REV	CALC. BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
0	M. Bruckman	1/14/2021	J. Murphy	1/14/2021	D. Feeney	1/14/2021
1	M. Bruckman	3/18/2021	J. Murphy	3/31/2021	D. Feeney	4/1/2021
2	J. Murphy	11/02/2021	D.M Feeney	11/3/2021	D.M Feeney	11/3/2021



Post-Development Conditions
Hydrologic Areas Map
Figure Number 002

Scale: 1" = 350'
Date: 11/02/2021
Plan No. 307703P006E-002
B+T Project No. 3077.03

100 Lacky Dam Road
Douglas, Sutton, and Uxbridge Massachusetts

Scannell Properties
8801 River Crossing Blvd., Suite 300
Indianapolis, Indiana

North Arrow
NORTH

Extreme Precipitation Tables

Northeast Regional Climate Center

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

Smoothing	Yes
State	Massachusetts
Location	
Longitude	71.693 degrees West
Latitude	42.098 degrees North
Elevation	0 feet
Date/Time	Wed, 23 Dec 2020 12:45:45 -0500

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.29	0.45	0.56	0.73	0.92	1.15	**1yr**	0.79	1.09	1.33	1.67	2.10	2.65	2.91	**1yr**	2.35	2.80	3.22	3.91	4.48	**1yr**
2yr	0.35	0.55	0.68	0.90	1.13	1.42	**2yr**	0.97	1.30	1.64	2.06	2.58	3.23	3.55	**2yr**	2.86	3.42	3.92	4.64	5.26	**2yr**
5yr	0.42	0.65	0.82	1.10	1.40	1.78	**5yr**	1.21	1.61	2.07	2.60	3.26	4.07	4.52	**5yr**	3.60	4.35	4.99	5.84	6.54	**5yr**
10yr	0.47	0.74	0.94	1.28	1.66	2.13	**10yr**	1.43	1.90	2.48	3.12	3.90	4.85	5.43	**10yr**	4.29	5.22	5.98	6.95	7.71	**10yr**
25yr	0.56	0.89	1.14	1.56	2.07	2.68	**25yr**	1.79	2.35	3.13	3.95	4.94	6.12	6.92	**25yr**	5.41	6.65	7.62	8.76	9.59	**25yr**
50yr	0.63	1.01	1.30	1.82	2.45	3.21	**50yr**	2.12	2.77	3.76	4.75	5.91	7.30	8.32	**50yr**	6.46	8.00	9.15	10.43	11.31	**50yr**
100yr	0.73	1.18	1.51	2.14	2.91	3.82	**100yr**	2.51	3.27	4.49	5.67	7.07	8.71	10.01	**100yr**	7.71	9.62	11.00	12.43	13.34	**100yr**
200yr	0.83	1.35	1.75	2.50	3.45	4.56	**200yr**	2.98	3.86	5.38	6.80	8.46	10.41	12.05	**200yr**	9.21	11.58	13.22	14.82	15.75	**200yr**
500yr	1.00	1.64	2.14	3.10	4.33	5.77	**500yr**	3.74	4.80	6.81	8.63	10.73	13.17	15.41	**500yr**	11.65	14.82	16.88	18.70	19.62	**500yr**

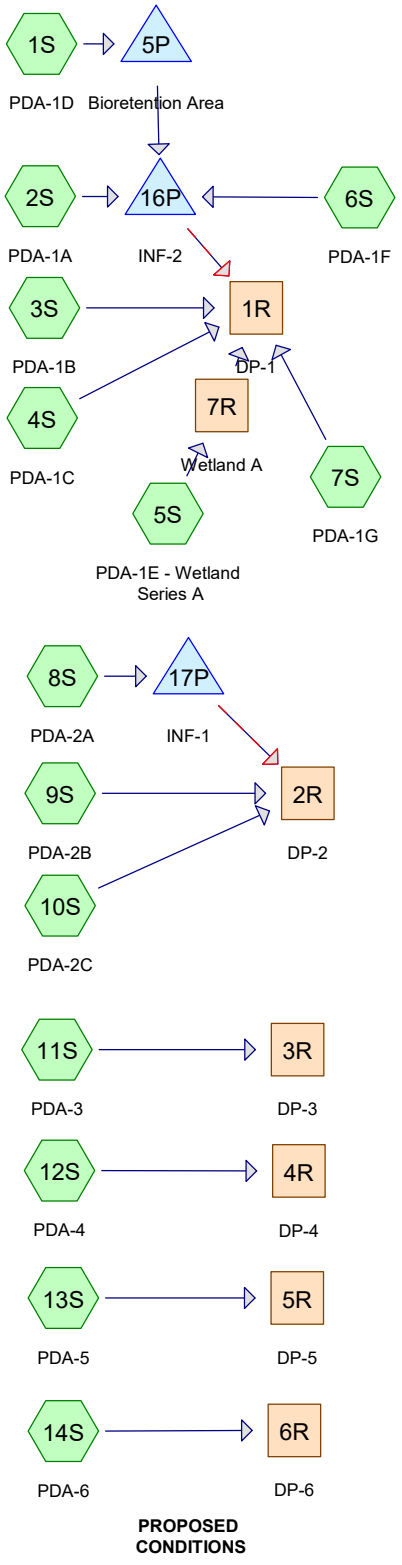
Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.24	0.37	0.45	0.60	0.74	0.94	**1yr**	0.64	0.92	1.13	1.45	1.90	2.40	2.65	**1yr**	2.13	2.55	2.98	3.48	4.16	**1yr**
2yr	0.34	0.53	0.66	0.89	1.09	1.29	**2yr**	0.94	1.26	1.47	1.93	2.47	3.06	3.44	**2yr**	2.71	3.31	3.73	4.45	5.03	**2yr**
5yr	0.39	0.60	0.75	1.03	1.31	1.53	**5yr**	1.13	1.50	1.74	2.28	2.89	3.75	4.18	**5yr**	3.32	4.02	4.61	5.27	5.87	**5yr**
10yr	0.44	0.67	0.83	1.16	1.50	1.74	**10yr**	1.29	1.70	1.98	2.59	3.25	4.30	4.84	**10yr**	3.81	4.66	5.33	5.97	6.56	**10yr**
25yr	0.51	0.77	0.96	1.37	1.81	2.07	**25yr**	1.56	2.02	2.34	3.08	3.82	5.19	5.89	**25yr**	4.60	5.66	6.48	7.00	7.61	**25yr**
50yr	0.57	0.86	1.07	1.54	2.08	2.35	**50yr**	1.79	2.30	2.67	3.50	4.30	5.99	6.88	**50yr**	5.30	6.61	7.55	7.90	8.44	**50yr**
100yr	0.64	0.97	1.21	1.75	2.40	2.68	**100yr**	2.07	2.62	3.04	3.99	4.87	6.95	8.06	**100yr**	6.15	7.75	8.84	8.94	9.41	**100yr**
200yr	0.72	1.08	1.37	1.99	2.77	3.07	**200yr**	2.39	3.00	3.46	4.57	5.51	8.06	9.44	**200yr**	7.13	9.08	10.36	10.10	10.47	**200yr**
500yr	0.85	1.26	1.62	2.36	3.36	3.66	**500yr**	2.90	3.58	4.12	5.48	6.52	9.90	11.75	**500yr**	8.76	11.30	12.84	11.91	12.02	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.32	0.50	0.61	0.82	1.01	1.22	**1yr**	0.87	1.20	1.40	1.79	2.33	2.93	3.35	**1yr**	2.60	3.22	3.70	4.36	4.88	**1yr**
2yr	0.37	0.57	0.70	0.95	1.17	1.37	**2yr**	1.01	1.34	1.57	2.05	2.62	3.42	3.73	**2yr**	3.03	3.59	4.18	4.92	5.55	**2yr**
5yr	0.45	0.69	0.86	1.18	1.50	1.78	**5yr**	1.30	1.74	2.03	2.62	3.30	4.36	4.86	**5yr**	3.86	4.68	5.37	6.44	7.33	**5yr**
10yr	0.53	0.82	1.01	1.41	1.82	2.17	**10yr**	1.57	2.12	2.47	3.17	3.93	5.31	6.02	**10yr**	4.70	5.78	6.61	7.97	9.08	**10yr**
25yr	0.66	1.01	1.26	1.80	2.36	2.82	**25yr**	2.04	2.76	3.19	4.04	4.96	6.91	7.93	**25yr**	6.11	7.62	8.68	10.62	12.05	**25yr**
50yr	0.78	1.19	1.49	2.14	2.87	3.44	**50yr**	2.48	3.36	3.89	4.87	5.90	8.40	9.75	**50yr**	7.44	9.38	10.66	13.19	14.99	**50yr**
100yr	0.93	1.41	1.77	2.55	3.50	4.19	**100yr**	3.02	4.10	4.72	5.88	7.05	10.22	12.01	**100yr**	9.04	11.55	13.09	16.36	18.62	**100yr**
200yr	1.11	1.67	2.11	3.05	4.26	5.12	**200yr**	3.68	5.01	5.75	7.08	8.39	12.42	14.75	**200yr**	10.99	14.18	16.05	20.34	23.14	**200yr**
500yr	1.40	2.08	2.67	3.88	5.52	6.68	**500yr**	4.76	6.53	7.46	9.06	10.57	16.07	19.34	**500yr**	14.22	18.60	21.01	27.00	30.87	**500yr**

Powered by ACIS Northeast Regional Climate Center



Subcat Reach Pond Link

Routing Diagram for 307703HC002C
Prepared by Beals and Thomas, Inc., Printed 11/2/2021

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	NRCC 24-hr	D	Default	24.00	1	3.23	2
2	10-Year	NRCC 24-hr	D	Default	24.00	1	4.85	2
3	100-Year	NRCC 24-hr	D	Default	24.00	1	8.71	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
7.213	49	50-75% Grass cover, Fair, HSG A (2S, 3S, 6S, 10S, 11S, 12S, 13S, 14S)
14.460	39	>75% Grass cover, Good, HSG A (1S, 2S, 4S, 5S, 6S, 7S, 8S, 9S, 10S, 11S)
0.196	96	Gravel surface, HSG A (2S, 4S, 10S)
17.683	98	Paved parking, HSG A (1S, 2S, 4S, 8S, 9S)
13.946	98	Roofs, HSG A (2S, 8S)
0.151	98	Walls, HSG A (2S, 8S, 9S)
15.668	30	Woods, Good, HSG A (2S, 3S, 4S, 5S, 6S, 7S, 9S, 10S, 11S, 12S, 13S, 14S)
2.378	77	Woods, Good, HSG D (12S, 13S, 14S)
71.695	**66**	**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: PDA-1D Runoff Area=0.989 ac 96.87% Impervious Runoff Depth>2.78"
Tc=6.0 min CN=96 Runoff=2.69 cfs 0.229 af

Subcatchment 2S: PDA-1A Runoff Area=27.569 ac 67.75% Impervious Runoff Depth>1.42"
Tc=6.0 min CN=80 Runoff=42.28 cfs 3.268 af

Subcatchment 3S: PDA-1B Runoff Area=1.751 ac 0.00% Impervious Runoff Depth>0.00"
Tc=6.0 min CN=40 Runoff=0.00 cfs 0.000 af

Subcatchment 4S: PDA-1C Runoff Area=1.771 ac 6.32% Impervious Runoff Depth>0.02"
Tc=6.0 min CN=42 Runoff=0.01 cfs 0.002 af

Subcatchment 5S: PDA-1E - Wetland Series Runoff Area=1.483 ac 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=33 Runoff=0.00 cfs 0.000 af

Subcatchment 6S: PDA-1F Runoff Area=2.018 ac 0.00% Impervious Runoff Depth>0.06"
Flow Length=608' Tc=14.7 min CN=46 Runoff=0.01 cfs 0.010 af

Subcatchment 7S: PDA-1G Runoff Area=0.943 ac 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=34 Runoff=0.00 cfs 0.000 af

Subcatchment 8S: PDA-2A Runoff Area=13.701 ac 86.09% Impervious Runoff Depth>2.19"
Tc=6.0 min CN=90 Runoff=31.64 cfs 2.504 af

Subcatchment 9S: PDA-2B Runoff Area=2.079 ac 11.35% Impervious Runoff Depth>0.03"
Tc=6.0 min CN=44 Runoff=0.01 cfs 0.006 af

Subcatchment 10S: PDA-2C Runoff Area=11.364 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=746' Tc=10.7 min CN=35 Runoff=0.00 cfs 0.000 af

Subcatchment 11S: PDA-3 Runoff Area=0.716 ac 0.00% Impervious Runoff Depth>0.03"
Flow Length=260' Tc=12.5 min CN=44 Runoff=0.00 cfs 0.002 af

Subcatchment 12S: PDA-4 Runoff Area=3.069 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=261' Tc=11.5 min CN=37 Runoff=0.00 cfs 0.000 af

Subcatchment 13S: PDA-5 Runoff Area=1.284 ac 0.00% Impervious Runoff Depth>0.01"
Flow Length=287' Tc=11.3 min CN=41 Runoff=0.00 cfs 0.001 af

Subcatchment 14S: PDA-6 Runoff Area=2.958 ac 0.00% Impervious Runoff Depth>0.42"
Tc=6.0 min CN=60 Runoff=0.87 cfs 0.103 af

Reach 1R: DP-1 Inflow=0.01 cfs 0.003 af
Outflow=0.01 cfs 0.003 af

Reach 2R: DP-2 Inflow=0.01 cfs 0.006 af
Outflow=0.01 cfs 0.006 af

Reach 3R: DP-3 Inflow=0.00 cfs 0.002 af
Outflow=0.00 cfs 0.002 af

Reach 4R: DP-4 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach 5R: DP-5 Inflow=0.00 cfs 0.001 af
Outflow=0.00 cfs 0.001 af

Reach 6R: DP-6 Inflow=0.87 cfs 0.103 af
Outflow=0.87 cfs 0.103 af

Reach 7R: Wetland A Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 5P: Bioretention Area Peak Elev=348.75' Storage=1,019 cf Inflow=2.69 cfs 0.229 af
Outflow=2.54 cfs 0.213 af

Pond 16P: INF-2 Peak Elev=326.14' Storage=45,085 cf Inflow=44.77 cfs 3.492 af
Discarded=5.63 cfs 3.473 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=5.63 cfs 3.473 af

Pond 17P: INF-1 Peak Elev=333.58' Storage=45,270 cf Inflow=31.64 cfs 2.504 af
Discarded=2.03 cfs 2.233 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=2.03 cfs 2.233 af

Total Runoff Area = 71.695 ac Runoff Volume = 6.126 af Average Runoff Depth = 1.03"
55.67% Pervious = 39.915 ac 44.33% Impervious = 31.780 ac

Summary for Subcatchment 1S: PDA-1D

Runoff = 2.69 cfs @ 12.13 hrs, Volume= 0.229 af, Depth> 2.78"
Routed to Pond 5P : Bioretention Area

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-Year Rainfall=3.23"

Area (ac)	CN	Description
0.031	39	>75% Grass cover, Good, HSG A
0.958	98	Paved parking, HSG A
0.989	96	Weighted Average
0.031		3.13% Pervious Area
0.958		96.87% Impervious Area

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

Summary for Subcatchment 2S: PDA-1A

Runoff = 42.28 cfs @ 12.13 hrs, Volume= 3.268 af, Depth> 1.42"
Routed to Pond 16P : INF-2

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-Year Rainfall=3.23"

	Area (ac)	CN	Description
	1.929	49	50-75% Grass cover, Fair, HSG A
	6.171	39	>75% Grass cover, Good, HSG A
	6.973	98	Roofs, HSG A
	11.633	98	Paved parking, HSG A
*	0.073	98	Walls, HSG A
	0.118	96	Gravel surface, HSG A
	0.672	30	Woods, Good, HSG A
	27.569	80	Weighted Average
	8.890		32.25% Pervious Area
	18.679		67.75% Impervious Area

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

Summary for Subcatchment 3S: PDA-1B

[73] Warning: Peak may fall outside time span

Runoff = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af, Depth> 0.00"
Routed to Reach 1R : DP-1

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-Year Rainfall=3.23"

Area (ac)	CN	Description
0.957	49	50-75% Grass cover, Fair, HSG A
0.794	30	Woods, Good, HSG A
1.751	40	Weighted Average
1.751		100.00% Pervious Area

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

Summary for Subcatchment 4S: PDA-1C

[73] Warning: Peak may fall outside time span

Runoff = 0.01 cfs @ 24.00 hrs, Volume= 0.002 af, Depth> 0.02"
Routed to Reach 1R : DP-1

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-Year Rainfall=3.23"

Area (ac)	CN	Description
1.342	39	>75% Grass cover, Good, HSG A
0.112	98	Paved parking, HSG A
0.011	96	Gravel surface, HSG A
0.306	30	Woods, Good, HSG A
1.771	42	Weighted Average
1.659		93.68% Pervious Area
0.112		6.32% Impervious Area

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

Summary for Subcatchment 5S: PDA-1E - Wetland Series A

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 7R : Wetland A

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-Year Rainfall=3.23"

Area (ac)	CN	Description
0.473	39	>75% Grass cover, Good, HSG A
1.010	30	Woods, Good, HSG A
1.483	33	Weighted Average
1.483		100.00% Pervious Area

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

Summary for Subcatchment 6S: PDA-1F

Runoff = 0.01 cfs @ 21.65 hrs, Volume= 0.010 af, Depth> 0.06"
Routed to Pond 16P : INF-2

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-Year Rainfall=3.23"

Area (ac)	CN	Description
1.665	49	50-75% Grass cover, Fair, HSG A
0.073	39	>75% Grass cover, Good, HSG A
0.280	30	Woods, Good, HSG A
2.018	46	Weighted Average
2.018		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	50	0.2000	0.16		**Sheet Flow, sf-1** Woods: Light underbrush n= 0.400 P2= 3.00"
0.4	64	0.2820	2.66		**Shallow Concentrated Flow, scf-2** Woodland Kv= 5.0 fps
0.8	164	0.2130	3.23		**Shallow Concentrated Flow, scf-3** Short Grass Pasture Kv= 7.0 fps
6.7	253	0.0080	0.63		**Shallow Concentrated Flow, scf-4** Short Grass Pasture Kv= 7.0 fps
1.7	77	0.0120	0.77		**Shallow Concentrated Flow, scf-5** Short Grass Pasture Kv= 7.0 fps
14.7	608	Total			

Summary for Subcatchment 7S: PDA-1G

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1R : DP-1

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-Year Rainfall=3.23"

Area (ac)	CN	Description
0.406	39	>75% Grass cover, Good, HSG A
0.537	30	Woods, Good, HSG A
0.943	34	Weighted Average
0.943		100.00% Pervious Area

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

Summary for Subcatchment 8S: PDA-2A

Runoff = 31.64 cfs @ 12.13 hrs, Volume= 2.504 af, Depth> 2.19"
Routed to Pond 17P : INF-1

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-Year Rainfall=3.23"

	Area (ac)	CN	Description
	1.906	39	>75% Grass cover, Good, HSG A
	6.973	98	Roofs, HSG A
	4.767	98	Paved parking, HSG A
*	0.055	98	Walls, HSG A
	13.701	90	Weighted Average
	1.906		13.91% Pervious Area
	11.795		86.09% Impervious Area

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

Summary for Subcatchment 9S: PDA-2B

[73] Warning: Peak may fall outside time span

Runoff = 0.01 cfs @ 24.00 hrs, Volume= 0.006 af, Depth> 0.03"
Routed to Reach 2R : DP-2

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-Year Rainfall=3.23"

	Area (ac)	CN	Description
	1.437	39	>75% Grass cover, Good, HSG A
	0.213	98	Paved parking, HSG A
*	0.023	98	Walls, HSG A
	0.406	30	Woods, Good, HSG A
	2.079	44	Weighted Average
	1.843		88.65% Pervious Area
	0.236		11.35% Impervious Area

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

Summary for Subcatchment 10S: PDA-2C

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 2R : DP-2

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-Year Rainfall=3.23"

Area (ac)	CN	Description
1.540	49	50-75% Grass cover, Fair, HSG A
2.505	39	>75% Grass cover, Good, HSG A
0.067	96	Gravel surface, HSG A
7.252	30	Woods, Good, HSG A
11.364	35	Weighted Average
11.364		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	50	0.0400	0.19		**Sheet Flow, sf-1** Grass: Short n= 0.150 P2= 3.00"
0.8	149	0.1800	2.97		**Shallow Concentrated Flow, scf-1** Short Grass Pasture Kv= 7.0 fps
5.5	547	0.1097	1.66		**Shallow Concentrated Flow, scf-2** Woodland Kv= 5.0 fps
10.7	746	Total			

Summary for Subcatchment 11S: PDA-3

[73] Warning: Peak may fall outside time span

Runoff = 0.00 cfs @ 23.13 hrs, Volume= 0.002 af, Depth> 0.03"
Routed to Reach 3R : DP-3

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-Year Rainfall=3.23"

Area (ac)	CN	Description
0.491	49	50-75% Grass cover, Fair, HSG A
0.116	39	>75% Grass cover, Good, HSG A
0.109	30	Woods, Good, HSG A
0.716	44	Weighted Average
0.716		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	50	0.0100	0.11		**Sheet Flow, sf-1** Grass: Short n= 0.150 P2= 3.00"
4.8	210	0.0110	0.73		**Shallow Concentrated Flow, scf-2** Short Grass Pasture Kv= 7.0 fps
12.5	260	Total			

Summary for Subcatchment 12S: PDA-4

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 4R : DP-4

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-Year Rainfall=3.23"

Area (ac)	CN	Description
0.175	49	50-75% Grass cover, Fair, HSG A
2.530	30	Woods, Good, HSG A
0.364	77	Woods, Good, HSG D
3.069	37	Weighted Average
3.069		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	50	0.0100	0.11		**Sheet Flow, sf-1** Grass: Short n= 0.150 P2= 3.00"
1.3	40	0.0050	0.49		**Shallow Concentrated Flow, scf-1** Short Grass Pasture Kv= 7.0 fps
2.5	171	0.0527	1.15		**Shallow Concentrated Flow, scf-2** Woodland Kv= 5.0 fps
11.5	261	Total			

Summary for Subcatchment 13S: PDA-5

[73] Warning: Peak may fall outside time span

Runoff = 0.00 cfs @ 24.00 hrs, Volume= 0.001 af, Depth> 0.01"
Routed to Reach 5R : DP-5

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-Year Rainfall=3.23"

Area (ac)	CN	Description
0.435	49	50-75% Grass cover, Fair, HSG A
0.729	30	Woods, Good, HSG A
0.120	77	Woods, Good, HSG D
1.284	41	Weighted Average
1.284		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	50	0.0100	0.11		**Sheet Flow, sf-1** Grass: Short n= 0.150 P2= 3.00"
3.6	237	0.0242	1.09		**Shallow Concentrated Flow, scf-1** Short Grass Pasture Kv= 7.0 fps
11.3	287	Total			

Summary for Subcatchment 14S: PDA-6

Runoff = 0.87 cfs @ 12.15 hrs, Volume= 0.103 af, Depth> 0.42"
Routed to Reach 6R : DP-6

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-Year Rainfall=3.23"

Area (ac)	CN	Description
1.043	30	Woods, Good, HSG A
1.894	77	Woods, Good, HSG D
0.021	49	50-75% Grass cover, Fair, HSG A
2.958	60	Weighted Average
2.958		100.00% Pervious Area

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

Summary for Reach 1R: DP-1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 36.524 ac, 54.07% Impervious, Inflow Depth > 0.00" for 2-Year event
Inflow = 0.01 cfs @ 24.00 hrs, Volume= 0.003 af
Outflow = 0.01 cfs @ 24.00 hrs, Volume= 0.003 af, 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 Reach 2R: DP-2

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 27.144 ac, 44.32% Impervious, Inflow Depth > 0.00" for 2-Year event
Inflow = 0.01 cfs @ 24.00 hrs, Volume= 0.006 af
Outflow = 0.01 cfs @ 24.00 hrs, Volume= 0.006 af, 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 Reach 3R: DP-3

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.716 ac, 0.00% Impervious, Inflow Depth > 0.03" for 2-Year event
Inflow = 0.00 cfs @ 23.13 hrs, Volume= 0.002 af
Outflow = 0.00 cfs @ 23.13 hrs, Volume= 0.002 af, 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 Reach 4R: DP-4

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.069 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 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= 0.05 hrs

Summary for Reach 5R: DP-5

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.284 ac, 0.00% Impervious, Inflow Depth > 0.01" for 2-Year event
Inflow = 0.00 cfs @ 24.00 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 24.00 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= 0.05 hrs

Summary for Reach 6R: DP-6

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.958 ac, 0.00% Impervious, Inflow Depth > 0.42" for 2-Year event
Inflow = 0.87 cfs @ 12.15 hrs, Volume= 0.103 af
Outflow = 0.87 cfs @ 12.15 hrs, Volume= 0.103 af, 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 Reach 7R: Wetland A

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.483 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 1R : DP-1

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

Summary for Pond 5P: Bioretention Area

Inflow Area = 0.989 ac, 96.87% Impervious, Inflow Depth > 2.78" for 2-Year event
Inflow = 2.69 cfs @ 12.13 hrs, Volume= 0.229 af
Outflow = 2.54 cfs @ 12.15 hrs, Volume= 0.213 af, Atten= 5%, Lag= 1.5 min
Primary = 2.54 cfs @ 12.15 hrs, Volume= 0.213 af
Routed to Pond 16P : INF-2

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 348.75' @ 12.15 hrs Surf.Area= 1,586 sf Storage= 1,019 cf

Plug-Flow detention time= 72.6 min calculated for 0.213 af (93% of inflow)
Center-of-Mass det. time= 33.8 min (814.8 - 781.0)

Volume	Invert	Avail.Storage	Storage Description
#1	348.00'	3,502 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
348.00	1,137	0	0
349.00	1,737	1,437	1,437
350.00	2,392	2,065	3,502

Device	Routing	Invert	Outlet Devices
#1	Primary	342.20'	**15.0" Round Culvert** L= 31.1' Ke= 1.000 Inlet / Outlet Invert= 342.20' / 341.36' S= 0.0270 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	348.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.53 cfs @ 12.15 hrs HW=348.75' (Free Discharge)
↑**1=Culvert** (Passes 2.53 cfs of 10.78 cfs potential flow)
↑**2=Orifice/Grate** (Weir Controls 2.53 cfs @ 1.63 fps)

Summary for Pond 16P: INF-2

Inflow Area = 30.576 ac, 64.22% Impervious, Inflow Depth > 1.37" for 2-Year event
Inflow = 44.77 cfs @ 12.13 hrs, Volume= 3.492 af
Outflow = 5.63 cfs @ 12.99 hrs, Volume= 3.473 af, Atten= 87%, Lag= 51.5 min
Discarded = 5.63 cfs @ 12.99 hrs, Volume= 3.473 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1R : DP-1
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1R : DP-1

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 326.14' @ 12.99 hrs Surf.Area= 71,013 sf Storage= 45,085 cf

Plug-Flow detention time= 69.8 min calculated for 3.466 af (99% of inflow)
Center-of-Mass det. time= 66.6 min (933.0 - 866.4)

Volume	Invert	Avail.Storage	Storage Description
#1	325.50'	343,148 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
325.50	68,931	0	0
326.00	70,540	34,868	34,868
328.00	77,100	147,640	182,508
330.00	83,540	160,640	343,148

Device	Routing	Invert	Outlet Devices
#1	Secondary	329.00'	**8.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Primary	325.50'	**24.0" Round Culvert** L= 39.0' Ke= 1.000 Inlet / Outlet Invert= 325.50' / 325.00' S= 0.0128 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#3	Device 2	327.00'	**10.0" Vert. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads
#4	Device 2	327.40'	**16.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 2	328.75'	**1.5' long x 0.25' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#6	Device 2	329.00'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#7	Discarded	325.50'	**2.410 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 324.00'

Discarded OutFlow Max=5.63 cfs @ 12.99 hrs HW=326.14' (Free Discharge)
└**7=Exfiltration** (Controls 5.63 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=325.50' (Free Discharge)
└**2=Culvert** (Controls 0.00 cfs)
  ├**3=Orifice/Grate** (Controls 0.00 cfs)
  ├**4=Orifice/Grate** (Controls 0.00 cfs)
  ├**5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  └**6=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=325.50' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 17P: INF-1

Inflow Area = 13.701 ac, 86.09% Impervious, Inflow Depth > 2.19" for 2-Year event
Inflow = 31.64 cfs @ 12.13 hrs, Volume= 2.504 af
Outflow = 2.03 cfs @ 13.85 hrs, Volume= 2.233 af, Atten= 94%, Lag= 103.2 min
Discarded = 2.03 cfs @ 13.85 hrs, Volume= 2.233 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 2R : DP-2
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 2R : DP-2

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 333.58' @ 13.85 hrs Surf.Area= 30,749 sf Storage= 45,270 cf

Plug-Flow detention time= 223.7 min calculated for 2.228 af (89% of inflow)
Center-of-Mass det. time= 167.1 min (990.0 - 822.9)

Volume	Invert	Avail.Storage	Storage Description
#1	332.00'	210,325 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
332.00	26,476	0	0
334.00	31,878	58,354	58,354
336.00	37,912	69,790	128,144
338.00	44,269	82,181	210,325

Device	Routing	Invert	Outlet Devices
#1	Secondary	337.00'	**8.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Primary	332.00'	**18.0" Round Culvert** L= 107.0' Ke= 1.000 Inlet / Outlet Invert= 332.00' / 331.00' S= 0.0093 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#3	Device 2	334.75'	**10.0" Vert. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads
#4	Device 2	336.00'	**6.0" Vert. Orifice/Grate X 3.00** C= 0.600

			Limited to weir flow at low heads
#5	Device 2	336.75'	**1.5' long x 1.00' rise Sharp-Crested Rectangular Weir**
			2 End Contraction(s) 1.0' Crest Height
#6	Discarded	332.00'	**2.410 in/hr Exfiltration over Horizontal area**
			Conductivity to Groundwater Elevation = 324.00'

Discarded OutFlow Max=2.03 cfs @ 13.85 hrs HW=333.58' (Free Discharge)
└**6=Exfiltration** (Controls 2.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=332.00' (Free Discharge)
└**2=Culvert** (Controls 0.00 cfs)
  ├**3=Orifice/Grate** (Controls 0.00 cfs)
  ├**4=Orifice/Grate** (Controls 0.00 cfs)
  └**5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=332.00' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

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: PDA-1D Runoff Area=0.989 ac 96.87% Impervious Runoff Depth>4.38"
Tc=6.0 min CN=96 Runoff=4.13 cfs 0.361 af

Subcatchment 2S: PDA-1A Runoff Area=27.569 ac 67.75% Impervious Runoff Depth>2.76"
Tc=6.0 min CN=80 Runoff=81.72 cfs 6.337 af

Subcatchment 3S: PDA-1B Runoff Area=1.751 ac 0.00% Impervious Runoff Depth>0.20"
Tc=6.0 min CN=40 Runoff=0.04 cfs 0.029 af

Subcatchment 4S: PDA-1C Runoff Area=1.771 ac 6.32% Impervious Runoff Depth>0.27"
Tc=6.0 min CN=42 Runoff=0.08 cfs 0.040 af

Subcatchment 5S: PDA-1E - Wetland Series Runoff Area=1.483 ac 0.00% Impervious Runoff Depth>0.03"
Tc=6.0 min CN=33 Runoff=0.01 cfs 0.004 af

Subcatchment 6S: PDA-1F Runoff Area=2.018 ac 0.00% Impervious Runoff Depth>0.44"
Flow Length=608' Tc=14.7 min CN=46 Runoff=0.26 cfs 0.073 af

Subcatchment 7S: PDA-1G Runoff Area=0.943 ac 0.00% Impervious Runoff Depth>0.05"
Tc=6.0 min CN=34 Runoff=0.01 cfs 0.004 af

Subcatchment 8S: PDA-2A Runoff Area=13.701 ac 86.09% Impervious Runoff Depth>3.73"
Tc=6.0 min CN=90 Runoff=52.24 cfs 4.256 af

Subcatchment 9S: PDA-2B Runoff Area=2.079 ac 11.35% Impervious Runoff Depth>0.35"
Tc=6.0 min CN=44 Runoff=0.17 cfs 0.061 af

Subcatchment 10S: PDA-2C Runoff Area=11.364 ac 0.00% Impervious Runoff Depth>0.06"
Flow Length=746' Tc=10.7 min CN=35 Runoff=0.09 cfs 0.061 af

Subcatchment 11S: PDA-3 Runoff Area=0.716 ac 0.00% Impervious Runoff Depth>0.35"
Flow Length=260' Tc=12.5 min CN=44 Runoff=0.05 cfs 0.021 af

Subcatchment 12S: PDA-4 Runoff Area=3.069 ac 0.00% Impervious Runoff Depth>0.11"
Flow Length=261' Tc=11.5 min CN=37 Runoff=0.03 cfs 0.028 af

Subcatchment 13S: PDA-5 Runoff Area=1.284 ac 0.00% Impervious Runoff Depth>0.24"
Flow Length=287' Tc=11.3 min CN=41 Runoff=0.04 cfs 0.025 af

Subcatchment 14S: PDA-6 Runoff Area=2.958 ac 0.00% Impervious Runoff Depth>1.21"
Tc=6.0 min CN=60 Runoff=3.58 cfs 0.299 af

Reach 1R: DP-1 Inflow=0.11 cfs 0.077 af
Outflow=0.11 cfs 0.077 af

Reach 2R: DP-2 Inflow=0.36 cfs 0.163 af
Outflow=0.36 cfs 0.163 af

Reach 3R: DP-3 Inflow=0.05 cfs 0.021 af
Outflow=0.05 cfs 0.021 af

Reach 4R: DP-4 Inflow=0.03 cfs 0.028 af
Outflow=0.03 cfs 0.028 af

Reach 5R: DP-5 Inflow=0.04 cfs 0.025 af
Outflow=0.04 cfs 0.025 af

Reach 6R: DP-6 Inflow=3.58 cfs 0.299 af
Outflow=3.58 cfs 0.299 af

Reach 7R: Wetland A Inflow=0.01 cfs 0.004 af
Outflow=0.01 cfs 0.004 af

Pond 5P: Bioretention Area Peak Elev=348.83' Storage=1,155 cf Inflow=4.13 cfs 0.361 af
Outflow=3.94 cfs 0.345 af

Pond 16P: INF-2 Peak Elev=327.01' Storage=107,472 cf Inflow=85.62 cfs 6.755 af
Discarded=8.08 cfs 6.722 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=8.08 cfs 6.722 af

Pond 17P: INF-1 Peak Elev=334.89' Storage=88,081 cf Inflow=52.24 cfs 4.256 af
Discarded=2.53 cfs 2.984 af Primary=0.25 cfs 0.041 af Secondary=0.00 cfs 0.000 af Outflow=2.79 cfs 3.026 af

Total Runoff Area = 71.695 ac Runoff Volume = 11.599 af Average Runoff Depth = 1.94"
55.67% Pervious = 39.915 ac 44.33% Impervious = 31.780 ac

Summary for Subcatchment 1S: PDA-1D

Runoff = 4.13 cfs @ 12.13 hrs, Volume= 0.361 af, Depth> 4.38"
Routed to Pond 5P : Bioretention Area

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-Year Rainfall=4.85"

Area (ac)	CN	Description
0.031	39	>75% Grass cover, Good, HSG A
0.958	98	Paved parking, HSG A
0.989	96	Weighted Average
0.031		3.13% Pervious Area
0.958		96.87% Impervious Area

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

Summary for Subcatchment 2S: PDA-1A

Runoff = 81.72 cfs @ 12.13 hrs, Volume= 6.337 af, Depth> 2.76"
Routed to Pond 16P : INF-2

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-Year Rainfall=4.85"

	Area (ac)	CN	Description
	1.929	49	50-75% Grass cover, Fair, HSG A
	6.171	39	>75% Grass cover, Good, HSG A
	6.973	98	Roofs, HSG A
	11.633	98	Paved parking, HSG A
*	0.073	98	Walls, HSG A
	0.118	96	Gravel surface, HSG A
	0.672	30	Woods, Good, HSG A
	27.569	80	Weighted Average
	8.890		32.25% Pervious Area
	18.679		67.75% Impervious Area

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

Summary for Subcatchment 3S: PDA-1B

Runoff = 0.04 cfs @ 13.04 hrs, Volume= 0.029 af, Depth> 0.20"
Routed to Reach 1R : DP-1

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-Year Rainfall=4.85"

Area (ac)	CN	Description
0.957	49	50-75% Grass cover, Fair, HSG A
0.794	30	Woods, Good, HSG A
1.751	40	Weighted Average
1.751		100.00% Pervious Area

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

Summary for Subcatchment 4S: PDA-1C

Runoff = 0.08 cfs @ 12.54 hrs, Volume= 0.040 af, Depth> 0.27"
Routed to Reach 1R : DP-1

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-Year Rainfall=4.85"

Area (ac)	CN	Description
1.342	39	>75% Grass cover, Good, HSG A
0.112	98	Paved parking, HSG A
0.011	96	Gravel surface, HSG A
0.306	30	Woods, Good, HSG A
1.771	42	Weighted Average
1.659		93.68% Pervious Area
0.112		6.32% Impervious Area

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

Summary for Subcatchment 5S: PDA-1E - Wetland Series A

[73] Warning: Peak may fall outside time span

Runoff = 0.01 cfs @ 24.00 hrs, Volume= 0.004 af, Depth> 0.03"
Routed to Reach 7R : Wetland A

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-Year Rainfall=4.85"

Area (ac)	CN	Description
0.473	39	>75% Grass cover, Good, HSG A
1.010	30	Woods, Good, HSG A
1.483	33	Weighted Average
1.483		100.00% Pervious Area

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

Summary for Subcatchment 6S: PDA-1F

Runoff = 0.26 cfs @ 12.34 hrs, Volume= 0.073 af, Depth> 0.44"
Routed to Pond 16P : INF-2

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-Year Rainfall=4.85"

Area (ac)	CN	Description
1.665	49	50-75% Grass cover, Fair, HSG A
0.073	39	>75% Grass cover, Good, HSG A
0.280	30	Woods, Good, HSG A
2.018	46	Weighted Average
2.018		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	50	0.2000	0.16		**Sheet Flow, sf-1** Woods: Light underbrush n= 0.400 P2= 3.00"
0.4	64	0.2820	2.66		**Shallow Concentrated Flow, scf-2** Woodland Kv= 5.0 fps
0.8	164	0.2130	3.23		**Shallow Concentrated Flow, scf-3** Short Grass Pasture Kv= 7.0 fps
6.7	253	0.0080	0.63		**Shallow Concentrated Flow, scf-4** Short Grass Pasture Kv= 7.0 fps
1.7	77	0.0120	0.77		**Shallow Concentrated Flow, scf-5** Short Grass Pasture Kv= 7.0 fps
14.7	608	Total			

Summary for Subcatchment 7S: PDA-1G

[73] Warning: Peak may fall outside time span

Runoff = 0.01 cfs @ 24.00 hrs, Volume= 0.004 af, Depth> 0.05"
Routed to Reach 1R : DP-1

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-Year Rainfall=4.85"

Area (ac)	CN	Description
0.406	39	>75% Grass cover, Good, HSG A
0.537	30	Woods, Good, HSG A
0.943	34	Weighted Average
0.943		100.00% Pervious Area

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

Summary for Subcatchment 8S: PDA-2A

Runoff = 52.24 cfs @ 12.13 hrs, Volume= 4.256 af, Depth> 3.73"
Routed to Pond 17P : INF-1

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-Year Rainfall=4.85"

	Area (ac)	CN	Description
	1.906	39	>75% Grass cover, Good, HSG A
	6.973	98	Roofs, HSG A
	4.767	98	Paved parking, HSG A
*	0.055	98	Walls, HSG A
	13.701	90	Weighted Average
	1.906		13.91% Pervious Area
	11.795		86.09% Impervious Area

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

Summary for Subcatchment 9S: PDA-2B

Runoff = 0.17 cfs @ 12.25 hrs, Volume= 0.061 af, Depth> 0.35"
Routed to Reach 2R : DP-2

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-Year Rainfall=4.85"

	Area (ac)	CN	Description
	1.437	39	>75% Grass cover, Good, HSG A
	0.213	98	Paved parking, HSG A
*	0.023	98	Walls, HSG A
	0.406	30	Woods, Good, HSG A
	2.079	44	Weighted Average
	1.843		88.65% Pervious Area
	0.236		11.35% Impervious Area

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

Summary for Subcatchment 10S: PDA-2C

Runoff = 0.09 cfs @ 22.60 hrs, Volume= 0.061 af, Depth> 0.06"
Routed to Reach 2R : DP-2

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-Year Rainfall=4.85"

Area (ac)	CN	Description
1.540	49	50-75% Grass cover, Fair, HSG A
2.505	39	>75% Grass cover, Good, HSG A
0.067	96	Gravel surface, HSG A
7.252	30	Woods, Good, HSG A
11.364	35	Weighted Average
11.364		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	50	0.0400	0.19		**Sheet Flow, sf-1** Grass: Short n= 0.150 P2= 3.00"
0.8	149	0.1800	2.97		**Shallow Concentrated Flow, scf-1** Short Grass Pasture Kv= 7.0 fps
5.5	547	0.1097	1.66		**Shallow Concentrated Flow, scf-2** Woodland Kv= 5.0 fps
10.7	746	Total			

Summary for Subcatchment 11S: PDA-3

Runoff = 0.05 cfs @ 12.40 hrs, Volume= 0.021 af, Depth> 0.35"
Routed to Reach 3R : DP-3

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-Year Rainfall=4.85"

Area (ac)	CN	Description
0.491	49	50-75% Grass cover, Fair, HSG A
0.116	39	>75% Grass cover, Good, HSG A
0.109	30	Woods, Good, HSG A
0.716	44	Weighted Average
0.716		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	50	0.0100	0.11		**Sheet Flow, sf-1** Grass: Short n= 0.150 P2= 3.00"
4.8	210	0.0110	0.73		**Shallow Concentrated Flow, scf-2** Short Grass Pasture Kv= 7.0 fps
12.5	260	Total			

Summary for Subcatchment 12S: PDA-4

Runoff = 0.03 cfs @ 16.60 hrs, Volume= 0.028 af, Depth> 0.11"
Routed to Reach 4R : DP-4

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-Year Rainfall=4.85"

Area (ac)	CN	Description
0.175	49	50-75% Grass cover, Fair, HSG A
2.530	30	Woods, Good, HSG A
0.364	77	Woods, Good, HSG D
3.069	37	Weighted Average
3.069		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	50	0.0100	0.11		**Sheet Flow, sf-1** Grass: Short n= 0.150 P2= 3.00"
1.3	40	0.0050	0.49		**Shallow Concentrated Flow, scf-1** Short Grass Pasture Kv= 7.0 fps
2.5	171	0.0527	1.15		**Shallow Concentrated Flow, scf-2** Woodland Kv= 5.0 fps
11.5	261	Total			

Summary for Subcatchment 13S: PDA-5

Runoff = 0.04 cfs @ 13.01 hrs, Volume= 0.025 af, Depth> 0.24"
Routed to Reach 5R : DP-5

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-Year Rainfall=4.85"

Area (ac)	CN	Description
0.435	49	50-75% Grass cover, Fair, HSG A
0.729	30	Woods, Good, HSG A
0.120	77	Woods, Good, HSG D
1.284	41	Weighted Average
1.284		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	50	0.0100	0.11		**Sheet Flow, sf-1** Grass: Short n= 0.150 P2= 3.00"
3.6	237	0.0242	1.09		**Shallow Concentrated Flow, scf-1** Short Grass Pasture Kv= 7.0 fps
11.3	287	Total			

Summary for Subcatchment 14S: PDA-6

Runoff = 3.58 cfs @ 12.14 hrs, Volume= 0.299 af, Depth> 1.21"
Routed to Reach 6R : DP-6

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-Year Rainfall=4.85"

Area (ac)	CN	Description
1.043	30	Woods, Good, HSG A
1.894	77	Woods, Good, HSG D
0.021	49	50-75% Grass cover, Fair, HSG A
2.958	60	Weighted Average
2.958		100.00% Pervious Area

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

Summary for Reach 1R: DP-1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 36.524 ac, 54.07% Impervious, Inflow Depth > 0.03" for 10-Year event
Inflow = 0.11 cfs @ 12.94 hrs, Volume= 0.077 af
Outflow = 0.11 cfs @ 12.94 hrs, Volume= 0.077 af, 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 Reach 2R: DP-2

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 27.144 ac, 44.32% Impervious, Inflow Depth > 0.07" for 10-Year event
Inflow = 0.36 cfs @ 14.45 hrs, Volume= 0.163 af
Outflow = 0.36 cfs @ 14.45 hrs, Volume= 0.163 af, 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 Reach 3R: DP-3

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.716 ac, 0.00% Impervious, Inflow Depth > 0.35" for 10-Year event
Inflow = 0.05 cfs @ 12.40 hrs, Volume= 0.021 af
Outflow = 0.05 cfs @ 12.40 hrs, Volume= 0.021 af, 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 Reach 4R: DP-4

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.069 ac, 0.00% Impervious, Inflow Depth > 0.11" for 10-Year event
Inflow = 0.03 cfs @ 16.60 hrs, Volume= 0.028 af
Outflow = 0.03 cfs @ 16.60 hrs, Volume= 0.028 af, 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 Reach 5R: DP-5

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.284 ac, 0.00% Impervious, Inflow Depth > 0.24" for 10-Year event
Inflow = 0.04 cfs @ 13.01 hrs, Volume= 0.025 af
Outflow = 0.04 cfs @ 13.01 hrs, Volume= 0.025 af, 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 Reach 6R: DP-6

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.958 ac, 0.00% Impervious, Inflow Depth > 1.21" for 10-Year event
Inflow = 3.58 cfs @ 12.14 hrs, Volume= 0.299 af
Outflow = 3.58 cfs @ 12.14 hrs, Volume= 0.299 af, 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 Reach 7R: Wetland A

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.483 ac, 0.00% Impervious, Inflow Depth > 0.03" for 10-Year event
Inflow = 0.01 cfs @ 24.00 hrs, Volume= 0.004 af
Outflow = 0.01 cfs @ 24.00 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 1R : DP-1

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

Summary for Pond 5P: Bioretention Area

Inflow Area = 0.989 ac, 96.87% Impervious, Inflow Depth > 4.38" for 10-Year event
Inflow = 4.13 cfs @ 12.13 hrs, Volume= 0.361 af
Outflow = 3.94 cfs @ 12.15 hrs, Volume= 0.345 af, Atten= 4%, Lag= 1.4 min
Primary = 3.94 cfs @ 12.15 hrs, Volume= 0.345 af
Routed to Pond 16P : INF-2

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 348.83' @ 12.15 hrs Surf.Area= 1,637 sf Storage= 1,155 cf

Plug-Flow detention time= 51.8 min calculated for 0.345 af (96% of inflow)
Center-of-Mass det. time= 25.5 min (793.4 - 767.8)

Volume	Invert	Avail.Storage	Storage Description
#1	348.00'	3,502 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
348.00	1,137	0	0
349.00	1,737	1,437	1,437
350.00	2,392	2,065	3,502

Device	Routing	Invert	Outlet Devices
#1	Primary	342.20'	**15.0" Round Culvert** L= 31.1' Ke= 1.000 Inlet / Outlet Invert= 342.20' / 341.36' S= 0.0270 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	348.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.93 cfs @ 12.15 hrs HW=348.83' (Free Discharge)
↑—**1=Culvert** (Passes 3.93 cfs of 10.86 cfs potential flow)
↑—**2=Orifice/Grate** (Weir Controls 3.93 cfs @ 1.88 fps)

Summary for Pond 16P: INF-2

Inflow Area = 30.576 ac, 64.22% Impervious, Inflow Depth > 2.65" for 10-Year event
Inflow = 85.62 cfs @ 12.13 hrs, Volume= 6.755 af
Outflow = 8.08 cfs @ 13.30 hrs, Volume= 6.722 af, Atten= 91%, Lag= 69.9 min
Discarded = 8.08 cfs @ 13.30 hrs, Volume= 6.722 af
Primary = 0.00 cfs @ 13.30 hrs, Volume= 0.000 af
Routed to Reach 1R : DP-1
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1R : DP-1

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 327.01' @ 13.30 hrs Surf.Area= 73,839 sf Storage= 107,472 cf

Plug-Flow detention time= 138.9 min calculated for 6.708 af (99% of inflow)
Center-of-Mass det. time= 135.7 min (979.1 - 843.4)

Volume	Invert	Avail.Storage	Storage Description
#1	325.50'	343,148 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
325.50	68,931	0	0
326.00	70,540	34,868	34,868
328.00	77,100	147,640	182,508
330.00	83,540	160,640	343,148

Device	Routing	Invert	Outlet Devices
#1	Secondary	329.00'	**8.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Primary	325.50'	**24.0" Round Culvert** L= 39.0' Ke= 1.000 Inlet / Outlet Invert= 325.50' / 325.00' S= 0.0128 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#3	Device 2	327.00'	**10.0" Vert. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads
#4	Device 2	327.40'	**16.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 2	328.75'	**1.5' long x 0.25' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#6	Device 2	329.00'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#7	Discarded	325.50'	**2.410 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 324.00'

Discarded OutFlow Max=8.08 cfs @ 13.30 hrs HW=327.01' (Free Discharge)
└**7=Exfiltration** (Controls 8.08 cfs)

Primary OutFlow Max=0.00 cfs @ 13.30 hrs HW=327.01' (Free Discharge)
└**2=Culvert** (Passes 0.00 cfs of 7.95 cfs potential flow)
  ├**3=Orifice/Grate** (Orifice Controls 0.00 cfs @ 0.26 fps)
  ├**4=Orifice/Grate** (Controls 0.00 cfs)
  ├**5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  └**6=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=325.50' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 17P: INF-1

Inflow Area = 13.701 ac, 86.09% Impervious, Inflow Depth > 3.73" for 10-Year event
Inflow = 52.24 cfs @ 12.13 hrs, Volume= 4.256 af
Outflow = 2.79 cfs @ 14.35 hrs, Volume= 3.026 af, Atten= 95%, Lag= 133.5 min
Discarded = 2.53 cfs @ 14.35 hrs, Volume= 2.984 af
Primary = 0.25 cfs @ 14.35 hrs, Volume= 0.041 af
Routed to Reach 2R : DP-2
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 2R : DP-2

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

Peak Elev= 334.89' @ 14.35 hrs Surf.Area= 34,577 sf Storage= 88,081 cf

Plug-Flow detention time= 269.8 min calculated for 3.019 af (71% of inflow)
Center-of-Mass det. time= 158.7 min (962.5 - 803.9)

Volume	Invert	Avail.Storage	Storage Description
#1	332.00'	210,325 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
332.00	26,476	0	0
334.00	31,878	58,354	58,354
336.00	37,912	69,790	128,144
338.00	44,269	82,181	210,325

Device	Routing	Invert	Outlet Devices
#1	Secondary	337.00'	**8.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Primary	332.00'	**18.0" Round Culvert** L= 107.0' Ke= 1.000 Inlet / Outlet Invert= 332.00' / 331.00' S= 0.0093 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#3	Device 2	334.75'	**10.0" Vert. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads
#4	Device 2	336.00'	**6.0" Vert. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads
#5	Device 2	336.75'	**1.5' long x 1.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height
#6	Discarded	332.00'	**2.410 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 324.00'

Discarded OutFlow Max=2.53 cfs @ 14.35 hrs HW=334.89' (Free Discharge)
└**6=Exfiltration** (Controls 2.53 cfs)

Primary OutFlow Max=0.25 cfs @ 14.35 hrs HW=334.89' (Free Discharge)
└**2=Culvert** (Passes 0.25 cfs of 9.35 cfs potential flow)
  ├**3=Orifice/Grate** (Orifice Controls 0.25 cfs @ 1.29 fps)
  ├**4=Orifice/Grate** (Controls 0.00 cfs)
  └**5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=332.00' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

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: PDA-1D Runoff Area=0.989 ac 96.87% Impervious Runoff Depth>8.22"
Tc=6.0 min CN=96 Runoff=7.52 cfs 0.678 af

Subcatchment 2S: PDA-1A Runoff Area=27.569 ac 67.75% Impervious Runoff Depth>6.29"
Tc=6.0 min CN=80 Runoff=180.23 cfs 14.440 af

Subcatchment 3S: PDA-1B Runoff Area=1.751 ac 0.00% Impervious Runoff Depth>1.57"
Tc=6.0 min CN=40 Runoff=2.44 cfs 0.229 af

Subcatchment 4S: PDA-1C Runoff Area=1.771 ac 6.32% Impervious Runoff Depth>1.79"
Tc=6.0 min CN=42 Runoff=2.97 cfs 0.264 af

Subcatchment 5S: PDA-1E - Wetland Series Runoff Area=1.483 ac 0.00% Impervious Runoff Depth>0.86"
Tc=6.0 min CN=33 Runoff=0.63 cfs 0.107 af

Subcatchment 6S: PDA-1F Runoff Area=2.018 ac 0.00% Impervious Runoff Depth>2.22"
Flow Length=608' Tc=14.7 min CN=46 Runoff=3.27 cfs 0.374 af

Subcatchment 7S: PDA-1G Runoff Area=0.943 ac 0.00% Impervious Runoff Depth>0.96"
Tc=6.0 min CN=34 Runoff=0.53 cfs 0.075 af

Subcatchment 8S: PDA-2A Runoff Area=13.701 ac 86.09% Impervious Runoff Depth>7.50"
Tc=6.0 min CN=90 Runoff=100.56 cfs 8.559 af

Subcatchment 9S: PDA-2B Runoff Area=2.079 ac 11.35% Impervious Runoff Depth>2.01"
Tc=6.0 min CN=44 Runoff=4.07 cfs 0.348 af

Subcatchment 10S: PDA-2C Runoff Area=11.364 ac 0.00% Impervious Runoff Depth>1.05"
Flow Length=746' Tc=10.7 min CN=35 Runoff=6.24 cfs 0.997 af

Subcatchment 11S: PDA-3 Runoff Area=0.716 ac 0.00% Impervious Runoff Depth>2.00"
Flow Length=260' Tc=12.5 min CN=44 Runoff=1.09 cfs 0.119 af

Subcatchment 12S: PDA-4 Runoff Area=3.069 ac 0.00% Impervious Runoff Depth>1.25"
Flow Length=261' Tc=11.5 min CN=37 Runoff=2.31 cfs 0.320 af

Subcatchment 13S: PDA-5 Runoff Area=1.284 ac 0.00% Impervious Runoff Depth>1.67"
Flow Length=287' Tc=11.3 min CN=41 Runoff=1.58 cfs 0.179 af

Subcatchment 14S: PDA-6 Runoff Area=2.958 ac 0.00% Impervious Runoff Depth>3.87"
Tc=6.0 min CN=60 Runoff=12.34 cfs 0.954 af

Reach 1R: DP-1 Inflow=15.11 cfs 3.997 af
Outflow=15.11 cfs 3.997 af

Reach 2R: DP-2 Inflow=18.39 cfs 4.331 af
Outflow=18.39 cfs 4.331 af

Reach 3R: DP-3 Inflow=1.09 cfs 0.119 af
Outflow=1.09 cfs 0.119 af

Reach 4R: DP-4 Inflow=2.31 cfs 0.320 af
Outflow=2.31 cfs 0.320 af

Reach 5R: DP-5 Inflow=1.58 cfs 0.179 af
Outflow=1.58 cfs 0.179 af

Reach 6R: DP-6 Inflow=12.34 cfs 0.954 af
Outflow=12.34 cfs 0.954 af

Reach 7R: Wetland A Inflow=0.63 cfs 0.107 af
Outflow=0.63 cfs 0.107 af

Pond 5P: Bioretention Area Peak Elev=349.00' Storage=1,437 cf Inflow=7.52 cfs 0.678 af
Outflow=7.26 cfs 0.662 af

Pond 16P: INF-2 Peak Elev=328.89' Storage=252,207 cf Inflow=189.47 cfs 15.476 af
Discarded=13.57 cfs 10.906 af Primary=13.37 cfs 3.322 af Secondary=0.00 cfs 0.000 af Outflow=26.94 cfs 14.228 af

Pond 17P: INF-1 Peak Elev=336.76' Storage=157,808 cf Inflow=100.56 cfs 8.559 af
Discarded=3.31 cfs 3.762 af Primary=11.97 cfs 2.987 af Secondary=0.00 cfs 0.000 af Outflow=15.28 cfs 6.748 af

Total Runoff Area = 71.695 ac Runoff Volume = 27.642 af Average Runoff Depth = 4.63"
55.67% Pervious = 39.915 ac 44.33% Impervious = 31.780 ac

Summary for Subcatchment 1S: PDA-1D

Runoff = 7.52 cfs @ 12.13 hrs, Volume= 0.678 af, Depth> 8.22"
Routed to Pond 5P : Bioretention Area

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-Year Rainfall=8.71"

Area (ac)	CN	Description
0.031	39	>75% Grass cover, Good, HSG A
0.958	98	Paved parking, HSG A
0.989	96	Weighted Average
0.031		3.13% Pervious Area
0.958		96.87% Impervious Area

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

Summary for Subcatchment 2S: PDA-1A

Runoff = 180.23 cfs @ 12.13 hrs, Volume= 14.440 af, Depth> 6.29"
Routed to Pond 16P : INF-2

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-Year Rainfall=8.71"

	Area (ac)	CN	Description
	1.929	49	50-75% Grass cover, Fair, HSG A
	6.171	39	>75% Grass cover, Good, HSG A
	6.973	98	Roofs, HSG A
	11.633	98	Paved parking, HSG A
*	0.073	98	Walls, HSG A
	0.118	96	Gravel surface, HSG A
	0.672	30	Woods, Good, HSG A
	27.569	80	Weighted Average
	8.890		32.25% Pervious Area
	18.679		67.75% Impervious Area

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

Summary for Subcatchment 3S: PDA-1B

Runoff = 2.44 cfs @ 12.14 hrs, Volume= 0.229 af, Depth> 1.57"
Routed to Reach 1R : DP-1

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-Year Rainfall=8.71"

Area (ac)	CN	Description
0.957	49	50-75% Grass cover, Fair, HSG A
0.794	30	Woods, Good, HSG A
1.751	40	Weighted Average
1.751		100.00% Pervious Area

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

Summary for Subcatchment 4S: PDA-1C

Runoff = 2.97 cfs @ 12.14 hrs, Volume= 0.264 af, Depth> 1.79"
Routed to Reach 1R : DP-1

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-Year Rainfall=8.71"

Area (ac)	CN	Description
1.342	39	>75% Grass cover, Good, HSG A
0.112	98	Paved parking, HSG A
0.011	96	Gravel surface, HSG A
0.306	30	Woods, Good, HSG A
1.771	42	Weighted Average
1.659		93.68% Pervious Area
0.112		6.32% Impervious Area

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

Summary for Subcatchment 5S: PDA-1E - Wetland Series A

Runoff = 0.63 cfs @ 12.17 hrs, Volume= 0.107 af, Depth> 0.86"
Routed to Reach 7R : Wetland A

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-Year Rainfall=8.71"

Area (ac)	CN	Description
0.473	39	>75% Grass cover, Good, HSG A
1.010	30	Woods, Good, HSG A
1.483	33	Weighted Average
1.483		100.00% Pervious Area

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

Summary for Subcatchment 6S: PDA-1F

Runoff = 3.27 cfs @ 12.25 hrs, Volume= 0.374 af, Depth> 2.22"
Routed to Pond 16P : INF-2

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-Year Rainfall=8.71"

Area (ac)	CN	Description
1.665	49	50-75% Grass cover, Fair, HSG A
0.073	39	>75% Grass cover, Good, HSG A
0.280	30	Woods, Good, HSG A
2.018	46	Weighted Average
2.018		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	50	0.2000	0.16		**Sheet Flow, sf-1** Woods: Light underbrush n= 0.400 P2= 3.00"
0.4	64	0.2820	2.66		**Shallow Concentrated Flow, scf-2** Woodland Kv= 5.0 fps
0.8	164	0.2130	3.23		**Shallow Concentrated Flow, scf-3** Short Grass Pasture Kv= 7.0 fps
6.7	253	0.0080	0.63		**Shallow Concentrated Flow, scf-4** Short Grass Pasture Kv= 7.0 fps
1.7	77	0.0120	0.77		**Shallow Concentrated Flow, scf-5** Short Grass Pasture Kv= 7.0 fps
14.7	608	Total			

Summary for Subcatchment 7S: PDA-1G

Runoff = 0.53 cfs @ 12.16 hrs, Volume= 0.075 af, Depth> 0.96"
Routed to Reach 1R : DP-1

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-Year Rainfall=8.71"

Area (ac)	CN	Description
0.406	39	>75% Grass cover, Good, HSG A
0.537	30	Woods, Good, HSG A
0.943	34	Weighted Average
0.943		100.00% Pervious Area

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

Summary for Subcatchment 8S: PDA-2A

Runoff = 100.56 cfs @ 12.13 hrs, Volume= 8.559 af, Depth> 7.50"
Routed to Pond 17P : INF-1

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-Year Rainfall=8.71"

	Area (ac)	CN	Description
	1.906	39	>75% Grass cover, Good, HSG A
	6.973	98	Roofs, HSG A
	4.767	98	Paved parking, HSG A
*	0.055	98	Walls, HSG A
	13.701	90	Weighted Average
	1.906		13.91% Pervious Area
	11.795		86.09% Impervious Area

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

Summary for Subcatchment 9S: PDA-2B

Runoff = 4.07 cfs @ 12.14 hrs, Volume= 0.348 af, Depth> 2.01"
Routed to Reach 2R : DP-2

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-Year Rainfall=8.71"

	Area (ac)	CN	Description
	1.437	39	>75% Grass cover, Good, HSG A
	0.213	98	Paved parking, HSG A
*	0.023	98	Walls, HSG A
	0.406	30	Woods, Good, HSG A
	2.079	44	Weighted Average
	1.843		88.65% Pervious Area
	0.236		11.35% Impervious Area

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

Summary for Subcatchment 10S: PDA-2C

Runoff = 6.24 cfs @ 12.22 hrs, Volume= 0.997 af, Depth> 1.05"
Routed to Reach 2R : DP-2

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-Year Rainfall=8.71"

Area (ac)	CN	Description
1.540	49	50-75% Grass cover, Fair, HSG A
2.505	39	>75% Grass cover, Good, HSG A
0.067	96	Gravel surface, HSG A
7.252	30	Woods, Good, HSG A
11.364	35	Weighted Average
11.364		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	50	0.0400	0.19		**Sheet Flow, sf-1** Grass: Short n= 0.150 P2= 3.00"
0.8	149	0.1800	2.97		**Shallow Concentrated Flow, scf-1** Short Grass Pasture Kv= 7.0 fps
5.5	547	0.1097	1.66		**Shallow Concentrated Flow, scf-2** Woodland Kv= 5.0 fps
10.7	746	Total			

Summary for Subcatchment 11S: PDA-3

Runoff = 1.09 cfs @ 12.22 hrs, Volume= 0.119 af, Depth> 2.00"
Routed to Reach 3R : DP-3

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-Year Rainfall=8.71"

Area (ac)	CN	Description
0.491	49	50-75% Grass cover, Fair, HSG A
0.116	39	>75% Grass cover, Good, HSG A
0.109	30	Woods, Good, HSG A
0.716	44	Weighted Average
0.716		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	50	0.0100	0.11		**Sheet Flow, sf-1** Grass: Short n= 0.150 P2= 3.00"
4.8	210	0.0110	0.73		**Shallow Concentrated Flow, scf-2** Short Grass Pasture Kv= 7.0 fps
12.5	260	Total			

Summary for Subcatchment 12S: PDA-4

Runoff = 2.31 cfs @ 12.22 hrs, Volume= 0.320 af, Depth> 1.25"
Routed to Reach 4R : DP-4

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-Year Rainfall=8.71"

Area (ac)	CN	Description
0.175	49	50-75% Grass cover, Fair, HSG A
2.530	30	Woods, Good, HSG A
0.364	77	Woods, Good, HSG D
3.069	37	Weighted Average
3.069		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	50	0.0100	0.11		**Sheet Flow, sf-1** Grass: Short n= 0.150 P2= 3.00"
1.3	40	0.0050	0.49		**Shallow Concentrated Flow, scf-1** Short Grass Pasture Kv= 7.0 fps
2.5	171	0.0527	1.15		**Shallow Concentrated Flow, scf-2** Woodland Kv= 5.0 fps
11.5	261	Total			

Summary for Subcatchment 13S: PDA-5

Runoff = 1.58 cfs @ 12.21 hrs, Volume= 0.179 af, Depth> 1.67"
Routed to Reach 5R : DP-5

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-Year Rainfall=8.71"

Area (ac)	CN	Description
0.435	49	50-75% Grass cover, Fair, HSG A
0.729	30	Woods, Good, HSG A
0.120	77	Woods, Good, HSG D
1.284	41	Weighted Average
1.284		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	50	0.0100	0.11		**Sheet Flow, sf-1** Grass: Short n= 0.150 P2= 3.00"
3.6	237	0.0242	1.09		**Shallow Concentrated Flow, scf-1** Short Grass Pasture Kv= 7.0 fps
11.3	287	Total			

Summary for Subcatchment 14S: PDA-6

Runoff = 12.34 cfs @ 12.13 hrs, Volume= 0.954 af, Depth> 3.87"
Routed to Reach 6R : DP-6

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-Year Rainfall=8.71"

Area (ac)	CN	Description
1.043	30	Woods, Good, HSG A
1.894	77	Woods, Good, HSG D
0.021	49	50-75% Grass cover, Fair, HSG A
2.958	60	Weighted Average
2.958		100.00% Pervious Area

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

Summary for Reach 1R: DP-1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 36.524 ac, 54.07% Impervious, Inflow Depth > 1.31" for 100-Year event
Inflow = 15.11 cfs @ 12.20 hrs, Volume= 3.997 af
Outflow = 15.11 cfs @ 12.20 hrs, Volume= 3.997 af, 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 Reach 2R: DP-2

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 27.144 ac, 44.32% Impervious, Inflow Depth > 1.91" for 100-Year event
Inflow = 18.39 cfs @ 12.25 hrs, Volume= 4.331 af
Outflow = 18.39 cfs @ 12.25 hrs, Volume= 4.331 af, 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 Reach 3R: DP-3

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.716 ac, 0.00% Impervious, Inflow Depth > 2.00" for 100-Year event
Inflow = 1.09 cfs @ 12.22 hrs, Volume= 0.119 af
Outflow = 1.09 cfs @ 12.22 hrs, Volume= 0.119 af, 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 Reach 4R: DP-4

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.069 ac, 0.00% Impervious, Inflow Depth > 1.25" for 100-Year event
Inflow = 2.31 cfs @ 12.22 hrs, Volume= 0.320 af
Outflow = 2.31 cfs @ 12.22 hrs, Volume= 0.320 af, 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 Reach 5R: DP-5

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.284 ac, 0.00% Impervious, Inflow Depth > 1.67" for 100-Year event
Inflow = 1.58 cfs @ 12.21 hrs, Volume= 0.179 af
Outflow = 1.58 cfs @ 12.21 hrs, Volume= 0.179 af, 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 Reach 6R: DP-6

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.958 ac, 0.00% Impervious, Inflow Depth > 3.87" for 100-Year event
Inflow = 12.34 cfs @ 12.13 hrs, Volume= 0.954 af
Outflow = 12.34 cfs @ 12.13 hrs, Volume= 0.954 af, 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 Reach 7R: Wetland A

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.483 ac, 0.00% Impervious, Inflow Depth > 0.86" for 100-Year event
Inflow = 0.63 cfs @ 12.17 hrs, Volume= 0.107 af
Outflow = 0.63 cfs @ 12.17 hrs, Volume= 0.107 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 1R : DP-1

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

Summary for Pond 5P: Bioretention Area

Inflow Area = 0.989 ac, 96.87% Impervious, Inflow Depth > 8.22" for 100-Year event
Inflow = 7.52 cfs @ 12.13 hrs, Volume= 0.678 af
Outflow = 7.26 cfs @ 12.15 hrs, Volume= 0.662 af, Atten= 3%, Lag= 1.2 min
Primary = 7.26 cfs @ 12.15 hrs, Volume= 0.662 af
Routed to Pond 16P : INF-2

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 349.00' @ 12.15 hrs Surf.Area= 1,737 sf Storage= 1,437 cf

Plug-Flow detention time= 31.4 min calculated for 0.660 af (97% of inflow)
Center-of-Mass det. time= 16.3 min (769.3 - 753.0)

Volume	Invert	Avail.Storage	Storage Description
#1	348.00'	3,502 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
348.00	1,137	0	0
349.00	1,737	1,437	1,437
350.00	2,392	2,065	3,502

Device	Routing	Invert	Outlet Devices
#1	Primary	342.20'	**15.0" Round Culvert** L= 31.1' Ke= 1.000 Inlet / Outlet Invert= 342.20' / 341.36' S= 0.0270 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	348.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.19 cfs @ 12.15 hrs HW=349.00' (Free Discharge)
↑—**1=Culvert** (Passes 7.19 cfs of 11.01 cfs potential flow)
↑—**2=Orifice/Grate** (Weir Controls 7.19 cfs @ 2.30 fps)

Summary for Pond 16P: INF-2

Inflow Area = 30.576 ac, 64.22% Impervious, Inflow Depth > 6.07" for 100-Year event
Inflow = 189.47 cfs @ 12.13 hrs, Volume= 15.476 af
Outflow = 26.94 cfs @ 12.70 hrs, Volume= 14.228 af, Atten= 86%, Lag= 34.4 min
Discarded = 13.57 cfs @ 12.70 hrs, Volume= 10.906 af
Primary = 13.37 cfs @ 12.70 hrs, Volume= 3.322 af
Routed to Reach 1R : DP-1
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1R : DP-1

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 328.89' @ 12.70 hrs Surf.Area= 79,958 sf Storage= 252,207 cf

Plug-Flow detention time= 151.3 min calculated for 14.198 af (92% of inflow)
Center-of-Mass det. time= 106.9 min (921.7 - 814.7)

Volume	Invert	Avail.Storage	Storage Description
#1	325.50'	343,148 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
325.50	68,931	0	0
326.00	70,540	34,868	34,868
328.00	77,100	147,640	182,508
330.00	83,540	160,640	343,148

Device	Routing	Invert	Outlet Devices
#1	Secondary	329.00'	**8.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Primary	325.50'	**24.0" Round Culvert** L= 39.0' Ke= 1.000 Inlet / Outlet Invert= 325.50' / 325.00' S= 0.0128 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#3	Device 2	327.00'	**10.0" Vert. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads
#4	Device 2	327.40'	**16.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 2	328.75'	**1.5' long x 0.25' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#6	Device 2	329.00'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#7	Discarded	325.50'	**2.410 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 324.00'

Discarded OutFlow Max=13.57 cfs @ 12.70 hrs HW=328.89' (Free Discharge)
└**7=Exfiltration** (Controls 13.57 cfs)

Primary OutFlow Max=13.37 cfs @ 12.70 hrs HW=328.89' (Free Discharge)
└**2=Culvert** (Passes 13.37 cfs of 17.53 cfs potential flow)
  ├**3=Orifice/Grate** (Orifice Controls 9.55 cfs @ 5.84 fps)
  ├**4=Orifice/Grate** (Orifice Controls 3.56 cfs @ 5.35 fps)
  ├**5=Sharp-Crested Rectangular Weir** (Weir Controls 0.25 cfs @ 1.21 fps)
  └**6=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=325.50' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 17P: INF-1

Inflow Area = 13.701 ac, 86.09% Impervious, Inflow Depth > 7.50" for 100-Year event
Inflow = 100.56 cfs @ 12.13 hrs, Volume= 8.559 af
Outflow = 15.28 cfs @ 12.61 hrs, Volume= 6.748 af, Atten= 85%, Lag= 28.9 min
Discarded = 3.31 cfs @ 12.61 hrs, Volume= 3.762 af
Primary = 11.97 cfs @ 12.61 hrs, Volume= 2.987 af
Routed to Reach 2R : DP-2
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 2R : DP-2

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

Peak Elev= 336.76' @ 12.61 hrs Surf.Area= 40,322 sf Storage= 157,808 cf

Plug-Flow detention time= 190.2 min calculated for 6.734 af (79% of inflow)
Center-of-Mass det. time= 96.3 min (876.9 - 780.6)

Volume	Invert	Avail.Storage	Storage Description
#1	332.00'	210,325 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
332.00	26,476	0	0
334.00	31,878	58,354	58,354
336.00	37,912	69,790	128,144
338.00	44,269	82,181	210,325

Device	Routing	Invert	Outlet Devices
#1	Secondary	337.00'	**8.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Primary	332.00'	**18.0" Round Culvert** L= 107.0' Ke= 1.000 Inlet / Outlet Invert= 332.00' / 331.00' S= 0.0093 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#3	Device 2	334.75'	**10.0" Vert. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads
#4	Device 2	336.00'	**6.0" Vert. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads
#5	Device 2	336.75'	**1.5' long x 1.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height
#6	Discarded	332.00'	**2.410 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 324.00'

Discarded OutFlow Max=3.31 cfs @ 12.61 hrs HW=336.76' (Free Discharge)
└**6=Exfiltration** (Controls 3.31 cfs)

Primary OutFlow Max=11.96 cfs @ 12.61 hrs HW=336.76' (Free Discharge)
└**2=Culvert** (Passes 11.96 cfs of 12.78 cfs potential flow)
  ├**3=Orifice/Grate** (Orifice Controls 9.94 cfs @ 6.07 fps)
  ├**4=Orifice/Grate** (Orifice Controls 2.02 cfs @ 3.43 fps)
  └**5=Sharp-Crested Rectangular Weir** (Weir Controls 0.00 cfs @ 0.29 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=332.00' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

BEALS+THOMAS
CIVIL ENGINEERS | LANDSCAPE ARCHITECTS |
LAND SURVEYORS | PLANNERS | ENVIRONMENTAL SPECIALISTS

JOB NO./LOCATION:

3077.03
Douglas, Sutton, Uxbridge, MA

CLIENT/PROJECT:

Scannell Properties
Blackstone Logistics Center

SUBJECT/TITLE:

Hydraulic Calculations

OBJECTIVE OF CALCULATION:

- To design a stormwater collection system to capture and convey runoff to proposed stormwater management BMPs.
- To design a stormwater management system to meet the design the design standards of the Massachusetts DEP Stormwater Management Handbook for erosion and scour protection.

CALCULATION METHOD(S):

- Drainage structures and drainpipes are designed using the Rational Formula and based on a 25-year storm for conveyance and the 50-year storm for surcharging of structures.
- The proposed stormwater collection system was analyzed using StormCAD V10i by Bentley Systems, Inc.

ASSUMPTIONS:

- Runoff coefficient C = 0.9 for pavement and 0.3 for grassed areas (adapted from the American Society of Civil Engineers Manual on Engineering Practice No. 37). n = 0.013 for high density polyethylene (HDPE).
- Minimum flowing-full velocity of 2 feet per second.
- Minimum Time of Concentration (Tc) assumed to be 6 minutes or 0.1 hours.

SOURCES OF DATA/EQUATIONS:

- Proposed Hydraulic Areas Map, prepared by Beals and Thomas, Inc., B+T plan no. 307703P006C-003.
- Rational Method (Q = CiA) was used to calculate peak runoff rates.
- Manning's Formula was used to determine pipe capacities.
- 25-year and 50-year storm intensities obtained from Intensity/Duration/Frequency rainfall curves from S.C.S Technical Paper No. 40.
- Massachusetts DEP Stormwater Management Handbook.

CONCLUSIONS:

- The proposed stormwater management design has been reviewed for compliance with the stormwater management standards described in the DEP's Stormwater Management Handbook, dated February 2008.
- Cleanouts from roof drainage to be sized.
- The proposed stormwater collection system will not surcharge above the rims of the structures from the 50-year design storm.

REV	CALC. BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
0	M. Bruckman	1/14/2021	J. Murphy	1/14/2021	D. Feeney	1/14/2021
1	M. Bruckman	4/1/2021	J. Murphy	3/31/2021	D. Feeney	4/1/2021
2	J. Murphy	11/02/2021	D.M Feeney	11/3/2021	D.M Feeney	11/3/2021

COMMONWEALTH OF MASSACHUSETTS
Daniel M. Feeney
CIVIL ENGINEER
NO. 41422
REGISTERED PROFESSIONAL ENGINEER
11/3/2021

Proposed Hydraulic Areas Map
Figure Number 003

Scale: Not To Scale

Date: 11/02/2021

Plan No. 307703P006E-003

B+T Project No. 3077.03

100 Lackey Dam Road
Douglas, Sutton, and Uxbridge Massachusetts

Scannell Properties
8801 River Crossing Blvd., Suite 300
Indianapolis, Indiana

North Arrow
NORTH

Conduit FlexTable: BTI Hydraulic Spreadsheet

Start Node	Stop Node	System Flow Time (min)	System CA (acres)	System Intensity (in/h)	Flow (cfs)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Invert (Upstream) (ft)	Invert (Downstream) (ft)	Diameter (in)	Material	Manning's n	Slope (Calculated) (ft/ft)	Capacity (Full Flow) (cfs)	Velocity (ft/s)	Excess Capacity (Full Flow) (cfs)
DCB-2	DMH-1	6.000	0.502	6.300	3.19	359.80	359.80	355.80	355.60	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.022	5.75	7.51	2.56
DCB-3	DMH-2	6.000	0.607	6.300	3.86	357.50	357.60	352.85	352.65	15.0	Corrugated HDPE (Smooth Interior)	0.012	0.019	9.54	7.36	5.69
CB-5	DMH-3	6.000	0.423	6.300	2.68	357.60	357.80	352.50	352.26	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.026	6.27	7.67	3.58
DMH-3	DMH-4	7.167	3.852	6.050	23.49	357.80	358.40	350.76	349.97	30.0	Corrugated HDPE (Smooth Interior)	0.012	0.005	31.42	7.02	7.93
DCB-6	DMH-5	6.000	0.457	6.300	2.91	353.10	353.60	349.45	349.41	15.0	Corrugated HDPE (Smooth Interior)	0.012	0.005	5.12	4.30	2.21
DMH-5	DMH-6	8.209	5.026	5.779	29.28	353.60	353.20	348.41	347.91	36.0	Corrugated HDPE (Smooth Interior)	0.012	0.003	39.24	6.09	9.96
DMH-6	DMH-6A	8.673	5.840	5.733	33.74	353.20	355.50	347.91	347.45	36.0	Corrugated HDPE (Smooth Interior)	0.012	0.003	39.46	6.27	5.71
DCB-7	DMH-6	6.000	0.814	6.300	5.17	352.90	353.20	349.00	348.91	15.0	Corrugated HDPE (Smooth Interior)	0.012	0.008	6.06	5.55	0.90
HW-2	DMH-17	0.000	0.000	6.600	56.11	348.50	355.10	343.50	343.17	36.0	Corrugated HDPE (Smooth Interior)	0.012	0.007	58.85	9.48	2.74
DMH-17	DMH-18	0.087	0.000	8.074	56.11	355.10	350.90	340.72	340.00	36.0	Corrugated HDPE (Smooth Interior)	0.012	0.007	59.43	9.56	3.32
CB-29	DMH-18	6.000	0.051	6.300	0.33	350.80	350.90	339.96	339.66	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.022	5.69	3.93	5.37
CB-30	DMH-18	6.000	0.133	6.300	0.85	350.80	350.90	340.20	339.66	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.018	5.19	4.87	4.34
DMH-18	DMH-19	6.102	0.185	6.280	57.28	350.90	345.90	336.90	336.10	36.0	Corrugated HDPE (Smooth Interior)	0.012	0.007	60.44	9.73	3.17
CB-31	DMH-19	6.000	0.059	6.300	0.38	345.80	345.90	335.60	335.46	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.012	4.28	3.36	3.90
CB-32	DMH-19	6.000	0.083	6.300	0.53	345.80	345.90	336.18	335.46	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.018	5.23	4.26	4.70
DMH-19	DMH-20	6.298	0.327	6.240	58.17	345.90	344.60	333.25	332.62	36.0	Corrugated HDPE (Smooth Interior)	0.012	0.007	60.33	9.72	2.16
CB-24	DMH-26	6.000	0.274	6.300	1.74	354.90	355.60	348.25	346.53	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.020	5.46	6.17	3.72
DMH-26	DMH-25	6.233	0.274	6.253	1.73	355.60	347.70	344.53	342.81	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.020	5.45	6.16	3.73
CB-25	DMH-27	6.000	0.233	6.300	1.48	354.80	348.30	347.16	344.52	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.030	6.69	6.84	5.21
CB-26	DMH-27	6.000	0.368	6.300	2.34	347.00	348.30	342.26	341.52	15.0	Corrugated HDPE (Smooth Interior)	0.012	0.009	6.82	5.04	4.48
CB-27	DMH-27	6.000	0.246	6.300	1.56	347.00	348.30	342.26	341.52	15.0	Corrugated HDPE (Smooth Interior)	0.012	0.012	7.59	4.87	6.03
DMH-27	DMH-25	6.258	0.847	6.248	5.34	348.30	347.70	341.52	339.81	18.0	Corrugated HDPE (Smooth Interior)	0.012	0.010	11.21	6.27	5.88
DMH-25	DMH-24	6.726	1.121	6.155	6.96	347.70	345.20	339.81	336.65	18.0	Corrugated HDPE (Smooth Interior)	0.012	0.020	16.00	8.74	9.04
DCB-28	DMH-24	6.000	0.503	6.300	3.19	344.70	345.20	337.00	336.65	15.0	Corrugated HDPE (Smooth Interior)	0.012	0.016	8.87	6.63	5.68
DCB-17	DMH-6A	6.000	0.739	6.300	4.69	352.90	355.50	348.90	348.45	15.0	Corrugated HDPE (Smooth Interior)	0.012	0.009	6.63	5.86	1.94

Conduit FlexTable: BTI Hydraulic Spreadsheet

Start Node	Stop Node	System Flow Time (min)	System CA (acres)	System Intensity (in/h)	Flow (cfs)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Invert (Upstream) (ft)	Invert (Downstream) (ft)	Diameter (in)	Material	Manning's n	Slope (Calculated) (ft/ft)	Capacity (Full Flow) (cfs)	Velocity (ft/s)	Excess Capacity (Full Flow) (cfs)
DCB-18	FE-6	6.000	0.692	6.300	4.40	352.90	348.50	349.00	348.50	15.0	Corrugated HDPE (Smooth Interior)	0.012	0.010	7.15	6.12	2.75
DCB-19	FE-7	6.000	0.698	6.300	4.44	352.90	348.00	349.00	348.00	15.0	Corrugated HDPE (Smooth Interior)	0.012	0.021	10.22	8.04	5.79
DCB-20	FE-8	6.000	0.763	6.300	4.84	352.90	347.00	348.00	347.00	15.0	Corrugated HDPE (Smooth Interior)	0.012	0.020	9.98	8.08	5.14
DCB-21	FE-9	6.000	0.433	6.300	2.75	352.60	347.00	347.36	347.00	15.0	Corrugated HDPE (Smooth Interior)	0.012	0.018	9.48	6.69	6.73
CB-33	DMH-23	6.000	0.186	6.300	1.18	339.50	339.10	331.15	331.00	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.019	5.31	5.43	4.13
CB-34	DMH-23	6.000	0.086	6.300	0.54	339.60	339.10	331.84	331.00	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.020	5.46	4.44	4.92
DMH-23	FE-13	6.157	0.271	6.269	1.71	339.10	327.00	328.00	327.00	15.0	Corrugated HDPE (Smooth Interior)	0.012	0.018	9.42	5.83	7.70
CB-35	WQI-2	6.000	0.064	6.300	0.41	331.80	332.10	328.00	327.20	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.019	5.30	3.99	4.89
CB-36	WQI-2	6.000	0.062	6.300	0.39	331.80	332.10	327.40	327.20	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.028	6.51	4.58	6.12
WQI-2	FE-14	6.177	0.126	6.265	0.80	332.10	326.50	327.20	326.50	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.018	5.19	4.79	4.40
CB-37	WQI-3	6.000	0.042	6.300	0.27	338.10	337.40	334.00	333.90	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.012	4.31	3.06	4.05
CB-38	WQI-3	6.000	0.045	6.300	0.29	338.10	337.40	334.20	333.90	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.016	4.89	3.40	4.60
WQI-3	FE-18	6.092	0.087	6.282	0.55	337.40	333.00	333.65	333.00	15.0	Corrugated HDPE (Smooth Interior)	0.012	0.005	4.74	2.58	4.19
CB-39	WQI-4	6.000	0.091	6.300	0.58	324.90	325.20	321.40	321.31	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.005	2.84	2.84	2.26
CB-40	WQI-4	6.000	0.093	6.300	0.59	324.90	325.20	321.40	321.31	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.008	3.43	3.27	2.84
WQI-4	FE-19	6.098	0.184	6.280	1.16	325.20	321.00	321.31	321.00	15.0	Corrugated HDPE (Smooth Interior)	0.012	0.005	4.96	3.30	3.80
OCS-1	FE-4	0.000	0.000	6.600	10.70	337.00	322.00	323.30	322.00	18.0	Corrugated HDPE (Smooth Interior)	0.012	0.010	11.34	7.30	0.64
OCS-2	FE-15	0.000	0.000	6.600	19.54	329.00	325.00	325.40	325.00	24.0	Corrugated HDPE (Smooth Interior)	0.012	0.012	26.35	9.18	6.81
CB-22	DMH-28	6.000	0.270	6.300	1.72	354.00	354.80	350.58	349.42	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.021	5.62	6.29	3.90
CB-23	DMH-28	6.000	0.603	6.300	3.83	354.00	354.80	350.42	349.42	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.020	5.40	7.46	1.57
DMH-28	FE-10	6.145	0.873	6.271	5.52	354.80	349.00	349.17	349.00	15.0	Corrugated HDPE (Smooth Interior)	0.012	0.012	7.77	6.87	2.25
OCS-3	DMH-34	0.000	0.000	6.600	7.26	348.50	348.00	341.76	341.36	15.0	Corrugated HDPE (Smooth Interior)	0.012	0.018	9.49	8.52	2.23
DMH-34	DMH-24	0.043	0.000	8.087	7.26	348.00	345.20	338.52	337.65	15.0	Corrugated HDPE (Smooth Interior)	0.012	0.026	11.30	9.78	4.04
CO-3	DMH-21	6.000	6.674	6.300	42.38	358.00	357.80	340.50	340.20	36.0	Concrete	0.013	0.007	56.83	8.81	14.45
CB-8	DMH-7	6.000	0.163	6.300	1.04	357.50	357.70	352.80	351.43	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.010	3.83	4.14	2.79
CB-9	DMH-7	6.000	0.086	6.300	0.54	357.50	357.70	351.61	351.43	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.015	4.73	4.01	4.18

Conduit FlexTable: BTI Hydraulic Spreadsheet

Start Node	Stop Node	System Flow Time (min)	System CA (acres)	System Intensity (in/h)	Flow (cfs)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Invert (Upstream) (ft)	Invert (Downstream) (ft)	Diameter (in)	Material	Manning's n	Slope (Calculated) (ft/ft)	Capacity (Full Flow) (cfs)	Velocity (ft/s)	Excess Capacity (Full Flow) (cfs)
DMH-7	DMH-8	6.560	0.249	6.188	1.55	357.70	353.40	351.33	349.45	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.010	3.84	4.62	2.28
DCB-10	DMH-8	6.000	0.577	6.300	3.66	353.00	353.40	349.25	349.20	15.0	Corrugated HDPE (Smooth Interior)	0.012	0.005	4.70	4.23	1.04
DMH-8	DMH-9	7.246	0.825	6.026	5.01	353.40	354.10	349.20	348.70	15.0	Corrugated HDPE (Smooth Interior)	0.012	0.007	5.74	5.27	0.72
CB-11	DMH-9	6.000	0.138	6.300	0.88	353.00	354.10	349.44	349.10	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.010	3.83	3.95	2.95
DCB-12	DMH-10	6.000	0.554	6.300	3.52	352.90	353.70	347.84	346.29	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.020	5.44	7.37	1.92
DMH-10	DMH-11	7.937	1.784	5.819	10.47	353.70	353.20	345.79	343.12	18.0	Corrugated HDPE (Smooth Interior)	0.012	0.013	12.96	8.16	2.50
DCB-13	DMH-11	6.000	0.577	6.300	3.66	352.60	353.20	345.30	345.10	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.014	4.55	6.45	0.89
DCB-15	DMH-13	6.000	0.577	6.300	3.66	352.90	353.20	348.90	348.76	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.013	4.37	6.23	0.71
DMH-13	DMH-12	6.815	1.341	6.137	8.30	353.20	353.20	345.27	343.79	18.0	Corrugated HDPE (Smooth Interior)	0.012	0.010	11.35	7.01	3.06
DCB-14	DMH-12	6.000	0.596	6.300	3.78	352.90	353.20	346.90	346.70	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.018	5.12	7.13	1.34
DMH-12	WQI-1	7.168	1.937	6.049	11.81	353.20	353.00	343.29	342.45	24.0	Corrugated HDPE (Smooth Interior)	0.012	0.007	20.16	6.67	8.35
DMH-11	WQI-1	8.357	2.361	5.764	13.72	353.20	353.00	342.62	342.45	24.0	Corrugated HDPE (Smooth Interior)	0.012	0.015	30.35	9.42	16.63
WQI-1	DMH-29	8.377	4.298	5.762	24.96	353.00	353.00	342.45	342.35	30.0	Corrugated HDPE (Smooth Interior)	0.012	0.010	44.65	9.35	19.68
DMH-29	DMH-30	8.395	4.298	5.761	24.96	353.00	347.00	340.28	339.85	30.0	Corrugated HDPE (Smooth Interior)	0.012	0.010	45.32	9.46	20.36
DMH-30	DMH-31	8.467	4.298	5.753	24.92	347.00	342.00	337.35	336.88	30.0	Corrugated HDPE (Smooth Interior)	0.012	0.009	41.43	8.83	16.51
DMH-31	DMH-32	8.569	4.298	5.743	24.88	342.00	338.90	334.10	333.80	30.0	Corrugated HDPE (Smooth Interior)	0.012	0.009	41.64	8.86	16.76
DMH-32	FE-2	8.634	4.298	5.737	24.85	338.90	334.25	333.70	333.50	30.0	Corrugated HDPE (Smooth Interior)	0.012	0.010	43.36	9.13	18.51
DMH-15	DMH-16	6.278	6.674	6.244	42.01	353.40	352.00	339.13	338.90	36.0	Corrugated HDPE (Smooth Interior)	0.012	0.008	63.76	9.63	21.75
DMH-16	FE-3	6.329	6.674	6.234	41.94	352.00	334.00	334.40	334.00	36.0	Corrugated HDPE (Smooth Interior)	0.012	0.008	63.73	9.62	21.80
DMH-22	FE-12	6.834	6.674	6.133	41.26	339.90	326.50	327.22	326.50	36.0	Corrugated HDPE (Smooth Interior)	0.012	0.007	60.25	9.18	18.99
FE-16	FE-17	6.000	0.468	6.300	2.97	329.00	327.00	326.00	324.75	12.0	Concrete	0.013	0.009	3.31	4.77	0.34
DMH-21	DMH-33	6.078	6.674	6.284	42.27	357.80	354.60	336.85	335.85	36.0	Concrete	0.013	0.007	57.19	8.85	14.92
DCB-1	DMH-1A	6.000	0.363	6.300	2.31	361.40	360.65	357.30	356.59	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.008	3.36	4.61	1.06
DMH-1A	DMH-1	6.338	0.815	6.232	5.12	360.65	359.80	356.34	355.35	15.0	Corrugated HDPE (Smooth Interior)	0.012	0.012	7.52	6.59	2.40
DCB-1A	DMH-1A	6.000	0.452	6.300	2.87	360.55	360.65	356.83	356.59	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.020	5.46	7.04	2.59
DMH-1	DMH-2A	6.554	1.317	6.189	8.22	359.80	358.85	355.10	353.59	18.0	Corrugated HDPE (Smooth Interior)	0.012	0.016	14.47	8.45	6.25

Conduit FlexTable: BTI Hydraulic Spreadsheet

Start Node	Stop Node	System Flow Time (min)	System CA (acres)	System Intensity (in/h)	Flow (cfs)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Invert (Upstream) (ft)	Invert (Downstream) (ft)	Diameter (in)	Material	Manning's n	Slope (Calculated) (ft/ft)	Capacity (Full Flow) (cfs)	Velocity (ft/s)	Excess Capacity (Full Flow) (cfs)
DMH-2A	DMH-2	6.738	1.884	6.152	11.69	358.85	357.60	353.09	352.00	24.0	Corrugated HDPE (Smooth Interior)	0.012	0.010	24.45	7.69	12.77
DMH-2	DMH-3A	6.976	2.491	6.105	15.33	357.60	357.70	351.90	351.70	24.0	Corrugated HDPE (Smooth Interior)	0.012	0.008	21.77	7.51	6.44
DMH-3A	DMH-3	7.032	3.121	6.090	19.16	357.70	357.80	351.20	350.76	30.0	Corrugated HDPE (Smooth Interior)	0.012	0.007	37.36	7.66	18.19
DCB-4	DMH-3A	6.000	0.630	6.300	4.00	356.80	357.70	352.48	352.10	18.0	Corrugated HDPE (Smooth Interior)	0.012	0.010	11.14	5.78	7.14
CB-5A	DMH-3	6.000	0.308	6.300	1.95	358.30	357.80	352.50	352.26	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.011	4.02	5.09	2.07
DMH-4	DMH-5A	7.542	3.852	5.937	23.05	358.40	354.20	349.97	349.26	30.0	Corrugated HDPE (Smooth Interior)	0.012	0.005	31.47	7.00	8.42
DMH-5A	DMH-5	7.879	4.568	5.836	26.88	354.20	353.60	348.76	348.41	36.0	Corrugated HDPE (Smooth Interior)	0.012	0.003	39.28	5.98	12.40
DCB-6A	DMH-5A	6.000	0.717	6.300	4.55	353.30	354.20	349.95	349.76	15.0	Corrugated HDPE (Smooth Interior)	0.012	0.005	5.12	4.72	0.57
DCB-2A	DMH-2A	6.000	0.567	6.300	3.60	358.80	358.85	354.29	354.09	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.020	5.44	7.40	1.84
DMH-24	DMH-20	7.031	1.624	6.091	17.23	345.20	344.60	334.65	333.52	24.0	Corrugated HDPE (Smooth Interior)	0.012	0.008	22.44	7.87	5.21
DMH-33	DMH-33A	6.334	6.674	6.233	41.93	354.60	345.60	332.50	331.62	36.0	Concrete	0.013	0.007	55.89	8.68	13.96
DMH-33A	DMH-22	6.575	6.674	6.185	41.61	345.60	339.90	328.27	327.32	36.0	Concrete	0.013	0.007	55.95	8.67	14.35
DMH-20	DMH-20A	7.317	1.951	6.005	75.18	344.60	342.00	332.02	331.87	42.0	Corrugated HDPE (Smooth Interior)	0.012	0.005	77.25	9.15	2.07
DMH-6A	DMH-6B	9.083	6.579	5.675	37.63	355.50	354.20	347.45	347.02	36.0	Corrugated HDPE (Smooth Interior)	0.012	0.003	39.43	6.35	1.79
DMH-6B	HW-1	9.462	6.579	5.561	36.88	354.20	352.80	347.02	346.95	36.0	Corrugated HDPE (Smooth Interior)	0.012	0.009	67.80	9.79	30.92
DCB-16	DMH-13A	6.000	0.596	6.300	3.78	352.90	352.93	348.90	348.76	15.0	Corrugated HDPE (Smooth Interior)	0.012	0.017	9.20	7.13	5.42
DMH-13A	DMH-13	6.422	0.764	6.216	4.79	352.93	353.20	346.96	345.52	15.0	Corrugated HDPE (Smooth Interior)	0.012	0.010	6.99	6.13	2.20
CB-16A	DMH-13A	6.000	0.168	6.300	1.07	352.90	352.93	348.90	347.21	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.014	4.57	4.75	3.50
DMH-20A	DMH-20B	7.371	1.951	5.989	75.15	342.00	335.00	329.41	329.26	42.0	Corrugated HDPE (Smooth Interior)	0.012	0.006	83.49	9.82	8.35
DMH-20B	FE-11	7.415	1.951	5.976	75.12	335.00	327.00	327.17	327.00	42.0	Corrugated HDPE (Smooth Interior)	0.012	0.005	78.28	9.26	3.16
DMH-14	DMH-14A	6.000	6.674	6.300	42.38	354.80	354.20	344.00	343.40	36.0	Corrugated HDPE (Smooth Interior)	0.012	0.008	63.17	9.58	20.79
DMH-14A	DMH-15	6.137	6.674	6.273	42.20	354.20	353.40	341.15	340.60	36.0	Corrugated HDPE (Smooth Interior)	0.012	0.007	60.50	9.25	18.30
DMH-9	DMH-9A	7.481	0.963	5.956	5.78	354.10	354.10	348.60	347.15	18.0	Corrugated HDPE (Smooth Interior)	0.012	0.013	12.99	7.14	7.21
DMH-9A	DMH-10	7.741	1.230	5.878	7.29	354.10	353.70	347.05	345.89	18.0	Corrugated HDPE (Smooth Interior)	0.012	0.013	12.99	7.56	5.70
CB-11A	DMH-9A	6.000	0.267	6.300	1.69	352.70	354.10	348.10	347.55	12.0	Corrugated HDPE (Smooth Interior)	0.012	0.020	5.51	6.18	3.82

Conduit FlexTable: BTI Pipe Properties

Start Node	Stop Node	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Diameter (in)	Material	Cover (Start) (ft)	Cover (Stop) (ft)	Velocity (ft/s)
DCB-2	DMH-1	359.80	359.80	12.0	Corrugated HDPE (Smooth Interior)	3.00	3.20	7.51
DCB-3	DMH-2	357.50	357.60	15.0	Corrugated HDPE (Smooth Interior)	3.40	3.70	7.36
CB-5	DMH-3	357.60	357.80	12.0	Corrugated HDPE (Smooth Interior)	4.10	4.54	7.67
DMH-3	DMH-4	357.80	358.40	30.0	Corrugated HDPE (Smooth Interior)	4.54	5.93	7.02
DCB-6	DMH-5	353.10	353.60	15.0	Corrugated HDPE (Smooth Interior)	2.40	2.94	4.30
DMH-5	DMH-6	353.60	353.20	36.0	Corrugated HDPE (Smooth Interior)	2.19	2.29	6.09
DMH-6	DMH-6A	353.20	355.50	36.0	Corrugated HDPE (Smooth Interior)	2.29	5.05	6.27
DCB-7	DMH-6	352.90	353.20	15.0	Corrugated HDPE (Smooth Interior)	2.65	3.04	5.55
HW-2	DMH-17	348.50	355.10	36.0	Corrugated HDPE (Smooth Interior)	2.00	8.93	9.48
DMH-17	DMH-18	355.10	350.90	36.0	Corrugated HDPE (Smooth Interior)	11.38	7.90	9.56
CB-29	DMH-18	350.80	350.90	12.0	Corrugated HDPE (Smooth Interior)	9.84	10.24	3.93
CB-30	DMH-18	350.80	350.90	12.0	Corrugated HDPE (Smooth Interior)	9.60	10.24	4.87
DMH-18	DMH-19	350.90	345.90	36.0	Corrugated HDPE (Smooth Interior)	11.00	6.80	9.73
CB-31	DMH-19	345.80	345.90	12.0	Corrugated HDPE (Smooth Interior)	9.20	9.44	3.36
CB-32	DMH-19	345.80	345.90	12.0	Corrugated HDPE (Smooth Interior)	8.62	9.44	4.26
DMH-19	DMH-20	345.90	344.60	36.0	Corrugated HDPE (Smooth Interior)	9.65	8.98	9.72
CB-24	DMH-26	354.90	355.60	12.0	Corrugated HDPE (Smooth Interior)	5.65	8.07	6.17

Conduit FlexTable: BTI Pipe Properties

Start Node	Stop Node	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Diameter (in)	Material	Cover (Start) (ft)	Cover (Stop) (ft)	Velocity (ft/s)
DMH-26	DMH-25	355.60	347.70	12.0	Corrugated HDPE (Smooth Interior)	10.07	3.89	6.16
CB-25	DMH-27	354.80	348.30	12.0	Corrugated HDPE (Smooth Interior)	6.64	2.78	6.84
CB-26	DMH-27	347.00	348.30	15.0	Corrugated HDPE (Smooth Interior)	3.49	5.53	5.04
CB-27	DMH-27	347.00	348.30	15.0	Corrugated HDPE (Smooth Interior)	3.49	5.53	4.87
DMH-27	DMH-25	348.30	347.70	18.0	Corrugated HDPE (Smooth Interior)	5.28	6.39	6.27
DMH-25	DMH-24	347.70	345.20	18.0	Corrugated HDPE (Smooth Interior)	6.39	7.05	8.74
DCB-28	DMH-24	344.70	345.20	15.0	Corrugated HDPE (Smooth Interior)	6.45	7.30	6.63
DCB-17	DMH-6A	352.90	355.50	15.0	Corrugated HDPE (Smooth Interior)	2.75	5.80	5.86
DCB-18	FE-6	352.90	348.50	15.0	Corrugated HDPE (Smooth Interior)	2.65	-1.25	6.12
DCB-19	FE-7	352.90	348.00	15.0	Corrugated HDPE (Smooth Interior)	2.65	-1.25	8.04
DCB-20	FE-8	352.90	347.00	15.0	Corrugated HDPE (Smooth Interior)	3.65	-1.25	8.08
DCB-21	FE-9	352.60	347.00	15.0	Corrugated HDPE (Smooth Interior)	3.99	-1.25	6.69
CB-33	DMH-23	339.50	339.10	12.0	Corrugated HDPE (Smooth Interior)	7.35	7.10	5.43
CB-34	DMH-23	339.60	339.10	12.0	Corrugated HDPE (Smooth Interior)	6.76	7.10	4.44
DMH-23	FE-13	339.10	327.00	15.0	Corrugated HDPE (Smooth Interior)	9.85	-1.25	5.83
CB-35	WQI-2	331.80	332.10	12.0	Corrugated HDPE (Smooth Interior)	2.80	3.90	3.99
CB-36	WQI-2	331.80	332.10	12.0	Corrugated HDPE (Smooth Interior)	3.40	3.90	4.58

Conduit FlexTable: BTI Pipe Properties

Start Node	Stop Node	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Diameter (in)	Material	Cover (Start) (ft)	Cover (Stop) (ft)	Velocity (ft/s)
WQI-2	FE-14	332.10	326.50	12.0	Corrugated HDPE (Smooth Interior)	3.90	-1.00	4.79
CB-37	WQI-3	338.10	337.40	12.0	Corrugated HDPE (Smooth Interior)	3.10	2.50	3.06
CB-38	WQI-3	338.10	337.40	12.0	Corrugated HDPE (Smooth Interior)	2.90	2.50	3.40
WQI-3	FE-18	337.40	333.00	15.0	Corrugated HDPE (Smooth Interior)	2.50	-1.25	2.58
CB-39	WQI-4	324.90	325.20	12.0	Corrugated HDPE (Smooth Interior)	2.50	2.89	2.84
CB-40	WQI-4	324.90	325.20	12.0	Corrugated HDPE (Smooth Interior)	2.50	2.89	3.27
WQI-4	FE-19	325.20	321.00	15.0	Corrugated HDPE (Smooth Interior)	2.64	-1.25	3.30
OCS-1	FE-4	337.00	322.00	18.0	Corrugated HDPE (Smooth Interior)	12.20	-1.50	7.30
OCS-2	FE-15	329.00	325.00	24.0	Corrugated HDPE (Smooth Interior)	1.60	-2.00	9.18
CB-22	DMH-28	354.00	354.80	12.0	Corrugated HDPE (Smooth Interior)	2.42	4.38	6.29
CB-23	DMH-28	354.00	354.80	12.0	Corrugated HDPE (Smooth Interior)	2.58	4.38	7.46
DMH-28	FE-10	354.80	349.00	15.0	Corrugated HDPE (Smooth Interior)	4.38	-1.25	6.87
OCS-3	DMH-34	348.50	348.00	15.0	Corrugated HDPE (Smooth Interior)	5.49	5.39	8.52
DMH-34	DMH-24	348.00	345.20	15.0	Corrugated HDPE (Smooth Interior)	8.23	6.30	9.78
CO-3	DMH-21	358.00	357.80	36.0	Concrete	14.50	14.60	8.81
CB-8	DMH-7	357.50	357.70	12.0	Corrugated HDPE (Smooth Interior)	3.70	5.27	4.14
CB-9	DMH-7	357.50	357.70	12.0	Corrugated HDPE (Smooth Interior)	4.89	5.27	4.01
DMH-7	DMH-8	357.70	353.40	12.0	Corrugated HDPE (Smooth Interior)	5.37	2.95	4.62

Conduit FlexTable: BTI Pipe Properties

Start Node	Stop Node	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Diameter (in)	Material	Cover (Start) (ft)	Cover (Stop) (ft)	Velocity (ft/s)
DCB-10	DMH-8	353.00	353.40	15.0	Corrugated HDPE (Smooth Interior)	2.50	2.95	4.23
DMH-8	DMH-9	353.40	354.10	15.0	Corrugated HDPE (Smooth Interior)	2.95	4.15	5.27
CB-11	DMH-9	353.00	354.10	12.0	Corrugated HDPE (Smooth Interior)	2.56	4.00	3.95
DCB-12	DMH-10	352.90	353.70	12.0	Corrugated HDPE (Smooth Interior)	4.06	6.41	7.37
DMH-10	DMH-11	353.70	353.20	18.0	Corrugated HDPE (Smooth Interior)	6.41	8.58	8.16
DCB-13	DMH-11	352.60	353.20	12.0	Corrugated HDPE (Smooth Interior)	6.30	7.10	6.45
DCB-15	DMH-13	352.90	353.20	12.0	Corrugated HDPE (Smooth Interior)	3.00	3.44	6.23
DMH-13	DMH-12	353.20	353.20	18.0	Corrugated HDPE (Smooth Interior)	6.43	7.91	7.01
DCB-14	DMH-12	352.90	353.20	12.0	Corrugated HDPE (Smooth Interior)	5.00	5.50	7.13
DMH-12	WQI-1	353.20	353.00	24.0	Corrugated HDPE (Smooth Interior)	7.91	8.55	6.67
DMH-11	WQI-1	353.20	353.00	24.0	Corrugated HDPE (Smooth Interior)	8.58	8.55	9.42
WQI-1	DMH-29	353.00	353.00	30.0	Corrugated HDPE (Smooth Interior)	8.05	8.15	9.35
DMH-29	DMH-30	353.00	347.00	30.0	Corrugated HDPE (Smooth Interior)	10.22	4.65	9.46
DMH-30	DMH-31	347.00	342.00	30.0	Corrugated HDPE (Smooth Interior)	7.15	2.62	8.83
DMH-31	DMH-32	342.00	338.90	30.0	Corrugated HDPE (Smooth Interior)	5.40	2.60	8.86
DMH-32	FE-2	338.90	334.25	30.0	Corrugated HDPE (Smooth Interior)	2.70	-1.75	9.13
DMH-15	DMH-16	353.40	352.00	36.0	Corrugated HDPE (Smooth Interior)	11.27	10.10	9.63

Conduit FlexTable: BTI Pipe Properties

Start Node	Stop Node	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Diameter (in)	Material	Cover (Start) (ft)	Cover (Stop) (ft)	Velocity (ft/s)
DMH-16	FE-3	352.00	334.00	36.0	Corrugated HDPE (Smooth Interior)	14.60	-3.00	9.62
DMH-22	FE-12	339.90	326.50	36.0	Corrugated HDPE (Smooth Interior)	9.68	-3.00	9.18
FE-16	FE-17	329.00	327.00	12.0	Concrete	2.00	1.25	4.77
DMH-21	DMH-33	357.80	354.60	36.0	Concrete	17.95	15.75	8.85
DCB-1	DMH-1A	361.40	360.65	12.0	Corrugated HDPE (Smooth Interior)	3.10	3.06	4.61
DMH-1A	DMH-1	360.65	359.80	15.0	Corrugated HDPE (Smooth Interior)	3.06	3.20	6.59
DCB-1A	DMH-1A	360.55	360.65	12.0	Corrugated HDPE (Smooth Interior)	2.72	3.06	7.04
DMH-1	DMH-2A	359.80	358.85	18.0	Corrugated HDPE (Smooth Interior)	3.20	3.76	8.45
DMH-2A	DMH-2	358.85	357.60	24.0	Corrugated HDPE (Smooth Interior)	3.76	3.60	7.69
DMH-2	DMH-3A	357.60	357.70	24.0	Corrugated HDPE (Smooth Interior)	3.70	4.00	7.51
DMH-3A	DMH-3	357.70	357.80	30.0	Corrugated HDPE (Smooth Interior)	4.00	4.54	7.66
DCB-4	DMH-3A	356.80	357.70	18.0	Corrugated HDPE (Smooth Interior)	2.82	4.10	5.78
CB-5A	DMH-3	358.30	357.80	12.0	Corrugated HDPE (Smooth Interior)	4.80	4.54	5.09
DMH-4	DMH-5A	358.40	354.20	30.0	Corrugated HDPE (Smooth Interior)	5.93	2.44	7.00
DMH-5A	DMH-5	354.20	353.60	36.0	Corrugated HDPE (Smooth Interior)	2.44	2.19	5.98
DCB-6A	DMH-5A	353.30	354.20	15.0	Corrugated HDPE (Smooth Interior)	2.10	3.19	4.72
DCB-2A	DMH-2A	358.80	358.85	12.0	Corrugated HDPE (Smooth Interior)	3.51	3.76	7.40
DMH-24	DMH-20	345.20	344.60	24.0	Corrugated HDPE (Smooth Interior)	8.55	9.08	7.87
DMH-33	DMH-33A	354.60	345.60	36.0	Concrete	19.10	10.98	8.68

Conduit FlexTable: BTI Pipe Properties

Start Node	Stop Node	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Diameter (in)	Material	Cover (Start) (ft)	Cover (Stop) (ft)	Velocity (ft/s)
DMH-33A	DMH-22	345.60	339.90	36.0	Concrete	14.33	9.58	8.67
DMH-20	DMH-20A	344.60	342.00	42.0	Corrugated HDPE (Smooth Interior)	9.08	6.63	9.15
DMH-6A	DMH-6B	355.50	354.20	36.0	Corrugated HDPE (Smooth Interior)	5.05	4.18	6.35
DMH-6B	HW-1	354.20	352.80	36.0	Corrugated HDPE (Smooth Interior)	4.18	2.85	9.79
DCB-16	DMH-13A	352.90	352.93	15.0	Corrugated HDPE (Smooth Interior)	2.75	2.92	7.13
DMH-13A	DMH-13	352.93	353.20	15.0	Corrugated HDPE (Smooth Interior)	4.72	6.43	6.13
CB-16A	DMH-13A	352.90	352.93	12.0	Corrugated HDPE (Smooth Interior)	3.00	4.72	4.75
DMH-20A	DMH-20B	342.00	335.00	42.0	Corrugated HDPE (Smooth Interior)	9.09	2.24	9.82
DMH-20B	FE-11	335.00	327.00	42.0	Corrugated HDPE (Smooth Interior)	4.33	-3.50	9.26
DMH-14	DMH-14A	354.80	354.20	36.0	Corrugated HDPE (Smooth Interior)	7.80	7.80	9.58
DMH-14A	DMH-15	354.20	353.40	36.0	Corrugated HDPE (Smooth Interior)	10.05	9.80	9.25
DMH-9	DMH-9A	354.10	354.10	18.0	Corrugated HDPE (Smooth Interior)	4.00	5.45	7.14
DMH-9A	DMH-10	354.10	353.70	18.0	Corrugated HDPE (Smooth Interior)	5.55	6.31	7.56
CB-11A	DMH-9A	352.70	354.10	12.0	Corrugated HDPE (Smooth Interior)	3.60	5.55	6.18

BEALS + THOMAS

Standard 3: Groundwater Recharge

Groundwater Recharge Volume Required:

Rv = F x Impervious Area, where:

Rv = Required Recharge Volume [Ac-ft]

F = Target Depth Factor associated with each Hydrologic Soil Group (HSG) [in]

Impervious Area = Total Pavement and Rooftop Area under Post-development Conditions [Ac]

			Impervious Area [Acres]	Required Recharge Volume [Ac-ft]	
HSG "A", use F =	0.6	in	31.780	1.589	
HSG "B", use F =	0.35	in	0.000	0.000	
HSG "C", use F =	0.25	in	0.000	0.000	
HSG "D", use F =	0.1	in	0.000	0.000	
Total Required Recharge Volume (Rv) =				**1.589**	**Ac-ft**

Capture Area Adjustment: (Ref: DEP Handbook V.3 Ch.1 P.27-28)

Total Site Impervious Area (Total)=	31.78	Acres
Impervious Area Draining to Infiltrative BMPs (infil) =	31.442	Acres (PDA-1A, 1D, 2A Impervious Area)
Percent Imp. Area Draining to Infiltrative BMPs =	98.9%	
Capture Area Adjustment Factor = (Total)/(Infil) = Ca =	1.01	
Adjusted Required Recharge Volume = Ca x Rv	**1.606**	**Ac-ft**

Groundwater Recharge Volume Provided :

BMP	Provided Recharge Volume [Ac-ft]	
Infiltration Basin 1 =	1.908	
Infiltration Basin 2 =	2.457	
Total Provided Recharge Volume =	**4.365**	**Ac-ft**

PROVIDED GROUNDWATER RECHARGE VOLUME IS GREATER THAN OR EQUAL TO THE REQUIRED RECHARGE VOLUME, THEREFORE PROPOSED STORMWATER MANAGEMENT DESIGN IS IN COMPLIANCE WITH STANDARD 3.

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Standard 4: Water Quality Volume Summary

$V_{WQ} = (D_{WQ} / 12 \text{ in/ft}) \times (A_{IMP} \times 43{,}560 \text{ SF/Ac})$ **where:**

V_{WQ} = Required Water Quality Volume [CF]

D_{WQ} = Water Quality Depth : 1-inch for discharges within a Zone II or Interim Wellhead Protection Area, to or near critical areas, runoff from LUHPPL, or exfiltration to soil with infiltration rate 2.4 in/hr or greater; ½-inch for discharges to other areas.

A_{IMP} = Post-development Impervious Area; may exclude rooftop and retaining wall areas [Ac]

Required Water Quality Volume:

Drainage Area/ Treatment Train	A_{IMP} [Ac]	D_{WQ} [in]	V_{WQ} Required [CF]	
PDA-1A	11.633	1	42,228	
PDA-1C	0.112	1	407	
PDA-1D	0.958	1	3,478	
PDA-2A	4.767	1	17,304	
PDA-2B	0.213	1	773	
Total Required Water Quality Volume:			64,190	Cubic Feet

Provided Water Quality Volume:

Drainage Area/ Treatment Train	BMP	Water Quality Volume Provided [CF]	
PDA-1A	Sediment Forebay	4,470	
PDA-1A	Infiltration Basin 2	107,048	
PDA-2A	Infiltration Basin 1	83,111	
WQI-1	Water Quality Inlet 1	16,953	
WQI-2	Water Quality Inlet 2	511	
WQI-3	Water Quality Inlet 3	351	
WQI-4	Water Quality Inlet 4	741	
Total Provided Water Quality Volume:		213,185	Cubic Feet

WATER QUALITY VOLUME PROVIDED IS GREATER THAN OR EQUAL TO THE REQUIRED WATER QUALITY VOLUME, THEREFORE PROPOSED STORMWATER MANAGEMENT DESIGN IS IN COMPLIANCE WITH STANDARD 4.

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BEALS + THOMAS
Proprietary Water Quality Inlet Sizing

Step 1: Define Minimum Flow Rate per Water Quality Inlet to Treat Desired Water Quality Volume

Water quality inlets are sized based on flow rate; therefore expressing Water Quality Volume as a flow rate based on the percentage of cumulative average volume captured ensures systems are sized to achieve the desired Water Quality treatment level.

$Q = (q_u)(A)(WQV)$ where:

Q = peak flow rate associated with first 1.0-inch of runoff [CFS]

q_u = The Peak Discharge [CFS/mi^2/in] Massachusetts DEP Standard Method to Convert Required Water Quality Volume to a Discharge Rate for Sizing Flow Based Manufactured Proprietary Stormwater Treatment Practices

A = Contributing Drainage Area, Impervious Surface Only [Ac]

WQV = The Water Quality Treatment Depth [In]

WQI No.	A (Ac)	Tc (Min)	WQV (in)	q_u (csm/in)	Q (cfs)
WQI-1	4.670	6.0	1.0	774	5.65
WQI-2	0.140	6.0	1.0	774	0.17
WQI-3	0.097	6.0	1.0	774	0.12
WQI-4	0.204	6.0	1.0	774	0.25
Total	5.111	Acres			

Step 2: Size Water Quality Inlet as recommended by Manufacturer

Note: Previously provided sizing report(s) for recommended models are still valid.
Tributary areas decreased slightly for WQI-1, 3, 4, and stayed the sa

Step 3: Water Quality Volume Provided by WQI unit(s)

Total Impervious Area Treated by WQI unit(s): 5.11 Acres
222,675 SF

Treated Water Quality Depth : 1.0 inches
(accounted for by Average Water Quality Flow Rate)

Total Water Quality Volume provided by Water Quality Inlets **18,556 CF**

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